ANNUAL INSPECTION OF CCR UNITS

Oak Grove Steam Electric Station
Robertson County, Texas

Submitted To: Melvin Mejia
Luminant
1601 Bryan Street
Dallas, TX 75201

Submitted By: Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

January 2017
CERTIFICATIONS

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Texas.

Jeffrey B. Fassett, PE     January 9, 2017

Golder Associates Inc.     F-2578
EXECUTIVE SUMMARY

The United States Environmental Protection Agency (EPA) promulgated the Resource Conservation and Recovery Act (RCRA) Coal Combustion Residuals (CCR) Rule (Rule) on April 17, 2015. The Rule requires owners or operators of existing CCR surface impoundments and landfills to have those units inspected on an annual basis by a qualified professional engineer in accordance with 40 CFR §257.83(b) §257.84(b). The annual qualified professional engineer inspections are required to be completed and the results documented in inspection reports per CFR §257.83(b)(2) for surface impoundments and §257.84(b)(2) for landfills.

As provided in §257.83(b)(4)(ii), in any calendar year in which both the annual inspection and the quinquennial structural stability assessment of existing surface impoundments are required to be completed, the annual inspection of the CCR surface impoundment is not required. Since the structural stability assessment was recently performed on the surface impoundments, this annual inspection was required for existing CCR landfills only.

Golder Associates Inc. (Golder) was retained by Luminant to perform the 2016 annual inspection of Ash Landfill 1 at the Oak Grove Steam Electric Station located near Franklin, Robertson County, Texas. The inspection of Ash Landfill 1 included the following:

- Review of applicable information regarding the status and condition of the CCR unit; and
- A visual inspection of the CCR unit to identify signs of distress or malfunction of the CCR unit.
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1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) published the final rule governing the disposal of coal combustion residuals (CCR) as solid waste regulated under subtitle D of the Resource Conservation and Recovery Act (RCRA) on April 17, 2015, with an effective date of October 19, 2015. The CCR Rule establishes national minimum criteria and new CCR management obligations for existing, new, and lateral expansions of CCR disposal units. One of the new obligations pertains to inspections. CCR unit owners/operators must conduct weekly and annual inspections of CCR units. This report presents the results of the second annual inspection of the CCR units at the Oak Grove Steam Electric Station (SES) conducted to comply with §257.83 and §257.84 of the new CCR Rule.

As noted in §257.83(b)(4)(ii), in any calendar year in which both the annual inspection and the quinquennial structural stability assessment [described in §257.73(d) and §257.74(d) (pertaining to existing and new CCR surface impoundment, respectively)] are required to be completed, the annual inspection of the CCR surface impoundment is not required. The structural stability assessment report for the CCR surface impoundments at the Oak Grove facility was prepared by Golder and submitted to Luminant on October 10, 2016; therefore, annual inspections are not required for the three existing surface impoundments at the site (FGD-A, FGD-B, and FGD-C Ponds) and the 2016 annual inspection was limited to Ash Landfill 1.

In accordance with §257.84(b)(1)(ii), a visual inspection of Ash Landfill 1 was conducted on November 16, 2016. The objective of the inspection is to identify signs of distress or malfunction of the CCR unit.

In accordance with §257.84(b)(2), this inspection report has been prepared by a qualified professional engineer documenting the points listed above, and identifying the following:

- any changes in geometry of the structure since the previous annual inspection;
- approximate volume of CCR contained in the unit at the time of inspection;
- any appearances of actual or potential structural weakness of the CCR unit and any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit; and
- any other changes which may have affected the stability or operation of the structure since the previous annual inspection.
2.0 FACILITY DESCRIPTION

The Oak Grove SES is located near Franklin, Robertson County, Texas. The following CCR units are present at the site.

- CCR surface impoundments
  - FGD-A Pond
  - FGD-B Pond
  - FGD-C Pond
- CCR landfill
  - Ash Landfill 1

The locations of the surface impoundments and landfill are shown on Figure 1.

Coal combustion byproducts such as fly ash, bottom ash, gypsum/scrubber sludge, and process wastewater are being generated during operation. Gypsum/scrubber sludge that cannot be recycled and selected process wastewaters are currently managed in FGD-A, FGD-B and FGD-C Ponds. All flyash and bottom ash generated at the facility is handled in a dry manner and deposited in Ash Landfill 1, other than that amount that is sold/beneficially used in accordance with the CCR regulation.

As noted previously, only Ash Landfill 1 was inspected in 2016. Ash Landfill 1, located near the western portion of the facility, was registered with the Texas Commission on Environmental Quality (TCEQ) as a Class 2 Non-hazardous Waste Landfill in 2008; the registration was updated in 2011 and 2012. The original design of the landfill included five cells, Cells 1 through 5; however, Luminant notified the TCEQ on September 2, 2016 that Cell 5 would not be constructed.
3.0 REVIEW OF OPERATIONAL RECORDS

The CCR Rule (§257.84(b)(i)) requires a review of information regarding the status and condition of each CCR landfill, including the following items.

- Results of weekly inspections by a qualified person
- Results of previous annual inspections

As part of the Ash Landfill 1 annual inspection, Golder reviewed the following documents:

- 7-Day Inspection Checklists; and
- Annual Inspection of CCR Units, Oak Grove Steam Electric Station, Golder Associates Inc., January 2016.
4.0 VISUAL INSPECTION OF CCR UNITS

In accordance with §257.84(b)(1)(ii), a visual inspection of Ash Landfill 1 was conducted on November 16, 2016 by Jeffrey B. Fassett, a registered professional engineer in the State of Texas. Mr. Fassett has over 25 years of experience with design and construction of waste containment systems. Mr. Fassett was accompanied by Melvin Mejia, Dustin Manthei, Larry Johnston, and Zachery Foster of Luminant.

The weather on the date of the visual inspection was sunny and approximately 75 degrees.

Prior to conducting the visual inspection, Luminant provided checklists from the 7-day inspections on Ash Landfill 1. In addition, the objectives of the visual inspection and safety concerns were discussed.

A field checklist and maps of the CCR landfill were used to record the findings. Photographs were taken to provide an additional record. The checklist and photographs are included in Appendix A and B, respectively.

4.1 Summary of Observations

During the visual inspection of Ash Landfill 1 the following observations were made.

- Construction of Cell 4 is complete.
- Embankments
  - Cell 1
    - Hog damage is prevalent on the south and east slopes.
    - The vegetation below the final cover bench is generally good.
    - Recently reseeded areas on the final cover have eroded due to recent rain.
    - The vegetation along the upper portion of the final cover is good; however, the slopes are poorly vegetated and the vegetative cover layer has eroded in places.
  - Cell 2
    - The southern slope is well-vegetated, with minor rilling in isolated areas.
    - Hog damage is present on the eastern portion of the south slope.
    - The northern slope is used to access the landfill and is in good condition.
  - Cell 3
    - The exterior slopes are well-vegetated.
    - Vegetation is present on the protective cover on the interior slopes. Large vegetation with roots that could reach the underlying clay liner, should be removed.
  - Cell 4
    - The exterior slopes are not vegetated and rills are present.
Benchs

- Some of the drop inlets on the Cell 1 embankment benches are covered or nearly covered with sediment.
- It appears that ponding due to clogged drop inlets has caused erosion at and below the edge of the benches.

Downchutes

- The concrete block downchute on the eastern slope of Cell 1 has been replaced with a textured geomembrane-lined downchute.
- The HDPE geomembrane-lined downchute located on the southern embankment at the western edge of Cell 1 is performing well.
- Surface water flow below the geotextile underlying the concrete blocks has eroded the soil below the end of the downchute along the lower bench of Cell 3.
- The concrete block downchute along the northern slope of the Cell 1 embankment is performing well.
5.0 INSPECTION REPORT

Table 1 provides information for each of the items listed in §258.84(b)(2), related to the inspection report.

Table 1: CCR Unit Information

<table>
<thead>
<tr>
<th>Item</th>
<th>Ash Landfill 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes in Geometry</td>
<td>Within last year:</td>
</tr>
<tr>
<td></td>
<td>• Completed construction of Cell 4</td>
</tr>
<tr>
<td></td>
<td>• Cell 2 has nearly reached capacity</td>
</tr>
<tr>
<td></td>
<td>• Replaced concrete block-lined east downchute (Cell 1) with HDPE geomembrane-lined downchute</td>
</tr>
<tr>
<td>Approximate Volume of CCR in Unit (1)</td>
<td>Approx. 8.39 million cy</td>
</tr>
<tr>
<td>Observed Structural Weakness of the CCR Unit</td>
<td>None</td>
</tr>
<tr>
<td>Changes That Affect Stability or Operation of the CCR Unit</td>
<td>None</td>
</tr>
</tbody>
</table>

Notes:
1. Volume of CCR in Ash Landfill 1 provided by Luminant.
6.0 SUMMARY OF FINDINGS AND RECOMMENDED ACTIONS

Based on observations made on November 16, 2016, the overall condition of Ash Landfill 1 is good. No structural weaknesses or safety issues were observed within the landfill.

A summary of the findings and items recommended for repair or maintenance is provided in Table 2.
7.0 CLOSING

This report has been prepared in general accordance with normally accepted civil engineering practices to fulfill reporting requirements in accordance with 40 CFR 257.84(b). Based on our review of the information provided by Luminant and on our on-site inspection, the overall condition of the Ash Landfill 1 is good.

GOLDER ASSOCIATES INC.

Varenya Kumar, PE
Project Geotechnical Engineer

Jeffrey B. Fassett, PE
Associate Geotechnical Engineer

JBF/VK/jbf
### Table 2: Summary of Findings and Recommendations

<table>
<thead>
<tr>
<th>CCR UNIT</th>
<th>Component</th>
<th>Condition</th>
<th>Severity</th>
<th>Actions Since Last Inspections and Other Observations and Remarks</th>
<th>Photograph</th>
<th>Further Actions and Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>D/S Slope</td>
<td>Good to Fair</td>
<td>Cell 1: good vegetation below upper bench (i.e. below final cover). Cell 2 and 3: south slope well vegetated; north side vegetation is fair to good.</td>
<td>Minor</td>
<td>15, 19</td>
<td>Fertilize and seed at start of growing season.</td>
<td></td>
</tr>
<tr>
<td>U/S Slope</td>
<td>Good</td>
<td>Cell 4: vegetation not established. Significant animal burrows present on south slope of Cell 2 and south and east slope of Cell 1. Erosion features due to ponded water present along upper bench on eastern and northern slopes of Cell 1.</td>
<td>Moderate</td>
<td>20, 21, 5, 6, 10, 12</td>
<td>Consider animal control program. Identify what the hogs are burrowing for and use herbicide to remove.</td>
<td></td>
</tr>
<tr>
<td>U/S Slope</td>
<td>Good</td>
<td>Vegetation is present on the protective cover in Cell 3.</td>
<td>Minor</td>
<td>4</td>
<td>Check the root depth of the vegetation. If it exceeds the thickness of the protective cover (1 foot) it should be controlled to prevent damage to the clay liner.</td>
<td></td>
</tr>
<tr>
<td>Benches</td>
<td>Fair</td>
<td>Silt fencing around drop inlets is in need of repair and some of the drop inlets are covered or partially covered with vegetation and/or sediment. Rutting affecting drainage along upper bench near southeast corner of Cell 1. Erosion features due to ponded water present along upper bench on eastern and northern slopes of Cell 1.</td>
<td>Moderate</td>
<td></td>
<td>Drop inlets likely need more frequent maintenance. Regrade and confirm that area drains to drop inlet. Monitor for ponding water. Grade benches to drain to drop inlets. Repair erosion and reseed.</td>
<td></td>
</tr>
<tr>
<td>Ash Landfill 1</td>
<td>Fair</td>
<td>Upper flat portion of the final cover vegetation is good. Vegetation on slopes not well established in areas. Repairs have been made, but nilling is occurring due to inadequate vegetation.</td>
<td>Moderate</td>
<td>8, 9, 16, 17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final Cover</td>
<td>Fair</td>
<td>The concrete-block downchute on the east slope Cell 1 has been removed and replaced with a temporary HDPE geomembrane-lined downchute. The concrete-block downchute along the northern slope of Cell 1 is performing well. The new temporary HDPE geomembrane downchute in Cell 1 and the geomembrane-lined downchute along the southern slope of Cell 2 are performing well. Seepage eroding soil below woven geotextile in the concrete block-lined downchute on the southern Cell 3 embankment.</td>
<td>Moderate</td>
<td>14, 7, 8</td>
<td>Continue monitoring. If conditions worsen, repair or replace downchute.</td>
<td></td>
</tr>
<tr>
<td>Control of Contact Water</td>
<td>Good</td>
<td>Water no longer ponding along south side of Cell 2. Contact water collecting in Cell 3 and Cell 4.</td>
<td>Minor</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: D/S - Downstream; U/S - Upstream

Inspection Date: November 16, 2016
CELL 1
FERTILIZE AND SEED EXTERIOR SLOPE OF CELLS

CELL 2
VEGETATION ON PROTECTIVE COVER
CELL 3 DOWNCHUTE
MINOR EROSION
RECENTLY REPAIRED/RESEEDED FINAL COVER

CELL 4
SHALLOW SCOUR/DUE TO PONDED WATER
EXTENSIVE ANIMAL BURROWING
RUTTING ON UPPER BENCH

FURTHER AND DEEPER EXTERIOR SLOPE OF CELLS

REFERENCE(S):
AERIAL PHOTO SOURCED FROM GOOGLE EARTH PRO DATED OCTOBER 2014
<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>CONDITION</th>
<th>OBSERVATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SURFACE CRACKING</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>ANIMAL BURROWS</td>
<td>Numerous animal burrows present, particularly on south and east side. Investigate vegetation responsible for increased hog burrowing.</td>
</tr>
<tr>
<td>3</td>
<td>SLIDE, SLOUGH, SCARP</td>
<td>Slough due to ponded water seepage below bench in Cell 1.</td>
</tr>
<tr>
<td>4</td>
<td>SETTLEMENT/DEPRESSIONS</td>
<td>None in embankment. Vehicle rutting near southwest corner of Cell 1.</td>
</tr>
<tr>
<td>5</td>
<td>VEGETATION CONDITION</td>
<td>Recently repaired sections of final cover have poor coverage. Vegetation not established on outer slopes of recently completed Cell 4.</td>
</tr>
<tr>
<td>6</td>
<td>EROSION</td>
<td>Rilling present primarily in recently reseeded areas of final cover in Cell 1 and recently completed Cell 4 downstream slope.</td>
</tr>
<tr>
<td>7</td>
<td>DRAINAGE FEATURES</td>
<td>Drop inlets partially or completely covered in vegetation and/or sediment. Ponding water on benches causing erosion below.</td>
</tr>
<tr>
<td>8</td>
<td>DOWNCHUTES</td>
<td>HDPE geomembrane downchutes performing well. Erosion observed below concrete block downchute in lower portion of Cell 3 south embankment.</td>
</tr>
<tr>
<td>9</td>
<td>FINAL COVER INTRUSIONS</td>
<td>None</td>
</tr>
<tr>
<td>10</td>
<td>CONTROL OF CONTACT WATER</td>
<td>Contact water collecting in Cell 3 and Cell 4.</td>
</tr>
</tbody>
</table>

ADDITIONAL COMMENTS: Cell 4 construction complete.
APPENDIX B
PHOTOGRAPHS
CAMERA LOCATION:
31.172N, -96.4971W
(Smartphone GPS)

PHOTO DESCRIPTION:
Southern slope of Cell 3.
CAMERA LOCATION:
31.1715N, −96.498W
(Smartphone GPS)

PHOTO DESCRIPTION:
Seepage below concrete block downchute of southern Cell 3 slope.
CAMERA LOCATION:
31.1715N, -96.4981W
(Smartphone GPS)

PHOTO DESCRIPTION:
Southern slope of Cell 3.
CAMERA LOCATION:
31.1714N, −96.4986W
(Smartphone GPS)

PHOTO DESCRIPTION:
Cell 3 southern embankment and recently completed Cell 4.
CAMERA LOCATION:
31.1729N, −96.497W
(Smartphone GPS)

PHOTO DESCRIPTION:
Southern slope of Cell 2.
Material place to direct contact water away from perimeter.

KEY MAP:
CAMERA LOCATION:
31.1738N, −96.4957W
(Smartphone GPS)

PHOTO DESCRIPTION:
Animal burrow on southern slope of Cell 2.
CAMERA LOCATION:
31.1738N, −96.4957W
(Smartphone GPS)

PHOTO DESCRIPTION:
HDPE geomembrane–lined
downchute at west end of Cell
1 southern slope.
CAMERA LOCATION:
31.174N, -96.4958W
(Smartphone GPS)

PHOTO DESCRIPTION:
Final cover along top of Cell 1.
CAMERA LOCATION:
31.1747N, -96.4946W
(Smartphone GPS)

PHOTO DESCRIPTION:
Erosion of recently repaired final cover near SW corner of Cell1.d
CAMERA LOCATION:
31.1748N, -96.4938W
(Smartphone GPS)

PHOTO DESCRIPTION:
Animal burrow on southern slope of Cell 1.
CAMERA LOCATION:
31.1751N, −96.4938W
(Smartphone GPS)

PHOTO DESCRIPTION:
Rutting on upper bench near SE corner of Cell 1.
CAMERA LOCATION:
31.1758N, −96.4935W
(Smartphone GPS)

PHOTO DESCRIPTION:
Animal burrow on eastern slope of Cell 1.
CAMERA LOCATION:
31.1775N, -96.4947W
(Smartphone GPS)

PHOTO DESCRIPTION:
Slough due to ponded water seepage below upper bench in Cell 1.
CAMERA LOCATION:
31.1771N, −96.4949W
(Smartphone GPS)

PHOTO DESCRIPTION:
Concrete block downchute on eastern slope of Cell 1 removed and replaced with HDPE-lining.
CAMERA LOCATION:
31.1775N, -96.4948W
(Smartphone GPS)

PHOTO DESCRIPTION:
Upper bench of southern slope of Cell 1.

KEY MAP:

ASH LANDFILL 1

PROJECT NO. 1669251
FILE REF. IMG_2951.JPG
SCALE: NTS
REV. 0

DESIGN: VK 11/30/2016
CHECK: VK 11/30/2016
REVIEW: JBF 11/30/2016

PHOTO 15
CAMERA LOCATION:
31.1786N, -96.4956W
(Smartphone GPS)

PHOTO DESCRIPTION:
Upper bench of southern slope of Cell 1. Note vegetation around drop inlet.
CAMERA LOCATION:
31.1785N, -96.4963W
(Smartphone GPS)

PHOTO DESCRIPTION:
Final cover along top of Cell 1.
CAMERA LOCATION:
31.1785N, -96.497W
(Smartphone GPS)

PHOTO DESCRIPTION:
Erosion below upper bench of northern Cell 1 slope.
CAMERA LOCATION:
31.1782N, -96.4974W
(Smartphone GPS)

PHOTO DESCRIPTION:
Northern slope of Cells 1 and 2.
CAMERA LOCATION:
31.171N, -96.4997W
(Smartphone GPS)

PHOTO DESCRIPTION:
Erosion on recently completed Cell 4 – SW corner of embankment.
CAMERA LOCATION:
31.1716N, -96.5022W
(Smartphone GPS)

PHOTO DESCRIPTION:
Erosion on recently completed Cell 4 – western embankment.