Report of Geotechnical Exploration and Slope Stability Evaluation

Ash Pond 4
Colbert Fossil Plant
Tuscumbia, Alabama

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Prepared for:
Tennessee Valley Authority
Chattanooga, Tennessee

January 22, 2010

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January 22, 2010 rpt_001_175559016

Mr. Barry Snider, PE
Tennessee Valley Authority
1101 Market Street
LP 2N
Chattanooga, Tennessee 37402

Re: Report of Geotechnical Exploration and Slope Stability Evaluation
Ash Pond 4
Colbert Fossil Plant
Tuscumbia, Alabama

Dear Mr. Snider:

As requested, Stantec Consulting Services Inc. (Stantec) has completed our Geotechnical Exploration and Slope Stability Evaluation for Ash Pond No. 4 at the Colbert Fossil Plant. The report documents the subsurface conditions, results of laboratory testing, findings from the historical document reviews, results of our analyses and evaluation, and recommendations for the facility. These services were performed under Engineering Service Request ESR/TAO 894 in accordance with the terms and provisions established in our System-Wide Services Agreement dated December 22, 2008.

Stantec appreciates the opportunity to provide engineering services for this project. If you have any questions, or if we may be of further assistance, feel free to contact our office.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Paul Cooper

Paul J. Cooper, EIT
Project Engineer

Randy L. Roberts

Randy L. Roberts, PE
Senior Associate

Enclosures

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Executive Summary

Stantec Consulting Services Inc. (Stantec) has completed the Geotechnical Exploration and Slope Stability Evaluation at Colbert Fossil Plant's Ash Pond 4. This study was performed to evaluate slope stability and seepage for the pond's existing conditions.

Background Information

Ash Pond 4 is approximately 52 acres in area, and is enclosed by a perimeter dike system that is approximately 6,700 feet in total length. In 1972, the first phase of Ash Pond 4, consisting of dikes constructed to a crest of El. 440 feet, was constructed and put into service. In 1984, the dikes were raised 20 feet using upstream construction methods (constructing inwardly over sluiced ash). The overall constructed height of the perimeter dike system now varies from approximately 20 to 30 feet on the west side, to about 40 feet on the east side, adjacent to Cane Creek. Dike slopes are approximately 2.5H:1V to 3H:1V.

TVA has recently classified Ash Pond 4 as a "high hazard" impoundment because of the consequences of failure relative to potential damage downstream. Currently, URS Corporation is conducting a feasibility study to address potential operational modifications to Ash Pond 4 so the hazard classification might possibly be reduced. Pond modifications being considered include reducing the size of the pond or perhaps pond closure.

Historical geotechnical issues include seepage areas located along the east and southeast sides of the pond. The seepage outbreaks are typically located near the contact of the upper and lower dikes. Recently, Stantec discovered additional seepage outbreaks along the south and west sides of the ponds near the same dike elevations, but these are much less pronounced and less widespread compared to conditions on the east and southeast sides. The seepage areas are wet and soft, but there is typically no, to minimal, flow of water and no visible piping of dike materials. The historical documents reviewed for Ash Pond 4 do not indicate a history of slope instability. In addition, signs of slope instability have not been observed in the field during this study.

Scope of Geotechnical Exploration

This study began with a review of TVA-provided historical information along with site inspections. A geotechnical exploration program was then developed and executed. The exploration consisted of drilling soil test/sample borings at 24 locations. Piezometers were installed at 21 locations. Drilling locations were positioned along ten cross-sections around the pond. The laboratory testing program included moisture content, classification, permeability and shear strength testing to establish key index properties and strength parameters.

Results of Exploration and Engineering Analyses

The results from the geotechnical exploration indicate that the upper and lower perimeter dike system for Ash Pond 4 is constructed of clay materials. The capacity of the pond was expanded in 1984 by constructing the upper dikes inwardly over sluiced ash. The exploration program did confirm the presence of sluiced ash beneath the upper dike. The dikes are underlain by native clays, silts, and sands, and then by limestone bedrock.

Following the drilling and laboratory testing program, slope stability and seepage analyses were performed to quantify factors of safety for current conditions. The dikes were assessed under static, long-term, steady state conditions since the dikes have been in their current configuration for a long time. The analysis focused on six cross-sections that were selected to represent typical conditions around the pond.

To evaluate the seepage conditions within the dikes, a finite element model was developed for each of the six cross-sections. On most cross-sections, the model predicts the potential for seepage outbreaks to occur on the exterior dike slopes just above the upper-lower dike interface (toe of the upper dike), and at lower areas along, or beyond, the dike toes. This prediction correlates well with field observations. This condition could create the potential to initiate soil piping if exit gradients are high enough. To judge whether or not a tendency for piping is possible, factors of safety can be calculated using the vertical exit gradients as predicted by the seepage models. For Ash Pond 4, the highest vertical exit gradients where minimum factors of safety against piping occur are located at points along the dike toes or just beyond. The minimum factor of safety values range from 1.6, to greater than 3. Based on the U.S. Army Corps of Engineers (USACE) design criteria for dams, Stantec reccomends a value of 3 as a minimum target factor of safety against piping for the evaluation of Ash Pond 4. Thus, the results indicate the seepage criterion is not currently being met at the toe areas of four out of the six cross-sections analyzed for Pond 4. The lowest factors of safety are along cross-sections that represent the east side of the pond adjacent to Cane Creek.

The slope stability of the Ash Pond 4 dikes was also evaluated. Factors of safety for slope stability were computed using Spencer's method of analysis, circular slip surfaces, and search routines that help to identify the critical (minimum factor of safety) failure surface. The slope stability models were evaluated using both pore pressures predicted with the seepage models and data from the piezometer readings. The results of the steady-state seepage and long-term slope stability analysis demonstrate that the factors of safety range from approximately 1.4 to greater than 1.5. TVA has adopted a minimum target factor of safety of 1.5 against slope stability based on USACE criteria. The results indicate that only one cross-section (Section D-D') has a safety factor less than the target. This cross-section is generally representing the east side of the pond along Cane Creek.

In conclusion, there are some locations where the current configuration of Ash Pond 4 exhibits deficient factors of safety against slope stability and piping. The lowest factors of safety occur along the east side of the pond adjacent to Cane Creek. This does not imply that the dike is in immediate danger of failure, but TVA should undertake mitigation efforts to improve long-term stability and seepage conditions. Improvements could be incorporated into upcoming design of pond modifications/closure, or a separate interim mitigation program could be implemented, depending on timing and as decided by TVA.

Report of Geotechnical Exploration and Slope Stability Evaluation

Ash Pond 4
Colbert Fossil Plant
Tuscumbia, Alabama

1. Introduction

In January 2009, the Tennessee Valley Authority (TVA) requested Stantec Consulting Services Inc. (Stantec) conduct assessments of its coal combustion product (CCP) disposal facilities at one closed, and eleven active, fossil plants. The plants are located in the states of Kentucky, Tennessee and Alabama. The assessments were performed for the purpose of determining if conditions were present to indicate an unstable condition that could possibly cause a release of CCP's into the environment.

Stantec's scope of services for the assessments was developed within the framework of current dam safety practice, and was performed in phases. Phase 1 included review of available documentation, site reconnaissance, field measurements, and providing recommendations for interim corrective measures, improvements, and further engineering studies. The Report of Phase 1 Facility Assessment for Coal Combustion Product Impoundments and Disposal Facilities for the two Alabama plants was completed on June 24, 2009. The conclusions and recommendations for Ash Pond 4 at the Colbert Fossil plant (COF) are included in that Phase 1 report. In addition to issues that require maintenance-type remedial activities, the Phase 1 recommendations included conducting a Phase 2 geotechnical exploration to evaluate slope stability and seepage for Ash Pond 4 at COF. As a result, the following geotechnical evaluation was authorized by TVA under Engineering Services Request ESR/TAO 894. This report documents the scope and results of the study and contains Stantec's conclusions and recommendations concerning slope stability and seepage for Ash Pond 4.

2. Site Description and Geology

2.1. Location and Description

The Colbert Fossil Plant is located in Tuscumbia, Colbert County, Alabama on the south bank of Pickwick Reservoir along the Tennessee River, approximately 50 miles west of Decatur in northwest Alabama. Ash Pond 4 is situated approximately 3,000 feet south of the plant's powerhouse. This disposal area is bordered by the plant access road to the west, US Highway 72 to the south, and Cane Creek to the north and east. Figure 2.1 on the following page provides a plan view of the Colbert Ash Pond 4 area.

Ash Pond 4 is approximately 52 acres in area, and is enclosed by a perimeter dike system that is approximately 6,700 feet in total length. The dike crest supports a gravel access road and is currently at an approximate elevation of 460 to 461 feet. The overall constructed height of the perimeter dike system varies from approximately 20 to 30 feet on the west side to about 40 feet on the east side, adjacent to Cane Creek.

Colbert Fossil Plant, Ash Pond 4
Tuscumbia, Alabama

Stantec

Figure 2.1. Colbert Ash Pond 4 Overview

Dike slopes are approximately 2.5:1V to 3H:1V. The slopes are vegetated with thick grasses. A few trees once existed at various locations around the ponds (primarily along the toe of the north dike slope). These trees were removed in April, 2009. Currently, approximately 30,000 tons per year of bottom ash is wet-sluiced to Ash Pond 4. Dewatered bottom ash is removed from Ash Pond 4 and stacked within its west side. This stacking operation began in 1999 and is active, but is progressing slowly.

TVA has recently classified Ash Pond 4 as a "high hazard" impoundment because of the consequences of failure relative to potential damage downstream. Currently, URS Corporation is conducting a feasibility study to address potential operational modifications to Ash Pond 4 so the hazard classification might possibly be reduced. Pond modifications being considered include reducing the size of the pond or perhaps pond closure. Stantec has assisted TVA with this effort by performing inundation mapping.

2.2. Geology

According to the Geologic Map of Alabama, compiled by the Geological Survey of Alabama, the Colbert Fossil Plant is underlain by the Tuscumbia Limestone formation. The Tuscumbia Limestone is of Mississippian age and consists of light gray, bioclastic limestone that is fine to very coarse grained and partly oolitic near the top. Light gray chert nodules are scattered throughout the formation and locally abundant. Given the limestone's karst features and differential dissolution of the carbonate in the unit, thickness varies throughout the region. Strike/dip joints are well developed in Tuscumbia Limestone with numerous outcrops along the southern bluff of the Tennessee River. The limestone has shown no discernable signs of faulting in the area, although weathered joints are likely, given the karstic nature of the formation.

Overburden consists primarily of residual clays. Silty clays are present at shallow depths, with moderate to high plasticity clays predominant at intermediate depths. Atop the soil/bedrock interface, a layer of silty clay with extensive chert fragments is present as a result of extensive weathering of the karstic limestone. Some alluvial and terrace deposits are present along the banks of Cane Creek within the location of Ash Pond 4, to an average depth of about 10 feet.

As mentioned above, the Tuscumbia Limestone is known for karst activity, with the formation of sinkholes, irregular bedrock surfaces, and varying solutioning/weathering being possible. Two known sinkhole collapses have occurred in the past at COF; one in the now abandoned/unused area of Disposal Area 5, and one at the area of the closed chemical pond adjacent to Ash Pond 4. However, the historical documentation reviewed by Stantec shows no known karst-related problems reported for Ash Pond 4.

3. Review of Available Information

3.1. General

During the Phase 1 Facility Assessment, Stantec's engineers reviewed documents provided by TVA pertaining to Ash Pond 4. The main objective of the document review was to develop a historical knowledge base of the impoundment. The documents reviewed included record drawings, cross-sections of dikes, old contour maps, annual dike stability reports, and

old geotechnical reports. A complete listing of the reviewed documents is included in the Phase 1 report.

Of particular interest and use in this study are the following documents and drawings:

- Colbert Steam Plant – Proposed Ash Disposal Area No. 4 – Dikes – Soil Investigation, Memorandum from Gene Farmer to F.P. Lacy, October 13, 1972.

- Colbert Steam Plant – Ash Disposal Area No. 4 Dike Raising – Soils Exploration and Testing – En Des Soils Schedule No. 67, Memorandum from Gene Farmer to G.L. Buchanan, March 27, 1978.

- Geology of the Colbert Steam Plant, Charles P. Bensiger, TVA Division of Water Control Planning, Geologic Branch, November, 1951.

- TVA Drawing Numbers 10N290, 291, 292, 293, 294-1 through 294-7, 287.

- TVA Annual Inspection Reports, 1993 to 2008.

These documents included site plans, cross-sections, boring plans, boring logs, results of laboratory tests, and geologic information. The information gained was evaluated and used to supplement the information obtained during Stantec's geotechnical exploration.

3.2. Site History

Construction began at Colbert Fossil Plant in 1951 and was completed in 1965. Colbert currently contains five coal-fired generating units and burns approximately 8,900 tons of coal per day.

Initially, ash materials were sluiced into Ash Disposal Area 1, located to the northwest of the powerhouse along the river. The pond was constructed by building dikes on the north and east side of the existing river shoreline. Sluicing to this area stopped in 1975. Dried, reclaimed ash from Ash Pond 4 was stacked in this area from 1982 until 1990. The area is now closed and no longer in use.

In 1972, the first phase of Ash Pond 4 was constructed and put into service. The first phase consisted of construction of 20-foot tall dikes to a crest of El. 440 feet. The majority of the initial dike construction occurred along the north, south, and east sides where the original ground elevations were lower. On the west side, the existing ground elevations were very close to or approximate at El. 440 feet and the initial pond appears to have been formed partially by excavating on this side. In 1984, the dikes were raised 20 feet using upstream construction methods (constructing inwardly over sluiced ash). From 1982 until 1990, both fly ash and bottom ash were sluiced into Ash Pond 4. After 1990, the pond began to receive only sluiced bottom ash. At present, approximately 30,000 tons per year of bottom ash is wet-sluiced to Ash Pond 4. Dewatered bottom ash is removed from Ash Pond 4 and stacked within its west side. This stacking operation began in 1999 and remains active, but is progressing slowly.

The most recent ash disposal area to be developed on the Colbert reservation is Disposal Area 5 located southeast of the plant's powerhouse. The disposal area was initially intended to be an ash pond, but a sinkhole failure occurred in the northwest portion upon initial filling.

The sinkhole was reportedly treated and capped and the entire north and northwest portions of Disposal Area 5 were abandoned. Operations then shifted to disposal into two dredge cells (Cells 1 and 2) that were constructed in the south and southeast portions of Area 5. This operation continued from the mid 1980's until 1990 when dredging was stopped and disposal methods were converted to a dry stacking operation. Dry disposal is following a stacking plan developed in the early 1990's. The ultimate height of the stack will range from 100 to 120 feet from top to toe of original perimeter dikes. Stacked fly ash is being constructed on approximately 4H:1V slopes, with benches every 20 feet in height. The stack appears fully built-out in the south and west portions. The current disposal activity is on the east side. At present, approximately 350,000 tons of dry fly ash is collected in silos each year and hauled to this disposal area. The report addressing the geotechnical exploration and slope stability evaluation for the Disposal Area 5 Dry Stack will be provided in the future under separate cover.

3.3. Historical Geotechnical Issues

As discussed in Section 1, the Phase 1 work included review of historical documents. A few primary issues that were found from the documents for Ash Pond 4 are discussed in the following paragraphs.

3.3.1. Seepage and Slope Stability

Historical documentation indicates that seepage has been occurring at various intervals along the mid-slope of the east and southeast dikes since 1984, when the pond was expanded by raising the dikes. In general, the seepage is occurring just above the interface elevation of the upper-lower dikes and appears to extend downslope. The seepage has been monitored by TVA with little or no change being reported through the years. In addition, Stantec has also noticed minimal change in seepage conditions at these locations since January, 2009. Currently, there is minimal to no flow occurring, and clear water is being emitted from the seepage areas. In 2007, TVA retained a geotechnical consultant to investigate the seepage. The investigation identified a seepage zone between the two phases of dike construction where a thin zone of bottom ash and organic material was found. The report recommended to continue monitoring the seepage and to install a collection system below the seeps.

A much smaller area of seepage is located at the dike toe along the northwest side of the pond below the sluice line piping. This area was discovered after vegetation was cleared earlier in 2009. Colbert maintenance personnel placed rip-rap over this seepage area.

Additional areas of seepage were also recently found by Stantec in November, 2009. These are located at various intervals around the south, southwest, and west sides of the pond. They are located near the toe of the upper dike (similar location as the east side), but are much less pronounced and less widespread than the seepage areas on the east and southeast sides. In fact, these areas were not noted until recently when ground conditions were drier and vegetation was lower. These areas have probably existed for some time, but have likely been obscured by tall vegetation or wet ground conditions after rain.

The documents reviewed for Ash Pond 4 do not indicate a history of slope instability. Additionally, no signs of slope instability have been observed in the field by Stantec throughout the course of this work.

3.3.2. Spillway Outlets

The outlet system for Ash Pond 4 consists of four 48-inch diameter reinforced concrete pipe (RCP) riser sections that discharge through four 36-inch RCP sections into a discharge channel. Over recent years, the historical documentation reports that some leakage of riser pipe joints has been occurring and annual sealing of joints within the top 12 feet or so is performed with oakum. The spillway system for Ash Pond 4 is planned to be evaluated by URS Corporation for possible replacement.

4. Scope of Exploration

The field portion of the geotechnical exploration was performed July 14 through August 8, 2009. These services were performed in general accordance with various Corps of Engineers procedures, along with standard procedures for geotechnical engineering practice.

Stantec personnel advanced 24 conventional sample borings using a combination of track-mounted and truck-mounted drill rigs. In general, the borings were positioned at the dike crest, toe, and mid-slope areas along ten cross-sections. All borings were advanced to apparent bedrock, with two borings being advanced ten feet into bedrock using NQ-sized (approximately two-inch diameter) rock coring equipment. The rock core borings were advanced to confirm bedrock depths. The locations of the borings are shown on the Boring Layout Plan in Appendix E. At completion of the drilling, TVA's survey crew located the borings and profiled the ground lines at the ten cross-sections.

The subsurface exploration was performed using 3¼- and 4¼-inch (ID) hollow stem augers equipped with a carbide-tipped tooth bit. Standard Penetration Testing (SPT) was performed in all 24 of the conventional sample borings at continuous intervals. A standard penetration test consists of dropping a 140-pound hammer to drive a split-spoon sampler 18 inches. The consistency or relative density of soil is estimated by the number of blows it takes to drive the spoon the last 12 inches. This method is typically used to obtain soil samples, estimate the consistency or relative density of the soil, and also to estimate the vertical limits of the subsurface soil horizons. In addition, undisturbed samples (Shelby tubes) were obtained in offset borings using a fixed head piston sampler from selected depth intervals within the cohesive materials to provide samples for subsequent laboratory strength testing. After completion of the drilling and sampling procedures, the boreholes were checked for subsurface water and backfilled with bentonite grout.

Stantec installed 21 piezometers within the upper and lower dikes in offset borings as a part of the overall stability evaluation to provide data on piezometric levels within the existing dikes and native foundation soils. Piezometer construction consisted of one-inch diameter Schedule 40 PVC, well screen (ten feet) and riser pipe. The annular backfill consisted of a sand filter pack to some distance above the screened interval followed by a bentonite seal. After allowing the bentonite to hydrate, the remaining annulus was backfilled with bentonite grout tremmied into place. Flush-mounted or riser-type protective covers were set in concrete to protect the piezometers. These instruments are scheduled to be monitored by Stantec until June 2010.

An engineer/geologist was present with each drill crew throughout the drilling operations. The engineer/geologist directed the drill crews, logged the subsurface materials encountered during the exploration, and collected samples. Particular attention was given to the

material's color, texture, moisture content, and consistency or relative density. The samples extracted from the borings were transported to Stantec laboratories for testing.

In the laboratory, standard penetration test (SPT) samples were subjected to natural moisture content determination in accordance with ASTM D 2216. Selected SPT samples were also combined and subjected to soil classification tests that included Atterberg limits testing (ASTM D 4318), specific gravity tests (ASTM D 854) and sieve and hydrometer analyses (ASTM D 422). Select bulk samples were also collected and subjected to standard moisture-density (Proctor) testing (ASTM D 698). Undisturbed samples were extruded and subjected to unit weight determination, falling head permeability testing (ASTM D 5084), and consolidated undrained triaxial compression testing with pore pressure measurements (ASTM D 4767).

The results of the field and laboratory testing services were used to develop cross-sections for slope stability and seepage analysis. Based on the results of the field exploration, cross-section geometry, and the preliminary slope stability analyses, Stantec selected six cross-sections to analyze.

5. Results of Geotechnical Exploration

5.1. Summary of Borings

Stantec developed a boring plan for the field exploration for Ash Pond 4 after a review of historical information and existing site conditions. TVA survey personnel established boring locations and elevations after drilling was completed. The boring layout plan is contained in Appendix E and boring logs are presented in Appendix A. A summary of the boring information is presented in Table 5.1 (all measurements are expressed in feet).

Table 5.1. Summary of Borings

Boring No.	Surface Elevation	Northing	Easting	Top of Rock** Depth	Top of Rock** Elevation	Boring Termination Depth	Bottom of Hole Elevation
STN-4-1	460.2	1723599.52	394359.89	53.0	407.2	54.0	406.2
STN-4-1S	460.2	1723599.52	394359.89	--	--	27.0	433.2
STN-4-2	439.4	1723632.72	394289.32	29.2	410.2	29.2	410.2
STN-4-3	427.3	1723645.94	394253.91	13.8	413.5	13.8	413.5
STN-4-3S	427.3	1723645.94	394253.91	18.0	409.3	18.0	409.3
STN-4-4	460.4	1723316.42	394738.76	66.3	394.1	66.3	394.1
STN-4-4S	460.4	1723316.42	394738.76	--	--	27.0	433.4
STN-4-5	439.5	1723366.01	394798.52	31.1	408.4	31.1	408.4
STN-4-5S	439.5	1723366.01	394798.52	--	--	23.5	416.0
STN-4-6	419.8	1723373.16	394864.54	13.2	406.6	13.2	406.6
STN-4-7	460.8	1722880.08	394960.81	54.1	406.7	54.1	406.7
STN-4-7S	460.8	1722880.08	394960.81	--	--	27.0	433.8
STN-4-8	421.6	1722943.49	395089.90	18.0	403.6	21.0	400.6
STN-4-9	461.2	1722306.36	395260.37	51.0	410.2	51.0	410.2
STN-4-9S	461.2	1722306.36	395260.37	--	--	42.0	419.2
STN-4-10	420.9	1722357.09	395401.10	14.5	406.4	14.5	406.4
STN-4-11	461.3	1721882.96	395485.31	50.8	410.5	50.8	410.5
STN-4-11S	461.3	1721882.96	395485.31	--	--	24.0	437.3

Table 5.1. Summary of Borings, continued

Boring No.	Surface Elevation	Northing	Easting	Top of Rock** Depth	Top of Rock** Elevation	Boring Termination Depth	Bottom of Hole Elevation
STN-4-12	446.2	1721504.87	395746.27	37.5	408.7	37.5	408.7
STN-4-12S	446.2	1721504.87	395746.27	--	--	22.0	424.2
STN-4-13*	425.3	1721330.83	395874.15	17.1	408.2	27.1	398.2
STN-4-14	461.9	1721420.08	395715.53	52.7	409.2	52.7	409.2
STN-4-14S	461.9	1721420.08	395715.53	--	--	41.0	420.9
STN-4-15	460.5	1721219.13	395347.89	50.0	410.5	50.0	410.5
STN-4-15S	460.5	1721219.13	395347.89	--	--	41.0	419.5
STN-4-16	435.1	1721126.23	395351.96	21.0	414.1	21.1	414.0
STN-4-16S	435.1	1721126.23	395351.96	21.0	414.1	21.0	414.1
STN-4-17	476.8	1721539.59	394582.90	58.9	417.9	58.9	417.9
STN-4-17	476.8	1721539.59	394582.90	--	--	22.0	454.8
STN-4-18	461.1	1721402.10	394555.64	43.1	418.0	43.1	418.0
STN-4-18S	461.1	1721402.10	394555.64	--	--	41.0	420.1
STN-4-19	440.3	1721352.01	394475.66	26.1	414.2	26.1	414.2
STN-4-19S	440.3	1721352.01	394475.66	26.0	414.3	26.0	414.3
STN-4-20	482.3	1721987.93	394461.02	61.5	420.8	61.7	420.6
STN-4-20S	482.3	1721987.93	394461.02	--	--	22.0	460.3
STN-4-21	460.2	1721985.14	394262.71	44.0	416.2	44.0	416.2
STN-4-22	438.0	1721957.70	394065.63	24.5	413.5	24.5	413.5
STN-4-22S	438.0	1721957.70	394065.63	24.0	414.0	24.0	414.0
STN-4-23	461.1	1722728.47	394227.94	41.2	419.9	41.2	419.9
STN-4-23S	461.1	1722728.47	394227.94	--	--	17.0	444.1
STN-4-24*	444.5	1722823.19	394138.84	32.3	412.2	42.4	402.1

* *Boring advanced into bedrock.*

** *Top of Rock, as used herein, refers to rock-like resistance to the advancement of the augers using a carbide-tipped-tooth bit. This may indicate the beginning of weathered bedrock, boulders, or rock remnants. An exact determination cannot be made without performing rock coring.*

5.2. Subsurface Conditions

5.2.1. Soil

Using the boring logs and laboratory tests from this geotechnical exploration, the boring information contained in previous geotechnical studies at the facility, TVA design drawings, old contour maps, and other historical information, Stantec developed a general profile for each stability cross-section at Ash Pond 4. The general profiles depict five major material horizons (or "layers") that are described below in sequence of descending lithology. The stability sections contained in Appendix E show these layers in graphical manner. In addition, the graphical logs shown on the stability sections also depict the material Unified Soil Classification System (USCS) classifications. The classifications are based on a combination of laboratory test results and visual observations where samples were not selected for such testing.

The "Upper Dike" extends upwardly from approximate El. 440 feet (crest of initial starter dike) to approximate El. 460 feet (current crest) and represents the most recent dike raising which

occurred in 1984. The upper dike materials are clay soils with USCS classifications of CL and CH, and with textural descriptions of lean clay with sand and fat clay with sand. The clays are moist in moisture content and predominately reddish brown in color, with occasional brown and tan mottling. Based on SPT N-values and laboratory strength testing, the upper dike clays have strength consistencies ranging from medium to very stiff.

The "Lower Dike" extends upwardly from original native ground to approximate El. 440 feet (crest of the initial dike construction) and is located on the north, east, and south sides of the pond. It appears that an initial lower dike was not needed on some portions of the west side because of higher ground elevations. The lower dike materials are clay soils with USCS classifications of CL and textural descriptions of sandy lean clay and lean clay with sand. The clays are mostly moist in moisture content with some isolated wet zones encountered and predominantly reddish brown to brown in color. Based on SPT N-values and laboratory strength testing, the lower dike clays have strength consistencies ranging mostly from medium to stiff, with a few isolated instances of soft to medium consistencies.

Below the "Lower Dike" material, "Native Clay" and/or "Native Clay and Silt" was encountered extending downwardly to or near apparent top of bedrock. Based on laboratory tests and on visual classifications, the "Native Clay" has USCS classifications of CL or CH and primary textural descriptions of lean clay or fat clay. The "Native Clay and Silt" has classifications of CL, CL-ML, or ML with primary textural descriptions of lean clay with sand, sandy lean clay, silty clay, and sandy silt. The "Native Clay and Silt" is typically less predominant. These horizons are typically dark brown, reddish brown or brown in color (with occasional tan, gray, and/or orange-brown mottling), and moist in moisture content with some isolated wet zones. Based on SPT N-values and laboratory strength testing, the clays and silts have strength consistencies ranging mostly from soft to stiff.

Below the "Native Clay" horizon, "Native Sand" was encountered in a few borings, specifically STN-4-1, 4-5, 4-7, 4-10, and 4-13 on the Cane Creek side of the pond. The native sand has USCS classifications of SM and SC-SM and textural descriptions of silty clayey sand and silty sand. The native sand is mostly described as brown to gray in color and wet in moisture content. Based on SPT N-values, the native silt/sand has relative densities ranging mostly from very loose to medium dense.

The thicknesses of the native soils above bedrock across the pond range from as little as approximately 3 feet to as much as about 30 feet. Most thicknesses are from about 10 to 20 feet. The lesser thicknesses were encountered in Borings STN-4-17 and 20 which were drilled within stacked materials along the interior of the pond (historical documents indicate that native materials were excavated from the pond interior and used as borrow to construct the initial perimeter dike). The thickest materials occur in borings drilled on the west side of the pond.

Hydraulically placed (sluiced) fly ash and bottom ash was also encountered beneath the upper dike in borings drilled through the crest. The ash was typically encountered at a depth of about 25 feet beneath the crest and extended to a depth of approximately 40 feet for an average thickness of about 15 feet. The borings typically encountered sluiced bottom ash overlying a lesser thickness of sluiced fly ash. Historical documents indicate that the pond was also used for disposal of fly ash in the past, in addition to the current bottom ash disposal. Classification testing performed on selected bottom ash samples resulted in USCS classifications of SW-SM with a textural description of well-graded sand with silt and gravel. Classification testing performed on selected fly ash samples resulted in a USCS

classification of ML with a textural description of sandy silt and silt with sand. The ash materials are black in color and wet in moisture content. SPT N-values indicate loose to medium relative densities for the bottom ash, and very soft to soft strength consistencies for the fly ash.

It should be noted that materials matching the "slime layer" as described in AECOM's findings relative to the failure at the Kingston Fossil Plant were not encountered during this study. These "slime" materials (as described by AECOM) are typically thin laminated layers of silt and fly ash that contain unusual index properties such as very high moisture contents and very high liquidity indices.

The subsurface logs presented in Appendix A include more detailed descriptions of the materials encountered at the specific boring locations.

5.2.2. Bedrock

Elevations of apparent bedrock across the pond site, as indicated by auger refusal, show a general trend of descending from west to east. On the west side, bedrock elevations typically range from about El. 415 to El. 420 feet. On the east side, the bedrock elevations are mostly in the range of El. 407 to El. 415 feet. There were two instances of irregularities where bedrock is deeper than these trends. One occurs at Boring STN-4-24 on the west side where bedrock is at El. 412 feet. The other is at Boring STN-4-4 on the east side where bedrock was encountered at El. 394 feet. These variations are typical for limestone bedrock formations where surface weathering and solutioning can create abrupt changes in the rock surface over relatively short distances.

Approximately 10 feet of rock coring was performed at two borings (STN-4-13 and 24) to confirm the presence of bedrock, and to gain general information on the underlying limestone. The rock cores were logged in terms of rock type, color, bedding characteristics, and other notable features. The limestone bedrock encountered, correlates well with the geologic mapping; i.e. Tuscumbia Limestone formation. The rock core specimens are generally described as limestone, light gray to light brown, fine to coarse grained, hard, thin bedded, and fossiliferous. No notable karst features such as voids or clay seams were encountered. Rock core recoveries were measured to be between 92% and 96%, and the measured Rock Quality Designations (RQD) is 79% to 82%. These values are indicative of competent bedrock.

5.3. Phreatic Conditions

At select boring locations, piezometers were installed to measure pore water pressures. In general, initial piezometer readings were taken at approximate two week intervals, and then extended to monthly intervals. It is anticipated that Stantec will continue to take readings until June 2010. Refer to Appendix B for piezometer installation details and readings (up to most recent set of readings). The most recent readings are also shown on graphical logs shown on the stability cross-sections in Appendix E. Piezometer locations and tip elevations are summarized in Table 5.2 below.

Table 5.2. Summary of Piezometers

Boring No.	Concrete Pad Elevation (Feet)	Piezometer Tip Elevation (Feet)
STN-4-1s	460.2	435.7 (upper dike)
STN-4-3s	427.3	409.3 (native clay)
STN-4-4s	460.4	435.4 (upper dike)
STN-4-5s	439.5	415.5 (native clay/lower dike)
STN-4-6s	419.8	406.3 (native clay)
STN-4-7s	460.8	435.8 (upper dike)
STN-4-8s	421.6	401.6 (native clay/sand)
STN-4-9s	461.2	437.7 (upper dike)
STN-4-10s	420.9	406.4 (native clay/sand)
STN-4-11s	461.3	439.3 (upper dike)
STN-4-12s	446.2	426.2 (lower dike)
STN-4-13s	425.3	409.3 (native sand)
STN-4-14s	461.9	436.9 (upper dike)
STN-4-15s	460.5	439.5 (upper dike)
STN-4-16s	435.1	414.1 (native clay/lower dike)
STN-4-18s	461.1	437.1 (upper dike)
STN-4-19s	440.3	414.3 (native clay)
STN-4-21s	460.2	440.2 (upper dike)
STN-4-22s	438.0	414.0 (native clay)
STN-4-23s	461.1	444.1 (upper dike)
STN-4-24s	444.5	411.5 (native clay)

In general, the series of readings to date have shown that water levels have remained fairly consistent, with only slight fluctuations being observed (usually only a few tenths of a foot to about one foot). These fluctuations are likely attributed to equalization of the water level within the piezometers over time. However, it should be noted that water levels can also fluctuate due to the seasons, precipitation events, and other factors.

6. Laboratory Testing

6.1. General

The results of laboratory testing performed are included within the appendices. ASTM testing specifications were observed. In particular, natural moisture content test results are shown on the attached boring logs in Appendix A and are also shown on the drafted stability sections in Appendix E. The results of the classification testing and shear strength testing performed on selected samples are included in Appendix C. The USCS classifications associated with each horizon are also discussed in Section 5.2 above. No further discussion relative to the results of moisture content and classification testing are provided in this section. The discussion that follows is limited to the laboratory testing associated with evaluation of the dike compaction characteristics and shear strengths of the cohesive soil horizons.

6.2. Cohesive Soils/Undisturbed (Shelby) Tube Samples

The borings drilled for Ash Pond 4 included 3-inch diameter undisturbed (Shelby) tube sampling within cohesive soil horizons. Stantec's soils laboratory extruded the tubes and trimmed 6-inch long specimens. Lab personnel determined visual classifications, unit weights (wet and dry), and natural moisture for each 6-inch specimen prior to submitting a summary of the extruded specimens to a geotechnical engineer for assignment of lab testing. Select 6-inch specimens extruded from Shelby tubes were then subjected to consolidated-undrained (CU) triaxial testing and permeability testing. The results of these tests are included in Appendix C and discussed below.

6.2.1. Consolidated Undrained (CU) Triaxial Testing

Stantec performed CU triaxial testing with pore pressure measurements on selected 6-inch long specimens extruded from 3-inch diameter Shelby tubes obtained during drilling. CU testing provides indicators of effective-stress shear strength parameters for slope stability analyses. The results of the CU triaxial tests are presented on the stability sections in Appendix E, and are summarized in Table 6.1. The stress path envelopes derived from CU triaxial testing are also presented in Appendix C.

Table 6.1. Summary of Consolidated – Undrained Triaxial Testing

Boring No.	Sample Interval (feet)	Soil Horizon	CU Triaxial Strength	
			c' (psf)	ϕ' (degrees)
STN-4-1	2.5 – 3.0	Upper Clay Dike	860	24.1
	5.1 – 5.6			
	10.0 – 10.5			
STN-4-2	4.0 – 4.5	Lower Clay Dike	2	33.4
	8.0 – 8.5			
STN-4-5	9.0 – 9.5			
STN-4-3	2.5 – 3.0	Native Clay	356	27.1
	6.5 – 7.0			
	10.0 – 10.5			
STN-4-4	2.8 – 3.3	Upper Clay Dike	497	28.9
	5.0 – 5.5			
	5.6 – 6.1			
STN-4-5	17.0 – 17.5	Lower Clay Dike/Native Clay	229	32.4
	17.6 – 18.1			
	22.3 – 22.8			
STN-4-11	5.0 – 5.5	Upper Clay Dike	600	29.2
	5.5 – 6.0			
	10.0 – 10.5			
STN-4-12	8.0 – 8.5	Lower Clay Dike	261	29.5
	8.6 – 9.1			
	15.0 – 15.5			
STN-4-15	5.4 – 5.9	Upper Clay dike	701	21.2
	10.1 – 10.6			
	15.5 – 16.1			
STN-4-16	4.0 – 4.5	Lower Clay Dike	641	29.2
	4.6 – 5.1			
	9.6 – 10.1			
STN-4-19	14.1 – 14.6	Native Clay	384	28.2
	19.1 – 19.6			
	19.7 – 20.2			
STN-4-19	14.1 – 14.6	Native Clay	0	36.0
STN-4-22	4.0 – 4.5			
	4.6 – 5.1			
STN-4-23	4.1 – 4.6	Upper Clay Dike	658	23.1
	9.3 – 9.8			

6.2.2. Permeability Testing

The following table summarizes the testing results from the falling head permeability testing. Permeability values are used in seepage analyses.

Table 6.2. Summary of Falling Head Permeability Testing

Boring No.	Sample Interval (feet)	Soil Horizon	Permeability (cm/sec)
STN-4-1	15.4-16.0	Upper Clay Dike	4.1 E-08
STN-4-7	15.0-15.5	Upper Clay Dike	2.4 E-08
STN-4-12	5.2-5.7	Lower Clay Dike	2.8 E-08
STN-4-14	11.0-11.5	Upper Clay Dike	6.1 E-08
STN-4-19	5.2-5.7	Lower Clay Dike	4.4 E-08
STN-4-23	9.9-10.4	Upper Clay Dike	6.5 E-08

6.3. Moisture-Density Relationships

Bag samples were obtained of materials associated with the upper and lower clay dikes. The results of the standard moisture-density tests performed on these samples are summarized in Table 6.3.

Table 6.3. Standard Moisture-Density (Proctor) Test Results

Sample Location	Sample Depth Interval (feet)	Dike Location	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
STN-4-2	0.0’ – 5.0’	Lower Dike	106.2	18.2
STN-4-7	15.0’ – 17.0’	Upper Dike	109.4	16.3
STN-4-11	20.0’ – 22.0’	Upper Dike	107.6	18.5
STN-4-14	20.0’ – 22.0’	Upper Dike	107.6	18.4

Following completion of the moisture-density testing, undisturbed samples taken within dike materials were extruded and unit weight and moisture content determinations were made in association with triaxial shear strength testing. The results of the unit weight and moisture content determinations for triaxial test samples are shown in Table 6.4. A comparison between the moisture-density test results and the unit weight determinations obtained from the undisturbed samples are also included. The comparison was made by using the moisture density test results that were nearest to the undisturbed sample locations (and which also had like classifications) to estimate relative compaction.

Table 6.4. Comparison Between Undisturbed Sample Conditions and Moisture-Density Test Results

Boring Location	Sample Depth Interval (feet)	Dike Location	Unit Weight Dry (pcf)	Moisture Content (%)	Maximum Dry Density (pcf)	Percent Maximum Dry Density (%)	Optimum Moisture Content (%)	Moisture Content Variation (%)
STN-4-1	2.5-3.0	Upper	108.4	19.9	109.4	99.1	16.3	+3.6
STN-4-1	5.1-5.6	Upper	103.5	21.6	109.4	94.6	16.3	+5.3
STN-4-1	10.0-10.5	Upper	96.9	25.3	109.4	88.6	16.3	+9.0
STN-4-2	4.0-4.5	Lower	103.7	21.5	106.2	97.6	18.2	+3.3
STN-4-2	8.0-8.5	Lower	101.2	20.4	106.2	95.3	18.2	+2.2
STN-4-5	9.0-9.5	Lower	107.6	20.4	106.2	101.3	18.2	+2.2
STN-4-4	2.8-3.3	Upper	102.5	20.1	107.6	95.3	18.5	+1.6
STN-4-4	5.0-5.5	Upper	102.8	20.8	107.6	95.5	18.5	+2.3
STN-4-4	5.6-6.1	Upper	99.0	22.0	107.6	92.0	18.5	+3.5
STN-4-5	17.0-17.5	Lower	108.0	16.8	106.2	101.7	18.2	-1.4
STN-4-5	17.6-18.1	Lower	107.9	16.2	106.2	101.6	18.2	-2.0
STN-4-11	5.0-5.5	Upper	102.9	22.1	107.6	95.6	18.5	+3.6
STN-4-11	5.5-6.0	Upper	110.4	18.0	107.6	102.6	18.5	-0.5
STN-4-11	10.0-10.5	Upper	105.8	20.2	107.6	98.3	18.5	+1.7
STN-4-12	8.0-8.5	Lower	96.8	22.8	106.2	91.1	18.2	+4.6
STN-4-12	8.6-9.1	Lower	110.2	16.8	106.2	103.8	18.2	-1.4
STN-4-12	15.0-15.5	Lower	108.4	20.0	106.2	102.1	18.2	+1.8
STN-4-16	4.0-4.5	Lower	107.9	20.1	106.2	101.6	18.2	+1.9
STN-4-16	4.6-5.1	Lower	110.4	18.9	106.2	104.0	18.2	+0.7
STN-4-16	9.6-10.1	Lower	107.4	20.3	106.2	101.1	18.2	+2.1

The existing in-situ dry densities of the dike materials were determined to range from about 91 percent to 104 percent of the standard Proctor dry densities, with most being greater than 95 percent. This data indicates that the dike materials appear to have been compacted in a controlled manner when compared to typically accepted target densities of 95 percent or greater for compacted clay soils in an earth dike. However, it should be noted that no construction documentation has been provided to confirm this comparison. The corresponding moisture values were mostly in the range of about 1 to 5 percent above the optimum moisture value. This is likely attributed to the dike materials being saturated by long-term steady-state seepage conditions.

6.4. Standard Penetration Test Samples

Recovered soil specimens from SPT sampling were subjected to natural moisture content determinations and select samples were combined for engineering classification testing. The engineering classification testing consisted of Atterberg limits, specific gravity, and sieve and hydrometer analyses. The results of the classification testing were used in conjunction with the N-values from SPT's to estimate soil strength based on published correlations of such data. The results of the moisture content tests and classification testing are included on the boring logs and stability section drawings in Appendixes A and E, respectively.

7. Engineering Analysis

7.1. General

Geotechnical engineering analyses included evaluations of strength and permeability parameters, seepage analyses, and slope stability analyses. Prior to beginning the analyses, the geotechnical data and cross-sections were combined and the geometry of the existing dikes and soil horizons were approximated using current and historical information. Once the geometry of the sections was approximated, each section was reviewed and evaluated to determine the critical cross-section for analyses. Selection of critical sections was based on the steepness of slopes, heights of dikes, geometry of the sections, phreatic surface, seepage conditions, and subsurface conditions. Based on this evaluation, six representative cross-sections were selected for analyses (Sections A-A', B-B', D-D', F-F', G-G', and I-I'). The locations of the sections are shown on the layout drawing presented in Appendix E. Results of the analyses and evaluations are summarized in the following paragraphs, and are shown on drawings/computer output provided in Appendices F and G.

It should be noted that construction records indicating the methods used to construct dikes, as-built dike configurations, etc. were not available for review. As a result, assumptions and generalizations in soil parameters and dike geometry were needed to construct the seepage and stability models.

7.2. Soil Horizons

Based on the results of the drilling, laboratory testing, historical documentation, and drawings, the materials on site were divided into five different soil layers for seepage and stability analyses. Refer to the stability sections in Appendix E for locations of the soil horizons. The soil horizons are briefly described as follows (refer to Section 5.2.1 for further descriptions):

- *Lower Dike:* This represents the material used for construction of the initial perimeter dike constructed in 1972. Historical data shows that this dike was constructed to a crest of El. 440 feet, with interior side slopes of 2H:1V and exterior side slopes of about 3H:1V. The dike is located primarily on the north, east, and south sides of the pond where native ground elevations were the lowest. It is present only in low heights on the southwest to west side.

- *Upper Dike:* This represents the material used for the 1984 construction of the raised dikes. Historical data shows that this dike was constructed to a crest of El. 460 feet above the initial "lower dike" and outwardly over sluiced ash. Historical data also shows that this dike was constructed with interior side slopes of 2H:1V and exterior side slopes of 3H:1V.

- *Native Clay and/or Native Clay and Silt:* This represents the uppermost layers of native clay and/or silty materials beneath the perimeter dikes and pond.

- *Native Sand:* This represents horizons of alluvial silty and clayey sand that were encountered in some instances below the native clay/silt materials.

- *Hydraulically Placed (sluiced) Ash:* This represents sluiced bottom ash/fly ash that is contained by the upper and lower dikes.

7.3. Seepage Analysis

7.3.1. SEEP/W Model

An analysis of steady state seepage through the Ash Pond 4 dikes was performed to estimate the magnitude of seepage gradients (for the evaluation of potential piping) and pore water pressures within the soils (for the evaluation of slope stability). The numerical seepage models for COF Ash Pond 4 were developed using SEEP/W 2007 (Version 7.14), a finite element code tailored for modeling groundwater seepage in soil and rock. SEEP/W is distributed by GEO-SLOPE International, Ltd, of Calgary, Alberta, Canada (www.geo-slope.com).

SEEP/W uses soil properties, geometry, and boundary conditions provided by the user to compute the total hydraulic head at nodal points within the modeled cross-section. Among other features, SEEP/W includes a graphical user interface, semi-automated mesh generation routines, iterative algorithms for solving unconfined flow problems, specialized boundary conditions (seepage faces, etc.), capabilities for steady-state or transient analyses, and features for visualizing model predictions. The code also includes material models that allow tracking both saturated and unsaturated flow, including the transition in seepage characteristics for soils that become saturated or unsaturated during the problem simulation.

Six dike cross-sections through Ash Pond 4 were modeled with SEEP/W, and then were subsequently evaluated for slope stability (Section 7.4). For the numerical analysis, each cross-section was subdivided into a mesh of elements, consisting of first-order quadrilateral and triangular finite elements. For seepage problems, where the primary unknown (hydraulic head) is a scalar quantity, first-order elements provide for efficient, effective modeling. Given appropriate hydraulic conductivity properties and applied boundary conditions, the finite element method (as implemented in the SEEP/W code) was then used to simulate steady seepage across the mesh. The total hydraulic head is computed at each nodal location, from which pore water pressures and seepage gradients can be determined.

7.3.2. Boundary Conditions

Steady-state seepage was assumed for the analysis, with the static pool level placed at approximate El. 457 feet (based on TVA provided survey data).

Boundary conditions for the SEEP/W analysis were assumed as follows. Along the vertical, upstream edge of the model, the hydraulic head at each node was constant with depth and equal to the pool elevation. A total head equal to the pool level was also applied to all submerged nodes along the ground surface of the upstream side (submerged sluiced ash and interior upper dike). Along the vertical, downstream edge of the model, the hydraulic head at each node was constant with depth and equal to the Cane Creek elevation or piezometer reading closest to the edge, depending on cross-section location. Other nodes along the ground surface were treated as potential seepage exits. At various steps in the computer analysis, if the software determines that water flows from the mesh at these nodes along the ground surface, SEEP/W assigned a head equal to the elevation of the node. This routine effectively models the seepage exit to the ground surface. The horizontal boundary

at the base of the model (located within the bedrock) was modeled as a seepage barrier, with no vertical flow across the boundary nodes.

7.3.3. Seepage Properties

For each modeled cross-section, a representative subsurface profile was compiled based on boring logs, available record drawings, and the known project history. Material properties were estimated based on available laboratory data, correlations with classification data, and on typical values for similar materials. Material properties used in the seepage analysis are summarized in Table 7.1.

Table 7.1. Material Properties for SEEP/W Analysis

Soil Horizon	Saturated k_v (cm/s)	Ratio k_h / k_v	Specific Gravity G_s	Void Ratio e	Volumetric Water Content		Basis
					Saturated (%)	Residual (%)	
Lower Dike	1.0e-7 to 1.0e-8	1 to 5	2.74	0.58	37	2	Available Laboratory Data and Correlation w/ Typical Values
Upper Dike	1.0e-7 to 1.0e-8	1 to 5	2.72	0.66	40	2	Available Laboratory Data and Correlation w/ Typical Values
Hydraulically Placed (Sluiced) Ash	1.0e-4 to 4e-5	10 to 35	2.30	0.85	46	1	Available Laboratory Data and Correlation w/ Typical Values
Native Clay / Native Clay and Silt	1.0e-4 to 1.0e-5	10 to 35	2.71	0.58	37	1	Available Laboratory Data and Correlation w/ Typical Values
Native Sand	1.0e-3 to 1.0e-4	30 to 50	2.72	0.84	46	1	Available Laboratory Data and Correlation w/ Typical Values
Limestone Bedrock	1.0e-3	10	2.60	0.14	12	1	Correlation w/ Typical Values

Note: SEEP/W requires input parameters k_h and ratio of k_v/k_h

Significant engineering judgment is needed to select appropriate hydraulic properties for earth/soil materials. Unlike other key properties, hydraulic conductivity can vary over several orders of magnitude for a range of soils, often with substantial anisotropy for seepage in horizontal versus vertical directions. Laboratory test samples often do not represent important variations within a larger soil deposit. For Ash Pond 4, an iterative process of parametric calibration (Section 7.3.4) was used to arrive at final estimates of the seepage properties. Results from trial simulations were compared to field data (measured piezometric

levels and observed seepage) and the material parameters were then varied until the solutions reasonably matched the field data. The final set of parameters (Table 7.1) resulted in the comparisons presented in Section 7.3.4.

The ratio of horizontal hydraulic conductivity (kh) to vertical hydraulic conductivity (kv) was estimated based on placement, depositional characteristics, and origin of the materials. An isotropic material would have kh/kv = 1, while deposits of horizontally layered soils will have much higher values. For Ash Pond 4, higher ranges of ratios were used for sluiced ash and native materials, whereas a lower range of ratios was assumed for compacted dike materials.

The governing equations in SEEP/W are formulated to consider seepage through unsaturated soils. In the simulations for Ash Pond 4, this formulation is used to locate the phreatic surface for unconfined seepage through the dike cross-sections. To represent the change in hydraulic conductivity due to de-saturation of each soil, SEEP/W implements a model based on two curves, a hydraulic conductivity function and a volumetric water content function. Three parameters are needed to define this behavior: the saturated hydraulic conductivity, saturated water content, and residual water content (water content of air dried soil). Of these, only the residual water contents were not previously estimated for each material. Values were estimated based on typical values for similar soils. The simulation results are not sensitive to the selection of these values.

7.3.4. Comparison to Field Observations

After the initial seepage parameters were estimated, results from the SEEP/W model were compared to pore water pressures measured in piezometers installed within Ash Pond 4. Data from the 21 piezometers were used in this evaluation. Nodes were placed in the model at the same location as the piezometer tip was installed in the field so that the total head predicted at the node could be compared to the corresponding piezometer reading. The material properties in each modeled cross-section were then varied until a reasonable match was obtained between the seepage predictions and field data. Specifically, the saturated hydraulic conductivity and the kh/kv ratios were adjusted (while still maintaining the parameters within expected ranges) to give model predictions as consistent as possible with field measurements and observations.

The comparison between the field piezometer measurements and final SEEP/W predictions show the predicted groundwater table ranging from about 3 feet below to 5 feet above the readings obtained in the piezometers installed within the dike crest. For the dike toe areas and mid-slope areas, the seepage model consistently predicted the water table position to be from about 3 to 10 feet above actual toe piezometer readings (or closer to the ground surface). Actual field conditions at toe/midslope piezometers were more difficult to match within the seepage model. For all locations, the maximum difference between the predictions and measurements is about 12 feet, while most differ by less than 3 to 6 feet. These differences are judged to be acceptable given the limited information available and unknown conditions between the modeled cross-sections and borings.

The results from the seepage model can also be compared to field observations of seepage. For Ash Pond 4, historical seepage has been present along the majority of the east and southeast dikes. Also, Stantec recently found less pronounced and less widespread seepage areas along the south, southwest, and west sides. The outbreak of the observed seepage typically begins a few feet above the toe of the upper dike. These observations

correlate well with the seepage models for the cross-sections which generally show the shape of the predicted phreatic surface extending to the slope face just above the lower dike.

In summary, the seepage models appear to give a reasonable prediction of the phreatic surface location when compared to field observations and piezometer measurements.

7.3.5. Critical Exit Gradients

Seepage forces, resulting from hydrodynamic drag on the soil particles, can destabilize earthen structures. Excessive hydraulic gradients near the ground surface can lead to the initiation of soil erosion and piping, which has caused numerous dam failures in the past. Hydraulic gradients (computed where seepage exits at the ground surface) can be evaluated to understand the potential severity of this problem.

Where upward seepage through a uniform soil exits the ground surface, the factor of safety with respect to soil piping (FSpiping) is as defined below.

$$FS_{piping} = \frac{i_{crit}}{i} \qquad \textbf{Eqn. 7.1}$$

Where "i" is the vertical gradient in the soil at the exit point. The critical gradient (icrit) is related to the submerged unit weight of the soil, and can be computed as:

$$i_{crit} = \frac{\gamma_{sub}}{\gamma_w} = \frac{G_s - 1}{1 + e} \qquad \textbf{Eqn. 7.2}$$

where γsub is the submerged unit weight of the soil, γw is the unit weight of water, Gs is the specific gravity of the soil particles, and e is the void ratio. For nearly all soils, the critical gradient is between about 0.6 and 1.4, with a typical value near 1.

When FSpiping = 1, the effective stress is zero and the near-surface soils are subject to piping or heaving, but only for vertical seepage that actually exits to the ground surface. If the phreatic surface is buried, then the FSpiping will be greater than 1 even when i=icrit.

7.3.6. Results of Seepage Analysis

Plots from the SEEP/W analyses of the six cross-sections through the Ash Pond 4 dikes are presented in Appendix F. The plots show the finite element mesh, material zones, and boundary conditions used in each analysis. The results are depicted in contour plots of total head, pore water pressure, and seepage gradients. For the slope stability analyses (Section 7.4), the pore water pressures along the considered slip surfaces were determined by interpolation between the nodal pore pressures predicted with the SEEP/W model. The seepage gradients were assessed for maximum exit gradients and the potential for soil piping.

On each modeled cross-section, examination of the output (predicted phreatic surface and vertical gradients) can be made to look for areas where the potential for excessive vertical gradients might exist that could possibly initiate the erosion or piping of material. In general, areas of potential concern are where water seeps laterally out onto a sloping ground surface, or where vertical, upward seepage occurs at the ground surface. The potential for piping was evaluated using the factor of safety equation as defined in Section 7.3.5. First, contour

plots of vertical gradient (Appendix F) were examined to determine the general location of the maximum vertical exit gradient. On the modeled cross-sections, the maximum upward gradient occurs near or beyond the toe of the lower dikes. For the factor of safety calculations, vertical gradients from these locations were then used along with the critical gradients determined from the soil properties.

The calculated factors of safety against piping are summarized in Table 7.2. They range from 1.6 to 3.1, with one value being relatively high (Section F-F') because a critical exit point was not predicted by the model. Stantec recommends a target factor of safety against piping of 3 for the evalution of Ash Pond 4, based on information contained in United States Army Corps of Engineers (USACE) manual EM 1110-2-1901. Hence, on four of the six cross sections modeled, Ash Pond 4 does not meet the recommended target factor of safety for piping at the critical seepage exit points located at or beyond the dike toes. The lowest factors of safety occur at cross-sections that represent the east side of the pond along Cane Creek.

Table 7.2. Summary of Computed Exit Gradients and Minimum Factors of Safety against Piping

Cross Section*	Vertical Gradient (i_v) at Critical Exit Point	Location of Critical Exit Point	Material	Critical Gradient (i_{crit})	FS_{piping}
A-A'	0.42	Toe	Native Clay	1.08	2.6
B-B'	0.69	Toe/Creek	Native Clay	1.08	1.6
D-D'	0.56	Toe/Creek	Native Sand	0.93	1.7
F-F'	Critical Exit Point Not Identified by Model	N/A	N/A	N/A	> 3
G-G'	0.44	Toe	Native Clay	1.08	2.5
I-I'	0.35	Toe	Native Clay	1.08	3.1

*Refer to Appendix E for locations of cross-sections.

7.4. Slope Stability Analyses

7.4.1. SLOPE/W Model

The stability of the Ash Pond 4 dikes were evaluated using limit equilibrium methods as implemented in the SLOPE/W software, which is available from GEO-SLOPE International, Ltd., of Calgary, Alberta, Canada (www.geo-slope.com). Analyses were completed for static, long-term conditions with steady-state. SLOPE/W is a special-purpose computer code designed to analyze the stability of earth slopes using two-dimensional, limit equilibrium methods. With SLOPE/W, the distribution of pore water pressures within the earth mass can be mapped directly from a SEEP/W solution. In this study, steady-state pore pressures were

obtained from the SEEP/W models described in Section 7.3. Stability analyses were also performed using data obtained from piezometer readings for comparison purposes.

7.4.2. Limit Equilibrium Methods in SLOPE/W

Limit equilibrium methods for evaluating slope stability consider the static equilibrium of a soil mass above a potential failure surface. For conventional, two-dimensional methods of analysis; the slide mass above an assumed failure surface is first divided into vertical slices, then stresses are evaluated along the sides and base of each slice. The factor of safety against a slope failure (FSslope) is defined as:

$$FS_{slope} = \frac{\text{shear strength of soil}}{\text{shear stress required for equilibrium}} \qquad \textbf{Eqn. 7.3}$$

where the strengths and stresses are computed along a defined failure surface located at the base of the vertical slices. The shearing resistance along the potential slip surface is computed, with appropriate Mohr-Coulomb strength parameters, as a function of the total or effective normal stress.

Spencer's solution procedure (Spencer 1967; USACE 2003; Duncan and Wright 2005), which satisfies all of the conditions of equilibrium for each slice, was used in this study. Spencer's procedure computes FSslope for an assumed failure surface. A search must be made to find the critical slip surface corresponding to the lowest FSslope. Both circular and noncircular potential failure surfaces can be evaluated.

7.4.3. Analysis Approach for Pond 4

The slope stability analyses for Ash Pond 4 were performed using SLOPE/W 2007 on the downstream (exterior) faces of the dikes. SLOPE/W incorporates various search routines to locate the critical slip surface. For the analyses presented here, the "Grid and Radius" method and the "Entrance and Exit" method were employed. Center points for the trial circles were confined to a specified range above the slope surface, while the trial radii were varied based on tangent horizontal lines within the soil. The minimum and maximum range for the center points and tangent lines were parametrically varied over a wide range to determine the likely solution region for the critical circle. In subsequent runs, the search was refined by narrowing the range and spacing for the candidate center points. The phreatic surface and distribution of pore water pressures obtained from the SEEP/W model were used in the analysis. For comparison, separate slope stability models were also prepared using the phreatic surface as obtained from the piezometer readings.

7.4.4. Selection of Shear Strength Parameters

The lower dikes for Ash Pond 4 were originally constructed in 1972, and the upper dikes were constructed in 1984. These dikes have existed in their current cross sectional geometry (slopes and crest elevation) for at least 25 years. Hence, excess pore pressures generated in the underlying soil during construction have had sufficient time to dissipate and steady state seepage conditions have developed within the dikes. The stability analyses presented in this report will focus only on static steady state seepage conditions (no

earthquake or other dynamic loads). For these conditions, soil unit weights and drained strength parameters (c' and ϕ') are needed.

The drained shear strength parameters used for the clay dikes and clay foundation materials were derived using results of laboratory triaxial tests, along with consideration given to standard penetration test data and laboratory classification test data. In addition, the strength parameters selected were further refined or confirmed by comparisons with the strength parameters listed in the TVA-provided historical reports. Representative strengths for each horizon were selected using the methodology outlined in the US Army Corps of Engineers Engineer Manual EM 1110-2-1902 as a guide. Results of triaxial testing were evaluated and effective stress p' versus q scatter plots were prepared of all of the data points. The maximum effective principal stress ratio was used to determine failure criteria for selection of these values within Stantec's laboratory test results. Once the p' versus q plots were prepared, a failure envelope was then selected such that two thirds of the plotted values were above the envelope. The p' versus q plots and selection of the failure envelope are shown for each horizon on the graphs presented in Appendix D. The strength parameters were rounded to the nearest degree with regards to ϕ'. The cohesion intercept point (c') was limited to a maximum of 200 pounds per square foot.

For non-cohesive native sands, shear strength parameters were estimated using published relationships which correlate SPT N-values with relative density, specific soil types and angles of internal friction.

In addition to the dike and foundation soils, both stacked and sluiced ash materials are present within Ash Pond 4. Shear strength parameters for ash materials were estimated using historical data, typical values, and published correlations using SPT N-values.

The following table provides a summary of the effective stress shear strengths selected for use in the slope stability analyses.

Table 7.3. Selected Strength Parameters for Stability Analyses

Soil Horizon	Unit Weight (pcf)	Effective Stress Strength Parameters	
		c' (psf)	Ø' (degrees)
Upper Dike	126	200	28
Lower Dike	127	200	29
Sluiced Ash	85	0	26
Native Clay/Silt	129	200	28
Native Sand	110	0	30
Stacked Ash	90	0	30

7.4.5. Results of Slope Stability Analysis

Using the strength parameters (c' and ϕ') listed in Table 7.3, in conjunction with the results of the seepage analyses and piezometer data, the existing dike configurations were analyzed at the six selected cross-sections. Geo-Slope's Slope/W computer program was used for the analyses with pore pressures imported from the seepage analyses. Separate analysis was also performed using the piezometer data instead of seepage model pore pressures for

comparison. Long term (effective stress) steady state seepage conditions were analyzed using Spencer's method. For the Spencer's method analyses, circular failure surfaces with optimization were conducted.

The stability analyses focused on the potential for failure along the exterior dike face. SLOPE/W failure surfaces from these analyses are presented on the drafted sheets in Appendix E. The results are summarized in Table 7.4 below.

Table 7.4. Summary of Minimum Computed Factors of Safety for Slope Stability

Cross-Section*	Minimum FS (using piezometer data)	Minimum FS (using pore water pressures from SEEP/W)
A-A'	2.10	1.50
B-B'	1.80	1.54
D-D'	1.40	1.42
F-F'	1.49	1.77
G-G'	1.95	1.50
I-I'	2.19	1.92

*Refer to Appendix E for plan view of cross-section locations.

Based on discussions with TVA and to be in accordance with current prevailing geotechnical practice, a minimum target factor of safety of 1.5 was established for long term conditions using the guidelines presented in USACE Manual EM 1110-2-1902 "Slope Stability". There is no formal dam safety program, regulations, or design criteria for dams in the state of Alabama.

The results of the slope stability analyses demonstrate that the factors of safety against long-term, steady state seepage slope stability range from about 1.4 to greater than 1.5. The results indicate that only one cross-section (Section D-D') has a safety factor less than the target. This cross-section is generally representing the east side of the pond along Cane Creek. The trends of safety factors determined from the analyses using the piezometer data versus the pore water pressures from the seepage model are fairly comparable, with the values using the seepage model tending to be a little lower. In each case, the critical slip surfaces extend into the dike to affect the crest and represent more of a global failure surface. The critical slip surfaces are depicted in Appendix E.

There was no indication in the slope stability analyses that a noncircular failure surface would give a factor of safety lower than that obtained for circular surfaces. Overall, the geometry of the dike cross-sections and the foundation stratigraphy do not appear to be susceptible to sliding along a planar surface. The optimization scheme available within SLOPE/W was used to consider noncircular, curved slip surfaces. The results presented in Table 7.4 and in Appendix E represent factors of safety computed from the optimized, circular slip surface routine.

8. Conclusions and Recommendations

The conclusions and recommendations that follow are based on Stantec's understanding of Ash Pond 4, as outlined in this report, and on TVA's plans for future modifications to downsize or possibly close the pond. This understanding has been developed from review of

historical information, discussions with TVA personnel, and from the results of this geotechnical exploration. In addition, Stantec understands that TVA has tasked URS Corporation with conducting a feasibility study to address potential operational modifications to Ash Pond 4 so that the hazard classification could possibly be reduced. Pond modifications being considered by TVA and URS include reducing the size of the pond or perhaps pond closure.

8.1. The results of the seepage analyses were reviewed to identify conditions where seepage and possible piping may occur. Seepage outbreaks along the slopes can create the potential for the initiation of soil piping if excessive vertical gradients exist. On most cross-sections, the model predicts the potential for seepage outbreaks to occur on the exterior dike slopes just above the upper-lower dike interface (toe of the upper dike), and at lower areas along or beyond the dike toes. These results are generally confirmed by the observation of intermittent seepage areas around the pond typically beginning as high as a few feet above the upper dike toe and extending downslope (most predominantly on the east side). The seepage analyses also showed that maximum vertical exit gradients typically occur at or just beyond the dike toe areas. Factors of safety against piping in these toe areas where the maximum exit gradients are predicted range from 1.6 to 2.6 for Sections A-A', B-B', D-D', and G-G', which is less than the recommended target of 3. The factors of safety against piping for Sections F-F' and I-I are greater than 3. Thus, for four of the six cross-sections analyzed, the factors of safety against piping at locations of the maximum exit gradients are less than the recommended target value. The lowest factors of safety occur at the toes of cross-sections that represent the east side of the pond along Cane Creek.

8.2. The results of the slope stability analyses indicate that factors of safety against long-term slope stability failure are mostly greater than the target value of 1.5, except for Section D-D' where a factor of safety of about 1.4 was calculated from the model. This section represents the east side of the pond adjacent to Cane Creek.

8.3. To improve the long-term stability and seepage conditions, it is recommended that TVA implement a mitigation design and construction program for Ash Pond 4 to improve factors of safety against slope stability and piping in areas where deficiencies are identified. These improvements could be incorporated into URS Corporation's design of pond modifications/closure, or a separate short-term interim mitigation program could be implemented, depending on timing and as decided by TVA. Final mitigation design should increase factors of safety to at least 1.5 for long term slope stability, and to at least 3 for piping.

8.4. If TVA decides to perform mitigation coincident with URS design of pond modifications/closure, then features for improvements should include a combination of stabilizing beams, flattening of dike slopes, and provisions for collecting and controlling seepage. Lowering the pool level will also help to improve slope stability and seepage conditions, and should be considered by URS in their evaluation of operational changes to Ash Pond 4. If stabilizing berms are used and are placed over areas subject to exit seepage, the gradation of the berm should be selected to filter the seepage water and to prevent piping.

8.5. If implementation of a short-term interim mitigation program is selected, then improvements should focus on the east and southeast sides of the pond where lower factors of safety against slope stability and piping have been calculated, and where the most predominant historical seepage conditions exist. Short term improvements should consist of

placement of a stabilizing berm. Since this berm would be placed over seepage areas, it should contain appropriate material zones and gradations to filter seepage water and to prevent piping.

8.6. It is recommended that URS Corporation's design of modifications/closure include an instrumentation monitoring program (including calculation of "alert" piezometric levels which would result in slope stability factors of safety falling below 1.5). Until mitigation/operational changes can be made that will improve stability/seepage, it is also recommended that TVA continue dike inspections/monitoring to look for changes or conditions that might affect dike integrity. The frequency of inspections should be daily (Site Foreman or PAE), weekly (Field Supervisor) and monthly (Construction Manager). This is consistent with the TVA's new programmatic inspection schedule.

8.7. Ash Pond 4 is underlain by limestone bedrock that can be susceptible to solutioning and the development of karst features, such as voids, solution channels, and sinkholes in the soil overburden and/or the underlying bedrock. Construction and operation in such areas is always accompanied by risk that internal soil erosion and ground subsidence could affect constructed facilities. It is not possible to completely investigate a site or design a facility to eliminate karst-related problems. However, throughout this study Stantec did not observe ground features nor detect unusual subsurface conditions at the boring locations that would indicate that karst-related issues are affecting Ash Pond 4.

9. Closure and Limitations of Study

9.1. The scope of this evaluation was limited to consider only the potential risks of the Ash Pond 4 dikes due to excessive seepage and slope instability under long-term, steady-state seepage loading conditions. This assessment did not consider potential failure modes related to spillway capacity and overtopping or seepage along penetrations through the embankment (including the buried spillway pipes).

9.2. These conclusions and recommendations are based on data and subsurface conditions from the borings advanced during this investigation using that degree of care and skill ordinarily exercised under similar circumstances by competent members of the engineering profession. No warranties can be made regarding the continuity of conditions between borings.

9.3. The boring logs and related information presented in this report depict approximate subsurface conditions only at the specific boring locations noted and at the time of drilling. Conditions at other locations may differ from those occurring at the boring locations. Also, the passage of time may result in a change in the subsurface conditions at the boring locations.

10. References

The following is a list of documents that were the main references for gaining historical information used to evaluate Ash Pond No. 4 and prepare this report:

- Colbert Steam Plant – Proposed Ash Disposal Area No. 4 – Dikes – Soil Investigation, Memorandum from Gene Farmer to F.P. Lacy, October 13, 1972.

- Colbert Steam Plant – Ash Disposal Area No. 4 Dike Raising – Soils Exploration and Testing – En Des Soils Schedule No. 67, Memorandum from Gene Farmer to G.L. Buchanan, March 27, 1978.

- Geology of the Colbert Steam Plant, Charles P. Bensiger, TVA Division of Water Control Planning, Geologic Branch, November, 1951.

- TVA Drawing Numbers 10N290, 291, 292, 293, 294-1 through 294-7, 213, 287.

- TVA Annual Inspection Reports, 1993 to 2008.

Additional reference documents:

- Slope Stability, Department of the Army, US Army Corps of Engineers, Engineering Manual EM 1110-2-1902, October 31, 2003.

- Seepage Analysis and Control for Dams, Department of the Army, US Army Corps of Engineers, Engineering Manual EM 1110-2-1901, April 30, 1993.

- Geotechnical Investigations, Department of the Army, US Army Corps of Engineers, Engineering Manual EM 1110-1-1804, January 1, 2001.

- GeoStudio, Computer Software. GEO-Slope International Ltd. Ver. 7.14, 2007.

- Soil Mechanics Design Manual 7.1, Department of the Navy – Navy Facilities Engineering Command, May 1982.

- Terzaghi, K., Peck, R.B., and Gholamreza, M., Soil Mechanics in Engineering Practice, 3rd Edition, New York, John Wiley and Sons, 1996.

Appendix A

Typed Boring Logs

SUBSURFACE LOG

Project No.	175559016	Location	N 1723599.52, E 394359.89 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-1** Total Depth 54.0 ft
Location	Colbert County, Alabama	Surface Elevation	460.2 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/14/09 Completed 7/14/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	25.0 ft Date/Time 7/14/09
Logged By	Greg Budd	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
460.2'	0.0'	Top of Hole							
459.8'	0.4'	Gravel and Ash Road Surface		SPT-1	0.0 - 1.5	0.9	3-3-3	22	Boring advanced using 3 1/4" Hollow Stem Augers.
		LEAN CLAY with Sand (upper dike), reddish brown, moist, stiff to very stiff, silty, with little fine sand and trace manganese concretions		SPT-2	1.5 - 3.0	1.0	3-5-8	21	
				SPT-3	3.0 - 4.5	1.5	9-12-14	24	
				SPT-4	4.5 - 6.0	1.5	6-6-8	21	
				SPT-5	6.0 - 7.5	1.0	5-7-8	25	
				SPT-6	7.5 - 9.0	1.2	6-7-8	21	
				SPT-7	9.0 - 10.5	0.9	3-4-5	20	
				SPT-8	10.5 - 12.0	1.1	3-4-6	17	
				SPT-9	12.0 - 13.5	1.5	6-8-12	19	
				SPT-10	13.5 - 15.0	1.5	3-4-7	22	
				SPT-11	15.0 - 16.5	1.3	3-4-7	21	
				SPT-12	16.5 - 18.0	1.4	5-9-11	20	
		-Mottled grayish brown		SPT-13	18.0 - 19.5	1.2	3-3-5	20	
				SPT-14	19.5 - 21.0	1.1	3-4-6	22	
				SPT-15	21.0 - 22.5	0.8	2-3-4	22	
				SPT-16	22.5 - 24.0	1.5	4-4-6	31	
435.2'	25.0'			SPT-17	24.0 - 25.5	1.5	4-11-14	26	
		BOTTOM ASH, black, wet, loose to medium dense		SPT-18	25.5 - 27.0	1.1	7-9-8	12	
				SPT-19	27.0 - 28.5	1.5	7-8-9	14	
				SPT-20	28.5 - 30.0	0.8	3-3-5	16	
				SPT-21	30.0 - 31.5	1.3	5-6-8	29	
				SPT-22	31.5 - 33.0	1.4	4-3-1	17	
				SPT-23	33.0 - 34.5	0.5	3-4-3	17	
				SPT-24	34.5 - 36.0	1.1	3-4-3	18	
				SPT-25	36.0 - 37.5	1.0	2-2-3	21	
				SPT-26	37.5 - 39.0	0.4	4-3-4	15	
420.2'	40.0'			SPT-27	39.0 - 40.5	0.3	3-5-11	21	
		LEAN CLAY with Sand, dark brown to tan, moist, stiff		SPT-28	40.5 - 42.0	1.0	5-6-6	20	
				SPT-29	42.0 - 43.5	1.0	3-4-5	23	

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1723599.52, E 394359.89 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-1**
		Total Depth	54.0 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		LEAN CLAY with Sand, dark brown to tan, moist, stiff *(Continued)*		SPT-30	43.5 - 45.0	1.2	2-3-6	21	
				SPT-31	45.0 - 46.5	1.5	3-6-7	22	
				SPT-32	46.5 - 48.0	1.1	4-6-8	24	
411.2'	49.0'			SPT-33	48.0 - 49.5	0.8	12-6-6	25	
		SILTY SAND, brown to gray, moist to wet, medium, fine grained, trace fine gravel		SPT-34	49.5 - 51.0	1.0	6-7-10	33	
				SPT-35	51.0 - 52.5	1.1	7-9-13	31	
407.2'	53.0'								
406.2'	54.0'	Weathered Limestone		SPT-36	52.5 - 54.0	0.9	10-30-19	24	
		Auger Refusal / Bottom of Hole							Boring backfilled with bentonite grout from 0.0 ft. to 54.0 ft.
		Top of Rock = 53.0' Elevation (407.2')							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1723599.52, E 394359.89 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-1S** Total Depth 27.0 ft
Location	Colbert County, Alabama	Surface Elevation	460.2 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/15/09 Completed 7/15/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	25.0 ft Date/Time 7/15/09
Logged By	Greg Budd	Automatic Hammer ☐	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
460.2'	0.0'	Top of Hole							
		See STN-4-1 for description of soils.		ST-1	2.0 - 4.0	1.9		22	Boring advanced using 3 1/4" Hollow Stem Augers.
				ST-2	5.0 - 7.0	1.8		22	Piezometer installed (see PZ detail sheet).
				ST-3	10.0 - 12.0	1.0		25	
				ST-4	15.0 - 17.0	1.8		20	
				ST-5	20.0 - 22.0	1.0		21	
433.2'	27.0'			ST-6	25.0 - 27.0	0.7		21	Boring backfilled with sand, bentonite pellets, and bentonite grout from 0.0 ft to 27.0 ft.
		No Refusal / Bottom of Hole							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1723632.72, E 394289.32 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-2** Total Depth 29.2 ft
Location	Colbert County, Alabama	Surface Elevation	439.4 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/26/09 Completed 7/27/09
Supervisor	Paul Cooper Driller J. Bowerman	Depth to Water	N/A Date/Time N/A
Logged By	Ben Phillips	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
439.4'	0.0'	Top of Hole							
		SANDY LEAN CLAY (lower dike), reddish brown to brown, moist, medium to very stiff, silty, with little fine sand		SPT-1	0.0 - 1.5	1.0	3-5-6	18	Boring advanced using 4 1/4" Hollow Stem Augers.
				SPT-2	1.5 - 3.0	1.5	5-6-7	19	
				ST-1	3.0 - 5.0	2.0	100%	22	
				SPT-3	5.0 - 6.5	1.2	3-5-8	21	
				SPT-4	6.5 - 8.0	1.3	3-5-6	16	
				ST-2	8.0 - 9.0	1.0	50%	23	
				SPT-5	9.0 - 10.5	1.4	19-15-10	20	
				SPT-6	10.5 - 12.0	1.4	3-5-6	17	
				SPT-7	12.0 - 13.5	1.5	3-4-7	20	
				SPT-8	13.5 - 15.0	1.2	3-5-8	19	
				SPT-9	15.0 - 16.5	0.8	2-4-8	19	
421.4'	18.0'			SPT-10	16.5 - 18.0	1.1	1-2-3	23	
		LEAN CLAY, reddish brown to tan, moist, medium to stiff, with trace chert fragments		SPT-11	18.0 - 19.5	1.5	2-3-4	20	
				SPT-12	19.5 - 21.0	1.5	2-3-6	20	
				SPT-13	21.0 - 22.5	1.5	2-3-4	19	
415.4'	24.0'			SPT-14	22.5 - 24.0	1.5	3-5-7	20	
		FAT CLAY, tan and gray mottled orange brown, moist, stiff		SPT-15	24.0 - 25.5	1.5	4-5-7	23	
				SPT-16	25.5 - 27.0	1.5	4-5-5	23	
				SPT-17	27.0 - 28.5	1.5	2-3-5	20	
410.2'	29.2'			SPT-18	28.5 - 29.2	0.7	7-50/0.2'	51	
		Auger Refusal / Bottom of Hole Top of Rock = 29.2' Elevation (410.2')							Boring backfilled with bentonite grout from 0.0 ft. to 29.2 ft.

SUBSURFACE LOG

Project No.	175559016	Location	N 1723645.94, E 394253.91 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-3** Total Depth 13.8 ft
Location	Colbert County, Alabama	Surface Elevation	427.3 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/21/09 Completed 7/21/09
Supervisor	Paul Cooper Driller J. Bowerman	Depth to Water	5.0 ft Date/Time 7/21/09
Logged By	Ben Phillips	Automatic Hammer ☐	Safety Hammer ☒ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
427.3'	0.0'	Top of Hole							
		LEAN CLAY with Sand, reddish brown to orange brown and tan, moist, soft to very stiff, with some fine sand and trace manganese concretions		SPT-1	0.0 - 1.5	1.3	4-6-6	23	Boring advanced using 3 1/4" Hollow Stem Augers.
				SPT-2	1.5 - 3.0	0.7	3-4-4	19	
				SPT-3	3.0 - 4.5	1.2	2-3-4	22	
				SPT-4	4.5 - 6.0	1.5	2-2-2	29	
				SPT-5	6.0 - 7.5	1.5	2-2-4	20	
		- increase in sand content with depth		SPT-6	7.5 - 9.0	1.5	2-4-4	21	
				SPT-7	9.0 - 10.5	1.5	4-7-9	14	
				SPT-8	10.5 - 12.0	1.3	5-8-9	17	
415.3'	12.0'								
		FAT CLAY, orange brown and light gray, moist, very stiff, with trace fine sand		SPT-9	12.0 - 13.5	1.2	2-6-39	34	
413.5'	13.8'			SPT-10	13.5 - 13.8	0.0	50/0.3'	--	
		Auger Refusal / Bottom of Hole Top of Rock = 13.8' Elevation (413.5')							Boring backfilled with bentonite grout from 0.0 ft. to 13.8 ft.

SUBSURFACE LOG

Project No.	175559016	Location	N 1723645.94, E 394253.91 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-3S** Total Depth 18.0 ft
Location	Colbert County, Alabama	Surface Elevation	427.3 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/21/09 Completed 7/21/09
Supervisor	Paul Cooper Driller J. Bowerman	Depth to Water	5.0 ft Date/Time 7/21/09
Logged By	Ben Phillips	Automatic Hammer ☐	Safety Hammer ☐ Other ☐

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
427.3'	0.0'	Top of Hole							
		See STN-4-3 for description of soils.							Boring advanced using 4 1/4" Hollow Stem Augers.
				ST-1	2.0 - 4.0	1.2		21	
									Piezometer installed (see PZ detail sheet).
				ST-2	6.0 - 8.0	1.8		21	
				ST-3	10.0 - 12.0	0.8		20	
				SPT-1	14.5 - 16.0	1.5	5-12-14	31	Piezometer backfilled with sand, bentonite pellets, and bentonite grout from 0.0 ft to 18.0 ft.
409.3'	18.0'			SPT-2	16.0 - 17.5	1.4	5-7-35	53	
		Auger Refusal / Bottom of Hole							
		Top of Rock = 17.5' Elevation (409.8')							

SUBSURFACE LOG

Project No.	175559016	Location	N 1723316.42, E 394738.76 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-4** Total Depth 66.3 ft
Location	Colbert County, Alabama	Surface Elevation	460.4 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/20/09 Completed 7/21/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	25.0 ft Date/Time 7/20/09
Logged By	Greg Budd	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
460.4'	0.0'	Top of Hole							
		LEAN CLAY with Sand (upper dike), reddish brown, moist, stiff to very stiff, trace chert fragments and mangenese concentrations		SPT-1	0.0 - 1.5	0.8	3-4-7	24	Boring advanced using 3 1/4" Hollow Stem Augers.
				SPT-2	1.5 - 3.0	1.3	5-8-11	21	
				SPT-3	3.0 - 4.5	1.2	12-11-12	20	
				SPT-4	4.5 - 6.0	1.1	3-4-8	20	
				SPT-5	6.0 - 7.5	1.1	8-11-13	20	
				SPT-6	7.5 - 9.0	1.4	9-12-13	20	
				SPT-7	9.0 - 10.5	1.2	4-7-6	27	
				SPT-8	10.5 - 12.0	1.5	5-7-13	21	
				SPT-9	12.0 - 13.5	1.5	11-12-13	19	
				SPT-10	13.5 - 15.0	1.3	3-7-11	20	
				SPT-11	15.0 - 16.5	1.3	4-5-8	20	
				SPT-12	16.5 - 18.0	1.2	9-13-14	19	
				SPT-13	18.0 - 19.5	1.0	12-12-13	27	
439.4'	21.0'			SPT-14	19.5 - 21.0	1.2	4-4-5	20	
		LEAN CLAY (upper dike), orange brown and gray, moist, stiff, trace chert fragments		SPT-15	21.0 - 22.5	1.5	6-7-8	28	
				SPT-16	22.5 - 24.0	1.5	6-6-5	29	
435.4'	25.0'			SPT-17	24.0 - 25.5	0.8	3-9-10	12	
		BOTTOM ASH, black, wet, very loose to medium dense		SPT-18	25.5 - 27.0	1.5	9-7-5	15	
				SPT-19	27.0 - 28.5	1.0	5-4-3	18	
				SPT-20	28.5 - 30.0	0.0	WOR-WOR-WOR	--	
				SPT-21	30.0 - 31.5	1.5	1-1-1	21	
				SPT-22	31.5 - 33.0	0.1	1-1-1	26	
				SPT-23	33.0 - 34.5	0.1	1-1-1	21	
425.4'	35.0'								
		FLY ASH, black, wet, very soft to soft		SPT-24	34.5 - 36.0	1.5	4-4-1	29	

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No. 175559016 | Location N 1723316.42, E 394738.76 (NAD27)

Project Name Colbert Fossil Plant - TVA | Boring No. **STN-4-4** | Total Depth 66.3 ft

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
		FLY ASH, black, wet, very soft to soft *(Continued)*		SPT-25	36.0 - 37.5	1.0	1-WOH-WOH	46	
				SPT-26	37.5 - 39.0	1.1	1-2-2	45	
419.9'	40.5'			SPT-27	39.0 - 40.5	1.5	2-2-WOH	28	
		SILTY CLAY, dark brown to tan, moist, medium to very stiff, trace organics and fine sand		SPT-28	40.5 - 42.0	1.0	2-4-5	20	
				SPT-29	42.0 - 43.5	1.0	4-3-4	18	
				SPT-30	43.5 - 45.0	0.4	WOH-WOH-WOH	21	
413.9'	46.5'			SPT-31	45.0 - 46.5	1.5	2-3-4	19	
		SANDY SILT, brown and gray, moist to wet, medium to stiff, trace fine gravel		SPT-32	46.5 - 48.0	1.5	3-5-6	18	
				SPT-33	48.0 - 49.5	1.0	6-9-10	20	
				SPT-34	49.5 - 51.0	1.0	7-10-10	20	
				SPT-35	51.0 - 52.5	0.5	5-4-4	24	
				SPT-36	52.5 - 54.0	0.5	2-2-3	39	
				SPT-37	54.0 - 55.5	0.4	1-2-3	44	
				SPT-38	55.5 - 57.0	0.4	5-3-1	41	
				SPT-39	57.0 - 58.5	0.3	1-2-2	47	
				SPT-40	58.5 - 60.0	0.4	1-1-1	--	
				SPT-41	60.0 - 61.5	0.5	2-5-7	32	
				SPT-42	61.5 - 63.0	1.1	1-1-1	--	
394.1'	66.3'			SPT-43	66.3 - 66.3	0.0	50/0.0'	--	
		Auger Refusal / Bottom of Hole							Boring backfilled with bentonite grout from 0.0 ft. to 66.3 ft.
		Top of Rock = 66.3' Elevation (394.1')							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1723316.42, E 394738.76 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-4S** Total Depth 27.0 ft
Location	Colbert County, Alabama	Surface Elevation	460.4 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/21/09 Completed 7/22/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	25.0 ft Date/Time 7/21/09
Logged By	Greg Budd	Automatic Hammer ☐	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
460.4'	0.0'	Top of Hole							
		See STN-4-4 for description of soils.		ST-1	2.0 - 4.0	2.0		21	Boring advanced using 3 1/4" Hollow Stem Augers.
				ST-2	5.0 - 7.0	2.0		22	Piezometer installed (see PZ detail sheet).
				ST-3	10.0 - 12.0	2.0		20	
				ST-4	15.0 - 17.0	2.0		21	
				ST-5	20.0 - 22.0	2.0		21	
				ST-6	25.0 - 27.0	2.0		20	Piezometer backfilled with sand, bentonite pellets, and bentonite grout from 0.0 ft to 27.0 ft.
433.4'	27.0'	No Refusal / Bottom of Hole							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1723366.01, E 394798.52 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-5** Total Depth 31.1 ft
Location	Colbert County, Alabama	Surface Elevation	439.5 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/24/09 Completed 7/25/09
Supervisor	Paul Cooper Driller J. Bowerman	Depth to Water	N/A Date/Time N/A
Logged By	Ben Phillips	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
439.5'	0.0'	Top of Hole							
		LEAN CLAY with Sand (upper dike), reddish brown, moist, stiff, trace manganese concentrations		SPT-1	0.0 - 1.5	1.5	2-4-8	12	Boring advanced using 3 1/4" Hollow Stem Augers.
				SPT-2	1.5 - 3.0	1.5	5-4-6	18	
				SPT-3	3.0 - 4.5	1.5	3-4-5	17	
				SPT-4	4.5 - 6.0	1.2	1-4-5	20	
				SPT-5	6.0 - 7.5	0.8	2-4-6	20	
				SPT-6	7.5 - 9.0	1.2	2-5-6	19	
		-trace fine sand below 9.0'		SPT-7	9.0 - 10.5	1.4	2-4-6	21	
				SPT-8	10.5 - 12.0	1.4	3-5-5	19	
				SPT-9	12.0 - 13.5	1.3	1-4-6	20	
		-mottled tan below 13.5'		SPT-10	13.5 - 15.0	1.5	3-4-7	26	
				SPT-11	15.0 - 16.5	1.5	2-4-6	15	
421.5'	18.0'			SPT-12	16.5 - 18.0	1.3	2-4-8	14	
		LEAN CLAY with Sand, tan and grayish brown, moist, soft to stiff, some fine to medium grained sand		SPT-13	18.0 - 19.5	1.5	2-5-9	15	
				SPT-14	19.5 - 21.0	1.4	3-5-9	17	
				SPT-15	21.0 - 22.5	1.5	2-2-4	17	
				SPT-16	22.5 - 24.0	1.5	1-2-3	19	
				SPT-17	24.0 - 25.5	1.5	1-1-2	23	
				SPT-18	25.5 - 27.0	1.5	2-2-3	17	
410.8'	28.7'			SPT-19	27.0 - 28.5	1.5	1-3-4	19	
		SILTY SAND, orange brown and gray, moist, loose, fine grained		SPT-20	28.5 - 30.0	1.5	1-3-3	22	
408.4'	31.1'			SPT-21	30.0 - 31.1	1.1	1-4-50/0.1'	20	
		Auger Refusal / Bottom of Hole Top of Rock = 31.1' Elevation (408.4')							Boring backfilled with bentonite grout from 0.0 ft. to 31.1 ft.

SUBSURFACE LOG

Project No.	175559016	Location	N 1723366.01, E 394798.52 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-5S** Total Depth 24.0 ft
Location	Colbert County, Alabama	Surface Elevation	439.5 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/25/09 Completed 7/25/09
Supervisor	Paul Cooper Driller J. Bowerman	Depth to Water	N/A Date/Time N/A
Logged By	Ben Phillips	Automatic Hammer ☐	Safety Hammer ☐ Other ☐

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
439.5'	0.0'	Top of Hole							
		See STN-4-5 for description of soils.							Boring advanced using 4 1/4" Hollow Stem Augers.
				ST-1	4.0 - 6.0	0.8		21	Piezometer installed (see PZ detail sheet).
				ST-2	9.0 - 11.0	1.8		23	
				ST-3	14.0 - 16.0	0.0		--	
				ST-4	17.0 - 19.0	2.0		15	
				ST-5	21.5 - 23.5	1.9		18	Piezometer backfilled with sand, bentonite pellets, and bentonite grout from 0.0 ft to 24.0 ft.
415.5'	24.0'	No Refusal / Bottom of Hole							

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SUBSURFACE LOG

Project No.	175559016	Location	N 1723373.16, E 394864.54 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-6** Total Depth 13.2 ft
Location	Colbert County, Alabama	Surface Elevation	419.8 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/24/09 Completed 7/24/09
Supervisor	Paul Cooper Driller J. Bowerman	Depth to Water	N/A Date/Time N/A
Logged By	Ben Phillips	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
419.8'	0.0'	Top of Hole							
		LEAN CLAY with Sand, brown, moist, soft to medium stiff		SPT-1	0.0 - 1.5	1.5	1-2-3	20	Boring advanced using 3 1/4" Hollow Stem Augers.
				SPT-2	1.5 - 3.0	1.5	1-2-2	19	
				SPT-3	3.0 - 4.5	1.5	1-2-1	24	
414.3'	5.5'			SPT-4	4.5 - 6.0	1.5	1-2-2	20	Piezometer installed (see PZ detail sheet).
		SANDY SILT, brown to gray, moist, very soft to medium stiff		SPT-5	6.0 - 7.5	1.2	1-2-2	24	
				SPT-6	7.5 - 9.0	1.4	1-3-5	21	Piezometer backfilled with sand, bentonite pellets, and bentonite grout from 0.0 ft to 13.2 ft.
		- with trace fine gravel below 9.0'		SPT-7	9.0 - 10.5	1.4	2-5-3	21	
				SPT-8	10.5 - 12.0	1.5	1-1-1	20	
406.6'	13.2'			SPT-9	12.0 - 13.2	1.2	1-4-50/0.2'	25	
		Auger Refusal / Bottom of Hole Top of Rock = 13.2' Elevation (406.6')							

SUBSURFACE LOG

Project No.	175559016	Location	N 1722880.08, E 394960.81 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-7** Total Depth 54.1 ft
Location	Colbert County, Alabama	Surface Elevation	460.8 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/22/09 Completed 7/22/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	25.5 ft Date/Time 7/22/09
Logged By	Greg Budd	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
460.8'	0.0'	Top of Hole							
460.3'	0.5'	Bottom ash road surface		SPT-1	0.0 - 1.5	1.1	3-3-3	68	Boring advanced using 3 1/4" Hollow Stem Augers.
		LEAN CLAY with Sand (upper dike), reddish brown, moist, medium to very stiff, silty, trace to little fine to coarse sand and trace fine gravel		SPT-2	1.5 - 3.0	1.2	5-7-9	25	
				SPT-3	3.0 - 4.5	1.1	7-7-7	22	
				SPT-4	4.5 - 6.0	0.7	5-3-4	22	
				SPT-5	6.0 - 7.5	1.3	4-7-7	20	
				SPT-6	7.5 - 9.0	1.1	11-11-10	23	
				SPT-7	9.0 - 10.5	1.4	3-5-6	22	
				SPT-8	10.5 - 12.0	1.1	8-8-8	20	
				SPT-9	12.0 - 13.5	1.2	10-10-8	19	
				SPT-10	13.5 - 15.0	1.1	3-4-5	19	
				SPT-11	15.0 - 16.5	1.2	3-5-7	22	
				SPT-12	16.5 - 18.0	1.3	5-7-8	21	
				SPT-13	18.0 - 19.5	1.2	8-10-10	23	
				SPT-14	19.5 - 21.0	1.2	3-4-4	--	
				SPT-15	21.0 - 22.5	0.9	3-2-4	21	
				SPT-16	22.5 - 24.0	1.0	3-4-3	20	
				SPT-17	24.0 - 25.5	1.5	3-3-4	23	
434.3'	26.5'			SPT-18	25.5 - 27.0	0.9	WOR-WOR-WOR	23	
		BOTTOM ASH, black, wet, very loose to loose		SPT-19	27.0 - 28.5	0.5	4-4-3	28	
				SPT-20	28.5 - 30.0	1.1	4-3-4	17	
429.3'	31.5'			SPT-21	30.0 - 31.5	0.6	2-1-1	15	
		FLY ASH, black, wet, very soft		SPT-22	31.5 - 33.0	1.5	WOH-WOH-1	39	
				SPT-23	33.0 - 34.5	1.5	1-2-2	42	
				SPT-24	34.5 - 36.0	1.5	1-2-1	28	
				SPT-25	36.0 - 37.5	1.5	1-1-1	31	
				SPT-26	37.5 - 39.0	1.0	WOH-WOH-1	43	
420.8'	40.0'			ST-1	39.0 - 41.0	1.6	80%	34	
		LEAN CLAY with Sand, brown to tan and gray, moist, medium to stiff, trace organics and chert fragments		SPT-27	41.0 - 42.5	1.5	2-2-4	23	
				SPT-28	42.5 - 44.0	1.5	3-3-4	23	

SUBSURFACE LOG

Project No.	175559016	Location	N 1722880.08, E 394960.81 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-7**
Total Depth	54.1 ft		

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
				SPT-29	44.0 - 45.5	0.8	3-4-6	18	
413.8'	47.0'			SPT-30	45.5 - 47.0	1.0	3-4-3	16	
		SILTY SAND, brown, moist, loose, trace to little clay		SPT-31	47.0 - 48.5	0.7	4-4-2	19	
				SPT-32	48.5 - 50.0	1.2	3-2-2	21	
				SPT-33	50.0 - 51.5	1.2	3-4-3	19	
				SPT-34	51.5 - 53.0	1.0	4-2-2	20	
406.7'	54.1'			SPT-35	53.0 - 54.1	0.5	4-2-50/0.1'	27	
		Auger Refusal / Bottom of Hole							Boring backfilled with bentonite grout from 0.0 ft. to 54.1 ft.
		Top of Rock = 54.1' Elevation (406.7')							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1722880.08, E 394960.81 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-7S** Total Depth 27.0 ft
Location	Colbert County, Alabama	Surface Elevation	460.8 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/22/09 Completed 7/22/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	25.5 ft Date/Time 7/22/09
Logged By	Greg Budd	Automatic Hammer ☐	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
460.8'	0.0'	Top of Hole							
		See STN-4-7 for description of soils.							Boring advanced using 3 1/4" Hollow Stem Auger
				ST-1	2.0 - 4.0	2.0		19	
				ST-2	5.0 - 7.0	1.7		22	Piezometer installed (see PZ detail sheet).
				ST-3	10.0 - 12.0	1.5		22	
				ST-4	15.0 - 17.0	2.0		18	
				BAG-1	15.0 - 17.0			--	
				ST-5	20.0 - 22.0	1.4		23	
									Piezometer backfilled with sand, bentonite pellets, and bentonite grout from 0.0 ft to 27.0 ft.
433.8'	27.0'			ST-6	25.0 - 27.0	2.0		18	
		No Refusal / Bottom of Hole							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1722943.49, E 395089.90 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-8** Total Depth 20.0 ft
Location	Colbert County, Alabama	Surface Elevation	421.6 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/25/09 Completed 7/25/09
Supervisor	Paul Cooper Driller J. Bowerman	Depth to Water	5.4 ft Date/Time 7/25/09
Logged By	Ben Phillips	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
421.6'	0.0'	Top of Hole							
		SANDY SILT, brown, moist, stiff		SPT-1	0.0 - 1.5	1.0	3-6-6	11	Boring advanced using 3 1/4" Hollow Stem Augers.
418.6'	3.0'			SPT-2	1.5 - 3.0	1.3	4-4-4	10	
		SANDY LEAN CLAY, brown and tan, moist, very soft to stiff		SPT-3	3.0 - 4.5	1.5	2-4-3	18	
				SPT-4	4.5 - 6.0	1.3	1-1-1	19	Piezometer installed (see PZ detail sheet).
				SPT-5	6.0 - 7.5	1.2	1-1-2	--	
				SPT-6	7.5 - 9.0	1.1	1-2-4	21	
				SPT-7	9.0 - 10.5	1.4	2-4-4	19	
410.7'	10.9'			SPT-8	10.5 - 12.0	1.2	5-16-11	16	
		SILTY SAND, tan and gray, moist, very loose to medium dense		SPT-9	12.0 - 13.5	0.0	1-1-1	--	
408.1'	13.5'								
		SANDY SILTY CLAY, gray, moist, very soft to medium stiff		SPT-10	13.5 - 15.0	1.5	1-2-2	26	
				SPT-11	15.0 - 16.5	1.5	1-1-2	26	Piezometer backfilled with sand, bentonite pellets, and bentonite grout from 0.0 ft to 20.0 ft.
404.1'	17.5'			SPT-12	16.5 - 18.0	1.3	1-9-11	21	
403.6'	18.0'	SANDY SILT, gray, moist, medium stiff, some limestone fragments		SPT-13	18.0 - 19.5	1.5	29-41-18	9	
401.6'	20.0'	Limestone, gray, highly weathered							
		Auger Refusal / Bottom of Hole							
		Top of Rock = 18.0' Elevation (403.6')							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1722306.36, E 395260.37 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-9** Total Depth 51.0 ft
Location	Colbert County, Alabama	Surface Elevation	461.2 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/23/09 Completed 7/23/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	24.5 ft Date/Time 7/23/09
Logged By	Greg Budd	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
461.2'	0.0'	Top of Hole							
460.7'	0.5'	Bottom Ash Road Surface		SPT-1	0.0 - 1.5	1.2	7-10-11	22	Boring advanced using 3 1/4" Hollow Stem Augers.
		LEAN CLAY with Sand (upper dike), reddish brown to tan, moist, stiff to very stiff, trace chert fragments and manganese concentrations		SPT-2	1.5 - 3.0	1.2	4-3-3	33	
				SPT-3	3.0 - 4.5	1.3	9-11-10	30	
				SPT-4	4.5 - 6.0	0.9	4-4-5	23	
				SPT-5	6.0 - 7.5	1.5	5-9-11	25	
				SPT-6	7.5 - 9.0	1.2	8-9-10	21	
				SPT-7	9.0 - 10.5	1.1	3-4-6	24	
				SPT-8	10.5 - 12.0	1.2	8-10-13	17	
				SPT-9	12.0 - 13.5	1.2	11-12-14	18	
				SPT-10	13.5 - 15.0	1.4	6-8-10	19	
				SPT-11	15.0 - 16.5	1.0	2-4-6	23	
				SPT-12	16.5 - 18.0	1.5	8-10-12	21	
441.7'	19.5'			SPT-13	18.0 - 19.5	1.2	10-13-13	19	
		SILTY CLAY (upper dike), brown to reddish brown, moist, stiff		SPT-14	19.5 - 21.0	1.0	4-4-5	20	
				SPT-15	21.0 - 22.5	1.0	5-5-5	20	
				SPT-16	22.5 - 24.0	1.5	4-3-5	23	
436.7'	24.5'			SPT-17	24.0 - 25.5	1.5	6-8-8	27	
		BOTTOM ASH, black, moist to wet, loose to medium		SPT-18	25.5 - 27.0	0.5	4-4-4	16	
				SPT-19	27.0 - 28.5	1.5	3-4-6	16	
432.7'	28.5'			SPT-20	28.5 - 30.0	1.5	5-3-6	24	
		FLY ASH, black, wet, very soft to soft		SPT-21	30.0 - 31.5	1.0	1-1-1	30	
				SPT-22	31.5 - 33.0	1.5	2-2-3	34	
				SPT-23	33.0 - 34.5	1.5	4-4-3	18	
				SPT-24	34.5 - 36.0	1.5	WOH-WOH-WOH	38	
				SPT-25	36.0 - 37.5	1.5	1-1-2	34	
				SPT-26	37.5 - 39.0	1.5	1-1-1	37	
420.7'	40.5'			SPT-27	39.0 - 40.5	1.5	WOH-WOH-WOH	34	
		LEAN CLAY, dark brown and tan, moist, stiff to very stiff, trace chert fragments and fine sand		SPT-28	40.5 - 42.0	1.0	4-6-10	17	
				SPT-29	42.0 - 43.5	1.0	3-6-5	17	

SUBSURFACE LOG

Project No.	175559016	Location	N 1722306.36, E 395260.37 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-9**
		Total Depth	51.0 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
		LEAN CLAY, dark brown and tan, moist, stiff to very stiff, trace chert fragments and fine sand *(Continued)*		SPT-30	43.5 - 45.0	0.8	2-4-4	19	
				SPT-31	45.0 - 46.5	0.5	2-3-6	21	
				SPT-32	46.5 - 48.0	1.2	4-4-5	21	
				SPT-33	48.0 - 49.5	1.0	4-5-6	22	
410.2'	51.0'			SPT-34	49.5 - 51.0	1.0	5-12-31	18	
		Auger Refusal / Bottom of Hole							Boring backfilled with bentonite grout from 0.0 ft. to 51.0 ft.
		Top of Rock = 51.0' Elevation (410.2')							

SUBSURFACE LOG

Project No.	175559016	Location	N 1722306.36, E 395260.37 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-9S** Total Depth 42.0 ft
Location	Colbert County, Alabama	Surface Elevation	461.2 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/23/09 Completed 7/23/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	24.5 ft Date/Time 7/23/09
Logged By	Greg Budd	Automatic Hammer ☐	Safety Hammer ☐ Other ☐

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
461.2'	0.0'	Top of Hole							
		See STN-4-9 for description of soils.							Boring advanced using 3 1/4" Hollow Stem Auger
				ST-1	2.0 - 4.0	2.0		24	
				ST-2	5.0 - 7.0	1.4		21	Piezometer installed (see PZ detail sheet).
				ST-3	10.0 - 12.0	1.6		21	
				ST-4	15.0 - 17.0	2.0		20	
				ST-5	20.0 - 22.0	1.5		20	
				ST-6	25.0 - 27.0	2.0		19	
				ST-7	30.0 - 32.0	2.0		--	
				ST-8	35.0 - 37.0	1.5		21	
419.2'	42.0'			ST-9	40.0 - 42.0	0.0		--	Piezometer backfilled with sand, bentonite pellets, and bentonite grout from 0.0 ft to 42.0 ft.
		No Refusal / Bottom of Hole							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1722357.09, E 395401.10 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-10** Total Depth 14.5 ft
Location	Colbert County, Alabama	Surface Elevation	420.9 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/25/09 Completed 7/25/09
Supervisor	Paul Cooper Driller J. Bowerman	Depth to Water	N/A Date/Time N/A
Logged By	Ben Phillips	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
420.9'	0.0'	Top of Hole							
		SANDY LEAN CLAY, brown to tan, moist, soft to medium stiff, silty, some fine sand		SPT-1	0.0 - 1.5	0.6	2-2-2	18	Boring advanced using 3 1/4" Hollow Stem Augers.
				SPT-2	1.5 - 3.0	1.3	2-2-4	20	
				SPT-3	3.0 - 4.5	1.1	1-2-2	20	
				SPT-4	4.5 - 6.0	1.4	1-2-2	22	Piezometer installed (see PZ detail sheet).
				SPT-5	6.0 - 7.5	0.1	1-2-3	18	
412.9'	8.0'								
		SILTY SAND, tan and gray, moist to wet, very loose to loose, trace organics		SPT-6	7.5 - 9.0	1.1	1-2-4	18	
				SPT-7	9.0 - 10.5	1.5	2-3-2	22	Piezometer backfilled with sand, bentonite pellets, and bentonite grout from 0.0 ft to 14.5 ft.
				SPT-8	10.5 - 12.0	1.5	1-2-1	21	
				SPT-9	12.0 - 13.5	1.0	WOH-	43	
406.4'	14.5'			SPT-10	13.5 - 14.5	1.0	WOH-4 12-50/0.5'	20	
		Auger Refusal / Bottom of Hole Top of Rock = 14.5' Elevation (406.4')							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1721882.96, E 395485.31 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-11** Total Depth 50.8 ft
Location	Colbert County, Alabama	Surface Elevation	461.3 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/15/09 Completed 7/15/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	24.0 ft Date/Time 7/15/09
Logged By	Greg Budd	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
461.3'	0.0'	Top of Hole							
460.8'	0.5'	Bottom Ash Road Surface		SPT-1	0.0 - 1.5	0.8	1-2-4	24	Boring advanced using 3 1/4" Hollow Stem Augers.
		LEAN CLAY with Sand (upper dike), reddish brown and tan, moist, stiff to very stiff, little fine sand and trace manganese concretions		SPT-2	1.5 - 3.0	1.4	6-11-12	20	
				SPT-3	3.0 - 4.5	1.3	11-12-14	23	
				SPT-4	4.5 - 6.0	1.3	2-4-6	24	
				SPT-5	6.0 - 7.5	1.2	7-9-11	27	
				SPT-6	7.5 - 9.0	1.2	11-11-13	21	
				SPT-7	9.0 - 10.5	1.1	5-9-10	19	
				SPT-8	10.5 - 12.0	1.4	7-11-13	20	
				SPT-9	12.0 - 13.5	1.3	7-12-15	18	
				SPT-10	13.5 - 15.0	1.4	5-5-7	22	
				SPT-11	15.0 - 16.5	1.1	2-5-8	22	
				SPT-12	16.5 - 18.0	1.2	7-8-10	22	
				SPT-13	18.0 - 19.5	1.0	8-10-11	25	
				SPT-14	19.5 - 21.0	0.9	4-7-7	18	
				SPT-15	21.0 - 22.5	1.1	10-10-9	20	
437.3'	24.0'			SPT-16	22.5 - 24.0	1.5	5-4-4	26	
		BOTTOM ASH, black to gray, wet, loose to medium dense		SPT-17	24.0 - 25.5	0.6	7-7-8	10	
				SPT-18	25.5 - 27.0	1.5	8-10-8	21	
432.8'	28.5'			SPT-19	27.0 - 28.5	1.1	4-3-5	33	
		FLY ASH, black, wet, very soft to soft		SPT-20	28.5 - 30.0	0.4	3-5-5	27	
				SPT-21	30.0 - 31.5	1.5	1-1-1	36	
				SPT-22	31.5 - 33.0	1.5	1-1-1	29	
				SPT-23	33.0 - 34.5	1.5	1-1-1	25	
				SPT-24	34.5 - 36.0	1.5	WOR-WOR-WOR	43	
424.3'	37.0'			SPT-25	36.0 - 37.5	1.5	WOR-1-1	41	
		FAT CLAY, gray and brown, moist, soft to stiff, trace fine sand		SPT-26	37.5 - 39.0	0.8	1-2-2	22	
				SPT-27	39.0 - 40.5	1.4	3-4-7	21	
				SPT-28	40.5 - 42.0	0.5	4-5-5	21	
				SPT-29	42.0 - 43.5	0.7	3-3-4	23	

SUBSURFACE LOG

Project No.	175559016	Location	N 1721882.96, E 395485.31 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-11** Total Depth 50.8 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		FAT CLAY, gray and brown, moist, soft to stiff, trace fine sand *(Continued)*		SPT-30	43.5 - 45.0	0.2	3-3-4	26	
				SPT-31	45.0 - 46.5	0.9	5-6-7	27	
				SPT-32	46.5 - 48.0	1.5	6-7-7	19	
				SPT-33	48.0 - 49.5	1.5	8-8-15	19	
410.5'	50.8'			SPT-34	49.5 - 50.8	0.5	9-12-50/0.3'	20	
		Auger Refusal / Bottom of Hole							Boring backfilled with bentonite grout from 0.0 ft. to 50.8 ft.
		Top of Rock = 50.8' Elevation (410.5')							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1721882.96, E 395485.31 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-11S** Total Depth 24.0 ft
Location	Colbert County, Alabama	Surface Elevation	461.3 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/16/09 Completed 7/16/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	24.0 ft Date/Time 7/16/09
Logged By	Greg Budd	Automatic Hammer ☐	Safety Hammer ☐ Other ☐

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
461.3'	0.0'	Top of Hole							
		See STN-4-11 for description of soils.							Boring advanced using 3 1/4" Hollow Stem Augers.
				ST-1	2.0 - 4.0	1.8		20	
				ST-2	5.0 - 7.0	2.0		20	Piezometer installed (see PZ detail sheet).
				ST-3	10.0 - 12.0	1.1		21	
				ST-4	15.0 - 17.0	0.4		17	
				ST-5	20.0 - 22.0	0.4		21	Bag sample collected from 20.0 ft to 22.0 ft. Piezometer backfilled with sand, bentonite pellets, and bentonite grout from 0.0 ft to 24.0 ft.
437.3'	24.0'			ST-6	22.0 - 24.0	1.5		29	
		No Refusal / Bottom of Hole							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1721504.87, E 395746.27 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-12** Total Depth 37.5 ft
Location	Colbert County, Alabama	Surface Elevation	446.2 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/22/09 Completed 7/23/09
Supervisor	Paul Cooper Driller J. Bowerman	Depth to Water	34.0 ft Date/Time 7/23/09
Logged By	Ben Phillips	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
446.2'	0.0'	Top of Hole							
		LEAN CLAY with Sand (upper dike into lower dike), brown and tan, moist, very soft to stiff, silty, trace manganese concretions and little fine sand		SPT-1	0.0 - 1.5	1.5	1-4-4	18	Boring advanced using 3 1/4" Hollow Stem Augers.
				SPT-2	1.5 - 3.0	1.5	2-2-6	23	
				SPT-3	3.0 - 4.5	1.2	2-2-4	23	
				SPT-4	4.5 - 6.0	1.5	2-4-5	21	
				SPT-5	6.0 - 7.5	1.5	2-5-9	19	
				SPT-6	7.5 - 9.0	1.2	2-2-4	20	
				SPT-7	9.0 - 10.5	0.7	1-1-1	19	
				SPT-8	10.5 - 12.0	1.1	2-6-5	14	
		-mottled gray below 11.5'		SPT-9	12.0 - 13.5	1.5	2-5-8	16	
				SPT-10	13.5 - 15.0	0.1	2-4-6	18	
				SPT-11	15.0 - 16.5	0.7	1-2-4	18	
429.4'	16.8'								
		FAT CLAY (lower dike), orange brown and tan mottled gray, moist, stiff to very stiff, trace fine to medium grained sand		SPT-12	16.5 - 18.0	1.3	2-5-9	17	
				SPT-13	18.0 - 19.5	1.3	2-4-8	23	
				SPT-14	19.5 - 21.0	1.4	2-4-8	24	
				SPT-15	21.0 - 22.5	0.8	2-5-10	19	
				SPT-16	22.5 - 24.0	0.3	3-5-7	17	
				SPT-17	24.0 - 25.5	1.5	2-4-8	18	
				SPT-18	25.5 - 27.0	1.4	2-6-9	18	
				SPT-19	27.0 - 28.5	1.4	2-5-6	16	
417.4'	28.8'								
		SANDY SILT, brown to gray, moist, medium stiff to stiff, some fine to coarse sand		SPT-20	28.5 - 30.0	1.5	2-4-6	17	
				SPT-21	30.0 - 31.5	1.3	2-4-5	18	
				SPT-22	31.5 - 33.0	1.5	1-4-4	20	
				SPT-23	33.0 - 34.5	1.5	2-7-10	19	
				SPT-24	34.5 - 36.0	1.3	2-5-7	20	
				SPT-25	36.0 - 37.5	1.4	5-4-50/0.5'	20	
408.7'	37.5'								
		Auger Refusal / Bottom of Hole Top of Rock = 37.5' Elevation (408.7')							Boring backfilled with bentonite grout from 0.0 ft. to 37.5 ft.

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1721504.87, E 395746.27 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-12S** Total Depth 22.0 ft
Location	Colbert County, Alabama	Surface Elevation	446.2 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/23/09 Completed 7/23/09
Supervisor	Paul Cooper Driller J. Bowerman	Depth to Water	N/A Date/Time N/A
Logged By	Ben Phillips	Automatic Hammer ☐	Safety Hammer ☐ Other ☐

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
446.2'	0.0'	Top of Hole							
		See STN-4-12 for description of soils.							Boring advanced using 4 1/4" Hollow Stem Augers.
				ST-1	2.0 - 4.0	1.8		23	
				ST-2	5.0 - 7.0	1.3		21	Piezometer installed (see PZ detail sheet).
				ST-3	8.0 - 10.0	1.6		22	
				ST-4	15.0 - 17.0	1.3		21	
				ST-5	20.0 - 22.0	1.0		22	Piezometer backfilled with sand, bentonite pellets, and bentonite grout from 0.0 ft to 22.0 ft.
424.2'	22.0'	No Refusal / Bottom of Hole							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1721330.83, E 395874.15 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-13** Total Depth 27.1 ft
Location	Colbert County, Alabama	Surface Elevation	425.3 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/28/09 Completed 7/28/09
Supervisor	Paul Cooper Driller G. Thompson	Depth to Water	13.0 ft Date/Time 7/28/09
Logged By	Patrick White	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
425.3'	0.0'	Top of Hole							
423.9'	1.4'	BOTTOM ASH, gray and black, moist, medium dense		SPT-1	0.0 - 1.5	1.0	2-5-10	16	Boring advanced using 3 1/4" Hollow Stem Augers.
				SPT-2	1.5 - 3.0	0.4	8-17-10	14	
422.2'	3.1'	SANDY LEAN CLAY, dark reddish brown, moist, stiff to very stiff, trace fine gravel		SPT-3	3.0 - 4.5	0.7	5-7-8	11	
				SPT-4	4.5 - 6.0	1.1	5-4-4	14	Piezometer installed (see PZ detail sheet).
		SILTY SAND, brown to tan, moist, loose to medium dense, fine to medium grained		SPT-5	6.0 - 7.5	0.6	4-4-4	15	
416.3'	9.0'			SPT-6	7.5 - 9.0	1.0	3-2-1	15	
		SILTY, CLAYEY SAND, tan to gray, moist, very loose to loose, medium to coarse grained		SPT-7	9.0 - 10.5	1.4	1-1-2	22	
				SPT-8	10.5 - 12.0	1.5	1-2-2	20	
				SPT-9	12.0 - 13.5	1.2	WOH-2-2	22	
				SPT-10	13.5 - 15.0	1.4	1-2-2	27	
				SPT-11	15.0 - 16.5	0.5	WOH-2-4	31	
408.2'	17.1'			SPT-12	16.5 - 17.1	0.6	5-50/0.1'	18	Began Core
		Limestone, light gray to light brown, fine to coarse grained, hard, thin bedded, weathered to unweathered, fossiliferous, near uniform distribution of sand-like xenoliths to 25.9 ft.							Piezometer backfilled with sand, bentonite pellets, and bentonite grout from 0.0 ft to 27.1 ft.
398.2'	27.1'			87%	10.0	10.0	100	27.1	
		Bottom of Hole							
		Base of Weathered Rock = 17.5'							
		Top of Rock = 17.1' Elevation (408.2')							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1721420.08, E 395715.53 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-14** Total Depth 52.7 ft
Location	Colbert County, Alabama	Surface Elevation	461.9 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/24/09 Completed 7/24/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	25.0 ft Date/Time 7/24/09
Logged By	Greg Budd	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
461.9'	0.0'	Top of Hole							
461.6'	0.3'	Bottom Ash Road Surface		SPT-1	0.0 - 1.5	1.1	3-2-3	23	Boring advanced using 3 1/4" Hollow Stem Augers.
		FAT CLAY (upper dike), brown to reddish brown, moist, medium to very stiff, trace chert fragments, manganese concentrations, and trace fine sand		SPT-2	1.5 - 3.0	1.2	5-7-8	17	
				SPT-3	3.0 - 4.5	1.0	8-8-10	27	
				SPT-4	4.5 - 6.0	0.9	8-3-5	23	
				SPT-5	6.0 - 7.5	1.0	5-6-8	20	
				SPT-6	7.5 - 9.0	1.1	10-11-10	28	
				SPT-7	9.0 - 10.5	1.1	3-3-4	20	
				SPT-8	10.5 - 12.0	1.0	5-6-7	21	
				SPT-9	12.0 - 13.5	1.5	8-9-10	17	
				SPT-10	13.5 - 15.0	0.9	3-5-7	23	
				SPT-11	15.0 - 16.5	1.0	2-3-5	18	
				SPT-12	16.5 - 18.0	1.1	5-7-11	19	
				SPT-13	18.0 - 19.5	1.1	10-9-10	21	
				SPT-14	19.5 - 21.0	1.4	3-7-8	17	
				SPT-15	21.0 - 22.5	1.2	10-10-13	18	
				SPT-16	22.5 - 24.0	0.9	12-12-9	23	
436.9'	25.0'			SPT-17	24.0 - 25.5	1.1	6-7-6	24	
		BOTTOM ASH, black, wet, very loose to loose		SPT-18	25.5 - 27.0	1.5	2-3-2	40	
				SPT-19	27.0 - 28.5	1.5	4-3-4	19	
				SPT-20	28.5 - 30.0	1.5	2-2-1	22	
				SPT-21	30.0 - 31.5	1.5	3-2-1	19	
428.9'	33.0'			SPT-22	31.5 - 33.0	1.5	2-2-1	35	
		FLY ASH, black, wet, very soft		SPT-23	33.0 - 34.5	0.5	1-1-1	42	
				SPT-24	34.5 - 36.0	1.0	WOH-1-1	37	

SUBSURFACE LOG

Project No.	175559016	Location	N 1721420.08, E 395715.53 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-14**
		Total Depth	52.7 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		FLY ASH, black, wet, very soft *(Continued)*		SPT-25	36.0 - 37.5	1.0	1-WOH-WOH	38	
				SPT-26	37.5 - 39.0	1.0	WOH-WOH-1	41	
422.4'	39.5'								
		SILTY CLAY, gray and dark brown, moist, soft to stiff, trace fine to medium grained sand		SPT-27	39.0 - 40.5	1.0	2-3-3	27	
				SPT-28	40.5 - 42.0	1.0	WOH-1-2	22	
418.4'	43.5'			SPT-29	42.0 - 43.5	1.2	3-4-5	17	
		SILT with Sand, brown and tan, moist, medium to stiff, some fine sand		SPT-30	43.5 - 45.0	0.8	3-2-3	23	
				SPT-31	45.0 - 46.5	0.8	2-3-2	25	
				SPT-32	46.5 - 48.0	1.2	3-3-2	24	
				SPT-33	48.0 - 49.5	0.6	2-2-3	20	
				SPT-34	49.5 - 51.0	0.5	3-4-6	20	
				SPT-35	51.0 - 52.5	0.3	4-3-3	24	
409.2'	52.7'			SPT-36	52.5 - 52.7	0.2	50/0.2'	30	
		Auger Refusal / Bottom of Hole							Boring backfilled with bentonite grout from 0.0 ft. to 52.7 ft.
		Top of Rock = 52.7' Elevation (409.2')							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1721420.08, E 395715.53 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-14S** Total Depth 41.0 ft
Location	Colbert County, Alabama	Surface Elevation	461.9 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/25/09 Completed 7/25/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	25.0 ft Date/Time 7/25/09
Logged By	Greg Budd	Automatic Hammer ☐	Safety Hammer ☐ Other ☐

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
461.9'	0.0'	Top of Hole							
		See STN-4-14 for description of soils.		ST-1	2.0 - 4.0	2.0		20	Boring advanced using 3 1/4" Hollow Stem Augers.
				ST-2	5.0 - 7.0	1.6		22	Piezometer installed (see PZ detail sheet).
				ST-3	10.0 - 12.0	1.9		23	
				ST-4	15.0 - 17.0	2.0		24	
				ST-5	20.0 - 22.0	2.0		24	Bag sample collected from 20.0 ft to 22.0 ft
				ST-6	25.0 - 27.0	2.0		17	
				ST-7	32.0 - 34.0	0.0		--	
				ST-8	35.0 - 37.0	0.0		--	
420.9'	41.0'			ST-9	39.0 - 41.0	1.9		--	Piezometer backfilled with sand, bentonite pellets, and bentonite grout from 0.0 ft to 41.0 ft.
		No Refusal / Bottom of Hole							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1721219.13, E 395347.89 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-15** Total Depth 50.0 ft
Location	Colbert County, Alabama	Surface Elevation	460.5 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/27/09 Completed 7/27/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	19.0 ft Date/Time 7/27/09
Logged By	Greg Budd	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
460.5'	0.0'	Top of Hole							
459.9'	0.6'	Bottom Ash Road Surface		SPT-1	0.0 - 1.5	1.3	3-3-4	23	Boring advanced using 3 1/4" Hollow Stem Augers.
		LEAN CLAY (upper dike), reddish brown to brown, moist, medium to very stiff, trace chert fragments and manganese concentrations		SPT-2	1.5 - 3.0	1.0	7-11-21	22	
				SPT-3	3.0 - 4.5	0.0	20-14-10	--	
				SPT-4	4.5 - 6.0	0.3	5-8-9	25	
				SPT-5	6.0 - 7.5	0.2	9-12-11	24	
				SPT-6	7.5 - 9.0	1.1	9-7-10	22	
450.0'	10.5'			SPT-7	9.0 - 10.5	1.3	4-5-5	26	
		FAT CLAY with Sand (uper dike), reddish brown and tan mottled gray, moist, stiff, trace chert fragments and manganese concentrations		SPT-8	10.5 - 12.0	1.4	5-5-6	23	
				SPT-9	12.0 - 13.5	1.5	6-7-9	21	
				SPT-10	13.5 - 15.0	1.5	2-3-3	25	
				SPT-11	15.0 - 16.5	1.5	4-6-7	34	
				SPT-12	16.5 - 18.0	1.5	5-6-6	26	
				SPT-13	18.0 - 19.5	0.5	2-2-2	30	
				SPT-14	19.5 - 21.0	1.5	1-2-2	27	
438.5'	22.0'			SPT-15	21.0 - 22.5	1.5	2-3-9	19	
		BOTTOM ASH, black, wet, very loose to loose		SPT-16	22.5 - 24.0	1.1	5-4-3	18	
				SPT-17	24.0 - 25.5	1.0	4-2-2	24	
				SPT-18	25.5 - 27.0	1.0	2-1-1	23	
				SPT-19	27.0 - 28.5	0.4	2-2-2	20	
				SPT-20	28.5 - 30.0	1.0	2-4-2	22	
429.0'	31.5'			SPT-21	30.0 - 31.5	1.3	2-3-2	16	
		FLY ASH, black, wet, soft to medium		SPT-22	31.5 - 33.0	1.5	3-4-7	47	
				SPT-23	33.0 - 34.5	0.5	4-3-2	46	
				SPT-24	34.5 - 36.0	0.5	4-3-2	52	
				SPT-25	36.0 - 37.5	1.0	4-4-5	39	
				SPT-26	37.5 - 39.0	1.0	6-5-4	25	
420.0'	40.5'			SPT-27	39.0 - 40.5	1.1	2-3-3	21	
				SPT-28	40.5 - 42.0	1.0	2-2-1	21	
				SPT-29	42.0 - 43.5	0.8	1-1-1	23	

SUBSURFACE LOG

Project No.	175559016	Location	N 1721219.13, E 395347.89 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-15** Total Depth 50.0 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		SANDY LEAN CLAY, brown and gray, moist to wet, very soft to very stiff, trace organics, some fine to medium grained sand *(Continued)*		SPT-30	43.5 - 45.0	1.1	1-1-3	24	
				SPT-31	45.0 - 46.5	1.5	2-4-2	24	
				SPT-32	46.5 - 48.0	1.0	4-8-8	43	
				SPT-33	48.0 - 49.5	1.1	4-4-4	34	
410.5'	50.0'			SPT-34	49.5 - 50.0	0.0	10-50/0.0'	--	
		Auger Refusal / Bottom of Hole Top of Rock = 50.0' Elevation (410.5')							Boring backfilled with bentonite grout from 0.0 ft. to 50.0 ft.

SUBSURFACE LOG

Project No.	175559016	Location	N 1721219.13, E 395347.89 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-15S** Total Depth 41.0 ft
Location	Colbert County, Alabama	Surface Elevation	460.5 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/27/09 Completed 7/27/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	19.0 ft Date/Time 7/27/09
Logged By	Greg Budd	Automatic Hammer ☐	Safety Hammer ☐ Other ☐

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
460.5'	0.0'	Top of Hole							
		See STN-4-15 for description of soils.							Boring advanced using 3 1/4" Hollow Stem Augers.
				ST-1	2.0 - 4.0	2.0		23	
				ST-2	5.0 - 7.0	1.3		26	Piezometer installed (see PZ detail sheet).
				ST-3	10.0 - 12.0	2.0		25	
				ST-4	15.0 - 17.0	2.0		23	
				ST-5	20.0 - 22.0	0.8		25	
				ST-6	33.0 - 35.0	0.0		--	
				ST-7	35.0 - 37.0	0.5		--	
				ST-8	39.0 - 41.0	0.0		--	Piezometer backfilled with sand, bentonite pellets, and bentonite grout from 0.0 ft to 41.0 ft.
419.5'	41.0'	No Refusal / Bottom of Hole							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1721126.23, E 395351.96 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-16** Total Depth 21.1 ft
Location	Colbert County, Alabama	Surface Elevation	435.1 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/25/09 Completed 7/26/09
Supervisor	Paul Cooper Driller J. Bowerman	Depth to Water	N/A Date/Time N/A
Logged By	Ben Phillips	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
435.1'	0.0'	Top of Hole							
		SANDY LEAN CLAY (lower dike), brown to reddish brown mottled gray, moist, stiff to very stiff, silty, some fine sand		SPT-1	0.0 - 1.5	1.5	2-5-6	15	Boring advanced using 3 1/4" Hollow Stem Augers.
				SPT-2	1.5 - 3.0	0.8	5-8-8	13	
				SPT-3	3.0 - 4.5	1.5	2-3-6	21	
				SPT-4	4.5 - 6.0	1.3	3-5-7	14	
				SPT-5	6.0 - 7.5	1.5	3-7-8	18	
				SPT-6	7.5 - 9.0	1.2	3-6-8	19	
				SPT-7	9.0 - 10.5	0.6	3-9-10	19	
				SPT-8	10.5 - 12.0	1.5	3-6-9	16	
421.7'	13.4'			SPT-9	12.0 - 13.5	1.5	3-5-6	19	
		SILTY CLAY, tan and gray, moist, very soft to medium stiff, trace fine sand		SPT-10	13.5 - 15.0	0.6	2-2-3	20	
				SPT-11	15.0 - 16.5	1.5	2-3-3	22	
				SPT-12	16.5 - 18.0	1.3	WOH-WOH-WOH	22	
				SPT-13	18.0 - 19.5	1.5	WOH-2-3	19	
				SPT-14	19.5 - 21.0	1.5	1-2-4	17	
414.0'	21.1'			SPT-15	21.0 - 21.1	0.1	50/0.1'	30	
		Auger Refusal / Bottom of Hole Top of Rock = 21.1' Elevation (414.0')							Boring backfilled with bentonite grout from 0.0 ft. to 21.1 ft.

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SUBSURFACE LOG

Project No.	175559016	Location	N 1721126.23, E 395351.96 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-16S** Total Depth 21.0 ft
Location	Colbert County, Alabama	Surface Elevation	435.1 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/26/09 Completed 7/26/09
Supervisor	Paul Cooper Driller J. Bowerman	Depth to Water	N/A Date/Time N/A
Logged By	Ben Phillips	Automatic Hammer ☐	Safety Hammer ☐ Other ☐

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
435.1'	0.0'	Top of Hole							
		See STN-4-16 for description of soils.							Boring advanced using 4 1/4" Hollow Stem Augers.
				ST-1	4.0 - 6.0	2.0		19	Piezometer installed (see PZ detail sheet).
				ST-2	9.0 - 11.0	2.0		18	
				ST-3	13.5 - 15.5	2.0		19	
414.1'	21.0'								Piezometer backfilled with sand, bentonite pellets, and bentonite grout from 0.0 ft to 21.0 ft.
		Auger Refusal / Bottom of Hole Top of Rock = 21.0' Elevation (414.1')							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1721539.59, E 394582.90 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-17** Total Depth 58.9 ft
Location	Colbert County, Alabama	Surface Elevation	476.8 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/25/09 Completed 7/25/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	19.0 ft Date/Time 7/25/09
Logged By	Greg Budd	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
476.8'	0.0'	Top of Hole							
476.3'	0.5'	Bottom Ash Road Surface		SPT-1	0.0 - 1.5	1.5	5-6-6	15	Boring advanced using 3 1/4" Hollow Stem Augers.
		BOTTOM ASH, black and gray, moist to wet, very loose to medium dense		SPT-2	1.5 - 3.0	1.4	8-9-9	41	
				SPT-3	3.0 - 4.5	1.5	7-9-9	20	
				SPT-4	4.5 - 6.0	1.0	8-8-8	13	
				SPT-5	6.0 - 7.5	1.0	9-11-12	27	
				SPT-6	7.5 - 9.0	1.2	10-12-12	16	
				SPT-7	9.0 - 10.5	1.5	5-6-4	22	
				SPT-8	10.5 - 12.0	1.5	4-3-6	23	
				SPT-9	12.0 - 13.5	1.3	7-8-8	18	
				SPT-10	13.5 - 15.0	1.5	4-5-6	39	
				SPT-11	15.0 - 16.5	1.5	5-8-8	24	
				SPT-12	16.5 - 18.0	1.2	4-4-3	27	
				SPT-13	18.0 - 19.5	1.5	2-2-2	35	
				SPT-14	19.5 - 21.0	1.2	2-2-1	43	
				SPT-15	21.0 - 22.5	0.6	1-1-1	35	
				SPT-16	22.5 - 24.0	0.7	1-1-1	38	
				SPT-17	24.0 - 25.5	1.5	WOH-1-1	70	
449.8'	27.0'			SPT-18	25.5 - 27.0	1.4	1-1-1	66	
		FLY ASH, black, wet, very soft		SPT-19	27.0 - 28.5	1.5	1-1-1	77	
				SPT-20	28.5 - 30.0	1.0	WOH-WOH-WOH	51	
				SPT-21	30.0 - 31.5	1.5	WOH-WOH-WOH	51	
				SPT-22	31.5 - 33.0	1.5	WOH-WOH-1	59	
				SPT-23	33.0 - 34.5	1.5	1-1-2	58	
		- Rod dropped 7.4' through fine fly ash from 34.5' to 41.9'		SPT-24	34.5 - 36.0	1.5	WOR-WOR-WOR	55	
				SPT-25	42.0 - 43.5	1.5	1-2-2	34	

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SUBSURFACE LOG

Project No.	175559016	Location	N 1721539.59, E 394582.90 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-17** Total Depth 58.9 ft

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
Elevation	Depth								
		FLY ASH, black, wet, very soft *(Continued)*		SPT-26	43.5 - 45.0	1.5	1-1-1	41	
				SPT-27	45.0 - 46.5	1.3	WOH-WOH-WOH	33	
				SPT-28	46.5 - 48.0	1.5	WOH-WOH-WOH	40	
				SPT-29	48.0 - 49.5	1.5	WOH-WOH-1	39	
		- Rod dropped 6.0' through fine fly ash from 49.5' to 55.5'		SPT-30	49.5 - 51.0	1.5	WOR-WOR-WOR	36	
420.8'	56.0'								
		SANDY LEAN CLAY, dark orange brown, wet, very stiff, some fine to coarse sand		SPT-31	55.5 - 57.0	0.8	8-23-11	37	
				SPT-32	57.0 - 58.5	0.9	12-13-13	37	
417.9'	58.9'			SPT-33	58.5 - 58.9	0.4	50/0.4'	26	
		Auger Refusal / Bottom of Hole							Boring backfilled with bentonite grout from 0.0 ft. to 58.9 ft.
		Top of Rock = 58.9' Elevation (417.9')							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1721539.59, E 394582.90 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-17S** Total Depth 22.0 ft
Location	Colbert County, Alabama	Surface Elevation	476.8 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/25/09 Completed 7/25/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	19.0 ft Date/Time 7/25/09
Logged By	Greg Budd	Automatic Hammer ☐	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
476.8'	0.0'	Top of Hole							
		See STN-4-17 for description of soils.		ST-1	2.0 - 4.0	2.0		--	Boring advanced with 3 1/4" Hollow Stem Augers.
				ST-2	5.0 - 7.0	2.0		--	
				ST-3	10.0 - 12.0	2.0		--	
				ST-4	15.0 - 17.0	2.0		--	
454.8'	22.0'			ST-5	20.0 - 22.0	2.0		--	
		No Refusal / Bottom of Hole							Boring backfilled with bentonite grout from 0.0 ft. to 22.0 ft.

SUBSURFACE LOG

Project No.	175559016	Location	N 1721402.10, E 394555.64 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-18** Total Depth 43.1 ft
Location	Colbert County, Alabama	Surface Elevation	461.1 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/28/09 Completed 7/28/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	19.5 ft Date/Time 7/28/09
Logged By	Greg Budd	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
461.1'	0.0'	Top of Hole							
460.6'	0.5'	Bottom Ash Road Surface							
		LEAN CLAY with Sand (upper dike), reddish brown, moist, medium to very stiff, trace chert fragments		SPT-1	0.0 - 1.5	0.8	3-3-4	19	Boring advanced using 3 1/4" Hollow Stem Augers.
				SPT-2	1.5 - 3.0	1.1	6-7-8	20	
				SPT-3	3.0 - 4.5	1.0	13-13-12	21	
				SPT-4	4.5 - 6.0	0.6	5-3-3	19	
				SPT-5	6.0 - 7.5	1.1	4-6-6	20	
				SPT-6	7.5 - 9.0	1.0	6-6-7	17	
				SPT-7	9.0 - 10.5	1.0	3-3-3	19	
				SPT-8	10.5 - 12.0	1.2	6-6-6	25	
				SPT-9	12.0 - 13.5	1.5	7-8-8	25	
				SPT-10	13.5 - 15.0	1.3	4-4-4	20	
444.6'	16.5'			SPT-11	15.0 - 16.5	1.5	3-5-5	22	
		BOTTOM ASH, gray to black, wet, medium		SPT-12	16.5 - 18.0	1.2	6-6-6	22	
				SPT-13	18.0 - 19.5	1.5	4-7-6	21	
				SPT-14	19.5 - 21.0	1.5	4-5-6	22	
				SPT-15	21.0 - 22.5	1.2	9-7-9	18	
437.1'	24.0'			SPT-16	22.5 - 24.0	1.5	9-9-9	14	
		FLY ASH, black, wet, very soft		SPT-17	24.0 - 25.5	1.0	4-1-1	44	
				SPT-18	25.5 - 27.0	1.5	2-1-1	40	
				SPT-19	27.0 - 28.5	0.7	2-1-1	35	

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1721402.10, E 394555.64 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-18**
		Total Depth	43.1 ft

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
Elevation	Depth								
		FLY ASH, black, wet, very soft *(Continued)*		SPT-20	28.5 - 30.0	1.5	1-1-WOH	36	
				SPT-21	30.0 - 31.5	1.5	1-1-WOH	47	
				SPT-22	31.5 - 33.0	1.5	1-2-1	52	
427.1'	34.0'			SPT-23	33.0 - 34.5	1.2	2-4-5	24	
		LEAN CLAY with Sand, reddish brown to orange brown mottled tan, moist to wet, stiff to very stiff, trace chert fragments		SPT-24	34.5 - 36.0	1.4	4-5-5	19	
				SPT-25	36.0 - 37.5	1.1	5-6-7	20	
				SPT-26	37.5 - 39.0	0.4	8-8-6	19	
				SPT-27	39.0 - 40.5	1.5	6-10-10	25	
				SPT-28	40.5 - 42.0	1.1	5-7-6	34	
418.0'	43.1'			SPT-29	42.0 - 43.1	0.8	5-6-50/0.1'	35	
		Auger Refusal / Bottom of Hole Top of Rock = 43.1' Elevation (418.0')							Boring backfilled with bentonite grout from 0.0 ft. to 43.1 ft.

SUBSURFACE LOG

Project No.	175559016	Location	N 1721402.10, E 394555.64 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-18S** Total Depth 41.0 ft
Location	Colbert County, Alabama	Surface Elevation	461.1 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	8/8/09 Completed 8/8/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	N/A Date/Time N/A
Logged By	Greg Budd	Automatic Hammer ☐	Safety Hammer ☐ Other ☐

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
461.1'	0.0'	Top of Hole							
		See STN-4-18 for description of soils.							Boring advanced using 3 1/4" Hollow Stem Augers.
				ST-1	2.0 - 4.0	1.7		--	
				ST-2	5.0 - 7.0	1.5		--	Piezometer installed (see PZ detail sheet).
				ST-3	10.0 - 12.0	2.0		--	
				ST-4	15.0 - 17.0	2.0		--	
				ST-5	20.0 - 22.0	1.7		--	
				ST-6	25.0 - 27.0	2.0		--	
									Piezometer backfilled with sand, bentonite pellets, and bentonite grout from 0.0 ft to 41.0 ft.
420.1'	41.0'			ST-7	39.0 - 41.0	0.0		--	
		No Refusal / Bottom of Hole							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1721352.01, E 394475.66 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-19** Total Depth 26.1 ft
Location	Colbert County, Alabama	Surface Elevation	440.3 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/26/09 Completed 7/26/09
Supervisor	Paul Cooper Driller J. Bowerman	Depth to Water	N/A Date/Time N/A
Logged By	Ben Phillips	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
440.3'	0.0'	Top of Hole							
		FAT CLAY (lower dike), reddish brown and tan, moist, medium to stiff, trace chert fragments and manganese concentrations		SPT-1	0.0 - 1.5	1.0	3-5-6	17	Boring advanced using 3 1/4" Hollow Stem Augers.
				SPT-2	1.5 - 3.0	0.9	3-4-7	18	
				SPT-3	3.0 - 4.5	1.4	5-7-8	18	
				SPT-4	4.5 - 6.0	1.3	2-6-7	25	
				SPT-5	6.0 - 7.5	1.4	4-5-6	18	
				SPT-6	7.5 - 9.0	1.3	4-6-8	19	
				SPT-7	9.0 - 10.5	1.3	3-6-8	18	
				SPT-8	10.5 - 12.0	1.4	3-6-8	18	
426.8'	13.5'			SPT-9	12.0 - 13.5	1.5	4-6-8	17	
		LEAN CLAY with Sand, reddish brown and gray mottled tan, moist to wet, medium to stiff, trace chert fragments		SPT-10	13.5 - 15.0	1.5	3-4-6	17	
				SPT-11	15.0 - 16.5	1.5	2-2-3	23	
				SPT-12	16.5 - 18.0	1.5	2-2-3	20	
				SPT-13	18.0 - 19.5	1.5	2-4-5	22	
				SPT-14	19.5 - 21.0	1.5	4-5-6	19	
				SPT-15	21.0 - 22.5	1.5	4-6-7	21	
				SPT-16	22.5 - 24.0	1.3	1-3-6	24	
				SPT-17	24.0 - 25.5	1.5	2-6-5	25	
414.2'	26.1'			SPT-18	25.5 - 26.1	0.6	4-50/0.1'	38	
		Auger Refusal / Bottom of Hole Top of Rock = 26.1' Elevation (414.2')							Boring backfilled with bentonite grout from 0.0 ft. to 26.1 ft.

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1721352.01, E 394475.66 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-19S** Total Depth 26.0 ft
Location	Colbert County, Alabama	Surface Elevation	440.3 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/26/09 Completed 7/26/09
Supervisor	Paul Cooper Driller J. Bowerman	Depth to Water	N/A Date/Time N/A
Logged By	Ben Phillips	Automatic Hammer ☐	Safety Hammer ☐ Other ☐

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
440.3'	0.0'	Top of Hole							
		See STN-4-19 for description of soils.							Boring advanced using 4 1/4" Hollow Stem Augers.
				ST-1	4.0 - 6.0	2.0		18	Piezometer installed (see PZ detail sheet).
				ST-2	9.0 - 11.0	1.7		20	
				ST-3	14.0 - 16.0	1.8		21	
				ST-4	19.0 - 21.0	1.8		22	
									Piezometer backfilled with sand, bentonite pellets, and bentonite grout from 0.0 ft to 26.0 ft.
414.3'	26.0'								
		Auger Refusal / Bottom of Hole Top of Rock = 26.0' Elevation (414.3')							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1721987.93, E 394461.02 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-20** Total Depth 61.7 ft
Location	Colbert County, Alabama	Surface Elevation	482.3 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/26/09 Completed 7/26/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	26.5 ft Date/Time 7/26/09
Logged By	Greg Budd	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
482.3'	0.0'	Top of Hole							
		BOTTOM ASH, black, moist to wet, loose to medium dense		SPT-1	0.0 - 1.5	1.0	4-4-7	41	Boring advanced using 3 1/4" Hollow Stem Augers.
				SPT-2	1.5 - 3.0	1.1	7-7-8	10	
				SPT-3	3.0 - 4.5	1.2	7-7-7	15	
				SPT-4	4.5 - 6.0	1.0	6-6-5	22	
				SPT-5	6.0 - 7.5	1.5	9-9-8	11	
				SPT-6	7.5 - 9.0	1.0	7-6-7	15	
				SPT-7	9.0 - 10.5	1.5	5-5-6	15	
				SPT-8	10.5 - 12.0	1.0	4-6-4	15	
				SPT-9	12.0 - 13.5	1.3	7-5-6	16	
				SPT-10	13.5 - 15.0	1.2	5-5-5	17	
				SPT-11	15.0 - 16.5	1.2	5-7-8	17	
				SPT-12	16.5 - 18.0	1.2	8-7-6	14	
				SPT-13	18.0 - 19.5	1.3	7-7-7	14	
				SPT-14	19.5 - 21.0	1.5	4-5-3	11	
				SPT-15	21.0 - 22.5	0.9	3-2-3	13	
				SPT-16	22.5 - 24.0	0.9	2-2-3	16	
				SPT-17	24.0 - 25.5	1.0	3-2-2	27	
				SPT-18	25.5 - 27.0	1.2	2-1-1	44	
453.8'	28.5'			SPT-19	27.0 - 28.5	0.2	2-1-1	19	
		FLY ASH, black, wet, very soft to soft		SPT-20	28.5 - 30.0	1.5	1-1-WOH	33	
				SPT-21	30.0 - 31.5	0.1	WOH-WOH-WOH	54	
				SPT-22	31.5 - 33.0	1.5	1-1-1	25	
				SPT-23	33.0 - 34.5	1.5	1-1-1	37	
				SPT-24	34.5 - 36.0	0.9	1-1-1	36	

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No. 175559016 Location N 1721987.93, E 394461.02 (NAD27)

Project Name Colbert Fossil Plant - TVA Boring No. **STN-4-20** Total Depth 61.7 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		FLY ASH, black, wet, very soft to soft *(Continued)*		SPT-25	36.0 - 37.5	1.5	2-2-2	24	
				SPT-26	37.5 - 39.0	1.5	2-2-2	17	
				SPT-27	39.0 - 40.5	1.5	2-3-3	25	
				SPT-28	40.5 - 42.0	1.5	2-2-1	26	
				SPT-29	42.0 - 43.5	1.5	1-1-2	35	
				SPT-30	43.5 - 45.0	1.5	WOH-WOH-WOH	26	
				SPT-31	45.0 - 46.5	1.5	1-1-WOH	18	
				SPT-32	46.5 - 48.0	1.5	1-1-WOH	39	
				SPT-33	48.0 - 49.5	1.5	2-4-3	40	
				SPT-34	49.5 - 51.0	1.5	2-5-3	23	
				SPT-35	51.0 - 52.5	1.5	2-3-4	15	
				SPT-36	52.5 - 54.0	1.5	4-5-5	21	
				SPT-37	54.0 - 55.5	1.5	3-3-2	24	
		-some bottom ash below 55.5'		SPT-38	55.5 - 57.0	1.5	2-1-2	24	
				SPT-39	57.0 - 58.5	1.5	2-2-1	24	
422.8'	59.5'			SPT-40	58.5 - 60.0	1.5	4-4-6	30	
		SILTY CLAY, orange brown, wet, medium stiff, trace chert fragments		SPT-41	60.0 - 61.5	0.3	3-3-5	29	
420.8'	61.5'			SPT-42	61.5 - 61.6	0.1	50/0.1'	32	
420.6'	61.7'	Weathered limestone							Boring backfilled with bentonite grout from 0.0 ft. to 61.7 ft.
		Auger Refusal / Bottom of Hole							
		Top of Rock = 61.5' Elevation (420.8')							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1721987.93, E 394461.02 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-20S** Total Depth 22.0 ft
Location	Colbert County, Alabama	Surface Elevation	482.3 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/26/09 Completed 7/26/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	N/A Date/Time N/A
Logged By	Greg Budd	Automatic Hammer ☐	Safety Hammer ☐ Other ☐

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
482.3'	0.0'	Top of Hole							
		See STN-4-20 for description of soils.		ST-1	2.0 - 4.0	2.0		--	Boring advanced using 3 1/4" Hollow Stem Augers.
				ST-2	5.0 - 7.0	2.0		--	
				ST-3	10.0 - 12.0	1.1		--	
				ST-4	15.0 - 17.0	2.0		--	
460.3'	22.0'			ST-5	20.0 - 22.0	2.0		--	
		No Refusal / Bottom of Hole							Boring backfilled with bentonite grout from 0.0 ft. to 22.0 ft.

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1721985.14, E 394262.71 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-21** Total Depth 44.0 ft
Location	Colbert County, Alabama	Surface Elevation	460.2 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	8/8/09 Completed 8/8/09
Supervisor	Paul Cooper Driller S. Wilks	Depth to Water	21.0 ft Date/Time 8/8/09
Logged By	Greg Budd	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
460.2'	0.0'	Top of Hole							
459.7'	0.5'	Bottom Ash Road Surface							
		LEAN CLAY with Sand (upper dike), reddish brown and gray, moist, medium to very stiff, with trace chert fragments and manganese concentrations		SPT-1	0.0 - 1.5	1.3	4-7-4	24	Boring advanced using 3 1/4" Hollow Stem Augers.
				SPT-2	1.5 - 3.0	1.5	4-6-8	16	
				SPT-3	3.0 - 4.5	1.1	10-12-12	19	
				SPT-4	4.5 - 6.0	1.0	6-3-6	22	Piezometer installed (see PZ detail sheet).
				SPT-5	6.0 - 7.5	1.0	8-8-9	29	
				SPT-6	7.5 - 9.0	1.0	9-9-9	16	
				SPT-7	9.0 - 10.5	0.8	2-2-3	29	
				SPT-8	10.5 - 12.0	0.9	2-3-4	24	
				SPT-9	12.0 - 13.5	1.0	6-9-7	21	
				SPT-10	13.5 - 15.0	1.1	10-10-10	18	
				SPT-11	15.0 - 16.5	1.3	3-5-7	24	
				SPT-12	16.5 - 18.0	1.2	7-8-7	20	
				SPT-13	18.0 - 19.5	1.1	7-6-7	26	
439.7'	20.5'			SPT-14	19.5 - 21.0	1.2	2-3-11	24	
		FLY ASH, black, wet, very stiff to very soft		SPT-15	21.0 - 22.5	1.5	22-26-22	16	
				SPT-16	22.5 - 24.0	1.2	8-8-8	18	
				SPT-17	24.0 - 25.5	1.5	1-1-WOH	17	
				SPT-18	25.5 - 27.0	1.5	WOH-9-12	27	
				SPT-19	27.0 - 28.5	1.3	5-2-4	14	

SUBSURFACE LOG

Project No.	175559016	Location	N 1721985.14, E 394262.71 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-21** Total Depth 44.0 ft

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
		FLY ASH, black, wet, very stiff to very soft *(Continued)*		SPT-20	28.5 - 30.0	1.5	2-1-2	12	
				SPT-21	30.0 - 31.5	1.5	1-1-WOH	29	
				SPT-22	31.5 - 33.0	1.2	3-1-1	15	
				SPT-23	33.0 - 34.5	1.5	1-1-WOH	22	
				SPT-24	34.5 - 36.0	1.5	WOH-WOH-WOH	41	
423.2'	37.0'			SPT-25	36.0 - 37.5	1.5	WOH-4-4	39	
		LEAN CLAY with Sand, dark orange brown to dark brown, moist to wet, stiff to very stiff, trace to some fine to medium sand		SPT-26	37.5 - 39.0	1.0	6-23-11	22	
				SPT-27	39.0 - 40.5	0.7	2-13-19	24	Piezometer backfilled with sand, bentonite pellets, and bentonite grout from 0.0 ft to 44.0 ft.
				SPT-28	40.5 - 42.0	1.0	5-5-4	28	
				SPT-29	42.0 - 43.5	0.8	4-4-4	50	
416.2'	44.0'			SPT-30	43.5 - 43.9	0.4	50/0.4'	24	
		Auger Refusal / Bottom of Hole Top of Rock = 44.0' Elevation (416.2')							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1721957.70, E 394065.63 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-22** Total Depth 24.5 ft
Location	Colbert County, Alabama	Surface Elevation	438.0 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/22/09 Completed 7/22/09
Supervisor	Paul Cooper Driller J. Bowerman	Depth to Water	N/A Date/Time N/A
Logged By	Ben Phillips	Automatic Hammer ☐	Safety Hammer ☒ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
438.0'	0.0'	Top of Hole							
		LEAN CLAY with Sand, reddish brown to gray, moist, soft to very stiff, trace manganese concentrations and chert fragments		SPT-1	0.0 - 1.5	1.5	2-7-8	16	Boring advanced using 4 1/4" Hollow Stem Augers.
				SPT-2	1.5 - 3.0	1.1	7-7-7	14	
				SPT-3	3.0 - 4.5	1.4	2-3-4	19	
				SPT-4	4.5 - 6.0	1.4	2-2-3	23	
				SPT-5	6.0 - 7.5	1.5	2-2-2	26	
				SPT-6	7.5 - 9.0	1.5	1-2-3	22	
427.5'	10.5'			SPT-7	9.0 - 10.5	1.3	2-6-28	25	
		FAT CLAY, reddish brown and yellowish brown, moist to wet, stiff to very stiff, trace manganese concentrations and chert fragments		SPT-8	10.5 - 12.0	1.4	2-4-6	36	
				SPT-9	12.0 - 13.5	1.5	2-4-7	33	
				SPT-10	13.5 - 15.0	1.4	4-8-8	38	
				SPT-11	15.0 - 16.5	1.5	4-8-10	38	
				SPT-12	16.5 - 18.0	1.5	3-7-8	34	
				SPT-13	18.0 - 19.5	1.2	2-6-10	34	
417.0'	21.0'			SPT-14	19.5 - 21.0	1.2	2-6-10	35	
		FAT CLAY with Sand, reddish brown and orange brown, wet, stiff, trace to some fine to medium grained sand		SPT-15	21.0 - 22.5	1.0	2-7-3	34	
				SPT-16	22.5 - 24.0	0.9	1-2-9	48	
413.5'	24.5'			SPT-17	24.0 - 24.5	0.5	50/0.5	21	
		Auger Refusal / Bottom of Hole Top of Rock = 24.0' Elevation (414.0')							Boring backfilled with bentonite grout from 0.0 ft. to 24.5 ft.

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1722728.47, E 394227.94 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-23** Total Depth 41.2 ft
Location	Colbert County, Alabama	Surface Elevation	461.1 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/27/09 Completed 7/28/09
Supervisor	Paul Cooper Driller J. Bowerman	Depth to Water	N/A Date/Time N/A
Logged By	Ben Phillips	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
461.1'	0.0'	Top of Hole							
		BOTTOM ASH, black, dry, medium dense		SPT-1	0.0 - 1.5	1.3	5-10-17	10	Boring advanced using 3 1/4" Hollow Stem Augers.
458.6'	2.5'			SPT-2	1.5 - 3.0	1.5	9-6-6	7	
		LEAN CLAY with Sand (upper dike), reddish brown, moist, stiff to very stiff, silty, little fine sand and trace medium sand		SPT-3	3.0 - 4.5	1.5	3-6-9	21	
				SPT-4	4.5 - 6.0	1.5	4-5-8	18	
				SPT-5	6.0 - 7.5	1.5	4-7-9	17	
				SPT-6	7.5 - 9.0	1.5	4-6-9	19	
				SPT-7	9.0 - 10.5	1.5	5-8-10	14	
				SPT-8	10.5 - 12.0	1.0	3-7-9	15	
				SPT-9	12.0 - 13.5	0.7	3-8-9	24	
				SPT-10	13.5 - 15.0	1.5	3-6-8	21	
				SPT-11	15.0 - 16.5	1.5	3-5-6	18	
				SPT-12	16.5 - 18.0	1.3	2-5-7	--	
				SPT-13	18.0 - 19.5	1.4	2-5-8	21	
441.1'	20.0'								
		BOTTOM ASH, black, wet, medium dense to dense, some fly ash between 23.0' to 28.5'		SPT-14	19.5 - 21.0	1.5	7-23-19	21	
				SPT-15	21.0 - 22.5	1.5	15-18-29	15	
				SPT-16	22.5 - 24.0	1.1	7-4-4	15	
				SPT-17	24.0 - 25.5	1.3	3-15-17	16	
				SPT-18	25.5 - 27.0	1.5	4-10-14	12	
				SPT-19	27.0 - 28.5	1.3	3-1-8	11	

SUBSURFACE LOG

Project No.	175559016	Location	N 1722728.47, E 394227.94 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-23** Total Depth 41.2 ft

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
				SPT-20	28.5 - 30.0	1.3	8-12-6	23	
430.1'	31.0'			SPT-21	30.0 - 31.5	1.3	5-10-4	20	
		FLY ASH, black, wet, very soft		SPT-22	31.5 - 33.0	1.5	1-1-1	11	
				SPT-23	33.0 - 34.5	1.5	WOH-WOH-1	24	
425.8'	35.3'			SPT-24	34.5 - 36.0	1.3	2-3-4	42	
		FAT CLAY, reddish brown and orange brown, wet, stiff to very stiff, trace chert fragments		SPT-25	36.0 - 37.5	1.3	4-7-9	35	
				SPT-26	37.5 - 39.0	1.5	4-7-7	40	
				SPT-27	39.0 - 40.5	1.5	3-6-9	41	
419.9'	41.2'			SPT-28	40.5 - 41.2	0.7	7-50/0.2'	43	
		Auger Refusal / Bottom of Hole Top of Rock = 41.2' Elevation (419.9')							Boring backfilled with bentonite grout from 0.0 ft. to 41.2 ft.

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1722728.47, E 394227.94 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-23S** Total Depth 17.0 ft
Location	Colbert County, Alabama	Surface Elevation	461.1 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/28/09 Completed 7/28/09
Supervisor	Paul Cooper Driller J. Bowerman	Depth to Water	N/A Date/Time N/A
Logged By	Ben Phillips	Automatic Hammer ☐	Safety Hammer ☐ Other ☐

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
461.1'	0.0'	Top of Hole							
		See STN-4-23 for description of soils.							Boring advanced using 4 1/4" Hollow Stem Augers.
				ST-1	4.0 - 6.0	2.0		19	Piezometer installed (see PZ detail sheet).
				ST-2	9.0 - 11.0	2.0		22	
444.1'	17.0'								Piezometer backfilled with sand, bentonite pellets, and bentonite grout from 0.0 ft to 17.0 ft.
		No Refusal / Bottom of Hole							

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

SUBSURFACE LOG

Project No.	175559016	Location	N 1722823.19, E 394138.84 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-24** Total Depth 42.4 ft
Location	Colbert County, Alabama	Surface Elevation	444.5 ft. (NGVD29)
Project Type	Geotechnical Exploration	Date Started	7/29/09 Completed 7/29/09
Supervisor	Paul Cooper Driller G. Thompson	Depth to Water	13.5 ft Date/Time 7/29/09
Logged By	Patrick White	Automatic Hammer ☒	Safety Hammer ☐ Other ☐

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
444.5'	0.0'	Top of Hole							
		FAT CLAY, reddish brown and yellowish brown, moist, soft to stiff, trace chert fragments		SPT-1	0.0 - 1.5	0.2	1-2-3	22	Boring advanced using 3 1/4" Hollow Stem Augers.
				SPT-2	1.5 - 3.0	1.0	3-3-6	19	
				SPT-3	3.0 - 4.5	1.3	2-2-4	21	
438.6'	5.9'			SPT-4	4.5 - 6.0	0.6	2-1-3	21	
437.1'	7.4'	SAND, reddish brown, moist, loose, medium to coarse grained, trace fine gravel		SPT-5	6.0 - 7.5	1.0	2-3-3	22	
		LEAN CLAY with Sand, reddish brown and yellowish brown mottled gray, moist to wet, soft to very stiff, some fine to medium grained sand		SPT-6	7.5 - 9.0	1.1	3-6-7	19	
				SPT-7	9.0 - 10.5	1.4	2-3-3	21	
				SPT-8	10.5 - 12.0	1.4	2-3-3	23	
				SPT-9	12.0 - 13.5	1.3	2-3-4	23	
				SPT-10	13.5 - 15.0	1.1	WOH-2-3	23	
				SPT-11	15.0 - 16.5	1.4	2-3-6	24	
				SPT-12	16.5 - 18.0	1.5	7-9-10	32	
				SPT-13	18.0 - 19.5	1.2	4-6-7	26	
423.5'	21.0'			SPT-14	19.5 - 21.0	1.2	3-10-13	31	
		SANDY FAT CLAY with Gravel, reddish brown, wet, medium to very stiff, fine to medium grained sand with fine gravel		SPT-15	21.0 - 22.5	1.4	13-12-13	31	
				SPT-16	22.5 - 24.0	0.2	3-6-9	32	
				SPT-17	24.0 - 25.5	1.2	4-7-7	37	
				SPT-18	25.5 - 27.0	1.3	4-6-11	34	
				SPT-19	27.0 - 28.5	0.4	4-9-7	26	

SUBSURFACE LOG

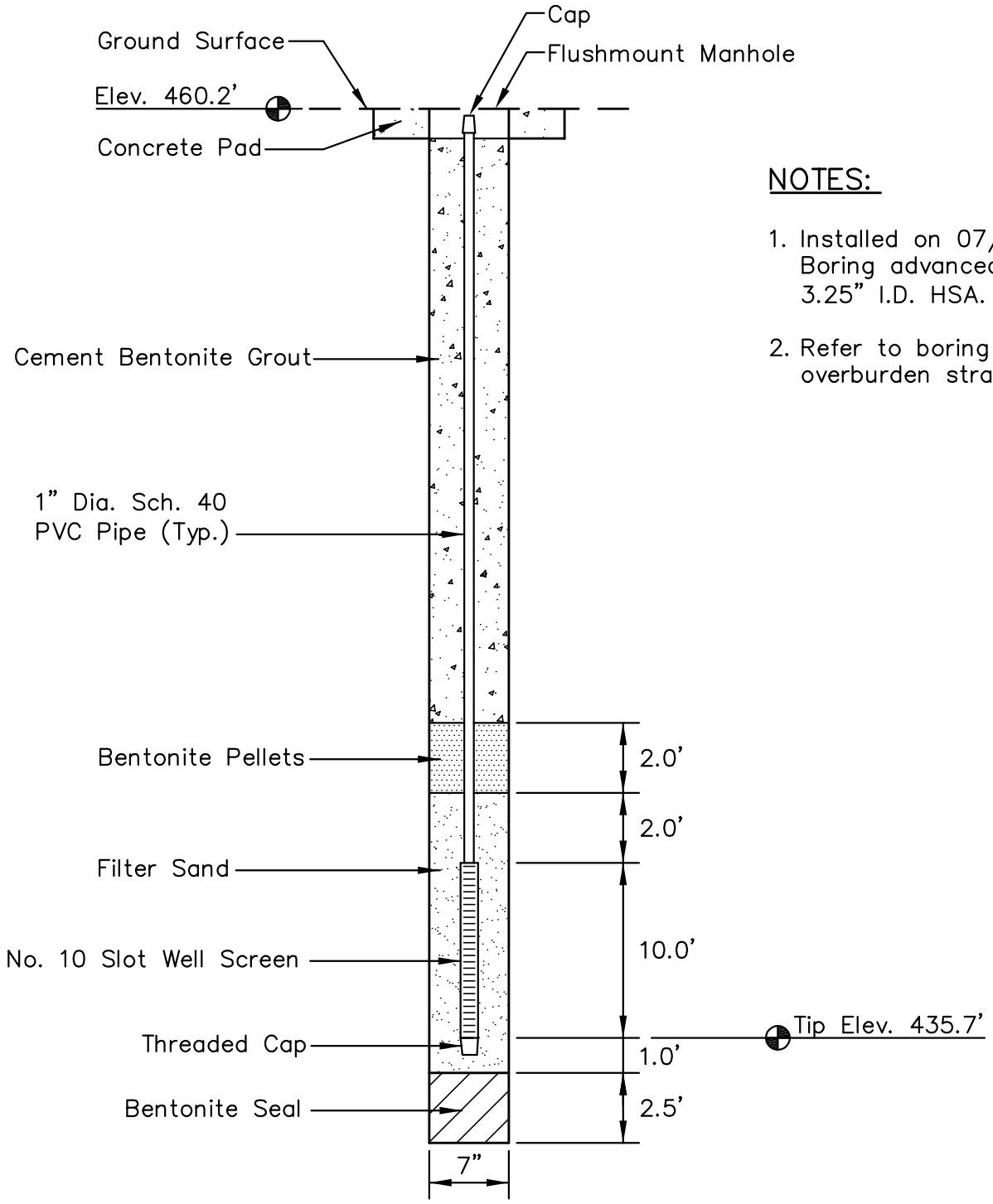
Project No.	175559016	Location	N 1722823.19, E 394138.84 (NAD27)
Project Name	Colbert Fossil Plant - TVA	Boring No.	**STN-4-24** Total Depth 42.4 ft

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
		SANDY FAT CLAY with Gravel, reddish brown, wet, medium to very stiff, fine to medium grained sand with fine gravel *(Continued)*		SPT-20	28.5 - 30.0	1.0	2-4-10	41	
				SPT-21	30.0 - 31.5	0.6	3-3-4	51	
412.2'	32.3'			SPT-22	31.5 - 32.4	0.4	13-50/0.4'	47	Began Core
		Limestone, gray to light brown, fine to coarse grained, hard, thin bedded, with sand xenoliths in limestone matrix							Sandy zones from 32.9 ft. to 35.3 ft, 35.9 ft to 36.2 ft., and 40.7 ft. to 42.4 ft. High angle fracture from 33.9 ft. to 34.4 ft.
402.1'	42.4'			68%	10.1	10.0	99	42.4	
		Bottom of Hole Top of Rock = 32.3' Elevation (412.2')							Boring backfilled with bentonite grout from 0.0 ft. to 42.4 ft.

FMSM_LEGACY 175559016 BORINGS.GPJ FMSM.GDT 1/4/10

Appendix B

Piezometer Installation Details and Readings



NOTES:

1. Installed on 07/15/09. Boring advanced with 3.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1723599.52
Easting: 394359.89
Ground Elevation: 460.2

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-1S
PIEZOMETER INSTALLATION DETAIL
COLBERT FOSSIL PLANT
ASH POND 4

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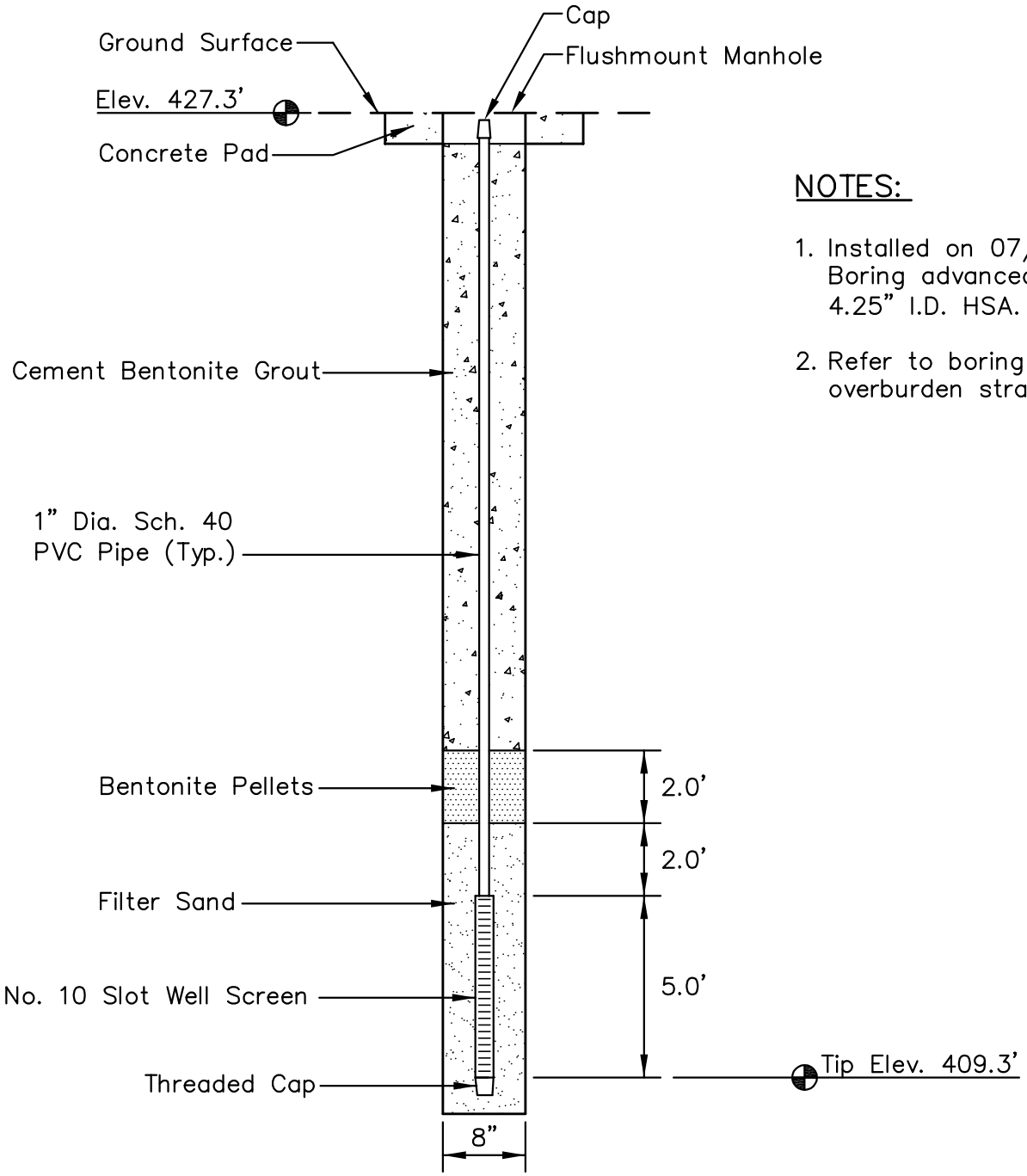
CHECKED BY	RLR	SCALE NTS	2.	4.	



NOTES:

1. Installed on 07/21/09. Boring advanced with 4.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1723645.94
Easting: 394253.91
Ground Elevation: 427.3

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-3S
PIEZOMETER INSTALLATION DETAIL
COLBERT FOSSIL PLANT
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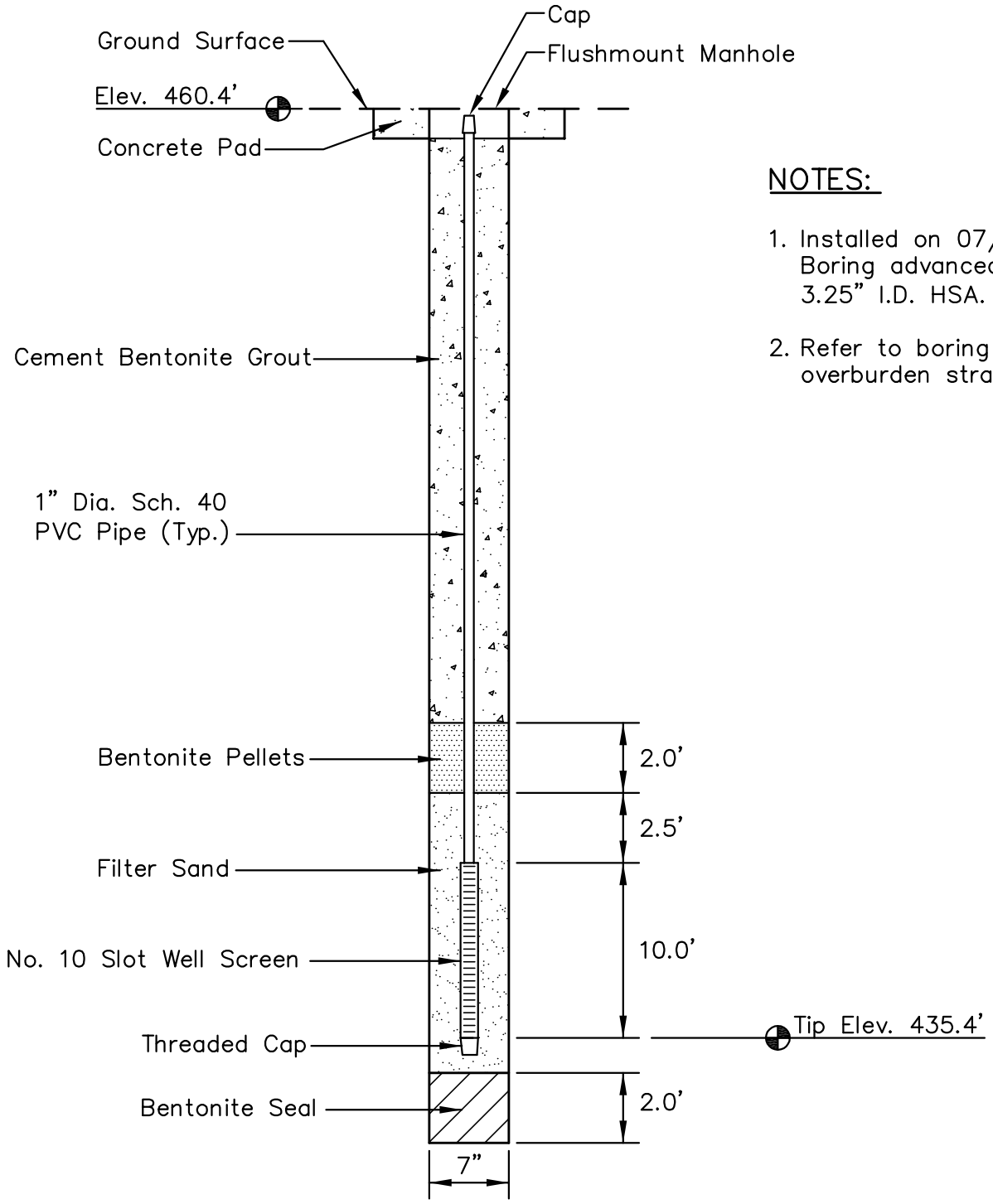

NOTES:

1. Installed on 07/21/09. Boring advanced with 3.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1723316.42
Easting: 394738.76
Ground Elevation: 460.4

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-4S
PIEZOMETER INSTALLATION DETAIL
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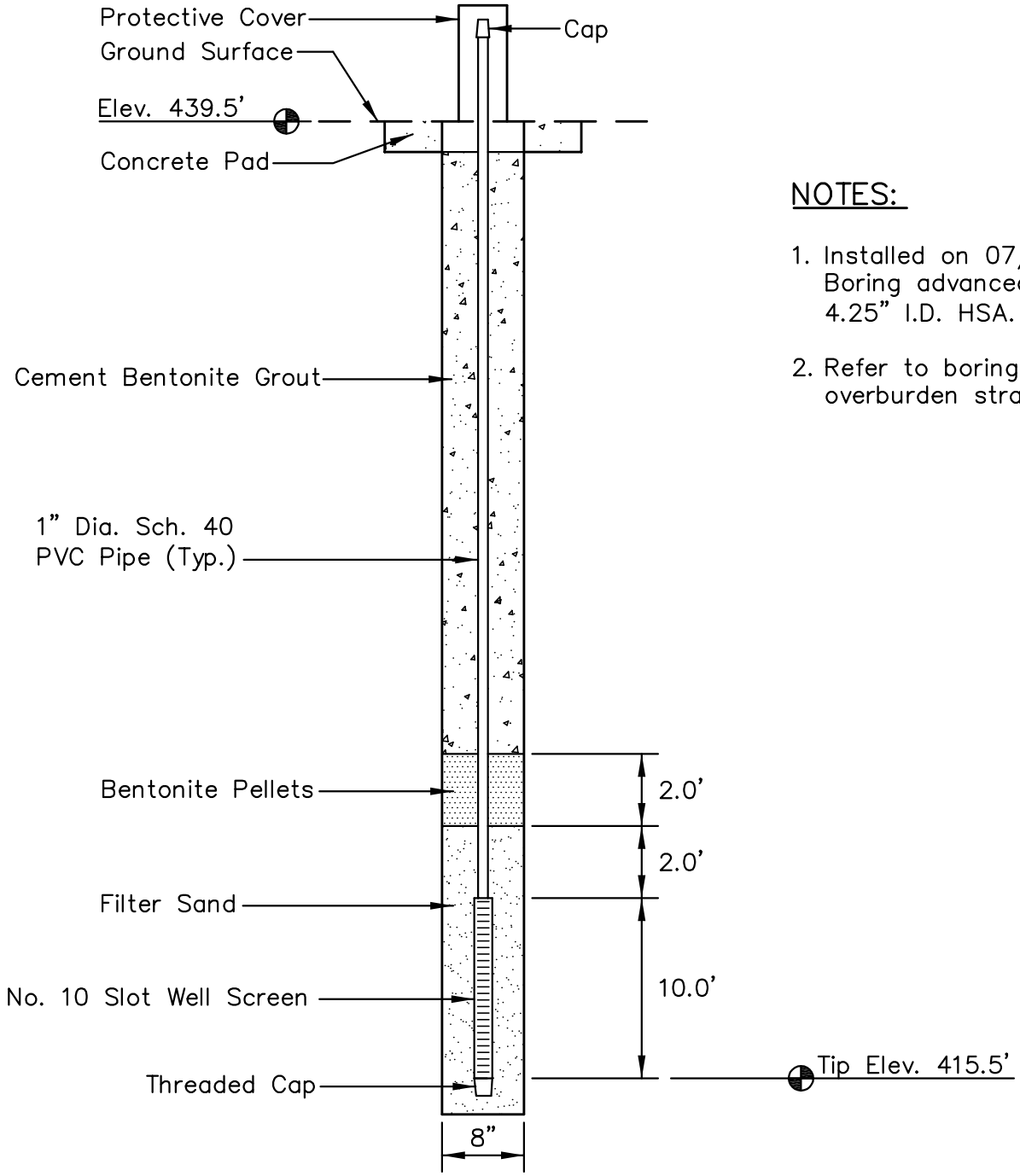

NOTES:

1. Installed on 07/25/09. Boring advanced with 4.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1723366.01
Easting: 394798.52
Ground Elevation: 439.5

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-5S
PIEZOMETER INSTALLATION DETAIL
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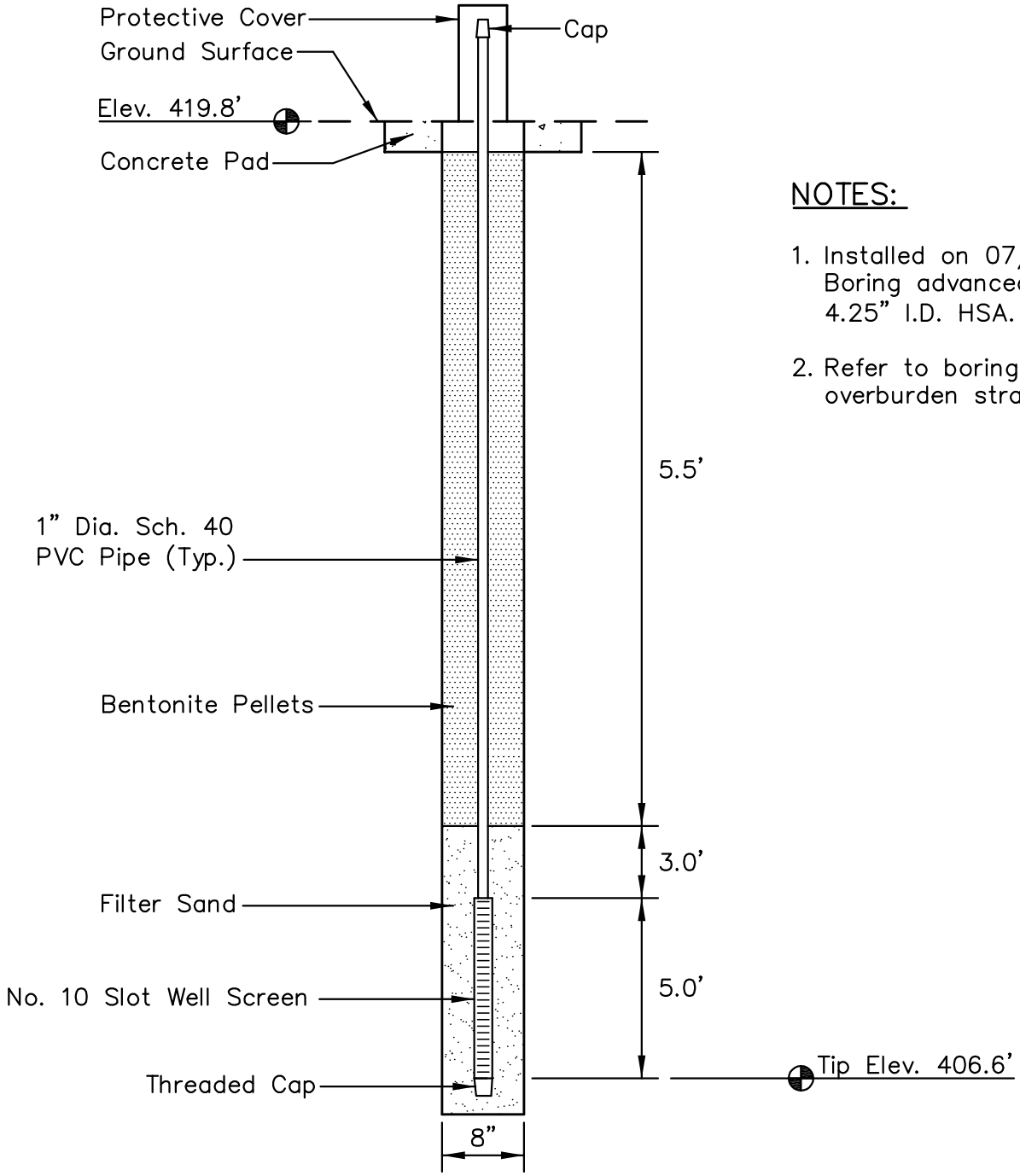
CHECKED BY	RLR	SCALE NTS	2.	4.	



NOTES:

1. Installed on 07/24/09. Boring advanced with 4.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1723373.16
Easting: 394864.54
Ground Elevation: 419.8

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-6S
PIEZOMETER INSTALLATION DETAIL
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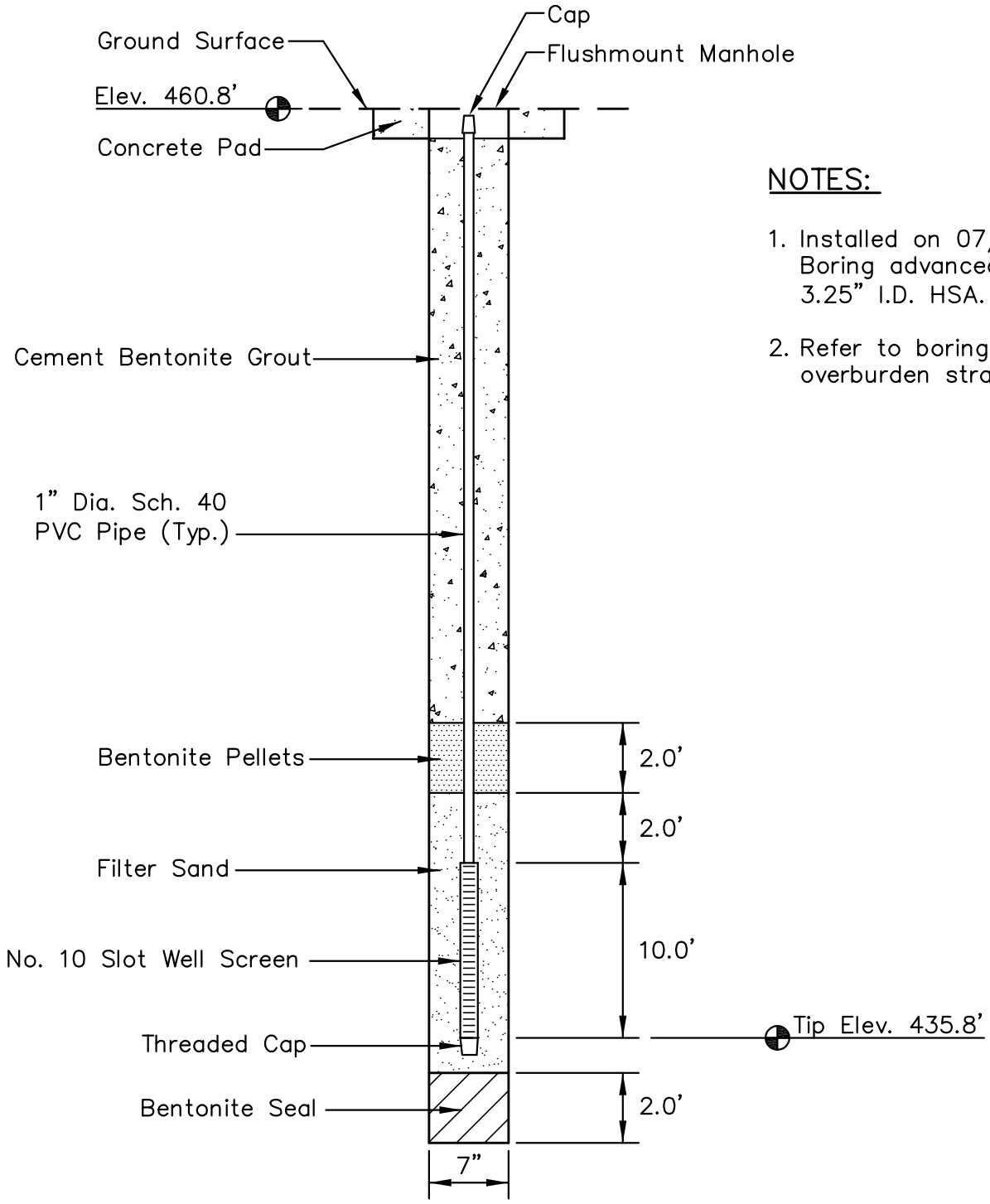
CHECKED BY	RLR	SCALE NTS	2.	4.	



NOTES:

1. Installed on 07/22/09. Boring advanced with 3.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1722880.08
Easting: 394960.81
Ground Elevation: 460.8

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-7S
PIEZOMETER INSTALLATION DETAIL
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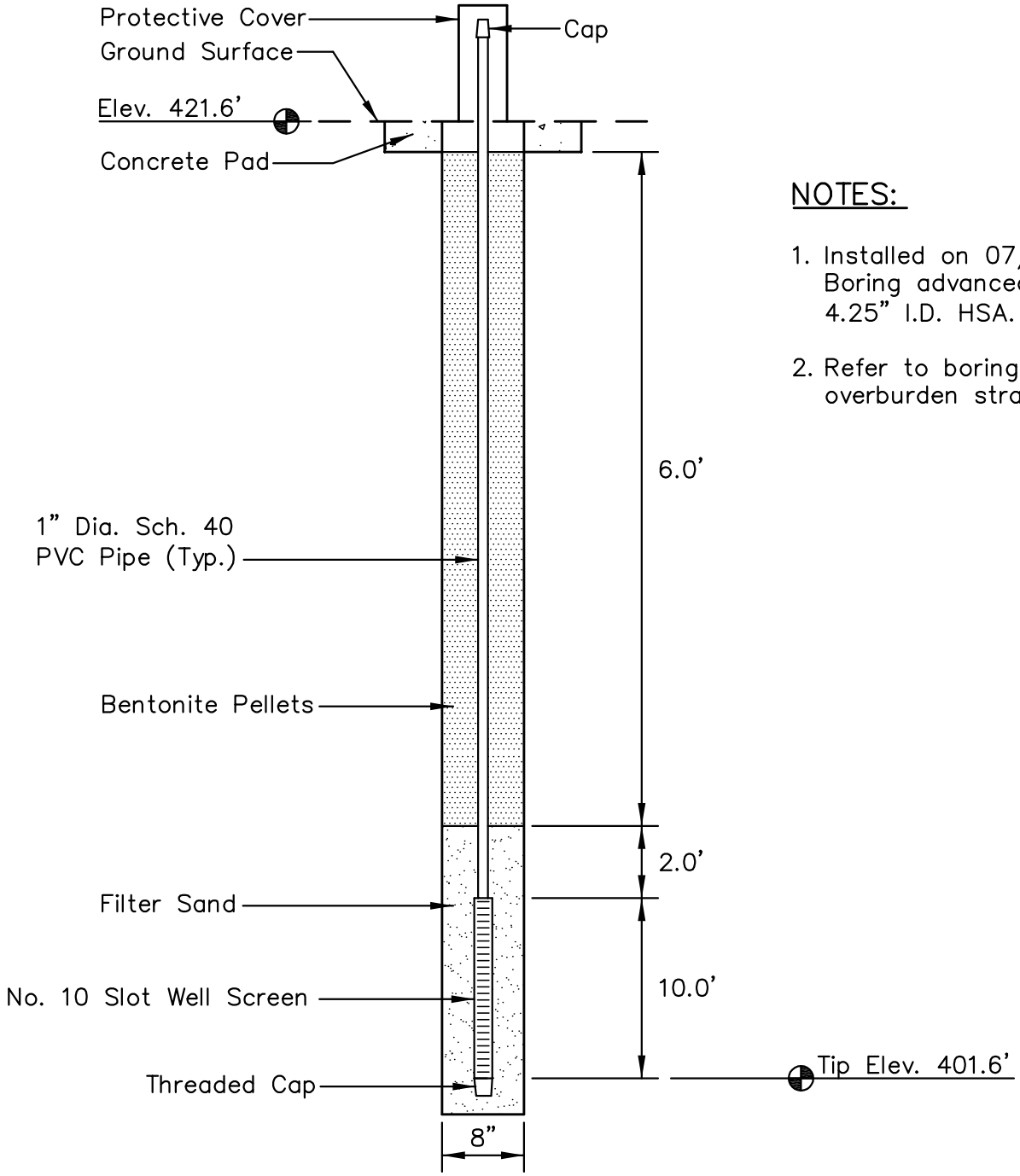
CHECKED BY	RLR	SCALE NTS	2.	4.	



NOTES:

1. Installed on 07/25/09. Boring advanced with 4.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1722943.49
Easting: 395089.90
Ground Elevation: 421.6

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-8S
PIEZOMETER INSTALLATION DETAIL
COLBERT FOSSIL PLANT
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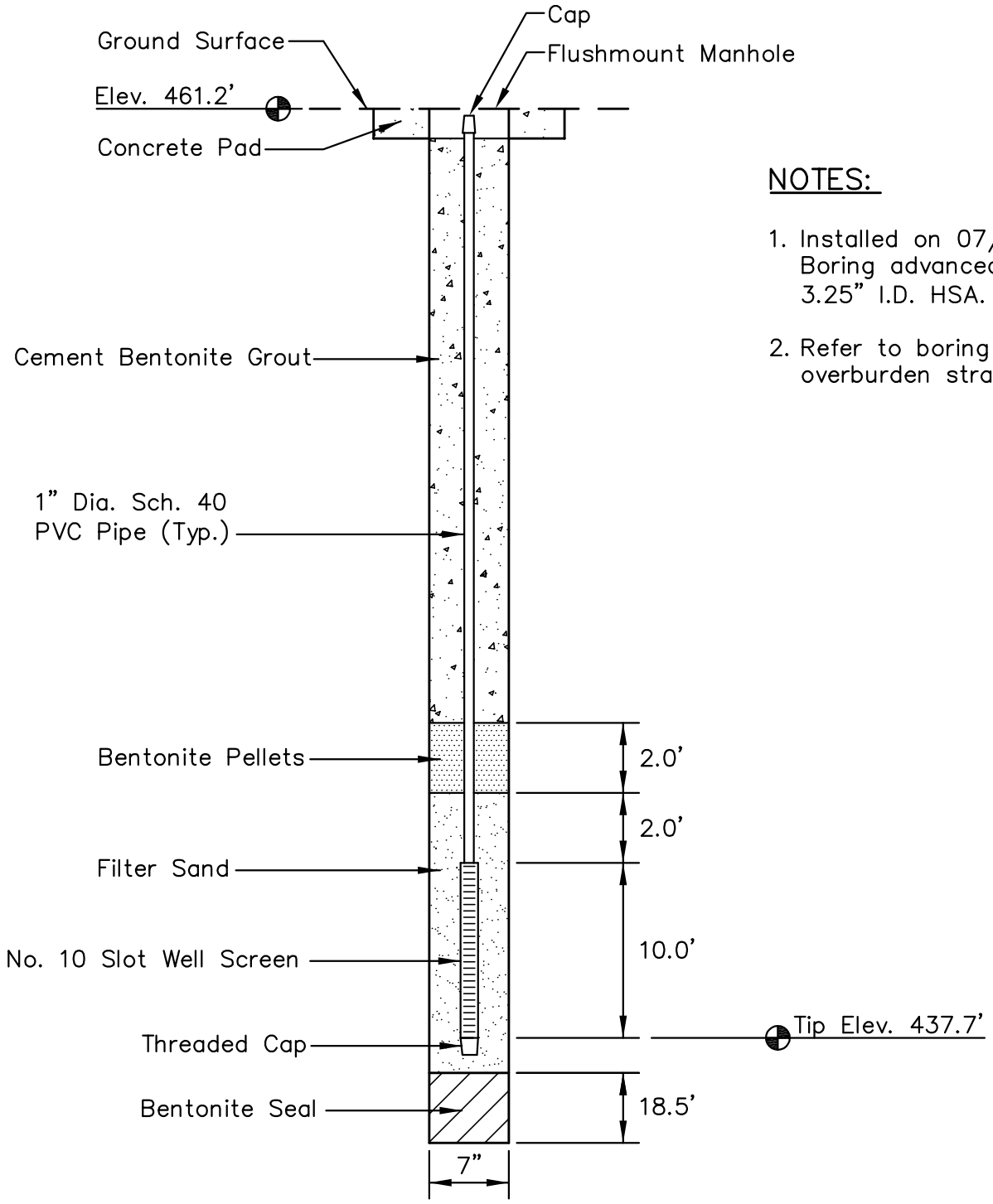
CHECKED BY	RLR	SCALE NTS	2.	4.	



NOTES:

1. Installed on 07/23/09. Boring advanced with 3.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1722306.36
Easting: 395260.37
Ground Elevation: 461.2

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-9S
PIEZOMETER INSTALLATION DETAIL
COLBERT FOSSIL PLANT
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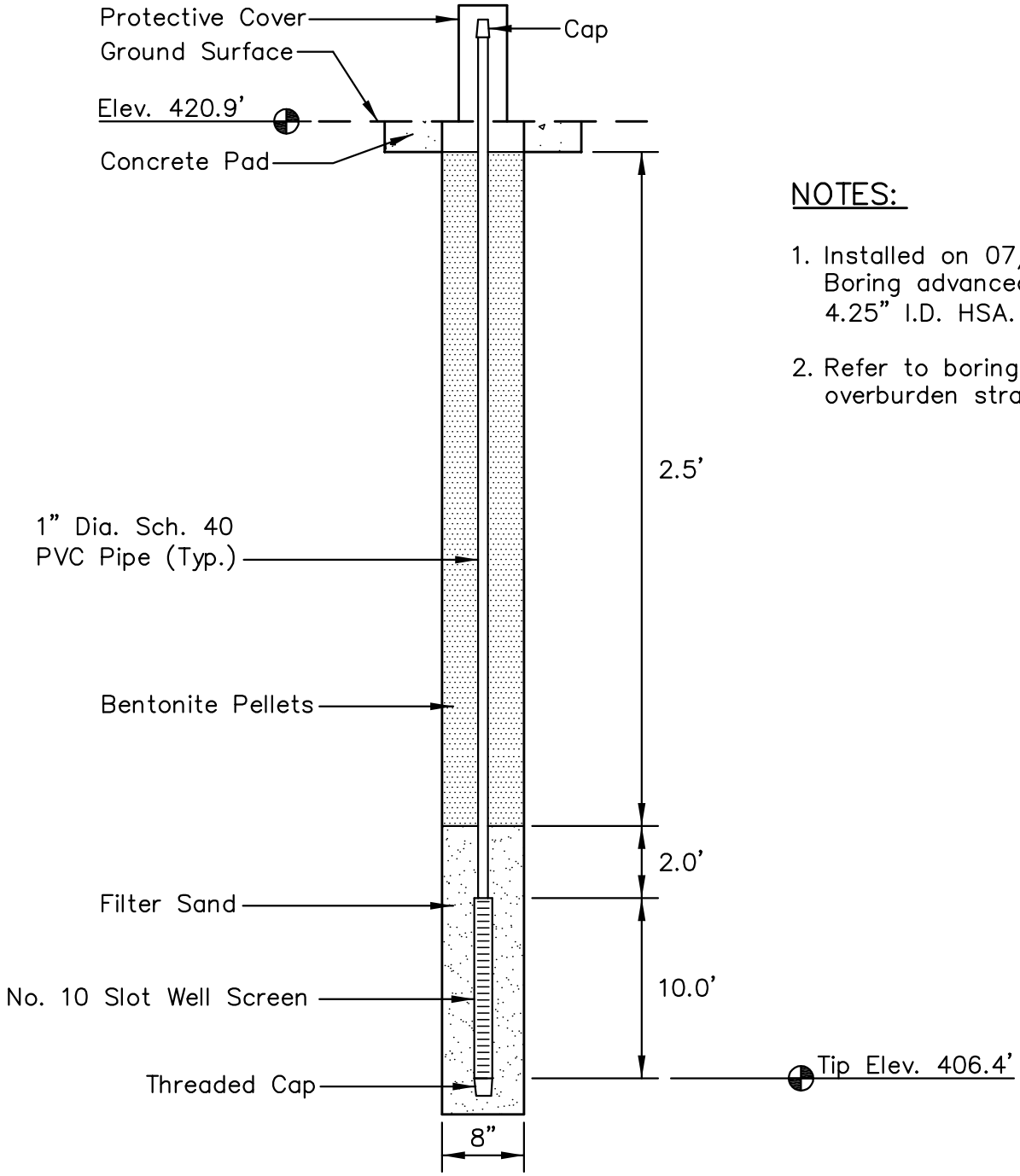
CHECKED BY	RLR	SCALE NTS	2.	4.	



NOTES:

1. Installed on 07/25/09. Boring advanced with 4.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1722357.09
Easting: 395401.10
Ground Elevation: 420.9

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-10S
PIEZOMETER INSTALLATION DETAIL
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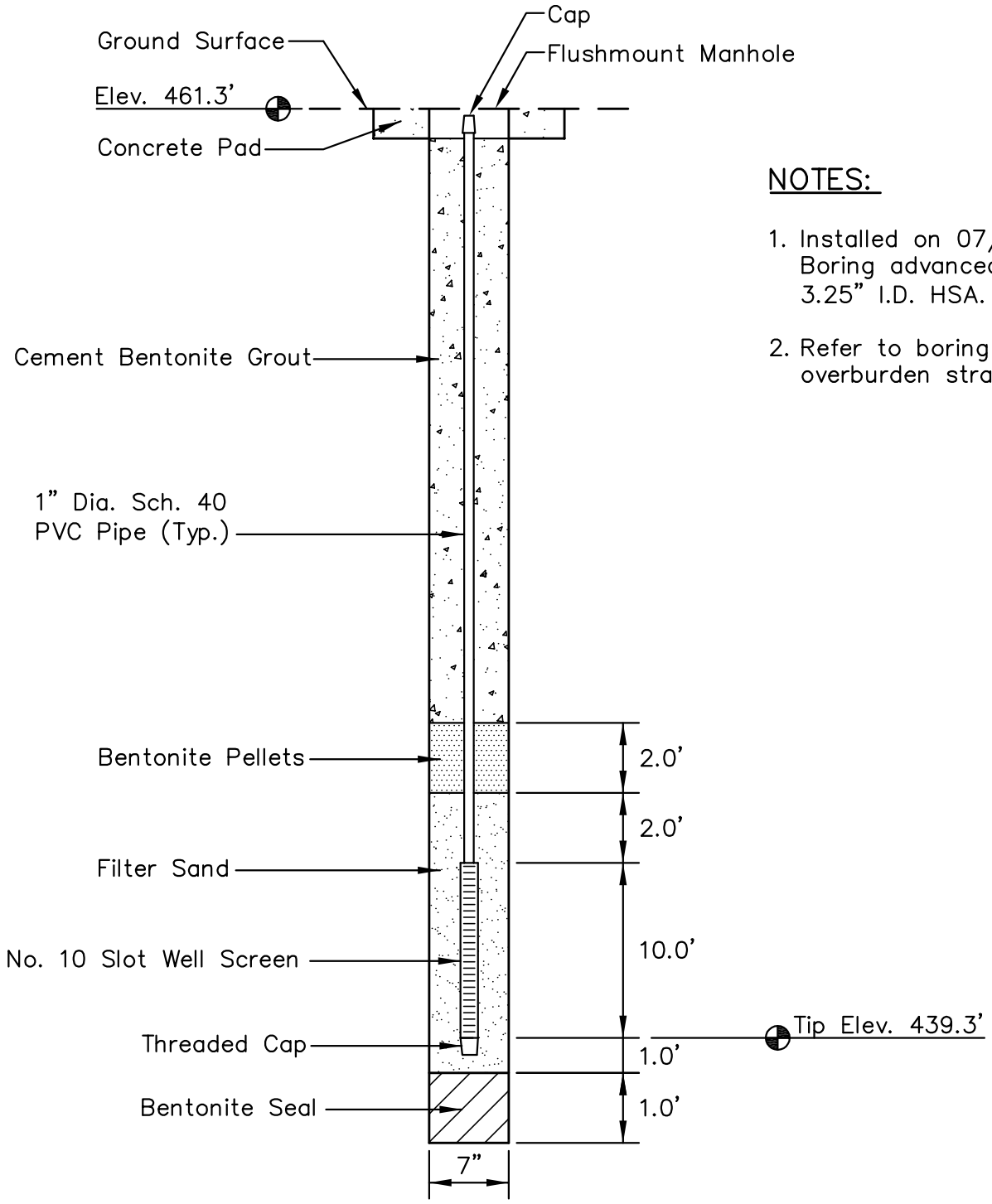
CHECKED BY	PJC	PROJ. NO. 175559016	1.	3.	9 OF 21
CHECKED BY	RLR	SCALE NTS	2.	4.	



NOTES:

1. Installed on 07/16/09. Boring advanced with 3.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1721882.96
Easting: 395485.31
Ground Elevation: 461.3

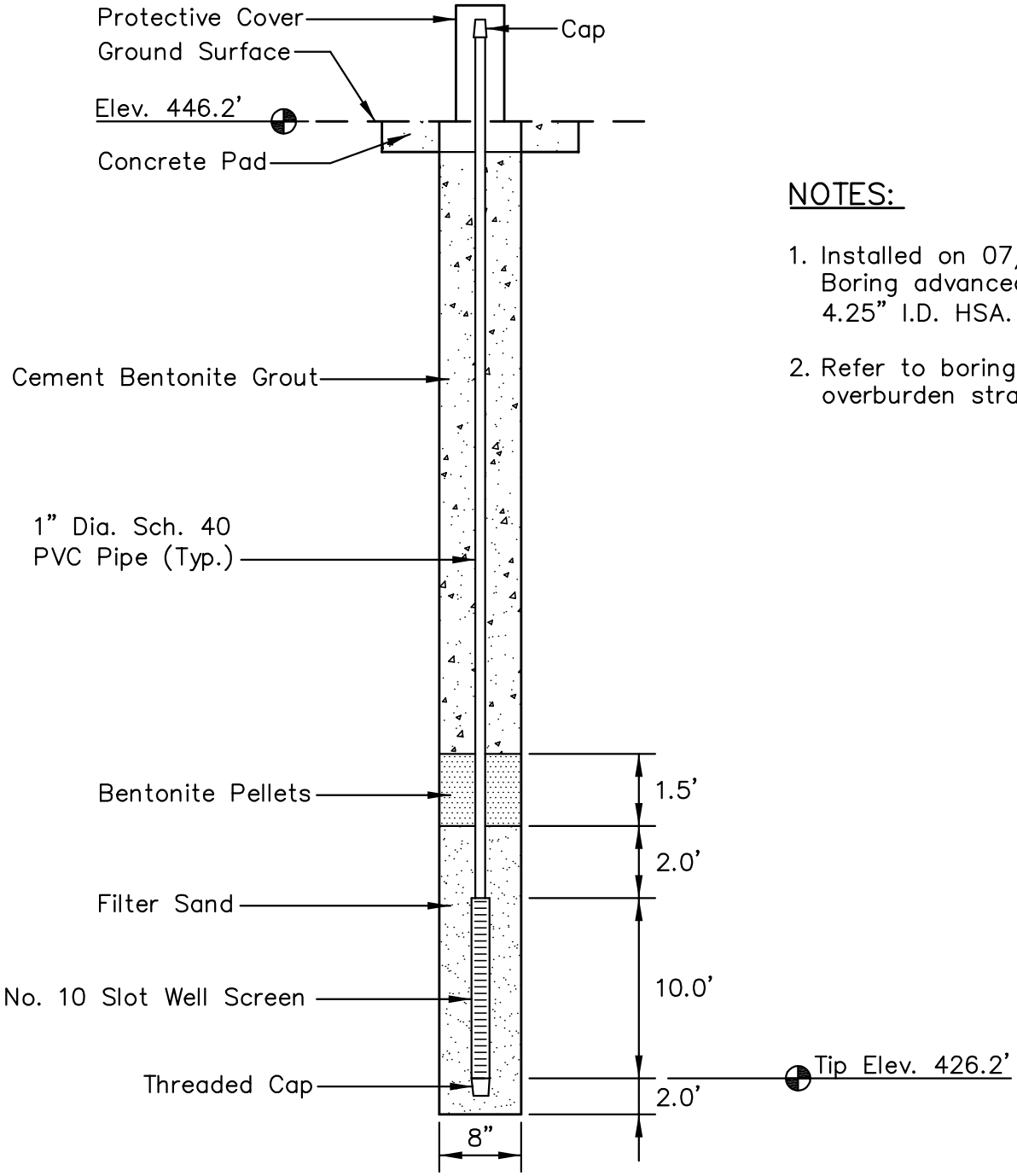
Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

PLOT DATE: 11/02/2009 USER: PETTY, RICHARD
V:\1755\ACTIVE\175559016\GEOTECHNICAL\DRAWING\PZ_DETAILS\59016PZ-4-11.DWG

STN-4-11S
PIEZOMETER INSTALLATION DETAIL
COLBERT FOSSIL PLANT
ASH POND 4

Stantec Consulting Services Inc.
1901 Nelson Miller Parkway
Louisville, Kentucky
40223-2177
502-212-5000
www.stantec.com

DRAWN BY	RRP	DATE SEPT., 2009	REVISED		SHEET
CHECKED BY	PJC	PROJ. NO. 175559016	1.	3.	10 OF 21
CHECKED BY	RLR	SCALE NTS	2.	4.	



NOTES:

1. Installed on 07/23/09. Boring advanced with 4.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1721504.87
Easting: 395746.27
Ground Elevation: 446.2

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-12S
PIEZOMETER INSTALLATION DETAIL
COLBERT FOSSIL PLANT
ASH POND 4

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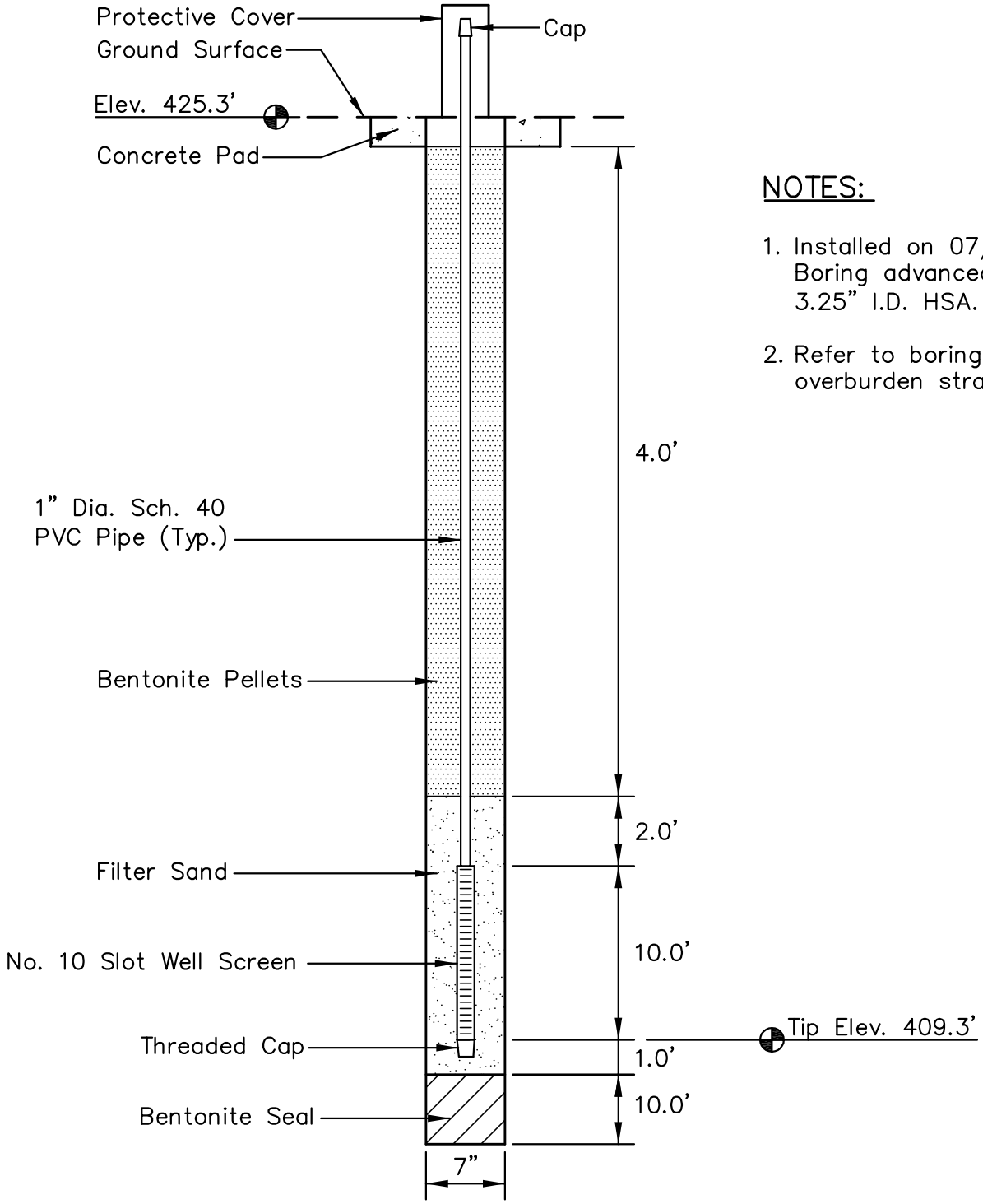
DRAWN BY	RRP	DATE SEPT., 2009	REVISED		SHEET
CHECKED BY	PJC	PROJ. NO. 175559016	1.	3.	11 OF 21
CHECKED BY	RLR	SCALE NTS	2.	4.	



NOTES:

1. Installed on 07/29/09. Boring advanced with 3.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1721330.83
Easting: 395874.15
Ground Elevation: 425.3

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-13S
PIEZOMETER INSTALLATION DETAIL
COLBERT FOSSIL PLANT
ASH POND 4

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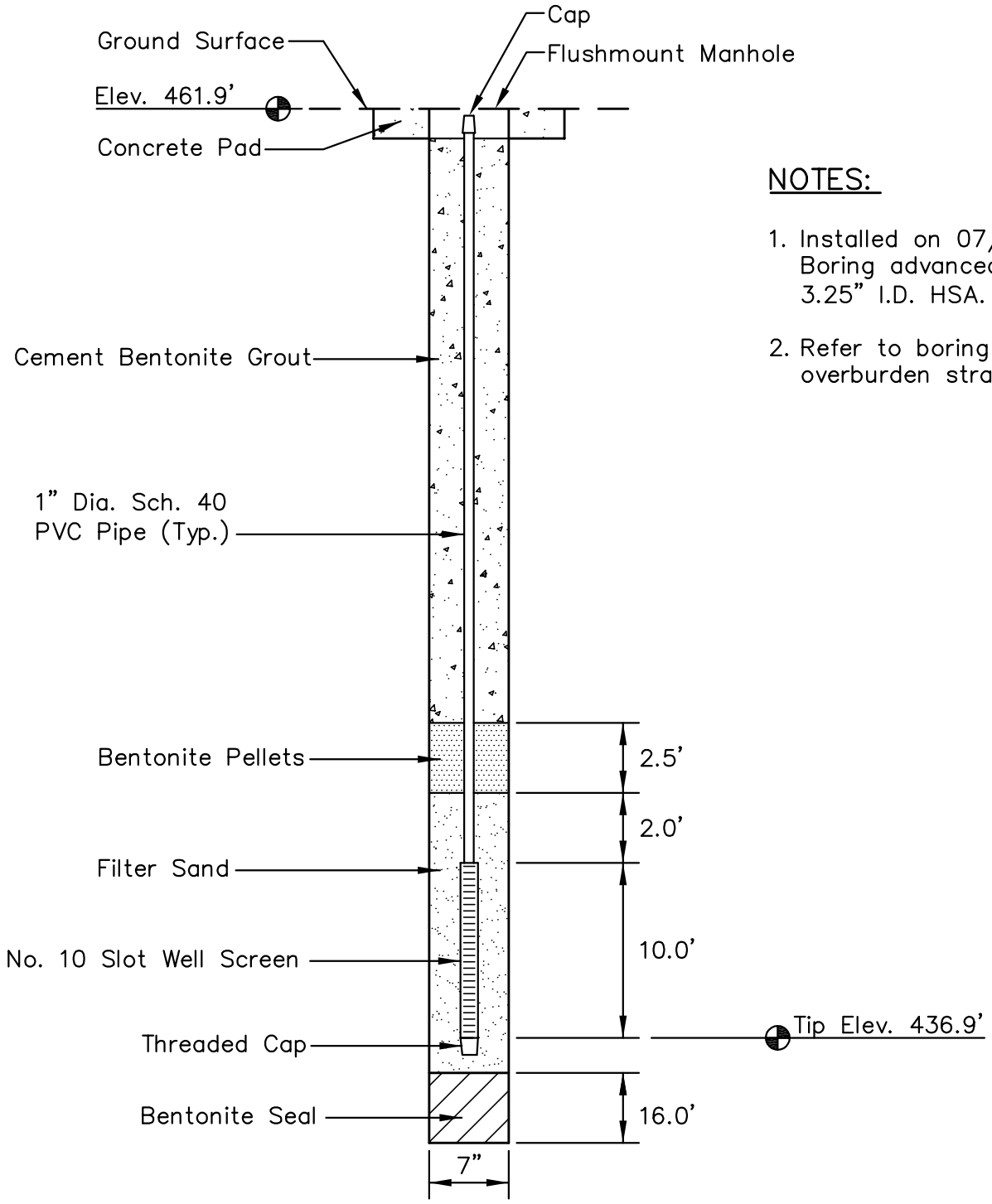
DRAWN BY	RRP	DATE SEPT., 2009	REVISED		SHEET
CHECKED BY	PJC	PROJ. NO. 175559016	1.	3.	12 OF 21
CHECKED BY	RLR	SCALE NTS	2.	4.	



NOTES:

1. Installed on 07/25/09. Boring advanced with 3.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1721420.08
Easting: 395715.53
Ground Elevation: 461.9

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-14S
PIEZOMETER INSTALLATION DETAIL
COLBERT FOSSIL PLANT
ASH POND 4

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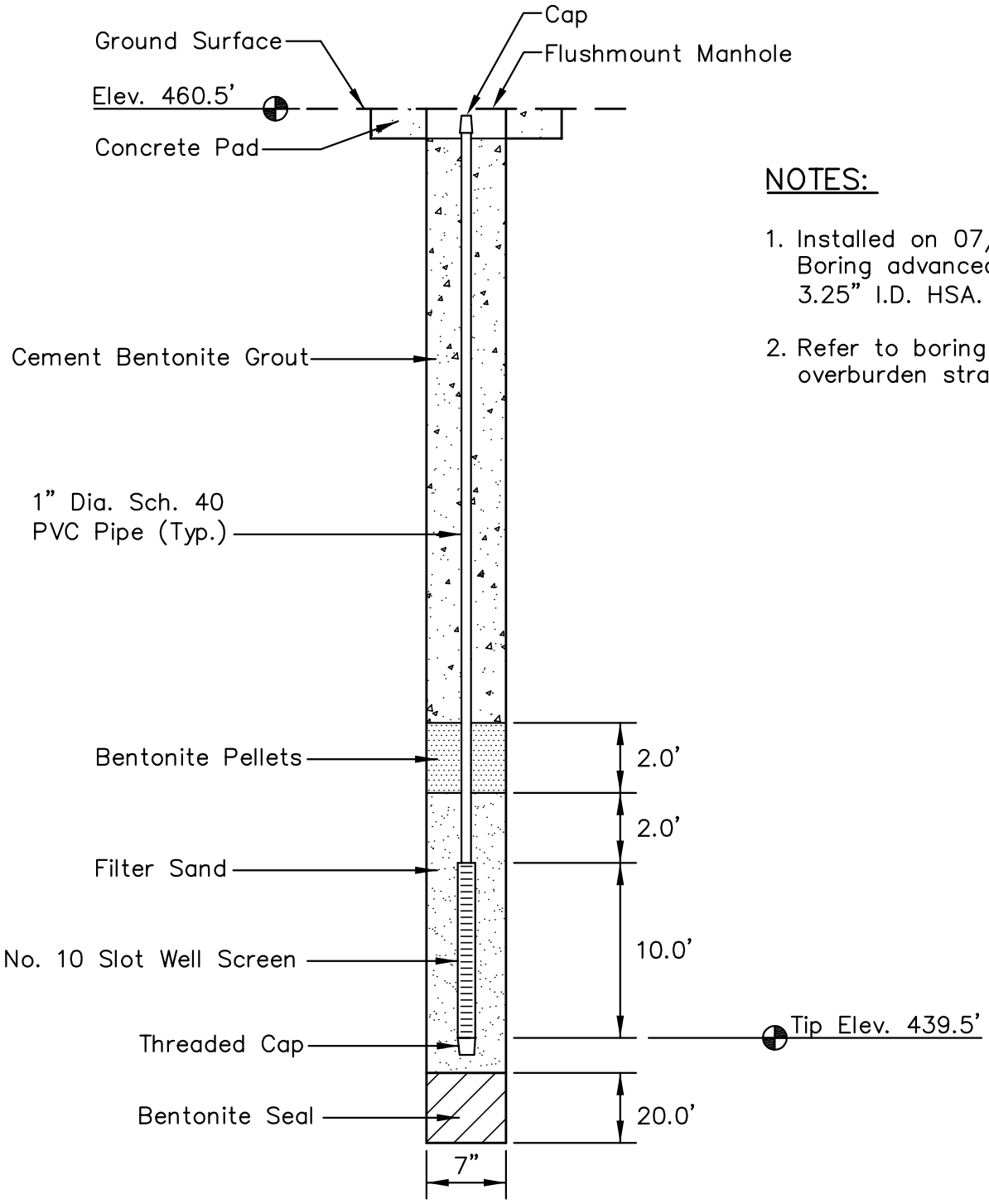
DRAWN BY	RRP	DATE SEPT., 2009	REVISED		SHEET
CHECKED BY	PJC	PROJ. NO. 175559016	1.	3.	13 OF 21
CHECKED BY	RLR	SCALE NTS	2.	4.	



NOTES:

1. Installed on 07/27/09. Boring advanced with 3.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1721219.13
Easting: 395347.89
Ground Elevation: 460.5

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-15S
PIEZOMETER INSTALLATION DETAIL
COLBERT FOSSIL PLANT
ASH POND 4

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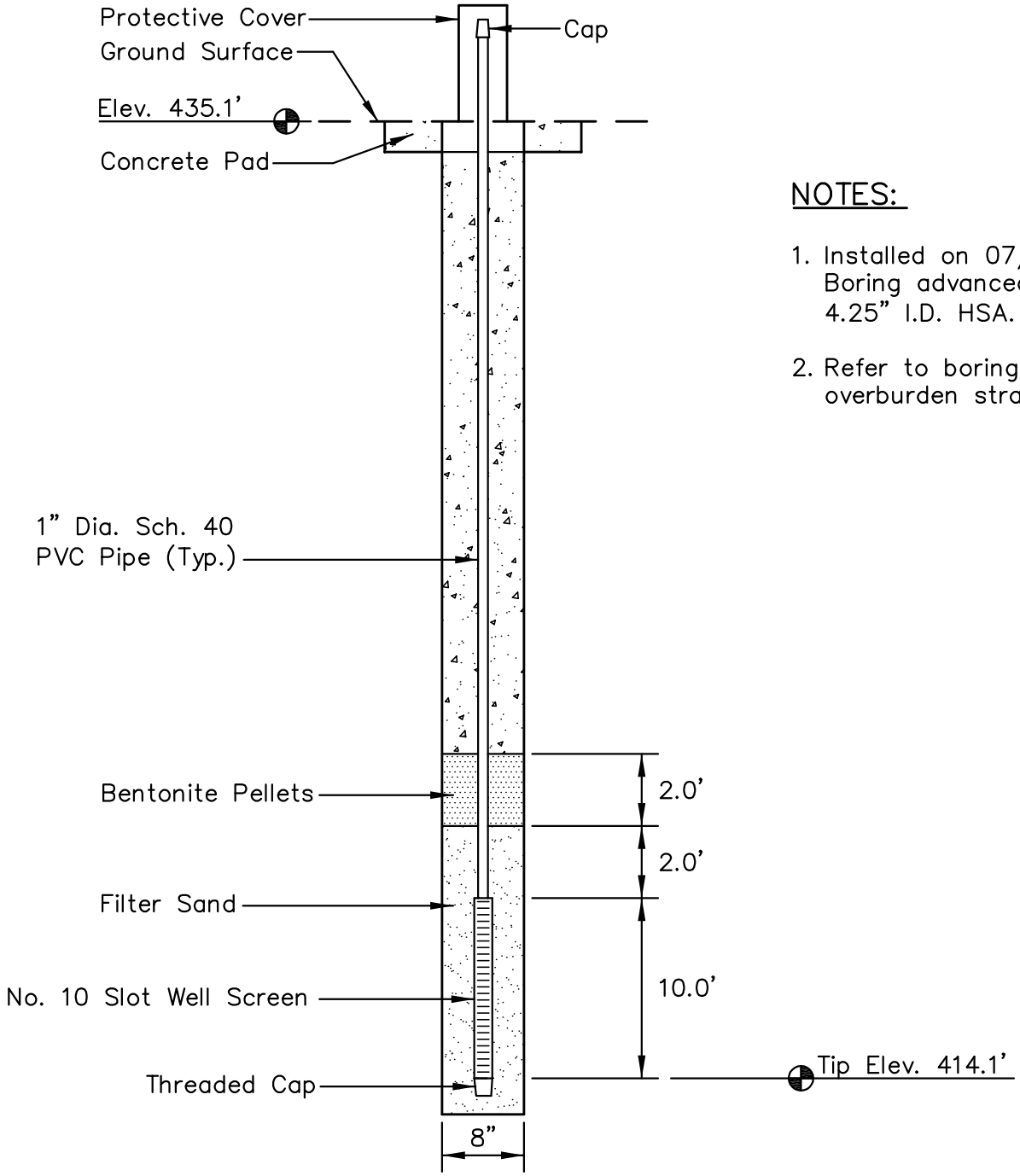
DRAWN BY	RRP	DATE SEPT., 2009	REVISED		SHEET
CHECKED BY	PJC	PROJ. NO. 175559016	1.	3.	14 OF 21
CHECKED BY	RLR	SCALE NTS	2.	4.	



NOTES:

1. Installed on 07/26/09. Boring advanced with 4.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1721126.23
Easting: 395351.96
Ground Elevation: 435.1

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-16S
PIEZOMETER INSTALLATION DETAIL
COLBERT FOSSIL PLANT
ASH POND 4

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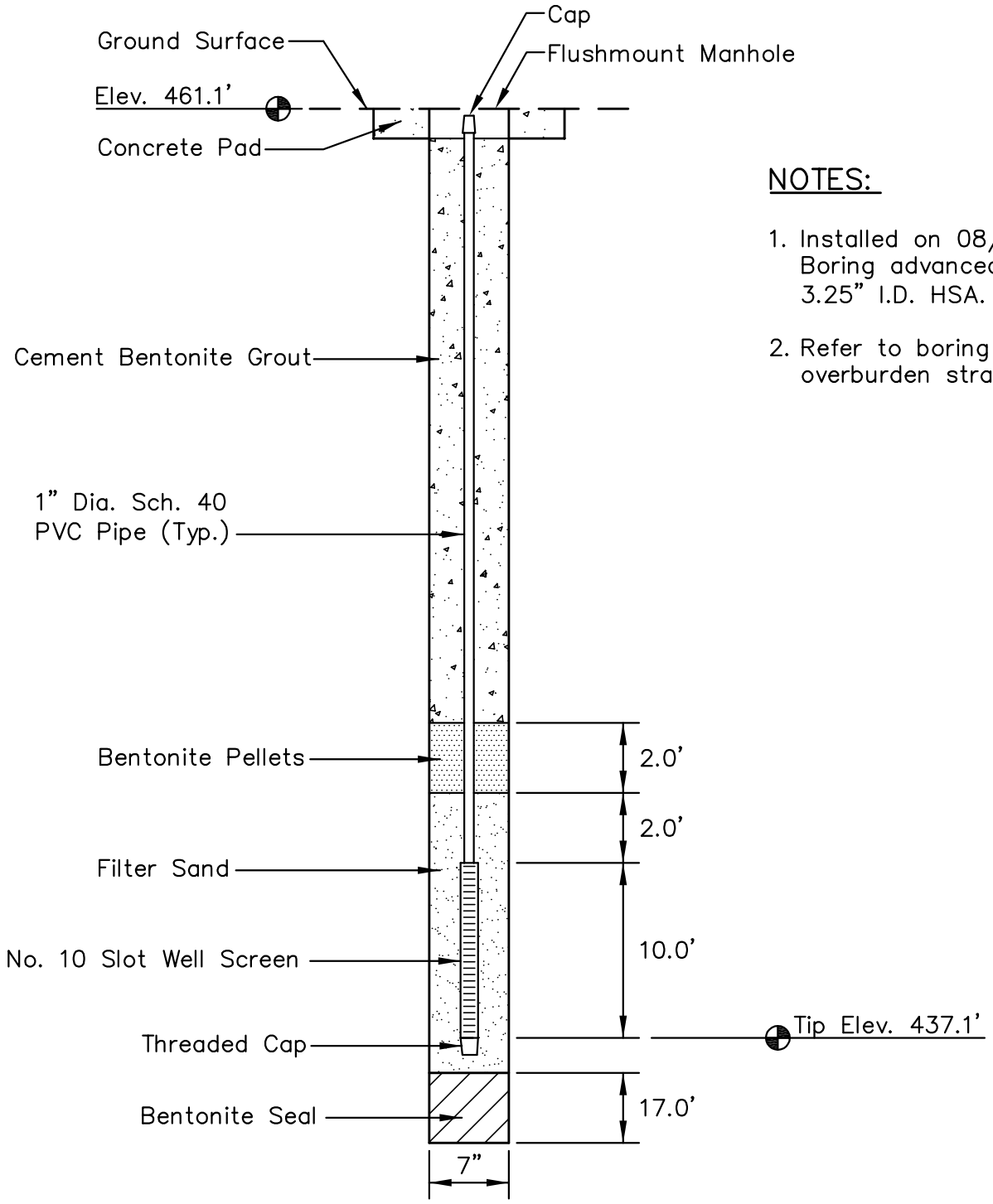
DRAWN BY	RRP	DATE SEPT., 2009	REVISED		SHEET
CHECKED BY	PJC	PROJ. NO. 175559016	1.	3.	15 OF 21
CHECKED BY	RLR	SCALE NTS	2.	4.	



NOTES:

1. Installed on 08/08/09. Boring advanced with 3.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1721402.10
Easting: 394555.64
Ground Elevation: 461.1

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-18S
PIEZOMETER INSTALLATION DETAIL
COLBERT FOSSIL PLANT
ASH POND 4

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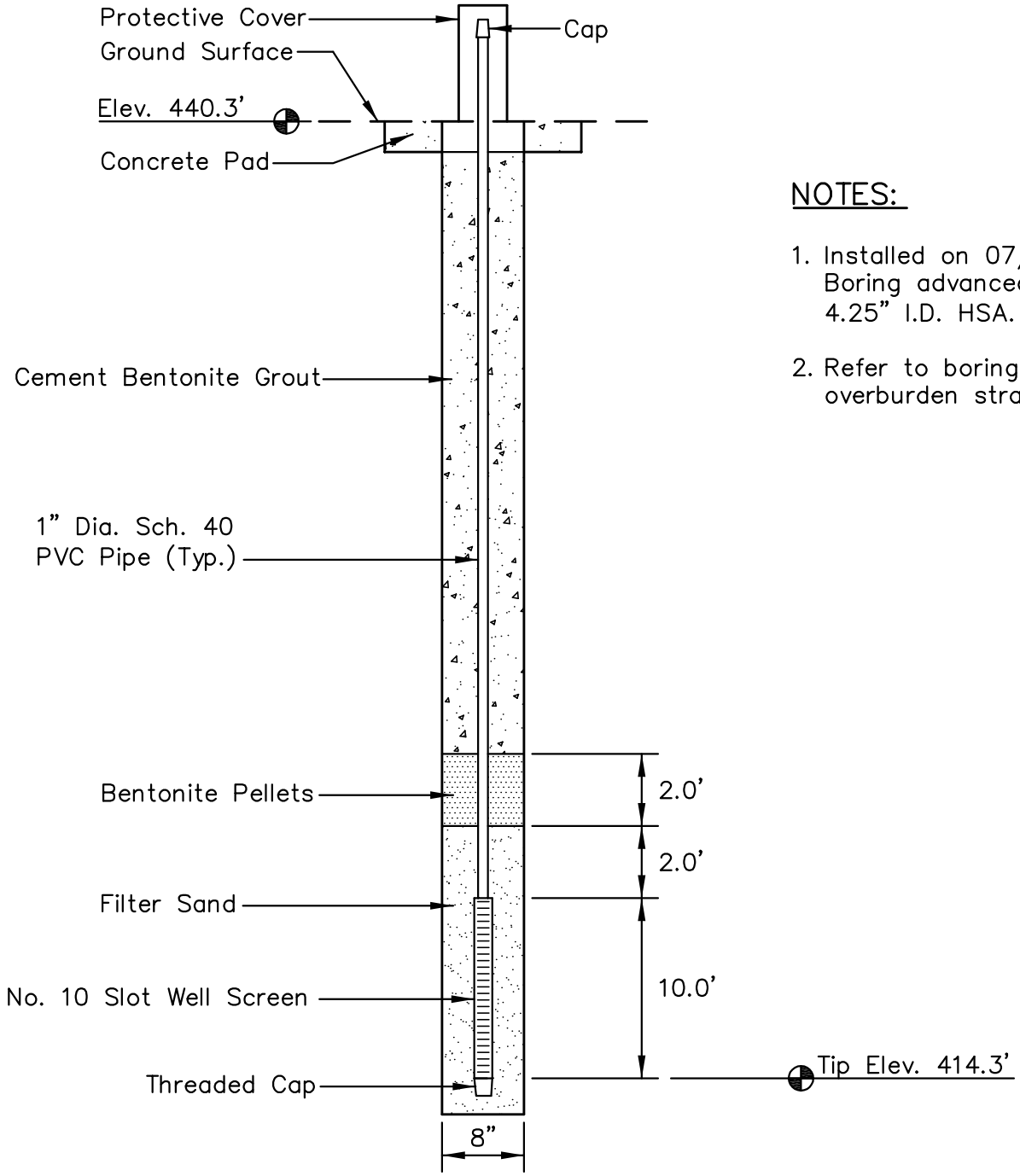
DRAWN BY	RRP	DATE SEPT., 2009	REVISED		SHEET
CHECKED BY	PJC	PROJ. NO. 175559016	1.	3.	16 OF 21
CHECKED BY	RLR	SCALE NTS	2.	4.	



NOTES:

1. Installed on 07/26/09. Boring advanced with 4.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1721352.01
Easting: 394475.66
Ground Elevation: 440.3

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-19S
PIEZOMETER INSTALLATION DETAIL
COLBERT FOSSIL PLANT
ASH POND 4

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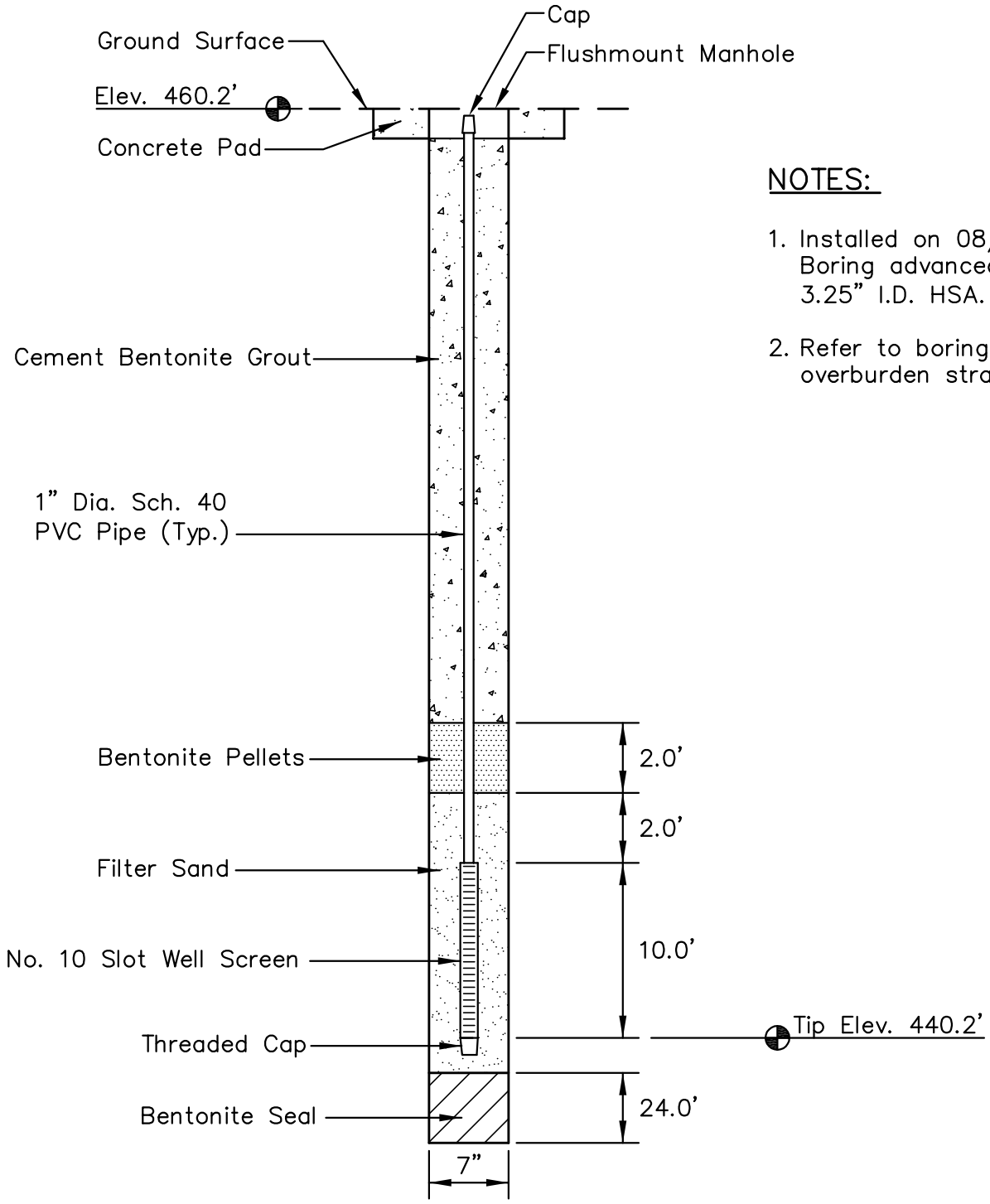
DRAWN BY	RRP	DATE SEPT., 2009	REVISED		SHEET
CHECKED BY	PJC	PROJ. NO. 175559016	1.	3.	17 OF 21
CHECKED BY	RLR	SCALE NTS	2.	4.	



NOTES:

1. Installed on 08/09/09. Boring advanced with 3.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1721985.14
Easting: 394262.71
Ground Elevation: 460.2

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-21S
PIEZOMETER INSTALLATION DETAIL
COLBERT FOSSIL PLANT
ASH POND 4

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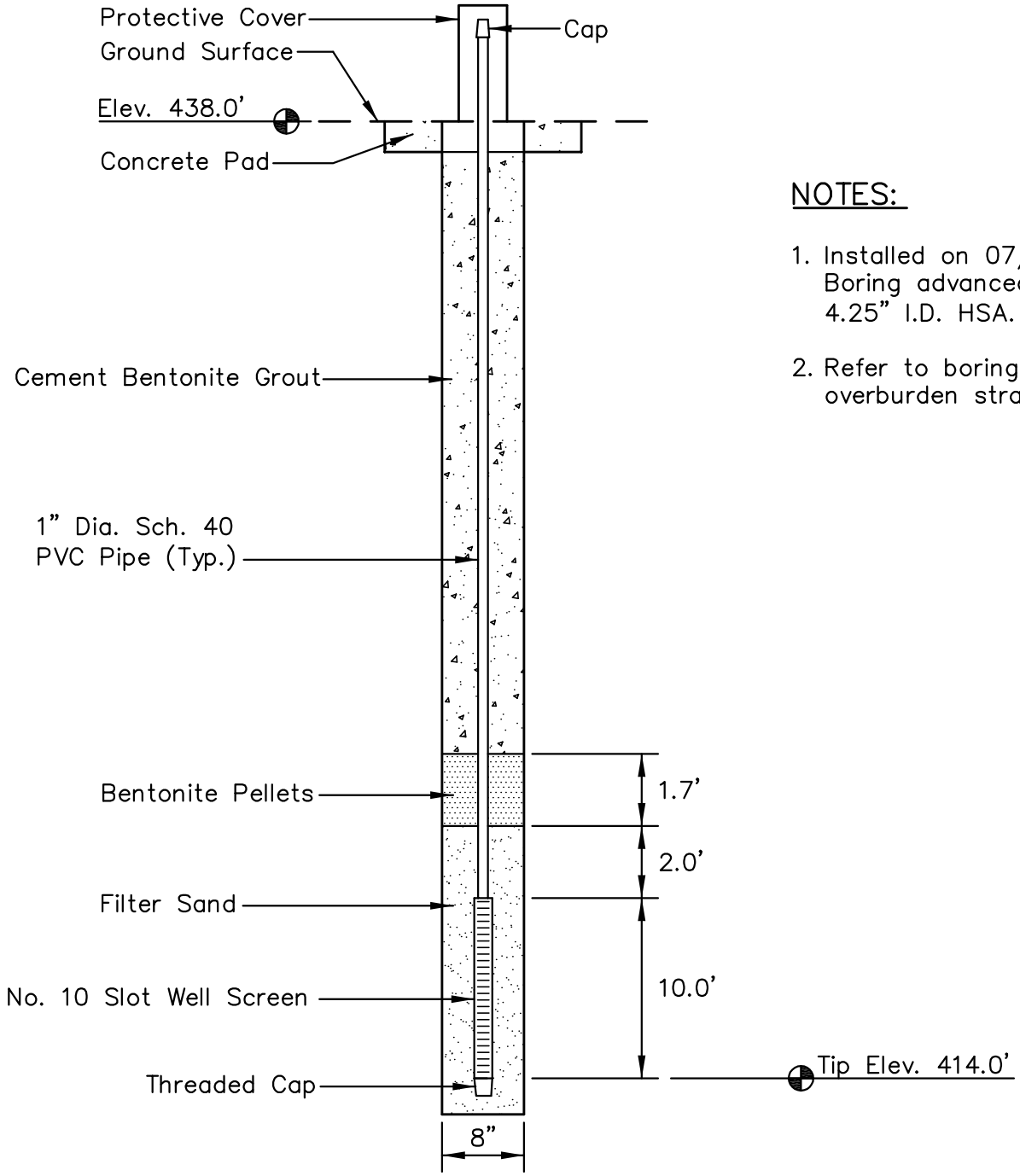
DRAWN BY	RRP	DATE SEPT., 2009	REVISED		SHEET
CHECKED BY	PJC	PROJ. NO. 175559016	1.	3.	18 OF 21
CHECKED BY	RLR	SCALE NTS	2.	4.	



NOTES:

1. Installed on 07/22/09. Boring advanced with 4.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1721957.70
Easting: 394065.63
Ground Elevation: 438.0

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-22S
PIEZOMETER INSTALLATION DETAIL
COLBERT FOSSIL PLANT
ASH POND 4

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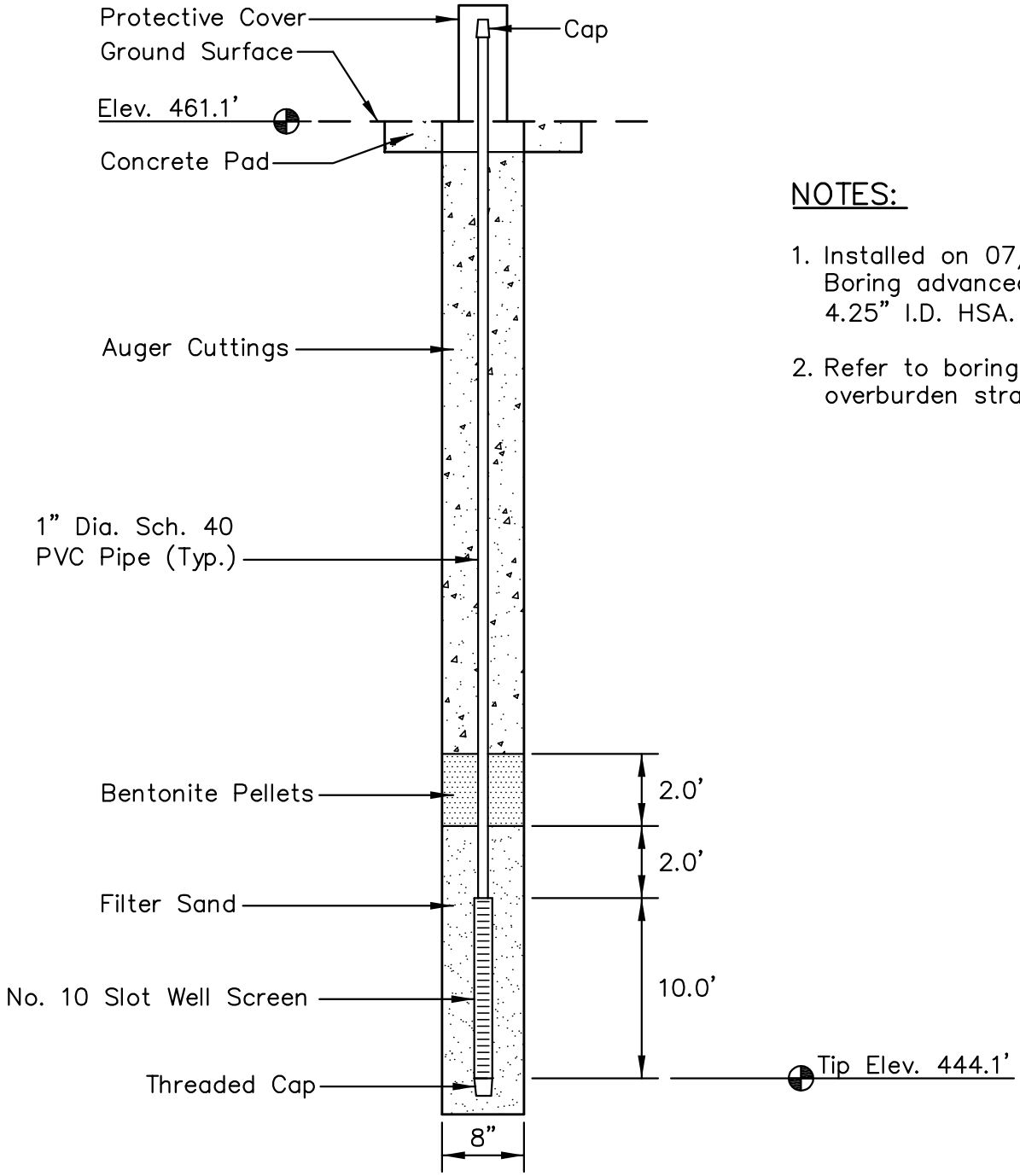
DRAWN BY	RRP	DATE SEPT., 2009	REVISED		SHEET
CHECKED BY	PJC	PROJ. NO. 175559016	1.	3.	19 OF 21
CHECKED BY	RLR	SCALE NTS	2.	4.	



NOTES:

1. Installed on 07/28/09. Boring advanced with 4.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1722728.47
Easting: 394227.94
Ground Elevation: 461.1

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-23S
PIEZOMETER INSTALLATION DETAIL
COLBERT FOSSIL PLANT
ASH POND 4

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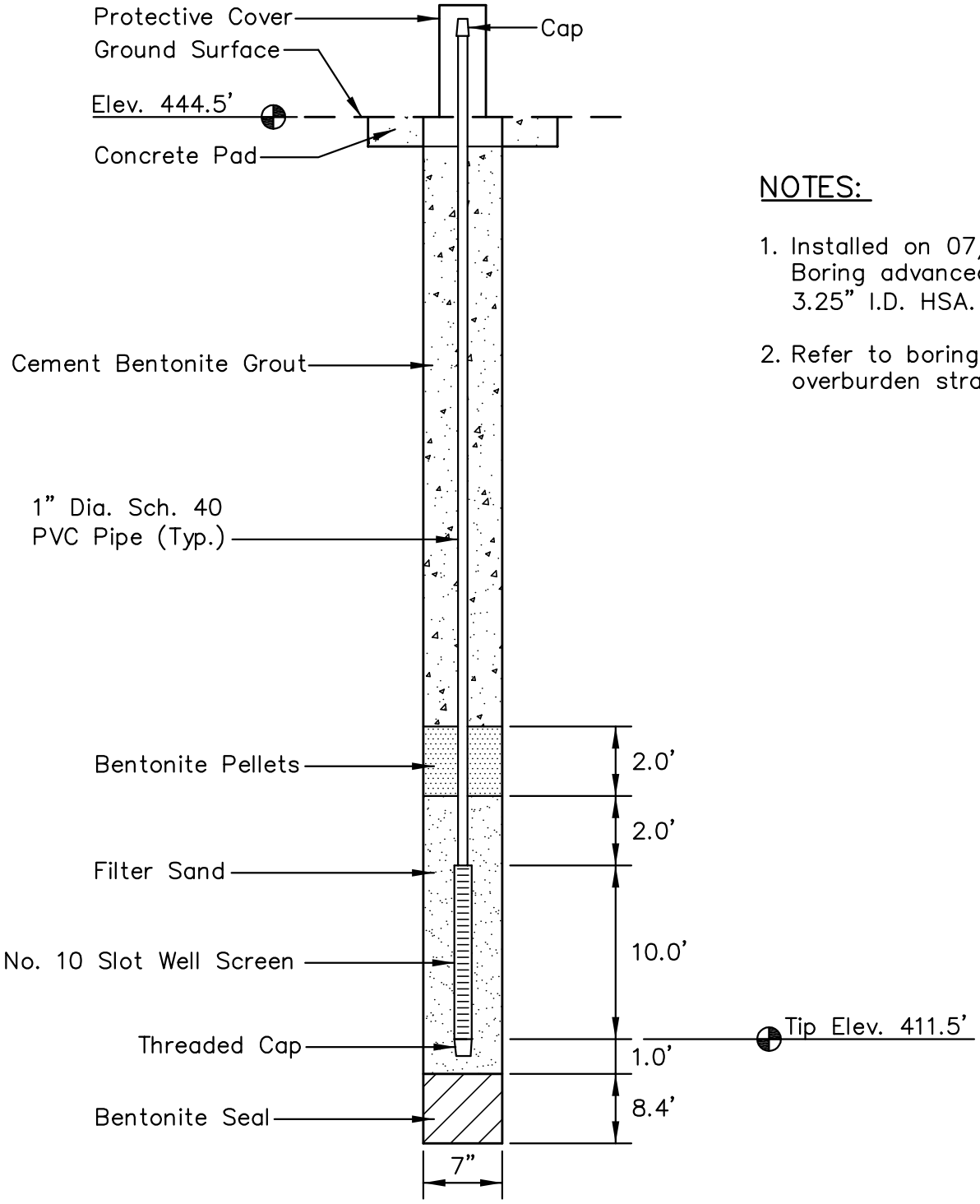
DRAWN BY	RRP	DATE SEPT., 2009	REVISED		SHEET
CHECKED BY	PJC	PROJ. NO. 175559016	1.	3.	20 OF 21
CHECKED BY	RLR	SCALE NTS	2.	4.	



NOTES:

1. Installed on 07/29/09. Boring advanced with 3.25" I.D. HSA.
2. Refer to boring log for overburden stratigraphy.

LOCATION

Northing: 1722823.19
Easting: 394138.84
Ground Elevation: 444.5

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

STN-4-24S
PIEZOMETER INSTALLATION DETAIL
COLBERT FOSSIL PLANT
ASH POND 4

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DRAWN BY	RRP	DATE SEPT., 2009	REVISED		SHEET
CHECKED BY	PJC	PROJ. NO. 175559016	1.	3.	21 OF 21
CHECKED BY	RLR	SCALE NTS	2.	4.	

COLBERT FOSSIL PLANT
ASH POND 4
Piezometer Readings

	Boring		Boring		Boring		Boring		Boring		Boring		Boring		Boring		Boring		Boring		Boring	
	STN-4-1		**STN-4-3**		**STN-4-4**		**STN-4-5**		**STN-4-6**		**STN-4-7**		**STN-4-8**		**STN-4-9**		**STN-4-10**		**STN-4-11**		**STN-4-12**	
	Surface Elev.		Surface Elev.		Surface Elev.		Surface Elev.		Surface Elev.		Surface Elev.		Surface Elev.		Surface Elev.		Surface Elev.		Surface Elev.		Surface Elev.	
	460.2		**427.3**		**460.4**		**439.5**		**419.8**		**460.8**		**421.6**		**461.2**		**420.9**		**461.3**		**446.2**	
	Tip Elevation		Tip Elevation		Tip Elevation		Tip Elevation		Tip Elevation		Tip Elevation		Tip Elevation		Tip Elevation		Tip Elevation		Tip Elevation		Tip Elevation	
	435.7		**409.3**		**435.4**		**415.5**		**406.3**		**435.8**		**401.6**		**437.7**		**406.4**		**439.3**		**426.2**	
Date	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation
1-Sep-09																						
2-Sep-09	8.6	451.6	3.6	423.7	4.9	455.5	18.1	421.4	3.8	416.0	5.1	455.7	6.3	415.3	8.8	452.4	5.7	415.2	9.0	452.3	-0.4	446.6
10-Sep-09	8.2	452.0	3.4	423.9	4.7	455.7	18.1	421.4	4.6	415.2	5.9	454.9	6.3	415.3	8.7	452.6	6.2	414.7	7.6	453.7	-0.4	446.6
23-Sep-09	8.2	452.0	3.2	424.1	4.8	455.6	15.8	423.7	1.0	418.8	5.7	455.1	2.2	419.4	8.7	452.5	4.0	416.9	7.7	453.6	-0.3	446.5
8-Oct-09	8.1	452.1	2.9	424.4	4.8	455.6	16.6	422.9	2.9	416.9	5.8	455.0	3.8	417.8	8.6	452.6	5.3	415.6	7.6	453.7	1.8	444.4
22-Oct-09	7.8	452.4	2.5	424.8	4.8	455.6	17.2	422.3	3.0	416.8	5.7	455.1	5.1	416.5	8.5	452.7	6.4	414.5	7.5	453.8	-1.4	447.6
5-Nov-09	7.8	452.5	2.5	424.8	4.8	455.6	17.2	422.3	3.0	416.8	5.7	455.1	5.1	416.5	8.5	452.7	6.4	414.5	7.5	453.8	-1.4	447.6
17-Nov-09	8.1	452.1	2.5	424.8	4.7	455.7	17.2	422.3	2.7	417.1	5.6	455.2	5.2	416.4	8.6	452.6	5.9	415.0	7.6	453.7	-1.1	447.3
16-Dec-09	8.2	452.0	2.1	425.2	4.7	455.7	16.7	422.8	2.4	417.4	5.9	454.9	4.3	417.3	8.9	452.3	4.9	416.0	7.8	453.5	-0.5	446.7

	Boring		Boring		Boring		Boring		Boring		Boring		Boring		Boring		Boring		Boring	
	STN-4-13		**STN-4-14**		**STN-4-15**		**STN-4-16**		**STN-4-18**		**STN-4-19**		**STN-4-21**		**STN-4-22**		**STN-4-23**		**STN-4-24**	
	Surface Elev.		Surface Elev.		Surface Elev.		Surface Elev.		Surface Elev.		Surface Elev.		Surface Elev.		Surface Elev.		Surface Elev.		Surface Elev.	
	425.3		**461.9**		**460.5**		**435.1**		**461.1**		**440.3**		**460.2**		**438.0**		**461.1**		**444.5**	
	Tip Elevation		Tip Elevation		Tip Elevation		Tip Elevation		Tip Elevation		Tip Elevation		Tip Elevation		Tip Elevation		Tip Elevation		Tip Elevation	
	409.3		**436.9**		**439.5**		**414.1**		**437.1**		**414.3**		**440.2**		**414.0**		**444.1**		**411.5**	
Date	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation
1-Sep-09				461.9	8.2	452.3	14.1	421.0			7.1	433.2	18.4	441.8	1.0	437.0	7.8	453.3	7.2	437.3
2-Sep-09	10.6	414.7	8.6	453.3					11.5	449.6										
10-Sep-09	10.8	414.6	8.4	453.5	8.2	452.3	14.1	421.0	11.6	449.5	6.9	433.4	18.4	441.8	0.1	438.0	3.6	457.5	7.2	437.4
23-Sep-09	9.5	415.8	8.5	453.4	8.2	452.3	13.3	421.8	11.3	449.8	6.4	433.9	17.9	442.3	-0.4	438.4	3.0	458.1	5.3	439.2
8-Oct-09	9.4	415.9	8.4	453.5	8.1	452.4	13.8	421.3	11.3	449.8	6.6	433.7	17.6	442.6	1.7	436.3	2.9	458.2	5.3	439.2
22-Oct-09	9.8	415.5	8.4	453.5	8.1	452.4	14.0	421.1	11.2	449.9	6.7	433.6	17.2	443.0	1.9	436.1	3.0	458.1	5.8	438.7
5-Nov-09	9.8	415.6	8.4	453.6	8.1	452.4	14.0	421.1	11.2	449.9	6.7	433.6	17.2	443.0	1.9	436.1	3.0	458.2	5.8	438.7
17-Nov-09	9.9	415.4	8.3	453.6	8.0	452.5	13.8	421.3	11.2	449.9	6.7	433.6	17.5	442.7	-0.2	438.2	2.4	458.7	6.3	438.2
16-Dec-09	8.9	416.4	8.4	453.5	8.3	452.2	13.7	421.4	11.3	449.8	6.6	433.7	17.1	443.1	-0.6	438.6	2.8	458.3	6.5	438.0

Appendix C

Laboratory Test Results

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-1, 12.0'-13.5', 13.5'-15.0', 15.0'-16.5'	Lab ID	678
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-24-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	100.0
3/8"	9.5	98.6
No. 4	4.75	98.0
No. 10	2	97.2
No. 40	0.425	94.3
No. 200	0.075	75.9
	0.02	63.5
	0.005	42.4
	0.002	36.7
estimated	0.001	35.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	2.0	2.8
Coarse Sand	0.8	2.9
Medium Sand	2.9	---
Fine Sand	18.4	18.4
Silt	33.5	39.2
Clay	42.4	36.7

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	46
Plastic Limit:	18
Plasticity Index:	28
Activity Index:	0.76

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.69

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay with sand
AASHTO Classification:	A-7-6 (20)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-1, 12.0'-13.5', 13.5'-15.0', 15.0'-16.5'	Lab ID	678

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded and Angular
Particle Hardness: Hard and Durable

Tested By: RHB
Test Date: 09-10-2009
Date Received 09-03-2009

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	100.0
3/8"	98.6
No. 4	98.0
No. 10	97.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

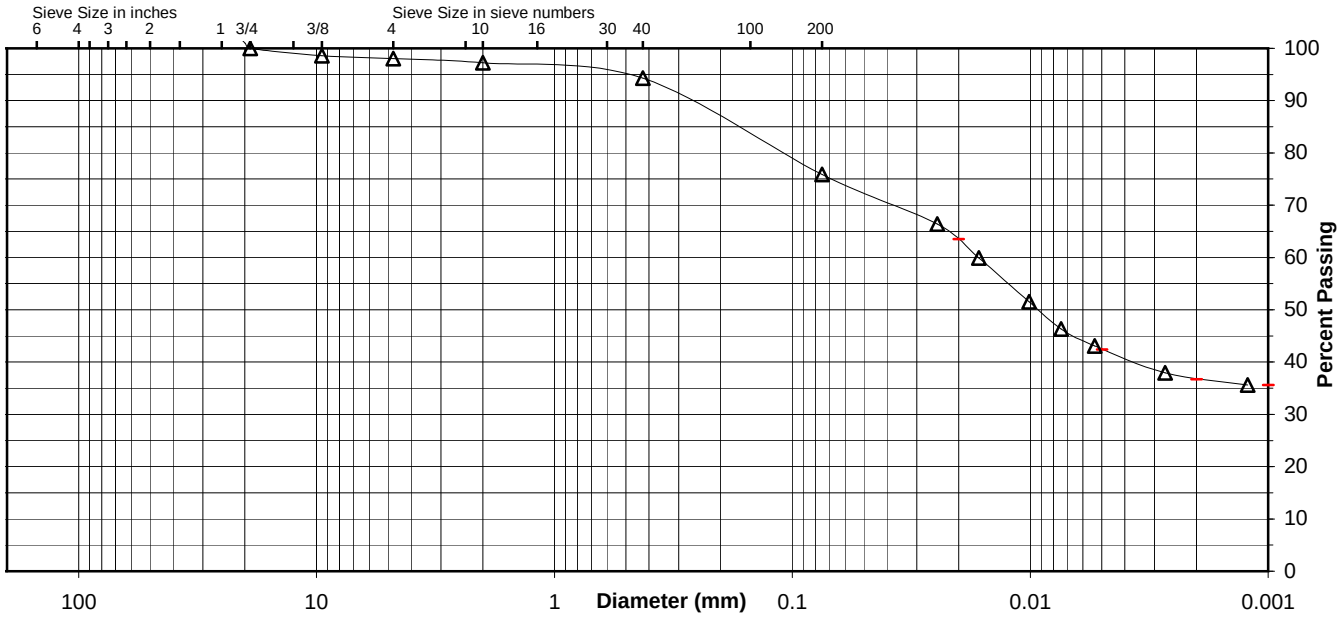
Specific Gravity 2.69

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	94.3
No. 200	75.9
0.02 mm	63.5
0.005 mm	42.4
0.002 mm	36.7
0.001 mm	35.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	2.0	0.8	2.9	18.4	33.5	42.4
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	2.8			2.9	18.4	39.2	36.7



Comments

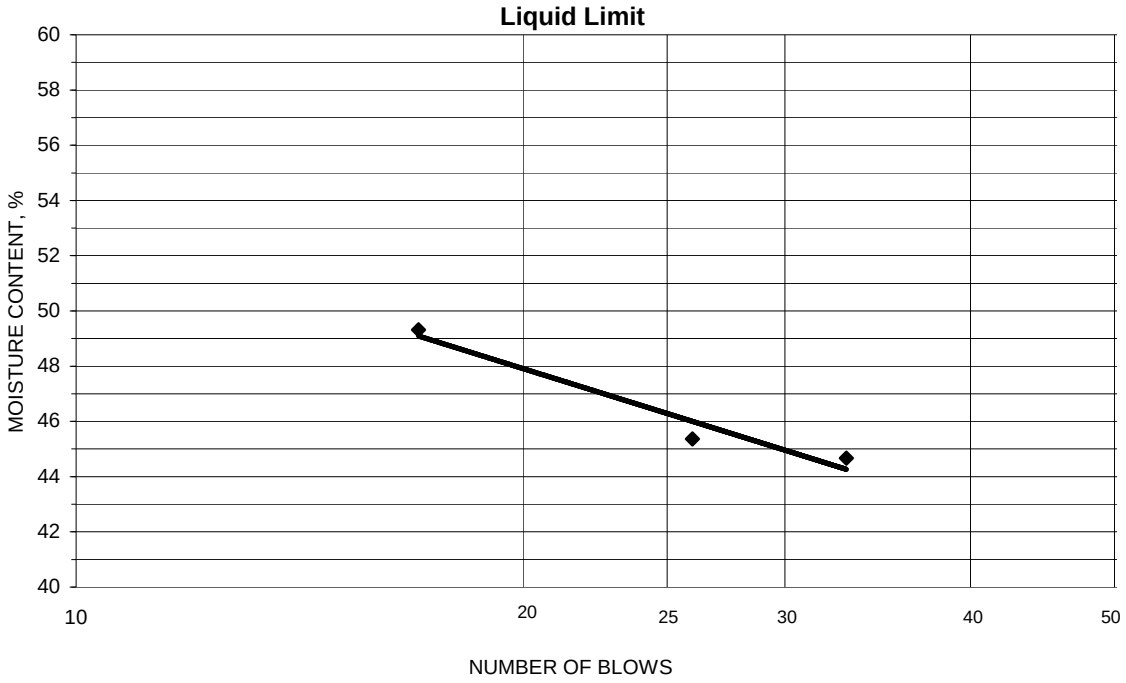
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-1, 12.0'-13.5', 13.5'-15.0', 15.0'-16.5'			Lab ID	678
				% + No. 40	6
Tested By	CLH	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-11-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
14.23	11.17	4.32	33	44.7	
14.96	11.63	4.29	26	45.4	
15.33	11.70	4.34	17	49.3	46



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
10.21	9.34	4.36	17.5	18	28
10.29	9.37	4.31	18.2		

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-1, 27.0'-28.5', 28.5'-30.0', 30.0'-31.5'	Lab ID	682
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-25-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	100.0
3/4"	19	98.3
3/8"	9.5	89.6
No. 4	4.75	72.9
No. 10	2	53.0
No. 40	0.425	30.1
No. 200	0.075	11.8
	0.02	3.8
	0.005	2.0
	0.002	1.6
estimated	0.001	1.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	27.1	47.0
Coarse Sand	19.9	22.9
Medium Sand	22.9	---
Fine Sand	18.3	18.3
Silt	9.8	10.2
Clay	2.0	1.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	---
Plastic Limit:	Non Plastic
Plasticity Index:	---
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.72

Classification

Unified Group Symbol:	SW-SM
Group Name:	Well-graded sand with silt and gravel
AASHTO Classification:	A-1-b (0)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-1, 27.0'-28.5', 28.5'-30.0', 30.0'-31.5'	Lab ID	682

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: CLH
Test Date: 09-16-2009
Date Received 09-03-2009

Maximum Particle size: 1" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	100.0
3/4"	98.3
3/8"	89.6
No. 4	72.9
No. 10	53.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

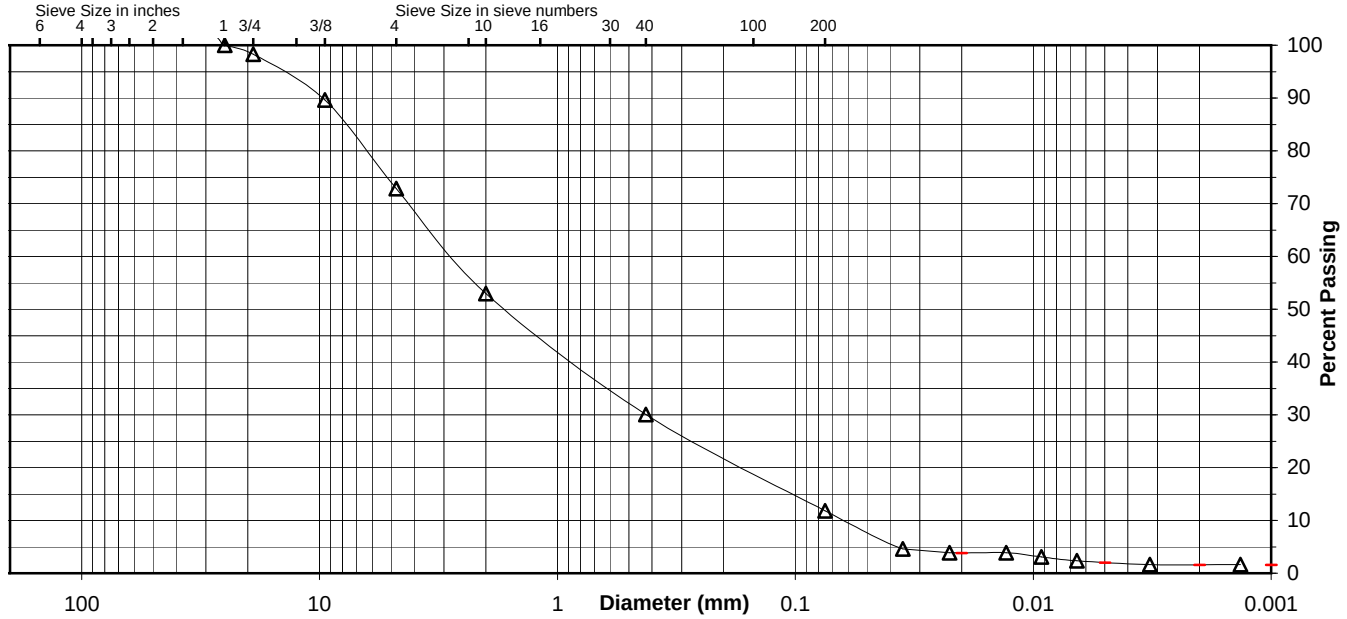
Specific Gravity 2.72

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	30.1
No. 200	11.8
0.02 mm	3.8
0.005 mm	2.0
0.002 mm	1.6
0.001 mm	1.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	1.7	25.4	19.9	22.9	18.3	9.8	2.0
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	47.0			22.9	18.3	10.2	1.6



Comments

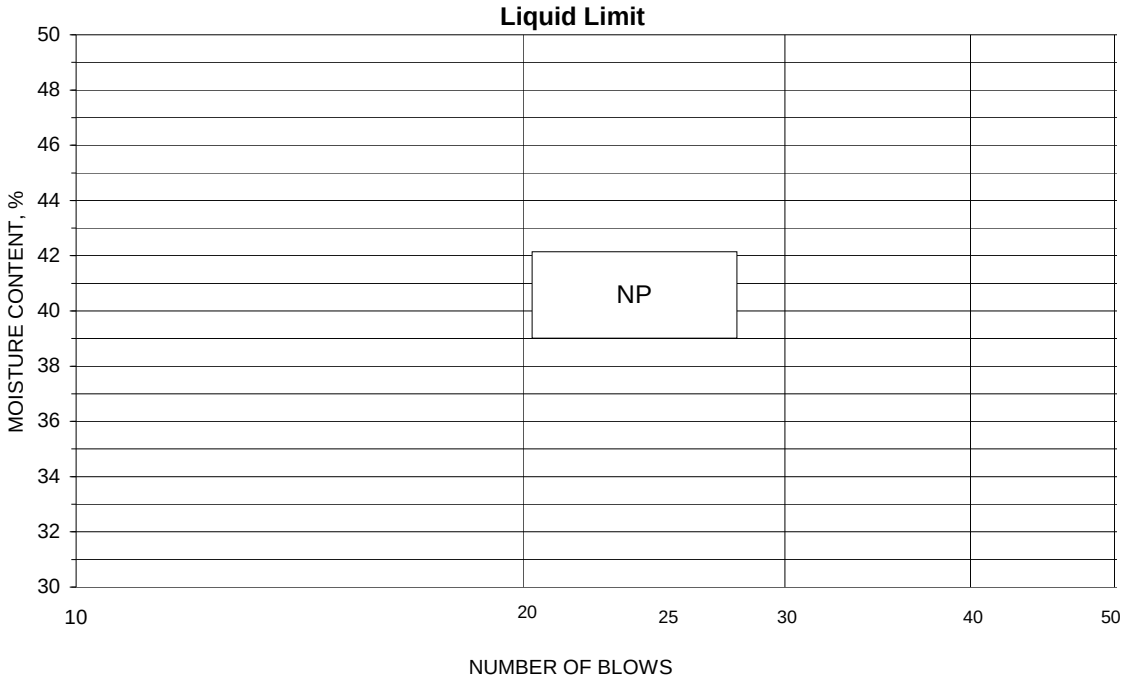
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-1, 27.0'-28.5', 28.5'-30.0', 30.0'-31.5'			Lab ID	682
				% + No. 40	70
Tested By	RHB	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-23-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-2, 9.0'-10.5', 10.5'-12.0', 12.0'-13.5'	Lab ID	686
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-24-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	100.0
3/4"	19	96.9
3/8"	9.5	92.6
No. 4	4.75	91.9
No. 10	2	86.7
No. 40	0.425	84.3
No. 200	0.075	66.0
	0.02	53.6
	0.005	33.6
	0.002	28.1
estimated	0.001	26.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	8.1	13.3
Coarse Sand	5.2	2.4
Medium Sand	2.4	---
Fine Sand	18.3	18.3
Silt	32.4	37.9
Clay	33.6	28.1

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	45
Plastic Limit:	17
Plasticity Index:	28
Activity Index:	1.00

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Sandy lean clay
AASHTO Classification:	A-7-6 (16)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-2, 9.0'-10.5', 10.5'-12.0', 12.0'-13.5'	Lab ID	686

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: AR
Test Date: 09-11-2009
Date Received 09-03-2009

Maximum Particle size: 1" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	100.0
3/4"	96.9
3/8"	92.6
No. 4	91.9
No. 10	86.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

Specific Gravity 2.7

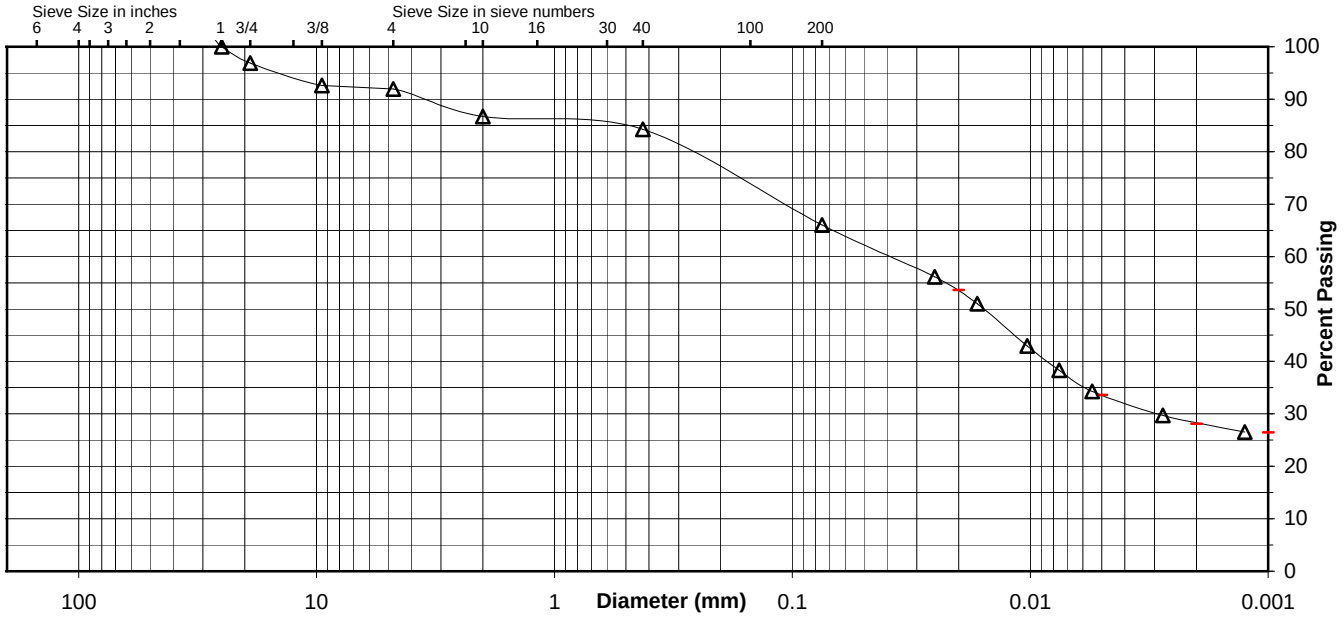
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	84.3
No. 200	66.0
0.02 mm	53.6
0.005 mm	33.6
0.002 mm	28.1
0.001 mm	26.5

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	3.1	5.0	5.2	2.4	18.3	32.4	33.6

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	13.3	2.4	18.3	37.9	28.1



Comments

Reviewed By RHB

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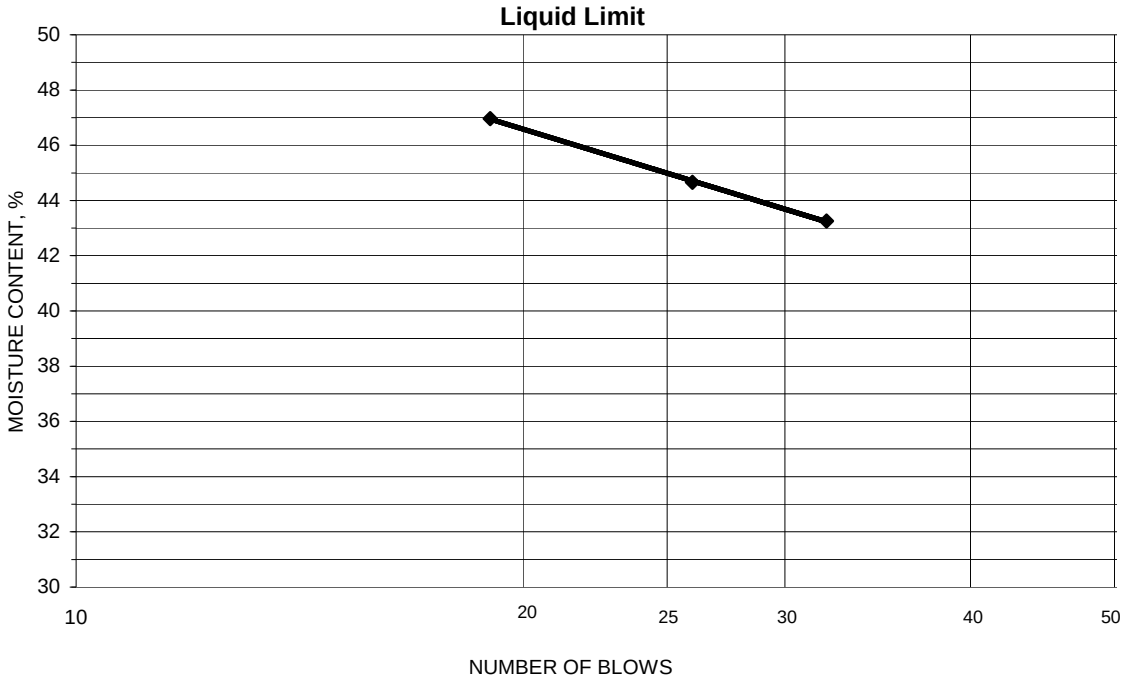
ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-2, 9.0'-10.5', 10.5'-12.0', 12.0'-13.5'			Lab ID	686
				% + No. 40	16
Tested By	JMB	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-14-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.68	14.11	4.38	19	47.0	
16.41	12.69	4.36	26	44.7	
15.62	12.22	4.36	32	43.3	45



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.49	17.22	9.92	17.4	17	28
16.42	15.26	8.29	16.6		

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-3, 1.5'-3.0', 3.0'-4.5', 4.5'-6.0'	Lab ID	690
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-25-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	100.0
3/8"	9.5	97.9
No. 4	4.75	97.3
No. 10	2	96.1
No. 40	0.425	93.1
No. 200	0.075	74.2
	0.02	55.8
	0.005	37.0
	0.002	31.0
estimated	0.001	29.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	2.7	3.9
Coarse Sand	1.2	3.0
Medium Sand	3.0	---
Fine Sand	18.9	18.9
Silt	37.2	43.2
Clay	37.0	31.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	38
Plastic Limit:	17
Plasticity Index:	21
Activity Index:	0.68

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.69

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay with sand
AASHTO Classification:	A-6 (14)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-3, 1.5'-3.0', 3.0'-4.5', 4.5'-6.0'	Lab ID	690

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method:	ASTM D 422
Prepared using:	ASTM D 421
Particle Shape:	Angular
Particle Hardness:	Hard and Durable
Tested By:	JMB
Test Date:	09-11-2009
Date Received	09-03-2009

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	100.0
3/8"	97.9
No. 4	97.3
No. 10	96.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

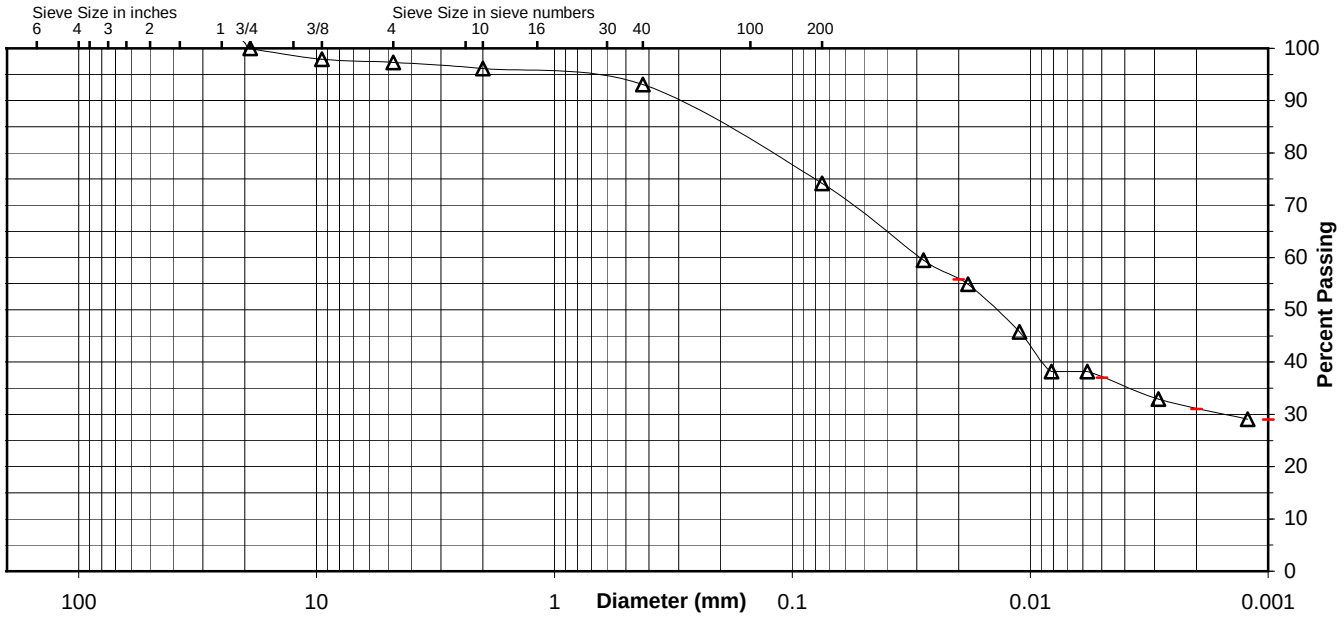
Specific Gravity 2.69

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	93.1
No. 200	74.2
0.02 mm	55.8
0.005 mm	37.0
0.002 mm	31.0
0.001 mm	29.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	2.7	1.2	3.0	18.9	37.2	37.0
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	3.9			3.0	18.9	43.2	31.0



Comments

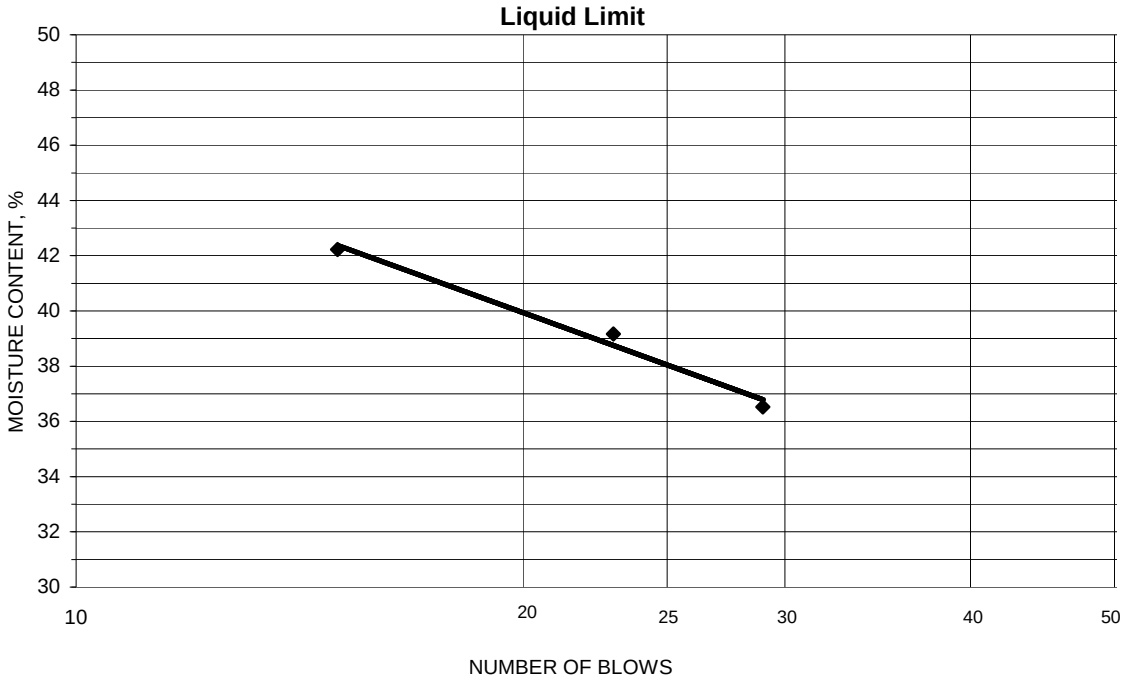
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-3, 1.5'-3.0', 3.0'-4.5', 4.5'-6.0'			Lab ID	690
				% + No. 40	7
Tested By	JMB	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-18-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
11.51	9.60	4.37	29	36.5	
13.66	11.04	4.35	23	39.2	
14.03	11.15	4.33	15	42.2	38



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
9.91	9.08	4.39	17.7	17	21
9.70	8.91	4.34	17.3		

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-3, 7.5'-9.0', 9.0'-10.5', 10.5'-12.0'	Lab ID	694
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-24-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	100.0
3/4"	19	95.0
3/8"	9.5	95.0
No. 4	4.75	93.4
No. 10	2	92.3
No. 40	0.425	90.8
No. 200	0.075	51.7
	0.02	42.2
	0.005	34.1
	0.002	31.2
estimated	0.001	30.4

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	6.6	7.7
Coarse Sand	1.1	1.5
Medium Sand	1.5	---
Fine Sand	39.1	39.1
Silt	17.6	20.5
Clay	34.1	31.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	49
Plastic Limit:	16
Plasticity Index:	33
Activity Index:	1.06

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.71

Classification

Unified Group Symbol:	CL
Group Name:	Sandy lean clay
AASHTO Classification:	A-7-6 (13)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-3, 7.5'-9.0', 9.0'-10.5', 10.5'-12.0'	Lab ID	694

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded and Angular
Particle Hardness: Hard and Durable

Tested By: RHB
Test Date: 09-10-2009
Date Received 09-03-2009

Maximum Particle size: 1" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	100.0
3/4"	95.0
3/8"	95.0
No. 4	93.4
No. 10	92.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

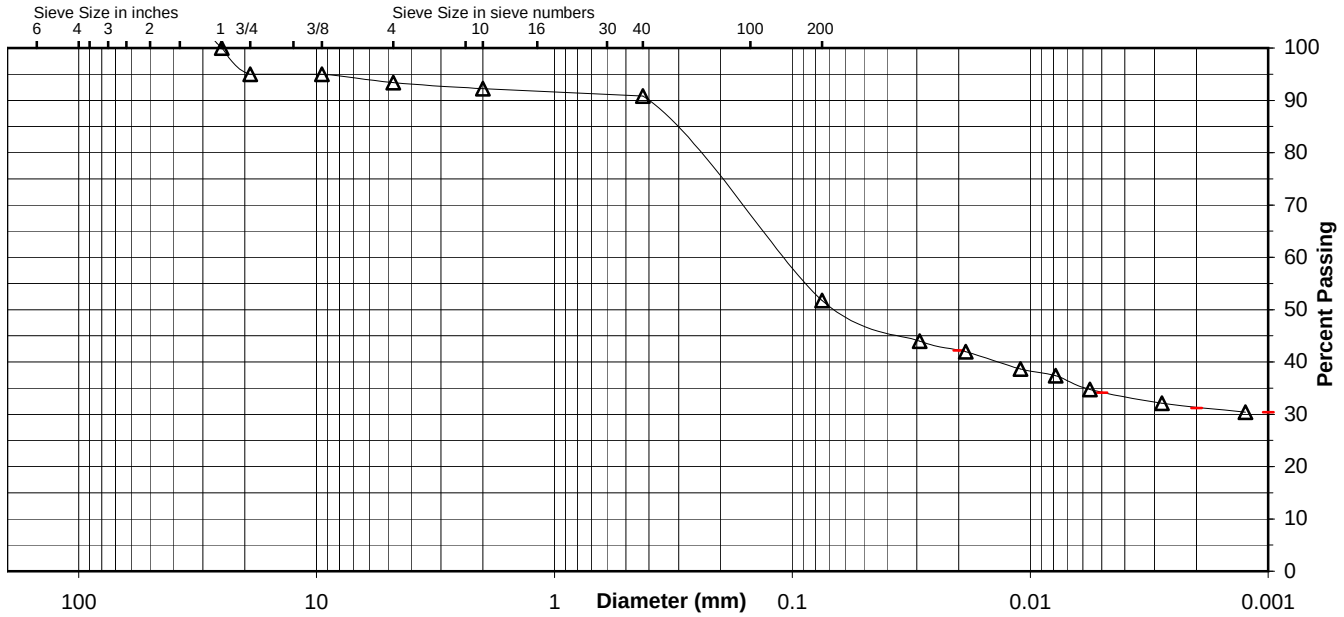
Specific Gravity 2.71

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	90.8
No. 200	51.7
0.02 mm	42.2
0.005 mm	34.1
0.002 mm	31.2
0.001 mm	30.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	5.0	1.6	1.1	1.5	39.1	17.6	34.1
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	7.7			1.5	39.1	20.5	31.2



Comments

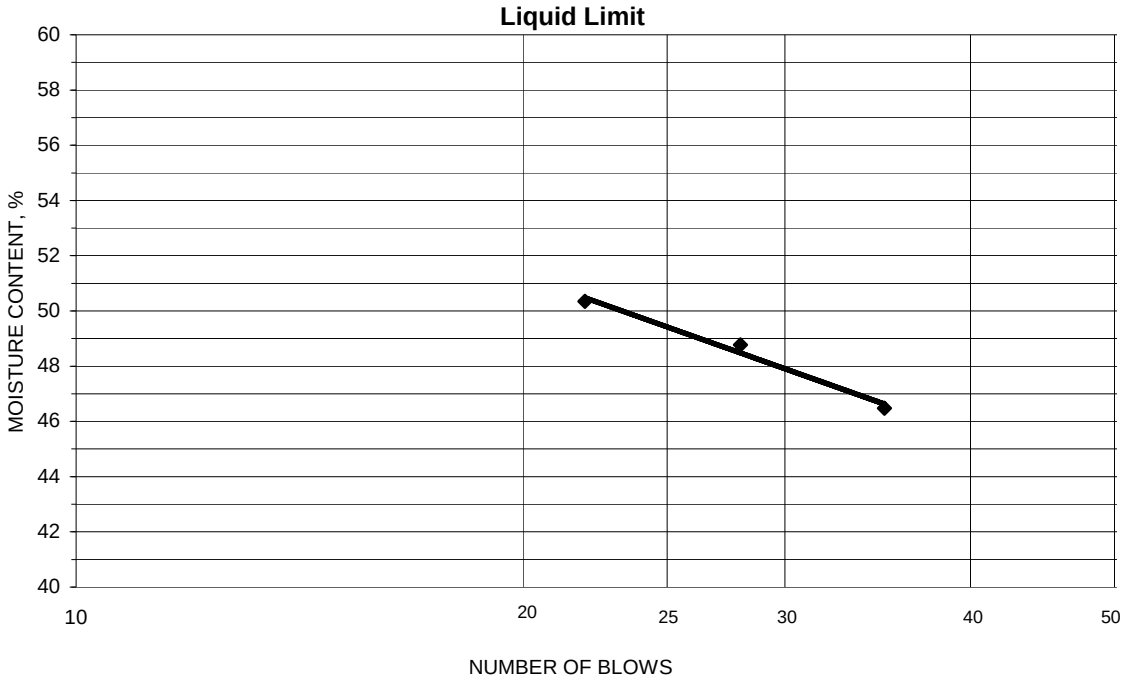
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-3, 7.5'-9.0', 9.0'-10.5', 10.5'-12.0'			Lab ID	694
				% + No. 40	9
Tested By	CLH	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-11-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
12.69	10.05	4.37	35	46.5	
12.81	10.04	4.36	28	48.8	
13.12	10.18	4.34	22	50.3	49



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
13.33	12.06	4.37	16.5	16	33
12.07	11.05	4.30	15.1		

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-4, 25.5'-27.0', 27.0'-28.5', 30.0'-31.5'	Lab ID	698
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-24-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	100.0
3/4"	19	97.4
3/8"	9.5	80.5
No. 4	4.75	54.1
No. 10	2	34.0
No. 40	0.425	14.5
No. 200	0.075	6.2
	0.02	3.0
	0.005	2.3
	0.002	2.2
estimated	0.001	2.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	45.9	66.0
Coarse Sand	20.1	19.5
Medium Sand	19.5	---
Fine Sand	8.3	8.3
Silt	3.9	4.0
Clay	2.3	2.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	---
Plastic Limit:	Non Plastic
Plasticity Index:	---
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.75

Classification

Unified Group Symbol:	SW-SM
Group Name:	Well-graded sand with silt and gravel
AASHTO Classification:	A-1-a (1)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-4, 25.5'-27.0', 27.0'-28.5', 30.0'-31.5'	Lab ID	698

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method:	ASTM D 422
Prepared using:	ASTM D 421
Particle Shape:	Angular
Particle Hardness:	Hard and Durable
Tested By:	CLH
Test Date:	09-16-2009
Date Received	09-03-2009

Maximum Particle size: 1" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	100.0
3/4"	97.4
3/8"	80.5
No. 4	54.1
No. 10	34.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

Specific Gravity 2.75

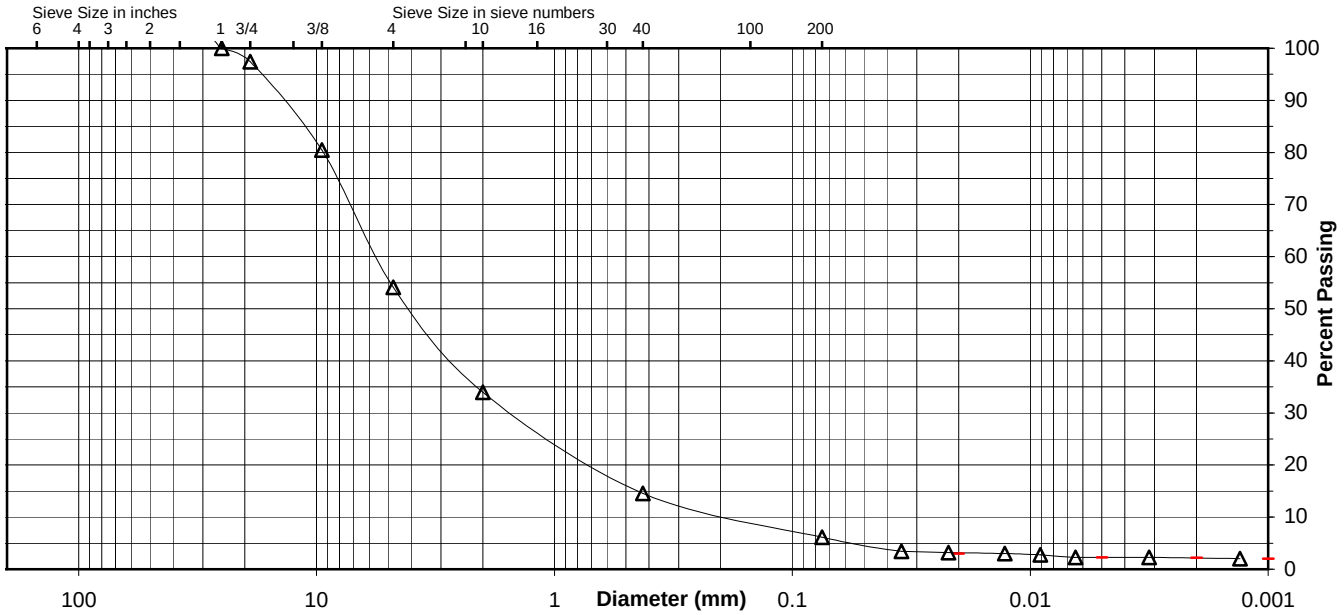
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	14.5
No. 200	6.2
0.02 mm	3.0
0.005 mm	2.3
0.002 mm	2.2
0.001 mm	2.0

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	2.6	43.3	20.1	19.5	8.3	3.9	2.3

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	66.0	19.5	8.3	4.0	2.2



Comments

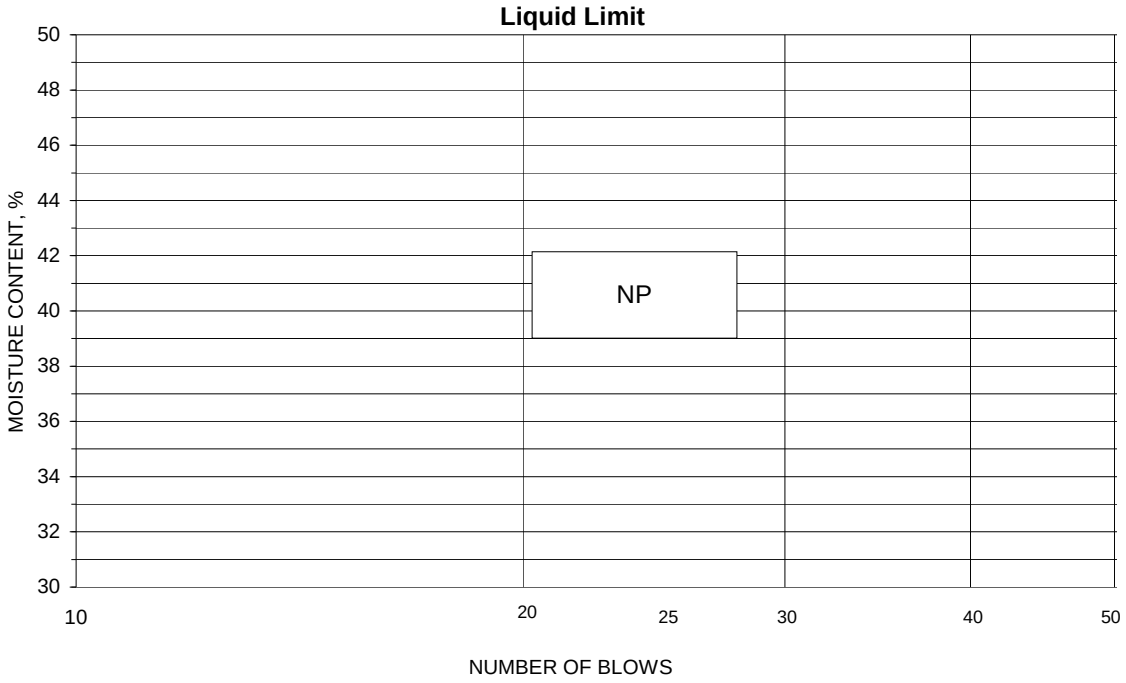
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-4, 25.5'-27.0', 27.0'-28.5', 30.0'-31.5'			Lab ID	698
				% + No. 40	85
Tested By	RHB	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-24-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-5, 4.5'-6.0', 6.0'-7.5', 7.5'-9.0'	Lab ID	702
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-25-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	100.0
3/8"	9.5	95.8
No. 4	4.75	94.1
No. 10	2	92.3
No. 40	0.425	89.2
No. 200	0.075	70.1
	0.02	50.1
	0.005	34.0
	0.002	29.4
estimated	0.001	27.3

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	5.9	7.7
Coarse Sand	1.8	3.1
Medium Sand	3.1	---
Fine Sand	19.1	19.1
Silt	36.1	40.7
Clay	34.0	29.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	39
Plastic Limit:	17
Plasticity Index:	22
Activity Index:	0.76

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.74

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay with sand
AASHTO Classification:	A-6 (13)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-5, 4.5'-6.0', 6.0'-7.5', 7.5'-9.0'	Lab ID	702

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method:	ASTM D 422
Prepared using:	ASTM D 421
Particle Shape:	Angular
Particle Hardness:	Hard and Durable
Tested By:	CLH
Test Date:	09-16-2009
Date Received	09-03-2009

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	100.0
3/8"	95.8
No. 4	94.1
No. 10	92.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

Specific Gravity 2.74

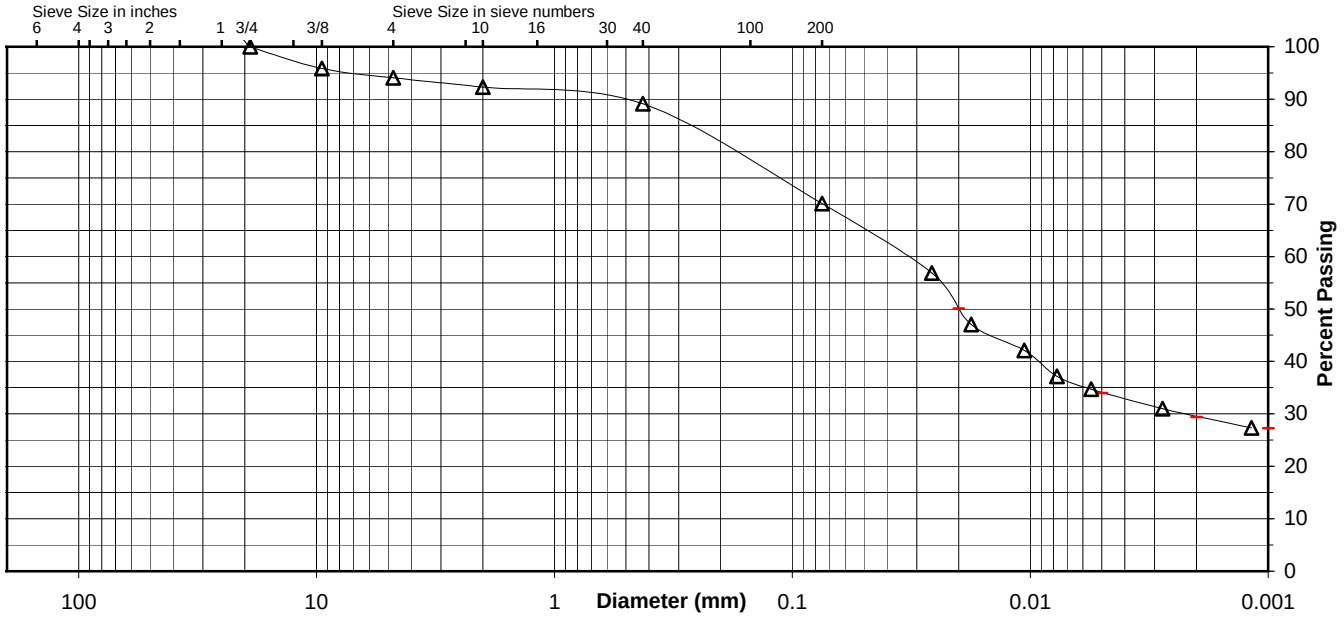
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	89.2
No. 200	70.1
0.02 mm	50.1
0.005 mm	34.0
0.002 mm	29.4
0.001 mm	27.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	5.9	1.8	3.1	19.1	36.1	34.0

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	7.7	3.1	19.1	40.7	29.4



Comments

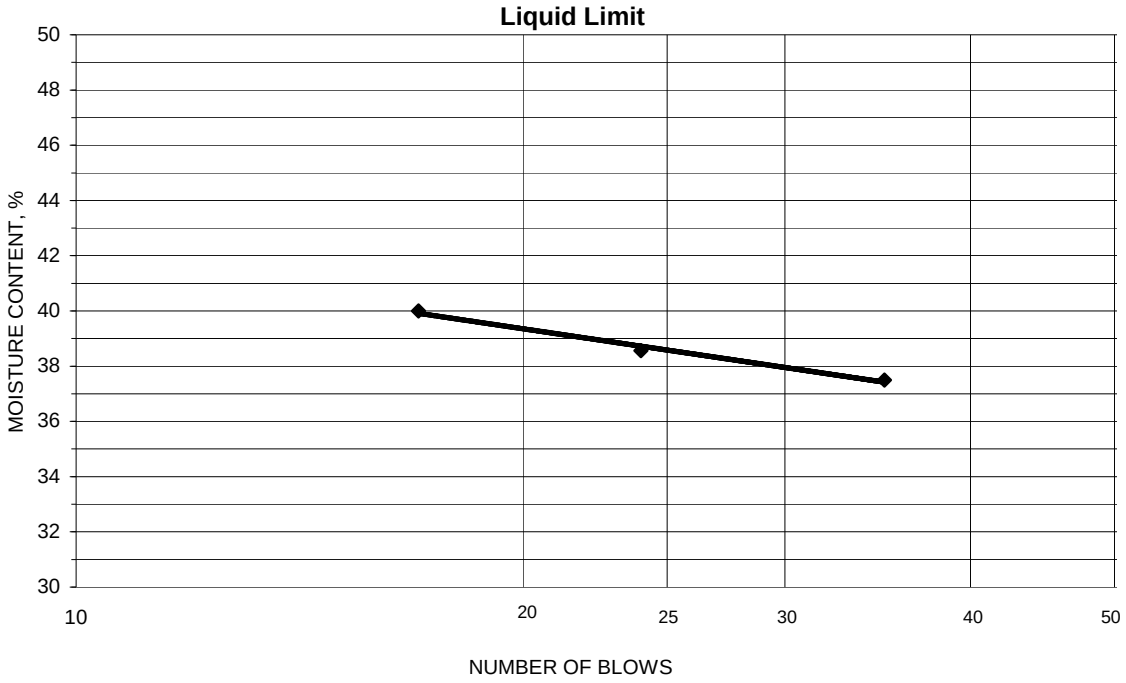
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-5, 4.5'-6.0', 6.0'-7.5', 7.5'-9.0'			Lab ID	702
				% + No. 40	11
Tested By	JMB	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-21-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
12.02	9.82	4.32	17	40.0	
11.83	9.74	4.32	24	38.6	
12.03	9.93	4.33	35	37.5	39



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
8.54	7.92	4.32	17.2	17	22
7.65	7.17	4.36	17.1		

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-7, 13.5'-15.0', 15.0'-16.5', 16.5'-18.0'	Lab ID	706
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-23-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	100.0
3/8"	9.5	98.1
No. 4	4.75	97.1
No. 10	2	94.0
No. 40	0.425	91.4
No. 200	0.075	76.8
	0.02	62.8
	0.005	43.2
	0.002	38.0
estimated	0.001	35.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	2.9	6.0
Coarse Sand	3.1	2.6
Medium Sand	2.6	---
Fine Sand	14.6	14.6
Silt	33.6	38.8
Clay	43.2	38.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	48
Plastic Limit:	16
Plasticity Index:	32
Activity Index:	0.84

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.72

Classification

Unified Group Symbol: CL

Group Name: Lean clay with sand

AASHTO Classification: A-7-6 (24)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-7, 13.5'-15.0', 15.0'-16.5', 16.5'-18.0'	Lab ID	706

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: JMB
Test Date: 09-09-2009
Date Received 09-03-2009

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	100.0
3/8"	98.1
No. 4	97.1
No. 10	94.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

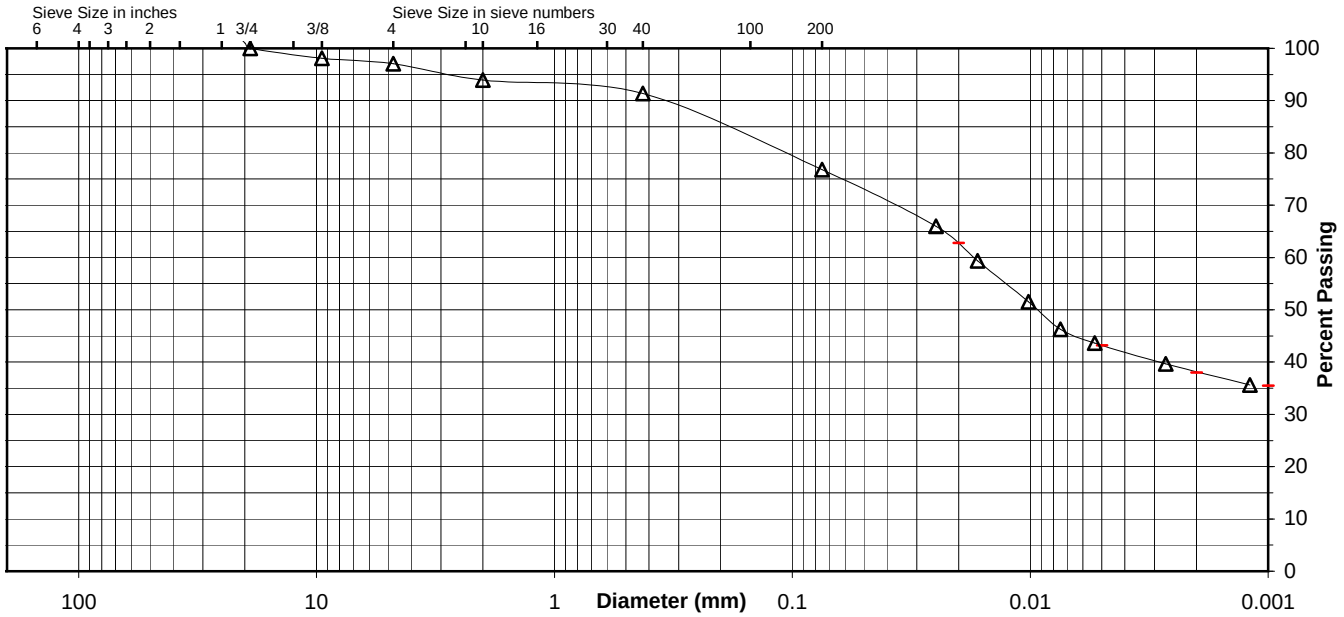
Specific Gravity 2.72

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	91.4
No. 200	76.8
0.02 mm	62.8
0.005 mm	43.2
0.002 mm	38.0
0.001 mm	35.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	2.9	3.1	2.6	14.6	33.6	43.2
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	6.0			2.6	14.6	38.8	38.0



Comments

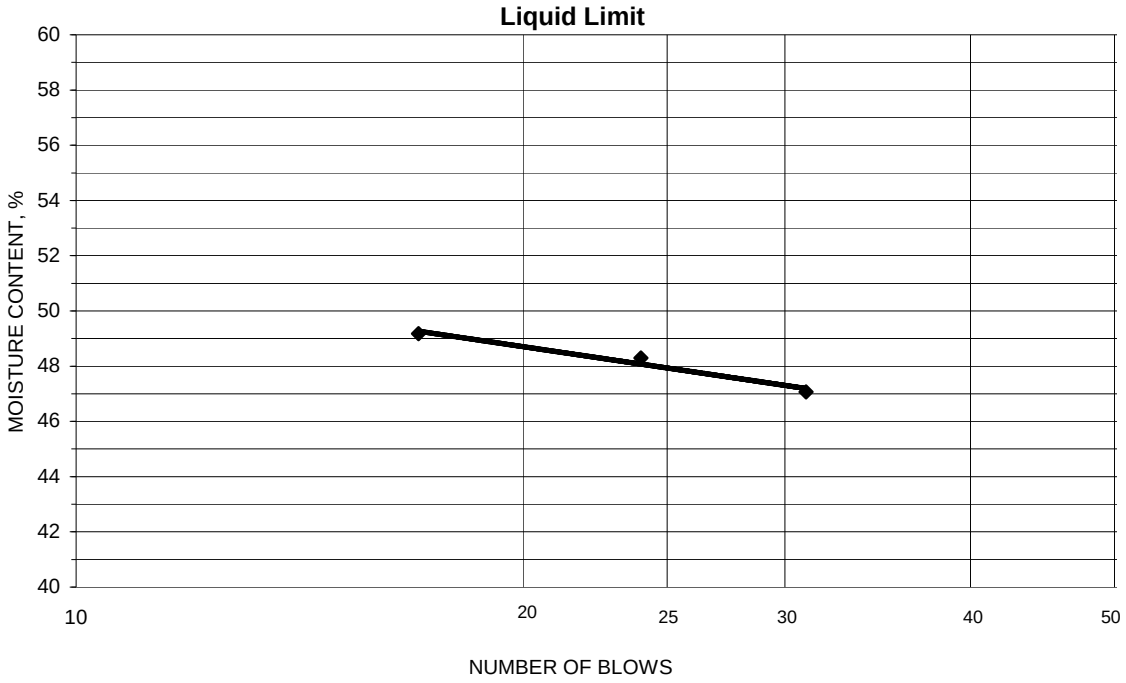
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-7, 13.5'-15.0', 15.0'-16.5', 16.5'-18.0'			Lab ID	706
				% + No. 40	9
Tested By	AR	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-10-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
21.83	17.44	8.35	24	48.3	
20.41	16.56	8.38	31	47.1	
19.71	16.14	8.88	17	49.2	48



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.94	17.93	11.73	16.3	16	32
19.00	17.99	11.69	16.0		

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-7, 47.0'-48.5', 48.5'-50.0', 50.0'-51.5'	Lab ID	710
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-24-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	
3/8"	9.5	100.0
No. 4	4.75	99.9
No. 10	2	99.7
No. 40	0.425	97.9
No. 200	0.075	31.7
	0.02	19.4
	0.005	11.6
	0.002	9.8
estimated	0.001	9.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.1	0.3
Coarse Sand	0.2	1.8
Medium Sand	1.8	---
Fine Sand	66.2	66.2
Silt	20.1	21.9
Clay	11.6	9.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: ---
Plastic Limit: Non Plastic
Plasticity Index: ---
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.72

Classification

Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-2-4 (0)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-7, 47.0'-48.5', 48.5'-50.0', 50.0'-51.5'	Lab ID	710

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded
Particle Hardness: Hard and Durable

Tested By: RHB
Test Date: 09-10-2009
Date Received 09-03-2009

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	
3/8"	100.0
No. 4	99.9
No. 10	99.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

Specific Gravity 2.72

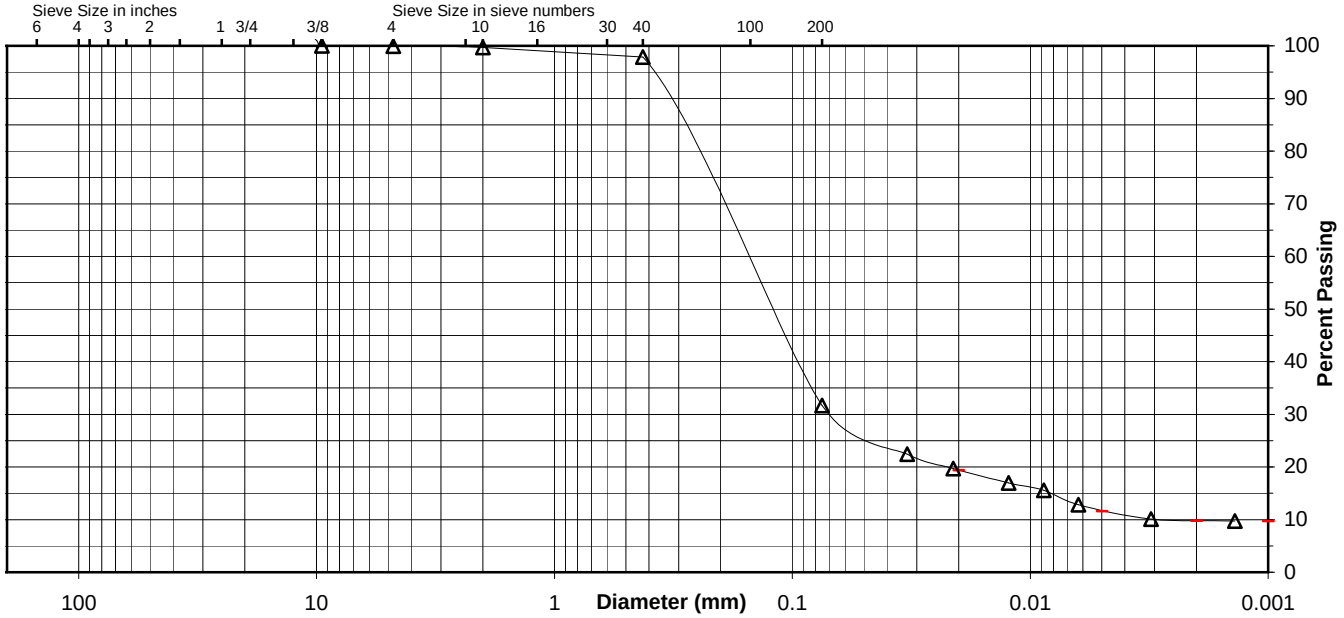
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	97.9
No. 200	31.7
0.02 mm	19.4
0.005 mm	11.6
0.002 mm	9.8
0.001 mm	9.7

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.1	0.2	1.8	66.2	20.1	11.6

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.3	1.8	66.2	21.9	9.8



Comments

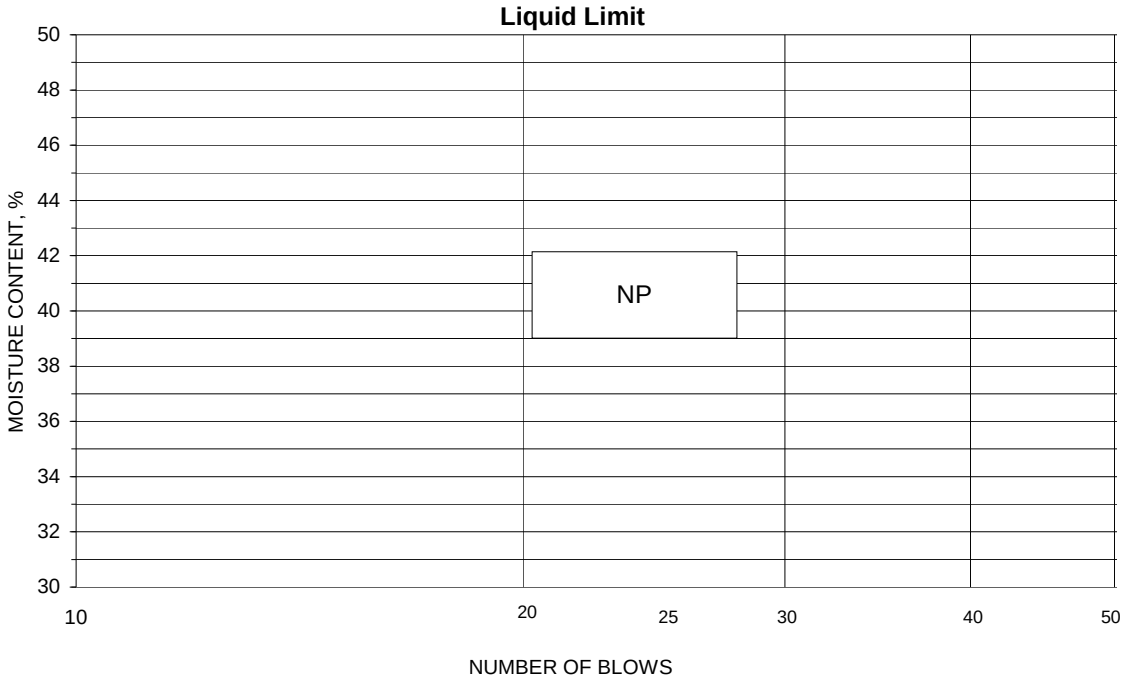
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-7, 47.0'-48.5', 48.5'-50.0', 50.0'-51.5'			Lab ID	710
				% + No. 40	2
Tested By	CLH	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-14-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-8, 3.0'-4.5', 4.5'-6.0', 6.0'-7.5'	Lab ID	714
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-25-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	
3/8"	9.5	100.0
No. 4	4.75	99.9
No. 10	2	99.6
No. 40	0.425	98.2
No. 200	0.075	63.4
	0.02	39.9
	0.005	23.0
	0.002	18.0
estimated	0.001	16.3

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.1	0.4
Coarse Sand	0.3	1.4
Medium Sand	1.4	---
Fine Sand	34.8	34.8
Silt	40.4	45.4
Clay	23.0	18.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	25
Plastic Limit:	16
Plasticity Index:	9
Activity Index:	0.50

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.74

Classification

Unified Group Symbol:	CL
Group Name:	Sandy lean clay
AASHTO Classification:	A-4 (3)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-8, 3.0'-4.5', 4.5'-6.0', 6.0'-7.5'	Lab ID	714

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method:	ASTM D 422
Prepared using:	ASTM D 421
Particle Shape:	Angular
Particle Hardness:	Hard and Durable
Tested By:	JMB
Test Date:	09-12-2009
Date Received	09-03-2009

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	
3/8"	100.0
No. 4	99.9
No. 10	99.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

Specific Gravity 2.74

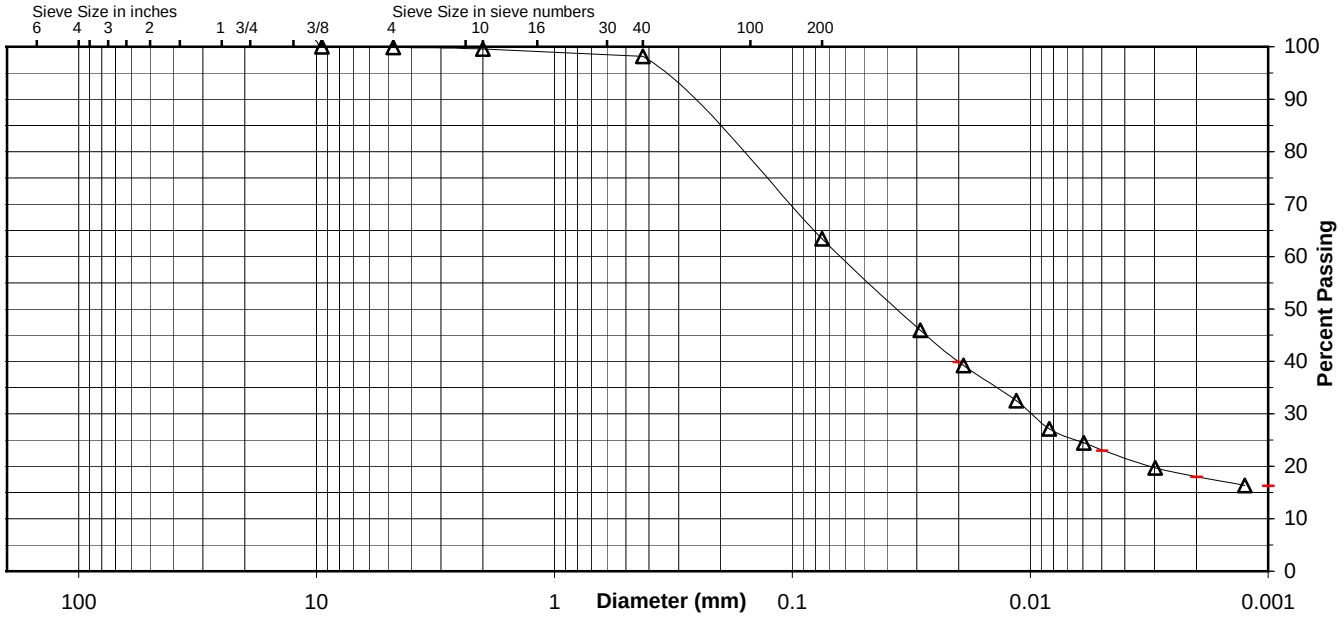
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	98.2
No. 200	63.4
0.02 mm	39.9
0.005 mm	23.0
0.002 mm	18.0
0.001 mm	16.3

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.1	0.3	1.4	34.8	40.4	23.0

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.4	1.4	34.8	45.4	18.0



Comments

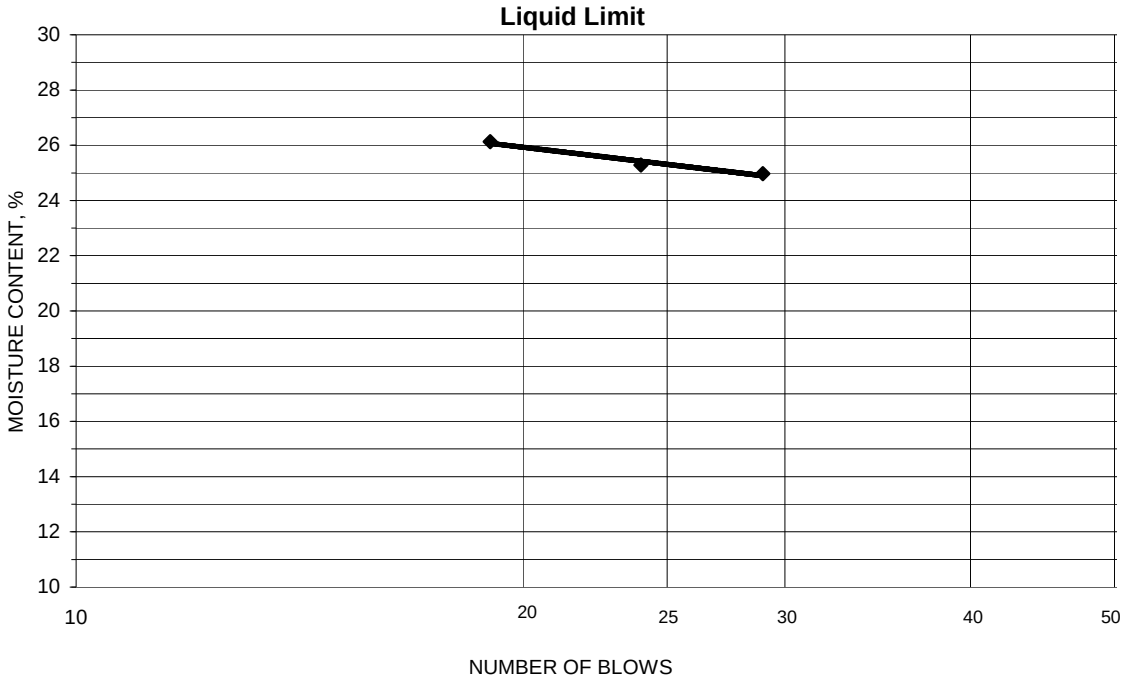
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-8, 3.0'-4.5', 4.5'-6.0', 6.0'-7.5'			Lab ID	714
				% + No. 40	2
Tested By	JMB	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-17-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
16.10	13.75	4.34	29	25.0	
15.48	13.23	4.33	24	25.3	
15.20	12.95	4.34	19	26.1	25



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
10.85	9.97	4.35	15.7	16	9
10.16	9.37	4.37	15.8		

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-10, 1.5'-3.0', 3.0'-4.5', 4.5'-6.0'	Lab ID	718
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-23-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	
3/8"	9.5	
No. 4	4.75	
No. 10	2	100.0
No. 40	0.425	99.6
No. 200	0.075	67.0
	0.02	39.6
	0.005	21.2
	0.002	16.6
estimated	0.001	15.4

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.4
Medium Sand	0.4	---
Fine Sand	32.6	32.6
Silt	45.8	50.4
Clay	21.2	16.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	29
Plastic Limit:	15
Plasticity Index:	14
Activity Index:	0.82

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.65

Classification

Unified Group Symbol:	CL
Group Name:	Sandy lean clay
AASHTO Classification:	A-6 (7)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-10, 1.5'-3.0', 3.0'-4.5', 4.5'-6.0'	Lab ID	718

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: JMB
Test Date: 09-08-2009
Date Received 09-03-2009

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	
3/8"	
No. 4	
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

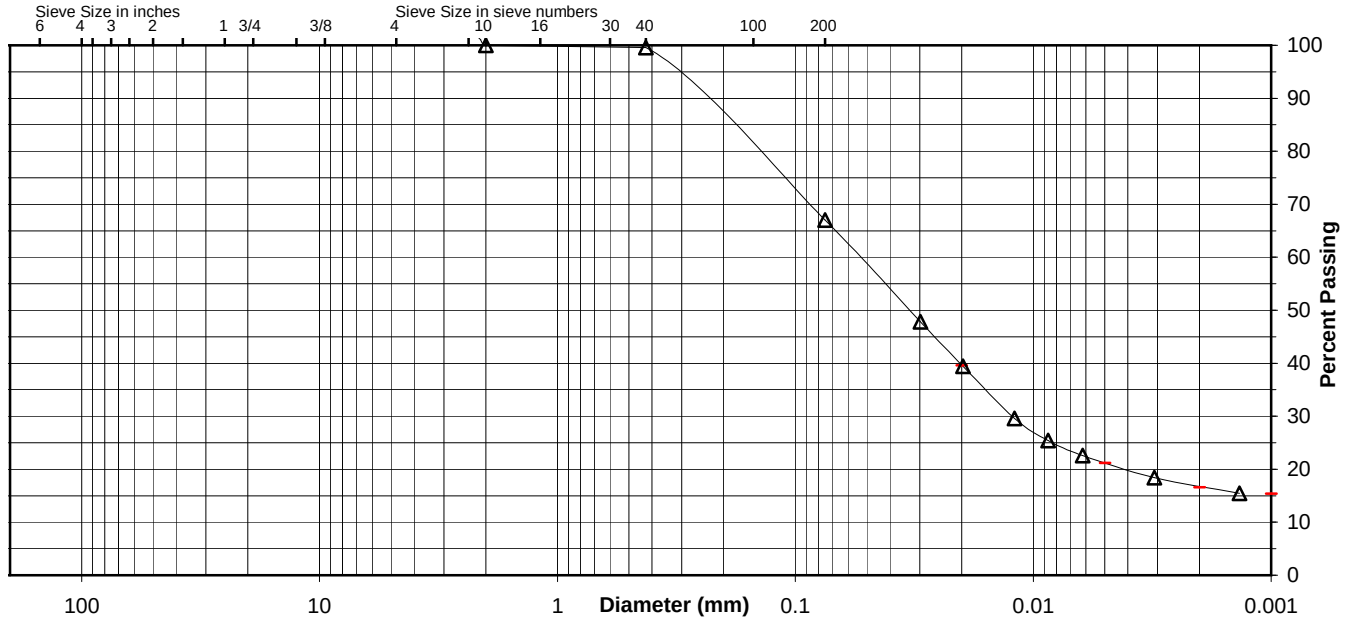
Specific Gravity 2.65

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	99.6
No. 200	67.0
0.02 mm	39.6
0.005 mm	21.2
0.002 mm	16.6
0.001 mm	15.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.4	32.6	45.8	21.2
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			0.4	32.6	50.4	16.6



Comments

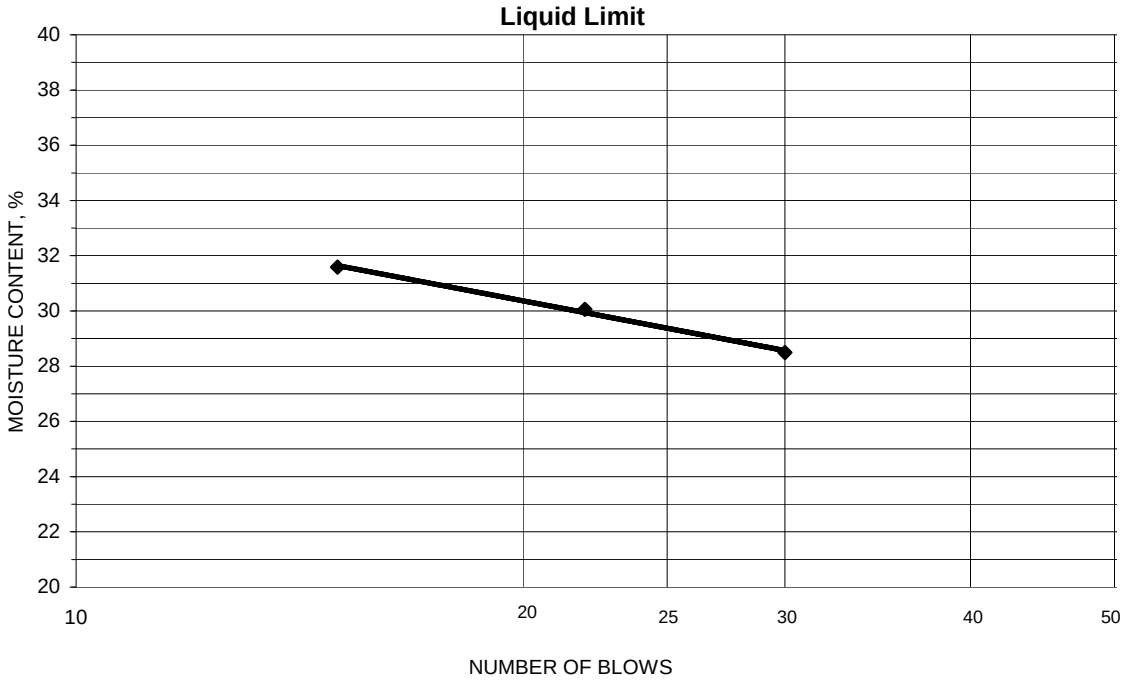
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-10, 1.5'-3.0', 3.0'-4.5', 4.5'-6.0'			Lab ID	718
				% + No. 40	0
Tested By	JMB	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-11-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
14.43	12.19	4.33	30	28.5	
14.69	12.30	4.35	22	30.1	
12.88	10.83	4.34	15	31.6	29



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
12.63	11.54	4.38	15.2	15	14
13.20	12.01	4.32	15.5		

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-11, 9.0'-10.5', 10.5'-12.0', 12.0'-13.5'	Lab ID	722
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-24-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	100.0
3/8"	9.5	96.6
No. 4	4.75	95.3
No. 10	2	93.9
No. 40	0.425	91.0
No. 200	0.075	72.8
	0.02	60.2
	0.005	40.7
	0.002	36.2
estimated	0.001	34.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	4.7	6.1
Coarse Sand	1.4	2.9
Medium Sand	2.9	---
Fine Sand	18.2	18.2
Silt	32.1	36.6
Clay	40.7	36.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	46
Plastic Limit:	16
Plasticity Index:	30
Activity Index:	0.83

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.71

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay with sand
AASHTO Classification:	A-7-6 (20)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-11, 9.0'-10.5', 10.5'-12.0', 12.0'-13.5'	Lab ID	722

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: JMB
Test Date: 09-09-2009
Date Received 09-03-2009

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	100.0
3/8"	96.6
No. 4	95.3
No. 10	93.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

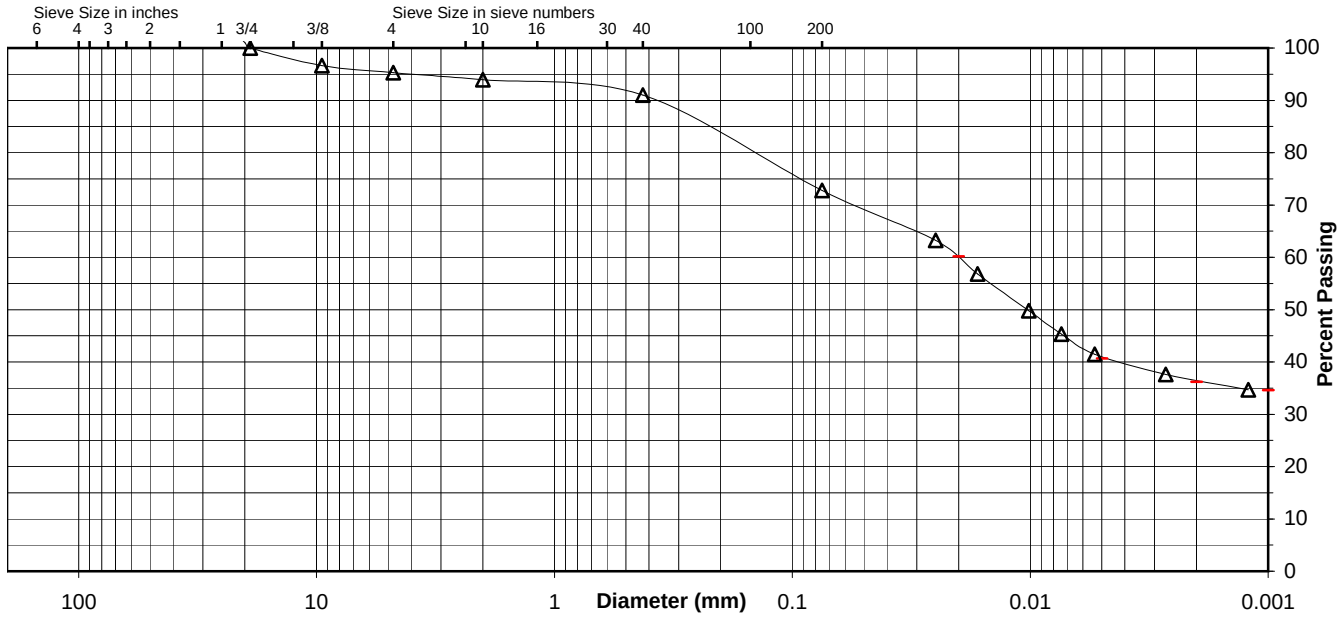
Specific Gravity 2.71

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	91.0
No. 200	72.8
0.02 mm	60.2
0.005 mm	40.7
0.002 mm	36.2
0.001 mm	34.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	4.7	1.4	2.9	18.2	32.1	40.7
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	6.1			2.9	18.2	36.6	36.2



Comments

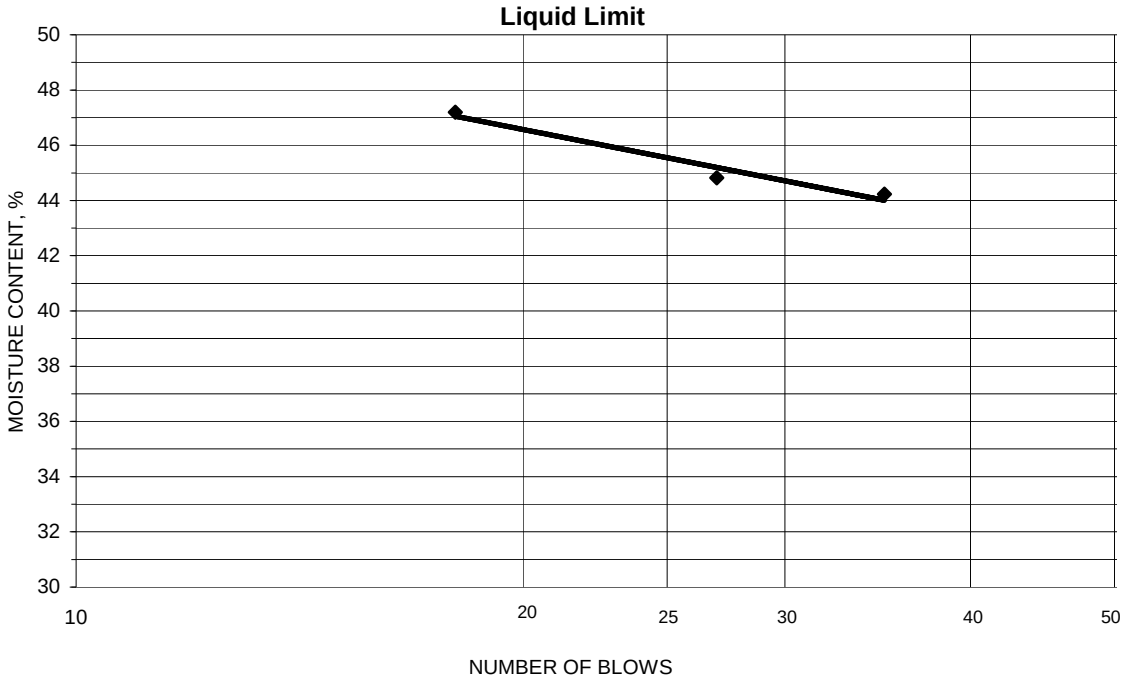
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-11, 9.0'-10.5', 10.5'-12.0', 12.0'-13.5'			Lab ID	722
				% + No. 40	9
Tested By	CLH	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-10-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
15.68	12.06	4.39	18	47.2	
15.82	12.27	4.35	27	44.8	
13.48	10.68	4.35	35	44.2	46



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
15.38	14.53	9.28	16.2	16	30
16.10	15.16	9.40	16.3		

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-11, 30.0'-31.5', 31.5'-33.0', 33.0'-34.5'	Lab ID	726
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-23-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	100.0
3/8"	9.5	97.6
No. 4	4.75	95.4
No. 10	2	93.9
No. 40	0.425	88.7
No. 200	0.075	74.2
	0.02	46.0
	0.005	15.1
	0.002	6.6
estimated	0.001	5.4

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	4.6	6.1
Coarse Sand	1.5	5.2
Medium Sand	5.2	---
Fine Sand	14.5	14.5
Silt	59.1	67.6
Clay	15.1	6.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	---
Plastic Limit:	Non Plastic
Plasticity Index:	---
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.57

Classification

Unified Group Symbol:	ML
Group Name:	Silt with sand
AASHTO Classification:	A-4 (0)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-11, 30.0'-31.5', 31.5'-33.0', 33.0'-34.5'	Lab ID	726

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method:	ASTM D 422
Prepared using:	ASTM D 421
Particle Shape:	Angular
Particle Hardness:	Hard and Durable
Tested By:	RHB
Test Date:	09-09-2009
Date Received	09-03-2009

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	100.0
3/8"	97.6
No. 4	95.4
No. 10	93.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

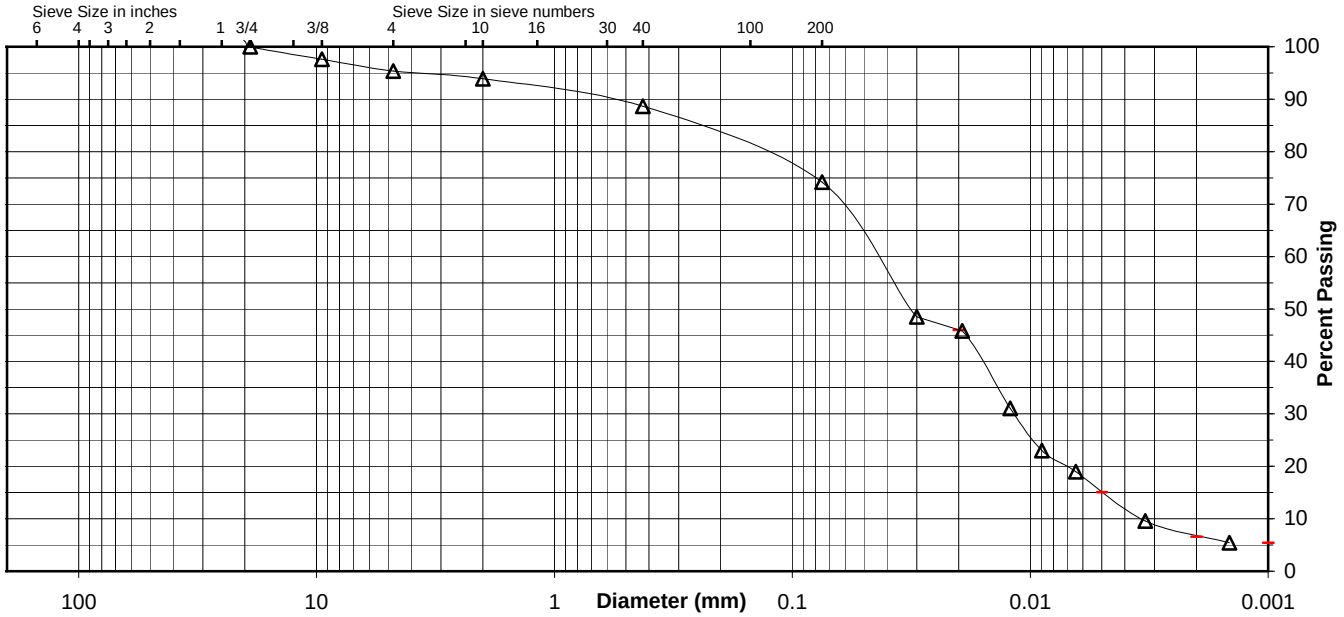
Specific Gravity 2.57

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	88.7
No. 200	74.2
0.02 mm	46.0
0.005 mm	15.1
0.002 mm	6.6
0.001 mm	5.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	4.6	1.5	5.2	14.5	59.1	15.1
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	6.1			5.2	14.5	67.6	6.6



Comments

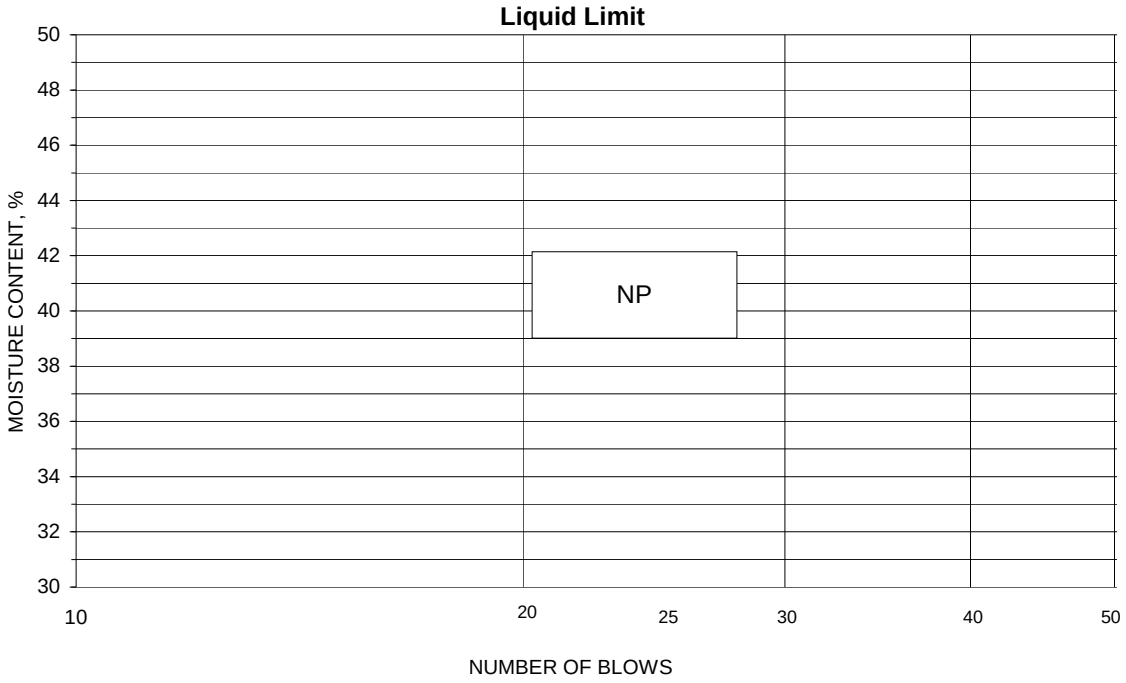
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-11, 30.0'-31.5', 31.5'-33.0', 33.0'-34.5'			Lab ID	726
				% + No. 40	11
Tested By	RHB	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-23-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-12, 4.5'-6.0', 6.0'-7.5', 7.5'-9.0'	Lab ID	730
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-23-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	100.0
3/8"	9.5	99.7
No. 4	4.75	97.5
No. 10	2	94.2
No. 40	0.425	92.0
No. 200	0.075	72.3
	0.02	51.9
	0.005	36.0
	0.002	31.7
estimated	0.001	28.2

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	2.5	5.8
Coarse Sand	3.3	2.2
Medium Sand	2.2	---
Fine Sand	19.7	19.7
Silt	36.3	40.6
Clay	36.0	31.7

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	42
Plastic Limit:	15
Plasticity Index:	27
Activity Index:	0.84

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.73

Classification

Unified Group Symbol: CL

Group Name: Lean clay with sand

AASHTO Classification: A-7-6 (17)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-12, 4.5'-6.0', 6.0'-7.5', 7.5'-9.0'	Lab ID	730

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded and Angular
Particle Hardness: Hard and Durable

Tested By: JMB
Test Date: 09-08-2009
Date Received 09-03-2009

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	100.0
3/8"	99.7
No. 4	97.5
No. 10	94.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

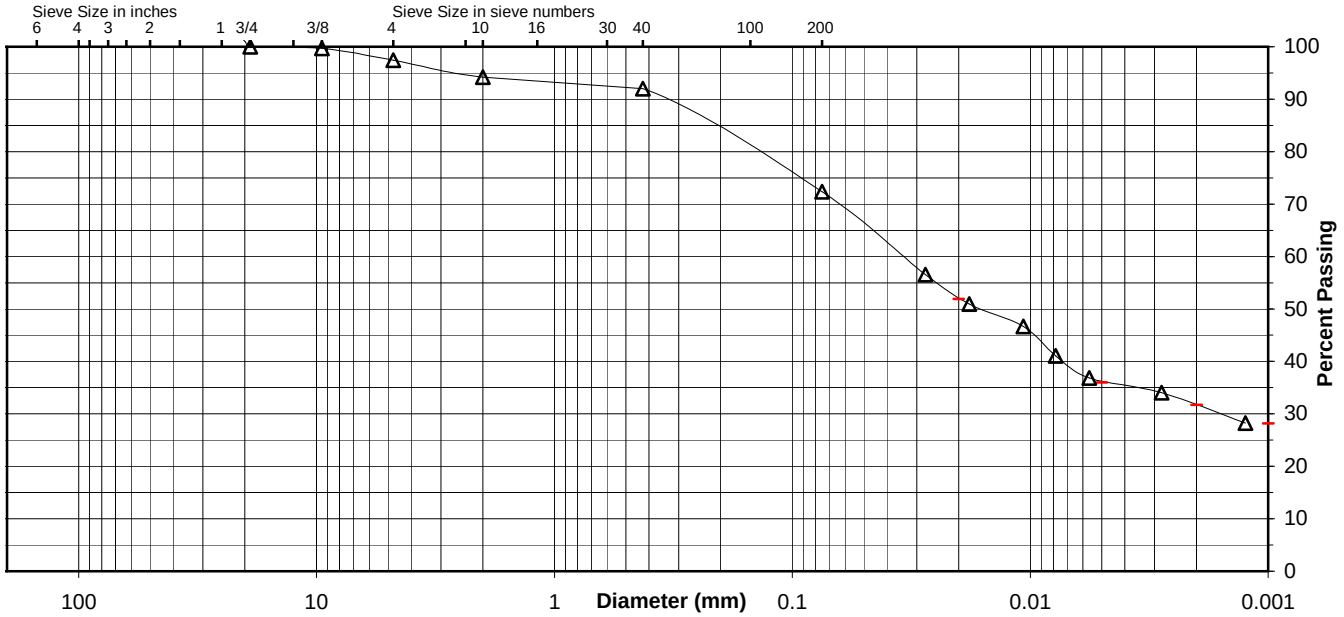
Specific Gravity 2.73

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	92.0
No. 200	72.3
0.02 mm	51.9
0.005 mm	36.0
0.002 mm	31.7
0.001 mm	28.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	2.5	3.3	2.2	19.7	36.3	36.0
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	5.8			2.2	19.7	40.6	31.7



Comments

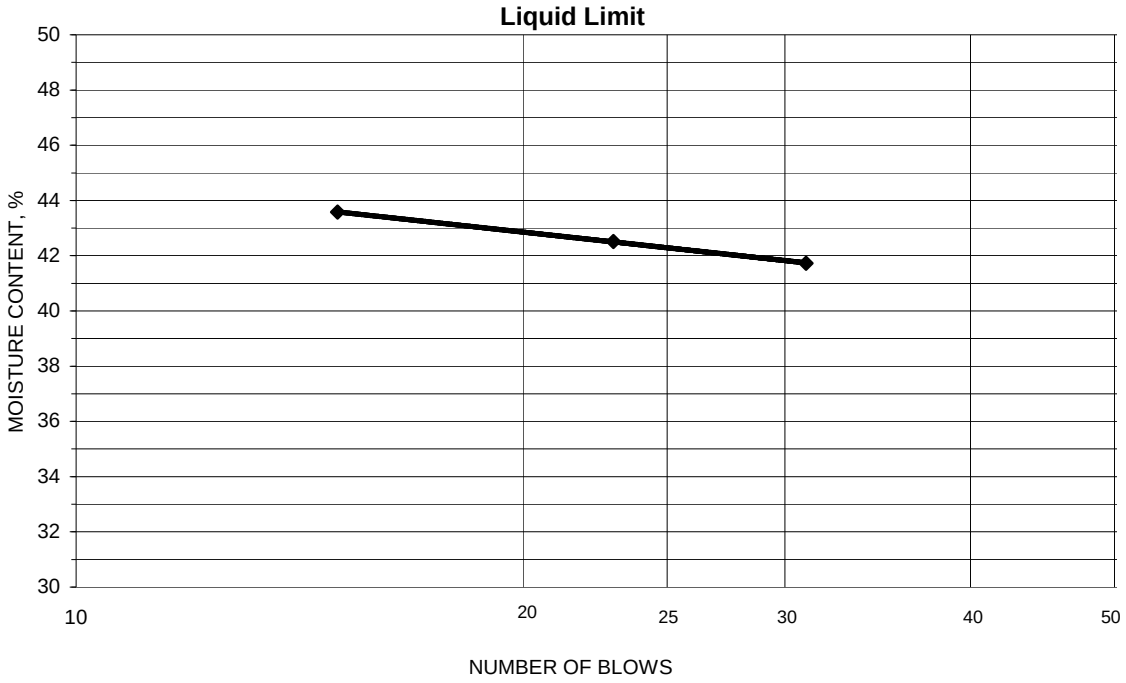
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-12, 4.5'-6.0', 6.0'-7.5', 7.5'-9.0'			Lab ID	730
				% + No. 40	8
Tested By	AR	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-11-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
13.68	10.93	4.34	31	41.7	
13.99	11.12	4.37	23	42.5	
13.71	10.86	4.32	15	43.6	42



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
10.30	9.52	4.29	14.9	15	27
10.29	9.51	4.39	15.2		

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-13, 9.0'-10.5', 10.5'-12.0', 12.0'-13.5'	Lab ID	734
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-29-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	
3/8"	9.5	
No. 4	4.75	
No. 10	2	100.0
No. 40	0.425	99.3
No. 200	0.075	48.9
	0.02	29.2
	0.005	18.1
	0.002	13.0
estimated	0.001	11.8

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.7
Medium Sand	0.7	---
Fine Sand	50.4	50.4
Silt	30.8	35.9
Clay	18.1	13.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	19
Plastic Limit:	15
Plasticity Index:	4
Activity Index:	0.31

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.71

Classification

Unified Group Symbol: SC-SM

Group Name: Silty, clayey sand

AASHTO Classification: A-4 (0)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-13, 9.0'-10.5', 10.5'-12.0', 12.0'-13.5'	Lab ID	734

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method:	ASTM D 422
Prepared using:	ASTM D 421
Particle Shape:	N/A
Particle Hardness:	N/A
Tested By:	JMB
Test Date:	09-12-2009
Date Received	09-03-2009

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	
3/8"	
No. 4	
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

Specific Gravity 2.71

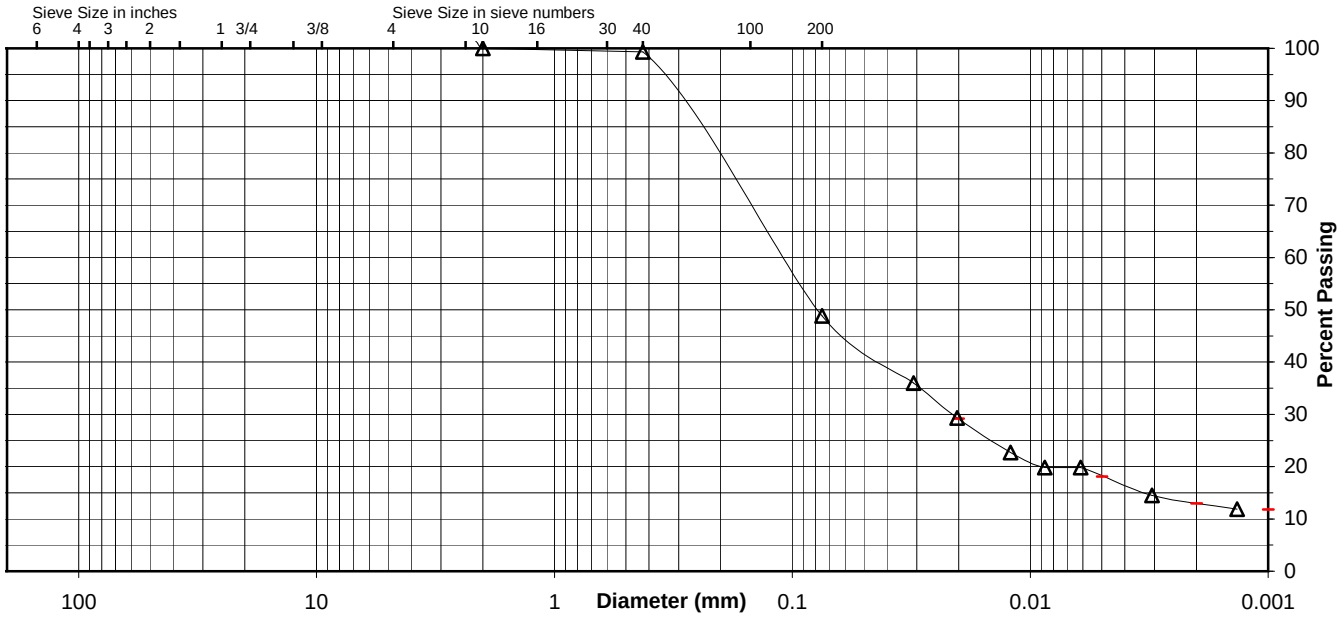
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	99.3
No. 200	48.9
0.02 mm	29.2
0.005 mm	18.1
0.002 mm	13.0
0.001 mm	11.8

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	0.7	50.4	30.8	18.1

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	0.7	50.4	35.9	13.0



Comments

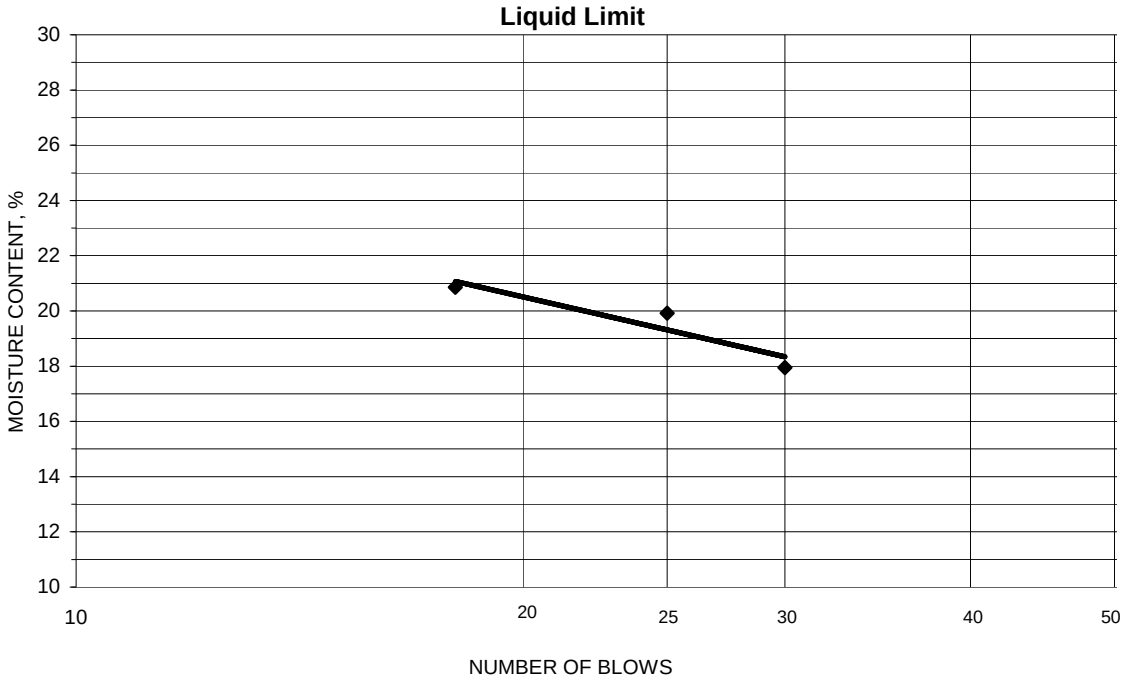
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-13, 9.0'-10.5', 10.5'-12.0', 12.0'-13.5'			Lab ID	734
				% + No. 40	1
Tested By	AR	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-23-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.70	15.67	4.36	30	17.9	
19.83	17.25	4.30	25	19.9	
17.10	14.90	4.35	18	20.9	19



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.80	16.76	9.77	14.9	15	4
17.24	16.12	8.83	15.4		

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-15, 9.0'-10.5', 10.5'-12.0', 12.0'-13.5'	Lab ID	738
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-30-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	100.0
3/4"	19	96.5
3/8"	9.5	96.5
No. 4	4.75	94.7
No. 10	2	91.3
No. 40	0.425	89.1
No. 200	0.075	74.7
	0.02	60.7
	0.005	43.9
	0.002	37.2
estimated	0.001	33.9

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	5.3	8.7
Coarse Sand	3.4	2.2
Medium Sand	2.2	---
Fine Sand	14.4	14.4
Silt	30.8	37.5
Clay	43.9	37.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	51
Plastic Limit:	19
Plasticity Index:	32
Activity Index:	0.86

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.73

Classification

Unified Group Symbol: CH

Group Name: Fat clay with sand

AASHTO Classification: A-7-6 (23)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-15, 9.0'-10.5', 10.5'-12.0', 12.0'-13.5'	Lab ID	738

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method:	ASTM D 422
Prepared using:	ASTM D 421
Particle Shape:	Rounded
Particle Hardness:	Hard and Durable
Tested By:	CLH
Test Date:	09-25-2009
Date Received	09-03-2009

Maximum Particle size: 1" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	100.0
3/4"	96.5
3/8"	96.5
No. 4	94.7
No. 10	91.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

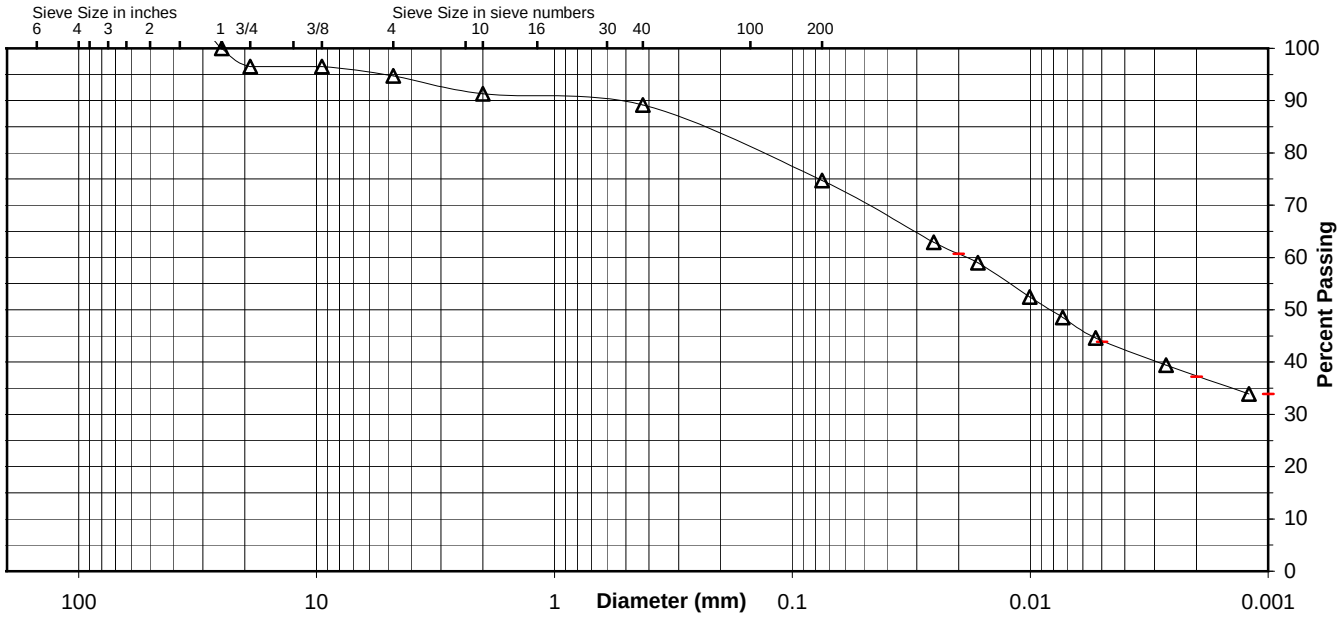
Specific Gravity 2.73

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	89.1
No. 200	74.7
0.02 mm	60.7
0.005 mm	43.9
0.002 mm	37.2
0.001 mm	33.9

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	3.5	1.8	3.4	2.2	14.4	30.8	43.9
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	8.7			2.2	14.4	37.5	37.2



Comments

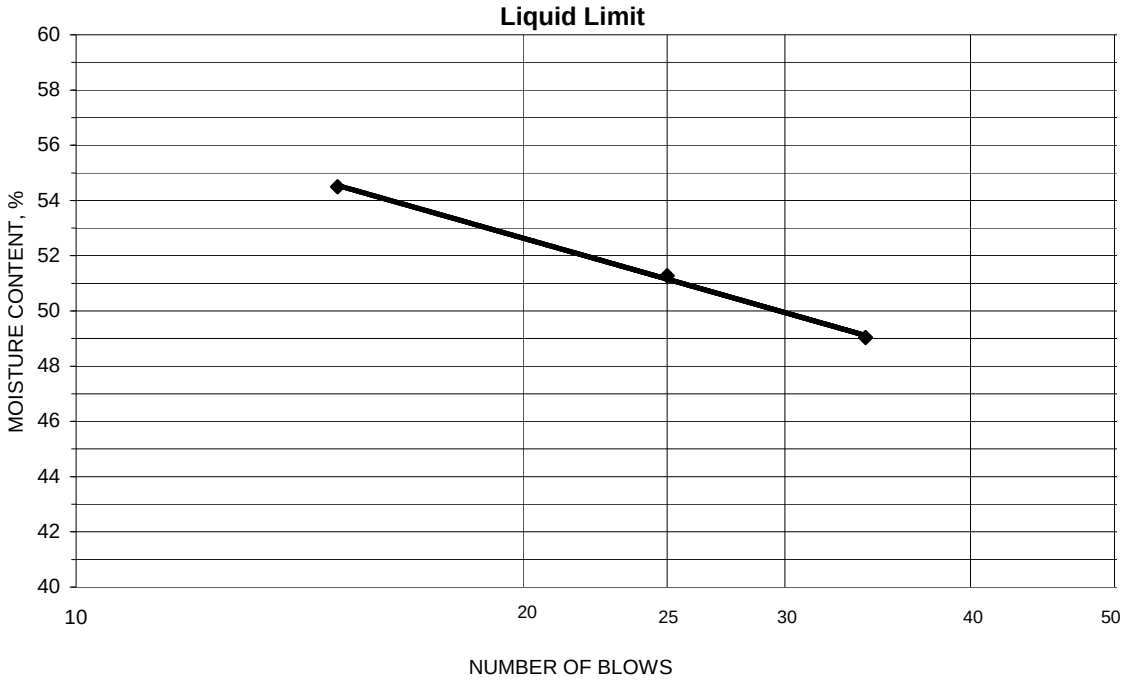
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-15, 9.0'-10.5', 10.5'-12.0', 12.0'-13.5'			Lab ID	738
				% + No. 40	11
Tested By	JMB	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-28-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
12.81	10.02	4.33	34	49.0	
11.42	9.01	4.31	25	51.3	
13.10	10.01	4.34	15	54.5	51



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
10.66	9.66	4.35	18.8	19	32
10.90	9.87	4.32	18.6		

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-15, 43.5'-45.0', 45.0'-46.5', 46.5'-48.0'	Lab ID	742
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-25-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	
3/8"	9.5	100.0
No. 4	4.75	98.4
No. 10	2	90.5
No. 40	0.425	86.0
No. 200	0.075	64.3
	0.02	43.5
	0.005	28.5
	0.002	23.9
estimated	0.001	23.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	1.6	9.5
Coarse Sand	7.9	4.5
Medium Sand	4.5	---
Fine Sand	21.7	21.7
Silt	35.8	40.4
Clay	28.5	23.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	34
Plastic Limit:	12
Plasticity Index:	22
Activity Index:	0.92

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.71

Classification

Unified Group Symbol:	CL
Group Name:	Sandy lean clay
AASHTO Classification:	A-6 (11)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-15, 43.5'-45.0', 45.0'-46.5', 46.5'-48.0'	Lab ID	742

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded
Particle Hardness: Hard and Durable

Tested By: CLH
Test Date: 09-14-2009
Date Received 09-03-2009

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	
3/8"	100.0
No. 4	98.4
No. 10	90.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

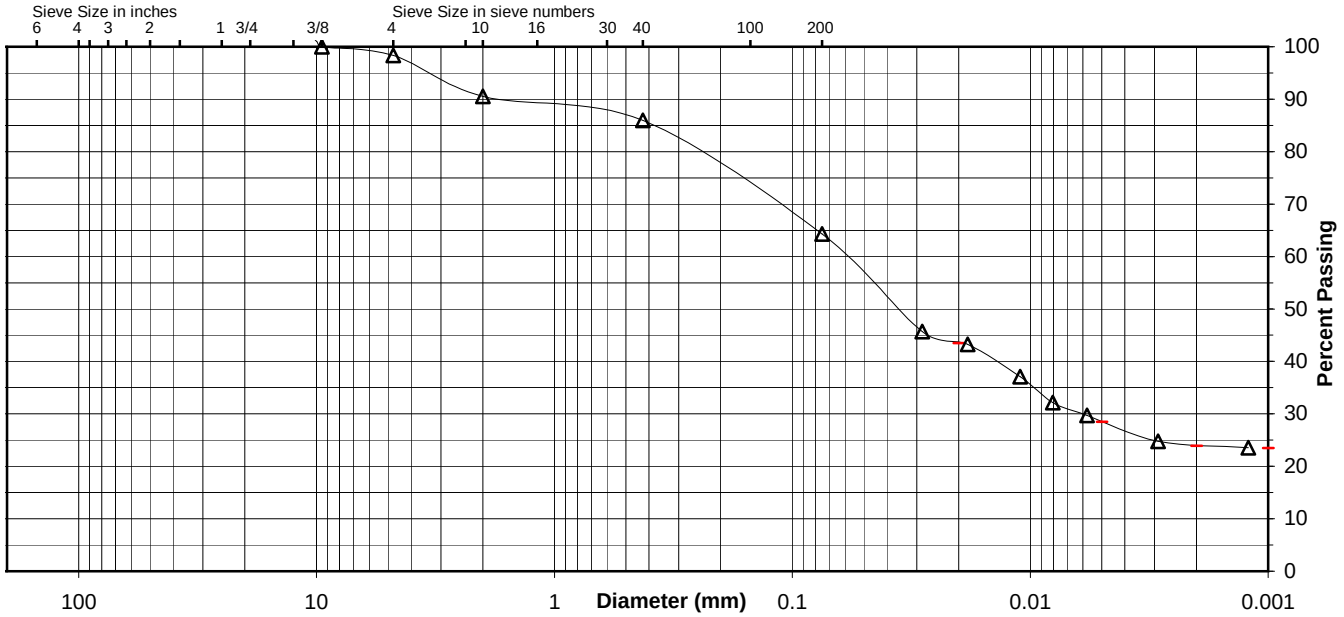
Specific Gravity 2.71

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	86.0
No. 200	64.3
0.02 mm	43.5
0.005 mm	28.5
0.002 mm	23.9
0.001 mm	23.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	1.6	7.9	4.5	21.7	35.8	28.5
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	9.5			4.5	21.7	40.4	23.9



Comments

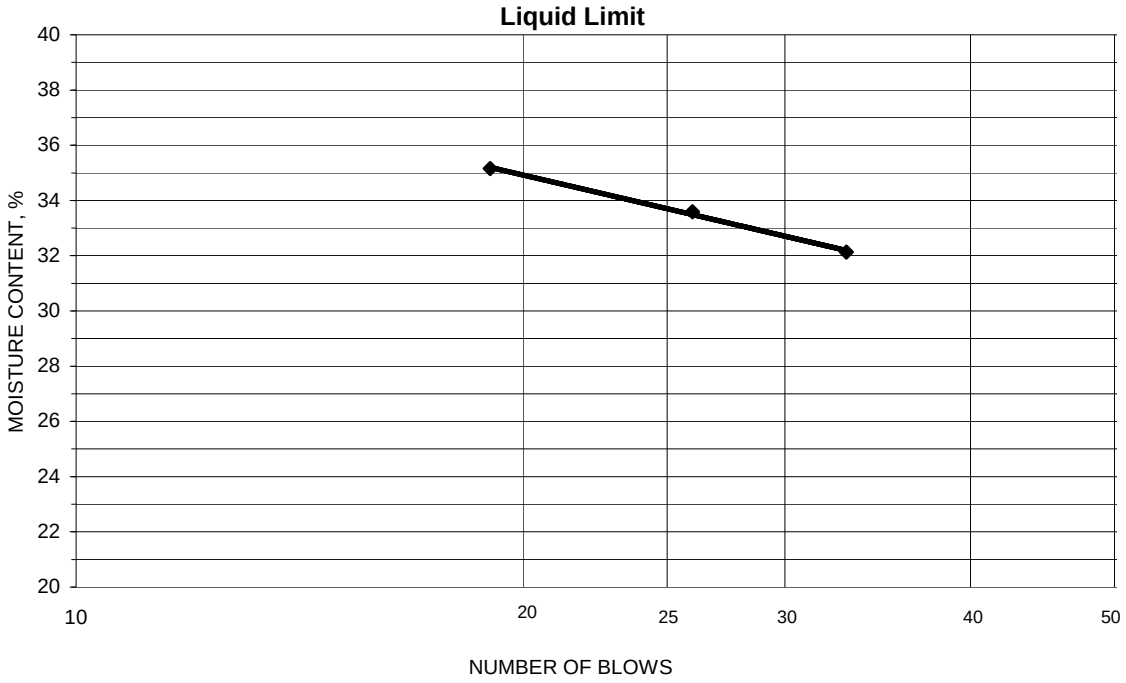
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-15, 43.5'-45.0', 45.0'-46.5', 46.5'-48.0'			Lab ID	742
				% + No. 40	14
Tested By	JMB	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-24-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
10.91	9.31	4.33	33	32.1	
12.91	10.76	4.36	26	33.6	
13.99	11.48	4.34	19	35.2	34



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
9.89	9.28	4.33	12.3	12	22
9.47	8.90	4.33	12.5		

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-16, 4.5'-6.0', 6.0'-7.5', 7.5'-9.0'	Lab ID	746
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-23-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	100.0
3/8"	9.5	97.8
No. 4	4.75	95.1
No. 10	2	89.2
No. 40	0.425	87.1
No. 200	0.075	63.9
	0.02	45.9
	0.005	32.6
	0.002	27.5
estimated	0.001	25.2

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	4.9	10.8
Coarse Sand	5.9	2.1
Medium Sand	2.1	---
Fine Sand	23.2	23.2
Silt	31.3	36.4
Clay	32.6	27.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	45
Plastic Limit:	16
Plasticity Index:	29
Activity Index:	1.04

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.78

Classification

Unified Group Symbol: CL

Group Name: Sandy lean clay

AASHTO Classification: A-7-6 (16)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-16, 4.5'-6.0', 6.0'-7.5', 7.5'-9.0'	Lab ID	746

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method:	ASTM D 422
Prepared using:	ASTM D 421
Particle Shape:	Angular
Particle Hardness:	Hard and Durable
Tested By:	JMB
Test Date:	09-09-2009
Date Received	09-03-2009

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	100.0
3/8"	97.8
No. 4	95.1
No. 10	89.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

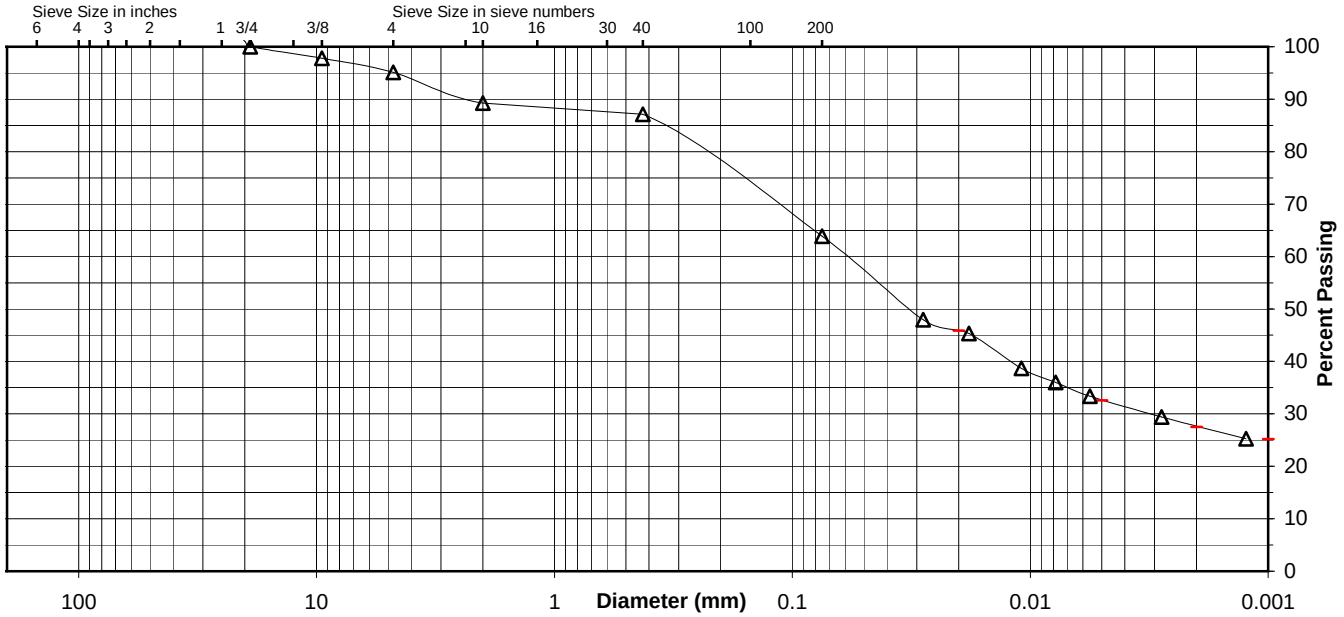
Specific Gravity 2.78

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	87.1
No. 200	63.9
0.02 mm	45.9
0.005 mm	32.6
0.002 mm	27.5
0.001 mm	25.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	4.9	5.9	2.1	23.2	31.3	32.6
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	10.8			2.1	23.2	36.4	27.5



Comments

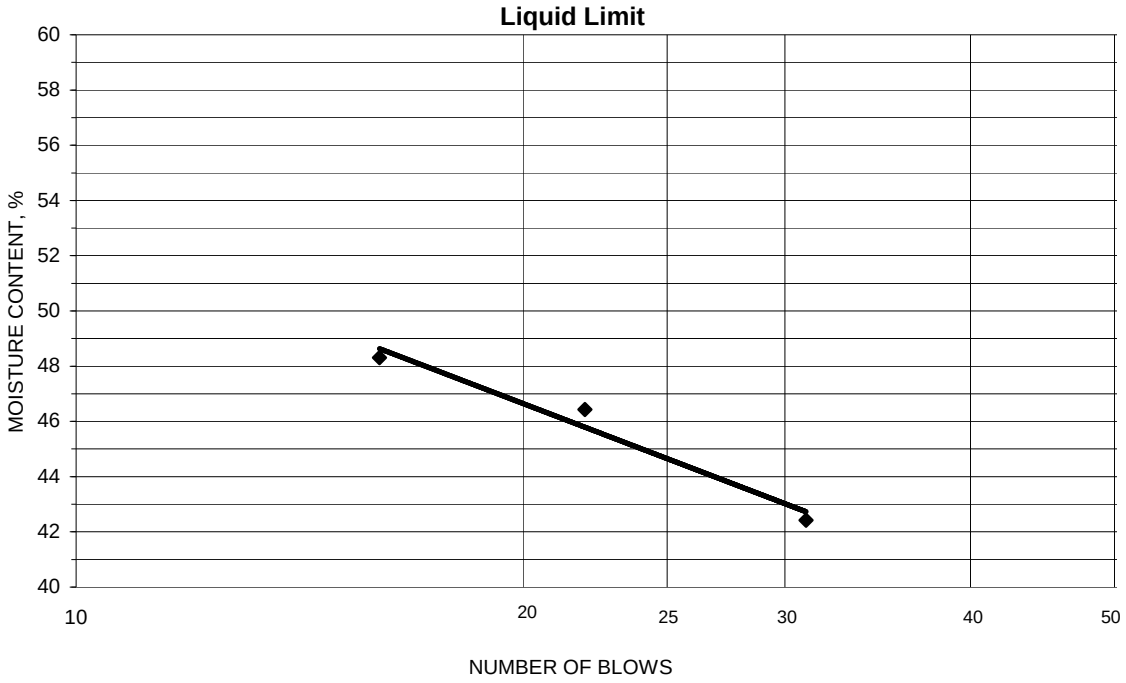
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-16, 4.5'-6.0', 6.0'-7.5', 7.5'-9.0'			Lab ID	746
				% + No. 40	13
Tested By	AR	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-10-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
25.46	19.91	8.42	16	48.3	
23.81	19.50	9.34	31	42.4	
22.06	18.02	9.32	22	46.4	45



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
19.33	18.07	10.18	16.0	16	29
19.19	18.04	10.69	15.6		

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-17, 28.5'-30.0', 30.0'-31.5', 31.5'-33.0'	Lab ID	750
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-25-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	100.0
3/8"	9.5	99.5
No. 4	4.75	99.3
No. 10	2	97.9
No. 40	0.425	97.8
No. 200	0.075	61.2
	0.02	16.0
	0.005	4.0
	0.002	1.2
estimated	0.001	0.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.7	2.1
Coarse Sand	1.4	0.1
Medium Sand	0.1	---
Fine Sand	36.6	36.6
Silt	57.2	60.0
Clay	4.0	1.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	---
Plastic Limit:	Non Plastic
Plasticity Index:	---
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.30

Classification

Unified Group Symbol:	ML
Group Name:	Sandy silt
AASHTO Classification:	A-4 (0)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-17, 28.5'-30.0', 30.0'-31.5', 31.5'-33.0'	Lab ID	750

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: AR
Test Date: 09-11-2009
Date Received 09-03-2009

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	100.0
3/8"	99.5
No. 4	99.3
No. 10	97.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

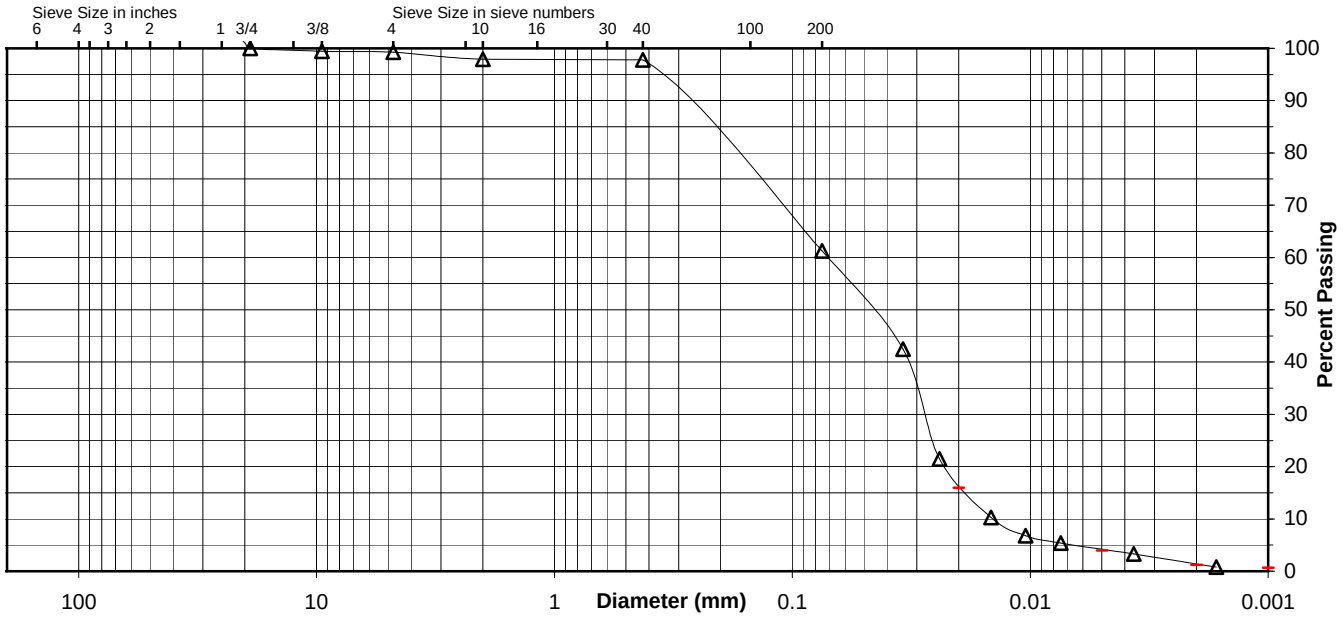
Specific Gravity 2.3

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	97.8
No. 200	61.2
0.02 mm	16.0
0.005 mm	4.0
0.002 mm	1.2
0.001 mm	0.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.7	1.4	0.1	36.6	57.2	4.0
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	2.1			0.1	36.6	60.0	1.2



Comments

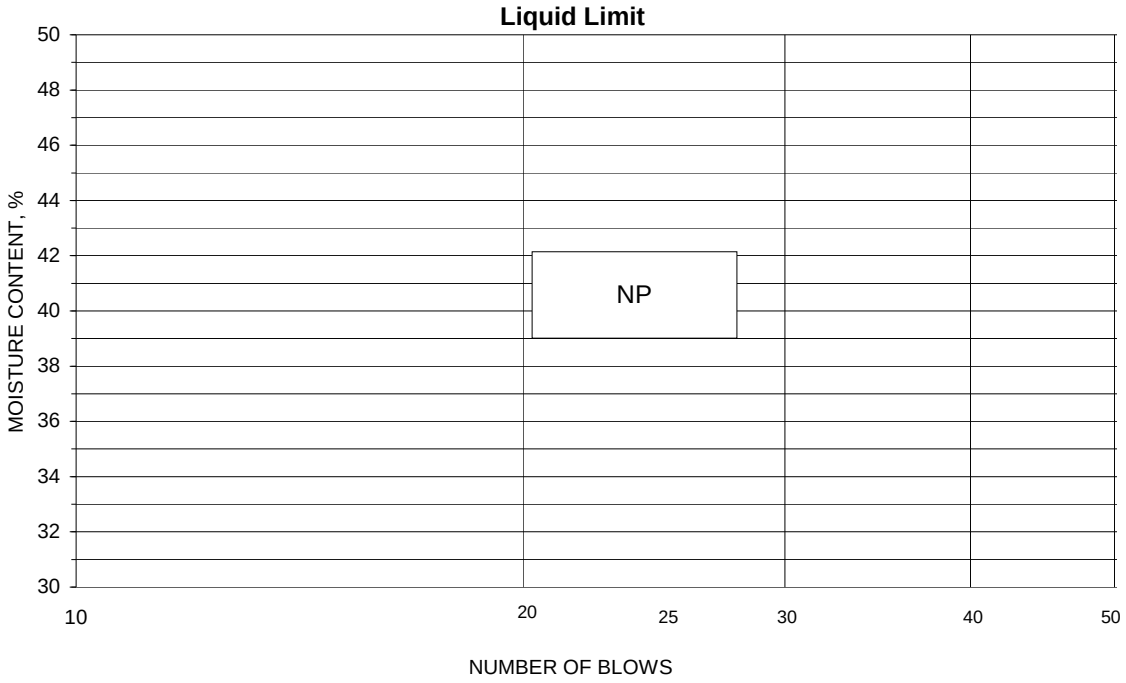
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-17, 28.5'-30.0', 30.0'-31.5', 31.5'-33.0'			Lab ID	750
				% + No. 40	2
Tested By	RHB	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-25-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-19, 15.0'-16.5', 16.5'-18.0', 18.0'-19.5'	Lab ID	754
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-25-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	
3/8"	9.5	
No. 4	4.75	
No. 10	2	100.0
No. 40	0.425	98.6
No. 200	0.075	82.8
	0.02	65.4
	0.005	40.5
	0.002	34.3
estimated	0.001	31.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	1.4
Medium Sand	1.4	---
Fine Sand	15.8	15.8
Silt	42.3	48.5
Clay	40.5	34.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	37
Plastic Limit:	15
Plasticity Index:	22
Activity Index:	0.65

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.73

Classification

Unified Group Symbol: CL

Group Name: Lean clay with sand

AASHTO Classification: A-6 (17)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-19, 15.0'-16.5', 16.5'-18.0', 18.0'-19.5'	Lab ID	754

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method:	ASTM D 422
Prepared using:	ASTM D 421
Particle Shape:	N/A
Particle Hardness:	N/A
Tested By:	JMB
Test Date:	09-11-2009
Date Received	09-03-2009

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	
3/8"	
No. 4	
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

Specific Gravity 2.73

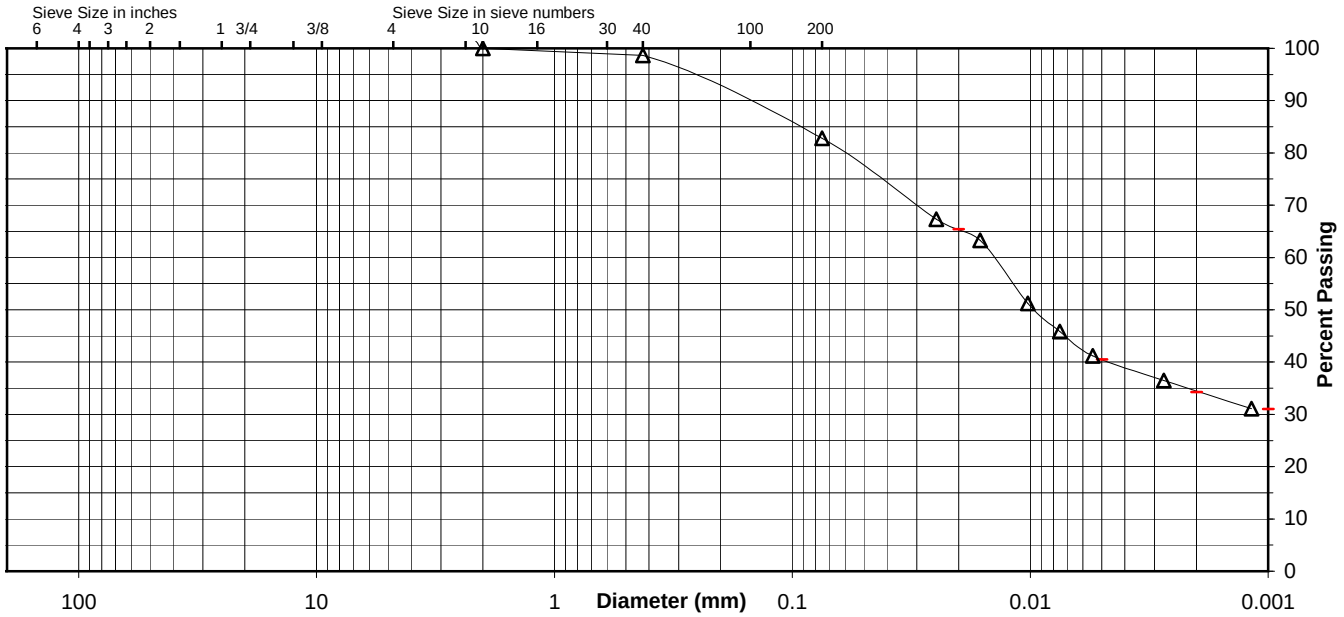
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	98.6
No. 200	82.8
0.02 mm	65.4
0.005 mm	40.5
0.002 mm	34.3
0.001 mm	31.0

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	1.4	15.8	42.3	40.5

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	1.4	15.8	48.5	34.3



Comments

Reviewed By RHB

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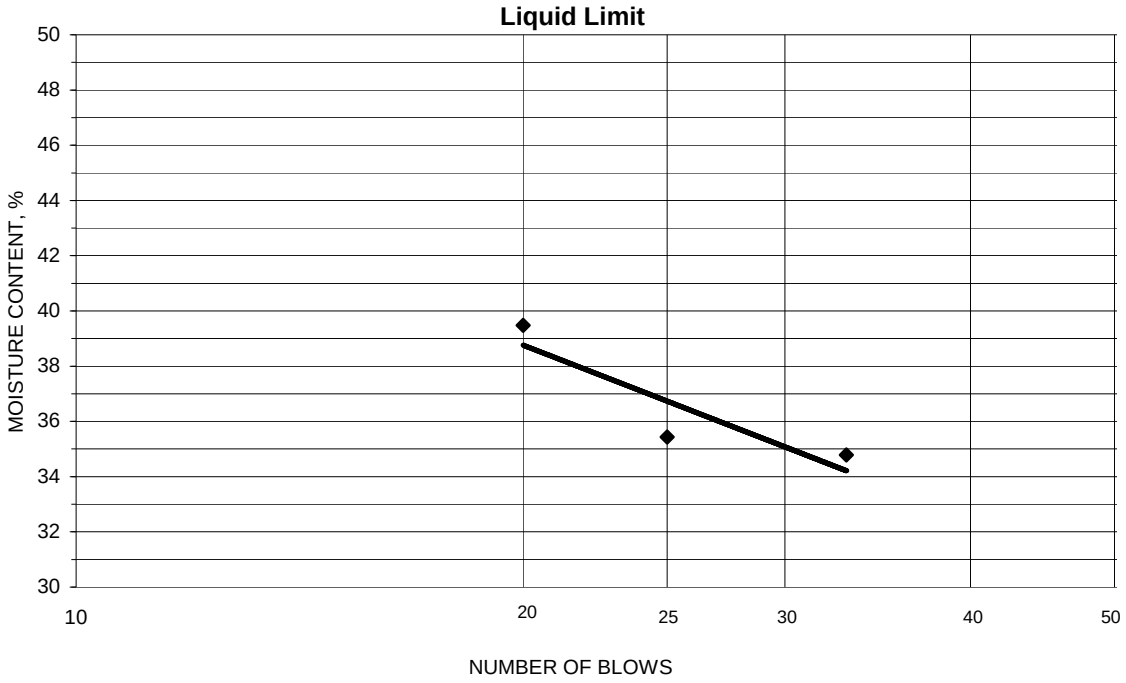
ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-19, 15.0'-16.5', 16.5'-18.0', 18.0'-19.5'			Lab ID	754
				% + No. 40	1
Tested By	CLH	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-22-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
13.59	11.20	4.33	33	34.8	
13.12	10.82	4.33	25	35.4	
12.90	10.48	4.35	20	39.5	37



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
10.16	9.38	4.36	15.5	15	22
9.94	9.19	4.33	15.4		

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-20, 12.0'-13.5', 13.5'-15.0', 15.0'-16.5'	Lab ID	758
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-23-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	100.0
3/8"	9.5	93.3
No. 4	4.75	85.6
No. 10	2	74.9
No. 40	0.425	48.6
No. 200	0.075	18.0
	0.02	6.5
	0.005	2.4
	0.002	2.0
estimated	0.001	1.8

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	14.4	25.1
Coarse Sand	10.7	26.3
Medium Sand	26.3	---
Fine Sand	30.6	30.6
Silt	15.6	16.0
Clay	2.4	2.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	---
Plastic Limit:	Non Plastic
Plasticity Index:	---
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.45

Classification

Unified Group Symbol:	SM
Group Name:	Silty sand
AASHTO Classification:	A-1-b (0)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-20, 12.0'-13.5', 13.5'-15.0', 15.0'-16.5'	Lab ID	758

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: RHB
Test Date: 09-09-2009
Date Received 09-03-2009

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	100.0
3/8"	93.3
No. 4	85.6
No. 10	74.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

Specific Gravity 2.45

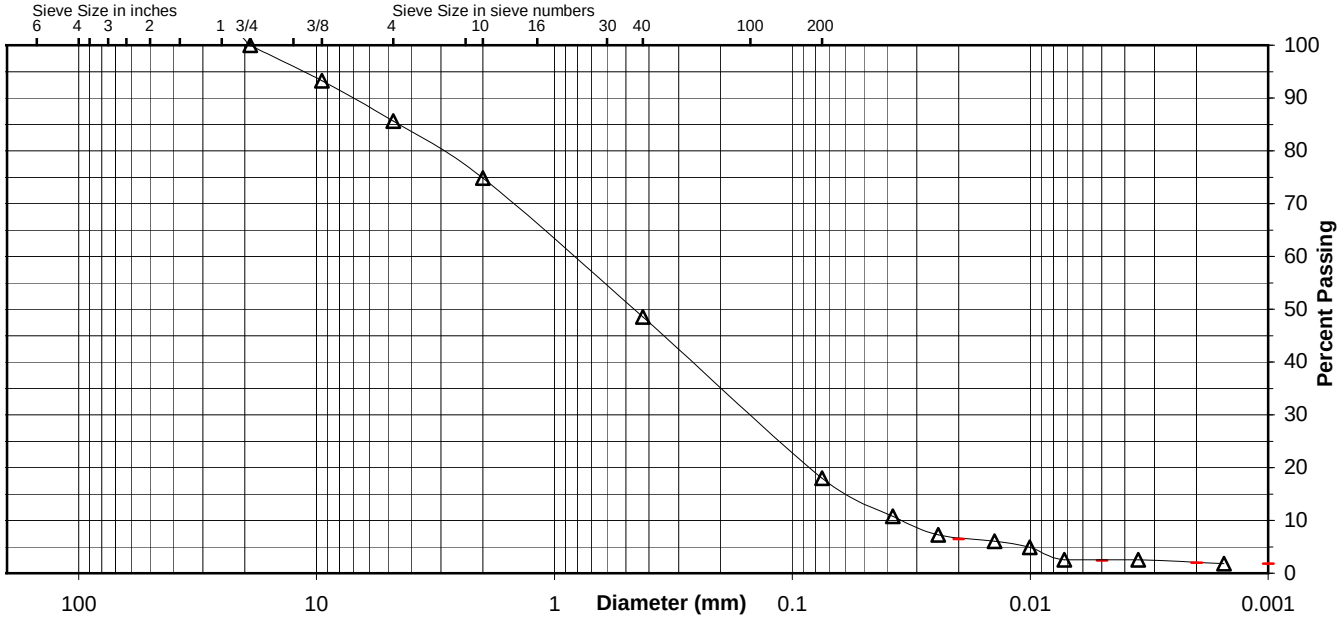
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	48.6
No. 200	18.0
0.02 mm	6.5
0.005 mm	2.4
0.002 mm	2.0
0.001 mm	1.8

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	14.4	10.7	26.3	30.6	15.6	2.4

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	25.1	26.3	30.6	16.0	2.0



Comments

Reviewed By RHB

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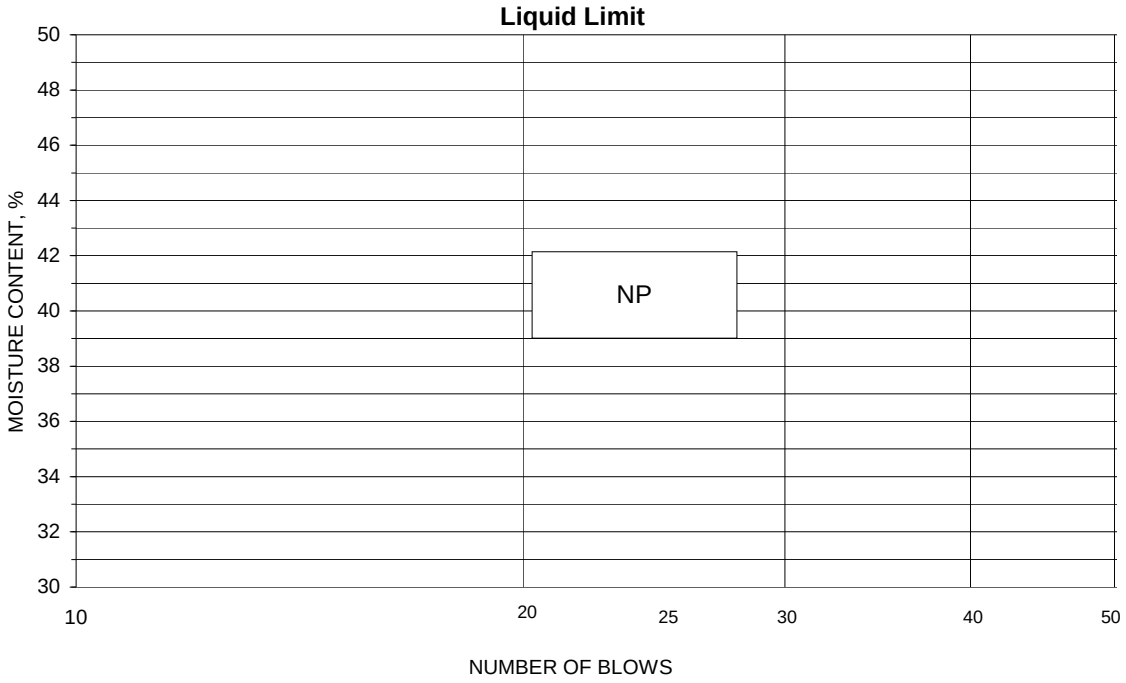
ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-20, 12.0'-13.5', 13.5'-15.0', 15.0'-16.5'			Lab ID	758
				% + No. 40	51
Tested By	RHB	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-23-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-22, 4.5'-6.0', 6.0'-7.5', 7.5'-9.0'	Lab ID	762
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-29-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	
3/8"	9.5	
No. 4	4.75	100.0
No. 10	2	99.9
No. 40	0.425	97.7
No. 200	0.075	80.2
	0.02	62.5
	0.005	37.7
	0.002	30.2
estimated	0.001	27.2

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.1
Coarse Sand	0.1	2.2
Medium Sand	2.2	---
Fine Sand	17.5	17.5
Silt	42.5	50.0
Clay	37.7	30.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	35
Plastic Limit:	13
Plasticity Index:	22
Activity Index:	0.73

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.75

Classification

Unified Group Symbol: CL

Group Name: Lean clay with sand

AASHTO Classification: A-6 (16)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-22, 4.5'-6.0', 6.0'-7.5', 7.5'-9.0'	Lab ID	762

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method:	ASTM D 422
Prepared using:	ASTM D 421
Particle Shape:	Rounded
Particle Hardness:	Hard and Durable
Tested By:	CLH
Test Date:	09-21-2009
Date Received	09-03-2009

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	
3/8"	
No. 4	100.0
No. 10	99.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

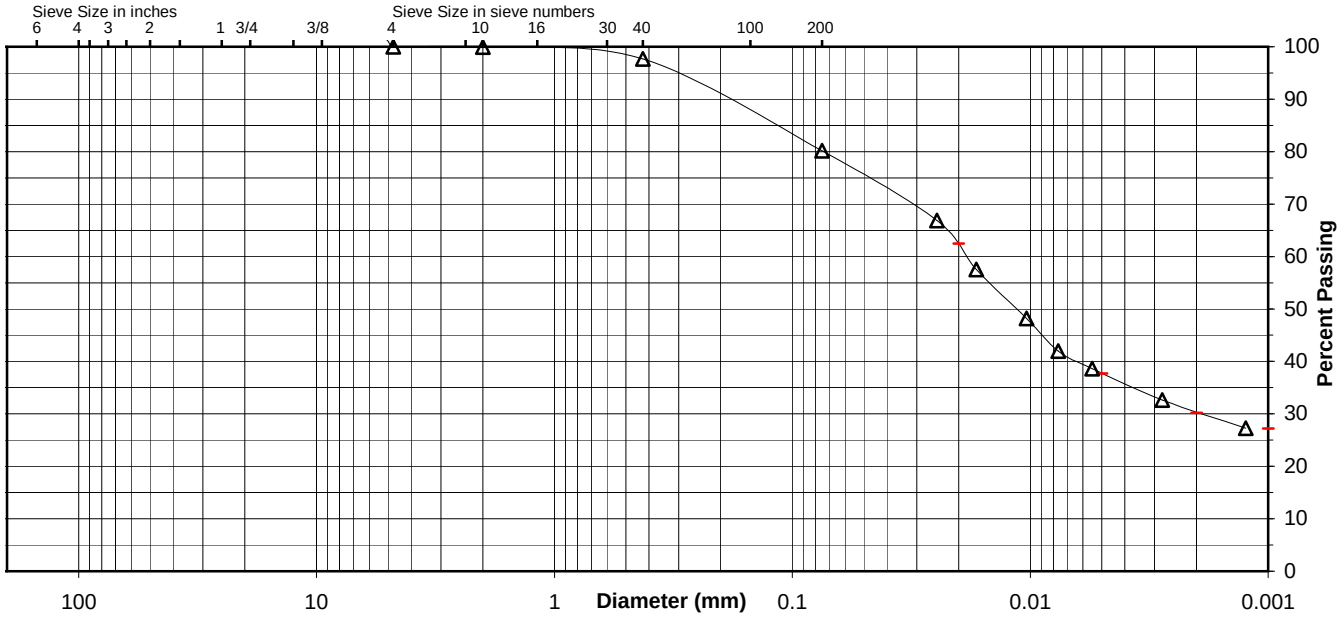
Specific Gravity 2.75

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	97.7
No. 200	80.2
0.02 mm	62.5
0.005 mm	37.7
0.002 mm	30.2
0.001 mm	27.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.1	2.2	17.5	42.5	37.7
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.1			2.2	17.5	50.0	30.2



Comments

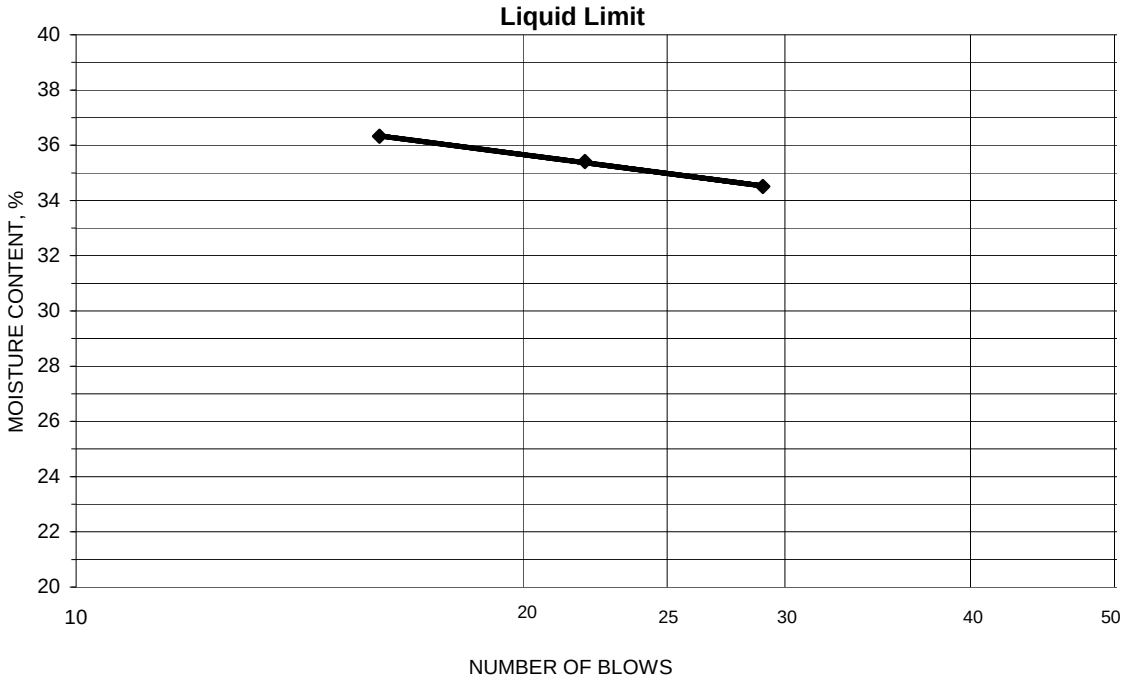
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-22, 4.5'-6.0', 6.0'-7.5', 7.5'-9.0'			Lab ID	762
				% + No. 40	2
Tested By	CLH	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-24-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
15.40	12.56	4.33	29	34.5	
17.19	13.83	4.34	22	35.4	
16.50	13.26	4.34	16	36.3	35



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
9.52	8.91	4.35	13.4	13	22
9.45	8.84	4.35	13.6		

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-23, 6.0'-7.5', 7.5'-9.0', 9.0'-10.5'	Lab ID	766
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-24-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	100.0
3/8"	9.5	95.7
No. 4	4.75	95.3
No. 10	2	94.8
No. 40	0.425	93.1
No. 200	0.075	77.3
	0.02	60.6
	0.005	37.0
	0.002	31.5
estimated	0.001	29.4

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	4.7	5.2
Coarse Sand	0.5	1.7
Medium Sand	1.7	---
Fine Sand	15.8	15.8
Silt	40.3	45.8
Clay	37.0	31.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	45
Plastic Limit:	20
Plasticity Index:	25
Activity Index:	0.78

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.75

Classification

Unified Group Symbol: CL

Group Name: Lean clay with sand

AASHTO Classification: A-7-6 (19)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-23, 6.0'-7.5', 7.5'-9.0', 9.0'-10.5'	Lab ID	766

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded and Angular
Particle Hardness: Hard and Durable

Tested By: RHB
Test Date: 09-10-2009
Date Received 09-03-2009

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	100.0
3/8"	95.7
No. 4	95.3
No. 10	94.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

Specific Gravity 2.75

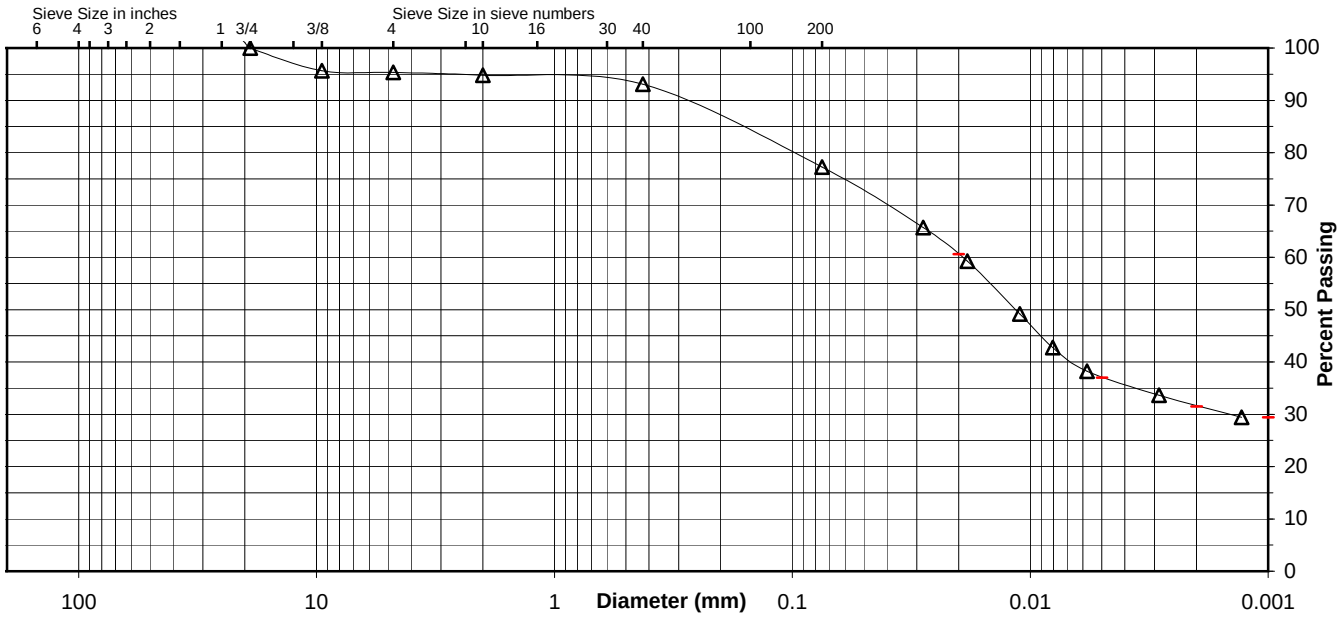
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	93.1
No. 200	77.3
0.02 mm	60.6
0.005 mm	37.0
0.002 mm	31.5
0.001 mm	29.4

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	4.7	0.5	1.7	15.8	40.3	37.0

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	5.2	1.7	15.8	45.8	31.5



Comments

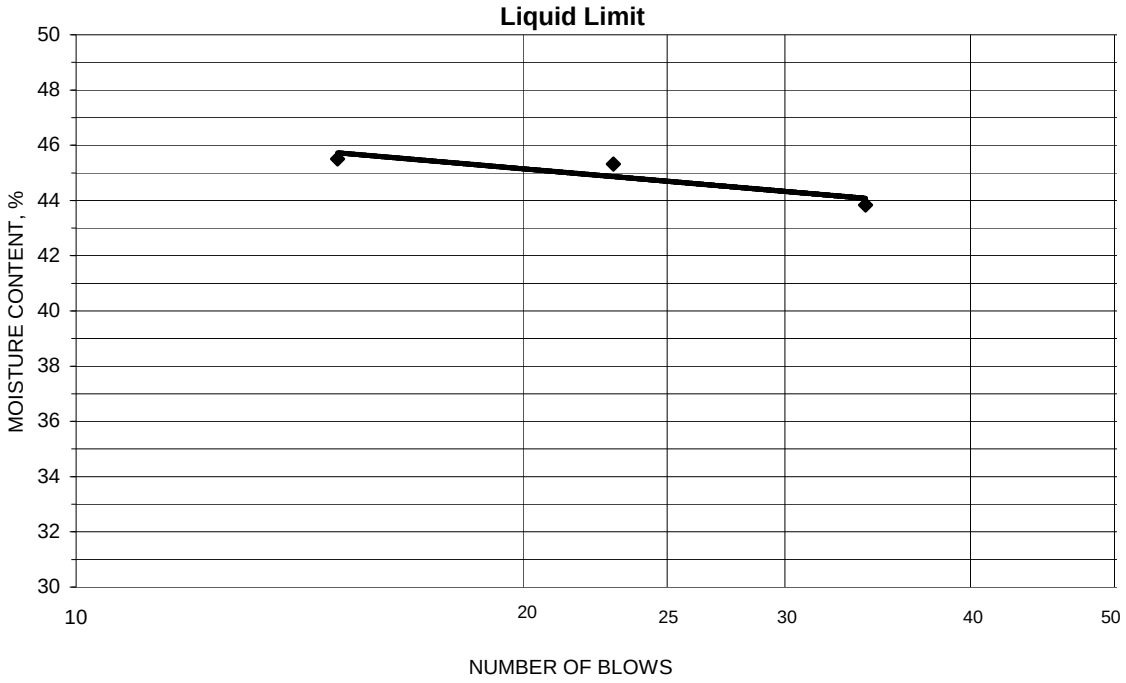
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-23, 6.0'-7.5', 7.5'-9.0', 9.0'-10.5'			Lab ID	766
				% + No. 40	7
Tested By	RHB	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-11-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
15.43	12.05	4.34	34	43.8	
14.30	11.20	4.36	23	45.3	
14.20	11.11	4.32	15	45.5	45



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
10.15	9.20	4.35	19.6	20	25
10.28	9.30	4.35	19.8		

Remarks:

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-24, 9.0'-10.5', 10.5'-12.0', 12.0'-13.5'	Lab ID	770
County	Colbert	Date Received	9-3-09
Sample Type	SPT Comp	Date Reported	9-25-09

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	
3/8"	9.5	
No. 4	4.75	100.0
No. 10	2	99.9
No. 40	0.425	98.0
No. 200	0.075	81.4
	0.02	63.2
	0.005	39.0
	0.002	33.8
estimated	0.001	32.2

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.1
Coarse Sand	0.1	1.9
Medium Sand	1.9	---
Fine Sand	16.6	16.6
Silt	42.4	47.6
Clay	39.0	33.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	39
Plastic Limit:	14
Plasticity Index:	25
Activity Index:	0.74

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay with sand
AASHTO Classification:	A-6 (19)

Comments:

Particle-Size Analysis of Soils
ASTM D 422

Project Name	Colbert Fossil Plant (COF) - Ash Pond 4	Project Number	175559016
Source	STN-4-24, 9.0'-10.5', 10.5'-12.0', 12.0'-13.5'	Lab ID	770

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method:	ASTM D 422
Prepared using:	ASTM D 421
Particle Shape:	Angular
Particle Hardness:	Hard and Durable
Tested By:	JMB
Test Date:	09-12-2009
Date Received	09-03-2009

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	
3/8"	
No. 4	100.0
No. 10	99.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

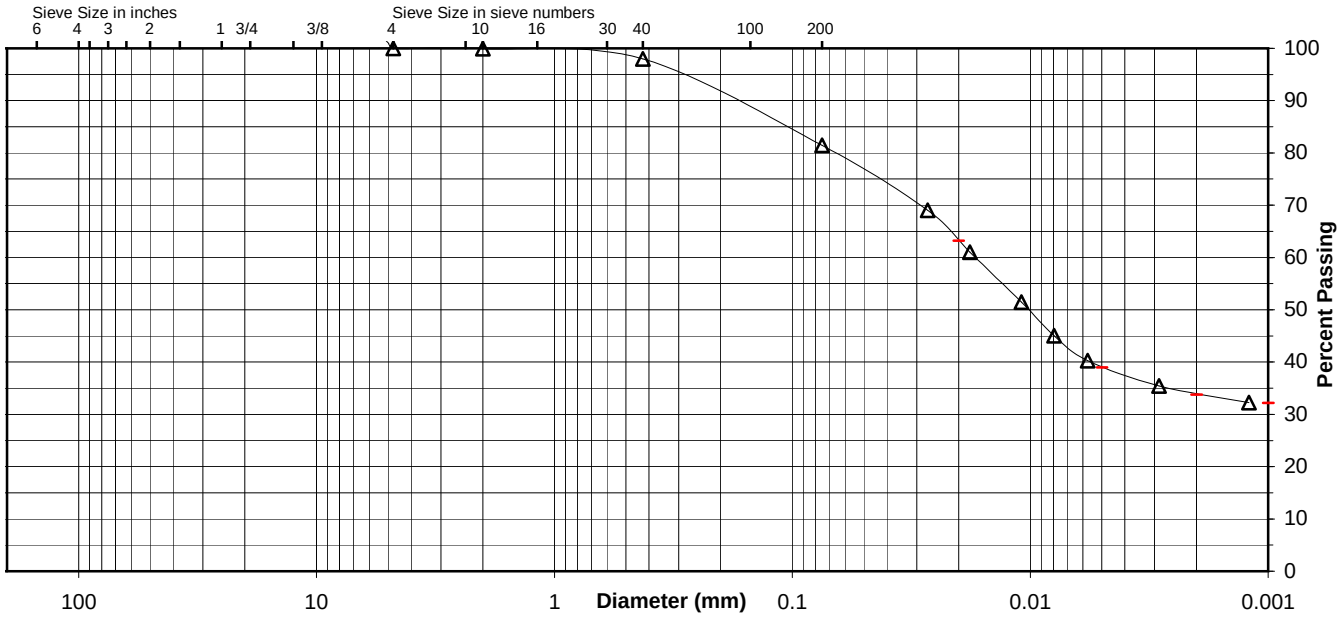
Specific Gravity 2.7

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	98.0
No. 200	81.4
0.02 mm	63.2
0.005 mm	39.0
0.002 mm	33.8
0.001 mm	32.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.1	1.9	16.6	42.4	39.0
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.1			1.9	16.6	47.6	33.8



Comments

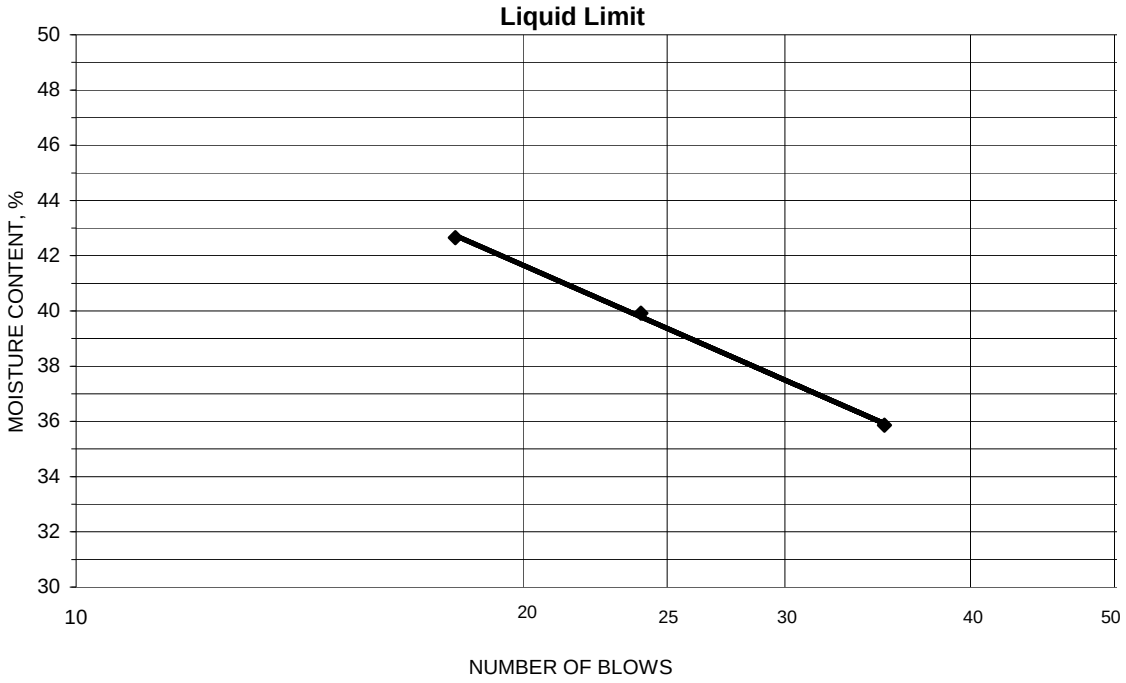
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	Colbert Fossil Plant (COF) - Ash Pond 4			Project No.	175559016
Source	STN-4-24, 9.0'-10.5', 10.5'-12.0', 12.0'-13.5'			Lab ID	770
				% + No. 40	2
Tested By	CLH	Test Method	ASTM D 4318 Method A	Date Received	09-03-2009
Test Date	09-21-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
13.27	10.91	4.33	35	35.9	
14.14	11.35	4.36	24	39.9	
13.61	10.85	4.38	18	42.7	39



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
10.29	9.55	4.31	14.1	14	25
10.45	9.70	4.37	14.1		

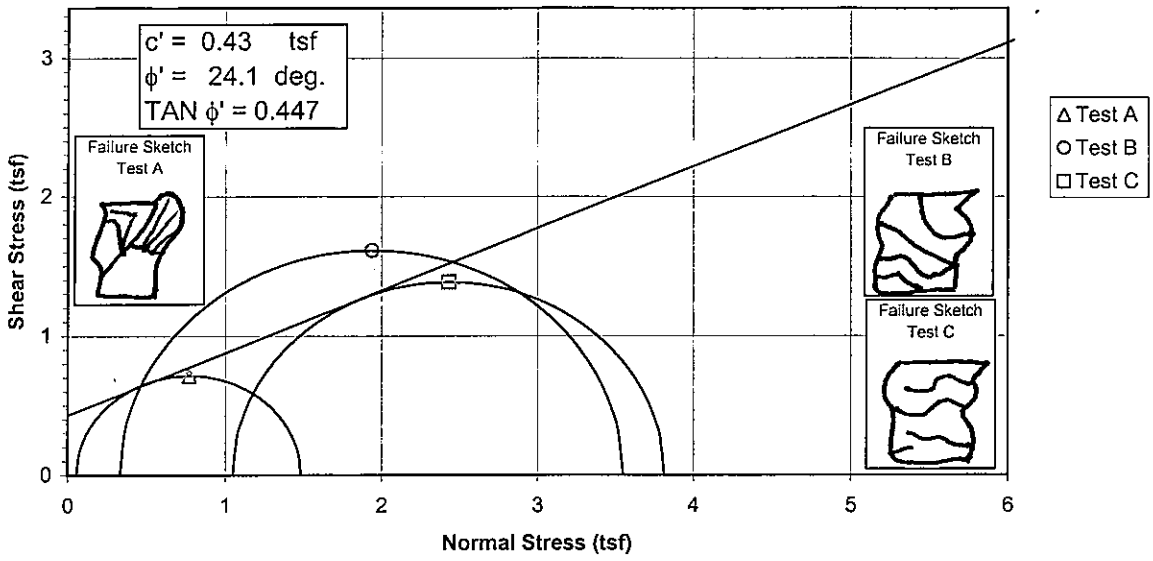
Remarks:

Reviewed By RHB

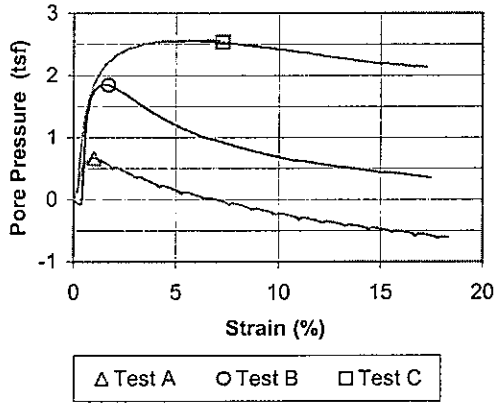
EM 1110-2-1906
Appendix X
30 Nov. 70

Failure Criterion: Maximum Effective Principal Stress Ratio

Effective Strength Envelope



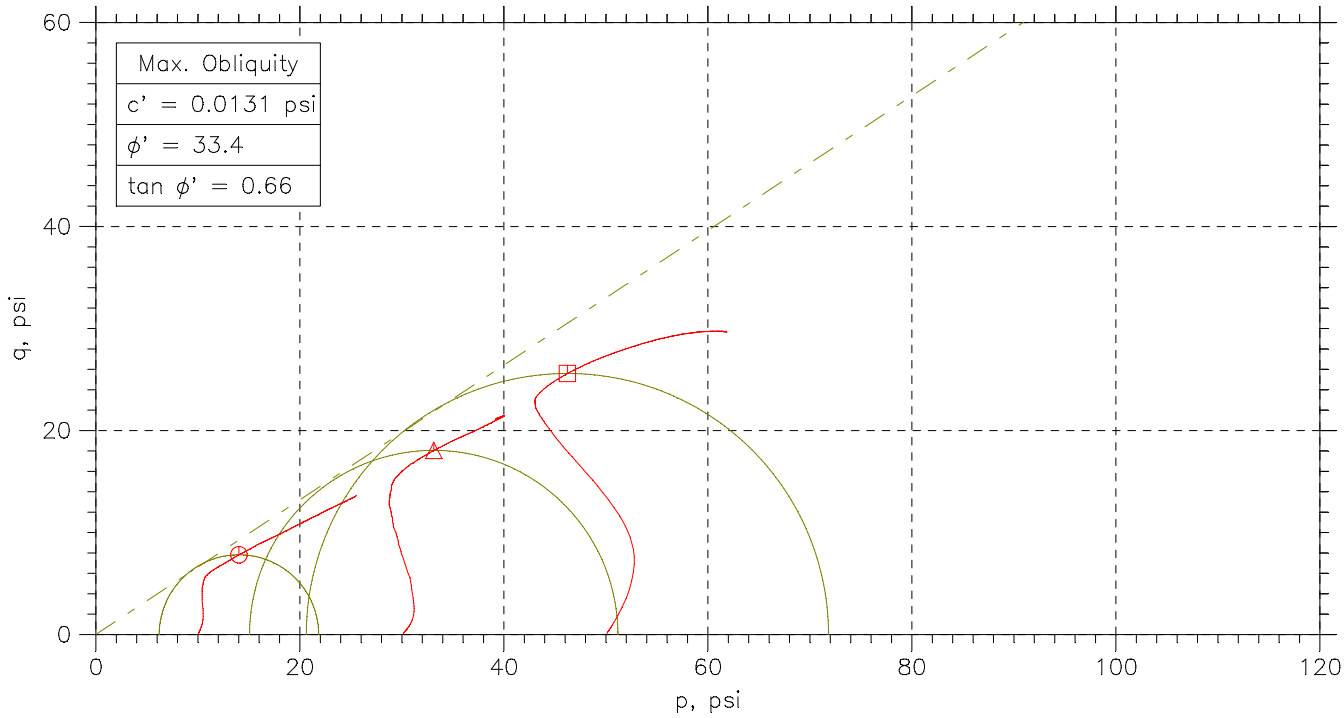
Induced Pore Pressure vs. Strain

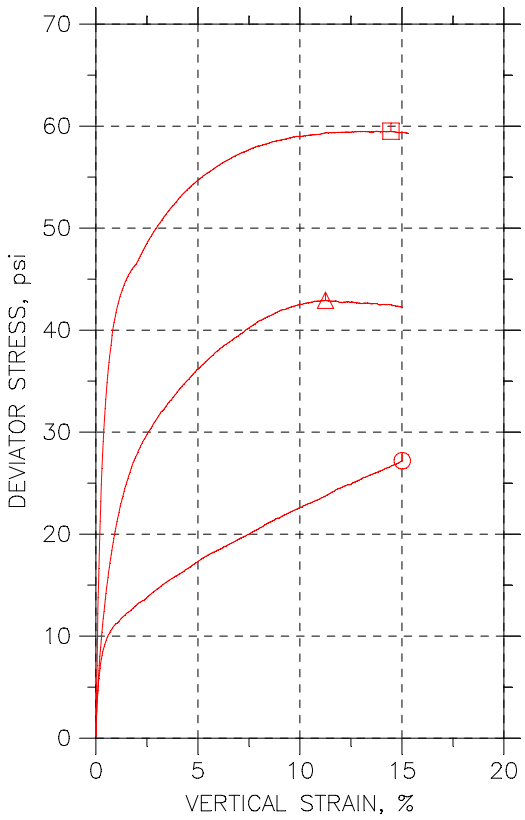


Specimen No.			A	B	C	
Initial Data	Water content %	W_o	19.9	21.6	25.3	
	Dry Density PCF	γ_{d_o}	108.4	103.5	96.9	
	Saturation %	S_o	97.4	93.1	92.7	
	Void Ratio	e_o	0.548	0.623	0.733	
After Shear	Water content %	W_f	20.6	22.2	23.4	
	Dry Density PCF	γ_{d_f}	108.1	105.2	103.1	
	Saturation %	S_f	100.0	100.0	100.0	
	Void Ratio	e_f	0.554	0.597	0.628	
	Final Back Pressure TSF	u_c	5.76	4.32	2.88	
Minor Principal Stress TSF @ failure		σ_3'f	0.06	0.33	1.05	
Maximum Deviator Stress (tsf) @ failure		$(\sigma_1'-\sigma_3')_{max}$	1.43	3.23	2.74	
Time to $(\sigma 1'-\sigma 3')$max min.		t_f	9.6	7.4	312.8	
Ultimate Deviator Stress, t/sq ft		$(\sigma 1'-\sigma 3')_{ult}$	n/a	n/a	n/a	
Initial Diameter, in.		D_o	2.852	2.881	2.876	
Initial Height, in.		H_o	5.938	5.981	5.887	

Controlled - Strain Test					
Description of Specimens	Fat Clay with Gravel (CH), red brown, moist, firm				
			Type of Specimen	Undisturbed	Type of test R
LL	PL	PI	Gs 2.69	Project	Colbert Fossil Plant (COF) - Ash Pond 4
Remarks:					
			Boring No.	STN-4-1	Sample No. 1
			Depth Elev.	2.5'-3.0', 5.1'-5.6', 10.0'-10.5'	
			Laboratory	Stantec	Date 8-26-09
			TRIAXIAL COMPRESSION TEST REPORT		

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		◷	△	□	
Sample No.		593	594	599	
Test No.		3.1	3.2	3.3	
Depth		4-4.5'	8-8.5 ft	9-9.5'	
Initial	Diameter, in	2.846	2.835	2.865	
	Height, in	6.019	6.009	6.044	
	Water Content, %	21.5	20.4	20.4	
	Dry Density, pcf	103.7	101.2	107.6	
	Saturation, %	92.7	83.0	97.2	
	Void Ratio	0.625	0.665	0.566	
Before Shear	Water Content, %	22.6	21.0	20.1	
	Dry Density, pcf	104.6	107.6	109.3	
	Saturation*, %	100.0	100.0	100.0	
	Void Ratio	0.611	0.566	0.543	
	Back Press., psi	91.8	83.22	65.25	
Ver. Eff. Cons. Stress, psi		9.957	30.01	49.98	
Shear Strength, psi		13.6	21.46	29.75	
Strain at Failure, %		15	11.3	14.5	
Strain Rate, %/min		0.016	0.016	0.016	
B-Value		0.96	0.96	0.95	
Estimated Specific Gravity		2.7	2.7	2.7	
Liquid Limit		---	---	---	
Plastic Limit		---	---	---	

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Project: Colbert Fossil Plant
Location: Ash Pond 4
Project No.: GTX-1495
Boring No.: STN-4-2
Sample Type: UD

Description: Brown Silty lean clay with gravel

Remarks: Note: Sample 599 from Boring STN-4-5

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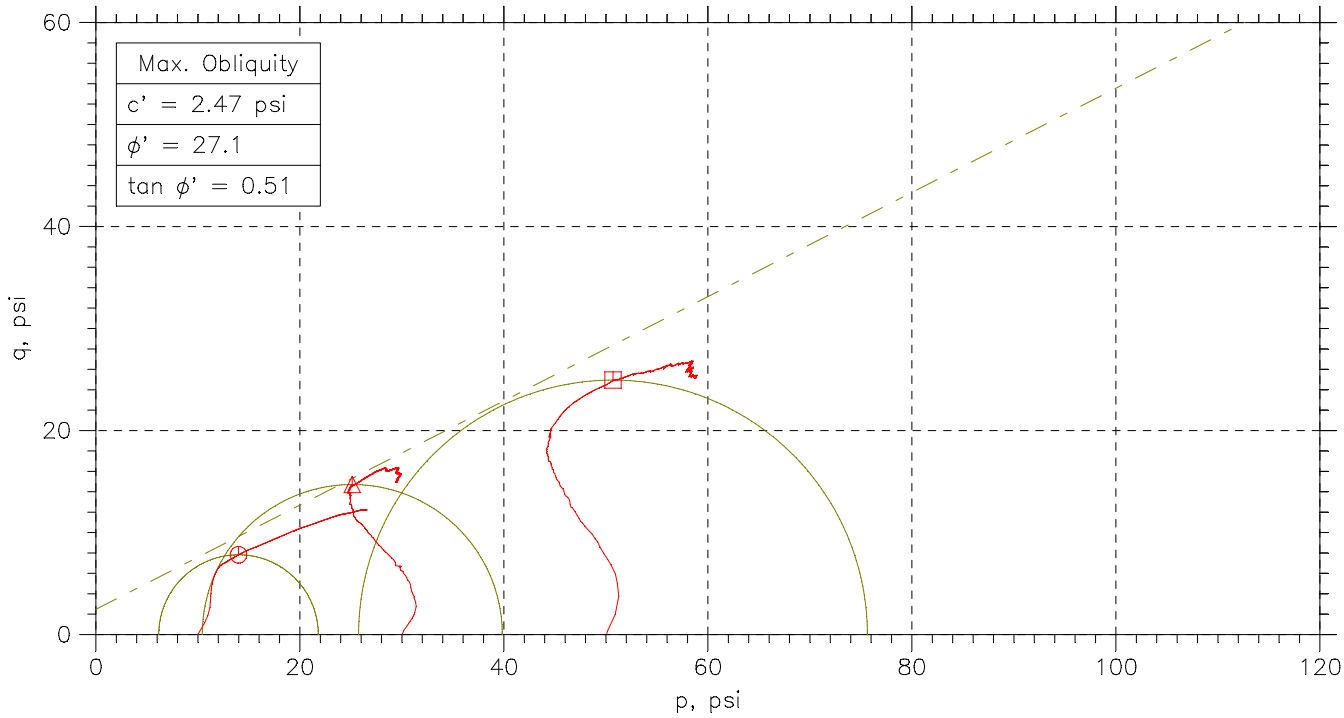
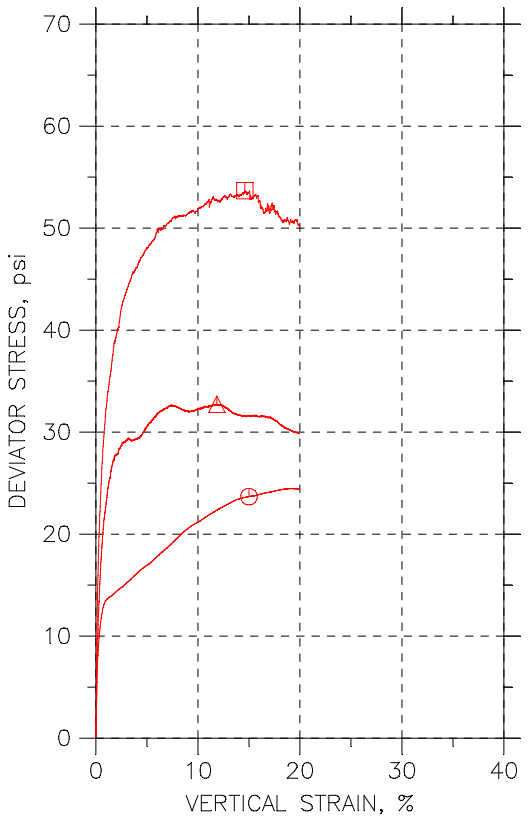
CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		⏲	△	◫	
Sample No.		595	596	597	
Test No.		CU-1-1	CU-1-2	CU-1-3	
Depth		2.5-3.0	6.5-7.0	10-10.5	
Initial	Diameter, in	2	2	2.01	
	Height, in	4.05	4.1	4.21	
	Water Content, %	19.5	20.3	20.5	
	Dry Density, pcf	108.3	107.2	102.3	
	Saturation, %	94.3	95.9	85.6	
	Void Ratio	0.557	0.572	0.647	
Before Shear	Water Content, %	21.2	19.7	20.7	
	Dry Density, pcf	107.2	110.1	108.2	
	Saturation*, %	100.0	100.0	100.0	
	Void Ratio	0.572	0.532	0.558	
	Back Press., psi	103	79	104.9	
Ver. Eff. Cons. Stress, psi		9.998	29.99	49.99	
Shear Strength, psi		11.84	16.37	26.83	
Strain at Failure, %		15	11.9	14.6	
Strain Rate, %/min		0.016	0.016	0.016	
B-Value		0.96	0.96	0.95	
Estimated Specific Gravity		2.7	2.7	2.7	
Liquid Limit		---	---	---	
Plastic Limit		---	---	---	

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Project: Colbert Fossil Plant
Location: ASh Pond 4
Project No.: GTX-9344
Boring No.: STN-4-3
Sample Type: UD
Description: Moist, reddish brown clay with gravel
Remarks: System 0

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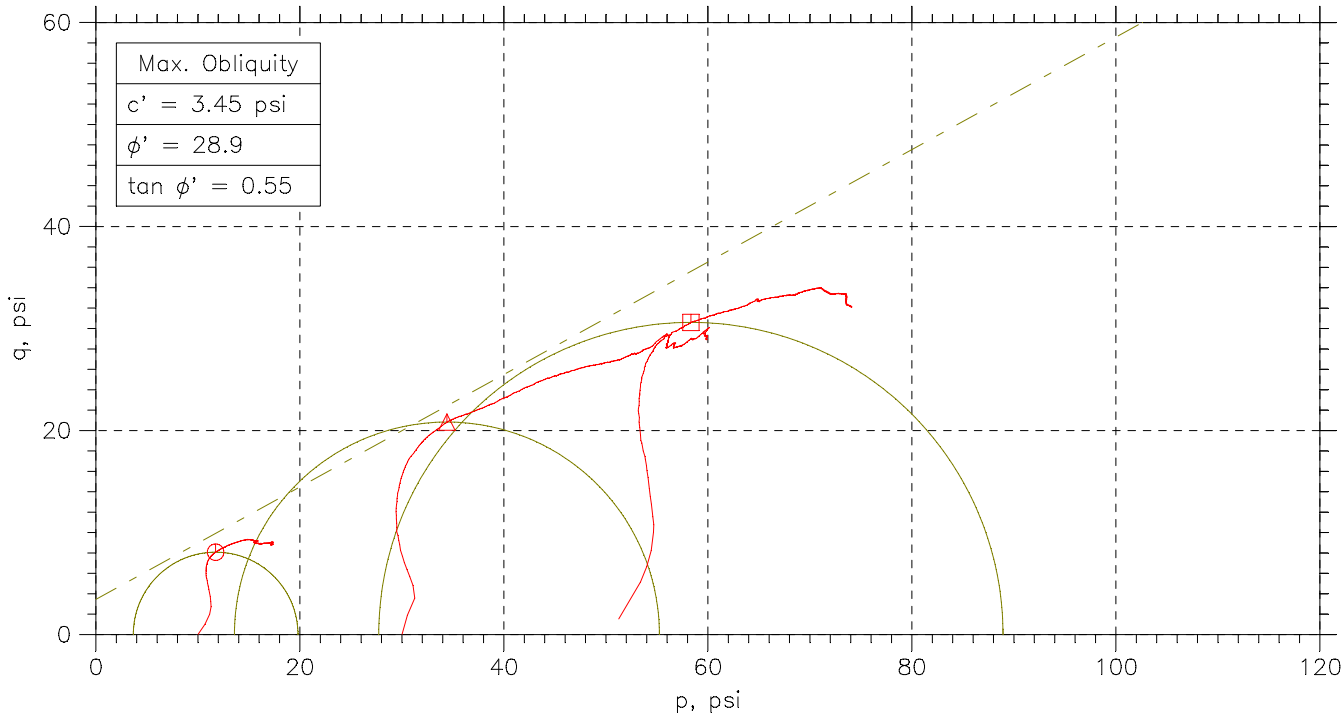
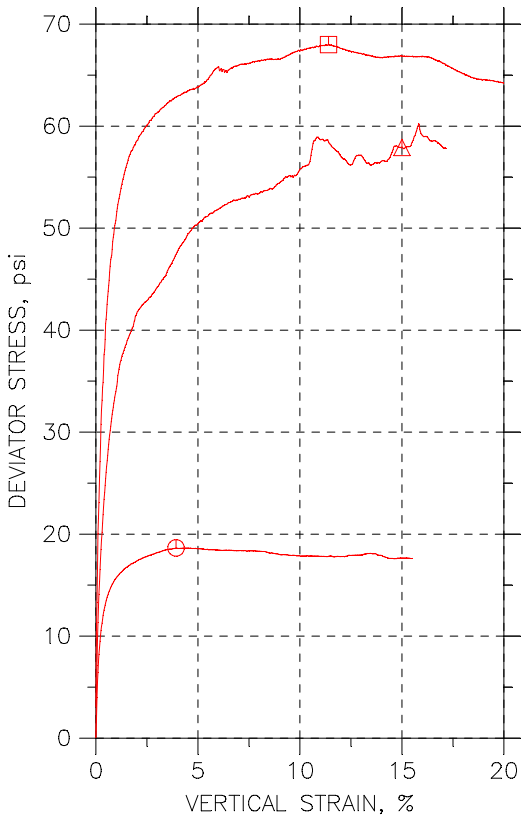
CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		⏲	△	◫	
Sample No.		663A	662B	663B	
Test No.		CU-4-1	CU-4-2	CU-4-3	
Depth		5.0-5.5	2.8-3.3	5.6-6.1	
Initial	Diameter, in	2	2	2	
	Height, in	3.98	4.13	4.11	
	Water Content, %	20.1	20.8	22.0	
	Dry Density, pcf	102.5	102.8	99.04	
	Saturation, %	84.4	88.0	84.7	
	Void Ratio	0.644	0.639	0.702	
Before Shear	Water Content, %	23.2	21.3	22.9	
	Dry Density, pcf	103.6	106.9	104.1	
	Saturation*, %	100.0	100.0	100.0	
	Void Ratio	0.627	0.576	0.619	
	Back Press., psi	29	128.9	67.26	
Ver. Eff. Cons. Stress, psi		9.998	29.99	49.73	
Shear Strength, psi		9.323	28.96	33.99	
Strain at Failure, %		3.93	15	11.4	
Strain Rate, %/min		0.016	0.016	0.016	
B-Value		0.96	0.95	0.96	
Estimated Specific Gravity		2.7	2.7	2.7	
Liquid Limit		---	---	---	
Plastic Limit		---	---	---	

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Project: Colbert Fossil Plant
Location: Ash Pond 4
Project No.: GTX-9344
Boring No.: STN-4-4
Sample Type: UD

Description: Moist, red, brown and yellow clay with sand and gravel

Remarks:

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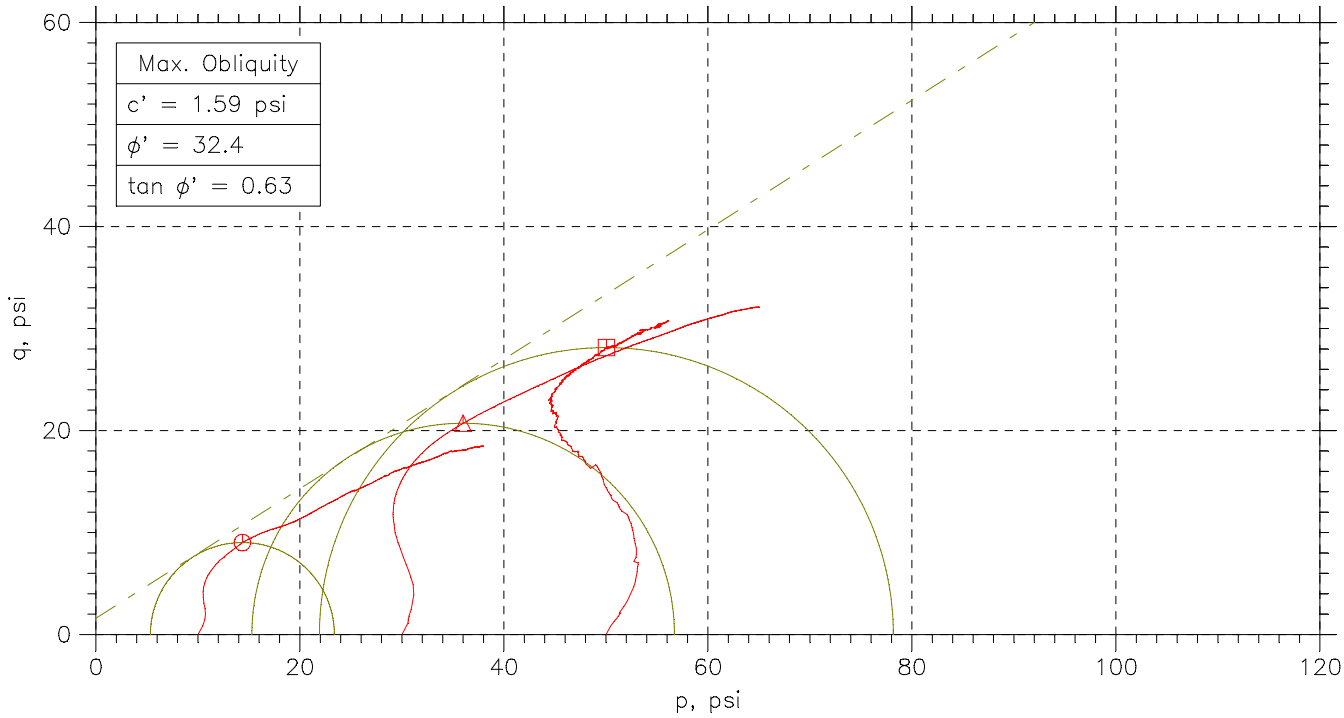
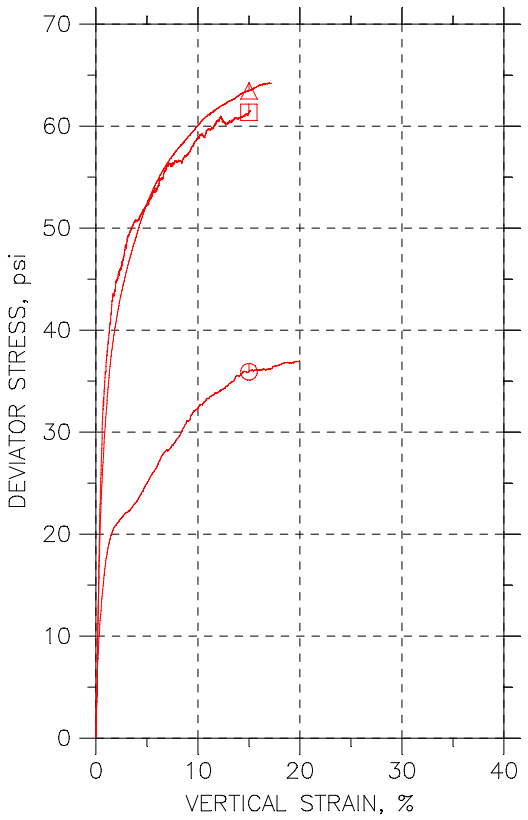
CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		⏲	△	⊡	
Sample No.		601B	601A	602	
Test No.		CU-3-1	CU-3-2	CU-3-3	
Depth		17.6-18.1	17-17.5	22.3-22.8	
Initial	Diameter, in	2	2.01	2	
	Height, in	4.13	4.04	4.16	
	Water Content, %	16.2	16.8	16.8	
	Dry Density, pcf	107.9	108.	109.1	
	Saturation, %	77.7	81.0	83.4	
	Void Ratio	0.562	0.56	0.544	
Before Shear	Water Content, %	17.5	17.0	15.9	
	Dry Density, pcf	114.5	115.4	117.9	
	Saturation*, %	100.0	100.0	100.0	
	Void Ratio	0.473	0.46	0.43	
	Back Press., psi	134.9	106.9	101	
Ver. Eff. Cons. Stress, psi		9.988	29.98	50	
Shear Strength, psi		17.96	31.73	30.68	
Strain at Failure, %		15	15	15	
Strain Rate, %/min		0.016	0.016	0.016	
B-Value		0.95	0.95	0.96	
Estimated Specific Gravity		2.7	2.7	2.7	
Liquid Limit		---	---	---	
Plastic Limit		---	---	---	

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Project: Colbert Fossil Plant
Location: Ash Pond 4
Project No.: GTX-9344
Boring No.: STN-4-5
Sample Type: UD

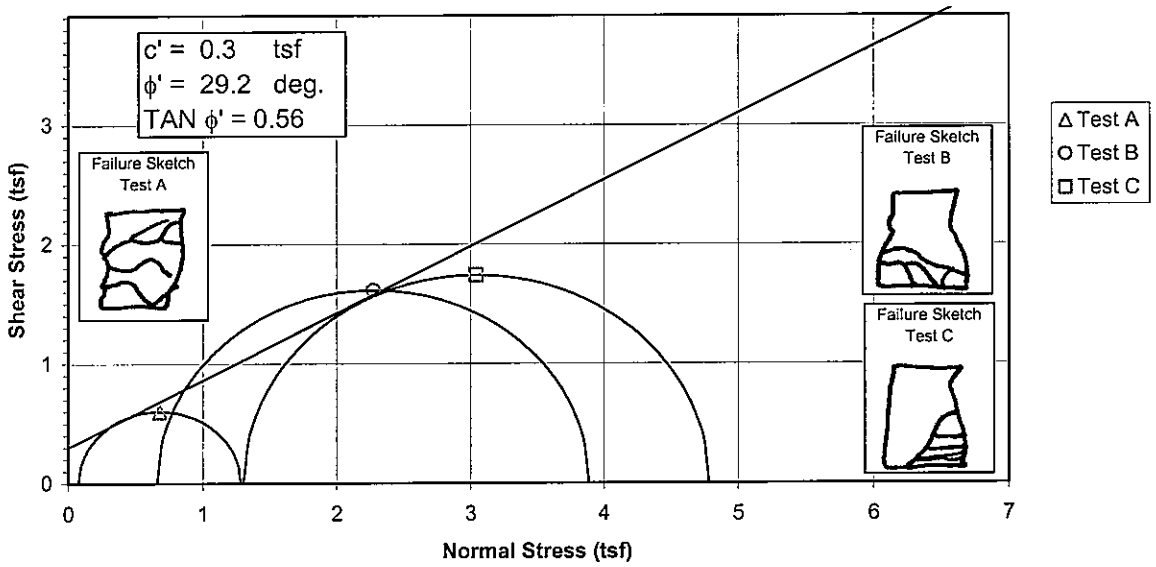
Description: Moist, yellow brown and red sandy clay with gravel

Remarks:

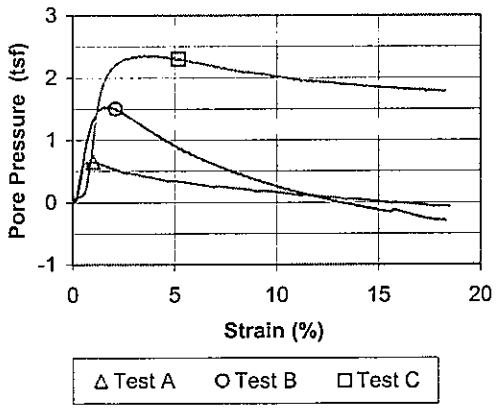
EM 1110-2-1906
Appendix X
30 Nov. 70

Failure Criterion: Maximum Effective Principal Stress Ratio

Effective Strength Envelope



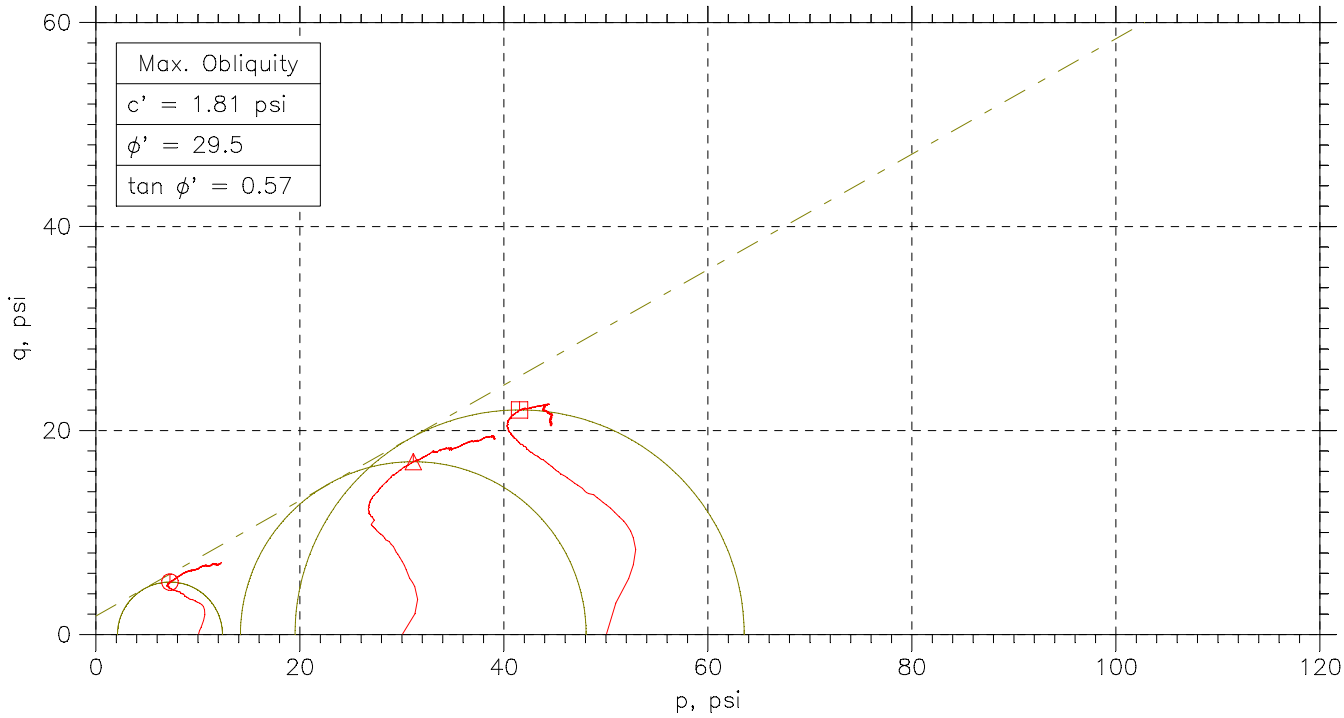
Induced Pore Pressure vs. Strain

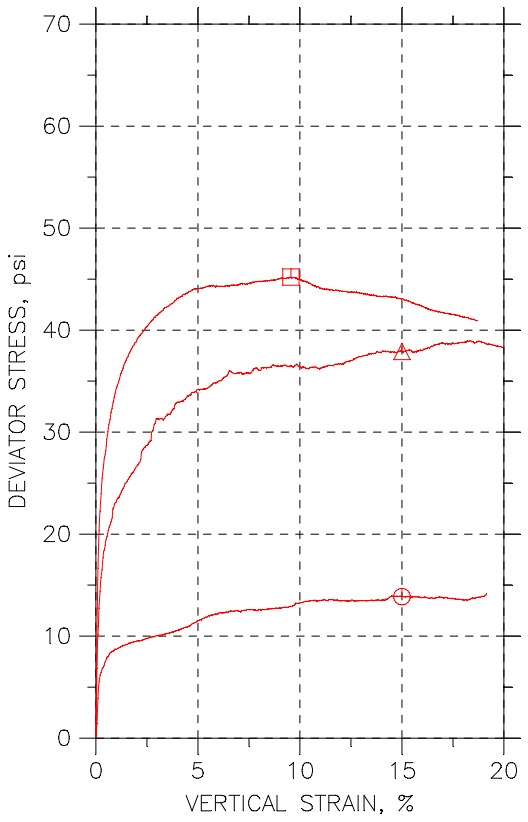


Specimen No.			A	B	C	
Initial Data	Water content %	W_o	22.1	18.0	20.2	
	Dry Density PCF	γd_o	102.9	110.4	105.8	
	Saturation %	S_o	94.3	92.9	92.5	
	Void Ratio	e_o	0.632	0.521	0.587	
After Shear	Water content %	W_f	23.3	18.3	20.0	
	Dry Density PCF	γd_f	103.3	112.5	109.1	
	Saturation %	S_f	100.0	100.0	100.0	
	Void Ratio	e_f	0.626	0.493	0.539	
	Final Back Pressure TSF	u_c	5.76	4.32	2.88	
Minor Principal Stress TSF @ failure		$\sigma_3'f$	0.08	0.66	1.30	
Maximum Deviator Stress (tsf) @ failure		$(\sigma_1'-\sigma_3')_{max}$	1.20	3.22	3.48	
Time to $(\sigma 1'-\sigma 3')$max min.		t_f	5.3	67.5	150.9	
Ultimate Deviator Stress, t/sq ft		$(\sigma 1'-\sigma 3')_{ult}$	n/a	n/a	n/a	
Initial Diameter, in.		D_o	2.881	2.884	2.884	
Initial Height, in.		H_o	5.989	6.057	6.028	

Controlled - Strain Test					
Description of Specimens	Fat Clay with Gravel (CH), red brown, moist, firm				
			Type of Specimen	Undisturbed	Type of test R
LL	PL	PI	Gs 2.69	Project	Colbert Fossil Plant (COF) - Ash Pond 4
Remarks:					
			Boring No.	STN-4-11	Sample No. 8
			Depth Elev.	5.0'-5.5', 5.5'-6.0', 10.0'-10.5'	
			Laboratory	Stantec	Date 8-27-09
			TRIAXIAL COMPRESSION TEST REPORT		

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		◷	△	◫	
Sample No.		621A	622	621B	
Test No.		CU-2-1	CU-2-2	CU-2-3	
Depth		8.0-8.5	15-15.5	8.6-9.1	
Initial	Diameter, in	2.01	2.01	2	
	Height, in	4.2	4.3	4.2	
	Water Content, %	22.8	16.8	20.0	
	Dry Density, pcf	96.79	110.2	108.4	
	Saturation, %	83.0	85.6	97.5	
	Void Ratio	0.741	0.529	0.555	
Before Shear	Water Content, %	23.0	16.7	19.6	
	Dry Density, pcf	104.	116.3	110.2	
	Saturation*, %	100.0	100.0	100.0	
	Void Ratio	0.621	0.45	0.53	
	Back Press., psi	101	125	107	
Ver. Eff. Cons. Stress, psi		10	30	49.99	
Shear Strength, psi		6.935	18.95	22.6	
Strain at Failure, %		15	15	9.56	
Strain Rate, %/min		0.016	0.016	0.016	
B-Value		0.95	0.96	0.95	
Estimated Specific Gravity		2.7	2.7	2.7	
Liquid Limit		---	---	---	
Plastic Limit		---	---	---	

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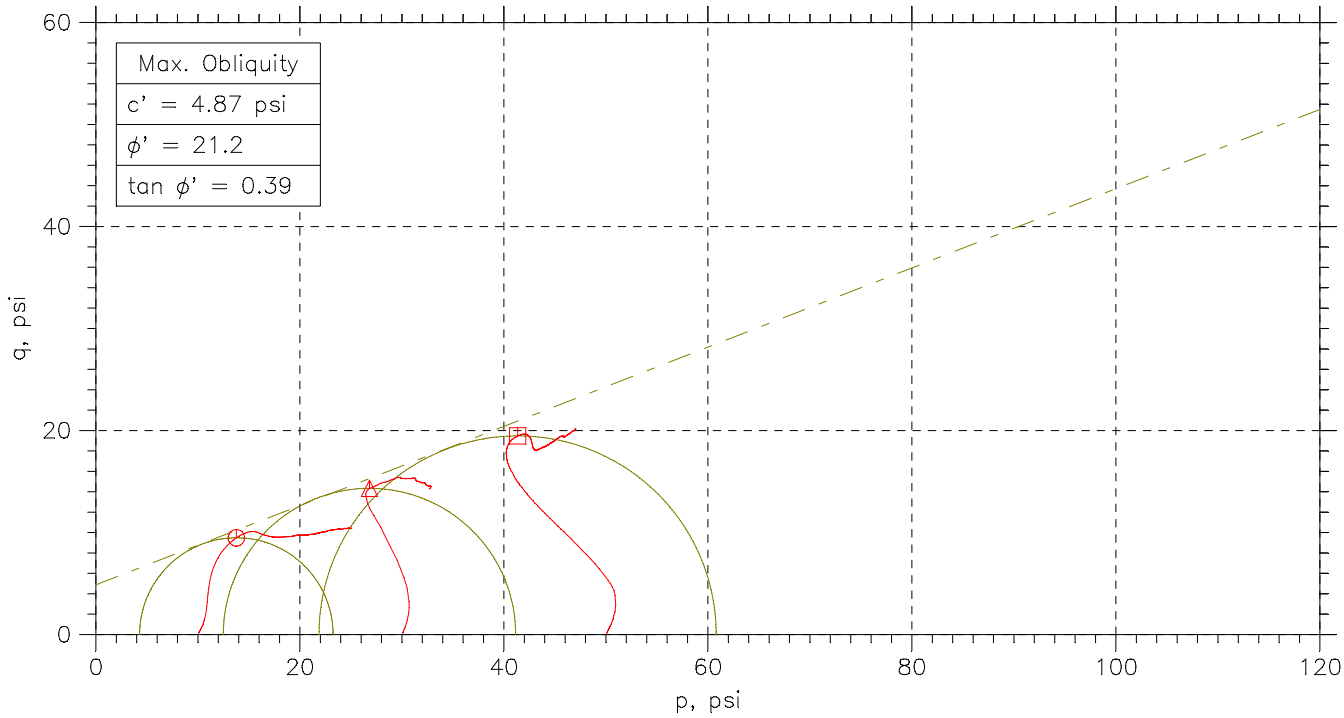
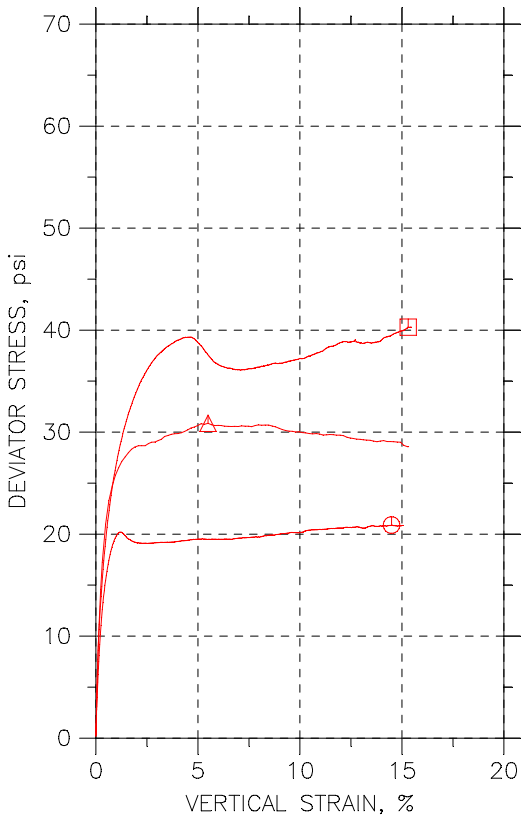
Project: Colbert Fossil Plant
Location: Ash Pond 4
Project No.: GTX-9344
Boring No.: STN-4-12
Sample Type: UD
Description: Moist, dark reddish brown clay
Remarks:

Fri, 16-OCT-2009 08:21:58

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		⏲	△	⊡	
Sample No.		645	646	647	
Test No.		10.1	10.2	10.3	
Depth		5.4-5.9	10.1-10.6	15.5-16.1	
Initial	Diameter, in	2.876	2.892	2.883	
	Height, in	5.981	5.995	5.938	
	Water Content, %	27.9	23.9	26.9	
	Dry Density, pcf	94.68	98.72	94.97	
	Saturation, %	96.7	91.1	93.8	
	Void Ratio	0.78	0.707	0.775	
Before Shear	Water Content, %	29.2	24.4	0.0	
	Dry Density, pcf	94.22	101.6	168.6	
	Saturation*, %	100.0	100.0	0.0	
	Void Ratio	0.789	0.66	0	
	Back Press., psi	62.29	121.6	101	
Ver. Eff. Cons. Stress, psi		9.936	29.93	49.98	
Shear Strength, psi		10.44	15.43	20.15	
Strain at Failure, %		14.5	5.5	15.3	
Strain Rate, %/min		0.016	0.016	0.016	
B-Value		0.95	0.96	0.95	
Estimated Specific Gravity		2.7	2.7	2.7	
Liquid Limit		---	---	---	
Plastic Limit		---	---	---	

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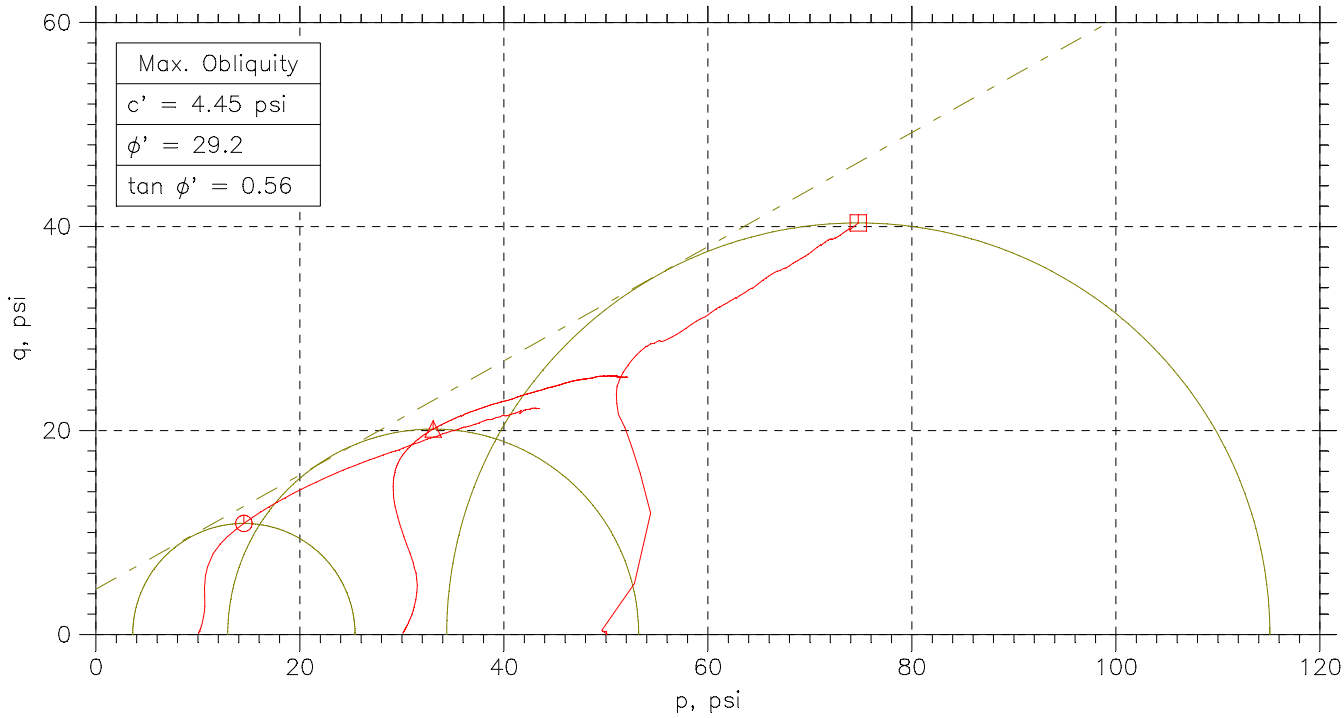
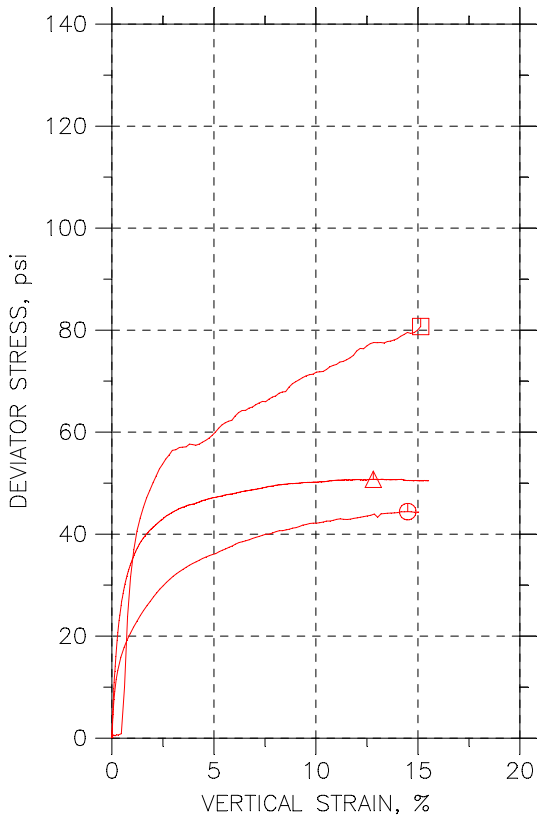
Project: Colbert Fossil Plant
Location: Ash Pond 4
Project No.: GTX-1495
Boring No.: STN-4-15
Sample Type: UD
Description: Brown Lean clay
Remarks: 2054

Fri, 16-OCT-2009 08:14:05

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		○	△	□	
Sample No.		633A	634	633A	
Test No.		1.1	1.2	1.3	
Depth		4-4.5 ft	9.6-10.1'	4.6-5.1'	
Initial	Diameter, in	2.872	2.865	2.879	
	Height, in	6.027	5.923	6.032	
	Water Content, %	20.1	18.9	20.3	
	Dry Density, pcf	107.9	110.4	107.4	
	Saturation, %	96.5	97.0	96.0	
	Void Ratio	0.562	0.527	0.57	
Before Shear	Water Content, %	21.1	19.3	20.6	
	Dry Density, pcf	107.4	110.8	108.3	
	Saturation*, %	100.0	100.0	100.0	
	Void Ratio	0.569	0.521	0.557	
	Back Press., psi	140	119	102	
Ver. Eff. Cons. Stress, psi		9.961	29.96	49.99	
Shear Strength, psi		22.21	25.38	40.35	
Strain at Failure, %		14.5	12.8	15.1	
Strain Rate, %/min		0.016	0.016	0.016	
B-Value		0.96	0.95	0.95	
Estimated Specific Gravity		2.7	2.7	2.7	
Liquid Limit		---	---	---	
Plastic Limit		---	---	---	

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Project: Colbert Fossil Plant
Location: Ash Pond 4
Project No.: GTX-1495
Boring No.: STN-4-16
Sample Type: UD
Description: Brown lean clay with sand
Remarks: System 1062

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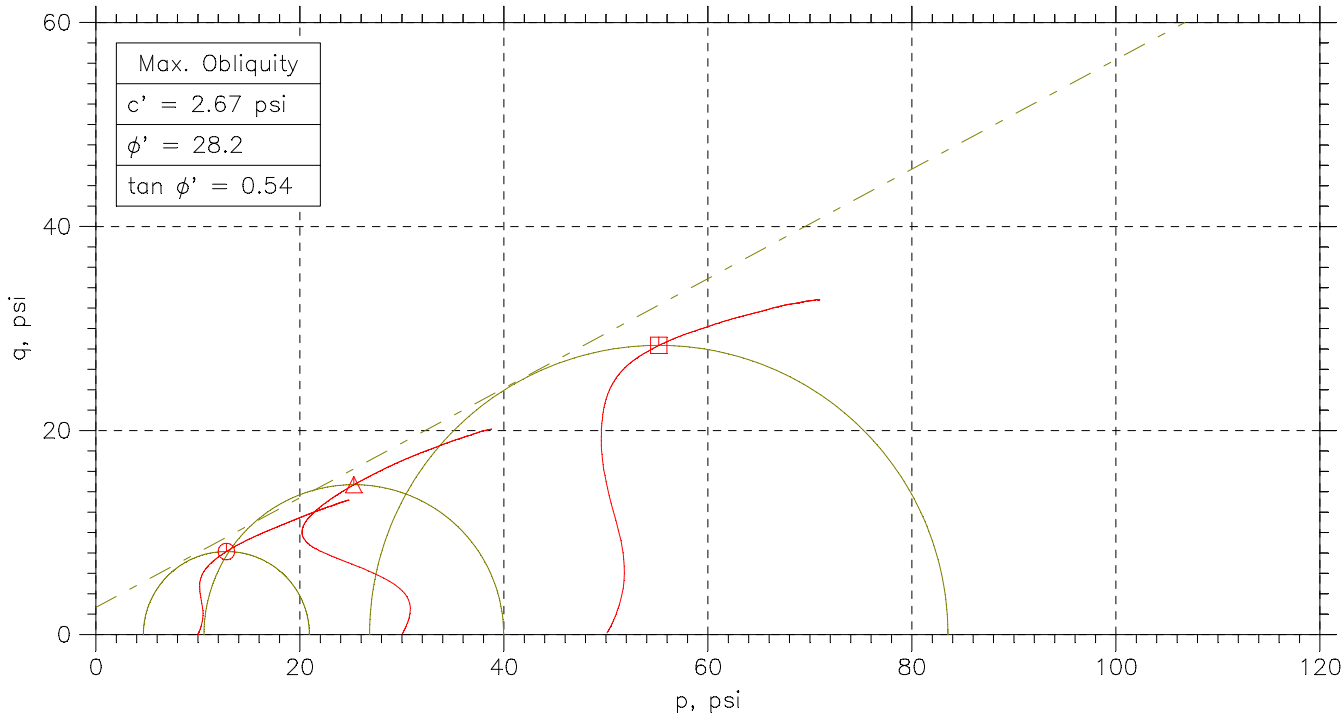
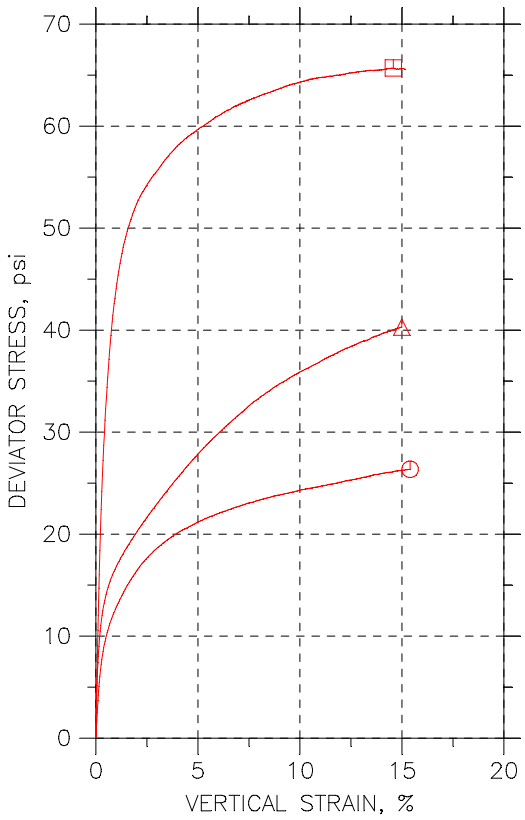
CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		○	△	□	
Sample No.		639A	638A	639B	
Test No.		2.1	4.2	2.3	
Depth		19.1-19.6'	14.1-14.6'	19.7-20.2'	
Initial	Diameter, in	2.863	2.857	2.867	
	Height, in	5.958	5.985	5.997	
	Water Content, %	22.3	18.1	20.8	
	Dry Density, pcf	105.3	111.7	107.2	
	Saturation, %	100.2	95.7	98.3	
	Void Ratio	0.601	0.509	0.572	
Before Shear	Water Content, %	22.6	17.5	20.6	
	Dry Density, pcf	104.7	114.5	108.3	
	Saturation*, %	100.0	100.0	100.0	
	Void Ratio	0.61	0.472	0.556	
	Back Press., psi	53.23	62.04	98.03	
Ver. Eff. Cons. Stress, psi		9.984	29.97	49.96	
Shear Strength, psi		13.18	20.14	32.85	
Strain at Failure, %		15.4	15	14.6	
Strain Rate, %/min		0.016	0.016	0.016	
B-Value		0.96	0.95	0.95	
Estimated Specific Gravity		2.7	2.7	2.7	
Liquid Limit		---	---	---	
Plastic Limit		---	---	---	

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Project: Colbert Fossil Plant
Location: Ash pond 4
Project No.: GTX-1495
Boring No.: STN-4-19
Sample Type: UD
Description: Brown Lean clay
Remarks: 2054

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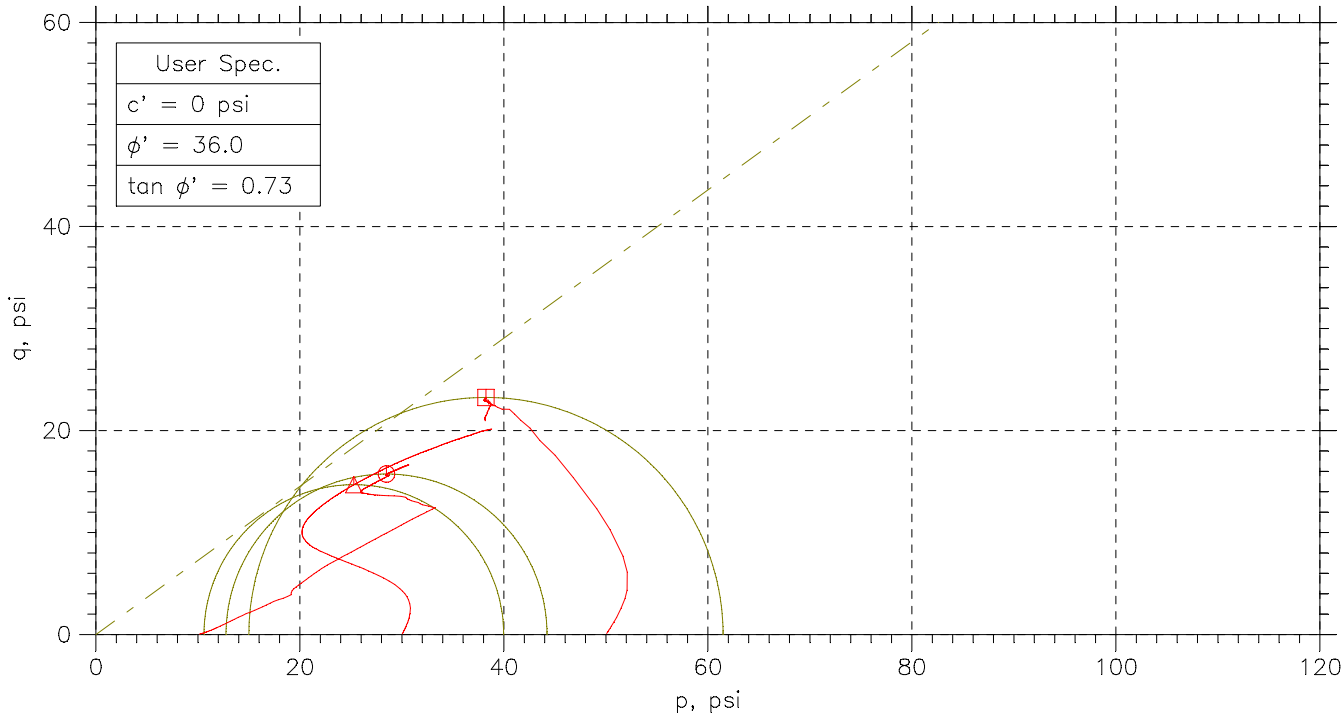
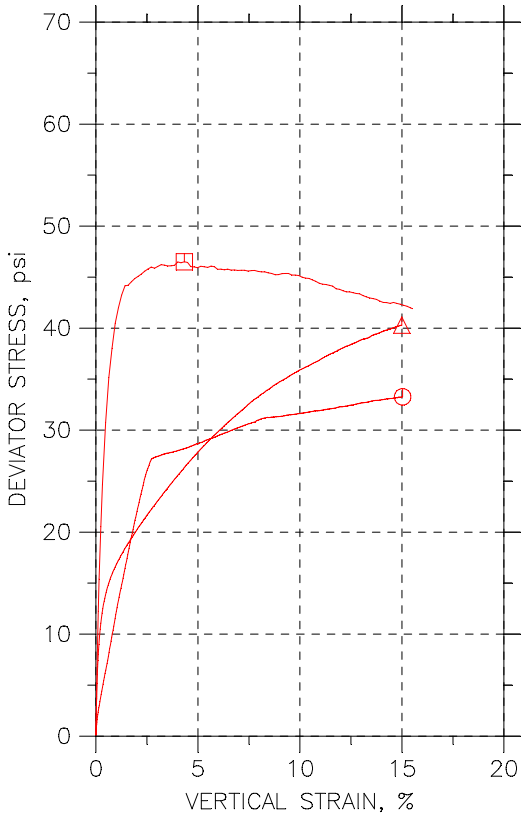
CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		○	△	□	
Sample No.		640A	638A	640B	
Test No.		4.1	4.2	4.3	
Depth		4-4.5'	14.1-14.6'	4.6-5.1'	
Initial	Diameter, in	2.861	2.857	2.85	
	Height, in	5.951	5.985	6.069	
	Water Content, %	21.4	18.1	22.6	
	Dry Density, pcf	106.6	111.7	103.8	
	Saturation, %	99.5	95.7	97.6	
	Void Ratio	0.581	0.509	0.624	
Before Shear	Water Content, %	20.4	17.5	21.0	
	Dry Density, pcf	108.7	114.5	107.6	
	Saturation*, %	100.0	100.0	100.0	
	Void Ratio	0.55	0.472	0.567	
	Back Press., psi	113.1	62.04	102	
Ver. Eff. Cons. Stress, psi		10.11	29.97	49.97	
Shear Strength, psi		16.63	20.14	23.25	
Strain at Failure, %		15	15	4.33	
Strain Rate, %/min		0.016	0.016	0.016	
B-Value		0.95	0.95	0.95	
Estimated Specific Gravity		2.7	2.7	2.7	
Liquid Limit		---	---	---	
Plastic Limit		---	---	---	

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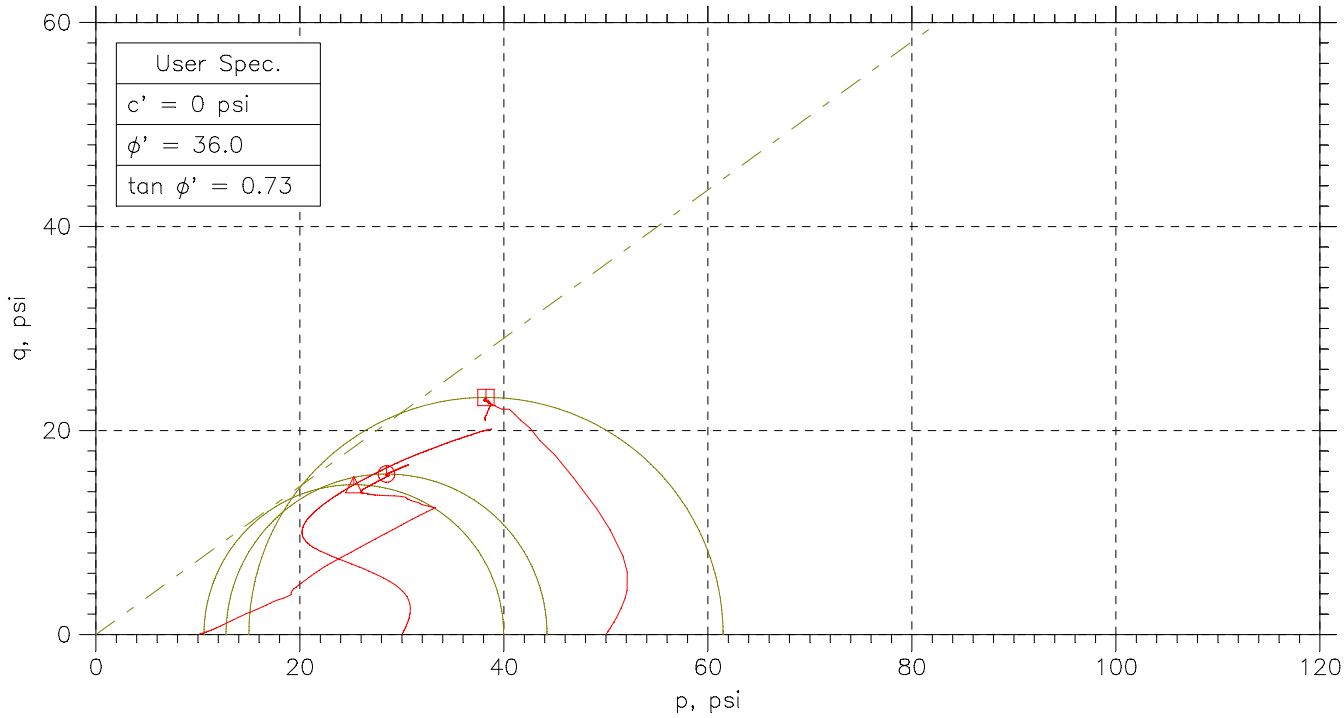
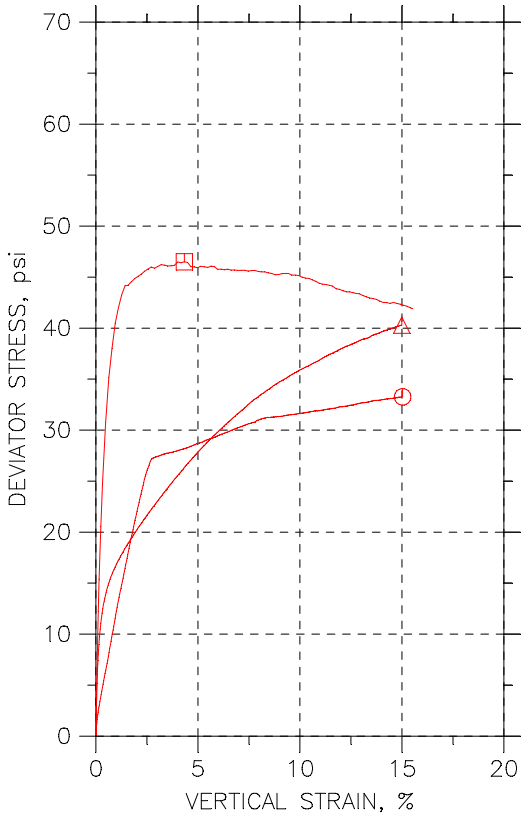
Project: Colbert Fossil Plant
Location: Ash Pond 4
Project No.: GTX-1495
Boring No.: STN-4-22
Sample Type: UD

Description: moist, brown clay

Remarks: Note: Sample 638A from Boring STN-4-19

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		○	△	□	
Sample No.		640A	638A	640B	
Test No.		4.1	4.2	4.3	
Depth		4-4.5'	14.1-14.6'	4.6-5.1'	
Initial	Diameter, in	2.861	2.857	2.85	
	Height, in	5.951	5.985	6.069	
	Water Content, %	21.4	18.1	22.6	
	Dry Density, pcf	106.6	111.7	103.8	
	Saturation, %	99.5	95.7	97.6	
	Void Ratio	0.581	0.509	0.624	
Before Shear	Water Content, %	20.4	17.5	21.0	
	Dry Density, pcf	108.7	114.5	107.6	
	Saturation*, %	100.0	100.0	100.0	
	Void Ratio	0.55	0.472	0.567	
	Back Press., psi	113.1	62.04	102	
Ver. Eff. Cons. Stress, psi		10.11	29.97	49.97	
Shear Strength, psi		16.63	20.14	23.25	
Strain at Failure, %		15	15	4.33	
Strain Rate, %/min		0.016	0.016	0.016	
B-Value		0.95	0.95	0.95	
Estimated Specific Gravity		2.7	2.7	2.7	
Liquid Limit		---	---	---	
Plastic Limit		---	---	---	

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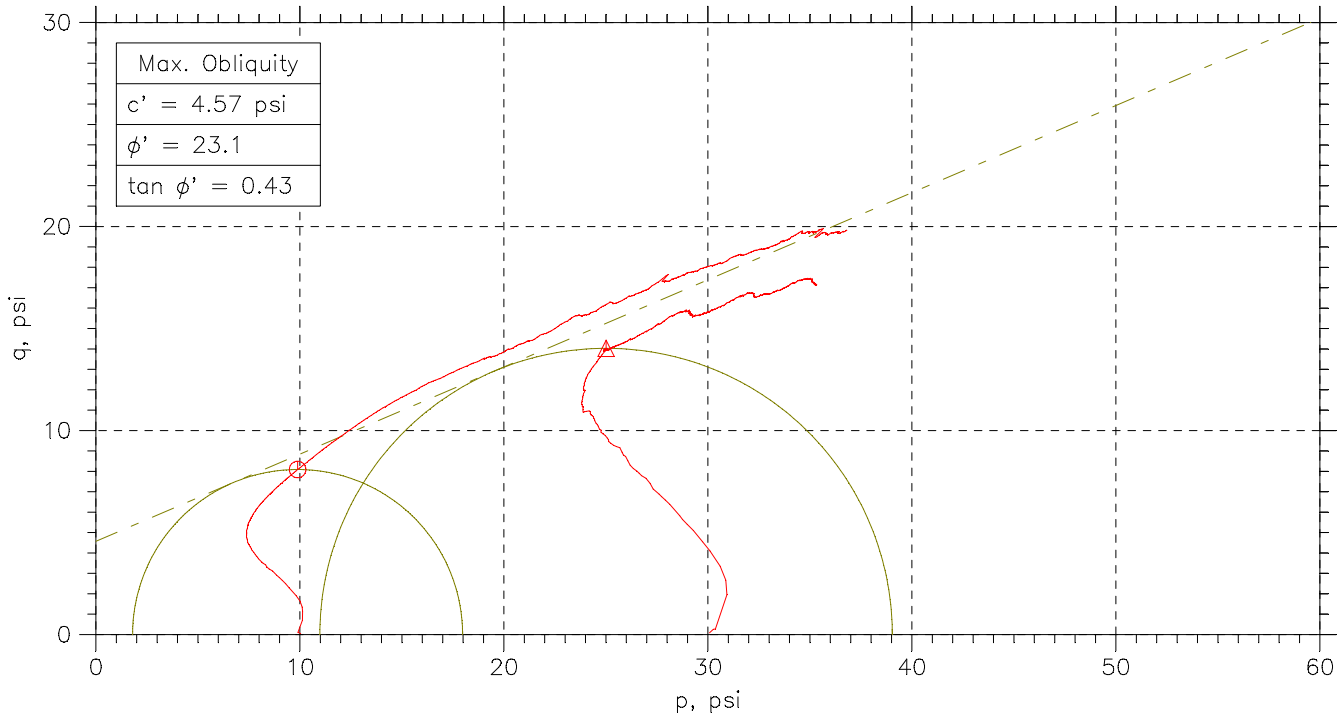
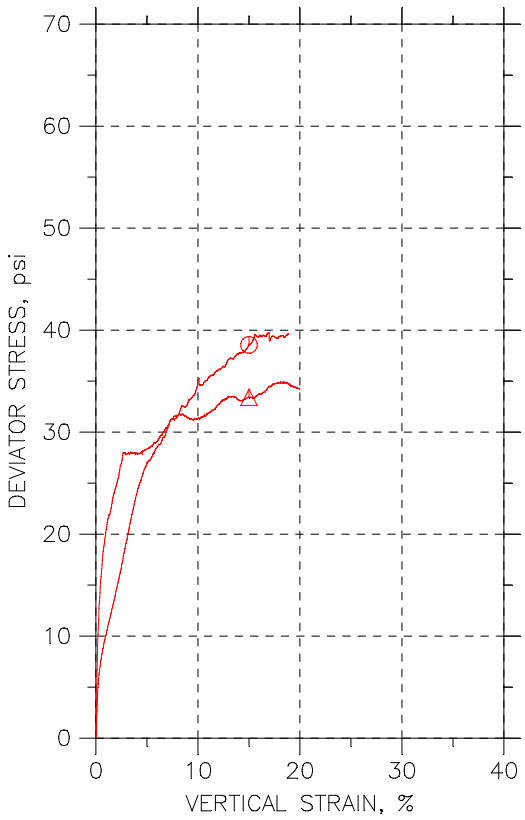
Project: Colbert Fossil Plant
Location: Ash Pond 4
Project No.: GTX-1495
Boring No.: STN-4-22
Sample Type: UD

Description: moist, brown clay

Remarks: Note: Sample 638A from Boring STN-4-19

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		⏲	△		
Sample No.		642A	643A		
Test No.		CU-5-1	CU-5-2		
Depth		4.1-4.6	9.3-9.8		
Initial	Diameter, in	2.01	2.01		
	Height, in	4.08	4.08		
	Water Content, %	18.3	21.5		
	Dry Density, pcf	108.4	95.5		
	Saturation, %	89.2	76.0		
	Void Ratio	0.555	0.765		
Before Shear	Water Content, %	18.3	21.5		
	Dry Density, pcf	112.7	106.6		
	Saturation*, %	100.0	100.0		
	Void Ratio	0.495	0.581		
	Back Press., psi	113	100.9		
Ver. Eff. Cons. Stress, psi		9.995	30		
Shear Strength, psi		19.28	16.71		
Strain at Failure, %		15	15		
Strain Rate, %/min		0.016	0.016		
B-Value		0.96	0.96		
Estimated Specific Gravity		2.7	2.7		
Liquid Limit		---	---		
Plastic Limit		---	---		

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Project: Colbert Fossil Plant
Location: Ash Pond 4
Project No.: GTX-9344
Boring No.: STN-4-23
Sample Type: UD

Description: Moist, mottled, red, yellow, brown , and gray sandy clay

Remarks:

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HYDRAULIC CONDUCTIVITY

Project No.	***GTX-1495***	Tested By	***JM***
Project Name	***Colbert Fossil Plant***	Test Date	***9/25/09***
Boring No.	***STN-4-1***	Reviewed By	***MM***
Sample No.	***4***	Review Date	***9/27/09***
Sample Depth	***15.4-16.0***	Lab No.	***14***
Sample Description	***Brown lean clay***		

ASTM D5084 - Falling Head (Method C RisingTail)

Sample Type:	*UD*
Sample Orientation:	*Vertical*
Initial Water Content, %:	*21.4*
Wet Unit Weight, pcf:	*125.0*
Dry Unit Weight, pcf:	*102.9*
Compaction, %:	*N/A*
Hydraulic Conductivity, cm/sec. @20 °C	***4.1E-08***

Remarks: _____

HYDRAULIC CONDUCTIVITY

Project No.	***GTX-1495***	Tested By	***JM***
Project Name	***Colbert Fossil Plant***	Test Date	***9/22/09***
Boring No.	***STN-4-7***	Reviewed By	***MM***
Sample No.	***606***	Review Date	***9/24/09***
Sample Depth	***15-15.5***	Lab No.	***15***
Sample Description	***Gray Lean clay***		

ASTM D5084 - Falling Head (Method C RisingTail)

Sample Type:	*UD*
Sample Orientation:	*Vertical*
Initial Water Content, %:	*20.9*
Wet Unit Weight, pcf:	*122.4*
Dry Unit Weight, pcf:	*101.2*
Compaction, %:	*N/A*
Hydraulic Conductivity, cm/sec. @20 °C	***2.4E-08***

Remarks: _____

HYDRAULIC CONDUCTIVITY

Project No.	***GTX-1495***	Tested By	***JM***
Project Name	***Colbert Fossil Plant***	Test Date	***9/27/2009***
Boring No.	***STN-4-12***	Reviewed By	***MM***
Sample No.	***620***	Review Date	***9/29/2009***
Sample Depth	***5.2-5.7***	Lab No.	***12***
Sample Description	***Brown Lean clay***		

ASTM D5084 - Falling Head (Method C RisingTail)

Sample Type:	*UD*
Sample Orientation:	*Vertical*
Initial Water Content, %:	*24.3*
Wet Unit Weight, pcf:	*128.7*
Dry Unit Weight, pcf:	*103.5*
Compaction, %:	*N/A*
Hydraulic Conductivity, cm/sec. @20 °C	***2.8E-08***

Remarks: _____

HYDRAULIC CONDUCTIVITY

Project No.	***GTX-1495***	Tested By	***JM***
Project Name	***Colbert Fossil Plant***	Test Date	***9/27/09***
Boring No.	***STN-4-14***	Reviewed By	***MM***
Sample No.	***626B***	Review Date	***9/28/09***
Sample Depth	***11-11.5 ft***	Lab No.	***16***
Sample Description	***Gray lean clay***		

ASTM D5084 - Falling Head (Method C RisingTail)

Sample Type:	*UD*
Sample Orientation:	*Vertical*
Initial Water Content, %:	*20.6*
Wet Unit Weight, pcf:	*126.0*
Dry Unit Weight, pcf:	*104.5*
Compaction, %:	*N/A*
Hydraulic Conductivity, cm/sec. @20 °C	***6.1E-08***

Remarks: _____

HYDRAULIC CONDUCTIVITY

Project No.	***GTX-1495***	Tested By	***JM***
Project Name	***Cobert Fossil Plant***	Test Date	***9/23/09***
Boring No.	***STN-4-19***	Reviewed By	***MM***
Sample No.	***636***	Review Date	***9/25/09***
Sample Depth	***5.2-5.7***	Lab No.	***13***
Sample Description	***Brown lean clay***		

ASTM D5084 - Falling Head (Method C RisingTail)

Sample Type:	*UD*
Sample Orientation:	*Vertical*
Initial Water Content, %:	*24.4*
Wet Unit Weight, pcf:	*129.7*
Dry Unit Weight, pcf:	*104.2*
Compaction, %:	*N/A*
Hydraulic Conductivity, cm/sec. @20 °C	***4.4E-08***

Remarks: _____

HYDRAULIC CONDUCTIVITY

Project No.	***GTX-1495***	Tested By	***JM***
Project Name	***Colbert Fossil Plant***	Test Date	***9/23/2009***
Boring No.	***STN-4-23***	Reviewed By	***MM***
Sample No.	***634B***	Review Date	***9/25/2009***
Sample Depth	***9.9-10.4***	Lab No.	***17***
Sample Description	***Gray lean clay***		

ASTM D5084 - Falling Head (Method C RisingTail)

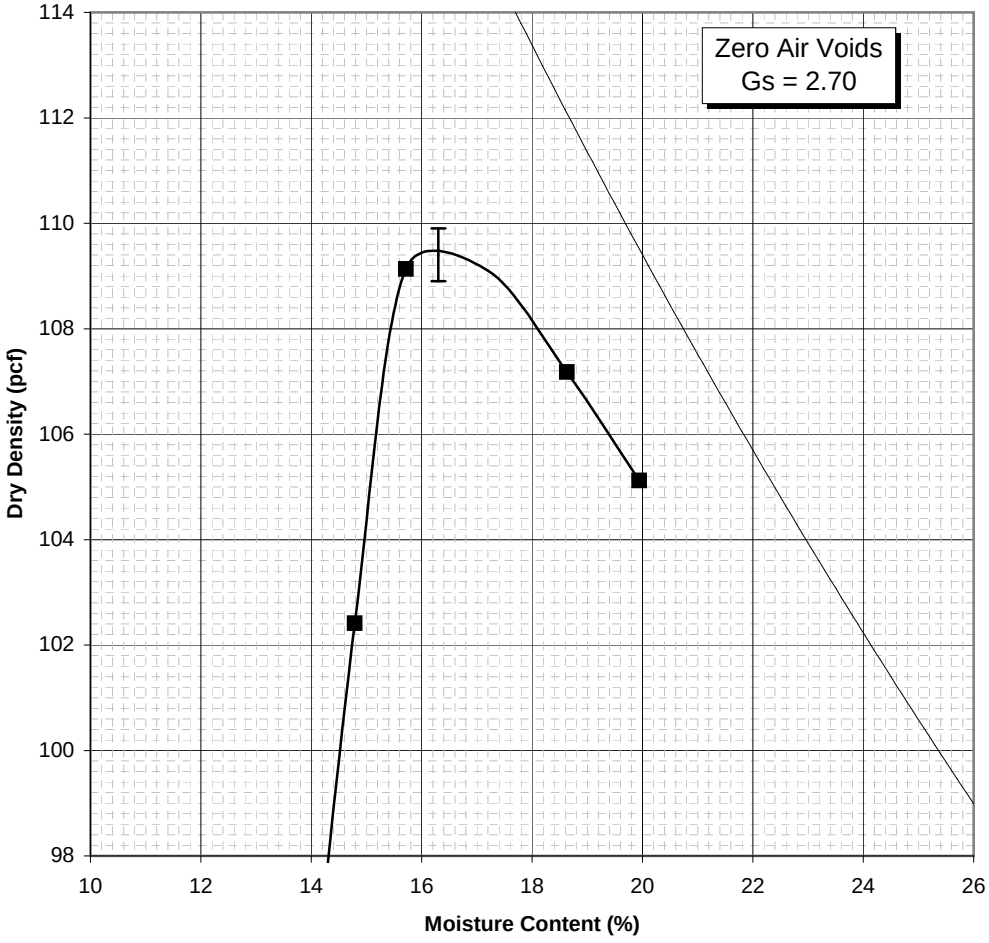
Sample Type:	*UD*
Sample Orientation:	*Vertical*
Initial Water Content, %:	*22.0*
Wet Unit Weight, pcf:	*122.4*
Dry Unit Weight, pcf:	*100.3*
Compaction, %:	*N/A*
Hydraulic Conductivity, cm/sec. @20 °C	***6.5E-08***

Remarks: _____

Moisture-Density Data Sheet

Project: Colbert Fossil Plant (COF) - Ash Pond 4 — Project No.: 175559016
Source: STN-4-7, 15.0'-17.0' — Sample No.: 188
Sample Description: Lean clay (CL), red
Visual Notes: with sand and gravel — Test Method: ASTM D 698 - Method A
Prepared: Dry — Oversized Fraction: < 5 % — Rammer: Manual — Gs - Fines: Assumed

Mold Weight 2038 grams		Moisture Determination				
Wet Weight plus Mold (grams)	Wet Weight minus Mold (grams)	Wet Soil and Can Weight (grams)	Dry Soil and Can Weight (grams)	Can Weight (grams)	Water Content (%)	Dry Density (pcf)
3644	1606	140.24	126.76	29.74	13.9	93.9
3803	1765	149.07	134.06	32.57	14.8	102.4
3934	1896	166.26	148.10	32.56	15.7	109.1
3947	1909	192.24	167.28	33.32	18.6	107.2
3931	1893	185.35	159.70	31.09	19.9	105.1

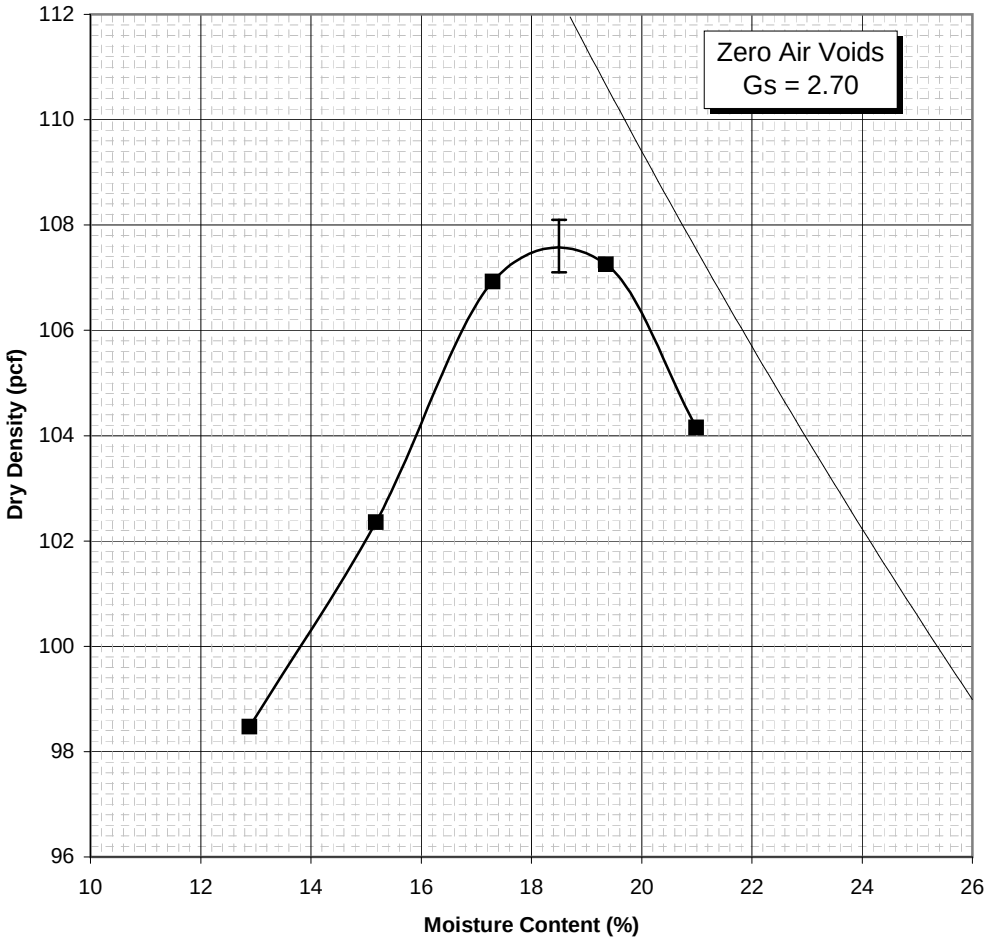


Maximum Dry Density 109.4 PCF
Optimum Moisture Content 16.3 %

Moisture-Density Data Sheet

Project: Colbert Fossil Plant (COF) - Ash Pond 4 — Project No.: 175559016
Source: STN-4-11, 20.0'-22.0' — Sample No.: 280
Sample Description: Lean clay (CL), red
Visual Notes: — Test Method: ASTM D 698 - Method A
Prepared: Dry — Oversized Fraction: < 5 % — Rammer: Manual — Gs - Fines: Assumed

Mold Weight 4230 grams		Moisture Determination				
Wet Weight plus Mold (grams)	Wet Weight minus Mold (grams)	Wet Soil and Can Weight (grams)	Dry Soil and Can Weight (grams)	Can Weight (grams)	Water Content (%)	Dry Density (pcf)
5899	1669	258.10	232.60	34.70	12.9	98.5
6000	1770	229.90	203.90	32.60	15.2	102.4
6113	1883	281.70	245.00	32.80	17.3	106.9
6152	1922	263.30	225.50	30.20	19.4	107.3
6122	1892	260.30	220.90	33.20	21.0	104.2

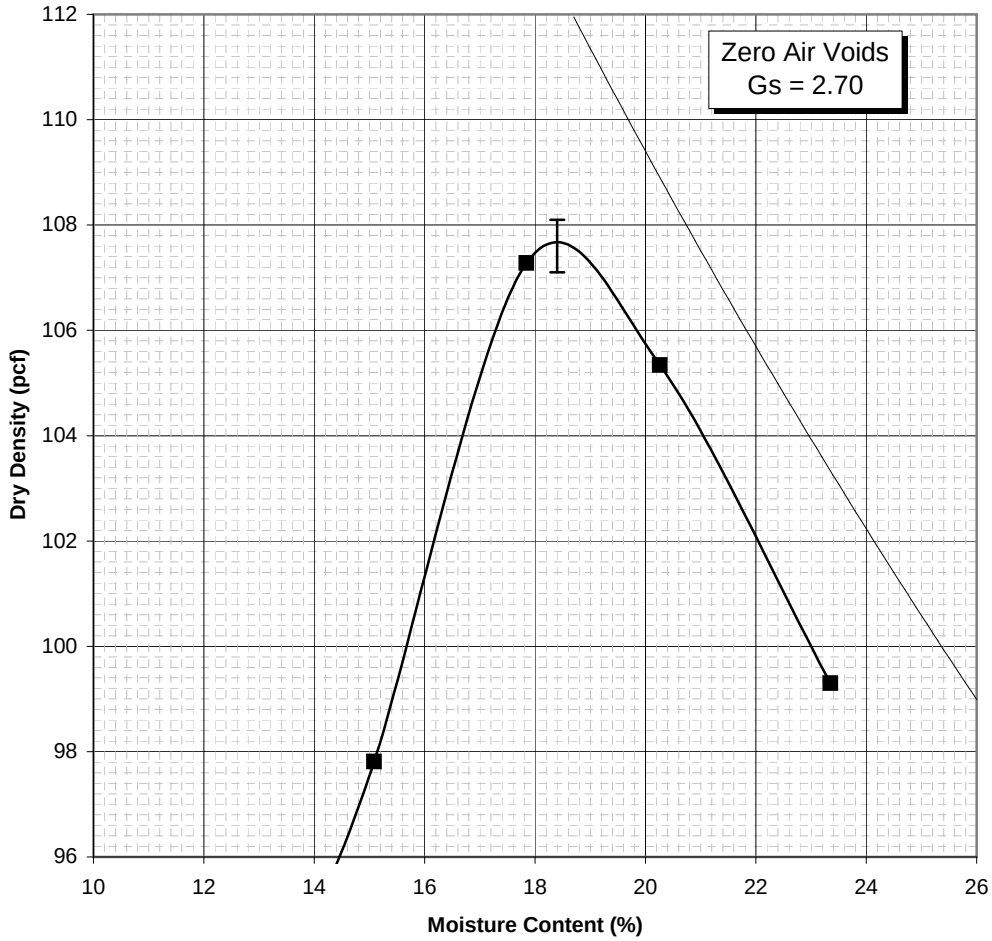


Maximum Dry Density 107.6 PCF
Optimum Moisture Content 18.5 %

Moisture-Density Data Sheet

Project: Colbert Fossil Plant (COF) - Ash Pond 4 — Project No.: 175559016
Source: STN-4-14, 20.0'-22.0' — Sample No.: 354
Sample Description: Lean clay (CL), reddish brown
Visual Notes: gravel — Test Method: ASTM D 698 - Method A
Prepared: Dry — Oversized Fraction: < 5 % — Rammer: Manual — Gs - Fines: Assumed

Mold Weight 2035 grams		Moisture Determination				
Wet Weight plus Mold (grams)	Wet Weight minus Mold (grams)	Wet Soil and Can Weight (grams)	Dry Soil and Can Weight (grams)	Can Weight (grams)	Water Content (%)	Dry Density (pcf)
3650	1615	147.58	133.13	28.82	13.9	94.5
3725	1690	110.29	99.94	31.33	15.1	97.8
3933	1898	156.54	137.25	29.13	17.8	107.3
3937	1902	140.64	121.72	28.34	20.3	105.3
3874	1839	101.22	87.72	29.90	23.3	99.3

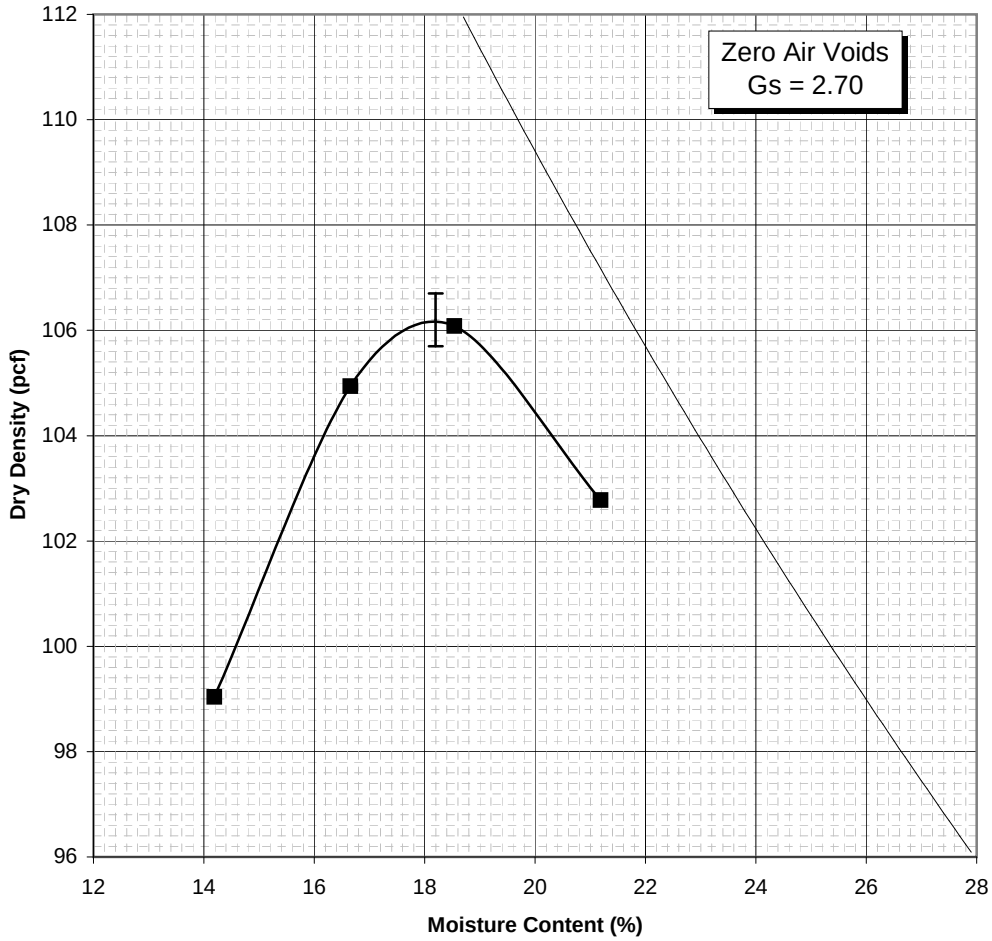


Maximum Dry Density 107.6 PCF
Optimum Moisture Content 18.4 %

Moisture-Density Data Sheet

Project: Colbert Fossil Plant (COF) - Ash Pond 4 — Project No.: 175559016
Source: STN-4-2, 0.0'-5.0' — Sample No.: 804
Sample Description: Lean clay (CL), red with sand
Visual Notes: — Test Method: ASTM D 698 - Method A
Prepared: Dry — Oversized Fraction: < 5 % — Rammer: Manual — Gs - Fines: Assumed

Mold Weight 2038 grams		Moisture Determination				
Wet Weight plus Mold (grams)	Wet Weight minus Mold (grams)	Wet Soil and Can Weight (grams)	Dry Soil and Can Weight (grams)	Can Weight (grams)	Water Content (%)	Dry Density (pcf)
3736	1698	204.60	183.30	33.20	14.2	99.0
3876	1838	218.80	192.30	33.20	16.7	104.9
3926	1888	156.10	149.50	113.90	18.5	106.1
3908	1870	166.60	156.60	109.40	21.2	102.8

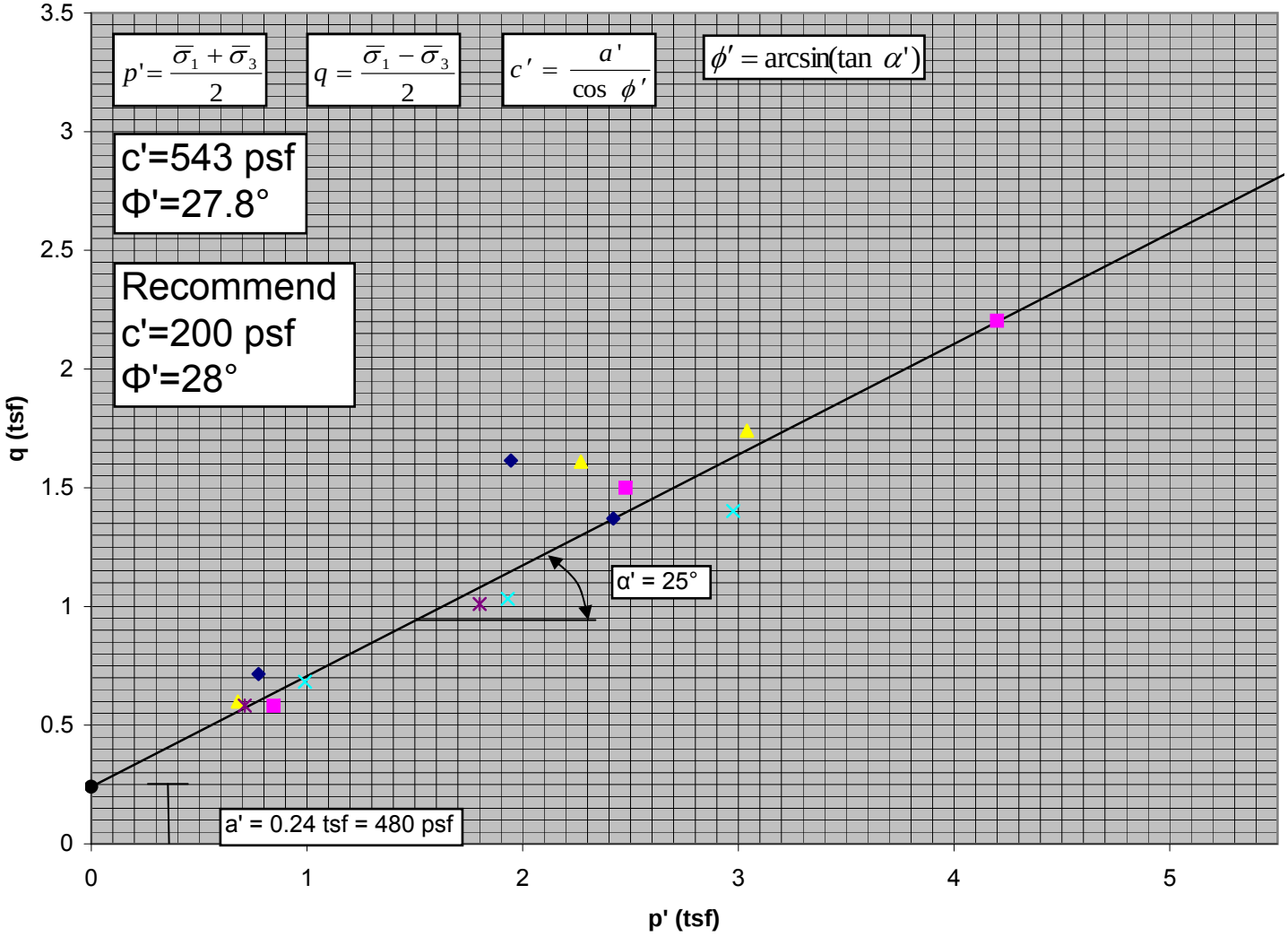


Maximum Dry Density 106.2 PCF
Optimum Moisture Content 18.2 %

Appendix D

Strength Parameter Selection

Upper Clay Dike
Effective Stress From CU Triaxial Tests

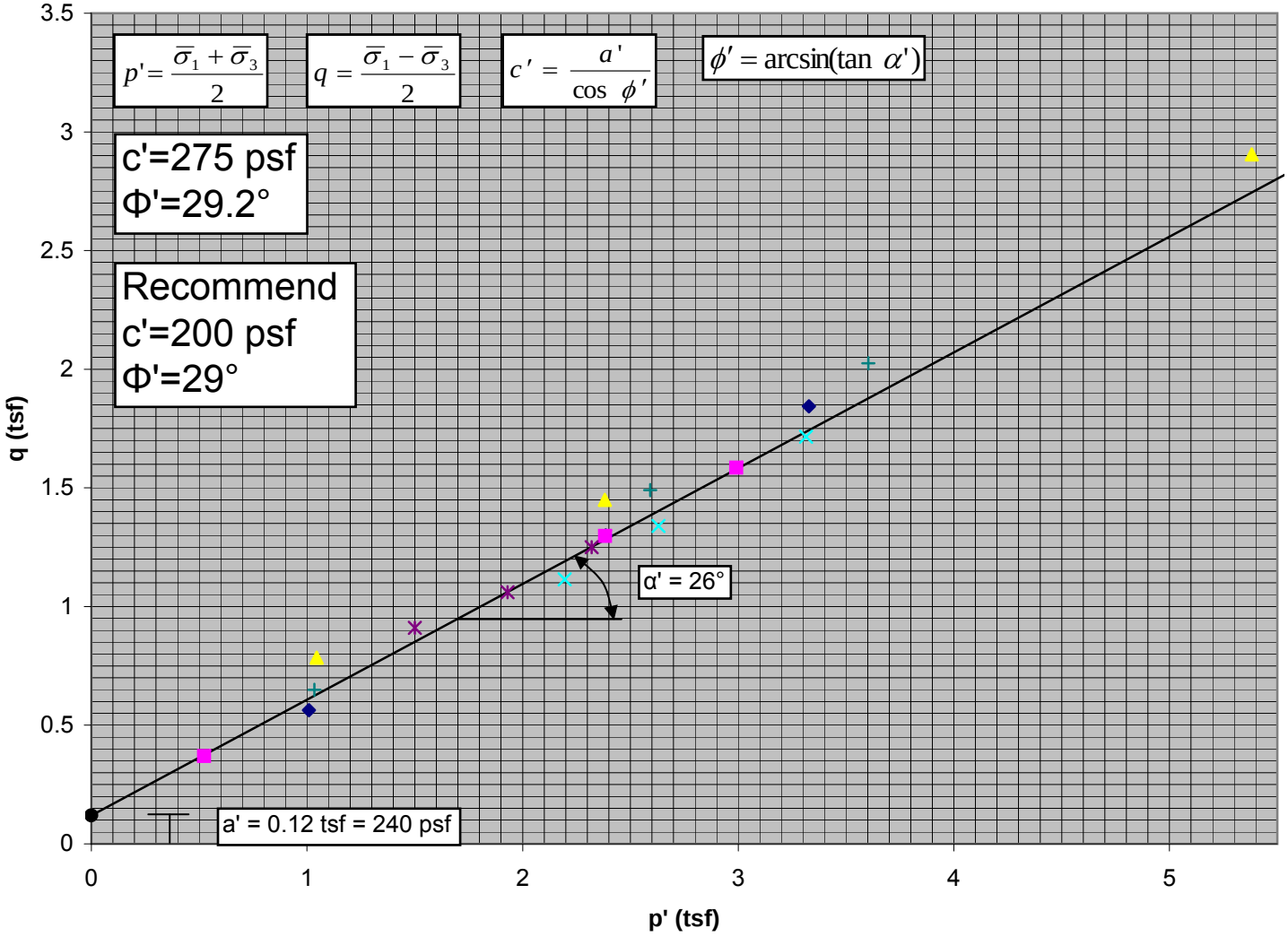


Boring ID

- STN-4-1
- STN-4-4
- STN-4-11
- STN-4-15
- STN-4-23

Stantec data used Maximum Effective Principal Stress Ratio to determine failure criteria.

Lower Clay Dike
Effective Stress From CU Triaxial Tests

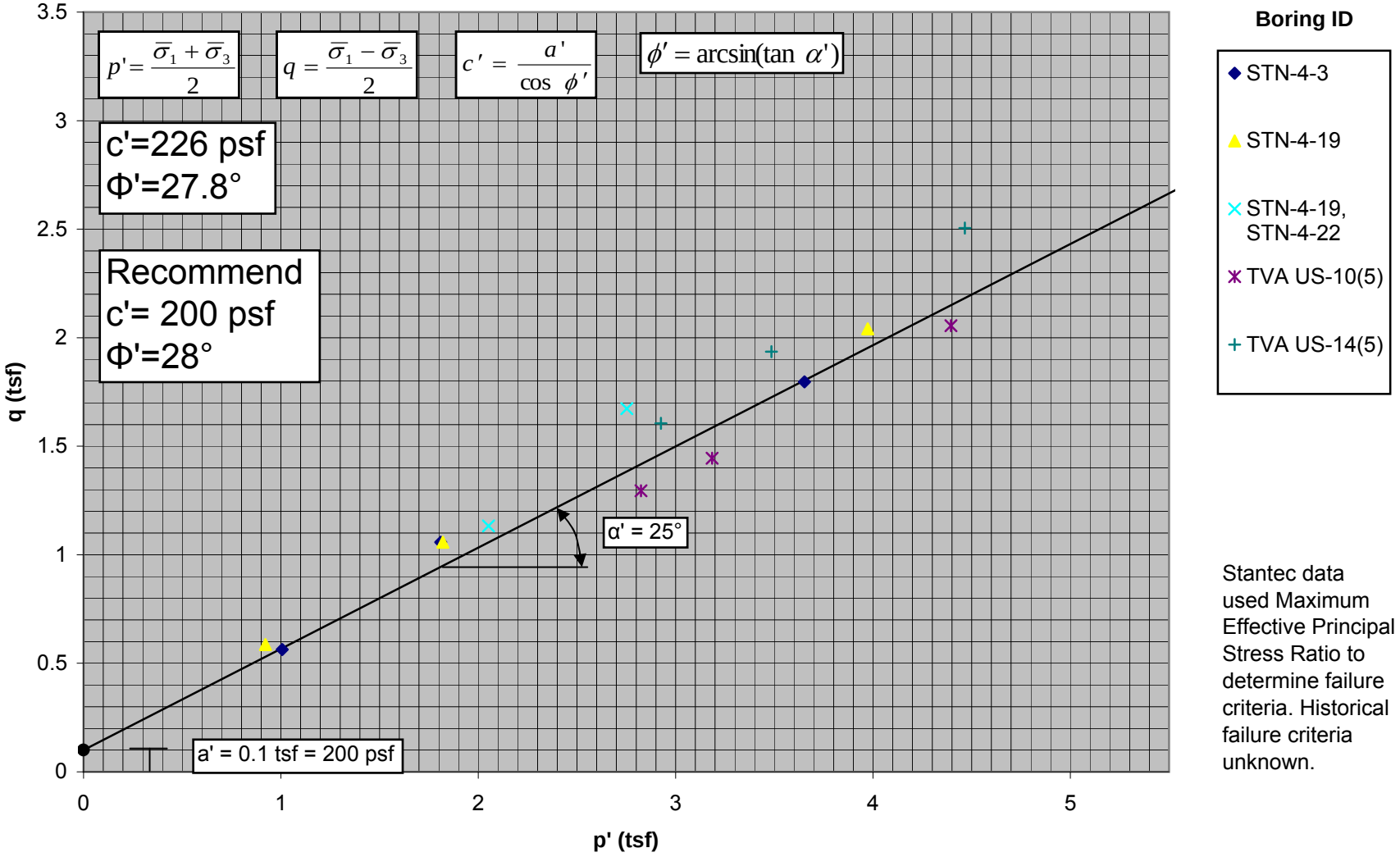


Boring ID

- STN-4-2, STN-4-5
- STN-4-12
- STN-4-16
- STN-4-5
- TVA US-4(2)
- TVA US-10(2)

Stantec data used Maximum Effective Principal Stress Ratio to determine failure criteria. Historical failure criteria unknown.

Native Clay
Effective Stress From CU Triaxial Tests



Stantec data used Maximum Effective Principal Stress Ratio to determine failure criteria. Historical failure criteria unknown.

Appendix E

Geotechnical Drawings

GEOTECHNICAL EXPLORATION
ASH POND 4
COLBERT FOSSIL PLANT
TUSCUMBIA, COLBERT COUNTY, ALABAMA

PREPARED FOR

TENNESSEE VALLEY AUTHORITY

PREPARED BY

Stantec Consulting Services Inc.
1901 Nelson Miller Parkway
Louisville, Kentucky
40223-2177
Tel. 502.212.5000
Fax 502.212.5055
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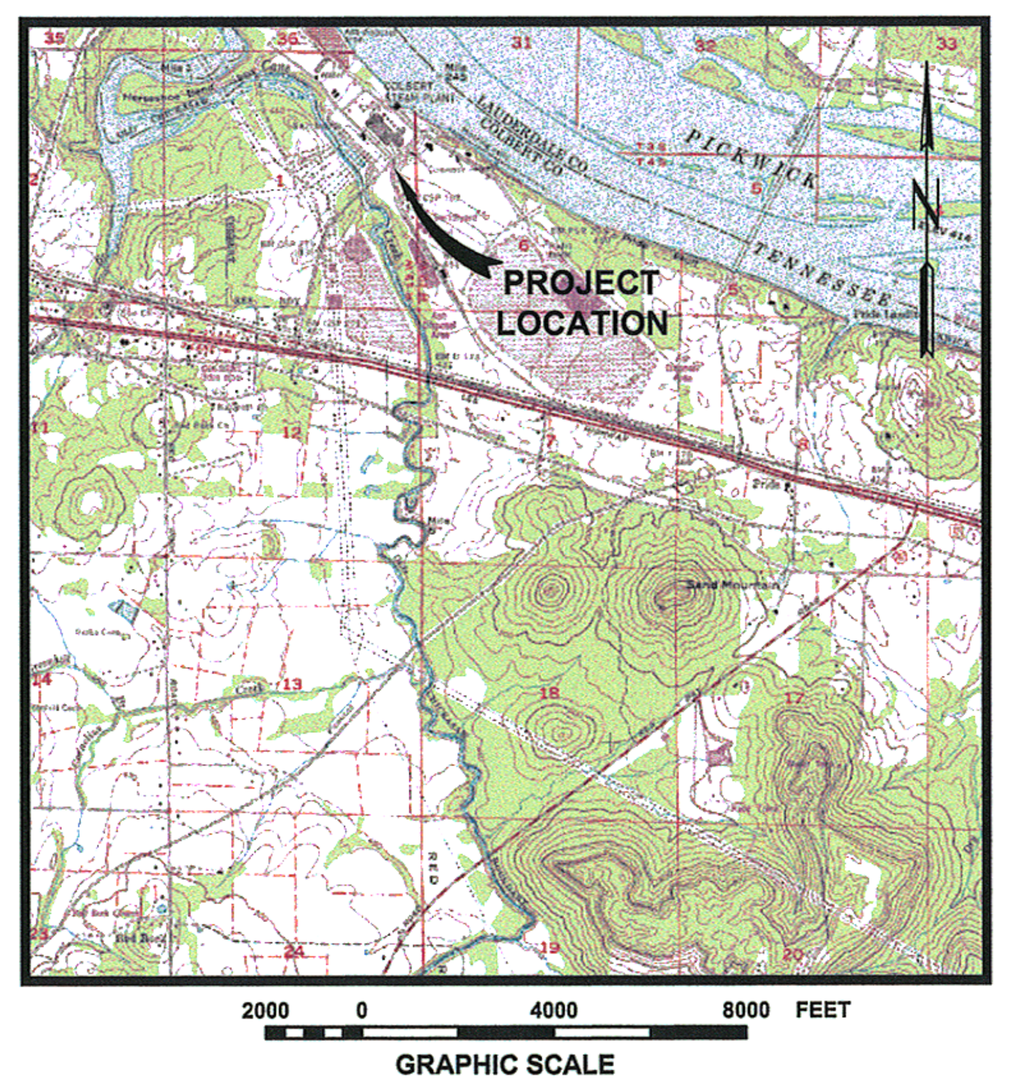

VICINITY MAP

INDEX OF SHEETS

RECORD DRAWING

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	01/22/10	PC	SB	PC	RLR	RLR	RLR	TJ	–	–	–
RECORD DRAWING											

DISCIPLINE INTERFACE: 1, 2, 3, 4

SCALE: NONE EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION
COVER SHEET

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

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COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 01/22/10 | 37 | C | 10W706–01 | R 0

STANTEC 0 PLOT FACTOR:XX C.A.D. DRAWING

37 C 10W706-02

BORING LOCATION TABLE

BORING	NORTHING	EASTING	ELEVATION
STN-4-1	1,723,599.52	394,359.89	460.2
STN-4-2	1,723,632.72	394,289.32	439.4
STN-4-3	1,723,645.94	394,253.91	427.3
STN-4-4	1,723,316.42	394,738.76	460.4
STN-4-5	1,723,366.01	394,798.52	439.5
STN-4-6	1,723,373.16	394,864.54	419.8
STN-4-7	1,722,880.08	394,960.81	460.8
STN-4-8	1,722,943.49	395,089.90	421.6
STN-4-9	1,722,306.36	395,260.37	461.2
STN-4-10	1,722,357.09	395,401.10	420.9
STN-4-11	1,721,882.96	395,485.31	461.3
STN-4-12	1,721,504.87	395,746.27	446.2
STN-4-13	1,721,330.83	395,874.15	425.3
STN-4-14	1,721,420.08	395,715.53	461.9
STN-4-15	1,721,219.13	395,347.89	460.5
STN-4-16	1,721,126.23	395,351.96	435.1
STN-4-17	1,721,539.59	394,582.90	476.8
STN-4-18	1,721,402.10	394,555.64	461.1
STN-4-19	1,721,352.01	394,475.66	440.3
STN-4-20	1,721,987.93	394,461.02	482.3
STN-4-21	1,721,985.14	394,262.71	460.2
STN-4-22	1,721,957.70	394,065.63	438.0
STN-4-23	1,722,728.47	394,227.94	461.1
STN-4-24	1,722,823.19	394,138.84	444.5

LEGEND

- Soil Boring With Continuous Standard Penetration Tests And/Or Shelby Tube Sampling
- Soil Boring With Continuous Standard Penetration Tests And/Or Shelby Tube Piston Sampling, And Piezometer Installation
- Soil Boring With Continuous Standard Penetration Tests And/or Shelby Tube Sampling, Rock Core, And Piezometer Installation

NOTES

1. Topographic and survey information provided by the Tennessee Valley Authority.
2. The Boring Logs And Related Information Shown On This Drawing Depict Approximate Subsurface Conditions Only At The Specific Boring Locations Noted And At The Time Of Drilling. Conditions At Other Locations May Differ From Those Occurring At The Boring Locations. Also, The Passage Of Time May Result In A Change In The Subsurface Conditions At The Boring Locations. Any Correlations Shown Between Borings Are Generally Based On Straight Line Interpolation. Actual Conditions Between Borings Are Unknown And May Differ From Those Shown.

RECORD DRAWING

100 0 200 400 FEET
GRAPHIC SCALE: 1"=200'

PLOT DATE: 01/22/2010 USER: PETTY, RICHARD
V:\1755\ACTIVE\175559016\GEOTECHNICAL\DRAWING\REV0_IFR\10W706-02-R0.DWG

For Supporting Design Calculations see FPGCOFFESCDX000002010001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	01/22/10	PC	SB	PC	RLR	RLR	RLR	TJ	–	–	–
RECORD DRAWING											

DISCIPLINE INTERFACE 1 2 3 4

SCALE: 1"=200' EXCEPT AS NOTED

ALABAMA LICENSED No. 30593 PROFESSIONAL ENGINEER RANDY LEE ROBERTS
Randy L Roberts 1/22/10

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION BORING AND STABILITY CROSS-SECTION PLAN

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

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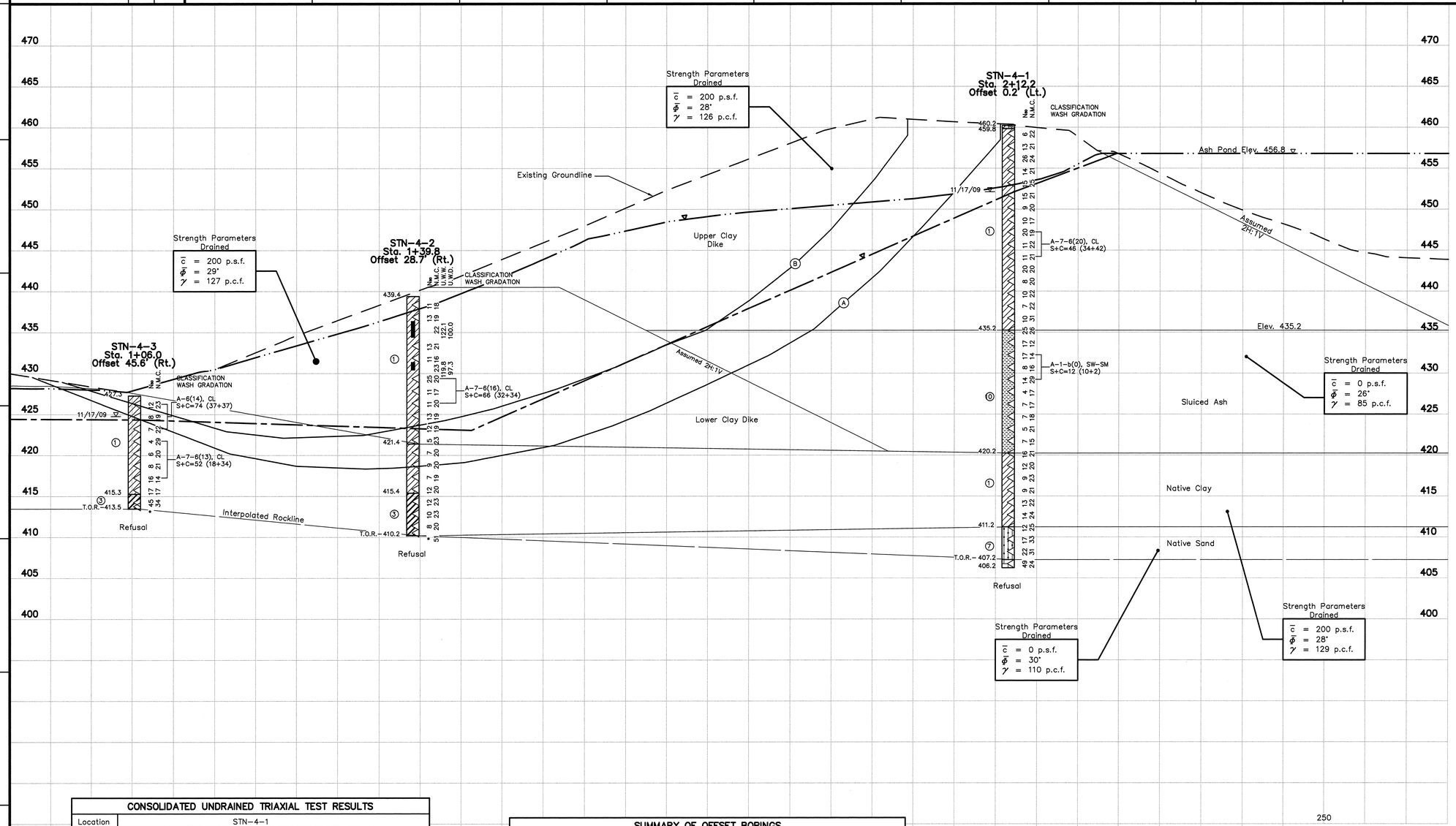
COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 01/22/10 | 37 | C | 10W706-02 | R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY



SECTION A-A'

LEGEND

①	Lean Clay, Sandy Lean Clay, Lean Clay with Sand
②	Silty, Clayey Sand
③	Fat Clay, Fat Clay with Sand
④	Overburden
⑤	Silty Clay
⑥	Poorly Graded Sand
⑦	Silty Sand
⑧	Silt, Sandy Silt, Silt with Sand
	Limestone
⑨	Fly Ash
⑩	Bottom Ash
WH	Weight of Hammer
WR	Weight of Rods
<	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N_{60}	Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{80}	Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C./U.U.	Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09 ▽	Piezometer Water Level Reading and Date Recorded
	Phreatic Surface from PZ Data
	Phreatic Surface from Seepage Model
T.O.R.-	Top of Rock (Indicates the beginning of rock-like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.-	Begin Rock Core
R.Q.D.	Rock Quality Designation (%)
REC.	Recovery (%)
Refusal	Auger Refusal using a carbide-tipped tooth auger bit
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

NOTE:

The geotechnical information and data furnished herein are not intended as representation or warranties but are furnished for information only. It shall be distinctly understood that the Owner or Engineer will not be responsible for any deduction, interpretation or conclusion drawn therefrom. The information is made available in order that the Contractor may have ready access to the same information available to the Owner and the Engineer and is not part of this contract.

CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Location	STN-4-1		
Depth	2.5'-3.0'	5.1'-5.6'	10.0'-10.5'
$\bar{\Phi}$	24.1°		
$\bar{c}$	860 p.s.f.		
Location	STN-4-3		
Depth	2.5'-3.0'	6.5'-7.0'	10.0'-10.5'
$\bar{\Phi}$	27.1°		
$\bar{c}$	356 p.s.f.		
Location	STN-4-2		STN-4-5
Depth	4.0'-4.5'	8.0'-8.5'	9.0-9.5'
$\bar{\Phi}$	33.4°		
$\bar{c}$	2 p.s.f.		

SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN-4-1S	460.2'	27.0'	14.5'-24.5'	2.0'-4.0' 5.0'-7.0' 10.0'-12.0' 15.0'-17.0' 20.0'-22.0' 25.0'-27.0'
STN-4-3S	427.3'	18.0'	13.0'-18.0'	2.0'-4.0' 6.0'-8.0' 10.0'-12.0'

SUMMARY OF GLOBAL STABILITY ANALYSES STATIC CONDITION

Failure Surface	Failure Mode	Factor of Safety
A	Circular Optimized With Phreatic Surface From PZ Data	2.10
B	Circular Optimized With Phreatic Surface From Seepage Model	1.50

RECORD DRAWING

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

ALABAMA LICENSED NO. 30983 PROFESSIONAL ENGINEER TIMOTHY LEE ROBERTS
1/22/10

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REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	DISCIPLINE INTERFACE
R 0	01/22/10	PC	SB	PC	RLR	RLR	RLR	TJ	-	-	-
RECORD DRAWING											

SCALE: 1"=5' EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION
STABILITY SECTION A-A'

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

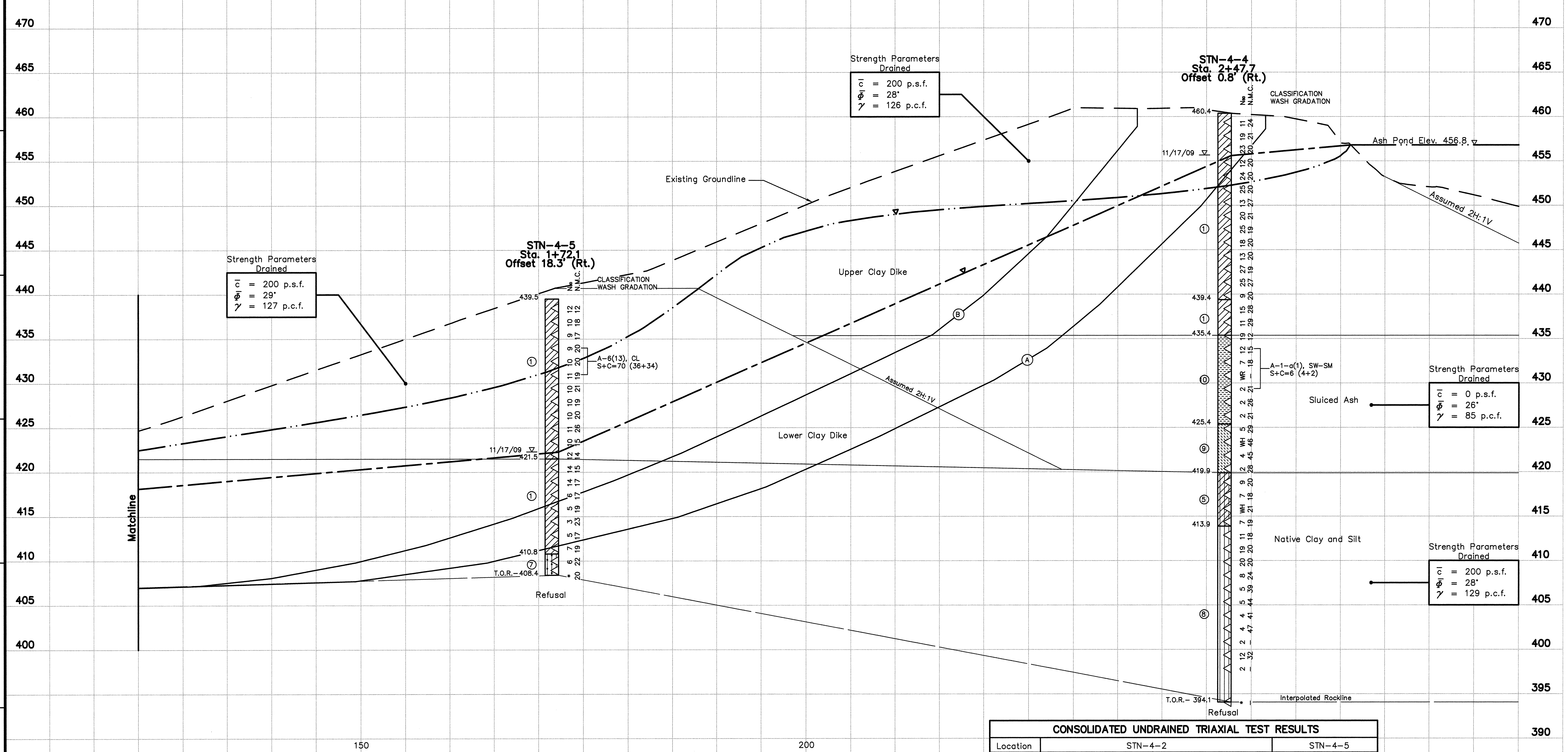
AUTOCAD R 2000	DATE 01/22/10	37	C	10W706-03	R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 01/22/2010 USER: PETTY, RICHARD
N:\TVA\ASHPOND\TECHNICAL\DRAWING\REVISED_RPT\10W706-03-RD.DWG



LEGEND

1. Lean Clay, Sandy Lean Clay, Lean Clay with Sand
2. Silty, Clayey Sand
3. Fat Clay, Fat Clay with Sand
4. Overburden
5. Silty Clay
6. Poorly Graded Sand
7. Silty Sand
8. Silt, Sandy Silt, Silt with Sand
- Limestone
9. Fly Ash
10. Bottom Ash

WH	Weight of Hammer
WR	Weight of Rods
◁	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N_{60}	Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{80}	Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C./U.U.	Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09 ▽	Piezometer Water Level Reading and Date Recorded
— - ▽ - —	Phreatic Surface from PZ Data
▽ ·· —	Phreatic Surface from Seepage Model
T.O.R.-	Top of Rock (Indicates the beginning of rock-like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.-	Begin Rock Core
R.Q.D.	Rock Quality Designation (%)
REC.	Recovery (%)
Refusal	Auger Refusal using a carbide-tipped tooth auger bit
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

NOTE:

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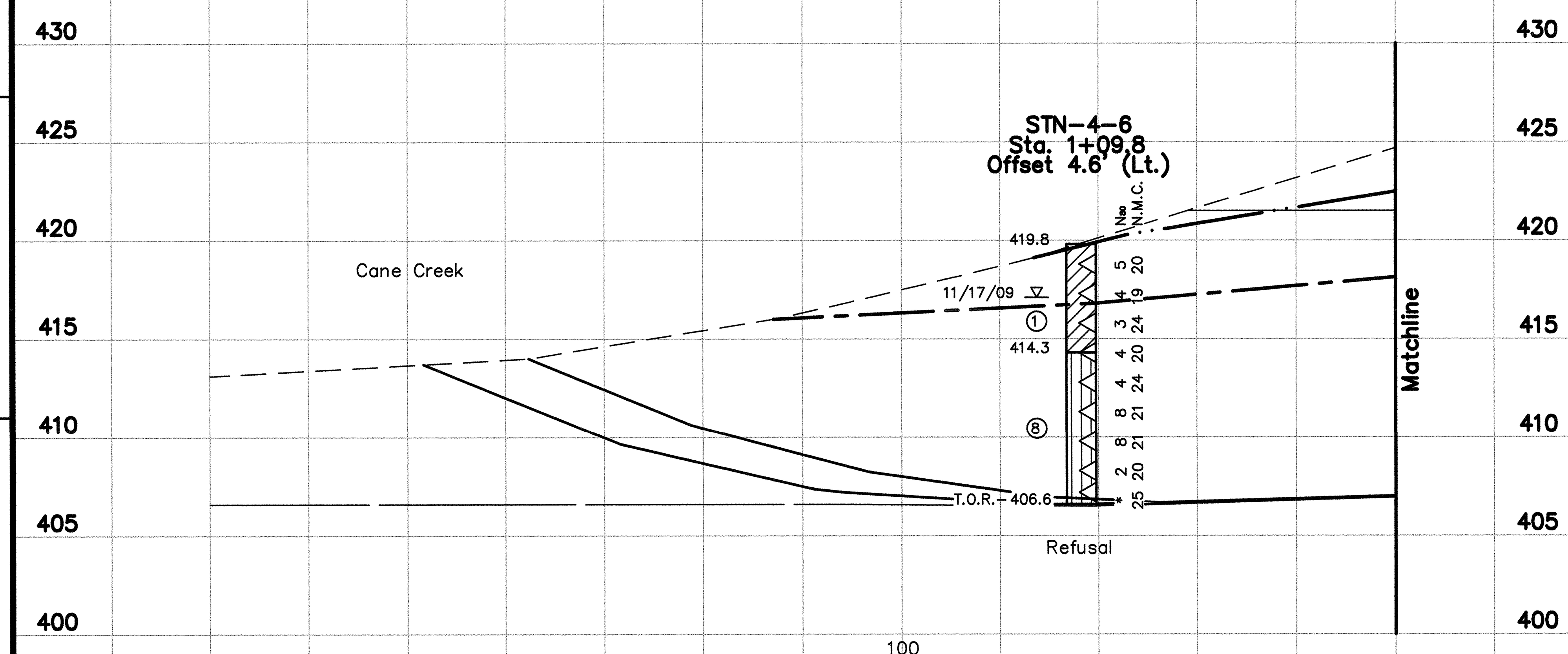
CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Location	STN-4-2		STN-4-5
Depth	4.0'-4.5'	8.0'-8.5'	9.0'-9.5'
$\bar{\phi}$	33.4°		
$\bar{c}$	2 p.s.f.		
Location	STN-4-4		
Depth	5.0'-5.5'	2.8'-3.3'	5.6'-6.1'
$\bar{\phi}$	28.9°		
$\bar{c}$	497 p.s.f.		
Location	STN-4-5		
Depth	17.6'-18.1'	17.0'-17.5'	22.3'-22.8'
$\bar{\phi}$	32.4°		
$\bar{c}$	229 p.s.f.		

SUMMARY OF GLOBAL STABILITY ANALYSES STATIC CONDITION

Failure Surface	Failure Mode	Factor of Safety
A	Circular Optimized With Phreatic Surface From PZ Data	1.80
B	Circular Optimized With Phreatic Surface From Seepage Model	1.54



SECTION B-B'

SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN-4-4S	460.4	27.0'	15.0'-25.0'	2.0'-4.0' 5.0'-7.0' 10.0'-12.0' 15.0'-17.0' 20.0'-22.0' 25.0'-27.0'
STN-4-5S	439.5'	24.0'	14.0'-24.0'	4.0'-6.0' 9.0'-11.0' 14.0'-16.0' 17.0'-19.0' 21.5'-23.5'
STN-4-6	419.8'	13.2'	8.2'-13.2'	No Samples

RECORD DRAWING

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R -	-	-	-	-	-	-	-	-	-	-	-
R 0	01/22/10 RECORD DRAWING	PC	SB	PC	RLR	RLR	RLR	TJ	-	-	-

DISCIPLINE INTERFACE 1 2 3 4

SCALE: 1"=5' EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION STABILITY SECTION B-B'

ALABAMA LICENSED No. 30563 PROFESSIONAL ENGINEER RANDY LEE ROBERTS 1/22/10

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

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COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

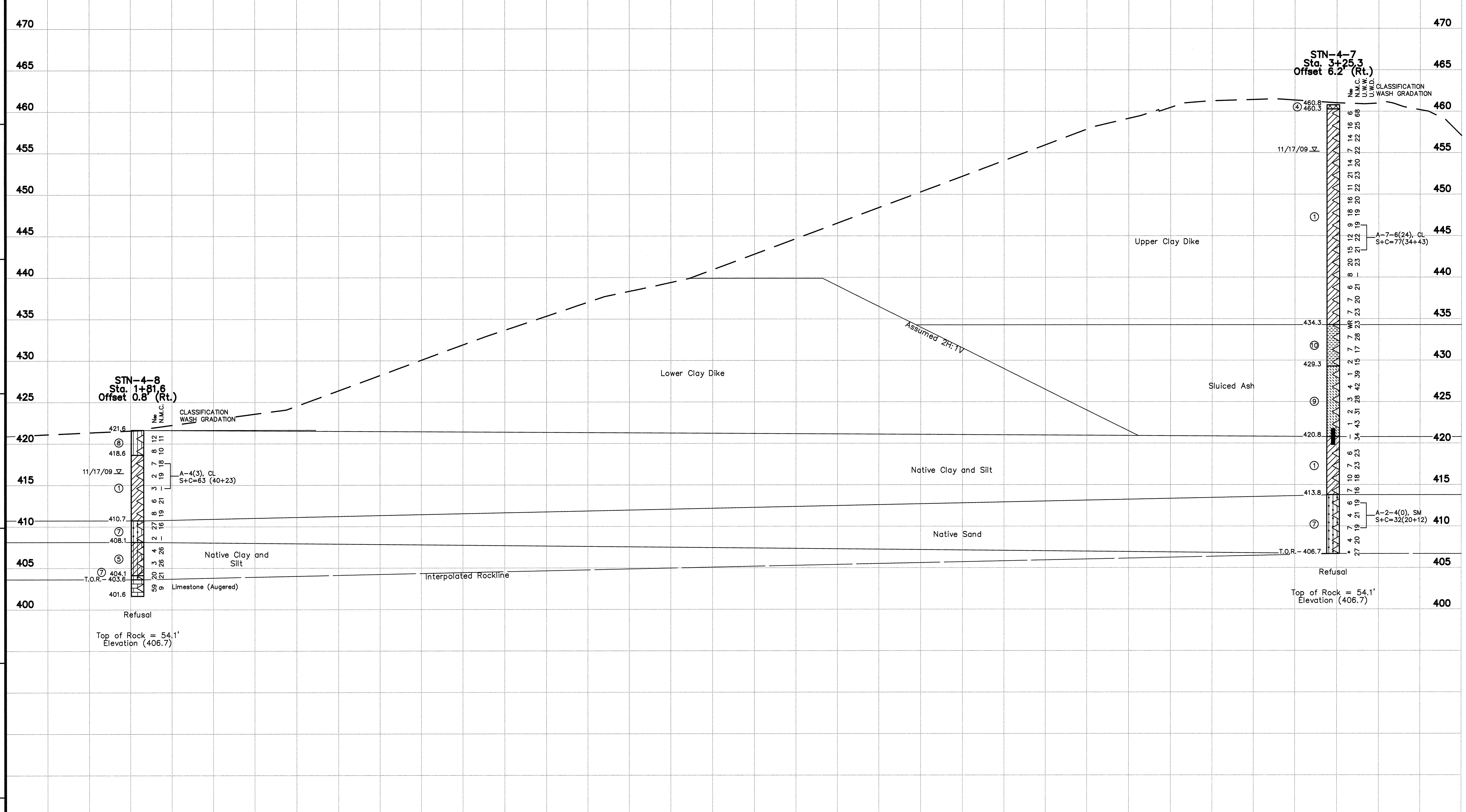
AUTOCAD R 2000 | DATE 01/22/10 | 37 | C | 10W706-04 | R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY

PLOT DATE: 01/22/2010



SECTION C-C'

SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN-4-7S	460.8'	27.0'	15.0'-25.0'	2.0'-4.0' 5.0'-7.0' 10.0'-12.0' 15.0'-17.0' 20.0'-22.0' 25.0'-27.0'
STN-4-8S	421.6'	20.0'	10.0'-20.0'	No Samples

LEGEND

- ① Lean Clay, Sandy Lean Clay, Lean Clay with Sand
- ② Silty, Clayey Sand
- ③ Fat Clay, Fat Clay with Sand
- ④ Overburden
- ⑤ Silty Clay
- ⑥ Poorly Graded Sand
- ⑦ Silty Sand
- ⑧ Silt, Sandy Silt, Silt with Sand
- Limestone
- ⑨ Fly Ash
- ⑩ Bottom Ash

WH	Weight of Hammer
WR	Weight of Rods
◁	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N_{60}	Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{80}	Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C./U.U.	Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09 ▽	Piezometer Water Level Reading and Date Recorded
T.O.R.-	Top of Rock (Indicates the beginning of rock-like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.-	Begin Rock Core
R.Q.D.	Rock Quality Designation (%)
REC.	Recovery (%)
Refusal	Auger Refusal using a carbide-tipped tooth auger bit
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

NOTE:

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RECORD DRAWING

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R -	-	-	-	-	-	-	-	-	-	-	-
R 0	01/22/10	PC	SB	PC	RLR	RLR	RLR	TJ	-	-	-

RECORD DRAWING

SCALE: 1"=5' EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION STABILITY SECTION C-C'

ALABAMA LICENSED No. 30563 PROFESSIONAL ENGINEER RANDY LEE ROBERTS 1/22/10

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

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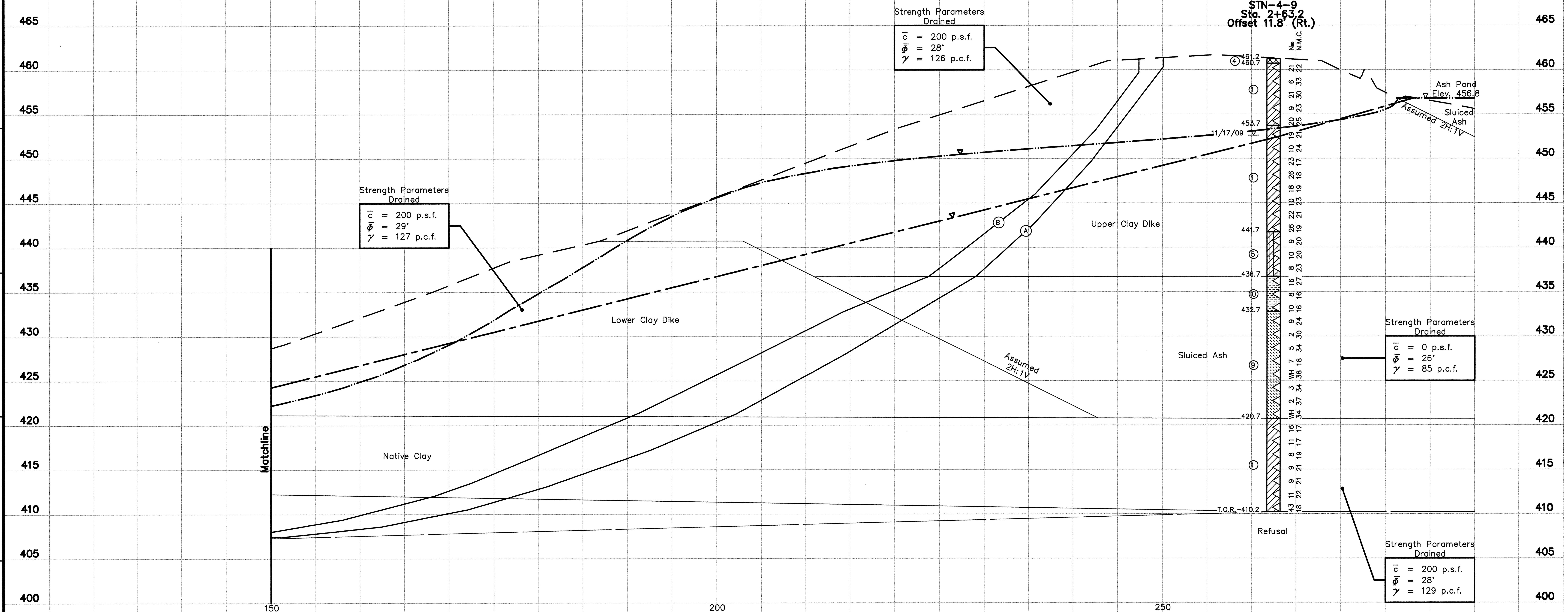
COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

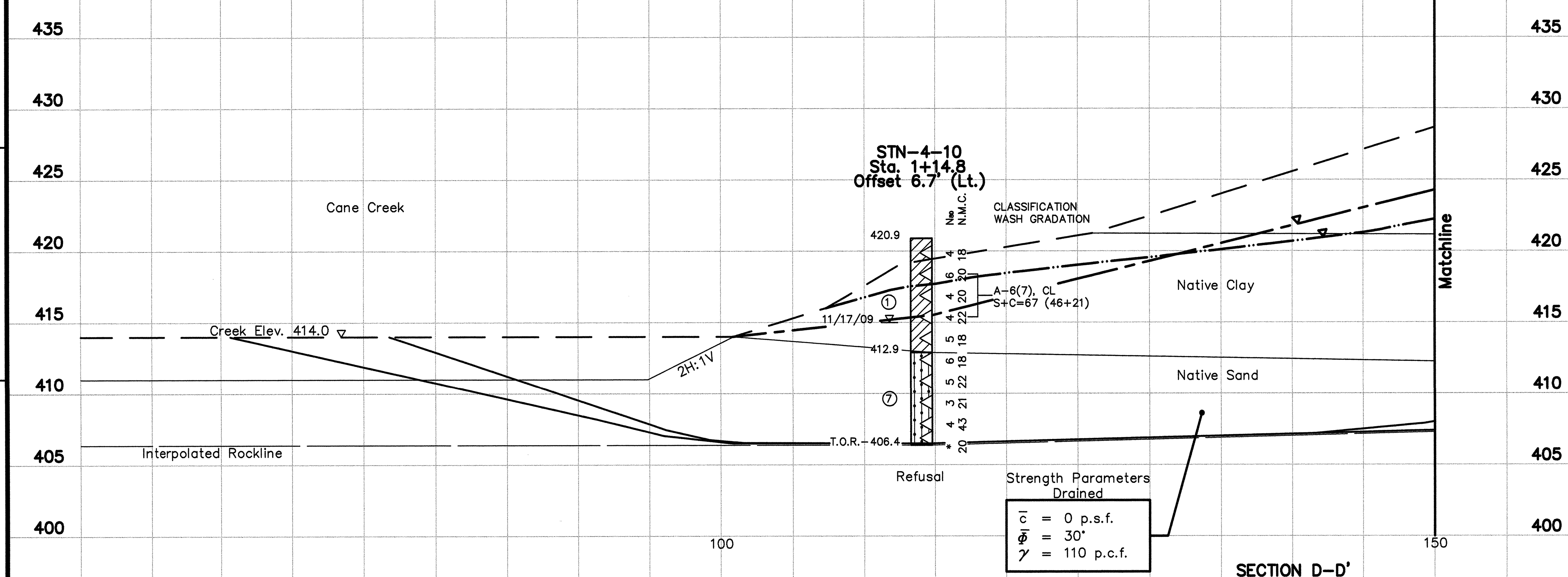
AUTOCAD R 2000 | DATE 01/22/10 | 37 | C | 10W706-05 | R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY





SECTION D-D'

LEGEND

① Lean Clay, Sandy Lean Clay, Lean Clay with Sand
② Silty, Clayey Sand
③ Fat Clay, Fat Clay with Sand
④ Overburden
⑤ Silty Clay
⑥ Poorly Graded Sand
⑦ Silty Sand
⑧ Silt, Sandy Silt, Silt with Sand
Limestone
⑨ Fly Ash
⑩ Bottom Ash

WH	Weight of Hammer
WR	Weight of Rods
◁	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N_{60}	Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{80}	Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C./U.U.	Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09 ▽	Piezometer Water Level Reading and Date Recorded
	Phreatic Surface from PZ Data
	Phreatic Surface from Seepage Model
T.O.R.-	Top of Rock (indicates the beginning of rock-like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.-	Begin Rock Core
R.Q.D.	Rock Quality Designation (%)
REC.	Recovery (%)
Refusal	Auger Refusal using a carbide-tipped tooth auger bit
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

NOTE:

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SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN-4-9S	461.2'	42.0'	13.5'-23.5'	2.0'-4.0' 5.0'-7.0' 10.0'-12.0' 15.0'-17.0' 20.0'-22.0' 25.0'-27.0' 30.0'-32.0' 35.0'-37.0' 40.0'-42.0'
STN-4-10S	420.9'	14.5'	4.5'-14.5'	No Samples

SUMMARY OF GLOBAL STABILITY ANALYSES STATIC CONDITION

Failure Surface	Failure Mode	Factor of Safety
A	Circular Optimized With Phreatic Surface From PZ Data	1.40
B	Circular Optimized With Phreatic Surface From Seepage Model	1.42

RECORD DRAWING

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 0	01/22/10	PC	SB	PC	RLR	RLR	RLR	TJ	-	-

RECORD DRAWING

SCALE: 1"=5' EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION
STABILITY SECTION D-D'

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

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COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

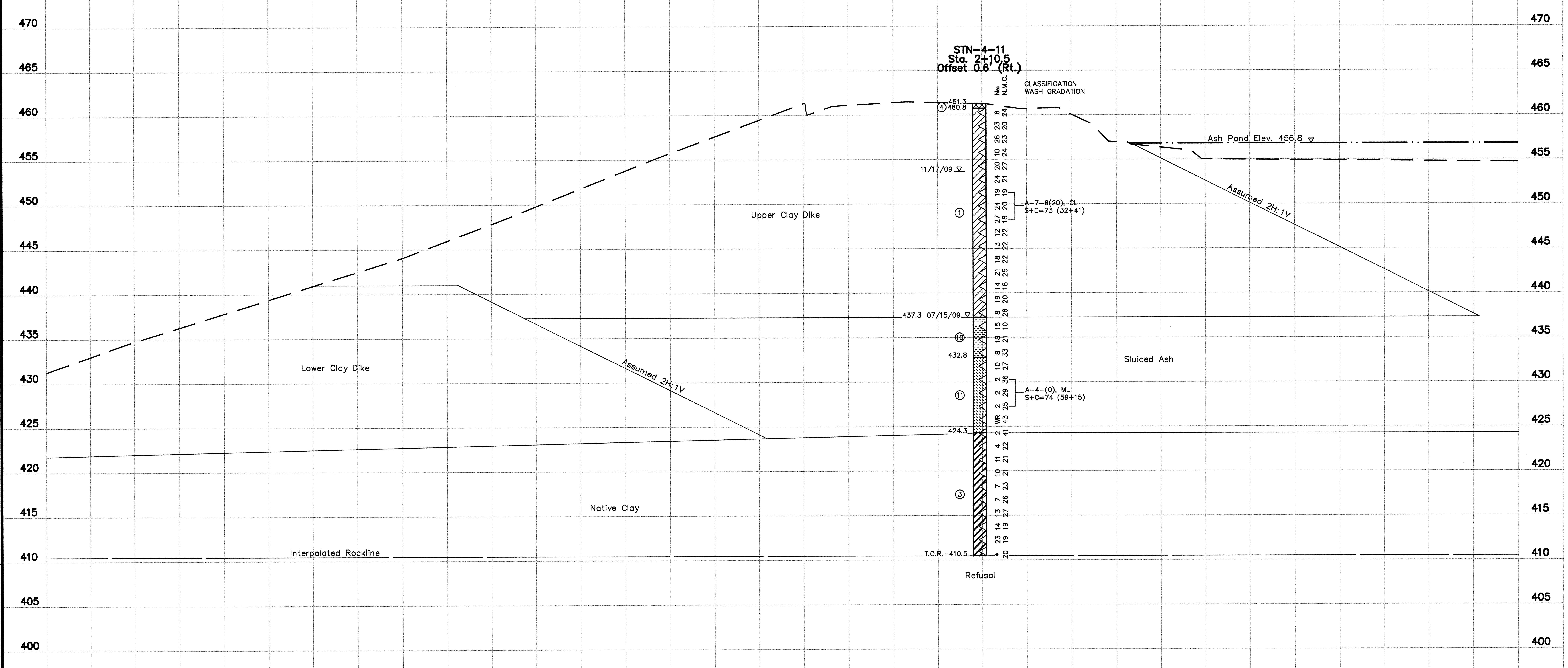
AUTOCAD R 2000 | DATE 01/22/10 | 37 | C | 10W706-06 | R 0

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY

STANTEC | 0
TASK COMPLETED BY: | REV NO.

37 C 10W706-07



SECTION E-E'

LEGEND

① Lean Clay, Sandy Lean Clay, Lean Clay with Sand
② Silty, Clayey Sand
③ Fat Clay, Fat Clay with Sand
④ Overburden
⑤ Silty Clay
⑥ Poorly Graded Sand
⑦ Silty Sand
⑧ Silt, Sandy Silt, Silt with Sand
Limestone
⑨ Fly Ash
⑩ Bottom Ash

WH	Weight of Hammer
WR	Weight of Rods
◁	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N_{60}	Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{80}	Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C./U.U.	Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09	Piezometer Water Level Reading and Date Recorded
T.O.R.-	Top of Rock (Indicates the beginning of rock-like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.-	Begin Rock Core
R.Q.D.	Rock Quality Designation (%)
REC.	Recovery (%)
Refusal	Auger Refusal using a carbide-tipped tooth auger bit
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

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RECORD DRAWING

CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Location	STN-4-11		
Depth	5.0'-5.5'	5.5'-6.0'	10.0'-10.5'
$\bar{\phi}$	29.2°		
$\bar{c}$	600 p.s.f.		

SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN-4-11S	461.3	24.0'	12.0'-22.0'	2.0'-4.0' 5.0'-7.0' 10.0'-12.0' 15.0'-17.0' 20.0'-22.0' 22.0'-24.0'

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 0	01/22/10	PC	SB	PC	RLR	RLR	RLR	TJ	–	–

RECORD DRAWING

SCALE: 1"=5' EXCEPT AS NOTED

YARD
ASH POND 4
GEOTECHNICAL EXPLORATION
STABILITY SECTION E-E'

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

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FOSSIL AND HYDRO ENGINEERING

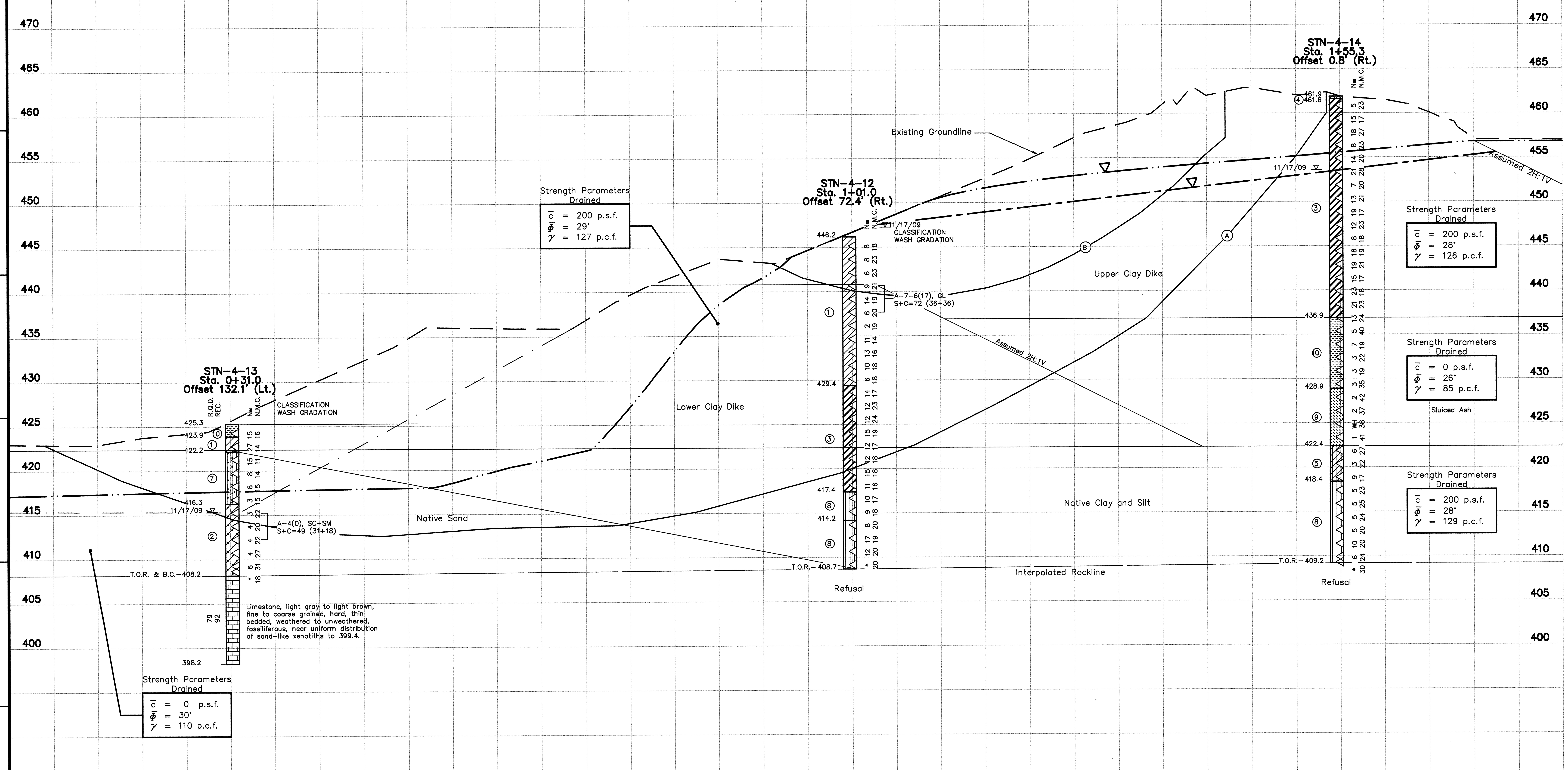
AUTOCAD R 2000 | DATE 01/22/10 | 37 | C | 10W706-07 | R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

37 C 10W706-08



SECTION F-F'

LEGEND

(1) Lean Clay, Sandy Lean Clay, Lean Clay with Sand
(2) Silty, Clayey Sand
(3) Fat Clay, Fat Clay with Sand
(4) Overburden
(5) Silty Clay
(6) Poorly Graded Sand
(7) Silty Sand
(8) Silt, Sandy Silt, Silt with Sand
Limestone
(9) Fly Ash
(0) Bottom Ash

WH	Weight of Hammer
WR	Weight of Rods
◁	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N_{60}	Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{80}	Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C./U.U.	Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09 ▽	Piezometer Water Level Reading and Date Recorded
▽	Phreatic Surface from PZ Data
▽	Phreatic Surface from Seepage Model
T.O.R.–	Top of Rock (Indicates the beginning of rock-like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.–	Begin Rock Core
R.Q.D.	Rock Quality Designation (%)
REC.	Recovery (%)
Refusal	Auger Refusal using a carbide-tipped tooth auger bit
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

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CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Location	STN-4-12		
Depth	8.0'-8.5'	15.0'-15.5'	8.6'-9.1'
φ̄	29.5°		
c̄	261 p.s.f.		

SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN-4-12S	446.2'	22.0'	10.0'-20.0'	2.0'-4.0' 5.0'-7.0' 8.0'-10.0' 15.0'-17.0' 20.0'-22.0'
STN-4-13S	425.3'	27.0'	6.0'-16.0'	No Samples
STN-4-14S	461.9'	41.0'	15.0'-25.0'	2.0'-4.0' 5.0'-7.0' 10.0'-12.0' 15.0'-17.0' 20.0'-22.0' 25.0'-27.0' 32.0'-34.0' 35.0'-37.0' 39.0'-41.0'

SUMMARY OF GLOBAL STABILITY ANALYSES STATIC CONDITION

Failure Surface	Failure Mode	Factor of Safety
A	Circular Optimized With Phreatic Surface From PZ Data	1.49
B	Circular Optimized With Phreatic Surface From Seepage Model	1.77

RECORD DRAWING

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

R 0 01/22/10 PC SB PC RLR RLR RLR TJ
RECORD DRAWING

SCALE: 1"=5' EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION
STABILITY SECTION F-F'

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

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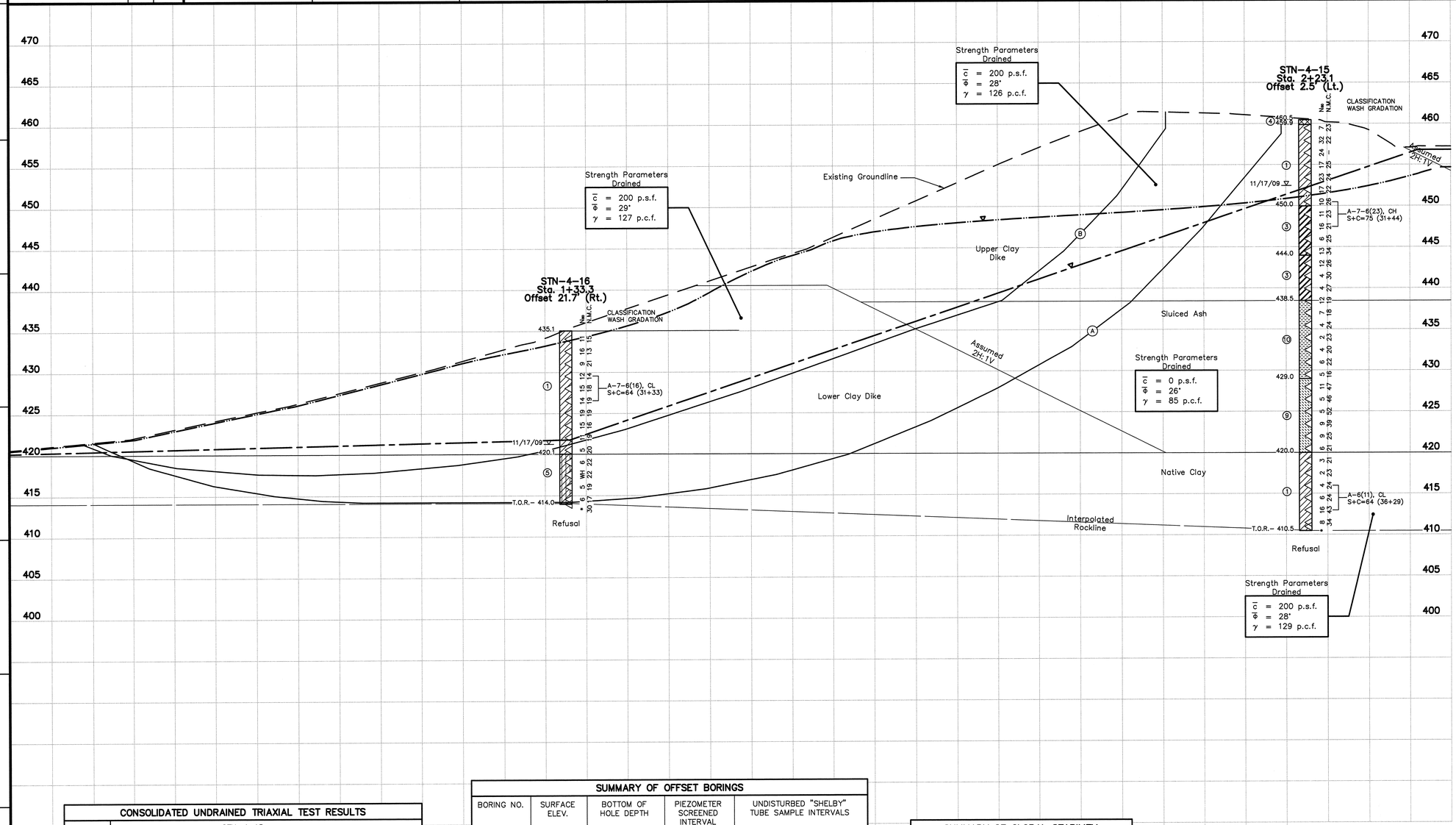
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 DATE 01/22/10 37 C 10W706-08 R 0

STANTEC 0
TASK COMPLETED BY: REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY



SECTION G–G'

LEGEND

①	Lean Clay, Sandy Lean Clay, Lean Clay with Sand
②	Silty, Clayey Sand
③	Fat Clay, Fat Clay with Sand
④	Overburden
⑤	Silty Clay
⑥	Poorly Graded Sand
⑦	Silty Sand
⑧	Silt, Sandy Silt, Silt with Sand
	Limestone
⑨	Fly Ash
⑩	Bottom Ash
WH	Weight of Hammer
WR	Weight of Rods
◁	Standard Penetration Test Interval
■	Undisturbed Thin–Walled (Shelby) Tube Sample
N_{60}	Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{60}	Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C./U.U.	Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09 ▽	Piezometer Water Level Reading and Date Recorded
	Phreatic Surface from PZ Data
	Phreatic Surface from Seepage Model
T.O.R.–	Top of Rock (Indicates the beginning of rock–like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.–	Begin Rock Core
R.Q.D.	Rock Quality Designation (%)
REC.	Recovery (%)
Refusal	Auger Refusal using a carbide–tipped tooth auger bit
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586–99. Refer to typed boring log.

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CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Location	STN–4–15		
Depth	5.4'–5.9'	10.1'–10.6'	15.5'–16.1'
$\bar{\Phi}$	21.2°		
$\bar{c}$	701 p.s.f.		
Location	STN–4–16		
Depth	4.0'–4.5'	9.6'–10.1'	4.6'–5.1'
$\bar{\Phi}$	29.2°		
$\bar{c}$	641 p.s.f.		

SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN–4–15S	460.5'	41.0'	11.0'–21.0'	2.0'–4.0' 5.0'–7.0' 10.0'–12.0' 15.0'–17.0' 20.0'–22.0' 33.0'–35.0' 35.0'–37.0' 39.0'–41.0'
STN–4–16S	435.1'	21.0'	11.0'–21.0'	4.0'–6.0' 9.0'–11.0' 13.5'–15.5'

SUMMARY OF GLOBAL STABILITY ANALYSES STATIC CONDITION

Failure Surface	Failure Mode	Factor of Safety
A	Circular Optimized With Phreatic Surface From PZ Data	1.95
B	Circular Optimized With Phreatic Surface From Seepage Model	1.50

RECORD DRAWING

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

ALABAMA LICENSED PROFESSIONAL ENGINEER No. 20069 REGISTERED RAYMOND LEE ROBERTS 1/22/10

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ⊘	AS CONST	DISCIPLINE INTERFACE
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	01/22/10	PC	SB	PC	RLR	RLR	RLR	TJ	–	–	–
RECORD DRAWING											

SCALE: 1"=5' EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION
STABILITY SECTION G–G'

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 01/22/10	37	C	10W706–09	R 0

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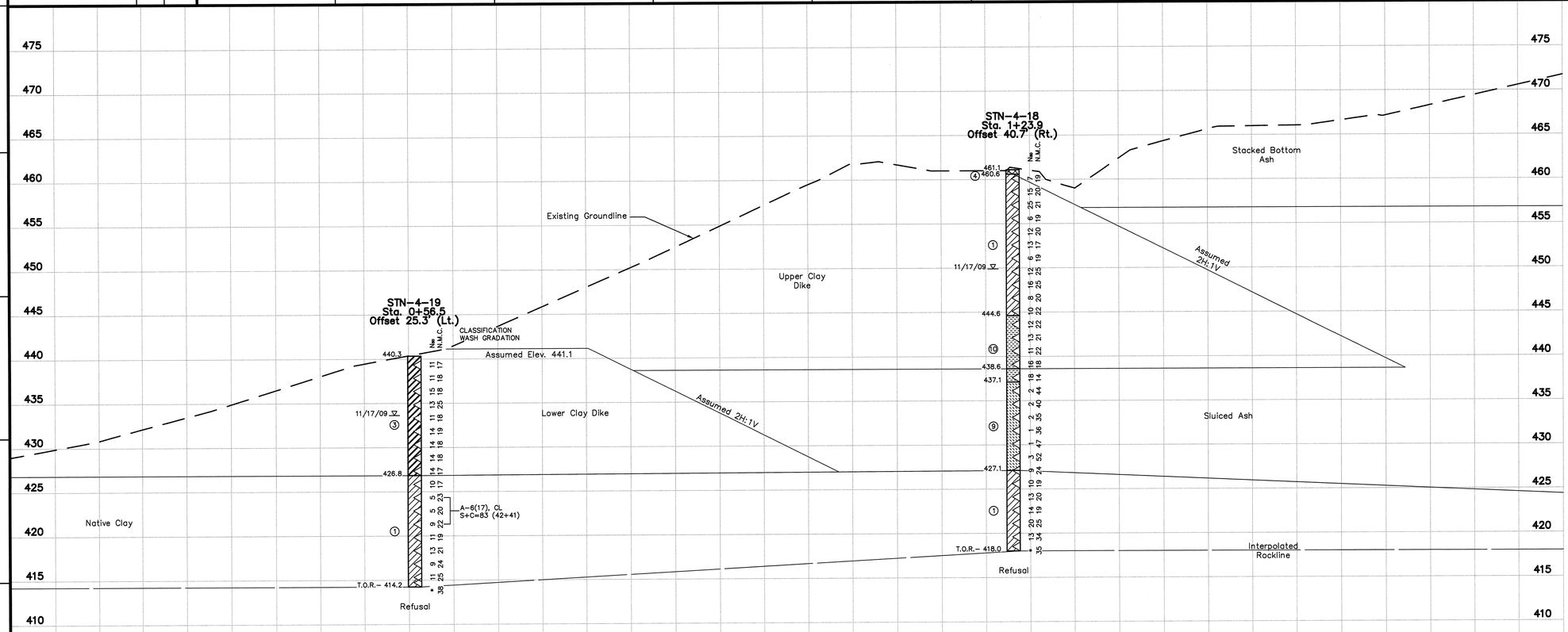
Louisville, Kentucky
40223-2177
Tel. 502.212.5000
Fax 502.212.5055
www.stantec.com

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 01/21/2010 USER: PITTY, RICHARD
N:\TVOA\ASHPOND\GEOTECHNICAL\DRAWINGS\RVD_GEO\10W706-09-RG.DWG



LEGEND

①	Lean Clay, Sandy Lean Clay, Lean Clay with Sand
②	Silty, Clayey Sand
③	Fat Clay, Fat Clay with Sand
④	Overburden
⑤	Silty Clay
⑥	Poorly Graded Sand
⑦	Silty Sand
⑧	Silt, Sandy Silt, Silt with Sand
	Limestone
⑨	Fly Ash
⑩	Bottom Ash
WH	Weight of Hammer
WR	Weight of Rods
◁	Standard Penetration Test Interval
■	Undisturbed Thin–Walled (Shelby) Tube Sample
N_{60}	Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{80}	Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C./U.U.	Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09 ▽	Piezometer Water Level Reading and Date Recorded
T.O.R.–	Top of Rock (Indicates the beginning of rock–like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.–	Begin Rock Core
R.Q.D.	Rock Quality Designation (%)
REC.	Recovery (%)
Refusal	Auger Refusal using a carbide–tipped tooth auger bit
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586–99. Refer to typed boring log.

NOTE:

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CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Location	STN–4–19		
Depth	19.1'–19.6'	14.1'–14.6'	19.7'–20.2'
$\bar{\Phi}$	28.2°		
$\bar{c}$	385 p.s.f.		
Location	STN–4–19	STN–4–22	
Depth	14.1'–14.6'	4.0'–4.5'	4.6'–5.1'
$\bar{\Phi}$	36.0°		
$\bar{c}$	0 p.s.f.		

SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN–4–17S	476.8'	22.0'	N/A	2.0'–4.0' 5.0'–7.0' 10.0'–12.0' 15.0'–17.0' 20.0'–22.0'
STN–4–18S	461.1'	41.0'	14.0'–24.0'	2.0'–4.0' 5.0'–7.0' 10.0'–12.0' 15.0'–17.0' 20.0'–22.0' 25.0'–27.0' 39.0'–41.0'
STN–4–19S	440.3'	26.0'	16.0'–26.0'	4.0'–6.0' 9.0'–11.0' 14.0'–16.0' 19.0'–21.0'

RECORD DRAWING

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT QA	AS CONST	DISCIPLINE INTERFACE REV.
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	01/22/10	PC	SB	PC	RLR	RLR	RLR	TJ	–	–	–
RECORD DRAWING											

SCALE: 1"=5' EXCEPT AS NOTED

ALABAMA LICENSED No. 30069 PROFESSIONAL ENGINEER KENNETH LEE ROBERTS 1/22/10

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION
STABILITY SECTION H–H'

Stantec Consulting Services Inc.
1901 Nelson Miller Pky.
Louisville, Kentucky
40223-2177
Tel. 502.212.5000
Fax 502.212.5055
www.stantec.com

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

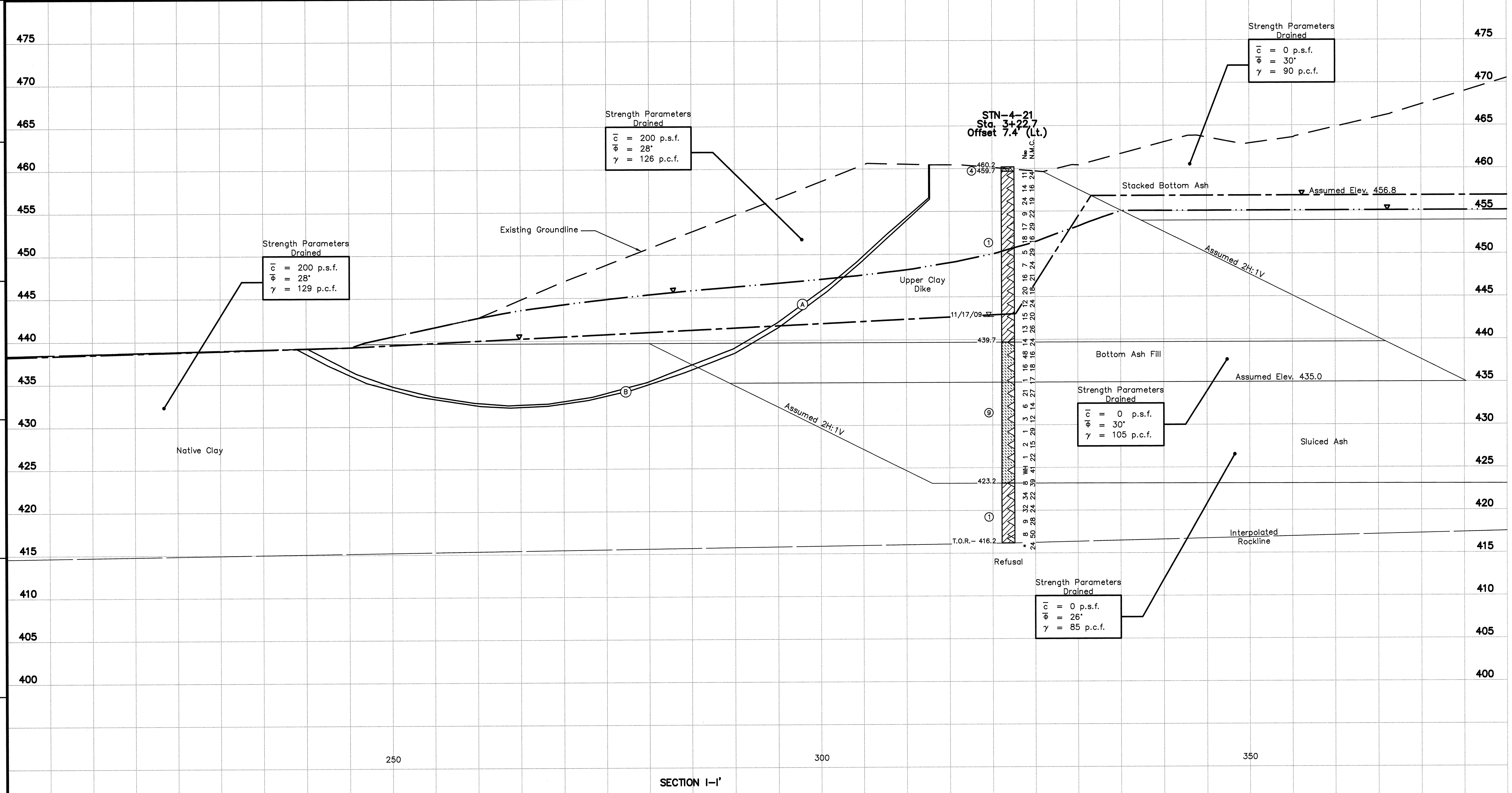
AUTOCAD R 2000	DATE 01/22/10	37	C	10W706–10	R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 01/21/2010 USER: PETTY, RICHARD
N:\TVA\ASH PONDS\COLBERT\GEOTECHNICAL\DRAWINGS\PLOT_SETS\10W706-10-R0.DWG



SECTION I-I'

LEGEND

1. Lean Clay, Sandy Lean Clay, Lean Clay with Sand
2. Silty, Clayey Sand
3. Fat Clay, Fat Clay with Sand
4. Overburden
5. Silty Clay
6. Poorly Graded Sand
7. Silty Sand
8. Silt, Sandy Silt, Silt with Sand

Limestone

9. Fly Ash
10. Bottom Ash

WH	Weight of Hammer
WR	Weight of Rods
◁	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N_{60}	Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{80}	Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C./U.U.	Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09 ▽	Piezometer Water Level Reading and Date Recorded
▽	Phreatic Surface from PZ Data
	Phreatic Surface from Seepage Model
T.O.R.–	Top of Rock (Indicates the beginning of rock-like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.–	Begin Rock Core
R.Q.D.	Rock Quality Designation (%)
REC.	Recovery (%)
Refusal	Auger Refusal using a carbide-tipped tooth auger bit
No Refusal	No Refusal Encountered
•	Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

NOTE:

The geotechnical information and data furnished herein are not intended as representation or warranties but are furnished for information only. It shall be distinctly understood that the Owner or Engineer will not be responsible for any deduction, interpretation or conclusion drawn therefrom. The information is made available in order that the Contractor may have ready access to the same information available to the Owner and the Engineer and is not part of this contract.

CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Location	STN-4-19	STN-4-22	
Depth	14.1'-14.6'	4.0'-4.5'	4.6'-5.1'
$\bar{\phi}$	36.0°		
$\bar{c}$	0 p.s.f.		

SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN-4-20S	482.3'	22.0'	N/A	2.0'-4.0' 5.0'-7.0' 10.0'-12.0' 15.0'-17.0' 20.0'-22.0'
STN-4-21	460.2'	44.0'	10.0'-20.0'	No Samples
STN-4-22S	438.0'	24.0'	14.0'-24.0'	4.0'-6.0' 12.0'-14.0'

SUMMARY OF GLOBAL STABILITY ANALYSES STATIC CONDITION

Failure Surface	Failure Mode	Factor of Safety
A	Circular Optimized With Phreatic Surface From PZ Data	2.19
B	Circular Optimized With Phreatic Surface From Seepage Model	1.92

RECORD DRAWING

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	01/22/10	PC	SB	PC	RLR	RLR	RLR	TJ	–	–	–

RECORD DRAWING

DISCIPLINE INTERFACE 1 2 3 4

SCALE: 1"=5' EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION
STABILITY SECTION I-I'

ALABAMA LICENSED No. 30563 PROFESSIONAL ENGINEER RANDY LEE ROBERTS 1/22/10

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

Stantec Consulting Services Inc.
1901 Nelson Miller Pky.
Louisville, Kentucky
40223-2177
Tel. 502.212.5000
Fax 502.212.5055
www.stantec.com

COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

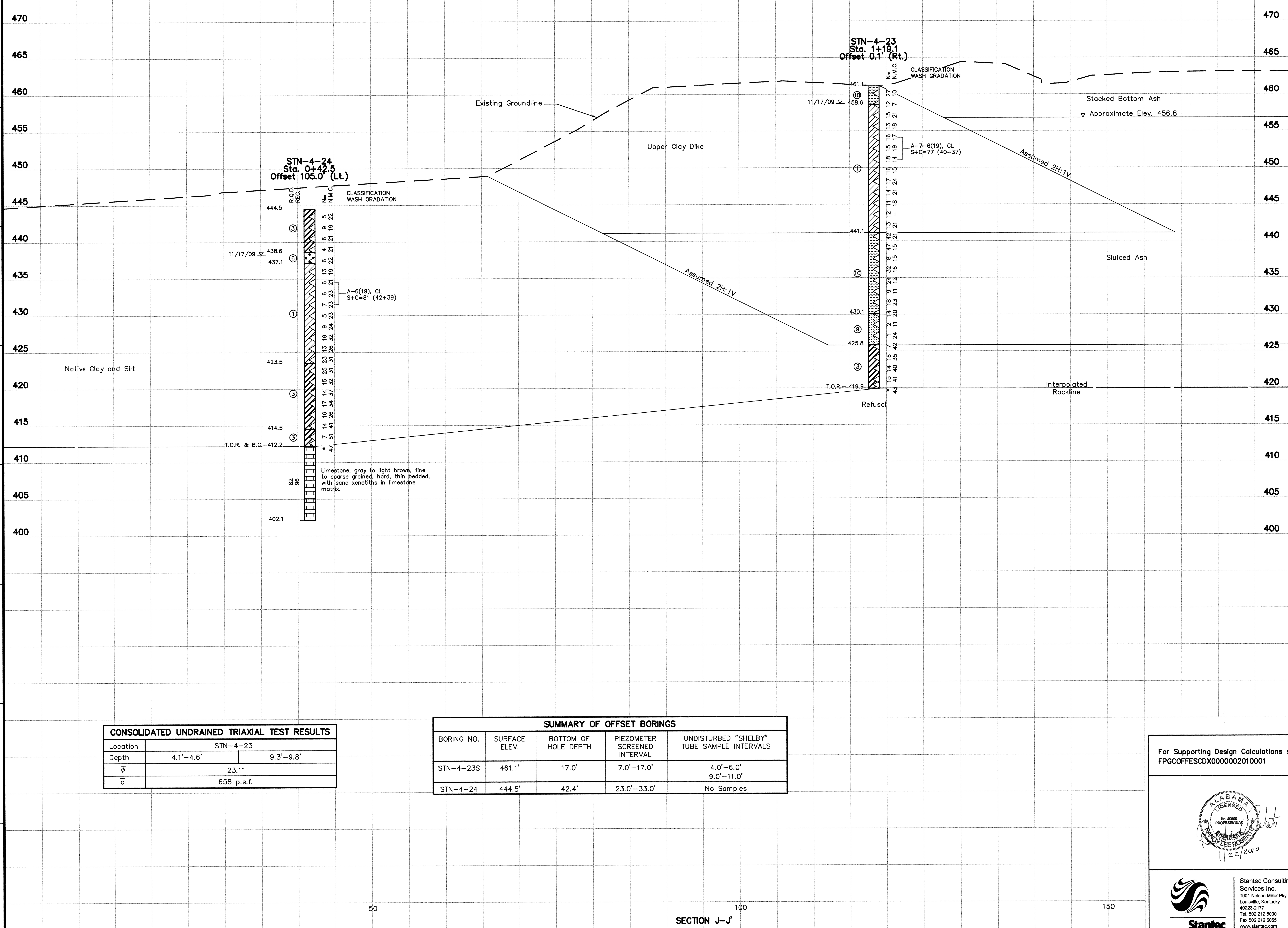
AUTOCAD R 2000 | DATE 01/22/10 | 37 | C | 10W706-11 | R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 01/22/2010



CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Location	STN-4-23	
Depth	4.1'-4.6'	9.3'-9.8'
$\bar{\phi}$	23.1°	
$\bar{c}$	658 p.s.f.	

SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN-4-23S	461.1'	17.0'	7.0'-17.0'	4.0'-6.0' 9.0'-11.0'
STN-4-24	444.5'	42.4'	23.0'-33.0'	No Samples

LEGEND

- ① Lean Clay, Sandy Lean Clay, Lean Clay with Sand
- ② Silty, Clayey Sand
- ③ Fat Clay, Fat Clay with Sand, Sandy Fat Clay
- ④ Overburden
- ⑤ Silty Clay
- ⑥ Poorly Graded Sand
- ⑦ Silty Sand
- ⑧ Silt, Sandy Silt, Silt with Sand
- Limestone
- ⑨ Fly Ash
- ⑩ Bottom Ash

WH	Weight of Hammer
WR	Weight of Rods
◁	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N_{60}	Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{80}	Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C./U.U.	Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09 ▽	Piezometer Water Level Reading and Date Recorded
T.O.R.-	Top of Rock (Indicates the beginning of rock-like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.-	Begin Rock Core
R.Q.D.	Rock Quality Designation (%)
REC.	Recovery (%)
Refusal	Auger Refusal using a carbide-tipped tooth auger bit
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

NOTE:

The geotechnical information and data furnished herein are not intended as representation or warranties but are furnished for information only. It shall be distinctly understood that the Owner or Engineer will not be responsible for any deduction, interpretation or conclusion drawn therefrom. The information is made available in order that the Contractor may have ready access to the same information available to the Owner and the Engineer and is not part of this contract.

RECORD DRAWING

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	01/22/10	PC	SB	PC	RLR	RLR	RLR	TJ	–	–	–

RECORD DRAWING

SCALE: 1"=5' EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION STABILITY SECTION J-J'

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

ALABAMA LICENSED No. 30563 PROFESSIONAL ENGINEER RANDY LEE ROBERTS 1/22/2010

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COLBERT FOSSIL PLANT
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FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 01/22/10 | 37 | C | 10W706-12 | R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

Appendix F

Seepage Analyses Results

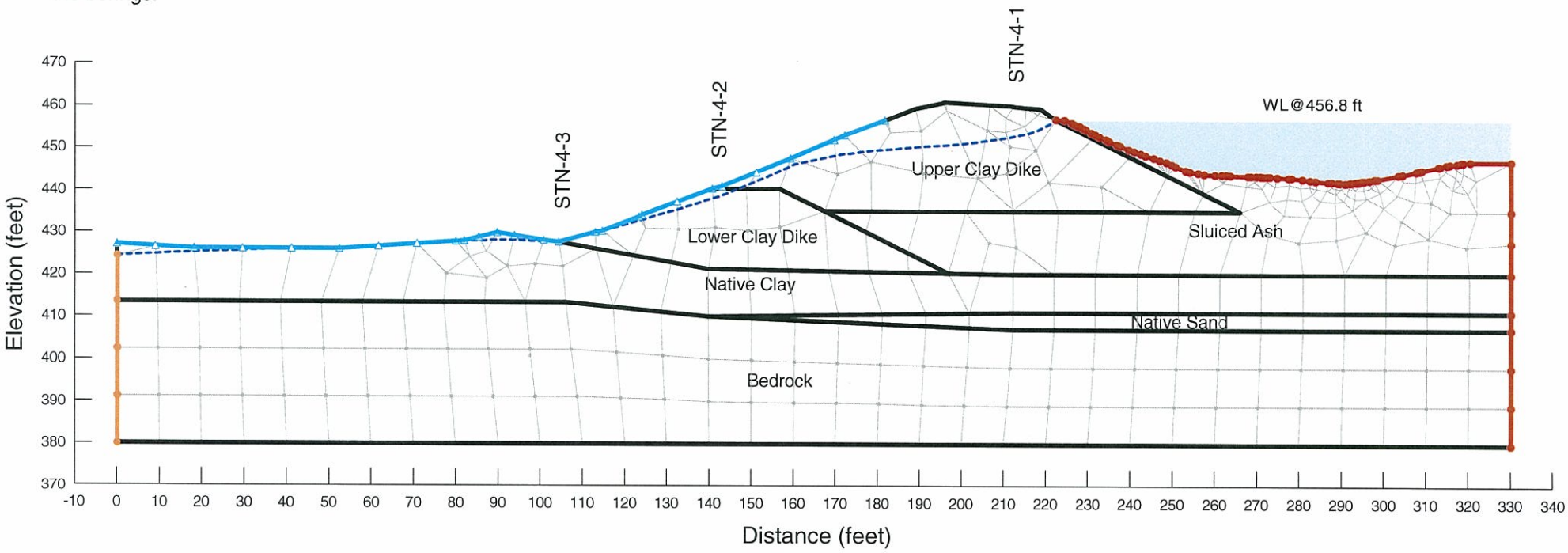
Slope Stability Section A-A'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

November 2009
Method: Steady-State
File Name: COFAP4_SectionA_seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Boundary Conditions with Mesh



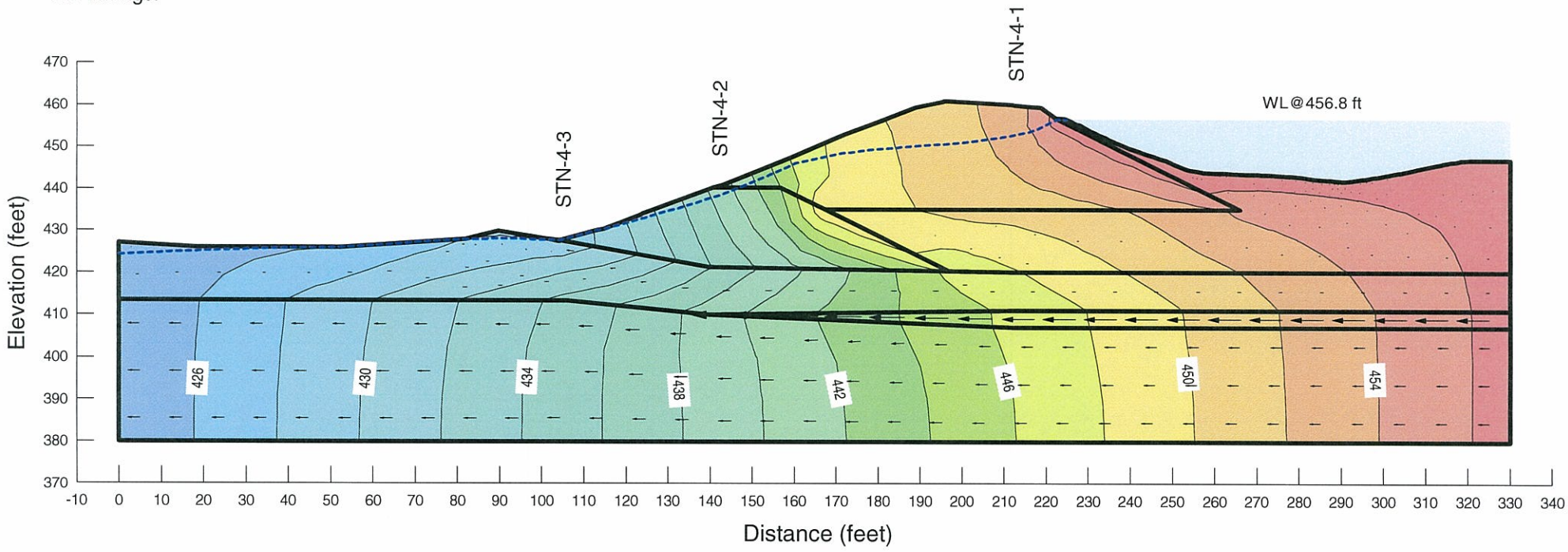
Slope Stability Section A-A'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

November 2009
Method: Steady-State
File Name: COFAP4_SectionA_seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Total Head with Flow Vectors



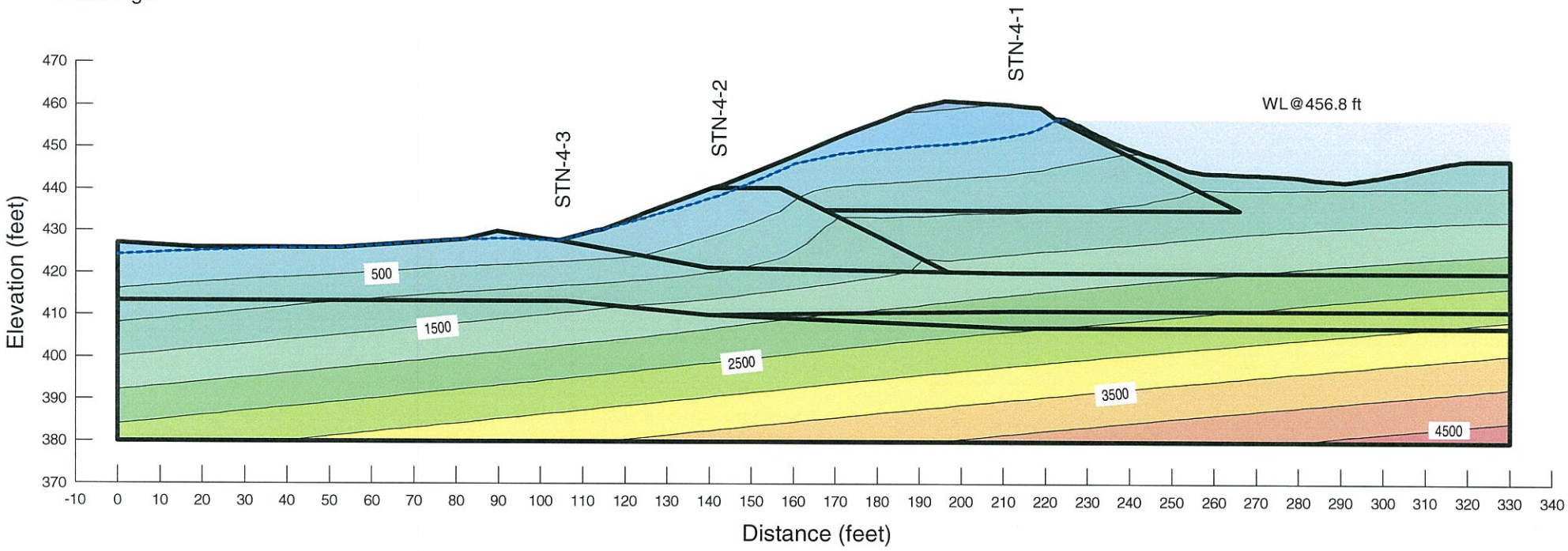
Slope Stability Section A-A'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

November 2009
Method: Steady-State
File Name: COFAP4_SectionA_seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Pore Water Pressure (psf)



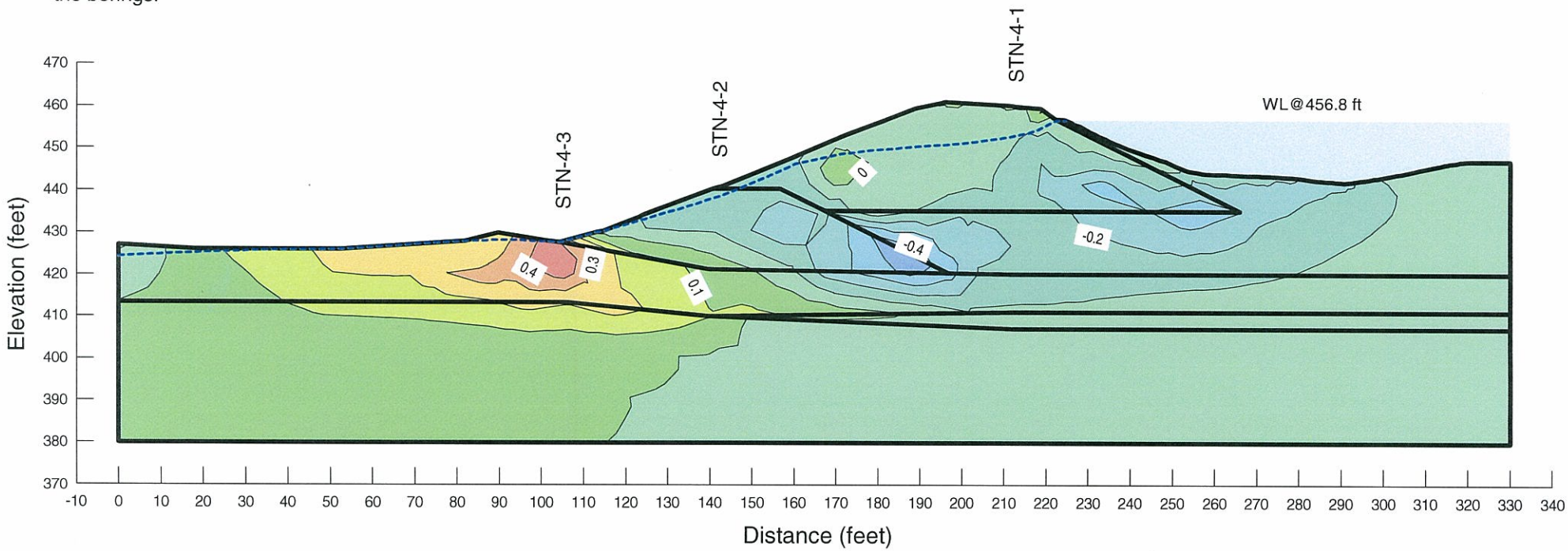
Slope Stability Section A-A'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

November 2009
Method: Steady-State
File Name: COFAP4_SectionA_seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Vertical Gradient



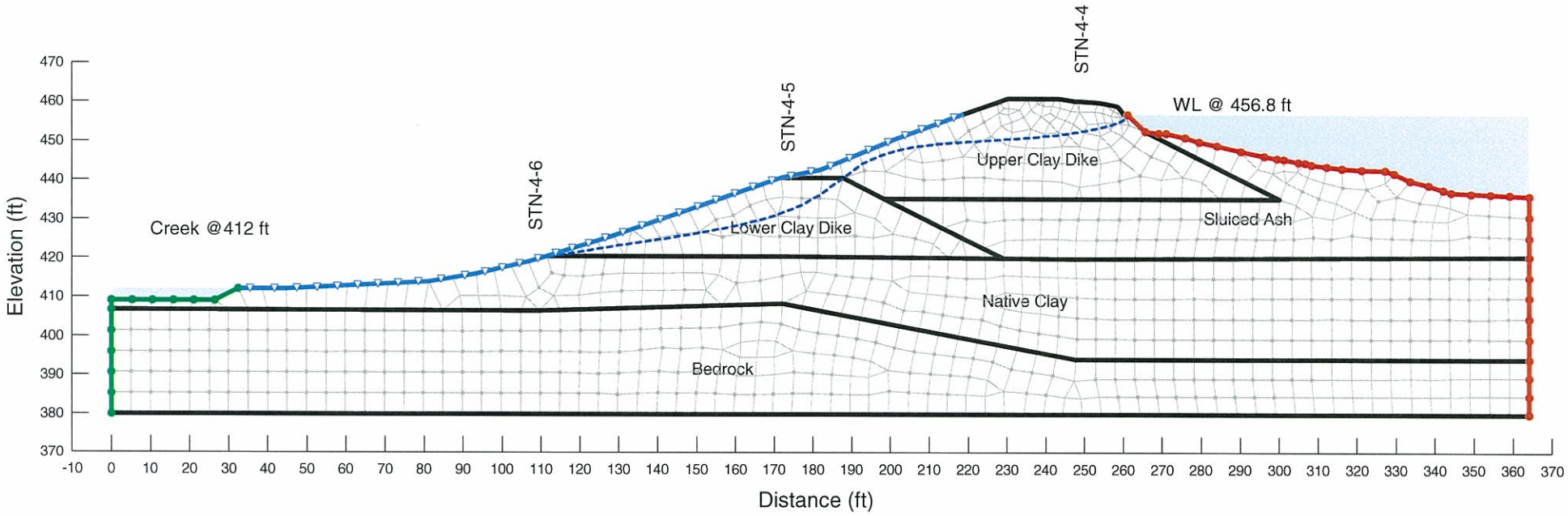
Slope Stability Section B-B'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

Boundary Conditions with Mesh

November 2009
Method: Steady-State
File Name: COFAP4_SectionB_Seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.



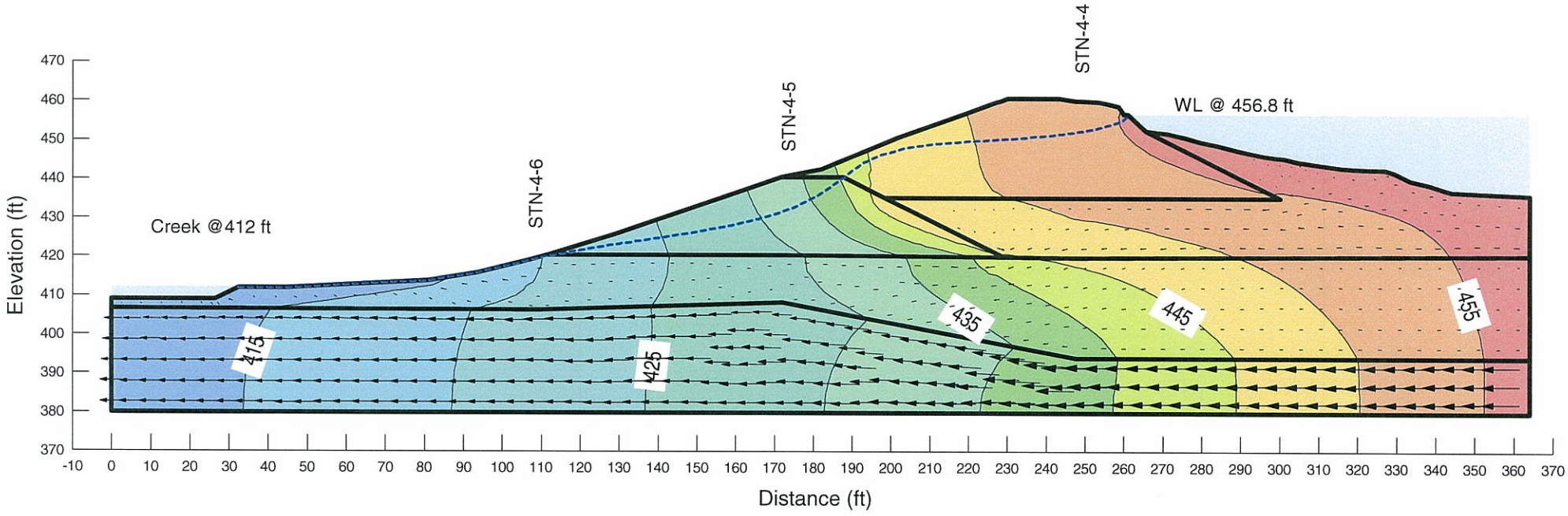
Slope Stability Section B-B'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

Total Head with Flow Vectors

November 2009
Method: Steady-State
File Name: COFAP4_SectionB_Seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.



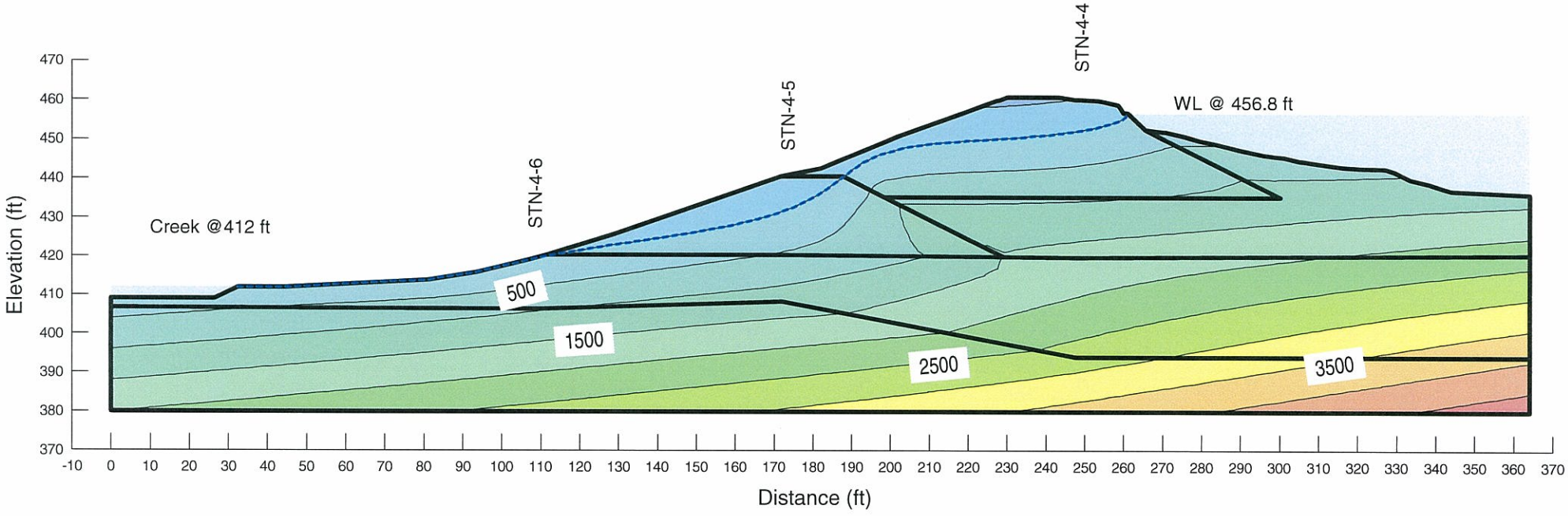
Slope Stability Section B-B'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

Pore Water Pressure (psf)

November 2009
Method: Steady-State
File Name: COFAP4_SectionB_Seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.



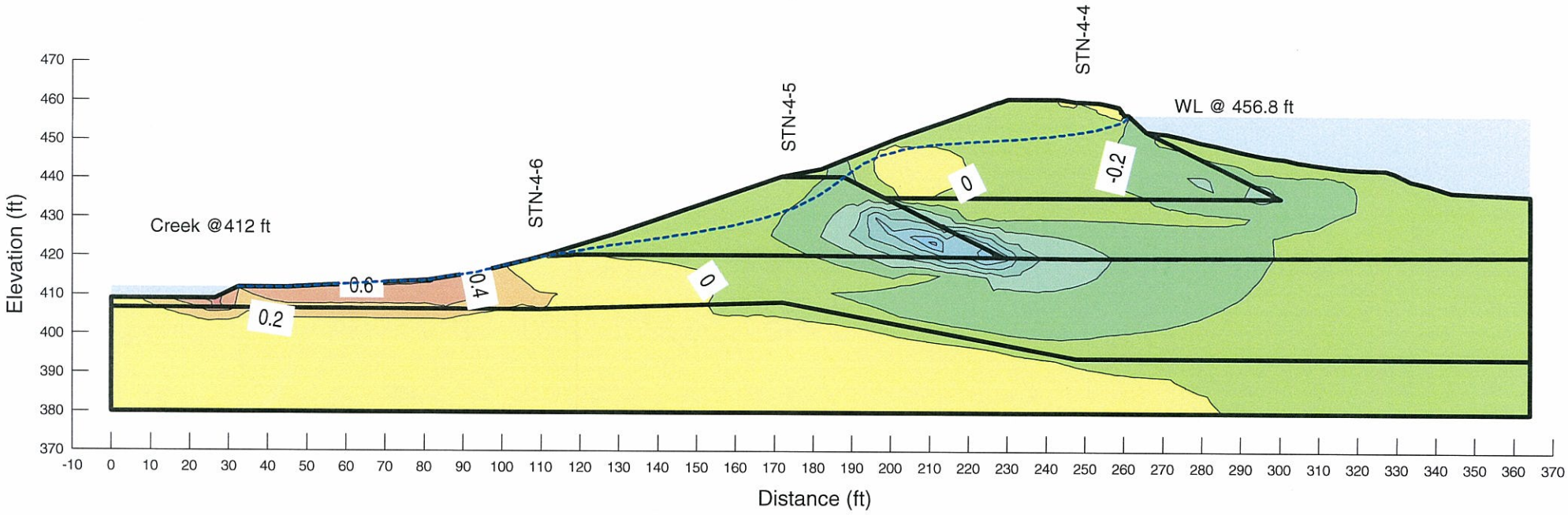
Slope Stability Section B-B'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

Vertical Gradient

November 2009
Method: Steady-State
File Name: COFAP4_SectionB_Seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.



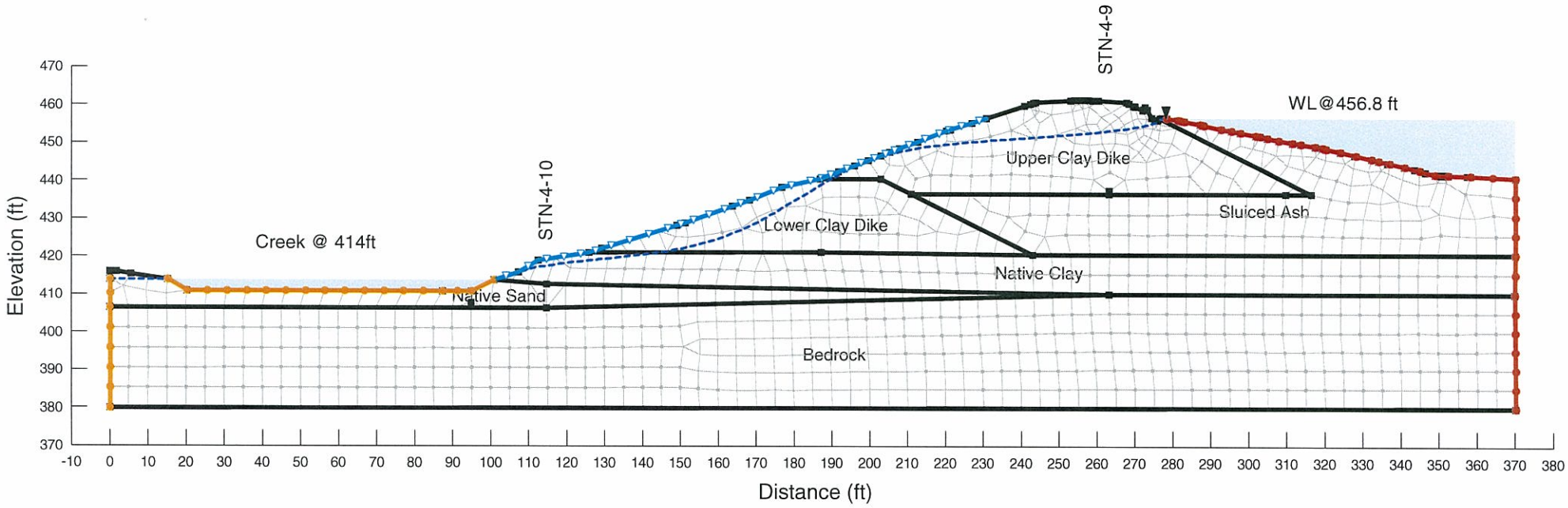
Slope Stability Section D-D'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

Boundary Conditions with Mesh

November 2009
Method: Steady-State
File Name: COFAP4_SectionD_seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.



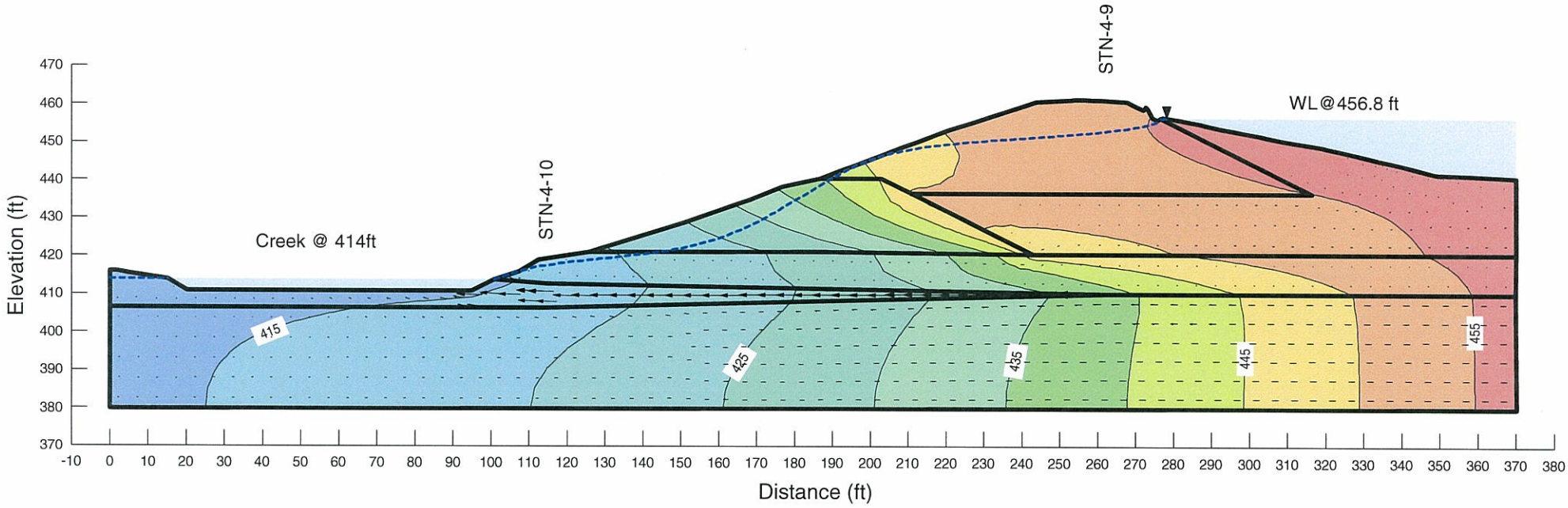
Slope Stability Section D-D'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

Total Head with Flow Vectors

November 2009
Method: Steady-State
File Name: COFAP4_SectionD_seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.



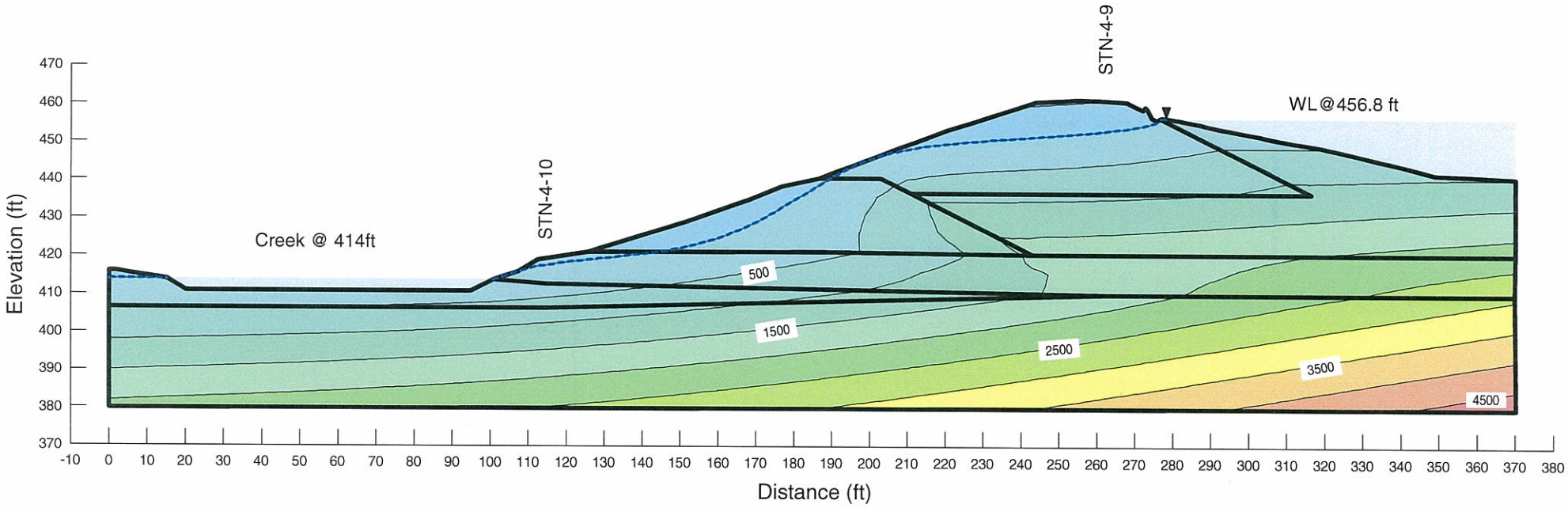
Slope Stability Section D-D'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

November 2009
Method: Steady-State
File Name: COFAP4_SectionD_seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Pore Water Pressure (psf)



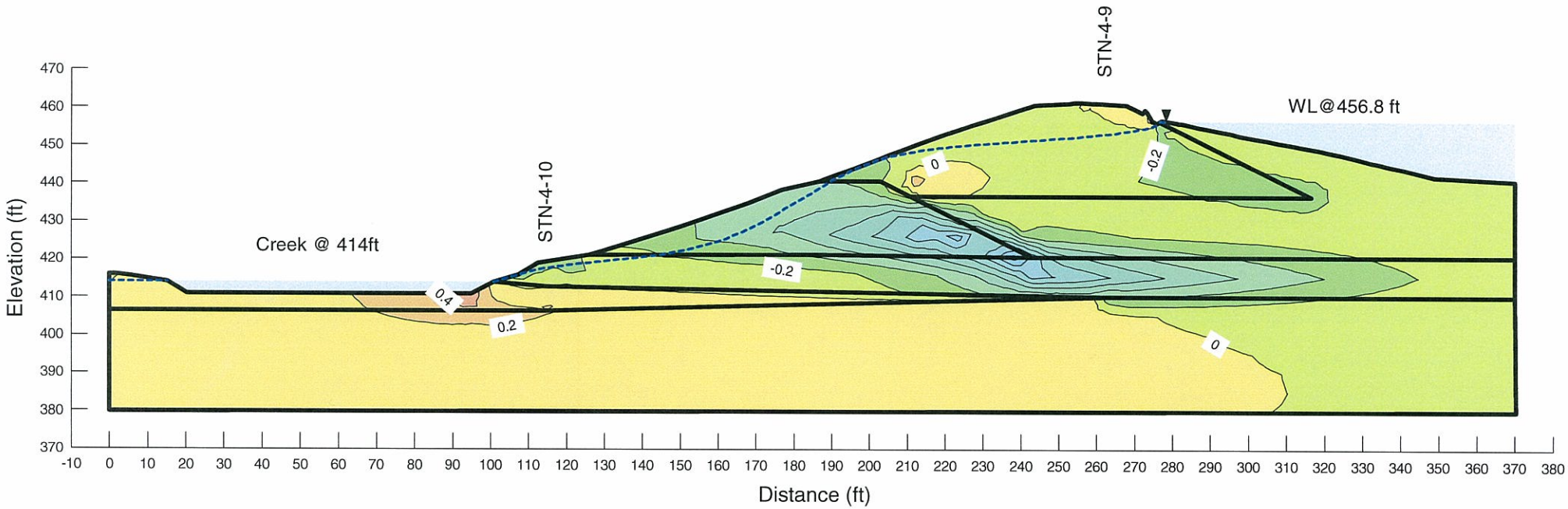
Slope Stability Section D-D'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

Vertical Gradient

November 2009
Method: Steady-State
File Name: COFAP4_SectionD_seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.



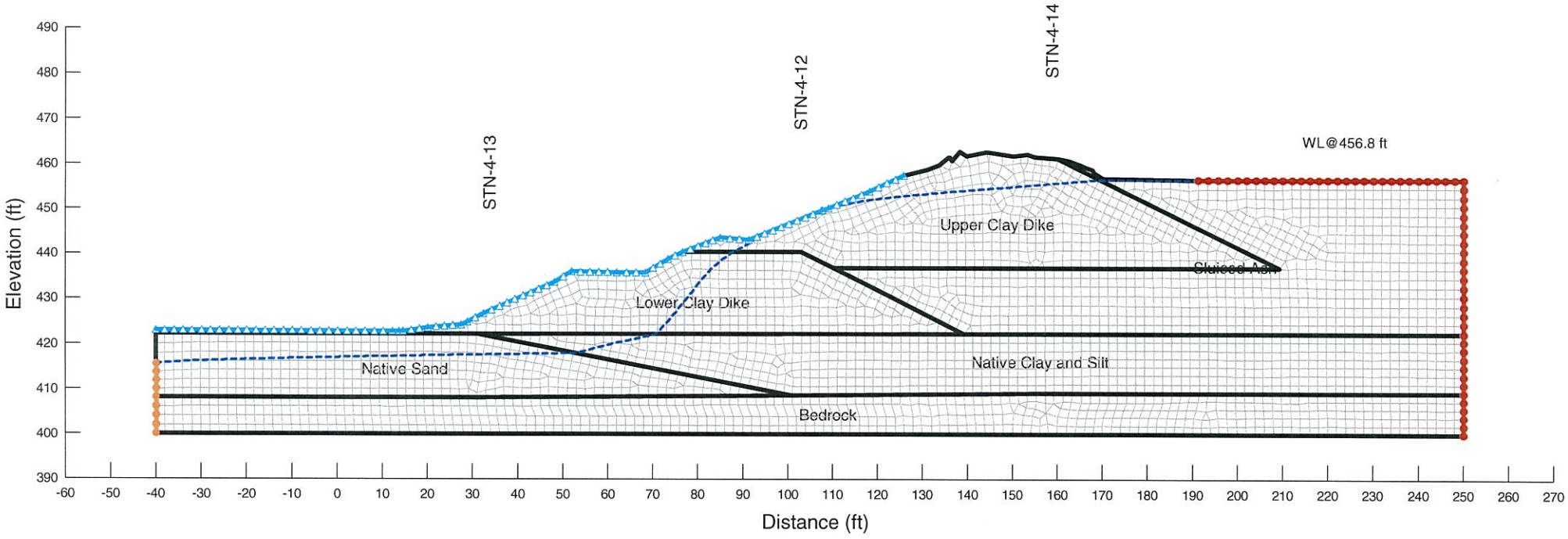
Slope Stability Section F-F'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

Boundary Conditions with Mesh

November 2009
Method: Steady-State
File Name: COFAP4_SEctionF_seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.



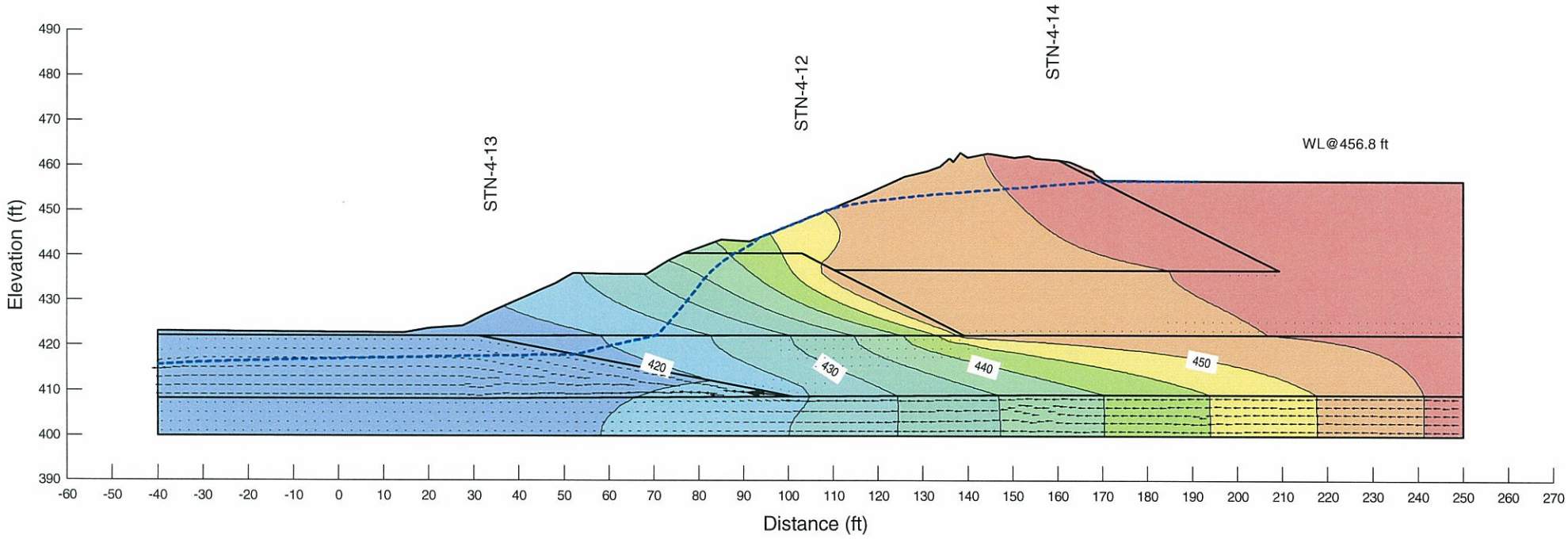
Slope Stability Section F-F'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

Total Head with Flow Vectors

November 2009
Method: Steady-State
File Name: COFAP4_SEctionF_seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.



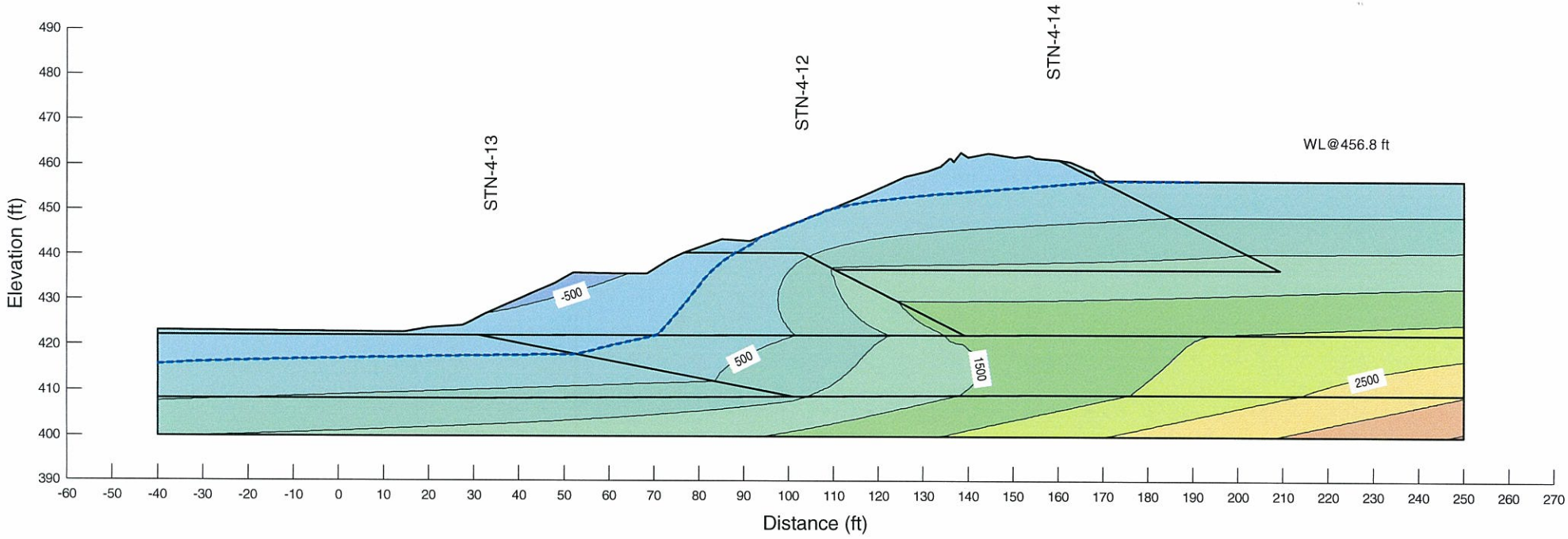
Slope Stability Section F-F'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

November 2009
Method: Steady-State
File Name: COFAP4_SEctionF_seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Pore Water Pressure (psf)



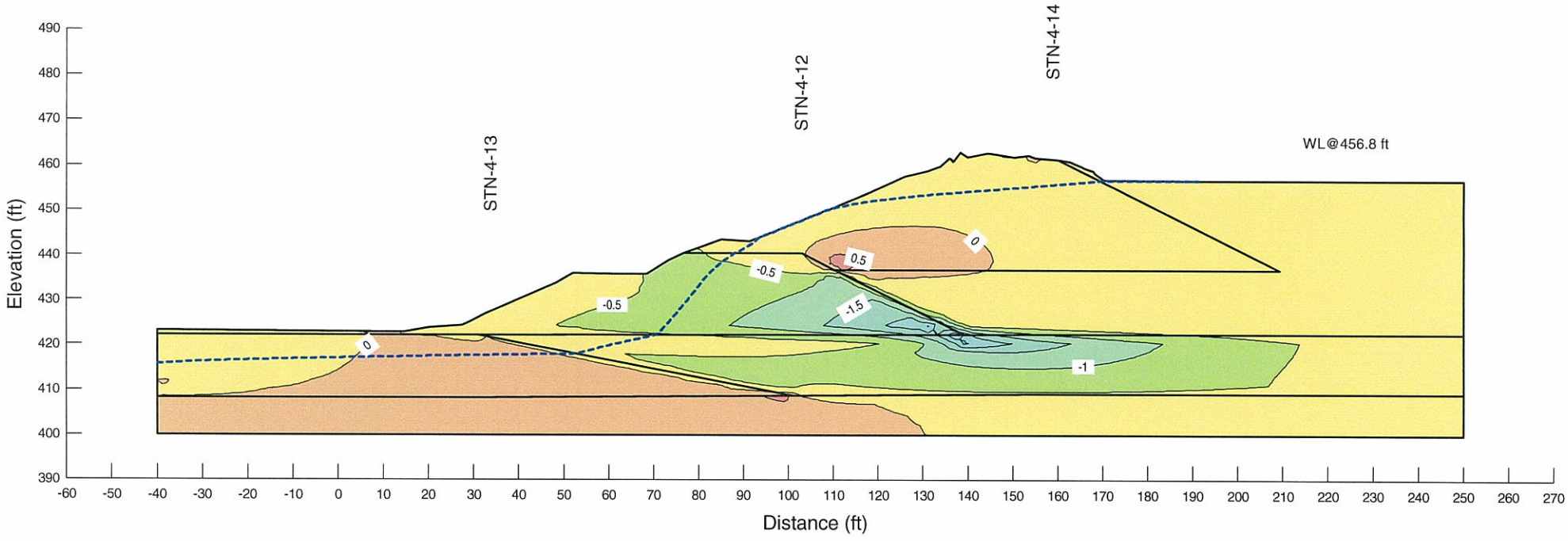
Slope Stability Section F-F'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

Vertical Gradient

November 2009
Method: Steady-State
File Name: COFAP4_SEctionF_seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.



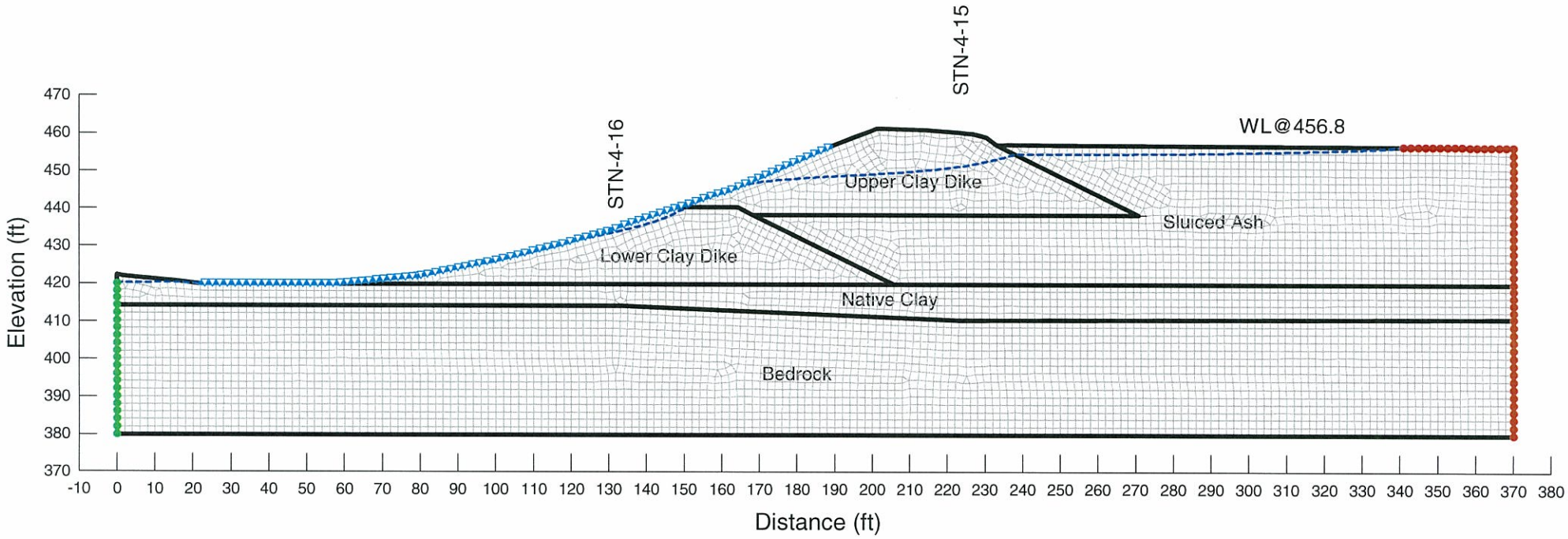
Slope Stability Section G-G'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

November 2009
Method: Steady-State
File Name: COFAP4_SectionG_seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Boundary Conditions with Mesh



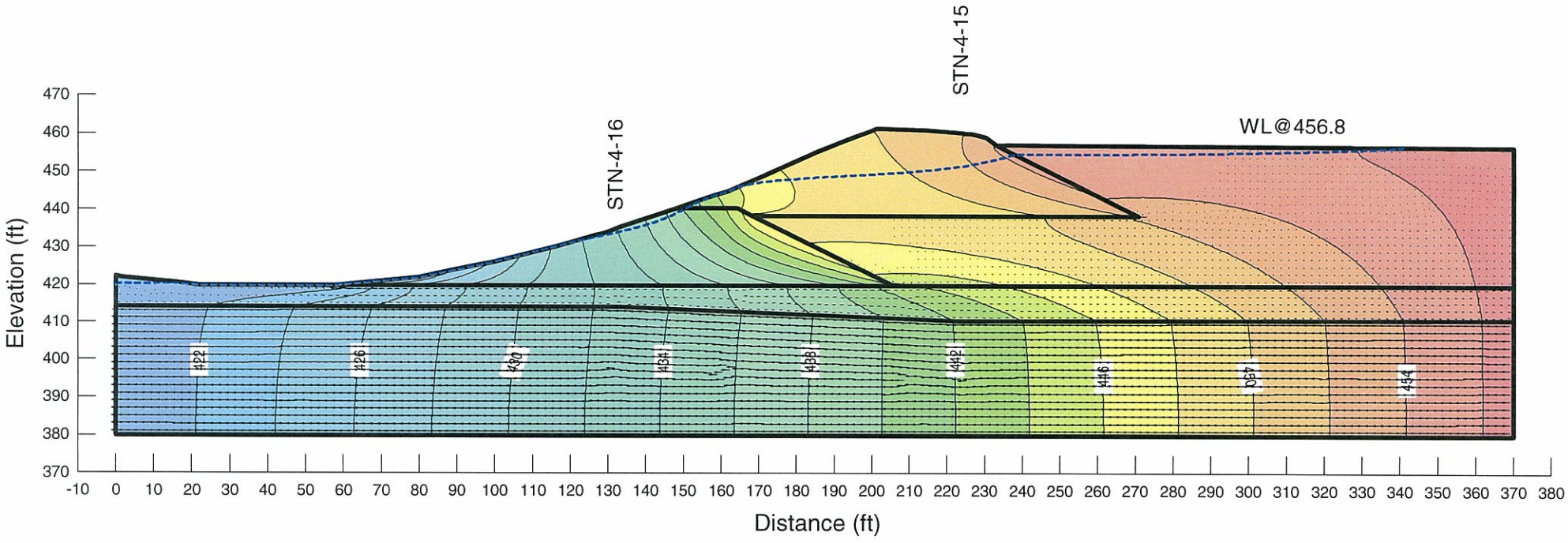
Slope Stability Section G-G'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

November 2009
Method: Steady-State
File Name: COFAP4_SectionG_seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Total Head with Flow Vectors



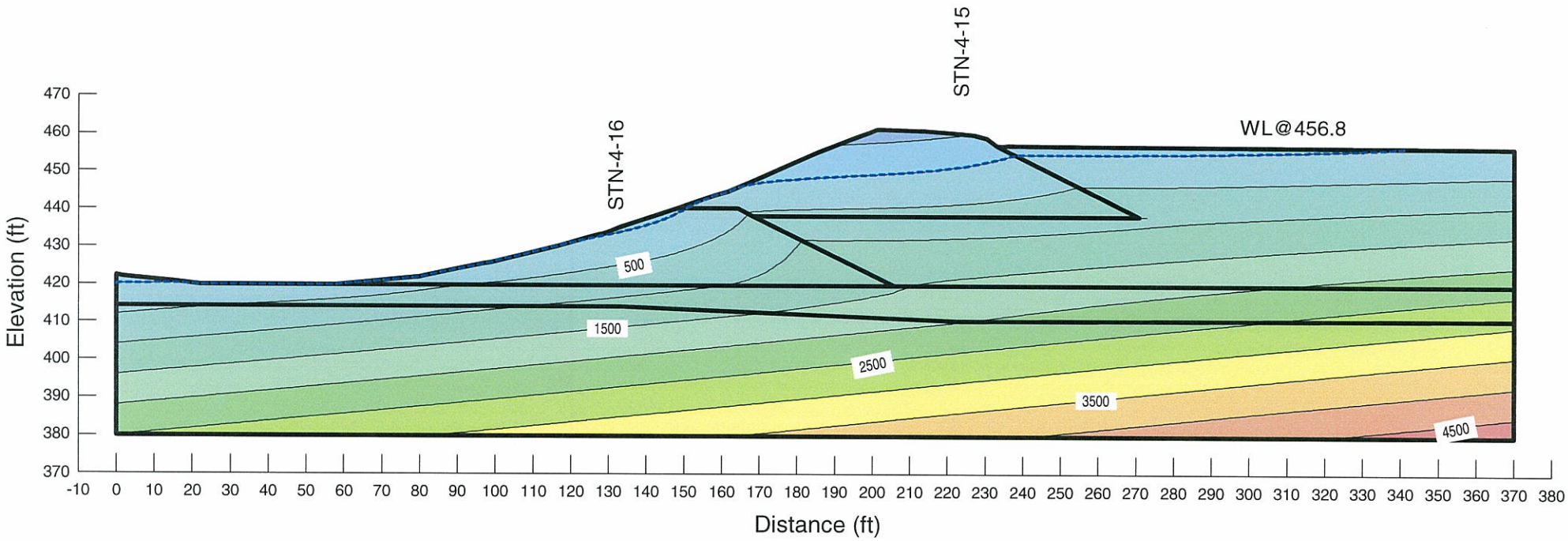
Slope Stability Section G-G'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

November 2009
Method: Steady-State
File Name: COFAP4_SectionG_seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Pore Water Pressure (psf)



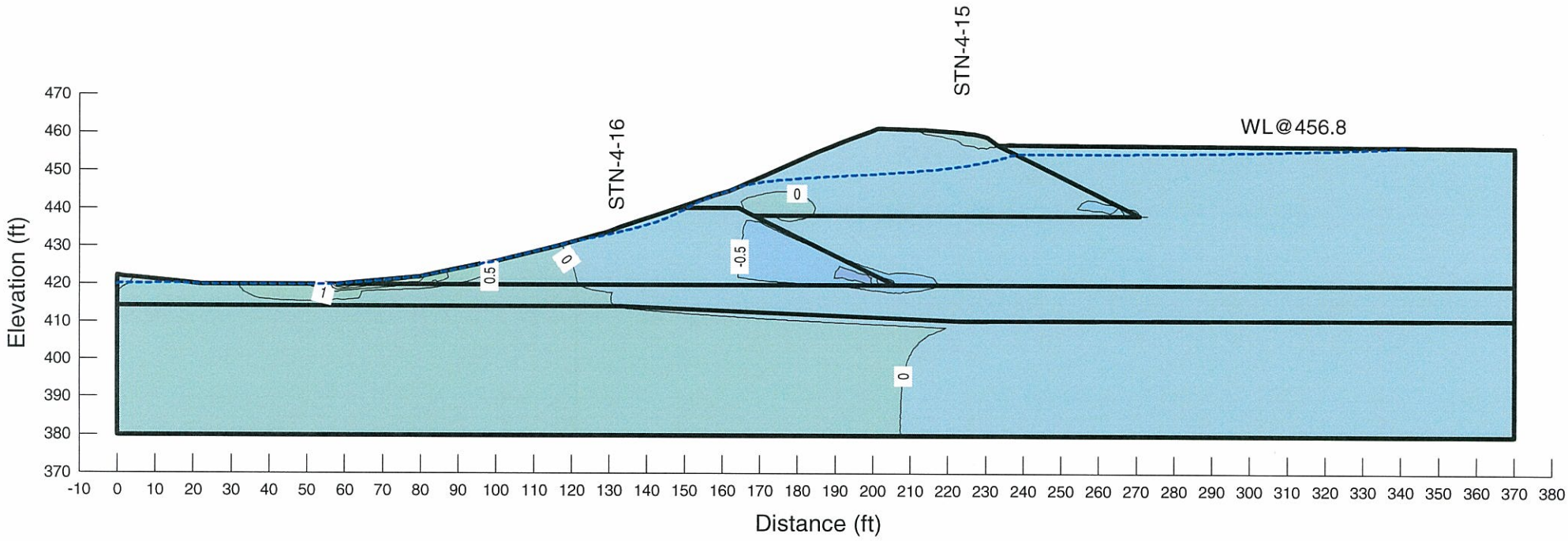
Slope Stability Section G-G'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

November 2009
Method: Steady-State
File Name: COFAP4_SectionG_seep.gsz

Vertical Gradient

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.



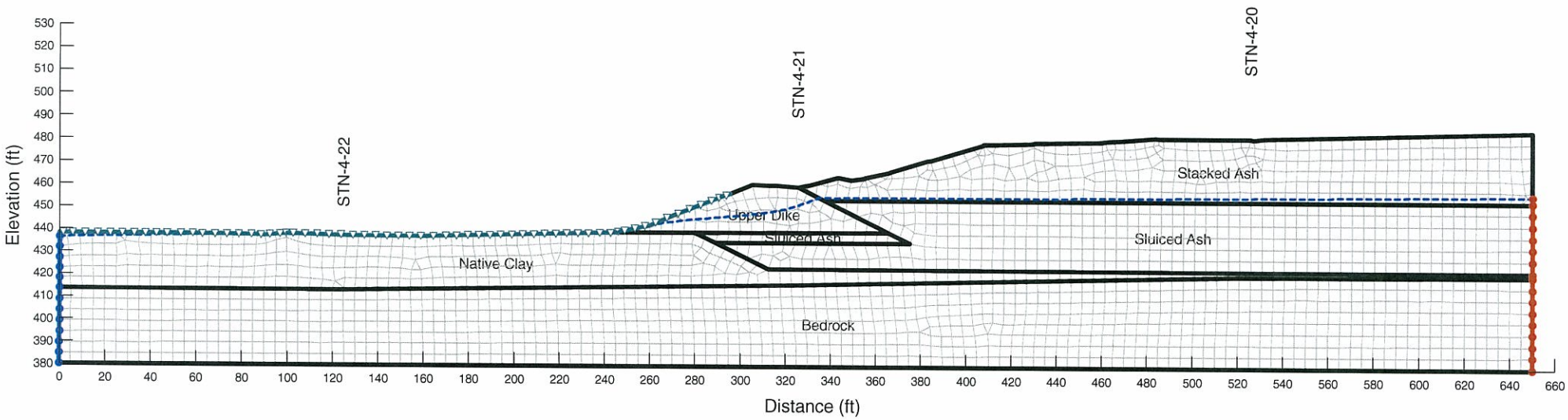
Slope Stability Section I-I'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

November 2009
Method: Steady-State
File Name: COFAP4_SectionI_seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Boundary Conditions with Mesh



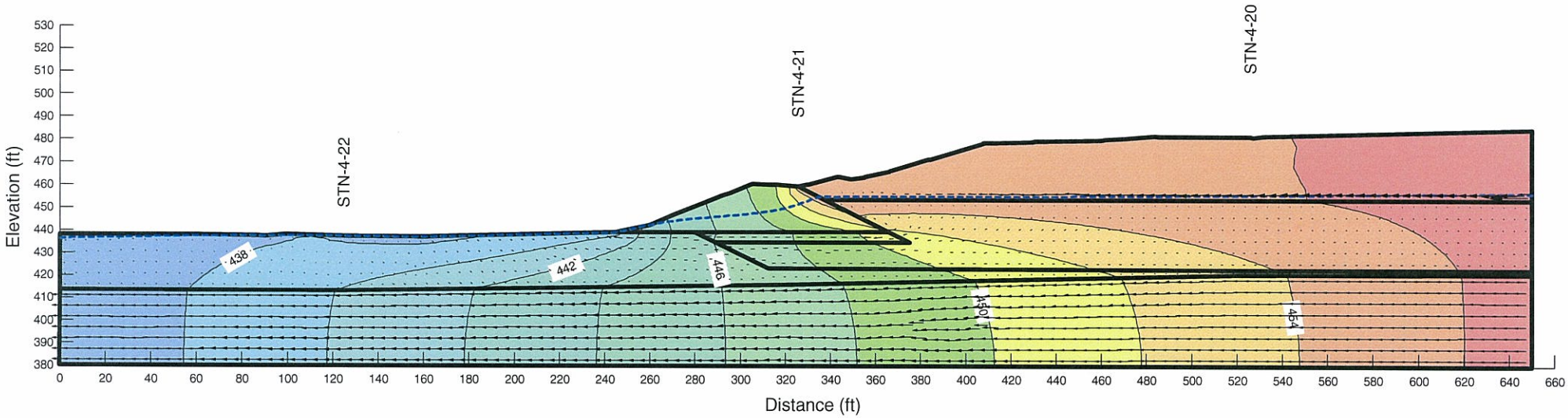
Slope Stability Section I-I'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

November 2009
Method: Steady-State
File Name: COFAP4_SectionI_seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Total Head with Flow Vectors



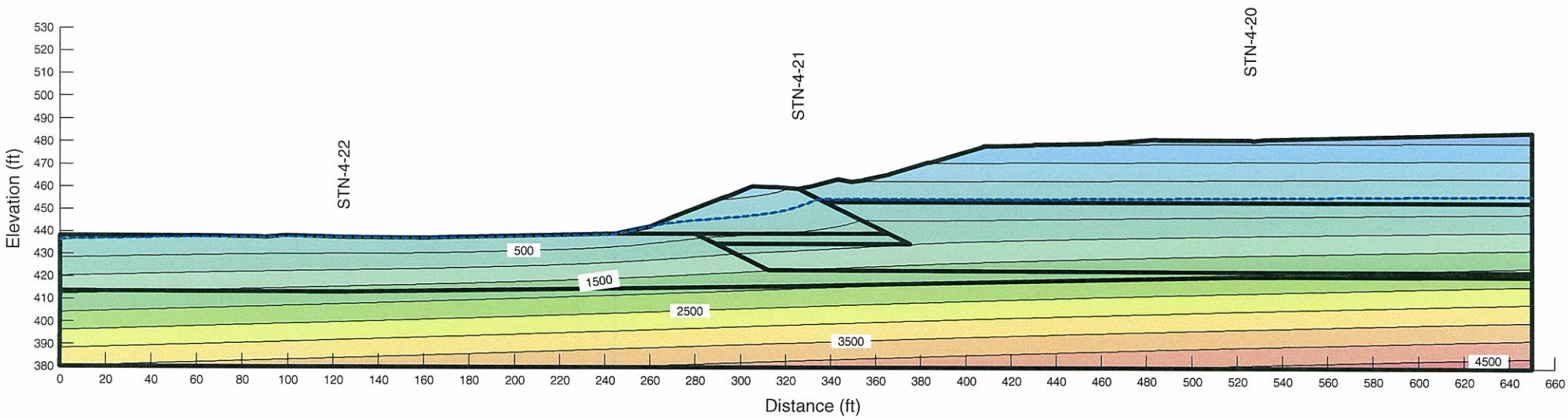
Slope Stability Section I-I'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

November 2009
Method: Steady-State
File Name: COFAP4_SectionI_seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Pore Water Pressure (psf)



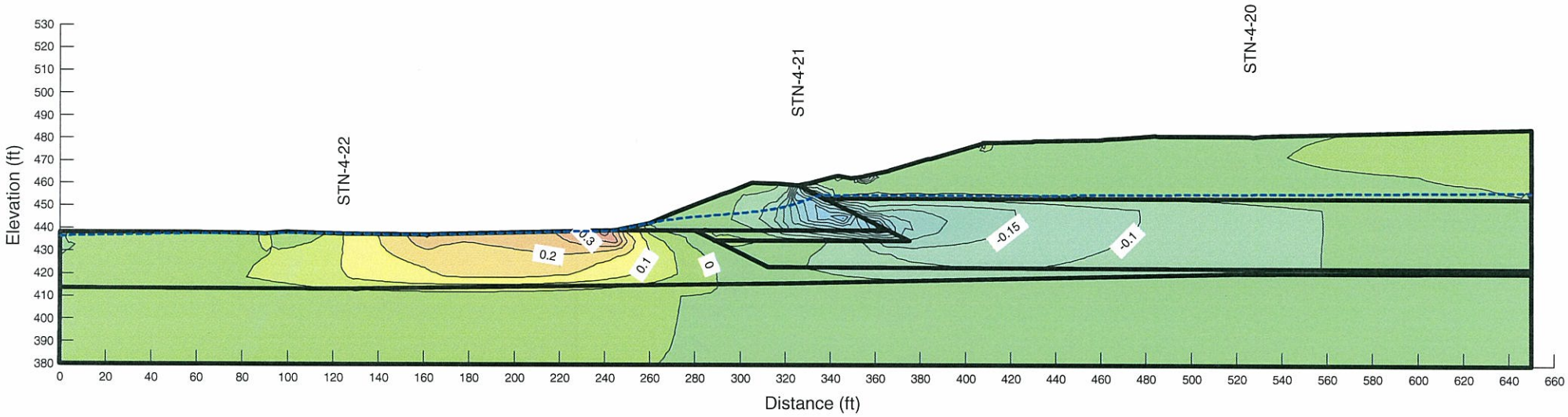
Slope Stability Section I-I'
Ash Pond 4

Colbert Fossil Plant
Tennessee Valley Authority

November 2009
Method: Steady-State
File Name: COFAP4_SectionI_seep.gsz

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Vertical Gradient



GEOTECHNICAL EXPLORATION
ASH POND 4
COLBERT FOSSIL PLANT
TUSCUMBIA, COLBERT COUNTY, ALABAMA

PREPARED FOR

TENNESSEE VALLEY AUTHORITY

PREPARED BY

Stantec

Stantec Consulting Services Inc.
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Louisville, Kentucky
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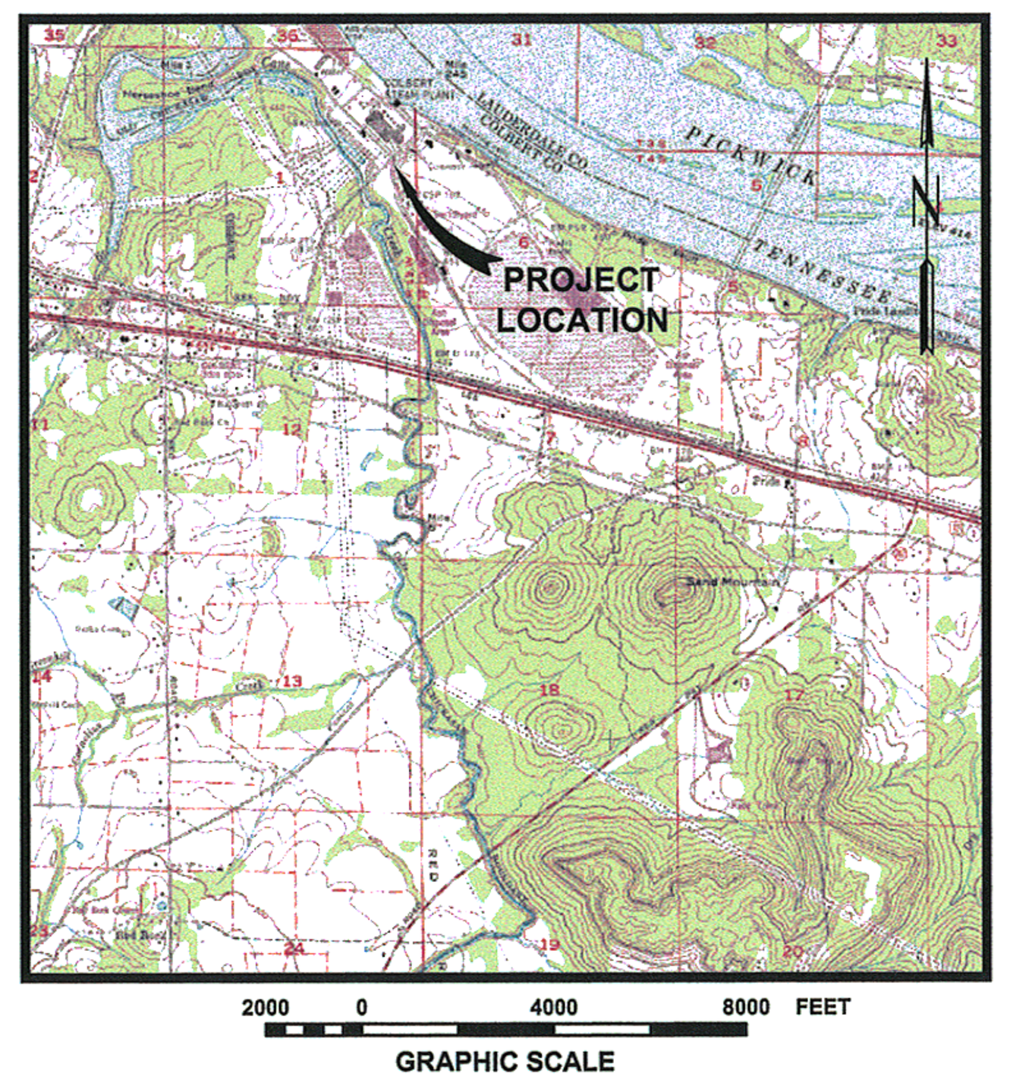
Tel. 502.212.5000
Fax 502.212.5055
www.stantec.com



VICINITY MAP

INDEX OF SHEETS

RECORD DRAWING

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	01/22/10	PC	SB	PC	RLR	RLR	RLR	TJ	–	–	–

RECORD DRAWING

SCALE: NONE EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION
COVER SHEET

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 01/22/10 | 37 | C | 10W706–01 | R 0

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ALABAMA LICENSED No. 30563 PROFESSIONAL ENGINEER RANDY LEE ROBERTS 1/22/10

DISCIPLINE INTERFACE

STANTEC 0

PLOT FACTOR:XX

C.A.D. DRAWING

37 C 10W706-02

BORING LOCATION TABLE

BORING	NORTHING	EASTING	ELEVATION
STN-4-1	1,723,599.52	394,359.89	460.2
STN-4-2	1,723,632.72	394,289.32	439.4
STN-4-3	1,723,645.94	394,253.91	427.3
STN-4-4	1,723,316.42	394,738.76	460.4
STN-4-5	1,723,366.01	394,798.52	439.5
STN-4-6	1,723,373.16	394,864.54	419.8
STN-4-7	1,722,880.08	394,960.81	460.8
STN-4-8	1,722,943.49	395,089.90	421.6
STN-4-9	1,722,306.36	395,260.37	461.2
STN-4-10	1,722,357.09	395,401.10	420.9
STN-4-11	1,721,882.96	395,485.31	461.3
STN-4-12	1,721,504.87	395,746.27	446.2
STN-4-13	1,721,330.83	395,874.15	425.3
STN-4-14	1,721,420.08	395,715.53	461.9
STN-4-15	1,721,219.13	395,347.89	460.5
STN-4-16	1,721,126.23	395,351.96	435.1
STN-4-17	1,721,539.59	394,582.90	476.8
STN-4-18	1,721,402.10	394,555.64	461.1
STN-4-19	1,721,352.01	394,475.66	440.3
STN-4-20	1,721,987.93	394,461.02	482.3
STN-4-21	1,721,985.14	394,262.71	460.2
STN-4-22	1,721,957.70	394,065.63	438.0
STN-4-23	1,722,728.47	394,227.94	461.1
STN-4-24	1,722,823.19	394,138.84	444.5

LEGEND

- Soil Boring With Continuous Standard Penetration Tests And/Or Shelby Tube Sampling
- Soil Boring With Continuous Standard Penetration Tests And/Or Shelby Tube Piston Sampling, And Piezometer Installation
- Soil Boring With Continuous Standard Penetration Tests And/or Shelby Tube Sampling, Rock Core, And Piezometer Installation

NOTES

1. Topographic and survey information provided by the Tennessee Valley Authority.
2. The Boring Logs And Related Information Shown On This Drawing Depict Approximate Subsurface Conditions Only At The Specific Boring Locations Noted And At The Time Of Drilling. Conditions At Other Locations May Differ From Those Occurring At The Boring Locations. Also, The Passage Of Time May Result In A Change In The Subsurface Conditions At The Boring Locations. Any Correlations Shown Between Borings Are Generally Based On Straight Line Interpolation. Actual Conditions Between Borings Are Unknown And May Differ From Those Shown.

RECORD DRAWING

100 0 200 400 FEET
GRAPHIC SCALE: 1"=200'

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 0	01/22/10	PC	SB	PC	RLR	RLR	RLR	TJ	–	–

RECORD DRAWING

SCALE: 1"=200' EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION
BORING AND STABILITY
CROSS-SECTION PLAN

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

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COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

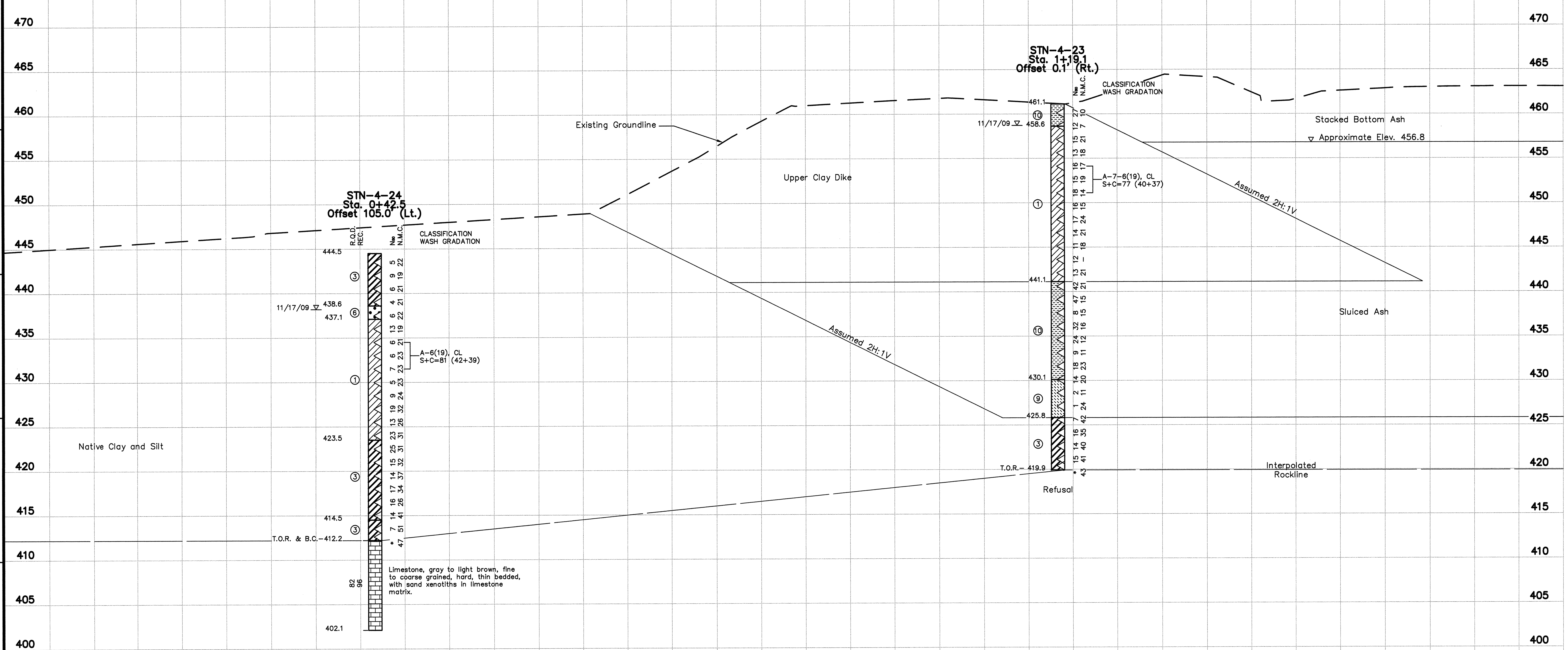
AUTOCAD R 2000 | DATE 01/22/10 | 37 | C | 10W706-02 | R 0

STANTEC 0
TASK COMPLETED BY: REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY

37 C 10W706-12



SECTION J-J'

LEGEND

①	Lean Clay, Sandy Lean Clay, Lean Clay with Sand
②	Silty, Clayey Sand
③	Fat Clay, Fat Clay with Sand, Sandy Fat Clay
④	Overburden
⑤	Silty Clay
⑥	Poorly Graded Sand
⑦	Silty Sand
⑧	Silt, Sandy Silt, Silt with Sand
	Limestone
⑨	Fly Ash
⑩	Bottom Ash
WH	Weight of Hammer
WR	Weight of Rods
◁	Standard Penetration Test Interval
▪	Undisturbed Thin-Walled (Shelby) Tube Sample
N_{60}	Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{80}	Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C./U.U.	Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09	Piezometer Water Level Reading and Date Recorded
T.O.R.-	Top of Rock (Indicates the beginning of rock-like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.-	Begin Rock Core
R.Q.D.	Rock Quality Designation (%)
REC.	Recovery (%)
Refusal	Auger Refusal using a carbide-tipped tooth auger bit
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

NOTE:

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CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Location	STN-4-23	
Depth	4.1'-4.6'	9.3'-9.8'
$\bar{\phi}$	23.1°	
$\bar{c}$	658 p.s.f.	

SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN-4-23S	461.1'	17.0'	7.0'-17.0'	4.0'-6.0' 9.0'-11.0'
STN-4-24	444.5'	42.4'	23.0'-33.0'	No Samples

RECORD DRAWING

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

R 0 01/22/10 PC SB PC RLR RLR RLR TJ — RECORD DRAWING

SCALE: 1"=5' EXCEPT AS NOTED

YARD
ASH POND 4
GEOTECHNICAL EXPLORATION
STABILITY SECTION J-J'

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

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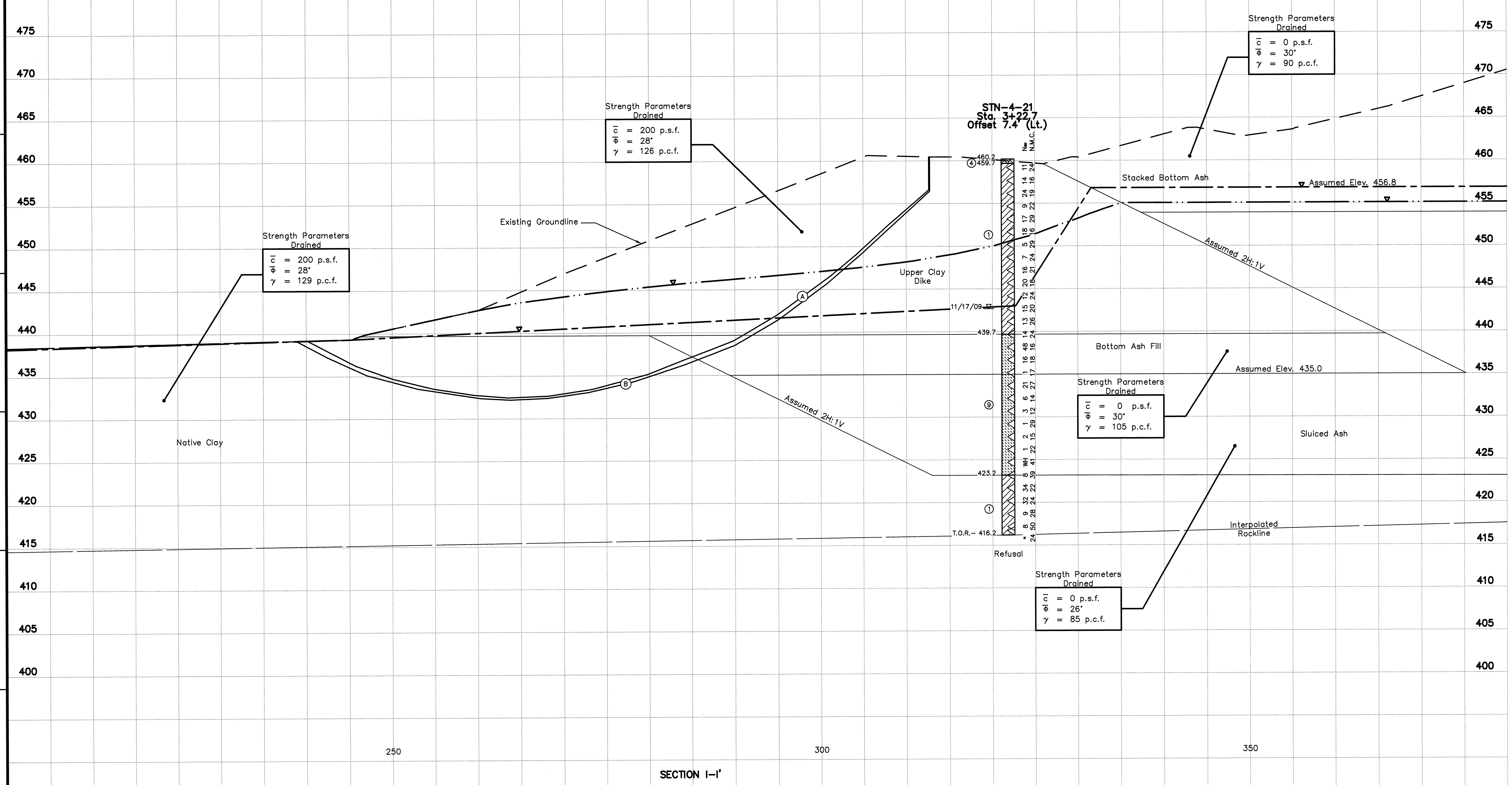
COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 DATE 01/22/10 37 C 10W706-12 R 0

STANTEC 0
TASK COMPLETED BY: REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY



SECTION I-I'

LEGEND

1. Lean Clay, Sandy Lean Clay, Lean Clay with Sand
2. Silty, Clayey Sand
3. Fat Clay, Fat Clay with Sand
4. Overburden
5. Silty Clay
6. Poorly Graded Sand
7. Silty Sand
8. Silt, Sandy Silt, Silt with Sand

Limestone

9. Fly Ash
10. Bottom Ash

WH — Weight of Hammer
WR — Weight of Rods
◁ — Standard Penetration Test Interval
■ — Undisturbed Thin–Walled (Shelby) Tube Sample
N_{60} — Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{80} — Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C. — Natural Moisture Content (%)
U.W.W. — Unit Weight Wet (lbs./cu.ft.)
U.W.D. — Unit Weight Dry (lbs./cu.ft.)
U.C./U.U. — Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09 — Piezometer Water Level Reading and Date Recorded
Phreatic Surface from PZ Data
Phreatic Surface from Seepage Model
T.O.R.– Top of Rock (Indicates the beginning of rock–like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.– Begin Rock Core
R.Q.D. — Rock Quality Designation (%)
REC. — Recovery (%)
Refusal — Auger Refusal using a carbide–tipped tooth auger bit
No Refusal — No Refusal Encountered
• — Standard Penetration Test (SPT) terminated per ASTM D 1586–99. Refer to typed boring log.

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CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Location	STN-4-19	STN-4-22	
Depth	14.1'–14.6'	4.0'–4.5'	4.6'–5.1'
$\bar{\Phi}$	36.0°		
$\bar{c}$	0 p.s.f.		

SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN-4-20S	482.3'	22.0'	N/A	2.0'–4.0' 5.0'–7.0' 10.0'–12.0' 15.0'–17.0' 20.0'–22.0'
STN-4-21	460.2'	44.0'	10.0'–20.0'	No Samples
STN-4-22S	438.0'	24.0'	14.0'–24.0'	4.0'–6.0' 12.0'–14.0'

SUMMARY OF GLOBAL STABILITY ANALYSES STATIC CONDITION

Failure Surface	Failure Mode	Factor of Safety
A	Circular Optimized With Phreatic Surface From PZ Data	2.19
B	Circular Optimized With Phreatic Surface From Seepage Model	1.92

RECORD DRAWING

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	01/22/10	PC	SB	PC	RLR	RLR	RLR	TJ	–	–	–

RECORD DRAWING

SCALE: 1"=5' EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION
STABILITY SECTION I-I'

ALABAMA LICENSED No. 30563 PROFESSIONAL ENGINEER RANDY LEE ROBERTS 1/22/10

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

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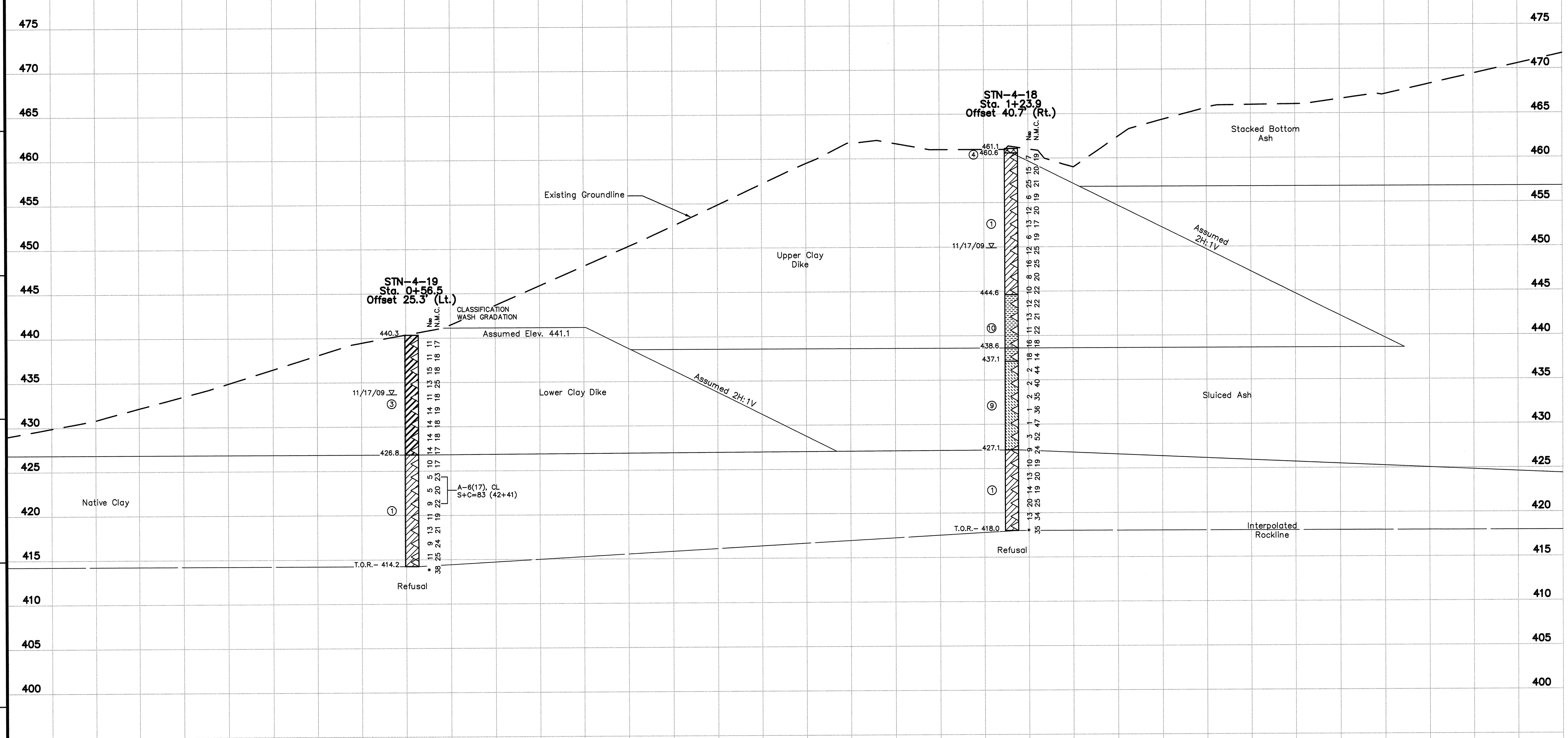
COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 01/22/10 | 37 | C | 10W706–11 | R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY



SECTION H-H'

LEGEND

1. Lean Clay, Sandy Lean Clay, Lean Clay with Sand
2. Silty, Clayey Sand
3. Fat Clay, Fat Clay with Sand
4. Overburden
5. Silty Clay
6. Poorly Graded Sand
7. Silty Sand
8. Silt, Sandy Silt, Silt with Sand
- Limestone
9. Fly Ash
10. Bottom Ash

WH	Weight of Hammer
WR	Weight of Rods
◁	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N_{60}	Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{80}	Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C./U.U.	Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09 ▽	Piezometer Water Level Reading and Date Recorded
T.O.R.-	Top of Rock (Indicates the beginning of rock-like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.-	Begin Rock Core
R.Q.D.	Rock Quality Designation (%)
REC.	Recovery (%)
Refusal	Auger Refusal using a carbide-tipped tooth auger bit
No Refusal	No Refusal Encountered
•	Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

NOTE:

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CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Location	STN-4-19		
Depth	19.1'-19.6'	14.1'-14.6'	19.7'-20.2'
$\bar{\phi}$	28.2°		
$\bar{c}$	385 p.s.f.		
Location	STN-4-19	STN-4-22	
Depth	14.1'-14.6'	4.0'-4.5'	4.6'-5.1'
$\bar{\phi}$	36.0°		
$\bar{c}$	0 p.s.f.		

SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN-4-17S	476.8'	22.0'	N/A	2.0'-4.0' 5.0'-7.0' 10.0'-12.0' 15.0'-17.0' 20.0'-22.0'
STN-4-18S	461.1'	41.0'	14.0'-24.0'	2.0'-4.0' 5.0'-7.0' 10.0'-12.0' 15.0'-17.0' 20.0'-22.0' 25.0'-27.0' 39.0'-41.0'
STN-4-19S	440.3'	26.0'	16.0'-26.0'	4.0'-6.0' 9.0'-11.0' 14.0'-16.0' 19.0'-21.0'

RECORD DRAWING

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD
R 0	01/22/10	PC	SB	PC	RLR	RLR	RLR	TJ

RECORD DRAWING

SCALE: 1"=5' EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION
STABILITY SECTION H-H'

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

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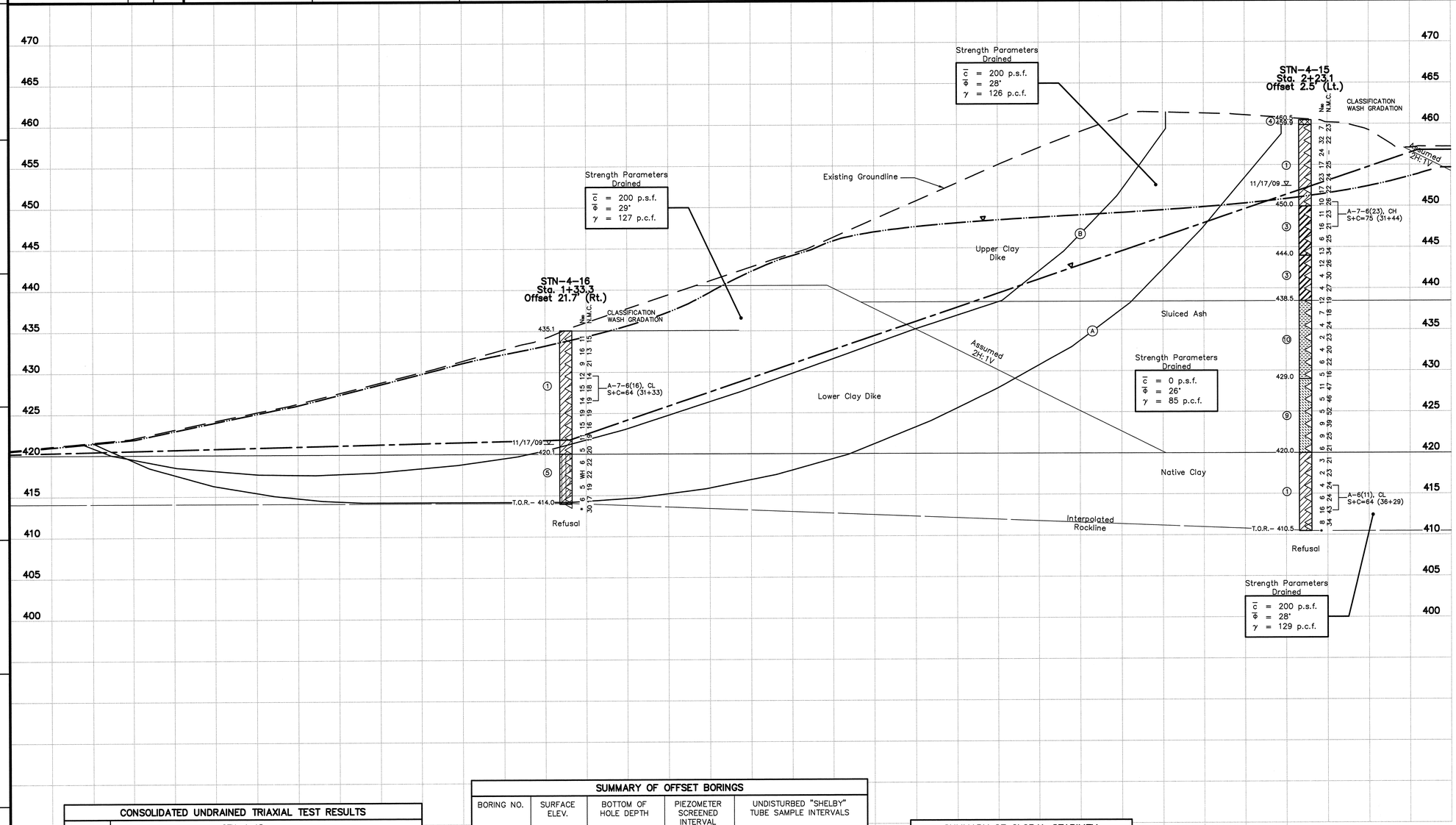
COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 01/22/10 | 37 | C | 10W706-10 | R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY



SECTION G–G'

LEGEND

①	Lean Clay, Sandy Lean Clay, Lean Clay with Sand
②	Silty, Clayey Sand
③	Fat Clay, Fat Clay with Sand
④	Overburden
⑤	Silty Clay
⑥	Poorly Graded Sand
⑦	Silty Sand
⑧	Silt, Sandy Silt, Silt with Sand
	Limestone
⑨	Fly Ash
⑩	Bottom Ash
WH	Weight of Hammer
WR	Weight of Rods
◁	Standard Penetration Test Interval
■	Undisturbed Thin–Walled (Shelby) Tube Sample
N_{60}	Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{60}	Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C./U.U.	Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09 ▽	Piezometer Water Level Reading and Date Recorded
	Phreatic Surface from PZ Data
	Phreatic Surface from Seepage Model
T.O.R.–	Top of Rock (Indicates the beginning of rock–like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.–	Begin Rock Core
R.Q.D.	Rock Quality Designation (%)
REC.	Recovery (%)
Refusal	Auger Refusal using a carbide–tipped tooth auger bit
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586–99. Refer to typed boring log.

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CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Location	STN–4–15		
Depth	5.4'–5.9'	10.1'–10.6'	15.5'–16.1'
$\bar{\Phi}$	21.2°		
$\bar{c}$	701 p.s.f.		
Location	STN–4–16		
Depth	4.0'–4.5'	9.6'–10.1'	4.6'–5.1'
$\bar{\Phi}$	29.2°		
$\bar{c}$	641 p.s.f.		

SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN–4–15S	460.5'	41.0'	11.0'–21.0'	2.0'–4.0' 5.0'–7.0' 10.0'–12.0' 15.0'–17.0' 20.0'–22.0' 33.0'–35.0' 35.0'–37.0' 39.0'–41.0'
STN–4–16S	435.1'	21.0'	11.0'–21.0'	4.0'–6.0' 9.0'–11.0' 13.5'–15.5'

SUMMARY OF GLOBAL STABILITY ANALYSES STATIC CONDITION

Failure Surface	Failure Mode	Factor of Safety
A	Circular Optimized With Phreatic Surface From PZ Data	1.95
B	Circular Optimized With Phreatic Surface From Seepage Model	1.50

RECORD DRAWING

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

ALABAMA LICENSED PROFESSIONAL ENGINEER No. 20069 REGISTERED RAYMOND LEE ROBERTS 1/22/10

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ⊘	AS CONST	DISCIPLINE INTERFACE
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	01/22/10	PC	SB	PC	RLR	RLR	RLR	TJ	–	–	–
RECORD DRAWING											

SCALE: 1"=5' EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION
STABILITY SECTION G–G'

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 01/22/10	37	C	10W706–09	R 0

Stantec Consulting Services Inc.
1901 Nelson Miller Pky.
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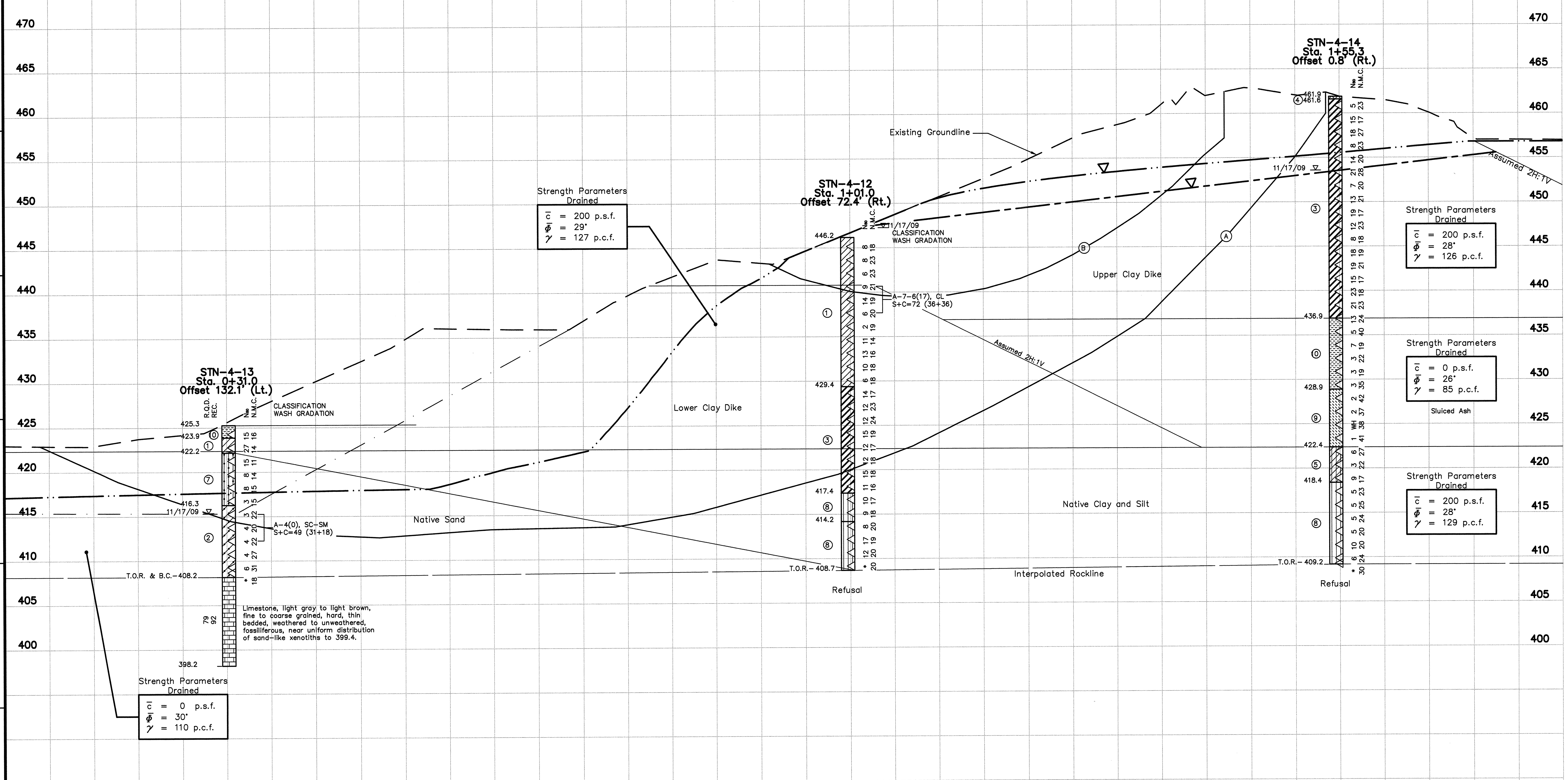
Fax 502.212.5055
www.stantec.com

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 01/21/2010 USER: PITTY, RICHARD
N:\TVOA\ASHPOND\GEOTECHNICAL\DRAWINGS\RVD_GEO\10W706-09-RG.DWG



LEGEND

- ① Lean Clay, Sandy Lean Clay, Lean Clay with Sand
- ② Silty, Clayey Sand
- ③ Fat Clay, Fat Clay with Sand
- ④ Overburden
- ⑤ Silty Clay
- ⑥ Poorly Graded Sand
- ⑦ Silty Sand
- ⑧ Silt, Sandy Silt, Silt with Sand
- Limestone
- ⑨ Fly Ash
- ⑩ Bottom Ash

WH	Weight of Hammer
WR	Weight of Rods
◁	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N_{60}	Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{80}	Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C./U.U.	Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09 ▽	Piezometer Water Level Reading and Date Recorded
▽	Phreatic Surface from PZ Data
▽	Phreatic Surface from Seepage Model
T.O.R.-	Top of Rock (Indicates the beginning of rock-like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.-	Begin Rock Core
R.Q.D.	Rock Quality Designation (%)
REC.	Recovery (%)
Refusal	Auger Refusal using a carbide-tipped tooth auger bit
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

NOTE:

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SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN-4-12S	446.2'	22.0'	10.0'-20.0'	2.0'-4.0' 5.0'-7.0' 8.0'-10.0' 15.0'-17.0' 20.0'-22.0'
STN-4-13S	425.3'	27.0'	6.0'-16.0'	No Samples
STN-4-14S	461.9'	41.0'	15.0'-25.0'	2.0'-4.0' 5.0'-7.0' 10.0'-12.0' 15.0'-17.0' 20.0'-22.0' 25.0'-27.0' 32.0'-34.0' 35.0'-37.0' 39.0'-41.0'

CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Location	STN-4-12		
Depth	8.0'-8.5'	15.0'-15.5'	8.6'-9.1'
$\bar{\phi}$	29.5°		
$\bar{c}$	261 p.s.f.		

SUMMARY OF GLOBAL STABILITY ANALYSES STATIC CONDITION

Failure Surface	Failure Mode	Factor of Safety
A	Circular Optimized With Phreatic Surface From PZ Data	1.49
B	Circular Optimized With Phreatic Surface From Seepage Model	1.77

SECTION F-F'

RECORD DRAWING

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R -	-	-	-	-	-	-	-	-	-	-	-
R 0	01/22/10	PC	SB	PC	RLR	RLR	RLR	TJ	-	-	-

RECORD DRAWING

SCALE: 1"=5' EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION STABILITY SECTION F-F'

ALABAMA LICENSED No. 30563 PROFESSIONAL ENGINEER RANDY LEE ROBERTS
1/22/10

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

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COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

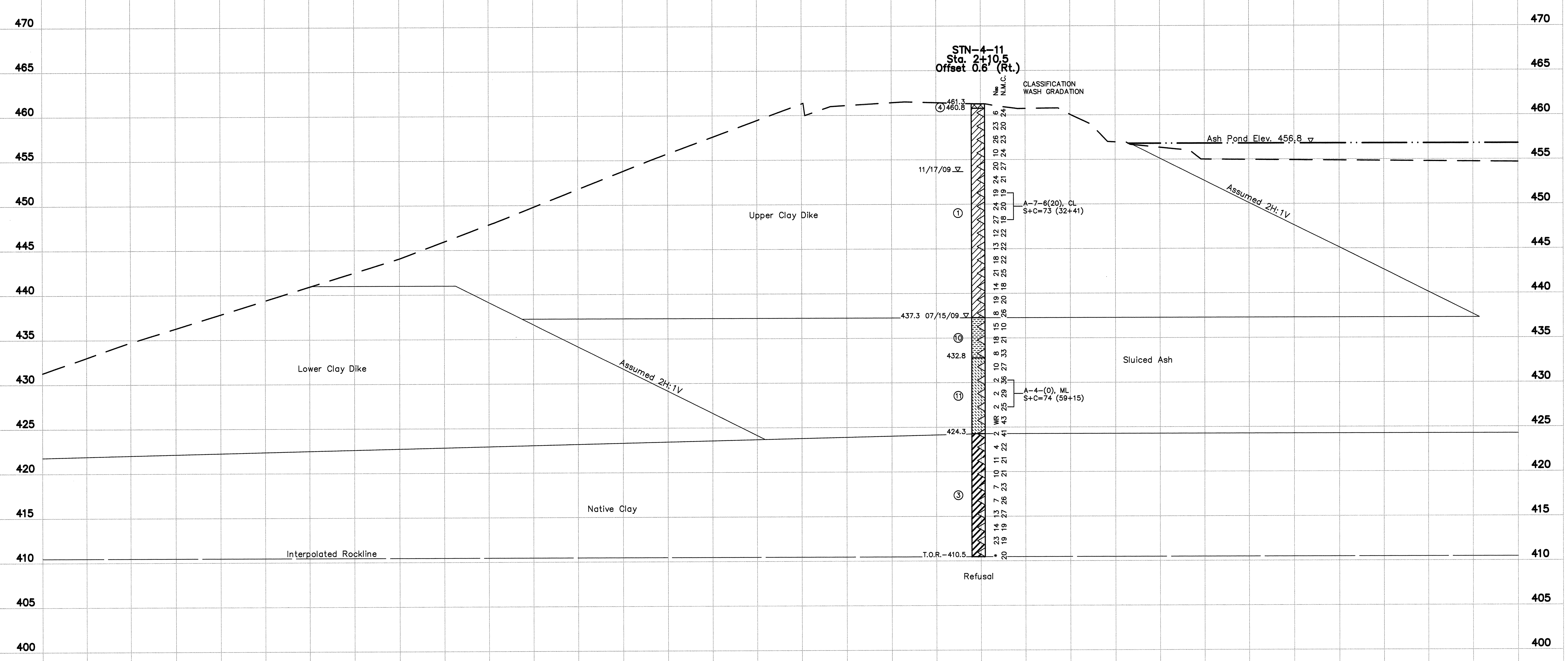
AUTOCAD R 2000 | DATE 01/22/10 | 37 | C | 10W706-08 | R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 01/21/2010



150 200 250

SECTION E-E'

LEGEND

- ① Lean Clay, Sandy Lean Clay, Lean Clay with Sand
- ② Silty, Clayey Sand
- ③ Fat Clay, Fat Clay with Sand
- ④ Overburden
- ⑤ Silty Clay
- ⑥ Poorly Graded Sand
- ⑦ Silty Sand
- ⑧ Silt, Sandy Silt, Silt with Sand
- Limestone
- ⑨ Fly Ash
- ⑩ Bottom Ash

WH	Weight of Hammer
WR	Weight of Rods
◁	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N_{60}	Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{80}	Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C./U.U.	Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09 ▽	Piezometer Water Level Reading and Date Recorded
T.O.R.-	Top of Rock (Indicates the beginning of rock-like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.-	Begin Rock Core
R.Q.D.	Rock Quality Designation (%)
REC.	Recovery (%)
Refusal	Auger Refusal using a carbide-tipped tooth auger bit
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

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CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Location	STN-4-11		
Depth	5.0'-5.5'	5.5'-6.0'	10.0'-10.5'
$\bar{\phi}$	29.2°		
$\bar{c}$	600 p.s.f.		

SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN-4-11S	461.3	24.0'	12.0'-22.0'	2.0'-4.0' 5.0'-7.0' 10.0'-12.0' 15.0'-17.0' 20.0'-22.0' 22.0'-24.0'

RECORD DRAWING

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R -	-	-	-	-	-	-	-	-	-	-	-
R 0	01/22/10	PC	SB	PC	RLR	RLR	RLR	TJ	-	-	-

R 0: RECORD DRAWING

DISCIPLINE INTERFACE

SCALE: 1"=5' EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION STABILITY SECTION E-E'

ALABAMA LICENSED No. 30583 PROFESSIONAL ENGINEER RANDY LEE ROBERTS 1/22/10

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

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COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 01/22/10 | 37 | C | 10W706-07 | R 0

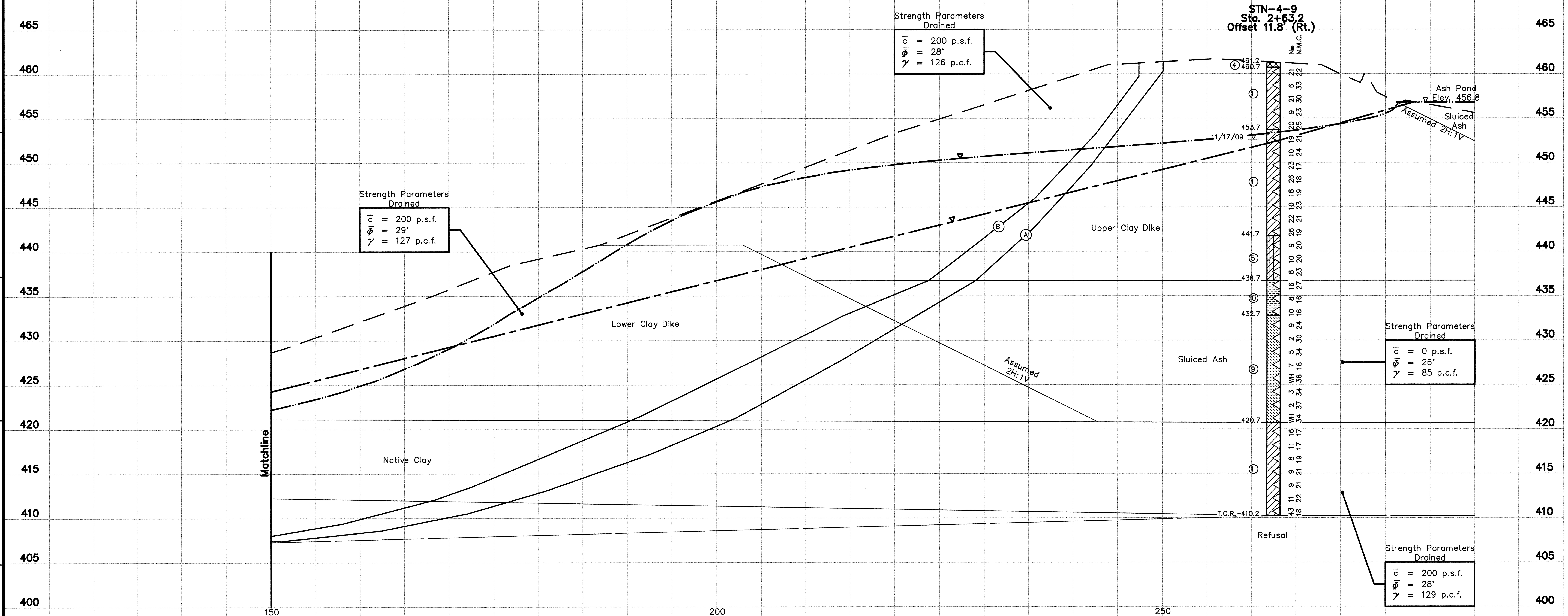
PLOT DATE: 01/21/2010 USER: PETTY, RICHARD

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

37 C 10W706-07



LEGEND

①	Lean Clay, Sandy Lean Clay, Lean Clay with Sand
②	Silty, Clayey Sand
③	Fat Clay, Fat Clay with Sand
④	Overburden
⑤	Silty Clay
⑥	Poorly Graded Sand
⑦	Silty Sand
⑧	Silt, Sandy Silt, Silt with Sand
	Limestone
⑨	Fly Ash
⑩	Bottom Ash
WH	Weight of Hammer
WR	Weight of Rods
◁	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N_{60}	Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{80}	Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C./U.U.	Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09 ▽	Piezometer Water Level Reading and Date Recorded
	Phreatic Surface from PZ Data
	Phreatic Surface from Seepage Model
T.O.R.–	Top of Rock (indicates the beginning of rock-like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.–	Begin Rock Core
R.Q.D.	Rock Quality Designation (%)
REC.	Recovery (%)
Refusal	Auger Refusal using a carbide-tipped tooth auger bit
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

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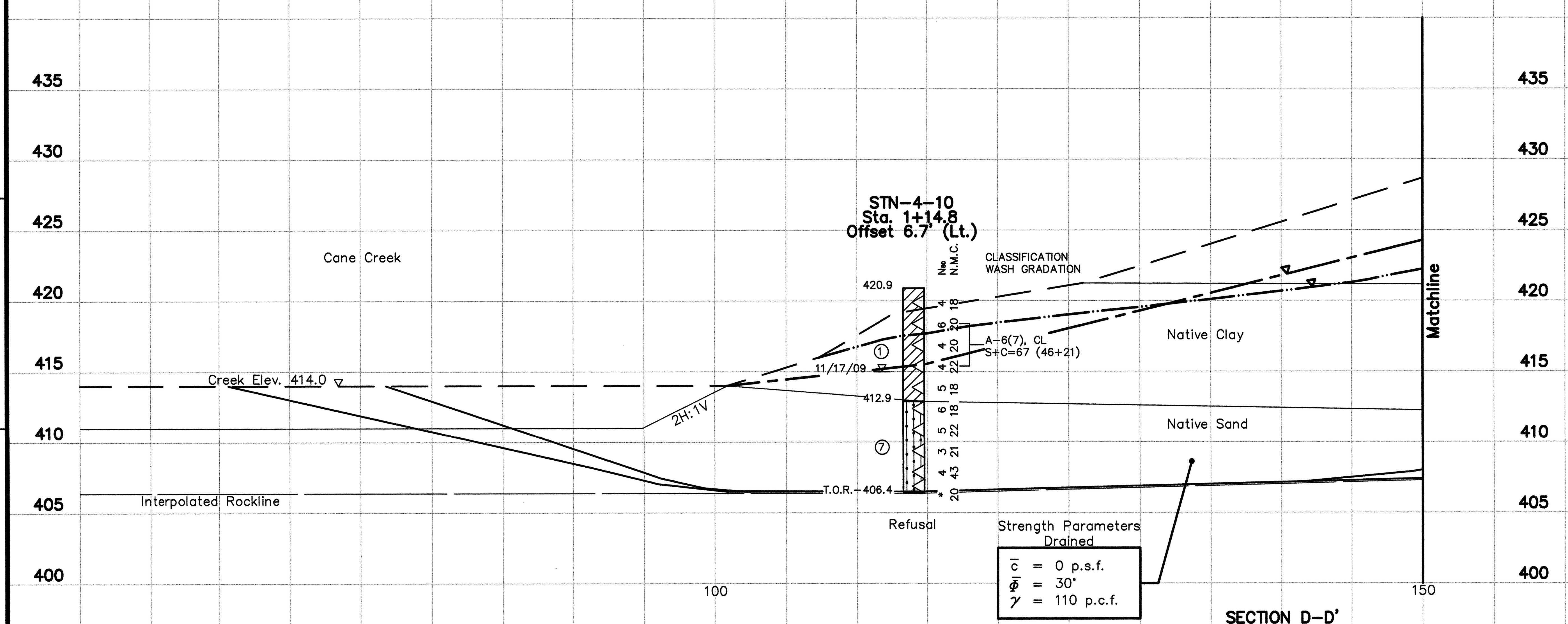
SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN-4-9S	461.2'	42.0'	13.5'-23.5'	2.0'-4.0' 5.0'-7.0' 10.0'-12.0' 15.0'-17.0' 20.0'-22.0' 25.0'-27.0' 30.0'-32.0' 35.0'-37.0' 40.0'-42.0'
STN-4-10S	420.9'	14.5'	4.5'-14.5'	No Samples

RECORD DRAWING



SECTION D-D'

SUMMARY OF GLOBAL STABILITY ANALYSES STATIC CONDITION

Failure Surface	Failure Mode	Factor of Safety
A	Circular Optimized With Phreatic Surface From PZ Data	1.40
B	Circular Optimized With Phreatic Surface From Seepage Model	1.42

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

R 0 | 01/22/10 | PC | SB | PC | RLR | RLR | RLR | TJ — RECORD DRAWING

SCALE: 1"=5' EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION
STABILITY SECTION D-D'

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
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COLBERT FOSSIL PLANT
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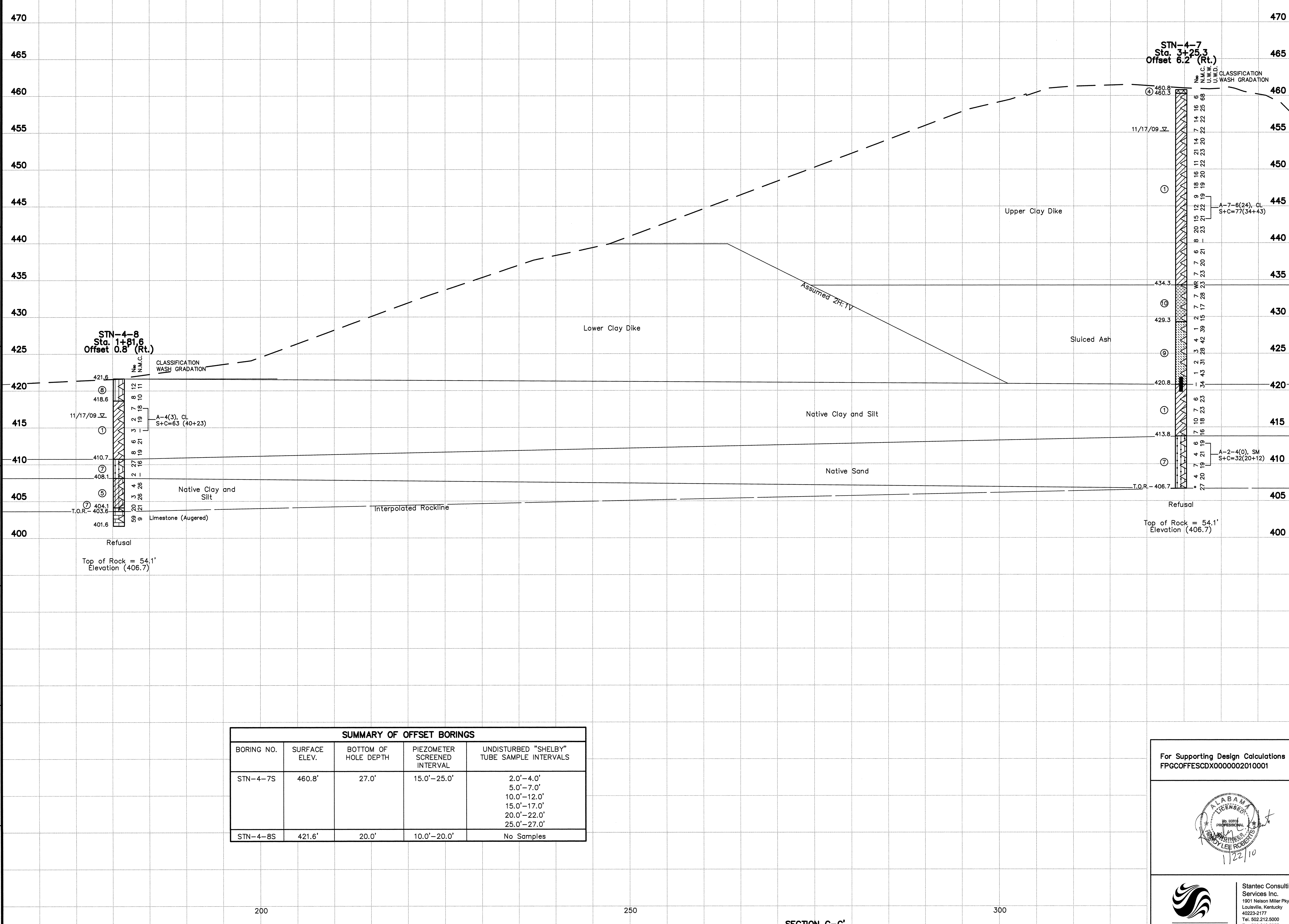
AUTOCAD R 2000 | DATE 01/22/10 | 37 | C | 10W706-06 | R 0

PLOT FACTOR:XX W_TVA

STANTEC 0 — TASK COMPLETED BY: REV NO.

C.A.D. DRAWING DO NOT ALTER MANUALLY



LEGEND

- ① Lean Clay, Sandy Lean Clay, Lean Clay with Sand
- ② Silty, Clayey Sand
- ③ Fat Clay, Fat Clay with Sand
- ④ Overburden
- ⑤ Silty Clay
- ⑥ Poorly Graded Sand
- ⑦ Silty Sand
- ⑧ Silt, Sandy Silt, Silt with Sand
- Limestone
- ⑨ Fly Ash
- ⑩ Bottom Ash

WH	Weight of Hammer
WR	Weight of Rods
◁	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N_{60}	Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{80}	Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C./U.U.	Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09	Piezometer Water Level Reading and Date Recorded
T.O.R.-	Top of Rock (Indicates the beginning of rock-like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.-	Begin Rock Core
R.Q.D.	Rock Quality Designation (%)
REC.	Recovery (%)
Refusal	Auger Refusal using a carbide-tipped tooth auger bit
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

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RECORD DRAWING

SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN-4-7S	460.8'	27.0'	15.0'-25.0'	2.0'-4.0' 5.0'-7.0' 10.0'-12.0' 15.0'-17.0' 20.0'-22.0' 25.0'-27.0'
STN-4-8S	421.6'	20.0'	10.0'-20.0'	No Samples

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R 0	01/22/10	PC	SB	PC	RLR	RLR	RLR	TJ	–	–	–

RECORD DRAWING

SCALE: 1"=5' EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION STABILITY SECTION C-C'

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

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COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

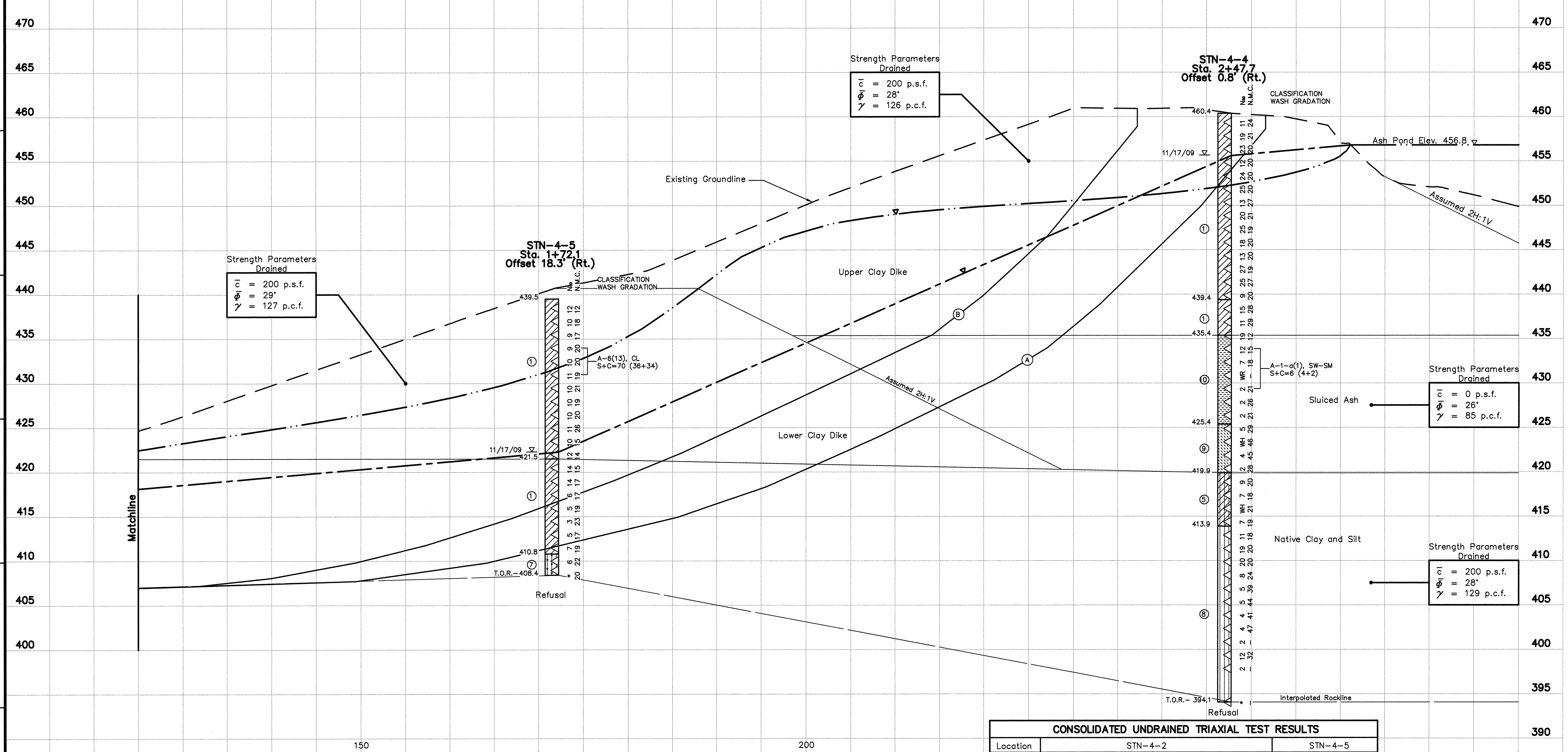
AUTOCAD R 2000 | DATE 01/22/10 | 37 | C | 10W706-05 | R 0

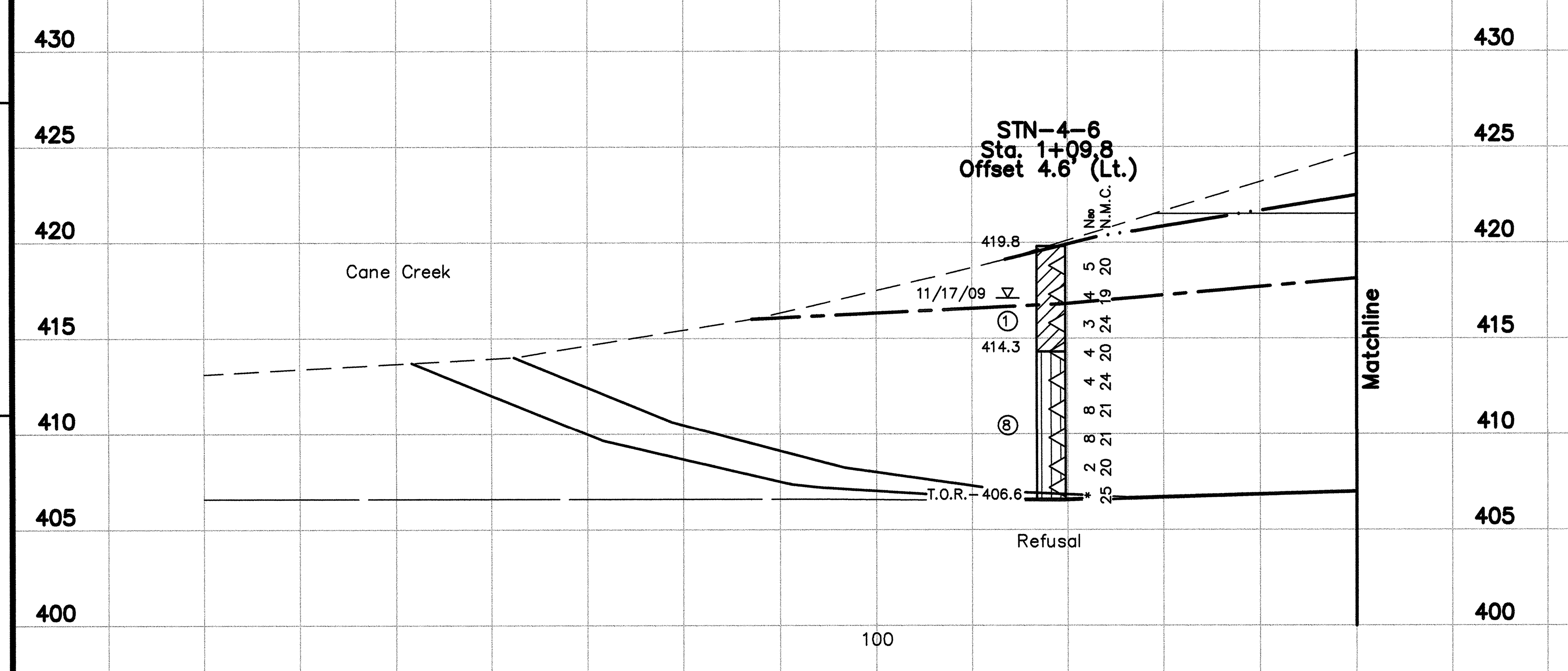
PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY

STANTEC | 0
TASK COMPLETED BY: | REV NO.

37 C 10W706-04





SECTION B-B'

SUMMARY OF GLOBAL STABILITY ANALYSES STATIC CONDITION

Failure Surface	Failure Mode	Factor of Safety
A	Circular Optimized With Phreatic Surface From PZ Data	1.80
B	Circular Optimized With Phreatic Surface From Seepage Model	1.54

CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Location	STN-4-2		STN-4-5
Depth	4.0'–4.5'	8.0'–8.5'	9.0'–9.5'
$\bar{\phi}$	33.4°		
$\bar{c}$	2 p.s.f.		
Location	STN-4-4		
Depth	5.0'–5.5'	2.8'–3.3'	5.6'–6.1'
$\bar{\phi}$	28.9°		
$\bar{c}$	497 p.s.f.		
Location	STN-4-5		
Depth	17.6'–18.1'	17.0'–17.5'	22.3'–22.8'
$\bar{\phi}$	32.4°		
$\bar{c}$	229 p.s.f.		

SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN-4-4S	460.4	27.0'	15.0'–25.0'	2.0'–4.0' 5.0'–7.0' 10.0'–12.0' 15.0'–17.0' 20.0'–22.0' 25.0'–27.0'
STN-4-5S	439.5'	24.0'	14.0'–24.0'	4.0'–6.0' 9.0'–11.0' 14.0'–16.0' 17.0'–19.0' 21.5'–23.5'
STN-4-6	419.8'	13.2'	8.2'–13.2'	No Samples

LEGEND

①	Lean Clay, Sandy Lean Clay, Lean Clay with Sand
②	Silty, Clayey Sand
③	Fat Clay, Fat Clay with Sand
④	Overburden
⑤	Silty Clay
⑥	Poorly Graded Sand
⑦	Silty Sand
⑧	Silt, Sandy Silt, Silt with Sand
	Limestone
⑨	Fly Ash
⑩	Bottom Ash
WH	Weight of Hammer
WR	Weight of Rods
◁	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N_{60}	Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{80}	Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C./U.U.	Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09 ▽	Piezometer Water Level Reading and Date Recorded
—▽—	Phreatic Surface from PZ Data
▽··	Phreatic Surface from Seepage Model
T.O.R.–	Top of Rock (Indicates the beginning of rock-like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.–	Begin Rock Core
R.Q.D.	Rock Quality Designation (%)
REC.	Recovery (%)
Refusal	Auger Refusal using a carbide-tipped tooth auger bit
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

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RECORD DRAWING

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	01/22/10 RECORD DRAWING	PC	SB	PC	RLR	RLR	RLR	TJ	–	–	–

SCALE: 1"=5' EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION
STABILITY SECTION B-B'

ALABAMA LICENSED No. 30563 PROFESSIONAL ENGINEER RANDY LEE ROBERTS 1/22/10

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

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COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 01/22/10 | 37 | C | 10W706-04 | R 0

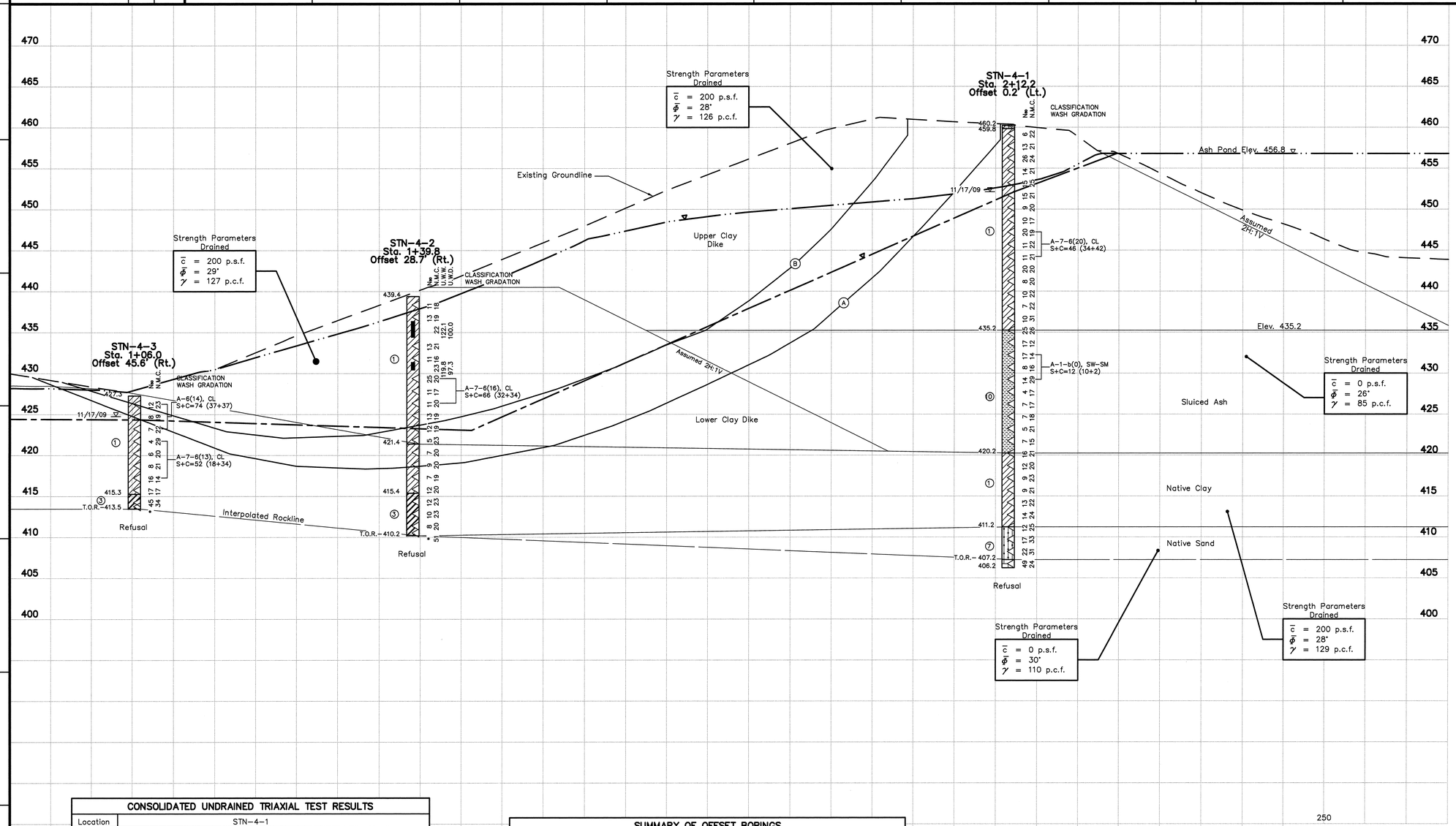
DISCIPLINE INTERFACE 1 2 3 4

STANTEC 0
TASK COMPLETED BY: REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 01/22/2010



SECTION A-A'

LEGEND

①	Lean Clay, Sandy Lean Clay, Lean Clay with Sand
②	Silty, Clayey Sand
③	Fat Clay, Fat Clay with Sand
④	Overburden
⑤	Silty Clay
⑥	Poorly Graded Sand
⑦	Silty Sand
⑧	Silt, Sandy Silt, Silt with Sand
	Limestone
⑨	Fly Ash
⑩	Bottom Ash
WH	Weight of Hammer
WR	Weight of Rods
<	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N_{60}	Standard Penetration Test Blow Count with a 140 lb Safety Hammer (blows/ft.)
N_{80}	Standard Penetration Test Blow Count with a 140 lb Automatic Hammer (blows/ft.)
N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C./U.U.	Unconfined Compressive Strength (psf)/ Unconsolidated Undrained Triaxial Test (psf)
03/31/09 ▽	Piezometer Water Level Reading and Date Recorded
	Phreatic Surface from PZ Data
	Phreatic Surface from Seepage Model
T.O.R.-	Top of Rock (Indicates the beginning of rock-like resistance to the advancement of the augers. This may indicate the beginning of weathered bedrock, boulders or rock remnants. An exact determination cannot be made without performing rock coring.)
B.C.-	Begin Rock Core
R.Q.D.	Rock Quality Designation (%)
REC.	Recovery (%)
Refusal	Auger Refusal using a carbide-tipped tooth auger bit
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

NOTE:

The geotechnical information and data furnished herein are not intended as representation or warranties but are furnished for information only. It shall be distinctly understood that the Owner or Engineer will not be responsible for any deduction, interpretation or conclusion drawn therefrom. The information is made available in order that the Contractor may have ready access to the same information available to the Owner and the Engineer and is not part of this contract.

CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Location	STN-4-1		
Depth	2.5'-3.0'	5.1'-5.6'	10.0'-10.5'
$\bar{\Phi}$	24.1°		
$\bar{c}$	860 p.s.f.		
Location	STN-4-3		
Depth	2.5'-3.0'	6.5'-7.0'	10.0'-10.5'
$\bar{\Phi}$	27.1°		
$\bar{c}$	356 p.s.f.		
Location	STN-4-2		STN-4-5
Depth	4.0'-4.5'	8.0'-8.5'	9.0-9.5'
$\bar{\Phi}$	33.4°		
$\bar{c}$	2 p.s.f.		

SUMMARY OF OFFSET BORINGS

BORING NO.	SURFACE ELEV.	BOTTOM OF HOLE DEPTH	PIEZOMETER SCREENED INTERVAL	UNDISTURBED "SHELBY" TUBE SAMPLE INTERVALS
STN-4-1S	460.2'	27.0'	14.5'-24.5'	2.0'-4.0' 5.0'-7.0' 10.0'-12.0' 15.0'-17.0' 20.0'-22.0' 25.0'-27.0'
STN-4-3S	427.3'	18.0'	13.0'-18.0'	2.0'-4.0' 6.0'-8.0' 10.0'-12.0'

SUMMARY OF GLOBAL STABILITY ANALYSES STATIC CONDITION

Failure Surface	Failure Mode	Factor of Safety
A	Circular Optimized With Phreatic Surface From PZ Data	2.10
B	Circular Optimized With Phreatic Surface From Seepage Model	1.50

RECORD DRAWING

For Supporting Design Calculations see FPGCOFFESCDX0000002010001

ALABAMA LICENSED NO. 30983 PROFESSIONAL ENGINEER TIMOTHY LEE ROBERTS
1/22/10

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www.stantec.com

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	DISCIPLINE INTERFACE
R 0	01/22/10	PC	SB	PC	RLR	RLR	RLR	TJ	-	-	-
RECORD DRAWING											

SCALE: 1"=5' EXCEPT AS NOTED

YARD
ASH POND 4

GEOTECHNICAL EXPLORATION
STABILITY SECTION A-A'

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
P. COOPER	S. BRADSHAW	P. COOPER	R. ROBERTS	R. ROBERTS	R. ROBERTS	T. JOHNSON

COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 01/22/10	37	C	10W706-03	R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 01/22/2010 USER: PETTY, RICHARD
N:\TVA\ASHPOND\TECHNICAL\DRAWING\REVISED_RPT\10W706-03-RD.DWG