



October 17, 2016
Amec Foster Wheeler Project No. 6706150060

Texas Municipal Power Agency
Regulatory and Compliance
12824 FM 244 RD
Anderson, TX

Attn.: Mr. Jan K. Horbaczewski
janh@texasmpa.org

**Re: Safety Factor Assessment of CCR units
Gibbons Creek Steam Electric Station
Anderson, Texas**

Dear Mr. Jan K. Horbaczewski

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) submits this Geotechnical Report for the above referenced project. The report includes the results of test drilling and laboratory analyses and presents results of dike stability analyses for the Ash Ponds and the Scrubber Sludge Pond at the TMPA facility at Gibbons Creek Steam Electric Station in Grimes County, Texas.

Should any questions arise concerning this report, we would be pleased to discuss them with you.

Respectfully submitted,

**Amec Foster Wheeler
Environment & Infrastructure, Inc.**

Reviewed by:

*Texas Registered Engineering Firm F-0012
Texas Registered Geoscience Firm 50184*

A handwritten signature in blue ink that reads "Hector A. Gonzalez".

Hector A Gonzalez, P.E.
Senior Engineer



A handwritten signature in blue ink that reads "John C. Lommler".

John C. Lommler, Ph.D., P.E. (NM #11549), D.GE
Principal Geotechnical Engineer

Copies: Addressee (3)

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1.0 INTRODUCTION

The Texas Municipal Power Agency (TMPA) retained Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) to perform stability assessment of the ash and scrubber sludge (SSP) ponds or Coal Combustion Residuals (CCR) Units located within the premises of their power plant located at 12824 FM 244 Road in Anderson, Texas. The TMPA is required by the Environmental Protection Agency (EPA) to periodically submit the results stability assessments of their CCR Units to meet the EPA's federal CCR Rule.

This report is submitted pursuant to a geotechnical study completed by Amec Foster Wheeler for the TMPA.

2.0 PURPOSE

The scope of services for this project included the following tasks:

1. Research and review existing reports, design and construction documents
2. Determine the various soil profile components at the existing pond locations;
3. Define the engineering characteristics of the subsurface materials encountered;
4. Observe the groundwater conditions at the site; and
5. Conduct analyses to obtain:
 - The calculated static factor of safety under the long-term, maximum storage pool loading condition, which must equal or exceed 1.50.
 - The calculated static factor of safety under the maximum surcharge pool loading condition, which must equal or exceed 1.40.
 - The calculated seismic factor of safety must equal or exceed 1.00.
6. Summarize the embankments stability analysis results and present findings in a geotechnical investigation report.

This report also briefly outlines the testing procedures and describes the site and subsurface conditions.

3.0 SOIL STUDY

3.1 Previous Explorations

An existing geotechnical exploration completed by National Soil Services, Inc. between 1976 and 1977 was reviewed and out of eighty eight (88) borings completed in the general power plant area, seven borings, Borings No B-68, B-70 and B-74 through B-78, with depths of 25 to 45 feet below grade were used due to their proximity to the ash pond location.

Other geotechnical existing exploration used was performed by Soils Mechanics, Inc. in 1983. This geotechnical exploration included 7 borings with depths reported to be 50 feet below the top of the SSP embankments.

Boring Location plans, Boring logs, coordinates, and surface elevations for these borings are located in Appendix B. The boring logs are provided for information purposes and as an overview of previous site exploration activities at the disposal areas.

3.2 Subsurface Exploration

Ten exploratory borings were advanced at the site to depths of about 38.5 to 50 feet below existing grades. The test borings were completed using a CME-75 truck-mounted drill rig equipped with 3¼ inch I.D. hollow stem augers. Standard penetration testing was completed at selected intervals in the borings. During the field study, the soils encountered were examined, visually classified and logged. Results of the field study are presented in **Appendix A**, which includes a brief description of drilling and sampling equipment and procedures, site plan showing the boring locations and logs of the test borings.

The boring logs and related information included in this report are indicators of subsurface conditions only at the specific locations and times noted. Subsurface conditions at other locations on the subject site may differ from conditions that were encountered at the locations sampled.

3.3 Laboratory Analysis

To aid in soil classification and evaluation of the engineering shear strength and unit weight properties of the soil, selected samples were tested for moisture content, Atterberg limits, particle size distribution, Direct Shear and Unconfined Compression tests. Laboratory tests were performed in general accordance with test standards ASTM D2216, ASTM D4318, ASTM D422 and ASTM D2166. The results of the moisture testing, Atterberg limits and particle distribution test are shown on the boring logs presented in **Appendix A**.

The soils encountered during the field study were classified in general accordance with the Unified Soil Classification System. The soil classification symbols appear on the boring logs and are briefly described in **Appendix A**.

4.0 SITE CONDITIONS & GEOTECHNICAL PROFILE

4.1 Site Conditions

The project site consists of the ash and scrubber sludge ponds located in the Southeastern quadrant of the plant site. Based on available topographic information, at the time of our field study the site slopes from approximate elevation (El.) 280 feet above mean sea level (MSL), at

the top of the embankments of the SSP, toward the northeast at the shore of the Gibbons Creek Reservoir at El. 247 feet MSL, approximately.

A railroad track surrounds the ash pond at about El 260 feet MSL. The bottom of the ash pond is estimates at El 250 feet MSL. Also the bottom of the SSP is estimates at EL 260 feet MSL.

From observations performed by Amec Foster Wheeler's representatives it was noted that the site was covered by native grasses and that some areas presented erosion where bare soil spots were encountered, primarily around the ash pond.

It was observed that overgrown vegetation was present within the retained areas of the ash pond.

Per historical documents reviewed as part of this assessment, it is our understanding that the bottom of the ash pond lies at El 250 feet MSL with 20 feet high embankments. Similarly the bottom of the SSP lies at El. 260 with 20 feet high embankments.

We understand that the ash pond and the SSP are used for handling water that has been in contact with or transported bottom ash. The volume of ash is greatly diminished since the plant switched from the nearby lignite coal to Powder River Basin Coal. There will not be a significant amount of additional ash fines added to either pond. The water level in each pond is controlled and excess water is discharged under the facility's NPDES permit. Consequently the permanent pool elevation at the ash pond and the SSP are expected to be approximately at El. 266 and 276 feet MSL.

From historical records it was found that the slopes of the embankments were designed to be 1V to 3H, (schematic: Sections Site-Grading, Job No. GC-1022 Rev A by Tippet & Gee, Inc.)

4.2 Regional Geology

Regional geologic mapping indicates that the site is underlain by the Wellborn (Ewb) geologic formation. The Wellborn Formation is comprised of fine to very fine, glauconitic, quartz sand interbedded with brown, lignitic clay and lignite, with abundant fossil wood and imprints of marine megafossils. This is the formation in which the Gibbons Creek power plant is located as well as the new Brazos Valley Solid Waste Management Agency municipal landfill.

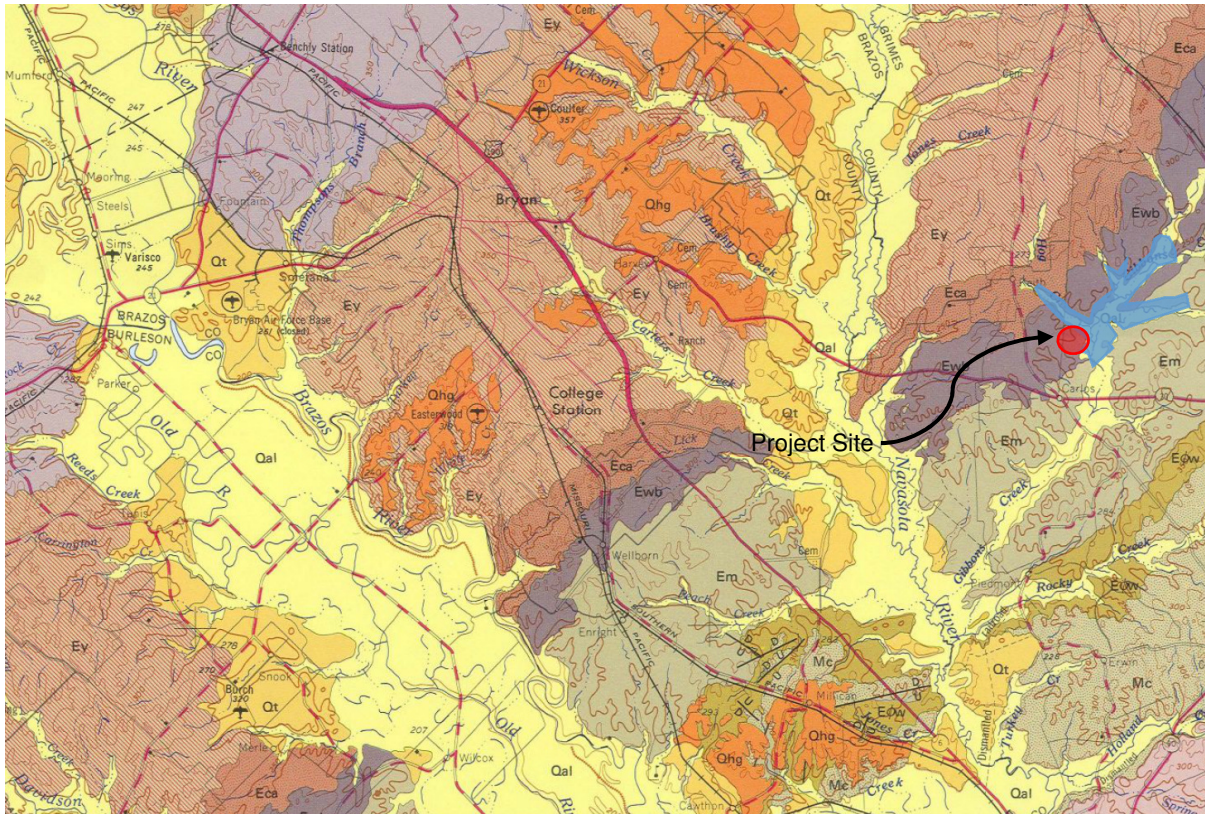


Figure 1. Geologic Map. Gibbons Creek power plant is located on top of the Wellborn formation (Ewb)

4.3 Seismic Zone

Based on the 2015 NEHRP provisions Site Class Definitions, in our opinion the site soils can be characterized as Site Class E, described as soft clay soil for the top 100 feet of the site profile. The Mapped Spectral Response Acceleration at Short Periods and 1-Second Periods, S_s and S_1 , as shown below, are calculated through the United States Geological Survey's (USGS) Seismic Hazard Curves and Uniform Hazard Response Spectra program according to the 2015 NEHRP provisions.

$$S_s = 0.068 \text{ g}$$
$$S_1 = 0.041 \text{ g}$$

The seismic event with a 2% probability of exceedance in 50 years, equivalent to a return period of approximately 2500 years is shown on the U.S. Geological Survey (USGS seismic hazard map included in the appendix of this report). Based on review of this map, the dikes at this site should be evaluated with a lateral seismic acceleration of not more than 0.04g.

4.4 Geotechnical Profile

Ash Pond Embankments Area

As the exploratory borings indicate, Fill material was encountered in all the borings drilled around the ash pond from the surface to a depth that ranged between 2 to 18 feet below existing grade (BEG). The fill material was heterogeneous in nature and included, in decreasing frequency of appearance: Sandy Fat Clay, Clayey Sand, Silty Sand, Fat Clay Sandy Lean Clay and Fly Ash. Based on laboratory testing results, the fraction passing the No 200 sieve in the cohesive and granular materials ranged between 59 and 73 percent, and between 24 and 47 percent, respectively. The cohesive material had a Liquid Limit between 45 and 88 and Plasticity Indices between 23 and 38. The encountered cohesive materials had a very stiff to hard consistency while in granular materials Standard Penetration Tests (SPT) revealed medium to dense relative density.

Below the Fill material, naturally deposited soils were encountered to a depth of about 40 feet BEG, the maximum depth explored in the ash pond area. The soils encountered in Borings LB-01 and to LB-03 were predominantly granular. The fraction passing the No 200 sieve in these soils ranged between 23 and 34 percent. SPTs indicated very dense relative density.

Borings LB-02 and LB-04 to 06 encountered mostly cohesive soils with different amounts of sand. Based on laboratory testing results, the fraction passing the No 200 sieve in the cohesive materials ranged between 55 and 96 percent. The cohesive soils had a Liquid Limit between 45 and 67 and Plasticity Indices between 18 and 30. Pocket Penetrometer and SPT values revealed that the encountered cohesive materials had a hard consistency.

Scrubber Sludge Pond (SSP) Embankments Area

Fill material was encountered in all the borings drilled around the SSP from the surface to a depth that ranged between 8 to 10 feet BEG. The fill material was heterogeneous in nature and included: Gravel, Clayey Sand, Sandy Fat Clay, and Sandy Clayey Silt. Based on laboratory testing results, the fraction passing the No 200 sieve in the cohesive and granular materials ranged between 53 and 67 percent, and between 25 and 33 percent, respectively. The cohesive material had a Liquid Limit between 66 and 90 and Plasticity Indices between 37 and 39. The encountered cohesive materials had a stiff to hard consistency while in granular materials Standard Penetration Tests (SPT) revealed medium dense relative density.

Below the Fill material, naturally deposited, cohesive soils were encountered to a depth of about 48 feet BEG. Based on laboratory testing results, the fraction passing the No 200 sieve in the cohesive materials ranged between 55 and 96 percent. The cohesive soils had a Liquid Limit between 45 and 67 and Plasticity Indices between 18 and 30. Pocket Penetrometer and SPT values revealed that the encountered cohesive materials had a stiff to hard consistency.

The soils encountered in below the cohesive soils were predominantly sand and silts to a depth of 50 feet BEG, the maximum depth explored in the SPP area. The fraction passing the No 200 sieve in these soils ranged between 23 and 72 percent. SPTs indicated the soils had a very dense relative density.

The descriptions for relative density are based on grain size and standard penetration tests as detailed in "Terminology Used to Describe the Relative Density, Consistency or Firmness of Soil" in Appendix A of this report.

4.5 Groundwater Conditions

Water level observations were made during and after the completion of drilling activities. Based upon the available information, it appears that the groundwater level at the ash pond at the time of the field exploration was as shallow as 4.5 feet below existing grade in boring LB-6. Similarly, the groundwater level at the SSP at the time of the field exploration was as shallow as 16.5 feet below existing grade in boring LB-10. Groundwater seepage was encountered at depths between 12 to 30 feet below existing grade. Groundwater observations, taken during the course of field activities, may be viewed in the Appendix on individual boring logs. It should be noted that groundwater level fluctuations may occur due to seasonal and climatic variations, alteration of drainage patterns, leaking utilities, land usage, and ground cover.

5.0 SLOPE STABILITY ANALYSES

5.1 Modeling

General. Using soil parameters derived from the results of laboratory testing and/or correlations with other applicable empirical relationships, and the slope geometry, the embankment of the detention ponds were simulated using SLOPE/W analytical slope stability software, produced by GEO-SLOPE INTERNATIONAL. SLOPE/W uses various modeling and slope stability analytical techniques to determine factors of safety for probable failure planes, under various conditions.

Methods of evaluation used within SLOPE/W are considered limited equilibrium methods of analysis, meaning that each individual shear plane is evaluated to determine the resulting shear stress at the point of failure. Factors of safety for slope stability analyses are computed as a ratio of the total resisting shear strength of the soil mass and the mobilized shear stress acting on the failing soil mass. For the purposes of this evaluation the Modified Bishop Method of analysis, which analyzes circular failure planes through the slope, was utilized. The Modified Bishop Method is a simplified analysis method that is suitable for clayey soil profiles.

Models used to evaluate the stability of the embankment slope were derived based on the geometry described herein and results of field and laboratory testing. Three scenarios were evaluated for each of the pond embankments:

- Long-term, maximum storage pool loading condition (a drained shear case), which must equal or exceed 1.50.
- The maximum surcharge pool loading condition (an undrained shear case), which must equal or exceed 1.40.
- The seismic factor of safety (an undrained shear case) must equal or exceed 1.00.

A description of each of these conditions is provided below.

Based on the design information provided by the client's representative, two (2) sections (Sections A-A' and D-D') of the proposed embankment expansion were input as model parameters. Section A-A' represents the most critical embankment in the ash pond, and Section D-D' represents the most critical embankment in the SSP. Location of these analysis sections is shown in Appendix C.

Long-term, maximum storage pool loading condition. This scenario models the long-term stability of the embankment once a consistent seepage condition has developed under a continued maximum pool level. Typically, the long-term seepage condition is evaluated based on a phreatic surface originating at the highest pool elevation and terminating at the embankment's downstream toe. Effective stress conditions (i.e. drained shear strength) are used to evaluate long-term, drained conditions.

The maximum surcharge pool loading condition. This scenario models the stability of the embankment when the maximum pool level at top of embankment is suddenly reached after heavy rains or flooding. Since the modeled embankments, will have a phreatic level that has reached equilibrium during the long-term maximum storage pool case, and will not be in equilibrium with the flooding surcharge pool. Consequently, its surface is modeled at average phreatic levels (obtained from monitoring wells) flowing to each embankment's downstream toe, and surcharge water is modeled as a hydraulic surcharge. Total stress conditions (undrained shear) are used to evaluate, sudden undrained loading conditions.

Steady State Seepage Condition with Seismic Forces. The steady state seepage condition is also evaluated for stability coinciding with a seismic event. In order to evaluate the impact of seismic forces on the embankments, a pseudo-static analysis of the slope, using simulated site-specific peak ground accelerations, was conducted. Peak ground acceleration obtained from the USGS National Seismic Hazard Mapping Project website (<http://geohazards.cr.usgs.gov/eq/>). Based on the aforementioned survey data (compiled in 2009), the anticipated peak ground acceleration of 0.02g occurs for 2 percent probability of exceedance in about 50 years.

Soil Parameters. Shear strength parameters used during this analysis were either derived empirically from the results from published correlations between field standard penetration testing (SPT) and soil index properties, or assumed based on prior laboratory testing. Inferred properties represent lower bound or average shear strength as derived from field penetration testing and

laboratory analysis. As mentioned, both undrained and drained soil properties were determined for the purposes of these analyses. The following table provides a summary of soil parameters utilized in the analyses described herein. Stability analyses are provided in the Appendix for additional review.

West Bank Embankment Ash Pond

Long Term Max Pool Conditions

Material Type	Model	γ (pcf)	C' or Su (psi)	Φ' or Φ_u
Fill Sandy Lean Clay	Mohr-Coulomb	120	6	17
Sandy Lean Clay	Mohr-Coulomb	120	2	16
Fat Clay Lignitic	Mohr-Coulomb	120	6	7
Lean Clay Lignitic	Mohr-Coulomb	120	6	16
Lignite	Mohr-Coulomb	84	3	17
Clayey Sand	Mohr-Coulomb	110	0	25

Short term Max Pool Conditions

Material Type	Model	γ (pcf)	C' or Su (psi)	Φ' or Φ_u
Fill Sandy Lean Clay	Undrained (Phi=0)	120	1,000	0
Sandy Lean Clay	Undrained (Phi=0)	120	2,750	0
Fat Clay Lignitic	Undrained (Phi=0)	120	4,500	0
Lean Clay Lignitic	Undrained (Phi=0)	120	4,500	0
Lignite	Mohr-Coulomb	84	3	17
Clayey Sand	Mohr-Coulomb	110	0	25

South Bank Embankment SSP

Long Term Max Pool Conditions

Material Type	Model	γ (pcf)	C' or Su (psi)	Φ' or Φ_u
[Fill] Gravel Base	Undrained (Phi=0)	110	1000	0
[Fill] Sandy Fat Clay I	Mohr-Coulomb	120	6	20
[Fill] Clayey Sand	Mohr-Coulomb	110	0	25
Sandy Fat Clay I	Mohr-Coulomb	120	6	20
Silty Sand	Mohr-Coulomb	84	0	27

Short term Max Pool Conditions

Material Type	Model	γ (pcf)	C' or Su (psi)	Φ' or Φ_u
[Fill] Gravel Base	Undrained (Phi=0)	110	4000	0
[Fill] Sandy Fat Clay I	Undrained (Phi=0)	120	1250	0
[Fill] Clayey Sand	Mohr-Coulomb	110	0	25
Sandy Fat Clay I	Undrained (Phi=0)	120	2000	0
Silty Sand	Mohr-Coulomb	84	0	27

5.2 Summary of Findings

A summary of the final slope stability factors of safety for each of the plan sections (Sections A-A' and D-D') for the various categories analyzed is provided below. Graphical representations of each analysis are included in the Appendix.

SUMMARY OF STABILITY ANALYSES Section A-A'			
Case	Factor of Safety		Comments
	Actual	Minimum Acceptable	
Long-term, maximum storage pool loading condition	1.5	1.5	Drained or effective stress condition. Phreatic surface modeled to represent permanent pool level (267.0 ft MSL).
The maximum surcharge pool loading condition	6.0	1.4	Undrained or total stress condition. Phreatic surface modeled to represent permanent pool level (270.0 ft MSL).
Steady State with Seismic	2.9	1.0	Pseudo-static analysis of Steady State Seepage condition, using site-specific peak ground accelerations (0.02g).

SUMMARY OF STABILITY ANALYSES			
Section D-D'			
Case	Factor of Safety		Comments
	Actual	Minimum Acceptable	
Long-term, maximum storage pool loading condition	1.5	1.5	Drained or effective stress condition. Phreatic surface modeled to represent permanent pool level (273.0 ft MSL).
The maximum surcharge pool loading condition	5.2	1.4	Undrained or total stress condition. Phreatic surface modeled to represent permanent pool level (280.0 ft MSL).
Steady State with Seismic	4.8	1.0	Pseudo-static analysis of Steady State Seepage condition, using site-specific peak ground accelerations (0.02g).

Based on the findings of this analysis, the evaluated embankments appear to be stable under all three (3) of the evaluated conditions for both Sections (A-A and D-D') considered. Stable condition is deemed by having an actual factor of safety greater than the minimum allowable factor of safety. Minimum factors of safety are based on guidelines issued by the EPA regarding minimum factors of safety for embankment dams under similar conditions.

Comments Regarding Factors of Safety. The slope stability outputs provided by SLOPE/W, as seen in the Appendix, provides the failure surface with the lowest factor of safety. The actual analysis is constructed using hundreds of potential planes; however for analysis purposes and simplification of viewing, only the most critical plane is displayed.

As listed in the previous table, reported factors of safety are only recorded to one (1) decimal place. For analysis purposes, as seen on the outputs provided in the Appendix, the calculated factor of safety is provided out to three (3) decimal places. It is imperative to understand that the model is a generalization of the situation present in the field. The purpose of using calculated factors of safety is to allow the program to differentiate between hundreds of potential failure planes. Given the nature of the constructed system and the assumptions made to model system, it is reasonable to limit the accuracy of the factor of safety to one (1) decimal place for evaluation purposes.



APPENDIX A

TEST DRILLING EQUIPMENT & PROCEDURES

SAMPLING PROCEDURES - Dynamically driven tube samples are usually obtained at selected intervals in the borings by the ASTM D-1586 procedures. In most cases, 2" O.D. samplers are used to obtain the standard penetration resistance. Undisturbed samples of firmer soil are often obtained with 3" O.D. samplers lined with 2.42" I.D. brass rings. The driving energy is generally recorded as the number of blows of a 140 pound, 30-inch free fall drop hammer required to advance the samplers in 6-inch increments. However, in stratified soil, driving resistance is sometimes recorded in 2 or 3-inch increments so that soil changes and the presence of scattered gravel or cemented layers can be readily detected and the realistic penetration values obtained for consideration in design. These values are expressed in blows per foot on the logs. Undisturbed sampling of softer soil is sometimes performed with thin walled Shelby tubes (ASTM D-1587). Where samples of rock are required, they are obtained in NX diamond core drilling (ASTM D-2113). Tube samples are labeled and placed in watertight containers to maintain field moisture contents for testing. When necessary for testing, larger bulk samples are taken from auger cuttings.

CONTINUOUS PENETRATION TESTS - Continuous penetration tests are performed by driving a 2" O.D. blunt nosed penetrometer adjacent to or in the bottom of borings. The penetrometer is attached to 1-inch O.D. drill rods to provide clearance to minimize side friction so that penetration values are recorded as the number of blows of a 140 pound, 30-inch free fall drop hammer required to advance the penetrometer in one foot increments or less.

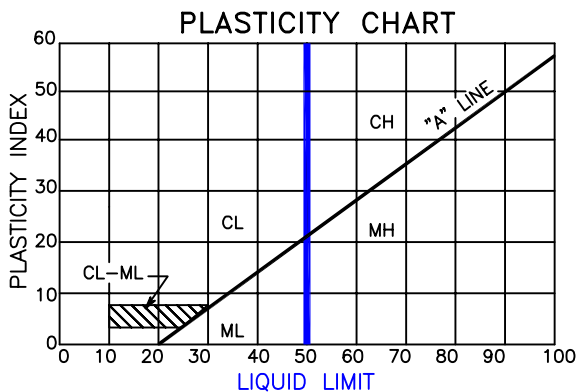
BORING RECORDS - Drilling operations are directed by our field engineer or geologist who examines soil recovery and prepares boring logs. Soil is visually classified in accordance with the Unified Soil Classification System (ASTM D-2487), with appropriate group symbols being shown on the logs.

UNIFIED SOIL CLASSIFICATION SYSTEM

Soils are visually classified by the Unified Soil Classification System on the boring logs presented in this report. Grain-size analysis and Atterberg Limits Tests are often performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. For a more detailed description of the system, see "The Unified Soil Classification System", Corp of Engineers, US Army Technical Memorandum No. 3-357 (Revised April 1960) or ASTM Designation: D2487-93T.

MAJOR DIVISIONS			GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES	
COARSE-GRAINED SOILS (Less than 50% passes No. 200 sieve)	GRAVELS (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)			GW	Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)			GM	Silty gravels, gravel-sand-silt mixtures
					GC	Clayey gravels, gravel-sand-clay mixtures
		SANDS (More than 50% of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 sieve)			SW
	SANDS WITH FINES (More than 12% passes No. 200 sieve)			SP	Poorly graded sands, gravelly sands	
				SM	Silty sands, sand-silt mixtures	
	SANDS WITH FINES (More than 12% passes No. 200 sieve)			SC	Clayey sands, sand-clay mixtures	
				SILTS OF LOW PLASTICITY (Liquid Limit Less Than 50%)		
SILTS OF HIGH PLASTICITY (Liquid Limit More Than 50%)			MH			Inorganic silts, micaceous or diatomaceous silty soils, elastic silts
		CLAYS OF LOW PLASTICITY (Liquid Limit Less Than 50%)				
CLAYS OF HIGH PLASTICITY (Liquid Limit More Than 50%)						

NOTE: Coarse grained soils with between 5% & 12% passing the No. 200 sieve and fine grained soils with limits plotting in the hatched zone on the plasticity chart to have double symbol.



SOIL COMPONENT	PARTICLE SIZE RANGE
COBBLES	Above 3 inches
GRAVEL	3 inches to No. 4 sieve
Coarse Gravel	3 inches to 3/4 inch
Fine Gravel	3/4 inch to No. 4 sieve
SAND	No. 4 sieve to No. 200
Coarse	No. 4 sieve to No. 10
Medium	No. 10 sieve to No. 40
Fine	No. 40 sieve to No. 200
FINES (SILT or CLAY)	Below No. 200 sieve

**TERMINOLOGY USED TO DESCRIBE THE RELATIVE DENSITY
CONSISTENCY, OR FIRMNESS OF SOIL**

The terminology used on the boring logs to describe the relative density, consistency or firmness of soil relative to the standard penetration resistance is presented below. The standard penetration resistance (N) in blow per foot is obtained by ASTM D-1586 procedure using 2" O.D., 1-inch I.D. samplers.

RELATIVE DENSITY: Terms for description of relative density of cohesionless, uncemented sand and sand-gravel mixtures.

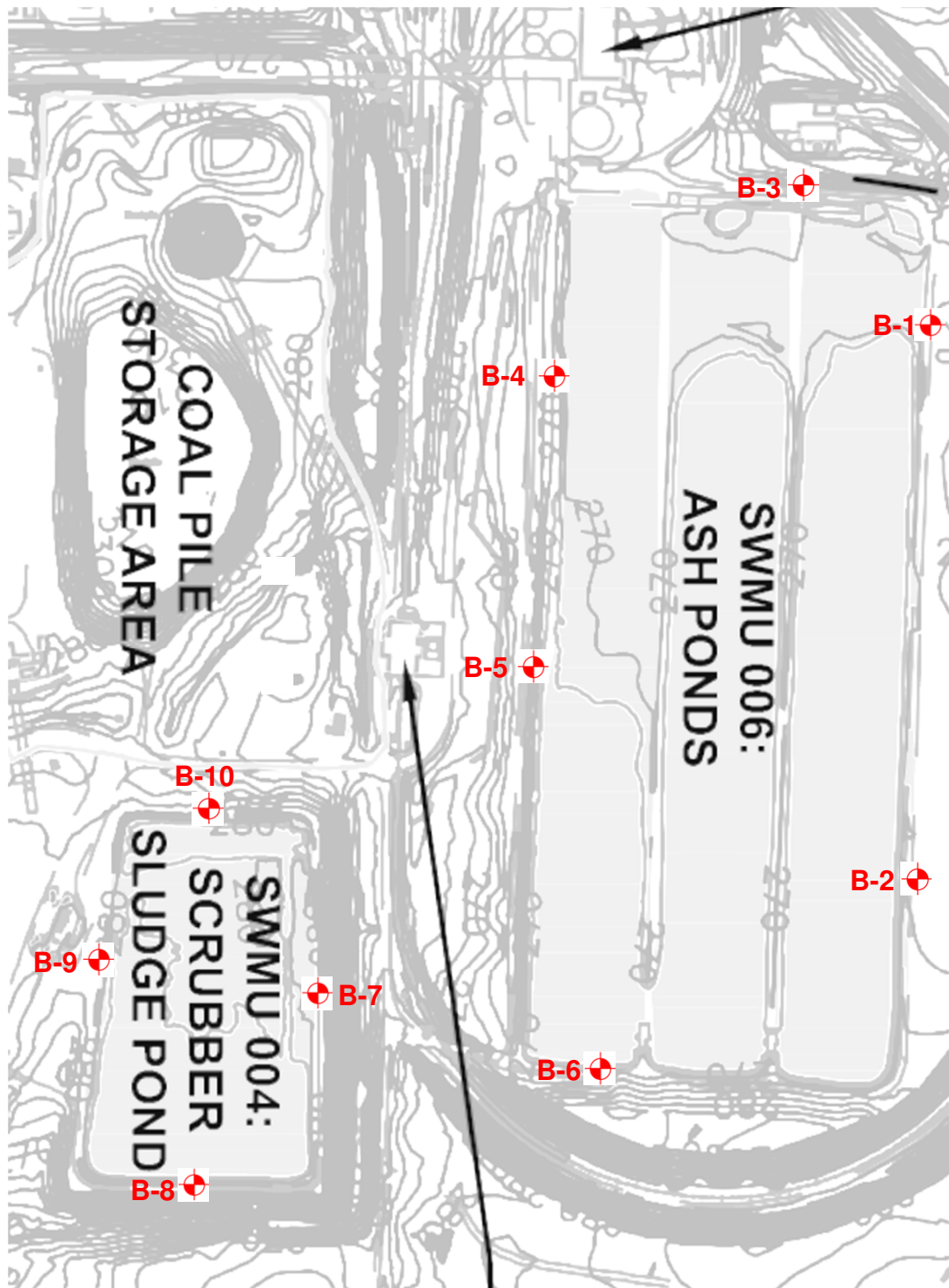
<u>N</u>	<u>RELATIVE DENSITY</u>
0-4	Very Loose
5-10	Loose
11-30	Medium Dense
31-50	Dense
50+	Very Dense

RELATIVE CONSISTENCY: Terms for the description of clay which is saturated or near saturation.

<u>N</u>	<u>RELATIVE CONSISTENCY</u>	<u>REMARKS</u>
0-2	Very Soft	Easily penetrated several inches with fist.
3-4	Soft	Easily penetrated several inches with thumb.
5-8	Medium Stiff	Can be penetrated several inches with thumb moderate effort.
9-15	Stiff	Readily indented with thumb but penetrated only with great effort.
16-30	Very Stiff	Readily indented with thumbnail.
30+	Hard	Indented only with difficulty by thumbnail.

RELATIVE FIRMNESS: Terms for the descriptions of partially saturated and/or cemented soil which commonly occurs in the Southwest including clay, cemented granular materials, silt and silty and clayey granular soil:

<u>N</u>	<u>RELATIVE DENSITY</u>
0-4	Very Soft
5-8	Soft
9-15	Moderately Firm
16-30	Firm
31-50	Very Firm
50+	Hard



Approximate Boring locations B-1

Note: Drawing not to scale

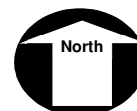


FIGURE 1
Site Plan
Safety Factor Assessment of CCR units
Gibbons Creek Steam Electric Station
Anderson, Texas

Drawn By: mjb Date: 10/17/2016

Checked By: _____ Drawing No.: 6706150060

Amec Foster Wheeler Project No. 6706150060

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scruber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/1/16

LOCATION See Site Plan

RIG TYPE CME 75
BORING TYPE Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
0				ST			5.8	23.7	26	NP	NP	SM		[FILL] SILTY SAND, gray, fine-grained sand, trace roots.
				ST			19.4	35.7	45	22	23	SC		[FILL] CLAYEY SAND, brown, fine-grained sand, trace pebbles.
5				ST										- yellowish brown from 4' to 8'.
				ST			29.8	47.3	54	24	30			
				ST										- brown from 8' to 10'. very dark gray inclusion - possibly top soil.
10				ST										- light yellowish brown from 10' to 15'.
				ST			33.2	39.0	61	34	27			
15				ST										
				ST								SC-SM		CLAYEY SILTY SAND, yellowish brown, fine-grained sand, ferrous stains.
20														- no recovery, pushed Shelby tube and encountered refusal, Shelby tube was bent.
25				SS	14-23-27	50	32.8	44.1	45	27	18	SC		CLAYEY SAND, yellowish brown, fine-grained sand, ferrous stains

GROUNDWATER

DEPTH(ft)	HOUR	DATE
17.5'		10/1/2016

SAMPLE TYPE
 A - Drill cuttings
 S - 2" O.D. 1.38" I.D. tube sample
 U - 3" O.D. 2.42" I.D. tube sample
 C - 3" O.D. CME tube sample
 SH - 3" Shelby sample
 MC - Modified California Sampler
 NR - No Recovery

LOG OF TEST BORING NO. LB-01

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scrubber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/1/16

LOCATION See Site Plan

RIG TYPE CME 75

BORING TYPE Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
30			X	SS	17-27-24	51								CLAYEY SAND, yellowish brown, fine-grained sand, ferrous stains
35			X	SS	16-22-33	55	34.1	13.2	NP	NP	NP			SILTY SAND, grayish brown, fine-grained.
40			X	SS	21-31-33	61								
40													Boring was terminated at 40 feet	
45														
50														
55														

GROUNDWATER

DEPTH(ft)	HOUR	DATE
17.5'		10/1/2016

SAMPLE TYPE

- A - Drill cuttings
- S - 2" O.D. 1.38" I.D. tube sample
- U - 3" O.D. 2.42" I.D. tube sample
- C - 3" O.D. CME tube sample
- SH - 3" Shelby sample
- MC - Modified California Sampler
- NR - No Recovery

LOG OF TEST BORING NO. LB-01

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scrubber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/2/16

LOCATION See Site Plan

RIG TYPE CME 75

BORING TYPE Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION	
0	PP (tsf)			ST			17.2	39.9	47	22	25	CL-ML		[FILL] SANDY SILTY CLAY, black, fine-grained sand, trace roots. becomes yellowish brown from 0.5' to 2', trace ferrous stains.	
0.00															
4.00				ST										[FILL] SANDY FAT CLAY, very stiff, yellowish brown, trace pebbles.	
5	4.50+			ST			31.1	55.9	61	37	24		Unconf. Compressive Strength= 0.92 tsf		
2.75				ST											
4.25				ST			32.0	63.2	59	30	29				
10														CH	SANDY FAT CLAY, medium stiff, dark gray, very fine-grained sand, slightly platy.
15	1.00			ST			28.9	50.0	56	36	20				
20															
				SS 14 - 50/7"		50	26.1	54.5	46	30	16	CL		SANDY LEAN CLAY, hard, dark gray, very fine-grained sand, slightly platy.	
25															
				SS 50/5"		50									

GROUNDWATER

DEPTH(ft)	HOUR	DATE
▼ Dry		10/2/2016
▼ 15.7'	17:53	10/2/2016
▼		
▼		

SAMPLE TYPE
 A - Drill cuttings
 S - 2" O.D. 1.38" I.D. tube sample
 U - 3" O.D. 2.42" I.D. tube sample
 C - 3" O.D. CME tube sample
 SH - 3" Shelby sample
 MC - Modified California Sampler
 NR - No Recovery

LOG OF TEST BORING NO. LB-02

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scrubber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/2/16

LOCATION See Site Plan

RIG TYPE CME 75

BORING TYPE Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
30			X	SS	50/6"	50	20.7	54.8	57	31	26	CL		SANDY LEAN CLAY, hard, dark gray, very fine-grained sand, slightly platy.
			X	SS	28 - 50/4"	50								
35														
40			X	SS	13 - 50/6"	60						Lignite		LIGNITE, hard, dry, dark brown, platy
40														Boring was terminated at 40 feet
45														
50														
55														

GROUNDWATER

DEPTH(ft)	HOUR	DATE
15.7'	17:53	10/2/2016

SAMPLE TYPE
 A - Drill cuttings
 S - 2" O.D. 1.38" I.D. tube sample
 U - 3" O.D. 2.42" I.D. tube sample
 C - 3" O.D. CME tube sample
 SH - 3" Shelby sample
 MC - Modified California Sampler
 NR - No Recovery

LOG OF TEST BORING NO. LB-02

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scrubber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/5/16

LOCATION See Site Plan

RIG TYPE CME 75

BORING TYPE Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
0	PP (tsf)			ST									Fly-Ash	[FILL] FLY ASH, dark gray.
4.50+				ST			17.7	24.6	33	18	15			[FILL] CLAYEY SAND, dense to very dense, yellowish brown, ferrous stains, fine-grained sand, trace pebbles and coarse-grained sand intrusions at intermittent depths.
5	4.25			ST										
	2.50			ST										
	3.25			ST			18.1	31.8	33	16	17			
10														
	2.25			ST										[FILL] FAT CLAY, very stiff, dark gray, ferrous stains, very fine-grained sand
15														
	1.00			ST			36.1	29.4	NP	NP	NP			SILTY SAND, medium stiff, light olive brown, fine-grained sand.
20														
				SS	26 - 50/6"	50	29.8	22.7	NP	NP	NP			SM
25														very dense below 23'.

GROUNDWATER

DEPTH(ft)	HOUR	DATE
18'		10/5/2016
11.7'	19:26	10/5/2016

SAMPLE TYPE
 A - Drill cuttings
 S - 2" O.D. 1.38" I.D. tube sample
 U - 3" O.D. 2.42" I.D. tube sample
 C - 3" O.D. CME tube sample
 SH - 3" Shelby sample
 MC - Modified California Sampler
 NR - No Recovery

LOG OF TEST BORING NO. LB-03

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scrubber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/5/16

LOCATION See Site Plan

RIG TYPE CME 75

BORING TYPE Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
30			X	SS24 - 26 - 38	64									SILTY SAND, very dense, light olive brown, fine-grained. - increased silt content with depth.
35			X	SS 25 - 50/6"	50									
40			X	SS 28 - 50/6"	60									
40													Boring was terminated at 40 feet	
45														
50														
55														

GROUNDWATER		
DEPTH(ft)	HOUR	DATE
18'		10/5/2016
11.7'	19:26	10/5/2016

SAMPLE TYPE
 A - Drill cuttings
 S - 2" O.D. 1.38" I.D. tube sample
 U - 3" O.D. 2.42" I.D. tube sample
 C - 3" O.D. CME tube sample
 SH - 3" Shelby sample
 MC - Modified California Sampler
 NR - No Recovery

LOG OF TEST BORING NO. LB-03

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scruber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/1/16

LOCATION See Site Plan

RIG TYPE CME 75

BORING TYPE Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
0	PP (tsf)			ST								SM		[FILL] SILTY SAND, light gray to dark gray, very fine-grained, trace roots at surface,
				ST			35.9	73.1	65	38	27	CH		[FILL] SANDY FAT CLAY, very stiff to hard, yellowish brown, ferrous stains, fine-grained sand, trace pebbles and coarse-grained sand intrusions at intermittent depths. - becomes yellowish brown from 4' to 6', with ferrous stains.
5				SS	7 - 9 - 10	19	30.0	59.4	62	28	34			- stiff to very stiff, brown to reddish brown below 6'.
				SS	5 - 6 - 8	12								
				ST										
2.50														
10												SC		CLAYEY SAND, reddish brown, very fine-grained
				ST			31.7	36.7	50	31	19			- very dense below 13'
4.00														
15														
				ST								Lignite		LIGNITE, hard, dark reddish brown, - sandy siltstone layer at 19.5'. hard, with very fine-grained sand.
20														
				SS	35 - 50/4'	85	34.0	89.2	67	37	30	CH		SANDY FAT CLAY, very dense, light olive brown, fine-grained.
25														

GROUNDWATER

DEPTH(ft)	HOUR	DATE
16.5'	17:00	10/1/2016

SAMPLE TYPE
 A - Drill cuttings
 S - 2" O.D. 1.38" I.D. tube sample
 U - 3" O.D. 2.42" I.D. tube sample
 C - 3" O.D. CME tube sample
 SH - 3" Shelby sample
 MC - Modified California Sampler
 NR - No Recovery

LOG OF TEST BORING NO. LB-04

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scrubber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/1/16

LOCATION See Site Plan

RIG TYPE CME 75

BORING TYPE Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
30				SS19 - 30 - 35	65									SANDY LEAN CLAY, hard, reddish brown, very fine-grained sand, with sand and silt intermittent partings and ferrous stains.
35				SS18 - 30 - 41	71	25.9	55.3	45	27	18				
40				SS7 - 11 - 24	35	33.5	23.5	35	NP	NP		SC	CLAYEY SAND, medium dense, yellowish brown, color darkens with depth,	
40													Boring was terminated at 40 feet	
45														
50														
55														

GROUNDWATER

DEPTH(ft)	HOUR	DATE
16.5'	17:00	10/1/2016

SAMPLE TYPE

- A - Drill cuttings
- S - 2" O.D. 1.38" I.D. tube sample
- U - 3" O.D. 2.42" I.D. tube sample
- C - 3" O.D. CME tube sample
- SH - 3" Shelby sample
- MC - Modified California Sampler
- NR - No Recovery

LOG OF TEST BORING NO. LB-04

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scrubber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/2/16

LOCATION See Site Plan

RIG TYPE CME 75
BORING TYPE Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
0	PP (tsf)	[Cross-hatched]	[Black bar]	ST			18.9	25.7	46	25	21	CL		[FILL] SANDY LEAN CLAY, light gray to dark gray, very fine-grained sand, trace roots at surface.
4.50+		[Diagonal lines]	[Black bar]	ST								CL	Unconf. Compressive Strength= 2.70 tsf	SANDY LEAN CLAY, stiff to hard, brown to yellowish brown, ferrous stains, fine-grained sand.
5	4.50+		[Black bar]	ST										
10	2.75		[Black bar]	ST										
15		[Diagonal lines]	[Black bar]	SS 7 - 7 - 19		28						Lignite		LIGNITE, hard, black and dark brown, with intermittent 2-inch thick sandy clay layers at 13' and 14.5'
20		[Diagonal lines]	[Black bar]	SS 18 - 22 - 26		48	38.9	96.2	94	44	50			FAT CLAY, hard, slickensided, dark olive gray, with lignite layer at 18'.
25		[Diagonal lines]	[Black bar]	SS 50/6"		50						CL		LEAN CLAY, hard, slickensided, dark brown, lignitic.

GROUNDWATER		
DEPTH(ft)	HOUR	DATE
∇	Dry	10/2/2016
▼	13.2'	17:48 10/2/2016
▼		
▼		

SAMPLE TYPE
 A - Drill cuttings
 S - 2" O.D. 1.38" I.D. tube sample
 U - 3" O.D. 2.42" I.D. tube sample
 C - 3" O.D. CME tube sample
 SH - 3" Shelby sample
 MC - Modified California Sampler
 NR - No Recovery

LOG OF TEST BORING NO. LB-05

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scrubber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/2/16

LOCATION See Site Plan

RIG TYPE CME 75

BORING TYPE Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
30			X	SS	50/6"	50								LEAN CLAY, hard, slickensided, dark brown, lignitic.
35			X	SS	50/6"	50								
40			X	SS29 - 31 - 30		61	22.5	48.2	55	25	30	SC		CLAYEY SAND, very dense, gray, ferrous stains, very fine-grained sand.
40														Boring was terminated at 40 feet
45														
50														
55														

GROUNDWATER

DEPTH(ft)	HOUR	DATE
▼ Dry		10/2/2016
▼ 13.2'	17:48	10/2/2016
▼		
▼		

SAMPLE TYPE
 A - Drill cuttings
 S - 2" O.D. 1.38" I.D. tube sample
 U - 3" O.D. 2.42" I.D. tube sample
 C - 3" O.D. CME tube sample
 SH - 3" Shelby sample
 MC - Modified California Sampler
 NR - No Recovery

LOG OF TEST BORING NO. LB-05

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scrubber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/2/16

LOCATION See Site Plan

RIG TYPE CME 75
BORING TYPE Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
0	PP (tsf)	[Cross-hatched]	X	SS	8 - 7 - 12	19	13.0	33.4	47	25	22	GW		[FILL] GRAVEL BASE, dark gray.
			X	SS	8 - 13 - 25	38	27.1	63.7	88	50	38	CH		[FILL] SANDY FAT CLAY, hard, yellowish brown, with ferrous stains.
5			X	SS	50/6"	50						CL		SANDY LEAN CLAY, hard, light to dark yellowish brown, ferrous stains, very fine-grained sand.
				ST			27.7	86.5	49	24	25			- pale brown below 8'
10	2.75			ST										
				ST			30.4	77.0	NP	NP	NP	ML		SANDY SILT, pale brown, ferrous stains, with siltstone layer at 15.75'
15	1.00			SS	50/6"	50						CL		SANDY LEAN CLAY, hard, dark gray,
20			X	SS	23 - 26 - 50	50								
25														

GROUNDWATER

DEPTH(ft)	HOUR	DATE
4.6'	09:43	10/3/2016

SAMPLE TYPE
 A - Drill cuttings
 S - 2" O.D. 1.38" I.D. tube sample
 U - 3" O.D. 2.42" I.D. tube sample
 C - 3" O.D. CME tube sample
 SH - 3" Shelby sample
 MC - Modified California Sampler
 NR - No Recovery

LOG OF TEST BORING NO. LB-06

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scrubber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/2/16

LOCATION See Site Plan

RIG TYPE CME 75

BORING TYPE Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
30			X	SS	50/5"	50								LEAN CLAY, hard, slickensided, dark brown to black, lignitic with lignite pockets.
35			X	SS29 - 36 - 36		72								
40			X	SS	50/6"	50								
40													Boring was terminated at 40 feet	
45														
50														
55														

GROUNDWATER

SAMPLE TYPE

DEPTH(ft)	HOUR	DATE
4.6'	09:43	10/3/2016

- A - Drill cuttings
- S - 2" O.D. 1.38" I.D. tube sample
- U - 3" O.D. 2.42" I.D. tube sample
- C - 3" O.D. CME tube sample
- SH - 3" Shelby sample
- MC - Modified California Sampler
- NR - No Recovery

LOG OF TEST BORING NO. LB-06

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scrubber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/5/16

LOCATION See Site Plan

RIG TYPE CME 75
BORING TYPE Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
0	PP (tsf)			ST			8.2	24.9	NP	NP	NP	GW		[FILL] GRAVEL BASE, light gray to dark gray, very fine-grained, trace roots at surface,
4.50+				ST										
3.25				ST										[FILL] SANDY LEAN CLAY, very stiff to hard, pale brown, ferrous stains, fine-grained sand, trace pebbles and trace calcareous nodules.
5	4.50+			ST			17.7	26.9	55	21	34	SC		CLAYEY SAND, dense, yellowish brown, fine-grained with calcareous nodules.
	2.00			ST									Unconf. Compressive Strength= 1.35 tsf	
10	1.75			ST			22.9	42.2	59	14	45	SC		CLAYEY SAND, dense, dark gray, ferrous stains, very fine-grained sand.
15	3.50			ST			47.0	65.0	78	43	35	CH		SANDY FAT CLAY, very stiff, reddish brown, very fine-grained
20	1.50			ST										
25	4.50+			ST			37.6	72.3	70	42	28			- hard below 23'.

GROUNDWATER		
DEPTH(ft)	HOUR	DATE
27.8'	19:07	10/5/2016

SAMPLE TYPE
 A - Drill cuttings
 S - 2" O.D. 1.38" I.D. tube sample
 U - 3" O.D. 2.42" I.D. tube sample
 C - 3" O.D. CME tube sample
 SH - 3" Shelby sample
 MC - Modified California Sampler
 NR - No Recovery

LOG OF TEST BORING NO. LB-07

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scrubber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/5/16

LOCATION See Site Plan

RIG TYPE CME 75

BORING TYPE Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
30			X	SS	50/6"	50								CLAYEY SAND, very dense, gray, very fine-grained sand, with sand and silt intermittent partings and ferrous stains.
35			X	SS	50/7"	50	25.3	80.0	66	35	31			
40			X	SS	15 - 50/6"	50								
40													Boring was terminated at 40 feet	
45														
50														
55														

GROUNDWATER

SAMPLE TYPE

DEPTH(ft)	HOUR	DATE
27.8'	19:07	10/5/2016

- A - Drill cuttings
- S - 2" O.D. 1.38" I.D. tube sample
- U - 3" O.D. 2.42" I.D. tube sample
- C - 3" O.D. CME tube sample
- SH - 3" Shelby sample
- MC - Modified California Sampler
- NR - No Recovery

LOG OF TEST BORING NO. LB-07

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scrubber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/2/16

LOCATION See Site Plan

RIG TYPE CME 75
BORING TYPE Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION	
0	PP (tsf)			ST			10.4	32.9	58	31	27	GW		[FILL] GRAVEL BASE, dark gray.	
				ST										[FILL] SANDY FAT CLAY, very stiff, yellowish brown, trace pebbles.	
3.75				ST									Unconf. Compressive Strength= 1.83 tsf		
5	1.25			ST			34.2	53.2	76	44	32				
				SS	7 - 9 - 10	19								[FILL] CLAYEY SAND, medium dense, light olive brown, ferrous stains, fine-grained.	
				SS	5 - 5 - 6	11								[FILL] SANDY FAT CLAY, stiff, light olive brown to light gray, ferrous stains, very fine-grained sand.	
10														SANDY FAT CLAY, hard, grayish brown to yellowish brown, ferrous stains, very fine-grained sand, trace wood fragments and roots.	
				SS	17 - 17 - 22	39									
				SS	10 - 18 - 20	38									
				ST			39.3	66.0	90	51	39				
25	2.00													- very stiff, brown, trace calcareous nodules below 23'.	

GROUNDWATER		
DEPTH(ft)	HOUR	DATE
41'	10:00	10/2/2016
22.9'		10/2/2016

SAMPLE TYPE
 A - Drill cuttings
 S - 2" O.D. 1.38" I.D. tube sample
 U - 3" O.D. 2.42" I.D. tube sample
 C - 3" O.D. CME tube sample
 SH - 3" Shelby sample
 MC - Modified California Sampler
 NR - No Recovery

LOG OF TEST BORING NO. LB-08

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scrubber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/2/16

LOCATION See Site Plan

RIG TYPE CME 75

BORING TYPE Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liqud Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION	
30	2.50	[Hatched Pattern]	[Black Box]	ST										CH	SANDY FAT CLAY, very stiff, brown, ferrous stains, very fine-grained sand, trace calcareous nodules. - hard, dark gray, trace organic matter inclusions increasing to a 2-inch. lignite seam at 33.5'.
35		[Hatched Pattern]	[X]	SS29 - 31 - 30	61	31.8	59.0	76	37	39					
40		[Hatched Pattern]	[X]	SS 50/5"	50										
45	2.50	[Dotted Pattern]	[Black Box]	ST										SM	SILTY SAND, very dense, olive gray, ferrous stains, very fine-grained.
50		[Dotted Pattern]	[X]	SS 50/6"	50	29.3	68.7	65	38	27					Boring was terminated at 50 feet
55		[Dotted Pattern]													

GROUNDWATER		
DEPTH(ft)	HOUR	DATE
41'	10:00	10/2/2016
22.9'		10/2/2016

- SAMPLE TYPE**
- A - Drill cuttings
 - S - 2" O.D. 1.38" I.D. tube sample
 - U - 3" O.D. 2.42" I.D. tube sample
 - C - 3" O.D. CME tube sample
 - SH - 3" Shelby sample
 - MC - Modified California Sampler
 - NR - No Recovery

LOG OF TEST BORING NO. LB-08

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scrubber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/3/16

LOCATION See Site Plan

RIG TYPE CME 75

BORING TYPE Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
0	PP (tsf)			ST										[FILL] SANDY LEAN CLAY, hard, black, fine-grained sand,
4.50+				ST		35.5	60.5	82	45	37				- stiff, reddish yellow with light yellowish brown mottling, from 2' to 4'.
2.50				ST										[FILL] SANDY CLAYEY SILT, very dense, brown, trace pebbles fine-grained sand.
5	4.50+			ST										[FILL] SANDY FAT CLAY, stiff, reddish yellow, ferrous stains, very fine-grained sand.
1.25				ST		36.4	67.2	78	49	29		CH	Unconf. Compressive Strength= 1.47 tsf	
1.25				ST										
10														SANDY FAT CLAY, stiff, grayish brown to yellowish brown, ferrous stains, very fine-grained sand, trace wood fragments and roots.
1.5				ST										
15														
1.00				ST		26.0	26.7	41	26	15		SC		CLAYEY SAND, brownish yellow, ferrous stains, very fine-grained.
20														
0.75				ST		35.2	76.9	NP	NP	NP		SM		SANDY SILT, medium dense, dark red, ferrous stains, fine-grained sand.
25														

GROUNDWATER

DEPTH(ft)	HOUR	DATE
19.1'	08:30	10/5/2016
20.0'	16:40	10/5/2016

SAMPLE TYPE
 A - Drill cuttings
 S - 2" O.D. 1.38" I.D. tube sample
 U - 3" O.D. 2.42" I.D. tube sample
 C - 3" O.D. CME tube sample
 SH - 3" Shelby sample
 MC - Modified California Sampler
 NR - No Recovery

LOG OF TEST BORING NO. LB-09

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scrubber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/3/16

LOCATION See Site Plan

RIG TYPE CME 75

BORING TYPE Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
30			ST									CL		SANDY LEAN CLAY, very stiff, brownish yellow, trace calcareous nodules.
35			SS	50/6"	50	23.0	50.8	64	36	28	SC			CLAYEY SAND, very dense, grayish brown to dark gray, very fine-grained.
40			SS	50/5"	50									Boring was terminated at 40 feet
45														
50														
55														

GROUNDWATER

DEPTH(ft)	HOUR	DATE
19.1'	08:30	10/5/2016
20.0'	16:40	10/5/2016

SAMPLE TYPE

- A - Drill cuttings
- S - 2" O.D. 1.38" I.D. tube sample
- U - 3" O.D. 2.42" I.D. tube sample
- C - 3" O.D. CME tube sample
- SH - 3" Shelby sample
- MC - Modified California Sampler
- NR - No Recovery

LOG OF TEST BORING NO. LB-09

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scrubber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/5/16

LOCATION See Site Plan

RIG TYPE CME 75
BORING TYPE Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
0	PP (tsf)			ST										[FILL] GRAVEL BASE, very dense, dark gray.
4.50+				ST			19.7	54.5	52	23	29			[FILL] SANDY FAT CLAY, hard to very stiff, brown, fine-grained sand, trace roots and pebbles,
2.25				ST										
5	3.50			ST										
3.00				ST			27.2	35.6	57	29	28	SC		CLAYEY SAND, dense, brown with pale brown mottles, fine-grained, trace gravel.
3.50				ST										- brownish yellow below 8'
10														SANDY FAT CLAY, stiff, grayish brown to yellowish brown, ferrous stains, very fine-grained sand, trace wood fragments and roots.
4.00				ST										
15														
0.75				ST			76.7	77.1	NP	NP	NP	ML		SANDY SILT, medium dense, reddish brown, ferrous stains, very fine-grained.
20														
0.75				ST			35.0	64.0	NP	NP	NP			- yellowish brown below 23'.
25														

GROUNDWATER

DEPTH(ft)	HOUR	DATE
16.5'	18:54	10/5/2016

SAMPLE TYPE
 A - Drill cuttings
 S - 2" O.D. 1.38" I.D. tube sample
 U - 3" O.D. 2.42" I.D. tube sample
 C - 3" O.D. CME tube sample
 SH - 3" Shelby sample
 MC - Modified California Sampler
 NR - No Recovery

LOG OF TEST BORING NO. LB-10

PROJECT Slope Stability Analyses of Embankments of the Ash Pond and the Scrubber Slur
 12824 FM 244 Road
 Anderson, Texas



Amec foster Wheeler
 4801 Spring Valley
 Dallas
 Telephone: 469 828 4118

JOB NO. 6706150060 **DATE** 10/5/16

LOCATION See Site Plan

RIG TYPE CME 75

BORING TYPE Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
30			X	SS	19-19-22	41								SANDY SILT, medium dense, yellowish brown, ferrous stains, very fine-grained.
35			X	SS	21-50	50								
40			X	SS	17-27-31	59			43	24	19	SC		CLAYEY SAND, very dense, dark gray, very fine-grained.
40														Boring Terminated at 40'
45														
50														
55														

GROUNDWATER

DEPTH(ft)	HOUR	DATE
16.5'	18:54	10/5/2016

SAMPLE TYPE

- A - Drill cuttings
- S - 2" O.D. 1.38" I.D. tube sample
- U - 3" O.D. 2.42" I.D. tube sample
- C - 3" O.D. CME tube sample
- SH - 3" Shelby sample
- MC - Modified California Sampler
- NR - No Recovery

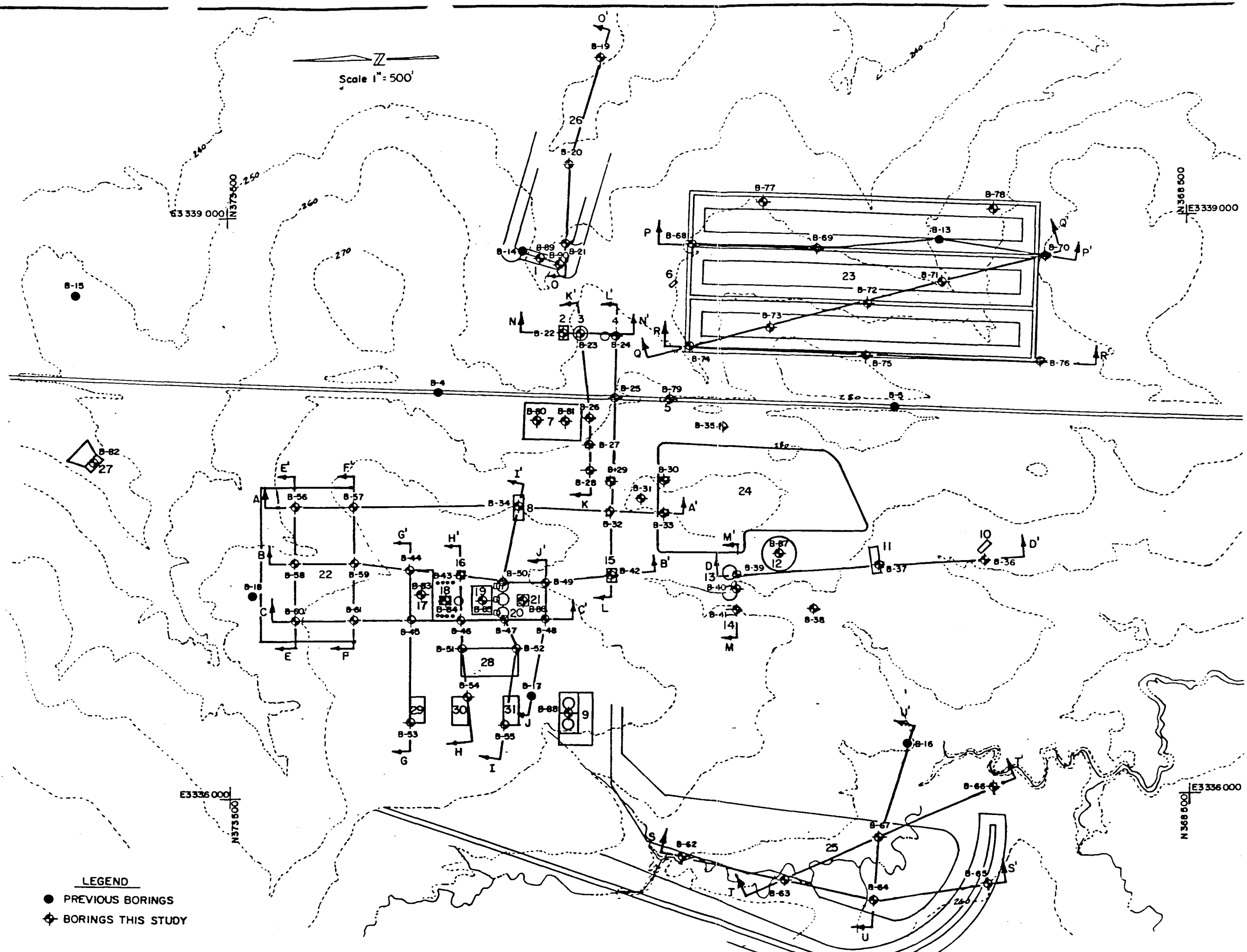
LOG OF TEST BORING NO. LB-10

APPENDIX B

KEY TO STRUCTURES

1. COOLING WATER INTAKE STRUCTURE.
2. FLY ASH DISPOSAL FACILITY.
3. FLY ASH SILO.
4. ASH DEWATERING TANKS.
5. LIMESTONE RECEIVING HOPPER.
6. SEWAGE TREATMENT PLANT.
7. LIMESTONE STORAGE FACILITY.
8. LIMESTONE PREPARATION AND STORAGE.
9. FUEL OIL STORAGE FACILITY.
10. LIGNITE RECEIVING HOPPER.
11. PRIMARY BREAKER.
12. READY PILE.
13. STORAGE SILOS.
14. TRANSFER HOOSE.
15. SECONDARY CRUSHER.
16. TRANSFER TOWER.
17. TURBINE BUILDING.
18. BOILER AREA.
19. PRECIPITATOR.
20. SO₂ SCRUBBERS.
21. STACK.
22. SWITCHYARD.
23. ASH POND.
24. LIGNITE DEAD STORAGE.
25. RETENTION POND.
26. COOLING WATER INTAKE CANAL.
27. COOLING WATER DISCHARGE.
28. MAINTENANCE BUILDING.
29. OFFICE BUILDING.
30. WAREHOUSE.
31. WAREHOUSE.

Scale 1" = 500'



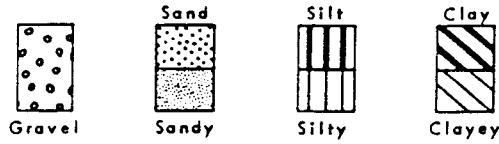
LEGEND

- PREVIOUS BORINGS
- ◆ BORINGS THIS STUDY

PLAN OF BORINGS

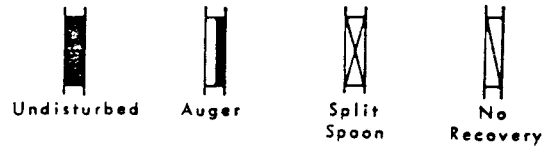
KEY TO SOIL CLASSIFICATIONS AND SYMBOLS

SOIL TYPE



Predominant type shown heavy

SAMPLE TYPE



TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS

(Major portion retained on No. 200 sieve)

Includes (1) clean gravels and sands described as fine, medium or coarse, depending on distribution of grain sizes and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as determined by laboratory tests or estimated from resistance to sampler penetration.

Penetration Resistance Blows/Foot**	Descriptive Term	Relative Density*
0 - 10	Loose	0 to 40%
10 - 30	Medium dense	40 to 70%
30 - 50	Dense	70 to 90%
Over 50	Very dense	90 to 100%

* From tests on undisturbed sand sample
** 140# hammer, 30-inch drop

Relative density is also used to describe condition of low plasticity ($P \leq 10$) fine grained soils such as sandy silts.

FINE GRAINED SOILS

(Major portion passing No. 200 sieve)

Includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings or by unconfined compression tests for soils with plasticity indices ≥ 10 .

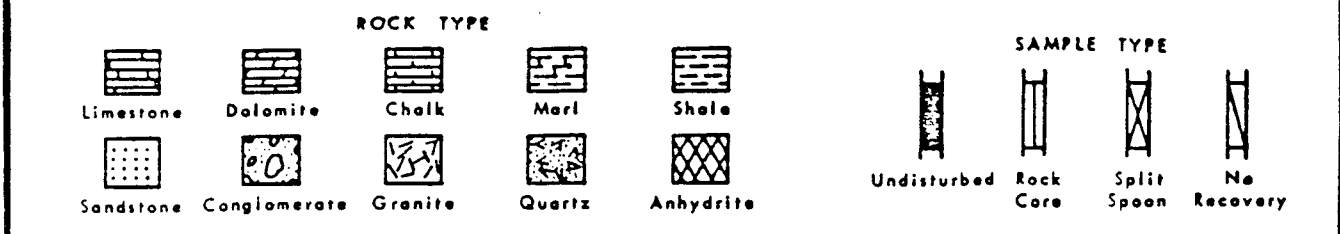
Descriptive Term	Compressive Strength Tons/Sq. Ft.
Very soft	less than 0.25
Soft	0.25 to 0.50
Firm	0.50 to 1.00
Stiff	1.00 to 2.00
Very stiff	2.00 to 4.00
Hard	4.00 and higher

Note: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above, because of planes and weakness or shrinkage cracks in the soil. The consistency ratings of such soils are based on penetrometer readings.

TERMS CHARACTERIZING SOIL STRUCTURE

Fissured	- containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical	Slickensided	- having inclined planes of weakness that are slick and glossy in appearance.
Sensitive	- pertaining to cohesive soils that are subject to appreciable loss of strength when remolded	Degree of slickenside development:	
Laminated	- composed of thin layers of varying color and texture	Slightly slickensided	- slickensides are present at intervals of 1-2 feet and soil does not easily break along these planes.
Interbedded	- composed of alternate layers of different soil types	Moderately slickensided	- slickensides are spaced at intervals of 1-2 feet and soil breaks easily along these planes.
Calcareous	- containing appreciable quantities of calcium carbonate	Extremely slickensided	- slickensides are spaced at intervals 4-12 inches, are continuous and interconnected. Soil breaks easily along the slickensides. Resulting size of broken pieces three to six inches.
Well graded	- having wide range in grain sizes and substantial amounts of all intermediate particle sizes	Intensely slickensided	- slickensides are spaced at intervals of less than four inches and are continuous in all directions. Soil breaks down along planes into nodules 0.25 - 2 inch in size.
Poorly graded	- predominately of one grain size, or having a range of sizes with some intermediate size missing		

KEY TO ROCK CLASSIFICATIONS AND SYMBOLS



TERMS CHARACTERIZING PHYSICAL PROPERTIES OF ROCK

Bedding Characteristics:

- Massive** - occurring in thick beds, free from minor joints and laminations, more than 100 mm. in thickness
- Thin to med.** - occurring in relatively thin layers or laminae, 2 mm. to 100 mm. bedding planes
- Fissile** - bedding which consists of laminae less than 2 mm. in thickness, splits easily along closely spaced parallel planes
- Cross-bedded** - arrangement of laminations of strata transverse or oblique to the main planes of stratification of the strata concerned
- Foliated** - the laminated structure resulting from segregation of granular and fine minerals into layers parallel to the schistosity (result of the parallel arrangement of platy and ellipsoidal mineral grains)
- Platy** - parallel arrangement of broad or flat minerals (giving a foliation) by slablike inclusions, by schlieren, or by bands of different mineralogy or texture
- Fragmental** - consisting of broken material, particularly that which has been moved from its place of origin

Lithologic Characteristics:

- Clayey, Shaly,** - The lithology is used describing the parent rock such as a shaly limestone or carbonaceous shale
- Calcareous (limy)**
- Siliceous**
- Sandy, Silty,**
- Plastic Seams**
- Carbonaceous**

Hardness and Degree of Cementation:

- Very soft or plastic** - can be remolded in hand, corresponds in consistency up to very stiff in soils
- Soft** - can be scratched with fingernail
- Moderately hard** - can be scratched easily with knife; cannot be scratched with fingernail
- Hard** - difficult to scratch with knife
- Very hard** - cannot be scratched with knife
- Poorly cemented or friable** - easily crumbled
- Cemented** - bound together by chemically precipitated material occurring in the interstices between allogenetic particles of rock - quartz, calcite, dolomite, siderite and iron oxide are common cementing materials

Swelling Properties:

Swelling and Non-Swelling

Slaking Properties:

Non-Slaking

Slakes slowly on exposure

Slakes readily on exposure

Texture:

- Dense** - fine-grained aphanitic rocks in which the grain size generally averages less than 0.05 to 0.1 mm.
- Fine** - more than 50% by weight smaller than 0.074 mm. in diameter (seen only with a strong hand lens or a microscope)
- Medium** - majority of grain sizes between 0.074 mm. and 0.5 mm.
- Coarse** - grain sizes range from 0.5 mm. to 1.0 mm. (crystals are visible to the unaided eye)

Structure:

- Bedding** - Flat (0° to 15°); Gently dipping (15° to 30°) Steeply dipping (30° to vertical)
- Fractures, scattered or open** - broken surface of minerals or rock which does not exhibit cleavage or bedding planes
- Fractures, closely spaced** - shows signs of broken minerals but now is cemented
- Brecciated (sheared & fragmented)** - rock made up of highly angular coarse fragments - may be sedimentary or formed by crushing or grinding along faults
- Joints** - fractures in rock, generally more or less vertical or transverse to bedding, along which no appreciable movement has occurred.
- Faulted** - fracture or fracture zone along which there has been displacement of the sides relative to one another parallel to the fracture - the displacement may be a few inches or many miles
- Slickensides** - polished and striated (scratched) surface that results from friction along a fault plane

Degree of Weathering:

- Unweathered** - rock in its natural state before being exposed to atmospheric agents
- Slightly weathered** - noted predominantly by color change with no disintegrated zones
- Weathered** - complete color change with zones of slightly decomposed rock
- Extremely weathered** - complete color change with consistency, texture, and general appearance approaching soil

Solution and Void Conditions:

- Solid** - contains no voids
- Vuggy (pitted)** - cavities in rock
- Vesicular** - containing many small cavities
- Porous** - containing voids, pores, interstices, or other openings which may or may not interconnect
- Cavities** - solutional concavity in limestone caves, the outline of which is determined by a joint or joints - also applied to small hollows in cavernous lava
- Cavernous** - containing cavities or caverns, sometimes quite large - most frequent in limestones and dolomites

LOG OF BORING NO. B-5
PRELIMINARY SITE INVESTIGATION
PROPOSED STEAM ELECTRIC STATION
GRIMES COUNTY, TEXAS

TYPE BORING: Undisturbed Sample

LOCATION: See Plan of Borings

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	ELEVATION: 273 [±]	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ. FT.			UNIT DRY WT. LBS./CU. FT.
									0.5	10	15	
			Loose gray and tan silty fine sand, w/clay inclusions (SM)			32	18	16				
			Very stiff light tan sandy clay, w/sand inclusions (CL)									
5			Loose tan silty fine sand (SM)			44	19	26				90
			Hard light tan sandy clay, w/yellow clay and sand inclusions -w/occasional clay laminations and inclusions (CL)			62	28	33				84
			Hard tan clay, w/sandy clay inclusions and iron stains (CH)									
10			Hard dark reddish-brown lignitic clay, w/lignitic material seams (OL)					58				49
15			Hard brown silty clay (CL)									
			Hard green clay, moderately slickensided (CH)			92	37	34				85
			Hard dark reddish-brown lignitic clay, w/clay seams (OH)			53	32	28				
20			Soft dark reddish-brown lignitic material, w/clay seams (Pt)			46	33	31				90
			Hard gray clayey silt (ML)									
25			Hard gray clay, w/occasional claystone laminations (CH)									
30			Hard gray sandy clay, w/numerous sand inclusions (CL)			33	18	22				101
35			Very dense gray silty fine sand, w/occasional clay laminations									
40												
45												
50												

(Continued)

LOG OF BORING NO. B-5 (Cont'd.)
 PRELIMINARY SITE INVESTIGATION
 PROPOSED STEAM ELECTRIC STATION
 GRIMES COUNTY, TEXAS

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ. FT.			UNIT DRY WT. LBS./CU. FT.
									0.5	1.0	1.5	
			(SM)	57								
55			Hard gray sandy clay, w/numerous sand inclusions -w/lignitic clay seam at 56.0'			48	19	24				97
			(CL)									
60			Hard gray clay, w/numerous silt laminations			73	32	30				88
			(CH)									
65			Hard gray clay									
			(CH)									
70						76	32	33				86
			-w/sand laminations and inclusions									
			(CH)									
80			Hard brown silty clay -1.0" thick lignitic material seam at 81.0'									
			(CL)									
85			-w/numerous silty fine sand laminations and inclusions and occasional clay laminations			43	22	27				93
			(CL)									
90			Hard brown silty clay, w/lignitic material inclusions									
			(CL)									
			Hard gray clay, w/sandy clay laminations									
			(CH)									
95			Very dense gray silty fine sand, w/numerous clay balls, laminations									
			(SM)									
			Hard gray clay, w/numerous thin silt laminations			81	28	29				90
			(CH)									
100			Hard brown silty clay, w/lignitic clay inclusions									
			(CL)									

(Continued)

LOG OF BORING NO. B-5 (Cont'd.)
PRELIMINARY SITE INVESTIGATION
PROPOSED STEAM ELECTRIC STATION
GRIMES COUNTY, TEXAS

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ. FT.			UNIT DRY WT LBS./CU. FT.
									0.5	10	15	
			Very dense gray clayey fine sand, w/sand inclusions -silty fine sand at 103.5-103.7' (SC)		33							
105			Hard gray sandy clay, -silty clay seam, w/lignitic laminations at 104.0-104.3' -silty fine sand seam at 105.3-105.5' -silty fine sand seam at 108.0-108.5' (CL)	50	3.5'							
110												
115			Hard gray clay, w/numerous sandy clay seams and laminations -slickensided									
120						49	22	26				96
125			-w/numerous clay and silt laminations									
130						65	21	28				94
			(CH)									
135			Hard greenish-gray clay, w/occasional silt laminations									
140						109	32	34 31				85 90
145												
150												

(Continued)

LOG OF BORING NO. B-5 (Cont'd.)
 PRELIMINARY SITE INVESTIGATION
 PROPOSED STEAM ELECTRIC STATION
 GRIMES COUNTY, TEXAS

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT.			UNIT DRY WT LBS./CU. FT.
									0.5	1.0	1.5	
155			(CH)									
160			Very dense gray clayey fine sand, w/clay balls and inclusions and fossil fragments (SC)		37	41	20	20				105
165			Very dense gray silty fine sand, w/occasional thin sandstone laminations									
170			-w/occasional sandstone and claystone laminations (SM)		34			24				98
175			Very dense gray silty fine sand									
180												
185												
190			-w/numerous clay laminations (SM)	503'	90							
195												
200			Hard gray clay, w/sandy clay inclusions (CH)		92	33	26					92

COMPLETION DEPTH: 200.0'
 DATE: 5/1/76

DEPTH TO WATER: 20.5'
 DATE: 5/2/76

LOG OF BORING NO. B-30
FINAL PLANT SITE INVESTIGATION
GIBBONS CREEK STEAM ELECTRIC STATION
GRIMES COUNTY, TEXAS

TYPE BORING: Undisturbed Sample

LOCATION: N371225;E3337630

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ.FT.			UNIT DRY WT. LBS./CU. FT.
									05	10	15	
			ELEVATION: 279.7									
			Loose brown silty sand (SM)									
5			Firm brown sandy clay, ironstained, -hard below 3.5', w/sand pockets (CL)									
10			Hard tan clay, ironstained w/silt laminations (CH)			72	38	39				
20			Very dense tan silty fine sand, w/clay laminations (SM)	36								
30			Hard gray clay (CH)									
35			Very dense gray and tan clayey sand, w/clay laminations and indurated seams (SC)	506"								
40			Hard gray silty clay, w/lignitic material seams									
50				92	53	32	31				(6, 80)	91

(Continued)

LOG OF BORING NO. 8-30 (Cont'd)
FINAL PLANT SITE INVESTIGATION
GIBBONS CREEK STEAM ELECTRIC STATION
GRIMES COUNTY, TEXAS

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ. FT.			UNIT DRY WT. LBS./CU. FT.
								0.5	1.0	1.5	
			(CL-CH)								
			Hard gray clay, w/occasional silt laminations								
55			(CH)								
			Hard gray silty clay								
			(CL)								
60			Very dense gray clayey fine sand								
			(SC)								
			Hard brown sandy clay, w/ lignitic laminations								
65			(CL)								
			Hard gray silty clay								
			(CL)								
70			Very dense gray sandy silt								
			(ML)								
75											
80											
85											
90											
95											
100											

COMPLETION DEPTH: 70.0'

DEPTH TO WATER: 4.0' Caved at 28.0'

DATE: 11/18/76

DATE: 11/21/76

LOG OF BORING NO. B-31
FINAL PLANT SITE INVESTIGATION
GIBBONS CREEK STEAM ELECTRIC STATION
GRIMES COUNTY, TEXAS

TYPE BORING: Undisturbed Sample

LOCATION: N371370; E3337550

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT.			UNIT DRY WT. LBS./CU. FT.
									0.5	1.0	1.5	
			ELEVATION: 282.0						0.5	1.0	1.5	
			Loose brown silty fine sand (SM)									
5			Very stiff gray sandy clay, w/ ironstained pockets (CL)									
			Very stiff tan silty clay (CL)									
10			Very dense light gray clayey sand, w/occasional silty sand and silty clay seams (SC)									
15			Hard tan silty clay (CL)									
			Hard tan sandy clay (CL)	54								
20			Very dense tan silty fine sand, w/occasional clay seams									
25						36	20					
30			-w/lignitic material laminations and clay pockets	50								
			-w/indurated seams	5.5"								
			-w/clayey sand seams	Seat								
35			-3" lignitic material seam at 37.5' (SM)									
40			Hard greenish gray clay, slickensided (CH)									
45			Hard gray clay, w/ occasional sand pockets -w/lignitic material seams at 45.0-45.4' (CL)									
50			Hard gray clay -w/occasional silt laminations					27			(6.59)	93

(Continued)

LOG OF BORING NO. B-31 (Cont'd)
FINAL PLANT SITE INVESTIGATION
GIBBONS CREEK STEAM ELECTRIC STATION
GRIMES COUNTY, TEXAS

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT.			UNIT DRY WT. LBS./CU. FT.
									0.5	1.0	1.5	
55			-w/occasional lignitic material pockets									
60			-w/lignitic material laminations (CH)									
65			Very dense gray and grayish brown silty fine sand, slightly clayey (SM)	89	10							
65			Hard gray and brown sandy clay, w/numerous lignitic material laminations (CL)									
70			Very dense gray and brown silty fine sand, lignitic -w/clay seams at 69.0' (SM)									
75												
80												
85												
90												
95												
100												

COMPLETION DEPTH: 70.0'

DATE: 11/21/76

DEPTH TO WATER: 1.0' Caved at 35.0'

DATE: 11/22/76

LOG OF BORING NO. B-33
FINAL PLANT SITE INVESTIGATION
GIBBONS CREEK STEAM ELECTRIC STATION
GRIMES COUNTY, TEXAS

TYPE BORING: Undisturbed Sample

LOCATION: N371225; E3337465

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ. FT.			UNIT DRY WT. LBS./CU. FT.
									0.5	1.0	1.5	
			ELEVATION: 281.5									
			Loose brown silty fine sand (SM)									
5			Stiff gray and red sandy clay -gray -w/silty sand seams (CL)		50	36	12	17				
15			Dense light gray sandy silt, w/clay laminations (ML)									
20			Hard light gray clay -w/silt laminations (CH)									
30			Dense light gray silty fine sand -w/clay laminations -w/indurated seams (SM)	39								
35			Hard light brownish tan clay, jointed -w/occasional silty seams -w/occasional selenite laminations (CH)									
40			Hard gray clay, w/occasional silty seams (CH)									
45			Hard brownish gray clay, w/silt pockets -w/numerous lignitic material pockets at 45.0-45.5' (CH)		67	26	31				(4, 31)	90
50			Hard gray silty clay, w/occasional lignitic material seams (CH)									

(Continued)

LOG OF BORING NO. 8-33 (Cont'd)
FINAL PLANT SITE INVESTIGATION
GIBBONS CREEK STEAM ELECTRIC STATION
GRIMES COUNTY, TEXAS

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT.			UNIT DRY WT. LBS./CU. FT.
									0.5	1.0	1.5	
55			-w/lignitic material and lignitic clay seams below 54.5'									
			(CL)									
60			Very dense gray silty fine sand (SM)									
65			Very dense gray and brown clayey fine sand -w/bentonitic sand pockets at 61.5' -lignitic -w/sandy silt seams at 65.1'	92/10"	24							
			(SC)									
70												
75												
80												
85												
90												
95												
100												

COMPLETION DEPTH: 70.0'

DEPTH TO WATER: 31.0' Caved at 65.0'

DATE: 11/22/76

DATE: 11/23/76

LOG OF BORING NO. B-35
FINAL PLANT SITE INVESTIGATION
GIBBONS CREEK STEAM ELECTRIC STATION
GRIMES COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: N370920; E3337910

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT.			UNIT DRY WT LBS./CU. FT.
								0.5	1.0	1.5	
			ELEVATION: 273.2								
			Loose light brown silty fine sand (SM)								
5			Soft tan sandy clay, ironstained, w/sand laminations - hard below 2.5' (CL)								
10			Hard tan silty clay, ironstained and jointed -very stiff below 9.0' (CL)		48	26					
15			Very stiff tan clayey silt, ironstained (ML)	87	45	24	30				84
20			-w/silt seams at 19.5' -w/numerous clay laminations below 20.0'								
25							26				88
30			Hard gray clay, indurated -lignitic below 31.0' (CH)		86	27	25			(23.3)	94
35			Hard gray sandy clay, w/indurated seams (CL)								
40			Hard gray clay, -w/0.5' sandstone seam at 37.0' -w/slickensides at 39.0' -w/sandstone seams at 40.0-41.0' -w/sandy clay seam at 43.5-44.5' (CH)		62	38					
45											
50			Hard gray clay, w/silt pockets -w/organic material								

(Continued)

LOG OF BORING NO. B-35 (Cont'd)
FINAL PLANT SITE INVESTIGATION
GIBBONS CREEK STEAM ELECTRIC STATION
GRIMES COUNTY, TEXAS

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT.			UNIT DRY WT. LBS./CU. FT.
								0.5	1.0	1.5	
			-lignitic below 50.0'								
			(CL)								
-55			Hard gray silty clay								
			(CL)								
			Hard gray clay								
			-w/occasional silt laminations								
-60			-slightly sandy, w/lignitic laminations at 60.0'								
			(CL-CH)								
-65											
-70											
-75											
-80											
-85											
-90											
-95											
-100											

COMPLETION DEPTH: 60.0'
 DATE: 11/17/76

LOG OF BORING NO. B-75
ASH STORAGE PONDS
GIBBONS CREEK STEAM ELECTRIC STATION
GRIMES COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: N370150; E3338275

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT.			UNIT DRY WT. LBS./CU. FT.
									0.5	1.0	1.5	
			ELEVATION: 277.8									
0-5			Loose brown and tan silty fine sand -w/red clay seam at 0.5' -w/occasional gravel (SM)									
5-10			Hard tan silty clay, jointed, w/indurated zones and iron-laminations -reddish-tan (CL)									
10-15			Very stiff tan clay (CH)									
15-20			Hard tannish-red lignitic clay, w/lignitic material seams at 9.0'-10.0' (OH)			92	37					
20-25			Hard brown clay, w/lignitic material seams (CH)		47	74	60	44	$K_v = 1.1 \times 10^{-7}$ cm/sec			62
25-30			Stiff dark green clay, w/occasional dark reddish-brown lignitic material seams (CH)									
30-35			Hard dark brown sandy clay, indurated -lignitic material seam (CL)		38	85	65	50	$K_v = 1.7 \times 10^{-4}$ cm/sec			61
35-40			Hard dark gray sandy clay, indurated (CL)									
40-45			Very dense green clayey fine sand (SC)	50/4"								
45-50			Hard green sandy clay (CL)									

COMPLETION DEPTH: 45.0'

DEPTH TO WATER: Caved at 3.0'

DATE: 12/1/76

DATE: 12/2/76

LOG OF BORING NO. B-76
ASH STORAGE PONDS
GIBBONS CREEK STEAM ELECTRIC STATION
GRIMES COUNTY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: N369260, E3338250

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ. FT.			UNIT DRY WT. LBS./CU. FT.
								0.5	1.0	1.5	
			ELEVATION: 277.5								
			Loose dark reddish-brown clayey fine sand (SC)								
5			Stiff tan silty clay (CL)								
10			Stiff tan and dark red clay, ironstained and jointed (CH)								
15			Hard light tan and light gray clay, w/silt laminations (CL-CH)	93	38	20	24				96
20			Hard dark tan clay (CH)								
25			Very dense dark gray silty fine sand, w/light gray clay pockets (SM)	48	49	24	25				105
30			Soft dark brown lignitic material, w/clay seams (Pt)								
35			Hard greenish-gray clay, slickensided (CH)								
40			Soft dark brown lignitic material (Pt)								
45											
50											

COMPLETION DEPTH: 45.5'

DEPTH TO WATER: 6.5'

DATE: 12/3/76

DATE: 12/4/76

LOG OF BORING NO. B-77
ASH STORAGE PONDS
GIBBONS CREEK STEAM ELECTRIC STATION
GRIMES COUNTY, TEXAS

TYPE BORING: Undisturbed Sample

LOCATION: N370723; E3339097

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT.			UNIT DRY WT. LBS./CU. FT.
								0.5	1.0	1.5	
			ELEVATION: 259.0								
			Loose brown silty fine sand (SM)								
			Firm brown sandy clay, w/iron stained laminations and numerous sand pockets								
5			-stiff below 2.0' (CL)								
			Stiff light tan silty clay, w/numerous sand laminations								
10											
15											
			(CL)								
20			Medium dense gray silty fine sand, w/clay balls								
25											
30											
35			(SM)								
40											
45											
50											

COMPLETION DEPTH: 35.0'

DATE: 4/2/77

DEPTH TO WATER: 10.0' - Caved at 31.0'

DATE: 4/3/77

LOG OF BORING NO. B-78
ASH STORAGE PONDS
GIBBONS CREEK STEAM ELECTRIC STATION
GRIMES COUNTY, TEXAS

TYPE BORING: Undisturbed Sample

LOCATION: N369513; E3339064

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT.			UNIT DRY WT. LBS./CU. FT.
								0.5	10	15	
			ELEVATION: 266.3								
			Loose reddish-brown silty fine sand w/iron stains and occasional clay laminations (SM)								
5			Stiff light tan silty clay, w/clay laminations and iron stains (CL)								
10			Very stiff light tan clay, w/iron stained lenses (CH)								
15			Hard grayish-green silty clay, w/clay and sand laminations								
20											
25			-w/lignitic material laminations (CL)								
30			Soft reddish-brown lignitic material -w/lignitic clay seams (Pt)								
35			Hard gray silty clay, w/lignitic clay seams (CL)								
40			Hard dark brown lignitic clay, w/silty clay and lignitic material seams (OL)								
45											
50											

COMPLETION DEPTH: 40.0'

DATE: 4/4/77

LOG OF BORING NO. B-79
FINAL PLANT SITE INVESTIGATION
GIBBONS CREEK STEAM ELECTRIC STATION
GRIMES COUNTY, TEXAS

TYPE BORING: Undisturbed Sample

LOCATION: N371246; E3338035

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT.			UNIT DRY WT. LBS./CU. FT.
									0.5	1.0	1.5	
			ELEVATION: 270.9									
			Firm light tan sandy clay, w/gravel (CL)									
5			Medium dense light tan silty fine sand, slightly clayey									
10												
15			-w/iron stained laminations -dense below 13.5'	41								
20												
25												
30				36								
35			-w/brown siltstone laminations and seams (SM)									
40			Hard brown siltstone, w/iron stained laminations									
45			Hard grayish-green clay, w/occasional silt laminations -w/lignitic material									
50												

(Continued)

LOG OF BORING NO. B-79 (Cont'd)
FINAL PLANT SITE INVESTIGATION
GIBBONS CREEK STEAM ELECTRIC STATION
GRIMES COUNTY, TEXAS

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT.			UNIT DRY WT LBS./CU. FT.
									0.5	1.0	1.5	
55			-w/clayey silt seams (CL-CH)									
60			Very dense grayish-brown silty fine sand, w/organic laminations (SM)									
75			Hard gray sandy clay, w/occasional sand seams -indurated -w/clay laminations -w/clay seams -crossbedded (CL)	50 1/4 seat								
95			Hard dark brown clay, w/silty fine sand laminations and seams -greenish-gray and dark brown (CH)									

COMPLETION DEPTH: 100.0'

DATE: 4/20/77

LOG OF BORING NO. B-87
FINAL PLANT SITE INVESTIGATION
GIBBONS CREEK STEAM ELECTRIC STATION
GRIMES COUNTY, TEXAS

TYPE BORING: Undisturbed Sample

LOCATION: N370721; E3337226

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT.			UNIT DRY WT. LBS./CU. FT.
								0.5	1.0	1.5	
			ELEVATION: 275.0								
			Medium dense brown silty fine sand (SM)								
5			Stiff tan clay, w/silty fine sand and iron stained laminations -hard, w/gravel (CL-CH)								
10			Hard light tan silty clay, w/ iron stained laminations (CL)								
15			Hard light tan sandy clay -w/tan sand and iron stained laminations (CL)								
20			Very dense tan clayey sand, slightly indurated, w/clay pockets (SC)								
25			Hard tan silty clay, w/silty fine sand and iron stained laminations (CL)								
30			Hard grayish-green silty clay, w/fine sand seams and tan clay laminations (CL)								
35			Very stiff gray clay, bentonitic, w/sand seams (CH)								
40			Hard gray clay, w/silt laminations -w/fine sand laminations and seams -w/lignitic clay laminations below 45.0'								
45											
50											

(Continued)

LOG OF BORING NO. B-87 (Cont'd.)
FINAL PLANT SITE INVESTIGATION
GIBBONS CREEK STEAM ELECTRIC STATION
GRIMES COUNTY, TEXAS

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT.			UNIT DRY WT. LBS./CU. FT.
									0.5	1.0	1.5	
55			(CH)									
60			Hard gray silty clay, w/silt laminations (CL)									
65			Very dense grayish-brown clayey fine sand, w/gray clay laminations (SC)									
70			Very dense gray silty fine sand (SM)									
75				50/3" seat								
80			Hard grayish-green clay, w/silty fine sand laminations and seams (CL-CH)									
85												
90												
95												
100			Hard greenish-gray clay, w/occasional silt laminations (CH)									

COMPLETION DEPTH: 100.0'

DATE: 4/13/77

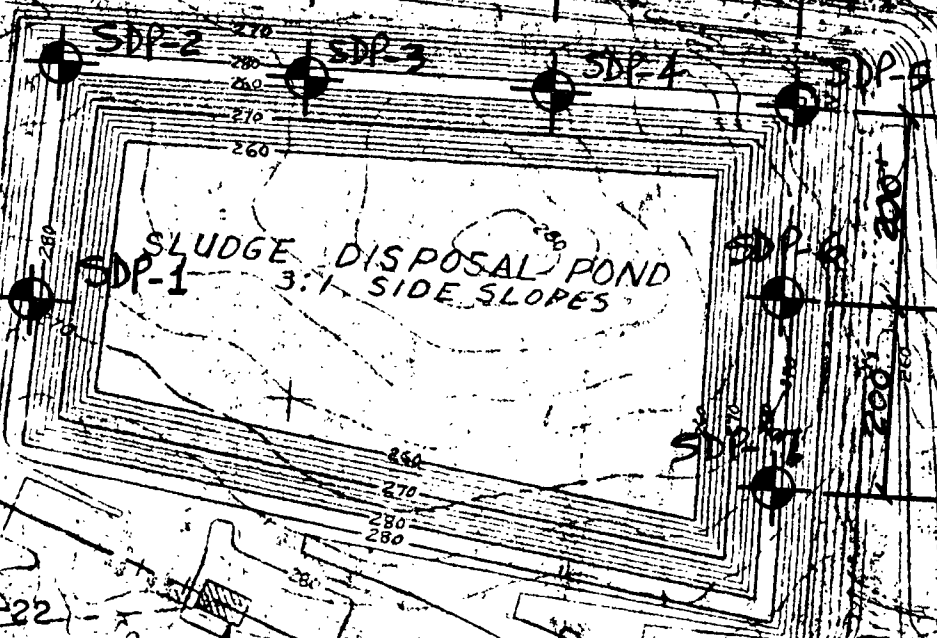
DEPTH TO WATER: Surface - Caved at 5.0'

DATE: 4/14/77

PLANT R.R.#2

Approx. NORTH

Note: Adjust boring locations in field to avoid sluice pipes.



6 FT. REC. HOPPER
 @ 83 857 285
 N369 530. ON
 AN AZIMUTH
 OF 8 210-30W
 TOP @ EL 282.0

STORM

CONVEYORS

PRIMARY BREAKER

CONVEYORS

16

C-22

DELETE CULVERT C-22

CHAIN-RIP RAP

PLATE

NORTH SIDE

EAST SIDE

SOUTH SIDE

SDP-1

SDP-2

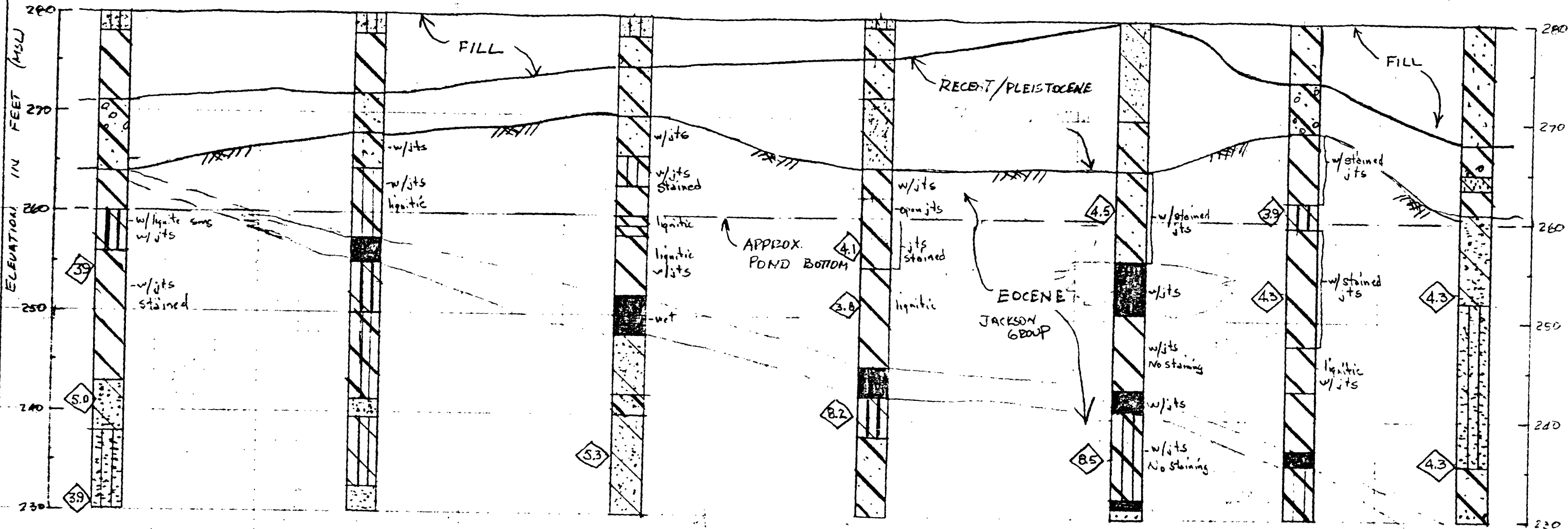
SDP-3

SDP-4

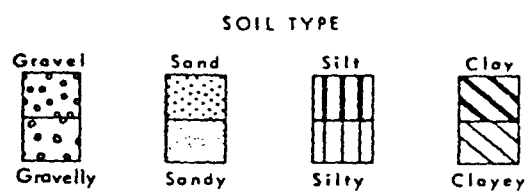
SDP-5

SDP-6

SDP-7



3.9 pH of Soil Sample determined in Lab



Scale: 1" = 100' Hor
1" = 10' Vert

SLUDGE POND
GENERALIZED SOILS
CONDITIONS

BORING LOG

PROJECT: Gibbons Creek S.E.S. Facility Sludge Disposal Pond, Carlos, Texas

BORING NO: SDP-1
 LOCATION: As directed by Client
 BORING TYPE: 4 1/2" Rotary
 GROUND ELEV: 280'±

CLIENT: TEXAS MUNICIPAL POWER AGENCY
 DATE: 9-27-83
 PROJECT NO: 283-202
 DRILLER: Anderson
 SOIL TECHNICIAN: Huff

Depth in Feet	Sample Type & No.	Penetrometer Reading, tsf	Blows / Foot	Legend				
				<input type="checkbox"/> - Shelby Tube Sample	<input checked="" type="checkbox"/> - Standard Penetration Test Sample	<input checked="" type="checkbox"/> - No Recovery	J-Jar	
DESCRIPTION OF STRATUM								
	2468			Topsoil, tan silty fine sand with roots				2'
	2469	4+		Hard tan and gray clay, fill				
5	2470	4+		Hard tan and gray clay with red clay streaks, fill				
	2471	4+		Hard tan clay				
	2472	4+		Hard brown clay to 8'2"				
10	2472	2.75		Very stiff gray sandy clay with gravel and sand pockets				
	2473	2.0		Stiff to very stiff tan sandy clay with gravel and sand pockets				
	2474	1.75		Stiff tan and gray sandy clay				
15	2475	4.0		Hard gray sandy clay with tan clay layer at 15.75'				16'
	2476	3.5		Very stiff brown clay with lignite seams, laminated and jointed				
	2476	2.5		Very stiff brown silty clay with organic clay layer and cemented sand nodules				20'
20	2477	2.5						
	2478	4+		Hard tan silty clay				
	2479	4+		Hard gray clay with iron stains and sand pockets				
25	2480	4+		Hard gray clay with iron stains, laminated and jointed				
	2481	4+		Hard gray clay with iron stains, laminated and jointed				
	2482	4+		Hard gray silty clay with iron stains and gypsum seams				
30								
	2483	4+		Hard gray clay with gypsum seam at 33'3", laminated and jointed				37'±
35								
	2484	2.0		Stiff gray sandy clay-clayey sand				42'±
40								
	2485	2.0		Alternating layers of gray sandy clay and clayey sand				
45								

BORING LOG

PROJECT: Gibbons Creek S.E.S. Facility Sludge Disposal Pond, Carlos, Texas

BORING NO: SDP-1
 LOCATION: As directed by Client
 BORING TYPE: 4 1/2" Rotary
 GROUND ELEV: 280'±

CLIENT: TEXAS MUNICIPAL POWER AGENCY
 DATE: 9-27-83
 DRILLER: Anderson
 PROJECT NO: 283-202
 SOIL TECHNICIAN: Huff

Depth in Feet	Sample Type & Sample No.	Penetrometer Reading, tsf	Blows / Foot	DESCRIPTION OF STRATUM
				<input type="checkbox"/> - Shelby Tube Sample <input checked="" type="checkbox"/> - Standard Penetration Test Sample <input checked="" type="checkbox"/> - No Recovery J-Jar
				DESCRIPTION OF STRATUM
				Alternating layers of gray sandy clay and clayey sand 47.5'
50	X 2486		58	Very dense gray sand <div style="text-align: center;"> <hr style="width: 20%; margin: 0 auto;"/> Bottom at 50' </div>
55				
60				
65				
				Boring filled with cement-bentonite grout upon completion of drilling.

BORING LOG

PROJECT: Gibbons Creek S.E.S. Facility Sludge
Disposal Pond, Carlos, Texas

BORING NO: SDP-2

LOCATION: As directed by
Client

CLIENT: TEXAS MUNICIPAL POWER AGENCY

BORING TYPE: 4 1/2" Rotary

DATE: 9-27-83

PROJECT NO: 283-202

GROUND ELEV: 280'±

DRILLER: Anderson

SOIL TECHNICIAN: Huff

Depth in Feet	Sample Type & Sample No.	Penetrometer Reading, tsf	Blows / Foot	<input type="checkbox"/> - Shelby Tube Sample <input checked="" type="checkbox"/> - Standard Penetration Test Sample <input type="checkbox"/> - No Recovery J-Jar			
				DESCRIPTION OF STRATUM			
	2448					Topsoil, tan silty fine sand with roots	2'
	2449	4+				Hard tan and gray clay with sand streaks, fill	
5	2450	4+				Hard tan and gray clay and sandy clay with sand streaks, fill	
	2451	4+				Hard gray clay with sand and clay pockets, fill	
	2452	2.25				Very stiff red and gray sandy clay with tan sand pockets	
10	2453	2.75 4+				Very stiff to hard red and gray sandy clay	
	2454	4+				Hard gray sandy clay, jointed	
15	2455	4+				Hard gray clay	15.5'
	2456	2.0				Brown lignitic clay, jointed Very stiff brown clay with trace of lignite, laminated and jointed	
	2457	3.0				Very stiff reddish brown silty clay, laminated and jointed	
20	2458	4+				Hard reddish brown silty clay with iron ore layer at 21'10"	
	2459	4+				Hard brown clay	22'7"
	2460	4+				Hard black lignite	
25	2461	4+				Hard black lignite	25'
	2462	4+				Hard gray silty clay, laminated	
	2463	4+				Hard gray silty clay, laminated	
30							
	2464	4+				Hard gray sandy clay with 2" sandstone layer at 33', laminated	
35							
	2465	4+				Cemented sand seam at 38' Hard gray clay with cemented sand seams	38.75'
40						Sand	40.5'
	2466	4+				Hard gray sandy clay with trace of lignite	
45							

BORING LOG

PROJECT: Gibbons Creek S.E.S. Facility Sludge Disposal Pond, Carlos, Texas

BORING NO: SDP-2
 LOCATION: As directed by Client
 BORING TYPE: 4 1/2" Rotary
 GROUND ELEV: 280'±

CLIENT: TEXAS MUNICIPAL POWER AGENCY
 DATE: 9-27-83
 PROJECT NO: 283-202
 DRILLER: Anderson
 SOIL TECHNICIAN: Huff

Depth in Feet	Sample Type & Sample No.	Penetrometer Reading, f/sf	Blows / Foot	DESCRIPTION OF STRATUM
				47.5'
50	2467		50 8"	Very dense gray sand <div style="text-align: center;"> <hr style="width: 20%; margin: 0 auto;"/> Bottom at 50' </div>
55				
60				
65				
				Boring filled with cement-bentonite grout upon completion of drilling

BORING LOG

PROJECT: Gibbons Creek S.E.S. Facility Sludge Disposal Pond, Carlos, Texas

BORING NO: SDP-3
 LOCATION: As directed by Client
 BORING TYPE: 4 1/2" Rotary
 GROUND ELEV: 280'±

CLIENT: TEXAS MUNICIPAL POWER AGENCY
 DATE: 9-27-83 PROJECT NO: 283-202
 DRILLER: Anderson SOIL TECHNICIAN: Huff

Depth in Feet	Sample Type & Sample No.	Penetrometer Reading, 1st	Blows / Foot	Legend				
				<input type="checkbox"/> - Shelby Tube Sample	<input checked="" type="checkbox"/> - Standard Penetration Test Sample	<input checked="" type="checkbox"/> - No Recovery	J-Jar	
DESCRIPTION OF STRATUM								
	2487			Topsoil, tan silty fine sand with roots				2'
	2488	4+		Hard gray clay with tan clay streaks and calcareous nodules				
5	2489	4+		Hard tan and gray sandy clay with sand pockets and gravel, fill				
	2490	4+		Hard tan and gray sandy clay with trace of gravel				
	2491	4+		Hard tan and gray sandy clay with occasional sand pockets and gravel				
10	2492	4+		Hard tan and gray sandy clay with organic material, jointed				
	2493	4+		Hard tan clay with organic material at 11'8", jointed				
	2494	2.0		Hard tan clay with iron stains and lignite streaks, laminated and jointed				14'
15	2495	4+		Stiff to hard brown silty clay with trace of lignite, laminated and jointed				
	2496	1.5		Stiff brown silty clay with trace of lignite				17'
	2497	4+		Hard tan clay				
20	2498	4+		Hard tan clay with iron ore seams, jointed				20'
	2499	2.5		Stiff brown lignitic clay, laminated and jointed				21'
	2500	4+		Hard tan clay with iron ore seams, laminated and jointed				22'
	2501	4+		Hard brown lignitic clay, laminated and jointed				
25	2502	3.5		Very stiff dark brown lignitic clay at 23', laminated, jointed				
	2503	4+		Hard brown lignitic clay, laminated and jointed				
	2504	4+		Hard brown lignitic clay, laminated and jointed				28'
30	2505	4+		Hard black lignite				
	2506	4+		Gray sandy clay				32'
35	2507	4+		Hard gray sandy clay				
	2508	4+		Hard gray sandy clay, laminated				
40	2509	4+		Cemented sand seam at 43'				
45	2510	2.0		Stiff gray sandy clay with sand pockets and cemented sand nodules				

BORING LOG

PROJECT: Gibbons Creek S.E.S. Facility Sludge Disposal Pond, Carlos, Texas

BORING NO: SDP-3
 LOCATION: As directed by Client

CLIENT: TEXAS MUNICIPAL POWER AGENCY

DATE: 9-27-83

PROJECT NO: 283-202

BORING TYPE: 4 1/2" Rotary

DRILLER: Anderson

SOIL TECHNICIAN: Dean

GROUND ELEV: 280'±

Depth in Feet	Sample Type & Sample No.	Penetrometer Reading, 'sf	Blows / Foot	<input type="checkbox"/> - Shelby Tube Sample <input checked="" type="checkbox"/> - Standard Penetration Test Sample <input checked="" type="checkbox"/> - No Recovery J-Jar	DESCRIPTION OF STRATUM
50	2505	4+			Hard gray sandy clay <hr style="width: 50%; margin: auto;"/> Bottom at 50'
55					
60					
65					
					Boring filled with cement-bentonite grout upon completion of drilling

BORING LOG

PROJECT: Gibbons Creek S.E.S. Facility Sludge Disposal Pond, Carlos, Texas

BORING NO: SDP-4
 LOCATION: As directed by Client
 BORING TYPE: 4 1/2" Rotary
 GROUND ELEV: 280'±

CLIENT: TEXAS MUNICIPAL POWER AGENCY
 DATE: 9-28-83 PROJECT NO: 283-202
 DRILLER: Anderson SOIL TECHNICIAN: Huff

Depth in Feet	Sample Type & Sample No.	Penetrometer Reading, ftsf	Blows / Foot	<input type="checkbox"/> - Shelby Tube Sample <input checked="" type="checkbox"/> - Standard Penetration Test Sample <input type="checkbox"/> - No Recovery J-Jar			
				DESCRIPTION OF STRATUM			
	2506	3.0		Topsoil, tan silty fine sand 10"			
				Very stiff tan clay			
	2507	4.0		Hard tan sandy clay with trace of lignite and gravel, fill			
5	2508	2.0		Stiff tan and gray sandy clay with gravel and 1" sand layer at 5'			
	2509	4+		Hard red and gray sandy clay			
	2510	2.5		Very stiff tan and gray sandy clay with clayey sand pockets			
10	2511	2.0		Very stiff tan and gray sandy clay with clayey sand pockets and trace of organic			
	2512	2.5		Very stiff tan and gray sandy clay with gravel, cemented sand nodules and tan sand pockets			
15	2513	2.5 4+		Very stiff tan and gray sandy clay Hard tan clay with sand nodules at 15'			
	2514	4+		Hard tan clay with iron stains 17'10"			
				Hard brown clay			
20	2515	2.5 4+		Very stiff brown clay Hard brown lignitic clay at 19', laminated and jointed 20'			
	2516	4+		Hard tan clay with iron stain streaks, jointed			
	2517	4+		Hard tan clay with iron stain streaks, jointed			
25	2518	4+		Hard tan clay with iron stain streaks, jointed 25'8"			
				Hard brown lignitic clay, jointed			
	2519	4+		Alternating 4-in. layers of brown lignitic clay and tan clay with iron stains, jointed			
	2520	4+		Hard tan clay Hard brown lignitic clay at 28.5', laminated and jointed			
30							
	2521	4+		Hard brown lignitic clay, laminated and jointed 35'			
35				Lignite 38'			
40	2522	4+		Hard gray silty clay with trace of lignite			
45	2523	4+		Hard gray sandy clay with cemented sand seams			

BORING LOG

PROJECT: Gibbons Creek S.E.S. Facility Sludge Disposal Pond, Carlos, Texas

BORING NO: SDP-4
 LOCATION: As directed by Client
 BORING TYPE: 4 1/2" Rotary
 GROUND ELEV: 280'±

CLIENT: TEXAS MUNICIPAL POWER AGENCY
 DATE: 9-28-83 PROJECT NO: 283-202
 DRILLER: Anderson SOIL TECHNICIAN: Huff

Depth in Feet	Sample Type & Sample No.	Penetrometer Reading, tsf	Blows / Foot	DESCRIPTION OF STRATUM
50	2524	4+		Hard gray sandy clay <div style="text-align: center;"> <hr style="width: 20%; margin: 0 auto;"/> Bottom at 50' </div>
55				
60				
65				
				Boring filled with cement-bentonite grout upon completion of drilling

BORING LOG

PROJECT: Gibbons Creek S.E.S. Facility Sludge
Disposal Pond, Carlos, Texas

BORING NO: SDP-5
LOCATION: As directed by
Client
BORING TYPE: 4 1/2" Rotary
GROUND ELEV: 280'±

CLIENT: TEXAS MUNICIPAL POWER AGENCY

DATE: 9-28-83

PROJECT NO: 283-202

DRILLER: Anderson

SOIL TECHNICIAN: Huff

Depth in Feet	Sample Type & Sample No.	Penetrometer Reading, 1st	Blows / Foot	Legend			
				■ - Shelby Tube Sample	☒ - Standard Penetration Test Sample	☑ - No Recovery	J-Jar
DESCRIPTION OF STRATUM							
	2525			Topsoil, tan silty fine sand _____ 1"			
				Tan, red and gray sandy clay with sand nodules and pockets			
	2526	3.5		Very stiff tan and gray sandy clay with cemented sand pockets _____ 4'±			
5	2527			Sandstone layers _____ 6'±			
	2528	2.5		Very stiff tan and gray sandy clay with sand nodules			
	2529	1.0		Plastic tan, red and gray sandy clay			
10	2530	2.5		Very stiff gray sandy clay			
	2531	3.75		Very stiff gray sandy clay with sand nodules and decayed organic material			
	2532	3.0 4+		Very stiff gray sandy clay with sand nodules Hard tan sandy clay with iron stains at 15'			
	2533	4+		Hard tan and gray clay with iron nodules and streaks, jointed			
	2534	4+		Hard tan and gray clay with iron nodules and streaks, laminated and jointed			
20	2535	4+		Hard tan sandy clay with iron stains			
	2536	4+		Hard tan clay, laminated and jointed _____ 23.5'			
				Hard brown clay, laminated and jointed _____ 24'			
25	2537	4+		Hard black lignite, laminated and jointed			
	2538	4+		Hard black lignite, laminated and jointed			
	2539	4+		Hard black lignite, laminated and jointed _____ 29.5'			
30				Clay			
	2540	4+		Hard green clay, jointed _____ 37'±			
	2541	4+		Hard black lignite, laminated and jointed _____ 39.5'±			
40							
	2542	4+		Hard gray silty clay, laminated and jointed			
45							

BORING LOG

PROJECT: Gibbons Creek S.E.S. Facility Sludge Disposal Pond, Carlos, Texas

BORING NO: SDP-5
 LOCATION: As directed by Client
 BORING TYPE: 4 1/2" Rotary
 GROUND ELEV: 280'±

CLIENT: TEXAS MUNICIPAL POWER AGENCY
 DATE: 9-28-83 PROJECT NO: 283-202
 DRILLER: Anderson SOIL TECHNICIAN: Huff

Depth in Feet	Sample Type	Sample No.	Penetrometer Reading, tsf	Blows / Foot	<input type="checkbox"/> - Shelby Tube Sample <input checked="" type="checkbox"/> - Standard Penetration Test Sample <input type="checkbox"/> - No Recovery J-Jar	DESCRIPTION OF STRATUM
						Lignite from 48 to 49'
50						Sandstone layer <hr style="width: 60%; margin: 0 auto;"/> Bottom at 50'
55						
60						
65						
						Boring filled with cement-bentonite grout upon completion of drilling

BORING LOG

PROJECT: Gibbons Creek S.E.S. Facility Sludge Disposal Pond, Carlos, Texas

BORING NO: SDP-6
 LOCATION: As directed by Client
 BORING TYPE: 4 1/2" Rotary
 GROUND ELEV: 280'±

CLIENT: TEXAS MUNICIPAL POWER AGENCY
 DATE: 9-28-83
 DRILLER: Anderson
 PROJECT NO: 283-202
 SOIL TECHNICIAN: Huff

Depth in Feet	Sample Type & No.	Penetrometer Reading, f/sf	Blows / Foot	<input type="checkbox"/> - Shelby Tube Sample <input checked="" type="checkbox"/> - Standard Penetration Test Sample <input type="checkbox"/> - No Recovery J-Jar			
				DESCRIPTION OF STRATUM			
	2544	4+		Topsoil, tan silty fine sand _____ 4"			
				Hard tan sandy clay			
	2545	2.5		Very stiff tan sandy clay with sand pockets and iron stains			
5	2546	2.5		Very stiff tan sandy clay with sand pockets and iron stains			
	2547	3.75		Very stiff tan sandy clay to clay			
	2548	2.5		Very stiff tan sandy clay to clay			
10				Tan and red sandy clay with gravel and sand pockets at 9'			
	2549	1.5		Stiff tan and red sandy clay with gravel and sand pockets			
		4+		Hard gray clay with iron ore pockets, jointed at 10'8"			
	2550	4+		Hard tan and gray clay with iron stains, jointed			
15				Hard tan clay with iron stains and decayed vegetation, jointed			
	2551	4+		Hard tan clay with iron stains and decayed vegetation, jointed			
	2552	4+		Hard tan clay with iron stains and decayed vegetation, jointed _____ 18'			
	2553	4+		Alternating 5-in. layers of brown lignitic clay, laminated and jointed and brown sandy clay			
20				Hard brown lignitic clay, laminated and jointed _____ 20.5'			
	2554	4+		Hard tan clay, jointed			
	2555	4+		Hard tan clay, jointed			
				Hard gray clay with small sand seams, jointed at 22.5'			
25				Hard gray clay with yellow seams, jointed			
	2556	4+		Hard gray clay with yellow seams, jointed			
	2557	4+		Hard gray clay, jointed with 3" layer of brown lignitic clay at 25'			
	2558	4+		Hard gray clay, jointed with 6" brown lignitic clay layer at 28'			
30				_____ 32.5'			
	2559	4+		Lignitic clay			
35				Hard brown lignitic clay, laminated and jointed with 3" gray sandy clay layer at 34'			
				_____ 37'±			
	2560	4+		Hard gray clay with cemented sand seams, laminated			
40				_____			
	2561	4+		Hard dark gray lignitic clay _____ 43'3"			
45				Black lignite _____ 44.5'			

BORING LOG

PROJECT: Gibbons Creek S.E.S. Facility Sludge Disposal Pond, Carlos, Texas

BORING NO: SDP-6
 LOCATION: As directed by Client

CLIENT: TEXAS MUNICIPAL POWER AGENCY

DATE: 9-28-83

PROJECT NO: 283-202

BORING TYPE: 4 1/2" Rotary

DRILLER: Anderson

SOIL TECHNICIAN: Huff

GROUND ELEV: 280'±

Depth in Feet	Sample Type & Sample No.	Penetrometer Reading, ftsf	Blows / Foot	<input type="checkbox"/> - Shelby Tube Sample <input checked="" type="checkbox"/> - Standard Penetration Test Sample <input checked="" type="checkbox"/> - No Recovery J-Jar	DESCRIPTION OF STRATUM
50	2562	4+			Hard gray silty clay, laminated <hr style="width: 50%; margin: 0 auto;"/> Bottom at 50'
55					
60					
65					
					Boring filled with cement-bentonite grout upon completion of drilling

BORING LOG

PROJECT: Gibbons Creek S.E.S. Facility Sludge
Disposal Pond, Carlos, Texas

BORING NO: SDP-7
LOCATION: As directed by
Client
BORING TYPE: 4 1/2" Rotary
GROUND ELEV: 280'±

CLIENT: TEXAS MUNICIPAL POWER AGENCY
DATE: 9-28,29-83
PROJECT NO: 283-202
DRILLER: Anderson
SOIL TECHNICIAN: Huff

Depth in Feet	Sample Type & Sample No.	Penetrometer Reading, tsf	Blows / Foot	Legend			
				■ - Shelby Tube Sample	☒ - Standard Penetration Test Sample	☑ - No Recovery	J-Jar
DESCRIPTION OF STRATUM							
	2563	3.75		Topsoil, tan silty fine sand _____ 6"			
				Very stiff gray sandy clay			
	2564	3.5		Very stiff tan and gray sandy clay with gray sand pocket at 3.5', fill			
5	2565	1.5 3.75		Stiff to very stiff tan and gray sandy clay			
	2566	3.5		Very stiff tan and gray sandy clay with sand nodules and organic material			
	2567	4.0		Hard tan and gray clay with gray clay pockets, fill			
10	2568	4+		Hard tan and gray clay with gravel and sand pockets			
	2569	4+		Hard tan clay with sandstone nodules			
15	2570	3.0		Very stiff tan and gray sandy clay _____ 15'			
				Gray clayey sand			
	2571	3.0		Gray and red clayey sand _____ 16.5'			
				Very stiff gray clay			
	2572	4+		Hard tan sandy clay _____ 18.5'			
20				Hard brown clay _____ 20'			
	2573	4+		Hard gray sandy clay			
	2574	4+		Hard gray sandy clay with organic streaks, jointed			
25	2575	2.25		Very stiff gray sandy clay			
	2576	2.25		Very stiff gray sandy clay _____ 28'			
	2577			Gray sandy clay-clayey sand			
30							
	2578	3.5		Very stiff gray sandy clay-clayey sand			
35							
	2579			Gray clayey sand with 1/2" layer of brown clayey sand at 39.5'			
40							
	2580	2.0		Gray clayey sand _____ 44.5'			
45				Very stiff gray sandy clay layer with tan sand layer at 45' and 4" layers of brown organic material			

BORING LOG

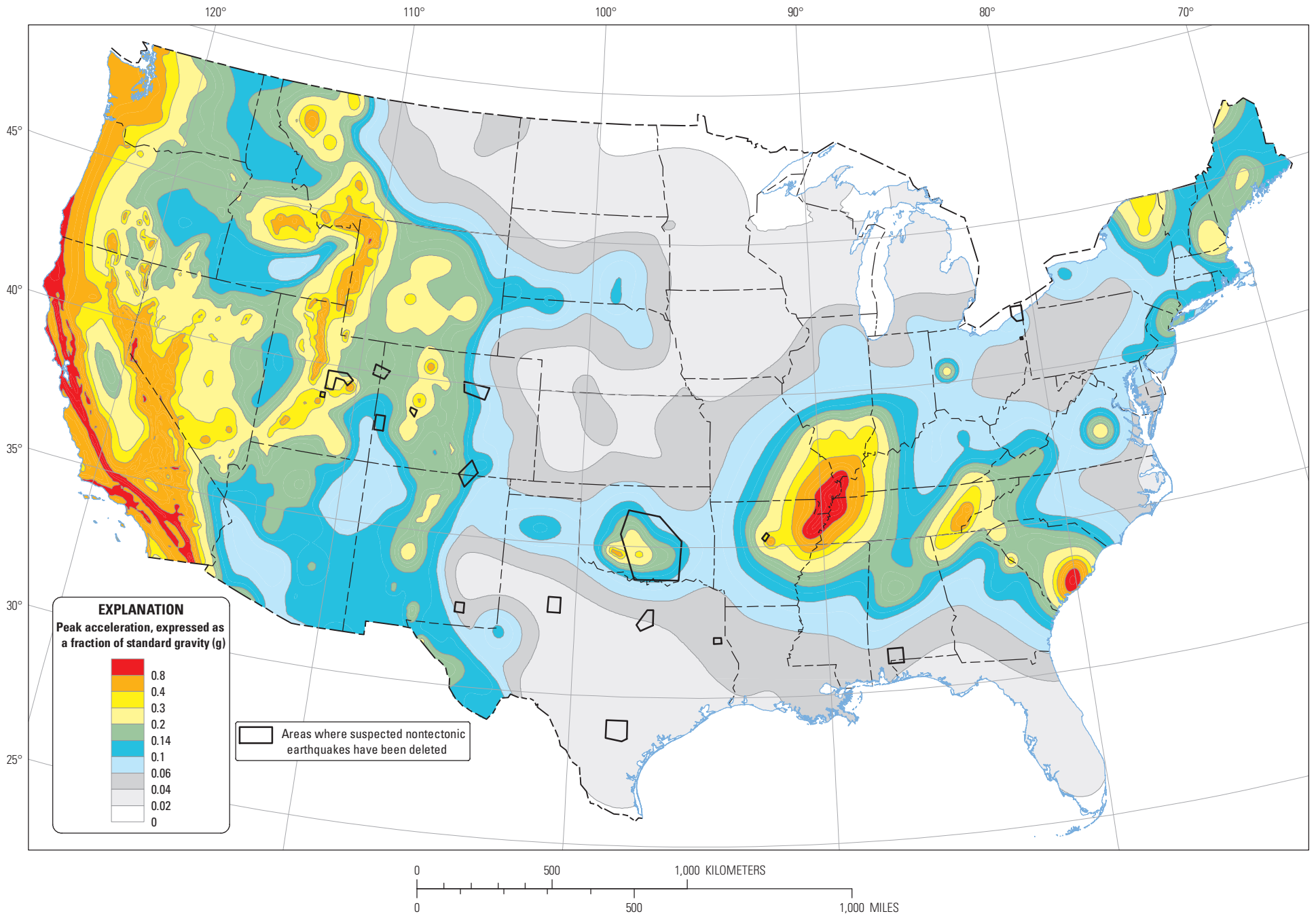
PROJECT: Gibbons Creek S.E.S. Facility Sludge Disposal Pond, Carlos, Texas

BORING NO: SDP-7
 LOCATION: As directed by Client
 BORING TYPE: 4 1/2" Rotary
 GROUND ELEV: 280'±

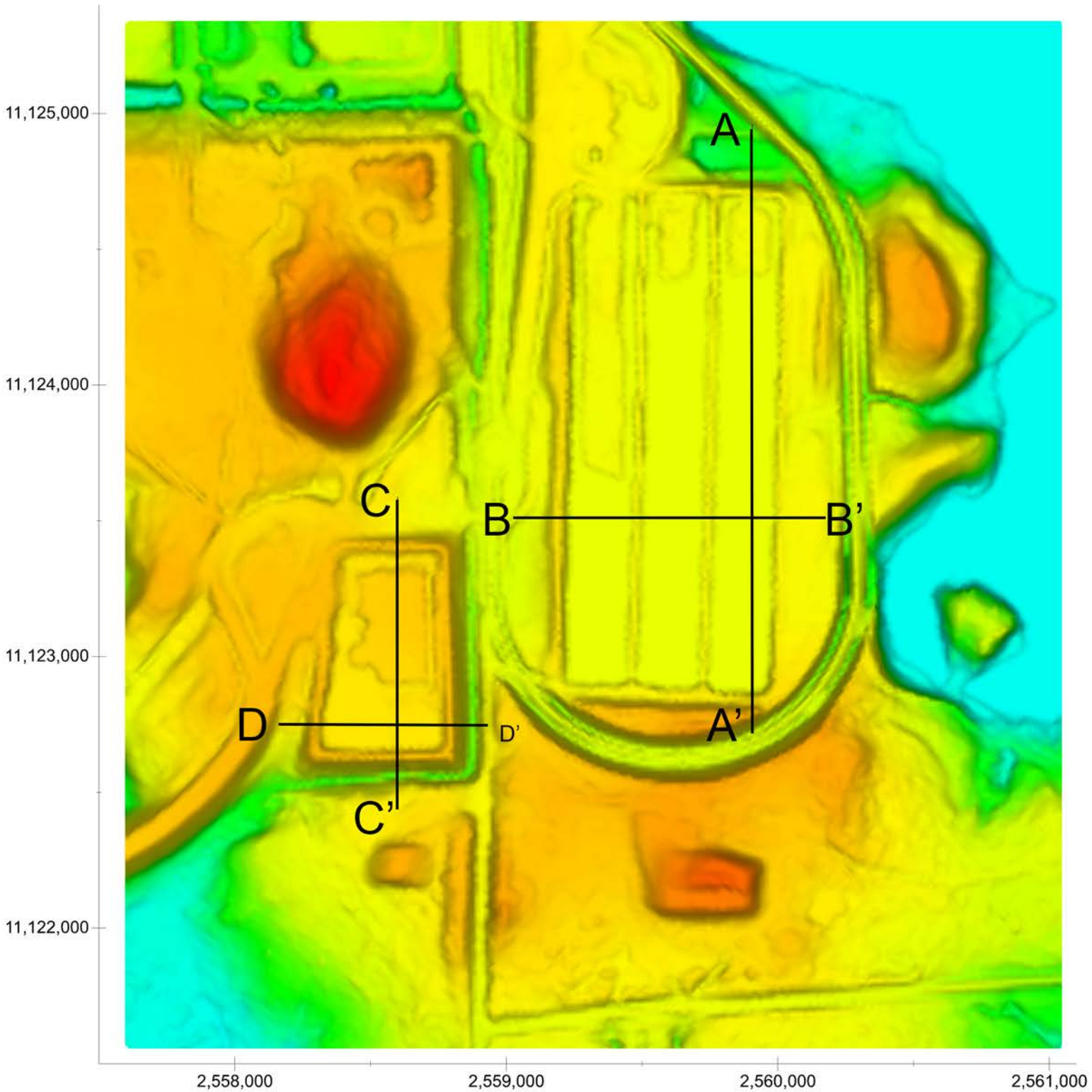
CLIENT: TEXAS MUNICIPAL POWER AGENCY
 DATE: 9-28,29-83 PROJECT NO: 283-202
 DRILLER: Anderson SOIL TECHNICIAN: Huff

Depth in Feet	Sample Type & Sample No.	Penetrometer Reading, 'tsf	Blows / Foot	<input type="checkbox"/> - Shelby Tube Sample <input checked="" type="checkbox"/> - Standard Penetration Test Sample <input type="checkbox"/> - No Recovery J-Jar	DESCRIPTION OF STRATUM
50	2581				Alternating layers of sandstone and gray sandy clay <hr style="width: 20%; margin: auto;"/> Bottom at 50'
55					
60					
65					
					Boring filled with cement-bentonite grout upon completion of drilling

APPENDIX C



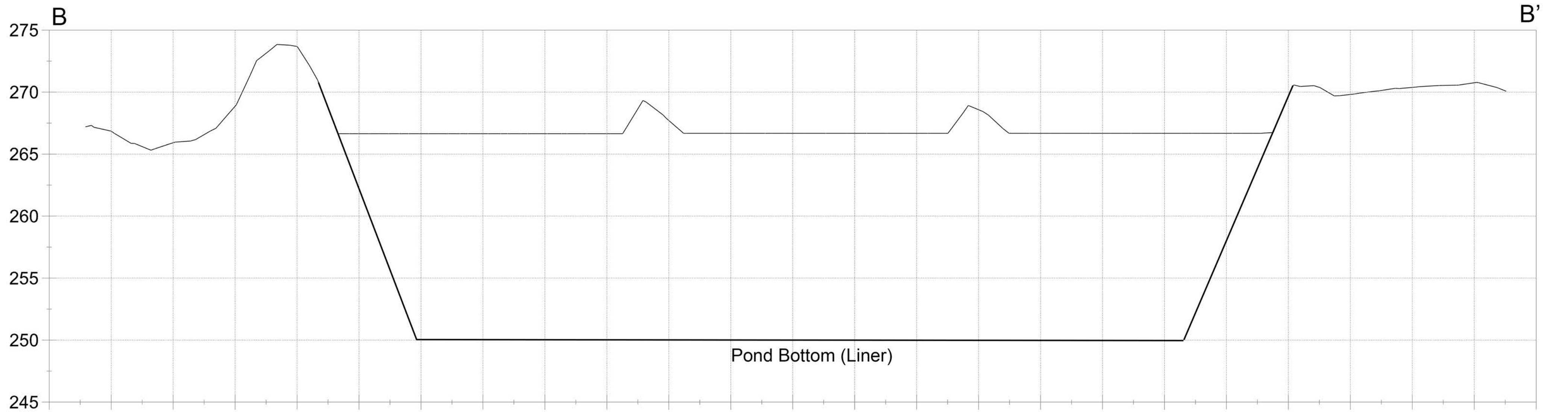
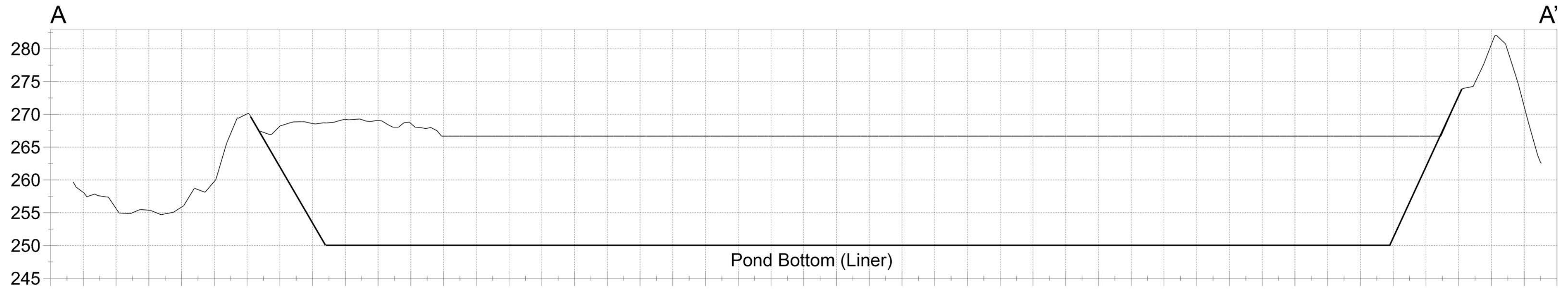
Two-percent probability of exceedance in 50 years map of peak ground acceleration



Coordinate Projection:
UTM Nad 1983 Zone 14 Feet



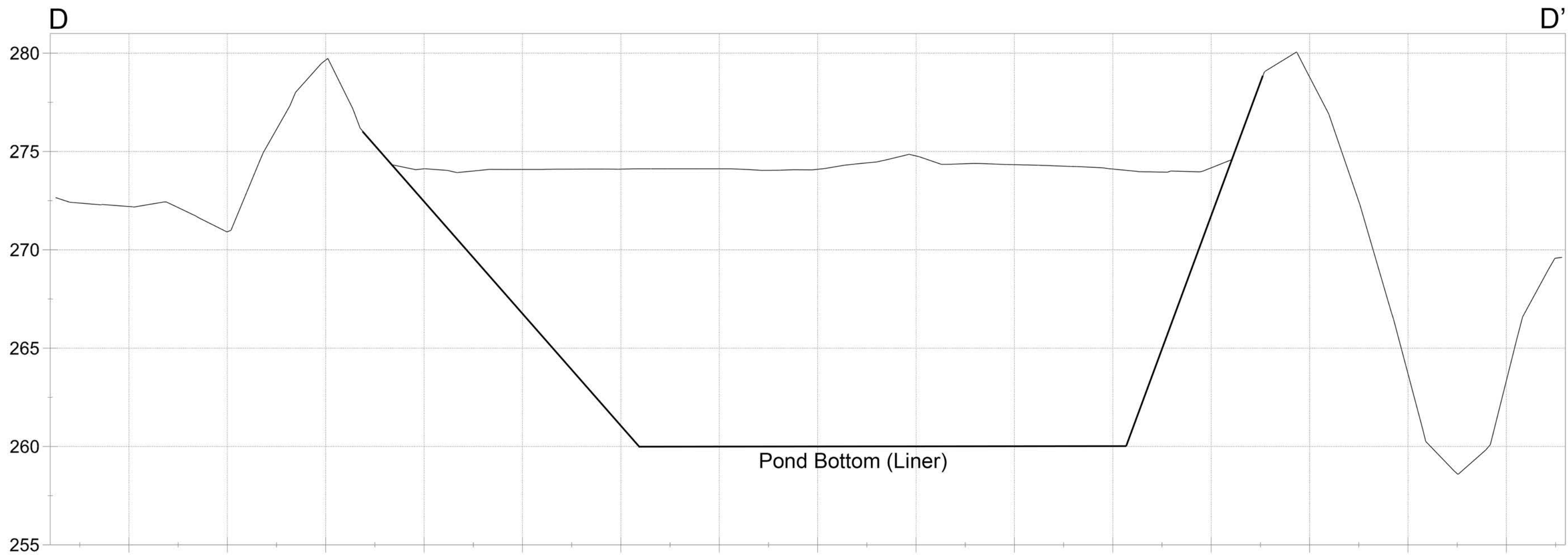
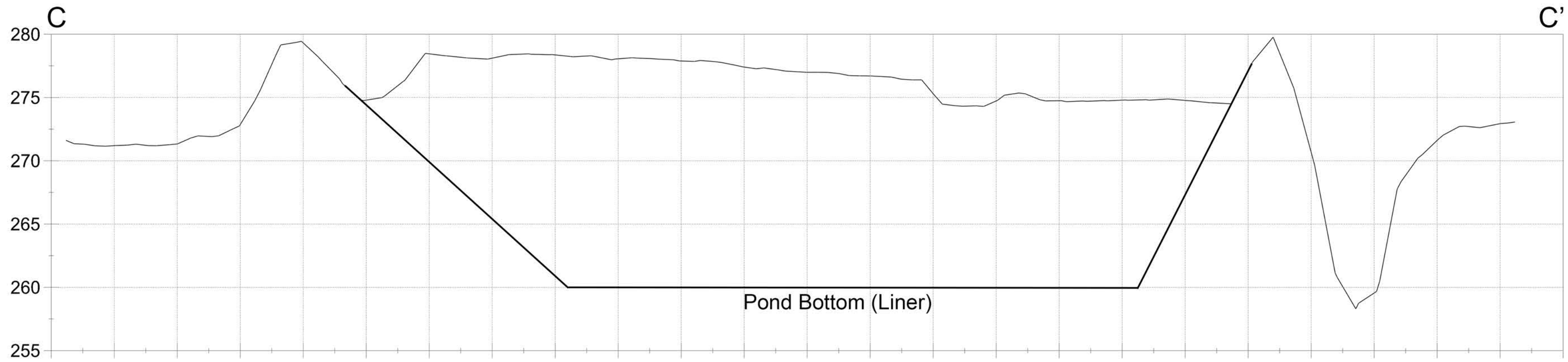
Cross Section Location Map
Texas Municipal Power Agency
Gibbons Creek Steam Electric Station
Carlos, Texas



Scale = 10:1 (Vertical:Horizontal)



Cross Sections
 Texas Municipal Power Agency
 Gibbons Creek Steam Electric Station
 Carlos, Texas



Scale = 10:1 (Vertical:Horizontal)



Cross Sections
 Texas Municipal Power Agency
 Gibbons Creek Steam Electric Station
 Carlos, Texas

