Luminant

Cynthia Vodopivec
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6555 Sierra Dr.
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September 29, 2020

Sent via email

Mr. Andrew R. Wheeler, EPA Administrator
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Mail Code 5304-P
Washington, DC 20460

Re: Coleto Creek Power Plant Alternative Closure Demonstration

Dear Administrator Wheeler:

Coleto Creek Power, LLC (CCP) hereby submits this request to the U.S. Environmental Protection Agency (EPA) for approval of a site-specific alternative deadline to initiate closure pursuant to 40 C.F.R. § 257.103(f)(1) for the Primary Ash Pond located at the Coleto Creek Power Plant near Fannin, Texas. CCP is requesting an extension pursuant to 40 C.F.R. § 257.103(f)(1) to allow the Primary Ash Pond to continue to receive CCR and non-CCR wastestreams after April 11, 2021, such that retrofits can be completed. The Primary Ash Pond is an eligible unlined CCR surface impoundment as defined under 40 C.F.R. § 257.53.

Enclosed is a demonstration prepared by Burns & McDonnell that addresses all of the criteria in 40 C.F.R. § 257.103(f)(1)(i)-(iii) and contains the documentation required by 40 C.F.R. § 257.103(f)(1)(iv). As allowed by the agency, in lieu of hard copies of these documents, electronic files were submitted to Kirsten Hillyer, Frank Behan, and Richard Huggins via email. If you have any questions regarding this submittal, please contact Renee Collins at 214-875-8338 or renee.collins@luminant.com.

Sincerely,

Cynthia Vodopivec
VP - Environmental Health & Safety

Enclosure

cc: Kirsten Hillyer
Frank Behan
Richard Huggins

Coleto Creek CCR Surface Impoundment Demonstration for a Site-Specific Alternative to Initiation of Closure Deadline

Coleto Creek Power, LLC

Coleto Creek Power Plant
Project No. 122702

Revision 0
September 28, 2020

Burns & McDonnell
Engineering Firm F-845

Coleto Creek CCR Surface Impoundment Demonstration for a Site-Specific Alternative to Initiation of Closure Deadline

Prepared for

Coleto Creek Power, LLC
Coleto Creek Power Plant
Project No. 122702
Fannin, Texas

Revision 0
September 28, 2020

Prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

INDEX AND CERTIFICATION

Coleto Creek Power, LLC
Coleto Creek CCR Surface Impoundment
Demonstration for a Site-Specific Alternative to Initiation of Closure Deadline

Report Index

Certification

I hereby certify, as a Professional Engineer in the state of Texas, that the information in this document as noted in the above Report Index was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by the Coleto Creek Power, LLC or others without specific verification or adaptation by the Engineer.

RANDELL LEE SEDLACEK
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Randell Lee Sedlacek
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Randell Lee Sedlacek, P.E.
(Texas License No. 99506)

Date: September 28, 2020

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LIST OF ABBREVIATIONS

Abbreviation	**Term/Phrase/Name**
BMcD	Burns & McDonnell
BOP	Balance of Plant
B&W	Babcock & Wilcox
CCP	Coleto Creek Power, LLC
CCR	Coal Combustion Residual
CFR	Code of Federal Regulations
Coleto Creek	Coleto Creek Power Plant
CSC	Compact Submerged Conveyors
ELG Rule	Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category
EPA	Environmental Protection Agency
GWPS	Groundwater Protection Standards
MAX-LP	Mechanical Ash Extractor - Low Profile
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
SGC	Submerged Grind Conveyor
SSI(s)	Statistically Significant Increases
SSL(s)	Statistically Significant Levels
UCC	United Conveyor Corporation

1.0 INTRODUCTION

On April 17, 2015, the Environmental Protection Agency (EPA) issued the federal Coal Combustion Residual (CCR) Rule, 40 C.F.R. Part 257, Subpart D, to regulate the disposal of CCR materials generated at coal-fueled electric generating units. The rule is being administered under Subtitle D of the Resource Conservation and Recovery Act (RCRA, 42 U.S.C. § 6901 *et seq*.).

On August 28, 2020, the EPA Administrator issued revisions to the CCR Rule that require all unlined surface impoundments to cease receipt of CCR and non-CCR waste and initiate closure by April 11, 2021, unless an alternative deadline is requested and approved. 40 C.F.R. § 257.101(a)(1) (85 Fed. Reg. 53,516 (Aug. 28, 2020)). Specifically, owners and operators of a CCR surface impoundment may seek and obtain an alternative closure deadline by demonstrating that there is currently no alternative capacity available on or off-site and that it is not technically feasible to complete the development of alternative capacity prior to April 11, 2021. 40 C.F.R. § 257.103(f)(1). To make this demonstration, the facility is required to provide detailed information regarding the process the facility is undertaking to develop the alternative capacity. 40 C.F.R. § 257.103(f)(1). Any extensions granted cannot extend past October 15, 2023, except an extension can be granted until October 15, 2024, if the impoundment qualifies as an "eligible unlined CCR surface impoundment" as defined by the rule. 40 C.F.R. § 257.103(f)(1)(vi). Regardless of the maximum time allowed under the rule, EPA explains in the preamble to the Part A rule that each impoundment "must still cease receipt of waste as soon as feasible, and may only have the amount of time [the owner/operator] can demonstrate is genuinely necessary." 85 Fed. Reg. at 53,546.

This document serves as CCP's Demonstration for a site-specific alternative deadline to initiate closure pursuant to 40 C.F.R. § 257.103(f)(1) for the Primary Ash Pond at the Coleto Creek Power Plant (Coleto Creek), located near Fannin, Texas. The Primary Ash Pond qualifies as an "eligible unlined CCR surface impoundment" as defined under 40 C.F.R. § 257.53.

To obtain an alternative closure deadline under 40 C.F.R. § 257.103(f)(1), a facility must meet the following three criteria:

1. **§ 257.103(f)(1)(i)** - There is no alternative disposal capacity available on-site or off-site. An increase in costs or the inconvenience of existing capacity is not sufficient to support qualification;
2. **§ 257.103(f)(1)(ii)** - Each CCR and/or non-CCR wastestream must continue to be managed in that CCR surface impoundment because it was technical infeasible to complete the measures necessary to obtain alternative disposal capacity either on or off-site of the facility by April 11, 2021; and

3. **§ 257.103(f)(1)(iii)** - The facility is in compliance with all the requirements of the CCR Rule.

To demonstrate that the first two criteria above have been met, 40 C.F.R. § 257.103(f)(1)(iv)(A) requires the owner or operator to submit a work plan that contains the following elements:

- A written narrative discussing the options considered both on and off-site to obtain alternative capacity for each CCR and/or non-CCR wastestream, the technical infeasibility of obtaining alternative capacity prior to April 11, 2021, and the option selected and justification for the alternative capacity selected. The narrative must also include all of the following:
    - An in-depth analysis of the site and any site-specific conditions that led to the decision to select the alternative capacity being developed;
    - An analysis of the adverse impact to plant operations if the CCR surface impoundment in question were to no longer be available for use; and
    - A detailed explanation and justification for the amount of time being requested and how it is the fastest technically feasible time to complete the development of the alternative capacity.
- A detailed schedule of the fastest technically feasible time to complete the measures necessary for alternative capacity to be available, including a visual timeline representation. The visual timeline must clearly show all of the following:
    - How each phase and the steps within that phase interact with or are dependent on each other and the other phases;
    - All of the steps and phases that can be completed concurrently;
    - The total time needed to obtain the alternative capacity and how long each phase and step within each phase will take; and
    - At a minimum, the following phases: engineering and design, contractor selection, equipment fabrication and delivery, construction, and start up and implementation.
- A narrative discussion of the schedule and visual timeline representation, which must discuss the following:
    - Why the length of time for each phase and step is needed and a discussion of the tasks that occur during the specific step;
    - Why each phase and step shown on the chart must happen in the order it is occurring;
    - The tasks that occur during each of the steps within the phase; and
    - Anticipated worker schedules.
- A narrative discussion of the progress the owner or operator has made to obtain alternative capacity for the CCR and/or non-CCR wastestreams. The narrative must discuss all the steps taken, starting from when the owner or operator initiated the design phase up to the steps occurring when the demonstration is being compiled. It must discuss where the facility currently is on the timeline and the efforts that are currently being undertaken to develop alternative capacity.

To demonstrate that the third criterion above has been met, 40 C.F.R. § 257.103(f)(1)(iv)(B) requires the owner or operator to submit the following information:

- A certification signed by the owner or operator that the facility is in compliance with all of the requirements of 40 C.F.R. Part 257, Subpart D;
- Visual representation of hydrogeologic information at and around the CCR unit(s) that supports the design, construction and installation of the groundwater monitoring system. This includes all of the following:
    - Map(s) of groundwater monitoring well locations in relation to the CCR unit(s);
    - Well construction diagrams and drilling logs for all groundwater monitoring wells; and
    - Maps that characterize the direction of groundwater flow accounting for seasonal variations.
- Constituent concentrations, summarized in table form, at each groundwater monitoring well monitored during each sampling event;
- A description of site hydrogeology including stratigraphic cross-sections;
- Any corrective measures assessment conducted as required at § 257.96;
- Any progress reports on corrective action remedy selection and design and the report of final remedy selection required at § 257.97(a);
- The most recent structural stability assessment required at § 257.73(d); and
- The most recent safety factor assessment required at § 257.73(e).

2.0 WORKPLAN

To demonstrate that the criteria in 40 C.F.R. § 257.103(f)(1)(i) and (ii) have been met, the following is a workplan, consisting of the elements required by § 257.103(f)(1)(iv)(A). Specifically, this workplan documents that there is no alternative capacity available on or off-site for each of the CCR and non-CCR wastestreams that CCP plans to continue to manage in the Primary Ash Pond and discusses the options considered for obtaining alternative disposal capacity. As discussed in more detail below, **CCP has elected to convert to dry ash handling at Coleto Creek.** The workplan provides a detailed schedule for the conversion project, including a narrative description of the schedule and an update on the progress already made toward obtaining the alternative capacity. In addition, the narrative includes an analysis of the site-specific conditions that led to the decision to convert to dry handling and an analysis of the adverse impact to plant operations if Coleto Creek were no longer able to use the Primary Ash Pond.

2.1 No Alternative Disposal Capacity and Approach to Obtain Alternative Capacity - § 257.103(f)(1)(iv)(A)(1)

CCP owns and operates Coleto Creek, a single-unit, 650-megawatt coal-fired facility located in Fannin, Texas that burns Powder River Basin coal. Coleto Creek has one CCR surface impoundment, known as the Primary Ash Pond, which receives both CCR and non-CCR wastestreams. The pond was constructed between 1976 and 1977 during the initial development of the power plant and is approximately 190 acres in size with a storage volume of 2,700 acre-feet. The pond is considered unlined per the requirements of the CCR Rule but meets all location restriction requirements. A groundwater monitoring system was developed for the Primary Ash Pond in 2017 and Assessment Monitoring was initiated in June of 2018, but no statistically significant levels of Appendix IV constituents have been identified. As such, the Primary Ash Pond meets the definition of an eligible unlined CCR surface impoundment. A site plan can be found on Figure 1 in Appendix A and a site water balance diagram can be found on Figure 2 in Appendix A.

2.1.1 CCR Wastestreams

CCP evaluated each CCR wastestream placed in the Primary Ash Pond at Coleto Creek. For the reasons discussed below in Table 2-1, the following CCR wastestreams must continue to be placed in the Primary Ash Pond due to lack of alternative capacity both on and off-site.

Table 2-1: Coleto Creek CCR Wastestreams

CCR Wastestream	Average Flow (gpm)	Description	CCP Notes
Fly Ash	Dry Handled with Intermittent Sluices from Silo for Disposal	Fly ash is currently collected dry and conveyed to a storage silo near the Primary Ash Pond. Normally, the ash is hauled offsite for beneficial use. Periodically, the market will not accept the ash due to varying properties or seasonal demand, in which case the ash is sluiced from the silo to the Primary Ash Pond. No conditioning equipment is currently installed to allow for trucking the material offsite for disposal, and no additional CCR units exist onsite at Coleto.	For normal operation, fly ash will continue to be handled dry using the current system and hauled offsite for beneficial use based on market conditions. Equipment will be added at the silo storage area to allow for conditioning of non-marketable ash and offsite disposal in a nearby municipal landfill. The silo will need to be emptied to perform this work, and this will be completed during the same outage used to execute the bottom ash conversion. The existing silo sluice system will be eliminated prior to the requested April 20, 2023 site-specific deadline to initiate closure.
Bottom Ash	Unknown	Bottom ash is currently sluiced to the Primary Ash Pond, where it is either removed for beneficial use or remains. The sluice water overflows from the Primary Ash Pond to the Secondary Settling Pond and is discharged via Outfall 003.	A new dry bottom ash system (CSC) will be installed. Bottom ash, economizer ash, and mill rejects will be collected and sent offsite for beneficial use or transported to a nearby municipal landfill. This wastestream will cease flow to the Primary Ash Pond prior to the requested April 20, 2023 site-specific deadline to initiate closure.
Economizer Ash	Unknown	Economizer ash is handled with the bottom ash.	
Mill Rejects (non-CCR but handled with CCR wastestreams)	Unknown	Mill rejects are handled with the bottom ash.	

2.1.2 Non-CCR Wastestreams

CCP evaluated each non-CCR wastestream placed in the Primary Ash Pond at Coleto Creek. For the reasons discussed below in Table 2-2, each of the following non-CCR wastestreams must continue to be placed in the Primary Ash Pond due to lack of alternative capacity both on and off-site.

Table 2-2: Coleto Creek Non-CCR Wastestreams

Non-CCR Wastestream	Average Flow (gpm)	Description	CCP Notes
Demineralizer Regeneration Flows and RO Reject	Unknown (Intermittent)	Collected in demineralizer sump and pumped to Primary Ash Pond.	Relocation of this flow will require modification of the site discharge permit, adding a minimum of 1000 feet of piping, and potentially replacing the demineralizer sump pumps and upsizing the power feeds. This wastestream will be rerouted to the existing Secondary Pond and/or Evaporation Pond prior to the requested April 20, 2023 site specific deadline to initiate closure.
Boiler Sump Discharges	Unknown (Intermittent)	Collects flow from multiple sources including laboratory drains, hopper overflow (ash contact/quench water), boiler blowdown condensate polisher regeneration, water pretreatment filter backwash, oil/water separator discharge, transformer area sump, stormwater from ash piping trench, fabric filter area wash, air heater wash, and boiler wash. Currently pumped to the Primary Ash Pond or the Evaporation Pond.	During normal operations, this wastestream will be rerouted to the existing Evaporation Pond prior to the April 11, 2021 deadline. During outages, this flow will be directed to the Primary Ash Pond to allow for the air heater wash and boiler wash volumes to be contained within that impoundment and not exceed the capacity of the Evaporation Pond.

Other site flows are currently directed either to the discharge canal or the Evaporation Pond. The existing site water balance is included in Appendix A of this Demonstration (see Figure 2).

2.1.3 Site-Specific Conditions Supporting Alternative Capacity Approach - § 257.103(f)(1)(iv)(A)(1)(i)

The plant has adequate space available for the installation of a compact submerged conveyor system and has selected this solution as the preferred alternative for compliance with both the ELG and CCR Rules. As shown on Figure 1 in Appendix A, Coleto Creek is bounded by the Coleto Creek Reservoir to the north and east and Perdido Creek to the south. The western boundary is formed by FM 2987 (farm to market road). The remaining impoundments onsite (the Secondary Pond, Evaporation Pond and Coal Pile Runoff Pond) are not authorized to receive CCR material. Consequently, in order to continue to operate and generate electricity, Coleto Creek must continue to use the Primary Ash Pond for treatment of both CCR and non-

CCR wastestreams until the plant can be retrofitted with a dry bottom ash handling system, modifications can be made to the fly ash handling system, and non-CCR process flows can be redirected away from the impoundment. As EPA explained in the preamble of the 2015 rule, it is not possible for sites that sluice CCR material to an impoundment to eliminate the impoundment and dispose of the material offsite. *See* 80 Fed. Reg. 21,301, 21,423 (Apr. 17, 2015) ("[W]hile it is possible to transport dry ash off-site to [an] alternate disposal facility that is simply not feasible for wet-generated CCR. Nor can facilities immediately convert to dry handling systems.").

2.1.4 Impact to Plant Operations if Alternative Capacity Not Obtained – § 257.103(f)(1)(iv)(A)(1)(ii)

As described in Sections 2.1.1, 2.1.2, and 2.1.6 of this demonstration, in order to continue to operate, generate electricity, and comply with both the CCR Rule and the discharge permit conditions, Coleto Creek must continue to use the Primary Ash Pond for treatment of both CCR and non-CCR wastestreams until alternative disposal capacity can be developed. If the Primary Ash Pond were removed from service on April 11, 2021, Coleto Creek would be required to cease operation until the conversion project is completed.

Coal-fired generation from plants such as Coleto Creek has provided approximately 17% of the generating capacity in ERCOT in 2020 to date, and the reserve margins available are currently less than this percentage. If coal-fired generation were required to cease in Texas, the stability of the electric grid would be compromised. To continue operation of Coleto Creek, CCP must be allowed additional time to complete the following three primary activities in order to cease routing CCR and non-CCR wastestreams to the Primary Ash Pond:

- Installation of a compact submerged conveyor, storage bunker, and ancillary equipment (eliminates bottom ash, economizer, and pyrites sluice flows to the Primary Ash Pond).
- Installation of a pugmill to allow for conditioning of the fly ash and to allow for the potential offsite disposal in a municipal landfill when market conditions do not support beneficial use (eliminates intermittent fly ash sluice flows to the Primary Ash Pond).
- Reroute of all remaining non-CCR wastestreams to the Secondary Pond and/or Evaporation Pond, including adding piping and potentially replacing the demineralizer sump pumps (eliminates non-CCR flows to the Primary Ash Pond).

2.1.5 Options Considered Both On and Off-Site to Obtain Alternative Capacity

The options considered for alternative disposal capacity of the wastestreams currently routed to the Primary Ash Pond are summarized in Table 2-3. Additional details on the CCR and non-CCR wastestreams included in this demonstration request are found in Table 2-1 and Table 2-2, respectively.

Table 2-3: Alternatives for Disposal Capacity

Alternative Capacity Technology	Average Time to Construct (Months)[1]	Feasible at Coleto Creek?	Selected?	CCP Notes
Conversion to dry handling	33.8	Yes	Yes	A dry bottom ash conversion is being performed and design is underway for a CSC system. CCP will add a pugmill at the fly ash silo to eliminate fly ash sluicing as well. CCP expects to complete this project in a total of 33 months (the decision was made to proceed with the conversion in July 2020 and the project will complete in April 2023), primarily driven by the timing of the scheduled major outage for the unit with ERCOT.
Non-CCR wastewater basin	23.5	NA	No	These are not viable alternatives for CCP since the existing Secondary Pond and/or Evaporation Pond has the capacity to receive the non-CCR wastestreams (following permit modifications and redirection of these streams).
Wastewater treatment facility	22.3	NA	No	
New CCR surface impoundment	31	Yes	No	CCP believes construction of the dry ash handling systems will be completed within a similar timeframe. Nor would a new impoundment alone provide compliance with the ELG Rule.
Retrofit of a CCR surface impoundment	29.8	Yes	No	CCP believes construction of the dry ash handling systems will be completed within a similar timeframe and simultaneously allow for ELG compliance.
Multiple technology system	39.1	NA	No	This is not a viable alternative for CCP since the existing Secondary Pond and/or Evaporation Pond has the capacity to receive the non-CCR wastestreams (following permit modifications and redirection of these streams). Dry handling of the ash streams should provide the necessary compliance needs on the fastest feasible schedule for the site.

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[1] From Table 3. See 85 Fed. Reg. at 53,534.

Alternative Capacity Technology	Average Time to Construct (Months)[1]	Feasible at Coleto Creek?	Selected?	CCP Notes
Temporary treatment system	Not defined	No	No	These systems would not realistically provide the required non-CCR wastewater storage capacity to replace the Primary Ash Pond. Rerouting flow to a temporary treatment system would require similar modifications to those required to reroute to the existing Secondary Pond and/or Evaporation Pond, and CCP has chosen to devote resources to completion of the selected project scope rather than a temporary solution.

2.1.6 Approach to Obtain Alternative Capacity

CCP plans to convert to dry handling of all CCR at Coleto Creek. In May 2019, CCP hired Burns & McDonnell (BMcD) to evaluate potential options for compliance with the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category (ELG Rule). The options considered are described in Table 2-4, below. BMcD followed this with a review of landfill disposal alternatives following release of the proposed Part A rule in December of 2019.

Table 2-4: Technology Alternatives Considered for CCR wastestreams

Technology	Practicability or Feasibility for Coleto Creek
Under boiler Drag Chain Conveyor System	Feasible
Remote Drag Chain Conveyor System	Feasible. Challenging to add remote pumps and power supply for recirculation not required with other options.
Dry Belt/Tray Conveying System	Feasible
Pneumatic Conveying System	Feasible
Vibratory Conveying System	Not practicable; high O&M and not industry standard practice for bottom ash.
Remote Settling Basins	Not practicable; high O&M and both water balance and safety concerns; challenging to add remote pumps and power supply for recirculation not required with other options.
Remote Dewatering Bins	Not practicable; high O&M and no longer industry standard practice for bottom ash (replaced by remote conveyors for similar costs).

As part of the review, BMcD recommended conversion to a “dry” bottom ash handling system based on the Babcock & Wilcox (B&W) Submerged Grind Conveyor (SGC) or United Conveyor Corporation (UCC) Mechanical Ash Extractor - Low Profile (MAX-LP) system. These systems are referred to as Compact Submerged Conveyors (CSC) herein. Of the feasible under boiler options presented in Table 2-4, this alternative should have the shortest equipment lead time and the shortest plant outage requirement as it will not require removal and replacement of the current bottom ash hoppers. For this and other business factors, CCP has selected this technology for implementation at Coleto Creek for compliance with the ELG rule requirements to eliminate discharge of ash transport water. Until the installation of the B&W SGC or UCC MA-LP system is complete, the Primary Ash Pond will need to receive CCR and non-CCR wastestreams similar to the existing configuration; however, after the tie-in outage the Primary Ash Pond can be removed from service and closed.

For the dry bottom ash handling conversion at Coleto, a new CSC system would replace the boiler hopper ash sluicing system. During operation, bottom ash falls from the boiler into the hopper and is routed through the crusher. The crushed ash is removed by the conveyor, which consists of a chain with metal flight bars that drags ash along the bottom of the conveyor to the inclined “dewatering” section. The dewatering section contains a chain conveyor that pulls bottom ash up an inclined ramp while water gravity drains back into the CSC. The inclined ramp drops dewatered ash into a three-walled bottom ash bunker. Typically, ash collects in the bunker and is loaded into haul trucks with a front-end loader. Alternatively, the bunker can be configured so that haul trucks can back into the bunker and accept ash directly.

Economizer ash and mill rejects typically require a separate system. Economizer ash will likely be handled with a series of dry flight conveyors that route the ash from the existing economizer hoppers to the CSC in a dry condition, thus eliminating the use of ash transport water. This ash is comingled with bottom ash in the CSC and deposited in the bunker with the bottom ash. The economizer ash could potentially be incorporated with the fly ash system if additional testing indicates that this would not impact marketability of the fly ash for beneficial use. The existing bottom ash sluice pumps are replaced with smaller pumps dedicated to the mill rejects and hopper flushing system, which sluice mill rejects directly to the bottom ash hoppers. Sluice flows from the mill reject system are not considered ash transport water since mill rejects are considered pre-combustion waste (i.e. not CCR).

Seal trough and hopper makeup to the existing boiler are maintained using the existing service water connections. Discharge from these systems, and overflow from the mill rejects sluice cycles, continue to be removed by the existing bottom ash sump pumps near the hopper. This overflow is classified as quench water rather than transport water and may also be conveyed to a process pond.

Per the BMcD ELG compliance review and landfill alternatives assessment, conversion to a dry bottom ash handling system such as the CSC at Coleto Creek would include the following general scope:

- Install 4 submerged conveyors and 2 new clinker grinders.
- Install two new dry flight conveyors to capture economizer ash and route it to the new submerged bottom ash conveyor system.
- Install a new concrete bunker equipped with drainage trenches and sumps to route any contact stormwater or excess quench water to the boiler sump.
- Install an overflow tank and pumps to allow for the pyrites to be sluiced into the boiler hopper and comingled with the bottom ash, similar to current operations (where they are comingled at the pond). This water is not considered ash transport water since pyrites are a pre-combustion material. Any excess water from the overflow tank will be routed to the boiler sump through existing piping.
- All bottom ash produced will be removed by Boral and sent offsite for beneficial use, similar to current operations. Any material that cannot be marketed will likely be disposed of in an offsite municipal landfill.

BMcD also reviewed current fly ash operations and water handling. As noted above, fly ash stored in the existing fly ash silos may currently be sluiced to the Primary Ash Pond during periods which Boral is not able to market the fly ash for beneficial reuse. CCP will need to remove this system and install a pugmill so fly ash can instead be loaded onto trucks for disposal.

BMcD noted in their review that CCP plans to modify the discharge permit as part of the Primary Ash Pond closure (or earlier) to reroute flows from the from the Coal Pile Runoff Pond and Sewage Treatment Plant effluent from the Evaporation Pond directly to the condenser discharge canal. Additionally, CCP will need to redirect the remaining non-CCR process flows (Demin Sump and Boiler Sump discharges) to the Secondary Pond and/or Evaporation Pond concurrently with the elimination of the bottom ash transport water to allow for initiation of the Primary Ash Pond closure.

2.1.7 Technical Infeasibility of Obtaining Alternative Capacity prior to April 11, 2021

Based on the foregoing facts, CCP cannot cease all CCR and non-CCR wastestreams and initiate closure of the Primary Ash Pond until the wet-to-dry ash handling conversion project is complete. The Primary Ash Pond is an "eligible unlined CCR surface impoundment" under § 257.53 and not previously subject to closure. CCP began its selected compliance project execution for Coleto Creek with scoping studies in 2019 and is developing specifications to procure the necessary long-lead equipment items in 2021. CCP investigated the possibility for meeting the alternate liner demonstration allowed under the proposed Part B Rule. The final requirements for this are unknown at this time; however, CCP has since elected to proceed with modifying plant operations and installing the CSC dry handling technology at Coleto Creek. This work is in progress but has not yet completed. There is a 28-day major outage scheduled for the Spring of 2021; however, it is not technically feasible to procure the equipment, perform the necessary detailed design, and complete the pre-outage construction activities over the course of the next six months. The conversion is forecasted to be completed in the Spring of 2023 as part of the next scheduled major outage (longer than 10 days). Consequently, it is not possible to implement the measures discussed above in a way that would likely be successful by April 11, 2021.

The conditions at Coleto Creek demonstrate that no alternative disposal capacity is available on-site or off-site, satisfying the requirement of 40 C.F.R. § 257.103(f)(1)(i), and CCP respectfully requests a site-specific extension of the deadline to initiate closure of the Primary Ash Pond until April 20, 2023.

2.1.8 Justification for Time Needed to Complete Development of Alternative Capacity Approach – § 257.103(f)(1)(iv)(A)(1)(iii)

The schedule for developing alternative disposal capacity is described in more detail in Sections 2.2 and 2.3. The schedule milestones and current progress are summarized in Table 2-5 below. CCP believes the schedule provided represents the fastest technically feasible timeframe for compliance at Coleto Creek, driven primarily by the need for a major outage to allow for removal of the current sluicing equipment and installation of the new crushers and conveyors. These outages are coordinated with ERCOT and are not easily modified due to the limited reserve generating capacity and resulting potential impacts to grid stability. Moreover, the project duration of approximately 33 months (after selection) including the current stage of scope development (including laser scanning and development of technical specifications for the procurement of the major equipment) until startup of the dry ash handling system is comparable to the average dry ash conversion timeline identified by EPA in the final Part A rule. See Table 3, 85 Fed. Reg. at 53,534.

Table 2-5: Compliance Project Progress Milestones

Year or Progress Reporting Period	Status	Milestone Description	CCP Notes
2020	Completed	Selection of dry ash handling solution and preparation of request for alternative site-specific deadline for initiation of closure of the Primary Ash Pond.	The bottom ash, economizer, fly ash, and pyrites wastestreams will be eliminated in the scheduled major outage in the Spring of 2023. Equipment must be procured to support the pre-outage construction schedule.
2020	On Schedule	FEED study and detailed scope development and specifications for dry bottom ash equipment	
April 30, 2021	Scheduled	Receive management approval for project based on budget estimate, issue conveyor specifications for bid, initiate permitting activities	Normal operation of the boiler sump discharge will be directed to the Evaporation Pond; however, outage flows will continue to be directed to the Primary Ash Pond. Detailed design for conveyors and BOP systems, and initiation of permitting activities will be occurring in 2021.
October 31, 2021	Scheduled	Award contract for conveyor design and submittal development, receive initial submittals, and initiate detailed engineering design for BOP systems	

Year or Progress Reporting Period	Status	Milestone Description	CCP Notes
April 30, 2022	Scheduled	Submit application for NPDES permit modifications, provide full notice to proceed to conveyor manufacturer to initiate fabrication of equipment	Fabrication released to support delivery dates during the scheduled pre-outage construction period.
October 31, 2022	Scheduled	Award construction contracts, perform site preparation activities (including necessary utility relocation), and initiate bunker construction	Allows contractors to procure necessary commodities to support pre-outage construction before the Spring 2023 major outage.
April 20, 2023	Scheduled	Completion of dry bottom ash conversion, pugmill installation, and re-route of non-CCR wastestreams	Normal flows of CCR wastewater to the Primary Ash Pond will cease by this date. Non-CCR wastestreams will be routed to the Secondary Pond and/or Evaporation Pond as described in Table 2-2. Punchlist items will be underway, but the unit will be started up and operating the new dry ash handling system as of April 20, 2023. CCP will no longer be routing wastestreams to the Primary Ash Pond.

2.2 Detailed Schedule to Obtain Alternative Disposal Capacity - § 257.103(f)(1)(iv)(A)(2)

The required visual timeline representation of the schedule is included in Appendix B of this demonstration and described further in Section 2.3 below.

2.3 Narrative of Schedule and Visual Timeline - § 257.103(f)(1)(iv)(A)(3)

The third section for the workplan is a "detailed narrative of the schedule and the timeline discussing all the necessary phases and steps in the workplan, in addition to the overall timeframe that will be required to obtain capacity and cease receipt of waste." 85 Fed. Reg. at 53,544. As EPA explained in the preamble to the Part A rule, this section of the workplan must discuss "why the length of time for each phase and step is needed, including a discussion of the tasks that occur during the specific stage of obtaining alternative capacity. It must also discuss the tasks that occur during each of the steps within the phase." 85 Fed. Reg. at 53,544. In addition, the schedule should "explain why each phase and step shown on the chart must happen in the order it is occurring and include a justification for the overall length of the phase" and the "anticipated worker schedule." 85 Fed. Reg. at 53,544. EPA notes the overall "discussion of the schedule assists EPA in understanding why the time requested is accurate." 85 Fed. Reg. at 53,544

Outage: The primary activity impacting the project schedule is the outage time required for installation of the dry ash handling system. There is a significant amount of work that is scheduled to take place during the unit outage, including removing the existing ash sluicing equipment, installing the new ash and pyrites handling equipment, completing piping ties, completing electrical ties, and performing startup of the new equipment and tuning of the ash and pyrites handling systems. CCP has major outages scheduled for the Spring of every other year. Based on generation capacity in Texas, the grid operator (ERCOT) does not typically allow CCP to adjust these outages or perform them in the summer months. It is not feasible to procure the necessary equipment to meet the Spring 2021 outage given the steps required for internal project approvals, the permitting efforts required for the project, and the lead time required for the equipment (which has not yet been bid but typically takes 9-12 months from award to receipt). The current schedule in Appendix B allows for a longer lead time but is focused on completion of the design, delivery of the equipment, and completion of pre-outage construction in advance of the Spring 2023 outage.

Design, Procurement, and Permitting Activities: CCP hired BMcD to prepare an AACE Class 3 Budgetary and Feed Study to develop preliminary engineering, a Level 2 schedule, and budgetary cost data to support owner review of the proposed dry bottom ash conversion project. This effort typically requires three months to get budgetary quotes from equipment suppliers and local subcontractors and will include laser scanning to identify interferences and firm up project scope as well as preparing specifications to procure the necessary ash handling equipment (which is part of the critical path for the project). Following the completion of the project budget under the Feed Study, CCP has included a three-month period for review, modifications to the project scope, and management approval for the project. A portion of this period will be impacted by the year-end holidays. Following management approval, CCP will develop the commercial terms for the contracts and package them with the technical specifications. This work is anticipated to take four weeks based on CCP procurement experience. CCP will bid and award a contract for the engineering (under limited notice to proceed (LNTP)) and fabrication (under full notice to proceed (FNTP)) of the bottom ash, economizer ash, pyrites handling, and fly ash pugmill equipment. CCP has included four weeks to bid the equipment contract and two months to select the preferred supplier and negotiate the contract terms for the LNTP.

The balance of plant (BOP) design will be completed by an engineering firm which will procure site survey and pilot trenching services to support detailed engineering while the equipment vendor prepares the initial submittals for their scope of supply. These submittals are usually received two to three months after equipment award and after these submittals are approved, the vendor typically starts with fabrication and the engineer begins the detailed design effort based on this information. Design will proceed, but the fabrication will be delayed slightly to support delivery of the equipment in the pre-outage construction period. The typical lead time on this equipment is 9-12 months; however, CCP expects this lead time to increase in the coming months as much of the industry will be procuring similar equipment. CCP has included 11 months for fabrication from the FNTP date, which essentially extends the lead time to 16 months total but provides for delivery once the mechanical contractor is onsite to receive the equipment in the necessary pre-outage construction period. If the lead time grows beyond what is allotted due to increased demand from industry, it could affect CCP's ability to get the conveyors onsite in time to support pre-construction activities for the Spring 2023 outage. This risk is reduced by accelerating the engineering of the equipment (with LNTP) as shown in the current project schedule.

The BOP engineer will prepare bid documents for site preparation and below-grade construction, DCS equipment, above-grade mechanical/structural construction, and above-grade electrical construction. These contracts can be prepared following award of the CSC package since procurement of the CSC equipment will have the longest lead time and the design for these construction packages will hinge on the submittals received from the CSC vendor. The current schedule includes a total of ten months for this design based on BMcD's experience with similar projects, including overlapping activities of four months for civil and underground design, five months for structural design of the bunkers and mechanical design (including pipe routing and development of specifications for contractor-supplied materials), and five months for electrical design, including cable tray and conduit routing, lighting plans, grounding plans, etc. CCP has included three weeks to review, address comments, and issue each contract, and this overlaps as the last three weeks of the total 10-month duration shown for engineering. The construction packages can be issued and awarded sequentially as allowed by the design process and will include a four-week bid period and eight-week selection and award period. This includes time to review bids, short-list the bidders, interview the short-listed firms, identify the preferred contractor, and negotiate the terms and conditions for the work. The bid and award of the construction contracts will be performed concurrently with acquiring the necessary permits for this project and must be completed as necessary to support the pre-outage construction. These construction contracts will purchase balance of plant items and commodities such as structural steel, piping, valves, raceway, cable, and other commodities as necessary to support the construction, and these pre-planning and mobilization activities are included in advance of the pre-outage construction period.

Construction Activities: The durations shown on the project are estimates by BMcD and are based on an average work schedule of five days per week, are subject to delays in procuring and delivering new equipment and construction labor, and are based on the following scope of work which may be performed in the sequence listed below:

- Consultant/surveyor(s) shall perform and transmit data from site survey (six weeks) and pilot trenching scope (six weeks).
- Contractors shall mobilize to the site as required per the schedule.
- Site Prep and Below-Ground Construction Contractor shall complete site preparation and below-grade construction (e.g. utility reroutes, laydown, and parking areas as well as any road improvements required). This activity is expected to take two months.
- Above-Ground Mechanical/Structural Contractor shall perform structural excavation, bunker construction, and conveyor support foundations). This must be completed before mechanical erection can begin. This activity is expected to take two months.
- Above-Ground Mechanical/Structural Contractor shall install CSC system (estimated at four months of pre-outage work, followed by one month of work during the available outage duration) to include:
    - Receipt of equipment from equipment vendor
    - Installation of support steel and platforms to provide access for the new conveyors.
    - Installation of submerged conveyors and clinker grinders.
    - New dry flight conveyors to capture economizer ash and route it to the new CSC system.
    - New bunker sump pumps and piping to route any contact stormwater or excess quench water to the boiler sump.
    - An overflow tank and pumps to allow for the pyrites to be sluiced into the boiler hopper and comingled with the bottom ash.
    - Installation of a new pugmill at the fly ash silo (two months of work finishing during the outage). Includes new water supply piping, support steel, and isolation valves.
    - Redirect process flows from the Primary Ash Pond to the Secondary Pond and/or Evaporation Pond (two months of labor for piping installation after permit modifications and pump/power supply modifications).

- The Electrical Contractor will install new electrical equipment (if new motor control centers are required), cable tray, conduit, and cable in accessible areas prior to the outage, as well as install new lighting at the bunker area. During the outage, the Electrical Contractor will terminate the power feeds and finish routing to new equipment following behind the Mechanical Contractor. The current schedule shows three months of pre-outage electrical work and the electrical contractor should finish prior to the end of the unit outage.

CCP will provide ongoing schedule updates in the required semi-annual progress reports.

2.4 Progress Towards Obtaining Alternative Capacity - § 257.103(f)(1)(iv)(A)(4)

In the preamble to the final Part A rule, EPA explains that this “section [of the workplan] must discuss all of the steps taken, starting from when the owner or operator initiated the design phase all the way up to the current steps occurring while the workplan is being drafted.” 85 Fed. Reg. at 53,544. The discussion also “must indicate where the facility currently is on the timeline and the processes that are currently being undertaken at the facility to develop alternative capacity.” 85 Fed. Reg. at 53,545.

As show in Appendix B and described in Section 2.1.6 and Table 2-5, CCP has made progress toward creating alternative disposal capacity for the CCR and non-CCR wastestreams at Coleto Creek. The conceptual design has been evaluated and the technical solution for compliance has been identified. As part of this process, a laser scan of the boiler area has been completed and transmitted to the equipment supplier(s). The equipment suppliers are providing budgetary quotes and three-dimensional modeling activities to identify potential interferences. BMcD will review the information received from the vendors to complete the preliminary design and develop the overall project scope and budget as well as the necessary equipment specifications. The remaining activities are provided in Appendix B and summarized in Table 2-5.

3.0 DOCUMENTATION AND CERTIFICATION OF COMPLIANCE

To demonstrate that the criteria in 40 C.F.R. § 257.103(f)(1)(iii) has been met, the following information and submissions are submitted pursuant to 40 C.F.R. § 257.103(f)(1)(iv)(B) to demonstrate that the Primary Ash Pond at Coleto Creek is in compliance with the CCR Rule.

3.1 Owner's Certification of Compliance - § 257.103(f)(1)(iv)(B)(1)

In accordance with 40 C.F.R. § 257.103(f)(1)(iv)(B)(1), I hereby certify that, based on my inquiry of those persons who are immediately responsible for compliance with environmental regulations for the CCR surface impoundments at Coleto Creek, the Primary Ash Pond is in compliance with all of the requirements contained in 40 C.F.R. Part 257, Subpart D – Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments. Coleto Creek's CCR compliance website is up-to-date and contains all the necessary documentation and notification postings.

COLETO CREEK POWER LLC

Cynthia E Vod

Cynthia Vodopivec
VP - Environmental Health & Safety
September 28, 2020

3.2 Visual Representation of Hydrogeologic Information - § 257.103(f)(1)(iv)(B)(2)

Consistent with the requirements of § 257.103(f)(1)(iv)(B)(2)(i) – (iii), CCP has attached the following items to this demonstration:

- Map(s) of groundwater monitoring well locations in relation to the CCR unit (Attachment C1)
- Well construction diagrams and drilling logs for all groundwater monitoring wells (Attachment C2)
- Maps that characterize the direction of groundwater flow accounting for seasonal variations (Attachment C3)

3.3 Groundwater Monitoring Results - § 257.103(f)(1)(iv)(B)(3)

Tables summarizing constituent concentrations at each groundwater monitoring well through the first 2020 semi-annual monitoring period are included as Attachment C4.

3.4 Description of Site Hydrogeology - § 257.103(f)(1)(iv)(B)(4)

A description of site hydrogeology and stratigraphic cross-sections of the site are included as Attachment C5.

3.5 Corrective Measures Assessment - § 257.103(f)(1)(iv)(B)(5)

Background sampling began at the Primary Ash Pond in March of 2017 and continued through July for eight rounds of background sampling. The first semiannual detection monitoring samples were collected in November 2017. The first assessment monitoring samples were collected in June 2018. The results, through the first 2020 semi-annual monitoring period, indicate the Primary Ash Pond is currently in assessment monitoring, with no exceedances recorded. Accordingly, an assessment of corrective measures is not currently required.

3.6 Remedy Selection Progress Report - § 257.103(f)(1)(iv)(B)(6)

As noted above, an assessment of corrective measures and the resulting remedy selection efforts are not currently required for the Primary Ash Pond.

3.7 Structural Stability Assessment - § 257.103(f)(1)(iv)(B)(7)

Pursuant to § 257.73(d), the initial structural stability assessment report for the Primary Ash Pond was prepared in October 2016 and revised in January 2018 (to remove the Secondary Pond). The revised report is included as Attachment C6. As required for compliance, another stability assessment will be completed in October 2021.

3.8 Safety Factor Assessment - § 257.103(f)(1)(iv)(B)(8)

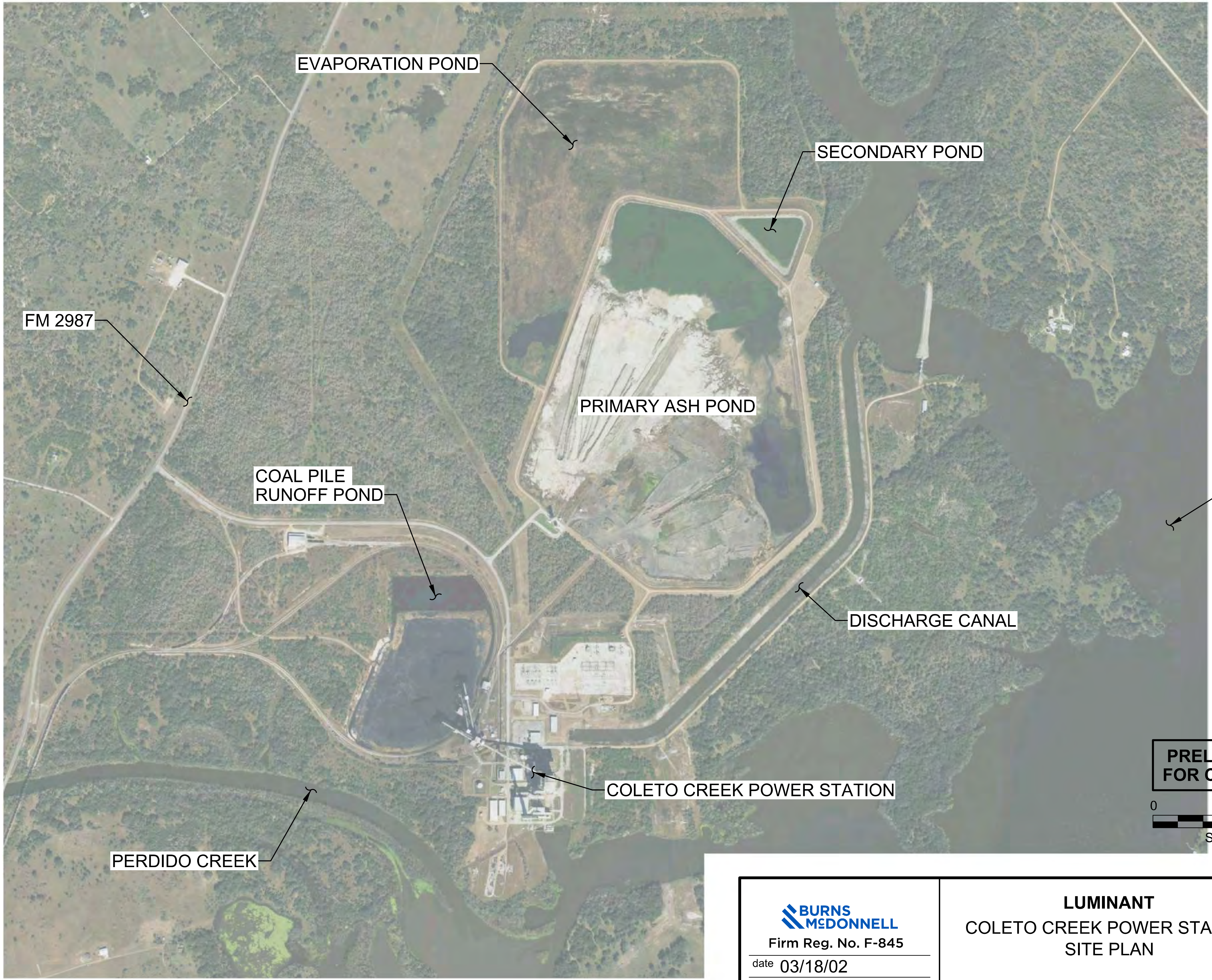
Pursuant to § 257.73(e), the initial safety factor assessment report for the Primary Ash Pond was prepared in October 2016 and revised in January 2018 (to remove the Secondary Pond). The revised report is included as Attachment C6. As required for compliance, another stability assessment will be completed in October 2021.

4.0 CONCLUSION

Based upon the information submitted in this demonstration, the Primary Ash Pond at Coleto Creek qualifies for a site-specific alternative deadline for the initiation of closure as allowed by 40 C.F.R. § 257.103(f)(1).

Therefore, CCP requests that EPA approve the demonstration and grant an alternative deadline of April 20, 2023 to complete the dry bottom ash conversion at Coleto Creek, cease routing all CCR and non-CCR wastestreams to the Primary Ash Pond which is subject to closure under 40 C.F.R. § 257.101(a), and initiate closure as required. As discussed previously, this date is subject to delays in procuring and delivering new bottom ash handling equipment and several other factors. CCP will update EPA on the project and any potential schedule impacts as part of the semi-annual progress reports required at 40 C.F.R. § 257.103(f)(1)(x), and if a need for a later compliance deadline is determined, CCP will seek additional time as described in 40 CFR § 257.103(f)(1)(vii).

APPENDIX A – SITE PLAN AND WATER BALANCE DIAGRAM



PRELIMINARY - NOT FOR CONSTRUCTION

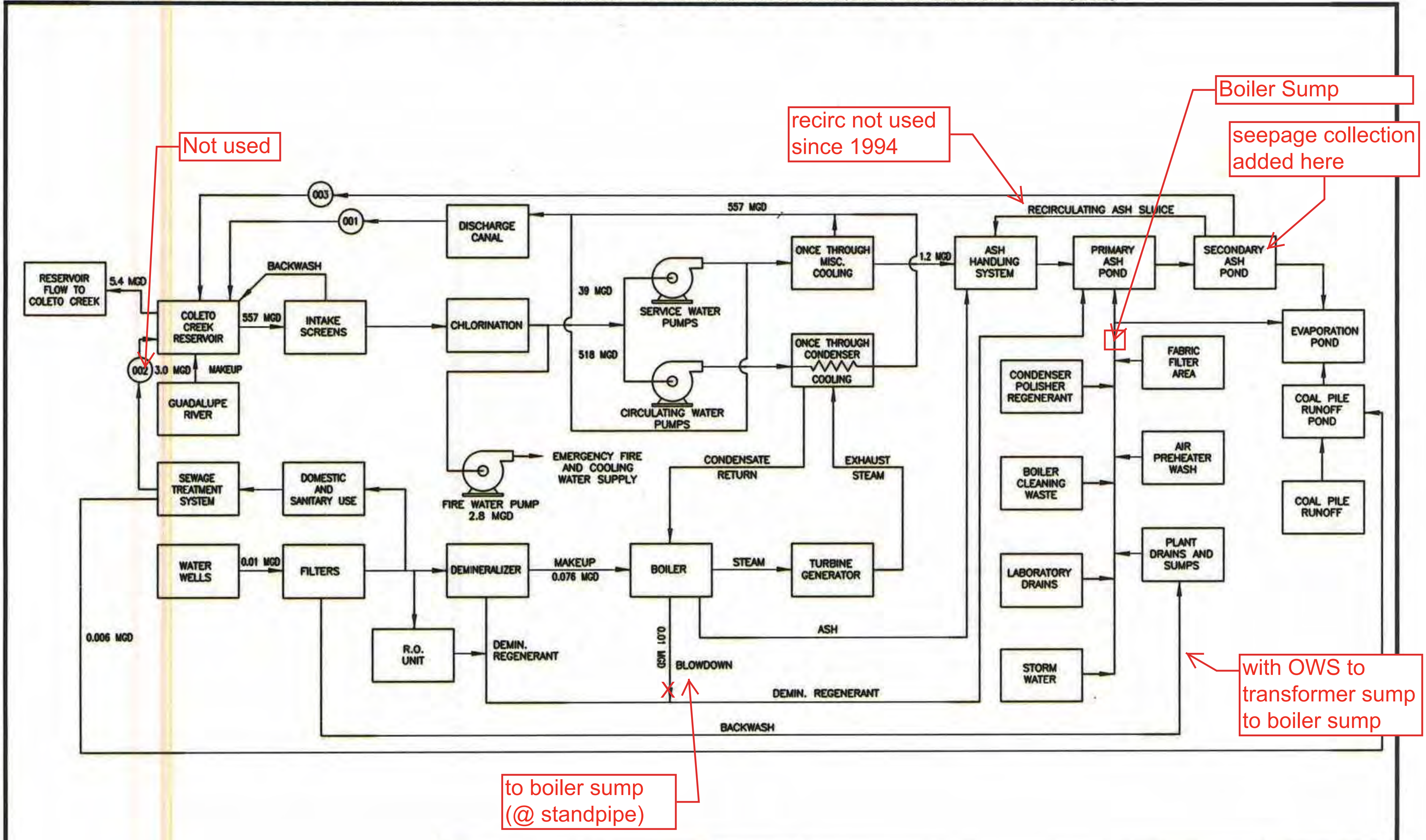
BURNS McDONNELL
Firm Reg. No. F-845

date 03/18/02
designed A. MYERS

LUMINANT
COLETO CREEK POWER STATION
SITE PLAN

project	122702
contract	-
dwg	**FIGURE 1** -

FILE INFO: J:\12261-IPA\12261-002 Coleto Creek Power Exp-Env Permitting\Water Permitting\2008 TPDES Application\02-TPDES Attachments\01-Final Attachments\Attach 10 Flow Schematic\Phase I Flow Diagram.dwg



Not used

recirc not used since 1994

Boiler Sump

seepage collection added here

with OWS to transformer sump to boiler sump

to boiler sump (@ standpipe)

FIGURE 2

ENSR CORPORATION
4888 LOOP CENTRAL DRIVE, SUITE 600
HOUSTON, TEXAS 77081-2214
PHONE: (713) 520-9900
FAX: (713) 520-6802
WEB: HTTP://WWW.ENSR.AECOM.COM

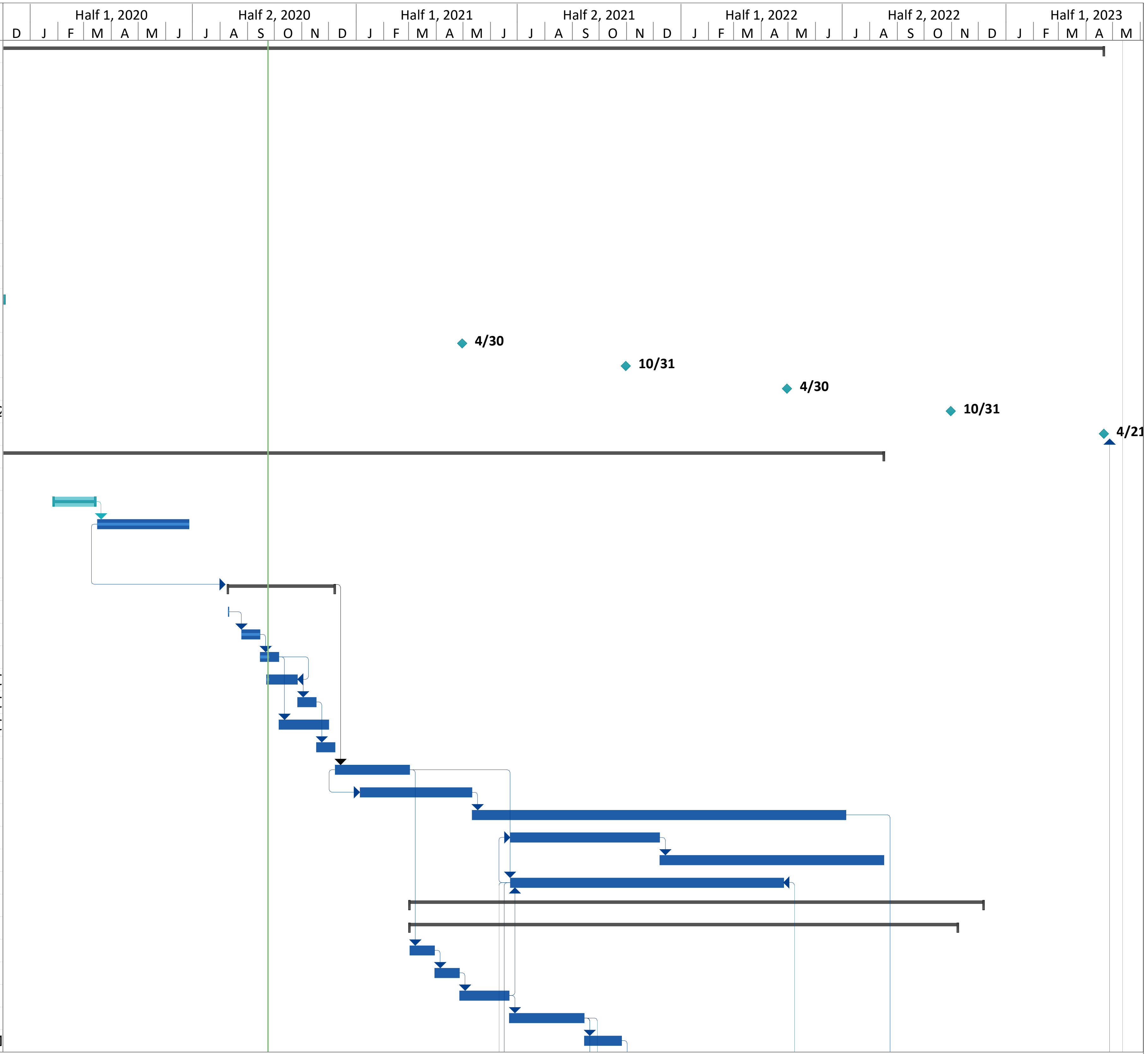
PHASE I FLOW DIAGRAM
COLETO CREEK POWER STATION

ATTACHMENT NO.
5

DRAWN BY:	DATE:	PROJECT NUMBER:	SHEET NUMBER:
GAJ	4-8-08	12261-003-300	1

APPENDIX B – SCHEDULE

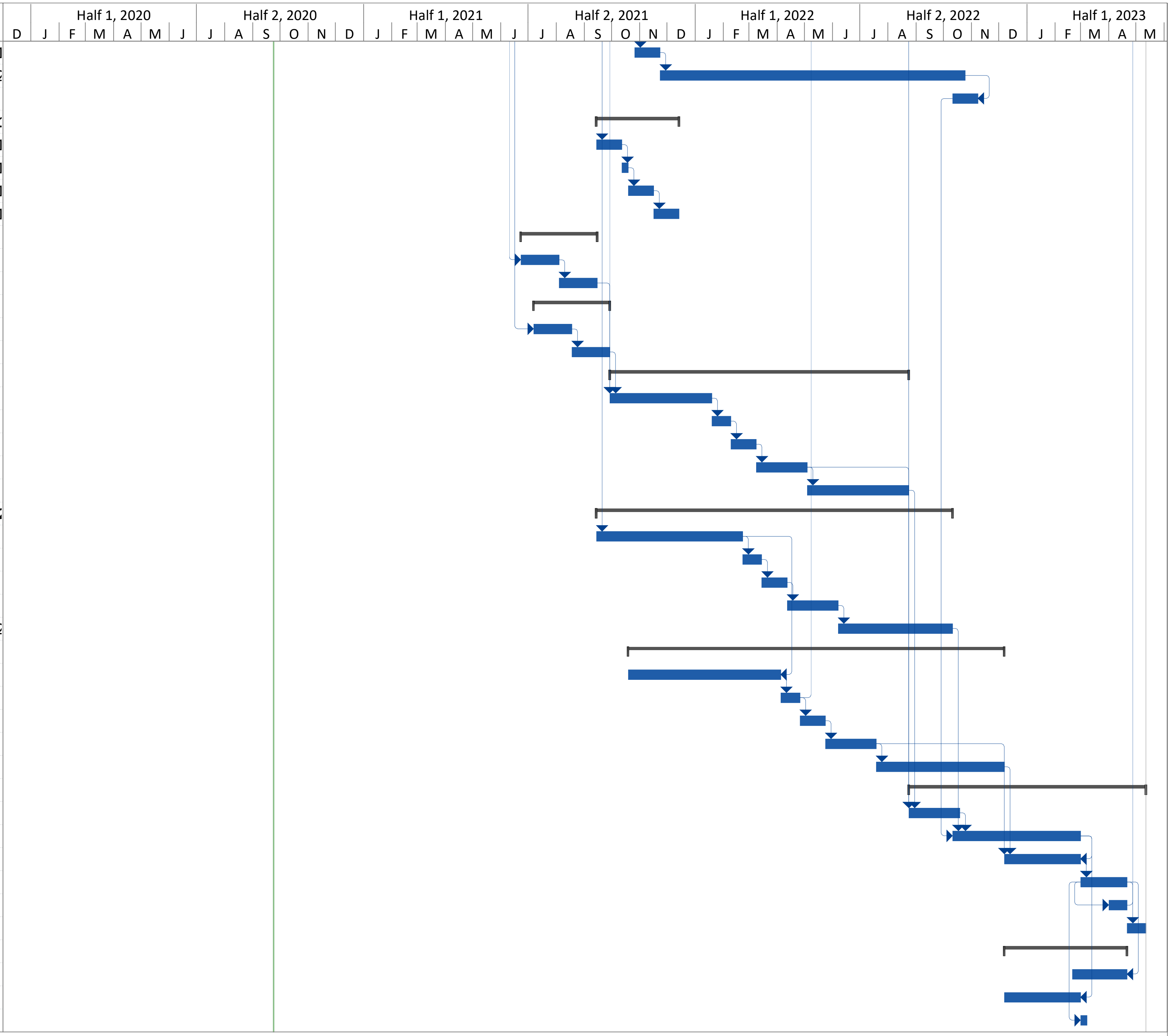
ID	Task Name	Duration	Start	Finish
1	**CCR Compliance Efforts**	**2091 days**	**Fri 4/17/15**	**Fri 4/21/23**
2	Final CCR Rule Published in Federal Register	0 days	Fri 4/17/15	Fri 4/17/15
3	Installed Groundwater Monitoring Wells	10 days	Tue 2/28/17	Mon 3/13/17
4	Background Groundwater Sampling	83 days	Tue 3/28/17	Thu 7/20/17
5	Completed Liner Documentation	0 days	Thu 10/13/16	Thu 10/13/16
6	Prepared Surface Impoundment History of Construction	0 days	Thu 10/13/16	Thu 10/13/16
7	First Detection Monitoring Samples	2 days	Tue 11/7/17	Wed 11/8/17
8	Assessment Monitoring Program - First Round	36 days	Tue 6/19/18	Tue 8/7/18
9	Assessment Monitoring Program - Second Round	19 days	Tue 9/18/18	Fri 10/12/18
10	Assessment Monitoring Program - Third Round	30 days	Mon 6/3/19	Fri 7/12/19
11	Assessment Monitoring Program - Fourth Round	25 days	Wed 10/2/19	Tue 11/5/19
12	EPA Published Proposed Draft ELG Rule and CCR Holistic Approach to Closure Part A Rule	21 days	Mon 11/4/19	Mon 12/2/19
13	Semi-Annual Progress Report #1	0 days	Fri 4/30/21	Fri 4/30/21
14	Semi-Annual Progress Report #2	0 days	Sun 10/31/21	Sun 10/31/21
15	Semi-Annual Progress Report #3	0 days	Sat 4/30/22	Sat 4/30/22
16	Semi-Annual Progress Report #4	0 days	Mon 10/31/22	Mon 10/31/22
17	Cease CCR and non-CCR wastestreams to Primary Ash Pond	0 days	Fri 4/21/23	Fri 4/21/23
18	**Bottom Ash Conversion - Engineering**	**860 days**	**Wed 5/1/19**	**Tue 8/16/22**
19	BMcD Screening Level ELG Assessment	43 days	Wed 5/1/19	Fri 6/28/19
20	BMcD Landfill Alternatives Analysis	35 days	Mon 1/27/20	Fri 3/13/20
21	Luminant Review Alternatives, Select Preferred Option, and Prepare Demonstration for Site-Specific Alternate to Intiation of Closure Deadline	75 days	Mon 3/16/20	Fri 6/26/20
22	**AACE Class 3 Budgetary and Feed Study**	**86 days**	**Mon 8/10/20**	**Mon 12/7/20**
23	Kickoff Meeting	1 day	Mon 8/10/20	Mon 8/10/20
24	Perform Laser Scan & Transmit Results	15 days	Tue 8/25/20	Mon 9/14/20
25	Initial Vendor Budget Quotes	15 days	Tue 9/15/20	Mon 10/5/20
26	Prepare Scope Documents and Subcontract Packages	25 days	Tue 9/22/20	Mon 10/26/2
27	Local Subcontractor Budget Quotes	15 days	Tue 10/27/20	Mon 11/16/2
28	Develop Technical Specification (for Conveyor Equipment)	40 days	Tue 10/6/20	Mon 11/30/2
29	Finalize Estimate and Report	15 days	Tue 11/17/20	Mon 12/7/20
30	Owner Review & Management Approval	60 days	Tue 12/8/20	Mon 3/1/21
31	Prepare Air Permit Application (if required)	90 days	Tue 1/5/21	Mon 5/10/21
32	TCEQ Review of Air Permit Application (if required)	300 days	Tue 5/11/21	Mon 7/4/22
33	Prepare Application for NPDES Permit Modification	120 days	Wed 6/23/21	Tue 12/7/21
34	TCEQ NPDES Permit Modification	180 days	Wed 12/8/21	Tue 8/16/22
35	Detailed Engineering	219 days	Wed 6/23/21	Mon 4/25/22
36	**Bottom Ash Conversion - Procurement**	**461 days**	**Tue 3/2/21**	**Tue 12/6/22**
37	**Compact Submerged Conveyor System**	**440 days**	**Tue 3/2/21**	**Mon 11/7/22**
38	Develop Commercial Documents/Issue Bid Package	20 days	Tue 3/2/21	Mon 3/29/21
39	Bid Period	20 days	Tue 3/30/21	Mon 4/26/21
40	Bid Evaluation/Award LNTP for Engineering	40 days	Tue 4/27/21	Mon 6/21/21
41	Receive Initial Vendor Submittals	60 days	Tue 6/22/21	Mon 9/13/21
42	Review and Approve Submittals	30 days	Tue 9/14/21	Mon 10/25/21



Project: Coleto Creek CCR Surface Impoundment Extension Demonstration
Date: Thu 9/24/20

Task	▬	Project Summary	⎴	Inactive Milestone	◇	Manual Summary Rollup	▬	Deadline	⇩
Split	┈	External Tasks	▬	Inactive Summary	⎴	Manual Summary	⎴	Progress	─
Milestone	◆	External Milestone	◆	Manual Task	▬	Start-only	[	Manual Progress	─
Summary	⎴	Inactive Task	▭	Duration-only	▬	Finish-only	]		

ID	Task Name	Duration	Start	Finish
43	Release FNTP for Fabrication	20 days	Tue 10/26/21	Mon 11/22/21
44	Conveyor Fabrication	240 days	Tue 11/23/21	Mon 10/24/22
45	Delivery Window	20 days	Tue 10/11/22	Mon 11/7/22
46	**DCS**	**65 days**	**Tue 9/14/21**	**Mon 12/13/2**
47	Develop Spec	20 days	Tue 9/14/21	Mon 10/11/21
48	Issue Bid Package	5 days	Tue 10/12/21	Mon 10/18/21
49	Bid Period	20 days	Tue 10/19/21	Mon 11/15/21
50	Bid Evaluation/Award	20 days	Tue 11/16/21	Mon 12/13/21
51	**Site Survey**	**60 days**	**Wed 6/23/21**	**Tue 9/14/21**
52	Bid/Negotiate/Award	30 days	Wed 6/23/21	Tue 8/3/21
53	Perform & Transmit	30 days	Wed 8/4/21	Tue 9/14/21
54	**Pilot Trenching**	**60 days**	**Wed 7/7/21**	**Tue 9/28/21**
55	Bid/Negotiate/Award	30 days	Wed 7/7/21	Tue 8/17/21
56	Perform & Transmit	30 days	Wed 8/18/21	Tue 9/28/21
57	**Site Prep & B/G Constuction**	**235 days**	**Wed 9/29/21**	**Tue 8/23/22**
58	Develop Drawings and Specs	80 days	Wed 9/29/21	Tue 1/18/22
59	Owner Review/Issue Bid Package	15 days	Wed 1/19/22	Tue 2/8/22
60	Bid Period	20 days	Wed 2/9/22	Tue 3/8/22
61	Bid Evaluation/Award	40 days	Wed 3/9/22	Tue 5/3/22
62	Pre-Plan, Procure, and Mobilize	80 days	Wed 5/4/22	Tue 8/23/22
63	**A/G Mechanical/Structural Constuction**	**280 days**	**Tue 9/14/21**	**Mon 10/10/2**
64	Develop Drawings and Specs	115 days	Tue 9/14/21	Mon 2/21/22
65	Owner Review/Issue Bid Package	15 days	Tue 2/22/22	Mon 3/14/22
66	Bid Period	20 days	Tue 3/15/22	Mon 4/11/22
67	Bid Evaluation/Award	40 days	Tue 4/12/22	Mon 6/6/22
68	Pre-Plan, Procure, and Mobilize	90 days	Tue 6/7/22	Mon 10/10/22
69	**A/G Electrical Constuction**	**296 days**	**Tue 10/19/21**	**Tue 12/6/22**
70	Develop Drawings and Specs	120 days	Tue 10/19/21	Mon 4/4/22
71	Owner Review/Issue Bid Package	15 days	Tue 4/5/22	Mon 4/25/22
72	Bid Period	20 days	Tue 4/26/22	Mon 5/23/22
73	Bid Evaluation/Award	40 days	Tue 5/24/22	Mon 7/18/22
74	Pre-Plan, Procure, and Mobilize	101 days	Tue 7/19/22	Tue 12/6/22
75	**Bottom Ash Conversion - Construction & Startup**	**188 days**	**Wed 8/24/22**	**Thu 5/11/23**
76	Site Prep & B/G Constuction	40 days	Wed 8/24/22	Tue 10/18/22
77	A/G Pre-Outage Mech/Struct Construction	101 days	Tue 10/11/22	Tue 2/28/23
78	A/G Pre-Outage Elect Construction	60 days	Wed 12/7/22	Tue 2/28/23
79	Outage	38 days	Wed 3/1/23	Thu 4/20/23
80	Startup	15 days	Sat 4/1/23	Thu 4/20/23
81	Final Walkdown & Punchlist	15 days	Fri 4/21/23	Thu 5/11/23
82	**Other Construction**	**98 days**	**Wed 12/7/22**	**Thu 4/20/23**
83	Install Pugmill at Fly Ash Silo	45 days	Mon 2/20/23	Thu 4/20/23
84	Install new piping and pumps to reroute demin sump	60 days	Wed 12/7/22	Tue 2/28/23
85	Finalize Tie-ins for Water Redirects	5 days	Wed 3/1/23	Tue 3/7/23

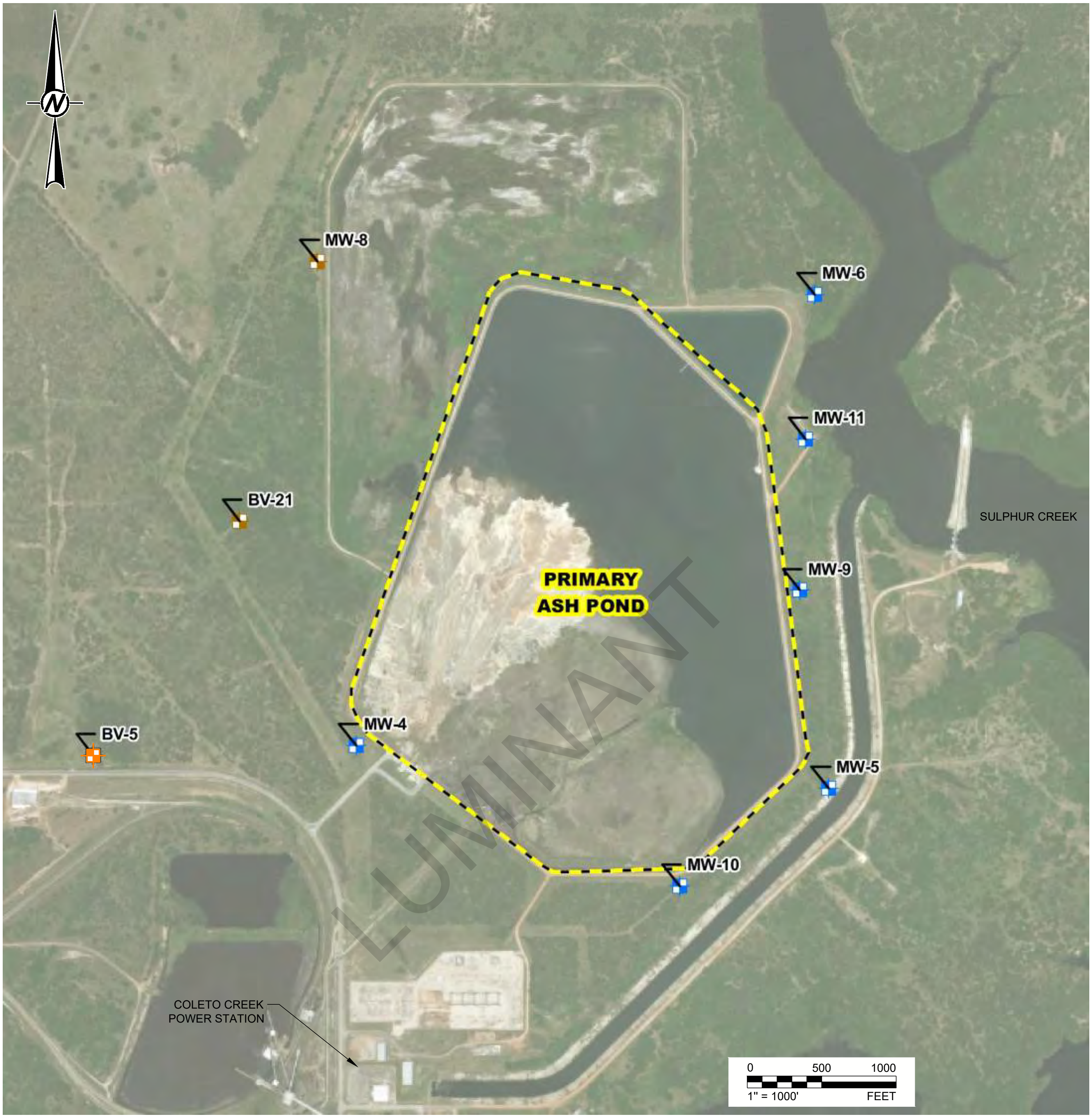


Project: Coleto Creek CCR Surface Impoundment
Extension Demonstration
Date: Thu 9/24/20

Task	▬	Project Summary	⎴	Inactive Milestone	◇	Manual Summary Rollup	▬	Deadline	↓
Split	┈	External Tasks	▬	Inactive Summary	⎴	Manual Summary	⎴	Progress	▬
Milestone	◆	External Milestone	◆	Manual Task	▬	Start-only	[	Manual Progress	▬
Summary	⎴	Inactive Task	▭	Duration-only	▬	Finish-only	]		

APPENDIX C – COMPLIANCE DOCUMENTS

APPENDIX C1 – MAP OF GROUNDWATER MONITORING WELL LOCATIONS



LEGEND

🟦	DOWNGRADIENT MONITORING WELL LOCATION
🟧	UPGRADIENT MONITORING WELL LOCATION
▭	CCR MONITORING UNIT

CLIENT
COLETO CREEK POWER LP

PROJECT
COLETO CREEK POWER STATION
FANNIN, TEXAS

TITLE
DETAILED SITE PLAN - COLETO CREEK PRIMARY ASH POND

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-14
DESIGNED	AJD
PREPARED	AJD
REVIEWED	WFV
APPROVED	WFV

PROJECT NO.	REV.	FIGURE
18106453	0	1

Last Edited By: adiamond Date: 2019-01-14 Time:1:54:25 PM | Printed By: adiamond Date: 2019-01-14 Time:1:54:58 PM
Path: \\texarkana\data\Projects - Round Rock\18106453 - Coleto Creek\2019-1 Jan\ | File Name: FIG 1 - Detailed Site Plan.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0

APPENDIX C2 – WELL CONSTRUCTION DIAGRAMS AND DRILLING LOGS

MONITORING WELL BORING LOGS

Appendix B: CCR Groundwater Monitoring Well System Boring Logs

Wells W-4 to W-6 and Well W-8
by Sargent & Lundy Engineers (March and April 1978). These monitoring wells are also designated as MW-4 to MW-6 and MW-8, respectively.

Wells W-9 and W-10
by Bullock, Bennett & Associates, LLC (May 2016). These monitoring wells are also designated as MW-9 and MW-10, respectively.

Well MW-11
by Bullock, Bennett & Associates, LLC (April 2017)

Wells BV-5 and BV-21
by Black & Veatch (August and September 2008)

Renamed
MW-4

BORING NO. W-4

PROJECT: Coleto Creek Power Station
CLIENT: Central Power & Light Co.
FEATURE: Monitoring Well W-4
SURFACE ELEVATION: 134.32Ft | TOTAL DEPTH: 86.5 Ft
LOCATION: N 13400 E0400
DEPTH TO WATER DURING DRILLING: 42.0Ft | DATE: 1-3-78
DRILLED BY: Trinity Testing Laboratories, Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Trinity Testing Laboratories, Inc.

DEPTH (Ft.)	SAMPLE NUMBER AND TYPE	BLOWS/FT. OR BLOWS/IN. (RECOVERY, %)	POCKET PENETROMETER	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	RQD (%)
0									
	ST1	(70)		16.0	40	21	SA		
5	ST2	(80)							
	ST3	(100)		13.2					
10	ST4	(80)		21.3	43	19	SA		
15	ST5	(61)		13.5			SA		
20	SS6	7-33-48 (100)							
25	SS7	14-20-4 (100)							
30	SS8	35-35-3 (100)					SA		
35	SS9	20-20-1 (100)							
40	SS10	41-30-2							
45	SS11	37-24-47 (100)					SA		
50	SS12	100/4 (100)							
55	SS13	32-40-20 (100)							
60	SS14	33-30-34 (100)					SA		
65	SS15	60-100/2 (100)							
70	SS16	10-37-100/5 (100)					SA		
75	SS17	32-46-66 (100)					SA		
80	SS18	19-41-56 (100)			46	23	SA		
85	SS19	37-53-84 (100)							
90									

20
30
40
50

SYMBOLS	DESCRIPTION	ELEVATION (Ft., MSL)
		134.32
SM	SAND, silty, brown.	132.32
SC	SAND, clayey, medium to fine, brown and yellow.	
	- seams of cemented sand between 21 Ft and 25 Ft.	113.32
SP-SM	SAND, medium to fine, trace silt, yellow.	109.32
CL	CLAY, silty, some medium to fine sand, calcareous, yellow.	103.32
SP	SAND, medium to fine, yellow.	100.32
CL	CLAY, silty and sandy, yellow.	99.32
SM	SAND, silty, coarse to fine, trace gravel, yellow.	98.32
	- cemented layer.	94.32 93.32
	- grades to no gravel, white ▽	92.32
	- grades to medium to fine.	89.32
	- grades to coarse to fine with gravel & caliche.	86.02
SM		84.32
CL	CLAY, sandy, yellow and gray.	76.02
SC-GC	SAND and Gravel, clayey, gray, with cemented layers.	74.32
CL	CLAY, sandy, gray. - grades to yellow	69.32 66.02
SM	SAND, silty, coarse to fine, yellow.	63.32 63.02
ML	Caliche, (Chalk)	60.02
SM	SAND, silty, coarse to fine, yellow.	
CL	CLAY, silty, little medium to fine sand, gray and brown with pockets of Caliche.	58.32
	END OF BORING - 86.5 Ft Groundwater encountered at 42.0 Ft.	47.82

86.5

ATTACHMENT 11

Renamed
MW-5

BORING NO. W-5

SHEET 1 OF 2

PROJECT: Coleto Creek Power Station
CLIENT: Central Power & Light Co.
FEATURE: Monitoring Well W-5
SURFACE ELEVATION: 119.57 Ft | TOTAL DEPTH: 71.5Ft
LOCATION: N 30+07.7 E 31+50.6
DEPTH TO WATER DURING DRILLING: 40.0 Ft | DATE: 3-30-78
DRILLED BY: Trinity Testing Laboratories, Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Trinity Testing Laboratories, Inc.

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf.)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	RQD (%)	SYMBOLS	DESCRIPTION	DEPTH (ft.)	ELEVATION (ft., MSL)
0										SM	SAND, silty, brown (Topsoil)	0	119.57
										SC	SAND, clayey, medium to fine, brown.		119.07
	ST1	(75)		12.8			SA						
5	ST2	(83)								CL	CLAY, silty, gray, with Caliche.	5	114.07
	ST3	(83)								SC	SAND, clayey, brown, with layers of Caliche.		111.57
10	ST4	(83)								CL	CLAY, silty, yellow and white, with lenses and pockets of Caliche.	10	108.57
15	ST5	(78)		3.1			SA			SP-SM	SAND, medium to fine, white.	15	104.57
20	SS6	8-13-20 (100)					SA					20	
25	SS7	7-47-100 /4.5 (100)								SC	SAND, clayey, calcareous, white. (Caliche)	25	93.57
										SM-SC	SAND, silty and clayey, white, with lenses and seems of Caliche - grades to gray.		90.57
30	SS8	6-13-31 (100)										30	
35	SS9	14-36-31 (100)					SA					35	
40	SS10	1-27-31 (100)								SM	SAND, silty, coarse to fine, white	▽ 40	79.57 79.07
45	SS11	16-67-100/5.5 (100)		34	15					CL	CLAY, silty, gray, with seems of Caliche.	45	73.57
50												50	

REVISION	DATE APPROVED BY	DESCRIPTION
0	10-24-78 D G Bartow	For Use

COLETO CREEK POWER STATION
LOG OF BORING W-5

CENTRAL POWER & LIGHT CO.

SARGENT & LUNDY
ENGINEERS

PROJECT NUMBER 4857

BORING NO. W-5 (cont'd) SHEET 2 OF 2

Renamed
MW-5

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	RQD (%)
50	SS12	72-100/1 (100)					SA		
55	SS13	50-74-130/5.5 (100)							
60	SS14	100/3.5 (100)			18	14	SA		
65	SS15	18-78-100/4.5 (100)							
70	SS16	9-17-21 (100)							
75									

SYMBOLS	DESCRIPTION	ELEVATION (ft., MSL)
		69.57
SM-SC	SAND, silty and clayey, calcareous, white, very dense. (Caliche)	
SM	SAND, silty, white.	66.57
SM-SC	SAND, silty and clayey, calcareous, white and brown, very dense. (Caliche)	62.57
CL	CLAY, silty, brown.	53.57
	END OF BORING - 71.5 Ft	48.07

Groundwater encountered at 40.0 Ft. and rose to 32.5 Ft.

REVISION	DATE APPROVED BY	DESCRIPTION
0	10-24-78 R.G. Bodin	For Use

COLETO CREEK POWER STATION
LOG OF BORING W-5 (cont'd)

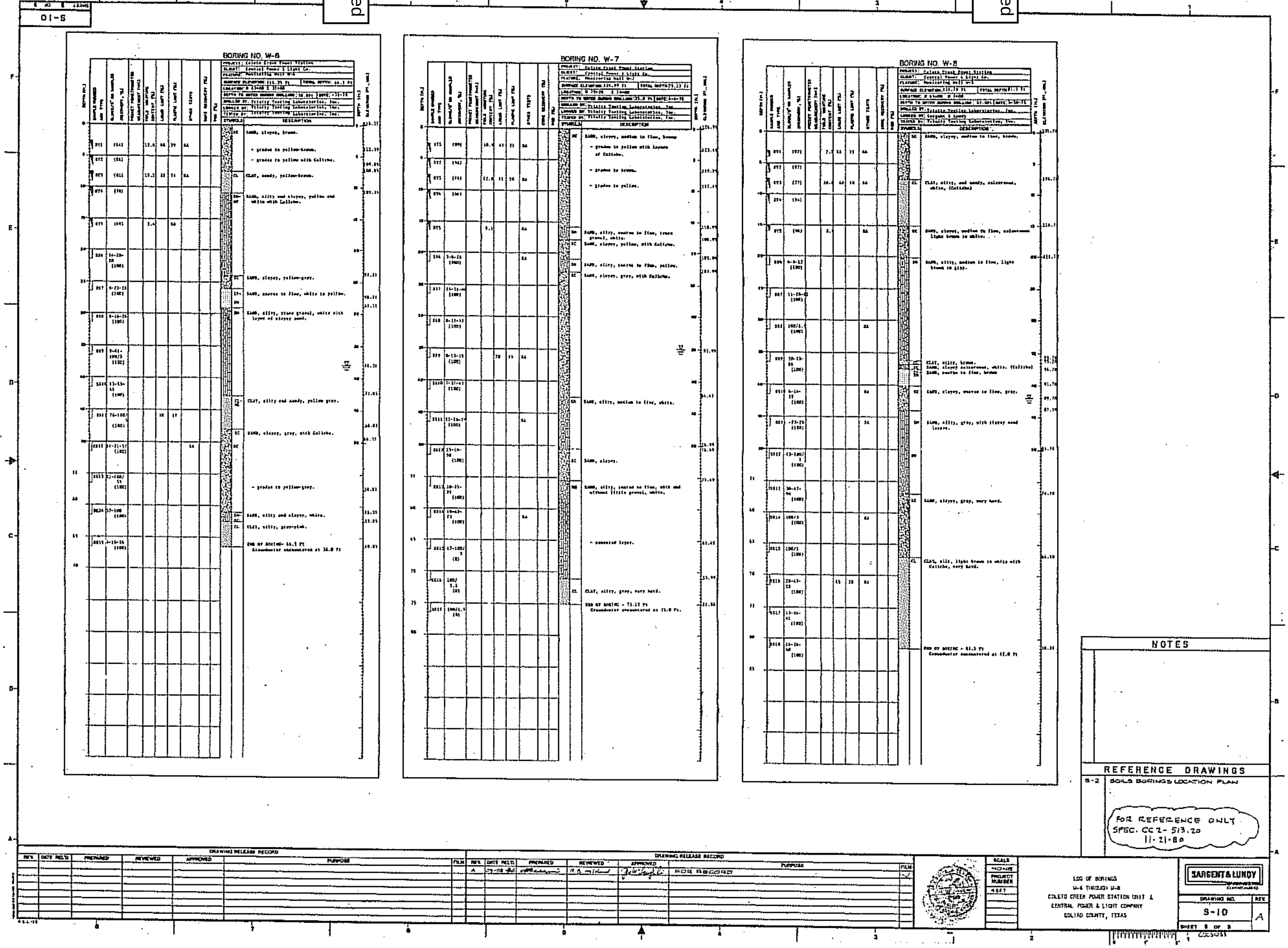
CENTRAL POWER & LIGHT CO.

SARGENT & LUNDY
ENGINEERS

PROJECT NUMBER 4857

Renamed MW-6

Renamed MW-8



NOTES

REFERENCE DRAWINGS

S-2 SOILS BORINGS LOCATION PLAN

FOR REFERENCE ONLY
SPEC. CCZ-513.20
11-21-80

DRAWING RELEASE RECORD

REV	DATE REL'D	PREPARED	REVIEWED	APPROVED	PURPOSE	FILM
A	29-... -80	[illegible]	R.S. [illegible]	[illegible]	FOR RECORD	✓

SCALE: NONE

PROJECT NUMBER: 4547

LOG OF BORINGS
W-6 THROUGH W-8
COLETO CREEK POWER STATION UNIT 1
CENTRAL POWER & LIGHT COMPANY
GOLIAD COUNTY, TEXAS

SARGENT & LUNDY
ENGINEERS
CHICAGO

DRAWING NO. S-10 REV A

SHEET 3 OF 3

CC53055

Bullock, Bennett & Associates, LLC
165 N. Lampasas Street
Bertram, TX 78605

LOG OF BORING W-9

Renamed MW-9

(Page 1 of 1)

COLETO CREEK POWER STATION
FANNIN, TX

Project No. 15215

Date	: 9/15/2015		Drilling Company	: EnviroCore
Easting	: 2543670.9		Driller	: Craig Schena (Lic. #4694)
Northing	: 13451651.2		Drill Rig	: CME75
Top of Casing Elevation	132.3 ft NAVD 88		Drilling Method	: Hollow Stem Auger - 6"
Logger	: EEF		Sampling Method	: Split-Spoon

DEPTH (feet)	Surface Elevation 129.3	DESCRIPTION	USCS	GRAPHIC	Recovery (ft/ft)	WELL DIAGRAM/REMARKS
0.0	128	(0-2.0) - Fill Material: CLAYEY SAND, mottled light gray and reddish brown, moist	SC		1.5/2	
5.0	124	(2.0-5.5) - Fill Material: Silty CLAY/Clayey SAND, brownish gray to white, soft to firm, Sand is fine to coarse grained, common caliche gravel, moist	SC/CL		2/2 2/2	
	120	(5.5-10.0) - Silty CLAY, dark gray to gray with orangish brown mottling, firm to hard, medium plasticity, common caliche gravel, minor roots, moist	CL		2/2 2/2	
10.0 15.0 20.0	116 112	(10.0-20.5) - Predominantly Caliche and Silty CLAY, light gray to white, Caliche is weakly cemented, low plasticity, dry	ML/CL		2/2 2/2 2/2 2/2 2/2	Well Construction: Riser ~3.0' AGL - 40.0' BGL Neat Cement: 0' - 2.0' BGL Bentonite chips seal: 2.0' - 38.0' BGL Sand Pack: 38.0' - 60.0' BGL Screen: 40.0' - 60.0' BGL
	108	(20.5-22.0) - SILTY SAND, very light brownish gray, fine to coarse grained, trace of gravel, moist	SM		2/2	
25.0 30.0 35.0 40.0	104 100 96 92 88	(22.0-44.0) - SAND, very light orangish brownish to very light gray, fine to coarse grained, slightly silty, wet	SW		2/2 2/2 2/2 2/2 2/2 2/2 2/2 2/2 2/2 2/2 2/2	Water Level: 25.2' BGL
45.0	84	(44.0-47.0) - SILTY SAND, light gray, fine to coarse grained, wet	SM		2/2 2/2	
50.0	80 76	(47.0-54.0) - Silty CLAY/Clayey SAND, light gray, soft to firm, Sand is fine to coarse grained, wet	SC/CL		2/2 2/2 2/2	
55.0 60.0	72	(54.0-60.0) - Silty, Clayey SAND, gray, fine to coarse grained, wet	SC/SM		2/2 2/2 2/2	

Craig E Bennett

CRAIG E. BENNETT
GEOLOGY
LIC. # 1205

5-26-16

Total Boring Depth = 60 ft Below Ground Level; North and Easting Coordinates from NAD-83, South Central Zone

Bullock, Bennett & Associates, LLC
165 N. Lampasas Street
Bertram, TX 78605

LOG OF BORING W-10

Renamed MW-10

(Page 1 of 1)

COLETO CREEK POWER STATION
FANNIN, TX

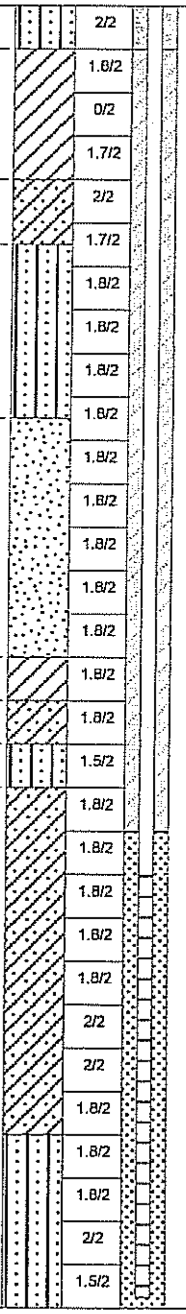
Project No. 15215

Date : 9/17/2015
Easting : 2542864.5
Northing : 13449694.0
Top of Casing Elevation 130.4 ft NAVD 88
Logger : EEF

Drilling Company : EnviroCore
Driller : Craig Schena (Lic. #4694)
Drill Rig : CME75
Drilling Method : Hollow Stem Auger - 6"
Sampling Method : Split-Spoon

DEPTH (feet)	Surface Elevation 127.6
0.0	
	124
5.0	
	120
10.0	
	116
15.0	
	112
	108
20.0	
	104
25.0	
	100
30.0	
	96
35.0	
	92
	88
40.0	
	84
45.0	
	80
50.0	
	76
55.0	
	72
60.0	68

DESCRIPTION	USCS	Recovery (ft/ft)
(0-2.0) - Fill Material: SILTY SAND, fine to coarse grained, brown, clayey, common roots, moist	SM	2/2
(2.0-8.0) - Silty,Sandy CLAY,mottled organish brown and light gray, firm, medium plasticity, moist	CL	1.8/2 0/2 1.7/2
(8.0-11.0) - Silty CLAY/Clayey SAND, light gray, Sand is medium grained, moist	SC/CL	2/2 1.7/2
(11.0-19.0) - SILTY SAND, very light gray, medium to coarse grained, abundant caliche, moist	SM	1.8/2 1.8/2 1.8/2 1.8/2
(19.0-30.0) - SAND, light gray, medium to coase grained, occasional gravel, moist	SP	1.8/2 1.8/2 1.8/2 1.8/2 1.8/2
(30.0-32.0) - Silty CLAY/Clayey SAND, light gray, soft to firm, occasional gravel and caliche, medium plasticity, wet	CL/SC	1.8/2
(32.0-34.0) - CLAYEY SAND, brownish grey, soft, very fine, wet	SC	1.8/2
(34.0-36.0) - SILTY SAND, light gray, fine to medium grained, wet	SM	1.5/2
(36.0-52.0) - Silty, Clayey SAND, light gray, fine to coarse grained, wet	SC/SM	1.8/2 1.8/2 1.8/2 1.8/2 1.8/2 2/2 2/2 1.8/2
(52.0-60.0) - SILTY SAND, light gray, fine to coarse grained, clayey, wet	SM	1.8/2 1.8/2 2/2 1.5/2



WELL DIAGRAM/REMARKS

Well Construction:
Riser ~3.0' AGL - 40.0' BGL
Neat Cement: 0' - 2.0' BGL
Bentonite chips seal: 2.0' - 38.0' BGL
Sand Pack: 38.0' - 60.0' BGL
Screen: 40.0' - 60.0' BGL

Water Level: 24.8' BGL

Craig E. Bennett

CRAIG E. BENNETT
GEOLOGY
LIC. # 1205

5-26-16

Total Boring Depth = 60 ft Below Ground Level; North and Easting Coordinates from NAD-83, South Central Zone

Bullock, Bennett & Associates, LLC
165 N. Lampasas Street
Bertram, TX 78605

LOG OF BORING MW-11

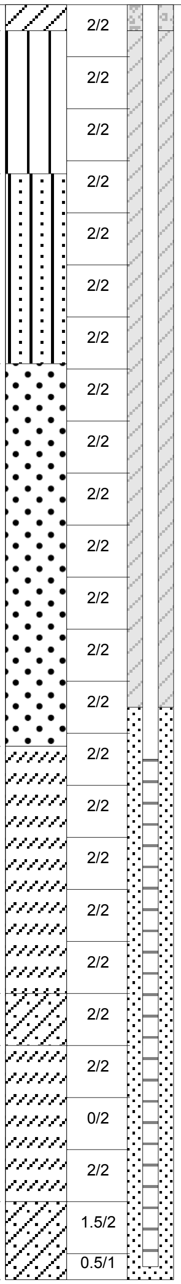
(Page 1 of 1)

COLETO CREEK POWER STATION
FANNIN, TX

Project No. 17252

Date : 4/25/2017
Easting : 2543727.0
Northing : 13452676.5
Top of Casing Elevation 118.66 ft NAVD 88
Logger : EEF

Drilling Company : EnviroCore
Driller : Craig Schena (Lic. #4694)
Drill Rig : CME75
Drilling Method : Hollow Stem Auger - 6"
Sampling Method : Split-Spoon



DEPTH (feet)	Surface Elevation 115.8	DESCRIPTION	USCS	Recovery (ft/ft)	WELL DIAGRAM/REMARKS
0.0		(0-1.0) - Silty CLAY, dark brown, soft to firm, medium plasticity, minor roots, moist	CL	2/2	
5.0	112	(1.0-6.5) - Predominantly Caliche and Silty CLAY, light gray to white, Caliche is weakly cemented, low to medium plascticity, wet	CL/ML	2/2 2/2	
10.0	108 104	(6.5-13.8) - Silty, Clayey SAND, light gray to white, very fine to medium grained, wet	SM	2/2 2/2 2/2 2/2	Water Level: 11.2' BGL
15.0 20.0 25.0	100 96 92 88	(13.8-28.5) - SAND, very light orangish brownish to very light gray, fine to coarse grained, abundant gravel, slightly silty, wet	SW	2/2 2/2 2/2 2/2 2/2 2/2 2/2	Well Construction: Riser ~2.7' AGL - 29.0' BGL Neat Cement: 0' - 1.0' BGL Bentonite chips seal: 1.0' - 27.0' BGL Sand Pack: 27.0' - 49.0' BGL Screen: 29.0' - 49.0' BGL
30.0 35.0	84 80	(28.5-38.0) - Silty, Clayey SAND, gray to light brownish gray, very fine to medium grained, wet	SM/SC	2/2 2/2 2/2 2/2 2/2	
	76	(38.0-40.0) - Silty CLAY/Clayey SAND, light gray, weakly caliche cemented, Sand is fine to medium grained, wet	CL/SC	2/2	
40.0 45.0	72	(40.0-46.0) - Silty, Clayey SAND, gray, fine to medium grained, wet	SM/SC	2/2 0/2 2/2	
	68	(46.0-49.0) - Silty CLAY/Clayey SAND, light gray, weakly caliche cemented, Sand is fine to medium grained, wet	SC	1.5/2 0.5/1	

CRAIG E. BENNETT
GEOLOGY
LIC #1205

Craig E. Bennett
4-28-2017

Total Boring Depth = 49 ft Below Ground Level; North and Easting Coordinates from NAD-83, South Central Zone

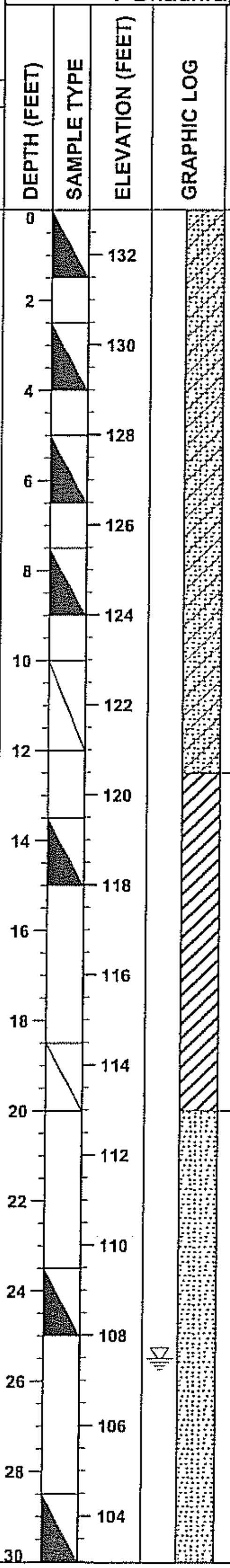
BLACK & VEATCH

PRELIMINARY BORING LOG

BORING NO. BV-5
SHEET 1 OF 3

CLIENT International Power America, Inc
PROJECT Coleto Creek Unit Two
PROJECT NO. 149116
PROJECT LOCATION Victoria, Texas
COORDINATES N 327129.3' E 2570579.3'
GROUND ELEVATION (DATUM) 133.0 ft (MSL)
TOTAL DEPTH 80.0 (feet)
SURFACE CONDITIONS Grassy, level, tan clayey sand
COORDINATE SYSTEM State Plane
DATE START 9/16/08
DATE FINISHED 9/17/08
LOGGED BY V Bhadriraju
CHECKED BY V Bhadriraju
APPROVED BY

SOIL SAMPLING						
SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY
ROCK CORING						
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD
SPT	1	3	7	11	18	1.0
SPT	2	13	11	10	21	1.2
SPT	3	6	10	13	23	1.2
SPT	4	6	10	13	23	1.1
CA	5	6	14	19	33	1.4
SPT	6	13	16	20	36	1.5
CA	7	19	30	28	58	1.5
SPT	8	6	8	8	16	1.5
SPT	9	50/5"	-	-	>50	0.3



CLASSIFICATION OF MATERIALS

Clayey SAND; brownish gray; medium dense; moist; fine grained; poorly graded; some roots

@ 3.0'-3.2' yellowish brown fine to medium sand partings; roots grade out

grading light gray w/ some black mottling

grading w/some light brown staining

12.5

CLAY; white; hard; moist; low plasticity; frequent pockets of gray fine grained clayey sand

grading w/ frequent pockets of gray & light brown clay

20.0

SAND; grayish white; moist; fine to medium grained; poorly graded

grading medium dense w/trace angular gravel
@ 24.0' gravel grades out

grading very dense
@29.2' calcareous sand nodules; some white silt w/

REMARKS

Boring advanced w/ 3-1/4" ID hollow stem auger. SPT performed w/ auto hammer. Sand partings are vertical and dry.

Encountered water @ 25.5' during drilling

Sand in augers. Augers being

BLACK & VEATCH

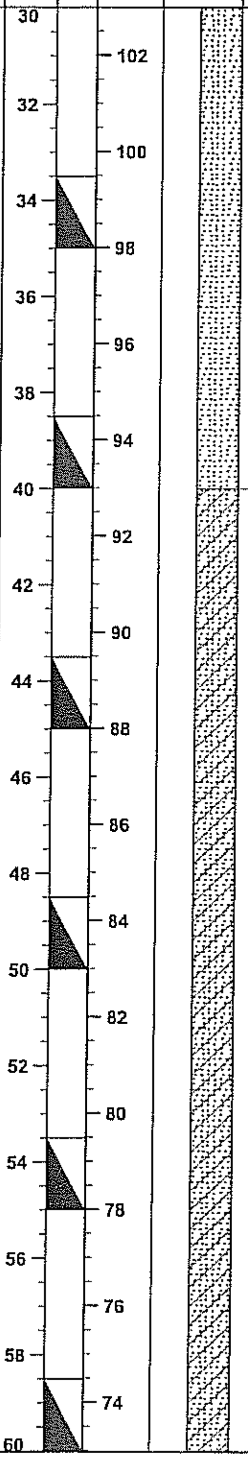
PRELIMINARY BORING LOG

BORING NO. BV-5
SHEET 2 OF 3

CLIENT International Power America, Inc		**PROJECT** Coleto Creek Unit Two	**PROJECT NO.** 149116
PROJECT LOCATION Victoria, Texas	**COORDINATES** N 327129.3' E 2570579.3'	**GROUND ELEVATION (DATUM)** 133.0 ft (MSL)	**TOTAL DEPTH** 80.0 (feet)
SURFACE CONDITIONS Grassy, level, tan clayey sand	**COORDINATE SYSTEM** State Plane	**DATE START** 9/16/08	**DATE FINISHED** 9/17/08
LOGGED BY V Bhadriraju	**CHECKED BY** V Bhadriraju	**APPROVED BY**	

SOIL SAMPLING / **ROCK CORING**

SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD
SPT	10	6	8	10	18	0.9
SPT	11	14	33	38	71	1.5
SPT	12	12	16	21	37	1.5
SPT	13	12	17	20	37	1.5
SPT	14	17	40	33	73	0.9
SPT	15	7	50/3"	-	>50	0.3



CLASSIFICATION OF MATERIALS

chalk nodules

grading medium dense; wet; fine to medium grained; well graded

grading very dense
@ 38.5'-39.3' yellow silty clay layer
@ 39.3' grading grayish white w/ fine grained sand & some silt

40.0

Clayey SAND; light gray; dense; moist; fine grained; poorly graded

grading light brown; silt grades out

grading fine to medium grained

some angular gravel

grading w/ white fine sand; some clay cementation

REMARKS

driven along w/ spoon. Below 28.5' continued w/ rotary wash method using 4" drag bit & bentonite slurry as drilling fluid. Driller reported trace gravel from 28.5'-38.5'.

Based on driller's comments.

Driller reported alternating hard and soft drilling efforts.

BLACK & VEATCH

PRELIMINARY
BORING LOG

BORING NO. BV-5
SHEET 3 OF 3

CLIENT International Power America, Inc	**PROJECT** Coleto Creek Unit Two	**PROJECT NO.** 149116

PROJECT LOCATION Victoria, Texas	**COORDINATES** N 327129.3'	E 2570579.3'	**GROUND ELEVATION (DATUM)** 133.0 ft (MSL)	**TOTAL DEPTH** 80.0 (feet)

SURFACE CONDITIONS Grassy, level, tan clayey sand	**COORDINATE SYSTEM** State Plane	**DATE START** 9/16/08	**DATE FINISHED** 9/17/08

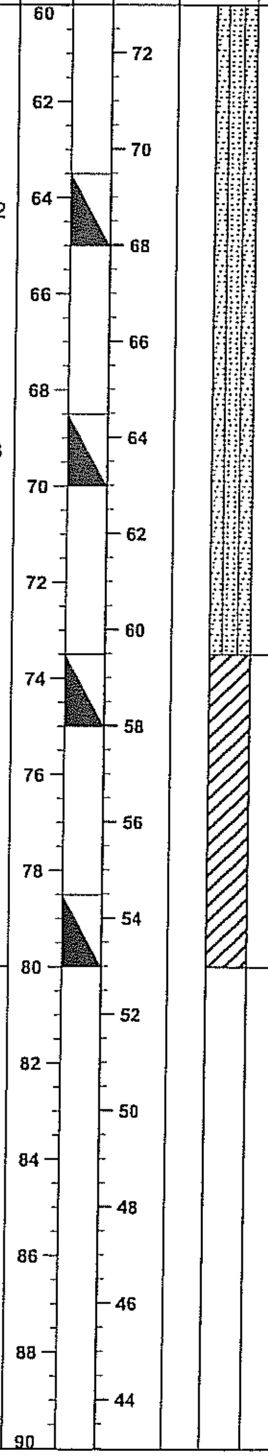
LOGGED BY V Bhadriraju	**CHECKED BY** V Bhadriraju	**APPROVED BY**

SOIL SAMPLING

SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY
SPT	16	50/4"	-	-	>50	0.2
SPT	17	50/3"	-	-	>50	0.3
SPT	18	12	17	22	39	1.5
SPT	19	13	17	22	39	1.5

ROCK CORING

CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD



CLASSIFICATION OF MATERIALS	REMARKS
60.0 Silty SAND; white; very dense; moist; fine grained; poorly graded; some pockets of light brown clay; highly cemented	Based on driller's comments & cuttings from rotary wash.
grading w/ trace angular to subangular gravel; clay pockets grade to trace	
73.5 CLAY; dark tan; hard; moist; low plasticity; some sand @ 74.5' yellowish gray	No clay cuttings in drilling fluid return.
	Bottom of boring @ 80.0'. Water level recorded @ 24.6' after 24 hours. Boring backfilled w/ bentonite pallets to 42.5' on 09/17/08. Piezometer PZ-5 set from 30.0' to 40.0'. Boring backfilled with cement bentonite grout to ground surface.

BLACK & VEATCH

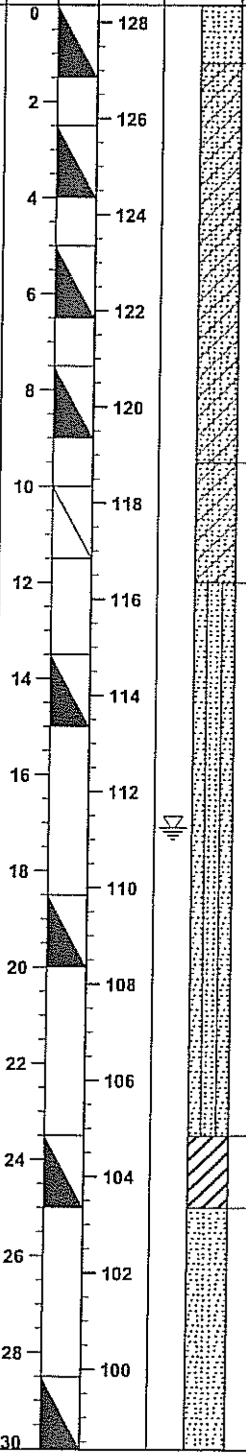
PRELIMINARY BORING LOG

BORING NO. BV-21

SHEET 1 OF 3

CLIENT International Power America, Inc	**PROJECT** Coleto Creek Unit Two	**PROJECT NO.** 149116
PROJECT LOCATION Victoria, Texas	**COORDINATES** N 328659.7' E 2571578.7'	**GROUND ELEVATION (DATUM)** 128.4 ft (MSL)
TOTAL DEPTH 80.0 (feet)	**SURFACE CONDITIONS** Level, loose, silty sand	**COORDINATE SYSTEM** State
DATE START 9/8/08	**DATE FINISHED** 9/8/08	
LOGGED BY V. Bhadriraju	**CHECKED BY** V Bhadriraju	**APPROVED BY**

SOIL SAMPLING						
SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY
ROCK CORING						
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD
SPT	1	1	2	5	7	0.9
SPT	2	5	5	6	11	1.5
SPT	3	4	6	9	15	1.5
SPT	4	5	6	8	14	1.1
CA	5	3	3	4	7	1.5
SPT	6	22	50/3	-	>50	0.7
SPT	7	24	50	50/4	>50	0.9
SPT	8	5	6	14	20	1.5
SPT	9	20	48	48	96	1.5



CLASSIFICATION OF MATERIALS

SAND; dark brown; loose; moist; fine grained; poorly graded

1.2

Clayey SAND; light brown; medium dense; moist; fine grained; poorly graded

grading light gray; some black mottling & trace roots

grading w/trace chalk nodules; roots grade out

grading w/frequent seams of chalk nodules

9.5

Clayey SAND; light gray; moist; fine to medium grained; poorly graded; trace gravel

grading w/highly cemented calcareous sand

12.0

Silty SAND; grayish white; very dense; moist; fine grained; poorly graded

grading orange; wet; fine to medium grained; trace calcareous sand nodules

23.5

CLAY; light gray; very stiff; moist; high plasticity; some light brown clay pockets

25.0

SAND; light gray; very dense; wet; fine to coarse grained; well graded; w/trace gravel

REMARKS

Boring advanced w/3-1/4" ID hollow stem auger. SPT performed w/auto hammer.

Water encountered during drilling @ 17.6'.

Driller reports softer drilling. Below 18.5' continued w/ rotary wash method using 4" drag bit & bentonite slurry as drilling fluid.

White silt & fine sand in bottom of SPT-8

BLACK & VEATCH

PRELIMINARY BORING LOG

BORING NO. BV-21
SHEET 2 OF 3

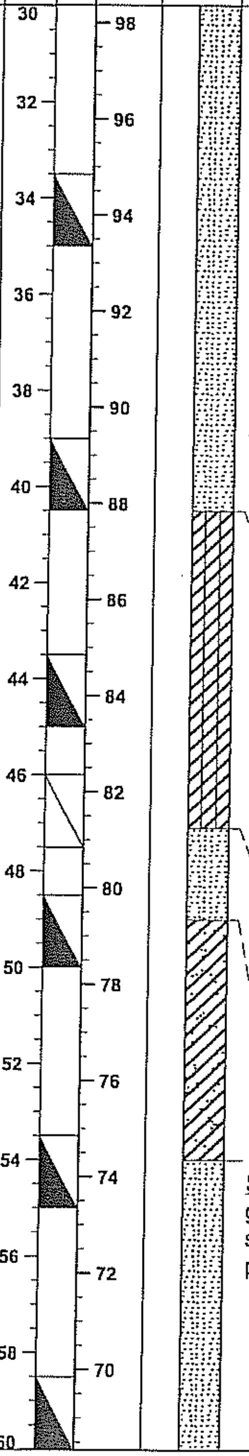
CLIENT	International Power America, Inc
PROJECT	Coleto Creek Unit Two
PROJECT NO.	149116
PROJECT LOCATION	Victoria, Texas
COORDINATES	N 328659.7' E 2571578.7'
GROUND ELEVATION (DATUM)	128.4 ft (MSL)
TOTAL DEPTH	80.0 (feet)
SURFACE CONDITIONS	Level, loose, silty sand
COORDINATE SYSTEM	State
DATE START	9/8/08
DATE FINISHED	9/8/08
LOGGED BY	V. Bhadriraju
CHECKED BY	V Bhadriraju
APPROVED BY	

SOIL SAMPLING

SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY
SPT	10	33	50/4"	-	>50	0.4
SPT	11	9	24	40	64	1.4
SPT	12	13	39	50/4"	>50	1.1
CA	13	30	45	50/5"	>50	1.0
SPT	14	36	50/5"	-	>50	1.0
SPT	15	17	30	32	62	1.5
SPT	16	50/4"	-	-	>50	0.3

ROCK CORING

CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD



CLASSIFICATION OF MATERIALS

grading grayish white; fine grained; poorly graded; w/ trace clay & some gravel

grading fine to medium grained; clay & gravel grade out

grading w/occasional light brown clay pockets

@ 40.5' white clayey silt & some chalk nodules

40.5

Silty CLAY; grayish white; hard; moist; low plasticity; w/ some light gray fine sand pockets

grading w/limestone nodules

47.1

SAND; light gray; wet; fine grained; poorly graded; highly cemented

@ 47.2' grading light brown; fine to medium grained; cementation grades out

49.0

Sandy CLAY; grayish white; hard; dry; low plasticity

54.0

SAND; light brown; very dense; wet; fine to medium grained; poorly graded; some gravel & coarse sand sized chalk nodules; occasional light brown clay pockets

REMARKS

@ 34.0'-35.0' boulder encountered. Hard drilling. Drilled through w/ 4" tricone driller bit. Driller reported limestone in cuttings. Continued w/4" paddle bit.
39.0'- 43.2' driller reported clay like drilling.

BLACK & VEATCH

PRELIMINARY BORING LOG

BORING NO. BV-21
SHEET 3 OF 3

CLIENT International Power America, Inc		**PROJECT** Coleto Creek Unit Two	**PROJECT NO.** 149116
PROJECT LOCATION Victoria, Texas	**COORDINATES** N 328659.7' E 2571578.7'	**GROUND ELEVATION (DATUM)** 128.4 ft (MSL)	**TOTAL DEPTH** 80.0 (feet)
SURFACE CONDITIONS Level, loose, silty sand	**COORDINATE SYSTEM** State	**DATE START** 9/8/08	**DATE FINISHED** 9/8/08
LOGGED BY V. Bhadriraju	**CHECKED BY** V Bhadriraju	**APPROVED BY**	

SOIL SAMPLING: SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY	DEPTH (FEET)	ELEVATION (FEET)	CLASSIFICATION OF MATERIALS	REMARKS
							60	68	@ 60.0' white chalk layer	
							61.0		CLAY; yellowish gray; hard; moist; high plasticity	Clay cuttings from rotary wash
SPT	17	11	20	25	45	1.5	64	64		
SPT	18	18	25	25	50	1.5	69		grading w/frequent partings of grayish white fine sand w/gravel sized chalk nodules	
							73.5		@ 73.5'-74.0' light brown	
SPT	19	14	27	27	54	1.5	74	54	fine sand partings grade to occasional	
SPT	20	18	18	29	47	1.5	79.0		SAND; grayish white; dense; moist; fine grained; poorly graded; trace clay	
							80	48		Bottom of boring @ 80.0'. Water level recorded @ 16.3' after 24 hours. Boring backfilled w/ bentonite pallets to 42.5' on 09/09/08. Piezometer PZ-21 set from 30.0' to 40.0'. Boring backfilled with cement bentonite grout to ground surface.

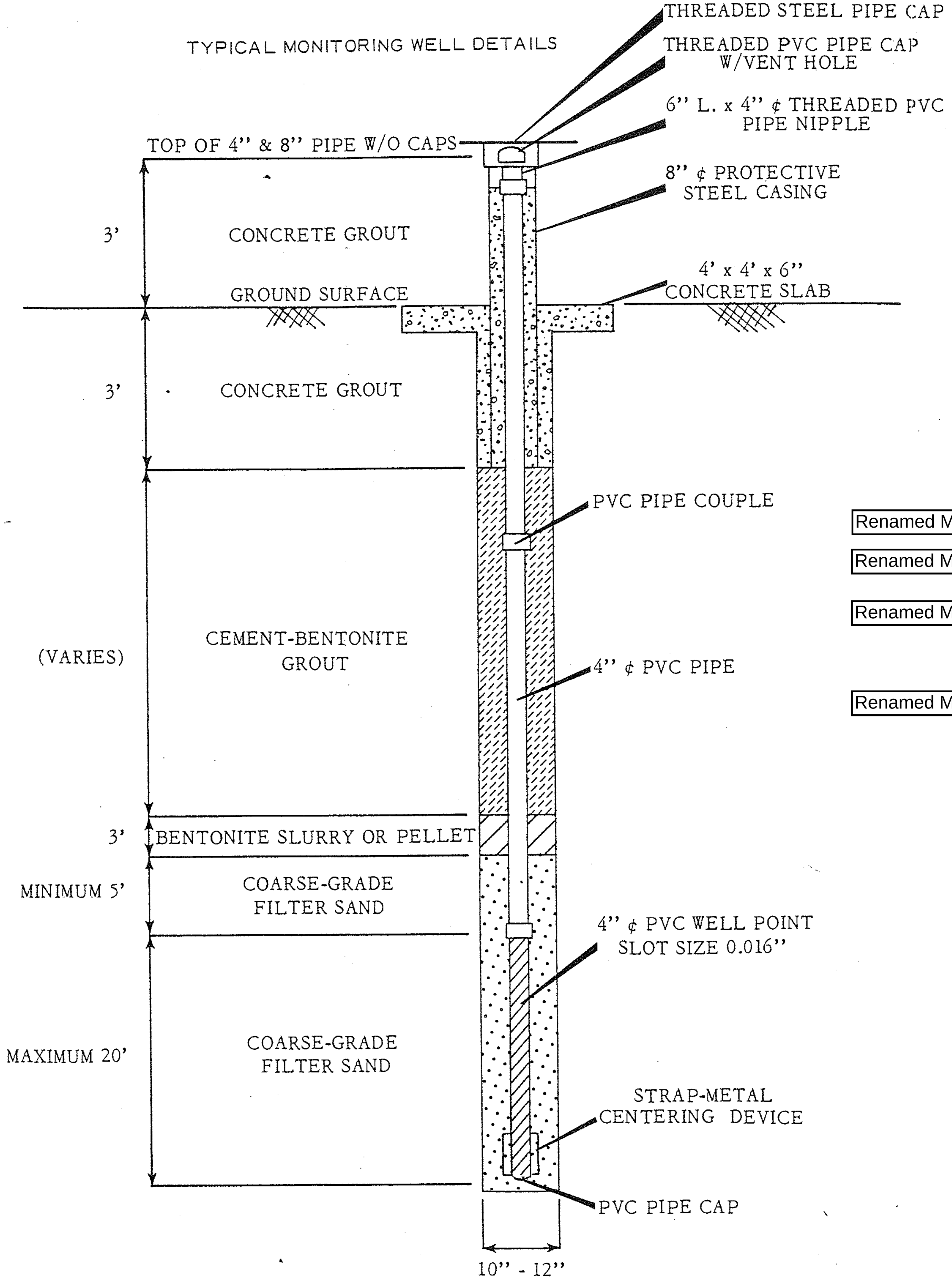
ROCK CORING: CORE SIZE | RUN NUMBER | RUN LENGTH | RUN RECOVERY | RQD RECOVERY | PERCENT RECOVERY | RQD

SAMPLE TYPE | GRAPHIC LOG

MONITORING WELL CONSTRUCTION FORMS

EXHIBIT 11
SL–3689

TYPICAL MONITORING WELL DETAILS



AS-BUILT DETAILS

	Well No.	Elevation Top of PVC	Elevation Ground Surface	Elevation Top of Gravelpack	Elevation Top Well Screen	Elevation Bottom of Well
	W-1	114.78	112.0	89.8	80.2	60.0
	W-2	127.38	124.2	93.3	85.0	65.2
	W-3	132.49	129.3	97.5	89.5	70.2
Renamed MW-4	W-4	137.71	134.3	110.5	83.8	64.2
Renamed MW-5	W-5	122.31	119.0	85.8	80.1	60.3
Renamed MW-6	W-6	119.22	116.4	82.2	75.1	55.2
	W-7	130.07	127.0	80.4	74.9	50.1
Renamed MW-8	W-8	134.72	131.8	103.0	94.8	74.9

NOTES:
1. ELEVATIONS ARE IN FT ABOVE MSL
2. MONITORING WELLS WERE INSTALLED USING TEMPORARY STEEL CASING TO EXCLUDE CAVING SOILS FROM CONTAMINATING WELL
3. MONITORING WELLS WERE INSTALLED AND DISINFECTED TO THE REQUIREMENTS OF SARGENT & LUNDY TECHNICAL SPECIFICATION FOR SOIL BORING AND MONITORING WELL WORK

SUMMARY OF GROUNDWATER MONITORING
WELL DETAILS

SARGENT & LUNDY
ENGINEERS

STATE OF TEXAS WELL REPORT for Tracking #423117

Owner: **IPA Operations, Inc.**

Owner Well #: **W-9** Renamed MW-9

Address:
Coleto Creek Power LP
PO Box 8
Fannin, TX 77960

Grid #: **79-23-2**

Latitude:

Longitude:

Well Location:
Coletto Creek Power Plant
Fannin, TX 77960

Elevation: **No Data**

Well County: **Goliad**

Type of Work: **New Well**

Proposed Use: **Monitor**

Drilling Start Date: **9/16/2015** Drilling End Date: **9/17/2015**

Borehole:

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**6**	**0**	**60**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Filter Material*	*Size*
38	**60**	**Sand**	**16/30**

Annular Seal Data:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
0	**2**	**Cement 1 Bags/Sacks**
2	**38**	**Bentonite 15 Bags/Sacks**

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed** **Surface Completion by Driller**

Water Level: **25.2 ft.** below land surface on **2015-09-18** Measurement Method: **water level meter**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	**No Data**

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **EnviroCore, Inc.**

7525 Idle Hour Dr.
Corpus Christi, TX 78414

Driller Name: **Craig Schena** License Number: **4694**

Comments: **No Data**

Report Amended on 5/26/2016 by Request #17930

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	**2**	**fill material**
2	**5.5**	**silty clay/clayey sand;brownish gray to white**
5.5	**10**	**silty clay; dark gray**
10	**20.5**	**caliche and silty clay;light gray to white**
20.5	**22**	**silty sand;brownish gray**
22	**44**	**sand; light orangish brown**
44	**47**	**silty sand; light gray**
47	**54**	**silty clay/clayey sand; light gray**
54	**60**	**silty, clayey sand; gray**

Casing:
BLANK PIPE & WELL SCREEN DATA

DIa (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	**Riser**	**New Plastic (PVC)**	**40**	**-3**	**40**
2	**Screen**	**New Plastic (PVC)**	**10**	**40**	**60**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #423118

Owner: **IPA Operations, Inc.**

Owner Well #: **W-10** Renamed MW-10

Address: **Coleto Creek Power LP**
PO Box 8
Fannin, TX 77960

Grid #: **79-23-2**

Latitude:

Longitude:

Well Location: **Coletto Creek Power Plant**
Fannin, TX 77960

Elevation: **No Data**

Well County: **Goliad**

Type of Work: **New Well**

Proposed Use: **Monitor**

Drilling Start Date: **9/15/2015** Drilling End Date: **9/15/2015**

Borehole:

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**6**	**0**	**60**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Filter Material*	*Size*
Filter Pack Intervals:	**38**	**60**	**Sand**	**16/30**

Annual Seal Data: **No Data**

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed** **Surface Completion by Driller**

Water Level: **24.8 ft.** below land surface on **2015-09-18** Measurement Method: **water level meter**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	**No Data**

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **EnviroCore, Inc.**

7525 Idle Hour Dr.
Corpus Christi, TX 78414

Driller Name: **Craig Schena**

License Number: **4694**

Comments: **No Data**

Report Amended on 5/26/2016 by Request #17931

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	**2**	**fill material**
2	**8**	**silty sandy clay; orangish brown**
8	**11**	**silty clay/clayey sand; light gray**
11	**19**	**silty sand; light gray**
19	**30**	**sand; light gray**
30	**32**	**silty clay/clayey sand; light gray**
32	**34**	**clayey sand; brownish gray**
34	**36**	**silty sand; light gray**
36	**52**	**silty, clayey sand; light gray**
52	**60**	**silty sand; light gray**

Casing:
BLANK PIPE & WELL SCREEN DATA

DIa (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	**Riser**	**New Plastic (PVC)**	**40**	**-3**	**40**
2	**Screen**	**New Plastic (PVC)**	**10**	**40**	**60**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #462686

Owner:	**Dynegy Inc.**	Owner Well #:	**MW-11**
Address:	**Coleto Creek Power Station PO Box 8 Fannin, TX 77960**	Grid #:	**79-23-2**
		Latitude:	**28° 43' 37.02" N**
Well Location:	**Coleto Creek Power Station Fannin, TX**	Longitude:	**097° 12' 18.36" W**
		Elevation:	**No Data**
Well County:	**Goliad**		

Type of Work: **New Well**

Proposed Use: **Monitor**

Drilling Start Date: **4/25/2017**

Drilling End Date: **4/25/2017**

Borehole:

Diameter (in.)	Top Depth (ft.)	Bottom Depth (ft.)
6	0	49

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

Top Depth (ft.)	Bottom Depth (ft.)	Filter Material	Size
27	49	Sand	16/30

Annular Seal Data:

Top Depth (ft.)	Bottom Depth (ft.)	Description (number of sacks & material)
0	1	Cement 1 Bags/Sacks
1	27	Bentonite 13 Bags/Sacks

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed**

Surface Completion by Driller

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	*Water Type*
No Data	**No Data**

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **EnviroCore, Inc.**

7525 Idle Hour Dr.
Corpus Christi, TX 78414

Driller Name: **Craig Schena** License Number: **4694**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**1**	**0-1.0 - Silty CLAY**
1	**6.5**	**Predominately Caliche and Silty Clay**
6.5	**13.8**	**Silty Clayey Sand**
13.8	**28.5**	**Sand with abundant gravel**
28.5	**38**	**Silty Clayey Sand**
38	**40**	**Silty Clay/Clayey Sand**
40	**46**	**Silty Clayey Sand**
46	**49**	**Silty Clay/Clayey Sand**

Casing:
BLANK PIPE & WELL SCREEN DATA

DIa (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**-3**	**29**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**29**	**49**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 334-5540

Bullock, Bennett & Associates, LLC
165 N. Lampasas Street
Bertram, TX 78605

LOG OF BORING MW-11

(Page 1 of 1)

COLETO CREEK POWER STATION
FANNIN, TX

Project No. 17252

Date : 4/25/2017
Easting : 2543727.0
Northing : 13452676.5
Top of Casing Elevation 118.66 ft NAVD 88
Logger : EEF

Drilling Company : EnviroCore
Driller : Craig Schena (Lic. #4694)
Drill Rig : CME75
Drilling Method : Hollow Stem Auger - 6"
Sampling Method : Split-Spoon

DEPTH (feet)	Surface Elevation 115.8	DESCRIPTION	USCS	Recovery (ft/ft)	WELL DIAGRAM/REMARKS
0.0		(0-1.0) - Silty CLAY, dark brown, soft to firm, medium plasticity, minor roots, moist	CL	2/2	
5.0	112	(1.0-6.5) - Predominantly Caliche and Silty CLAY, light gray to white, Caliche is weakly cemented, low to medium plascticity, wet	CL/ML	2/2 2/2	
10.0	108 104	(6.5-13.8) - Silty, Clayey SAND, light gray to white, very fine to medium grained, wet	SM	2/2 2/2 2/2 2/2	Water Level: 11.2' BGL
15.0 20.0 25.0	100 96 92 88	(13.8-28.5) - SAND, very light orangish brownish to very light gray, fine to coarse grained, abundant gravel, slightly silty, wet	SW	2/2 2/2 2/2 2/2 2/2 2/2 2/2	Well Construction: Riser ~2.7' AGL - 29.0' BGL Neat Cement: 0' - 1.0' BGL Bentonite chips seal: 1.0' - 27.0' BGL Sand Pack: 27.0' - 49.0' BGL Screen: 29.0' - 49.0' BGL
30.0 35.0	84 80	(28.5-38.0) - Silty, Clayey SAND, gray to light brownish gray, very fine to medium grained, wet	SM/SC	2/2 2/2 2/2 2/2 2/2	
		(38.0-40.0) - Silty CLAY/Clayey SAND, light gray, weakly caliche cemented, Sand is fine to medium grained, wet	CL/SC	2/2	
40.0 45.0	76 72	(40.0-46.0) - Silty, Clayey SAND, gray, fine to medium grained, wet	SM/SC	2/2 0/2 2/2	
	68	(46.0-49.0) - Silty CLAY/Clayey SAND, light gray, weakly caliche cemented, Sand is fine to medium grained, wet	SC	1.5/2 0.5/1	

STATE OF TEXAS
CRAIG E. BENNETT
GEOLOGY
LIC #1205
LICENSED
PROFESSIONAL GEOSCIENTIST

Craig E. Bennett
4-28-2017

Total Boring Depth = 49 ft Below Ground Level; North and Easting Coordinates from NAD-83, South Central Zone

BLACK & VEATCH

PRELIMINARY BORING LOG

BORING NO. BV-5
SHEET 1 OF 3

CLIENT International Power America, Inc		**PROJECT** Coleto Creek Unit Two	**PROJECT NO.** 149116
PROJECT LOCATION Victoria, Texas	**COORDINATES** N 327129.3' E 2570579.3'	**GROUND ELEVATION (DATUM)** 133.0 ft (MSL)	**TOTAL DEPTH** 80.0 (feet)
SURFACE CONDITIONS Grassy, level, tan clayey sand	**COORDINATE SYSTEM** State Plane	**DATE START** 9/16/08	**DATE FINISHED** 9/17/08
LOGGED BY V Bhadriraju	**CHECKED BY** V Bhadriraju	**APPROVED BY**	

SOIL SAMPLING: SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY
ROCK CORING: CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD
SPT	1	3	7	11	18	1.0
SPT	2	13	11	10	21	1.2
SPT	3	6	10	13	23	1.2
SPT	4	6	10	13	23	1.1
CA	5	6	14	19	33	1.4
SPT	6	13	16	20	36	1.5
CA	7	19	30	28	58	1.5
SPT	8	6	8	8	16	1.5
SPT	9	50/5"	-	-	>50	0.3

DEPTH (FEET): 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30

SAMPLE TYPE

ELEVATION (FEET): 132, 130, 128, 126, 124, 122, 120, 118, 116, 114, 112, 110, 108, 106, 104

GRAPHIC LOG

CLASSIFICATION OF MATERIALS

Clayey <u>SAND</u>; brownish gray; medium dense; moist; fine grained; poorly graded; some roots

@ 3.0'-3.2' yellowish brown fine to medium sand partings; roots grade out

grading light gray w/ some black mottling

grading w/some light brown staining

12.5

<u>CLAY</u>; white; hard; moist; low plasticity; frequent pockets of gray fine grained clayey sand

grading w/ frequent pockets of gray & light brown clay

20.0

<u>SAND</u>; grayish white; moist; fine to medium grained; poorly graded

grading medium dense w/trace angular gravel
@ 24.0' gravel grades out

▽

grading very dense
@29.2' calcareous sand nodules; some white silt w/

REMARKS

Boring advanced w/ 3-1/4" ID hollow stem auger. SPT performed w/ auto hammer. Sand partings are vertical and dry.

Encountered water @ 25.5' during drilling

Sand in augers. Augers being

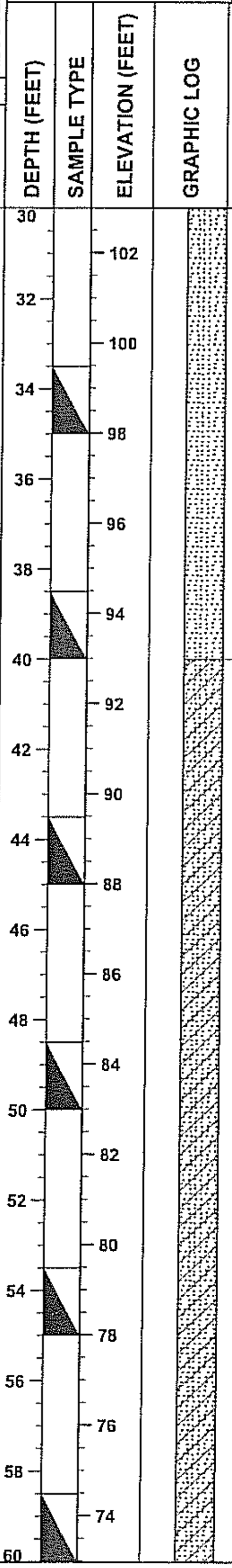
BLACK & VEATCH

PRELIMINARY BORING LOG

BORING NO. BV-5

SHEET 2 OF 3

CLIENT International Power America, Inc	PROJECT Coleto Creek Unit Two		PROJECT NO. 149116
PROJECT LOCATION Victoria, Texas	COORDINATES N 327129.3' E 2570579.3'	GROUND ELEVATION (DATUM) 133.0 ft (MSL)	TOTAL DEPTH 80.0 (feet)
SURFACE CONDITIONS Grassy, level, tan clayey sand	COORDINATE SYSTEM State Plane	DATE START 9/16/08	DATE FINISHED 9/17/08
LOGGED BY V Bhadriraju	CHECKED BY V Bhadriraju	APPROVED BY	



SOIL SAMPLING: SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY	CLASSIFICATION OF MATERIALS	REMARKS
ROCK CORING: CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD		
							chalk nodules	driven along w/ spoon. Below 28.5' continued w/ rotary wash method using 4" drag bit & bentonite slurry as drilling fluid. Driller reported trace gravel from 28.5'-38.5'.
SPT	10	6	8	10	18	0.9	grading medium dense; wet; fine to medium grained; well graded	
SPT	11	14	33	38	71	1.5	grading very dense @ 38.5'-39.3' yellow silty clay layer @ 39.3' grading grayish white w/ fine grained sand & some silt — — — — — — — — — — — — — — — 40.0 Clayey SAND; light gray; dense; moist; fine grained; poorly graded	Based on driller's comments.
SPT	12	12	16	21	37	1.5		
SPT	13	12	17	20	37	1.5	grading light brown; silt grades out	
SPT	14	17	40	33	73	0.9	grading fine to medium grained some angular gravel	
SPT	15	7	50/3"	-	>50	0.3	grading w/ white fine sand; some clay cementation	Driller reported alternating hard and soft drilling efforts.

BLACK & VEATCH

PRELIMINARY BORING LOG

BORING NO. BV-5

SHEET 3 OF 3

CLIENT International Power America, Inc	**PROJECT** Coleto Creek Unit Two	**PROJECT NO.** 149116

PROJECT LOCATION Victoria, Texas	**COORDINATES** N 327129.3'	E 2570579.3'	**GROUND ELEVATION (DATUM)** 133.0 ft (MSL)	**TOTAL DEPTH** 80.0 (feet)

SURFACE CONDITIONS Grassy, level, tan clayey sand	**COORDINATE SYSTEM** State Plane	**DATE START** 9/16/08	**DATE FINISHED** 9/17/08

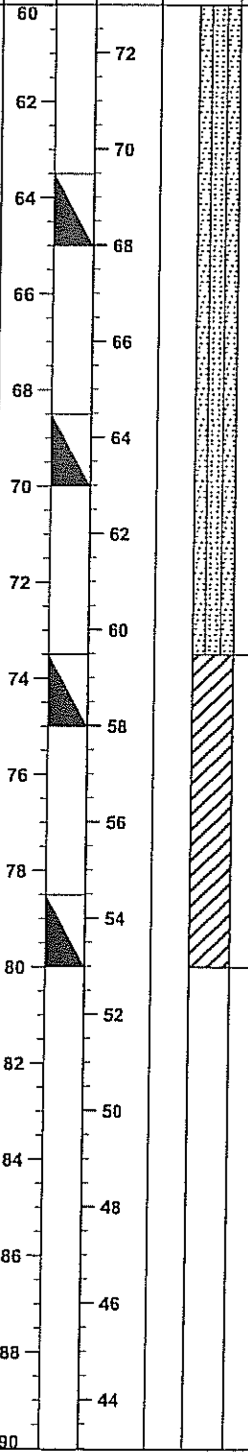
LOGGED BY V Bhadriraju	**CHECKED BY** V Bhadriraju	**APPROVED BY**

SOIL SAMPLING

SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY
SPT	16	50/4"	-	-	>50	0.2
SPT	17	50/3"	-	-	>50	0.3
SPT	18	12	17	22	39	1.5
SPT	19	13	17	22	39	1.5

ROCK CORING

CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD



CLASSIFICATION OF MATERIALS	REMARKS
60.0 Silty SAND; white; very dense; moist; fine grained; poorly graded; some pockets of light brown clay; highly cemented	Based on driller's comments & cuttings from rotary wash.
grading w/ trace angular to subangular gravel; clay pockets grade to trace	
73.5 CLAY; dark tan; hard; moist; low plasticity; some sand @ 74.5' yellowish gray	No clay cuttings in drilling fluid return.
	Bottom of boring @ 80.0'. Water level recorded @ 24.6' after 24 hours. Boring backfilled w/ bentonite pallets to 42.5' on 09/17/08. Piezometer PZ-5 set from 30.0' to 40.0'. Boring backfilled with cement bentonite grout to ground surface.

BLACK & VEATCH

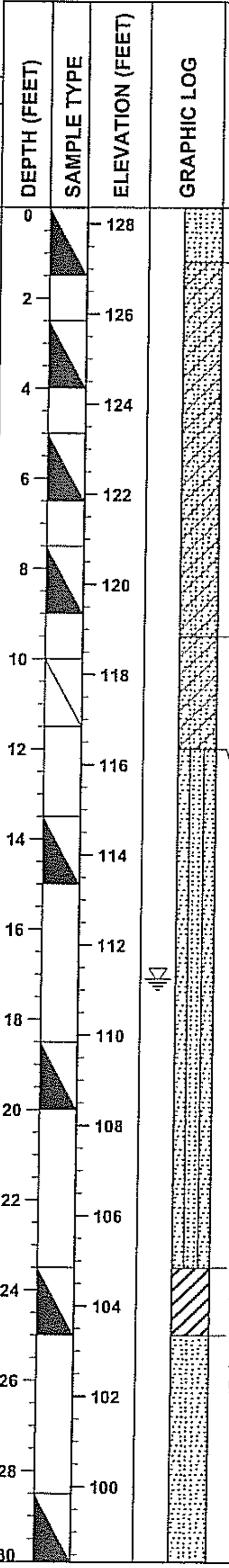
PRELIMINARY BORING LOG

BORING NO. BV-21

SHEET 1 OF 3

CLIENT International Power America, Inc		**PROJECT** Coleto Creek Unit Two	**PROJECT NO.** 149116
PROJECT LOCATION Victoria, Texas	**COORDINATES** N 328659.7' E 2571578.7'	**GROUND ELEVATION (DATUM)** 128.4 ft (MSL)	**TOTAL DEPTH** 80.0 (feet)
SURFACE CONDITIONS Level, loose, silty sand	**COORDINATE SYSTEM** State	**DATE START** 9/8/08	**DATE FINISHED** 9/8/08
LOGGED BY V. Bhadriraju	**CHECKED BY** V Bhadriraju	**APPROVED BY**	

SOIL SAMPLING: SAMPLE TYPE ROCK CORING: CORE SIZE	SAMPLE NUMBER RUN NUMBER	SET 6 INCHES RUN LENGTH	2ND 6 INCHES RUN RECOVERY	3RD 6 INCHES RQD RECOVERY	N VALUE PERCENT RECOVERY	SAMPLE RECOVERY RQD
SPT	1	1	2	5	7	0.9
SPT	2	5	5	6	11	1.5
SPT	3	4	6	9	15	1.5
SPT	4	5	6	8	14	1.1
CA	5	3	3	4	7	1.5
SPT	6	22	50/3	-	>50	0.7
SPT	7	24	50	50/4	>50	0.9
SPT	8	5	6	14	20	1.5
SPT	9	20	48	48	96	1.5



CLASSIFICATION OF MATERIALS

SAND; dark brown; loose; moist; fine grained; poorly graded

1.2

Clayey SAND; light brown; medium dense; moist; fine grained; poorly graded

grading light gray; some black mottling & trace roots

grading w/trace chalk nodules; roots grade out

grading w/frequent seams of chalk nodules

9.5

Clayey SAND; light gray; moist; fine to medium grained; poorly graded; trace gravel

grading w/highly cemented calcareous sand

12.0

Silty SAND; grayish white; very dense; moist; fine grained; poorly graded

grading orange; wet; fine to medium grained; trace calcareous sand nodules

23.5

CLAY; light gray; very stiff; moist; high plasticity; some light brown clay pockets

25.0

SAND; light gray; very dense; wet; fine to coarse grained; well graded; w/trace gravel

REMARKS

Boring advanced w/3-1/4" ID hollow stem auger. SPT performed w/auto hammer.

Water encountered during drilling @ 17.6'.

Driller reports softer drilling. Below 18.5' continued w/ rotary wash method using 4" drag bit & bentonite slurry as drilling fluid.

White silt & fine sand in bottom of SPT-8

PRELIMINARY BORING LOG

BORING NO. BV-21

SHEET 2 OF 3

CLIENT International Power America, Inc

PROJECT Coleto Creek Unit Two

PROJECT NO. 149116

PROJECT LOCATION Victoria, Texas

COORDINATES N 328659.7' E 2571578.7'

GROUND ELEVATION (DATUM) 128.4 ft (MSL)

TOTAL DEPTH 80.0 (feet)

SURFACE CONDITIONS Level, loose, silty sand

COORDINATE SYSTEM State

DATE START 9/8/08

DATE FINISHED 9/8/08

LOGGED BY V. Bhadriraju

CHECKED BY V Bhadriraju

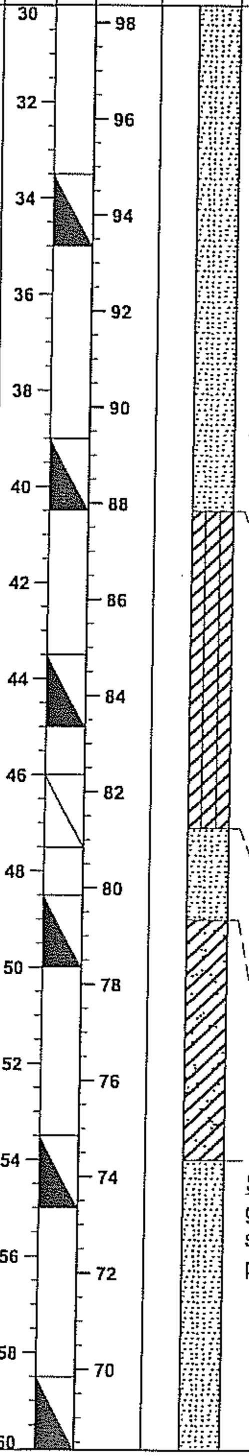
APPROVED BY

SOIL SAMPLING

SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY
SPT	10	33	50/4"	-	>50	0.4
SPT	11	9	24	40	64	1.4
SPT	12	13	39	50/4"	>50	1.1
CA	13	30	45	50/5"	>50	1.0
SPT	14	36	50/5"	-	>50	1.0
SPT	15	17	30	32	62	1.5
SPT	16	50/4"	-	-	>50	0.3

ROCK CORING

CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD



CLASSIFICATION OF MATERIALS

grading grayish white; fine grained; poorly graded; w/ trace clay & some gravel

grading fine to medium grained; clay & gravel grade out

grading w/occasional light brown clay pockets

@ 40.5' white clayey silt & some chalk nodules

40.5

Silty CLAY; grayish white; hard; moist; low plasticity; w/ some light gray fine sand pockets

grading w/limestone nodules

47.1

SAND; light gray; wet; fine grained; poorly graded; highly cemented

@ 47.2' grading light brown; fine to medium grained; cementation grades out

49.0

Sandy CLAY; grayish white; hard; dry; low plasticity

54.0

SAND; light brown; very dense; wet; fine to medium grained; poorly graded; some gravel & coarse sand sized chalk nodules; occasional light brown clay pockets

REMARKS

@ 34.0'-35.0' boulder encountered. Hard drilling. Drilled through w/ 4" tricone driller bit. Driller reported limestone in cuttings. Continued w/4" paddle bit. 39.0'- 43.2' driller reported clay like drilling.

BLACK & VEATCH

PRELIMINARY BORING LOG

BORING NO. BV-21
SHEET 3 OF 3

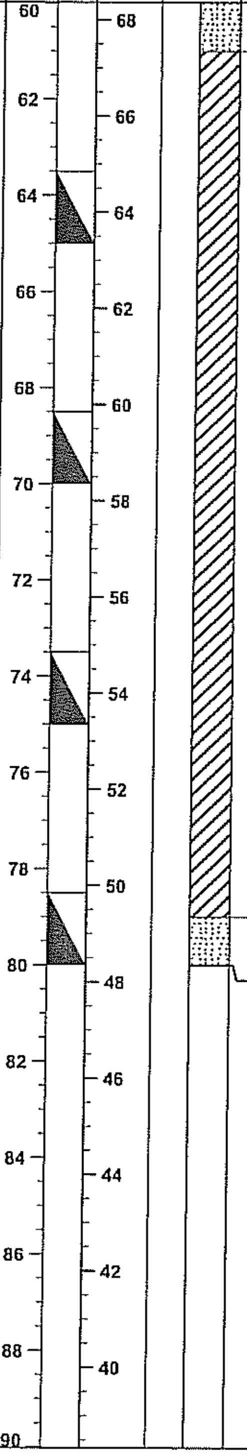
CLIENT International Power America, Inc
PROJECT Coleto Creek Unit Two
PROJECT NO. 149116
PROJECT LOCATION Victoria, Texas
COORDINATES N 328659.7' E 2571578.7'
GROUND ELEVATION (DATUM) 128.4 ft (MSL)
TOTAL DEPTH 80.0 (feet)
SURFACE CONDITIONS Level, loose, silty sand
COORDINATE SYSTEM State
DATE START 9/8/08
DATE FINISHED 9/8/08
LOGGED BY V. Bhadriraju
CHECKED BY V Bhadriraju
APPROVED BY

SOIL SAMPLING

SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY
SPT	17	11	20	25	45	1.5
SPT	18	18	25	25	50	1.5
SPT	19	14	27	27	54	1.5
SPT	20	18	18	29	47	1.5

ROCK CORING

CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD



CLASSIFICATION OF MATERIALS

@ 60.0' white chalk layer

61.0

CLAY; yellowish gray; hard; moist; high plasticity

grading w/frequent partings of grayish white fine sand w/gravel sized chalk nodules

@ 73.5'-74.0' light brown

fine sand partings grade to occasional

79.0

SAND; grayish white; dense; moist; fine grained; poorly graded; trace clay

REMARKS

Clay cuttings from rotary wash

Bottom of boring @ 80.0'. Water level recorded @ 16.3' after 24 hours. Boring backfilled w/ bentonite pallets to 42.5' on 09/09/08. Piezometer PZ-21 set from 30.0' to 40.0'. Boring backfilled with cement bentonite grout to ground surface.

STATE OF TEXAS
WELL COMPLETION REPORTS

STATE OF TEXAS WELL REPORT for Tracking #423117

Owner: **IPA Operations, Inc.**

Owner Well #: **W-9** Renamed MW-9

Address:
Coleto Creek Power LP
PO Box 8
Fannin, TX 77960

Grid #: **79-23-2**

Latitude:

Longitude:

Well Location:
Coletto Creek Power Plant
Fannin, TX 77960

Elevation: **No Data**

Well County: **Goliad**

Type of Work: **New Well**

Proposed Use: **Monitor**

Drilling Start Date: **9/16/2015** Drilling End Date: **9/17/2015**

Borehole:

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**6**	**0**	**60**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Filter Material*	*Size*
Filter Pack Intervals:	**38**	**60**	**Sand**	**16/30**

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
Annular Seal Data:	**0**	**2**	**Cement 1 Bags/Sacks**
	2	**38**	**Bentonite 15 Bags/Sacks**

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed** **Surface Completion by Driller**

Water Level: **25.2 ft.** below land surface on **2015-09-18** Measurement Method: **water level meter**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	**No Data**

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **EnviroCore, Inc.**

7525 Idle Hour Dr.
Corpus Christi, TX 78414

Driller Name: **Craig Schena**

License Number: **4694**

Comments: **No Data**

Report Amended on 5/26/2016 by Request #17930

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	**2**	**fill material**
2	**5.5**	**silty clay/clayey sand;brownish gray to white**
5.5	**10**	**silty clay; dark gray**
10	**20.5**	**caliche and silty clay;light gray to white**
20.5	**22**	**silty sand;brownish gray**
22	**44**	**sand; light orangish brown**
44	**47**	**silty sand; light gray**
47	**54**	**silty clay/clayey sand; light gray**
54	**60**	**silty, clayey sand; gray**

Casing:
BLANK PIPE & WELL SCREEN DATA

DIa (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	**Riser**	**New Plastic (PVC)**	**40**	**-3**	**40**
2	**Screen**	**New Plastic (PVC)**	**10**	**40**	**60**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #423118

Owner: **IPA Operations, Inc.**

Owner Well #: **W-10** Renamed MW-10

Address:
Coleto Creek Power LP
PO Box 8
Fannin, TX 77960

Grid #: **79-23-2**

Latitude:

Well Location:
Coletto Creek Power Plant
Fannin, TX 77960

Longitude:

Elevation: **No Data**

Well County: **Goliad**

Type of Work: **New Well**

Proposed Use: **Monitor**

Drilling Start Date: **9/15/2015** Drilling End Date: **9/15/2015**

Borehole:

Diameter (in.)	Top Depth (ft.)	Bottom Depth (ft.)
6	0	60

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

Top Depth (ft.)	Bottom Depth (ft.)	Filter Material	Size
38	60	Sand	16/30

Annular Seal Data: **No Data**

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed** **Surface Completion by Driller**

Water Level: **24.8 ft.** below land surface on **2015-09-18** Measurement Method: **water level meter**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	**No Data**

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **EnviroCore, Inc.**

7525 Idle Hour Dr.
Corpus Christi, TX 78414

Driller Name: **Craig Schena** License Number: **4694**

Comments: **No Data**

Report Amended on 5/26/2016 by Request #17931

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	**2**	**fill material**
2	**8**	**silty sandy clay; orangish brown**
8	**11**	**silty clay/clayey sand; light gray**
11	**19**	**silty sand; light gray**
19	**30**	**sand; light gray**
30	**32**	**silty clay/clayey sand; light gray**
32	**34**	**clayey sand; brownish gray**
34	**36**	**silty sand; light gray**
36	**52**	**silty, clayey sand; light gray**
52	**60**	**silty sand; light gray**

Casing:
BLANK PIPE & WELL SCREEN DATA

DIa (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	**Riser**	**New Plastic (PVC)**	**40**	**-3**	**40**
2	**Screen**	**New Plastic (PVC)**	**10**	**40**	**60**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #462686

Owner:	**Dynegy Inc.**	Owner Well #:	**MW-11**
Address:	**Coleto Creek Power Station PO Box 8 Fannin, TX 77960**	Grid #:	**79-23-2**
		Latitude:	**28° 43' 37.02" N**
Well Location:	**Coleto Creek Power Station Fannin, TX**	Longitude:	**097° 12' 18.36" W**
		Elevation:	**No Data**
Well County:	**Goliad**		

Type of Work: **New Well**

Proposed Use: **Monitor**

Drilling Start Date: **4/25/2017** Drilling End Date: **4/25/2017**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
6	**0**	**49**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Filter Material*	*Size*
27	**49**	**Sand**	**16/30**

Annular Seal Data:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
0	**1**	**Cement 1 Bags/Sacks**
1	**27**	**Bentonite 13 Bags/Sacks**

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	*Water Type*
No Data	**No Data**

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **EnviroCore, Inc.**

7525 Idle Hour Dr.
Corpus Christi, TX 78414

Driller Name: **Craig Schena**

License Number: **4694**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**1**	**0-1.0 - Silty CLAY**
1	**6.5**	**Predominately Caliche and Silty Clay**
6.5	**13.8**	**Silty Clayey Sand**
13.8	**28.5**	**Sand with abundant gravel**
28.5	**38**	**Silty Clayey Sand**
38	**40**	**Silty Clay/Clayey Sand**
40	**46**	**Silty Clayey Sand**
46	**49**	**Silty Clay/Clayey Sand**

Casing:
BLANK PIPE & WELL SCREEN DATA

DIa (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**-3**	**29**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**29**	**49**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 334-5540

MONITORING WELL DEVELOPMENT DOCUMENTATION

WELL DEVELOPMENT RECORD

PAGE 1 of 1

Project Number: 15215 Project Name: Coleto Creek Power, LP Date: 9.22.2015

ell Location (well ID, etc.): W-9

Renamed
MW-9

Developed by: C. Winkler / E. FICKER

Measuring Point (MP) of Well: TOC/PVC

Screened Interval (ft. BGL): 40-60

Filter Pack Interval (ft. BGL): 30-60

Starting Water Level (ft. BMP): 28.30

Casing Stickup (ft.): 3.15

Starting Water Level (ft. BGL): 25.15

Total Depth (ft. BGL): 60.00

Casing Diameter (In ID): 2.0

Casing Volume (gal.): 15.8

QUALITY ASSURANCE

METHODS (describe): Submersible pump and/or surge block cleaned between wells

Cleaning Equipment: Deionized water triple rinse

Purging: Water quality stabilization Surge Equipment: Submersible pump

Disposal of Discharged Water: Temporarily stored on-site in 55-gallon drums until authorized disposal

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: Water line 300 Thermometer: Horiba U50

pH Meter: Horiba U50 Field Calibration: Horiba U50 Autocal

Conductivity Meter: Horiba U50 Field Calibration: Horiba U50 Autocal

Other:

DEVELOPMENT MEASUREMENTS

	Flow		Water Quality			Appearance		
Time 1026	Cum. Vol. (gal. / L)	Purge Rate (gal. / L pm)	Temp. (°C)	pH	Spec. Cond. (μΣ/cm)	Color	Turbidity & Sediment	Remarks
1030	0	1.25	23.49	7.30	0.663	TAN, ~~CLOUDY~~	1000	D.O. 0.92
1034	5	"	23.40	7.26	0.657	"	1000	D.O. 0.65
1038	10	"	23.40	7.26	0.652	"	1000	D.O. 0.54
1045	15	~0.75	23.46	7.25	0.650	CLEARING	1,000	WL = 29.80
1051	20	~0.85	23.40	7.25	0.659	"	1000	D.O. 0.48
1059	25	~0.65	23.56	7.25	0.653	"	1000	WL = 29.80
1108	30	~0.55	23.78	7.25	0.648	"	1000	D.O. 0.42
1130	40	~0.45	24.10	7.28	0.652	"	1000	D.O. 0.40
1142	50	~0.85	23.39	7.24	0.656	"	1000	D.O. 0.35
1156	60	~0.70	23.54	7.24	0.659	"	1000	D.O. 0.31
1206	70	~1.00	23.49	7.21	0.662	NEUTRAL	727	D.O. 0.30
1212	75	~0.85	23.41	7.21	0.663	"	946	D.O. 0.29
1218	80	~1.25	23.41	7.21	0.663	"	843	D.O. 0.28

Total Discharge (gallons): 80

Observations/Comments:

PURGED WELL 5 OF 10 WELL VOLUMES
VARIABLE FLOW RATE DUE TO BATTERY POWER
DRAIN ON GEN., SWITCHED TO VEHICLE.

Bullock, Bennett, & Associates, LLC
165 N. Lampasas St.
Bertram, TX 78605
(512) 355-9198 Fax (512) 355-9197

3

WELL DEVELOPMENT RECORD

PAGE 1 of 1

Project Number: 15215 Project Name: Coleto Creek Power, LP Date: 9.22.15

'ell Location (well ID, etc.): W-10 Renamed MW-10

Developed by: C. Winkler / E. Ficker

Measuring Point (MP) of Well: TOC/PVC

Screened Interval (ft. BGL): ~40'-60'

Filter Pack Interval (ft. BGL): ~30-60

Starting Water Level (ft. BMP): 27.73

Casing Stickup (ft.): ~3.00

Starting Water Level (ft. BGL): 24.73

Total Depth (ft. BGL): ~62.00

Casing Diameter (In ID): 2.0

Casing Volume (gal.): ~5.30

QUALITY ASSURANCE

METHODS (describe): Submersible pump and/or surge block cleaned between wells

Cleaning Equipment: Deionized water triple rinse

Purging: Water quality stabilization Surge Equipment: Submersible pump

Disposal of Discharged Water: Temporarily stored on-site in 55-gallon drums until authorized disposal

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: Water line 300 Thermometer: Horiba U50

pH Meter: Horiba U50 Field Calibration: Horiba U50 Autocal

Conductivity Meter: Horiba U50 Field Calibration: Horiba U50 Autocal

Other:

DEVELOPMENT MEASUREMENTS

Time	Flow		Water Quality			Appearance		Remarks
	Cum. Vol. (gal. / L)	Purge Rate (gal. / L pm)	Temp. (°C)	pH	Spec. Cond. (μΣ/cm)	Color	Turbidity & Sediment	
0828	—	—	—	—	—	TAN ~~[illegible]~~	—	
0832	5	~1.75	24.48	6.83	1.27	CLOUDY	1000	D.O. 6.39
0836	10	"	24.54	6.79	1.26	"	1000	D.O. 5.14
0840	15	"	24.55	6.77	1.27	"	1000	D.O. 3.93
0844	20	"	24.56	6.76	1.31	~~[illegible]~~ CLY	1000	WL = 41.51
0849	25	"	24.57	6.76	1.32	"	511	WL 41.51
0853	30	"	24.53	6.77	1.30	"	419	" 42.73
0857	35	"	24.57	6.75	1.33	"	348	D.O. 0.62
0901	40	"	24.55	6.76	1.32	"	278	D.O. 0.60
0905	45	"	24.55	6.76	1.32	"	257	D.O. 0.62
0909	50	"	24.55	6.76	1.32	"	202	D.O. 0.60
0913	55	"	24.55	6.76	1.32	"	216	WL = 42.80
0918	60	"	24.52	6.73	1.34	"	223	D.O = 0.58
0922 Total Discharge (gallons):	65	"	24.51	6.75	1.34	"	181	D.O. = 0.62

Observations/Comments: PURGING 10 WELL VOLUMES, PARAMETERS RECORDED AFTER EACH WELL VOLUME.

X LOWERED PUMP ~ 4 FEET

Bullock, Bennett, & Associates, LLC
165 N. Lampasas St.
Bertram, TX 78605
(512) 355-9198 Fax (512) 355-9197

WELL DEVELOPMENT RECORD

PAGE 1 of 1

Project Number: 17252 Project Name: Coleto Creek Power Date: 4.26.17

Well Location (well ID, etc.): MW 11

Developed by: EEF

Measuring Point (MP) of Well: TOC

Screened Interval (ft. BGL): 29-49

Filter Pack Interval (ft. BGL): 27-49

Starting Water Level (ft. BMP): 13.93

Casing Stickup (ft.): 2.7

Starting Water Level (ft. BGL): 11.23

Total Depth (ft. ~~BGL~~ MP): 51.83

Casing Diameter (In ID): 2"

Casing Volume (gal.): 6.1

QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: Alconox Solution rinse then triple rinse of pump & tubing with DI water

Purging: Water quality Stabilization Surge Equipment: Submersible pump

Disposal of Discharged Water: Temporarily Stored in 55-gallon drum

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: Solinst 300 Thermometer: Horiba U50

pH Meter: Horiba U50 Field Calibration: Horiba U50 Autocal

Conductivity Meter: Horiba U50 Field Calibration: Horiba U50 Autocal

Other:

DEVELOPMENT MEASUREMENTS

Time	Flow		Water Quality			Appearance		Remarks WL
	Cum. Vol. (gal. / L)	Purge Rate (gal. / L pm)	Temp. (°C)	pH	Spec. Cond. (µΣ/cm)	Color	Turbidity & Sediment	
1220	5	1	24.11	7.56	0.727	white	71000	46
1225	10	1.7	23.76	7.68	0.717	White	"	-16 17.35
1228	15	1.7	~	—	—	white	"	-20
1231	20	1.7	23.31	7.65	0.716	White	"	-33 17.85
1234	25	1.7	23.16	7.45	0.719	Cloudy	975	-26
1237	30	1.7	23.16	7.48	0.721	Clear	642	-5
1241	35	0.5	24.33	7.76	0.743	Clear	704	44 lower pump
1317	40	1	24.04	7.68	0.742	Clear	358	4
1322	45	1	23.72	7.60	0.735	Clear	319	6 18.25
1327	50	1	23.51	7.47	0.735	Clear	206	-7
1332	55	1	23.56	7.35	0.733	Clear	187	-18
1337	60	1	23.46	7.39	0.732	Clear	176	-1 18.70
1342	65	1	23.42	7.28	0.733	Clear	132	-11

Total Discharge (gallons): 65

Observations/Comments:

Purged ten well volumes

Bullock, Bennett, & Associates, LLC
165 N. Lampasas St.
Bertram, TX 78605
(512) 355-9198 Fax (512) 355-9197

WELL DEVELOPMENT RECORD

PAGE 1 of 1

Project Number: 17258 Project Name: Coleto Creek Power Date: 3.21.17

Well Location (well ID, etc.): BV-21

Developed by: EEF

Measuring Point (MP) of Well: Toc

Screened Interval (ft. BGL): 30 - 40

Filter Pack Interval (ft. BGL): 30 - 40

Starting Water Level (ft. BMP): 18.88

Casing Stickup (ft.): ~3

Starting Water Level (ft. BGL): 15.88

Total Depth (ft. B~~GL~~mp): 40.71

Casing Diameter (In ID): 2

Casing Volume (gal.): 3.5

QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: Alconox solution rinse then triple rinse of pump & tubing with DI water

Purging: Water quality Stabilization Surge Equipment: Submersible pump

Disposal of Discharged Water: Temporarily stored in 55-gallon drum

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: Solinst 300 Thermometer: Horiba U50

pH Meter: Horiba U50 Field Calibration: Horiba U50 Autocal

Conductivity Meter: Horiba U50 Field Calibration: Horiba U50 Autocal

Other:

DEVELOPMENT MEASUREMENTS

Time	Flow		Water Quality			Appearance		Remarks
	Cum. Vol. (gal. / L)	Purge Rate (gal. / L pm)	Temp. (°C)	pH	Spec. Cond. (μΣ/cm)	Color	Turbidity & Sediment	
1400	5	1	24.42	7.12	0.707	White, Cloudy	>1000	
1405	10	1	23.58	6.88	0.719	" "	>1000	WL = 19.50
1410	15	1	23.79	6.78	0.726	" "	>1000	WL = 19.50
1425	20	0.5	24.21	6.90	0.735	" "	>1000	WL = 19.10
1430	25	1	24.72	6.99	0.666	" "	>1000	
1440	30	0.5	24.12	6.99	0.721	" "	>1000	
1450	35	0.5	23.99	7.04	0.723	" "	429	
1500	40	0.5	24.19	7.12	0.725	" "	792	

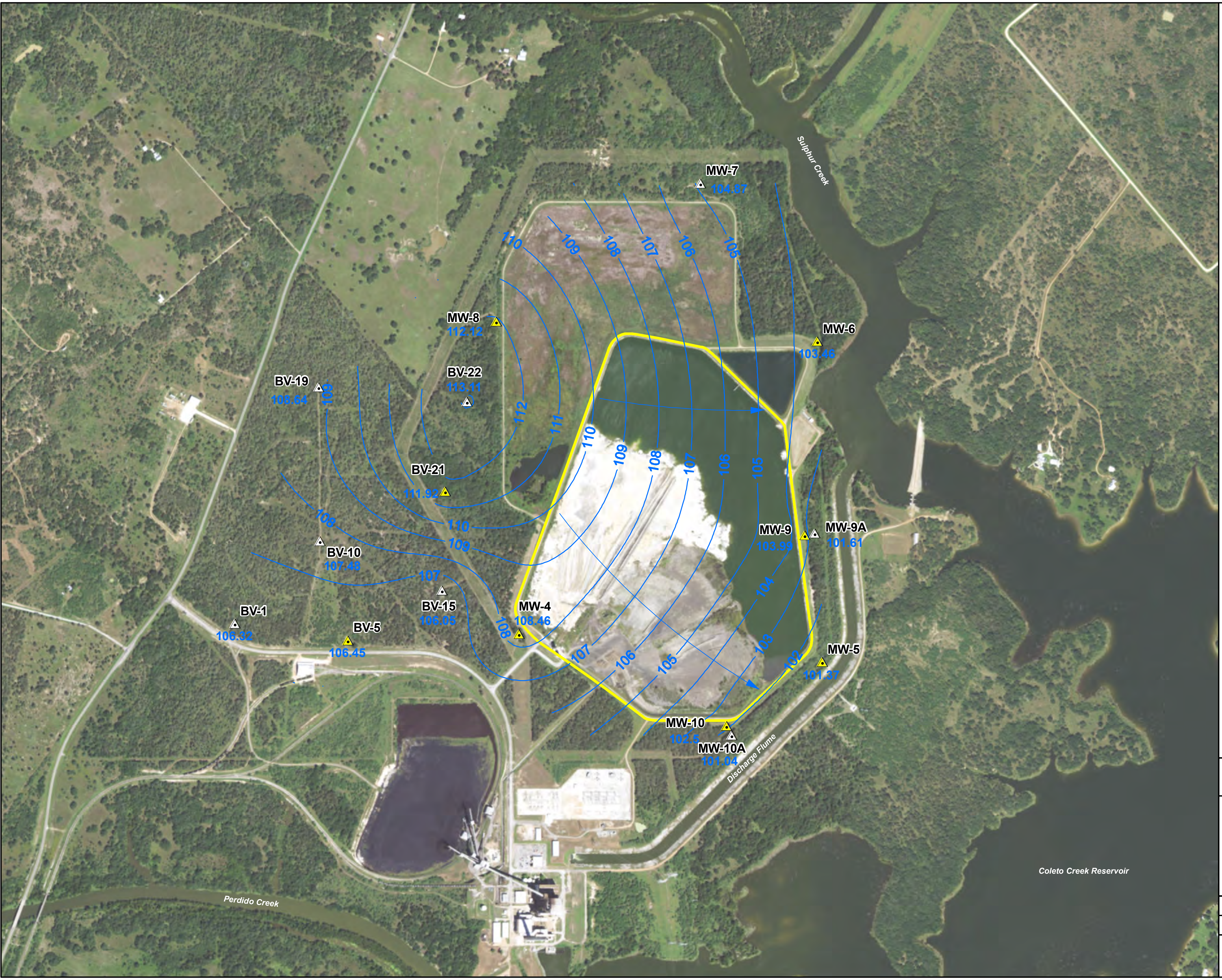
Total Discharge (gallons): 40

Observations/Comments:

Purged ten well
Volumes

Bullock, Bennett, & Associates, LLC
165 N. Lampasas St.
Bertram, TX 78605
(512) 355-9198 Fax (512) 355-9197

APPENDIX C3 – MAPS OF THE DIRECTION OF GROUNDWATER FLOW



Explanation

▲	CCR Rule Monitoring Well
△	Non-CCR Rule Monitoring Well
105	March 2017 Potentiometric Surface Elevation Contour (ft. MSL)
☐	CCR Monitored Unit
→	Groundwater Flow Direction

CRAIG E. BENNETT
GEOLOGY
LIC #1205

Craig E. Bennett
10-4-2017

Ref: Orthoimagery from ArGIS World Imagery Server

N

0 1:12,000 2,000 Feet

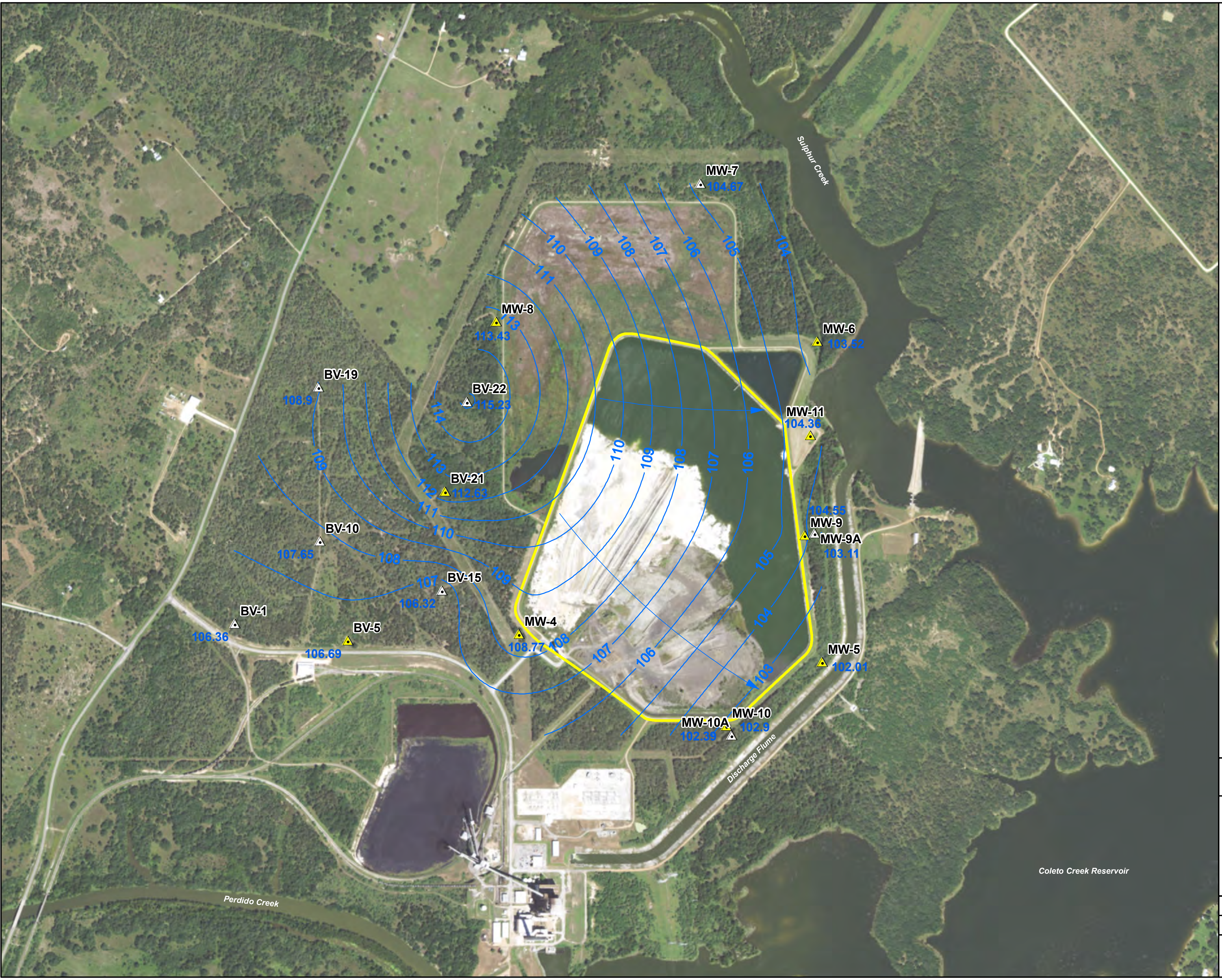
COLETO CREEK POWER STATION

Primary Ash Pond (Unit Id: 141) Uppermost Aquifer Unit Potentiometric Surface Map Round 1: March 28-30, 2017

PROJECT: 17258	BY: EEF	REVISIONS
DATE: Oct 2017	CHECKED: CEB	

Bullock, Bennett & Associates, LLC
Engineering and Geoscience
Texas Registrations: Engineering F-8542, Geoscience 50127

Plot Date: 10/4/2017 - 2:01:19 PM, Plotted by: E.Ficker
Drawing Path: D:\BBA\Coleto Creek\CCR\MXDs\Final Pot Maps\Round 1 March 2017 Pot Map.mxd



Explanation

- ▲ CCR Rule Monitoring Well
- △ Non-CCR Rule Monitoring Well
- 105 May 2017 Potentiometric Surface Elevation Contour (ft. MSL)
- ☐ CCR Monitored Unit
- → Groundwater Flow Direction

CRAIG E. BENNETT
LIC #1205

Craig E. Bennett
10-4-2017

Ref: Orthoimagery from ArGIS World Imagery Server

N

0 1:12,000 2,000 Feet

COLETO CREEK POWER STATION

Primary Ash Pond (Unit Id: 141)
Uppermost Aquifer Unit
Potentiometric Surface Map
Round 2: May 9-11, 2017

PROJECT: 17258	BY: EEF	REVISIONS
DATE: Oct 2017	CHECKED: CEB	

Bullock, Bennett & Associates, LLC
Engineering and Geoscience
Texas Registrations: Engineering F-8542, Geoscience 50127

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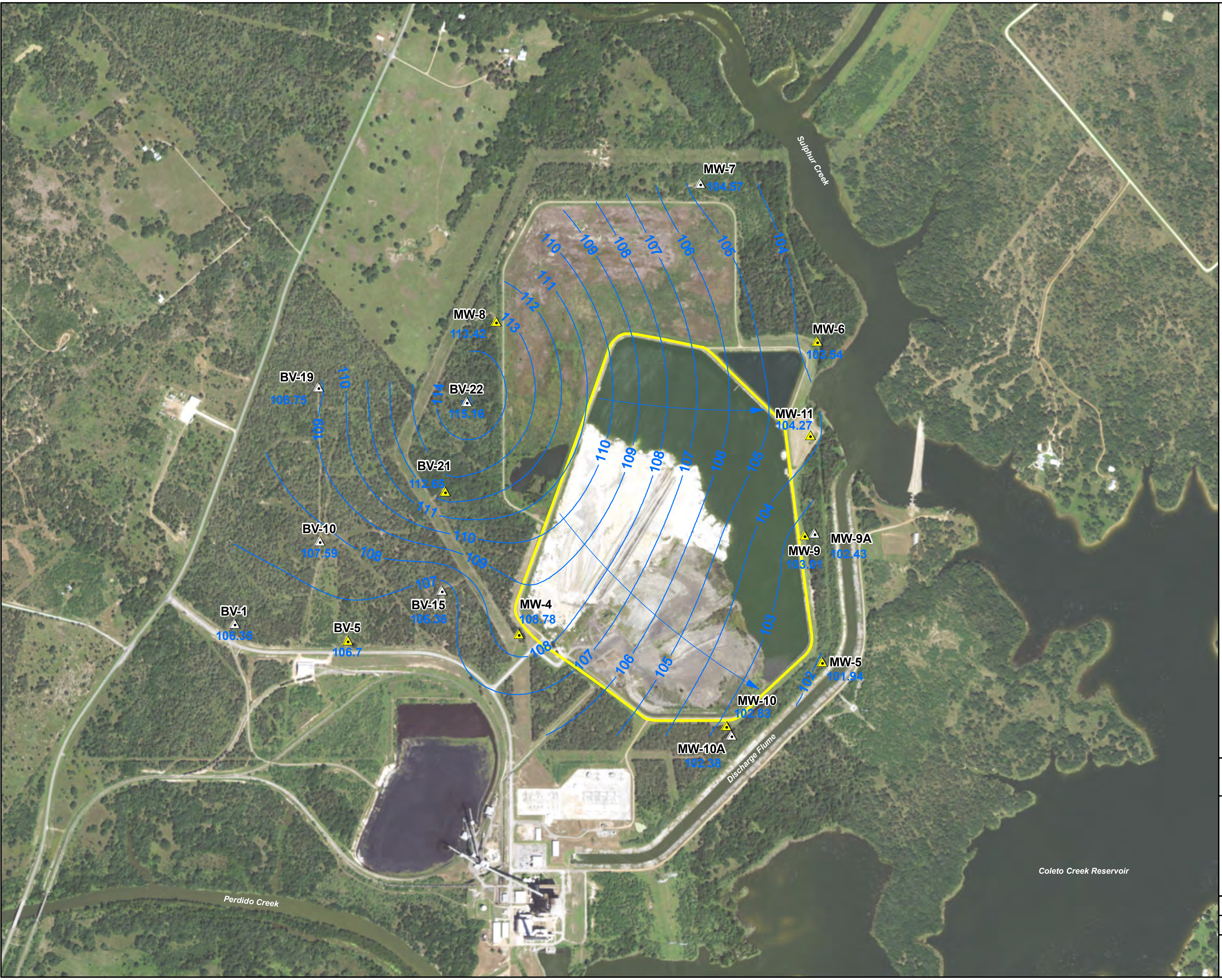

Explanation

- ▲ CCR Rule Monitoring Well
- △ Non-CCR Rule Monitoring Well
- 105 May 2017 Potentiometric Surface Elevation Contour (ft. MSL)
- ☐ CCR Monitored Unit
- → Groundwater Flow Direction

CRAIG E. BENNETT
GEOLOGY
LIC #1205

Craig E. Bennett
10-4-2017

Ref: Orthoimagery from ArGIS World Imagery Server

N

0 — 1:12,000 — 2,000 Feet

COLETO CREEK POWER STATION

Primary Ash Pond (Unit Id: 141)
Uppermost Aquifer Unit
Potentiometric Surface Map
Round 3: May 15-17, 2017

PROJECT: 17258	BY: EEF	REVISIONS
DATE: Oct 2017	CHECKED: CEB	

Bullock, Bennett & Associates, LLC
Engineering and Geoscience
Texas Registrations: Engineering F-8542, Geoscience 50127

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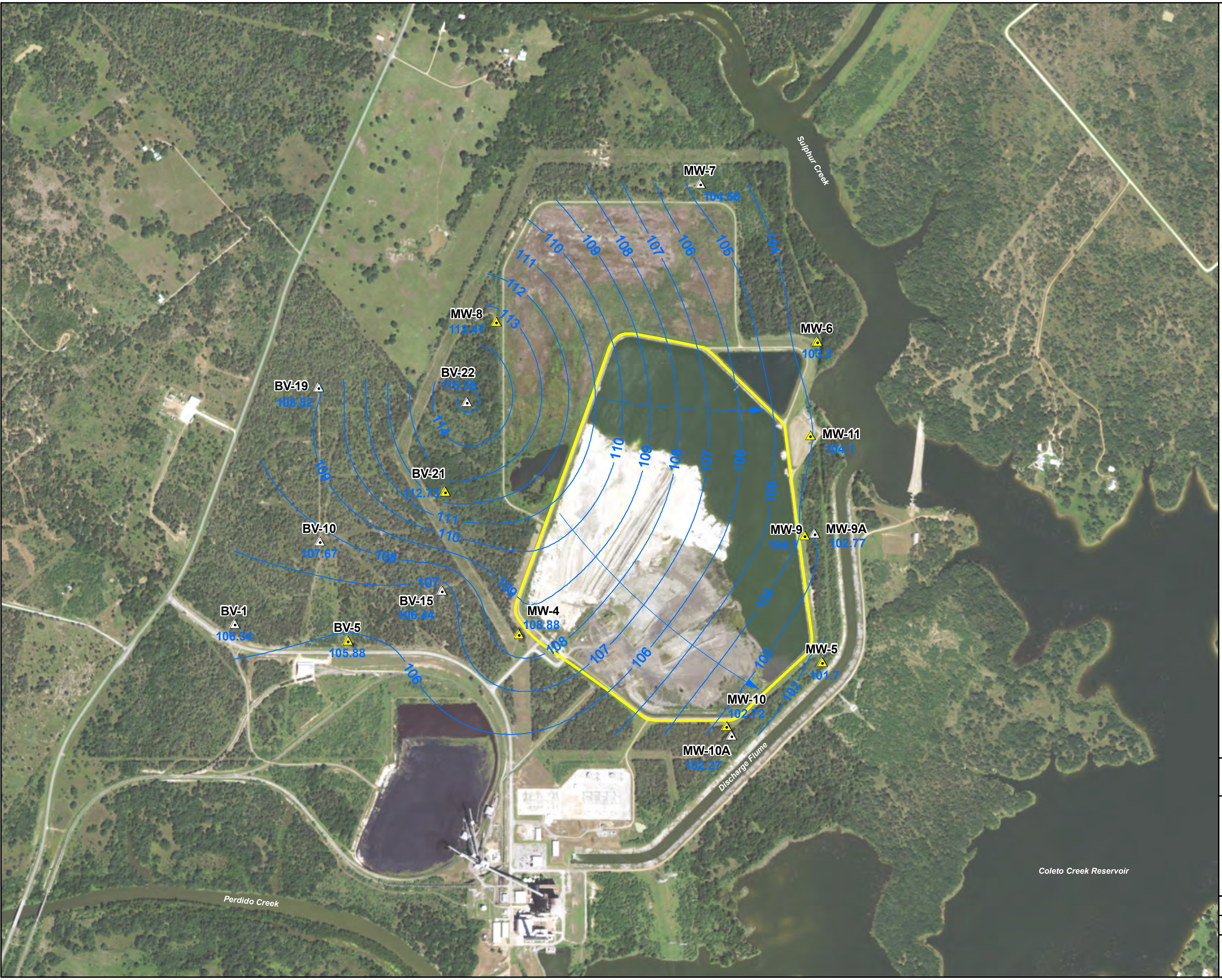

Explanation

- ▲ CCR Rule Monitoring Well
- △ Non-CCR Rule Monitoring Well
- 105 June 2017 Potentiometric Surface Elevation Contour (ft. MSL)
- ☐ CCR Monitored Unit
- → Groundwater Flow Direction

CRAIG E. BENNETT
GEOLOGY
LIC #1205

Craig E Bennett
10-4-2017

Ref: Orthoimagery from ArGIS World Imagery Server

N

0 1:12,000 2,000 Feet

COLETO CREEK POWER STATION

Primary Ash Pond (Unit Id: 141)
Uppermost Aquifer Unit
Potentiometric Surface Map
Round 4: June 6-8, 2017

PROJECT: 17258	BY: EEF	REVISIONS
DATE: Oct 2017	CHECKED: CEB	

Bullock, Bennett & Associates, LLC
Engineering and Geoscience
Texas Registrations: Engineering F-8542, Geoscience 50127

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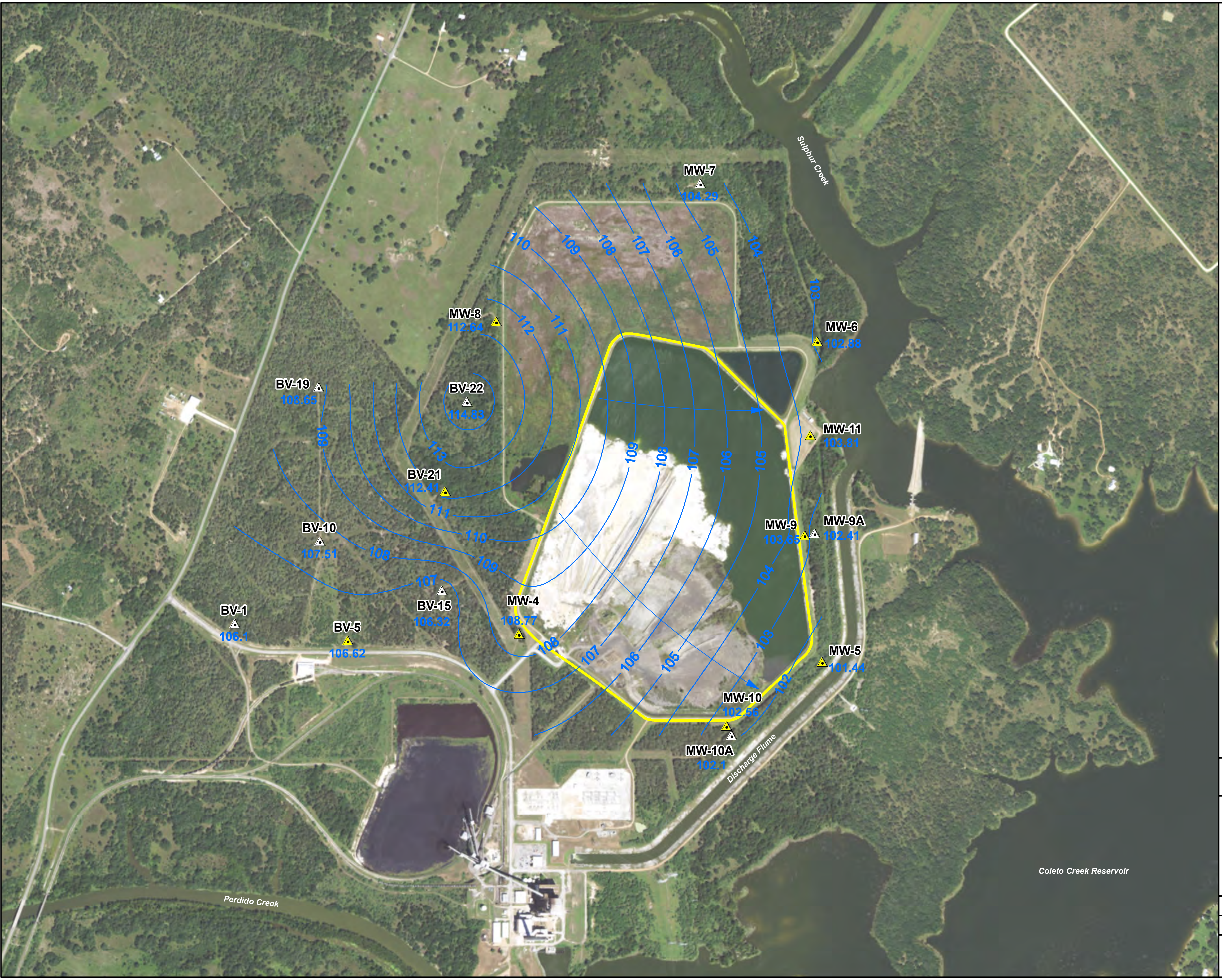


Explanation

▲ CCR Rule Monitoring Well

△ Non-CCR Rule Monitoring Well

105 June 2017 Potentiometric Surface Elevation Contour (ft. MSL)

☐ CCR Monitored Unit

→ Groundwater Flow Direction

CRAIG E. BENNETT
LIC #1205

Craig E. Bennett
10-4-2017

Ref: Orthoimagery from ArGIS World Imagery Server

N

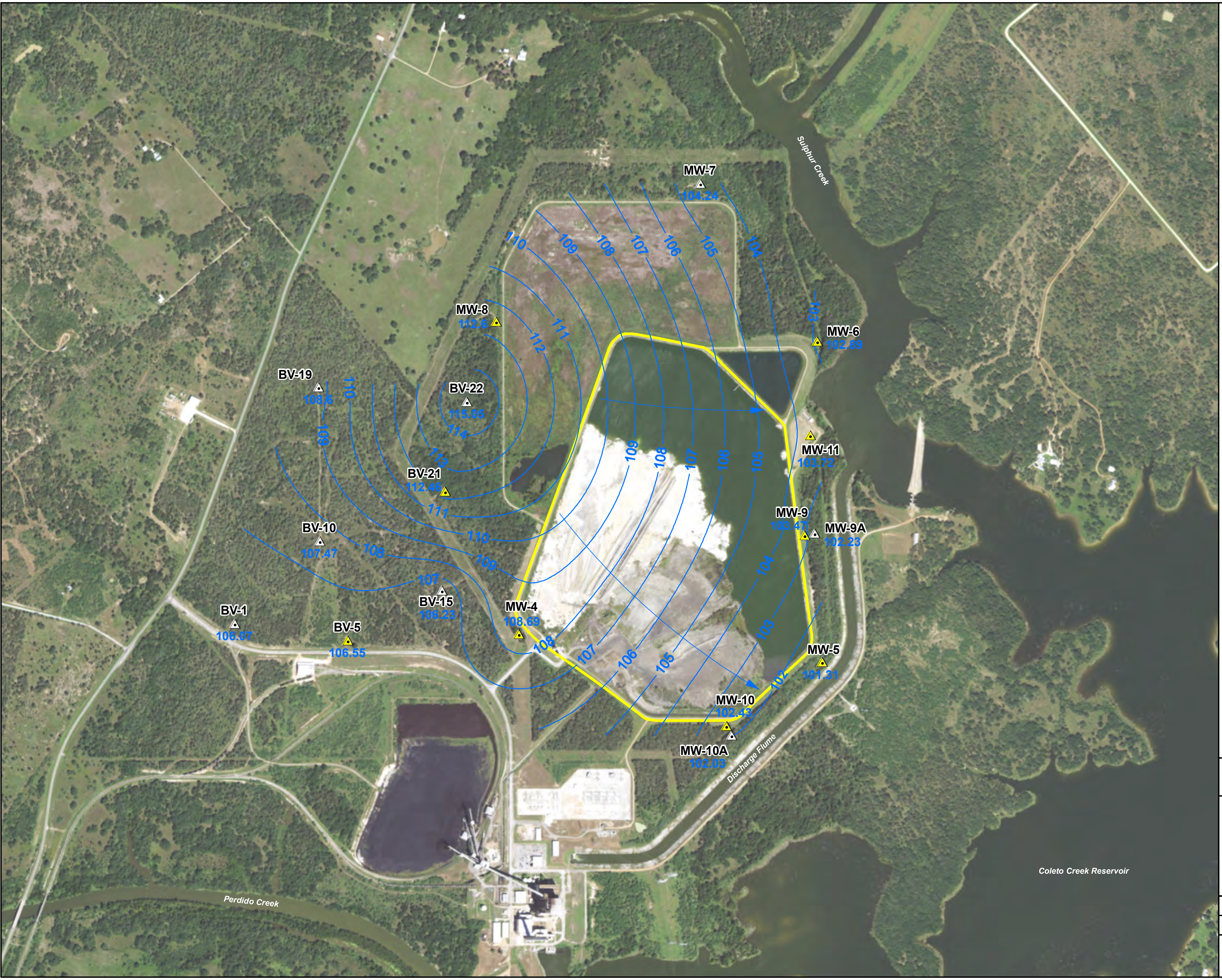
0 1:12,000 2,000 Feet

COLETO CREEK POWER STATION

Primary Ash Pond (Unit Id: 141)
Uppermost Aquifer Unit
Potentiometric Surface Map
Round 5: June 20-22, 2017

PROJECT: 17258	BY: EEF	REVISIONS
DATE: Oct 2017	CHECKED: CEB	

Bullock, Bennett & Associates, LLC
Engineering and Geoscience
Texas Registrations: Engineering F-8542, Geoscience 50127



Explanation

- ▲ CCR Rule Monitoring Well
- △ Non-CCR Rule Monitoring Well
- 105 June 2017 Potentiometric Surface Elevation Contour (ft. MSL)
- ▭ CCR Monitored Unit
- → Groundwater Flow Direction

CRAIG E. BENNETT
GEOLOGY
LIC #1205

Craig E. Bennett
10-4-2017

Ref: Orthoimagery from ArGIS World Imagery Server

N

0 1:12,000 2,000 Feet

COLETO CREEK POWER STATION

Primary Ash Pond (Unit Id: 141)
Uppermost Aquifer Unit
Potentiometric Surface Map
Round 6: June 26-28, 2017

PROJECT: 17258
BY: EEF
DATE: Oct 2017
CHECKED: CEB
REVISIONS

Bullock, Bennett & Associates, LLC
Engineering and Geoscience
Texas Registrations: Engineering F-8542, Geoscience 50127

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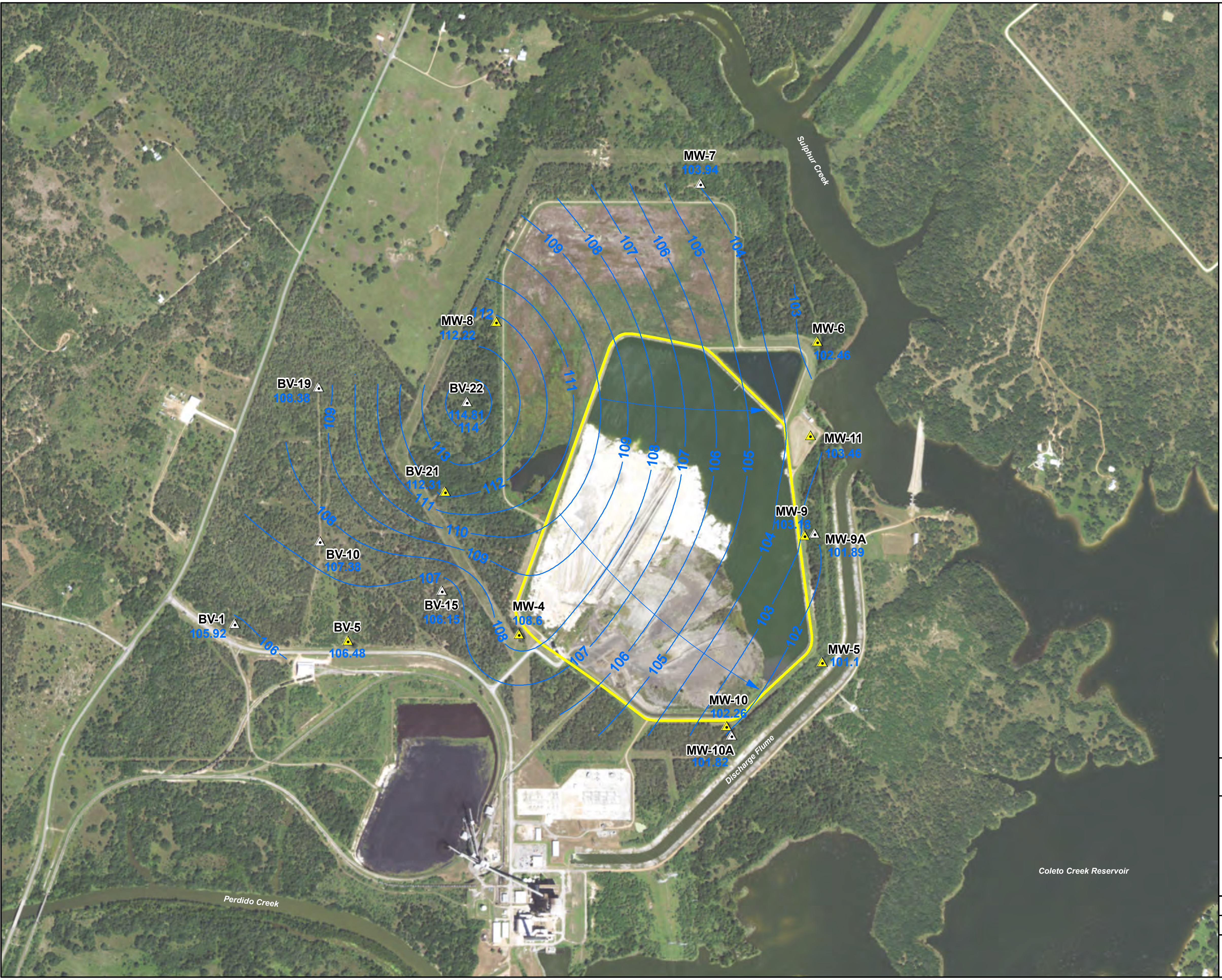

Explanation

▲ CCR Rule Monitoring Well

△ Non-CCR Rule Monitoring Well

105 July 2017 Potentiometric Surface Elevation Contour (ft. MSL)

☐ CCR Monitored Unit

→ Groundwater Flow Direction

CRAIG E. BENNETT
LIC #1205

Craig E. Bennett
10-4-2017

Ref: Orthoimagery from ArGIS World Imagery Server

N

0 1:12,000 2,000 Feet

COLETO CREEK POWER STATION

Primary Ash Pond (Unit Id: 141) Uppermost Aquifer Unit Potentiometric Surface Map Round 7: July 10-12, 2017

PROJECT: 17258	BY: EEF	REVISIONS
DATE: Oct 2017	CHECKED: CEB	

Bullock, Bennett & Associates, LLC
Engineering and Geoscience
Texas Registrations: Engineering F-8542, Geoscience 50127

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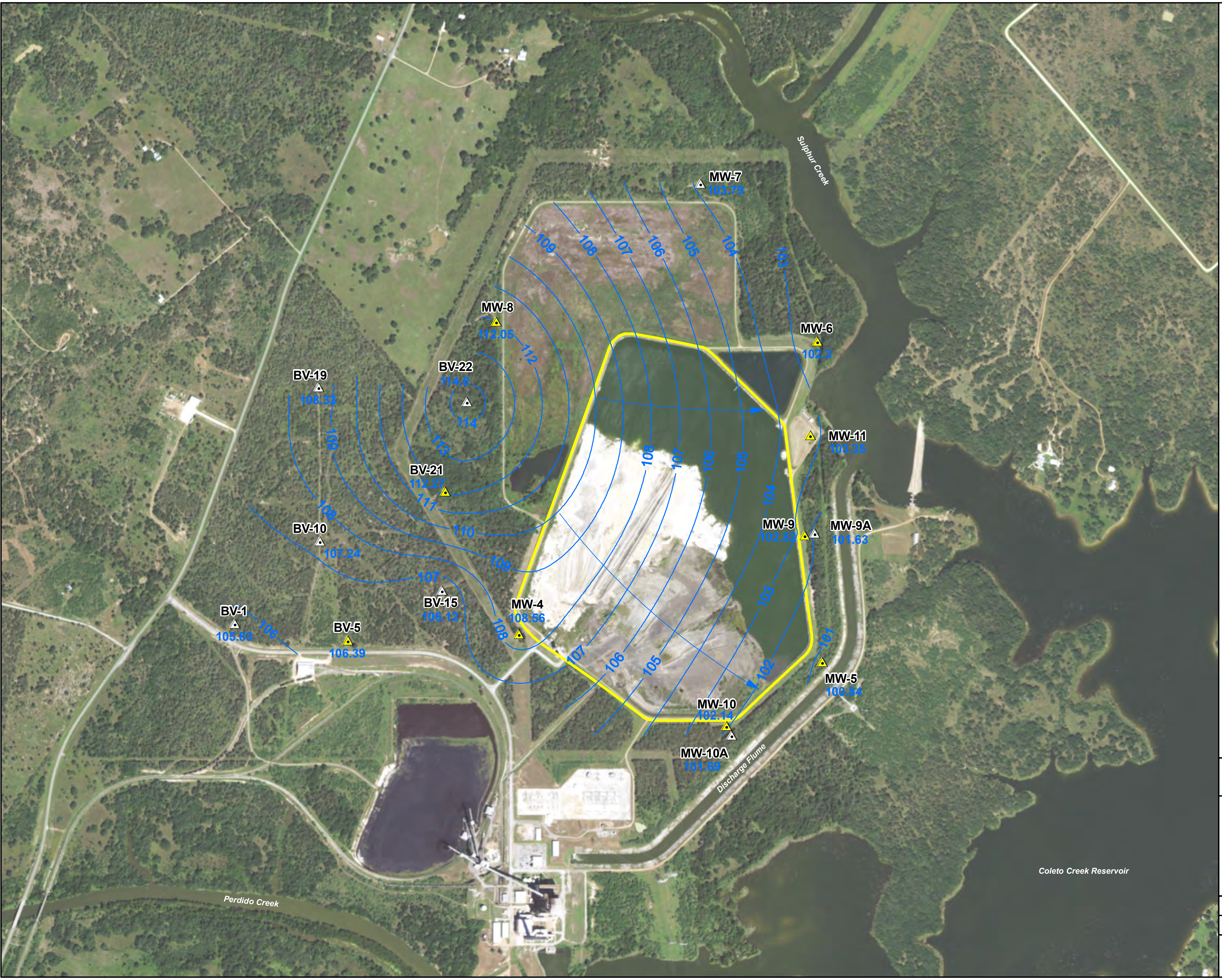

Explanation

△ CCR Rule Monitoring Well

△ Non-CCR Rule Monitoring Well

105 July 2017 Potentiometric Surface Elevation Contour (ft. MSL)

▢ CCR Monitored Unit

→ Groundwater Flow Direction

CRAIG E. BENNETT
GEOLOGY
LIC #1205

Craig E. Bennett
10-4-2017

Ref: Orthoimagery from ArGIS World Imagery Server

N

0 1:12,000 2,000 Feet

COLETO CREEK POWER STATION

Primary Ash Pond (Unit Id: 141) Uppermost Aquifer Unit Potentiometric Surface Map Round 8: July 18-20, 2017

PROJECT: 17258	BY: EEF	REVISIONS
DATE: Oct 2017	CHECKED: CEB	

Bullock, Bennett & Associates, LLC
Engineering and Geoscience
Texas Registrations: Engineering F-8542, Geoscience 50127

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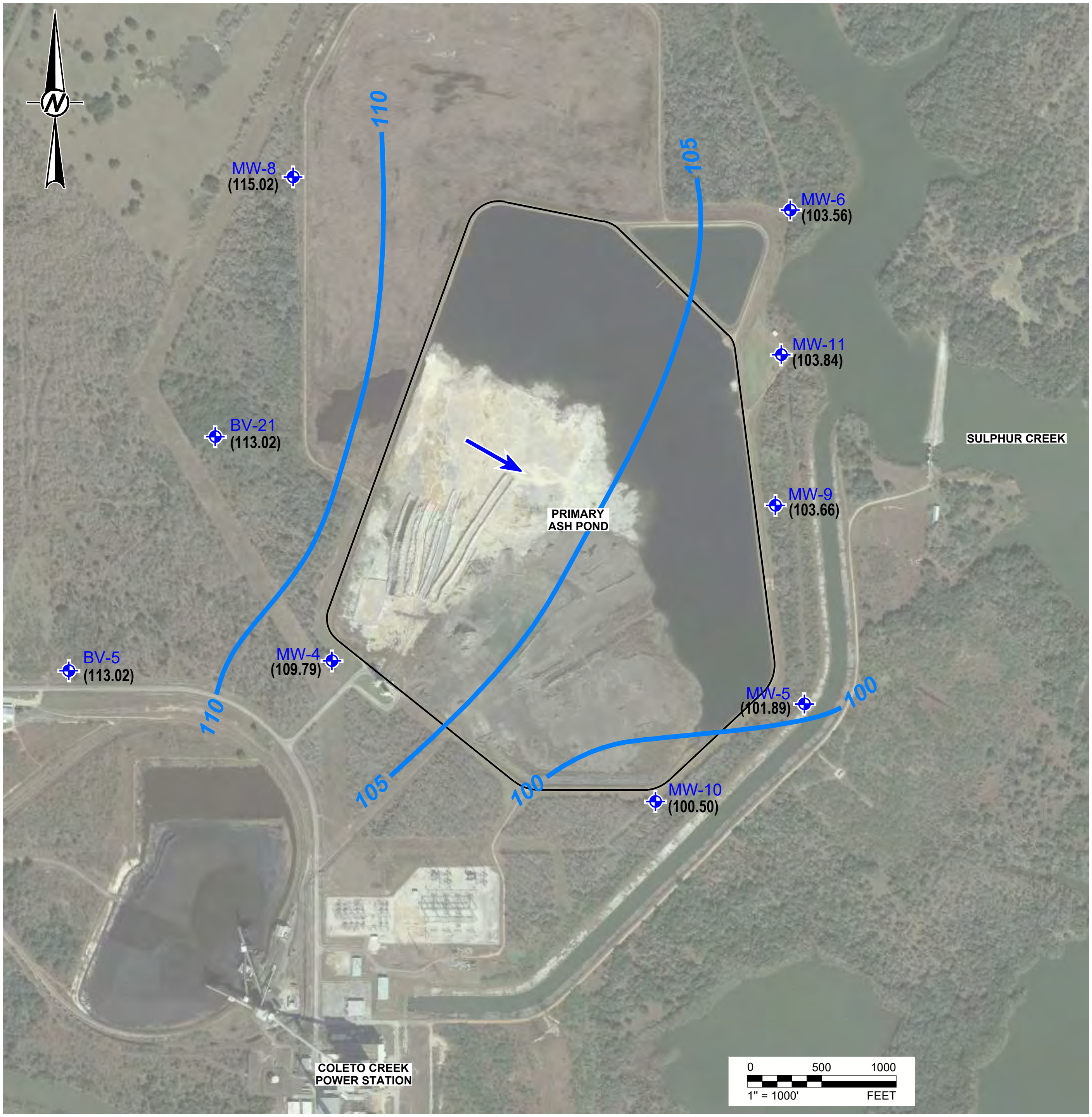

LEGEND

⊕	CCR MONITORING WELL
(113.02)	GROUNDWATER POTENTIOMETRIC SURFACE (FT MSL)
━	GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (C.I. = 10 FT)
→	INFERRED DIRECTION OF GROUNDWATER FLOW

REFERENCE(S)

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 1/22/16.

CLIENT

LUMINANT

PROJECT

COLETO CREEK POWER STATION
FANNIN, TEXAS

TITLE

PRIMARY ASH POND
POTENTIOMETRIC SURFACE MAP - OCTOBER 2, 2019

CONSULTANT

GOLDER

YYYY-MM-DD	2020-03
DESIGNED	AJD
PREPARED	TNB
REVIEWED	WFV
APPROVED	WFV

PROJECT NO.	REV.	FIGURE
19122449	----	1

Last Edited By: tbookout Date: 2020-04-02 Time:3:57:03 PM | Printed By: TBookout Date: 2020-04-02 Time:3:59:42 PM
Path: \\texarkana\Data\projects - round rock_2019\19122449 - luminant\Coleto Creek\ | File Name: FIG 1 - Pot Surface Map-Primary Ash Pond (October 2019).dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
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APPENDIX C4 – TABLES SUMMARIZING CONSTITUENT CONCENTRATIONS AT EACH MONITORING WELL

APPENDIX III ANALYTICAL RESULTS
COLETO CREEK PRIMARY ASH POND

Sample Location	Date Sampled	B	Ca	Cl	Fl	field pH	SO_4	TDS
Prediction Limit:		1.26	143	118	0.61	6.51 7.33	148	966
Upgradient Wells								
BV-5	03/29/17	1.15	90.5	118	0.54	7.01	147	860
	05/11/17	1.03	81.6	106	0.57	6.89	148	862
	05/16/17	1.17	99	107	0.55	6.9	145	832
	06/07/17	1.11	88.8	109	0.56	6.64	147	810
	06/20/17	1.02	90.7	106	0.58	6.54	145	716
	06/27/17	1.14	100	114	0.55	6.76	144	743
	07/12/17	1.07	96.8	112	0.56	6.88	140	430
	07/18/17	1.17	143	117	0.56	6.68	142	817
	11/07/17	1.10	94.2	109	0.62	6.96	136	850
	06/19/18	1.18	56.4	112	0.97	--	147	775
	09/18/18	1.27	86.2	145	0.667	6.53	146	904
	06/05/19	1.26	82.9	123	0.769	6.89	146	828
	10/03/19	1.31	72.2	141	0.753	7.11	145	806
	06/09/20	1.35	90.4	171	0.498	6.97	159	951
BV-21	03/28/17	0.651	6.89	36	0.61	7.09	69	490
	05/09/17	0.687	65.2	38	0.61	7.04	55	410
	05/17/17	0.709	74.3	39	0.58	7.05	53	454
	06/06/17	0.657	69	40	0.59	7.11	49	452
	06/20/17	0.642	77	40	0.61	6.7	45	356
	06/27/17	0.727	84.9	40	0.6	6.97	46	420
	07/10/17	0.674	90.6	39	0.58	7.22	45	427
	07/18/17	0.618	84.4	39	0.6	6.91	44	380
	11/07/17	0.515	73.6	42	0.64	7.12	46	423
	06/25/18	0.543	69.3	38.4	0.62	--	38.4	380
	09/18/18	0.624	72.1	33.3	0.479	6.64	36.4	416
	06/05/19	0.576	61.3	30.3	0.602	7.1	34.2	379
	10/03/19	0.534	63.4	23.9	0.588	6.82	33.2	342
	06/09/20	0.447	72.5	34.2	0.522	6.96	18.5	362
MW-8	03/28/17	1.2	7.76	79	0.49	7.06	76	626
	05/09/17	1.21	77.5	77	0.44	7.15	79	564
	05/15/17	1.16	81.2	76	0.44	7.01	79	558
	06/06/17	1.26	78.1	72	0.45	6.92	83.5	570
	06/20/17	1.24	86.5	67	0.43	6.7	89	476
	06/27/17	1.23	89.6	66	0.44	6.85	97	533
	07/10/17	1.24	92.6	63	0.44	7.13	97	533
	07/18/17	1.25	92.9	61	0.46	6.91	100	533
	11/07/17	1.21	78.8	61	0.49	7.08	100	540
	06/25/18	1.25	80.3	65.9	0.52	--	95.2	565
	09/18/18	1.29	76.5	53.7	0.402	6.70	94.8	543
	06/05/19	1.11	65.2	51.4	0.497	7.10	79	515
	10/03/19	1.2	76.7	58.3	0.419	6.76	90.1	541
	06/09/20	1.33	73.1	46.4	0.392 J	7.04	72.3	511

APPENDIX III ANALYTICAL RESULTS
COLETO CREEK PRIMARY ASH POND

Sample Location	Date Sampled	B	Ca	Cl	Fl	field pH	SO_4	TDS
Prediction Limit:		1.26	143	118	0.61	6.51 7.33	148	966
Downgradient Wells								
MW-4	03/28/17	0.287	9.14	102	0.61	9.81	157	794
	05/09/17	0.395	88.7	101	0.61	7.27	156	668
	05/17/17	0.251	92.1	101	0.6	6.93	157	702
	06/06/17	0.243	90.7	101	0.63	7.13	157	728
	06/20/17	0.254	99.3	101	0.62	6.71	157	626
	06/27/17	0.254	102	101	0.63	6.87	157	690
	07/10/17	0.271	111	101	0.62	7.16	158	670
	07/18/17	0.292	108	101	0.63	6.82	157	717
	11/07/17	0.255	94.5	99	0.62	7.12	155	700
	06/21/18	0.267	92.5	104	0.6	--	159	665
	09/18/18	0.28	91.8	102	0.582	6.63	155	720
	06/05/19	0.379	85.3	108	0.67	6.92	161	718
	10/03/19	0.367	93.1	102	0.559	6.7	155	693
	06/09/20	0.241	94.9	24.6	0.205 J	6.88	26.8	400
MW-5	03/30/17	0.11	110	140	0.51	6.85	184	830
	05/10/17	0.115	114	139	0.54	6.86	183	900
	05/16/17	0.215	121	139	0.5	6.81	183	848
	06/08/17	0.122	118	139	0.55	6.8	182	862
	06/21/17	0.122	124	138	0.53	6.6	182	813
	06/26/17	0.121	129	139	0.54	6.79	184	900
	07/11/17	0.111	120	138	0.52	6.91	184	797
	07/19/17	0.001	0.005	137	0.53	6.84	181	857
	11/08/17	0.149	116	138	0.52	6.92	183	883
	06/25/18	0.119	114	140	0.56	--	183	820
	09/18/18	0.146	114	136	0.493	6.70	183	824
	06/03/19	0.146	113	143	0.596	7.06	187	864
	10/02/19	0.179	111	147	0.543	7.06	202	842
	09/06/20	0.152	117	138	0.370 J	6.84	182	858
MW-6	03/29/17	1.67	73.9	69	0.38	7.34	99	510
	05/11/17	1.94	70.6	70	0.37	7.1	110	490
	05/16/17	1.84	76.3	70	0.36	7.23	107	506
	06/07/17	1.8	73.8	70	0.37	6.97	103	492
	06/22/17	1.97	79.9	69	0.37	7.11	100	510
	06/28/17	1.74	81.8	69	0.37	7.16	99	570
	07/12/17	1.76	81.6	69	0.35	7.24	98	557
	07/20/17	0.005	0.0002	69	0.39	6.9	97	530
	11/07/17	1.72	76.4	69	0.39	7.41	101	483
	06/22/18	0.0171	76.6	70.7	0.41	--	107	490
	09/18/18	2.09	70.8	72.5	0.353 J	6.97	114	505
	06/03/19	1.9	73.9	73	0.043	7.31	103	514
	10/02/19	1.83	73.6	76.4	0.357 J	7.29	115	507
	06/09/20	2.51	69.7	80.9	0.4	6.95	122	507

APPENDIX III ANALYTICAL RESULTS
COLETO CREEK PRIMARY ASH POND

Sample Location	Date Sampled	B	Ca	Cl	Fl	field pH	SO_4	TDS
Prediction Limit:		1.26	143	118	0.61	6.51 7.33	148	966
MW-9	03/30/17	3.38	54.5	71	1.13	7.35	62	406
	05/10/17	3.16	52.7	66	1.29	7.48	59	410
	05/17/17	3.18	53.3	67	1.26	7.34	58	440
	06/07/17	3.12	52	67	1.26	7.03	57	380
	06/21/17	3.44	60.7	66	1.39	7.09	60	393
	06/26/17	3.31	60.6	67	1.4	7.23	61	407
	07/11/17	3.35	52.1	64	1.3	7.51	60	927
	07/19/17	3.4	50.2	63	1.4	7.29	62	407
	11/08/17	2.84	49.4	62	1.56	7.54	50	397
	06/21/18	2.94	46.9	71.5	1.5	--	35.7	370
	09/18/18	2.79	51.7	71.4	1.1	6.99	49.1	394
	06/05/19	4.26	48	74.7	1.38	7.4	66.3	421
	10/03/19	3.97	71.3	70.9	1.41	7.37	63.6	462
	09/06/20	4.10	47.4	63.7	1.58	7.21	54.9	397
MW-10	03/30/17	3.74	92.1	151	0.54	6.99	130	804
	05/10/17	7.32	56.1	82	0.83	7.23	96	582
	05/16/17	7.45	62.7	81	0.81	7.28	95	612
	06/08/17	7.54	58.1	77	0.84	7.23	92	604
	06/21/17	9.22	60.7	77	0.84	6.97	92	550
	06/26/17	8.21	63.4	78	0.84	7.14	92	530
	07/11/17	7.99	49.5	76	0.84	7.4	88	617
	07/19/17	8.74	56.6	74	0.86	7.25	86	533
	11/08/17	8.72	77.7	74	0.88	7.35	81	590
	06/22/18	8.47	84.4	76.7	0.88	--		550
	09/18/18	8.45	51.9	81.4	0.759	6.98	95.1	577
	06/03/19	8.28	43.1	87.2	0.953	7.52	97.7	587
	10/02/19	8.28	44.2	85.5	0.891	7.46	104	575
	06/09/20	7.58	46.9	76.9	0.818	7.13	96.5	575
MW-11	05/10/17	1.35	64.1	55	0.82	7.27	61	394
	05/16/17	1.39	62.3	52	0.85	7.29	58	362
	05/18/17	1.27	61.6	47.8	0.94		52.4	390
	06/07/17	1.23	59.8	48	0.93	7.25	50	372
	06/21/17	1.19	73.1	43.7	1.04	7.15	44	373
	06/26/17	1.15	82	44	1	7.3	43	407
	07/11/17	1.23	44.7	44	1	7.55	42	603
	07/19/17	1.17	48.6	43	1.01	7.21	42	360
	11/08/17	1.13	52.2	43	1.02	7.61	56	367
	06/21/18	1.07	69.6	44.3	0.96	--	61.4	355
	09/18/18	1.12	39.3	44.6	0.754	7.00	44.4	354
	06/03/19	1.27	43.4	42.2	0.837	7.55	44.8	372
	10/02/19	1.22	43.4	41.4	0.768	7.43	10.8	355
	06/09/20	1.20	56.6	44.4	0.571	6.88	67.7	414

Notes:

1. All concentrations in mg/L. pH in standard units.
2. J - concentration is below sample quantitation limit; result is an estimate.

APPENDIX IV ANALYTICAL RESULTS
COLETO CREEK PRIMARY ASH POND

Sample Location	Date Sampled	Sb	As	Ba	Be	Cd	Cr	Co	Fl	Pb	Li	Hg	Mo	Se	Tl	Ra 226	Ra 228	Ra 226/228 Combined
GWPS:		0.006	0.128	2	0.004	0.005	0.10	0.0499	4	0.015	0.04	0.002	0.10	0.05	0.002	--	--	5
Upgradient Wells																		
BV-5	03/29/17	<0.0025	0.00856	0.04510	<0.001	<0.001	<0.005	0.0497	0.540	<0.001	0.0206	<0.0002	0.00925	<0.005	<0.0015	--	--	1.503
	05/11/17	<0.0025	0.00786	0.03680	<0.001	<0.001	<0.005	0.0462	0.570	<0.001	0.018	<0.0002	0.0101	<0.005	<0.0015	--	--	1.555
	05/16/17	<0.0025	0.00885	0.04520	<0.001	<0.001	<0.005	0.0495	0.550	0.00151	0.0171	<0.0002	0.0102	<0.005	<0.0015	--	--	0.7550
	06/07/17	<0.0025	0.00829	0.03760	<0.001	<0.001	<0.005	0.0483	0.560	<0.001	0.0207	<0.0002	0.01	<0.005	<0.0015	--	--	1.457
	06/20/17	<0.0025	0.00841	0.04010	<0.001	<0.001	<0.005	0.0499	0.580	<0.001	0.0208	<0.0002	0.0114	<0.005	<0.0015	--	--	0.4920
	06/27/17	<0.0025	0.0083	0.04120	<0.001	<0.001	<0.005	0.046	0.550	<0.001	0.0198	<0.0002	0.00942	<0.005	<0.0015	--	--	2.247
	07/12/17	<0.0025	0.00849	0.04160	<0.001	<0.001	<0.005	0.0484	0.560	<0.001	0.0188	<0.0002	0.0096	<0.005	<0.0015	--	--	2.139
	07/18/17	<0.0025	0.00951	0.05780	<0.001	<0.001	0.00739	0.0453	0.560	0.00288	0.022	<0.0002	0.0083	<0.005	<0.0015	--	--	1.260
	06/19/18	<0.0025	0.0106	0.0336	<0.001	<0.001	0.0022 J	0.0513 J	0.970	<0.00074 J	0.016	<0.0002	0.0139	<0.005	<0.0015	0.327	<1.680	2.01
	09/18/18	NA	0.00949	0.0436	NA	NA	0.00228 J	0.0487	0.667	0.00039 J	0.0206	NA	0.0102	NA	NA	0.302	<0.608	0.91
	06/05/19	<0.0008	0.0092	0.042	<0.0003	0.0009 J	<0.002	0.0466	0.769	0.00144	0.0201	<0.00008	0.0109	<0.0020	<0.0005	<0.687	<1.130	<1.82
	10/03/19	<0.0008	0.00941	0.0441	<0.0003	<0.0003	0.00285 J	0.0437	0.753	0.0039	0.0172	<0.00008	0.0122	<0.0020	<0.0005	0.928	1.35	2.28
	06/09/20	<0.0008	0.00879	0.0462	<0.0003	<0.0003	0.00818	0.0486	0.498	0.00162	0.0201	<0.0000800	0.0120	<0.00200	<0.000500	0.363	0	0.363
BV-21	03/28/17	<0.0025	0.0954	0.09630	<0.001	<0.001	<0.005	0.0083	0.610	<0.001	<0.010	<0.0002	<0.005	<0.005	<0.0015	--	--	1.390
	05/09/17	<0.0025	0.108	0.09720	<0.001	<0.001	<0.005	0.00852	0.610	<0.001	<0.010	<0.0002	<0.005	<0.005	<0.0015	--	--	0.7460
	05/17/17	<0.0025	0.117	0.09440	<0.001	<0.001	<0.005	0.00878	0.580	<0.001	<0.010	<0.0002	<0.005	<0.005	<0.0015	--	--	0.9190
	06/06/17	<0.0025	0.118	0.09540	<0.001	<0.001	<0.005	0.00806	0.590	<0.001	<0.010	<0.0002	<0.005	<0.005	<0.0015	--	--	0.6710
	06/20/17	<0.0025	0.121	0.1010	<0.001	<0.001	<0.005	0.00744	0.610	<0.001	<0.010	<0.0002	<0.005	<0.005	<0.0015	--	--	1.672
	06/27/17	<0.0025	0.128	0.1040	<0.001	<0.001	<0.005	0.00841	0.600	<0.001	<0.010	<0.0002	<0.005	<0.005	<0.0015	--	--	0.5200
	07/10/17	<0.0025	0.123	0.1100	<0.001	<0.001	<0.005	0.0086	0.580	<0.001	<0.010	<0.0002	<0.005	<0.005	<0.0015	--	--	0.8050
	07/18/17	<0.0025	0.115	0.1010	<0.001	<0.001	<0.005	0.00784	0.600	<0.001	<0.010	<0.0002	<0.005	<0.005	<0.0015	--	--	4.812
	06/25/18	<0.0025	0.0697	0.104	<0.001	<0.001	<0.005	0.00682	0.620	<0.00074 J	0.00513 J	<0.0002	0.00428 J	<0.005	<0.0015	0.267	<1.417	1.68
	09/18/18	NA	0.0625	0.109	NA	NA	<0.002	0.0064	0.479	0.000555 J	0.00624 J	NA	0.00450 J	NA	NA	<0.31	<0.528	<0.838
	06/05/19	<0.0008	0.0531	0.105	<0.0003	<0.0003	<0.002	0.00574	0.602	0.000354	0.00558 J	<0.00008	0.00685	<0.0020	<0.0005	0.65	<0.687	1.337
	10/03/19	<0.0008	0.049	0.0963	<0.0003	<0.0003	<0.002	0.00542	0.588	0.000333 J	<0.005	<0.00008	0.00784	<0.0020	<0.0005	0.346	1.54	1.89
	06/09/20	<0.0008	0.0793	0.132	<0.0003	<0.0003	0.007	0.00437 J	0.522	0.00033 J	<0.005	<0.00008	0.00698	<0.0020	<0.0005	0.211	1.15	1.36
MW-8	03/28/17	<0.0025	0.00839	0.0623	<0.001	<0.001	<0.005	0.0236	0.490	<0.001	0.0111	<0.0002	0.0154	<0.005	<0.0015	--	--	0.4520
	05/09/17	<0.0025	0.00848	0.064	<0.001	<0.001	<0.005	0.0272	0.440	<0.001	0.0111	<0.0002	0.0157	<0.005	<0.0015	--	--	0.4740
	05/15/17	<0.0025	0.00926	0.064	<0.001	<0.001	<0.005	0.0311	0.440	<0.001	0.0112	<0.0002	0.016	<0.005	<0.0015	--	--	0.6140
	06/06/17	<0.0025	0.00912	0.0616	<0.001	<0.001	0.00744	0.0308	0.450	<0.001	0.0107	<0.0002	0.0157	<0.005	<0.0015	--	--	0.1320
	06/20/17	<0.0025	0.00885	0.0669	<0.001	<0.001	<0.005	0.0297	0.430	<0.001	0.0121	<0.0002	0.0171	<0.005	<0.0015	--	--	0.5380
	06/27/17	<0.0025	0.00939	0.0633	<0.001	<0.001	<0.005	0.0314	0.440	<0.001	0.0115	<0.0002	0.0163	<0.005	<0.0015	--	--	0.9390
	07/10/17	<0.0025	0.00902	0.0631	<0.001	<0.001	<0.005	0.031	0.440	<0.001	0.0112	<0.0002	0.0165	<0.005	<0.0015	--	--	0.8040
	07/18/17	<0.0025	0.00937	0.0635	<0.001	<0.001	<0.005	0.0352	0.460	<0.001	0.0118	<0.0002	0.0185	<0.005	<0.0015	--	--	2.113
	06/25/18	<0.0025	0.0101	0.0632	<0.001	<0.001	<0.005	0.029	0.520	0.0011	0.0107	<0.0002	0.017	<0.005	<0.0015	<0.234	<1.204	<1.44
	09/18/18	NA	0.00896	0.0582	NA	NA	<0.00200	0.0237	0.402	<0.0003	0.0117	NA	0.0178	NA	NA	<0.281	<0.558	<0.84
	06/05/19	<0.0008	0.00946	0.0596	<0.0003	<0.0003	<0.002	0.0217	0.497	0.000355 J	0.011	<0.00008	0.0156	<0.0020	<0.0005	0.528	<0.619	1.147
	10/03/19	<0.0008	0.0083	0.0607	<0.0003	<0.0003	<0.002	0.231	0.419	<0.0003	0.0106	<0.00008	0.0144	<0.0020	<0.0005	0.224	0.241	0.465
	06/09/20	<0.0008	0.00856	0.0599	<0.0003	<0.0003	<0.002	0.0174	0.392 J	0.000479 J	0.0104	<0.00008	0.0158	<0.002	<0.0005	0.304	2.64	2.94

APPENDIX IV ANALYTICAL RESULTS
COLETO CREEK PRIMARY ASH POND

Sample Location	Date Sampled	Sb	As	Ba	Be	Cd	Cr	Co	Fl	Pb	Li	Hg	Mo	Se	Tl	Ra 226	Ra 228	Ra 226/228 Combined
GWPS:		0.006	0.128	2	0.004	0.005	0.10	0.0499	4	0.015	0.04	0.002	0.10	0.05	0.002	--	--	5
Downgradient Wells																		
MW-4	03/28/17	<0.0025	0.00738	0.0575	<0.001	<0.001	<0.005	0.007	0.610	<0.001	0.0192	<0.0002	<0.005	<0.005	<0.0015	--	--	0.4600
	05/09/17	<0.0025	0.00733	0.0576	<0.001	<0.001	<0.005	0.007	0.610	<0.001	0.0182	<0.0002	<0.005	<0.005	<0.0015	--	--	0.6940
	05/15/17	<0.0025	0.00794	0.0556	<0.001	<0.001	<0.005	0.007	0.600	<0.001	0.0166	<0.0002	<0.005	<0.005	<0.0015	--	--	1.451
	06/06/17	<0.0025	0.0077	0.0556	<0.001	<0.001	<0.005	0.007	0.630	<0.001	0.0179	<0.0002	<0.005	<0.005	<0.0015	--	--	0.1740
	06/20/17	<0.0025	0.0081	0.0596	<0.001	<0.001	0.00877	0.008	0.620	<0.001	0.0195	<0.0002	<0.005	<0.005	<0.0015	--	--	0.5430
	06/27/17	<0.0025	0.00786	0.0554	<0.001	<0.001	<0.005	0.007	0.630	<0.001	0.0185	<0.0002	<0.005	<0.005	<0.0015	--	--	0.6390
	07/10/17	<0.0025	0.00846	0.0582	<0.001	<0.001	<0.005	0.009	0.620	<0.001	0.0187	<0.0002	<0.005	<0.005	<0.0015	--	--	1.069
	07/18/17	<0.0025	0.00815	0.0549	<0.001	<0.001	<0.005	0.008	0.630	<0.001	0.0183	<0.0002	<0.005	<0.005	<0.0015	--	--	0.1910
	06/21/18	<0.0025	0.00843	0.0591	<0.001	<0.001	<0.005	0.00711	0.600	<0.00072 J	0.0175	<0.0002	<0.005	<0.005	<0.0015	0.370	1.705	2.08
	09/18/18	NA	0.00793	0.0577	NA	NA	<0.002	0.00673	0.582	<0.0003	0.019	NA	<0.002	NA	NA	1.610	<0.543	2.15
	06/05/19	<0.0008	0.0079	0.0571	<0.0003	<0.0003	<0.002	0.00729	0.670	<0.0003	0.0195	<0.00008	<0.002	<0.0020	<0.0005	0.436	<0.547	0.98
	10/03/19	<0.0008	0.00764	0.0532	<0.0003	<0.0003	<0.002	0.00699	0.559	0.00101	0.017	<0.00008	<0.002	<0.002	<0.0005	1.85	-0.102	1.85
	06/09/20	<0.0008	<0.002	0.0376	<0.0003	<0.0003	<0.002	<0.003	0.205 J	<0.0003	0.00751 J	<0.00008	0.0021 J	<0.002	<0.0005	0.0553	0.264	0.319
MW-5	03/30/17	<0.0025	0.00953	0.0748	<0.001	<0.001	<0.005	<0.005	0.510	<0.001	0.0192	<0.0002	<0.005	<0.005	<0.0015	--	--	1.443
	05/10/17	<0.0025	0.00955	0.0706	<0.001	<0.001	<0.005	<0.005	0.540	<0.001	0.0179	<0.0002	<0.005	<0.005	<0.0015	--	--	0.6150
	05/16/17	<0.0025	0.00967	0.0708	<0.001	<0.001	<0.005	<0.005	0.500	<0.001	0.0181	<0.0002	<0.005	<0.005	<0.0015	--	--	0.6410
	06/08/17	<0.0025	0.00908	0.0701	<0.001	<0.001	<0.005	<0.005	0.550	<0.001	0.0200	<0.0002	<0.005	<0.005	<0.0015	--	--	0.1790
	06/21/17	<0.0025	0.00917	0.0767	<0.001	<0.001	<0.005	<0.005	0.530	<0.001	0.0197	<0.0002	<0.005	<0.005	<0.0015	--	--	0.1060
	06/26/17	<0.0025	0.00955	0.0735	<0.001	<0.001	<0.005	<0.005	0.540	<0.001	0.0204	<0.0002	<0.005	<0.005	<0.0015	--	--	1.112
	07/11/17	<0.0025	0.00945	0.0712	<0.001	<0.001	<0.005	<0.005	0.520	<0.001	0.0183	<0.0002	<0.005	<0.005	<0.0015	--	--	0.5120
	07/19/17	<0.0025	0.00941	0.0735	<0.001	<0.001	<0.005	<0.005	0.530	<0.001	0.0186	<0.0002	<0.005	<0.005	<0.0015	--	--	0.1910
	06/25/18	<0.0025	0.00998	0.0733	<0.001	<0.001	<0.005	<0.005	0.560	<0.001	0.0182	<0.0002	<0.005	<0.005	<0.0015	<0.251	<1.369	<1.62
	09/18/18	NA	0.00945	0.0697	NA	NA	<0.002	<0.003	0.493	<0.0003	0.0195	NA	<0.002	NA	NA	<0.282	<0.606	<0.89
	06/03/19	<0.0008	0.00948	0.0678	<0.0003	<0.0003	<0.002	<0.003	0.596	<0.0003	0.0206	<0.00008	<0.002	<0.002	<0.0005	<0.619	<0.917	<1.54
	10/02/19	<0.0008	0.00918	0.067	<0.0003	<0.0003	<0.002	<0.003	0.543	<0.0003	0.0187	<0.00008	<0.002	<0.002	<0.0005	0.47	0.117	0.587
	06/09/20	<0.0008	0.00891	0.0689	<0.0003	<0.0003	<0.002	<0.003	0.370 J	<0.0003	0.0192	<0.00008	<0.002	<0.002	<0.0005	0.171	0.211	0.382
MW-6	03/29/17	<0.0025	0.00827	0.0900	<0.001	<0.001	<0.005	<0.005	0.380	<0.001	<0.010	<0.0002	0.00749	<0.005	<0.0015	--	--	1.009
	05/11/17	<0.0025	0.00738	0.0758	<0.001	<0.001	<0.005	<0.005	0.370	<0.001	0.0101	<0.0002	0.0176	<0.005	<0.0015	--	--	0.8250
	05/16/17	<0.0025	0.00803	0.0784	<0.001	<0.001	<0.005	<0.005	0.360	<0.001	<0.010	<0.0002	0.0131	<0.005	<0.0015	--	--	0.7740
	06/07/17	<0.0025	0.00772	0.0798	<0.001	<0.001	<0.005	<0.005	0.370	<0.001	<0.010	<0.0002	0.00949	<0.005	<0.0015	--	--	0.6640
	06/22/17	<0.0025	0.00764	0.083	<0.001	<0.001	<0.005	<0.005	0.370	<0.001	0.0109	<0.0002	0.0084	<0.005	<0.0015	--	--	0.2150
	06/28/17	<0.0025	0.00779	0.0842	<0.001	<0.001	<0.005	<0.005	0.370	<0.001	<0.010	<0.0002	0.00806	<0.005	<0.0015	--	--	1.730
	07/12/17	<0.0025	0.0077	0.0819	<0.001	<0.001	<0.005	<0.005	0.350	<0.001	<0.010	<0.0002	0.0076	<0.005	<0.0015	--	--	1.012
	07/20/17	<0.0025	0.001	0.0010	<0.001	<0.001	<0.005	<0.005	0.390	<0.001	<0.010	<0.0002	0.001	<0.005	<0.0015	--	--	0.3660
	06/22/18	<0.0025	0.00861	0.0912	<0.001	<0.001	<0.005	<0.005	0.410	<0.001	0.00924 J	<0.0002	0.00837	<0.005	<0.0015	<0.309	<1.243	<1.55
	09/18/18	NA	0.008	0.0828	NA	NA	<0.002	<0.003	0.353 J	0.000349 J	0.0107	NA	0.0274	NA	NA	<0.196	1.06	1.256
	06/03/19	<0.0008	0.00799	0.0894	<0.0003	<0.0003	<0.002	<0.003	0.438	<0.0003	0.00968 J	<0.00008	0.00884	<0.0020	<0.0005	<0.407	<0.623	<1.03
	10/02/19	<0.0008	0.00775	0.0876	<0.0003	<0.0003	<0.002	<0.003	0.357 J	<0.0003	0.00875 J	<0.00008	0.00875	<0.0020	<0.0005	0.715	1.23	1.94
	06/09/20	<0.0008	0.00799	0.078	<0.0003	<0.0003	<0.002	<0.003	0.4	<0.0003	0.0113	<0.00008	0.0357	<0.002	<0.0005	0.00643	0.127	0.134

APPENDIX IV ANALYTICAL RESULTS
COLETO CREEK PRIMARY ASH POND

Sample Location	Date Sampled	Sb	As	Ba	Be	Cd	Cr	Co	Fl	Pb	Li	Hg	Mo	Se	Tl	Ra 226	Ra 228	Ra 226/228 Combined
GWPS:		0.006	0.128	2	0.004	0.005	0.10	0.0499	4	0.015	0.04	0.002	0.10	0.05	0.002	--	--	5
MW-9	03/30/17	<0.0025	0.00909	0.121	<0.001	<0.001	<0.005	<0.005	1.130	0.00217	<0.010	<0.0002	0.0747	<0.005	<0.0015	--	--	1.353
	05/10/17	<0.0025	0.00996	0.105	<0.001	<0.001	<0.005	<0.005	1.290	0.00433	<0.010	<0.0002	0.0900	<0.005	<0.0015	--	--	0.4800
	05/17/17	<0.0025	0.00958	0.101	<0.001	<0.001	<0.005	<0.005	1.260	0.00377	<0.010	<0.0002	0.0899	<0.005	<0.0015	--	--	0.3600
	06/07/17	<0.0025	0.0093	0.100	<0.001	<0.001	<0.005	<0.005	1.260	<0.001000	<0.010	<0.0002	0.0926	<0.005	<0.0015	--	--	0.4760
	06/21/17	<0.0025	0.00937	0.119	<0.001	<0.001	<0.005	<0.005	1.390	0.00136	<0.010	<0.0002	0.1020	<0.005	<0.0015	--	--	1.579
	06/26/17	<0.0025	0.0107	0.114	<0.001	<0.001	0.0102	<0.005	1.400	0.00217	<0.010	<0.0002	0.1060	<0.005	<0.0015	--	--	1.023
	07/11/17	<0.0025	0.0105	0.103	<0.001	<0.001	0.00566	<0.005	1.300	0.00124	<0.010	<0.0002	0.1050	<0.005	<0.0015	--	--	0.8630
	07/19/17	<0.0025	0.0103	0.101	<0.001	<0.001	<0.005	<0.005	1.400	<0.001000	<0.010	<0.0002	0.1130	<0.005	<0.0015	--	--	0.5840
	06/21/18	<0.0025	0.0104	0.100	<0.001	<0.001	<0.005	<0.005	1.500	<0.00072 J	<0.01	<0.0002	0.0617	<0.005	<0.0015	0.608	<1.303	1.91
	09/18/18	NA	0.0103	0.0985	NA	NA	<0.002	<0.003	1.100	<0.000300	0.00639 J	NA	0.0502	NA	NA	0.618	<0.638	1.26
	06/05/19	<0.0008	0.0109	0.102	<0.0003	<0.0003	<0.002	<0.003	1.380	<0.0003	0.00545 J	<0.00008	0.0683	<0.002	<0.0005	<0.402	<0.683	<1.085
	10/03/19	<0.0008	0.0109	0.128	0.000689 J	<0.0003	<0.002	0.00337 J	1.410	0.00876	0.0064 J	<0.00008	0.0507	0.0041 J	<0.0005	0.577	0.747	1.32
	06/09/20	<0.0008	0.0126	0.0865	<0.0003	<0.0003	<0.002	<0.003	1.58	0.000577 J	<0.005	<0.00008	0.0774	<0.002	<0.0005	0.132	-0.0432	0.132
MW-10	03/30/17	<0.0025	0.0110	0.0844	<0.001	<0.001	<0.005	<0.005	0.540	<0.001	0.0179	<0.0002	0.0342	<0.005	<0.0015	--	--	1.439
	05/10/17	<0.0025	0.0146	0.0554	<0.001	<0.001	0.00533	<0.005	0.830	<0.001	0.0122	<0.0002	0.102	<0.005	<0.0015	--	--	0.8880
	05/16/17	<0.0025	0.0150	0.0598	<0.001	<0.001	<0.005	<0.005	0.810	<0.001	0.0123	<0.0002	0.0987	<0.005	<0.0015	--	--	0.1830
	06/08/17	<0.0025	0.0144	0.0544	<0.001	<0.001	<0.005	<0.005	0.840	<0.001	0.0115	<0.0002	0.106	<0.005	<0.0015	--	--	0.06700
	06/21/17	<0.0025	0.0149	0.054	<0.001	<0.001	<0.005	<0.005	0.840	<0.001	0.0133	<0.0002	0.113	<0.005	<0.0015	--	--	0.7090
	06/26/17	<0.0025	0.0160	0.0587	<0.001	<0.001	0.0177	<0.005	0.840	<0.001	0.0137	<0.0002	0.116	<0.005	<0.0015	--	--	0.7180
	07/11/17	<0.0025	0.0149	0.0508	<0.001	<0.001	<0.005	<0.005	0.840	<0.001	0.0119	<0.0002	0.114	<0.005	<0.0015	--	--	1.713
	07/19/17	<0.0025	0.0146	0.0633	<0.001	<0.001	0.00963	<0.005	0.860	<0.001	0.0127	<0.0002	0.121	<0.005	<0.0015	--	--	2.132
	06/22/18	<0.0025	0.0154	0.0692	<0.001	<0.001	<0.005	<0.005	0.88	<0.00095 J	0.0122	<0.0002	0.134	<0.005	<0.0015	<0.212	<1.192	<1.40
	09/18/18	NA	0.0140	0.0446	NA	NA	<0.002	<0.003	0.759	<0.0003	0.0141	NA	0.125	NA	NA	0.151	<0.848	0.999
	06/03/19	<0.0008	0.0142	0.0420	<0.0003	<0.0003	<0.002	<0.003	0.953	<0.0003	0.0139	<0.00008	0.109	<0.002	<0.0005	<0.203	0.814	1.017
	10/02/19	<0.0008	0.0139	0.0406	<0.0003	<0.0003	<0.002	<0.003	0.891	<0.0003	0.0127	<0.00008	0.106	<0.002	<0.0005	-0.0288	0.901	0.901
	06/09/20	<0.0008	0.014	0.0444	<0.0003	<0.0003	<0.002	0.00334 J	0.818	<0.0003	0.013	<0.00008	0.088	<0.002	<0.0005	0.0959	1.22	1.31
MW-11	05/10/17	<0.0025	0.0156	0.0899	<0.001	<0.001	<0.005	<0.005	0.82	0.00239	0.0125	<0.0002	0.0082	<0.005	<0.0015	--	--	0.4560
	05/16/17	<0.0025	0.018	0.0869	<0.001	<0.001	0.00731	<0.005	0.85	0.0113	0.0144	<0.0002	0.00841	<0.005	<0.0015	--	--	1.418
	05/18/17	<0.0025	0.0188	0.0779	<0.001	<0.001	<0.005	<0.005	0.94	0.00204	0.0122	<0.0002	0.00781	<0.005	<0.0015	--	--	0.6390
	06/07/17	<0.0025	0.0175	0.0835	<0.001	<0.001	<0.005	<0.005	0.93	0.00171	0.0137	<0.0002	0.00744	<0.005	<0.0015	--	--	0.5020
	06/21/17	<0.0025	0.0203	0.0822	<0.001	<0.001	<0.005	<0.005	1.04	0.00322	0.0136	<0.0002	0.00659	<0.005	<0.0015	--	--	1.084
	06/26/17	<0.0025	0.0237	0.0954	<0.001	<0.001	0.0131	<0.005	1.00	0.00593	0.0176	<0.0002	0.00796	<0.005	<0.0015	--	--	3.067
	07/11/17	<0.0025	0.0212	0.0725	<0.001	<0.001	<0.005	<0.005	1.00	<0.001	0.012	<0.0002	0.00765	<0.005	<0.0015	--	--	0.7530
	07/19/17	<0.0025	0.0224	0.0709	<0.001	<0.001	0.00762	<0.005	1.01	0.0018	0.0137	<0.0002	0.00783	<0.005	<0.0015	--	--	1.551
	06/21/18	<0.0025	0.0367	0.0805	<0.001	<0.001	<0.005	<0.005	0.96	0.00241	0.0135	<0.0002	0.00465	<0.005	<0.0015	<0.234	<1.312	<1.55
	09/18/18	NA	0.0382	0.0645	NA	NA	<0.002	<0.003	0.754	<0.0003	0.0139	NA	0.00445 J	NA	NA	<0.188	0.597	0.785
	06/03/19	<0.0008	0.0379	0.0834	<0.0003	<0.0003	<0.002	<0.003	0.0837	<0.0003	0.0154	<0.00008	0.00316 J	<0.002	<0.0005	<0.481	0.991	1.472
	10/02/19	<0.0008	0.0379	0.0744	<0.0003	<0.0003	<0.002	<0.003	0.768	0.000391 J	0.014	<0.00008	0.00259 J	<0.002	<0.0005	1.57	0.478	2.040
	06/09/20	<0.0008	0.0293	0.0948	<0.0003	<0.0003	<0.002	<0.003	0.571	0.000675 J	0.0156	<0.00008	0.00215 J	<0.002	<0.0005	0.163	1.31	1.480

Notes:

1. All concentrations in mg/L. Ra 226/228 Combined in pCi/L.
2. J - concentration is below sample quantitation limit; result is an estimate.
3. Non-detect Ra isotope results were assigned a value equal to the minimum detectable concentration.
4. NA = Not analyzed.

APPENDIX C5 – SITE HYDROGEOLOGY AND STRATIGRAPHIC CROSS-SECTIONS OF THE SITE

ENVIRONMENT
& HEALTH

CONCEPTUAL SITE MODEL AND DESCRIPTION OF SITE HYDROGEOLOGY (PRIMARY ASH POND)

The Coleto Creek conceptual site model (CSM) and Description of Site Hydrogeology for the Primary Ash Pond (PAP), located near Fannin, Texas are described in the following sections.

REGIONAL SETTING

The Site is located on the Lissie Formation which is part of the Houston Group (BBA, 2017). The Lissie Formation is a deltaic plain that consists primarily of undifferentiated alluvium, fine-grained channel facies, and fine-grained overbank facies (Moore and Wermund, 1993). The Lissie Formation is middle Pleistocene in age and is described as primarily sands, silts, and clays containing iron and manganese nodules, calcareous concretions, and organic-rich lenses (Moore and Wermund, 1993). Below the Lissie Formation are the Goliad Formation, the Oakville Sandstone/Fleming Formation, and the Catahoula Formations which consist primarily of sand, clays, sands, and tuffs respectively (Nicot et. al, 2010).

Within the central coastal plain of Texas, the Lissie Formation's outcrop is a belt ranging from approximately 10 to 20 miles wide (Solis, 1981). Located within the western region of the Gulf Coast Basin, Lissie sediments extend into the subsurface, dipping southeast at 5 to 20 ft per mile (Doering, 1935). Maximum outcrop thickness is estimated to be about 600 ft in East Texas and 400 ft in South Texas (Plummer, 1932).

SITE GEOLOGY

The Site is located on the Lissie Formation described above (BBA, 2017). Surficial soils in the vicinity of the Site include the following (described in order from shallow to deep) based on Site soil borings (BBA, 2017):

- Upper Confining Unit (Unit 1) – a laterally continuous low permeability unit approximately 11 to 25 feet thick that contains primarily sandy clay and clayey sand with intermittent layers of silty clay.
- Intermediate Sand Unit (Unit 2, Uppermost Aquifer) - a laterally continuous sand and silty sand unit approximately 40 to 54 feet thick that contains discontinuous cohesive layers and variable mineralized zones.
- Lower Confining Unit (Unit 3) - a laterally continuous basal clay unit greater than 25 feet hick consisting primarily of clay and silty clay.

The geologic units discussed above are shown on cross-sections attached to this demonstration.

SITE HYDROGEOLOGY

The Site is located in the Coleto Creek Watershed, adjacent to Sulphur Creek, part of the Coleto Creek Reservoir. The Coleto Creek Reservoir was constructed in the 1970s for use as a cooling pond. The Uppermost Aquifer is monitored by nine monitoring wells surrounding the PAP as part of the CCR groundwater monitoring system. All wells included in the CCR monitoring system are screened in the intermediate sand unit (i.e., uppermost aquifer) at the Site (BBA, 2017).

The CCR groundwater monitoring system consists of nine monitoring wells installed in the Uppermost Aquifer and adjacent to the PAP (BV-5, BV-21, MW-4, MW-5, MW-6, MW-8, MW-9, MW10, and MW-11) (see Monitoring Well Location Map, and Well Construction Diagrams and Drilling Logs attached to this demonstration). The unit utilizes three background monitoring wells (BV-5, BV-21, and MW-8) as part of the CCR groundwater monitoring system.

Hydraulic Conductivity

Hydraulic conductivity results from field testing (i.e., slug tests) at monitoring wells BV-5, BV-21, BV-22, MW-9, MW-10, and MW-11 in the intermediate sand unit (Uppermost Aquifer) ranged from approximately 5.14 x 10^{-4} to 1.37 x 10^{-2} centimeters per second (cm/s), with a geometric mean of approximately 3.35 x 10^{-5} cm/s (BBA, 2017). Generally, hydraulic conductivities upgradient of the PAP were higher than hydraulic conductivities downgradient of the PAP, which was attributed to the varying clay and silt contents of the sandy soils (BBA, 2017).

Groundwater Elevations, Flow Direction and Velocity

Groundwater elevations adjacent to the Site for the eight CCR background monitoring events from March to July 2017 ranged from approximately 101.1 feet North American Vertical Datum of 1988 (NAVD88) to 113.5 feet NAVD88, corresponding to groundwater depths from approximately 14.3 to 29.9 feet below ground surface (BBA, 2017). Groundwater typically flows east to southeast across the PAP towards Sulphur Creek, part of the Coleto Creek Reservoir. During the background monitoring events, the average horizontal hydraulic gradient was calculated as 0.0027 feet per foot (ft/ft) and 0.0029 ft/ft across the northern and southern boundaries of the PAP. The average groundwater flow velocity was between 0.13 and 9.46 feet per day (ft/day) (BBA, 2017). These groundwater elevations, flow direction, and flow velocities are consistent with the groundwater potentiometric map for October 2, 2019 provided as an attachment to this demonstration.

REFERENCES

Doering, JA. 1935. Post-Fleming surface formations of coastal southeast Texas and southern Louisiana: American Association of Petroleum Geologists Bulletin, v.19, no.5, p. 651-688.

Moore, David W. and Wermund, E.G., Jr. 1993. Quaternary Geologic Map of Austin 4° x 6° Quadrangle, United States. Quaternary Geologic Atlas of the United States. Map I-1420 (NH-14). Scale 1:1,000,000.

Nicot, Jean-Philippe, Bridget R Scanlon, Changbing Yang, and John B Gates. 2010. Geological and Geographical Attributes of the South Texas Uranium Province, Texas Commission on Environmental Quality and Bureau of Economic Geology. April 2010.

Plummer, FB. 1932. Cenozoic Systems in Texas, Part 3, in The Geology of Texas: University of Texas, Austin, Bulletin 3232, p.729-795.

Solis, Raul Fernando. 1981. Upper Tertiary and Quaternary Depositional Systems, Central Coastal Plain, Texas, University of Texas at Austin Bureau of Economic Geology Report of Investigations No. 108.

Explanation

- ▲ Downgradient CCR Monitoring Well
- ▲ Upgradient/Backround CCR Monitoring Well
- ☐ CCR Monitored Unit

CRAIG E. BENNETT
LIC #1205

Craig E. Bennett
10-17-2017

Ref: Orthoimagery from ArGIS World Imagery Server

Feet
0 1:12,000 2,000

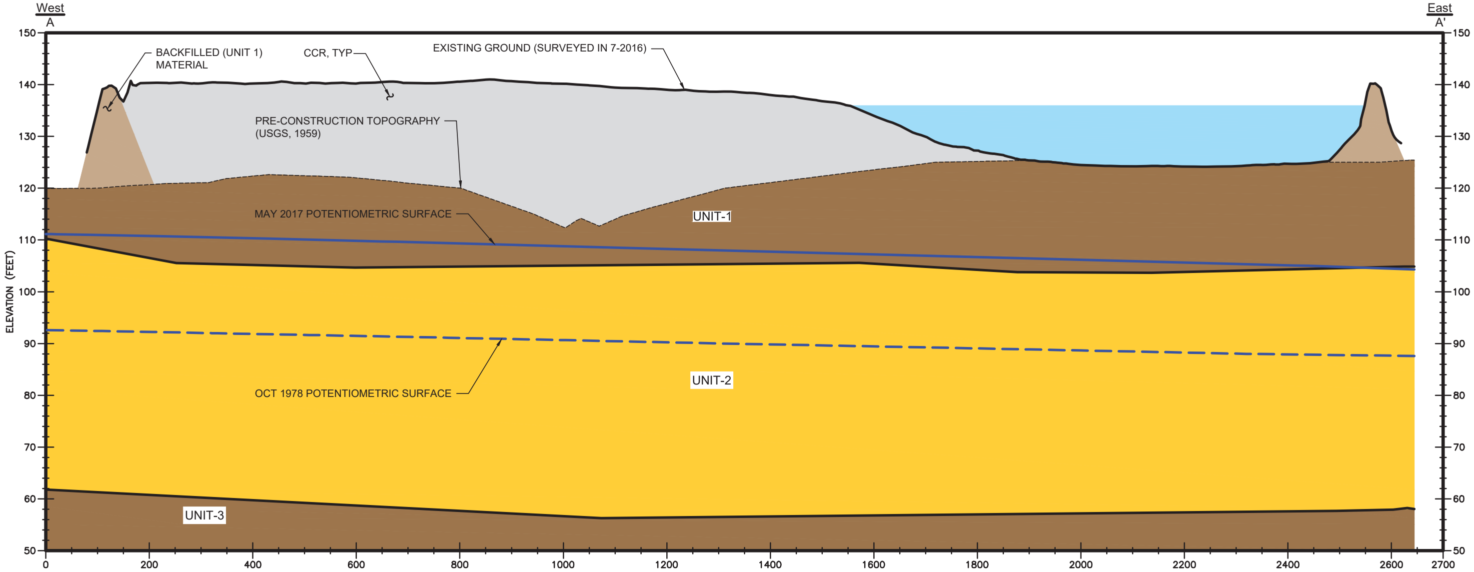
Coleto Creek Power, LP

Monitoring Well Locations

PROJECT: 17258	BY: EEF	REVISIONS
DATE: Oct 2017	CHECKED: CEB	

Bullock, Bennett & Associates, LLC
Engineering and Geoscience
Texas Registrations: Engineering F-8542, Geoscience 50127

Plot Date: 10/13/2017 - 6:10:57 PM, Plotted by: E.Ficker
Drawing Path: D:\BBA\Coleto Creek\CCR\HMP\MXDs\Figure 2 - Monitoring Well Locations.mxd



PROFILE A-A' (LOOKING NORTH)
SCALE:1"=120'(H), 1"=12'(V)

NOTES:

July 2016 bathymetry and topographic surface data collected by Naismith Marine Services of Corpus Christi, Texas.

Unit 1 thickness based on EXHIBIT 3: BORING LOCATION PLAN AND THICKNESS CONTOURS OF INSITU COHESIVE SOILS from Sargent & Lundy (1978).

Original pond bottom depths and site stratigraphy are estimated and interpolated based on data in Sargent & Lundy (1978), 1959 USGS pre-construction topographic data, AECOM (2009), and various post-construction borings located outside of pond footprint.

October 1978 potentiometric surface estimated from data in Sargent & Lundy (1978).

May 2017 potentiometric surface based on groundwater data collected by Coleto Creek Power.

UNIT DESCRIPTIONS:

Unit 1 - Sandy CLAY and Silty CLAY. Surficial unit.

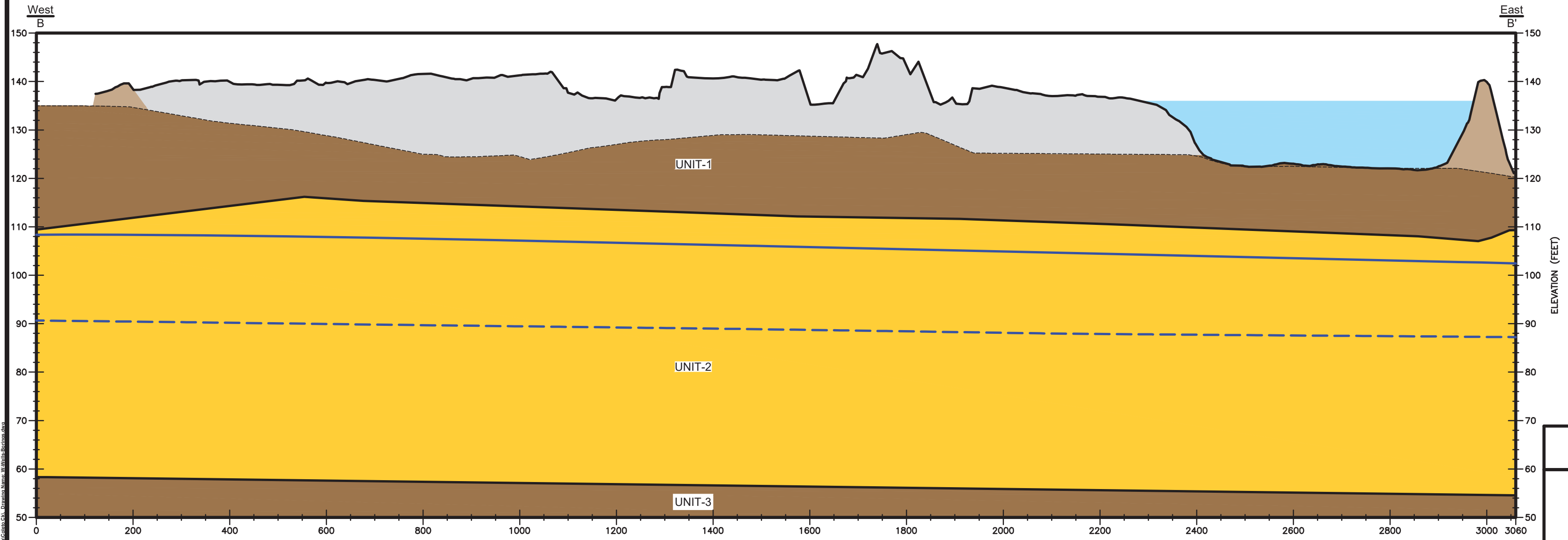
Unit 2 - Sand and Silty SAND with caliche and CLAY/Sandy CLAY lenses. First groundwater-bearing unit.

Unit 3 - CLAY and Silty CLAY. Basal unit.

Unit descriptions based on AECOM (2009).

CRAIG E. BENNETT
GEOLOGY
LIC #1205

Craig E. Bennett
10-17-2017



PROFILE B-B' (LOOKING NORTH)
SCALE:1"=120'(H), 1"=12'(V)

Plot Date: 10/16/17 - 8:43am, Plotted by: roodrj
Drawing Path: K:\clients\bba\Coleto Ck\, Drawing Name: W-Wells-Borings.dwg

Coleto Creek Power, LP

GENERALIZED GEOLOGIC
CROSS SECTIONS A-A' AND B-B'

PROJECT: 17258	DATE: OCT 2017	BY: RCAD-RR	CHECKED: CBB

Bullock, Bennett & Associates, LLC
ENGINEERING AND GEOSCIENCE
Texas Registrations: Engineering F-8542, Geoscience 50127

APPENDIX C6 – STRUCTURAL STABILITY AND SAFETY FACTOR ASSESSMENT

COAL COMBUSTION RESIDUALS
SURFACE IMPOUNDMENT
HISTORY OF CONSTRUCTION AND
INITIAL HAZARD POTENTIAL ASSESSMENT, STRUCTURAL INTEGRITY ASSESSMENT, AND SAFETY FACTOR ASSESSMENT

COLETO CREEK POWER PLANT
FANNIN, TEXAS

OCTOBER 13, 2016

Prepared for:

COLETO CREEK POWER, LP
Coleto Creek Power Plant
Fannin, Texas

Prepared by:

BULLOCK, BENNETT & ASSOCIATES, LLC
Engineering and Geoscience
Registrations: Engineering F-8542, Geoscience 50127

165 N. Lampasas Street
Bertram, Texas 78605
(512) 355-9198

BBA Project No. 15214-5

Certification Statement 40 CFR § 257.73 - Structural Integrity Criteria for Existing CCR Surface Impoundments

CCR Unit: Coleto Creek Power, LP; Coleto Creek Power Station; Primary and Secondary Ash Ponds

I, Daniel Bullock, being a Registered Professional Engineer in good standing in the State of Texas, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this assessment report has been prepared in accordance with the accepted practice of engineering. I certify, for the above referenced CCR Unit, that the information contained in the History of Construction and Initial Hazard Potential Assessment, Structural Integrity Assessment, and Safety Factor Assessment, dated October 13, 2016, meets the requirements of 40 *CFR* § 257.73.

DANIEL B. BULLOCK
82596

Daniel B. Bullock 10/13/2016

Daniel B. Bullock, P.E. (TX 82596)

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LIST OF APPENDICES

1.0 INTRODUCTION

Coleto Creek Power Station is located at 45 FM 2987 just outside the city of Fannin in Goliad County, Texas. The power station consists of one coal-fired boiler. Bottom ash and fly ash, or coal combustion residuals (CCR), generated in the boiler are either shipped off-site for beneficial re-use or managed in on-site CCR surface impoundments that are divided into primary and secondary collection areas (Primary and Secondary Ash Ponds). Figures 1-1A and 1-1B provide site location maps showing the Primary and Secondary Ash Pond configuration.

In April 2015, the Environmental Protection Agency (EPA) enacted rules 40 *CFR* Part 257 to address potential risks associated with operating CCR surface impoundments at coal-fired power plants. This report has been prepared to specifically address the requirements identified in §257.73 *Structural Integrity Criteria for Existing CCR Surface Impoundments*. Section 2.0 of the report provides the History of Construction (§257.73(c)(1)(i – xii)). Section 3.0 contains the Initial Potential Hazard Classification Assessment (§257.73(a)(2)), Section 4.0 provides the Initial Structural Stability Assessment (§257.73(d)(1)), and Section 5.0 includes the Initial Safety Factor Assessment (§257.73(e)(1).

2.0 HISTORY OF CONSTRUCTION

The following History of Construction has been prepared in accordance with the requirements defined in §257.73 (c)(1)(i – xii).

2.1 Owner and Operator of CCR Unit

The Coleto Creek Power Station is owned and operated by Coleto Creek Power, LP. The address is as follows:

Coleto Creek Power Station
45 FM 2987
PO Box 8
Fannin, Texas 77960
Primary Ash Pond SWR No. 31911, Unit No. 001
Secondary Ash Pond SWR No. 31911, Unit No. 003

2.2 CCR Unit Location

The Coleto Creek Power Station and associated CCR surface impoundments (Primary and Secondary Ash Ponds, or collectively referred to as Ash Ponds) are located just outside the city of Fannin in Goliad County, Texas on approximately 8,000 total acres. The Primary Ash Pond is approximately 190 acres in surface area with a reported storage capacity of 2,700 acre-feet and the associated Secondary Ash Pond is approximately 10 acres in size with 300 acre-feet of storage capacity (S&L, December 1978). Figure 2-1 (U.S.G.S. Area Map) shows the CCR surface impoundments on the most recent US Geological Survey (USGS) 7½ minute quadrangle topographic map.

2.3 Ash Pond Statement of Purpose

The Primary and Secondary Ash Ponds were constructed between 1976 and 1977 during the power plant site development. The ponds were designed and constructed to accommodate wastes from two coal-fired boilers (S&L, December 1978). However, only one boiler has been constructed and operated at the facility.

Bottom ash is collected from the boiler, combined with water, and transferred in slurry form for disposal in the facility's surface impoundment. Fly ash is collected from the boiler exhaust using a baghouse. The fly ash is transported pneumatically to two storage silos. From there, the fly ash is loaded onto enclosed dry haul hoppers for off-site beneficial use. Fly ash not meeting required beneficial reuse specifications is combined with water and pumped to the facility's Primary Ash Pond for disposal. CCR solids settle out of the conveyance water in the Primary Ash Pond and the excess water then overflows a weir to the smaller Secondary Ash Pond for final settling of any remaining solids. Water from the Secondary Ash Pond can be recirculated to the ash sluice system or discharged in accordance with the facility's TPDES permit.

Other plant wastes may also reportedly be sluiced into the Ash Ponds including aqueous lab waste, boiler chemical cleaning rinseate, air preheater cleaning rinseate, air preheater cleaning residue, basin solids, de-ionizer regenerate wastewater, heat exchanger cleaning rinseate, waste de-ionizer resin beads, waste molybdate contaminated cooling water, waste filter media, boiler blowdown, demineralizer effluent, storm water, low volume waste, and effluent water/wastewater from plant processes (S&L, 1981).

2.4 Watershed Description

Coleto Creek Power Station is located in the lower half of the Coleto Creek Watershed (Figure 2-2) which is maintained by the Guadalupe-Blanco River Authority (GBRA). Coleto Creek is approximately 27 miles long, beginning in DeWitt County and travels through Goliad and Victoria Counties before its confluence with the Guadalupe River (GBRA, 2013). Approximately 558 square miles drain into the Coleto Creek Watershed. Typical land uses in the watershed include farming, ranching, oil and gas production and more recently, in-situ uranium mining. The only urbanized area in the watershed is the small city of Yorktown located upstream of the power plant in DeWitt County.

Coleto Creek Reservoir Dam was constructed in the late 1970s to create the approximate 3,100 surface acre Coleto Creek Reservoir which serves as a cooling pond for the Coleto Creek power plant. The power plant discharges approximately 360,000 gallons per minute of water to the reservoir (GBRA, 2013). Perdido Creek, Turkey Creek, and Sulphur Creek also feed into the reservoir. Although the reservoir is managed by the GBRA, it is reportedly wholly owned by Coleto Creek Power, LP up to an elevation of 104 feet MSL.

2.5 Ash Pond Foundation and Abutment Material Description

The Ash Ponds were designed and constructed under the guidance of Sargent & Lundy Engineers (S&L). As part of the design process, S&L advanced 63 soil borings and installed eight monitoring wells in the immediate vicinity of the ponds. Based on the information collected, the ponds are constructed within a surface deposit of cohesive soils consisting of mostly clayey sand and silty clay with varying amounts of caliche. The soils are classified as CH, CL, and SC soils using the Unified Soil Classification System. These soils range in thickness from 4 to 20 feet, and average 13 feet (S&L, December 1978). Figure 2-3 provides the Thickness Contour Map for In-Situ Cohesive Soils beneath the Ash Ponds. The impoundment dikes are continuous and do not include a conventional spillway, thus there are no abutments with other structures.

2.6 Ash Pond Construction Summary

As noted in Section 2.3, the CCR surface impoundments were constructed between 1976 and 1977 during overall site development. Construction was performed by H. B. Zachary Construction with full-time on-site inspection by S&L. Field testing of site soils and construction materials was performed by Trinity Testing Laboratory, Inc. In general, the Primary and Secondary Ash Pond dikes have a total circumference of approximately 12,900 feet and a height ranging from approximately 4 feet up to 56 feet. The maximum reported storage volume is 2,700 acre-feet in the Primary Ash Pond and 300 acre-ft in the Secondary Ash Pond (S&L, December 1978).

As further described below, a limited topographic and bathymetric survey was conducted for the Ash Ponds in July 2016. Results of that survey were combined with assumptions regarding the original base elevation of the pond (limited as-built base elevation data is available) to generate area-capacity estimates for use in subsequent assessments presented in this report. The area-capacity estimates generated using 2016 data indicate that the top of dike capacity is approximately 3,700 acre-ft, or nearly 1,000 acre-ft more than originally reported by S&L. The originally reported 2,700 acre-ft corresponds to an approximate elevation of 135 feet in the 2016 assessment, which is also the operating level identified in the S&L report. For the purposes of this report, the larger capacity is used where appropriate.

In-situ cohesive soils were used as the pond lining and the geotechnical characteristics of those soils are documented in the S&L construction summary report dated December, 1978. Laboratory geotechnical testing was performed on representative samples collected post-construction from the borings advanced in the in-situ liner soils. The median laboratory permeability was reported as $3.8x10^{-8}$ cm/sec. The average plasticity index, liquid limit, and fines content were listed as 23%, 42%, and 40%, respectively. S&L concluded that the soil liner as constructed overall either met or exceeded requirements for a 3-foot thick compacted clay liner of 1x10-7 cm/sec permeability in accordance with Texas Department of Water Resources technical guidelines for the design and construction of waste water ponds that were in place at the time of construction (S&L, December 1978).

Ash pond dikes were constructed using controlled and compacted cohesive fill excavated from borrow areas around the Plant site (S&L, December 1978). As noted previously, site soils generally consist of clayey sand and silty clay, with various amounts of caliche. The dikes were constructed with side slopes ranging from 2.5 and/or 3.0 horizontal to 1.0 vertical. This side slope was specified in accordance with the Bureau of Reclamation Design of Small Dams, 1974, for small homogenous dams constructed with cohesive fill on a stable foundation. Side slopes were reportedly seeded.

Dike fill was specified to be placed and compacted to a minimum of 95% of the maximum dry density as determined by ASTM D698. Four hundred and twenty field density tests conducted specifically on Ash Pond dike materials during construction reported densities ranging from a minimum of 92 percent up to 110 percent, with an average of 98 percent.

The exterior dikes for the Ash Ponds were constructed approximately 4 to 56 feet above the existing grade. The crest of the dike is reportedly 15 feet wide and includes a gravel perimeter access road. Typical cross-sections depicting the Ash Pond construction configuration are provided on Figure 2-5.

The Ash Ponds are separated by a dike that has side slopes of approximately 3.0 horizontal to 1.0 vertical and a height of approximately 40 feet above natural grade. This dike also has a crest that is approximately 15 feet wide and contains a gravel road (see Figure 2-5). A concrete weir intersects the divider dike to allow the overflow of water from the Primary Ash Pond to the Secondary Ash Pond. The weir inlet is located in the Primary Ash Pond and consists of a 7-feet wide by 9.5-feet long concrete structure configured with stoplogs supported by a 12-feet wide by 14.5 feet long foundation. The inlet structure is accessed by a walkway extending from the shared Primary and Secondary Ash pond dike into the Primary Ash Pond. The concrete inlet structure is intersected by a 30-inch diameter corrugated metal pipe (CMP) with 7-feet by 7-feet steel seepage collars at 28 feet on center. The CMP has an inlet elevation of El. 106 and an outlet elevation of El. 105 (CDM, March 2011).

Bottom ash and boiler slag are sluiced along the south embankment into the Primary Ash Pond via one 12-inch-diameter high density polyethylene (HDPE) pipe and one 12-inch-diameter carbon steel pipe (CSP). The ash slurry is sluiced onto a screen processor to separate fine and coarse material. Demineralizer effluent is sluiced into the Primary Ash Pond along the southeast embankment through an 8-inch-diameter HDPE pipe.

A boiler area sump in the plant collects other liquid waste and sluices it through a 20-inch diameter Class 200 polyvinyl chloride (PVC) pipe along the Primary Ash Pond west embankment adjacent to the groin with the evaporation pond. A valve in the pipeline also allows the boiler area sump water to be discharged directly into the evaporation pond. Flow to the Primary Ash Pond from the boiler area sump is regulated depending on water levels and weather conditions. The pipeline can also be used as a clean water decanting pipe.

A seep collection system was constructed in approximately 1982 along the southeastern boundary of the Secondary Ash Pond dike. This system included four drain lines consisting of 8-inch diameter corrugated polyethylene pipes with 1/8-inch diameter holes located at approximately 6-inch intervals circumferentially and longitudinally. The pipes were wrapped with filter cloth to prevent infiltration of fine soils then installed with special equipment that cut a shallow trench and embedded the pipe in one continuous operation. Collected water flows to a sump and is pumped back into the Primary Ash Pond (URM, 1982).

In 2012, Coleto Creek Power, LLC contracted AECOM Technical Services, Inc. (AECOM) to prepare a hydraulic and geotechnical stability analysis of the Ash Pond (AECOM, March 2012). Under that study, AECOM conducted field and laboratory testing to evaluate the current geotechnical stability of the Ash Pond dike system. According to the report, AECOM found that "the ash pond has adequate factor of safety under the steady-state, normal operating, maximum operating, rapid drawdown, and seismic conditions modeled."

2.7 Ash Pond Drawings

Figures 2-4 and 2-5A, -B, and -C provide dimensional drawings of the Ash Ponds as required in §257.73(c)(1)(vii).

2.8 Ash Pond Instrumentation

Ash Pond water levels are observed on a daily basis during site inspections using the pond staff gauge located on the inlet structure. The staff gauge has a maximum reading of +140 feet which approximately corresponds to the top of the dike embankment. Based on an on-site topographic survey conducted by Naismith Marine Services of Corpus Christi, Texas (Naismith) in July 2016, the elevation 140 reading on the staff gauge corresponds to approximate elevation 140.4 feet NAVD88. Furthermore, the plant datum (referred to as MSL) was surveyed and determined by Naismith to be equal to NAVD88. Water levels are normally maintained at an elevation of El. 136 feet (NAVD88) or lower. There is no other instrumentation used to monitor the Ash Ponds.

2.9 Ash Pond Area-Capacity Curves

Figure 2-6 provides the area-capacity curves for the Primary Ash Pond. Area capacity curves for the Secondary Ash Pond are not included because minimal solids accumulation is expected to occur relative to the Primary Ash Pond.

2.10 Ash Pond Spillway and Diversion Design Features

The Ash Ponds were not constructed with a conventional spillway. Original pond design documents indicate two, 20-inch-diameter CSPs on the east Secondary Ash Pond dike that would discharge water at an outfall into the "hot" side of Coleto Creek Reservoir. The discharge pipes have 6-feet by 6-feet steel seepage collars constructed at 25 feet on center. These pipes were subsequently replaced with two, 20-inch-diameter Class 200 PVC pipes. Prior to the power plant going online, however, the recirculating pump station was constructed and the two 20-inch pipes were connected to a 10-inch diameter discharge pipe and the recirculating pump station (CDM, March 2011). Water from the Ash Ponds is primarily lost through evaporation. Excess water that needs to be removed to maintain proper freeboard distances can either be discharged through Outfall 003 in accordance with the plant's Texas Pollutant Discharge Elimination System Permit No. WQ0002159000 or recirculated back to the plant for re-use.

Pond water levels are maintained to accommodate safe plant operations and are primarily dependent on plant water and ash loading rates as no storm water runoff from the surrounding area (other than run-off from the dike crest) enters the ponds. Water levels are monitored daily and the amount discharged to the outfall or recirculated to the plant can be adjusted to accommodate for expected rain events or draught conditions. The ponds are currently operated with approximately four feet of freeboard to allow removal of bottom ash and fly ash for off-site beneficial reuse.

2.11 Ash Pond Surveillance, Maintenance, and Repair Provisions

Formal and informal inspections of the ponds are conducted by qualified facility personnel for the purpose of ensuring proper and safe operation in accordance with the provisions defined in §257.83(a). Weekly inspections include observation of the static pond water level, vegetation control, and structural integrity evaluations of dike embankments and any noted issues are addressed as necessary. In addition to the weekly observational inspections performed by site personnel, formal inspections of the pond conditions are conducted by outside engineers annually in accordance with §257.83(b).

2.12 Ash Pond Structural Stability History

There is no record or knowledge of structural instability of either the Primary or Secondary Ash Ponds. The pond dikes have been maintained to minimize the potential for structural failure.

3.0 INITIAL POTENTIAL HAZARD CLASS ASSESSMENT

According to 40 *CFR* §257.73(a)(2), the owner and operator of a CCR surface impoundment must assign a hazard potential classification to each operating unit. For the purposes of the rule, hazard potential classification means "the possible adverse incremental consequences that result from the release of water or stored contents due to failure of the diked CCR surface impoundment or mis-operation of the diked CCR surface impoundment or its appurtenances." The impoundment must be classified as high hazard, significant hazard, or low hazard. Each hazard potential classification is defined as follows (§257.53):

> (1) *High hazard potential CCR surface impoundment* means a diked surface impoundment where failure or mis-operation will probably cause loss of human life.
>
> (2) *Low hazard potential CCR surface impoundment* means a diked surface impoundment where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the surface impoundment owner's property.
>
> (3) *Significant hazard potential CCR surface impoundment* means a diked surface impoundment where failure or mis-operation results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns.

In 2010 the United States Environmental Protection Agency (USEPA) contracted CDM to perform site assessments of selected CCR surface impoundments which included the Primary and Secondary Ash Ponds at the Coleto Creek Power Plant. As part of the assessment, CDM assigned each of the ponds with a Low Hazard classification (CDM, 2011).

Subsequent to the CDM report findings, Coleto Creek Power contracted AECOM Technical Services, Inc. (AECOM) to perform geotechnical studies to further evaluate the structural stability of the CCR surface impoundments. AECOM implemented a subsurface investigation and performed a geotechnical stability evaluation, a liquefaction assessment, and hydraulic analysis. AECOM also performed an independent hazard assessment of the Ash Ponds. The results of that assessment supported the initial CDM classification of Low Hazard.

3.1 Dam Breach Analysis

Bullock, Bennett & Associates (BBA) performed a simplified dam breach analysis of the Ash Ponds to support the loss of life, and environmental and economic impact analyses. The Primary and Secondary Ash Ponds combined, as indicated by the most recent survey conducted in July 2016, have a maximum storage capacity of approximately 4,000 acre-ft and a maximum levee height for the Secondary Pond of approximately 39 feet above adjacent lake level of 101 feet MSL. Construction was complete in 1978 and the effective fluid storage capacity in the Primary Ash Pond has significantly diminished with the placement of CCR over time. According to topography and bathymetric survey data collected in July 2016, the fluid capacity in the Ash Ponds has been reduced to approximately 1,720 acre-ft at the maximum dike crest height.

The Ash Ponds are located next to the Coleto Creek Reservoir which was constructed to serve as a cooling pond for the power plant. The reservoir is divided into a “hot” side and a “cool” side. The ponds are located immediately adjacent to the hot side of the lake. The hot side of the lake is created from Sulphur Creek behind Dike No. 1 (Dike No. 1 Lake) which is connected to Turkey Creek behind Dike No. 2 (Dike No. 2 Lake) by a secondary flume. Water from these lakes then flows into Main Lake which is the cool side. Decant water from the Secondary Pond can be combined with other plant water then routed through TCEQ-approved Outfall 003 to the hot side of the lake. Cool water is pumped into the power plant from the Main Lake.

GBRA provided area-capacity tables for the Coleto Creek Reservoir and Dike Lake Nos. 1 and 2. These tables are presented as Attachments 3-1, 3-2, and 3-3 in Appendix E. Dike No. 1 Lake consists of approximately 164 acres at the normal operating elevation of 101 feet MSL. Dike No. 2 Lake is approximately 429 acres at the normal operating elevation of 101 feet MSL. The two Dike Lakes are separated from Coleto Creek Reservoir by splitter dikes with an approximate elevation of 102 feet MSL (GBRA, 2016). Coleto Creek Reservoir covers an area of approximately 2,652 acres at a normal operating elevation of 98 feet MSL (GBRA, 2016). Coleto Creek Power, LP reportedly controls the lake up to an elevation of 104 feet MSL. An area map showing the relative locations of the Ash Ponds, Dike Lakes, and Coleto Creek Reservoir is presented in the attachments as Figure 1-1.

For the purposes of this evaluation, a conservatively worst-case dam breach scenario was developed assuming that the breach was due to overtopping of the surface impoundment levees and that the breach occurs in the shared Primary and Secondary dike and subsequently in the Secondary Pond dike adjacent to Coleto Creek Reservoir, releasing the entire water contents of the Ash Ponds. This scenario allows for the greatest quantity of pond decant water to be released.

An evaluation of potential water and residual solids flow paths was performed to support the loss of life, environmental, and economic evaluations. Surface elevation cross-sections assembled from Google Earth™ profiles of the areas adjacent to the pond dikes were reviewed to estimate the potential flow path of the released water and solids. As shown in Figure 1-1A, the wet side of the ponds are bound by the evaporation pond followed by Dike No. 1 lake on the north-northwest, Dike No. 1 lake on the northeast corner, and the primary plant discharge flume on the east. The surface elevation of the terrain that bounds the east side of the discharge flume appears to extend to approximately elevation 132 feet. The flume channel, therefore, appears to be located within a larger basin bounded to the west by the Ash Pond dikes (approximate elevation 140 feet) and to the east by land mass (approximate elevation 132 feet). The distance between the dike on the west side of the basin and land mass high points on the east side appears to be approximately 300 feet. The flume channel and basin would route flow from an east-side breach of the dike to the hot side of the lake. Released water and solids, therefore, would initially flow to the hot side of the lake regardless of the location of the breach. From there, water levels would increase one foot (the amount of available freeboard behind Dike No. 1 and Dike No. 2 lakes) then flow into the Main lake. Eventually all water would be released into the Main lake.

Using the tables provided by GBRA, a one-foot increase in the Main lake elevation requires an additional approximately 2,720 acre-feet of water. The estimated maximum volume of discharge from the Ash Ponds is approximately 1,720 acre-feet of water, resulting in a water surface elevation change on the reservoir of approximately eight inches. An eight-inch change in water surface elevation is considered to be nominal and would not result in the loss of major infrastructure elements or disrupt lifeline facilities.

3.2 Loss of Life Evaluation

The Ash Ponds are located apart from the active industrial areas of the power plant. Two fly-ash silos are located adjacent to the western border of the surface impoundment and loading of trucks for off-site transport and beneficial reuse of the fly ash regularly occurs at this location. These silos and truck loading operations are adjacent to the southwest half of the Primary Ash pond which is filled with dry and compact CCRs, and any catastrophic failure of the impoundment in this area is highly unlikely. If a failure were to occur, it would probably be located on the “wet” side of the pond, including the northern or eastern dikes for both the Primary and Secondary Ash Ponds (see Figure 1-1). There are no regular or active plant operations that occur downstream of those areas where personnel would be expected to be present in the event of a catastrophic failure of the dike. There are no residences or other off-site manned operations immediately downstream of the ponds. As noted in Section 3.1 the Dike 1, Dike 2, and Main Lakes would absorb the released water and raise reservoir levels a nominal amount (less than a foot). Loss of life in the event of a catastrophic failure of the surface impoundment dike system, therefore, is considered to be improbable.

3.3 Economic and/or Environmental Loss Evaluation

Additional consideration was given to the impacts of the water quality from a large volume discharge from the Ash Ponds into the Coleto Creek Reservoir. Using the volume ratio of Ash Pond water (approximately 1,720 acre-feet) that could potentially be discharged into the Coleto Creek Reservoir to the existing volume of water in the reservoir (approx. 31,280 acre-feet at elevation 98 feet msl), the impacts to the water quality are minimal (31,280 acre-feet/1,720 acre-feet = ~18 dilution factor of analytes in the Ash Pond water). Ash Pond water is currently discharged to the Coleto Creek Reservoir under Permit No. WQ002159000 (TCEQ, 2010).

Currently, the coal combustion by-products are sluiced into the Primary Ash Pond. The assumed ratio of solids-to-water is approximated at a 20%-to-80%. The solids settle out of solution and the water decants to the surface. As the solids settle out of solution, they consolidate. Additionally, based on field observations the ash “sets up” similar to cement, becoming very hard and massive. The expected flow of any unconsolidated solids from the Ash Pond is believed to be minimal.

Additionally, approximately 90% of the approximate 90,000 cubic yards of ash produced annually is currently being sold and recycled rather than disposed in the Ash Pond (Coleto Creek Power, 2015). However, for the sake of conservatism, it is assumed that a volume of ash equivalent to six months of production (assuming no recycling) is disposed in the Primary Ash

Pond and may not be consolidated, and may flow should a breach occur. Under these assumptions, there is potential for approximately 45,000 cubic yards (approximately 28 acre-feet) of ash flow. The ash volume would be in solution with the decant water, displacing an equal volume of the decant water. This ash would be expected to be contained within the hot side of the lake. Impacts would therefore be primarily limited to the owner’s property.

3.4 Hazard Potential Classification

Based on a review of previous studies, analytical data, ash production/recycling volumes, available impoundment capacities, available lake capacities, observed current conditions at the site, assumptions, and other factors, the Coleto Creek Ash Pond is classified as a Low Hazard Potential impoundment.

4.0 INITIAL STRUCTURAL STABILITY ASSESSMENT

According to §257.73(d), the owner or operator of the CCR surface impoundment "must conduct initial and periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein."

This initial structural stability assessment addresses each of the seven structural elements that are specifically identified in the rule as follows:

Stable foundations and abutments. As noted in Section 2.5, the Ash Ponds were constructed on a foundation of in-place cohesive soils whose geotechnical characteristics either met or exceeded Texas Department of Water Resources technical guidelines for the design and construction of waste water ponds that were in force at the time of construction (S&L, December 1978). The dikes are continuous, with no constructed abutments. A review of the geotechnical data collected at the time of construction confirms that the foundation for the ponds should continue to be stable over their operational life.

Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown. The dikes were constructed with 2.5 to 3 horizontal to 1 vertical side slope. Outer slopes were seeded for slope protection but interior dike surfaces were not. Vegetation does naturally occur on these surfaces thus assisting in the control of erosion. The interior dike sections in areas impounding water are armored with rock riprap. The dikes are regularly inspected in accordance with §257.83(a) and (b) and repaired as necessary to maintain their integrity. An engineering site inspection was performed in September 2015 in accordance with the requirements defined in §257.83(b) which included an evaluation of the surface impoundment dikes. No additional slope protection was deemed to be necessary at that time. (BBA, 2015).

Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit. The dike system was engineered by S&L and constructed in approximately 1978. As discussed in Section 2.6 – Ash Pond Construction Summary, dike fill material was placed in controlled, mechanically compacted lifts, averaging approximately 98%

maximum dry density as determined by ASTM D698. Full time field inspection was performed during construction, with approximately 420 field density tests performed on the dikes.

Vegetated slopes of dikes and surrounding areas not to exceed a height of six inches above the slope of the dike, except for slopes which have an alternate form or forms of slope protection. The slopes of the dikes and surrounding areas are vegetated as required. The slopes are reportedly mowed as necessary to comply with height of grass requirements.

A single spillway or a combination of spillways configured as specified in paragraph (d)(1)(v)(A) of the section of the rule. As is common with surface impoundments of this type, the ponds were not constructed with a spillway. The results of the hydraulic analysis completed in support of the Inflow Design Flood Control System evaluation (BBA, September 2016) showed that the Primary and Secondary Ash Ponds, as configured without a spillway and when operated at a maximum storage operating elevation of 136.1 feet NAVD88, have sufficient capacity to manage the design flood. The design flood is designated by rule for a Low Hazard Potential surface impoundment (see Section 3.0) to equal the 100-year rainfall event. It is therefore not necessary for the surface impoundment to have a spillway.

Hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure. The weir system and pipe penetrations were visually inspected by a professional engineer in September of 2015 (BBA, 2015). There were no observations of conditions that would negatively impact operation of the structures. The inspection was limited to visual observations during a site visit, and did not include, for instance, use of a remote video camera in the weir outlet pipe for inspection of internal conditions.

For CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body. The Coleto Creek Reservoir is adjacent to the Secondary Pond, and a small portion of the pond exterior slope can be inundated by the reservoir. Therefore, the Secondary Pond exterior slope was evaluated for stability in the event of inundation followed by a rapid drawdown of the reservoir, as further discussed in Section 5.0 Initial Safety Factor Assessments.

No structural stability deficiencies associated with the Primary and Secondary Ponds were identified in this initial Structural Stability Assessment that would require corrective measures. A certification from a qualified professional engineer stating that this initial assessment was conducted in accordance with the requirements of the rule is included in Appendix C.

5.0 INITIAL SAFETY FACTOR ASSESSMENTS

§257.63(e) requires that owners of existing and newly constructed CCR surface impoundments conduct initial and periodic safety factor assessments. The purpose of the safety factor assessment is to document that the as-constructed CCR surface impoundment configuration either meets or exceeds regulatory safety factor criteria under static end-of-construction loading conditions, long-term, maximum storage pool loading conditions, and maximum surcharge pool loading conditions. In addition, the liquefaction and seismic factor of safety must be estimated.

The rule requires that the safety factor evaluation be performed across the critical cross section of the impoundment dikes. For the purposes of this initial assessment, previous data collected as part of historical site assessments as noted in Section 4.0 were evaluated to determine whether it represented the critical cross section of the pond dikes that would be most susceptible to failure. The three critical cross sections for the primary pond dike, the secondary pond dike, and the divider dike between the two pond sections as shown in Figure 2-3 are in the areas of the pond that still contain water, are generally representative of the tallest sections of dikes and contain representative side slopes, and are where the highest potential impacts would be expected were a dike breach to occur.

Geotechnical sampling and analysis of as-constructed dike materials has been conducted during three different events. The first was performed by S&L during and after construction of the pond in 1978. Subsequent studies were performed in 1981 by Underground Resource Management, Inc. (URM) (URM, July 29, 1981) and in 2012 by AECOM Technical Services, Inc. (AECOM, March 2012).

BBA reviewed the previous site geotechnical investigation data gathered by S&L, URM and AECOM used in previously conducted stability analyses of the dikes and the data appears sufficient to provide a reliable estimation of current conditions, therefore no further geotechnical testing was required for the current analysis. Coleto Creek Power provided all previous investigation data to BBA for use in evaluation and preparation of an updated structural stability analysis. The most recent stability analysis, conducted by AECOM in 2012, summarizes previous evaluations by others. A brief summary of previous geotechnical investigations is provided below.

S&L completed approximately 80 soil borings to document the subsurface soils in and around the Ash Ponds. All of the borings were reportedly completed prior to construction of the Ash Ponds, in support of Ash Ponds design. Following commissioning of Unit 1 and filling of the Ash Ponds to normal operating levels, seepage was observed west and adjacent to the Recirculating Pump House. URM was contracted to investigate the seeps and their potential impact to dike stability. URM completed a geotechnical investigation of the pond dikes near the seep location, and assessment of both the dike embankment stability and groundwater quality indicated no detrimental effects due to the seep at that time and that, based on site geotechnical investigation, laboratory data analysis, and slope stability modeling of the dike, short and long-term stability of the embankments in the study area were considered satisfactory (URM, July 29, 1981).

AECOM, upon reviewing previous geotechnical investigations from S&L and URM, completed a supplemental geotechnical investigation program to evaluate stability of the dike system in 2012. While their review of previous data found the data to be acceptable for use in evaluation of dike stability of the ponds, they also identified critical areas of interest within the dike system for further evaluation, and implemented a geotechnical investigation of these critical areas (cross sections A, B and C, as shown in Figure 2-5A of the attachments). BBA agrees that these locations are the critical areas to evaluate for stability, given, cross section A is near a location of observed seepage at the outside toe of the Primary Pond dike, cross section B is located along the splitter dike that separates the Primary Pond and Secondary Pond, and cross section C is located along the small portion of the Secondary Pond that can be inundated by the Coleto Creek Reservoir. It should be noted that a seepage collection system is currently in design to address the seepage condition near the cross section A location. However, evaluation of stability at section A was completed based on current conditions.

AECOM field data gathering included construction of 8 geotechnical borings extending from depths ranging from 29.5 to 121.5 feet below ground surface (bgs). Five borings were completed from the top of the dikes and three borings were located along the exterior toe of dike. Laboratory testing included water content, dry unit weight, calibrated penetrometer, grain-size distribution, triaxial shear testing and direct shear testing. AECOM contracted with Subsurface Exploration Services, LLC of Green Bay, Wisconsin to complete the field work, and AECOM field staff observed the exploration work, assisted with collection of soil samples, and completed field boring logs. Laboratory testing was conducted by AECOM geotechnical laboratory technicians. AECOM geotechnical laboratories are reportedly certified by multiple state and federal agencies to complete geotechnical testing in accordance with American Society for Testing and Materials (ASTM), United States Army Corp of Engineers, (USACE), and State Department of Transportation approved methods and standards (AECOM, 2012).

BBA reviewed the data available from the S&L, URM, and the supplemental data gathered by AECOM including geotechnical data, cross sections, and methodology used by AECOM for modeling slope stability. The data and methods are suitable for evaluation of slope stability of the critical cross section locations. The geotechnical investigation data from the AECOM study, including soil bore logs and geotechnical laboratory data is included in Appendices A and B, respectively, of this report.

BBA contracted Naismith to complete an existing conditions topographic survey of these critical cross section areas, as well as topography of the entire perimeter dike system and bathymetry of the pond interiors. Using the 2016 existing conditions survey data, and geotechnical data obtained from the previous studies (including similar lithology as indicated in the AECOM study for the critical cross sections), BBA graphically reconstructed the cross section locations A, B, and C for completion of further analysis. Upon review of all data and methodologies used by AECOM in analysis of the critical cross section locations of the dike systems, BBA completed a similar analysis. BBA compared the 2016 as-built topographic survey cross sections at cross section locations A, B and C, to the design sections. Based on this review it appeared the as-built sections generally were slightly overbuilt when compared to the design sections, and contained slightly gentler slopes. Based on comparison of design versus as-built sections at each location it was determined that the design sections were likely worse case than the as-built sections in regards to analysis for slope stability, therefore only the design sections were evaluated.

Based on review of the AECOM bore logs and geotechnical laboratory test data, BBA generally agrees with the lithology and soil engineering strength properties used in the AECOM stability analysis. However, BBA’s evaluation of field data and laboratory indices testing completed did result in minor changes in assumed soil properties – the reduction of the effective shear strength of caliche from 36 degrees to 34 degrees for cross sections B and C, the increase in unit weight from 120 pounds per cubic foot (pcf) to 130 pcf, and the increase of shear strength from 32 degrees to 36 degrees for the medium dense to dense sands and silts in cross section C. BBA evaluated stability with both sets of data and observed that these changes do not alter the overall safety factor for these sections, however, the revised data set appear more appropriate based on review of field and indices test data and are therefore reported. Review of the data indicates that generally the AECOM engineering strength properties used in their analysis was conservative and representative of the field and laboratory data gathered.

Similar to the AECOM stability evaluation, BBA evaluated the dikes using two sets of time-dependent strength parameters, effective stress and total stress. Effective stress analysis was used to model drained, long-term, steady-state loading conditions where excess pore pressures have had time to dissipate. This would be the normal steady state operating conditions (maximum storage pool) of the pond. Total stress analysis was used to model undrained, short-term loading conditions such as maximum surcharge pool, rapid drawdown, and seismic events, where excess pore water pressure could develop in fine grained silts clays and not have had time to dissipate. The rapid drawdown case is representative of the conditions that would occur immediately after a significant flood event.

The seismic conditions analyze the effect an earthquake would have on the stability of the dike. BBA selected a maximum probable earthquake for Coleto Creek based on the 2014 United States Geological Survey National Seismic Hazard Maps found at (http://earthquake.usgs.gov/hazards/products/conterminous/2014/2014pga2pct.pdf). The maximum probable earthquake has a peak ground acceleration of 0.03 g with a 2 percent Probability of Exceedance in 50 years.

Table 5-1 summarizes the effective and total stress soil strength parameters used for each soil layer in the analysis:

TABLE 5-1

Soil Strength Parameters used in Geotechnical Stability Analysis
(color shading as shown in cross sections)

Cross Section A-A’

Soil Description	Unit Weight (pcf)	Effective Stress Strength Parameters		Total Stress Strength Parameters	
		c’ (psf)	Ø’	c (psf)	Ø
Clayey Sand Fill Material (SC)	130	150	29	3,000	0
Natural Silty Clay or Clayey Sand (CL, SC, CL-Caliche)	130	150	27	4,000	0
Natural Sands (SM, SP, SC)	130	0	36	0	36

Cross Section B-B’

Soil Description	Unit Weight (pcf)	Effective Stress Strength Parameters		Total Stress Strength Parameters	
		c’ (psf)	Ø’	c (psf)	Ø
Clayey Sand Fill Material (SC)	130	150	29	3,000	0
Caliche (SC)	135	250	34	250	0
Medium Dense to Dense Sands (SP)	132	0	36	0	36
Dense to Extremely Dense Sands (SP, SC, SM, SP-SM)	133	0	38	0	38
Very Stiff to Hard Silty Clay (CL, CL-ML, CH)	128	0	29	3,250	0

Cross Section C-C’

Soil Description	Unit Weight (pcf)	Effective Stress Strength Parameters		Total Stress Strength Parameters	
		c’ (psf)	Ø’	c (psf)	Ø
Clayey Sand Fill Material (SC)	130	150	29	3,000	0
Caliche (SC)	135	250	34	250	0
Medium Dense to Dense Sands and Silts (SP, ML, CL)	130	0	36	0	36
Dense to Extremely Dense Sands (SM, SC, SP-SM, SP)	130	0	34	0	34
Very Stiff to Hard Silty Clay (CL, CL-ML, CH)	128	0	29	3250	0

Based on field observations, the ash located within the ponds tends to set up, much like cement, into a hard, blocky mass of material. However, as was assumed in the AECOM evaluation, for conservative modeling purposes the interior material was considered to be water, with no structural strength that would add a stabilizing force.

Four model conditions were evaluated at each cross section location, as deemed applicable, including: maximum storage pool (the highest normal operating level) and maximum surcharge pool (level reached during inundation from design storm) conditions, rapid drawdown, and the seismic condition. The normal operating water level, based on the Hydrologic and Hydraulic Capacity Requirements evaluation completed by BBA (BBA, 2016) is 136.1 (NAVD88). The water level projected in event of a design storm (the 100 year, 24-hour storm) is 138.0 (NAVD88). The lowest top of dike elevation observed in the 2016 survey was 139.7 (NAVD88).

Cross section A, located in the observed seep location near the southeast corner of the Primary Pond, was assumed to have a water table elevation at the ground surface along the exterior toe of slope, as observed in the field and as documented in the AECOM stability analysis as well as the BBA inspection report of 2015. Cross section B, located along the separator dike between the Primary and Secondary ponds, was modeled with the maximum storage and maximum surcharge pool elevations. And cross section C, located along the east side of the Secondary Pond where the reservoir inundates the exterior toe, was modeled with the maximum storage and maximum surcharge WSELs in the pond, and included elevation 101.0 (NAVD88) for the reservoir (normal operating level). Cross sections B & C were also evaluated for the rapid draw down (RDD) condition. It is conservatively assumed the phreatic surface at cross section A exits the exterior dike surface at approximately 1/3 the height of the dike (although the only field observations of wet soil occurred at the toe of slope, where the seep locations are located). The phreatic surface for cross section B is at the same elevation as the assumed pond water levels. The phreatic surface for cross section C is assumed to traverse from the interior pond WSEL to the exterior toe reservoir elevation.

Dikes should be designed with appropriate safety factors. Required safety factors per §257.73(e)(1)(i) through (e)(1)(iv) for critical embankment sections are as follows:

Table 5-2
Required Factors of Safety

Condition	**Required Factor of Safety**
End-of-Construction Loading Static Factor of Safety	1.3
Long-Term, Maximum Storage Pool Loading Static Factor of Safety	1.5
Maximum Surcharge Pool Loading Static Factor of Safety	1.4
Seismic Factor of Safety	1.0
Liquefaction Factor of Safety	1.2

BBA used the 2D limit equilibrium computer program SLIDE 7.0 by Rocscience to complete the slope stability analysis for the critical cross sections. A combination of the Simplified Bishop and the Morgenstern-Price method of slices, for both circular and block-type failures, was used to analyze the stability of the slopes. Thirty stability cases were evaluated for the critical cross sections as summarized in Table 5-3, and the lowest factor of safety generated for each case is reported:

Table 5-3
Slope Stability Analysis Summary

Cross Section	Conditions	Effective Stress Analysis Safety Factor		Total Stress Analysis Safety Factor	
		Block	Circular	Block	Circular
A-A’	Max Storage Pool/Static	1.8 (1)	1.9 (2)	4.9 (3)	5.5 (4)
A-A’	Max Surcharge Pool/Static	1.7 (5)	1.8 (6)	4.9 (7)	5.5 (8)
A-A’	Max Storage Pool /Seismic	NA	NA	4.3 (9)	4.8 (10)
B-B’	Max Storage Pool /Static	2.8 (11)	2.8 (12)	3.7 (13)	5.1 (14)
B-B’	Max Surcharge Pool, Rapid Drawdown	NA	NA	2.0 (15)	2.1 (16)
B-B’	Max Storage Pool/Seismic	NA	NA	3.0 (17)	4.1 (18)
C-C’	Max Storage Pool/Static	1.5 (19)	1.6 (20)	2.1 (21)	2.1 (22)
C-C’	Max Surcharge Pool/Static	1.5 (23)	1.5 (24)	2.0 (25)	2.1 (26)
C-C’	Max Surcharge Pool, Rapid Drawdown	NA	NA	1.9 (27)	1.8 (28)
C-C’	Max Storage Pool/Seismic	NA	NA	1.9 (29)	1.9 (30)

Note: (#) = Case Number (referenced on model output data in Appendix C).

Cross sections, bore logs, laboratory data, and SLIDE 7.0 stability model output data are included in Figure 2-5A and Appendices A, B, & C, respectively of this report.

As shown in Table 5-3, thirty stability cases were modeled and all cases meet or exceed required factors of safety.

5.1 Liquefaction Assessment

BBA utilized the liquefaction assessment process outlined in the U.S. EPA guidance document titled RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities, EPA/600/R-95/051, April 1995, published by the Office of Research and Development and other relevant source documents to perform this liquefaction factor of safety evaluation. As identified in those documents, the liquefaction assessment process begins by screening the subject site for its liquefaction potential using the following criteria.

- Geologic age and origin. If a soil layer is a fluvial, lacustrine or aeolian deposit of Holocene age, a greater potential for liquefaction exists than for till, residual deposits, or older deposits.

- Fines content and plasticity index. Liquefaction potential in a soil layer increases with decreasing fines content and plasticity of the soil. Cohesionless soils having less than 15 percent (by weight) of particles smaller than 0.005 mm, a liquid limit less than 35 percent, and an in situ water content greater than 0.9 times the liquid limit may be susceptible to liquefaction.

- Saturation. Although low water content soils have been reported to liquefy, at least 80 to 85 percent saturation is generally deemed to be a necessary condition for soil liquefaction.

- Depth below ground surface. If a soil layer is within 50 feet of the ground surface, it is more likely to liquefy than deeper layers.

- Soil Penetration Resistance. Soil layers with a normalized SPT blowcount [$(N_1)_{60}$] less than 22 have been known to liquefy. Other sources suggest an SPT value of [$(N_1)_{60}$] less than 30 as the threshold to use for suspecting liquefaction potential.

If three or more of the above criteria indicate that liquefaction is not likely, the potential for liquefaction is considered to be negligible. Otherwise, further evaluation of the liquefaction potential at a facility is required. The soils at the Coleto Creek Power facility generally meet at least three of the specified screening criteria and their liquefaction potential is unlikely. However, there are exceptions such as certain layers that are described in the soil borings logs as SP, or sandy soils, which would by definition have a low fines content. In addition, some liquid limits are below 35 percent. Therefore, further evaluation of the soil data has been completed, and factors of safety against liquefaction calculated for each critical layer, as further described below.

A review of existing data regarding site conditions, soil stratigraphy, soil properties, and potential critical layers as well as the methods used to develop that data indicate that the findings presented in the AECOM report (AECOM, 2012) are sufficient for use in this assessment. As noted in previous sections of this report, AECOM drilled eight borings through critical areas of the site to depths ranging from approximately 30 to 120 feet bgs. Standard penetrometer (SPT) blows per foot, plastic limit, water content, and liquid limit data were collected at two to five foot intervals. In addition, samples were collected and sent to an off-site laboratory for analyses of general geotechnical properties. Copies of the boring logs and laboratory data used in this assessment are provided in Appendices A and B.

When available, site specific information such as SPT blow count and percent fines content (soils passing the #200 sieve) was used in the evaluation of liquefaction potential. For strata with no site specific data, conservative estimates were used based on industry accepted references and engineering judgement. For example, earthquake potential maps and tables presented in the USEPA guidance document were used to estimate the worst-case earthquake magnitude and associated maximum ground acceleration. USGS references for low to mid-ranges of fines content for the reported soil types were used when no laboratory data existed.

A complete discussion of the methodology used and the calculation spreadsheets for each strata identified in the eight boring logs are presented in Appendix D. The findings of the liquefaction assessment indicate that the factor of safety is well above the 1.2 required. This finding is expected given the generally high fines content of most soil strata, the low water content, and low ground acceleration that would be observed in the unlikely event that an earthquake was to occur in this area.

6.0 SUMMARY

In accordance with §257.73, Structural Integrity Criteria for Existing CCR Surface Impoundments, the critical cross sections of the Primary and Secondary Ponds at the Coleto Creek facility have been evaluated for slope stability under appropriate loading conditions, including steady-state seepage, maximum surcharge pool, rapid drawdown, and seismic. In addition, a liquefaction assessment has been completed. Based on review of historic studies, geotechnical data that has been previously gathered, and on stability analysis evaluation, the Primary and Secondary Ponds have an adequate factor of safety for all evaluated loading conditions.

7.0 REFERENCES

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BBA. (2015, November 24). Letter to Mr. Robert Stevens from Mr. Dan Bullock. *Coleto-Creek Power - September 2015 Primary and Secondary Ash Ponds Dike Inspection*. Bullock, Bennett & Associates, LLC.

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FIGURES

N

APPROXIMATE SCALE: 1" = 3000'

0 750 1500 3000

SOURCE: AERIAL PHOTO PROVIDED BY BING, PHOTO TAKEN 5-2011.

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82596

Daniel B. Bullock
10-13-2016

Coleto Creek Power, LP

Figure 1-1A

SITE LOCATION MAP

PROJECT: 15214-8	BY: RR	DATE: OCT 2016	CHECKED: DBB

Bullock, Bennett & Associates, LLC
Engineering and Geoscience
Texas Registrations: Engineering F-8542, Geoscience 50127

Plot Date: 10/13/16 - 7:47am, Plotted by: Admin
Drawing Path: K:\ACAD\clients\BBA\Coleto Ck\, Drawing Name: C-ST-PL115.dwg

APPROXIMATE SCALE: 1" = 1000'

SOURCE: AERIAL PHOTO PROVIDED BY T.N.R.I.S., NAD83 UTM ZONE 14N, DATE: OCT 2014-AUG 2015.

Coleto Creek Power, LP

Figure 1-1B

SITE LOCATION MAP

PROJECT: 15214-3	BY: RR	DATE: OCT 2016	CHECKED: DBB

Bullock, Bennett & Associates, LLC
Engineering and Geoscience
Texas Registrations: Engineering F-8542, Geoscience 50127

Plot Date: 10/04/16 - 10:54am, Plotted by: Admin
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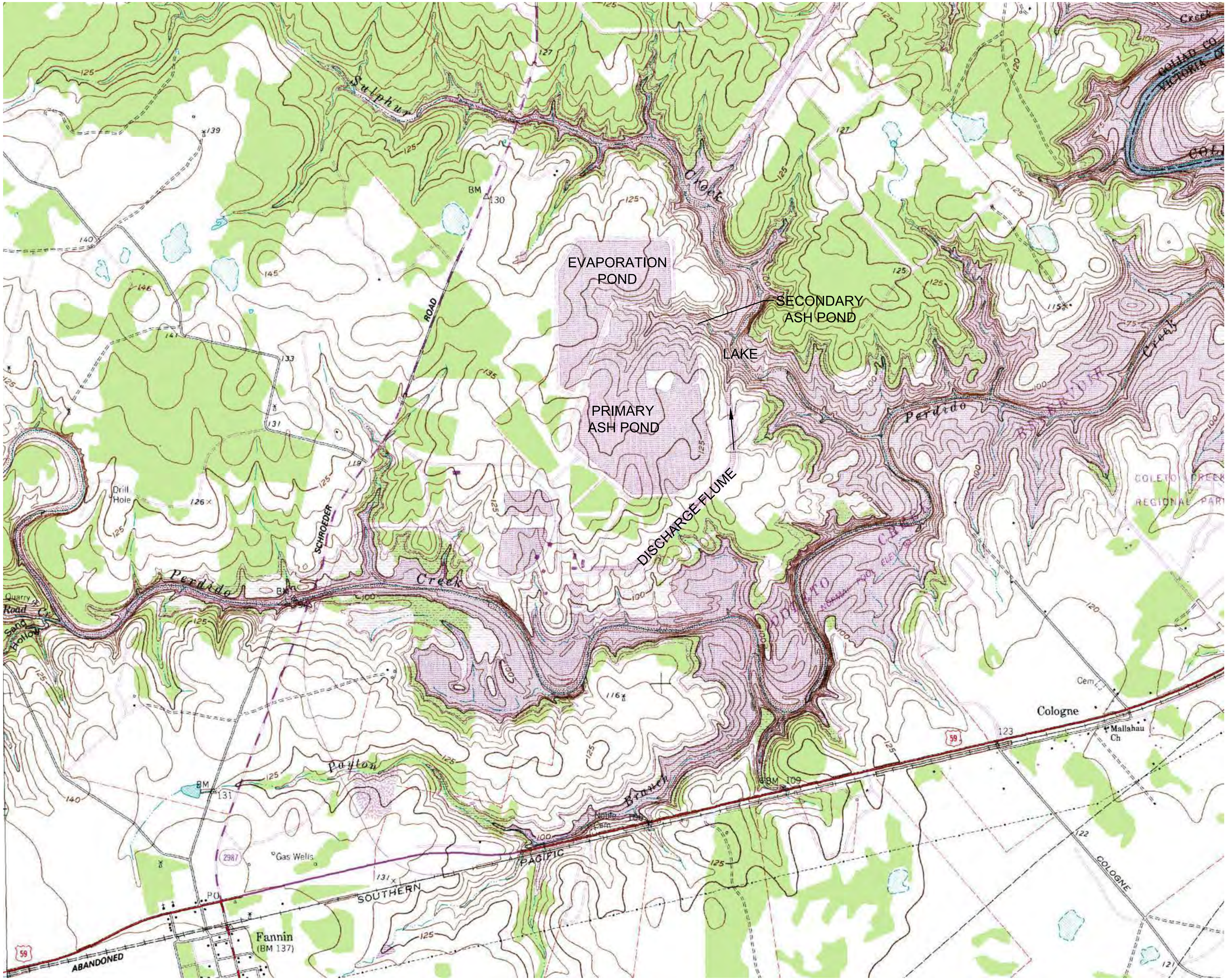

N

APPROXIMATE SCALE: 1" = 2000'

0 1000 2000 4000

NOTE: CONTOUR DATA SHOWN ON U.S.G.S. MAP IN AREAS OF ASH PONDS ARE REPRESENTATIVE OF CONDITIONS PRIOR TO ASH POND CONSTRUCTION.

SOURCE: U.S.G.S. FANNIN TEXAS, DATE: 2016, SCALE 1:24000, 10' CONTOURS. NAD1983, NAVD1988.

Coleto Creek Power, LP

Figure 2-1

U.S.G.S. AREA MAP

PROJECT: 15214-3	BY: RR	DATE: OCT 2016	CHECKED: DBB

Bullock, Bennett & Associates, LLC
Engineering and Geoscience
Texas Registrations: Engineering F-8542, Geoscience 50127

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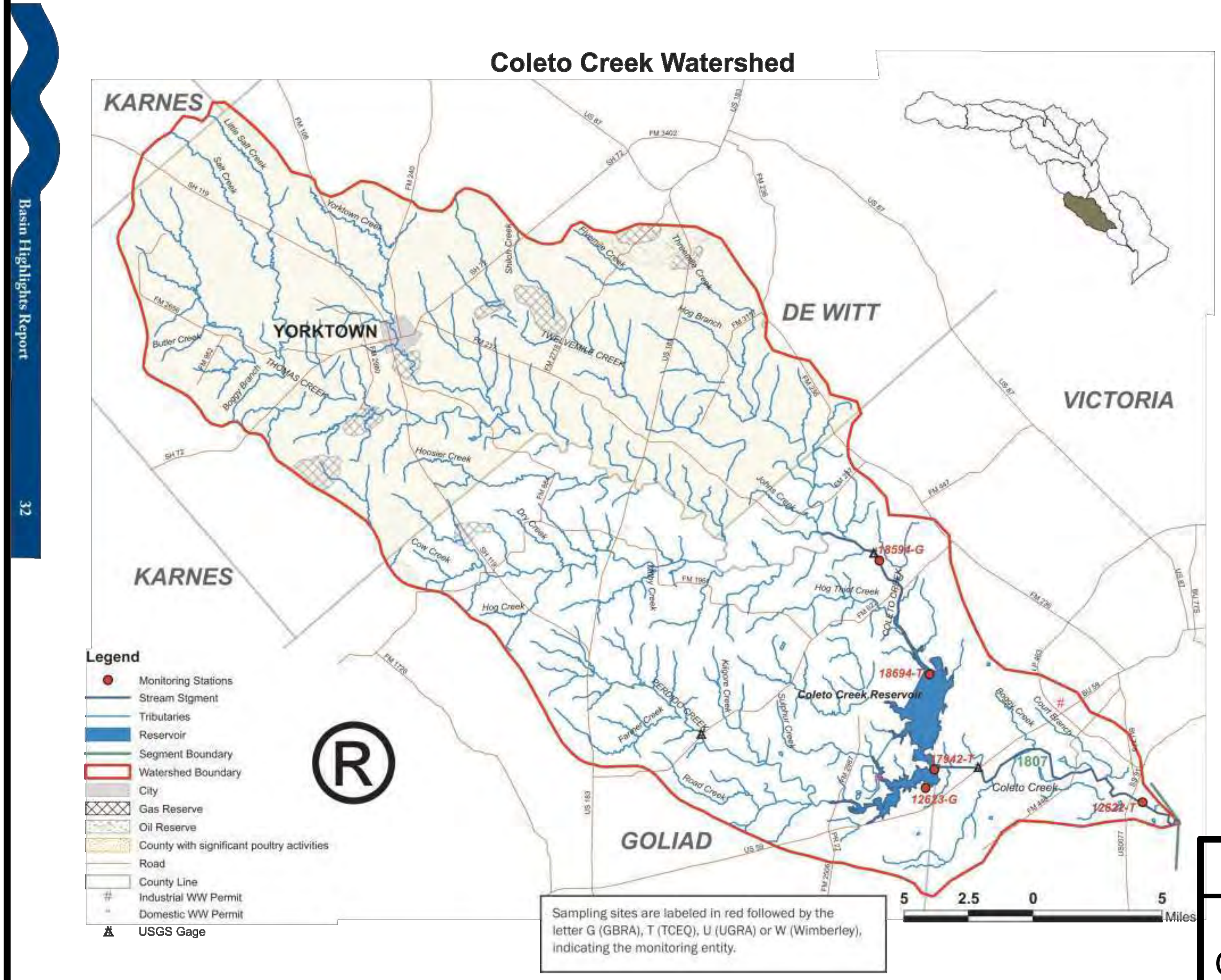


Sampling sites are labeled in red followed by the letter G (GBRA), T (TCEQ), U (UGRA) or W (Wimberley), indicating the monitoring entity.

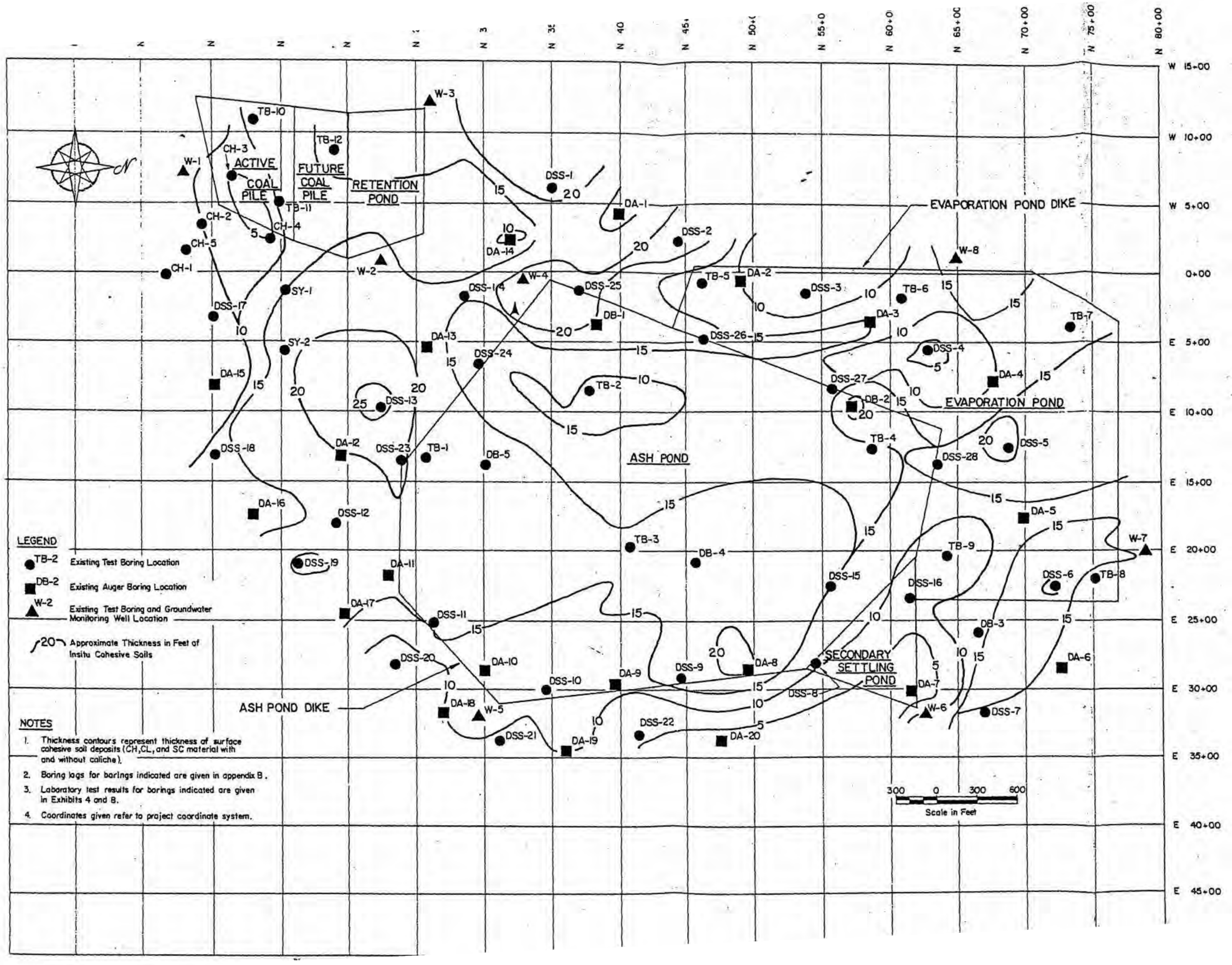
Coleto Creek Power, LP

Figure 2-2

COLETO CREEK WATERSHED

PROJECT: 15214	BY: RR	DATE: OCT. 2016	CHECKED: DBB

Bullock, Bennett & Associates, LLC
Engineering and Geoscience
Texas Registrations: Engineering F-8542, Geoscience 50127



LEGEND

- ● TB-2 Existing Test Boring Location
- ■ DB-2 Existing Auger Boring Location
- ▲ W-2 Existing Test Boring and Groundwater Monitoring Well Location
- 20 Approximate Thickness in Feet of Insitu Cohesive Soils

NOTES

1. Thickness contours represent thickness of surface cohesive soil deposits (CH, CL, and SC material with and without caliche).
2. Boring logs for borings indicated are given in appendix B.
3. Laboratory test results for borings indicated are given in Exhibits 4 and 8.
4. Coordinates given refer to project coordinate system.

SOURCE: MAP PROVIDED BY SARGENT AND LUNDY ENGINEERS, CHICAGO, IL.

Coleto Creek Power, LP

Figure 2-3

THICKNESS MAP OF IN-SITU COHESIVE SOILS

PROJECT: 15214-3	BY: RR	DATE: OCT. 2016	CHECKED: DBB

Bullock, Bennett & Associates, LLC
Engineering and Geoscience
Texas Registrations: Engineering F-8542, Geoscience 50127

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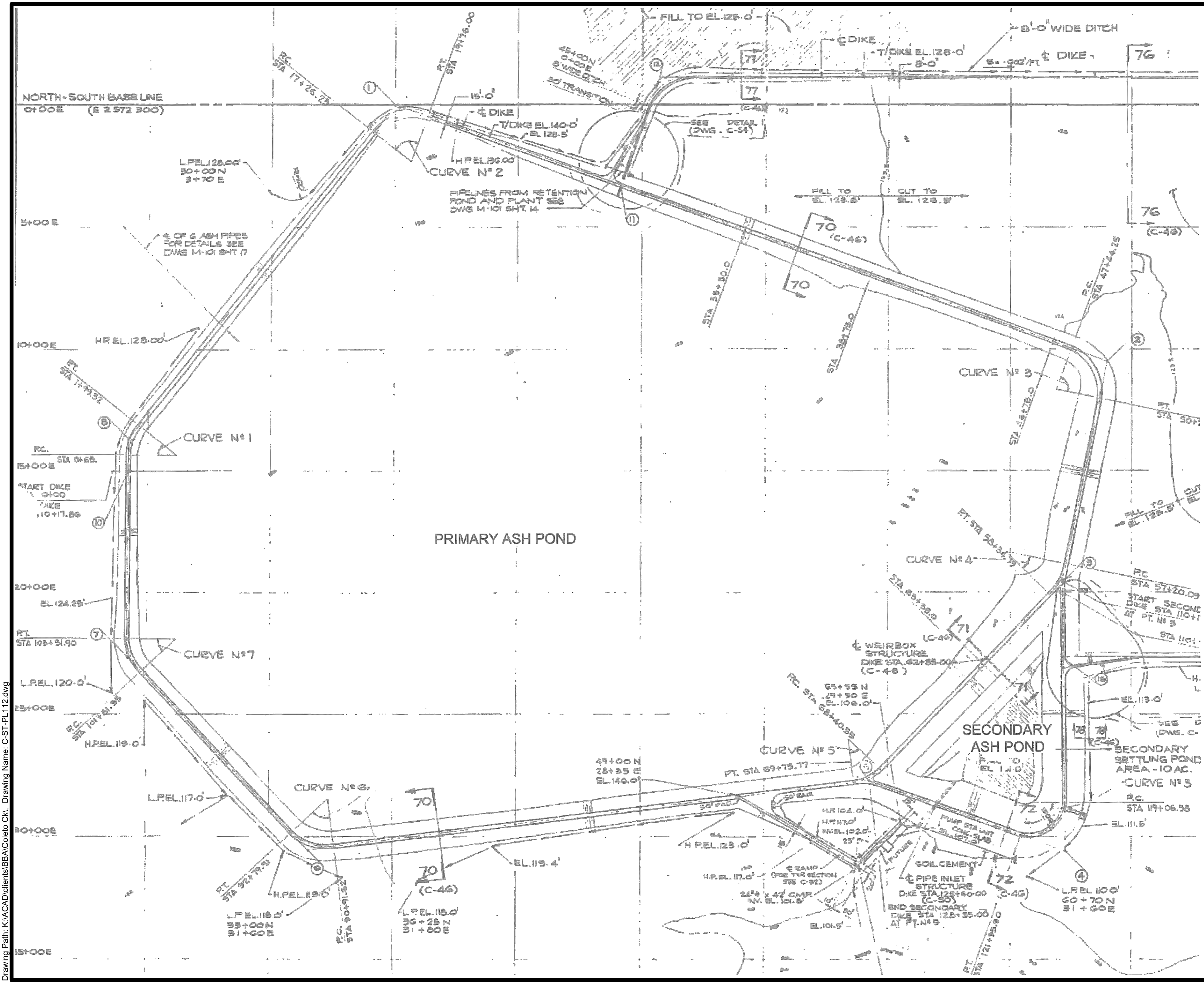

NOTE:

THE MAX STORAGE POOL FOR THE PRIMARY ASH POND IS 135.9 (NAVD88).

SOURCE:

BACKGROUND DRAWING PROVIDED BY SARGENT & LUNDY, APRIL 1978.

APPROXIMATE SCALE: 1" = 400'

0 200 400 800

Coleto Creek Power, LP

Figure 2-4

SURFACE IMPOUNDMENT CONFIGURATION

PROJECT: 15214-3	BY: RR	DATE: OCT 2016	CHECKED: DBB

Bullock, Bennett & Associates, LLC
Engineering and Geoscience
Texas Registrations: Engineering F-8542, Geoscience 50127

Plot Date: 10/04/16 - 10:56am, Plotted by: Admin
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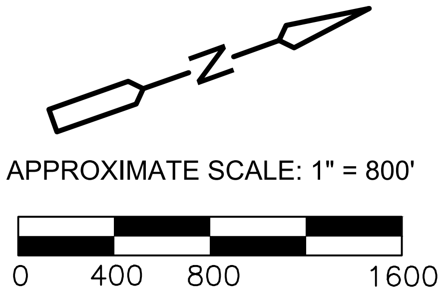
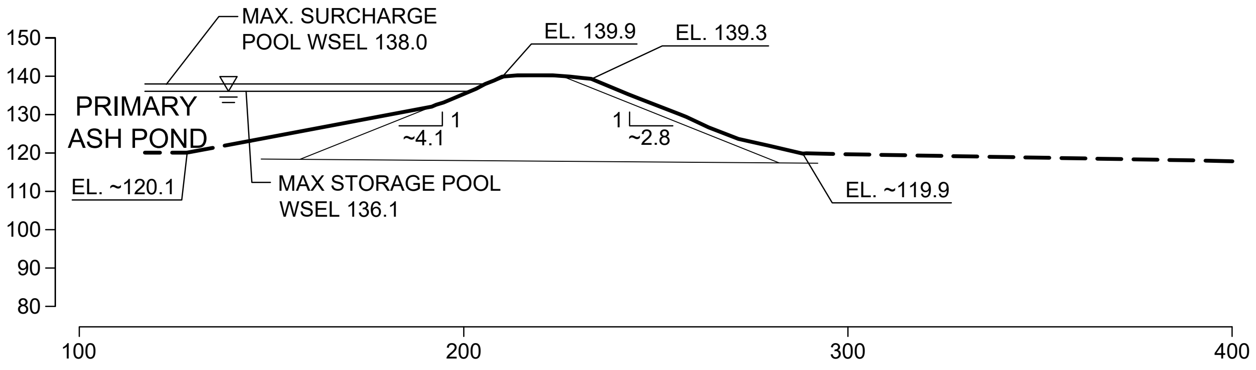
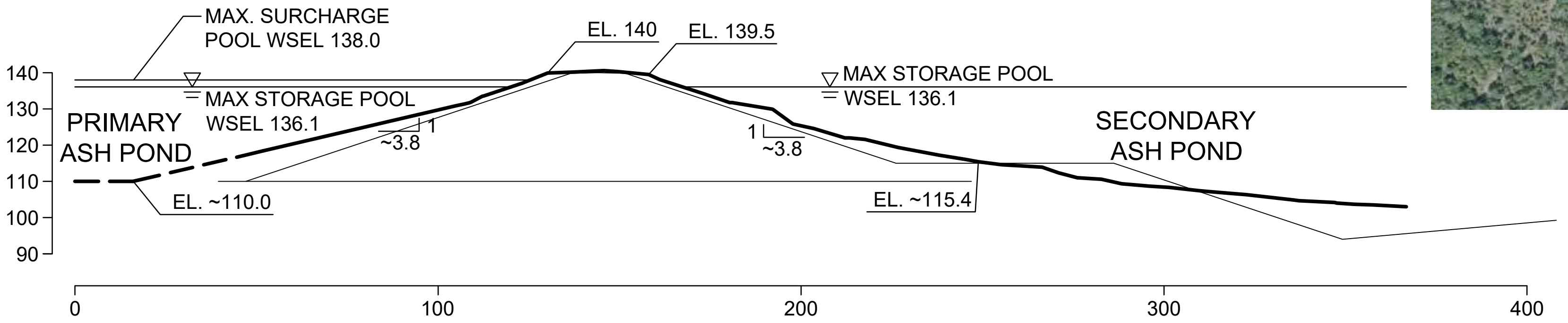


APPROXIMATE SCALE: 1" = 800'



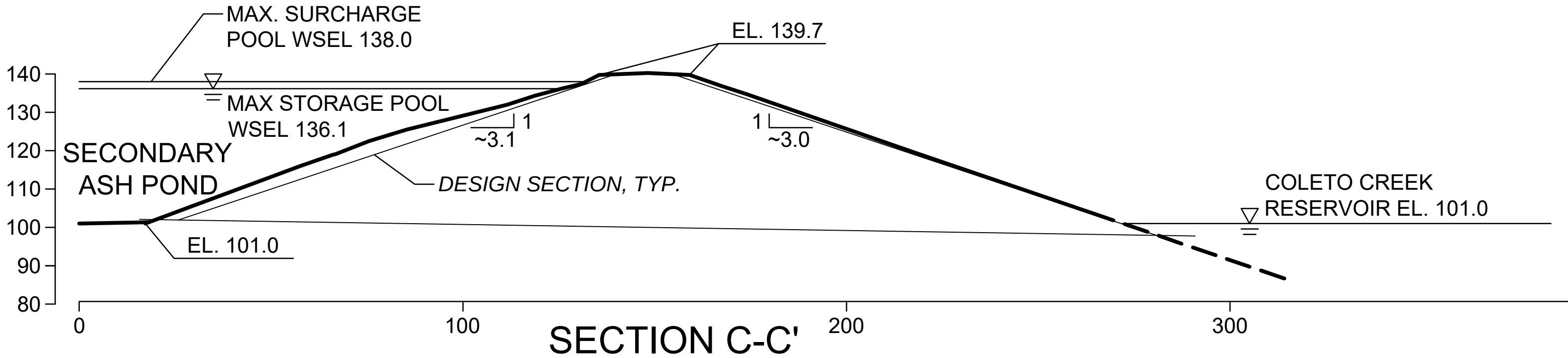
SECTION A-A'

SCALE: 1"=50'



SECTION B-B'

SCALE: 1"=50'



SECTION C-C'

SCALE: 1"=50'

PARTIAL PLAN

SOURCES:

ON-GROUND TOPOGRAPHIC AND BATHYMETRIC SURVEY PROVIDED BY NAISMITH MARINE SERVICES ON JULY 2016. HORIZONTAL DATUM: NAD83, TEXAS CENTRAL SOUTH ZONE, US FEET. VERTICAL DATUM: NAVD88.

AERIAL PHOTO PROVIDED BY IMAGEPATCH.COM EARTHSTAR GEOGRAPHICS, DATE: MAY-OCT 2011.

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Figure 2-5A

ASH POND PLAN AND
CROSS SECTIONS

PROJECT: 15214-3	BY: RR	DATE: OCT 2016	CHECKED: DBB

Bullock, Bennett & Associates, LLC
Engineering and Geoscience
Texas Registrations: Engineering F-8542, Geoscience 50127

Plot Date: 10/13/16 - 7:59am, Plotted by: Admin
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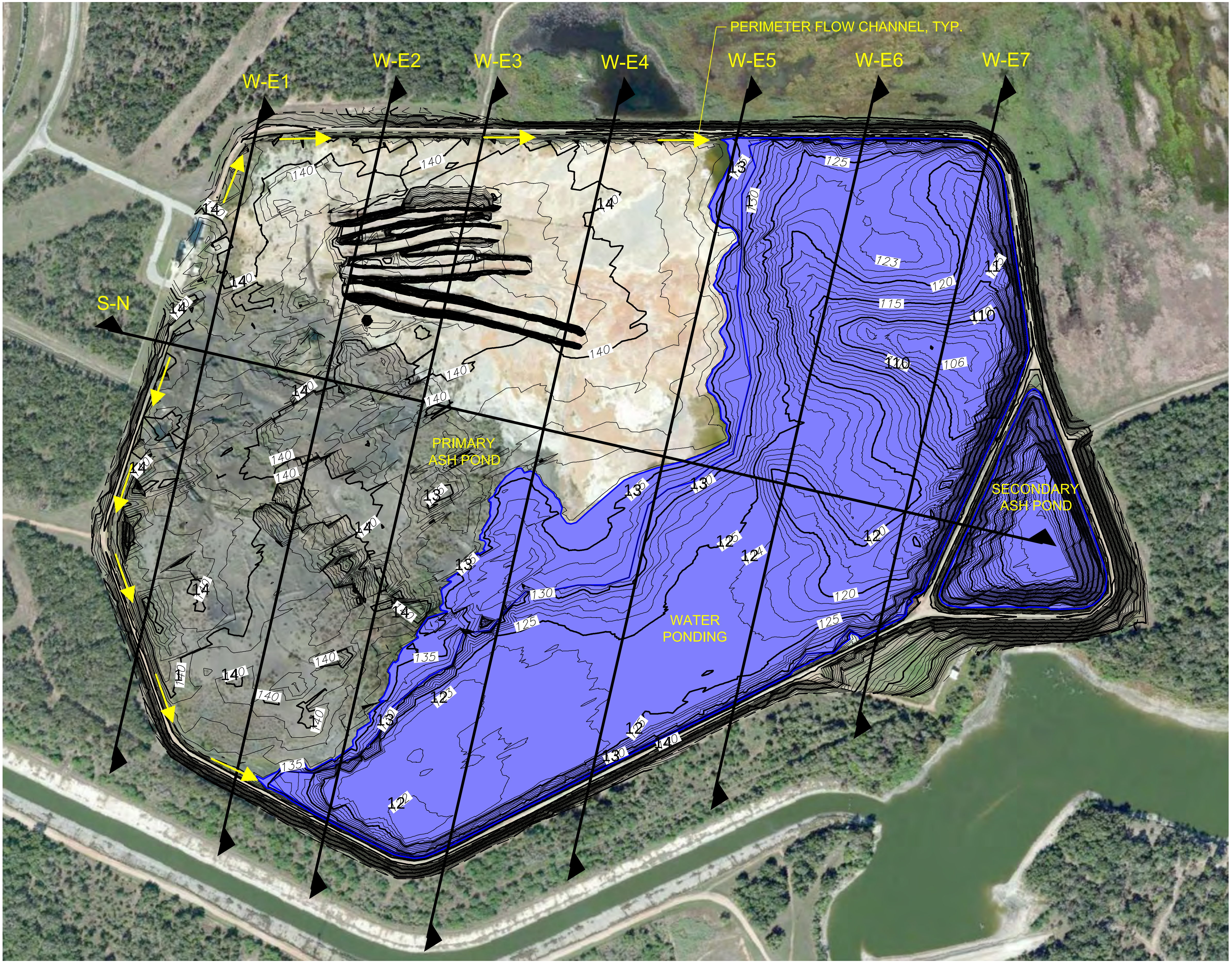

APPROXIMATE SCALE: 1" = 400'

0 200 400 800

NOTES:

PRIMARY POND DECANT WATER VOLUME CAPACITY. APPROXIMATELY 1,520 AC-FT TO TOP OF DIKE.

SECONDARY POND DECANT WATER VOLUME CAPACITY. APPROXIMATELY 200 AC-FT TO TOP OF DIKE.

SOURCES:

ON-GROUND TOPOGRAPHIC AND BATHYMETRIC SURVEY PROVIDED BY NAISMITH MARINE SERVICES ON JULY 2016. HORIZONTAL DATUM: NAD83, TEXAS CENTRAL SOUTH ZONE, US FEET. VERTICAL DATUM: NAVD88.

AERIAL PHOTO PROVIDED BY IMAGEPATCH.COM EARTHSTAR GEOGRAPHICS, DATE: MAY-OCT 2011.

STATE OF TEXAS
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REGISTERED PROFESSIONAL ENGINEER

Daniel B. Bullock
10-13-2016

Coleto Creek Power, LP

Figure 2-5B

BATHYMETRIC SURVEY PLAN VIEW

PROJECT: 15214-8 BY: RR DATE: OCT 2016 CHECKED: DBB

Bullock, Bennett & Associates, LLC
Engineering and Geoscience
Texas Registrations: Engineering F-8542, Geoscience 50127

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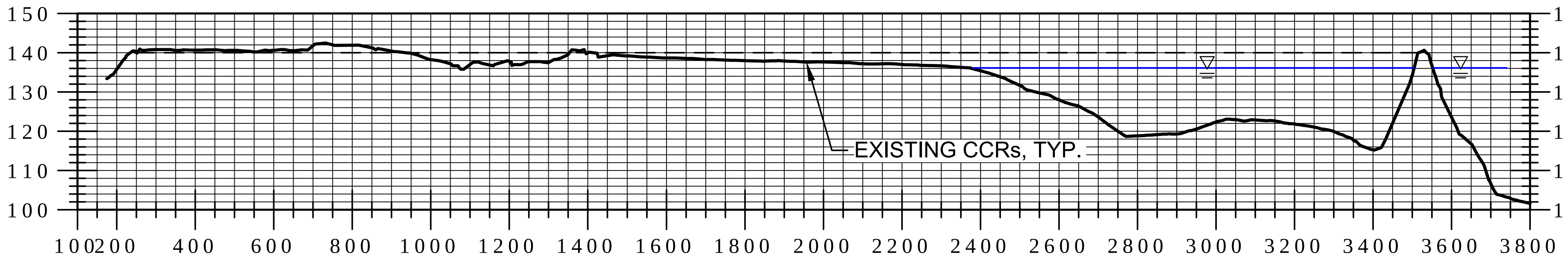
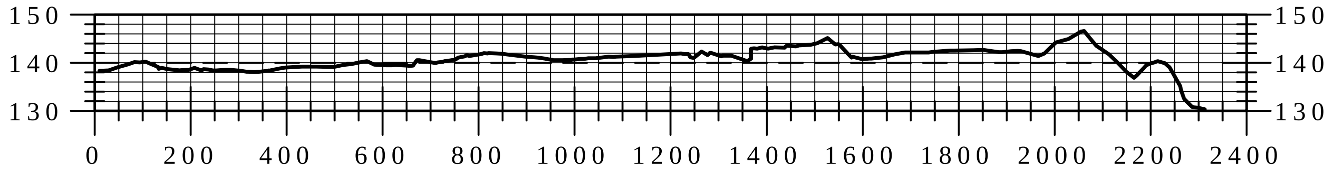
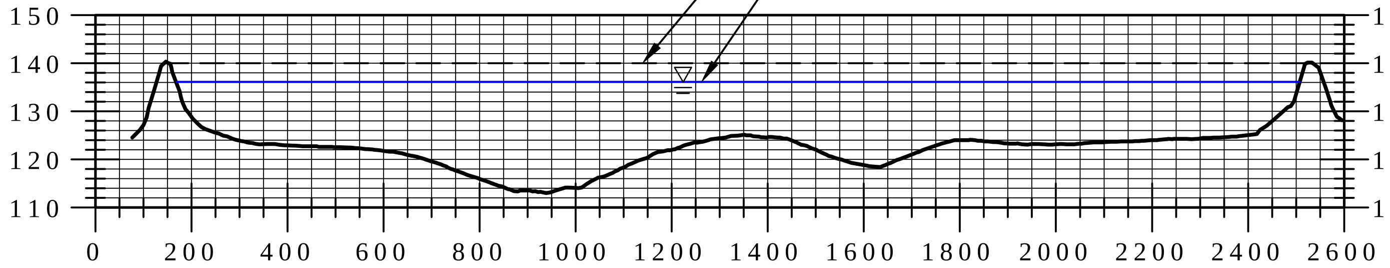


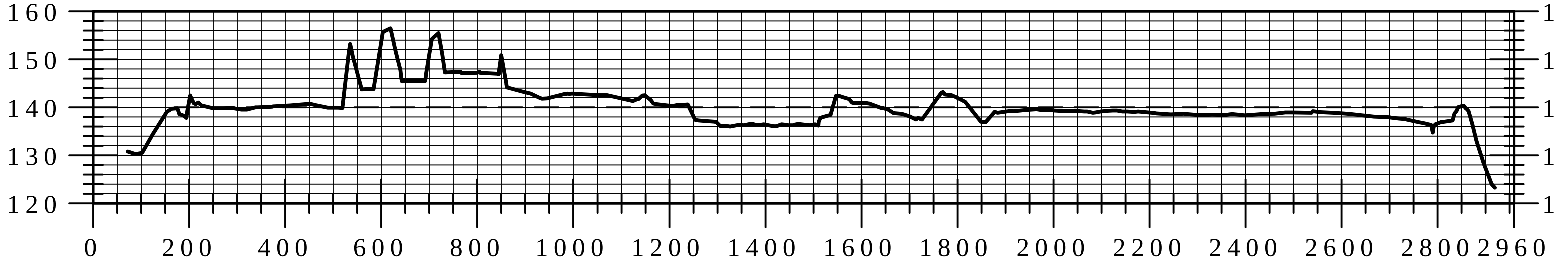
PROFILE S-N – PRIMARY POND



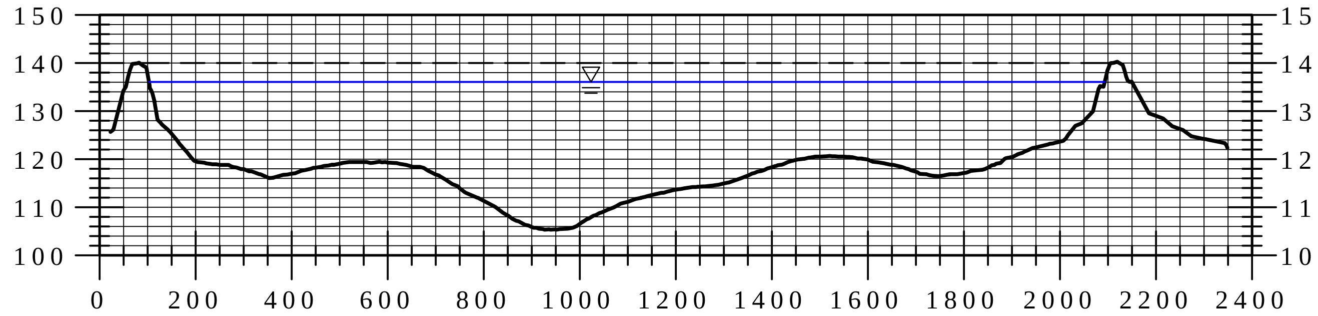
PROFILE W-E1 – PRIMARY POND



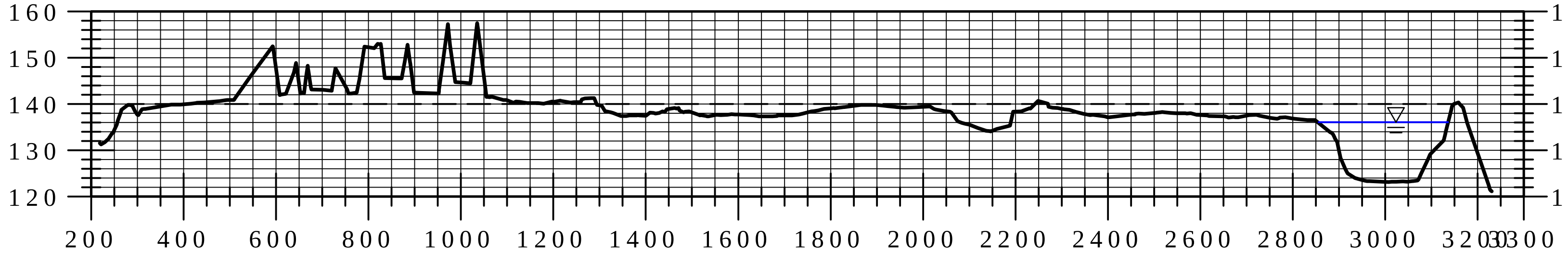
PROFILE W-E6 – PRIMARY POND



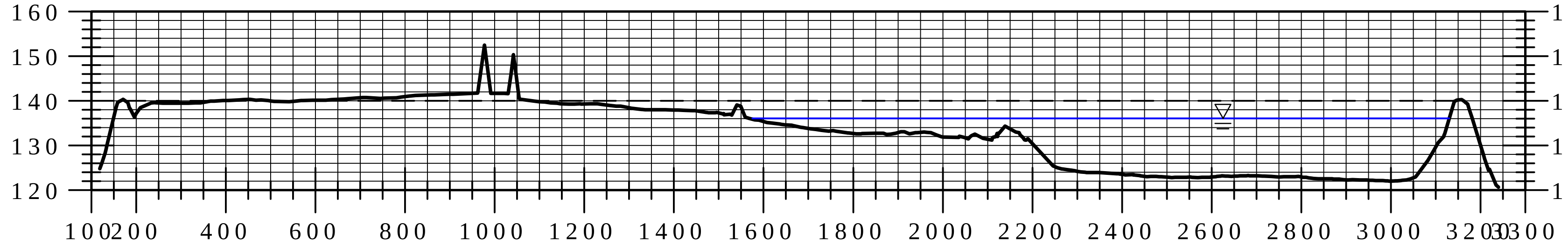
PROFILE W-E2 – PRIMARY POND



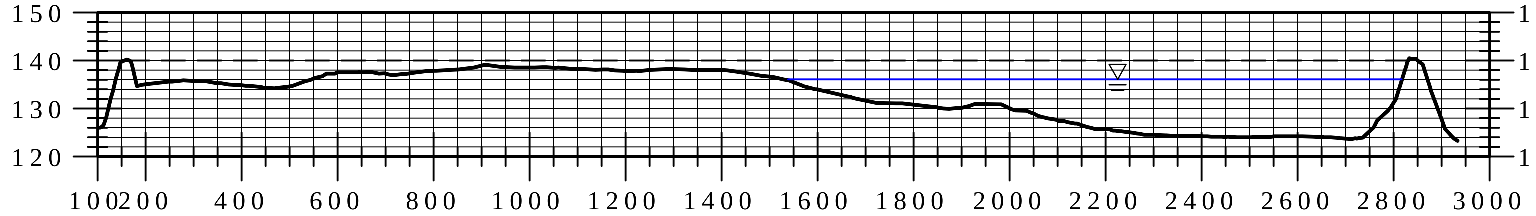
PROFILE W-E7 – PRIMARY POND



PROFILE W-E3 – PRIMARY POND



PROFILE W-E4 – PRIMARY POND



PROFILE W-E5 – PRIMARY POND

SOURCES:

ON-GROUND TOPOGRAPHIC AND BATHYMETRIC SURVEY PROVIDED BY NAISMITH MARINE SERVICES ON JULY 2016. HORIZONTAL DATUM: NAD83, TEXAS CENTRAL SOUTH ZONE, US FEET. VERTICAL DATUM: NAVD88.

DANIEL B. BULLOCK
82596

Daniel B. Bullock
10-13-2016

Coleto Creek Power, LP

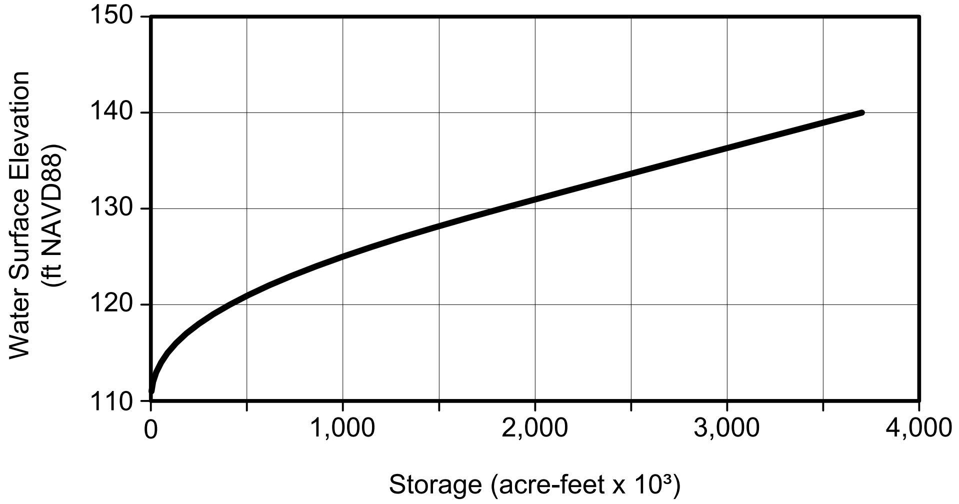
Figure 2-5C

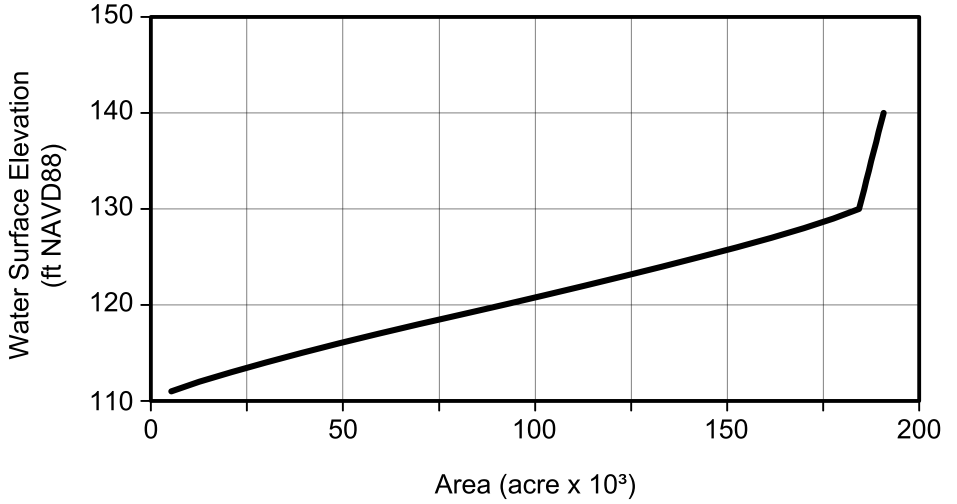
BATHYMETRIC SURVEY SECTIONS

PROJECT: 15214-8	BY: RR	DATE: OCT 2016	CHECKED: DBB

Bullock, Bennett & Associates, LLC
Engineering and Geoscience
Texas Registrations: Engineering F-8542, Geoscience 50127

Plot Date: 10/13/16 - 8:03am, Plotted by: Admin
Drawing Path: K:\ACAD\clients\BBA\Coleto Ck\, Drawing Name: X-EG-15JULY2016 working file.dwg





STATE OF TEXAS
DANIEL B. BULLOCK
82596
REGISTERED PROFESSIONAL ENGINEER

Daniel B. Bullock
10-13-2016

Coleto Creek Power, LP

Figure 2-6

CAPACITY FOR PRIMARY POND

PROJECT: 15214-3	BY: RR	DATE: OCT 2016	CHECKED: DBB

Bullock, Bennett & Associates, LLC
Engineering and Geoscience
Texas Registrations: Engineering F-8542, Geoscience 50127

Plot Date: 10/13/16 - 7:58am, Plotted by: Admin
Drawing Path: K:\ACAD\clients\BBA\Coleto Ck\, Drawing Name: C-LG-DT102.DWG

APPENDIX A: GEOTECHNICAL BORELOGS

AECOM

CLIENT
IPR-GDF SUEZ North America

LOG OF BORING NUMBER **B-1-1**

PROJECT NAME
Coleto Creek Energy Facility Ash Pond

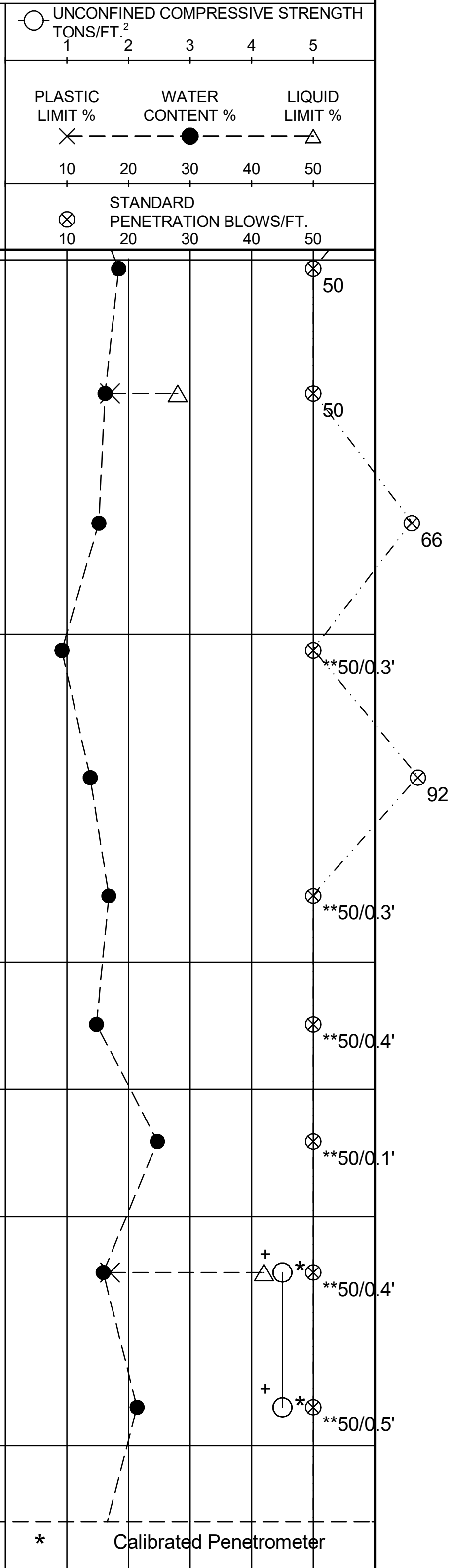
ARCHITECT/ENGINEER

SITE LOCATION
Goliad County, Fannin, Texas

SURFACE ELEVATION: +139.6 (Continued)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS. / Ft.^{3}
	26	SS	50.4 Grayish brown fine to coarse sand (SP), trace fine to coarse gravel - wet - very dense	
52.0				
54.0				
56.0	27	SS		113.5
58.0				
60.0				
	28	SS		
62.0				
64.0				
			65.1	
66.0	29	SS	White and gray clayey fine to coarse sand (SC-caliche) - wet - extremely dense	
68.0				
70.0				
	30	SS		117.3
72.0				
74.0				
76.0	31	SS		
78.0			78.0	
			Light brown fine to coarse sand (SP) with occasional thin layers of white and gray silty fine to coarse sand (SM-Caliche) - moist to wet - extremely dense Drillers noted hard drilling and gravel while drilling form 80.0 to 85.0 feet	
80.0				
	32	SS		
82.0				
			83.0	
84.0			Gray and white silty fine to medium sand (SM) with caliche - wet - extremely dense	
	33	SS		
86.0				
88.0			88.0	
			Light gray silty clay (CL), some sand, trace caliche - moist to wet - hard	
90.0				
	34	SS		126.5
92.0				
94.0				
96.0	35	SS		107.6
			97.0	
98.0			Light gray clayey fine to coarse sand (SC) - moist - extremely dense	
100.0				

. . . continued



* Calibrated Penetrometer

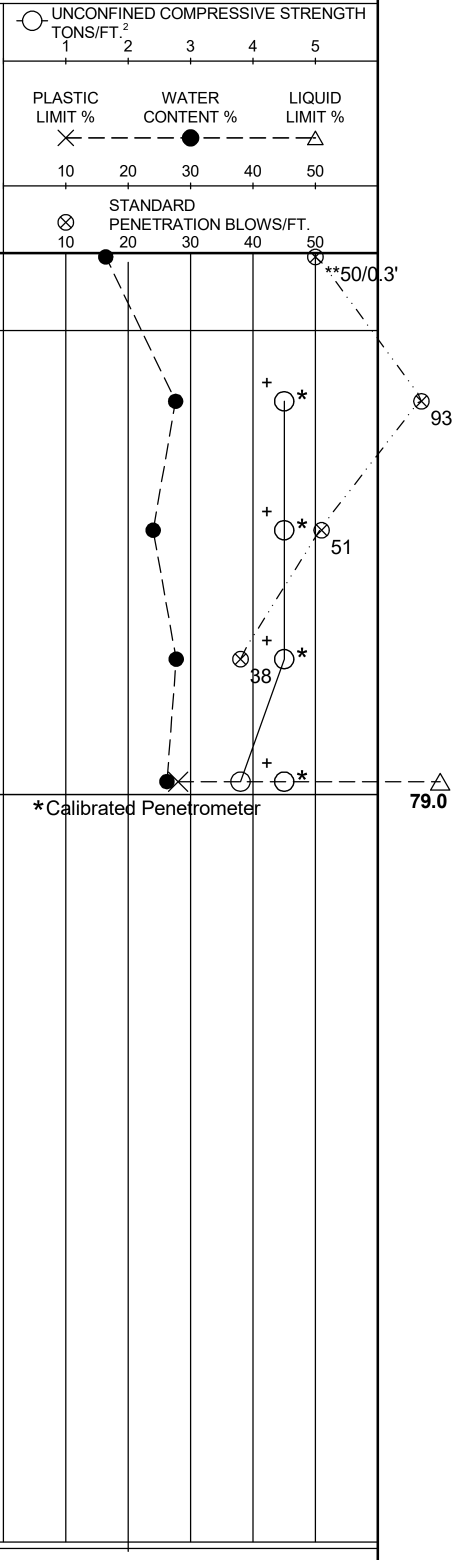
The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60225561

SHEET NO. 2 OF 3

AECOM	CLIENT **IPR-GDF SUEZ North America**
LOG OF BORING NUMBER	**B-1-1**
PROJECT NAME	**Coleto Creek Energy Facility Ash Pond**
ARCHITECT/ENGINEER	
SITE LOCATION	**Goliad County, Fannin, Texas**

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL SURFACE ELEVATION: +139.6 (Continued)	UNIT DRY WT. LBS. / Ft.^{3}
		36	SS			Light gray clayey fine to coarse sand (SC) - moist - extremely dense	
102.0							
						103.0	
104.0						Brown silty clay (CH) with irrgular gray silty clay lenses - moist - hard	
106.0		37	SS				92.5
108.0							
110.0							
		38	SS				102.6
112.0							
114.0							
116.0		39	SS				94.8
118.0							
120.0							
		40	ST			121.0	98.0
121.0						End of Boring Boring advanced to 6.0 feet with solid-stem auger HW casing driven to 5.0 feet Boring advanced from 6.0 feet to 50.0 feet with 4-inch rock bit and drilling fluid Boring advanced from 50.0 feet to 100.0 feet with 3-inch rock bit and drilling fluid Boring abandoned with bentonite quick grout using tremie method Split-spoons were driven with cathead and rope	



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WL **Dry before casing installation**	BORING STARTED **11/5/11**	AECOM OFFICE **1035 Kepler Drive** **Green Bay, Wisconsin 54311**
WL **10.0 to 12.0 feet WS**	BORING COMPLETED **11/6/11**	ENTERED BY **CAH** SHEET NO. **3** OF **3**
WL	RIG/FOREMAN **D-25/BZ**	APP'D BY **TMT** AECOM JOB NO. **60225561**

AECOM	CLIENT **IPR-GDF SUEZ North America**	LOG OF BORING NUMBER **B-2-1**	
	PROJECT NAME **Coleto Creek Energy Facility Ash Pond**	ARCHITECT/ENGINEER	

SITE LOCATION
Goliad County, Fannin, Texas

SURFACE ELEVATION: +139.2

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS. / Ft.^{3}
2.0		1	SS	Fill: Gray and brown mottled clayey sand (SC), trace fine gravel, trace caliche nodules and layers, occasional thin, saturated silty sand lenses - moist to wet - very stiff to hard	121.6
4.0		2	SS		
6.0		3	SS		116.1
8.0		4	SS		
10.0		5	SS		121.3
12.0		6	ST		118.6
14.0		7	SS		117.4
16.0		8	SS		
18.0		9	3" ST		114.0
20.0		10	ST		110.9
22.0		11	SS		114.5
24.0		12	SS		
26.0		13	SS		113.0
28.0		14	3" ST		
30.0		15	SS		
32.0		16	SS	32.0	
34.0		17	ST	White and light gray clayey sand (SC-caliche) - wet - loose to medium dense	118.4
36.0		18	SS		
38.0		19	SS	Note: Saturated loose zone from 36.0 feet to 36.9 feet	
40.0		20	SS		
		21	SS	40.9	
42.0		21A	SS	Grayish brown fine to coarse sand (SP) - wet - medium dense to dense	
44.0		22	SS	Note: Clayey sand (SC-Caliche) layers encountered from 42.9 feet to 43.3 feet and 44.0 feet to 45.0 feet	
46.0		23	SS		136.7
48.0		24	SS		
50.0		25	SS	50.0	

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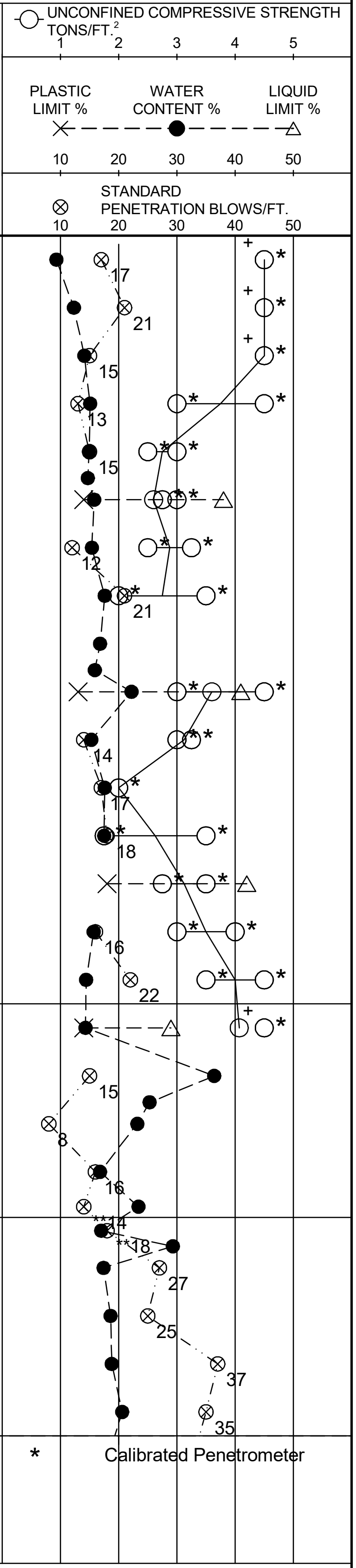


The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60225561 | SHEET NO. 1 OF 3

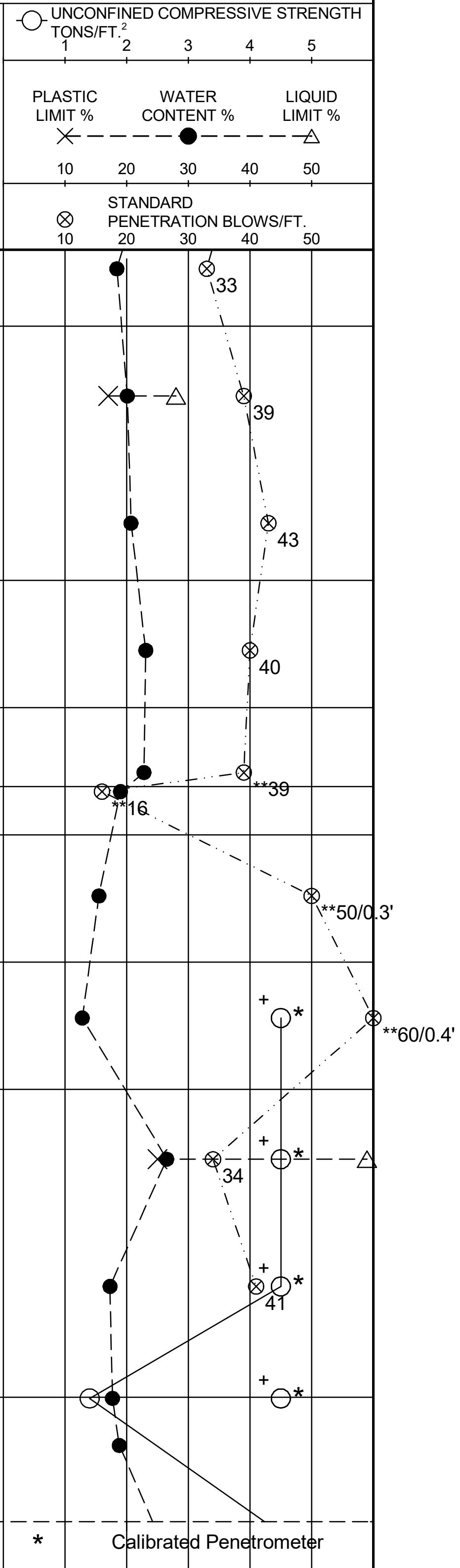
CLIENT	LOG OF BORING NUMBER
IPR-GDF SUEZ North America	**B-2-1**
PROJECT NAME	ARCHITECT/ENGINEER
Coleto Creek Energy Facility Ash Pond	

SITE LOCATION
Goliad County, Fannin, Texas

SURFACE ELEVATION: +139.2 (Continued)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS. / Ft.³
52.0	26	SS	Grayish brown silty fine sand (SM) - wet - dense	110.4
53.0				
54.0			Light gray clayey fine sand (SC) - wet - dense	
56.0	27	SS		99.2
58.0				
60.0				
62.0	28	SS		
63.0				
64.0			Light gray fine sand (SP-SM), trace silt - wet - dense	
66.0	29	SS		
68.0				
			Light gray fine to coarse sand (SP) - wet - dense	
70.0	30	SS		
71.1	30A	SS		
72.0			Light gray and white clayey sand (SC-caliche) - wet - medium dense	
73.0				
74.0			Light gray silty fine to medium sand (SM), trace to little clay, trace fine gravel - moist to wet - extremely dense	
76.0	31	SS		
78.0				
			Tan clayey silt (CL-ML-Weathered Sandstone) - moist to wet - hard	
80.0	32	SS		
82.0				
83.0				
84.0			Light gray and brown mottled silty clay (CH), trace sand - moist - hard	
86.0	33	SS		91.6
88.0				
90.0	34	SS		117.3
92.0				
94.0				
95.1	35	ST		
96.0			Light gray clayey fine sand (SC) - moist - extremely dense	
98.0				110.9
100.0				

. . . continued



* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60225561 SHEET NO. 2 OF 3

AECOM

CLIENT
IPR-GDF SUEZ North America

LOG OF BORING NUMBER **B-2-1**

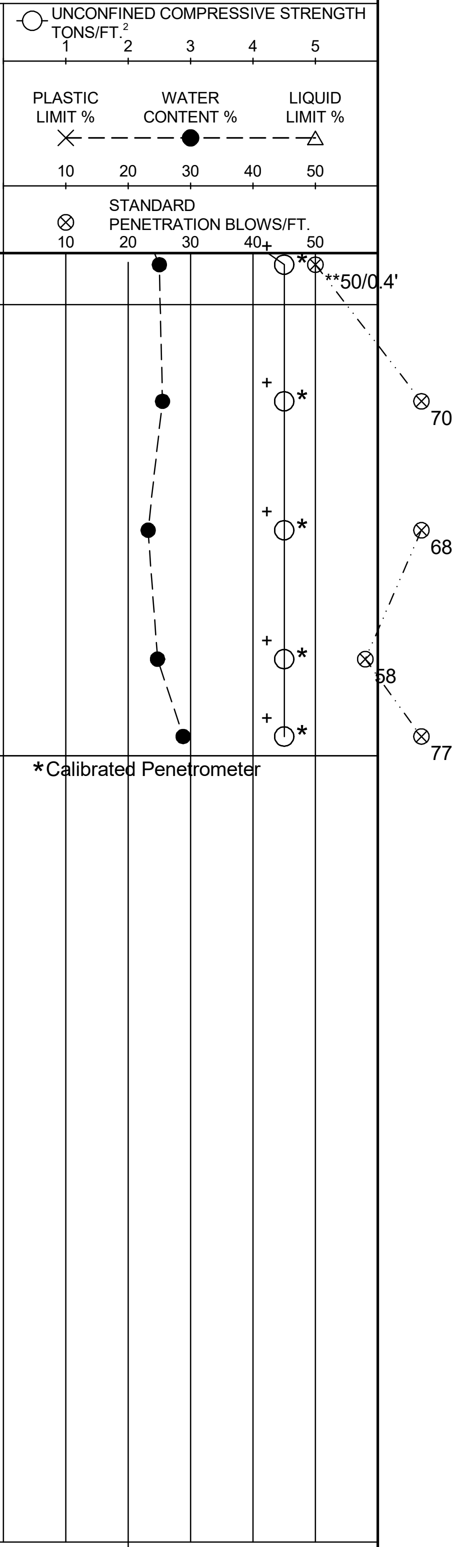
PROJECT NAME
Coleto Creek Energy Facility Ash Pond

ARCHITECT/ENGINEER

SITE LOCATION
Goliad County, Fannin, Texas

SURFACE ELEVATION: +139.2 (Continued)

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS. / Ft.^{3}
		36	SS	Light gray clayey fine sand (SC) - moist - extremely dense	
102.0				102.0	
				Brown silty clay (CH) with gray silty clay and silt lenses, trace thin sand lenses - moist - hard	
104.0					
106.0		37	SS		99.9
108.0					
110.0					
		38	SS		96.4
112.0					
114.0					
116.0		39	SS		96.7
118.0					
		40	SS	119.5	
119.5				End of Boring Boring advanced to 6.0 feet with solid-stem auger HW casing driven to 5.0 feet Boring advanced from 6.0 feet to 50.0 feet with 4-inch rock bit and drilling fluid Boring advanced from 50.0 feet to 118.0 feet with 3-inch rock bit and drilling fluid Boring abandoned with bentonite quick grout using tremie method Split-spoons were driven with cathead and rope	



*Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WL **Dry before casing installation**	BORING STARTED **11/3/11**	AECOM OFFICE **1035 Kepler Drive Green Bay, Wisconsin 54311**	
WL **8.0 to 10.0 feet WS**	BORING COMPLETED **11/4/11**	ENTERED BY **CAH**	SHEET NO. **3** OF **3**
WL	RIG/FOREMAN **D-25/BZ**	APP'D BY **TMT**	AECOM JOB NO. **60225561**

AECOM

CLIENT
IPR-GDF SUEZ North America

LOG OF BORING NUMBER **B-2-2**

PROJECT NAME
Coleto Creek Energy Facility Ash Pond

ARCHITECT/ENGINEER

SITE LOCATION
Goliad County, Fannin, Texas

SURFACE ELEVATION: +105.1

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL		UNIT DRY WT. LBS. / Ft.³
2.0	1 2	SS SS	Black and dark brown organic sandy clay (OL), little fine gravel, trace wood - moist - very stiff to hard	2.8	
4.0 6.0 8.0 10.0	2A 3 4 5 6	SS SS SS SS SS	Light gray and white clayey fine to coarse sand (SC-Caliche), trace fine to coarse gravel - moist to wet - dense to medium dense Note: Light brown fine to coarse sand (SP) layers encountered from 6.5 feet to 7.0 feet and 8.3 feet to 8.9 feet	10.6	90.9 113.3
12.0	6A	SS	Light gray fine to coarse sand (SP) - wet - medium dense	12.0	
14.0	7	SS	Light gray and brown mottled silt (ML), trace clay, trace sand - moist - medium dense	14.9	
16.0	7A	SS	Light gray silty clay (CL), trace sand - moist - hard	17.0	
18.0 20.0 22.0	8	SS	Light gray silt (ML), trace to little sand, trace clay - moist - medium dense	22.0	
24.0 26.0 28.0 30.0 32.0	9 10	SS SS	Light brown fine sand (SP) - wet - dense	33.5	
34.0 36.0 38.0 40.0 42.0	11 12	SS SS	Light gray and light brown mottled clayey fine to coarse sand (SC), trace fine to coarse gravel - moist - dense to extremely dense Drillers noted hard drilling from 34.0 to 39.0 feet and gravel while drilling	42.0	
44.0 46.0	13	SS	Light brown fine to coarse sand (SP) - wet - dense	47.0	
48.0 50.0			Light gray and brown mottled silty clay (CL), trace sand - moist - hard		100.6

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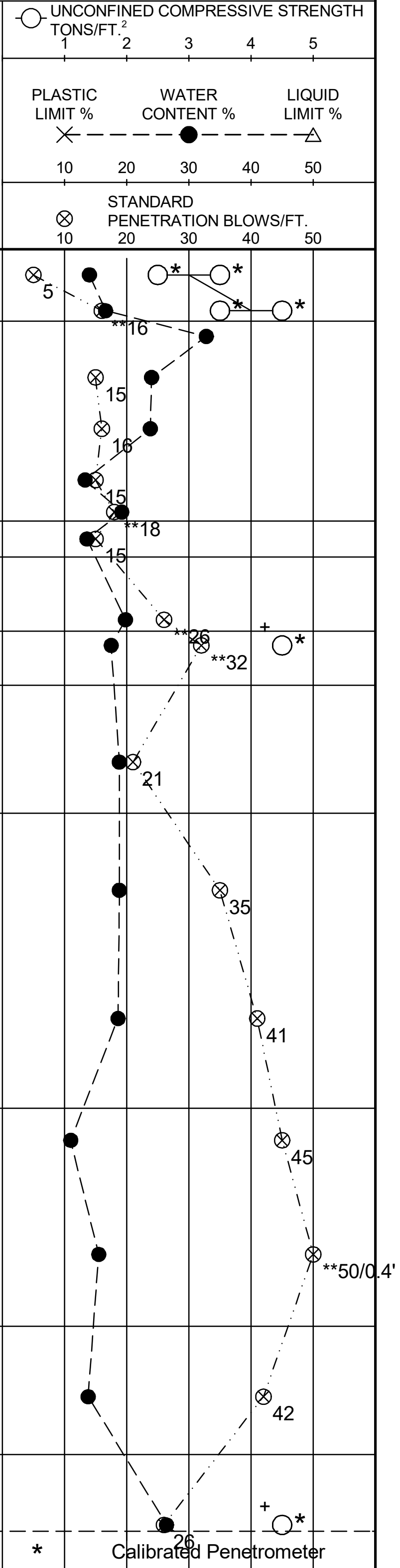


The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

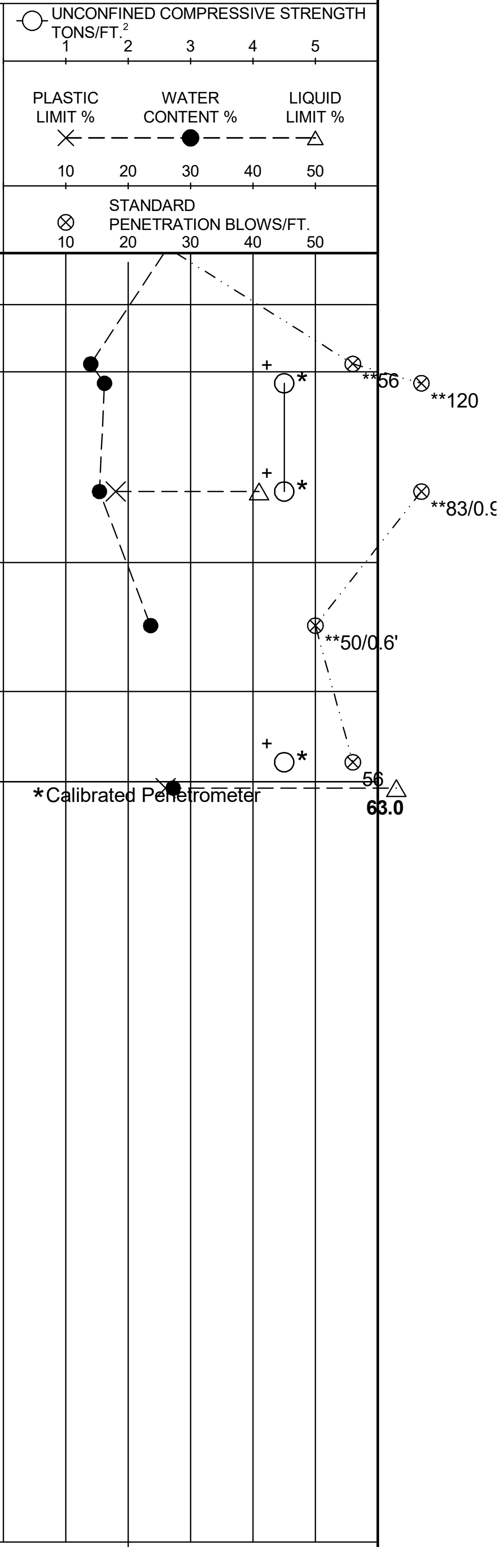
AECOM JOB NO. **60225561**

SHEET NO. **1** OF **2**

CLIENT **IPR-GDF SUEZ North America**	LOG OF BORING NUMBER **B-2-2**
PROJECT NAME **Coleto Creek Energy Facility Ash Pond**	ARCHITECT/ENGINEER
SITE LOCATION **Goliad County, Fannin, Texas**	

SURFACE ELEVATION: +105.1 (Continued)

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY		DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS. / Ft.^{3}
		14	SS			52.0	Light gray and brown mottled silty clay (CL), trace sand - moist - hard	
52.0								
							Light brown fine to coarse sand (SP) - wet - very dense	
54.0								
		15	SS			54.6		
		15A	SS				Light brown and light gray mottled silty sandy clay (CL), trace thin poorly-graded sand seams (SP) - moist - hard	115.0
56.0								
58.0								
		16	SS					117.8
60.0								
62.0						62.0		
							Light brown and brown mottled silty fine sand (SM) - wet - extremely dense	
64.0								
		17	SS					
66.0						67.0		
							Light gray silty clay (CH), trace sand, trace fine to coarse gravel - moist - hard	
68.0								
70.0		18	SS			70.5		
70.5			SS				End of Boring Boring advanced to 6.0 feet with solid-stem auger HW casing driven to 8.0 feet Boring advanced from 6.0 feet to 16.0 feet with 3-inch rock bit and drilling fluid HW casing driven from 8.0 feet to 10.0 feet Boring advanced from 16.0 feet to 69.0 feet with 3-inch rock bit and drilling fluid Boring abandoned with bentonite quick grout using tremie method Split-spoons were driven with cathead and rope	



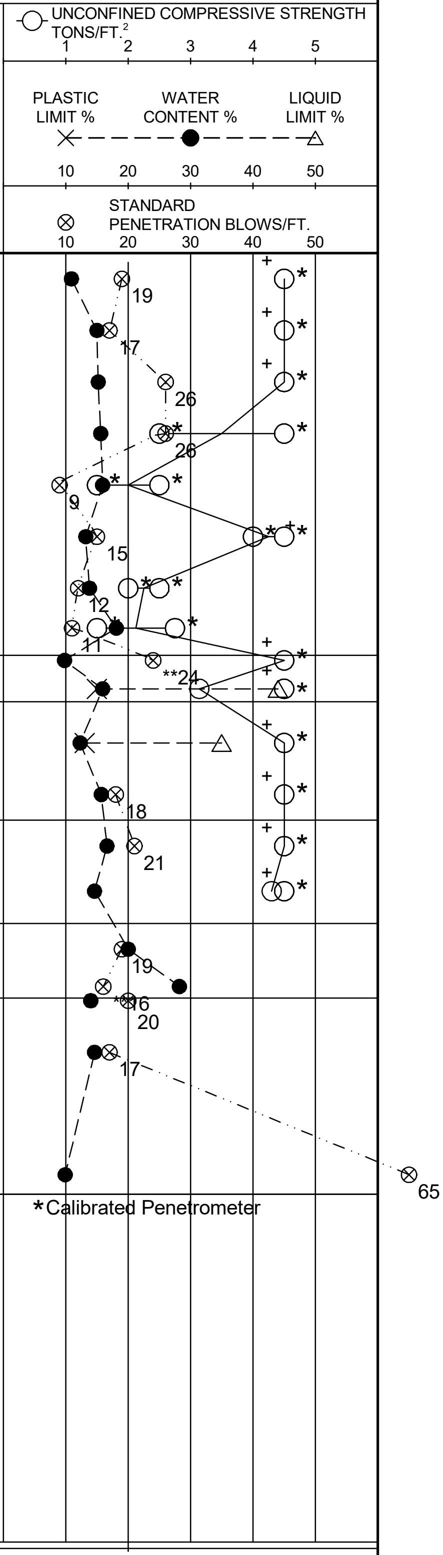
The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WL **3.5 feet WS**	BORING STARTED **11/1/11**	AECOM OFFICE	**1035 Kepler Drive Green Bay, Wisconsin 54311**
WL **3.5 feet before casing installation**	BORING COMPLETED **11/1/11**	ENTERED BY **CAH**	SHEET NO. **2** OF **2**
WL	RIG/FOREMAN **D-25/BZ**	APP'D BY **TMT**	AECOM JOB NO. **60225561**

AECOM	CLIENT **IPR-GDF SUEZ North America**	LOG OF BORING NUMBER **B-3-1**	
	PROJECT NAME **Coleto Creek Energy Facility Ash Pond**	ARCHITECT/ENGINEER	
SITE LOCATION **Goliad County, Fannin, Texas**			

SURFACE ELEVATION: +139.3

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS. / Ft.^{3}
2.0		1	SS			Fill: Gray and brown mottled clayey sand (SC), trace fine gravel, occasional irregular thin silty sand seams and lenses, trace caliche nodules and layers - moist to wet - stiff to hard	114.5
4.0		2	SS				114.0
6.0		3	SS				115.3
8.0		4	SS				110.4
10.0		5	SS				112.2
12.0		6	SS			Note: Saturated silty sand seams encountered from 10.5 feet to 10.9 feet, 12.5 feet to 12.7 feet, and from 15.4 feet to 15.5 feet	124.6
14.0		7	SS				
		8	SS			15.6	106.1
16.0		8A	SS			Gray clayey fine to medium sand (SC), trace caliche nodules, trace thin silty sand seams - moist to wet - very stiff to hard	121.5
18.0		9	ST			17.4	113.7
20.0		10	SS			Dark brown clayey sand (SC), trace caliche nodules - moist to wet - hard	
22.0		11	SS			22.0	109.1
24.0		12	SS			Light gray silty sandy clay (CL), occasional irregular silty clayey caliche (CL-caliche) layers and lenses - moist to wet - hard	113.6
26.0		13	SS			26.0	117.9
28.0		14	SS			Light gray clayey sand (SC), occasional silty clay (CL-caliche) layers and lenses, trace fine gravel - moist to wet - medium dense	
		15	SS			28.9	
30.0		15A	SS			Note: Saturated zone encountered from 28.0 feet to 28.5 feet	111.3
32.0		16	SS			Light gray silty fine to coarse and (SM), trace to little clay, trace fine gravel, trace caliche nodules - moist to wet - medium dense to very dense	
34.0							
36.0		17	SS			36.5	
36.5						End of Boring Boring advanced to 6.0 feet with solid-stem auger HW casing driven to 5.0 feet Boring advanced from 6.0 feet to 30.0 feet with 4-inch rock bit and drilling fluid Boring advanced from 30.0 feet to 35.0 feet with 3-inch rock bit and drilling fluid Boring abandoned with bentonite quick grout using tremie method Split-spoons were driven with cathead and rope	



*Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WL **Dry before casing installation**	BORING STARTED **11/8/11**	AECOM OFFICE **1035 Kepler Drive Green Bay, Wisconsin 54311**	
WL **8.0 to 10.0 feet WS**	BORING COMPLETED **11/8/11**	ENTERED BY **CAH**	SHEET NO. **1** OF **1**
WL	RIG/FOREMAN **D-25/BZ**	APP'D BY **TMT**	AECOM JOB NO. **60225561**

AECOM

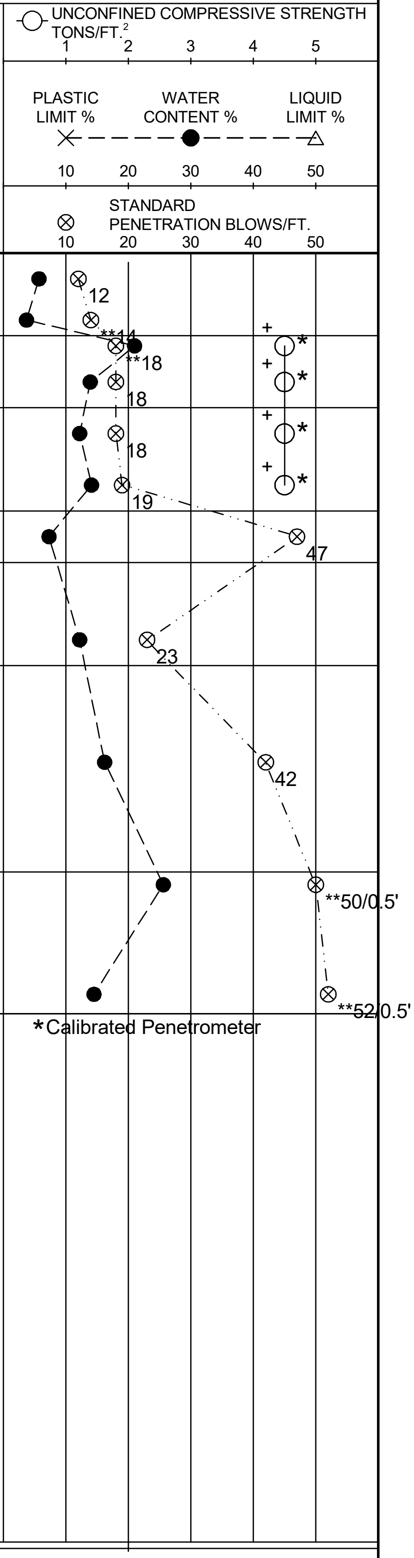
CLIENT **IPR-GDF SUEZ North America**	LOG OF BORING NUMBER **B-3-2**
PROJECT NAME **Coleto Creek Energy Facility Ash Pond**	ARCHITECT/ENGINEER

SITE LOCATION
Goliad County, Fannin, Texas

SURFACE ELEVATION: +122.8

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS. / Ft.³
2.0		1 2	SS SS			Fill: Dark brown or brown silty fine sand (SM), trace clay, trace roots - moist - medium dense (3.2)	
4.0 6.0		2A 3	SS SS			Fill: Brown and gray mottled silty sandy clay (CL), trace fine gravel, trace roots - desiccated - hard (6.0)	117.0
8.0 10.0		4 5	SS SS			Light gray and white silty sandy clay (CL-caliche), trace to little fine gravel - moist - hard (10.0)	122.1 113.8
12.0		6	SS			White silty fine sand (SM-caliche), trace to little clay - moist - dense (12.0)	
14.0 16.0		7	SS			Light brown fine to coarse sand (SP), trace fine gravel - wet - dense to medium dense (16.0)	
18.0 20.0 22.0 24.0		8	SS			Brown sitly fine to coarse sand (SM), trace to little fine gravel - wet - dense Drillers noted gravel while drilling from 16.0 feet to 19.0 feet and 23.0 feet and 24.0 feet (24.0)	
26.0 28.0 29.5		9 10	SS SS			Light brown fine to coarse sand (SP) - wet - extremely dense (29.5)	

End of Boring
Boring advanced to 10.0 feet with solid-stem auger
HW casing driven to 10.0 feet
Boring advanced from 10.0 feet to 20.0 feet with 3-inch rock bit and drilling fluid
Boring abandoned with bentonite quick grout using tremie method
Split-spoons were driven with cathead and rope



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WL **Dry before casing installation**	BORING STARTED **11/2/11**	AECOM OFFICE	**1035 Kepler Drive** **Green Bay, Wisconsin 54311**
WL **14.0 feet WS**	BORING COMPLETED **11/2/11**	ENTERED BY **CAH**	SHEET NO. **1** OF **1**
WL	RIG/FOREMAN **D-25/BZ**	APP'D BY **TMT**	AECOM JOB NO. **60225561**

AECOM

CLIENT
IPR-GDF SUEZ North America

LOG OF BORING NUMBER **B-4-1**

PROJECT NAME
Coleto Creek Energy Facility Ash Pond

ARCHITECT/ENGINEER

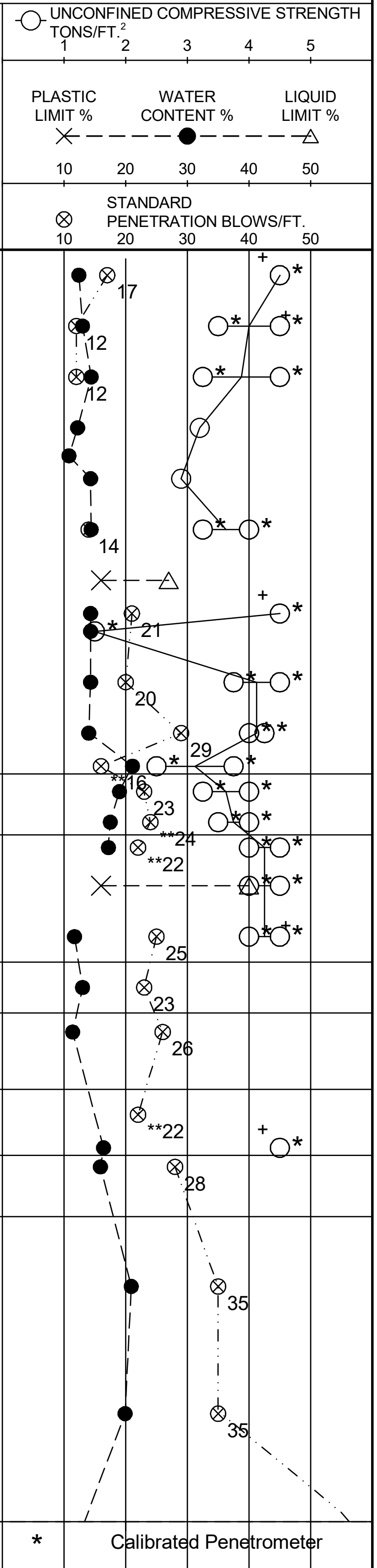
SITE LOCATION
Goliad County, Fannin, Texas

SURFACE ELEVATION: +139.2

DEPTH (FT): 2.0, 4.0, 6.0, 8.0, 10.0, 12.0, 14.0, 16.0, 18.0, 20.0, 22.0, 24.0, 26.0, 28.0, 30.0, 32.0, 34.0, 36.0, 38.0, 40.0, 42.0, 44.0, 46.0, 48.0, 50.0

DESCRIPTION OF MATERIAL	Depth
Fill: Gray and brown mottled clayey sand (SC), trace fine gravel, trace thin irregular silty sand seams and lenses, trace silty clay caliche nodules and layers - moist - very stiff to hard	20.6
Light brown silty sandy clay (CL) with caliche - moist to wet - very stiff to hard	23.0
Light brown, dark brown, and gray mottled clayey sand (SC), trace organics, trace fine gravel, trace thin irregular silty sand seams and lenses - moist - hard **Triaxial Test S-14** **Dry Unit Weight = 121 pcf Ø' = 27 deg**	28.0
Light brown clayey sand (SC) - moist to wet - medium dense	30.0
Light brown silty fine to coarse sand (SM), trace clay - moist to wet - medium dense	33.0
Light brown silty sandy clay (CL) with caliche, trace fine gravel - moist to wet - hard	35.6
Light brown fine to coarse sand (SP) - wet - medium dense	38.0
Grayish brown fine to coarse sand (SP) - wet - dense Drillers noted sporadic, thin gravel layers while drilling from 35.0 to 50.0 feet	50.0

SAMPLE NO.	SAMPLE TYPE	UNIT DRY WT. LBS. / Ft.³
1	SS	117.3
2	SS	
3	SS	111.4
4	ST	124.4 117.7
5	ST	
6	SS	114.9
7	3" ST	
8	SS	122.0 118.2
9	SS	110.1
10	SS	115.2
11	SS	102.3
11A	SS	110.2
12	SS	107.9
12A	SS	110.8
13	3" ST	
14	SS	
15	SS	115.7
16	SS	
17	SS	
17A	SS	
18	SS	
19	SS	



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The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60225561

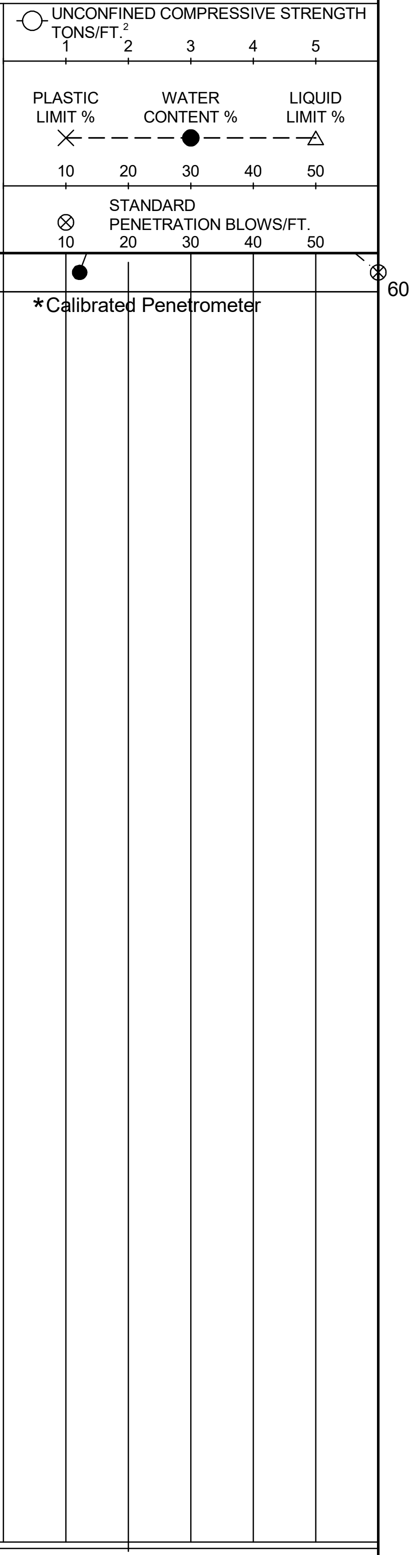
SHEET NO. 1 OF 2

AECOM

CLIENT	LOG OF BORING NUMBER
IPR-GDF SUEZ North America	**B-4-1**
PROJECT NAME	ARCHITECT/ENGINEER
Coleto Creek Energy Facility Ash Pond	

SITE LOCATION
Goliad County, Fannin, Texas

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL SURFACE ELEVATION: +139.2 (Continued)	UNIT DRY WT. LBS. / Ft.^{3}
		20	SS			51.5 Grayish bown fine to coarse sand (SP), trace to little fine gravel, occasional thin layers of gray silty clay and caliche - moist to wet - very dense	
51.5						End of Boring Boring advanced to 6.0 feet with solid-stem auger HW casing driven to 5.5 feet Boring advanced from 6.0 feet to 30.0 feet with 4-inch rock bit and drilling fluid Boring advanced from 30.0 feet to 50.0 feet with 3-inch rock bit and drilling fluid Boring abandoned with bentonite quick grout using tremie method Split-spoons were driven with cathead and rope	



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

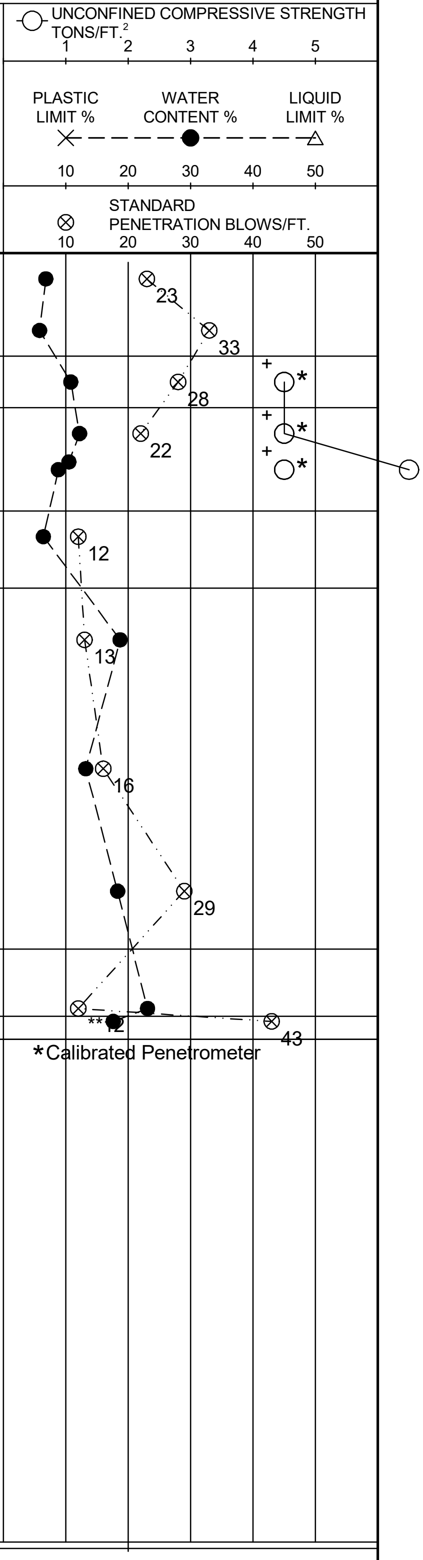
WL **Dry before casing installation**	BORING STARTED **11/7/11**	AECOM OFFICE **1035 Kepler Drive** **Green Bay, Wisconsin 54311**	
WL **10.0 to 12.0 feet**	BORING COMPLETED **11/7/11**	ENTERED BY **CAH**	SHEET NO. **2** OF **2**
WL	RIG/FOREMAN **D-25/BZ**	APP'D BY **TMT**	AECOM JOB NO. **60225561**

AECOM	CLIENT **IPR-GDF SUEZ North America**	LOG OF BORING NUMBER **B-4-2**
	PROJECT NAME **Coleto Creek Energy Facility Ash Pond**	ARCHITECT/ENGINEER

SITE LOCATION
Goliad County, Fannin, Texas

SURFACE ELEVATION: +119.6

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS. / Ft.³
2.0	1	SS	Fill: Dark brown and brown silty fine to medium sand (SM), trace fine gravel, trace roots, trace clay - moist - medium dense	115.3
4.0	2	SS	4.0	122.1
6.0	3	SS	Buried Topsoil: Dark brown and black organic silty clay (OL), trace to little sand - desiccated - hard 6.0	125.8
8.0	4	SS	Light brown and light gray mottled silty clayey sand (SC), trace fine gravel, trace irregular caliche nodules - moist - hard	126.0
	5	ST	Note: Dark gray silty sandy clay (CL) layer from 8.0 feet to 8.3 feet	129.3
10.0			10.0	
12.0	6	SS	Light brown silty fine sand (SM), trace clay - moist - medium dense Note: Plastic liner was used within split-spoon for Sample 6	124.6
14.0			13.0	
16.0	7	SS	Light brown fine to coarse sand (SP) - wet - medium dense	
18.0				
20.0	8	SS		
22.0			Drillers noted hard drilling at 22.0 feet	
24.0				
26.0	9	SS	Note: White silty clay (CL-caliche) layer from 24.7 feet to 25.1 feet	106.9
			27.0	
28.0			Light gray silty fine sand (SM), trace clay - wet - medium dense	
30.0	10	SS	29.6	
	10A	SS	Light brown fine to coarse sand (SP) - wet - dense 30.5	
30.5			End of Boring Boring advanced to 10.0 feet with solid-stem auger HW casing driven to 8.0 feet Boring advanced from 10.0 feet to 29.0 feet with 3-inch rock bit and drilling fluid Boring abandoned with bentonite quick grout using tremie method Split-spoons were driven with cathead and rope	



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WL **Dry before casing installation**	BORING STARTED **11/2/11**	AECOM OFFICE	**1035 Kepler Drive Green Bay, Wisconsin 54311**
WL **14.0 feet WS**	BORING COMPLETED **11/2/11**	ENTERED BY **CAH**	SHEET NO. **1** OF **1**
WL	RIG/FOREMAN **D-25/BZ**	APP'D BY **TMT**	AECOM JOB NO. **60225561**

CLIENT
IPR-GDF SUEZ North America

LOG OF BORING NUMBER **B-5-1**

PROJECT NAME
Coleto Creek Energy Facility Ash Pond

ARCHITECT/ENGINEER

SITE LOCATION
Goliad County, Fannin, Texas

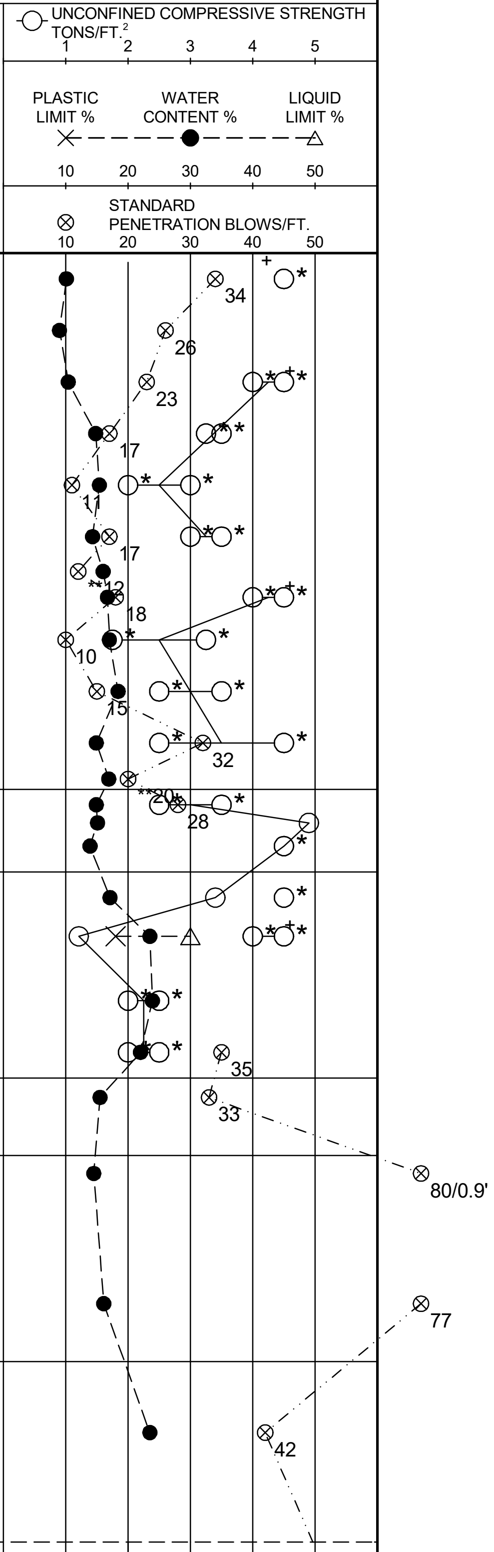
DESCRIPTION OF MATERIAL

SURFACE ELEVATION: +139.6

DEPTH (FT)	DESCRIPTION OF MATERIAL
0.0 – 20.8	Fill: Light gray and brown mottled clayey sand (SC), trace fine gravel, occasional thin irregular silty sand seams, trace silty clay caliche nodules and layers - moist to wet - very stiff to hard
20.8 – 24.0	Gray and brown silty clay (CL), trace organics, trace sand, trace thin saturated silty sand seams and lenses - moist to wet - very stiff to hard
24.0 – 32.0	White and gray silty clay (CL-caliche), little sand - moist to wet - stiff to hard
32.0 – 35.0	Gray silty fine to coarse sand (SM), trace fine gravel, trace clay - wet - dense
35.0 – 43.0	Gray fine to coarse sand (SP), trace fine gravel - wet - extremely dense to very dense Note: Hard white silty clay (CL-caliche) in tip of Sample 18
43.0 – 50.0	Gray silty fine sand (SM) - wet - dense to extremely dense Drillers noted hard drilling and gravel and cobbles from 43.0 to 45.0 feet

SAMPLE NO.	SAMPLE TYPE	UNIT DRY WT. LBS. / Ft.^{3}
1	SS	128.2
2	SS	124.7
3	SS	127.5
4	SS	111.9
5	SS	
6	SS	118.7
7	SS	
7A	SS	108.9
8	SS	
9	SS	111.3
~~10~~	~~SS~~	
11	SS	
11A	SS	116.1
12	ST	118.2
13	SS	107.5
14	ST	99.1
15	SS	102.5
16	SS	103.6
17	SS	
18	SS	
19	SS	
20	SS	

DEPTH (FT): 2.0, 4.0, 6.0, 8.0, 10.0, 12.0, 14.0, 16.0, 18.0, 20.0, 22.0, 24.0, 26.0, 28.0, 30.0, 32.0, 34.0, 36.0, 38.0, 40.0, 42.0, 44.0, 46.0, 48.0, 50.0



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* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60225561

SHEET NO. 1 OF 2

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AECOM	CLIENT **IPR-GDF SUEZ North America**	LOG OF BORING NUMBER **B-5-1**
	PROJECT NAME **Coleto Creek Energy Facility Ash Pond**	ARCHITECT/ENGINEER

SITE LOCATION
Goliad County, Fannin, Texas

○ UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} 1 2 3 4 5

PLASTIC LIMIT % ✕ — — WATER CONTENT % ● — — LIQUID LIMIT % △

10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL SURFACE ELEVATION: +139.6 (Continued)	UNIT DRY WT. LBS. / Ft.^{3}	
		21	SS	I		50.4 No recovery Sample 21		*Calibrated Penetrometer ⊗ 50/0.4'
50.4						End of Boring Boring advanced to 6.0 feet with solid-stem auger HW casing driven to 5.0 feet Boring advanced from 6.0 feet to 32.0 feet with 4-inch rock bit and drilling fluid Boring advanced from 32.0 feet to 50.0 feet with 3-inch rock bit and drilling fluid Boring abandoned with bentonite quick grout using tremie method Split-spoons were driven with cathead and rope		

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WL **Dry before casing installation**	BORING STARTED **11/7/11**	AECOM OFFICE **1035 Kepler Drive Green Bay, Wisconsin 54311**	
WL **8.0 to 10.0 feet WS**	BORING COMPLETED **11/7/11**	ENTERED BY **CAH**	SHEET NO. **2** OF **2**
WL	RIG/FOREMAN **D-25/BZ**	APP'D BY **TMT**	AECOM JOB NO. **60225561**

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

(1) GENERAL INFORMATION

Unique Well No.
Well ID No.
County Goliad

Common Well Name B-1-1 ______ Gov't Lot (if applicable)

____ 1/4 of ____ 1/4 of Sec. ______ ; T. ______ N; R. ______ ☐ E ☐ W

Grid Location
13453086.8 ft. ☒ N. ☐ S., 2543146.7 ft. ☒ E. ☐ W.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☐

Lat ____ ° ____ ' ______ " Long ____ ° ____ ' ____ " or

State Plane __________ ft. N. __________ ft. E. S ☐ C ☐ N ☐ Zone

Reason For Abandonment Geotech Boring

Unique Well No. of Replacement Well

(2) FACILITY /OWNER INFORMATION

Facility Name Coleto Creek Energy Facility

Facility ID

License/Permit/Monitoring No.

Street Address of Well 45 FM 2987

City, Village, or Town Goliad County, Fannin, Texas 77960

Present Well Owner Coleto Creek Energy Facility

Original Owner Same

Street Address or Route of Owner 45 FM 2987

City, State, Zip Code Fannin, Texas 77960

(3) WELL/DRILLHOLE/BOREHOLE INFORMATION

Original Construction Date 11/5/11

☐ Monitoring Well
☐ Water Well
☒ Drillhole / Borehole

If a Well Construction Report is available, please attach.

Construction Type:

☒ Drilled ☐ Driven (Sandpoint) ☐ Dug

☐ Other (Specify) ______

Formation Type:

☒ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft) (From ground surface) 121.0

Casing Diameter (in.) 4.0

Casing Depth (ft.) 5.0

Lower Drillhole Diameter (in.) 3.0

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown

If Yes, To What Depth? N/A Feet

Depth to Water (Feet) 14.0

(4) PUMP, LINER, SCREEN, CASING, & SEALING MATERIAL

Pump & Piping Removed?	☐ Yes	☐ No	☒ Not Applicable
Liner(s) Removed?	☐ Yes	☐ No	☒ Not Applicable
Screen Removed?	☐ Yes	☐ No	☒ Not Applicable
Casing Left in Place?	☐ Yes	☐ No	
Was Casing Cut Off Below Surface?	☐ Yes	☒ No	
Did Sealing Material Rise to Surface?	☒ Yes	☐ No	
Did Material Settle After 24 Hours?	☐ Yes	☒ No	
If Yes, Was Hole Retopped?	☐ Yes	☒ No	

Required Method of Placing Sealing Material

☐ Conductor Pipe - Gravity ☒ Conductor Pipe - Pumped
☐ Screened & Poured (Bentonite Chips) ☐ Other (Explain)

Sealing Materials
☐ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry
☒ Bentonite-Sand Slurry
☐ Chipped Bentonite

For monitoring wells and monitoring well boreholes only
☐ Bentonite Chips
☐ Granular Bentonite
☐ Bentonite-Cement Grout
☐ Bentonite - Sand Slurry

(5) Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks, Sealant, or Volume	Mix Ratio or Mud Weight
Quik-Grout	Surface	121.0	50 gallons	

(6) Comments

(7) Name of Person or Firm Doing Sealing Work AECOM Technical Services, Inc.

Date of Abandonment 11/6/11

Signature of Person Doing Work

Date Signed 11/6/11

Street or Route 1035 Kepler Drive

Telephone Number 920-468-1978

City, State, Zip Code Green Bay, Wisconsin 54311

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

(1) GENERAL INFORMATION

Unique Well No.

Well ID No.

County: Goliad

Common Well Name: B-2-1

Gov't Lot (if applicable)

Grid Location: ____ 1/4 of ____ 1/4 of Sec. ____ ; T. ____ N; R. ____ ☐ E ☐ W

13453065.2 ft. ☒ N. ☐ S., 2543576.6 ft. ☒ E. ☐ W.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☐

Lat ____ ° ____ ' ____ " Long ____ ° ____ ' ____ " or

State Plane ____ ft. N. ____ ft. E. ☐ S ☐ C ☐ N Zone

Reason For Abandonment: Geotech Boring

Unique Well No. of Replacement Well

(2) FACILITY /OWNER INFORMATION

Facility Name: Coleto Creek Energy Facility

Facility ID

License/Permit/Monitoring No.

Street Address of Well: 45 FM 2987

City, Village, or Town: Goliad County, Fannin, Texas 77960

Present Well Owner: Coleto Creek Energy Facility

Original Owner: Same

Street Address or Route of Owner: 45 FM 2987

City, State, Zip Code: Fannin, Texas 77960

(3) WELL/DRILLHOLE/BOREHOLE INFORMATION

Original Construction Date: 11/3/11

☐ Monitoring Well

☐ Water Well

☒ Drillhole / Borehole

If a Well Construction Report is available, please attach.

Construction Type:

☒ Drilled ☐ Driven (Sandpoint) ☐ Dug

☐ Other (Specify)

Formation Type:

☒ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft) (From ground surface): 119.5

Casing Diameter (in.): 4.0

Casing Depth (ft.): 5.0

Lower Drillhole Diameter (in.): 3.0

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown

If Yes, To What Depth? N/A Feet

Depth to Water (Feet)

(4) PUMP, LINER, SCREEN, CASING, & SEALING MATERIAL

Pump & Piping Removed? ☐ Yes ☐ No ☒ Not Applicable

Liner(s) Removed? ☐ Yes ☐ No ☒ Not Applicable

Screen Removed? ☐ Yes ☐ No ☒ Not Applicable

Casing Left in Place? ☐ Yes ☐ No

Was Casing Cut Off Below Surface? ☐ Yes ☒ No

Did Sealing Material Rise to Surface? ☒ Yes ☐ No

Did Material Settle After 24 Hours? ☐ Yes ☒ No

If Yes, Was Hole Retopped? ☐ Yes ☒ No

Required Method of Placing Sealing Material

☐ Conductor Pipe - Gravity ☒ Conductor Pipe - Pumped

☐ Screened & Poured (Bentonite Chips) ☐ Other (Explain)

Sealing Materials

☐ Neat Cement Grout

☐ Sand-Cement (Concrete) Grout

☐ Concrete

☐ Clay-Sand Slurry

☒ Bentonite-Sand Slurry

☐ Chipped Bentonite

For monitoring wells and monitoring well boreholes only

☐ Bentonite Chips

☐ Granular Bentonite

☐ Bentonite-Cement Grout

☐ Bentonite - Sand Slurry

(5) Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks, Sealant, or Volume	Mix Ratio or Mud Weight
Quik-Grout	Surface	19.5	50 gallons	

(6) Comments

(7) Name of Person or Firm Doing Sealing Work: AECOM Technical Services, Inc.

Date of Abandonment: 11/4/11

Signature of Person Doing Work

Date Signed: 11/4/11

Street or Route: 1035 Kepler Drive

Telephone Number: 920-468-1978

City, State, Zip Code: Green Bay, Wisconsin 54311

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

(1) GENERAL INFORMATION

Unique Well No.
Well ID No.
County Goliad

Common Well Name B-2-2 ______ Gov't Lot (if applicable)

____ 1/4 of ____ 1/4 of Sec. ____ ; T. ____ N; R. ____ ☐ E ☐ W

Grid Location
13452977.2 ft. ☒ N. ☐ S., 2543676.7 ft. ☒ E. ☐ W.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☐

Lat ____ ° ____ ' ____ " Long ____ ° ____ ' ____ " or

State Plane ____ ft. N. ____ ft. E. ☐ S ☐ C ☐ N Zone

Reason For Abandonment Geotech Boring

Unique Well No. of Replacement Well

(2) FACILITY /OWNER INFORMATION

Facility Name Coleto Creek Energy Facility

Facility ID

License/Permit/Monitoring No.

Street Address of Well 45 FM 2987

City, Village, or Town Goliad County, Fannin, Texas 77960

Present Well Owner Coleto Creek Energy Facility

Original Owner Same

Street Address or Route of Owner 45 FM 2987

City, State, Zip Code Fannin, Texas 77960

(3) WELL/DRILLHOLE/BOREHOLE INFORMATION

Original Construction Date 11/1/11

☐ Monitoring Well
☐ Water Well
☒ Drillhole / Borehole

If a Well Construction Report is available, please attach.

Construction Type:

☒ Drilled ☐ Driven (Sandpoint) ☐ Dug

☐ Other (Specify) ______

Formation Type:

☒ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft) 70.5
(From ground surface)

Casing Diameter (in.) 4.0

Casing Depth (ft.) 10.0

Lower Drillhole Diameter (in.) 3.0

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown

If Yes, To What Depth? N/A Feet

Depth to Water (Feet) 3.5

(4) PUMP, LINER, SCREEN, CASING, & SEALING MATERIAL

Pump & Piping Removed? ☐ Yes ☐ No ☒ Not Applicable
Liner(s) Removed? ☐ Yes ☐ No ☒ Not Applicable
Screen Removed? ☐ Yes ☐ No ☒ Not Applicable
Casing Left in Place? ☐ Yes ☒ No

Was Casing Cut Off Below Surface? ☐ Yes ☒ No
Did Sealing Material Rise to Surface? ☒ Yes ☐ No
Did Material Settle After 24 Hours? ☐ Yes ☒ No
If Yes, Was Hole Retopped? ☐ Yes ☒ No

Required Method of Placing Sealing Material

☐ Conductor Pipe - Gravity ☒ Conductor Pipe - Pumped
☐ Screened & Poured (Bentonite Chips) ☐ Other (Explain)

Sealing Materials
☐ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry
☒ Bentonite-Sand Slurry
☐ Chipped Bentonite

For monitoring wells and monitoring well boreholes only
☐ Bentonite Chips
☐ Granular Bentonite
☐ Bentonite-Cement Grout
☐ Bentonite - Sand Slurry

(5) Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks, Sealant, or Volume	Mix Ratio or Mud Weight
Quik-Grout	Surface	70.5	30 gallons	

(6) Comments ______

(7) Name of Person or Firm Doing Sealing Work AECOM Technical Services, Inc.

Date of Abandonment 11/2/11

Signature of Person Doing Work

Date Signed 11/2/11

Street or Route 1035 Kepler Drive

Telephone Number 920-468-1978

City, State, Zip Code Green Bay, Wisconsin 54311

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

(1) GENERAL INFORMATION

Unique Well No.
Well ID No.
County: Goliad

Common Well Name: B-3-1
Gov't Lot (if applicable)

Grid Location ____ 1/4 of ____ 1/4 of Sec. ____ ; T. ____ N; R. ____ ☐ E ☐ W

13451245.3 ft. ☒ N. ☐ S., 2543663.1 ft. ☒ E. ☐ W.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☐

Lat ____ ° ____ ' ____ " Long ____ ° ____ ' ____ " or

State Plane ________ ft. N. ________ ft. E. S ☐ C ☐ N ☐ Zone

Reason For Abandonment: Geotech Boring

Unique Well No. of Replacement Well

(2) FACILITY /OWNER INFORMATION

Facility Name: Coleto Creek Energy Facility

Facility ID

License/Permit/Monitoring No.

Street Address of Well: 45 FM 2987

City, Village, or Town: Goliad County, Fannin, Texas 77960

Present Well Owner: Coleto Creek Energy Facility

Original Owner: Same

Street Address or Route of Owner: 45 FM 2987

City, State, Zip Code: Fannin, Texas 77960

(3) WELL/DRILLHOLE/BOREHOLE INFORMATION

Original Construction Date: 11/8/11

☐ Monitoring Well
☐ Water Well
☒ Drillhole / Borehole

If a Well Construction Report is available, please attach.

Construction Type:

☒ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (Specify)

Formation Type:

☒ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft) (From ground surface)

Casing Diameter (in.): 4.0

Casing Depth (ft.): 5.0

Lower Drillhole Diameter (in.): 3.0

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown

If Yes, To What Depth? N/A Feet

Depth to Water (Feet): N/A

(4) PUMP, LINER, SCREEN, CASING, & SEALING MATERIAL

Pump & Piping Removed? ☐ Yes ☐ No ☒ Not Applicable
Liner(s) Removed? ☐ Yes ☐ No ☒ Not Applicable
Screen Removed? ☐ Yes ☐ No ☒ Not Applicable
Casing Left in Place? ☐ Yes ☒ No

Was Casing Cut Off Below Surface? ☐ Yes ☒ No
Did Sealing Material Rise to Surface? ☒ Yes ☐ No
Did Material Settle After 24 Hours? ☐ Yes ☒ No
If Yes, Was Hole Retopped? ☐ Yes ☒ No

Required Method of Placing Sealing Material

☐ Conductor Pipe - Gravity
☒ Conductor Pipe - Pumped
☐ Screened & Poured (Bentonite Chips)
☐ Other (Explain)

Sealing Materials

☐ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry
☒ Bentonite-Sand Slurry
☐ Chipped Bentonite

For monitoring wells and monitoring well boreholes only

☐ Bentonite Chips
☐ Granular Bentonite
☐ Bentonite-Cement Grout
☐ Bentonite - Sand Slurry

(5)

Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks, Sealant, or Volume	Mix Ratio or Mud Weight
Quik-Grout	Surface	36.5	20 gallons	

(6) Comments

(7) Name of Person or Firm Doing Sealing Work: AECOM Technical Services, Inc.

Date of Abandonment: 11/8/11

Signature of Person Doing Work

Date Signed: 11/8/11

Street or Route: 1035 Kepler Drive

Telephone Number: 920-468-1978

City, State, Zip Code: Green Bay, Wisconsin 54311

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

(1) GENERAL INFORMATION

Unique Well No.

Well ID No.

County Goliad

Common Well Name B-3-2 Gov't Lot (if applicable)

Grid Location ___ 1/4 of ___ 1/4 of Sec. ___ ; T. ___ N; R. ___ ☐ E ☐ W

1341251.3 ft. ☒ N. ☐ S., 2543721.2 ft. ☒ E. ☐ W.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☐

Lat ___ ° ___ ' ___ " Long ___ ° ___ ' ___ " or

State Plane ___ ft. N. ___ ft. E. S ☐ C ☐ N ☐ Zone

Reason For Abandonment Geotech Boring

Unique Well No. of Replacement Well

(2) FACILITY /OWNER INFORMATION

Facility Name Coleto Creek Energy Facility

Facility ID

License/Permit/Monitoring No.

Street Address of Well 45 FM 2987

City, Village, or Town Goliad County, Fannin, Texas 77960

Present Well Owner Coleto Creek Energy Facility

Original Owner Same

Street Address or Route of Owner 45 FM 2987

City, State, Zip Code Fannin, Texas 77960

(3) WELL/DRILLHOLE/BOREHOLE INFORMATION

Original Construction Date 11/2/11

☐ Monitoring Well

☐ Water Well

☒ Drillhole / Borehole

If a Well Construction Report is available, please attach.

Construction Type:

☒ Drilled ☐ Driven (Sandpoint) ☐ Dug

☐ Other (Specify)

Formation Type:

☒ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft) (From ground surface) 29.5

Casing Diameter (in.) 4.0

Casing Depth (ft.) 5.0

Lower Drillhole Diameter (in.) 3.0

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown

If Yes, To What Depth? N/A Feet

Depth to Water (Feet) 14.0

(4) PUMP, LINER, SCREEN, CASING, & SEALING MATERIAL

Pump & Piping Removed? ☐ Yes ☐ No ☒ Not Applicable

Liner(s) Removed? ☐ Yes ☐ No ☒ Not Applicable

Screen Removed? ☐ Yes ☐ No ☒ Not Applicable

Casing Left in Place? ☐ Yes ☒ No

Was Casing Cut Off Below Surface? ☐ Yes ☒ No

Did Sealing Material Rise to Surface? ☒ Yes ☐ No

Did Material Settle After 24 Hours? ☐ Yes ☒ No

If Yes, Was Hole Retopped? ☐ Yes ☒ No

Required Method of Placing Sealing Material

☐ Conductor Pipe - Gravity ☒ Conductor Pipe - Pumped

☐ Screened & Poured (Bentonite Chips) ☐ Other (Explain)

Sealing Materials

☐ Neat Cement Grout

☐ Sand-Cement (Concrete) Grout

☐ Concrete

☐ Clay-Sand Slurry

☒ Bentonite-Sand Slurry

☐ Chipped Bentonite

For monitoring wells and monitoring well boreholes only

☐ Bentonite Chips

☐ Granular Bentonite

☐ Bentonite-Cement Grout

☐ Bentonite - Sand Slurry

(5) Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks, Sealant, or Volume	Mix Ratio or Mud Weight
Quik-Grout	Surface	29.5	20 gallons	

(6) Comments

(7) Name of Person or Firm Doing Sealing Work AECOM Technical Services, Inc.

Date of Abandonment 11/2/11

Signature of Person Doing Work

Date Signed 11/2/11

Street or Route 1035 Kepler Drive

Telephone Number 920-468-1978

City, State, Zip Code Green Bay, Wisconsin 54311

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

(1) GENERAL INFORMATION

Unique Well No.

Well ID No.

County Goliad

Common Well Name B-4-1

Gov't Lot (if applicable)

Grid Location ___ 1/4 of ___ 1/4 of Sec. ___ ; T. ___ N; R. ___ ☐ E ☐ W

1340613.7 ft. ☒ N. ☐ S., 2543740.9 ft. ☒ E. ☐ W.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☐

Lat ___ ° ___ ' ___ " Long ___ ° ___ ' ___ " or

State Plane ___ ft. N. ___ ft. E. ☐ S ☐ C ☐ N Zone

Reason For Abandonment Geotech Boring

Unique Well No. of Replacement Well

(2) FACILITY /OWNER INFORMATION

Facility Name Coleto Creek Energy Facility

Facility ID

License/Permit/Monitoring No.

Street Address of Well 45 FM 2987

City, Village, or Town Goliad County, Fannin, Texas 77960

Present Well Owner Coleto Creek Energy Facility

Original Owner Same

Street Address or Route of Owner 45 FM 2987

City, State, Zip Code Fannin, Texas 77960

(3) WELL/DRILLHOLE/BOREHOLE INFORMATION

Original Construction Date 11/7/11

☐ Monitoring Well

☐ Water Well

☒ Drillhole / Borehole

If a Well Construction Report is available, please attach.

Construction Type:

☒ Drilled ☐ Driven (Sandpoint) ☐ Dug

☐ Other (Specify)

Formation Type:

☒ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft) (From ground surface) 51.5

Casing Diameter (in.) 5.0

Casing Depth (ft.) 4.0

Lower Drillhole Diameter (in.) 3.0

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown

If Yes, To What Depth? N/A Feet

Depth to Water (Feet) N/A

(4) PUMP, LINER, SCREEN, CASING, & SEALING MATERIAL

Pump & Piping Removed? ☐ Yes ☐ No ☒ Not Applicable

Liner(s) Removed? ☐ Yes ☐ No ☒ Not Applicable

Screen Removed? ☐ Yes ☐ No ☒ Not Applicable

Casing Left in Place? ☐ Yes ☒ No

Was Casing Cut Off Below Surface? ☐ Yes ☒ No

Did Sealing Material Rise to Surface? ☒ Yes ☐ No

Did Material Settle After 24 Hours? ☐ Yes ☒ No

If Yes, Was Hole Retopped? ☐ Yes ☒ No

Required Method of Placing Sealing Material

☐ Conductor Pipe - Gravity ☒ Conductor Pipe - Pumped

☐ Screened & Poured (Bentonite Chips) ☐ Other (Explain)

Sealing Materials

☐ Neat Cement Grout

☐ Sand-Cement (Concrete) Grout

☐ Concrete

☐ Clay-Sand Slurry

☒ Bentonite-Sand Slurry

☐ Chipped Bentonite

For monitoring wells and monitoring well boreholes only

☐ Bentonite Chips

☐ Granular Bentonite

☐ Bentonite-Cement Grout

☐ Bentonite - Sand Slurry

(5) Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks, Sealant, or Volume	Mix Ratio or Mud Weight
Quik-Grout	Surface	51.5	25 gallons	

(6) Comments

(7) Name of Person or Firm Doing Sealing Work AECOM Technical Services, Inc.

Date of Abandonment 11/7/11

Signature of Person Doing Work

Date Signed 11/7/11

Street or Route 1035 Kepler Drive

Telephone Number 920-468-1978

City, State, Zip Code Green Bay, Wisconsin 54311

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

(1) GENERAL INFORMATION

Unique Well No.	Well ID No.	County
		Goliad

Common Well Name B-4-2 ______ Gov't Lot (if applicable)

____ 1/4 of ____ 1/4 of Sec. ____ ; T. ____ N; R. ____ ☐ E ☐ W

Grid Location

13450619.3 ft. ☒ N. ☐ S., 2543806.7 ft. ☒ E. ☐ W.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☐

Lat ____ ° ____ ' ____ " Long ____ ° ____ ' ____ " or

State Plane ______ ft. N. ______ ft. E. ☐ S ☐ C ☐ N Zone

Reason For Abandonment	Unique Well No. of Replacement Well
Geotech Boring	

(2) FACILITY /OWNER INFORMATION

Facility Name
Coleto Creek Energy Facility

Facility ID	License/Permit/Monitoring No.

Street Address of Well
45 FM 2987

City, Village, or Town
Goliad County, Fannin, Texas 77960

Present Well Owner	Original Owner
Coleto Creek Energy Facility	Same

Street Address or Route of Owner
45 FM 2987

City, State, Zip Code
Fannin, Texas 77960

(3) WELL/DRILLHOLE/BOREHOLE INFORMATION

Original Construction Date 11/2/11

☐ Monitoring Well
☐ Water Well
☒ Drillhole / Borehole

If a Well Construction Report is available, please attach.

Construction Type:

☒ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (Specify) ______

Formation Type:

☒ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft) 31.0 (From ground surface)
Casing Diameter (in.) 4.0
Casing Depth (ft.) 5.0
Lower Drillhole Diameter (in.) 3.0

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown
If Yes, To What Depth? N/A Feet
Depth to Water (Feet) 14.0

(4) PUMP, LINER, SCREEN, CASING, & SEALING MATERIAL

Pump & Piping Removed? ☐ Yes ☐ No ☒ Not Applicable
Liner(s) Removed? ☐ Yes ☐ No ☒ Not Applicable
Screen Removed? ☐ Yes ☐ No ☒ Not Applicable
Casing Left in Place? ☐ Yes ☒ No

Was Casing Cut Off Below Surface? ☐ Yes ☒ No
Did Sealing Material Rise to Surface? ☒ Yes ☐ No
Did Material Settle After 24 Hours? ☐ Yes ☒ No
If Yes, Was Hole Retopped? ☐ Yes ☒ No

Required Method of Placing Sealing Material
☐ Conductor Pipe - Gravity ☒ Conductor Pipe - Pumped
☐ Screened & Poured (Bentonite Chips) ☐ Other (Explain)

Sealing Materials
☐ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry
☒ Bentonite-Sand Slurry
☐ Chipped Bentonite

For monitoring wells and monitoring well boreholes only
☐ Bentonite Chips
☐ Granular Bentonite
☐ Bentonite-Cement Grout
☐ Bentonite - Sand Slurry

(5) Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks, Sealant, or Volume	Mix Ratio or Mud Weight
Quik-Grout	Surface	31.0	20 gallons	

(6) Comments ______

(7) Name of Person or Firm Doing Sealing Work	Date of Abandonment
AECOM Technical Services, Inc.	11/2/11

Signature of Person Doing Work	Date Signed
	11/2/11

Street or Route	Telephone Number
1035 Kepler Drive	920-468-1978

City, State, Zip Code
Green Bay, Wisconsin 54311

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

(1) GENERAL INFORMATION

Unique Well No.	Well ID No.	County
		Goliad

Common Well Name B-5-1 ______ Gov't Lot (if applicable)

____ 1/4 of ____ 1/4 of Sec. ____ ; T. ____ N; R. ____ ☐ E ☐ W

Grid Location

13451003.7 ft. ☒ N. ☐ S., 2543693.8 ft. ☒ E. ☐ W.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☐

Lat ____ ° ____ ' ____ " Long ____ ° ____ ' ____ " or

State Plane ____ ft. N. ____ ft. E. S ☐ C ☐ N ☐ Zone

Reason For Abandonment	Unique Well No. of Replacement Well
Geotech Boring	

(2) FACILITY /OWNER INFORMATION

Facility Name
Coleto Creek Energy Facility

Facility ID	License/Permit/Monitoring No.

Street Address of Well
45 FM 2987

City, Village, or Town
Goliad County, Fannin, Texas 77960

Present Well Owner	Original Owner
Coleto Creek Energy Facility	Same

Street Address or Route of Owner
45 FM 2987

City, State, Zip Code
Fannin, Texas 77960

(3) WELL/DRILLHOLE/BOREHOLE INFORMATION

Original Construction Date 11/7/11

☐ Monitoring Well
☐ Water Well
☒ Drillhole / Borehole

If a Well Construction Report is available, please attach.

Construction Type:

☒ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (Specify) ______

Formation Type:

☒ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft) 50.9 (From ground surface)

Casing Diameter (in.) 4.0

Casing Depth (ft.) 5.0

Lower Drillhole Diameter (in.) 3.0

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown

If Yes, To What Depth? N/A Feet

Depth to Water (Feet) N/A

(4) PUMP, LINER, SCREEN, CASING, & SEALING MATERIAL

Pump & Piping Removed? ☐ Yes ☐ No ☒ Not Applicable
Liner(s) Removed? ☐ Yes ☐ No ☒ Not Applicable
Screen Removed? ☐ Yes ☐ No ☒ Not Applicable
Casing Left in Place? ☐ Yes ☒ No

Was Casing Cut Off Below Surface? ☐ Yes ☒ No
Did Sealing Material Rise to Surface? ☒ Yes ☐ No
Did Material Settle After 24 Hours? ☐ Yes ☒ No
If Yes, Was Hole Retopped? ☐ Yes ☒ No

Required Method of Placing Sealing Material

☐ Conductor Pipe - Gravity ☒ Conductor Pipe - Pumped
☐ Screened & Poured (Bentonite Chips) ☐ Other (Explain)

Sealing Materials

☐ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry
☒ Bentonite-Sand Slurry
☐ Chipped Bentonite

For monitoring wells and monitoring well boreholes only

☐ Bentonite Chips
☐ Granular Bentonite
☐ Bentonite-Cement Grout
☐ Bentonite - Sand Slurry

(5) Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks, Sealant, or Volume	Mix Ratio or Mud Weight
Quik-Grout	Surface	50.9	25 gallons	

(6) Comments ______

(7) Name of Person or Firm Doing Sealing Work	Date of Abandonment
AECOM Technical Services, Inc.	11/7/11
Signature of Person Doing Work	**Date Signed**
	11/7/11
Street or Route	**Telephone Number**
1035 Kepler Drive	920-468-1978

City, State, Zip Code
Green Bay, Wisconsin 54311

AECOM General Notes

Drilling and Sampling Symbols:

SS : Split Spoon - 1-3/8" I.D. 2" O.D. (Unless otherwise noted)	HS : Hollow Stem Auger
ST : Shelby Tube-2" O.D. (Unless otherwise noted)	WS : Wash Sample
PA : Power Auger	FT : Fish Tail
DB : Diamond Bit-NX, BX, AX	RB : Rock Bit
AS : Auger Sample	BS : Bulk Sample
JS : Jar Sample	PM : Pressuremeter Test
VS : Vane Shear	GS : Giddings Sampler
OS : Osterberg Sampler	

Standard "N" Penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch O.D. split spoon sampler, except where otherwise noted.

Water Level Measurement Symbols:

WL : Water Level	WCI : Wet Cave In
WS : While Sampling	DCI : Dry Cave In
WD : While Drilling	BCR : Before Casing Removal
AB : After Boring	ACR : After Casing Removal

Water levels indicated on the boring logs are the levels measured in the boring at the time indicated. In pervious soils, the indicated elevations are considered reliable groundwater levels. In impervious soils, the accurate determination of groundwater elevations may not be possible, even after several days of observations; additional evidence of groundwater elevations must be sought.

Gradation Description and Terminology:

Coarse grained or granular soils have more than 50% of their dry weight retained on a #200 sieve; they are described as boulders, cobbles, gravel or sand. Fine grained soils have less than 50% of their dry weight retained on a #200 sieve; they are described as clay or clayey silt if they are cohesive and silt if they are non-cohesive. In addition to gradation, granular soils are defined on the basis of their relative in-place density and fine grained soils on the basis of their strength or consistency and their plasticity.

Major Component of Sample	Size Range	Description of Other Components Present in Sample	Percent Dry Weight
Boulders	Over 8 in. (200 mm)	Trace	1-9
Cobbles	8 inches to 3 inches (200 mm to 75 mm)	Little	10-19
Gravel	3 inches to #4 sieve (75 mm to 4.76 mm)	Some	20-34
Sand	#4 to #200 sieve (4.76 mm to 0.074 mm)	And	35-50
Silt	Passing #200 sieve (0.074 mm to 0.005 mm)		
Clay	Smaller than 0.005 mm		

Consistency of Cohesive Soils: Relative Density of Granular Soils:

Unconfined Compressive Strength, Qu, tsf	Consistency	N-Blows per foot	Relative Density
<0.25	Very Soft	0 - 3	Very Loose
0.25 - 0.49	Soft	4 - 9	Loose
0.50 - 0.99	Medium (firm)	10 - 29	Medium Dense
1.00 - 1.99	Stiff	30 - 49	Dense
2.00 - 3.99	Very Stiff	50 - 80	Very Dense
4.00 - 8.00	Hard	>80	Extremely Dense
>8.00	Very Hard		

AECOM Field and Laboratory Procedures

Field Sampling Procedures

Auger Sampling (AS)

In this procedure, soil samples are collected from cuttings off of the auger flights as they are removed from the ground. Such samples provide a general indication of subsurface conditions; however, they do not provide undisturbed samples, nor do they provide samples from discrete depths.

Split-Barrel Sampling (SS) - (ASTM Standard D-1586-99)

In the split-barrel sampling procedure, a 2-inch O.D. split barrel sampler is driven into the soil a distance of 18 inches by means of a 140-pound hammer falling 30 inches. The value of the Standard Penetration Resistance is obtained by counting the number of blows of the hammer over the final 12 inches of driving. This value provides a qualitative indication of the in-place relative density of cohesionless soils. The indication is qualitative only, however, since many factors can significantly affect the Standard Penetration Resistance Value, and direct correlation of results obtained by drill crews using different rigs, drilling procedures, and hammer-rod-spoon assemblies should not be made. A portion of the recovered sample is placed in a sample jar and returned to the laboratory for further analysis and testing.

Shelby Tube Sampling Procedure (ST) - ASTM Standard D-1587-94

In the Shelby tube sampling procedure, a thin-walled steel seamless tube with a sharp cutting edge is pushed hydraulically into the soil and a relatively undisturbed sample is obtained. This procedure is generally employed in cohesive soils. The tubes are identified, sealed and carefully handled in the field to avoid excessive disturbance and are returned to the laboratory for extrusion and further analysis and testing.

Giddings Sampler (GS)

This type of sampling device consists of 5-foot sections of thin-wall tubing which are capable of retrieving continuous columns of soil in 5-foot maximum increments. Because of a continuous slot in the sampling tubes, the sampler allows field determination of stratification boundaries and containerization of soil samples from any sampling depth within the 5-foot interval.

AECOM Field and Laboratory Procedures

Subsurface Exploration Procedures

Hand-Auger Drilling (HA)

In this procedure, a sampling device is driven into the soil by repeated blows of a sledge hammer or a drop hammer. When the sampler is driven to the desired sample depth, the soil sample is retrieved. The hole is then advanced by manually turning the hand auger until the next sampling depth increment is reached. The hand auger drilling between sampling intervals also helps to clean and enlarge the borehole in preparation for obtaining the next sample.

Power Auger Drilling (PA)

In this type of drilling procedure, continuous flight augers are used to advance the boreholes. They are turned and hydraulically advanced by a truck, trailer or track-mounted unit as site accessibility dictates. In auger drilling, casing and drilling mud are not required to maintain open boreholes.

Hollow Stem Auger Drilling (HS)

In this drilling procedure, continuous flight augers having open stems are used to advance the boreholes. The open stem allows the sampling tool to be used without removing the augers from the borehole. Hollow stem augers thus provide support to the sides of the borehole during the sampling operations.

Rotary Drilling (RB)

In employing rotary drilling methods, various cutting bits are used to advance the boreholes. In this process, surface casing and/or drilling fluids are used to maintain open boreholes.

Diamond Core Drilling (DB)

Diamond core drilling is used to sample cemented formations. In this procedure, a double tube (or triple tube) core barrel with a diamond bit cuts an annular space around a cylindrical prism of the material sampled. The sample is retrieved by a catcher just above the bit. Samples recovered by this procedure are placed in sturdy containers in sequential order.

AECOM Laboratory Procedures

Water Content (Wc)

The water content of a soil is the ratio of the weight of water in a given soil mass to the weight of the dry soil. Water content is generally expressed as a percentage.

Hand Penetrometer (Qp)

In the hand penetrometer test, the unconfined compressive strength of a soil is determined, to a maximum value of 4.5 tons per square foot (tsf) or 7.0 tsf depending on the testing device utilized, by measuring the resistance of the soil sample to penetration by a small, spring-calibrated cylinder. The hand penetrometer test has been carefully correlated with unconfined compressive strength tests, and thereby provides a useful and a relatively simple testing procedure in which soil strength can be quickly and easily estimated.

Unconfined Compression Tests (Qu)

In the unconfined compression strength test, an undisturbed prism of soil is loaded axially until failure or until 20% strain has been reached, whichever occurs first.

Dry Density (γd)

The dry density is a measure of the amount of solids in a unit volume of soil. Use of this value is often made when measuring the degree of compaction of a soil.

Classification of Samples

In conjunction with the sample testing program, all soil samples are examined in our laboratory and visually classified on the basis of their texture and plasticity in accordance with the AECOM Soil Classification System which is described on a separate sheet. The soil descriptions on the boring logs are derived from this system as well as the component gradation terminology, consistency of cohesive soils and relative density of granular soils as described on a separate sheet entitled "AECOM General Notes". The estimated group symbols included in parentheses following the soil descriptions on the boring logs are in general conformance with the Unified Soil Classification System (USCS) which serves as the basis of the AECOM Soil Classification System.

AECOM Standard Boring Log Procedures

In the process of obtaining and testing samples and preparing this report, standard procedures are followed regarding field logs, laboratory data sheets and samples.

Field logs are prepared during performance of the drilling and sampling operations and are intended to essentially portray field occurrences, sampling locations and procedures.

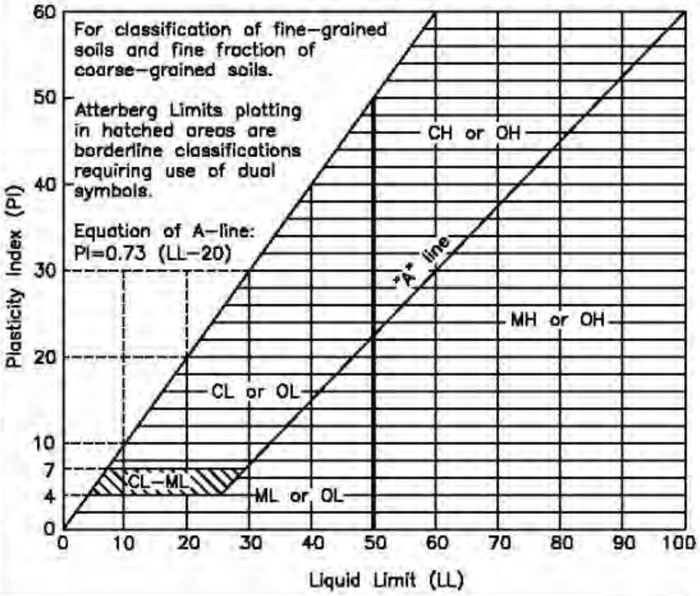
Samples obtained in the field are frequently subjected to additional testing and reclassification in the laboratory by experienced geotechnical engineers, and as such, differences between the field logs and the final logs may exist. The engineer preparing the report reviews the field logs, laboratory test data and classifications, and using judgment and experience in interpreting this data, may make further changes. It is common practice in the geotechnical engineering profession not to include field logs and laboratory data sheets in engineering reports, because they do not represent the engineer's final opinions as to appropriate descriptions for conditions encountered in the exploration and testing work. Results of laboratory tests are generally shown on the boring logs or are described in the text of the report, as appropriate.

Samples taken in the field, some of which are later subjected to laboratory tests, are retained in our laboratory for sixty days and are then discarded unless special disposition is requested by our client. Samples retained over a long period of time, even in sealed jars, are subject to moisture loss which changes the apparent strength of cohesive soil, generally increasing the strength from what was originally encountered in the field. Since they are then no longer representative of the moisture conditions initially encountered, observers of these samples should recognize this factor.

AECOM Soil Classification System (1)

	Major Divisions		Group Symbols	Typical Names	Laboratory Classification Criteria		
Coarse-grained soils (More than half of material is ***larger*** than No. 200 sieve size)	Gravel (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravel (Little or no fines)	GW	Well-graded, gravel, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 percent . . . . . GW, GP, SW, SP More than 12 percent . . . . . GM, GC, SM, SC 5 to 12 percent . . . . . Borderline cases ***requiring*** dual symbols(3)	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 & 3	
			GP	Poorly graded gravel, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW	
		Gravel with fines (Appreciable amount of fines)	GM	Silty gravel, gravel-sand-silt mixtures		Atterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are ***borderline*** cases requiring use of dual symbols
			GC	Clayey gravel, gravel-sand-clay mixtures		Atterberg limits above "A" line or PI greater than 7	
	Sand (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sand (Little or no fines)	SW	Well-graded sand, gravelly sand, little or no fines		$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 & 3	
			SP	Poorly graded sand, gravelly sand, little or no fines		Not meeting all gradation requirements for SW	
		Sand with fines (Appreciable amount of fines)	SM	Silty sand, sand-silt mixtures		Atterberg limits below "A" line or PI less than 4	Limits plotting in hatched zone with PI between 4 and 7 are ***borderline*** cases requiring use of dual symbols
			SC	Clayey sand, sand-clay mixtures		Atterberg limits above "A" line or PI greater than 7	
Fine-grained soils (More than half of material is ***smaller*** than No. 200 sieve size)	Silt and clay (Liquid limit less than 50)		ML	Inorganic silt and very fine sand, rock flour, silty or clayey fine sand or clayey silt with slight plasticity	Plasticity Chart (2)		
			CL	Inorganic clay of low to medium plasticity, gravelly clay, sandy clay, silty clay, lean clay			
			OL	Organic silt and organic silty clay of low plasticity			
	Silt and clay (Liquid limit greater than 50)		MH	Inorganic silt, micaceous or diatomaceous fine sandy or silty soils, elastic silt			
			CH	Inorganic clay of high plasticity, fat clay			
			OH	Organic clay of medium to high plasticity, organic silt			
	Highly organic soils		PT	Peat and other highly organic soil			

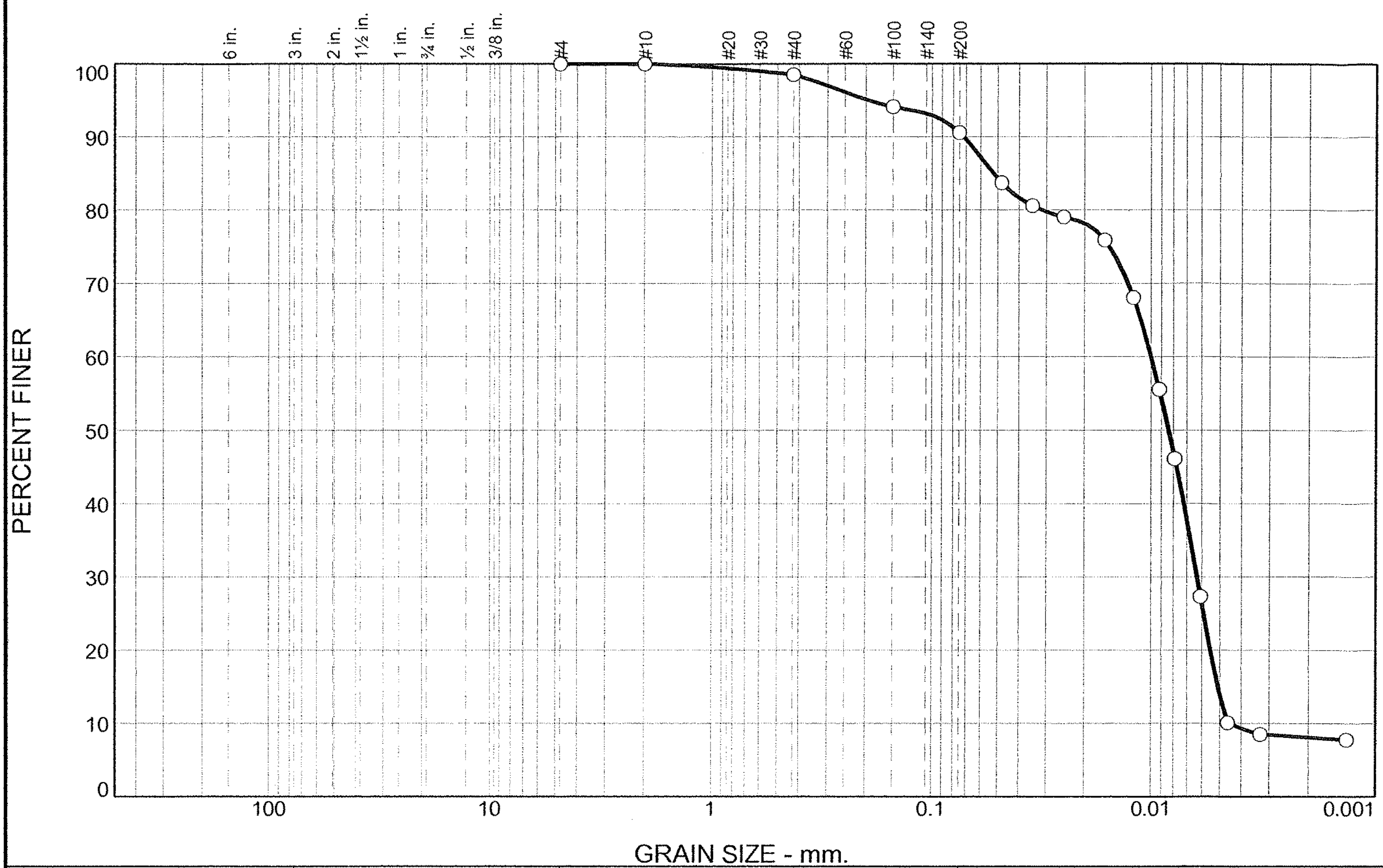
Plasticity Chart (2)



1. See AECOM General Notes for component gradation terminology, consistency of cohesive soils and relative density of granular soils.
2. Reference: Unified Soil Classification Systems
3. Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC, well-graded gravel-sand mixture with clay binder.

APPENDIX B: GEOTECHNICAL LABORATORY DATA

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.5	7.9	76.7	13.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#40	98.5		
#100	94.1		
#200	90.6		

* (no specification provided)

Material Description

LIGHT GRAY SILTY CLAY, TRACE SAND

Atterberg Limits

PL= 14 LL= 22 PI= 8

Coefficients

D_{90}= 0.0716 D_{85}= 0.0523 D_{60}= 0.0100
D_{50}= 0.0084 D_{30}= 0.0063 D_{15}= 0.0051
D_{10}= 0.0045 C_u= 2.21 C_c= 0.88

Classification

USCS= CL AASHTO= A-4(5)

Remarks

Source of Sample: B-1-1 **Depth:** 8'-10'
Sample Number: B-1-1 S-5

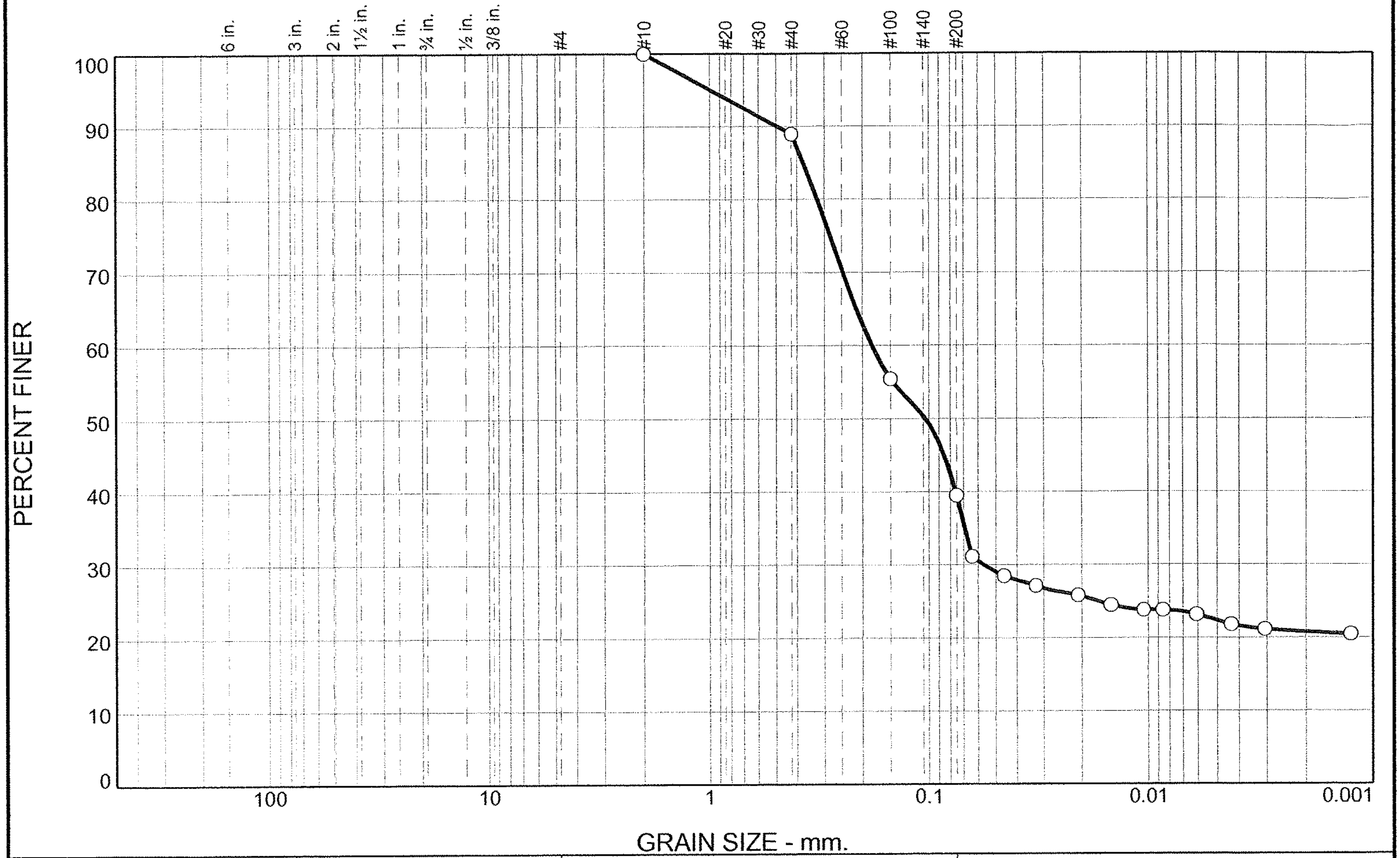
Date: 12/09/11

AECOM

Client: IPR-GDF SUEZ
Project: COLETO CREEK

Project No: 60225561 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	11.0	49.5	17.1	22.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	89.0		
#100	55.5		
#200	39.5		

* (no specification provided)

Material Description

CLAYEY FINE TO MEDIUM SAND, BROWNISH GRAY

Atterberg Limits

PL= 14 LL= 38 PI= 24

Coefficients

D_{90}= 0.4902 D_{85}= 0.3732 D_{60}= 0.1816
D_{50}= 0.1036 D_{30}= 0.0564 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-6(4)

Remarks

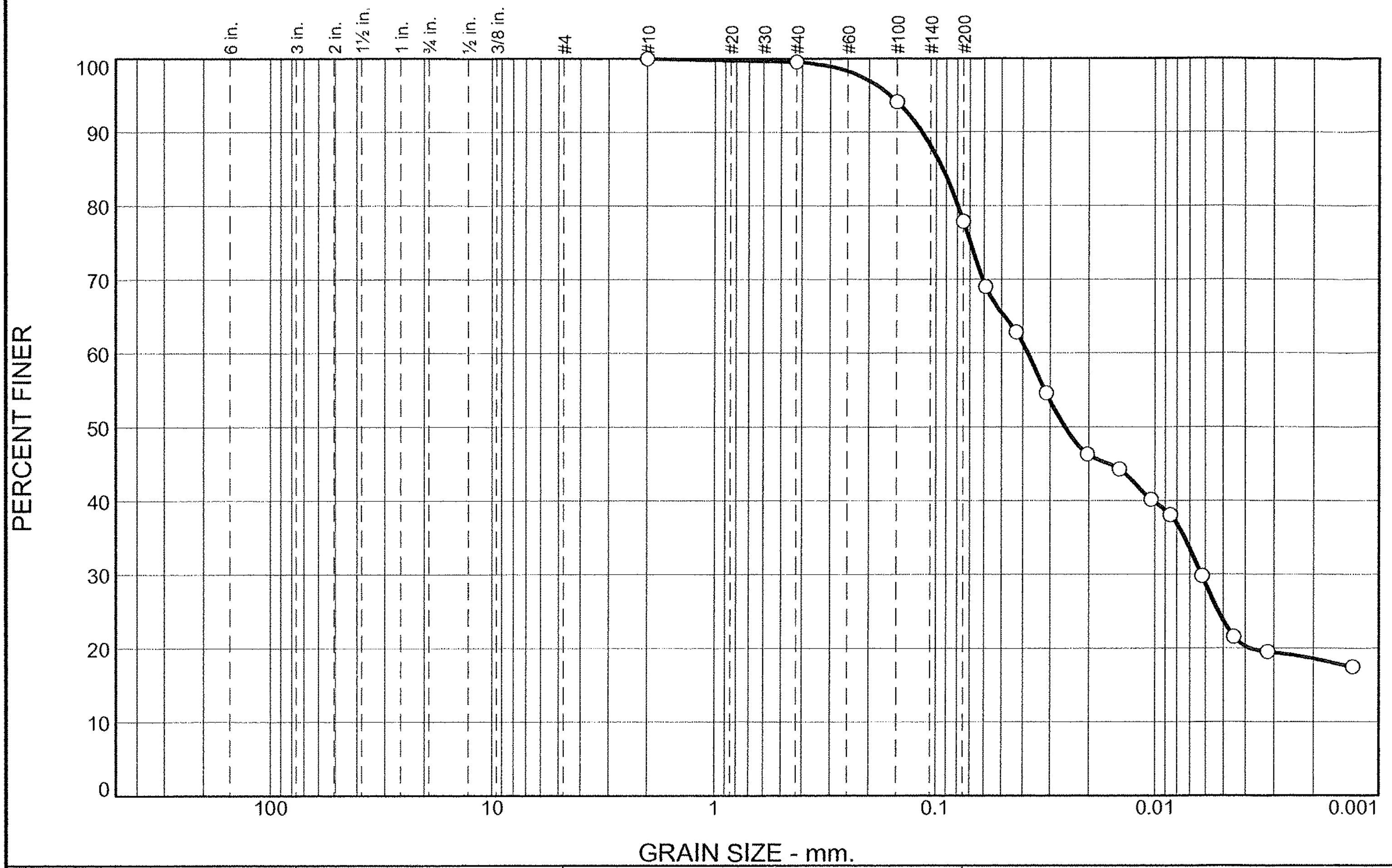
Source of Sample: B-1-1 **Depth:** 20'-22'
Sample Number: B-1-1 S-11

Date: 12/9/11

AECOM

Client: IPR-GDF SUEZ
Project: COLETO CREEK
Project No: 60225561 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.4	21.7	54.2	23.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.6		
#100	94.1		
#200	77.9		

* (no specification provided)

Material Description

SILTY CLAY, SOME SAND, LIGHT GRAY

Atterberg Limits

PL= 17 LL= 42 PI= 25

Coefficients

D_{90}= 0.1156 D_{85}= 0.0934 D_{60}= 0.0380
D_{50}= 0.0258 D_{30}= 0.0062 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(18)

Remarks

Source of Sample: B-1-1 **Depth:** 90'-90.4'
Sample Number: B-1-1 S-34

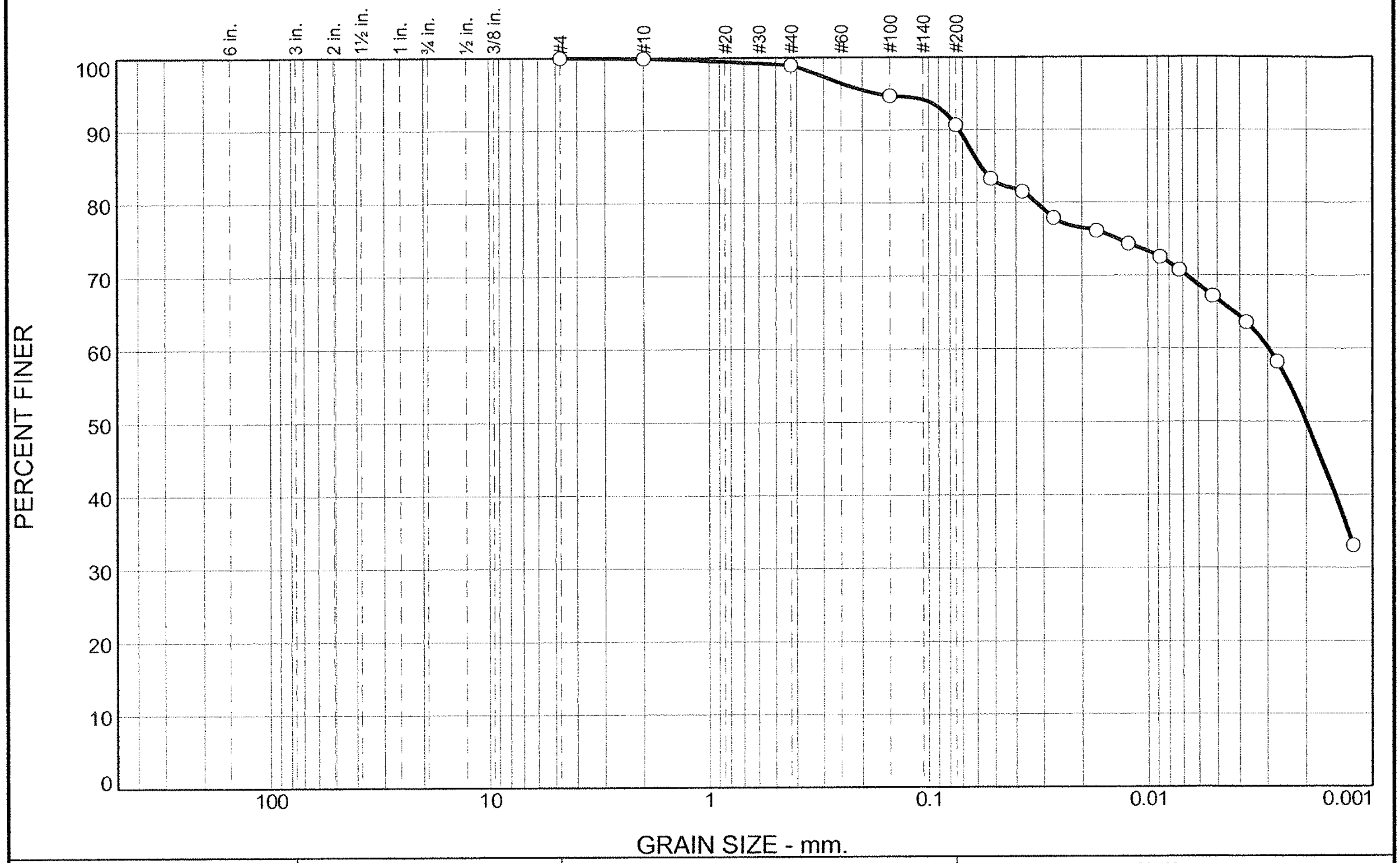
Date: 12/15/11

AECOM

Client: IPR-GDF SUEZ
Project: COLETO CREEK

Project No: 60225561 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	1.0	8.2	23.9	66.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#40	98.9		
#100	94.7		
#200	90.7		

* (no specification provided)

Material Description

SILTY CLAY, TRACE SAND, BROWN

Atterberg Limits

PL= 28 LL= 79 PI= 51

Coefficients

D_{90}= 0.0724 D_{85}= 0.0576 D_{60}= 0.0030
D_{50}= 0.0020 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(53)

Remarks

Source of Sample: B-1-1 **Depth:** 120'-121'
Sample Number: B-1-1 S-40

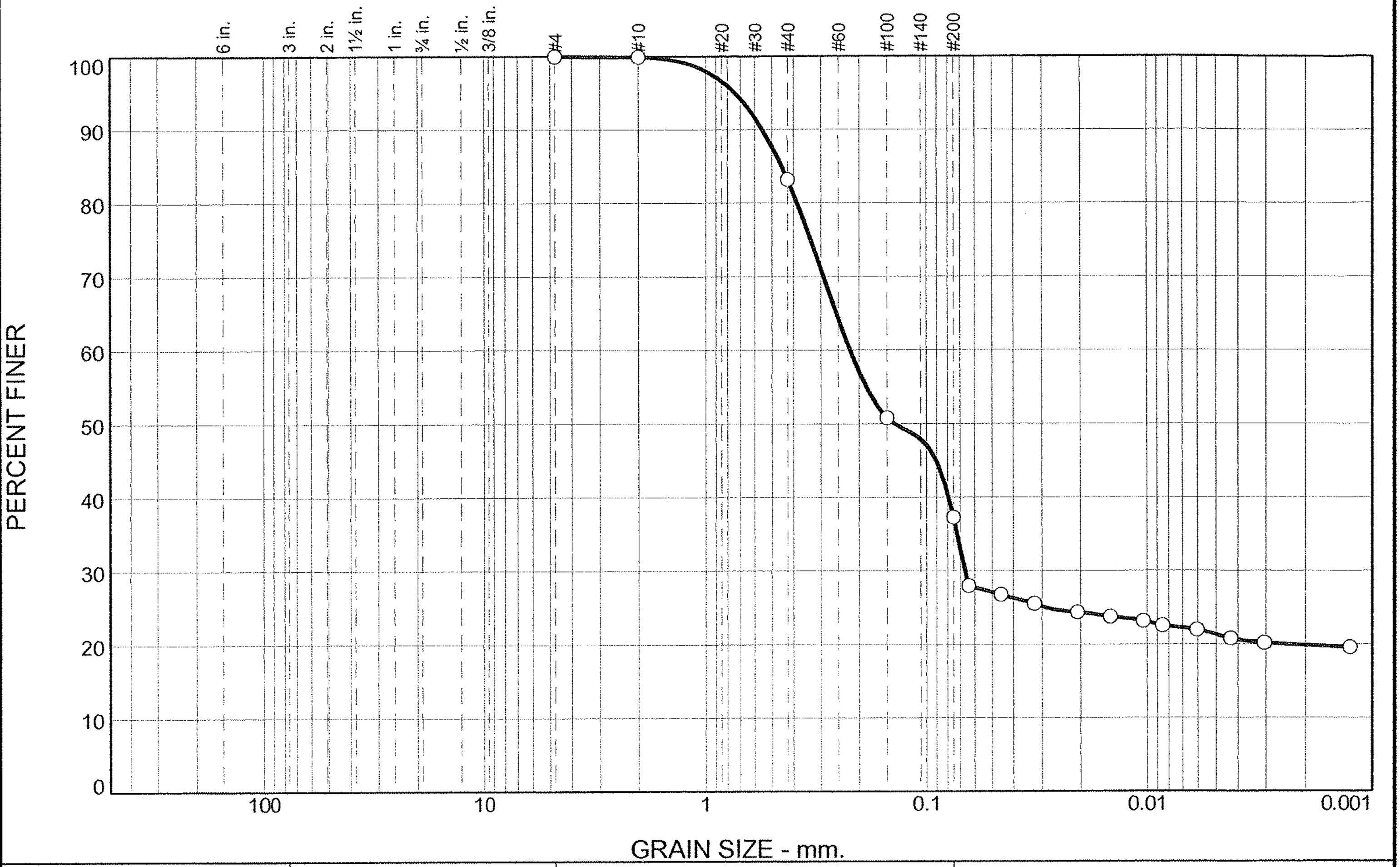
Date: 12/9/11

AECOM

Client: 1PR-GDF SUEZ
Project: COLETO CREEK

Project No: 60225561 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	16.7	45.9	15.9	21.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#40	83.2		
#100	50.8		
#200	37.3		

* (no specification provided)

Material Description

CLAYEY FINE TO MEDIUM SAND, GRAYISH BROWN

Atterberg Limits

PL= 14 LL= 38 PI= 24

Coefficients

D_{90}= 0.5520 D_{85}= 0.4512 D_{60}= 0.2202
D_{50}= 0.1389 D_{30}= 0.0666 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-6(3)

Remarks

Source of Sample: B-2-1 **Depth:** 10'-12'
Sample Number: B-2-1 S-6

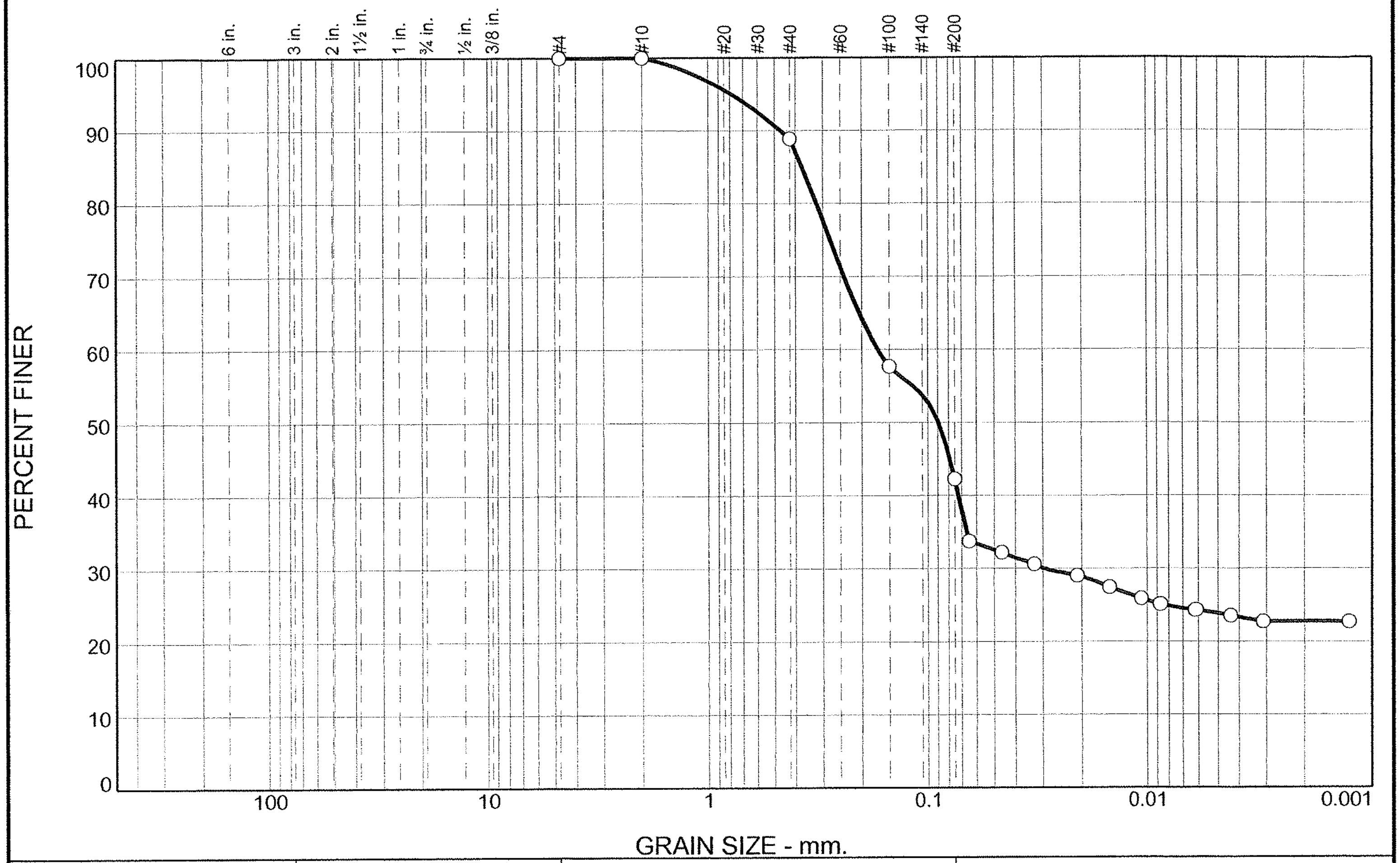
Date: 12/9/11

AECOM

Client: IPR-GDF SUEZ
Project: COLETO CREEK

Project No: 60225561 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	11.1	46.6	18.4	23.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#40	88.9		
#100	57.7		
#200	42.3		

* (no specification provided)

Material Description

CLAYEY FINE TO MEDIUM SAND, GRAYISH BROWN

Atterberg Limits

PL= 13 LL= 41 PI= 28

Coefficients

D_{90}= 0.4679 D_{85}= 0.3722 D_{60}= 0.1697
D_{50}= 0.0893 D_{30}= 0.0293 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-7-6(6)

Remarks

Source of Sample: B-2-1 **Depth:** 18'-20'
Sample Number: B-2-1 S-10

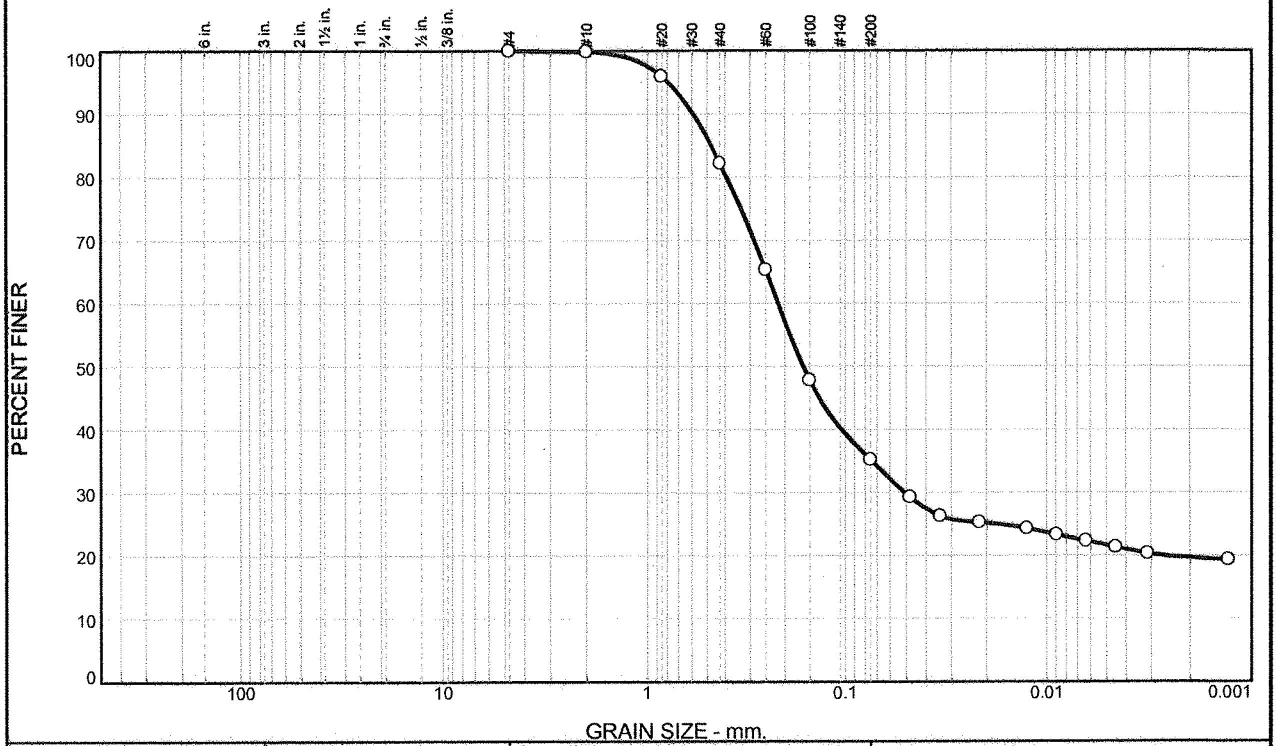
Date: 12/9/11

AECOM

Client: IPR-GDF SUEZ
Project: COLETO CREEK

Project No: 60225561 **Figure**

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	17.7	47.0	13.6	21.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	96.0		
#40	82.2		
#60	65.3		
#100	47.8		
#200	35.2		

* (no specification provided)

Material Description

Clayey F-M Sand Little Silt - Brownish Gray

Atterberg Limits

PL= 18　LL= 42　PI= 24

Coefficients

D_{90}= 0.5889　D_{85}= 0.4733　D_{60}= 0.2159
D_{50}= 0.1616　D_{30}= 0.0509　D_{15}=
D_{10}=　C_u=　C_c=

Classification

USCS= SC　AASHTO= A-2-7(3)

Remarks

Source of Sample: Boring 2-1　**Depth:** 26.0-28.0
Sample Number: S-14

Date: 12/7/2011

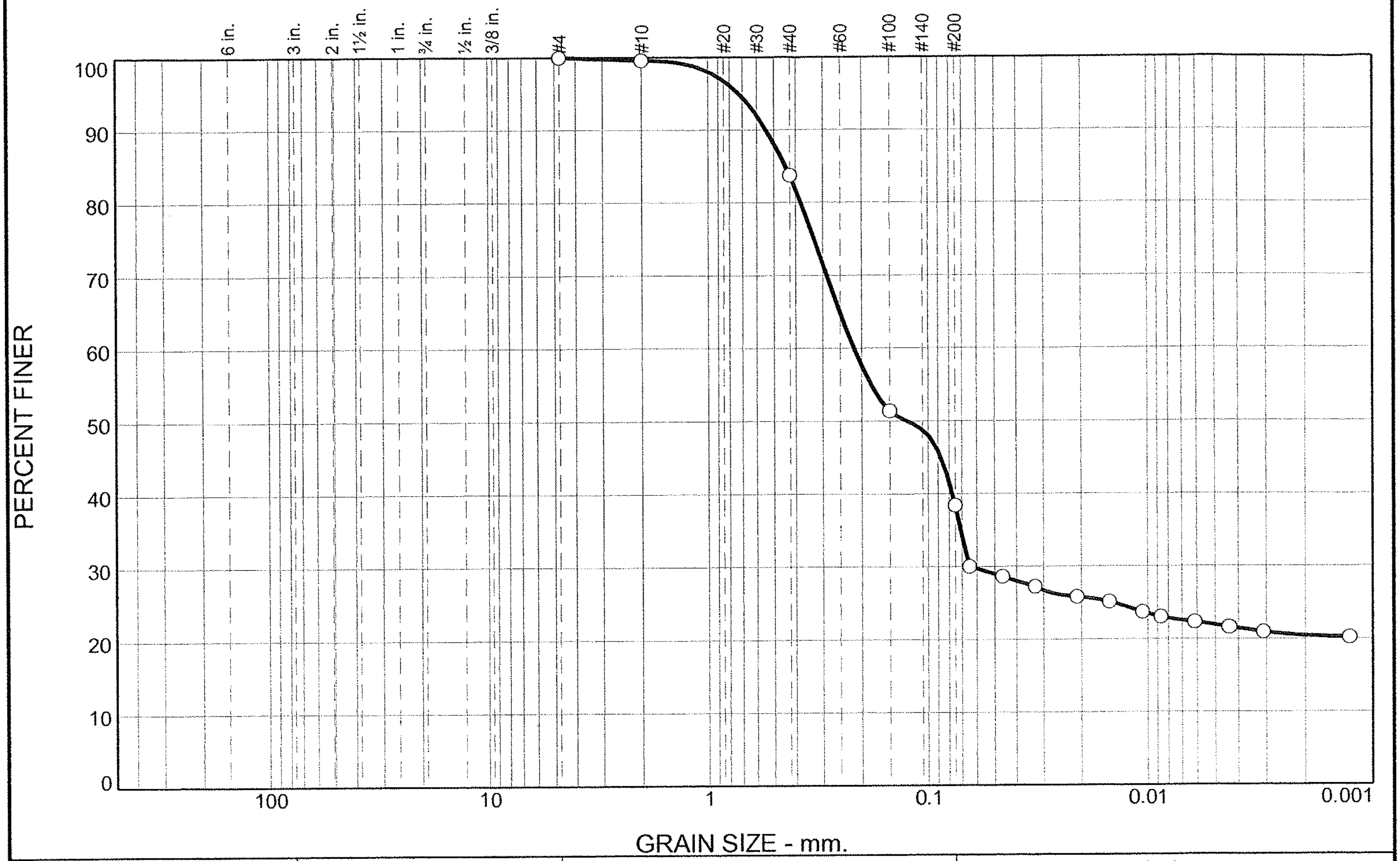
AECOM

Client: IPR-GDP Suez
Project: Coleto Creek Facility

Project No: 60225561

Tested By: BCM　**Checked By:** WPQ

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.4	15.8	45.4	16.4	22.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.6		
#40	83.8		
#100	51.4		
#200	38.4		

* (no specification provided)

Material Description

CLAYEY FINE TO MEDIUM SAND, GRAY

Atterberg Limits

PL= 14 LL= 29 PI= 15

Coefficients

D_{90}= 0.5414 D_{85}= 0.4433 D_{60}= 0.2165
D_{50}= 0.1251 D_{30}= 0.0637 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-6(2)

Remarks

Source of Sample: B-2-1 **Depth:** 32'-34'
Sample Number: B-2-1 S-17

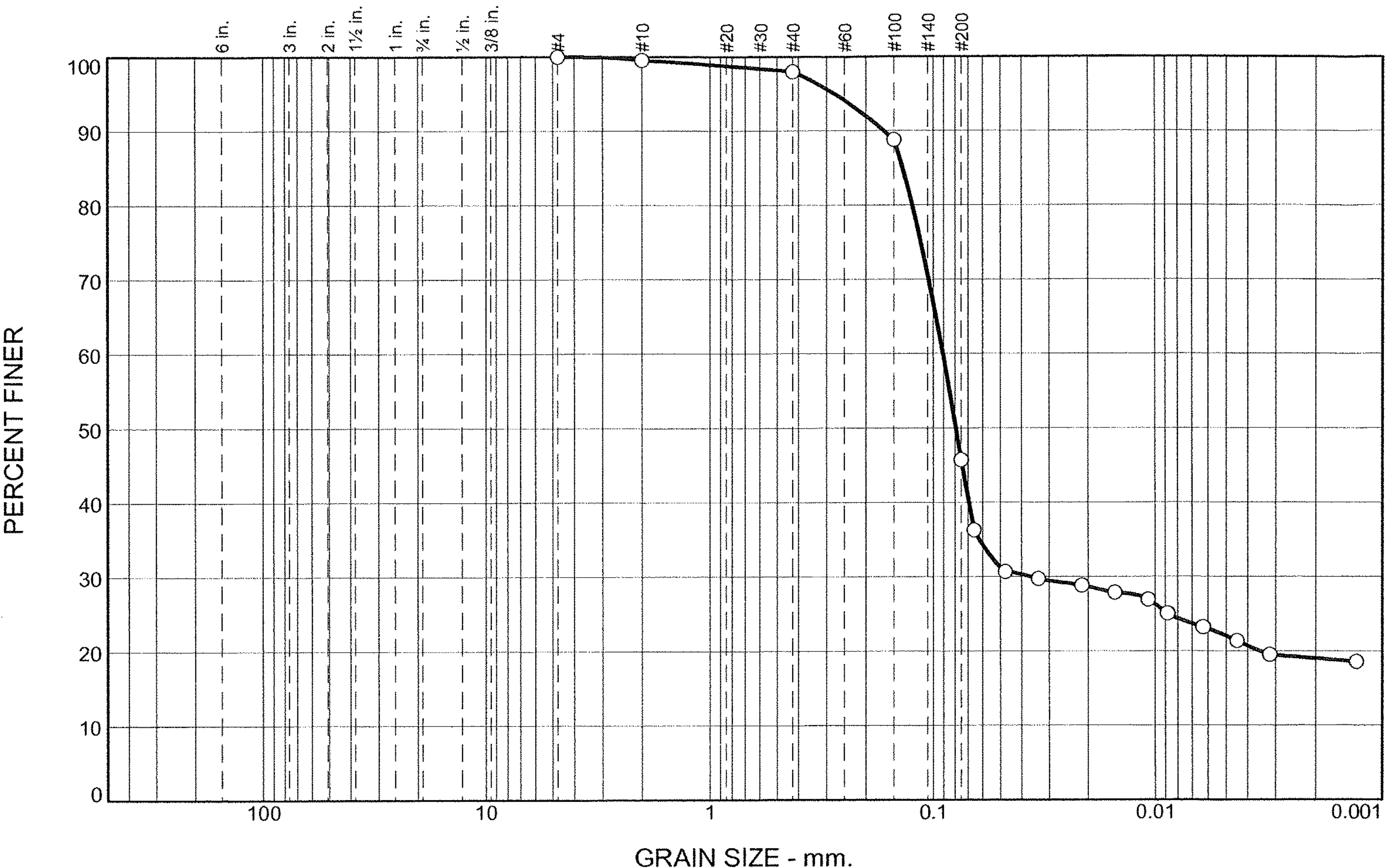
Date: 12/9/11

AECOM

Client: IPR-GDF SUEZ
Project: COLETO CREEK

Project No: 60225561 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.5	1.5	52.3	23.7	22.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.5		
#40	98.0		
#100	88.8		
#200	45.7		

* (no specification provided)

Material Description

CLAYEY FINE SAND, LIGHT GRAY

Atterberg Limits

PL= 17　LL= 28　PI= 11

Coefficients

D_{90}= 0.1663	D_{85}= 0.1371	D_{60}= 0.0906
D_{50}= 0.0793	D_{30}= 0.0362	D_{15}=
D_{10}=	C_u=	C_c=

Classification

USCS= SC　AASHTO= A-6(2)

Remarks

Source of Sample: B-2-1　**Depth:** 55.0'-56.6'
Sample Number: B-2-1 S-27

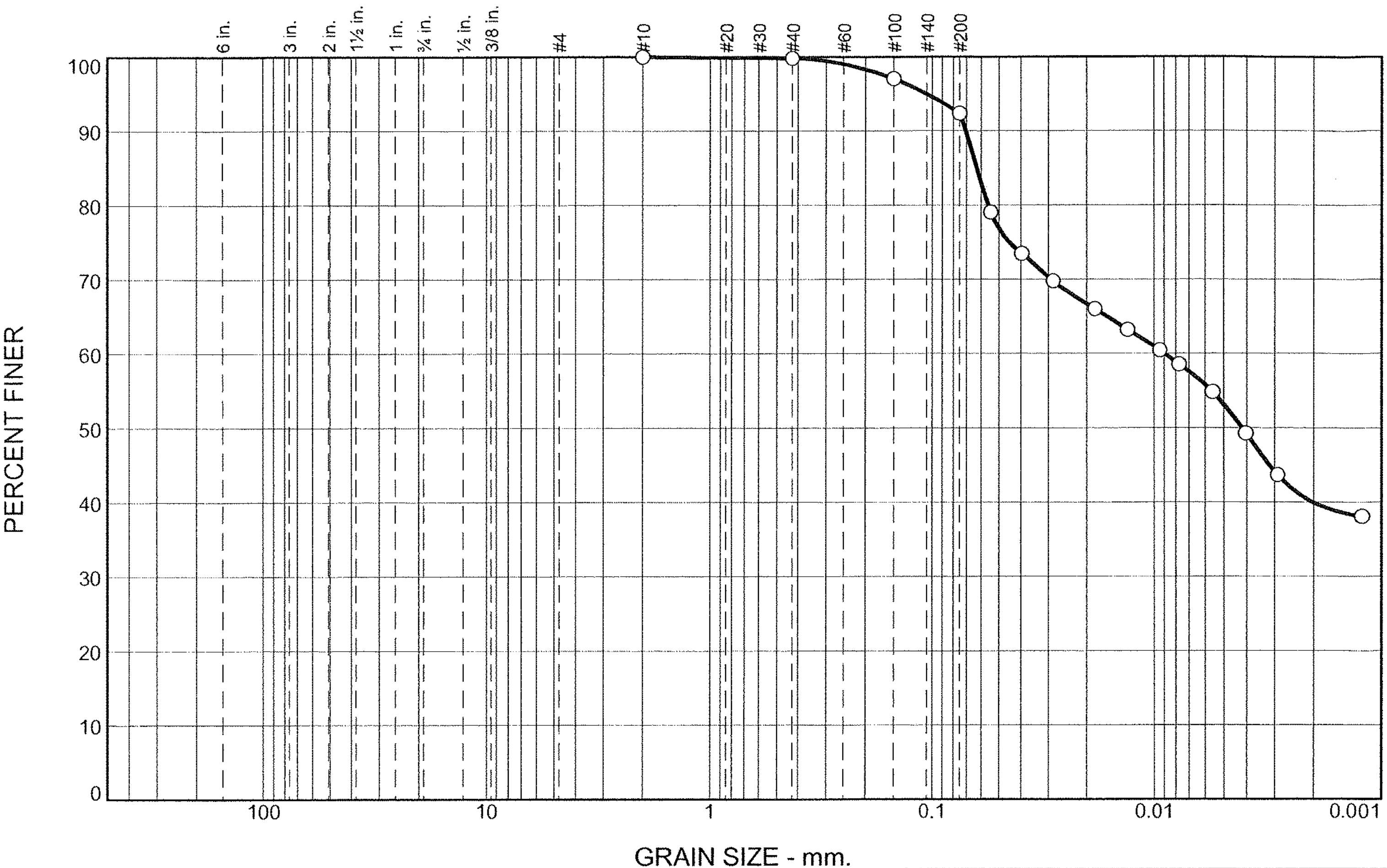
Date: 12/15/11

AECOM

Client: IPR-GDF SUEZ
Project: COLETO CREEK

Project No: 60225561　**Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	7.4	39.2	53.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.8		
#100	97.0		
#200	92.4		

* (no specification provided)

Material Description

SILTY CLAY, TRACE SAND, LIGHT GRAYISH BROWN

Atterberg Limits

PL= 25 LL= 59 PI= 34

Coefficients

D_{90}= 0.0705 D_{85}= 0.0630 D_{60}= 0.0090
D_{50}= 0.0042 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(35)

Remarks

Source of Sample: B-2-1 **Depth:** 85.0'-86.5'
Sample Number: B-2-1 S-33

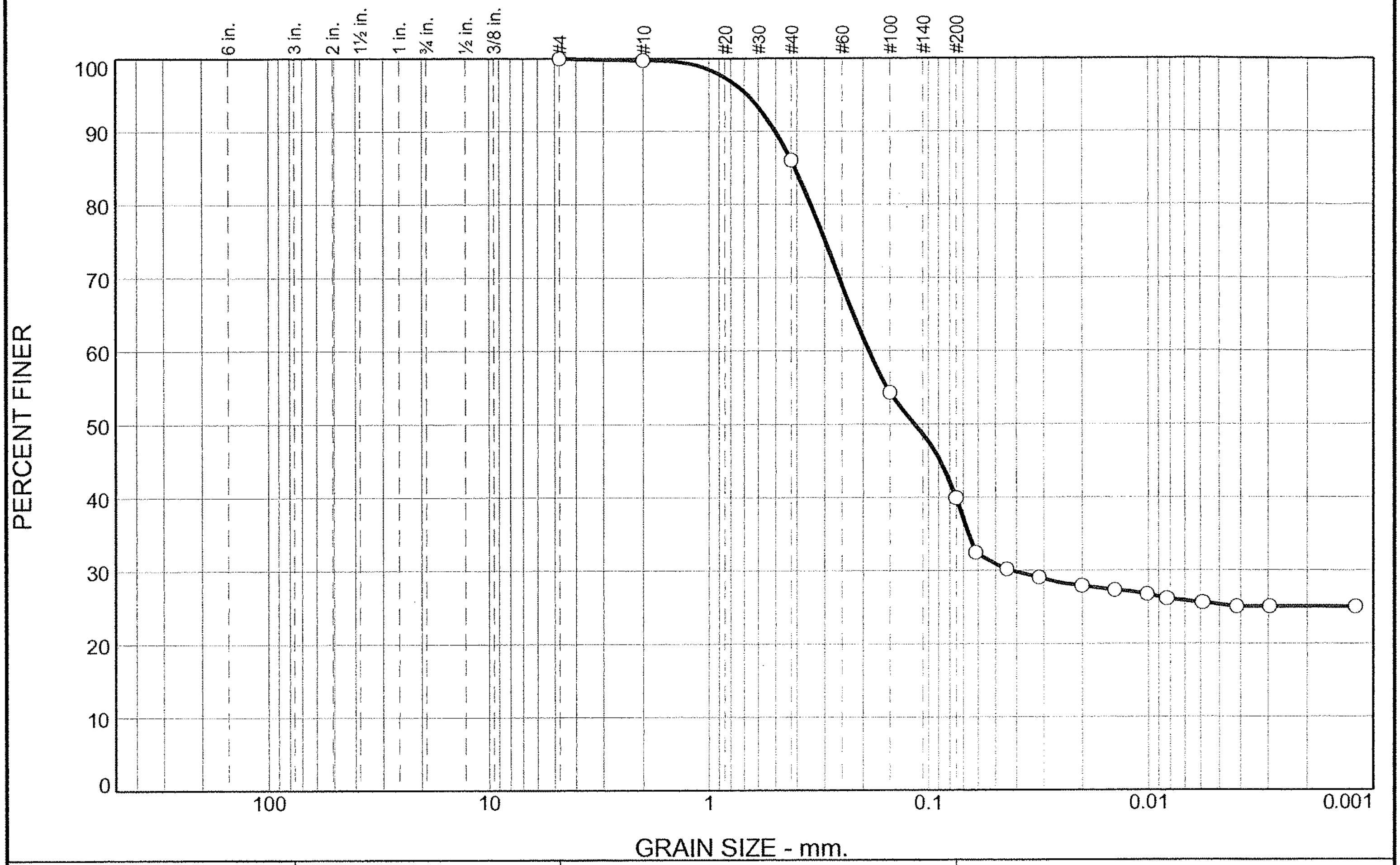
Date: 12/15/11

AECOM

Client: IPR-GDF SUEZ
Project: COLETO CREEK

Project No: 60225561 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	13.6	46.1	14.6	25.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#40	86.1		
#100	54.4		
#200	40.0		

* (no specification provided)

Material Description

CLAYEY FINE TO MEDIUM SAND, GRAY

Atterberg Limits

PL= 15 LL= 44 PI= 29

Coefficients

D_{90}= 0.5011 D_{85}= 0.4085 D_{60}= 0.1882
D_{50}= 0.1152 D_{30}= 0.0416 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-7-6(6)

Remarks

Source of Sample: B-3-1 **Depth:** 16.0'-17.8'
Sample Number: B-3-1 S-9

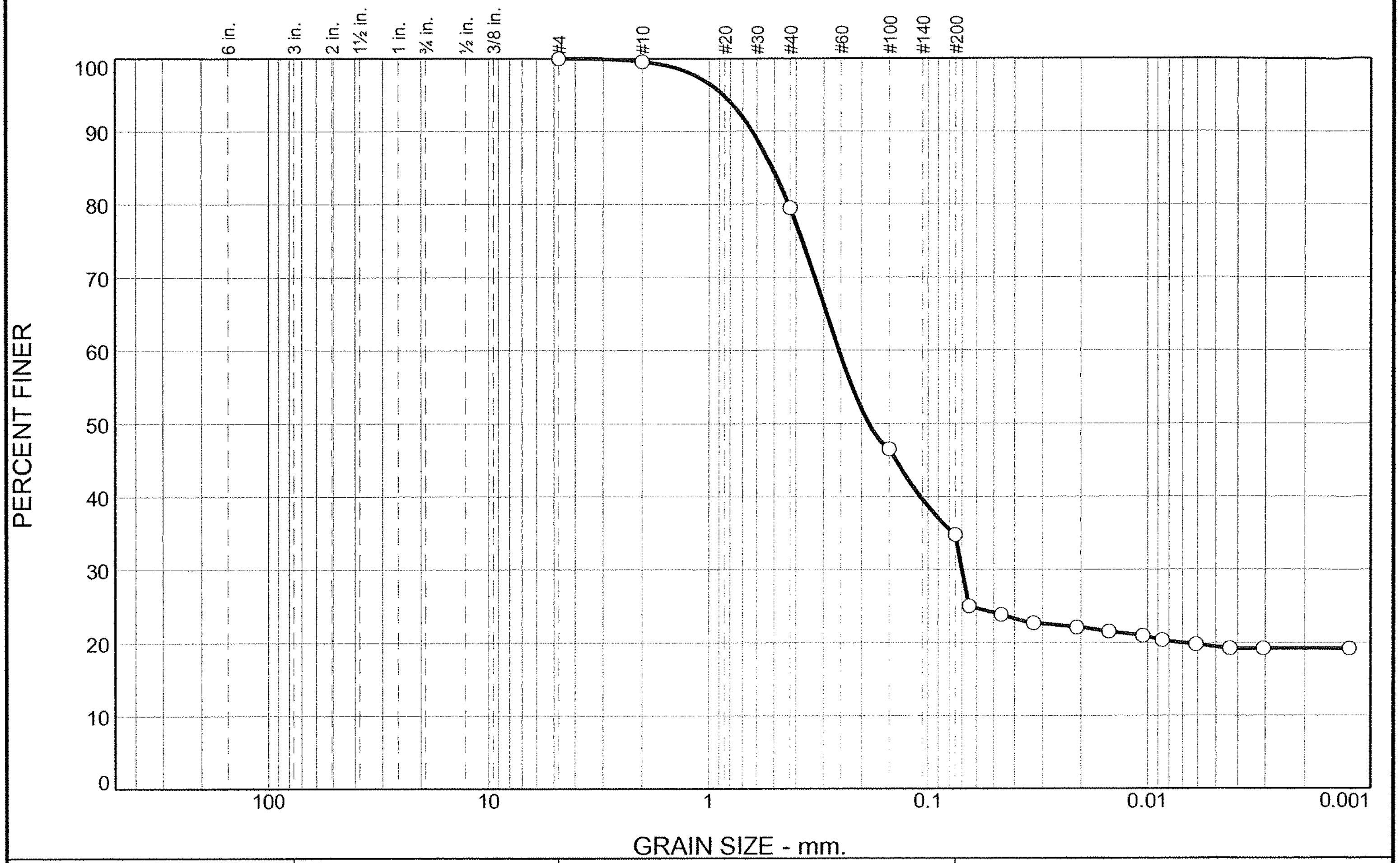
Date: 12/9/11

AECOM

Client: IPR-GDF SUEZ
Project: COLETO CREEK

Project No: 60225561 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.4	20.1	44.7	15.4	19.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.6		
#40	79.5		
#100	46.5		
#200	34.8		

* (no specification provided)

Material Description

CLAYEY FINE TO MEDIUM SAND, DARK BROWN

Atterberg Limits

PL= 13 LL= 35 PI= 22

Coefficients

D_{90}= 0.6299 D_{85}= 0.5094 D_{60}= 0.2547
D_{50}= 0.1856 D_{30}= 0.0701 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-2-6(2)

Remarks

Source of Sample: B-3-1 **Depth:** 18'-20'
Sample Number: B-3-1 S-10

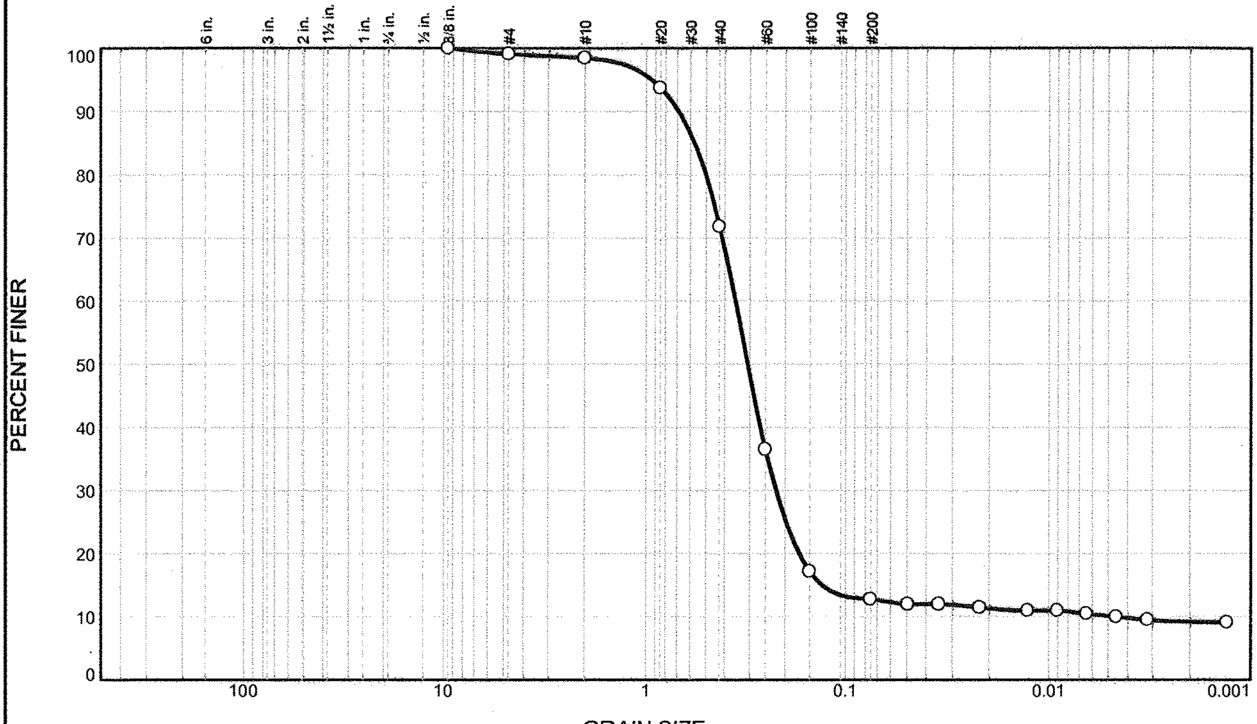
Date: 12/9/11

AECOM

Client: IPR-GDF SUEZ
Project: COLETO CREEK

Project No: 60225561 **Figure**

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.9	0.6	26.7	59.0	2.7	10.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.1		
#10	98.5		
#20	93.7		
#40	71.8		
#60	36.5		
#100	17.2		
#200	12.8		

* (no specification provided)

Material Description

F-M Sand Little Clay Trace Silt - Brownish Gray

Atterberg Limits

PL= 16 LL= 27 PI= 11

Coefficients

D_{90}= 0.6879 D_{85}= 0.5721 D_{60}= 0.3538
D_{50}= 0.3070 D_{30}= 0.2214 D_{15}= 0.1304
D_{10}= 0.0046 C_u= 76.58 C_c= 29.98

Classification

USCS= SC AASHTO= A-2-6(0)

Remarks

Source of Sample: Boring 4-1 **Depth:** 12.0-14.0
Sample Number: S-7

Date: 12/7/11

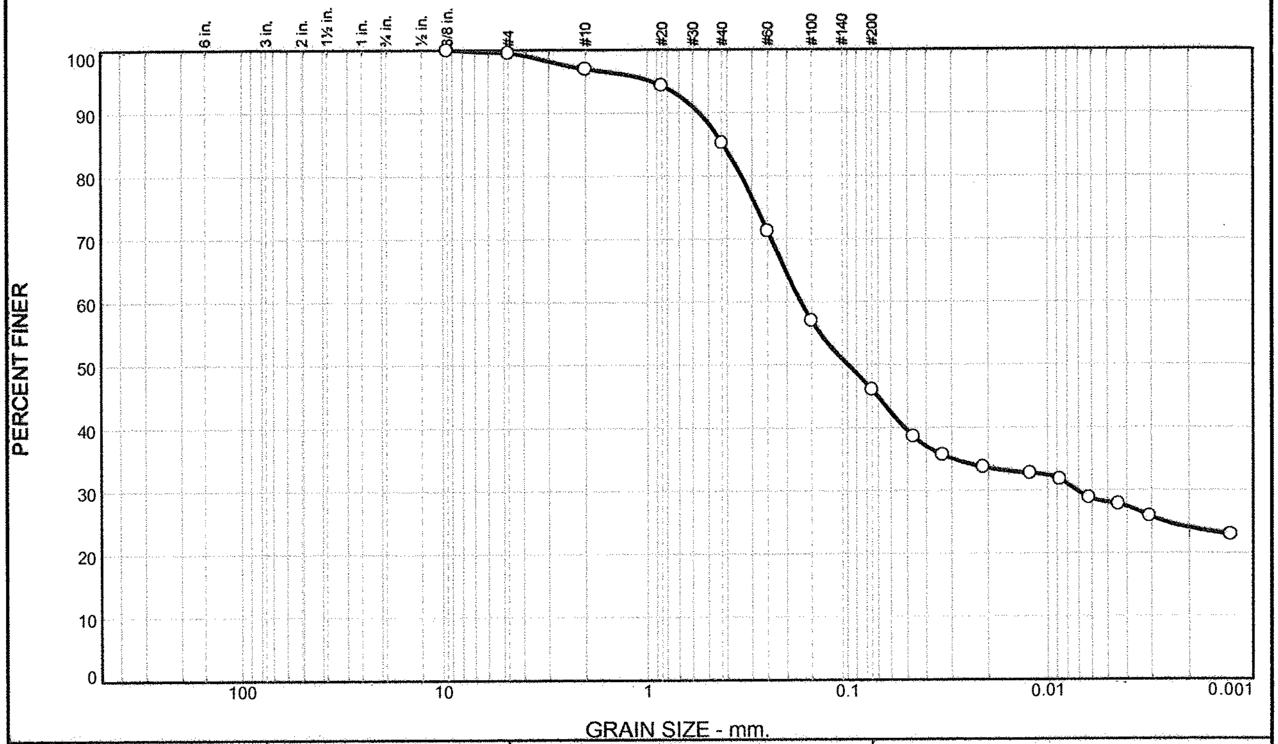
AECOM

Client: IPR-GDP Suez
Project: Coleto Creek Facility

Project No: 60225561

Tested By: BCM **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.4	2.6	11.8	39.2	17.9	28.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.6		
#10	97.0		
#20	94.3		
#40	85.2		
#60	71.3		
#100	57.0		
#200	46.0		

* (no specification provided)

Material Description

Clayey F-M Sand Little Silt - Brownish Gray

Atterberg Limits

PL= 16 LL= 40 PI= 24

Coefficients

D_{90}= 0.5576 D_{85}= 0.4206 D_{60}= 0.1695
D_{50}= 0.0994 D_{30}= 0.0071 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-6(7)

Remarks

Source of Sample: Boring 4-1 **Depth:** 24.0-26.0
Sample Number: S-13

Date: 12/7/11

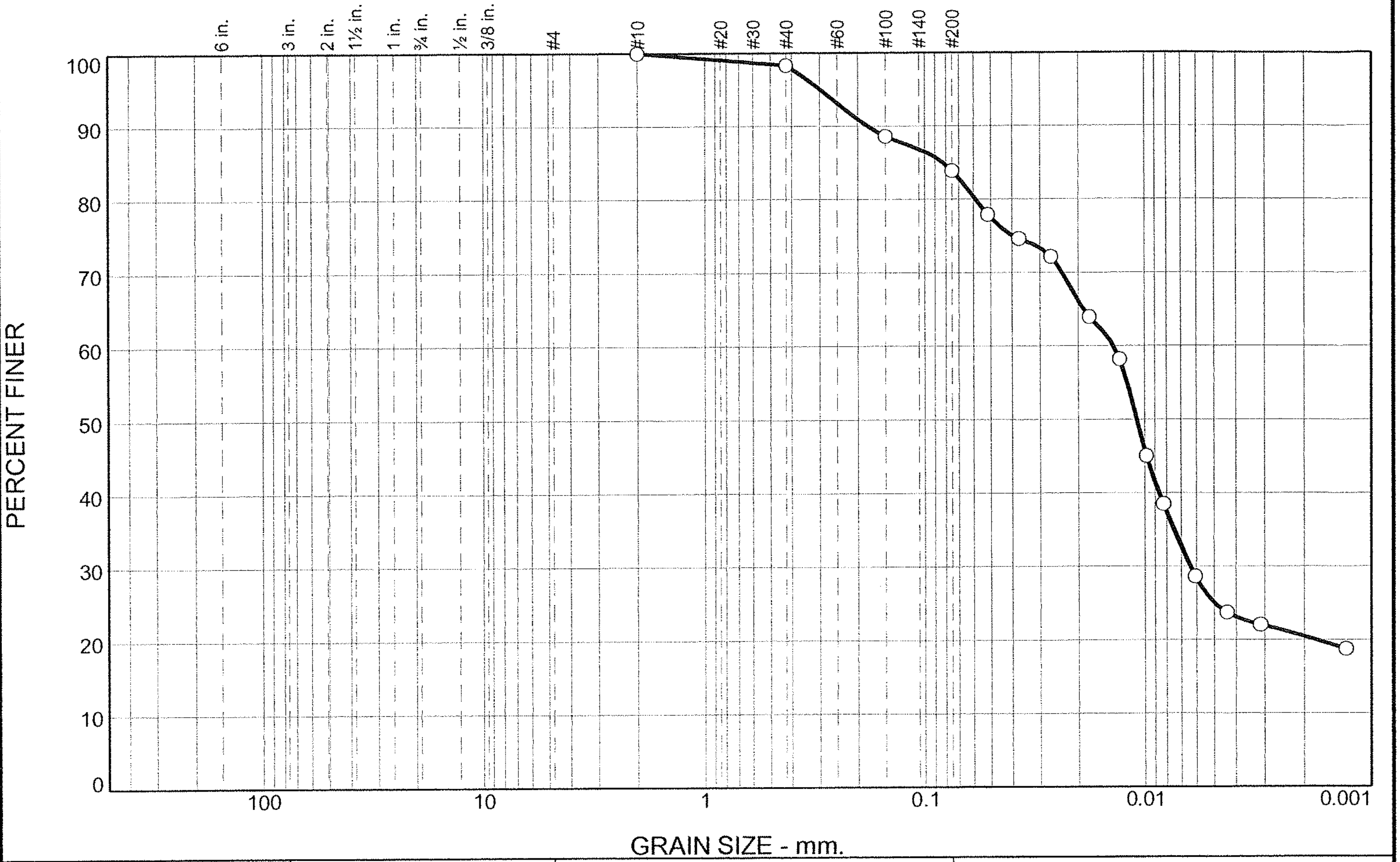
AECOM

Client: IPR-GDP Suez
Project: Coleto Creek Facility

Project No: 60225561

Tested By: BCM **Checked By:** WPQ

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.7	14.4	58.8	25.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	98.3		
#100	88.6		
#200	83.9		

* (no specification provided)

Material Description

SILTY CLAY, LITTLE FINE TO MEDIUM SAND, WHITE AND GRAY

Atterberg Limits

PL= 18 LL= 30 PI= 12

Coefficients

D_{90}= 0.1803 D_{85}= 0.0826 D_{60}= 0.0138
D_{50}= 0.0108 D_{30}= 0.0064 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(9)

Remarks

Source of Sample: B-5-1 **Depth:** 26'-27'
Sample Number: B-5-1 S-14

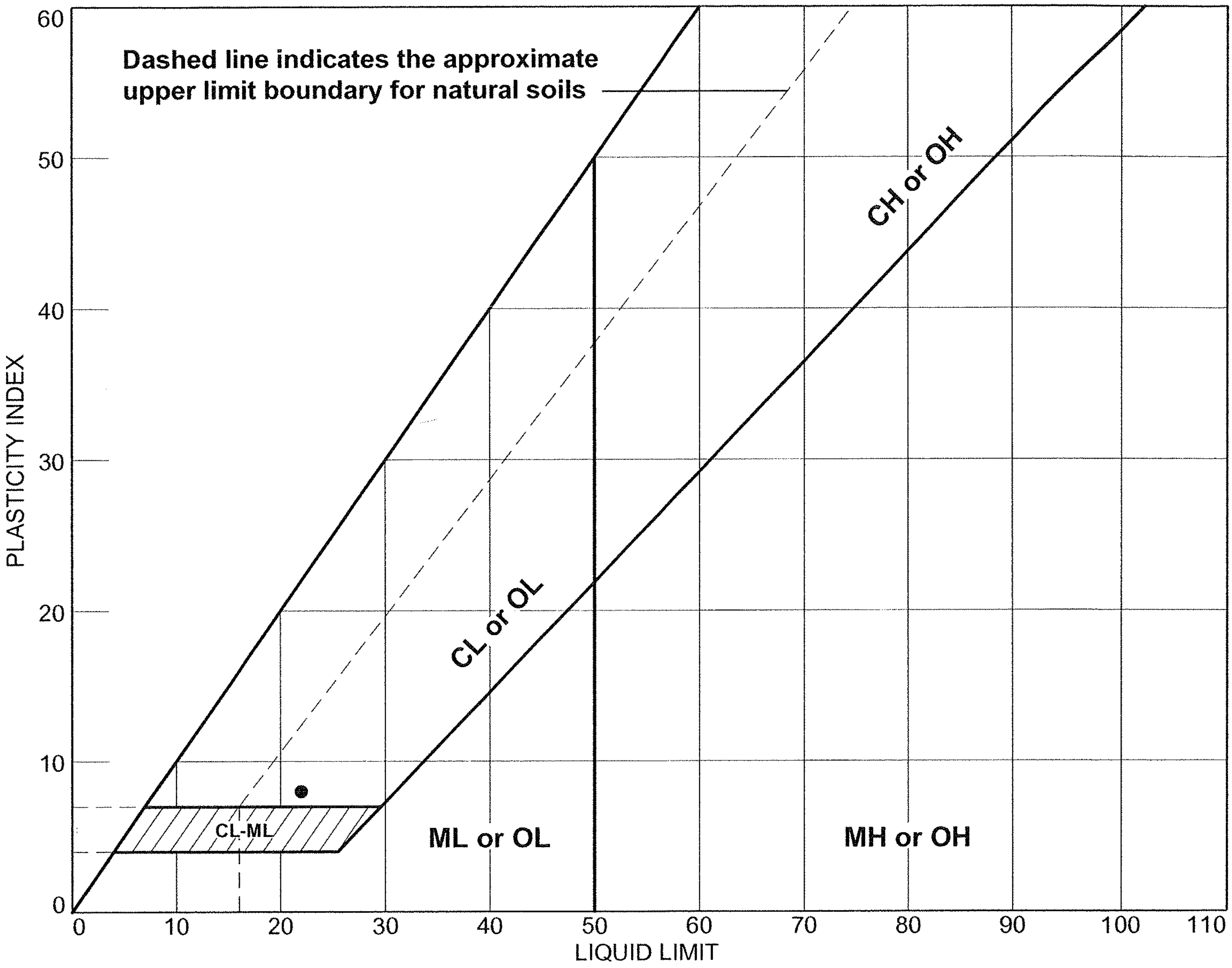
Date: 12/9/11

AECOM

Client: IPR-GDF SUEZ
Project: COLETO CREEK

Project No: 60225561 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-1-1	B-1-1 S-5	8'-10'		14	22	8	CL

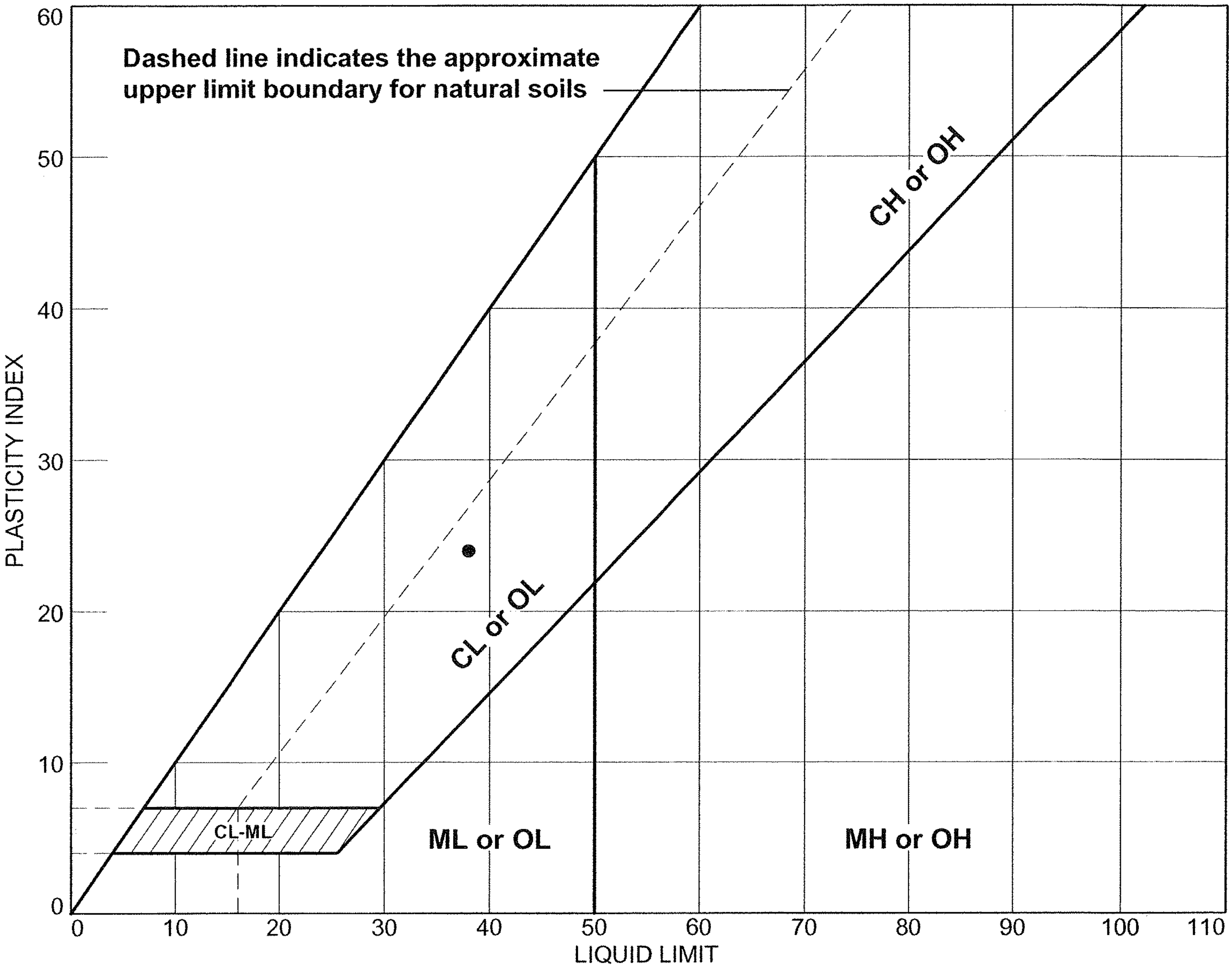
AECOM

Client: IPR-GDF SUEZ

Project: COLETO CREEK

Project No.: 60225561 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-1-1	B-1-1 S-11	20'-22'		14	38	24	SC

AECOM

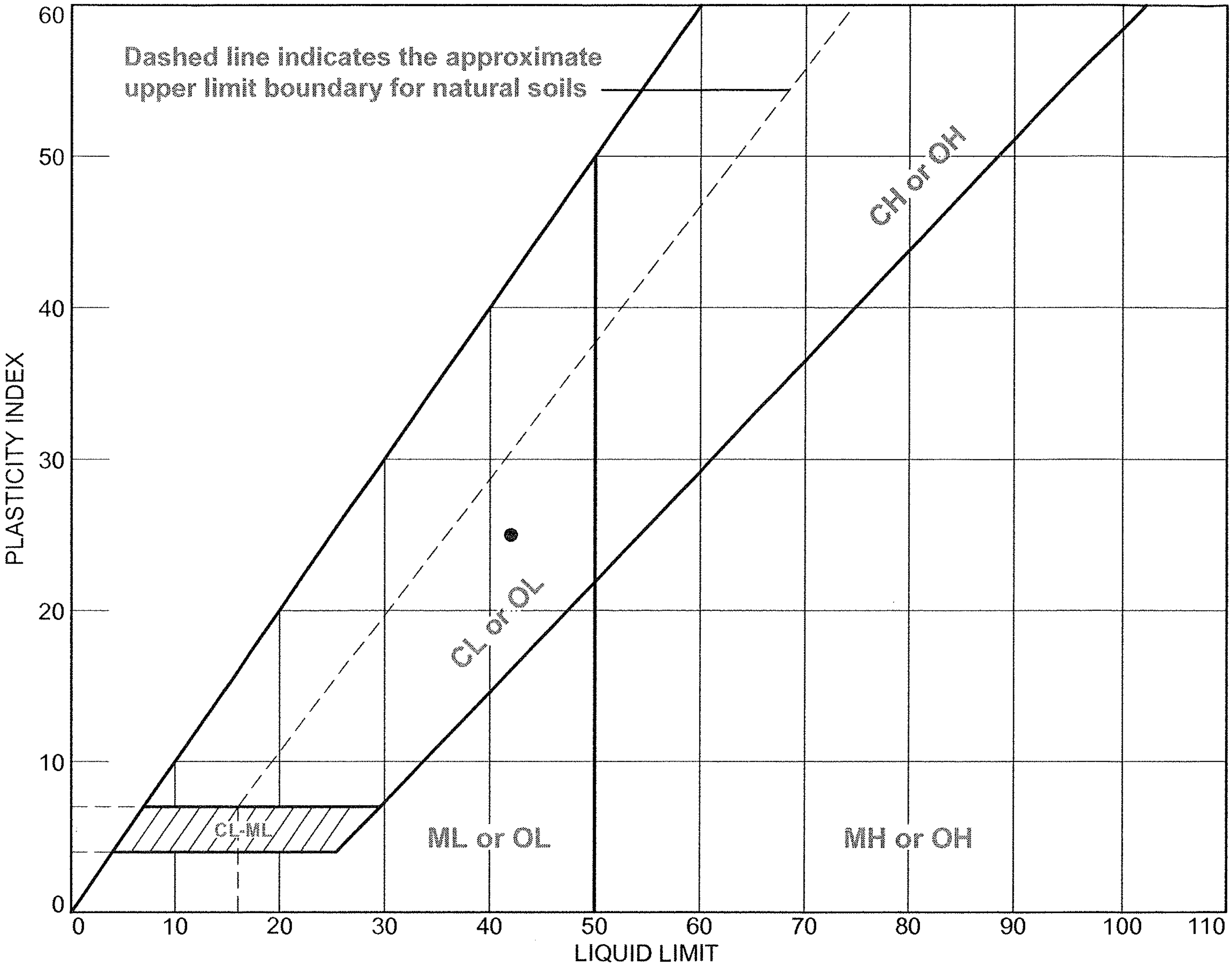
Client: IPR-GDF SUEZ

Project: COLETO CREEK

Project No.: 60225561

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-1-1	B-1-1 S-34	90'-90.4'		17	42	25	CL

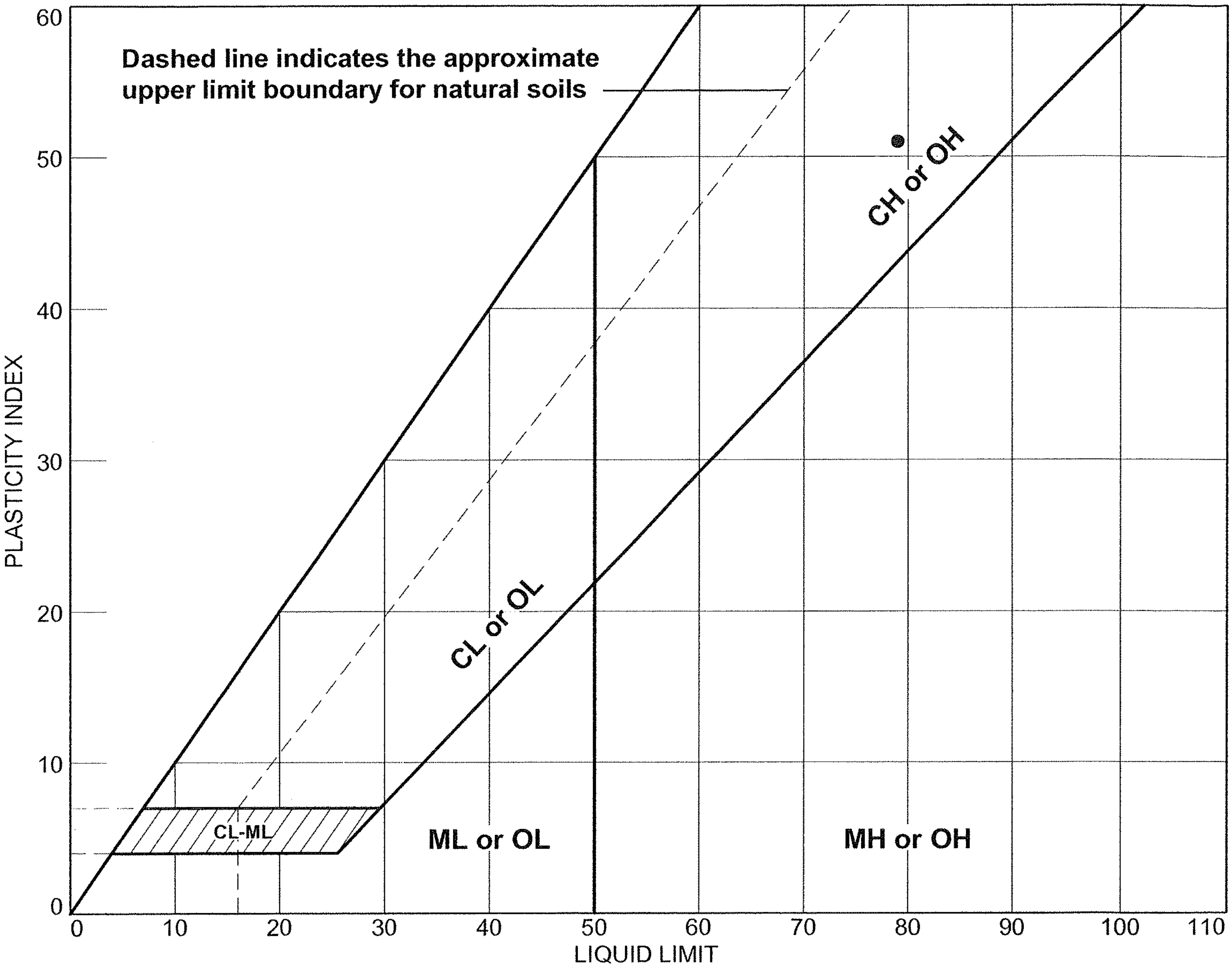
AECOM

Client: IPR-GDF SUEZ

Project: COLETO CREEK

Project No.: 60225561 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

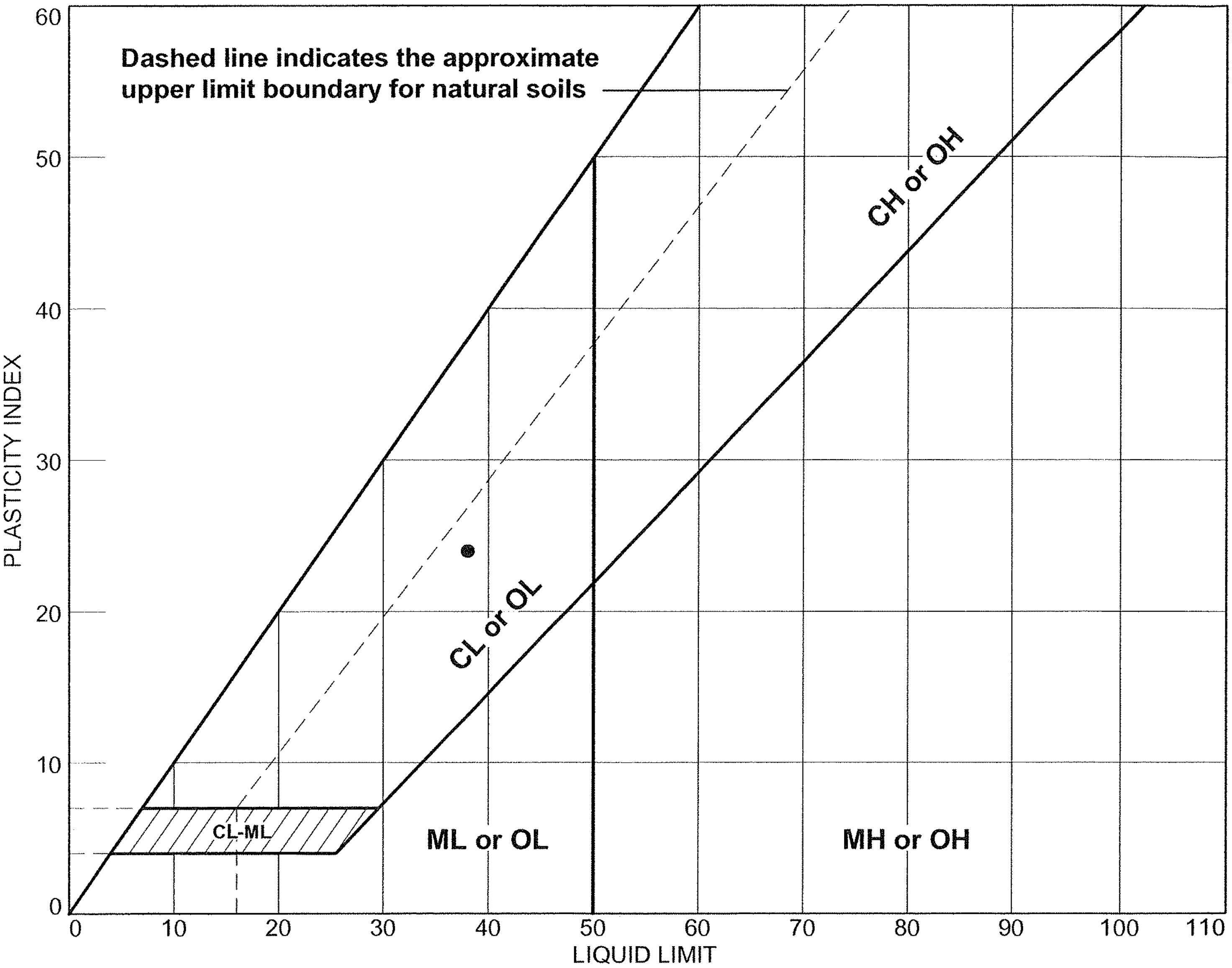
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-1-1	B-1-1 S-40	120'-121'		28	79	51	CH

AECOM

Client: IPR-GDF SUEZ
Project: COLETO CREEK

Project No.: 60225561 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

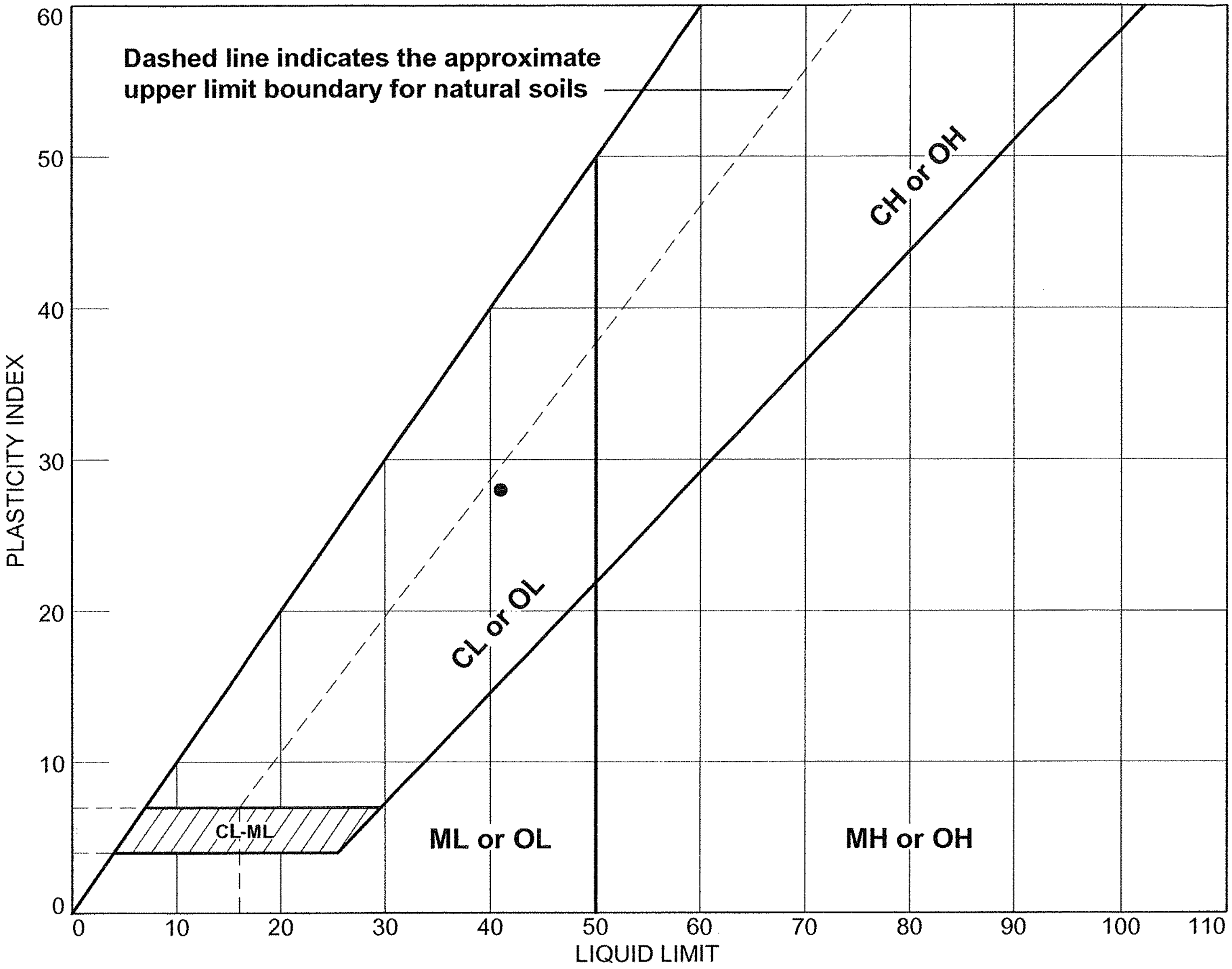
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-2-1	B-2-1 S-6	10'-12'		14	38	24	SC

AECOM

Client: IPR-GDF SUEZ
Project: COLETO CREEK

Project No.: 60225561 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-2-1	B-2-1 S-10	18'-20'		13	41	28	SC

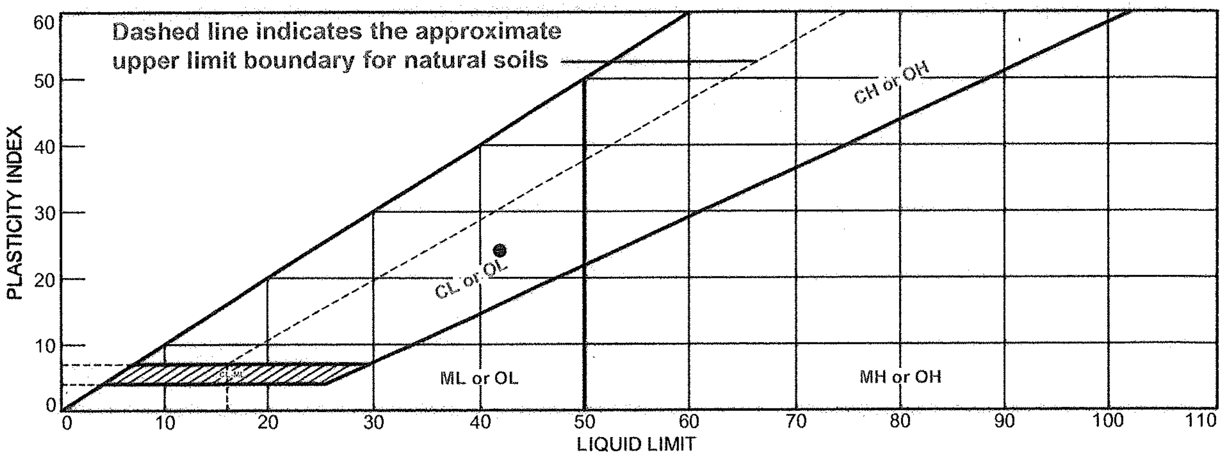
AECOM

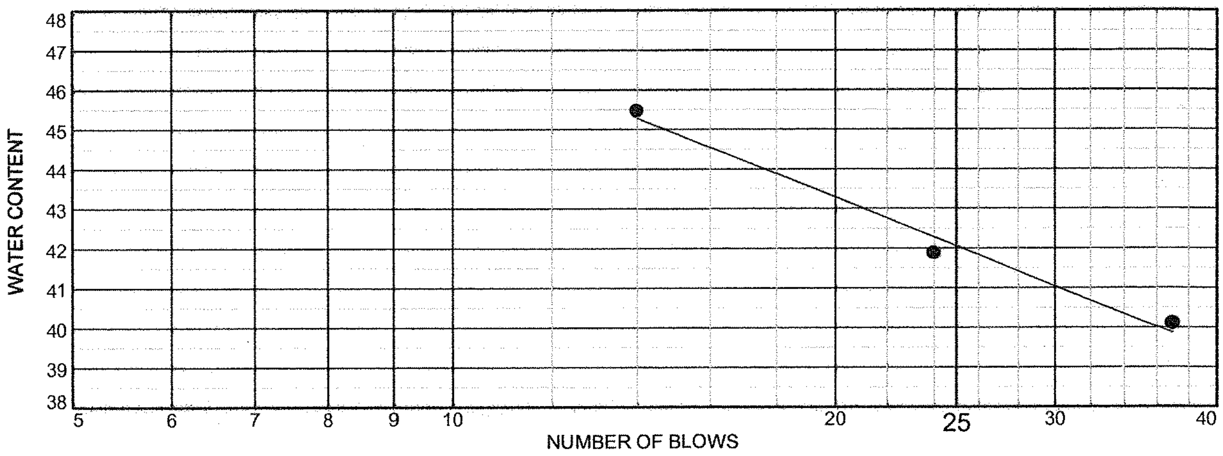
Client: IPR-GDF SUEZ

Project: COLETO CREEK

Project No.: 60225561 **Figure**

LIQUID AND PLASTIC LIMITS TEST ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clayey F-M Sand Little Silt - Brownish Gray	42	18	24	82.2	35.2	SC

Project No. 60225561 **Client:** IPR-GDP Suez

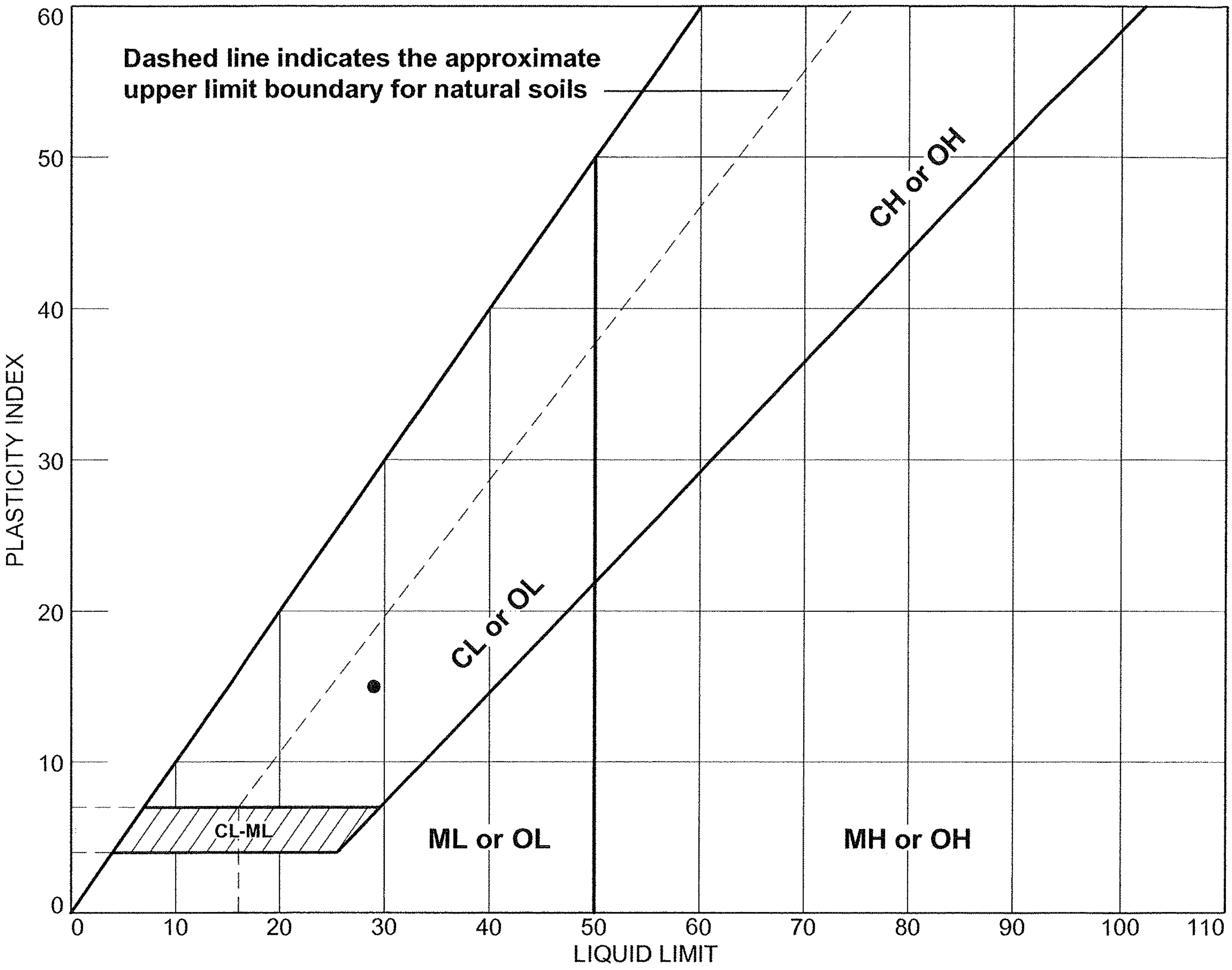
Project: Coleto Creek Facility

●**Source of Sample:** Boring 2-1 **Depth:** 26.0-28.0 **Sample Number:** S-14

Remarks:

AECOM

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

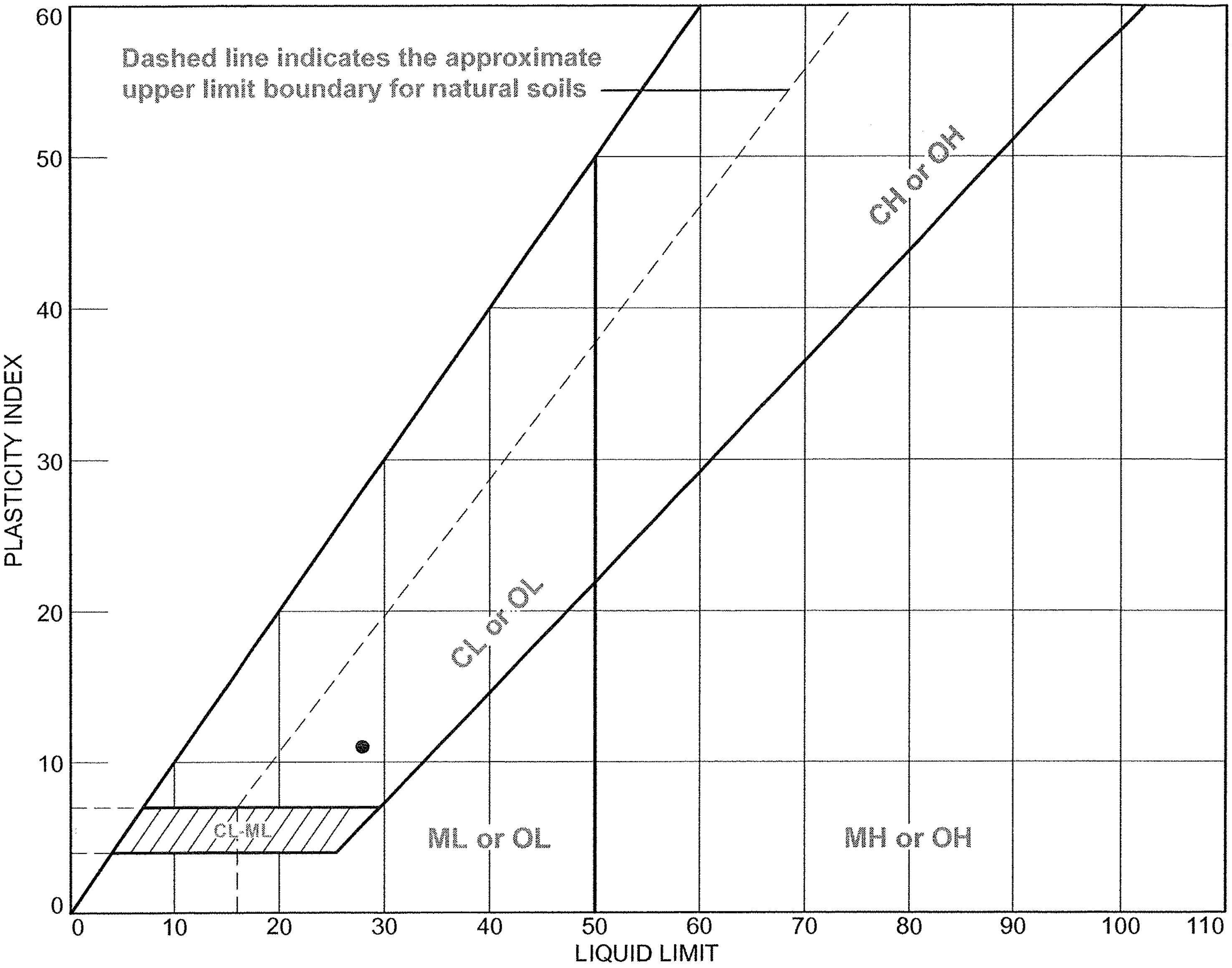
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-2-1	B-2-1 S-17	32'-34'		14	29	15	SC

AECOM

Client: IPR-GDF SUEZ
Project: COLETO CREEK

Project No.: 60225561 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

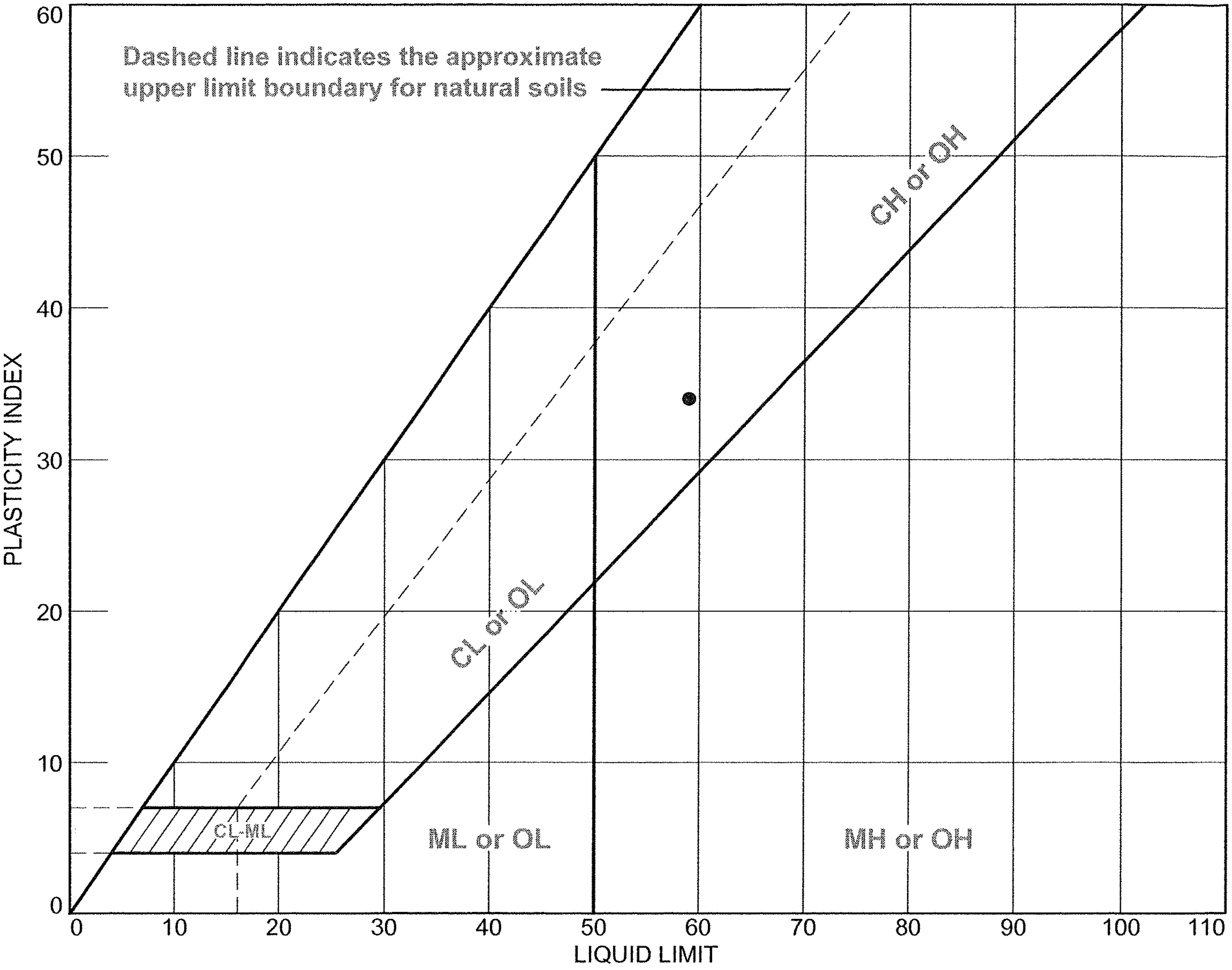
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-2-1	B-2-1 S-27	55.0'-56.6'		17	28	11	SC

AECOM

Client: IPR-GDF SUEZ
Project: COLETO CREEK

Project No.: 60225561 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-2-1	B-2-1 S-33	85.0'-86.5'		25	59	34	CH

AECOM

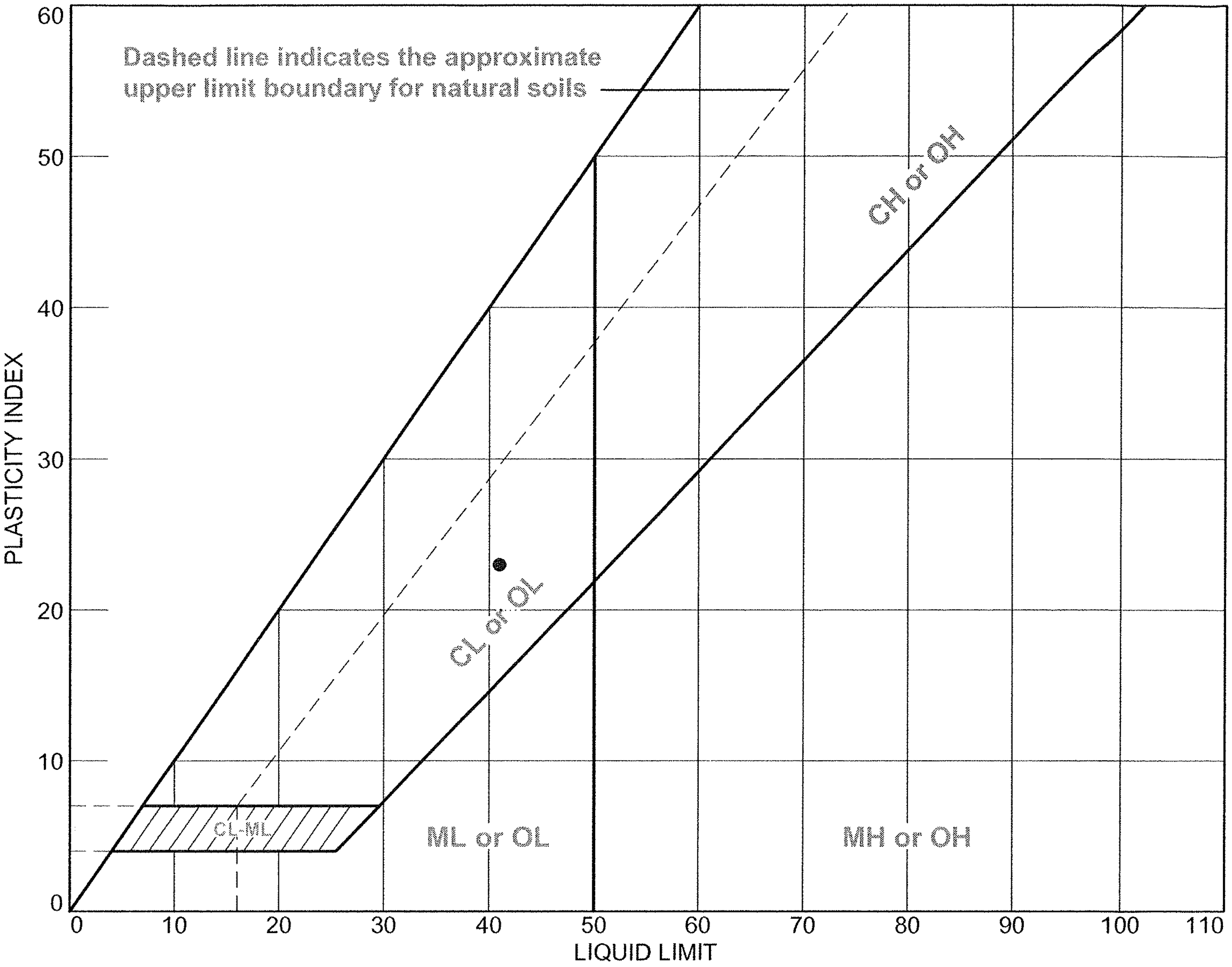
Client: IPR-GDF SUEZ

Project: COLETO CREEK

Project No.: 60225561

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

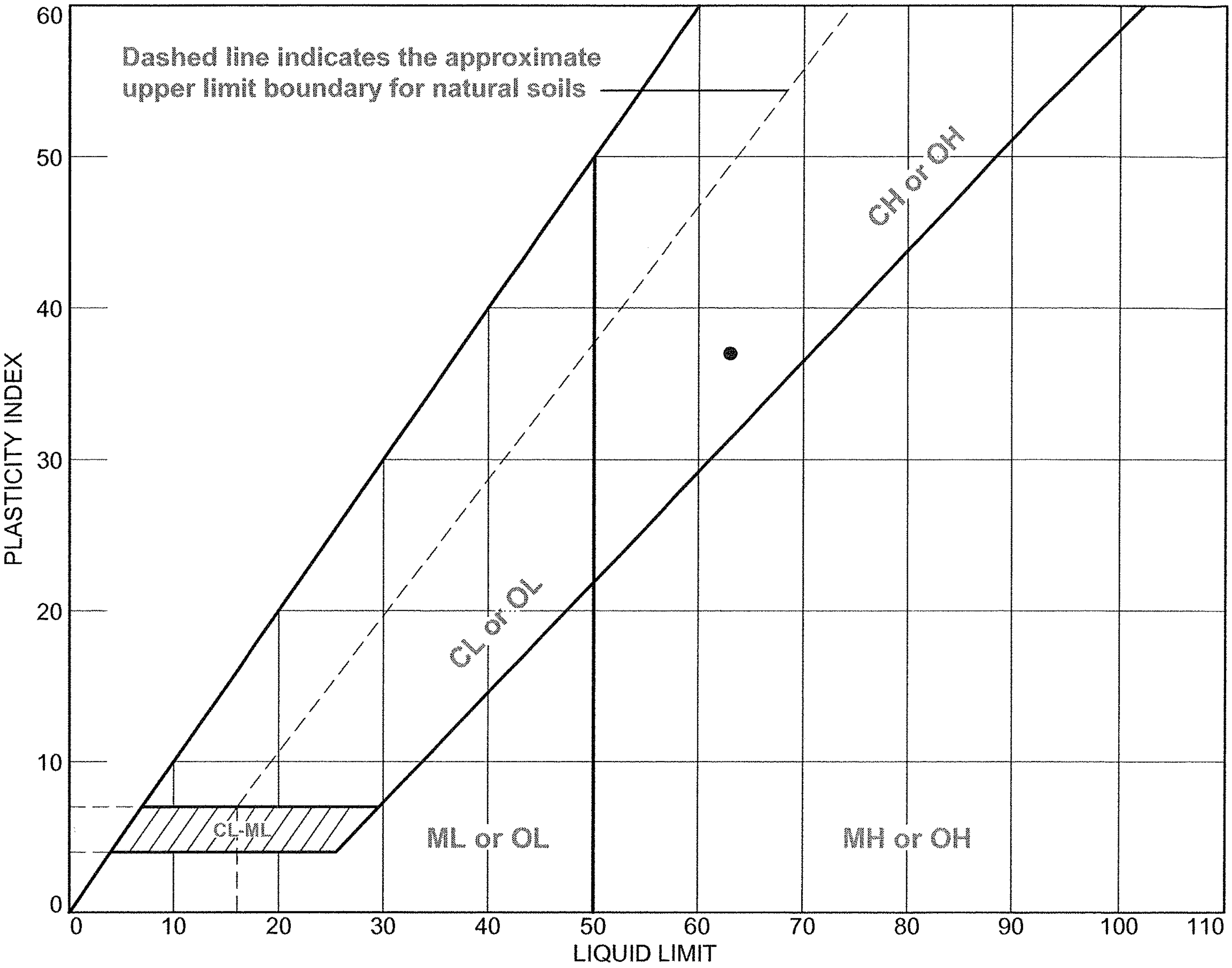
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-2-2	B-2-2 S-16	59.0'-60.5'		18	41	23	CL

AECOM

Client: IPR-GDF SUEZ
Project: COLETO CREEK

Project No.: 60225561 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-2-2	B-2-2 S-18	69.0'-70.5'		26	63	37	CH

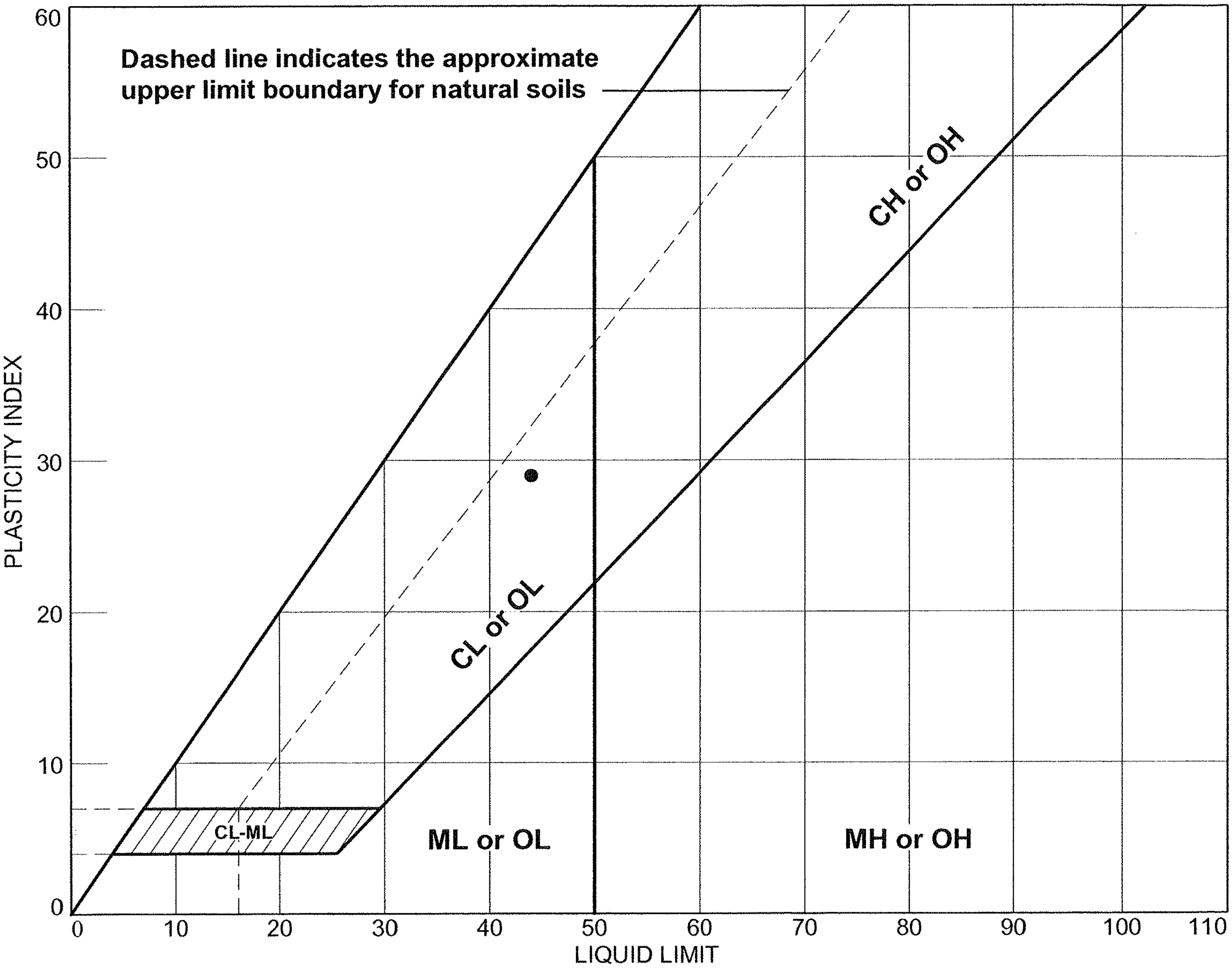
AECOM

Client: IPR-GDF SUEZ

Project: COLETO CREEK

Project No.: 60225561 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-3-1	B-3-1 S-9	16.0'-17.8'		15	44	29	SC

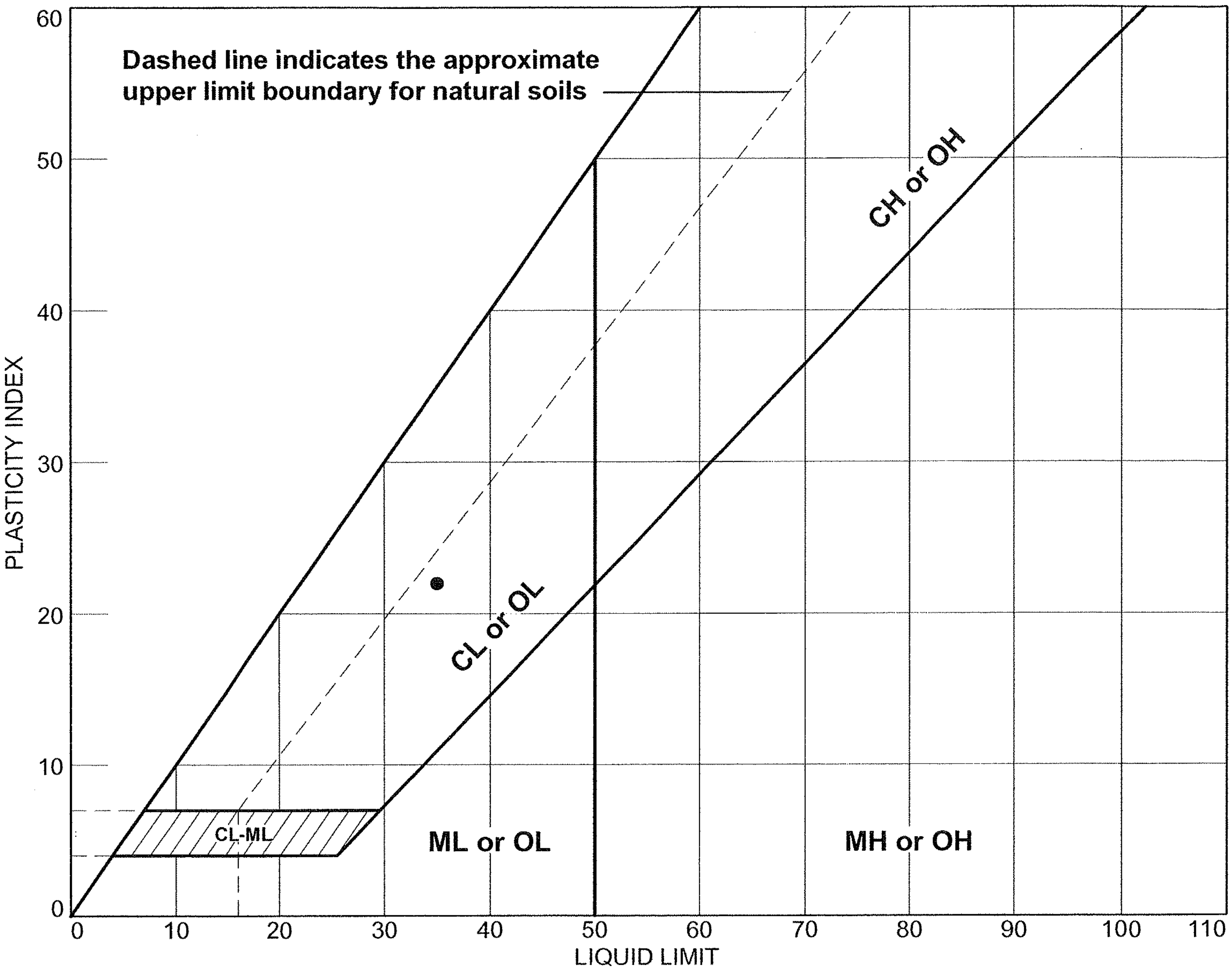
AECOM

Client: IPR-GDF SUEZ

Project: COLETO CREEK

Project No.: 60225561 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-3-1	B-3-1 S-10	18'-20'		13	35	22	SC

AECOM

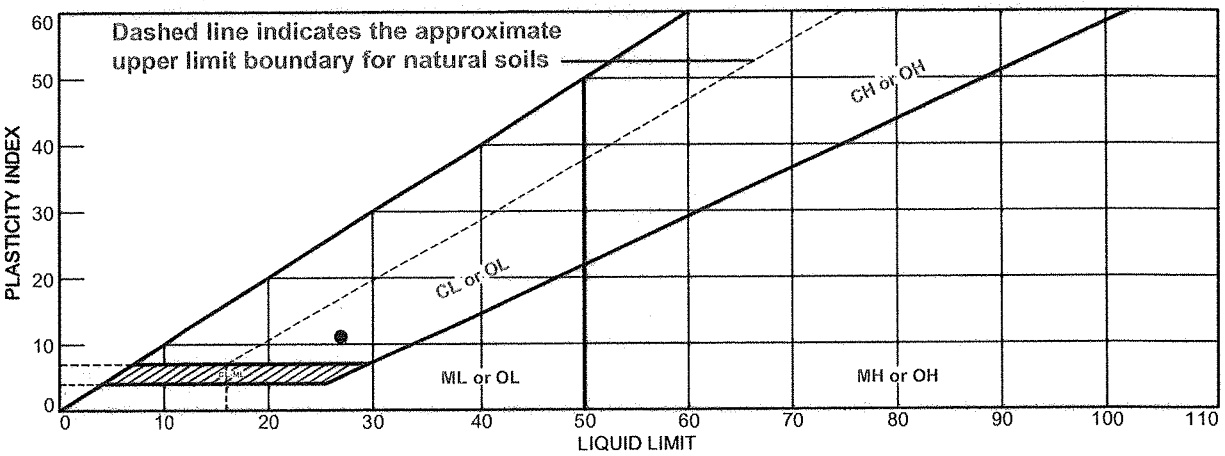
Client: IPR-GDF SUEZ

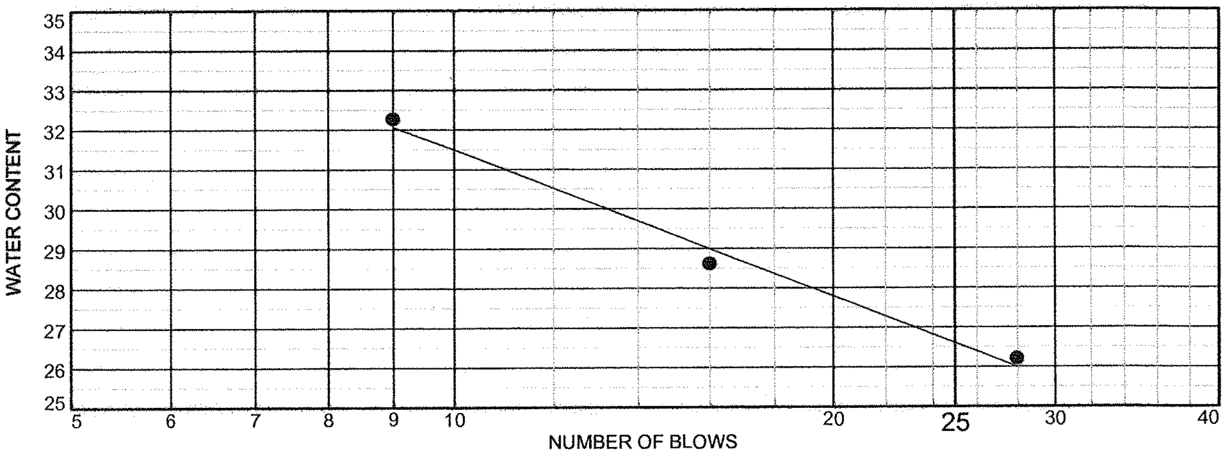
Project: COLETO CREEK

Project No.: 60225561

Figure

LIQUID AND PLASTIC LIMITS TEST ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	F-M Sand Little Clay Trace Silt - Brownish Gray	27	16	11	71.8	12.8	SC

Project No. 60225561 **Client:** IPR-GDP Suez

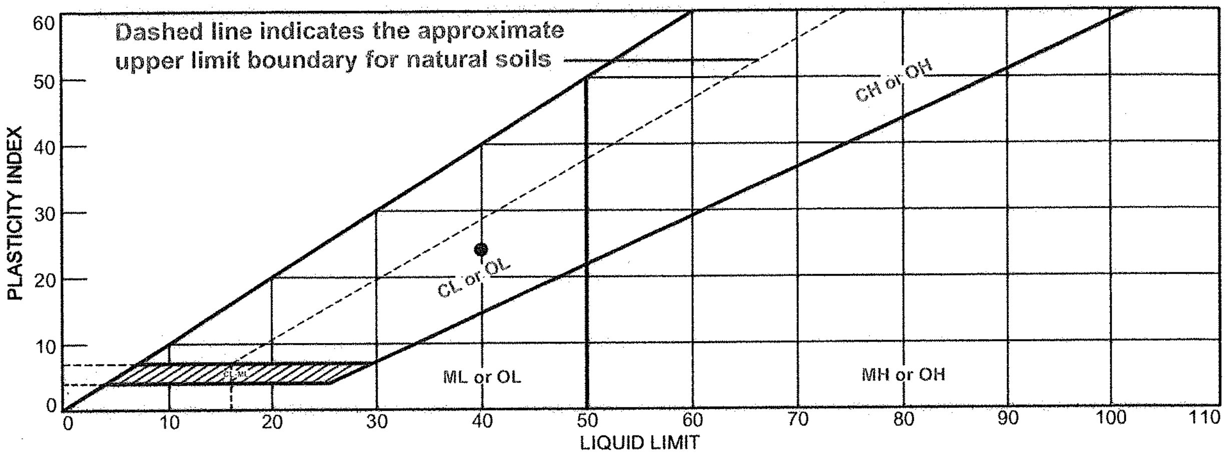
Project: Coleto Creek Facility

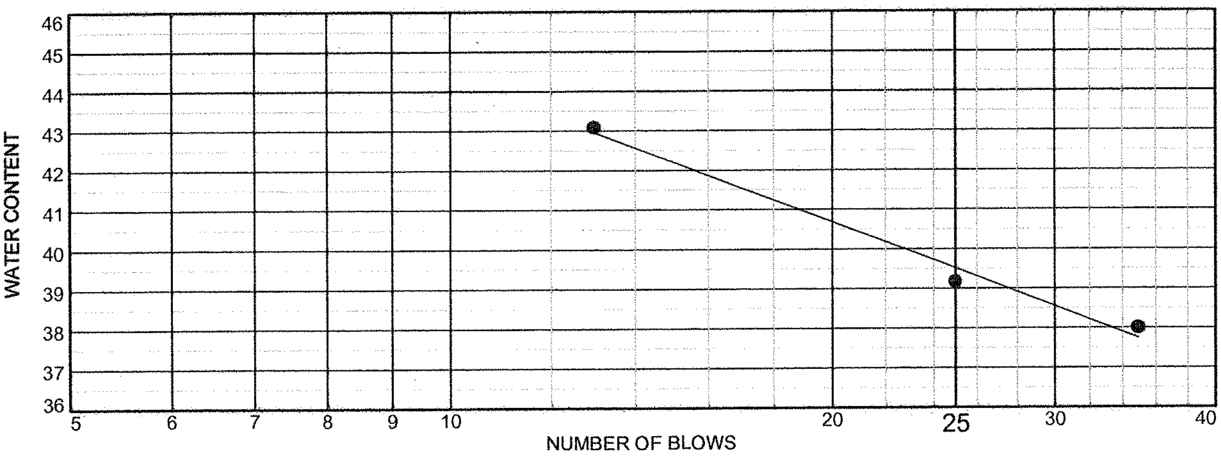
●**Source of Sample:** Boring 4-1 **Depth:** 12.0-14.0 **Sample Number:** S-7

Remarks:

AECOM

LIQUID AND PLASTIC LIMITS TEST ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clayey F-M Sand Little Silt - Brownish Gray	40	16	24	85.2	46.0	SC

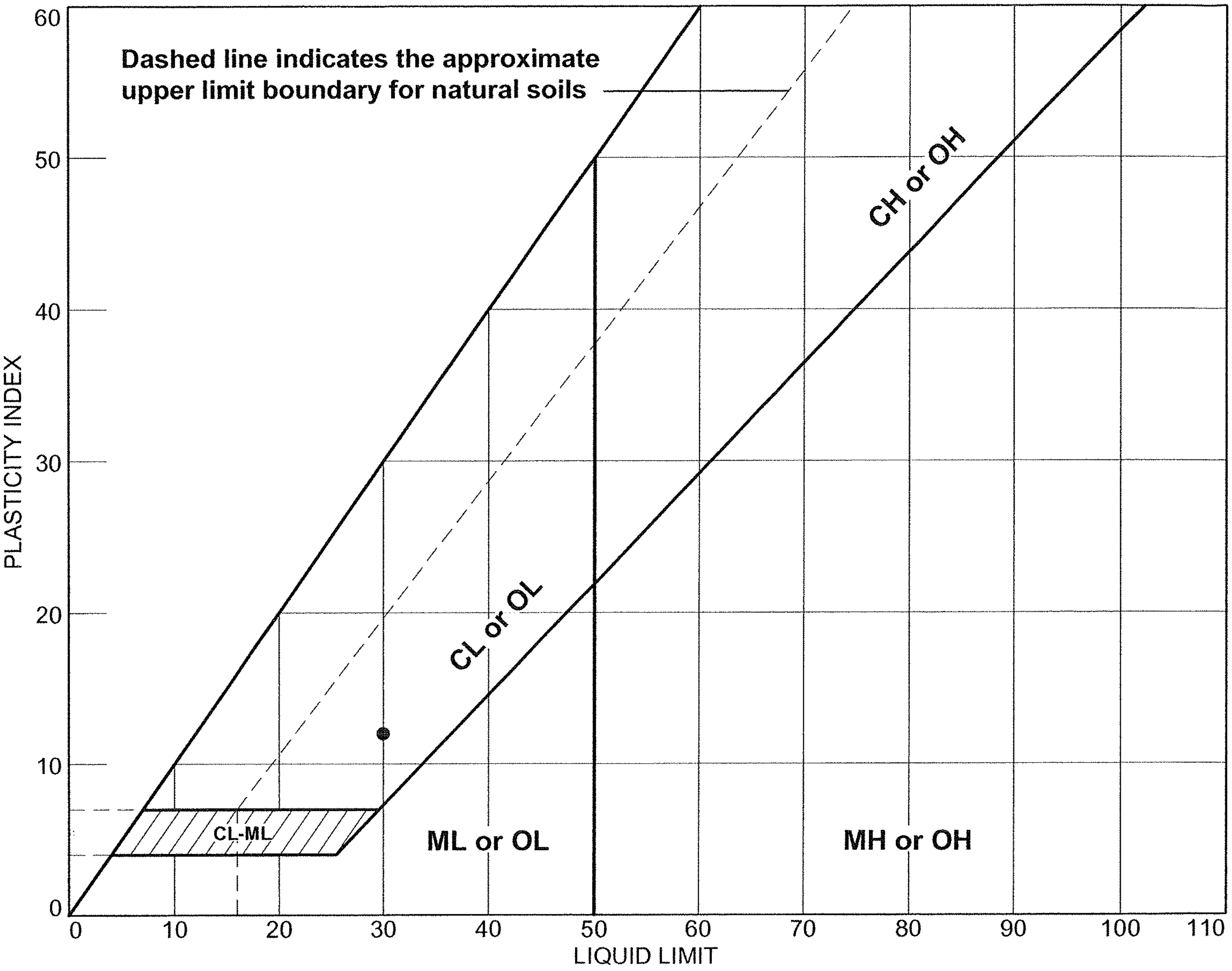
Project No. 60225561 **Client:** IPR-GDP Suez

Project: Coleto Creek Facility

●**Source of Sample:** Boring 4-1 **Depth:** 24.0-26.0 **Sample Number:** S-13

Remarks:

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-5-1	B-5-1 S-14	26'-27'		18	30	12	CL

Client: IPR-GDF SUEZ
Project: COLETO CREEK

Project No.: 60225561 **Figure**

SPECIFIC GRAVITY OF SOIL SOLIDS
ASTM D-854

AECOM Project No.: 60225561 **Test Date: 12/6/2011**
Project Name: **Coleto Creek Facility**
IPR-GDP Suez

Boring/Source: 1-1
Sample No.: 16,17,18
Depth (ft.): 30.0-36.7
Description: Caliche - White

Boring/Source: 4-1
Sample No.: 7
Depth (ft.): 12.0-14.0
Description: F-M Sand Little Clay Traee Silt - Brownish Gray SC

	Test 1
Flask No.	**SG-3**
Wt. Flask + Soil + Water (W2)	742.20
Wt. Flask + Water (W3)	677.46
Temperature (C)	21.5
Density of Water @ test Tem.	0.99789
Tare No.	**ED-4**
Wt. Tare	578.17
Wt. Tare + Soil	681.20
Wt. Soil (W2-W3)	103.03
(k) Temp. Correction	0.99968
Specific Gravity (Gs)	**2.690**

	Test 2
Flask No.	**SG-10**
Wt. Flask + Soil + Water (W2)	742.38
Wt. Flask + Water (W3)	668.44
Temperature (C)	21.5
Density of Water @ test Tem.	0.99789
Tare No.	**ED-4**
Wt. Tare	576.51
Wt. Tare + Soil	695.11
Wt. Soil (W2-W3)	118.60
(k) Temp. Correction	0.99968
Specific Gravity (Gs)	**2.655**

Boring/Sourcc: 4-1
Sample No.: 13
Depth (ft.): 24.0-26.0
Description: Clayey F-M Sand Little Silt - Brownish Gray SC

Boring/Source: 2-1
Sample No.: 14
Depth (ft.): 26.0-28..0
Description: Clayey F-M Sand Little Silt - Brownish Gray SC

	Test 3
Flask No.	**SG-1**
Wt. Flask + Soil + Water (W2)	726.62
Wt. Flask + Water (W3)	675.32
Temperature (C)	21.5
Density of Water @ test Tem.	0.99789
Tare No.	**ED-6**
Wt. Tare	602.23
Wt. Tare + Soil	684.30
Wt. Soil (W2-W3)	82.07
(k) Temp. Correction	0.99680
Specific Gravity (Gs)	**2.659**

	Test 4
Flask No.	**SG-2**
Wt. Flask + Soil + Water (W2)	738.44
Wt. Flask + Water (W3)	668.48
Temperature (C)	21.5
Density of Water @ test Tem.	0.99789
Tare No.	**ED-10**
Wt. Tare	619.18
Wt. Tare + Soil	730.96
Wt. Soil (W2-W3)	111.78
(k) Temp. Correction	0.99968
Specific Gravity (Gs)	**2.672**

Technician **BCM** Calculated **BCM** Checked **WPQ**
Date **12/2/11** Date **12/2/11** Date **12/6/11**

ORGANIC CONTENT TEST
ASTM D-2974
Method C

AECOM Project No.:	60225561
Project Name:	Coleto Creek Facility - IPR-GDP Suez
Date Tested:	12/6/2011

Sample Information

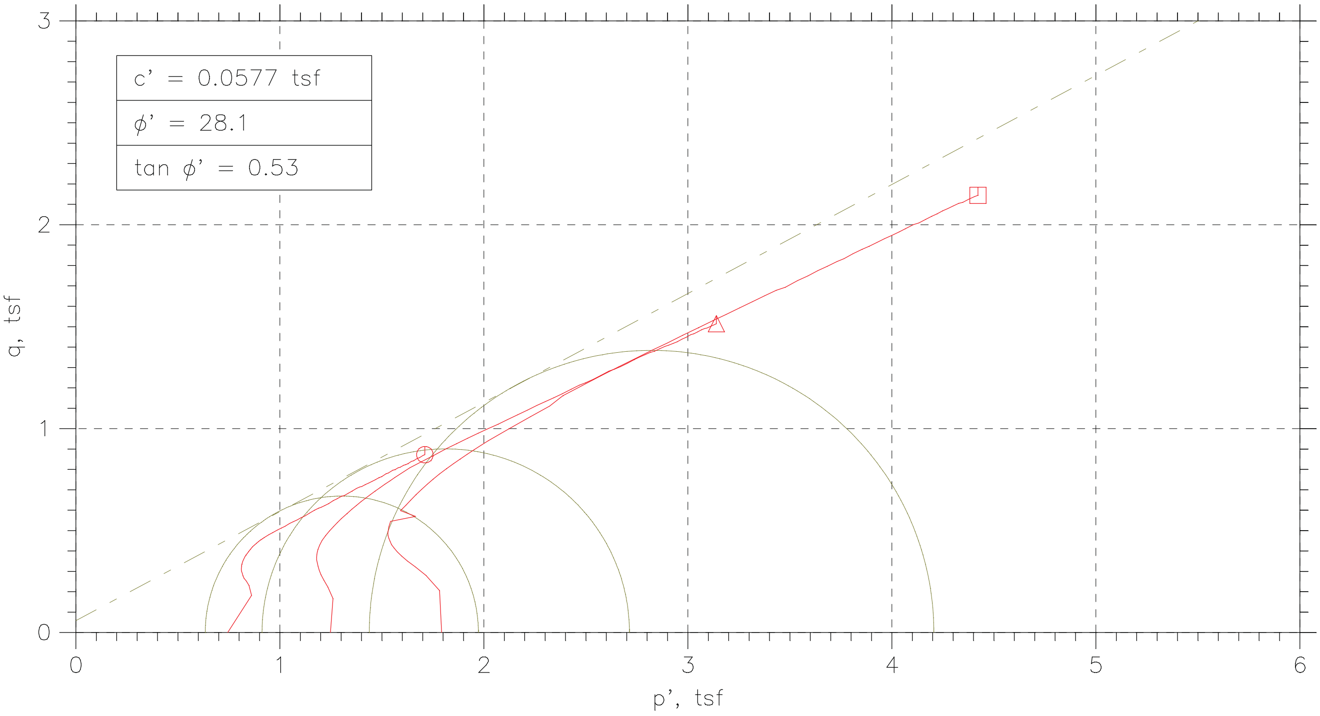
Boring / Source:	B-4-1
Sample No.:	13
Depth (ft.):	24.0-26.0

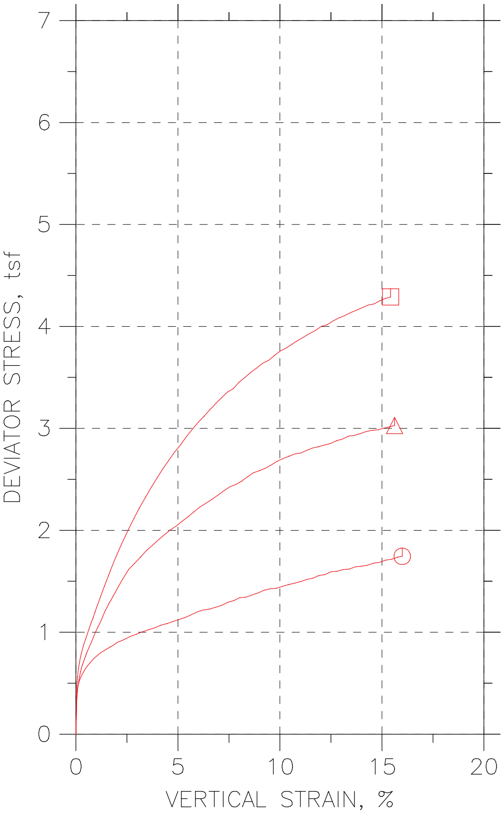
Organic Content Test Data

Tare No.:	N
Tare Wt. (gm): T	17.71
Wet Wt. + Tare (gm): A+T	48.27
Dry Wt. + Tare (gm): B+T	44.70
Moisture Content (%):	**13.23**
Wt. of Ash + Tare (gm): D+T	44.65
Percent Ash: (D-T/B-T)x100 = E	99.81
Organic Content (%):	**0.19**

** Note: Test performed by heating the sample to 440 degrees centigrade for a period of three hours.

TRIAXIAL COMPRESSION TEST REPORT





Symbol		○	△	□	
Test No.		10.4 PSI	17.4 PSI	24.3 PSI	
Initial	Diameter, in	2.8362	2.8441	2.8457	
	Height, in	5.9134	6.0831	6.0173	
	Water Content, %	21.81	14.93	13.70	
	Dry Density, pcf	105.5	115.9	120.2	
	Saturation, %	100.17	90.88	94.34	
	Void Ratio	0.58172	0.4389	0.38805	
Before Shear	Water Content, %	21.39	15.80	14.06	
	Dry Density, pcf	106.1	117.3	121.3	
	Saturation, %	100.00	100.00	100.00	
	Void Ratio	0.57165	0.42209	0.37567	
	Back Press., tsf	5.0449	5.0454	5.0404	
Minor Prin. Stress, tsf		0.74395	1.2474	1.7924	
Max. Dev. Stress, tsf		1.7444	3.0288	4.2889	
Time to Failure, min		1612.1	1613.1	1614.3	
Strain Rate, %/min		0.02	0.02	0.03	
B-Value		.98	.97	.95	
Measured Specific Gravity		2.67	2.67	2.67	
Liquid Limit		42	42	42	
Plastic Limit		24	24	24	
Plasticity Index		18	18	18	
Failure Sketch					

Project: COLETO CREEK FACILITY

Location: IPR-GDF SUEZ

Project No.: 60225561

Boring No.: B-2-1 S-14

Sample Type: 3'' ST

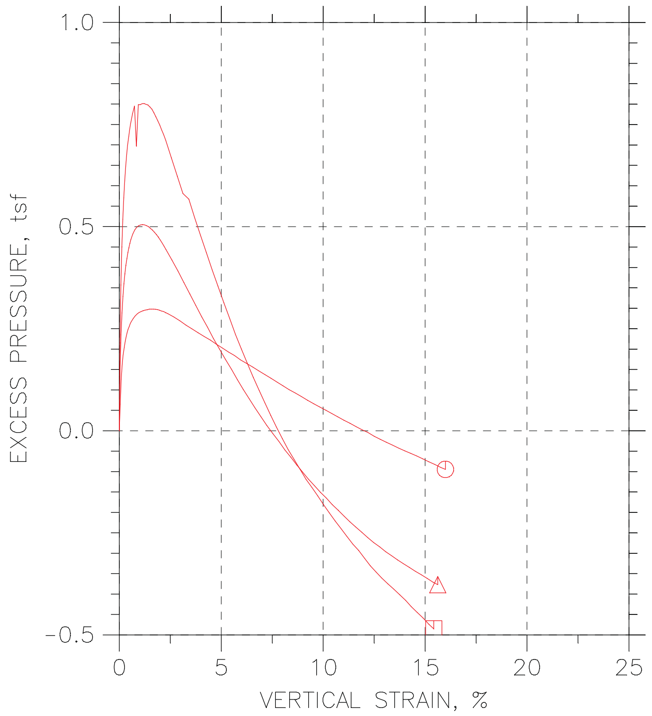
Description: CLAYEY F-M SAND LITTLE SILT- BROWNISH GRAY SC

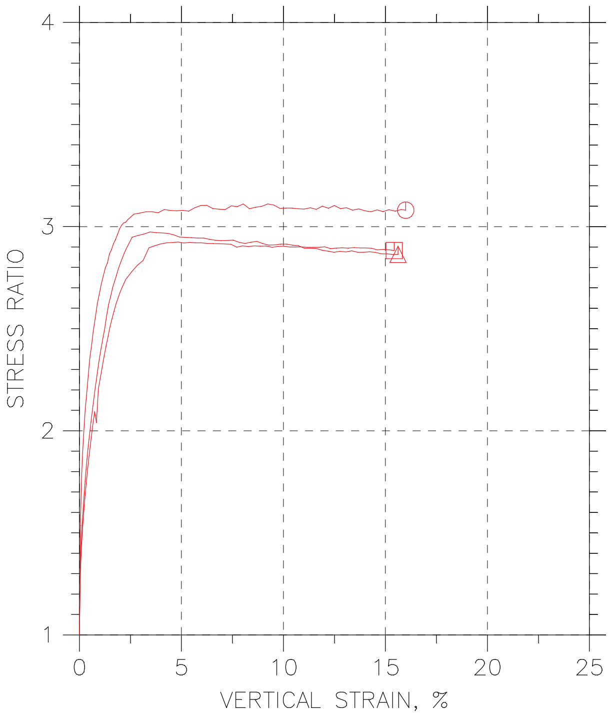
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

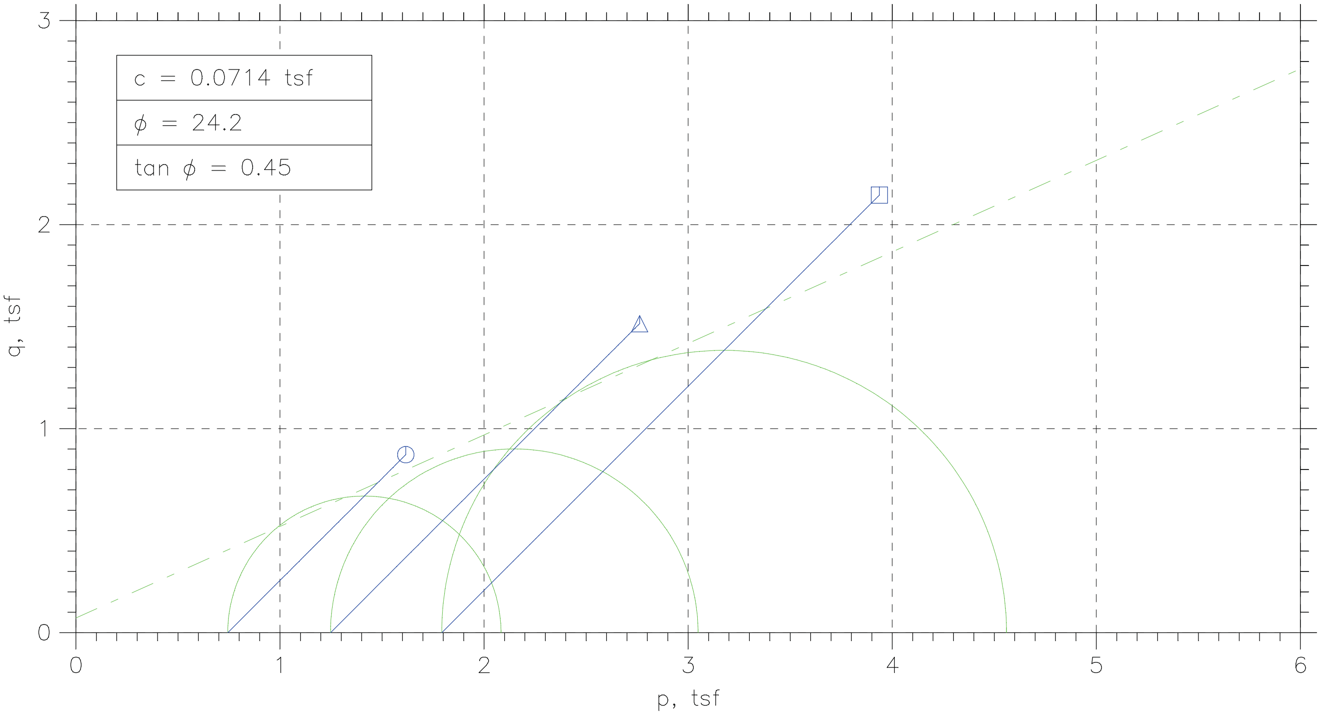
Mon, 12-DEC-2011 10:07:19

TRIAXIAL COMPRESSION TEST REPORT

AECOM







Project: COLETO CREEK FACILITY	Location: IPR-GDF SUEZ	Project No.: 60225561
Boring No.: B-2-1 S-14	Tested By: BCM	Checked By: WPQ
Sample No.: S-14	Test Date: 12/5/11	Depth: 26.0'-28.0'
Test No.: B-2-1 S-14	Sample Type: 3" ST	Elevation: ----
Description: CLAYEY F-M SAND LITTLE SILT- BROWNISH GRAY SC		
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767		

Mon, 12-DEC-2011 10:08:34

TRIAXIAL TEST

Project: COLETO CREEK FACILITY
Boring No.: B-2-1 S-14
Sample No.: S-14
Test No.: 10.4 PSI

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/5/11
Sample Type: 3" ST

Project No.: 60225561
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

Soil Description: CLAYEY F-M SAND LITTLE SILT- BROWNISH GRAY SC
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 5.91 in
Specimen Area: 6.32 in^2
Specimen Volume: 37.36 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 24

Measured Specific Gravity: 2.67

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3179	0	0	5.0449	5.7888	5.7888
2	5.0001	0.045204	6.3207	31.887	0.36323	5.1097	5.7888	6.152
3	10	0.094782	6.3239	40.44	0.46042	5.1704	5.7888	6.2492
4	15	0.14144	6.3268	44.344	0.50464	5.2061	5.7888	6.2934
5	20	0.18956	6.3299	46.761	0.53189	5.2306	5.7888	6.3207
6	25	0.23768	6.3329	48.992	0.557	5.2487	5.7888	6.3458
7	30.001	0.28726	6.3361	51.038	0.57997	5.2633	5.7888	6.3688
8	35.001	0.33538	6.3391	52.618	0.59764	5.275	5.7888	6.3864
9	40.001	0.3835	6.3422	54.012	0.61318	5.2849	5.7888	6.402
10	45.001	0.43308	6.3453	55.5	0.62975	5.2931	5.7888	6.4186
11	50.001	0.4812	6.3484	57.08	0.64737	5.3001	5.7888	6.4362
12	55.001	0.53078	6.3516	58.289	0.66075	5.3066	5.7888	6.4495
13	60.001	0.5789	6.3546	59.311	0.67202	5.3112	5.7888	6.4608
14	70.001	0.6766	6.3609	61.636	0.69766	5.3194	5.7888	6.4865
15	80.001	0.77576	6.3673	63.588	0.71904	5.3258	5.7888	6.5078
16	90.002	0.87346	6.3735	65.633	0.74144	5.3311	5.7888	6.5302
17	100	0.97115	6.3798	67.213	0.75854	5.3346	5.7888	6.5473
18	110	1.0703	6.3862	68.794	0.7756	5.3369	5.7888	6.5644
19	120	1.1695	6.3926	70.281	0.79158	5.3387	5.7888	6.5804
20	130	1.2701	6.3991	71.676	0.80646	5.3404	5.7888	6.5953
21	140	1.3707	6.4057	72.605	0.81609	5.341	5.7888	6.6049
22	150	1.4699	6.4121	74.093	0.83197	5.3428	5.7888	6.6208
23	160	1.5676	6.4185	75.023	0.84157	5.3428	5.7888	6.6304
24	170	1.6682	6.425	76.231	0.85426	5.3428	5.7888	6.6431
25	180	1.7688	6.4316	77.254	0.86483	5.3422	5.7888	6.6536
26	190	1.8694	6.4382	78.462	0.87746	5.3416	5.7888	6.6663
27	200	1.9715	6.4449	79.95	0.89316	5.3399	5.7888	6.682
28	210	2.0706	6.4514	81.065	0.90471	5.3381	5.7888	6.6935
29	220	2.1712	6.4581	81.809	0.91207	5.3369	5.7888	6.7009
30	230	2.2719	6.4647	82.553	0.91942	5.334	5.7888	6.7082
31	240	2.3725	6.4714	83.575	0.92985	5.3317	5.7888	6.7186
32	270	2.6699	6.4912	86.457	0.95898	5.3235	5.7888	6.7478
33	300	2.9674	6.5111	88.688	0.98072	5.3142	5.7888	6.7695
34	330	3.2678	6.5313	91.198	1.0054	5.3036	5.7888	6.7942
35	360	3.5609	6.5511	93.244	1.0248	5.2943	5.7888	6.8136
36	390	3.8584	6.5714	95.103	1.042	5.2849	5.7888	6.8308
37	420	4.1602	6.5921	97.892	1.0692	5.2756	5.7888	6.858
38	450	4.4621	6.6129	99.658	1.0851	5.2668	5.7888	6.8739
39	480	4.761	6.6337	101.8	1.1049	5.2569	5.7888	6.8937
40	510	5.0585	6.6545	104.03	1.1256	5.2476	5.7888	6.9144
41	540	5.3574	6.6755	106.07	1.1441	5.2376	5.7888	6.9329
42	570	5.6505	6.6962	108.95	1.1715	5.2289	5.7888	6.9603
43	600	5.9465	6.7173	111.93	1.1997	5.2184	5.7888	6.9885
44	630	6.244	6.7386	114.07	1.2188	5.2096	5.7888	7.0076
45	660	6.5458	6.7604	115.28	1.2277	5.2008	5.7888	7.0165
46	690	6.8477	6.7823	117.32	1.2455	5.1915	5.7888	7.0343
47	720	7.1466	6.8041	119.46	1.2641	5.1821	5.7888	7.0529
48	750	7.4441	6.826	122.62	1.2934	5.1734	5.7888	7.0822
49	780	7.7386	6.8478	124.67	1.3108	5.164	5.7888	7.0996
50	810	8.0332	6.8697	127.73	1.3387	5.1547	5.7888	7.1275
51	840	8.3306	6.892	128.57	1.3432	5.1453	5.7888	7.132
52	870	8.6296	6.9146	131.08	1.3649	5.1372	5.7888	7.1537
53	900	8.9329	6.9376	133.59	1.3864	5.1284	5.7888	7.1752
54	930	9.2333	6.9605	136.57	1.4126	5.1196	5.7888	7.2014
55	960	9.5336	6.9837	138.42	1.4271	5.1109	5.7888	7.2159
56	990	9.8282	7.0065	139.35	1.432	5.1033	5.7888	7.2208
57	1020	10.121	7.0293	141.59	1.4502	5.0951	5.7888	7.239
58	1050	10.419	7.0527	143.72	1.4673	5.0869	5.7888	7.2561
59	1080	10.718	7.0763	145.68	1.4822	5.0787	5.7888	7.271
60	1110	11.017	7.1	147.72	1.498	5.0706	5.7888	7.2868
61	1140	11.317	7.1241	150.23	1.5183	5.063	5.7888	7.3071
62	1170	11.613	7.148	151.9	1.5301	5.0548	5.7888	7.3189
63	1200	11.91	7.1721	155.16	1.5576	5.0472	5.7888	7.3464
64	1230	12.205	7.1962	156.37	1.5645	5.0402	5.7888	7.3533
65	1260	12.5	7.2204	159.71	1.5926	5.0314	5.7888	7.3814
66	1290	12.794	7.2448	160.74	1.5974	5.0238	5.7888	7.3862
67	1320	13.092	7.2696	163.06	1.615	5.0168	5.7888	7.4038
68	1350	13.395	7.295	164.18	1.6204	5.0098	5.7888	7.4092
69	1380	13.697	7.3205	166.87	1.6412	5.0022	5.7888	7.43
70	1410	13.996	7.346	168.08	1.6474	4.9958	5.7888	7.4362
71	1440	14.293	7.3715	169.66	1.6571	4.9894	5.7888	7.4459
72	1470	14.589	7.397	172.36	1.6777	4.9829	5.7888	7.4665
73	1500	14.881	7.4224	173.75	1.6855	4.9759	5.7888	7.4743
74	1530	15.174	7.448	176.63	1.7075	4.9689	5.7888	7.4963
75	1560	15.473	7.4744	178.03	1.7149	4.9625	5.7888	7.5037
76	1590	15.773	7.501	181	1.7374	4.9549	5.7888	7.5262
77	1612.1	15.995	7.5208	182.21	1.7444	4.9502	5.7888	7.5332

TRIAXIAL TEST

Project: COLETO CREEK FACILITY
Boring No.: B-2-1 S-14
Sample No.: S-14
Test No.: 10.4 PSI

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/5/11
Sample Type: 3" ST

Project No.: 60225561
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

Soil Description: CLAYEY F-M SAND LITTLE SILT- BROWNISH GRAY SC
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 5.91 in
Specimen Area: 6.32 in^2
Specimen Volume: 37.36 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 24

Measured Specific Gravity: 2.67

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	5.7888	5.7888	0	0.000	0.74395	0.74395	1.000	0.74395	0
2	0.05	6.152	5.7888	0.064842	0.179	1.0423	0.6791	1.535	0.86072	0.18161
3	0.09	6.2492	5.7888	0.1256	0.273	1.0788	0.61835	1.745	0.84856	0.23021
4	0.14	6.2934	5.7888	0.16123	0.319	1.0874	0.58272	1.866	0.83504	0.25232
5	0.19	6.3207	5.7888	0.18576	0.349	1.0901	0.55818	1.953	0.82413	0.26595
6	0.24	6.3458	5.7888	0.20387	0.366	1.0971	0.54007	2.031	0.81857	0.2785
7	0.29	6.3688	5.7888	0.21848	0.377	1.1054	0.52547	2.104	0.81545	0.28998
8	0.34	6.3864	5.7888	0.23016	0.385	1.1114	0.51379	2.163	0.8126	0.29882
9	0.38	6.402	5.7888	0.24009	0.392	1.117	0.50385	2.217	0.81044	0.30659
10	0.43	6.4186	5.7888	0.24827	0.394	1.1254	0.49568	2.270	0.81055	0.31488
11	0.48	6.4362	5.7888	0.25528	0.394	1.136	0.48867	2.325	0.81235	0.32369
12	0.53	6.4495	5.7888	0.26171	0.396	1.143	0.48224	2.370	0.81262	0.33037
13	0.58	6.4608	5.7888	0.26638	0.396	1.1496	0.47757	2.407	0.81358	0.33601
14	0.68	6.4865	5.7888	0.27456	0.394	1.1671	0.46939	2.486	0.81822	0.34883
15	0.78	6.5078	5.7888	0.28098	0.391	1.182	0.46296	2.553	0.82248	0.35952
16	0.87	6.5302	5.7888	0.28624	0.386	1.1991	0.45771	2.620	0.82842	0.37072
17	0.97	6.5473	5.7888	0.28975	0.382	1.2127	0.4542	2.670	0.83347	0.37927
18	1.07	6.5644	5.7888	0.29208	0.377	1.2275	0.45186	2.716	0.83966	0.3878
19	1.17	6.5804	5.7888	0.29384	0.371	1.2417	0.45011	2.759	0.8459	0.39579
20	1.27	6.5953	5.7888	0.29559	0.367	1.2548	0.44836	2.799	0.85159	0.40323
21	1.37	6.6049	5.7888	0.29617	0.363	1.2639	0.44777	2.823	0.85582	0.40804
22	1.47	6.6208	5.7888	0.29792	0.358	1.278	0.44602	2.865	0.86201	0.41599
23	1.57	6.6304	5.7888	0.29792	0.354	1.2876	0.44602	2.887	0.86681	0.42079
24	1.67	6.6431	5.7888	0.29792	0.349	1.3003	0.44602	2.915	0.87315	0.42713
25	1.77	6.6536	5.7888	0.29734	0.344	1.3114	0.44661	2.936	0.87902	0.43242
26	1.87	6.6663	5.7888	0.29676	0.338	1.3247	0.44719	2.962	0.88592	0.43873
27	1.97	6.682	5.7888	0.295	0.330	1.3421	0.44894	2.989	0.89553	0.44658
28	2.07	6.6935	5.7888	0.29325	0.324	1.3554	0.4507	3.007	0.90305	0.45236
29	2.17	6.7009	5.7888	0.29208	0.320	1.3639	0.45186	3.018	0.9079	0.45604
30	2.27	6.7082	5.7888	0.28916	0.315	1.3742	0.45478	3.022	0.91449	0.45971
31	2.37	6.7186	5.7888	0.28683	0.308	1.387	0.45712	3.034	0.92205	0.46492
32	2.67	6.7478	5.7888	0.27865	0.291	1.4243	0.4653	3.061	0.94479	0.47949
33	2.97	6.7695	5.7888	0.2693	0.275	1.4554	0.47465	3.066	0.96501	0.49036
34	3.27	6.7942	5.7888	0.25879	0.257	1.4905	0.48516	3.072	0.98784	0.50268
35	3.56	6.8136	5.7888	0.24944	0.243	1.5193	0.49451	3.072	1.0069	0.51239
36	3.86	6.8308	5.7888	0.24009	0.230	1.5459	0.50385	3.068	1.0249	0.521
37	4.16	6.858	5.7888	0.23075	0.216	1.5824	0.5132	3.083	1.0478	0.5346
38	4.46	6.8739	5.7888	0.22198	0.205	1.607	0.52196	3.079	1.0645	0.54253
39	4.76	6.8937	5.7888	0.21205	0.192	1.6368	0.53189	3.077	1.0843	0.55243
40	5.06	6.9144	5.7888	0.20271	0.180	1.6668	0.54124	3.080	1.104	0.56278
41	5.36	6.9329	5.7888	0.19277	0.168	1.6952	0.55117	3.076	1.1232	0.57204
42	5.65	6.9603	5.7888	0.18401	0.157	1.7314	0.55993	3.092	1.1457	0.58576
43	5.95	6.9885	5.7888	0.1735	0.145	1.7702	0.57045	3.103	1.1703	0.59986
44	6.24	7.0076	5.7888	0.16473	0.135	1.798	0.57921	3.104	1.1886	0.60939
45	6.55	7.0165	5.7888	0.15597	0.127	1.8157	0.58797	3.088	1.2018	0.61386
46	6.85	7.0343	5.7888	0.14663	0.118	1.8428	0.59732	3.085	1.2201	0.62274
47	7.15	7.0529	5.7888	0.13728	0.109	1.8708	0.60667	3.084	1.2387	0.63205
48	7.44	7.0822	5.7888	0.12852	0.099	1.9088	0.61543	3.102	1.2621	0.6467
49	7.74	7.0996	5.7888	0.11917	0.091	1.9356	0.62478	3.098	1.2802	0.65539
50	8.03	7.1275	5.7888	0.10982	0.082	1.9729	0.63412	3.111	1.3035	0.66937
51	8.33	7.132	5.7888	0.10048	0.075	1.9866	0.64347	3.087	1.315	0.67158
52	8.63	7.1537	5.7888	0.092298	0.068	2.0166	0.65165	3.095	1.3341	0.68246
53	8.93	7.1752	5.7888	0.083536	0.060	2.0468	0.66041	3.099	1.3536	0.69322
54	9.23	7.2014	5.7888	0.074773	0.053	2.0818	0.66917	3.111	1.3755	0.70632
55	9.53	7.2159	5.7888	0.066011	0.046	2.1051	0.67794	3.105	1.3915	0.71356
56	9.83	7.2208	5.7888	0.058417	0.041	2.1176	0.68553	3.089	1.4015	0.71602
57	10.12	7.239	5.7888	0.050238	0.035	2.1439	0.69371	3.091	1.4188	0.72512
58	10.42	7.2561	5.7888	0.04206	0.029	2.1691	0.70189	3.090	1.4355	0.73363
59	10.72	7.271	5.7888	0.033882	0.023	2.1923	0.71006	3.087	1.4512	0.74111
60	11.02	7.2868	5.7888	0.025703	0.017	2.2162	0.71824	3.086	1.4672	0.749
61	11.32	7.3071	5.7888	0.018109	0.012	2.2442	0.72584	3.092	1.485	0.75916
62	11.61	7.3189	5.7888	0.0099308	0.006	2.2641	0.73402	3.085	1.4991	0.76505
63	11.91	7.3464	5.7888	0.0023367	0.002	2.2992	0.74161	3.100	1.5204	0.77881
64	12.21	7.3533	5.7888	-0.0046733	-0.003	2.3131	0.74862	3.090	1.5309	0.78225
65	12.50	7.3814	5.7888	-0.013436	-0.008	2.35	0.75738	3.103	1.5537	0.79631
66	12.79	7.3862	5.7888	-0.02103	-0.013	2.3624	0.76498	3.088	1.5637	0.79871
67	13.09	7.4038	5.7888	-0.02804	-0.017	2.387	0.77199	3.092	1.5795	0.8075
68	13.39	7.4092	5.7888	-0.03505	-0.022	2.3994	0.779	3.080	1.5892	0.81019
69	13.70	7.43	5.7888	-0.042644	-0.026	2.4278	0.78659	3.087	1.6072	0.82062
70	14.00	7.4362	5.7888	-0.04907	-0.030	2.4404	0.79302	3.077	1.6167	0.8237
71	14.29	7.4459	5.7888	-0.055496	-0.033	2.4566	0.79944	3.073	1.628	0.82857
72	14.59	7.4665	5.7888	-0.061922	-0.037	2.4835	0.80587	3.082	1.6447	0.83883
73	14.88	7.4743	5.7888	-0.068932	-0.041	2.4983	0.81288	3.073	1.6556	0.84273
74	15.17	7.4963	5.7888	-0.075942	-0.044	2.5274	0.81989	3.083	1.6736	0.85376
75	15.47	7.5037	5.7888	-0.082367	-0.048	2.5412	0.82631	3.075	1.6838	0.85746
76	15.77	7.5262	5.7888	-0.089961	-0.052	2.5713	0.83391	3.083	1.7026	0.86869
77	15.99	7.5332	5.7888	-0.094635	-0.054	2.583	0.83858	3.080	1.7108	0.87219

TRIAXIAL TEST

Project: COLETO CREEK FACILITY
Boring No.: B-2-1 S-14
Sample No.: S-14
Test No.: 17.4 PSI

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/5/11
Sample Type: 3" ST

Project No.: 60225561
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

Soil Description: CLAYEY F-M SAND LITTLE SILT- BROWNISH GRAY SC
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 6.08 in
Specimen Area: 6.35 in^2
Specimen Volume: 38.65 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 24

Measured Specific Gravity: 2.67

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.353	0	0	5.0454	6.2928	6.2928
2	5.0038	0.0388	6.3555	29.35	0.3325	5.1985	6.2928	6.6253
3	10.004	0.085062	6.3584	39.31	0.44513	5.2806	6.2928	6.7379
4	15.004	0.13132	6.3613	45.38	0.51363	5.3339	6.2928	6.8064
5	20.004	0.17908	6.3644	50.036	0.56606	5.3744	6.2928	6.8589
6	25	0.22683	6.3674	53.985	0.61044	5.4054	6.2928	6.9032
7	30	0.27459	6.3705	57.344	0.64811	5.4298	6.2928	6.9409
8	35	0.32234	6.3735	60.35	0.68176	5.4504	6.2928	6.9746
9	40	0.37159	6.3767	62.884	0.71004	5.4676	6.2928	7.0028
10	45	0.42083	6.3798	65.477	0.73895	5.482	6.2928	7.0317
11	50	0.46859	6.3829	67.658	0.76319	5.4936	6.2928	7.056
12	55.001	0.51634	6.386	70.074	0.79007	5.5042	6.2928	7.0829
13	60.001	0.5641	6.389	72.196	0.8136	5.513	6.2928	7.1064
14	70.001	0.65961	6.3952	76.204	0.85794	5.5269	6.2928	7.1507
15	80.001	0.75512	6.4013	80.27	0.90285	5.5375	6.2928	7.1957
16	90.001	0.85361	6.4077	84.573	0.9503	5.5436	6.2928	7.2431
17	100	0.95061	6.414	88.698	0.99568	5.5474	6.2928	7.2885
18	110	1.0491	6.4203	92.706	1.0396	5.5497	6.2928	7.3324
19	120	1.1446	6.4265	96.124	1.0769	5.5502	6.2928	7.3697
20	130	1.2401	6.4328	99.719	1.1161	5.5497	6.2928	7.4089
21	140	1.3356	6.439	104.26	1.1658	5.5474	6.2928	7.4586
22	150	1.4326	6.4453	108.32	1.2101	5.5452	6.2928	7.5029
23	160	1.5266	6.4515	111.57	1.2451	5.5408	6.2928	7.5379
24	170	1.6251	6.4579	115.28	1.2852	5.5369	6.2928	7.578
25	180	1.7206	6.4642	118.28	1.3175	5.5314	6.2928	7.6103
26	190	1.8162	6.4705	121.41	1.351	5.5258	6.2928	7.6438
27	200	1.9102	6.4767	124.71	1.3863	5.5197	6.2928	7.6791
28	210	2.0057	6.483	127.83	1.4197	5.5125	6.2928	7.7125
29	220	2.1012	6.4893	131.01	1.4536	5.5053	6.2928	7.7464
30	230	2.1967	6.4957	134.2	1.4875	5.4975	6.2928	7.7803
31	240	2.2907	6.5019	137.2	1.5193	5.4892	6.2928	7.8121
32	270	2.5817	6.5213	146.28	1.615	5.4637	6.2928	7.9078
33	300	2.8757	6.5411	152.23	1.6757	5.4365	6.2928	7.9685
34	330	3.1682	6.5608	158.3	1.7372	5.4082	6.2928	8.03
35	360	3.4592	6.5806	164.61	1.801	5.3805	6.2928	8.0938
36	390	3.7502	6.6005	169.79	1.8521	5.3527	6.2928	8.1449
37	420	4.0397	6.6204	175.22	1.9055	5.325	6.2928	8.1983
38	450	4.3292	6.6405	180.28	1.9547	5.2989	6.2928	8.2475
39	480	4.6202	6.6607	185.23	2.0023	5.2712	6.2928	8.2951
40	510	4.9127	6.6812	189.48	2.0419	5.2451	6.2928	8.3347
41	540	5.2082	6.702	194.43	2.0887	5.2201	6.2928	8.3815
42	570	5.5007	6.7228	199.32	2.1347	5.1957	6.2928	8.4275
43	600	5.7902	6.7434	204.39	2.1823	5.1702	6.2928	8.4751
44	630	6.0782	6.7641	209.28	2.2277	5.1469	6.2928	8.5205
45	660	6.3692	6.7851	213.41	2.2645	5.1242	6.2928	8.5573
46	690	6.6587	6.8062	217.65	2.3024	5.1014	6.2928	8.5952
47	720	6.9497	6.8275	222.13	2.3425	5.0798	6.2928	8.6353
48	750	7.2407	6.8489	226.9	2.3853	5.0582	6.2928	8.6781
49	780	7.5362	6.8708	231.56	2.4265	5.0382	6.2928	8.7193
50	810	7.8302	6.8927	234.5	2.4496	5.0188	6.2928	8.7424
51	840	8.1197	6.9144	238.39	2.4824	4.9982	6.2928	8.7752
52	870	8.4107	6.9364	243.17	2.5241	4.9805	6.2928	8.8169
53	900	8.6987	6.9583	247.82	2.5643	4.9622	6.2928	8.8571
54	930	8.9883	6.9804	250.54	2.5842	4.9444	6.2928	8.877
55	960	9.2793	7.0028	253.72	2.6086	4.9267	6.2928	8.9014
56	990	9.5718	7.0254	257.61	2.6401	4.9106	6.2928	8.9329
57	1020	9.8643	7.0482	261.97	2.6761	4.8945	6.2928	8.9689
58	1050	10.157	7.0712	265.5	2.7034	4.8806	6.2928	8.9962
59	1080	10.446	7.094	268.63	2.7264	4.8646	6.2928	9.0192
60	1110	10.736	7.1171	271.69	2.7486	4.8507	6.2928	9.0414
61	1140	11.024	7.1401	273.58	2.7587	4.8363	6.2928	9.0515
62	1170	11.31	7.1632	277	2.7842	4.8224	6.2928	9.077
63	1200	11.6	7.1866	280.18	2.807	4.8096	6.2928	9.0998
64	1230	11.889	7.2102	282.3	2.819	4.7969	6.2928	9.1118
65	1260	12.183	7.2344	285.01	2.8366	4.7836	6.2928	9.1294
66	1290	12.477	7.2587	287.49	2.8516	4.7714	6.2928	9.1444
67	1320	12.771	7.2831	291.2	2.8788	4.7608	6.2928	9.1716
68	1350	13.064	7.3076	293.85	2.8952	4.7492	6.2928	9.188
69	1380	13.355	7.3322	297.62	2.9226	4.7392	6.2928	9.2154
70	1410	13.643	7.3566	299.45	2.9308	4.7292	6.2928	9.2236
71	1440	13.932	7.3814	302.28	2.9485	4.7198	6.2928	9.2413
72	1470	14.226	7.4067	305.4	2.9688	4.7109	6.2928	9.2616
73	1500	14.519	7.432	307.76	2.9815	4.7015	6.2928	9.2743
74	1530	14.814	7.4578	309.29	2.986	4.6926	6.2928	9.2788
75	1560	15.107	7.4835	312.12	3.003	4.6837	6.2928	9.2958
76	1590	15.398	7.5092	314.54	3.0159	4.6743	6.2928	9.3087
77	1613.1	15.62	7.529	316.72	3.0288	4.6682	6.2928	9.3216

TRIAXIAL TEST

Project: COLETO CREEK FACILITY
Boring No.: B-2-1 S-14
Sample No.: S-14
Test No.: 17.4 PSI

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/5/11
Sample Type: 3" ST

Project No.: 60225561
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

Soil Description: CLAYEY F-M SAND LITTLE SILT- BROWNISH GRAY SC
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 6.08 in
Specimen Area: 6.35 in^2
Specimen Volume: 38.65 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 24

Measured Specific Gravity: 2.67

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.2928	6.2928	0	0.000	1.2474	1.2474	1.000	1.2474	0
2	0.04	6.6253	6.2928	0.15311	0.460	1.4268	1.0943	1.304	1.2605	0.16625
3	0.09	6.7379	6.2928	0.23521	0.528	1.4573	1.0122	1.440	1.2348	0.22257
4	0.13	6.8064	6.2928	0.28847	0.562	1.4726	0.95893	1.536	1.2158	0.25682
5	0.18	6.8589	6.2928	0.32896	0.581	1.4845	0.91844	1.616	1.2015	0.28303
6	0.23	6.9032	6.2928	0.36003	0.590	1.4978	0.88737	1.688	1.1926	0.30522
7	0.27	6.9409	6.2928	0.38444	0.593	1.5111	0.86296	1.751	1.187	0.32406
8	0.32	6.9746	6.2928	0.40496	0.594	1.5242	0.84244	1.809	1.1833	0.34088
9	0.37	7.0028	6.2928	0.42216	0.595	1.5353	0.82524	1.860	1.1803	0.35502
10	0.42	7.0317	6.2928	0.43658	0.591	1.5498	0.81082	1.911	1.1803	0.36947
11	0.47	7.056	6.2928	0.44823	0.587	1.5624	0.79917	1.955	1.1808	0.3816
12	0.52	7.0829	6.2928	0.45877	0.581	1.5787	0.78863	2.002	1.1837	0.39504
13	0.56	7.1064	6.2928	0.46765	0.575	1.5934	0.77975	2.043	1.1866	0.4068
14	0.66	7.1507	6.2928	0.48152	0.561	1.6238	0.76588	2.120	1.1949	0.42897
15	0.76	7.1957	6.2928	0.49206	0.545	1.6582	0.75534	2.195	1.2068	0.45143
16	0.85	7.2431	6.2928	0.49816	0.524	1.6995	0.74924	2.268	1.2244	0.47515
17	0.95	7.2885	6.2928	0.50204	0.504	1.741	0.74536	2.336	1.2432	0.49784
18	1.05	7.3324	6.2928	0.50426	0.485	1.7828	0.74314	2.399	1.263	0.51982
19	1.14	7.3697	6.2928	0.50482	0.469	1.8195	0.74258	2.450	1.281	0.53846
20	1.24	7.4089	6.2928	0.50426	0.452	1.8593	0.74314	2.502	1.3012	0.55806
21	1.34	7.4586	6.2928	0.50204	0.431	1.9111	0.74536	2.564	1.3283	0.5829
22	1.43	7.5029	6.2928	0.49982	0.413	1.9576	0.74758	2.619	1.3526	0.60504
23	1.53	7.5379	6.2928	0.49539	0.398	1.9971	0.75202	2.656	1.3746	0.62255
24	1.63	7.578	6.2928	0.4915	0.382	2.0411	0.7559	2.700	1.3985	0.64262
25	1.72	7.6103	6.2928	0.48596	0.369	2.0789	0.76145	2.730	1.4202	0.65874
26	1.82	7.6438	6.2928	0.48041	0.356	2.1179	0.76699	2.761	1.4425	0.67548
27	1.91	7.6791	6.2928	0.47431	0.342	2.1594	0.7731	2.793	1.4663	0.69317
28	2.01	7.7125	6.2928	0.46709	0.329	2.2	0.78031	2.819	1.4902	0.70984
29	2.10	7.7464	6.2928	0.45988	0.316	2.2411	0.78752	2.846	1.5143	0.72681
30	2.20	7.7803	6.2928	0.45212	0.304	2.2828	0.79529	2.870	1.539	0.74374
31	2.29	7.8121	6.2928	0.4438	0.292	2.3229	0.80361	2.891	1.5633	0.75966
32	2.58	7.9078	6.2928	0.41828	0.259	2.4441	0.82912	2.948	1.6366	0.8075
33	2.88	7.9685	6.2928	0.39109	0.233	2.532	0.85631	2.957	1.6941	0.83783
34	3.17	8.03	6.2928	0.3628	0.209	2.6218	0.8846	2.964	1.7532	0.86861
35	3.46	8.0938	6.2928	0.33507	0.186	2.7133	0.91234	2.974	1.8128	0.9005
36	3.75	8.1449	6.2928	0.30733	0.166	2.7922	0.94007	2.970	1.8661	0.92607
37	4.04	8.1983	6.2928	0.27959	0.147	2.8734	0.96781	2.969	1.9206	0.95277
38	4.33	8.2475	6.2928	0.25352	0.130	2.9486	0.99388	2.967	1.9713	0.97737
39	4.62	8.2951	6.2928	0.22578	0.113	3.0239	1.0216	2.960	2.0228	1.0012
40	4.91	8.3347	6.2928	0.19971	0.098	3.0896	1.0477	2.949	2.0686	1.021
41	5.21	8.3815	6.2928	0.17474	0.084	3.1614	1.0727	2.947	2.117	1.0444
42	5.50	8.4275	6.2928	0.15034	0.070	3.2318	1.0971	2.946	2.1644	1.0673
43	5.79	8.4751	6.2928	0.12482	0.057	3.3048	1.1226	2.944	2.2137	1.0911
44	6.08	8.5205	6.2928	0.10152	0.046	3.3735	1.1459	2.944	2.2597	1.1138
45	6.37	8.5573	6.2928	0.078774	0.035	3.4332	1.1686	2.938	2.3009	1.1323
46	6.66	8.5952	6.2928	0.056029	0.024	3.4938	1.1914	2.933	2.3426	1.1512
47	6.95	8.6353	6.2928	0.034394	0.015	3.5555	1.213	2.931	2.3842	1.1712
48	7.24	8.6781	6.2928	0.012759	0.005	3.62	1.2346	2.932	2.4273	1.1927
49	7.54	8.7193	6.2928	-0.0072117	-0.003	3.6811	1.2546	2.934	2.4679	1.2133
50	7.83	8.7424	6.2928	-0.026628	-0.011	3.7236	1.274	2.923	2.4988	1.2248
51	8.12	8.7752	6.2928	-0.047153	-0.019	3.777	1.2946	2.918	2.5358	1.2412
52	8.41	8.8169	6.2928	-0.064905	-0.026	3.8364	1.3123	2.923	2.5744	1.262
53	8.70	8.8571	6.2928	-0.083212	-0.032	3.895	1.3306	2.927	2.6128	1.2822
54	8.99	8.877	6.2928	-0.10096	-0.039	3.9325	1.3484	2.917	2.6404	1.2921
55	9.28	8.9014	6.2928	-0.11872	-0.046	3.9747	1.3661	2.910	2.6704	1.3043
56	9.57	8.9329	6.2928	-0.1348	-0.051	4.0223	1.3822	2.910	2.7022	1.32
57	9.86	8.9689	6.2928	-0.15089	-0.056	4.0744	1.3983	2.914	2.7363	1.338
58	10.16	8.9962	6.2928	-0.16476	-0.061	4.1156	1.4122	2.914	2.7639	1.3517
59	10.45	9.0192	6.2928	-0.18085	-0.066	4.1547	1.4282	2.909	2.7915	1.3632
60	10.74	9.0414	6.2928	-0.19472	-0.071	4.1907	1.4421	2.906	2.8164	1.3743
61	11.02	9.0515	6.2928	-0.20914	-0.076	4.2153	1.4565	2.894	2.8359	1.3794
62	11.31	9.077	6.2928	-0.22301	-0.080	4.2546	1.4704	2.893	2.8625	1.3921
63	11.60	9.0998	6.2928	-0.23577	-0.084	4.2902	1.4832	2.893	2.8867	1.4035
64	11.89	9.1118	6.2928	-0.24853	-0.088	4.3149	1.4959	2.884	2.9054	1.4095
65	12.18	9.1294	6.2928	-0.26184	-0.092	4.3458	1.5092	2.879	2.9275	1.4183
66	12.48	9.1444	6.2928	-0.27404	-0.096	4.3731	1.5214	2.874	2.9473	1.4258
67	12.77	9.1716	6.2928	-0.28458	-0.099	4.4108	1.532	2.879	2.9714	1.4394
68	13.06	9.188	6.2928	-0.29623	-0.102	4.4389	1.5436	2.876	2.9913	1.4476
69	13.35	9.2154	6.2928	-0.30622	-0.105	4.4762	1.5536	2.881	3.0149	1.4613
70	13.64	9.2236	6.2928	-0.3162	-0.108	4.4944	1.5636	2.874	3.029	1.4654
71	13.93	9.2413	6.2928	-0.32563	-0.110	4.5216	1.573	2.874	3.0473	1.4743
72	14.23	9.2616	6.2928	-0.33451	-0.113	4.5507	1.5819	2.877	3.0663	1.4844
73	14.52	9.2743	6.2928	-0.34394	-0.115	4.5729	1.5913	2.874	3.0821	1.4908
74	14.81	9.2788	6.2928	-0.35282	-0.118	4.5862	1.6002	2.866	3.0932	1.493
75	15.11	9.2958	6.2928	-0.36169	-0.120	4.6121	1.6091	2.866	3.1106	1.5015
76	15.40	9.3087	6.2928	-0.37112	-0.123	4.6344	1.6185	2.863	3.1265	1.5079
77	15.62	9.3216	6.2928	-0.37723	-0.125	4.6534	1.6246	2.864	3.139	1.5144

TRIAXIAL TEST

Project: COLETO CREEK FACILITY
Boring No.: B-2-1 S-14
Sample No.: S-14
Test No.: 24.3 PSI

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/5/11
Sample Type: 3" ST

Project No.: 60225561
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

Soil Description: CLAYEY F-M SAND LITTLE SILT- BROWNISH GRAY SC
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 6.02 in
Specimen Area: 6.36 in^2
Specimen Volume: 38.27 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 24

Measured Specific Gravity: 2.67

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.36	0	0	5.0404	6.8328	6.8328
2	5.0037	0.032682	6.3621	36.347	0.41134	5.2561	6.8328	7.2441
3	10.004	0.078153	6.365	49.512	0.56007	5.3969	6.8328	7.3929
4	15.004	0.12504	6.368	56.855	0.64283	5.4904	6.8328	7.4756
5	20.004	0.17194	6.371	61.995	0.70062	5.5581	6.8328	7.5334
6	25.004	0.22025	6.3741	66.401	0.75005	5.6109	6.8328	7.5828
7	30	0.26714	6.3771	70.072	0.79115	5.6527	6.8328	7.6239
8	35	0.31261	6.38	73.376	0.82808	5.6874	6.8328	7.6609
9	40	0.3595	6.383	76.366	0.86141	5.716	6.8328	7.6942
10	45	0.40924	6.3862	79.355	0.89468	5.7402	6.8328	7.7275
11	50	0.45755	6.3893	81.978	0.9238	5.7605	6.8328	7.7566
12	55	0.50444	6.3923	84.443	0.95113	5.7781	6.8328	7.7839
13	60.001	0.55133	6.3953	86.961	0.97903	5.793	6.8328	7.8118
14	70.001	0.64512	6.4013	92.153	1.0365	5.8172	6.8328	7.8693
15	80.001	0.74458	6.4077	97.083	1.0909	5.8354	6.8328	7.9237
16	90.001	0.83695	6.4137	101.44	1.1387	5.7374	6.8328	7.9715
17	100	0.92789	6.4196	106.63	1.1959	5.8392	6.8328	8.0287
18	110	1.0217	6.4257	111.51	1.2494	5.8392	6.8328	8.0822
19	120	1.1169	6.4319	116.07	1.2993	5.8414	6.8328	8.1321
20	130	1.2107	6.438	120.95	1.3526	5.842	6.8328	8.1854
21	140	1.3059	6.4442	125.67	1.4041	5.8398	6.8328	8.2369
22	150	1.4039	6.4506	130.28	1.4542	5.8381	6.8328	8.287
23	160	1.4949	6.4565	134.85	1.5037	5.8337	6.8328	8.3365
24	170	1.5943	6.4631	139.57	1.5548	5.8282	6.8328	8.3876
25	180	1.6924	6.4695	144.34	1.6064	5.8194	6.8328	8.4392
26	190	1.7862	6.4757	148.8	1.6544	5.8101	6.8328	8.4872
27	200	1.8814	6.482	153.15	1.7012	5.8002	6.8328	8.534
28	210	1.9794	6.4885	157.5	1.7478	5.7892	6.8328	8.5806
29	220	2.076	6.4949	161.7	1.7926	5.777	6.8328	8.6254
30	230	2.1727	6.5013	165.74	1.8355	5.766	6.8328	8.6683
31	240	2.2707	6.5078	169.99	1.8807	5.7523	6.8328	8.7135
32	270	2.5577	6.527	181.26	1.9996	5.7083	6.8328	8.8324
33	300	2.8433	6.5462	192.44	2.1166	5.6637	6.8328	8.9494
34	330	3.1219	6.565	202.56	2.2215	5.6214	6.8328	9.0543
35	360	3.406	6.5843	212.47	2.3234	5.6076	6.8328	9.1562
36	390	3.6945	6.604	222.12	2.4217	5.5625	6.8328	9.2545
37	420	3.9815	6.6238	231.46	2.5159	5.519	6.8328	9.3487
38	450	4.2714	6.6438	240.43	2.6055	5.4761	6.8328	9.4383
39	480	4.557	6.6637	248.71	2.6873	5.4343	6.8328	9.5201
40	510	4.8398	6.6835	256.9	2.7675	5.3947	6.8328	9.6003
41	540	5.1254	6.7036	264.34	2.8392	5.354	6.8328	9.672
42	570	5.411	6.7239	272.37	2.9166	5.316	6.8328	9.7494
43	600	5.6995	6.7444	280.03	2.9894	5.2759	6.8328	9.8222
44	630	5.9894	6.7652	287.37	3.0584	5.2401	6.8328	9.8912
45	660	6.2778	6.786	294.03	3.1197	5.2054	6.8328	9.9525
46	690	6.5705	6.8073	301.01	3.1837	5.1713	6.8328	10.016
47	720	6.8604	6.8285	307.77	3.2452	5.1389	6.8328	10.078
48	750	7.1432	6.8493	314.07	3.3015	5.1086	6.8328	10.134
49	780	7.426	6.8702	320.31	3.3568	5.0784	6.8328	10.19
50	810	7.7101	6.8914	324.19	3.3871	5.0492	6.8328	10.22
51	840	7.9943	6.9126	331.48	3.4526	5.0212	6.8328	10.285
52	870	8.2828	6.9344	336.93	3.4984	4.9942	6.8328	10.331
53	900	8.5741	6.9565	342.91	3.5492	4.9705	6.8328	10.382
54	930	8.8668	6.9788	348.21	3.5925	4.9458	6.8328	10.425
55	960	9.1609	7.0014	353.93	3.6396	4.9216	6.8328	10.472
56	990	9.448	7.0236	357.76	3.6674	4.9012	6.8328	10.5
57	1020	9.7336	7.0458	363.58	3.7153	4.8809	6.8328	10.548
58	1050	10.022	7.0684	368.98	3.7585	4.8589	6.8328	10.591
59	1080	10.301	7.0904	373.02	3.7879	4.8391	6.8328	10.621
60	1110	10.585	7.1129	377.95	3.8258	4.8192	6.8328	10.659
61	1140	10.877	7.1363	382.93	3.8635	4.8005	6.8328	10.696
62	1170	11.167	7.1596	387.34	3.8952	4.7813	6.8328	10.728
63	1200	11.457	7.183	392.06	3.9299	4.7626	6.8328	10.763
64	1230	11.743	7.2062	396.36	3.9601	4.7472	6.8328	10.793
65	1260	12.027	7.2295	401.76	4.0012	4.7279	6.8328	10.834
66	1290	12.308	7.2527	404.59	4.0165	4.7098	6.8328	10.849
67	1320	12.591	7.2762	409.47	4.0518	4.6944	6.8328	10.885
68	1350	12.88	7.3003	413.98	4.0829	4.6795	6.8328	10.916
69	1380	13.172	7.3249	417.76	4.1063	4.6652	6.8328	10.939
70	1410	13.464	7.3495	422.16	4.1357	4.6526	6.8328	10.969
71	1440	13.758	7.3746	425.99	4.1591	4.6388	6.8328	10.992
72	1470	14.042	7.399	429.93	4.1836	4.625	6.8328	11.016
73	1500	14.323	7.4233	434.02	4.2096	4.6096	6.8328	11.042
74	1530	14.609	7.4481	436.53	4.2199	4.5953	6.8328	11.053
75	1560	14.897	7.4734	441.31	4.2516	4.5816	6.8328	11.084
76	1590	15.19	7.4992	445.29	4.2753	4.5662	6.8328	11.108
77	1614.3	15.429	7.5203	447.97	4.2889	4.5552	6.8328	11.122

TRIAXIAL TEST

Project: COLETO CREEK FACILITY
Boring No.: B-2-1 S-14
Sample No.: S-14
Test No.: 24.3 PSI

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/5/11
Sample Type: 3" ST

Project No.: 60225561
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

Soil Description: CLAYEY F-M SAND LITTLE SILT- BROWNISH GRAY SC
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 6.02 in
Specimen Area: 6.36 in^2
Specimen Volume: 38.27 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

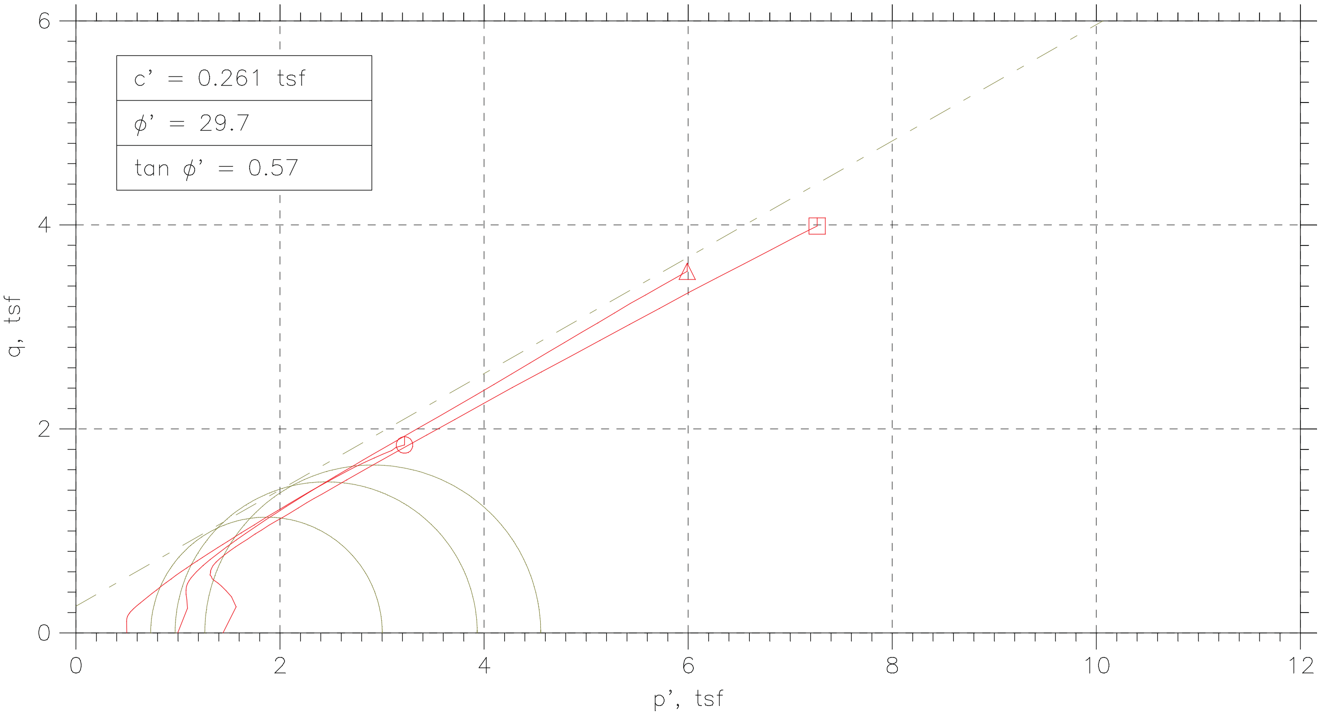
Plastic Limit: 24

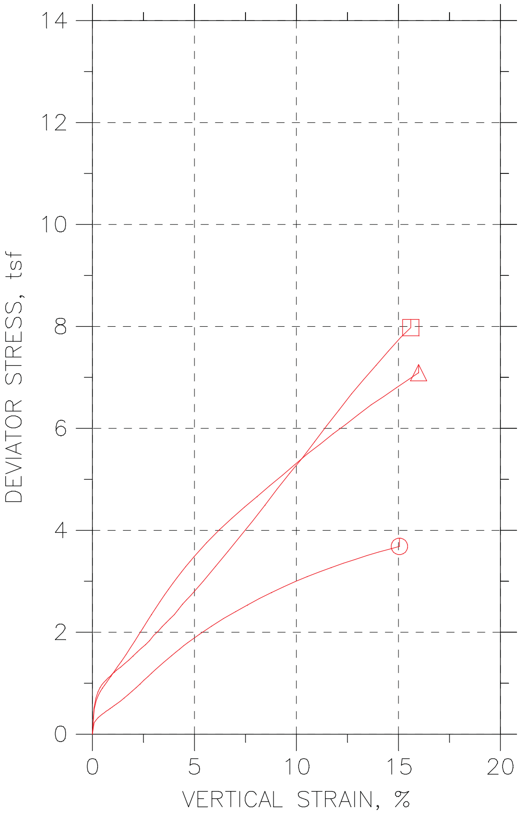
Measured Specific Gravity: 2.67

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.8328	6.8328	0	0.000	1.7924	1.7924	1.000	1.7924	0
2	0.03	7.2441	6.8328	0.21566	0.524	1.9881	1.5767	1.261	1.7824	0.20567
3	0.08	7.3929	6.8328	0.35649	0.637	1.996	1.4359	1.390	1.7159	0.28004
4	0.13	7.4756	6.8328	0.45002	0.700	1.9852	1.3424	1.479	1.6638	0.32142
5	0.17	7.5334	6.8328	0.51768	0.739	1.9753	1.2747	1.550	1.625	0.35031
6	0.22	7.5828	6.8328	0.5705	0.761	1.9719	1.2219	1.614	1.5969	0.37502
7	0.27	7.6239	6.8328	0.61231	0.774	1.9712	1.1801	1.670	1.5757	0.39557
8	0.31	7.6609	6.8328	0.64697	0.781	1.9735	1.1454	1.723	1.5595	0.41404
9	0.36	7.6942	6.8328	0.67558	0.784	1.9782	1.1168	1.771	1.5475	0.4307
10	0.41	7.7275	6.8328	0.69978	0.782	1.9873	1.0926	1.819	1.54	0.44734
11	0.46	7.7566	6.8328	0.72014	0.780	1.9961	1.0723	1.862	1.5342	0.4619
12	0.50	7.7839	6.8328	0.73774	0.776	2.0058	1.0547	1.902	1.5302	0.47557
13	0.55	7.8118	6.8328	0.7526	0.769	2.0188	1.0398	1.942	1.5293	0.48951
14	0.65	7.8693	6.8328	0.7768	0.749	2.0521	1.0156	2.021	1.5338	0.51825
15	0.74	7.9237	6.8328	0.79496	0.729	2.0883	0.99744	2.094	1.5429	0.54543
16	0.84	7.9715	6.8328	0.69703	0.612	2.2341	1.0954	2.040	1.6647	0.56936
17	0.93	8.0287	6.8328	0.79881	0.668	2.1895	0.99359	2.204	1.5915	0.59796
18	1.02	8.0822	6.8328	0.79881	0.639	2.243	0.99359	2.258	1.6183	0.62472
19	1.12	8.1321	6.8328	0.80101	0.616	2.2907	0.99139	2.311	1.641	0.64966
20	1.21	8.1854	6.8328	0.80156	0.593	2.3435	0.99084	2.365	1.6672	0.67632
21	1.31	8.2369	6.8328	0.79936	0.569	2.3971	0.99304	2.414	1.6951	0.70204
22	1.40	8.287	6.8328	0.79771	0.549	2.4489	0.99469	2.462	1.7218	0.7271
23	1.49	8.3365	6.8328	0.79331	0.528	2.5028	0.99909	2.505	1.751	0.75187
24	1.59	8.3876	6.8328	0.7878	0.507	2.5594	1.0046	2.548	1.782	0.7774
25	1.69	8.4392	6.8328	0.779	0.485	2.6198	1.0134	2.585	1.8166	0.80319
26	1.79	8.4872	6.8328	0.76965	0.465	2.6772	1.0227	2.618	1.8499	0.82721
27	1.88	8.534	6.8328	0.75975	0.447	2.7338	1.0326	2.647	1.8832	0.85058
28	1.98	8.5806	6.8328	0.74874	0.428	2.7914	1.0436	2.675	1.9175	0.87389
29	2.08	8.6254	6.8328	0.73664	0.411	2.8483	1.0558	2.698	1.952	0.89628
30	2.17	8.6683	6.8328	0.72564	0.395	2.9023	1.0668	2.721	1.9845	0.91776
31	2.27	8.7135	6.8328	0.71188	0.379	2.9612	1.0805	2.741	2.0209	0.94034
32	2.56	8.8324	6.8328	0.66787	0.334	3.1241	1.1245	2.778	2.1243	0.99978
33	2.84	8.9494	6.8328	0.62331	0.294	3.2856	1.1691	2.810	2.2274	1.0583
34	3.12	9.0543	6.8328	0.58095	0.262	3.433	1.2114	2.834	2.3222	1.1108
35	3.41	9.1562	6.8328	0.5672	0.244	3.5486	1.2252	2.896	2.3869	1.1617
36	3.69	9.2545	6.8328	0.52209	0.216	3.692	1.2703	2.906	2.4811	1.2108
37	3.98	9.3487	6.8328	0.47862	0.190	3.8297	1.3138	2.915	2.5717	1.258
38	4.27	9.4383	6.8328	0.43571	0.167	3.9622	1.3567	2.921	2.6595	1.3028
39	4.56	9.5201	6.8328	0.3939	0.147	4.0858	1.3985	2.922	2.7421	1.3437
40	4.84	9.6003	6.8328	0.35429	0.128	4.2056	1.4381	2.924	2.8218	1.3837
41	5.13	9.672	6.8328	0.31358	0.110	4.318	1.4788	2.920	2.8984	1.4196
42	5.41	9.7494	6.8328	0.27562	0.095	4.4333	1.5168	2.923	2.9751	1.4583
43	5.70	9.8222	6.8328	0.23546	0.079	4.5463	1.5569	2.920	3.0516	1.4947
44	5.99	9.8912	6.8328	0.1997	0.065	4.6511	1.5927	2.920	3.1219	1.5292
45	6.28	9.9525	6.8328	0.16504	0.053	4.747	1.6274	2.917	3.1872	1.5598
46	6.57	10.016	6.8328	0.13093	0.041	4.8452	1.6615	2.916	3.2533	1.5918
47	6.86	10.078	6.8328	0.098476	0.030	4.9391	1.6939	2.916	3.3165	1.6226
48	7.14	10.134	6.8328	0.068218	0.021	5.0256	1.7242	2.915	3.3749	1.6507
49	7.43	10.19	6.8328	0.03796	0.011	5.1113	1.7544	2.913	3.4328	1.6784
50	7.71	10.22	6.8328	0.0088023	0.003	5.1707	1.7836	2.899	3.4771	1.6935
51	7.99	10.285	6.8328	-0.019255	-0.006	5.2642	1.8116	2.906	3.5379	1.7263
52	8.28	10.331	6.8328	-0.046212	-0.013	5.337	1.8386	2.903	3.5878	1.7492
53	8.57	10.382	6.8328	-0.069868	-0.020	5.4114	1.8623	2.906	3.6368	1.7746
54	8.87	10.425	6.8328	-0.094625	-0.026	5.4795	1.887	2.904	3.6832	1.7962
55	9.16	10.472	6.8328	-0.11883	-0.033	5.5509	1.9112	2.904	3.731	1.8198
56	9.45	10.5	6.8328	-0.13919	-0.038	5.599	1.9316	2.899	3.7653	1.8337
57	9.73	10.548	6.8328	-0.15954	-0.043	5.6673	1.9519	2.903	3.8096	1.8577
58	10.02	10.591	6.8328	-0.18155	-0.048	5.7324	1.9739	2.904	3.8532	1.8792
59	10.30	10.621	6.8328	-0.20135	-0.053	5.7816	1.9937	2.900	3.8877	1.8939
60	10.58	10.659	6.8328	-0.22116	-0.058	5.8393	2.0136	2.900	3.9264	1.9129
61	10.88	10.696	6.8328	-0.23986	-0.062	5.8958	2.0323	2.901	3.964	1.9318
62	11.17	10.728	6.8328	-0.25912	-0.067	5.9468	2.0515	2.899	3.9991	1.9476
63	11.46	10.763	6.8328	-0.27782	-0.071	6.0001	2.0702	2.898	4.0351	1.9649
64	11.74	10.793	6.8328	-0.29323	-0.074	6.0458	2.0856	2.899	4.0657	1.9801
65	12.03	10.834	6.8328	-0.31248	-0.078	6.1061	2.1049	2.901	4.1055	2.0006
66	12.31	10.849	6.8328	-0.33064	-0.082	6.1395	2.123	2.892	4.1313	2.0083
67	12.59	10.885	6.8328	-0.34604	-0.085	6.1903	2.1384	2.895	4.1643	2.0259
68	12.88	10.916	6.8328	-0.36089	-0.088	6.2362	2.1533	2.896	4.1948	2.0415
69	13.17	10.939	6.8328	-0.3752	-0.091	6.2739	2.1676	2.894	4.2208	2.0532
70	13.46	10.969	6.8328	-0.38785	-0.094	6.316	2.1802	2.897	4.2481	2.0679
71	13.76	10.992	6.8328	-0.4016	-0.097	6.3531	2.194	2.896	4.2735	2.0795
72	14.04	11.016	6.8328	-0.41536	-0.099	6.3914	2.2078	2.895	4.2996	2.0918
73	14.32	11.042	6.8328	-0.43076	-0.102	6.4328	2.2232	2.894	4.328	2.1048
74	14.61	11.053	6.8328	-0.44507	-0.105	6.4574	2.2375	2.886	4.3474	2.11
75	14.90	11.084	6.8328	-0.45882	-0.108	6.5029	2.2512	2.889	4.377	2.1258
76	15.19	11.108	6.8328	-0.47422	-0.111	6.5419	2.2666	2.886	4.4043	2.1376
77	15.43	11.122	6.8328	-0.48523	-0.113	6.5665	2.2776	2.883	4.4221	2.1444

TRIAXIAL COMPRESSION TEST REPORT

AECOM





	Symbol	○	△	□	
	Test No.	7 PSI	13.9 PSI	20.8 PSI	
Initial	Diameter, in	2.8457	2.8382	2.837	
	Height, in	5.9839	5.9646	5.7075	
	Water Content, %	13.01	13.76	17.65	
	Dry Density, pcf	117.3	118.	109.8	
	Saturation, %	83.50	90.24	92.02	
	Void Ratio	0.41352	0.40495	0.50912	
Before Shear	Water Content, %	15.40	14.54	18.60	
	Dry Density, pcf	117.7	119.6	111.	
	Saturation, %	100.00	100.00	100.00	
	Void Ratio	0.40877	0.3861	0.49381	
	Back Press., tsf	5.046	5.0443	5.0958	
	Minor Prin. Stress, tsf	0.49798	0.99651	1.4418	
	Max. Dev. Stress, tsf	3.6849	7.0909	7.9769	
	Time to Failure, min	770.98	772.22	773.86	
	Strain Rate, %/min	0.02	0.02	0.02	
	B-Value	.97	.95	.99	
	Measured Specific Gravity	2.65	2.65	2.65	
	Liquid Limit	27	27	27	
	Plastic Limit	11	11	11	
	Plasticity Index	16	16	16	
	Failure Sketch				

Project: COLETO CREEK FACILITY

Location: IPR-GDF SUEZ

Project No.: 60225561

Boring No.: B-4-1 S-7

Sample Type: 3" ST

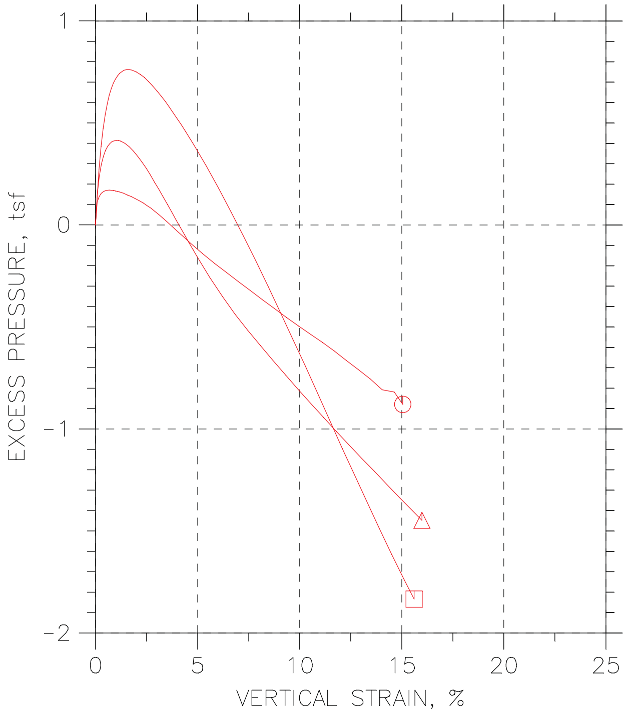
Description: F-M SAND LITTLE CLAY TRACE SILT - BROWNISH GRAY SC

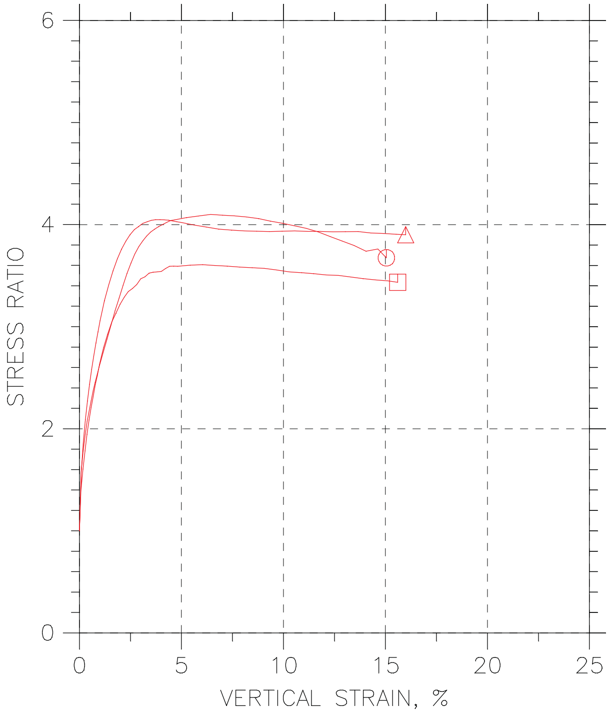
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

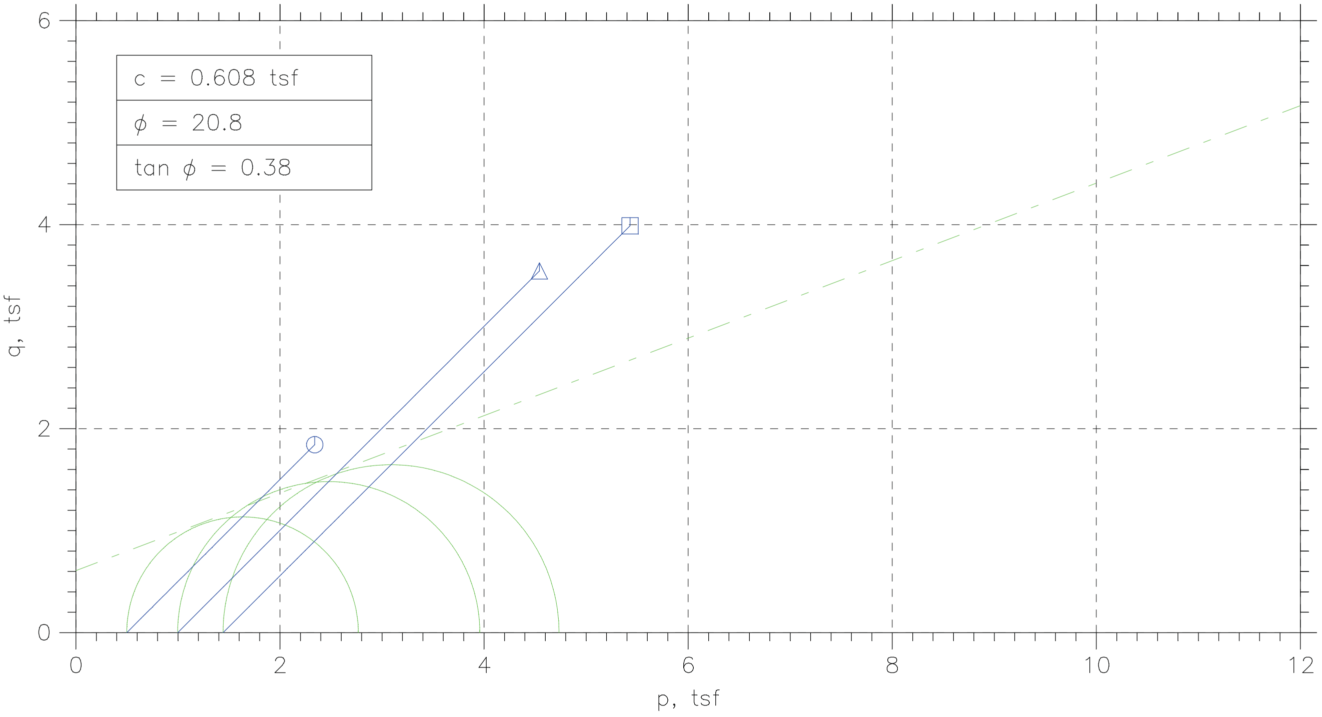
Mon, 12-DEC-2011 10:34:18

TRIAXIAL COMPRESSION TEST REPORT

AECOM







Project: COLETO CREEK FACILITY	Location: IPR-GDF SUEZ	Project No.: 60225561
Boring No.: B-4-1 S-7	Tested By: BCM	Checked By: WPQ
Sample No.: S-7	Test Date: 12/1/11	Depth: 12.0'-14.0'
Test No.: B-4-1 S-7	Sample Type: 3" ST	Elevation: ----
Description: F-M SAND LITTLE CLAY TRACE SILT - BROWNISH GRAY SC		
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767		

Mon, 12-DEC-2011 10:34:58

TRIAXIAL TEST

Project: COLETO CREEK FACILITY
Boring No.: B-4-1 S-7
Sample No.: S-7
Test No.: 7 PSI

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/1/11
Sample Type: 3" ST

Project No.: 60225561
Checked By: WPQ
Depth: 12.0'-14.0'
Elevation: ----

Soil Description: F-M SAND LITTLE CLAY TRACE SILT - BROWNISH GRAY SC
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

Specimen Height: 5.98 in
Specimen Area: 6.36 in^2
Specimen Volume: 38.06 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 27

Plastic Limit: 11

Measured Specific Gravity: 2.65

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.36	0	0	5.046	5.544	5.544
2	5	0.086461	6.3655	19.795	0.2239	5.1593	5.544	5.7679
3	10	0.18589	6.3719	24.744	0.2796	5.1856	5.544	5.8236
4	15	0.28388	6.3781	28.64	0.3233	5.2008	5.544	5.8673
5	20	0.38187	6.3844	31.851	0.3592	5.209	5.544	5.9032
6	25	0.47842	6.3906	34.536	0.38911	5.2137	5.544	5.9331
7	30.001	0.57785	6.397	37.116	0.41775	5.216	5.544	5.9618
8	35.001	0.6744	6.4032	40.064	0.4505	5.2166	5.544	5.9945
9	40.001	0.77094	6.4094	42.433	0.47667	5.216	5.544	6.0207
10	45.001	0.86893	6.4158	44.961	0.50456	5.2148	5.544	6.0486
11	50.001	0.96692	6.4221	47.488	0.5324	5.2125	5.544	6.0764
12	55.001	1.0649	6.4285	50.015	0.56017	5.2102	5.544	6.1042
13	60.001	1.1629	6.4349	52.436	0.58671	5.2078	5.544	6.1307
14	70.001	1.3589	6.4476	57.701	0.64434	5.2014	5.544	6.1883
15	80.001	1.5549	6.4605	63.545	0.70819	5.1932	5.544	6.2522
16	90.002	1.7494	6.4733	69.652	0.77472	5.1851	5.544	6.3187
17	100	1.9454	6.4862	75.812	0.84155	5.1751	5.544	6.3855
18	110	2.1399	6.4991	82.287	0.91162	5.1652	5.544	6.4556
19	120	2.333	6.5119	89.026	0.98433	5.1535	5.544	6.5283
20	130	2.5261	6.5248	95.87	1.0579	5.1407	5.544	6.6019
21	140	2.7178	6.5377	102.5	1.1289	5.1278	5.544	6.6729
22	150	2.9109	6.5507	109.3	1.2013	5.1126	5.544	6.7453
23	160	3.1054	6.5639	115.93	1.2716	5.0963	5.544	6.8156
24	170	3.2999	6.5771	122.56	1.3417	5.0793	5.544	6.8857
25	180	3.4959	6.5904	129.2	1.4115	5.0618	5.544	6.9555
26	190	3.6904	6.6037	135.46	1.4769	5.0443	5.544	7.0209
27	200	3.8879	6.6173	141.83	1.5432	5.0262	5.544	7.0872
28	210	4.0838	6.6308	148.15	1.6087	5.0081	5.544	7.1527
29	220	4.2798	6.6444	154.31	1.6721	4.9905	5.544	7.2161
30	230	4.4744	6.6579	160.52	1.7359	4.973	5.544	7.2799
31	240	4.6675	6.6714	166.1	1.7926	4.9555	5.544	7.3366
32	270	5.2482	6.7123	182.69	1.9596	4.9052	5.544	7.5036
33	300	5.839	6.7544	198.8	2.1191	4.8568	5.544	7.6631
34	330	6.4298	6.7971	214.22	2.2692	4.8118	5.544	7.8132
35	360	7.012	6.8396	228.12	2.4014	4.7674	5.544	7.9454
36	390	7.597	6.8829	242.18	2.5333	4.723	5.544	8.0773
37	420	8.1879	6.9272	255.97	2.6605	4.6786	5.544	8.2045
38	450	8.7758	6.9719	269.13	2.7794	4.6354	5.544	8.3234
39	480	9.3565	7.0165	281.45	2.8881	4.5921	5.544	8.4321
40	510	9.943	7.0622	293.66	2.9939	4.5506	5.544	8.5379
41	540	10.532	7.1087	305.19	3.0911	4.5098	5.544	8.6351
42	570	11.116	7.1554	316.25	3.1822	4.47	5.544	8.7262
43	600	11.698	7.2026	326.89	3.2677	4.428	5.544	8.8117
44	630	12.285	7.2508	337.63	3.3526	4.3812	5.544	8.8966
45	660	12.874	7.2998	347.58	3.4282	4.3368	5.544	8.9722
46	690	13.463	7.3495	357.84	3.5056	4.2901	5.544	9.0496
47	720	14.047	7.3994	367.48	3.5757	4.2381	5.544	9.1197
48	750	14.632	7.4501	376.32	3.6369	4.2264	5.544	9.1809
49	770.98	15.049	7.4867	383.16	3.6849	4.1663	5.544	9.2289

TRIAXIAL TEST

Project: COLETO CREEK FACILITY
Boring No.: B-4-1 S-7
Sample No.: S-7
Test No.: 7 PSI

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/1/11
Sample Type: 3" ST

Project No.: 60225561
Checked By: WPQ
Depth: 12.0'-14.0'
Elevation: ----

Soil Description: F-M SAND LITTLE CLAY TRACE SILT - BROWNISH GRAY SC
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

Specimen Height: 5.98 in
Specimen Area: 6.36 in^2
Specimen Volume: 38.06 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 27

Plastic Limit: 11

Measured Specific Gravity: 2.65

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	5.544	5.544	0	0.000	0.49798	0.49798	1.000	0.49798	0
2	0.09	5.7679	5.544	0.11333	0.506	0.60855	0.38465	1.582	0.4966	0.11195
3	0.19	5.8236	5.544	0.13962	0.499	0.63796	0.35836	1.780	0.49816	0.1398
4	0.28	5.8673	5.544	0.1548	0.479	0.66648	0.34317	1.942	0.50483	0.16165
5	0.38	5.9032	5.544	0.16298	0.454	0.6942	0.335	2.072	0.5146	0.1796
6	0.48	5.9331	5.544	0.16766	0.431	0.71943	0.33032	2.178	0.52488	0.19455
7	0.58	5.9618	5.544	0.16999	0.407	0.74574	0.32799	2.274	0.53686	0.20888
8	0.67	5.9945	5.544	0.17058	0.379	0.7779	0.3274	2.376	0.55265	0.22525
9	0.77	6.0207	5.544	0.16999	0.357	0.80466	0.32799	2.453	0.56632	0.23834
10	0.87	6.0486	5.544	0.16882	0.335	0.83372	0.32915	2.533	0.58144	0.25228
11	0.97	6.0764	5.544	0.16649	0.313	0.86389	0.33149	2.606	0.59769	0.2662
12	1.06	6.1042	5.544	0.16415	0.293	0.894	0.33383	2.678	0.61391	0.28009
13	1.16	6.1307	5.544	0.16181	0.276	0.92288	0.33616	2.745	0.62952	0.29336
14	1.36	6.1883	5.544	0.15539	0.241	0.98693	0.34259	2.881	0.66476	0.32217
15	1.55	6.2522	5.544	0.14721	0.208	1.059	0.35077	3.019	0.70486	0.35409
16	1.75	6.3187	5.544	0.13903	0.179	1.1337	0.35895	3.158	0.7463	0.38736
17	1.95	6.3855	5.544	0.1291	0.153	1.2104	0.36888	3.281	0.78965	0.42077
18	2.14	6.4556	5.544	0.11917	0.131	1.2904	0.37881	3.407	0.83462	0.45581
19	2.33	6.5283	5.544	0.10749	0.109	1.3748	0.39049	3.521	0.88265	0.49216
20	2.53	6.6019	5.544	0.094635	0.089	1.4612	0.40334	3.623	0.93229	0.52895
21	2.72	6.6729	5.544	0.081783	0.072	1.5451	0.4162	3.712	0.98063	0.56444
22	2.91	6.7453	5.544	0.066595	0.055	1.6327	0.43138	3.785	1.032	0.60064
23	3.11	6.8156	5.544	0.050238	0.040	1.7194	0.44774	3.840	1.0836	0.63582
24	3.30	6.8857	5.544	0.033297	0.025	1.8064	0.46468	3.887	1.1355	0.67085
25	3.50	6.9555	5.544	0.015772	0.011	1.8937	0.48221	3.927	1.1879	0.70573
26	3.69	7.0209	5.544	-0.0017525	-0.001	1.9766	0.49973	3.955	1.2382	0.73846
27	3.89	7.0872	5.544	-0.019862	-0.013	2.061	0.51784	3.980	1.2894	0.7716
28	4.08	7.1527	5.544	-0.037971	-0.024	2.1446	0.53595	4.002	1.3403	0.80433
29	4.28	7.2161	5.544	-0.055496	-0.033	2.2256	0.55347	4.021	1.3895	0.83606
30	4.47	7.2799	5.544	-0.073021	-0.042	2.3069	0.571	4.040	1.4389	0.86795
31	4.67	7.3366	5.544	-0.090546	-0.051	2.3811	0.58852	4.046	1.4848	0.89631
32	5.25	7.5036	5.544	-0.14078	-0.072	2.5983	0.63876	4.068	1.6186	0.97979
33	5.84	7.6631	5.544	-0.18927	-0.089	2.8063	0.68725	4.083	1.7468	1.0595
34	6.43	7.8132	5.544	-0.23425	-0.103	3.0014	0.73223	4.099	1.8668	1.1346
35	7.01	7.9454	5.544	-0.27865	-0.116	3.178	0.77663	4.092	1.9773	1.2007
36	7.60	8.0773	5.544	-0.32304	-0.128	3.3543	0.82102	4.086	2.0877	1.2667
37	8.19	8.2045	5.544	-0.36744	-0.138	3.5259	0.86542	4.074	2.1957	1.3302
38	8.78	8.3234	5.544	-0.41067	-0.148	3.688	0.90865	4.059	2.2983	1.3897
39	9.36	8.4321	5.544	-0.4539	-0.157	3.84	0.95187	4.034	2.3959	1.4441
40	9.94	8.5379	5.544	-0.49537	-0.165	3.9873	0.99335	4.014	2.4903	1.497
41	10.53	8.6351	5.544	-0.53626	-0.173	4.1254	1.0342	3.989	2.5798	1.5456
42	11.12	8.7262	5.544	-0.57599	-0.181	4.2562	1.074	3.963	2.6651	1.5911
43	11.70	8.8117	5.544	-0.61805	-0.189	4.3837	1.116	3.928	2.7499	1.6338
44	12.28	8.8966	5.544	-0.66478	-0.198	4.5154	1.1628	3.883	2.8391	1.6763
45	12.87	8.9722	5.544	-0.70918	-0.207	4.6354	1.2072	3.840	2.9213	1.7141
46	13.46	9.0496	5.544	-0.75591	-0.216	4.7595	1.2539	3.796	3.0067	1.7528
47	14.05	9.1197	5.544	-0.8079	-0.226	4.8816	1.3059	3.738	3.0937	1.7879
48	14.63	9.1809	5.544	-0.81958	-0.225	4.9544	1.3176	3.760	3.136	1.8184
49	15.05	9.2289	5.544	-0.87975	-0.239	5.0627	1.3777	3.675	3.2202	1.8425

TRIAXIAL TEST

Project: COLETO CREEK FACILITY
Boring No.: B-4-1 S-7
Sample No.: S-7
Test No.: 13.9 PSI

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/1/11
Sample Type: 3" ST

Project No.: 60225561
Checked By: WPQ
Depth: 12.0'-14.0'
Elevation: ----

Soil Description: F-M SAND LITTLE CLAY TRACE SILT - BROWNISH GRAY SC
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

Specimen Height: 5.96 in
Specimen Area: 6.33 in^2
Specimen Volume: 37.74 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 27

Plastic Limit: 11

Measured Specific Gravity: 2.65

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3266	0	0	5.0443	6.0408	6.0408
2	5.0001	0.088226	6.3322	42.594	0.48432	5.1902	6.0408	6.5251
3	10	0.18929	6.3386	57.838	0.65698	5.2828	6.0408	6.6978
4	15	0.29035	6.3451	67.028	0.76059	5.3416	6.0408	6.8014
5	20	0.39301	6.3516	74.03	0.83918	5.381	6.0408	6.88
6	25	0.49407	6.358	79.864	0.9044	5.4104	6.0408	6.9452
7	30.001	0.59834	6.3647	85.335	0.96534	5.4304	6.0408	7.0061
8	35.001	0.7026	6.3714	90.44	1.022	5.4431	6.0408	7.0628
9	40.001	0.80687	6.3781	95.837	1.0819	5.4526	6.0408	7.1227
10	45.001	0.91274	6.3849	101.02	1.1391	5.4565	6.0408	7.1799
11	50.001	1.0154	6.3915	106.41	1.1987	5.4587	6.0408	7.2395
12	55.001	1.1213	6.3984	111.81	1.2582	5.4581	6.0408	7.299
13	60.001	1.2223	6.4049	117.43	1.32	5.4554	6.0408	7.3608
14	70.001	1.4357	6.4188	128	1.4358	5.4448	6.0408	7.4766
15	80.002	1.649	6.4327	139.67	1.5633	5.4271	6.0408	7.6041
16	90.002	1.8576	6.4464	151.49	1.692	5.406	6.0408	7.7328
17	100	2.0661	6.4601	163.52	1.8225	5.3805	6.0408	7.8633
18	110	2.273	6.4738	175.56	1.9525	5.3527	6.0408	7.9933
19	120	2.4816	6.4876	187.81	2.0843	5.3222	6.0408	8.1251
20	130	2.6885	6.5014	200.21	2.2172	5.2895	6.0408	8.258
21	140	2.8954	6.5153	212.32	2.3463	5.2534	6.0408	8.3871
22	150	3.1056	6.5294	224.42	2.4747	5.219	6.0408	8.5155
23	160	3.3157	6.5436	236.46	2.6018	5.1813	6.0408	8.6426
24	170	3.5242	6.5577	248.35	2.7267	5.1441	6.0408	8.7675
25	180	3.736	6.5722	259.8	2.8461	5.107	6.0408	8.8869
26	190	3.9461	6.5865	270.88	2.9611	5.0693	6.0408	9.0019
27	200	4.1563	6.601	281.75	3.0732	5.0321	6.0408	9.114
28	210	4.3648	6.6154	292.4	3.1824	4.9949	6.0408	9.2232
29	220	4.5717	6.6297	302.54	3.2856	4.9583	6.0408	9.3264
30	230	4.7787	6.6441	312.53	3.3868	4.9222	6.0408	9.4276
31	240	4.984	6.6585	322.3	3.4851	4.8873	6.0408	9.5259
32	270	5.6016	6.7021	349.8	3.7579	4.7863	6.0408	9.7987
33	300	6.224	6.7465	375.84	4.011	4.6926	6.0408	10.052
34	330	6.8335	6.7907	399.69	4.2378	4.6066	6.0408	10.279
35	360	7.4495	6.8359	422.95	4.4548	4.5289	6.0408	10.496
36	390	8.0687	6.8819	445.56	4.6616	4.454	6.0408	10.702
37	420	8.6911	6.9288	468.98	4.8733	4.3803	6.0408	10.914
38	450	9.3087	6.976	492.1	5.079	4.3087	6.0408	11.12
39	480	9.9279	7.024	516.31	5.2925	4.2377	6.0408	11.333
40	510	10.552	7.073	540.67	5.5038	4.1678	6.0408	11.545
41	540	11.176	7.1226	563.06	5.6918	4.1007	6.0408	11.733
42	570	11.797	7.1728	587.2	5.8943	4.0319	6.0408	11.935
43	600	12.416	7.2235	609.6	6.0761	3.9659	6.0408	12.117
44	630	13.033	7.2748	633.59	6.2708	3.9004	6.0408	12.312
45	660	13.659	7.3275	657.66	6.4622	3.8366	6.0408	12.503
46	690	14.283	7.3808	679.18	6.6254	3.7706	6.0408	12.666
47	720	14.902	7.4345	701.93	6.7979	3.7068	6.0408	12.839
48	750	15.525	7.4893	724.47	6.9648	3.643	6.0408	13.006
49	772.22	15.991	7.5309	741.68	7.0909	3.5959	6.0408	13.132

TRIAXIAL TEST

Project: COLETO CREEK FACILITY
Boring No.: B-4-1 S-7
Sample No.: S-7
Test No.: 13.9 PSI

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/1/11
Sample Type: 3" ST

Project No.: 60225561
Checked By: WPQ
Depth: 12.0'-14.0'
Elevation: ----

Soil Description: F-M SAND LITTLE CLAY TRACE SILT - BROWNISH GRAY SC
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

Specimen Height: 5.96 in
Specimen Area: 6.33 in^2
Specimen Volume: 37.74 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 27

Plastic Limit: 11

Measured Specific Gravity: 2.65

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.0408	6.0408	0	0.000	0.99651	0.99651	1.000	0.99651	0
2	0.09	6.5251	6.0408	0.1459	0.301	1.3349	0.85061	1.569	1.0928	0.24216
3	0.19	6.6978	6.0408	0.23854	0.363	1.4149	0.75797	1.867	1.0865	0.32849
4	0.29	6.8014	6.0408	0.29734	0.391	1.4598	0.69917	2.088	1.0795	0.3803
5	0.39	6.88	6.0408	0.33673	0.401	1.499	0.65978	2.272	1.0794	0.41959
6	0.49	6.9452	6.0408	0.36613	0.405	1.5348	0.63038	2.435	1.0826	0.4522
7	0.60	7.0061	6.0408	0.3861	0.400	1.5757	0.61041	2.581	1.0931	0.48267
8	0.70	7.0628	6.0408	0.39886	0.390	1.6197	0.59765	2.710	1.1087	0.51101
9	0.81	7.1227	6.0408	0.40829	0.377	1.6701	0.58822	2.839	1.1292	0.54094
10	0.91	7.1799	6.0408	0.41217	0.362	1.7235	0.58434	2.949	1.1539	0.56956
11	1.02	7.2395	6.0408	0.41439	0.346	1.7809	0.58212	3.059	1.1815	0.59937
12	1.12	7.299	6.0408	0.41384	0.329	1.8409	0.58267	3.159	1.2118	0.62909
13	1.22	7.3608	6.0408	0.41107	0.311	1.9055	0.58545	3.255	1.2455	0.66002
14	1.44	7.4766	6.0408	0.40053	0.279	2.0318	0.59599	3.409	1.3139	0.7179
15	1.65	7.6041	6.0408	0.38277	0.245	2.1771	0.61374	3.547	1.3954	0.78166
16	1.86	7.7328	6.0408	0.36169	0.214	2.3268	0.63482	3.665	1.4808	0.84599
17	2.07	7.8633	6.0408	0.33617	0.184	2.4828	0.66034	3.760	1.5716	0.91125
18	2.27	7.9933	6.0408	0.30844	0.158	2.6406	0.68807	3.838	1.6643	0.97625
19	2.48	8.1251	6.0408	0.27793	0.133	2.8029	0.71858	3.901	1.7607	1.0422
20	2.69	8.258	6.0408	0.2452	0.111	2.9685	0.75131	3.951	1.8599	1.1086
21	2.90	8.3871	6.0408	0.20914	0.089	3.1337	0.78737	3.980	1.9605	1.1731
22	3.11	8.5155	6.0408	0.17474	0.071	3.2965	0.82177	4.011	2.0591	1.2374
23	3.32	8.6426	6.0408	0.13702	0.053	3.4613	0.85949	4.027	2.1604	1.3009
24	3.52	8.7675	6.0408	0.099854	0.037	3.6233	0.89666	4.041	2.26	1.3633
25	3.74	8.8869	6.0408	0.062686	0.022	3.78	0.93383	4.048	2.3569	1.4231
26	3.95	9.0019	6.0408	0.024963	0.008	3.9327	0.97155	4.048	2.4521	1.4806
27	4.16	9.114	6.0408	-0.012204	-0.004	4.0819	1.0087	4.047	2.5453	1.5366
28	4.36	9.2232	6.0408	-0.049372	-0.016	4.2283	1.0459	4.043	2.6371	1.5912
29	4.57	9.3264	6.0408	-0.085985	-0.026	4.3681	1.0825	4.035	2.7253	1.6428
30	4.78	9.4276	6.0408	-0.12204	-0.036	4.5053	1.1186	4.028	2.8119	1.6934
31	4.98	9.5259	6.0408	-0.15699	-0.045	4.6386	1.1535	4.021	2.8961	1.7426
32	5.60	9.7987	6.0408	-0.25796	-0.069	5.0124	1.2545	3.996	3.1334	1.8789
33	6.22	10.052	6.0408	-0.35171	-0.088	5.3592	1.3482	3.975	3.3537	2.0055
34	6.83	10.279	6.0408	-0.43769	-0.103	5.672	1.4342	3.955	3.5531	2.1189
35	7.45	10.496	6.0408	-0.51536	-0.116	5.9667	1.5119	3.947	3.7393	2.2274
36	8.07	10.702	6.0408	-0.59025	-0.127	6.2483	1.5868	3.938	3.9175	2.3308
37	8.69	10.914	6.0408	-0.66403	-0.136	6.5338	1.6605	3.935	4.0972	2.4367
38	9.31	11.12	6.0408	-0.73559	-0.145	6.8111	1.7321	3.932	4.2716	2.5395
39	9.93	11.333	6.0408	-0.8066	-0.152	7.0956	1.8031	3.935	4.4494	2.6463
40	10.55	11.545	6.0408	-0.8765	-0.159	7.3768	1.873	3.938	4.6249	2.7519
41	11.18	11.733	6.0408	-0.94362	-0.166	7.6319	1.9401	3.934	4.786	2.8459
42	11.80	11.935	6.0408	-1.0124	-0.172	7.9032	2.0089	3.934	4.9561	2.9472
43	12.42	12.117	6.0408	-1.0784	-0.177	8.1511	2.0749	3.928	5.113	3.0381
44	13.03	12.312	6.0408	-1.1439	-0.182	8.4112	2.1404	3.930	5.2758	3.1354
45	13.66	12.503	6.0408	-1.2077	-0.187	8.6664	2.2042	3.932	5.4353	3.2311
46	14.28	12.666	6.0408	-1.2737	-0.192	8.8956	2.2702	3.918	5.5829	3.3127
47	14.90	12.839	6.0408	-1.3375	-0.197	9.1319	2.334	3.913	5.7329	3.3989
48	15.52	13.006	6.0408	-1.4013	-0.201	9.3626	2.3978	3.905	5.8802	3.4824
49	15.99	13.132	6.0408	-1.4484	-0.204	9.5358	2.4449	3.900	5.9904	3.5454

TRIAXIAL TEST

Project: COLETO CREEK FACILITY
Boring No.: B-4-1 S-7
Sample No.: S-7
Test No.: 20.8 PSI

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/1/11
Sample Type: 3" ST

Project No.: 60225561
Checked By: WPQ
Depth: 12.0'-14.0'
Elevation: ----

AECOM

Soil Description: F-M SAND LITTLE CLAY TRACE SILT - BROWNISH GRAY SC
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

Specimen Height: 5.71 in
Specimen Area: 6.32 in^2
Specimen Volume: 36.08 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 27

Plastic Limit: 11

Measured Specific Gravity: 2.65

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3214	0	0	5.0958	6.5376	6.5376
2	5.0038	0.074905	6.3261	45.054	0.51278	5.2246	6.5376	7.0504
3	10.004	0.17378	6.3324	62.257	0.70787	5.3665	6.5376	7.2455
4	15.004	0.27265	6.3386	72.957	0.82871	5.4806	6.5376	7.3663
5	20.004	0.37303	6.345	80.614	0.91477	5.5686	6.5376	7.4524
6	25.004	0.4749	6.3515	86.279	0.97804	5.636	6.5376	7.5156
7	30	0.57677	6.358	90.422	1.024	5.6898	6.5376	7.5616
8	35	0.67415	6.3643	93.779	1.0609	5.7316	6.5376	7.5985
9	40	0.77752	6.3709	97.975	1.1073	5.7648	6.5376	7.6449
10	45.002	0.87939	6.3774	100.65	1.1363	5.7909	6.5376	7.6739
11	50.003	0.97976	6.3839	104.95	1.1837	5.8104	6.5376	7.7213
12	55.003	1.0801	6.3904	107.84	1.215	5.8262	6.5376	7.7526
13	60.003	1.1835	6.3971	111.51	1.255	5.8387	6.5376	7.7926
14	70.003	1.3842	6.4101	117.22	1.3167	5.8539	6.5376	7.8543
15	80.004	1.5895	6.4235	123.99	1.3898	5.8583	6.5376	7.9274
16	90.004	1.7887	6.4365	130.13	1.4556	5.855	6.5376	7.9932
17	100	1.9925	6.4499	137.42	1.534	5.8463	6.5376	8.0716
18	110	2.1962	6.4633	144.6	1.6108	5.8338	6.5376	8.1484
19	120	2.3955	6.4765	151.58	1.6851	5.8186	6.5376	8.2227
20	130	2.5992	6.4901	158.24	1.7555	5.7979	6.5376	8.2931
21	140	2.8059	6.5039	165.9	1.8365	5.7762	6.5376	8.3741
22	150	3.0097	6.5175	175.55	1.9393	5.7523	6.5376	8.4769
23	160	3.2119	6.5311	182.73	2.0145	5.7278	6.5376	8.5521
24	170	3.4142	6.5448	191.81	2.1101	5.7018	6.5376	8.6477
25	180	3.6119	6.5582	199.36	2.1887	5.6735	6.5376	8.7263
26	190	3.8127	6.5719	206.81	2.2657	5.6442	6.5376	8.8033
27	200	4.0164	6.5859	214.52	2.3452	5.6148	6.5376	8.8828
28	210	4.2187	6.5998	224.32	2.4473	5.5849	6.5376	8.9849
29	220	4.4164	6.6134	234.24	2.5501	5.5534	6.5376	9.0877
30	230	4.6187	6.6275	242.73	2.637	5.5208	6.5376	9.1746
31	240	4.8209	6.6415	250.97	2.7207	5.4876	6.5376	9.2583
32	270	5.4291	6.6843	278.4	2.9988	5.3849	6.5376	9.5364
33	300	6.0389	6.7276	307.61	3.2921	5.2746	6.5376	9.8297
34	330	6.6411	6.771	336.99	3.5833	5.1589	6.5376	10.121
35	360	7.2433	6.815	367.41	3.8816	5.0409	6.5376	10.419
36	390	7.8605	6.8607	398.56	4.1827	4.9187	6.5376	10.72
37	420	8.4643	6.9059	431.13	4.4949	4.7937	6.5376	11.033
38	450	9.0605	6.9512	464.49	4.8112	4.6665	6.5376	11.349
39	480	9.6658	6.9978	497.43	5.118	4.535	6.5376	11.656
40	510	10.283	7.0459	529.79	5.4138	4.4035	6.5376	11.951
41	540	10.887	7.0936	564.88	5.7335	4.2698	6.5376	12.271
42	570	11.48	7.1412	599.97	6.0491	4.1361	6.5376	12.587
43	600	12.084	7.1902	634.95	6.3581	4.0008	6.5376	12.896
44	630	12.699	7.2409	671.35	6.6755	3.8687	6.5376	13.213
45	660	13.303	7.2913	704.92	6.9608	3.7378	6.5376	13.498
46	690	13.902	7.3421	738.01	7.2373	3.6073	6.5376	13.775
47	720	14.505	7.3938	771.63	7.514	3.4807	6.5376	14.052
48	750	15.119	7.4473	805.72	7.7897	3.3563	6.5376	14.327
49	773.86	15.606	7.4903	829.85	7.9769	3.2617	6.5376	14.514

TRIAXIAL TEST

Project: COLETO CREEK FACILITY
Boring No.: B-4-1 S-7
Sample No.: S-7
Test No.: 20.8 PSI

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/1/11
Sample Type: 3" ST

Project No.: 60225561
Checked By: WPQ
Depth: 12.0'-14.0'
Elevation: ----

Soil Description: F-M SAND LITTLE CLAY TRACE SILT - BROWNISH GRAY SC
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

Specimen Height: 5.71 in
Specimen Area: 6.32 in^2
Specimen Volume: 36.08 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 27

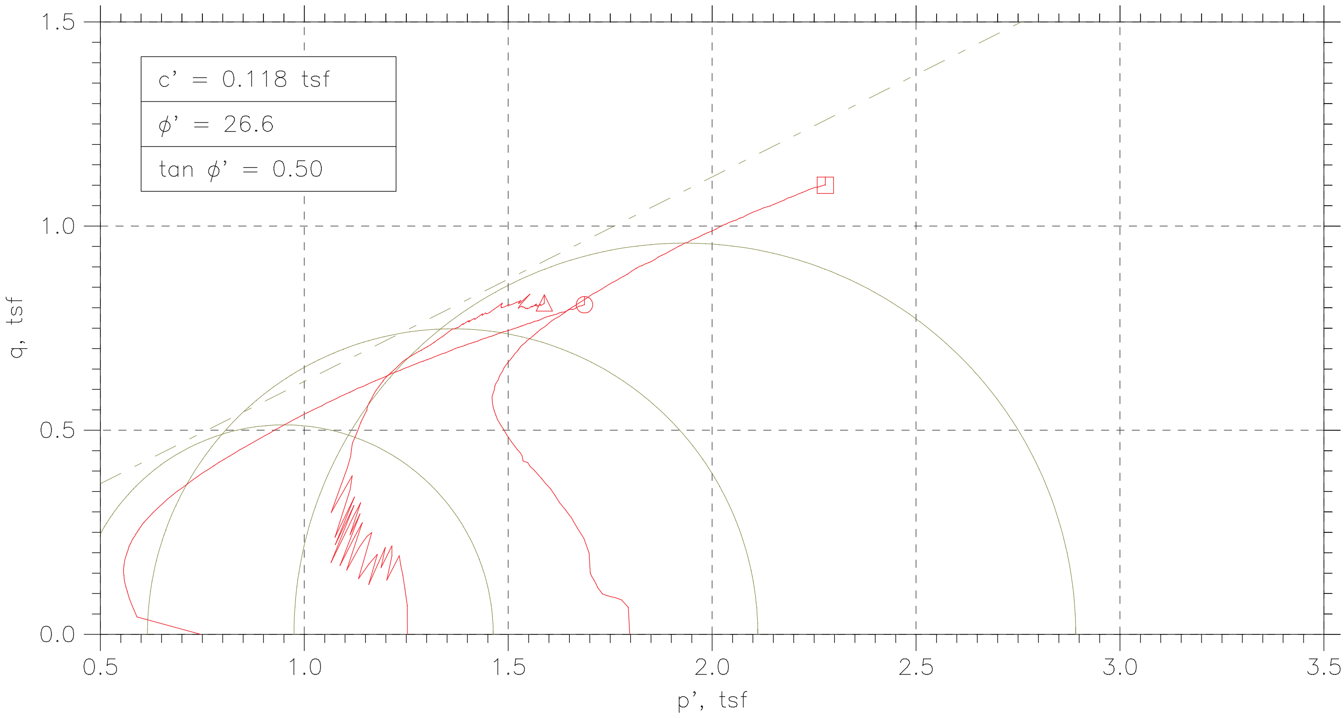
Plastic Limit: 11

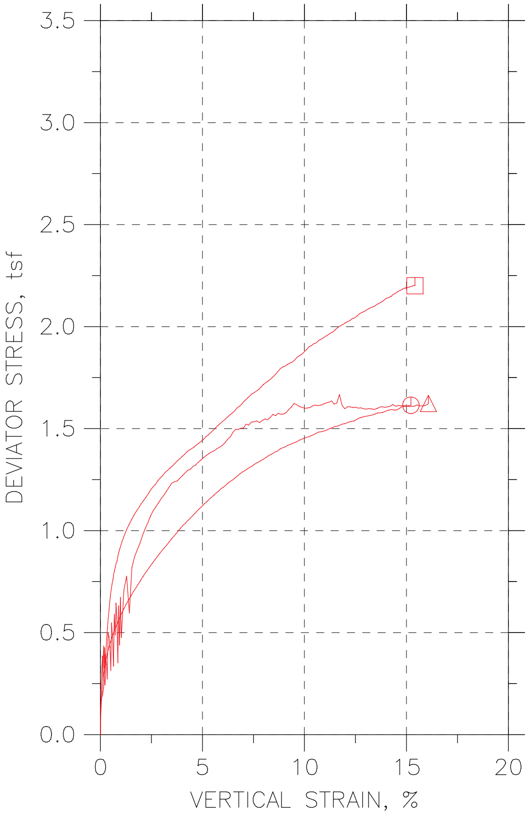
Measured Specific Gravity: 2.65

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.5376	6.5376	0	0.000	1.4418	1.4418	1.000	1.4418	0
2	0.07	7.0504	6.5376	0.12879	0.251	1.8258	1.313	1.391	1.5694	0.25639
3	0.17	7.2455	6.5376	0.27063	0.382	1.879	1.1711	1.604	1.5251	0.35394
4	0.27	7.3663	6.5376	0.38475	0.464	1.8857	1.057	1.784	1.4714	0.41435
5	0.37	7.4524	6.5376	0.47279	0.517	1.8838	0.96898	1.944	1.4264	0.45738
6	0.47	7.5156	6.5376	0.54018	0.552	1.8796	0.9016	2.085	1.3906	0.48902
7	0.58	7.5616	6.5376	0.59398	0.580	1.8718	0.8478	2.208	1.3598	0.51198
8	0.67	7.5985	6.5376	0.63582	0.599	1.8669	0.80595	2.316	1.3364	0.53047
9	0.78	7.6449	6.5376	0.66897	0.604	1.8801	0.7728	2.433	1.3264	0.55363
10	0.88	7.6739	6.5376	0.69506	0.612	1.883	0.74672	2.522	1.3149	0.56816
11	0.98	7.7213	6.5376	0.71462	0.604	1.9108	0.72715	2.628	1.319	0.59183
12	1.08	7.7526	6.5376	0.73038	0.601	1.9264	0.71139	2.708	1.3189	0.60749
13	1.18	7.7926	6.5376	0.74288	0.592	1.9539	0.69889	2.796	1.3264	0.62751
14	1.38	7.8543	6.5376	0.7581	0.576	2.0004	0.68368	2.926	1.342	0.65834
15	1.59	7.9274	6.5376	0.76244	0.549	2.0691	0.67933	3.046	1.3742	0.69489
16	1.79	7.9932	6.5376	0.75918	0.522	2.1382	0.68259	3.132	1.4104	0.72781
17	1.99	8.0716	6.5376	0.75049	0.489	2.2253	0.69129	3.219	1.4583	0.76699
18	2.20	8.1484	6.5376	0.73799	0.458	2.3146	0.70379	3.289	1.5092	0.80542
19	2.40	8.2227	6.5376	0.72277	0.429	2.4041	0.719	3.344	1.5616	0.84255
20	2.60	8.2931	6.5376	0.70212	0.400	2.4951	0.73965	3.373	1.6174	0.87774
21	2.81	8.3741	6.5376	0.68039	0.370	2.5979	0.76139	3.412	1.6797	0.91827
22	3.01	8.4769	6.5376	0.65647	0.339	2.7246	0.7853	3.469	1.7549	0.96965
23	3.21	8.5521	6.5376	0.63202	0.314	2.8242	0.80976	3.488	1.817	1.0072
24	3.41	8.6477	6.5376	0.60593	0.287	2.9459	0.83584	3.524	1.8909	1.055
25	3.61	8.7263	6.5376	0.57768	0.264	3.0528	0.8641	3.533	1.9584	1.0943
26	3.81	8.8033	6.5376	0.54833	0.242	3.1592	0.89345	3.536	2.0263	1.1329
27	4.02	8.8828	6.5376	0.51898	0.221	3.268	0.92279	3.541	2.0954	1.1726
28	4.22	8.9849	6.5376	0.48909	0.200	3.3999	0.95268	3.569	2.1763	1.2236
29	4.42	9.0877	6.5376	0.45758	0.179	3.5343	0.9842	3.591	2.2593	1.2751
30	4.62	9.1746	6.5376	0.42497	0.161	3.6538	1.0168	3.593	2.3353	1.3185
31	4.82	9.2583	6.5376	0.39182	0.144	3.7707	1.05	3.591	2.4103	1.3604
32	5.43	9.5364	6.5376	0.28911	0.096	4.1515	1.1527	3.602	2.6521	1.4994
33	6.04	9.8297	6.5376	0.17879	0.054	4.5551	1.263	3.607	2.909	1.6461
34	6.64	10.121	6.5376	0.063039	0.018	4.9621	1.3787	3.599	3.1704	1.7917
35	7.24	10.419	6.5376	-0.054887	-0.014	5.3783	1.4967	3.594	3.4375	1.9408
36	7.86	10.72	6.5376	-0.17716	-0.042	5.8017	1.6189	3.584	3.7103	2.0914
37	8.46	11.033	6.5376	-0.30215	-0.067	6.2388	1.7439	3.577	3.9914	2.2475
38	9.06	11.349	6.5376	-0.42932	-0.089	6.6822	1.8711	3.571	4.2767	2.4056
39	9.67	11.656	6.5376	-0.56083	-0.110	7.1206	2.0026	3.556	4.5616	2.559
40	10.28	11.951	6.5376	-0.69234	-0.128	7.5479	2.1341	3.537	4.841	2.7069
41	10.89	12.271	6.5376	-0.82603	-0.144	8.0013	2.2678	3.528	5.1345	2.8667
42	11.48	12.587	6.5376	-0.95971	-0.159	8.4506	2.4015	3.519	5.426	3.0245
43	12.08	12.896	6.5376	-1.095	-0.172	8.8949	2.5368	3.506	5.7159	3.1791
44	12.70	13.213	6.5376	-1.2271	-0.184	9.3444	2.6689	3.501	6.0066	3.3378
45	13.30	13.498	6.5376	-1.3581	-0.195	9.7607	2.7998	3.486	6.2803	3.4804
46	13.90	13.775	6.5376	-1.4885	-0.206	10.168	2.9303	3.470	6.5489	3.6186
47	14.50	14.052	6.5376	-1.6151	-0.215	10.571	3.0569	3.458	6.8139	3.757
48	15.12	14.327	6.5376	-1.7395	-0.223	10.971	3.1813	3.449	7.0762	3.8948
49	15.61	14.514	6.5376	-1.8341	-0.230	11.253	3.2759	3.435	7.2643	3.9884

TRIAXIAL COMPRESSION TEST REPORT

AECOM





	Symbol	○	△	□	
	Test No.	10.4 PSI	17.4 PSI	24.3 PSI	
Initial	Diameter, in	2.722	2.8299	2.6157	
	Height, in	6.0571	5.4106	5.9323	
	Water Content, %	5.02	7.46	5.91	
	Dry Density, pcf	121.2	121.3	120.9	
	Saturation, %	36.18	53.82	42.11	
	Void Ratio	0.36923	0.3684	0.37292	
Before Shear	Water Content, %	13.55	13.79	12.58	
	Dry Density, pcf	122.	121.5	124.4	
	Saturation, %	100.00	100.00	100.00	
	Void Ratio	0.36021	0.36668	0.33456	
	Back Press., tsf	5.0425	5.0399	5.042	
	Minor Prin. Stress, tsf	0.74626	1.2529	1.798	
	Max. Dev. Stress, tsf	1.6147	1.6669	2.202	
	Time to Failure, min	3930	2700	3930	
	Strain Rate, %/min	0.006	0.006	0.006	
	B-Value	.95	.95	.97	
	Measured Specific Gravity	2.66	2.66	2.66	
	Liquid Limit	40	40	40	
	Plastic Limit	24	24	24	
	Plasticity Index	16	16	16	
	Failure Sketch				

Project: COLETO CREEK FACILITY

Location: IPR-GDF SUEZ

Project No.: 60225561

Boring No.: B-4-1 S-13

Sample Type: 3" ST

Description: CLAYEY F-C SAND LITTLE SILT - BROWNISH GRAY SC

Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

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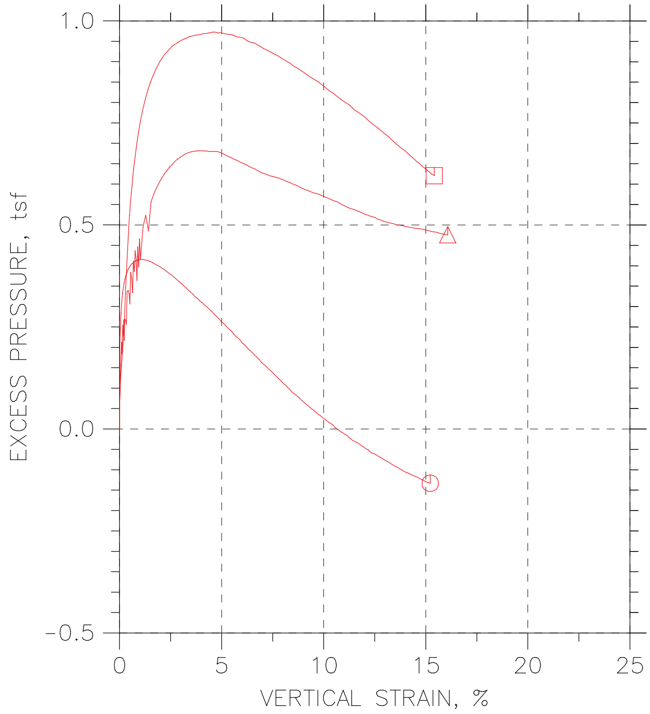
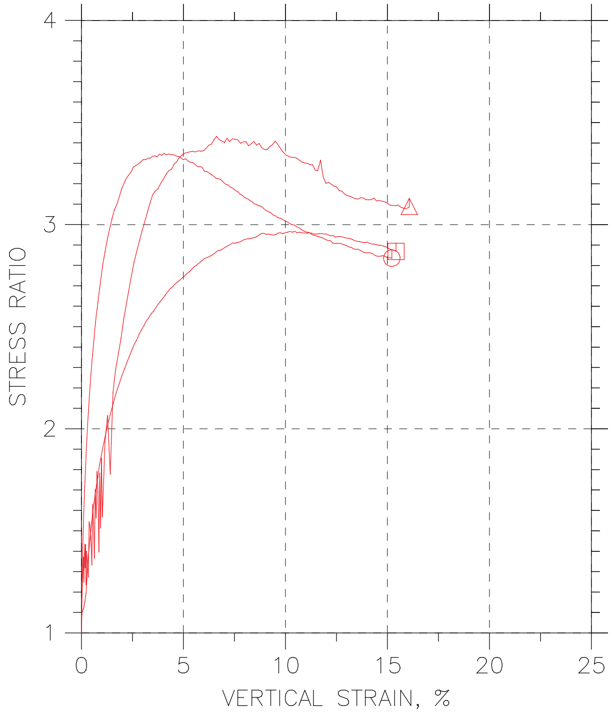
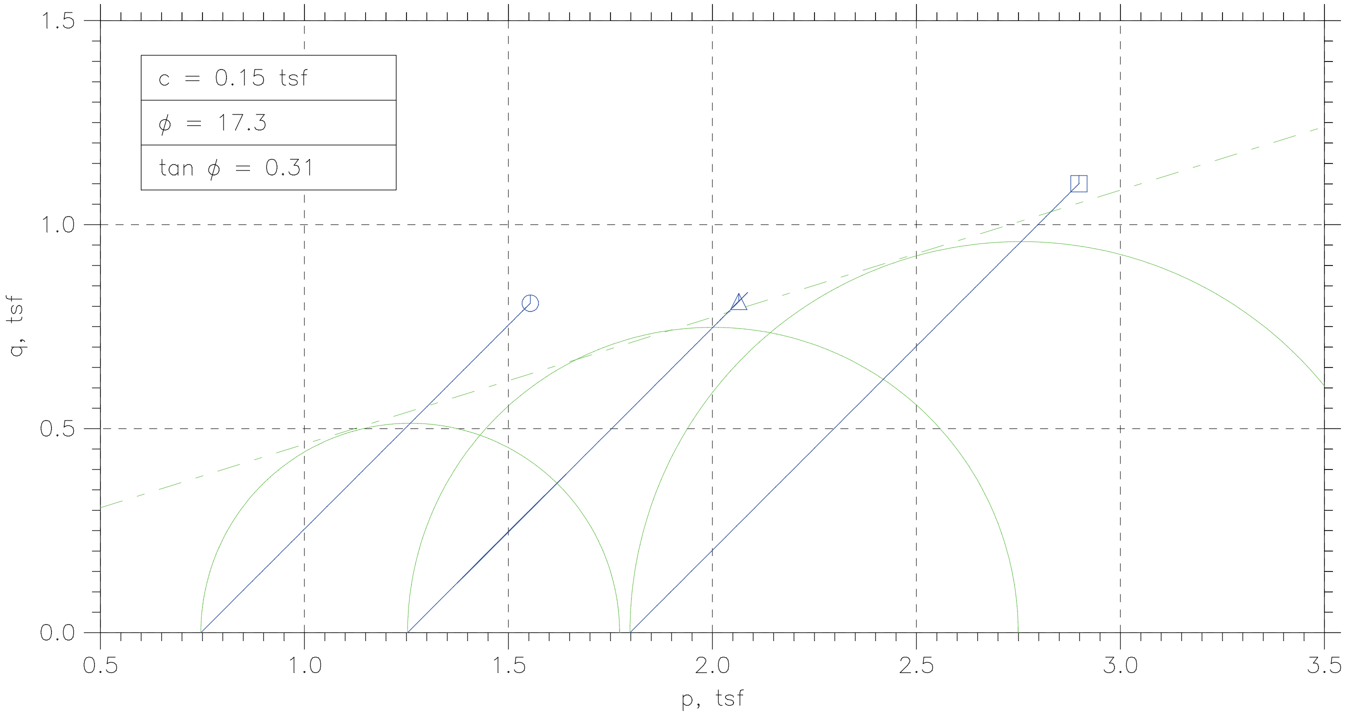
TRIAXIAL COMPRESSION TEST REPORT







Project: COLETO CREEK FACILITY	Location: IPR-GDF SUEZ	Project No.: 60225561
Boring No.: B-4-1 S-13	Tested By: BCM	Checked By: WPQ
Sample No.: S-13	Test Date: 12/2/11	Depth: 24.0'-26.0'
Test No.: B-4-1 S-13	Sample Type: 3" ST	Elevation: -----
Description: CLAYEY F-C SAND LITTLE SILT - BROWNISH GRAY SC		
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767		

Mon, 12-DEC-2011 10:58:11

TRIAXIAL TEST

Project: COLETO CREEK FACILITY
Boring No.: B-4-1 S-13
Sample No.: S-13
Test No.: 10.4 PSI

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/2/11
Sample Type: 3" ST

Project No.: 60225561
Checked By: WPQ
Depth: 24.0'-26.0'
Elevation: -----

Soil Description: CLAYEY F-C SAND LITTLE SILT - BROWNISH GRAY SC
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 6.06 in
Specimen Area: 5.82 in^2
Specimen Volume: 35.25 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 40

Plastic Limit: 24

Measured Specific Gravity: 2.66

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	5.8194	0	0	5.0425	5.7888	5.7888
2	5.0041	0.017083	5.8204	6.8968	0.085314	5.2419	5.7888	5.8741
3	10	0.037013	5.8216	11.372	0.14064	5.2811	5.7888	5.9294
4	15	0.056944	5.8228	14.478	0.17902	5.308	5.7888	5.9678
5	20	0.075451	5.8238	16.9	0.20893	5.3273	5.7888	5.9977
6	25	0.093957	5.8249	18.795	0.23232	5.3425	5.7888	6.0211
7	30	0.11389	5.8261	20.48	0.25309	5.3553	5.7888	6.0419
8	35.001	0.13239	5.8272	21.901	0.27061	5.3658	5.7888	6.0594
9	40.001	0.1509	5.8282	23.27	0.28747	5.3746	5.7888	6.0763
10	45.001	0.17083	5.8294	24.428	0.30172	5.3828	5.7888	6.0905
11	50.001	0.19076	5.8306	25.481	0.31466	5.3892	5.7888	6.1035
12	55.001	0.21069	5.8317	26.481	0.32695	5.3951	5.7888	6.1157
13	60.001	0.2292	5.8328	27.482	0.33923	5.4003	5.7888	6.128
14	70.001	0.26764	5.8351	29.272	0.36119	5.4097	5.7888	6.15
15	80.001	0.3075	5.8374	30.904	0.38118	5.4173	5.7888	6.17
16	90.002	0.34593	5.8396	32.325	0.39856	5.4231	5.7888	6.1874
17	100	0.38579	5.842	33.694	0.41527	5.4284	5.7888	6.2041
18	110	0.42281	5.8441	34.905	0.43003	5.4337	5.7888	6.2188
19	120	0.46124	5.8464	36.063	0.44413	5.4372	5.7888	6.2329
20	130	0.50111	5.8487	37.116	0.45691	5.4407	5.7888	6.2457
21	140	0.54097	5.8511	38.169	0.46969	5.4436	5.7888	6.2585
22	150	0.5794	5.8534	39.117	0.48116	5.4454	5.7888	6.27
23	160	0.61784	5.8556	40.012	0.49198	5.4477	5.7888	6.2808
24	170	0.65628	5.8579	40.907	0.50279	5.4494	5.7888	6.2916
25	180	0.69471	5.8602	41.802	0.51359	5.4512	5.7888	6.3024
26	190	0.73457	5.8625	42.644	0.52373	5.453	5.7888	6.3125
27	200	0.77159	5.8647	43.276	0.53129	5.4541	5.7888	6.3201
28	210	0.81145	5.867	44.013	0.54012	5.4553	5.7888	6.3289
29	220	0.84846	5.8692	44.75	0.54896	5.4565	5.7888	6.3378
30	230	0.8869	5.8715	45.645	0.55973	5.4565	5.7888	6.3485
31	270	1.0406	5.8806	48.593	0.59495	5.4576	5.7888	6.3838
32	300	1.156	5.8875	50.541	0.61808	5.4576	5.7888	6.4069
33	330	1.2713	5.8944	52.489	0.64116	5.4565	5.7888	6.43
34	360	1.3866	5.9013	54.174	0.66096	5.4553	5.7888	6.4498
35	390	1.5005	5.9081	55.911	0.68137	5.453	5.7888	6.4702
36	420	1.6172	5.9151	57.596	0.70107	5.4506	5.7888	6.4899
37	450	1.7325	5.922	59.07	0.71817	5.4465	5.7888	6.507
38	480	1.8492	5.9291	60.702	0.73714	5.4436	5.7888	6.5259
39	510	1.966	5.9361	62.334	0.75606	5.4407	5.7888	6.5449
40	540	2.0841	5.9433	63.966	0.77492	5.4366	5.7888	6.5637
41	570	2.2009	5.9504	65.44	0.79183	5.4331	5.7888	6.5806
42	600	2.3176	5.9575	66.862	0.80806	5.4284	5.7888	6.5969
43	630	2.4358	5.9647	68.388	0.82551	5.4231	5.7888	6.6143
44	660	2.5539	5.972	69.863	0.84229	5.4196	5.7888	6.6311
45	690	2.6721	5.9792	71.179	0.85711	5.4144	5.7888	6.6459
46	720	2.7902	5.9865	72.548	0.87254	5.4091	5.7888	6.6613
47	750	2.9056	5.9936	73.916	0.88795	5.4038	5.7888	6.6767
48	780	3.0223	6.0008	75.285	0.9033	5.3992	5.7888	6.6921
49	810	3.1376	6.0079	76.391	0.91548	5.3939	5.7888	6.7043
50	840	3.2515	6.015	77.707	0.93016	5.3886	5.7888	6.719
51	870	3.3654	6.0221	78.971	0.94417	5.3828	5.7888	6.733
52	900	3.4807	6.0293	80.287	0.95876	5.3781	5.7888	6.7476
53	930	3.5946	6.0364	81.498	0.97207	5.3729	5.7888	6.7609
54	960	3.7085	6.0436	82.656	0.98472	5.3664	5.7888	6.7735
55	990	3.8238	6.0508	84.025	0.99983	5.3623	5.7888	6.7886
56	1020	3.9377	6.058	85.235	1.013	5.3559	5.7888	6.8018
57	1050	4.053	6.0653	86.446	1.0262	5.3518	5.7888	6.815
58	1080	4.1683	6.0726	87.447	1.0368	5.346	5.7888	6.8256
59	1110	4.285	6.08	88.658	1.0499	5.3413	5.7888	6.8387
60	1140	4.4018	6.0874	89.658	1.0604	5.336	5.7888	6.8492
61	1170	4.5185	6.0948	90.816	1.0728	5.3308	5.7888	6.8616
62	1200	4.6352	6.1023	91.974	1.0852	5.3243	5.7888	6.874
63	1230	4.752	6.1098	93.133	1.0975	5.3185	5.7888	6.8863
64	1260	4.8701	6.1174	94.185	1.1085	5.3126	5.7888	6.8973
65	1290	4.9883	6.125	95.238	1.1195	5.3056	5.7888	6.9083
66	1320	5.1064	6.1326	96.502	1.133	5.301	5.7888	6.9218
67	1350	5.2232	6.1402	97.45	1.1427	5.2945	5.7888	6.9315
68	1380	5.3385	6.1476	98.555	1.1543	5.2881	5.7888	6.9431
69	1410	5.4552	6.1552	99.555	1.1645	5.2834	5.7888	6.9533
70	1440	5.5705	6.1627	100.56	1.1748	5.277	5.7888	6.9636
71	1470	5.683	6.1701	101.61	1.1857	5.27	5.7888	6.9745
72	1500	5.7983	6.1776	102.45	1.1941	5.2659	5.7888	6.9829
73	1530	5.9136	6.1852	103.61	1.2061	5.26	5.7888	6.9949
74	1560	6.0275	6.1927	104.35	1.2132	5.2524	5.7888	7.002
75	1590	6.1428	6.2003	105.29	1.2227	5.2477	5.7888	7.0115
76	1620	6.2581	6.2079	106.35	1.2334	5.2413	5.7888	7.0222
77	1650	6.372	6.2155	107.24	1.2423	5.2355	5.7888	7.0311
78	1680	6.4887	6.2233	107.98	1.2493	5.2302	5.7888	7.0381
79	1710	6.6041	6.2309	108.87	1.2581	5.2238	5.7888	7.0469

80	1740	6.7236	6.2389	109.93	1.2686	5.2185	5.7888	7.0574
81	1770	6.8418	6.2468	110.98	1.2791	5.2127	5.7888	7.0679
82	1800	6.9585	6.2547	111.82	1.2872	5.2057	5.7888	7.076
83	1830	7.0767	6.2626	112.56	1.2941	5.1998	5.7888	7.0829
84	1860	7.1948	6.2706	113.45	1.3027	5.1951	5.7888	7.0915
85	1890	7.3144	6.2787	114.24	1.3101	5.1887	5.7888	7.0989
86	1920	7.4326	6.2867	114.98	1.3168	5.184	5.7888	7.1056
87	1950	7.5493	6.2946	115.82	1.3248	5.1776	5.7888	7.1136
88	1980	7.6646	6.3025	116.61	1.3322	5.1723	5.7888	7.121
89	2010	7.7814	6.3105	117.24	1.3377	5.1665	5.7888	7.1265
90	2040	7.8953	6.3183	118.03	1.3451	5.1612	5.7888	7.1339
91	2070	8.0077	6.326	118.72	1.3512	5.1548	5.7888	7.14
92	2100	8.1216	6.3339	119.56	1.3591	5.1501	5.7888	7.1479
93	2130	8.2369	6.3418	120.35	1.3664	5.1443	5.7888	7.1552
94	2160	8.3522	6.3498	121.09	1.373	5.139	5.7888	7.1618
95	2190	8.4647	6.3576	121.77	1.3791	5.1326	5.7888	7.1679
96	2220	8.58	6.3656	122.56	1.3863	5.1279	5.7888	7.1751
97	2250	8.6939	6.3735	123.14	1.3911	5.1238	5.7888	7.1799
98	2280	8.8092	6.3816	124.14	1.4006	5.1185	5.7888	7.1894
99	2310	8.9259	6.3898	124.77	1.4059	5.1127	5.7888	7.1947
100	2340	9.0441	6.3981	125.3	1.41	5.1074	5.7888	7.1988
101	2370	9.1608	6.4063	126.04	1.4165	5.1022	5.7888	7.2053
102	2400	9.279	6.4147	126.67	1.4218	5.0981	5.7888	7.2106
103	2430	9.3957	6.4229	127.25	1.4264	5.0922	5.7888	7.2152
104	2460	9.5139	6.4313	127.83	1.4311	5.0881	5.7888	7.2199
105	2490	9.632	6.4397	128.41	1.4357	5.0829	5.7888	7.2245
106	2520	9.7516	6.4482	129.25	1.4432	5.0782	5.7888	7.232
107	2550	9.8698	6.4567	129.88	1.4483	5.0735	5.7888	7.2371
108	2580	9.9837	6.4649	130.35	1.4518	5.0688	5.7888	7.2406
109	2610	10.102	6.4734	131.04	1.4575	5.0648	5.7888	7.2463
110	2640	10.219	6.4818	131.46	1.4603	5.0601	5.7888	7.2491
111	2670	10.332	6.49	132.09	1.4654	5.056	5.7888	7.2542
112	2700	10.448	6.4984	132.72	1.4705	5.0525	5.7888	7.2593
113	2730	10.562	6.5066	133.46	1.4768	5.046	5.7888	7.2656
114	2760	10.677	6.515	134.2	1.4831	5.0414	5.7888	7.2719
115	2790	10.792	6.5235	134.46	1.484	5.0373	5.7888	7.2728
116	2820	10.909	6.532	134.88	1.4867	5.0338	5.7888	7.2755
117	2850	11.024	6.5405	135.41	1.4906	5.0297	5.7888	7.2794
118	2880	11.14	6.549	135.99	1.4951	5.0268	5.7888	7.2839
119	2910	11.256	6.5576	136.67	1.5006	5.0209	5.7888	7.2894
120	2940	11.373	6.5662	137.2	1.5044	5.0162	5.7888	7.2932
121	2970	11.491	6.575	137.88	1.5099	5.0127	5.7888	7.2987
122	3000	11.609	6.5838	138.25	1.5119	5.0098	5.7888	7.3007
123	3030	11.73	6.5928	138.83	1.5162	5.0063	5.7888	7.305
124	3060	11.847	6.6015	139.57	1.5222	5.0016	5.7888	7.311
125	3090	11.965	6.6104	139.94	1.5242	4.9981	5.7888	7.313
126	3120	12.083	6.6193	140.51	1.5284	4.9934	5.7888	7.3172
127	3150	12.2	6.6281	141.15	1.5333	4.9911	5.7888	7.3221
128	3180	12.317	6.6369	141.62	1.5364	4.9841	5.7888	7.3252
129	3210	12.432	6.6456	141.94	1.5378	4.9829	5.7888	7.3266
130	3240	12.55	6.6546	142.67	1.5437	4.98	5.7888	7.3325
131	3270	12.666	6.6634	143.52	1.5507	4.9759	5.7888	7.3395
132	3300	12.78	6.6721	144.09	1.555	4.9724	5.7888	7.3438
133	3330	12.893	6.6808	144.57	1.558	4.9689	5.7888	7.3468
134	3360	13.009	6.6897	144.99	1.5605	4.966	5.7888	7.3493
135	3390	13.124	6.6986	145.36	1.5624	4.9624	5.7888	7.3512
136	3420	13.238	6.7074	145.83	1.5654	4.9595	5.7888	7.3542
137	3450	13.355	6.7164	146.2	1.5673	4.9554	5.7888	7.3561
138	3480	13.471	6.7255	146.89	1.5725	4.9519	5.7888	7.3613
139	3510	13.588	6.7345	147.46	1.5766	4.9496	5.7888	7.3654
140	3540	13.706	6.7438	147.78	1.5778	4.9455	5.7888	7.3666
141	3570	13.823	6.7529	148.1	1.579	4.942	5.7888	7.3678
142	3600	13.938	6.7619	148.68	1.5831	4.9385	5.7888	7.3719
143	3630	14.058	6.7714	149.41	1.5887	4.9355	5.7888	7.3775
144	3660	14.175	6.7806	149.89	1.5916	4.9338	5.7888	7.3804
145	3690	14.291	6.7898	150.25	1.5933	4.9303	5.7888	7.3821
146	3720	14.411	6.7993	150.25	1.5911	4.9279	5.7888	7.3799
147	3750	14.529	6.8087	150.52	1.5917	4.9256	5.7888	7.3805
148	3780	14.645	6.8179	151.31	1.5979	4.9227	5.7888	7.3867
149	3810	14.76	6.8271	152.36	1.6068	4.9192	5.7888	7.3956
150	3840	14.875	6.8364	152.73	1.6085	4.9168	5.7888	7.3973
151	3870	14.99	6.8456	153.04	1.6097	4.9133	5.7888	7.3985
152	3900	15.104	6.8548	153.57	1.613	4.911	5.7888	7.4018
153	3930	15.218	6.864	153.94	1.6147	4.9092	5.7888	7.4035

TRIAXIAL TEST

Project: COLETO CREEK FACILITY
Boring No.: B-4-1 S-13
Sample No.: S-13
Test No.: 10.4 PSI

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/2/11
Sample Type: 3" ST

Project No.: 60225561
Checked By: WPQ
Depth: 24.0'-26.0'
Elevation: -----

Soil Description: CLAYEY F-C SAND LITTLE SILT - BROWNISH GRAY SC
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 6.06 in
Specimen Area: 5.82 in^2
Specimen Volume: 35.25 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 40

Plastic Limit: 24

Measured Specific Gravity: 2.66

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	5.7888	5.7888	0	0.000	0.74626	0.74626	1.000	0.74626	0
2	0.02	5.8741	5.7888	0.19936	2.337	0.63221	0.5469	1.156	0.58956	0.042657
3	0.04	5.9294	5.7888	0.23853	1.696	0.64837	0.50773	1.277	0.57805	0.070321
4	0.06	5.9678	5.7888	0.26543	1.483	0.65986	0.48083	1.372	0.57035	0.089512
5	0.08	5.9977	5.7888	0.28472	1.363	0.67047	0.46154	1.453	0.56601	0.10447
6	0.09	6.0211	5.7888	0.29992	1.291	0.67866	0.44634	1.520	0.5625	0.11616
7	0.11	6.0419	5.7888	0.31278	1.236	0.68657	0.43348	1.584	0.56002	0.12655
8	0.13	6.0594	5.7888	0.32331	1.195	0.69356	0.42295	1.640	0.55826	0.1353
9	0.15	6.0763	5.7888	0.33208	1.155	0.70165	0.41418	1.694	0.55792	0.14373
10	0.17	6.0905	5.7888	0.34026	1.128	0.70772	0.406	1.743	0.55686	0.15086
11	0.19	6.1035	5.7888	0.34669	1.102	0.71423	0.39957	1.787	0.5569	0.15733
12	0.21	6.1157	5.7888	0.35254	1.078	0.72067	0.39372	1.830	0.5572	0.16347
13	0.23	6.128	5.7888	0.3578	1.055	0.72769	0.38846	1.873	0.55808	0.16962
14	0.27	6.15	5.7888	0.36716	1.017	0.7403	0.37911	1.953	0.5597	0.1806
15	0.31	6.17	5.7888	0.37476	0.983	0.75268	0.37151	2.026	0.56209	0.19059
16	0.35	6.1874	5.7888	0.3806	0.955	0.76421	0.36566	2.090	0.56494	0.19928
17	0.39	6.2041	5.7888	0.38586	0.929	0.77566	0.3604	2.152	0.56803	0.20763
18	0.42	6.2188	5.7888	0.39113	0.910	0.78517	0.35514	2.211	0.57015	0.21501
19	0.46	6.2329	5.7888	0.39463	0.889	0.79576	0.35163	2.263	0.57369	0.22206
20	0.50	6.2457	5.7888	0.39814	0.871	0.80503	0.34812	2.313	0.57658	0.22846
21	0.54	6.2585	5.7888	0.40106	0.854	0.81488	0.3452	2.361	0.58004	0.23484
22	0.58	6.27	5.7888	0.40282	0.837	0.8246	0.34344	2.401	0.58402	0.24058
23	0.62	6.2808	5.7888	0.40516	0.824	0.83308	0.3411	2.442	0.58709	0.24599
24	0.66	6.2916	5.7888	0.40691	0.809	0.84214	0.33935	2.482	0.59075	0.25139
25	0.69	6.3024	5.7888	0.40866	0.796	0.85119	0.3376	2.521	0.59439	0.2568
26	0.73	6.3125	5.7888	0.41042	0.784	0.85957	0.33584	2.559	0.59771	0.26187
27	0.77	6.3201	5.7888	0.41159	0.775	0.86596	0.33467	2.587	0.60032	0.26565
28	0.81	6.3289	5.7888	0.41276	0.764	0.87363	0.3335	2.620	0.60357	0.27006
29	0.85	6.3378	5.7888	0.41393	0.754	0.8813	0.33233	2.652	0.60682	0.27448
30	0.89	6.3485	5.7888	0.41393	0.740	0.89206	0.33233	2.684	0.6122	0.27986
31	1.04	6.3838	5.7888	0.4151	0.698	0.92612	0.33117	2.797	0.62864	0.29748
32	1.16	6.4069	5.7888	0.4151	0.672	0.94925	0.33117	2.866	0.64021	0.30904
33	1.27	6.43	5.7888	0.41393	0.646	0.97349	0.33233	2.929	0.65291	0.32058
34	1.39	6.4498	5.7888	0.41276	0.624	0.99447	0.3335	2.982	0.66398	0.33048
35	1.50	6.4702	5.7888	0.41042	0.602	1.0172	0.33584	3.029	0.67653	0.34069
36	1.62	6.4899	5.7888	0.40808	0.582	1.0393	0.33818	3.073	0.68872	0.35054
37	1.73	6.507	5.7888	0.40399	0.563	1.0604	0.34227	3.098	0.70136	0.35909
38	1.85	6.5259	5.7888	0.40106	0.544	1.0823	0.3452	3.135	0.71377	0.36857
39	1.97	6.5449	5.7888	0.39814	0.527	1.1042	0.34812	3.172	0.72615	0.37803
40	2.08	6.5637	5.7888	0.39405	0.509	1.1271	0.35221	3.200	0.73967	0.38746
41	2.20	6.5806	5.7888	0.39054	0.493	1.1475	0.35572	3.226	0.75163	0.39591
42	2.32	6.5969	5.7888	0.38586	0.478	1.1685	0.3604	3.242	0.76443	0.40403
43	2.44	6.6143	5.7888	0.3806	0.461	1.1912	0.36566	3.258	0.77842	0.41276
44	2.55	6.6311	5.7888	0.37709	0.448	1.2115	0.36917	3.282	0.79031	0.42114
45	2.67	6.6459	5.7888	0.37183	0.434	1.2315	0.37443	3.289	0.80299	0.42856
46	2.79	6.6613	5.7888	0.36657	0.420	1.2522	0.37969	3.298	0.81596	0.43627
47	2.91	6.6767	5.7888	0.36131	0.407	1.2729	0.38495	3.307	0.82893	0.44397
48	3.02	6.6921	5.7888	0.35663	0.395	1.2929	0.38963	3.318	0.84128	0.45165
49	3.14	6.7043	5.7888	0.35137	0.384	1.3104	0.39489	3.318	0.85263	0.45774
50	3.25	6.719	5.7888	0.34611	0.372	1.3303	0.40015	3.324	0.86523	0.46508
51	3.37	6.733	5.7888	0.34026	0.360	1.3502	0.406	3.326	0.87808	0.47208
52	3.48	6.7476	5.7888	0.33558	0.350	1.3694	0.41068	3.335	0.89006	0.47938
53	3.59	6.7609	5.7888	0.33032	0.340	1.388	0.41594	3.337	0.90197	0.48603
54	3.71	6.7735	5.7888	0.32389	0.329	1.4071	0.42237	3.331	0.91473	0.49236
55	3.82	6.7886	5.7888	0.3198	0.320	1.4263	0.42646	3.344	0.92638	0.49991
56	3.94	6.8018	5.7888	0.31337	0.309	1.4459	0.43289	3.340	0.93941	0.50652
57	4.05	6.815	5.7888	0.30928	0.301	1.4632	0.43699	3.348	0.95008	0.5131
58	4.17	6.8256	5.7888	0.30343	0.293	1.4797	0.44283	3.341	0.96124	0.51841
59	4.29	6.8387	5.7888	0.29875	0.285	1.4974	0.44751	3.346	0.97246	0.52495
60	4.40	6.8492	5.7888	0.29349	0.277	1.5132	0.45277	3.342	0.983	0.53022
61	4.52	6.8616	5.7888	0.28823	0.269	1.5309	0.45803	3.342	0.99445	0.53642
62	4.64	6.874	5.7888	0.2818	0.260	1.5497	0.46446	3.336	1.0071	0.5426
63	4.75	6.8863	5.7888	0.27595	0.251	1.5678	0.47031	3.334	1.0191	0.54876
64	4.87	6.8973	5.7888	0.2701	0.244	1.5847	0.47616	3.328	1.0304	0.55427
65	4.99	6.9083	5.7888	0.26309	0.235	1.6027	0.48317	3.317	1.0429	0.55977
66	5.11	6.9218	5.7888	0.25841	0.228	1.6208	0.48785	3.322	1.0543	0.56649
67	5.22	6.9315	5.7888	0.25198	0.221	1.637	0.49428	3.312	1.0656	0.57135
68	5.34	6.9431	5.7888	0.24555	0.213	1.655	0.50071	3.305	1.0778	0.57713
69	5.46	6.9533	5.7888	0.24087	0.207	1.6699	0.50539	3.304	1.0877	0.58227
70	5.57	6.9636	5.7888	0.23444	0.200	1.6866	0.51182	3.295	1.0992	0.5874
71	5.68	6.9745	5.7888	0.22743	0.192	1.7045	0.51884	3.285	1.1117	0.59285
72	5.80	6.9829	5.7888	0.22333	0.187	1.717	0.52293	3.283	1.12	0.59703
73	5.91	6.9949	5.7888	0.21749	0.180	1.7349	0.52877	3.281	1.1318	0.60304
74	6.03	7.002	5.7888	0.20989	0.173	1.7496	0.53637	3.262	1.143	0.6066
75	6.14	7.0115	5.7888	0.20521	0.168	1.7638	0.54105	3.260	1.1524	0.61135
76	6.26	7.0222	5.7888	0.19878	0.161	1.7809	0.54748	3.253	1.1642	0.61671
77	6.37	7.0311	5.7888	0.19293	0.155	1.7956	0.55333	3.245	1.1745	0.62114
78	6.49	7.0381	5.7888	0.18767	0.150	1.8079	0.55859	3.236	1.1832	0.62463

79	6.60	7.0469	5.7888	0.18124	0.144	1.8231	0.56502	3.227	1.1941	0.62903
80	6.72	7.0574	5.7888	0.17598	0.139	1.8389	0.57028	3.225	1.2046	0.6343
81	6.84	7.0679	5.7888	0.17013	0.133	1.8553	0.57613	3.220	1.2157	0.63957
82	6.96	7.076	5.7888	0.16312	0.127	1.8704	0.58315	3.207	1.2268	0.64361
83	7.08	7.0829	5.7888	0.15727	0.122	1.8831	0.58899	3.197	1.236	0.64703
84	7.19	7.0915	5.7888	0.15259	0.117	1.8964	0.59367	3.194	1.245	0.65135
85	7.31	7.0989	5.7888	0.14616	0.112	1.9102	0.6001	3.183	1.2551	0.65504
86	7.43	7.1056	5.7888	0.14148	0.107	1.9216	0.60478	3.177	1.2632	0.65842
87	7.55	7.1136	5.7888	0.13505	0.102	1.936	0.61121	3.168	1.2736	0.66241
88	7.66	7.121	5.7888	0.12979	0.097	1.9487	0.61647	3.161	1.2826	0.6661
89	7.78	7.1265	5.7888	0.12394	0.093	1.96	0.62232	3.150	1.2912	0.66886
90	7.90	7.1339	5.7888	0.11868	0.088	1.9726	0.62758	3.143	1.3001	0.67253
91	8.01	7.14	5.7888	0.11225	0.083	1.9852	0.63401	3.131	1.3096	0.67561
92	8.12	7.1479	5.7888	0.10757	0.079	1.9978	0.63869	3.128	1.3182	0.67956
93	8.24	7.1552	5.7888	0.10173	0.074	2.0109	0.64453	3.120	1.3277	0.68319
94	8.35	7.1618	5.7888	0.096466	0.070	2.0228	0.6498	3.113	1.3363	0.68651
95	8.46	7.1679	5.7888	0.090035	0.065	2.0353	0.65623	3.102	1.3458	0.68954
96	8.58	7.1751	5.7888	0.085358	0.062	2.0472	0.6609	3.098	1.354	0.69314
97	8.69	7.1799	5.7888	0.081265	0.058	2.0561	0.665	3.092	1.3605	0.69554
98	8.81	7.1894	5.7888	0.076003	0.054	2.0709	0.67026	3.090	1.3706	0.70031
99	8.93	7.1947	5.7888	0.070157	0.050	2.082	0.6761	3.079	1.3791	0.70297
100	9.04	7.1988	5.7888	0.064895	0.046	2.0914	0.68137	3.069	1.3864	0.70502
101	9.16	7.2053	5.7888	0.059634	0.042	2.1031	0.68663	3.063	1.3949	0.70826
102	9.28	7.2106	5.7888	0.055541	0.039	2.1125	0.69072	3.058	1.4016	0.71088
103	9.40	7.2152	5.7888	0.049695	0.035	2.123	0.69657	3.048	1.4098	0.71321
104	9.51	7.2199	5.7888	0.045602	0.032	2.1317	0.70066	3.042	1.4162	0.71553
105	9.63	7.2245	5.7888	0.04034	0.028	2.1416	0.70592	3.034	1.4238	0.71783
106	9.75	7.232	5.7888	0.035663	0.025	2.1538	0.7106	3.031	1.4322	0.72158
107	9.87	7.2371	5.7888	0.030986	0.021	2.1636	0.71528	3.025	1.4394	0.72416
108	9.98	7.2406	5.7888	0.026309	0.018	2.1717	0.71995	3.016	1.4458	0.72588
109	10.10	7.2463	5.7888	0.022216	0.015	2.1815	0.72404	3.013	1.4528	0.72874
110	10.22	7.2491	5.7888	0.017539	0.012	2.189	0.72872	3.004	1.4589	0.73013
111	10.33	7.2542	5.7888	0.013447	0.009	2.1982	0.73281	3.000	1.4655	0.73271
112	10.45	7.2593	5.7888	0.0099389	0.007	2.2069	0.73632	2.997	1.4716	0.73527
113	10.56	7.2656	5.7888	0.0035079	0.002	2.2196	0.74275	2.988	1.4812	0.73841
114	10.68	7.2719	5.7888	-0.0011693	-0.001	2.2305	0.74743	2.984	1.489	0.74153
115	10.79	7.2728	5.7888	-0.0052618	-0.004	2.2356	0.75152	2.975	1.4935	0.74202
116	10.91	7.2755	5.7888	-0.0087696	-0.006	2.2418	0.75503	2.969	1.4984	0.74337
117	11.02	7.2794	5.7888	-0.012862	-0.009	2.2497	0.75912	2.964	1.5044	0.74531
118	11.14	7.2839	5.7888	-0.015785	-0.011	2.2571	0.76205	2.962	1.5096	0.74753
119	11.26	7.2894	5.7888	-0.021632	-0.014	2.2685	0.76789	2.954	1.5182	0.7503
120	11.37	7.2932	5.7888	-0.026309	-0.017	2.277	0.77257	2.947	1.5248	0.7522
121	11.49	7.2987	5.7888	-0.029817	-0.020	2.286	0.77608	2.946	1.531	0.75495
122	11.61	7.3007	5.7888	-0.03274	-0.022	2.2909	0.779	2.941	1.535	0.75595
123	11.73	7.305	5.7888	-0.036248	-0.024	2.2987	0.78251	2.938	1.5406	0.75808
124	11.85	7.311	5.7888	-0.040925	-0.027	2.3094	0.78719	2.934	1.5483	0.7611
125	11.97	7.313	5.7888	-0.044433	-0.029	2.3149	0.79069	2.928	1.5528	0.76209
126	12.08	7.3172	5.7888	-0.04911	-0.032	2.3238	0.79537	2.922	1.5596	0.76421
127	12.20	7.3221	5.7888	-0.051449	-0.034	2.331	0.79771	2.922	1.5643	0.76663
128	12.32	7.3252	5.7888	-0.058464	-0.038	2.3411	0.80473	2.909	1.5729	0.76818
129	12.43	7.3266	5.7888	-0.059634	-0.039	2.3437	0.80589	2.908	1.5748	0.76888
130	12.55	7.3325	5.7888	-0.062557	-0.041	2.3525	0.80882	2.909	1.5806	0.77183
131	12.67	7.3395	5.7888	-0.066649	-0.043	2.3636	0.81291	2.908	1.5883	0.77536
132	12.78	7.3438	5.7888	-0.070157	-0.045	2.3714	0.81642	2.905	1.5939	0.77748
133	12.89	7.3468	5.7888	-0.073665	-0.047	2.378	0.81993	2.900	1.5989	0.77902
134	13.01	7.3493	5.7888	-0.076588	-0.049	2.3834	0.82285	2.896	1.6031	0.78025
135	13.12	7.3512	5.7888	-0.080096	-0.051	2.3888	0.82636	2.891	1.6076	0.7812
136	13.24	7.3542	5.7888	-0.083019	-0.053	2.3947	0.82928	2.888	1.612	0.78272
137	13.35	7.3561	5.7888	-0.087112	-0.056	2.4006	0.83337	2.881	1.617	0.78364
138	13.47	7.3613	5.7888	-0.09062	-0.058	2.4094	0.83688	2.879	1.6231	0.78625
139	13.59	7.3654	5.7888	-0.092958	-0.059	2.4158	0.83922	2.879	1.6275	0.78828
140	13.71	7.3666	5.7888	-0.097051	-0.062	2.4211	0.84331	2.871	1.6322	0.78889
141	13.82	7.3678	5.7888	-0.10056	-0.064	2.4258	0.84682	2.865	1.6363	0.78951
142	13.94	7.3719	5.7888	-0.10407	-0.066	2.4334	0.85033	2.862	1.6419	0.79153
143	14.06	7.3775	5.7888	-0.10699	-0.067	2.442	0.85325	2.862	1.6476	0.79435
144	14.17	7.3804	5.7888	-0.10874	-0.068	2.4466	0.855	2.861	1.6508	0.79579
145	14.29	7.3821	5.7888	-0.11225	-0.070	2.4518	0.85851	2.856	1.6552	0.79666
146	14.41	7.3799	5.7888	-0.11459	-0.072	2.4519	0.86085	2.848	1.6564	0.79555
147	14.53	7.3805	5.7888	-0.11693	-0.073	2.4549	0.86319	2.844	1.659	0.79584
148	14.64	7.3867	5.7888	-0.11985	-0.075	2.464	0.86611	2.845	1.6651	0.79894
149	14.76	7.3956	5.7888	-0.12336	-0.077	2.4764	0.86962	2.848	1.673	0.80341
150	14.88	7.3973	5.7888	-0.1257	-0.078	2.4805	0.87196	2.845	1.6762	0.80426
151	14.99	7.3985	5.7888	-0.12921	-0.080	2.4851	0.87547	2.839	1.6803	0.80484
152	15.10	7.4018	5.7888	-0.13154	-0.082	2.4909	0.87781	2.838	1.6843	0.80652
153	15.22	7.4035	5.7888	-0.1333	-0.083	2.4943	0.87956	2.836	1.6869	0.80737

TRIAXIAL TEST

Project: COLETO CREEK FACILITY
Boring No.: B-4-1 S-13
Sample No.: S-13
Test No.: 17.4 PSI

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/2/11
Sample Type: 3 " ST

Project No.: 60225561
Checked By: WPQ
Depth: 24.0'-26.0'
Elevation: ----

Soil Description: CLAYEY F-C SAND LITTLE SILT - BROWNISH GRAY SC
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 5.41 in
Specimen Area: 6.29 in^2
Specimen Volume: 34.03 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 40

Plastic Limit: 24

Measured Specific Gravity: 2.66

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.2898	0	0	5.0399	6.2928	6.2928
2	5.0042	0.0151	6.2908	12.364	0.14151	5.111	6.2928	6.4343
3	10	0.035234	6.292	19.701	0.22544	5.1588	6.2928	6.5182
4	15	0.057045	6.2934	25.408	0.29068	5.1965	6.2928	6.5835
5	20	0.078856	6.2948	29.756	0.34035	5.2265	6.2928	6.6331
6	25	0.10067	6.2962	33.696	0.38533	5.2526	6.2928	6.6781
7	30	0.12248	6.2975	23.234	0.26563	5.2232	6.2928	6.5584
8	35.001	0.14261	6.2988	33.628	0.38439	5.2704	6.2928	6.6772
9	40.001	0.16442	6.3002	37.976	0.434	5.2948	6.2928	6.7268
10	45.001	0.18623	6.3016	28.533	0.32601	5.2676	6.2928	6.6188
11	50.001	0.20637	6.3028	37.297	0.42606	5.307	6.2928	6.7189
12	55.001	0.23154	6.3044	21.332	0.24362	5.2565	6.2928	6.5364
13	60.001	0.24999	6.3056	34.375	0.39251	5.3098	6.2928	6.6853
14	70.001	0.29529	6.3085	30.163	0.34426	5.3065	6.2928	6.6371
15	80.001	0.33724	6.3111	23.845	0.27204	5.2959	6.2928	6.5648
16	90.002	0.37583	6.3136	43.751	0.49893	5.377	6.2928	6.7917
17	100	0.42113	6.3164	42.12	0.48012	5.3792	6.2928	6.7729
18	110	0.46475	6.3192	37.636	0.42882	5.3715	6.2928	6.7216
19	120	0.51005	6.3221	27.582	0.31412	5.3459	6.2928	6.6069
20	130	0.55032	6.3246	48.098	0.54756	5.4242	6.2928	6.8404
21	140	0.59394	6.3274	42.052	0.47851	5.4087	6.2928	6.7713
22	150	0.64092	6.3304	29.552	0.33612	5.3737	6.2928	6.6289
23	160	0.67951	6.3329	51.971	0.59087	5.4514	6.2928	6.8837
24	170	0.72481	6.3357	42.935	0.48792	5.4248	6.2928	6.7807
25	180	0.76507	6.3383	56.794	0.64515	5.477	6.2928	6.938
26	190	0.8087	6.3411	50.612	0.57467	5.4603	6.2928	6.8675
27	200	0.85567	6.3441	30.979	0.35158	5.4031	6.2928	6.6444
28	210	0.89594	6.3467	55.639	0.6312	5.4864	6.2928	6.924
29	220	0.94124	6.3496	38.723	0.4391	5.4364	6.2928	6.7319
30	230	0.98151	6.3522	59.376	0.67301	5.5064	6.2928	6.9658
31	240	1.0268	6.3551	41.984	0.47566	5.4553	6.2928	6.7685
32	270	1.1543	6.3633	62.637	0.70873	5.5347	6.2928	7.0015
33	300	1.2835	6.3716	68.751	0.77689	5.5636	6.2928	7.0697
34	330	1.4161	6.3802	52.854	0.59645	5.5253	6.2928	6.8893
35	360	1.5436	6.3884	72.691	0.81926	5.5963	6.2928	7.1121
36	390	1.6728	6.3968	77.515	0.87247	5.6152	6.2928	7.1653
37	420	1.8053	6.4055	80.504	0.90489	5.6297	6.2928	7.1977
38	450	1.9362	6.414	83.425	0.93648	5.643	6.2928	7.2293
39	480	2.0654	6.4225	87.229	0.9779	5.6547	6.2928	7.2707
40	510	2.1962	6.4311	90.218	1.0101	5.6647	6.2928	7.3029
41	540	2.3254	6.4396	92.936	1.0391	5.6735	6.2928	7.3319
42	570	2.4563	6.4482	95.925	1.0711	5.6819	6.2928	7.3639
43	600	2.5855	6.4568	98.439	1.0977	5.6885	6.2928	7.3905
44	630	2.7163	6.4654	100.27	1.1167	5.6957	6.2928	7.4095
45	660	2.8489	6.4743	102.18	1.1363	5.7013	6.2928	7.4291
46	690	2.9781	6.4829	104.15	1.1567	5.7057	6.2928	7.4495
47	720	3.1089	6.4916	105.84	1.1739	5.7102	6.2928	7.4667
48	750	3.2381	6.5003	107.75	1.1934	5.7141	6.2928	7.4862
49	780	3.369	6.5091	109.72	1.2136	5.7169	6.2928	7.5064
50	810	3.4982	6.5178	111.55	1.2323	5.7191	6.2928	7.5251
51	840	3.6307	6.5268	112.37	1.2396	5.7202	6.2928	7.5324
52	870	3.7616	6.5357	112.91	1.2439	5.7213	6.2928	7.5367
53	900	3.8925	6.5446	114.34	1.2579	5.7218	6.2928	7.5507
54	930	4.0233	6.5535	115.56	1.2696	5.7218	6.2928	7.5624
55	960	4.1525	6.5623	116.99	1.2835	5.7213	6.2928	7.5763
56	990	4.2817	6.5712	118.21	1.2952	5.7207	6.2928	7.588
57	1020	4.4143	6.5803	118.96	1.3016	5.7196	6.2928	7.5944
58	1050	4.5418	6.5891	120.31	1.3147	5.7202	6.2928	7.6075
59	1080	4.6726	6.5981	121.13	1.3218	5.7202	6.2928	7.6146
60	1110	4.8018	6.6071	122.56	1.3355	5.7196	6.2928	7.6283
61	1140	4.931	6.6161	123.71	1.3463	5.7174	6.2928	7.6391
62	1170	5.0619	6.6252	125	1.3585	5.7146	6.2928	7.6513
63	1200	5.1928	6.6343	126.09	1.3684	5.7113	6.2928	7.6612
64	1230	5.322	6.6434	127.18	1.3783	5.708	6.2928	7.6711
65	1260	5.4545	6.6527	128.06	1.3859	5.7052	6.2928	7.6787
66	1290	5.5837	6.6618	128.81	1.3921	5.7019	6.2928	7.6849
67	1320	5.7129	6.6709	129.89	1.4019	5.6991	6.2928	7.6947
68	1350	5.8437	6.6802	130.71	1.4088	5.6957	6.2928	7.7016
69	1380	5.9746	6.6895	131.73	1.4178	5.6924	6.2928	7.7106
70	1410	6.1055	6.6988	133.15	1.4312	5.6896	6.2928	7.724
71	1440	6.2363	6.7082	134.85	1.4474	5.6869	6.2928	7.7402
72	1470	6.3655	6.7174	136.14	1.4592	5.683	6.2928	7.752
73	1500	6.4947	6.7267	138.38	1.4812	5.6796	6.2928	7.774
74	1530	6.6239	6.736	140.02	1.4966	5.6774	6.2928	7.7894
75	1560	6.7531	6.7453	140.15	1.496	5.6735	6.2928	7.7888
76	1590	6.884	6.7548	140.9	1.5018	5.6696	6.2928	7.7946
77	1620	7.0132	6.7642	141.24	1.5034	5.6669	6.2928	7.7962
78	1650	7.1407	6.7735	143.21	1.5223	5.6647	6.2928	7.8151
79	1680	7.2682	6.7828	142.94	1.5173	5.6624	6.2928	7.8101

80	1710	7.3991	6.7924	144.57	1.5324	5.6597	6.2928	7.8252
81	1740	7.5299	6.802	144.91	1.5339	5.6585	6.2928	7.8267
82	1770	7.6641	6.8119	145.45	1.5374	5.6563	6.2928	7.8302
83	1800	7.7984	6.8218	144.97	1.5301	5.6547	6.2928	7.8229
84	1830	7.9292	6.8315	146.13	1.5401	5.6524	6.2928	7.8329
85	1860	8.0618	6.8414	147.01	1.5472	5.6497	6.2928	7.84
86	1890	8.1927	6.8511	146.81	1.5428	5.6463	6.2928	7.8356
87	1920	8.3235	6.8609	148.1	1.5542	5.6441	6.2928	7.847
88	1950	8.4527	6.8706	149.8	1.5698	5.6408	6.2928	7.8626
89	1980	8.5836	6.8804	149.39	1.5633	5.6386	6.2928	7.8561
90	2010	8.7128	6.8901	150.75	1.5753	5.6358	6.2928	7.8681
91	2040	8.842	6.8999	150.48	1.5702	5.6319	6.2928	7.863
92	2070	8.9695	6.9096	150.82	1.5716	5.6291	6.2928	7.8644
93	2100	9.0987	6.9194	151.63	1.5778	5.6263	6.2928	7.8706
94	2130	9.2295	6.9294	153.33	1.5932	5.6241	6.2928	7.886
95	2160	9.3604	6.9394	154.76	1.6057	5.6213	6.2928	7.8985
96	2190	9.4913	6.9494	156.66	1.6231	5.6191	6.2928	7.9159
97	2220	9.6238	6.9596	156.32	1.6172	5.6169	6.2928	7.91
98	2250	9.7547	6.9697	155.71	1.6085	5.6152	6.2928	7.9013
99	2280	9.8872	6.9799	155.5	1.6041	5.6119	6.2928	7.8969
100	2310	10.02	6.9902	155.3	1.5996	5.6097	6.2928	7.8924
101	2340	10.151	7.0004	155.71	1.6015	5.6069	6.2928	7.8943
102	2370	10.285	7.0109	156.18	1.604	5.6041	6.2928	7.8968
103	2400	10.417	7.0213	157.2	1.612	5.6008	6.2928	7.9048
104	2430	10.548	7.0315	157.75	1.6153	5.598	6.2928	7.9081
105	2460	10.681	7.042	157.75	1.6129	5.5963	6.2928	7.9057
106	2490	10.81	7.0522	158.22	1.6154	5.5925	6.2928	7.9082
107	2520	10.939	7.0624	158.97	1.6207	5.5886	6.2928	7.9135
108	2550	11.07	7.0728	159.78	1.6266	5.5858	6.2928	7.9194
109	2580	11.199	7.0831	160.26	1.6291	5.5825	6.2928	7.9219
110	2610	11.328	7.0934	161.14	1.6356	5.5797	6.2928	7.9284
111	2640	11.459	7.1039	159.85	1.6202	5.578	6.2928	7.913
112	2670	11.59	7.1144	160.6	1.6253	5.5752	6.2928	7.9181
113	2700	11.718	7.1247	164.95	1.6669	5.573	6.2928	7.9597
114	2730	11.852	7.1355	159.92	1.6137	5.5703	6.2928	7.9065
115	2760	11.983	7.1461	158.56	1.5976	5.5669	6.2928	7.8904
116	2790	12.112	7.1566	159.78	1.6075	5.5647	6.2928	7.9003
117	2820	12.243	7.1673	159.92	1.6065	5.5619	6.2928	7.8993
118	2850	12.375	7.1781	159.85	1.6034	5.5603	6.2928	7.8962
119	2880	12.506	7.1889	160.26	1.6051	5.558	6.2928	7.8979
120	2910	12.639	7.1998	160.06	1.6006	5.5541	6.2928	7.8934
121	2940	12.771	7.2107	160.4	1.6016	5.5525	6.2928	7.8944
122	2970	12.904	7.2217	160.19	1.5971	5.5497	6.2928	7.8899
123	3000	13.035	7.2326	160.33	1.5961	5.5475	6.2928	7.8889
124	3030	13.169	7.2438	160.74	1.5976	5.5458	6.2928	7.8904
125	3060	13.298	7.2545	160.87	1.5966	5.5442	6.2928	7.8894
126	3090	13.427	7.2654	160.87	1.5942	5.543	6.2928	7.887
127	3120	13.56	7.2765	161.62	1.5992	5.5403	6.2928	7.892
128	3150	13.689	7.2874	162.43	1.6049	5.5397	6.2928	7.8977
129	3180	13.818	7.2983	162.98	1.6078	5.538	6.2928	7.9006
130	3210	13.947	7.3093	162.84	1.6041	5.5369	6.2928	7.8969
131	3240	14.078	7.3204	163.39	1.607	5.5353	6.2928	7.8998
132	3270	14.208	7.3314	163.93	1.6099	5.5342	6.2928	7.9027
133	3300	14.338	7.3426	165.02	1.6181	5.533	6.2928	7.9109
134	3330	14.468	7.3537	164.4	1.6097	5.5319	6.2928	7.9025
135	3360	14.598	7.365	165.02	1.6132	5.5314	6.2928	7.906
136	3390	14.731	7.3765	165.15	1.612	5.5303	6.2928	7.9048
137	3420	14.864	7.3879	165.49	1.6128	5.5292	6.2928	7.9056
138	3450	14.994	7.3993	165.56	1.611	5.5275	6.2928	7.9038
139	3480	15.127	7.4109	165.42	1.6072	5.5258	6.2928	7.9
140	3510	15.261	7.4226	165.9	1.6092	5.5242	6.2928	7.902
141	3540	15.394	7.4342	166.31	1.6107	5.523	6.2928	7.9035
142	3570	15.525	7.4457	167.12	1.6161	5.5219	6.2928	7.9089
143	3600	15.655	7.4573	166.99	1.6122	5.5197	6.2928	7.905
144	3630	15.788	7.469	167.19	1.6117	5.5181	6.2928	7.9045
145	3660	15.916	7.4804	167.6	1.6132	5.5169	6.2928	7.906
146	3690	16.048	7.4922	168.55	1.6198	5.5153	6.2928	7.9126
147	3695.9	16.073	7.4944	168.96	1.6232	5.5158	6.2928	7.916

TRIAXIAL TEST

Project: COLETO CREEK FACILITY
Boring No.: B-4-1 S-13
Sample No.: S-13
Test No.: 17.4 PSI

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/2/11
Sample Type: 3 " ST

Project No.: 60225561
Checked By: WPQ
Depth: 24.0'-26.0'
Elevation: ----

Soil Description: CLAYEY F-C SAND LITTLE SILT - BROWNISH GRAY SC
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 5.41 in
Specimen Area: 6.29 in^2
Specimen Volume: 34.03 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 40

Plastic Limit: 24

Measured Specific Gravity: 2.66

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.2928	6.2928	0	0.000	1.2529	1.2529	1.000	1.2529	0
2	0.02	6.4343	6.2928	0.071079	0.502	1.3233	1.1818	1.120	1.2525	0.070757
3	0.04	6.5182	6.2928	0.11883	0.527	1.3595	1.134	1.199	1.2468	0.11272
4	0.06	6.5835	6.2928	0.1566	0.539	1.3869	1.0963	1.265	1.2416	0.14534
5	0.08	6.6331	6.2928	0.18658	0.548	1.4066	1.0663	1.319	1.2365	0.17017
6	0.10	6.6781	6.2928	0.21268	0.552	1.4255	1.0402	1.370	1.2328	0.19267
7	0.12	6.5584	6.2928	0.18325	0.690	1.3352	1.0696	1.248	1.2024	0.13282
8	0.14	6.6772	6.2928	0.23045	0.600	1.4068	1.0224	1.376	1.2146	0.1922
9	0.16	6.7268	6.2928	0.25488	0.587	1.432	0.99798	1.435	1.215	0.217
10	0.19	6.6188	6.2928	0.22767	0.698	1.3512	1.0252	1.318	1.1882	0.16301
11	0.21	6.7189	6.2928	0.2671	0.627	1.4118	0.98576	1.432	1.1988	0.21303
12	0.23	6.5364	6.2928	0.21657	0.889	1.2799	1.0363	1.235	1.1581	0.12181
13	0.25	6.6853	6.2928	0.26988	0.688	1.3755	0.98299	1.399	1.1792	0.19626
14	0.30	6.6371	6.2928	0.26655	0.774	1.3306	0.98632	1.349	1.1585	0.17213
15	0.34	6.5648	6.2928	0.25599	0.941	1.2689	0.99687	1.273	1.1329	0.13602
16	0.38	6.7917	6.2928	0.33707	0.676	1.4147	0.9158	1.545	1.1653	0.24947
17	0.42	6.7729	6.2928	0.33929	0.707	1.3937	0.91357	1.526	1.1536	0.24006
18	0.46	6.7216	6.2928	0.33152	0.773	1.3502	0.92135	1.465	1.1358	0.21441
19	0.51	6.6069	6.2928	0.30597	0.974	1.261	0.94689	1.332	1.104	0.15706
20	0.55	6.8404	6.2928	0.38427	0.702	1.4161	0.86859	1.630	1.1424	0.27378
21	0.59	6.7713	6.2928	0.36872	0.771	1.3627	0.88414	1.541	1.1234	0.23926
22	0.64	6.6289	6.2928	0.33374	0.993	1.2552	0.91913	1.366	1.0872	0.16806
23	0.68	6.8837	6.2928	0.41148	0.696	1.4323	0.84138	1.702	1.1368	0.29543
24	0.72	6.7807	6.2928	0.38483	0.789	1.356	0.86804	1.562	1.112	0.24396
25	0.77	6.938	6.2928	0.43702	0.677	1.461	0.81584	1.791	1.1384	0.32258
26	0.81	6.8675	6.2928	0.42036	0.731	1.4072	0.8325	1.690	1.1198	0.28734
27	0.86	6.6444	6.2928	0.36317	1.033	1.2413	0.8897	1.395	1.0655	0.17579
28	0.90	6.924	6.2928	0.44646	0.707	1.4376	0.8064	1.783	1.122	0.3156
29	0.94	6.7319	6.2928	0.39649	0.903	1.2955	0.85638	1.513	1.0759	0.21955
30	0.98	6.9658	6.2928	0.46646	0.693	1.4594	0.78641	1.856	1.1229	0.3365
31	1.03	6.7685	6.2928	0.41537	0.873	1.3132	0.8375	1.568	1.0753	0.23783
32	1.15	7.0015	6.2928	0.49478	0.698	1.4668	0.75809	1.935	1.1125	0.35436
33	1.28	7.0697	6.2928	0.52365	0.674	1.5061	0.72921	2.065	1.1177	0.38845
34	1.42	6.8893	6.2928	0.48534	0.814	1.364	0.76753	1.777	1.0658	0.29823
35	1.54	7.1121	6.2928	0.55641	0.679	1.5157	0.69645	2.176	1.1061	0.40963
36	1.67	7.1653	6.2928	0.57529	0.659	1.55	0.67757	2.288	1.1138	0.43624
37	1.81	7.1977	6.2928	0.58973	0.652	1.568	0.66313	2.365	1.1156	0.45245
38	1.94	7.2293	6.2928	0.60306	0.644	1.5863	0.6498	2.441	1.118	0.46824
39	2.07	7.2707	6.2928	0.61472	0.629	1.616	0.63814	2.532	1.1271	0.48895
40	2.20	7.3029	6.2928	0.62472	0.618	1.6382	0.62815	2.608	1.1332	0.50503
41	2.33	7.3319	6.2928	0.6336	0.610	1.6584	0.61926	2.678	1.1388	0.51955
42	2.46	7.3639	6.2928	0.64193	0.599	1.682	0.61093	2.753	1.1465	0.53554
43	2.59	7.3905	6.2928	0.64859	0.591	1.702	0.60427	2.817	1.1531	0.54885
44	2.72	7.4095	6.2928	0.65581	0.587	1.7137	0.59705	2.870	1.1554	0.55833
45	2.85	7.4291	6.2928	0.66137	0.582	1.7278	0.5915	2.921	1.1596	0.56814
46	2.98	7.4495	6.2928	0.66581	0.576	1.7437	0.58706	2.970	1.1654	0.57833
47	3.11	7.4667	6.2928	0.67025	0.571	1.7565	0.58261	3.015	1.1696	0.58697
48	3.24	7.4862	6.2928	0.67414	0.565	1.7722	0.57873	3.062	1.1754	0.59672
49	3.37	7.5064	6.2928	0.67692	0.558	1.7896	0.57595	3.107	1.1828	0.60681
50	3.50	7.5251	6.2928	0.67914	0.551	1.806	0.57373	3.148	1.1899	0.61613
51	3.63	7.5324	6.2928	0.68025	0.549	1.8122	0.57262	3.165	1.1924	0.61978
52	3.76	7.5367	6.2928	0.68136	0.548	1.8154	0.57151	3.176	1.1934	0.62193
53	3.89	7.5507	6.2928	0.68191	0.542	1.8288	0.57095	3.203	1.1999	0.62893
54	4.02	7.5624	6.2928	0.68191	0.537	1.8405	0.57095	3.224	1.2057	0.63479
55	4.15	7.5763	6.2928	0.68136	0.531	1.855	0.57151	3.246	1.2133	0.64176
56	4.28	7.588	6.2928	0.6808	0.526	1.8673	0.57206	3.264	1.2197	0.6476
57	4.41	7.5944	6.2928	0.67969	0.522	1.8748	0.57317	3.271	1.224	0.65079
58	4.54	7.6075	6.2928	0.68025	0.517	1.8873	0.57262	3.296	1.23	0.65734
59	4.67	7.6146	6.2928	0.68025	0.515	1.8944	0.57262	3.308	1.2335	0.66089
60	4.80	7.6283	6.2928	0.67969	0.509	1.9087	0.57317	3.330	1.2409	0.66777
61	4.93	7.6391	6.2928	0.67747	0.503	1.9217	0.57539	3.340	1.2485	0.67315
62	5.06	7.6513	6.2928	0.67469	0.497	1.9366	0.57817	3.350	1.2574	0.67923
63	5.19	7.6612	6.2928	0.67136	0.491	1.9499	0.5815	3.353	1.2657	0.6842
64	5.32	7.6711	6.2928	0.66803	0.485	1.9631	0.58483	3.357	1.274	0.68915
65	5.45	7.6787	6.2928	0.66525	0.480	1.9735	0.58761	3.359	1.2806	0.69297
66	5.58	7.6849	6.2928	0.66192	0.475	1.9831	0.59094	3.356	1.287	0.69606
67	5.71	7.6947	6.2928	0.65915	0.470	1.9957	0.59372	3.361	1.2947	0.70097
68	5.84	7.7016	6.2928	0.65581	0.466	2.0058	0.59705	3.360	1.3014	0.70439
69	5.97	7.7106	6.2928	0.65248	0.460	2.0182	0.60038	3.361	1.3093	0.7089
70	6.11	7.724	6.2928	0.64971	0.454	2.0343	0.60316	3.373	1.3187	0.71558
71	6.24	7.7402	6.2928	0.64693	0.447	2.0533	0.60594	3.389	1.3296	0.7237
72	6.37	7.752	6.2928	0.64304	0.441	2.0691	0.60982	3.393	1.3394	0.72962
73	6.49	7.774	6.2928	0.63971	0.432	2.0944	0.61315	3.416	1.3538	0.74061
74	6.62	7.7894	6.2928	0.63749	0.426	2.112	0.61538	3.432	1.3637	0.7483
75	6.75	7.7888	6.2928	0.6336	0.424	2.1152	0.61926	3.416	1.3673	0.74799
76	6.88	7.7946	6.2928	0.62971	0.419	2.125	0.62315	3.410	1.3741	0.75092
77	7.01	7.7962	6.2928	0.62694	0.417	2.1293	0.62593	3.402	1.3776	0.75169
78	7.14	7.8151	6.2928	0.62472	0.410	2.1504	0.62815	3.423	1.3893	0.76113

79	7.27	7.8101	6.2928	0.6225	0.410	2.1476	0.63037	3.407	1.389	0.75864
80	7.40	7.8252	6.2928	0.61972	0.404	2.1656	0.63315	3.420	1.3994	0.76621
81	7.53	7.8267	6.2928	0.61861	0.403	2.1681	0.63426	3.418	1.4012	0.76693
82	7.66	7.8302	6.2928	0.61639	0.401	2.1738	0.63648	3.415	1.4052	0.76868
83	7.80	7.8229	6.2928	0.61472	0.402	2.1683	0.63814	3.398	1.4032	0.76506
84	7.93	7.8329	6.2928	0.6125	0.398	2.1805	0.64036	3.405	1.4104	0.77006
85	8.06	7.84	6.2928	0.60972	0.394	2.1903	0.64314	3.406	1.4167	0.7736
86	8.19	7.8356	6.2928	0.60639	0.393	2.1893	0.64647	3.387	1.4179	0.77142
87	8.32	7.847	6.2928	0.60417	0.389	2.2029	0.64869	3.396	1.4258	0.7771
88	8.45	7.8626	6.2928	0.60084	0.383	2.2218	0.65203	3.408	1.4369	0.7849
89	8.58	7.8561	6.2928	0.59862	0.383	2.2175	0.65425	3.389	1.4359	0.78165
90	8.71	7.8681	6.2928	0.59584	0.378	2.2323	0.65702	3.398	1.4447	0.78764
91	8.84	7.863	6.2928	0.59195	0.377	2.2311	0.66091	3.376	1.446	0.78511
92	8.97	7.8644	6.2928	0.58918	0.375	2.2352	0.66369	3.368	1.4495	0.78578
93	9.10	7.8706	6.2928	0.5864	0.372	2.2443	0.66646	3.367	1.4554	0.78891
94	9.23	7.886	6.2928	0.58418	0.367	2.2619	0.66869	3.383	1.4653	0.79659
95	9.36	7.8985	6.2928	0.5814	0.362	2.2772	0.67146	3.391	1.4743	0.80285
96	9.49	7.9159	6.2928	0.57918	0.357	2.2968	0.67368	3.409	1.4852	0.81154
97	9.62	7.91	6.2928	0.57696	0.357	2.2931	0.6759	3.393	1.4845	0.8086
98	9.75	7.9013	6.2928	0.57529	0.358	2.2861	0.67757	3.374	1.4818	0.80427
99	9.89	7.8969	6.2928	0.57196	0.357	2.285	0.6809	3.356	1.4829	0.80204
100	10.02	7.8924	6.2928	0.56974	0.356	2.2827	0.68312	3.342	1.4829	0.79981
101	10.15	7.8943	6.2928	0.56696	0.354	2.2874	0.6859	3.335	1.4866	0.80074
102	10.28	7.8968	6.2928	0.56419	0.352	2.2926	0.68868	3.329	1.4907	0.80198
103	10.42	7.9048	6.2928	0.56086	0.348	2.3041	0.69201	3.330	1.498	0.80602
104	10.55	7.9081	6.2928	0.55808	0.346	2.31	0.69478	3.325	1.5024	0.80763
105	10.68	7.9057	6.2928	0.55641	0.345	2.3093	0.69645	3.316	1.5029	0.80643
106	10.81	7.9082	6.2928	0.55253	0.342	2.3157	0.70034	3.307	1.508	0.80769
107	10.94	7.9135	6.2928	0.54864	0.339	2.3249	0.70422	3.301	1.5146	0.81033
108	11.07	7.9194	6.2928	0.54586	0.336	2.3336	0.707	3.301	1.5203	0.81329
109	11.20	7.9219	6.2928	0.54253	0.333	2.3394	0.71033	3.293	1.5249	0.81453
110	11.33	7.9284	6.2928	0.53976	0.330	2.3488	0.71311	3.294	1.5309	0.81782
111	11.46	7.913	6.2928	0.53809	0.332	2.3349	0.71478	3.267	1.5249	0.81008
112	11.59	7.9181	6.2928	0.53531	0.329	2.3429	0.71755	3.265	1.5302	0.81266
113	11.72	7.9597	6.2928	0.53309	0.320	2.3867	0.71977	3.316	1.5532	0.83346
114	11.85	7.9065	6.2928	0.53031	0.329	2.3362	0.72255	3.233	1.5294	0.80683
115	11.98	7.8904	6.2928	0.52698	0.330	2.3235	0.72588	3.201	1.5247	0.79878
116	12.11	7.9003	6.2928	0.52476	0.326	2.3356	0.7281	3.208	1.5319	0.80376
117	12.24	7.8993	6.2928	0.52199	0.325	2.3374	0.73088	3.198	1.5341	0.80325
118	12.38	7.8962	6.2928	0.52032	0.325	2.3359	0.73255	3.189	1.5342	0.8017
119	12.51	7.8979	6.2928	0.5181	0.323	2.3398	0.73477	3.184	1.5373	0.80254
120	12.64	7.8934	6.2928	0.51421	0.321	2.3393	0.73865	3.167	1.539	0.8003
121	12.77	7.8944	6.2928	0.51255	0.320	2.3419	0.74032	3.163	1.5411	0.80079
122	12.90	7.8899	6.2928	0.50977	0.319	2.3402	0.7431	3.149	1.5416	0.79855
123	13.03	7.8889	6.2928	0.50755	0.318	2.3414	0.74532	3.141	1.5433	0.79803
124	13.17	7.8904	6.2928	0.50588	0.317	2.3446	0.74698	3.139	1.5458	0.79882
125	13.30	7.8894	6.2928	0.50422	0.316	2.3453	0.74865	3.133	1.547	0.79831
126	13.43	7.887	6.2928	0.50311	0.316	2.344	0.74976	3.126	1.5469	0.79712
127	13.56	7.892	6.2928	0.50033	0.313	2.3517	0.75254	3.125	1.5521	0.7996
128	13.69	7.8977	6.2928	0.49977	0.311	2.3579	0.75309	3.131	1.5555	0.80243
129	13.82	7.9006	6.2928	0.49811	0.310	2.3626	0.75476	3.130	1.5587	0.80391
130	13.95	7.8969	6.2928	0.497	0.310	2.3599	0.75587	3.122	1.5579	0.80203
131	14.08	7.8998	6.2928	0.49533	0.308	2.3645	0.75753	3.121	1.561	0.80349
132	14.21	7.9027	6.2928	0.49422	0.307	2.3685	0.75864	3.122	1.5636	0.80495
133	14.34	7.9109	6.2928	0.49311	0.305	2.3779	0.75975	3.130	1.5688	0.80905
134	14.47	7.9025	6.2928	0.492	0.306	2.3705	0.76087	3.116	1.5657	0.80484
135	14.60	7.906	6.2928	0.49144	0.305	2.3746	0.76142	3.119	1.568	0.80659
136	14.73	7.9048	6.2928	0.49033	0.304	2.3745	0.76253	3.114	1.5685	0.806
137	14.86	7.9056	6.2928	0.48922	0.303	2.3765	0.76364	3.112	1.57	0.80641
138	14.99	7.9038	6.2928	0.48756	0.303	2.3763	0.76531	3.105	1.5708	0.8055
139	15.13	7.9	6.2928	0.48589	0.302	2.3741	0.76697	3.095	1.5706	0.80358
140	15.26	7.902	6.2928	0.48422	0.301	2.3779	0.76864	3.094	1.5733	0.80462
141	15.39	7.9035	6.2928	0.48311	0.300	2.3804	0.76975	3.092	1.5751	0.80533
142	15.52	7.9089	6.2928	0.482	0.298	2.3869	0.77086	3.096	1.5789	0.80803
143	15.66	7.905	6.2928	0.47978	0.298	2.3853	0.77308	3.085	1.5792	0.80612
144	15.79	7.9045	6.2928	0.47812	0.297	2.3864	0.77475	3.080	1.5806	0.80584
145	15.92	7.906	6.2928	0.47701	0.296	2.389	0.77586	3.079	1.5824	0.80658
146	16.05	7.9126	6.2928	0.47534	0.293	2.3973	0.77752	3.083	1.5874	0.80988
147	16.07	7.916	6.2928	0.4759	0.293	2.4002	0.77697	3.089	1.5886	0.81159

TRIAXIAL TEST

Project: COLETO CREEK FACILITY   Location: IPR-GDF SUEZ   Project No.: 60225561
Boring No.: B-4-1 S-13   Tested By: BCM   Checked By: WPQ
Sample No.: S-13   Test Date: 12/2/11   Depth: 24.0'-26.0'
Test No.: 24.3 PSI   Sample Type: 3" ST   Elevation: ----

Soil Description: CLAYEY F-C SAND LITTLE SILT - BROWNISH GRAY SC
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 5.93 in   Piston Area: 0.00 in^2   Filter Strip Correction: 0.00 tsf
Specimen Area: 5.37 in^2   Piston Friction: 0.00 lb   Membrane Correction: 0.00 lb/in
Specimen Volume: 31.88 in^3   Piston Weight: 0.00 lb   Correction Type: Uniform

Liquid Limit: 40   Plastic Limit: 24   Measured Specific Gravity: 2.66

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	5.3738	0	0	5.042	6.84	6.84
2	5	0.017296	5.3747	9.9129	0.13279	5.1121	6.84	6.9728
3	10	0.036033	5.3757	12.588	0.16859	5.1464	6.84	7.0086
4	15	0.054771	5.3767	13.427	0.1798	5.167	6.84	7.0198
5	20	0.073508	5.3778	13.847	0.18538	5.1822	6.84	7.0254
6	25	0.092245	5.3788	14.319	0.19167	5.1958	6.84	7.0317
7	30.001	0.11242	5.3799	14.843	0.19865	5.2083	6.84	7.0386
8	35.001	0.13116	5.3809	15.945	0.21335	5.2214	6.84	7.0533
9	40.001	0.15134	5.3819	17.046	0.22804	5.2344	6.84	7.068
10	45.001	0.17152	5.383	18.515	0.24764	5.2485	6.84	7.0876
11	50.001	0.19026	5.384	19.931	0.26653	5.2632	6.84	7.1065
12	55.001	0.20899	5.3851	21.189	0.28331	5.2768	6.84	7.1233
13	60.001	0.22773	5.3861	22.553	0.30149	5.2898	6.84	7.1415
14	70.001	0.26521	5.3881	29.739	0.39739	5.3404	6.84	7.2374
15	80.001	0.30124	5.39	35.088	0.46871	5.3887	6.84	7.3087
16	90.002	0.34015	5.3921	39.127	0.52245	5.4322	6.84	7.3625
17	100	0.37907	5.3943	42.746	0.57055	5.4703	6.84	7.4106
18	110	0.41799	5.3964	45.788	0.61092	5.5056	6.84	7.4509
19	120	0.45546	5.3984	48.463	0.64637	5.5376	6.84	7.4864
20	130	0.49582	5.4006	51.138	0.68177	5.5664	6.84	7.5218
21	140	0.53473	5.4027	53.498	0.71295	5.5925	6.84	7.553
22	150	0.57365	5.4048	55.439	0.73853	5.6175	6.84	7.5785
23	160	0.61401	5.407	57.274	0.76267	5.6393	6.84	7.6027
24	170	0.65292	5.4091	58.9	0.78401	5.6594	6.84	7.624
25	180	0.69184	5.4112	60.474	0.80464	5.6789	6.84	7.6446
26	190	0.7322	5.4134	61.837	0.82245	5.6974	6.84	7.6625
27	200	0.77111	5.4156	63.306	0.84166	5.7132	6.84	7.6817
28	210	0.81147	5.4178	63.935	0.84968	5.7284	6.84	7.6897
29	220	0.85039	5.4199	65.824	0.87443	5.7431	6.84	7.7144
30	230	0.8893	5.422	67.082	0.8908	5.7566	6.84	7.7308
31	240	0.92966	5.4242	68.131	0.90436	5.7697	6.84	7.7444
32	270	1.0493	5.4308	71.121	0.9429	5.8034	6.84	7.7829
33	300	1.1689	5.4374	73.639	0.9751	5.8306	6.84	7.8151
34	330	1.2871	5.4439	75.999	1.0052	5.8545	6.84	7.8452
35	360	1.4053	5.4504	77.939	1.0296	5.8746	6.84	7.8696
36	390	1.5235	5.4569	79.775	1.0526	5.8925	6.84	7.8926
37	420	1.6417	5.4635	81.611	1.0755	5.9083	6.84	7.9155
38	450	1.7599	5.4701	83.184	1.0949	5.9219	6.84	7.9349
39	480	1.8781	5.4767	84.653	1.1129	5.9333	6.84	7.9529
40	510	1.9977	5.4833	86.174	1.1315	5.9441	6.84	7.9715
41	540	2.1159	5.49	87.538	1.148	5.9534	6.84	7.988
42	570	2.2326	5.4965	88.849	1.1638	5.9615	6.84	8.0038
43	600	2.3494	5.5031	90.265	1.181	5.9675	6.84	8.021
44	630	2.4704	5.5099	91.838	1.2001	5.974	6.84	8.0401
45	660	2.5872	5.5165	93.097	1.2151	5.9805	6.84	8.0551
46	690	2.7068	5.5233	94.146	1.2273	5.9843	6.84	8.0673
47	720	2.8236	5.5299	95.667	1.2456	5.9876	6.84	8.0856
48	750	2.9418	5.5367	96.821	1.2591	5.992	6.84	8.0991
49	780	3.0599	5.5434	97.818	1.2705	5.9952	6.84	8.1105
50	810	3.1781	5.5502	99.129	1.2859	5.9979	6.84	8.1259
51	840	3.2934	5.5568	99.968	1.2953	6.0001	6.84	8.1353
52	870	3.4102	5.5635	101.02	1.3073	6.0034	6.84	8.1473
53	900	3.5284	5.5703	101.86	1.3166	6.0045	6.84	8.1566
54	930	3.6451	5.5771	102.96	1.3292	6.0061	6.84	8.1692
55	960	3.7633	5.5839	104.01	1.3411	6.0072	6.84	8.1811
56	990	3.883	5.5909	104.95	1.3516	6.0083	6.84	8.1916
57	1020	3.9997	5.5977	105.95	1.3627	6.0093	6.84	8.2027
58	1050	4.1179	5.6046	106.89	1.3732	6.011	6.84	8.2132
59	1080	4.2346	5.6114	107.99	1.3857	6.011	6.84	8.2257
60	1110	4.3514	5.6183	108.83	1.3947	6.0126	6.84	8.2347
61	1140	4.4681	5.6251	109.46	1.4011	6.0131	6.84	8.2411
62	1170	4.5849	5.632	110.25	1.4094	6.0148	6.84	8.2494
63	1200	4.7045	5.6391	111.14	1.419	6.0142	6.84	8.259
64	1230	4.8213	5.646	112.03	1.4287	6.0126	6.84	8.2687
65	1260	4.9438	5.6533	112.98	1.4388	6.0131	6.84	8.2788
66	1290	5.0576	5.6601	113.81	1.4478	6.0115	6.84	8.2878
67	1320	5.1744	5.667	114.97	1.4607	6.0104	6.84	8.3007
68	1350	5.294	5.6742	115.81	1.4695	6.0093	6.84	8.3095
69	1380	5.4093	5.6811	116.8	1.4803	6.0088	6.84	8.3203
70	1410	5.5261	5.6881	117.91	1.4924	6.0077	6.84	8.3324
71	1440	5.6443	5.6953	118.95	1.5038	6.005	6.84	8.3438
72	1470	5.7596	5.7022	120.06	1.5159	6.0028	6.84	8.3559
73	1500	5.8763	5.7093	120.95	1.5253	6.0023	6.84	8.3653
74	1530	5.9945	5.7165	121.94	1.5359	6.0012	6.84	8.3759
75	1560	6.1141	5.7238	122.84	1.5452	5.999	6.84	8.3852
76	1590	6.2309	5.7309	123.94	1.5571	5.9941	6.84	8.3971
77	1620	6.3491	5.7381	124.93	1.5676	5.9914	6.84	8.4076
78	1650	6.4673	5.7454	125.83	1.5768	5.9892	6.84	8.4168
79	1680	6.5854	5.7526	126.87	1.588	5.9882	6.84	8.428

80	1710	6.7036	5.7599	128.13	1.6017	5.9849	6.84	8.4417
81	1740	6.8204	5.7671	128.92	1.6095	5.9816	6.84	8.4495
82	1770	6.9386	5.7745	130.02	1.6212	5.9784	6.84	8.4612
83	1800	7.0582	5.7819	131.33	1.6354	5.9746	6.84	8.4754
84	1830	7.1793	5.7894	132.43	1.647	5.9713	6.84	8.487
85	1860	7.2946	5.7966	133.48	1.658	5.9686	6.84	8.498
86	1890	7.4099	5.8039	134.58	1.6696	5.9659	6.84	8.5096
87	1920	7.5252	5.8111	135.27	1.676	5.9621	6.84	8.516
88	1950	7.6405	5.8184	136.05	1.6836	5.9593	6.84	8.5236
89	1980	7.7558	5.8256	136.84	1.6912	5.9566	6.84	8.5312
90	2010	7.8726	5.833	138.05	1.704	5.9528	6.84	8.544
91	2040	7.9893	5.8404	139.25	1.7167	5.949	6.84	8.5567
92	2070	8.1075	5.8479	140.14	1.7255	5.9458	6.84	8.5655
93	2100	8.2228	5.8553	140.98	1.7336	5.942	6.84	8.5736
94	2130	8.3396	5.8627	141.87	1.7424	5.9387	6.84	8.5824
95	2160	8.4577	5.8703	143.03	1.7543	5.9338	6.84	8.5943
96	2190	8.5745	5.8778	144.08	1.7649	5.93	6.84	8.6049
97	2220	8.6956	5.8856	145.44	1.7792	5.9267	6.84	8.6192
98	2250	8.8123	5.8931	146.81	1.7936	5.9229	6.84	8.6336
99	2280	8.9305	5.9008	147.7	1.8022	5.9191	6.84	8.6422
100	2310	9.0516	5.9086	148.17	1.8055	5.9153	6.84	8.6455
101	2340	9.1683	5.9162	149.11	1.8147	5.911	6.84	8.6547
102	2370	9.2865	5.9239	149.79	1.8206	5.9066	6.84	8.6606
103	2400	9.4033	5.9316	150.42	1.8259	5.9028	6.84	8.6659
104	2430	9.5214	5.9393	151.42	1.8356	5.899	6.84	8.6756
105	2460	9.6382	5.947	152.78	1.8498	5.8958	6.84	8.6898
106	2490	9.7549	5.9547	153.62	1.8575	5.892	6.84	8.6975
107	2520	9.8731	5.9625	154.36	1.8639	5.8871	6.84	8.7039
108	2550	9.9884	5.9701	155.56	1.8761	5.8827	6.84	8.7161
109	2580	10.107	5.978	156.77	1.8882	5.8778	6.84	8.7282
110	2610	10.222	5.9857	158.08	1.9015	5.8729	6.84	8.7415
111	2640	10.343	5.9937	158.71	1.9065	5.8686	6.84	8.7465
112	2670	10.46	6.0015	159.76	1.9166	5.8653	6.84	8.7566
113	2700	10.578	6.0095	160.28	1.9204	5.8604	6.84	8.7604
114	2730	10.695	6.0173	161.49	1.9323	5.8556	6.84	8.7723
115	2760	10.813	6.0253	162.17	1.9379	5.8512	6.84	8.7779
116	2790	10.931	6.0333	163.01	1.9453	5.8469	6.84	8.7853
117	2820	11.049	6.0413	163.9	1.9534	5.8425	6.84	8.7934
118	2850	11.167	6.0494	164.74	1.9608	5.8392	6.84	8.8008
119	2880	11.284	6.0573	165.58	1.9682	5.8349	6.84	8.8082
120	2910	11.404	6.0655	166.37	1.9749	5.8289	6.84	8.8149
121	2940	11.519	6.0734	167.47	1.9854	5.8235	6.84	8.8254
122	2970	11.637	6.0815	168.57	1.9957	5.8197	6.84	8.8357
123	3000	11.754	6.0896	169.46	2.0036	5.8159	6.84	8.8436
124	3030	11.872	6.0977	170.2	2.0096	5.8115	6.84	8.8496
125	3060	11.992	6.106	171.14	2.018	5.8072	6.84	8.858
126	3090	12.107	6.114	171.88	2.024	5.8018	6.84	8.864
127	3120	12.224	6.1222	172.56	2.0294	5.7963	6.84	8.8694
128	3150	12.344	6.1305	173.66	2.0395	5.792	6.84	8.8795
129	3180	12.46	6.1387	174.13	2.0424	5.7865	6.84	8.8824
130	3210	12.577	6.1469	175.23	2.0525	5.7827	6.84	8.8925
131	3240	12.694	6.1551	176.28	2.0621	5.7778	6.84	8.9021
132	3270	12.813	6.1636	177.17	2.0697	5.7729	6.84	8.9097
133	3300	12.932	6.1719	177.8	2.0742	5.7681	6.84	8.9142
134	3330	13.05	6.1803	178.69	2.0818	5.7632	6.84	8.9218
135	3360	13.172	6.189	179.59	2.0892	5.7583	6.84	8.9292
136	3390	13.288	6.1973	180.27	2.0944	5.7528	6.84	8.9344
137	3420	13.412	6.2061	180.84	2.098	5.7474	6.84	8.938
138	3450	13.527	6.2144	181.89	2.1074	5.7414	6.84	8.9474
139	3480	13.644	6.2228	182.68	2.1137	5.7371	6.84	8.9537
140	3510	13.763	6.2315	183.52	2.1204	5.7316	6.84	8.9604
141	3540	13.88	6.2399	184.36	2.1272	5.7273	6.84	8.9672
142	3570	13.998	6.2485	185.56	2.1382	5.723	6.84	8.9782
143	3600	14.118	6.2572	186.14	2.1419	5.7175	6.84	8.9819
144	3630	14.237	6.2659	186.93	2.1479	5.7121	6.84	8.9879
145	3660	14.348	6.274	188.03	2.1578	5.7072	6.84	8.9978
146	3690	14.465	6.2826	188.82	2.1639	5.7018	6.84	9.0039
147	3720	14.581	6.2911	189.76	2.1718	5.6963	6.84	9.0118
148	3750	14.702	6.3	190.55	2.1777	5.6925	6.84	9.0177
149	3780	14.814	6.3083	191.39	2.1844	5.6871	6.84	9.0244
150	3810	14.934	6.3172	192.12	2.1897	5.6817	6.84	9.0297
151	3840	15.046	6.3255	192.49	2.191	5.6768	6.84	9.031
152	3870	15.164	6.3344	193.12	2.1951	5.6719	6.84	9.0351
153	3900	15.281	6.3431	193.75	2.1992	5.667	6.84	9.0392
154	3930	15.402	6.3522	194.27	2.202	5.6637	6.84	9.042
155	3934.9	15.419	6.3535	194.17	2.2004	5.6626	6.84	9.0404

TRIAXIAL TEST

Project: COLETO CREEK FACILITY
Boring No.: B-4-1 S-13
Sample No.: S-13
Test No.: 24.3 PSI

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/2/11
Sample Type: 3" ST

Project No.: 60225561
Checked By: WPQ
Depth: 24.0'-26.0'
Elevation: ----

Soil Description: CLAYEY F-C SAND LITTLE SILT - BROWNISH GRAY SC
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 5.93 in
Specimen Area: 5.37 in^2
Specimen Volume: 31.88 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 40

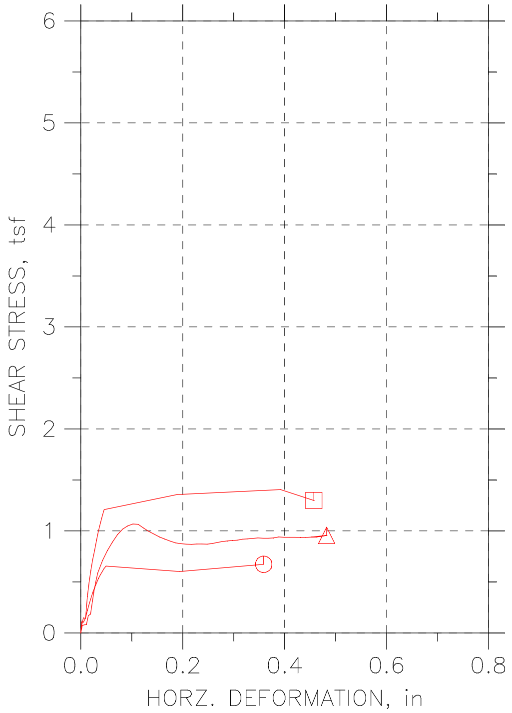
Plastic Limit: 24

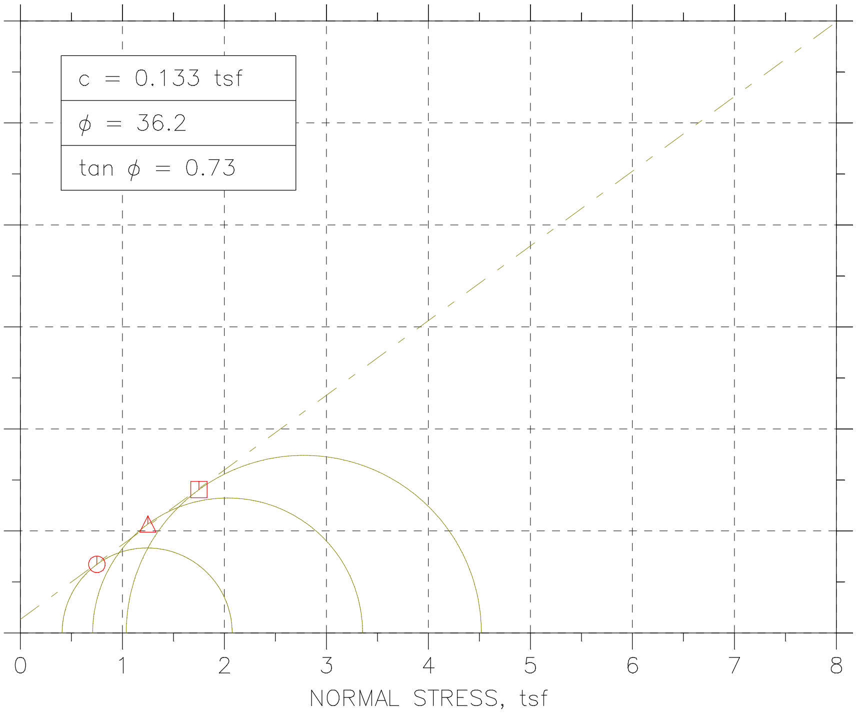
Measured Specific Gravity: 2.66

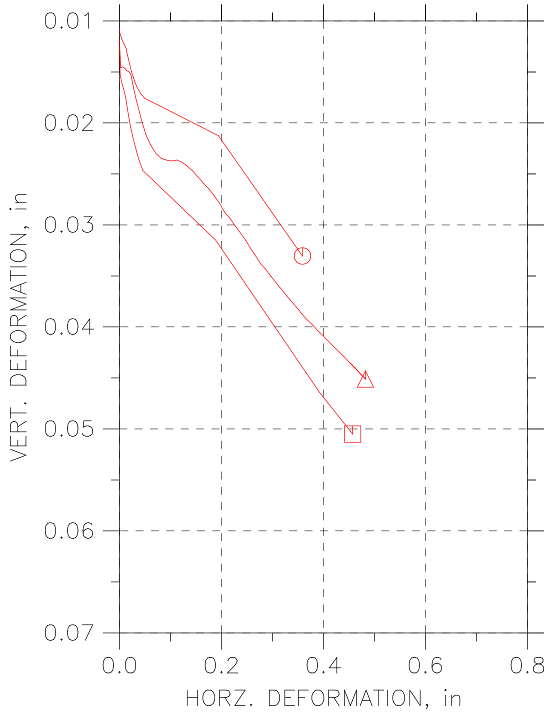
	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.84	6.84	0	0.000	1.798	1.798	1.000	1.798	0
2	0.02	6.9728	6.84	0.070104	0.528	1.8607	1.7279	1.077	1.7943	0.066397
3	0.04	7.0086	6.84	0.10434	0.619	1.8622	1.6936	1.100	1.7779	0.084297
4	0.05	7.0198	6.84	0.12499	0.695	1.8528	1.673	1.107	1.7629	0.0899
5	0.07	7.0254	6.84	0.14021	0.756	1.8432	1.6578	1.112	1.7505	0.092692
6	0.09	7.0317	6.84	0.15379	0.802	1.8359	1.6442	1.117	1.74	0.095834
7	0.11	7.0386	6.84	0.16629	0.837	1.8303	1.6317	1.122	1.731	0.099325
8	0.13	7.0533	6.84	0.17933	0.841	1.832	1.6186	1.132	1.7253	0.10667
9	0.15	7.068	6.84	0.19238	0.844	1.8336	1.6056	1.142	1.7196	0.11402
10	0.17	7.0876	6.84	0.20651	0.834	1.8391	1.5915	1.156	1.7153	0.12382
11	0.19	7.1065	6.84	0.22118	0.830	1.8433	1.5768	1.169	1.7101	0.13326
12	0.21	7.1233	6.84	0.23477	0.829	1.8465	1.5632	1.181	1.7049	0.14165
13	0.23	7.1415	6.84	0.24781	0.822	1.8517	1.5502	1.194	1.7009	0.15074
14	0.27	7.2374	6.84	0.29835	0.751	1.897	1.4996	1.265	1.6983	0.1987
15	0.30	7.3087	6.84	0.34671	0.740	1.92	1.4513	1.323	1.6856	0.23436
16	0.34	7.3625	6.84	0.39019	0.747	1.9302	1.4078	1.371	1.669	0.26123
17	0.38	7.4106	6.84	0.42823	0.751	1.9403	1.3697	1.417	1.655	0.28528
18	0.42	7.4509	6.84	0.46355	0.759	1.9453	1.3344	1.458	1.6399	0.30546
19	0.46	7.4864	6.84	0.49562	0.767	1.9487	1.3024	1.496	1.6255	0.32318
20	0.50	7.5218	6.84	0.52442	0.769	1.9553	1.2736	1.535	1.6144	0.34088
21	0.53	7.553	6.84	0.5505	0.772	1.9604	1.2475	1.572	1.6039	0.35648
22	0.57	7.5785	6.84	0.5755	0.779	1.961	1.2225	1.604	1.5917	0.36926
23	0.61	7.6027	6.84	0.59724	0.783	1.9634	1.2007	1.635	1.5821	0.38133
24	0.65	7.624	6.84	0.61735	0.787	1.9646	1.1806	1.664	1.5726	0.39201
25	0.69	7.6446	6.84	0.63691	0.792	1.9657	1.1611	1.693	1.5634	0.40232
26	0.73	7.6625	6.84	0.65539	0.797	1.965	1.1426	1.720	1.5538	0.41123
27	0.77	7.6817	6.84	0.67115	0.797	1.9685	1.1268	1.747	1.5477	0.42083
28	0.81	7.6897	6.84	0.68636	0.808	1.9613	1.1116	1.764	1.5365	0.42484
29	0.85	7.7144	6.84	0.70104	0.802	1.9714	1.0969	1.797	1.5342	0.43721
30	0.89	7.7308	6.84	0.71462	0.802	1.9742	1.0834	1.822	1.5288	0.4454
31	0.93	7.7444	6.84	0.72766	0.805	1.9747	1.0703	1.845	1.5225	0.45218
32	1.05	7.7829	6.84	0.76136	0.807	1.9795	1.0366	1.910	1.5081	0.47145
33	1.17	7.8151	6.84	0.78853	0.809	1.9845	1.0094	1.966	1.497	0.48755
34	1.29	7.8452	6.84	0.81244	0.808	1.9907	0.98553	2.020	1.4881	0.50258
35	1.41	7.8696	6.84	0.83255	0.809	1.995	0.96543	2.066	1.4802	0.51479
36	1.52	7.8926	6.84	0.85048	0.808	2.0001	0.94749	2.111	1.4738	0.52628
37	1.64	7.9155	6.84	0.86624	0.805	2.0072	0.93173	2.154	1.4695	0.53775
38	1.76	7.9349	6.84	0.87983	0.804	2.0131	0.91815	2.193	1.4656	0.54746
39	1.88	7.9529	6.84	0.89124	0.801	2.0196	0.90674	2.227	1.4632	0.55645
40	2.00	7.9715	6.84	0.90211	0.797	2.0274	0.89587	2.263	1.4616	0.56576
41	2.12	7.988	6.84	0.91135	0.794	2.0347	0.88663	2.295	1.4606	0.57402
42	2.23	8.0038	6.84	0.9195	0.790	2.0423	0.87848	2.325	1.4604	0.58192
43	2.35	8.021	6.84	0.92548	0.784	2.0535	0.8725	2.354	1.463	0.59049
44	2.47	8.0401	6.84	0.932	0.777	2.0661	0.86598	2.386	1.466	0.60004
45	2.59	8.0551	6.84	0.93852	0.772	2.0745	0.85946	2.414	1.467	0.60754
46	2.71	8.0673	6.84	0.94232	0.768	2.0829	0.85565	2.434	1.4693	0.61363
47	2.82	8.0856	6.84	0.94558	0.759	2.098	0.85239	2.461	1.4752	0.62279
48	2.94	8.0991	6.84	0.94993	0.754	2.1071	0.84804	2.485	1.4776	0.62954
49	3.06	8.1105	6.84	0.95319	0.750	2.1153	0.84478	2.504	1.48	0.63524
50	3.18	8.1259	6.84	0.95591	0.743	2.128	0.84207	2.527	1.485	0.64297
51	3.29	8.1353	6.84	0.95808	0.740	2.1352	0.83989	2.542	1.4875	0.64765
52	3.41	8.1473	6.84	0.96134	0.735	2.1439	0.83663	2.563	1.4903	0.65365
53	3.53	8.1566	6.84	0.96243	0.731	2.1521	0.83555	2.576	1.4938	0.65828
54	3.65	8.1692	6.84	0.96406	0.725	2.1631	0.83392	2.594	1.4985	0.66459
55	3.76	8.1811	6.84	0.96515	0.720	2.1739	0.83283	2.610	1.5034	0.67054
56	3.88	8.1916	6.84	0.96623	0.715	2.1833	0.83174	2.625	1.5075	0.67578
57	4.00	8.2027	6.84	0.96732	0.710	2.1934	0.83065	2.641	1.512	0.68137
58	4.12	8.2132	6.84	0.96895	0.706	2.2022	0.82902	2.656	1.5156	0.68659
59	4.23	8.2257	6.84	0.96895	0.699	2.2147	0.82902	2.671	1.5218	0.69283
60	4.35	8.2347	6.84	0.97058	0.696	2.2221	0.82739	2.686	1.5248	0.69736
61	4.47	8.2411	6.84	0.97112	0.693	2.2279	0.82685	2.694	1.5274	0.70053
62	4.58	8.2494	6.84	0.97276	0.690	2.2346	0.82522	2.708	1.5299	0.70471
63	4.70	8.259	6.84	0.97221	0.685	2.2448	0.82576	2.718	1.5353	0.70952
64	4.82	8.2687	6.84	0.97058	0.679	2.2561	0.82739	2.727	1.5417	0.71433
65	4.94	8.2788	6.84	0.97112	0.675	2.2657	0.82685	2.740	1.5463	0.71942
66	5.06	8.2878	6.84	0.96949	0.670	2.2763	0.82848	2.748	1.5524	0.7239
67	5.17	8.3007	6.84	0.96841	0.663	2.2902	0.82957	2.761	1.5599	0.73034
68	5.29	8.3095	6.84	0.96732	0.658	2.3001	0.83065	2.769	1.5654	0.73474
69	5.41	8.3203	6.84	0.96678	0.653	2.3115	0.8312	2.781	1.5714	0.74016
70	5.53	8.3324	6.84	0.96569	0.647	2.3247	0.83228	2.793	1.5785	0.74622
71	5.64	8.3438	6.84	0.96297	0.640	2.3388	0.835	2.801	1.5869	0.75192
72	5.76	8.3559	6.84	0.9608	0.634	2.3531	0.83718	2.811	1.5951	0.75795
73	5.88	8.3653	6.84	0.96026	0.630	2.363	0.83772	2.821	1.6004	0.76264
74	5.99	8.3759	6.84	0.95917	0.624	2.3747	0.83881	2.831	1.6068	0.76795
75	6.11	8.3852	6.84	0.957	0.619	2.3861	0.84098	2.837	1.6136	0.77258
76	6.23	8.3971	6.84	0.9521	0.611	2.403	0.84587	2.841	1.6244	0.77854
77	6.35	8.4076	6.84	0.94939	0.606	2.4162	0.84859	2.847	1.6324	0.78381
78	6.47	8.4168	6.84	0.94721	0.601	2.4276	0.85076	2.853	1.6392	0.78841

79	6.59	8.428	6.84	0.94613	0.596	2.4398	0.85185	2.864	1.6458	0.79398
80	6.70	8.4417	6.84	0.94287	0.589	2.4568	0.85511	2.873	1.656	0.80084
81	6.82	8.4495	6.84	0.93961	0.584	2.4679	0.85837	2.875	1.6631	0.80475
82	6.94	8.4612	6.84	0.93634	0.578	2.4828	0.86163	2.882	1.6722	0.8106
83	7.06	8.4754	6.84	0.93254	0.570	2.5009	0.86543	2.890	1.6832	0.81772
84	7.18	8.487	6.84	0.92928	0.564	2.5157	0.8687	2.896	1.6922	0.8235
85	7.29	8.498	6.84	0.92656	0.559	2.5294	0.87141	2.903	1.7004	0.82899
86	7.41	8.5096	6.84	0.92385	0.553	2.5437	0.87413	2.910	1.7089	0.8348
87	7.53	8.516	6.84	0.92004	0.549	2.5539	0.87793	2.909	1.7159	0.83798
88	7.64	8.5236	6.84	0.91732	0.545	2.5643	0.88065	2.912	1.7225	0.8418
89	7.76	8.5312	6.84	0.91461	0.541	2.5746	0.88337	2.915	1.729	0.84561
90	7.87	8.544	6.84	0.9108	0.535	2.5911	0.88717	2.921	1.7392	0.85199
91	7.99	8.5567	6.84	0.907	0.528	2.6077	0.89098	2.927	1.7493	0.85834
92	8.11	8.5655	6.84	0.90374	0.524	2.6197	0.89424	2.930	1.757	0.86273
93	8.22	8.5736	6.84	0.89993	0.519	2.6317	0.89804	2.930	1.7648	0.86681
94	8.34	8.5824	6.84	0.89667	0.515	2.6437	0.9013	2.933	1.7725	0.87118
95	8.46	8.5943	6.84	0.89178	0.508	2.6605	0.90619	2.936	1.7833	0.87713
96	8.57	8.6049	6.84	0.88798	0.503	2.6749	0.91	2.939	1.7924	0.88244
97	8.70	8.6192	6.84	0.88472	0.497	2.6925	0.91326	2.948	1.8029	0.88961
98	8.81	8.6336	6.84	0.88091	0.491	2.7107	0.91706	2.956	1.8139	0.8968
99	8.93	8.6422	6.84	0.87711	0.487	2.723	0.92087	2.957	1.8219	0.90108
100	9.05	8.6455	6.84	0.87331	0.484	2.7302	0.92467	2.953	1.8274	0.90276
101	9.17	8.6547	6.84	0.86896	0.479	2.7437	0.92902	2.953	1.8364	0.90735
102	9.29	8.6606	6.84	0.86461	0.475	2.754	0.93336	2.951	1.8437	0.91031
103	9.40	8.6659	6.84	0.86081	0.471	2.7631	0.93717	2.948	1.8501	0.91296
104	9.52	8.6756	6.84	0.857	0.467	2.7766	0.94097	2.951	1.8588	0.91781
105	9.64	8.6898	6.84	0.85374	0.462	2.794	0.94423	2.959	1.8691	0.92488
106	9.75	8.6975	6.84	0.84994	0.458	2.8055	0.94804	2.959	1.8768	0.92876
107	9.87	8.7039	6.84	0.84505	0.453	2.8169	0.95293	2.956	1.8849	0.93197
108	9.99	8.7161	6.84	0.8407	0.448	2.8334	0.95728	2.960	1.8953	0.93806
109	10.11	8.7282	6.84	0.83581	0.443	2.8503	0.96217	2.962	1.9063	0.94409
110	10.22	8.7415	6.84	0.83092	0.437	2.8686	0.96706	2.966	1.9178	0.95076
111	10.34	8.7465	6.84	0.82657	0.434	2.8779	0.97141	2.963	1.9247	0.95326
112	10.46	8.7566	6.84	0.82331	0.430	2.8913	0.97467	2.966	1.933	0.95831
113	10.58	8.7604	6.84	0.81842	0.426	2.8999	0.97956	2.960	1.9397	0.96019
114	10.69	8.7723	6.84	0.81353	0.421	2.9168	0.98445	2.963	1.9506	0.96615
115	10.81	8.7779	6.84	0.80918	0.418	2.9267	0.9888	2.960	1.9577	0.96895
116	10.93	8.7853	6.84	0.80483	0.414	2.9385	0.99314	2.959	1.9658	0.97267
117	11.05	8.7934	6.84	0.80049	0.410	2.9509	0.99749	2.958	1.9742	0.97669
118	11.17	8.8008	6.84	0.79722	0.407	2.9615	1.0008	2.959	1.9811	0.98039
119	11.28	8.8082	6.84	0.79288	0.403	2.9733	1.0051	2.958	1.9892	0.98409
120	11.40	8.8149	6.84	0.7869	0.398	2.9859	1.0111	2.953	1.9985	0.98743
121	11.52	8.8254	6.84	0.78146	0.394	3.0019	1.0165	2.953	2.0092	0.99268
122	11.64	8.8357	6.84	0.77766	0.390	3.0161	1.0203	2.956	2.0182	0.99787
123	11.75	8.8436	6.84	0.77386	0.386	3.0278	1.0241	2.956	2.0259	1.0018
124	11.87	8.8496	6.84	0.76951	0.383	3.0381	1.0285	2.954	2.0333	1.0048
125	11.99	8.858	6.84	0.76516	0.379	3.0508	1.0328	2.954	2.0418	1.009
126	12.11	8.864	6.84	0.75973	0.375	3.0623	1.0382	2.949	2.0503	1.012
127	12.22	8.8694	6.84	0.75429	0.372	3.0731	1.0437	2.944	2.0584	1.0147
128	12.34	8.8795	6.84	0.74995	0.368	3.0876	1.048	2.946	2.0678	1.0198
129	12.46	8.8824	6.84	0.74451	0.365	3.0958	1.0535	2.939	2.0746	1.0212
130	12.58	8.8925	6.84	0.74071	0.361	3.1098	1.0573	2.941	2.0835	1.0263
131	12.69	8.9021	6.84	0.73582	0.357	3.1242	1.0622	2.941	2.0932	1.031
132	12.81	8.9097	6.84	0.73093	0.353	3.1367	1.0671	2.940	2.1019	1.0348
133	12.93	8.9142	6.84	0.72603	0.350	3.1461	1.0719	2.935	2.109	1.0371
134	13.05	8.9218	6.84	0.72114	0.346	3.1586	1.0768	2.933	2.1177	1.0409
135	13.17	8.9292	6.84	0.71625	0.343	3.1709	1.0817	2.931	2.1263	1.0446
136	13.29	8.9344	6.84	0.71082	0.339	3.1815	1.0872	2.926	2.1343	1.0472
137	13.41	8.938	6.84	0.70538	0.336	3.1906	1.0926	2.920	2.1416	1.049
138	13.53	8.9474	6.84	0.69941	0.332	3.206	1.0986	2.918	2.1523	1.0537
139	13.64	8.9537	6.84	0.69506	0.329	3.2166	1.1029	2.916	2.1598	1.0568
140	13.76	8.9604	6.84	0.68962	0.325	3.2288	1.1084	2.913	2.1686	1.0602
141	13.88	8.9672	6.84	0.68528	0.322	3.2399	1.1127	2.912	2.1763	1.0636
142	14.00	8.9782	6.84	0.68093	0.318	3.2553	1.117	2.914	2.1862	1.0691
143	14.12	8.9819	6.84	0.67549	0.315	3.2644	1.1225	2.908	2.1934	1.0709
144	14.24	8.9879	6.84	0.67006	0.312	3.2759	1.1279	2.904	2.2019	1.074
145	14.35	8.9978	6.84	0.66517	0.308	3.2906	1.1328	2.905	2.2117	1.0789
146	14.47	9.0039	6.84	0.65973	0.305	3.3021	1.1382	2.901	2.2202	1.0819
147	14.58	9.0118	6.84	0.6543	0.301	3.3154	1.1437	2.899	2.2296	1.0859
148	14.70	9.0177	6.84	0.6505	0.299	3.3252	1.1475	2.898	2.2363	1.0888
149	14.81	9.0244	6.84	0.64506	0.295	3.3373	1.1529	2.895	2.2451	1.0922
150	14.93	9.0297	6.84	0.63963	0.292	3.348	1.1583	2.890	2.2532	1.0948
151	15.05	9.031	6.84	0.63474	0.290	3.3542	1.1632	2.884	2.2587	1.0955
152	15.16	9.0351	6.84	0.62985	0.287	3.3632	1.1681	2.879	2.2657	1.0975
153	15.28	9.0392	6.84	0.62495	0.284	3.3722	1.173	2.875	2.2726	1.0996
154	15.40	9.042	6.84	0.62169	0.282	3.3783	1.1763	2.872	2.2773	1.101
155	15.42	9.0404	6.84	0.62061	0.282	3.3777	1.1774	2.869	2.2776	1.1002

DIRECT SHEAR TEST REPORT







Symbol		○	△	□	
Test No.		.75 TSF	1.25 TSF	1.75 TSF	
Sample No.		S-16-18	S-16-18	S-16-18	
Shape		Circular	Circular	Circular	
Initial	Dimension, in	2.3504	2.3504	2.3504	
	Area, in^2	4.3388	4.3388	4.3388	
	Height, in	1	1	1	
	Water Content, %	16.12	16.62	16.15	
	Dry Density, pcf	117.9	117.1	117.9	
	Saturation, %	99.55	100.36	99.77	
	Void Ratio	0.44047	0.45053	0.44026	
Consol. Height, in		0.98989	0.9897	0.98947	
Consol. Void Ratio		0.42591	0.43558	0.4251	
Final	Water Content, %	14.02	14.02	12.51	
	Dry Density, pcf	121.9	122.6	124.2	
	Saturation, %	97.07	99.04	92.56	
	Void Ratio	0.39288	0.38509	0.36752	
Normal Stress, tsf		0.75	1.25	1.75	
Max. Shear Stress, tsf		0.67243	1.0674	1.4045	
Ult. Shear Stress, tsf		0.67243	0.95657	1.2984	
Time to Failure, min		180.15	62.996	198	
Disp. Rate, in/min		0.001417	0.001417	0.001417	
Estimated Specific Gravity		2.72	2.72	2.72	
Liquid Limit		---	---	---	
Plastic Limit		---	---	---	
Plasticity Index		---	---	---	

Project: COLETO CREEK FACILITY

Location: IPR-GDF SUEZ

Project No.: 60225561

Boring No.: B-1-1

Sample Type: TRIMMED

Description: CALICHE SOIL (CALSIUM CARBONATE) SOME F-C SAND TRACE F GRAVEL - WHITE

Remarks: TEST PERFORMED AS PER ASTM D 3080. SPECIMEN REMOLDED TO 117.0 PCF@ 16.5 WC

Thu, 22-DEC-2011 13:30:56

DIRECT SHEAR TEST DATA

Project: COLETO CREEK FACILITY
Boring No.: B-1-1
Sample No.: S-16-18
Test No.: .75 TSF

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/17/11
Sample Type: TRIMMED

Project No.: 60225561
Checked By: WPQ
Depth: ----
Elevation: ----

Soil Description: CALICHE SOIL (CALSIUM CARBONATE) SOME F-C SAND TRACE F GRAVEL - WHITE
Remarks: TEST PERFORMED AS PER ASTM D 3080. SPECIMEN REMOLDED TO 117.0 PCF@ 16.5 WC

Step: 1 of 1

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in	Cumulative Displacement in
1	0.00	0.75	0.01082	0	0	0
2	2.00	0.75	0.01127	0.06009	0.001129	0.001129
3	4.00	0.75	0.01182	0.1469	0.004796	0.004796
4	6.00	0.75	0.01225	0.143	0.008888	0.008888
5	8.00	0.75	0.01266	0.2189	0.0127	0.0127
6	10.00	0.75	0.0135	0.2873	0.01651	0.01651
7	12.00	0.75	0.01429	0.3483	0.02031	0.02031
8	14.00	0.75	0.01498	0.4009	0.02384	0.02384
9	16.00	0.75	0.01557	0.4496	0.02751	0.02751
10	18.00	0.75	0.01607	0.4908	0.03104	0.03104
11	20.00	0.75	0.01648	0.5329	0.03456	0.03456
12	22.00	0.75	0.01683	0.5689	0.03809	0.03809
13	24.00	0.75	0.01715	0.6005	0.0419	0.0419
14	26.00	0.75	0.01735	0.6294	0.04543	0.04543
15	28.00	0.75	0.01757	0.6558	0.04938	0.04938
16	98.00	0.75	0.02125	0.6014	0.1943	0.1943
17	180.15	0.75	0.03304	0.6724	0.3589	0.3589

DIRECT SHEAR TEST DATA

Project: COLETO CREEK FACILITY
Boring No.: B-1-1
Sample No.: S-16-18
Test No.: 1.25 TSF

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/17/11
Sample Type: TRIMMED

Project No.: 60225561
Checked By: WPQ
Depth: ----
Elevation: ----

Soil Description: CALICHE SOIL (CALSIUM CARBONATE) SOME F-C SAND TRACE F GRAVEL - WHITE
Remarks: TEST PERFORMED AS PER ASTM D 3080. SPECIMEN REMOLDED TO 117.0 PCF@ 16.5 WC

Step: 1 of 1

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in	Cumulative Displacement in
1	0.00	1.25	0.01189	0	0	0
2	12.00	1.25	0.01458	0.07233	0.002821	0.002821
3	14.00	1.25	0.01451	0.07971	0.006913	0.006913
4	16.00	1.25	0.01467	0.08127	0.011	0.011
5	18.00	1.25	0.01488	0.1684	0.01481	0.01481
6	20.00	1.25	0.01499	0.1843	0.0189	0.0189
7	22.00	1.25	0.0153	0.313	0.02271	0.02271
8	24.00	1.25	0.01616	0.413	0.0261	0.0261
9	26.00	1.25	0.01703	0.5094	0.02963	0.02963
10	28.00	1.25	0.01777	0.5879	0.03315	0.03315
11	33.00	1.25	0.01959	0.7097	0.04246	0.04246
12	38.00	1.25	0.02117	0.8061	0.05206	0.05206
13	43.00	1.25	0.02223	0.8912	0.06193	0.06193
14	48.00	1.25	0.02302	0.9647	0.07209	0.07209
15	53.00	1.25	0.02348	1.018	0.08196	0.08196
16	58.00	1.25	0.02364	1.05	0.09198	0.09198
17	63.00	1.25	0.02373	1.067	0.1021	0.1021
18	68.00	1.25	0.02364	1.064	0.1126	0.1126
19	73.00	1.25	0.02385	1.029	0.123	0.123
20	78.00	1.25	0.02424	0.9962	0.1333	0.1333
21	83.00	1.25	0.0247	0.969	0.1436	0.1436
22	88.00	1.25	0.02532	0.941	0.1542	0.1542
23	93.00	1.25	0.02591	0.9196	0.1648	0.1648
24	98.00	1.25	0.02646	0.9006	0.1754	0.1754
25	103.00	1.25	0.02715	0.8831	0.1859	0.1859
26	108.00	1.25	0.02788	0.8749	0.1964	0.1964
27	113.00	1.25	0.02879	0.8695	0.2068	0.2068
28	118.00	1.25	0.02939	0.8679	0.2174	0.2174
29	123.00	1.25	0.03015	0.871	0.2277	0.2277
30	128.00	1.25	0.03082	0.8718	0.2378	0.2378
31	133.00	1.25	0.03154	0.8706	0.248	0.248
32	138.00	1.25	0.03235	0.8772	0.2577	0.2577
33	143.00	1.25	0.03304	0.8858	0.2673	0.2673
34	148.00	1.25	0.0338	0.8955	0.2769	0.2769
35	153.00	1.25	0.03439	0.9017	0.2872	0.2872
36	158.00	1.25	0.03505	0.9064	0.2972	0.2972
37	163.00	1.25	0.03568	0.9091	0.3074	0.3074
38	168.00	1.25	0.0363	0.9185	0.3176	0.3176
39	173.00	1.25	0.03691	0.922	0.3276	0.3276
40	178.00	1.25	0.03753	0.9262	0.3377	0.3377
41	183.00	1.25	0.03808	0.9321	0.3476	0.3476
42	188.00	1.25	0.03874	0.9282	0.3578	0.3578
43	193.00	1.25	0.0393	0.929	0.3678	0.3678
44	198.00	1.25	0.03976	0.9309	0.3779	0.3779
45	203.00	1.25	0.04033	0.941	0.3884	0.3884
46	208.00	1.25	0.04084	0.9383	0.399	0.399
47	213.00	1.25	0.04139	0.9371	0.4095	0.4095
48	218.00	1.25	0.04193	0.9379	0.42	0.42
49	223.00	1.25	0.04244	0.9356	0.4307	0.4307
50	228.00	1.25	0.04296	0.936	0.4413	0.4413
51	233.00	1.25	0.04351	0.9391	0.4517	0.4517
52	238.00	1.25	0.04403	0.9406	0.462	0.462
53	243.00	1.25	0.04459	0.9476	0.4723	0.4723
54	248.00	1.25	0.04511	0.9566	0.4823	0.4823

DIRECT SHEAR TEST DATA

Project: COLETO CREEK FACILITY
Boring No.: B-1-1
Sample No.: S-16-18
Test No.: 1.75 TSF

Location: IPR-GDF SUEZ
Tested By: BCM
Test Date: 12/17/11
Sample Type: TRIMMED

Project No.: 60225561
Checked By: WPQ
Depth: ----
Elevation: ----

Soil Description: CALICHE SOIL (CALSIUM CARBONATE) SOME F-C SAND TRACE F GRAVEL - WHITE
Remarks: TEST PERFORMED AS PER ASTM D 3080. SPECIMEN REMOLDED TO 117.0 PCF@ 16.5 WC

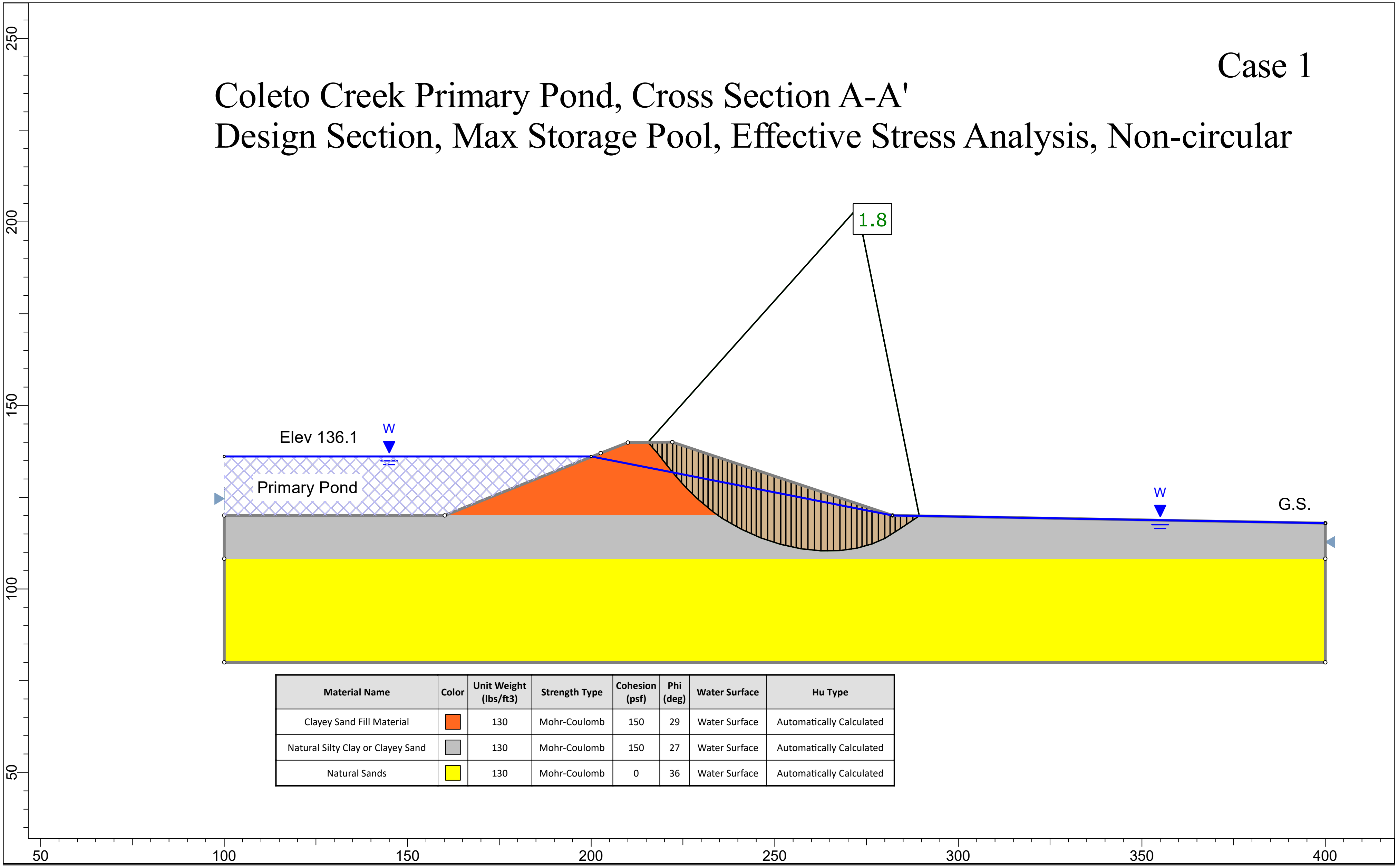
Step: 1 of 1

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in	Cumulative Displacement in
1	0.00	1.75	0.01256	0	0	0
2	4.00	1.75	0.01529	0.1083	0.001552	0.001552
3	6.00	1.75	0.0162	0.107	0.00522	0.00522
4	8.00	1.75	0.01687	0.1474	0.009311	0.009311
5	10.00	1.75	0.01767	0.3553	0.0127	0.0127
6	12.00	1.75	0.01877	0.497	0.01622	0.01622
7	14.00	1.75	0.01979	0.615	0.01961	0.01961
8	16.00	1.75	0.0207	0.7159	0.02328	0.02328
9	18.00	1.75	0.02152	0.8062	0.02694	0.02694
10	20.00	1.75	0.02223	0.904	0.03061	0.03061
11	22.00	1.75	0.02289	0.9887	0.03414	0.03414
12	24.00	1.75	0.02361	1.072	0.03809	0.03809
13	26.00	1.75	0.02409	1.144	0.0419	0.0419
14	28.00	1.75	0.02466	1.209	0.04585	0.04585
15	98.00	1.75	0.0315	1.356	0.1888	0.1888
16	198.00	1.75	0.04639	1.405	0.392	0.392
17	243.36	1.75	0.0505	1.298	0.4572	0.4572

APPENDIX C: SLIDE 7.0 STABILITY ANALYSIS MODELS

Case 1

Coleto Creek Primary Pond, Cross Section A-A'
Design Section, Max Storage Pool, Effective Stress Analysis, Non-circular



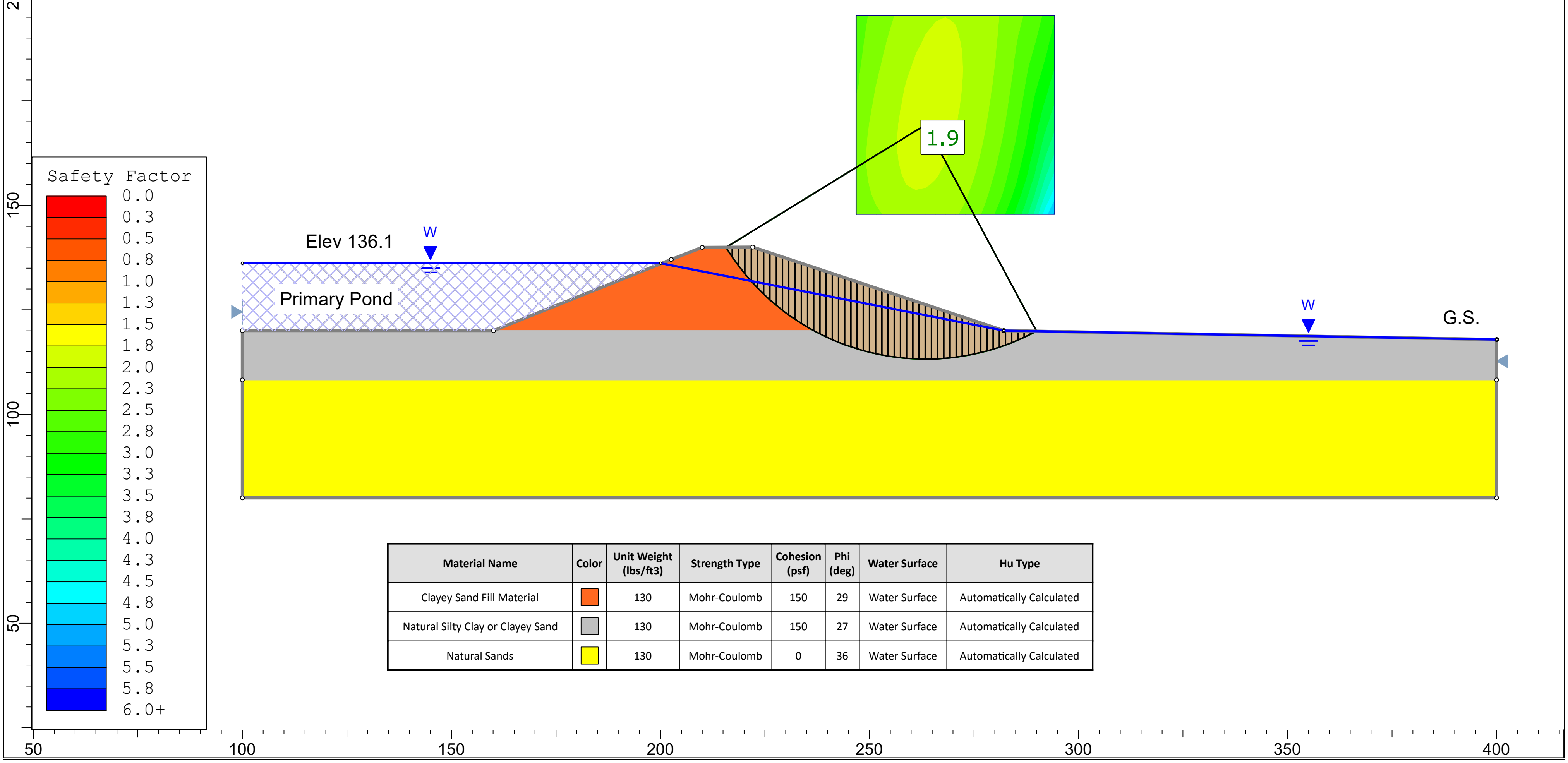
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	150	29	Water Surface	Automatically Calculated
Natural Silty Clay or Clayey Sand	⬜	130	Mohr-Coulomb	150	27	Water Surface	Automatically Calculated
Natural Sands	🟨	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated

Coleto 1_A-A_design_maxstor_eff_noncir.slmd

Bullock, Bennett & Associates, LLC

Case 2

Coleto Creek Primary Pond, Cross Section A-A'
Design Section, Max Storage Pool, Effective Stress Analysis, Circular



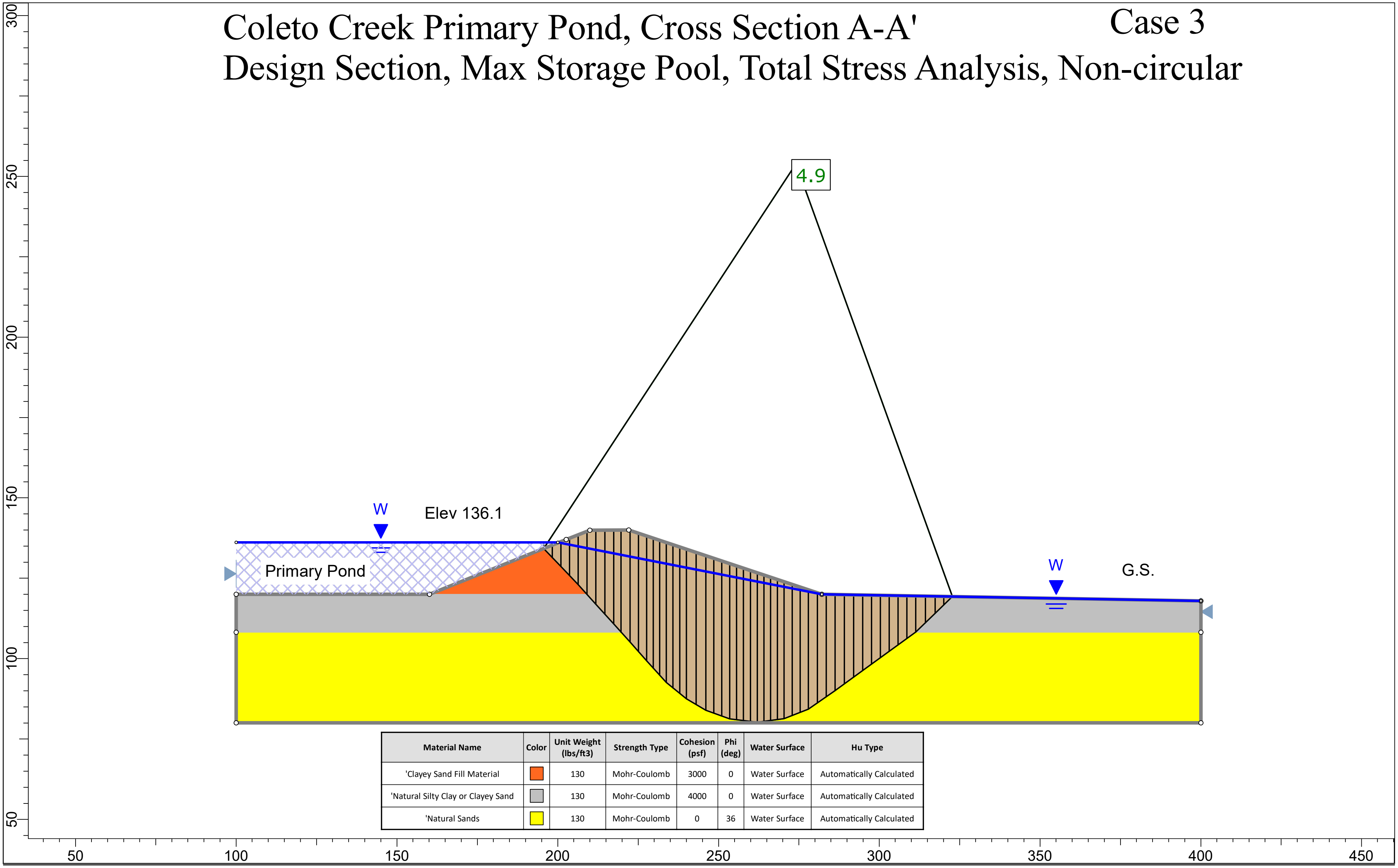
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	150	29	Water Surface	Automatically Calculated
Natural Silty Clay or Clayey Sand	⬜	130	Mohr-Coulomb	150	27	Water Surface	Automatically Calculated
Natural Sands	🟨	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated

Coleto 2_A-A_design_maxstor_eff_cir.slmd

Bullock, Bennett & Associates, LLC

Coleto Creek Primary Pond, Cross Section A-A'
Design Section, Max Storage Pool, Total Stress Analysis, Non-circular

Case 3



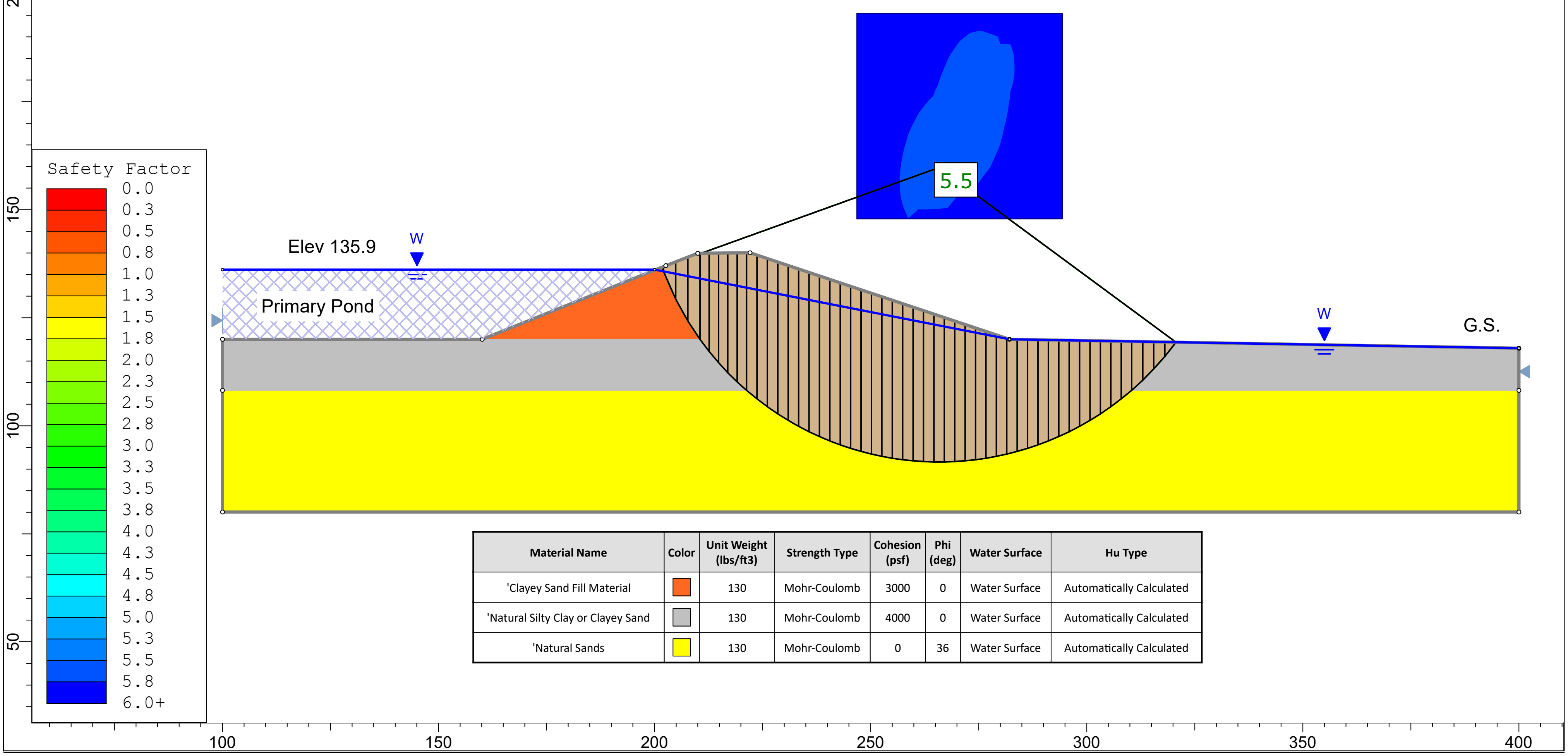
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Natural Silty Clay or Clayey Sand	⬜	130	Mohr-Coulomb	4000	0	Water Surface	Automatically Calculated
'Natural Sands	🟨	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated

Coleto 3_A-A_design_maxstor_tot_noncir.slmd

Bullock, Bennett & Associates, LLC

Case 4

Coleto Creek Primary Pond, Cross Section A-A'
Design Section, Max Storage Pool, Total Stress Analysis, Circular



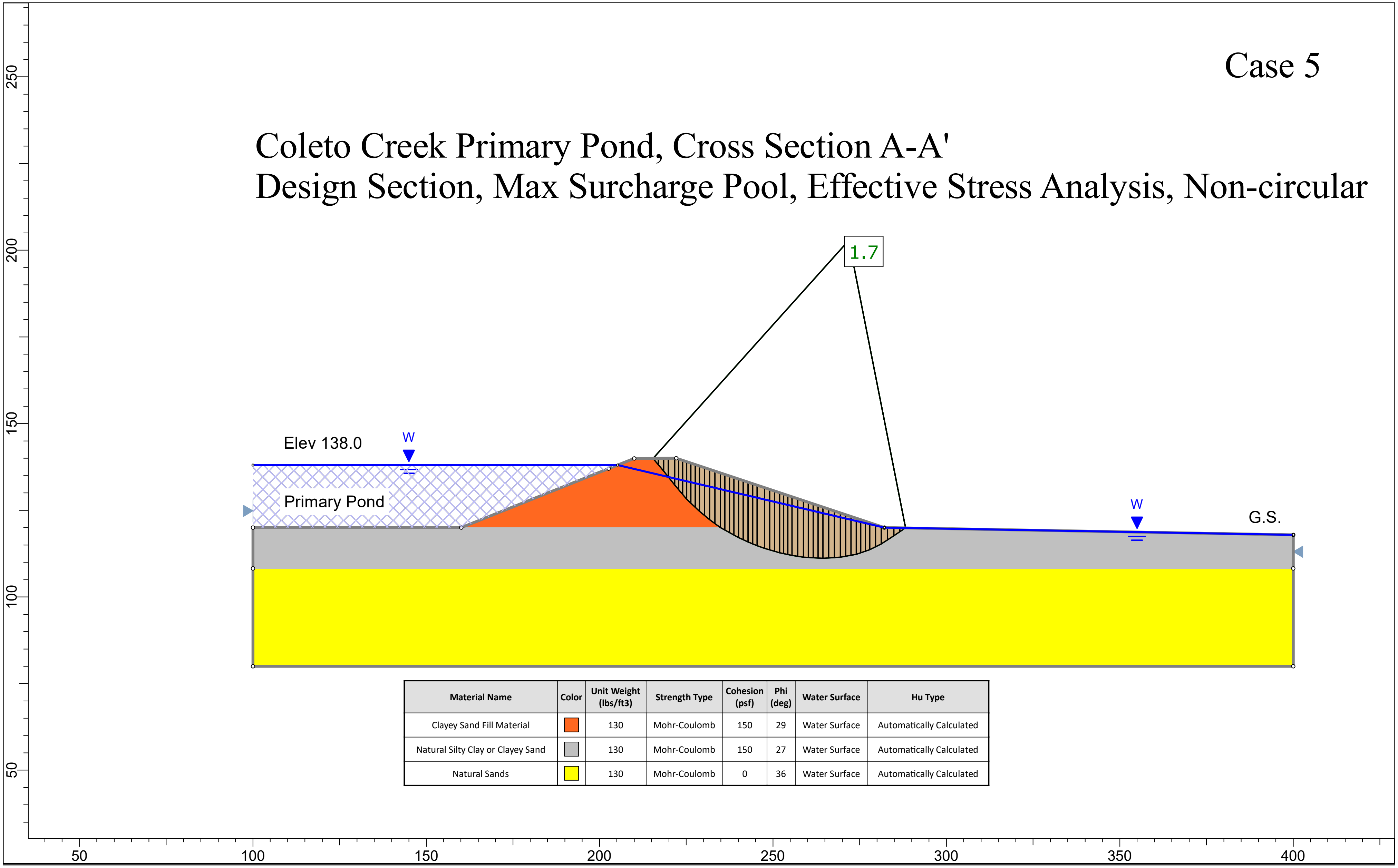
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Natural Silty Clay or Clayey Sand	⬜	130	Mohr-Coulomb	4000	0	Water Surface	Automatically Calculated
'Natural Sands	🟨	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated

Coleto 4_A-A_design_maxstor_tot_cir.slmd

Bullock, Bennett & Associates, LLC

Case 5

Coleto Creek Primary Pond, Cross Section A-A'
Design Section, Max Surcharge Pool, Effective Stress Analysis, Non-circular

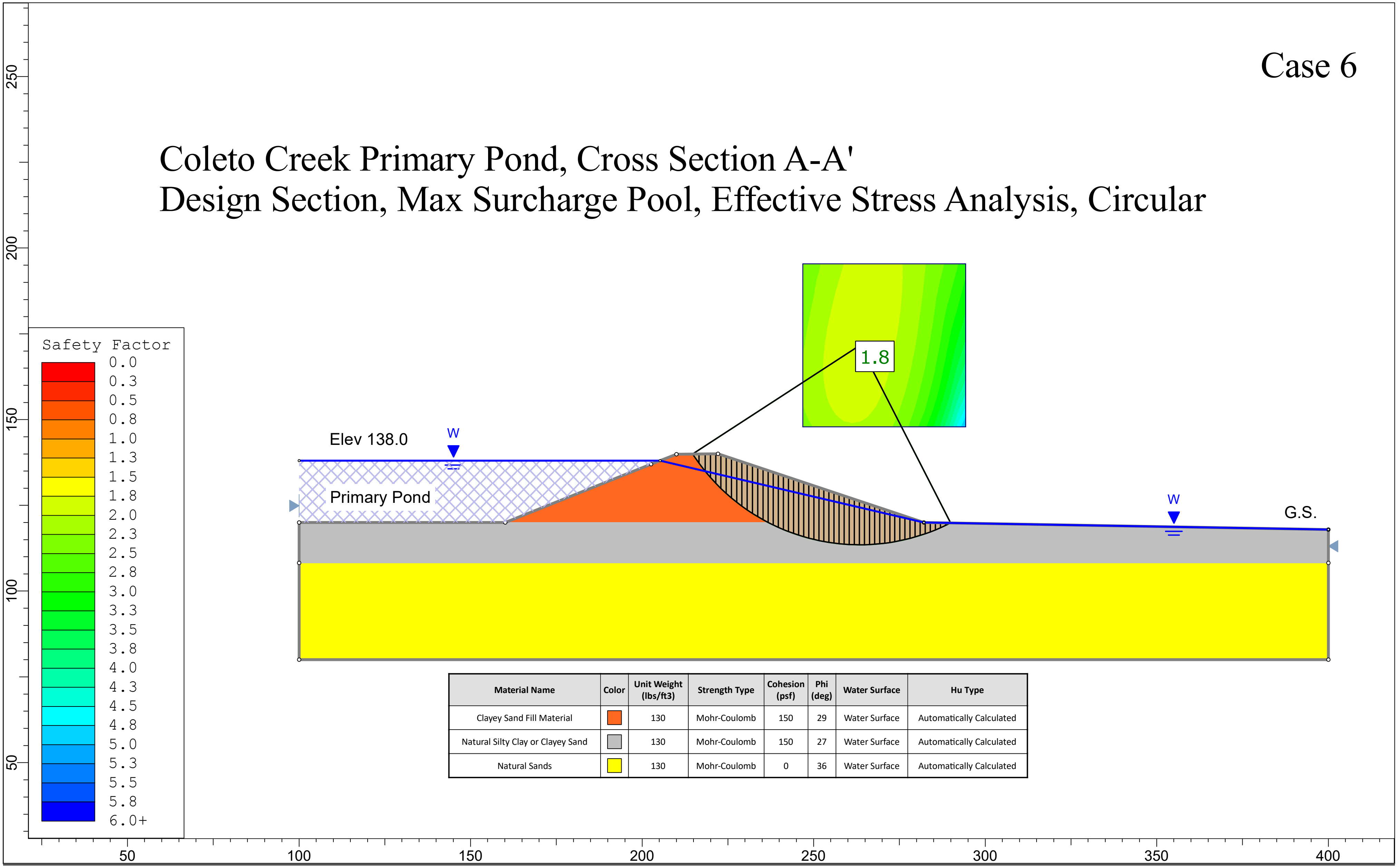


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	150	29	Water Surface	Automatically Calculated
Natural Silty Clay or Clayey Sand	⬜	130	Mohr-Coulomb	150	27	Water Surface	Automatically Calculated
Natural Sands	🟨	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated

Coleto 5_A-A_design_maxsur_eff_noncir.slmd

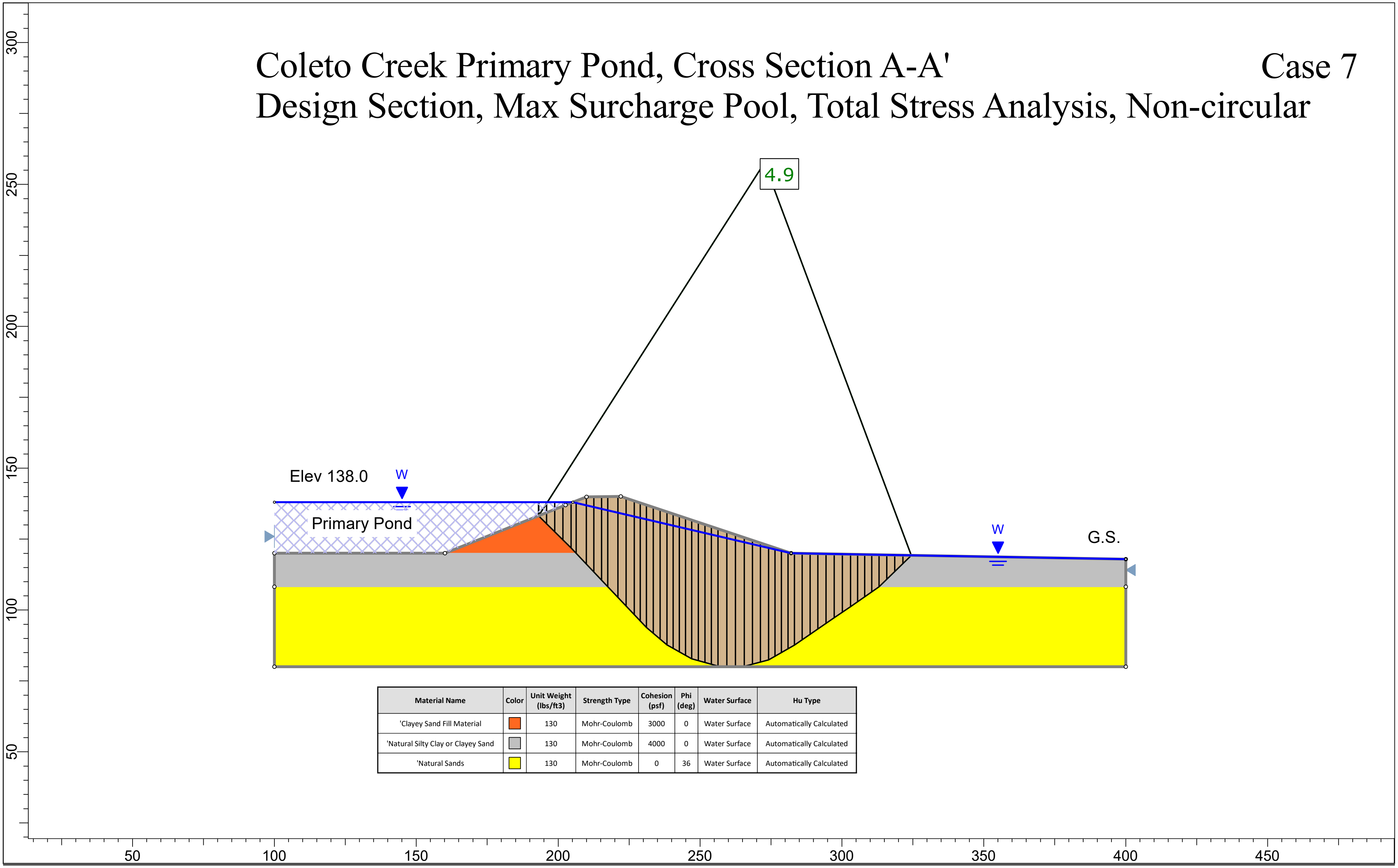
Case 6

Coleto Creek Primary Pond, Cross Section A-A'
Design Section, Max Surcharge Pool, Effective Stress Analysis, Circular



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	150	29	Water Surface	Automatically Calculated
Natural Silty Clay or Clayey Sand	⬜	130	Mohr-Coulomb	150	27	Water Surface	Automatically Calculated
Natural Sands	🟨	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated

Coleto Creek Primary Pond, Cross Section A-A' Case 7
Design Section, Max Surcharge Pool, Total Stress Analysis, Non-circular



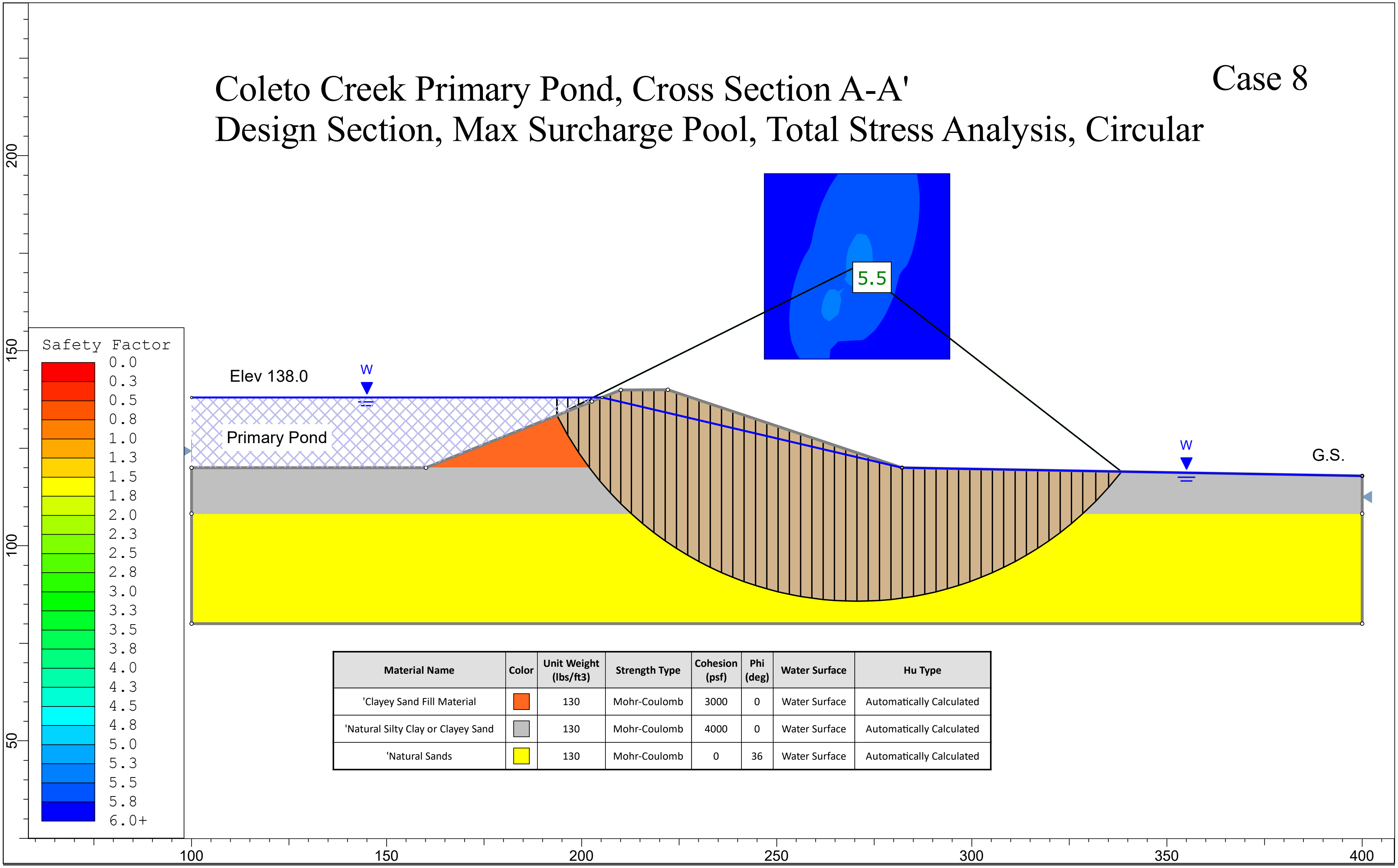
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Natural Silty Clay or Clayey Sand	⬜	130	Mohr-Coulomb	4000	0	Water Surface	Automatically Calculated
'Natural Sands	🟨	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated

Coleto 7_A-A_design_maxsur_tot_noncir.slmd

Bullock, Bennett & Associates, LLC

Coleto Creek Primary Pond, Cross Section A-A'
Design Section, Max Surcharge Pool, Total Stress Analysis, Circular

Case 8



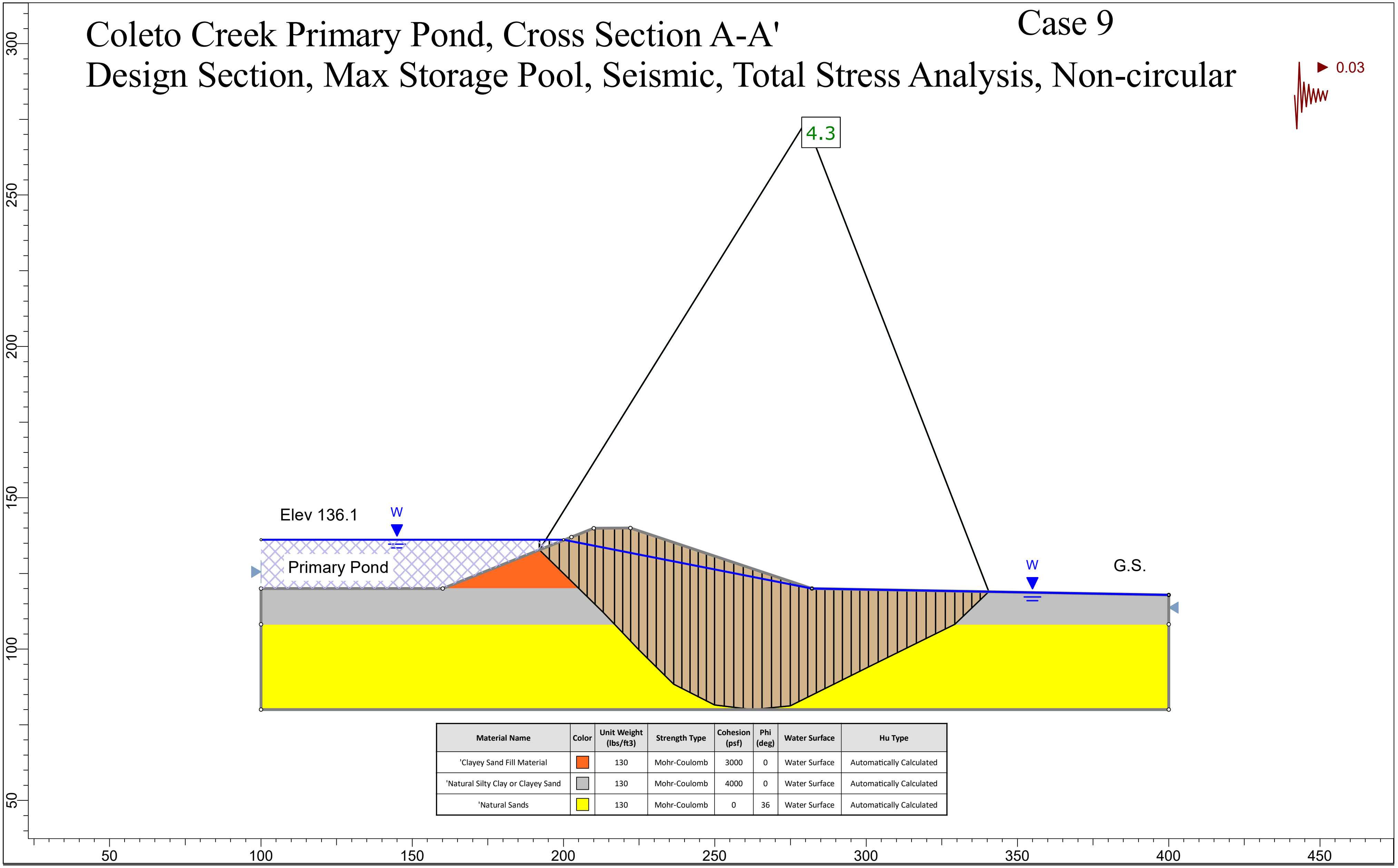
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Natural Silty Clay or Clayey Sand	⬜	130	Mohr-Coulomb	4000	0	Water Surface	Automatically Calculated
'Natural Sands	🟨	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated

Coleto 8_A-A_design_maxsur_tot_cir.slmd

Bullock, Bennett & Associates, LLC

Coleto Creek Primary Pond, Cross Section A-A'
Design Section, Max Storage Pool, Seismic, Total Stress Analysis, Non-circular

Case 9



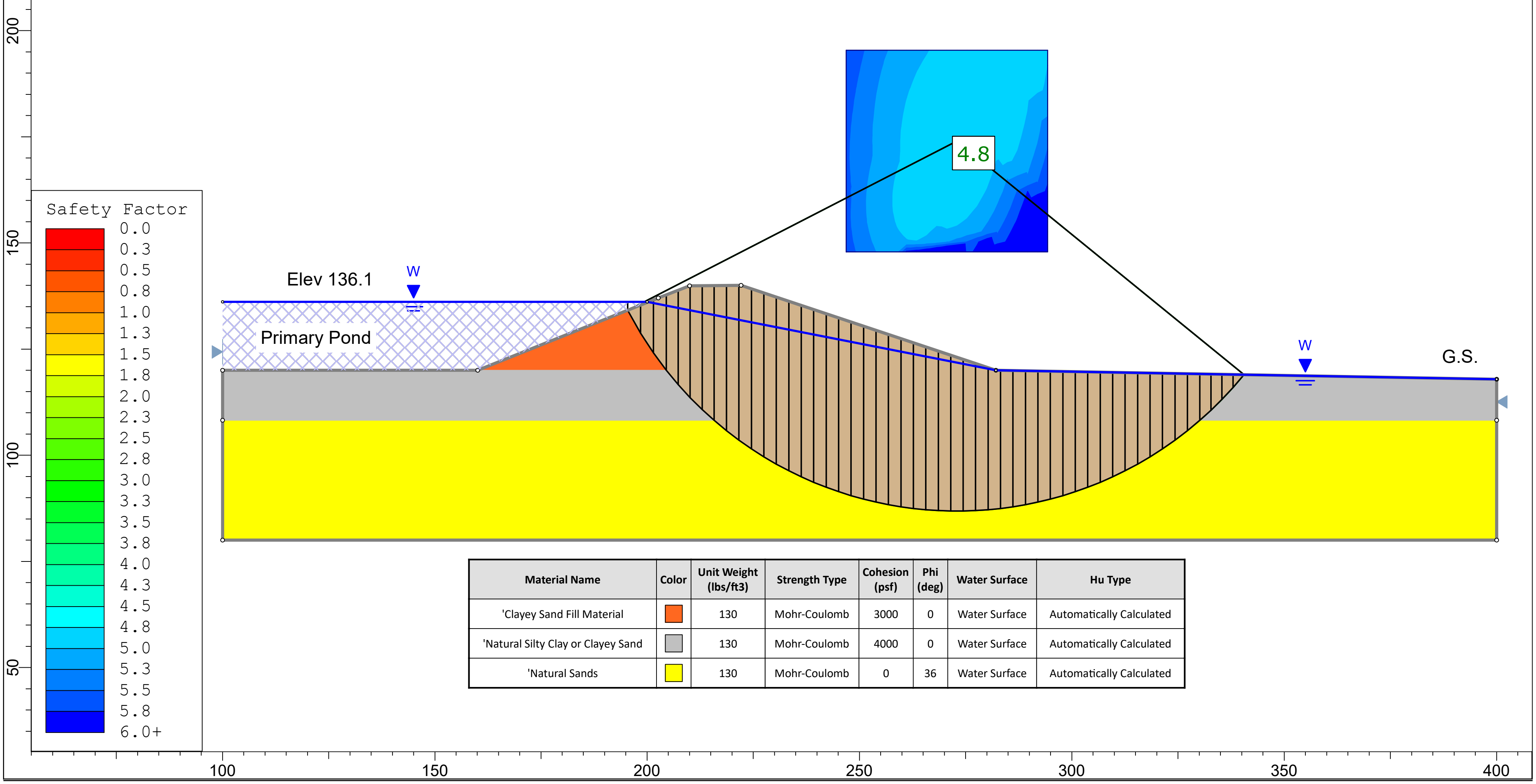
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Natural Silty Clay or Clayey Sand	⬜	130	Mohr-Coulomb	4000	0	Water Surface	Automatically Calculated
'Natural Sands	🟨	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated

Coleto 9_A-A_design_maxstor_seis_tot_noncir.slmd

Bullock, Bennett & Associates, LLC

Case 10

Coleto Creek Primary Pond, Cross Section A-A'
Design Section, Max Storage Pool, Seismic, Total Stress Analysis, Circular



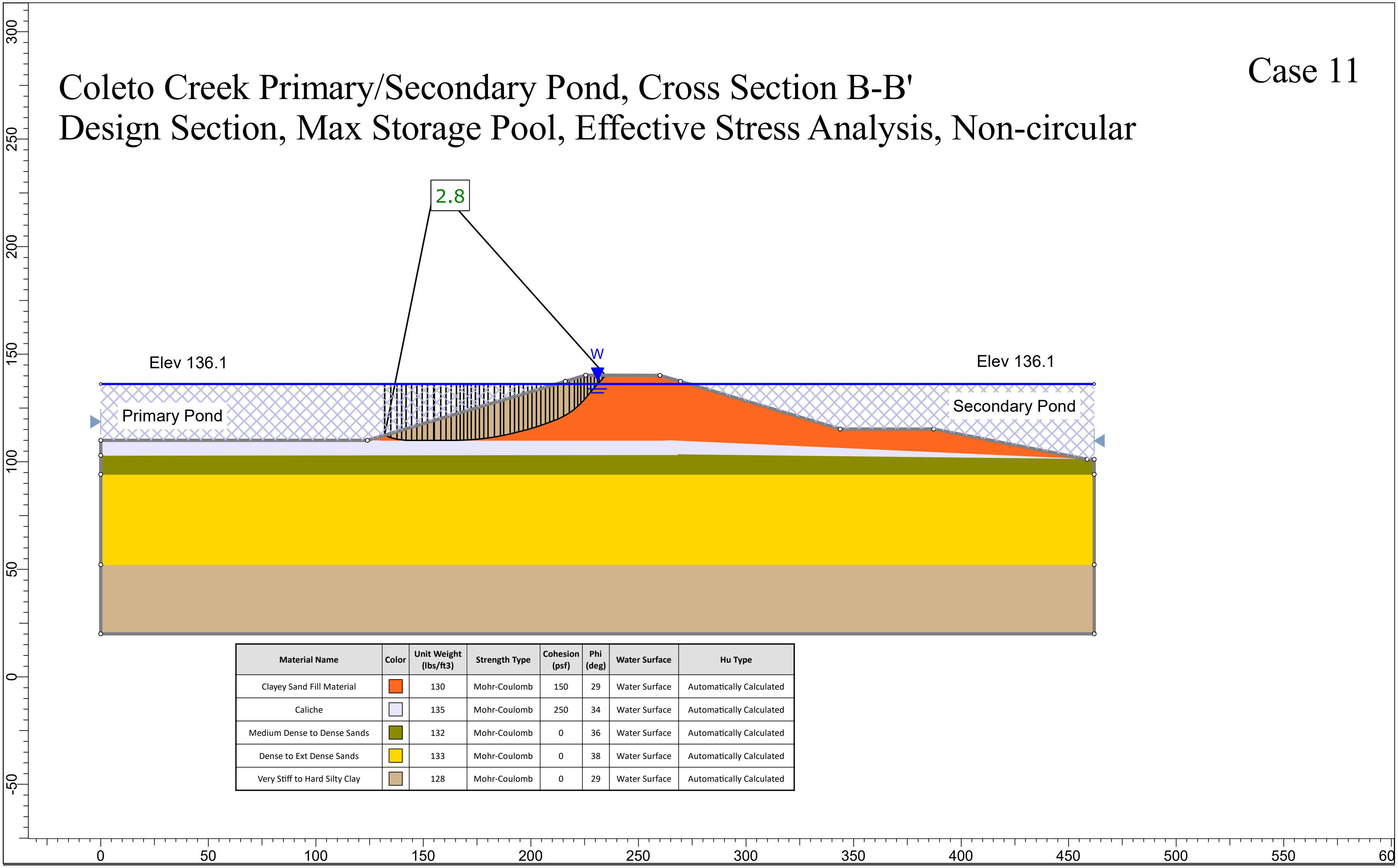
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Natural Silty Clay or Clayey Sand	⬜	130	Mohr-Coulomb	4000	0	Water Surface	Automatically Calculated
'Natural Sands	🟨	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated

Coleto 10_A-A_design_maxstor_seis_tot_cir.slmd

Bullock, Bennett & Associates, LLC

Coleto Creek Primary/Secondary Pond, Cross Section B-B'
Design Section, Max Storage Pool, Effective Stress Analysis, Non-circular

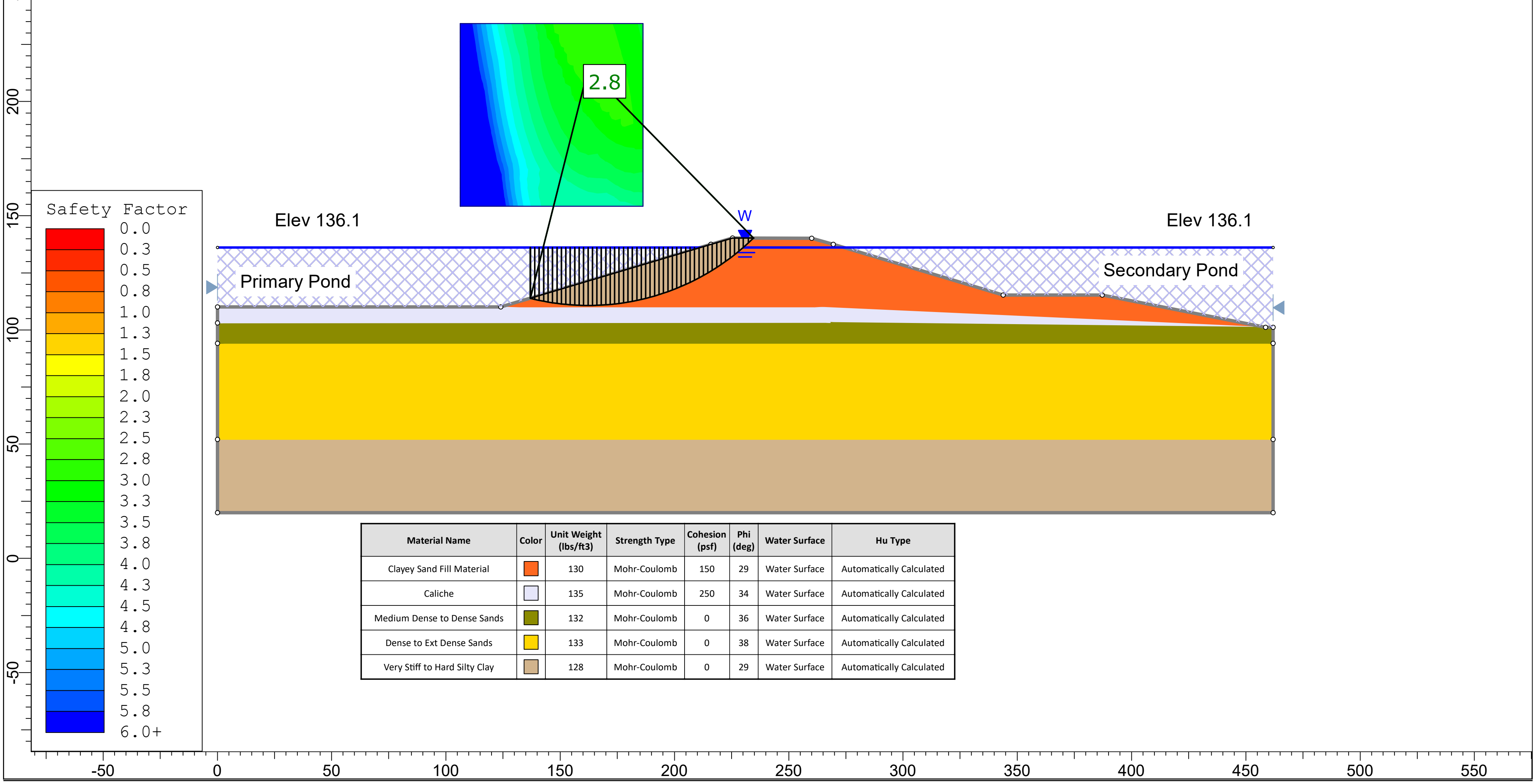
Case 11



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	150	29	Water Surface	Automatically Calculated
Caliche	⬜	135	Mohr-Coulomb	250	34	Water Surface	Automatically Calculated
Medium Dense to Dense Sands	🟩	132	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
Dense to Ext Dense Sands	🟨	133	Mohr-Coulomb	0	38	Water Surface	Automatically Calculated
Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	0	29	Water Surface	Automatically Calculated

Case 12

Coleto Creek Primary/Secondary Pond, Cross Section B-B'
Design Section, Max Storage Pool, Effective Stress Analysis, Circular



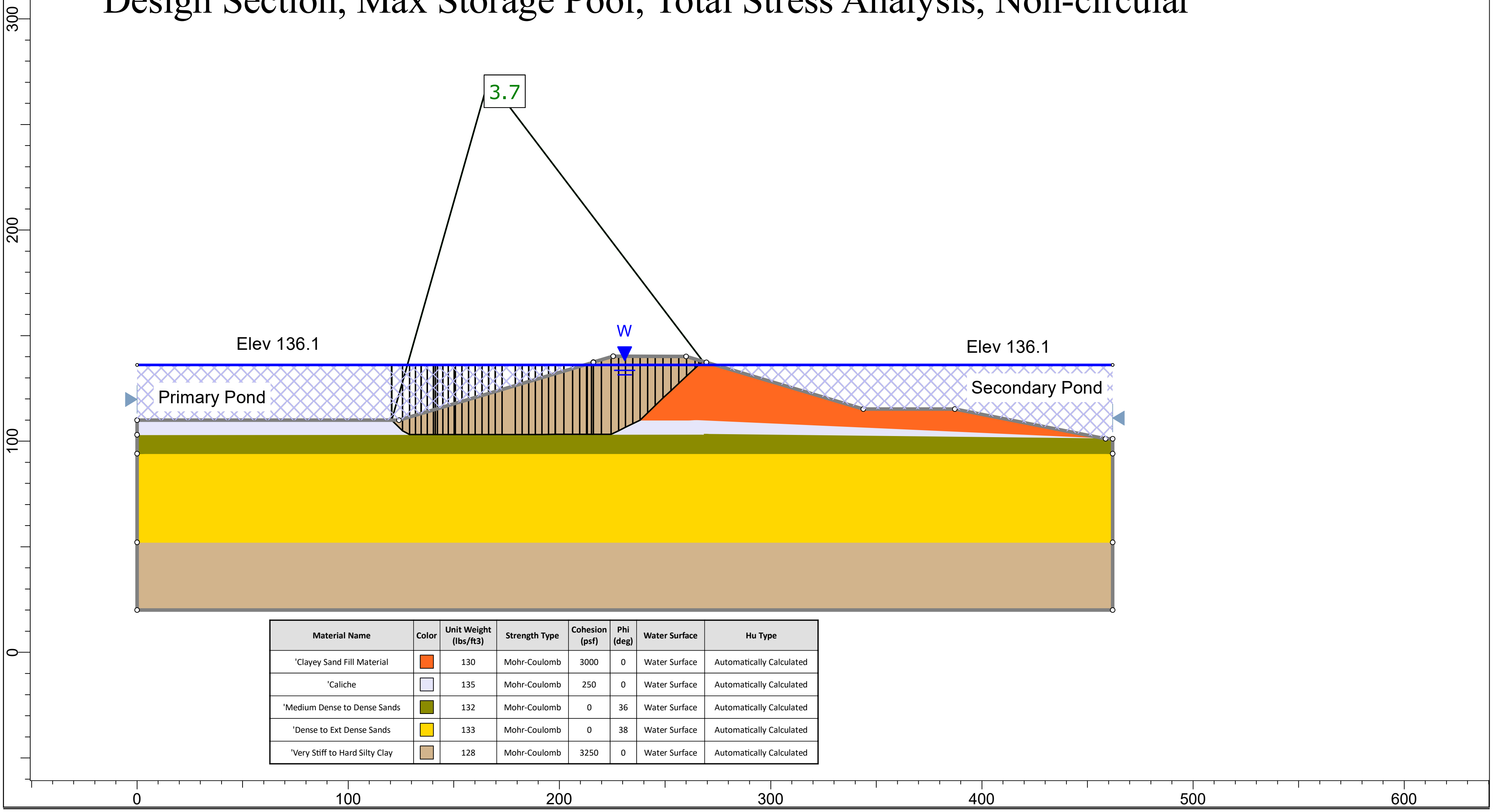
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	150	29	Water Surface	Automatically Calculated
Caliche	⬜	135	Mohr-Coulomb	250	34	Water Surface	Automatically Calculated
Medium Dense to Dense Sands	🟩	132	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
Dense to Ext Dense Sands	🟨	133	Mohr-Coulomb	0	38	Water Surface	Automatically Calculated
Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	0	29	Water Surface	Automatically Calculated

Coleto 12_B-B Design_maxstor_effective_circ.slmd

Bullock, Bennett & Associates, LLC

Case 13

Coleto Creek Primary/Secondary Pond, Cross Section B-B'
Design Section, Max Storage Pool, Total Stress Analysis, Non-circular



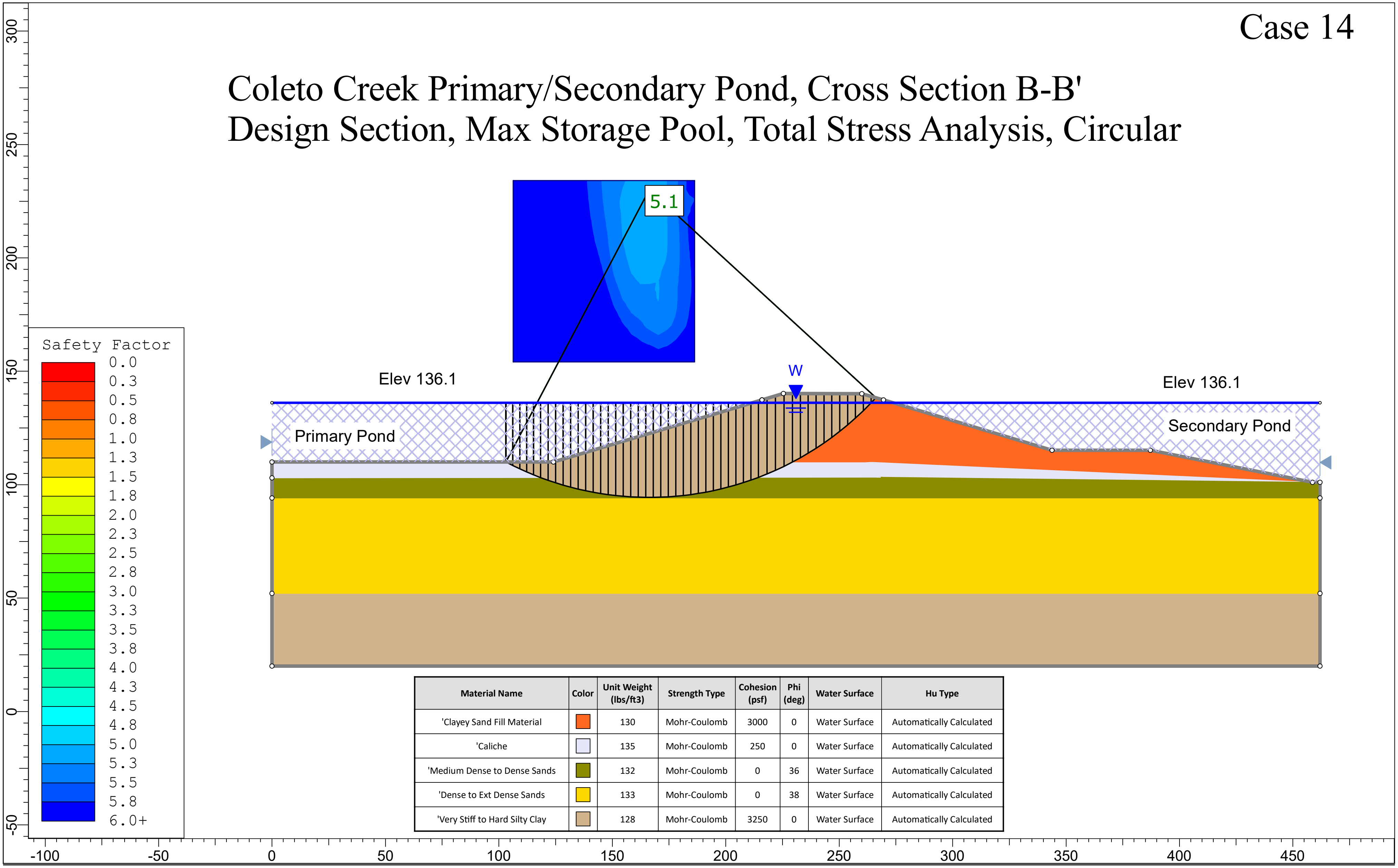
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Caliche	⬜	135	Mohr-Coulomb	250	0	Water Surface	Automatically Calculated
'Medium Dense to Dense Sands	🟩	132	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
'Dense to Ext Dense Sands	🟨	133	Mohr-Coulomb	0	38	Water Surface	Automatically Calculated
'Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	3250	0	Water Surface	Automatically Calculated

Coleto 13_B-B Design_maxstor_total_noncirc.slmd

Bullock, Bennett & Associates, LLC

Case 14

Coleto Creek Primary/Secondary Pond, Cross Section B-B'
Design Section, Max Storage Pool, Total Stress Analysis, Circular

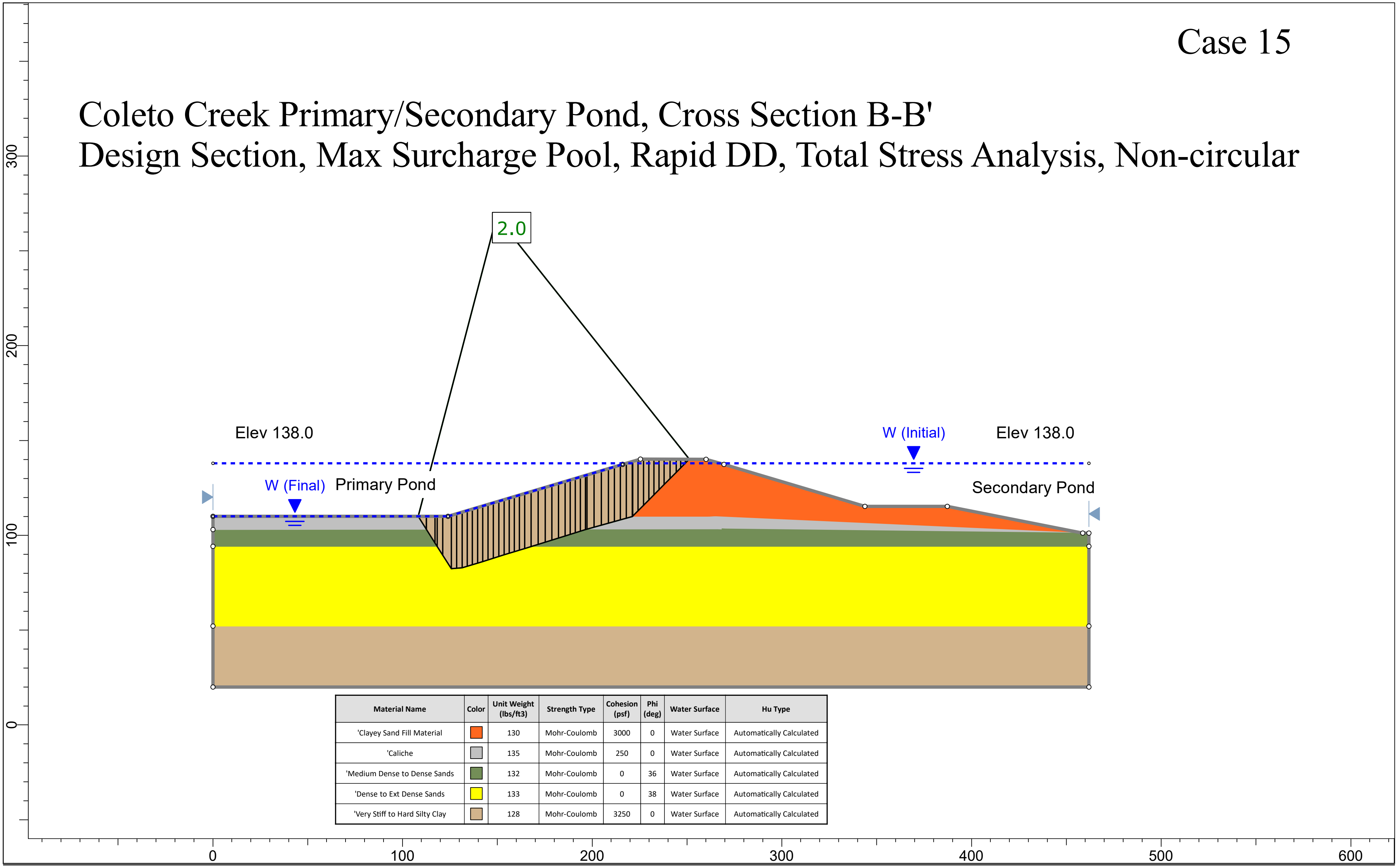


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Caliche	⬜	135	Mohr-Coulomb	250	0	Water Surface	Automatically Calculated
'Medium Dense to Dense Sands	🟩	132	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
'Dense to Ext Dense Sands	🟨	133	Mohr-Coulomb	0	38	Water Surface	Automatically Calculated
'Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	3250	0	Water Surface	Automatically Calculated

Coleto 14_B-B Design_maxstor_total_circ.slmd

Case 15

Coleto Creek Primary/Secondary Pond, Cross Section B-B'
Design Section, Max Surcharge Pool, Rapid DD, Total Stress Analysis, Non-circular



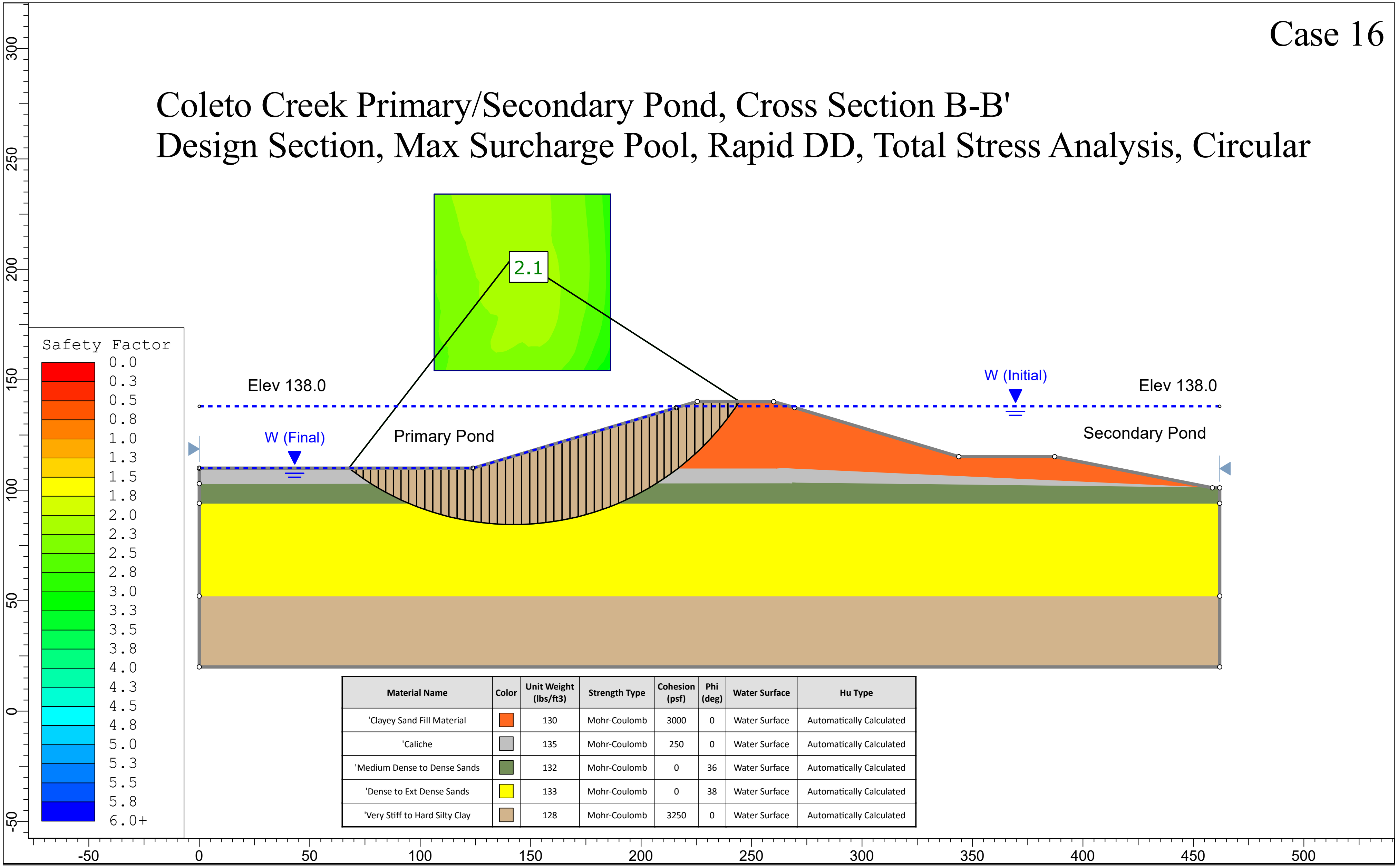
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Caliche	⬜	135	Mohr-Coulomb	250	0	Water Surface	Automatically Calculated
'Medium Dense to Dense Sands	🟩	132	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
'Dense to Ext Dense Sands	🟨	133	Mohr-Coulomb	0	38	Water Surface	Automatically Calculated
'Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	3250	0	Water Surface	Automatically Calculated

Coleto 15_B-B Model_Maxsur_Rapid DD_total_noncirc.slmd

Bullock, Bennett & Associates, LLC

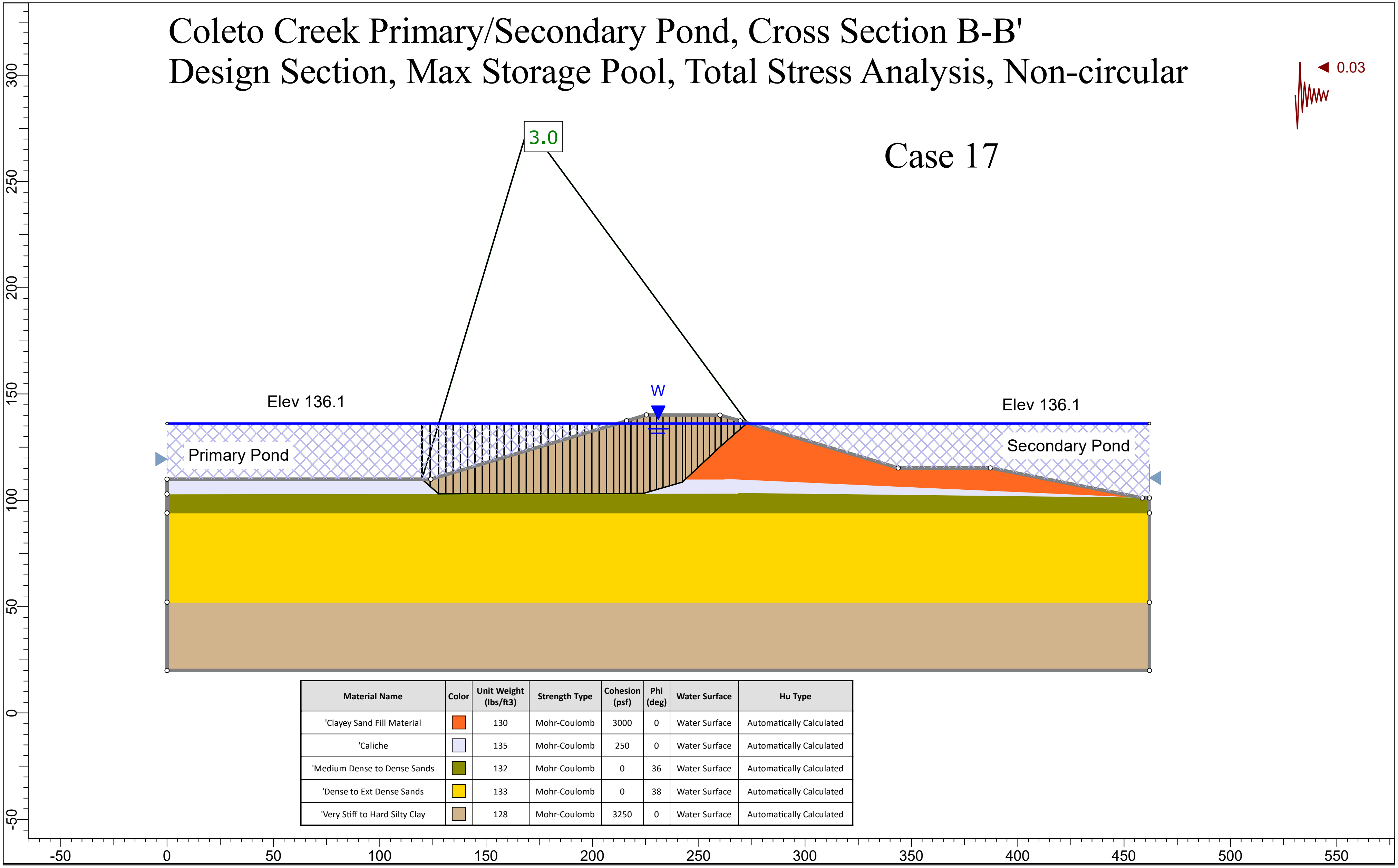
Case 16

Coleto Creek Primary/Secondary Pond, Cross Section B-B'
Design Section, Max Surcharge Pool, Rapid DD, Total Stress Analysis, Circular



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Caliche	⬜	135	Mohr-Coulomb	250	0	Water Surface	Automatically Calculated
'Medium Dense to Dense Sands	🟩	132	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
'Dense to Ext Dense Sands	🟨	133	Mohr-Coulomb	0	38	Water Surface	Automatically Calculated
'Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	3250	0	Water Surface	Automatically Calculated

Coleto Creek Primary/Secondary Pond, Cross Section B-B'
Design Section, Max Storage Pool, Total Stress Analysis, Non-circular



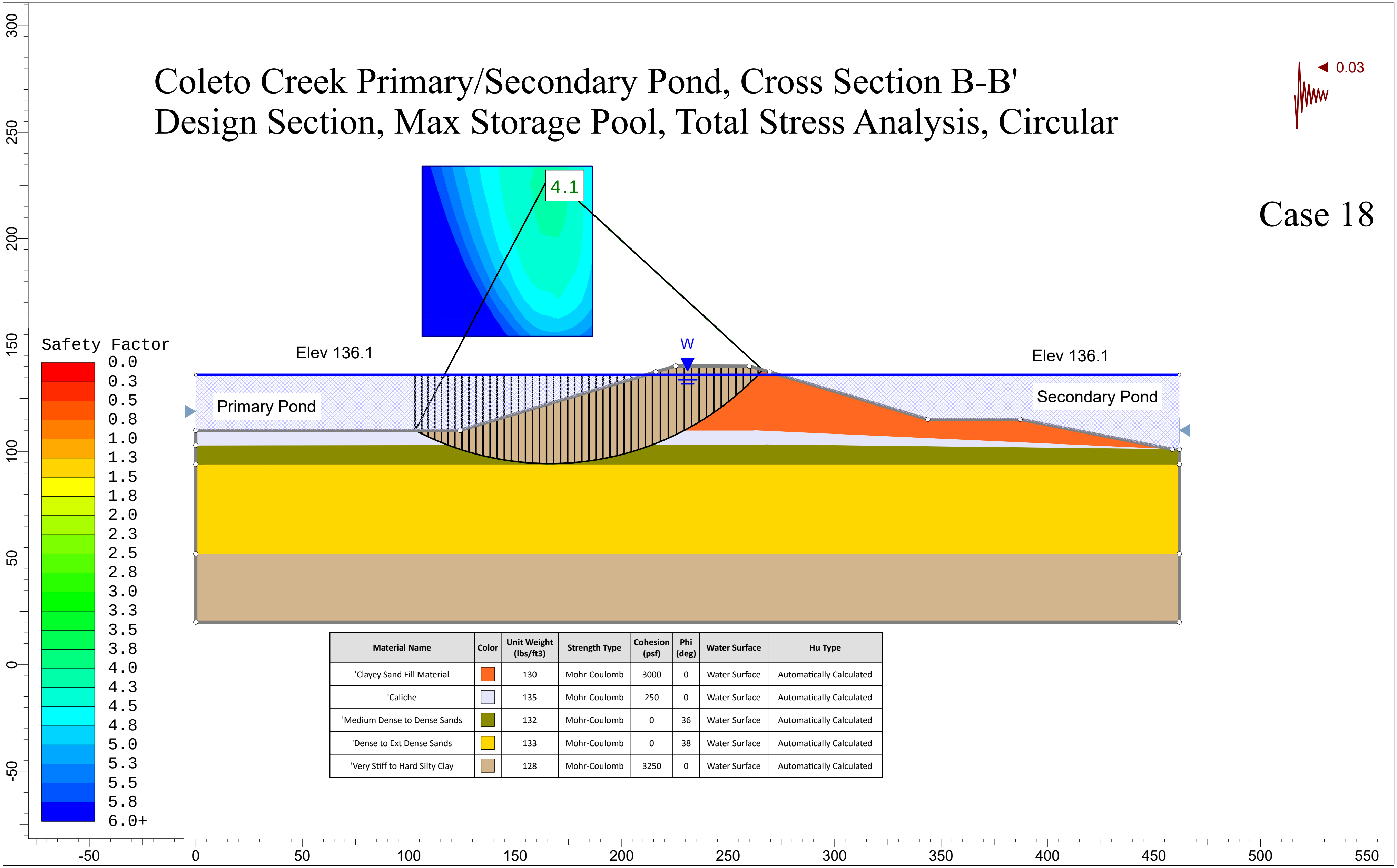
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Caliche	⬜	135	Mohr-Coulomb	250	0	Water Surface	Automatically Calculated
'Medium Dense to Dense Sands	🟩	132	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
'Dense to Ext Dense Sands	🟨	133	Mohr-Coulomb	0	38	Water Surface	Automatically Calculated
'Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	3250	0	Water Surface	Automatically Calculated

Coleto 17_B-B Design_maxstor_total__seismic_noncirc.slmd

Bullock, Bennett & Associates, LLC

Coleto Creek Primary/Secondary Pond, Cross Section B-B'
Design Section, Max Storage Pool, Total Stress Analysis, Circular

Case 18



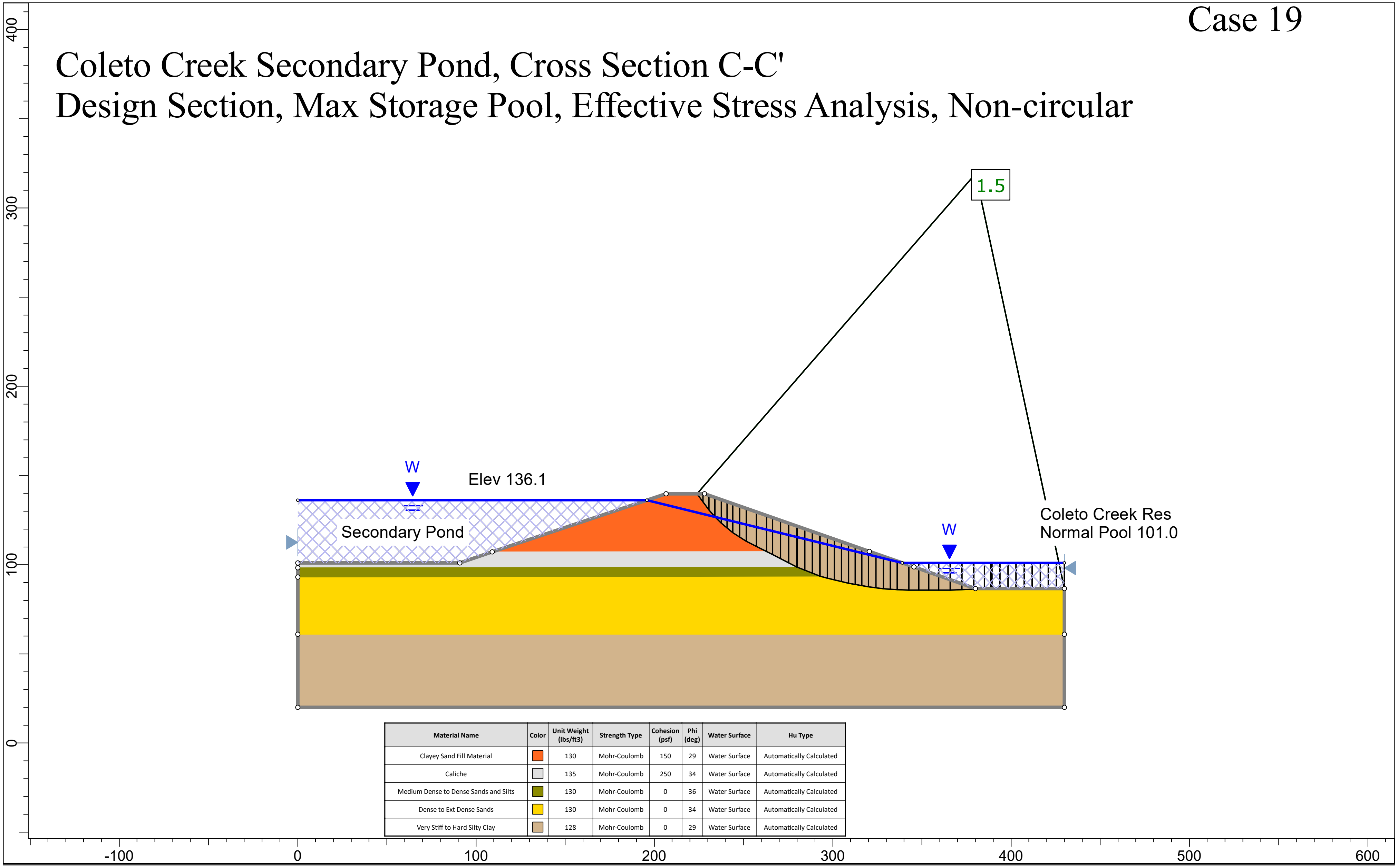
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Caliche	⬜	135	Mohr-Coulomb	250	0	Water Surface	Automatically Calculated
'Medium Dense to Dense Sands	🟩	132	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
'Dense to Ext Dense Sands	🟨	133	Mohr-Coulomb	0	38	Water Surface	Automatically Calculated
'Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	3250	0	Water Surface	Automatically Calculated

Coleto 18_B-B Design_maxstor_total__seismic_circ.slmd

Bullock, Bennett & Associates, LLC

Case 19

Coleto Creek Secondary Pond, Cross Section C-C'
Design Section, Max Storage Pool, Effective Stress Analysis, Non-circular



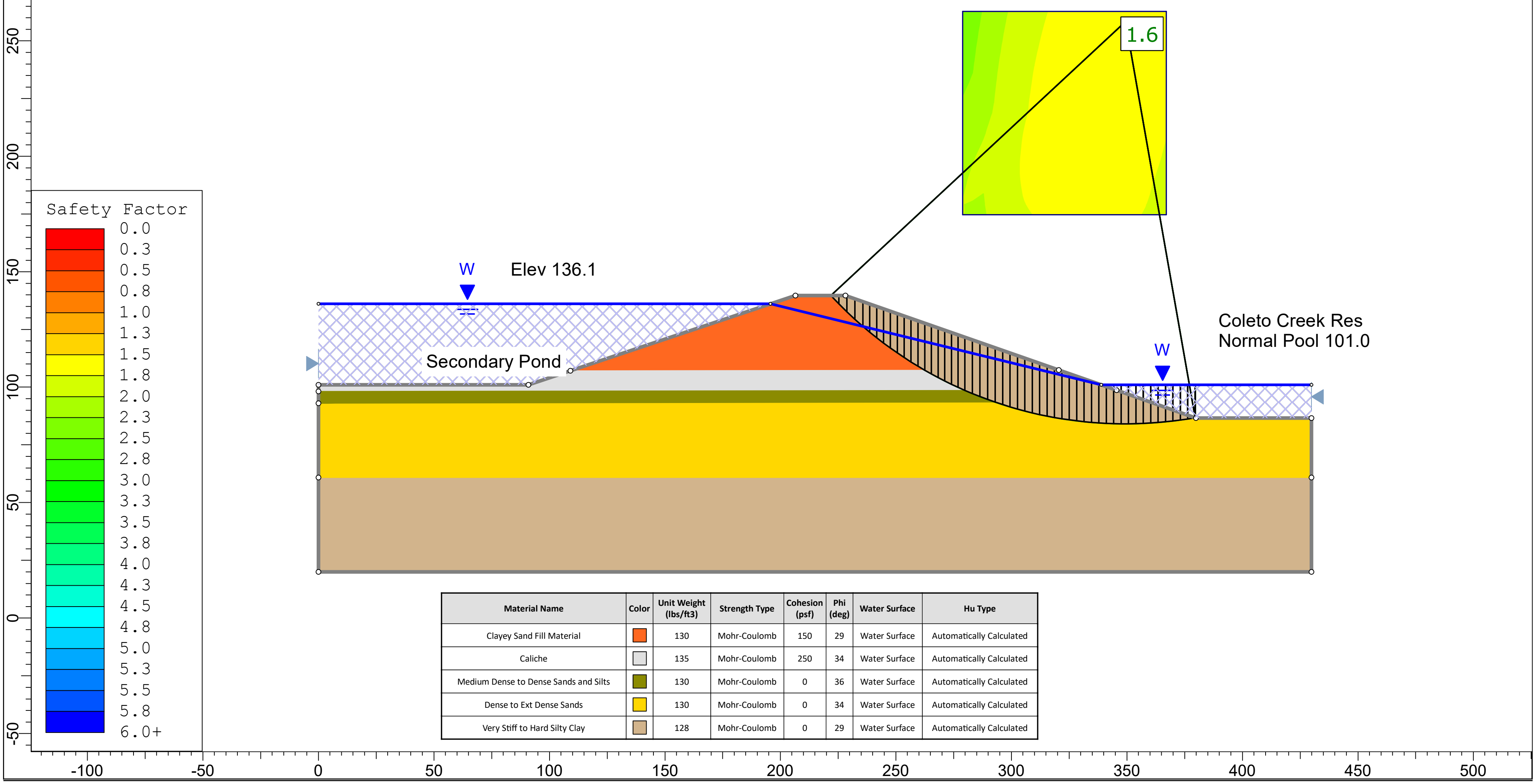
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	150	29	Water Surface	Automatically Calculated
Caliche	⬜	135	Mohr-Coulomb	250	34	Water Surface	Automatically Calculated
Medium Dense to Dense Sands and Silts	🟩	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
Dense to Ext Dense Sands	🟨	130	Mohr-Coulomb	0	34	Water Surface	Automatically Calculated
Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	0	29	Water Surface	Automatically Calculated

Coleto 19_C-C_desgn_maxstor_eff_stat_noncirc.slmd

Bullock, Bennett & Associates, LLC

Case 20

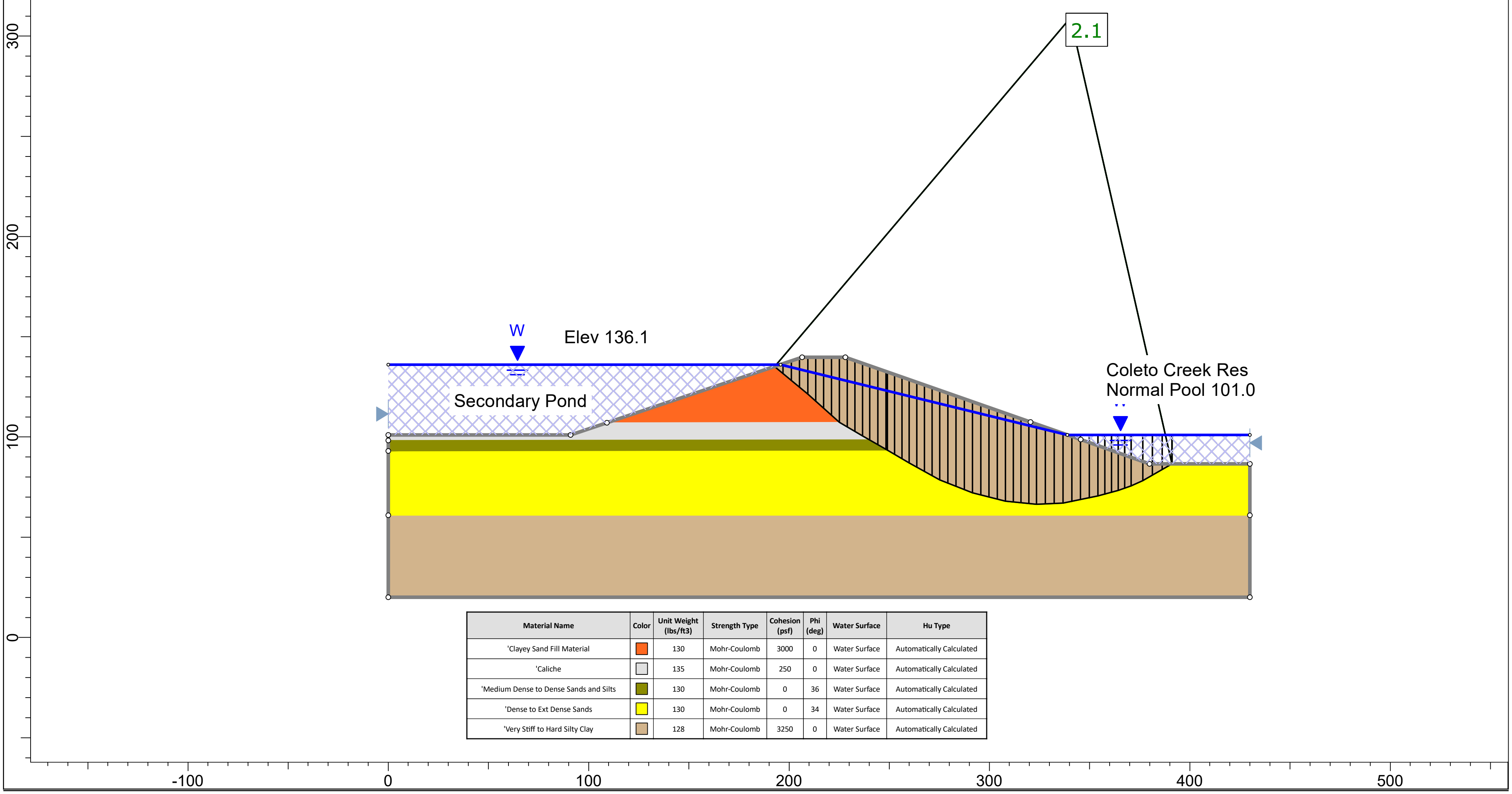
Coleto Creek Secondary Pond, Cross Section C-C'
Design Section, Max Storage Pool, Effective Stress Analysis, Circular



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	150	29	Water Surface	Automatically Calculated
Caliche	⬜	135	Mohr-Coulomb	250	34	Water Surface	Automatically Calculated
Medium Dense to Dense Sands and Silts	🟩	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
Dense to Ext Dense Sands	🟨	130	Mohr-Coulomb	0	34	Water Surface	Automatically Calculated
Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	0	29	Water Surface	Automatically Calculated

Case 21

Coleto Creek Secondary Pond, Cross Section C-C'
Design Section, Max Storage Pool, Total Stress Analysis, Non-circular



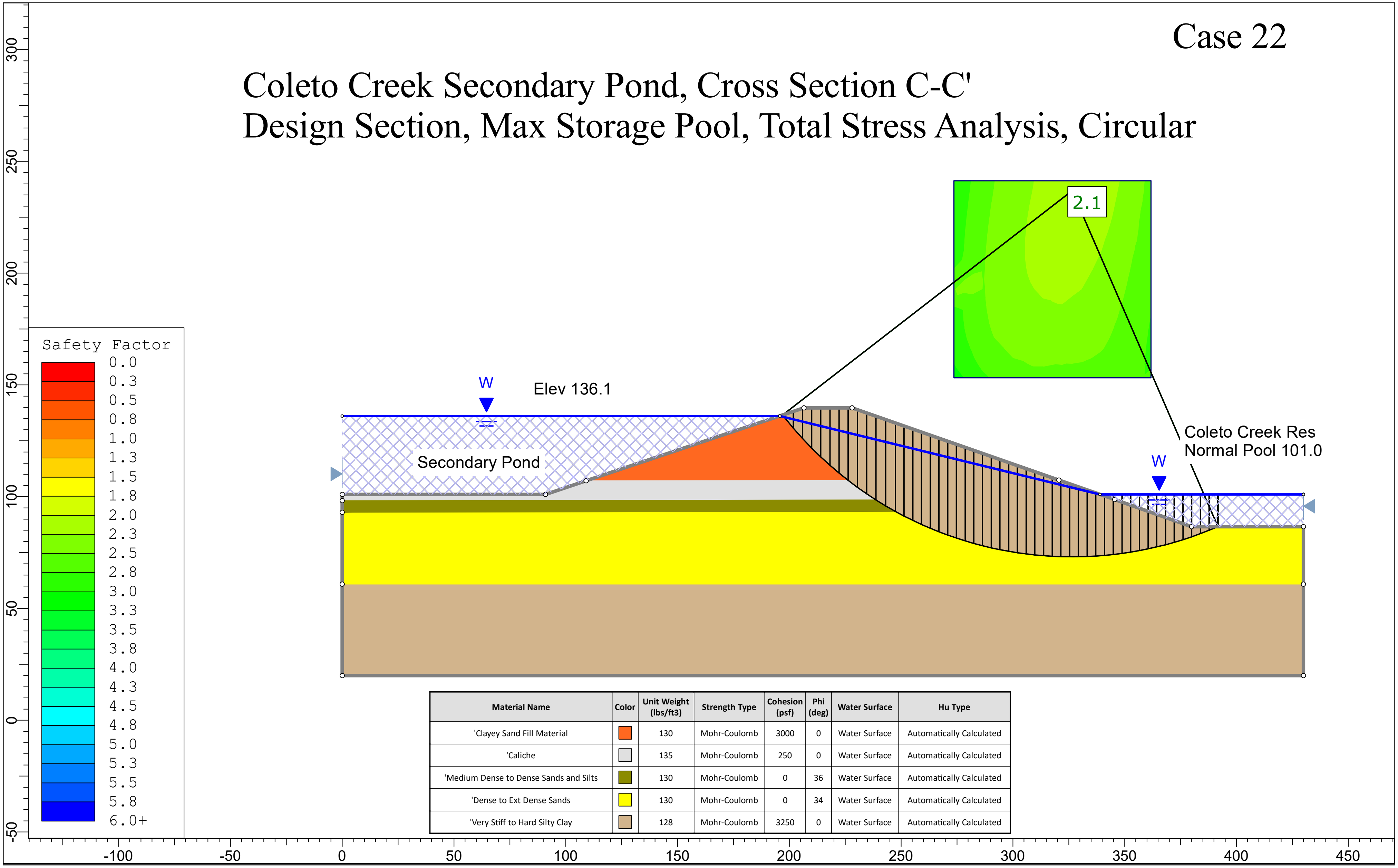
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Caliche	⬜	135	Mohr-Coulomb	250	0	Water Surface	Automatically Calculated
'Medium Dense to Dense Sands and Silts	🟫	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
'Dense to Ext Dense Sands	🟨	130	Mohr-Coulomb	0	34	Water Surface	Automatically Calculated
'Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	3250	0	Water Surface	Automatically Calculated

Coleto 21_C-C_design_maxstor_tot_stat_noncirc.slmd

Bullock, Bennett & Associates, LLC

Case 22

Coleto Creek Secondary Pond, Cross Section C-C'
Design Section, Max Storage Pool, Total Stress Analysis, Circular



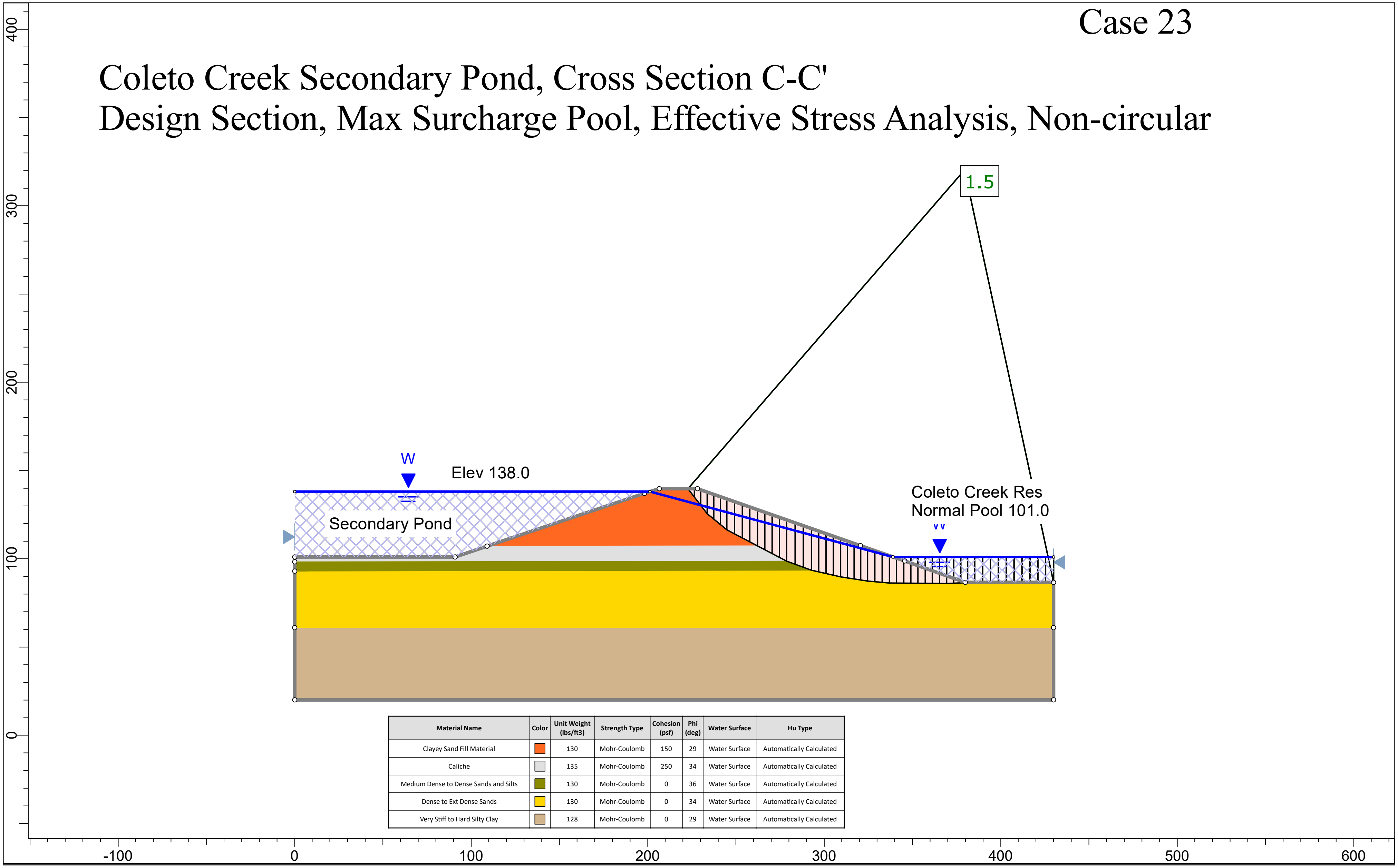
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Caliche	⬜	135	Mohr-Coulomb	250	0	Water Surface	Automatically Calculated
'Medium Dense to Dense Sands and Silts	🟩	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
'Dense to Ext Dense Sands	🟨	130	Mohr-Coulomb	0	34	Water Surface	Automatically Calculated
'Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	3250	0	Water Surface	Automatically Calculated

Coleto 22_C-C_design_maxstor_tot_stat_circ.slmd

Bullock, Bennett & Associates, LLC

Case 23

Coleto Creek Secondary Pond, Cross Section C-C'
Design Section, Max Surcharge Pool, Effective Stress Analysis, Non-circular



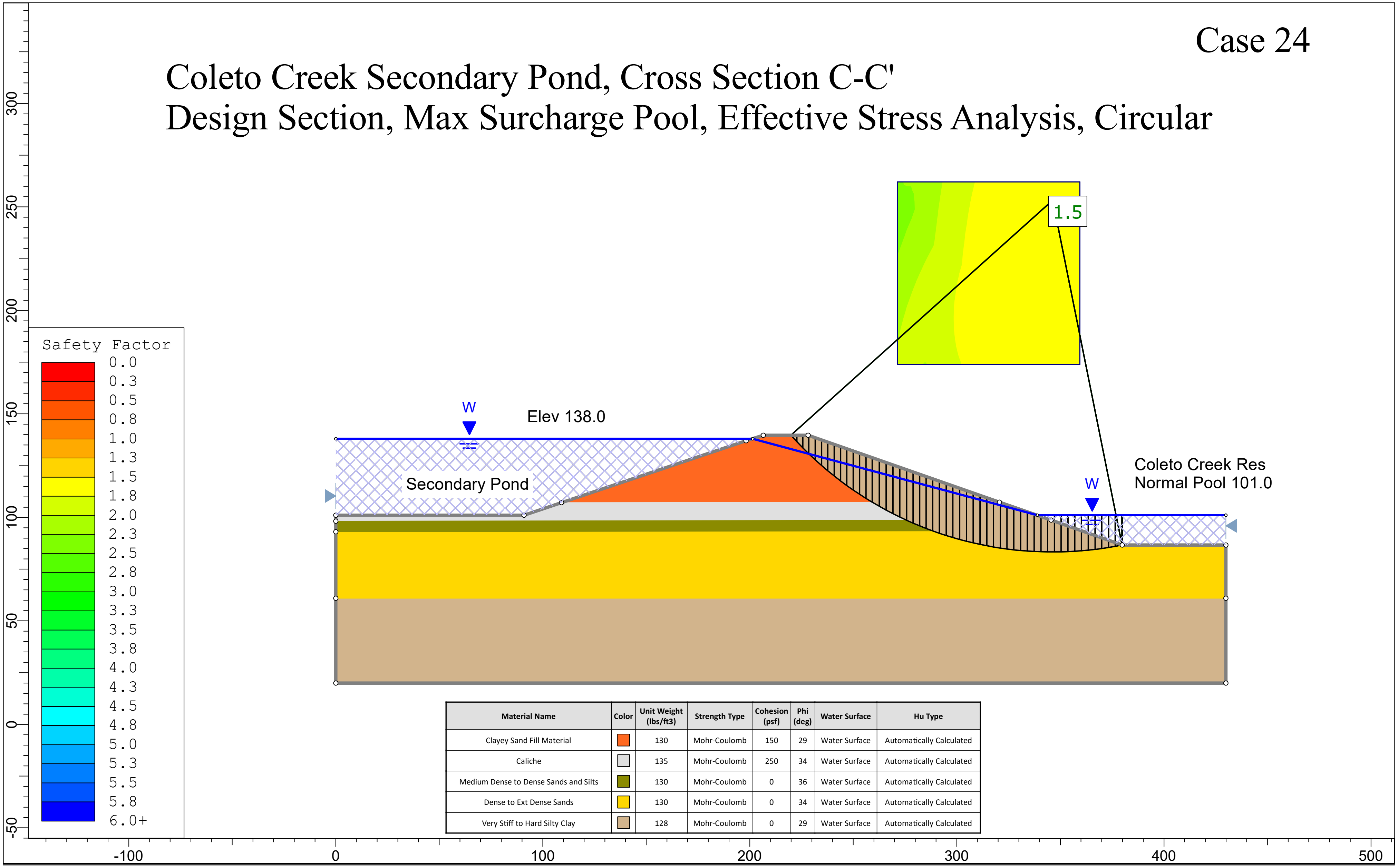
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	150	29	Water Surface	Automatically Calculated
Caliche	⬜	135	Mohr-Coulomb	250	34	Water Surface	Automatically Calculated
Medium Dense to Dense Sands and Silts	🟩	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
Dense to Ext Dense Sands	🟨	130	Mohr-Coulomb	0	34	Water Surface	Automatically Calculated
Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	0	29	Water Surface	Automatically Calculated

Coleto 23_C-C_desgn_maxsur_eff_stat_noncirc.slmd

Bullock, Bennett & Associates, LLC

Case 24

Coleto Creek Secondary Pond, Cross Section C-C'
Design Section, Max Surcharge Pool, Effective Stress Analysis, Circular



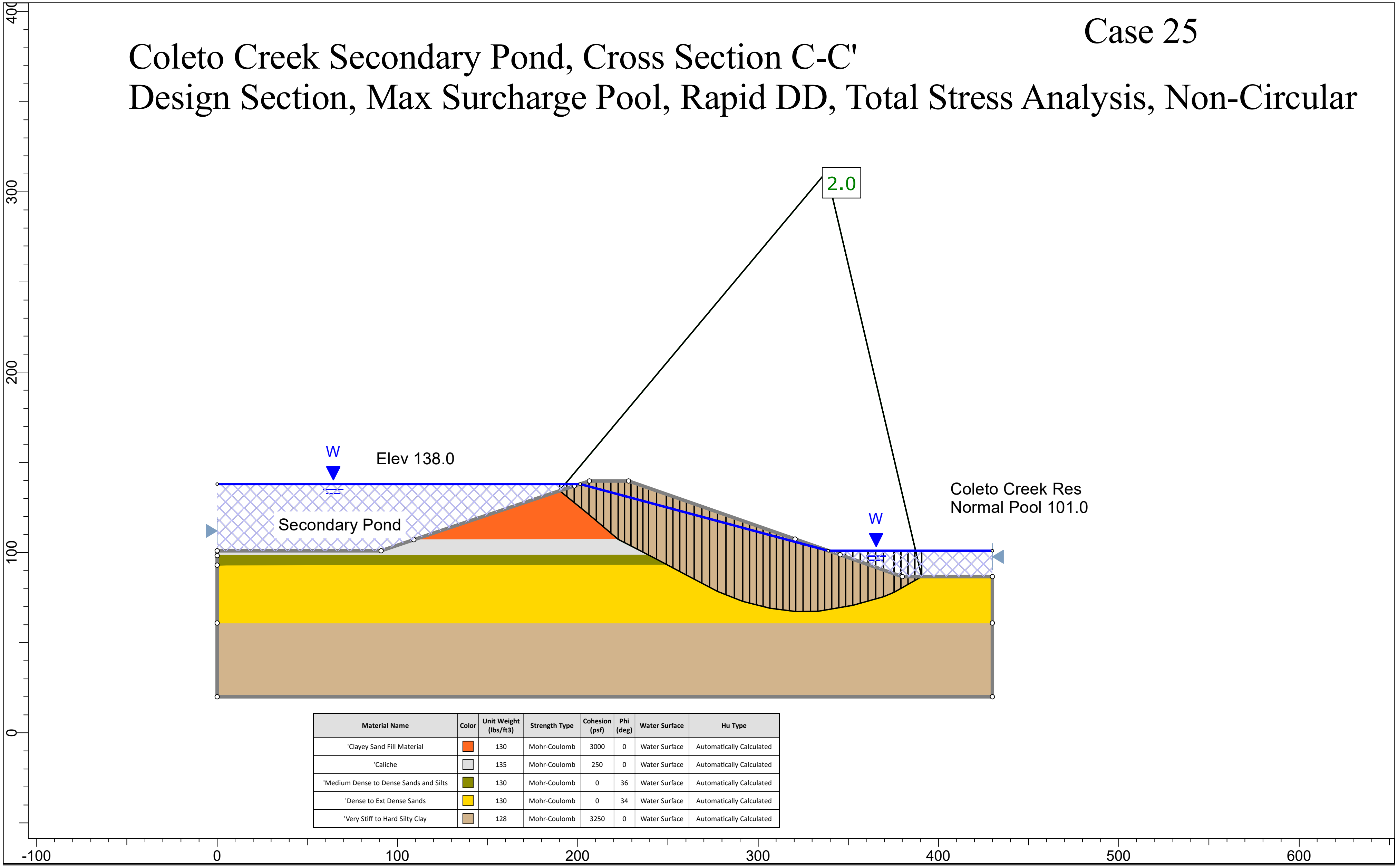
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	150	29	Water Surface	Automatically Calculated
Caliche	⬜	135	Mohr-Coulomb	250	34	Water Surface	Automatically Calculated
Medium Dense to Dense Sands and Silts	🟩	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
Dense to Ext Dense Sands	🟨	130	Mohr-Coulomb	0	34	Water Surface	Automatically Calculated
Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	0	29	Water Surface	Automatically Calculated

Coleto 24_C-C_design_maxsur_eff_stat_circ.slmd

Bullock, Bennett & Associates, LLC

Case 25

Coleto Creek Secondary Pond, Cross Section C-C'
Design Section, Max Surcharge Pool, Rapid DD, Total Stress Analysis, Non-Circular



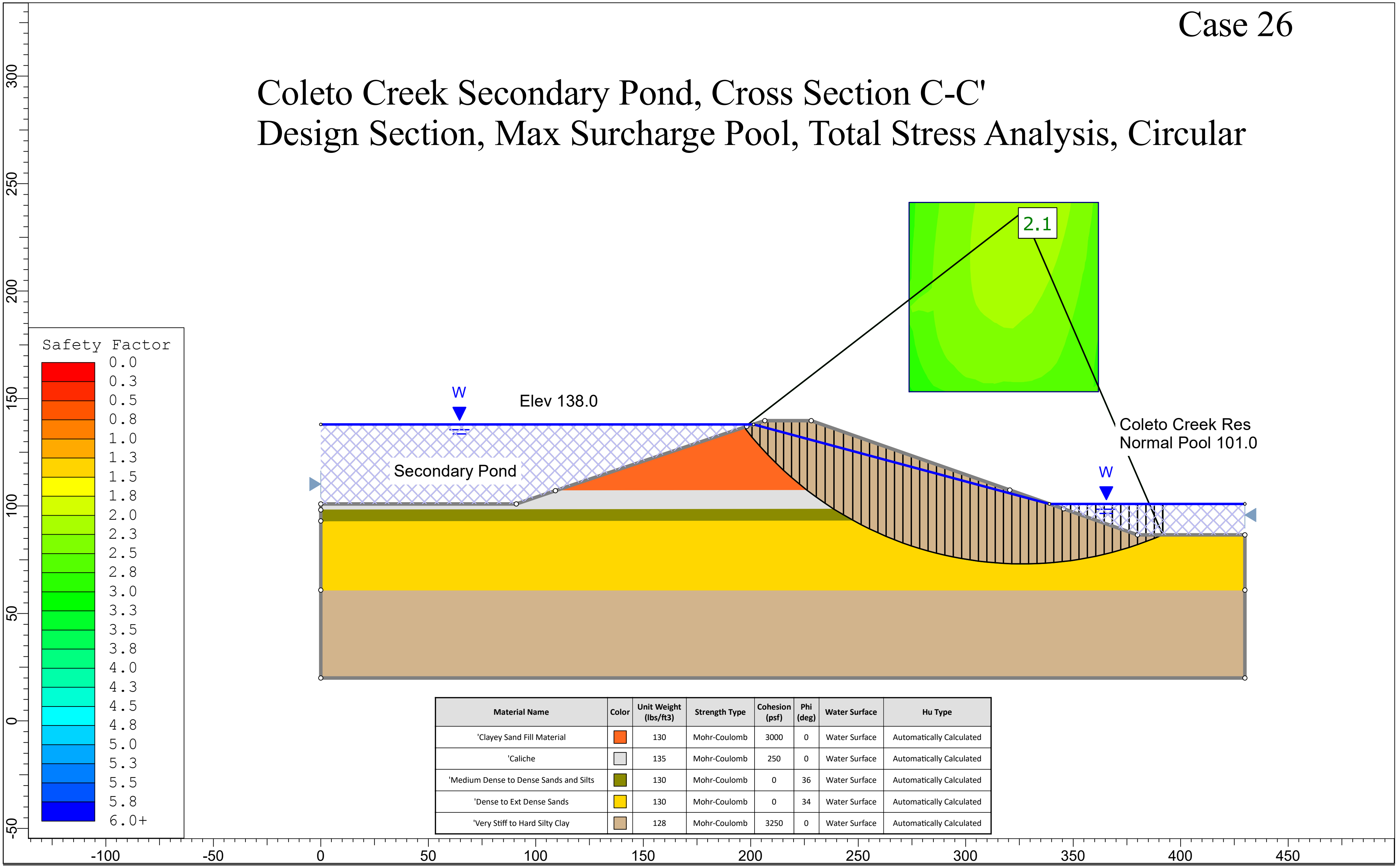
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Caliche	⬜	135	Mohr-Coulomb	250	0	Water Surface	Automatically Calculated
'Medium Dense to Dense Sands and Silts	🟩	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
'Dense to Ext Dense Sands	🟨	130	Mohr-Coulomb	0	34	Water Surface	Automatically Calculated
'Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	3250	0	Water Surface	Automatically Calculated

Coleto 25_C-C_desgn_maxsur_total_stat_noncirc.slmd

Bullock, Bennett & Associates, LLC

Case 26

Coleto Creek Secondary Pond, Cross Section C-C'
Design Section, Max Surcharge Pool, Total Stress Analysis, Circular



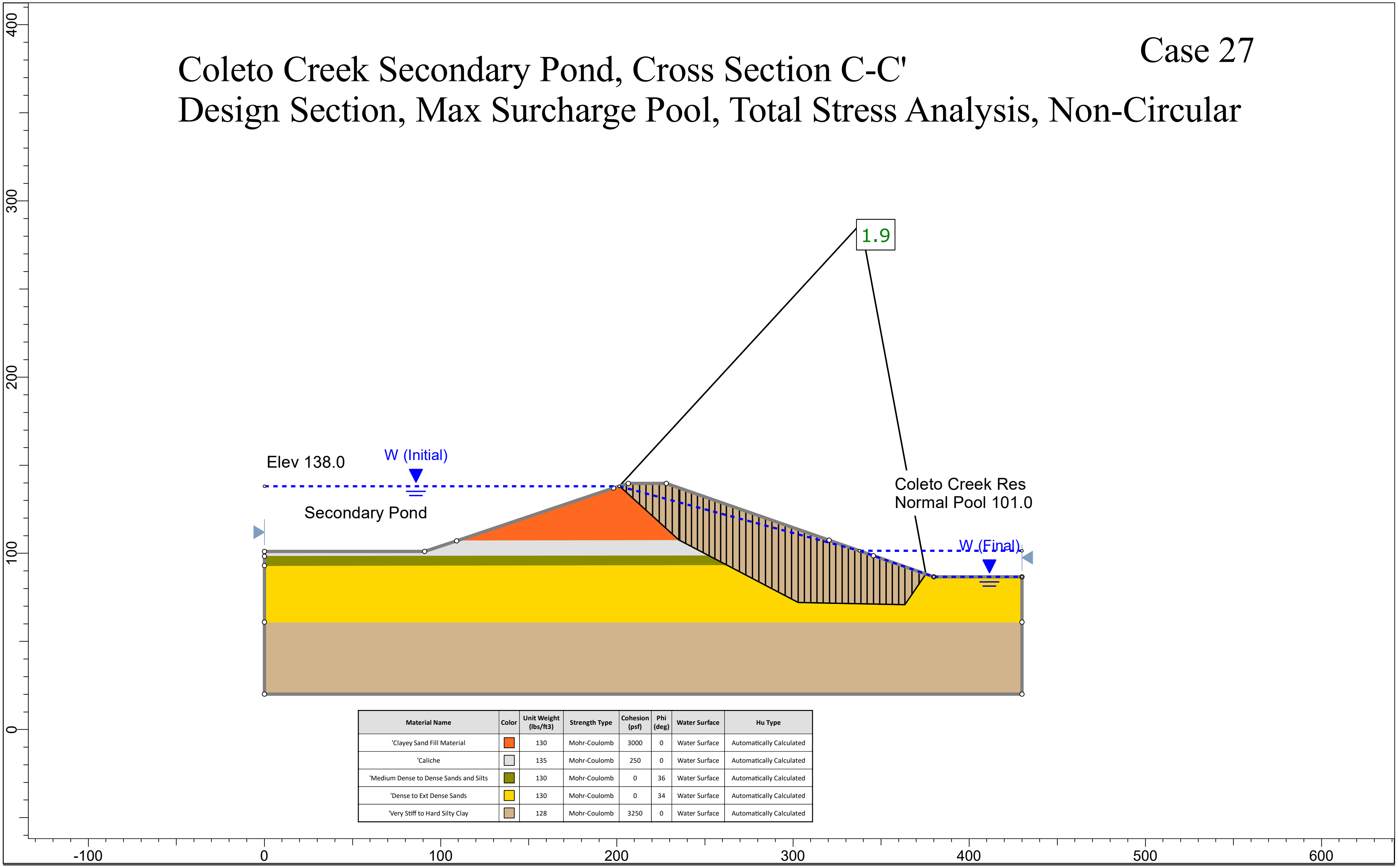
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Caliche	⬜	135	Mohr-Coulomb	250	0	Water Surface	Automatically Calculated
'Medium Dense to Dense Sands and Silts	■	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
'Dense to Ext Dense Sands	🟨	130	Mohr-Coulomb	0	34	Water Surface	Automatically Calculated
'Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	3250	0	Water Surface	Automatically Calculated

Coleto 26_C-C_design_maxsur_total_stat_circ.slmd

Bullock, Bennett & Associates, LLC

Case 27

Coleto Creek Secondary Pond, Cross Section C-C'
Design Section, Max Surcharge Pool, Total Stress Analysis, Non-Circular



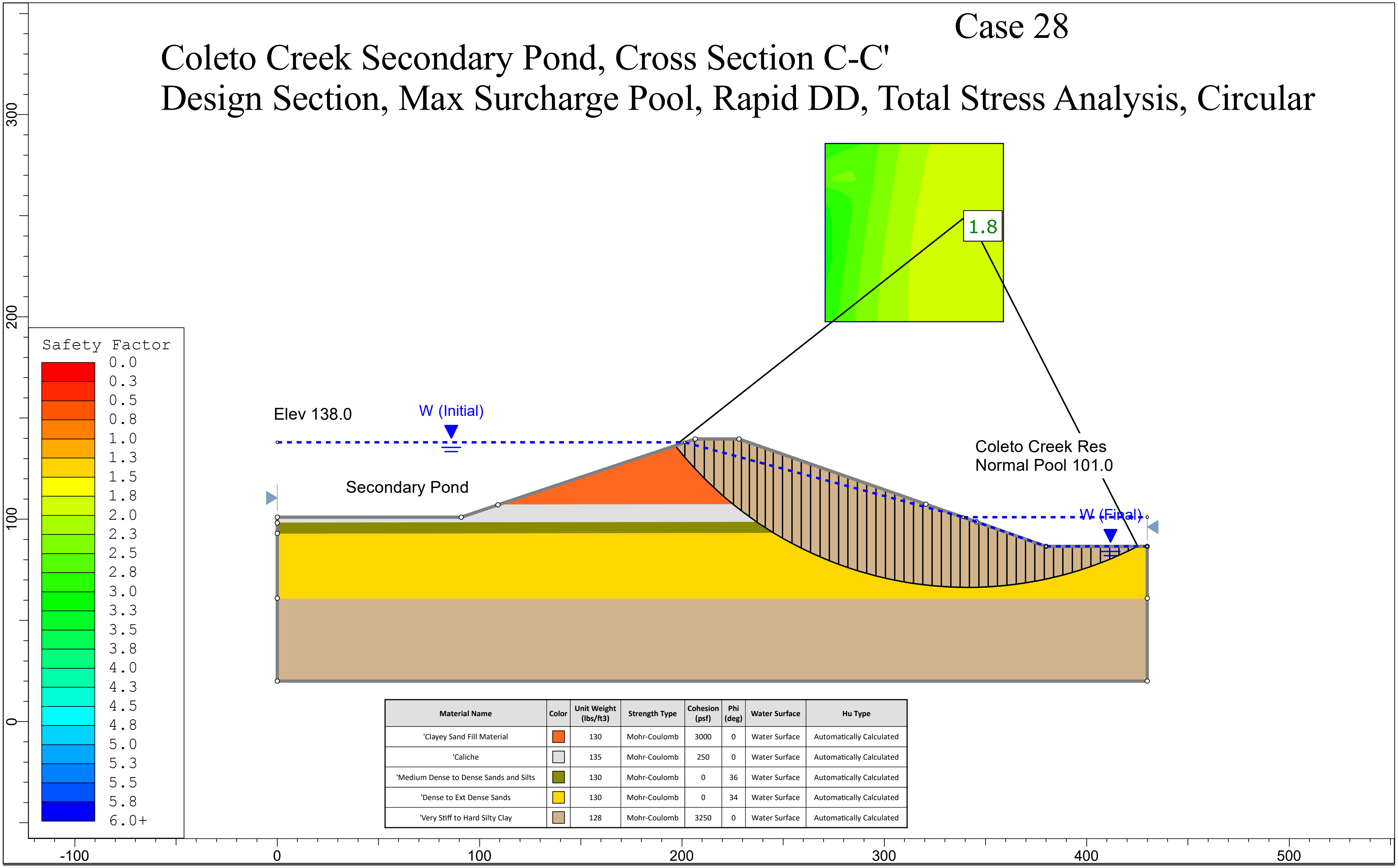
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Caliche	⬜	135	Mohr-Coulomb	250	0	Water Surface	Automatically Calculated
'Medium Dense to Dense Sands and Silts	🟩	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
'Dense to Ext Dense Sands	🟨	130	Mohr-Coulomb	0	34	Water Surface	Automatically Calculated
'Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	3250	0	Water Surface	Automatically Calculated

Coleto 27_C-C_desgn_maxsur_rapidDD_total_stat_noncirc.slmd

Bullock, Bennett & Associates, LLC

Case 28

Coleto Creek Secondary Pond, Cross Section C-C'
Design Section, Max Surcharge Pool, Rapid DD, Total Stress Analysis, Circular



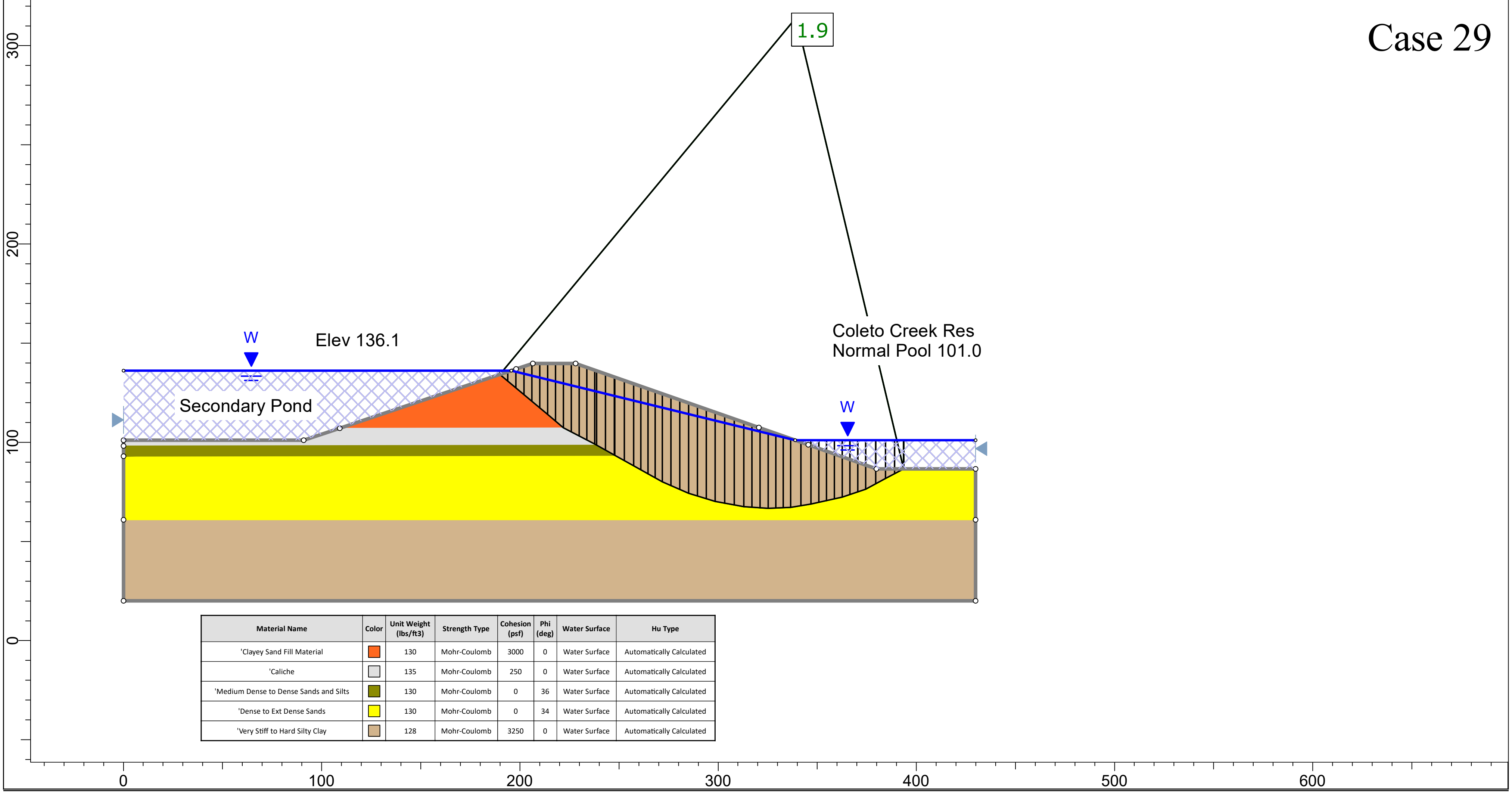
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Caliche	⬜	135	Mohr-Coulomb	250	0	Water Surface	Automatically Calculated
'Medium Dense to Dense Sands and Silts	🟩	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
'Dense to Ext Dense Sands	🟨	130	Mohr-Coulomb	0	34	Water Surface	Automatically Calculated
'Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	3250	0	Water Surface	Automatically Calculated

Coleto 28_C-C_desgn_maxsur_rapidDD_total_stat_circ.slmd

Bullock, Bennett & Associates, LLC

Coleto Creek Secondary Pond, Cross Section C-C'
Design Section, Max Storage Pool, Seismic, Total Stress Analysis, Non-circular

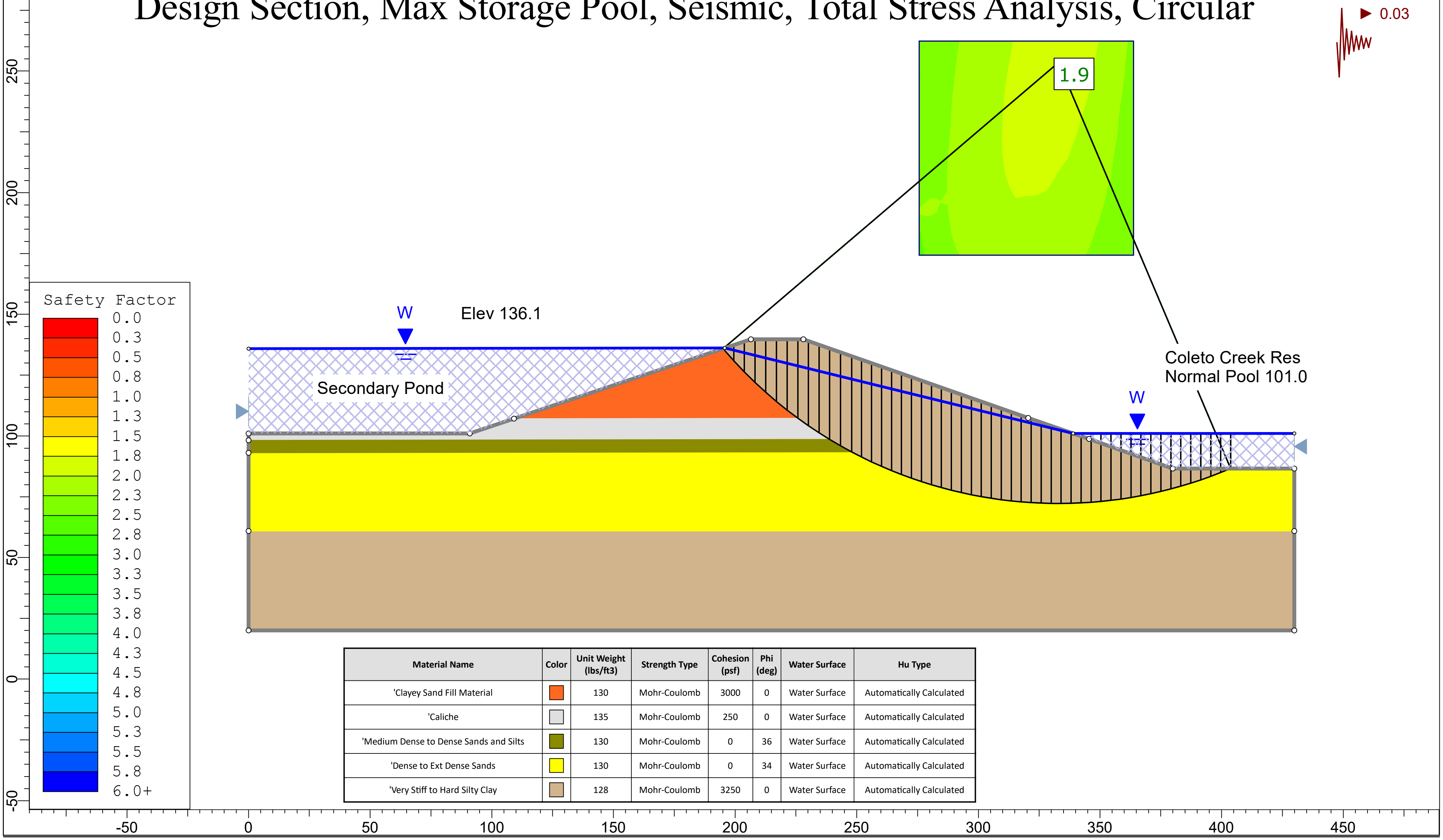
Case 29



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Caliche	⬜	135	Mohr-Coulomb	250	0	Water Surface	Automatically Calculated
'Medium Dense to Dense Sands and Silts	🟩	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
'Dense to Ext Dense Sands	🟨	130	Mohr-Coulomb	0	34	Water Surface	Automatically Calculated
'Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	3250	0	Water Surface	Automatically Calculated

Coleto Creek Secondary Pond, Cross Section C-C' Case 30

Design Section, Max Storage Pool, Seismic, Total Stress Analysis, Circular



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
'Clayey Sand Fill Material	🟧	130	Mohr-Coulomb	3000	0	Water Surface	Automatically Calculated
'Caliche	⬜	135	Mohr-Coulomb	250	0	Water Surface	Automatically Calculated
'Medium Dense to Dense Sands and Silts	🟫	130	Mohr-Coulomb	0	36	Water Surface	Automatically Calculated
'Dense to Ext Dense Sands	🟨	130	Mohr-Coulomb	0	34	Water Surface	Automatically Calculated
'Very Stiff to Hard Silty Clay	🟫	128	Mohr-Coulomb	3250	0	Water Surface	Automatically Calculated

Coleto 30_C-C_design_seism_maxstor_tot_stat_circ.slmd

Bullock, Bennett & Associates, LLC

APPENDIX D: LIQUEFACTION ASSESSMENT CALCULATIONS

APPENDIX D
LIQUEFACTION FACTOR OF SAFETY
ASSESSMENT METHODOLOGY
Coleto Creek Power Plant

Sources: Coduto, Donald P., Geotechnical Engineering Principles and Practices. Prentice-Hall.

Rauch, Alan F., May 1997. EPOLLS: *An Empiracle Method for Predicting Surface Displacements Due to Liquefaction-Induced Lateral Spreading in Earthquakes.* Dissertation Submitted to Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for degree of Doctor of Philosophy in Civil Engineering.

United States Environmental Protection Agency (USEPA), April 1995. RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities. Office of Research and Development. Washington, DC. EPA/600/R-95/051

Methodology: Standard Penetration Test (SPT)

Step 1: Compute the standardized value of number of blow counts per foot normalized for overburden stress at the depth of the test

$$(N_1)_{60} = N_{SPT} \cdot C_N \cdot C_E \cdot C_B \cdot C_S \cdot C_R$$

where:

$(N_1)_{60}$ = Measured blowcount normalized for overburden stress at the depth of the test

C_N = Correction factor to normalize the measured blowcount to an equivalent value under one atmosphere of effective overburden stress

$$C_N = \sqrt{\frac{Pa}{\sigma'_{vo}}} \leq 2.0$$

where:

Pa = one atmosphere of pressure (101.325kPa) in the same units as σ'_{vo}

σ'_{vo} = vertical efffective stress at depth of N_{SPT}

C_E =Correction factor of the measured SPT blowcount for level of energy delivered by the SPT hammer, 1.0 for safety hammer type with rope and pulley hammer release

C_B = Correction factor for borehole diameters outside the recommended range of 2.5 to 4.5 inch, 1.0 for borehole inside range

C_S = Correction factor for SPT samplers used without a sample liner, 1.0 for standard sampler

C_R = Correction factor for loss of energy through reflection in short lengths of drill rod:

where:

For $z < 3$ m; $C_R = 0.75$

For $3 < z < 9$ m; $C_R = (15+z)/24$

For $z > 9$ m; $C_R = 1.0$

where: z = length of drill rod in meters (approximately equal to depth of N_{SPT})

Step 2: Compute a clean-sand equivalent value of $(N_1)_{60}$

$$(N_1)_{60} - cs = (N_1)_{60} + \Delta(N_1)$$

where:

$\Delta(N_1)_{60}$ = correction factor computed as follows:

For FC < 5%, $\Delta(N_1)_{60} = 0.0$

For 5 < FC < 35%, $\Delta(N_1)_{60} = 7*(FC - 5)/30$

For FC > 35%, $\Delta(N_1)_{60} = 7.0$

where:

FC = Fines content (percent finer than 0.075 mm)

Note: Where data was available, those FC were used. Otherwise, representative values from the USGS standard soil classification were used for the soil type observed during drilling.

Step 3: Compute the cyclic resistance ratio for a standardized magnitude 7.5 earthquake (CRR $_{M7.5}$)

$$100 \cdot CRR_{M7.5} = \frac{95}{34 - (N_1)_{60} - cs} + \frac{(N_1)_{60} - cs}{1.3} - \frac{1}{2}$$

Note: A value of $(N_1)_{60}$-cs > 30 indicates an unliquefiable soil with an infinite CRR. Designated as UL in the calculation tables.

Step 4: Adjust the standardized cyclic resistance ratio for the worst-case magnitude of earthquake for the area

$$CRR = CRR_{M7.5} \cdot MSF \cdot K\sigma \cdot K\alpha$$

where:

MSF = magnitude scaling factor computed as follows:

For $M_w < 7.0$; MSF = $10^{3.00} * M_w^{-3.46}$

where:

M_w = estimated worst-case magnitude eartquake, 6.1 taken from Figure 3.3 Seismic Source Zones in the Contiguous United States (USGS, 1982) and Table 3.1 Parameters for Seismic Source Zones (USGS, 2982) (USEPA, 1995)

Note: Two additional correction factors are potentially applicable for liquefiable soil deposits subject to significant overburden with a stress factor greater than 1 tsf (2000 psf) (Kσ) or static shear stresses such as significant slopes (Kα). Kσ values were interpolated using Figure 5.7 Curves for Estimation of Correction Factor (Harder 1988, and Hynes 1988, as Quoted in Marcuson, et.al., 1990) (USEPA, 1998). No Kα factor was applied due to the relatively flat ground surface in the area.

Step 5: Estimate the average cyclic shear stress (CSR)

$$CSR = 0.65 \cdot \frac{a_{max}}{g} \cdot \frac{\sigma_{vo}}{\sigma'_{vo}} \cdot rd$$

where:

a_{max}/g = peak horizonal acceleration that would occur at the ground surface in the absence of excess pore pressures or liquefaction, 0.03 g taken from the 2014 United States Geological Survey National Seismic Hazard Maps found at http://earthquake.usgs.gov/hazards/products/conterminous/2014/2014pga2pct.pdf).

σ_{vo} = total vertical overburden stress

g = acceleration due to gravity, 9.81 m/s^2

r_d = stress reduction factor calculated as follows for depths up to 30 m:

$r_d = 1.0 + 1.6*10^{-6}(z^4 - 42z^3 + 105z^2 - 4200z)$

Step 6: Calculate the Factor of Safety against liquefaction (FS_{liq})

$$FS_{liq} = \frac{CRR}{CSR}$$

LIQUEFACTION FACTOR OF SAFETY ASSESSMENT
TEST BORING B-1-1[1]
Coleto Creek Power Plant
Primary and Secondary Ash Ponds

Depth to Water =	12	ft
Average Unsaturated Soil Unit Weight, γ_d =	125	pcf
Average Saturated Soil Unit Weight, γ_s =	130	pcf
Average Water Unit Weight, γ_w =	62.3	pcf
Earthquake Magnitude, M_W =	6.1	
Borehole Diameter =	4", to 50' bgs 3", 50' to end of boring	

Sample Number	Depth (ft)	Depth (m)	Note	N_{SPT}	Soil Type	σ'_{vo} (psf)	C_N	C_E	C_B	C_S	C_R	$(N_1)_{60}$	FC	$\Delta(N_1)_{60}$	$(N_1)_{60}$-cs	$CRR_{M7.5}$	MSF	Kσ	CRR	a_{max}/g	σ_{vo}	r_d	CSR	FS_{liq}
1	2	0.61	Unsaturated	40	SC	250	2.00	1.0	1.00	1.0	0.75	60.0	35	7.0	67.0	UL	1.92	NA	UL	0.03	250	1.00	UL	UL
2	4	1.22	Unsaturated	13	SC	500	2.00	1.0	1.00	1.0	0.75	19.5	35	7.0	26.5	0.33	1.92	NA	0.62	0.03	500	0.99	0.019	32
3	6	1.83	Unsaturated	14	SC	750	1.68	1.0	1.00	1.0	0.75	17.6	35	7.0	24.6	0.29	1.92	NA	0.55	0.03	750	0.99	0.019	28
4	8	2.44	Unsaturated	15	SC	1000	1.45	1.0	1.00	1.0	0.75	16.4	90.6	7.0	23.4	0.26	1.92	NA	0.51	0.03	1000	0.98	0.019	26
7	14	4.27	Saturated	10	SC	1635.4	1.14	1.0	1.00	1.0	0.80	9.1	35	7.0	16.1	0.17	1.92	NA	0.33	0.03	1760	0.97	0.020	16
8	16	4.88	Saturated	13	SC	1770.8	1.09	1.0	1.00	1.0	0.83	11.8	35	7.0	18.8	0.20	1.92	NA	0.39	0.03	2020	0.96	0.021	18
9	18	5.49	Saturated	9	SC	1906.2	1.05	1.0	1.00	1.0	0.85	8.1	35	7.0	15.1	0.16	1.92	NA	0.31	0.03	2280	0.96	0.022	14
10	20	6.10	Saturated	15	SC	2041.6	1.02	1.0	1.00	1.0	0.88	13.4	39.5	7.0	20.4	0.22	1.92	0.93	0.40	0.03	2540	0.95	0.023	17
12	24	7.32	Saturated	13	SC	2312.4	0.96	1.0	1.00	1.0	0.93	11.6	35	7.0	18.6	0.20	1.92	0.92	0.35	0.03	3060	0.94	0.024	15
13	26	7.92	Saturated	21	SC	2447.8	0.93	1.0	1.00	1.0	0.96	18.7	35	7.0	25.7	0.31	1.92	0.92	0.54	0.03	3320	0.93	0.025	22
14	28	8.53	Saturated	15	SC	2583.2	0.91	1.0	1.00	1.0	0.98	13.3	35	7.0	20.3	0.22	1.92	0.91	0.39	0.03	3580	0.92	0.025	16
15	30	9.14	Saturated	28	SC	2718.6	0.88	1.0	1.00	1.0	1.0	24.7	35	7.0	31.7	UL	1.92	0.91	UL	0.03	3840	0.91	UL	UL
16	32	9.75	Saturated	12	SC	2854	0.86	1.0	1.00	1.0	1.0	10.3	35	7.0	17.3	0.19	1.92	0.90	0.32	0.03	4100	0.90	0.025	13
18	34.7	10.58	Saturated	6	SM	3036.79	0.83	1.0	1.00	1.0	1.0	5.0	15	2.3	7.3	0.09	1.92	0.90	0.15	0.03	4451	0.89	0.025	6
18A	36	10.97	Saturated	15	SM	3124.8	0.82	1.0	1.00	1.0	1.0	12.3	15	2.3	14.7	0.16	1.92	0.90	0.27	0.03	4620	0.88	0.025	11
19	36.7	11.19	Saturated	24	SP	3172.19	0.82	1.0	1.00	1.0	1.0	19.6	1	0.0	19.6	0.21	1.92	0.89	0.36	0.03	4711	0.88	0.025	14
19A	38	11.58	Saturated	26	SP	3260.2	0.81	1.0	1.00	1.0	1.0	20.9	1	0.0	20.9	0.23	1.92	0.89	0.39	0.03	4880	0.87	0.025	15
20	40	12.19	Saturated	39	SP	3395.6	0.79	1.0	1.00	1.0	1.0	30.8	1	0.0	30.8	UL	1.92	0.89	UL	0.03	5140	0.86	UL	UL
21	42	12.80	Saturated	27	SP	3531	0.77	1.0	1.00	1.0	1.0	20.9	1	0.0	20.9	0.23	1.92	0.88	0.39	0.03	5400	0.84	0.025	15
22	44	13.41	Saturated	35	SM	3666.4	0.76	1.0	1.00	1.0	1.0	26.6	15	2.3	28.9	0.40	1.92	0.88	0.68	0.03	5660	0.83	UL	UL
23	46	14.02	Saturated	34	SP	3801.8	0.75	1.0	1.00	1.0	1.0	25.4	1	0.0	25.4	0.30	1.92	0.87	0.50	0.03	5920	0.82	UL	UL
24	48	14.63	Saturated	66	SP	3937.2	0.73	1.0	1.00	1.0	1.0	48.4	1	0.0	48.4	UL	1.92	0.87	UL	0.03	6180	0.80	UL	UL
25	50	15.24	Saturated	56	SP	4072.6	0.72	1.0	1.00	1.0	1.0	40.4	1	0.0	40.4	UL	1.92	0.86	UL	0.03	6440	0.79	UL	UL
26	52	15.85	Saturated	50	SP	4208	0.71	1.0	1.00	1.0	1.0	35.5	1	0.0	35.5	UL	1.92	0.86	UL	0.03	6700	0.77	UL	UL
27	57	17.37	Saturated	50	SP	4546.5	0.68	1.0	1.00	1.0	1.0	34.1	1	0.0	34.1	UL	1.92	0.85	UL	0.03	7350	0.73	UL	UL
28	62	18.90	Saturated	66	SP	4885	0.66	1.0	1.00	1.0	1.0	43.4	1	0.0	43.4	UL	1.92	0.84	UL	0.03	8000	0.68	UL	UL
29	67	20.42	Saturated	50	SC	5223.5	0.64	1.0	1.00	1.0	1.0	31.8	35	7.0	38.8	UL	1.92	0.83	UL	0.03	8650	0.64	UL	UL
30	72	21.95	Saturated	92	SC	5562	0.62	1.0	1.00	1.0	1.0	56.7	35	7.0	63.7	UL	1.92	0.81	UL	0.03	9300	0.59	UL	UL
31	75	22.86	Saturated	50	SC	5765.1	0.61	1.0	1.00	1.0	1.0	30.3	35	7.0	37.3	UL	1.92	0.81	UL	0.03	9690	0.57	UL	UL
32	81	24.69	Saturated	50	SP	6171.3	0.59	1.0	1.00	1.0	1.0	29.3	1	0.0	29.3	UL	1.92	0.79	UL	0.03	10470	0.52	UL	UL
33	86	26.21	Saturated	50	SM	6509.8	0.57	1.0	1.00	1.0	1.0	28.5	15	2.3	30.8	UL	1.92	0.78	UL	0.03	11120	0.48	UL	UL
34	91	27.74	Saturated	50	CL	6848.3	0.56	1.0	1.00	1.0	1.0	27.8	77.9	7.0	34.8	UL	1.92	0.77	UL	0.03	11770	0.46	UL	UL
35	96	29.26	Saturated	50	CL	7186.8	0.54	1.0	1.00	1.0	1.0	27.1	90	7.0	34.1	UL	1.92	0.76	UL	0.03	12420	0.44	UL	UL
36	100	30.48	Saturated	50	SC	7457.6	0.53	1.0	1.00	1.0	1.0	26.6	35	7.0	33.6	UL	1.92	0.75	UL	0.03	12940	0.43	UL	UL
37	107	32.61	Saturated	93	CH	7931.5	0.52	1.0	1.00	1.0	1.0	48.0	90	7.0	55.0	UL	1.92	0.74	UL	0.03	13850	0.44	UL	UL
38	112	34.14	Saturated	51	CH	9516	0.47	1.0	1.00	1.0	1.0	24.1	90	7.0	31.1	UL	1.92	0.68	UL	0.03	14500	0.47	UL	UL
39	117	35.66	Saturated	38	CH	9854.5	0.46	1.0	1.00	1.0	1.0	17.6	90	7.0	24.6	0.29	1.92	0.67	0.37	0.03	15150	0.51	0.015	24

Source: AECOM, 2012. (See Appendices A and B for boring logs and laboratory testing results)

LIQUEFACTION FACTOR OF SAFETY ASSESSMENT
TEST BORING B-2-1[1]
Coleto Creek Power Plant
Primary and Secondary Ash Ponds

Depth to Water = 32 ft

Average Unsaturated Soil Unit Weight, γ_d = 125 pcf

Average Saturated Soil Unit Weight, γ_s = 130 pcf

Average Water Unit Weight, γ_w = 62.3 pcf

Earthquake Magnitude, M_W = 6.1

Borehole Diameter = 4", to 50' bgs
3", 50' to end of boring

Sample Number	Depth (ft)	Depth (m)	Note	N_{SPT}	Soil Type	σ'_{vo} (psf)	C_N	C_E	C_B	C_S	C_R	$(N_1)_{60}$	FC	$\Delta(N_1)_{60}$	$(N_1)_{60}$-cs	$CRR_{M7.5}$	MSF	Kσ	CRR	a_{max}/g	σ_{vo}	r_d	CSR	FS_{liq}
1	2	0.61	Unsaturated	17	SC	250	2.00	1.0	1.00	1.0	0.75	25.5	35	7.0	32.5	UL	1.92	NA	UL	0.03	250	1.00	UL	UL
2	4	1.22	Unsaturated	21	SC	500	2.00	1.0	1.00	1.0	0.75	31.5	35	7.0	38.5	UL	1.92	NA	UL	0.03	500	0.99	UL	UL
3	6	1.83	Unsaturated	15	SC	750	1.68	1.0	1.00	1.0	0.75	18.9	35	7.0	25.9	0.31	1.92	NA	0.60	0.03	750	0.99	0.019	31
4	8	2.44	Unsaturated	13	SC	1000	1.45	1.0	1.00	1.0	0.75	14.2	35	7.0	21.2	0.23	1.92	NA	0.45	0.03	1000	0.98	0.019	23
5	10	3.05	Unsaturated	15	SC	1250	1.30	1.0	1.00	1.0	0.75	14.6	37.3	7.0	21.6	0.24	1.92	NA	0.46	0.03	1250	0.98	0.019	24
7	14	4.27	Unsaturated	12	SC	1750	1.10	1.0	1.00	1.0	0.80	10.6	35	7.0	17.6	0.19	1.92	NA	0.36	0.03	1750	0.97	0.019	19
8	16	4.88	Unsaturated	21	SC	2000	1.03	1.0	1.00	1.0	0.83	17.9	35	7.0	24.9	0.29	1.92	NA	0.56	0.03	2000	0.96	0.019	30
9	18	5.49	Unsaturated	9	SC	2250	0.97	1.0	1.00	1.0	0.85	7.4	42.3	7.0	14.4	0.15	1.92	NA	0.30	0.03	2250	0.96	0.019	16
11	22	6.71	Unsaturated	14	SC	2750	0.88	1.0	1.00	1.0	0.90	11.1	35	7.0	18.1	0.19	1.92	0.91	0.34	0.03	2750	0.95	0.018	18
12	24	7.32	Unsaturated	17	SC	3000	0.84	1.0	1.00	1.0	0.93	13.3	35	7.0	20.3	0.22	1.92	0.90	0.38	0.03	3000	0.94	0.018	21
13	26	7.92	Unsaturated	18	SC	3250	0.81	1.0	1.00	1.0	0.96	13.9	35.2	7.0	20.9	0.23	1.92	0.89	0.39	0.03	3250	0.93	0.018	22
15	30	9.14	Unsaturated	16	SC	3750	0.75	1.0	1.00	1.0	1.0	12.0	35	7.0	19.0	0.20	1.92	0.88	0.34	0.03	3750	0.91	0.018	19
16	32	9.75	Saturated	22	SC	4000	0.73	1.0	1.00	1.0	1.0	16.0	38.4	7.0	23.0	0.26	1.92	0.87	0.43	0.03	4000	0.90	0.018	24
18	36	10.97	Saturated	15	SC	4270.8	0.70	1.0	1.00	1.0	1.0	10.6	35	7.0	17.6	0.19	1.92	0.86	0.31	0.03	4520	0.88	0.018	17
19	38	11.58	Saturated	8	SC	4406.2	0.69	1.0	1.00	1.0	1.0	5.5	35	7.0	12.5	0.14	1.92	0.85	0.22	0.03	4780	0.87	0.018	12
20	40	12.19	Saturated	16	SC	4541.6	0.68	1.0	1.00	1.0	1.0	10.9	35	7.0	17.9	0.19	1.92	0.85	0.31	0.03	5040	0.86	0.019	17
21A	42	12.80	Saturated	14	SP	4677	0.67	1.0	1.00	1.0	1.0	9.4	1	0.0	9.4	0.11	1.92	0.84	0.17	0.03	5300	0.84	0.019	9
22	44	13.41	Saturated	27	SP	4812.4	0.66	1.0	1.00	1.0	1.0	17.9	1	0.0	17.9	0.19	1.92	0.84	0.31	0.03	5560	0.83	0.019	17
23	46	14.02	Saturated	25	SP	4947.8	0.65	1.0	1.00	1.0	1.0	5.0	1	0.0	5.0	0.07	1.92	0.84	0.11	0.03	5820	0.82	0.019	6
24	48	14.63	Saturated	37	SP	5083.2	0.65	1.0	1.00	1.0	1.0	23.9	1	0.0	23.9	0.27	1.92	0.83	0.43	0.03	6080	0.80	0.019	23
25	50	15.24	Saturated	35	SP	5218.6	0.64	1.0	1.00	1.0	1.0	22.3	1	0.0	22.3	0.25	1.92	0.83	0.39	0.03	6340	0.79	0.019	21
26	52	15.85	Saturated	33	SM	5354	0.63	1.0	1.00	1.0	1.0	20.7	35	7.0	27.7	0.36	1.92	0.82	0.57	0.03	6600	0.77	0.018	31
27	56	17.07	Saturated	39	SC	5624.8	0.61	1.0	1.00	1.0	1.0	23.9	45.7	7.0	30.9	UL	1.92	0.81	UL	0.03	7120	0.74	UL	UL
28	61	18.59	Saturated	43	SC	5963.3	0.60	1.0	1.00	1.0	1.0	25.6	35	7.0	32.6	UL	1.92	0.80	UL	0.03	7770	0.69	UL	UL
29	66	20.12	Saturated	40	SP-SM	6301.8	0.58	1.0	1.00	1.0	1.0	23.2	10	1.2	24.3	0.28	1.92	0.79	0.43	0.03	8420	0.65	0.017	25
30	71	21.64	Saturated	39	SP	6640.3	0.56	1.0	1.00	1.0	1.0	22.0	1	0.0	22.0	0.24	1.92	0.78	0.36	0.03	9070	0.60	0.016	23
31	76	23.16	Saturated	50	SM	6978.8	0.55	1.0	1.00	1.0	1.0	27.5	35	7.0	34.5	UL	1.92	0.77	UL	0.03	9720	0.56	UL	UL
32	81	24.69	Saturated	60	CL-ML-S	7317.3	0.54	1.0	1.00	1.0	1.0	32.3	50	0.0	32.3	UL	1.92	0.76	UL	0.03	10370	0.52	UL	UL
33	86	26.21	Saturated	34	CH	7655.8	0.53	1.0	1.00	1.0	1.0	17.9	92.4	7.0	24.9	0.29	1.92	0.74	0.41	0.03	11020	0.48	0.014	31
34	91	27.74	Saturated	41	CH	7994.3	0.51	1.0	1.00	1.0	1.0	21.1	90	7.0	28.1	0.37	1.92	0.73	0.52	0.03	11670	0.46	0.013	40
36	101	30.78	Saturated	50	SC	8671.3	0.49	1.0	1.00	1.0	1.0	24.7	35	7.0	31.7	UL	1.92	0.71	UL	0.03	12970	0.43	UL	UL
37	107	32.61	Saturated	70	CH	9077.5	0.48	1.0	1.00	1.0	1.0	33.8	90	7.0	40.8	UL	1.92	0.70	UL	0.03	13750	0.44	UL	UL
38	111	33.83	Saturated	68	CH	9348.3	0.48	1.0	1.00	1.0	1.0	32.4	90	7.0	39.4	UL	1.92	0.69	UL	0.03	14270	0.46	UL	UL
39	116	35.36	Saturated	58	CH	9686.8	0.47	1.0	1.00	1.0	1.0	27.1	90	7.0	34.1	UL	1.92	0.68	UL	0.03	14920	0.50	UL	UL
40	119	36.27	Saturated	77	CH	9889.9	0.46	1.0	1.00	1.0	1.0	35.6	90	7.0	42.6	UL	1.92	0.67	UL	0.03	15310	0.54	UL	UL

Source: AECOM, 2012. (See Appendices A and B for boring logs and laboratory testing results)

LIQUEFACTION FACTOR OF SAFETY ASSESSMENT
TEST BORING B-2-2[1]
Coleto Creek Power Plant
Primary and Secondary Ash Ponds

Depth to Water = 3.5 ft
Average Unsaturated Soil Unit Weight, γ_d = 125 pcf
Average Saturated Soil Unit Weight, γ_s = 130 pcf
Average Water Unit Weight, γ_w = 62.3 pcf
Earthquake Magnitude, M_W = 6.1
Borehole Diameter = 3", to end of boring

Sample Number	Depth (ft)	Depth (m)	Note	N_{SPT}	Soil Type	σ'_{vo} (psf)	C_N	C_E	C_B	C_S	C_R	$(N_1)_{60}$	FC	$\Delta(N_1)_{60}$	$(N_1)_{60}$-cs	$CRR_{M7.5}$	MSF	Kσ	CRR	a_{max}/g	σ_{vo}	r_d	CSR	FS_{liq}
1	1	0.30	Unsaturated	5	OL	125	2.00	1.0	1.00	1.0	0.75	7.5	50	7.0	14.5	0.16	1.92	NA	0.30	0.03	125	1.00	0.019	UL
2	3	0.91	Unsaturated	16	OL	375	2.00	1.0	1.00	1.0	0.75	24.0	50	7.0	31.0	0.55	1.92	NA	1.05	0.03	375	0.99	0.019	UL
3	5	1.52	Saturated	15	SC	510.4	2.04	1.0	1.00	1.0	0.75	22.9	35	7.0	29.9	0.46	1.92	NA	0.88	0.03	635	0.99	0.024	37
4	7	2.13	Saturated	16	SP	645.8	1.81	1.0	1.00	1.0	0.75	21.7	1	0.0	21.7	0.24	1.92	NA	0.46	0.03	895	0.99	0.027	17
5	9	2.74	Saturated	15	SP	781.2	1.65	1.0	1.00	1.0	0.75	18.5	1	0.0	18.5	0.20	1.92	NA	0.38	0.03	1155	0.98	0.028	13
6	10	3.05	Saturated	18	SP	848.9	1.58	1.0	1.00	1.0	0.75	21.3	1	0.0	21.3	0.23	1.92	NA	0.45	0.03	1285	0.98	0.029	16
6A	11	3.35	Saturated	15	SP	916.6	1.52	1.0	1.00	1.0	0.75	17.1	1	0.0	17.1	0.18	1.92	NA	0.35	0.03	1415	0.98	0.029	12
7	14	4.27	Saturated	26	ML	1119.7	1.37	1.0	1.00	1.0	0.80	28.6	50	7.0	35.6	UL	1.92	NA	UL	0.03	1805	0.97	UL	UL
7A	15	4.57	Saturated	32	CL	1187.4	1.34	1.0	1.00	1.0	0.75	32.0	50	7.0	39.0	UL	1.92	NA	UL	0.03	1935	0.97	UL	UL
8	20	6.10	Saturated	21	ML	1525.9	1.18	1.0	1.00	1.0	0.88	21.8	50	7.0	28.8	0.40	1.92	NA	0.76	0.03	2585	0.95	0.031	24
9	25	7.62	Saturated	35	SP	1864.4	1.07	1.0	1.00	1.0	0.94	35.1	1	0.0	35.1	UL	1.92	NA	UL	0.03	3235	0.93	UL	UL
10	31	9.45	Saturated	41	SP	2270.6	0.97	1.0	1.00	1.0	1.02	40.4	1	0.0	40.4	UL	1.92	0.92	UL	0.03	4015	0.91	UL	UL
11	35	10.67	Saturated	45	SC	2541.4	0.91	1.0	1.00	1.0	1.07	43.9	35	7.0	50.9	UL	1.92	0.92	UL	0.03	4535	0.89	UL	UL
12	39	11.89	Saturated	50	SC	2812.2	0.87	1.0	1.00	1.0	1.12	48.6	35	7.0	55.6	UL	1.92	0.91	UL	0.03	5055	0.86	UL	UL
13	45	13.72	Saturated	42	SP	3218.4	0.81	1.0	1.00	1.0	1.20	40.9	1	0.0	40.9	UL	1.92	0.89	UL	0.03	5835	0.82	UL	UL
14	50	15.24	Saturated	26	CL	3556.9	0.77	1.0	1.00	1.0	1.0	20.1	50	7.0	27.1	0.34	1.92	0.88	0.57	0.03	6485	0.79	0.028	21
15	54	16.46	Saturated	56	SP	3827.7	0.74	1.0	1.00	1.0	1.0	41.6	1	0.0	41.6	UL	1.92	0.87	UL	0.03	7005	0.75	UL	UL
15A	55	16.76	Saturated	120	SP	3895.4	0.74	1.0	1.00	1.0	1.0	88.4	1	0.0	88.4	UL	1.92	0.87	UL	0.03	7135	0.74	UL	UL
16	59	17.98	Saturated	83	CL	4166.2	0.71	1.0	1.00	1.0	1.0	59.2	50	7.0	66.2	UL	1.92	0.86	UL	0.03	7655	0.71	UL	UL
17	65	19.81	Saturated	50	SM	4572.4	0.68	1.0	1.00	1.0	1.0	34.0	35	7.0	41.0	UL	1.92	0.85	UL	0.03	8435	0.66	UL	UL
18	70	21.34	Saturated	56	CH	4910.9	0.66	1.0	1.00	1.0	1.0	36.8	90	7.0	43.8	UL	1.92	0.84	UL	0.03	9085	0.61	UL	UL

Source: AECOM, 2012. (See Appendices A and B for boring logs and laboratory testing results)

LIQUEFACTION FACTOR OF SAFETY ASSESSMENT
TEST BORING B-3-1[1]
Coleto Creek Power Plant
Primary and Secondary Ash Ponds

Depth to Water = 28 ft (Only saturated strata was found between 28.0 and 28.5 ft bgs)
Average Unsaturated Soil Unit Weight, γ_d = 125 pcf
Average Saturated Soil Unit Weight, γ_s = 130 pcf
Average Water Unit Weight, γ_w = 62.3 pcf
Earthquake Magnitude, M_W = 6.1
Borehole Diameter = 4", to 30'
3", to end of boring

Sample Number	Depth (ft)	Depth (m)	Note	N_{SPT}	Soil Type	σ'_{vo} (psf)	C_N	C_E	C_B	C_S	C_R	$(N_1)_{60}$	FC	$\Delta(N_1)_{60}$	$(N_1)_{60}$-cs	$CRR_{M7.5}$	MSF	$K\sigma$	CRR	a_{max}/g	σ_{vo}	r_d	CSR	FS_{liq}
1	1	0.30	Unsaturated	19	SC	125	2.00	1.0	1.00	1.0	0.75	28.5	35	7.0	35.5	UL	1.92	NA	UL	0.03	125	1.00	UL	UL
2	3	0.91	Unsaturated	17	SC	375	2.00	1.0	1.00	1.0	0.75	25.5	35	7.0	32.5	UL	1.92	NA	UL	0.03	375	0.99	UL	UL
3	5	1.52	Unsaturated	26	SC	625	1.84	1.0	1.00	1.0	0.75	35.9	35	7.0	42.9	UL	1.92	NA	UL	0.03	625	0.99	UL	UL
4	7	2.13	Unsaturated	26	SC	875	1.56	1.0	1.00	1.0	0.75	30.3	35	7.0	37.3	UL	1.92	NA	UL	0.03	875	0.99	UL	UL
5	9	2.74	Unsaturated	9	SC	1125	1.37	1.0	1.00	1.0	0.75	9.3	35	7.0	16.3	0.17	1.92	NA	0.33	0.03	1125	0.98	0.019	17
6	11	3.35	Unsaturated	15	SC	1375	1.24	1.0	1.00	1.0	0.75	14.0	35	7.0	21.0	0.23	1.92	NA	0.44	0.03	1375	0.98	0.019	23
7	13	3.96	Unsaturated	12	SC	1625	1.14	1.0	1.00	1.0	0.79	10.8	35	7.0	17.8	0.19	1.92	NA	0.37	0.03	1625	0.97	0.019	19
8	15	4.57	Unsaturated	11	SC	1875	1.06	1.0	1.00	1.0	0.75	8.8	35	7.0	15.8	0.17	1.92	NA	0.32	0.03	1875	0.97	0.019	17
8A	16	4.88	Unsaturated	24	SC	2000	1.03	1.0	1.00	1.0	0.83	20.5	40	7.0	27.5	0.35	1.92	NA	0.68	0.03	2000	0.96	0.019	36
11	21	6.40	Unsaturated	18	SC	2625	0.90	1.0	1.00	1.0	0.89	14.4	34.8	7.0	21.4	0.23	1.92	0.91	0.41	0.03	2625	0.95	0.019	22
12	23	7.01	Unsaturated	21	CL	2875	0.86	1.0	1.00	1.0	0.92	16.6	50	7.0	23.6	0.27	1.92	0.90	0.46	0.03	2875	0.94	0.018	25
14	27	8.23	Unsaturated	19	SC	3375	0.79	1.0	1.00	1.0	1.0	15.0	35	7.0	22.0	0.24	1.92	0.89	0.42	0.03	3375	0.93	0.018	23
15	28.5	8.69	Saturated	16	SC	3533.85	0.77	1.0	1.00	1.0	1.0	12.4	35	7.0	19.4	0.21	1.92	0.88	0.35	0.03	3565	0.92	0.018	20
15A	29	8.84	Unsaturated	20	SM	3627.5	0.76	1.0	1.00	1.0	1.0	15.3	35	7.0	22.3	0.25	1.92	0.88	0.42	0.03	3627.5	0.92	0.018	23
16	31	9.45	Unsaturated	17	SM	3877.5	0.74	1.0	1.00	1.0	1.0	12.6	35	7.0	19.6	0.21	1.92	0.87	0.35	0.03	3877.5	0.91	0.018	20
17	36	10.97	Unsaturated	65	SM	4502.5	0.69	1.0	1.00	1.0	1.0	44.6	35	7.0	51.6	UL	1.92	0.85	UL	0.03	4502.5	0.88	UL	UL

Source: AECOM, 2012. (See Appendices A and B for boring logs and laboratory testing results)

LIQUEFACTION FACTOR OF SAFETY ASSESSMENT
TEST BORING B-3-2[1]
Coleto Creek Power Plant
Primary and Secondary Ash Ponds

Depth to Water = 14 ft
Average Unsaturated Soil Unit Weight, γ_d = 125 pcf
Average Saturated Soil Unit Weight, γ_s = 130 pcf
Average Water Unit Weight, γ_w = 62.3 pcf
Earthquake Magnitude, M_W = 6.1
Borehole Diameter = 3", to end of boring

Sample Number	Depth (ft)	Depth (m)	Note	N_{SPT}	Soil Type	σ'_{vo} (psf)	C_N	C_E	C_B	C_S	C_R	$(N_1)_{60}$	FC	$\Delta(N_1)_{60}$	$(N_1)_{60}$-cs	$CRR_{M7.5}$	MSF	$K\sigma$	CRR	a_{max}/g	σ_{vo}	r_d	CSR	FS_{liq}
1	1	0.30	Unsaturated	12	SM	125	2.00	1.0	1.00	1.0	0.75	18.0	35	7.0	25.0	0.29	1.92	NA	0.56	0.03	125	1.00	0.019	29
2	3	0.91	Unsaturated	14	CL	375	2.00	1.0	1.00	1.0	0.75	21.0	50	7.0	28.0	0.37	1.92	NA	0.71	0.03	375	0.99	0.019	36
2A	4	1.22	Unsaturated	18	CL	500	2.00	1.0	1.00	1.0	0.75	27.0	50	7.0	34.0	UL	1.92	NA	UL	0.03	500	0.99	UL	UL
3	5	1.52	Unsaturated	18	CL	625	1.84	1.0	1.00	1.0	0.75	24.8	50	7.0	31.8	UL	1.92	NA	UL	0.03	625	0.99	UL	UL
4	7	2.13	Unsaturated	18	CL	875	1.56	1.0	1.00	1.0	0.75	21.0	50	7.0	28.0	0.37	1.92	NA	0.71	0.03	875	0.99	0.019	37
5	9	2.74	Unsaturated	19	CL	1125	1.37	1.0	1.00	1.0	0.75	19.5	50	7.0	26.5	0.33	1.92	NA	0.63	0.03	1125	0.98	0.019	33
6	11	3.35	Unsaturated	47	SM	1375	1.24	1.0	1.00	1.0	0.76	44.3	35	7.0	51.3	UL	1.92	NA	UL	0.03	1375	0.98	UL	UL
7	15	4.57	Saturated	23	SP	1817.7	1.08	1.0	1.00	1.0	0.82	20.3	1	0.0	20.3	0.22	1.92	NA	0.42	0.03	1880	0.97	0.020	22
8	20	6.10	Saturated	42	SM	2156.2	0.99	1.0	1.00	1.0	0.75	31.2	35	7.0	38.2	UL	1.92	NA	UL	0.03	2530	0.95	UL	UL
9	24	7.32	Saturated	50	SP	2427	0.93	1.0	1.00	1.0	0.93	43.4	1	0.0	43.4	UL	1.92	0.92	UL	0.03	3050	0.94	UL	UL
10	29	8.84	Saturated	52	SP	2765.5	0.87	1.0	1.00	1.0	0.99	45.0	1	0.0	45.0	UL	1.92	0.91	UL	0.03	3700	0.92	UL	UL

Source: AECOM, 2012. (See Appendices A and B for boring logs and laboratory testing results)

LIQUEFACTION FACTOR OF SAFETY ASSESSMENT
TEST BORING B-4-1[1]
Coleto Creek Power Plant
Primary and Secondary Ash Ponds

Depth to Water = 35.6 ft

Average Unsaturated Soil Unit Weight, γ_d = 125 pcf

Average Saturated Soil Unit Weight, γ_s = 130 pcf

Average Water Unit Weight, γ_w = 62.3 pcf

Earthquake Magnitude, M_W = 6.1

Borehole Diameter = 3", to end of boring

Sample Number	Depth (ft)	Depth (m)	Note	N_{SPT}	Soil Type	σ'_{vo} (psf)	C_N	C_E	C_B	C_S	C_R	$(N_1)_{60}$	FC	$\Delta(N_1)_{60}$	$(N_1)_{60}$-cs	$CRR_{M7.5}$	MSF	Kσ	CRR	a_{max}/g	σ_{vo}	r_d	CSR	FS_{liq}
1	1	0.30	Unsaturated	17	SC	125	2.00	1.0	1.00	1.0	0.75	25.5	12.8	1.8	27.3	0.35	1.92	NA	0.67	0.03	125	1.00	0.019	34
2	3	0.91	Unsaturated	12	SC	375	2.00	1.0	1.00	1.0	0.75	18.0	12.8	1.8	19.8	0.21	1.92	NA	0.41	0.03	375	0.99	0.019	21
3	5	1.52	Unsaturated	12	SC	625	1.84	1.0	1.00	1.0	0.75	16.6	12.8	1.8	18.4	0.20	1.92	NA	0.38	0.03	625	0.99	0.019	20
6	11	3.35	Unsaturated	14	SC	1375	1.24	1.0	1.00	1.0	0.76	13.2	12.8	1.8	15.0	0.16	1.92	NA	0.31	0.03	1375	0.98	0.019	16
8	14	4.27	Unsaturated	21	SC	1750	1.10	1.0	1.00	1.0	0.80	18.5	12.8	1.8	20.3	0.22	1.92	NA	0.42	0.03	1750	0.97	0.019	22
9	17	5.18	Unsaturated	20	SC	2125	1.00	1.0	1.00	1.0	0.84	16.8	12.8	1.8	18.6	0.20	1.92	0.93	0.38	0.03	2125	0.96	0.019	20
10	19	5.79	Unsaturated	29	SC	2375	0.94	1.0	1.00	1.0	0.87	23.8	12.8	1.8	25.6	0.31	1.92	0.92	0.59	0.03	2375	0.96	0.019	31
11	20	6.10	Unsaturated	16	CL	2500	0.92	1.0	1.00	1.0	0.88	13.0	50	7.0	20.0	0.22	1.92	0.92	0.41	0.03	2500	0.95	0.019	22
11A	21	6.40	Unsaturated	23	CL	2625	0.90	1.0	1.00	1.0	0.89	18.4	50	7.0	25.4	0.30	1.92	0.91	0.58	0.03	2625	0.95	0.019	31
12	22	6.71	Unsaturated	24	CL	2750	0.88	1.0	1.00	1.0	0.90	18.9	50	7.0	25.9	0.31	1.92	0.91	0.60	0.03	2750	0.95	0.018	33
12A	23	7.01	Unsaturated	22	CL	2875	0.86	1.0	1.00	1.0	0.92	17.4	50	7.0	24.4	0.28	1.92	0.90	0.54	0.03	2875	0.94	0.018	29
14	27	8.23	Unsaturated	25	SC	3375	0.79	1.0	1.00	1.0	0.97	19.2	35	7.0	26.2	0.32	1.92	0.89	0.61	0.03	3375	0.93	0.018	34
15	29	8.84	Unsaturated	23	SC	3625	0.76	1.0	1.00	1.0	0.99	17.4	35	7.0	24.4	0.28	1.92	0.88	0.54	0.03	3625	0.92	0.018	30
16	31	9.45	Unsaturated	26	SM	3875	0.74	1.0	1.00	1.0	1.0	19.2	35	7.0	26.2	0.32	1.92	0.87	0.61	0.03	3875	0.91	0.018	35
17	34	10.36	Unsaturated	22	CL	4242	0.71	1.0	1.00	1.0	1.0	15.5	50	7.0	22.5	0.25	1.92	0.86	0.48	0.03	4242	0.89	0.017	28
17A	36	10.97	Saturated	28	SP	4477.08	0.69	1.0	1.00	1.0	1.0	19.3	1	0.0	19.3	0.21	1.92	0.85	0.40	0.03	4502	0.88	0.017	23
18	41	12.50	Saturated	35	SP	4815.58	0.66	1.0	1.00	1.0	1.0	23.2	1	0.0	23.2	0.26	1.92	0.84	0.50	0.03	5152	0.85	0.018	28
19	46	14.02	Saturated	35	SP	5154.08	0.64	1.0	1.00	1.0	1.0	22.4	1	0.0	22.4	0.25	1.92	0.83	0.48	0.03	5802	0.82	0.018	27
20	51	15.54	Unsaturated	60	SP	6427	0.57	1.0	1.00	1.0	1.0	34.4	1	0.0	34.4	UL	1.92	0.79	UL	0.03	6427	0.78	UL	UL

Source: AECOM, 2012. (See Appendices A and B for boring logs and laboratory testing results)

LIQUEFACTION FACTOR OF SAFETY ASSESSMENT
TEST BORING B-4-2[1]
Coleto Creek Power Plant
Primary and Secondary Ash Ponds

Depth to Water = 14 ft

Average Unsaturated Soil Unit Weight, γ_d = 125 pcf

Average Saturated Soil Unit Weight, γ_t = 130 pcf

Average Water Unit Weight, γ_w = 62.3 pcf

Earthquake Magnitude, M_W = 6.1

Borehole Diameter = 3", to end of boring

Sample Number	Depth (ft)	Depth (m)	Note	N_{SPT}	Soil Type	σ'_{vo} (psf)	C_N	C_E	C_B	C_S	C_R	$(N_1)_{60}$	FC	$\Delta(N_1)_{60}$	$(N_1)_{60}$-cs	$CRR_{M7.5}$	MSF	Kσ	CRR	a_{max}/g	σ_{vo}	r_d	CSR	FS_{liq}
1	1	0.30	Unsaturated	23	SM	125	2.00	1.0	1.00	1.0	0.75	34.5	35	7.0	41.5	UL	1.92	NA	UL	0.03	125	1.00	UL	UL
2	3	0.91	Unsaturated	33	SM	375	2.00	1.0	1.00	1.0	0.75	49.5	35	7.0	56.5	UL	1.92	NA	UL	0.03	375	0.99	UL	UL
3	5	1.52	Unsaturated	28	OL	625	1.84	1.0	1.00	1.0	0.75	38.6	50	7.0	45.6	UL	1.92	NA	UL	0.03	625	0.99	UL	UL
4	7	2.13	Unsaturated	22	SC	875	1.56	1.0	1.00	1.0	0.75	25.7	35	7.0	32.7	UL	1.92	NA	UL	0.03	875	0.99	UL	UL
6	11	3.35	Unsaturated	12	SM	1375	1.24	1.0	1.00	1.0	0.76	11.3	35	7.0	18.3	0.20	1.92	NA	0.38	0.03	1375	0.98	0.019	20
7	15	4.57	Saturated	13	SP	1817.7	1.08	1.0	1.00	1.0	0.82	11.5	1	0.0	11.5	0.13	1.92	NA	0.24	0.03	1880	0.97	0.020	12
8	20	6.10	Saturated	16	SP	2156.2	0.99	1.0	1.00	1.0	0.75	11.9	1	0.0	11.9	0.13	1.92	0.93	0.25	0.03	2530	0.95	0.022	11
9	25	7.62	Saturated	29	SP	2494.7	0.92	1.0	1.00	1.0	0.94	25.1	1	0.0	25.1	0.29	1.92	0.92	0.57	0.03	3180	0.93	0.023	24
10	29	8.84	Saturated	12	SM	2765.5	0.87	1.0	1.00	1.0	0.99	10.4	35	7.0	17.4	0.19	1.92	0.91	0.36	0.03	3700	0.92	0.024	15
10A	29.5	8.99	Saturated	43	SP	2799.35	0.87	1.0	1.00	1.0	1.00	37.4	1	0.0	37.4	UL	1.92	0.91	UL	0.03	3765	0.91	UL	UL

Source: AECOM, 2012. (See Appendices A and B for boring logs and laboratory testing results)

LIQUEFACTION FACTOR OF SAFETY ASSESSMENT
TEST BORING B-5-1[1]
Coleto Creek Power Plant
Primary and Secondary Ash Ponds

Depth to Water =	32	ft
Average Unsaturated Soil Unit Weight, γ_d =	125	pcf
Average Saturated Soil Unit Weight, γ_s =	130	pcf
Average Water Unit Weight, γ_w =	62.3	pcf
Earthquake Magnitude, M_W =	6.1	
Borehole Diameter =	3", to end of boring	

Sample Number	Depth (ft)	Depth (m)	Note	N_{SPT}	Soil Type	σ'_{vo} (psf)	C_N	C_E	C_B	C_S	C_R	$(N_1)_{60}$	FC	$\Delta(N_1)_{60}$	$(N_1)_{60}$-cs	$CRR_{M7.5}$	MSF	$K\sigma$	CRR	a_{max}/g	σ_{vo}	r_d	CSR	FS_{liq}
1	1	0.30	Unsaturated	34	SC	125	2.00	1.0	1.00	1.0	0.75	51.0	35	7.0	58.0	UL	1.92	NA	UL	0.03	125	1.00	UL	UL
2	3	0.91	Unsaturated	26	SC	375	2.00	1.0	1.00	1.0	0.75	39.0	35	7.0	46.0	UL	1.92	NA	UL	0.03	375	0.99	UL	UL
3	5	1.52	Unsaturated	23	SC	625	1.84	1.0	1.00	1.0	0.75	31.7	35	7.0	38.7	UL	1.92	NA	UL	0.03	625	0.99	UL	UL
4	7	2.13	Unsaturated	17	SC	875	1.56	1.0	1.00	1.0	0.75	19.8	35	7.0	26.8	0.33	1.92	NA	0.64	0.03	875	0.99	0.019	33
5	9	2.74	Unsaturated	11	SC	1125	1.37	1.0	1.00	1.0	0.75	11.3	35	7.0	18.3	0.20	1.92	NA	0.38	0.03	1125	0.98	0.019	20
6	11	3.35	Unsaturated	17	SC	1375	1.24	1.0	1.00	1.0	0.75	15.8	35	7.0	22.8	0.26	1.92	NA	0.49	0.03	1375	0.98	0.019	26
7	12	3.66	Unsaturated	12	SC	1500	1.19	1.0	1.00	1.0	0.75	10.7	35	7.0	17.7	0.19	1.92	NA	0.36	0.03	1500	0.97	0.019	19
7A	13	3.96	Unsaturated	18	SC	1625	1.14	1.0	1.00	1.0	0.75	15.4	35	7.0	22.4	0.25	1.92	NA	0.48	0.03	1625	0.97	0.019	25
8	15	4.57	Unsaturated	10	SC	1875	1.06	1.0	1.00	1.0	0.75	8.0	35	7.0	15.0	0.16	1.92	NA	0.31	0.03	1875	0.97	0.019	16
9	17	5.18	Unsaturated	15	SC	2125	1.00	1.0	1.00	1.0	0.75	11.2	35	7.0	18.2	0.20	1.92	0.93	0.37	0.03	2125	0.96	0.019	20
10	19	5.79	Unsaturated	32	SC	2375	0.94	1.0	1.00	1.0	0.75	22.7	35	7.0	29.7	0.44	1.92	0.92	0.85	0.03	2375	0.96	0.019	45
11	20	6.10	Unsaturated	20	SC	2500	0.92	1.0	1.00	1.0	0.75	13.8	35	7.0	20.8	0.23	1.92	0.92	0.44	0.03	2500	0.95	0.019	23
11A	21	6.40	Unsaturated	28	CL	2625	0.90	1.0	1.00	1.0	0.75	18.9	83.9	7.0	25.9	0.31	1.92	0.91	0.60	0.03	2625	0.95	0.019	32
16	31	9.45	Unsaturated	35	CL	3875	0.74	1.0	1.00	1.0	0.75	19.4	50	7.0	26.4	0.32	1.92	0.87	0.62	0.03	3875	0.91	0.018	35
17	33	10.06	Saturated	33	SM	4067.7	0.72	1.0	1.00	1.0	0.75	17.9	35	7.0	24.9	0.29	1.92	0.86	0.56	0.03	4130	0.90	0.018	31
18	36	10.97	Saturated	80	SP	4270.8	0.70	1.0	1.00	1.0	0.75	42.2	1	0.0	42.2	UL	1.92	0.86	UL	0.03	4520	0.88	UL	UL
19	41	12.50	Saturated	77	SP	4609.3	0.68	1.0	1.00	1.0	0.75	39.1	1	0.0	39.1	UL	1.92	0.85	UL	0.03	5170	0.85	UL	UL
20	46	14.02	Saturated	42	SM	4947.8	0.65	1.0	1.00	1.0	0.75	20.6	35	7.0	27.6	0.36	1.92	0.84	0.68	0.03	5820	0.82	0.019	36
21	50	15.24	Saturated	50	SM	5218.6	0.64	1.0	1.00	1.0	0.75	23.9	35	7.0	30.9	UL	1.92	0.83	UL	0.03	6340	0.79	UL	UL

Source: AECOM, 2012. (See Appendices A and B for boring logs and laboratory testing results)

APPENDIX E: GUADALUPE-BLANCO RIVER AUTHORITY LAKE AREA-CAPACITY CURVES

ATTACHMENT 3-1

TABLE 1

COLETO CREEK RESERVOIR
AREAS AND CAPACITIES
INITIAL CONDITIONS*

Elev.	0	1	2	3	4	5	6	7	8	9
					AREA IN ACRES					
50									0	9
60	18	26	34	42	50	60	80	100	120	145
70	170	200	239	277	314	351	397	442	495	547
80	599	679	758	835	910	984	1087	1189	1299	1408
90	1504	1650	1796	1940	2084	2230	2369	2514	2652	2787
100	2918	3077	3255	3461	3698	3954	4207	4458	4706	4949
110	5190	5531	5910	6324	6763	7234	7734	8229	8725	9223
120	9723									
					CAPACITY IN ACRE-FEET					
50									0	4
60	18	40	70	108	154	209	279	369	479	611
70	769	954	1174	1432	1727	2060	2434	2853	3322	3843
80	4416	5055	5774	6570	7442	8389	9425	10,563	11,807	13,160
90	14,617	16,194	17,917	19,786	21,798	23,955	26,254	28,695	31,277	33,996
100	36,849	39,846	43,012	46,370	49,949	53,744	57,855	62,187	66,769	71,597
110	76,667	82,027	87,747	93,863	100,406	107,409	114,807	122,878	131,354	140,328
120	149,800									

*Areas and capacities of impoundments behind Dike Nos. 1 and 2 are not included in this tabulation.

ATTACHMENT 3-2

TABLE 2

COLETO CREEK PROJECT
AREAS AND CAPACITIES
SULPHUR CREEK BEHIND DIKE NO. 1
INCLUDING FLUME NO. 1

Elev.	0	1	2	3	4	5	6	7	8	9
AREA IN ACRES										
70								0	1	2
80	3	5	7	10	14	18	22	26	31	36
90	49	56	64	73	82	90	101	113	126	138
100	151	164	178	193	207	223	240	259	279	303
110	329	358	388	419	455	499	540	590	641	699
120	770									
CAPACITY IN ACRE-FEET										
70									0	2
80	4	8	14	23	35	51	71	95	123	157
90	199	251	311	379	456	542	638	745	865	997
100	1141	1299	1470	1656	1856	2071	2303	2553	2822	3113
110	3429	3773	4146	4550	4987	5464	5984	6549	7165	7835
120	8570									

ATTACHMENT 3-3

TABLE 3

COLETO CREEK PROJECT
AREAS AND CAPACITIES
TURKEY CREEK BEHIND DIKE NO. 2
INCLUDING FLUME NO. 2

AREA IN ACRES

Elev.	0	1	2	3	4	5	6	7	8	9
70		0	1	3	6	9	13	18	24	31
80	38	46	55	65	76	88	101	115	130	146
90	167	184	200	217	234	250	270	293	322	355
100	391	429	467	506	545	583	623	663	705	748
110	791	831	882	947	1032	1118	1206	1291	1374	1458
120	1537									

CAPACITY IN ACRE-FEET

Elev.	0	1	2	3	4	5	6	7	8	9
70		0	0	2	7	14	25	41	62	89
80	124	166	216	276	347	429	523	631	754	892
90	1048	1224	1416	1624	1850	2092	2352	2634	2942	3281
100	3654	4064	4512	4998	5524	6089	6691	7334	8018	8744
110	9513	10,324	11,181	12,096	13,086	14,161	15,323	16,572	17,905	19,321
120	20,819									

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