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Coal Combustion Residue Impoundment

Round 12 - Dam Assessment Report

Martin Lake Steam Electric Plant

Coal Combustion Residuals Impoundments
Luminant
Tatum, Texas

Prepared for:

United States Environmental Protection Agency
Office of Resource Conservation and Recovery

Prepared by:

Dewberry Consultants, LLC
Fairfax, Virginia

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INTRODUCTION, SUMMARY CONCLUSIONS AND RECOMMENDATIONS

The release of over five million cubic yards from the Tennessee Valley Authority's Kingston, Tennessee facility in December 2008, which flooded more than 300 acres of land, damaging homes and property, is a wake-up call for diligence on coal combustion residue disposal units. We must marshal our best efforts to prevent such catastrophic failure and damage. A first step toward this goal is to assess the stability and functionality of the ash impoundments and other units, then quickly take any needed corrective measures.

This assessment of the stability and functionality of the three CCR management units, (Ash Disposal Ponds, impoundments PDP-4 and PDP-5) at Martin Lake Steam Electric Plant is based on a review of available documents and on the site assessment conducted by Dewberry personnel on September 25, 2012. We initially found the supporting technical documentation inadequate (Section 1.1.3). However, additional studies were provided later that addressed the inadequacy. As detailed in Section 1.2.4, there is one recommendation based on field observations that may help to maintain a safe and trouble-free operation.

In summary, the Martin Lake Steam Electric Plant impoundments are rated as SATISFACTORY for continued safe and reliable operation.

PURPOSE AND SCOPE

The U.S. Environmental Protection Agency (EPA) is embarking on an initiative to investigate the potential for catastrophic failure of Coal Combustion Surface Impoundments (i.e., management unit) from occurring at electric utilities in an effort to protect lives and property from the consequences of a dam failure or the improper release of impounded slurry. The EPA initiative is intended to identify conditions that may adversely affect the structural stability and functionality of a management unit and its appurtenant structures (if present); to note the extent of deterioration (if present), status of maintenance and/or a need for immediate repair; to evaluate conformity with current design and construction practices; and to determine the hazard potential classification for units not currently classified by the management unit owner or by a state or federal agency. The initiative will address management units that are classified as having a Less-than-Low, Low, Significant or High Hazard Potential ranking. (For Classification, see pp. 3-8 of the 2004 Federal Guidelines for Dam Safety)

In February 2009, the EPA sent letters to coal-fired electric utilities seeking information on the safety of surface impoundments and similar facilities that receive liquid-borne material that store or dispose of coal combustion residue. This letter was issued under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104(e), to assist the Agency in assessing the structural stability and functionality of such management units, including which facilities should be visited to perform a safety assessment of the berms, dikes, and dams used in the construction of these impoundments.

EPA requested that utility companies identify all management units including surface impoundments or similar diked or bermed management units or management units designated as landfills that receive liquid-borne material used for the storage or disposal of residuals or by-products from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals. Utility companies provided information on the size, design, age and the amount of material placed in the units. The EPA used the information received from the utilities to determine preliminarily which management units had or potentially could have High Hazard Potential ranking.

The purpose of this report is **to evaluate the condition and potential of residue release from management units and to determine the hazard potential classification**. This evaluation included a site visit. Prior to conducting the site visit, a two-person team reviewed the information submitted to EPA, reviewed any relevant publicly available information from state or federal agencies regarding the unit hazard potential classification (if any) and accepted information provided via telephone communication with the management unit owner. Also, after the field visit, additional information was received by Dewberry about the Martin Lake Steam Electric Plant CCR management units that were reviewed and used in preparation of this report.

Factors considered in determining the hazard potential classification of the management units(s) included the age and size of the impoundment, the quantity of coal combustion residuals or by-products that were stored or disposed of in these impoundments, its past operating history, and its geographic location relative to down gradient population centers and/or sensitive environmental systems.

This report presents the opinion of the assessment team as to the potential of catastrophic failure and reports on the condition of the management unit(s).

LIMITATIONS

The assessment of dam safety reported herein is based on field observations and review of readily available information provided by the owner/operator of the subject coal combustion residue management unit(s). Qualified Dewberry engineering personnel performed the field observations and review and made the assessment in conformance with the required scope of work and in accordance with reasonable and acceptable engineering practices. No other warranty, either written or implied, is made with regard to our assessment of dam safety.

DRAFT

Table of Contents

Page

DRAFT

1.0 CONCLUSIONS AND RECOMMENDATIONS

1.1 CONCLUSIONS

Conclusions are based on visual observations from a one-day site visit, September 25, 2012, and review of technical documentation provided by Luminant.

1.1.1 Conclusions Regarding the Structural Soundness of the Management Unit(s)

The dike embankments appear to be structurally sound based on Dewberry engineers' observations during the site visit. Initially documentation of slope stability Factors of Safety under static and seismic conditions for one Permanent Disposal Pond (PDP-5) and Ash Disposal Pond East Cell was the only information provided for review. Subsequent to the site inspection, Luminant provided Dewberry a stability analysis report that included PDP-4, and a reanalysis of the Bottom Ash Pond, East Cell, and Emergency Sludge Cells. HDR conducted a 'Soil and Liner Evaluation Report' for PDP-5, (See Appendix A, Doc 07) certifying that the liner has been constructed as designed in accordance with the issued permit and in general compliance with the regulations. Golder Associates performed slope stability studies for the other coal combustion waste management units (See Appendix C, Doc 16).

Based on the documentation of slope stability factors of safety for the cells (East Cell, West Cell and Emergency Sludge Cell) in the Ash Disposal Pond and PDP-4 and PDP-5, the slope stability of the coal combustion waste management units is satisfactory.

1.1.2 Conclusions Regarding the Hydrologic/Hydraulic Safety of the Management Unit(s)

The Ash Disposal Ponds and Permanent Disposal Ponds (PDPs), which do not receive off-site runoff, appear to have adequate hydrologic/hydraulic safety against design rainfall events. This conclusion is based on review of furnished technical information and Dewberry engineers' simple calculations to check capacity of the Ash impoundments to safely contain design rainfall over the area of the ponds.

1.1.3 Conclusions Regarding the Adequacy of Supporting Technical Documentation

The supporting technical documentation is fair. No documentation of either hydrologic or hydraulic safety for any of the impoundments was provided. Slope stability documentation was provided and considered adequate.

1.1.4 Conclusions Regarding the Description of the Management Unit(s)

The description of the management units provided by the owner was an accurate representation of what Dewberry observed in the field.

1.1.5 Conclusions Regarding the Field Observations

Dewberry staff was provided access to all areas in the vicinity of the management units required to conduct a thorough field observation. The visible parts of the embankment dikes and outlet structure were observed to have no signs of overstress, significant settlement, shear failure, or other signs of instability although visual observations were hampered by the presence of thick vegetation in some areas. Embankments appear structurally sound. There are no apparent indications of unsafe conditions or conditions needing remedial action.

The impoundments do not have outlet structures (i.e., there is no discharge to the environment). Sluice water and storm water falling into the impoundments are directed to the Ash Disposal Ponds before being pumped back to the power plant for reuse.

During the field observations burrowing animal (e.g. ground hogs) holes were observed in the embankments. The animals should be removed and the holes should be filled.

1.1.6 Conclusions Regarding the Adequacy of Maintenance and Methods of Operation

The current maintenance and methods of operation appear to be adequate for the coal combustion residuals management units. There was no evidence of significant embankment repairs or prior releases observed during the field inspection.

1.1.7 Conclusions Regarding the Adequacy of the Surveillance and Monitoring Program

The surveillance program appears to be adequate. The PDP-4 and PDP-5 dikes are instrumented. Based on the size of the dikes, the portion of the impoundment currently used to store wet ash and slag, the history of satisfactory performance and the current inspection program, piezometric data is not needed at this time.

1.1.8 Classification Regarding Suitability for Continued Safe and Reliable Operation

Based on the technical information provided and the findings of the field observations, impoundments PDP-4, PDP-5, and the Bottom Ash Disposal Pond are each rated SATISFACTORY at Martin Lake Steam Generating Plant for continued operation.

1.2 RECOMMENDATIONS

1.2.1 Recommendations Regarding the Structural Stability

No recommendations appear warranted at this time.

1.2.2 Recommendations Regarding the Hydrologic/Hydraulic Safety

No recommendations for remedial work to ensure hydrologic/hydraulic safety appear warranted at this time.

1.2.3 Recommendations Regarding the Supporting Technical Documentation

No recommendations appear warranted at this time.

1.2.4 Recommendations Regarding the Field Observations

Based on the field observations, a maintenance recommendation is:

- Control all burrowing animals (e.g. ground hogs) and appropriately fill-in burrows in the embankments around the ponds. The burrows were also noted in the two annual inspection reports; see Appendix A – Docs 01 and 04.

1.3 PARTICIPANTS AND ACKNOWLEDGEMENT

1.3.1 List of Participants

Gary Spicer, Luminant
Mark Kelly, Luminant
Michael McLaren P.E., Dewberry
Joseph P. Klein, III, P.E., Dewberry
Golam Mustafa, USEPA
Patrick Kelly, USEPA
Karla Henson, Luminant
Randy Fletcher, Luminant
Razen Thomas, Luminant
Isaac Turner, Luminant
John Dawson, Luminant

1.3.2 Acknowledgement and Signature

We acknowledge that the management units referenced herein have been assessed on September 25, 2012.

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Michael McLaren, P.E. Joseph P. Klein, III, P.E.

2.0 DESCRIPTION OF THE COAL COMBUSTION RESIDUE MANAGEMENT UNIT(S)

2.1 LOCATION AND GENERAL DESCRIPTION

Martin Lake Steam Electric Plant is located in the northeast corner of Texas approximately 3.9 miles southwest of Tatum, Texas in Rusk County. Martin Lake borders the plant on the north, east and south sides. See Figure 2.1-1 for the location of the facility on an USGS topographic map. The facility is a coal-fired electric generating station featuring 3 Units that total 2,250 megawatts. The three units were brought on line in 1977, 1978 and 1979.

The facility currently maintains three impoundments. On the east side of the plant is the Ash Disposal Pond. This pond has three cells (East, West and Emergency Sludge). The cells are separated by interior dikes. The Ash Disposal Pond receives sluiced ash from the plant. Two additional ponds are located on the west side of the plant, Permanent Disposal Pond (PDP)-4 and PDP-5.

Below is a summary of the impoundments.

<u>Ash Disposal Pond</u>:

- *The Emergency Sludge Pond (ESP)*: The ESP is used to collect process water from the thickener area, as well as rain water run-off from the thickener area. This water is reused as wet-well make-up water, and can also be used as emergency make-up water in the scrubber area.
- *West Ash Pond (WAP)*: The WAP is used to supply water to the bottom ash area on all units, and receives process water from the bottom ash areas, dewatering bins and the sludge area.
- *East Ash Pond (EAP)*: EAP is used as a temporary containment for coal combustion residues (CCRs), such as fly ash, bottom ash and FGD solids.

<u>Permanent Disposal Ponds (i.e., Desilting Basins):</u>

- *PDP-4*: PDP-4 is used to collect solid disposal from the plant, as well as solids dredged from the ESP or WAP Ponds.
- *PDP-5*: PDP-5 has only been in operation for a year. It is used to collect solid disposal from the plant, as well as solids dredged from Ash Disposal Pond.

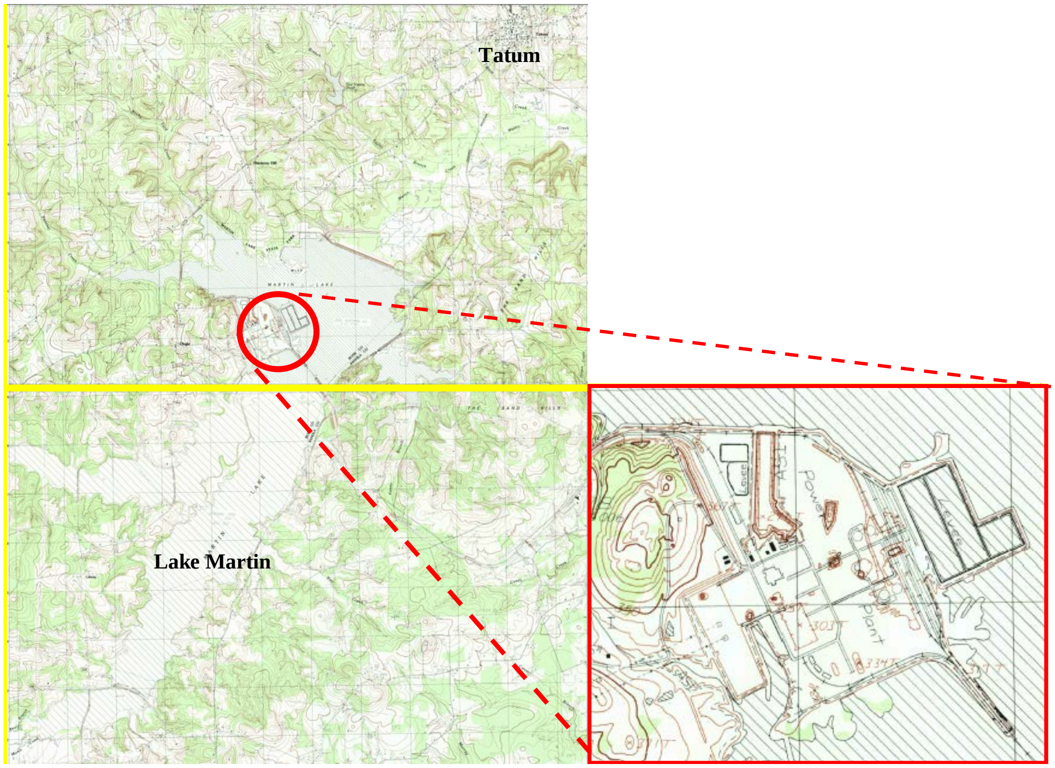

Figure 2.1-1 Plant location

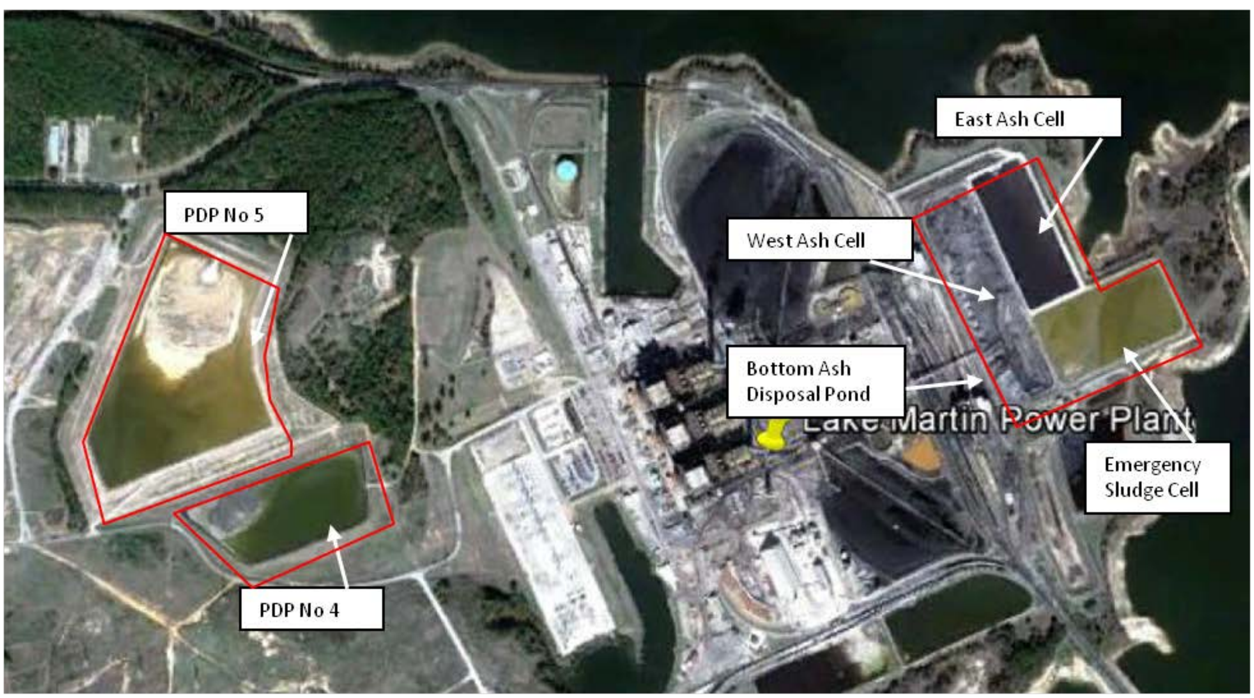

Figure 2.1-2 Impoundment locations.

Table 2.1: Summary of Dam Dimensions and Size			
	Bottom Ash Disposal Pond (3 Cells)	**PDP 4**	**PDP 5**
Dam Height (ft)	25	20	15
Crest Width (ft)	16	20	15
Length (ft)	4,600	3,600	4,950
Side Slopes (upstream) H:V	2.5:1	3:1	3:1
Side Slopes (downstream) H:V	2.5:1	4:1	4:1

2.2 COAL COMBUSTION RESIDUE HANDLING

2.2.1 Fly Ash

The Martin Lake Steam Electric Plant currently operates three coal fired electrical power generating Units. Fly ash is collected at the base of each stack by electrostatic precipitators. The collected ash is stored in hoppers and conveyed pneumatically to a silo. Periodically ash from the silo is loaded into trucks for sale, or off-site disposal.

2.2.2 Bottom Ash

Bottom ash is collected in hoppers beneath the boilers. A jet pump and sluice method is used to draw material from the hoppers through a crusher and sluice gate before sluicing the crushed material to the Ash Disposal Pond.

2.2.3 Boiler Slag

Boiler slag is collected in the hoppers with the bottom ash.

2.2.4 Flue Gas Desulfurization Sludge

Flue gas desulfurization sludge is generated by the plant. The sludge is directed to one of two thickener bins and then to an underflow tank. The solids are removed and land filled offsite. See Doc 08 for additional information.

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2.3 SIZE AND HAZARD CLASSIFICATION

According to documentation provided by Luminant, Ash Disposal Pond has 3 individual cells with a maximum capacity of 557.3 acre-feet and a maximum design height for storage of 25 feet. PDP-4 has a maximum capacity of approximately 251.6 acre-feet with a maximum design height of 20 feet. PDP-5 has a maximum capacity of 190.3 acre-feet with a maximum design height for storage of 15 feet. Based on USACE ER 1110-2-106, all three impoundments are classified as small-sized impoundment considering dam height and small size considering storage capacity.

Table 2.2a: USACE ER 1110-2-106 Size Classification		
	Impoundment	
Category	**Storage (Ac-ft)**	**Height (ft)**
Small	50 and < 1,000	25 and < 40
Intermediate	1,000 and < 50,000	40 and < 100
Large	> 50,000	> 100

For all three impoundments, loss of human life is not expected. If failure occurred, ash would remain on Luminant property. Luminant reported that if the sluice pipe broke that a release would be controlled by drainage measures and would not be released to the environment. However, a major release could discharge coal combustion residuals into Martin Lake. Although the lake is owned by Luminant, a State Park provides public access for recreational purposes. A release into the lake is expected to have economic and environmental impacts. Therefore a Significant hazard potential classification is given to impoundments PDP-4, PDP-5, and the Ash Disposal Pond.

Table 2.2b: FEMA Federal Guidelines for Dam Safety Hazard Classification		
	Loss of Human Life	**Economic, Environmental, Lifeline Losses**
Low	None Expected	Low and generally limited to owner
Significant	None Expected	Yes
High	Probable. One or more expected	Yes (but not necessary for classification)

2.4 AMOUNT AND TYPE OF RESIDUALS CURRENTLY CONTAINED IN THE UNIT(S) AND MAXIMUM CAPACITY

The CCW management units receive bottom ash and boiler slag. Flue gas desulfurization (fgd) sludge is generated by the plant and directed to one of two thickener bins and then to an underflow tank. The fgd solids are removed and landfilled offsite. See Doc. 08 for additional information.

Table 2.3: Maximum Capacity of Unit

	Ash Disposal Pond (3 Cells)	PDP 4	PDP 5
Surface Area (acre)[1]	36.68	15.34	32.94
Current Storage Capacity (cubic yards)[2]	676,400	324,800	290,700
Current Storage Capacity (acre-feet) [2]	419 [3]	201	180
Total Storage Capacity (cubic yards)[1]	1,026,868	405,994	306,000
Total Storage Capacity (acre-feet)	557.3	251.6	190.3
Crest Elevation (feet) [1]	330	360	406
Normal Pond Level (feet) [1]	328	354.9	404

[1] Critical Impoundment Inspection Report April 19, 2012
[2] Information provided by Luminant after site visit.
[3] West Cell is predominately dry, ash being removed.

2.5 PRINCIPAL PROJECT STRUCTURES

2.5.1 Earth Embankment

PDP-4

PDP-4 is constructed of on-site soils. The top of embankment elevation is 360 ft. The normal water elevation is 354.9 ft. The interior side slopes of the basin is 3 horizontal (H) to 1 vertical (V). The perimeter dike embankment is highest at 20 ft above the outside toe and has an exterior slope that has a 4:1 slope. The exterior slopes are covered with grass and weeds.

The interior side slopes are indicated on construction drawings as having a 3-foot clay layer.

The design also includes a bottom liner and drain consisting of a 5-foot thick sand drainage blanket between a 2-foot thick clay cover above and a 1-foot thick clay base layer. The drainage blanket discharges to a 10-inch diameter perforated pipe at the inside tow of the embankment.

PDP-5

PDP-5 is constructed of on-site soils. The top of embankment elevation is 406 ft. The normal water elevation is 354.9 ft. The interior side slopes of the basin is 3 horizontal (H) to 1 vertical (V). The perimeter dike embankment is highest at 15 ft above the outside toe and has an exterior slope that has a 4:1 slope. The exterior slopes are grass covered with isolated denuded areas. (The impoundment was constructed in 2011 and the grass has not germinated in isolated areas). PDP-5 was constructed over top of the closed impoundments PDP-1, 2 and 3. Prior to the construction of PDP-5 a 3 ft clay layer was placed over top the closed ponds below the new berm. Portions of the embankment were constructed over the existing ash fill. (Appendix A Doc 11 – PDP-5 Typical Cross Section).

On the bottom the liner is indicated to consist of the following in descending order:

1. 0.5 ft protective cover;
2. 2 ft clay layer (beneath the new berm is a 3 ft clay layer).

On the side slopes the liner is indicated to consist of:
1. 3 ft clay layer.

The clay liner was designed to be installed and compacted in 6 inch lifts.

Ash Disposal Pond

The Ash Disposal Pond was constructed of native clay soils. The Ash Disposal Pond contains three individual cells separated by interior dikes. The top of embankment elevation is 330 ft. The normal water elevation is 327 ft. The interior side slopes of the basin are 2.5 horizontal (H) to 1 vertical (V). The perimeter dike embankment is highest at 25 ft above the outside toe and has an exterior slope that has a 2.5:1 slope. The exterior slopes are grass and weeds. Soil cement is placed to protect the embankment where the exterior slope of the embankments come in contact with Martin Lake. (Appendix A - Doc 12 Ash Disposal System Ash Ponds Plan).

On the bottom the liner is indicated to consist of the following in descending order:

1. 4 inch revetment mat;
2. 60-mil HDPE liner;
3. 1.5 ft clay layer.

On the side slopes the liner is indicated to consist of:

1. 4 inch revetment mat;
2. 60-mil HDPE liner;
3. 3 ft clay layer.

2.5.2 Outlet Structures

Water from each cell in the Ash Disposal Pond is pumped through suction hoses located at the bottom of each cell. Water is pumped to a valve chamber for routing to the plant for recycling. Water is pumped from PDP-5 to PDP-4. Water from PDP-4 is recycled back to the plant.

2.6 CRITICAL INFRASTRUCTURE WITHIN FIVE MILES DOWN GRADIENT

The Martin Lake Electric Steam Plant is located on the west side of Martin Lake. The town of Tatum is located northeast of the Plant approximately 4 miles (See Figure 2.6-1). Typical critical infrastructures in the town are fire house stations, schools and medical facilities. Other than the town of Tatum the surrounded area is rural. Topography in the area slopes to the northeast toward Tatum. Martin Lake was formed by the construction of an earth filled dam in 1974. The crest of the dam is approximately 321 ft with a normal lake elevation of 306 ft. The emergency spillway elevation is at 312 ft. Based on the size of the impoundments, and site topographic conditions, a release due to failure or misoperation of the impoundments is not expected to impact critical infrastructure facilities.

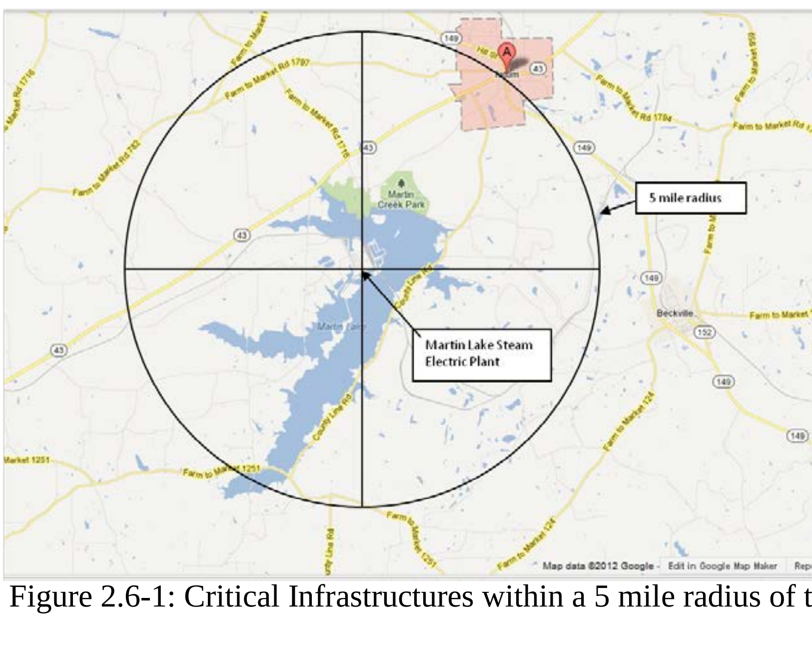

Figure 2.6-1: Critical Infrastructures within a 5 mile radius of the facility.

3.0 SUMMARY OF RELEVANT REPORTS, PERMITS, AND INCIDENTS

3.1 SUMMARY OF REPORTS ON THE SAFETY OF THE MANAGEMENT UNIT

Luminant provided a copy of the "Critical Impoundment Inspection Report" dated March 16, 2011. (See Appendix A - Doc 01) The report included a visual inspection of the inner and outer berms, crest for vegetative cover, erosion, misalignment, slides, settlements, damage and erosion, seeps, cracks and lining condition. No significant deficiencies were noted. Items were identified to be repaired and monitored.

3.2 SUMMARY OF LOCAL, STATE, AND FEDERAL ENVIRONMENTAL PERMITS

Discharge from the impoundment is regulated by the Texas Commission on Environmental Quality (TCEQ) and the impoundment has been issued a Texas Pollutant Discharge Elimination System Permit (TIDES). Permit No. WO0001784000 was issued June 18, 2009 (See Appendix A – Doc 02)

3.3 SUMMARY OF SPILL/RELEASE INCIDENTS

Data reviewed by Dewberry did not indicate any spills, unpermitted releases, or other performance related problems with the dam over the last 10 years. Luminant stated that no significant release of CCR has occurred.

4.0 SUMMARY OF HISTORY OF CONSTRUCTION AND OPERATION

4.1 SUMMARY OF CONSTRUCTION HISTORY

4.1.1 Original Construction

The facility is a coal-fired electric generating station featuring 3 units that total 2,250 megawatts. The three Units were brought on line in 1977, 1978 and 1979. PDP-4 was constructed in 1982. PDP-5 was constructed in 2011. No information was provided for the original construction dates of the Ash Disposal Ponds. However, the East Cell was re-lined in 2011.

4.1.2 Significant Changes/Modifications in Design since Original Construction

No information was provided on significant changes or modifications in the original design since construction.

4.1.3 Significant Repairs/Rehabilitation since Original Construction

The information provided to Dewberry revealed two significant repairs and new construction. Impoundments PDP 1, 2 and 3 were closed and PDP-5 was constructed on top of the impoundments in 2010/2011. ETTL Engineers and Consultants Inc. designed the new pond. Liner composition was provided in Section 2.5; see Appendix a Doc 03 for additional design information.

In the early- to mid-1980s, evidence of significant seepage was reported. The Ash Disposal Pond was upgraded with a new liner and revetment system. The upgrade consisted of a new drainage net and HDPE liner over the bottom of the impoundment, and new compacted clay liner with an HDPE cover over the interior slopes of the embankments. A 4-inch thick cement mesh revetment was placed along the embankment interior slopes.

The East Cell of Ash Disposal Pond was relined in 2009/2010. ETTL Engineers and Consultants Inc. designed the new liner for the East Cell. Liner composition was provided in Section 2.5; see Appendix a Doc 02 for additional design information.

4.2 SUMMARY OF OPERATIONAL PROCEDURES

4.2.1 Original Operational Procedures

Data describing the original operating procedures were not provided to Dewberry for review.

4.2.2 Significant Changes in Operational Procedures and Original Startup

No information was provided to Dewberry concerning significant changes in the operational procedures or from the original startup.

4.2.3 Current Operational Procedures

Currently the Ash Disposal Pond receives slurried bottom ash and boiler slag into the pond. As ash settles out and fills a cell, the ash is excavated and hauled to an off-site, permitted disposal facility. See Appendix A Doc 08 (Process Flow Diagrams) for additional information. The water from the ash pond cells is recycled back to the plant via submersible pumps.

PDP-5 receives and stores sluiced fly ash during non-typical operations. The PDP-5 outlet is a 500-gallons-per-minute submersible pump located at the south end of the impoundment. The pump riser and discharge pipe are supported on a steel pier.

Discharge from PDP-5 is directed into PDP-4. The primary function of PDP-4 is to receive and store discharge from PDP-5. PDP-4 can also receive and store fly ash during non-typical operations. The PDP-4 outlet consists of a submersible pump at the east end of the impoundment. The pump discharges to pipe supported on a floating pier. The outlet discharge is pumped to the plan for recycling.

4.2.4 Other Notable Events since Original Startup

No additional information was provided to Dewberry concerning notable events impacting the operation of the impoundment.

5.0 FIELD OBSERVATIONS

5.1 PROJECT OVERVIEW AND SIGNIFICANT FINDINGS

Dewberry personnel Michael McLaren, P.E. and Joseph Klein, P.E. performed a site visit on September 25, 2012 in company with the participants, listed in Section 1.3.

The site visit began 8:30 AM. The weather was sunny and warm. Photographs were taken of conditions observed. Please refer to the Dam Inspection Checklist in Appendix C. Selected photographs are included here for ease of visual reference. All pictures were taken by Dewberry personnel during the site visit.

The overall assessment of the PDP-5, PDP-5 and Bottom Ash Disposal Pond embankments was that they are each in satisfactory condition and no significant findings were noted.

5.2 EARTH EMBANKMENT ASH DISPOSAL POND

5.2.1 Crest

The crest of the embankment had no signs of significant depressions, tension cracks or other indications of settlement or shear failure. Figures 5.2.1-1 through 5.2.3-3 shows the typical crest conditions along the embankments.

Figure 5.2.1-1 Ash Pond West Cell south Dike crest.

Figure 5.2.1-2 Ash Disposal Pond East cell Dike. Lake Martin is shown to the left of the dike.

Figure 5.2.1-3 West-East Ash Disposal Pond interior dike.

5.2.2 Upstream/Inside Slope

The interior slopes appear stable and maintained. There were no observed scarps, sloughs, bulging, cracks, depressions or other indications of slope instability. Figures 5.2.2-1 and 5.2.2-2 show representative sections of the embankment.

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Figure 5.2.2-1 West cell interior slope.

Figure 5.2.2-2 East cell interior slope.

5.2.3 Downstream/Outside Slope and Toe

The outside slope of the embankment appeared to have a fairly well maintained cover of grasses/weeds. No scarps, sloughs, bulging, cracks, depressions or other indications of slope instability were observed along the slope. Figures 5.2.3-2 and 5.2.3-3 show representative sections of the embankment. Figure 5.2.3-1 shows the outside slope of Ash Pond East cell adjacent to Martin Lake. The base of this slope is constructed with soil-cement.

Figure 5.2.3-1 Ash Disposal Pond East cell exterior slope south end. Martin Lake right of the embankment.

Figure 5.2.3-2 Ash Disposal Pond Emergency Sludge cell north exterior slope.

Figure 5.2.3-3 Ash Disposal Pond West cell south dike exterior slope.

5.2.4 Abutments and Groin Areas

There were no observed scarps, sloughs, bulging, cracks, depressions or other indications of slope instability at dike abutments and groin areas of the Ash Disposal Pond.

Figure 5.2.4-1 Typical exterior groin in the Ash Disposal Pond.

5.3 EARTH EMBANKMENT PDP-4

5.3.1 Crest

The crest of the embankment had no signs of significant depressions, tension cracks or other indications of settlement or shear failure.

Figure 5.2.1-2 PDP-4 south crest.

5.3.2 Upstream/Inside Slope

Inside slope of the PDP-4 Pond is lined with a HDPE protective cover over a 3 foot thick compacted clay layer. The slopes appear stable and well maintained. There were no observed scarps, sloughs, bulging, cracks, depressions or other indications of slope instability.

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Figure 5.2.2-1 PDP-4 east interior slope.

5.3.3 Downstream/Outside Slope and Toe

The outside slope of the PDP-4 Pond embankment appeared to have a satisfactorily maintained cover of grasses/weeds. No scarps, sloughs, bulging, cracks, depressions or other indications of slope instability were observed along the slope. Figures 5.3.3-1 shows a section of the PDP-4 Pond outside slope.

Figure 5.3.3-1 Typical exterior slope at PDP-4

5.3.4 Abutments and Groin Areas

There were no observed scarps, sloughs, bulging, cracks, depressions or other indications of slope instability at dike abutments and groin areas of the PDP-4 Pond. Evidence of potential animal burrows was observed in isolated locations. Such burrows may weaken the structural integrity of the embankments.

Figure 5.3.4-1 Typical groining area at PDP-4 Pond. Potential rodent burrow lower left quadrant.

5.4 EARTH EMBANKMENT PDP-5

5.4.1 Crest

The crest of the embankment had no signs of significant depressions, tension cracks or other indications of settlement or shear failure.

Figure 5.3.1-1 Typical crest around PDP-5 Pond.

5.4.2 Upstream/Inside Slope

Inside slope of the PDP-5 Pond is lined with a 3-foot thick clay layer. The slopes appear stable and well maintained. There were no observed scarps, sloughs, bulging, cracks, depressions or other indications of slope instability.

Figure 5.2.2-3 PDP-5 north interior slope.

5.4.3 Outside Slope and Toe

The outside slope of the PDP-5 Pond embankment appeared to have a satisfactorily maintained cover of grasses/weeds. No scarps, sloughs, bulging, cracks, depressions or other indications of slope instability were observed along the slope. Figures 5.4.3-1 shows a section of the PDP-5 Pond outside slope.

5.4.4 Abutments and Groin Areas

There were no observed scarps, sloughs, bulging, cracks, depressions or other indications of slope instability at dike abutments and groin areas of the PDP-5 Pond. Figure 5.4.4-1 shows the south groin of PDP-5.

Figure 5.4.4-1 South groin of PDP-5.

5.5 OUTLET STRUCTURES

5.5.1 Overflow Structure

No overflow structures were noted on any of the impoundments.

5.5.2 Outlet Conduit

The outlet at all of the impoundments consist of a submersible pump at the east end of the impoundment via a SDR17 High Density Polyethylene Pipe (HDPE) smooth lined 19.5" outside diameter pipe. The water from the Ash Disposal Pond and PDP-4 is pumped to the plant for recycling. Water from PDP-5 Pond is pumped back to PDP-4.

DRAFT

Figure 5.5.2-1 Outlet pump for Ash Disposal Pond.

5.5.3 Emergency Spillway

Not applicable; no emergency spillway exists at this facility.

5.5.4 Low Level Outlet

Not applicable; no low level outlet exists at this facility.

6.0 HYDROLOGIC/HYDRAULIC SAFETY

6.1 SUPPORTING TECHNICAL DOCUMENTATION

6.1.1 Flood of Record

No documentation has been provided about the flood of record. However, the impoundments receive no off-site surface drainage. The water levels in the ponds are controlled by plant process as not by precipitation events. Thus, a flood of record for the ponds is not applicable.

In addition, there are no reported instances of plant operational problems that would have caused the pond water levels to significantly exceed the normal water levels.

6.1.2 Inflow Design Flood

According to FEMA Federal Guidelines for Dam Safety, the current practice in the design of dams is to use the Inflow Design Flood (IDF) that is deemed appropriate for the hazard potential of the dam and reservoir, and to design spillways and outlet works that are capable of safely accommodating the flood flow without risking the loss of the dam or endangering areas downstream from the dam to flows greater than the inflow. The recommended IDF or spillway design flood for a Significant hazard, small-sized structure (See section 2.2) in accordance with the USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 criteria is the 100-year storm (See Table 6.1.2).

Table 6.1.2: USACE Hydrologic Evaluation Guidelines
Recommended Spillway Design Floods

Hazard	Size	Spillway Design Flood
Low	Small	50- to 100-year frequency
	Intermediate	100-year to ½ PMF
	Large	½ PMF to PMF
Significant	Small	100-year to ½ PMF
	Intermediate	½ PMF to PMF
	Large	PMF
High	Small	½ PMF to PMF
	Intermediate	PMF
	Large	PMF

Probable Maximum Flood (PMF)

The Probable Maximum Precipitation (PMP) is defined by the American Meteorological Society as the theoretically greatest depth of precipitation for a given duration that is physically possible over a particular drainage area at a certain time of year. The National Weather Service (NWS) further states that in consideration of the complicated processes and interrelationships in storms, PMP values are identified as estimates. The NWS has published application procedures that can be used with PMP estimates to develop spatial and temporal characteristics of a Probable Maximum Storm (PMS). A PMS thus developed can be used with a precipitation-runoff simulation model to calculate a PMF hydrograph.

No hydrologic and hydraulic documentation was provided to Dewberry for review. Martin Lake Electric Steam Plant is located on Martin Lake which was formed by the construction of an earth-filled dam. The dam has a normal pool elevation of 306 ft. The crest elevation of the dam is 321.5 ft with the emergency spillway elevation at 312 ft. (See Appendix A - Doc 09), based on the information reviewed. The lowest crest elevation of the impoundments is 330 feet.

A brief internet search by Dewberry found data from the Texas Department of Transportation, 2011, published rainfall data indicating the one percent probability in any given year (100-year storm) 24 hour precipitation event in Rusk County is 10.80 inches (See Appendix A – Doc 10). This is well below the 2-ft freeboard of both the Ash Disposal Pond and PDP-5; and the 5-ft freeboard of PDP-4.

Topography in the vicinity of the plant generally directs surface drainage around rather than through the plant site. Based on the elevation of the dike crests, and the area topography, storm water inflow into the impoundments is expected to be limited to direct precipitation.

6.1.3 Spillway Rating

The Impoundment Ponds do not have spillway discharges. The sole method of discharge from the impoundments is recirculation pumping to the plant.

6.1.4 Downstream Flood Analysis

Data reviewed by Dewberry did not contain a downstream flood analysis.

6.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

No rigorous or even simple hydrologic/hydraulic analyses have been provided for any of the impoundments. For ponds that are totally contained within perimeter dike systems and do not receive uncontrolled off-site drainage, rigorous analyses of natural flooding events are not warranted. Dewberry has provided a simple analysis for assessing the hydrologic safety of the PDP-4, PDP-5, and Ash Disposal Ponds. However, formal documentation of the hydrologic/hydraulic safety of each pond should be developed by Luminant and maintained on file for record purposes.

6.3 ASSESSMENT OF HYDROLOGIC/HYDRAULIC SAFETY

It is calculated that adequate capacity and freeboard exists to safely pass the design storm based on that fact that the ponds have a contributing drainage area equal to the surface area of the ponds. Since the water is recycled back into the plant no overflow would occur assuming all pumps remain operational.

7.0 STRUCTURAL STABILITY

7.1 SUPPORTING TECHNICAL DOCUMENTATION

7.1.1 Stability Analyses and Load Cases Analyzed

Slope Stability reports were provided for one of the cells (East) in the Ash Disposal Pond and PDP-5 at the time of the site visit. Subsequent to the site inspection Luminant provided Dewberry a stability analysis report that included PDP-4, and a reanalysis of the Bottom Ash Pond, East Cell, and Emergency Sludge Cells.

Ash Disposal Pond (East Cell)

In 2008 Luminant retained ETTL Engineers and Consultants Inc. to perform a geotechnical investigation and slope stability analyses for the East Cell of the Ash Disposal Pond for the purpose of installing a new liner. See Appendix A Doc 02. ETTL performed field sampling, laboratory testing and slope analyses for several sections along the East Cell. The slope stability was evaluated using GSTABL7 software. Analyses included short term, long term, and seismic conditions.

In 2012 Luminant retained Golder Associates to conduct a new geotechnical investigation and slope stability analysis for the East Cell and Emergency Sludge Cell, designated in the Golder report as the West Ash Pond, and Scrubber Pond respectively. The results of the Golder analyses are used in this report, see Appendix C Doc 16.

The slope stability was evaluated using the computer program SLIDE, Version 6.019. Analyses included short term, long term, steady state with seismic.

PDP-4

The 2012 Golder geotechnical investigation and slope stability analyses included PDP-4. Slope stability was evaluated using the computer program SLIDE, Version 6.019. Analyses included short term, long term, and rapid drawdown conditions.

PDP-5

In 2008 Luminant retained ETTL Engineers and Consultants Inc. to perform a geotechnical investigation and slope stability analyses for the construction of the PDP-5. PDP-5 was going to be constructed over the existing PDP ponds 1, 2 and 3. See Appendix A Doc 03. ETTL performed field sampling, laboratory testing and slope analyses for several sections along PDPs 1, 2 and 3 Ponds.

The slope stability was evaluated using the computer program GSTABL7 with STEDwin (short term, long term, stead state with seismic). The analysis was conducted using the modified Bishop method.

The analysis showed that groundwater would need to be controlled to have a static condition factor of safety of 1.6. If the water were to rise to the top of the new containment berms (i.e. high groundwater conditions), the factor of safety would be 1.3. The report states that if the proposed berm was constructed with a clay cover, the Factors of Safety would increase. Construction drawings provided to Dewberry for review indicate the berm was constructed with a 3-foot thick clay liner, and a 6-inch thick protective cover. See Appendix A, Doc. 11.

7.1.2 Design Parameters and Dam Materials

Ash Disposal Pond East Cell and PDP-4

Documentation provided to Dewberry for review indicated the stability analyses for Ash Disposal Pond (East Cell) and PDP-4. The material properties used in the analysis are shown in Table 7.1a.

Table 7.1a – Summary of stability Analysis Soil Parameters for Ash Disposal Pond (East Cell) and PDP-4

Soil Type	Moist Unit Weight γ (pcf)	Effective Stress Parameters		Total Stress Parameters	
		Friction Angle ø	Cohesion c (psf)	Friction Angle ø	Cohesion c (psf)
Sandy Clay / Clayey Sand	125	14	1000	0	1750
Sand	120	30	0	30	0

PDP-5

Documentation provided to Dewberry for review indicated the stability PDP-5. The material properties used in the analyses are shown in Table 7.1b. For the evaluation of steady-state conditions, the soils were evaluated using effective stress parameters. Total stress parameters for the clay are based on saturated unconfined strength derived from the consolidated undrained strengths.

Table 7.1b – Summary of stability Analysis Soil Parameters for PDP-5					
Soil Type	**Moist Unit Weight γ (pcf)**	**Effective Stress Parameters**		**Total Stress Parameters**	
		Friction Angle ø	**Cohesion c (psf)**	**Friction Angle ø**	**Cohesion c (psf)**
Native Cohesionless Foundation Soils (minimum)	125	38	0	38	0
Remolded Clay Berm (CL/CH) (minimum)	120	23	200	15	500
Existing Fly Ash CCBs	90	37.5	0	37.5	0
New Fly Ash	90	37.4	0	37.4	0

7.1.3 Uplift and/or Phreatic Surface Assumptions

A Geotechnical Investigation Report contained information concerning uplift (See Appendix A Doc 02). Calculations show that a temporary underdrain system would be required during construction of the new liner in the East Cell to relieve any hydrostatic uplift pressures. Liner protection against long-term hydrostatic uplift pressures is provided by counteracting weight of materials over the liner, or ballast, including the weight of the leachate collection system, protective cover and waste.

No other uplift information was provided.

7.1.4 Factors of Safety and Base Stresses

No data pertaining to base stresses were provided to Dewberry for review.

The safety factors computed in the Geotechnical Investigations (See Appendix A Docs 02 and 03 and Appendix C Doc 16) are listed in Table 7.1.4.

Table 7.1.4 Factors of Safety for Martin Lake

Loading Condition	Required Safety Factor (US Army Corps of Engineers)	Computed Average Safety Factor			
		PDP - 4	Emergency Sludge Pond	Ash Disposal Pond (East Cell)	PDP-5
Steady State	1.5	2.9	2.7	3.0	1.5
Seismic Loading	1.0	*	2.2	*	1.8
High Ground-Water Conditions	1.3				1.3
Rapid Drawdown	1.3	2.2	2.1	2.6	

**In Appendix C, Document 16, Golder Associates stated that slope analyses for earthquake conditions >1.5*

7.1.5 Liquefaction Potential

The Golder Associates report (Appendix C, Doc. 16) indicates that a review of soil, site, and seismic conditions concluded that the site soils are not susceptible to liquefaction. Dewberry concurs with that conclusion.

7.1.6 Critical Geological Conditions

A subsurface investigation was conducted at two of the impoundments. The results revealed that soils below the impoundments (PDP-5 and Ash Disposal Pond- East Cell) consist of primarily medium stiff to very stiff lean clay and/or fat clay with some loose to medium dense clayey sand. The deeper borings (100 feet) encountered very dense silt (ML) with hard lean clay (CL) seams.

The supplemental subsurface investigation conducted at the Ash Disposal Pond-East Cell, Emergency Sludge Pond, and PDP-4 revealed similar interbedded stiff to hard sandy clay, and firm to dense sand. Isolated zone of sand with relatively low Standard Penetration results (N-values) were reported as likely due to soil disturbance resulting from the use of hollow stem augers below the groundwater level.

The Geologic Atlas of Texas, Tyler sheet shows the site is within the Wilcox soil group. The Wilcox Group is a thick series of non-marine sands, silty sands, clays, and gravels with some thick deposits of lignite. [1]

7.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Structural stability documentation is adequate.

7.3 ASSESSMENT OF STRUCTURAL STABILITY

Overall the structural stability of the PDP-4, PDP-5, Ash Disposal Pond East Cell, and Emergency Sludge Cell dams is considered **SATISFACTORY**. .

[1] Geologic Atlas of Texas, Tyler Sheet – The University of Texas at Austin Bureau of Economic Geology 1975 – John T. Lonsdale Memorial Edition

8.0 ADEQUACY OF MAINTENANCE AND METHODS OF OPERATION

8.1 OPERATING PROCEDURES

The operating procedures are adequate. All water from the ash ponds is recycled through the plant. All bottom ash material is temporarily stored on site, dewatered, and hauled off site via truck for recycling.

8.2 MAINTENANCE OF THE DAM AND PROJECT FACILITIES

Luminant conducts an annual inspection on all of their critical impoundments. Dewberry engineers reviewed two reports, March 2011 and April 2012 (See Appendix A - Docs-01 and 04). These reports did not present any serious concerns. Based on this review and the findings of our visit, operation and maintenance procedures seem to be adequate.

8.3 ASSESSMENT OF MAINTENANCE AND METHODS OF OPERATIONS

8.3.1 Adequacy of Operating Procedures

Based on the assessments of this report, operating procedures appear to be adequate.

8.3.2 Adequacy of Maintenance

Maintenance of the impounding embankments and outlet works of the Ash Disposal Ponds and the PDP Ponds appears to be generally adequate. No major maintenance issues were noted from review of the inspection reports. Based on the field observations, some minor maintenance is recommended (see Subsection 1.2.4).

9.0 ADEQUACY OF SURVEILLANCE AND MONITORING PROGRAM

9.1 SURVEILLANCE PROCEDURES

Daily inspections are conducted by plant personnel. Inspection observations are documented on the Area 3 Shift Log visual inspection check list and report (see Appendix A - Doc 05).

<u>Annual inspections</u>

Luminant conducts an annual inspection of all their critical impoundments. Dewberry engineers reviewed two annual reports, March 2011 and April 2012. (See Appendix A - Docs-01 and 04) These reports did not reflect any serious concerns.

9.2 INSTRUMENTATION MONITORING

The Martin Lake Stream Electric Plant ash impoundment dikes PDP-4 and PDP-5 have a piezometric monitoring system. The data were not provided to Dewberry.

9.3 ASSESSMENT OF SURVEILLANCE AND MONITORING PROGRAM

9.3.1 Adequacy of Inspection Program

Based on the data reviewed by Dewberry, including observations during the site visit, the inspection program is adequate

9.3.2 Adequacy of Instrumentation Monitoring Program

Piezometric data, though available, is not required to determine the safety of the CCW management units.

APPENDIX A

Document 1

Critical Impoundment Inspection Report for Martin Lake SES, April 19, 2012, by HDR

HDR

Luminant

Martin Lake Steam Electric Station
Rusk County, Texas

Critical Impoundment Inspection Report

April 19, 2012

HDR Project No. 179596

Texas P.E. Firm Registration No. F-754

STATE OF TEXAS
DAVID C. VOGT
93905
LICENSED
PROFESSIONAL ENGINEER

4/19/12

FOR INFORMATION ONLY

Contents

PAGE (S) REMOVED

NOT IN SCOPE

- Sacrificial liner too small for discharge

Permanent Disposal Pond #5

- Upstream embankment erosion
- Small bushes growing in upstream embankment
- Downstream embankment erosion and bare spots
- Submersible pump on clay liner
- Ponding water at southeast corner of PDP #3
- Return line broken in sump access structures
- Bush growing near southeast dewatering structure

Background

The critical impoundments at Luminant's steam electric stations are visually inspected annually for features which could undermine the integrity of the containment systems. Items which could potentially affect the integrity of the structure are then documented and recommendations are given for corrective action in a report prepared following each annual inspection.

The Texas Commission of Environmental Quality has published a guideline for the safe operation and maintenance of impoundments entitled "Guidelines for Operation and Maintenance of Dams in Texas". The general guidance given in this manual was used as a basis for inspecting the impoundments and in the development of action items. The inspections observed and documented conditions of the upstream embankment, crest and downstream embankment of each impoundment as applicable.

This report provides action items to Luminant based on their relative priority for implementation and communicates that priority by assigning it either a "Critical Item", "Moderate Item" or "Minor Item" classification to each action item identified.

"Critical Items" are items that are critical to the integrity of the impoundment and require immediate attention such as:

- An impoundment about to be overtopped or is overtopping
- An impoundment about to be breached (by progressive erosion, slope failure or other circumstance)
- An impoundment showing signs of piping or internal erosion indicated by cloudy seepage
- Evidence of excessive seepage such as a saturated embankment or seepage on the downstream face of the impoundment
- New embankment slides, structural cracking or sinkholes

"Moderate Items" are items that should be addressed at the earliest opportunity and before the next inspection. Moderate items include:

- Remove all underbrush and trees from the impoundment and establish good grass cover
- Fill animal burrows

- Restore and reseed eroded areas and gullies on impoundment
- Repair defective valves, pipes, walkways, structural foundations and other appurtenant features

"Minor Items" are items which will require continual maintenance by the plant on a routine basis or require additional inspections and monitoring throughout the year to determine if the item needs to be addressed before it becomes a more serious problem. "Minor Items" include:

- Transmission pipe seepage
- Minor erosion rills
- Mowing of grass/vegetation on embankments
- Inspecting downstream toe of embankment for ponding during dry periods (could indicate seepage from embankment)
- Vehicle rutting on crest

Inspections of the Martin Lake Critical Impoundments occurred on February 6 and 7, 2012. The inspections were performed by:

- Mark Kelly, Luminant System Engineering
- Isaac Turner, Luminant Martin Lake SES
- Dave Vogt, HDR Engineering, Inc.

The last formal inspection of Martin Lake's critical impoundments occurred on January 25 and 26, 2011.

The critical impoundments at Martin Lake contain liquids, sludges, slurries and/or solid process and waste materials resulting from the combustion of coal. The impoundments inspected at this steam electric station were (Figure 1):

- East Ash Pond
- West Ash Pond
- Emergency Sludge Pond
- Old Emergency Sludge Pond
- Storm Water Retention Pond
- Permanent Disposal Pond #4 (PDP #4)
- Permanent Disposal Pond #5 (PDP #5)
- West Low Volume Retention Pond (West LARP)
- East Low Volume Retention Pond (East LARP)
- Fuel Oil Tank
- Fuel Oil Unloading and Transfer Stations

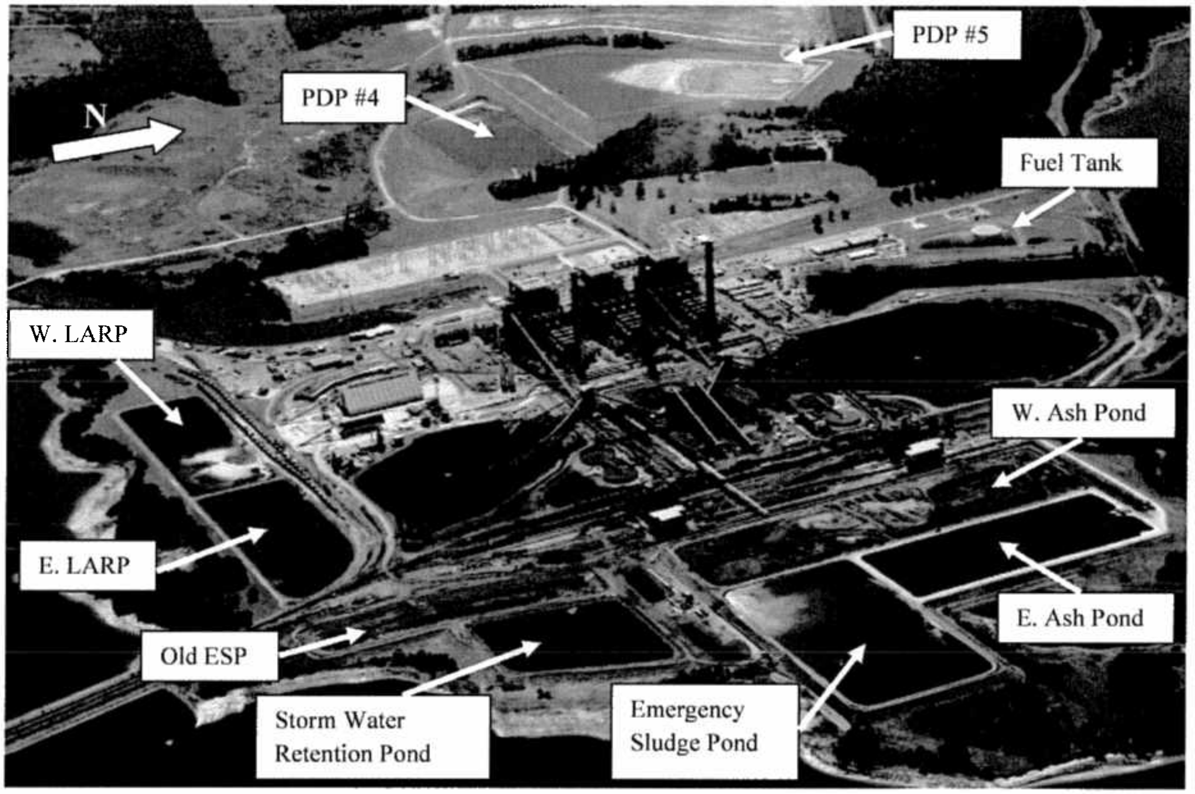

Figure 1: Martin Lake Critical Impoundments

The last rainfall recorded for this site occurred on February 2, 2012. The recorded rainfall for this event was 0.50 inches. At the time of inspection, the ground was moist and there were areas of standing water present.

East Bottom Ash Pond:

The East Bottom Ash Pond is located adjacent to the West Bottom Ash Pond Emergency Sludge Pond (see Figure 1). The pond is approximately 9.58 acres in size. The length is approximately 1,020 feet and the width is approximately 400 feet. The pond is surrounded by a berm whose top elevation is approximately 330 feet. The pond is 21 feet deep and has a storage volume of approximately 203,000 cubic yards (41 million gallons). The pond has a two foot freeboard depth with a maximum operating elevation 328 feet. On the day of the inspection, the East Bottom Ash Pond had a freeboard elevation of 2 feet 6 inches.

The pond liner consists of a 1.5 foot compacted clay liner overlain by two 60 mil HDPE liners. A geonet leak detection system is located between the two HDPE liners. A 4 inch concrete revetment is placed on top of the HDPE liners to protect the system during cleaning operations (see Figure 2).

Figure 2: East Bottom Ash Pond (Note this picture was taken during construction before becoming operational and not during the inspection)

The concrete revetment matting on the interior of the impoundment was in good condition. No cracks, bulges or slides were observed (Figure 3). The crest of the berm was in good condition with occasional patches of minor rutting from vehicular traffic. The exterior side of the berm was well vegetated and there was no evidence of sloughing, major erosion rills or seepage (Figure 4).

There were no "Critical" or "Moderate" action items found at this impoundment.

Recommendation 1: Continued mowing of grass and vegetation around the downstream side of the impoundment and control of vegetation growing on the crest of the embankment.

Figure 3: Upstream Slope of Berm and Crest

Figure 4: Downstream Slope of Berm

Emergency Sludge Pond:

The Emergency Sludge Pond has 12.5 surface acres and a capacity of 64.8 million gallons at full capacity (zero freeboard). The maximum freeboard for this impoundment is 2 feet 3 inches below zero freeboard elevation. On the day of the inspection the water level was 2 feet 8 inches below the zero freeboard elevation. This pond is lined with 4-inch thick concrete revetment mat. Erosion control is also in place on the south and north (lakeside) downstream embankments. The elevation of the top of the dike is 330-feet.

MODERATE ITEM: The crest of the impoundment had areas with rutting from vehicular traffic (Figures 5 and 6) in localized areas around the entire pond.

Recommendation 1: Repair damaged areas and grade to drain.

Recommendation 2: Discourage vehicular traffic from driving on impoundment crests after storm events.

Figure 5: Crest Rutting North Side

Figure 6: Crest Rutting North Side

MODERATE ITEM: In general, the concrete revetment matting on the interior of the impoundment was in good condition. Along the western edge of the impoundment, the revetment was damaged and a plant was observed growing in one of the liner vents (Figure 7).

Recommendation 1: Remove plant from vent.

Recommendation 2: Monitor damaged areas for wave erosion.

Recommendation 3: Investigate integrity of underlying HDPE liner which may also have been damaged when this damage occurred to revetment.

Recommendation 4: Repair concrete revetment.

Figure 7: Revetment Damage and Plant in Liner Vent

MODERATE ITEM: In general, the downstream side of the impoundment was well vegetated. There were two locations identified with large bushes that should be removed (Figures 8 and 9).

Recommendation 1: Mow grass to remove bushes.

Recommendation 2: Apply herbicide to bushes.

Figure 8: Bush on Downstream Slope

Figure 9: Bush on Downstream Slope

MODERATE ITEM: Along the south side of the impoundment, near the Low Volume Pump Station, a flexible hose was transporting water from the catch basin to the Emergency Sludge Pond. This hose had a leak that was allowing water to jet out and erode the outer face of the berm (Figure 10).

Luminant initiated corrective action to repair the hose while the inspections were occurring.

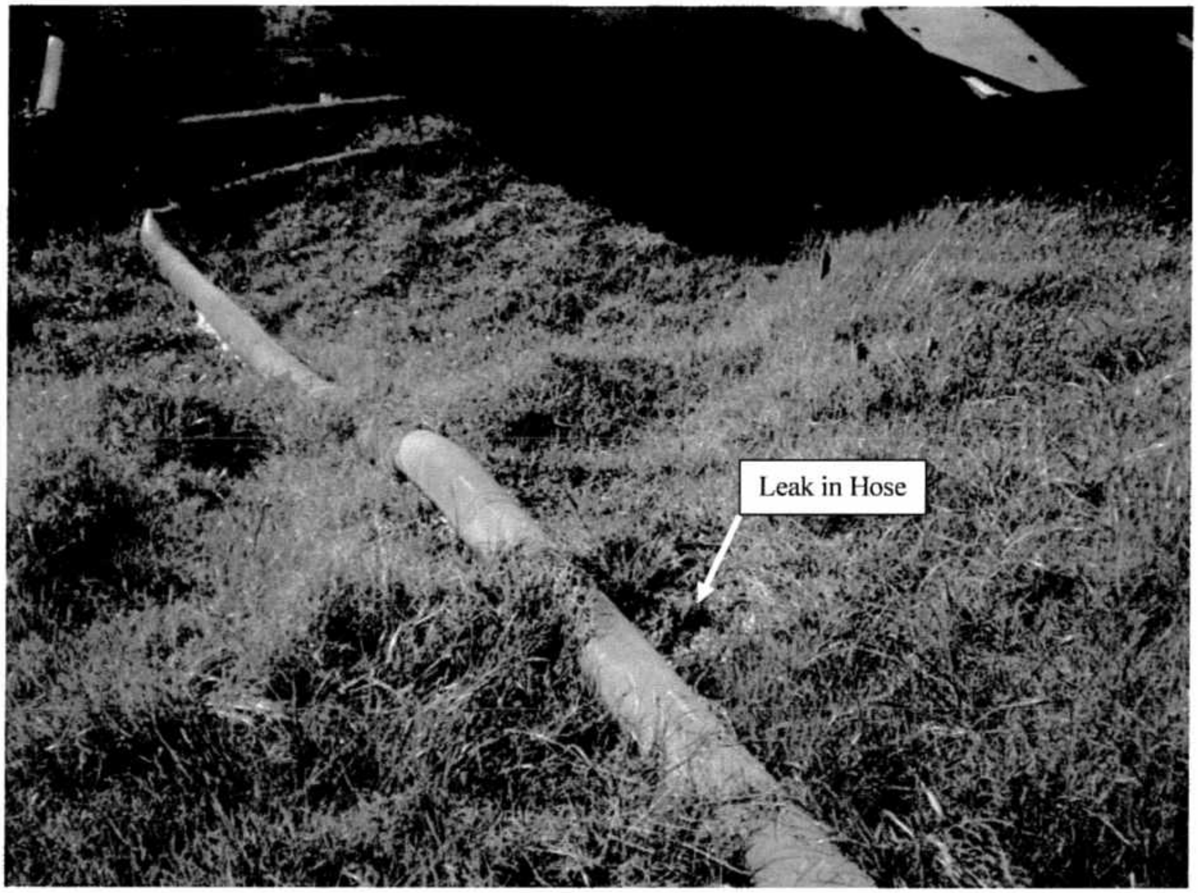

Figure 10 - Leak in Flexible Hose

MODERATE ITEM: At the Low Volume Service Pump area, a leak was observed in the "3C ESP Pump" from the coupling (Figure 11).

Recommendation 1: Repair leak

Recommendation 2: Luminant intends to construct improvements to mange uncontrolled releases of water from this location in 2013.

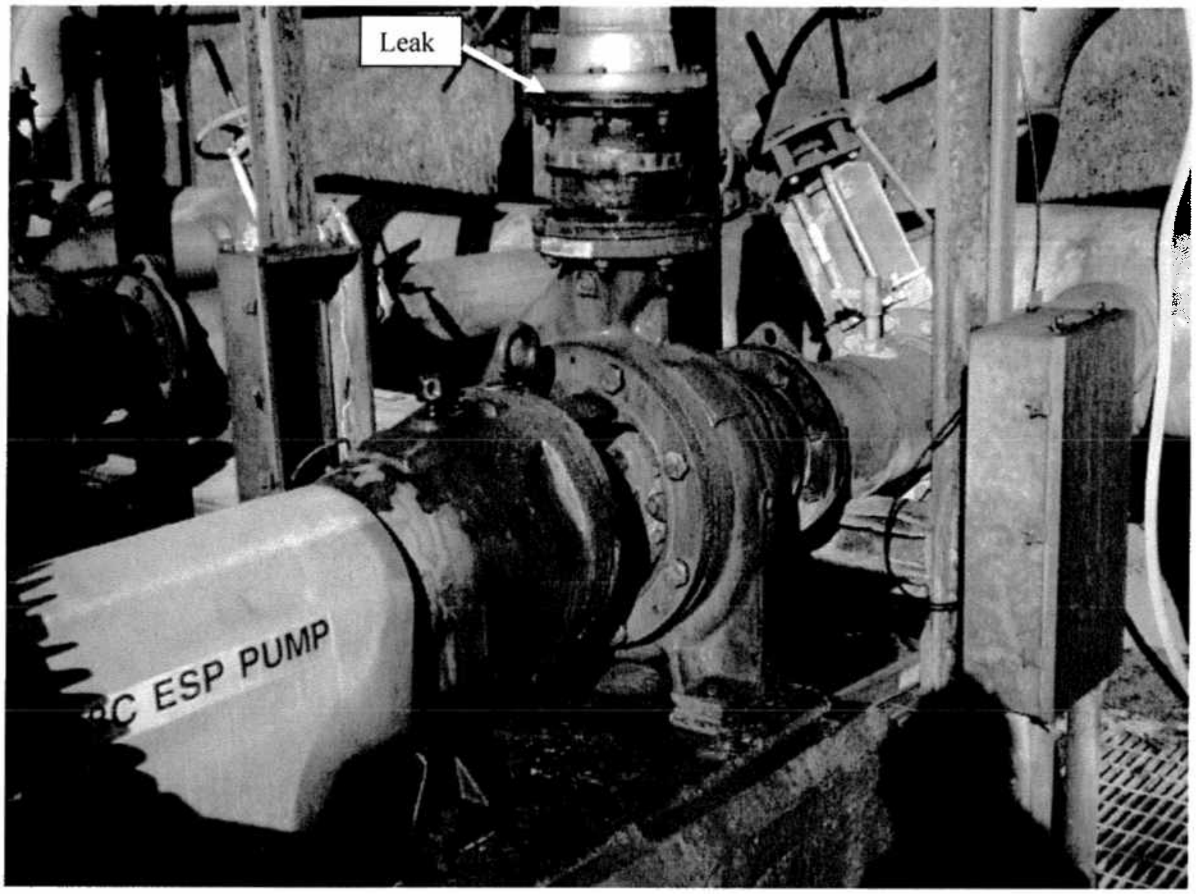

Figure 11: Leak at 3C ESP Pump

West Bottom Ash Pond:

The West Bottom Ash Pond has 14.6 surface acres at full capacity (zero freeboard) of 75.8 million gallons. The elevation of the top of the dike is 330 feet with a freeboard of 2 feet 6 inches. At the time of this inspection, the pond was partially drained and ash material was being excavated from the site (Figure 12).

The pond liner consists of two 60 mil HDPE liners with a geonet leak detection system. A 4 inch concrete revetment is placed on top of the HDPE liners to protect the system during cleaning operations.

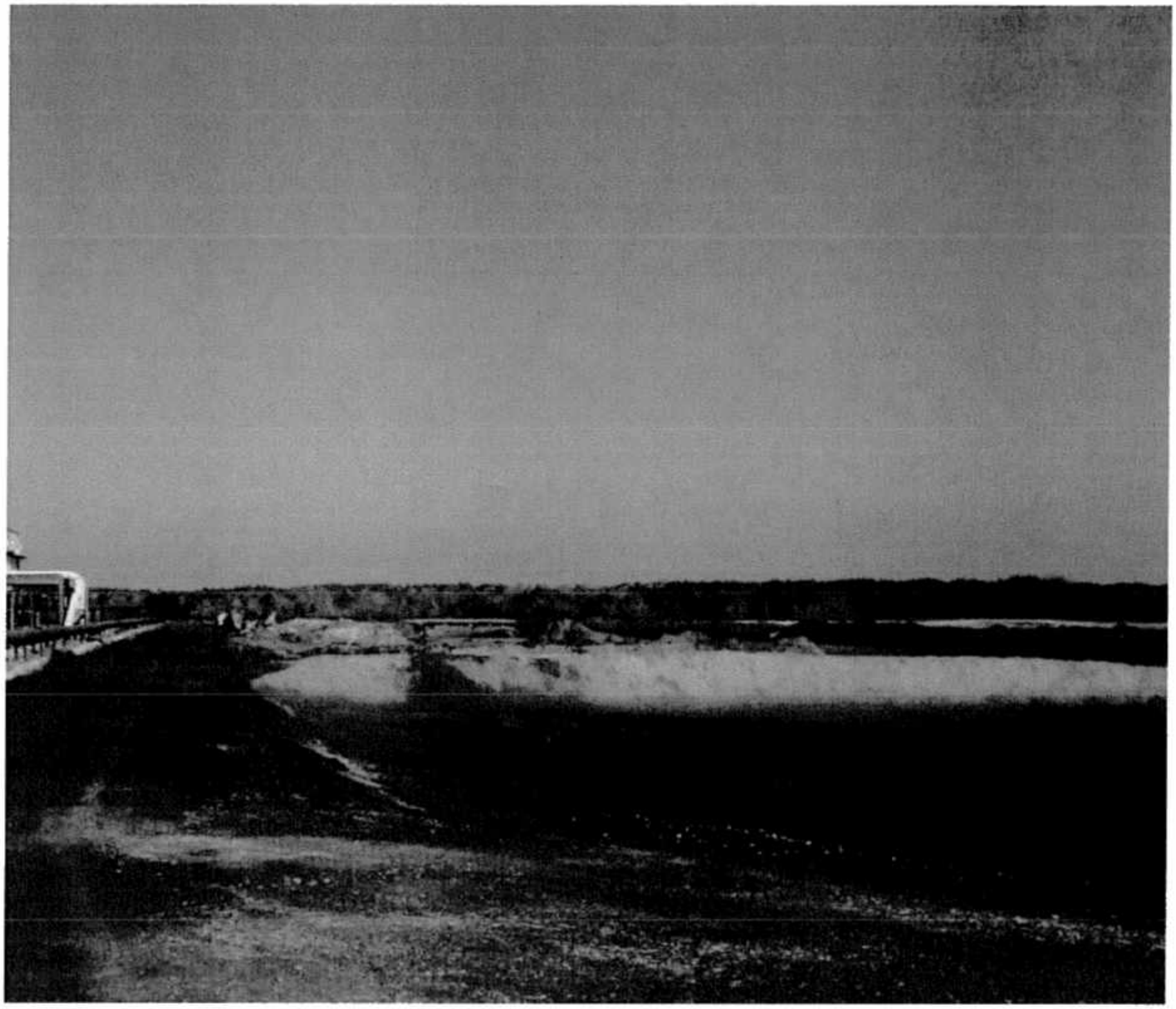

Figure 12: Partially Drained and Excavated West Bottom Ash Pond

MODERATE ITEM: The crest of the impoundment had areas with moderate rutting from vehicular traffic (Figure 13 and 14) in localized areas around the pond.

Recommendation 1: Repair damaged areas and grade to drain.

Recommendation 2: Discourage vehicular traffic from driving on impoundment crests after storm events.

Figure 13: Rutting in Crest from Vehicular Traffic

Figure 14: Rutting in Crest

MODERATE ITEM: In general, the downstream side of the impoundment was well vegetated. There was an area at the southwest corner of the pond that appeared to be either a berm slide or erosion washout from the high volume pipes (Figure 15 and 16).

Recommendation 1: Backfill to original slopes with compacted cohesive soil and reestablish vegetation.

Recommendation 2: Continued monitoring of this area for evidence of berm bulges or seepage at toe of berm.

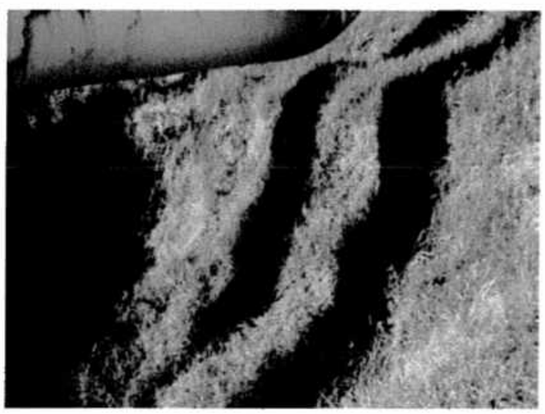

Figure 15: Possible Erosion or Berm Slide

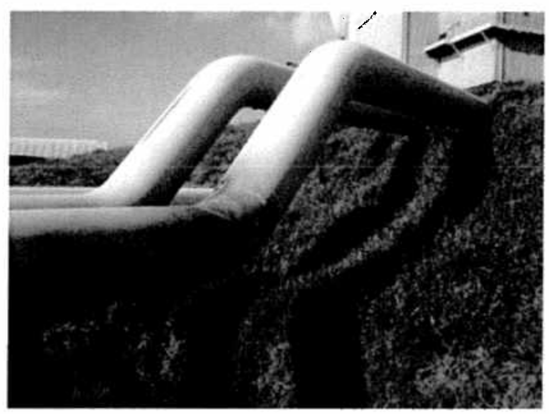

Figure 16: Possible Erosion or Berm Slide

MINOR ITEM: Numerous areas along the eastern outside perimeter of the pond had leaking/seeping pipes (Figures 17 and 18). Each of these leaks has been identified by Martin Lake operations personnel with an alphanumeric code (i.e. X-15) and are being monitored until repairs can be made.

Recommendation 1: Continue monitoring seepage leaks until repairs are complete.

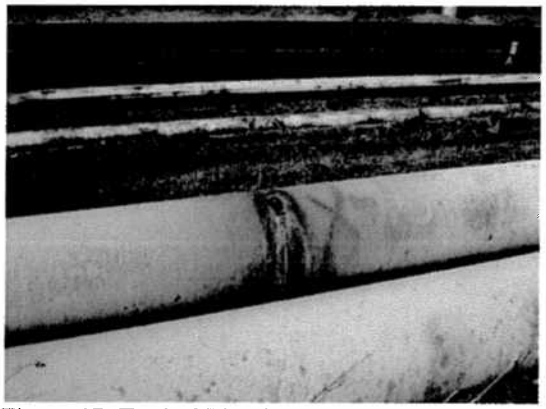
Figure 17: Typical Pipe Seepage/Leak


Figure 18: Typical Pipe Seepage/Leak

MODERATE ITEM: Evidence of erosion was found along the downstream side of the northern berm (Figures 19 and 20).

Recommendation 1: Backfill with compacted cohesive soil and reestablish vegetation.

Recommendation 2: Continue to monitor after repairs are complete.


Figure 19: Berm Erosion


Figure 20: Berm Erosion

MODERATE ITEM: The downstream side of the pipe rack located on the north end of the pond has severe erosion undercutting the foundation of the rack (Figure 21). Repairs were made to try and correct the erosion after the last inspection.

Recommendation 1: Backfill with compact cohesive soils and incorporate a geosynthetic to minimize further erosion. Reseed the area with grass that grows under low light/shady conditions.

Recommendation 2: Continue to monitor after repairs are complete.

Figure 21: Erosion Under Pipe Rack

Storm Water Retention Pond:

The Storm water Retention Pond is located between the West Ash Pond/Emergency Sludge Pond and the Old Emergency Sludge Pond. Its dimensions are 620 feet by 550 feet. The capacity is 31.2 million gallons at zero freeboard. The elevation of the top of the dike is 323 feet. On the day of inspection, the freeboard elevation of the pond was 3 feet 10 inches.

At the time of inspection, the level of the pond was being decreased through the use of a portable pump (Figure 22). The water was being pumped from this pond to one of the storm water catch basins at the base of this pond. Water was then being pumped from the catch basin to the Emergency Sludge Pond.

Figure 22: Portable Pump Removing Water from Storm Water Pond

MODERATE ITEM: The crest of the impoundment had areas with moderate rutting from vehicular traffic (Figure 23 and 24) in localized areas around the pond.

Recommendation 1: Repair damaged areas and grade to drain.

Recommendation 2: Discourage vehicular traffic from driving on impoundment crests after storm events.


Figure 23: Crest Rutting from Vehicular Traffic


Figure 24: Crest Rutting

MODERATE ITEM: A localized fuel spill was noted on the crest near the southwest pump station (Figure 25).

Recommendation 1: Excavate contaminated soils from this location and dispose properly. Backfill excavation with compacted cohesive soil and reestablish vegetation.

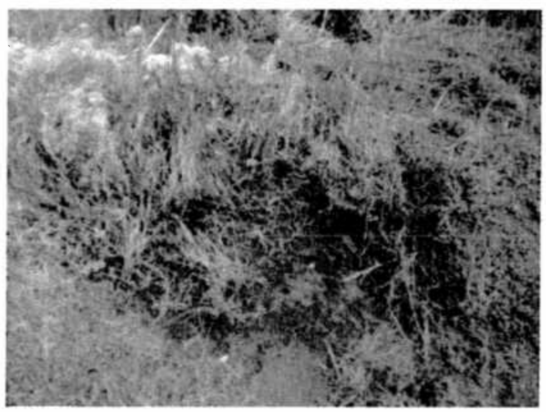
Figure 25: Fuel Spill Near Southwest Pump Station

MODERATE ITEM: In general, the upstream side of the impoundment was in good condition and well vegetated. There was an occasional erosion gully (Figure 26) from storm water impacting the protective cover of the pond.

Recommendation 1: Continue to monitor for erosion.

Recommendation 2: Backfill erosion gullies with compacted cohesive soil and reestablish vegetation.

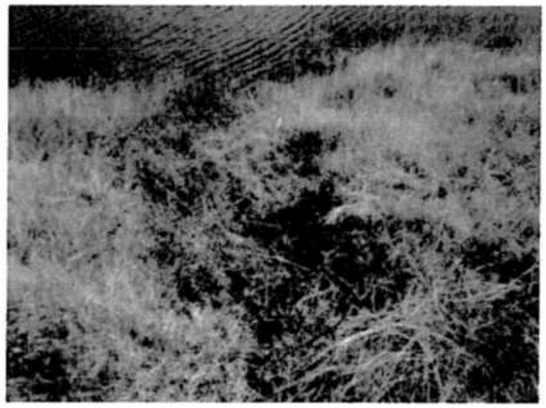

Figure 26: Upstream Embankment Erosion

MODERATE ITEM: A discharge line at the pump station located near the southwest corner of the impoundment was eroding the protective cover of the pond (Figure 27).

Recommendation 1: Extend discharge line into pond to limit erosion to protective cover.

Recommendation 2: Continue to monitor this area for additional erosion to protective cover.

Figure 27: Erosion from Discharge Pipe

In general, the downstream side of the impoundment was well vegetated (Figure 28).

Figure 28: Vegetation on Downstream Side of Impoundment

MODERATE ITEM: A few large animal burrows were found on the downstream side of the impoundment (Figures 29 and 30).

Recommendation 1: Backfill burrows with compacted cohesive soil and reestablish vegetation.

Recommendation 2: Continue to monitor for burrow reestablishment or erosion to restored areas.

Figure 29: Animal Burrow

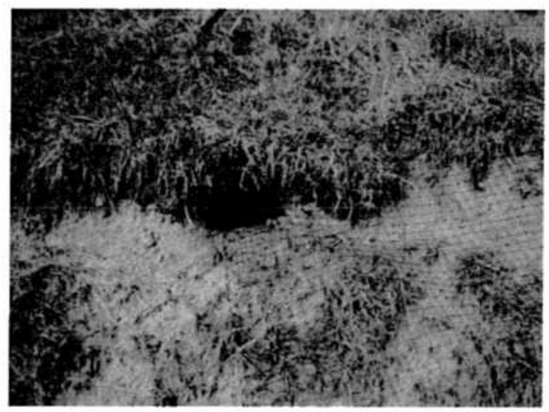

Figure 30: Animal Burrow

MODERATE ITEM: Slope slides were identified, and have been documented on previous inspections, on along the eastern side of the impoundment (Figure 31) and at the southeast corner (Figure 32). There was not an indication that the slides were worse since the previous inspection nor was there evidence of bulging or seepage from the berm.

Recommendation 1: Reestablish vegetation in these areas.

Recommendation 2: Backfill slide areas with compacted cohesive soil and reestablish vegetation.

Recommendation 3: Continue to monitor for evidence of additional sliding, berm bulging or seepage from impoundment.

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Figure 54: Downstream Embankment West LARP

MODERATE ITEM: An animal burrow was identified on the south side of the East LARP (Figure 55).

Recommendation 1: Backfill burrows with compacted cohesive soil and reestablish vegetation.

Recommendation 2: Continue to monitor for burrow reestablishment or erosion to restored areas.

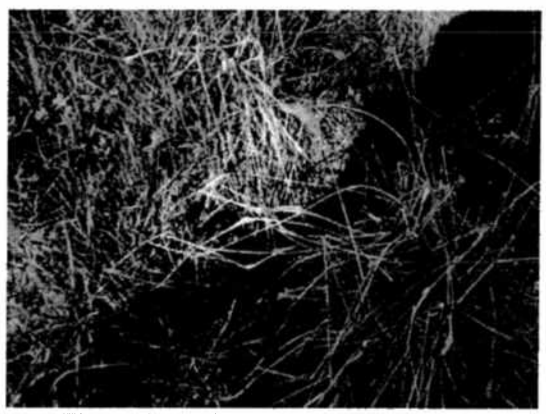
Figure 55: Animal Burrow East LARP

Permanent Disposal Pond (PDP) #4

The PDP #4 has 15.34 surface acres with a maximum capacity of 82 million gallons at zero freeboard (Figure 56). The elevation of the top of the dike is 360 feet and the water elevation was 355 feet 11 inches with a freeboard of 4 feet 1 inch.

Figure 56: PDP #4

Most of the crest was well vegetation and in good condition (Figure 57).

Figure 57: Typical Condition of Crest

MODERATE ITEM: Along the northern crest, there are areas with severe erosion (Figures 58 and 59). Luminant has installed geotextiles to mitigate the erosion but these efforts are not producing the desired results. This area is above the freeboard elevation of the pond and does not appear to be adversely affecting the pond or the anchor trench for the liner. The primary concern is for the stability of the crest and numerous large rocks and debris scratching and gouging the liner as they are carried by storm water.

Recommendation 1: Remove old geotextile material, regrade area and backfill gullies with compacted cohesive soil, provide an erosion control blanket, compact soils and reestablish vegetation.

Recommendation 2: Remove large rocks and debris from top of liner.

Recommendation 3: Continue monitoring for additional erosion.

Figure 58: Erosion at Crest of Impoundment

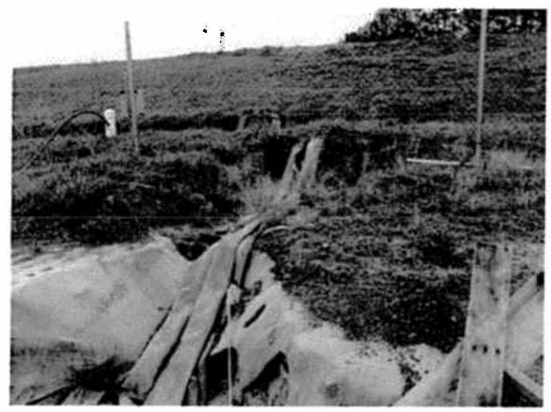

Figure 59: Erosion at Crest of Impoundment

MODERATE ITEM: Metal pickets installed along the crest to anchor pipes leading to the pond have come loose from the aforementioned erosion. These pickets have created minor tears and punctures as they impacted the liner (Figure 60 and 61).

Recommendation 1: Repair gouges and small tears in liner.

Recommendation 2: If metal pickets must be installed to anchor pipes, set the pickets further back on the crest and away from the liner.

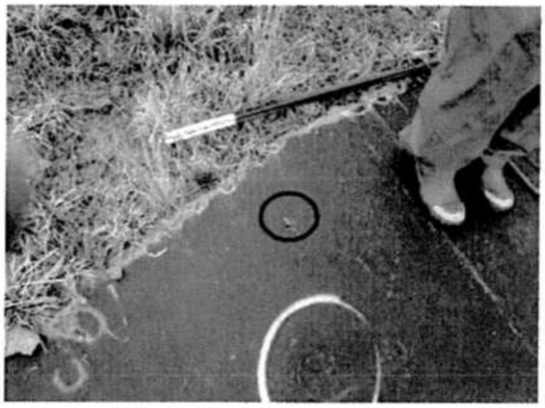

Figure 60: Minor Tear from Picket

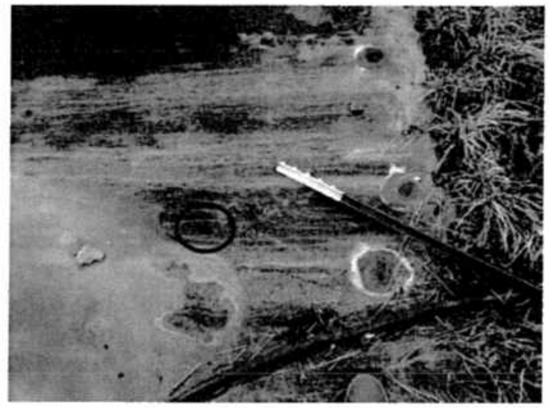

Figure 61: Minor Tear from Picket

CRITICAL ITEM: The most significant action item discovered at this pond was a large tear in the liner (Figure 62).

Recommendation 1: Repair liner.

MODERATE ITEM: A sacrificial liner was installed near the outfall of the pipes from PDP #5 near this tear. As shown in Figure 62, the outfall is exceeding the limits of the sacrificial liner.

Recommendation 1: Install another sacrificial liner beyond the limits of the pipe discharge.

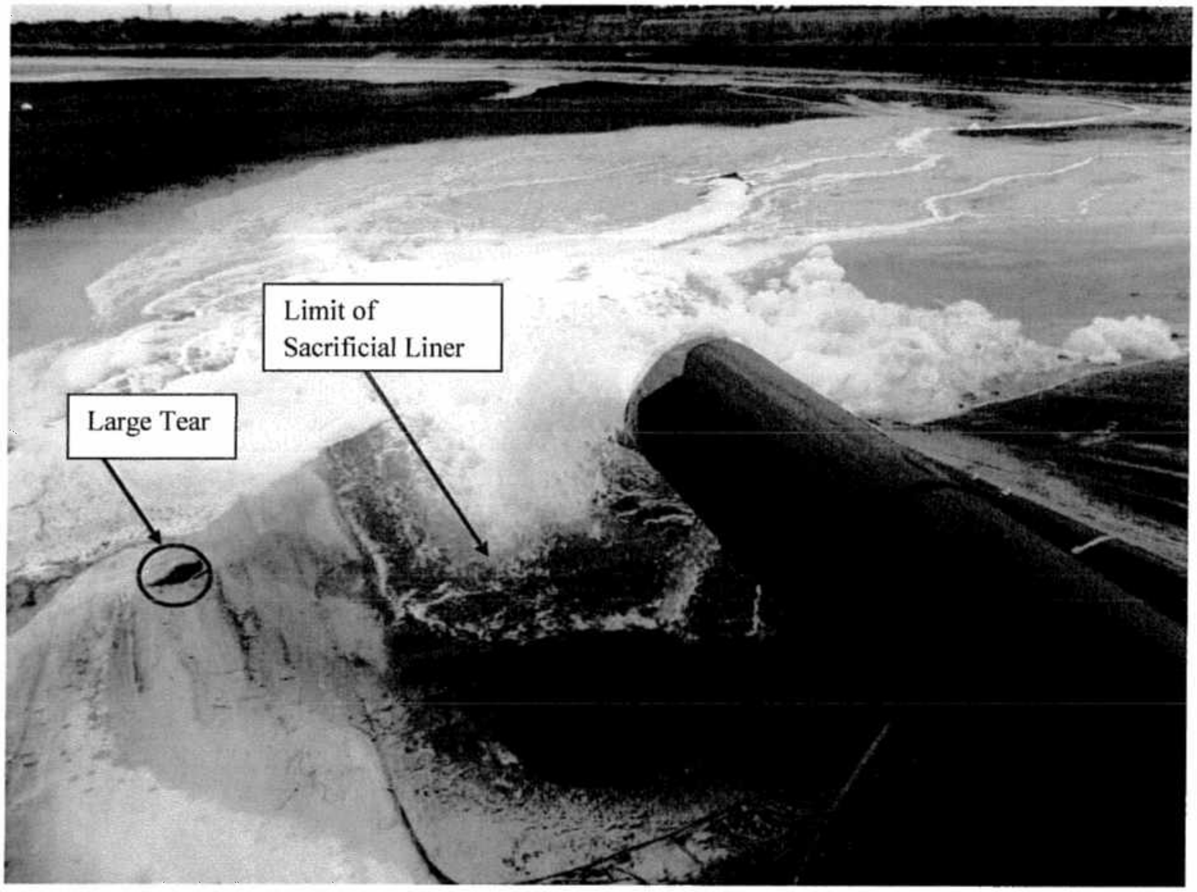

Figure 62: Tear in Liner and Outfall Exceeds Sacrificial Liner

Permanent Disposal Pond (PDP) #5

PDP #5 is located approximately 2,000 ft west of the Martin Lake Steam Electric Station's generating units. PDP #5 was built on top of PDPs #1, 2 and 3 which had reached their permitted capacity. The floor of the pond is approximately 29 acres in size. The pond is surrounded by a berm whose top elevation is approximately 406 feet. The pond is approximately 2 feet deep at the center and approximately 14 feet deep along the perimeter (average depth 8.9 feet). The pond can hold approximately 306,000 cubic yards (62 million gallons) at the maximum operating elevation of 404 feet. The pond has a two foot freeboard depth. At the time of the inspection, the pond had an elevation of 399 feet 7 inches with a freeboard depth of 4 feet 5 inches. Construction of this pond was completed in 2011.

The crest of the impoundment was found to be in good condition around the perimeter of the pond (Figures 63and 64).

Figure 63: Crest of Pond

Figure 64: Crest of Pond

MODERATE ITEM: In general, the upstream embankment was in good condition. Minor to moderate erosion rills were found around the entire interior of the pond (Figures 65 and 66).

Recommendation 1: Continue to monitor for erosion.

Recommendation 2: Backfill bare erosion gullies with compacted cohesive soil and reestablish vegetation.

Recommendation 3: Raise pond level to minimize erosion to protective cover.

Figure 65: Minor Erosion Rills Upstream Face

Figure 66: Moderate Erosion Rills Upstream Face

MODERATE ITEM: Small bushes were beginning to grow around the entire interior perimeter of the upstream embankment (Figure 67).

Recommendation 1: Remove bushes or apply herbicide.

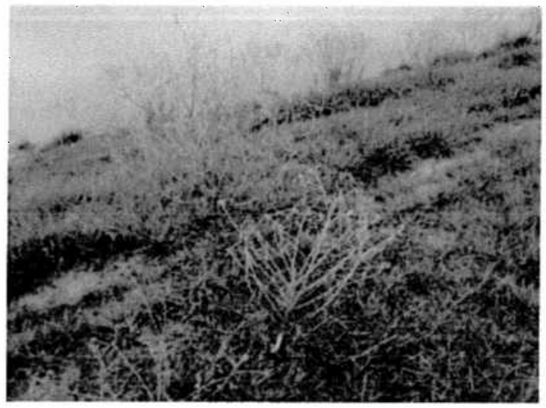

Figure 67: Bushes Growing on Upstream Embankment

CRITICAL ITEM: A portable submersible pump was placed on the Decant Structure on the south end of the impoundment (Figure 68). This pump was resting on the pond floor potentially impacting the clay liner underneath it.

Recommendation 1: Elevate the submersible pump off the pond floor.

Recommendation 2: This structure was designed to accommodate an additional fixed submersible pump off the end of the platform. Provide an additional fixed pump.

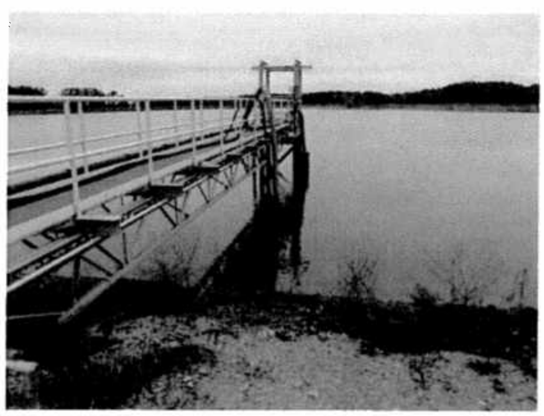

Figure 68: Submersible Pump at Decant Structure

MODERATE ITEM: The overflow return line at the southeast, southwest and northeast sump access structures was separated from the structure (Figures 69, 70 and 71). In the event of an uncontrolled release of water, this pipe returns the water to the pond.

Recommendation 1: Reinstall pipe.

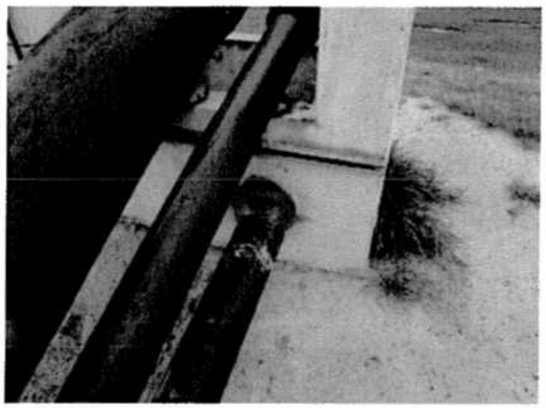

Figure 69: Return Line Southeast Structure

Figure 70: Return Line Southwest Structure

Figure 71: Return Line Northeast Structure

Additional protective rails were installed on the Slurry Channel (Figure 72) in 2011 to prevent erosion to the protective cover from slurry splashing. These appeared to be effective and no slurry splash erosion concerns were noted during this inspection.

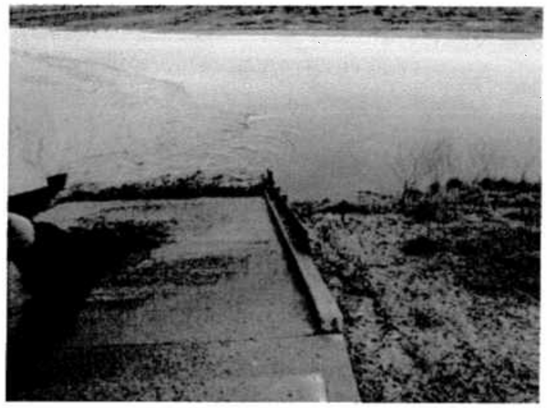

Figure 72: Slurry Channel with Protective Rails

In general, the downstream side of the impoundment was in good condition (Figures 73 and 74). The grass was beginning to take hold and grow after the prolonged drought. At the time of the inspection, the grass was well maintained.

Figure 73: Downstream Side of Impoundment

Figure 74: Downstream Side of Impoundment

MODERATE ITEM: Bare areas and minor erosion rills were beginning to form in isolated areas around the perimeter of the impoundment (Figures 75 and 76).

Recommendation 1: Reseed and reestablish vegetation in these bare areas.

Recommendation 2: Continue to monitor these areas (after vegetation established) for additional erosion.

Figure 75: Minor Erosion Rills

Figure 76: Minor Erosion Rills

MODERATE ITEM: Erosion gullies were found at the southern access ramp (Figure 77), slurry transmission line (Figure 78), northeast sump access structure (Figure 79) and where the PDP #3 cap terminates near the southeast corner (Figure 80) of the landfill.

Recommendation 1: Backfill bare erosion gullies with compacted cohesive soil and reestablish vegetation.

Recommendation 2: Place riprap in areas of concentrated flow.

Recommendation 3: Continue to monitor areas after repairs for additional erosion.

Figure 77: Erosion at South Access Ramp

Figure 78: Erosion at Slurry Transmission Line

Figure 79: Erosion at Northeast Access Structure

Figure 80: Erosion at PDP #3 Cap

MODERATE ITEM: A large bush is growing near the southeast dewatering access structure (Figure 81)

Recommendation 1: Remove bush and repair disturbed area.

Figure 81: Bush near Southeast Dewatering Access Structure

MINOR ITEM: Water is ponding at the southeast corner of the PDP #3 cap (Figure 82). It is assumed the water was from recent storm activities, but this could also represent water migrating from PDP #5.

Recommendation 1: Continue to monitor this area, especially during dry (rain free) periods to determine if this is storm water or water migrating from the pond.

Recommendation 2: Continue to monitor toe drain discharge and ensure dewatering wells are operational.

Recommendation 3: Provide compacted cohesive soil and grade to eliminate the ponding area.

Figure 82: Ponded Water on PDP #3 Cap

MINOR ITEM: Two large corrugated plastic pipes were located on the north downstream side of PDP #1 (Figures 83 and 84). No water was noticed exiting the pipes during the inspection.

Recommendation 1: Continue to monitor these pipes for discharge.

Figure 83: Corrugated Plastic Pipe

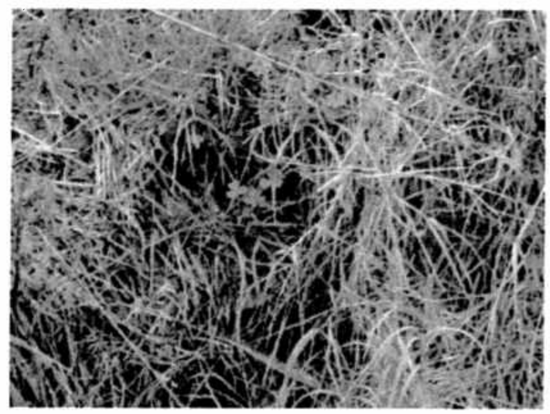

Figure 84: Corrugated Plastic Pipe

MODERATE ITEM: There was downstream erosion at the PDP #1 embankment (Figure 85) which appeared to initiate from the eastern corrugated pipe.

Recommendation 1: Backfill bare erosion gullies with compacted cohesive soil and reestablish vegetation.

Recommendation 2: Place riprap in areas of concentrated flow.

Recommendation 3: Continue to monitor areas after repairs for additional erosion.

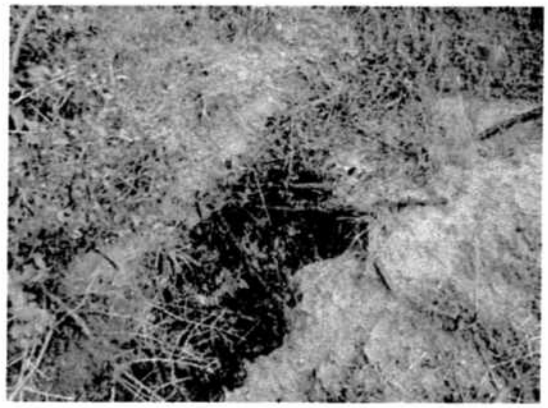

Figure 85: Erosion on Downstream Face of PDP #1 Berm

MINOR ITEM: The downstream toe of PDP #3 appeared to have been excavated recently (Figure 86).

Recommendation 1: Reestablish toe with compacted cohesive soil and re-vegetate.

Recommendation 2: Continue to monitor this location for possible slope slides, seepage, unusual movement and abutment contact problems.

Figure 86: Downstream Toe of PDP #3 Berm

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ATTACHMENT 1

Inspection Checklists

IMPOUNDMENT INSPECTION CHECKLIST

Impoundment: East Bottom Ash Pond	Inspection Date:2/6/12	Weather: Partly Overcast
Inspected By: Mark Kelly, Isaac Turner and Dave Vogt	Last Inspection Date: 1/25/11	

Element	Item	Component	Current Observations	Change From Last Inspection				Action				
				Similar	Improved	Deteriorated	Unknown	OK	Critical	Moderate	Minor	Monitor
Crest	1	Surface Cracking		X				X				
	2	Animal Burrows		X				X				
	3	Crest Sinks		X				X				
	4	Horizontal Alignment		X				X				
	5	Ruts/Puddles		X				X				
	6	Vegetation		X				X				
	7	Trees		X				X				
	8	Piezometer Readings					X					
	9	Piezometer Condition					X					
Upstream Embankment and Cap Area	10	Cap Erosion		X				X				
	11	Cap Vegetation/Trees		X				X				
	12	Berm Slide, Slough		X				X				
	13	Slope Protection		X				X				
	14	Berm Sinks		X				X				
	15	Animal Burrows		X				X				
	16	Abutment Contact		X				X				
	17	Erosion		X				X				
	18	Vegetation		X				X				
	19	Trees		X				X				
	20	Drains		X				X				
	21	Berm Bulges		X				X				
Downstream Embankment	22	Wet Areas/Seepage		X				X				
	23	Estimated Seepage Rate		X				X				
	24	Seepage Description		X				X				
	25	Toe Drain Status		X				X				
	26	Berm Slide/Slough		X				X				
	27	Abutment Contact		X				X				
	28	Animal Burrows		X				X				
	29	Erosion		X				X				
	30	Unusual Movement		X				X				
	31	Vegetation		X				X				
	32	Trees		X				X				
	33	Piezometer Reading					X					
	34	Piezometer Condition					X					

Comments and Photo Information:

IMPOUNDMENT INSPECTION CHECKLIST

Impoundment: Emergency Sludge Pond	Inspection Date:2/6/12	Weather: Partly Overcast
Inspected By: Mark Kelly, Isaac Turner and Dave Vogt	Last Inspection Date: 1/25/11	

Element	Item	Component	Current Observations	Change From Last Inspection					Action				
				Similar	Improved	Deteriorated	Unknown		OK	Critical	Moderate	Minor	Monitor
Crest	1	Surface Cracking		X					X				
	2	Animal Burrows		X					X				
	3	Crest Sinks		X					X				
	4	Horizontal Alignment		X					X				
	5	Ruts/Puddles		X							X		
	6	Vegetation		X					X				
	7	Trees		X					X				
	8	Piezometer Readings					X						
	9	Piezometer Condition					X						
Upstream Embankment and Cap Area	10	Cap Erosion		X					X				
	11	Cap Vegetation/Trees		X							X		
	12	Berm Slide, Slough		X					X				
	13	Slope Protection		X					X				
	14	Berm Sinks		X					X				
	15	Animal Burrows		X					X				
	16	Abutment Contact		X					X				
	17	Erosion		X					X				
	18	Vegetation		X					X				
	19	Trees		X					X				
	20	Drains		X					X				
	21	Berm Bulges		X					X				
Downstream Embankment	22	Wet Areas/Seepage		X					X				
	23	Estimated Seepage Rate		X					X				
	24	Seepage Description		X					X				
	25	Toe Drain Status		X					X				
	26	Berm Slide/Slough		X					X				
	27	Abutment Contact		X					X				
	28	Animal Burrows		X					X				
	29	Erosion		X					X				
	30	Unusual Movement		X					X				
	31	Vegetation		X							X		
	32	Trees		X					X				
	33	Piezometer Reading					X						
	34	Piezometer Condition					X						

Comments and Photo Information:
Moderate Item: Hose leak found from portable pump.
Moderate Item: Valve leak at pump station.

IMPOUNDMENT INSPECTION CHECKLIST

Impoundment: West Bottom Ash Pond	Inspection Date:2/6/12	Weather: Partly Overcast
Inspected By: Mark Kelly, Isaac Turner and Dave Vogt	Last Inspection Date: 1/25/11	

Element	Item	Component	Current Observations	Change From Last Inspection				Action				
				Similar	Improved	Deteriorated	Unknown	OK	Critical	Moderate	Minor	Monitor
Crest	1	Surface Cracking		X				X				
	2	Animal Burrows		X				X				
	3	Crest Sinks		X				X				
	4	Horizontal Alignment		X				X				
	5	Ruts/Puddles		X						X		
	6	Vegetation		X				X				
	7	Trees		X				X				
	8	Piezometer Readings					X					
	9	Piezometer Condition					X					
Upstream Embankment and Cap Area	10	Cap Erosion		X				X				
	11	Cap Vegetation/Trees		X				X				
	12	Berm Slide, Slough		X				X				
	13	Slope Protection		X				X				
	14	Berm Sinks		X				X				
	15	Animal Burrows		X				X				
	16	Abutment Contact		X				X				
	17	Erosion		X				X				
	18	Vegetation		X				X				
	19	Trees		X				X				
	20	Drains		X				X				
	21	Berm Bulges		X				X				
Downstream Embankment	22	Wet Areas/Seepage		X				X				
	23	Estimated Seepage Rate		X				X				
	24	Seepage Description		X				X				
	25	Toe Drain Status		X				X				
	26	Berm Slide/Slough		X						X		
	27	Abutment Contact		X				X				
	28	Animal Burrows		X				X				
	29	Erosion		X						X		
	30	Unusual Movement		X				X				
	31	Vegetation		X				X				
	32	Trees		X				X				
	33	Piezometer Reading					X					
	34	Piezometer Condition					X					

Comments and Photo Information:
Minor Item: Transmission pipe seepage/leakage

IMPOUNDMENT INSPECTION CHECKLIST

Impoundment: Storm Water Retention Pond	Inspection Date:2/6/12	Weather: Partly Overcast
Inspected By: Mark Kelly, Isaac Turner and Dave Vogt	Last Inspection Date: 1/25/11	

Element	Item	Component	Current Observations	Change From Last Inspection				Action				
				Similar	Improved	Deteriorated	Unknown	OK	Critical	Moderate	Minor	Monitor
Crest	1	Surface Cracking		X				X				
	2	Animal Burrows		X				X				
	3	Crest Sinks		X				X				
	4	Horizontal Alignment		X				X				
	5	Ruts/Puddles		X						X		
	6	Vegetation		X				X				
	7	Trees		X				X				
	8	Piezometer Readings					X					
	9	Piezometer Condition					X					
Upstream Embankment and Cap Area	10	Cap Erosion		X				X				
	11	Cap Vegetation/Trees		X				X				
	12	Berm Slide, Slough		X				X				
	13	Slope Protection		X				X				
	14	Berm Sinks		X				X				
	15	Animal Burrows		X				X				
	16	Abutment Contact		X				X				
	17	Erosion		X						X		
	18	Vegetation		X				X				
	19	Trees		X				X				
	20	Drains		X				X				
	21	Berm Bulges		X				X				
Downstream Embankment	22	Wet Areas/Seepage		X				X				
	23	Estimated Seepage Rate		X				X				
	24	Seepage Description		X				X				
	25	Toe Drain Status		X				X				
	26	Berm Slide/Slough		X						X		
	27	Abutment Contact		X				X				
	28	Animal Burrows		X						X		
	29	Erosion		X						X		
	30	Unusual Movement		X				X				
	31	Vegetation		X				X				
	32	Trees		X				X				
	33	Piezometer Reading					X					
	34	Piezometer Condition					X					

Comments and Photo Information:
Moderate Item: Fuel spill located at southwest corner

IMPOUNDMENT INSPECTION CHECKLIST

Impoundment: Permanent Disposal Pond #4	Inspection Date:2/7/12	Weather: Partly Overcast
Inspected By: Mark Kelly, Isaac Turner and Dave Vogt	Last Inspection Date: 1/25/11	

Element	Item	Component	Current Observations	Change From Last Inspection				Action				
				Similar	Improved	Deteriorated	Unknown	OK	Critical	Moderate	Minor	Monitor
Crest	1	Surface Cracking		X				X				
	2	Animal Burrows		X				X				
	3	Crest Sinks		X				X				
	4	Horizontal Alignment		X				X				
	5	Ruts/Puddles		X				X				
	6	Vegetation		X				X				
	7	Trees		X				X				
	8	Piezometer Readings					X					
	9	Piezometer Condition					X					
Upstream Embankment and Cap Area	10	Cap Erosion		X						X		
	11	Cap Vegetation/Trees		X				X				
	12	Berm Slide, Slough		X						X		
	13	Slope Protection		X						X		
	14	Berm Sinks		X				X				
	15	Animal Burrows		X				X				
	16	Abutment Contact		X				X				
	17	Erosion		X						X		
	18	Vegetation		X				X				
	19	Trees		X				X				
	20	Drains		X				X				
	21	Berm Bulges		X				X				
Downstream Embankment	22	Wet Areas/Seepage		X				X				
	23	Estimated Seepage Rate		X				X				
	24	Seepage Description		X				X				
	25	Toe Drain Status		X				X				
	26	Berm Slide/Slough		X				X				
	27	Abutment Contact		X				X				
	28	Animal Burrows		X				X				
	29	Erosion		X				X				
	30	Unusual Movement		X				X				
	31	Vegetation		X				X				
	32	Trees		X				X				
	33	Piezometer Reading					X					
	34	Piezometer Condition					X					

Comments and Photo Information:
Moderate Item: Minor tears from metal pickets
Critical Item: Large tear near discharge piping outfall
Moderate Item: Sacrificial liner to small

IMPOUNDMENT INSPECTION CHECKLIST

Impoundment: Permanent Disposal Pond #5	Inspection Date:2/7/12	Weather: Partly Overcast
Inspected By: Mark Kelly, Isaac Turner and Dave Vogt	Last Inspection Date: 1/25/11	

Element	Item	Component	Current Observations	Change From Last Inspection				Action				
				Similar	Improved	Deteriorated	Unknown	OK	Critical	Moderate	Minor	Monitor
Crest	1	Surface Cracking		X				X				
	2	Animal Burrows		X				X				
	3	Crest Sinks		X				X				
	4	Horizontal Alignment		X				X				
	5	Ruts/Puddles		X				X				
	6	Vegetation		X				X				
	7	Trees		X				X				
	8	Piezometer Readings					X					
	9	Piezometer Condition					X					
Upstream Embankment and Cap Area	10	Cap Erosion		X				X				
	11	Cap Vegetation/Trees		X				X				
	12	Berm Slide, Slough		X				X				
	13	Slope Protection		X				X				
	14	Berm Sinks		X				X				
	15	Animal Burrows		X				X				
	16	Abutment Contact		X				X				
	17	Erosion		X						X		
	18	Vegetation		X						X		
	19	Trees		X				X				
	20	Drains		X				X				
	21	Berm Bulges		X				X				
Downstream Embankment	22	Wet Areas/Seepage		X							X	
	23	Estimated Seepage Rate		X				X				
	24	Seepage Description		X				X				
	25	Toe Drain Status		X				X				
	26	Berm Slide/Slough		X				X				
	27	Abutment Contact		X				X				
	28	Animal Burrows		X				X				
	29	Erosion		X						X	X	
	30	Unusual Movement		X				X				
	31	Vegetation		X						X		
	32	Trees		X				X				
	33	Piezometer Reading					X					
	34	Piezometer Condition					X					

Comments and Photo Information:
Critical Item – Submersible pump on clay liner
Moderate Item – Return lines separated from sump access structures

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NOT IN SCOPE

ATTACHMENT 3

Inspection Maps

POINT NO.	NORTHING	EASTING	DESCRIPTION
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3	[illegible]	[illegible]	RUT
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5	[illegible]	[illegible]	LEAKING PIPE
6	[illegible]	[illegible]	RUT
7	[illegible]	[illegible]	POND & RUT
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9	[illegible]	[illegible]	SLOPE EROSION
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26	[illegible]	[illegible]	EROSION GULLY
27	[illegible]	[illegible]	EROSION GULLY
28	[illegible]	[illegible]	TRIPPING HAZARD
29	[illegible]	[illegible]	EROSION GULLY
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31	[illegible]	[illegible]	RUT
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33	[illegible]	[illegible]	BUSH
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56	[illegible]	[illegible]	RUT
57	[illegible]	[illegible]	EROSION
58	[illegible]	[illegible]	EROSION

Luminant

HDR
HDR ENGINEERING, INC.
17111 Preston Road
Suite 200
Dallas, Texas 75248
Texas P.E. Firm
Firm Registration No. F-754

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	
DRAWN BY	B.COX
QA/QC	
PROJECT NUMBER	179596

PRELIMINARY
FOR INTERIM REVIEW ONLY. NOT FOR PERMITTING, BIDDING, OR CONSTRUCTION.
Prepared by or under the Direct Supervision of
DAVID C. VOGT, P.E. 86865
4/20/2012

MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

IMPOUNDMENT INSPECTIONS
SHEET 1 OF 3

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SCALE
SHEET ML1

DATE 4/20/2012
TIME 5:55:02 AM
USER rcox
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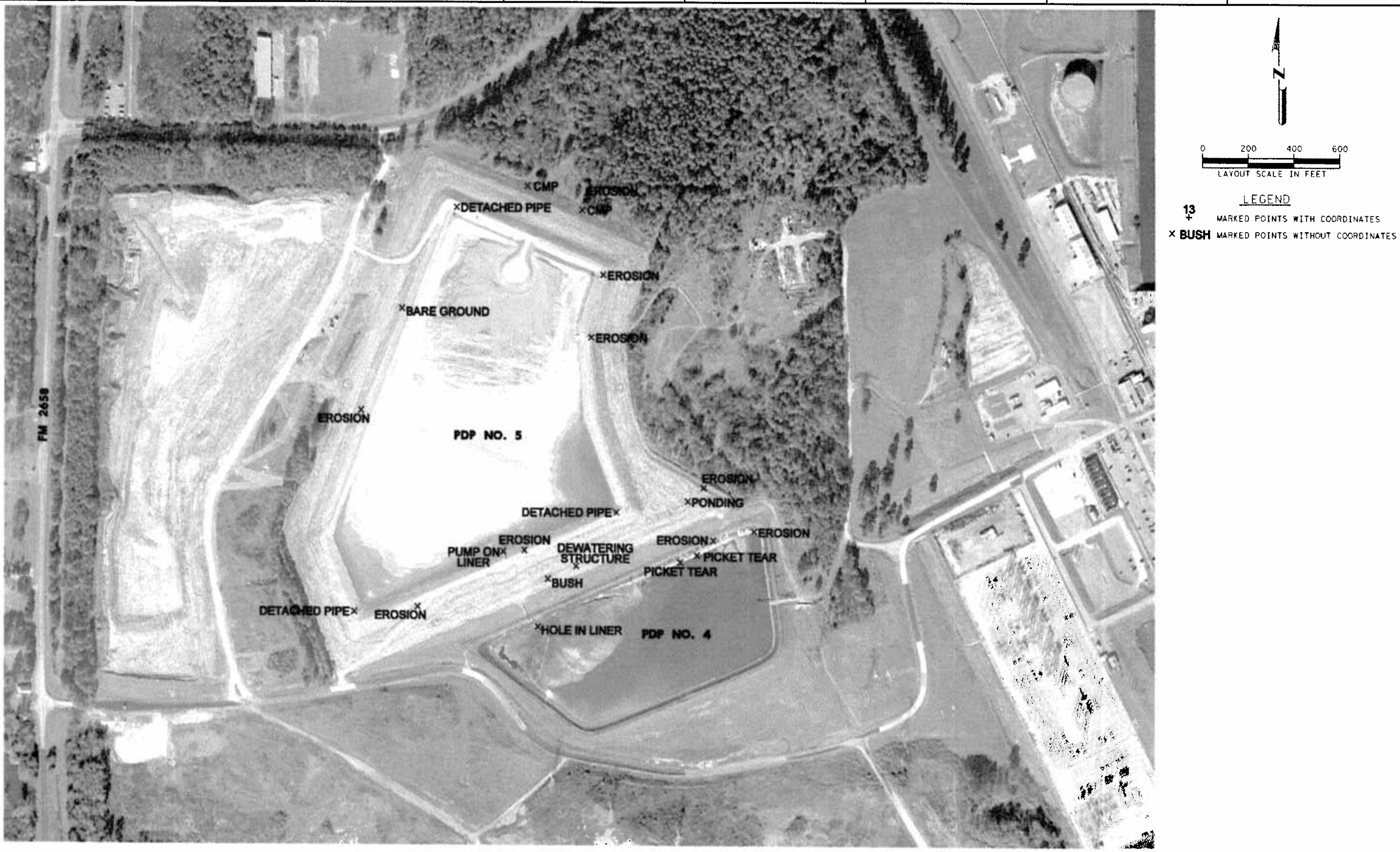
PENTABLE 179596.tbl
FILENAME ML_SP01.dgn



Luminant

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4/20/2012

MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

IMPOUNDMENT INSPECTIONS
SHEET 3 OF 3

FILENAME ML_SP03.dgn
SCALE
SHEET ML3

DATE 4/23/2012
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USER rcox
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PENTABLE 179596.tbl
FILENAME ML_SP03.dgn

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APPENDIX A

Document 2

Luminant Martin Lake SES, Reline East Ash Disposal Pond, Tatum, Texas Geotechnical Investigation

ETTL Engineers & Consultants Inc.
GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

December 12, 2008

Dave Vogt, P.E.
HDR Engineering, Inc.
4500 West Eldorado Parkway, Suite 3500
McKinney, Texas 75070

SUBJECT: Luminant Martin Lake SES, Reline East Ash Disposal Pond, Tatum, Texas
Geotechnical Investigation
ETTL Job No. G2972-081

Dear Mr. Vogt:

Submitted herein is the report summarizing the results of a geotechnical investigation conducted at the site of the above referenced project.

If you have any questions concerning this report, or if we can be of further assistance during construction, please contact us. We are available to perform any construction materials testing and inspection services that you may require.

Thank you for the opportunity to be of service.

Sincerely,
ETTL Engineers & Consultants Inc.

Robert M. Duke, P.E.
Senior Project Manager

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Geotechnical Investigation
Luminant Martin Lake SES
Reline East Ash Disposal Pond
Tatum, Texas

Submitted to

HDR Engineering, Inc.
McKinney, Texas

Prepared by

ETTL Engineers & Consultants Inc.
Tyler, Texas

December 2008

EXECUTIVE SUMMARY

This Executive Summary is provided as a brief synopsis of the specific recommendations and design criteria provided in the attached report. It is not intended as a substitute for a thorough reading of the report in its entirety.

Project Description

Relining the east ash pond, which is approximately 10.4 acres in size, to meet TCEQ guidelines. The ash was removed prior to this investigation. The pond may be double lined with 60-mil HDPE or other dual layer liner system approved by TCEQ. A single layer CCL (compacted clay liner) may also be acceptable. Ballast or a groundwater dewatering system will be necessary.

Site Description

Existing pond is located east of the existing Martin Lake Plant and west of the lake. The top of the existing containment berm is approximate elevation 330 ft msl. The lake has a normal pool elevation of 306 ft msl. The containment berms have approximate 3H:1V slopes front and back.

Depth & Number of Borings

11 borings 40 feet deep and one boring to 100 feet deep around the perimeter of the ash area. Three borings were deleted on site in the center of the pond due to the standing water. Therefore, the ash thickness was not determined, however, the ash was removed previously. It is possible that the bottom liner was also removed.

Ash and Soils Encountered

None of the borings were drilled in the center of the pond due to limited access (pond was full of water). The ash from a previous investigation (G2810-081) classifies as poorly graded sand (SP) in some locations to silt (ML) in other locations. The borings through the fill material (in the containment berm) encountered primarily medium stiff to hard sandy lean clay (CL) and/or loose to medium dense clayey sand (SC) with one layer of stiff fat clay (CH) in B-7. The soils near the terminal depth of the borings consist of medium dense silty sand (SM) or clayey sand (SC). The deep boring (B-14) had intermittent layers of hard lean clay (CL) within the very dense silty sand (SM). Some lignite was also encountered. Atterberg Plasticity Indices of the tested soils ranged from 3 to 36.

Groundwater Depth

Perched water is contained within the berm. In the borings through the berm, the groundwater varied from 21 to 26 feet below the top of the berm (groundwater elevation of approximately 304 to 309 ft msl).

Proposed Liner

The proposed liner is feasible considering the settlement induced in the existing and proposed liner and a slope stability analysis of the proposed ultimate configuration (i.e. pond full of ash and water). However, the pond must be dewatered prior to installation. After placing the new liner, ash may be placed to the top of berm elevation (el. 330). The 3H:1V berm slopes are acceptable. Steeper slopes will be difficult to maintain with equipment. The final configuration is predicted to have a factor of safety of 1.6 or greater in the long term. Rapid drawdown of the level of water in the pond prior to placing the new liner does not adversely affect the predicted overall stability factor of safety (predicted to be 1.9 in this instance). Settlement at the top of the existing pond bottom (base of new containment berm) is predicted to range from 6 to 8 inches as a maximum. We do not anticipate any unacceptable stresses induced in the liner for settlement in this range.

TABLE OF CONTENTS

1.0 INTRODUCTION

This study was performed at the request and authorization to proceed granted by Kevin Shepard, P.E. with HDR Engineering Inc., Dallas, Texas in accordance with our proposal dated July 24, 2008. Field operations were conducted on October 6 to 10, 2008.

The purpose of this investigation was to define and evaluate the general subsurface conditions for relining of the east disposal pond in Tatum, Texas. Specifically, the study was planned to determine the following:

- Subsurface stratigraphy within the limits of exploratory borings;
- Classification, strength, expansive properties, and compressibility characteristics of the ash deposits and foundation soils;
- Slope stability and immediate and long term settlement of the elements of the proposed expansion;
- Construction requirements; and
- Other construction related problems that may be anticipated.

To determine this information a variety of tests were performed on the soil and ash samples. The scope of testing for this report comprised Standard Penetration, Atterberg liquid and plastic limits, Percentage of Fines Passing the No. 200 sieve, Natural Moisture Content, and Consolidated Undrained Triaxial tests. These tests were conducted to classify the soil strata according to a widely used engineering classification system; identify, and provide quantitative data for active (expansive) soils; define shear strength characteristics; predict total settlement; and assess construction workability of the soils.

The conclusions and recommendations that follow are based on limited information regarding site grading provided to ETTL by others. Borings were drilled at locations based on a site plan provided by the client. *Should any portion of it prove incorrect, this firm should be notified in order to assess the need for revisions to this report.*

2.0 PROJECT DESCRIPTION

The east disposal pond, which is to be used as temporary containment for coal combustion byproducts (CCBs) (such as fly ash, bottom ash, FGD solids) and other Class 2 Industrial wastes, was investigated for the purposes of determining the physical properties and thickness of the existing containment berms and ash and to provide global stability analysis and recommendations for relining the existing pond. The east ash pond is approximately 10.4 acres in size and will be relined to meet TCEQ guidelines. The pond may be double lined with 60-mil HDPE or other dual layer liner system approved by TCEQ. A single layer CCL (compacted clay liner) may also be acceptable. A leak detection system will also be provided. Ballast or a groundwater dewatering system will be necessary for the construction of the new liner.

3.0 SITE DESCRIPTION

The existing pond is located east of the existing Martin Lake SES Power Plant and west of the cooling lake. The top of the existing containment berm is approximate elevation 330 ft msl. The lake has a normal pool elevation of 306 ft msl. The containment berms have approximate 3H:1V slopes front and back. The bottom of the disposal pond is elevation 297 feet msl based on the current survey. Borings were not drilled inside the pond due to standing water.

4.0 FOUNDATION STRATIGRAPHY & PROPERTIES

Detailed on the boring logs are the specific types and depths of the various ash and soil strata encountered. None of the borings were drilled in the center of the pond due to limited access (pond was full of water). The ash from a previous investigation (G2810-081) classifies as poorly graded sand (SP) in some locations to silt (ML) in other locations. The borings through the fill material (in the containment berm) encountered primarily medium stiff to hard sandy lean clay (CL) and/or loose to medium dense clayey sand (SC) with one layer of stiff fat clay (CH) in B-7. The soils near the terminal depth of the borings consist of medium dense silty sand (SM) or clayey sand (SC). The deep boring (B-14) had intermittent layers of hard lean clay (CL) within the very dense silty sand (SM). Some lignite was also encountered. Atterberg Plasticity Indices of the tested soils ranged from 3 to 36.

5.0 GROUNDWATER OBSERVATIONS

Groundwater level and seepage depth were monitored during and upon completion of drilling as well as at some point following completion. Perched water is contained within the berm above the surrounding ground elevation and lake elevation at the time of drilling. In the perimeter borings through the berm, the groundwater varied from 21 to 26 feet below the top of the berm which is typically elevation 330. Therefore, measured groundwater elevations ranged from approximately 304 to 309 ft msl. Since the pond is located at the tip of a peninsula in the lake, the groundwater elevation is assumed to be equal to the normal pool elevation of the lake which is 306 feet msl. The higher readings are most likely due to the water contained inside the berms.

It should be noted, however, that seasonal groundwater conditions might vary throughout the year depending upon prevailing climatic conditions. This magnitude of variance will be largely dependent upon the duration and intensity of precipitation, surface drainage characteristics of the surrounding area, and significant changes in site topography.

6.0 PROPOSED DISPOSAL POND SECTION

The proposed reline will not change the containment berms around the perimeter of the existing pond. The berm height will remain the same. After constructing the new liner, additional ash will be backfilled against the berms, temporarily. The ash will be removed at a later date for use or to be placed in the permanent disposal ponds west of the plant. A worst case scenario was used for the design checks in this report. It was assumed that the ash may fill the pond to the top of berm elevation and that the ash will be completely saturated with water.

The additional ash (and water) will cause some additional settlement, which was checked in the section below to determine if it might cause distress in the pond liners. The slopes were also checked for stability.

6.1. Slope Stability Analysis

All embankment slopes must be stable with respect to shear failure through the embankment and the foundation strata. The existing embankments were investigated at the existing soil densities for design strength properties.

Slope stability was evaluated using the computer program GSTABL7 with STEDwin developed by Gregory Geotechnical Software. The program calculates the factor of safety for potential failure circles using several different methods. This analysis was conducted using the modified Bishop method. The program has an automatic search routine for determining the minimum factor of safety. The resulting analyses, which also show the cross section, are included in the Appendix.

Since the berms are constructed with clay, we have assumed, for the purpose of slope stability analysis, that the embankments will be modeled with this lowest strength material tested and that the CCBs will fill the pond to a maximum elevation of 330 ft msl. If the water is removed from the ash, the Factors of Safety would increase. Perched water is assumed to be equal to the top of the containment berm since the ash delivered to the pond is a slurry.

The "worst case" embankment was modeled to cover all of the proposed perimeter embankments. This would be the section on the east side where the lake is adjacent to the temporary disposal pond. The entire embankment was modeled using 85 percent of the average strength values determined from testing. The results were reduced to accommodate potential variations in the soil (or ash). The "post peak" friction angle and cohesion were used from the direct shears conducted in the previous investigations. Soil properties used in the analysis are summarized in **Table 6.1.1** below.

Table 6.1.1 - Summary of Stability Analysis Soil Parameters

Soil Type	Moist Unit Weight (pcf)	Effective Stress Parameters		Total Stress Parameters	
		Friction Angle	Cohesion (psf)	Friction Angle	Cohesion (psf)
Native Cohesionless Foundation Soils (minimum)	125	32/36 below elevation 270	0	32/36 below elevation 270	0
Clay Berm (CL) (minimum)	120	19.4	450	0	1200
Ash CCBs	90	37.4	0	37.4	0

Four cases are typically analyzed for slope stability: end of construction (short term), steady-state (long term), steady state with rapid drawdown and steady state with seismic. End of construction is not applicable for this project since the berms already exist. Seismic properties were derived from the USGS Spectral Response Maps using the 2006 IBC, Section 1613, "Earthquake Loads". For the evaluation of steady-state conditions, the soils were evaluated using *effective* stress parameters. Total stress parameters for the clay are based on saturated unconfined strength derived from the consolidated undrained strengths. Graphical representations of the slope stability results are included in the **Appendix**. Results of the analysis are summarized in **Table 6.1.2**, below.

The slope stability analyses were conducted using the worst case condition of completely filling the pond with the ash slurry. Therefore, the ash is completely saturated and the water was allowed to saturate the berm. This will not be likely since this condition would take years of saturation to occur, but is considered an extreme worst case. Lower volumes of ash and unsaturated berms will increase the factor of safety.

Table 6.1.2 – Embankment Slope Stability Results			
Case	**Strength Parameter**	**Factor of Safety**	**Required Factor of Safety**
End of Construction	Total Stress	N/A	1.3
Steady State	Effective Stress	1.6	1.5
Steady State Rapid Drawdown	Total Stress	1.9	1.3
Steady State with Seismic	Effective Stress	1.6	1.2

6.2 Settlement Potential

For the purpose of making a prediction of long-term settlement potential in the native soil due to embankment load, an assumption was made that the soil below the depth of exploration is about the same as that above this depth (very likely the case based on typical characteristics of these geologies). Settlement was based on assumption that the ash to be added will completely fill the pond and the average unit weight and the depth to the very hard soils was based on boring B-14. The maximum settlement of the foundation soils beneath the proposed new fill is predicted to range from about 6 to 8 inches. However, a portion of this settlement has already occurred when the pond was previously used. The amount of settlement potential remaining is dependent upon the depth of the ash previously in the pond. If the pond was previously filled halfway, then half of the settlement potential should remain (linear relationship). It is not anticipated that settlement in this range will be detrimental to the new liner.

Any new leachate collection system should have a slope of greater than 0.5% to insure that the pipe does not reverse the direction of flow. It would be better to have a slope of 1%.

6.3 Liner Foundation Preparation

Preparation prior to liner construction will require clearing and grubbing of the area. Strip the subgrade over the entire area to remove soft soil and any vegetation. Stripping of surface soils (or ash) should be to a minimum depth of approximately 1 foot. Greater depths of stripping may be required in the areas where weak, soft soils may be exposed during construction.

After completion of stripping, the exposed soil should be scarified, the moisture content adjusted, and then recompacted to the density specified for the embankment. Groundwater may be encountered based on the depth of water in the borings. Dewatering using wells, interception trenches, and or sump pits may be necessary to drop the water level for construction.

6.4 Liner Construction

The bottom and sides of the disposal area will require a new liner system. The liner system may consist of either a 3-foot compacted clay liner (CCL), a geosynthetic clay liner (GCL) or double lined with a 60-mil HDPE liner or other dual liner system approved by the TCEQ. The top component of a composite liner system typically consists of a geomembrane. Typical geomembrane materials used in waste disposal facilities include PVC, HDPE and VLDPE. The liner system is unknown at this time. However, if a soil liner is chosen, soils suitable for CCL's must meet the following requirements:

Test	**Specifications**
In-place Dry Density	95% of Maximum Standard Proctor (ASTM D 698) Dry Density
In-place Moisture Content	Standard Proctor Optimum Moisture Content or greater
Hydraulic Conductivity	1.0×10^{-7} cm/sec or less
Plasticity Index	15 minimum
Liquid Limit, percent	30 minimum
Percent Passing No. 200 Mesh Sieve	30 minimum
Percent Passing 1-inch Sieve	100

Representative preliminary sampling should be performed on stockpiled soils to be used as liner material. Prior to construction, conformance tests that include liquid limit, plastic limit, percent passing the no. 200 sieve, standard Proctor (ASTM D 698) compaction test and remolded hydraulic conductivity test should be performed for each different material proposed for liner construction. Additional conformance tests will be conducted if there are visual changes in borrow material or the liquid limit or plasticity index vary by more than 10 points.

The top component of the composite liner system will consist of a geomembrane. Typical geomembrane materials used in waste disposal facilities include PVC, HDPE and VLDPE. As a minimum the installation should follow the requirements of the TCEQ Liner Construction and Testing Handbook latest edition (Municipal Waste) and Technical Guide No. 3 (Industrial Waste).

6.5 Slope (and Cover) Protection

Earthen embankment slopes require some form of protection from excessive erosion. A good cover of approved grasses should provide adequate slope protection. A very effective method for protection consists of establishing a good grass cover. The existing slopes have a grass cover. Topsoil stripped from the foundation area may be used to plate areas that are to be seeded. Information for seeding for erosion control may be found in Item 164, "Seeding for Erosion Control," Texas Department of Transportation *Standard Specifications for Construction of Highways, Streets and Bridges,* 2004 Edition. The root system of healthy grass is more effective in retaining surficial soil against surface water erosion than other forms of vegetation. Bushes and trees of two feet or more in height are not considered satisfactory slope protection because of the harmful effect on grass and the safety hazards of trees near the roadways. A routine and periodic maintenance program should be implemented to prevent excessive growth. Animal control should also be considered an integral part of routine embankment maintenance.

7.0 GENERAL CONSTRUCTION CONSIDERATIONS

7.1 Design for Construction Below the Groundwater Table

7.1.1 General

The groundwater investigation (section 5 of this report) indicates that a potentiometric surface (inferred groundwater surface) will be encountered within the disposal area excavation during construction activities. This potentiometric surface may induce an uplift pressure on the installed liner system. The following section details the design to control potential hydrostatic uplift pressure caused by this hydrogeologic unit and thereby precluding damage to the integrity of the liner system.

The hydrogeologic characterization was reviewed to estimate the potential hydrostatic pressure conditions below the liner system. The potential hydrostatic pressure delineation is based on:

- The groundwater investigation performed for this expansion (Section 5, above).
- Ballast calculations conducted for the East Pond (see Appendix).
- Observation of field seepage conditions within the expansion area.
- Topographical survey (see Plate 1 - Plan of Borings).

A temporary hydrostatic relief underdrain should be designed to control the potential hydrostatic uplift pressures for those portions of the pond which will be impacted by the potentiometric surface. The use of the lateral drainage system is only required until enough fill (or waste) is in place above the floor and sidewalls to ballast any potential hydrostatic uplift, at which point the hydrostatic pressure relief underdrain operations may be discontinued with approval of the TCEQ (see Section 3.4.3).

7.1.2 Temporary Hydrostatic Pressure Relief Underdrain

A temporary underdrain system will be installed to collect seepage during construction and relieve any hydrostatic uplift pressures that may develop in those portions of the excavation that are below the water table. The underdrain is only required until enough protective cover and/or waste is in place above the impacted areas to ballast any potential hydrostatic uplift. Once sufficient ballast is in place and with the approval of TCEQ, the underdrain will be decommissioned.

The drainage layer should be placed over the prepared liner subgrade in areas where the seasonal high water table is indicated to be above the bottom of the liner. Any seepage occurring will be collected in the layer and drain to collection trenches. The collection trenches will drain to a sump where water will be removed by a submersible pump.

During construction, the subgrade must be kept at a surface-dry condition to provide a firm and unyielding subgrade for construction of the soil liner system. If seepage is encountered outside the designed lateral drainage layer, the wet soils should be over excavated and replaced with compacted clay to seal off the seepage or the underdrain should be extended to cover the wet areas.

7.1.3 Liner Ballast

Liner protection against long-term hydrostatic uplift pressures will be provided by the counteracting weight of the materials placed above the liner. Ballast may be required on the bottom above the saturated sands and silts due to hydrostatic pressure in the materials. This counteracting weight of materials over the liner, or *ballast*, includes the weight of the leachate collection system, protective cover, and waste. The ballast calculations do not include the weight of the soil liner as the soil liner could saturate with time and the hydrostatic pressure of the groundwater will be transferred to the relatively impermeable geomembrane. Example calculations for determining the height of waste or additional protective cover soil above the liner system is provided in the Appendix. Once the calculated height of waste has been achieved for each area, the temporary trench drains below the liner no longer need to remain operational and the groundwater can be allowed to rebound against the bottom of the liner system. A ballast evaluation report (BER) may be required by the TCEQ to (1) document that the adequate ballast height has been achieved to offset potential hydrostatic pressures for each lined area, and (2) to request that the temporary dewatering trench operations be discontinued. Once the BER is accepted by the TCEQ, operation of the temporary hydrostatic pressure relief trench below the area specified may be discontinued.

8.0 LIMITATIONS

Geotechnical design work is characterized by the presence of a calculated risk that soil and groundwater conditions may not have been fully revealed by the exploratory borings. This risk derives from the practical necessity of basing interpretations and design conclusions on a limited sampling of the subsoil stratigraphy at the project site. The number of borings and spacing is chosen in such a manner as to decrease the possibility of undiscovered anomalies, while considering the nature of loading, size and cost of the project. The recommendations given in this report are based upon the conditions that existed at the boring locations at the time they were drilled. The term "existing groundline" or "existing subgrade" refers to the ground elevations and soil conditions at the time of our field operations.

It is conceivable that soil conditions throughout the site may vary from those observed in the exploratory borings. If such discontinuities do exist, they may not become evident until construction begins or possibly much later. Consequently, careful observations by the geotechnical engineer must be made of the construction as it progresses to help detect significant and obvious deviations of actual conditions throughout the project area from those inferred from the exploratory borings. Should any conditions at variance with those noted in this report be encountered during construction, this office should be notified immediately so that further investigations and supplemental recommendations can be made.

This company is not responsible for the conclusions, opinions, or recommendations made by others based on the contents of this report. The recommendations made in this report are applicable only to the proposed structure(s) as defined in **SECTION 2.0 PROJECT DESCRIPTION**. The purpose of this study is only as stated elsewhere herein and is not intended to comply with the requirements of 30 TAC 330 Subchapter T regarding testing to determine the presence of a landfill. Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. No warranties are either expressed or implied.

APPENDIX

I.0 FIELD OPERATIONS

Subsurface conditions were defined by 11 sample core borings drilled to depths ranging from 40 to 100 feet. ETTL personnel drilled the borings at locations based on a site plan provided by the client. Field boring logs were prepared as drilling and sampling progressed. The final boring logs are also included in the Appendix. Descriptive terms and symbols used on the logs are in accordance with the Unified Soil Classification System (ASTM D 2487). A reference key is provided on the final page of this report.

A truck-mounted drill rig utilizing dry auger drilling procedures was used to advance the borings. Soils were sampled by means of a 1 3/8-inch I.D. by 24-inch long split-spoon sampler driven into the bottom of the borehole in accordance with ASTM D 1586 procedures. In conjunction with this sampling technique, the Standard Penetration Test was conducted by recording the N-value, which is the number of blows required by a 140-pound weight falling 30 inches to drive a split-spoon sampler 1 foot into the ground. For very dense strata, the number of blows is limited to a maximum of 50 blows within a 6-inch increment. Where possible, the sampler is "seated" six inches before the N-value is determined. The N-value obtained from the Standard Penetration Test provides an approximate measure of the relative density, which correlates with the shear strength of soil. The disturbed samples were removed from the sampler, logged, packaged, and transported to the laboratory for further identification and classification.

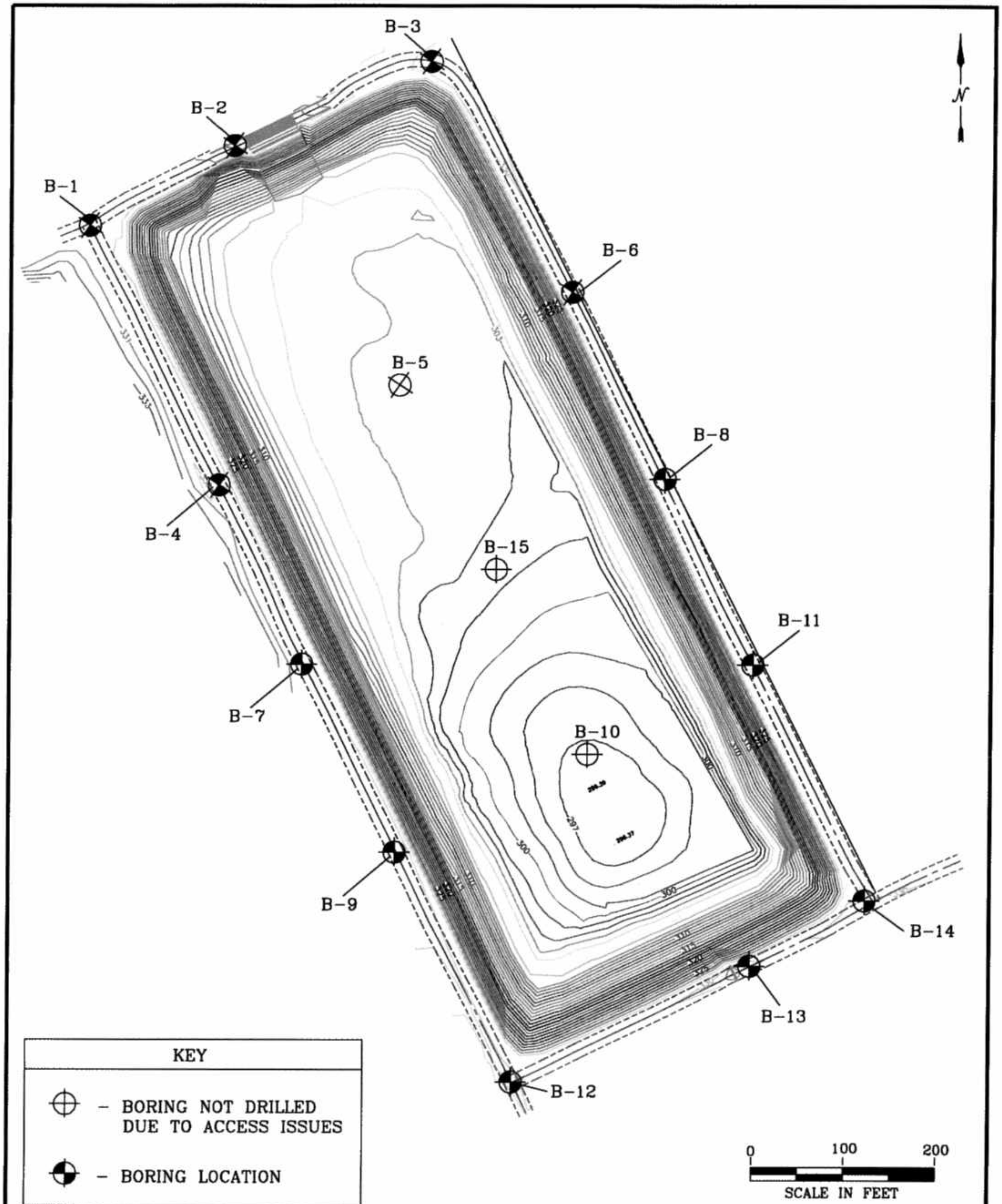
Soils were sampled by means of a 3-inch O.D. by 24-inch long thick-walled Shelby Tube sampler. Using the drilling rig's hydraulic pressure, the sampler was pushed smoothly into the bottom of the borehole. The consistency of these samples was measured in the field by a calibrated pocket penetrometer. These values, recorded in tons per square foot, are shown on the boring logs. Such samples were extruded in the field, logged, sealed to maintain *in situ* conditions, and packaged for transport to the laboratory.

All boreholes were backfilled with cuttings after collecting final groundwater readings. Samples obtained during our field studies and not consumed by laboratory testing procedures will be retained in our Tyler office free of charge for a period of 60 days. To arrange storage beyond this point in time, please contact the Tyler office.

II.0 LABORATORY TESTING

Upon return to the laboratory, a geotechnical engineer visually examined all samples and several specimens were selected for representative identification of the substrata. By determining the Atterberg liquid and plastic limits (ASTM D 4318) and percentage of fines passing the No. 200 sieve (ASTM D 1140), field classification of the various strata was verified. Also conducted were natural moisture content tests (ASTM D 2216).

Strength characteristics of the cohesive substrata were evaluated by conducting consolidated, undrained triaxial compression tests (ASTM D 4767) on selected undisturbed field samples obtained with the Shelby tube sampler. The results of these tests are either presented in the individual log of boring provided in this Appendix or as a separate result behind the logs in the Appendix.



ETTL ENGINEERS & CONSULTANTS MAIN OFFICE 1717 East Erwin Tyler, Texas 75702 (903) 595-4421	MARTIN LAKE LUMINANT EAST ASH DISPOSAL POND RUSK COUNTY, TEXAS	PLATE 1 - PLAN OF BORINGS JOB NO.: G 2972-08 DATE: NOV. 2008 — SCALE: AS SHOWN	APPROVED BY: DRAWN BY: K.C.R.

LOG OF BORING B-1

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/8/08

SURFACE ELEVATION

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	CL	SANDY LEAN CLAY(CL) hard; red, tan, and gray; mottled	P=4.5+					9	28	14	14	55	+40 Sieve =0%, +4 Sieve =0%
		--very stiff	P=3.75										
		--with trace lignite	P=3.0					16	37	14	23	66	+40 Sieve =1%, +4 Sieve =0%
			P=2.75										
10		--hard	P=4.5+										
			N=11										
20			N=16					17	39	16	23	70	+40 Sieve =1%, +4 Sieve =0%
	SM	SILTY SAND(SM) medium dense; red, tan, and gray	N=19										
30		--with gravel	N=22										
	CL	LEAN CLAY WITH SAND(CL) very stiff; red, tan, and gray; interbedded; laminated	N=17										
40		Bottom of Boring @ 40'											

Water Level Est: ▽ Measured: ▼ Perched: ▼

Water Observations: Seepage @ 28' while drilling. Water level @ 26' and open to 33' upon completion. Water level @ 24' and open to 27' on 10/9/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.850', W 94°33.910'

ETTL
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CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

LOG OF BORING B-11

DATE 10/7/08

SURFACE ELEVATION

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	SC	CLAYEY SAND(SC) tan, gray, and red; mottled; with gravel						6	28	12	16	33	+40 Sieve =28%, +4 Sieve =24%
			P=3.0										
			P=2.25										
	CL	SANDY LEAN CLAY(CL) very stiff; tan, gray, and red; mottled	N=17					13	32	13	19	56	+40 Sieve =1%, +4 Sieve =0%
10		--stiff	N=11										
20			P=2.25										
			P=3.25					16	38	14	24	68	+40 Sieve =1%, +4 Sieve =0%
30		–red and gray; mottled	P=2.25										
		–tan, red, and gray; mottled	N=15										
	SM	SILTY SAND(SM) medium dense; gray	N=16										
40		Bottom of Boring @ 40'											

Graph legend: BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0

Natural Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit; 20 40 60 80

Water Level Est.: ▽ Measured: ▼ Perched: ▼

Water Observations: Seepage @ 38' while drilling. Water level @ 36' and open to 37' upon completion. Water level @ 21' and open to 22' on 10/8/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.773', W 94°33.782'

LOG OF BORING B-12

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Martin Lake - Luminant East Ash Disposal, Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/9/08

SURFACE ELEVATION

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	CL	SANDY LEAN CLAY(CL) brown; with gravel							
				13	32	15	17	54	+40 Sieve =1%, +4 Sieve =0%
		--mottled; tan, red, and gray; with sand seams	P=3.5	13	34	15	19	57	+40 Sieve =0%, +4 Sieve =0%
10									
		--with silty sand							
	CL	LEAN CLAY WITH SAND(CL) very stiff; tan, red, and gray; mottled	N=18	16	30	14	16	75	+40 Sieve =1%, +4 Sieve =0%
20									
			N=15						
		--with sand seams	N=22						
30									
	SM	SILTY SAND(SM) dense; gray and red; mottled	N=38						
	CL	SANDY LEAN CLAY(CL) very stiff; gray, red, and tan; mottled	N=18						
40		Bottom of Boring @ 40'							

Columns also shown (no data): SAMPLES; WATER LEVEL (measured level marked at about 23'); BLOW COUNT (20–80) / Qu (tsf) (1–4) / PPR (tsf) (1.0–4.0) / Torvane (tsf) (1.0–4.0); DRY DENSITY (pcf); COMPRESSIVE STRENGTH (tsf); FAILURE STRAIN (%); CONFINING PRESSURE (psi); Natural Moisture Content and Atterberg Limits (Plastic Limit, Moisture Content, Liquid Limit; 20, 40, 60, 80).

Water Level Est: ▽ Measured: ▼ Perched: ▼

Water Observations: Seepage @ 33' while drilling. Water level @ 34' and open to 35' upon completion. Water level @ 23' and open to 31' on 10/10/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.696', W 94°33.830'

LOG OF BORING B-13

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/7/08

SURFACE ELEVATION

USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
CL	SANDY LEAN CLAY(CL) very stiff; tan, gray, and red; mottled	P=3.25						
CL	LEAN CLAY WITH SAND(CL) very stiff; tan, gray, and red; mottled	P=3.0	15	39	16	23	70	+40 Sieve =6%
	–tan and brown	P=3.75						
SC	CLAYEY SAND(SC) dense; tan, brown, and red; with gravel	P=3.25	10	40	16	24	47	+40 Sieve =36%, +4 Sieve =33%
CL	LEAN CLAY WITH SAND(CL) very stiff; tan, brown, and red; with lignite	P=2.75						
	–red and tan	P=2.0	17	38	16	22	74	+40 Sieve =3%, +4 Sieve =0%
		P=2.25						
	–tan, red, and gray; mottled	N=18						
SC	CLAYEY SAND(SC) loose; tan, red, and gray; with trace gravel and ferric material	N=9	18	36	17	19	43	+40 Sieve =36%, +4 Sieve =25%
	–medium dense	N=18						
	Bottom of Boring @ 40'							

Columns DRY DENSITY (pcf), COMPRESSIVE STRENGTH (tsf), FAILURE STRAIN (%), CONFINING PRESSURE (psi): no data.

Graph scales: BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0. Natural Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit; 20 40 60 80.

Depth (ft): 0, 10, 20, 30, 40

Water Level — Est.: ▽ Measured: ▼ Perched: ▼

Water Observations: Seepage @ 37' while drilling. Water level @ 36' and open to 38' upon completion. Water level @ 25' and open to 26' on 10/8/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.713', W 94°33.777'

LOG OF BORING B-14

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/6/08

SURFACE ELEVATION

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	CL	SANDY LEAN CLAY(CL) hard; tan, gray, and red; mottled; with gravel	P=4.5+										
			P=4.5+					14	40	16	24	53	+40 Sieve =50%, +4 Sieve =49%
			P=4.5+ P=4.5+										
10		--stiff	N=12					13	29	13	16	63	+40 Sieve =1%, +4 Sieve =0%
	CL	SANDY LEAN CLAY(CL) very stiff; tan, gray, and red; mottled	N=16										
20		--stiff; interbedded	N=14					16	31	16	15	58	+40 Sieve =2%, +4 Sieve =0%
			N=15										
30		--hard; brown, tan, and red	P=4.5+					12	40	14	26	77	+40 Sieve =1%, +4 Sieve =0%
			N=19										
40		--hard; with gray and brown silty sand	P=4.25										
	SM	SILTY SAND(SM) medium dense; red and gray; saturated											

Water Level Est.: ▽ Measured: ▼ Perched: ▼

Water Observations: Water level @ 22' and open to 89' upon completion. Water level @ 26' and open to 27' on 10/9/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.723', W 94°33.756'

LOG OF BORING B-14

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/6/08

SURFACE ELEVATION

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
			N=18						
50			N=16	22				25	+40 Sieve =1%, +4 Sieve =0%
		--red and tan	N=23						
60	CL	LEAN CLAY WITH SAND(CL) hard; red and tan; interbedded; laminated; with ferric material seams	N=32	22	53	29	24	77	+40 Sieve =3%, +4 Sieve =0%
		--with black lignite seams	N=50/3"						
70	SM	SILTY SAND(SM) very dense; gray; with fat clay partings	N=50/5.5"						
		--gray	N=50/5"						
80			N=50/6"	24	24	21	3	41	+40 Sieve =0%, +4 Sieve =0%
	CL	LEAN CLAY(CL) hard; gray	N=50/6"						

Columns also printed (no data): SAMPLES, WATER LEVEL, DRY DENSITY (pcf), COMPRESSIVE STRENGTH (tsf), FAILURE STRAIN (%), CONFINING PRESSURE (psi). Plot legends: BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0; Natural Moisture Content and Atterberg Limits — Plastic Limit, Moisture Content, Liquid Limit; 20 40 60 80.

Water Level Est.: ▽ Measured: ▼ Perched: ▼

Water Observations: Water level @ 22' and open to 89' upon completion. Water level @ 26' and open to 27' on 10/9/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.723', W 94°33.756'

LOG OF BORING B-14

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

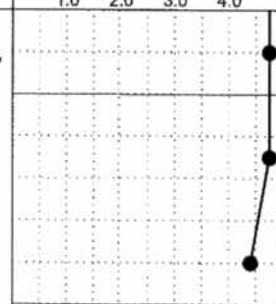
PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/6/08

SURFACE ELEVATION

DEPTH (ft)	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	BLOW COUNT / Qu (tsf) / PPR (tsf) / Torvane (tsf)	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits	MOISTURE CONTENT (%)	LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
90	–with black lignite	N=50/3.5"												
	–dark brown; with silt seams; with lignite seam	N=50/6"												
100		N=88												
	Bottom of Boring @ 100'													



Water Level — Est.: ▽ Measured: ▼ Perched: ▼

Water Observations: Water level @ 22' and open to 89' upon completion. Water level @ 26' and open to 27' on 10/9/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes: GPS Coordinates: N 32°15.723', W 94°33.756'

LOG OF BORING B-2

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/8/08

SURFACE ELEVATION

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	CL	SANDY LEAN CLAY(CL) very stiff; tan, red, and gray	N=19	8	32	14	18	50	+40 Sieve =0%, +4 Sieve =0%
		–hard; red, tan, and gray; mottled	P=4.25						
			P=3.75						
10			P=4.0						
		–with some gravel	P=4.5+						
20		–tan, red, and gray; mottled	N=1	17	28	15	13	63	+40 Sieve =1%, +4 Sieve =0%
		–gray, red, and tan; mottled	N=22	13	39	15	24	54	+40 Sieve =0%, +4 Sieve =0%
30	SM	SILTY SAND(SM) medium dense; red and gray; saturated	N=15						
			N=13						
40		Bottom of Boring @ 40'							

Water Level — Est.: ∇ Measured: ▼ Perched: ∇

Water Observations: Seepage @ 32' while drilling. Water level @ 29' and open to 32' upon completion. Water level @ 25' and open to 25' on 10/9/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.860', W 94°33.890'

LOG OF BORING B-3

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

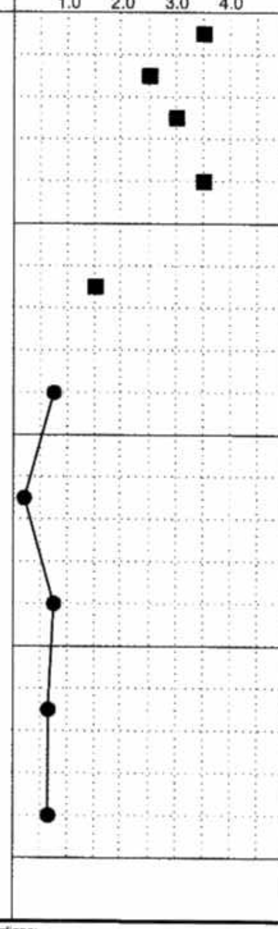
PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

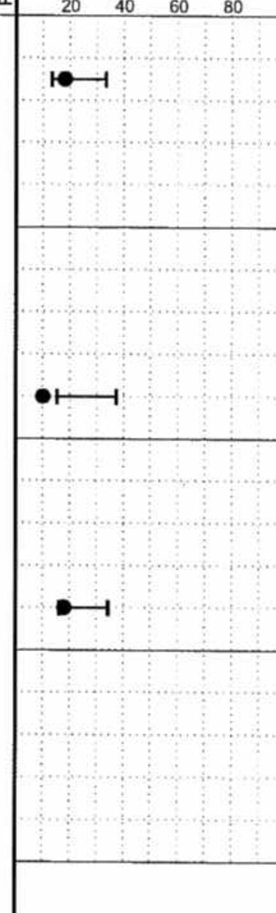
PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/8/08

SURFACE ELEVATION

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	CL	SANDY LEAN CLAY(CL) very stiff; tan, red, and gray; mottled	P=3.5										
			P=2.5					18	33	13	20	68	+40 Sieve =1%, +4 Sieve =0%
			P=3.0										
			P=3.5										
10		--stiff	P=1.5										
	SC	CLAYEY SAND(SC) medium dense; red	N=15					10	37	15	22	19	+40 Sieve =15%, +4 Sieve =7%
20		--gray	N=4										
	CL	LEAN CLAY WITH SAND(CL) stiff; red, tan, and gray; mottled	N=15					18	34	16	18	71	+40 Sieve =5%, +4 Sieve =0%
30		--with sand seams	N=13										
	SC	CLAYEY SAND(SC) medium dense; gray and red; mottled; with clay seams	N=13										
40		Bottom of Boring @ 40'											





Water Level Est.: ▽ Measured: ▼ Perched: ▽

Water Observations: Seepage @ 29' while drilling. Water level @ 28' and open to 34' upon completion. Water level @ 25' and open to 32' on 10/9/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.876', W 94°33.842'

LOG OF BORING B-4

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

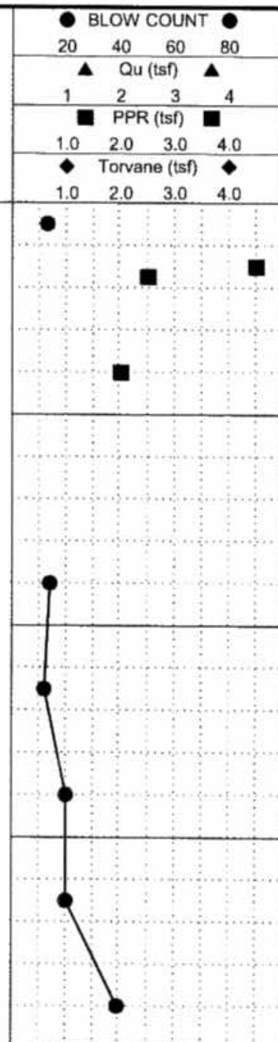
PROJECT: Martin Lake - Luminant East Ash Disposal, Rusk County, Texas

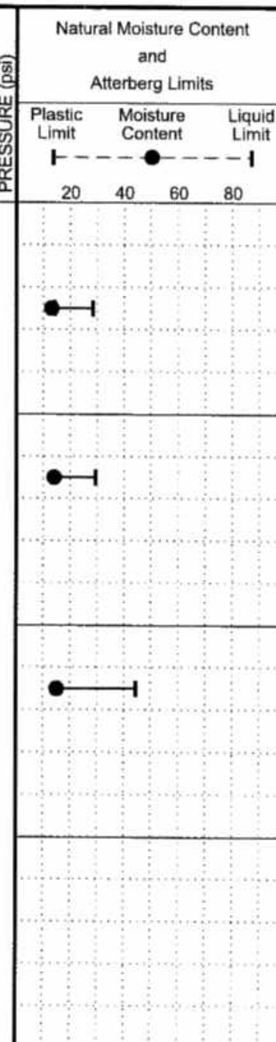
PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/8/08

SURFACE ELEVATION

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	CL	SANDY LEAN CLAY(CL) stiff; tan, red, and gray; mottled	N=13										
			P=2.5 P=4.5+					13	28	14	14	60	+40 Sieve =1%, +4 Sieve =0%
10			P=2.0										
	SC	CLAYEY SAND(SC) red, tan, and gray; mottled						14	29	14	15	36	+40 Sieve =0%, +4 Sieve =0%
20	CL	SANDY LEAN CLAY(CL) stiff; tan, red, and gray; mottled; with sand seams	N=14										
		–red and tan	N=12					15	44	15	29	67	+40 Sieve =0%, +4 Sieve =0%
30		–with sand seams	N=20										
	SM	SILTY SAND(SM) medium dense; red; saturated	N=20										
40		–red and tan; with gravel	N=39										
		Bottom of Boring @ 40'											





Water Level Est: ∇ Measured: ▼ Perched: ∇

Water Observations: Seepage @ 28' while drilling. Water level @ 27' and open to 30' upon completion. Water level @ 23' and open to 28' on 10/9/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.804', W 94°33.891'

LOG OF BORING B-6

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

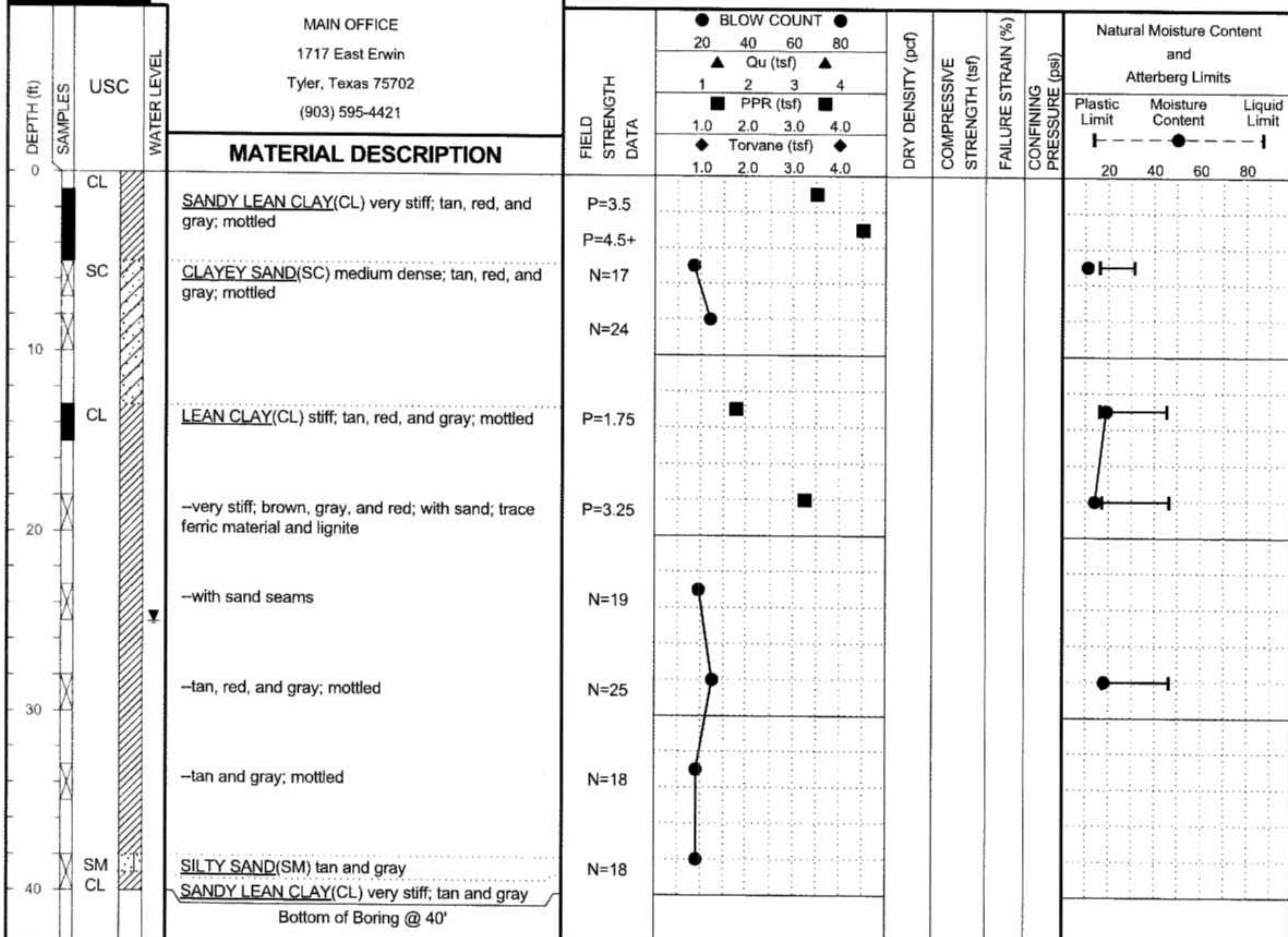
PROJECT: Martin Lake - Luminant East Ash Disposal, Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/7/08

SURFACE ELEVATION

USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
CL	SANDY LEAN CLAY(CL) very stiff; tan, red, and gray; mottled	P=3.5						
		P=4.5+						
SC	CLAYEY SAND(SC) medium dense; tan, red, and gray; mottled	N=17	11	31	16	15	43	+40 Sieve =1%, +4 Sieve =0%
		N=24						
CL	LEAN CLAY(CL) stiff; tan, red, and gray; mottled	P=1.75	19	45	16	29	88	+40 Sieve =0%, +4 Sieve =0%
	--very stiff; brown, gray, and red; with sand; trace ferric material and lignite	P=3.25	14	46	17	29	74	+40 Sieve =0%, +4 Sieve =0%
	--with sand seams	N=19						
	--tan, red, and gray; mottled	N=25	18	46	17	29	84	+40 Sieve =8%, +4 Sieve =3%
	--tan and gray; mottled	N=18						
SM	SILTY SAND(SM) tan and gray	N=18						
CL	SANDY LEAN CLAY(CL) very stiff; tan and gray							
	Bottom of Boring @ 40'							



Water Level Est: Measured: Perched:

Water Observations: Seepage @ 28' while drilling. Water level @ 26' and open to 34' upon completion. Water level @ 25' and open to 27' on 10/8/08.

Key to Abbrevations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes: GPS Coordinates: N 32°15.833', W 94°33.814'

ETTL
ENGINEERS &
CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

LOG OF BORING B-7

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/8/08

SURFACE ELEVATION

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	CL	SANDY LEAN CLAY(CL) hard; tan, red, and gray; mottled	P=4.0						
	CL ML	SANDY SILTY CLAY(CL-ML) very stiff; tan, red, and gray; mottled	P=3.0	16	21	14	7	63	+40 Sieve =0%, +4 Sieve =0%
			P=3.0						
10	CL	LEAN CLAY WITH SAND(CL) very stiff; tan, red, and gray; mottled	P=3.25	15	34	16	18	74	+40 Sieve =1%, +4 Sieve =0%
		--stiff	P=1.5						
20			P=1.5	15	36	15	21	72	+40 Sieve =0%, +4 Sieve =0%
30	CH	FAT CLAY(CH) stiff; gray, red, and tan; mottled	N=11	25	55	19	36	88	+40 Sieve =1%, +4 Sieve =0%
	SM	SILTY SAND(SM) medium dense; tan, red, gray, mottled	N=10						
40	CL	SANDY LEAN CLAY(CL) very stiff; red, tan, and gray; mottled	N=20						

Bottom of Boring @ 40'

Chart column headings: BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0; DRY DENSITY (pcf); COMPRESSIVE STRENGTH (tsf); FAILURE STRAIN (%); CONFINING PRESSURE (psi); Natural Moisture Content and Atterberg Limits (Plastic Limit, Moisture Content, Liquid Limit) 20 40 60 80

Water Level — Est: ▽ Measured: ▼ Perched: ▼

Water Observations: Seepage @ 33' while drilling. Water level @ 32' and open to 35' upon completion. Water level @ 23' and open to 27' on 10/9/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.775', W 94°33.875'

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

LOG OF BORING B-8

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/7/08

SURFACE ELEVATION

USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
CL	SANDY LEAN CLAY(CL) hard; tan, red, and gray; mottled	P=4.5+					11	30	13	17	67	+40 Sieve =2%, +4 Sieve =0%
		P=4.5+										
		P=3.5					13	29	13	16	67	+40 Sieve =0%, +4 Sieve =0%
		P=4.0										
		P=3.5										
	--very stiff	N=15					18	44	18	26	70	+40 Sieve =3%, +4 Sieve =0%
		P=2.5										
		N=15					16	36	16	20	63	+40 Sieve =9%, +4 Sieve =3%
	--red and gray; mottled	N=16										
SM	SILTY SAND(SM) dense; red, tan, and reddish gray; mottled; saturated	N=26										
	Bottom of Boring @ 40'											

Chart legend: BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0. Natural Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit; 20 40 60 80. Depth (ft): 0, 10, 20, 30, 40.

Water Level — Est.: ∇ Measured: ▼ Perched: ▼

Water Observations: Seepage @ 38' while drilling. Water level @ 35' and open to 36' upon completion. Water level @ 23' and open to 27' on 10/8/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.803', W 94°33.798'

LOG OF BORING B-9

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Martin Lake - Luminant East Ash Disposal
Rusk County, Texas

PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/9/08

SURFACE ELEVATION

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	CL	SANDY LEAN CLAY(CL) hard; tan, red, and gray; mottled	P=4.5+						
			P=4.5						
			P=2.5	14	29	14	15	59	+40 Sieve =2%, +4 Sieve =0%
			P=3.25						
10		--sand content increasing	SF	14	36	15	21	58	+40 Sieve =1%, +4 Sieve =0%
		--with bluish green sandy clay	P=2.5	13	38	14	24	56	+40 Sieve =1%, +4 Sieve =0%
20	SM	SILTY SAND(SM) medium dense; gray, tan, and red; mottled	N=16						
	CL	SANDY LEAN CLAY(CL) very stiff; gray, tan, and red; mottled							
	SM	SILTY SAND(SM) medium dense; tan, red, and gray	N=23						
30		--with clay seams	N=14						
		--saturated	N=23						
40		Bottom of Boring @ 40'							

Water Level — Est.: ∇ Measured: ▼ Perched: ▼

Water Observations: Seepage @ 28' while drilling. Water level @ 23' and open to 31' upon completion. Water level @ 23' and open to 29' on 10/10/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.745', W 94°33.857'

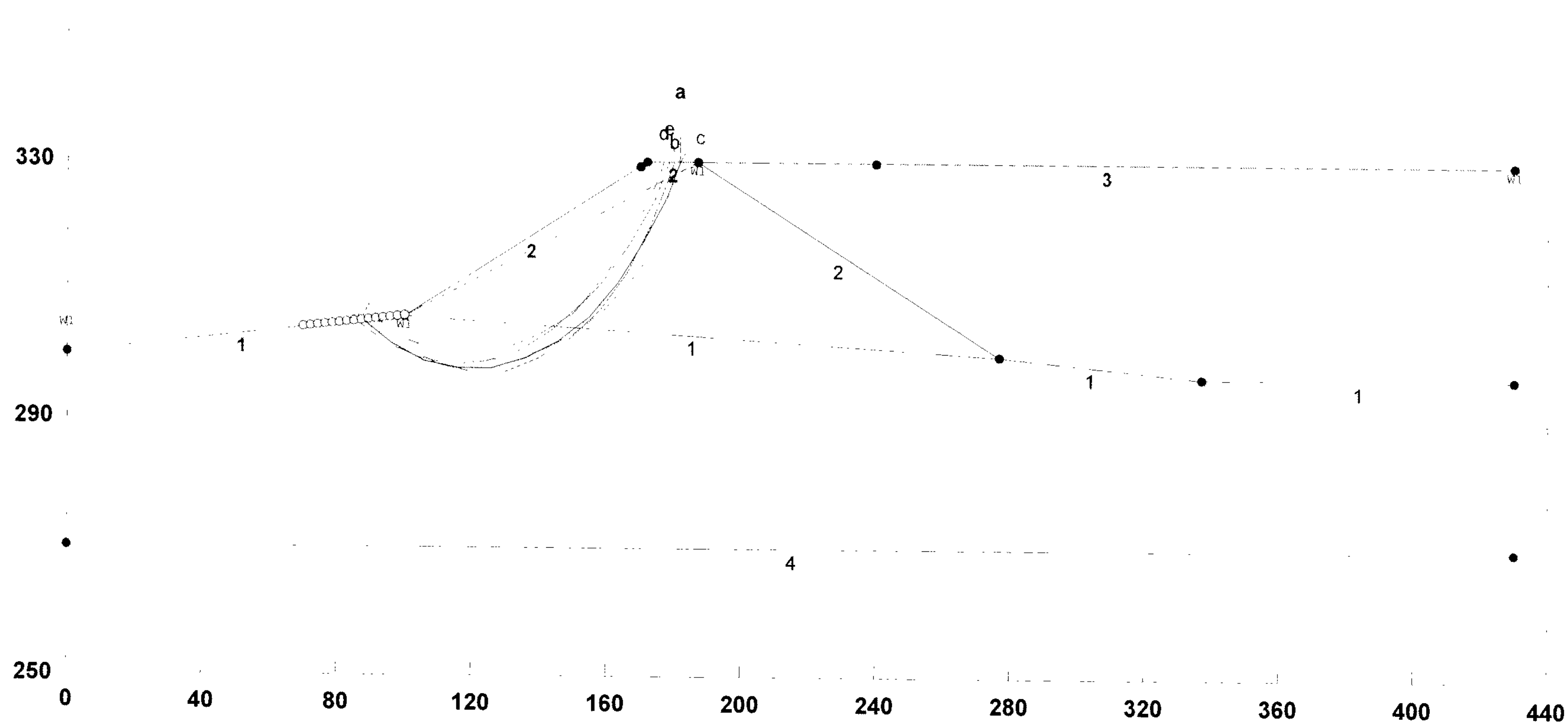
Luminant Martin Lake East Disposal Pond Long Term with Seismic

z:\geotech\2008 geotechnical job files\2972-08 luminant martin lake east disposal pond\g2972 long term seismic.pl2 Run By: Username 12/11/2008 05:36PM

#	FS
a	**1.6**
b	1.7
c	1.7
d	1.7
e	1.7

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Sub #1	1	120.0	126.0	0.0	32.0	0.00	0.0	W1
Clay	2	130.0	135.0	450.0	19.4	0.00	0.0	W1
Ash	3	90.0	110.0	0.0	37.4	0.00	0.0	W1
Sub #2	4	125.0	130.0	0.0	36.0	0.00	0.0	W1

Load	Value
Peak(A)	0.500(g)



GSTABL7 v.2 FSmin=1.6
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Luminant Martin Lake East Disposal Pond Long Term

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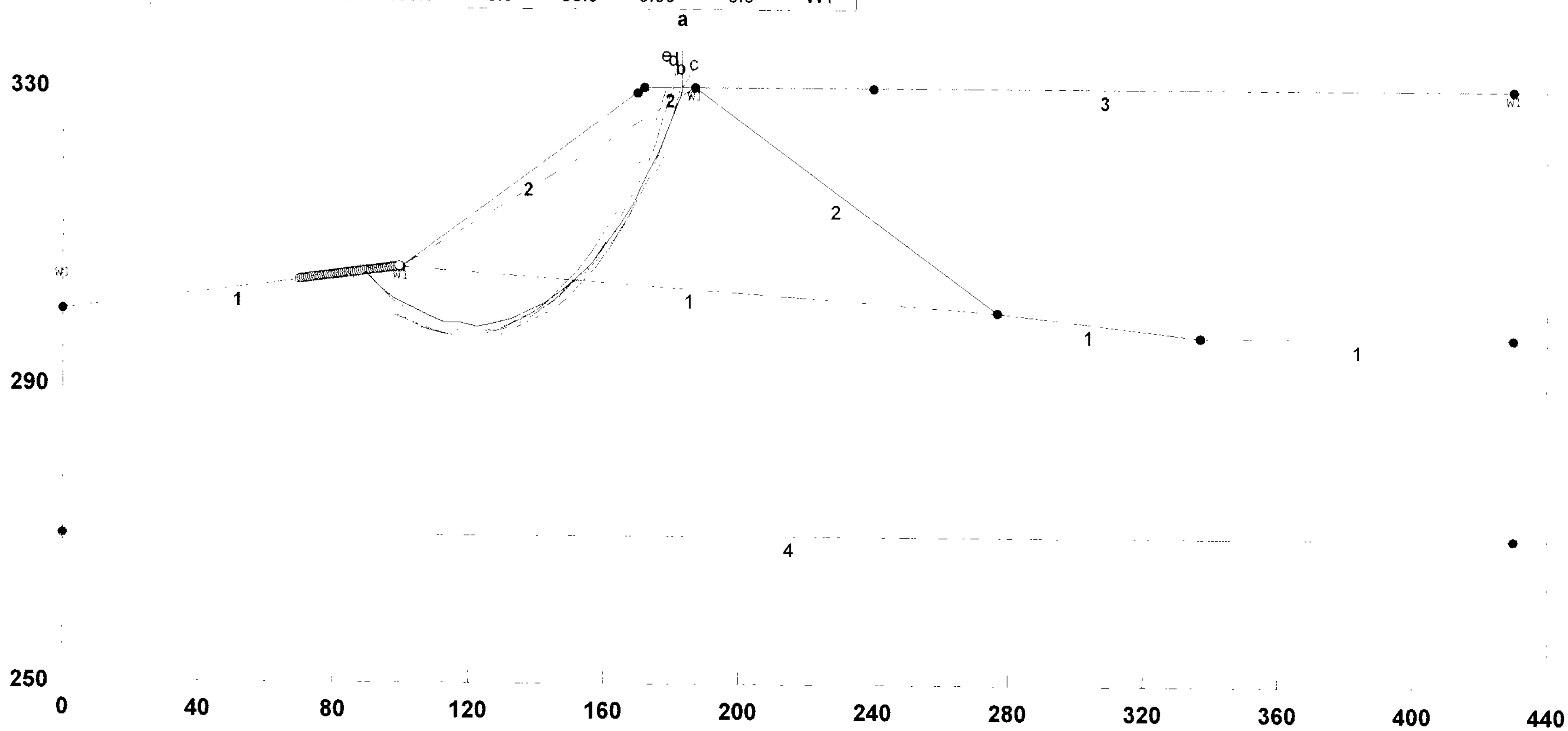
#	FS
a	**1.6**
b	1.6
c	1.6
d	1.6
e	1.6

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Sub #1	1	120.0	126.0	0.0	32.0	0.00	0.0	W1
Clay	2	130.0	135.0	450.0	19.4	0.00	0.0	W1
Ash	3	90.0	110.0	0.0	37.4	0.00	0.0	W1
Sub #2	4	125.0	130.0	0.0	36.0	0.00	0.0	W1



GSTABL7 v.2 FSmin=1.6
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Luminant Martin Lake East Disposal Pond Rapid Drawdown

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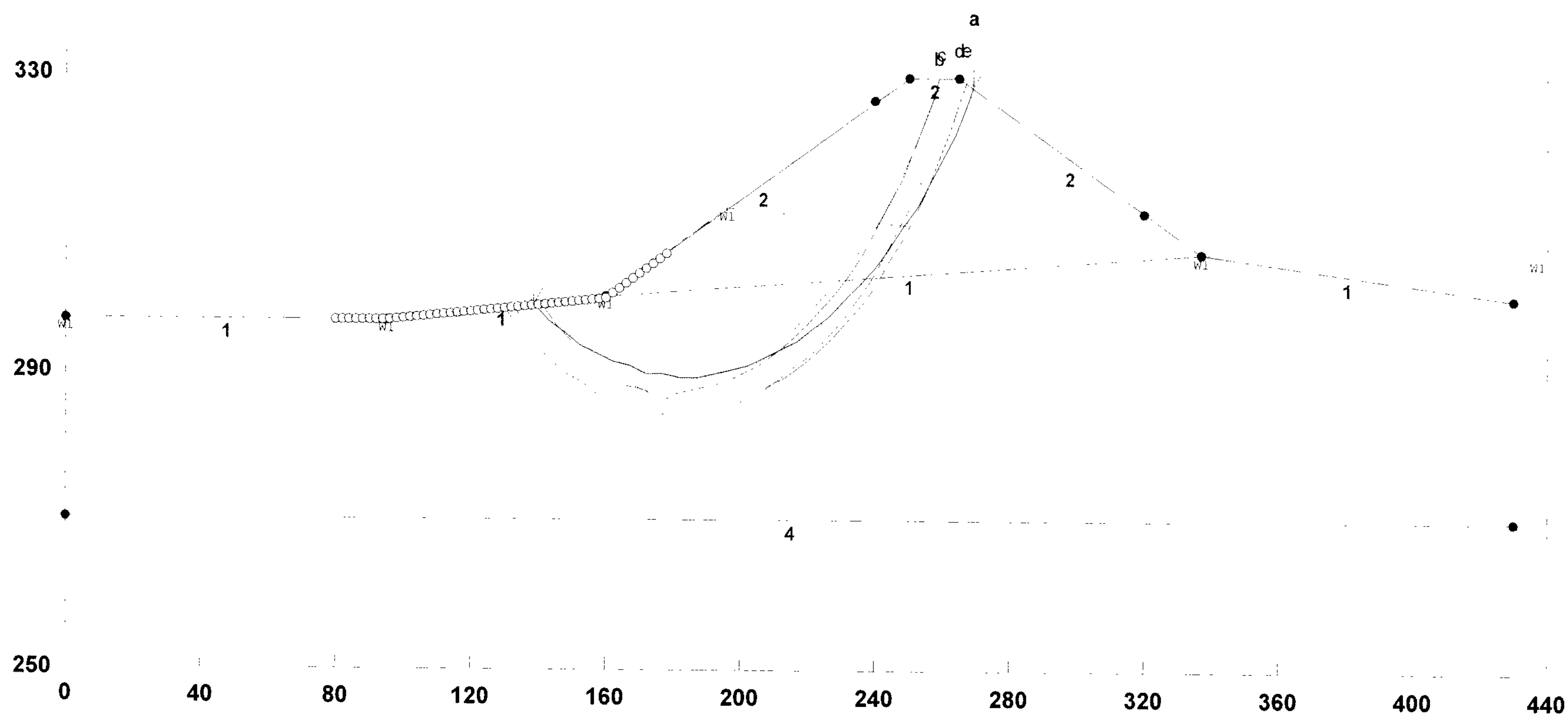
#	FS
a	**1.9**
b	1.9
c	1.9
d	1.9
e	1.9

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Sub #1	1	120.0	126.0	0.0	32.0	0.00	0.0	W1
Clay	2	130.0	135.0	1200.0	0.0	0.00	0.0	W1
Ash	3	90.0	110.0	0.0	37.4	0.00	0.0	W1
Sub #2	4	125.0	130.0	0.0	36.0	0.00	0.0	W1



GSTABL7 v.2 FSmin=1.9

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

PROJECT INFORMATION

PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

TRIAXIAL TEST PROGRAM BY GARRY H. GREGORY, P.E.

VERSION 1.0 - AUGUST 1998 - REVISED MARCH 24, 1999

THIS COPY LICENSED TO:
ETTL ENGINEERS AND CONSULTANTS, INC.
1717 East Erwin
Tyler, TX 75702

TEST DESCRIPTION

TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Possible Fill Sample
DESCRIPTION: Tan, Brown & Red Sandy Lean Clay
Sampled on Site, B-13 3' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve

PLATE: B.1

PLATE: B.2

PLATE: B.3

Number of Specimens = 3

SPECIMEN DATA

SPECIMEN NO. 1

	initial		final		Diameter			Height		
Moist soil & Tare :	522.40	g	621.30	g	top	2.04	in	Ht 1	4.44	in
Dry soil and Tare :	468.70	g	544.40	g	mid	2.04	in	Ht 2	4.44	in
Tare :	129.80	g	119.40	g	bot	2.04	in	Ht 3	4.44	in
Moisture content :	15.85	%	[illegible]	%	Avg	2.04	in	Ht4	4.44	in
Weight:	496.1	g						Avg Ht	4.44	in

Change in Ht due to saturation :	-0.02	in	Initial specimen vol :	[illegible]	cc
Change in Ht due to consolidation :	-0.018	in	At test specimen vol :	[illegible]	cc
Change in pipet vol due to consolidation :	2.0	cc	Initial dry density :	[illegible]	pcf
Saturation Parameter " B " = 0.95			At test dry density:	[illegible]	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	2.7	Effective Cell Pressure (psi) =	10.0
σ_1' Failure (psi) =	20.41	σ_1 Failure (psi) =	[illegible]	Estimated ν =	0.35
σ_3' Failure (psi) =	5.41	σ_3 Failure (psi) =	10.00	Back Pressure (psi) =	50.0
ΔU =	4.6	Total Pore Pressure =	54.6	Cell Pressure (psi) =	60.0

SPECIMEN NO. 2

	initial		final		Diameter			Height		
Moist soil & Tare :	549.80	g	636.40	g	top	2.01	in	Ht 1	4.44	in
Dry soil and Tare :	489.20	g	560.20	g	mid	2.01	in	Ht 2	4.44	in
Tare :	123.20	g	139.10	g	bot	2.01	in	Ht 3	4.44	in
Moisture content :	[illegible]	%	[illegible]	%	Avg	2.01	in	Ht4	4.44	in
Weight:	496.0	g						Avg Ht	4.44	in

Change in Ht due to saturation :	-0.006	in	Initial specimen vol :	[illegible]	cc
Change in Ht due to consolidation :	-0.034	in	At test specimen vol :	[illegible]	cc
Change in pipet vol due to consolidation :	3.9	cc	Initial dry density :	[illegible]	pcf
Saturation Parameter " B " = 0.97			At test dry density:	[illegible]	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	3.9	Effective Cell Pressure (psi) =	20.0
σ_1' Failure (psi) =	37.62	σ_1 Failure (psi) =	[illegible]	Estimated ν =	0.35
σ_3' Failure (psi) =	12.02	σ_3 Failure (psi) =	20.00	Back Pressure (psi) =	50.0
ΔU =	8.0	Total Pore Pressure =	58.0	Cell Pressure (psi) =	70.0

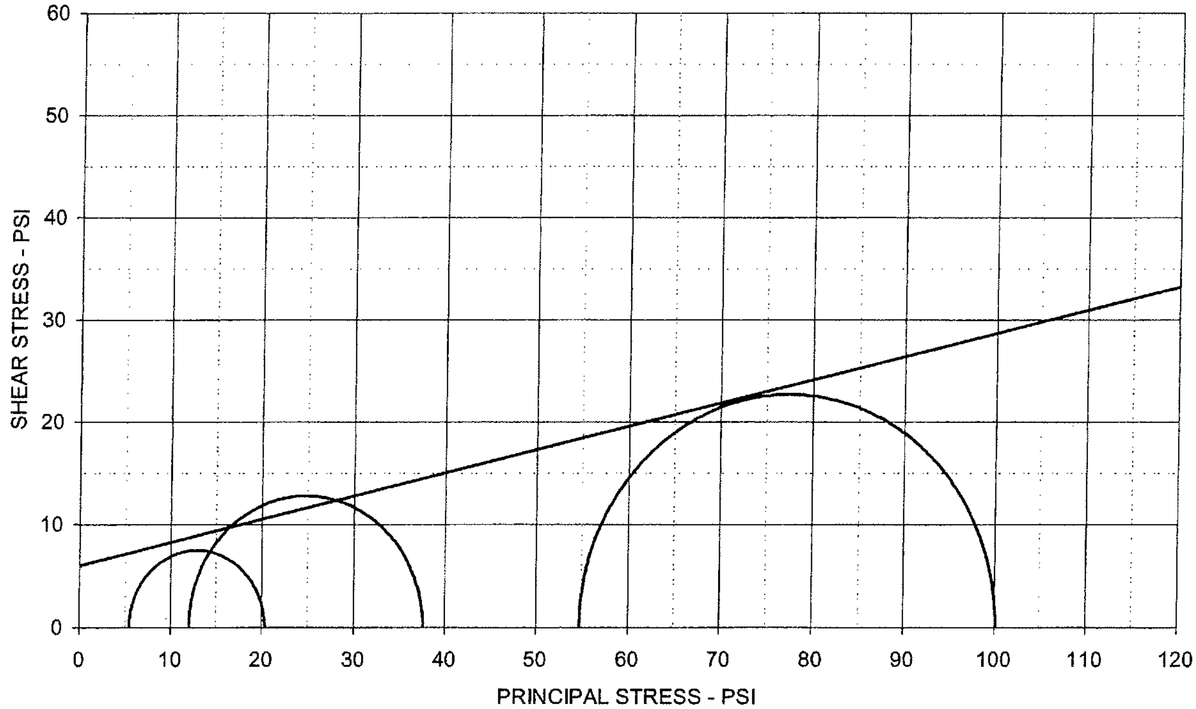
SPECIMEN NO. 3

	initial		final		Diameter			Height		
Moist soil & Tare :	594.50	g	656.50	g	top	2.06	in	Ht 1	4.54	in
Dry soil and Tare :	530.10	g	579.20	g	mid	2.06	in	Ht 2	4.54	in
Tare :	126.30	g	139.30	g	bot	2.06	in	Ht 3	4.54	in
Moisture content :	15.95	%	17.67	%	Avg	2.06	in	Ht4	4.54	in
Weight:	518.0	g						Avg Ht	4.54	in

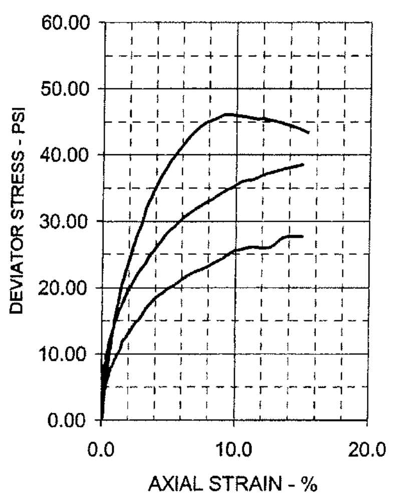
Change in Ht due to saturation :	-0.001	in	Initial specimen vol :	[illegible]	cc
Change in Ht due to consolidation :	-0.052	in	At test specimen vol :	[illegible]	cc
Change in pipet vol due to consolidation :	5.6	cc	Initial dry density :	[illegible]	pcf
Saturation Parameter " B " = 0.97			At test dry density:	[illegible]	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	8.5	Effective Cell Pressure (psi) =	40.0
σ_1' Failure (psi) =	100.17	σ_1 Failure (psi) =	[illegible]	Estimated ν =	0.35
σ_3' Failure (psi) =	54.77	σ_3 Failure (psi) =	40.00	Back Pressure (psi) =	50.0
ΔU =	-14.8	Total Pore Pressure =	35.2	Cell Pressure (psi) =	90.0

TRIAXIAL SHEAR TEST REPORT



EFFECTIVE STRESS PARAMETERS	φ ' = 12.8 deg	c' = 6.0 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	15.8	16.6	15.9	
Dry Density - pcf	113.0	115.0	112.5	
Diameter - inches	2.04	2.01	2.06	
Height - inches	4.44	4.44	4.54	
AT TEST				
Final Moisture - %	18.1	18.1	17.6	
Dry Density - pcf	114.0	116.9	115.1	
Calculated Diameter (in.)	2.02	2.00	2.04	
Height - inches	4.40	4.40	4.49	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	15.00	25.60	45.40	
Total Pore Pressure - psi	54.6	58.0	35.2	
Strain Rate - inches/min.	0.00050	0.00050	0.00050	
Failure Strain - %	2.7	3.9	8.5	
σ_1' Failure - psi	20.41	37.62	100.17	
σ_3' Failure - psi	5.41	12.02	54.77	

TEST DESCRIPTION

TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Possible Fill Sample
DESCRIPTION: Tan, Brown & Red Sandy Lean Clay
Sampled on Site, B-13 3' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve

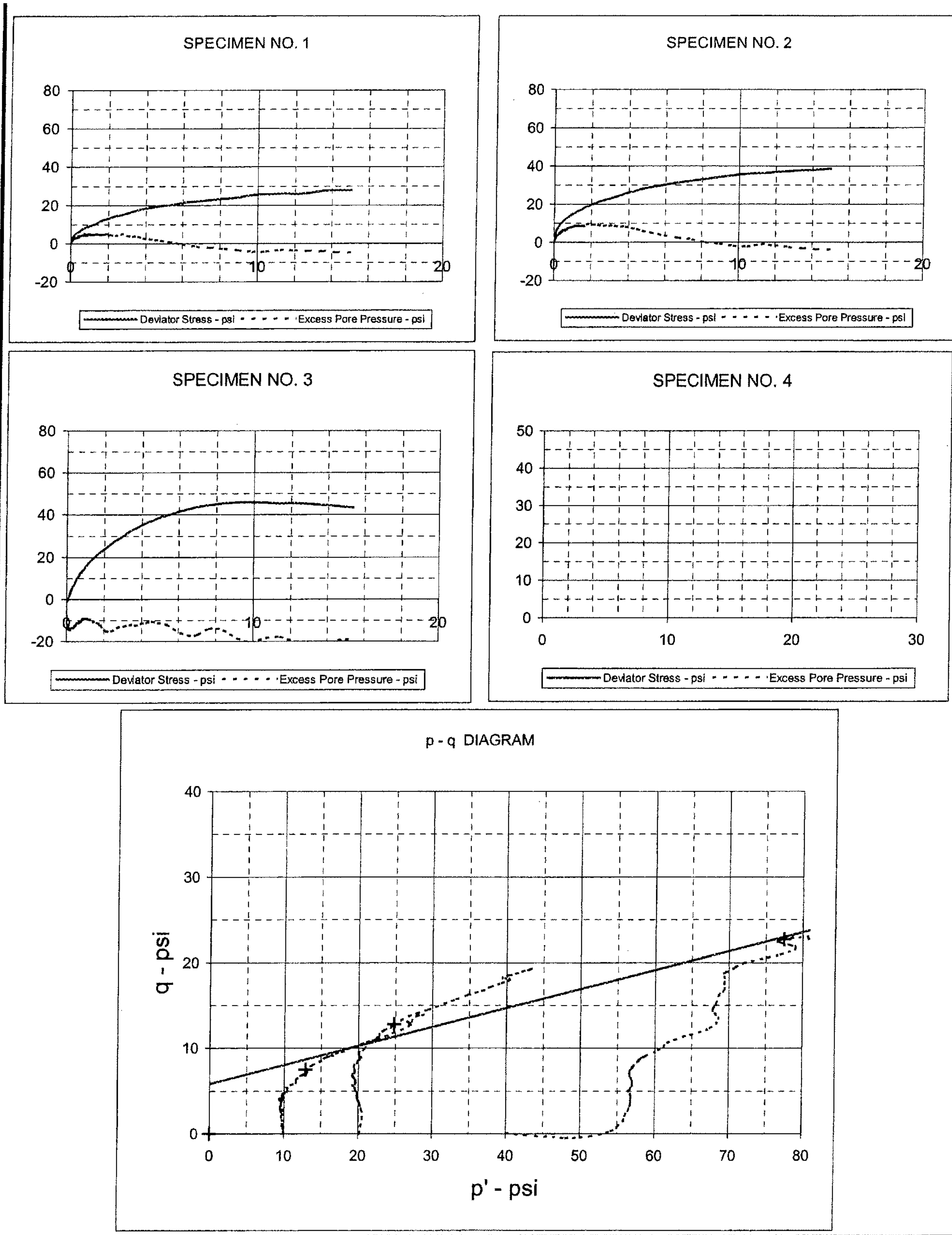
PROJECT INFORMATION

PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

ETTL ENGINEERS & CONSULTANTS

PLATE: B.1

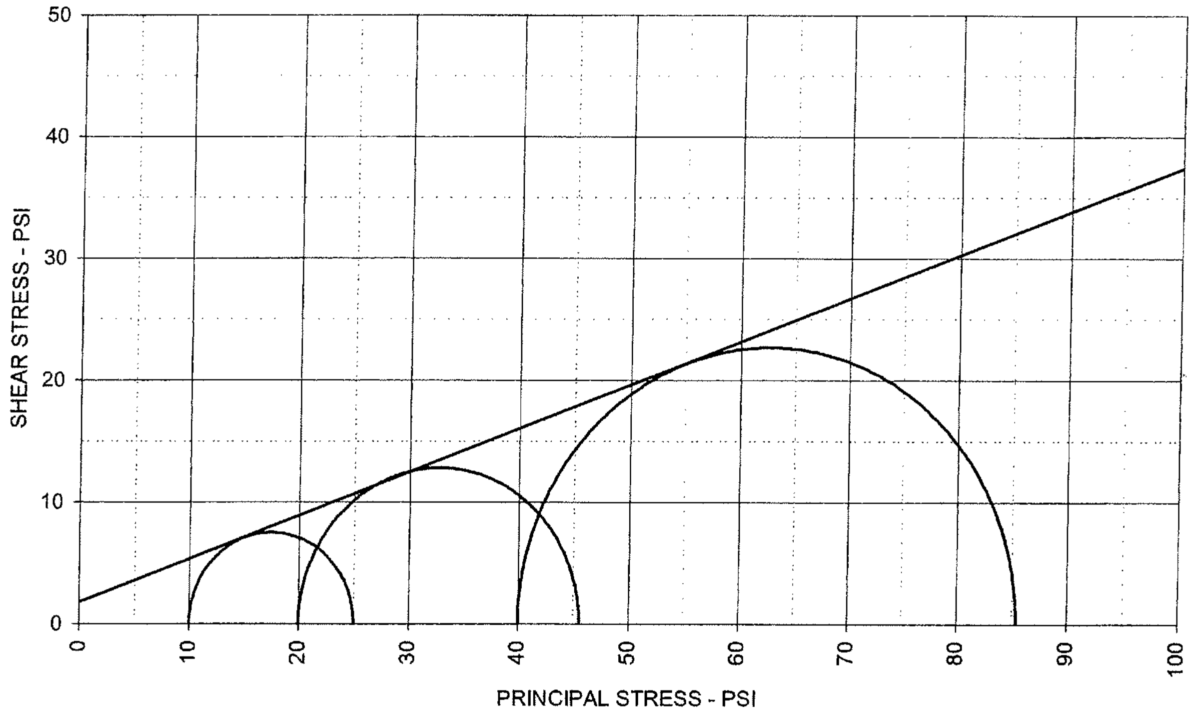
G 2972-08, B-13, 3'-10' Fill



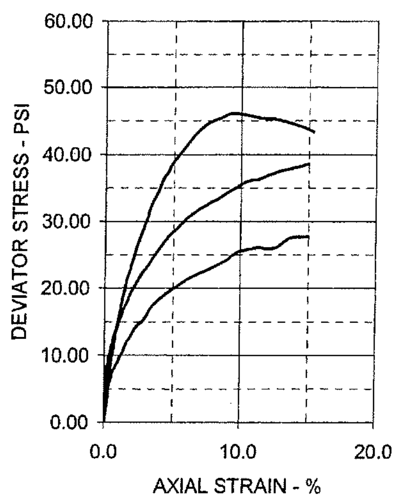
EFFECTIVE STRESS PARAMETERS	R^2 = 0.97	α (deg) = 12.5	a (psi) = 5.8
PROJECT: Luminant East Ash Disposal		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 2972 - 08		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Tan, Brown & Red Sandy Lean Clay			

G 2972-08, B-13, 3'-10' Fill

TRIAXIAL SHEAR TEST REPORT



TOTAL STRESS PARAMETERS	φ = 19.6 deg	c = 1.8 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	15.8	16.6	15.9	
Dry Density - pcf	113.0	115.0	112.5	
Diameter - inches	2.04	2.01	2.06	
Height - inches	4.44	4.44	4.54	
AT TEST				
Final Moisture - %	18.1	18.1	17.6	
Dry Density - pcf	114.0	116.9	115.1	
Calculated Diameter (In.)	2.02	2.00	2.04	
Height - inches	4.40	4.40	4.49	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	15.00	25.60	45.40	
Total Pore Pressure - psi	54.6	58.0	35.2	
Strain Rate - inches/min.	0.00050	0.00050	0.00050	
Failure Strain - %	2.7	3.9	8.5	
σ_1 Failure - psi	25.00	45.60	85.40	
σ_3 Failure - psi	10.00	20.00	40.00	

TEST DESCRIPTION

TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Possible Fill Sample
DESCRIPTION: Tan, Brown & Red Sandy Lean Clay
Sampled on Site, B-13 3' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve

PROJECT INFORMATION

PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

ETTL ENGINEERS & CONSULTANTS | PLATE: B.3

PROJECT INFORMATION

PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

TRIAXIAL TEST PROGRAM BY GARRY H. GREGORY, P.E.

VERSION 1.0 - AUGUST 1998 - REVISED MARCH 24, 1999

THIS COPY LICENSED TO:
ETTL ENGINEERS AND CONSULTANTS, INC.
1717 East Erwin
Tyler, TX 75702

TEST DESCRIPTION

TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Native Sample
DESCRIPTION: Gray, Tan & Redd. Br Sandy Clay w/ some Gravel
Sampled on Site, B-2 8' to 20' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve

Number of Specimens = 3

PLATE: B.1

PLATE: B.2

PLATE: B.3

SPECIMEN DATA

SPECIMEN NO. 1

	initial		final		Diameter			Height		
Moist soil & Tare :	479.30	g	630.20	g	top	2.08	in	Ht 1	4.25	in
Dry soil and Tare :	429.60	g	548.70	g	mid	2.08	in	Ht 2	4.25	in
Tare :	129.70	g	128.00	g	bot	2.08	in	Ht 3	4.25	in
Moisture content :	[illegible]	%	[illegible]	%	Avg	2.08	in	Ht4	4.25	in
Weight:	496.8	g						Avg Ht	4.25	in

Change in Ht due to saturation :	-0.014	in	Initial specimen vol :	[illegible]	cc
Change in Ht due to consolidation :	0.005	in	At test specimen vol :	[illegible]	cc
Change in pipet vol due to consolidation :	0.6	cc	Initial dry density :	[illegible]	pcf
Saturation Parameter " B " = 0.96			At test dry density:	[illegible]	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	2.4	Effective Cell Pressure (psi) =	10.0
σ_1' Failure (psi) =	36.26	σ_1 Failure (psi) =	[illegible]	Estimated ν =	0.35
σ_3' Failure (psi) =	8.24	σ_3 Failure (psi) =	[illegible]	Back Pressure (psi) =	50.0
ΔU =	1.6	Total Pore Pressure =	51.8	Cell Pressure (psi) =	60.0

SPECIMEN NO. 2

	initial		final		Diameter			Height		
Moist soil & Tare :	505.50	g	616.20	g	top	2.08	in	Ht 1	4.40	in
Dry soil and Tare :	451.40	g	537.60	g	mid	2.08	in	Ht 2	4.40	in
Tare :	114.00	g	102.60	g	bot	2.08	in	Ht 3	4.40	in
Moisture content :	[illegible]	%	[illegible]	%	Avg	2.08	in	Ht4	4.40	in
Weight:	611.6	g						Avg Ht	4.40	in

Change in Ht due to saturation :	0.01	in	Initial specimen vol :	[illegible]	cc
Change in Ht due to consolidation :	-0.048	in	At test specimen vol :	[illegible]	cc
Change in pipet vol due to consolidation :	7.0	cc	Initial dry density :	[illegible]	pcf
Saturation Parameter " B " = 0.98			At test dry density:	[illegible]	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	3.4	Effective Cell Pressure (psi) =	20.0
σ_1' Failure (psi) =	48.53	σ_1 Failure (psi) =	[illegible]	Estimated ν =	0.35
σ_3' Failure (psi) =	13.88	σ_3 Failure (psi) =	20.00	Back Pressure (psi) =	50.0
ΔU =	6.1	Total Pore Pressure =	56.1	Cell Pressure (psi) =	70.0

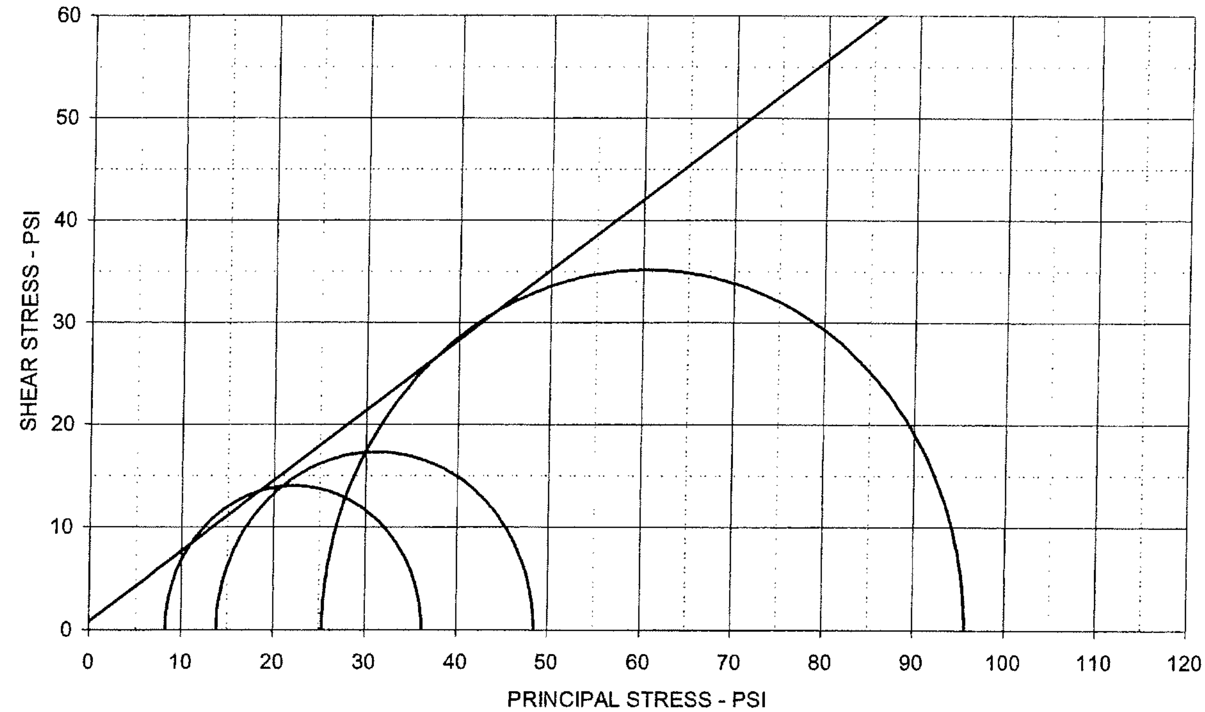
SPECIMEN NO. 3

	initial		final		Diameter			Height		
Moist soil & Tare :	414.70	g	721.50	g	top	2.11	in	Ht 1	4.62	in
Dry soil and Tare :	381.70	g	652.20	g	mid	2.11	in	Ht 2	4.62	in
Tare :	102.50	g	139.10	g	bot	2.11	in	Ht 3	4.62	in
Moisture content :	[illegible]	%	[illegible]	%	Avg	2.11	in	Ht4	4.62	in
Weight:	579.6	g						Avg Ht	4.62	in

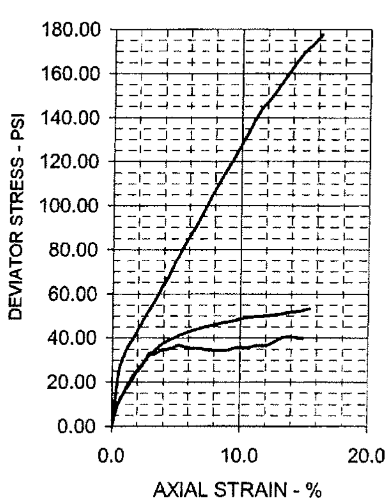
Change in Ht due to saturation :	-0.021	in	Initial specimen vol :	[illegible]	cc
Change in Ht due to consolidation :	-0.018	in	At test specimen vol :	[illegible]	cc
Change in pipet vol due to consolidation :	5.4	cc	Initial dry density :	[illegible]	pcf
Saturation Parameter " B " = 0.99			At test dry density:	[illegible]	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	4.6	Effective Cell Pressure (psi) =	40.0
σ_1' Failure (psi) =	95.68	σ_1 Failure (psi) =	[illegible]	Estimated ν =	0.35
σ_3' Failure (psi) =	25.40	σ_3 Failure (psi) =	40.00	Back Pressure (psi) =	50.0
ΔU =	14.6	Total Pore Pressure =	64.6	Cell Pressure (psi) =	90.0

TRIAXIAL SHEAR TEST REPORT



EFFECTIVE STRESS PARAMETERS	ϕ' = 34.4 deg	c' = 0.8 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	16.6	16.0	11.8	
Dry Density - pcf	112.3	112.1	122.3	
Diameter - inches	2.08	2.08	2.11	
Height - inches	4.25	4.40	4.62	
AT TEST				
Final Moisture - %	19.4	18.1	13.5	
Dry Density - pcf	112.6	115.3	124.9	
Calculated Diameter (in.)	2.08	2.07	2.10	
Height - inches	4.24	4.37	4.58	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	28.02	34.65	70.28	
Total Pore Pressure - psi	51.8	56.1	64.6	
Strain Rate - inches/min.	0.00050	0.00050	0.00050	
Failure Strain - %	2.4	3.4	4.6	
σ_1' Failure - psi	36.26	48.53	95.68	
σ_3' Failure - psi	8.24	13.88	25.40	

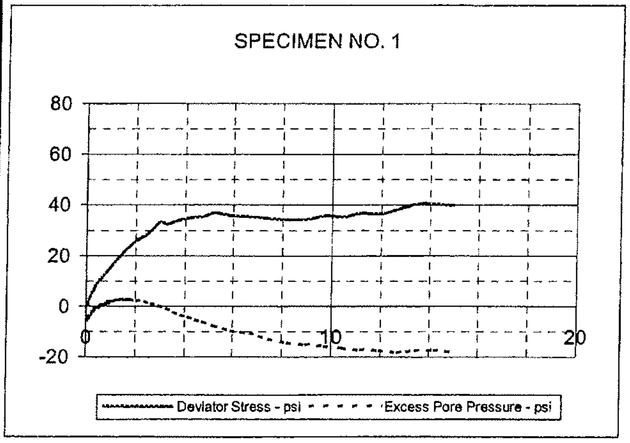
TEST DESCRIPTION

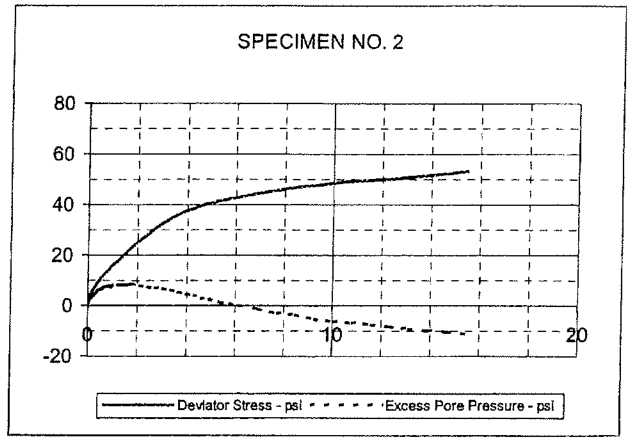
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Native Sample
DESCRIPTION: Gray, Tan & Redd. Br Sandy Clay w/ some Gravel
Sampled on Site, B-2 8' to 20' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve
G 2972-08, B-2, 8'-20' Native

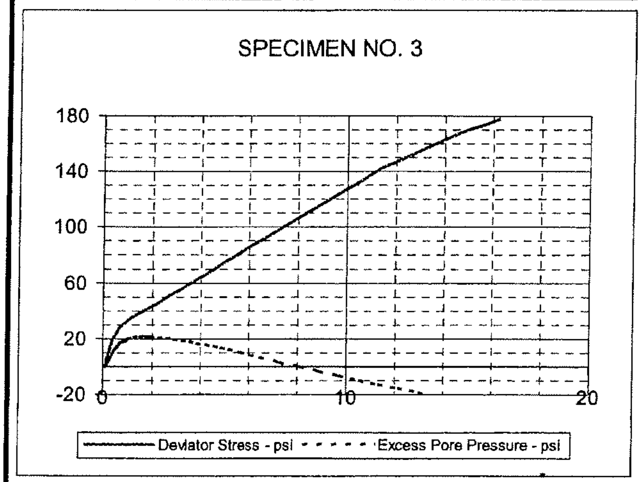
PROJECT INFORMATION

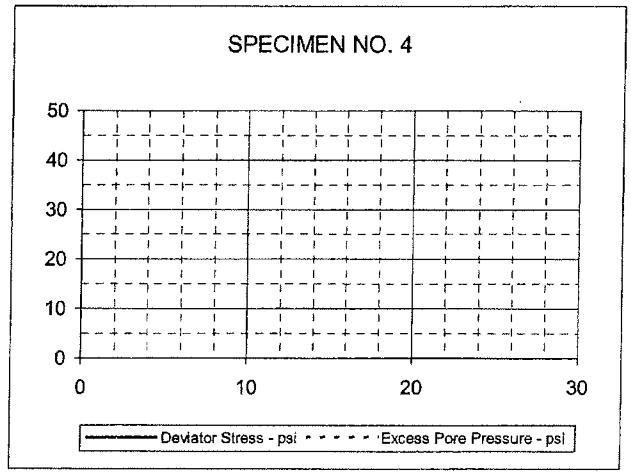
PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

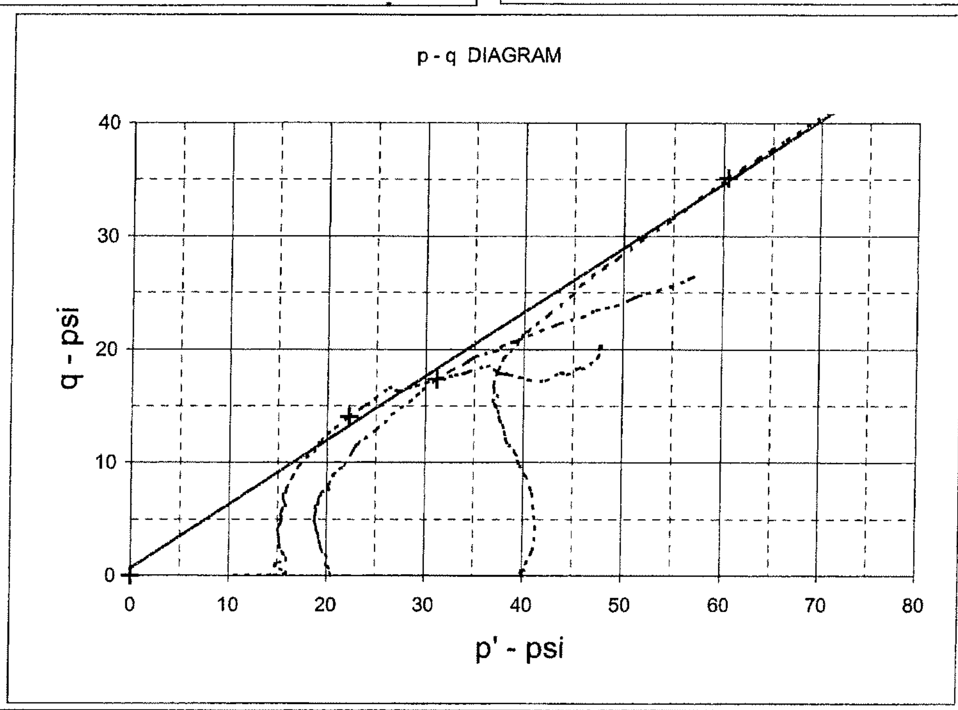
ETTL ENGINEERS & CONSULTANTS PLATE: B.1







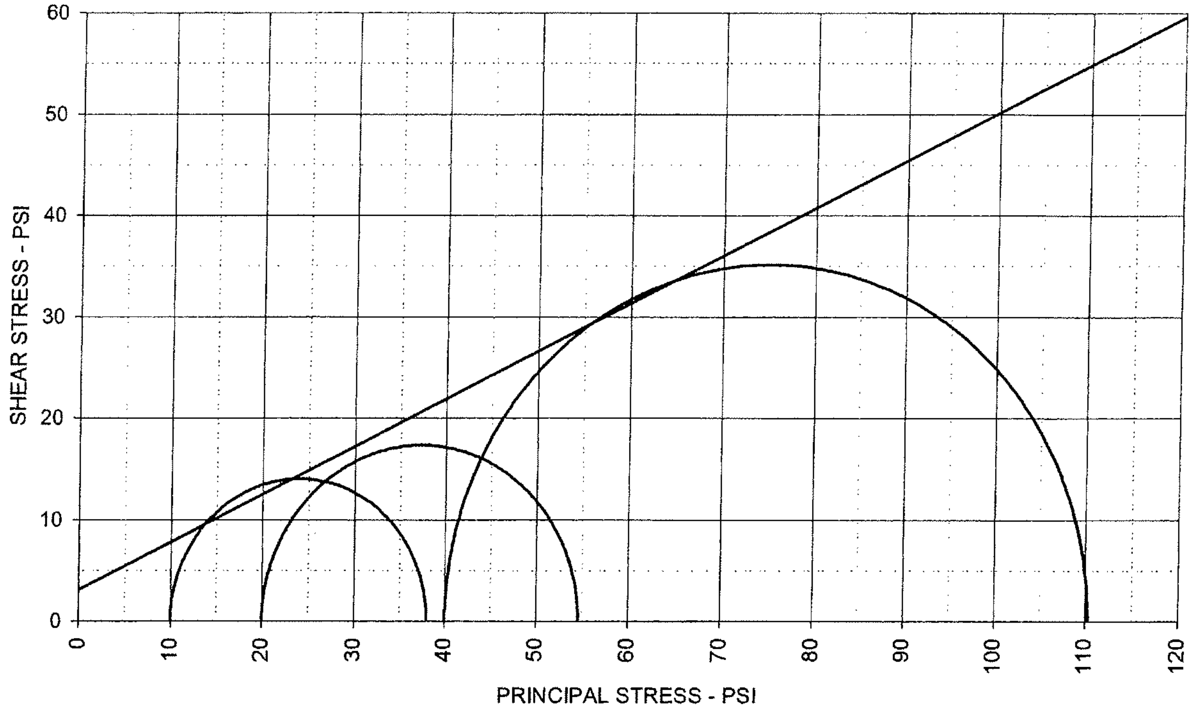




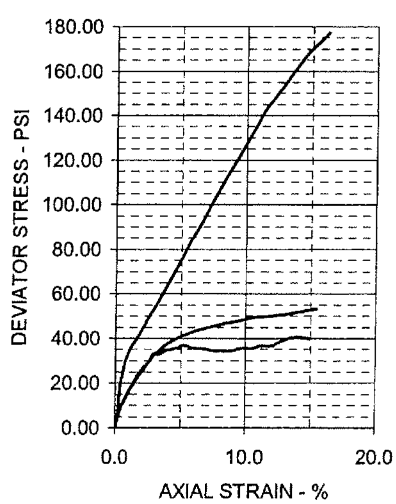
EFFECTIVE STRESS PARAMETERS	R^2 = 0.99	α (deg) = 29.5	a (psi) = 0.7
PROJECT: Luminant East Ash Disposal		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 2972 - 08		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Gray, Tan & Redd. Br Sandy Clay w/ some Gravel			

G 2972-08, B-2, 8'-20' Native

TRIAXIAL SHEAR TEST REPORT



TOTAL STRESS PARAMETERS	ϕ = 25.2 deg	c = 3.1 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	16.6	16.0	11.8	
Dry Density - pcf	112.3	112.1	122.3	
Diameter - inches	2.08	2.08	2.11	
Height - inches	4.25	4.40	4.62	
AT TEST				
Final Moisture - %	19.4	18.1	13.5	
Dry Density - pcf	112.6	115.3	124.9	
Calculated Diameter (in.)	2.08	2.07	2.10	
Height - inches	4.24	4.37	4.58	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	28.02	34.65	70.28	
Total Pore Pressure - psi	51.8	56.1	64.6	
Strain Rate - inches/min.	0.00050	0.00050	0.00050	
Failure Strain - %	2.4	3.4	4.6	
σ_1 Failure - psi	38.02	54.65	110.28	
σ_3 Failure - psi	10.00	20.00	40.00	

TEST DESCRIPTION

TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Native Sample
DESCRIPTION: Gray, Tan & Redd. Br Sandy Clay w/ some Gravel
Sampled on Site, B-2 8' to 20' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve

PROJECT INFORMATION

PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

ETTL ENGINEERS & CONSULTANTS PLATE: B.3

PROJECT INFORMATION

PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember, 2008

TRIAXIAL TEST PROGRAM BY GARRY H. GREGORY, P.E.

VERSION 1.0 - AUGUST 1998 - REVISED MARCH 24, 1999

THIS COPY LICENSED TO:
ETTL ENGINEERS AND CONSULTANTS, INC.
1717 East Erwin
Tyler, TX 75702

TEST DESCRIPTION

TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Possible Fill Sample
DESCRIPTION: Tan & Red Sandy Lean Clay w/ Roots
Sampled on Site, B-1 3' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve

PLATE: B.1

PLATE: B.2

PLATE: B.3

Number of Specimens = 3

SPECIMEN DATA

SPECIMEN NO. 1

	initial		final		Diameter			Height		
Moist soil & Tare :	539.30	g	625.10	g	top	2.07	in	Ht 1	4.23	in
Dry soil and Tare :	462.00	g	546.00	g	mid	2.07	in	Ht 2	4.23	in
Tare :	127.40	g	126.90	g	bot	2.07	in	Ht 3	4.23	in
Moisture content :	[redacted]	%	[redacted]	%	Avg	[redacted]	in	Ht4	4.23	in
Weight:	493.2	g						Avg Ht	[redacted]	in

Change in Ht due to saturation :	0.02	in	Initial specimen vol :	[redacted]	cc
Change in Ht due to consolidation :	-0.006	in	At test specimen vol :	[redacted]	cc
Change in pipet vol due to consolidation :	3.2	cc	Initial dry density :	[redacted]	pcf
Saturation Parameter " B " =	0.97		At test dry density:	[redacted]	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	1.4	Effective Cell Pressure (psi) =	[redacted]
σ_1' Failure (psi) =	29.29	σ_1 Failure (psi) =	[redacted]	Estimated ν =	0.35
σ_3' Failure (psi) =	6.35	σ_3 Failure (psi) =	[redacted]	Back Pressure (psi) =	50.0
ΔU =	[redacted]	Total Pore Pressure =	53.7	Cell Pressure (psi) =	60.0

SPECIMEN NO. 2

	initial		final		Diameter			Height		
Moist soil & Tare :	548.00	g	591.00	g	top	2.01	in	Ht 1	4.25	in
Dry soil and Tare :	492.70	g	519.10	g	mid	2.01	in	Ht 2	4.25	in
Tare :	136.60	g	124.60	g	bot	2.01	in	Ht 3	4.25	in
Moisture content :	[redacted]	%	[redacted]	%	Avg	[redacted]	in	Ht4	4.25	in
Weight:	462.2	g						Avg Ht	[redacted]	in

Change in Ht due to saturation :	-0.009	in	Initial specimen vol :	[redacted]	cc
Change in Ht due to consolidation :	-0.033	in	At test specimen vol :	[redacted]	cc
Change in pipet vol due to consolidation :	4.2	cc	Initial dry density :	[redacted]	pcf
Saturation Parameter " B " =	0.99		At test dry density:	[redacted]	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	3.0	Effective Cell Pressure (psi) =	[redacted]
σ_1' Failure (psi) =	40.52	σ_1 Failure (psi) =	[redacted]	Estimated ν =	0.35
σ_3' Failure (psi) =	14.53	σ_3 Failure (psi) =	[redacted]	Back Pressure (psi) =	50.0
ΔU =	[redacted]	Total Pore Pressure =	55.5	Cell Pressure (psi) =	70.0

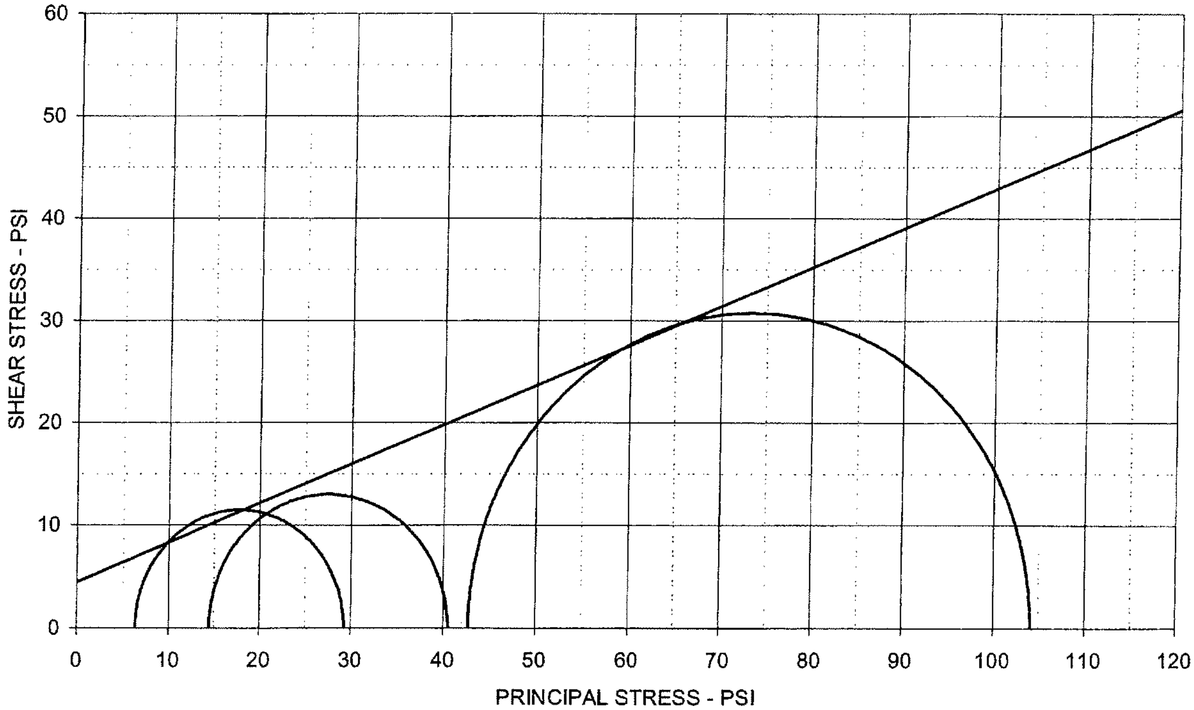
SPECIMEN NO. 3

	initial		final		Diameter			Height		
Moist soil & Tare :	431.00	g	628.40	g	top	2.10	in	Ht 1	4.28	in
Dry soil and Tare :	385.90	g	558.80	g	mid	2.10	in	Ht 2	4.28	in
Tare :	105.00	g	119.40	g	bot	2.10	in	Ht 3	4.28	in
Moisture content :	[redacted]	%	[redacted]	%	Avg	[redacted]	in	Ht4	4.28	in
Weight:	510.5	g						Avg Ht	[redacted]	in

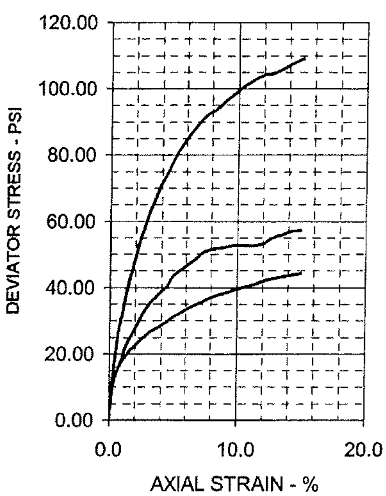
Change in Ht due to saturation :	-0.017	in	Initial specimen vol :	[redacted]	cc
Change in Ht due to consolidation :	-0.039	in	At test specimen vol :	[redacted]	cc
Change in pipet vol due to consolidation :	4.6	cc	Initial dry density :	[redacted]	pcf
Saturation Parameter " B " =	0.97		At test dry density:	[redacted]	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	3.0	Effective Cell Pressure (psi) =	[redacted]
σ_1' Failure (psi) =	104.13	σ_1 Failure (psi) =	[redacted]	Estimated ν =	0.35
σ_3' Failure (psi) =	42.71	σ_3 Failure (psi) =	[redacted]	Back Pressure (psi) =	50.0
ΔU =	[redacted]	Total Pore Pressure =	47.3	Cell Pressure (psi) =	90.0

TRIAXIAL SHEAR TEST REPORT



EFFECTIVE STRESS PARAMETERS	φ ' = 21.0 deg	c' = 4.5 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	16.2	15.5	16.1	
Dry Density - pcf	113.6	113.1	113.3	
Diameter - inches	2.07	2.01	2.10	
Height - inches	4.23	4.25	4.28	
AT TEST				
Final Moisture - %	18.3	18.2	15.8	
Dry Density - pcf	115.2	115.3	115.5	
Calculated Diameter (in.)	2.08	1.99	2.08	
Height - inches	4.24	4.21	4.22	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	22.94	25.99	61.42	
Total Pore Pressure - psi	53.7	55.5	47.3	
Strain Rate - inches/min.	0.00050	0.00050	0.00050	
Failure Strain - %	1.4	3.0	3.0	
σ_1' Failure - psi	29.29	40.52	104.13	
σ_3' Failure - psi	6.35	14.53	42.71	

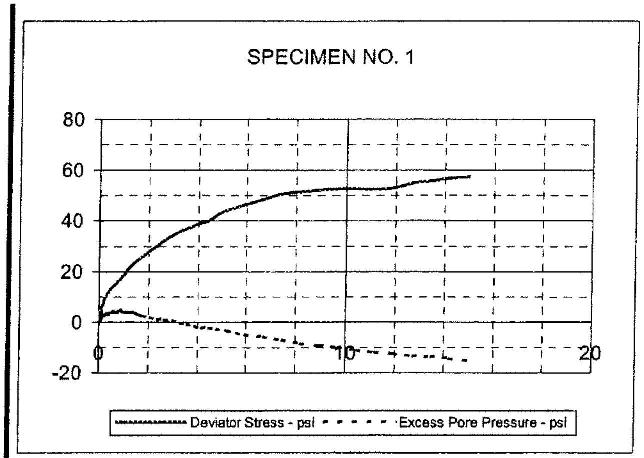
TEST DESCRIPTION

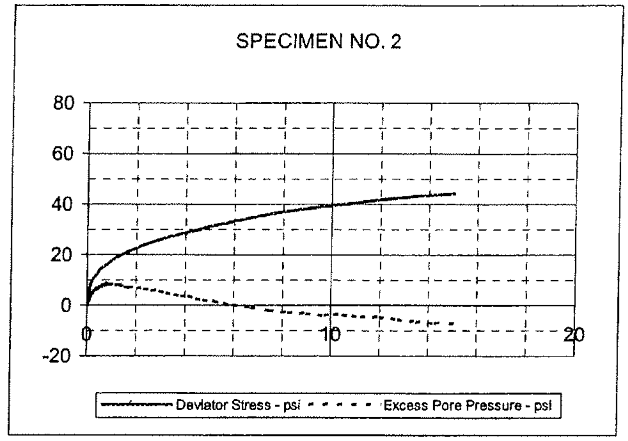
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Possible Fill Sample
DESCRIPTION: Tan & Red Sandy Lean Clay w/ Roots
Sampled on Site, B-1 3' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve
G-2972-08, B-1, 3'-10' Fill

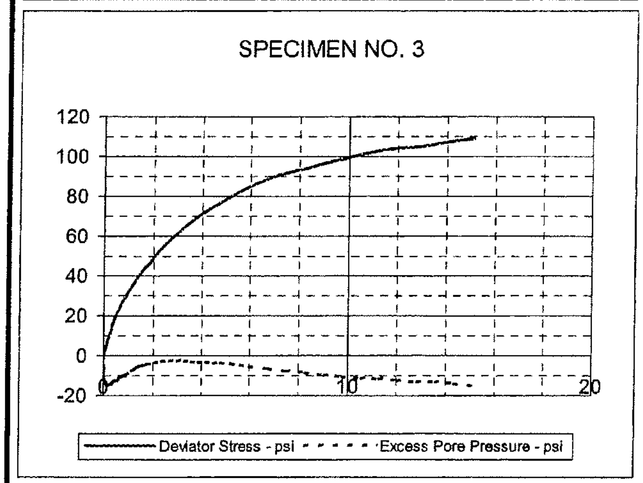
PROJECT INFORMATION

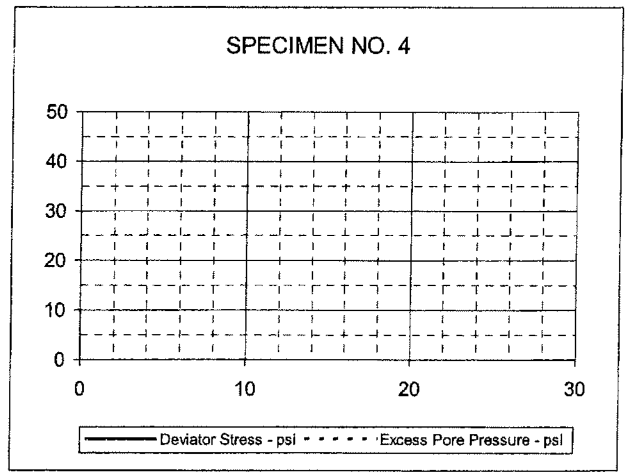
PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

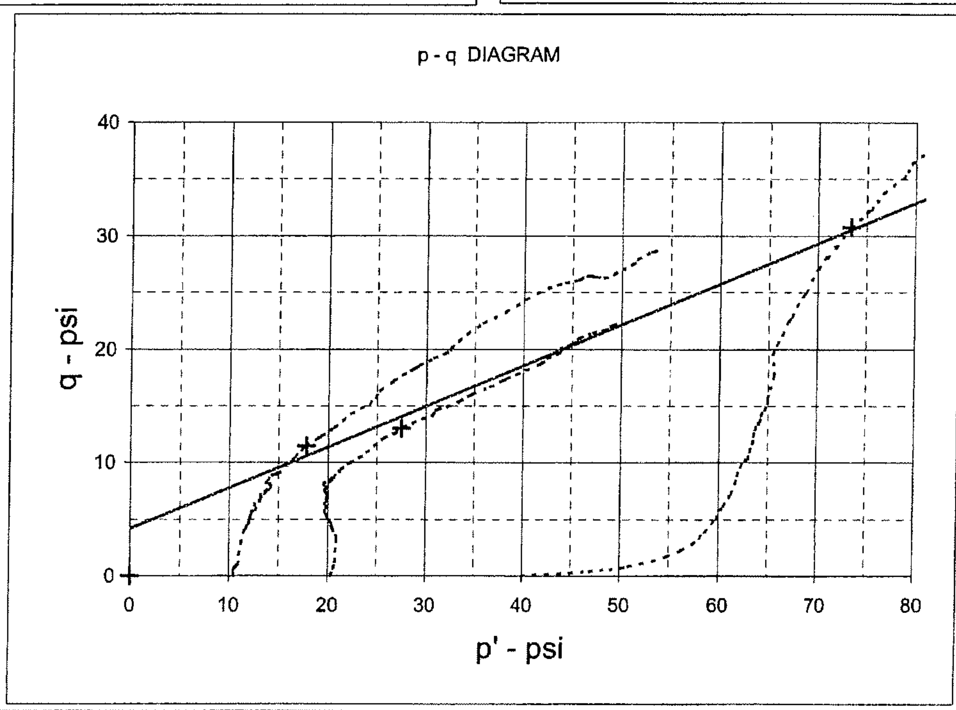
ETTL ENGINEERS & CONSULTANTS | PLATE: B.1







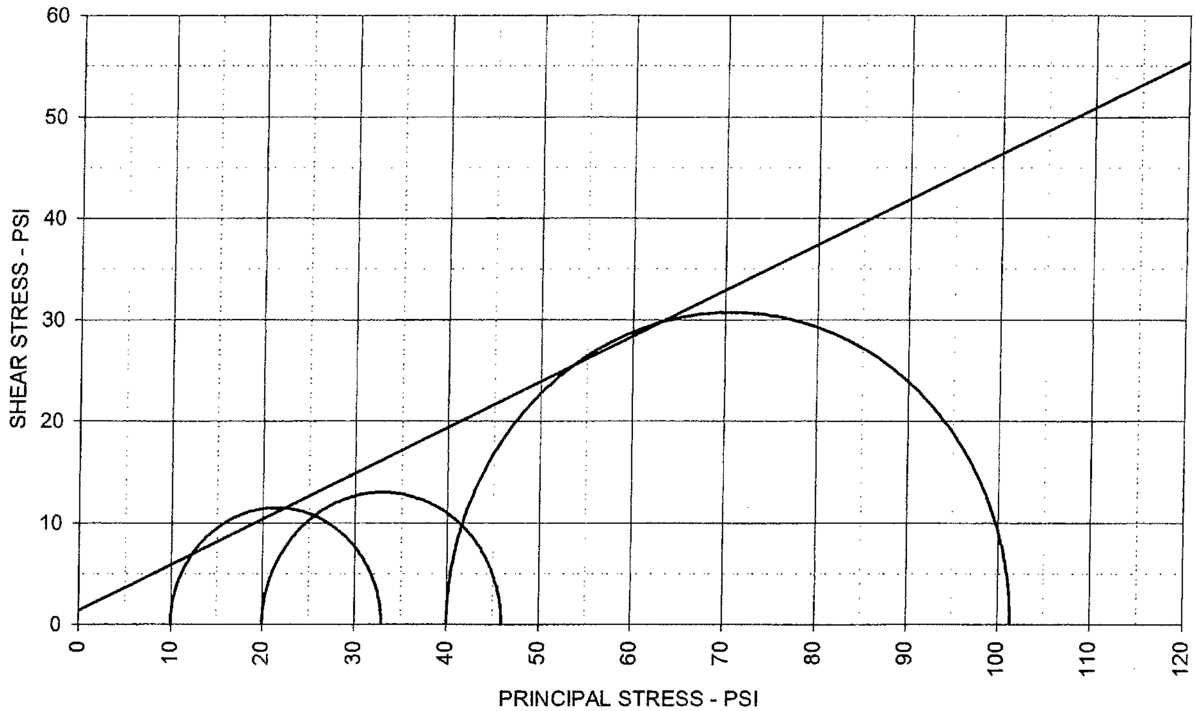




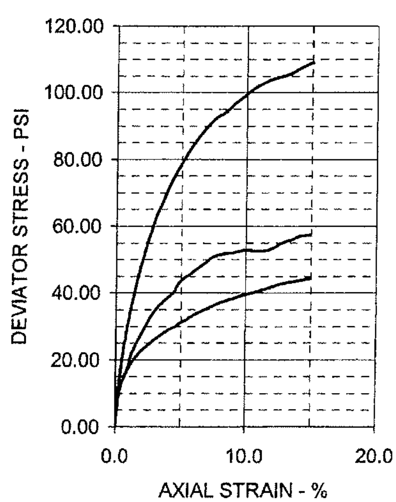
EFFECTIVE STRESS PARAMETERS	R^2 = 0.99	α (deg) = 19.7	a (psi) = 4.2
PROJECT: Luminant East Ash Disposal		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 2972 - 08		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Tan & Red Sandy Lean Clay w/ Roots			

G 2972-08, B-1, 3'-10' Fill

TRIAXIAL SHEAR TEST REPORT



TOTAL STRESS PARAMETERS	φ = 24.2 deg	c = 1.4 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	16.2	15.5	16.1	
Dry Density - pcf	113.6	113.1	113.3	
Diameter - inches	2.07	2.01	2.10	
Height - inches	4.23	4.25	4.28	
AT TEST				
Final Moisture - %	18.3	18.2	15.8	
Dry Density - pcf	115.2	115.3	115.5	
Calculated Diameter (in.)	2.08	1.99	2.08	
Height - inches	4.24	4.21	4.22	
Effect. Cell Pressure - psi	10.0	20.0	40.0	
Failure Stress - psi	22.94	25.99	61.42	
Total Pore Pressure - psi	53.7	55.5	47.3	
Strain Rate - inches/min.	0.00050	0.00050	0.00050	
Failure Strain - %	1.4	3.0	3.0	
σ_1 Failure - psi	32.94	45.99	101.42	
σ_3 Failure - psi	10.00	20.00	40.00	

TEST DESCRIPTION

TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Possible Fill Sample
DESCRIPTION: Tan & Red Sandy Lean Clay w/ Roots
Sampled on Site, B-1 3' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve

PROJECT INFORMATION

PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

ETTL ENGINEERS & CONSULTANTS

PLATE: B.3

BALLAST EVALUATION CALCULATIONS

Assumptions

1. Geocomposite drainage layer material unit weights are negligible
2. CCB will be used as ballast
3. If calculated Factor of Safety is less than 1.5, then additional ballast will be required
4. Protective Cover thickness is minimum 2.0 feet
5. Groundwater elevation is assumed to be equal to the Normal Pool Elevation of 306

Term Definitions

γ_{was} ≡ unit weight of waste
γ_w ≡ unit weight of water
γ_{pc} ≡ unit weight of cover
γ_g ≡ unit weight of gravel
FS ≡ Factor of Safety
β ≡ Slope Angle
K_o ≡ Coefficient of Earth Pressure at Rest
E_{hw} ≡ Interpolated Historical High Groundwater Elevation from Contour Map — from Contour Map (see Section 12)
E_l ≡ Top of Clay Liner / Bottom of Geomembrane Liner Elevation from Survey Data Table — from Survey Data Table (see Section 12)
E_{pc} ≡ Top of Protective Cover Elevation
T_{pc} ≡ Protective Cover Thickness
T_{was} ≡ Thickness of Ballast Required to Offset Hydrostatic Pressure

Equations

Total Head = $E_{hw} - E_l$

$T_{pc} = E_{pc} - E_l$

FS = $(\gamma_{pc} * T_{pc}) / (\gamma_w * \text{Total Head})$

FS within LCS = $(\gamma_g * T_{pc}) / (\gamma_w * \text{Total Head})$

FS on Sidewalls *vertical* = $(\gamma_{pc} * T_{pc}) / (\gamma_w * \text{Total Head} * \cos\beta)$

FS on Sidewalls *horizontal* = $(\gamma_{pc} * T_{pc} * K_o) / (\gamma_w * \text{Total Head} * \sin\beta)$

where $T_{pcv} = T_{pc} / \cos\beta$

Ballast on the Floor = $[(FS * \text{Total Head} * \gamma_w) - (T_{pc} * \gamma_{pc})] / \gamma_{was}$

where FS = 1.5

Ballast within LCS = $[(FS * \text{Total Head} * \gamma_w) - (T_{pc} * \gamma_g)] / \gamma_{was}$

Ballast on Sidewalls *vertical* = $[(FS * \text{Total Head} * \gamma_w * \cos\beta) - (T_{pc} * \gamma_{pc})] / \gamma_{was}$

Ballast on Sidewalls *horizontal* = $[(FS * \text{Total Head} * \gamma_w * \sin\beta) - (T_{pc} * K_o * \gamma_{pc})] / (\gamma_{was} * K_o)$

Unit Weights

γ_{was} = 100.0 pcf
γ_w = 62.4 pcf
γ_{pc} = 80.0 pcf
γ_g = 92.8 pcf
FS = 1.5
β = 18.44 deg
$\cos\beta$ = 0.9487
$\sin\beta$ = 0.3163
K_o = 0.7

Ballast Calculation Summary Table 1

Location of Ballast Calculation	E_{hw} [MSL ft]	E_l [MSL ft]	Total Head [ft]	E_{pc} [MSL ft]	T_{pc} [ft]	Calculated FS	T_{was} [ft]	Minimum Waste Elevation [MSL ft]
LCS Trench / Sump								
Low Point of Pond	306.00	297.00	9.00	300.00	3.00	0.50	6.02	306.02

Ballast Calculation Summary Table 2

Location of Ballast Calculation	E_{hw} [MSL ft]	E_i [MSL ft]	Total Head [ft]	E_{pc} [MSL ft]	T_{pc} [ft]	Calculated FS	T_{was} [ft]	Minimum Waste Elevation [MSL ft]
Floor / Bottom								
Bottom of Pond	306.00	297.00	9.00	300.00	3.00	0.43	6.02	306.02

Ballast Calculation Summary Table 3

Location of Ballast Calculation	E_{hw} [MSL ft]	E_l [MSL ft]	Total Head [ft]	E_{pc} [MSL ft]	T_{pc} [ft]	Calculated FS	T_{was} [ft]	Minimum Waste Elevation [MSL ft]
Sidewall / Slope								
Toe of Slope	306.00	303.00	3.00	303.00	0.00	0.00	5.77	308.77

APPENDIX A

Document 3

Luminant Martin Lake SES, Vertical Expansion of Permanent Disposal Ponds 1, 2, and 3 Tatum, Texas

ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

July 17, 2008

Dave Vogt, P.E.
HDR Engineering, Inc.
4500 West Eldorado Parkway, Suite 3500
McKinney, Texas 75070

SUBJECT: Luminant Martin Lake SES, Vertical Expansion Of Permanent Disposal Ponds 1, 2 and 3, Tatum, Texas
Geotechnical Investigation
ETTL Job No. G2810-081

Dear Mr. Vogt:

Submitted herein is the report summarizing the results of a geotechnical investigation conducted at the site of the above referenced project.

If you have any questions concerning this report, or if we can be of further assistance during construction, please contact us. We are available to perform any construction materials testing and inspection services that you may require.

Thank you for the opportunity to be of service.

Sincerely,
ETTL Engineers & Consultants Inc.

Robert M. Duke, P.E.
Senior Project Manager

STATE OF TEXAS
ROBERT M. DUKE
91757
LICENSED
PROFESSIONAL ENGINEER
7-17-08

C. Brandon Quinn, P.E.
Manager of Engineering Services
Vice President

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Geotechnical Investigation
Luminant Martin Lake SES
Vertical Expansion Of Permanent Disposal Ponds 1, 2 and 3
Tatum, Texas

Submitted to

HDR Engineering, Inc.
Austin, Texas

Prepared by

ETTL Engineers & Consultants Inc.
Tyler, Texas

July 2008

EXECUTIVE SUMMARY

This Executive Summary is provided as a brief synopsis of the specific recommendations and design criteria provided in the attached report. It is not intended as a substitute for a thorough reading of the report in its entirety.

Project Description

Three permanent disposal ponds (PDP) for fly ash were investigated for the purposes of determining the physical properties and thickness of the existing ash and to provide global stability analysis and recommendations for the proposed vertical expansion.

Site Description

The three existing disposal ponds are approximately 55 acres in size. An additional pond is located to the south, which is currently filled with water.

Depth & Number of Borings

11 borings ranging from 20 to 100 feet deep. The two borings to 100 feet deep are outside the ash area and the others are inside the present ash disposal areas. Two borings were deleted on site. 3 CPT borings ranging from 25 to 75 feet deep adjacent to three of the standard borings in the ash.

Ash and Soils Encountered

Most borings were drilled through the ash, which has a large range of grain size distributions. The ash classifies as poorly graded sand (SP) in some locations to silt (ML) in other locations. The consistency also ranged from very loose to medium dense. The borings through the fill material (in the containment berm) encountered primarily medium stiff to very stiff lean clay (CL) and/or fat clay (CH) with some loose to medium dense clayey sand (SC). The deeper borings encountered the native soils, which classify as very dense silt (ML) with lean clay (CL) seams. Atterberg Plasticity Indices of the tested soils ranged from non-plastic to 40.

Groundwater Depth

Groundwater appears perched in the ash and ranged from 382 to 392, typically around elevation 388. In the two borings outside the ash, the groundwater varied from approximately 355 on the south to 368 on the northwest. The pond to the south has a water surface level of 360.

Proposed Vertical Expansion

The proposed vertical expansion is feasible considering the settlement induced in the existing liner and a slope stability analysis of the proposed ultimate configuration. Ash may be placed to the proposed elevation (el. 446) and capped with properly compacted soils meeting the classification and permeability requirements. The proposed containment berms will be constructed using the same material as the cap. The proposed 3H:1V berm slopes are acceptable. Steeper slopes will be difficult to maintain with equipment. The final configuration is predicted to have a factor of safety of 1.6 or greater in the long term. Rapid drawdown of the level of water in the pond to the south does not adversely affect the predicted overall stability factor of safety (predicted to be 1.7 in this instance). Settlement at the top of the existing ash pile (base of new containment berm) is predicted to range from 7 to 9 inches. Settlement of the bottom liner is predicted to range from 5 to 7 inches. We do not anticipate any unacceptable stresses induced in the liner for settlement in this range.

TABLE OF CONTENTS

1.0 INTRODUCTION

This study was performed at the request and authorization to proceed granted by Kevin Shepard, P.E. with HDR Engineering Inc., Dallas, Texas in accordance with our proposal dated January 30, 2008. Field operations were conducted on February 19 to 28, 2008.

The purpose of this investigation was to define and evaluate the general subsurface conditions for the vertical expansion of permanent disposal ponds (PDP) 1, 2 and 3 in Tatum, Texas. Specifically, the study was planned to determine the following:

- Subsurface stratigraphy within the limits of exploratory borings;
- Classification, strength, expansive properties, and compressibility characteristics of the ash deposits and foundation soils;
- Slope stability and immediate and long term settlement of the elements of the proposed expansion;
- Construction requirements; and
- Other construction related problems that may be anticipated.

To determine this information a variety of tests were performed on the soil and ash samples. The scope of testing for this report comprised Standard Penetration, Atterberg liquid and plastic limits, Percentage of Fines Passing the No. 200 sieve and Natural Moisture Content, Unconsolidated Undrained Triaxial tests, Hydrometer, Permeability, Direct Shear and Piezocone Penetration testing. These tests were conducted to classify the soil strata and ash deposits according to a widely used engineering classification system; identify, and provide quantitative data for active (expansive) soils; define shear strength characteristics; predict total settlement; and assess construction workability of the soils.

The conclusions and recommendations that follow are based on limited information regarding site grading provided to ETTL by others. Borings were drilled at locations based on a site plan provided by the client. *Should any portion of it prove incorrect, this firm should be notified in order to assess the need for revisions to this report.*

2.0 PROJECT DESCRIPTION

Three permanent disposal ponds (PDP) for fly ash were investigated for the purposes of determining the physical properties and thickness of the existing ash and to provide global stability analysis and recommendations for the proposed vertical expansion.

3.0 SITE DESCRIPTION

The existing three disposal ponds are approximately 55 acres in size. A plan view and a cross section are included in the Appendix of this report. An additional pond is located to the south, which is filled with water.

4.0 FOUNDATION STRATIGRAPHY & PROPERTIES

Detailed on the boring logs are the specific types and depths of the various ash and soil strata encountered. Most of the borings were drilled through the ash, which has a large range of grain size distributions, unit weight and moisture content. The ash classifies as poorly graded sand (SP) in some locations and ranges in gradation down to silt (ML) at other locations and depths. The consistency also ranged from very loose to medium dense. The borings through the fill material (existing berms) encountered primarily medium stiff to very stiff lean clay (CL) and/or fat clay (CH) with some loose to medium dense clayey sand (SC) in the fill zone. The deeper two borings (B-12 and B-13) encountered the native soils, which classify as very dense silt (ML) with hard lean clay (CL) seams. Atterberg Plasticity Indices of the tested soils ranged from non-plastic to 40.

5.0 GROUNDWATER OBSERVATIONS

Groundwater level and seepage depth were monitored during and upon completion of drilling as well as at some point following completion. Groundwater appears to be perched in the ash ponds at a range of 382 to 392 and was typically encountered near elevation 388. In the two borings outside the ash, the groundwater was approximately 355 to 368. The pond to the south has a water surface level of 360. Increasing the berm heights will likely increase the amount of perched water unless a dewatering system is used. It is our understanding that a leachate collection system will be installed at the existing surface elevation. The calculations contained in this report assume that the ash will be saturated to the existing berm elevation in order to analyze the worst case scenario.

It should be noted, however, that seasonal groundwater conditions might vary throughout the year depending upon prevailing climatic conditions. This magnitude of variance will be largely dependent upon the duration and intensity of precipitation, surface drainage characteristics of the surrounding area, and significant changes in site topography.

6.0 PROPOSED DISPOSAL POND SECTION

The proposed vertical expansion will incorporate raising the containment berms around the perimeter of the existing three ponds. The berm height will be increased approximately 23 feet above the existing containment berm elevation. After constructing the new berms additional ash will be backfilled against the berms, which will slope up at a 5% grade from the berms toward the middle of the pond area. Preliminary designs for the vertical expansion may include an intermediate or secondary liner system constructed at the existing grade prior to backfilling with ash. After filling the containment ponds to the new level, a cap will be placed.

The additional ash will cause additional settlement, which should be checked to determine if it might cause distress in the pond liners. The resulting slopes must also be checked for stability.

6.1. Slope Stability Analysis

All embankment slopes must be stable with respect to shear failure through the embankment and the foundation strata. Construction of the embankments should be monitored to help assure that proper material is used and that it is properly compacted.

Slope stability was evaluated using the computer program GSTABL7 with STEDwin developed by Gregory Geotechnical Software. The program calculates the factor of safety for potential failure circles using several different methods. This analysis was conducted using the modified Bishop method. The program has an automatic search routine for determining the minimum factor of safety. The resulting analyses, which also show the cross section, are included in the Appendix.

Since the berms may be constructed with clay, we have assumed, for the purpose of slope stability analysis, that all embankments will be constructed with this material and that the fly ash will be used to fill to a maximum elevation of 446 (5% slope behind berm). If the berms are constructed with the fly ash and covered with the clay, the Factors of Safety would increase. Therefore, the analysis assumes all clay in the berms. Perched water is assumed to be equal to the top of the containment berm since the existing ash is basically filled with water. A leachate collection system will be installed at the same elevation as the bottom of the new containment berms (near existing grade). Therefore, the new ash was modeled in an unsaturated state.

The "worst case" embankment was modeled to cover all of the proposed perimeter embankments. This would be the section on the south where the water filled pond is adjacent to the PDP's. The entire embankment was modeled using 85 percent of the strength values determined from testing. The results were reduced to accommodate potential variations in the soil (or ash). The "post peak" friction angle and cohesion were used from the direct shears. The remolded direct shear tests were molded at the lower densities found in the samples. Soil properties used in the analysis are summarized in **Table 6.1.1** below.

Table 6.1.1 - Summary of Stability Analysis Soil Parameters

Soil Type	Moist Unit Weight (pcf)	Effective Stress Parameters		Total Stress Parameters	
		Friction Angle	Cohesion (psf)	Friction Angle	Cohesion (psf)
Native Cohesionless Foundation Soils (minimum)	125	38	0	38	0
Remolded Clay Berm (CL/CH) (minimum)	120	23	200	15	500
Existing Fly Ash	90	37.5	0	37.5	0
New Fly Ash	90	37.4	0	37.4	0

Four cases were analyzed for slope stability: end of construction (short term), steady-state (long term), steady state with rapid drawdown of the water in the pond and steady state with seismic. Seismic properties were derived from the USGS Spectral Response Maps using the 2006 IBC, Section 1613, "Earthquake Loads". For the evaluation of steady-state conditions, the soils were evaluated using *effective* stress parameters. For the end of construction case the slope was evaluated using *total* stress parameters. Graphical representations of the slope stability results are included in the **Appendix**. Results of the analysis are summarized in **Table 6.1.2**, below.

Table 6.1.2 – Embankment Slope Stability Results

Case	Strength Parameter	Factor of Safety	Required Factor of Safety
End of Construction	Total Stress	1.6	1.3
Steady State	Effective Stress	1.8	1.5

Table 6.1.2 – Embankment Slope Stability Results			
Case	**Strength Parameter**	**Factor of Safety**	**Required Factor of Safety**
Steady State Rapid Drawdown	Effective Stress	1.7	1.3
Steady State with Seismic	Effective Stress	1.8	1.2

The groundwater should be controlled to keep the factor of safety at the acceptable range of 1.5. If the water were to rise to the top of the new containment berms, the factor of safety would still be a 1.3. If the berm is constructed with ash and covered with a clay cover, the anticipated Factors of Safety will increase.

6.2 Settlement Potential

For the purpose of making a prediction of long-term settlement potential in the native soil due to embankment load, an assumption was made that the soil below the depth of exploration is about the same as that above this depth (very likely the case based on typical characteristics of these geologies). Settlement was calculated using the computer program Unisettle, Version 3.3 using Janbu's settlement method. Based on anticipated thicknesses of ash to be added and the average unit weight and the depth to the very hard soils, the maximum settlement of the foundation soils beneath the proposed new fill is predicted to range from about 7 to 9 inches (based on the consolidation test results and depths of loose soil identified in the borings for this study. Settlement at the liner level will be in the range of 5 to 7 inches. It is not anticipated that settlement in this range will be detrimental to the existing liner.

The new leachate collection system should have a slope of greater than 0.5% to insure that the pipe does not reverse the direction of flow. It would be better to have a slope of 1%.

6.3 Liner and Embankment Foundation Preparation

Preparation prior to liner and embankment construction will require clearing and grubbing of the area beneath the embankment section. Strip the subgrade over the entire embankment area to remove soft soil and any vegetation. Stripping of surface soils (or ash) should be to a minimum depth of approximately 1 foot. Greater depths of stripping may be required in the areas where weak, soft soils may be exposed during construction.

After completion of stripping, the exposed soil should be scarified, the moisture content adjusted, and then recompacted to the density specified for the embankment. Groundwater may be encountered in the ash based on the depth of water in the borings. Dewatering using wells, interception trenches, and or sump pits may be necessary to drop the water level for construction.

6.4 Liner and Embankment Construction

Liner and/or cap should consist of a minimum of three feet of properly compacted soil with permeability of $1X10^{-7}$ cm/sec, or less, LL of 30% or greater, PI of 15% to 35%, and more than 50% by weight passing the No. 200 sieve. A low permeability liner consisting of the above compacted soil liner in combination with a 60-mil HDPE, or 30-mil PVC can reduce the thickness of the compacted soil liner. A geosynthetic clay liner (GCL) can also be considered instead of the compacted clay liner.

It is anticipated that the proposed containment berm will be constructed with a homogeneous material. The material should be placed in the following manner:

- Prepare the subgrade in accordance with the recommendations discussed in a previous section of this report entitled **Embankment Foundation Preparation**. Sites that slope more than about 15% should be benched with 5-foot wide benches prior to placing fill.

- Place subsequent lifts of fill in thin, loose layers not exceeding nine inches in thickness to the desired rough grade and compact to a minimum of 95% of the maximum density defined by ASTM D 698. Maintain moisture within a range of optimum to optimum +3%.

- Conduct in-place field density tests at a rate of one test per 5,000 square feet for every lift with a minimum of 2 tests per lift. *Density testing is essential to assure that the soil is properly placed.*

- Prevent excessive loss of moisture during construction.

6.5 Slope (and Cover) Protection

Earthen embankment slopes require some form of protection from excessive erosion. A good cover of approved grasses should provide adequate slope protection. A very effective method for protection consists of establishing a good grass cover. Topsoil stripped from the foundation area may be used to plate areas that are to be seeded. Information for seeding for erosion control may be found in Item 164, "Seeding for Erosion Control," Texas Department of Transportation *Standard Specifications for Construction of Highways, Streets and Bridges,* 2004 Edition. The root system of healthy grass is more effective in retaining surficial soil against surface water erosion than other forms of vegetation. Bushes and trees of two feet or more in height are not considered satisfactory slope protection because of the harmful effect on grass and the safety hazards of trees near the roadways. A routine and periodic maintenance program should be implemented to prevent excessive growth. Animal control should also be considered an integral part of routine embankment maintenance.

7.0 GENERAL CONSTRUCTION CONSIDERATIONS

7.1 Dewatering

The excavation requirement for the proposed project in combination with the proximity to ground water may create construction problems in the fly ash. Excavations (including excavations site preparation), which are near or below the observed ground water level, may experience infiltration and this water will need to be dealt with during construction.

Although no excavations are anticipated to be below the ground water depth, they may closely approach a saturated zone containing water under pressure. Prudent provisions for managing or removing water appear advisable. Water removal is likely to be as simple as pumping it from a sump. Construction during drier seasons of the year may alleviate potential problems to a great extent. It is necessary to achieve compaction on all lifts of the embankment. Other stabilization procedures may also be possible. More detailed options for stabilization of the subgrade for placement of the fill would be more apparent during construction.

8.0 LIMITATIONS

Geotechnical design work is characterized by the presence of a calculated risk that soil and groundwater conditions may not have been fully revealed by the exploratory borings. This risk derives from the practical necessity of basing interpretations and design conclusions on a limited sampling of the subsoil stratigraphy at the project site. The number of borings and spacing is chosen in such a manner as to decrease the possibility of undiscovered anomalies, while considering the nature of loading, size and cost of the project. The recommendations given in this report are based upon the conditions that existed at the boring locations at the time they were drilled. The term "existing groundline" or "existing subgrade" refers to the ground elevations and soil conditions at the time of our field operations.

It is conceivable that soil conditions throughout the site may vary from those observed in the exploratory borings. If such discontinuities do exist, they may not become evident until construction begins or possibly much later. Consequently, careful observations by the geotechnical engineer must be made of the construction as it progresses to help detect significant and obvious deviations of actual conditions throughout the project area from those inferred from the exploratory borings. Should any conditions at variance with those noted in this report be encountered during construction, this office should be notified immediately so that further investigations and supplemental recommendations can be made.

This company is not responsible for the conclusions, opinions, or recommendations made by others based on the contents of this report. The purpose of this study is only as stated elsewhere herein and is not intended to comply with the requirements of 30 TAC 330 Subchapter T regarding testing to determine the presence of a landfill. Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. No warranties are either expressed or implied.

APPENDIX

I.0 FIELD OPERATIONS

Subsurface conditions were defined by 11 sample core borings drilled to depths ranging from 20 to 100 feet and 3 CPT borings that ranged from 25 to 75 feet deep. ETTL personnel drilled the borings at locations based on a site plan provided by the client. Field boring logs were prepared as drilling and sampling progressed. The final boring logs are also included in the Appendix. Descriptive terms and symbols used on the logs are in accordance with the Unified Soil Classification System (ASTM D 2487). A reference key is provided on the final page of this report.

A truck-mounted drill rig utilizing dry auger drilling procedures was used to advance the borings. Soils were sampled by means of a 1 3/8-inch I.D. by 24-inch long split-spoon sampler driven into the bottom of the borehole in accordance with ASTM D 1586 procedures. In conjunction with this sampling technique, the Standard Penetration Test was conducted by recording the N-value, which is the number of blows required by a 140-pound weight falling 30 inches to drive a split-spoon sampler 1 foot into the ground. For very dense strata, the number of blows is limited to a maximum of 50 blows within a 6-inch increment. Where possible, the sampler is "seated" six inches before the N-value is determined. The N-value obtained from the Standard Penetration Test provides an approximate measure of the relative density, which correlates with the shear strength of soil. The disturbed samples were removed from the sampler, logged, packaged, and transported to the laboratory for further identification and classification.

Soils were sampled by means of a 3-inch O.D. by 24-inch long thick-walled Shelby Tube sampler. Using the drilling rig's hydraulic pressure, the sampler was pushed smoothly into the bottom of the borehole. The consistency of these samples was measured in the field by a calibrated pocket penetrometer. These values, recorded in tons per square foot, are shown on the boring logs. Such samples were extruded in the field, logged, sealed to maintain *in situ* conditions, and packaged for transport to the laboratory.

All boreholes were backfilled with cuttings after collecting final groundwater readings. Samples obtained during our field studies and not consumed by laboratory testing procedures will be retained in our Tyler office free of charge for a period of 60 days. To arrange storage beyond this point in time, please contact the Tyler office.

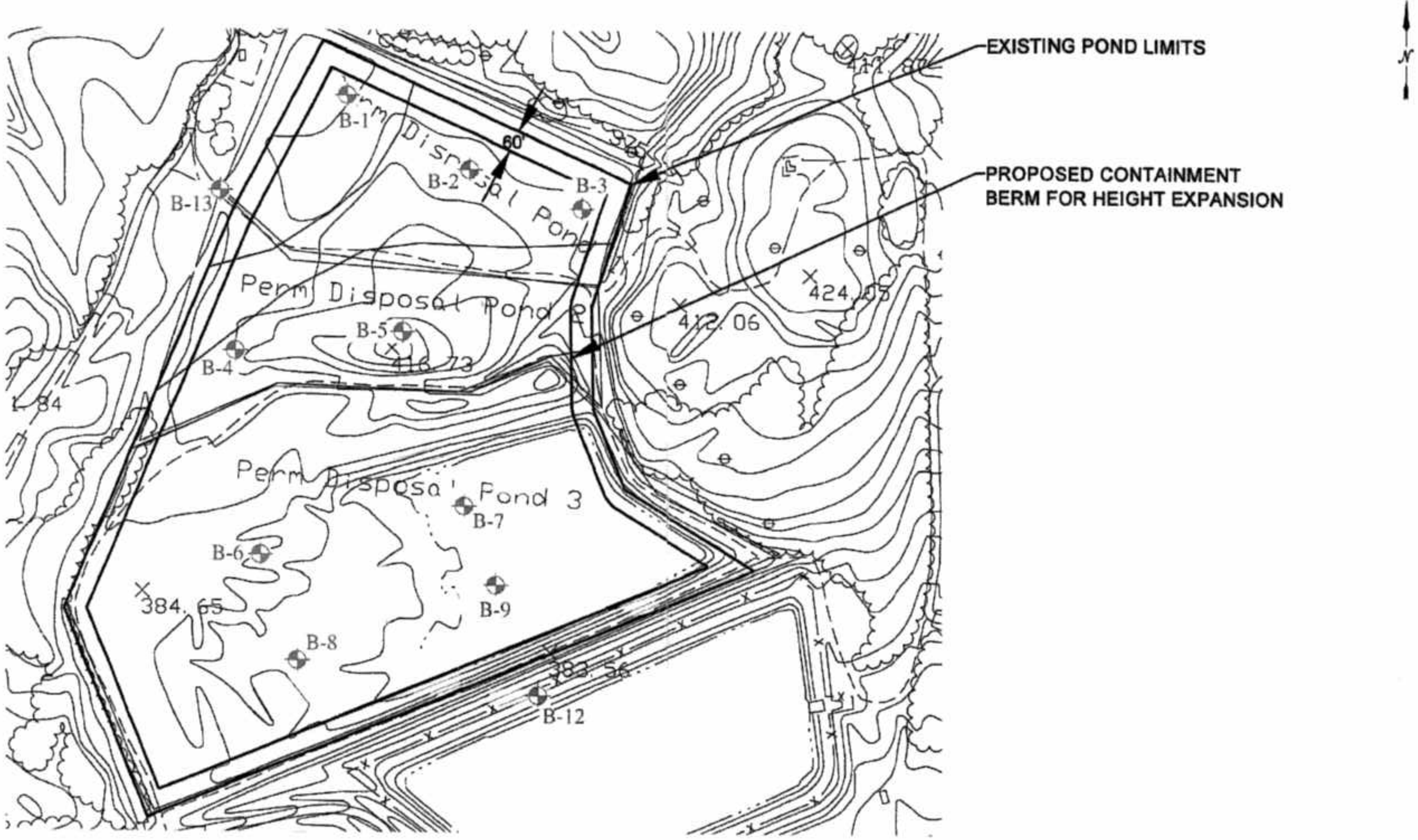
II.0 LABORATORY TESTING

Upon return to the laboratory, a geotechnical engineer visually examined all samples and several specimens were selected for representative identification of the substrata. By determining the Atterberg liquid and plastic limits (ASTM D 4318) and percentage of fines passing the No. 200 sieve (ASTM D 1140), field classification of the various strata was verified. Also conducted were natural moisture content tests (ASTM D 2216).

Size distribution of several soil samples was determined using a Hydrometer test (ASTM D 422). Consolidation tests (ASTM D 2435) were performed on the ash and some of the fill soils. A permeability (ASTM D 5084) was also performed on a representative sample.

Strength characteristics of the cohesive substrata were evaluated by conducting unconsolidated, undrained triaxial compression tests (ASTM D 2850) on selected undisturbed field samples obtained with the Shelby tube sampler. Direct Shear tests (ASTM D 3080) were performed on undisturbed samples retrieved during drilling operations and also from remolded bulk ash samples. The results of these tests are either presented in the individual log of boring provided in this

Appendix or as a separate result behind the logs in the Appendix.



ETTL ENGINEERS & CONSULTANTS	LUMINANT MARTIN LAKE PDP 1-3 TATUM, TEXAS	PLATE 1 – PLAN OF BORINGS	APPROVED BY:
		JOB No.: G 2810-08	DRAWN BY: K.C.R.
		DATE: MARCH 2008 / SCALE: N.T.S.	

LOG OF BORING B-1

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Flight Auger

DATE 2/22/08

SURFACE ELEVATION 390'

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	SM	SILTY SAND(SM) loose; tan; moist; with ferric oxide; with organics	N=5					17	16	14	2	34	+40 Sieve =8%, +4 Sieve =3%
		ASH SEDIMENT medium dense; black and gray; coarse to very fine-grained sand	N=22	101				23					
			N=17					23					
10		–black		82				28				23	+40 Sieve =55%, +4 Sieve =26%
		–loose; black and gray; coarse to very fine-grained sand	N=8					36					
20			N=9					32				53	
		Bottom of Boring @ 20'											

Chart legend: BLOW COUNT (20, 40, 60, 80); Qu (tsf) (1, 2, 3, 4); PPR (tsf) (1.0, 2.0, 3.0, 4.0); Torvane (tsf) (1.0, 2.0, 3.0, 4.0). Natural Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit (20, 40, 60, 80).

Water Level: Est.: ▽ Measured: ▼ Perched: ▽

Water Observations: Seepage @ 7' while drilling. Water level @ 1' and caved to 6' on 2/29/08.

Key to Abbrevations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.790', W 94°34.996'. Minus #200 Sieve (53%) @ 18' (Hydrometer - Specific Gravity 2.608). Dry Density (82) @ 8' (Hydraulic Conductivity K=2.79E-04 cm/sec).

LOG OF BORING B-12

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Luminant Martin Lake PDP 1-3, Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Rotary Wash

DATE 2/27/08

SURFACE ELEVATION 380'

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	SC	CLAYEY SAND(SC) medium dense; red and orange	N=25	16	35	15	20	37	+40 Sieve =10%, +4 Sieve =3%
		–loose; gray, red, and orange	N=9						
	CL	LEAN CLAY WITH SAND(CL) stiff; red, orange, and tan	N=10						
10		–gray and red	N=13	24	47	19	28	79	+40 Sieve =3%, +4 Sieve =0%
		–red and orange							
20	SC	CLAYEY SAND(SC) medium dense; red and orange	N=11						
30		–with iron oxide cemented sandstone gravel	N=12	17	36	15	21	44	+40 Sieve =21%, +4 Sieve =18%
	SM	SILTY SAND(SM) medium dense; gray, red, and orange	N=17						
40	CL	SANDY LEAN CLAY(CL) medium dense; red, orange, and gray	N=20	20	40	16	24	61	+40 Sieve =5%, +4 Sieve =3%
			N=17						
		–red and orange; with iron oxide cemented sandstone seam @ 45'							
50	SM	SILTY SAND(SM) medium dense; gray, orange, and tan	N=23						

Columns shown without data: DRY DENSITY (pcf); COMPRESSIVE STRENGTH (tsf); FAILURE STRAIN (%); CONFINING PRESSURE (psi).

Plot scales: BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0. Natural Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit; 20 40 60 80.

Water Level: Est. Measured: Perched:

Water Observations: Dry and open to 25' on 2/29/08.

Key to Abbrevations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes: GPS Coordinates: N 32°15.513', W 94°34.904'.

LOG OF BORING B-12

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

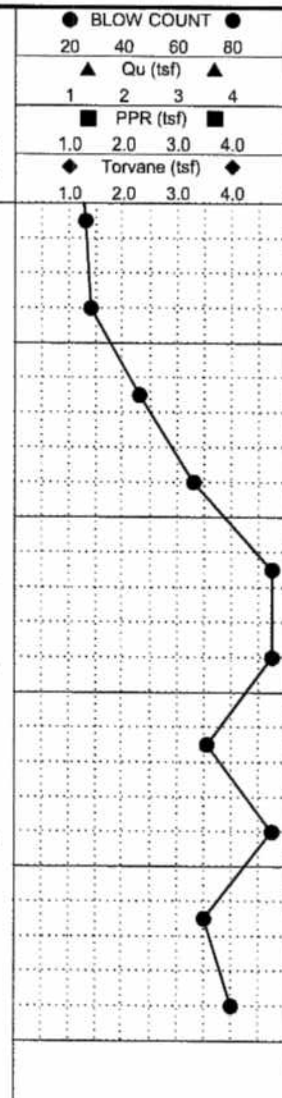
PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

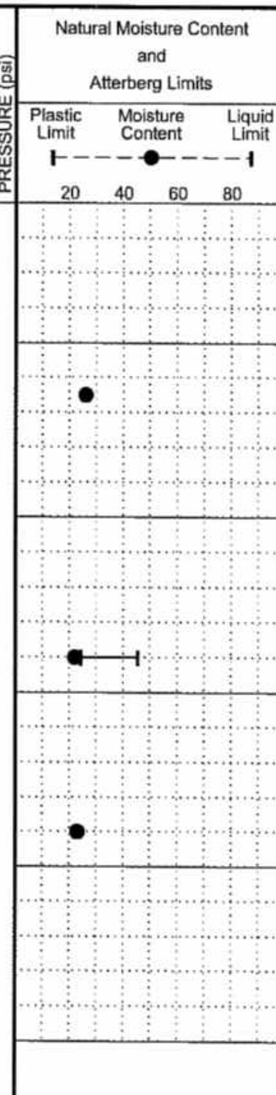
PROJECT NO.: G 2810-08 **BORING TYPE:** Rotary Wash

DATE 2/27/08

SURFACE ELEVATION 380'

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
		-gray, red, brown	N=26										
60		-gray and brown	N=28										
	ML	SILT(ML) dense; brown and gray	N=46	99				26				96	+40 Sieve =2%, +4 Sieve =0%
70		-very dense	N=66										
	CL	LEAN CLAY WITH SAND(CL) hard; gray	N=50/3"										
80			N=50/4"	102				22	45	24	21	73	+40 Sieve =24%, +4 Sieve =23%
	ML	SILT(ML) very dense; gray	N=71										
90			N=50/5"	107				23				94	+40 Sieve =2%, +4 Sieve =0%
			N=70										
100			N=80										
		Bottom of Boring @ 100'											





Water Level: Est.: ∇ Measured: ▼ Perched: ▼

Water Observations: Dry and open to 25' on 2/29/08.

Key to Abbrevations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.513', W 94°34.904'.

LOG OF BORING B-13

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

DATE 2/19/08

SURFACE ELEVATION 380'

PROJECT: Luminant Martin Lake PDP 1-3, Tatum, Texas

PROJECT NO.: G 2810-08

BORING TYPE: Rotary Wash

Depth (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	SC	CLAYEY SAND(SC) medium dense; red	N=11										
			N=16					14	24	14	10	46	+40 Sieve =3%, +4 Sieve =1%
		–brown and gray	N=38										
		–dense; red and tan	N=47										
		–tan, red, and gray	N=37										
	CH	FAT CLAY(CH) stiff; red, gray, and tan	P=1.5					23	51	20	31	89	+40 Sieve =7%, +4 Sieve =1%
		–with iron laminations	P=1.5 P=1.5										
	CL	LEAN CLAY(CL) very stiff; gray	N=26					23	48	21	27	94	+40 Sieve =2%, +4 Sieve =0%
		–hard	P=4.5+										
		–gray and brown; with iron oxide cemented sandstone seams	P=4.5+										
	ML	SANDY SILT(ML) very dense; gray; with clay seams	N=63					26				66	+40 Sieve =2%, +4 Sieve =0%
50			N=63										

Water Level Est.: ∇ Measured: ▼ Perched: ∇

Water Observations: Seepage @ 29' while drilling. Water level @ 28' and open upon completion. Water level @ 12' and caved to 14' on 2/29/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.752', W 94°35.072'.

LOG OF BORING B-13

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Luminant Martin Lake PDP 1-3, Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Rotary Wash

DATE 2/19/08

SURFACE ELEVATION 380'

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
		–hard; laminated with sand seams	P=4.5+						
60		–very stiff; gray and green; with sand seams	P=2.5						
	CL	LEAN CLAY(CL) hard; gray; laminated with sand seams	N=76	26	47	24	23	96	+40 Sieve =2%, +4 Sieve =0%
70	SM	SILTY SAND(SM) very dense; gray	N=75						
			N=50/3.5"						
80	ML	SILT(ML) very dense; gray	N=78						
		–with clay seams	P=SF						
90			N=50/5"						
			N=50/3"						
100			N=50/4"						
		Bottom of Boring @ 100'							

Columns also printed (no data): DRY DENSITY (pcf); COMPRESSIVE STRENGTH (tsf); FAILURE STRAIN (%); CONFINING PRESSURE (psi). Plot scales: BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0. Natural Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit; 20 40 60 80.

Water Level — Est.: ∇ Measured: ▼ Perched: ▼

Water Observations: Seepage @ 29' while drilling. Water level @ 28' and open upon completion. Water level @ 12' and caved to 14' on 2/29/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes: GPS Coordinates: N 32°15.752', W 94°35.072'.

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MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

LOG OF BORING B-2

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Flight Auger

DATE 2/22/08

SURFACE ELEVATION 390'

USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
CH	SANDY FAT CLAY(CH) stiff; red and orange	N=11					22	51	18	33	65	+40 Sieve =9%, +4 Sieve =6%
		N=11					23					
	–with sand	N=12					28	57	17	40	78	+40 Sieve =2%, +4 Sieve =0%
	ASH SEDIMENT medium dense; black	N=11					29				16	+40 Sieve =63%, +4 Sieve =40%
	–very loose; with organic odor	N=3					30				39	+40 Sieve =36%, +4 Sieve =12%
											93	
	–light gray						42					
	Bottom of Boring @ 25'											

Water Level: Est.: ▽ Measured: ▼ Perched: ▼

Water Observations: Seepage @ 13' while drilling. Water level @ 1' and caved to 8' on 2/29/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.764', W 94°34.903'. Minus #200 Sieve (93%) @ 23' (Hydrometer - Specific Gravity 2.675).

LOG OF BORING B-3

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Flight Auger

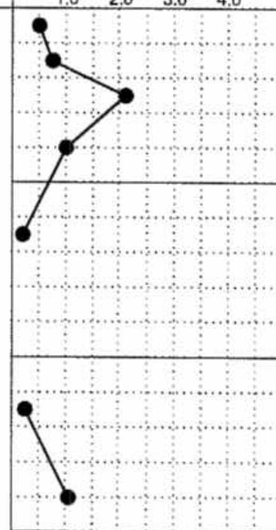
DATE 2/22/08

SURFACE ELEVATION 390'

USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
CH	SANDY FAT CLAY(CH) medium stiff; red and orange	N=10						
	–stiff	N=15	21	54	19	35	69	+40 Sieve =5%, +4 Sieve =1%
	ASH SEDIMENT dense; black	N=42	26				42	
	–medium dense; black and gray; coarse-grained sand	N=20	26				10	+40 Sieve =60%, +4 Sieve =10%
	–very loose; black; coarse to fine-grained sand	N=4	28				9	+40 Sieve =67%, +4 Sieve =35%
	–no recovery							
	–loose; light gray	N=5	69	49	41	8	100	+40 Sieve =0%, +4 Sieve =0%
	–medium dense; black; with organic odor	N=21						
	Bottom of Boring @ 30'							

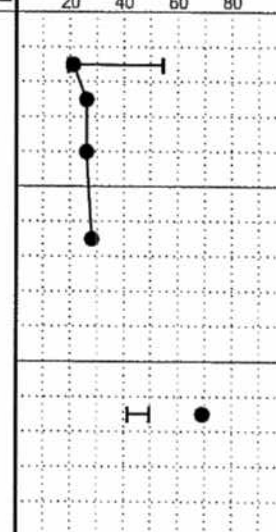
Depth (ft): 0, 10, 20, 30

BLOW COUNT (20, 40, 60, 80) / Qu (tsf) (1, 2, 3, 4) / PPR (tsf) (1.0, 2.0, 3.0, 4.0) / Torvane (tsf) (1.0, 2.0, 3.0, 4.0)



DRY DENSITY (pcf) | COMPRESSIVE STRENGTH (tsf) | FAILURE STRAIN (%) | CONFINING PRESSURE (psi)

Natural Moisture Content and Atterberg Limits — Plastic Limit, Moisture Content, Liquid Limit (20, 40, 60, 80)



Water Level — Est.: ▽ Measured: ▼ Perched: ▼

Water Observations: Seepage @ 8' while drilling. Water level @ 2' and caved to 8' on 2/29/08..

Key to Abbrevations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.746', W 94°34.855'. Minus #200 Sieve (42%) @ 5' (Hydrometer - Specific Gravity 2.561).

LOG OF BORING B-4

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

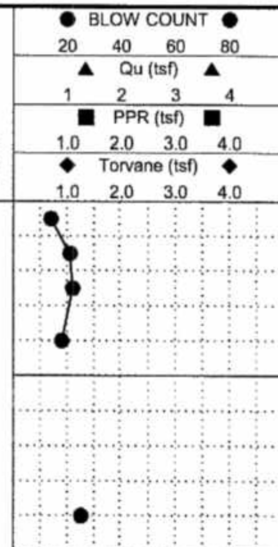
PROJECT: Luminant Martin Lake PDP 1-3, Tatum, Texas

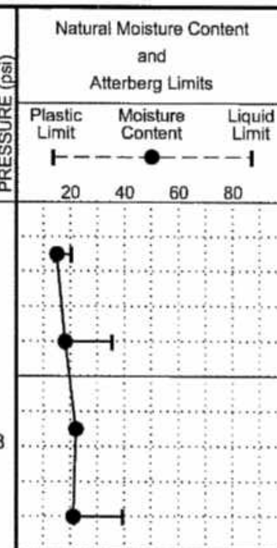
PROJECT NO.: G 2810-08 **BORING TYPE:** Flight Auger

DATE: 2/22/08

SURFACE ELEVATION: 385'

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	SC SM	SILTY CLAYEY SAND(SC-SM) medium dense; red and brown	N=14										
		–very stiff; red and orange	N=21					15	20	14	6	42	+40 Sieve =1%, +4 Sieve =0%
	SM	SILTY SAND(SM) medium dense; red and tan	N=22										
10	CL	LEAN CLAY(CL) very stiff; red, orange, and tan	N=18					18	35	18	17	85	+40 Sieve =5%, +4 Sieve =1%
		–red, tan, and gray	P=3.5	99	2.40	10	13	22					
20			N=25					21	39	21	18	81	+40 Sieve =0%, +4 Sieve =0%
		Bottom of Boring @ 20'											





Water Level — Est.: ▽ Measured: ▼ Perched: ▼

Water Observations: Seepage @ 3' while drilling. Water level @ Surface and caved to 15' on 2/29/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes: GPS Coordinates: N 32°15.675', W 94°35.083'.

LOG OF BORING B-5

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

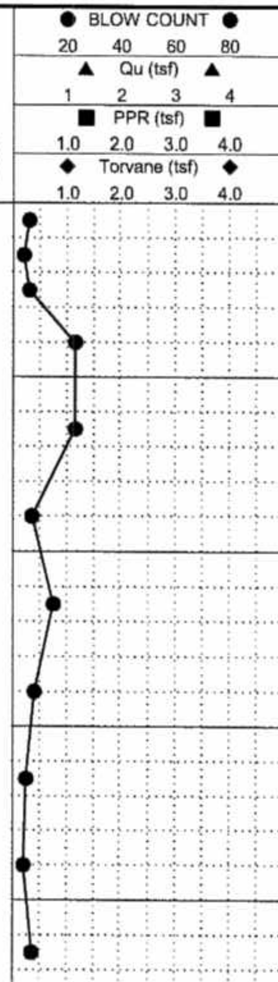
PROJECT: Luminant Martin Lake PDP 1-3, Tatum, Texas

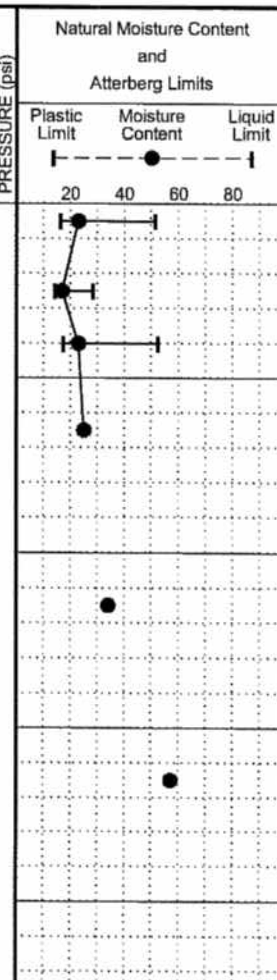
PROJECT NO.: G 2810-08 **BORING TYPE:** Flight Auger

DATE: 2/22/08

SURFACE ELEVATION: 415'

USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
CH	FAT CLAY WITH SAND(CH) medium stiff; red, orange, and gray	N=6					23	51	16	35	77	+40 Sieve =4%, +4 Sieve =1%
	--soft	N=4										
CL	SANDY LEAN CLAY(CL) medium stiff; red and orange	N=6					17	28	14	14	60	+40 Sieve =6%, +4 Sieve =1%
CH	FAT CLAY WITH SAND(CH) very stiff; red and orange	N=23					23	52	17	35	77	+40 Sieve =4%, +4 Sieve =1%
	ASH SEDIMENT medium dense; gray and black	N=23					25				16	+40 Sieve =54%, +4 Sieve =24%
	–loose	N=7										
	–medium dense	N=15	62				34				32	+40 Sieve =37%, +4 Sieve =16%
	–loose	N=8										
	–gray	N=5	62				57				99	+40 Sieve =1%, +4 Sieve =0%
	–very loose	N=4										
	–loose	N=7										
	Bottom of Boring @ 45'											





Water Level: Est.: ∇ Measured: ▼ Perched: ∇

Water Observations: Water level @ 23' and caved to 26' on 2/29/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.667', W 94°34.936'.

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MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

LOG OF BORING B-6

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Flight Auger

DATE 2/22/08

SURFACE ELEVATION 385'

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0–4		ASH SEDIMENT medium dense; black and tan	N=19					26				44	+40 Sieve =30%, +4 Sieve =13%
			P=SF										
4–14	CL	SANDY LEAN CLAY(CL) stiff; red and tan	N=10					22	35	19	16	61	+40 Sieve =7%, +4 Sieve =4%
		–very stiff	P=2.5										
14–20		ASH SEDIMENT loose; black	N=9					40				61	+40 Sieve =5%, +4 Sieve =2%
		–medium dense	N=12					68				84	
20		Bottom of Boring @ 20'											

Water Level Est.: ∇ Measured: ▼ Perched: ∇

Water Observations: Seepage @ 4' while drilling. Water level @ 4' and caved to 7' upon completion. Water level @ 1' and caved to 8' on 2/29/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.591', W 94°35.088'. Minus #200 Sieve (84) @ 18' (Hydrometer - Specific Gravity 2.732).

LOG OF BORING B-7

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Rotary Wash

DATE 2/28/08

SURFACE ELEVATION 390'

DEPTH (ft)	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		▼	ASH SEDIMENT medium dense; black	N=13					37				16	+40 Sieve =49%, +4 Sieve =10%
			–dense; black	N=40										
				P=4.5	98	2.30	2	6	23					
10			–loose	N=7										
			–very loose	N=4					38				11	
20	CL		LEAN CLAY WITH SAND(CL) medium stiff; orange and black	N=7					27	42	17	25	75	+40 Sieve =4%, +4 Sieve =0%
			–tan and red		104	0.50	13	22	21					
30			–medium dense; red and orange	N=22										
	CH		SANDY FAT CLAY(CH) medium dense; red and orange	N=23					27	53	20	33	69	+40 Sieve =27%, +4 Sieve =22%
40				N=22										
			Bottom of Boring @ 40'											

Blow count plot legend: ● BLOW COUNT ● 20 40 60 80; ▲ Qu (tsf) ▲ 1 2 3 4; ■ PPR (tsf) ■ 1.0 2.0 3.0 4.0; ◆ Torvane (tsf) ◆ 1.0 2.0 3.0 4.0

Natural Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit; 20 40 60 80

Water Level: Est.: ▽ Measured: ▼ Perched: ▼

Water Observations: Water level @ 3' and caved to 24' on 2/29/08.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.646', W 94°34.870'. Minus #200 Sieve (11%) @ 13' (Hydrometer - Specific Gravity 2.655).

LOG OF BORING B-8

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Flight Auger

DATE 2/20/08

SURFACE ELEVATION 390'

DEPTH (ft)	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	ASH SEDIMENT loose; gray	N=7										
	-very loose; gray and black	N=0					73				95	+40 Sieve =3%, +4 Sieve =0%
	-medium dense; brown	N=14										
10												
	-very loose; black	N=1										
20		N=3					72				95	+40 Sieve =1%, +4 Sieve =0%
		N=0										
30	-strong odor	N=0					85				99	+40 Sieve =0%, +4 Sieve =0%
	Bottom of Boring @ 30'											

Graph legends: BLOW COUNT (20, 40, 60, 80); Qu (tsf) (1, 2, 3, 4); PPR (tsf) (1.0, 2.0, 3.0, 4.0); Torvane (tsf) (1.0, 2.0, 3.0, 4.0). Natural Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit (20, 40, 60, 80).

USC | WATER LEVEL | SAMPLES

Water Level Est.: ∇ Measured: ▼ Perched: ▼

Water Observations: Seepage @ 4' while drilling. Water level @ 6' and caved to 17' upon completion. Dry and caved to 3' and on 2/29/08.

Key to Abbrevations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N 32°15.548', W 94°34.570'.

LOG OF BORING B-9

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

PROJECT: Luminant Martin Lake PDP 1-3
Tatum, Texas

PROJECT NO.: G 2810-08 **BORING TYPE:** Flight Auger

DATE 2/20/08

SURFACE ELEVATION 390'

MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
ASH SEDIMENT very loose; gray	N=3					45				89	
–loose; black and gray	N=10										
–medium dense	N=18					45				77	+40 Sieve =4%, +4 Sieve =0%
–very loose; black	N=0										
–loose	N=10					57				94	+40 Sieve =3%, +4 Sieve =0%
	N=5										
–very loose	N=1					49				68	+40 Sieve =4%, +4 Sieve =0%
–gray and black; strong odor	N=0					88				97	+40 Sieve =2%, +4 Sieve =0%
Bottom of Boring @ 30'											

Depth (ft): 0, 10, 20, 30

Plot legend: BLOW COUNT (20, 40, 60, 80); Qu (tsf) (1, 2, 3, 4); PPR (tsf) (1.0, 2.0, 3.0, 4.0); Torvane (tsf) (1.0, 2.0, 3.0, 4.0)

Natural Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit (20, 40, 60, 80)

Water Level Est.: ∇ Measured: ▼ Perched: ▼

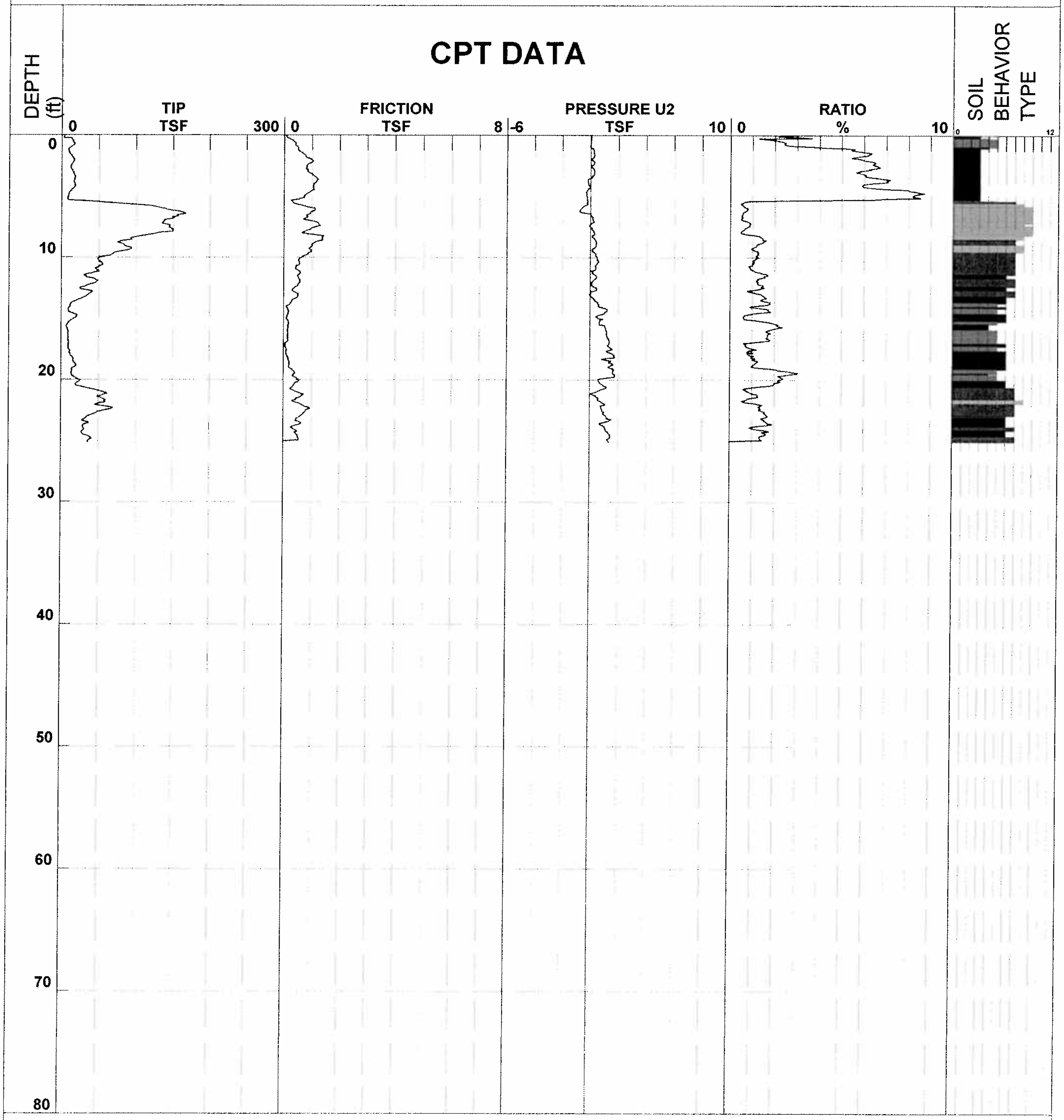
Water Observations: Seepage @ 4' while drilling. Water level @ 6' and caved to 18' upon completion. Dry and caved to 4' on 2/29/08.

Key to Abbreviations:
- N - SPT Data (Blows/Ft)
- P - Pocket Penetrometer (tsf)
- T - Torvane (tsf)
- L - Lab Vane Shear (tsf)

Notes: GPS Coordinates: N 32°15.556', W 94°34.913'. Minus #200 Sieve (89%) @ 1' (Hydrometer - Specific Gravity 2.761).

CPT Data

Job Number	04.1908-0020	CPT Number	B-02	Location	Tatum-Tx
Operator	GLENN JOHNSON	Date and T	16-Apr-2008 13:47:38	Cone Number	F7.5CKEW2/B 1866
Client		Elevation		Water Table	

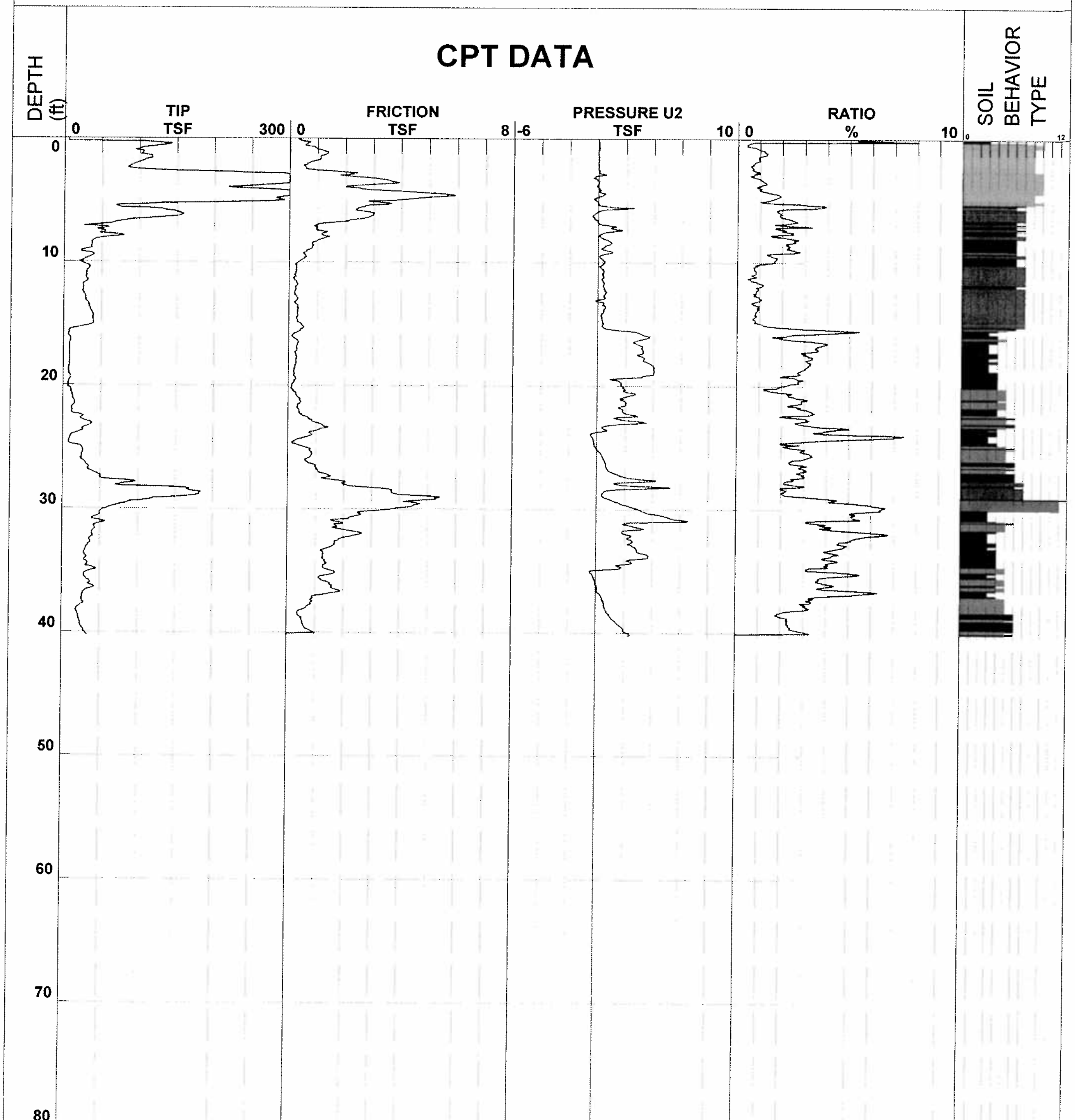


1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)

Robertson et al. 1986 * Overconsolidated or Cemented

CPT Data

Job Number	04.1908-0020	CPT Number	B-07	Location	Tatum-Tx
Operator	GLENN JOHNSON	Date and T	16-Apr-2008 12:40:51	Cone Number	F7.5CKEW2/B 1866
Client		Elevation		Water Table	



1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)

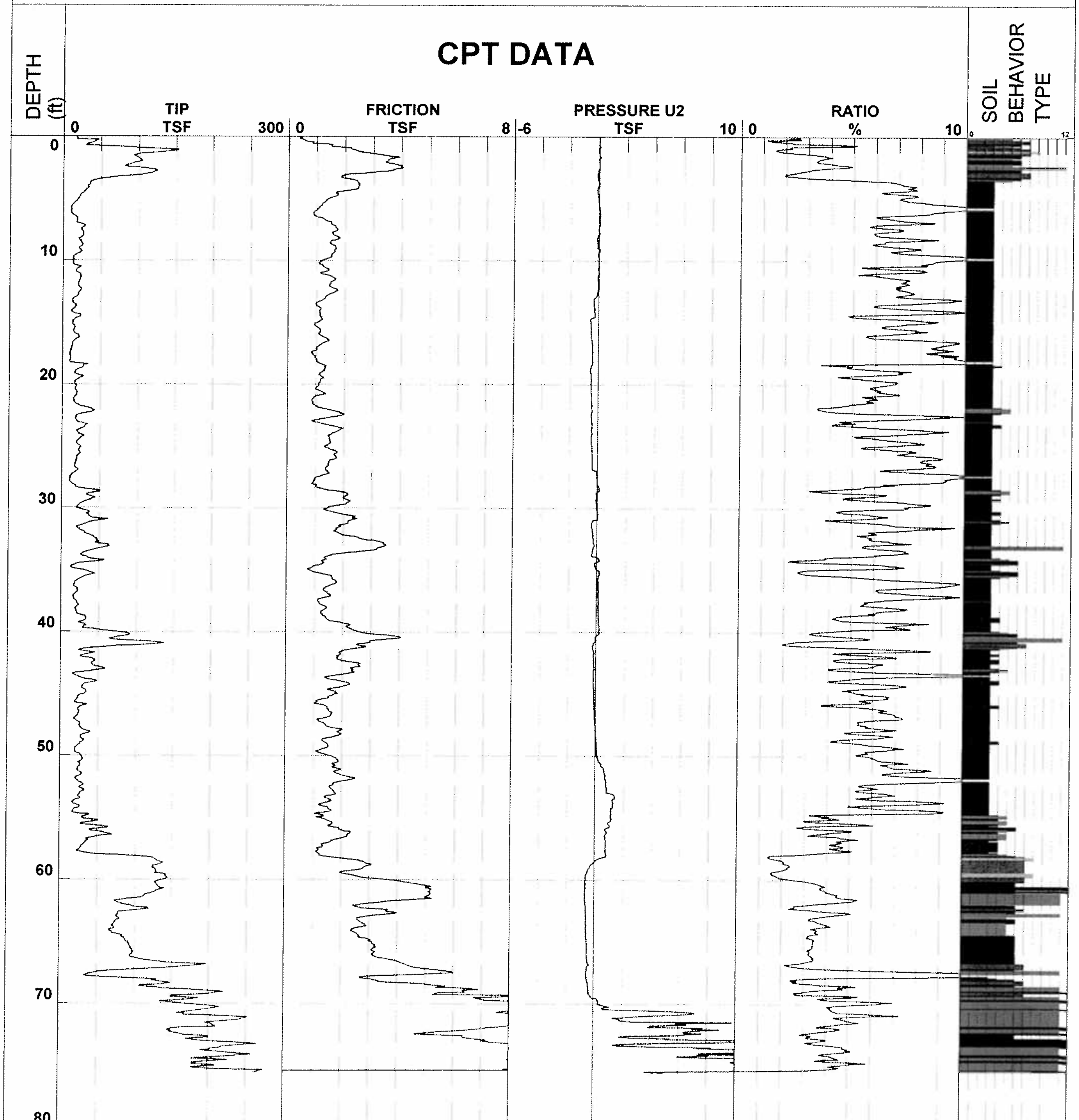
Robertson et al. 1986 * Overconsolidated or Cemented

CPT Data

Job Number 04.1908-0020 | CPT Number B-12 | Location Tatum-Tx

Operator GLENN JOHNSON | Date and T 16-Apr-2008 10:58:47 | Cone Number F7.5CKEW2/B 1866

Client | Elevation | Water Table



■ 1 - sensitive fine grained	■ 4 - silty clay to clay	■ 7 - silty sand to sandy silt	■ 10 - gravelly sand to sand
■ 2 - organic material	■ 5 - clayey silt to silty clay	■ 8 - sand to silty sand	■ 11 - very stiff fine grained (*)
■ 3 - clay	■ 6 - sandy silt to clayey silt	■ 9 - sand	■ 12 - sand to clayey sand (*)

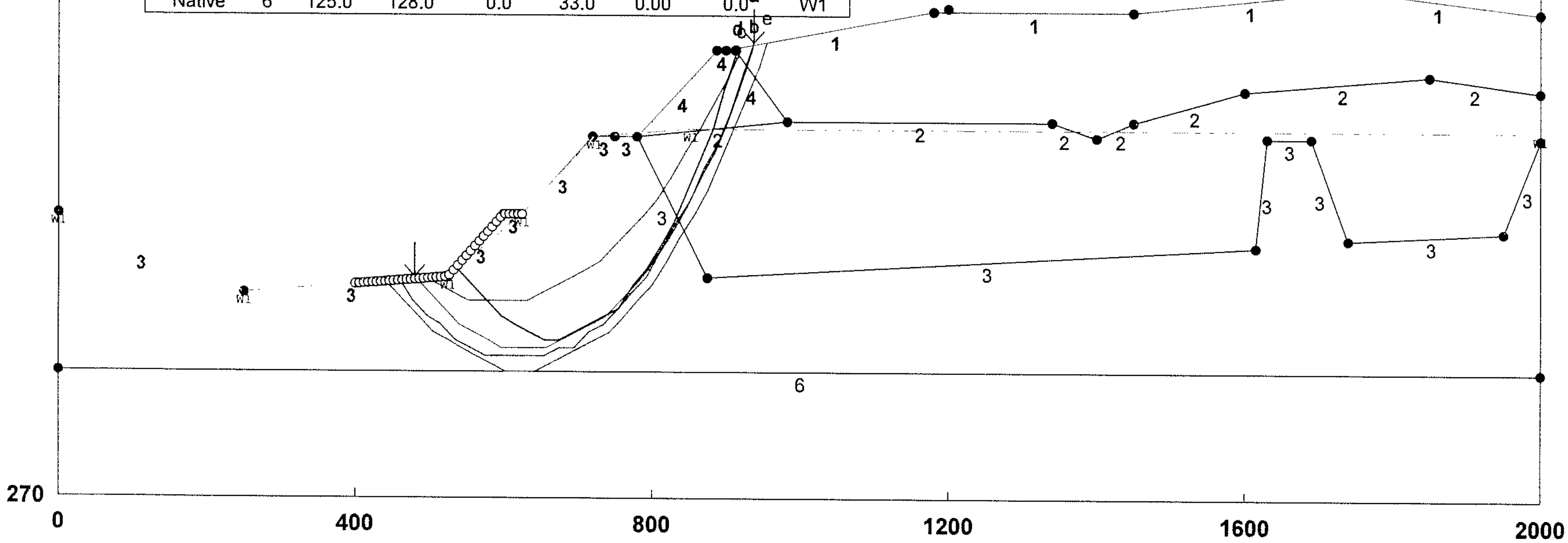
Robertson et al. 1986 * Overconsolidated or Cemented

Luminant Martin Lake PDP Expansion Final Profile - Rapid Drawdown

z:\geotech\2008 geotechnical job files\2810-08 luminant martin lake pdp 1-3, tatum, tx\slope stability\txu martin lake ash ponds revised.pl2 Run By: Username 7/9/2008 03:47PM

#	FS
a	**1.7**
b	1.7
c	1.7
d	**1.7**
e	1.8

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
New Ash	1	90.0	100.0	0.0	33.0	0.00	0.0	W1
Old Ash	2	95.0	105.0	0.0	33.0	0.00	0.0	W1
Old Fill	3	120.0	125.0	175.0	21.5	0.00	0.0	W1
Berms	4	120.0	125.0	175.0	21.5	0.00	0.0	W1
Stockpil	5	115.0	125.0	150.0	20.0	0.00	0.0	W1
Native	6	125.0	128.0	0.0	33.0	0.00	0.0	W1



GSTABL7 v.2 FSmin=1.7

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Luminant Martin Lake PDP Expansion Final Profile - Long Term

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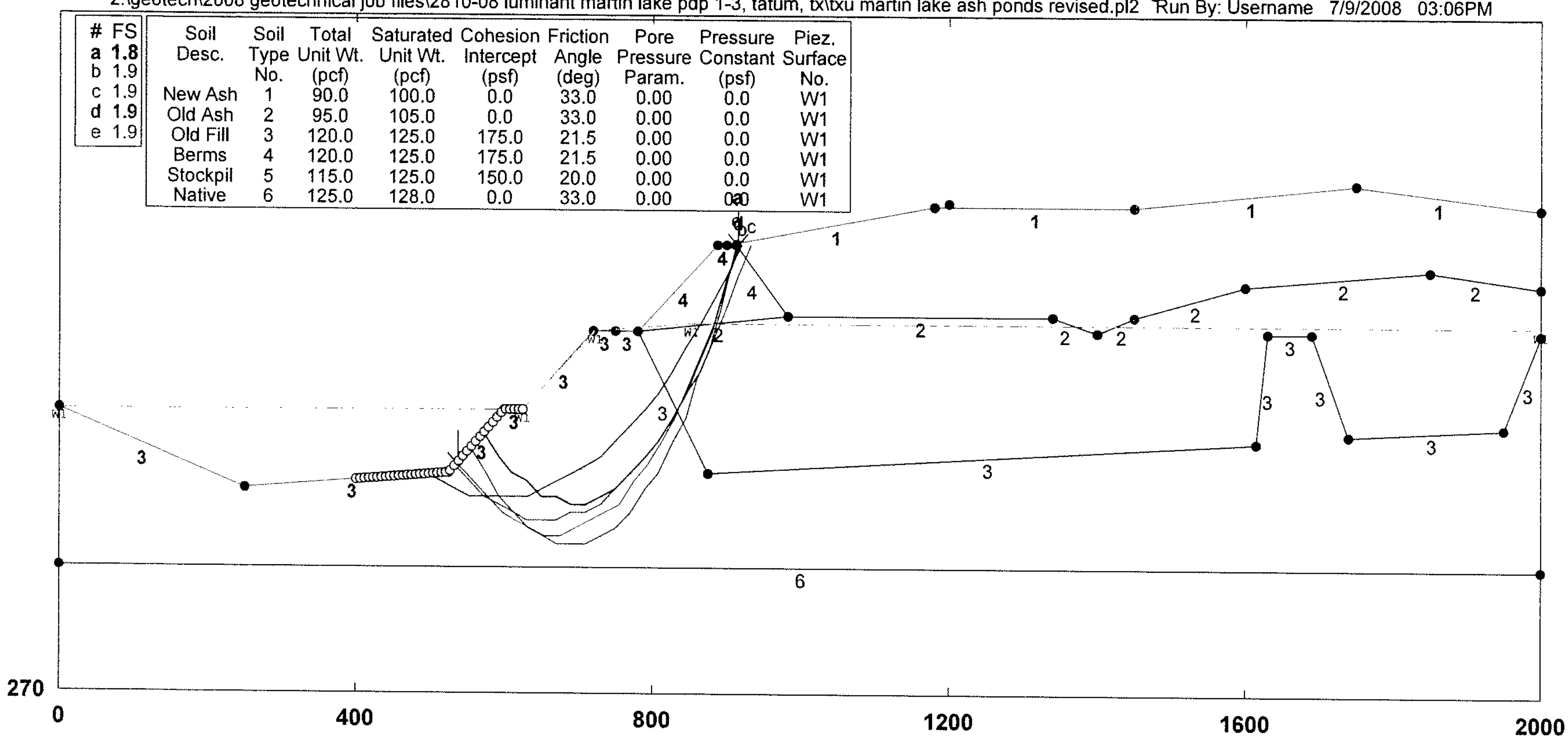
#	FS
a	**1.8**
b	1.9
c	1.9
d	**1.9**
e	1.9

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
New Ash	1	90.0	100.0	0.0	33.0	0.00	0.0	W1
Old Ash	2	95.0	105.0	0.0	33.0	0.00	0.0	W1
Old Fill	3	120.0	125.0	175.0	21.5	0.00	0.0	W1
Berms	4	120.0	125.0	175.0	21.5	0.00	0.0	W1
Stockpil	5	115.0	125.0	150.0	20.0	0.00	0.0	W1
Native	6	125.0	128.0	0.0	33.0	0.00	0.0	W1



GSTABL7 v.2 FSmin=1.8

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Luminant Martin Lake PDP Expansion Final Profile - End of Construction

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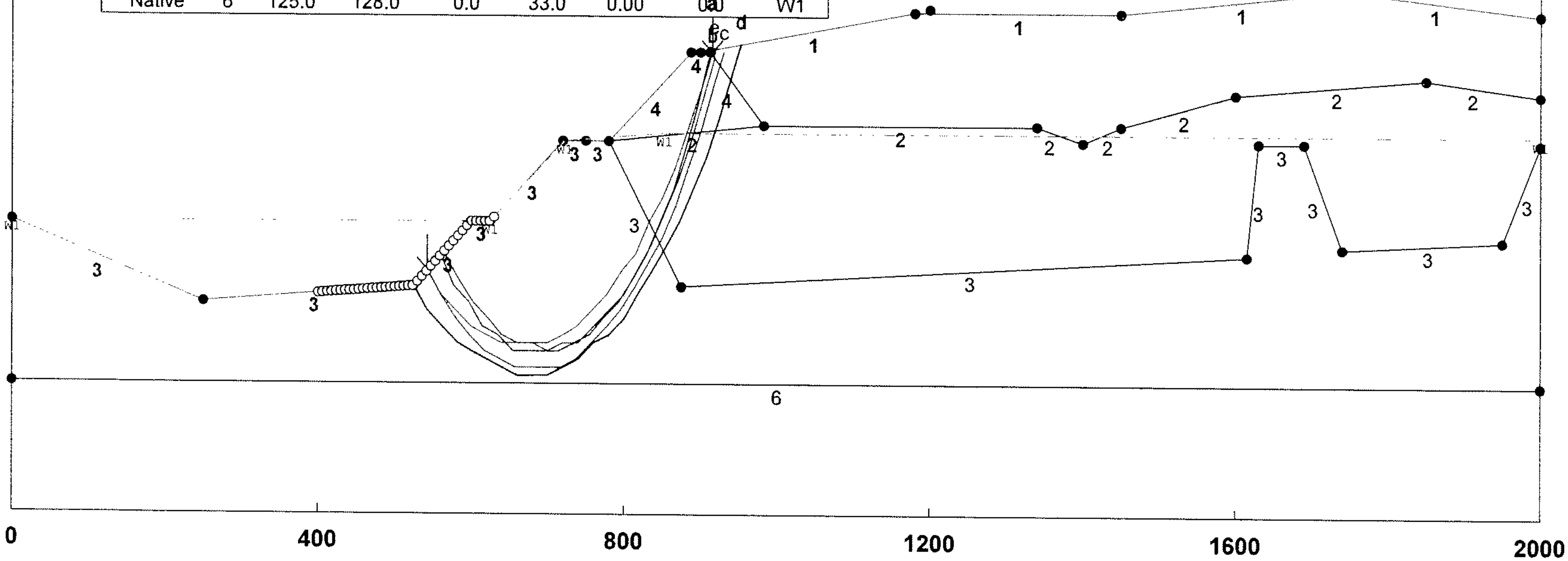
#	FS
a	**1.6**
b	1.6
c	1.7
d	1.7
e	1.7

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
New Ash	1	90.0	100.0	0.0	33.0	0.00	0.0	W1
Old Ash	2	95.0	105.0	0.0	33.0	0.00	0.0	W1
Old Fill	3	120.0	125.0	425.0	13.0	0.00	0.0	W1
Berms	4	120.0	125.0	425.0	13.0	0.00	0.0	W1
Stockpil	5	115.0	125.0	250.0	18.0	0.00	0.0	W1
Native	6	125.0	128.0	0.0	33.0	0.00	0.0	W1



GSTABL7 v.2 FSmin=1.6
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Luminant Martin Lake PDP Expansion Final Profile - Long Term

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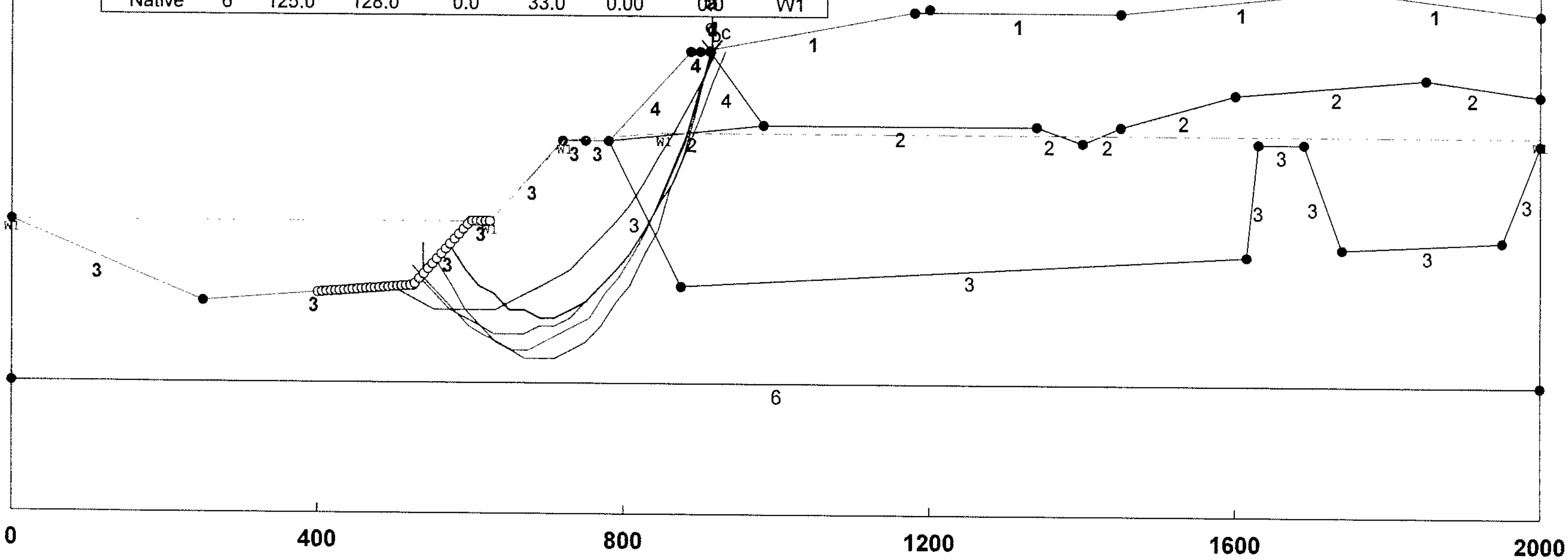
#	FS
a	**1.8**
b	1.9
c	1.9
d	**1.9**
e	1.9

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
New Ash	1	90.0	100.0	0.0	33.0	0.00	0.0	W1
Old Ash	2	95.0	105.0	0.0	33.0	0.00	0.0	W1
Old Fill	3	120.0	125.0	175.0	21.5	0.00	0.0	W1
Berms	4	120.0	125.0	175.0	21.5	0.00	0.0	W1
Stockpil	5	115.0	125.0	150.0	20.0	0.00	0.0	W1
Native	6	125.0	128.0	0.0	33.0	0.00	0.0	W1

Load	Value
Peak(A)	0.200(g)



GSTABL7 v.2 FSmin=1.8
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT:	Luminant Martin Lake, PDP 1-3
CLIENT:	TXU
CONTRACTOR:	not given
JOB No. :	**G 2810 - 08**
REPORT No.:	
DATE SAMPLED:	February 2008
SAMPLED BY:	ETTL Drill Crew
LOCATION:	MLSES
SAMPLE No. :	
DESCRIPTION:	Gray & Dark Gray Bottom Ash
TECHNICIAN:	M. Thompson
DATE:	04/15/08

RESULTS

	Grain Diameter	
% Retain	+2.0 mm	**47.69**
% Retain	+0.05 mm	**99.26**
% Passing	0.05 to 2.0 mm	**51.57**
% Passing	0.002 to 0.05 mm	**0.72**
% Passing	> 0.002 mm	**0.02**

WEIGHT OF SAMPLE (AIR DRY)	100.00
WEIGHT OF SAMPLE (OVEN DRY)	99.90
PERCENT RETAINED ON # 10	47.69
SPECIFIC GRAVITY	2.563

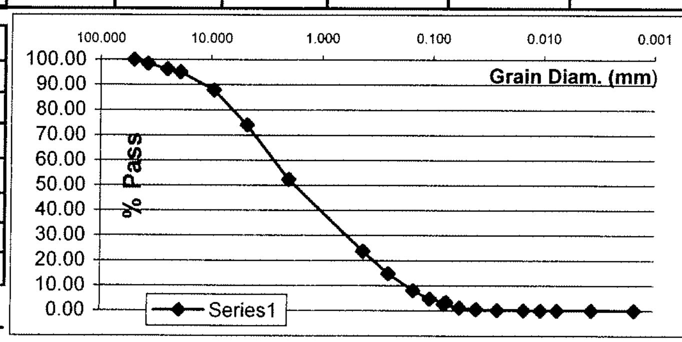
Mc Hydrom	
Tare Wt	29.89
Wet Wt.	68.94
Dry Wt	68.90
MC	0.1025%

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
40	54.66	76.31	0.425	23.69
60	71.63	85.20	0.250	14.80
100	84.45	91.91	0.150	8.09
140	90.93	95.30	0.105	4.70
200	93.54	96.67	0.075	3.33

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
21.5	5.7	11.0	5.3	15.5	0.0141	1.02	0.5	0.0787	2.82
21.5	5.7	8.0	2.3	16	0.0141	1.02	1	0.0566	1.21
21.5	5.7	6.8	1.1	16.1	0.0141	1.02	2	0.0401	0.57
21.5	5.7	6.2	0.5	16.3	0.0141	1.02	5	0.0255	0.25
21.5	5.7	6.0	0.3	16.3	0.0141	1.02	15	0.0147	0.15
21.5	5.7	5.8	0.1	16.3	0.0141	1.02	30	0.0104	0.04
21.5	5.7	5.8	0.1	16.3	0.0141	1.02	60	0.0074	0.04
21.5	5.7	5.8	0.1	16.3	0.0141	1.02	250	0.0036	0.04
22.0	5.6	5.6	0.0	16.3	0.0140	1.02	1440	0.0015	0.02

SPECIFIC GRAVITY		BOTTLE #	Bottle Wt	Bott & Water	WaterTemp	Corr.Soil	Bott, S & Water	WaterTemp	Specif. Grav
Air dry Sample(gr)	100	10	188.06	686.13	22.5	99.90	747.18	21.5	**2.563**

	Sieve Size	Grams Retain	% Pass
Sieve % Pass	2"	0.00	100.00
	1-1/2"	89.00	98.47
Air Dry Start Wt.:	1"	215.04	96.31
5836.8	3/4"	288.14	95.06
Dry Start Wt.:	3/8"	709.78	87.83
5830.82	No 4	1510.97	74.09
	No 10	2780.46	52.31



Remarks:

HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Luminant Martin Lake, PDP 1-3
CLIENT: TXU
CONTRACTOR: not given
JOB No. : **G 2810 - 08**

REPORT No.:
DATE SAMPLED: February 2008
SAMPLED BY: ETTL Drill Crew
LOCATION: B-9, 1'-3'
SAMPLE No. :
DESCRIPTION: Gray Ash (Cementing)
TECHNICIAN: H. Walka
DATE: 03/14/08

RESULTS

	Grain Diameter	
% Retain	+2.0 mm	**0.08**
% Retain	+0.05 mm	**41.35**
% Passing	0.05 to 2.0 mm	**41.27**
% Passing	0.002 to 0.05 mm	**56.63**
% Passing	> 0.002 mm	**2.02**

WEIGHT OF SAMPLE (AIR DRY)	100.00
WEIGHT OF SAMPLE (OVEN DRY)	99.73
PERCENT RETAINED ON # 10	0.08
SPECIFIC GRAVITY	2.761

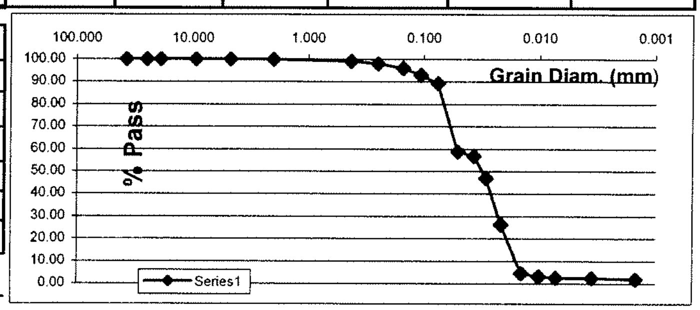
Mc Hydrom	
Tare Wt	29.50
Wet Wt.	62.41
Dry Wt	62.32
MC	0.2742%

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
40	0.92	1.00	0.425	99.00
60	1.92	2.00	0.250	98.00
100	3.90	3.99	0.150	96.01
140	7.07	7.16	0.105	92.84
200	10.67	10.77	0.075	89.23

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
23.0	5.2	65.0	59.8	6.6	0.0138	0.98	0.5	0.0502	58.67
23.0	5.2	63.0	57.8	7	0.0138	0.98	1	0.0365	56.71
23.0	5.2	53.0	47.8	8.6	0.0138	0.98	2	0.0286	46.89
23.0	5.2	32.0	26.8	12	0.0138	0.98	5	0.0214	26.27
22.5	5.4	10.0	4.6	15.6	0.0140	0.98	15	0.0142	4.51
22.5	5.4	8.5	3.1	15.8	0.0140	0.98	30	0.0101	3.04
22.5	5.4	8.0	2.6	16	0.0140	0.98	60	0.0072	2.55
22.0	5.6	8.0	2.4	16	0.0140	0.98	250	0.0035	2.39
22.0	5.6	7.5	1.9	16.1	0.0140	0.98	1440	0.0015	1.90

SPECIFIC GRAVITY		BOTTLE #	Bottle Wt	Bott & Water	WaterTemp	Corr.Soil	Bott, S & Water	WaterTemp	Specif. Grav
Air dry Sample(gr)	50	7	179.97	678.12	22.5	49.86	709.93	22.5	**2.761**

	Sieve Size	Grams Retain	% Pass
Sieve % Pass	1-1/2"	0.00	100.00
Air Dry Start Wt.:	1"	0.00	100.00
334.9	3/4"	0.00	100.00
Dry Start Wt.:	3/8"	0.00	100.00
333.98	No 4	0.00	100.00
	No 10	0.26	99.92



Remarks:

HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT:	Luminant Martin Lake, PDP 1-3
CLIENT:	TXU
CONTRACTOR:	not given
JOB No. :	**G 2810 - 08**

REPORT No.:	
DATE SAMPLED:	February 2008
SAMPLED BY:	ETTL Drill Crew
LOCATION:	B-7, 13'-15'
SAMPLE No. :	
DESCRIPTION:	Gray Ash
TECHNICIAN:	H. Walka
DATE:	03/14/08

RESULTS

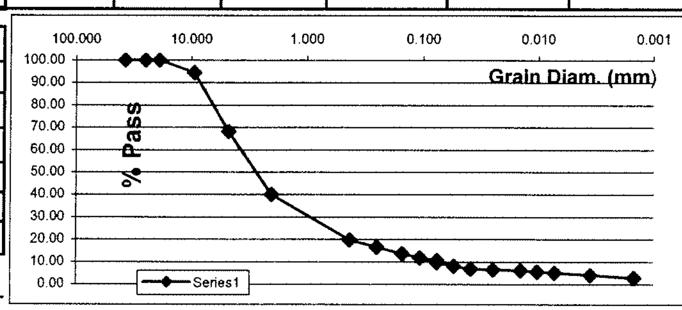
	Grain Diameter	
% Retain	+2.0 mm	**59.89**
% Retain	+0.05 mm	**92.28**
% Passing	0.05 to 2.0 mm	**32.39**
% Passing	0.002 to 0.05 mm	**4.63**
% Passing	> 0.002 mm	**3.09**

				SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
		Mc Hydrom		40	25.25	80.22	0.425	19.78
WEIGHT OF SAMPLE (AIR DRY)	50.00	Tare Wt	30.03	60	29.25	83.44	0.250	16.56
WEIGHT OF SAMPLE (OVEN DRY)	49.81	Wet Wt.	45.86	100	32.74	86.25	0.150	13.75
PERCENT RETAINED ON # 10	59.89	Dry Wt	45.80	140	35.11	88.16	0.105	11.84
SPECIFIC GRAVITY	2.655	MC	0.3805%	200	36.67	89.42	0.075	10.58

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
22.0	5.6	17.5	11.9	14.5	0.0140	1.00	0.5	0.0752	9.61
22.0	5.6	15.5	9.9	14.8	0.0140	1.00	1	0.0537	8.00
22.0	5.6	14.0	8.4	15	0.0140	1.00	2	0.0383	6.79
22.0	5.6	13.5	7.9	15.2	0.0140	1.00	5	0.0244	6.39
22.0	5.6	13.0	7.4	15.2	0.0140	1.00	15	0.0141	5.99
21.5	5.7	12.5	6.8	15.3	0.0141	1.00	30	0.0101	5.46
21.5	5.7	12.0	6.3	15.3	0.0141	1.00	60	0.0071	5.05
22.0	5.6	10.5	4.9	15.6	0.0140	1.00	250	0.0035	3.97
22.0	5.6	9.0	3.4	15.8	0.0140	1.00	1440	0.0015	2.77

SPECIFIC GRAVITY		BOTTLE #	Bottle Wt	Bott & Water	WaterTemp	Corr.Soil	Bott, S & Water	WaterTemp	Specif. Grav
Air dry Sample(gr)	25	4	179.25	677.26	22.5	24.91	692.79	22.5	**2.655**

	Sieve Size	Grams Retain	% Pass
Sieve % Pass	1-1/2"	0.00	100.00
Air Dry Start Wt.:	1"	0.00	100.00
243.3	3/4"	0.00	100.00
Dry Start Wt.:	3/8"	13.45	94.47
242.38	No 4	77.42	68.18
	No 10	145.71	40.11



Remarks:

HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Luminant Martin Lake, PDP 1-3
CLIENT: TXU
CONTRACTOR: not given
JOB No. : **G 2810 - 08**

REPORT No.:
DATE SAMPLED: February 2008
SAMPLED BY: ETTL Drill Crew
LOCATION: B-6, 18'-20'
SAMPLE No. :
DESCRIPTION: Tan Ash
TECHNICIAN: H. Walka
DATE: 03/14/08

RESULTS

	Grain Diameter	
% Retain	+2.0 mm	**10.97**
% Retain	+0.05 mm	**18.74**
% Passing	0.05 to 2.0 mm	**7.77**
% Passing	0.002 to 0.05 mm	**77.39**
% Passing	> 0.002 mm	**3.87**

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	49.81
PERCENT RETAINED ON # 10	10.97
SPECIFIC GRAVITY	2.732

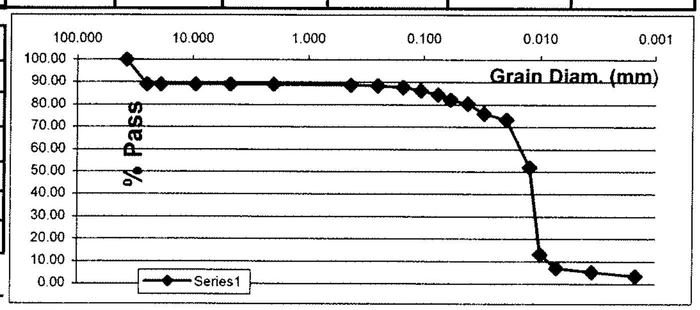
Mc Hydrom	
Tare Wt	29.86
Wet Wt.	51.33
Dry Wt	51.25
MC	0.3740%

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
40	0.26	11.44	0.425	88.56
60	0.42	11.72	0.250	88.28
100	0.78	12.36	0.150	87.64
140	1.61	13.85	0.105	86.15
200	2.62	15.65	0.075	84.35

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
22.0	5.6	52.0	46.4	8.8	0.0140	0.99	0.5	0.0586	82.16
22.0	5.6	51.0	45.4	8.9	0.0140	0.99	1	0.0417	80.39
22.0	5.6	48.5	42.9	9.4	0.0140	0.99	2	0.0303	75.97
22.0	5.6	47.0	41.4	9.6	0.0140	0.99	5	0.0194	73.31
22.0	5.6	35.0	29.4	11.5	0.0140	0.99	15	0.0122	52.08
22.0	5.6	13.0	7.4	15.2	0.0140	0.99	30	0.0099	13.15
22.0	5.6	9.5	3.9	15.8	0.0140	0.99	60	0.0072	6.96
22.0	5.6	8.5	2.9	16	0.0140	0.99	250	0.0035	5.19
22.0	5.6	7.5	1.9	16.1	0.0140	0.99	1440	0.0015	3.42

SPECIFIC GRAVITY		BOTTLE #	Bottle Wt	Bott & Water	WaterTemp	Corr.Soil	Bott, S & Water	WaterTemp	Specif. Grav
Air dry Sample(gr)	50	3	179.93	678.11	22.5	49.81	709.70	22.5	**2.732**

	Sieve Size	Grams Retain	% Pass
Sieve % Pass	1-1/2"	0.00	100.00
Air Dry Start Wt.:	1"	28.83	89.03
262.8	3/4"	28.83	89.03
Dry Start Wt.:	3/8"	28.83	89.03
261.82	No 4	28.83	89.03
	No 10	28.83	89.03



Remarks:

HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Luminant Martin Lake, PDP 1-3
CLIENT: TXU
CONTRACTOR: not given
JOB No. : **G 2810 - 08**

REPORT No.:
DATE SAMPLED: February 2008
SAMPLED BY: ETTL Drill Crew
LOCATION: B-3, 5'-7'
SAMPLE No. :
DESCRIPTION: Black Ash
TECHNICIAN: H. Walka
DATE: 03/06/08

RESULTS

	Grain Diameter	
% Retain	+2.0 mm	**11.60**
% Retain	+0.05 mm	**76.50**
% Passing	0.05 to 2.0 mm	**64.91**
% Passing	0.002 to 0.05 mm	**21.88**
% Passing	> 0.002 mm	**1.62**

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	49.53
PERCENT RETAINED ON # 10	11.60
SPECIFIC GRAVITY	2.561

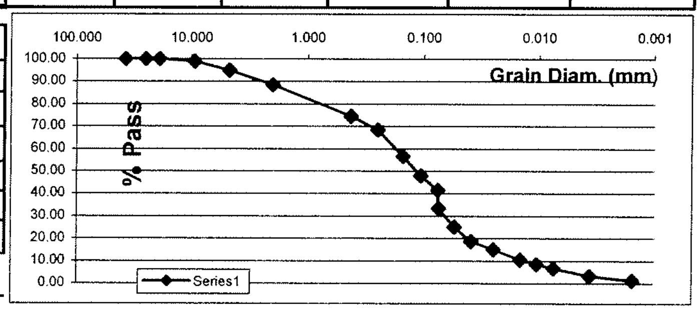
Mc Hydrom	
Tare Wt	29.43
Wet Wt.	65.41
Dry Wt	65.07
MC	0.9540%

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
40	7.81	25.54	0.425	74.46
60	11.21	31.61	0.250	68.39
100	17.82	43.41	0.150	56.59
140	22.64	52.01	0.105	47.99
200	26.25	58.45	0.075	41.55

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
20.0	6.2	24.5	18.3	13.3	0.0143	1.02	0.5	0.0738	33.31
20.0	6.2	20.0	13.8	14.2	0.0143	1.02	1	0.0539	25.11
20.0	6.2	16.5	10.3	14.7	0.0143	1.02	2	0.0388	18.74
20.0	6.2	14.5	8.3	15	0.0143	1.02	5	0.0248	15.10
20.0	6.2	12.0	5.8	15.5	0.0143	1.02	15	0.0145	10.55
19.5	6.4	11.0	4.6	15.6	0.0145	1.02	30	0.0104	8.44
19.5	6.4	10.0	3.6	15.8	0.0145	1.02	60	0.0074	6.62
20.0	6.2	8.0	1.8	16.1	0.0143	1.02	250	0.0036	3.27
19.5	6.4	7.0	0.6	16.3	0.0145	1.02	1440	0.0015	1.15

SPECIFIC GRAVITY		BOTTLE #	Bottle Wt	Bott & Water	WaterTemp	Corr.Soil	Bott, S & Water	WaterTemp	Specif. Grav
Air dry Sample(gr)	100	7	179.97	678.12	22.5	99.06	738.67	21.0	**2.561**

	Sieve Size	Grams Retain	% Pass
Sieve % Pass	1-1/2"	0.00	100.00
Air Dry Start Wt.:	1"	0.00	100.00
335.3	3/4"	0.00	100.00
Dry Start Wt.:	3/8"	3.42	98.98
332.13	No 4	17.17	94.88
	No 10	38.89	88.40



Remarks:

HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT:	Luminant Martin Lake, PDP 1-3
CLIENT:	TXU
CONTRACTOR:	not given
JOB No. :	**G 2810 - 08**
REPORT No.:	
DATE SAMPLED:	February 2008
SAMPLED BY:	ETTL Drill Crew
LOCATION:	B-2, 23'-25'
SAMPLE No. :	
DESCRIPTION:	Light Gray & Black Ash
TECHNICIAN:	H. Walka
DATE:	03/06/08

RESULTS

	Grain Diameter	
% Retain	+2.0 mm	**0.76**
% Retain	+0.05 mm	**16.00**
% Passing	0.05 to 2.0 mm	**15.24**
% Passing	0.002 to 0.05 mm	**83.90**
% Passing	> 0.002 mm	**0.09**

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	49.16
PERCENT RETAINED ON # 10	0.76
SPECIFIC GRAVITY	2.675

Mc Hydrom	
Tare Wt	29.91
Wet Wt.	55.02
Dry Wt	54.60
MC	1.7011%

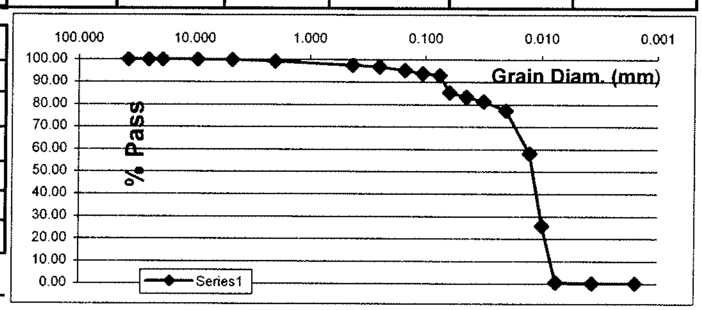
SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
40	0.89	2.56	0.425	97.44
60	1.22	3.22	0.250	96.78
100	2.01	4.82	0.150	95.18
140	2.67	6.15	0.105	93.85
200	3.07	6.96	0.075	93.04

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
20.0	6.2	48.5	42.3	9.4	0.0143	1.00	0.5	0.0620	85.37
20.0	6.2	47.5	41.3	9.6	0.0143	1.00	1	0.0443	83.35
20.0	6.2	46.5	40.3	9.7	0.0143	1.00	2	0.0315	81.33
20.0	6.2	44.5	38.3	10.1	0.0143	1.00	5	0.0203	77.30
20.0	6.2	35.0	28.8	11.7	0.0143	1.00	15	0.0126	58.12
20.0	6.2	19.0	12.8	14.3	0.0143	1.00	30	0.0099	25.83
20.0	6.2	6.5	0.3	16.3	0.0143	1.00	60	0.0075	0.59
20.0	6.2	6.3	0.1	16.3	0.0143	1.00	250	0.0037	0.19
19.5	6.4	6.4	0.0	16.3	0.0145	1.00	1440	0.0015	0.07

SPECIFIC GRAVITY		BOTTLE #	Bottle Wt	Bott & Water	WaterTemp	Corr.Soil	Bott, S & Water	WaterTemp	Specif. Grav
Air dry Sample(gr)	50	4	179.25	677.26	22.5	49.16	708.22	21.0	**2.675**

	Sieve Size	Grams Retain	% Pass
Sieve % Pass	1-1/2"	0.00	100.00
Air Dry Start Wt.:	1"	0.00	100.00
144.3	3/4"	0.00	100.00
Dry Start Wt.:	3/8"	0.00	100.00
141.89	No 4	0.10	99.93
	No 10	1.10	99.24

Remarks:



HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT:	Luminant Martin Lake, PDP 1-3
CLIENT:	TXU
CONTRACTOR:	not given
JOB No. :	**G 2810 - 08**
REPORT No.:	
DATE SAMPLED:	February 2008
SAMPLED BY:	ETTL Drill Crew
LOCATION:	B-1, 18'-20'
SAMPLE No. :	
DESCRIPTION:	Black, Tan & Gray Ash
TECHNICIAN:	H. Walka
DATE:	03/06/08

RESULTS

	Grain Diameter	
% Retain	+2.0 mm	**14.96**
% Retain	+0.05 mm	**64.42**
% Passing	0.05 to 2.0 mm	**49.46**
% Passing	0.002 to 0.05 mm	**35.29**
% Passing	> 0.002 mm	**0.29**

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	49.29
PERCENT RETAINED ON # 10	14.96
SPECIFIC GRAVITY	2.608

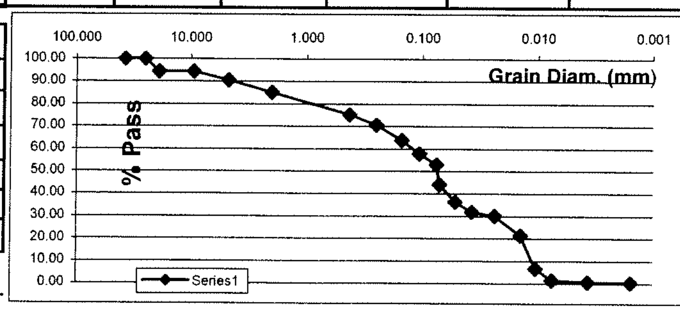
Mc Hydrom	
Tare Wt	29.29
Wet Wt.	59.40
Dry Wt	58.97
MC	1.4488%

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
40	5.76	24.90	0.425	75.10
60	8.38	29.42	0.250	70.58
100	12.31	36.20	0.150	63.80
140	15.78	42.19	0.105	57.81
200	18.60	47.05	0.075	52.95

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
20.0	6.2	31.5	25.3	12.2	0.0143	1.01	0.5	0.0707	44.08
20.0	6.2	27.0	20.8	13	0.0143	1.01	1	0.0516	36.24
20.0	6.2	24.5	18.3	13.3	0.0143	1.01	2	0.0369	31.88
20.0	6.2	23.5	17.3	13.5	0.0143	1.01	5	0.0235	30.14
20.0	6.2	18.5	12.3	14.3	0.0143	1.01	15	0.0140	21.43
20.0	6.2	10.0	3.8	15.8	0.0143	1.01	30	0.0104	6.61
20.0	6.2	7.0	0.8	16.3	0.0143	1.01	60	0.0075	1.38
20.0	6.2	6.5	0.3	16.3	0.0143	1.01	250	0.0037	0.51
19.5	6.4	6.5	0.1	16.3	0.0145	1.01	1440	0.0015	0.23

SPECIFIC GRAVITY		BOTTLE #	Bottle Wt	Bott & Water	WaterTemp	Corr.Soil	Bott, S & Water	WaterTemp	Specif. Grav
Air dry Sample(gr)	100	3	179.93	678.11	22.5	98.57	739.11	20.5	**2.608**

	Sieve Size	Grams Retain	% Pass
Sieve % Pass	1-1/2"	0.00	100.00
Air Dry Start Wt.:	1"	0.00	100.00
268.4	3/4"	15.10	94.37
Dry Start Wt.:	3/8"	15.10	94.37
264.57	No 4	25.58	90.47
	No 10	40.15	85.04



Remarks:

HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT:	Luminant Martin Lake, PDP 1-3
CLIENT:	TXU
CONTRACTOR:	not given
JOB No. :	**G 2810 - 08**
REPORT No.:	
DATE SAMPLED:	February 2008
SAMPLED BY:	ETTL Drill Crew
LOCATION:	MLSES
SAMPLE No. :	
DESCRIPTION:	Tan & Gray Econimizet Ash
TECHNICIAN:	M. Thompson
DATE:	04/15/08

RESULTS

	Grain Diameter	
% Retain	+2.0 mm	**41.02**
% Retain	+0.05 mm	**95.89**
% Passing	0.05 to 2.0 mm	**54.87**
% Passing	0.002 to 0.05 mm	**3.55**
% Passing	> 0.002 mm	**0.55**

WEIGHT OF SAMPLE (AIR DRY)	50.00	Tare Wt	30.27
WEIGHT OF SAMPLE (OVEN DRY)	49.98	Wet Wt.	62.43
PERCENT RETAINED ON # 10	41.02	Dry Wt	62.42
SPECIFIC GRAVITY	2.670	MC	0.0311%

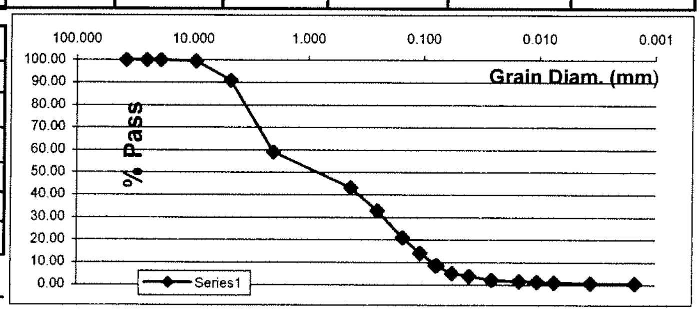
Mc Hydrom

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
40	13.34	56.76	0.425	43.24
60	22.12	67.12	0.250	32.88
100	32.26	79.09	0.150	20.91
140	38.01	85.87	0.105	14.13
200	42.66	91.36	0.075	8.64

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
21.5	5.7	13.0	7.3	15.2	0.0141	1.00	0.5	0.0780	8.58
21.5	5.7	10.0	4.3	15.6	0.0141	1.00	1	0.0558	5.04
21.5	5.7	9.0	3.3	15.8	0.0141	1.00	2	0.0397	3.86
21.5	5.7	7.5	1.8	16.1	0.0141	1.00	5	0.0254	2.09
21.5	5.7	7.0	1.3	16.1	0.0141	1.00	15	0.0146	1.50
21.5	5.7	6.8	1.1	16.1	0.0141	1.00	30	0.0104	1.27
21.5	5.7	6.5	0.8	16.3	0.0141	1.00	60	0.0074	0.91
21.5	5.7	6.3	0.6	16.3	0.0141	1.00	250	0.0036	0.68
22.0	5.6	6.0	0.4	16.3	0.0140	1.00	1440	0.0015	0.51

SPECIFIC GRAVITY		BOTTLE #	Bottle Wt	Bott & Water	WaterTemp	Corr.Soil	Bott, S & Water	WaterTemp	Specif. Grav
Air dry Sample(gr)	100	7	179.97	678.12	22.5	99.97	740.78	21.5	**2.670**

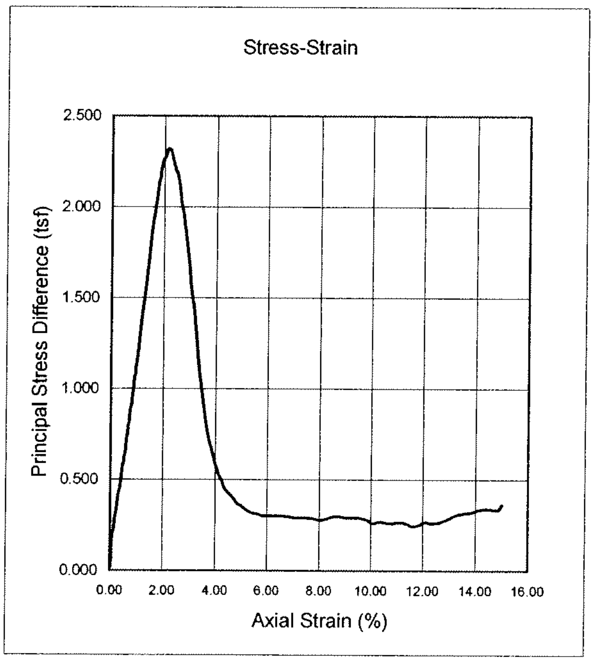
	Sieve Size	Grams Retain	% Pass
Sieve % Pass	1-1/2"	0.00	100.00
Air Dry Start Wt.:	1"	0.00	100.00
2182.9	3/4"	0.00	100.00
Dry Start Wt.:	3/8"	12.53	99.43
2182.22	No 4	200.01	90.83
	No 10	895.12	58.98



Remarks:

ASTM D 2850 Confined Compressive Strength of Cohesive Soil

Project: Luminant Martin Lake: PDP 1-3



Project No.:	G 2810-08	
Boring No.:	B-7	
Depth, ft.:	5'-7'	
Material:	Black Ash with Gravel	
Initial Height	5.706	Inches
Initial Diameter	2.767	Inches
Moisture Content:	22.9%	%
Dry Density:	97.5	lbs/cu ft
Specific Gravity (Assumed)	2.670	
Volume of Solids:	0.585	
Volume of Voids	0.415	
Void Ratio:	0.709	
Confining Pressure:	6.1	PSI
Pocket Penetr. Reading:	4.5	
Torvane (T)		
Rate of Strain: (%/ min)	1.0%	
Peak Strain:	**2.1**	%
Max Stress:	**2.32**	**TSF**
Date:	3/11/2008	

1/2 Stress (KSF) 2.321

Strain at 1/2 Stress (%) 0.99

Type of Specimen: Native

Remarks:

Secant Modulus (KSF) @ 1/2 Peak Stress 234

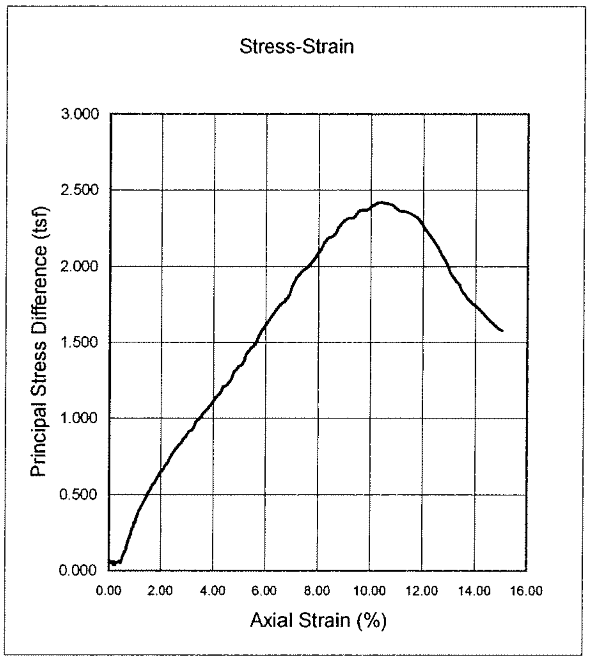
RQD Value: 100%

Angle of Fracture in Degrees: 65

Sketch of Fracture:

ASTM D 2850 Confined Compressive Strength of Cohesive Soil

Project: TXU PDP: Martin Lake, TX



Project No.:	G 2810-08	
Boring No.:	B-4	
Depth, ft.:	13'-15'	
Material:	Red & Gray Laminated Lean Clay	
Initial Height	3.613	Inches
Initial Diameter	2.667	Inches
Moisture Content:	22.3%	%
Dry Density:	99.4	lbs/cu ft
Specific Gravity (Assumed)	2.670	
Volume of Solids:	0.596	
Volume of Voids	0.404	
Void Ratio:	0.677	
Confining Pressure:	13	PSI
Pocket Penetr. Reading:	3.5	
Torvane (T)		
Rate of Strain: (%/ min)	1.0%	
Peak Strain:	**10.3**	%
Max Stress:	**2.42**	**TSF**
Date:	5/12/2008	

1/2 Stress (KSF) 2.416

Secant Modulus (KSF) @ 1/2 Peak Stress 61

Strain at 1/2 Stress (%) 3.94

RQD Value: 100%

Type of Specimen: Native

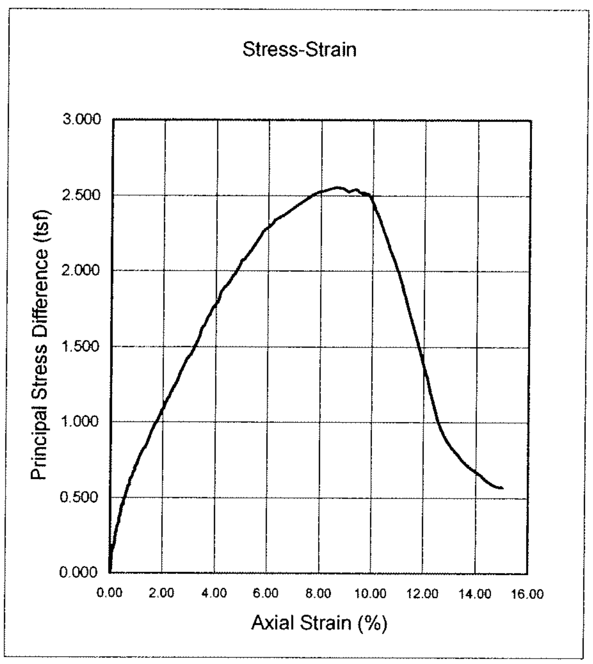
Angle of Fracture in Degrees: N/A

Remarks: undefined fracture

Sketch of Fracture:

ASTM D 2850 Confined Compressive Strength of Cohesive Soil

Project: Luminant Martin Lake: PDP 1-3



Project No.:	G 2810-08	
Boring No.:	B-4	
Depth, ft.:	13'-15'	
Material:	Light Gray & Red Slity Clayey Sand w/ Ferric seams	
Initial Height	5.688	Inches
Initial Diameter	2.75	Inches
Moisture Content:	21.5%	%
Dry Density:	104.6	lbs/cu ft
Specific Gravity (Assumed)	2.670	
Volume of Solids:	0.628	
Volume of Voids	0.372	
Void Ratio:	0.593	
Confining Pressure:	13	PSI
Pocket Penetr. Reading:	3.9	
Torvane (T)	1.138	
Rate of Strain: (%/ min)	1.0%	
Peak Strain:	**8.6**	%
Max Stress:	**2.55**	**TSF**
Date:	4/11/2008	

1/2 Stress (KSF) 2.552

Strain at 1/2 Stress (%) 2.54

Type of Specimen: Native

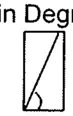
Remarks:

Secant Modulus (KSF) @ 1/2 Peak Stress 100

RQD Value: 100%

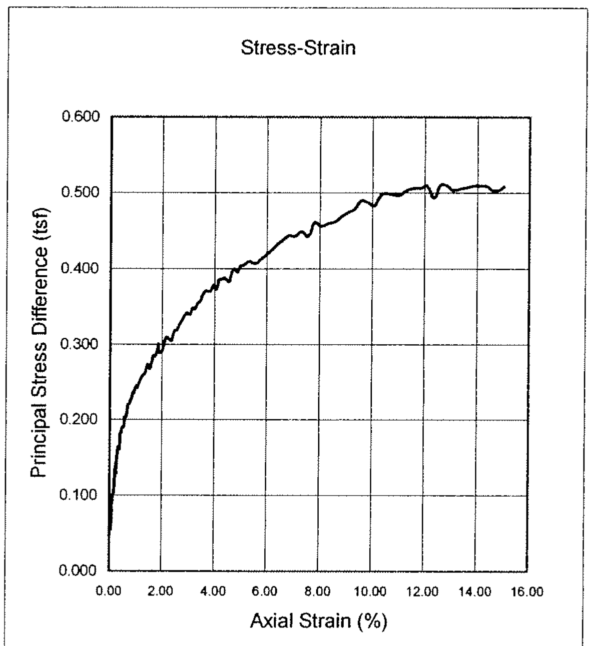
Angle of Break in Degrees: 60

Sketch of Fracture:



ASTM D 2850 Confined Compressive Strength of Cohesive Soil

Project: Luminant Martin Lake: PDP 1-3



Project No.:	G 2810-08	
Boring No.:	B-7	
Depth, ft.:	23'-25'	
Material:	Black, Red, Tan, & Gray Clay w/ gravel	
Initial Height	5.686	Inches
Initial Diameter	2.717	Inches
Moisture Content:	21.0%	%
Dry Density:	103.9	lbs/cu ft
Specific Gravity (Assumed)	2.670	
Volume of Solids:	0.624	
Volume of Voids	0.376	
Void Ratio:	0.603	
Confining Pressure:	21.7	PSI
Pocket Penetr. Reading:		
Torvane (T)		
Rate of Strain: (%/ min)	1.0%	
Peak Strain:	**12.8**	%
Max Stress:	**0.51**	**TSF**
Date:	3/11/2008	

1/2 Stress (KSF) 0.510

Secant Modulus (KSF) @ 1/2 Peak Stress 43

Strain at 1/2 Stress (%) 1.20

RQD Value: 100%

Type of Specimen: Native

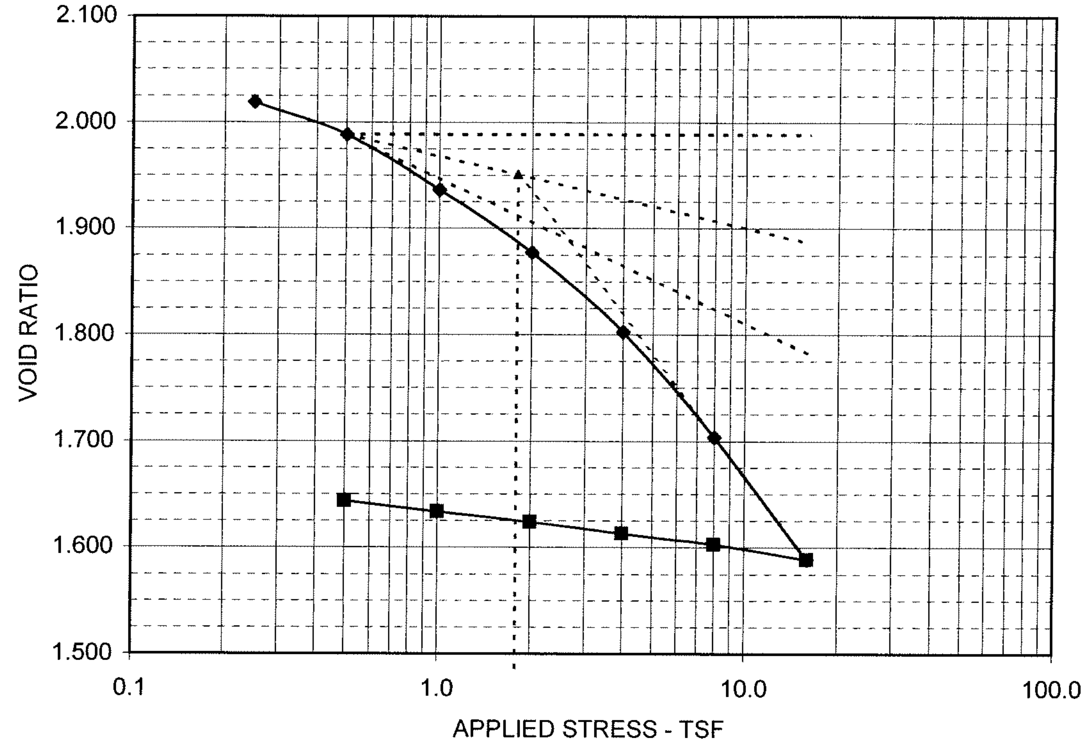
Angle of Break in Degrees: 53

Remarks: Not able to find a well defined fracture

Sketch of Fracture:

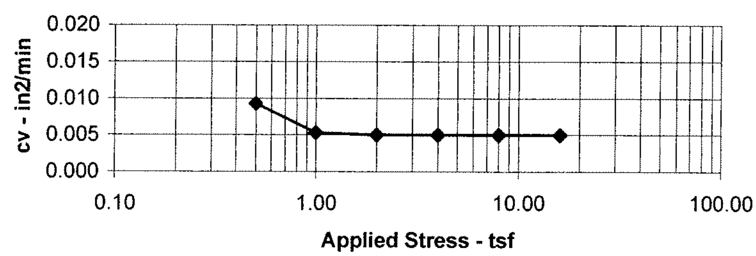
CONSOLIDATION TEST REPORT

ASTM D 2435



C_c = 0.381	C_r = 0.033	e_0 = 2.0191	Pc (tsf) = 1.79	OCR = 10.2

LOAD tsf	c_v in^2/min	k in/min
Seating	NA	NA
0.50	9.34E-03	9.85E-07
1.00	5.36E-03	4.89E-07
2.00	5.03E-03	2.65E-07
4.00	5.04E-03	1.73E-07
8.00	5.03E-03	1.18E-07
16.00	5.03E-03	7.08E-08



c_v values calculated by Sivaram and Swamee's Method

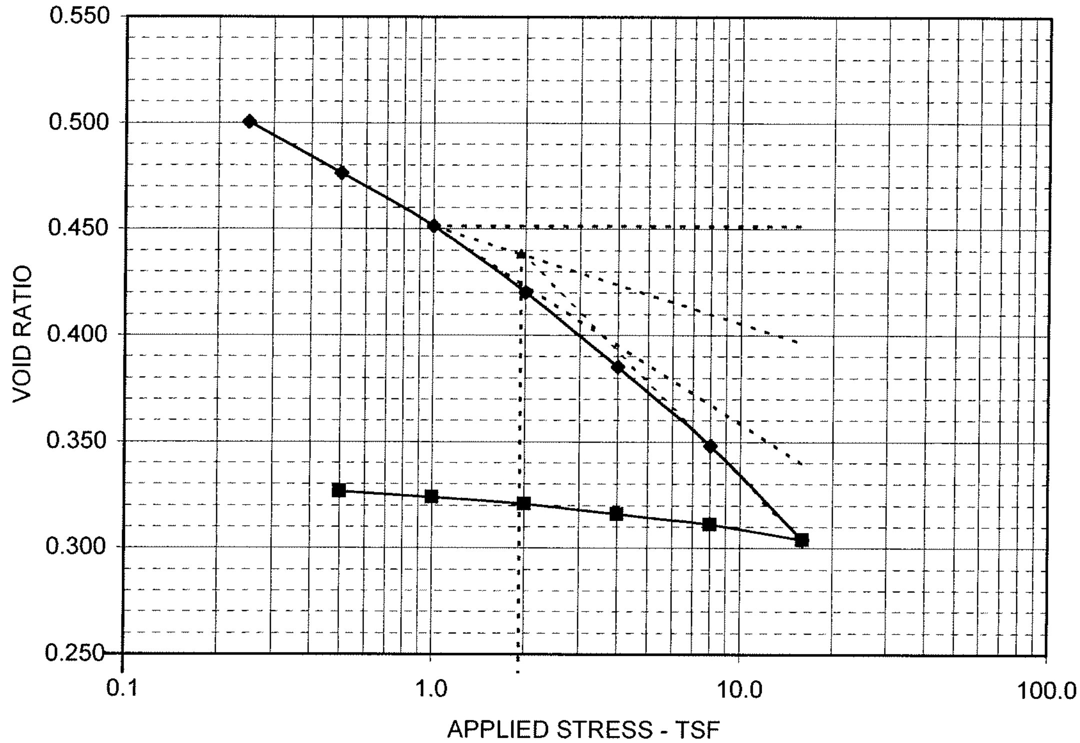
SAMPLE AND TEST DATA			
SAMPLE LOCATION: B-6, 3-5'			
DESCRIPTION: Ash, black and dark gray			
LL: NA	PL: NA	PI: NA	-200:NA
ASSUMED SPECIFIC GRAVITY:			2.70
MC Initial:	58.1%	MC Final:	47.2%
Dia. (in.) :	2.50	Height (in.) :	1.000
Initial Sat %:	70.2	Final Sat %:	100.0
DRY DENSITY (pcf):		55.8	

PROJECT INFORMATION	
PROJECT:	Luminant Martin Lake PDP 1-3
LOCATION:	Rusk, TX.
PROJECT NO.:	ETT08002-07
CLIENT:	ETTL Engineers & Consultants, Inc.
CLIENT NO.:	G2810-08
DATE:	4/24/2008
REMARKS: OCR calculated based on Pc and vertical overburden	

GREGORY GEOTECHNICAL | PLATE B-CN.1

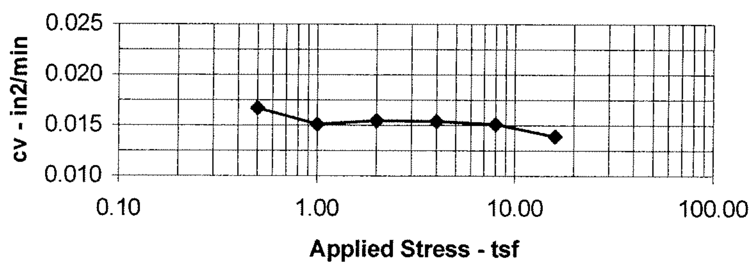
CONSOLIDATION TEST REPORT

ASTM D 2435



C_c = 0.146	C_r = 0.012	e_0 = 0.5597	Pc (tsf) = 1.93	OCR = 3.5

LOAD tsf	c_v in^2/min	k in/min
Seating	NA	NA
0.50	1.67E-02	2.82E-06
1.00	1.51E-02	1.33E-06
2.00	1.55E-02	8.75E-07
4.00	1.54E-02	5.00E-07
8.00	1.51E-02	2.67E-07
16.00	1.39E-02	1.50E-07



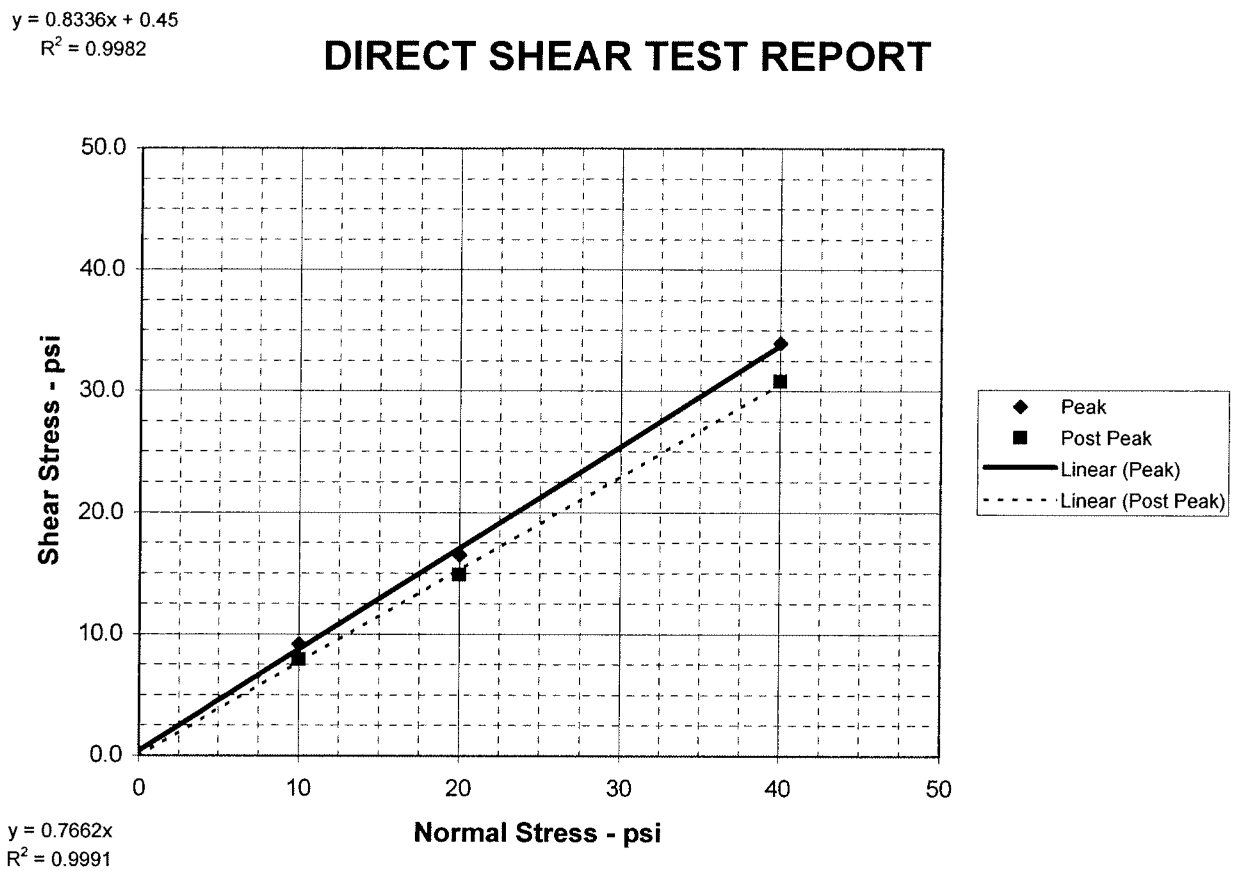
c_v values calculated by Sivaram and Swamee's Method

SAMPLE AND TEST DATA			
SAMPLE LOCATION: B-4, 8-10'			
DESCRIPTION: Clayey Sand , reddish brown with gray			
LL: NA	PL: NA	PI: NA	-200: NA
ASSUMED SPECIFIC GRAVITY:			2.70
MC Initial:	13.0%	MC Final:	19.6%
Dia. (in.) :	2.50	Height (in.) :	1.000
Initial Sat %:	70.2	Final Sat %:	100.0
DRY DENSITY (pcf):		108.0	

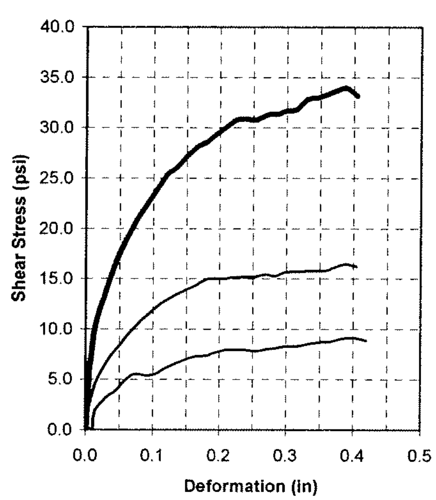
PROJECT INFORMATION	
PROJECT:	Luminant Martin Lake PDP 1-3
LOCATION:	Rusk, TX.
PROJECT NO.:	ETT08002-07
CLIENT:	ETTL Engineers & Consultants, Inc.
CLIENT NO.:	G2810-08
DATE:	4/24/2008
REMARKS: OCR calculated based on Pc and vertical overburden	

GREGORY GEOTECHNICAL | PLATE B-CN.2

DIRECT SHEAR TEST REPORT



PEAK STRENGTH PARAMETERS	φ =	39.8 deg	c =	0.5 psi
POST PEAK STRENGTH PARAMETERS	φ =	37.5 deg	c =	0.0 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	52.1	29.3	21.2	
Dry Density - pcf	50.2	71.7	95.2	
Diameter - inches	2.50	2.50	2.50	
Height - inches	1.13	1.13	1.13	
AT TEST				
Final Moisture - %	64.3	25.0	31.6	
Dry Density - pcf	55.8	79.1	117.3	
Height-End of Consol. (in.)	1.02	1.03	0.92	
Height-End of Shear (in.)	0.97	0.99	0.89	
Normal Stress - psi	10.0	20.0	40.0	
Peak Failure Stress-psi	9.2	16.5	34.0	
Post Peak Failure Stress-psi	7.9	14.9	30.8	
Strain Rate - inches/min.	0.00300	0.00300	0.00300	
Peak Failure Strain - %	16.2	15.6	15.6	
Post Peak Failure Strain %	8.4	7.2	9.6	

Dry Density at test based on initial moisture and height at end of consolidation.

TEST DESCRIPTION

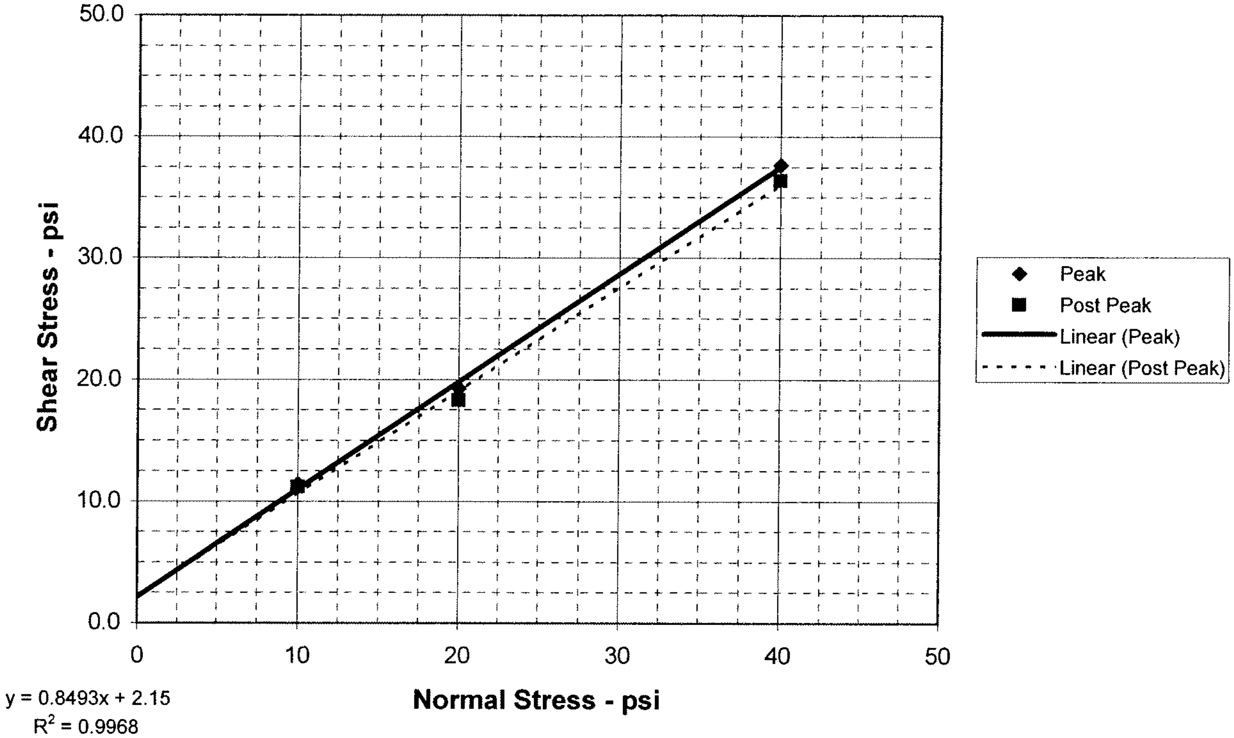
TYPE OF TEST & NO: CD-DS-1
SAMPLE TYPE: Shelby Tube
DESCRIPTION: Ash, black and gray
SAMPLE LOCATION: B-6, 3-5 ft
ASSUMED SPECIFIC GRAVITY: 2.65
LL: 35 PL: 19 PI: 16 Percent -200: 61
REMARKS: Multi-Specimen

PROJECT INFORMATION

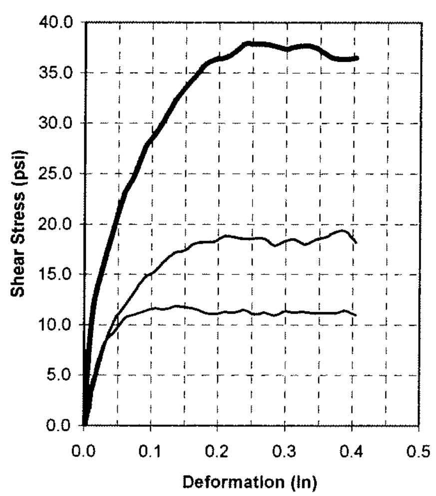
PROJECT: Luminant Martin Lake PDP 1-3
LOCATION: Rusk , TX
PROJECT NO: ETT08002-07 (G2810-08)
CLIENT : ETTL Engineers & Consultants, Inc
DATE:4/25/08

GREGORY GEOTECHNICAL PLATE: B-DS.1

DIRECT SHEAR TEST REPORT



PEAK STRENGTH PARAMETERS	φ =	41.4 deg	c =	2.2 psi
POST PEAK STRENGTH PARAMETERS	φ =	40.3 deg	c =	2.2 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	13.1	13.1	13.1	
Dry Density - pcf	71.8	71.7	71.7	
Diameter - inches	2.50	2.50	2.50	
Height - inches	1.00	1.00	1.00	
AT TEST				
Final Moisture - %	38.5	37.4	31.6	
Dry Density - pcf	73.6	73.7	75.8	
Height-End of Consol. (in.)	0.98	0.97	0.95	
Height-End of Shear (in.)	1.00	0.96	0.92	
Normal Stress - psi	10.0	20.0	40.0	
Peak Failure Stress-psi	11.4	19.3	37.7	
Post Peak Failure Stress-psi	11.2	18.3	36.4	
Strain Rate - inches/min.	0.00300	0.00300	0.00300	
Peak Failure Strain - %	15.6	15.6	13.2	
Post Peak Failure Strain %	13.8	12.0	15.0	

Dry Density at test based on initial moisture and height at end of consolidation.

TEST DESCRIPTION

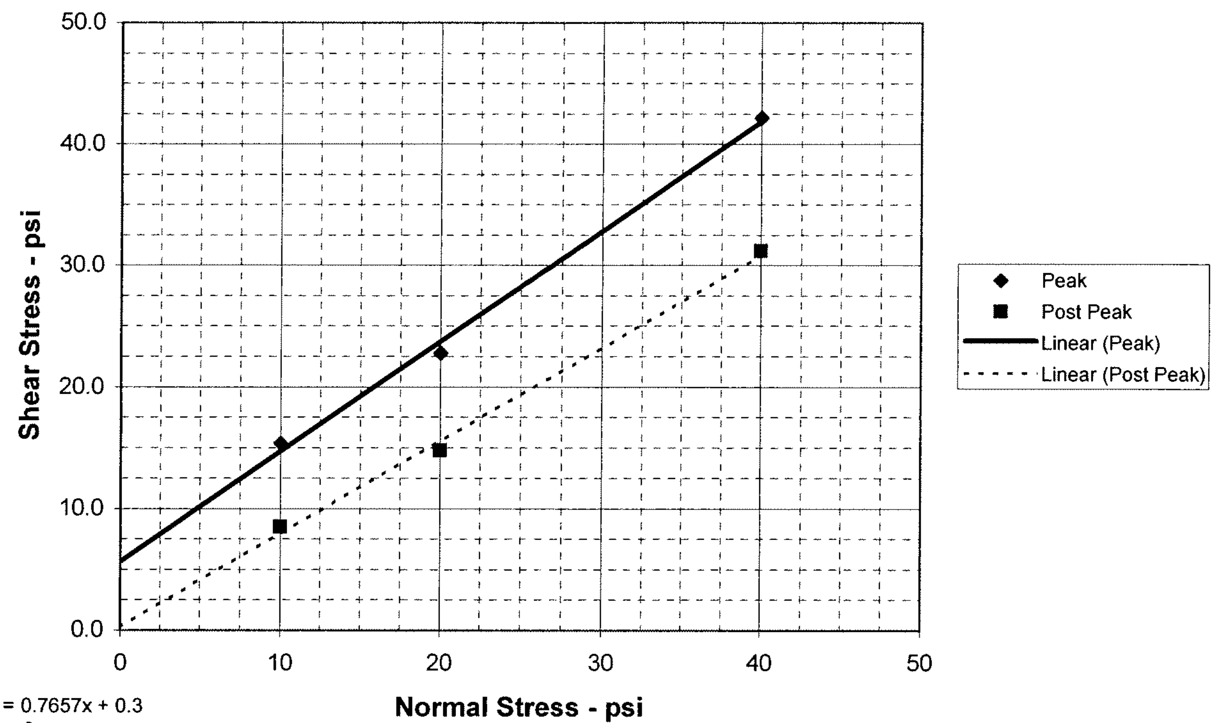
TYPE OF TEST & NO: CD-DS-2
SAMPLE TYPE: Re-Compacted
DESCRIPTION: Ash, black and dark gray
SAMPLE LOCATION: MLSES (Bulk)
SPECIFIC GRAVITY: 2.56
LL: NP PL: NP PI: NP Percent -200: 3.33
REMARKS: Multi-Specimen

PROJECT INFORMATION

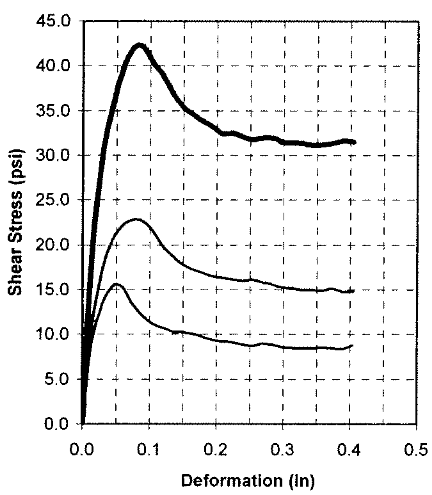
PROJECT: Luminant Martin Lake PDP 1-3
LOCATION: Rusk , TX
PROJECT NO: ETT08002-07 (G2810-08)
CLIENT : ETTL Engineers & Consultants, Inc
DATE:5/6/08

GREGORY GEOTECHNICAL PLATE: B-DS.2

DIRECT SHEAR TEST REPORT



PEAK STRENGTH PARAMETERS	φ =	42.1 deg	c =	5.7 psi
POST PEAK STRENGTH PARAMETERS	φ =	37.4 deg	c =	0.3 psi



SPECIMEN NO.	1	2	3	4
INITIAL				
Moisture Content - %	0.1	0.1	0.1	
Dry Density - pcf	71.7	71.7	71.7	
Diameter - inches	2.50	2.50	2.50	
Height - inches	1.00	1.00	1.00	
AT TEST				
Final Moisture - %	50.3	37.4	31.6	
Dry Density - pcf	73.4	73.1	73.1	
Height-End of Consol. (in.)	0.98	0.98	0.98	
Height-End of Shear (in.)	1.01	1.01	0.99	
Normal Stress - psi	10.0	20.0	40.0	
Peak Failure Stress-psi	15.4	22.8	42.2	
Post Peak Failure Stress-psi	8.5	14.8	31.2	
Strain Rate - inches/min.	0.00300	0.00300	0.00300	
Peak Failure Strain - %	17.6	3.0	3.6	
Post Peak Failure Strain %	15.0	15.6	13.8	

Dry Density at test based on initial moisture and height at end of consolidation.

TEST DESCRIPTION

TYPE OF TEST & NO: CD-DS-2
SAMPLE TYPE: Re-Compacted
DESCRIPTION: Economized Ash, tan and gray
SAMPLE LOCATION: MLSES (Bulk)
SPECIFIC GRAVITY: 2.67
LL: NP PL: NP PI: NP Percent -200: 8.64
REMARKS: Multi-Specimen

PROJECT INFORMATION

PROJECT: Luminant Martin Lake PDP 1-3
LOCATION: Rusk , TX
PROJECT NO: ETT08002-07 (G2810-08)
CLIENT : ETTL Engineers & Consultants, Inc
DATE:5/20/08

GREGORY GEOTECHNICAL PLATE: B-DS.3

APPENDIX A

Document 4

Critical Impoundment Inspection Report for Martin Lake SES, March 16, 2011, by Mark W. Kelly, P.E.

Critical Impoundment Inspection Report

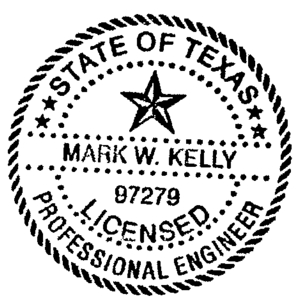
For

Martin Lake SES

The attached report is based on an on-site inspection conducted on January 25-26, 2011, at Luminant's Martin Lake Steam Electric Station located in Rusk County, Texas.

Draft Report date: February 11, 2011

Final Report date: March 16, 2011



March 16, 2011

Report prepared by: Mark W. Kelly, P.E.

FOR INFORMATION ONLY

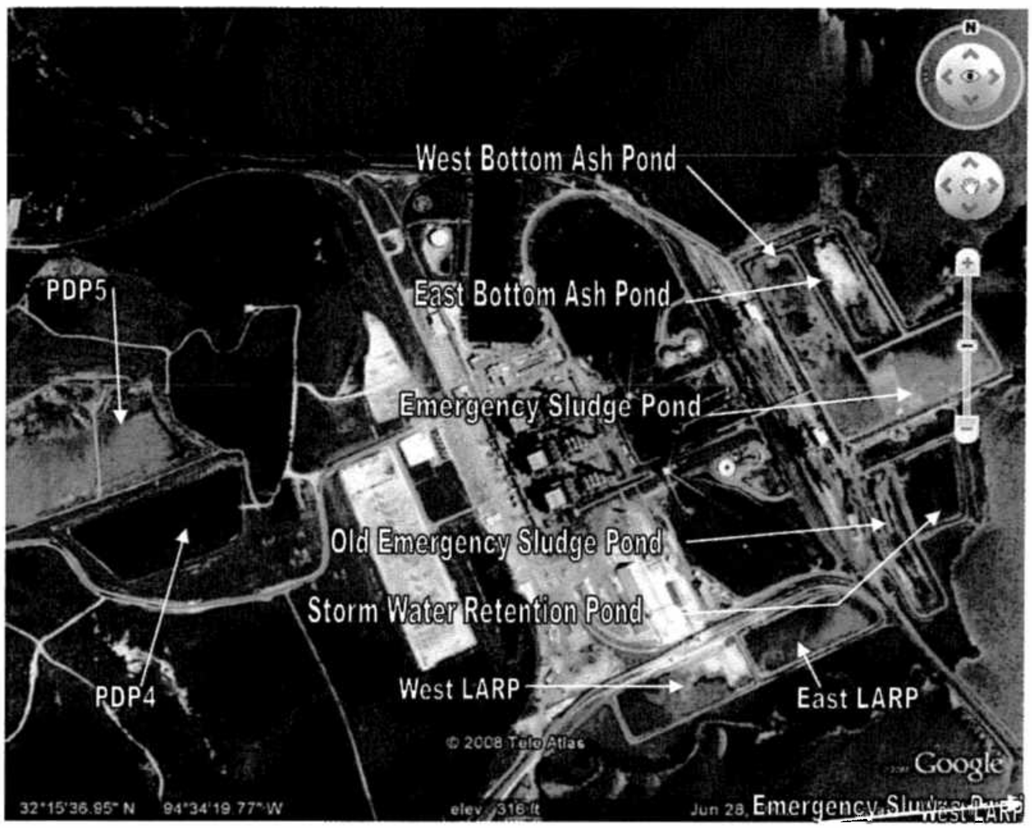
Luminant
500 N. Akard St., Dallas, TX 75201
Office: 214-875-8259 <> Fax: 214-875-8284
Email: mark.kelly@luminant.com

Table of Contents:

Introduction:

The critical impoundments at Martin Lake SES were inspected for dike structural stability on January 25-26, 2011. The inspection was performed by Mark Kelly of Luminant - Fossil Engineering Servicest and Isaac Turner Luminant – Martin Lake SES. As shown on Figure 1, the impoundments inspected were:

- Permanent Disposal Pond 4 (PDP4)
- Permanent Disposal Pond 5 (PDP5) (See Note 1)
- East Bottom Ash Pond
- West Bottom Ash Pond
- Emergency Sludge Pond
- West Low Volume Retention Pond (West LARP)
- East Low Volume Retention Pond (East LARP)
- Storm Water Retention Pond
- Old Emergency Sludge Pond



1. An aerial site photo showing the PDP5 complete was not available.

Figure 1: Martin Lake Steam Electric Station Site Impoundments

The last rainfall recorded for this site was on January 25, 2011 in the amount of 0.13-inches. At the time of inspection, the ground was moist with no standing water present.

Pond Critical Impoundment Inspections:

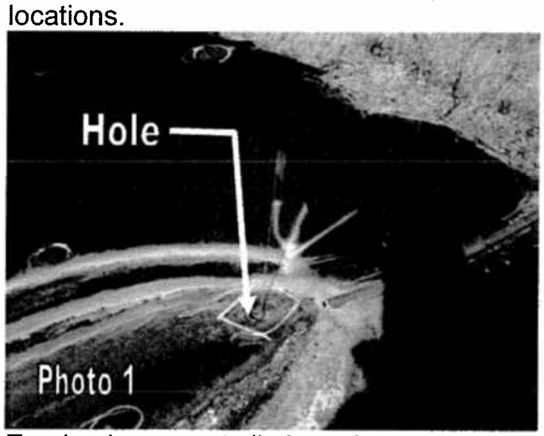
The inspection of Martin Lake's pond critical impoundments included a visual inspection of the inner and outer berms and crest for vegetative cover, erosion, misalignment, slides, settlement, damage and erosion, seeps, cracks, and lining condition. The previous formal inspection of these impoundments took place on January 26-27, 2010.

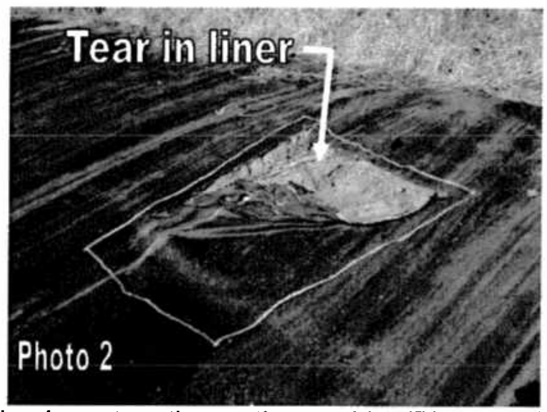
Permanent Disposal Pond 4 (PDP4):

The PDP4 has 15.34 surface acres with a maximum capacity of 82 million gallons at zero freeboard. The elevation of the top of the dike is 360-ft. and the water elevation was 353-ft. 7-in. with a freeboard of 6-ft. 5-in.

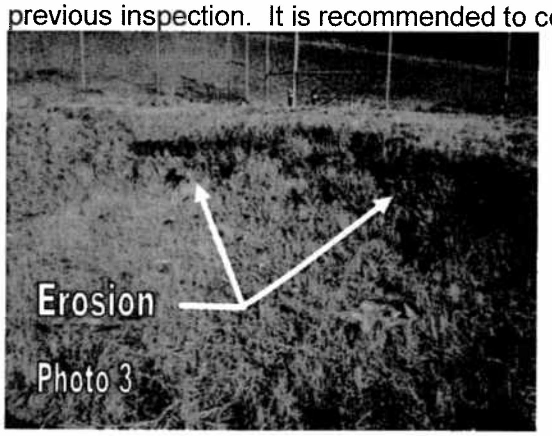
Following are the observations with recommendations:

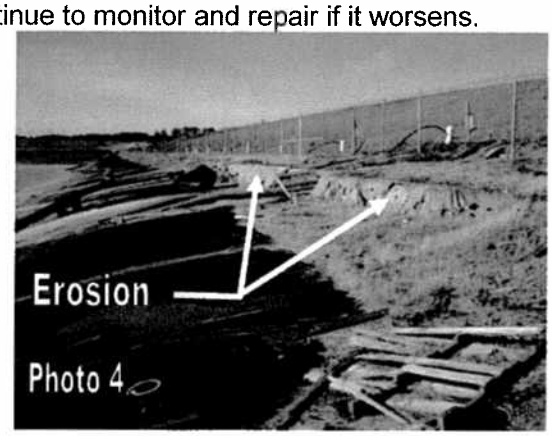
The poly liner was in great condition along the west, south and east side. On the north side there are four small holes (photo 1) and one large tear (Photo 2). See SK-1 for all the hole locations.



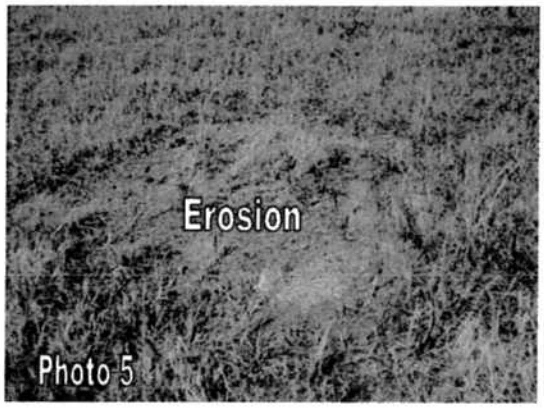


Erosion is present all along the upstream embankment on the northeast side. (Photos 3 & 4) The erosion is believed to be a result of runoff from the construction of PDP5 which is located upstream. The construction of PDP5 is complete and the erosion has not deteriorated since the previous inspection. It is recommended to continue to monitor and repair if it worsens.





Overall the downstream embankment was in good condition and well vegetated. There was one area near the toe of the embankment on the center of the south side that is bare of vegetation. This needs to be monitored through the winter and ensure that grass fills in this area during the spring growing season (Photo 5). Reseed if the grass is not establish by the end of May.



Permanent Disposal Pond 5 (PDP5):

The PDP5 has 32.94 surface acres with a maximum capacity of 82.84 million gallons at zero freeboard. The elevation of the top of the dike is 406-ft. and the pond recently become operational and was not filled to the design freeboard level.

Overall PDP5 was in good condition.

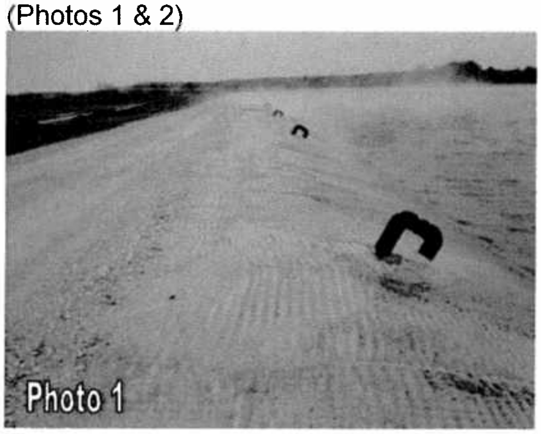
The grass on the downstream slopes is becoming established and there were not any areas of erosion present. (Photos 1 & 2)

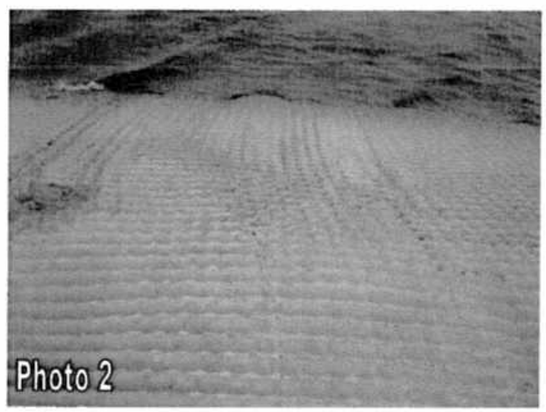
A majority of the upstream slope is not filled in with vegetative cover. This increases the slopes' exposure to erosion and will need to be monitored until the grass becomes established. (Photos 3 & 4)

East Bottom Ash Pond:

The East Bottom Ash Pond is adjacent to the West Bottom Ash Pond and Emergency Sludge Pond (see SK-3 for layout). Maximum capacity of this pond is 66.8 million gallons at zero freeboard. During the inspection in 2010 the East Pond was drained and being relined, but was in operation at the time of this inspection. The elevation of the top of the dike is 330-ft. and the water elevation was 327-ft. 3-in. with a freeboard of 2-ft. 9-in.

The concrete revetment matting was in good condition. No cracks, bulges or slides were found. (Photos 1 & 2)





The outfall pipes were in good condition and no leaks were detected. (Photos 3 & 4)

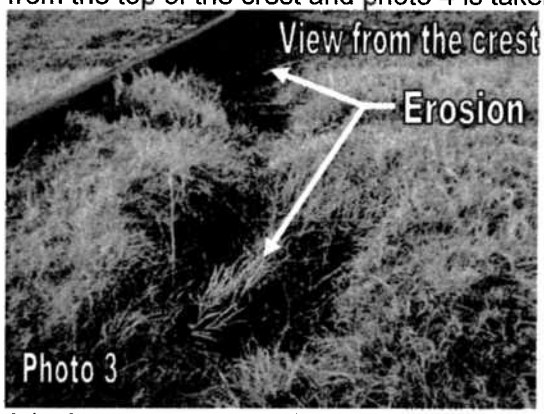
During the construction the downstream embankment on the north side was exposed, but has been revegetated. January 2010 (Photo 5a). January 2011 (Photo 5b).

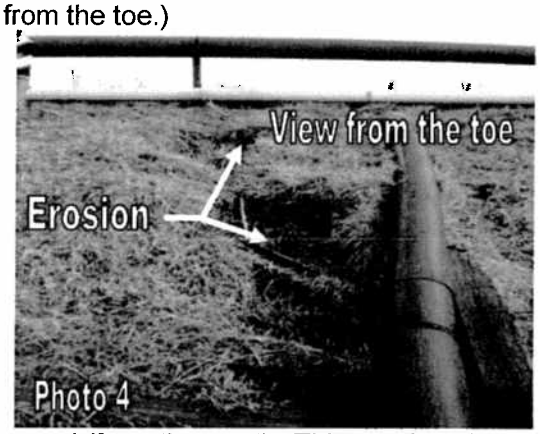
West Bottom Ash Pond:

The West Bottom Ash Pond has 14.6 surface acres at full capacity (zero freeboard) of 75.8 million gallons. The elevation of the top of the dike is 330-ft. and the water elevation was 327-ft. 6-in. with a freeboard of 2-ft. 6-in.

Under the support structure for the pipes on the downstream side on the north side there is significant erosion. This needs to be filled in and vegetation re-established. Monitor closely until repairs are completed. (Photos 1 & 2)

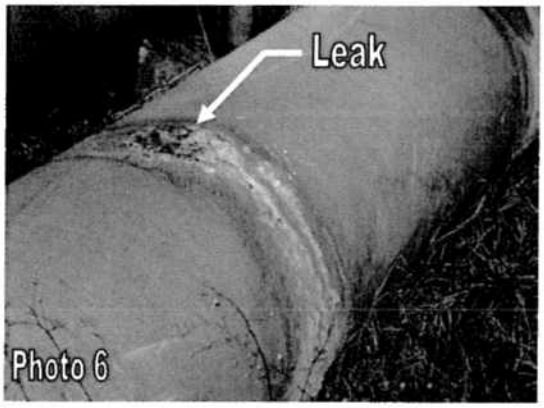
Overall the downstream embankment was in good condition with the exception of a large gully on the center of the west side. This needs to be filled in and re-vegetated. (Photo 3 is the view from the top of the crest and photo 4 is taken from the toe.)

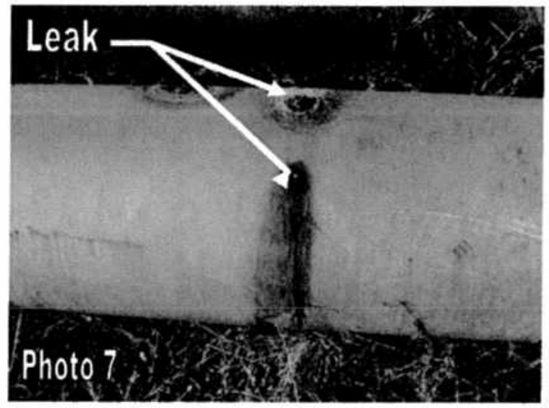




A leak was present on the gate valve on the second (from the west). This needs to be repaired to prevent saturation which could weaken the embankment and possibly result in a slide in this location. Monitor regularly until the repairs are completed. (Photo 5a & 5b)

There are steel pipes that are leaking what appears to be sulphur dioxide. These leaks appear to be small and the leaking minimal. Repairs need to be undertaken as soon as possible. (Photo 6 & 7)





Rutting was present in several locations along the crest (Photos 8 and 9). These need to be repaired to prevent rainfall runoff from collecting and penetrating which can potentially lead to weakening of the embankment. Care should be taken to avoid driving on the crest when it is soft when possible. See SK-3 for all locations.

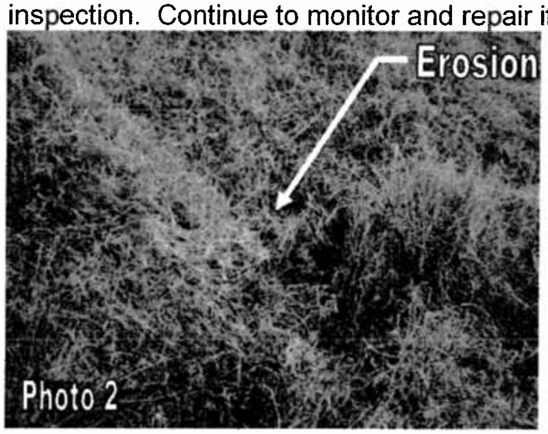
Emergency Sludge Pond:

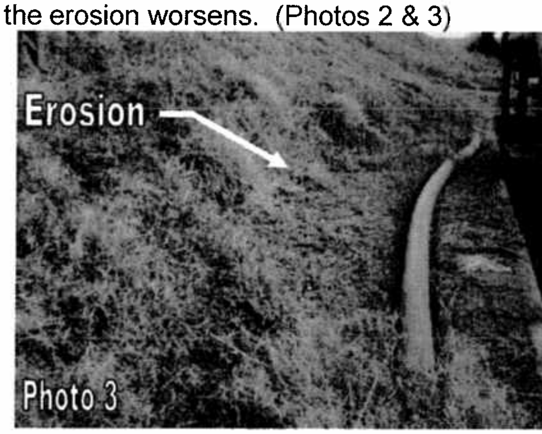
The Emergency Sludge Pond has 12.5 surface acres and a capacity of 64.8 million gallons at full capacity (zero freeboard). On the day of the inspection the water level was 2.2-feet below freeboard. This pond is lined with 4-inch thick concrete revetment mat. Erosion control is also in place on the south and north (lakeside) downstream embankments. The elevation of the top of the dike is 330-ft. and the water elevation was 327-ft. 9-in. with a freeboard of 2-ft. 3-in.

Following are the observations with recommendations:

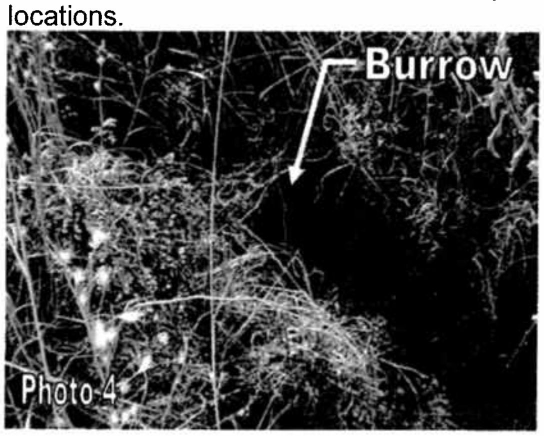
During the 2010 inspection a leak was present in the piping on the south side on the downstream slope. (Photo 1a) This has been corrected. (Photo 1b)

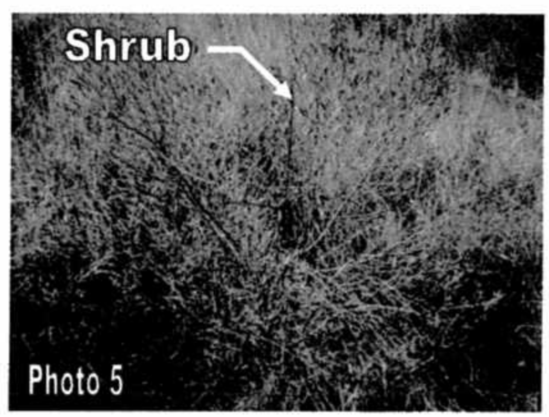
There were two areas on the downstream embankment adjacent to the pump station were erosion has occurred. Both are well vegetated and have not degraded since the previous inspection. Continue to monitor and repair if the erosion worsens. (Photos 2 & 3)





Other action items include filling in the burrow on the north side of the northeast corner (Photo 4) and removing the small shrub on the north side on the downstream slope near where it merges with the East Bottom Ash Pond (Photo 5). There was some rutting on the crest. These need to be repaired to prevent water from collecting and penetrating the embankment. See SK-3 for the locations.





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APPENDIX A

INSPECTION WORKSHEETS

CRITICAL IMPOUNDMENT INSPECTION CHECKLIST

Impoundment: Perm. Disposal Pond 4 (PDP4)	**Inspection Date: January 26, 2010**	**Weather: Cool and Cloudy**
Inspected By: Mark Kelly	**Last Inspection Date: January 27, 2009**	

Area	Item	Condition	Current Observations	Change From Last Inspection: Similar	Improved	Deteriorated	unknown	Action: OK	Monitor	Repair
CREST	1	SURFACE CRACKING	None observed	X				X		
	2	ANIMAL BURROWS	None observed	X				X		
	3	CREST SINKS	None observed	X				X		
	4	HORIZONTAL ALIGNMENT	No visual misalignment observed	X				X		
	5	RUTS/PUDDLES	None observed	X				X		
	6	VEGETATION	Grass	X				X		
	7	TREES	None observed	X				X		
	8	CREST - OTHER	None observed	X				X		
	9									
	10									
UPSTREAM EMBANKMENT	11	BERM SLIDE, SLOUGH	None observed		X			X		
	12	SLOPE PROTECTION	Hypolon liner over clay. Repair large tear and small holes.			X				X
	13	BERM SINKS	None observed	X				X		
	14	ANIMAL BURROWS	None observed	X				X		
	15	ABUTMENT CONTACT	Good	X				X		
	16	EROSION	North side (photos 3 & 4)	X					X	
	17	VEGETATION	At the top adjacent to the crest. Good coverage.		X			X		
	18	TREES	None observed	X				X		
	19	DRAINS	Not applicable	X				X		
	20	BERM BULGES	None observed	X				X		
	21	UPSTREAM - OTHER	None observed	X				X		
	22									
	23									
DOWNSTREAM EMBANKMENT	24	WET AREAS, SEEPAGE	None observed	X				X		
	25	EST. SEEPAGE RATE	None observed	X				X		
	26	SEEPAGE DESCRIPTION	None observed	X				X		
	27	TOE DRAIN STATUS	Not applicable	X				X		
	28	BERM SLIDE, SLOUGH	None observed	X				X		
	29	ABUTMENT CONTACT	Good	X				X		
	30	ANIMAL BURROWS	None observed	X				X		
	31	EROSION	None observed	X				X		
	32	UNUSUAL MOVEMENT	None observed	X				X		
	33	VEGETATION	Near toe at south center side.	X					X	X
	34	TREES	None observed		X			X		
	35	DOWNSTREAM - OTHER	None observed	X				X		
	36									
	37									

Comments and Photo Information:

Notes:

CRITICAL IMPOUNDMENT INSPECTION CHECKLIST

Impoundment: Perm. Disposal Pond 5 (PDP5)	**Inspection Date: January 26, 2010**	**Weather: Cool and Sunny**
Inspected By: Mark Kelly	**Last Inspection Date: N/A. See Note 1**	

Area	Item	Condition	Current Observations	Change From Last Inspection: Similar	Improved	Deteriorated	unknown	Action: OK	Monitor	Repair
CREST	1	SURFACE CRACKING	None observed					X		
	2	ANIMAL BURROWS	None observed					X		
	3	CREST SINKS	None observed					X		
	4	HORIZONTAL ALIGNMENT	No visual misalignment observed					X		
	5	RUTS/PUDDLES	None observed					X		
	6	VEGETATION	Grass is becoming established					X		
	7	TREES	None observed					X		
	8	CREST - OTHER	None observed					X		
	9									
	10									
UPSTREAM EMBANKMENT	11	BERM SLIDE, SLOUGH	None observed					X		
	12	SLOPE PROTECTION	Grass needed on the upper portion of the slope.					X		
	13	BERM SINKS	None observed					X		
	14	ANIMAL BURROWS	None observed					X		
	15	ABUTMENT CONTACT	Good					X		
	16	EROSION	None observed					X		
	17	VEGETATION	Grass needed at the top adjacent to the crest.						X	X
	18	TREES	None observed					X		
	19	BERM BULGES	None observed					X		
	20	UPSTREAM - OTHER	None observed					X		
	21									
	22									
	23									
DOWNSTREAM EMBANKMENT	24	EST. SEEPAGE RATE	None observed					X		
	25	SEEPAGE DESCRIPTION	None observed					X		
	26	BERM SLIDE, SLOUGH	None observed					X		
	27	ABUTMENT CONTACT	Good					X		
	28	ANIMAL BURROWS	None observed					X		
	29	EROSION	None observed					X		
	30	UNUSUAL MOVEMENT	None observed					X		
	31	VEGETATION	Grass is becoming established.					X		
	32	TREES	None observed					X		
	33	DOWNSTREAM - OTHER	None observed					X		
	34									
	35									

Comments and Photo Information:

Notes:

1. The pond was under construction during the previous inspection.

CRITICAL IMPOUNDMENT INSPECTION CHECKLIST

Impoundment: East Bottom Ash Pond	**Inspection Date: January 25, 2010**	**Weather: Cool and Cloudy**
Inspected By: Mark Kelly	**Last Inspection Date: January 26, 2009**	

Area	Item	Condition	Current Observations	Change From Last Inspection				Action		
				Similar	Improved	Deteriorated	unknown	OK	Monitor	Repair
CREST	1	SURFACE CRACKING	None observed	X				X		
	2	ANIMAL BURROWS	None observed	X				X		
	3	CREST SINKS	None observed	X				X		
	4	HORIZONTAL ALIGNMENT	No visual misalignment observed	X				X		
	5	RUTS/PUDDLES	None observed		X			X		
	6	VEGETATION	Some near the downstream embankment	X				X		
	7	TREES	None observed	X				X		
	8	CREST - OTHER	No defects found in the concrete lining	X				X		
	9									
	10									
UPSTREAM EMBANKMENT	11	BERM SLIDE, SLOUGH	None observed	X				X		
	12	SLOPE PROTECTION	New concrete revetment matting in place	X				X		
	13	BERM SINKS	None observed	X				X		
	14	ANIMAL BURROWS	None observed	X				X		
	15	ABUTMENT CONTACT	Good	X				X		
	16	EROSION	None observed	X				X		
	17	VEGETATION	Not applicable	X				X		
	18	TREES	None observed	X				X		
	19	BERM BULGES	None observed	X				X		
	20	UPSTREAM - OTHER	None observed	X				X		
	21									
	22									
	23									
DOWNSTREAM EMBANKMENT	24	WET AREAS, SEEPAGE	None observed	X				X		
	25	EST. SEEPAGE RATE	None observed	X				X		
	26	SEEPAGE DESCRIPTION	None observed	X				X		
	27	TOE DRAIN STATUS	Not applicable	X				X		
	28	BERM SLIDE, SLOUGH	None observed	X				X		
	29	ABUTMENT CONTACT	Good	X				X		
	30	ANIMAL BURROWS	None observed	X				X		
	31	EROSION	None observed		X			X		
	32	UNUSUAL MOVEMENT	None observed	X				X		
	33	VEGETATION	Grass - good coverage		X			X		
	34	TREES	None observed	X				X		
	35	DOWNSTREAM - OTHER	Not applicable	X				X		
	36									
	37									

Comments and Photo Information:

Notes: This impoundment was being relined at the time of the inspection.

CRITICAL IMPOUNDMENT INSPECTION CHECKLIST

Impoundment: West Bottom Ash Pond			**Inspection Date: January 25, 2010**	**Weather: Cool and Cloudy**						
Inspected By: Mark Kelly			**Last Inspection Date: January 26, 2009**							
Area	**Item**	**Condition**	**Current Observations**	**Change From Last Inspection**				**Action**		
				Similar	**Improved**	**Deteriorated**	**unknown**	**OK**	**Monitor**	**Repair**
CREST	1	SURFACE CRACKING	None observed	X				X		
	2	ANIMAL BURROWS	None observed	X				X		
	3	CREST SINKS	None observed	X				X		
	4	HORIZONTAL ALIGNMEN	No visual misalignment observed	X				X		
	5	RUTS/PUDDLES	Numerous. See SK-3 for locations	X						X
	6	VEGETATION	Near the top at the downstream embankment	X				X		
	7	TREES	None observed	X				X		
	8	CREST - OTHER	Leaking pipes carrying FGD slurry on west side. (Photos 7 & 8)				X		X	X
	9									
	10									
UPSTREAM EMBANKMENT	11	BERM SLIDE, SLOUGH	None observed	X				X		
	12	SLOPE PROTECTION	4-inch concrete revetment mat over HDPE liner over clay	X				X		
	13	BERM SINKS	None observed	X				X		
	14	ANIMAL BURROWS	None observed	X				X		
	15	ABUTMENT CONTACT	Good	X				X		
	16	EROSION	None observed	X				X		
	17	VEGETATION	Not applicable	X				X		
	18	TREES	None observed	X				X		
	19	BERM BULGES	None observed	X				X		
	20									
	21									
	22									
	23									
DOWNSTREAM EMBANKMENT	24	WET AREAS, SEEPAGE	None observed	X				X		
	25	EST. SEEPAGE RATE	None observed	X				X		
	26	SEEPAGE DESCRIPTION	None observed	X				X		
	27	BERM SLIDE, SLOUGH	None observed	X				X		
	28	ABUTMENT CONTACT	Good	X				X		
	29	ANIMAL BURROWS	None observed	X				X		
	30	EROSION	See notes 1 & 2.			X				X
	31	UNUSUAL MOVEMENT	None observed	X				X		
	32	VEGETATION	Grass coverage		X			X		
	33	TREES	None observed	X				X		
	34	UPSTREAM - OTHER	Pipe leaking on the South side. (Photos 5 & 6)	X						X
	35									
	36									
	37									

Comments and Photo Information:

Notes:

1. Significant erosion is undercutting the crossing structure. This needs to be filled in and vegetated. (Photos 1 and 2)
2. Large gulley on the center of the west side. Fill in and reseed. (Photos 3 and 4)

CRITICAL IMPOUNDMENT INSPECTION CHECKLIST

Impoundment: Emergency Sludge Pond	Inspection Date: January 25, 2010	Weather: Cool and Cloudy
Inspected By: Mark Kelly	Last Inspection Date: January 26, 2009	

Area	Item	Condition	Current Observations	Change From Last Inspection				Action		
				Similar	Improved	Deteriorated	unknown	OK	Monitor	Repair
	1	SURFACE CRACKING	None observed	X				X		
	2	ANIMAL BURROWS	None observed	X				X		
	3	CREST SINKS	None observed	X				X		
	4	HORIZONTAL ALIGNMENT	No misalignment found	X				X		
CREST	5	RUTS/PUDDLES	At various locations. See SK-2	X						X
	6	VEGETATION	Adjacent to downstream embankment	X				X		
	7	TREES	None observed	X				X		
	8	CREST - OTHER	None observed		X			X		
	9									
	10									
	11	BERM SLIDE, SLOUGH	None observed	X				X		
	12	SLOPE PROTECTION	4-inch concrete revetment mat over HDPE liner over clay	X				X		
	13	BERM SINKS	None observed	X				X		
	14	ANIMAL BURROWS	None observed	X				X		
	15	ABUTMENT CONTACT	Good	X				X		
	16	EROSION	None observed	X				X		
UPSTREAM EMBANKMENT	17	VEGETATION	None	X				X		
	18	TREES	None observed	X				X		
	19	BERM BULGES	None observed	X				X		
	20	UPSTREAM - OTHER	None observed	X				X		
	21									
	22									
	23									
	24	WET AREAS, SEEPAGE	None observed		X			X		
	25	EST. SEEPAGE RATE	Not applicable	X				X		
	26	SEEPAGE DESCRIPTION	Not applicable	X				X		
	27	BERM SLIDE, SLOUGH	None observed	X					X	
	28	ABUTMENT CONTACT	Good	X				X		
	29	ANIMAL BURROWS	NE corner	X						X
DOWNSTREAM EMBANKMENT	30	EROSION	See Note 1	X					X	
	31	UNUSUAL MOVEMENT	None observed	X				X		
	32	VEGETATION	Good	X				X		
	33	TREES	Small shrub on north center side near EBAP embankment.	X						X
	34	DOWNSTREAM - OTHER	Leaking pipe fixed from the 2010 inspection.		X			X		
	35									
	36									
	37									

Comments and Photo Information:

Notes:

1. Along the south center side there are two minor areas of erosion that are well vegetated. These do not appear to be recent or worsening. Continue to monitor.

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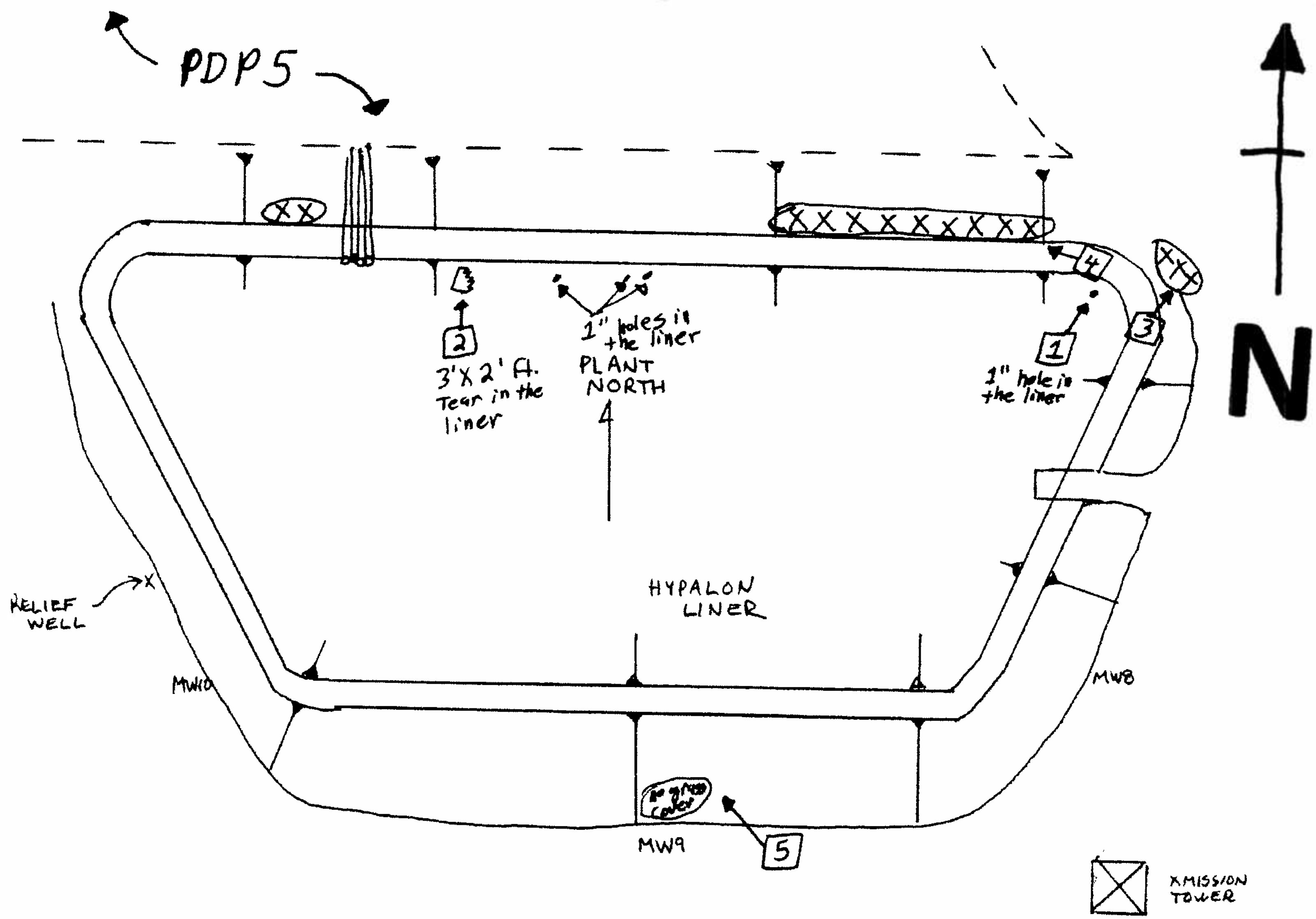
NOT IN SCOPE

APPENDIX B

PHOTO LOCATOR PLANS



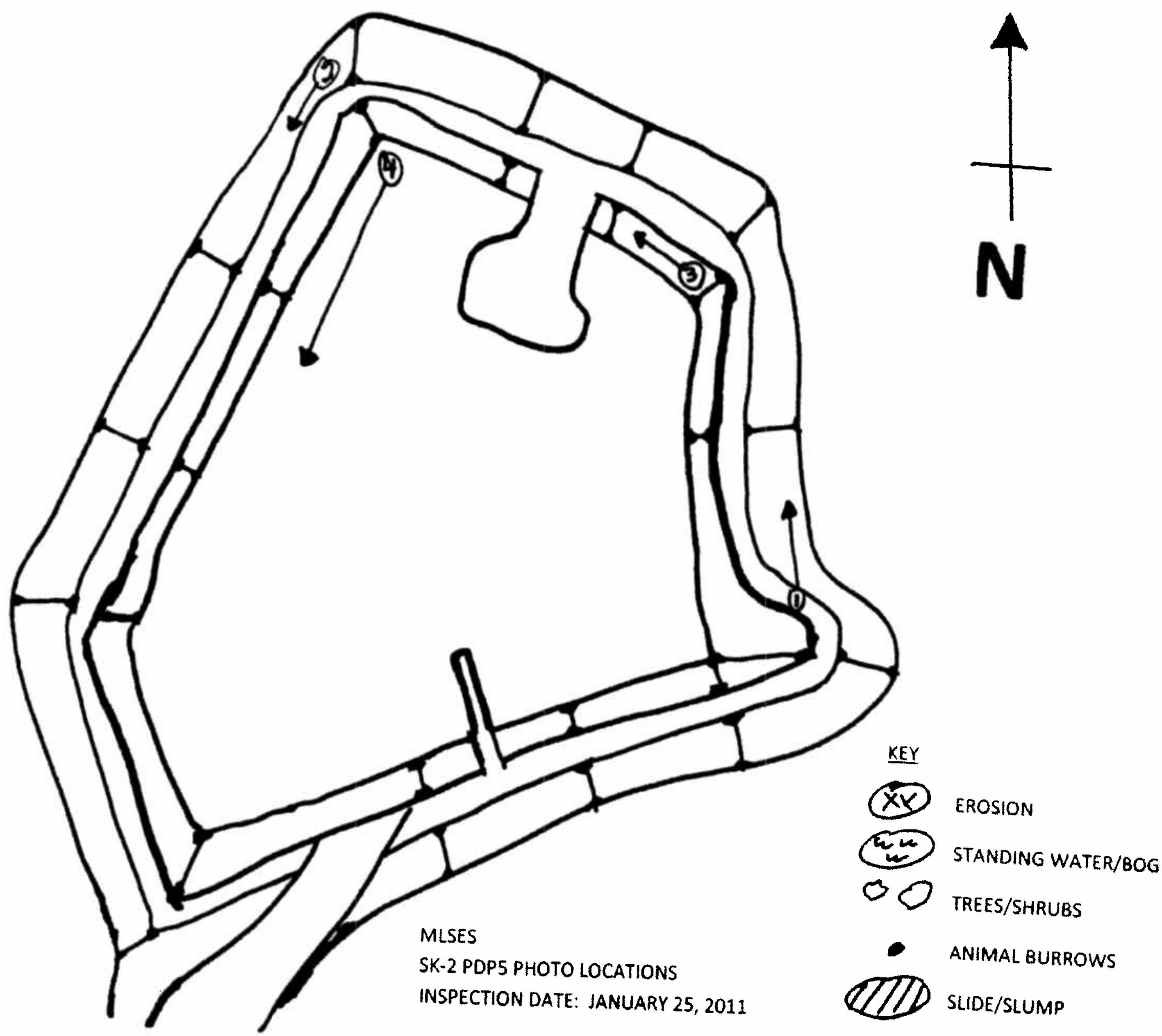
KEY

- EROSION
- STANDING WATER/BOG
- TREES/SHRUBS
- ANIMAL BURROWS
- SLIDE/SLUMP

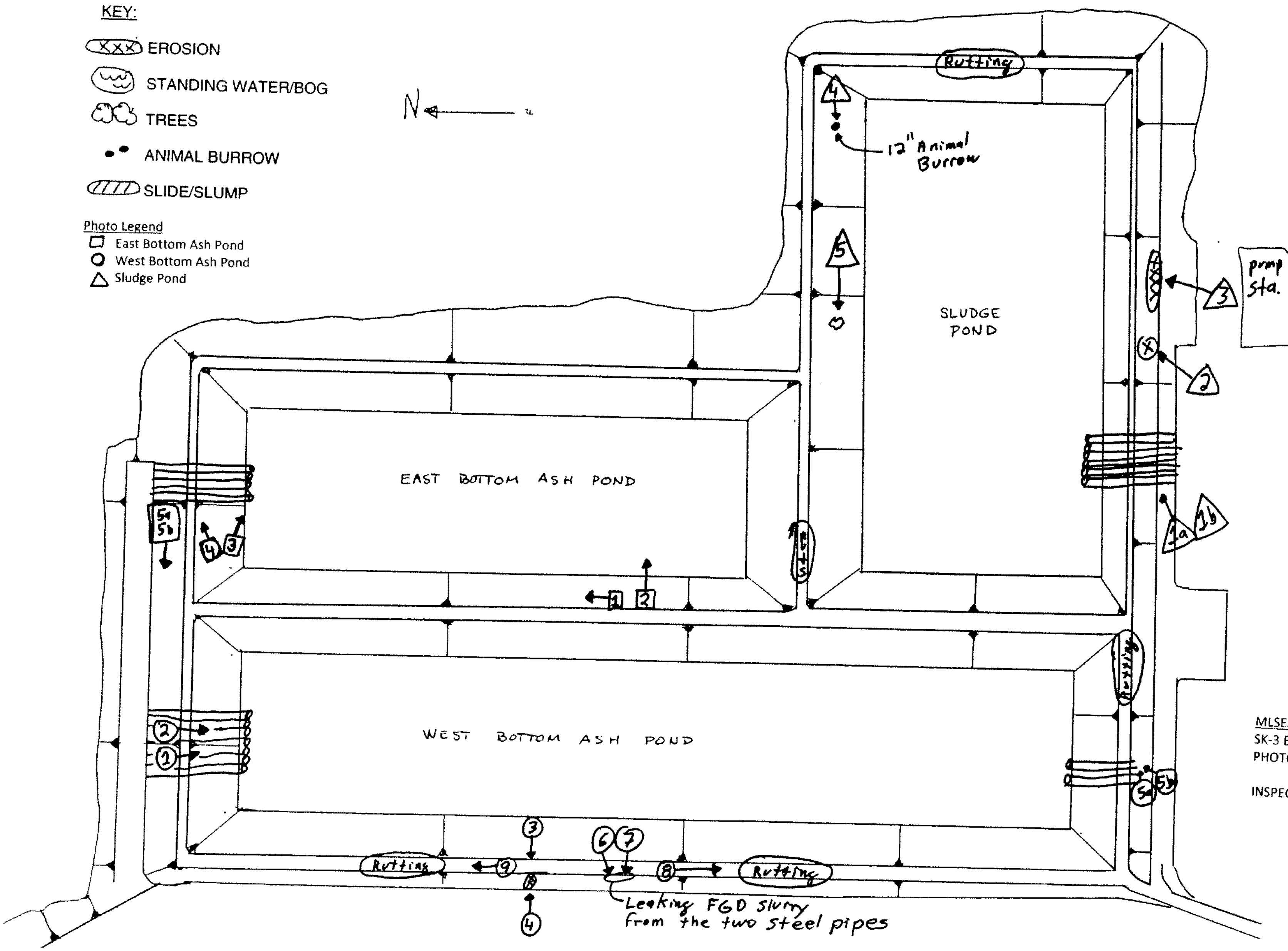
MLSES

SK – 1 PDP4 PHOTO LOCATIONS

INSPECTION DATE: JANUARY 26, 2011.



N
1
2
3
4
MLSES
SK-2 PDP5 PHOTO LOCATIONS
INSPECTION DATE: JANUARY 25, 2011
KEY
XY
EROSION
STANDING WATER/BOG
TREES/SHRUBS
ANIMAL BURROWS
SLIDE/SLUMP



MLSES
SK-3 BOTTOM ASH & SLUDGE PONDS
PHOTO LOCATIONS

INSPECTION DATE: JANUARY 25, 2011

PAGE (S) REMOVED

NOT IN SCOPE

APPENDIX A

Document 5

Area 3 Shift Log (9-25-12 and 9-24-12)

AREA 3 SHIFT LOG

DATE 09/25/12 FOREMAN DENTON SHIFT C

Fuel Summary

1,500	#1 Surge Silo
6,000	Bypass
2,800	#2 Surge Silo
0	#1 S/R East
8,000	#1 S/R West
3,000	#2 S/R East
13,000	#2 S/R West
	TOTAL FUEL
8	Total Lignite Loads Dumped
0	Total PRB Cars Dumped

Sludge Summary

Cars	Vacuum Filters
	Belt Filter USG cars
18	Belt Filter TXU cars
	VF-101
	VF-201
18	TOTAL CARS
	Underflow Tank Level
Pond Levels	**Freeboard**
2.5	ESP
2.4	EAP
	WAP
7.6	swp
3.3	LVRP
4.9	PDP4
7.8	PDP5

Housekeeping Audit

Area	Wash (Y/N)
#1 TR	y
#2 TR	y
#1 SS	y
#2 SS	y
#1 Crusher	y
#3 Crusher	y

Deep Well Pump to LVRP	off

Ash Summary

Flyash Levels	Air Space	Cars Loaded
#1 Silo	46	0
#2 Silo	42	24
Bottom Ash	Cars Loaded	24
Decant/992 pit	Cars Loaded	
SLUDGE AND ASH CARS LOADED		66
Decant Pad Level		15%

Thickeners	Rake	Density	Torque
T111	100%	1.49	6%
T112	95%	1.52	1%
T301B	97%	1.06	5%

Tainter Gates	ALL
Lake Level	302.0
Gate Position	clsd
8" Valve	clsd

River Pumps	level-2
Time of reading	2130pm
Current Flow (gpm)	10269.0
Total Flow (kgal)	8834700
Note in comments time of pump start and/or stop	

Safety

none

Personnel / Training

Environmental

esp to eap--service water to eap--pdp-4 to eap

Lignite/Western Delivery

unloaded 0 western---stacked out around 3000 lignite #3

Fly Ash/Sludge Removal

running belt filter----

Maintenance

break-ins- none

Misc.

A river pump on NOTE: #2 unloader hopper sprays will not turn off--valved

AREA 3 SHIFT LOG

DATE 09/24/12 FOREMAN DENTON SHIFT C

Fuel Summary

2,500	#1 surge silo
6,000	Bypass
3,000	#2 Surge Silo
4,000	#1 S/R East
4,000	#1 S/R West
2,000	#2 S/R East
28,000	#2 S/R West
	TOTAL FUEL
4	Total Lignite Loads Dumped
48	Total PRB Cars Dumped

Sludge Summary

Cars	Vacuum Filters
	Belt Filter USG cars
16	Belt Filter TXU cars
	VF-101
	VF-201
16	TOTAL CARS
	Underflow Tank Level
Pond Levels	**Freeboard**
2.8	ESP
2.1	EAP
	WAP
7.6	swp
3.3	LVRP
5.1	PDP4
7.0	PDP5

Housekeeping Audit

Area	Wash (Y/N)
#1 TR	y
#2 TR	y
#1 SS	y
#2 SS	y
#1 Crusher	y
#3 Crusher	y

Deep Well Pump to LVRP	off

Ash Summary

Flyash Levels	Air Space	Cars Loaded
#1 Silo	44	
#2 Silo	36	24
Bottom Ash	Cars Loaded	0
Decant/992 pit	Cars Loaded	
SLUDGE AND ASH CARS LOADED		40
Decant Pad Level		

Thickeners	Rake	Density	Torque
T111	100%	1.33	4%
T112	96%	1.31	0%
T301B	96%	1.10	5%

Tainter Gates	ALL
Lake Level	301.0
Gate Position	clsd
8" Valve	clsd

River Pumps	level-2.0
Time of reading	1125pm
Current Flow (gpm)	10086.0
Total Flow (kgal)	6865256
Note in comments time of pump start and/or stop	

Safety

none

Personnel / Training

Randy Fausett fly ash

Environmental

esp to pdp-4--disel on esp to eap

Lignite/Western Delivery

unloaded 48 western----- stacked out western #1 stacker--reclaimed lignite #3

Fly Ash/Sludge Removal

running belt filter----headwater here to load 8 fly

Maintenance

break-ins-none

Misc.

NOTE: A river pump on---cleaned fly ash tracks

AREA 3 SHIFT LOG

DATE	09/24/12	FOREMAN	Dennis Phillips	SHIFT	D

Fuel Summary

4,000	#1 Surge Silo
5,000	Bypass
4,900	#2 Surge Silo
4,000	#1 S/R East
0	#1 S/R West
3,000	#2 S/R East
23,000	#2 S/R West
[illegible]	TOTAL FUEL
6.5	Total Lignite Loads Dumped
80	Total PRB Cars Dumped

Sludge Summary

Cars	Vacuum Filters
0	Belt Filter USG cars
19	Belt Filter TXU cars
0	VF-101
0	VF-201
19	TOTAL CARS
0.08	Underflow Tank Level
Pond Levels	**Freeboard**
2'0"	ESP
2'0"	EAP
8'+	WAP
7'10"	SWP
3'3"	LVRP
5'3"	PDP4
8'0"	PDP5

Housekeeping Audit

Area	Wash (Y/N)
#1 TR	Y
#2 TR	Y
#1 SS	Y
#2 SS	Y
#1 Crusher	Y
#3 Crusher	Y

Ash Summary

Flyash Levels	Air Space	Cars Loaded
#1 Silo	50'	0
#2 Silo	31'	36
Bottom Ash	Cars Loaded	24
Decant/992 pit	Cars Loaded	0
SLUDGE AND ASH CARS LOADED		79
Decant Pad Level		10%

Thickener Summary

Thickeners	Rake	Density	Torque
T111	100%	1.62	19%
T112	95%	1.28	2%
T301B	96%	1.17	6%

Tainter Gates	ALL
Lake Level	300.9
Gate Position	Closed
8" Valve	Closed

River Pumps	A Running
Time of reading	13:55
Current Flow (gal)	9,990
Total Flow (kgal)	8,839,264
Level	2.0

Deep Well Pump to LVRP	Off

Safety

Personnel / Training

Environmental

ESP to EAP, PDP4 to EAP, Diesel pump ESP to EAP, SW to EAP. Shut down ESP to EAP, PDP4 to EAP, SW to EAP. EAP. Diesel pump still running.

Lignite/Western Delivery

No Blend. Stacking western on #2 stacker. Reclaiming lignite on #2 stacker.

Fly Ash/Sludge Removal

Running Belt Filter.

Maintenance

Break-in to cut end of flyash cable @ drum. Tighten gasket on 3E B/A hopper.

Misc.

Clearance tainter gates at dam for merico to water blast drains on side walls.
Clearacne on 3D dewatering bin. Clearance on track 9 & 10. Track 9 & 10 released.

AREA 3 SHIFT LOG

DATE 09/11/12 FOREMAN Rodney Hall SHIFT B

Fuel Summary

3,800	#1 Surge Silo
4,000	Bypass
4,800	#2 Surge Silo
8,000	#1 S/R East
18,000	#1 S/R West
0	#2 S/R East
13,200	#2 S/R West
	TOTAL FUEL
7	Total Lignite Loads Dumped
31	Total PRB Cars Dumped

Cars	Vacuum Filters
	Belt Filter USG cars
11	Belt Filter TXU cars
	VF-101
	VF-201
11	TOTAL CARS
OOS	Underflow Tank Level

Pond Levels	Freeboard
	ESP
	EAP
	WAP
	SWP
	LVRP
	PDP4
	PDP5

Housekeeping Audit

Area	Wash (Y/N)
#1 TR	y
#2 TR	y
#1 SS	y
#2 SS	y
#1 Crusher	y
#3 Crusher	y

Ash Summary

Flyash Levels	Air Space	Cars Loaded
#1 Silo	51	0
#2 Silo	35	0
Bottom Ash	loaded	0
Decant/992 pit	Cars Loaded	12
cars loaded		23
Decant Pad Level		15%

Thickener Summary

Thickeners	Rake	Density	Torque
T111	98%	1.42	9%
T112	80%	1.00	0%
T301B	96%	1.11	5%

Tainter Gates	ALL
Lake Level	301.0
Gate Position	clsd
8" Valve	clsd

River Pumps	
Time of reading	12:00 PM
Current Flow (gpm)	9,983
Total Flow (kgal)	8662798
river level 2.0	

deep well to LVRP	off

Safety

none

Personnel / Training

Environmental

PDP # 4 to LVRP pond, PDP # 5 to PDP # 4, ESP to EAP

Lignite/Western Delivery

unloaded western train stacked on three,

Fly Ash/Sludge Removal

loading with belt filter, loading from flyash silo # 2,

Maintenance

Break in work,

Misc.

Martin Lake Critical Impoundment Inspection Action Items

Action Task Identifier	Impoundment	Description	Level of Concern	Recommended Action(s)	Status	Date Completed	Lead Person	Location & Photo #
CR-2012-000183-1	Emergency Sludge Pond	Rutting along the crest	Moderate	Repair the rutting and grade to drain. Discourage vehicular traffic from driving on the crest following rainfall events.	**Complete 9/7/12**	**9/7/2012**	KM	page 7 photo 5 & 6
CR-2012-000183-2	Emergency Sludge Pond	Damage to the revetment matting on the on the western edge including a tree growing in one of the liner vents.	Moderate	Remove the plant from the liner vent. Monitor damaged areas for wave erosion. Investigate the integrity of underlying HDPE liner which may also have been damaged when the matting was. Repair the concrete revetment.	Weed was moved from the vent Work order number 12-138573. Repairing the east and west side.	**8/13/2012**	KM	page 8 photo 7
CR-2012-000183-3	Emergency Sludge Pond	Undesirable vegetation (shrubs) growing in the downstream embankment.	Moderate	Remove the shrubs.	Complete as per Benchmark	**7/27/2012**	KM	page 9 photo 8 & 9
CR-2012-000183-4	Emergency Sludge Pond	Leaking flexible hose on the south side of the downstream embankment.	Moderate	Repair the leak in the hose.	Complete as per Benchmark	**7/27/2012**	KM	page 10 photo 10
CR-2012-000183-5	Emergency Sludge Pond	In the pump area on the south side, leak on the "3C" pump.	Moderate	Repair the leak.	3C ESP Pump leak has been repaired, no leak		CJ	page 11 photo 11
CR-2012-000183-6	West Bottom Ash Pond	Rutting along the crest	Moderate	Repair the rutting and grade to drain. Discourage vehicular traffic from driving on the crest following rainfall events.	**Complete 9/7/12**	**9/7/2012**	KM	page 13 photo 13 & 14
CR-2012-000183-7	West Bottom Ash Pond	Downstream embankment on the southwest corner there is an area that appears to be a berm slide or erosion washout from high volume pipes.	Moderate	Backfill to the original slopes and reestablish vegetative cover. Continue to monitor this area for evidence of berm bulges or seepage at the toe of the berm.	Complete as per Benchmark	**8/20/2012**	KM	page 13 photo 15 & 16
CR-2012-000183-8	West Bottom Ash Pond	Leaking pipes along the western side.	Minor	Continue to monitor the leaks until repairs are complete.	Project has been submitted		CJ	page 14 photo 17 & 18
CR-2012-000183-9	West Bottom Ash Pond	Erosion along the downstream side of the northern berm.	Moderate	Backfill and reestablish vegetation. Continue to monitor for additional erosion.	Complete as per Benchmark	**8/20/2012**	KM	page 14 photo 19 & 20
CR-2012-000183-10	West Bottom Ash Pond	Severe erosion on the downstream side under the pipe rack located on the north end of the pond.	Moderate	Backfill with compact cohesive soil and incorporate a geosynthetic to minimize further erosion and then reseed the area with grass that grows under shady conditions. Continue to monitor after the repairs are made.	This area is to be addressed by the West Ash Pond Clean Out Project onece the project is complete contact on the project is KP.		KM	page 15 photo 21
CR-2012-000183-27	Permanent Disposal Pond #4 (PDP#4)	Holes in the liner caused by the metal pickets used to anchor the pipes.	Moderate	Repair the gouges and small tears in the liner. Set the metal pickets further back on the crest away from the liner.	Annual PM scheduled for November but need to get moved up. The PM has been moved up to October material should be here in mid September to do the work		CJ	page 33 photo 60 & 61
CR-2012-000183-28	Permanent Disposal Pond #4 (PDP#4)	Severe erosion along the northern edge.	Moderate	Remove the old geotextile material, regrade the area and backfill the gullies, install an erosion control blanket and reestablish vegetation. Remove large rocks and debris from the liner. Continue to monitor for additional erosion.	This will be addressed in 2013		KM/CJ	page 32 photo 58 & 59
CR-2012-000183-29	Permanent Disposal Pond #4 (PDP#4)	Large tear in the liner under the discharge.	Moderate	Repair the liner	Complete	**12-May**	CJ	page 34 photo 62
CR-2012-000183-30	Permanent Disposal Pond #4 (PDP#4)	The sacrificial liner was installed near the outfall from PDP#5 near the large tear. The outfall exceeds the limits of the sacrificial liner.	Moderate	Install another sacrificial liner beyond the limits of the pipe discharge.	Complete	**12-May**	CJ	page 34 photo 62
CR-2012-000183-31	Permanent Disposal Pond #5 (PDP#5)	Minor to moderate erosion rills around the entire interior of the pond.	Moderate	Continue to monitor for erosion. Backfill the bare erosion gullies and reestablish vegetation. Raise the pond level to minimize the erosion to the protective cover.	Backfield by Benchmark	**8/20/2012**	KM	page 35 photo 65 & 66
CR-2012-000183-32	Permanent Disposal Pond #5 (PDP#5)	Small shrubs along the entire upstream embankment.	Moderate	Remove the shrubs.	Complete as per Benchmark	**7/27/2012**	KM	page 36 photo 67
CR-2012-000183-33	Permanent Disposal Pond #5 (PDP#5)	Portable submersible pump at the decant structure was placed in the water resting on the bottom eroding the liner.	Critical	Elevate the submersible pump off the pond floor. The decant structure was designed to accommodate an additional fixed submersible pump at the end of the platform. Recommended to install an additional fixed pump.	Engineering said this will be done at time of installing permanent installation	**8/12/2012**	CJ JM	page 36 photo 68
CR-2012-000183-34	Permanent Disposal Pond #5 (PDP#5)	The overflow return lines on the SE, SW and NE sump access structures was separated.	Moderate	Reinstall the pipes.	Work Order 12-142933 has been created	**5-Sep**	CJ	page 37 photo 69,70,& 71
CR-2012-000183-35	Permanent Disposal Pond #5 (PDP#5)	Bare areas and minor erosion rills in isolated areas along the downstream slope.	Moderate	Reseed and reestablish vegetation in these bare areas and continue to monitor for additional erosion.	minor backfill completed by benchmark. Vegetation to naturally fill	**8/20/2012**	KM	page 39 photo 75 & 76
CR-2012-000183-36	Permanent Disposal Pond #5 (PDP#5)	Erosion gullies at the southern access ramp, slurry transmission line, northeast sump structure and where PDP#3 cap terminates near the SE corner of the landfill.	Moderate	Backfill the eroded areas and reestablish vegetation. Place rip rap in areas where the water flow is concentrated. Continue to monitor for additional erosions.	Backfield by benchmark	8/20/2012	KM	page 39 photo 78,79, & 80
CR-2012-000183-37	Permanent Disposal Pond #5 (PDP#5)	Large shrub near the southeast dewatering structure.	Moderate	Remove the shrub.	Complete as per Benchmark	**7/27/2012**	KM	page 40 photo 81
CR-2012-000183-38	Permanent Disposal Pond #5 (PDP#5)	Water collecting at the SE corner of the PDP#3 cap.	Minor	It's assumed that this is from recent rains, but continue monitoring especially in dry period to ascertain it's not seepage from the impoundment. Continue to monitor the toe drain discharge and ensure that the dewatering wells are operational. Backfill this area and grade so that the water does not gather.	No water standing at this location		CJ	page 40 photo 82
CR-2012-000183-39	Permanent Disposal Pond #5 (PDP#5)	Exposed corrugated plastic pipes on the north side of PDP#1. no water was draining from the pipes at the time of the inspection.	Minor	Continue to monitor for discharge.	Continue monitoring no changes	**12-May**	IT KM	page 41 photo 83 & 84

CR-2012-000183-40	Permanent Disposal Pond #5 (PDP#5)	Erosion at the PDP#1 embankment on the north side downstream from the corrugated plastic pipe.	Moderate	Backfill the eroded areas and reestablish vegetation. Place rip rap in areas where the water flow is concentrated. Continue to monitor for additional erosions.	Backfield by benchmark	8/20/2012	KM	page 41 photo 83 & 84
CR-2012-000183-41	Permanent Disposal Pond #5 (PDP#5)	The downstream tow of PDP#3 appears to have recently excavated.	Minor	Reestablish the toe with compacted soil and vegetation. Continue to monitor the location for possible slope slides, seepage, unusual movement and abutment problems.	Backfield by benchmark	8/20/2012	KM	page 42 photo 86

APPENDIX A

Document 6

Texas Pollutant Discharge Elimination System Permit

TPDES PERMIT NO. WQ0001784000
[For TCEQ office use only -
EPA I.D. No. TX0054500]

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
P. O. Box 13087
Austin, Texas 78711-3087

This supersedes and replaces TPDES Permit No. WQ0001784000, issued on September 26, 2006.

PERMIT TO DISCHARGE WASTES
under provisions of
Section 402 of the Clean Water Act
and Chapter 26 of the Texas Water Code

Luminant Generation Company LLC

whose mailing address is

500 N. Akard Street
Dallas, Texas 75201

is authorized to treat and discharge wastes from the Martin Lake Steam Electric Station, a steam electric generating facility (SIC 4911)

located adjacent to Martin Lake, east of Farm-to-Market Road 2658 and approximately five miles southwest of the City of Tatum, in Rusk and Panola Counties, Texas

to Martin Lake, thence to Martin Creek, thence to the Sabine River Above Toledo Bend Reservoir in Segment No. 0505 of the Sabine River Basin

only according to effluent limitations, monitoring requirements and other conditions set forth in this permit, as well as the rules of the Texas Commission on Environmental Quality (TCEQ), the laws of the State of Texas, and other orders of the TCEQ. The issuance of this permit does not grant to the permittee the right to use private or public property for conveyance of wastewater along the discharge route described in this permit. This includes, but is not limited to, property belonging to any individual, partnership, corporation or other entity. Neither does this permit authorize any invasion of personal rights nor any violation of federal, state, or local laws or regulations. It is the responsibility of the permittee to acquire property rights as may be necessary to use the discharge route.

This permit shall expire at midnight on April 1, 2012.

ISSUED DATE: **JUN 18 2009**

For the Commission

APPENDIX A

Document 7

Soil and Liner Evaluation Report for PDP-5

SLER

Luminant - Martin Lake S.E.S.
Permanent Disposal Pond 5
Rusk County, Texas
TCEQ Solid Waste Registration No. 31277
ETTL Job Number L213-09

Luminant

Prepared for:

HDR

HDR Engineering, Inc.
4500 West Eldorado Parkway, Suite 3500
McKinney, Texas 75070-5757

Prepared by:

SLER
Luminant Martin Lake S.E.S.
Permanent Disposal Pond 5
Rusk County, Texas
TCEQ Solid Waste Registration No. 31277
ETTL Job Number L213-09

Submitted to

Mike Zieminski
Luminant
500 North Akard Street
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Prepared for:

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Prepared by:

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Tyler, Texas 75702-6346

Rev.	Date	Reason for Revision	By	Check	P.E.
00	3/2/2011	Preliminary Draft	JL	DV	BQ
01	3/25/2011	Per HDR Review	JL	DV	BQ

TABLE OF CONTENTS

SECTION

PART F: SIGNATURE OF THE PROFESSIONAL OF RECORD

I certify that the liner has been constructed as designed in accordance with the issued permit and in general compliance with the regulations.

AFFIX PROFESSIONAL ENGINEER'S SEAL (Date & Sign)

STATE OF TEXAS
C. BRANDON QUINN
72441
LICENSED
PROFESSIONAL ENGINEER

5/12/11
(Date signed)

C. Brandon Quinn, P.E., P.G., C.P.G.
(Typed or printed name)

(903) 595-4421
(Phone number)

(903) 595-6113
(Fax number)

ETTL Engineers & Consultants Inc.
(Company or business name)

1717 East Erwin Street, Tyler, TX, 75702
(Address, city, zip code)

Note: A professional engineer must be registered in Texas.

PART G: SIGNATURE OF PERMITTEE

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

(Signature) (Typed or Printed Name)

(Title) (Date Signed)

(Phone Number) (Fax Number)

Luminant
(Company or Business Name)

(Address, City, Zip Code)

SECTION 1 - INTRODUCTION

This report documents the construction quality assurance (CQA) effort conducted on the compacted clay liner (CCL) and earth embankment within Permanent Disposal Pond 5. The CQA program is defined within the Soil and Liner Quality Control Plan (SLQCP), dated January 2009 by HDR Engineering, Inc, and in conformance with Texas Commission on Environmental Quality (TCEQ) Technical Guideline No. 4, "Nonhazardous Industrial Solid Waste Surface Impoundments".

This project was originally referred to as the Vertical Expansion of Permanent Disposal Ponds (PDP's) #1, 2 and 3. Upon conclusion of the project, the pond was formally renamed PDP #5. All references to the Vertical Expansion of PDP's #1-3 in original reports, tables and figures are equivalent to the formal designation PDP #5.

The attached Soil and Liner Evaluation Report (SLER) is separated into eleven sections for ease of review. Each section is marked with a numbered divider tab. The SLER form (TCEQ-00674) is located in Section 2. The remaining sections support the SLER form and address the applicable parts of the SLQCP.

SECTION – 6 SUMMARY TABLES & TEST LOCATIONS

Location	Lift	Permeability, % Passing #200 Sieve, Atterberg Limits		In Place Moisture-Density	
		Required	Taken	Required	Taken
Base	1	24	26	300	300
	2	24	24	300	300
	3	24	24	300	304
	4	24	24	300	300
	5	12	14	143	144
	6	12	12	143	146
Slope	1	2	2	20	20
	2	2	3	20	20
	3	2	2	20	20
	4	2	2	20	20
	5	2	2	20	25
	6	2	2	20	24

Tests Required by SLQCP

Pre-Construction Samples

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location				Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
11/03/09	8801	D	1	N	228393.5	E	2902302.4	20.7	104.9	96.2	45	26	76	1.44E-08	
11/03/09	8801	D	2	N	228190.5	E	2902332.8	22.1	104.4	95.7					
11/03/09	8894	D	3	N	228284.3	E	2902302.4	22.5	103.6	100.4					
11/03/09	8801	D	4	N	228355.4	E	2902371.5	21.4	105.8	97.0					
11/03/09	8801	D	5	N	228450.1	E	2902245.2	22.2	104.2	95.5					
11/03/09	8801	D	6	N	228528.1	E	2902301.8	18.6	109.7	100.5					
11/03/09	8801	D	7	N	228602.4	E	2902222.4	22.6	106.8	97.9					
11/03/09	8801	D	8	N	228632.8	E	2902271.1	23.4	105.6	96.8					
11/04/09	8801	D	9	N	228122.7	E	2902381.1	19.8	109.1	100.0					
11/04/09	8801	D	10	N	228088.3	E	2902453.2	21.6	106.9	98.0					
11/04/09	8801	D	11	N	228033.0	E	2902297.0	22.3	104.5	95.8					
11/04/09	8801	D	12	N	228057.9	E	2902144.8	22.8	103.9	95.2					
11/04/09	8801	D	13	N	227969.3	E	2902097.8	20.3	105.9	97.1	48	27	69	1.42E-08	
11/04/09	8801	D	14	N	227995.9	E	2902007.3	18.5	107.3	98.4					
11/04/09	8801	D	15	N	227874.3	E	2901955.1	20.2	105.2	96.4					
11/04/09	8801	D	16	N	227937.0	E	2901854.4	18.7	107.0	98.1					
11/06/09	8801	D	17	N	227704.0	E	2901455.7	22.5	105.2	96.4	44	28	67	2.58E-08	
11/06/09	8894	D	18	N	227963.0	E	2901083.6	21.0	103.1	99.9	44	28	65	1.35E-08	
11/07/09	8894	D	19	N	229310.9	E	2902051.2	24.8	99.8	96.7	41	22	75	1.78E-07	
11/11/09	8910	D	19B	N	229310.9	E	2902051.2	20.3	105.9	96.4	39	23	71	1.93E-08	X
11/07/09	8910	D	20	N	228908.6	E	2902241.7	20.2	109.0	99.3	36	18	71	4.17E-08	
11/07/09	8894	D	21	N	228014.1	E	2901877.0	21.0	104.2	101.0	44	23	73	3.73E-08	
11/07/09	8801	D	22	N	227857.7	E	2901881.3	18.1	107.4	98.4					
11/07/09	8801	D	23	N	227886.7	E	2901744.4	18.6	107.5	98.5					
11/07/09	8801	D	24	N	227779.9	E	2901701.0	17.7	109.1	100.0					
11/07/09	8801	D	25	N	227805.0	E	2901555.0	17.1	109.8	100.6					
11/07/09	8801	D	26	N	227639.7	E	2901370.9	18.4	110.7	101.5					
11/07/09	8801	D	27	N	227666.3	E	2901280.5	20.8	106.8	97.9					
11/07/09	8801	D	28	N	227576.6	E	2901193.3	17.2	111.1	101.8					
11/07/09	8801	D	29	N	227703.6	E	2901180.5	19.4	108.0	99.0					
11/07/09	8801	D	30	N	227755.9	E	2901098.6	18.8	108.6	99.5					
11/07/09	8801	D	31	N	227880.6	E	2901132.3	21.2	104.5	95.8					
11/07/09	8801	D	32	N	227917.9	E	2901035.4	20.7	104.6	95.9					
11/07/09	8895	D	33	N	228039.3	E	2901081.5	25.7	96.6	97.9					
11/08/09	8894	D	34	N	227772.9	E	2901317.7	20.1	104.7	101.5					
11/08/09	8910	D	35	N	227866.2	E	2901401.7	21.3	104.8	95.4					
11/08/09	8910	D	36	N	227844.7	E	2901544.6	19.5	106.8	97.3					
11/08/09	8910	D	37	N	227955.5	E	2901600.3	20.2	106.4	96.9					
11/08/09	8910	D	38	N	227922.7	E	2901731.1	20.9	105.7	96.3					
11/08/09	8910	D	39	N	228040.2	E	2901768.0	22.5	104.9	95.5					
11/08/09	8910	D	40	N	228018.7	E	2901910.8	21.0	106.3	96.8					
11/08/09	8910	D	41	N	228114.1	E	2901939.1	22.1	105.1	95.7					
11/08/09	8910	D	42	N	228059.5	E	2902070.5	21.5	105.9	96.4					
11/08/09	8910	D	43	N	228177.0	E	2902107.5	21.8	108.2	98.5					
11/08/09	8910	D	44	N	228130.6	E	2902139.7	20.2	109.0	99.3					
11/08/09	8910	D	45	N	228235.6	E	2902251.2	21.4	106.1	96.6					
11/08/09	8894	D	46	N	228674.5	E	2902198.8	23.2	100.9	97.8					
11/08/09	8894	D	47	N	228788.6	E	2902245.1	21.6	102.0	98.8					

Pre-Construction Samples

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location				Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
11/08/09	8894	D	48	N	228841.4	E	2902178.7	24.3	99.9	96.8					
11/08/09	8894	D	49	N	229020.5	E	2902207.7	23.4	99.9	96.8					
11/08/09	8894	D	50	N	229107.3	E	2902319.7	22.3	101.4	98.3					
11/08/09	8801	D	51	N	229189.8	E	2902274.1	22.1	104.3	95.6					
11/08/09	8801	D	52	N	229267.4	E	2902185.4	22.0	104.4	95.7					
11/08/09	8801	D	53	N	229225.1	E	2902106.2	21.2	106.6	97.7					
11/08/09	8801	D	54	N	229325.5	E	2902050.8	20.1	107.8	98.8					
11/08/09	8801	D	55	N	229300.1	E	2901921.6	20.6	106.5	97.6					
11/08/09	8801	D	56	N	229389.4	E	2901863.5	20.0	105.7	96.9					
11/08/09	8801	D	57	N	229233.3	E	2901744.1	21.3	103.8	95.1					
11/11/09	8894	D	92	N	228309.7	E	2901120.4	22.4	101.3	98.2					
11/11/09	8894	D	93	N	228452.6	E	2901153.5	21.8	102.7	99.5					
11/11/09	8894	D	94	N	228348.8	E	2901215.2	20.7	104.0	100.8					
11/11/09	8894	D	95	N	228517.8	E	2901272.3	21.7	104.1	100.9					
11/11/09	8894	D	96	N	228622.0	E	2901226.1	21.7	102.3	99.1					
11/11/09	8894	D	97	N	228672.3	E	2901333.0	21.0	102.5	99.3	43	26	67	1.73E-08	
11/11/09	8894	D	98	N	228772.8	E	2901283.8	20.3	102.6	99.4					
11/11/09	8894	D	99	N	228815.8	E	2901387.7	25.7	98.8	95.7					
11/11/09	8894	D	100	N	228912.7	E	2901338.7	23.9	101.1	98.0					
11/11/09	8894	D	101	N	228955.3	E	2901433.3	22.9	103.6	100.4					
11/11/09	8894	D	102	N	229056.1	E	2901393.4	24.8	101.9	98.7					
11/11/09	8801	D	103	N	229088.2	E	2901500.8	21.7	108.0	99.0					
11/11/09	8894	D	104	N	229195.9	E	2901448.3	22.6	103.2	100.0					
11/11/09	8894	D	105	N	229227.6	E	2901540.2	23.8	101.5	98.4	43	25	75	1.14E-08	
11/11/09	8894	D	106	N	229328.2	E	2901494.1	22.4	104.2	101.0					
11/11/09	8894	D	107	N	229371.2	E	2901601.1	22.4	103.4	100.2					
11/11/09	8801	D	108	N	229464.4	E	2901549.1	21.0	105.0	96.2					
11/11/09	8801	D	109	N	229485.6	E	2901656.7	21.5	105.0	96.2					
11/11/09	8801	D	110	N	229385.7	E	2901727.5	18.8	106.7	97.8					
11/11/09	8801	D	111	N	229417.2	E	2901813.2	20.4	105.4	96.6					
11/11/09	8801	D	112	N	229355.7	E	2901960.3	20.5	105.6	96.8					
11/11/09	8801	D	113	N	229244.5	E	2902019.0	20.4	106.1	97.3					
11/11/09	8801	D	114	N	229200.3	E	2902128.5	19.4	107.7	98.7					
11/11/09	8801	D	115	N	229253.5	E	2902210.5	19.6	107.2	98.3					
11/11/09	8801	D	116	N	229159.8	E	2902244.0	19.1	107.5	98.5					
11/13/09	8801	D	145	N	228347.4	E	2902214.0	19.8	109.9	100.7					
11/13/09	8801	D	146	N	228392.0	E	2902116.9	18.3	110.4	101.2					
11/13/09	8801	D	147	N	228480.9	E	2902173.2	18.8	109.6	100.5					
11/13/09	8801	D	148	N	228554.8	E	2902081.5	19.5	108.0	99.0					
11/13/09	8801	D	149	N	228633.4	E	2902159.7	18.5	109.6	100.5					
11/13/09	8801	D	150	N	228696.8	E	2902083.7	21.1	105.7	96.9	48	29	69	8.75E-08	
11/13/09	8801	D	151	N	228785.7	E	2902140.0	20.0	108.1	99.1					
11/13/09	8801	D	152	N	228856.6	E	2902073.1	19.0	105.8	97.0					
11/13/09	8801	D	153	N	228945.8	E	2902138.7	18.0	109.5	100.4					
11/13/09	8801	D	154	N	229020.8	E	2902087.1	21.7	105.4	96.6					
11/13/09	8894	D	155	N	229085.1	E	2902175.0	22.4	103.9	100.7					
11/13/09	8894	D	156	N	229135.2	E	2902145.8	23.9	101.8	98.6					
11/13/09	8801	D	166	N	227912.6	E	2901103.6	20.7	108.5	99.5					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location				Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
05/22/10	8906	D-F	213	N	227628.6	E	2901232.1	11.6	111.5	99.9					
05/22/10	8910	D-F	214	N	227670.6	E	2901172.1	12.3	104.5	95.2					
05/22/10	8906	D-F	215	N	227735.6	E	2901151.8	13.7	111.7	100.1					
05/22/10	8906	D-F	216	N	227826.8	E	2901161.6	10.7	106.5	95.4					
05/22/10	8906	D-F	217	N	227912.4	E	2901097.4	13.9	110.7	99.2					
05/22/10	8906	D-F	218	N	227983.6	E	2901039.8	13.0	108.9	97.6					
05/22/10	8906	D-F	219	N	228074.6	E	2901040.3	15.2	107.6	96.4					
05/22/10	8910	D-F	220	N	228134.1	E	2901088.1	13.6	109.4	99.6					
05/22/10	8906	D-F	221	N	228194.0	E	2901145.2	12.9	108.4	97.1					
05/22/10	8906	D-F	222	N	228274.7	E	2901170.8	11.5	110.4	98.9					
05/22/10	8906	D-F	223	N	228351.0	E	2901165.6	12.2	109.0	97.7					
05/22/10	8906	D-F	224	N	228446.2	E	2901184.6	13.1	110.9	99.4					
05/22/10	8906	D-F	225	N	228502.2	E	2901235.6	14.3	114.4	102.5					
05/22/10	8906	D-F	226	N	228572.6	E	2901283.2	17.2	111.4	99.8					
05/22/10	8905	D-F	227	N	228656.5	E	2901287.0	14.0	113.8	96.9					
05/22/10	8906	D-F	228	N	228733.0	E	2901291.1	15.5	113.6	101.8					
05/22/10	8905	D-F	229	N	228796.3	E	2901341.9	13.2	114.3	97.4					
05/22/10	8906	D-F	230	N	228888.5	E	2901385.7	12.7	109.1	97.8					
05/22/10	8906	D-F	231	N	228983.8	E	2901410.9	13.1	108.6	97.3					
05/24/10	8905	D-F	232	N	229087.2	E	2901463.7	6.5	117.7	100.3					
05/24/10	8905	D-F	233	N	229163.8	E	2901470.8	6.1	118.4	100.9					
05/24/10	8905	D-F	234	N	229251.3	E	2901474.6	11.9	114.0	97.1					
05/24/10	8905	D-F	235	N	229322.0	E	2901531.4	9.6	118.5	100.9					
05/24/10	8905	D-F	236	N	229385.5	E	2901591.5	14.5	113.2	96.4					
05/24/10	8905	D-F	237	N	229451.1	E	2901592.7	9.5	119.2	101.5					
05/24/10	8905	D-F	238	N	229457.3	E	2901685.3	8.4	113.0	96.3					
05/24/10	8905	D-F	239	N	229404.7	E	2901757.9	12.0	121.1	103.2					
05/24/10	8905	D-F	240	N	229338.3	E	2901855.6	7.9	116.5	99.2					
05/24/10	8905	D-F	241	N	229326.2	E	2901945.6	13.0	119.1	101.4					
05/24/10	8905	D-F	242	N	229314.7	E	2902054.2	10.2	116.6	99.3					
05/24/10	8905	D-F	243	N	229248.0	E	2902142.6	9.8	118.0	100.5					
05/24/10	8905	D-F	244	N	229195.7	E	2902224.5	12.8	113.5	96.7					
05/24/10	8905	D-F	245	N	229183.9	E	2902323.8	10.4	114.8	97.8					
05/24/10	8905	D-F	246	N	229081.4	E	2902305.0	12.4	113.5	96.7					
05/24/10	8905	D-F	247	N	228996.2	E	2902248.6	13.0	112.5	95.8					
05/24/10	8905	D-F	248	N	228900.1	E	2902198.7	12.8	116.8	99.5					
05/24/10	8905	D-F	249	N	228802.5	E	2902220.0	13.2	115.8	98.6					
05/24/10	8905	D-F	250	N	228691.0	E	2902269.4	12.3	116.1	98.9					
05/24/10	8905	D-F	251	N	228599.3	E	2902244.2	12.0	117.2	99.8					
05/24/10	8905	D-F	252	N	228497.2	E	2902234.6	12.3	114.5	97.5					
05/24/10	8905	D-F	253	N	228406.9	E	2902261.9	12.7	111.9	95.3					
05/24/10	8905	D-F	254	N	228332.0	E	2902316.5	15.1	114.6	97.6					
05/24/10	8905	D-F	255	N	228261.7	E	2902405.1	14.4	114.3	97.4					
05/24/10	8905	D-F	256	N	228173.4	E	2902370.4	15.0	114.5	97.5					
05/28/10	9151	D-F	257	N	228023.7	E	2902352.9	11.6	108.7	96.6					
05/28/10	9151	D-F	258	N	228053.6	E	2902250.0	10.9	109.2	97.1					
05/28/10	9151	D-F	259	N	228043.1	E	2902135.9	11.3	108.3	96.3					
05/28/10	9151	D-F	260	N	227986.8	E	2902072.5	11.0	111.0	98.7					
05/28/10	9151	D-F	261	N	227893.7	E	2901997.8	10.4	112.9	100.4					

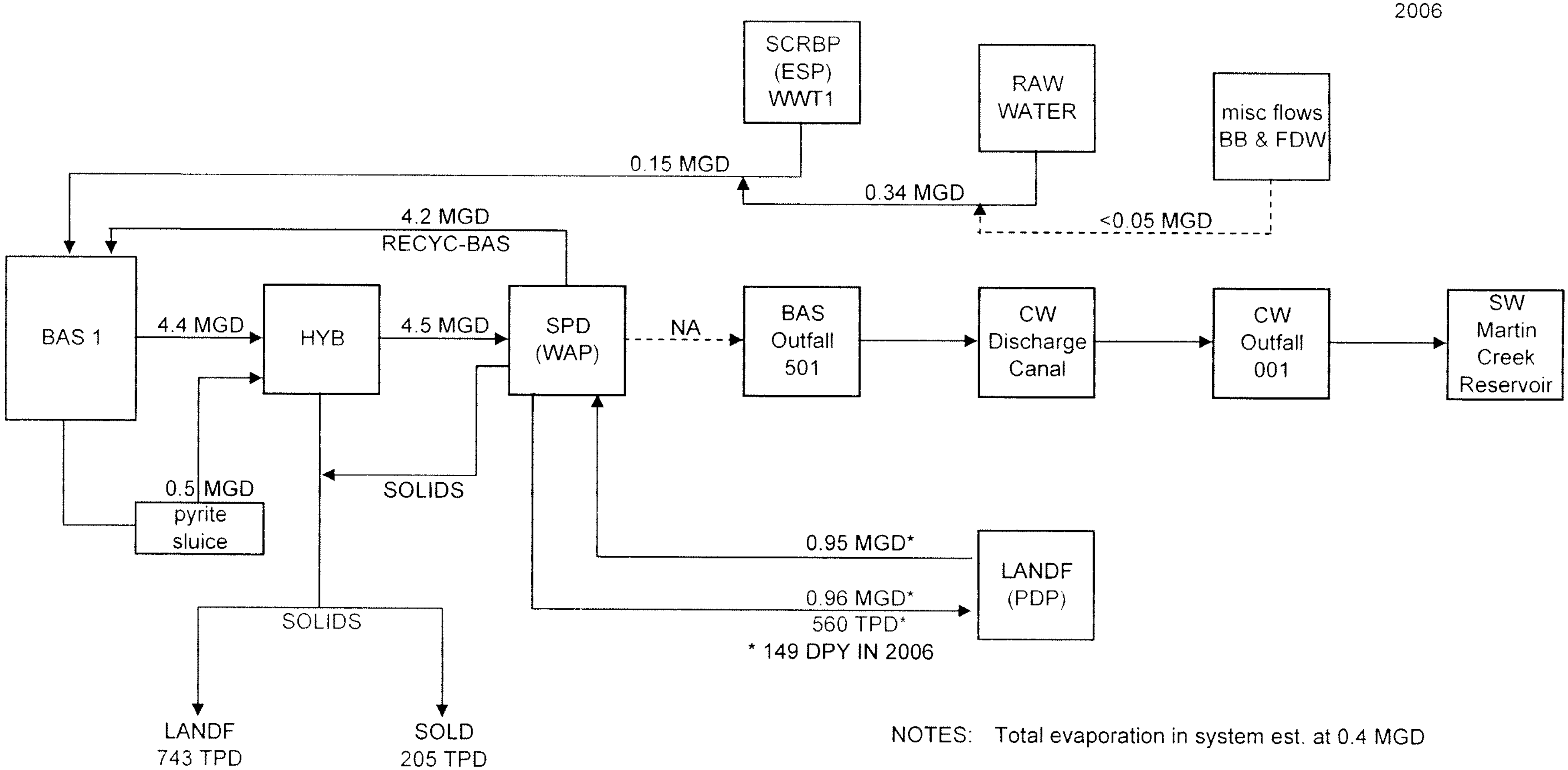
APPENDIX A

Document 8

Process Flow Diagrams

Company Name: TXU Generation Company, LP
Plant Name: Martin Lake Steam Electric Station

Diagram 5-2
WWT 2
BAS
2006



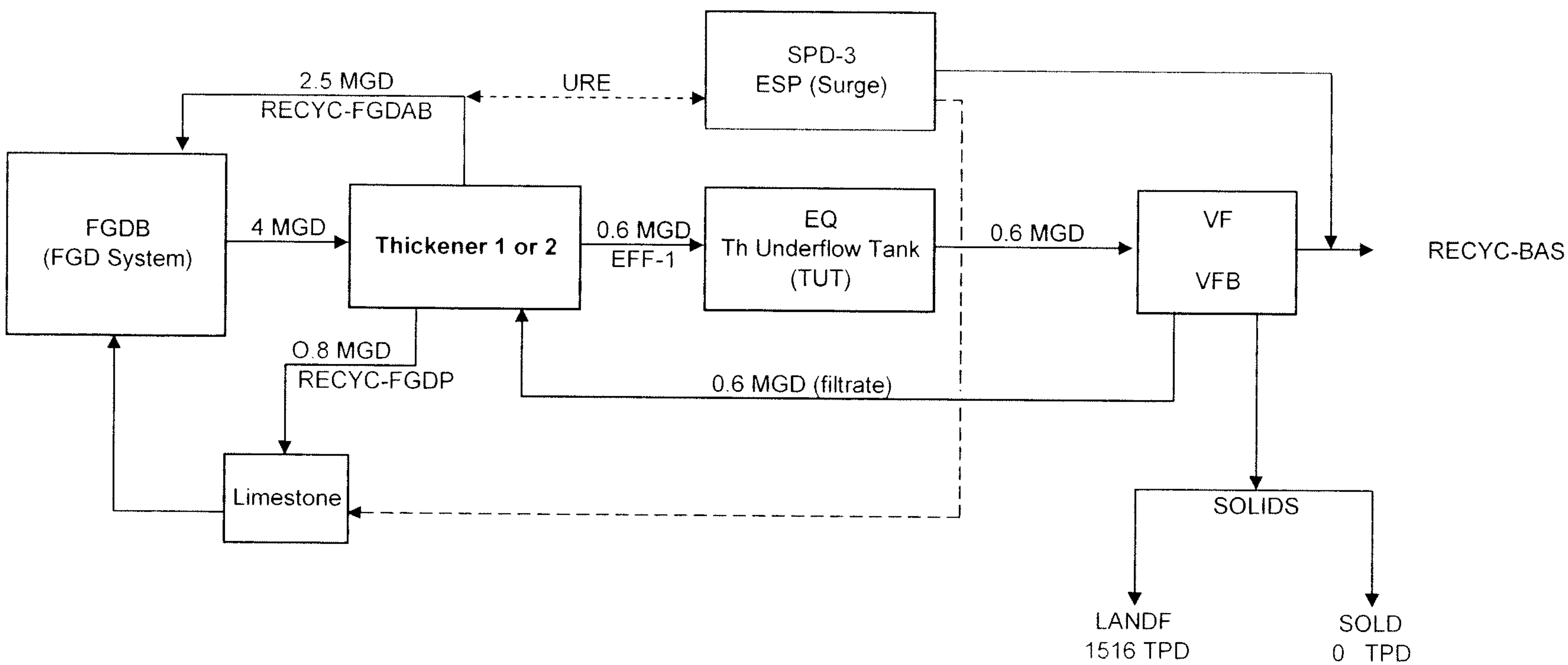
NOTES: Total evaporation in system est. at 0.4 MGD

------- Dashed line represents non-typical routes/sources

FOR INFORMATION ONLY

Part: D
Section: 3.1 Wastewater Treatment Diagram
Question: D3-1

Diagram: **D-1**
Plant Name: Martin Lake Steam Electric Station
Plant ID: 07596
Unit ID: WWT-1



Dashed

NOTES: Dashed line represents non-typical routes/sources

All flows are estimates and are subject to operational and climatic variability

APPENDIX A

Document 9

Martin Lake Dam Information

Martin Lake Dam and Martin Lake

OWNER

Dallas Power and Light Company.
Texas Electric Service Company.
Texas Power and Light Company.
Texas Utilities Services, Inc. (Agent).

ENGINEER

Forrest and Cotton, Inc.

LOCATION

On Martin Creek in Rusk and Panola Counties, 17 miles northeast of Henderson and 3 miles southwest of Tatum.

DRAINAGE AREA

130 square miles.

DAM

Type	Earthfill
Length	6,875 ft
Height	61± ft
Top width	20 ft
Top elevation	321.5 ft above msl

SPILLWAY (emergency)

Location	Left of the dam
Type	Uncontrolled
Crest length	1,000 ft
Crest elevation	312.0 ft above msl

SPILLWAY (service)

Location	Near left end of the dam
Type	Concrete ogee and chute
Crest length (net)	160 ft
Crest elevation	294.0 ft above msl
Control	4 tainter gates, each 40 by 14 ft

OUTLET WORKS

One low-flow outlet is a 3 by 5 ft conduit with sluice gate control located in one of the gate piers with invert at elevation 284.0 ft above msl. Additional low-flow outlet is an 8-inch pipe with invert at elevation 286.0 ft above msl with a downstream sluice gate control. Water is pumped from the lake to the powerplant and returned to the lake.

POWER FEATURE

Ultimate capacity	Four 750,000 kw units

AUTHORIZATION

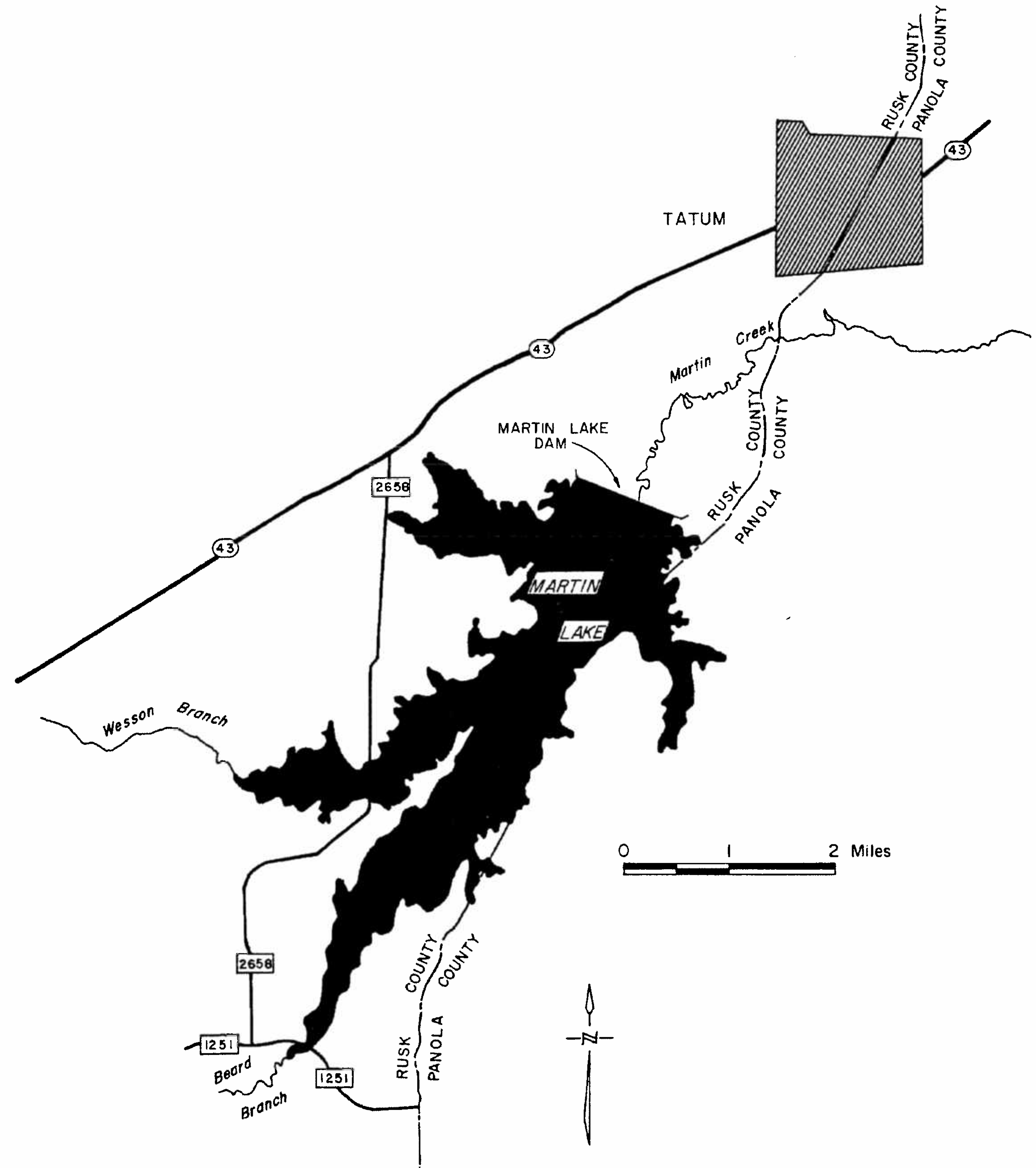
Permit No. 2693 (Application No. 2932), November 19, 1971, to Dallas Power and Light Company, Texas Electric Service Company, and Texas Power and Light Company authorizes the construction of a dam to impound 77,619 acre-feet of water. Permittee is authorized to divert and use 6,250 acre-feet of water per annum for each 750,000 kw unit. The maximum rate of diversion for cooling purposes will be 4,190 cubic feet per second.

RESERVOIR DATA

Capacity	77,619 acre-feet at elevation 306.0 ft above msl
Area	5,020 acres at elevation 306.0 ft above msl

GENERAL

Construction started	May 31, 1972
Construction completed	September 30, 1974



Information courtesy of Texas Utilities Services Inc.

APPENDIX A

Document 10

Texas Department Transportation Rain Fall Information

County	1-year	2-year	5-year	10-year	25-year	50-year	100-year
Anderson		4.44	5.80	7.25	8.01	9.93	10.88
Andrews		2.60	3.32	4.19	5.15	5.67	6.34
Angelina		4.91	6.47	7.69	9.38	10.40	11.78
Aransas		4.45	6.01	7.90	9.33	10.52	12.01
Archer		3.53	4.90	5.49	6.62	7.53	8.86
Armstrong		2.64	3.89	4.60	5.23	5.95	5.99
Atascosa		4.02	5.61	6.57	7.95	9.23	10.19
Austin		4.53	6.12	7.68	9.41	10.64	12.17
Bailey		2.46	3.10	4.62	4.89	5.26	5.98
Bandera		3.83	5.48	6.18	7.57	8.62	9.35
Bastrop		4.34	5.87	7.06	8.24	9.65	10.76
Baylor		3.41	4.85	5.44	6.60	7.26	8.55
Bee		4.14	5.70	7.40	8.74	10.06	11.32
Bell		4.04	5.67	6.66	7.90	9.23	10.35
Bexar		4.04	5.59	6.54	7.83	9.20	10.02
Blanco		3.99	5.46	6.34	7.73	8.97	10.03
Borden		2.84	3.88	4.62	5.47	6.40	7.12
Bosque		4.07	5.46	6.44	7.70	8.89	9.82
Bowie		4.49	5.70	6.80	8.18	8.99	10.12
Brazoria		5.05	7.11	8.24	10.05	11.62	13.48
Brazos		4.42	6.02	7.44	8.84	10.39	11.35
Brewster		2.29	3.71	3.91	4.86	5.08	6.18
Briscoe		2.75	3.75	4.64	5.34	6.29	6.46
Brooks		4.23	5.81	7.30	8.51	10.31	11.04
Brown		3.67	5.04	6.14	7.18	8.05	9.12
Burleson		4.39	5.91	7.35	8.55	10.43	10.85
Burnet		3.87	5.53	6.30	7.66	9.06	9.93
Caldwell		4.26	5.70	6.85	8.12	9.54	10.71
Calhoun		4.62	6.36	7.70	9.33	10.67	12.20
Callahan		3.61	4.97	5.78	7.10	7.67	8.58
Cameron		4.35	6.13	7.34	9.03	11.24	12.06
Camp		4.39	5.67	6.98	8.10	9.36	10.34
Carson		2.67	3.76	4.42	5.07	5.61	6.05
Cass		4.45	5.83	7.05	8.21	9.26	10.23
Castro		2.56	3.46	4.55	4.90	5.46	6.30
Chambers		5.31	6.60	8.24	10.04	11.82	13.45
Cherokee		4.56	5.95	7.45	8.63	9.86	11.11
Childress		3.02	4.38	5.00	5.91	6.53	7.51
Clay		3.63	5.00	5.65	6.87	7.56	9.04
Cochran		2.41	3.18	4.61	4.90	5.36	5.96
Coke		3.20	4.64	5.46	6.42	7.10	8.11
Coleman		3.61	5.02	5.83	7.26	7.51	8.73
Collin		4.13	5.46	6.59	7.61	8.63	9.79
Collingsworth		2.96	4.14	4.90	5.53	6.51	7.21
Colorado		4.49	6.17	7.73	9.29	10.64	11.94
Comal		4.10	5.63	6.65	7.91	9.10	10.13
Comanche		3.81	5.22	6.23	7.18	8.19	9.40
Concho		3.61	5.04	5.55	7.20	7.21	8.58
Cooke		3.81	5.38	6.33	7.05	8.12	9.36
Coryell		3.97	5.67	6.38	7.64	8.96	9.94
Cottle		3.03	4.36	5.13	5.96	6.59	7.62

Crane	2.42	3.40	4.11	5.46	5.78	6.34
Crockett	3.06	4.25	5.14	5.99	6.88	7.67
Crosby	2.84	3.88	4.59	5.44	6.21	7.00
Culberson	2.05	2.59	3.28	3.97	4.48	4.87
Dallam	2.34	2.98	4.05	4.57	4.66	5.73
Dallas	4.10	5.51	6.55	7.72	8.86	9.93
Dawson	2.70	3.67	4.36	5.19	6.06	6.70
De Witt	4.29	5.94	7.52	8.68	10.03	11.29
Deaf Smith	2.42	3.09	4.52	4.65	5.10	6.10
Delta	4.19	5.46	6.56	7.86	9.00	10.00
Denton	3.93	5.46	6.37	7.34	8.38	9.53
Dickens	2.97	4.11	4.93	5.69	6.43	7.25
Dimmit	3.42	5.03	6.04	7.55	8.56	9.35
Donley	2.78	3.82	4.67	5.24	6.18	6.59
Duval	4.11	5.53	6.85	8.18	9.66	10.63
Eastland	3.70	5.05	6.06	7.06	7.84	8.93
Ector	2.54	3.41	4.11	5.23	5.73	6.32
Edwards	3.36	5.17	6.03	6.77	7.45	8.71
El Paso	1.74	2.38	3.09	3.11	3.08	3.85
Ellis	4.04	5.50	6.63	7.98	8.91	9.98
Erath	3.86	5.31	6.36	7.05	8.36	9.44
Falls	4.23	5.66	6.93	8.10	9.61	10.58
Fannin	4.13	5.50	6.40	7.53	8.19	9.65
Fayette	4.45	5.91	7.33	8.49	10.11	10.99
Fisher	3.22	4.55	5.23	6.34	6.92	7.91
Floyd	2.76	3.84	2.62	5.29	6.26	6.65
Foard	3.17	4.68	5.23	6.14	6.84	7.88
Fort Bend	4.83	6.75	8.12	10.01	11.08	12.59
Franklin	4.36	5.59	6.78	8.04	9.03	10.07
Freestone	4.31	5.67	7.12	8.09	9.68	10.60
Frio	3.91	5.46	6.31	7.75	8.80	9.79
Gaines	2.58	3.26	4.31	5.08	5.67	6.13
Galveston	5.23	7.31	8.45	10.28	12.58	13.45
Garza	2.86	3.93	4.75	5.48	6.29	7.10
Gillespie	3.83	5.46	6.41	7.52	8.68	9.53
Glasscock	2.82	4.02	4.58	5.69	6.38	7.34
Goliad	4.23	5.77	7.42	8.77	10.21	11.26
Gonzales	4.30	5.74	7.16	8.46	9.92	11.03
Gray	2.76	3.79	4.53	5.17	6.00	6.34
Grayson	3.97	5.42	6.45	7.26	8.48	9.61
Gregg	4.50	5.71	7.36	8.40	9.56	10.56
Grimes	4.56	5.99	7.70	9.29	10.29	11.87
Guadalupe	4.24	5.62	6.79	8.16	9.51	10.43
Hale	2.66	3.56	4.39	5.04	5.98	6.52
Hall	2.87	4.02	4.77	5.56	6.37	7.19
Hamilton	3.98	5.48	6.79	7.42	8.64	9.72
Hansford	2.52	3.70	4.39	4.70	5.40	6.20
Hardeman	3.12	4.52	5.15	6.00	6.90	7.92
Hardin	5.27	7.25	8.14	10.18	11.23	12.80
Harris	4.83	7.21	8.10	10.01	10.92	12.82
Harrison	4.65	5.97	7.16	8.36	9.70	10.49
Hartley	2.37	3.19	4.29	4.51	4.76	6.01

Haskell	3.44	4.72	5.29	6.63	7.05	8.22
Hays	4.10	5.55	6.60	7.97	9.40	10.25
Hemphill	2.86	3.72	4.55	5.34	6.10	6.65
Henderson	4.26	5.63	6.98	8.04	9.37	10.50
Hidalgo	4.19	5.89	7.25	8.59	10.19	11.32
Hill	4.08	5.50	6.55	7.87	9.05	10.05
Hockley	2.59	3.37	4.32	5.07	5.74	6.33
Hood	3.89	5.45	6.49	7.29	8.47	9.56
Hopkins	4.19	5.63	6.56	7.95	9.23	10.22
Houston	4.57	6.00	7.58	8.92	10.22	11.36
Howard	2.88	3.97	4.55	5.55	6.52	7.36
Hudspeth	1.92	2.33	2.91	3.71	3.68	4.30
Hunt	4.11	5.46	6.43	7.86	9.14	10.03
Hutchinson	2.57	3.60	4.33	4.89	5.43	6.23
Irion	3.04	4.23	5.19	6.19	7.75	7.95
Jack	3.69	5.21	5.90	7.13	7.94	9.29
Jackson	4.52	6.50	7.77	9.43	10.67	12.33
Jasper	5.35	7.00	8.27	10.00	11.08	12.80
Jeff Davis	2.13	2.78	3.33	4.54	4.79	5.23
Jefferson	5.29	7.52	8.95	10.17	11.90	13.58
Jim Hogg	4.14	5.30	6.84	8.05	9.68	10.63
Jim Wells	4.20	5.73	7.33	8.43	10.16	11.21
Johnson	4.00	5.55	6.66	7.61	8.68	9.86
Jones	3.37	4.82	5.42	6.74	7.09	8.30
Karnes	4.26	5.69	7.00	8.22	9.64	10.91
Kaufman	4.14	5.50	6.77	7.81	9.11	10.10
Kendall	4.02	5.62	6.40	7.76	8.81	9.67
Kenedy	4.29	5.90	7.37	8.74	10.94	11.73
Kent	3.03	4.23	5.12	5.78	6.65	7.49
Kerr	3.77	5.32	6.37	7.44	8.28	9.33
Kimble	3.58	5.11	6.14	7.29	7.67	8.97
King	3.10	4.38	5.10	6.09	6.75	7.77
Kinney	3.45	5.10	6.05	6.89	7.41	8.81
Kleberg	4.23	5.86	7.48	8.77	10.63	11.61
Knox	3.27	4.49	5.36	6.34	6.92	8.00
La Salle	3.93	5.43	6.33	7.69	8.94	9.93
Lamar	4.26	5.54	6.54	7.74	8.90	9.87
Lamb	2.55	3.47	4.47	4.87	5.48	6.32
Lampasas	3.83	5.57	6.45	7.55	8.81	9.86
Lavaca	4.36	5.99	7.58	9.10	10.37	11.65
Lee	4.38	5.91	7.11	8.40	9.97	10.87
Leon	4.42	5.89	7.28	8.62	10.00	11.06
Liberty	5.12	7.20	8.15	10.22	10.96	12.72
Limestone	4.27	5.57	6.88	8.01	9.30	10.58
Lipscomb	2.73	3.63	4.52	5.26	5.92	6.55
Live Oak	4.14	5.60	7.08	8.43	9.67	10.78
Llano	3.86	5.38	6.46	7.48	8.65	9.62
Loving	2.26	2.96	3.69	4.34	4.97	5.68
Lubbock	2.68	3.65	4.45	5.18	5.89	6.67
Lynn	2.72	3.59	4.45	5.15	6.08	6.72
Madison	4.49	6.02	7.42	9.13	9.86	11.44
Marion	4.54	5.92	7.26	8.31	9.39	10.33

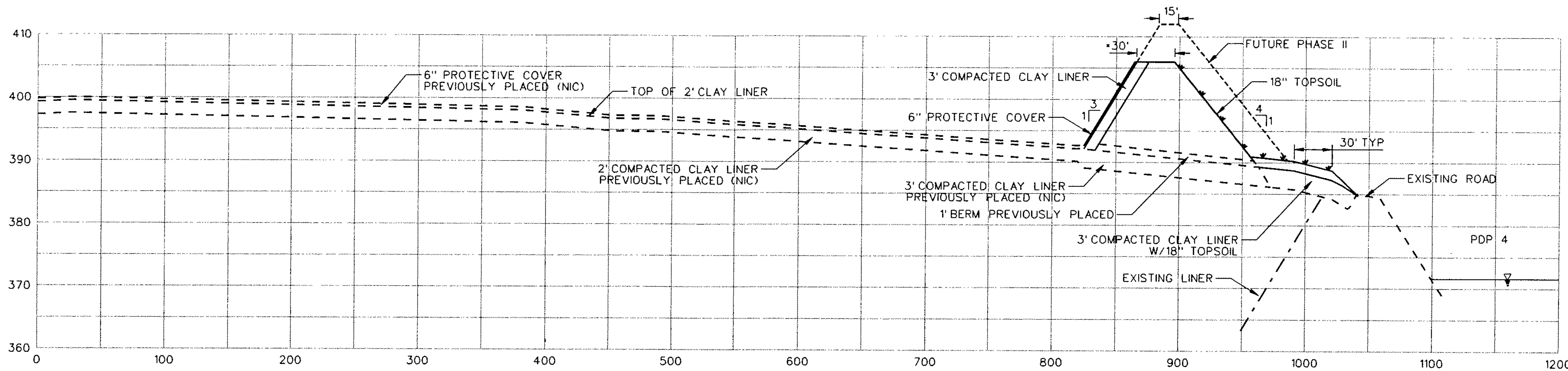
Martin	2.74	3.68	4.29	5.41	6.16	6.97
Mason	3.67	5.10	6.46	7.16	8.10	9.39
Matagorda	4.83	6.90	7.95	9.78	11.36	12.58
Maverick	3.29	4.94	5.89	7.13	7.75	8.66
McCulloch	3.71	5.00	6.05	7.19	7.93	9.12
McLennan	4.08	5.54	6.55	7.81	9.13	10.30
McMullen	4.05	5.59	6.72	8.04	9.25	10.14
Medina	3.83	5.54	6.30	7.54	8.71	9.68
Menard	3.67	5.18	5.63	7.36	7.54	8.96
Midland	2.63	3.71	4.26	5.50	6.11	6.92
Milam	4.24	5.75	6.94	8.16	9.65	10.82
Mills	3.78	5.25	6.42	7.32	8.46	9.47
Mitchell	2.99	4.50	5.18	5.87	6.62	7.76
Montague	3.74	5.15	6.03	7.05	7.75	9.15
Montgomery	4.83	6.41	7.87	9.84	10.42	12.40
Moore	2.48	3.28	4.26	4.70	5.25	6.21
Morris	4.50	5.63	6.75	7.87	9.28	10.30
Motley	2.88	3.95	4.89	5.73	6.47	7.08
Nacogdoches	4.72	6.14	7.57	8.91	9.95	11.28
Navarro	4.16	5.52	6.77	7.89	9.23	10.40
Newton	5.42	7.10	8.16	9.81	11.30	12.51
Nolan	3.35	4.66	5.58	6.44	7.17	8.02
Nueces	4.23	5.86	7.40	8.71	10.48	11.70
Ochiltree	2.63	3.73	4.40	4.93	5.57	6.48
Oldham	2.45	3.30	4.28	4.69	5.08	6.10
Orange	5.29	7.52	8.76	10.05	11.99	13.48
Palo Pinto	3.75	5.20	6.04	7.10	8.00	9.28
Panola	4.59	6.05	7.53	8.62	10.01	10.72
Parker	3.80	5.29	6.20	7.18	8.31	9.53
Parmer	2.39	3.17	4.50	4.63	5.13	6.03
Pecos	2.48	3.46	4.19	5.42	5.71	6.18
Polk	4.93	6.51	7.78	9.81	10.41	12.36
Potter	2.53	3.64	4.36	4.90	5.33	6.40
Presidio	2.14	2.84	3.45	4.06	4.50	5.28
Rains	4.19	5.74	6.60	7.98	9.00	10.35
Randall	2.54	3.88	4.46	4.83	5.38	6.28
Reagan	2.80	4.12	4.69	5.86	6.68	7.37
Real	3.49	5.08	5.97	6.90	8.10	8.95
Red River	4.34	5.58	6.75	7.81	8.66	9.86
Reeves	2.23	2.89	3.60	4.63	5.08	5.50
Refugio	4.30	5.97	7.80	9.13	10.33	11.58
Roberts	2.70	3.60	4.45	5.11	5.71	6.48
Robertson	4.38	5.91	7.23	8.34	9.96	10.89
Rockwall	4.05	5.46	6.49	7.67	8.96	9.98
Runnels	3.52	4.89	5.59	6.86	7.23	8.41
Rusk	**4.42**	**5.87**	**7.41**	**8.52**	**9.70**	**10.80**
Sabine	5.03	6.37	7.81	9.47	10.55	11.73
San Augustine	5.00	6.46	7.86	9.32	10.51	11.61
San Jacinto	4.86	6.61	8.02	9.83	10.69	12.36
San Patricio	4.30	6.00	7.47	8.84	10.32	11.56
San Saba	3.84	5.33	6.46	7.28	8.31	9.46
Schleicher	3.36	4.65	5.49	6.59	7.54	8.31

Scurry	2.95	4.05	5.11	5.82	6.74	7.56
Shackelford	3.64	4.87	5.66	6.89	7.52	8.54
Shelby	4.75	6.10	7.69	8.77	10.40	11.24
Sherman	2.42	3.33	4.20	4.66	5.11	6.22
Smith	4.37	5.78	7.22	8.27	9.47	10.77
Somervell	4.00	5.53	6.45	7.29	8.57	9.75
Starr	4.14	5.61	6.75	8.13	9.64	10.73
Stephens	3.70	5.03	5.83	7.02	7.67	9.01
Sterling	2.98	4.38	5.09	5.89	6.83	7.64
Stonewall	3.19	4.51	5.22	6.17	6.80	7.98
Sutton	3.41	4.85	5.63	6.69	7.40	8.31
Swisher	2.63	3.88	4.65	5.11	5.93	6.22
Tarrant	3.95	5.50	6.47	7.55	8.61	9.58
Taylor	3.68	4.94	5.63	6.77	7.31	8.34
Terrell	2.88	4.04	4.76	5.68	6.19	7.12
Terry	2.61	3.42	4.42	5.12	5.84	6.31
Throckmorton	3.56	4.88	5.57	6.75	7.22	8.60
Titus	4.31	5.67	6.89	7.91	9.29	10.26
Tom Green	3.32	4.54	5.37	6.58	7.12	8.40
Travis	4.10	5.67	6.56	7.91	9.23	10.38
Trinity	4.78	6.56	7.77	9.53	10.34	11.92
Tyler	5.27	6.75	8.14	10.09	10.86	12.26
Upshur	4.41	5.75	7.03	8.16	9.43	10.49
Upton	2.58	3.75	4.23	5.58	6.12	6.95
Uvalde	3.57	5.30	6.04	7.23	8.22	8.92
Val Verde	3.34	4.70	5.51	6.25	6.83	8.14
Van Zandt	4.27	5.57	6.73	7.92	9.16	10.43
Victoria	4.33	6.07	7.69	9.07	10.28	11.70
Walker	4.69	6.09	7.66	9.30	10.34	11.83
Waller	4.66	6.10	7.81	9.55	10.88	12.22
Ward	2.36	3.13	4.02	5.00	5.42	6.07
Washington	4.46	5.99	7.56	9.09	10.34	11.40
Webb	3.77	5.27	6.34	7.74	8.40	9.72
Wharton	4.62	6.50	7.81	9.59	10.76	12.40
Wheeler	2.91	3.99	4.78	5.62	6.36	7.00
Wichita	3.54	4.95	5.60	6.63	7.55	8.58
Wilbarger	3.45	4.86	5.59	6.44	7.22	8.23
Willacy	4.29	5.96	7.31	8.90	11.07	11.88
Williamson	4.04	5.63	6.47	7.83	9.34	10.45
Wilson	4.23	5.57	6.94	8.07	9.57	10.64
Winkler	2.46	3.22	4.00	5.04	5.20	6.03
Wise	3.77	5.42	6.24	7.21	8.16	9.34
Wood	4.23	5.70	6.89	8.21	9.20	10.39
Yoakum	2.50	3.11	4.25	5.01	5.33	6.00
Young	3.59	5.05	5.82	6.93	7.57	8.85
Zapata	3.99	5.35	6.70	7.84	9.29	10.26
Zavala	3.56	5.12	6.10	7.36	8.17	9.17

APPENDIX A

Document 11

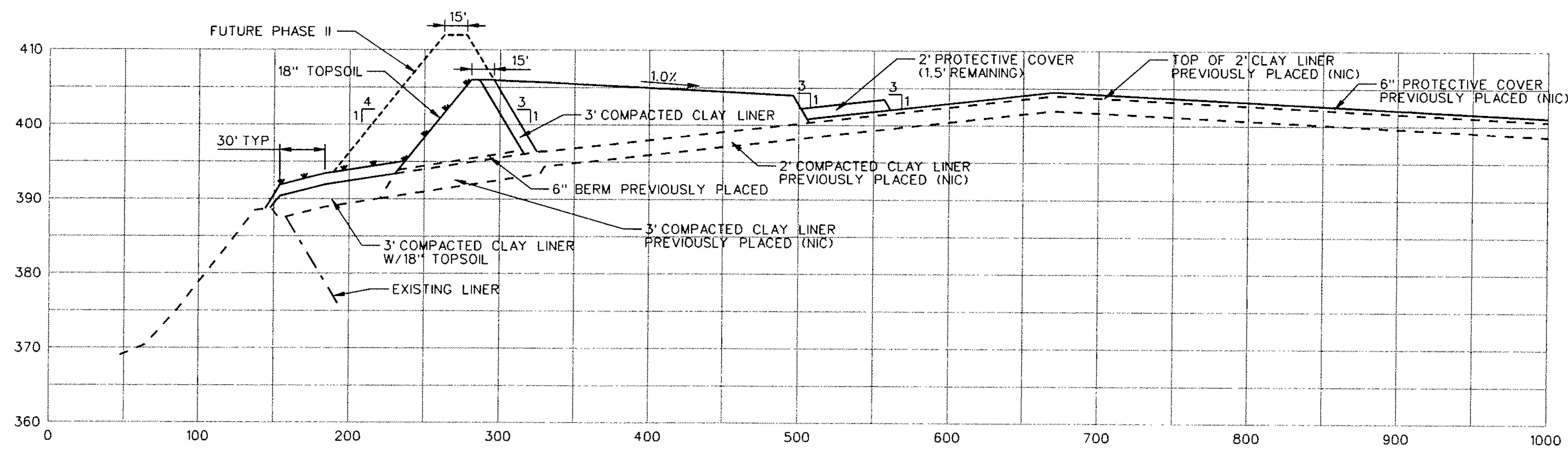
PDP-5 Typical Cross Section Drawing No 139-E001-305 C-27



CROSS SECTION 1 / C-27

5V:1H

• 30' FOR TURNAROUND AREA (15' TYP.)



CROSS SECTION 2 / C-27

5V:1H

NOTES:

1. PROVIDE 3' COMPACTED CLAY LINER FROM FILL LIMITS TO OUTSIDE TOE OF BERM. PROVIDE 18" OF TOPSOIL AND VEGETATION FROM OUTSIDE OF BERM TO LIMITS OF DISTURBANCE.
2. FOR CROSS SECTION LOCATIONS SEE SHEET C-4.

DATE: 4/21/2010
TIME: 10:52:57 AM
USER: rcox
FILE: Luminant_Generation_Company_LLC/TXU_ML_SES_PDP_Closure/13.00_Project_Cad/Const Sheet Files/139-E001-305

PLTDRVER: 34X22LASER_BW_PDF.plt
PENTABLE: REISSUE 139-E001-304.tbl
FILENAME: ML-TCS01-R1.dgn

Luminant

HDR
HDR ENGINEERING, INC.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070
Texas P.E. Firm
Firm Registration No.754

ISSUE	DATE	DESCRIPTION
0	04/10	ISSUED FOR CONSTRUCTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	B.COX
DRAWN BY	B.COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

STATE OF TEXAS — DAVID C. VOGT — 93605 — LICENSED PROFESSIONAL ENGINEER
4/21/10

MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

VERTICAL EXPANSION OF PDP'S # 1, 2 AND 3
PHASE I

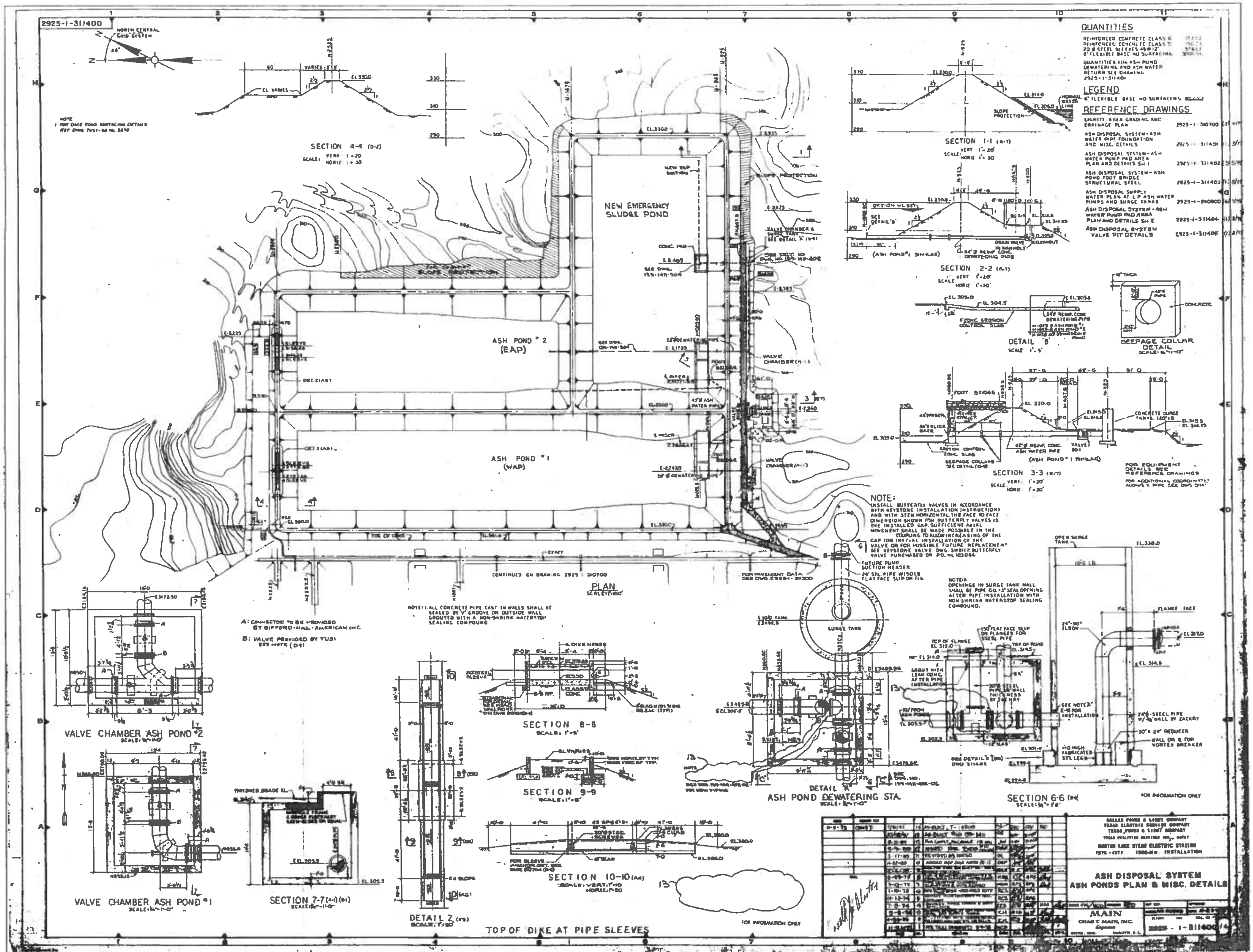
TYPICAL CROSS SECTIONS
139-E001-305

FILENAME	ML-TCS01-R1.dgn	SHEET	C-27
SCALE			

APPENDIX A

Document 12

Ash Disposal System Ash Ponds Plan Drawing No 2915-1-311400


2925-1-311400
QUANTITIES
LEGEND
REFERENCE DRAWINGS
NEW EMERGENCY SLUDGE POND
ASH POND #2 (EAP)
ASH POND #1 (WAP)
PLAN
CONTINUED ON DRAWING 2925-1-310700
SECTION 4-4
SECTION 1-1
SECTION 2-2
SECTION 3-3
DETAIL 'B'
SEEPAGE COLLAR DETAIL
NOTE:
INSTALL BUTTERFLY VALVES IN ACCORDANCE WITH KEYSTONE INSTALLATION INSTRUCTIONS AND WITH STEM HORIZONTAL.
A: CONNECTOR TO BE PROVIDED BY GIFFORD-HILL-AMERICAN INC.
B: VALVE PROVIDED BY TUSI SEE NOTE (D1)
SURGE TANK
VALVE CHAMBER ASH POND #2
VALVE CHAMBER ASH POND #1
SECTION 7-7
DETAIL Z
SECTION 8-8
SECTION 9-9
SECTION 10-10
TOP OF DIKE AT PIPE SLEEVES
DETAIL ASH POND DEWATERING STA.
SECTION 6-6
FOR INFORMATION ONLY
DALLAS POWER & LIGHT COMPANY
TEXAS ELECTRIC SERVICE COMPANY
TEXAS POWER & LIGHT COMPANY
TEXAS UTILITIES SERVICES INC., AGENT
MARTIN LAKE STEAM ELECTRIC STATION
ASH DISPOSAL SYSTEM
ASH PONDS PLAN & MISC. DETAILS
MAIN
CHAS T. MAIN, INC.
2925-1-311400

APPENDIX B

Document 13

Dam Inspection Check List Form – Ash Disposal Pond

Site Name:	**Marin Lake Steam Electric Plant**	Date:	**September 25, 2012**
Unit Name:	**Ash Disposal Pond**	Operator's Name:	**Luminant**
Unit I.D.:		Hazard Potential Classification:	**High** ☐ **Significant** ☒ **Low** ☐
Inspector's Name:		Michael McLaren, P.E. & Joe Klein, P.E.	

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	X		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	325 ft.		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?		N/A	20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?		N/A	Is water entering inlet, but not exiting outlet?		N/A
5. Lowest dam crest elevation (operator records)?	330 ft.		Is water exiting outlet, but not entering inlet?		N/A
6. If instrumentation is present, are readings recorded (operator records)?	X		Is water exiting outlet flowing clear?		N/A
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?		INA	From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?		N/A	From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		N/A	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		N/A	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		N/A	23. Water against downstream toe?	X	
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Issue #	Comments
1	Formal engineering inspection performed annually. Daily inspections by plant personnel.
3, 4,12, 14, 15, 16, 20	Discharge from Ash Disposal Pond is accomplished collected for recycling using suction pipes at the bottom of each cell, pumping to a valve chamber to direct flow back to the plant.
6	Piezometers located along embankment toe. Piezometers read semi-annually.
8	INA: Information Not Available
23	Normal pool elevation of Martin Lake reach the portions of the east and north embankments.

Coal Combustion Waste (CCW)

Impoundment Inspection

Impoundment NPDES Permit WQ0001784000

INSPECTOR Mike McLaren
Joe Klein

Date September 25, 2012
Impoundment Name Ash Disposal Pond

Impoundment Company Luminant
EPA Region 6

State Agency (Field Office) Address Texas Commission on Environmental Quality
P.O. Box 13807
Austin, TX 78711

Name of Impoundment Ash Disposal Pond

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ☐ **Update** ☒

	Yes	No
Is impoundment currently under construction?	☐	☒
Is water or ccw currently being pumped into the impoundment?	☒	☐

IMPOUNDMENT FUNCTION: Receive and store sluiced bottom ash.

Nearest Downstream Town Name: Tatum, TX

Distance from the impoundment: 3.9 miles

Location:

Latitude	32	Degrees	15	Minutes	41.55	Seconds	**N**
Longitude	94	Degrees	33	Minutes	49.45	Seconds	**W**

State **County**

	Yes	No
Does a state agency regulate this impoundment?	☒	☐

If So Which State Agency? Texas Commission on Environmental Quality

HAZARD POTENTIAL *(In the event the impoundment should fail, the following would occur):*

☐ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

☐ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

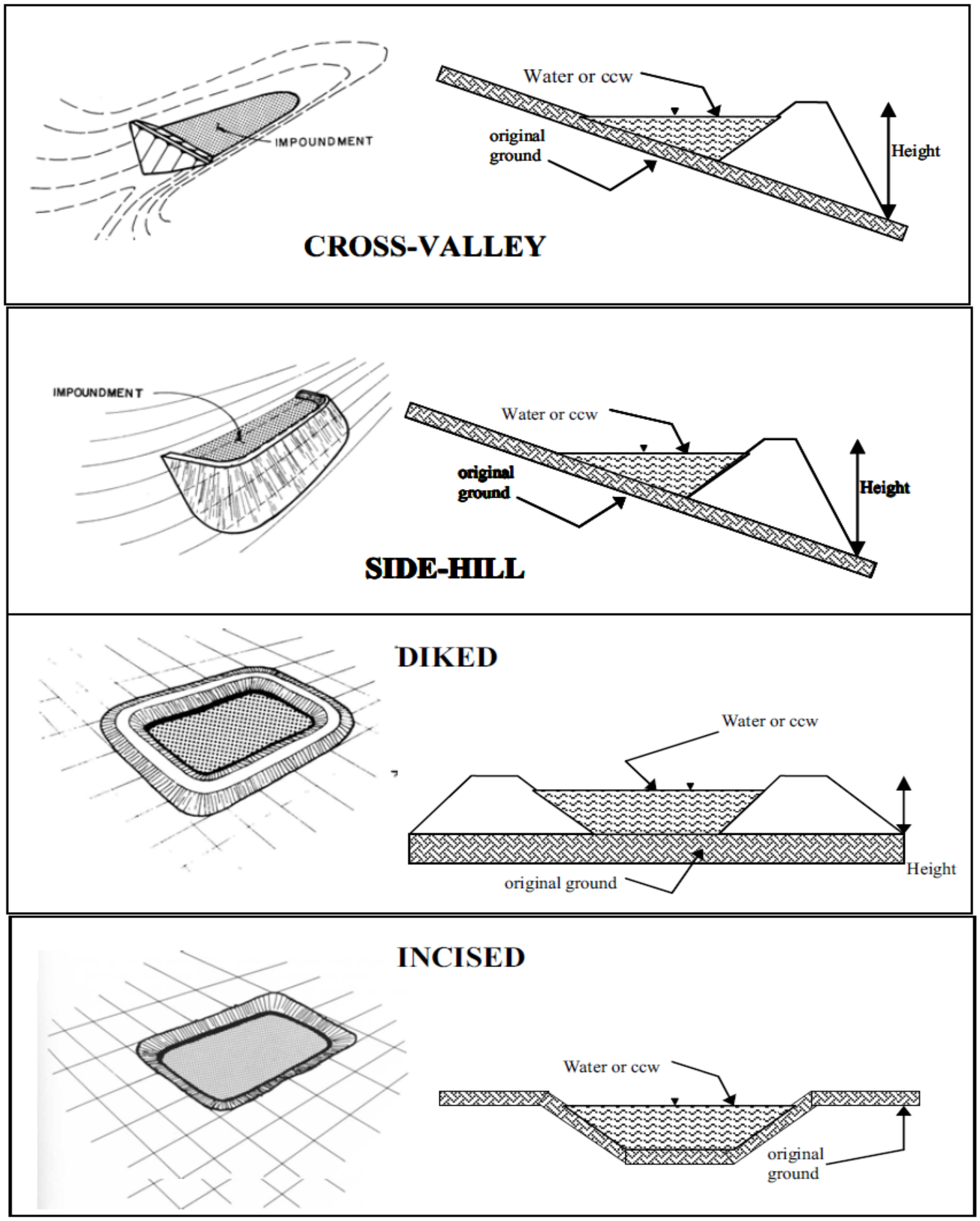
☒ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

☐ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Based on the size and location of the Martin Lake Steam Electric Station Ash Disposal Pond, there is no expected probable loss of life in the event of failure or misoperation. Economic and environmental losses are expected to be low and limited to the owner's property. The plant owner owns Martin Lake and much of the surrounding property. Martin Lake State Park is located on across an arm of the lake north and down gradient from the plant. However, the park property is owned by Luminant and leased to the State for a nominal annual amount to provide public recreational access to the lake.

CONFIGURATION:



☐ Cross-Valley ☐ Side-Hill ☒ Diked

☐ Incised (form completion optional) ☐ Combination Incised/Diked

Embankment Height (ft)	25	**Embankment Material**	On site native clay
Pool Area (ac)	36.3	**Liner**	Compacted clay liner overlain be HDPE sheet
Current Freeboard (ft)	5	**Liner Permeability**	10^{-7} cm/sec

TYPE OF OUTLET (Mark all that apply)

☐ **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

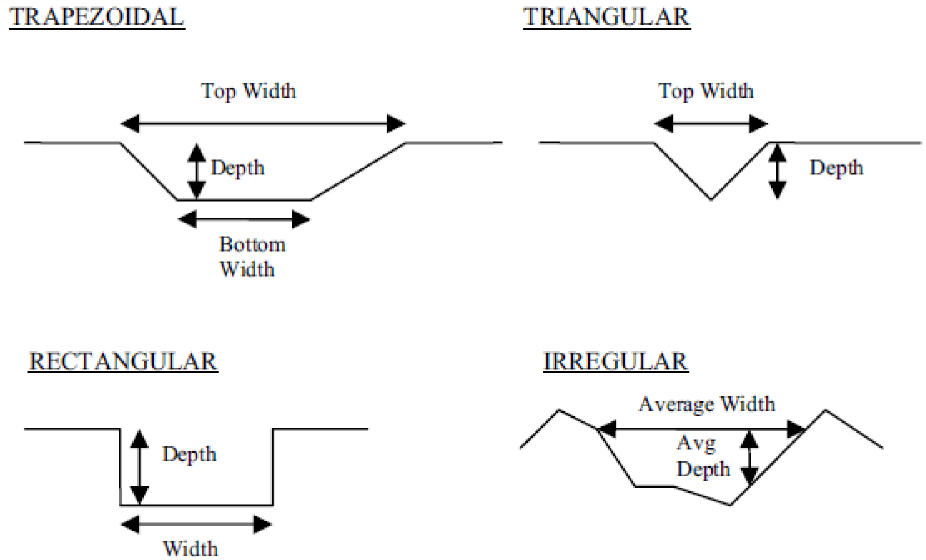
☐ Rectangular

☐ Irregular

depth (ft)

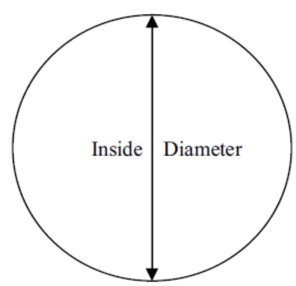
average bottom width (ft)

top width (ft)



☐ **Outlet**

18” inside diameter
(SDR 17 – smooth lined – 19.5” OD)



Material

☐ corrugated metal

☐ welded steel

☐ concrete

☐ plastic (hdpe, pvc, etc.)

☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☐	☐

☐ **No Outlet**

☒ **Other Type of Outlet** (specify): Water from each of three cells making up the Ash Disposal Pond is pumped through suction hoses located at the bottom of each cell. Water is pumped to a valve chamber for routing to the plant for recycling.

The Impoundment was Designed By **Texas Utilities Generating C0.**

	Yes	No
Has there ever been a failure at this site?	☐	☒

If So When?

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☒	☐

If So When? Early to mid-1980s

If So Please Describe : Evidence of significant seepage was reported. The Ash Disposal Pond was upgraded with a new liner and revetment system. The upgrade consisted of a new drainage net and HDPE liner over the bottom of the impoundment, and new compacted clay liner with an HDPE cover over the interior slopes of the embankments. A 4-inch thick cement mesh revetment was placed along the embankment interior slopes.

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	☒

If so, which method (e.g., piezometers, gw pumping,...)?

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

No. Design drawings and observations during the field visit indicate the embankments are supported on natural ground.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

No documentation of original foundation preparation was provided.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

Neither observations during the site visit, nor photographs in prior inspection reports provide to Dewberry indicate prior releases, failures, or patchwork on the dikes.

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name:	Date:
Unit Name:	Operator's Name:
Unit I.D.:	Hazard Potential Classification: High Significant Low
Inspector's Name:	

Inspection Issue #	Comments

APPENDIX B

Document 14

Dam Inspection Check List Form – PDP-4

Site Name:	**Martin Lake Steam Electric Plant**	Date:	**September 25, 2011**
Unit Name:	**Permanent Disposal Pond (PDP) 4**	Operator's Name:	**Luminant**
Unit I.D.:		Hazard Potential Classification:	**High** ☐ **Significant** ☒ **Low** ☐
	Inspector's Name:		

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	X		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	354.9		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?		N/A	20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?		N/A	Is water entering inlet, but not exiting outlet?		N/A
5. Lowest dam crest elevation (operator records)?	360		Is water exiting outlet, but not entering inlet?		N/A
6. If instrumentation is present, are readings recorded (operator records)?	X		Is water exiting outlet flowing clear?		N/A
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?		INA	From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?		N/A	From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		N/A	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		N/A	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		N/A	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Issue #	Comments
1	Formal engineering inspection annually. Daily checklist inspections by plant personnel.
3, 4,12, 14, 15, 16, 20	Discharge from PDP 4 is accomplished using a submersible pump suspended from a pump platform long the east embankment. Water pumped from PDP 4 is piped to the plant for recycling.
6	Piezometers located along embankment toe. Piezometers read semi-annually.
8	INA: Information Not Available

Coal Combustion Waste (CCW)

Impoundment Inspection

Impoundment NPDES Permit	TX0001748000	**INSPECTOR**	Mike McLaren Joe Klein
Date	September 25, 2012		
Impoundment Name	Martin Lake Steam Electric Plant PDP 4		
Impoundment Company	LUMINANT Generating Co. LLC		
EPA Region	6		
State Agency (Field Office) Address	Texas Commission on Environmental Quality P.O. Box 13087 Austin, TX 78711		
Name of Impoundment	Martin Lake Steam Electric Plant PDP 4		

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ☐ **Update** ☒

	Yes	No
Is impoundment currently under construction?	☐	☒
Is water or ccw currently being pumped into the impoundment?	☐	☒

IMPOUNDMENT FUNCTION: Primary function is to receive decant water from the adjoin PDP 5. Secondary function is to receive and store sluiced ash during non-typical operations.

Nearest Downstream Town Name: Tatum, TX

Distance from the impoundment: 3.9 miles

Location:

Latitude	32	Degrees	15	Minutes	43.86	Seconds	**N**
Longitude	94	Degrees	34	Minutes	56.03	Seconds	**W**

State Texas **County** Rusk

	Yes	No
Does a state agency regulate this impoundment?	☒	☐

If So Which State Agency? Texas Commission on Environmental Quality

HAZARD POTENTIAL *(In the event the impoundment should fail, the following would occur):*

☐ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

☐ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

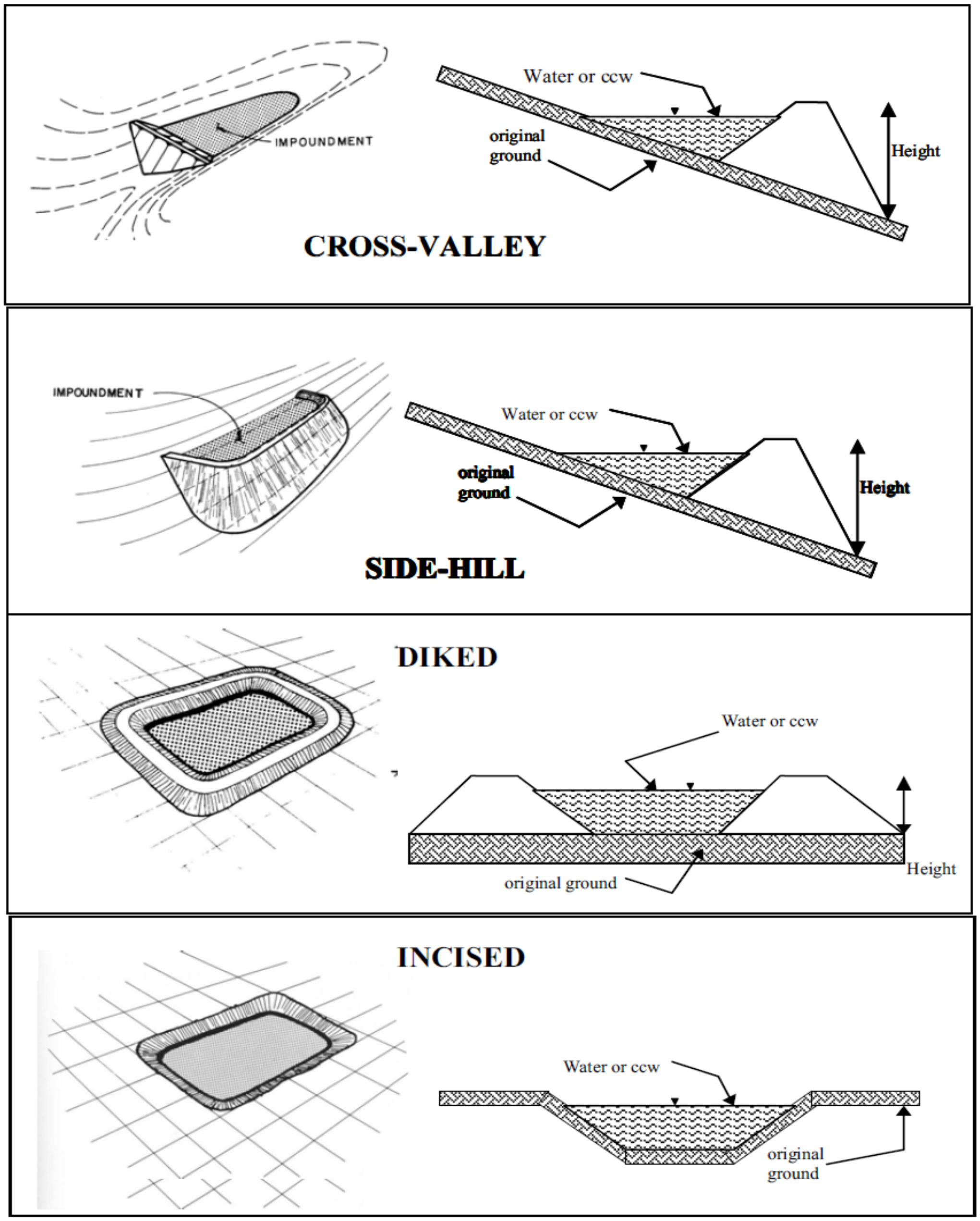
☒ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

☐ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Based on the size and location of the Martin Lake Steam Electric Station PDP 4, there is no expected probable loss of life in the event of failure or misoperation. Economic and environmental losses are expected to be low and limited to the owner's property. The plant owner owns Martin Lake and much of the surrounding property. Martin Lake State Park is located on across an arm of the lake north and down gradient from the plant. However, the park property is owned by Luminant and leased to the State for a nominal annual amount to provide public recreational access to the lake.

CONFIGURATION:



☐ Cross-Valley ☐ Side-Hill ☒ Diked

☐ Incised (form completion optional) ☐ Combination Incised/Diked

Embankment Height (ft) 20

Pool Area (ac) 15.34

Current Freeboard (ft) 5.1

Embankment Material On-site soil borrow

Liner 3 ft. thick compacted clay with HDPE protective cover

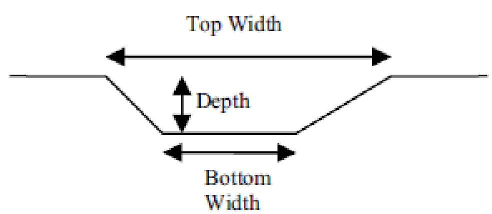
Liner Permeability 10^{-7} cm/sec

TYPE OF OUTLET (Mark all that apply)

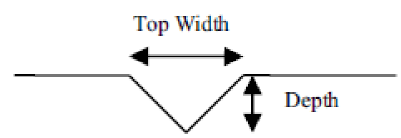
☐ Open Channel Spillway

☐ Trapezoidal
☐ Triangular
☐ Rectangular
☐ Irregular
depth (ft)
average bottom width (ft)
top width (ft)

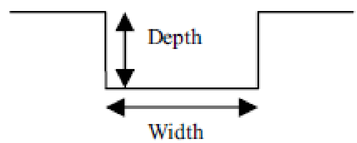
TRAPEZOIDAL



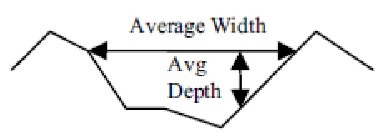
TRIANGULAR



RECTANGULAR

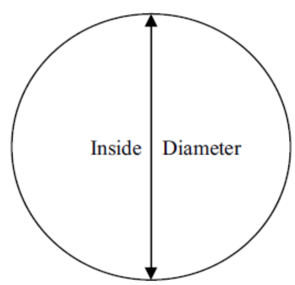


IRREGULAR



☐ Outlet

18” inside diameter
(SDR 17 – smooth lined – 19.5” OD)



Material

☐ corrugated metal
☐ welded steel
☐ concrete
☐ plastic (hdpe, pvc, etc.)
☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☐	☐

☐ **No Outlet**

☒ **Other Type of Outlet** (specify):

Outlet consists of a submersible pump at the east end of the impoundment. The pump discharges to pipe supported on a floating pier.

The outlet discharge is pumped to the plant for recycling.

The Impoundment was Designed By PDP 4 designed by Texas Utilities Services, Inc.

	Yes	No
Has there ever been a failure at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	☒

If so, which method (e.g., piezometers, gw pumping,...)?

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

No. Design drawings and observations during the field visit indicate the embankments are supported on natural soils.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

No documentation of original foundation preparation was provided.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

Neither observations during the site visit, nor photographs in prior inspection reports provided to Dewberry indicate prior releases, failures or patchwork on the dikes.

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name:	Date:
Unit Name:	Operator's Name:
Unit I.D.:	Hazard Potential Classification: High Significant Low
Inspector's Name:	

Inspection Issue #	Comments

APPENDIX B

Document 15

Dam Inspection Check List Form – PDP-5

Site Name:	**Martin Lake Steam Electric Plant**	Date:	**September 25, 2011**
Unit Name:	**Permanent Disposal Pond (PDP) 5**	Operator's Name:	**Luminant**
Unit I.D.:		Hazard Potential Classification:	**High** ☐ **Significant** ☒ **Low** ☐
	Inspector's Name:	Michael McLaren, P.E. and Joe Klein, P.E.	

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	X		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	398		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?			20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?			Is water entering inlet, but not exiting outlet?		N/A
5. Lowest dam crest elevation (operator records)?	406		Is water exiting outlet, but not entering inlet?		N/A
6. If instrumentation is present, are readings recorded (operator records)?	X		Is water exiting outlet flowing clear?		N/A
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?		N/A	From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?		N/A	From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		N/A	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		N/A	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Issue #	Comments
1	Formal engineering inspection annually. Daily checklist inspections by plant personnel.
3, 4,12, 14, 15, 16, 20	Discharge from PDP 4 is accomplished using a submersible pump suspended from a pump platform long the east embankment. Water pumped from PDP 4 is piped to the plant for recycling.
6	Piezometers located along embankment toe. Piezometers read semi-annually.
8	INA: Information Not Available

Coal Combustion Waste (CCW)

Impoundment Inspection

Impoundment NPDES Permit	WQ0001748000	**INSPECTOR**	Mike McLaren Joe Klein
Date	September 25, 2012		
Impoundment Name	Martin Lake Steam Electric Plant PDP 5		
Impoundment Company	LUMINANT Generating Co. LLC		
EPA Region	6		
State Agency (Field Office) Address	Texas Commission on Environmental Quality P.O. Box 13087 Austin, TX 78711		
Name of Impoundment	Martin Lake Steam Electric Plant PDP 5		

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ☐ **Update** ☒

	Yes	**No**
Is impoundment currently under construction?	☐	☒
Is water or ccw currently being pumped into the impoundment?	☒	☐

IMPOUNDMENT FUNCTION: Receives and stored sluiced fly ash during non-typical operations.

Nearest Downstream Town Name: Tatum, TX

Distance from the impoundment: 3.9 miles

Location:

Latitude	32	Degrees	15	Minutes	43.86	Seconds	**N**
Longitude	94	Degrees	34	Minutes	56.03	Seconds	**W**

State Texas **County** Rusk

	Yes	No
Does a state agency regulate this impoundment?	☒	☐

If So Which State Agency? Texas Commission on Environmental Quality

HAZARD POTENTIAL *(In the event the impoundment should fail, the following would occur):*

☐ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

☐ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

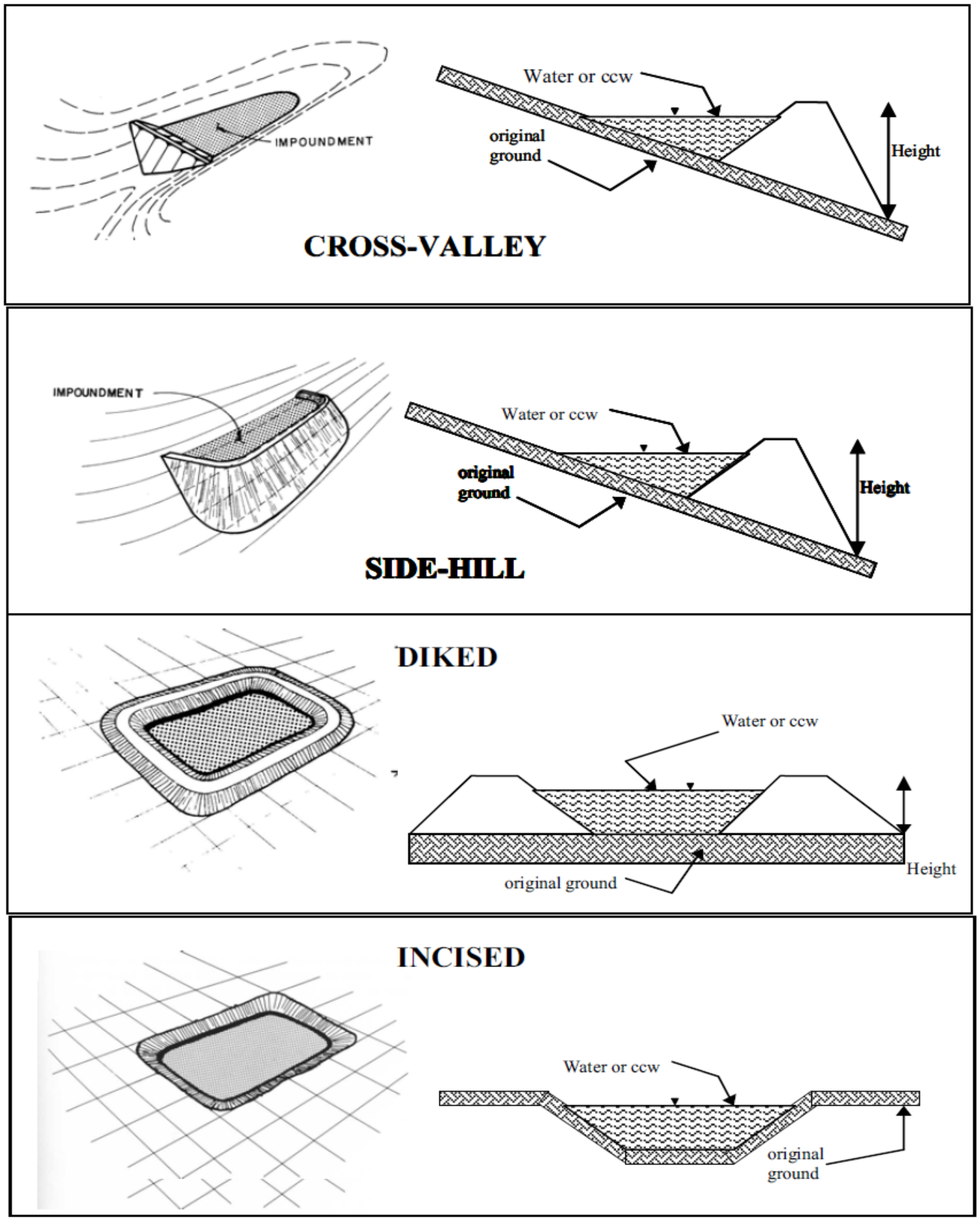
☒ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

☐ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Based on the size and location of the Martin Lake Steam Electric Station PDP 5, there is no probable loss of life in the event of failure or misoperation. Economic and environmental losses are expected to be low and limited to the owner's property. The plant owner owns Martin Lake and much of the surrounding property. Martin Lake State Park located on across an arm of the lake north and down gradient from the plant. However, the park property is owned by Luminant and leased to the State for a nominal annual amount to provide public recreational access to the lake.

CONFIGURATION:



☐ Cross-Valley ☐ Side-Hill ☒ Diked

☐ Incised (form completion optional) ☐ Combination Incised/Diked

Embankment Height (ft) 15

Pool Area (ac) 32.4

Current Freeboard (ft) 7.9

Embankment Material On-site soil borrow

Liner 3 ft. thick compacted clay

Liner Permeability 10^{-7} cm/sec

TYPE OF OUTLET (Mark all that apply)

☐ **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

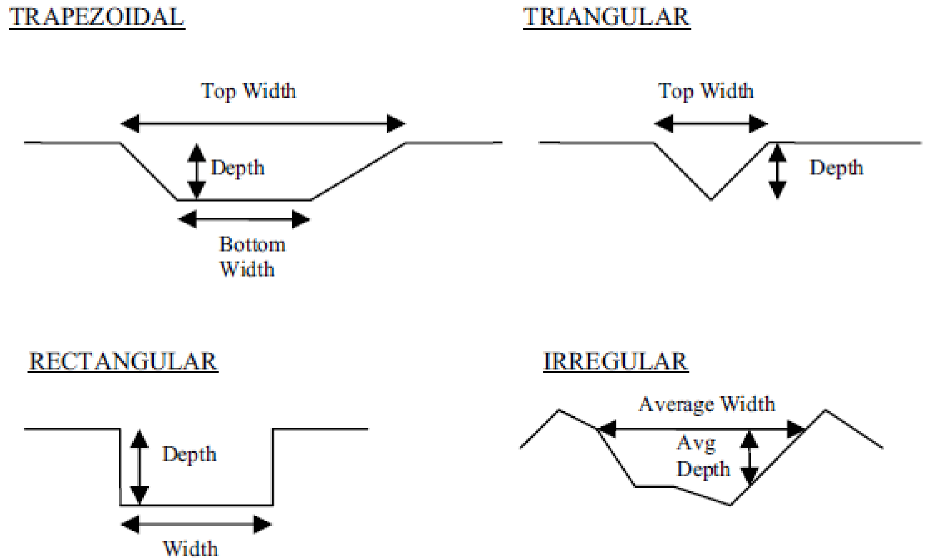
☐ Rectangular

☐ Irregular

depth (ft)

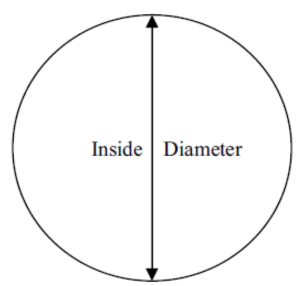
average bottom width (ft)

top width (ft)



☐ **Outlet**

18” inside diameter
(SDR 17 – smooth lined – 19.5” OD)



Material

☐ corrugated metal

☐ welded steel

☐ concrete

☐ plastic (hdpe, pvc, etc.)

☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☐	☐

☐ **No Outlet**

☒ **Other Type of Outlet** (specify):

Outlet consists of a 500 gpm submersible pump at the south end of the impoundment. The riser and discharge pipe are supported by a steel pier structure.

The outlet discharges to PDP 4 located south of PDP 5.

The Impoundment was Designed By PDP 5 designed by HDR Engineering

	Yes	No
Has there ever been a failure at this site?	☐	☒

If So When?

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	☒

If So When?

If So Please Describe :

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	☒

If so, which method (e.g., piezometers, gw pumping,...)?

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

Yes. The site of PDP 5 was originally developed with three smaller adjoining impoundments, designated PDP 1, PDP 2, and PDP 3. In the late 1980s, in response to the three ponds nearing capacity, the facility was expanded vertically. The expansion design included:

- Grading the existing ash in each pond to drain toward the berms
- Installing a compacted clay liner
- Constructing a new embankment with the outside toe located inside the crest of the original embankment.

The new embankment was constructed over the compacted clay liner installed over the original ash deposits.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

No documentation of original foundation preparation was provided.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

Neither observations during the site visit, nor photographs in prior inspection reports provided to Dewberry indicate prior releases, failures or patchwork on the dikes.

Coal Combustion Dam Inspection Checklist Form
US Environmental Protection Agency

Site Name:	Date:
Unit Name:	Operator's Name:
Unit I.D.:	Hazard Potential Classification: High Significant Low
Inspector's Name:	

Inspection Issue # Comments

APPENDIX C

Document 16

Ash and Scrubber Ponds and Permanent Disposal Pond #4 Stability Investigation Report Dated December 2012

ASH AND SCRUBBER PONDS AND PERMANENT DISPOSAL POND #4

STABILITY INVESTIGATION REPORT

Luminant Martin Lake Power Plant, Rusk County, Texas

REPORT

Submitted To: Luminant – Systems Engineering
Energy Plaza, Floor 27
1601 Bryan Street
Dallas, Texas 75201

Submitted By: Golder Associates Inc.
500 Century Plaza Drive
Suite 190
Houston, TX 77073 USA
Texas Registration Number: F-2578

STATE OF TEXAS
2/12/12
P. CHRIS MARSHALL
91893
LICENSED
PROFESSIONAL ENGINEER

December 2012 **123-94128.003**

A world of capabilities delivered locally

Golder Associates

Table of Contents

List of Tables

List of Figures

List of Appendices

1.0 INTRODUCTION

1.1 Project Description

Luminant Power (Luminant) operates the Martin Lake Power Plant, a lignite-fueled power plant near Tatum, Rusk County, Texas. As part of regulatory compliance, existing ash and scrubber ponds are being characterized for slope stability. Stability analyses were completed for the west ash pond and the scrubber pond located northeast of the power plant. The scrubber pond is located east of the south end of the west ash pond. The plant's east ash pond is located adjacent to and east of the west ash pond and north of the scrubber pond. Stability of the east ash pond was evaluated previously by others and is not included in the scope of this report.

Stability analyses were also completed for permanent disposal pond #4 (PDP4) located to the west of the power plant. Relative pond locations are depicted on Figure 1 included herein. Stability analyses for permanent disposal pond #5 (PDP5), located northwest of PDP4, were previously completed by others and is not included in the scope of this report.

Golder Associates Inc. (Golder) has been contracted by Luminant to perform a geotechnical site investigation at the facility and analyze the ash and scrubber pond slope stability. This report presents the findings of the field investigation, boring logs, laboratory test results, a description of the subsurface soil conditions, and results of the slope stability analyses.

1.2 Scope of Investigation

The scope of this investigation included:

- Drilling and sampling of eleven (11) geotechnical soil borings,
- Laboratory testing of representative soil samples,
- Characterization of subsurface conditions, and
- Slope stability analyses.

The subsurface investigation was performed between October 28 and November 2, 2012.

1.3 Coordinate System and Unit System

Soil boring locations were measured by Golder using a handheld GPS device. Elevations were estimated by Golder using existing topographic maps. We have reported coordinates with reference to latitude and longitude with WGS84 datum. All elevations are referenced to mean sea level (msl).

This report is presented using U.S. customary (or English) units.

2.0 SUBSURFACE EXPLORATION

Golder performed a total of eleven (11) subsurface explorations at the Site. Eight (8) borings were drilled to depths of between 50 and 60 feet below ground surface (bgs) at the west ash and scrubber ponds. Three (3) borings were drilled to depths between 50 and 70 feet at ash pond PDP4. Table 1 provides the boring coordinates and elevations. Soil boring locations were measured by Golder using a handheld GPS device. Elevations were estimated by Golder using existing topographic maps. Boring locations are shown on Figure 1.

TABLE 1. BORING COORDINATES

Boring Number	Latitude	Longitude	Elevation (ft-msl)	Boring Depth (ft)
West/Scrubber Ponds				
BH-201	32.2597° N	94.5643° W	330.0	50
BH-202	32.2616° N	94.5654° W	330.0	50
BH-203	32.2636° N	94.5664° W	330.0	50
BH-204	32.2602° N	94.5632° W	330.0	50
BH-205	32.2607° N	94.5617° W	330.5	60
BH-206	32.2613° N	94.5604° W	330.5	60
BH-207	32.2626° N	94.5609° W	330.5	60
BH-208	32.2621° N	94.5625° W	330.5	60
PDP4				
BH-209	32.2568° N	94.5814° W	360.0	50
BH-210	32.2571° N	94.5801° W	360.0	70
BH-211	32.2576° N	94.5787° W	360.0	70

2.4 Soil Boring Procedures

The borings were drilled by W.E.S.T. Drilling (West) of Waxahachie, Texas using an all-terrain truck-mounted drilling rig and rotary drilling methods with hollow stem augers. Soil samples were collected at 2-foot intervals within the top 10 feet of the boring and at 5-foot intervals below 10 feet. The boring logs from the site investigation are included as Appendix A.

Disturbed soil samples were obtained in sand using an ASTM standard split spoon sampler, i.e., 2-inch outer diameter and 1-3/8-inch inner diameter. Standard Penetration Tests (SPT) were conducted during sampling. Sampling and testing were carried out in general agreement with the guidelines in ASTM D1586.

SPTs involve counting the number of blows of a 140 lb hammer dropping 30 inches needed for the sampler to penetrate three successive 6-inch increments into the soil. The reported N value is the number of blows required to penetrate the second and third 6-inch intervals, with units of blows/12 inches. In some hard clays and very dense sands, 50 blows were insufficient to advance the sampler 6 inches and penetration "refusal" was encountered. In this case the N value is not obtained and the incomplete penetration is recorded. This is registered in the boring logs as, for example, 50/5 in., i.e. 50 blows with only 5 inches of penetration.

For clayey soils, thin-walled steel Shelby tubes were pushed to obtain the relatively undisturbed samples for laboratory testing. Shelby tubes were 30-inch long and 3-inch outer diameter (OD). The inside diameter was 2.87 inch giving an area ratio of 9% (Ca = 100 x (OD2 – ID2)/ID2). These Shelby tubes have a cutting edge diameter (De) of 2.85 in., thus an inside clearance ratio (Ci = 100 x (ID-De)/De) equal to 0.7%. The recovery ratio (length recovered/length pushed) is typically variable and dependent on the soil stiffness, with higher recovery values generally obtained in softer clays. The recovery ratio is reported in the individual boring logs.

All borings were sampled by a Golder field engineer and the soils were described using a modified version of the Unified Soil Classification System (ASTM D 2487). The soil description included a density or consistency qualifier, color, structural characteristics when evident, composition with major component in capital letters, and minor characteristics.

After visual classification, recovered samples from SPTs were placed in plastic bags to preserve the natural moisture content. After retrieval and visual soil identification of each Shelby tube sample, a pocket penetrometer test was performed at the bottom end of the sample. Shelby tubes pushed in stiff to hard soils were extruded in the field and the recovered samples were placed in plastic storage tubes and plastic bags to preserve the moisture content. All samples were labeled and transported back to the Golder's Houston office for laboratory soils testing.

Boring logs were prepared from the field logs using the software package gINT v. 8.1.021. The boring logs are provided in Appendix A.

Following the completion of each soil boring, the boreholes were backfilled with bentonite pellets to the surface.

2.5 Laboratory Testing

Laboratory testing was performed on selected samples, in accordance with commonly accepted methods and practices. Undisturbed and disturbed soil samples were tested to determine water content, Atterberg limits, grain size distribution, and shear strength. Water content determination was performed in accordance with ASTM D2216; Atterberg limits were determined in accordance with ASTM D4318; and grain size distribution was performed in accordance with ASTM D422. Shear strength testing consisted of unconsolidated-undrained (UU) triaxial tests in general accordance with ASTM D2850. Laboratory data summary sheets are presented in Appendix B. Laboratory test result sheets are presented in Appendix C.

2.6 Subsurface Conditions

The soils encountered in the borings generally consisted of stiff to hard sandy clays and firm to very dense sands. The subsurface stratigraphy generally consisted of interchanging layers of clays, sandy clays, clayey sands and nonplastic sands.

Some sand layers are interpreted to be loose on the boring logs based on measured SPT N values below 10. The low N values are likely due to soil disturbance caused by drilling below the water table rather than the soils actually having a loose consistency. Conservative strength parameters are assigned to these sand layers in the event that loose soils are present. However, it is likely that these sand layers are denser than represented on the boring logs and have a higher strength.

The clayey sand layers ranged in thickness from 2 to 16 feet. This stratum was encountered at the ground surface in borings BH-209, BH-210, BH-211. The clayey sand is typically described as compact, except in borings BH-202, BH-207 and BH-208 where loose layers were encountered. The sandy clay and clay strata are described as firm to hard, low to high plasticity clays and vary in in thickness from 2 to 38 feet. Clay was encountered at the ground surface in borings BH-205 and BH-206. Borings BH-204 and BH-207 terminated in stiff to very stiff clay.

Loose to very dense, silty or poorly graded sand was typically encountered beneath or interlayered with the sandy clay/clayey sand strata. Borings BH-201, BH-202, BH-203, BH-205, BH-206, BH-209, BH-210 and BH-211 all terminated in this layer. Though typically described as compact, dense to very dense layers were encountered in borings BH-203, BH204, BH-206, BH-209 and BH-211, and loose layers were encountered in borings BH-202, BH-205 and BH 206. This non-plastic sand stratum ranged in thickness from 2 to 27 feet.

Groundwater elevations were measured in 8 of the 11 borings. Groundwater elevations encountered during drilling ranged from 298.2 to 305.6 ft-msl, with an average of 302.6 ft-msl. Our analyses were conducted assuming a groundwater elevation at each cross section based on the boring closest to that cross section.

3.0 STABILITY ANALYSES

Slope stability analyses were performed using the commercial slope stability software program, SLIDE Version 6.019. The site topography and geometry used in the analyses were determined from site survey and design drawings provided by Luminant.

The typical containment dike section to the east of the power plant at the scrubber and west ash pond has an interior (wet side) and a minimum exterior (dry side) slope of 2.5H:1V. The containment dike section at PDP4 has an interior slope of 3H:1V and a minimum exterior slope of 4H:1V. The crest elevations of the containment dikes are at approximately 300 to 330.5 ft-msl at the west ash and scrubber ponds, respectively, and 360 ft-msl at PDP4. The pond floors vary from approximately 305 to 308.5 ft-msl at the west ash and scrubber ponds and 335 to 340 ft-msl at PDP4 .

Stability analyses were performed for two (2) separate slope sections at the west ash pond (north and west slopes), one (1) section at the scrubber pond (north slope) and one (1) section at PDP4 (south slope) to assess the various soil conditions and slope geometries around the ponds. Analysis locations are shown on Figure 2. Stability analyses considered “empty pond” and “full pond” conditions.

A rapid drawdown scenario was analyzed for one full pond condition at each section. The analysis was completed on the drained sections. The analysis was completed using the B-bar method to simulate the effects of rapid drawdown in a low permeability material such as the sandy clays and clayey sands encountered at Martin Lake. The initial water level was modeled as the full condition and the final water level was modeled at the pond floor, representing a final condition after drawdown where the pond is empty.

The most critical slope geometry was identified along the north slope at the scrubber pond, consisting of an approximately 25-foot high, 2.5H:1V slope. The effect of pseudo-static earthquake loading was also analyzed at this location. Based on the “US Seismic Hazard 2008 Map” by the USGS the peak ground acceleration (PGA) for a 2% probability of exceedance in 50 years event is about 6%g for the subject site. A seismic coefficient of 0.06g was therefore used in the earthquake loading analysis.

Based on a review of soil, site, and seismic conditions, the site soils are not expected to be susceptible to liquefaction.

3.7 Soil Properties

For each slope section, a conservative, generalized subsurface stratigraphy was developed based on soil boring information and laboratory soil testing results from the borings conducted as part of this investigation, and engineering judgment based on previous experience with similar soils. The soil properties assumed for the slope sections are provided in Table 2.

TABLE 2. SOIL MATERIAL PROPERTIES FOR ASH AND SCRUBBER POND SECTIONS

Soil Material	Description	Moist Unit Weight (lb/ft^3)	Saturated Unit Weight (lb/ft^3)	Undrained Soil Properties		Drained Soil Properties	
				Undrained Shear Strength, su (lb/ft^2)	Friction Angle, φ (°)	Cohesion, c' (lb/ft^2)	Friction Angle, φ' (°)
I	Sandy Clay/Clayey Sand	125	132	1750	0	1000	14
II	Sand	120	125	0	30	0	30

3.8 Slope Stability Results

Slope stability analyses were performed for both short-term and long-term conditions using undrained and drained soil properties, respectively. The results of the analyses are provided in Table 3. SLIDE output files are included in Appendix D. A factor of safety of 1.5 is typically considered adequate for permanent slopes. The minimum calculated factor of safety from our analyses is 2.7 for normal loading conditions. Therefore, our analyses indicate that the proposed slopes will be stable. Additionally slopes analyses for rapid drawdown and earthquake conditions had factors of safety greater than 1.5 as well.

TABLE 3. SLOPE STABILITY FACTORS OF SAFETY

Case	Description	Factor of Safety
1	Scrubber pond; north slope; empty pond; short term (undrained) conditions	3.2
2	Scrubber pond; north slope; empty pond; long term (drained) conditions	2.7
3	Scrubber pond; north slope; full pond; short term (undrained) conditions	7.7
4	Scrubber pond; north slope; full pond; long term (drained) conditions	7.2
5	Scrubber pond; north slope; rapid drawdown	2.1
6	Scrubber pond; north slope; empty pond; short term (drained) conditions (seismic loading)	2.2
7	West ash pond; north slope; empty pond; short term (undrained) conditions	3.5
8	West ash pond; north slope; empty pond; long term (drained) conditions	3.1
9	West ash pond; north slope; full pond; short term (undrained) conditions	8.2
10	West ash pond; north slope; full pond; long term (drained) conditions	7.9
11	West ash pond; north slope; rapid drawdown	2.6
12	West ash pond; west slope; empty pond; short term (undrained) conditions	3.5
13	West ash pond; west slope; empty pond; long term (drained) conditions	3.0
14	West ash pond; west slope; full pond; short term (undrained) conditions	8.0
15	West ash pond; west slope; full pond; long term (drained) conditions	7.6
16	West ash pond; west slope; rapid drawdown	2.6
17	PDP4; south slope; empty pond; short term (undrained) conditions	3.2
18	PDP4; south slope; empty pond; long term (drained) conditions	2.9
19	PDP4; south slope; full pond; short term (undrained) conditions	7.9
20	PDP4; south slope; full pond; long term (drained) conditions	7.6
21	PDP4: south slope: rapid drawdown	2.2

4.0 USE OF THIS REPORT

Attention is drawn to the document - “Important Information About Your Geotechnical Engineering Report”, which is included in Appendix E of this report. This document has been prepared by the ASFE (Professional Firms Practicing in the Geosciences), of which Golder is a member. The statements presented in this document are intended to advise owners of what their realistic expectations of this report should be, and to present recommendations on how to minimize the risks associated with the groundworks for this project. The document is not intended to reduce the level of responsibility accepted by Golder, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

5.0 CLOSING

Golder appreciates the opportunity to assist Luminant with this project. If you have any questions, or require further assistance from Golder, please contact the undersigned at (281) 821-6868.

Very truly yours,
GOLDER ASSOCIATES INC.

Maysill G. Pascal
Senior Geotechnical Engineer

P. Chris Marshall, P.E.
Senior Project Engineer

Charles F. Rickert, P.E.
Associate

Drawing file: 12394128A003.dwg Dec 06, 2012 – 11:05am

LEGEND

BH-101 BORING LOCATION

REFERENCE

1.) AERIAL SHOWN LICENSED FROM GOOGLE EARTH PROFESSIONAL.

700 0 700

SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

LUMINANT - MARTIN LAKE
ASH & SCRUBBER POND SLOPE STABILITY INVESTIGATION REPORT
RUSK COUNTY, TEXAS

TITLE

BORING LOCATIONS

Golder Associates
Mt. Laurel, New Jersey
NJ Authorization #24GA28029100

PROJECT No.		123–94128	FILE No.	12394128A003
DESIGN	MGP	12/04/12	SCALE AS SHOWN	REV. 0
CADD	RG	12/04/12		
CHECK	MGP	12/04/12	FIGURE 1	
REVIEW	PCM	12/04/12		

Drawing file: 12394128A004.dwg Dec 06, 2012 – 11:04am

LEGEND

ANALYSIS LOCATION

REFERENCE

1.) AERIAL SHOWN LICENSED FROM GOOGLE EARTH PROFESSIONAL.

700 0 700

SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

LUMINANT - MARTIN LAKE
ASH & SCRUBBER POND SLOPE STABILITY INVESTIGATION REPORT
RUSK COUNTY, TEXAS

TITLE

ANALYSIS LOCATIONS

Golder Associates
Mt. Laurel, New Jersey

NJ Authorization #24GA28029100

PROJECT No.	123-94128		FILE No.	12394128A004
DESIGN	MGP	12/04/12	SCALE AS SHOWN	REV. 0
CADD	RG	12/04/12		
CHECK	MGP	12/04/12	FIGURE 2	
REVIEW	PCM	12/04/12		

APPENDIX A
BORING LOGS

Golder Associates
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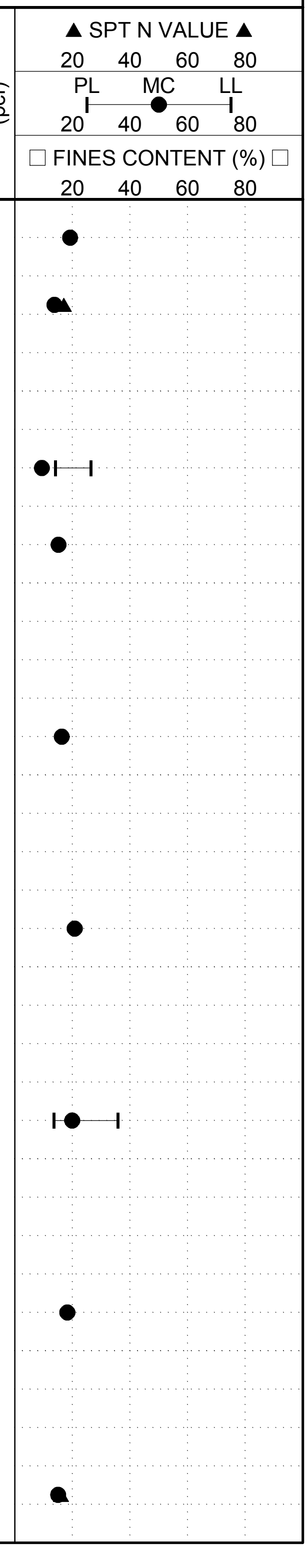
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

BORING NUMBER BH-201

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 10/28/12 **COMPLETED** 10/28/12
GROUND ELEVATION 330 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 28.30 ft / Elev 301.70 ft
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	Remove 8" sandy gravel as road base					
	(CL) SILTY CLAY, low plasticity, some sand, trace gravels, red, dry, hard	SH 1	44		5.0	
	(SC) CLAYEY SAND, non-plastic, some silt, tan and gray, dry, compact	SS 2	58	15-10-7 (17)		
5	(CL) SANDY CLAY, low plasticity, some silt, red, tan, and gray, mottled, dry, stiff	SH 3	44		3.5	
	(SC) CLAYEY SAND, fine, subangular, non-plastic, little silt, tan and gray, mottled, dry	SH 4	38		1.5	
10	(CL) SANDY CLAY, low plasticity, little silt and gravel, red, tan, and gray, mottled, dry, hard	SH 5	42		4.5	
15	some silt, no gravel, very stiff at 13.0'	SH 6	58		3.5	
20	some sand veins at 18.0'	SH 7	38		3.0	
25	gray, moist at 23.0'	SH 8	58		2.5	
30	▽ (SC) CLAYEY SAND, fine, subangular, low plasticity, some to little silt	SH 9	71		2.0	
35	some silt, tan and gray, mottled, moist at 33.0'	SS 10	100	9-7-9 (16)		



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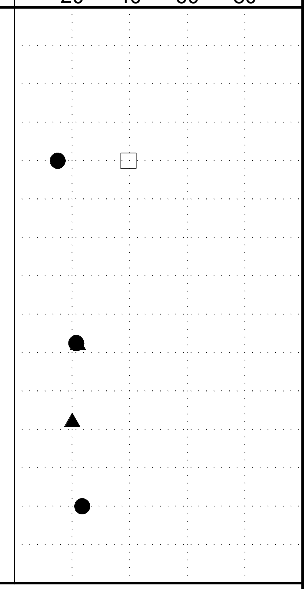
BORING NUMBER BH-201

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / □ FINES CONTENT (%) □ 20 40 60 80
35								
40		some silty sand veins at 38.0'	SH 11	50		2.0		
45		(SM) SILTY SAND, fine, subangular, non-plastic, little clay, tan and red, wet, compact	SS 12	100	11-11-11 (22)			
		(SP) SAND, medium to fine, subangular, poorly graded, some silt, tan, wet, compact	SS 13	100	5-9-11 (20)			
50								



Bottom of borehole at 50.0 feet.

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BORING NUMBER BH-202

CLIENT	Luminant	**PROJECT NAME**	Pond Slope Stability
PROJECT NUMBER	123-94128	**PROJECT LOCATION**	Martin Lake
DATE STARTED	10/29/12 **COMPLETED** 10/29/12	**GROUND ELEVATION**	330 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR	WEST Drilling	**GROUND WATER LEVELS:**	
DRILLING METHOD	Hollow Stem Auger	∇ **AT TIME OF DRILLING**	26.70 ft / Elev 303.30 ft
LOGGED BY	FW **CHECKED BY** MP	**AT END OF DRILLING**	---
NOTES		**AFTER DRILLING**	---

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	Remove 6" sandy gravel from road bed					
	(CH) CLAY, medium to high plasticity, some silt, trace fine sand, tan and gray, dry, very stiff to hard	SH 1	50		4.5	
	some sand at 2.0'	SH 2	63		3.5	
5		SH 3	50		5.0	
		SH 4	63		3.75	
	(CL) SANDY CLAY, low plasticity, some to little silt, tan and gray, mottled, moist, firm	SH 5	42		4.0	
10						
	some sand seams, very stiff at 13.0'	SH 6	42		3.0	
15						
	(CL) SILTY CLAY, medium to high plasticity, little find sand, brown, moist, firm	SH 7	58		1.0	
20						
	low plasticity, gray, moist at 23.0'	SH 8	71		5.0	
25	∇					
	(SM) SILTY SAND, fine, subangular, non-plastic, some clay, gray and tan, wet, compact	SS 9	83	7-7-9 (16)		
30						
	(SC) CLAYEY SAND, fine, subangular, low plasticity, some silt, tan and gray, wet, compact	SS 10	100	3-5-6 (11)		
35						

▲ SPT N VALUE ▲ (20 40 60 80)
PL MC LL (20 40 60 80)
☐ FINES CONTENT (%) ☐ (20 40 60 80)

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GEOTECH BH PLOTS - GINT STD US LAB.GDT - 12/4/12 15:58 - P:_2012 PROJECT FOLDERS\123-94128 LUMINANT POND SLOPE STABILITY\MARTIN LAKE\LAB TESTING\94128MARTINLAKE.GPJ

Golder Associates
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BORING NUMBER BH-202

CLIENT Luminant | **PROJECT NAME** Pond Slope Stability
PROJECT NUMBER 123-94128 | **PROJECT LOCATION** Martin Lake

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
35							
		interbedded clay and sand seams at 38.0'	SS 11	100	8-7-8 (15)		
40							
		no seams at 43.0'	SS 12	89	4-4-4 (8)		
45							
		(SP) SAND, medium to fine, poorly graded, subangular, non-plastic, some silt and clay, wet, loose	SS 13	100	2-3-4 (7)		
50							

▲ SPT N VALUE ▲ 20 40 60 80
PL MC LL 20 40 60 80
☐ FINES CONTENT (%) ☐ 20 40 60 80

Bottom of borehole at 50.0 feet.

GEOTECH BH PLOTS - GINT STD US LAB.GDT - 12/4/12 15:58 - P:_2012 PROJECT FOLDERS\123-94128 LUMINANT POND SLOPE STABILITY\MARTIN LAKE\LAB TESTING\94128MARTINLAKE.GPJ

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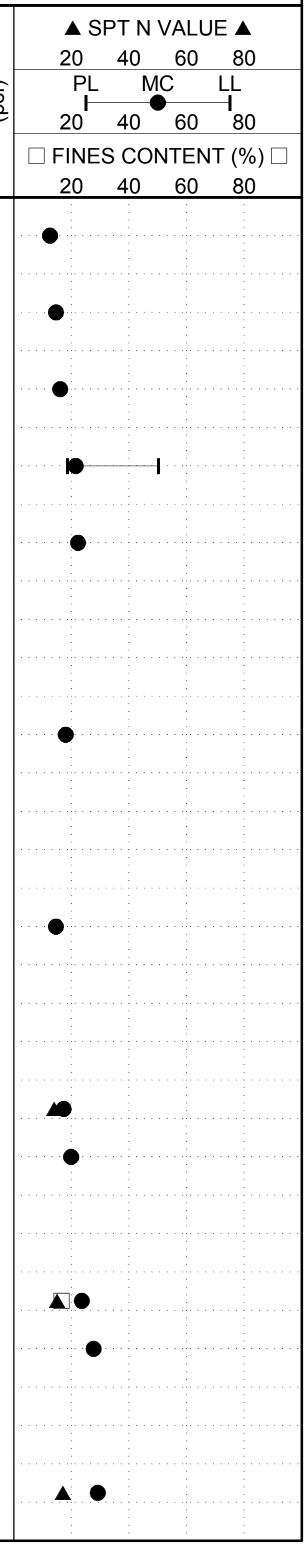
BORING NUMBER BH-203

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 10/30/12 **COMPLETED** 10/30/12
GROUND ELEVATION 330 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
∇ **AT TIME OF DRILLING** 28.80 ft / Elev 301.20 ft
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	remove 14" sandy GRAVEL as roadbed	SH 1	44		2.75	
	(CL) SILTY CLAY, low plasticity, little sand, gray and tan, mottled, dry, very stiff					
	(CL) SANDY CLAY, low plasticity, some silt, gray and tan, mottled, dry, stiff	SH 2	50		1.5	
5	low plasticity, some sand veins, soft	SH 3	42		1.25	
	(CL-CH) CLAY, low plasticity to medium plasticity, some silt, dark to light gray, dry, stiff	SH 4	67		1.75	
	very stiff at 8.0'	SH 5	50		3.25	
10						
15	low plasticity, some silt and fine sand, little coarse sand and fine gravels, subrounded, red and tan, stiff at 13.0'	SH 6	38		1.5	
20	(CL) SANDY CLAY, low plasticity, some silt, tan and gray, mottled, dry, stiff	SH 7	44		2.0	
25	(SC) CLAYEY SAND, low plasticity, some silt, tan and gray, mottled, compact, moist	SS 8	94	3-7-7 (14)		
30	∇ low plasticity, with grey silty clay, some sand, tan at 28.0'	SS 9	94	4-7-8 (15)		
35	(SM) SILTY SAND, non-plastic, grading to sand, some silt, little to trace clay, gray, wet, compact	SS 10	100	3-8-9 (17)		



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BORING NUMBER BH-203

CLIENT Luminant **PROJECT NAME** Pond Slope Stability
PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / □ FINES CONTENT (%) □ 20 40 60 80
35								
		some clay and silt veins, tan at 38.0'	SS 11	100	3-6-6 (12)			
40								
		(SC) CLAYEY SAND, low plasticity, some silt, tan and brown, wet, compact	SS 12	100	4-8-10 (18)			
45								
		(SM) SILTY SAND, non-plastic, trace clay, tan and gray, wet, dense	SS 13	100	8-14-20 (34)			
50								

Bottom of borehole at 50.0 feet.

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BORING NUMBER BH-204

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 10/30/12 **COMPLETED** 10/30/12
GROUND ELEVATION 330 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 31.80 ft / Elev 298.20 ft
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
removed SANDY GRAVEL from roadbed					
(CL) SILTY CLAY, low plasticity, some sand, tan and gray, mottled, dry, hard	SH 1	67		4.25	
(CL) LEAN CLAY, low plasticity, some silt, sand, and sand veins, red and gray, dry, very stiff	SH 2	50		3.0	
(SC) CLAYEY SAND, low plasticity, some silt and black sandy gravel veins, tan and gray, dry	SH 3	33		5.0	
(CL) SANDY CLAY, low plasticity, little silt, tan and gray, dry, stiff	SH 4	58		2.0	
(SC) CLAYEY SAND, non-plastic to low plasticity, little silty clay seam, tan, brown, with little gray, dry	SH 5	44		2.5	
(CL) LEAN CLAY, low to medium plasticity, some silt, trace fine sand, tan, brown, and gray, mottled, dry, stiff	SH 6	67		2.0	
some sand, little silt	SH 7	67		1.5	
(CL) SANDY CLAY, low plasticity, little silt, tan and gray, moist, very stiff	SH 8	46		3.0	
(ML) SANDY SILT, low plasticity to non-plastic, fine, subangular, some clay, tan and gray, moist, soft	SS 9	100	2-1-3 (4)		
(SM) SILTY SAND, low plasticity to non-plastic, fine, subangular, gray with little brown, dense	SS 10	94	11-14-18 (32)		

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BORING NUMBER BH-204

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / □ FINES CONTENT (%) □ 20 40 60 80
35								
		(SC) CLAYEY SAND, fine, subangular, interbedded with gray, silty sand, some clay, tan, wet, compact	SS 11	94	4-5-6 (11)			
40								
		(CH) CLAY, medium plasticity, little silt, trace fine sand, gray, wet, stiff	SS 12	100	3-5-7 (12)			
45								
50			SH 13	75		2.0		

Bottom of borehole at 50.0 feet.

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BORING NUMBER BH-205

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 10/30/12 **COMPLETED** 10/30/12
GROUND ELEVATION 330.5 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 29.40 ft / Elev 301.10 ft
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	(CL) LEAN CLAY, medium plasticity, some silt, trace sand, tan and gray, mottled, dry, hard	SH 1	50		4.0	
	with silty sand seams, very stiff at 2.0'	SH 2	60		3.5	
5	stiff at 4.0'	SH 3	40		1.25	
	very stiff at 6.0'	SH 4	58		3.75	
10		SH 5	44		3.5	
15	some to little silt at 13.0'	SH 6	42		3.0	
20	some clayey sand seams, stiff at 18.0'	SH 7	40		1.5	
25	(CL) SILTY CLAY, low plasticity, some sand, dark gray, moist, stiff	SH 8	67		1.75	
30	(CL) SANDY SILTY CLAY, low plasticity, little clay, light gray with little brown, moist, stiff ▽	SS 9	67	2-5-7 (12)		
35	(CL) SANDY CLAY, low plasticity, some silt, tan and gray, moist, very stiff	SH 10	60		3.0	

▲ SPT N VALUE ▲ 20 40 60 80
PL MC LL 20 40 60 80
☐ FINES CONTENT (%) ☐ 20 40 60 80

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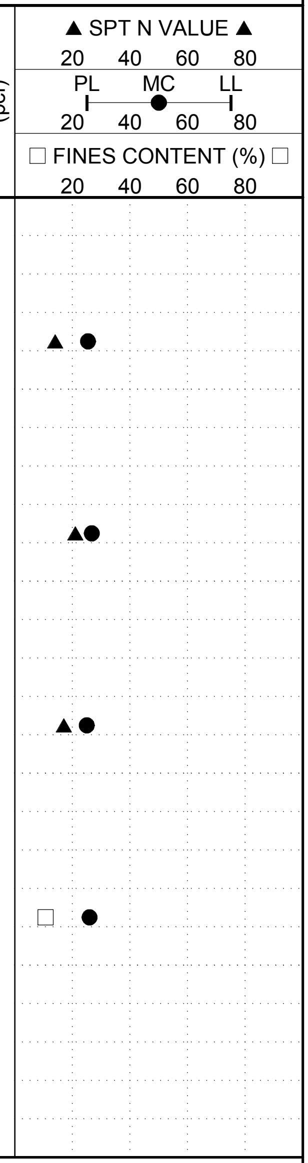
BORING NUMBER BH-205

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
35							
38.0		(SC) CLAYEY SAND, interbedded with gray silty SAND, fine, subangular, little clay, compact, wet	SS 11	100	3-6-8 (14)		
40							
43.0		(SP) SAND, fine, subangular, non-plastic, some clay, little silt, tan and brown, wet, compact	SS 12	100	4-9-12 (21)		
45							
48.0		medium to fine, tan at 48.0'	SS 13	100	3-6-11 (17)		
50							
53.0		very loose at 53.0'	SS 14	33			
55							
60							

Bottom of borehole at 60.0 feet.



GEOTECH BH PLOTS - GINT STD US LAB.GDT - 12/4/12 15:58 - P:_2012 PROJECT FOLDERS\123-94128 LUMINANT POND SLOPE STABILITY\MARTIN LAKE\LAB TESTING\94128MARTINLAKE.GPJ

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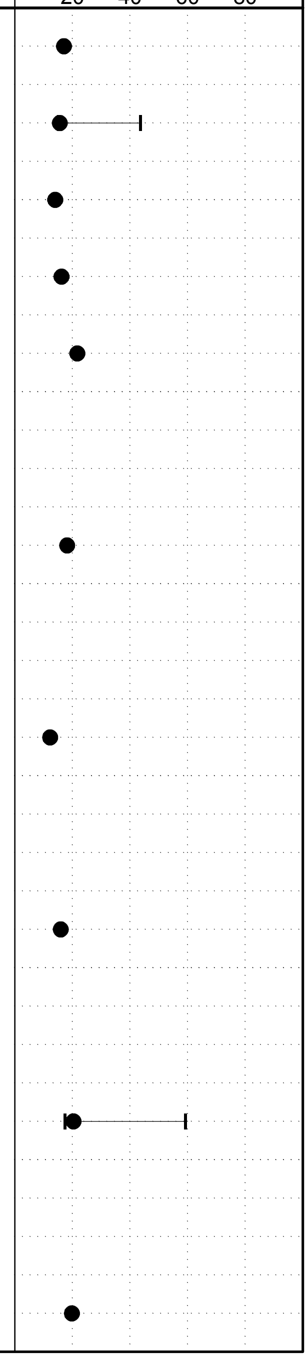
BORING NUMBER BH-206

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 10/30/12 **COMPLETED** 10/30/12
GROUND ELEVATION 330.5 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 30.20 ft / Elev 300.30 ft
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	(CL) SANDY CLAY, low plasticity, some silt, tan and gray, mottled, dry, stiff	SH 1	44		2.25	
	decreased sand content, very stiff at 2.0'	SH 2	67		3.5	
5	interbedded with silty clay layers, very stiff at 4.0'	SH 3	50		2.25	
	some silty sand veins, very stiff at 6.0'	SH 4	67		3.5	
10		SH 5	52		3.5	
15	trace organics, hard at 13.0'	SH 6	54		4.5	
20	with clayey sand veins, hard at 18.0'	SH 7	50		5.0	
25	some red, moist at 23.0'	SH 8	50		4.5	
30	(CH) SANDY CLAY, medium to high plasticity, some silt, tan and gray, very stiff	SH 9	52		3.25	
35	increased sand and silt content, dark gray, stiff at 33.0'	SH 10	56		1.5	

▲ SPT N VALUE ▲ 20 40 60 80
PL MC LL 20 40 60 80
☐ FINES CONTENT (%) ☐ 20 40 60 80



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BORING NUMBER BH-206

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
35								
		(SC) CLAYEY SAND, fine, subangular, low plasticity, some to little silt, gray, tan, and red, mottled, wet, compact	SS 11	100	5-6-6 (12)			
40								
		(SM) SILTY SAND, fine, subangular, non-plastic, some clay, wet, loose	SS 12	100	3-4-5 (9)			
45								
		(SP) SAND, medium to fine, trace coarse, poorly graded, subangular, non-plastic, some silt, tan, wet, compact	SS 13	100	2-6-12 (18)			
50								
		no coarse, trace clay at 53.0'	SS 14	100	5-8-13 (21)			
55								
		dense at 58.0'	SS 15	100	9-18-23 (41)			
60								

Bottom of borehole at 60.0 feet.

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BORING NUMBER BH-207

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 10/31/12 **COMPLETED** 10/31/12
GROUND ELEVATION 330.5 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 34.40 ft / Elev 296.10 ft
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	remove 8" of SANDY GRAVEL from roadbed					
	(CL) SILTY CLAY, low plasticity, trace fine sand, gray, dry, hard	SH 1	33		5.0	
	(CL) SANDY CLAY, low plasticity, some silt and interbedded sand seams, tan and gray, mottled, dry, firm	SH 2	58		3.0	
5	(SP) SAND, poorly graded, non-plastic, some silt, clay, and gravel, black and tan, dry	SH 3	38		0.0	
	(CL) SANDY CLAY, low plasticity, some silt, gray and tan, dry, firm	SH 4	54		3.0	
	hard at 8.0'	SH 5	50		5.0	
10						
	decrease sand content, stiff at 13.0'	SH 6	56		3.75	
15						
	some sand seams at 18.0'	SH 7	52		2.5	
20						
	(SM) SILTY SAND, non-plastic, fine, subangular, little clay, gray, moist	SH 8	33			
25						
	(CL) SILTY CLAY, non-plastic, some sand, gray, moist, hard	SH 9	60		5.0	
30						
	(SM) SILTY SAND, non-plastic, fine, subangular, little clay, gray with little tan, moist, compact ▽	SS 10	89	6-7-7 (14)		
35						

Plot legend: ▲ SPT N VALUE ▲ (20, 40, 60, 80); PL — MC ● — LL (20, 40, 60, 80); ☐ FINES CONTENT (%) ☐ (20, 40, 60, 80)

(Continued Next Page)

Golder Associates
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Telephone: (281) 821-6868
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BORING NUMBER BH-207

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
35						
38	(SC) CLAYEY SAND, non-plastic, fine, subangular, some silt, gray and tan, wet, loose	SS 11	67	2-3-4 (7)		
43	compact at 43.0'	SS 12	100	3-5-5 (10)		
48		SS 13	100	3-5-6 (11)		
53	(SP) SAND, medium to fine, non-plastic, some silt and clay, gray and tan, wet, loose	SS 14	89	2-2-5 (7)		
58	(CL) SILTY CLAY, low plasticity, trace fine sand, gray, wet, very stiff	SS 15	100	3-7-12 (19)		
60						

▲ SPT N VALUE ▲ (20, 40, 60, 80); PL — MC — LL (20, 40, 60, 80); ☐ FINES CONTENT (%) ☐ (20, 40, 60, 80)

Bottom of borehole at 60.0 feet.

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BORING NUMBER BH-208

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 10/31/12 **COMPLETED** 10/31/12
GROUND ELEVATION 330.5 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 30.00 ft / Elev 300.50 ft
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / □ FINES CONTENT (%) □ 20 40 60 80
0		remove 12" of SANDY GRAVEL from roadbed						
		(CL) SANDY CLAY, low plasticity, some silt, tan and gray, dry, stiff	SH 1	44		3.5		
		stiff to very stiff at 2.0'	SH 2	50		4.0		
5		hard at 4.0'	SH 3	54		5.0		
		SILTY SAND, nonplastic, some clay, dry	SH 4	31		1.5		
10		(CL) SANDY CLAY, low plasticity, some silt, tan, gray, and red, dry, soft to firm	SH 5	50		2.0		
15			SH 6	40		2.5		
20		very stiff at 18.0'	SH 7	50		3.5		
25		hard at 23.0'	SH 8	46		5.0		
30	▽	some sand seams, moist, very stiff at 28.0'	SH 9	54		3.0		
35		(SC) CLAYEY SAND, fine, subangular, some silt, tan, gray, and red, moist	SH 10	60		2.5		

(Continued Next Page)

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BORING NUMBER BH-208

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
35						
38.0	wet at 38.0'	SH 11	50			
43.0	loose at 43.0'	SS 12	100	3-2-3 (5)		
48.0	(SP) SAND, fine, little medium, non-plastic, subangular, little clay, tan, compact	SS 13	72	1-6-8 (14)		
53.0		SS 14	100	3-6-7 (13)		
	(SC) CLAYEY SAND, medium, some silt, brown					
	(SM) SILTY SAND, fine, subangular, non-plastic, little clay, gray, compact					
58.0	(CL) SILTY CLAY, low plasticity, dark gray, dense	SS 15	100	7-43-50 (93)		
	SANDY GRAVEL, non-plastic, planar, lignite coal seam, black, hard					
60						

Bottom of borehole at 60.0 feet.

▲ SPT N VALUE ▲ (20 40 60 80); PL MC LL (20 40 60 80); □ FINES CONTENT (%) □ (20 40 60 80)

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BORING NUMBER BH-209

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 11/1/12 **COMPLETED** 11/1/12
GROUND ELEVATION 360 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 46.20 ft / Elev 313.80 ft no reading, cave in at 46
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / □ FINES CONTENT (%) □ 20 40 60 80
0		(SC) CLAYEY SAND, fine, subangular, medium plasticity, some fine rounded gravel, red and brown, dry	SH 1	33		5.0		
		trace fine rounded gravel, tan and gray, mottled at 2.0'	SH 2	38		5.0		
5		little silt, no gravel at 4.0'	SH 3	38		5.0		
		some silt at 6.0'	SH 4	29		4.5		
		(CL) SANDY CLAY, low plasticity, some silt, tan and gray, dry, firm	SS 5	33	2-2-5 (7)			
10								
		some red, hard at 13.0'	SH 6	21		5.0		
15								
		gray, moist, very stiff at 18.0'	SH 7	29		2.5		
20								
		(CL) LEAN CLAY, low plasticity, some silt, trace fine sand, gray and tan, moist, stiff	SS 8	67	4-6-8 (14)			
25								
		little silt, hard, gray at 28.0'	SH 9	50		5.0		
30								
		grading to clayey sand, very stiff at 33.0'	SH 10	42		3.0		
35								

(Continued Next Page)

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BORING NUMBER BH-209

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / □ FINES CONTENT (%) □ 20 40 60 80
35								
		some silt and sand, gray, tan, and brown, hard at 38.0'	SS 11	100	7-13-14 (27)			
40								
		(CL) SILTY CLAY, low plasticity, dark gray, moist, hard	SS 12	100	12-20-26 (46)			
45	▽							
		(SM) SILTY SAND, fine, subangular, non-plastic, some clay, tan and gray, moist, very dense	SS 13	100	14-27-36 (63)			
50								

Bottom of borehole at 50.0 feet.

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BORING NUMBER BH-210

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 11/1/12 **COMPLETED** 11/1/12
GROUND ELEVATION 360 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 47.00 ft / Elev 313.00 ft no reading, cave in at 47
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	SPT N VALUE / PL MC LL / FINES CONTENT (%) (20 40 60 80)
0		(SC) CLAYEY SAND, fine, subangular, some silt, little fine rounded gravel, red, dry trace roots at 1.0'	SH 1	25		5.0		
		tan, gray, and red, mottled at 2.0'	SH 2	21		5.0		
5		compact at 4.0'	SS 3	67	4-7-10 (17)			
			SS 4	39	3-6-6 (12)			
10			SS 5	33	3-4-6 (10)			
15		(CL) SANDY CLAY, low to medium plasticity, little silt, red and gray, dry, very stiff	SH 6	21		3.0		
20		some silt and sand seams, gray and tan, moist, very stiff at 18.0'	SH 7	89		3.5		
25		little red, hard at 23.0'	SH 8	50		4.5		
30		trace subrounded fine gravels and coarse sand at 28.0'	SH 9	29		4.0		
35		(SC) CLAYEY SAND, fine, subangular, some silt, brown and tan, moist	SH 10	35		4.0		

(Continued Next Page)

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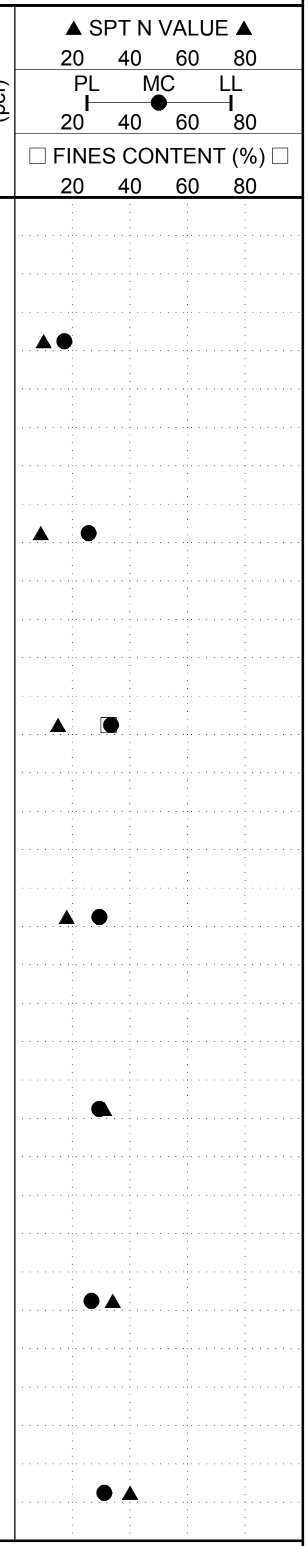
BORING NUMBER BH-210

CLIENT Luminant | **PROJECT NAME** Pond Slope Stability
PROJECT NUMBER 123-94128 | **PROJECT LOCATION** Martin Lake

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
35							
		(SM) SILTY SAND, fine, subangular, non-plastic, little clay, dark gray, moist, compact	SS 11	50	4-5-5 (10)		
40							
		(CL) SILTY CLAY, low plasticity, little fine sand, gray, moist, stiff	SS 12	94	2-4-5 (9)		
45							
		(SM) SILTY SAND, fine, subangular, non-plastic, some clay, gray and tan, mottled, wet, compact	SS 13	100	4-7-8 (15)		
50							
			SS 14	89	5-9-9 (18)		
55							
		little tan, dense at 58.0'	SS 15	100	7-14-17 (31)		
60							
			SS 16	100	11-15-19 (34)		
65							
		some dark brown clay seams at 68.0'	SS 17	100	10-15-25 (40)		
70							

Bottom of borehole at 70.0 feet.



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BORING NUMBER BH-211

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake
DATE STARTED 11/2/12 **COMPLETED** 11/2/12
GROUND ELEVATION 360 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR WEST Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 60.20 ft / Elev 299.80 ft no reading, cave in at 60
LOGGED BY FW **CHECKED BY** MP
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0		(SC) CLAYEY SAND, some silt and fine rounded gravel, red, dry	SH 1	29		5.0		
		fine, subangular, gray, tan, and red at 2.0'	SH 2	29		3.5		
5		trace fine gravels and coarse sand, loose at 4.0'	SS 3	50	2-3-6 (9)			
		some sandy clay seams, compact at 6.0'	SS 4	39	4-5-8 (13)			
10		increase clay and silt content at 8.0'	SS 5	72	4-8-8 (16)			
15		(CL-CH) SANDY CLAY, low to medium plasticity, little silt, gray, tan, and red, dry, stiff	SS 6	33	2-5-6 (11)			
20		some silt at 18.0'	SH 7	50		3.25		
25		brown and tan at 23.0'	SH 8	44		5.0		
30		(ML) SANDY SILT, little clay, tan, moist	SH 9	25				
35		(SM) SILTY SAND, fine, subangular, some clay, tan and gray, dense	SS 10	67	7-15-19 (34)			

(Continued Next Page)

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BORING NUMBER BH-211

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
35						
38		SS 11	89	9-17-25 (42)		
43		SS 12	100	10-14-18 (32)		
48	(SC) CLAYEY SAND, low plasticity, fine, subangular, some silt and lean clay, gray and tan, wet, dense	SS 13	89	9-14-18 (32)		
53	(SP) SAND, fine, subangular, non-plastic, some silt, little to trace clay, tan, wet, very dense	SS 14	100	17-29-38 (67)		
58	little medium at 58.0'	SS 15	78	14-28-33 (61)		
60	∇					
63		SS 16	100	17-29-34 (63)		
68	(SM) SILTY SAND, fine, subangular, non-plastic, little to trace clay, gray and tan, wet, very dense	SS 17	72	18-27-37 (64)		
70						

Bottom of borehole at 70.0 feet.

▲ SPT N VALUE ▲ 20 40 60 80
PL MC LL 20 40 60 80
☐ FINES CONTENT (%) ☐ 20 40 60 80

APPENDIX B
LABORATORY TEST SUMMARY SHEETS

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SUMMARY OF LABORATORY RESULTS

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
BH-201	0.0							19.2			
BH-201	2.0							13.7			
BH-201	6.0	26	14	12				9.4			
BH-201	8.0							15.1			
BH-201	13.0							16.3			
BH-201	18.0							20.8			
BH-201	23.0	36	14	22				19.9			
BH-201	28.0							18.2			
BH-201	33.0							15.0			
BH-201	38.0				0.85	40		14.9			
BH-201	43.0							21.4			
BH-201	48.0							23.5			
BH-202	0.0							20.8			
BH-202	2.0	55	19	36				17.1			
BH-202	4.0							20.5			
BH-202	6.0							26.7			
BH-202	8.0							15.3			
BH-202	13.0							14.9			
BH-202	18.0	29	13	16				17.1			
BH-202	23.0							17.6			
BH-202	28.0				0.85	49		18.1			
BH-202	33.0							17.0			
BH-202	38.0							20.8			
BH-202	43.0							23.0			
BH-202	48.0							26.2			
BH-203	0.0							12.6			
BH-203	2.0							14.6			
BH-203	4.0							16.1			
BH-203	6.0	50	19	31				21.5			
BH-203	8.0							22.3			
BH-203	13.0							18.0			
BH-203	18.0							14.6			
BH-203	23.0							17.3			
BH-203	25.0							19.9			
BH-203	28.0				2	17		23.6			
BH-203	30.0							27.7			
BH-203	33.0							29.1			
BH-203	38.0							29.4			
BH-204	0.0							13.9			
BH-204	2.0							21.1			
BH-204	4.0							15.0			
BH-204	6.0							16.6			
BH-204	8.0							13.5			

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SUMMARY OF LABORATORY RESULTS

CLIENT Luminant **PROJECT NAME** Pond Slope Stability
PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
BH-204	28.0				4.75	58		19.1			
BH-204	33.0							13.8			
BH-204	38.0							21.0			
BH-204	43.0	51	20	31				26.6			
BH-204	48.0							23.8			
BH-205	0.0							17.5			
BH-205	2.0							15.6			
BH-205	4.0							15.5			
BH-205	6.0							20.7			
BH-205	8.0							17.4			
BH-205	13.0	47	15	32				23.0			
BH-205	18.0							22.9			
BH-205	23.0	28	17	11				16.3			
BH-205	28.0				4.75	69		16.4			
BH-205	33.0							14.7			
BH-205	38.0							25.4			
BH-205	43.0							26.7			
BH-205	48.0							25.0			
BH-205	53.0				9.5	11		25.9			
BH-206	0.0							17.1			
BH-206	2.0	44	15	29				15.6			
BH-206	4.0							14.0			
BH-206	6.0							16.2			
BH-206	8.0							21.7			
BH-206	13.0							18.1			
BH-206	18.0							12.2			
BH-206	23.0							15.9			
BH-206	28.0	59	17	42				20.3			
BH-206	33.0							19.8			
BH-206	38.0							18.2			
BH-206	43.0							22.1			
BH-206	48.0							23.3			
BH-206	53.0							23.0			
BH-206	58.0							22.1			
BH-207	0.0							15.6			
BH-207	2.0							15.3			
BH-207	4.0							14.9			
BH-207	6.0							18.2			
BH-207	13.0							18.9			
BH-207	18.0							13.0			
BH-207	23.0							16.9			
BH-207	28.0	31	16	15				16.7			
BH-207	33.0							17.4			

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SUMMARY OF LABORATORY RESULTS

CLIENT Luminant **PROJECT NAME** Pond Slope Stability
PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
BH-207	38.0							19.0			
BH-207	43.0							21.8			
BH-207	48.0							22.2			
BH-207	53.0							25.2			
BH-207	58.0							29.8			
BH-208	0.0							20.2			
BH-208	2.0							16.2			
BH-208	4.0							12.9			
BH-208	6.0							11.5			
BH-208	8.0	28	15	13				15.2			
BH-208	13.0							15.9			
BH-208	18.0							20.2			
BH-208	23.0							18.0			
BH-208	28.0							21.3			
BH-208	33.0							18.1			
BH-208	38.0							19.1			
BH-208	43.0							23.7			
BH-208	48.0				4.75	11		24.5			
BH-208	53.0							27.1			
BH-208	58.0							26.1			
BH-209	0.0							9.0			
BH-209	2.0							11.8			
BH-209	4.0	62	21	41				11.8			
BH-209	6.0							12.1			
BH-209	8.0							19.2			
BH-209	13.0							12.3			
BH-209	18.0							21.0			
BH-209	28.0	41	15	26				23.3			
BH-209	33.0							20.0			
BH-209	35.0							21.2			
BH-209	38.0							17.9			
BH-209	43.0							24.0			
BH-209	48.0							21.2			
BH-210	0.0							8.2			
BH-210	2.0							10.7			
BH-210	4.0							13.4			
BH-210	6.0							14.4			
BH-210	8.0							15.7			
BH-210	13.0							21.3			
BH-210	18.0	36	14	22				22.9			
BH-210	23.0							25.0			
BH-210	28.0							18.5			
BH-210	33.0							19.3			

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SUMMARY OF LABORATORY RESULTS

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
BH-210	38.0							17.2			
BH-210	43.0							25.6			
BH-210	48.0				9.5	33		33.4			
BH-210	53.0							29.3			
BH-210	58.0							29.3			
BH-210	63.0							26.6			
BH-210	68.0							31.1			
BH-211	0.0							8.7			
BH-211	2.0							13.3			
BH-211	4.0							15.0			
BH-211	6.0							14.5			
BH-211	8.0							13.2			
BH-211	13.0							17.6			
BH-211	18.0	50	17	33				15.0			
BH-211	23.0							11.6			
BH-211	28.0				9.5	52		11.6			
BH-211	33.0							22.5			
BH-211	38.0							21.1			
BH-211	43.0							24.3			
BH-211	48.0							24.3			
BH-211	53.0							24.9			
BH-211	58.0							22.9			
BH-211	63.0							29.5			
BH-211	68.0							26.6			

APPENDIX C
LABORATORY TEST RESULTS

ATTERBERG LIMIT RESULTS

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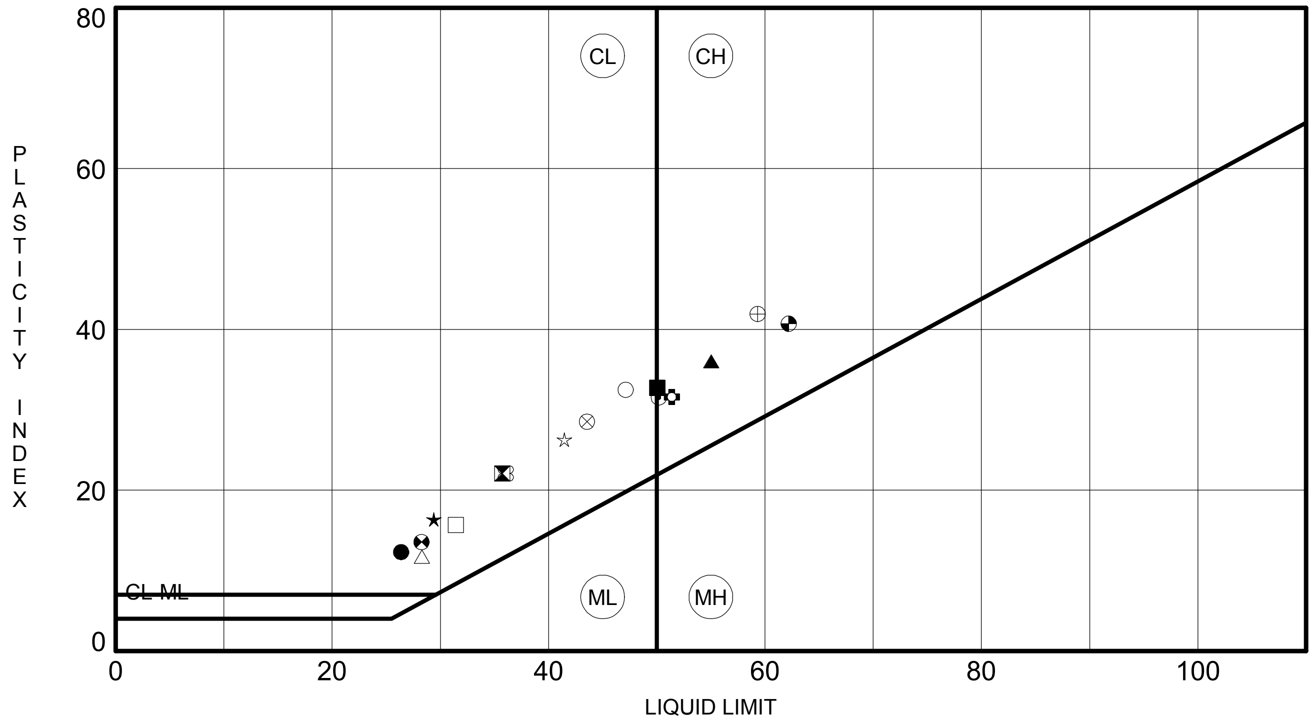
ATTERBERG LIMITS' RESULTS

CLIENT Luminant
PROJECT NAME Pond Slope Stability
PROJECT NUMBER 123-94128
PROJECT LOCATION Martin Lake



BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
● BH-201	6.0	26	14	12		
⧗ BH-201	23.0	36	14	22		
▲ BH-202	2.0	55	19	36		
★ BH-202	18.0	29	13	16		
⊙ BH-203	6.0	50	19	31		
✪ BH-204	43.0	51	20	31		
○ BH-205	13.0	47	15	32		
△ BH-205	23.0	28	17	11		
⊗ BH-206	2.0	44	15	29		
⊕ BH-206	28.0	59	17	42		
□ BH-207	28.0	31	16	15		
◉ BH-208	8.0	28	15	13		
◕ BH-209	4.0	62	21	41		
☆ BH-209	28.0	41	15	26		
✿ BH-210	18.0	36	14	22		
■ BH-211	18.0	50	17	33		

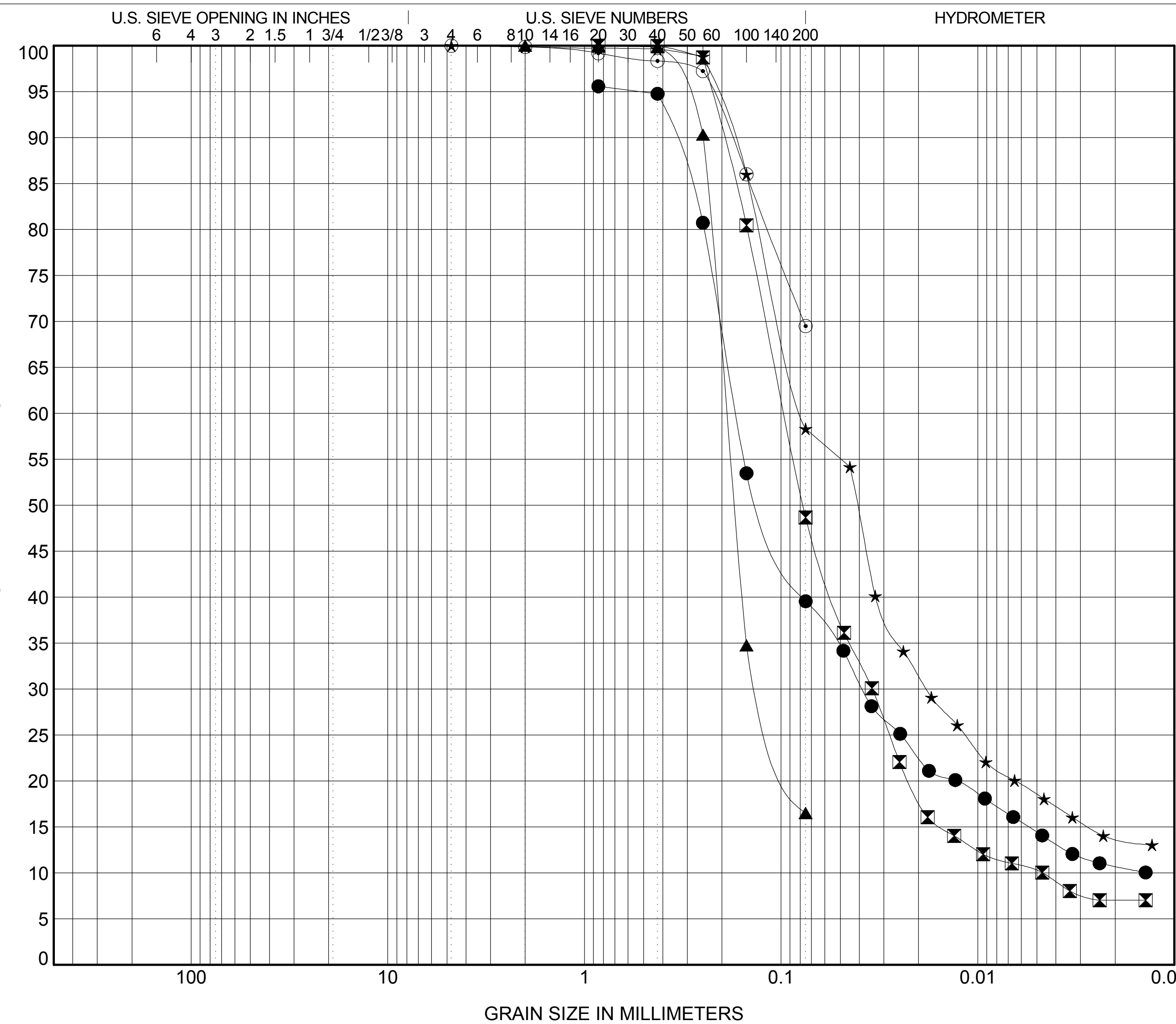
GRAIN SIZE ANALYSIS

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

GRAIN SIZE DISTRIBUTION

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake



	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**BH-201**	**38**						
⧗	**BH-202**	**28**					**2.63**	**20.54**
▲	**BH-203**	**28**						
★	**BH-204**	**28**						
⊙	**BH-205**	**28**						

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BH-201**	**38**	**0.85**	**0.169**	**0.038**			**56.0**	**25.1**	**14.4**
⧗	**BH-202**	**28**	**0.85**	**0.096**	**0.034**	**0.005**	**0.0**	**51.3**	**38.4**	**10.2**
▲	**BH-203**	**28**	**2**	**0.189**	**0.125**		**0.0**	**83.5**	**16.5**	
★	**BH-204**	**28**	**4.75**	**0.078**	**0.018**		**0.0**	**41.7**	**39.8**	**18.5**
⊙	**BH-205**	**28**	**4.75**				**0.0**	**30.5**	**69.5**	

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Houston, Texas 77073
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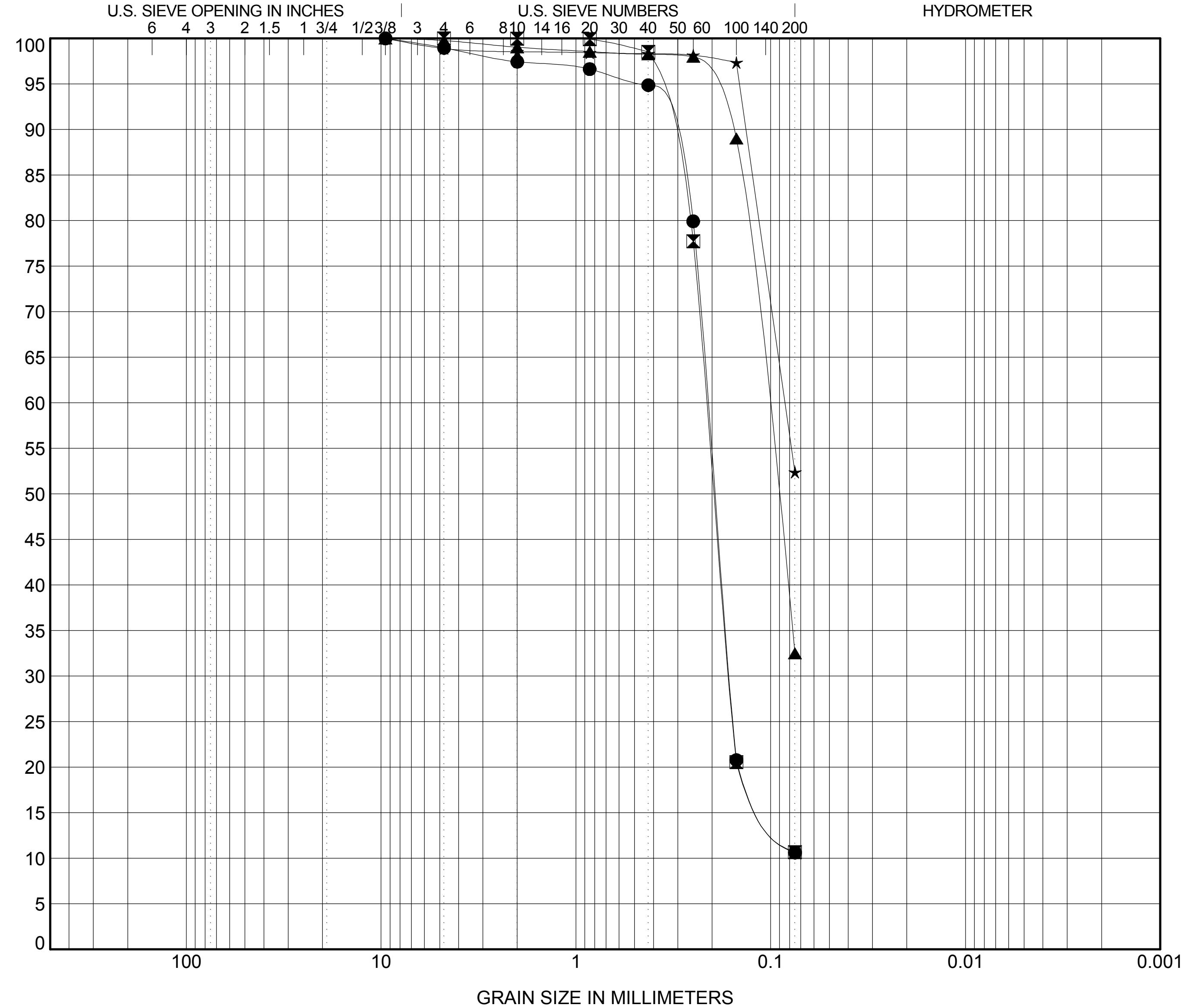
GRAIN SIZE DISTRIBUTION

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

PROJECT NUMBER 123-94128 **PROJECT LOCATION** Martin Lake



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

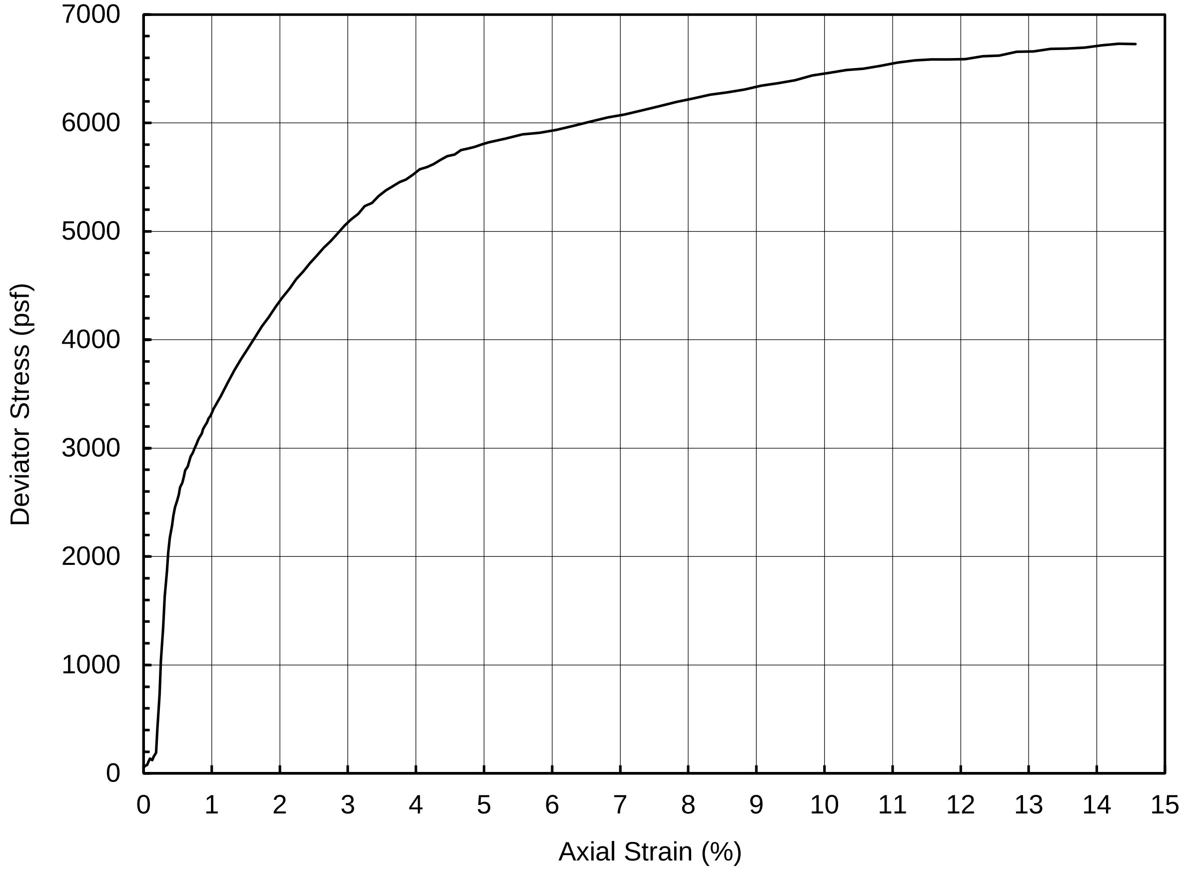
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**BH-205**	**53**					**1.74**	**2.93**
⧗	**BH-208**	**48**					**1.75**	**2.98**
▲	**BH-210**	**48**						
★	**BH-211**	**28**						

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BH-205**	**53**	**9.5**	**0.21**	**0.162**		**1.1**	**88.3**	**10.6**	
⧗	**BH-208**	**48**	**4.75**	**0.213**	**0.163**		**0.0**	**89.3**	**10.7**	
▲	**BH-210**	**48**	**9.5**	**0.105**			**0.2**	**67.2**	**32.5**	
★	**BH-211**	**28**	**9.5**	**0.084**			**1.1**	**46.5**	**52.4**	

GRAIN SIZE - CQA - GINT STD US LAB.GDT - 11/29/12 16:21 - P:_2012 PROJECT FOLDERS\123-94128 LUMINANT POND SLOPE STABILITY\MARTIN LAKE\94128MARTINLAKE.GPJ

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH (UU)

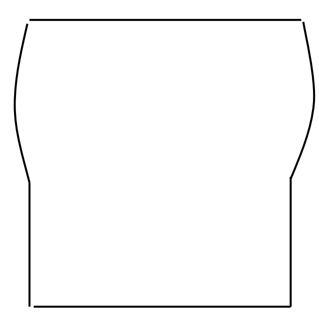
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Reddish Yellow Clay (visual classification)						
LL		PI		LI		USCS	

Depth (ft)	4.0	Confining Pressure (psf)	617
Specimen Height (inch)	6.0	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	6732
Initial Specimen Weight (g)	1263.7	Axial Strain at Peak Stress (%)	14.3
Moist Unit Weight (pcf)	131.9		
Initial Water Content (%)	15		
Initial Dry Unit Weight (pcf)	114.6		

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-201 TO-3
Comments	

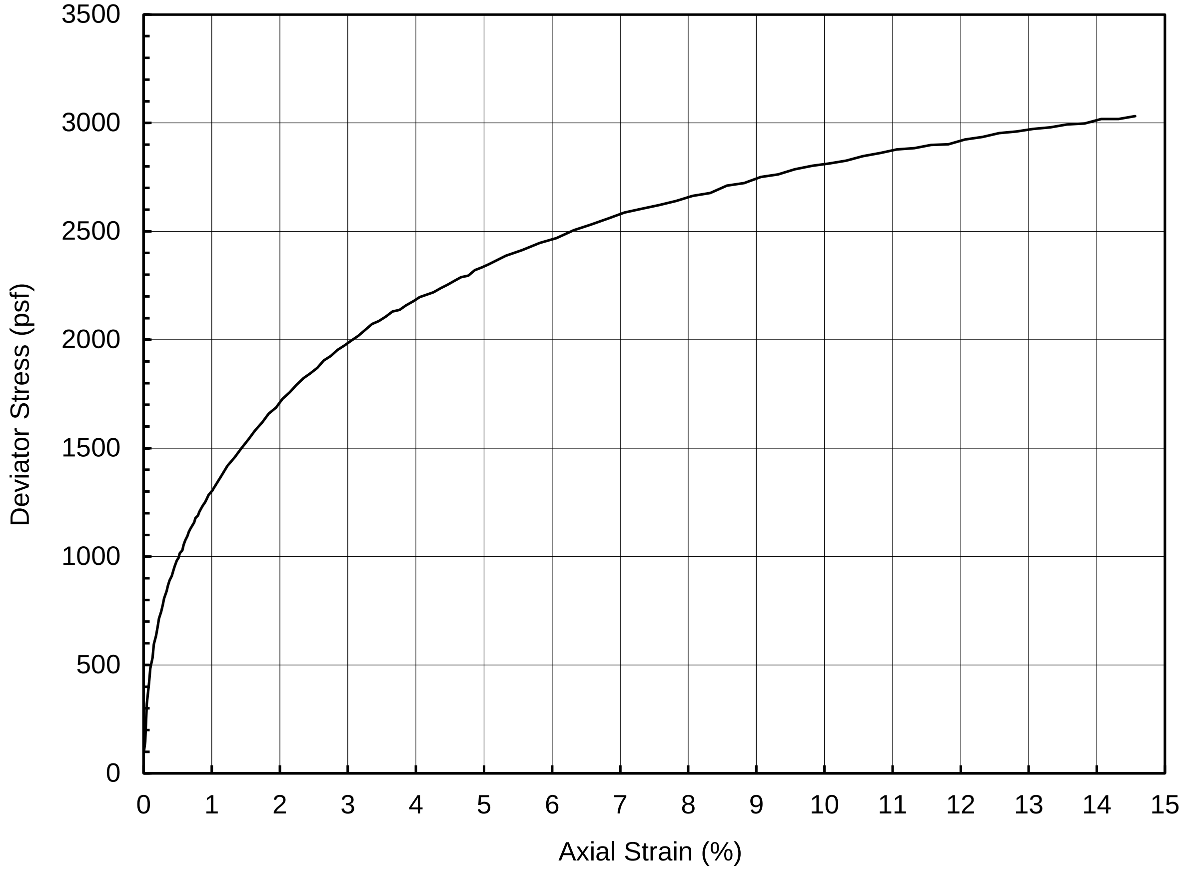


Failure Sketch

Golder Associates

Performed by	**PN**
Date	**12-Nov-12**
Check	**HR**
Review	**SBK**

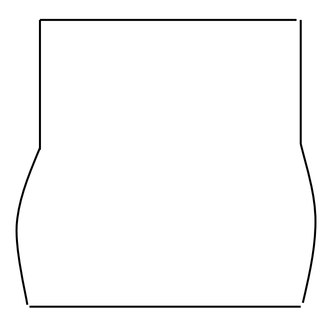
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Reddish Yellow Clay (visual classification)						
LL		PI		LI		USCS	

Depth (ft)	18.0	Confining Pressure (psf)	2371
Specimen Height (inch)	5.9	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	3035
Initial Specimen Weight (g)	1232.8	Axial Strain at Peak Stress (%)	14.8
Moist Unit Weight (pcf)	132.4		
Initial Water Content (%)	19		
Initial Dry Unit Weight (pcf)	111.7		

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-202 TO-7
Comments	

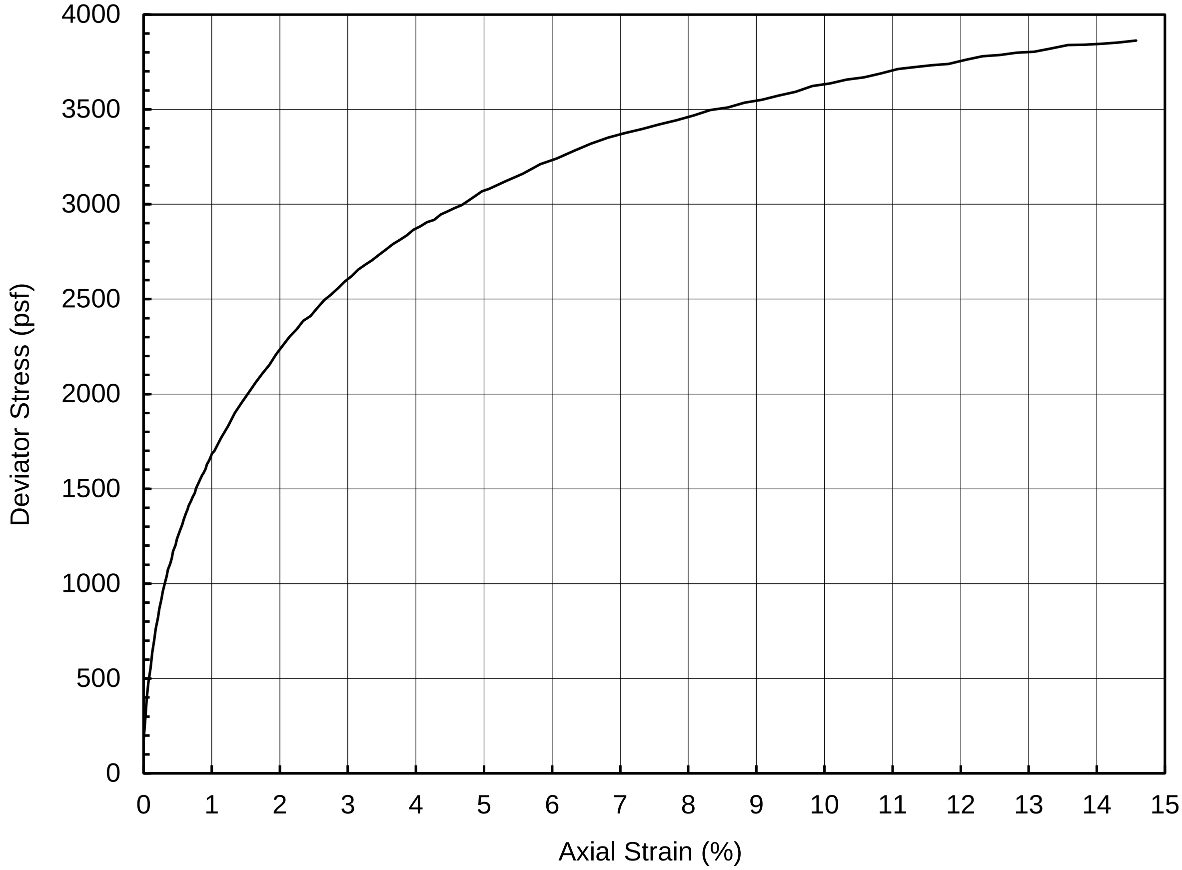


Failure Sketch

Golder Associates

Performed by	**PN**
Date	**13-Nov-12**
Check	**HR**
Review	**SBK**

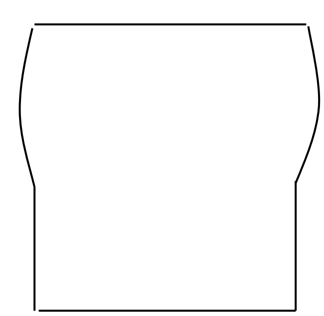
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Reddish Gray Clay (visual classification)						
LL		PI		LI		USCS	

Depth (ft)	6.0	Confining Pressure (psf)	858
Specimen Height (inch)	6.0	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	3877
Initial Specimen Weight (g)	1199.6	Axial Strain at Peak Stress (%)	14.8
Moist Unit Weight (pcf)	124.7		
Initial Water Content (%)	21		
Initial Dry Unit Weight (pcf)	102.7		

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-203 TO-4
Comments	

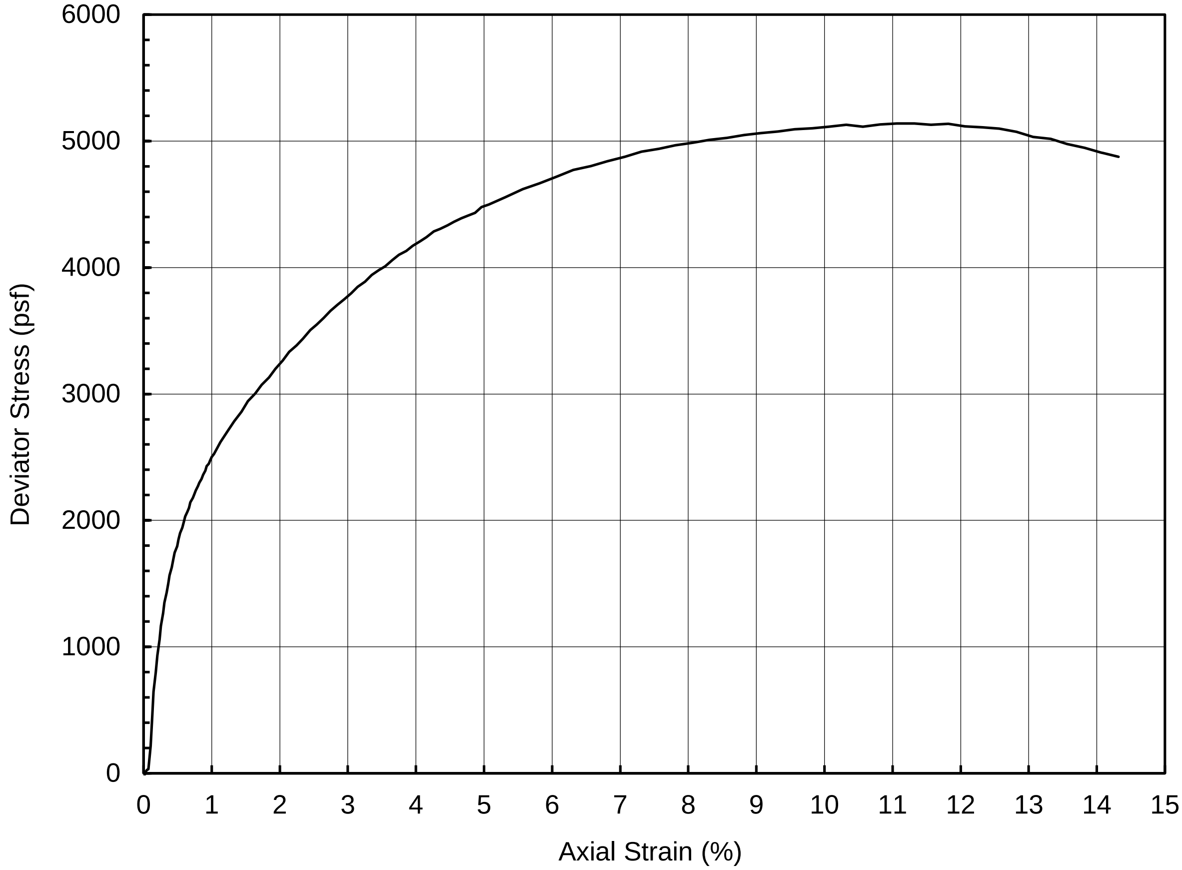


Failure Sketch

Golder Associates

Performed by	**PN**
Date	**13-Nov-12**
Check	**HR**
Review	**SBK**

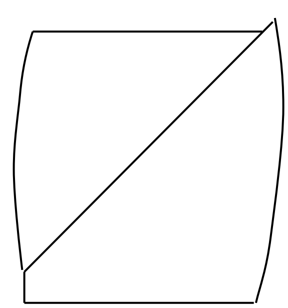
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Reddish Gray Clay (visual classification)						
LL		PI		LI		USCS	

Depth (ft)	23.0	Confining Pressure (psf)	3008
Specimen Height (inch)	6.0	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	5139
Initial Specimen Weight (g)	1192.8	Axial Strain at Peak Stress (%)	11.3
Moist Unit Weight (pcf)	126.6		
Initial Water Content (%)	26		
Initial Dry Unit Weight (pcf)	100.9		

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-204 TO-8
Comments	

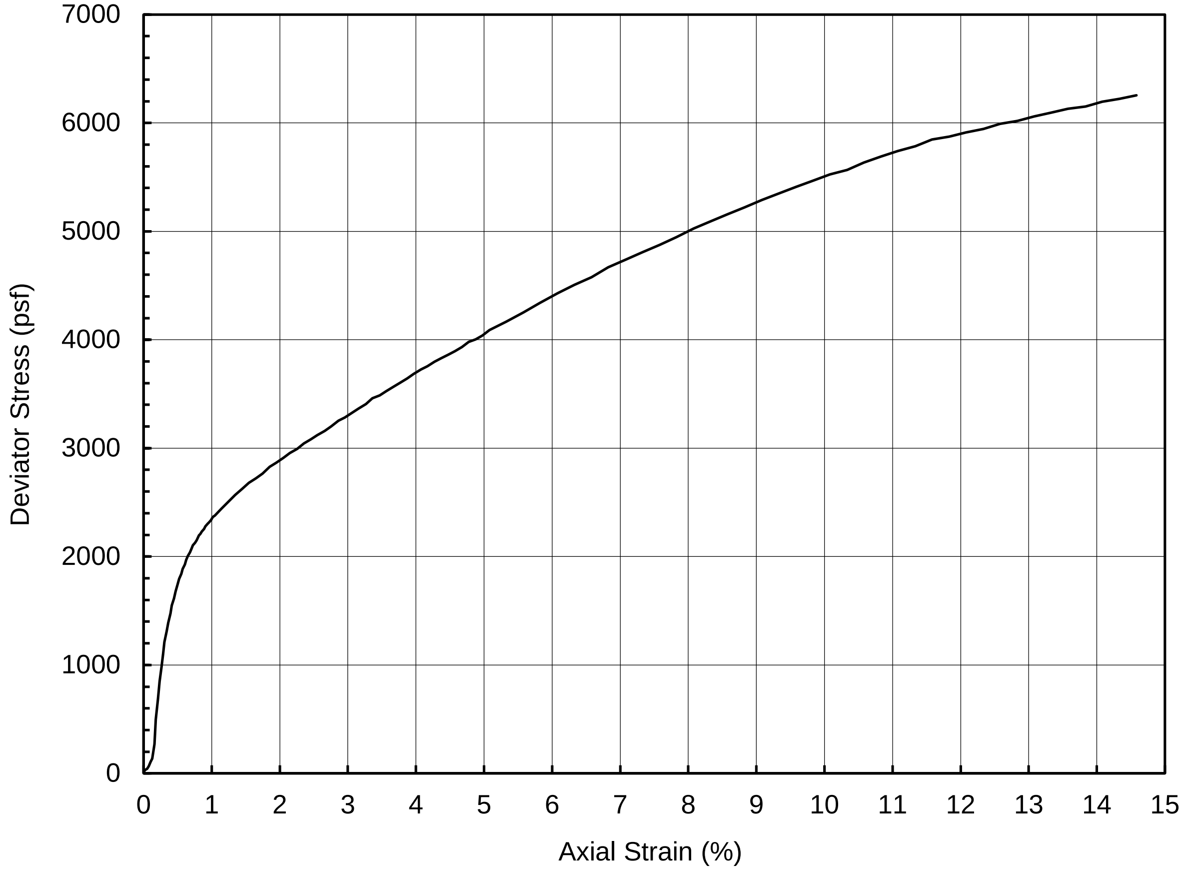


Failure Sketch

Golder Associates

Performed by	**PN**
Date	**13-Nov-12**
Check	**HR**
Review	**SBK**

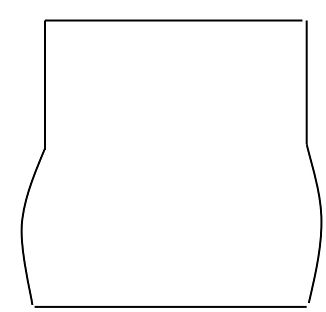
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Reddish Yellow Clay (visual classification)						
LL		PI		LI		USCS	

Depth (ft)	13.0	Confining Pressure (psf)	1760
Specimen Height (inch)	5.9	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	6270
Initial Specimen Weight (g)	1252.5	Axial Strain at Peak Stress (%)	14.8
Moist Unit Weight (pcf)	131.9		
Initial Water Content (%)	27		
Initial Dry Unit Weight (pcf)	104.1		

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-205 TO-6
Comments	

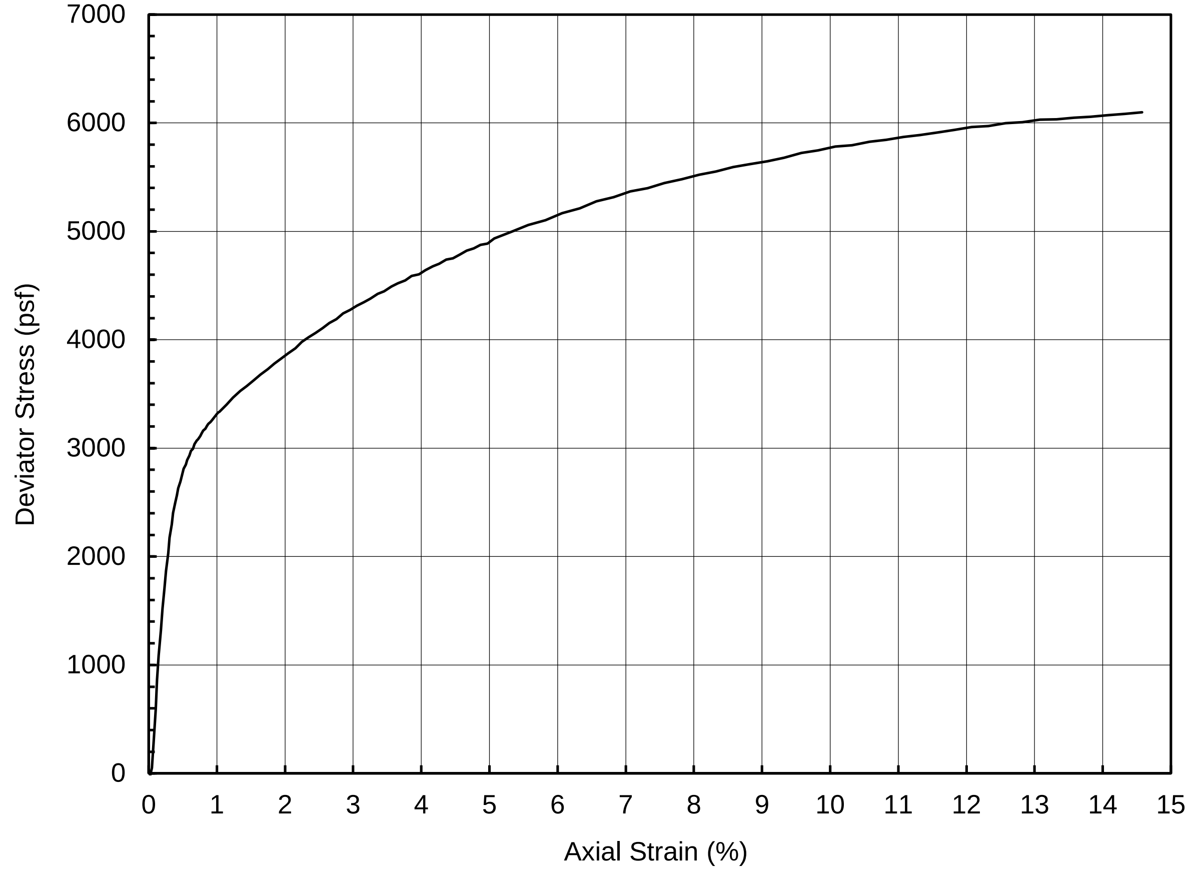


Failure Sketch

Golder Associates

Performed by	**PN**
Date	**13-Nov-12**
Check	**HR**
Review	**SBK**

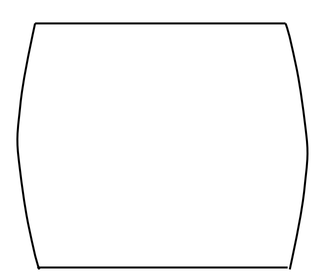
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Grayish Brown Fat Clay						
LL	59	PI	42	LI	0.1	USCS	CH

Depth (ft)	28.0	Confining Pressure (psf)	3627
Specimen Height (inch)	5.9	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	6110
Initial Specimen Weight (g)	1219.7	Axial Strain at Peak Stress (%)	14.8
Moist Unit Weight (pcf)	127.5		
Initial Water Content (%)	20		
Initial Dry Unit Weight (pcf)	106.6		

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-206 TO-9
Comments	

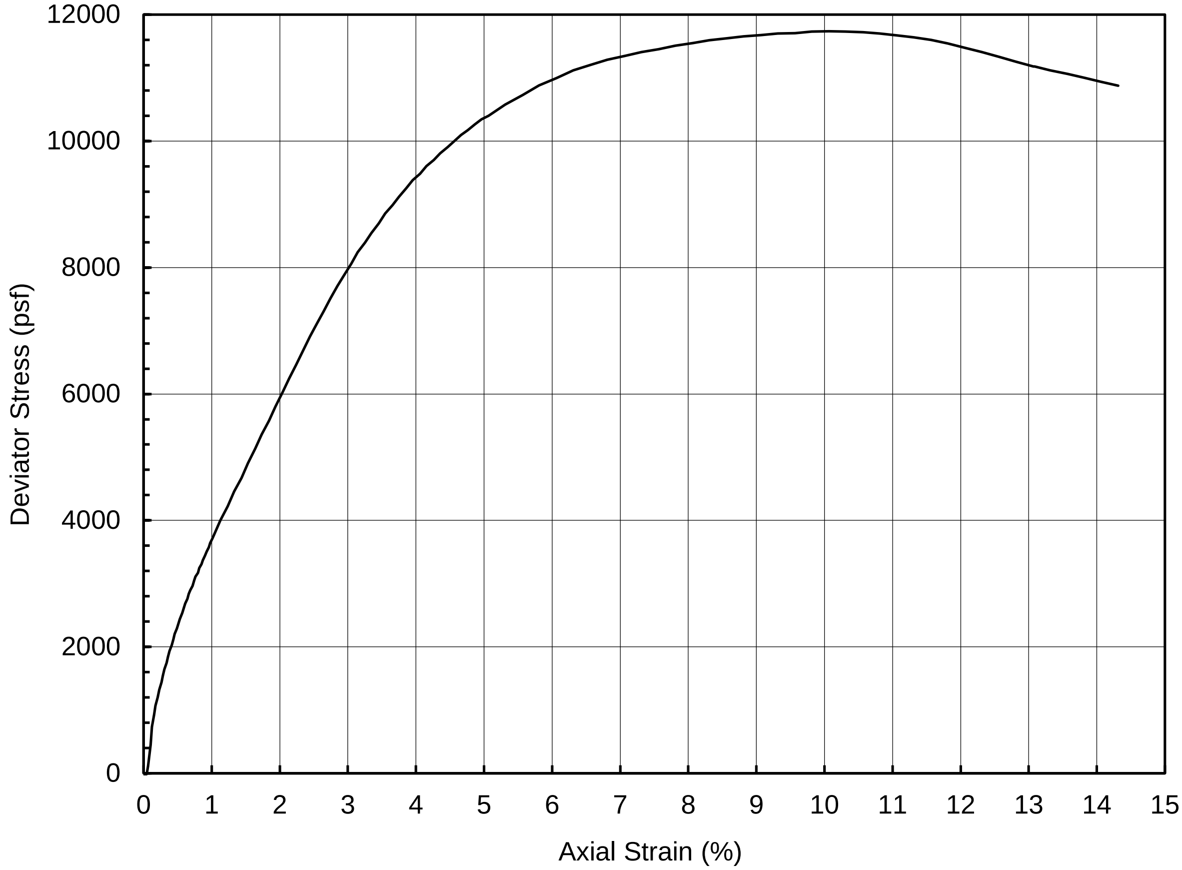


Failure Sketch

Golder Associates

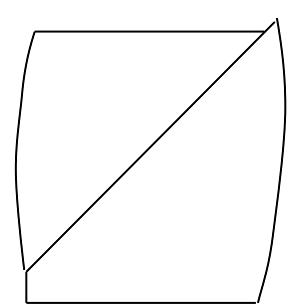
Performed by	**PN**
Date	**15-Nov-12**
Check	**HR**
Review	**JF**

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Grayish Brown Lean Clay						
LL	31	PI	15	LI	0.0	USCS	CL

Depth (ft)	28.0	Confining Pressure (psf)	3620
Specimen Height (inch)	5.9	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	11735
Initial Specimen Weight (g)	1251.9	Axial Strain at Peak Stress (%)	10.1
Moist Unit Weight (pcf)	127.7		
Initial Water Content (%)	16		
Initial Dry Unit Weight (pcf)	109.9		



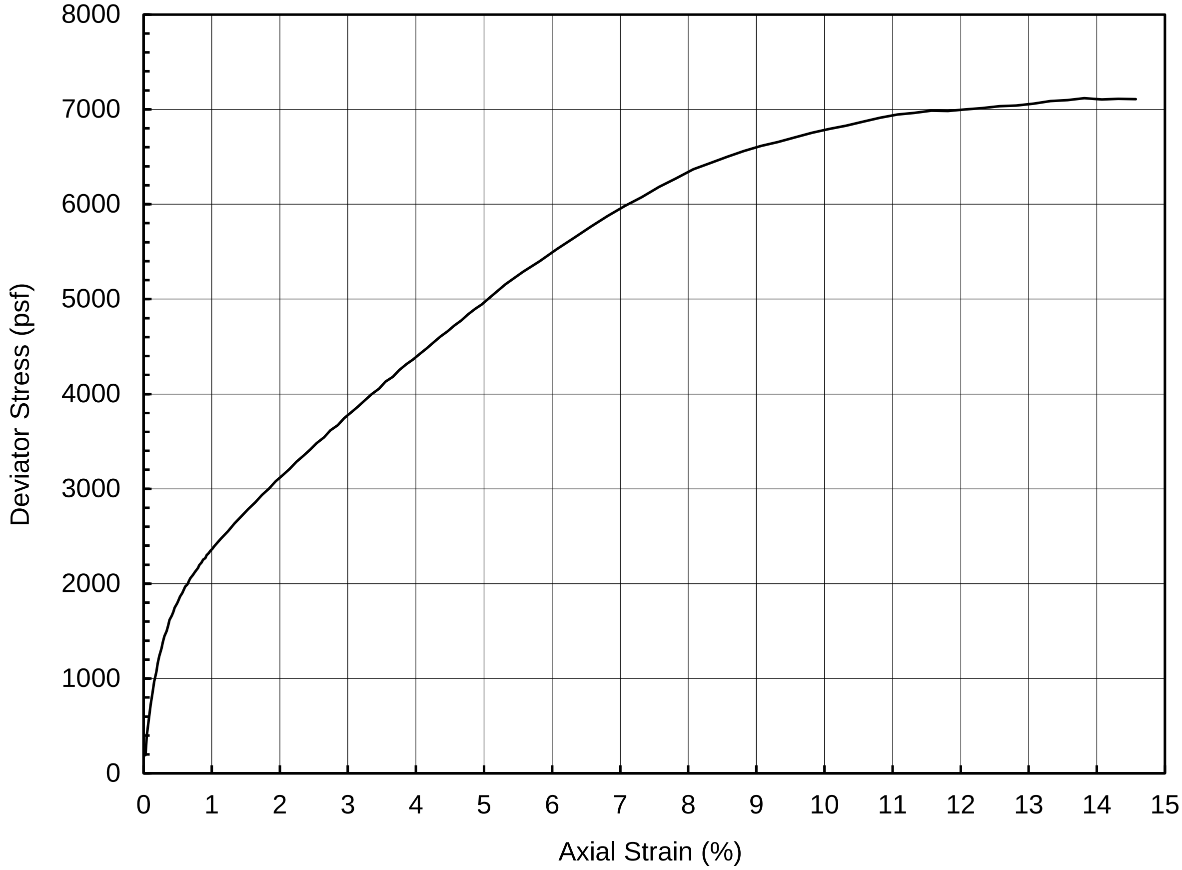
Failure Sketch

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-207 TO-9
Comments	

Golder Associates

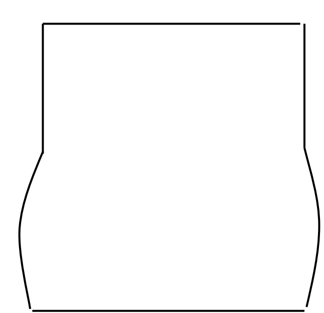
Performed by	**PN**
Date	**15-Nov-12**
Check	**HR**
Review	**JF**

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Reddish Yellow Lean Clay						
LL	28	PI	13	LI	0.0	USCS	CL

Depth (ft)	8.0	Confining Pressure (psf)	1046
Specimen Height (inch)	5.9	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	7118
Initial Specimen Weight (g)	1287.7	Axial Strain at Peak Stress (%)	13.8
Moist Unit Weight (pcf)	138.1		
Initial Water Content (%)	14		
Initial Dry Unit Weight (pcf)	120.7		

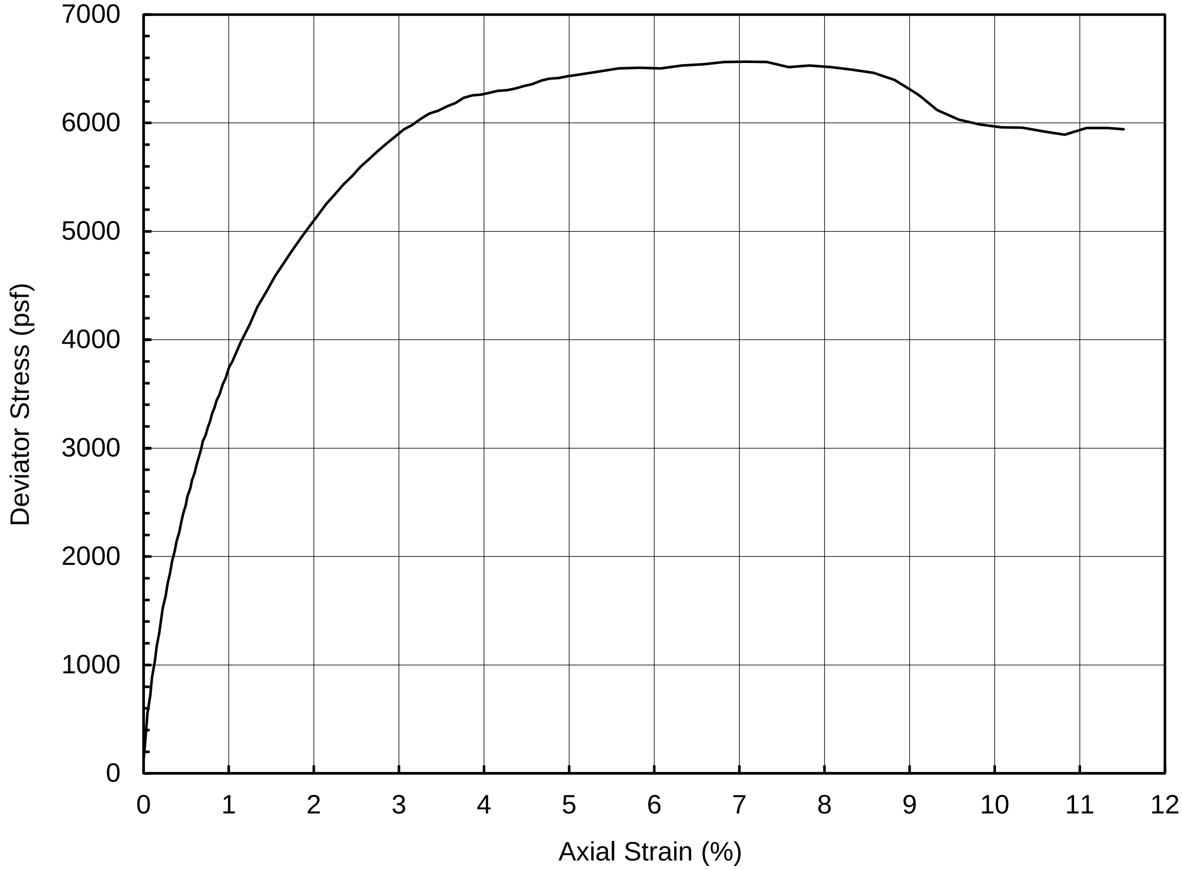

Failure Sketch

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-208 TO-5
Comments	

Golder Associates

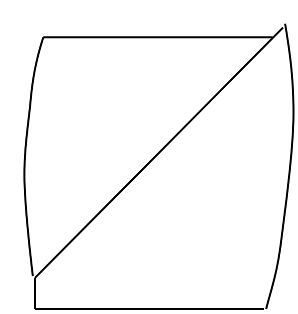
Performed by	**PN**
Date	**16-Nov-12**
Check	**HR**
Review	**JF**

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Grayish Brown Lean Clay						
LL	41	PI	26	LI	0.3	USCS	CL

Depth (ft)	28.0	Confining Pressure (psf)	3624
Specimen Height (inch)	6.0	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	6566
Initial Specimen Weight (g)	1202.8	Axial Strain at Peak Stress (%)	7.1
Moist Unit Weight (pcf)	128.0		
Initial Water Content (%)	22		
Initial Dry Unit Weight (pcf)	104.7		



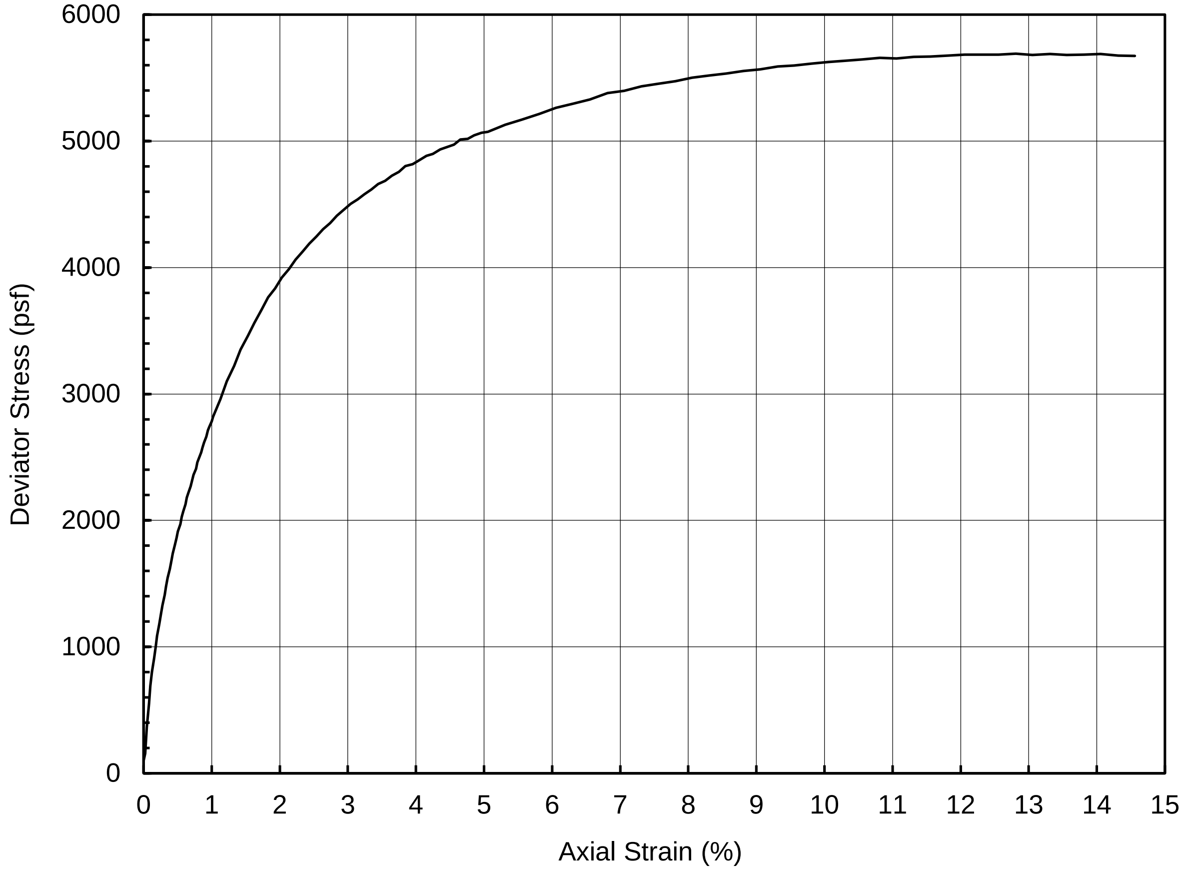
Failure Sketch

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-209 TO-9
Comments	

Golder Associates

Performed by	**PN**
Date	**16-Nov-12**
Check	**HR**
Review	**JF**

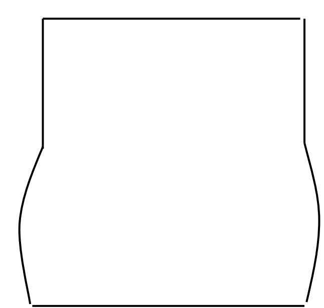
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Reddish Gray Lean Clay						
LL	36	PI	22	LI	0.5	USCS	CL

Depth (ft)	18.0	Confining Pressure (psf)	2375
Specimen Height (inch)	6.0	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.8	Peak Deviator Stress (psf)	5691
Initial Specimen Weight (g)	1192.0	Axial Strain at Peak Stress (%)	12.8
Moist Unit Weight (pcf)	126.7		
Initial Water Content (%)	24		
Initial Dry Unit Weight (pcf)	102.2		

Project Title	Luminant - Martin Lake Slope Stability
Project Number	123-94128
Sample Type	Shelby Tube
Sample ID	BH-210 TO-7
Comments	



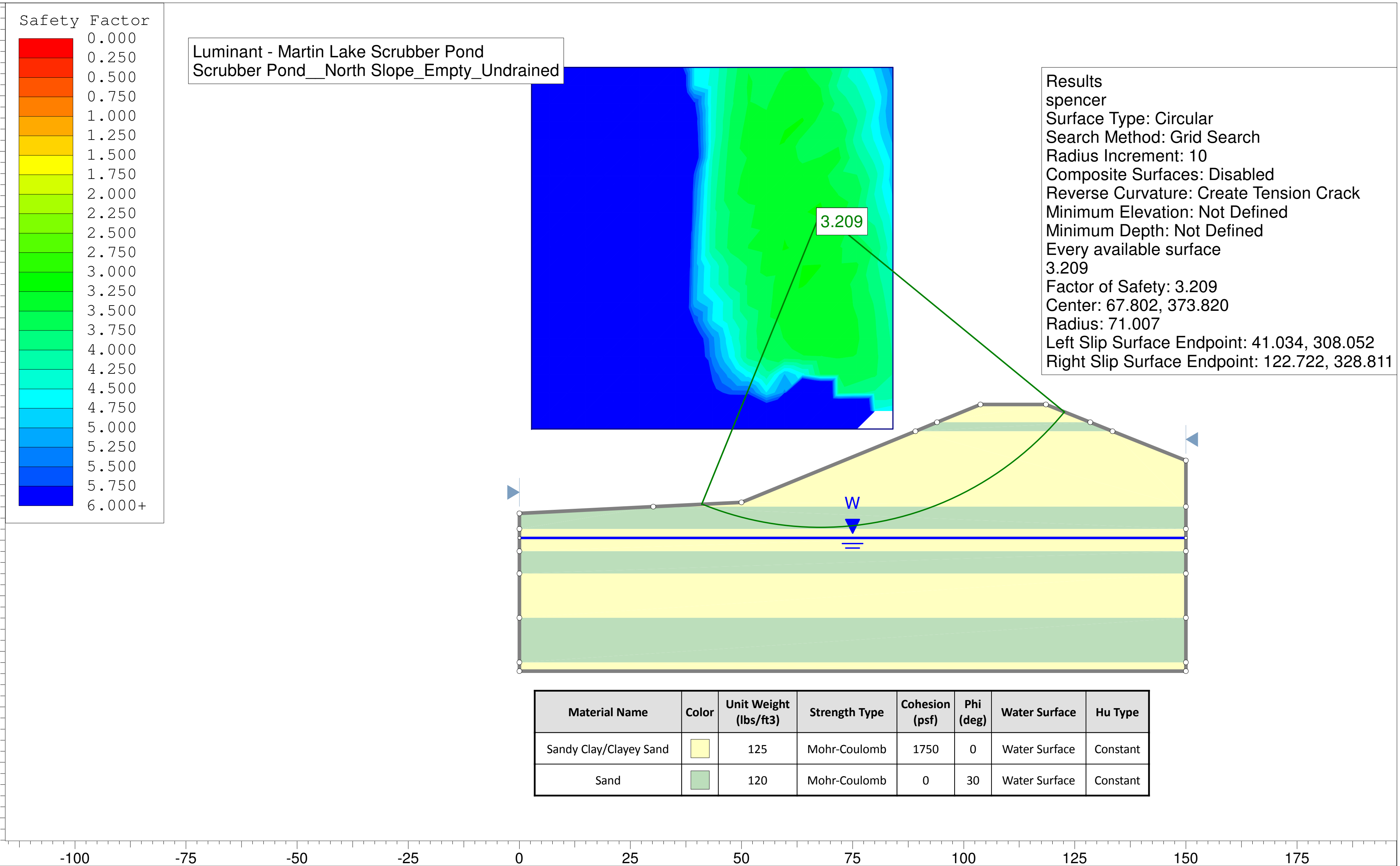
Failure Sketch

Golder Associates

Performed by	**PN**
Date	**16-Nov-12**
Check	**HR**
Review	**JF**

APPENDIX D
SLOPE STABILITY CALCULATIONS

CASE 1



Results
spencer
Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined
Every available surface
3.209
Factor of Safety: 3.209
Center: 67.802, 373.820
Radius: 71.007
Left Slip Surface Endpoint: 41.034, 308.052
Right Slip Surface Endpoint: 122.722, 328.811

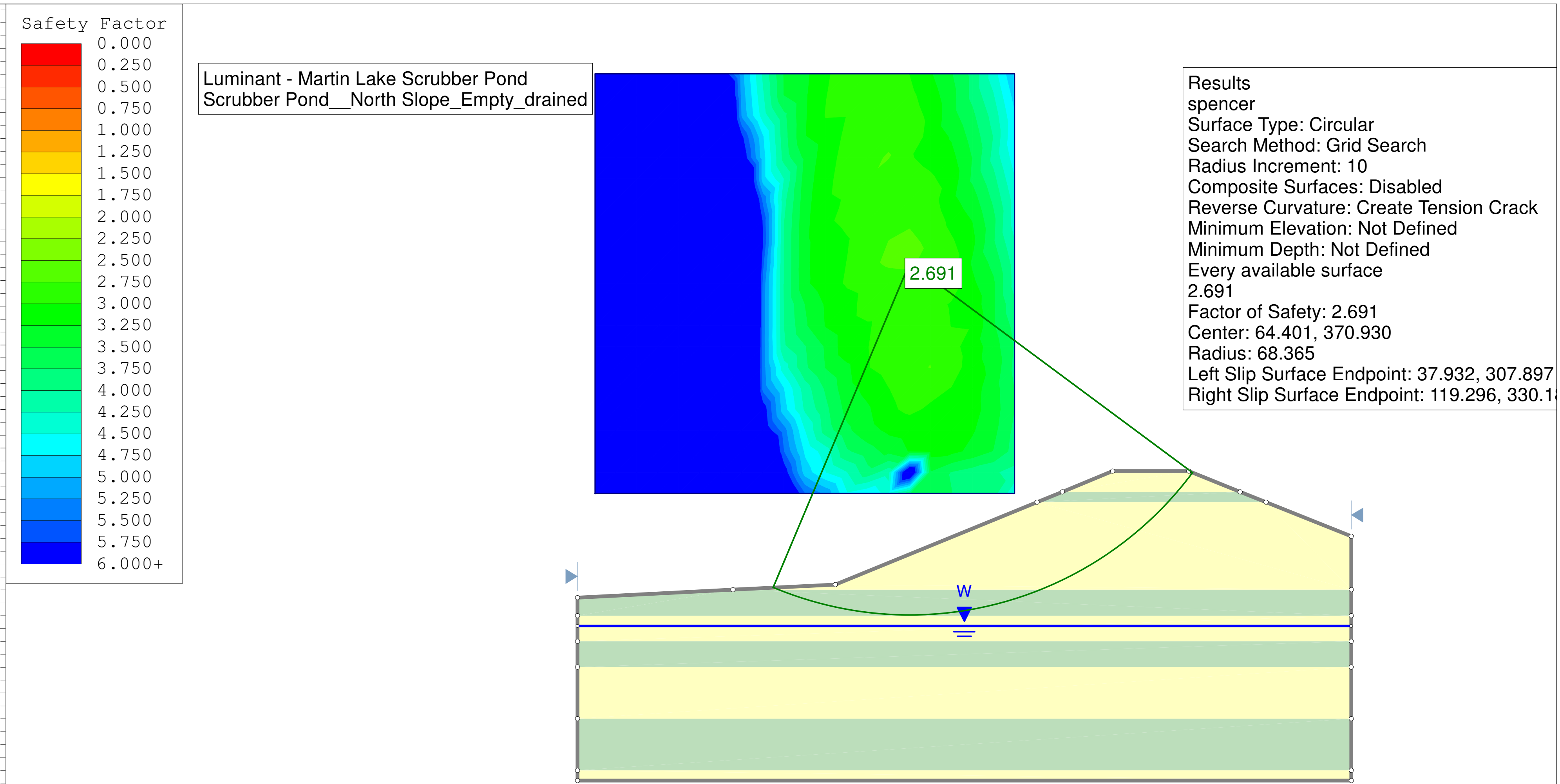
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Sandy Clay/Clayey Sand		125	Mohr-Coulomb	1750	0	Water Surface	Constant
Sand		120	Mohr-Coulomb	0	30	Water Surface	Constant

rocscience

IDEINTERPRET 6.019

Project	Luminant - Martin Lake Scrubber Pond		
Analysis Description	Scrubber Pond__North Slope_Empty_Undrained		
Drawn By M Pascal	*Scale* 1:365	*Company*	Golder Associates Inc
Date	11/30/2012, 10:36:53 AM	*File Name*	Scrubber pond_North Slope_empty_undrained.slim

CASE 2



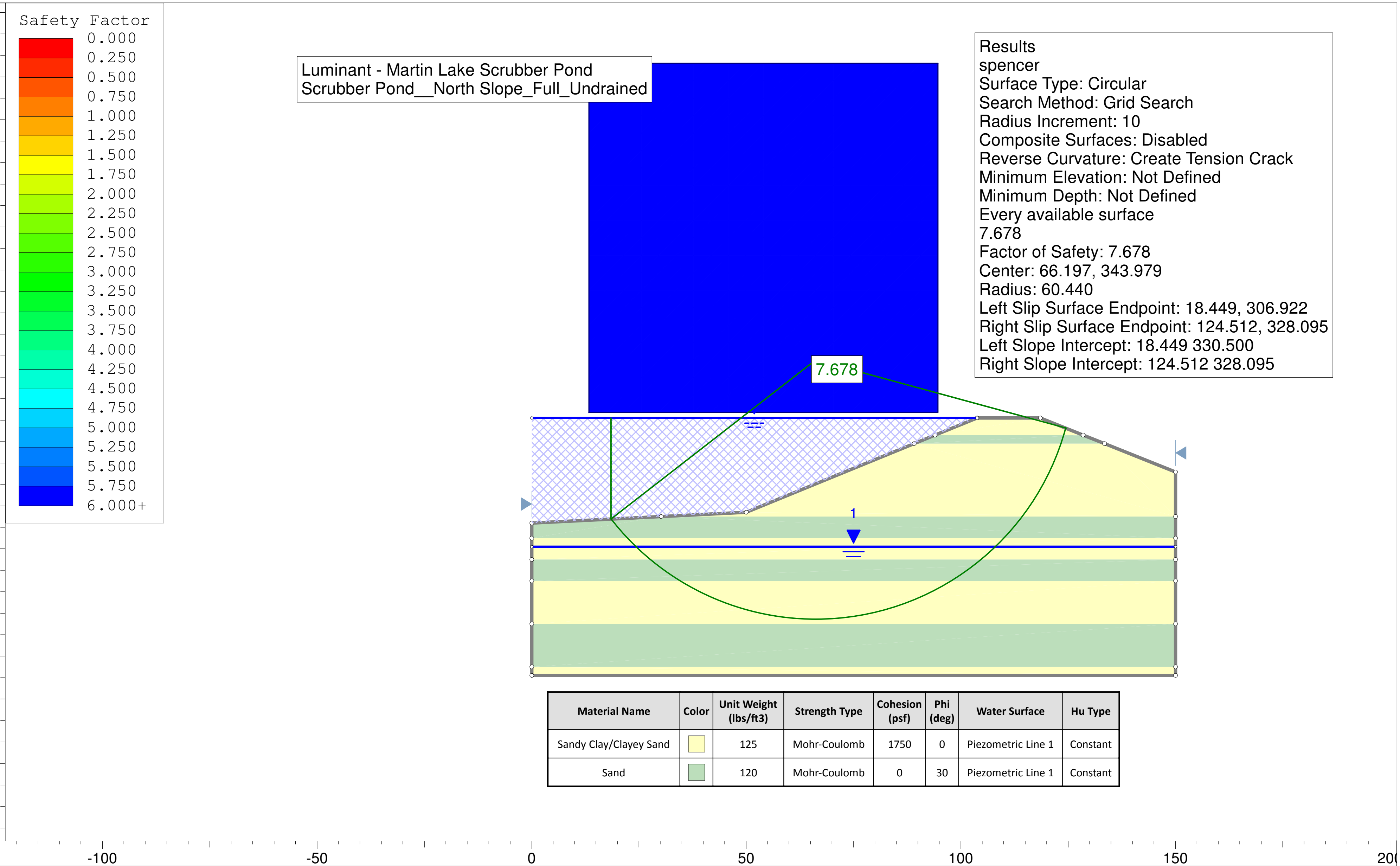
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Sandy Clay/Clayey Sand		125	Mohr-Coulomb	1000	14	Water Surface	Constant
Sand		120	Mohr-Coulomb	0	30	Water Surface	Constant

Project	Luminant - Martin Lake Scrubber Pond		
Analysis Description	Scrubber Pond__North Slope_Empty_drained		
Drawn By M Pascal	*Scale* 1:350	*Company*	Golder Associates Inc
Date 11/30/2012, 10:36:53 AM		*File Name*	Scrubber pond_North Slope_empty_drained.slim

rocscience

IDEINTERPRET 6.019

CASE 3

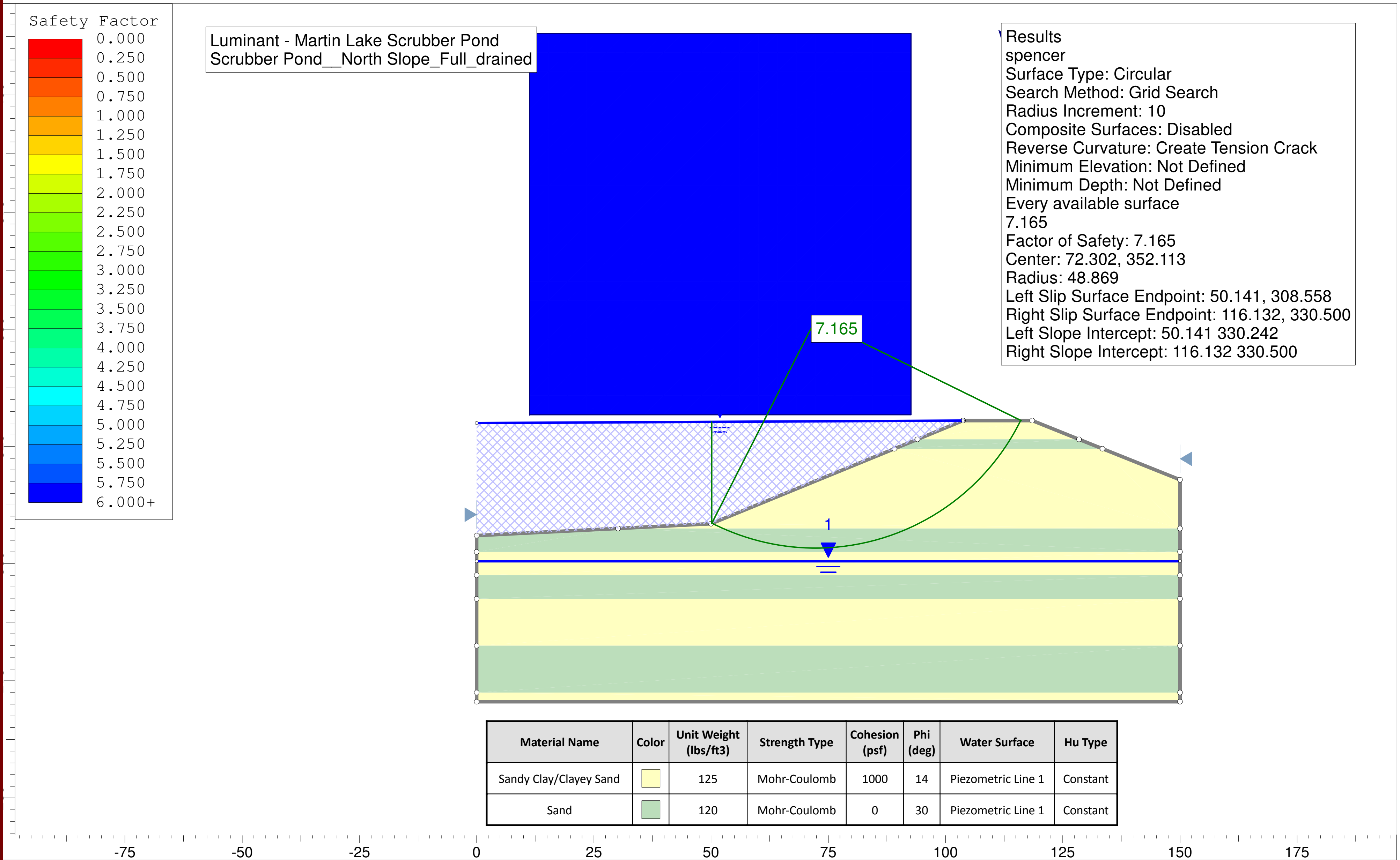


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Sandy Clay/Clayey Sand		125	Mohr-Coulomb	1750	0	Piezometric Line 1	Constant
Sand		120	Mohr-Coulomb	0	30	Piezometric Line 1	Constant

Project	Luminant - Martin Lake Scrubber Pond		
Analysis Description	Scrubber Pond__North Slope_Full_Undrained		
Drawn By M Pascal	*Scale* 1:377	*Company*	Golder Associates Inc
Date 11/30/2012, 10:36:53 AM		*File Name*	Scrubber pond_North Slope_full_undrained.slim

IDEINTERPRET 6.019

CASE 4



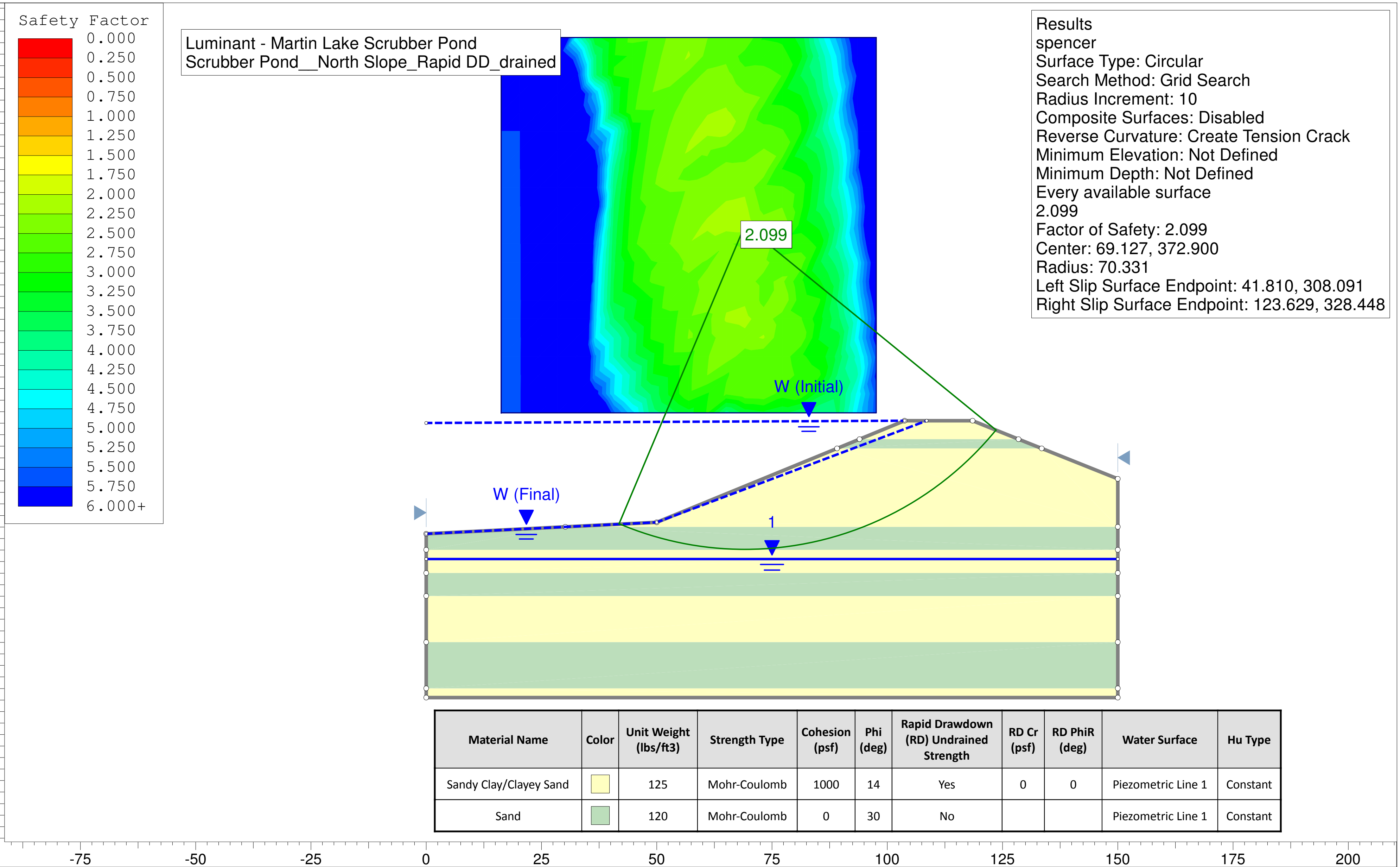
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Sandy Clay/Clayey Sand		125	Mohr-Coulomb	1000	14	Piezometric Line 1	Constant
Sand		120	Mohr-Coulomb	0	30	Piezometric Line 1	Constant

rocscience

SLIDEINTERPRET 6.019

Project	Luminant - Martin Lake Scrubber Pond		
Analysis Description	Scrubber Pond__North Slope_Full_drained		
Drawn By M Pascal	*Scale* 1:343	*Company*	Golder Associates Inc
Date	11/30/2012, 10:36:53 AM	*File Name*	Scrubber pond_North Slope_full_drained.slim

CASE 5



Results
spencer
Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined
Every available surface
2.099
Factor of Safety: 2.099
Center: 69.127, 372.900
Radius: 70.331
Left Slip Surface Endpoint: 41.810, 308.091
Right Slip Surface Endpoint: 123.629, 328.448

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Rapid Drawdown (RD) Undrained Strength	RD Cr (psf)	RD PhiR (deg)	Water Surface	Hu Type
Sandy Clay/Clayey Sand		125	Mohr-Coulomb	1000	14	Yes	0	0	Piezometric Line 1	Constant
Sand		120	Mohr-Coulomb	0	30	No			Piezometric Line 1	Constant

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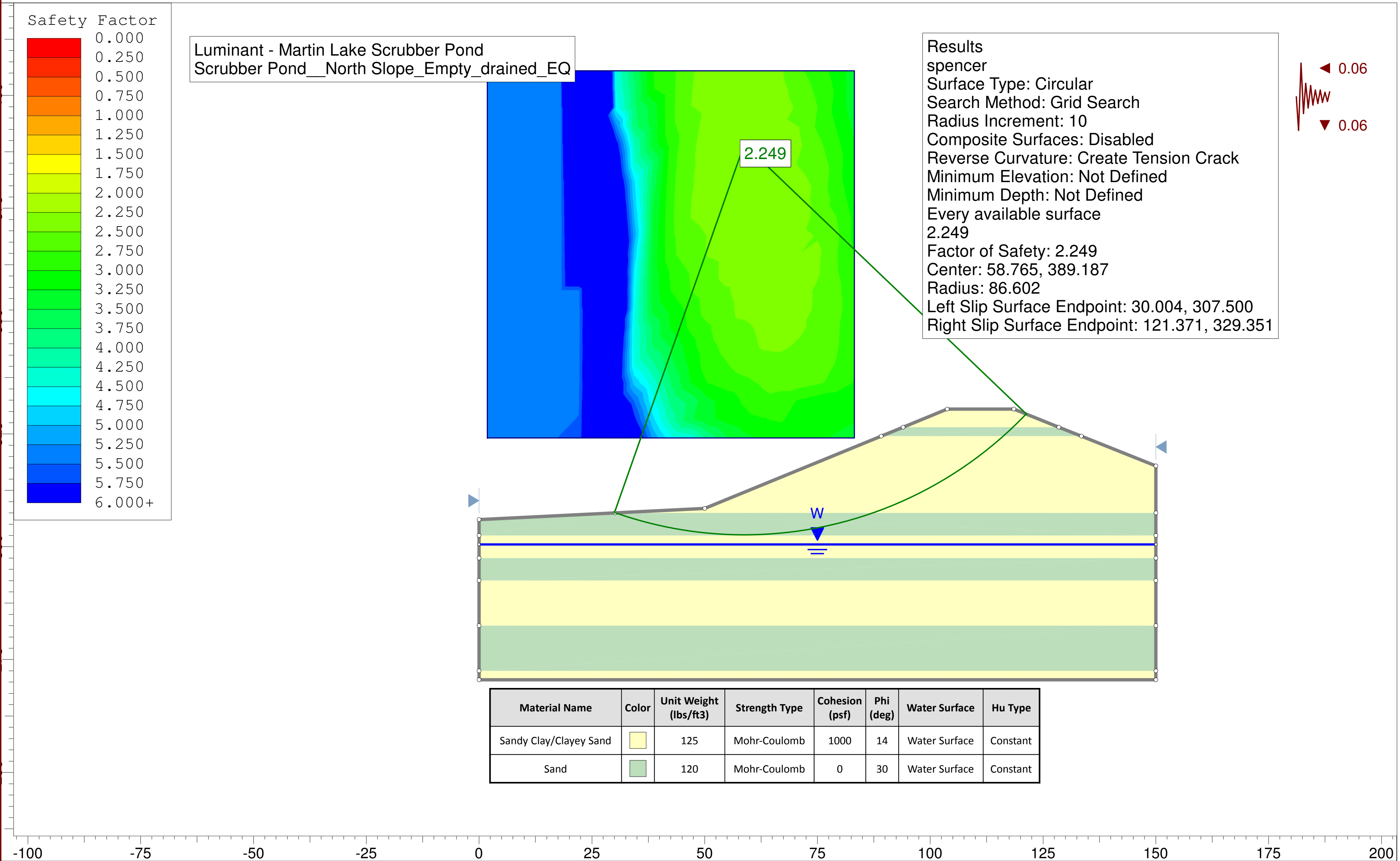
SLIDEINTERPRET 6.019

Project	Luminant - Martin Lake Scrubber Pond
Analysis Description	Scrubber Pond__North Slope_Rapid DD_drained
Drawn By M Pascal	*Scale* 1:352
Company	Golder Associates Inc
Date 11/30/2012, 10:36:53 AM	*File Name* Scrubber pond_North Slope_rapid DD_drained.slim

CASE 6



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Sandy Clay/Clayey Sand		125	Mohr-Coulomb	1000	14	Water Surface	Constant
Sand		120	Mohr-Coulomb	0	30	Water Surface	Constant

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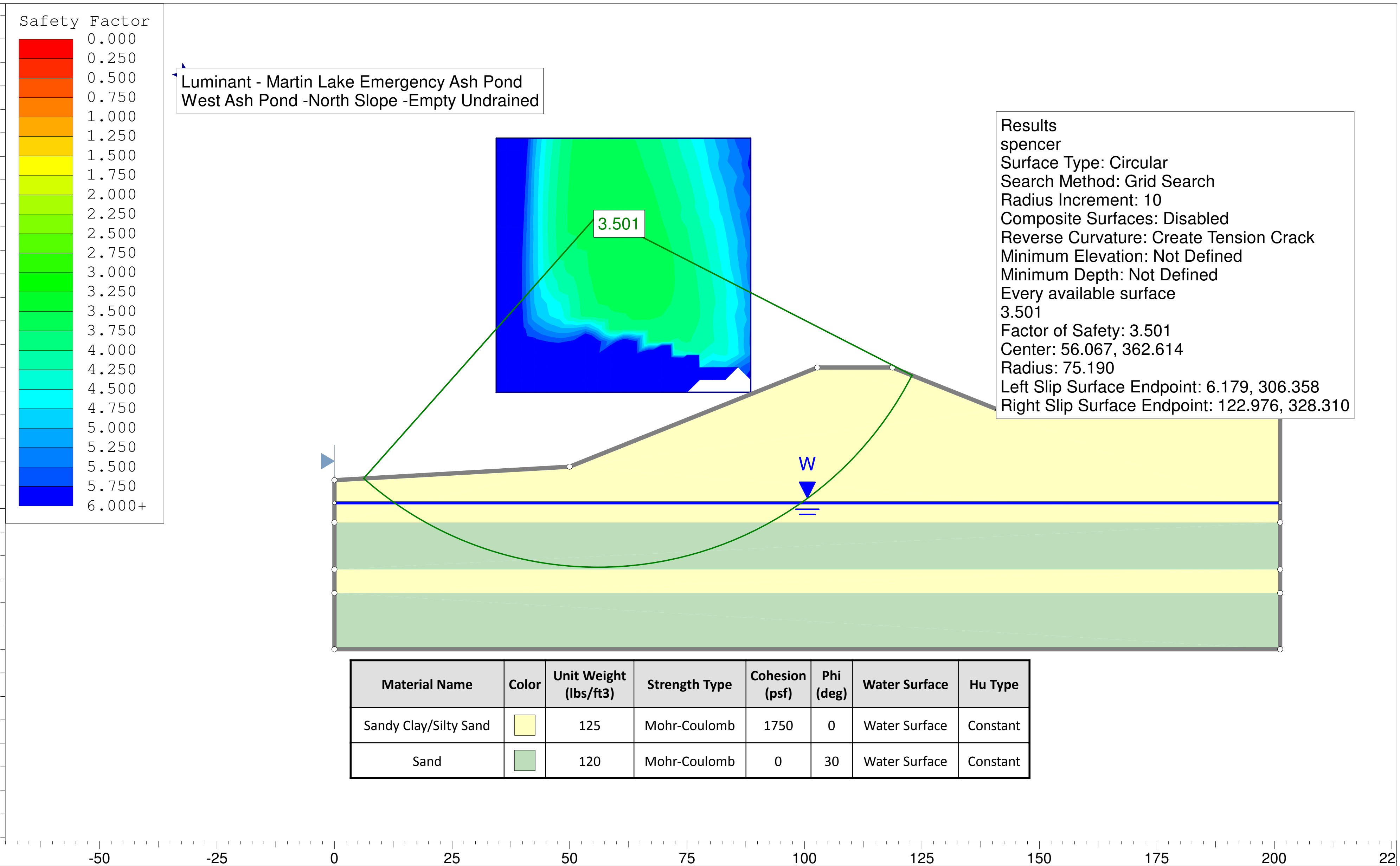
SLIDEINTERPRET 6.019

Project	Luminant - Martin Lake Scrubber Pond
Analysis Description	Scrubber Pond__North Slope_Empty_drained_EQ
Drawn By	M Pascal
Scale	1:357
Company	Golder Associates Inc
Date	11/30/2012, 10:36:53 AM
File Name	Scrubber pond_North Slope_empty_drained_EQ.slim

CASE 7



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Sandy Clay/Silty Sand		125	Mohr-Coulomb	1750	0	Water Surface	Constant
Sand		120	Mohr-Coulomb	0	30	Water Surface	Constant

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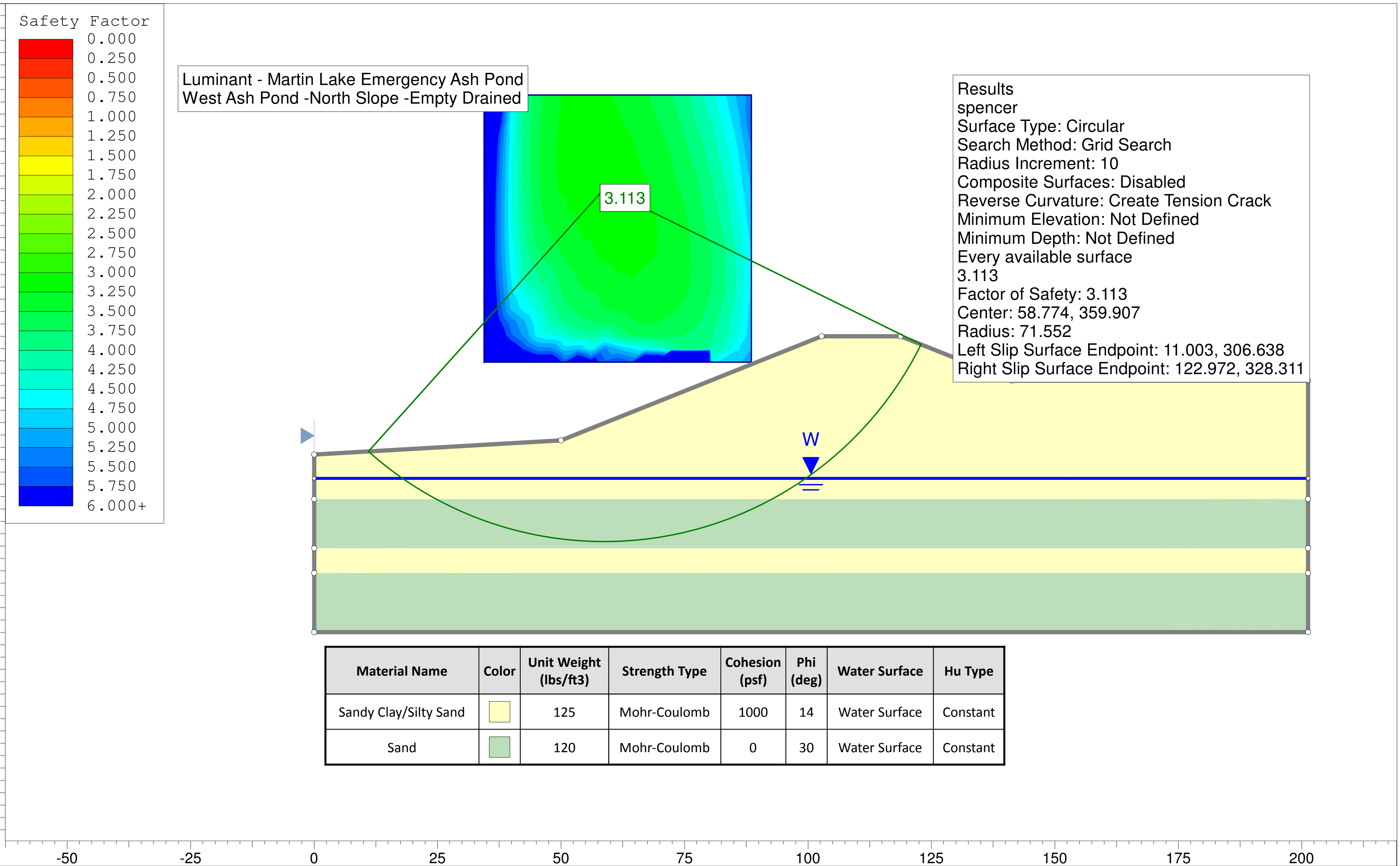
SLIDEINTERPRET 6.019

Project	Luminant - Martin Lake Emergency Ash Pond
Analysis Description	West Ash Pond -North Slope -Empty Undrained
Drawn By	M Pascal
Scale	1:345
Company	Golder Associates Inc.
Date	11/30/2012, 9:47:32 AM
File Name	West Ash pond_north Slope_empty_undrained.slim

CASE 8



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Sandy Clay/Silty Sand		125	Mohr-Coulomb	1000	14	Water Surface	Constant
Sand		120	Mohr-Coulomb	0	30	Water Surface	Constant

Project	Luminant - Martin Lake Emergency Ash Pond
Analysis Description	West Ash Pond -North Slope -Empty Drained
Drawn By	M Pascal
Scale	1:328
Company	Golder Associates Inc.
Date	11/30/2012, 9:47:32 AM
File Name	West Ash pond_north Slope_empty_drained.slim

IDEINTERPRET 6.019

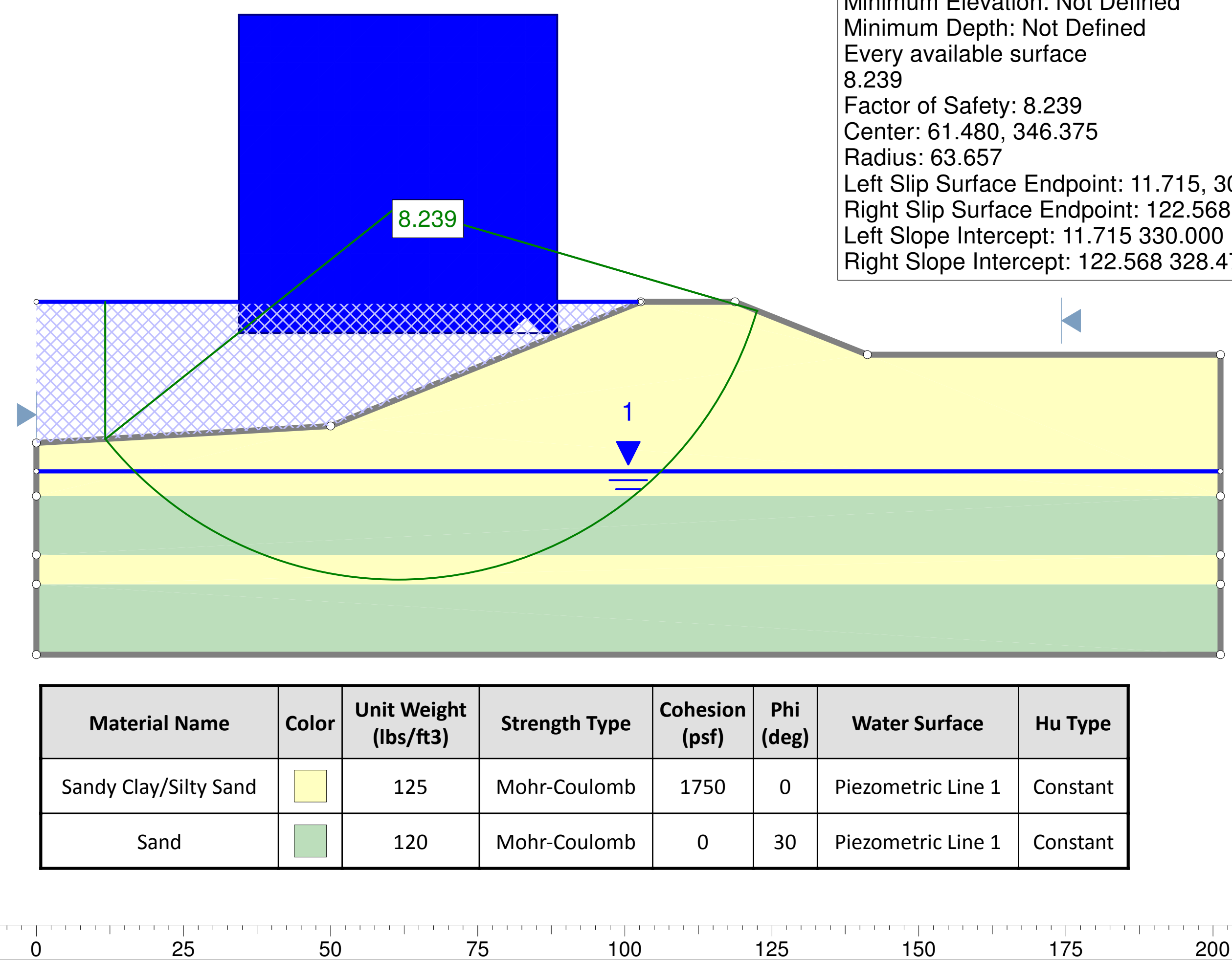
CASE 9

Safety Factor

Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+

Luminant - Martin Lake Emergency Ash Pond
West Ash Pond -North Slope -Full_Undrained

Results
spencer
Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined
Every available surface
8.239
Factor of Safety: 8.239
Center: 61.480, 346.375
Radius: 63.657
Left Slip Surface Endpoint: 11.715, 306.679
Right Slip Surface Endpoint: 122.568, 328.473
Left Slope Intercept: 11.715 330.000
Right Slope Intercept: 122.568 328.473

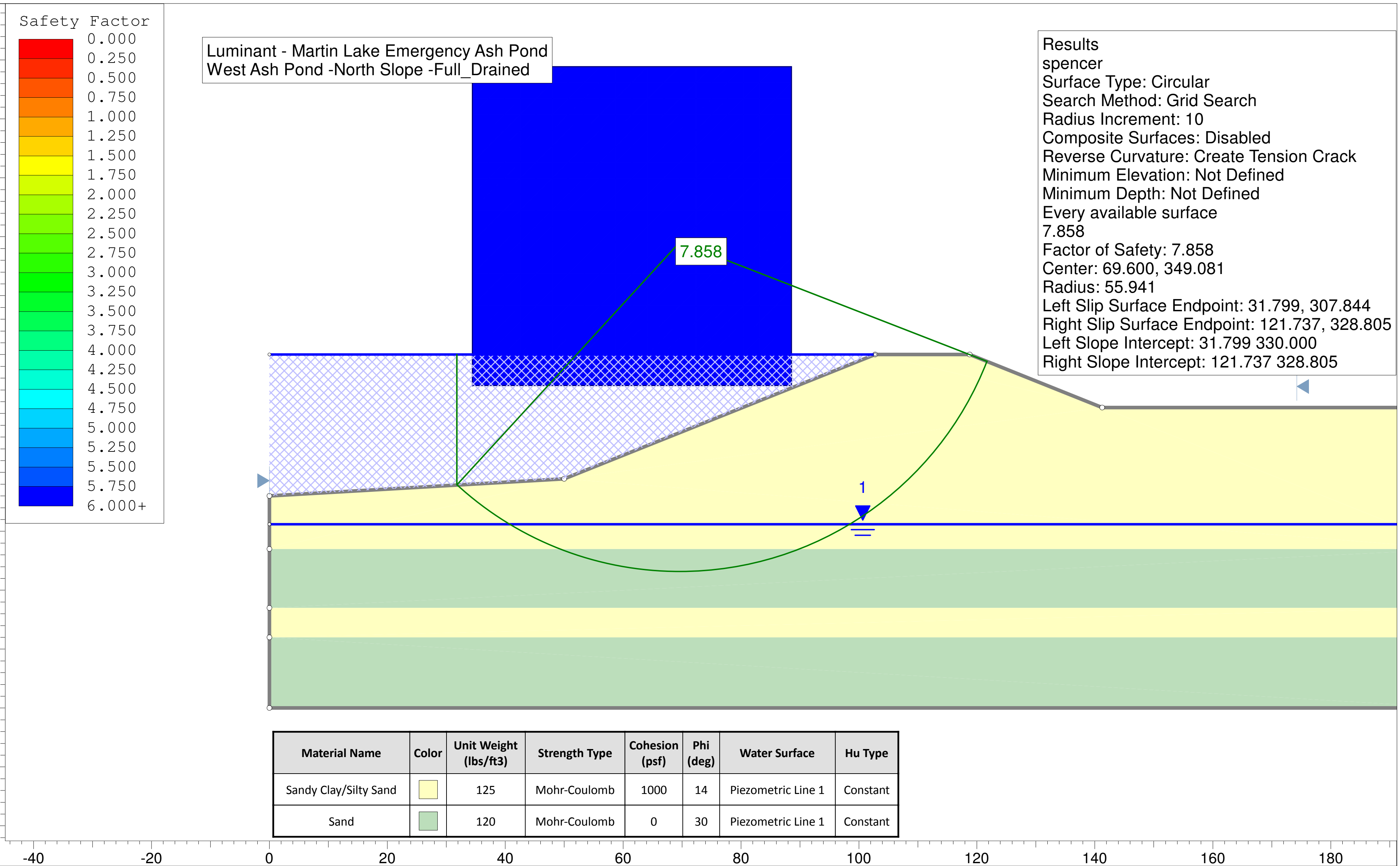


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Sandy Clay/Silty Sand		125	Mohr-Coulomb	1750	0	Piezometric Line 1	Constant
Sand		120	Mohr-Coulomb	0	30	Piezometric Line 1	Constant

Project	Luminant - Martin Lake Emergency Ash Pond
Analysis Description	West Ash Pond -North Slope -Full_Undrained
Drawn By	M Pascal
Scale	1:383
Company	Golder Associates Inc.
Date	11/30/2012, 9:47:32 AM
File Name	West Ash pond_north Slope_full_undrained.slim

IDEINTERPRET 6.019

CASE 10



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Sandy Clay/Silty Sand		125	Mohr-Coulomb	1000	14	Piezometric Line 1	Constant
Sand		120	Mohr-Coulomb	0	30	Piezometric Line 1	Constant

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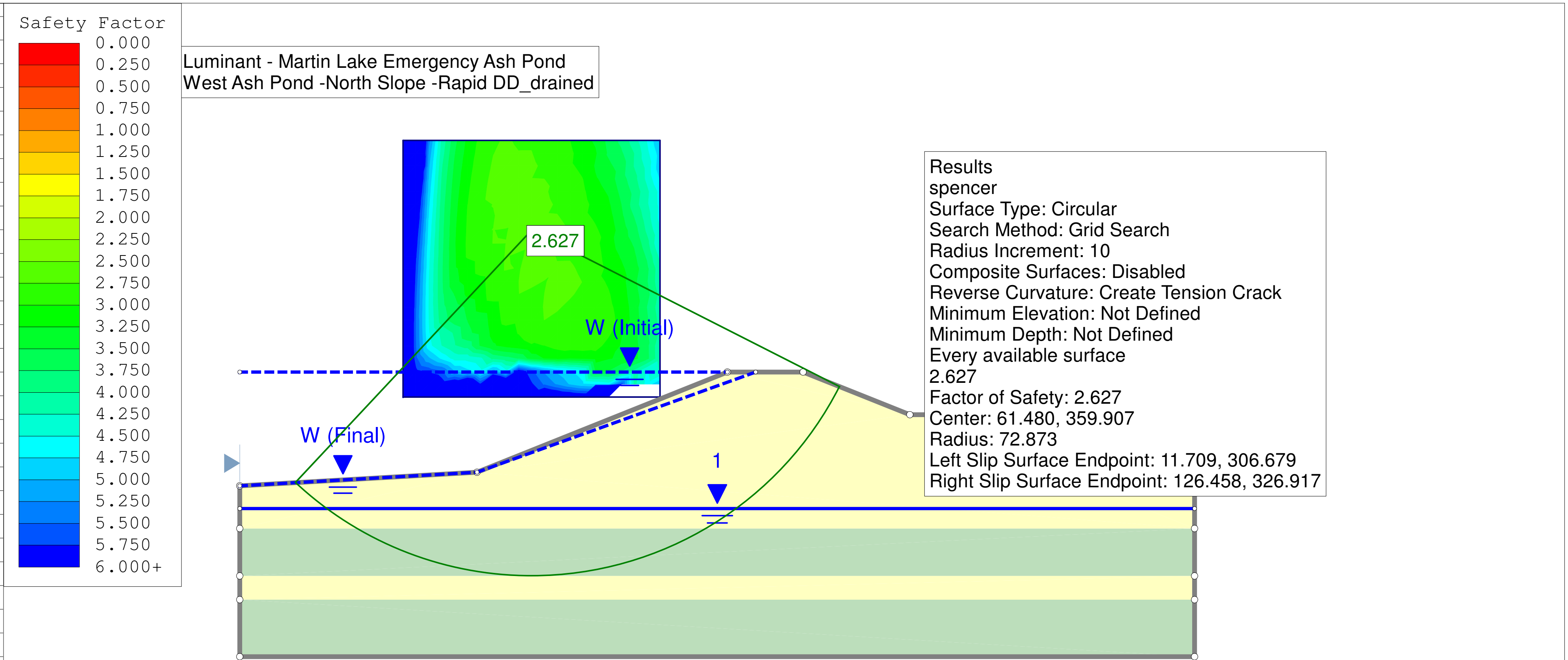
Project	Luminant - Martin Lake Emergency Ash Pond		
Analysis Description	West Ash Pond -North Slope -Full_Drained		
Drawn By M Pascal	*Scale* 1:275	*Company*	Golder Associates Inc.
Date 11/30/2012, 9:47:32 AM		*File Name*	West Ash pond_north Slope_full_drained.slim

SLIDEINTERPRET 6.019

CASE 11



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Rapid Drawdown (RD) Undrained Strength	RD Cr (psf)	RD PhiR (deg)	Water Surface	Hu Type
Sandy Clay/Silty Sand		125	Mohr-Coulomb	1000	14	Yes	0	0	Piezometric Line 1	Constant
Sand		120	Mohr-Coulomb	0	30	No			Piezometric Line 1	Constant

0 50 100 150 200 250

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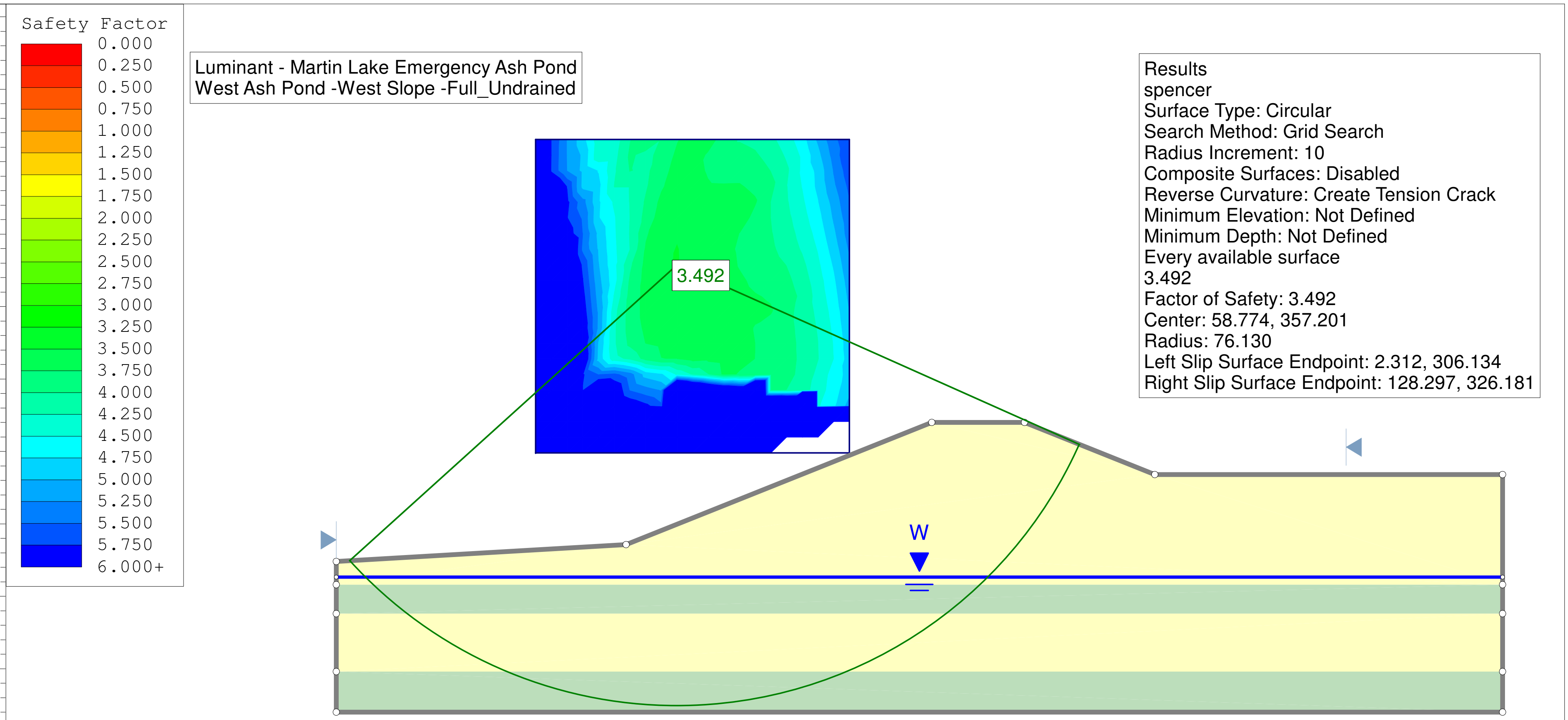
SLIDEINTERPRET 6.019

Project	Luminant - Martin Lake Emergency Ash Pond		
Analysis Description	West Ash Pond -North Slope -Rapid DD_drained		
Drawn By M Pascal	*Scale* 1:383	*Company*	Golder Associates Inc.
Date 11/30/2012, 9:47:32 AM		*File Name*	West Ash pond_north Slope_rapid DD_drained.slim

CASE 12



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Sandy Clay/Silty Sand		125	Mohr-Coulomb	1750	0	Water Surface	Constant
Sand		120	Mohr-Coulomb	0	30	Water Surface	Constant

-50 -25 0 25 50 75 100 125 150 175 200

Project	Luminant - Martin Lake Emergency Ash Pond		
Analysis Description	West Ash Pond -West Slope -Full_Undrained		
Drawn By M Pascal	*Scale* 1:313	*Company*	Golder Associates Inc.
Date 11/30/2012, 9:47:32 AM		*File Name*	West Ash pond_west slope_empty_undrained.slim

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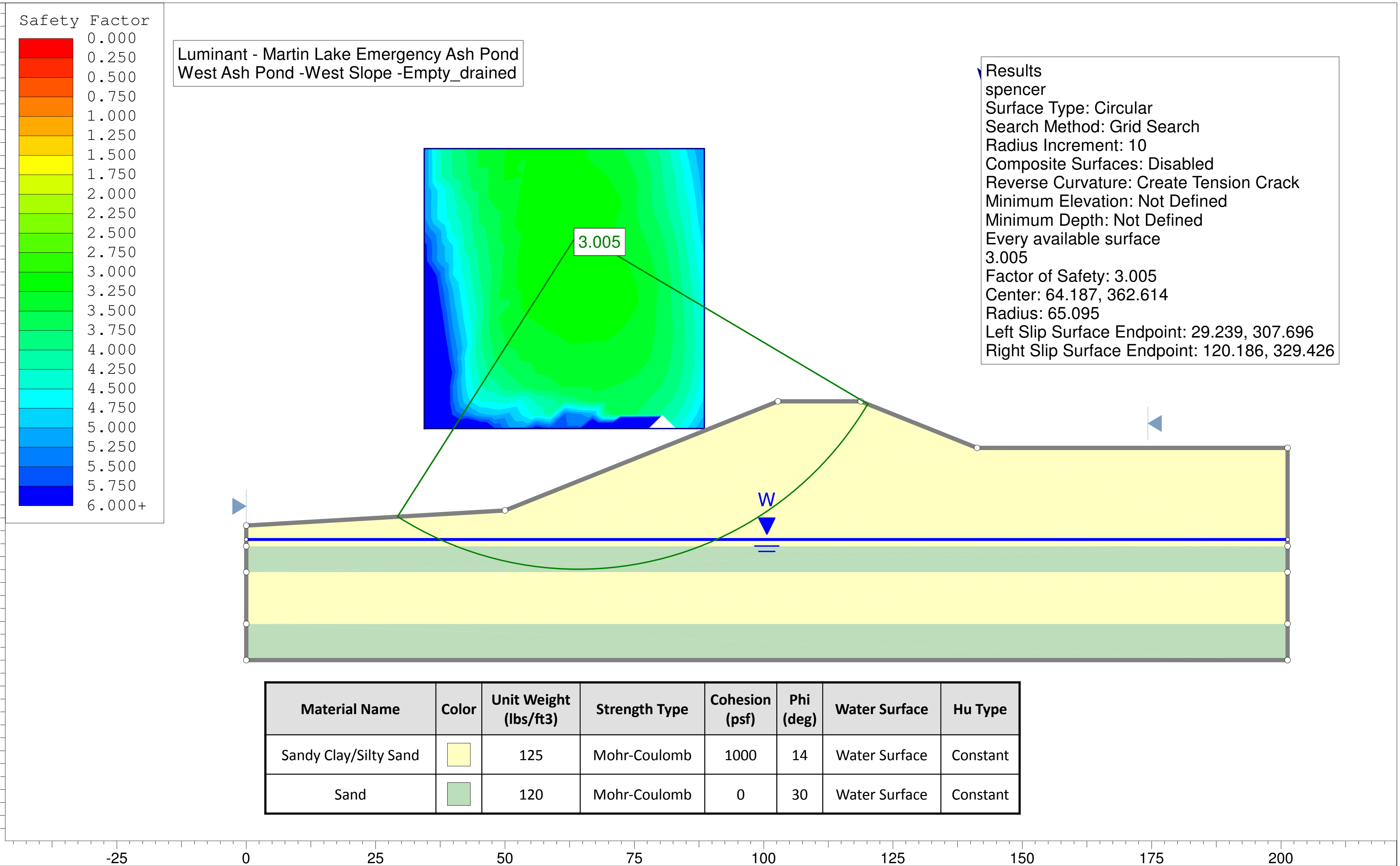
CASE 13



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Sandy Clay/Silty Sand		125	Mohr-Coulomb	1000	14	Water Surface	Constant
Sand		120	Mohr-Coulomb	0	30	Water Surface	Constant

Project	Luminant - Martin Lake Emergency Ash Pond
Analysis Description	West Ash Pond -West Slope -Empty_drained
Drawn By	M Pascal
Scale	1:313
Company	Golder Associates Inc.
Date	11/30/2012, 9:47:32 AM
File Name	West Ash pond_west slope_empty_drained.slim

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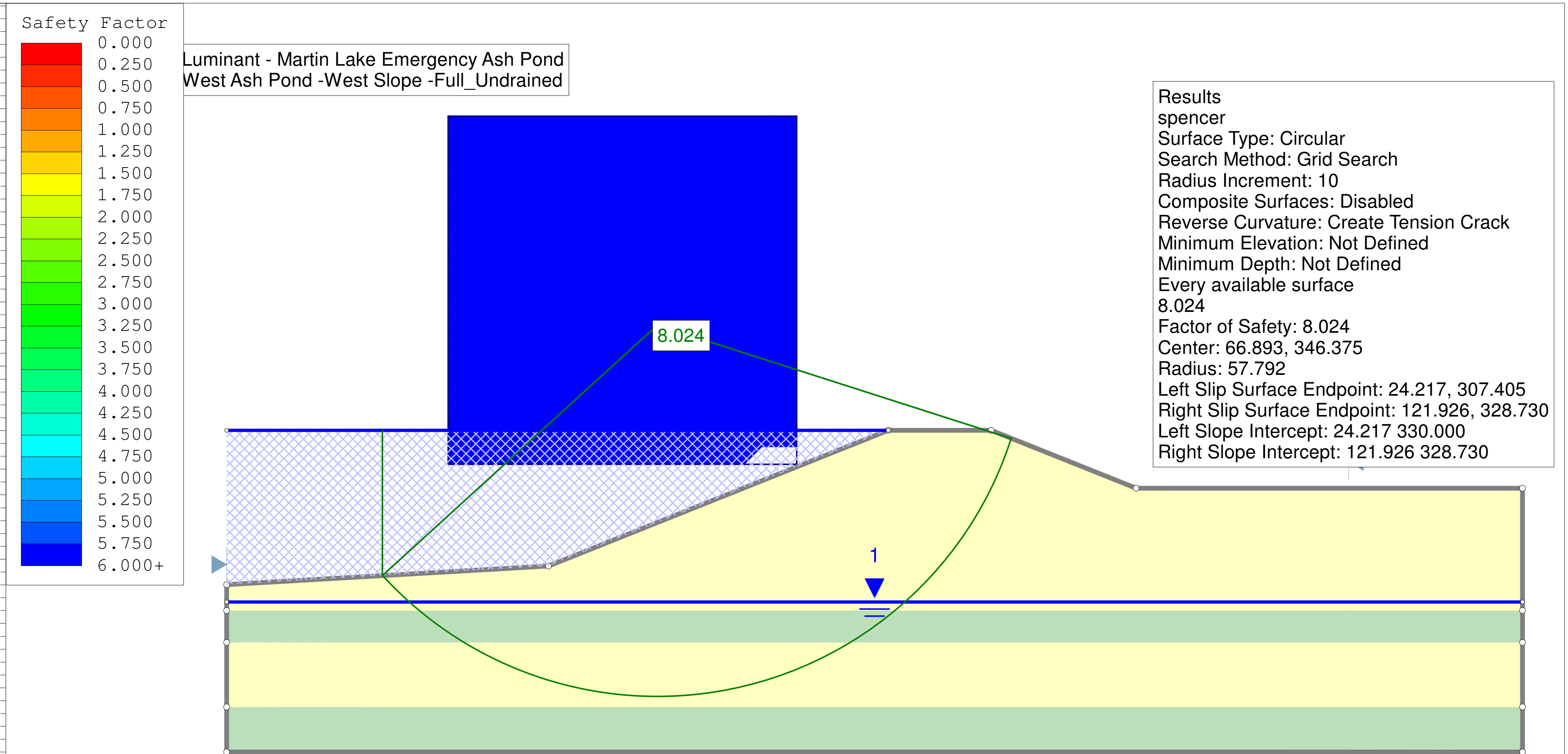
CASE 14



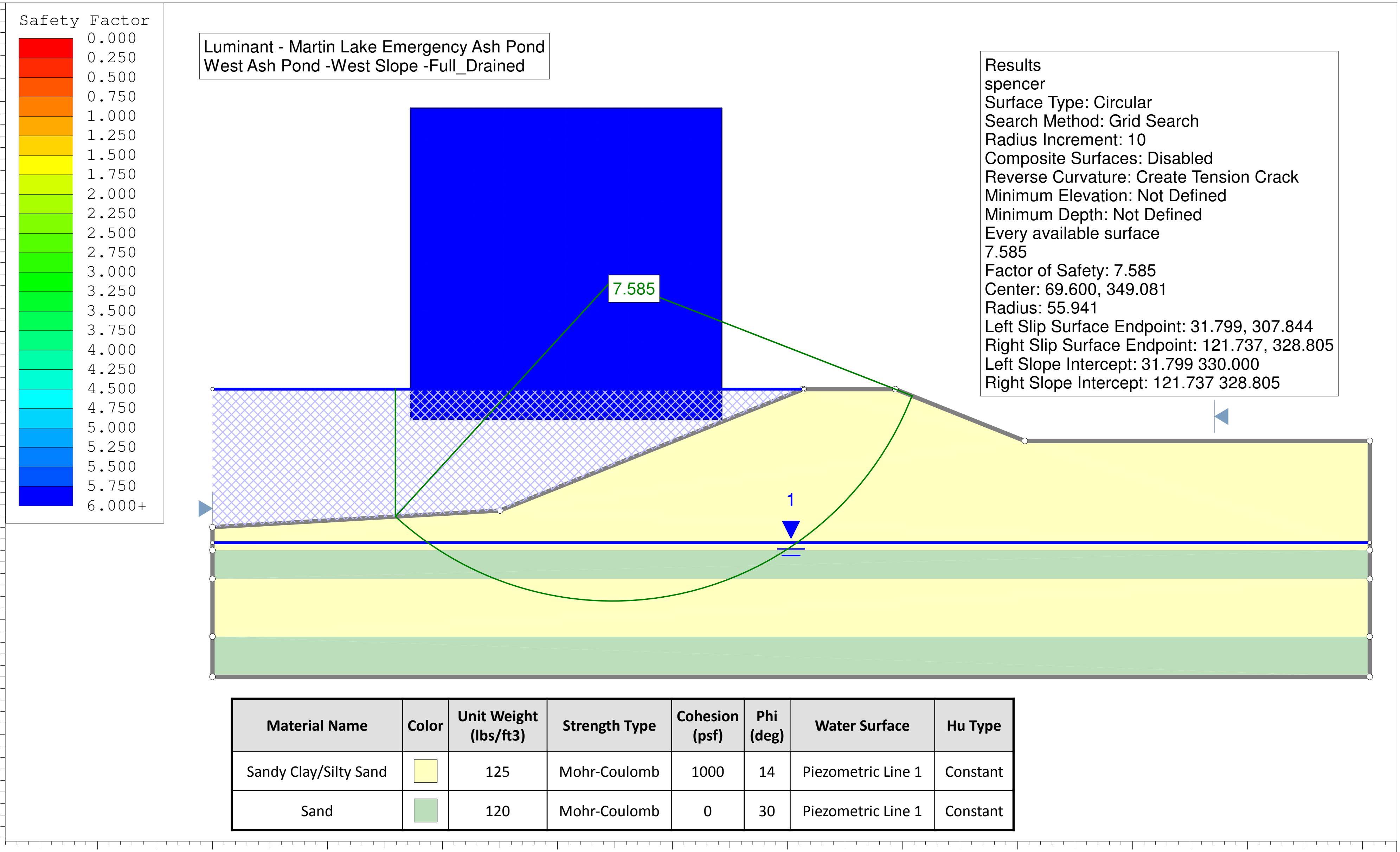
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Sandy Clay/Silty Sand		125	Mohr-Coulomb	1750	0	Piezometric Line 1	Constant
Sand		120	Mohr-Coulomb	0	30	Piezometric Line 1	Constant

-20 0 20 40 60 80 100 120 140 160 180 200

Project	Luminant - Martin Lake Emergency Ash Pond		
Analysis Description	West Ash Pond -West Slope -Full_Undrained		
Drawn By M Pascal	*Scale* 1:282	*Company*	Golder Associates Inc.
Date	11/30/2012, 9:47:32 AM	*File Name*	West Ash pond_west slope_full_undrained.slim

IDEINTERPRET 6.019

CASE 15



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Sandy Clay/Silty Sand		125	Mohr-Coulomb	1000	14	Piezometric Line 1	Constant
Sand		120	Mohr-Coulomb	0	30	Piezometric Line 1	Constant

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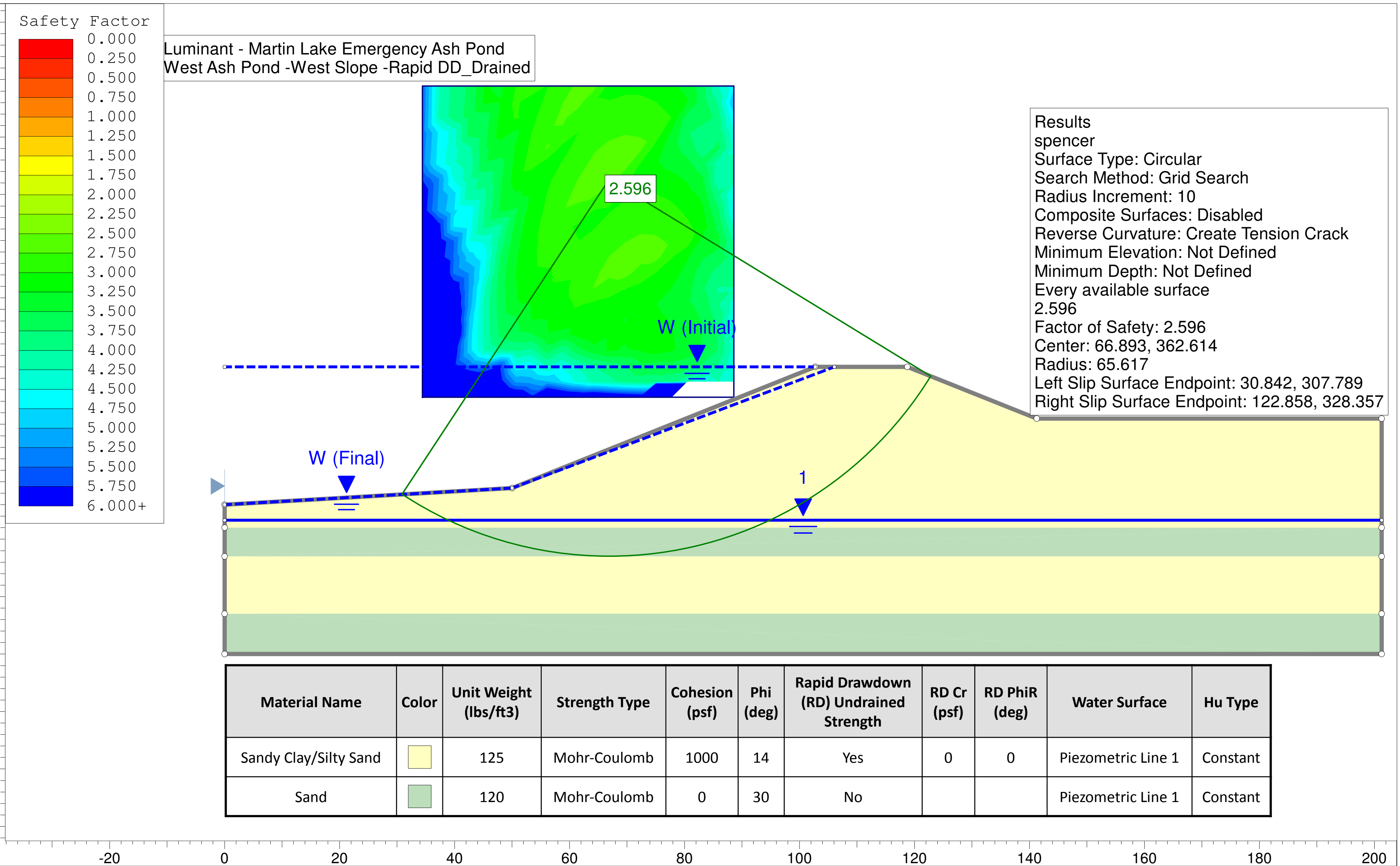
Project	Luminant - Martin Lake Emergency Ash Pond		
Analysis Description	West Ash Pond -West Slope -Full_Drained		
Drawn By M Pascal	*Scale* 1:282	*Company*	Golder Associates Inc.
Date 11/30/2012, 9:47:32 AM		*File Name*	West Ash pond_west slope_full_drained.slim

SLIDEINTERPRET 6.019

US EPA ARCHIVE DOCUMENT

CASE 16



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Rapid Drawdown (RD) Undrained Strength	RD Cr (psf)	RD PhiR (deg)	Water Surface	Hu Type
Sandy Clay/Silty Sand		125	Mohr-Coulomb	1000	14	Yes	0	0	Piezometric Line 1	Constant
Sand		120	Mohr-Coulomb	0	30	No			Piezometric Line 1	Constant

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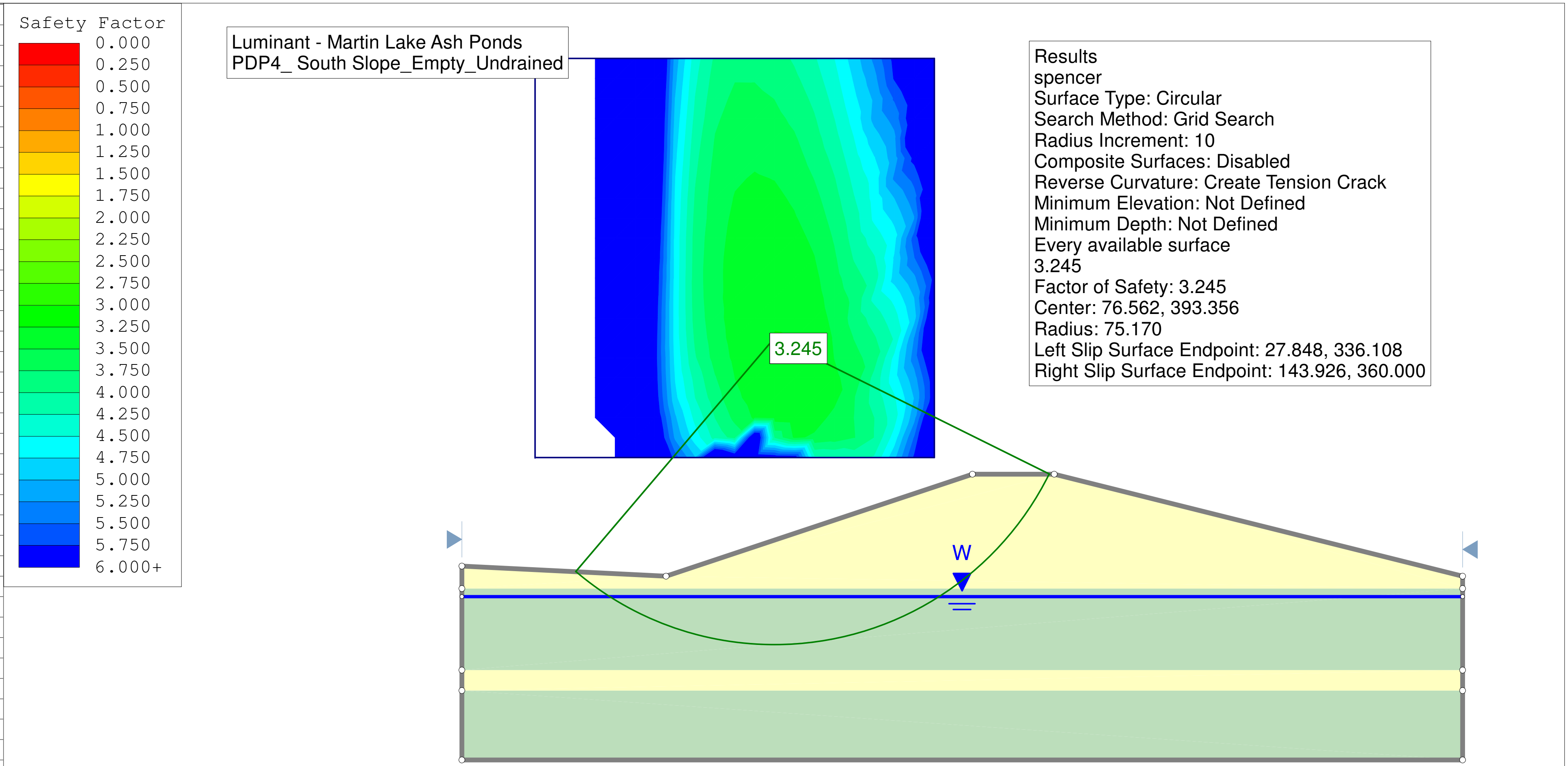
Project	Luminant - Martin Lake Emergency Ash Pond		
Analysis Description	West Ash Pond -West Slope -Rapid DD_Drained		
Drawn By	M Pascal	*Scale* 1:282	*Company* Golder Associates Inc.
Date	11/30/2012, 9:47:32 AM	*File Name*	West Ash pond_west slope_rapid DD_drained.slim

CASE 17



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Sandy Clay/Clayey Sand		125	Mohr-Coulomb	1750	0	Water Surface	Constant
Sand		120	Mohr-Coulomb	0.02	30	Water Surface	Constant

-100 -50 0 50 100 150 200 250

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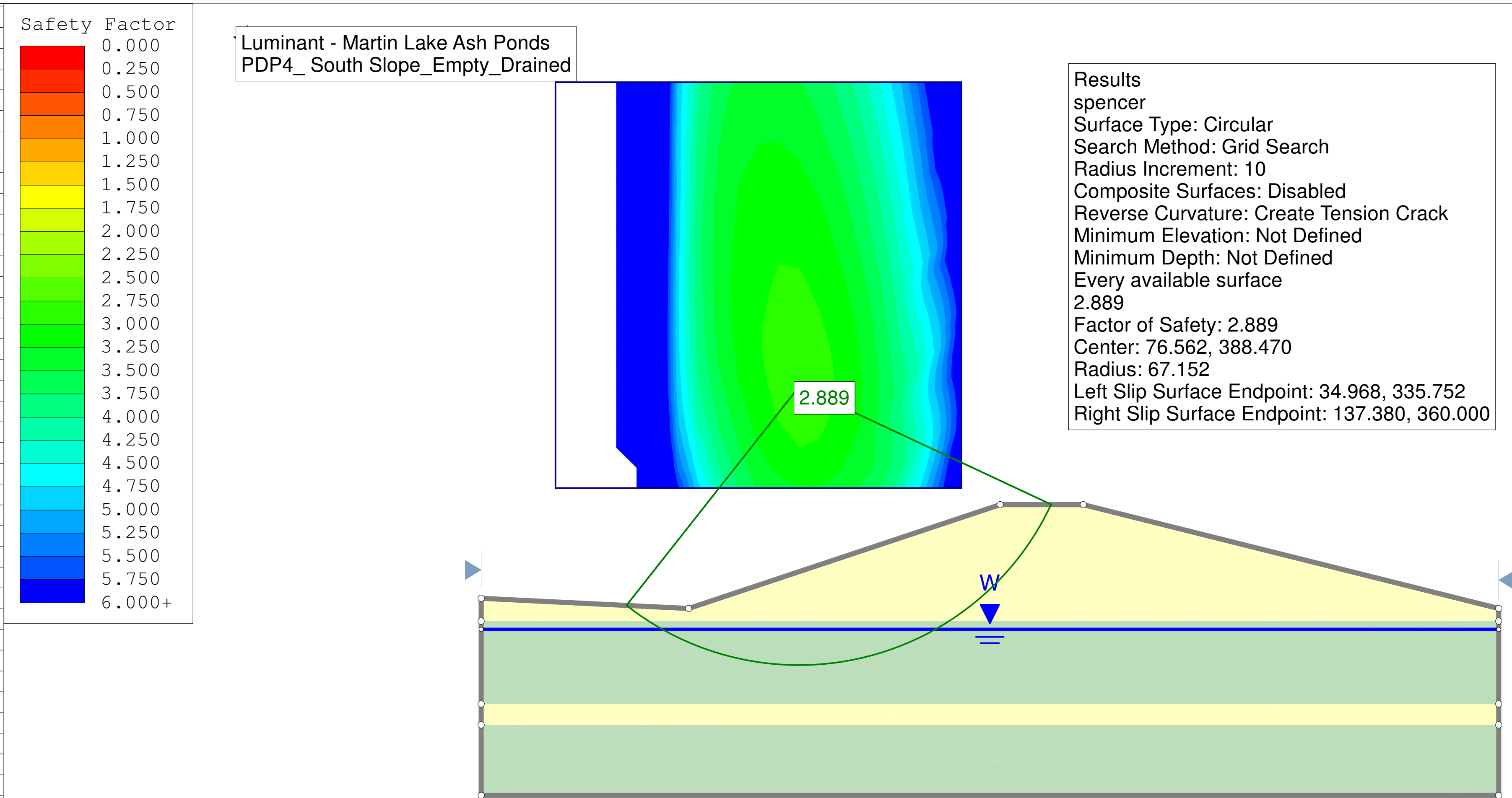
Project	Luminant - Martin Lake Ash Ponds
Analysis Description	PDP4_ South Slope_Empty_Undrained
Drawn By	M Pascal
Scale	1:445
Company	Golder Associates
Date	11/30/2012, 12:56:32 PM
File Name	PDP4_ South slope_empty undrained.slim

CASE 18



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Sandy Clay/Clayey Sand		125	Mohr-Coulomb	1000	14	Water Surface	Constant
Sand		120	Mohr-Coulomb	0	30	Water Surface	Constant

-100 -50 0 50 100 150 200 250

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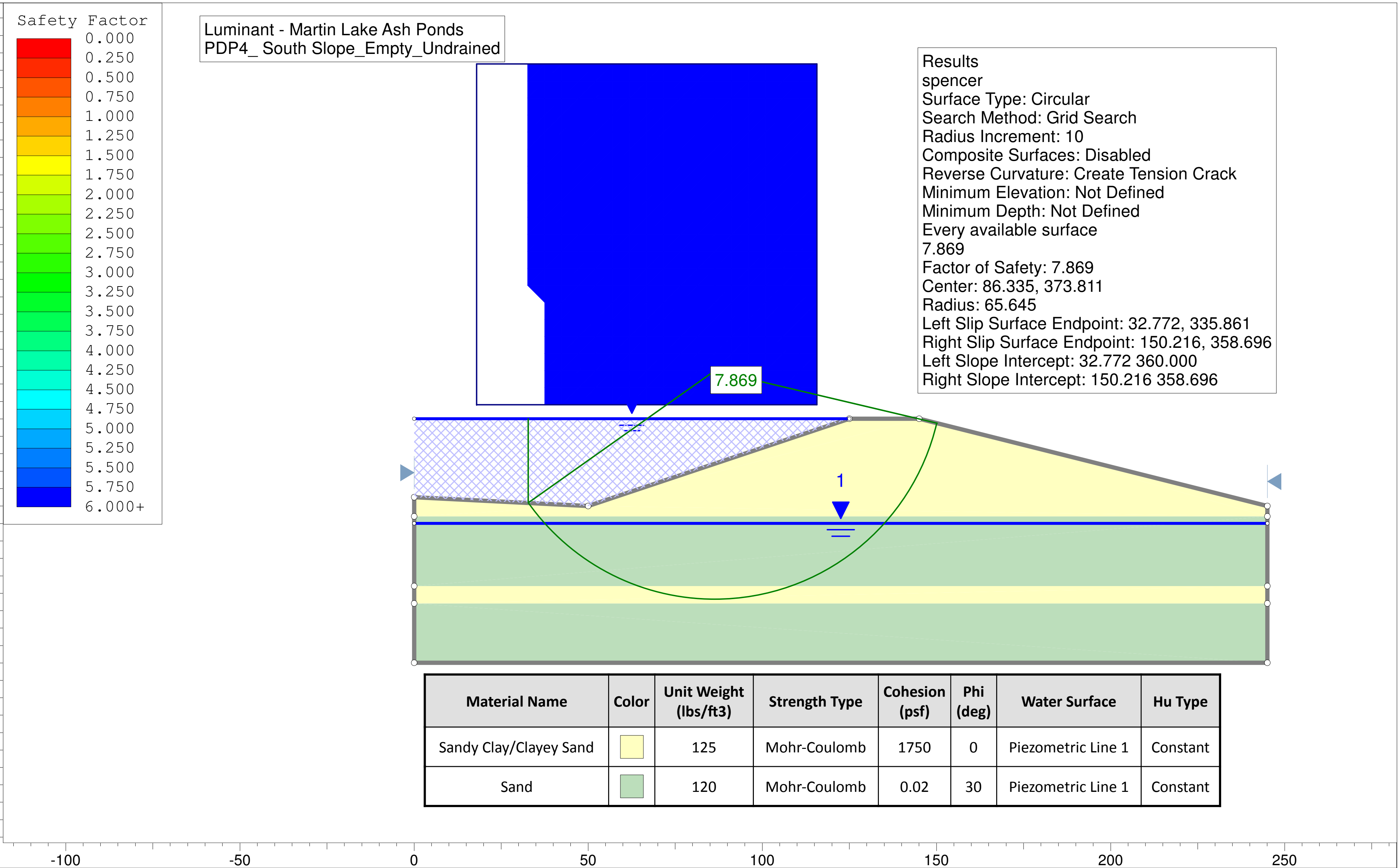
Project	Luminant - Martin Lake Ash Ponds		
Analysis Description	PDP4_ South Slope_Empty_Drained		
Drawn By	M Pascal	*Scale*	1:465
Company	Golder Associates		
Date	11/30/2012, 12:56:32 PM	*File Name*	PDP4_ South slope_empty drained.slim

CASE 19



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Sandy Clay/Clayey Sand		125	Mohr-Coulomb	1750	0	Piezometric Line 1	Constant
Sand		120	Mohr-Coulomb	0.02	30	Piezometric Line 1	Constant

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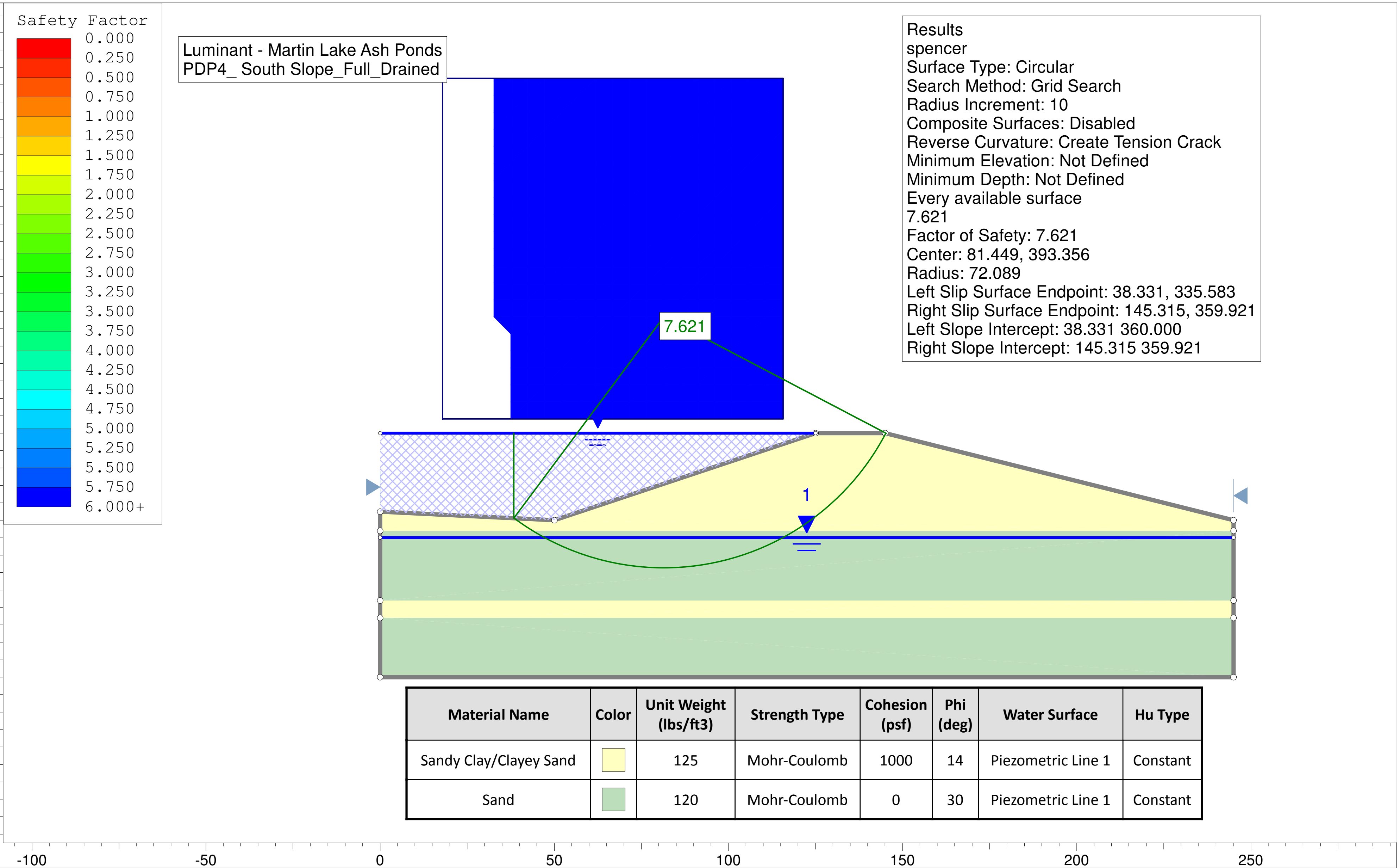
Project	Luminant - Martin Lake Ash Ponds		
Analysis Description	PDP4_ South Slope_Empty_Undrained		
Drawn By M Pascal	*Scale* 1:466	*Company*	Golder Associates
Date	11/30/2012, 12:56:32 PM	*File Name*	PDP4_ South slope_full undrained.slim

CASE 20



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Sandy Clay/Clayey Sand		125	Mohr-Coulomb	1000	14	Piezometric Line 1	Constant
Sand		120	Mohr-Coulomb	0	30	Piezometric Line 1	Constant

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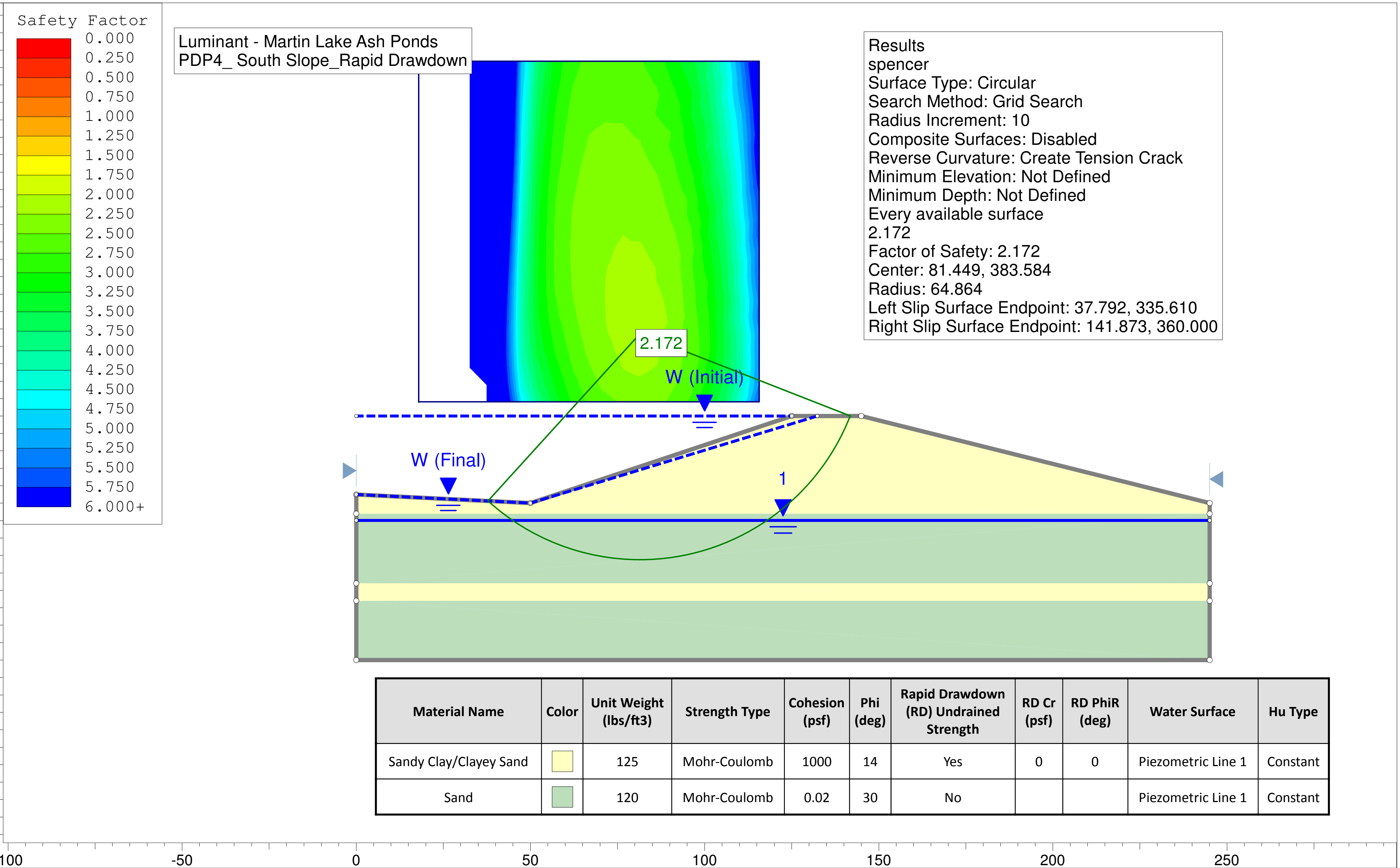
Project	Luminant - Martin Lake Ash Ponds
Analysis Description	PDP4_ South Slope_Full_Drained
Drawn By	M Pascal
Scale	1:466
Company	Golder Associates
Date	11/30/2012, 12:56:32 PM
File Name	PDP4_ South slope_full drained.slim

CASE 21



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Rapid Drawdown (RD) Undrained Strength	RD Cr (psf)	RD PhiR (deg)	Water Surface	Hu Type
Sandy Clay/Clayey Sand		125	Mohr-Coulomb	1000	14	Yes	0	0	Piezometric Line 1	Constant
Sand		120	Mohr-Coulomb	0.02	30	No			Piezometric Line 1	Constant

Project	Luminant - Martin Lake Ash Ponds		
Analysis Description	PDP4_ South Slope_Rapid Drawdown		
Drawn By M Pascal	*Scale* 1:466	*Company*	Golder Associates
Date 11/30/2012, 12:56:32 PM		*File Name*	PDP4_ South slope_rapid DD drained.slim

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SLIDEINTERPRET 6.019

APPENDIX E
IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL REPORT

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.
The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely for the client. *No one except you* should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one - not even you -* should apply the report for any purpose or project except the one originally contemplated.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, Project-specific factors when establishing the scope of a study. Typical factors include the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, *do not rely on a geotechnical engineering report that was:*

- not prepared for you,
- not prepared for your project.
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, always inform your geotechnical engineer of project changes-even minor ones-and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations*. Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an *opinion* about subsurface conditions throughout the site. Actual sub-surface conditions may differ - sometimes significantly - from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions

A Report's Recommendations Are *Not* Final

Do not over-rely on the construction recommendations included in your report. Those *recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability* for the report's recommendations if that engineer does not perform construction observation.

A Geotechnical Engineering Report Is Subject To Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should never be redrawn for inclusion in architectural or other design drawings. Only photo graphic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, but preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A brand conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce such risks, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations", many of these provisions indicate where geotechnical engineers responsibilities begin and end, to help others recognize their own responsibilities and risks. Read these provisions closely. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a geoenvironmental study differ significantly from those used to perform a geotechnical study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations: e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures*. If you have not yet obtained your own geoenviromental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Rely on Your Geotechnical Engineer for Additional Assistance

Membership in ASFE exposes geotechnical engineers to a wide army of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE

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email: info@asde.org www.asfe.org

At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

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South America	+ 55 21 3095 9500

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