Final Report of Geotechnical Exploration

Scrubber Sludge Complex
Paradise Fossil Plant
Muhlenberg County, Kentucky

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Prepared for:
Tennessee Valley Authority
Chattanooga, Tennessee

June 14, 2010

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June 14, 2010 rpt_001_175569040

Mr. Scott Turnbow
Tennessee Valley Authority
1101 Market Street, LP 2G-C
Chattanooga, Tennessee 37402

Re: Final Report of Geotechnical Exploration
Scrubber Sludge Complex
Paradise Fossil Plant
Muhlenberg County, Kentucky

Dear Mr. Turnbow:

Stantec Consulting Services Inc. (Stantec) has completed a geotechnical exploration of the Scrubber Sludge Complex at the Paradise Fossil Plant. Our final report, transmitted herewith, includes discussions of general site conditions, scope of work performed, subsurface conditions, and results of laboratory testing and our engineering analyses. The report also includes a review of historical documentation provided by TVA, and our conclusions and recommendations relative to future use of the facility. These services were performed under Engineering Service Request ESR/TAO 700 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, please contact our office.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Sharath C. Vemuri, PE
Senior Project Engineer

Hugo R. Aparicio, PE
Principal

/rws

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Executive Summary

Stantec has completed a geotechnical exploration of the Scrubber Sludge Complex at Paradise Fossil Plant. The scope of work consisted of reviewing pertinent historical documentation provided by TVA, field observations, a geotechnical exploration, engineering analyses and providing recommendations relative to the future use of the facility.

The complex consists of two adjoining ponds - East Pond and West Pond - and a stilling pond. It is approximately 225 acres in area and partially enclosed by a 1.4-mile long dike with a maximum height of 62 feet. Opened in 1986, the complex was originally operated as a conventional pond with an earthen dike and received gypsum sluiced from the plant. In 1996, the complex was expanded to stack co-mingled gypsum and fly ash sludge utilizing the upstream method of construction and rim-ditch mode of operation, which can allow attaining proper compaction along rim areas of dikes.

There is reasonably complete design and as-built drawings of the initial pond dike dated January, 1985. Conversely, the only documentation available for the expansion of the facility consists of a preliminary design report dated September, 1993 and a set of drawings dated October, 1995. The report appears to have been the basis for preparing the 1995 drawings, but both documents only provide basic information relative to the design of the stacking phase of the project. No information documenting project specific material testing, engineering analyses or construction records of the stacking phase of the facility was available for review.

The geotechnical exploration consisted of advancing 24 borings, performing field testing, installing instrumentation to monitor phreatic levels and ground movement, and testing samples in the laboratory. The exploration encountered mine spoil deposits as the foundation material in every boring and confirmed that this material was utilized to construct the initial pond dike. It was also confirmed that material impounded behind the initial dike is gypsum and material placed above the initial dike is co-mingled gypsum and fly ash. The relative density of the byproduct materials, as determined by standard penetration testing, varies significantly from boring to boring and within different intervals regardless of depth. Furthermore, when plotted on dike cross-sections, the phreatic level obtained from piezometer readings does not follow a gradual descending pattern mirroring the dike slope. Instead, there are borings where the phreatic surface is higher than in borings advanced from a higher ground surface elevation and closer to the pool.

Seepage analysis was performed on two cross sections using a finite element seepage model developed based on estimated material properties of the predominant soils. Steady-state conditions were assumed to estimate total hydraulic head values at nodal points throughout the cross sections and compare these values to phreatic levels measured in the piezometers. However, attempting to adjust the hydraulic properties of the subsoil to develop a seepage model that matches actual piezometric readings was unsuccessful due to the unusual piezometer readings obtained. Seepage analyses performed using strictly soil properties and ignoring actual piezometric readings indicate that the under-drain system installed is not adequate to lower and control the phreatic line in critical areas of the dike.

The stability of the dike was evaluated using two-dimensional limit equilibrium methods of analysis, assuming static, long-term and fully drained conditions within the existing dike. Slope stability analyses were performed for five cross sections using shear strength parameters selected based on laboratory testing and a phreatic line developed based on piezometer readings. Predictably, as a result of the varying subsurface conditions, the slope stability calculations produced factors of safety against sliding ranging widely from 1.1 to 4.7. Current USACE criteria for long-term slope stability of similar dikes require a factor of safety of at least 1.5.

Wet and soft conditions were observed throughout the lower two-thirds of the exterior stacking dike slopes, suggesting that features constructed to control and lower seepage in critical areas of the dike are not functioning properly. The uncontrolled seepage has caused unstable slope conditions such as a blowout and sloughing on the south slope of the West Dike, water boils on an intermediate bench immediately above the northwest corner of the stilling pond, a deep seated slump at the toe of the East Pond south slope and sloughing and mudflows throughout the north slope of the East Pond.

It is our opinion that the stability of the dikes is marginal due principally to lack of adequate seepage control. The facility cannot be expanded as planned and meeting acceptable safety criteria for long-term slope stability without implementing significant and costly modifications. Stantec recommends that the complex be closed and abandoned and a new landfill facility be designed, permitted and constructed, simultaneously. The complex can continue to be operated for a few years, with no disruption of scrubber sludge storage, provided certain modifications and repairs are implemented as part of a closure plan. In addition to determining the CCP disposal and storage capacity requirements until the new landfill is opened, the closure plan should include engineering analyses and measures that address and correct the deficiencies of the existing dike. The corrective measures will likely include using flatter slopes and properly designed under-drain features for temporary expansion and permanent dewatering of the facility. If implemented correctly and with proper timing, the conversion process can be completed without impacting the ongoing power generation operations.

Final Report of Geotechnical Exploration

Scrubber Sludge Complex
Paradise Fossil Plant
Muhlenberg County, Kentucky

1. Introduction

1.1. General

Tennessee Valley Authority (TVA) retained Stantec Consulting Services Inc. (Stantec) to perform facility assessments at eleven (11) active fossil plants and one closed fossil plant near the Watts Bar Nuclear Power plant. Specifically, Stantec was requested to assess the coal combustion by-product (CCB) disposal facilities at these plants. In general the facilities consisted of ash ponds, scrubber sludge (gypsum) ponds, wet ash dredge cells, dry ash stacks and gypsum stacks. A number of facilities were abandoned (having completed their design life), while majority of them were actively receiving by-products at the time of this project.

1.2. Facilities Assessment Project

Stantec's scope of work for the facilities assessment project was divided into four (4) main phases designated as Phases 1 through 4. Phase 1 was sub-divided into two phases, 1A and 1B. A brief description of Stantec's scope of work for each of the phases is presented in the following paragraphs.

- Phase 1A – Review most recent TVA inspection reports, observe critical disposal features accompanied by TVA personnel, develop a list of primary concerns and recommend immediate action or engineering assessment as considered necessary.

- Phase 1B – Review available historical documentation, visit sites for more detailed observations and measurements, complete dam safety checklists adapted from standard dam safety protocols, recommend immediate action as judged necessary and recommend sites/features that should undergo further evaluation.

- Phase 2 – Evaluate TVA facilities based on current dam safety criteria adopted by the state where the plant is located, conduct geotechnical explorations and engineering analyses at sites recommended in Phase 1B as well as complete conceptual and final repair designs and budget level costs estimates.

- Phase 3 – Design of repairs for sites recommended in Phase 2, plans and specifications for construction as well as permit/planning documents.

- Phase 4 – Dam safety training for TVA Staff and preparation of operation manuals.

At the time of this writing, Phase 1 of the assessment was completed at all fossil plants and Phase 2 was being implemented at several facilities located within the different plants. Phase 1 report recommended that Phase 2 evaluations include geotechnical exploration and hydraulic/hydrologic assessment. This report addresses the results of a geotechnical exploration of the Scrubber Sludge Complex facility located within the Paradise Fossil Plant.

2. Paradise Fossil Plant

2.1. General

The Paradise Fossil Plant is located in western Kentucky on the banks of Green River near the town of Drakesboro, Kentucky. The plant can be accessed by taking State Route 176 northeast from Drakesboro. Figure 1 shows the approximate location of the plant.

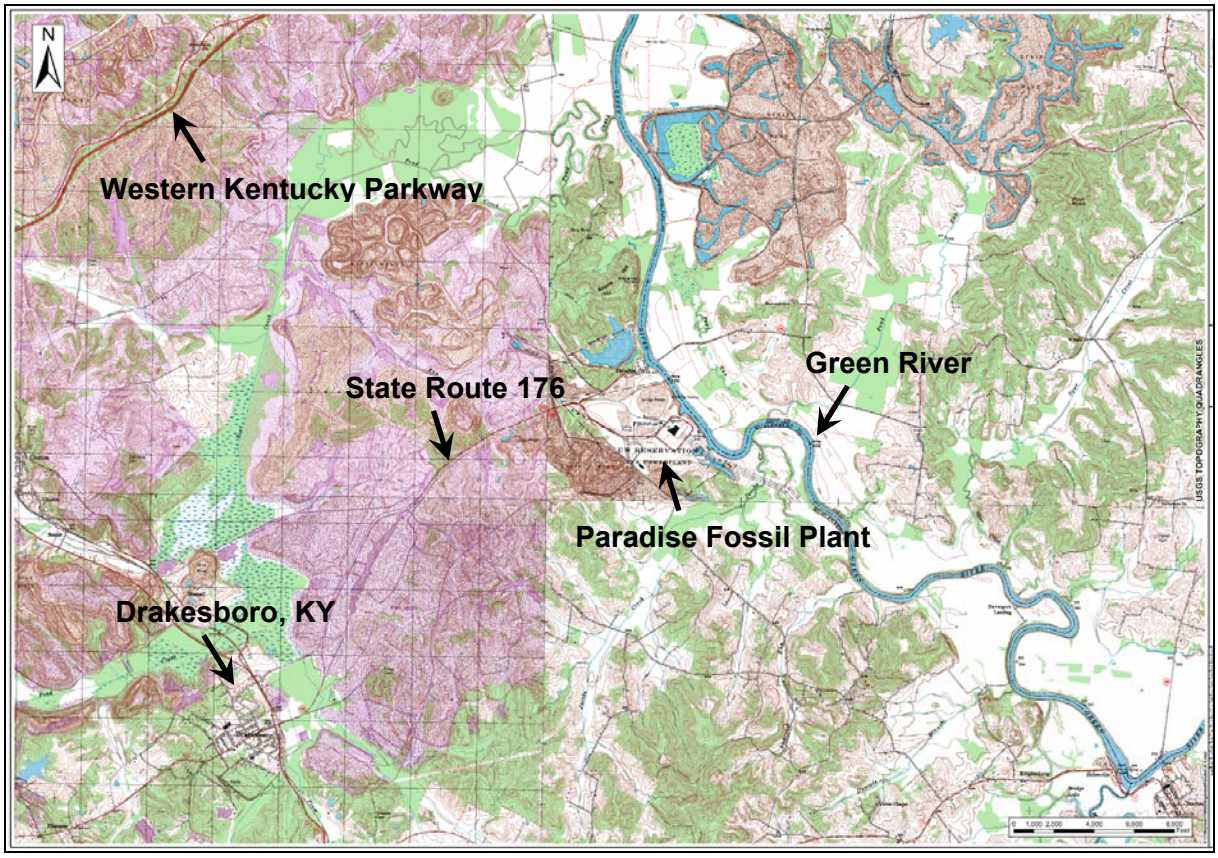


Figure 1. Approximate Site Location

2.2. Power Generation

Paradise Fossil Plant has three generating units completed between 1963 and 1970, and three large natural-draft cooling towers to provide cooling water. The plant generates 14 billion kilowatt-hours of electricity a year, enough to supply more than 930,000 homes. The winter net dependable generating capacity is 2,273 megawatts and the plant consumes approximately 20,000 tons of coal a day.

3. Scrubber Sludge Complex

3.1. General

The Scrubber Sludge Complex is located in the southwest corner of the Paradise facility (see Figure 2). The original construction of the complex took place in 1985-86 when an initial dike was built. Since then, the facility has been used for disposing gypsum and fly ash. At first, gypsum was sluiced into the pond and water decanted to a secondary stilling pool via skimmer and standard spillway. Specifically, the gypsum cake as it comes off the filter is mixed with water and pumped as slurry through a pipeline to a gypsum disposal area. The solids are allowed to settle out and clarified excess water is then decanted into a stilling pond. However, in 1996, faced with capacity issues, the complex was converted to wet stacking method which involves mechanically stacking CCB's on top of hydraulically placed gypsum to build perimeter dikes. The Scrubber Sludge Complex is being operated using elevated rim ditching method and upstream method of construction. Backhoes and excavators are being used to construct rim ditches and raise the perimeter gypsum dikes.

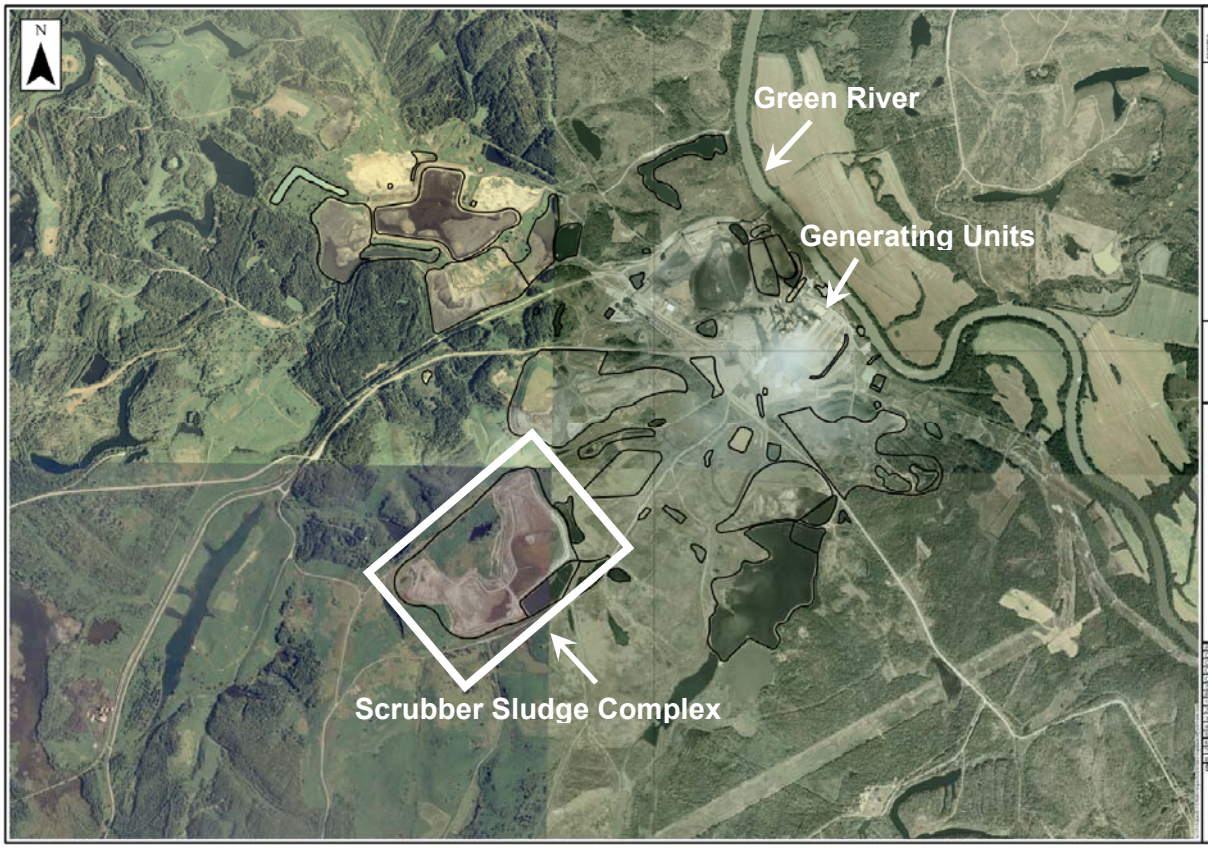


Figure 2. Location of Scrubber Sludge Complex

3.2. Main Structures within Scrubber Sludge Complex

The Scrubber Sludge Complex consists of two adjoining ponds – East Pond and West Pond – separated by a divider dike and accompanied by a stilling pond. The layout of these structures is presented in Figure 3.

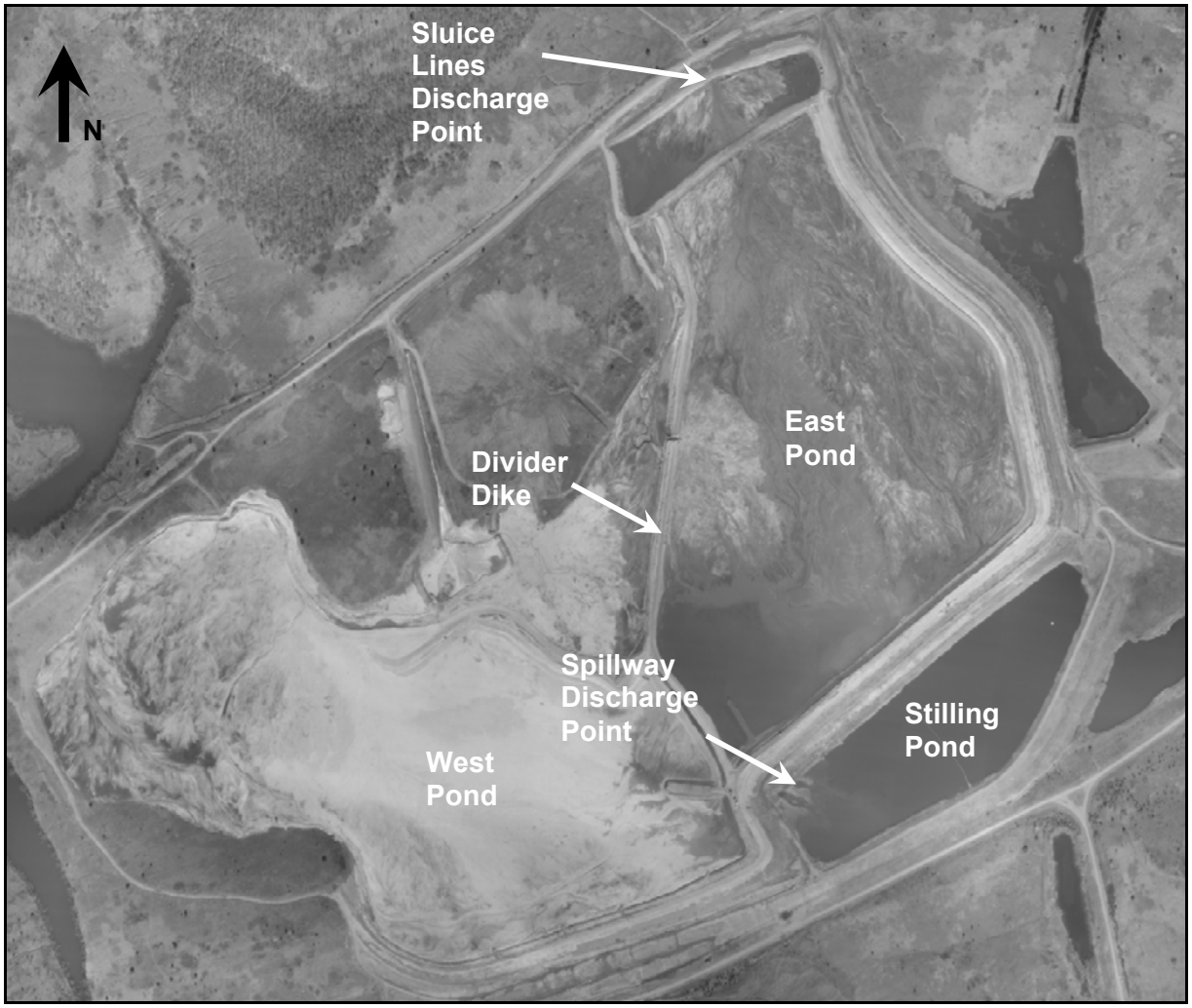


Figure 3. Main Structures within Scrubber Sludge Complex

Table 1 presents key details of the Scrubber Sludge Complex.

Table 1. Details of Scrubber Sludge Complex

Item	Value
Original Construction	1983
Elevation of Initial Dike	484 feet
Current Elevation of Dike	510 feet
Planned Final Elevation of Dike	700 feet
Current Maximum Height	62 feet
Planned Maximum Height	252 feet
Current Overall Dike Length	7,500 feet
Current Total Area	225 acres

3.3. Disposal Operations

Co-mingled gypsum and fly ash is currently sluiced to the Scrubber Sludge Complex and discharged at the north end of the East Pond. Through a network of sluice ditches and rim ditches, the discharged gypsum and fly ash are deposited either into the East or West Pond and clarified water is decanted into the Stilling Pond via riser and spillway pipe. From the Stilling Pond the water is discharged into a ditch that drains into another pond and eventually flows into the Jacobs Creek Fly Ash Pond a half mile away.

The plant currently generates both fly ash and gypsum in addition to other CCB's. Scrubbers are installed for all three generating units. The timeline regarding CCB disposal at Scrubber Sludge Complex is presented in Table 2.

Table 2. Timeline for CCB Disposal at Scrubber Sludge Complex[(1)]

Time Frame	CCB Disposal
1983 - 1996/1997	➢ Units 1&2 scrubbers went into service in the early 1983 ➢ Approximately 100% gypsum to pond
1996/1997 - 2005	➢ Gypsum and fly-ash from Units 1&2 ➢ Addition of SCR's and removal of electrostatic precipitators
2005 - present	➢ Gypsum and fly-ash from Units 1&2 and Gypsum from Unit 3 ➢ Addition of Unit 3 scrubber

(1) Based on email received from Mr. Brian S. Lankford (TVA) on April 7, 2009

4. Scope of Work

The scope of the geotechnical exploration was divided into the following tasks.

a. Review of Available Information

b. Review of General Site Geology and Coal Mining Records

c. Subsurface Exploration

d. Field Instrumentation and Monitoring

e. Surveying

f. Laboratory Testing

g. Review of Existing Conditions and Ongoing repairs

h. Engineering Analyses

The work performed as part of these tasks is described in the following paragraphs

5. Review of Available Information

5.1. General

As part of the Phase 1 of facilities assessment project, Stantec reviewed all the documents provided by TVA pertaining to the Scrubber Sludge Complex. However, only the documents listed below (in Table 3) were considered relevant to the geotechnical exploration.

Table 3. List of Documents Reviewed for Geotechnical Exploration

Reference No.(1)	Document Name	Type of Document	Dated	Agency	TVA Reference No.
1	Proposed Scrubber Sludge Disposal Area	Geotechnical Exploration	April 1984	TVA	NA(2)
2	Wet Scrubber System Gypsum Ponding	Design Drawings	January 1985	TVA	10W4280 1 through 11
3	Scrubber Sludge Stacking Plan	Memo	March 1993	TVA	NA(2)
4	Incremental Scrubber Sludge Stacking Plan	Report	September 1993	Gilbert/ Common wealth	NA(2)
5	Wet Scrubber System Gypsum Stacking	Conceptual Design Drawings	August 1993/ October 1995	TVA	10W4280 12 through 17
6	Stack Decant Spillway System/Weir Modifications	Design Drawings	June 2007	TVA	SK-1 SK-2
7	Annual Inspection of Waste Disposal Areas(3)	Reports	FY'96 to FY'08	TVA	NA(2)

(1) Presented as attachments in this order in Appendix A

(2) Not Applicable

(3) Copies of annual reports received from TVA are not included with the report due to space constraints

5.2. Summary of Events

The documents listed in Table 3 were used to gain an understanding of key events related to the planning, construction and operation of the Scrubber Sludge Complex. These events are listed in Table 4 in chronological order.

Table 4. Summary of Events

Date*	Event
April, 1982	Environmental Site Assessment done for new Scrubber Sludge Complex
April, 1984	Geotechnical Exploration performed for new Scrubber Sludge Complex
March, 1986	Construction of Scrubber Sludge Complex (Gypsum Pond) Completed
1986 to 1993	Gypsum Pond Used for Disposal
March, 1993	TVA Approves Gypsum Stacking (in light of upcoming capacity issues)
September, 1993	Gypsum Stacking Plan (Rim-Ditch Method) Prepared by Gilbert Inc.
December, 1993	Gypsum Stacking Partial Design Drawings Prepared by TVA
Fall 1996	Gypsum Pond Capacity Reached and Gypsum Stacking Begins

*-All dates listed are approximate based on Stantec's review of available documents

5.3. Grouping of Documents Reviewed

The technical documents considered pertinent to the geotechnical exploration were grouped as listed in Table 5 for purposes of this review. The contents of these documents are described in more detail in subsequent paragraphs.

Table 5. Type of Documents Reviewed

No.	Task	Type of Documents
1	Document Review	Design drawings
2		As-built drawings
3		O&M manuals
4		Annual reports

5.4. Design Drawings

5.4.1. Reference No. 2 – Initial Dike

Reference No. 2 (listed in Table 3) consists of design drawings titled "*Wet Scrubber System Gypsum Ponding",* dated January, 1985 and prepared by TVA. These drawings appear to have been used for constructing the initial dike along the south side of what was termed at that time the Wet Scrubber System Gypsum Ponding. These drawings are reasonably complete and reflect the external conditions presently encountered along the south dike of the West Pond. In fact, a set of drawings available for Stantec's review include an "As Constructed" note, presumably indicating the initial dike was built as per the design drawings. According to these drawings, the initial dike did not include significant bends in its alignment.

According to Sheets 3 and 4 of the drawings, the construction of the dike included an under-drain system to control subsurface seepage across the dike and a spillway system with a pipe crossing the East Scrubber Dike. The under-drain system (shown in Figure 4) consisted of a chimney drain located under the top of dike exterior crest.

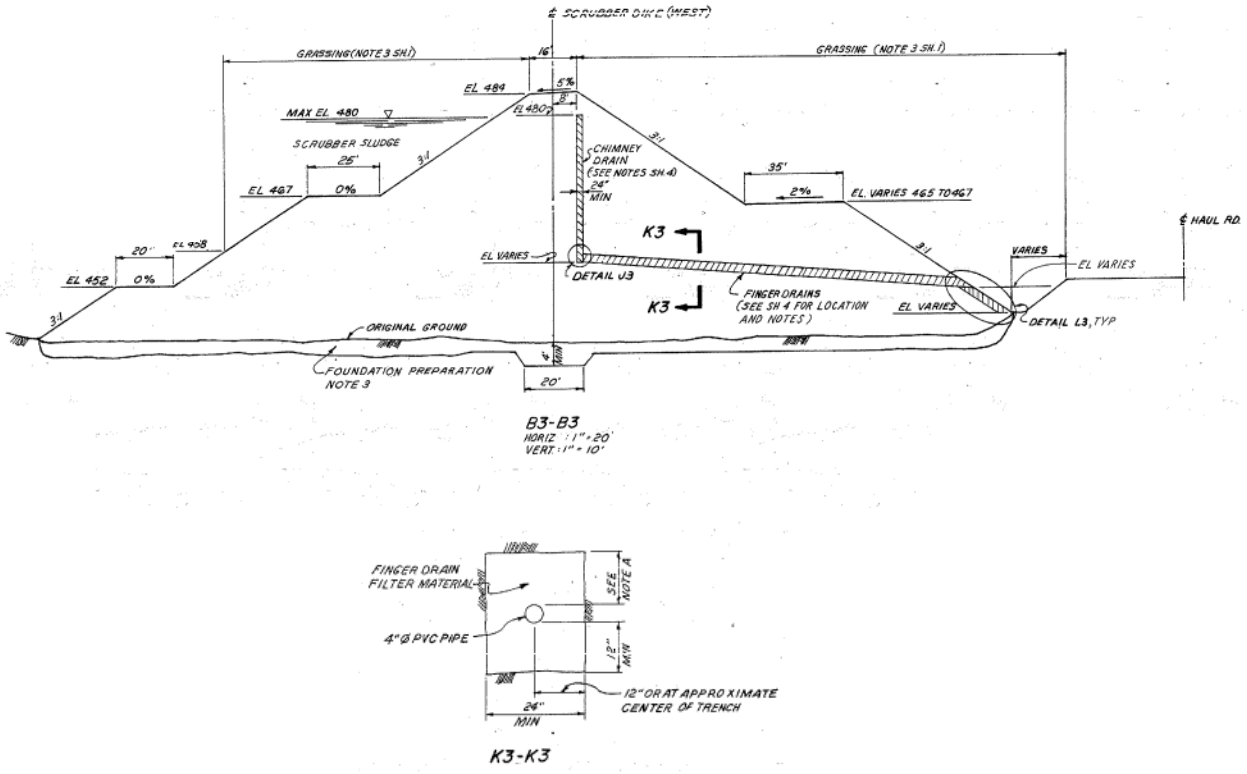


Figure 4. Under-drain System for Initial Dike (1986)

The chimney drain was connected to a collector pipe at the base which in turn was connected to lateral finger drains spaced horizontally 130 feet to 150 feet apart. The collector pipe was a 4-inch diameter perforated PVC pipe wrapped with geotextile fabric and embedded in chimney drain filter material. The finger drains consisted of 4-inch PVC pipes embedded in finger drain filter material.

5.4.2. Reference No. 4 – Preliminary Design of Stacking Dike

Reference No. 4 (listed in Table 3) consists of a report titled "*Incremental Scrubber Sludge Stacking Plan",* dated September, 1993 prepared by Gilbert/Commonwealth Inc. of Reading, Pennsylvania (Gilbert). According to the report, the East and West Scrubber Sludge Ponds were close to reaching their capacity and needed to be expanded for future use. Drawings in the report indicate that by 1993 the original alignment of the initial dike had been modified to construct the settling pond adjacent to the south side of the East Pond. The report discusses a preliminary design for the incremental stacking of scrubber sludge within the existing pond,

where the stacking would utilize the rim-ditch method for conveyance of the sludge within the ponds. The report includes several plan view drawings corresponding to nine (9) stages that would raise the top of the stack to near elevation 552 feet.

According to the 1993 report, a slope stability analysis was not performed during preliminary design of the proposed expansion. The exterior slopes used to plan the expansion were based on slopes used at the Widows Creek gypsum-fly ash stack. Since the strength parameters for the Paradise gypsum-fly ash stack were unknown, the report recommends obtaining these strength parameters in order to evaluate the stability of the proposed expansion. The report recommends implementing a subsurface exploration and laboratory testing program as part of the final design.

The report also discusses the need to install under-drains, suggesting that the design of these features be similar to the ones recommended by Ardaman & Associates, Inc. (Ardaman) in a document titled "*Preliminary Evaluation – Proposed Under-drain System, Widows Creek Gypsum-Fly ash Storage Facility*" dated August 2, 1991. The preliminary evaluation by Ardaman indicated that two under-drain alternatives (shown in Figure 5) will perform adequately with the FGD (Flue Gas De-sulfurization) gypsum-fly ash. However, the Ardaman report also recommended that additional testing should be done before finalizing the type and size of the under-drain system.

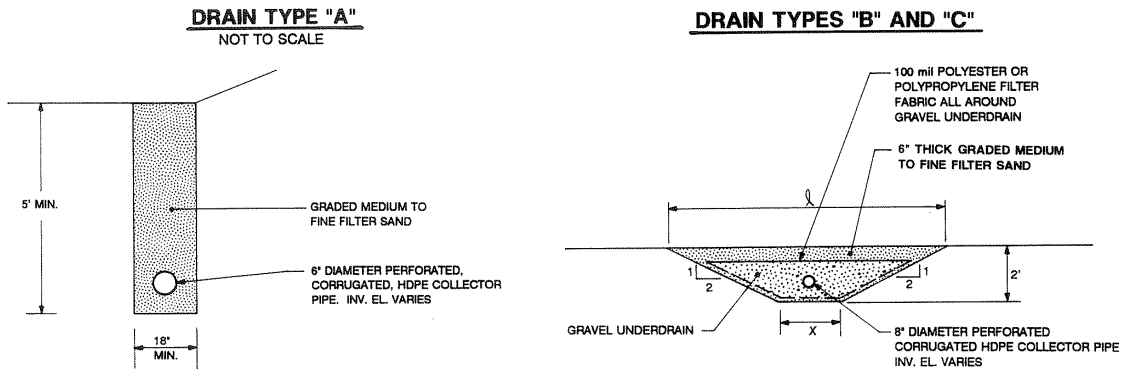


Figure 5. Under-drains Evaluated for WCF Gypsum-Fly ash Storage Facility

It is our understanding that sometime after 1991, based on further evaluation (by Ardaman or others), Drain Type "A" with larger dimensions was chosen as the under-drain system for the WCF Facility.

Figure 11 of the September 1993 report (Reference No. 4) shows two typical cross-sections of the proposed expansion configuration and a typical under-drain detail. The approximate proposed bottom elevation of the under-drain within the East Pond is 473 feet and 468 feet within the West Pond (see Figure 6). The report recommends that field and laboratory testing of the Paradise gypsum-fly ash material was required to verify the preliminary design and prepare the final design of the under-drain system.

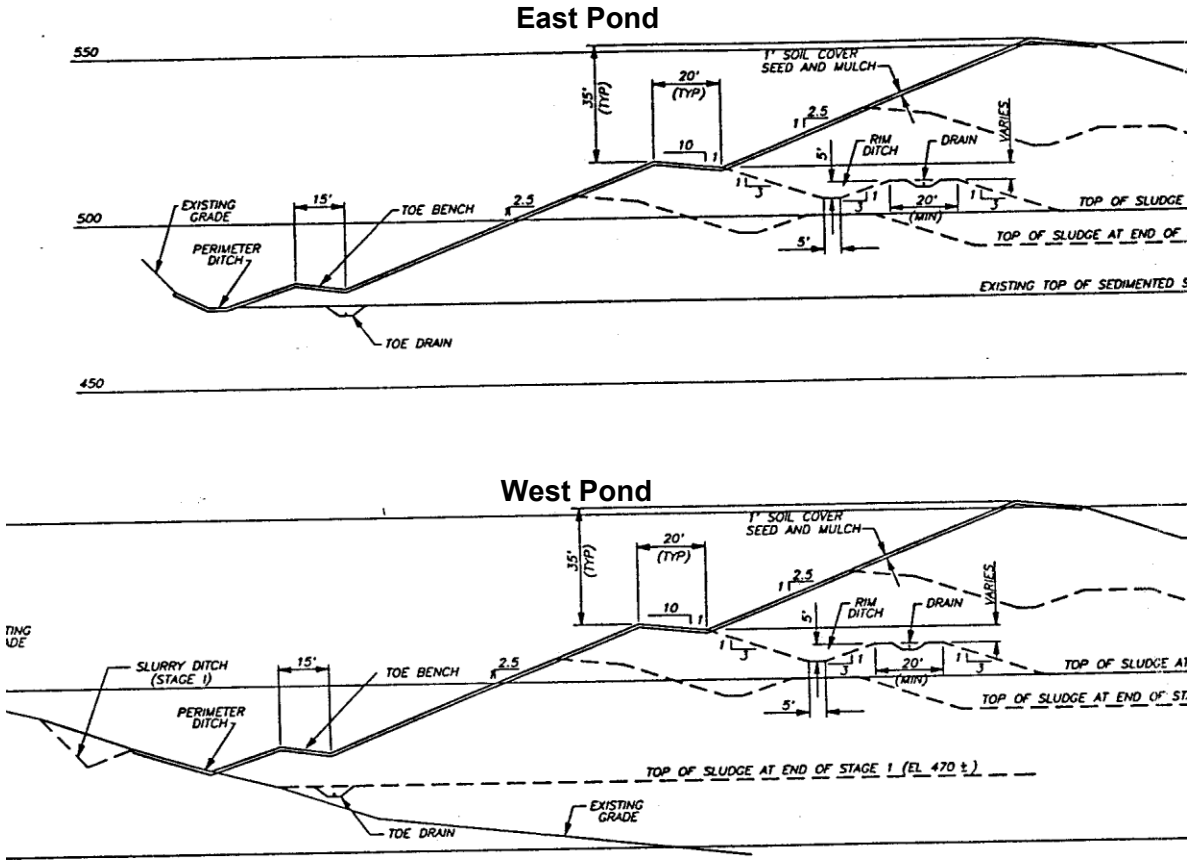


Figure 6. Typical Cross Sections of Proposed Gypsum Stack (1993)

The cross-sections in Figure 6 depict exterior surfaces consisting of 2.5:1 (horizontal to vertical) slopes and 20-foot wide intermediate benches at 35-foot elevation intervals. Another relevant detail included in the cross-sections is the location of the perimeter ditch. The perimeter ditches are located upslope but below the top of the initial dike and along the toe of the new stack slope. This confined location and proper ditch grading (1% or steeper ditch bottom slope) would presumably collect surface runoff from the lower expansion stack slopes and direct it toward the stilling pond.

5.4.3. Reference No. 5 – TVA Gypsum Stacking Drawings

Reference No. 5 (listed in Table 3) consists of design drawings titled "*Wet Scrubber System Gypsum Stacking",* dated August 1993 & October 1995 prepared by TVA. The set of drawings appeared to have been developed based generally on the preliminary design documents described in the previous section of this report. These drawings show plan views of planned stages where the low point of the rim ditch would be at 481', 500' and 550', and a final grading plan where the top of the stack would reach elevation 700'. A typical section (see Figure 7) shows an under-drain feature at two locations, one near the toe of the stack

wall and a second one 240 feet (horizontally) from the first one, toward the interior of the pond, and 20 feet below the stack slope surface. This typical section also depicts the exterior stack surface as consisting of 3:1 (horizontal to vertical) slopes and 15-foot wide intermediate benches at varying elevation intervals selected based on the plan views.

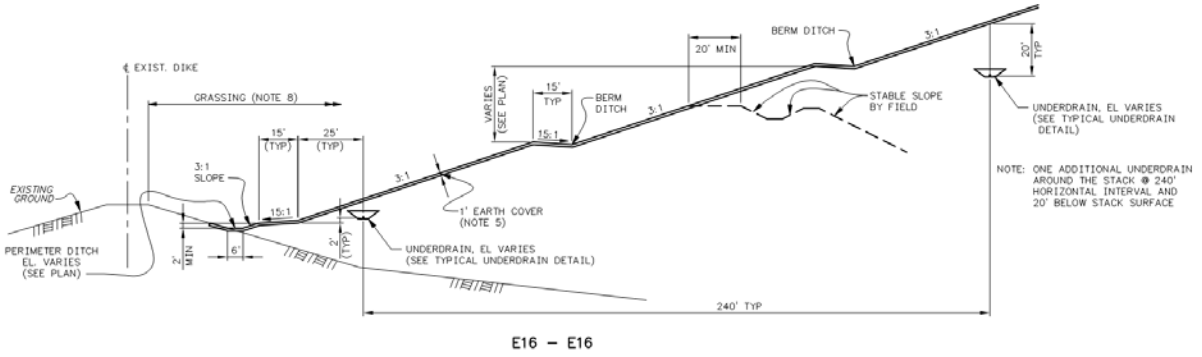


Figure 7. Planned Typical Cross Section of Gypsum Stack (1995)

A typical under-drain detail included on the drawing (see Figure 8) calls for a 6-inch slotted corrugated HDPE collector pipe embedded in backfill material (specified as bottom ash), with the backfill material completely wrapped in filter fabric. The under-drain feature is shown as capped with a 6-inch thick layer of bottom ash. The overall feature has a trapezoidal cross-section measuring 2 feet at the bottom, 12 feet at the top and a total height of 2 feet.

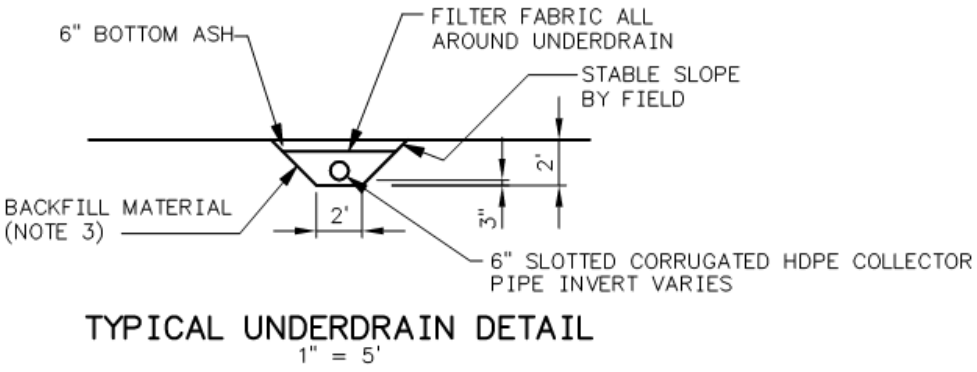


Figure 8. Under-drain detail as shown in Reference No. 5

The October 1995 drawings include plan views, construction notes and some typical sections that provide general guidelines to be followed during construction, but also leave several aspects of the design to presumably be defined during the construction phase. No information was available for review indicating that geotechnical engineering work was done as part of the final design.

5.4.4. Gypsum Stack Weir Modifications

Two drawings (Reference No. 6) dated June 26, 2007 present a typical cross-section (See Figure 9) of the decant spillway system and weir modifications to be used for the different stages of the stacking project. Each stage system is shown to consist of a vertical weir spillway located well within the stacking area.

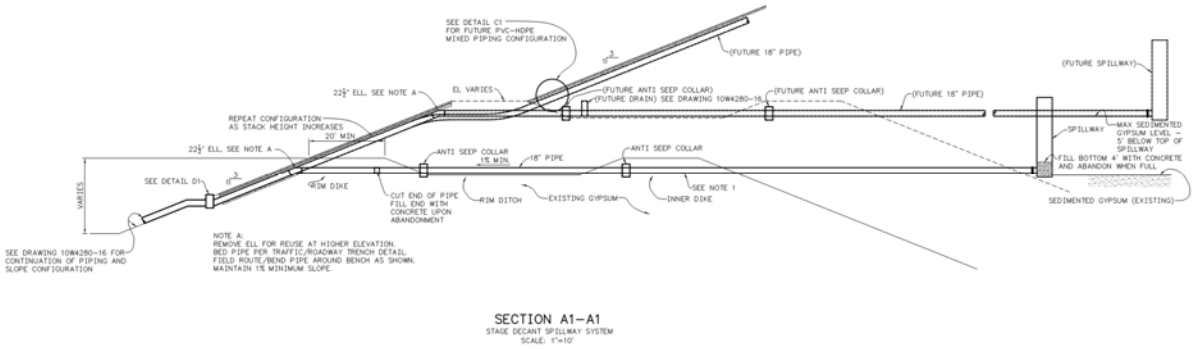


Figure 9. Planned Stage Decant Spillway System (1995)

The weir is connected to an 18" pipe that crosses the inner dike, rim ditch and rim dike before emerging at the exterior slope where it turns downward with an elbow section and from there on lays on the exterior slope surface until it enters a pipe junction box. The typical section also shows the decant spillway system for the next stage, which uses identical components and layout as in the first stage. Once the pipe of this second stage emerges and descends along the slope, it is supposed to be connected to the previous stage pipe (already lying on the slope) by using another pipe junction box. A note on the drawings next to the weir of the first stage reads "*Fill bottom 4' with concrete and abandon when full".*

5.5. As-Built Drawings

The title block of the Wet Scrubber System Gypsum Ponding drawings (Reference No. 2) is dated January 25, 1985. According to a note below the title block dated January 13, 1986 these are record drawings as constructed. The revision notes above the title block include "FINAL FIELD REVISION" or "AS CONSTRUCTED" labels dated June 3, 1986. Therefore, it is assumed these are as-built drawings.

The title block of the Wet Scrubber System Gypsum Stacking drawings (Reference No. 5) is dated either August 12, 1993 or October 6, 1995. A revision note above the title block of the August 12, 1993 drawings reads "COMPLETELY REDRAWN AND REVISED" and is dated October 6, 1995. As-built drawings for the Wet Scrubber System Gypsum Stacking were not available for review.

5.6. O&M Manual

The only document provided by TVA that discusses operations related to the handling of byproduct materials is titled '*Coal Combustion By-Product Disposal, Paradise Fossil Plant, By-Products Operations Manual'* (date unknown). This manual does not address the critical operations and maintenance guidelines needed for a structure such as Scrubber Sludge

Complex. The only reference in the above mentioned manual regarding periodic monitoring of dike stability was found in Section 3.6 of the document titled *Technical Instruction, Pond & Ash Management*. Paragraph V, Activity A18 of this section reads as follows:

*"At least **once each year,** Fossil Engineering Services (FES) prepares a Dike Stability report based on inspections of all pond dikes (ash, yard drainage, red water, and fines) for leaks, erosion, rooted trees, and red water seeps. FES provides copies of the report to Plant Engineering, the Ash Management Team and Yard Ops. The Ash Management Team and Yard Ops are responsible for implementation of necessary maintenance and corrective actions identified in the report. If more than 1 acre of the exterior face of the dike is disturbed, a storm water construction permit may be required."*

There were no documents for review indicating that the Scrubber Sludge Complex currently has established criteria for routine operations such as proper methods for stacking byproduct materials, proper methods for compaction of gypsum and fly ash and overall best practices for construction of perimeter dikes.

5.7. Annual Reports

Documents reviewed by Stantec did not include any detailed records of maintenance work performed on the Scrubber Sludge Complex. The only regular maintenance records available for review were contained in the annual reports (listed as Reference No. 7 of Table 3). These annual reports dedicate a brief portion of the report to Scrubber Sludge Complex, but do not include any prescribed maintenance methods or records that maintenance work has been performed on a regular basis.

6. General Site Geology

6.1. Geology

The Paradise Fossil Plant is underlain by coal rich Pennsylvanian age bedrock formations. Extensive strip mining operations performed prior to the construction of the plant have significantly altered the topography and geology within the vicinity of the plant and, as such, large areas of the plant are underlain by deep mine spoil deposits.

According to the USGS Geologic Map of the Drakesboro Quadrangle (1972), the Scrubber Sludge Complex site is underlain by bedrock belonging to the Lisman and Carbondale Formations, in general order of descending geology, and alluvium deposits. The Lisman Formation is described as consisting of inter layered sandstone, shale, coal, underclay, limestone and siltstone. The coal seams listed within this formation in descending order are known as No. 14, No. 13 and No. 12, with the lowest seam being the thickest. The mapping also shows three unnamed seams between the No. 14 and No. 13 seams. The Carbondale Formation generally consists of cyclic sequences of fine-grained sandstone, sandy shale, coal, and silty underclay. This formation contains in descending order the No. 11, No. 10 and No. 9 coal seams. No. 11 seam was mapped at the top of the formation together with No. 12 seam.

The No. 12 and No. 11 seams are shown outcropping immediately west of the site, while an unnamed seam outcropped within the site (see Figure 10). According to the topographic information shown in the geologic map, parts of the complex site were developed over what used to be the floodplain of two Jacobs Creek tributary streams. The floodplain is shown to have contained alluvial deposits generally consisting of gravel, sand, silt, and clay.

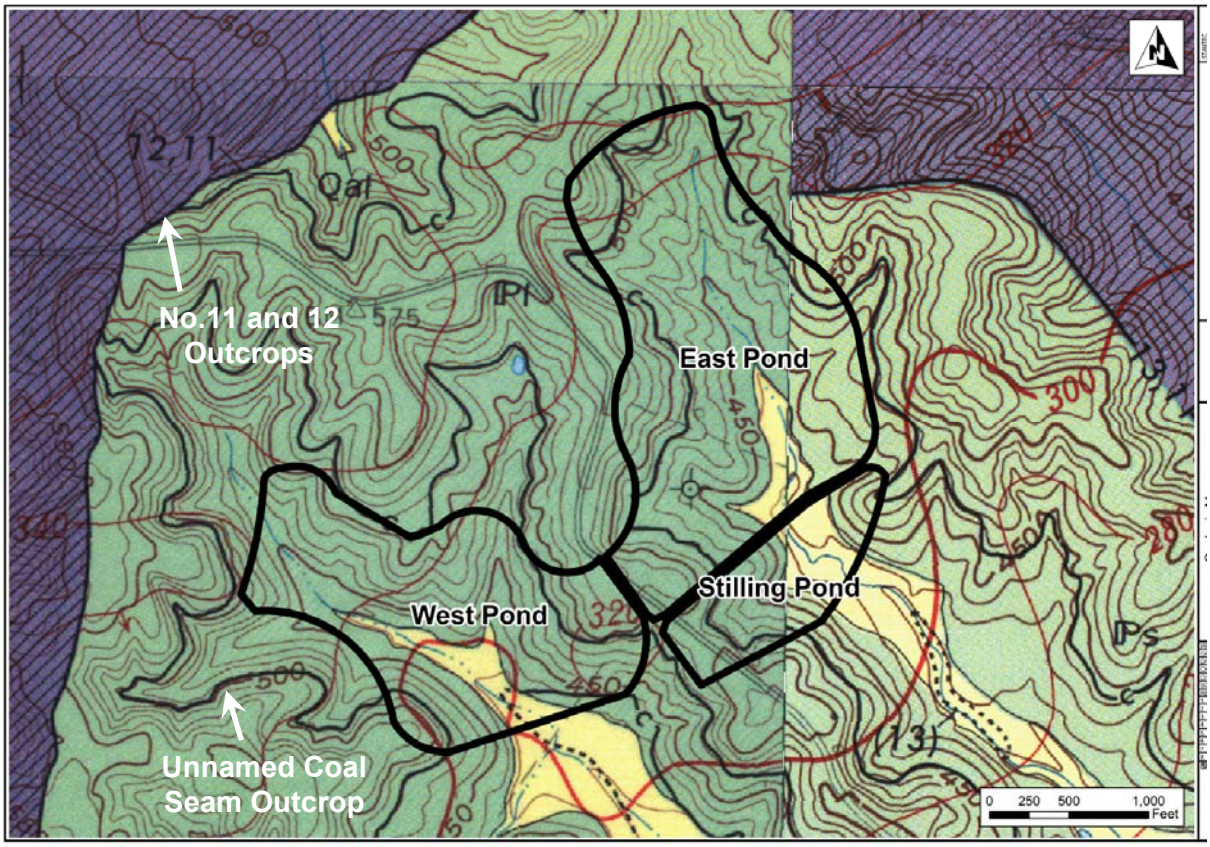


Figure 10. Geologic Map of Scrubber Sludge Complex (Source: USGS)

6.2. Coal Mining

Extensive coal mining has occurred at the Scrubber Sludge Complex site over the years. Coal seams mined underneath the site include West Kentucky Coal Bed Numbers 9, 10 and 11 associated with the Carbondale Formation and West Kentucky Coal Bed Numbers 12 and 13 associated with the Lisman Formation. There have also been numerous rider coal seams and unnamed coal seams mined in the vicinity of the power plant. Based on the USGS Geologic Map of the Drakesboro Quadrangle (1972), the coal bed thicknesses prior to mining are presented in Table 6:

Table 6. Coal Bed Thicknesses

Name of Coal Bed	Coal Thickness (Inches)
9	48 – 63
10	0 – 10
11	30 – 78
12	0 – 70
13	Unknown

Coal in the area of Scrubber Sludge Complex has been deep mined, using room and pillar and room and rib methods, as well as surface mined, extensively. A summary of mining operations at the Scrubber Sludge Complex is presented in Table 7. Mine maps based on the information obtained from the Kentucky Mine Mapping Information System (www.minemaps.ky.gov) are presented in Appendix H.

Table 7. Mining Activity in the Area of Scrubber Sludge Complex

Seam No.(1)	State File No.(s)	Type(2)	Company	Date(s) Mined	Seam(s) Mined	Type of Mining(3)
580	02106	SRC	Pittsburg & Midway Coal	1960-79	9,10,11,12,13	Surface
585	02106	SRC	Pittsburg & Midway Coal	1960-79	9,10,11,12,13	Surface
590	00825-2	STC	Peabody Coal Co.	1962-81	9,11,12,13	Surface
	00825-2	STC	Peabody Coal Co.	1962-81	9,11,12,13	Surface
600	92789	NA	W. A. Wickliffe Coal Co	1951(4)	9	Deep
	06620-4	URC	Pittsburg & Midway Coal	1970-79	9	Deep
	05877-15	UTC	Peabody Coal Company	1974-91	9	Deep

(1) In descending elevation;

(2) SRC=Surface Rail Coal, STC = Surface Truck Coal, URC=Underground Rail Coal, UTC=Underground Truck Coal, NA=Not Available;

(3) Surface = Area Surface Mining, Deep = Room and Pillar (or) Room and Rib Underground Mining

(4) Date of mine map reviewed

7. Subsurface Exploration

7.1. General

Fieldwork for the geotechnical exploration was performed by Stantec during the months of February and March, 2009. The field work consisted of advancing a total of twenty four (24) borings at the project site. Boring locations were chosen by Stantec and staked and surveyed by TVA. The locations of the borings and their corresponding elevations are given on the boring layout drawing presented in Appendix B. The subsurface exploration was performed using 4¼ inch (ID) hollow stem augers following a carbide tipped tooth bit.

Standard Penetration Testing (SPT) was performed in selected borings at continuous depth intervals within the gypsum-fly ash material and at selected depth intervals within the underlying mine spoil. A standard penetration test consists of dropping a 140-pound

hammer to drive a split-barrel sampler 18 inches. The consistency or relative density of the soil material is estimated by the number of blows it takes to drive the split spoon sampler 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. The results of SPT testing are presented on the boring logs included in Appendix C. Drilling fluid (typically used to limit the amount of "blow-up" into the hollow-stem auger) was not used when sampling below the phreatic surface.

Undisturbed Shelby tube samples of gypsum-fly ash and gypsum deposits were obtained from various borings at selected depth intervals. All Shelby tube samples were sealed with caps in the field and transported to Stantec's laboratory for testing. A list of recovered samples, including sample depths and percent recovery is presented on the boring logs in Appendix C.

In addition to the samples mentioned above, disturbed bag samples of gypsum – fly ash, gypsum and mine spoil were also obtained during the subsurface exploration for further laboratory testing. The bag samples typically consisted of auger cuttings obtained from the borehole during drilling process.

Upon completion of the drilling and sampling procedures, the boreholes were either backfilled with auger cuttings or well backfill materials (cement, sand and/or bentonite) depending on the type of instrumentation (piezometer versus slope inclinometer) the borehole was planned to receive. A geotechnical engineer (or geologist) was present on-site throughout the drilling and sampling operations. The engineer (or geologist) directed the drill crew, logged the subsurface materials encountered during the exploration and collected soil samples. Particular attention was given to the material's color, texture, moisture content and consistency or relative density. Following the field exploration, the SPT samples, Shelby tubes and bag samples were transported to our laboratory. The samples will be available for review up to thirty (30) days following the submittal of this report, at which time the samples will be discarded unless prior arrangements for storage have been made.

7.2. Summary of Borings

A boring layout drawing is presented on a drawing included in Appendix B. Typed boring logs are presented in Appendix C. Summary of boring information is presented in Table 8, where all measurements are expressed in feet.

Table 8. Summary of Borings

Boring No.	Top of Hole (Elevation)	Bottom of Hole (Elevation)	Bottom of Hole (Feet)
STN-1	509.8	398.3	111.5
STN-1A[(1)]	509.8	473.3	36.5
STN-2	494.2	402.7	91.5
STN-3	483.4	412.9	70.5
STN-4	467.5	417.5	50.0
STN-5	451.9	396.9	55.0
STN-6	510.9	409.4	101.5
STN-6A	510.9	470.9	40.0
STN-7	486.7	408.7	78.0

Table 8. Summary of Borings

Boring No.	Top of Hole (Elevation)	Bottom of Hole (Elevation)	Bottom of Hole (Feet)
STN-7A	486.7	481.7	5.0
STN-7B	486.7	472.3	14.4
STN-8	510.2	412.2	98.0
STN-8A	510.2	448.7	61.5
STN-9	497.5	417.5	80.0
STN-9A	497.5	455.5	42.0
STN-9B	497.5	452.2	45.3
STN-10	514.0	443.0	71.0
STN-10A	514.0	487.2	26.8
STN-11	504.4	428.9	75.5
STN-11A	504.4	492.4	12.0
STN-12	494.4	459.4	35.0
STN-13	525.1	485.1	40.0
STN-13A	525.1	500.1	25.0
STN-14*	510.9	459.4	51.5
STN-15[(2)]	480.9	409.4	71.5
STN-16[(2)]	481.1	409.6	71.5

[(1)] Letter 'A' or 'B' besides the boring number indicates that it is an offset boring drilled within 10 feet from the original boring location to obtain undisturbed Shelby tube samples. For example, boring B-1A was drilled within 10 feet or less from boring B-1 in order to obtain undisturbed Shelby tube samples.

[(2)] Drilled in May, 2009 as part of immediate response by Stantec for slope slump along south dike of East Pond.

7.3. Subsurface Soil Conditions

The subsurface conditions encountered in different borings consisted of co-mingled gypsum and fly ash, gypsum, mine spoil or a combination thereof. A thin layer of top soil cover was encountered in some of the borings located on intermediate benches of the dikes.

Co-mingled gypsum-fly ash material encountered in different borings can be described as moist to wet, light gray to dark gray, mottled, and very loose to very dense. The N-values (from SPT blow counts) for the gypsum-fly ash material had a wide range from 2 to 100+. The higher N-values (30 or more) represent dense to very dense conditions, while lower N-values (10 or less) represent loose to very loose conditions. Values in between indicate medium dense conditions. The relative density of the gypsum-fly ash material was widely varying throughout the boring locations.

Gypsum material encountered in different borings can be described as light gray to gray, moist to wet and medium dense to dense. The N-Values (from SPT blow counts) were varying widely from values as low as 6 to as high as 100+. The relative density of the gypsum material was widely varying throughout the boring locations.

Mine spoils encountered in different borings can be visually described as lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone and siltstone fragments. Laboratory tests on mine spoil were classified as CL according to Unified Soil Classification System (USCS) and A-6(7) and A-6(4) according to American Association of State Highway and Transportation Officials (AASHTO) soil classification system.

7.4. Bedrock Conditions

No rock coring was performed in any of the borings advanced during this exploration. All borings, with the exception of Boring STN-2, were terminated before encountering auger refusal. Auger refusal in Boring STN-2 was encountered 91.5 feet below the ground surface, or at elevation 402.7 feet. According to the results of the subsurface exploration performed by others in 1984, the bedrock surface at the Scrubber Sludge Complex site underlying mine spoil deposits was encountered near elevation 390 feet.

7.5. Subsurface Water

Subsurface water was encountered in most of the borings advanced during this exploration. The water level reading was taken after the boring had been drilled and before the installation of instrumentation. Typically, subsurface water was not found in borings advanced purposely to a shallow depth to obtain undisturbed samples. The depths to water noted immediately after drilling are shown on the boring logs presented in Appendix C. Additional water level readings were obtained from piezometers installed in some of the borings, is discussed in the following section of this report.

8. Field Instrumentation and Monitoring

8.1. General

As part of the geotechnical exploration, Stantec devised and implemented a slope monitoring program. The program started by installing instrumentation in the boreholes drilled for the geotechnical exploration. After taking initial or baseline instrumentation readings the monitoring of the dike slope conditions continued by obtaining periodic readings. The monitoring through the information obtained from the readings will continue until actions are implemented to provide adequate long term stability of the structure. Some of the instrumentation readings were also used to arrive to the results of the engineering analysis presented in this report. The following paragraphs provide additional details regarding the instrumentation and monitoring program.

8.2. Instrumentation

Two (2) types of instrumentation were installed as part of the geotechnical exploration. These include standpipe piezometers (PZ) and slope inclinometer (SI) casing. Standpipe piezometers, installed in a borehole, consisted of a filter tip joined to a 1-inch diameter riser pipe. The filter tip was placed in a sand pack and a bentonite seal was placed above the sand to isolate the target pore water pressure reading area. The annular space between the riser pipe and the borehole was backfilled to the surface with bentonite grout to prevent vertical migration of water. The riser pipe was terminated slightly above ground level and protected with a lockable metal cover.

Slope inclinometers consisted of 2.75-inch (OD) casing with interior vertical grooves also installed in a borehole. The annular space between the casing and borehole was backfilled to the surface with cement bentonite grout. The casing was terminated slightly above ground level and protected with a lockable metal cover as shown in Figure 11. Table 9 provides a summary of the instruments installed. Appendix D present the PZ and SI Instrumentation Logs.

Figure 11. Slope Inclinometer Installed by Stantec

Table 9. Summary of Instrumentation

Serial No.	Boring No.	Instrument	Instrument ID	Tip Elev (feet)	Zone		
					From	To	Material
1	STN-2	PZ	PZ-2	468.4	467.4	477.4	Gypsum
2	STN-2	PZ	PZ-2A	437.1	436.1	446.1	Minespoil
3	STN-4	PZ	PZ-4	420.7	419.7	429.7	Minespoil
4	STN-5	PZ	PZ-5	399.3	398.3	408.3	Minespoil
5	STN-6	PZ	PZ-6	413.1	412.1	422.1	Minespoil
6	STN-6A	PZ	PZ-6A	472.6	471.6	481.6	Gypsum
7	STN-7B	PZ	PZ-7B	474.4	473.4	479.4	Minespoil
8	STN-8A	PZ	PZ-8A	452.3	451.3	461.3	Gypsum
9	STN-9B	PZ	PZ-9B	455.5	454.5	464.5	Gypsum
10	STN-10A	PZ	PZ-10	465.7	464.7	474.7	Minespoil, Gypsum
11	STN-12	PZ	PZ-12	464.4	463.4	473.4	Minespoil
12	STN-13A	PZ	PZ-13A	504.0	503.0	513.0	Gypsum-Flyash
13	STN-1	SI	SI-1	N/A			
14	STN-3	SI	SI-3				
15	STN-8	SI	SI-8				
16	STN-11	SI	SI-11				
17	STN-15[(1)]	SI	SI-15				
18	STN-16[(1)]	SI	SI-16				

(1) These borings were drilled and instrumented in May, 2009 when a rock buttress was being constructed along the south dike of East Pond.

8.3. Monitoring of Dike Slope Conditions

Stantec began a monitoring program upon installation of instruments listed above. The purpose of the monitoring program was to obtain periodic water level readings (from PZs) and slope movement data (from SIs). PZ readings were taken using a water level indicator and SI readings were obtained using a portable traversing inclinometer probe designed for this purpose. The first SI survey established the initial profile of the casing and subsequent surveys measured changes in the profile of the casing if movement has occurred around the casing.

Stantec's schedule for monitoring program is presented in Table 10. Results of monitoring program are presented in Appendix E in the following order:

- Attachment 1 – PZ Readings,
- Attachment 2 – SI Readings, and
- Attachment 3 – Slug Testing Data

Table 10. Monitoring Program Schedule

Month	Reading Number	Tentatively Scheduled During the Week of	Actual Date of Reading
1	1	February 23, 2009	February 27, 2009
	2	March 2, 2009	March 6, 2009
	3	March 9, 2009	March 11, 2009
	4	March 16, 2009	March 18, 2009
2	5	March 30, 2009	March 31, 2009
	6	April 13, 2009	April 17, 2009
3	7	April 27, 2009	April 29, 2009
	8	May 11, 2009	May 12, 2009
4	9	May 25, 2009	May 29, 2009
	10	June 8, 2009	June 10, 2009
5	11	June 22, 2009	June 26, 2009
	12	July 6, 2009	July 7, 2009
6	13	July 20, 2009	July 20, 2009

8.4. Slug Testing

In addition to obtaining water level readings at frequent intervals, Stantec also performed slug testing on PZs. The slug tests were performed in general accordance with ASTM D 4043. Two methods were used to collect aquifer data at the site due to different diameters of riser pipe in the piezometers. A pressure transducer with data recorder manufactured by In-Situ, Inc. was used to collect water level information from wells with a riser pipe of sufficient diameter to accommodate the instrument. On other wells, water level data was collected using an electronic water level indicator.

All wells were tested by taking an initial measurement of static water level and then the pressure transducer or electronic water level indicator was placed into the well. One half gallon of water was then poured into the well to cause a nearly instantaneous change in the water level. The water levels were then recorded at regular intervals until reaching near static levels. If the test was done with an electronic water level indicator, the results were recorded in a notebook. If a pressure transducer was used, the results were recorded electronically and downloaded into a data collector. Raw data was checked in the field for any discrepancies prior to demobilizing from the site.

The field data once collected and returned to the office, was entered into AQTESOLV software program to estimate the hydraulic conductivity of the in situ soils. The software utilized the Bouwer-Rice solution for a slug test in an unconfined aquifer to estimate the hydraulic conductivity of the subsurface soil. The hydraulic conductivity is estimated for the strata of soil that the piezometer tip is set in. Results from the slug testing data are presented in Appendix E and Summarized in Table 11.

Table 11. K_h Values (Slug Test Vs Seep/w)

PZ	Material	Slug Test Kh (cm/sec)	SEEP/W Kh (cm/sec)
PZ-2	Gypsum	6.69E-06	1.00E-03
PZ-2A	Minespoil	9.45E-05	1.50E-04
PZ-4	Minespoil	7.82E-04	1.50E-04
PZ-5	Minespoil	4.97E-05	1.50E-04
PZ-6	Minespoil	2.43E-04	1.50E-04
PZ-6A	Gypsum	3.01E-04	1.00E-03
PZ-7B	Minespoil	1.09E-04	1.50E-04
PZ-8A	Gypsum	5.74E-06	1.00E-03
PZ-9B	Gypsum	6.79E-04	1.00E-03
PZ-10	Minespoil, Gypsum	3.24E-04	NA
PZ-12	Minespoil	3.76E-04	1.50E-04
PZ-13A	Gypsum-Flyash	8.22E-05	1.00E-03

9. Surveying

9.1. General

Topographic mapping of the Scrubber Sludge Complex (developed from aerial photographs) and contour mapping of the bottom of the stilling pond (developed from a hydrographic field survey) were provided by TVA. Stantec's scope of work included a field topographic survey of selected areas of the complex. A summary of survey data obtained is presented in the following paragraphs.

9.2. Aerial Survey

TVA provided topographic mapping of the overall Scrubber Sludge Complex based on aerial photographs taken in February, 2009. The limits of the topographic mapping as well as control points referenced to the plant coordinate system were established by Stantec. The results of aerial survey can be seen on the basemap presented in Appendix B.

9.3. Topographic Survey

Stantec performed a field topographic survey of certain areas of the East and West Pond exterior dike slopes in February 2009. The objective of this work was to supplement the aerial mapping with more accurate survey of the following features:

(i) Limits of saturated slopes and wet areas,
(ii) Drainage ditches,
(iii) Pipe outlets,
(iv) Limits of previous repairs,
(v) Limits of on-going repairs, and
(vi) Cross sections of existing ground near the boring locations.

The results of Stantec's topographic survey can be seen on the basemap presented in Appendix B.

9.4. Hydrographic Survey

At the request of Stantec, TVA also performed a hydrographic survey of the stilling pond bottom to supplement land and aerial survey data of the East Pond south dike. The combined survey information was used to design a toe buttress to stabilize a slumped area of the south dike slope which extended below the normal pool elevation of the stilling pond.

10. Laboratory Testing

10.1. General

The gypsum-fly ash, gypsum and mine spoil samples obtained from the boreholes were subjected to laboratory tests by Stantec and TVA. The laboratory tests were performed in general accordance with ASTM standard testing procedures. Detailed results of laboratory testing are presented in Appendix F.

10.2. Laboratory Tests Performed

Stantec performed laboratory testing of gypsum-fly ash, gypsum and mine spoil samples to estimate their engineering properties. Chemical composition tests for gypsum-fly ash and gypsum samples were performed by TVA's Central Laboratories based on the request received from Stantec. A summary of laboratory tests performed in presented in Table 12.

Table 12. Laboratory Tests Performed

Serial No. (1)	Testing for	Standard	Materials Tested (3)
1	Natural Moisture Content	ASTM D 2216	G-F, G, Mine Spoil
2	Chemical Composition	--(2)	G-F, G
3	Particle Size Analysis	ASTM D 422	G-F, G
4	Dry Density	ASTM D 2166	G-F, G
5	Shear Strength	ASTM D 4767	G-F, G
6	Permeability	ASTM D 5084	G-F, G
7	Atterberg Limits	ASTM D 4318	G-F, G
	Specific Gravity	ASTM D 422	G-F, G
	Particle Size Analysis	ASTM D 854	G-F, G

(1) Results Presented in this order in Appendix F.

(2) Available with TVA Central Laboratories Services

(3) 'G-F' stands for Gypsum-Fly Ash and 'G' stands for Gypsum

10.3. Natural Moisture Content

Natural moisture content tests were performed on split-spoon samples and selected undisturbed samples of gypsum-fly ash, gypsum and mine spoil deposits. For gypsum-fly ash and gypsum samples, an initial oven drying temperature of 40ºC was used to prevent the loss of chemically bound water. After the initial drying in the 40ºC oven and a weight measurement, the samples were subsequently dried in a 200ºC oven to determine the

change in apparent moisture content. Stantec utilized the approach proposed by Ardaman & Associates Inc. in a report titled "Engineering Evaluation and Design Recommendations for Renovation of Widows Creek Gypsum Fly ash Storage Facility, Widows Creek Fossil Plant, Stevenson, Alabama dated October 14, 2004. The results of moisture content determinations are presented in Attachment 1 of Appendix F.

The percent gypsum and percent non-gypsum content in a given sample can be estimated based on the apparent change in moisture content when dried at 40ºC and 200ºC oven temperatures. For a sample comprised of 100% gypsum, the theoretical change in apparent moisture content between the low and high oven temperatures is 20.92%, decreasing linearly to 0% for a sample containing no gypsum.

The tables provided at the end of Attachment 1 of Appendix F summarize the results of moisture content testing along with the estimated gypsum and non-gypsum components, assuming that the gypsum component is in the dehydrate form.

10.4. Chemical Composition and Specific Gravity

Composite samples of gypsum-fly ash and gypsum were sent to TVA's Central Laboratories in Chattanooga for laboratory determinations of composition by percent weight of fly ash (acid insoluble), un-reacted limestone (Dolomite [$CaCo_3.MgCo_3$] and Calcium Carbonate [$CaCo_3$]) and Calcium Sulfite. The results of the TVA chemical analyses are presented as Attachment 2 in Appendix F and Summarized in Table 13.

Table 13. Chemical Composition and Specific Gravity

Sample ID	Boring No.	Sample Depth (ft)	Misc. Test		Calcium (%)	Magnesium (%)	Acid Insoluble	S03 (%)	Total as % S04
			%C03	Result (%)					
AK18716	B-14	39.0-45.0	5.63	L585643 8.NT	18.25	0.00	30.79	0.00	33.20
AK18717	B-13	6.0-12.0	7.55	L585645 6.NT	20.55	0.37	18.38	0.00	38.65
AK18718	B-11	24.0-30.0	0.33	L585646 7.NT	18.96	0.14	18.02	0.00	45.49
AK18719	B-10	6.0-12.0	0.77	L585647 4.NT	17.50	0.43	22.86	0.00	42.47
AK18720	B-9	36.0-42.0	0.60	L585648 0.NT	20.42	0.40	10.35	0.00	49.58
AK18721	B-8	9.0-15.0	3.04	L585648 8.NT	19.76	0.00	19.01	0.00	42.32
AK18722	B-7	1.5-6.0	3.75	L585649 4.NT	17.10	0.42	28.30	0.00	36.67
AK18723	B-6	7.5-13.5	6.05	L585650 0.NT	19.09	0.84	19.82	0.00	39.41
AK18724	B-2	22.5-28.5	0.00	L585650 8.NT	19.30	0.19	14.08	0.00	49.37
AK18725	9-15.0	9.0-15.0	2.63	L585651 4.NT	16.47	0.57	29.68	0.00	37.53

10.5. Particle Size Distribution and Fines Content

Particle size distribution tests were performed on ten (10) composite samples of the Paradise gypsum-fly ash and gypsum deposits. The composite samples were prepared from SPT samples. The tests were performed in general accordance with ASTM D-422, "Particle Size Analysis of Soils," using sieve analysis for the soil fraction greater than 0.074mm (No. 200 sieve size) and hydrometer analysis for the fraction smaller than 0.074mm. Due to the solubility of gypsum, all tests were performed using gypsum saturated water. The individual grain size distribution curves generated from these tests are presented as Attachment 3 in Appendix F and Summarized in Table 14.

Table 14. Particle Size Distribution and Fines Content

			Sieve Size										
Source	Depth (feet)	Lab ID	1"	3/4"	3/8"	No. 4	No. 10	No. 40	No. 200	0.02 mm	0.005 mm	0.002 mm	0.001 mm
B-1	3.0-4.5, 4.5-6.0, 6.0-7.5, 7.5-9.0	588	100.0	100.0	98.5	97.2	95.6	93.7	89.6	61.6	2.9	2.9	3.0
B-2	16.5-18.0, 18.0-19.5, 19.5-21.0, 21.0-22.5	593	100.0	100.0	100.0	100.0	100.0	99.9	98.4	6.5	8.1	8.1	8.0
B-6	1.5-3.0, 3.0-4.5, 4.5-6.0, 6.0-7.5	598	100.0	100.0	97.9	96.8	96.0	93.9	85.9	24.9	3.3	3.5	3.0
B-7	6.0-7.5, 7.5-9.0	603	100.0	98.9	96.9	96.0	94.0	91.8	88.6	54.7	2.3	2.7	3.0
B-8	3.0-4.5, 4.5-6.0, 6.0-7.5, 7.5-9.0	606A	100.0	100.0	99.8	99.3	98.8	96.9	92.2	34.2	6.7	6.0	5.0
B-8	3.0-4.5, 4.5-6.0, 6.0-7.5, 7.5-9.0	606B	100.0	100.0	99.8	99.3	98.8	96.9	92.5	26.1	3.9	3.9	3.0
B-9	30.0-31.5, 31.5-33.0, 33.0-34.5, 34.5-36.0	611A	100.0	100.0	100.0	100.0	100.0	99.7	98.5	22.7	4.5	4.0	4.0
B-9	30.0-31.5, 31.5-33.0, 33.0-34.5, 34.5-36.0	611B	100.0	100.0	100.0	100.0	100.0	99.8	98.0	2.9	4.7	4.5	4.0
B-10	0.0-1.5, 1.5-3.0, 3.0-4.5, 4.5-6.0	616A	100.0	100.0	100.0	99.5	98.5	96.4	87.7	28.7	5.3	4.7	4.0
B-10	0.0-1.5, 1.5-3.0, 3.0-4.5, 4.5-6.0	616B	100.0	100.0	100.0	99.5	98.5	95.9	86.3	31.9	3.5	3.7	4.0
B-11	30.0-31.5, 31.5-33.0, 33.0-34.5, 34.5-36.0	621	100.0	100.0	100.0	99.3	98.7	97.5	95.3	53.3	3.5	3.5	3.0
B-13	0.0-1.5, 1.5-3.0, 3.0-4.5, 4.5-6.0	626	100.0	100.0	99.2	97.8	96.1	93.4	71.6	28.4	3.3	3.5	3.0

10.6. Gypsum – Fly Ash Dry Density

The undisturbed Shelby tube samples of gypsum-fly ash and gypsum material obtained from the subsurface exploration were extruded and trimmed into six-inch specimens in the laboratory for dry density testing. The trimmings from each specimen were used to determine the natural moisture content and the sample size and weight were noted for total density measurements. The respective dry density for each sample was then calculated from the total density and the moisture content measurement. The results of dry density tests are presented as Attachment 4 in Appendix F and Summarized in Table 15.

Table 15. Gypsum – Fly Ash Dry Density

Boring No.	Depth (feet)	Lab ID	Initial Wet Density (pcf)	Initial Dry Density (pcf)	Initial Moisture Content (%)
B-1	4.5-5.0	345A	121.5	105.0	15.7
B-1	5.4-5.7	345B	N/A	N/A	17.0
B-1	6.0-6.2	345C	118.5	97.3	21.8
B-1	9.7-10.2	346A	111.6	90.8	22.8
B-1	10.4-10.9	346B	112.5	90.2	24.8
B-1	11.0-11.5	346C	114.7	93.1	23.1
B-1	14.7-15.2	347A	115.9	96.3	20.4
B-1	15.3-15.8	347B	110.3	83.5	32.2
B-1	16.0-16.5	347C	109.7	84.8	29.3
B-1	19.8-20.3	348A	116.3	95.9	21.4
B-1	20.4-20.9	348B	115.9	95.4	21.5
B-1	21.0-21.5	348C	115.4	94.1	22.6
B-1	24.8-25.3	349A	116.6	94.3	23.6
B-1	25.3-25.8	349B	119.2	97.6	22.1
B-1	25.9-26.4	349C	115.5	97.1	18.8
B-1	34.7-35.2	350A	117.6	95.2	23.6
B-1	35.3-35.8	350B	120.8	99.0	22.1
B-1	36.0-36.5	350C	113.9	94.4	20.7
B-6A	4.7-5.2	561A	126.4	111.1	13.8
B-6A	9.8-10.3	562A	100.6	88.4	13.8
B-6A	10.4-10.9	562B	110.2	93.4	18.0
B-6A	11.0-11.5	562C	109.9	88.3	24.4
B-6A	14.6-15.1	563A	107.1	90.0	19.0
B-6A	15.2-15.7	563B	113.4	91.6	23.8
B-6A	19.6-20.1	564A	110.7	93.6	18.3
B-6A	20.2-20.7	564B	112.1	94.3	18.9
B-6A	20.8-21.3	564C	112.9	91.8	22.9
B-6A	24.5-25.0	565A	121.0	97.9	23.6
B-6A	25.1-25.6	565B	116.8	98.3	18.9
B-6A	29.7-30.2	566A	124.9	104.3	19.7
B-6A	30.3-30.8	566B	121.7	100.8	20.8
B-6A	30.9-31.4	566C	115.8	96.7	19.8
B-7A	3.3-3.8	567A	130.5	113.3	15.1
B-7A	4.0-4.5	567B	130.0	115.6	12.4
B-8A	4.7-5.2	568A	105.4	92.0	14.6
B-8A	5.3-5.8	568B	102.7	91.8	12.0
B-8A	9.7-10.2	569A	111.5	93.2	19.7
B-8A	10.3-10.8	569B	111.9	90.4	23.8
B-8A	11.0-11.5	569C	113.5	91.2	24.4
B-8A	14.5-15.0	570A	112.2	93.5	19.9
B-8A	15.1-15.6	570B	116.5	95.9	21.5
B-8A	19.5-20.0	571A	115.0	97.5	18.0
B-8A	20.0-20.5	571B	115.2	95.3	20.9

Table 15. Gypsum – Fly Ash Dry Density

Boring No.	Depth (feet)	Lab ID	Initial Wet Density (pcf)	Initial Dry Density (pcf)	Initial Moisture Content (%)
B-8A	20.7-21.2	571C	115.1	93.6	23.0
B-8A	24.8-25.3	572A	118.4	98.4	20.3
B-8A	25.4-25.9	572B	114.5	94.7	20.8
B-8A	26.0-26.5	572C	113.7	90.9	25.1
B-8A	29.8-30.3	573A	114.6	95.2	20.4
B-8A	30.4-30.9	573B	119.0	98.7	20.5
B-8A	31.0-31.5	573C	120.5	100.4	20.0
B-8A	34.5-35.0	574A	118.5	97.0	22.2
B-8A	35.0-35.5	574B	121.2	101.9	19.0
B-8A	39.8-40.3	575A	121.3	101.5	19.6
B-8A	40.3-40.8	575B	120.0	100.5	19.4
B-8A	40.9-41.4	575C	116.3	98.1	18.5
B-8A	44.8-45.3	576A	118.1	97.6	21.0
B-8A	45.4-45.9	576B	118.1	97.8	20.8
B-8A	45.9-46.4	576C	114.8	98.0	17.1
B-8A	49.5-50.0	577A	113.3	92.4	22.6
B-8A	50.1-50.6	577B	114.1	94.2	21.0
B-8A	50.7-51.2	577C	119.7	101.0	18.6
B-8A	54.8-55.3	578A	112.4	92.4	21.6
B-8A	55.3-55.8	578B	113.4	91.2	24.4
B-8A	59.8-60.3	579A	113.9	83.2	37.0
B-8A	60.3-60.8	579B	118.3	103.4	14.4
B-9A	5.0-5.4	580A	126.5	100.2	26.2
B-9A	40.0-40.5	587	114.3	96.2	18.8
B-10A	4.8-5.3	631A	107.7	93.6	15.1
B-10A	5.3-5.8	631B	96.0	87.4	9.8
B-10A	5.9-6.5	631C	N/A	N/A	12.8
B-10A	9.7-10.3	632A	N/A	N/A	10.8
B-10A	103.-10.8	632B	94.9	85.1	11.5
B-10A	11.0-11.5	632C	95.9	85.6	12.0
B-10A	15.7-16.2	633A	101.1	85.5	18.3
B-10A	15.3-15.7	633B	102.7	82.0	25.3
B-10A	19.7-20.2	634A	100.2	84.1	19.1
B-10A	20.3-20.8	634B	107.0	86.1	24.3
B-10A	20.8-21.3	634C	107.7	87.3	23.4
B-10A	24.5-25.0	635A	113.4	93.0	21.9
B-10A	25.0-25.5	635B	113.1	91.4	23.7
B-10A	29.5-30.0	636A	115.6	96.2	20.2
B-10A	30.1-30.6	636B	118.1	97.5	21.1
B-10A	30.6-31.1	636C	115.7	93.5	23.7
B-10A	34.8-35.3	637A	116.0	94.4	22.8
B-10A	35.4-35.9	637B	114.9	96.1	19.6
B-10A	39.8-40.3	638A	118.6	99.5	19.2

Table 15. Gypsum – Fly Ash Dry Density

Boring No.	Depth (feet)	Lab ID	Initial Wet Density (pcf)	Initial Dry Density (pcf)	Initial Moisture Content (%)
B-10A	40.3-40.8	638B	116.4	95.9	21.4
B-10A	45.4-45.9	639B	115.1	97.7	17.8
B-10A	44.8-45.3	639A	N/A	N/A	19.1
B-10A	46.0-46.5	439C	116.7	99.3	17.5
B-11	5.2-5.5	351A	101.8	88.1	15.6
B-11	5.8-6.3	351B	100.6	82.3	22.2
B-11	6.5-7.0	351C	121.3	98.6	23.0
B-11	10.3-10.8	352A	108.7	86.9	25.1
B-11	10.9-11.4	352B	114.2	92.1	24.0
B-11	11.5-12.0	352C	112.3	90.9	23.6
B-13A	5.2-5.7	641A	102.5	89.3	14.8
B-13A	5.8-6.4	641B	N/A	N/A	20.2
B-13A	6.4-7.0	641C	N/A	N/A	17.7
B-13A	10.3-10.8	642A	116.1	95.2	22.0
B-13A	11.0-11.5	642B	116.3	92.7	25.4
B-13A	15.3-15.8	643A	116.1	96.3	20.6
B-13A	15.8-16.3	643B	113.6	91.9	23.5
B-13A	16.5-17.0	643C	113.2	90.8	24.7
B-13A	23.0-23.5	645A	143.3	116.8	22.7
B-13A	23.5-24.0	645B	131.3	110.5	18.9

10.7. Shear Strength

Consolidated undrained tri-axial compression tests with pore pressure measurements were performed on four (4) undisturbed samples. These tests were performed to obtain shear strength parameters for use in stability analysis of the dike slopes. All shear strength tests were performed in general accordance with ASTM D 4767. The test results are presented in Attachment 5 of Appendix F and Summarized in Table 16.

Table 16. Shear Strength

Test No.	Sample No.	Sample Depth (feet)	Boring No.	$\bar{\phi}$' (degrees)	c' (tsf)
346	CU-346A	9.7-10.2	B-1	42.6	0.00
	CU-346B	10.4-10.9	B-1		
	CU-346C	11.0-11.5	B-1		
347	CU-347A	14.7-15.2	B-1	44.5	0.00
	CU-367B	15.3-15.8	B-1		
	CU-347C	16.0-16.5	B-1		
770	CU-562A	9.8-11.3	B-6A	35.6	0.00
	CU-562B	10.4-10.9	B-6A		
	CU-562C	11.0-11.5	B-6A		

Table 16. Shear Strength

Test No.	Sample No.	Sample Depth (feet)	Boring No.	$\bar{\phi}'$ (degrees)	c' (tsf)
566	CU-566A	29.7-30.2	B-6A	35.1	0.00
	CU-566B	30.3-30.8	B-6A		
	CU-566C	30.9-31.4	B-6A		

10.8. Permeability

Falling head permeability tests were performed on selected undisturbed Shelby tube samples. The tests were performed in tri-axial cells in general accordance with ASTM D 5084, using gypsum saturated water as permeate (to prevent dissolution of the water soluble gypsum saturated crystals during testing.) Confining pressures ranging from 5 to 10 psi were used during the testing and a back pressure of 65 psi was used to achieve saturation. The permeability test results are presented in Attachment 6 of Appendix F and Summarized in Table 17.

Table 17. Permeability

Boring No.	Depth (feet)	Lab ID	Normal Moisture Content (%)	Hydraulic Conductivity (cm/s)	
				Average Last 4 Determinations	Average (last run)
B-1	4.5-5.0	345A	22.4	1.86E-07	1.86E-07
B-1	34.7-35.2	350A	39.1	1.07E-05	1.06E-05
B-6A	4.7-5.2	561A	15.8	1.99E-07	1.99E-07
B-6A	25.1-25.6	565B	35.2	1.06E-05	1.06E-05
B-8A	5.3-5.8	568B	26.5	3.65E-06	3.65E-06
B-9A	40.0-40.5	587	48.2	2.22E-05	2.22E-05
B-10A	4.8-5.3	631A	20.7	3.65E-07	3.65E-07
B-10A	39.7-40.2	638A	42.7	3.20E-05	3.20E-05
B-13A	5.2-5.7	641A	34.9	2.75E-05	2.75E-05
B-13A	15.2-15.7	643A	36.7	1.91E-05	1.91E-05

10.9. Classification Testing and Proctor Testing

Soil classification testing consisting of Atterberg Limits, particle-size analysis, specific gravity, and modified proctor testing was performed on four (4) bag samples of the underlying mine spoil. The results can be found in Attachment 7 of Appendix F and Summarized in Table 18.

Table 18. Classification Testing and Proctor Testing

Boring No.	Depth (feet)	Lab ID	Liquid Limit	Plastic Limit	Activity Index	Max Dry Density (pcf)	Optimum Moisture Content (%)
B-3	1.5-7.5	828	37	19	18	0.82	N/A
B-4	9.0-15.0	829	33	18	15	0.88	N/A
Sample 1, Bag 1 of 2	N/A	830	51	24	27	0.66	115.9
Sample 1, Bag 2 of 2	N/A	831	52	25	27	0.64	108.9

11. Review of Existing Conditions and On-Going Repairs

11.1. General

The review of existing conditions presented below starts with a discussion of relevant events or actions that occurred prior to January 2009, as understood from our review of available historical information, and observations of actions taken since January 2009. Table 19 lists the main subjects reviewed.

Table 19. Summary of Subjects Reviewed

No.	Subject
1	Initial dike construction to pond scrubber sludge
2	Stacking of scrubber sludge
3	Under-drain features
4	Surface drainage conveyance
5	Stage decant spillway system
6	Slope conditions and uncontrolled seepage

11.2. Construction of Initial Dike

The earliest project specific document available pertinent to this review is a subsurface exploration performed in 1984. The main finding of the exploration confirmed the presence of thick mine spoil deposits extending down to the bedrock surface, which was encountered at about elevation of 390'. The exploration also included borings in borrow areas to determine the suitability of mine spoil material for construction of the initial dike.

The construction of the initial dike took place sometime between April, 1984 and March, 1986. According to construction drawings (Reference No. 2 of Appendix A) of this structure, foundation preparation for the dike consisted of dewatering the area, clearing of vegetation, compaction of sub grade and scarification of the foundation area. The construction of the dike included placement of earth fill (mine spoil) in layers of six (6) inches compacted to 95 percent of maximum dry density. While the drawing also called for in-place density tests, no QA/QC records were available for Stantec's review. The alignment of the east half (+/-) of the dike was modified at some point by introducing two 90-degree bends, one toward the north and one toward the east, then following approximately the alignment of a deflector dike presumably constructed as part of the original layout of the ponding system.

According to Sheet No. 10W280-4 of the 1985 drawings, the construction of the initial dike included an internal drain system consisting of chimney drains, perforated collector pipes and finger drains. Specifically, the drawing calls for eleven (11) finger drains for the West Pond dike and seven (7) finger drains for the East Pond dike with outlet elevations ranging from 449 feet to 468 feet. Stantec was able to locate only two of these finger drain outlets; one along the eastern portion of the West Pond south dike and one along the south slope of the stilling pond. Both of these finger drains consisted of 6-inch solid PVC pipe. It is not known if the under-drain system was included in the construction of the East Pond initial dike.

11.3. Gypsum-Fly Ash Stacking

TVA switched from gypsum ponding to gypsum-fly ash stacking sometime during the fall of 1996. The switch to stacking appears to have been executed based on 1995 drawings prepared by TVA (Reference No. 5 of Appendix A). According to the 2009 topographic mapping, the exterior face of the dikes was built using a 3:1 slope and 15-foot wide intermediate benches at different elevation intervals, which is the configuration depicted on a typical section (Figure 7) included in the 1995 TVA drawings.

The typical cross-section in the 1995 documents also show an under-drain feature at two locations, one near the toe of the stack wall and a second one 240 feet (horizontally) from the first one, toward the interior of the pond, and 20 feet below the stack slope surface. The under-drain detail is shown in Figure 8 of this report. Although no as-built documents were available for review, an under-drain feature was reportedly installed near the toe of the stack slope presumably following the detail shown in the 1995 documents. Seepage collected by this feature is presumably drained by 6-inch corrugated HDPE pipes or finger drains as depicted by the 1995 documents. During the field reconnaissance eighteen (18) finger drain outlet pipes, similar to the one shown in Figure 12, were observed along the West Pond south dike and the East Pond south and east dikes. No outlet pipes were observed along the north dike of the East Pond. At the time of inspection, most of the outlet pipes were discharging little or no seepage and several were found to be damaged.

Figure 12. Under-drain Outlet Pipe

11.4. Surface Drainage Conveyance

The 1995 documents use arrows to indicate that surface runoff from stacking exterior slopes would be conveyed toward the stilling pond by ditches constructed on the interior edge of intermediate benches. These documents also show a perimeter ditch along the toe of the stacking dike slope located upslope but below the top of the initial dike and. This depressed location and proper ditch grading (shown as 1% or steeper ditch bottom slope) would presumably collect surface runoff from the toe of the stack slopes and direct it toward the stilling pond. The actual exterior dike slopes observed in January 2009 included a shallow ditch along the uphill side of the initial dike crest, which is also the toe of the stack.

Numerous intermediate bench areas with standing water noted during early 2009 field observations revealed lack of positive drainage conditions along several areas of both the East Pond and West Pond exterior slopes. The standing water promoted dense Phragmites growth along the benches.

11.5. Stage Decant Spillway System

The 1995 drawings show the West Pond decant spillway system located near the southeast corner of the dike, with the 18" pipe traversing first a southeasterly direction and then turning to a northeasterly direction before ending at the west side of the stilling pond. The East Pond spillway system is shown as starting near the southwest corner of the pond and the 18" pipe following a southeasterly direction without turns toward the north bank of the stilling pond. According to the 2007 drawings (Reference No. 6 listed in Table 3), these pipes are to lay on the slope surface after they emerge from the interior of the stacking.

The current development of the stacking appears to be in its second stage. The weir for each of the ponds appears to be located approximately as shown on the 1995 documents. The West Pond spillway pipe outlet is located at the northwest corner of the stilling pond, while the East Pond spillway outlet pipe drains at about the same location shown on the 1995 drawings. Both outlet pipes are 18 inch in diameter.

The 2009 field reconnaissance only located what appears to be the outlet of the spillway pipe corresponding to the first stage of the East Pond. Based on this pipe outlet location, it appears the spillway pipe remains buried for most of its alignment, unlike the layout depicted on the 1995 and 2007 drawings, where the pipe is supposed to emerge at the exterior slope surface of the stacking slightly below the bottom elevation of the weir. The two pipe outlet locations also suggest that each of the East Pond stages has a separate spillway system.

According to the 2007 drawings, when a stage is full the corresponding spillway is to be abandoned by filling the bottom four (4) feet of the weir structure with concrete and then cutting the spillway pipe near the exterior slope surface of the stacking and filling the end with concrete. TVA personnel provided the following narrative regarding abandonment of the riser and spillway pipe corresponding to the first stage of the East Pond stacking:

"On the East Pond old weir- closed out 24" discharge pipe smashed the end of pipe in stilling pond-wadded up fabric put it in weir- put approximately 5 buckets of rip rap in weir and 4 cubic yards of concrete and removed old weir".

Stantec engineers found the abandoned East Pond spillway pipe protruding along the north bank of the stilling pond and noted it to be partially smashed, partially covered with concrete slabs and oozing some water. The diameter of this pipe appeared to be 24 inches. The oozing water was causing erosion of the surrounding ground. The abandoned West Pond spillway outlet could not be located in the field.

11.6. Slope Stability Conditions and Uncontrolled Seepage

Annual inspection reports prepared by TVA from 1996 (when gypsum stacking began) to 2008 do not mention significant slope stability issues or concerns at the Scrubber Sludge Complex until 2008 when a blow out of the slope was noted in the southeast portion of the West Pond dike. Specifically, a 15 foot high by 250 foot long section of the dike slumped causing stability concerns. This area was reportedly observed to be wet and soft prior to the blow out. TVA repaired this area excavating the loose material and placing filter fabric and crushed limestone (rip-rap) over the excavated area. An aerial view of this repair (taken in early 2009) is presented in Figure 13.

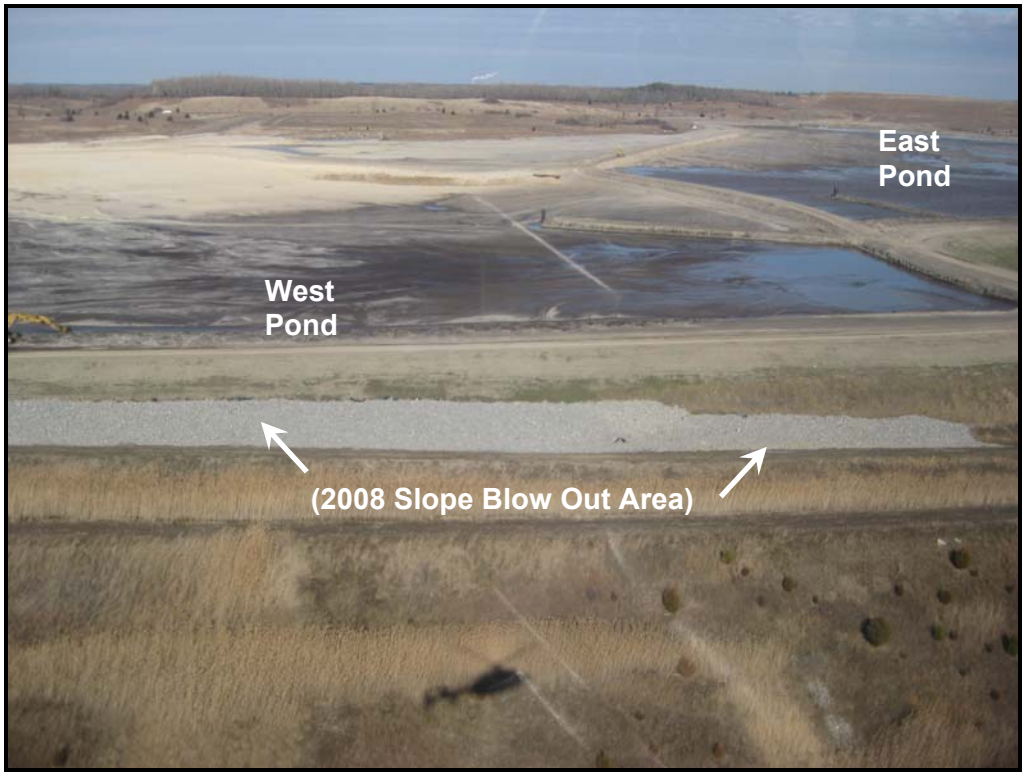


Figure 13. Aerial View of 2008 Slope Blow Out Repair

During 2009 site visits Stantec personnel observed numerous wet and soft conditions throughout the lower two-thirds of the East and West Pond stacking slopes. Surface runoff along the top of the initial dike was also observed draining onto the slope of the initial dike.

The most obvious areas exhibiting disturbance features are listed in Table 20 and graphically represented in Figure 14.

Table 20. Disturbance Features Noted at Scrubber Sludge Complex[(1)]

No.	Structure	Location	Type of Disturbance	Possible Cause
1	East Pond	North dike exterior slope	Sloughing	Uncontrolled seepage
2	East Pond	East dike rim ditch	Soil piping	Poor compaction
3	East Pond	South dike toe of exterior slope	Slump	Poor surface drainage and uncontrolled seepage
4	West pond	East dike intermediate bench	Wet and soft surface	Uncontrolled seepage and water 'boils'
5	West Pond	East dike southeast corner	Sloughing	Uncontrolled seepage
6	West Pond	South dike slope	Slope blowout	Uncontrolled seepage
7	West Pond	South dike slope	Wet and soft surface	Uncontrolled seepage
8	East Pond	East Slope	Marginally stable slopes	Steep slopes

(1) Numbering also used to show area locations in Figure 14.

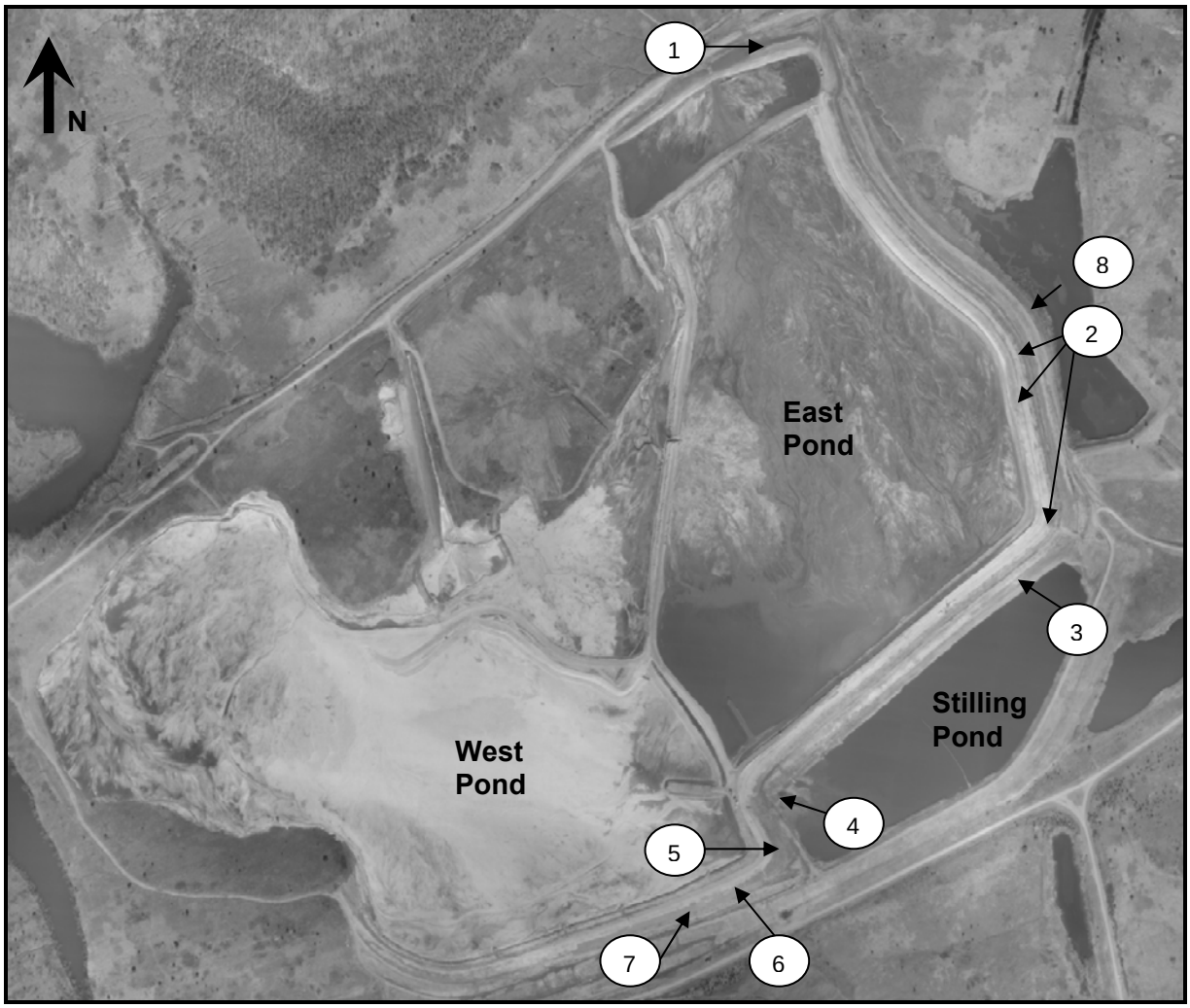


Figure 14. Approximate Location of Areas with Slope Stability Concerns

Area 1 - By January 2009 the wet and soft conditions due to uncontrolled seepage from the stacking had already resulted in significant slumps and byproduct mudflows along the north side of the East Pond. The slumps left steep slopes and uncontrolled runoff towards the nearby access road.

Area 2 - A different type of unstable slope conditions was observed when surface runoff flowing along the rim ditch near the southeast corner of the East Pond drained through minute piping channels in the bottom of the ditch at three separate locations. Unless seepage through piping channels is controlled (in this case through filtering or adequate compaction of the byproduct forming the ditch), the piping channels can become larger allowing increased migration of byproduct fines and eventually creating voids at or below, in this case, the surface of the ditch.

Area 3 - A slump of the East Pond south slope near the northeast corner of the stilling pond was noted after dense Phragmites growth was mowed. The slump was approximately 150 feet wide and extended toward the center of the pond below the normal pool surface. Although the entire length of the stilling pond north bank is wet above the normal pool elevation, as evidenced by the dense Phragmites growth present throughout, the slump appears to have occurred near a deep area of the pond where the bottom of the pond slopes steeply toward the center of the pond.

Area 4 - The stacking slope and intermediate bench area directly above the northwest corner of the stilling pond was observed to be wet and very soft during site visits in early 2009. Active seeps (water boils) were observed emerging at the surface of the curved area of the bench. The seepage had a strong odor and contained gypsum and fly ash fines as sediment. Furthermore, there are potentially four spillway pipe penetrations crossing this area in addition to five abandoned sluice lines located immediately south of the bench curve. As-built information or closure of spillway pipes corresponding to the first stacking stage and crossing this area was not available for review. The area around the water boils was saturated, but it is not known if the source was seepage through the dike and/or leakage from an abandoned spillway pipe. The wet and soft conditions had practically kept vehicular traffic from crossing this bench area.

Area 5 – The uphill side of the intermediate bench area directly above the southwest corner of the stilling pond collected runoff from two intermediate benches of the West Pond south slope and the intermediate bench described above as Area 4. A shallow pool of water formed in this area before flowing into a pipe that directed the water to the stilling pond. Sloughing of the slope immediately above the bench suggested that uncontrolled seepage wetting the slope was affecting the stability of this area.

Area 6 – This is the area where the 2008 blow out was reported to have occurred. TVA personnel indicated the area was wet and soft before the blow out, which suggests that this area was also affected by uncontrolled seepage from the stacking pool.

Area 7 – This area is adjacent to Area 6, above the uppermost intermediate bench of the West Dike south slope. During a site visit on January 24, 2009, Area 7 was observed to be extremely wet and soft, raising concern that a new blow out may occur.

Area 8 – The East Pond east slope is marginally stable below the access road (approximate elevation 490 feet and below). The stacking slopes above the access road appear to wet with possible seepage related issues and storm water run-off issues.

In addition, there were dike slope areas where uncontrolled surface runoff had created erosion rills or channels. Some of the erosion rills had already cut through the soil cover and started to remove gypsum and fly ash. The wet conditions along the lower areas of the stacking slopes and their potential to weaken the slope were also evident during 2009 repair work. In March 2009, as drainage ditch lining was being performed along the east slope of the East Pond, partial excavation of the soil cover resulted in saturated byproduct moving into the excavation as mudflow.

11.7. Ongoing Repairs

After the January 24, 2009 site visit and in view of the wet and soft conditions observed in numerous areas of the exterior stacking slopes, Stantec provided several recommendations to begin immediate repair work on some of these areas. The purpose of the repair work was to address cases where these conditions may affect the stability of the slopes if allowed to continue unaltered. Additionally, the repair work would provide Stantec time to perform more detailed reviews of project documentation and a geotechnical exploration.

As part of a facilities assessment project, Stantec has been assisting TVA with repairs associated with slope stability, drainage, and maintenance issues for the Scrubber Sludge Complex. Several repairs were performed over the past few months ranging from slope stabilization measures to drainage ditch lining and grade improvement. Over the past few months, Stantec has issued several work plans associated with dike repairs. A list of dike repair work plans issued by Stantec for the Scrubber Sludge Complex is presented in Table 21.

Table 21. Dike Repair Work Plans at Scrubber Sludge Complex

No.[1]	Structure	Location	Type of Disturbance	Repair Type	Work plan Issued
1	East Pond	North dike slope	Slope slumping	Slope armoring and flattening	January 26, 2009
2	East Pond	East dike rim ditch	Soil piping	Treatment with gypsum-fly ash and fabric	June 5, 2009
3	East Pond	South dike lower slope	Slope slumping	Toe buttressing (See Figure 16)	April 17, 2009 June 8, 2009
4	West pond	East dike slope and intermediate bench	Saturated and soft surface	Toe buttressing (See Figure 17)	February 24, 2009
5	West Pond	East dike slope and intermediate bench	Sloughing and standing water	Slope armoring, ditch lining and pipe inlet improvements	March 3, 3009
6	West Pond	South dike slope	Slope blowout	Slope armoring	Not Applicable[2]
7	West Pond	South dike slope	Wet and soft ground	Slope armoring	January 26, 2009
8	East Pond	East slope	Marginally stable slopes	Toe buttressing	March 4, 2010

[1] Presented in the same order as Table 20; [2] Repairs performed by TVA in 2008

The most significant repair work in terms of slope stability was implemented in Areas 1, 3 and 4 (See Figure 14 for graphical presentation). After removing wet sloughed material, Area 1 slope was stabilized with large crushed stone (see Figure 15). The stone was then covered with a layer of geotextile fabric before placing dry gypsum-fly ash material to form a flatter slope. These are temporary measures requiring close monitoring until long term plans for the use of the facility are formalized.

Figure 15. North Dike Slope Slump Repair (Area 1)

The slope slump discovered in Area 3 extended from a scarp located on a poorly defined bench area down into the stilling pond. An attempt was made to stabilize the areas by constructing a rock buttress from the bench. After additional movement of the slump was detected, two borings were drilled from the top of the buttress to install slope inclinometer casing and determine the subsurface location of the slump. Of the two inclinometers (SI-15 and SI-16) installed as part of the subsurface exploration, SI-16 sheared off few weeks later and was no longer available for taking readings. SI-15 is being read as of this writing. The field exploratory work was followed by a stability analysis of the slumped area to formulate measures that would stabilize the slope. Stantec prepared a work plan to increase the dimensions of the buttress toward the middle of the pond. The area buttressed first and the beginnings of the buttress expansion are depicted in Figure 16. For more information regarding the work plan and associated instrumentation (SI-15 and SI-16) please refer to work plan number let_009_paf_175569040.

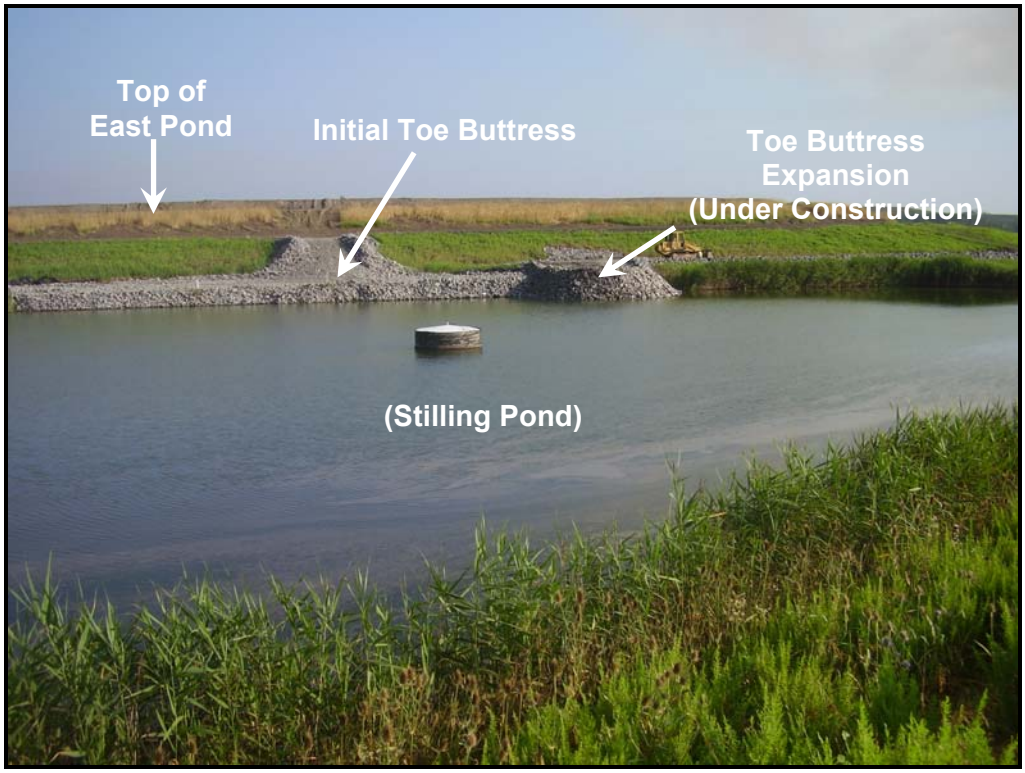


Figure 16. East Pond South Dike Toe Buttress (Area 3)

Area 4 is part of an intermediate bench above four spillway pipe penetrations and where the surface was observed to be extremely wet and soft and with active seeps (water 'boils') emerging from the ground. The water 'boils' contained sediment which is indicative that seepage paths causing internal erosion have already developed in this area. A rock buttress was constructed along the toe of the slope to protect this area against slope failure. Figure 17 shows the buttress constructed in Area 4 as well as the armoring of the slope above the intermediate bench.

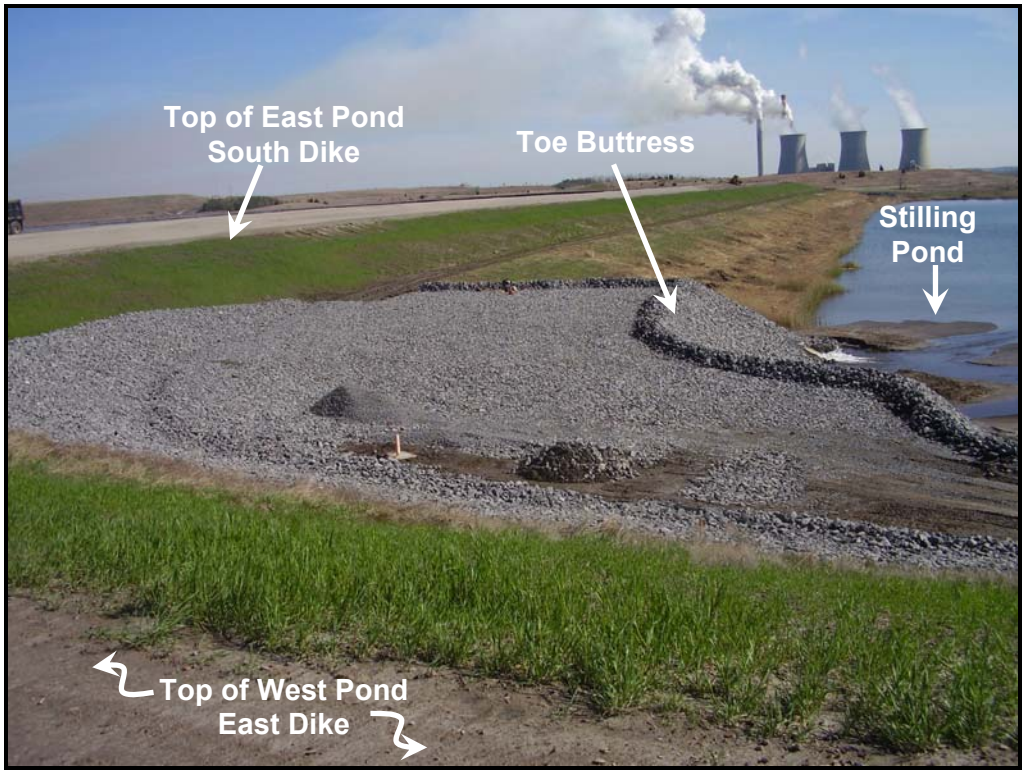


Figure 17. West Pond East Dike Toe Buttress (Area 4)

Following the construction of rock buttresses in Area 3 and Area 4, Stantec issued another work plan on October 27, 2009 to construct a rock buttress connecting Areas 3 and 4. Specifically, the work plan consisted of constructing a rock buttress along the entire south slope of the East Pond.

11.8. Other Repairs

In addition to the repairs listed above, Stantec has recommended and overseen several other repairs at the Scrubber Sludge Complex over the past few months. These are listed in Table 22. Most of this repair work consisted of improving surface drainage conditions by providing positive grading and lining the ditches. For a comprehensive list of work plans issued by Stantec please refer to Appendix I of the report.

Table 22. Other Repairs at Scrubber Sludge Complex

No.	Structure	Location	Type of Repair	Work plan Issued
1	West Pond	East dike	Ditch repair	February 26, 2009
2	West Pond	East and south dike	Ditch repair	March 11, 2009
3	East Pond	South slope	Vegetation removal	March 11, 2009
4	East Pond	East dike access road	Ditch repair	March 20, 2009
5	West Pond	South dike	Ditch and bench regrade	March 31, 2009 April 2, 2009
6	East Pond	South and east dike	Ditch and bench regrade	April 20, 2009

12. Engineering Analyses

12.1. General

Based on the review of available information, results of geotechnical exploration and results of laboratory testing, Stantec performed engineering analyses of the Scrubber Sludge Complex. This included seepage analysis of two (2) cross sections of the dike and slope stability analysis of five (5) cross sections of the dike. The analysis procedure used and the results of the analyses are presented in the following paragraphs.

12.2. Seepage Analysis

12.2.1. Background

The objective of the seepage analysis was to understand the total head (and pore water pressure) distribution within a given cross section of the dike. Seepage analysis was performed using SEEP/W, a numerical software tool developed by Geo-Slope International Inc. SEEP/W is a finite element software product for analyzing groundwater seepage and excess pore-water pressure dissipation problems within porous materials such as soil and rock.

The first step in the seepage analysis was to develop typical cross sections of the dike. Stantec utilized a combination of boring logs, piezometer data, historic drawings and topographic survey information to estimate the dimensions of the cross section and build its geometry. SEEP/W uses the concept of regions and points to define the geometry of a problem and to facilitate discretization (or meshing) of the problem. Upon defining the geometry of the model (with automatic mesh generation) material properties were assigned using the *Saturated/Unsaturated Model* offered in SEEP/W. The next step in the process was to define boundary conditions. All boundary conditions were applied directly on geometry items such as region faces and region lines. Upon defining the boundary conditions, the model was analyzed using *Steady State* seepage analysis option available in SEEP/W based on the assumption that the boundary conditions are constant over time. Specific details regarding the analysis procedure are presented in the following sections.

12.2.2. Cross Sections

Seepage analysis was performed for the following existing ground cross sections. Two cross sections were analyzed for seepage using SEEP/W in order to quantify the functionality of the under drains. The selected cross sections were generally representative of the dikes.

1) A-A’ (cross section through borings STN-1 to STN-5) [See Figure 18]
2) C-C’ (cross section through borings STN-8 and STN-9) [See Figure 19]

Table 23 presents the list of piezometers installed at the above mentioned cross sections.

Table 23. Piezometers at Seepage Analysis Cross Sections

Cross Section	Piezometer	Tip Elevation (feet)
A-A'	PZ-2	468.4
	PZ-2A	437.0
	PZ-4	420.5
	PZ-5	399.2
C-C'	PZ-8A	452.3
	PZ-9	455.4

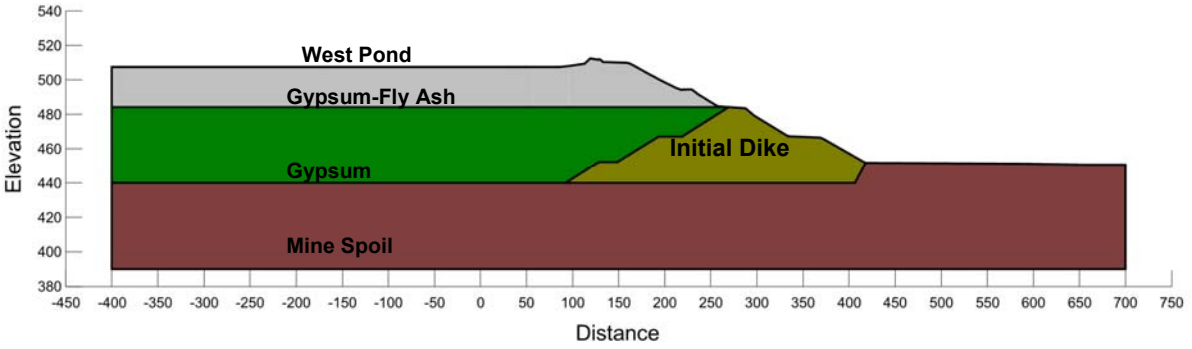


Figure 18. Cross Section A-A'

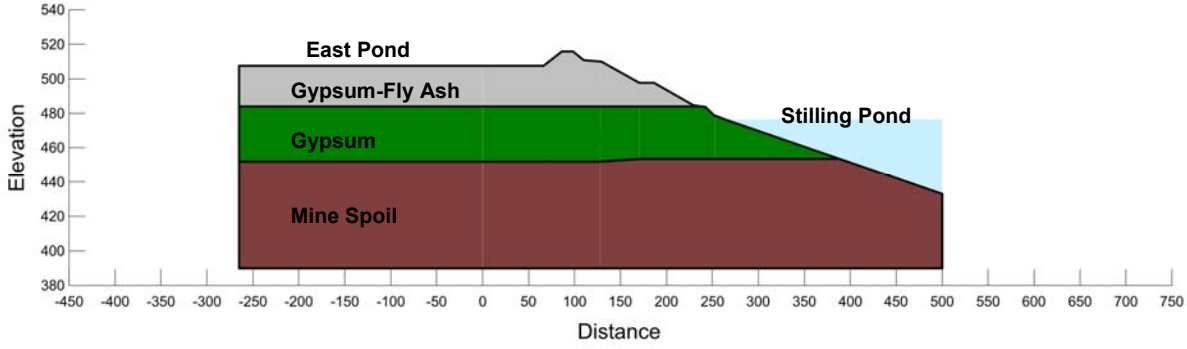


Figure 19. Cross Section C-C'

12.2.3. Material Properties

The material properties used for seepage analysis are presented in Table 24.

Table 24. Material Properties used for Seepage Analysis

Material	Kv (cm/sec)	Kv/Kh	Kh/Kv	Gs	e	w (%)	w-sat (%)	w-res (%)
Gypsum – Fly Ash	2E-5	0.02	50	2.45	0.65	22	41	3
Gypsum	2E-5	0.02	50	2.45	0.70	21	39	3
Initial Dike	2E-7	1.00	1	2.65	0.50	16	34	2
Mine Spoil	5E-5	0.33	3	2.70	0.60	18	37	2

Where,

- k_v is the vertical hydraulic conductivity
- k_h is the horizontal hydraulic conductivity
- G_s is the specific gravity
- ***e*** is the void ratio
- *w* is the water content
- w_{sat} is the saturated water content, and
- w_{res} is the residual water content

Vertical Hydraulic Conductivity (Kv): The *Kv* values of three materials (gypsum-fly ash, gypsum and initial dike) were estimated based on the laboratory test results (ASTM D5084) presented in Appendix F. The *Kv* value for mine spoil was assumed.

Horizontal Hydraulic Conductivity (Kh): The *Kh* values of all materials were calculated from the Kv to Kh ratios. The ratio of Kv to Kh was back calculated from SEEP/W runs to calibrate the seepage model to match measured phreatic water level keeping in mind the placement of the material. The closer the material was to behaving in an isotropic manner the higher the value of the ratio. The initial dike layer was assumed to be relatively homogenous, isotropic, and well compacted. Gypsum and gypsum-fly ash layers were assumed to be relatively anisotropic due to the fact that they were hydraulically placed. The mine spoil was assumed to be very anisotropic due to the varying particles (soil and rock) that comprise mine spoil. A comparison of Kh values from slug tests versus SEEP/W values is presented in Table 11.

Specific Gravity (Gs): The *Gs* values of three materials (gypsum-fly ash, gypsum and initial dike) were estimated based on the laboratory test results (ASTM D5084) presented in Appendix F. The *Gs* value for mine spoil was assumed.

Void Ratio (e): The ***e*** values of three materials (gypsum-fly ash, gypsum and initial dike) were estimated based on the laboratory test results (ASTM D5084) presented in Appendix F. The ***e*** value for mine spoil was assumed.

Water Content (w): The *w* values of all materials (gypsum-fly ash, gypsum and initial dike) were estimated based on the laboratory test results (ASTM D2216) presented in Appendix F.

Saturated Water Content (w-sat): The *w-sat* values of all materials (gypsum-fly ash, gypsum and initial dike) were calculated using the following relationship:

$$\gamma_{sat} = \frac{\gamma_w (G_s + e)}{1 + e}$$

Residual Water Content (w-rest): The *w-res* values of all materials were assumed using the reference Rawls et al.'s "Estimation of Soil Water Properties".

12.2.4. Under-drains

Two (2) cases were analyzed including one case without under-drain features and one case with under-drain features. The objective of using two (2) cases was to evaluate the functionality of the under drains. The cases are designated as follows.

X) No Under-drains (assumes no under-drains to be present) [See Fig. 18 and 19]
Y) With Under-drains (assumes under-drains to be present) [See Figures 20 and 21]

The locations of under-drains shown in figures are approximate. The location of the chimney under-drain (Figure 20) was estimated based on Drawing No. 10W4280-3 of Reference No. 2 (of Table 3). The elevation of the under-drain (in Figure 20 and 21) was estimated based on the surveyed location of the outlet pipe. The horizontal location of the under-drain was assumed based on Drawing No. 10W4280-16 of Reference No. 5.

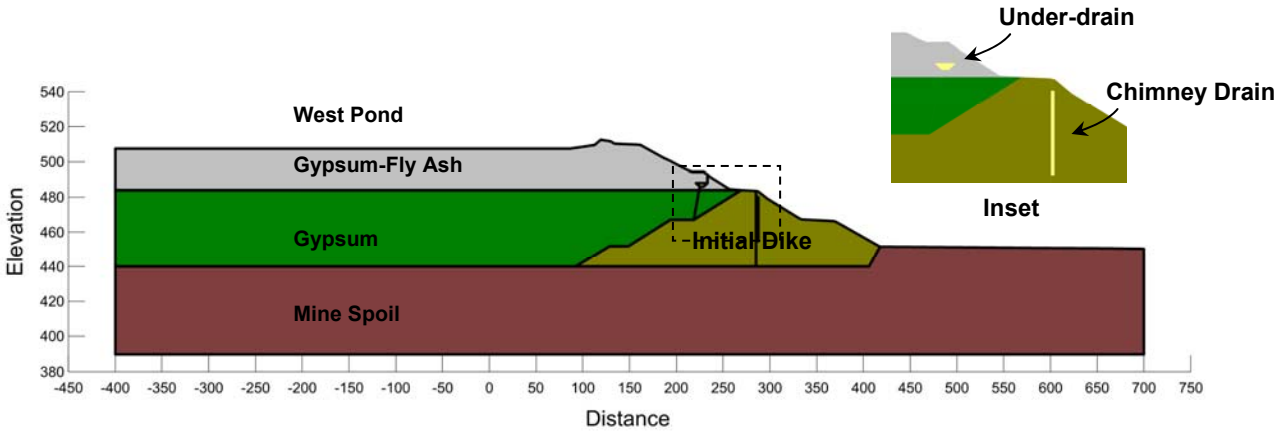
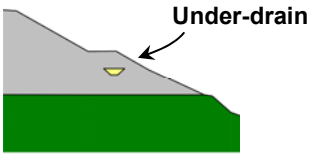


Figure 20. Cross Section A-A' with Under-Drains



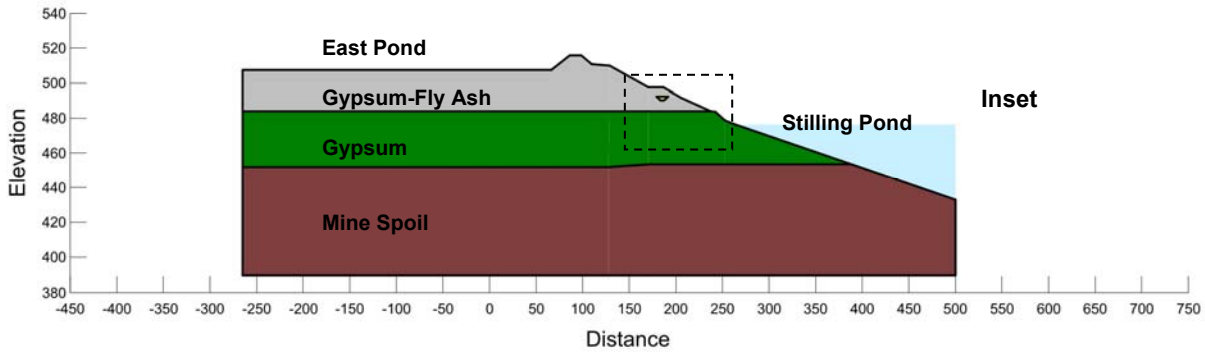


Figure 21. Cross Section C-C' with Under-Drains

12.2.5. Case IDs

The IDs for various cases of seepage analysis are presented in Table 25. The electronic file names presented on the CD also follow the same naming convention.

Table 25. Seepage Analysis Case IDs

Cross Section		No Under-drains	With Under-drains
		X	Y
1	A-A'	1X	1Y
2	C-C'	2X	2Y

12.2.6. Results

Detailed results of seepage analysis are presented in Attachment 1 of Appendix G. SEEP/W electronic files (.gsz files) are provided in the attached CD. A discussion of the results is presented in the following paragraphs.

The total head distribution for cross section A-A' is presented in Figure 22 and the total head distribution for cross section C-C' is presented in Figure 23. Table 26 presents a comparison of the SEEP/W results (total head) with the measurements taken from the piezometers.

Table 26. Total Head Measurements*

Cross-Section	Piezometer	Tip Elevation (feet)	SEEP/W No Under-Drains	SEEP/W With Under-Drains	Average Field Measurement
A-A'	PZ-2	468	489	484	492
	PZ-2A	437	474	467	471
	PZ-4	421	463	459	456
	PZ-5	399	454	453	452
C-C'	PZ-8A	452	490	490	487
	PZ-9	455	488	488	496

*-rounded to the nearest foot

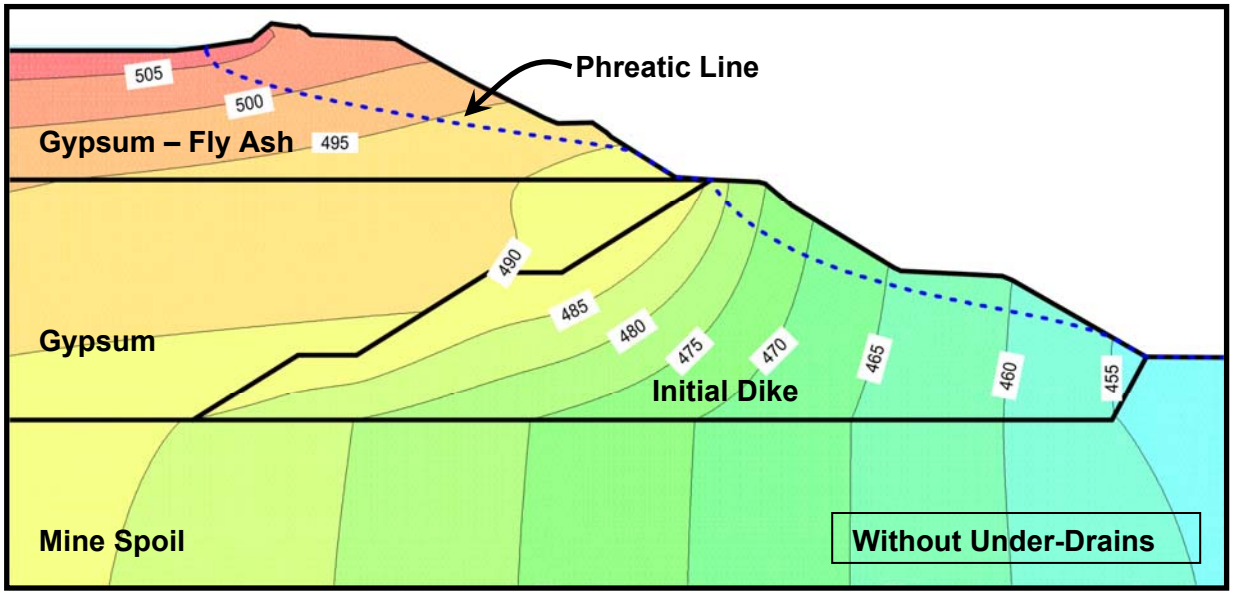
The results from the seepage analysis were also examined to identify conditions where piping and erosion of soil might develop due to seepage forces. The model results indicated a shallow phreatic surface (ground water table) within the gypsum-fly ash dike; these results are generally confirmed by the observation of shallow water in areas where Phragmites were removed. On both cross sections analyzed, the model indicated seepage flows to the sloping downstream face of the gypsum-fly ash dike. This condition creates the potential for the initiation of soil piping, as seepage water will tend to erode material from the dike face at these locations.

Upward, vertical exit gradients in the area of the gypsum-fly ash dike toe were also found to be excessive. Factors of safety against piping, computed for the surficial 3 to 5 feet of soil in these areas, ranged from 1.0 to 3.0 (see Table 27).

Table 27. Summary of Computed Exit Gradients and Factors of Safety against Piping

Case	Vertical Gradient (i_v) at Critical Exit Point*	Critical Gradient (i_{crit})	FS_{piping}
1X	0.9-1.1	0.9	1.0
1Y	0.2-03	0.9	3.0
2X	0.2-0.4	0.9	2.1
2Y	0.4-0.5	0.9	2.1

*-Critical exit point was located near the toe of the gypsum stack constructed after 1996. See plots in Appendix G for additional information.



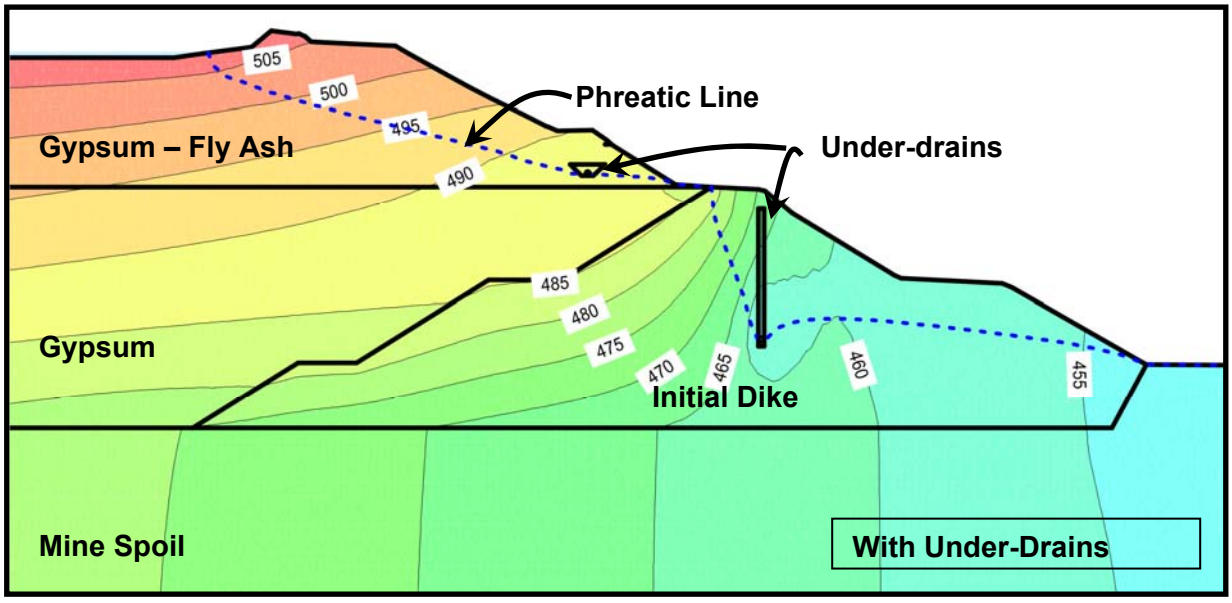


Figure 22. Cross Section A-A' (Total Head Contours in Feet)

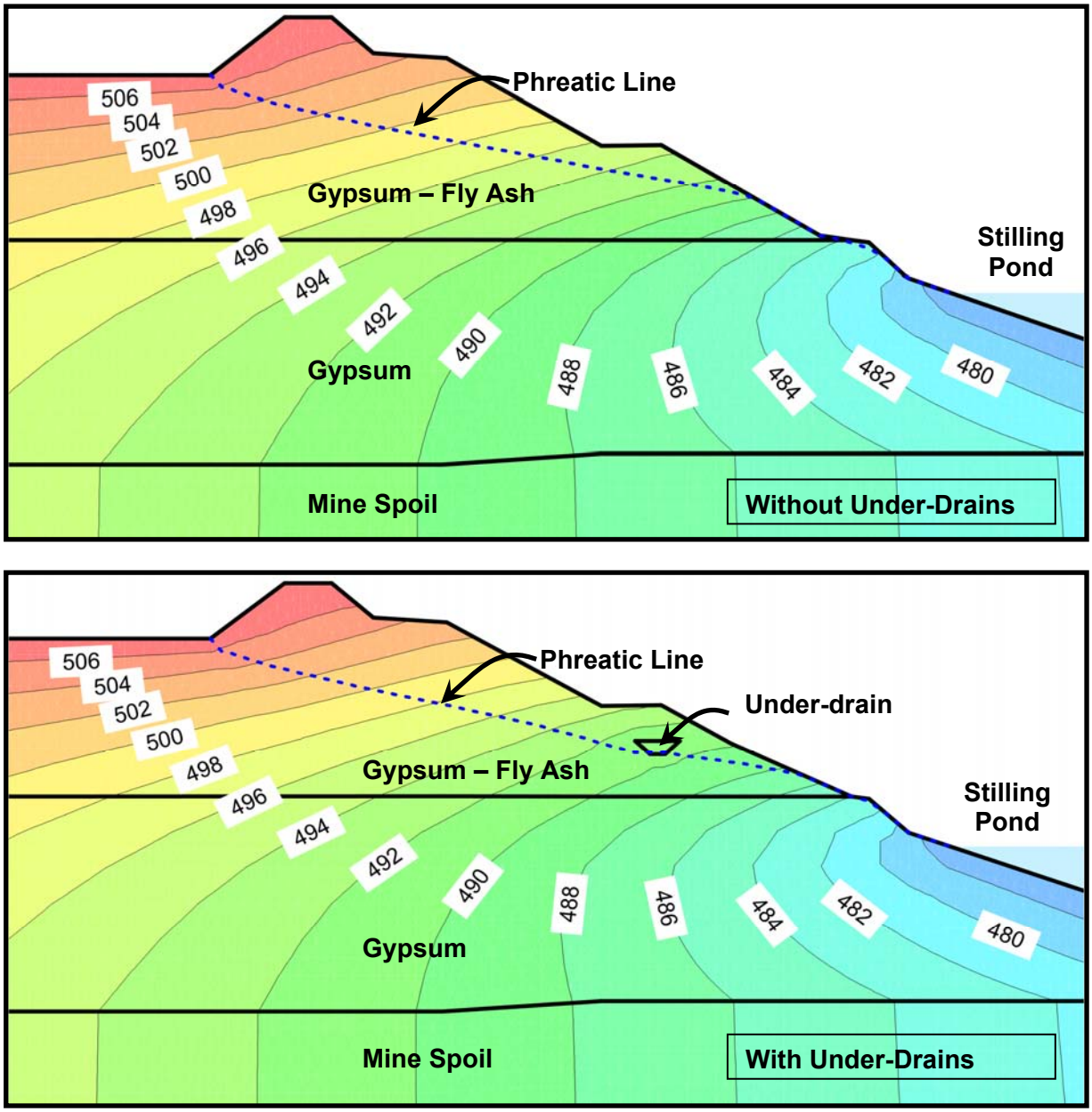


Figure 23. Cross Section C-C' (Total Head Contours in Feet)

12.3. Slope Stability Analysis

12.3.1. Background

The stability of the existing dike slopes was evaluated using two-dimensional limit equilibrium methods of analysis. Factors of safety against failure were calculated using Spencer's method of analysis, circular and translational slip surfaces and search routines to identify critical surfaces. The resistance to sliding was calculated using effective stresses and shear strength parameters selected based on laboratory testing and using two phreatic line

conditions. Slope stability analysis was performed using UTexas4 Computer Program distributed by Shinoak Software Inc) for static, long-term and fully drained conditions within the dike.

12.3.2. Cross Sections

Slope stability analysis was performed for the following existing ground cross sections. These cross sections were selected as they were generally representative of the dikes.

1) A-A' (cross section through borings STN-1 to STN-5)
2) B-B' (cross section through borings STN-6 and STN-7)
3) C-C' (cross section through borings STN-8 and STN-9)
4) D-D' (cross section through borings STN-10 to STN-12)
5) E-E' (cross section through boring STN-13)

12.3.3. Material Properties

The material properties (effective stress shear strength) were selected assuming that all soils exhibit no cohesion for the analysis of long-term, fully drained conditions. The soil properties used for stability analysis are presented in Table 28.

Table 28. Assumed Material Properties for SLOPE/W Analysis

Material	Cohesion (c')	Friction Angle (Φ')
Gypsum – Fly Ash	0	35º
Gypsum	0	35º
Initial Dike	0	28º
Mine Spoil	0	28º

Where,

- *c'* is the cohesion
- *Φ*' is the friction angle

The friction angle for gypsum-fly ash and gypsum material was estimated based on the results of laboratory testing. The friction angle values for the remaining materials were assumed based on soil type.

Co-mingled gypsum fly ash material encountered in different borings can be described as moist to wet, light gray to dark gray, mottled, and very loose to very dense. The N-values (from SPT blow counts) for the gypsum fly ash material had a wide range from 2 to 100+. The higher N-values (30 or more) represent dense to very dense conditions, while lower N-values (10 or less) represent loose to very loose conditions. Values in between indicate medium dense conditions. The relative density of the gypsum fly ash material was widely varying throughout the boring locations.

Gypsum material encountered in different borings can be described as light gray to gray, moist to wet and medium dense to dense. The N-values (from SPT blow counts) were varying widely from values as low as 6 to as high as 100+. The relative density of the gypsum material was widely varying throughout the boring locations.

Mine spoils encountered in different borings can be visually described as lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone and siltstone fragments. Laboratory tests on mine spoil were classified as CL according to Unified Soil Classification System (USCS) and A-6(7) and A-6(4) according to American Association of State Highway and Transportation Officials (AASHTO) soil classification system.

12.3.4. Failure Modes

The following failure modes were analyzed for all the cross sections.

X) Auto Search (searches for critical failure circle)
Y) Forced Circle (circular failure forced through three points)
Z) Wedge (non-circular failure surface forced through three points)

12.3.5. Phreatic Lines

The following phreatic line locations were analyzed for all the cross sections and failure modes.

A) Location A (phreatic line follows PZ levels observed)
B) Location B (phreatic line follows existing ground line as discussed below)

Location B of the phreatic line was selected in an attempt to reflect the wet conditions encountered along the lower two-thirds of the stacking dike slope due to uncontrolled seepage. In some areas (see Areas 1, 4, 5 and 6 in Figure 14), these wet conditions have already caused slumps, soil pumping and sloughing which, if left unattended, could have developed into a dike slope failure.

12.3.6. Case IDs

A total of thirty (30) cases of slope stability [5 cross sections x 3 failure modes x 2 phreatic line locations] were analyzed. The case identifications (IDs) given to each case are presented in Table 29.

Table 29. Slope Stability Analysis Case IDs

Cross Section	Failure Mode		Phreatic Line	
			Location A	Location B
1	X	Auto Search	1XA	1XB
	Y	Forced Circle	1YA	1YB
	Z	Wedge	1ZA	1ZB
2	X	Auto Search	2XA	2XB
	Y	Forced Circle	2YA	2YB
	Z	Wedge	2ZA	2ZB
3	X	Auto Search	3XA*	3XB
	Y	Forced Circle	3YA*	3YB
	Z	Wedge	3ZA*	3ZB
4	X	Auto Search	4XA	4XB
	Y	Forced Circle	4YA	4YB
	Z	Wedge	4ZA	4ZB
5	X	Auto Search	5XA	5XB
	Y	Forced Circle	5YA	5YB
	Z	Wedge	5ZA	5ZB

* Phreatic line was slightly modified for these cases due to non-traditional water levels pattern observed in PZs.

12.3.7. Results

The computed factors of safety for each case are presented in Table 30. Results of slope stability analysis are presented in Attachment 2 of Appendix G. UTexas4 electronic files are provided in the attached CD.

Table 30. Slope Stability Analysis Factors of Safety

Cross Section	Failure Mode		Phreatic Line	
			A	B[(1)]
			Factor of Safety	
1	X	Auto Search	1.6	1.4
	Y	Forced Circle	2.2	1.5
	Z	Wedge	2.6	1.6
2	X	Auto Search	1.5	1.3
	Y	Forced Circle	2.1	1.2
	Z	Wedge	2.6	1.4
3	X	Auto Search	1.3	1.2
	Y	Forced Circle	2.8	1.3
	Z	Wedge	3.2	1.4
4	X	Auto Search	1.1	0.6
	Y	Forced Circle	4.7	2.2
	Z	Wedge	4.6	2.2
5	X	Auto Search	1.9	1.2
	Y	Forced Circle	2.6	1.5
	Z	Wedge	3.3	1.8

(1) Phreatic line location B assumes the phreatic line emerges at the top of the lower two-thirds of the stacking dike and follows the ground surface until it reaches the initial dike. Thereafter it follows the phreatic line as observed in the piezometers.

12.4. Additional Slope Stability Analysis

12.4.1. Background

As part of Stantec's assistance with the on-going repairs at the Scrubber Sludge Complex, Stantec performed a slope stability analysis for the design of a toe buttress at the south dike of the East Pond. Slope inclinometer readings were used in estimating the approximate location of the failure plane. The results of this additional analysis were presented to TVA in a letter titled "East Pond Slope Toe Buttress near North East Corner of Stilling Pond", dated June 10, 2009, and are also presented in this report for the benefit of completeness.

12.4.2. Cross Section

Only one (1) cross section, taken near the center of the slope failure was analyzed.

12.4.3. Failure Modes

Slope stability analysis was performed for the following cases.

1) Search Circle (searches for critical failure circle)
2) Forced Circle (circular failure forced through three points)
3) Wedge (non-circular failure surface forced through three points)

12.4.4. Buttress Widths

For each of the cases, the following top of buttress widths were considered. Please note that the initial toe buttress width was approximately 25 feet.

A) 25 feet + 0 feet (existing condition)
B) 25 feet + 40 feet (proposed condition)
C) 25 feet + 45 feet (proposed condition)
D) 25 feet + 50 feet (proposed condition)

12.4.5. Material Properties

The subsurface information obtained from Borings STN-15 and STN-16 was utilized to develop the subsurface profile for slope stability analysis. For the dike configuration above the slide, Stantec utilized the borings drilled during February, 2009 as part of the geotechnical exploration of the gypsum stack. By combining the data available from these sources, Stantec developed an approximate subsurface profile which consisted of gypsum-fly ash and gypsum materials underlain by mine spoil and deep bedrock conditions.

The shear strength parameters for gypsum – fly ash, gypsum and mine spoil (presented in Table 31) were back calculated using the limiting equilibrium methodology. Under this method, different shear strength parameters (friction angles) are input into the program until the existing slope (assumed to be marginally stable) achieves a factor of safety of 1.0. This procedure is normally used when specific shear strength data (from laboratory or field) is not readily available. This method was implemented for all three cases and the shear strength parameters obtained were as follows. Please note that the cohesion values for all cases were assumed to be zero, which is typically recommended when analyzing the long-term (effective stress) stability condition.

Table 31. Shear Strength Parameters

	Search Circle	Forced Circle	Wedge
	Φ' (deg)	Φ' (deg)	Φ' (deg)
Gypsum-Fly ash	39	37	35
Gypsum	39	37	35
Mine spoil	25	23	22
Channel Lining	40	40	40

12.4.6. Cases

A total of twelve (12) cases of slope stability [1 cross section x 3 failure modes x 4 buttress widths] were analyzed. The case identifications (IDs) given to each case are presented in Table 32.

Table 32. Additional Slope Stability Analysis Case IDs

		A	B	C	D
		25+0	25+40	25+45	25+50
1	**Search Circle**	1A	1B	1C	1D
2	**Forced Circle**	2A	2B	2C	2D
3	**Wedge**	3A	3B	3C	3D

12.4.7. Results

Upon obtaining the shear strength parameters for limiting equilibrium condition (FOS = 1.0), additional slope stability analysis was performed wherein the width of the buttress was increased until the factor of safety was equal to 1.5, which is normally recommended for long-term (effective stress) condition. The results of factors of safety computation are presented in Table 33.

Table 33. Factors of Safety

		A	B	C	D
		25+0	25+40	25+45	25+50
1	**Search Circle**	1.0	1.38	1.42	1.47
2	**Forced Circle**	1.0	1.46	1.57	1.70
3	**Wedge**	1.0	1.66	1.71	1.77

12.4.8. Factors of Safety Progression

A summary of factors of safety progression is presented in Table 34.

Table 34. Factors of Safety Progression

Cross Section	Slope	Factor of Safety		Repairs*
		Before Repairs	After Repairs	
AA'	West Pond South Slope	1.5	1.5	Completed
BB'	West Pond East Slope	1.3	1.5	Proposed
CC'	East Pond South Slope	1.2	1.5	Completed
DD'	East Pond East Slope	1.0	1.5	On-going
EE'	East Pond North Slope	1.5	1.5	Proposed

*as of June 8, 2010

13. Conclusions and Recommendations

13.1. General

Based on field conditions observed during numerous visits to the site, review of project documentation made available by TVA and results of the geotechnical exploration and engineering analyses reported herein, it is our opinion that the stability of the existing structure is marginal due principally to lack of adequate seepage control. Furthermore, the structure cannot be developed safely as planned unless significantly drastic and costly modifications are implemented.

Project documents describe the dimensions and location of under-drain features that needed to be constructed within the stacking dikes and TVA personnel reported verbally that these features were installed along one location within the stacking phase of the project. However, the wet and soft conditions observed throughout the lower two-thirds of the structure exterior slopes indicate that the design of these features was inadequate in terms of its intended purpose and/or these features are not functioning properly due to faulty construction,

The uncontrolled seepage has not only caused wet and soft conditions on the surface of exterior dike slopes, but in some areas the wetness and softness have developed into unstable exterior surface conditions such as: (1) a blowout in 2008 and sloughing along the south slope of the West Dike, (2) water boils on the intermediate bench of the East and West Pond south side, immediately above the northwest corner of the stilling pond, (3) a deep seated slump at the toe of the East Dike south slope near the northeast corner of the stilling pond and (4) sloughing and mudflows along the north slope of the East Pond.

Understanding the full impact of the uncontrolled seepage on the existing slope conditions and expansion of the facility as currently planned is complicated by the lack of information documenting the engineering analyses, design assumptions and construction records that would normally be part of a project such as the PAF Scrubber Sludge Complex. Our conclusions relative to the available information and recommendations about the current plans to expand the complex are described in the following paragraphs.

13.2. Subsurface Conditions

13.2.1. West Pond South Dike

A general profile of the subsurface conditions under the south dike of West Pond is presented in Table 35. The profile is based on the information obtained from borings STN-1 through 5 and historic drawings available for review.

Table 35. Subsurface Profile Under South Dike of West Pond*

Elevation (feet)		Material	Time Frame
from	to		
510	484	Gypsum-Fly Ash	1996 to Present
484	440	Initial Dike	1986
484	440	Gypsum	1986 to 1996
440	390	Mine Spoil (Original Ground)	Prior to 1986
390	-	Bedrock	--

*-Approximate depths and based on straight line interpolation between borings

13.2.2. East Pond South Dike

A general profile of the subsurface conditions under the south dike of East Pond is presented in Table 36. The profile is based on the information obtained from borings STN-8 and 9 and historic drawings available for review.

Table 36. Subsurface Profile Under South Dike of East Pond*

Elevation (feet)		Material	Time Frame
from	to		
510	484	Gypsum-Fly Ash	1996 to Present
484	440	Gypsum	1986 to 1996
440	390	Mine Spoil (Original Ground)	Prior to 1986
390	-	Bedrock	--

*-Approximate depths and based on straight line interpolation between borings

13.2.3. Foundation Deposits

All borings encountered deep mine spoil deposits as the foundation material. This is confirmed by historical information which also indicates the presence of extensive abandoned underground mines under the complex site. The mine spoil deposit thickness below the toe of the dike along the south side of Scrubber Sludge Complex averages approximately 50 feet.

A potential adverse effect of building the dike on the mined site would have been differential settlement of the embankments due to non-uniform consolidation of the mine spoil deposits. The information obtained during this exploration does not indicate that differential settlement of the dike structure has occurred.

13.2.4. Initial (Ponding Phase) Dike Materials

The boring information confirms that the initial dike was constructed with mine spoil materials. The dike material encountered in Borings STN-3 and STN-4 classified as plastic clay, which is a suitable material to construct dikes provided it is properly placed and compacted. However, the dike material also contained sand lenses and fragment of coal, shale, sandstone and silt. The standard penetration tests performed in this borings yielded N-values ranging from 2 to 33. The wide range of N-values suggests that the dike was not constructed applying uniform compaction. On the other hand, the few unusually high N-values obtained indicate that undesirable large rock fragments and boulders were probably removed from the mine spoil material before using it to construct the dike.

13.2.5. Impounded and Stacked Materials

According to project documents, the complex received mostly gypsum during the ponding phase of the construction. After 1996, the complex has received co-mingled CCB consisting mostly of gypsum and fly ash (see Table 2) from the three plant units, which means the stacking walls have been constructed using co-mingled byproducts.

Commingling gypsum and fly ash complicates the design, construction and assessment of the stacking walls. The engineering properties of fly ash are significantly inferior to those of gypsum. Therefore, when the two materials are co-mingled their combined properties are highly dependent on the proportions of gypsum and fly ash making up the sludge used in the construction of the stacking walls. Even if the proportions of the CCB materials in the sludge leaving the plant sluiced are known, the rim ditching method used to stack the sludge will cause the coarser and heavier particles to settle first while the finer material settles later at a different location of the stacking. Therefore, when constructing stacking walls using the rim ditching method and co-mingled gypsum and fly ash require quality control testing of the material placement to confirm design assumptions. There are no project documents for review showing quality control testing after the CCB was placed.

13.3. Project Design

13.3.1. Initial (Ponding) Dike

The documents prepared to construct the initial dike for the ponding phase appear to be reasonably complete. They were developed based on a geotechnical exploration that evaluated the sub-grade conditions and tested borrow areas for material to be used to construct the dike. The documents specified the placement and compaction of the dike materials and construction of under-drain features to control seepage across the dike. The documents provided for review were labeled “As Constructed”, presumably implying the dike was built as designed.

13.3.2. Stacking Phase

A September 30, 1993 preliminary design report appears to have been the basis to prepare the only set of drawings (dated October 1995) available for review that present information relative to the design of the stacking phase of the project. Both sets of documents only provide basic information relative to the construction of different stages of the upstream method of stacking.

Building dikes over hydraulically placed gypsum and fly ash using the upstream method of construction requires detailed engineering analyses and design. Performing stability analysis based on testing of the by-product engineering properties, such as shear strength, hydraulic conductivity and unit weight is essential in determining the geometrical configuration of the rim dikes (stack walls) required to attain a minimum factor of safety against failure. Drawing 10W4280-16 of the October 1995 drawings shows a typical cross-section with a trapezoidal outline of the rim dikes for each stage but provides no dimensions. One critical dimension set by the stability analyses is the bottom width of the rim dikes. When the rim dikes are constructed based on this width and attaining a prescribed minimum density, the location of the critical failure plane providing an adequate factor of safety is pushed toward the center of the ponds, behind the rim dikes.

The stability analysis also assumes seepage will occur through the rim dike under certain conditions. The seepage patterns are analyzed based on the hydraulic conductivity of the materials being stacked and the pool elevation maintained during the stacking process. The main objective of the seepage analyses is to formulate methods to control seepage paths and reduce their impact on the stability of the rim dike exterior slopes. In practice, under-drain features are constructed within the exterior rim dikes in an attempt to control and lower the seepage before it surfaces along the exterior slopes. Therefore, determining the hydraulic conductivity of the specific by-product material being stacked is critical to the design of stable dike slopes. In this case, determining the permeability of stacked material is significantly more important because two different CCB materials are being co-mingled.

No information documenting the different engineering analyses described above was available for review of the design of the Scrubber Sludge Complex.

13.4. Project Construction

13.4.1. Initial (Ponding) Dike

The ponding dike appears to have been constructed according to the January 25, 1985 drawings except for one deviation relative to the layout of the dike forming the south side of the East Pond. The change in this layout included construction of the stilling pond currently adjoining the south dike of the East Pond and the east dike of the West Pond. The original alignment of the East Pond south dike was modified by introducing two 90-degree bends, one toward the north and one toward the east, then following approximately the alignment of a deflector dike presumably constructed as part of the original layout of the ponding system. It is not known if the east dike was first built according to the 1985 drawings and then modified to the current alignment, or if it was built according to the current alignment to begin with.

According to “As Constructed” drawings, an internal drainage collection system was installed within the ponding dike by June 3, 1986. It consisted of chimney drains, perforated collector pipe and finger drains. Specifically, the system had a total of eighteen (18) finger drains with outlet elevations ranging from 449 feet to 468 feet. Stantec was able to locate only two (2) of these finger drains in the field, one along the south slope of the West Pond and another on the south slope of the Stilling Pond. Although no finger drain outlets were found near Borings STN-3, STN-4 and STN-5, the piezometric information obtained in these borings appears to indicate the internal drainage collection system in this area (where the borings were drilled) of the West Pond south dike is working properly.

13.4.2. Stacking Dike

The only information available for review relative to the construction of the stacking phase of the project is current topographic mapping of the complex. Based on this information, the existing stacking dike layout and exterior slope configuration appears to be similar to what is shown on the October 1995 drawings.

The current (second stage of the East and West Ponds) decant spillway systems are located in plan view approximately as shown on the 1995 drawings. However, the corresponding outlet pipes emerge along the ponding dike slope, a few feet above the stilling pond normal pool elevation, whereas the 1995 drawings show the outlet pipes day-lighting within the stacking dike slope and then lying on the slope. Records documenting the location and closure of the decant spillway system for the first stage of the stacking are not available for review. Stantec engineers only found what is assumed to be the abandoned East Pond spillway outlet pipe protruding out of the initial (or ponding) dike near the northwest corner of the stilling pond. The pipe was partially smashed, partially covered with concrete slabs and draining some water. The abandoned West Pond spillway outlet could not be located in the field.

Pipe penetrations through dikes impounding CCB slurry pose two significant potential problems: (1) If the pipes, or weirs leading to them, are not removed or properly plugged upon abandonment, they can become a source of leakage or even cause the loss of the impounded slurry; (2) If not properly constructed, the interface between the exterior pipe surface and the surrounding backfill material can become a seepage path that gradually erodes the backfill material and eventually causes large internal voids to form. In this case, the location of the first stage spillway pipes is unknown, except for the outlet of one of the abandoned spillways.

The spillway pipe penetrations occur in an area where the intermediate bench was observed to be extremely wet and soft, with active seeps (water ‘boils’) emerging at the surface. The water ‘boils’ contained sediment which may indicate that seepage paths causing internal erosion have already developed in this area. In view of all the conditions observed, a rock buttress was constructed along the toe of the slope to protect this area against slope failure until further testing, analyses and monitoring are performed. Stantec is currently initiating efforts to find the abandoned spillway pipes.

The October 1995 drawings show a typical under-drain detail and their location within the dike of the stacking phase of the project. Verbal reports and outlet pipes observed in the field indicate that an under-drain feature was constructed near the toe of the dike, but no records documenting their installation were available for review. During field reconnaissance, most of the outlet pipes were observed discharging little or no seepage and several were found to be damaged.

The use of under-drain features to control seepage, together with the slope configuration and placement and compaction of the stack walls (exterior rim dike), as determined by the engineering analyses and design of structures such as the Scrubber Sludge Complex, is critical to attain long term stability of the dike slope. Gypsum and fly ash are cohesion-less materials extremely sensitive to seepage flow under increasing hydraulic head conditions. In this case, the wet conditions observed throughout the lower portion of the slope and the disturbance (blowouts, slumps and sloughing) caused by these conditions, demonstrate that the design and/or construction of this feature are not providing the desired objective, i.e., long term slope stability.

13.4.3. East Pond South Slope Slump

The slump near the northeast corner of the stilling pond was discovered in February, 2009 after dense Phragmites growth along the north bank of the stilling pond was mowed. The slump appears to have occurred near an area where the depth of the pond is unusually deep. At first, an attempt was made to repair the slump by constructing a rock buttress along the bank of the pond. However, as the construction of the buttress was near completion, the top of the buttress started to move. Slope inclinometers were installed in two borings advanced from the top of the buttress to determine the slip plane location. The boring data, slope inclinometer information, hydrographic survey of the bottom of the pond and slope stability analyses were used to design a larger buttress.

The slump described above, dense Phragmites growth - which is indicative of wet conditions - and irregular slope geometry along the north and west banks of the stilling pond suggest that the toe of the dike in these areas has marginal stability. These areas should be maintained properly by keeping the Phragmites growth short to allow regular inspection of the surface conditions.

13.5. Geotechnical Exploration and Engineering Analyses

13.5.1. General

There were no records available for Stantec's review documenting engineering analyses that precedes the design of the dike or as-built conditions. The engineering analyses provide criteria to design a stable dike configuration which is then presented in construction drawings and reassessed periodically during construction. As-built drawings confirm that the design features, or modifications thereof made after reevaluating the original design, were duly constructed.

In this case, as an example, the engineering analyses would have determined the width of the rim dike (stacking wall) of each stage that needed to be built with CCB material placed and compacted to a certain minimum density. Design drawings would have shown the required minimum widths of the rim dike and as-built drawings would have recorded the actual widths. The actual widths are critical information in developing representative subsurface profiles used in the stability analyses during assessment of current field conditions. Trying to obtain sufficient information to configure the actual geometry of the stacking walls by performing a geotechnical exploration, after the dike has been built, is impractical or may dictate that conservative assumptions be adopted to proceed with the engineering analyses.

13.5.2. Instrumentation

Piezometers readings taken over the course of last six (6) months (presented in Appendix E) indicate water levels within a borehole to be fairly consistent over time (with limited fluctuation). However, the phreatic level obtained from piezometer readings, when plotted on dike cross-sections, does not follow a gradual descending pattern mirroring the dike slope. Instead, there are borings where the phreatic surface is higher than in borings advanced from a higher ground surface elevation, indicating the presence of perched subsurface water conditions. Inclinometers installed within the boreholes recorded minimal to no movement of the slopes over past six (6) months (See Appendix E).

13.5.3. Seepage Analysis

Attempts to develop a model of total head distribution representative of field conditions were unsuccessful due to the unusual piezometric readings obtained as a result of the uncontrolled seepage. If the piezometer readings are ignored and seepage analysis is performed strictly based on selected material properties and pool elevation, the analyses produces high total head distribution, which implies that under-drain features are necessary to control and lower the total head. If one assumes that certain under-drain features were installed as suggested by the historical documentation and ignore the piezometer readings, the results of the analysis show that the total head distribution would still be high within the stacking dike, but would be significantly lower within the initial dike (ponding phase) where reportedly a more elaborate under-drain system was installed. Table 19 presents a summary of total head measurements obtained from the different analyses and actual field measurements.

Table 20 presents the computed factors of safety against piping. Based on draft TVA design guidance, factors of safety against piping should be no less than four (4). However, the results from the seepage model show the factors of safety (against piping) to be ranging from 1.0 to 3.0. This indicates that the west pond and east pond dikes do not meet current criteria for preventing soil piping due to seepage.

13.5.4. Slope Stability Analysis

The stability of the dike was evaluated using two-dimensional limit equilibrium methods of analysis, assuming only static, long-term, drained conditions within the existing dike. Slope stability analysis was performed for five (5) cross sections using shear strength parameters selected based on laboratory testing and assuming the phreatic line follows the piezometer levels observed during the exploration. Due to the varying subsurface conditions, the cross sections used in the slope stability analysis may not be representative of the entire dike, both in terms of material properties as well as seepage conditions. Predictably, the slope stability calculations produced factors of safety against sliding ranging widely from 1.1 to 4.7. Accepted criteria for long-term stability require a factor of safety of at least 1.5.

13.6. Future Use of Facility

The existing facility slopes are marginally stable due to uncontrolled seepage through the dike walls. Attempting to control the seepage to attain acceptable long-term stability conditions and continue expanding the facility as planned is not practical. As the stacking is elevated, the higher slurry pool will cause the head pressure driving the seepage to increase and the uncontrolled seepage will create new wet and soft areas. Based on the conditions

observed to date, the uncontrolled seepage will eventually result in slumping, sloughing or failure of the slope unless continuing and costly repair measures such as extensive rock lining and large buttresses are constructed. Therefore, continuing to develop the facility as currently planned is not recommended.

The existing facility can continue to be operated for a few years and receive additional CCB material from the plant provided temporary repair and maintenance measures continue to be applied, the stability of the dike slopes is monitored on a regular basis and the expansion design of the facility is modified. Based on recent mitigation work performed, the anticipated repair work will consist of armoring wet and soft exterior dike surfaces and possibly constructing additional rock buttresses if new significant slumps develop. The surface drainage conditions need to be continually improved to protect and allow proper inspection of dike surfaces and direct surface runoff to the stilling pond. Proper maintenance of all surfaces is also required to allow proper inspection of the dike surfaces.

Temporary continued use of the facility will still require elevating the stacking and the associated higher pool and hydrostatic pressure will result in further uncontrolled seepage. Therefore, the design of the temporary development of the facility should reduce uncontrolled seepage by shifting the next stage of the stacking toward the center of the pool. Internal drainage features installed within the temporary stacking should collect seepage and direct it to surface ditches that drain the flow to areas of the existing slopes that are protected against surface erosion. Improved seepage control will reduce cost of repairs required to stabilize wet and soft surface areas.

The geometrical configuration of the temporary stacking should be designed with slopes that reduce the area that eventually needs to be capped with soil and vegetation before closure while providing the anticipated storage capacity. Flatter slopes would reduce the area that needs to be capped for closure purposes and provide acceptable stability. Conversely, the slopes should be sufficiently steep to provide the anticipated storage capacity.

The stability analyses and design of the closure will probably require dewatering of the complex. The most effective way to attain long term stability of the abandoned structure will be to reduce the seepage affecting the exterior slope of the rim dikes. Specific dewatering measures should be formulated in conjunction with the design of the temporary stacking.

13.7. Conversion to Dry Storage Operation

Based on the existing conditions of the East and West Pond dike and in order to provide for the continued operation of the Paradise Fossil Plant with no disruption of scrubber sludge storage, Stantec recommends that the existing Scrubber Sludge Complex be closed and abandoned by TVA and simultaneously a new landfill facility be designed, permitted and constructed. If implemented correctly and with proper timing, this conversion process can be completed without impacting the ongoing power generation operations.

The recommended parallel and sequential tasks are presented in Table 37.

Table 37. Recommended Solution*

Time Frame (year)		Structure	
From	To	Existing Facility	New Landfill
Aug, 2009	Dec, 2009	Closure Design (60%)	Siting Study
Jan, 2010	Dec, 2011	Design (100%) and Permitting	Design (100%) and Permitting
Jan, 2012	Dec, 2013	Preparations for Closure	Construction of First Cell
Jan, 2014	Jan, 2014	Begin Closure	Begin Landfill Operations

* Dates provided here are approximate. Actual dates will slightly vary

The new facility to store the scrubber sludge in a dry manner would be a landfill, where the byproduct material is placed and distributed with conventional earthwork equipment such as trucks and dozers. While this option will have a relatively significant construction cost, it can be configured for a long life and can be operated in a manner that virtually eliminates the risk of an embankment breach type failure.

Provided the planned schedules are adhered to, the construction of the new landfill storage facility and the closure of the existing facility will not have any impact on the continued operation of power generation at the Paradise Fossil Plant. Coordination between the closure of the existing byproduct storage facility and the implementation of the new facility, assuming a conservative project critical path schedule, should reduce the risk of impacting power generation to an acceptable low level.

13.8. Undrained Shear Strength Analysis

It is also recommended that undrained shear strength analysis be performed for cross section CC' (East Pond South Slope) and cross section DD' (East Pond East Slope). The results of undrained shear strength should be provided as an addendum to Phase 2 geotechnical report.

14. Closure

The recommendations presented herein are based on information gathered (from various sources) using that degree of care and skill ordinarily exercised under similar circumstances by competent members of the engineering profession. Subsurface profiles are generally based on straight line interpolation between borings and no warranties can be made regarding the continuity of subsurface conditions between the borings. The recommended solution presented herein is based on certain assumptions and should be used for conceptual and preliminary planning purposes only. Final design for existing wet stack and new landfill has not been performed at the time of this writing. The results of final design may require some of the assumptions and conclusions presented here to be altered. In no case should this document be used for construction of the project.

Appendix A

Historic Documents

PARADISE STEAM PLANT

PROPOSED SCRUBBER SLUDGE DISPOSAL AREA

EN DES SOIL SCHEDULE 88.5

TO : O. P. Thornton, Project Manager, Fossil Design Projects, 102 SPT-K

FROM : Frank Van Meter, Chief, Construction Services Branch, 500 SPT-K

DATE : April 17, 1984

SUBJECT: PARADISE STEAM PLANT - SOIL INVESTIGATION - PROPOSED SCRUBBER SLUDGE DISPOSAL AREA - EN DES SOIL SCHEDULE 88.5

The soil investigation requested in FDP 0126 003 is complete. Its purpose was to provide data for dike design and construction, utilizing in-place and borrow soils. After consulting with EN DES, the program was changed to allow offset of borings falling in pond areas or near the haul road centerline. Boring SS-4 was eliminated and the SPT sampling interval was increased to 5 ft below depths of 20 ft. Also, the auger boring depths were increased to 15 ft.

The field exploration was completed between February 17 and March 6, 1984. Borings were advanced by CME-75 and Mobile B-61 drills equipped with 3-3/8-in. and 6-in. id hollow stem augers and with 6-in. continuous flight augers. Dry methods were used and work conformed to ASTM D 1452, D 1586, D 1587, and D 2488. A total of 846 lin ft was drilled and sampled at 6 SPT locations, 2 undisturbed locations on or near the dike axis, and 17 auger (borrow) locations west of the proposed dikes.

Site Conditions

Foundation

The site is located on a reclaimed portion of Peabody Coal Company's Sinclair Mine. The area was strip mined and reclaimed with mine spoilfill from the existing surface to undisturbed bedrock. The overburden spoilfill averages some 65 ft in thickness along the proposed dike axis.

Soils underlying the dike axis include 56 percent clayey sands (SC), 35 percent sandy lean clay (CL), and 11 percent clayey gravel (GC). Cobble to boulder sizes are also present locally. There is no apparent lateral continuity based on soil classes. However, the profile can be divided into

Groundwater Levels

At the time of the exploration the ponded water was near elevation 446. Under the southern dike segment, water levels varied from 425.5 to 441.9 and averaged 432.9. Under the northern segment, water levels varied from 430.8 to 441.7 and averaged 440.7. These relatively low water levels in borings adjacent to higher ponded water levels suggests relatively low permeabilities.

Borrow Area

The explored area extends some 1500 feet west (up slope) of the dikes and includes an area of about 55 acres. Surface elevations vary from 514 to 460. Basic soil classes present include 80 percent clayey sands (SC), 18 percent sandy lean clays (CL), and 2 percent well-graded silty sands (SW-SM). Cobble sizes are present locally. The in-place soil consists of a mixture of original soil and shale and sandstone particles which often degrade easily. Coal particles, roots, and wood debris are also present locally. It is apparent sampling, processing, and testing degrade a percentage of the material.

In-place soil moistures vary as below:

	max	min	avg
SC	15.1	6.9	12.1
CL	19.5	11.9	16.6
SW-SM	11.3	11.3	11.3

These moistures reflect conditions after winter rains and snow melts.

Groundwater Levels

Water levels varied from the surface to no water to a depth of 15 ft. The average water level was 10 ft below the surface. It is likely the average water level will drop during warmer, dryer seasons. However, assuming the

material with close field inspection and testing, it could be successfully utilized. Soils at the time of the exploration were wet of optimum moisture.

Original signed by
Frank Van Meter

Frank Van Meter

HPM:ASY
Attachments
cc (Attachments):
R. O. Barnett, W9D224 C-K
W. H. Childres, SME-K
MEDS, W5B63 C-K

Principally prepared by H. P. Matthews, extension 2771.

A14107.2

Table 1

SOUTHERN DIKE

SUMMARY OF SPT DATA

Strata	N Value			Soil Class			Average Moisture Content		
	max	min	avg	CL %	SC %	GC %	CL %	SC %	GC %
F1	5	2	4	50	50	0	16.0	14.6	--
F2	12	6	8	40	60	0	15.7	15.1	--
F3	22	8	13	31	54	15	17.0	12.2	7.5
F4	35	12	25	22	61	17	10.1	12.2	5.5
F5	50+	32	43	29	43	28	9.3	12.8	11.5
Total	--	--	--	34	54	12	--	--	--

A14104.1

Table 2

NORTHERN DIKE

SUMMARY OF SPT DATA

Strata	N Value			Soil Class			Average Moisture Content		
	max	min	avg	CL %	SC %	GC %	CL %	SC %	GC %
F1	5	3	4	25	75	0	15.1	15.3	--
F2	9	8	8	25	50	25	16.6	11.4	14.8
F3	23	10	16	10	54	36	10.7	14.1	13.6
F4	28	28	28	0	100	0	--	17.8	--
F5	50+	48	50	20	20	60	7.4	16.6	11.8
Total	--	--	--	16	60	24	--	--	--

A14104.2

Table 3

PARADISE STEAM PLANT

SCRUBBER SLUDGE DISPOSAL AREA

UMMARY OF LABORATORY TEST DATA

	Atterb Limits				Triaxial Q		Saturated Triaxial R				Coefficien
	Liq	Plastic.	Dry	Void	Undisturbed		Apparent		Effective		Permeabil
	Limit	Index	Dens.	Ratio	ϕ	c	ϕ	c	ϕ	c	k_v
Om	%	%	pcf		deg	tsf	deg	tsf	deg	tsf	cm/sec
-	28	9	100.7	.684	3.5	.20	17.1	.48	32.1	.08	3.0 x 10
-	30	12	101.1	.598							
-	30	14	109.8	.534							7.9 x 10
-	25	10	109.9	.536	3.2	.52	22.5	.21	32.3	0.00	
-	34	15	127.3	.307							
-	37	16	114.8	.464							5.0 x 1
18	37	17	109.8	.535			15.4	.17	31.4	.01	
-	39	19	104.3	.648	11.0	.42	16.2	0.04	23.8	.00	
-	34	15	119.2	.374							
-	31	13	123.8	.371							

Table 4

PARADISE STEAM PLANT

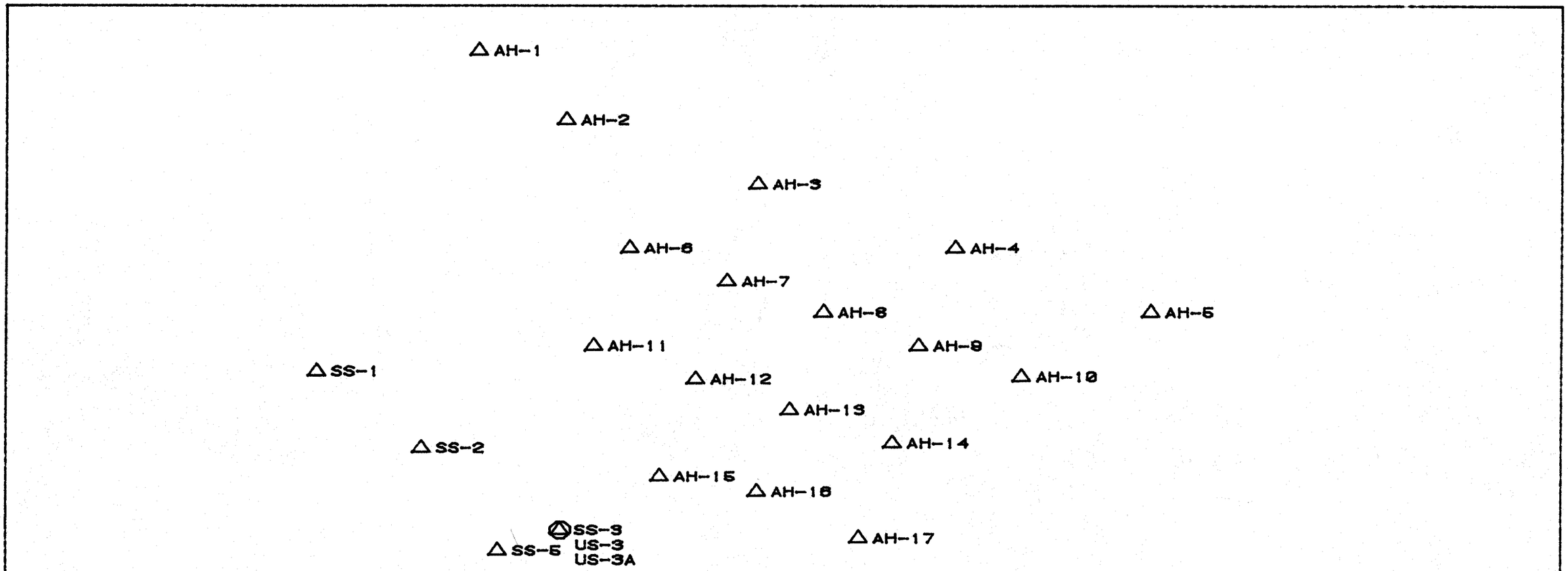
SCRUBBER SLUDGE DISPOSAL AREA

SUMMARY OF LABORATORY TEST DATA

BORROW SOIL CLASSES

Class	I	II
Symbol	CL	CL
Mechanical and Hydrometer Analysis		
Gravel, percent	23	12
Sand, percent	24	25
Silt, percent	24	27
Clay, percent	29	36
Atterberg Limits		
Liquid limit, percent	35	36
Plastic limit, percent	19	19
Plasticity index, percent	16	17
Shrinkage limit, percent	--	--
Standard Proctor Compaction		
Optimum moisture, percent	12.5	13.2
Maximum density, pcf	119.0	114.0
Penetration resistance, psi	--	--
Shear Strength at 3% Wet of Optimum Moisture and at 95% of Maximum Unit Weight		
Triaxial Q: ϕ degrees	3.2	-0.4
c tsf	0.34	0.91
Shear Strength at 3% Dry of Optimum Moisture and at 95% of Maximum Unit Weight		
Triaxial R: ϕ degrees	16.3	15.1
c tsf	0.07	0.11
Coefficient of Permeability, cm/sec	5.8×10^{-7}	6.3×10^{-7}

A34107.1



See Dwg. 10W262 for Boring Locations

SCALE : 1'' = 400'

LEGEND

△ SPLITSPOON OR AUGER BORING

○ UNDISTURBED BORING

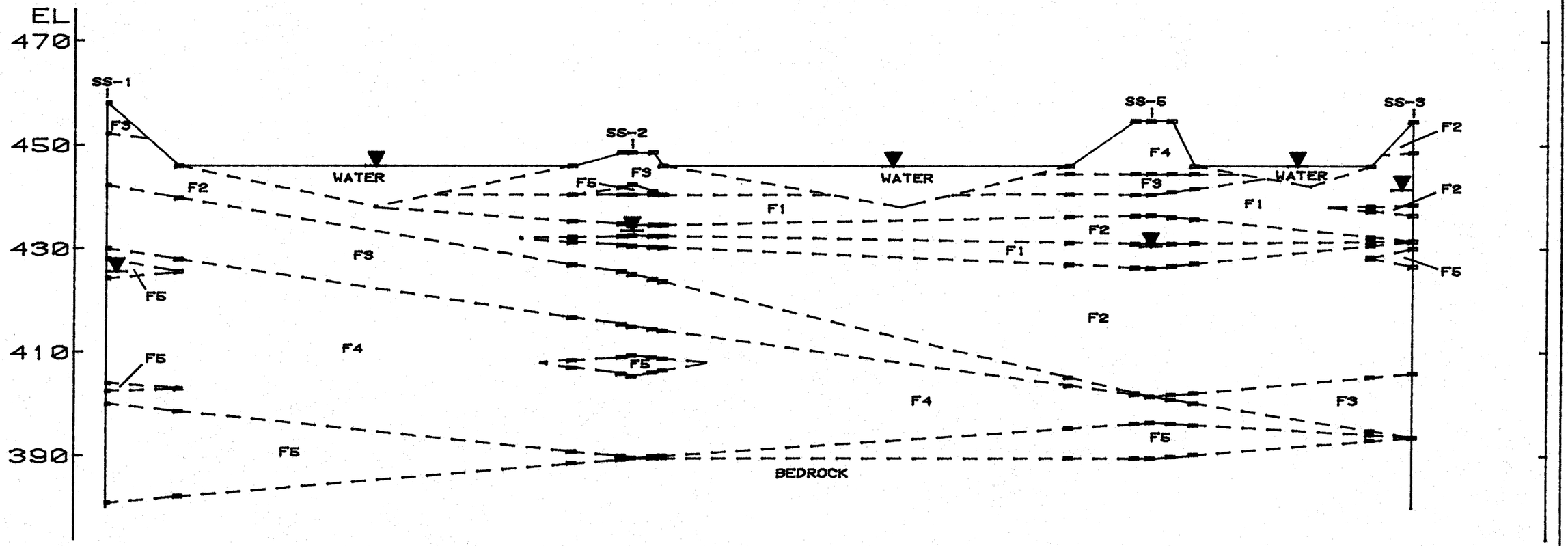
PARADISE STEAM PLANT

SCRUBBER SLUDGE
DISPOSAL AREA
PLAN OF BORING LOCATIONS

TENNESSEE VALLEY AUTHORITY
MATERIALS ENGINEERING LABORATORY

SUBMITTED	RECOMMENDED	APPROVED
BA	HPM	

KNOXVILLE	041284	64	CS	5	804B2044R0



LEGEND

F1	AVG. N=4
F2	AVG. N=8
F3	AVG. N=13
F4	AVG. N=25
F5	AVG. N=43
▼	24 H WATERTABLE

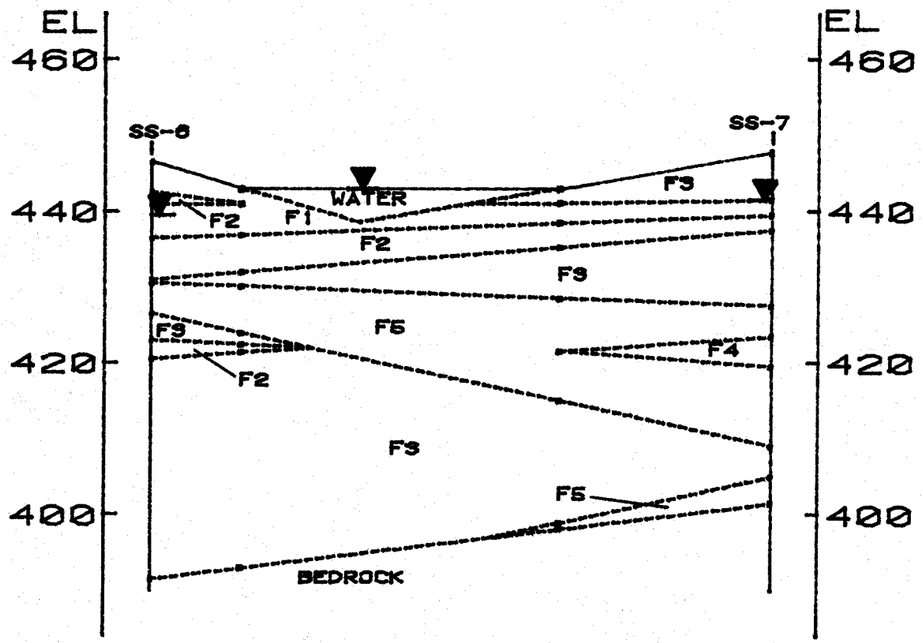
SCALE: VERT. 1'' = 20'
HORIZ. 1'' =100'

PARADISE STEAM PLANT

SCRUBBER SLUDGE DISPOSAL AREA GENERALIZED CROSS SECTION #1

TENNESSEE VALLEY AUTHORITY
MATERIALS ENGINEERING LABORATORY

SUBMITTED	RECOMMENDED	APPROVED				
BA	HPM					
KNOXVILLE	041284	64	CS	3	604B2042R0	



LEGEND

F1	AVG. N=4
F2	AVG. N=8
F3	AVG. N=16
F4	AVG. N=28
F5	AVG. N=50
▼	24 H WATERTABLE

SCALE: VERT. 1'' = 20'
HORIZ. 1'' =100'

PARADISE STEAM PLANT

SCRUBBER SLUDGE
DISPOSAL AREA
GENERALIZED CROSS SECTION #2

TENNESSEE VALLEY AUTHORITY
MATERIALS ENGINEERING LABORATORY

SUBMITTED	RECOMMENDED	APPROVED
BA	HPM	

KNOXVILLE	041284	64	CS	3	604B2043R0

FIELD LOG ABBREVIATIONS

Typical Name	Abbreviation
Sandy gravel	sd Gv
Silty gravel	si Gv
Clayey gravel	cl Gv
Sand	Sd
Silty sand	si Sd
Clayey sand	cl Sd
Sandy silt	sd Si
Clayey silt	cl Si
Fat silt	ft Si
Sandy clay	sd Cl
Silty clay	si Cl
Riprap	RR
Medium clay	md Cl
Fat clay	ft Cl
Cobble	Cob
Boulder	Bld
Topsoil	TS

Name Modifiers

Clean	cln
Coarse	crs
Dirty	dty
Fine	fn
Organic	org
Poorly graded	pgd
Well graded	wgd
Degraded	degdd

Gravel Shape

Angular	ang
Platy	plty
Rounded	rd
Subangular	sb ang
Subrounded	sb rd

Lithology and Mineralogy	Abbreviation
Bedrock	br
Chert	cht
Dolomite	dol
Limestone	ls
Manganese	mn
Micaceous	mic
Pyrite	py
Quartz	qtz
Sandstone	ss
Shale	sh
Bentonite	bent
Hematite	hem

Color

Black	blk
Blue	blu
Brown	brn
Cream	crm
Dark	dk
Gray	gy
Green	grn
Light	lt
Mottled	mott
Pink	pk
Red	r
Tan	tn
White	wht
Yellow	yel
Purple	pur

Moisture

Dry	d
Moist	mst
Very moist	V mst
Wet	w

Structure	Abbreviation	Consistency	Abbreviation
Blocky	blky	Dense	dns
Fissured	fis	Firm	f
Homogeneous	homo	Hard	hd
Laminated	lam	Loose	lse
Saprolitic	sapr	Soft	s
Shaly	shly	Stiff	stf
Slickensided	slsid	Very stiff	v stf
Stratified	strat		

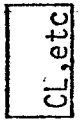
Origin	
Alluvial	all
Colluvial	coll
Loess	lss
Residual	resd

General Modifiers			
Alternating	altng	Trace	tr
Angle	∠	Variable	var
Augering	augg	Vertical	vert
Contaminated	cont	Weathered	wth
Dip	dp	With	w/
Debris	dbr		
Discontinued	Disc		
Drilling mud	mud		
Drive	dr		
Elevation	El		
Feet	ft		
Fill	fl		
High	H		
Horizontal	hor		
Inch	in		
Inclusion	inc		
Incomplete recovery	IR		
Low	L		
Medium	Med		
Original	orig		
Partings	prtgs		
Roots	rts		
Rough	rou		
Slow	sl		
Small	sm		
Spoil	sp		
Thick	thk		
Thin	thn		

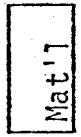
DEPTH 1"=5'	EL	SPT (N)	LOG	W	LL	PI	X	REMARKS OR TEST RESULTS
Boring Depth and Scale	Elevation	Blows/Foot (SS Boring)	Lab Soil Type	Moisture Content	Liquid Limit	Plasticity Index	Soil Letter	

LEGEND

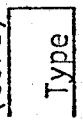
Topsoil



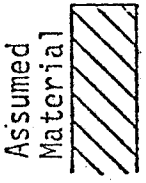
Soil Type (Unified Classification)



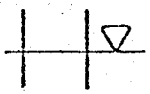
Notation of Soil Not Sampled (SS, PA, HA Logs)



Bedrock (Note Core if Cored)



Refusal (Impractical to Penetrate with Boring Equipment Used)



Watertable (Date)

Explanation of UD Sampling Limits if Applicable

BORING SYMBOLS

SS - 2" OD Splitspoon Boring

IN BLOCKS BESIDE UD BORING SAMPLES		
Test	Engineering Test Results	
Q, R, R̄, S	Friction Angle (Degrees)	Cohesion (tsf)
UC	Unconfined Compressive Strength (tsf)	Sensitivity Ratio
C	Compression Index	Preconsolidation Pressure (tsf)
k	Coefficient of Permeability (cm/sec x 10^{-4})	

Example: Blocks as Required:

Q	12.0	0.62	R	19.6	0.21	S	34.0	0
UC	4.0	2.6	C	0.27	2.0	k	5.6	

SOIL TEST SYMBOLS

Q - Unconsolidated-Undrained Triaxial Compression
R - Consolidated-Undrained Triaxial Compression
R̄ - Effective Consolidated-Undrained Triaxial Compression
S - Consolidated-Drained Direct Shear
UC - Unconfined Compression
C - Consolidation
k - Permeability
X - Letter Identification of Soil Type, Lower Case (a, etc.)

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: SS-1 STATION: 113+70S RANGE: 20+40W SURFACE EL: 458.2
DATE DRILLED: 2/17/84 TO 2/22/84 PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
	455	12		22.9			CRS SD GV(WTH SH), GY, D, SP FL (WOOD DEBRIS)
5		15	GC	5.9	32	14	CRS SD GV(WTH SH,WTH SS DEGDD BY DRIVE), GY, D, SP FL
		6	CL	11.3	34	15	CL SD GV, BRN-GY, MST, SP FL
	450	10	CL	8.0	34	16	CRS SD GV(TR CL)(WTH SH DEGDD BY DRIVE), GY, D, SP FL
10		7					NO RECOVERY
	445	7	CL	13.8	34	15	SD GV(WTH SH DEGDD BY DRIVE), GY-BRN, D, SP FL
15		8	CL	12.3	34	15	GV CL(GV WTH SH DEGDD BY DRIVE), BRN-GY, MST, SP FL
		11	GC	9.1	32	14	CRS SD GV(WTH SH DEGDD BY DRIVE) GY, D, SP FL
	440	12	SC	11.1	35	16	CRS SD GV(WTH SH,COAL,SS DEGDD BY DRIVE), BRN-GY-BLK, D, SP FL
20		12	SC	10.5	35	16	CRS SD GV(WTH SH DEGDD BY DRIVE) GY, MST, SP FL
	435	9	CL	18.4	28	11	GV CL SI, BRN-GY, MST, SP FL
25		15	CL	17.5	28	11	CL SI, TR GV&COAL, BRN-GY, MST, SP FL
		18	SC	18.4	29	13	STRAT: CL SI 80%, CRS SD GV(WTH SH)20%, BRN-GY-BLK, MST, SP FL
	430	28	SC	11.3	35	16	STRAT: CL GV 60%, CRS SD GV(COAL DEGDD BY DR),GY-BLK, MST, SP FL
30		44	GC	1.8	29	13	CRS SD GV(SS DEGDD BY DRIVE), GY, D, SP FL
		38	C	11.9	35	16	▽ CL SI, GY-BRN, D, TR COAL&WTH SH
	425						FL

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: SS-1 STATION: 113+70S RANGE: 20+40W SURFACE EL: 458.2
DATE DRILLED: 2/17/84 TO 2/22/84 PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
		28	SC	11.7	35	16	CL SI, GY, MST, TR COL&WTH SH, FL
	420						
40		28	SC	8.4	35	16	CL SI, GY, MST, TR WTH SH, FL
		30	SC	13.9	34	15	SD SI, GY, W, TR COL&WTH SH&LS GV DEGDD BY DR, FL
	415	19	GC	7.8	33	15	SI SD, GY, W, TR WTH SH&LS GV DEGDD BY DR, FL
45		28	SC	11.8	31	15	SI SD, GY, W, TR WTH SH&LS GV DEGDD BY DR, FL
		23	SC	9.7	35	16	CL SI, GY, MST, TR LS GV DEGDD BY DR, TR COAL&WTH SH, FL
	410						
50		25	SC	13.7	35	16	CL SI, GY, MST, TR LS GV DEGDD BY DR, TR COAL&WTH SH, FL
		25	CL	11.3	34	16	CL SI, GY, MST, TR WTH SH&COAL& WD&LS GV, FL
	405	20	SC	12.0	35	16	CL SI, GY, MST, TR COL&WTH SH, FL
55		29	SC	11.6	35	16	CL SI, GY, MST, TR WTH SH, FL
		50+	CL	9.0	34	16	CL SI, GY, MST, TR WTH SH, FL
	400						
60		29	CL	12.2	34	15	CL SI, GY, MST, TR COL&WTH SH, FL
		32	CL	9.1	34	16	CL SI, GY, MST, TR COL&WTH SH, FL
	395	35	SC	11.4	35	16	CL SI, GY, MST, TR COL&SS GV, FL
65		44	CL	7.5	34	16	CL SI, GY, MST, TR LS GV DEGDD BY DR, TR WTH SH, FL
		50+	GC	16.1	33	15	CL SI, GY, SAT, TR WTH SH DEGDD BY DR, FL
	390						CL SI, GY, MST, TR LS GV DEGDD

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: SS-1 STATION: 113+70S RANGE: 20+40W SURFACE EL: 458.2
DATE DRILLED: 2/17/84 TO 2/22/84 PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
		46	SC	10.1	35	16	CL SI, GY, MST, TR WTH SH, FL
	385	45	SC	13.1	35	16	CL SI, GY, MST, TR LS GV&WTH SH& WD&COAL, FL
75		39	SC	12.2	35	16	CL SI, GY, MST, TR COL&WTH SH, FL
		46	SC	11.7	35	16	CL SI, GY, MST, TR COL&LS GV&WTH SH, RESD
	380	50	CL	11.0	34	16	CL SI, GY, MST TR COAL&WTH SH, RESD
80		50+	SC	12.2	34	16	CL SI, GY, MST, TR COAL&LS GV DEGDD BY DR, TR WTH SH, RESD
	375	60	CL	11.5	34	16	CL SI, GY, MST, TR LS GV DEGDD BY DR, TR COL&WTH SH, RTS, RESD
85		50	SC	11.3	35	16	CL SI, GY, MST, TR COL&LS GV&WTH SH, RESD
	370	51+	CL	10.3	34	16	CL SI, GY, MST, TR COL&SS GV&WTH SH, RESD
90							DISCONTINUED. EL 369.7
	365						
95							
	360						
100							
	355						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: SS-2 STATION: 109+60S RANGE: 17+40W SURFACE EL: 448.6
DATE DRILLED: 2/24/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
		8	SC	16.3	29	12	CL SI(TR COAL),BRN-GY-BLK,MST,FL
	445						
5		11	SC	15.7	29	13	STRAT: CL SI 50%, GV CRS SD(COAL DEGD BY DR)50%,GY-BRN-BLK,MST,FL
		41	GC	6.7	32	14	GV CRS SD(WTH SH DEGDD BY DR), GY, D, FL
	440	5	CL	7.4	34	15	CL SI, TR GV&COAL,GY-BRN,MST,FL
10							
		4	SC	14.8	29	12	SD SI(TR COAL DEGDD BY DR),BRN-R BRN, MST, FL (TR WD)
		3	CL	10.5	34	15	CL SI, TR GV&COAL, BRN, MST, FL
	435						
15		9	SC	14.8	31	15	CL SI, TR GV(SH), BRN-GY, MST,FL
		4	SC	10.9	35	16	STRAT: CL SI 70%, FT CL 30%, YEL-GY-BLK, MST, FL
	430	11	SC	7.8	31	15	SD GV(WTH SH DEGDD GY DR),TR COAL, GY-BLK, MST, FL
20							
		7					NO RECOVERY
	425	12	SC	13.2	31	15	CL SI(WTH SH DEGDD BY DR), GY, MST, FL
25							
	420	13	SC	11.3	35	16	GV CL SI, GY, MST, FL
30							
			SC				SD GV(WTH SH DEGDD BY DR), GY,

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: SS-2 STATION: 109+60S RANGE: 17+40W SURFACE EL: 448.6
DATE DRILLED: 2/24/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
40	410	50+					NO RECOVERY
45	405	19	US	17.9	29	12	SI CL, TR SH&SS GV&WD, GY-BRN-BLK, MST, FL
50	400	29	US	12.3	31	15	CRS SD GV(WTH SH,TR COAL), GY, MST, FL
55	395	28	US	13.2	35	16	STRAT: CRS SD(DEGDD BY DR)50%, CL SI(WTH SH)50%, BLK-GY, MST,FL
60	390						BEDROCK. EL 389.6
65	385						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: SS-3 STATION: 104+20S RANGE: 14+20W SURFACE EL: 454.6
DATE DRILLED: 2/24/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
		6	CL	16.1	34	15	CL SI, BRN, MST, TR RTS&WTH SH, FL
5	450	12	SC	10.9	29	13	SD SI, BRN-BLK, MST, TR COAL, FL
		4	CL	18.2	28	11	CL SD, BRN, MST, TR SS GV, FL
		4	CL	22.6	28	11	SI CL, BRN, MST, TR COAL, FL
10	445	5	SC	11.5	35	16	CL SI, GY, V MST, TR WTH SH, FL
		3	SC	20.9	29	12	CL SI, GY, V MST, TR WTH SH&RTS, FL
15	440	2	SC	18.3	29	12	SI CL, GY-BRN, V MST, TR RTS&WTH SH, FL
		10	SC	18.7	29	12	CL SD, BRN, V MST, TR COAL, FL
		4	CL	22.7	28	11	SI CL, BRN, V MST, TR RTS, FL
20	435	5	CL	21.9	28	11	SI CL, BRN, V MST, TR LS GV, FL
25	430	46	SC	18.1	29	12	SD CL, BRN-GY, V MST, TR WTH SH, FL
30	425	8	SC	16.0	29	12	CL SD, BRN, V MST, TR COAL&WTH SH, FL
			CL				CL SD, BRN, V MST, TR SS GV, FL

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: SS-3 STATION: 104+20S RANGE: 14+20W SURFACE EL: 454.6
DATE DRILLED: 2/24/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
40	415	8	SC	16.1	29	12	CL SD, BRN, MST, TR SS GV&LS GV& WTH SH&RTS, FL
45	410	6	CL	15.3	34	15	CL SD, BRN, MST, TR SS GV&WTH SH, FL
50	405	22	CL	18.4	28	11	CL SD, BRN-YEL, MST, TR SS GV& WTH SH, FL
55	400	11	CL	13.7	34	15	CL SD, GY-BRN, MST, TR WTH SH& RTS, FL
60	395	50+	CL	7.7	34	16	SD SI, GY, D, TR WTH SH DEGDD BY DR, TR COAL, FL
65	390						REFUSAL. EL ±393.6

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: SS-5 STATION: 106+60S RANGE: 13+40W SURFACE EL: 454.7
DATE DRILLED: 2/22/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
		19	CL	8.1	34	16	CL SI, GY, D, TR COAL, FL
5	450	23	CL	7.6	34	16	CL SI, GY, D, TR COAL&LS GV, FL
		35	GC	8.1	32	14	CL SI, GY, D, TR COAL&WTH SH, FL
		29	GC	3.7	32	14	SD SI, GY, D, TR LS GV DEGDD BY DR, FL
10	445	17	GC	2.6	32	14	CRS GV SD, GY, D, TR LS GV DEGDD BY DR, FL
		12	CL	11.2	34	15	CL SI, GY, MST, TR WTH SH&COAL, FL
15	440	5	CL	9.0	34	16	CRS GV SD, GY, MST, TR COAL&LS GV, FL
		4	SC	11.8	35	16	CRS GV SD, GY, MST, TR LS GV DEGDD BY DR, TR WTH SH, FL
		11	SC	12.6	35	16	CL SI, GY, MST, TR LS GV&WTH SH& COAL, FL
20	435	9	SC	12.2	35	16	CRS GV SD, GY, MST, TR WTH SH&LS GV, FL
		4	SC	14.1	35	16	CRS GV SD, GY, MST, TR GV DEGDD BY DR, TR WTH SH, FL
25	430						
		7	SC	17.5	29	12	CRS GV SD, GY, MST, TR COAL&LS GV&RTS, FL
30	425						
			SC		29	12	CL SI, BRN, MST, TR COAL, FL

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: SS-5 STATION: 106+60S RANGE: 13+40W SURFACE EL: 454.7
DATE DRILLED: 2/22/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
40	415	6	CL	19.0	28	11	CL SI, BRN, MST, TR WD&WTH SH& LS GV, FL
45	410	10	SC	17.3	29	12	CL SI, BRN, MST, FL
50	405	8	SC	17.4	29	12	SD SI, BRN, MST, TR RTS, FL
55	400	29	SC	15.0	31	15	SD SI, GY, W, TR WTH SH, FL
60	395	49	CL	11.4	34	16	CL SI, GY, MST, TR COAL, FL
65	390	50+	GC	5.9	32	14	GV CRS SD, GY, WTH BR
		50+	GC	3.2	32	14	GV CRS SD, GY, WTH BR

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: SS-5 STATION: 106+60S RANGE: 13+40W SURFACE EL: 454.7
DATE DRILLED: 2/22/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
		50+					NO RECOVERY
75	380						
		50+	U U	6.8	32	14	CRS GV SD, DEGDD BY DR, GY, BR
80	375						
							DISCONTINUED. BEDROCK EL 374.6
85	370						
90	365						
95	360						
100	355						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: SS-6 STATION: 90+60S RANGE: 9+30W SURFACE EL: 446.5
DATE DRILLED: 2/27/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
	445						
		4	SC	15.8	29	12	SD SI, GY-BRN, MST, TR WTH SH& SS&LS GV, FL
5		8	SC	16.7	29	12	SD SI, GY-BRN, MST, TR WTH SH&SS GV&RTS&COAL, FL
	440	3	SC	19.1	29	12	SD SI, GY, MST, TR WTH SH&COAL& RTS, FL
		3	CL	15.1	34	15	SI SD, GY-TN-YEL-BLK, TR WTH SH& COAL&SS GV, FL
10		6					NO RECOVERY
	435						
		9	SC	6.2	29	12	SI SD, GY-BRN, TR WTH SH DEGDD BY DR, TR LS&SS GV, FL
15		8	GC	14.8	33	15	SI SD, GY, V MST, TR WTH SH DEGD BY DR, COAL, FL
	430	48+	CL	7.4	34	16	SI SD, GY, D, TR WTH SH DEGDD BY DR, FL
							BOULDER
20							NO RECOVERY
		15					
	425						
		8	CL	16.6	28	11	SD CL, BRN-TN, MST, TR WTH SH DEGDD BY DR, TR SS GV&ORG MATL, FL
25							
	420						
		16	SC	15.3	29	12	SD SI, GY-BRN, MST, TR WTH SH DEGDD BY DR, COAL, TR SS GV, RTS FL
30							
	415						
			C				SD CL, GY-BRN, TR WTH SH&COAL&SS

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: SS-6 STATION: 90+60S RANGE: 9+30W SURFACE EL: 446.5
DATE DRILLED: 2/27/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
40	410	14	CL	10.7	34	15	SI SD, BRN-GY-BLK, MST, TR COAL& WTH SH DEGDD BY DR, TR SS GV, FL
	405	18	GC	19.5	33	15	SI SD, GY-BLK, MST, TR PYRITES& COAL DEGDD BY DR, FL
45	400						
50	395	21	SW SM	21.4	NP	NP	CRS GV SD(COAL) DEGDD BY DR, FL
55	390						DISCONTINUED. REFUSAL EL 391.5
60	385						
65	380						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: SS-7 STATION: 86+50S RANGE: 930W SURFACE EL: 447.8
DATE DRILLED: 2/28/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
	445	16	SC	16.6	29	12	SI SD, BRN-TN, MST, TR RTS&COAL& LS GV&SS GV, FL
5		13	SC	9.1	35	16	SI SD, BRN-GY, MST, TR WTH SH& COAL, FL
		5	SC	11.0	35	16	SI SD, GY, MST, TR WTH SH DEGDD BY DR, TR COAL, FL
	440	7					NO RECOVERY
10		23	GC	9.0	33	15	SI SD, GY, W, TR LS GV DEGDD BY DR, FL
	435						BOULDER. NO RECOVERY
15		10	GC	15.1	35	15	SI SD, GY, W, TR COAL&WTH SH&WD, FL
		12	SC	13.4	31	15	SI SD, GY, MST, TR COAL&WTH SH DEGDD BY DR, FL
	430	19	SC	10.7	35	16	SI SD, GY, MST, TR COAL&WTH SH DEGDD BY DR, FL
20		50+	SC	16.6	34	15	STRAT: SI SD 60%±, SI CL 40%±, TR WTH SH DEGDD BY DR, FL
	425	28	SC	17.8	29	12	SI SD, GY-BRN, MST, TR WTH SH DEGDD BY DR, TR SS GV&COAL, FL
25							
	420	50+	GC	13.4	33	15	SI SD, GY, V MST, TR WTH SH DEGD BY DR, TR COAL, FL
30							
	415	50+	GC	11.8	32	14	SI SD, GY, D, WTH SH DEGDD BY DR

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: SS-7 STATION: 86+50S RANGE: 930W SURFACE EL: 447.8
DATE DRILLED: 2/28/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
40	410	22	U S	10.8	35	16	SI SD, GY, MST, TR WTH SH DEGDD BY DR, TR SS GV&ORG MATL, FL
45	405	50+	U O	11.1	33	15	SI SD, GY, W, TR LS GV DEGDD BY DR, TR WTH SH&COAL&RTS, FL
50	400						DISCONTINUED. REFUSAL EL 401.3
55	395						
60	390						
65	385						
	380						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: AH-1 STATION: 107+40S RANGE: 32+90W SURFACE EL: 462.3
DATE DRILLED: 3/1/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
							TOPSOIL, SP FL
5	460		SC	13.3	37	18	SI SD, BRN, MST, TR COAL&RTS&LS GV DEGDD BY AUGER, FL
10	455		SC	9.2	35	16	CRS SI SD, DK GY, MST, TR COAL& LS GV, FL
15	450		SC	10.4	36	18	SI SD, DK GY, MST, TR COAL&WTH SH, FL
20	445						DISCONTINUED.
25	440						
30	435						
	430						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: AH-2 STATION: 104+00S RANGE: 30+20W SURFACE EL: 486.2
DATE DRILLED: 3/1/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
0	485						TOPSOIL, SP FL
			U S	11.5	37	18	SI SD, BRN, MST, TR WTH SH DEGDD BY AUGER, TR LS GV, FL
5	480		U S	12.0	37	18	SI SD, BRN, MST, TR COAL&WTH SH, FL
10	475		U S	10.9	37	18	SI SD, BRN, MST, TR COAL&WTH SH, FL
15	470						DISCONTINUED.
20	465						
25	460						
30	455						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: AH-3 STATION: 96+50S RANGE: 27+70W SURFACE EL: 514.2
DATE DRILLED: 2/29/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
							TOPSOIL, SP FL
5	510		SC	14.2	37	17	SI SD, DK GY, MST, TR WTH SH& COAL&SS GV, FL
10	505		SC	12.7	37	17	CRS SI SD, DK GY, MST, TR COAL& WTH SH, FL
15	500		SC	11.0	37	17	CRS SI SD, DK GY, MST, TR COAL& WTH SH, FL
							DISCONTINUED.
20	495						
25	490						
30	485						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: AH-4 STATION: 88+80S RANGE: 25+20W SURFACE EL: 467.8
DATE DRILLED: 3/1/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
							TOPSOIL, SP FL
5	465		SW SM	11.3	32	8	SI SD, BLK, MST, TR WTH SH&COAL& FLY ASH, FL
10	460		SC	15.1	37	17	CL SD, GY, MST, TR COAL&SH&SS GV FL
15	455		CL	14.2	38	18	SI SD, BRN, MST, TR WTH SH&SS GV FL
20	450						DISCONTINUED.
25	445						
30	440						
	435						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: AH-5 STATION: 81+20S RANGE: 22+70W SURFACE EL: 473.7
DATE DRILLED: 3/1/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
							TOPSOIL, SP FL
5	470		US	12.4	35	16	SI SD, GY, MST, TR COAL&SH, FL
10	465		US	15.4	35	16	CL SD, GY, MST, TR COAL&SH, FL
15	460		US	11.6	37	18	SI SD, GY, MST, TR COAL&SH, FL
							DISCONTINUED.
20	455						
25	450						
30	445						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.

BORING: AH-6 STATION: 101+50S RANGE: 25+20W SURFACE EL: 492.0

DATE DRILLED: 3/1/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
							TOPSOIL, SP FL
	490		SC	11.8	37	18	SI SD, BRN, MST, TR COAL&SS GV& RTS&WTH SH, FL
5							▼
	485		CL	11.9	32	15	CL SD, BRN, MST, TR COAL&WTH SH, FL
10							
	480		CL	14.7	38	18	CL SD, BRN, MST, TR COAL&WTH SH, FL
15							
	475						DISCONTINUED.
20							
	470						
25							
	465						
30							
	460						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: AH-7 STATION: 97+70S RANGE: 23+90W SURFACE EL: 508.9
DATE DRILLED: 2/29/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
							TOPSOIL, SP FL
5	505		CS	12.0	37	18	SI SD, DK GY, MST, TR WTH SH&SS GV&RTS&COAL, FL
10	500		CS	12.7	37	18	SI SD, DK GY, MST, TR WTH SH&SS GV&LS GV&COAL, FL
15	495		CS	13.3	37	17	SI SD, DK GY, MST, TR WTH SH&LS GV&COAL, FL
							DISCONTINUED.
20	490						
25	485						
30	480						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: AH-8 STATION: 93+90S RANGE: 22+70W SURFACE EL: 485.9
DATE DRILLED: 3/1/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
	485						TOPSOIL, SP FL
			SC	13.0	37	18	SI SD, GY, MST, TR COAL&SH&RTS, FL
5	480		SC	12.2	35	16	SI SD, GY, MST, TR COAL&SS GV& WTH SH, FL
10	475		SC	13.0	37	17	SI SD, BRN, MST, TR WTH SH&COAL, FL
15	470						DISCONTINUED.
20	465						
25	460						
30	455						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: AH-9 STATION: 90+20S RANGE: 21+40W SURFACE EL: 460.6
DATE DRILLED: 3/1/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
	460						TOPSOIL, SP FL
			SC	13.9	35	16	SI SD, DK GY, V MST, TR COAL, LS GV, FL
5	455		SC	12.9	35	16	SI SD, DK GY, MST, TR COAL AND WTH SH, FL
10	450		SC	12.3	37	17	SI SD, DK GY, MST, TR COAL & WTH SH, FL
15	445						DISCONTINUED.
20	440						
25	435						
30	430						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: AH-10 STATION: 86+20S RANGE: 20+20W SURFACE EL: 460.5
DATE DRILLED: 3/1/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
	460						TOPSOIL, SP FL
			CL	14.5	32	15	SI SD, LT BRN, MST, TR SS GV, SH, FL
5	455		SC	10.3	37	18	SI SD, LT GY, MST, TR SH&COAL, FL
10	450		SC	10.9	35	16	CRS SI SD, LT GY, MST, TR SH, COAL, LS GV, FL
15	445						DISCONTINUED.
20	440						
25	435						
30	430						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: AH-11 STATION: 102+90S RANGE: 21+40W SURFACE EL: 470.7
DATE DRILLED: 3/1/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
	470						TOPSOIL, SP FL
			U S	10.6	37	18	SI SD, DK BRN, MST, TR COAL&RTS, SH, FL
5	465		U S	13.3	35	16	SI SD, DK BRN, MST, TR COAL&RTS& SS GV&SH, FL
10	460		U S	13.0	35	16	SI SD, DK BRN, MST, TR COAL&SS GV&WTH SH&WD&RTS, FL
15	455						DISCONTINUED.
20	450						
25	445						
30	440						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: AH-12 STATION: 98+90S RANGE: 20+10W SURFACE EL: 491.9
DATE DRILLED: 2/29/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
							TOPSOIL, SP FL
5	490		USCS	10.4	35	16	SI SD, DK BRN, MST, TR COAL&LS GV&WTH SH, FL
10	485		USCS	11.7	35	16	SI SD, DK GY, MST, TR COAL&LS GV &WTH SH, FL
15	480		USCS	6.9	35	16	CRS SI SD, GY, MST, TR COAL&LS GV&SS GV DEGDD BY DR, FL
20	475						DISCONTINUED.
25	470						
30	465						
	460						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: AH-13 STATION: 95+20S RANGE: 18+90W SURFACE EL: 491.0
DATE DRILLED: 3/1/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
	490						TOPSOIL, SP FL
5			US	13.3	37	18	SI SD, BRN, MST, TR RTS&COAL& WTH SH, FL
	485		US	8.5	37	18	CRS SI SD, DK BRN, MST, TR WTH SH&COAL&SS GV, FL
10							
	480		US	10.6	35	16	CRS SI SD, DK BRN, MST, TR WTH SH&COAL&SS GV, FL
15							
	475						DISCONTINUED.
20							
	470						
25							
	465						
30							
	460						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: AH-14 STATION: 91+20S RANGE: 17+60W SURFACE EL: 473.3
DATE DRILLED: 3/1/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
							TOPSOIL, SP FL
5	470		SC	11.4	37	18	SI SD, BRN, MST, TR COAL&SH&RTS, FL
10	465		SC	11.7	35	16	SI SD, BRN, MST, TR COAL&SH, FL
15	460		SC	8.8	35	16	SI SD, BRN, MST, TR COAL&SH, FL
							DISCONTINUED.
20	455						
25	450						
30	445						
	440						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: AH-15 STATION: 100+30S RANGE: 16+30W SURFACE EL: 479.4
DATE DRILLED: 2/29/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
							TOPSOIL, SP FL
5	475		SC	15.0	37	17	CL SI, MST, DK GY, TR WTH SH& SS GV, FL
10	470		CL	17.1	38	18	CL SI, DK GY, MST, TR COAL&WTH SH&SS GV, FL
15	465		SC	13.0	37	17	SI SD, GY, MST, TR COAL&LS GV& SS GV&WTH SH, FL
							DISCONTINUED.
20	460						
25	455						
30	450						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: AH-16 STATION: 96+50S RANGE: 15+70W SURFACE EL: 468.4
DATE DRILLED: 2/29/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
							TOPSOIL, SP FL
5	465		CL	19.4	36	17	CL SI, GY, MST, TR SH DEGDD BY AUGER, TR RTS, FL
10	460		CL	19.5	36	17	CL SI, GY, V MST, TR WTH SH DEGD BY AUGER, TR COAL, FL
15	455		CL	17.6	36	17	CL SI, GY, V MST, TR WTH SH DEGD BY AUGER, TR COAL&SS GV, FL
20	450						DISCONTINUED.
25	445						
30	440						
	435						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: AH-17 STATION: 92+50S RANGE: 13+90W SURFACE EL: 458.7
DATE DRILLED: 2/29/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	FIELD DESCRIPTION
							TOPSOIL, SP FL
5	455		CL	15.6	37	17	SI SD, GY, MST, TR WTH SH&WD&LS GV, FL
							▼
10	450		CL	18.6	38	18	SI SD, BRN, MST, TR SS GV&WTH SH FL
15	445		CL	16.1	38	18	SI SD, BRN, MST, TR COAL&WTH SH& LS GV&SS GV, FL
							DISCONTINUED.
20	440						
25	435						
30	430						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: US-3 STATION: 104+15S RANGE: 14+20W SURFACE EL: 454.6
DATE DRILLED: 3/1/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	DESCRIPTION (ENGINEERING TEST RESULTS)
5	450						
10	445						
15	440						NO RECOVERY
			CL	23.8	28	9	SD SI,R BRN-GY-BLK, V MST, S, FL R 17.1 0.48 $\bar{R}$ 32.1 0.08 Q 3.5 0.20
			CL	20.5	30	12	
20	435						NO RECOVERY
25	430		CL	20.5	30	14	SI CL, TR GV, BRN, MST, S, FL
30	425		CL	17.6	25	10	SI CL, BRN-GY, MST, S, FL R 22.5 0.21 $\bar{R}$ 32.3 0.00 Q 3.2 0.52

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: US-3 STATION: 104+15S RANGE: 14+20W SURFACE EL: 454.6
DATE DRILLED: 3/1/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	DESCRIPTION (ENGINEERING TEST RESULTS)
40	415						
45	410						NO RECOVERY
50	405						
55	400						
60	395						DISCONTINUED. REFUSAL EL 396.9
65	390						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: US-3A STATION: 104+15S RANGE: 14+15W SURFACE EL: 455.6
DATE DRILLED: 3/2/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	DESCRIPTION (ENGINEERING TEST RESULTS)
	455						
5	450						
10	445						
15	440						
20	435						
25	430						
30	425						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: US-3A STATION: 104+15S RANGE: 14+15W SURFACE EL: 455.6
DATE DRILLED: 3/2/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	DESCRIPTION (ENGINEERING TEST RESULTS)
	420						
40	415						
45	410						
50	405						
			CL	10.9	34	15	CL SI, TR LS GV, GY, MST, V F,FL
55	400						REFUSAL
							DISCONTINUED. EL 400.1
60	395						
65	390						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: US-6 STATION: 91+05S RANGE: 9+30W SURFACE EL: 446.5
DATE DRILLED: 3/5/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	DESCRIPTION (ENGINEERING TEST RESULTS)
	445						
5							
	440						
			CL	14.0	37	16	SI CL, TR WTH SH&SS GV, GY, MST, S, FL
10							
	435		GC	18.8			SI CL, TR WTH SH&SS GV&COAL, GY, MST, S, FL
					37	17	R 15.4 0.17 $\bar{R}$ 31.4 0.01
15							
	430						
20							
	425						
			CL	21.0			CL SI(WTH SH), GY-BRN, D, FL
25					39	19	R 9.5 0.47 $\bar{R}$ 18.6 0.24
	420						Q 11.0 0.42
30							
	415						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: US-6 STATION: 91+05S RANGE: 9+30W SURFACE EL: 446.5
DATE DRILLED: 3/5/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	DESCRIPTION (ENGINEERING TEST RESULTS)
	410						
40							NO RECOVERY
	405						
45							
	400						DISCONTINUED. REFUSAL EL 401.3
50							
	395						
55							
	390						
60							
	385						
65							
	380						

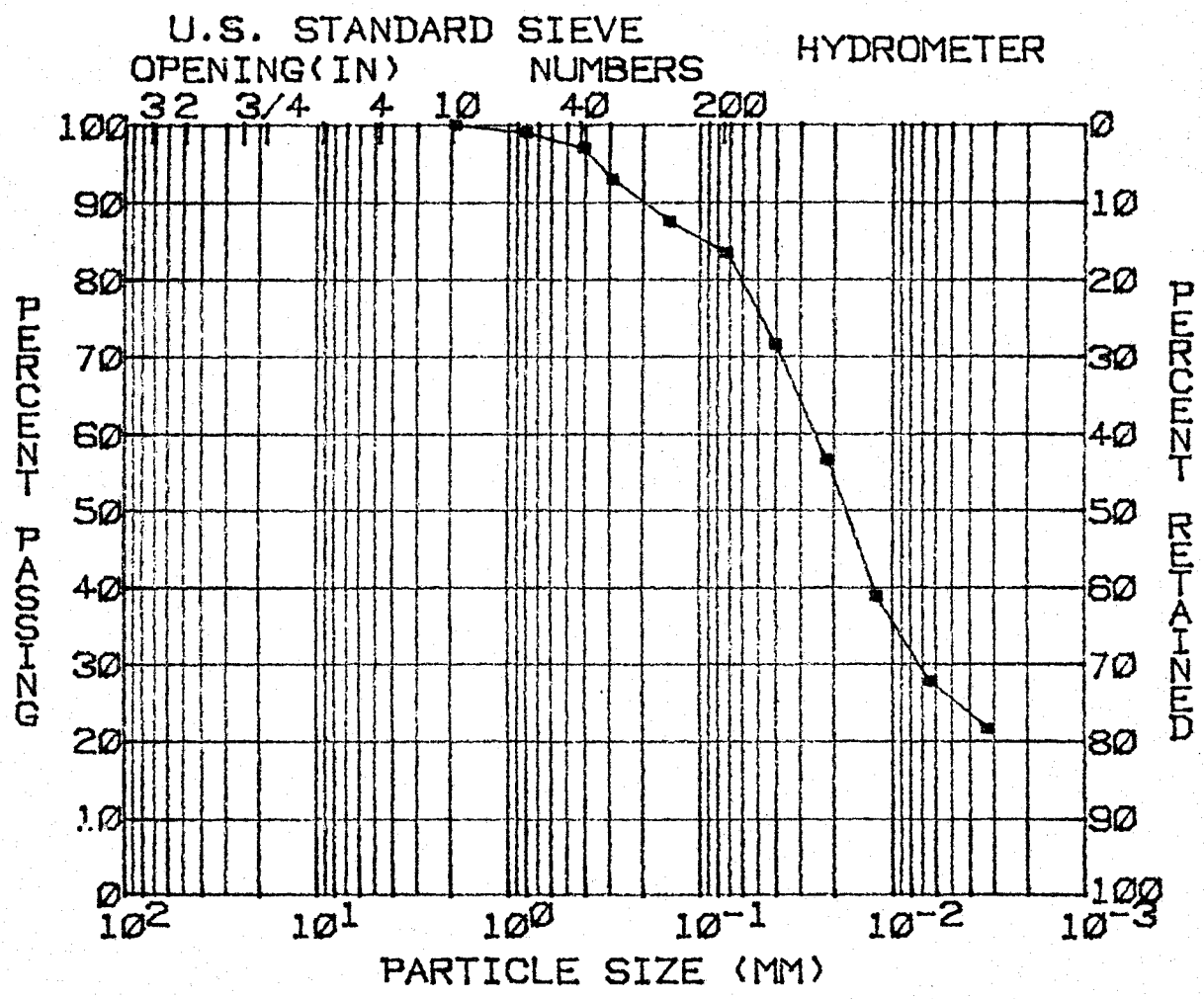
PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: US-6A STATION: 91+00S RANGE: 9+30W SURFACE EL: 446.5
DATE DRILLED: 3/5/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	DESCRIPTION (ENGINEERING TEST RESULTS)
	445						
5							
	440						
10							
	435						
15							
	430						
20							
	425						
25							
	420						
30							
	415						

PROJECT: PARADISE S.P. FEATURE: SCBR SLDG DPSL A.
BORING: US-6A STATION: 91+00S RANGE: 9+30W SURFACE EL: 446.5
DATE DRILLED: 3/5/84 TO PREPARED BY: MHD CHECKED BY: BA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	DESCRIPTION (ENGINEERING TEST RESULTS)
40	410						
	405		CL	12.2	34	15	IR; GV CL SI(COAL GV), GY-BLK, D, F, FL
45			CL	13.5	31	13	CL SI, TR GV, GY, MST, F, FL
	400						DISCONTINUED. EL 399.7
50	395						
55	390						
60	385						
65	380						

PROJECT:PARADISE S.P. BORING:US-3
FEATURE:SCBR SLDG DPSL A. EL. :438.6-437.9
STATION:104+15S SAMPLE:1
RANGE :14+20W DATE :3-22-84



GRAVEL(%)= 0
SAND(%) = 16
SILT(%) = 58
CLAY(%) = 26

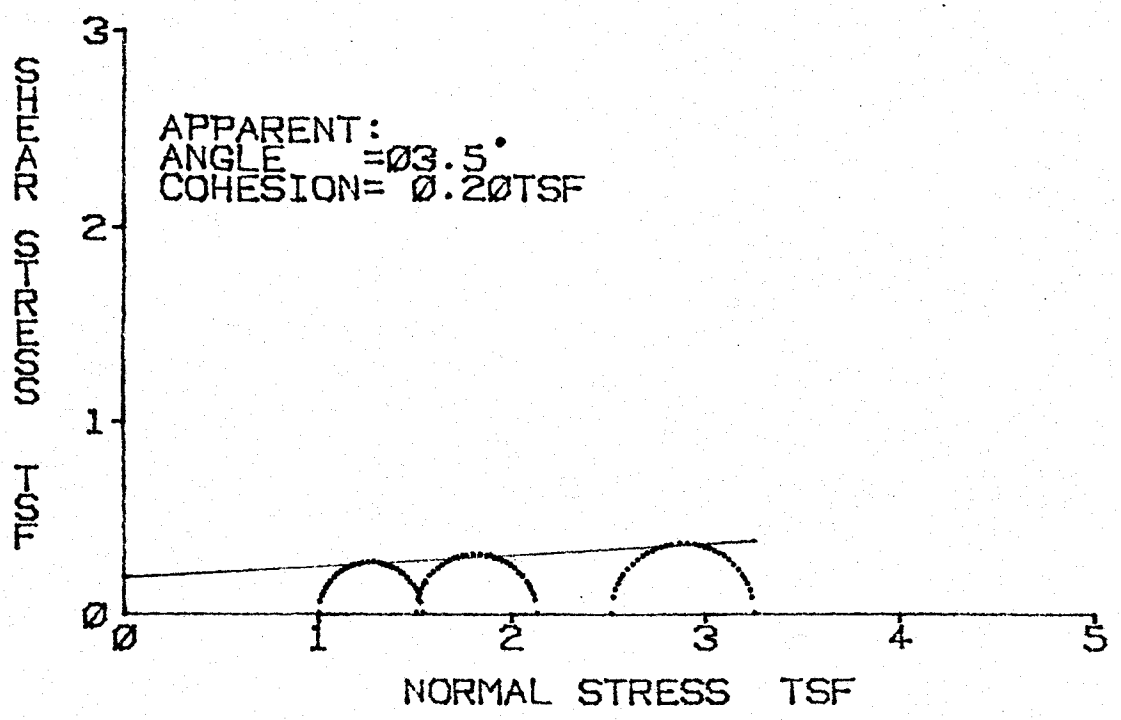
D10(MM) = --
D30(MM) = --
D60(MM) = --
COEF UNIF= --

SOIL SYMBOL= CL
MOISTURE(%)= 23.3
SP. GR. = 2.72

L.L.(%) = 28
P.I.(%) = 9

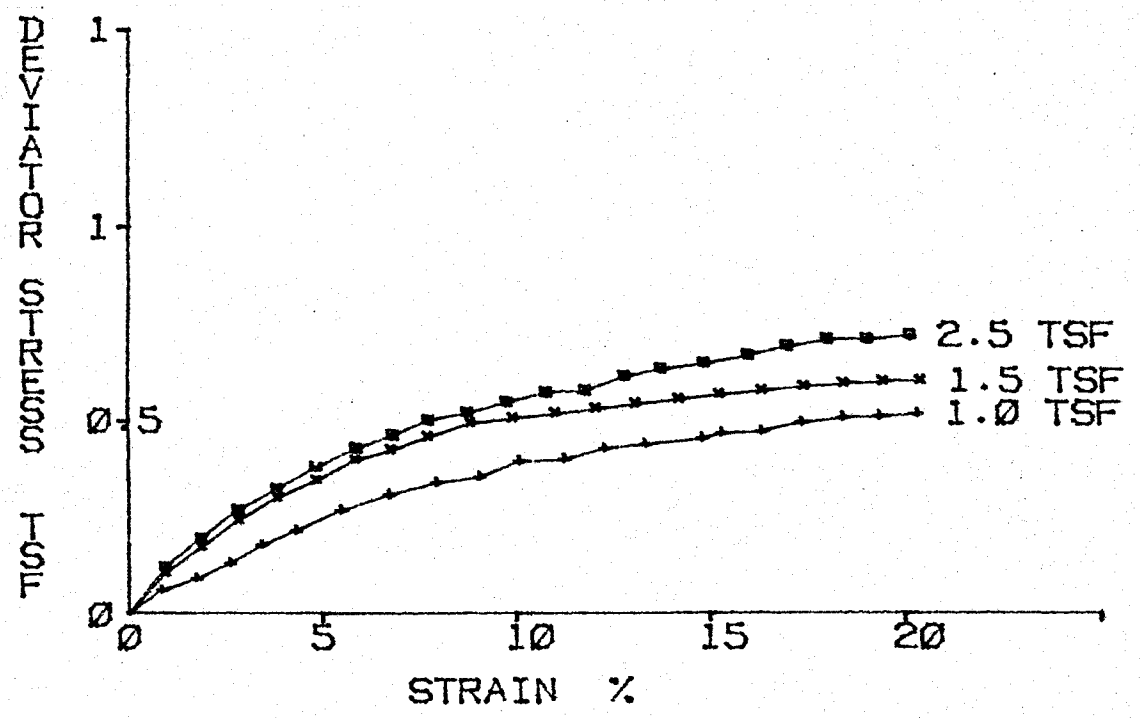
REMARKS:

PROJECT:PARADISE S.P. EL. :438.7-438.4
FEATURE:SBR SLDG DPSL A. SAMPLE :1
STATION:104+15S PART :1
RANGE :14+20W SOIL SYM:CL
BORING :US-3 DATE :3-28-84



REMARKS:

PROJECT:PARADISE S.P. EL. :438.7-438.4
FEATURE:SBR SLDG DPSL A. SAMPLE :1
STATION:104+15S PART :1
RANGE :14+20W SOIL SYM:CL
BORING :US-3 DATE :3-28-84



REMARKS:

Project: PARADISE S.P.
Feature: SCBR SLDG DPSL A.
Station: 104+15S
Range : 14+20W
Boring : US-3

El. : 438.7-438.4
Sample: 1
Part : 1

Tested By : EL
Computed By: MHD
Checked By : CBA
Report Date: 3-28-84

Soil Sybmbol= CL
Sp. Gr. = 2.72

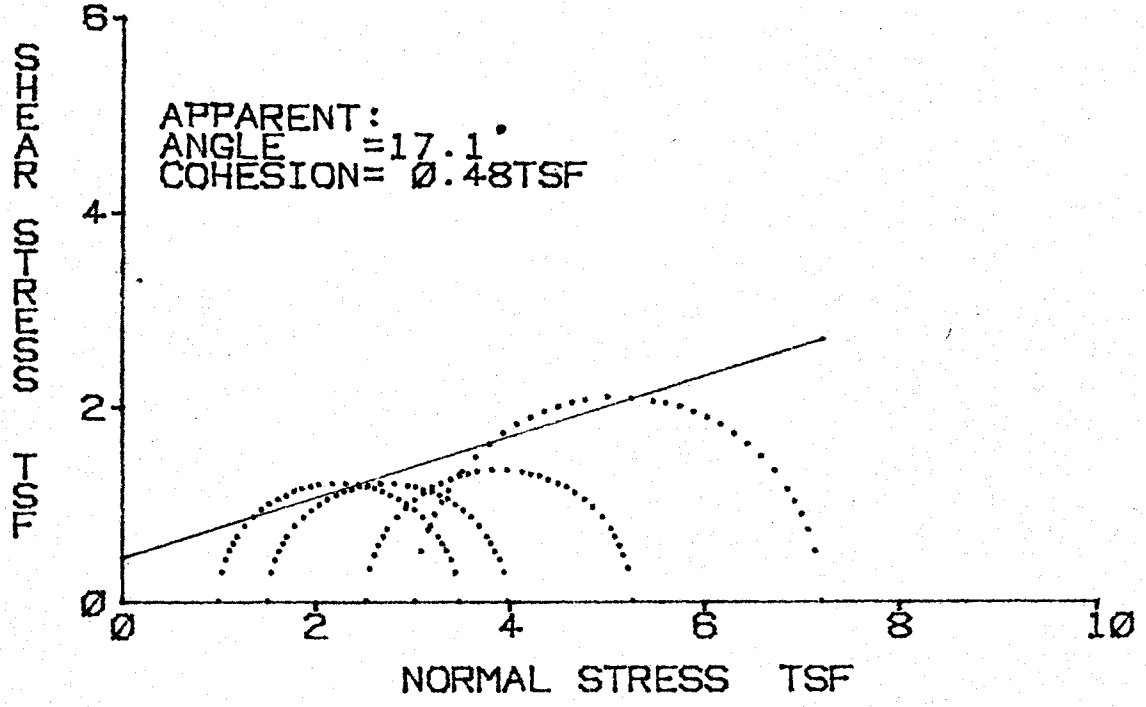
L.L.(%)= 28
D10(mm)= 0

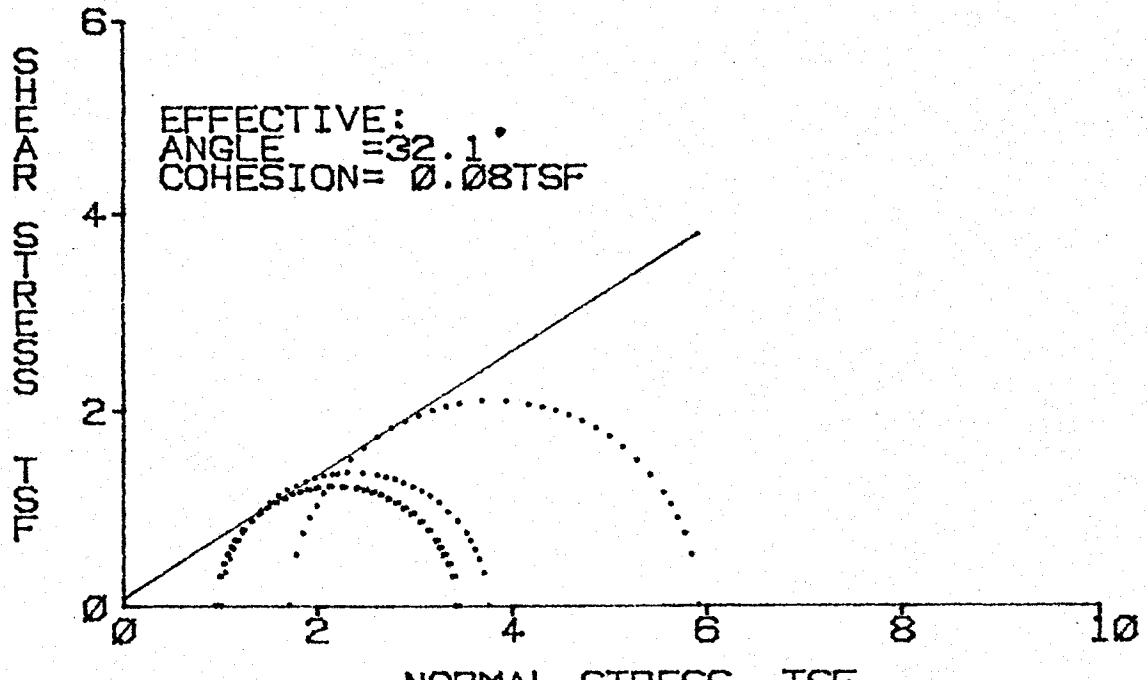
P.I.(%)= 9

Specimen Number	1	2	3	4
Initial:				
Moisture Content(%)	23.8	24.7	23.7	0.0
Dry Density(pcf)	101.6	99.9	102.4	0.0
Void Ratio	0.672	0.700	0.659	0.000
Saturation(%)	96.2	96.1	97.7	0.0
Before Shearing:				
Moisture(%) (after satur.)	--	--	--	--
Saturation(%)	--	--	--	--
Moisture(%) (after cons.)	--	--	--	--
Void Ratio (after cons.)	--	--	--	--
Final Moisture Content(%)	23.1	24.4	23.2	0.0
Minor Principal Stress(tsf)	1.01	1.51	2.52	0.00
Major Principal Stress(tsf)	1.55	2.14	3.26	0.00
Eff. Minor Prin. Stress(tsf)	--	--	--	--
Eff. Major Prin. Stress(tsf)	--	--	--	--
Time to Failure(min.)	20	20	20	0
Rate of Strain(%/min.)	1.03	1.03	1.02	0.00
Specimen Height(in.)	3.08	3.08	3.08	3.08
Specimen Diameter(in.)	1.40	1.40	1.40	1.40

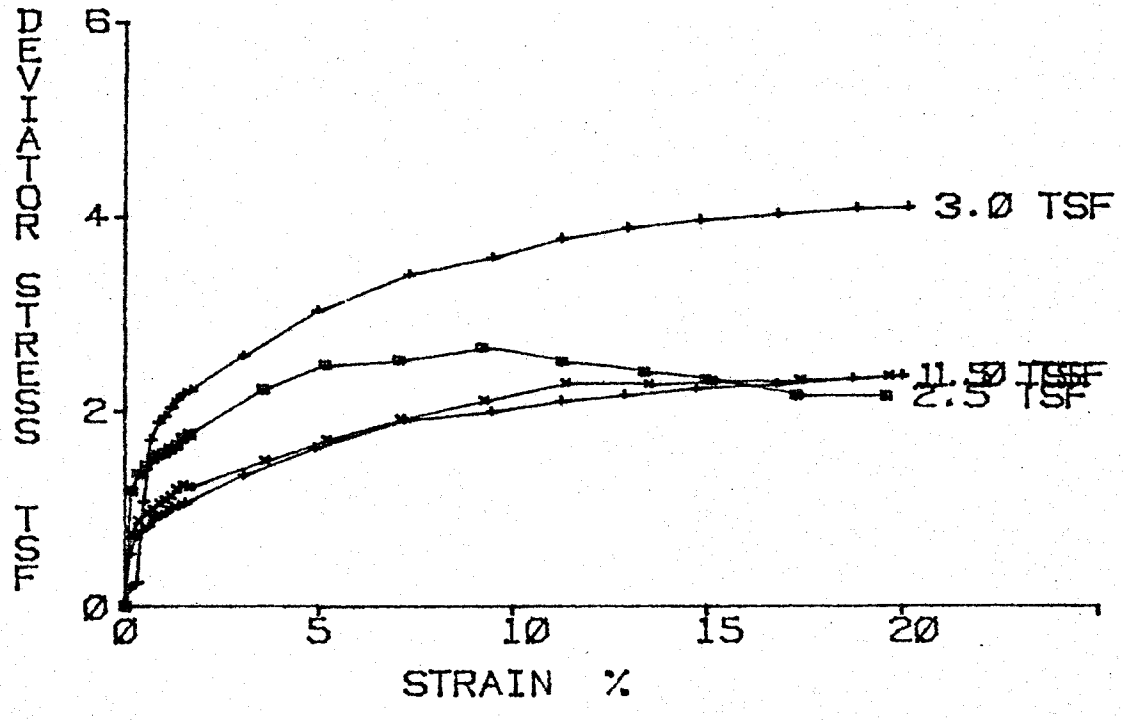
Shear Strength	Deg.	c(tsf)
Apparent	3.5	0.20
Effective	--	--

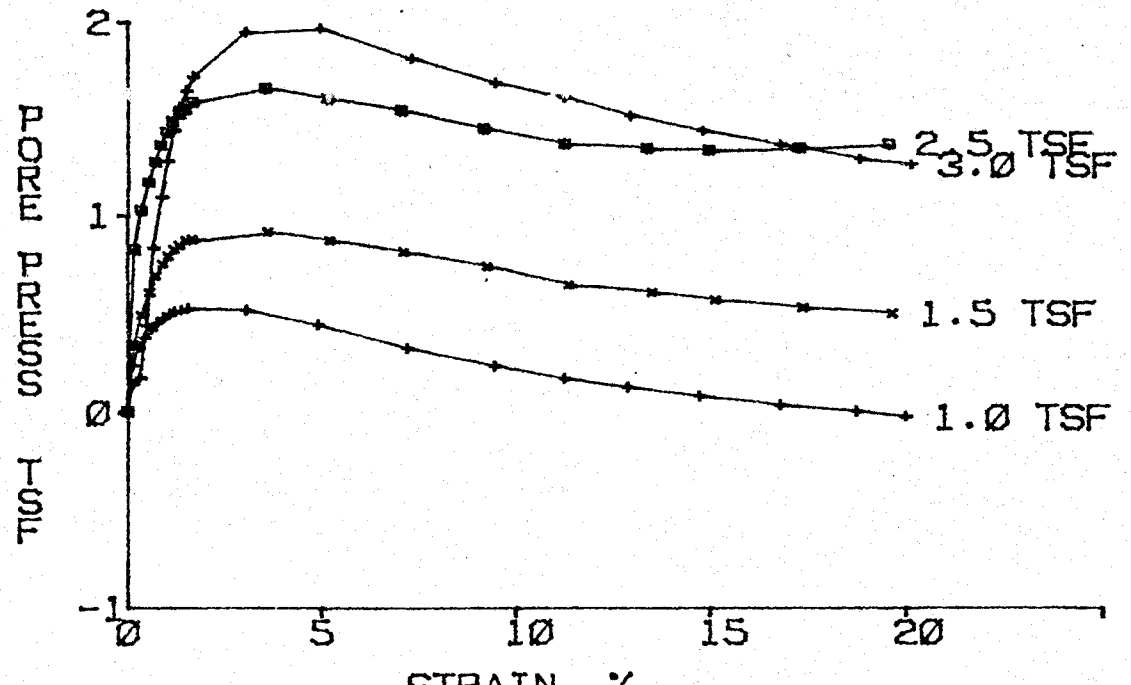
PROJECT:PARADISE S.P. EL. :438.4-437.9
FEATURE:SBR SLD DPSL A. SAMPLE :1
STATION:1Ø4+15S PART :2
RANGE :14+2ØW SOIL SYM:CL
BORING :US-3 DATE :3-27-84





PROJECT:PARADISE S.P. EL. :438.4-437.9
FEATURE:SBR SLD DPSL A. SAMPLE :1
STATION:10+15S PART :2
RANGE :14+20W SOIL SYM:CL
BORING :US-3 DATE :3-27-84





Consolidated Undrained Triaxial Compression (R) Test

Project: PARADISE S.P.
Feature: SCBR SLDG DPSL A.
Station: 104+15S
Range : 14+20W
Boring : US-3

El. : 438.4-437.9
Sample: 1
Part : 2

Tested By : TAL
Computed By: MHD
Checked By : CBE
Report Date: 3-27-84

Soil Sybmbol= CL
Sp. Gr. = 2.72

L.L.(%)= 28
D10(mm)= 0

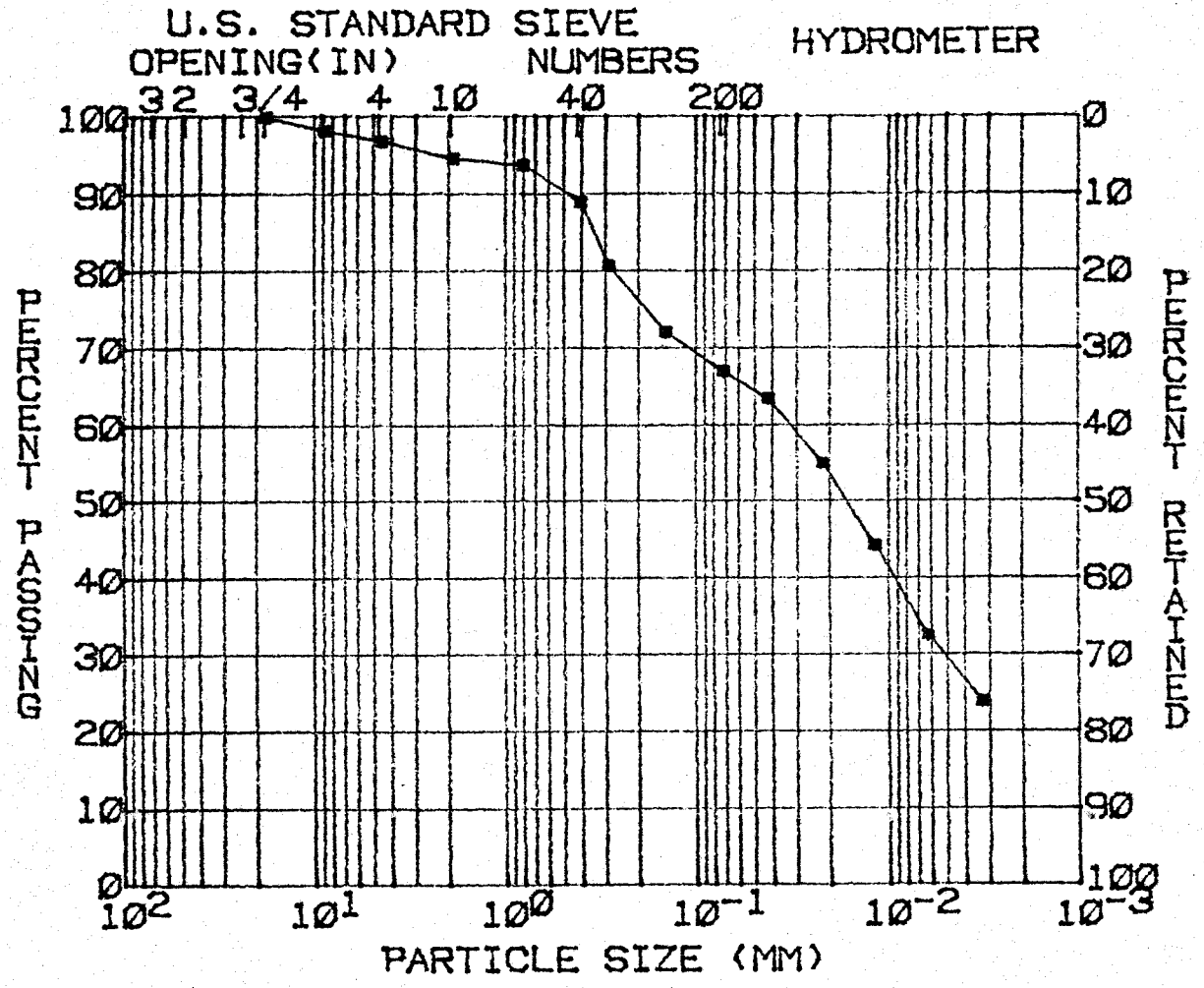
P.I.(%)= 9

Specimen Number	1	2	3	4
Initial:				
Moisture Content(%)	23.9	23.4	23.7	23.9
Dry Density(pcf)	100.6	100.0	101.2	99.8
Void Ratio	0.688	0.699	0.678	0.701
Saturation(%)	94.4	91.1	95.2	92.7
Before Shearing:				
Moisture(%) (after satur.)	25.3	25.7	24.9	25.8
Saturation(%)	100.0	100.0	100.0	100.0
Moisture(%) (after cons.)	23.8	23.2	23.9	23.9
Void Ratio (after cons.)	0.646	0.631	0.650	0.627
Final Moisture Content(%)	20.5	20.7	20.1	19.7
Minor Principal Stress(tsf)	1.01	1.51	2.52	3.02
Major Principal Stress(tsf)	3.49	3.99	5.27	7.23
Eff. Minor Prin. Stress(tsf)	0.99	0.96	1.03	1.72
Eff. Major Prin. Stress(tsf)	3.47	3.44	3.78	5.93
Time to Failure(min.)	105	100	50	105
Rate of Strain(%/min.)	0.19	0.20	0.19	0.19
Specimen Height(in.)	3.14	3.14	3.14	3.14
Specimen Diameter(in.)	1.41	1.41	1.41	1.41

Shear Strength	Deg.	c(tsf)
Apparent	17.1	0.48
Effective	32.1	0.08

PROJECT:PARADISE S.P.
FEATURE:SCBR SLDG DPSL A.
STATION:104+15S
RANGE :14+20W

BORING:US-3
EL. :437.9-436.8
SAMPLE:1
DATE :3-22-84



GRAVEL(%)= 2
SAND(%) = 30
SILT(%) = 38
CLAY(%) = 30

D10(MM) = --
D30(MM) = --
D60(MM) = --
COEF UNIF= --

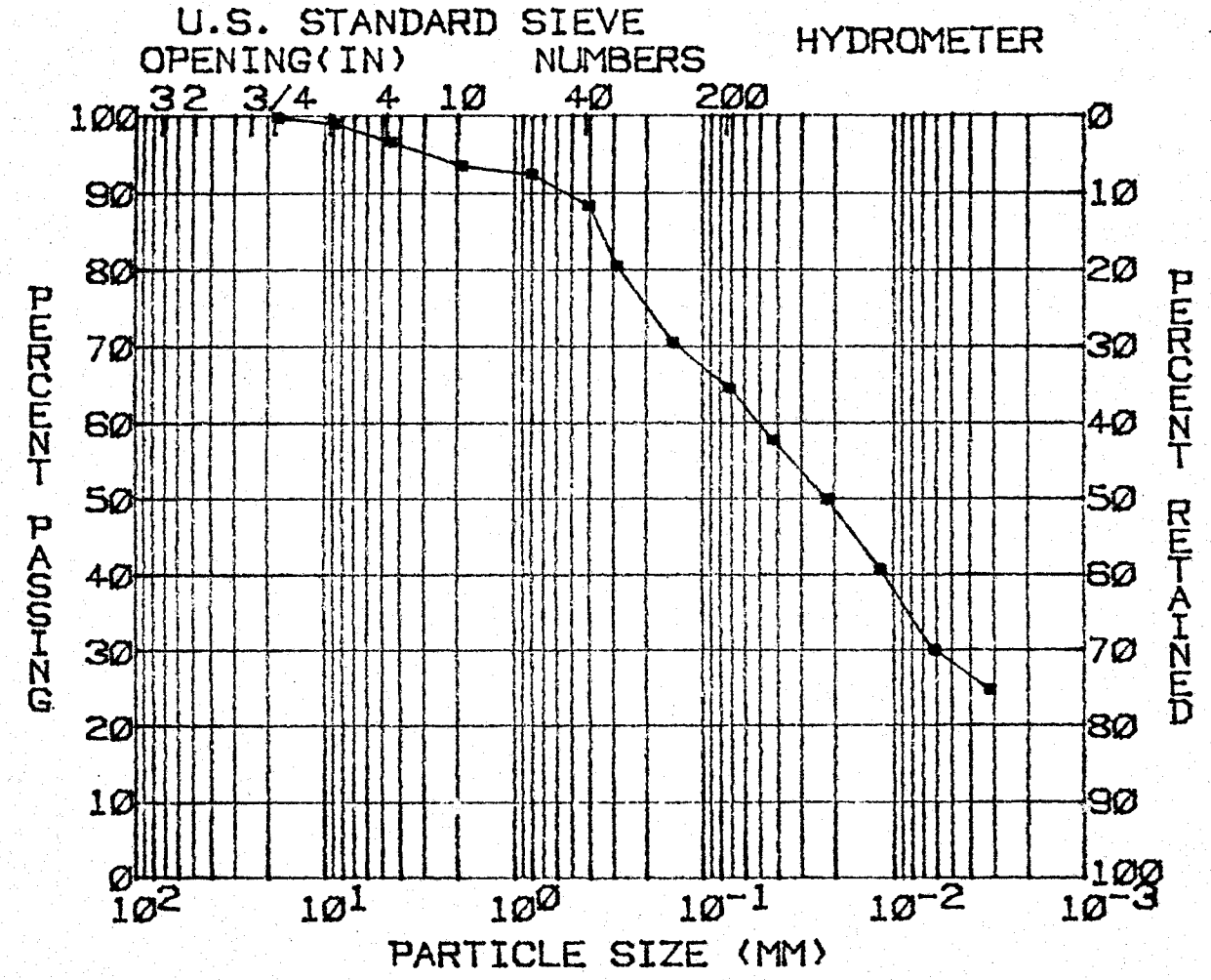
SOIL SYMBOL= CL
MOISTURE(%)= 20.5
SP. GR. = 2.61

L.L.(%) = 30
P.I.(%) = 12

REMARKS:

PROJECT:PARADISE S.P.
FEATURE:SCBR SLDG DPSL A.
STATION:104+15S
RANGE :14+20W

BORING:US-3
EL. :431.6 429.8
SAMPLE:2
DATE :3-22-84



GRAVEL(%)= 3
SAND(%) = 32
SILT(%) = 37
CLAY(%) = 28

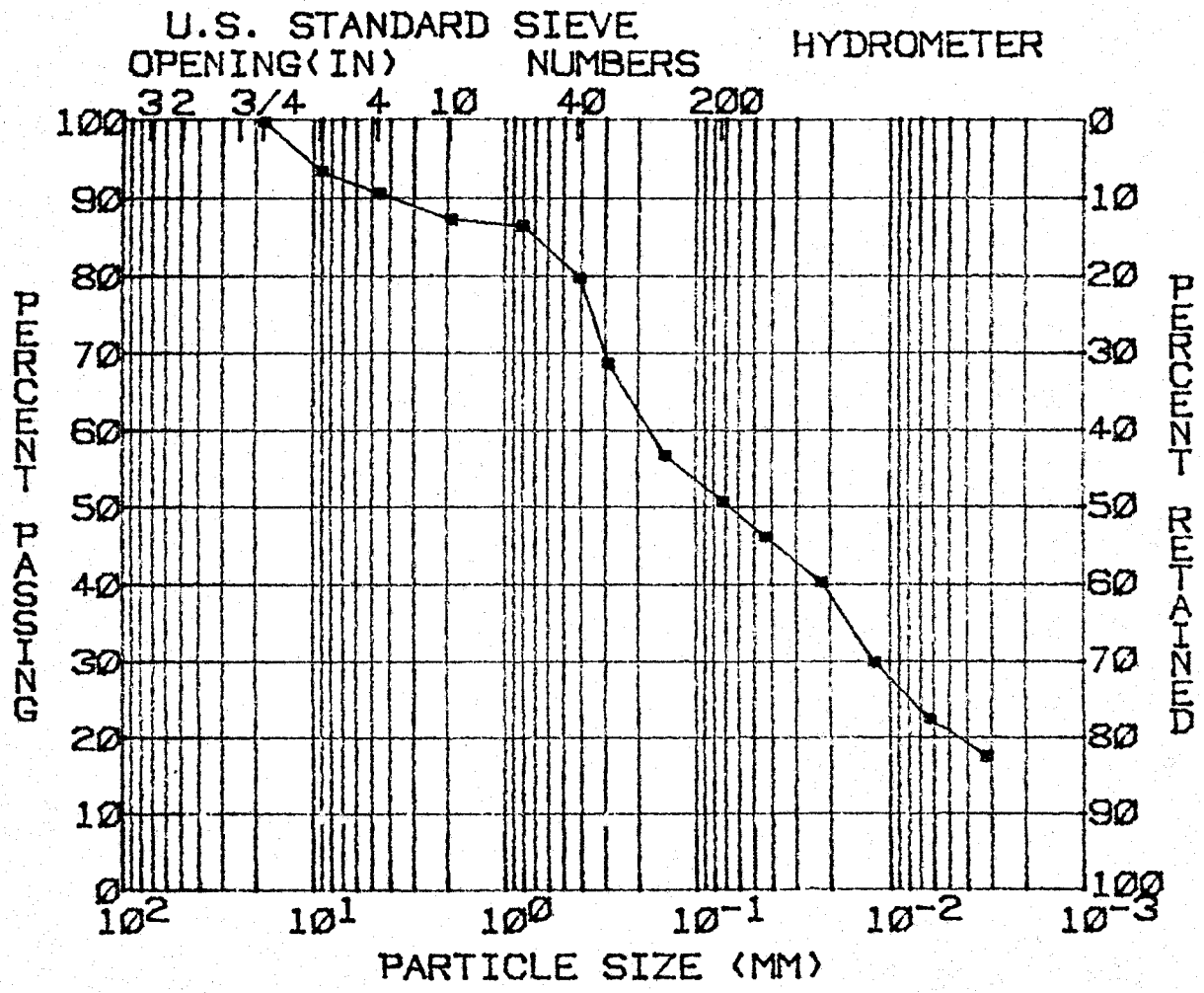
D10(MM) = --
D30(MM) = --
D60(MM) = --
COEF UNIF= --

SOIL SYMBOL= CL
MOISTURE(%)= 17.9
SP. GR. = 2.69

L.L.(%) = 30
P.I.(%) = 14

REMARKS:

PROJECT:PARADISE S.P. BORING:US-3
FEATURE:SCBR SLDG DPSL A. EL. :424.6-422.5
STATION:104+15S SAMPLE:3
RANGE :14+20W DATE :3-22-84



GRAVEL(%)= 9
SAND(%) = 40
SILT(%) = 30
CLAY(%) = 21

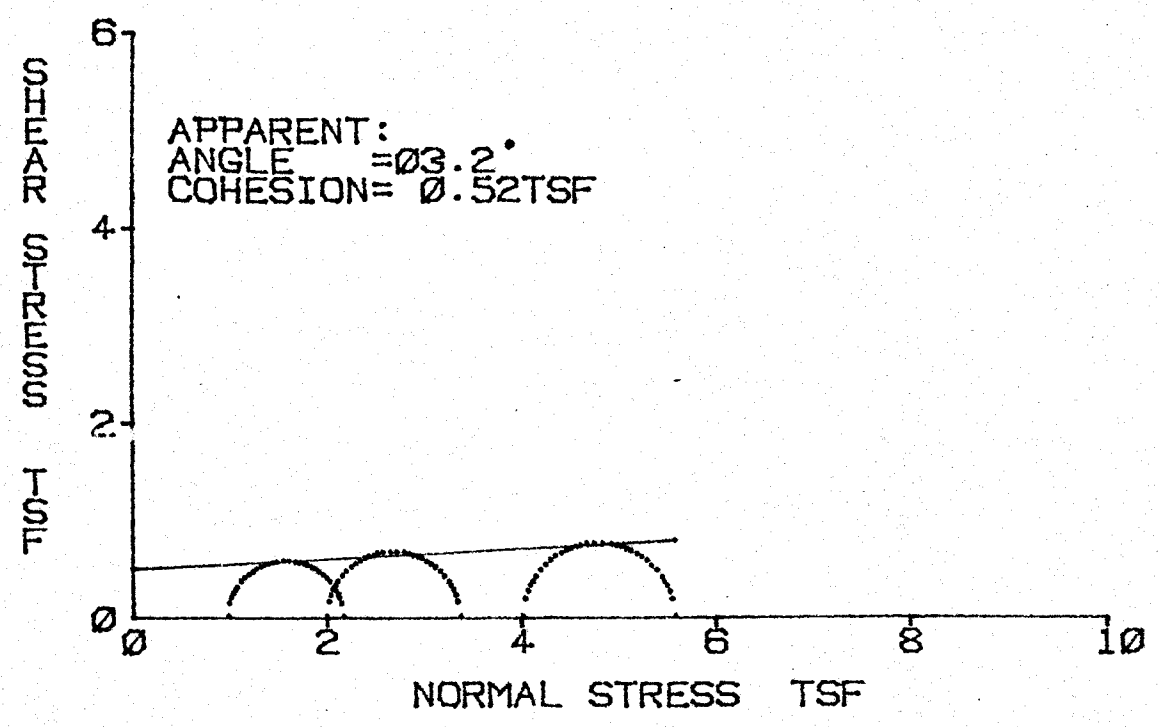
D10(MM) = --
D30(MM) = --
D60(MM) = --
COEF UNIF= --

SOIL SYMBOL= CL
MOISTURE(%)= 16.8
SP. GR. = 2.70

L.L.(%) = 25
P.I.(%) = 10

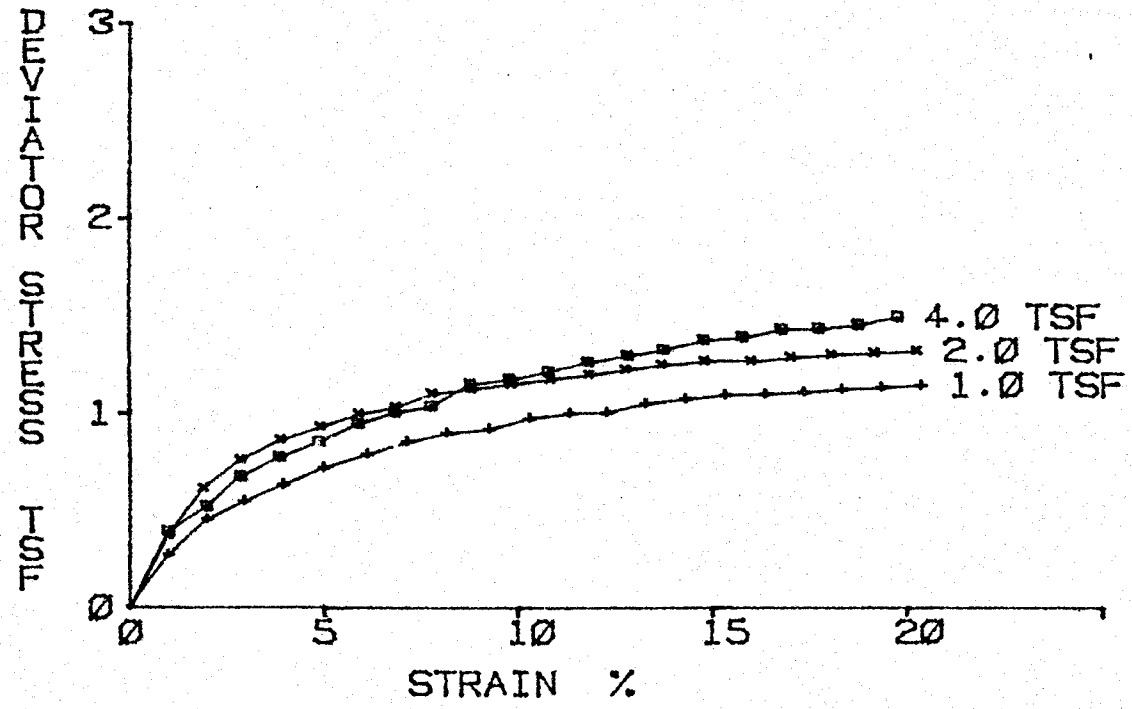
REMARKS:

PROJECT:PARADISE S.P. EL. :424.1-423.6
FEATURE:SRB SLDG DPSL A. SAMPLE :3
STATION:104+15S PART :2
RANGE :14+20S SOIL SYM:CL
BORING :US-3 DATE :3-27-84



REMARKS:

PROJECT:PARADISE S.P. EL. :424.1-423.6
FEATURE:SRB SLDG DPSL A.SAMPLE :3
STATION:104+15S PART :2
RANGE :14+20S SOIL SYM:CL
BORING :US-3 DATE :3-27-84



REMARKS:

Unconsolidated Undrained Triaxial Compression (Q) Test

Project: PARADISE S.P.
Feature: SCRB SLDG DPSL A.
Station: 104+15S
Range : 14+20S
Boring : US-3

El. : 424.1-423.6
Sample: 3
Part : 2

Tested By : EL
Computed By: MHD
Checked By : CBLee
Report Date: 3-27-84

Soil Symbol= CL
Sp. Gr. = 2.7

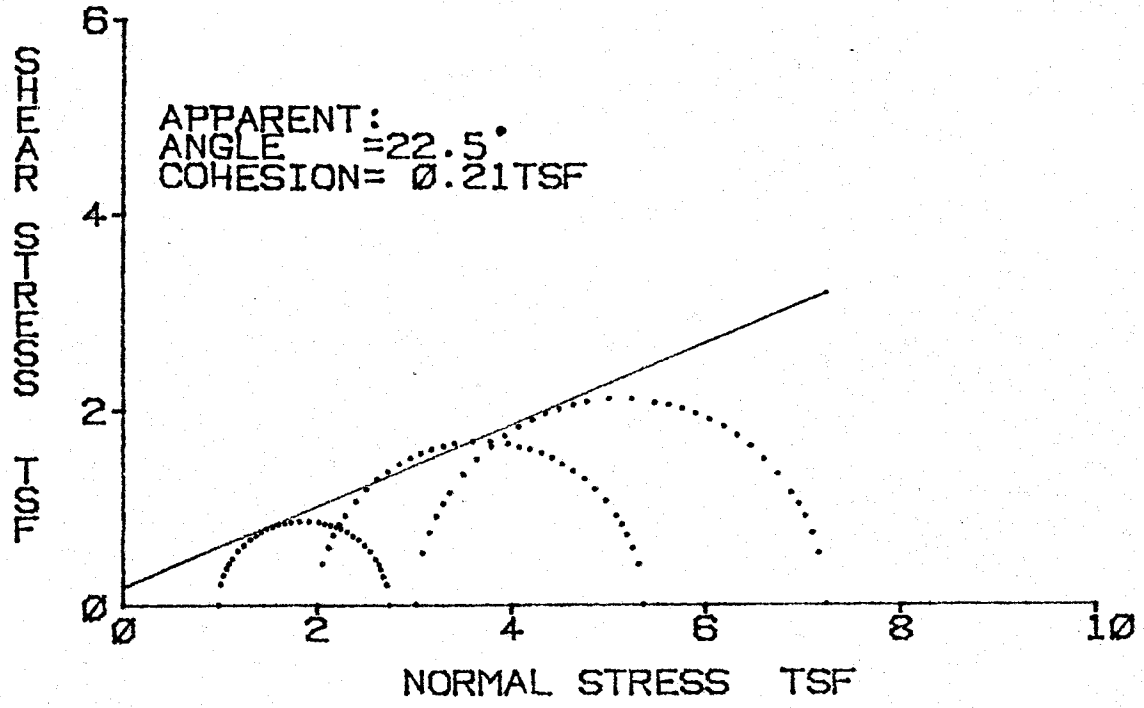
L.L.(%)= 25
D10(mm)= 0

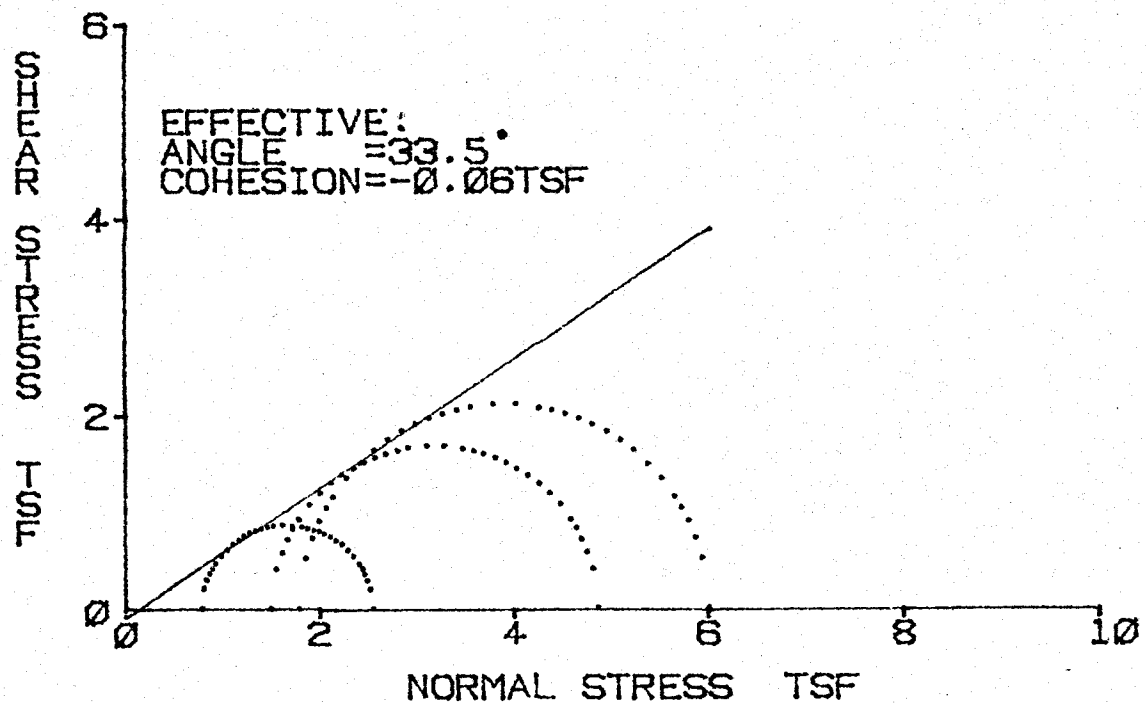
P.I.(%)= 10

Specimen Number	1	2	3	4
Initial:				
Moisture Content(%)	17.0	17.4	16.8	0.0
Dry Density(pcf)	110.3	111.0	111.0	0.0
Void Ratio	0.528	0.519	0.519	0.000
Saturation(%)	86.9	90.6	87.2	0.0
Before Shearing:				
Moisture(%) (after satur.)	--	--	--	--
Saturation(%)	--	--	--	--
Moisture(%) (after cons.)	--	--	--	--
Void Ratio (after cons.)	--	--	--	--
Final Moisture Content(%)	16.8	17.1	16.6	0.0
Minor Principal Stress(tsf)	1.01	2.02	4.03	0.00
Major Principal Stress(tsf)	2.20	3.40	5.59	0.00
Eff. Minor Prin. Stress(tsf)	--	--	--	--
Eff. Major Prin. Stress(tsf)	--	--	--	--
Time to Failure(min.)	20	20	20	0
Rate of Strain(%/min.)	1.03	1.03	1.00	0.00
Specimen Height(in.)	3.08	3.08	3.08	3.08
Specimen Diameter(in.)	1.40	1.40	1.40	1.40

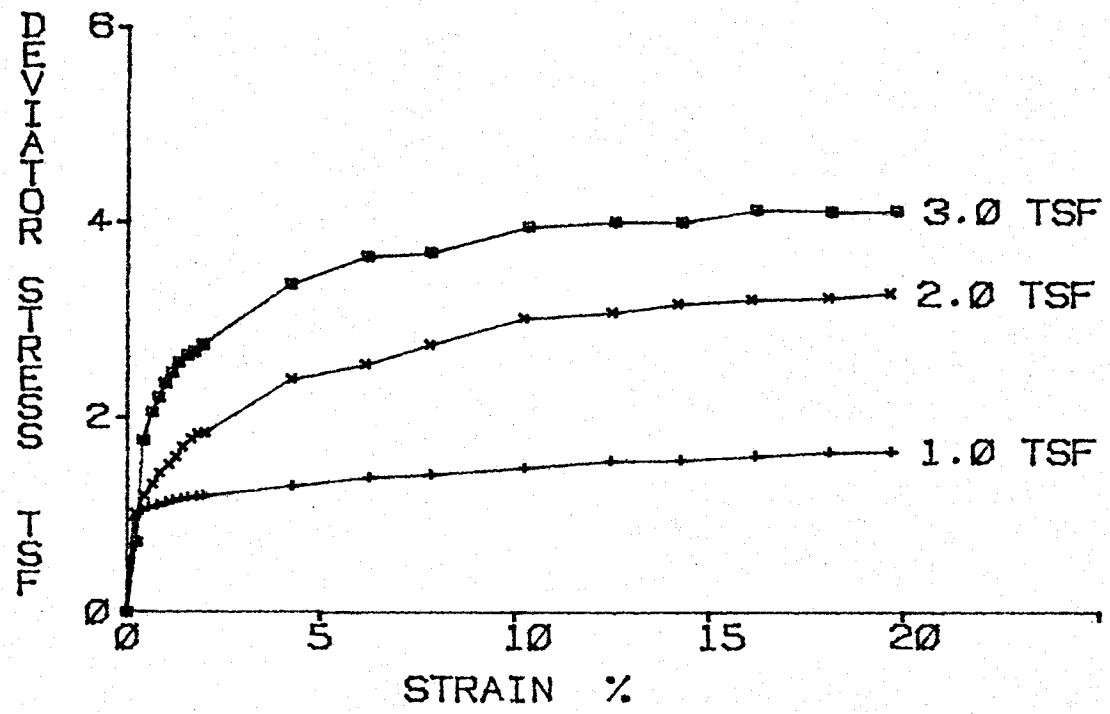
Shear Strength	Deg.	c(tsf)
Apparent	3.2	0.52
Effective	--	--

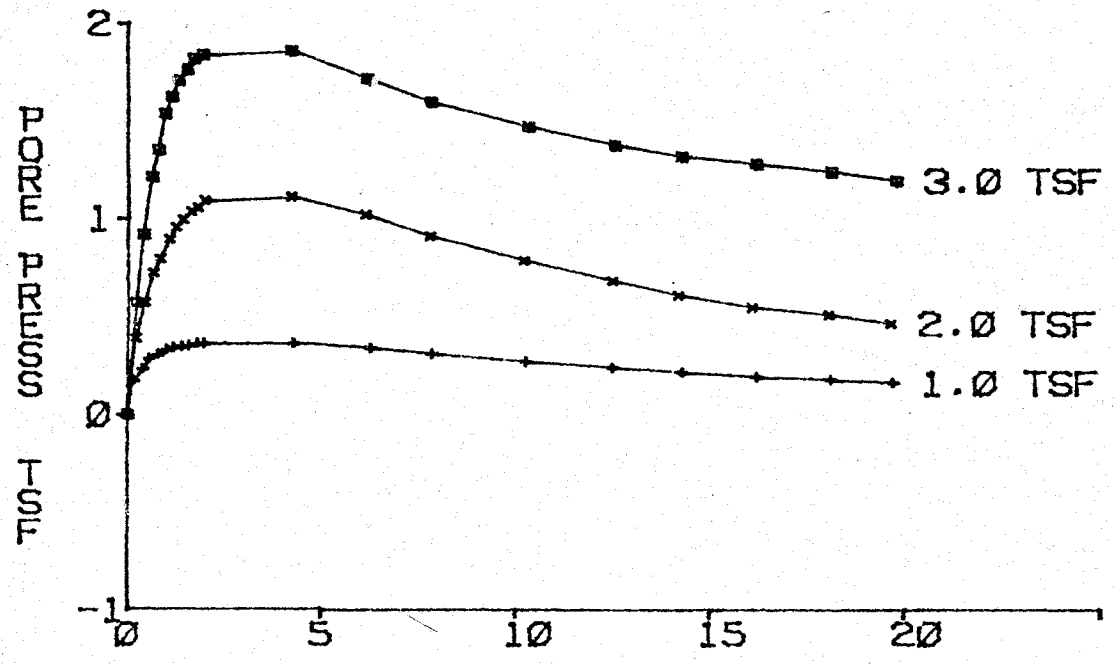
PROJECT:PARADISE S.T. LL: :428.8 424.1
FEATURE:SBR SDG DPSL A. SAMPLE :3
STATION:104+15S PART :1
RANGE :14+20W SOIL SYM:CL
BORING :US-3 DATE :3-27-84





PROJECT:PARADISE S.P. EL. :426.6-424.1
FEATURE:SBR SDG DPSL A. SAMPLE :3
STATION:104+15S PART :1
RANGE :14+20W SOIL SYM:CL
BORING :US-3 DATE :3-27-84





Consolidated Undrained Triaxial Compression (R) Test

Project: PARADISE S.P.
Feature: SCBR SLDG DPSL A.
Station: 104+15S
Range : 14+20W
Boring : US-3

El. : 426.6-424.1
Sample: 3
Part : 1

Tested By : EL MD
Computed By: MHD
Checked By : UBG
Report Date: 3-27-84

Soil Sybmbol= CL
Sp. Gr. = 2.7

L.L.(%)= 25
D10(mm)= 0

P.I.(%)= 10

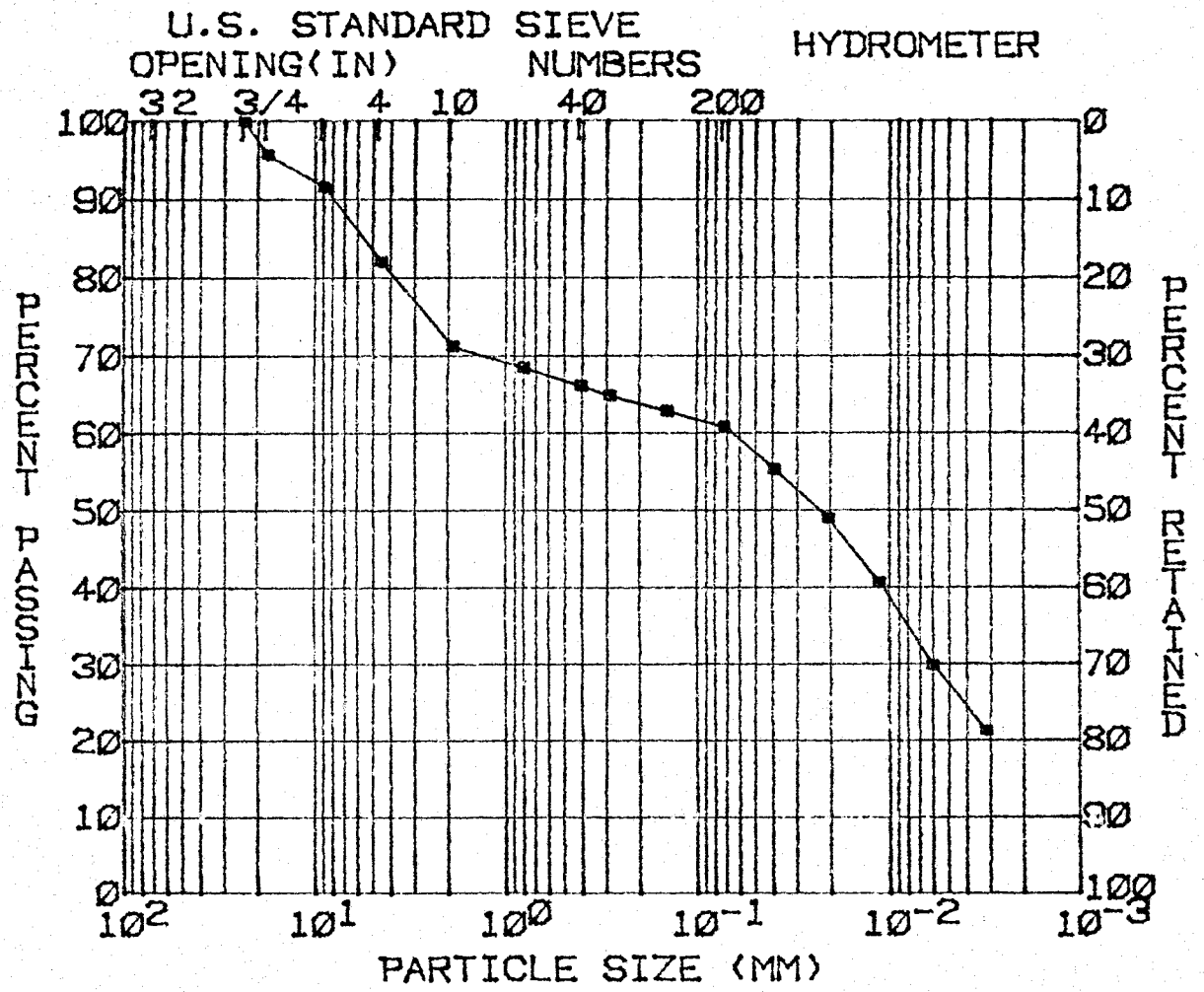
Specimen Number	1	2	3	4
Initial:				
Moisture Content(%)	19.6	17.9	18.0	0.0
Dry Density(pcf)	106.2	110.2	109.8	0.0
Void Ratio	0.587	0.530	0.536	0.000
Saturation(%)	90.3	91.2	90.9	0.0
Before Shearing:				
Moisture(%) (after satur.)	21.7	19.6	19.8	0.0
Saturation(%)	100.0	100.0	100.0	0.0
Moisture(%) (after cons.)	19.1	16.9	15.9	15.9
Void Ratio (after cons.)	0.515	0.455	0.430	0.000
Final Moisture Content(%)	18.1	16.3	16.1	0.0
Minor Principal Stress(tsf)	1.01	2.02	3.02	0.00
Major Principal Stress(tsf)	2.77	5.38	7.25	0.00
Eff. Minor Prin. Stress(tsf)	0.81	1.52	1.79	0.00
Eff. Major Prin. Stress(tsf)	2.56	4.89	6.02	0.00
Time to Failure(min.)	100	100	100	0
Rate of Strain(%/min.)	0.20	0.20	0.20	0.00
Specimen Height(in.)	3.08	3.08	3.08	3.08
Specimen Diameter(in.)	1.40	1.40	1.40	1.40

Shear Strength	Deg.	c(tsf)
Apparent	22.5	0.21
Effective	33.5	-0.06

Remarks: Analyzing the data by the method of least squares in the form of y=mx, the effective friction angle is 32.3° and the effective cohesion is 0.00 tsf.

PROJECT:PARADISE S.P.
FEATURE:SCBR SLDG DPSL A.
STATION:104+15S
RANGE :14+15W

BORING:US-3A
EL. :402.6-401.7
SAMPLE:1
DATE :3-22-84



GRAVEL(%)= 17
SAND(%) = 21
SILT(%) = 34
CLAY(%) = 28

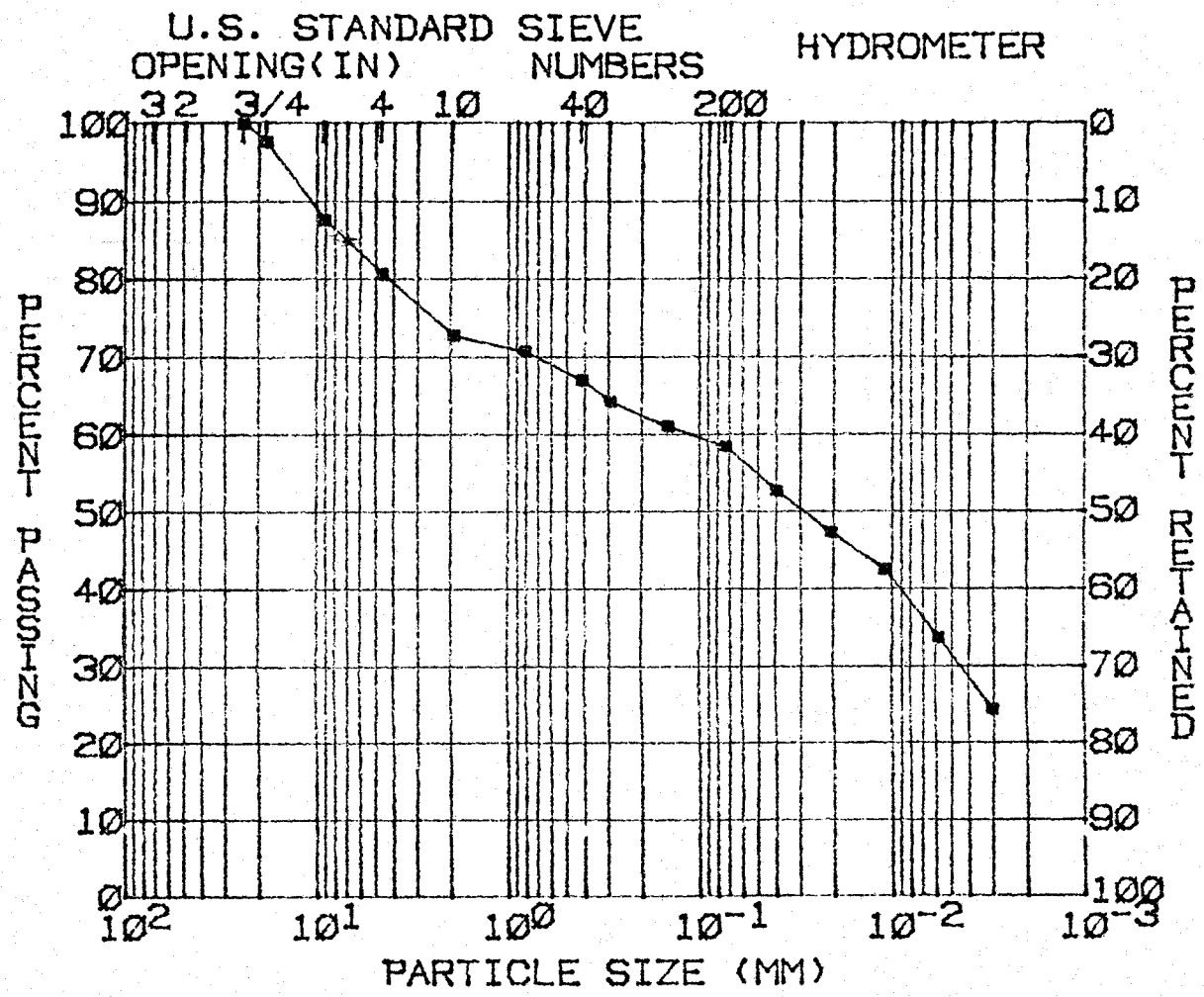
D10(MM) = --
D30(MM) = --
D60(MM) = --
COEF UNIF= --

SOIL SYMBOL= CL
MOISTURE(%)= 10.6
SP. GR. = 2.69

L.L.(%) = 34
P.I.(%) = 15

REMARKS:

PROJECT:PARADISE S.P. BORING:US-6
FEATURE:SCBR SLDG DPSL A. EL. :438.5-437.1
STATION:91+05S SAMPLE:1
RANGE :9+30W DATE :3-22-84



GRAVEL(%)= 19
SAND(%) = 23
SILT(%) = 27
CLAY(%) = 31

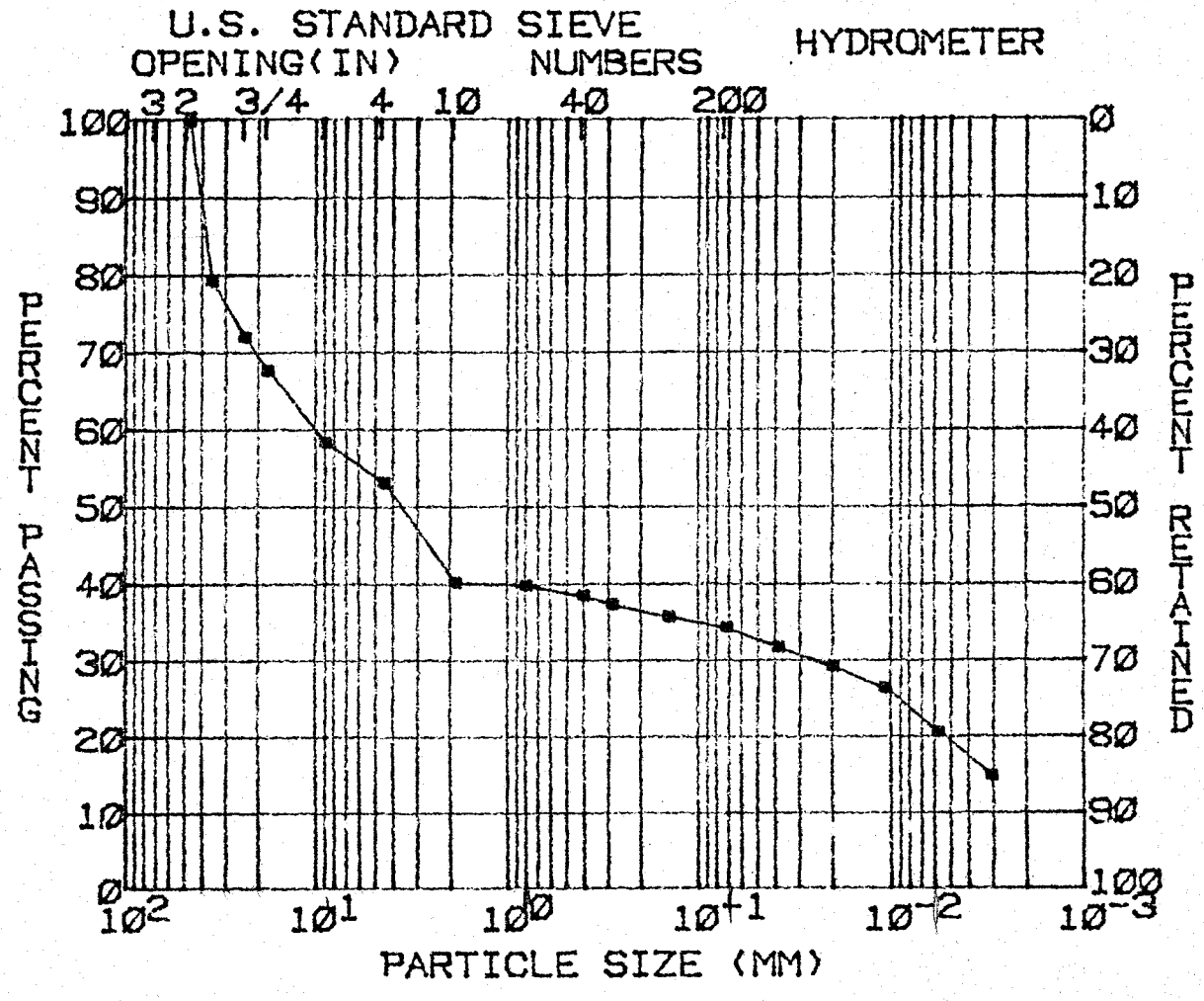
D10(MM) = --
D30(MM) = --
D60(MM) = --
COEF UNIF= --

SOIL SYMBOL= CL
MOISTURE(%)= 14.4
SP. GR. = 2.75

L.L.(%) = 37
P.I.(%) = 16

REMARKS:

PROJECT:PARADISE S.P. BORING:US-6
FEATURE:SCBR SLDG DPSL A. EL. :433.5-431.6
STATION:91+Ø5S SAMPLE:2
RANGE :9+3ØW DATE :3-26-84



GRAVEL(%)= 46
SAND(%) = 19
SILT(%) = 15
CLAY(%) = 20

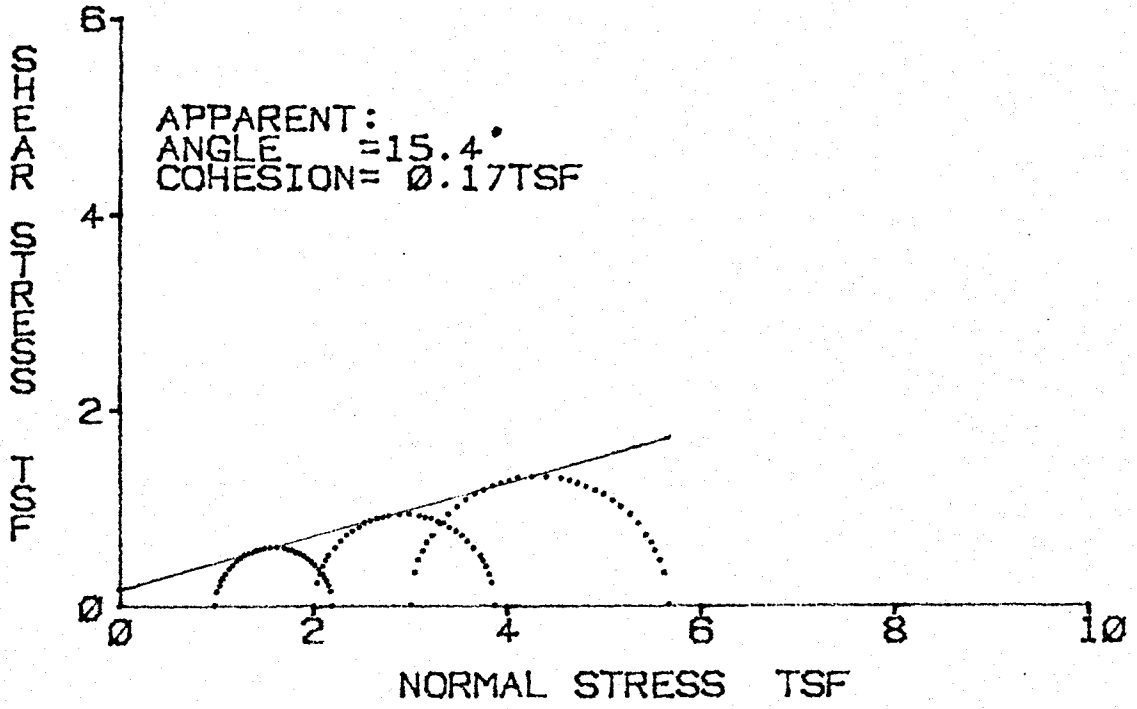
D10(MM) = Ø.ØØ18
D30(MM) = Ø.Ø227
D60(MM) =10.1130
COEF UNIF> 100

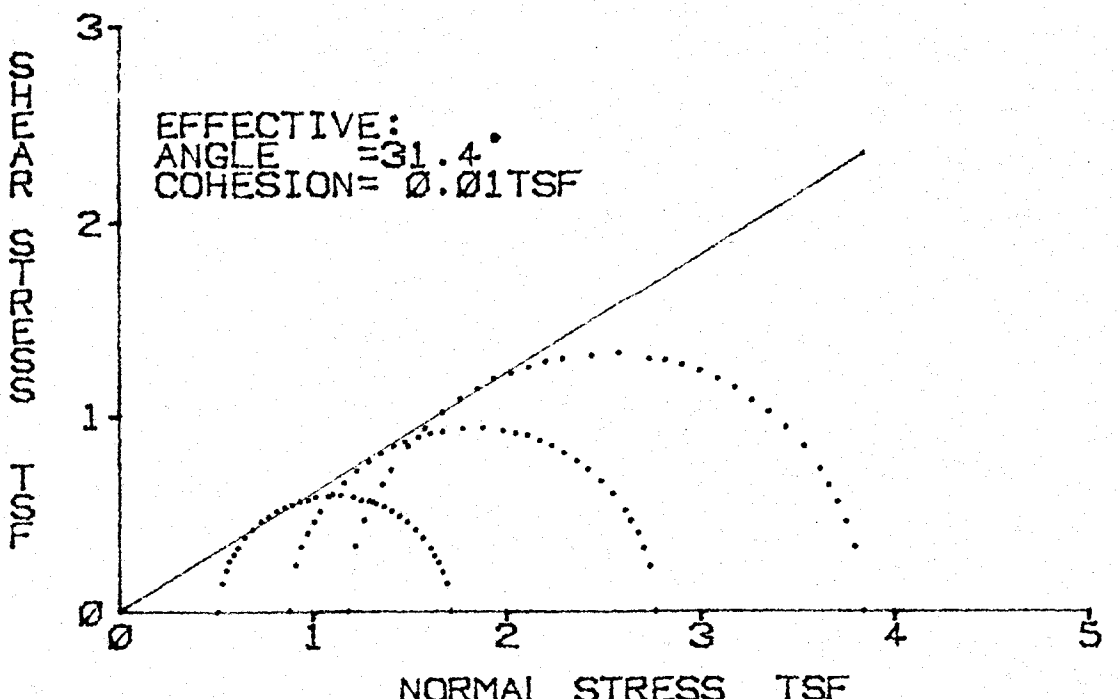
SOIL SYMBOL= GC
MOISTURE(%)=14.1
SP. GR. = 2.70Ø

L.L.(%) =37
P.I.(%) =17

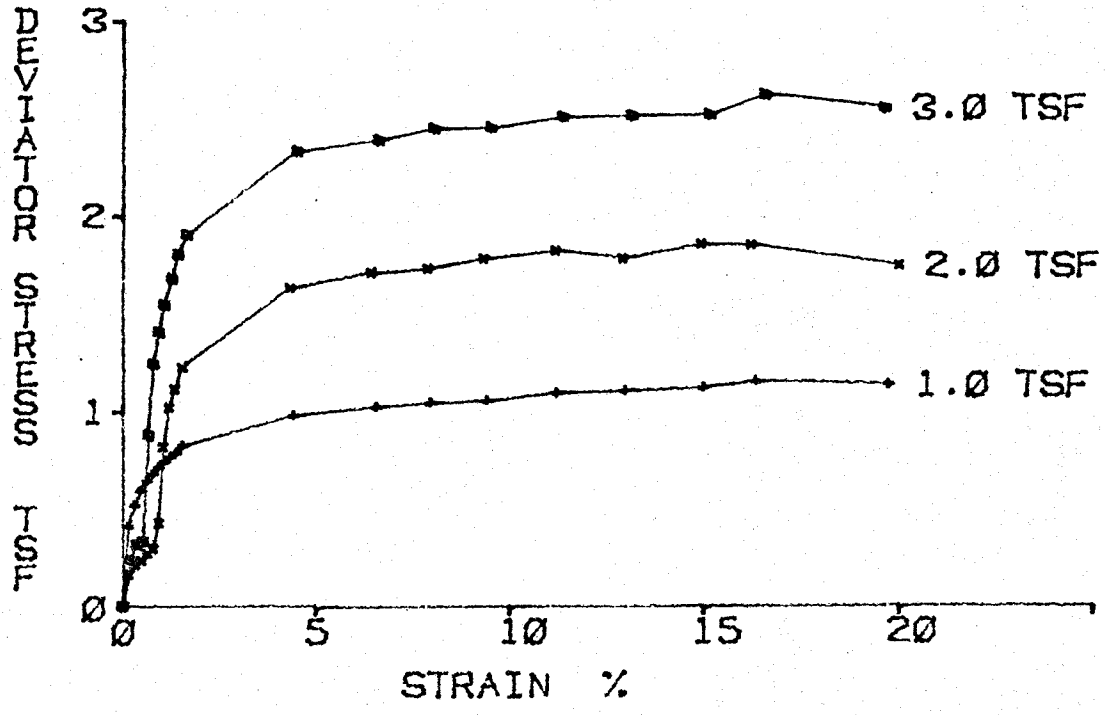
REMARKS:

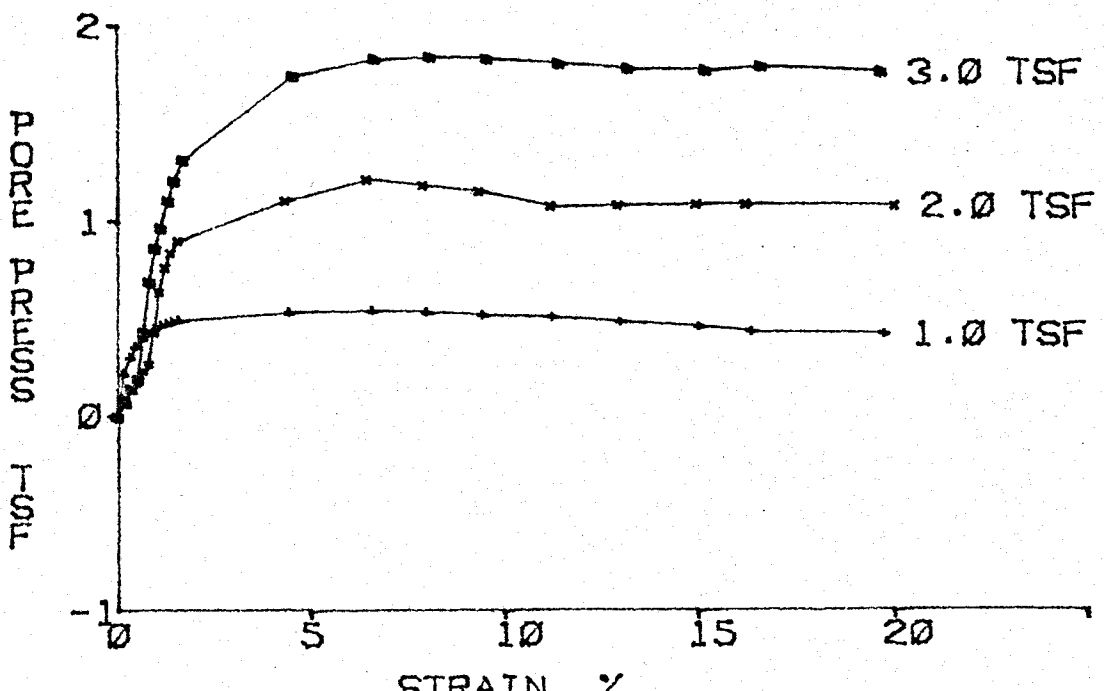
PROJECT:PARADISE S.P. EL. :433.5-431.6
FEATURE:SBR SLDG DPSL A. SAMPLE :2
STATION:91+Ø5S PART :1
RANGE :9+3ØW SOIL SYM:GC
BORING :US-6 DATE :4-7-84





PROJECT:PARADISE S.P. EL. :433.5-431.6
FEATURE:SBR SLDG DPSL A. SAMPLE :2
STATION:91+Ø5S PART :1
RANGE :9+3ØW SOIL SYM:GC
BORING :US-6 DATE :4-7-84





Project: PARADISE S.P.
Feature: SCBR SLGD DPSL A.
Station: 91+05S
Range : 9+30W
Boring : US-6

El. : 433.57431.6
Sample: 2
Part : 1

Tested By : EL
Computed By: MHD
Checked By : CLG
Report Date: 4-7-84

Soil Sybmbol= GC
Sp. Gr. = 2.7

L.L.(%)= 37
D10(mm)= .0018

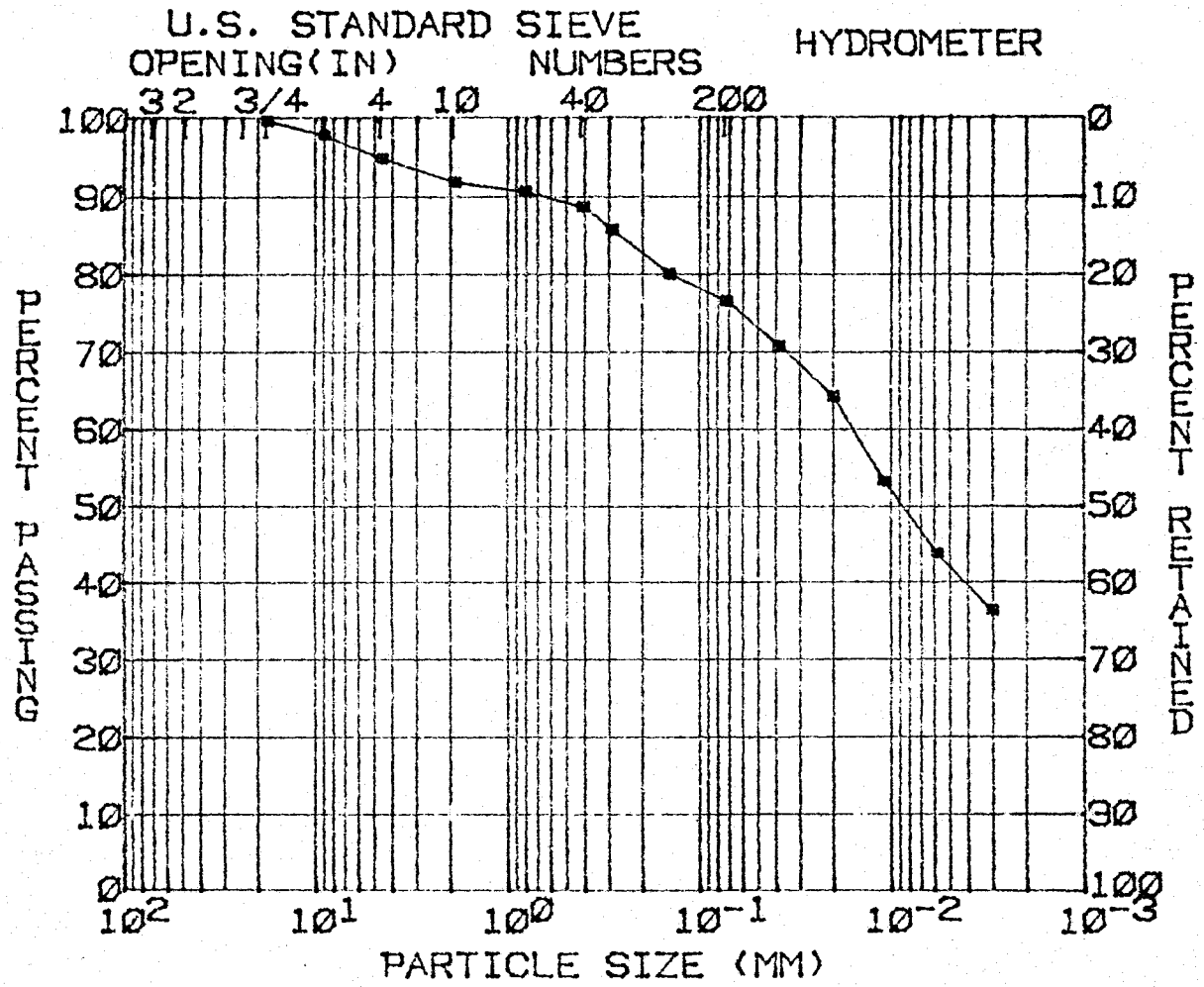
P.I.(%)= 17

Specimen Number	1	2	3	4
Initial:				
Moisture Content(%)	19.3	18.9	18.1	0.0
Dry Density(pcf)	109.1	109.2	111.0	0.0
Void Ratio	0.545	0.543	0.518	0.000
Saturation(%)	95.5	93.8	94.6	0.0
Before Shearing:				
Moisture(%) (after satur.)	20.2	20.1	19.2	0.0
Saturation(%)	100.0	100.0	100.0	0.0
Moisture(%) (after cons.)	17.4	16.9	16.1	16.1
Void Ratio (after cons.)	0.471	0.457	0.436	0.000
Final Moisture Content(%)	18.4	17.1	16.3	0.0
Minor Principal Stress(tsf)	1.01	2.02	3.02	0.00
Major Principal Stress(tsf)	2.21	3.91	5.68	0.00
Eff. Minor Prin. Stress(tsf)	0.52	0.89	1.19	0.00
Eff. Major Prin. Stress(tsf)	1.72	2.78	3.85	0.00
Time to Failure(min.)	90	80	90	0
Rate of Strain(%/min.)	0.18	0.19	0.19	0.00
Specimen Height(in.)	5.98	5.98	5.98	5.98
Specimen Diameter(in.)	2.81	2.81	2.81	2.81

Shear Strength	Deg.	c(tsf)
Apparent	15.4	0.17
Effective	31.4	0.01

Remark:REMOLDED AT NATURAL MOISTURE AND DENSITY.
ALL MATERIAL PASSES THE 1/2-IN. SIEVE.

PROJECT:PARADISE S.P. BORING:US-6
FEATURE:SCBR SLDG DPSL A. EL. :412.5-411.Ø
STATION:91+Ø5S SAMPLE:3
RANGE :9+3ØW DATE :3-22-84



GRAVEL(%)= 4
SAND(%) = 19
SILT(%) = 35
CLAY(%) = 42

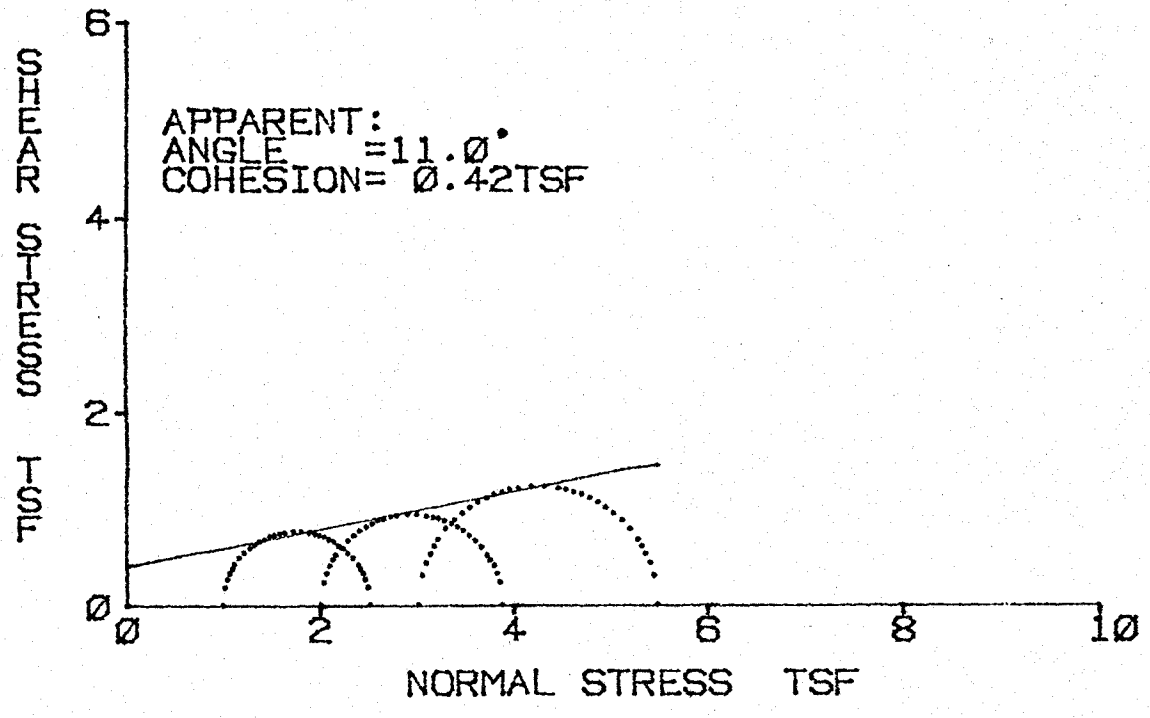
D1Ø(MM) = --
D3Ø(MM) = --
D6Ø(MM) = --
COEF UNIF= --

SOIL SYMBOL= CL
MOISTURE(%)= 23.Ø
SP. GR. = 2.75

L.L.(%) = 39
P.I.(%) = 19

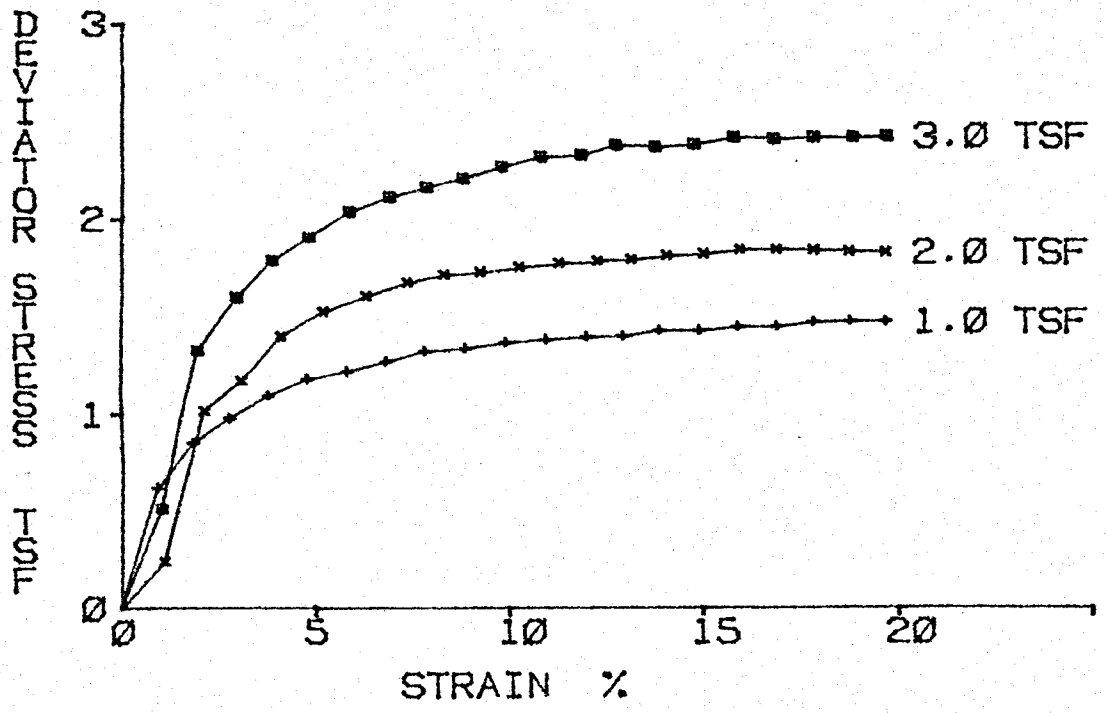
REMARKS:

PROJECT:PARADISE S.P. EL. :412.1-411.6
FEATURE:SBR SLDG DPSL A. SAMPLE :3
STATION:9+Ø5S PART :2
RANGE :9+3ØW SOIL SYM:CL
BORING :US-6 DATE :3-27-84



REMARKS:

PROJECT:PARADISE S.P. EL. :412.1-411.8
FEATURE:SBR SLDG DPSL A. SAMPLE :3
STATION:9+05S PART :2
RANGE :9+30W SOIL SYM:CL
BORING :US-6 DATE :3-27-84



REMARKS:

Unconsolidated Undrained Triaxial Compression (Q) Test

Project: PARADISE S.P.
Feature: SCBR SLDG DPSL A.
Station: 9+05S
Range : 9+30W
Boring : US-6

El. : 412.1-411.6
Sample: 3
Part : 2

Tested By : EL
Computed By: MHD
Checked By : DDG
Report Date: 3-27-84

Soil Sybmbol= CL
Sp. Gr. = 2.75

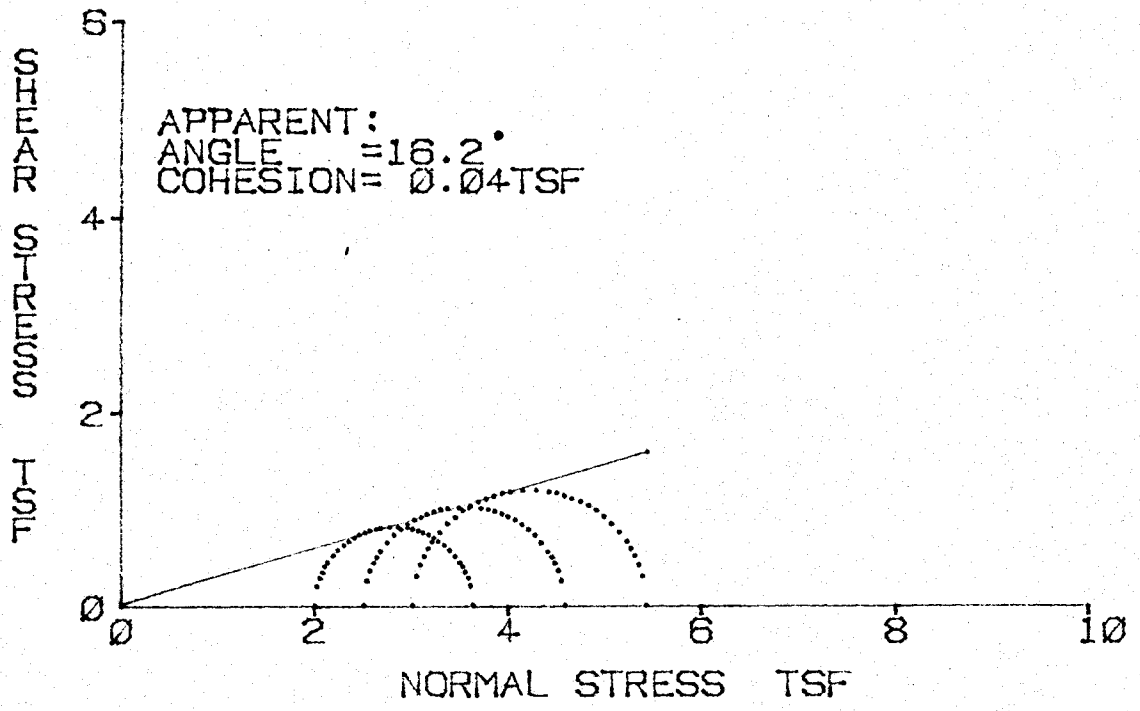
L.L.(%)= 39
D10(mm)= 0

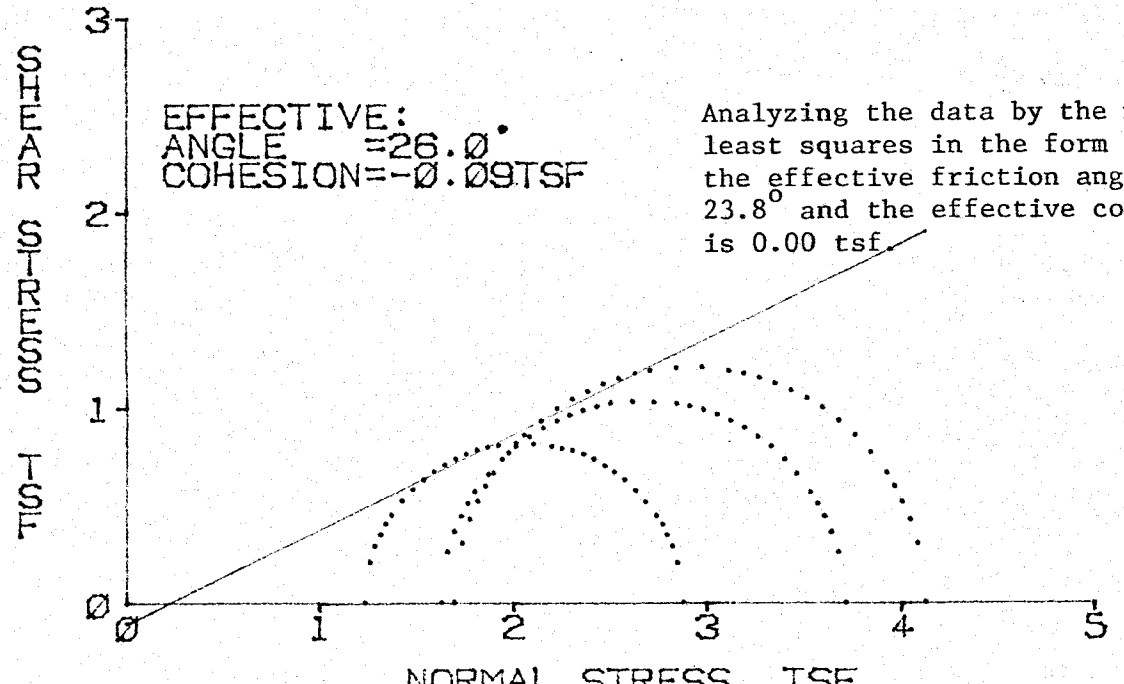
P.I.(%)= 19

Specimen Number	1	2	3	4
Initial:				
Moisture Content(%)	19.4	18.7	18.4	0.0
Dry Density(pcf)	107.8	107.8	108.6	0.0
Void Ratio	0.593	0.593	0.580	0.000
Saturation(%)	90.0	86.5	87.1	0.0
Before Shearing:				
Moisture(%) (after satur.)	--	--	--	--
Saturation(%)	--	--	--	--
Moisture(%) (after cons.)	--	--	--	--
Void Ratio (after cons.)	--	--	--	--
Final Moisture Content(%)	19.2	18.5	18.3	0.0
Minor Principal Stress(tsf)	1.01	2.02	3.02	0.00
Major Principal Stress(tsf)	2.54	3.90	5.50	0.00
Eff. Minor Prin. Stress(tsf)	--	--	--	--
Eff. Major Prin. Stress(tsf)	--	--	--	--
Time to Failure(min.)	19	17	20	0
Rate of Strain(%/min.)	1.00	1.01	1.00	0.00
Specimen Height(in.)	3.08	3.08	3.08	3.08
Specimen Diameter(in.)	1.40	1.40	1.40	1.40

Shear Strength	Deg.	c(tsf)
Apparent	11.0	0.42
Effective	--	--

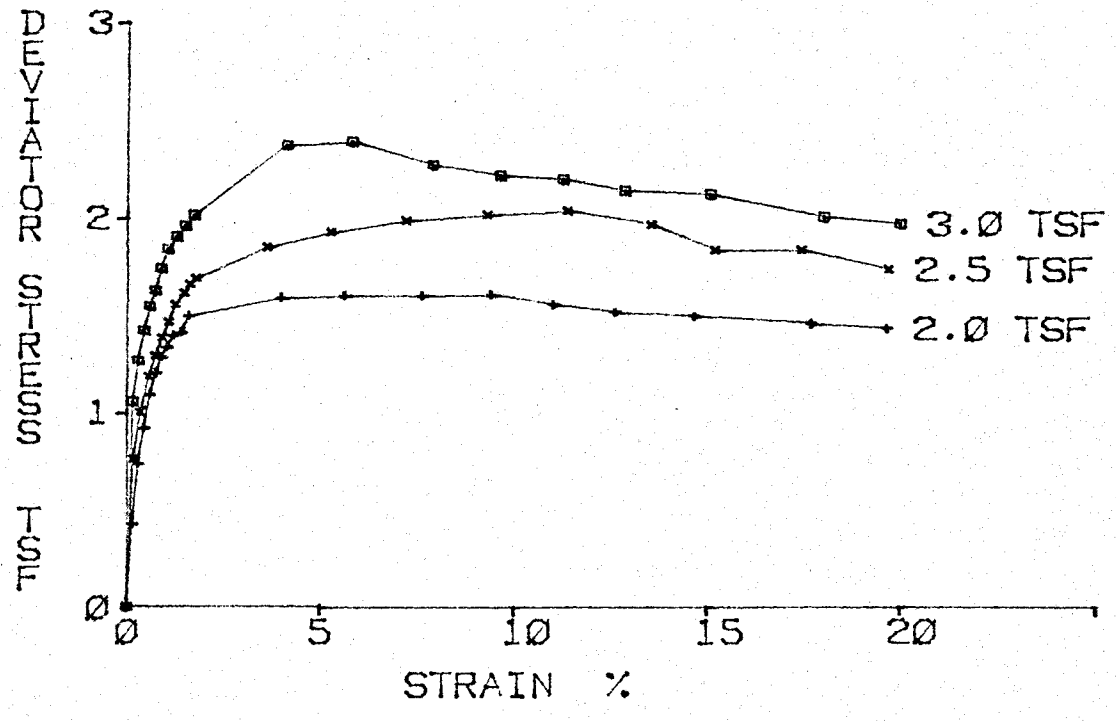
PROJECT:PARADISE S.P. EL. :411.6-411.1
FEATURE:SBR SLDG DPSL A. SAMPLE :3
STATION:91+Ø5S PART :3
RANGE :9+3ØW SOIL SYM:CL
BORING :US-6 DATE :4-13-84

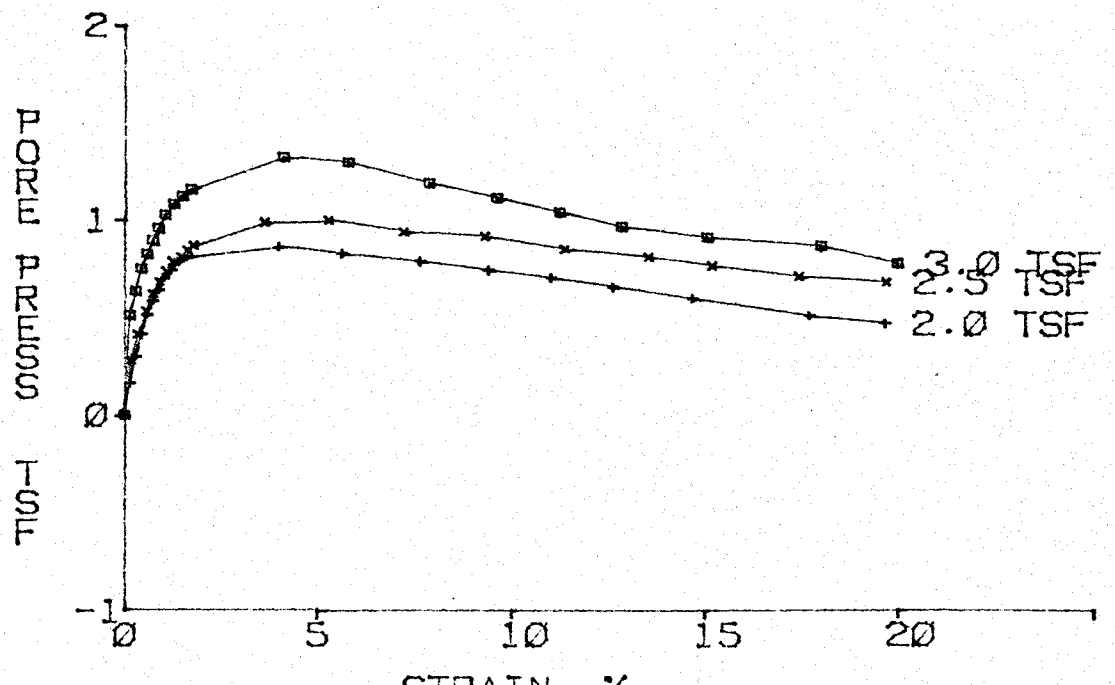




Analyzing the data by the method of least squares in the form of y = mx, the effective friction angle is 23.8° and the effective cohesion is 0.00 tsf.

PROJECT:PARADISE S.P. EL. :411.6-411.1
FEATURE:SBR SLDG DPSL A. SAMPLE :3
STATION:91+Ø5S PART :3
RANGE :9+3ØW SOIL SYM:CL
BORING :US-6 DATE :4-13-84





Consolidated Undrained Triaxial Compression (R) Test

Project: PARADISE S.P.
Feature: SCBR SLDG DPSL A.
Station: 91+05S
Range : 9+30W
Boring : US-6

El. : 411.6-411.1
Sample: 3
Part : 3

Tested By : TAL
Computed By: MHD
Checked By : CBG
Report Date: 4-13-84

Soil Symbol= CL
Sp. Gr. = 2.75

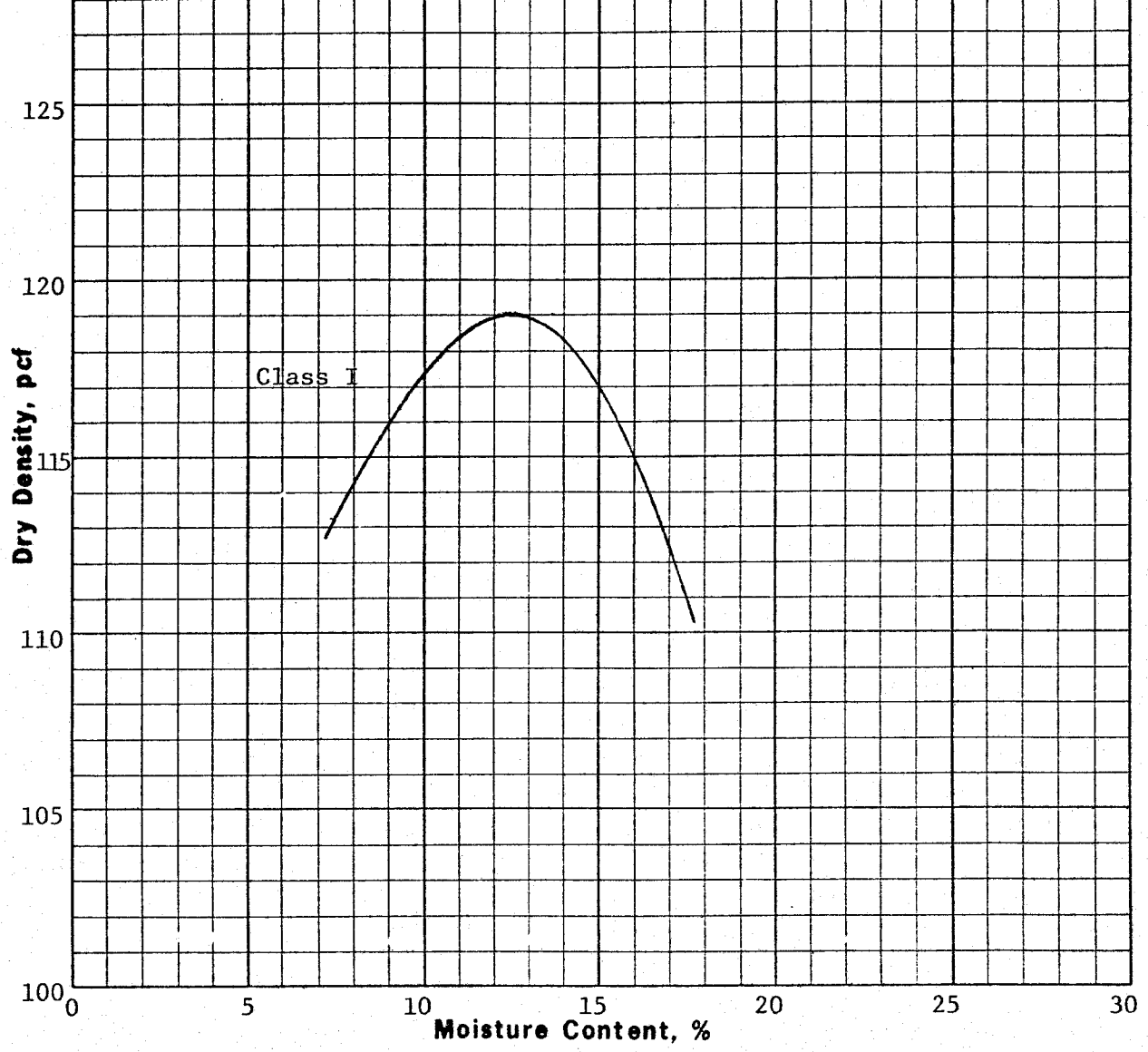
L.L.(%)= 39
D10(mm)= 0

P.I.(%)= 19

Specimen Number	1	2	3	4
Initial:				
Moisture Content(%)	21.1	21.0	23.0	0.0
Dry Density(pcf)	102.8	103.2	101.0	0.0
Void Ratio	0.670	0.664	0.700	0.000
Saturation(%)	86.5	87.0	90.4	0.0
Before Shearing:				
Moisture(%) (after satur.)	24.4	24.1	25.5	0.0
Saturation(%)	100.0	100.0	100.0	0.0
Moisture(%) (after cons.)	23.2	22.6	22.4	22.4
Void Ratio (after cons.)	0.637	0.623	0.615	0.000
Final Moisture Content(%)	21.3	21.3	22.8	0.0
Minor Principal Stress(tsf)	2.02	2.52	3.02	0.00
Major Principal Stress(tsf)	3.66	4.60	5.45	0.00
Eff. Minor Prin. Stress(tsf)	1.24	1.63	1.70	0.00
Eff. Major Prin. Stress(tsf)	2.89	3.72	4.13	0.00
Time to Failure(min.)	50	60	30	0
Rate of Strain(%/min.)	0.19	0.19	0.20	0.00
Specimen Height(in.)	3.14	3.14	3.14	3.14
Specimen Diameter(in.)	1.41	1.41	1.41	1.41

Shear Strength	Deg.	c(tsf)
Apparent	16.2	0.04
Effective	26.0	-0.09

REMARKS: Analyzing the data by the method of least squares in the form of y = mx, the effective friction angle is 23.8° and the effective cohesion is 0.00 tsf.



Soil Class	Gravel %	Sand %	Silt %	Clay %	Specific Gravity	LL %	PI %	Optimum Moisture, %	Maximum Density, pcf
I-CL	23	24	24	29	2.67	35	16	12.5	119.0

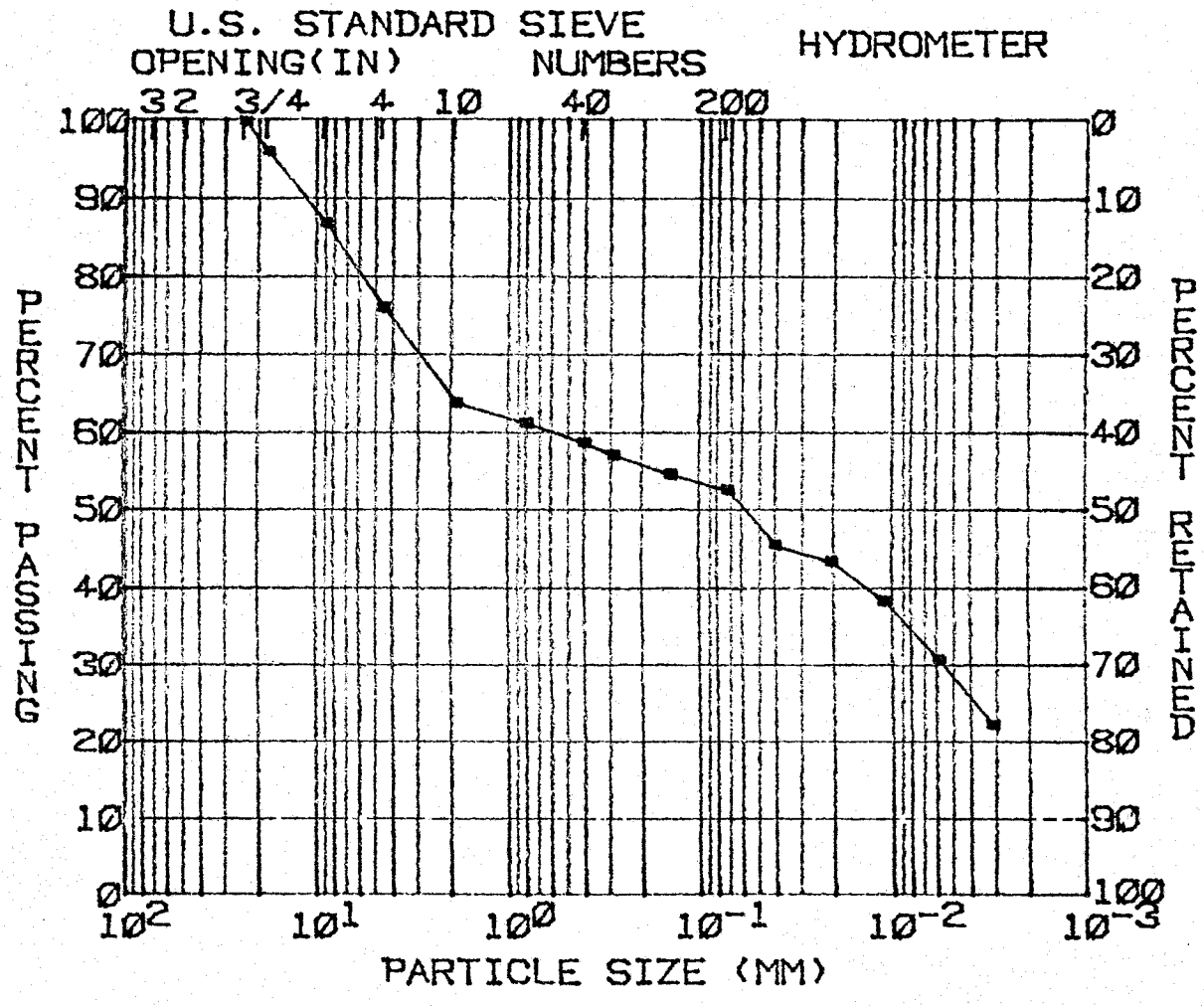
Plus No. 4 Specific Gravity, S S D	2.52
Plus No. 4 Absorption, %	3.42

Project Paradise Steam Plant

Sludge Disposal Area

PROJECT:PARADISE S.P.
FEATURE:SLDG DPSL BORROW
STATION:
RANGE :

BORING:
EL. :
SAMPLE:CLASS I
DATE :4-3-84



GRAVEL(%)= 23
SAND(%) = 24
SILT(%) = 24
CLAY(%) = 29

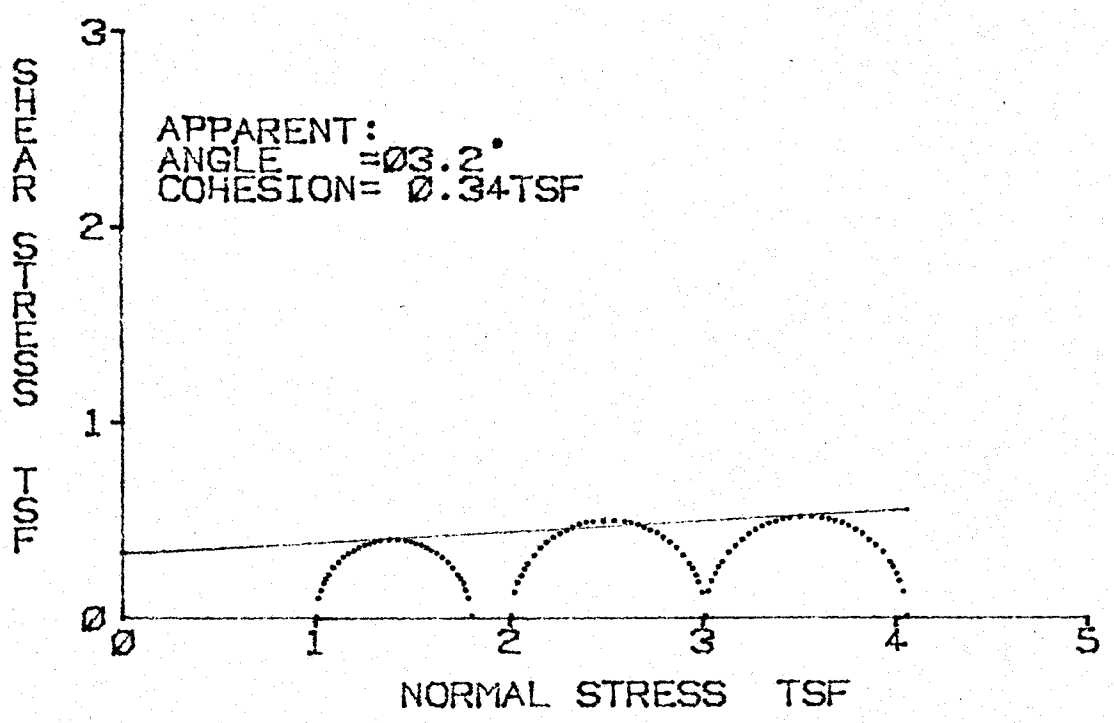
D10(MM) = --
D30(MM) = --
D60(MM) = --
COEF UNIF= --

SOIL SYMBOL= CL
MOISTURE(%)= --
SP. GR. = 2.67

L.L.(%) = 35
P.I.(%) = 16

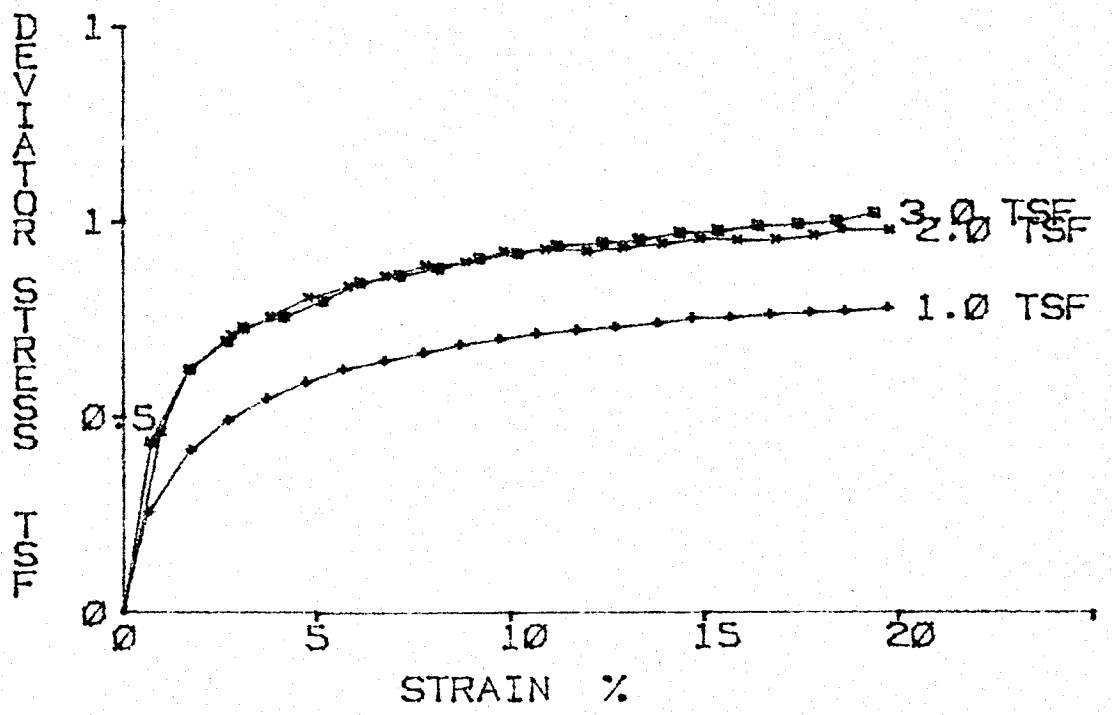
REMARKS:

PROJECT:	PARADISE S.P.	EL.	:
FEATURE:	ASH DPSL A.	SAMPLE	: CLASS I
STATION:		PART	:
RANGE	:	SOIL SYM:	CL
BORING	: BORROW	DATE	: 4-12-84



REMARKS: REMOLDED AT 3 (%) WET OF OPTIMUM MOISTURE

PROJECT:PARADISE S.P. EL. :
FEATURE:ASH DPSL A. SAMPLE :CLASS I
STATION: PART :
RANGE : SOIL SYM:CL
BORING :BORROW DATE :4-12-84



REMARKS:REMOLDED AT 3 (%) WET OF OPTIMUM MOISTURE

Unconsolidated Undrained Triaxial Compression (Q) Test

Project: PARADISE S.P.
Feature: ASH DPSL A.
Station:
Range :
Boring : BORROW

El. :
Sample: CLASS I
Part :

Tested By : EL
Computed By: MHD
Checked By : CPG
Report Date: 4-12-84

Soil Symbol= CL
Sp. Gr. = 2.67

L.L.(%)= 35
D10(mm)= 0

P.I.(%)= 16

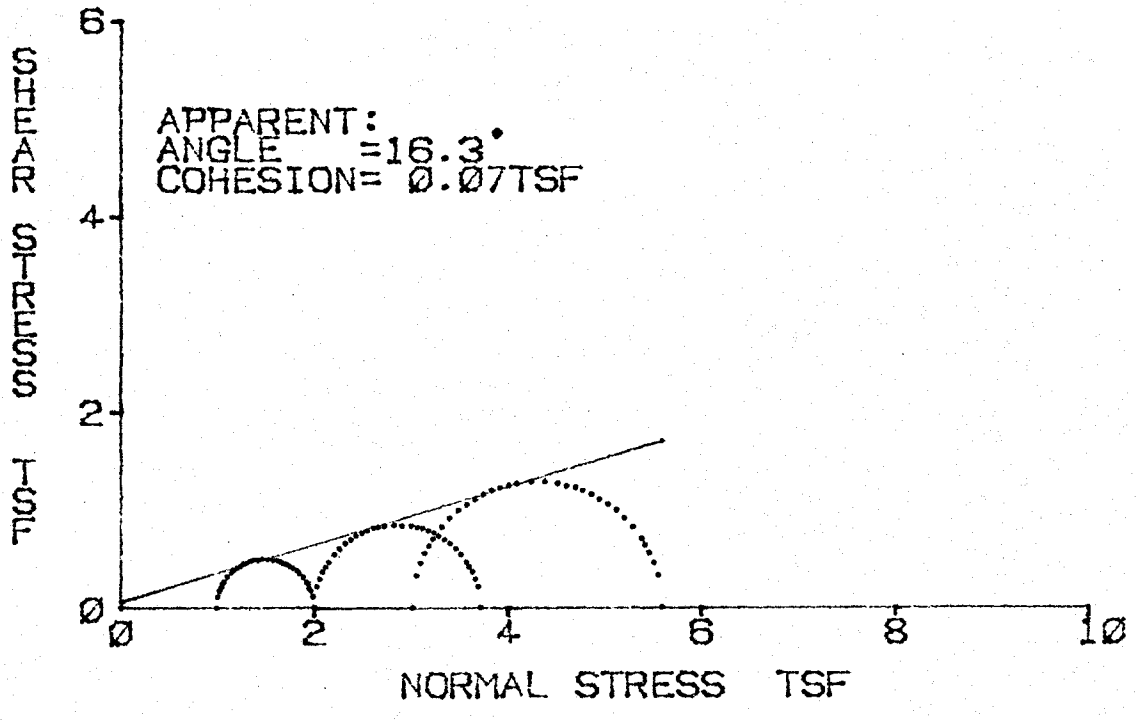
Specimen Number	1	2	3	4
Initial:				
Moisture Content(%)	17.3	16.9	17.0	0.0
Dry Density(pcf)	111.4	110.8	111.8	0.0
Void Ratio	0.496	0.504	0.491	0.000
Saturation(%)	95.0	89.7	92.5	0.0
Before Shearing:				
Moisture(%) (after satur.)	--	--	--	--
Saturation(%)	--	--	--	--
Moisture(%) (after cons.)	--	--	--	--
Void Ratio (after cons.)	--	--	--	--
Final Moisture Content(%)	17.1	16.8	16.9	0.0
Minor Principal Stress(tsf)	1.01	2.02	3.02	0.00
Major Principal Stress(tsf)	1.81	3.02	4.07	0.00
Eff. Minor Prin. Stress(tsf)	--	--	--	--
Eff. Major Prin. Stress(tsf)	--	--	--	--
Time to Failure(min.)	20	19	20	0
Rate of Strain(%/min.)	1.00	0.99	0.98	0.00
Specimen Height(in.)	6.31	6.31	6.31	6.31
Specimen Diameter(in.)	2.81	2.81	2.81	2.81

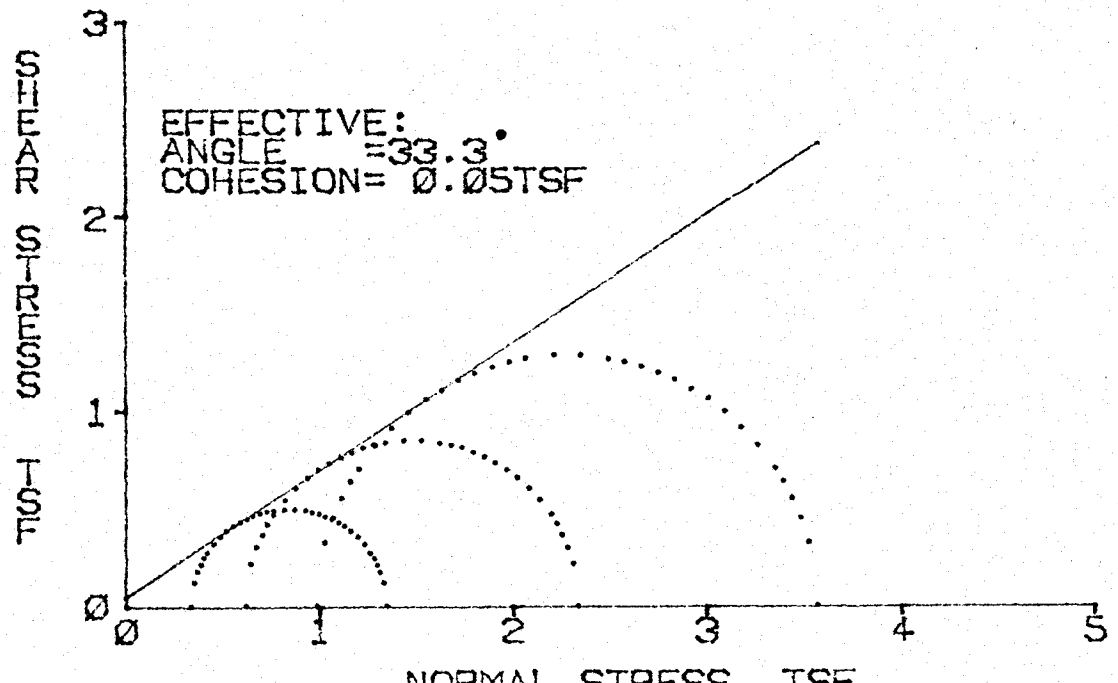
Shear Strength	Deg.	c(tsf)
Apparent	3.2	0.34
Effective	--	--

Remark:REMOLDED AT 3 (%) WET OF OPTIMUM MOISTURE
AND AT 95 (%) OF MAXIMUM UNIT WEIGHT.

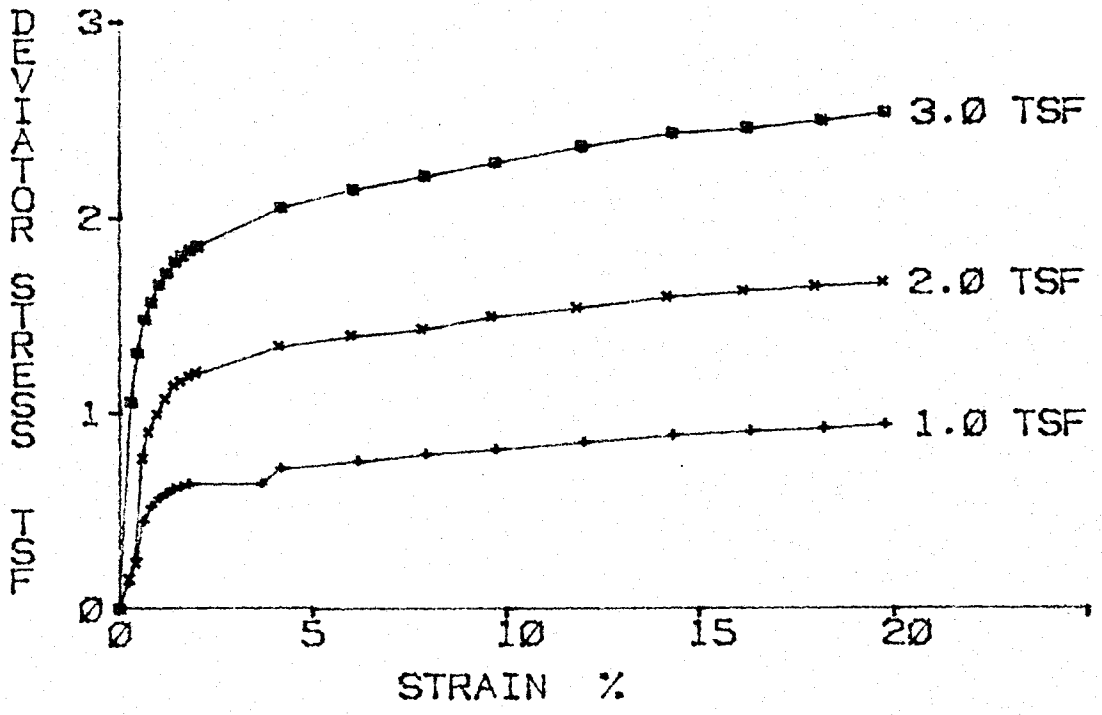
PROJECT:PARADISE S.P.
FEATURE:SLDG DPSL A.
STATION:
RANGE :
BORING :BORROW

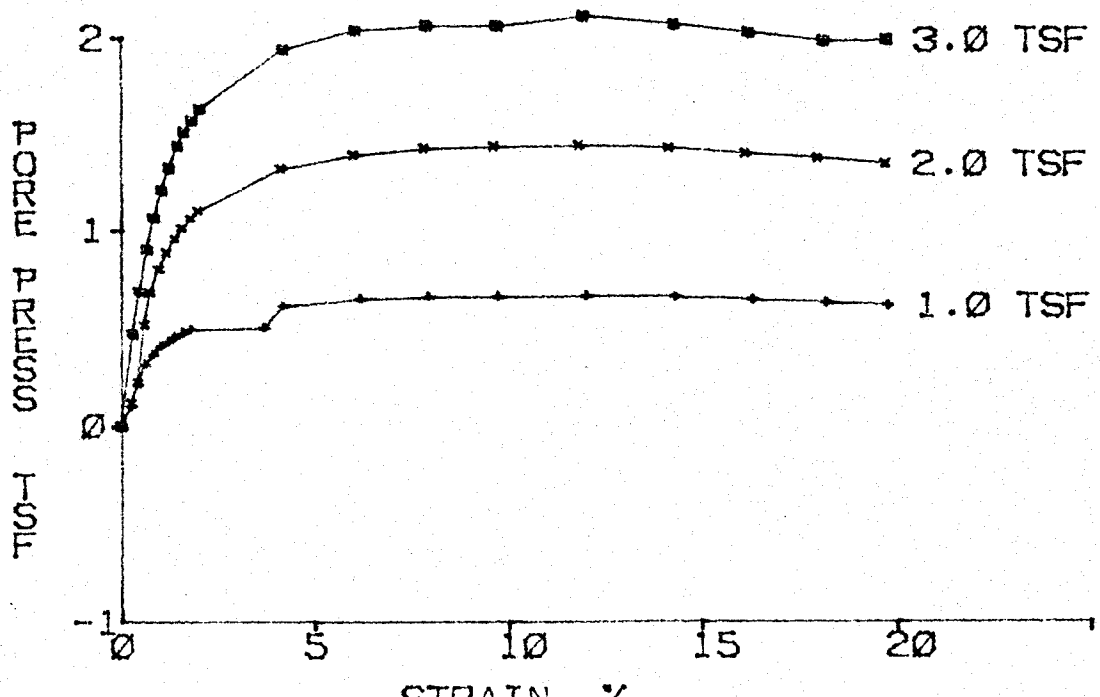
EL. :
SAMPLE :CLASS I
PART :
SOIL SYM:CL
DATE :4-10-84





PROJECT:PARADISE S.P. EL. :
FEATURE:SLDG DPSL A. SAMPLE :CLASS I
STATION: PART :
RANGE : SOIL SYM:CL
BORING :BORROW DATE :4-10-84





Project: PARADISE S.P.
Feature: SLDG DPSL A.
Station:
Range :
Boring : BORROW

El. :
Sample: CLASS I
Part :

Tested By : EL
Computed By: MHD
Checked By : CBG
Report Date: 4-10-84

Soil Sybmbol= CL
Sp. Gr. = 2.67

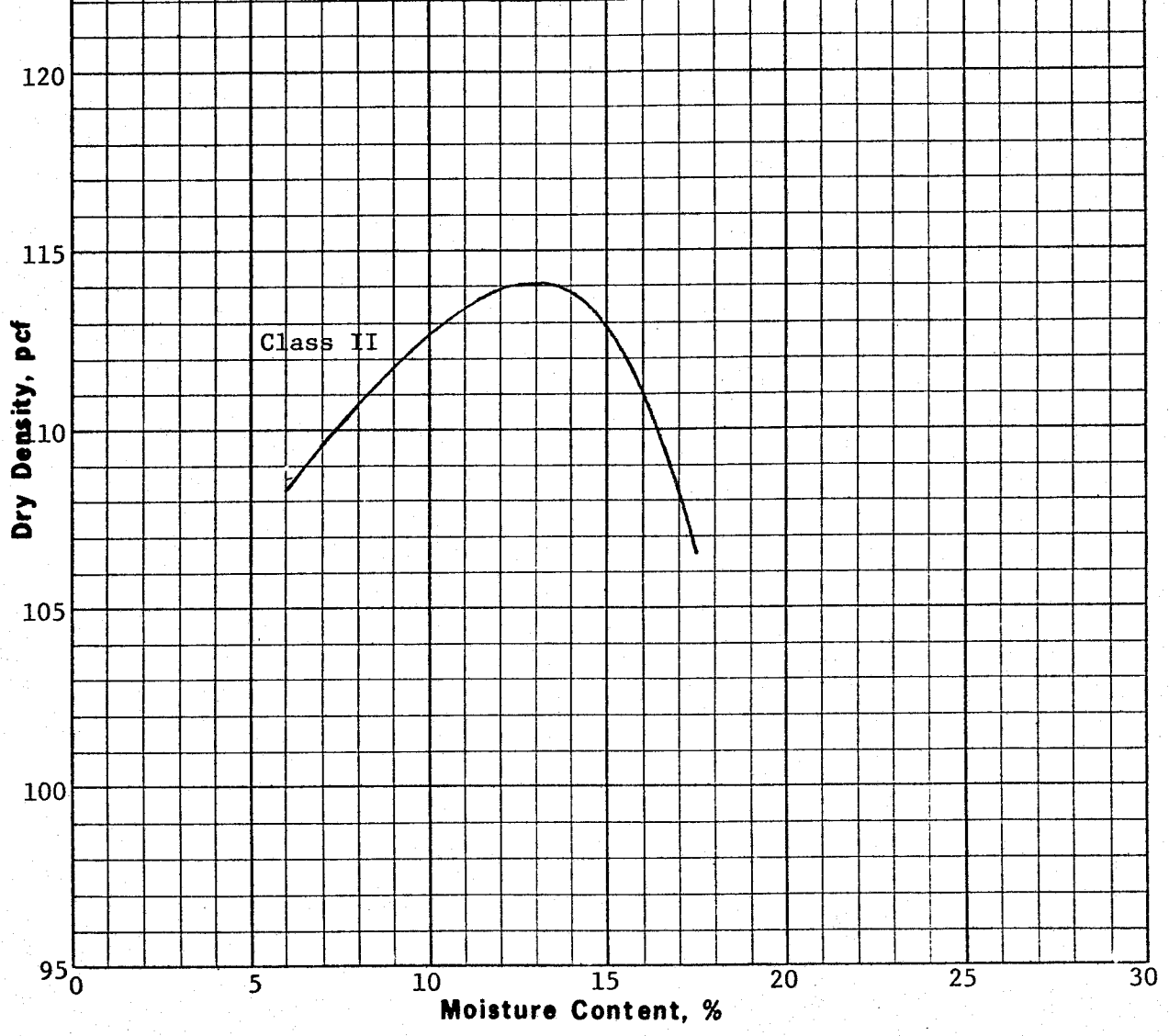
L.L.(%)= 35
DIO(mm)= 0

P.I.(%)= 16

Specimen Number	1	2	3	4
Initial:				
Moisture Content(%)	10.5	10.5	10.5	0.0
Dry Density(pcf)	111.8	110.6	110.8	0.0
Void Ratio	0.491	0.507	0.504	0.000
Saturation(%)	57.3	55.2	55.9	0.0
Before Shearing:				
Moisture(%) (after satur.)	18.4	19.0	18.9	0.0
Saturation(%)	100.0	100.0	100.0	0.0
Moisture(%) (after cons.)	16.4	16.6	15.6	15.6
Void Ratio (after cons.)	0.437	0.442	0.415	0.000
Final Moisture Content(%)	16.5	15.4	14.8	0.0
Minor Principal Stress(tsf)	1.01	2.02	3.02	0.00
Major Principal Stress(tsf)	2.02	3.74	5.61	0.00
Eff. Minor Prin. Stress(tsf)	0.35	0.63	0.99	0.00
Eff. Major Prin. Stress(tsf)	1.35	2.35	3.58	0.00
Time to Failure(min.)	101	101	101	0
Rate of Strain(%/min.)	0.20	0.20	0.20	0.00
Specimen Height(in.)	6.09	6.09	6.09	6.09
Specimen Diameter(in.)	2.81	2.81	2.81	2.81

Shear Strength	Deg.	c(tsf)
Apparent	16.3	0.07
Effective	33.3	0.05

Remark:REMOLDED AT 3 (%) DRY OF OPTIMUM MOISTURE
AND AT 95 (%) OF MAXIMUM UNIT WEIGHT.



Soil Class	Gravel %	Sand %	Silt %	Clay %	Specific Gravity	LL %	PI %	Optimum Moisture, %	Maximum Density, pcf
II-CL	12	25	27	36	2.72	36	17	13.2	114.0

Plus No. 4 Specific Gravity, S S D	2.52
Plus No. 4 Absorption, %	3.42

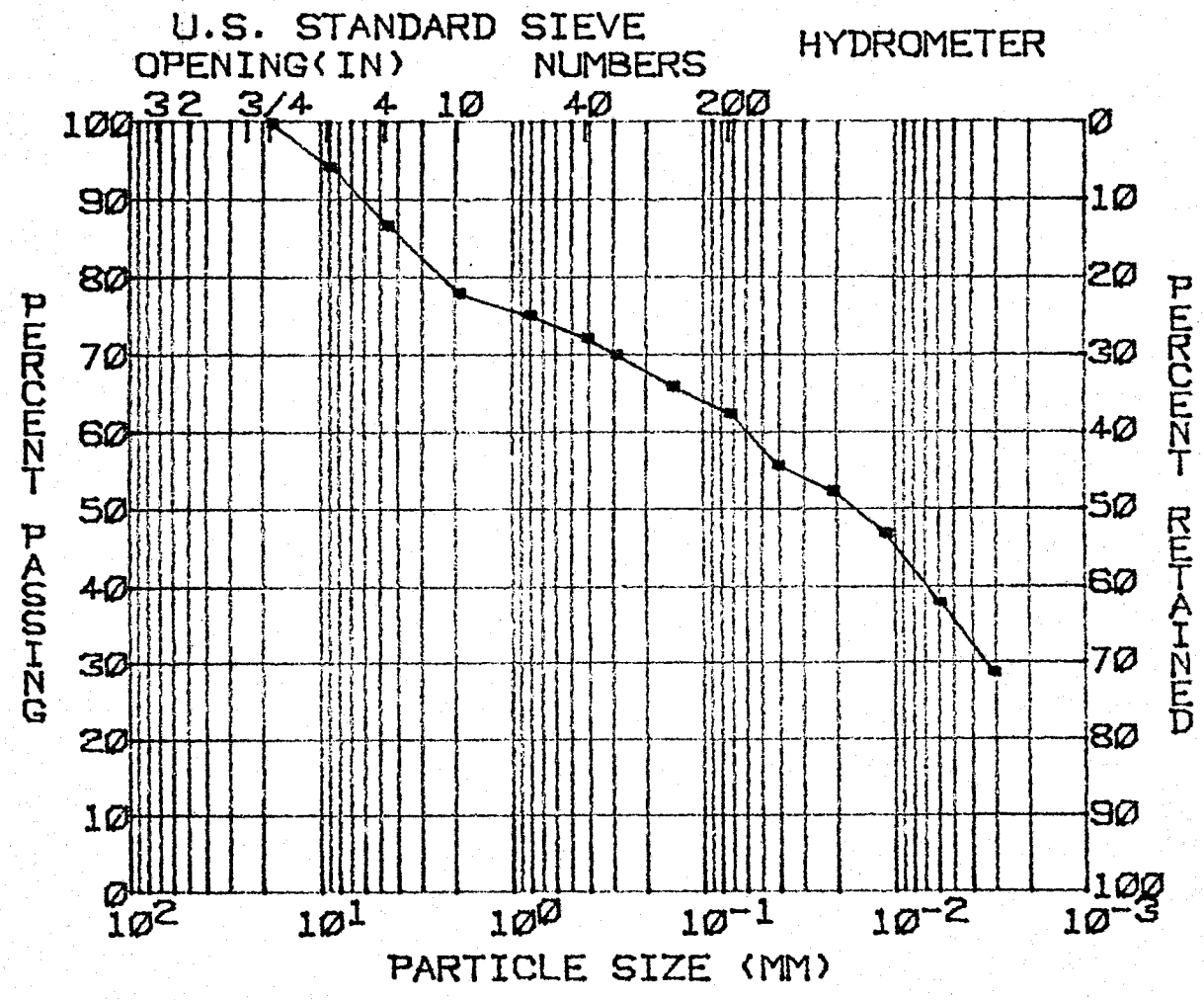
Remarks:

Project Paradise Steam Plant

Sludge Disposal Area

Feature Borrow

PROJECT:PARADISE S.P. BORING:
FEATURE:SLDG DPSL BORROW EL. :
STATION: SAMPLE:CLASS II
RANGE : DATE :4-3-84



GRAVEL(%)= 12
SAND(%) = 25
SILT(%) = 27
CLAY(%) = 36

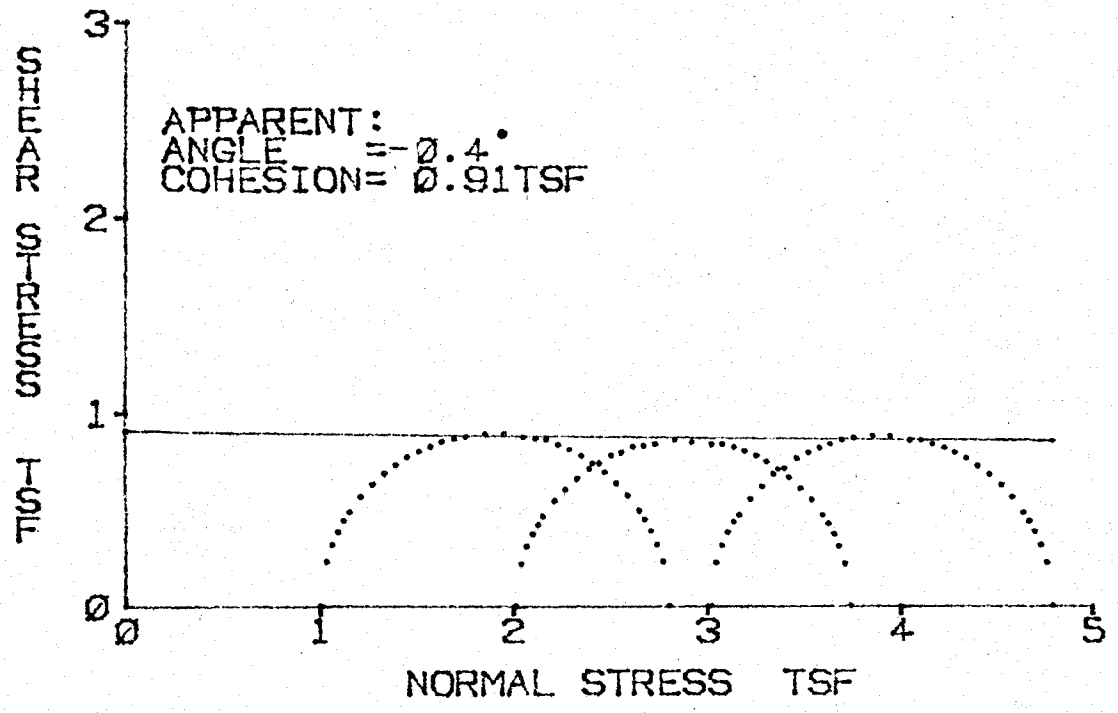
D10(MM) = --
D30(MM) = --
D60(MM) = --
COEF UNIF= --

SOIL SYMBOL= CL
MOISTURE(%)= --
SP. GR. = 2.72

L.L.(%) = 36
P.I.(%) = 17

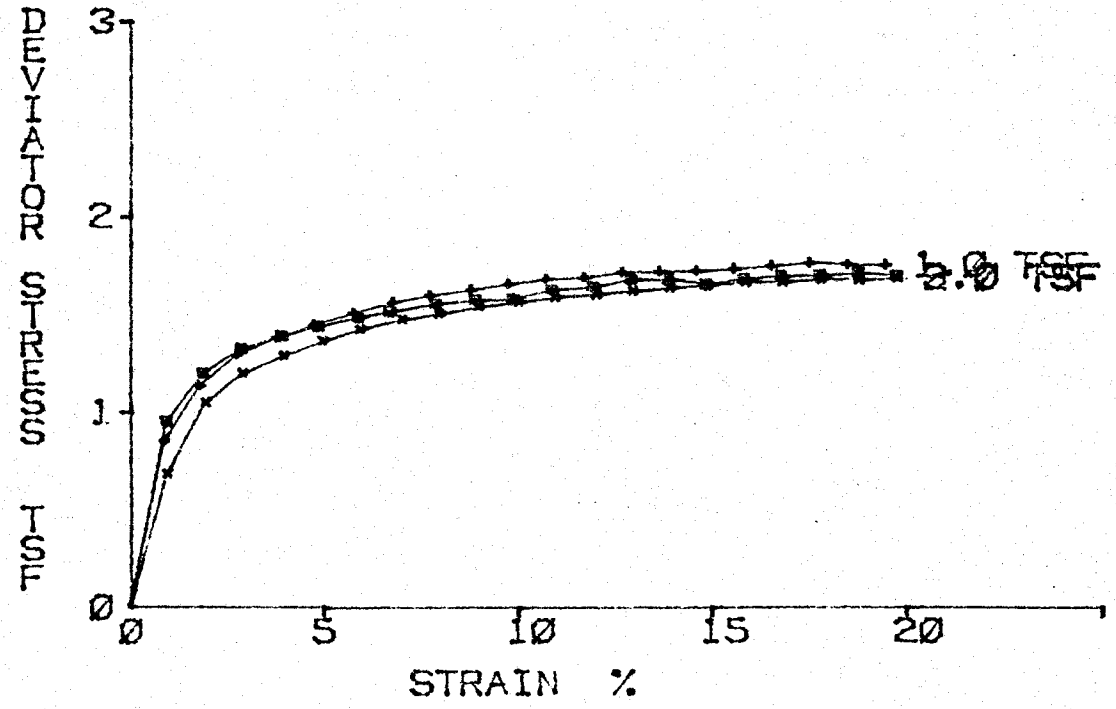
REMARKS:

PROJECT:PARADISE S.P.	EL. :
FEATURE:ASH DPSL A.	SAMPLE :CLASS II
STATION:	PART :
RANGE :	SOIL SYM:CL
BORING :BORROW	DATE :4-12-84



REMARKS:REMOLDED AT 3 (%) WET OF OPTIMUM MOISTURE

PROJECT:PARADISE S.P.	EL. :
FEATURE:ASH DPSL A.	SAMPLE :CLASS II
STATION:	PART :
RANGE :	SOIL SYM:CL
BORING :BORROW	DATE :4-12-84



REMARKS:REMOLDED AT 3 (%) WET OF OPTIMUM MOISTURE

Unconsolidated Undrained Triaxial Compression (Q) Test

Project: PARADISE S.P.
Feature: ASH DPSL A.
Station:
Range :
Boring : BORROW

El. :
Sample: CLASS II
Part :

Tested By
Computed By
Checked By
Report Date:

Soil Sybmbol= CL
Sp. Gr. = 2.72

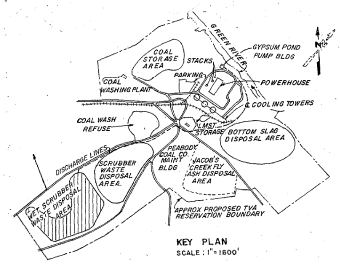
L.L.(%)= 36
D10(mm)= 0

P.I.(%)= 17

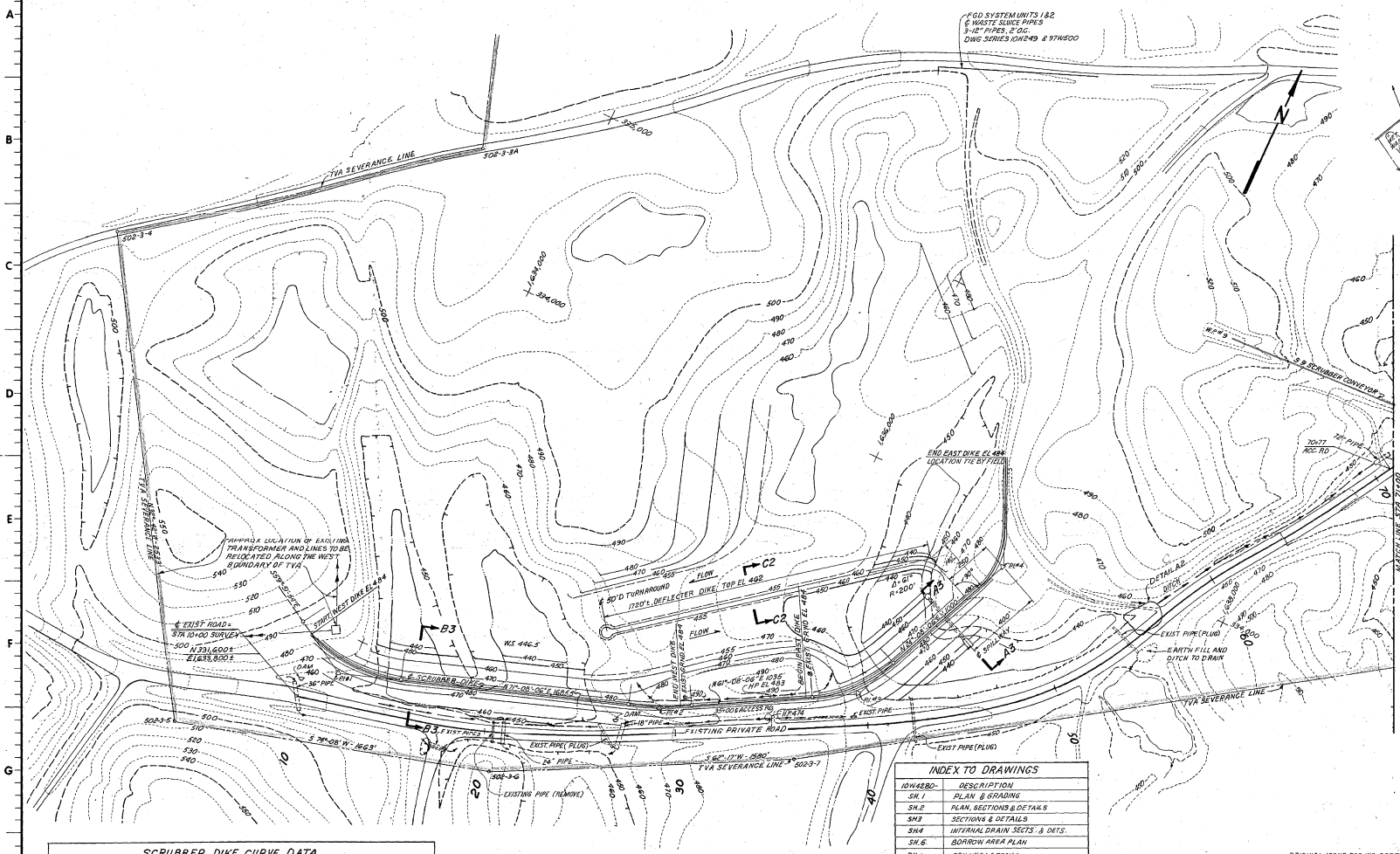
Specimen Number	1	2	3	4
Initial:				
Moisture Content(%)	17.4	17.3	17.3	0.0
Dry Density(pcf)	107.4	107.3	107.6	0.0
Void Ratio	0.582	0.582	0.578	0.000
Saturation(%)	81.3	81.0	81.2	0.0
Before Shearing:				
Moisture(%) (after satur.)	--	--	--	--
Saturation(%)	--	--	--	--
Moisture(%) (after cons.)	--	--	--	--
Void Ratio (after cons.)	--	--	--	--
Final Moisture Content(%)	17.3	17.2	17.1	0.0
Minor Principal Stress(tsf)	1.01	2.02	3.02	0.00
Major Principal Stress(tsf)	2.61	3.75	4.80	0.00
Eff. Minor Prin. Stress(tsf)	--	--	--	--
Eff. Major Prin. Stress(tsf)	--	--	--	--
Time to Failure(min.)	18	20	19	0
Rate of Strain(%/min.)	0.99	1.00	1.01	0.00
Specimen Height(in.)	6.31	6.31	6.31	6.31
Specimen Diameter(in.)	2.81	2.81	2.81	2.81

Shear Strength	Deg.	c(tsf)
Apparent	- 0.4	0.91
Effective	--	--

Remark:REMOLDED AT 3 (%) WET OF OPTIMUM MOISTURE
AND AT 95 (%) OF MAXIMUM UNIT WEIGHT.



KEY PLAN
SCALE : 1" = 1500'



NOTES:
1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE T-1 SPECIFICATIONS UNLESS OTHERWISE NOTED.
2. CONTOURS DASHED CONTOURS ARE EXISTING GROUND. SOLID CONTOURS INDICATE THE FINISHED GRADE.
3. CUT AND FILL SLOPES AND OTHER DISTURBED AREAS SHALL BE SEEDED WITH TYPE 6 MIXTURE 5. SEEDED AREAS ARE TO BE FERTILIZED AND MULCHED IN ACCORDANCE WITH 580 AND 582 RESPECTIVELY.
4. RIPRAP SHALL CONSIST OF SOUND DURABLE STONES, 50% BY WEIGHT EQUAL TO 100 LBS OR GREATER EACH IN ACCORDANCE WITH SECTS 574 & 576.
5. FILTER BLANKET SHALL CONFORM TO SECTION 570.
6. CRUSHED STONE SURFACING 4 INCHES THICK, SHALL BE IN ACCORDANCE WITH SECTION 305.
7. NOTES FOR DIKE CONSTRUCTION ARE ON DRAWING NO. 10W4280-3.
8. NOTES FOR THE INTERNAL DRAIN SYSTEM ARE ON DRAWING NO. 10W4280-4.
9. NOTES FOR THE EARTH BORROW LOCATION ARE ON DRAWING NO. 10W4280-5.
10. FOR SUMMARY OF QUANTITIES SEE DRAWING NO. 10W4280-2, & 7.
11. FOR PIPE SECTIONS SEE SHEET 10H4280-GO1 FOR CROSS SECTIONS SEE SHEETS 10H4280-701 THRU 710
12. COORDINATES OF PI'S AND BEARINGS GIVEN ARE BASED ON KENTUCKY STATE RECTANGULAR COORDINATE SYSTEM.
13. FOR BERM RELIEF DITCH SEE 10H4280-8.

SCRUBBER DIKE CURVE DATA

PI #1	PI #2	PI #3	PI #4
Δ = 49°	Δ = 10°	Δ = 37°	Δ = 81° FIELD
D = 8°	D = 3°	D = 8°	D = 285.38'-52"
R = 716.20'	R = 1909.86'	R = 716.20'	R = 200'
T = 326.39'	T = 167.09'	T = 239.64'	
L = 612.50'	L = 333.33'	L = 462.50'	
N = 331,800 (SET)	N = 332,940 (SET)	N = 330,869.6 (CALCU)	N = 333,768.8 (CALCU)
E = 1,639,955 (SET)	E = 1,635,550 (SET)	E = 1,636,456.4 (CALCU)	E = 1,636,865.3 (CALCU)

INDEX TO DRAWINGS

10W4280-	DESCRIPTION
SH. 1	PLAN & GRADING
SH. 2	PLAN, SECTIONS & DETAILS
SH. 3	SECTIONS & DETAILS
SH. 4	INTERNAL DRAIN SECTS. & DETS.
SH. 5	BORROW AREA PLAN
SH. 6	SPILLWAY DETAILS
SH. 7	SKIMMER DETAILS
10H4280-	
SH. 8	MISCELLANEOUS DRAINAGE DETAILS
SH. 9	PIPE CULVERT INSTL. & BEDDING DET
SH. 10	EROSION CONTROL MAT DETAILS
SH. 11	MISCELLANEOUS DITCH PROT. DETAILS
SH. G01	PIPE CULVERTS
SH 701-710	CROSS-SECTIONS

ORIGINAL ISSUE FOR WO 2077

COMPANION DRAWINGS.
10W4280-2 THRU-7 -
10H4280-8 THRU 11, G01, & 701 THRU 710

INSPECTED AND APPROVED FOR ISSUE
O.P. Thornton

NO.	1	4/3/86	JWS	NAR	JDE	WMB	AEH	MTJ
	FINAL FIELD REVISION.							
NO.	SCH/FOR	DATE	DSGN	DWN	CHKD	PMG	APR	SUP

DSGN A.H. Spebber
DWN A.H. SPEBBER
CHKD Unmarked
SUPV Unmarked
INSP
ENGINEER M.H. Miller

SCALE: 1" = 200' EXCEPT AS NOTED

YARD: FGD SYSTEM
UNITS 1&2

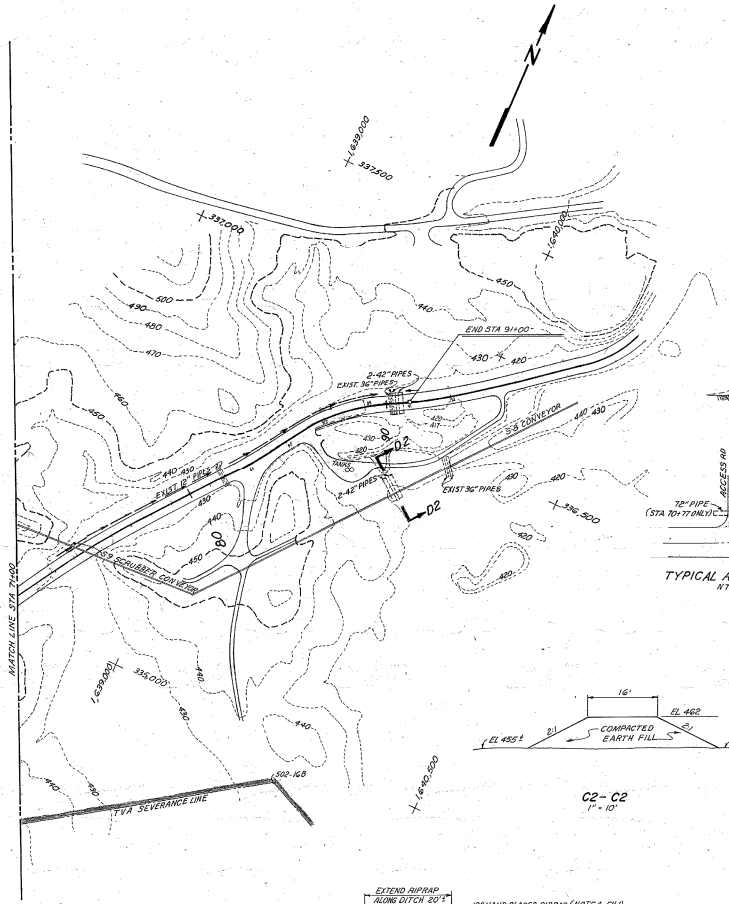
WET SCRUBBER SYSTEM
GYPSUM PONDING
PLAN & GRADING SH. 1

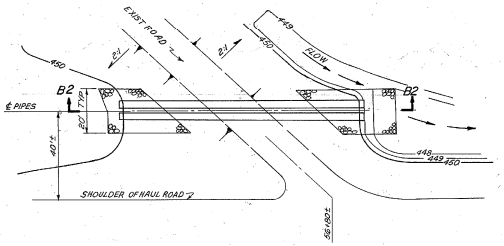
PARADISE STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED
M.H. Miller	A.E. Hamm	R.D. Bennett

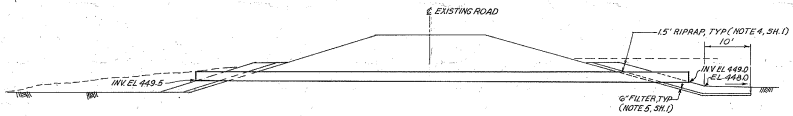
KNOXVILLE 1/25/85 64 C 10W4280-1 R1

RECORD DRAWING AS CONSTRUCTED
Frank Van Meter 11-3-86 R1





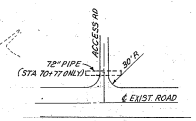
DETAIL A2
1"=20'



DOUBLE PIPE
112"-43" x 27" PIPE-ARCH (EACH)
14 GAGE FERROUS P/CM
FULLY BITUMINOUS COATED

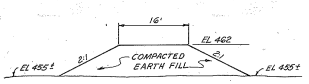
STR EXCAV	310 C.Y.
CHAN EXCAV	500 C.Y.
RIPRAP	40 C.Y.
FILTER	18 TON

NOTES:
1. FOR NOTES SEE SHEET 1.
2. FOR ADDITIONAL QUANTITIES SEE SHEETS G & 7

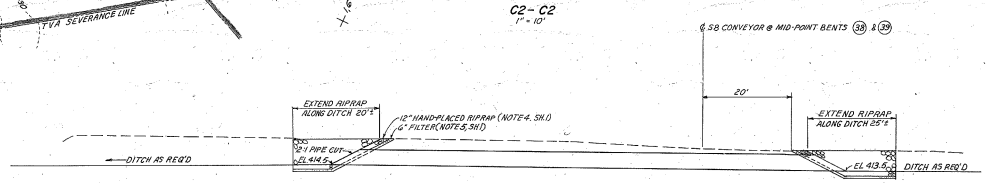


TYPICAL ACCESS ROAD
NTS

B2-B2
HORIZ 1"=10'
VERT 1"=10'



C2-C2
1"=10'



DOUBLE PIPE
117'-42" FL LENGTH
110'-42" NET LENGTH (EACH)
90°
14 GAGE FERROUS P/CM
FULLY BITUMINOUS COATED

STR EXCAV	200 C.Y.
CHAN EXCAV	600 C.Y.
RIPRAP	180 S.Y.
FILTER	80 TON

D2-D2
1"=10'

*SUMMARY OF QUANTITIES

ITEM NO.	DESCRIPTION	QUANTITIES
110	REMOVAL OF STRUCTURES †	LS
120	UNCLASSIFIED EXCAVATION	47,150 C.Y.
123	EARTH BORROW EXCAVATION	726,000 C.Y.
125	STRUCTURAL EXCAVATION	1,418 C.Y.
305	CRUSHED STONE SURFACING	1250 TON
402	CLASS B CONC.	16 C.Y.
560	NYLON EROSION MAT	460 S.Y.
570	FILTER BLANKET	160 TON
575	RIPRAP	120 C.Y.
576	HAND-PLACED RIPRAP	300 S.Y.
580 & 582	SEEDING & MULCHING	82,700 S.Y.
	INTERNAL DRAIN SYSTEM	
125	STRUCTURAL EXCAVATION	4600 C.Y.
	CHIMNEY & FINGER DRAIN MATL.	3100 C.Y.
	4" Ø PE PERFORATED PIPE	3000 L.F.
	4" Ø PVC NON-PERFORATED PIPE	2100 L.F.
	4" PE ELL	4 EA.
	4" PE TEE	14 EA.
	PIPE CULVERT	
481	18" C.M. PIPE 14 GAGE	138 L.F.
481	24" C.M. PIPE 14 GAGE	110 L.F.
481	36" C.M. PIPE 14 GAGE	142 L.F.
482	42" C.M. PIPE 14 GAGE	220 L.F.
463	42" CONC. PIPE CLASS III	220 L.F.
485	43" x 27" PIPE-ARCH 14 GAGE	224 L.F.
499	72" CMP RELAID PIPE CULVERT	90 L.F.

* SEE NOTE 2
† 120"-24" C.M. PIPE

ORIGINAL ISSUE FOR WO 20717

INSPECTED AND APPROVED FOR ISSUE
O.P. Stanton
KNOXVILLE 1/25/85

64	C	10W4280-2	R1

RECORD DRAWING AS CONSTRUCTED
Franklin Miller 1-13-86 R1

6/3/86 AMH DGSE DSE KMB PSH comp

AS CONSTRUCTED.

REV. NO.	ECN NO.	DATE	DSGN	DRWN	CHKD	TS/VC	APPD	ISSD
DSGN	Harold E. Ellering						INSP	
DRWN	A.H. SPERBER							
CHKD	W.D. Sargent						ENGINEER	
SUPV	[illegible]							M.H. Miller

SCALE: 1"=200' EXCEPT AS NOTED

YARD: F G D SYSTEM
UNITS 1 & 2

WET SCRUBBER SYSTEM
GYPSUM PONDING
PLAN SECTIONS & DETS. SH. 2

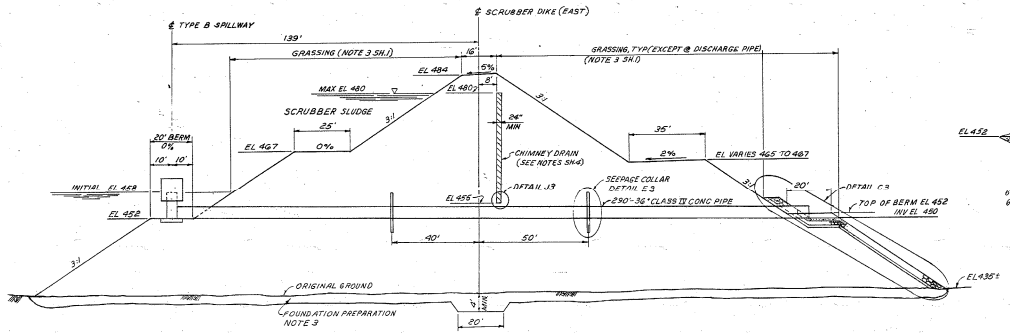
PARADISE STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED
M.H. Miller	E. Ellering	S. Bennett

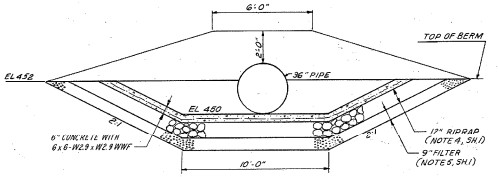
PRINT H
SIZE F
BR OR PROJ AS CE EE ME SE FD HD SD EL BM WS PM
PRINTS REQD—R

HNTS LOTS 1&2

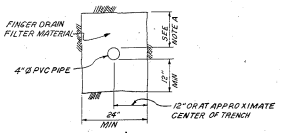
64 C 10W4280-3



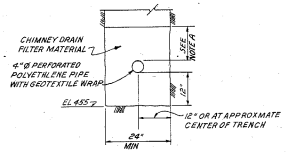
A3-A3
HORIZ: 1"=20'
VERT: 1"=10'



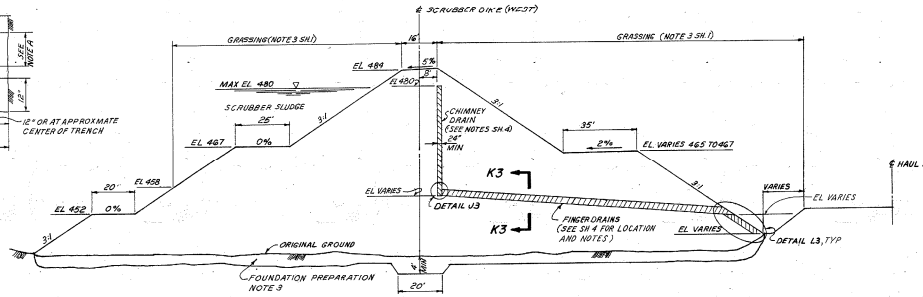
D3-D3
3/8"=1'-0"



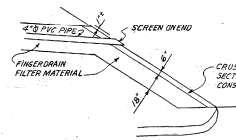
K3-K3



DETAIL J3

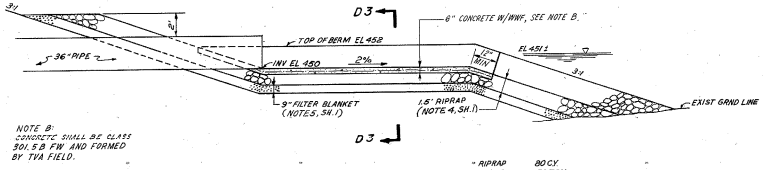


B3-B3
HORIZ: 1"=20'
VERT: 1"=10'



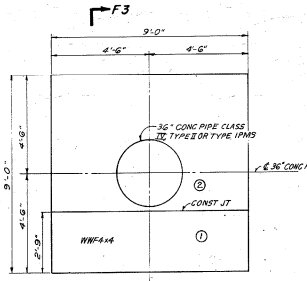
DETAIL L3

NOTE A:
A MINIMUM OF 12 INCHES OF COMPACTED FILTER MATERIAL IS REQUIRED PRIOR TO ALLOWING ACCESS BY HEAVY CONSTRUCTION EQUIPMENT.

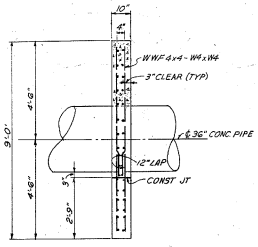


NOTE B:
CONCRETE SHALL BE CLASS 3QI, S & FW AND FORMED BY TVA FIELD.

DETAIL C3
1/4"=1'-0"



ELEVATION



F3-F3

DETAIL E3 SEEPAGE COLLAR (2 REQ'D)
1/2"=1'-0"

	RIPRAP	FILTER
	80 CY	50 TON

DIKE CONSTRUCTION NOTES:
1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH GENERAL CONSTRUCTION SPECIFICATION NO. G-9 "ROLLED EARTHFILL FOR DAMS AND POWER PLANTS", EXCEPT AS NOTED.
2. ALL EXCAVATION AND FILL PLACEMENT SHALL BE DONE UNDER THE SUPERVISION OF A QUALIFIED SOILS INSPECTOR.
3. DIKE FOUNDATION PREPARATION -
   a. THE AREAS FOR THE PROPOSED DIKES SHALL BE DEWATERED TO ALLOW ACCESS BY HEAVY CONSTRUCTION EQUIPMENT. THE METHOD OF DEWATERING IS AT THE OPTION OF CONSTRUCTION, BUT MAY INCLUDE SUMPS, WELL POINTS OR GRADING.
   b. THE AREAS FOR THE PROPOSED DIKES SHALL BE CLEARED OF ALL VEGETATION, ROOTS, AND ORGANIC TOPSOIL.
   c. SOFT SOILS, WHEN ENCOUNTERED BENEATH THE TOPSOIL SHALL ALSO BE REMOVED. THE SOFT SOILS MAY EXTEND UP TO 8 TO 10 FEET BELOW GRADE.
   d. THE ENTIRE FOUNDATION AREA SHALL BE COMPACTED WITH A SHEEPSFOOT ROLLER FOLLOWED BY A FLAT WHEELED ROLLER UNTIL THE AREA WILL SUPPORT HEAVY EQUIPMENT WITHOUT RUTTING INTO THE GROUND AND HEAVING ITS AREA.
   e. PRIOR TO PLACING FILL THE FOUNDATION AREA SHALL BE SCARIFIED TO PROVIDE A GOOD BOND BETWEEN FOUNDATION AND FILL.
4. EARTH FILL NOTES:
   a. EARTH FILL SHALL BE OBTAINED FROM BORROW AREAS AS SHOWN ON DRAWING 10W4280-5.
   b. EARTH FILL SHALL BE UNIFORMLY COMPACTED IN LAYERS WHICH WHEN COMPACTED DO NOT EXCEED A THICKNESS OF 6 INCHES. COMPACTION SHALL BE ACCOMPLISHED USING A SHEEPSFOOT ROLLER PULLED BY A DOZER OR A TAMPING (SHEEPSFOOT) ROLLER (REX FACTOR 3.50, OR AN OFFICE OF ENGINEERING APPROVED EQUAL). EACH LAYER SHALL BE COMPACTED TO AT LEAST 95% OF MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D698. THE MOISTURE CONTENT SHALL BE CONTROLLED TO ACHIEVE ADEQUATE COMPACTION. ALLOWABLE MOISTURE CONTENT DURING PLACEMENT AND COMPACTION SHALL BE BETWEEN 3% ABOVE AND 3% BELOW OPTIMUM MOISTURE CONTENT. THE FAMILY-OF-COMPACTION CURVES DEVELOPED FOR BORROW AREA "A" BY SAE IS TO BE USED TO CONTROL THE EARTHFILL COMPACTION, (EXCEPT AS NOTED IN C2-C2 DRAWING 10W4280-2) THE CURVES WERE SUBMITTED ON A 45 D FROM FRANK VAN METER TO O.P. THORNTON ENTITLED "CSB 840417.30 - PARADISE STEAM PLANT - PROPOSED SCRUBBER SLUDGE DISPOSAL AREA - END DES SOIL SCHEDULE BB.5 - SUPPLEMENTAL INFORMATION" (CSB 840517.302)
   c. IN-PLACE DENSITY TESTS USING THE SAND CONE (ASTM D1556) OR RUBBER BALLOON (ASTM D2167) TEST METHODS SHALL BE MADE AT A RATE OF AT LEAST ONE TEST PER EACH 2000 CUBIC YARDS OF EARTH FILL PLACED (IN-PLACE VOLUME) OR A MINIMUM OF ONE PER DAY. BLOCK SAMPLES SHALL BE OBTAINED AS OUTLINED IN SECTION 11.3 OF GENERAL CONSTRUCTION SPECIFICATION G-9
   d. NO ROCKS LARGER THAN 6 INCHES IN DIAMETER SHALL BE PLACED WITHIN THE DIKE FILL.
5. NOTES FOR THE INTERNAL DRAIN SYSTEM ARE ON DRAWING 10W4280-4.
6. NOTES FOR THE EARTH BORROW LOCATION ARE ON DRAWING 10W4280-5.
7. CIRCULAR ARC STABILITY ANALYSES SAFETY FACTORS FOR THE EXTERIOR DIKES BASED UPON AN EVALUATION OF THE SOILS INVESTIGATION SCHEDULE NO. BB.5 ARE AS FOLLOWS:
   a. INITIAL CONSTRUCTION: SAFETY FACTOR ≥ 1.3.
   b. OPERATING CONDITION WITH ASH AND WATER TO EL 480: SAFETY FACTOR ≥ 1.5.
   c. SUDDEN DRAWDOWN CONDITION FROM EL 480: SAFETY FACTOR ≥ 1.2.

CONSTRUCTION SEQUENCE
1. POUR CONCRETE TO DESIGNED CONSTRUCTION JOINT, AREA ①. ALLOW THREE DAYS TO CURE.
2. COAT CONST. JOINT AND 36" CONCRETE PIPE WITH BONDING AGENT.
3. POUR AREA ②.

ORIGINAL ISSUE FOR W.O 20717

INSPECTED AND APPROVED FOR ISSUE: O.P. Thornton

NO.	ECN/FCR	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD
1		10/3/86						

AS CONSTRUCTED.

DSGN A.M. SPENCER
DRWN A.M. SPENCER
CHKD [illegible]
SUPV [illegible]
INSP
ENGINEER M.H. Miller

SCALE: EXCEPT AS NOTED

YARD: FGD SYSTEM
UNITS 1 & 2

WET SCRUBBER SYSTEM GYPSUM PONDING SECTIONS & DETS. SH. 3

PARADISE STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED
M.H. Miller	[illegible]	[illegible]

KNOXVILLE 1/25/85 64 C 10W4280-3 R1

RECORD DRAWING AS CONSTRUCTED. [illegible] 1-13-86 R1

PRINT

TECHNICAL INFORMATION CENTER KNOXVILLE

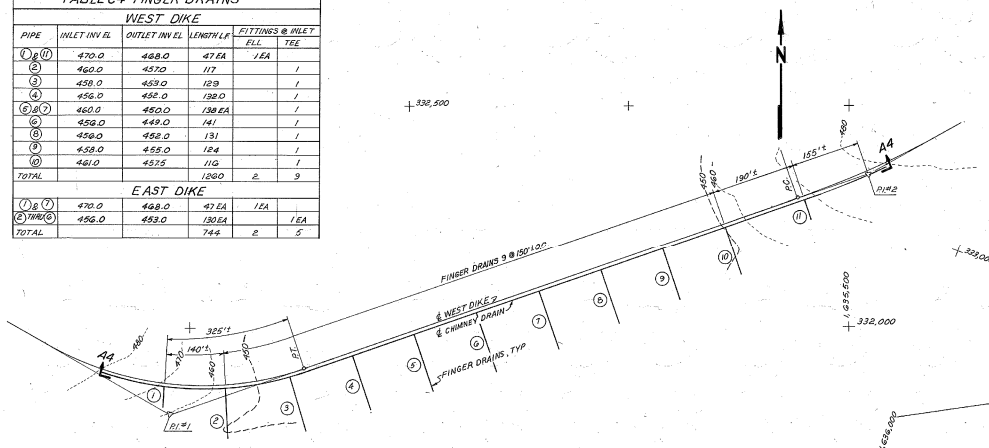
TABLE C4 FINGER DRAINS

WEST DIKE

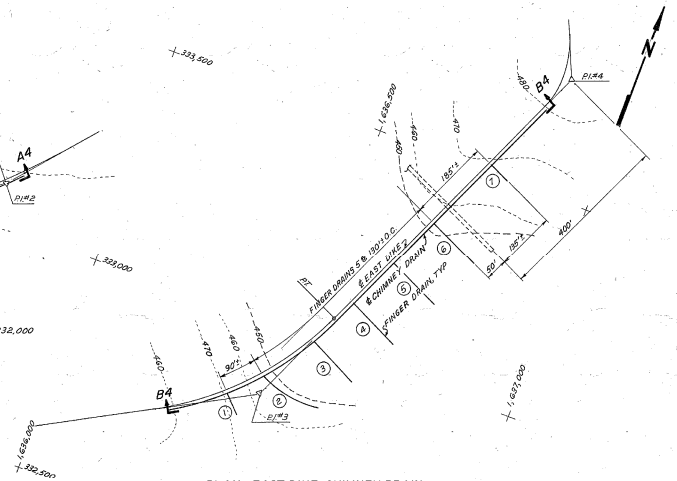
PIPE	INLET INV EL	OUTLET INV EL	LENGTH L.F.	FITTINGS @ INLET ELL	FITTINGS @ INLET TEE
(1) & (11)	470.0	468.0	47 EA	1 EA	
(2)	460.0	457.0	117		1
(3)	458.0	453.0	129		1
(4)	456.0	451.0	138.0		1
(5) & (7)	460.0	450.0	138 EA		1
(6)	459.0	449.0	141		1
(8)	456.0	452.0	131		1
(9)	458.0	455.0	124		1
(10)	461.0	457.5	119		1
TOTAL			1260	2.	9

EAST DIKE

(1) & (7)	470.0	468.0	47 EA	1 EA	
(2) THRU (6)	459.0	453.0	130 EA		1 EA
TOTAL			744	2	5



PLAN WEST DIKE CHIMNEY DRAIN



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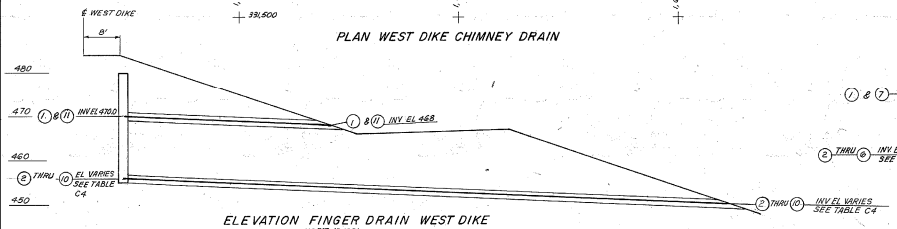
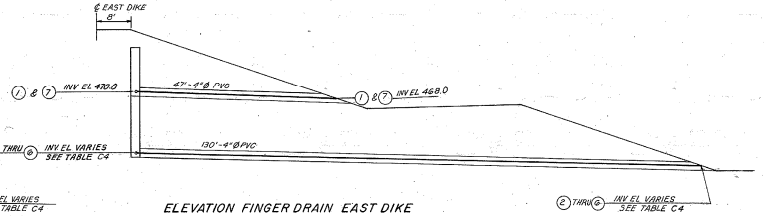
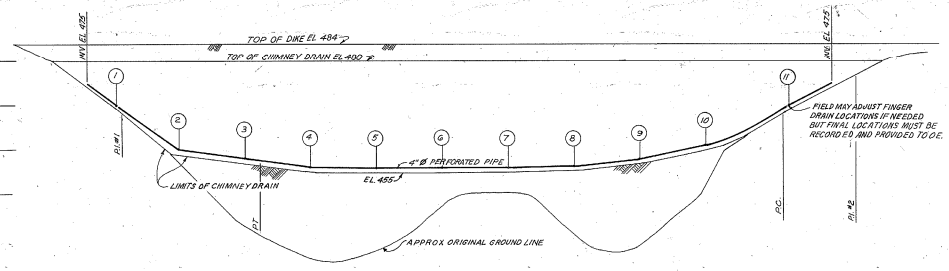


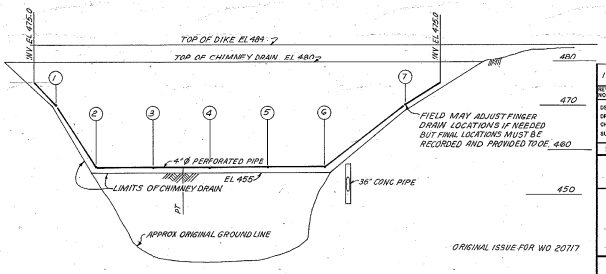
ELEVATION FINGER DRAIN WEST DIKE
HORIZ 1"=100'
SCALE: VERT 1"= 10'



ELEVATION FINGER DRAIN EAST DIKE
HORIZ 1"=100'
SCALE VERT 1"= 10'



A4-A4
PROFILE CHIMNEY DRAIN AND COLLECTOR PIPE
HORIZ. 1"= 100'
SCALE: VERT. 1"= 10'



B4-B4
PROFILE CHIMNEY DRAIN AND COLLECTOR PIPE
HORIZ 1"=100'
SCALE: VERT 1"= 10'

INTERNAL DRAIN SYSTEM:

1. THE INTERNAL DRAIN SYSTEM CONSISTS OF A CHIMNEY DRAIN, PERFORATED COLLECTOR PIPE, AND FINGER DRAINS.

A. MATERIALS

1. THE MATERIAL USED FOR THE CHIMNEY DRAIN AND BACKFILL IN THE FINGER DRAINS SHALL MEET THE REQUIREMENTS OF GENERAL CONSTRUCTION SPECIFICATION NO. T-1, SECTION 1000, EXCEPT THE FOLLOWING GRADATION WILL BE USED:

SIEVE SIZE	%(BY WEIGHT) PASSING MINIMUM	MAXIMUM
3/8 INCH	100	—
NO 4	95	100
" 8	80	100
" 16	50	85
" 30	25	60
" 50	10	30
" 100	0	5
" 200	0	2

2. THE PERFORATED COLLECTOR PIPE AT THE BASE OF THE CHIMNEY DRAIN SHALL BE 4 INCH DIAMETER CORRUGATED POLYETHELENE PIPE MEETING THE REQUIREMENTS OF ASTM F405. THE PIPE SHALL HAVE A GEOTEXTILE WRAP. THE GEOTEXTILE WRAP SHALL BE 100% CONTINUOUS POLYESTER KNITTED WITH A MINIMUM APPLIED WEIGHT OF 3 OZ/YD², A MINIMUM E.O.S. OF 30, A MINIMUM BURST STRENGTH PER ASTM D3786 OF 100 PSI, AND A WATER FLOW RATE OF 345 GAL/MIN/FT² AT 3 INCHES OF HEAD.
3. THE PIPE USED IN THE FINGER DRAIN SHALL BE 4 INCH DIAMETER SCHEDULE 80 PVC (NON-PERFORATED). ALL JOINTS ARE TO BE SEALED TO PREVENT INFLOW OF THE FILTER MATERIAL.

B. CONSTRUCTION PROCEDURE

1. THE FILTER MATERIAL SHALL BE PLACED IN LOOSE LAYERS (12 INCHES MAXIMUM THICKNESS) AND UNIFORMLY COMPACTED WITH A BOMAG VIBRATORY ROLLER MODEL 36 OR AN OE APPROVED EQUAL. COMPACTION SHALL BE DONE TO OBTAIN A DRY DENSITY BETWEEN 125 AND 140 LB/FT³.
2. THE REQUIRED NUMBER OF PASSES TO ACHIEVE THE REQUIRED COMPACTION MAY BE DETERMINED USING A TEST FILL OR BY USING THE COMPACTION CONTROL TEST PROCEDURES. SEVERAL TIMES IN THE FIRST LIFT OF FILTER MATERIAL PLACEMENT.
3. EXCESSIVE COMPACTION SHALL NOT BE PERMITTED TO REDUCE THE POTENTIAL FOR PARTICLE BREAKDOWN. IF THE IN-PLACE DRY DENSITY EXCEEDS 140 LB/FT³, THE MATERIAL TAKEN FOR THE COMPACTION TEST SHALL BE SUBJECTED TO A SIEVE ANALYSIS (ASTM D546). IF THE % PASSING (BY WEIGHT) EXCEEDS THE SPECIFIED GRADATION CRITERIA FOR THE FILTER MATERIAL FOR THE NO. 100 SIEVE SIZE, OR THE DRY DENSITY EXCEEDS 145 LB/FT³, THE MATERIAL REPRESENTED BY THAT TEST SHALL BE REMOVED, WASTED, AND REPLACED WITH MATERIAL THAT MEETS THE GRADATION REQUIREMENTS.
4. COMPACTION SHALL BE CONTROLLED BY THE USE OF EITHER THE SAND CONE (ASTM 1556) OR RUBBER BALLOON (ASTM D2167) TEST PROCEDURES. THE FREQUENCY OF COMPACTION CONTROL TESTS SHALL BE AS FOLLOWS:
   a. A MINIMUM OF 1 TEST FOR EACH 50 YD³ OF FILTER MATERIAL PLACED.
   b. NO MORE THAN 3 FEET (VERTICAL) OF FILTER MATERIAL SHALL BE PLACED WITHOUT A COMPACTION TEST.

ORIGINAL ISSUE FOR WO 20717

REV NO.	DATE	DRAWN	CHKD	APPD	ISSD
1	4/15/86	LPH	DEB	DJB	CLH
	AS CONSTRUCTED				

DSGN Rudolf P. Hellwig — DSGR
DRWN A.H. SPERRER — DRAWER M.H. Mills
CHKD [illegible]
SUPV [illegible]

SCALE: 1"=100' EXCEPT AS NOTED

YARD: FGD SYSTEM
UNITS 1 & 2

WET SCRUBBER SYSTEM GYPSUM PONDING SECTIONS & DETAILS SH. 4

PARADISE STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED
M.H. Mills	[illegible]	[illegible]

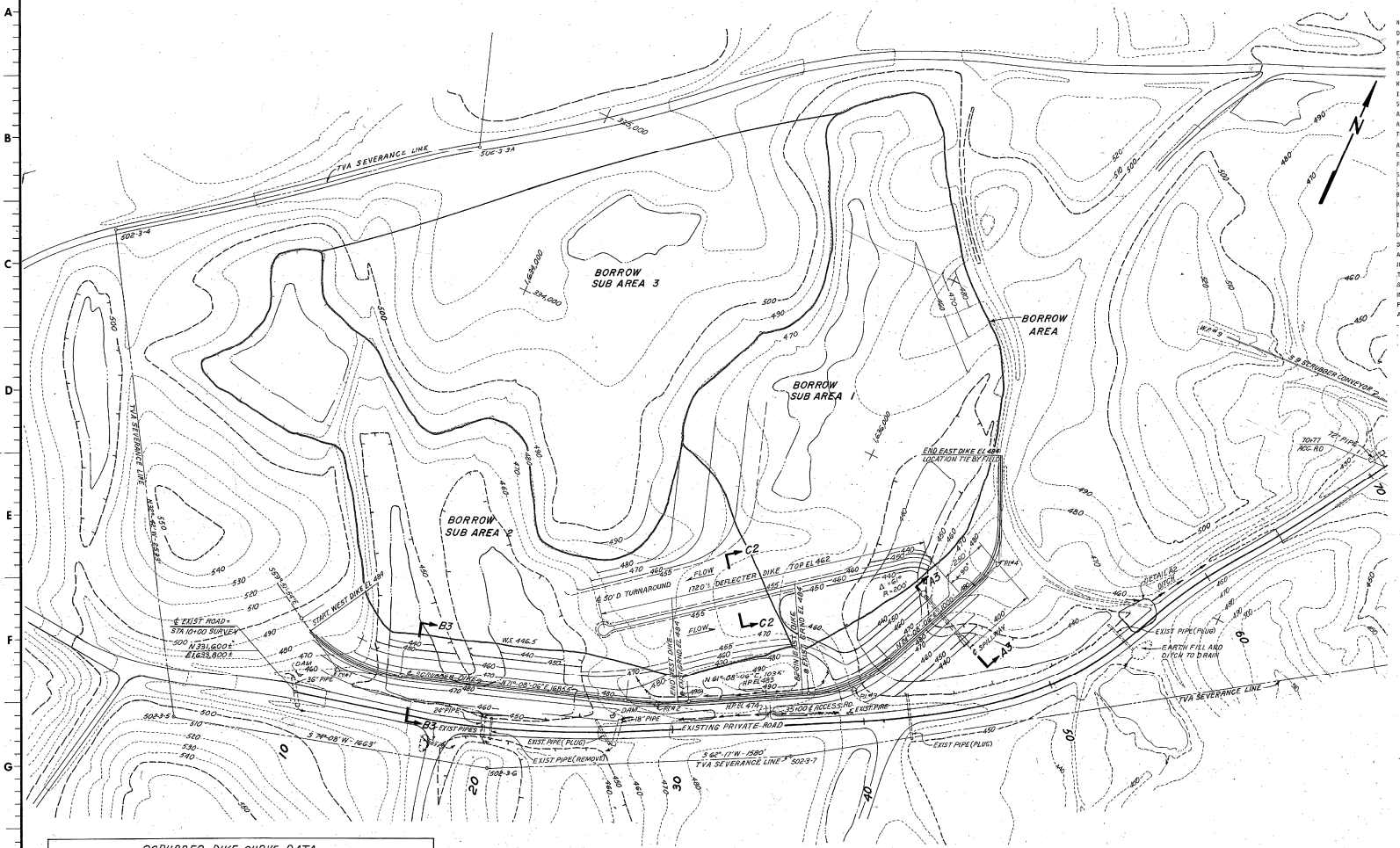
KNOXVILLE 11/25/85 64 C 10W4280-4 R1

INSPECTED AND APPROVED FOR ISSUE [illegible]

RECORD DRAWING AS CONSTRUCTED [illegible] 1-13-86 R1

PRINT H
SIZE F
BR OR PROJ IAS CE EE ME NE FD HD SD BL SW WD PW
PRINTS REQD—R

PROPERTY OF TVA — RETURN TO ENGINEERING LIBRARY KNOXVILLE



NOTES:

DUE TO THE TWO-STAGE CONSTRUCTION PROGRAM FOR THE EAST DIKE, BORROW FROM SUB-AREA 1 SHALL BE INITIALLY USED FOR THE EAST DIKE. THE LOWER ELEVATION MATERIAL SHOULD BE USED AS MUCH AS PRACTICAL SINCE IT WILL BE THE FIRST AREA COVERED BY SCRUBBER SLUDGE. SUB-AREA 2 SHALL BE USED FOR THE COMPLETION OF THE EAST DIKE, AS NECESSARY, AND FOR THE WEST DIKE. SUB-AREA 3 SHALL ONLY BE USED IF ADDITIONAL BORROW MATERIAL IS NEEDED. EXCAVATION OF SUB-AREA 3 SHALL START FROM THE EXISTING SLOPES OF SUB-AREAS 1 AND 2. SIDESLOPES OF THE BORROW AREA EXCAVATION ARE TO BE MAINTAINED AT NO STEEPER THAN 3H:1V. THE EDGE OF ANY BORROW AREA EXCAVATION SHALL BE KEPT A MINIMUM OF 50 FEET FROM STRUCTURES OR TOE OF THE DIKES.

ANY EXCAVATION FOR BORROW MATERIAL GREATER THAN 15 FEET IN DEPTH WILL EXCEED THE LIMITS OF THE SOIL INVESTIGATION PROGRAM. WHEN MATERIAL FROM DEPTHS GREATER THAN 15 FEET IS CONSIDERED FOR USE AS BORROW, BAG SAMPLES REPRESENTING EACH 5 FEET OF DEPTH AND APPROXIMATELY 20,000 SQUARE FEET OF SURFACE AREA SHALL BE COLLECTED. THESE BAG SAMPLES MAY BE SUBMITTED TO SME FOR TESTING AND COMPARISON WITH THE FAMILY-OF-COMPACTION CURVES, OR 4-POINT MOISTURE VS DRY DENSITY CURVES MAY BE DEVELOPED BY THE FIELD LABORATORY AND COMPARED WITH THE FAMILY-OF-COMPACTION CURVES. IF AGREEMENT BETWEEN THE TESTING OF THE BAG SAMPLES AND THE FAMILY-OF-COMPACTION CURVES IS GOOD AS DETERMINED BY THE INSPECTOR, THESE CURVES SHALL BE SUBMITTED TO GGEO OF CEB FOR REVIEW AND APPROVAL FOR USE AS COMPACTION CONTROL BEFORE ANY PLACEMENT OF THIS MATERIAL IN THE DIKE. IF AGREEMENT BETWEEN TESTING OF THE BAG SAMPLES AND THE FAMILY-OF-CURVES IS NOT GOOD, THE SAMPLES SHALL BE SUBMITTED TO SME FOR DEVELOPMENT OF A FAMILY-OF-CURVES FOR THAT MATERIAL. IN ORDER TO EXPEDITE THE TESTING OF THIS BORROW MATERIAL, THUS PREVENTING CONSTRUCTION DELAYS TEST PITS SHALL BE EXCAVATED IN ADVANCE OF THE INTENDED USE OF THIS MATERIAL.

SCRUBBER DIKE CURVE DATA

P.I. #1	P.I. #2	P.I. #3	P.I. #4
Δ = 49°	Δ = 10°	Δ = 31°	Δ = MT. FIELD
D = 8°	D = 3°	D = 8°	D = 28°38'52"
R = 716.60'	R = 1909.86'	R = 716.20'	R = 200'
T = 326.39'	T = 167.09'	T = 239.64'	
L = 612.50'	L = 333.33'	L = 462.50	
N = 931,805 (SET)	N = 932,350 (SET)	N = 932,849.6 (CALCU)	N = 933,762.8 (CALCU)
E = 1,633,955 (SET)	E = 1,635,550 (SET)	E = 1,636,459.4 (CALCU)	E = 1,636,866.3 (CALCU)

ORIGINAL ISSUE FOR WD 7/7/7

INSPECTED AND APPROVED FOR ISSUE

NO.	REVISION	DATE	DSGN	DRWN	CKD	SUPV	INSP	ENGR
1	6/3/86	JNH	RBW	KWB	RCT	GPS		
	AS CONSTRUCTED.							

DSGN G.P. Sanders
DRWN A.H. SPERBER
CKD W.M. Hamon
SUPV W.M. Hamon
INSP
ENGINEER M.H. Miller

SCALE: 1" = 200' EXCEPT AS NOTED

YARD FGD SYSTEM
UNITS 1 & 2

WET SCRUBBER SYSTEM
GYPSUM PONDING
BORROW AREA-PLAN SH. 5

PARADISE STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED
M.H. Miller	E.E. Brown	G.P. Sanders

KNOXVILLE 1/27/87 64 C 10W4280-5 R1

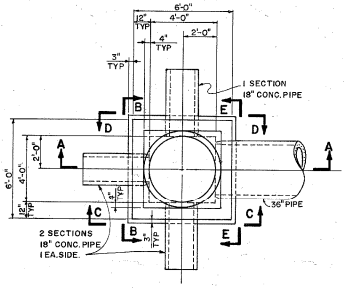
RECORD DRAWING APPROVED
J. A. Bacon Manager 1-13-86 R1

PRINT H
SIZE F

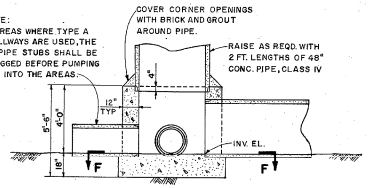
BR OR PROJ ME EE CE AD CD ED MD TP EP SW BL NP TC
PRINTS REQD-R

TECHNICAL INFORMATION CENTER RECEIVED 10/23/87

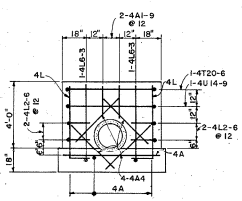
10W4280-5
64 C



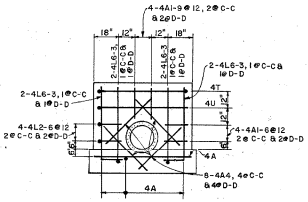
PLAN - SPILLWAY TYPE A



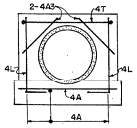
SECTION A-A



B-B

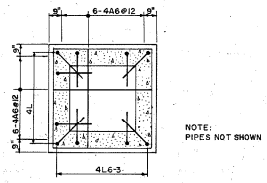


C-C & D-D
D-D OPPOSITE HAND



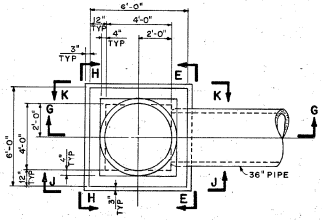
E-E
(TYPE A & B)

NOTES:
1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE T-I SPECIFICATIONS, UNLESS OTHERWISE NOTED.
2. ALL CONCRETE SHALL BE CLASS B IN ACCORDANCE WITH SECTION 400, TYPE II PORTLAND CEMENT SHALL BE USED.
3. ALL REINFORCEMENT SHALL CONFORM TO ASTM SPECIFICATION A615 GRADE 60, DEFORMED.
4. DIMENSIONS SHOWN ARE TO THE CENTERLINE OF REINFORCING BARS, UNLESS OTHERWISE NOTED.
5. CONCRETE CLEAR COVER DIMENSIONS ARE AS FOLLOWS:
   3 INCHES FOR FACES CAST AGAINST EARTH OR ROCK;
   2 INCHES FOR ALL OTHER FACES.

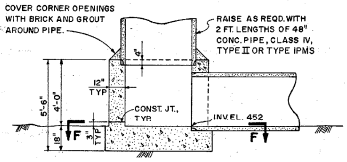


NOTE:
PIPES NOT SHOWN

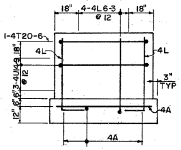
F-F
(TYPE A & B)



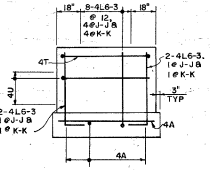
PLAN - SPILLWAY TYPE B



G-G



H-H



J-J & K-K
K-K OPPOSITE HAND

BENT BAR LIST

BAR MARK	NO REQD	BENDING DIMENSIONS a	b	c	e
4L6-3	10	4-4	EX		
4T20-6	1	5-0	5-0		
4U14-9	1	5-0	5-0	EX	
4L2-6	4	1-3	EX		

TYPE A SPILLWAYS

BENT BAR LIST

BAR MARK	NO REQD	BENDING DIMENSIONS a	b	c	e
4L6-3	16	4-4	EX		
4T20-6	1	5-0	5-0		
4U14-9	3	5-0	5-0	EX	

TYPE B SPILLWAYS

*** BILL OF MATERIAL**

ITEM	DESCRIPTION	NO. OF SPLWYS	PER SPLWY	TOTAL REQD
402	CLASS B CONCRETE WITH TYPE II PORTLAND CEMENT	1	5 CU YD	5 CU YD
425	REINFORCING STEEL	1	170 LB	170 LB
463	36" D REINFORCED CONCRETE PIPE - CLASS IV, TYPE II OR TYPE IPMS ("O" RING RUB GSKT)	1	290 FT	290 FT
463	48" D REINFORCED CONCRETE PIPE - CLASS IV, TYPE II OR TYPE IPMS (BELL & SPIGOT)	1	24 FT	24 FT

* NOTE: ITEMS ARE NOT INCLUDED IN SUMMARY OF QUANTITIES SHOWN ON DRAWING 10W4280-2

ORIGINAL ISSUE FOR WO EOTIT

INSPECTED AND APPROVED FOR ISSUE — K.C. Hunter — KNOXVILLE 1/25/85

REV NO.	ECN NO.	DATE	DSGN	DRWN	CHKD	RVWD	APPD	TSSD
1		6/3/86	APL	TKEN	ERG	MWM	KCH	comp
AS CONSTRUCTED.								

DSGN: Gerald K. Bell
DRWN: ALBERT L. SPEARS
CHKD: J. A. Hall
SUPV: J. Wagner
INSP:
ENGINEER: M. H. Miller

SCALE: 3/8" = 1'-0" EXCEPT AS NOTED

YARD: FGD SYSTEM
UNITS 1 & 2

ASH DISPOSAL AREA
SPILLWAYS TYPE A & B SH. 6

PARADISE STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED
M. H. Miller	J. E. Hanna	B. Abernathy

KNOXVILLE 1/25/85 | 64 | C | 10W4280-6 | R1

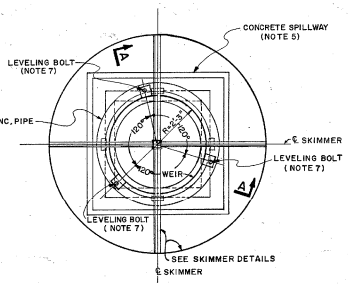
RECORD DRAWING AS CONSTRUCTED — Jan Miller — 1-8-86 R1

INFORMATION ONLY

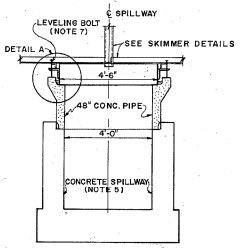
SD-C11.1 R1

PRINT H
SIZE F
BR OR PROJ ME EE CE AD CO ED MD SM BL AA
PRINTS REQD-6

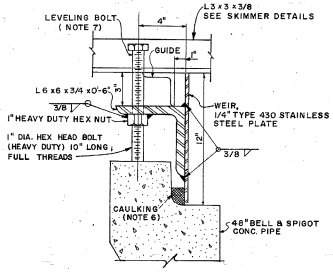
TECHNICAL INFORMATION CENTER INDEXED KNOXVILLE



PLAN



SECTION A-A



DETAIL A
3 REQUIRED
SCALE: 3"= 1'-0"

WEIR DISCHARGE* IN CUBIC FEET PER SECOND

HEAD IN FEET	0.0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	.0	.04	.11	.21	.35	.52	.72	.95	1.20	1.34
0.1	1.54	1.75	1.97	2.20	2.44	2.70	2.96	3.24	3.52	3.81
0.2	4.11	4.41	4.72	5.04	5.36	5.69	6.04	6.38	6.73	7.10
0.3	7.47	7.85	8.23	8.62	9.00	9.41	9.82	10.20	10.60	11.10
0.4	11.50	11.90	12.40	12.80	13.30	13.70	14.20	14.70	15.10	15.60
0.5	16.10	16.60	17.10	17.60	18.10	18.60	19.10	19.60	20.10	20.70
0.6	21.20	21.70	22.30	22.80	23.40	23.90	24.50	25.00	25.60	26.20
0.7	26.70	27.30	27.90	28.50	29.10	29.70	30.30	30.90	31.50	32.10
0.8	32.70	33.40	34.00	34.60	35.20	35.90	36.50	37.20	37.80	38.50
0.9	39.10	39.80	40.40	41.10	41.80	42.50	43.10	43.80	44.50	45.20
1.0	45.90									

*4'-6" DIAMETER

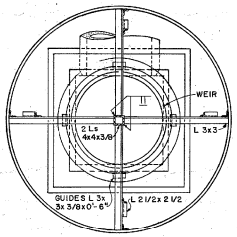
*BILL OF MATERIAL

ITEM	DESCRIPTION	NO. SPLWYS.	PER SPLWY.	TOTAL REQD.
	WEIR			
ANGLE	6 x 6 x 3/4 x 0'-6"		3	
BOLT	1" ø x 0'-10" HEAVY DUTY (FULL THREADS) WITH NUT		3	
PL	1/4 x 12 x 14'-2" TYPE 430 STAINLESS		1	
CAULKING	BY FIELD			
	SKIMMER			
48Ø	120°-12 GAGE CMP PIPE (SEE NOTES 1 & 4)	1	5 FT.	5 FT
BOLT	1/2" ø x 0'- 11 1/2" GALVANIZED	1	12	12
PL	1/8" METAL COVER (BY FIELD SEE DETAILS)	1	1	1
ANGLE	2 1/2 x 2 1/2 x 3/8	1	23 FT.	23 FT.
ANGLE	3 x 3 x 3/8	1	64 FT.	64 FT.
ANGLE	4 x 4 x 3/8	1	8 FT.	8 FT.

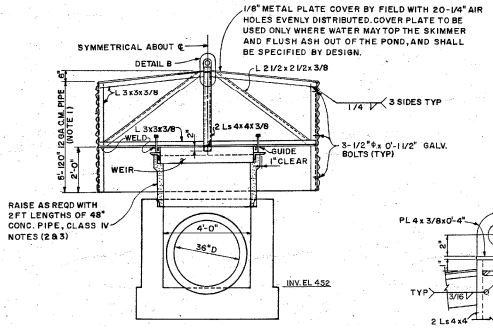
* NOTE: ITEMS ARE NOT INCLUDED IN SUMMARY OF QUANTITIES SHOWN ON DRAWING 10W4280-2.

WEIR DETAILS

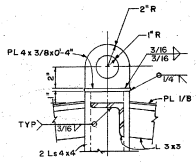
NOTES:
1. A SECTION OF 120° CORRUGATED METAL PIPE, FULLY COATED, SHALL BE USED FOR THE SKIMMER DEVICE. ALL SEAMS AND JOINTS SHALL BE RIVETED. FABRICATION OF THE PIPE SHALL BE COMPLETE PRIOR TO COATING.
2. ONE SECTION OF 48" PIPE SHALL BE INSTALLED DURING INITIAL CONSTRUCTION.
3. AS ADDITIONAL SECTIONS OF 48" PIPE ARE ADDED, GROUT THE JOINT TO FORM A STABLE AND WATER TIGHT CONNECTION.
4. ALL CONNECTIONS TO BE WELDED.
5. FOR SPILLWAY DETAILS SEE STD. DWG. SD-CII.1.
6. CAULKING SHALL EXTEND COMPLETELY AROUND THE WEIR AND FORM A WATER TIGHT SEAL.
7. WHEN THE WEIR IS INSTALLED THE TOP SHALL BE LEVELED WITH THE USE OF LEVELING BOLTS.
8. ALL WELDS BY TVA FIELD SHALL BE MADE AND INSPECTED IN ACCORDANCE WITH TVA CONSTRUCTION SPECIFICATION G29C.
9. ALL WELDS BY TVA TO HAVE VISUAL INSPECTION.
10. ALL EXPOSED SURFACES OF FIELD FABRICATED STEEL ITEMS TO BE PAINTED IN ACCORDANCE WITH CONSTRUCTION SPECIFICATION G14, PART XIX.



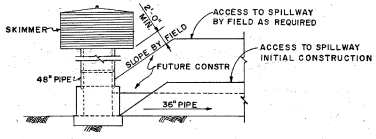
SECTIONAL PLAN



SECTIONAL ELEVATION



DETAIL B
SCALE: 3"= 1'-0"



TYPICAL SECTION FOR ACCESS TO SPILLWAYS
SCALE: 3/16"= 1'-0"

SKIMMER DETAILS

NOTE: WEIR SHALL NOT BE INSTALLED.

ORIGINAL ISSUE FOR WO 2071?

REV	ECN NO.	DATE	DSGN	DRWN	CHKD	SUPV	APPD	ISSD
1	AS CONSTRUCTED.	6/3/86	JNG	DCK	JDS	KMD	JDS	JNG

DSGN Neil J. Gilbert
DRWN ALBERT H. BRENNER
CHKD [illegible]
SUPV [illegible]
INSP
ENGINEER M.H. Mills

SCALE: 1/2" = 1'-0" EXCEPT AS NOTED

YARD: FGD SYSTEM
UNITS 1 & 2

ASH DISPOSAL AREA

WEIR & SKIMMER DETS. SH.7

PARADISE STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED
M.H. Mills	R.E. Hann	L.M. Hamilton
KNOXVILLE 1/25/85	64 C	10W4280-7 RI

INSPECTED AND APPROVED FOR ISSUE
G.P. Hamilton

RECORD DRAWING AS CONSTRUCTED
Frank Van Pelt 11-9-86 RI

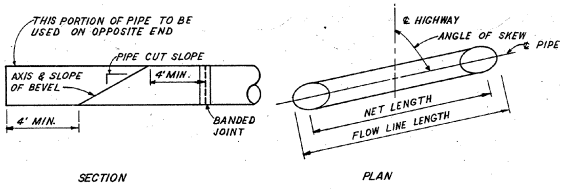
PRINT
SIZE
SN OR PROJ NO. EE CE AD CP EC BE SW AL MI
PRINTS REQD - R

TECHNICAL INFORMATION CENTER INDEXED KNOXVILLE

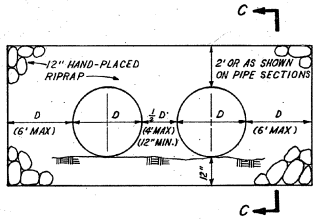
SD-CII.2 RO

64 C 10H4280-8

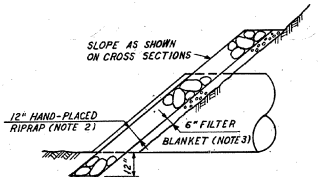
PROJECT



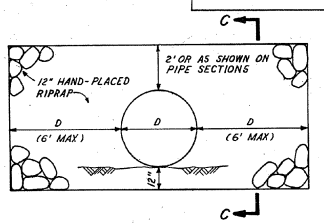
TYPICAL SKEWED AND BEVELED PIPE CULVERTS



ELEVATION OF DOUBLE PIPES

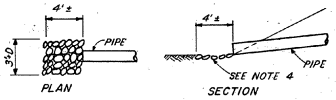


SECTION C-C

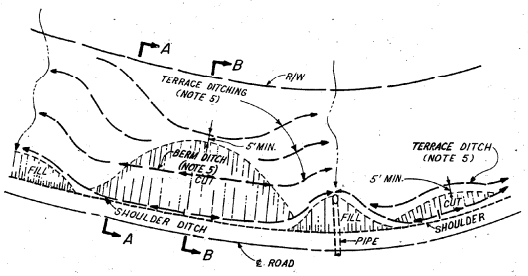


ELEVATION OF SINGLE PIPE

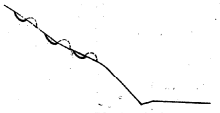
RIPRAP AT INLET & OUTLET OF PIPES
FOR QUANTITIES SEE TABLE

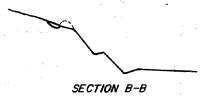


TYPICAL ROCK OUTLET



TYPICAL BERM AND TERRACE DITCHES



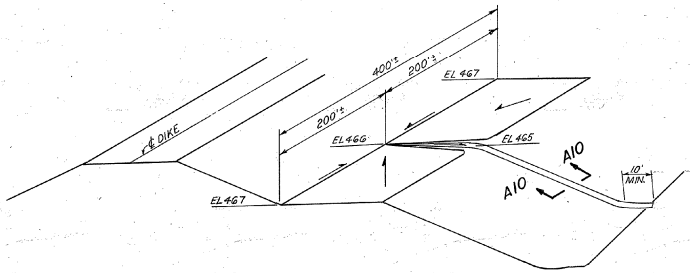


QUANTITIES * HAND-PLACED RIPRAP

	1.5:1 SLOPE		2:1 SLOPE		2.5:1 SLOPE		3:1 SLOPE	
PIPE D INCHES	RIPRAP SQ. YD.	FILTER TON	RIPRAP SQ. YD.	FILTER TON	RIPRAP SQ. YD.	FILTER TON	RIPRAP SQ. YD.	FILTER TON
36	18.9	4.7	23.4	5.8	28.0	6.9	33.0	8.2
42	23.6	5.9	29.2	7.2	35.1	8.7	41.4	10.2
48	28.1	1.1	35.6	8.8	42.6	10.6	50.3	12.4
54	34.4	8.5	42.5	10.5	51.0	12.7	60.2	14.9
60	40.4	10.0	50.0	12.4	60.0	14.9	70.7	17.5
66	46.8	11.6	58.0	14.4	69.6	17.2	82.1	20.3
72	53.8	13.3	66.4	16.4	79.9	19.8	94.2	23.3
78	57.4	14.2	71.0	17.6	85.2	21.1	100.4	24.9
84	60.9	15.1	75.4	18.7	90.5	22.4	106.7	26.4
90	64.6	16.0	80.0	19.8	95.9	23.8	113.1	28.0

* FOR BOTH ENDS

NOTES:
1. ALL WORK SHALL BE IN ACCORDANCE WITH GEN CONST SPECIFICATION - NO.71, UNLESS OTHERWISE NOTED.
2. HAND-PLACED RIPRAP SHALL CONFORM TO SECTION 576.
3. FILTER BLANKET SHALL CONFORM TO SECTION 570.
4. PLACE ROCKS (1' ± DIAMETER) AT OUTLET END OF PIPE TO REDUCE VELOCITIES AND PREVENT SCOUR WHERE INDICATED.
5. BERM DITCHES OR TERRACE DITCHES SHALL BE CONSTRUCTED WHERE INDICATED ON THE PLANS OR DIRECTED BY THE ENGINEER.
   BERM DITCHES SHALL BE CONSTRUCTED AT LEAST FIVE FEET FROM THE TOPS OF CUTS AND WHEREVER POSSIBLE, SHOULD NOT BE CONSTRUCTED ON A GRADE STEEPER THAN ONE PERCENT.
   IN GENERAL WHEREVER THE TOPOGRAPHY IS SUCH THAT GRADES GREATER THAN ONE PERCENT WILL BE REQUIRED, TERRACE DITCHES SHALL BE CONSTRUCTED. A SUFFICIENT NUMBER OF THESE SHOULD BE CONSTRUCTED TO TAKE CARE OF THE DRAINAGE IN A MANNER TO CHECK EROSION. THESE TERRACE DITCHES SHOULD ALSO BE CONSTRUCTED ON ABOUT ONE PERCENT GRADES.
   ALL DITCHES SHOULD SLOPE AWAY FROM THE ROADWAY SO THAT THE DISCHARGE WILL NOT CAUSE EROSION ADJACENT TO CUTS AND FILLS.



TYPICAL RELIEF DITCH AT BERM, EL 467
(APPLIES TO OUTSIDE SLOPE, EACH DIKE)

NOT TO SCALE

ORIGINAL ISSUE FOR WO 20717

REV NO.	ECN NO.	DATE	DSGN	DRWN	CHKD	APVD	ISSD
1		4/3/86	JPHS	RBH	JDS	WMB	RDH
	AS CONSTRUCTED.						

DSGN Lowell R. Williams
DRWN A.H. SPERGER
CHKD [illegible]
SUPV [illegible]
ISSD
ENGINEER M.H. Miller

YARD: FGD SYSTEM
UNITS 1&2

MISCELLANEOUS
DRAINAGE DETAILS SH.8

PARADISE STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED
M.H. Miller	K.E. Lyons	L.D. Bennett
KNOXVILLE 1/25/85	64 C 10H4280-8 RI	

INSPECTED AND APPROVED FOR ISSUE
O.P. Thornton

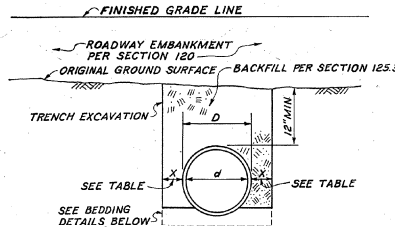
RECORD DRAWING AS CONSTRUCTED
Lowell R. Williams 1-13-86 RI

TECHNICAL INFORMATION CENTER INDEXED - KNOXVILLE

SD-C11.6 RI

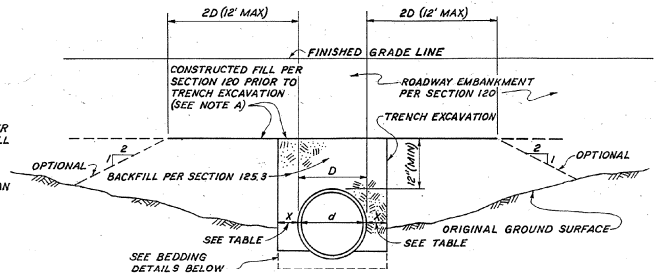
①	②	③	④	⑤	⑥

64 C 10H4280-9



NEGATIVE PROJECTION CONDITION
ORIGINAL GROUND SURFACE AT LEAST ONE FOOT ABOVE TOP OF PIPE

NOTE A:
FOR PIPES 48" OR LESS IN DIAMETER (OR SPAN WIDTH) EMBANKMENT SHALL BE CONSTRUCTED TO A MINIMUM ELEVATION OF ONE FOOT ABOVE TOP OF PIPE PRIOR TO TRENCH EXCAVATION. FOR PIPES GREATER THAN 48" IN DIAMETER (OR SPAN WIDTH) CONSTRUCTION OF EMBANKMENT PRIOR TO PIPE INSTALLATION IS OPTIONAL.

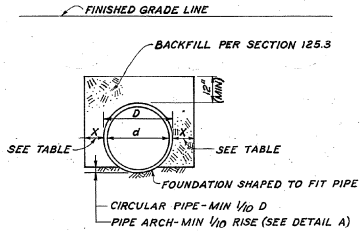


POSITIVE PROJECTION CONDITION
GROUND SURFACE LESS THAN ONE FOOT ABOVE TOP OF PIPE

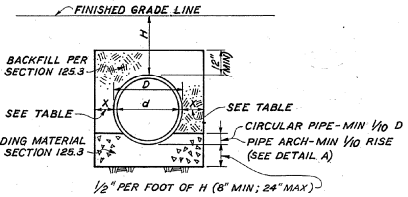
PIPE SHAPE	DIAMETER(d) OR SPAN WIDTH	X
CIRCULAR	d LESS THAN 36"	6"(MIN)-12"(MAX)
	d = 36" AND OVER	18"
ARCH (SEE DETAIL A)	SPAN LESS THAN 36"	12"
	SPAN = 36" AND OVER	18"

TABLE-EXCAVATION WIDTH X

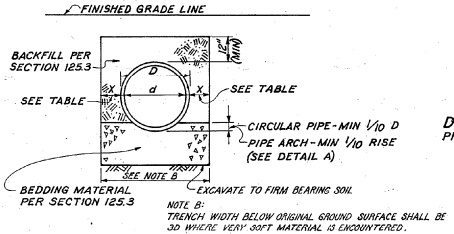
CIRCULAR PIPE INSTALLATION, ALSO APPLICABLE TO PIPE ARCH



EXISTING FIRM EARTH FOUNDATION

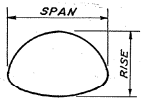


ROCK FOUNDATION



NOTE B:
TRENCH WIDTH BELOW ORIGINAL GROUND SURFACE SHALL BE 3D WHERE VERY SOFT MATERIAL IS ENCOUNTERED.

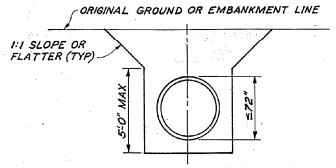
SOFT, YIELDING OR OTHERWISE UNDESIRABLE FOUNDATION MATERIAL



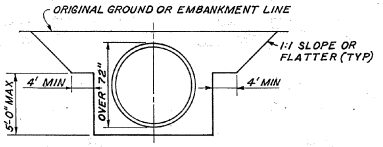
DETAIL A
PIPE ARCH NOMENCLATURE

NOTES
1. THE BEDDING DETAILS SHOWN ON THIS DRAWING ARE IN CONFORMANCE WITH A CONVENTIONAL "CLASS C" BEDDING.
2. EXCAVATION, BACKFILL AND BEDDING FOR PIPE CULVERTS SHALL BE IN ACCORDANCE WITH GENERAL CONSTRUCTION SPECIFICATION NO T-1, SECTION 125.
3. THE INSTALLATION AND BEDDING OF ALL PIPE CULVERTS SHALL CONFORM TO THE REQUIREMENTS AS SHOWN ON THIS DRAWING.

CIRCULAR PIPE BEDDING DETAILS, ALSO APPLICABLE TO PIPE ARCH

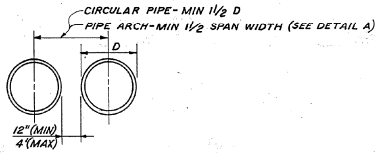


DIAMETER OR RISE 72" OR LESS



DIAMETER OR RISE GREATER THAN 72"

TRENCH EXCAVATION SAFETY REQUIREMENTS



DOUBLE CIRCULAR PIPE SPACING, ALSO APPLICABLE TO PIPE ARCH

NOT TO SCALE

ORIGINAL ISSUE FOR WO 20717

INSPECTED AND APPROVED FOR ISSUE
O.P. Hornsby

1 4/3/86 MMS TMM DWG WMB RCH OPT AS CONSTRUCTION.

REV NO	ECN NO	DATE	DSGN	DRWN	CHKD	REVWD	APPD	ISSD

DSGN Lowell F. Sullivan
DRWN R.A.S. PEREZ
CHKD 10H4442-A
SUPV W.M. MARTIN, J.M. SIVERS
INSP
ENGINEER M.H. Miller

YARD: FGD SYSTEM
UNITS 1&2

PIPE CULVERT INSTALLATION & BEDDING DETAILS SH.9

PARADISE STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED
M.H. Miller	E.E. Harris	K.O. Beaty
KNOXVILLE 1/25/85	64 C 10H4280-9 R1	

RECORD DRAWING AS CONSTRUCTED
Frank Van Meter 1-13-86 R1

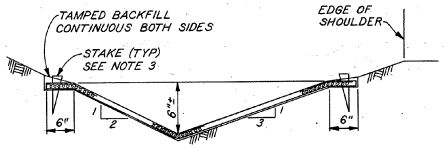
TECHNICAL INFORMATION CENTER INDEXED KNOXVILLE

SD-C11.8 R0

①	②	③	④	⑤	⑥

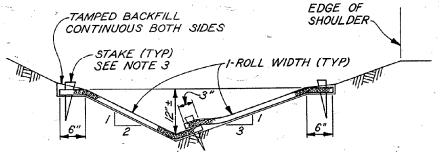
17047RO
19323RO
20106 RO

64C 10H4280-10



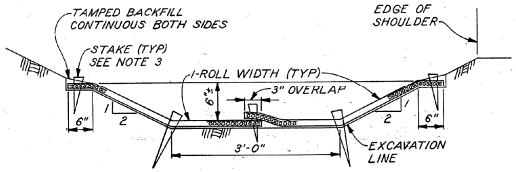
1 ROLL WIDTH

STA	TO	STA	LORR
	–		
	–		
	–		
	–		
	–		
	–		
	–		
	–		



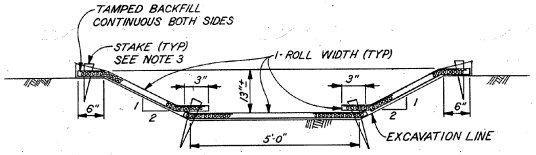
2 ROLL WIDTHS

STA	TO	STA	LORR
	–		
	–		
	–		
	–		
	–		
	–		
	–		
	–		



2 ROLL WIDTHS

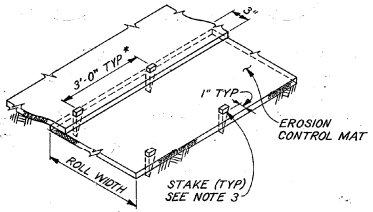
STA	TO	STA	LORR
	–		
	–		
	–		
	–		
	–		
	–		
	–		
	–		



3 ROLL WIDTHS

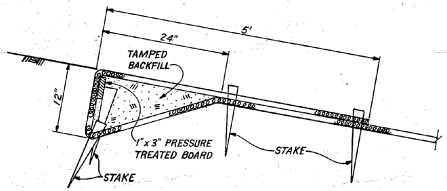
LOCATION	QUANTITY S.Y.
WEST DIKE	360
EAST DIKE	100
TOTAL	460

A10 - A10
(FOR PLAN SEE(10H4280-8))

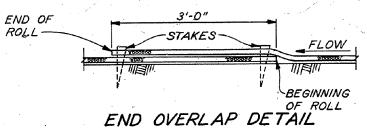


GROUND FASTENER LOCATION DETAIL

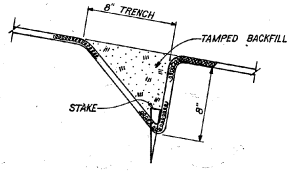
* THIS DIMENSION MAY BE INCREASED TO 5'-0" FOR NON-CONCENTRATED FLOW APPLICATIONS ON DENSE, WELL COMPACTED SOILS; SUBJECT TO THE ENGINEER'S APPROVAL.



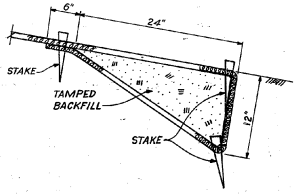
UPSTREAM TERMINAL DETAIL



END OVERLAP DETAIL FOR SUCCESSIVE ROLLS



TRANSVERSE CHECK SLOT DETAIL
(SPACED @ 25' INTERVALS)



DOWNSTREAM TERMINAL DETAIL

NOTES:
1. EROSION CONTROL MAT TO BE IN ACCORDANCE WITH SECTION 560, GENERAL CONSTRUCTION SPECIFICATION NO. T1.
2. ALL SURFACES TO BE PROTECTED WITH EROSION CONTROL MAT SHALL BE GRADED, SHAPED, AND FINISHED SO THAT THE SURFACES ARE STABLE, FIRM, AND FREE FROM ROCKS OR OBSTRUCTIONS WHICH WOULD PREVENT THE MAT FROM LYING IN DIRECT CONTACT WITH THE SOIL SURFACE.
3. THE EROSION CONTROL MAT SHALL BE FASTENED WITH WOODEN STAKES, MADE FROM 1"x3" HARDWOOD SAWED TO A POINT; 12" LONG FOR DENSE, WELL COMPACTED SOILS, AND 18" LONG FOR LOOSE OR SOFT SOILS. STAKES ARE TO BE DRIVEN TO WITHIN 2" TO 3" OF BEING FLUSH WITH THE GROUND. STAKES ARE TO BE ORIENTED BROADSIDE TO STREAMFLOW. IN TRAPEZOIDAL CHANNELS, STAKES ARE TO BE PLACED IN THE TOE AT THE UPTURN SLOPE.
4. SEEDING, FERTILIZING, AND LIMING SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 580 AFTER INSTALLATION OF THE MAT IS COMPLETE.

ORIGINAL ISSUE FOR WO 20717

SCALE: NTS

INSPECTED AND APPROVED FOR ISSUE
O.P. Thornton

REV NO	ECN/FCR	DATE	DSGN	DRWN	CHK(REVWD)	APPD	ISSD
1	FINAL FIELD REVISION.	12-3-86					

DSGN Lloyd E. Gilbert — INSP
DRWN Ann Sterbis
CHKD John Wiggins
SUPV [illegible] — ENGINEER M.H. Miller

YARD: FGD SYSTEM
UNITS 1 & 2

EROSION CONTROL MAT LOCATION AND INSTALLATION DETS. SH.10

PARADISE STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED
M.L. Miller	R.E. Harris	R.O. Bruette
KNOXVILLE 11/25/85	64 C 10H4280-10 R1	

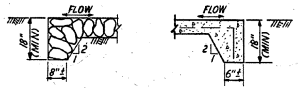
RECORD DRAWING AS CONSTRUCTED
Frank D. Van Meter 1-13-86 R1

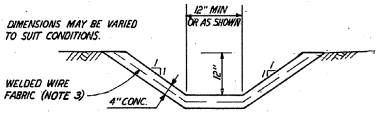
SD-C11.19

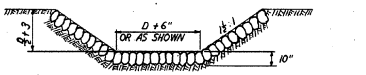
TECHNICAL INFORMATION CENTER INDEXED KNOXVILLE

①	②	③	④	⑤	⑥

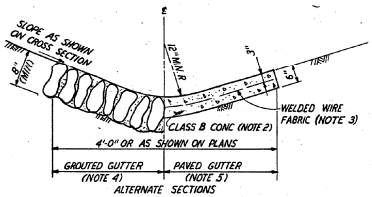
64C 10H4280-11





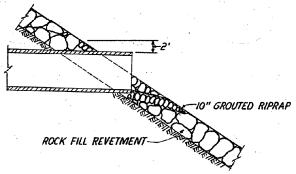


GROUTED RUBBLE GUTTER TO BE CONSTRUCTED WHERE OUTLET PORTION OF FILL BENEATH PIPE OUTLET DOES NOT CONTAIN SUFFICIENT ROCK TO PREVENT EROSION OR DISPLACEMENT OF FILL HOWEVER ROCK IS PREFERRED, IF AVAILABLE WITH A REASONABLE DISTANCE.



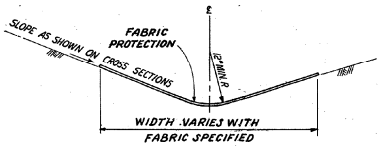
TYPICAL ARMORED DITCH

FOR USE WHERE SHOWN ON PLANS OR WHERE NEEDED TO CONTROL EROSION.



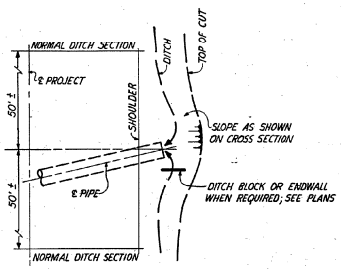
SECTION-OUTLET END OF PIPE

THROUGH ROCK FILL

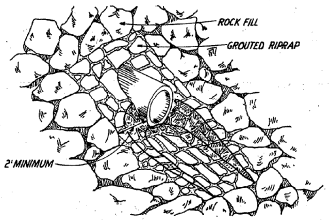


FABRIC PROTECTED DITCH

FABRIC SHALL BE: ① JUTE MESH (NOTE 6), ② NYLON MESH WOVEN WITH PAPER (NOTE 7.); OR ③ OTHER APPROVED FABRIC. TYPE OF FABRIC TO BE SPECIFIED FOR EACH PROJECT. INSTALLATION SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
DITCH TO RECEIVE SEEDING AND MULCHING IN ACCORDANCE WITH SECTIONS 580 & 582 OF THE SPECIFICATION, EXCEPT WHERE "HOLD GRO" IS USED MULCHING IS NOT REQUIRED.



DITCH TRANSITION DETAIL



SKETCH-OUTLET END OF PIPE

SHOWING RIPRAP

NOTES:
1. ALL WORK SHALL BE IN ACCORDANCE WITH GEN CONST SPECIFICATION – NO. T1, UNLESS OTHERWISE NOTED.
2. CONCRETE SHALL BE CLASS "B" IN ACCORDANCE WITH SECTION 400.
3. WELDED WIRE FABRIC SHALL CONFORM TO ASTM-A185 PLAIN FINISH AND SHALL HAVE A MINIMUM LAP DISTANCE OF 6 INCHES.
4. GROUTED GUTTERS SHALL CONFORM TO SECTION 512.
5. PAVED GUTTER SHALL CONFORM TO SECTION 521.
6. JUTE MESH SHALL BE SOIL SAVER AS MANUFACTURED BY LUDLOW TEXTILES, DIVISION OF LUDLOW CORPORATION, P.O. BOX 101, NEEDHAM HEIGHTS, MASS. OR EQUAL.
7. NYLON MESH SHALL BE "HOLD GRO" AS MANUFACTURED BY GULF STATES PAPER COMPANY OR EQUAL.

NOT TO SCALE

ORIGINAL ISSUE FOR WO 20717

INSPECTED AND APPROVED FOR ISSUE
O.P. Thornton

PROJECT

REV NO.	ECN NO.	DATE	DSGN	DRWN	CHKD	RVWD	APVD	ISSD
1	AS CONSTRUCTED.	4/3/86	JMC	RJS	JCC	KWB	DCH	OPT

DSGN Gerald E. Adams — IN SUP.
DRWN R.J. SCHAEFER — ENGINEER M. H. Miller
CHKD [illegible]
SUPV [illegible]

YARD: FGD SYSTEM
UNITS 1 & 2

MISCELLANEOUS DITCH PROTECTION DETAILS SH II

PARADISE STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED
M. H. Miller	E. Harris	R. Dunnette
KNOXVILLE 1/25/85	64 C 10H4280-11	R1

RECORD DRAWING AS CONSTRUCTED
Frank Van Meter 1-13-86 R1

TECHNICAL INFORMATION CENTER APPROVED KNOXVILLE

SD-C11.7 R2

MF RD KJ

①	②	③	④	⑤	⑥

March 1, 1993

W. D. Hall, BR 4A-C

PARADISE FOSSIL PLANT - SCRUBBER SLUDGE STACKING PLAN - PHASE I

The subject project was approved on February 19, 1993. Attached is the project authorization package showing the approved budget, cash flow, and account numbers for Phases I.

The level 2 schedule bar chart and listing are also attached. The key dates of the project are as follows:

Phase I Authorization	February 19, 1993
Preliminary stacking plan complete	April 8, 1993
Complete stacking plan	May 8, 1993
Complete evaluation for use of stacking contractor	June 7, 1993
Complete study of Scrubber Sludge Stacking Plan	August 28, 1993

Please proceed with the Phase I work for this project. If you have any questions, call me at extension 6995, in Chattanooga.

M.T. Scott

M. T. Scott
Project Manager
Paradise Fossil Plant
LP 5D-C

Will stacking plan for 5 yrs. be acceptable for bid pkg.?

Attachment
cc(Attachment):
J. S. Baugh, LP 2E-C
S. B. Brothers, Paradise
M. L. Brown, LP 5D-C
W. W. Dorroh, Paradise
C. D. West, Paradise

PIX421D

FOSSIL & HYDRO POWER

PROJECT AUTHORIZATION

PLANT/UNIT: Paradise Fossil Plant

PROJECT NAME/PHASE: Scrubber Sludge Stacking Plan - Phase I

Michael T Scott 2-18-92
PROJECT MANAGER DATE

CONCURRENCE [signature] 2-19-93
PLANT MANAGER DATE

CONCURRENCE [signature] 2-4-93
APPROPRIATE VICE PRESIDENT DATE

CONCURRENCE _____
MANAGER OF BUSINESS SERVICES DATE

APPROVED BY: _____
SENIOR VICE PRESIDENT, FOSSIL & HYDRO POWER DATE

F&HP 8990G (2/92) 4680W/1

TENNESSEE VALLEY AUTHORITY
F&HP
Project Authorization

Approved 2/19/93
(outside PAB)

PTFA 23600

X New ____ Revised

Project Control Number (PCN) 421D
Addition Acct # 70A5-544042-X421DA
Retirement Acct # NA

P. R. Loc. Symbol SE-28
Org to Perform Work 70
Org to Perform Engg 68

PLANT/UNIT: Paradise Fossil Plant
PROJECT NAME/PHASE: Scrubber Sludge Stacking Plan - Phase I

REASON FOR PROJECT (Major Benefit Category): Check only one. ____Plant Performance; ____Fuel Handling; __X__Ash Handling; ____Asbestos; ____Environmental; ____Safety; ____Work Space Improvement; ____Plant Appearance; ____Other (specify)

BUDGET INFORMATION:
$ in FY93 budget X Yes __ No

ECONOMIC EVALUATION:*
(Based on remaining costs)
Rate of Return NA

Net Present Value (NPV) NA
(NPV) Payback (Years) NA
(NPV) Deferral** NA

Recommended Alternative
Incremental IRR NA

NPV Based on Remaining Costs
*15%/Medium Load Forecast
15-Year Evaluation Period
**Next Available Period

COST SUMMARY ($000):

Sunk Cost $ 0

	Previous	Current FY(s)	1993	1994	Future Years	Project Total
Approved Est.						
I. Study						
II. Design						
Long-Lead Procurement						
III. Implementation						
TOTAL						
Approved Spend Plan			30			30
Current Est.						
I. Study			30			30
II. Design						
Long-Lead Procurement						
III. Implementation						
TOTAL			30			30

PREVIOUS APPROVED SCHEDULE:

	Study	Design	Implementation
Start Work			
Complete Work			

CURRENT SCHEDULE:

	Study	Design	Implementation
Start Work	2/93	NA	NA
Complete Work	9/93	NA	NA

PROBLEM STATEMENT: The existing scrubber sludge pond is projected to reach its present dike capacity in the summer of 1995.

PROJECT DESCRIPTION AND BENEFITS EXPECTED: This project will provide a detailed engineered design for the incremental stacking of scrubber sludge within the present pond. This plan will utilize the rim ditch method for the conveyance of sludge within the pond. This design will increase the elevation of the pond/stack to maximize the storage potential of the pond area. This design should increase the storage capacity of the pond area by approximately 15 years.

SUPPORTING INFORMATION

PLANT/UNIT: Paradise Fossil Plant

PROJECT NAME/PHASE: Scrubber Sludge Stacking Plan - Phase I

Additional Information: Outage No. NA

This project is in the FY 1993 Fossil Fuels budget and funded for $30,000.

Explanation/Impact of Cost or Schedule Revision:
This cost is based on cost for other stacking plans for by-product storage areas.

Options Considered and Rate(s) of Return:

1. Doing nothing is not feasible; existing pond capacity will be reached in 1995.
2. Buying land and building a new pond would be much more expensive than proposed project.

Risk Assumptions:
NA

Operations/Maintenance/Generation Savings/Heat Rate Gain:
Implementation of this project will provide the plant with a design to maximize the scrubber sludge pond area.

Environmental Review:
This project is a routine improvement of existing TVA facilities, and it has been determined that this project falls within categorical exclusion Section 5.2.1 of the TVA Instruction IX ENVIRONMENTAL REVIEW and requires neither environmental assessment nor an environmental impact statement.

PROJECT AUTHORIZATION SUMMARY

PLANT/UNIT: Paradise Fossil Plant

PROJECT NAME/PHASE: Scrubber Sludge Stacking Plan - Phase I

Reason for Improvement:
Currently, the scrubber sludge pond is being utilized as a conventional wet pond operation, which is expected to reach its present pond capacity in 1995.

Problem Definition:
The development of the scrubber sludge pond as a conventional pond will result in financial losses due to inefficient use of storage area.

Analysis:
1. Determine stability of present conventional pond.
2. Determine how to modify the existing conventional pond to a rim-ditch pond/stack operation to maximize storage capacity.

Solutions:
1. Develop incremental stack plan using the rim-ditch method of operation.
2. Ensure efficient and effective disposal operation.

INCREMENTAL SCRUBBER SLUDGE STACKING PLAN PARADISE FOSSIL PLANT

TENNESSEE VALLEY AUTHORITY

September 30, 1993

Prepared by:
Gilbert/Commonwealth, Inc.
Reading, PA

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11	Wet Scrubber System Gypsum Stacking Plan - Sections and Details
12	Wet Scrubber System Gypsum Stacking Plan - Proposed Boring Locations

INCREMENTAL SCRUBBER SLUDGE STACKING PLAN
PARADISE FOSSIL PLANT

1.0 INTRODUCTION

Paradise Fossil Plant currently sluices approximately 500,000 cubic yards of scrubber sludge (gypsum-flyash) per year to the East and West Scrubber Sludge Ponds. These ponds are close to their present capacity and need to be expanded for future use. Gilbert/Commonwealth, Inc. was contracted to provide a preliminary design for the incremental stacking of scrubber sludge within the present pond configurations (See Figure 1). This plan would utilize the rim-ditch method for the conveyance of sludge within the ponds. The design would increase the elevation of the ponds/stack to maximize the storage potential of the site and increase the storage capacity of the facility by at least 15 years.

A proposed preliminary management plan for the continued use of the East and West Scrubber Sludge Ponds is presented in this report. This plan utilizes the rim-ditch method for conveyance of scrubber sludge within the present pond configurations and increases the storage capacity of the pond area by approximately 22 years. Since there is no laboratory data for the Paradise scrubber sludge at the present time, the preliminary design for the expansion of the site was based on data obtained for the Widows Creek scrubber sludge. It is assumed that the properties of the scrubber sludge for Paradise and Widows Creek would be similar, however, this needs to be verified prior to final design and construction of the expansion. A recommended exploration and laboratory testing program for the Paradise scrubber sludge is included in Section 3.0.

2.0 PROPOSED MANAGEMENT PLAN

2.1 UPSTREAM METHOD OF CONSTRUCTION AND RIM-DITCH OPERATIONS

The upstream method of construction using wet cast gypsum-flyash excavated from the pond with a dragline is apparently working well at the slurry input points at the Widows Creek gypsum-flyash stack. With the single-point discharge procedures currently being used at Paradise, the sedimented deposits at the remote end of the stack should be comprised of the finer grained materials. These are inherently less pervious (take longer to drain), lower in strength, and are generally more difficult to handle than the coarser materials that settle near the slurry input point. To successfully use conventional, upstream methods of construction (wet casting with either a dragline or backhoe excavator) it will be necessary to deposit coarser materials at the remote end of the stack. The rim-ditch mode of operation is one way to achieve this end and is the recommended scheme for this project.

In the rim-ditch mode of operation, the gypsum-flyash mixture is made to flow in an elevated ditch around the inside of the stack perimeter. The coarser particles tend to settle in the rim-ditch while the finer fraction of the gypsum-flyash slurry is sluiced to the center of the pond through openings cut in the inner berm of the rim-ditch. The rim-ditch concept of operation only can be successful if the rim-ditch is elevated above the ponded water level in the interior of the pond. Elevating the ditch accelerates dewatering of the deposits in the rim-ditch (the coarser particle sizes) and facilitates more rapid excavation and construction of each new lift of the starter dike.

The gypsum-flyash mixture is more erodible than conventional

gypsum without flyash. Therefore, additional water level control structures may be required to prevent the inner berm of the rim-ditch from being eroded down to the pond elevation when discharging through the sluice cuts. With a control structure in place, the base elevation for erosion in the rim-ditch would be the control elevation of the structure (weir elevation). Without a control structure, the elevation of the pond may become the control elevation for erosion of the rim-ditch.

Wet cast materials are more stable than dozer pushed or loosely placed and uncompacted moist materials that can become "bulked" and are subject to collapse upon wetting. We recommend that every effort be made to construct the starter dikes and inner berms with wet cast materials. If hauled material is required, we recommend that the hauled materials be wetted and compacted sufficiently to preclude sudden collapse or large settlements when the material is inundated.

If TVA is unable to effectively implement the rim-ditch mode of operation, an alternative slurry distribution system may be required to distribute the coarser materials to the remote ends of the stack. Without an adequate slurry distribution system, it may be necessary to either provide extended periods for dewatering and drying of the fine-grained materials at the lower ends of the stack or continuously haul materials to these portions of the dike. A piped slurry distribution system with multiple discharge points around the perimeter of the stack could be used as an alternative to the rim-ditch method of distribution. Piped distribution systems are easy to operate once in place, but must be raised with each lift of the dike. Disadvantages also include initial equipment costs (pumps, piping, and valves).

We recommend that TVA utilize the rim-ditch mode of operation. This procedure is being successfully implemented at Widows Creek. This effort will require more frequent monitoring of stack operations, daily construction, and maintenance of the rim-ditch and starter dikes. The stack management plan presented herein assumes a rim-ditch mode of operation.

2.2 DESIGN CRITERIA

According to the topographic map provided by TVA, the average natural slope of the sedimented gypsum-flyash in the East Scrubber Sludge Pond is approximately 2.5 feet vertical per 1000 feet horizontal. An average slope of 5.0 feet vertical per 1000 feet was used for the layout of the rim ditch. This is the same slope recommended for Widows Creek. The benches and collection ditches were laid out at a slope of 2.5 feet vertical per 1000 feet horizontal.

A gypsum-flyash disposal rate of 500,000 cubic yards per year was provided by TVA. This value includes the scrubber sludge for Units 1 and 2 and does not account for a future scrubber on Unit 3. For a dry density of 91.5 pounds per cubic foot (pcf), the gypsum-flyash production rate would be 1,688 tons per day. This compares to a daily production rate of 2,886 tons per day for Widows Creek.

2.3 STAGED CONSTRUCTION TECHNIQUES

Figures 2 through 10 illustrate the nine-stage construction scheme for the scrubber sludge stacking site. An alternating scheme is proposed, whereby sludge is deposited

in one of the ponds while dewatering and dike construction proceeds in the other pond. This will provide continuous disposal at the facility throughout its projected lifetime without disrupting operations. Figures 2 through 10 correspond to Stages 1 through 9. Odd-numbered stages, with the exception of Stage 9, involve dike and rim-ditch construction in the east pond and sludge disposal in the west pond. Stage 9 consists of no new construction. Even-numbered stages involve dike and rim-ditch construction in the west pond and sludge disposal in the east pond. The development of nine construction stages minimizes the volume of new dikes to be constructed for each stage while still allowing adequate time to raise the dikes.

Stage 1

West Pond

During Stage 1 of this project, sludge will flow to the west scrubber sludge pond while dewatering and dike construction commences in the east pond. Construction of approximately 2,300 feet of pipeline will be required for this stage. The pipeline will extend southwesterly from the current slurry outfall at the northern boundary of the east pond to a high point (approx. elev. 538) adjacent to the access road that forms the northwestern boundary of the site (See Figure 2). This pipeline also will be utilized during future stages. At the high point, the pipeline will empty into a slurry ditch that has a minimum slope of 0.5 percent and variable depth. Approximately 4,300 feet of slurry ditch will be cut into existing terrain during this stage. This will require placement of some fill along an approximate 400 foot length of ditch to achieve a 0.5 percent slope for the slurry ditch.

Once the pipeline and slurry ditch have been constructed, flow will then be diverted from its current outfall at the east pond to the west pond and the east pond will begin to dewater. Beginning at the southern edge of the west pond, the cut embankment of the slurry ditch will be excavated at specific locations to control fill elevations in the pond. The west pond will fill with approximately 595,000 cubic yards of sludge to an average elevation of 470 feet during the estimated stage length of 1.2 years. This assumes an annual disposal rate of 500,000 cubic yards. Sludge disposal levels at opposite ends of the pond will differ by approximately ten feet due to the required minimum slope of the slurry ditch. An access road along the west pond will also be constructed during this stage.

East Pond

Once the east pond has been dewatered sufficiently for construction, a permanent collection ditch will be constructed along approximately 4,000 feet of the east pond perimeter at an approximate slope of 0.25 percent. This ditch will channel storm water from adjacent areas away from the site to prevent erosion of the toe bench. The ditch will extend to the southwestern corner of the east pond, where it will empty into a culvert and drain to the clarification pond.

Next, the starter dike for the east pond will be constructed from the dewatered scrubber sludge that currently fills the pond to an approximate elevation of 475 feet. The toe bench will be constructed first and will include the installation of a perforated drain pipe (See Figure 11 for drain detail). This drain will slope at approximately 0.25 percent for approximately 4,100 feet and will empty into the perimeter ditch at the facility's low point. The starter dike will

313,000 c.y.

then be raised at a 2.5:1 slope for approximately 25 vertical feet with a temporary 20-feet wide bench at the top of the slope. A typical cross section of the starter dike for the east pond is shown on Figure 11. A divider dike also will be constructed between the east and west ponds. This will facilitate the alternating construction and disposal schemes for the two ponds.

A rim-ditch will be constructed on the pond side of the starter dike and will have an approximate slope of 0.5 percent. The rim-ditch construction technique will allow the coarser sludge particles that will be used for future dike construction to be deposited adjacent to the dike and finer particles to be deposited in the pond interior. A rim-ditch will not be constructed adjacent to the divider dike during this stage.

Once the starter dike is constructed, the slopes, toe bench, and perimeter ditch will be covered with one foot of soil cover, and seeded and mulched in accordance with Section 2.5 of this Plan. The top bench for this stage will not be vegetated since it is only temporary and will be covered with sludge during Stage 3. Additionally, a central storm water collection ditch, lined with erosion control matting, will be constructed at the facility's low point to convey storm water runoff from the toe bench to the perimeter ditch.

Stage 2

East Pond

During Stage 2, sludge will flow to the east scrubber sludge pond while dewatering and starter dike construction

commences in the west pond. The slurry will be diverted from the pipeline constructed in Stage 1 to the east pond's rim-ditch, where it will flow at a 0.5 percent slope towards the southern edge of the pond. The inner berm of the dike will be excavated at desired locations to control fill elevations in the pond. The east pond will fill with approximately 1,379,000 cubic yards of sludge to an average elevation of 490 feet during the estimated stage length of approximately 2.8 years (See Figure 3).

West Pond

Once the west pond has been dewatered, approximately 3,600 feet of permanent collection ditch will be constructed along the perimeter of the pond. This ditch will channel storm water runoff from adjacent areas away from the site to a culvert that empties into the clarification pond. A 15-feet wide toe bench and drain, similar to those constructed for the east pond, will be constructed using sludge deposited during Stage 1. The toe drain and bench will slope at approximately 0.25 percent with the drain tieing into the east pond's toe drain before discharging to the perimeter ditch. /The starter dike will then be raised at a 2.5:1 slope for approximately 25 vertical feet./ A rim-ditch will then be constructed with an approximate slope of 0.5 percent. Once construction of the dike and rim-ditch is complete, the perimeter ditch, toe bench, and side slopes will be covered with one foot of soil cover and vegetated. The top bench will not be vegetated, as it will be covered with sludge during Stage 4. A typical cross section of the starter dike for the west pond is shown on Figure 11.

Stage 3

West Pond

During Stage 3, sludge will flow to the west scrubber sludge pond while dewatering and dike construction proceeds in the east pond. The slurry will be diverted from the pipeline to the slurry ditch (both constructed in Stage 1), and will flow for approximately 1,200 feet before entering the west pond rim-ditch. The inner berm of the dike will be excavated at desired locations beginning at the downstream end of the rim-ditch to control fill elevations of the pond. The west pond will fill with approximately 1,112,000 cubic yards of sludge to an average elevation of approximately 490 feet during the estimated stage length of 2.2 years (See Figure 4).

East Pond

Once the east pond has been dewatered sufficiently for construction to proceed, the coarser sludge particles deposited adjacent to the rim-ditch during Stage 2 will be used to raise the dike approximately ten feet and create a new rim ditch. A permanent 20-feet wide bench will be created at the top of this dike. Additional sludge will also be placed to extend and elevate the divider dike to the extent necessary for sludge disposal in Stage 4. Once constructed, the new side slopes will be covered with one foot of soil cover and vegetated.

Stage 4

East Pond

During Stage 4, sludge will flow to the east pond while dewatering and dike construction proceeds in the west pond. The slurry will flow from the pipeline constructed during Stage 1 into the east pond's rim-ditch and run at a slope of 0.5 percent to the southern edge of the pond. The inner berm of the dike will be excavated at desired locations beginning at the downstream end of the rim-ditch to control fill elevations of the pond. The east pond will fill with approximately 942,000 cubic yards of sludge to an average elevation of approximately 500 feet during the estimated stage length of 1.9 years (See Figure 5).

West Pond

Once the west pond has been dewatered sufficiently for construction, the coarser sludge particles deposited adjacent to the rim-ditch during Stage 3 will be used to raise the dike approximately ten feet and create a new rim-ditch. A permanent 20-feet wide bench will be created at the top of the dike. The new side slopes will be covered with one foot of soil cover and vegetated.

Stage 5

West Pond

During Stage 5, sludge will flow to the west pond while dewatering and dike construction proceeds at the east pond. The slurry will flow from the pipeline into the slurry ditch (both constructed during Stage 1), which will then empty

into the new rim-ditch. The inner berm of the dike will be excavated at desired locations beginning at the downstream end of the rim-ditch to control fill elevations of the pond. The west pond will fill with approximately 582,000 cubic yards to an average elevation of 500 feet during the estimated stage length of 1.2 years (See Figure 6).

East Pond

Once the east pond has been dewatered sufficiently for construction, approximately 4,100 feet of perforated underdrain pipe at 0.50 percent slope will be installed along the centerline of the inner berm that was constructed during Stage 3. The top of drain elevation will coincide with the top surface elevation of the berm. An additional section of non-perforated drain pipe will tie this upper underdrain to the perimeter ditch. Once this is accomplished, the coarser sludge particles deposited adjacent to the rim-ditch during stage 4 will be used to raise the dike approximately fifteen feet and create a new rim-ditch. A temporary 20-feet wide bench will be constructed at the top of the dike.

Additional sludge will also be reclaimed from areas adjacent to the rim-ditch and placed to extend and elevate the divider dike to the level required for sludge disposal in Stage 6. The newly constructed dike side slopes and permanent bench below will be covered with one foot of soil cover and vegetated. Additionally, the central storm water collection ditch lined with erosion control matting will be extended upward to the permanent bench above the toe bench and seeded.

Stage 6

East Pond

During Stage 6, sludge will flow to the east pond while dewatering and starter dike construction proceeds at the west pond. Sludge will flow from the pipeline constructed during Stage 1 to the east pond rim-ditch, through which it will flow to the southern end of the pond. The inner berm of the dike will be excavated at desired locations beginning at the downstream end of the rim-ditch to control fill elevations of the pond. The east pond will fill with approximately 1,465,000 cubic yards of sludge to an average elevation of 515 feet during the estimated stage length of 2.9 years (See Figure 7).

West Pond

Once the west pond has been sufficiently dewatered for construction, approximately 3,200 feet of perforated underdrain pipe will be installed at a 0.50 percent slope along the centerline of the inner berm that was constructed during Stage 4. The outlet of this pipe will tie into the perimeter ditch. Once this is accomplished, the coarser sludge particles deposited adjacent to the rim-ditch during Stage 5 will be used to raise the starter dike approximately fifteen feet and create and new rim-ditch. A temporary 20-feet wide bench will be constructed at the top of the dike. The newly constructed dike side slopes and permanent bench below will be covered with one foot of soil cover and vegetated.

Stage 7

West Pond

During Stage 7, sludge will flow to the west pond while dewatering and dike construction proceeds at the east pond. The slurry will flow from the pipeline into the slurry ditch constructed during Stage 1, which will then empty into the new rim-ditch. The inner berm of the dike will be excavated at desired locations beginning at the downstream end of the rim-ditch to control fill elevations of the pond. The west pond will fill with approximately 995,000 cubic yards of sludge to an average elevation of 515 feet during the estimated stage length of 2.0 years (See Figure 8).

East Pond

Once the east pond has been dewatered sufficiently for construction, the coarser particles deposited adjacent to the rim-ditch during Stage 6 will be used to raise the starter dike approximately twenty feet and create a new rim-ditch. A permanent 20-feet wide bench will be constructed at the top of the bench. Additional sludge will also be placed to elevate and extend the divider dike to meet the starter dike at the northern edge of the pond. A rim-ditch with an approximate slope of one percent will also be constructed along the divider dike. This will allow coarser particles to be deposited along the divider dike in the event that the divider dike would be raised in the future. The newly constructed dike side slopes will then be covered with one foot of soil cover and vegetated.

Stage 8

East Pond

During Stage 8, sludge will flow to the east pond while dewatering and starter dike construction proceeds in the west pond. The slurry will discharge to the east pond's rim-ditches, through which it will flow at a 0.5 percent slope towards the southern end of the pond. The inner berm of the dike will be excavated at desired locations beginning at the southern end of the rim-ditches to control fill elevations in the pond. The east pond will fill with approximately 2,144,000 cubic yards of sludge to an average elevation of 535 feet during the estimated stage length of 4.3 years (See Figure 9).

West Pond

Once the west pond has been sufficiently dewatered for construction, the coarser particles deposited adjacent to the rim-ditch during Stage 7 will be used to raise the starter dike approximately twenty feet and create a new rim-ditch. This construction will join the west pond's starter dike with the east pond's dike and divider dike at the northern edge of the facility. A permanent 20-feet wide bench will be constructed at the top of the bench. The newly constructed dike side slopes will then be covered with one foot of soil cover and vegetated.

Stage 9

West Pond

During Stage 9, sludge will flow into the west pond's rim-ditch while the east pond is dewatered. The inner berm of the dike will be excavated at desired locations beginning at the downstream end of the rim-ditch to control fill elevations in the pond. The west pond will fill with approximately 1,584,000 cubic yards of sludge to an average elevation of 515 feet during the estimated stage length of 3.2 years. With the conclusion of this stage, approximately 10.8 million cubic yards of sludge will have been deposited over an estimated 22-year period.

If additional capacity is needed beyond Stage 9, the alternating construction scheme between the east and west ponds would continue to be implemented. As designed, significant additional storage capacity will exist at the facility at the end of Stage 9. Closure of the site would consist of final grading on the top of the stack to ensure positive drainage, placement of soil cover, and vegetation.

2.4 STORAGE VOLUMES AND LIFE

From the topographic map provided by TVA and the proposed final stack geometry presented in Figure 10, we estimate that the total volume of the stack at the end of Stage 9 will be approximately 10.8 million cubic yards. At the current production rate of gypsum-flyash, the storage volume should be sufficient for a total storage life of 21.7 years from the present. The storage area can easily be expanded upward to provide additional storage life, if required.

The following table lists the approximate time periods and available storage volumes for each of the stages presented in the proposed management plan. These times are approximate and may differ from that shown due to variations in the slope of the sedimented deposits, natural ground elevations, perimeter dike heights, actual patterns of distribution, plant operating periods, and other factors.

TABLE 1

PARADISE FOSSIL PLANT

INCREMENTAL STACKING PLAN

CAPACITY AND DURATION FOR EACH STAGE

STAGE	VOLUME FOR EACH STAGE* (YD^3)	DURATION (YEARS)	TOTAL TIME** (YEARS)
1	600,000	1.2	1.2
2	1,400,000	2.8	4.0
3	1,100,000	2.2	6.2
4	900,000	1.9	8.1
5	600,000	1.2	9.3
6	1,500,000	2.9	12.2
7	1,000,000	2.0	14.2
8	2,100,000	4.3	18.5
9	1,600,000	3.2	21.7

* Total available volume at the site per the preliminary designs is approximately 10,800,000 cubic yards

** Assuming an annual production rate of 500,000 cubic yards per year of scrubber sludge.

2.5 EROSION CONTROL

The outside slopes of the gypsum-flyash stack need to be stabilized against erosion from rainfall runoff. There are a variety of methods available for slope surface stabilization, but it is anticipated that conventional seeding and mulching techniques will prove to be the most economical. It is recommended that 12-inches of soil cover be placed on the slopes, benches, and ditches, and vegetated in accordance with Sections 580 and 582 of the T-1 Specifications. Seed mix should be Rebel Fescue (40lbs/acre), Hard Fescue (10 lbs/acre), and White Clover (5 lbs/acre). Seed should be applied between March 15th to May 15th or between August 15th and October 15th. The most economical location to obtain the fill would be from the area that is planned to be covered by the expansion of the East and West Scrubber Sludge Ponds. It is recommended that approximately ten test pits be dug in this area to determine if the soils are suitable for fill and if there are available quantities.

2.6 EVALUATION OF STACK SLOPE STABILITY

A slope stability analysis was not performed for the proposed construction of the gypsum-flyash stack at Paradise. A review was performed on the recommendations provided by Ardaman & Associates for the Widows Creek gypsum-flyash stack. Their recommendation to limit the stack to an overall slope of 3:1 (horizontal:vertical) appears to be reasonable, based on the data they obtained for Widows Creek. We anticipate that the strength parameters for the Paradise gypsum-flyash would be similar to the Widows Creek gypsum-flyash. However, the strength parameters for the Paradise gypsum-flyash are unknown and

must be obtained in order to evaluate the stability of the proposed gypsum-flyash stack.

The proposed design of the stack includes 20-feet wide benches at elevation intervals of 35 feet for surface erosion control, as shown on Figure 11. The side slopes of the stack between bench elevations are at a slope of 2.5:1 in order to provide an overall slope of approximately 3:1. The benches are sloped back toward the pile and longitudinally to collect and convey rainfall runoff from each slope to a collection ditch, which will convey the runoff to the perimeter collection ditch.

In order to provide the required stability at a 3:1 slope, Ardaman & Associates required the installation of three underdrains. Since we are only proposing the construction of two benches (approximately 70-feet in vertical height), it is anticipated that only two underdrains are required in order to provide sufficient stability of the stack slopes. Widows Creek involves the construction of four benches (approximately 140-feet in vertical height). If it is desired to add more benches in the future at Paradise, additional underdrains could be installed at that time in order to provide the required stability. The preliminary design for the underdrain system is shown on Figure 11. Field and laboratory testing of the gypsum-flyash materials is required in order to verify this preliminary design and provide information for final design. It is recommended that bottom ash be investigated as a potential drainage media in lieu of the expensive sand and gravel recommended by Ardaman & Associates for Widows Creek. G/C has successfully used bottom ash as a drainage media at many power stations.

3.0 RECOMMENDED EXPLORATION AND LABORATORY TESTING PROGRAM

The preliminary design for the Paradise FGD Gypsum-Flyash Storage Facility was based on the laboratory testing program and characterization of Widows Creek FGD Gypsum-Flyash prepared by Ardaman & Associates, as detailed in "Interim Report on Evaluation of FGD Gypsum-Flyash Wet-Stacking Disposal Facility - Widows Creek Steam Plant," April 1991. A field and laboratory testing program is required for this site to determine the in-situ conditions and physical properties of the wet-stacked gypsum-flyash.

3.1 SUBSURFACE EXPLORATION PROGRAM

It is recommended that seven Standard Penetration Test (SPT) borings be performed in the area of the East Scrubber Sludge Pond, as indicated on Figure 12. These borings will help define the nature, extent, thickness, and consistency of the existing gypsum-flyash in the East Scrubber Sludge Pond. Piezometers should be installed in each of the borings in order to determine the depth to the equilibrium water table. The in-situ horizontal coefficient of permeability of the slurry deposits should be determined by performing slug tests in the piezometers. In addition, 24 split-spoon and approximately 21 undisturbed Shelby tube samples of the gypsum-flyash should be recovered for subsequent laboratory testing.

It is recommended that an additional ten test pits be excavated in the proposed expansion area for the East and West Scrubber Sludge Ponds. The test pits will help determine if there are suitable quantities of soil available for cover on the completed stack slopes. If suitable material is not available from the immediate area, cover material would have to be obtained from elsewhere on site or

off-site.

3.2 LABORATORY TESTING PROGRAM

Samples of gypsum-flyash recovered from the test borings should be visually inspected and tested to characterize the in-situ density and moisture content, index properties (particle size distribution and specific gravity), chemical composition, shear strength, and permeability. Tests also would be performed on samples of the natural soils immediately underlying the gypsum-flyash in order to determine the shear strength of these materials. The strength data will be used in performing stability analyses.

It is recommended that the following tests be performed for the testing program:

- Natural Moisture Content (24 split-spoon samples and 21 undisturbed Shelby tube samples)
- Dry Density and Total Unit Weight (21 undisturbed Shelby tube samples)
- Particle Size Distribution and Fines Content (9 undisturbed Shelby tube samples)
- Specific Gravity (2 undisturbed Shelby tube samples)
- Chemical Composition (9 undisturbed Shelby tube samples)
- Consolidated Undrained Triaxial Compression Tests with Pore Pressure Measurements (6 undisturbed Shelby tube samples)

- Direct Shear of Triaxial Compression Tests for Natural Soil beneath the site (3 tests)

- Permeability Tests (9 undisturbed Shelby tube samples)

In addition, it is recommended that four particle size distribution and fines content tests be performed on station bottom ash. This test will help determine if the bottom ash could be used as a drainage media for the underdrains in lieu of expensive sand and gravel.

4.0 RECOMMENDATIONS FOR FINAL DESIGN

Included in this preliminary plan is an incremental stack design that will provide storage of approximately 10,800,000 cubic yards of gypsum-flyash over a period of approximately 22 years. There will be additional storage capacity available at the end of this period should this need develop in the future. Expansion of the East and West Scrubber Sludge Ponds will require further analysis of the Paradise gypsum-flyash and natural soils to finalize design of the facility. This analysis should consist of the recommended exploration and laboratory testing program mentioned in Section 3.0 of this report.

Results of the exploration and testing program will help to confirm or modify this preliminary design with regards to stack geometry, dike stability, and the underdrain system. Our preliminary design and mode of operation is based on analysis of the Widows Creek Scrubber sludge disposal site and the engineering properties of its gypsum-flyash. It is assumed that the properties of the scrubber sludge for Paradise and Widows Creek would be similar, however, this needs to be verified prior to final design and construction of the expansion. In addition, detailed hydrologic and hydraulic calculations should be performed to finalize design of stormwater management, the underdrain system, and the discharge structures.

5.0 REFERENCES

1. "Interim Report on Evaluation of FGD Gypsum-Flyash Wet-Stacking Disposal Facility - Widows Creek Steam Plant," Ardaman and Associates, April 22, 1991.

2. "Proposed Management Plan - Widows Creek Gypsum-Flyash Storage Facility," Ardaman and Associates, June 18, 1991.

3. "Preliminary Evaluation, Proposed Underdrain System - Widows Creek Gypsum-Flyash Storage Facility," Ardaman and Associates, August 2, 1991.

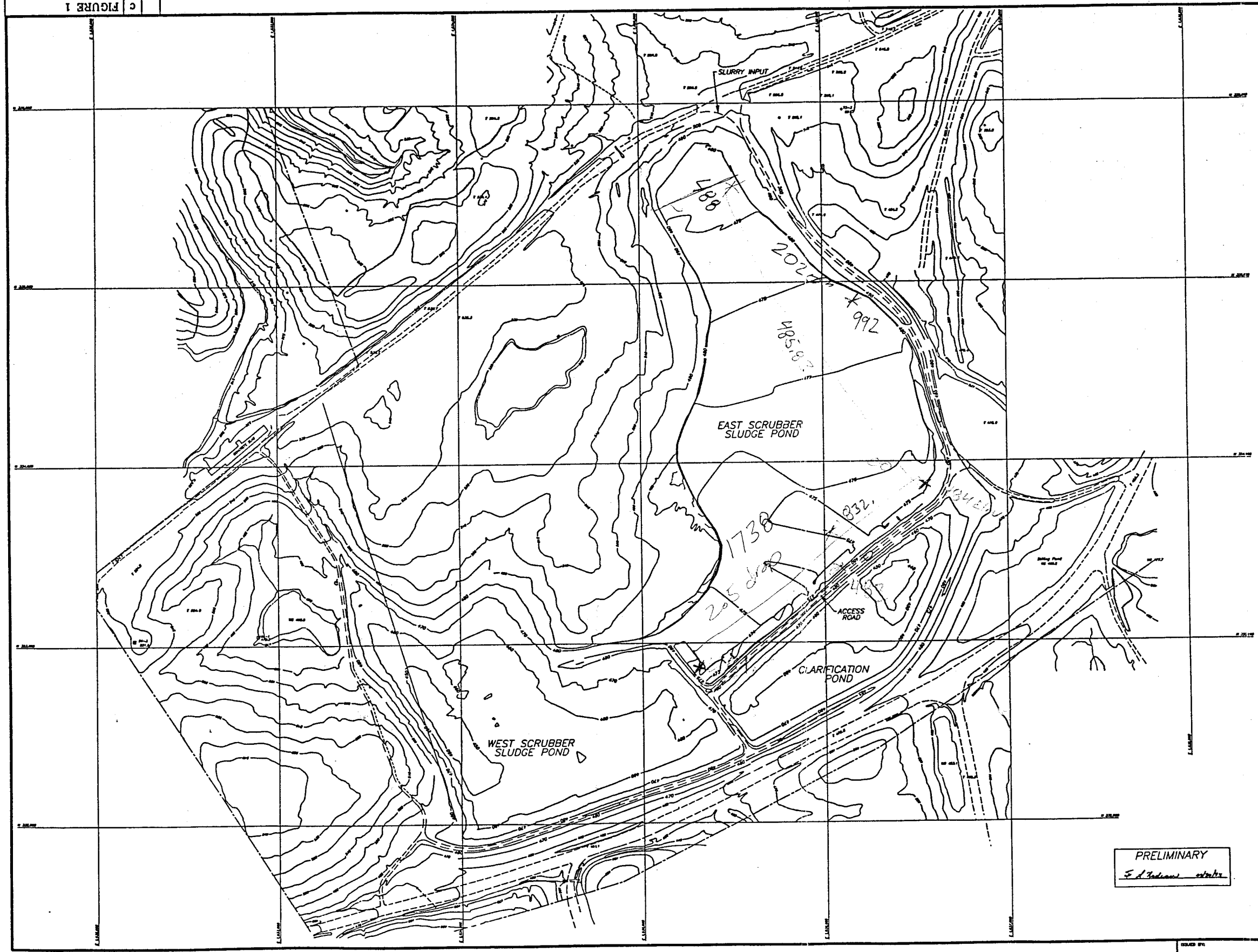
4. Drawing 10W4280-1, Wet Scrubber System Gypsum Ponding Plan and Grading, Paradise Steam Plant, Tennessee Valley Authority.

5. Drawing 10w4280-12, Wet Scrubber System Gypsum Stacking Plan - Stage 1, Paradise Fossil Plant, Tennessee Valley Authority.

6. Drawing 10W4280-13, Wet Scrubber Gypsum Stacking Sections and Details - Stage 1, Paradise Fossil Plant, Tennessee Valley Authority.

FIGURES

c | FIGURE 1



PRELIMINARY

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	DWG	APVD	ISSD	AS CONST

SCALE: 1"=200' EXCEPT AS NOTED 0

YARD

WET SCRUBBER SYSTEM GYPSUM STACKING PLAN – EXISTING CONDITIONS

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DESIGNED	SUPERVISED	1	2	
DRAWN	REVIEWED	3	4	
CHECKED				
ENGINEERING	DATE	c	FIGURE 1	R

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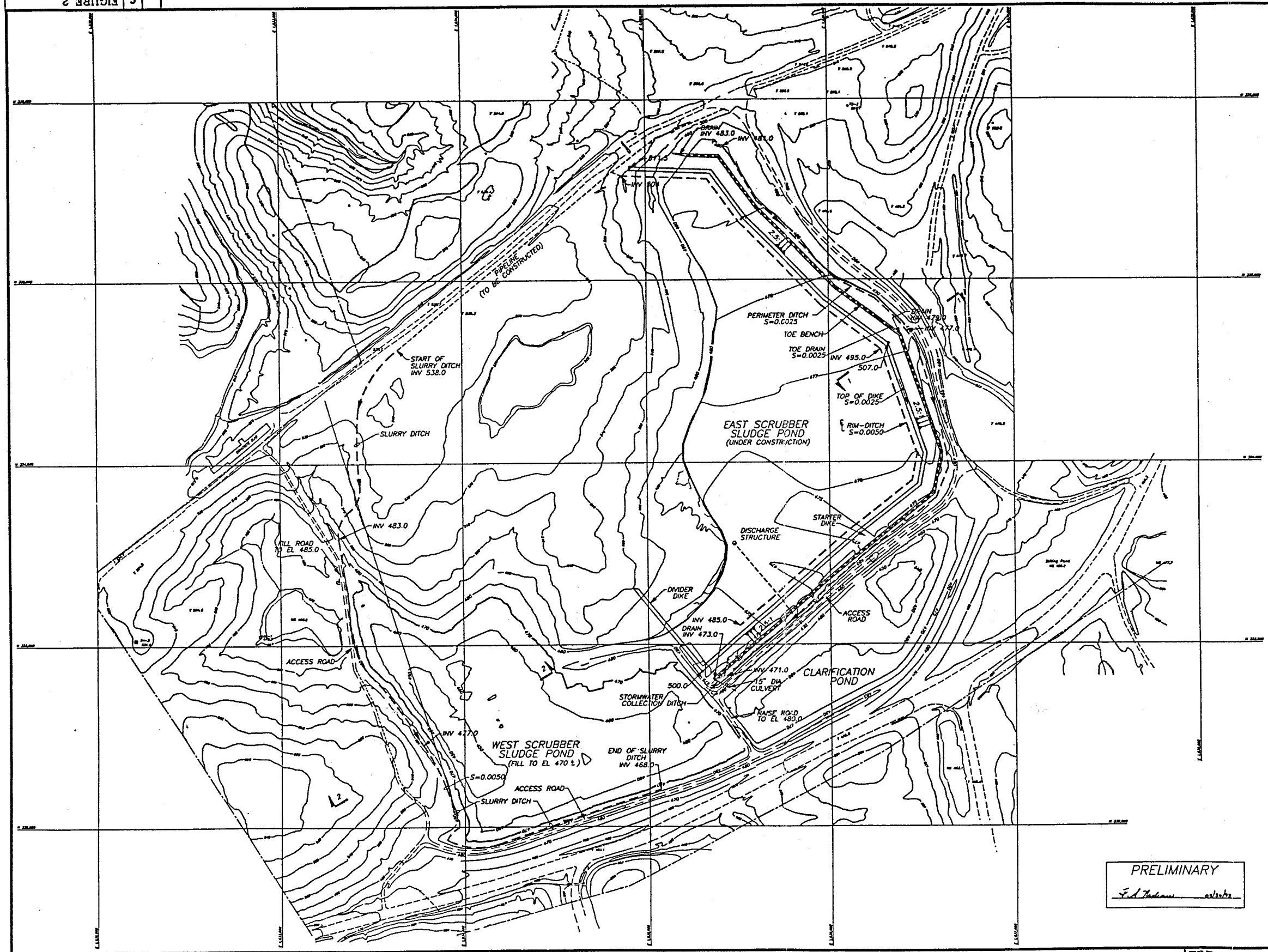

PRELIMINARY

F. A. Tedesco 03/30/93

REV NO.	DATE	DESCN	DRAWN	CHKD	SUPV	ENGRD	APPD	ISSD	AS CONST

SCALE: 1"=200' EXCEPT AS NOTED 0

YARD

WET SCRUBBER SYSTEM GYPSUM STACKING PLAN – STAGE 1

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DESIGNED	SUPERVISED	1	2	
DRAWN	REVIEWED	3	4	
CHECKED				
ENGINEERING	DATE	c	FIGURE 2	R

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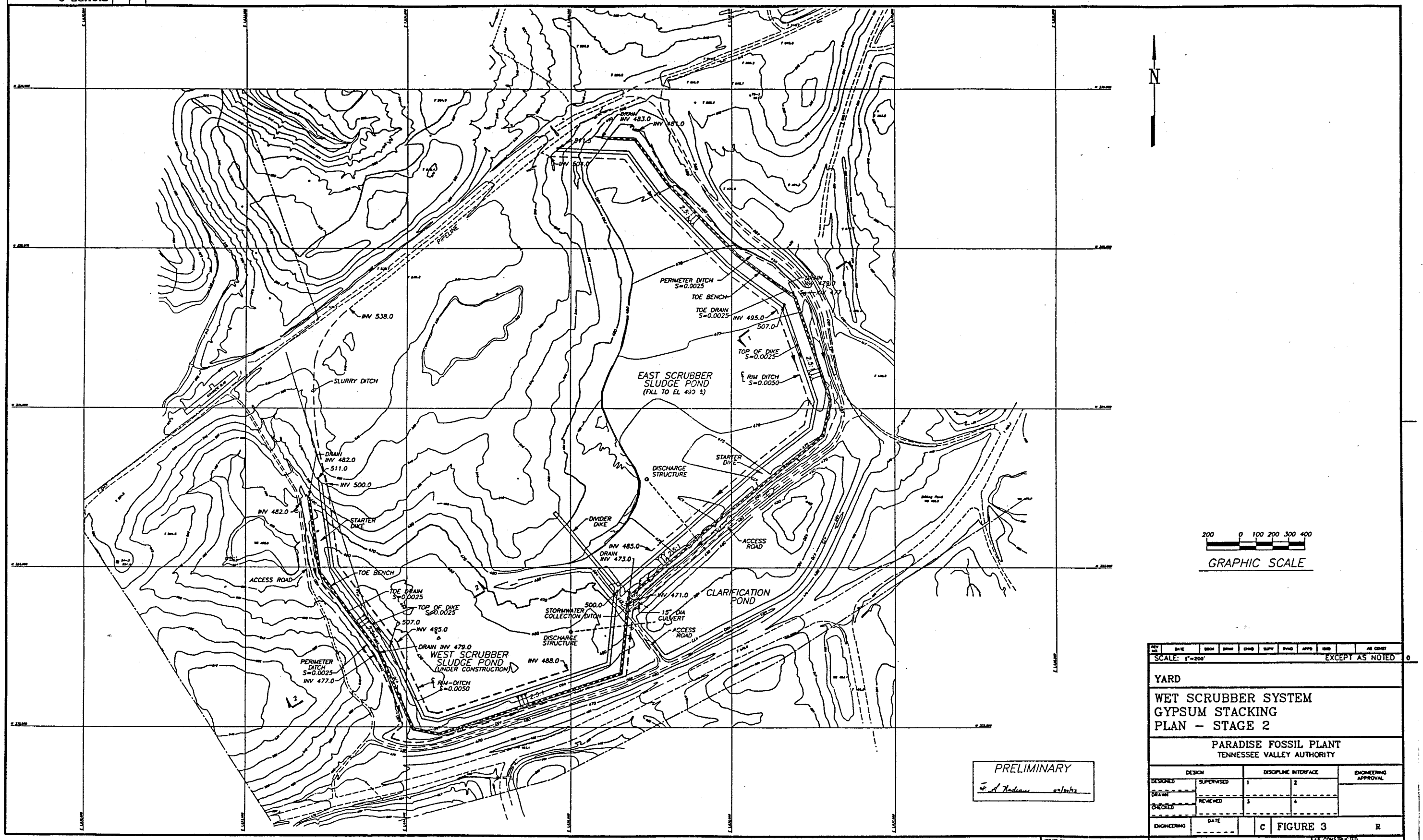

PRELIMINARY

F. A. Nadeau 07/30/02

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SCALE: 1"=200' EXCEPT AS NOTED 0

YARD

WET SCRUBBER SYSTEM GYPSUM STACKING PLAN – STAGE 2

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DESIGNED	SUPERVISED	1	2	
DRAWN	REVIEWED	3	4	
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ENGINEERING	DATE	C	FIGURE 3	R

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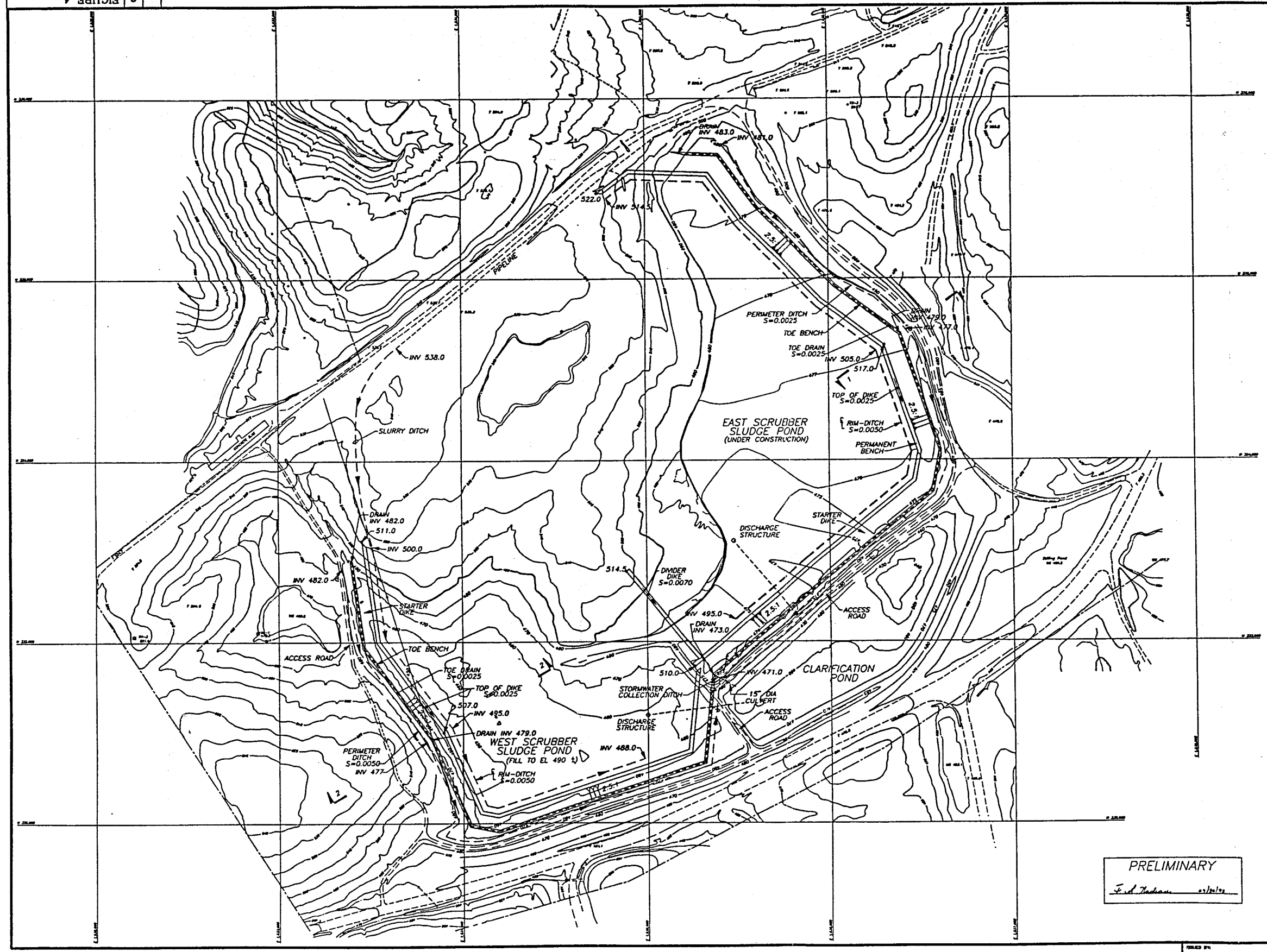

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F. A. Hadam 07/01/04

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SCALE: 1"=200' EXCEPT AS NOTED

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WET SCRUBBER SYSTEM GYPSUM STACKING PLAN – STAGE 3

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DESIGNED	SUPERVISED	1	2	
DRAWN				
CHECKED	REVIEWED	3	4	
ENGINEERING	DATE	C	FIGURE 4	R

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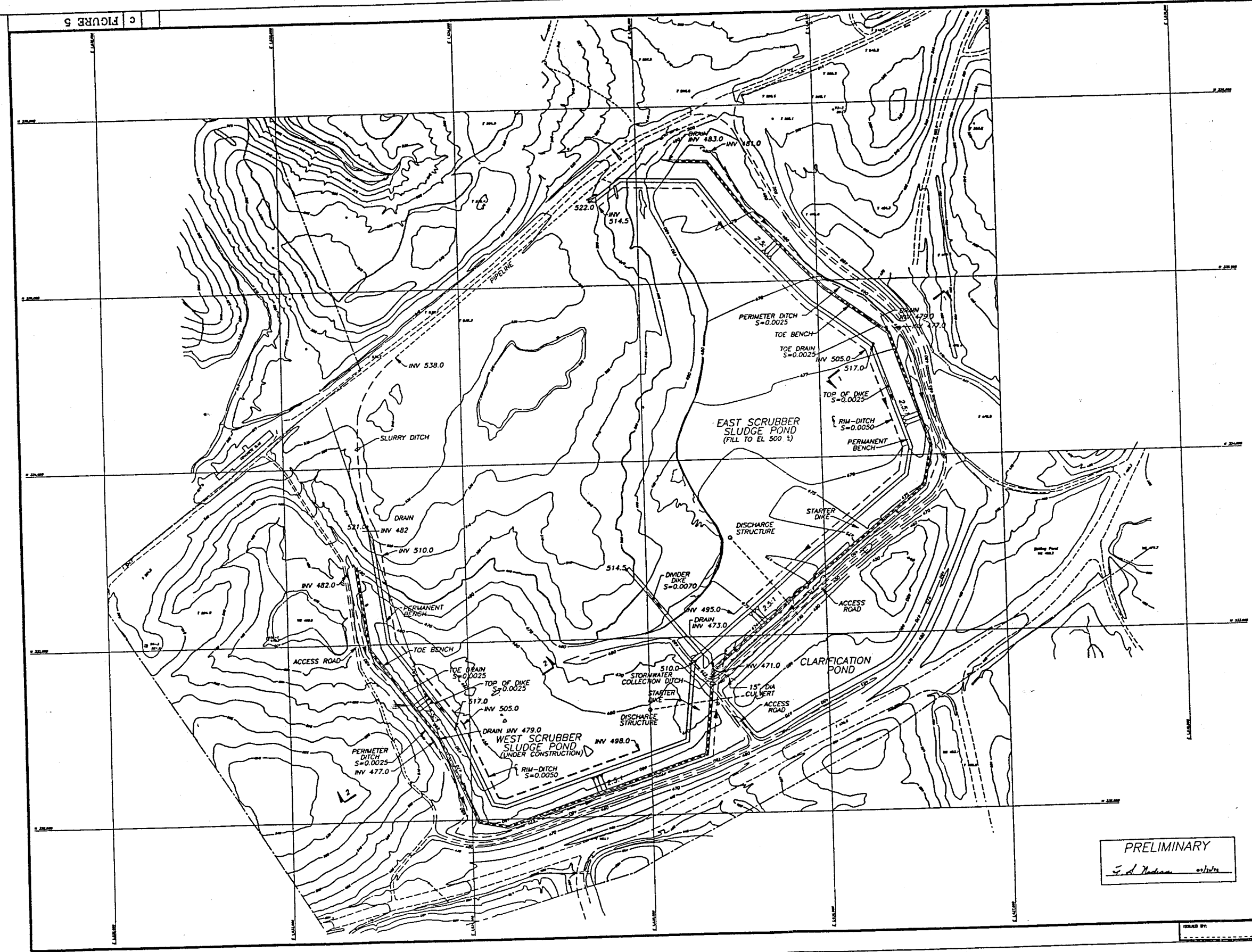

PRELIMINARY

F. A. Madonna 10/30/96

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YARD

WET SCRUBBER SYSTEM GYPSUM STACKING PLAN – STAGE 4

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DESIGNED	SUPERVISED	1	2	
DRAWN	REVIEWED	3	4	
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ENGINEERING	DATE	C	FIGURE 5	R

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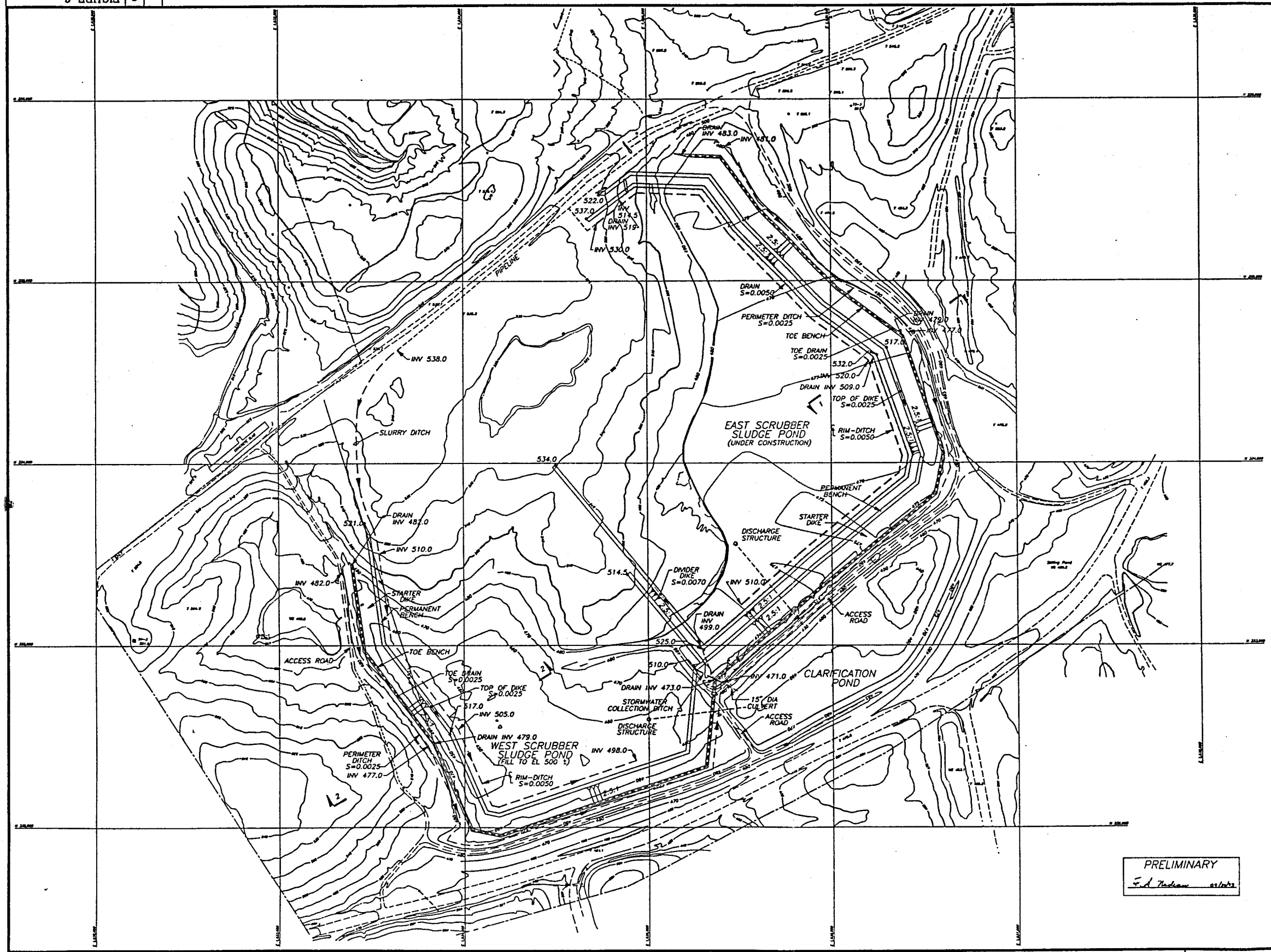
FIGURE 6 | C



PRELIMINARY

F. A. Nadeau 02/10/83

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YARD

WET SCRUBBER SYSTEM GYPSUM STACKING PLAN – STAGE 5

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DESIGNED	SUPERVISED	1	2	
DRAWN				
CHECKED	REVIEWED	3	4	
ENGINEERING	DATE	C	FIGURE 6	R

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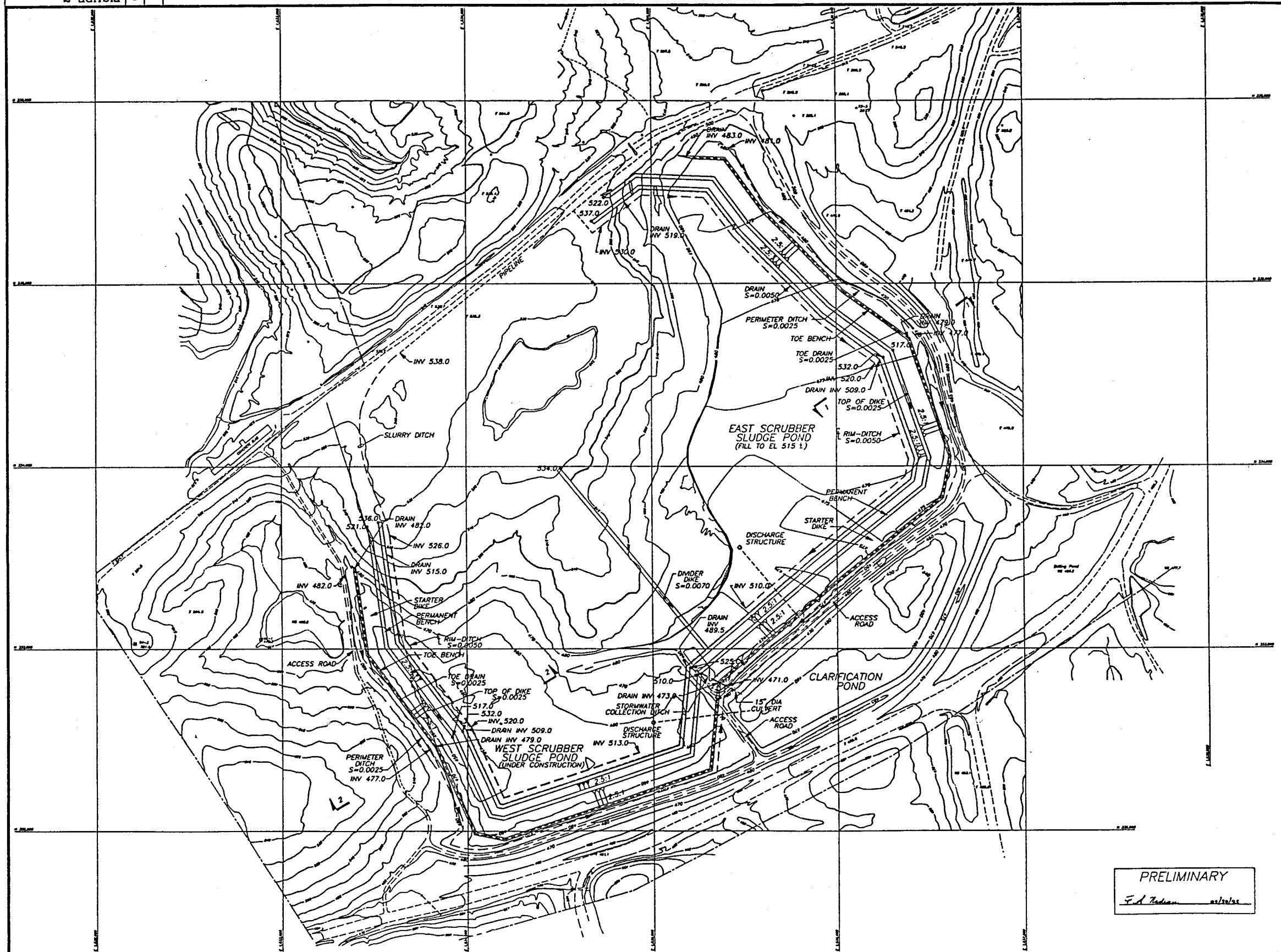
c | FIGURE 7



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F. A. Nadeau 02/20/02

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SCALE: 1"=200' EXCEPT AS NOTED 0

YARD

WET SCRUBBER SYSTEM GYPSUM STACKING PLAN – STAGE 6

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DESIGNED	SUPERVISED	1	2	
DRAWN	REVIEWED	3	4	
CHECKED				
ENGINEERING	DATE	C	FIGURE 7	R

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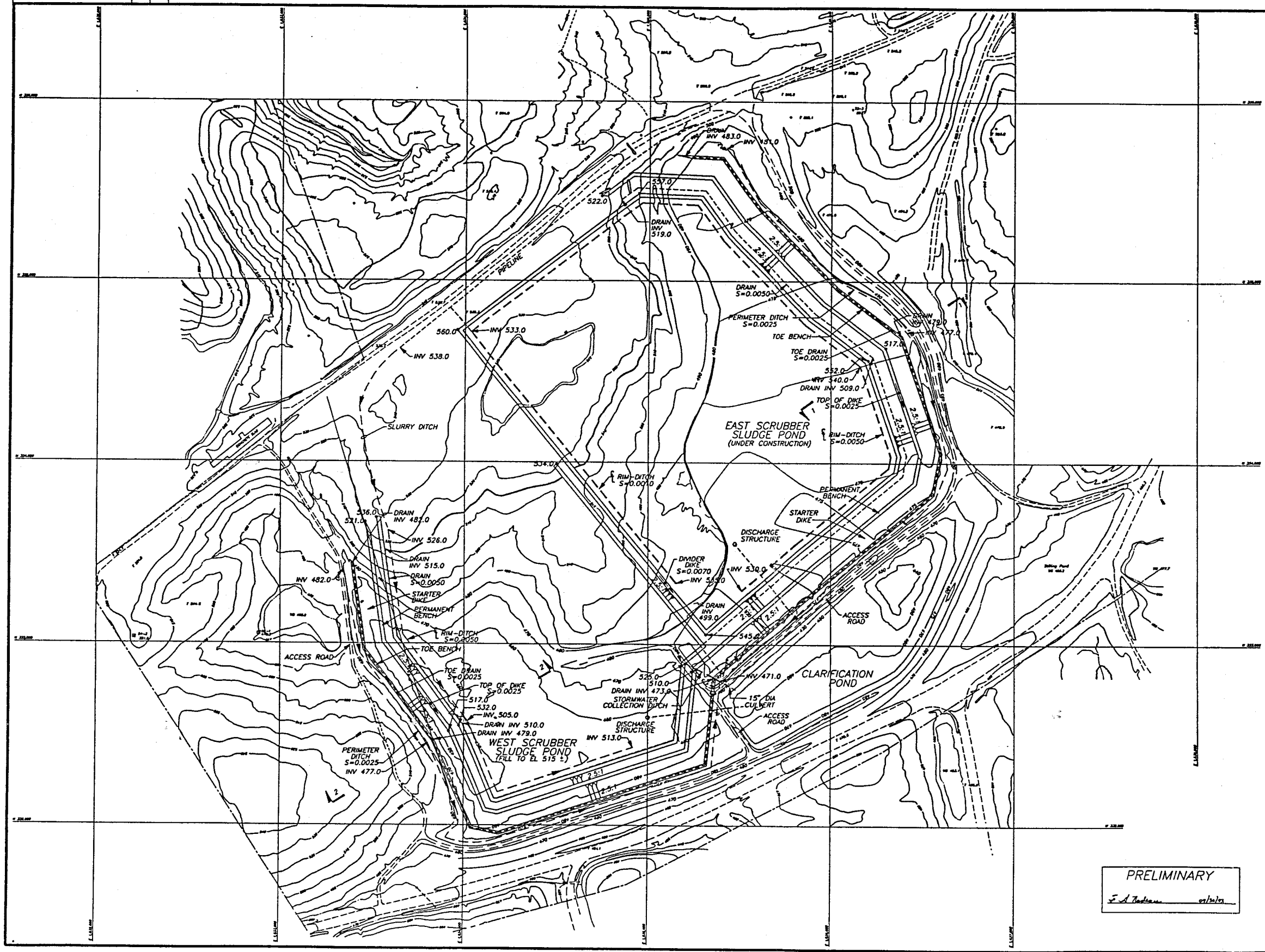
FIGURE 8 | C



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E. A. Thackeray 07/31/09

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SCALE: 1"=200' EXCEPT AS NOTED 0

YARD

WET SCRUBBER SYSTEM
GYPSUM STACKING
PLAN - STAGE 7

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DESIGNED	SUPERVISED	1	2	
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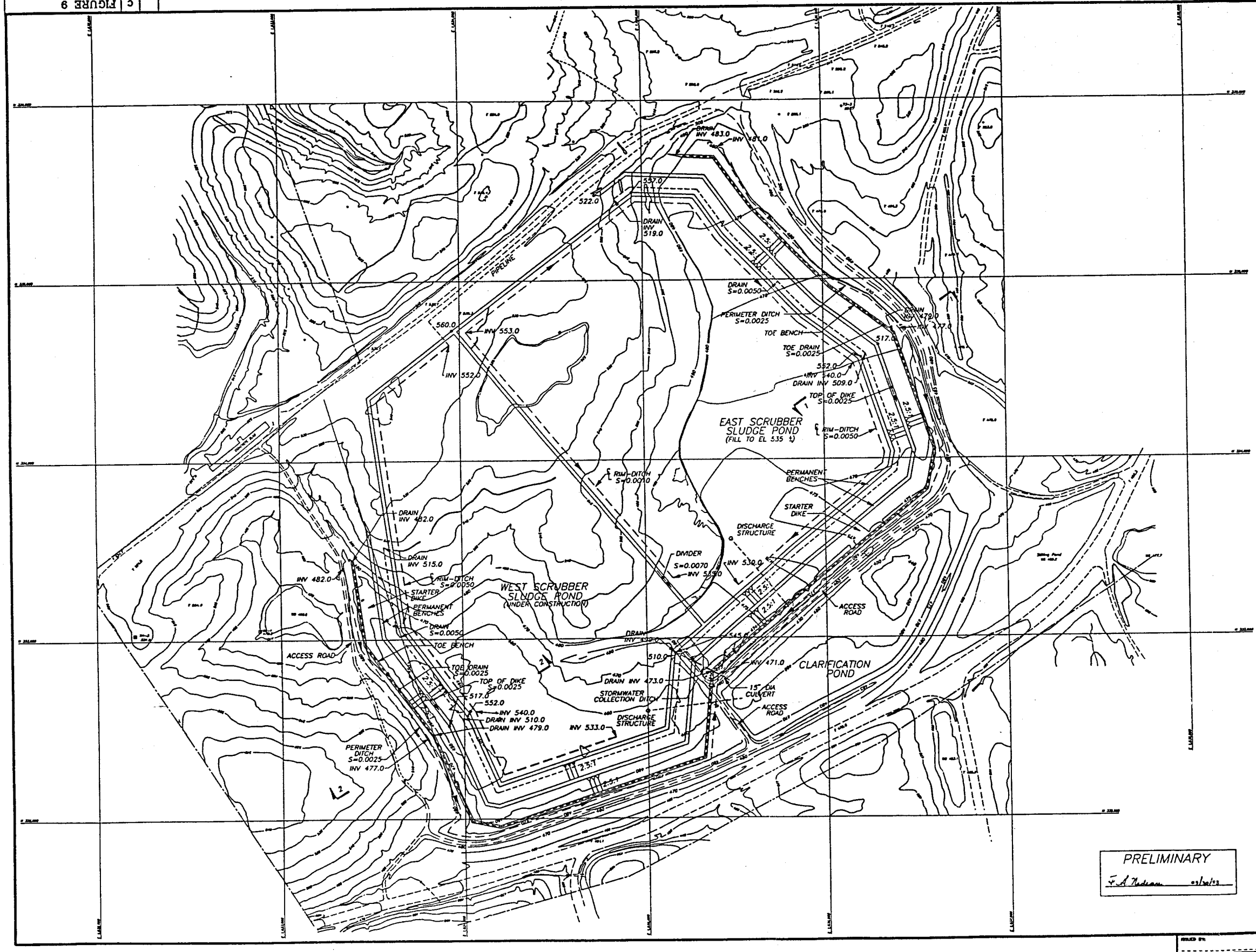

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GRAPHIC SCALE

PRELIMINARY

F. A. Nadeau 05/04/82

REV NO.	BY	DES	DRWN	CHKD	SUPV	ENGD	APPD	MGR		AS CONST

SCALE: 1"=200' EXCEPT AS NOTED 0

YARD

WET SCRUBBER SYSTEM
GYPSUM STACKING
PLAN – STAGE 8

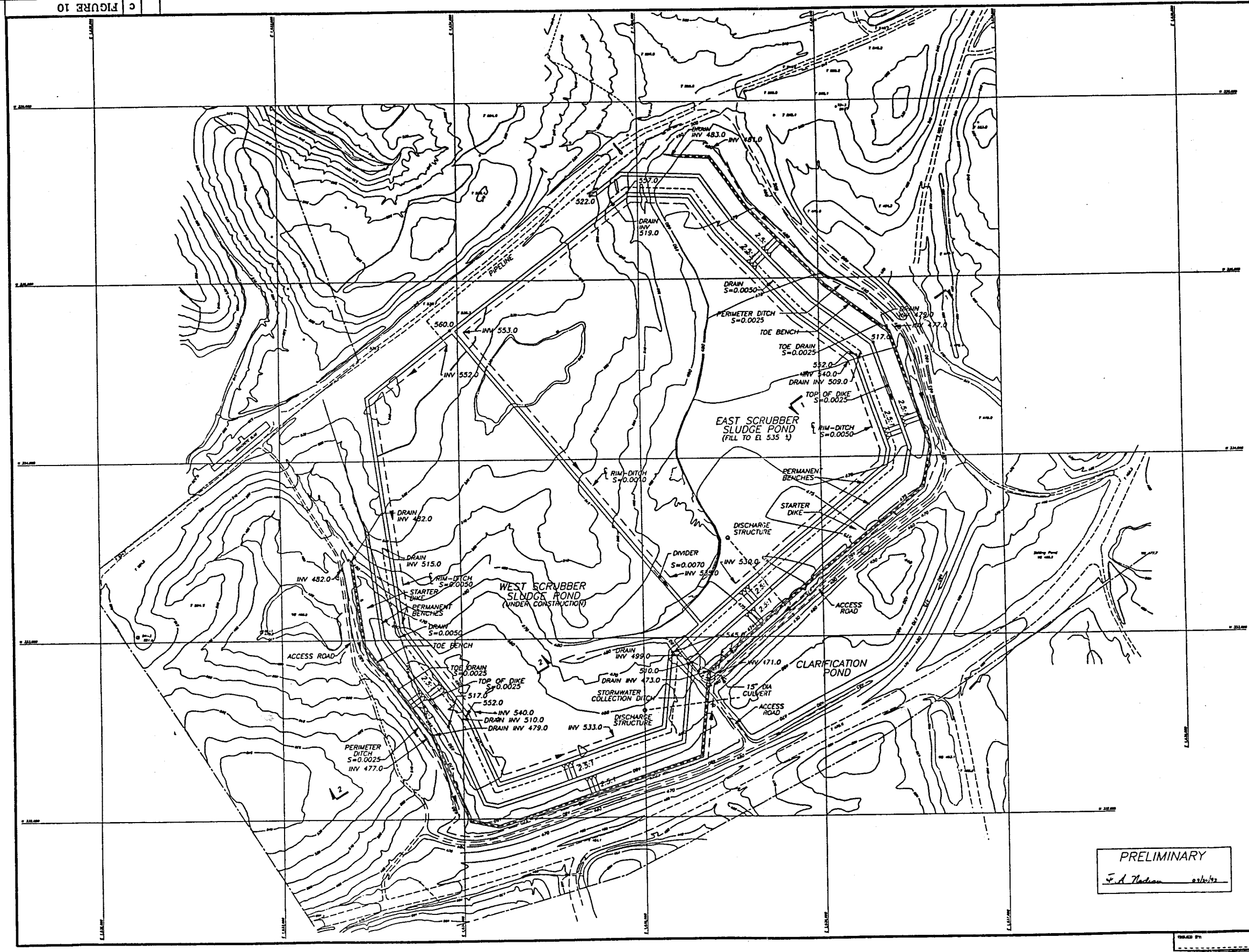
PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DESIGNED	SUPERVISED	1	2	
DRAWN	REVIEWED	3	4	
CHECKED				
ENGINEERING	DATE	C	FIGURE 9	R

ISSUED BY | AS CONSTRUCTED

CAD SYSTEM ORIGINAL
DO NOT CHANGE MANUALLY

FIGURE 10 | C



PRELIMINARY

F. A. Nadim 02/10/93

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	ENGD	APPD	RESP	AS CONST

SCALE: 1"=200' EXCEPT AS NOTED 0

YARD

WET SCRUBBER SYSTEM
GYPSUM STACKING
PLAN – STAGE 9

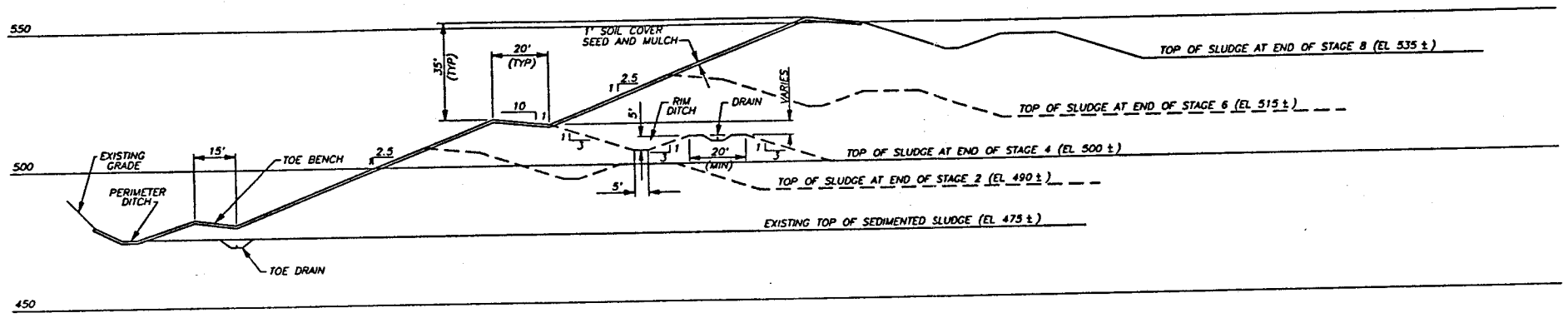
PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DESIGNED	SUPERVISED	1	2	
DRAWN	REVIEWED	3	4	
CHECKED				
ENGINEERING	DATE	C	FIGURE 10	R

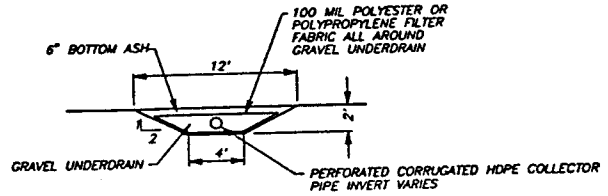
ISSUED FOR

AS CONSTRUCTED

CAD SYSTEM ORIGINAL
DO NOT CHANGE MANUALLY



SECTION 1–1
(EAST SCRUBBER SLUDGE POND)



TYPICAL DRAIN DETAIL

SECTION 2–2
(WEST SCRUBBER SLUDGE POND)

PRELIMINARY
F. A. Nadeau 05/20/22

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	ENGD	APPD	ISSUED		AS CONST
										0

SCALE: NONE — EXCEPT AS NOTED

YARD

WET SCRUBBER SYSTEM
GYPSUM STACKING
SECTIONS AND DETAILS

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY

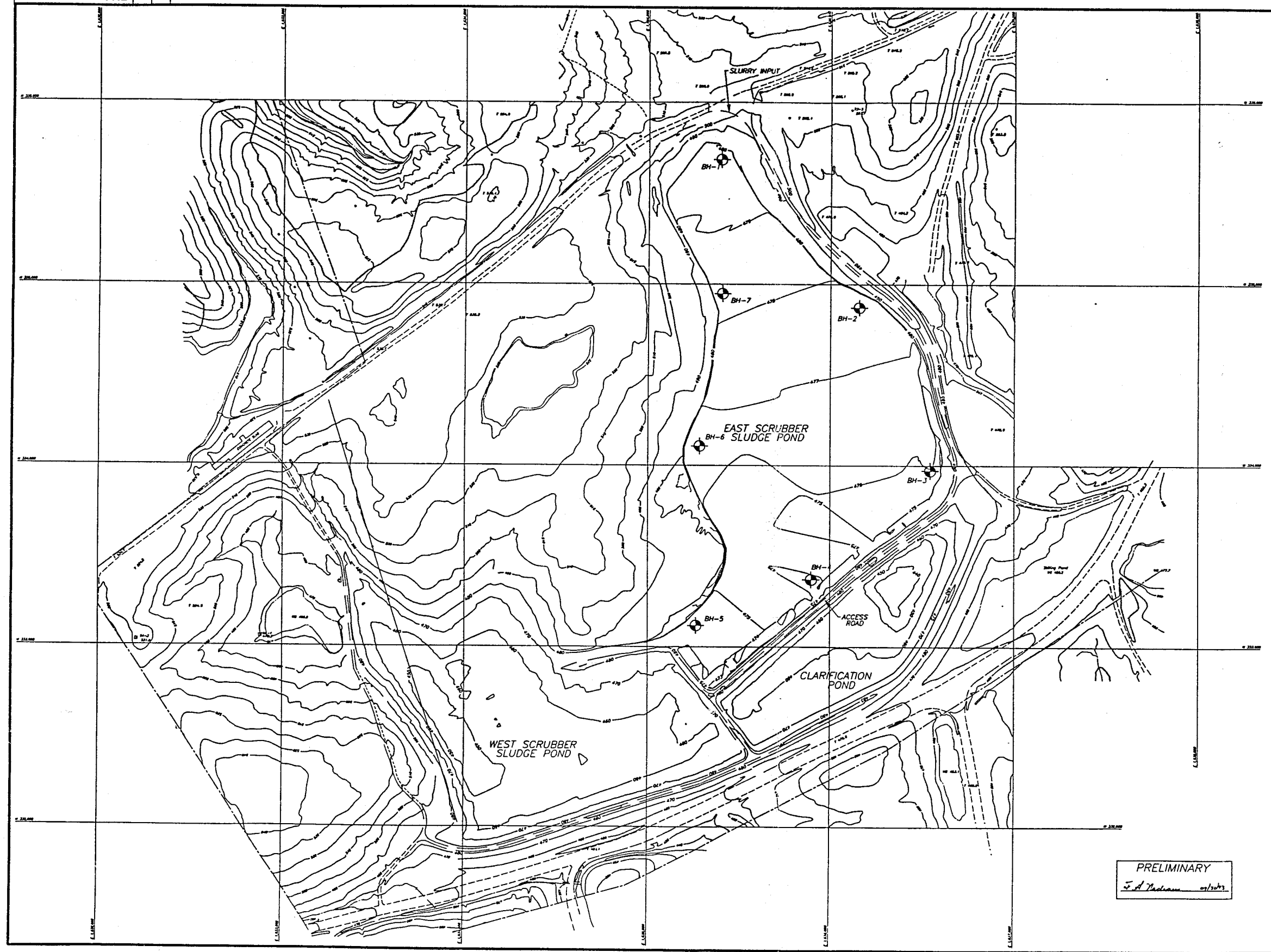
DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DESIGNED	SUPERVISED	1	2	
DRAWN				
CHECKED	REVIEWED	3	4	
ENGINEERING	DATE	C	FIGURE 11	R

AS CONSTRUCTED

ISSUED BY:

CAD SYSTEM ORIGINAL
DO NOT CHANGE MANUALLY

FIGURE 12 | C



PRELIMINARY
T. A. Hardaway 09/24/87

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD		AS CONST

SCALE: 1"=200' EXCEPT AS NOTED 0

YARD

WET SCRUBBER SYSTEM
GYPSUM STACKING PLAN
PROPOSED BORING LOCATIONSS

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DESIGNED	SUPERVISED	1	2	
DRAWN				
CHECKED	REVIEWED	3	4	
ENGINEERING	DATE	C	FIGURE 12	R

ISSUED BY: AS CONSTRUCTED

CAD SYSTEM ORIGINAL
DO NOT CHANGE MANUALLY

64 | C | 10W4280-12

R 1		RDP	MGH	JLG	JLG	KWB	RGJ	WDH	423F		D
COMPLETELY REDRAWN AND REVISED											
R 0	8-12-93	RDP	GCL	RDP	JLG	KWB	RGJ				
INITIAL ISSUE											

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD

DISCIPLINE INTERFACE

SCALE: 1" = 200' EXCEPT AS NOTED

YARD: FGD SYSTEM
UNITS 1 & 2

WET SCRUBBER SYSTEM
GYPSUM STACKING
PLAN – RIM DITCH L.P. @ EL 481±

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:

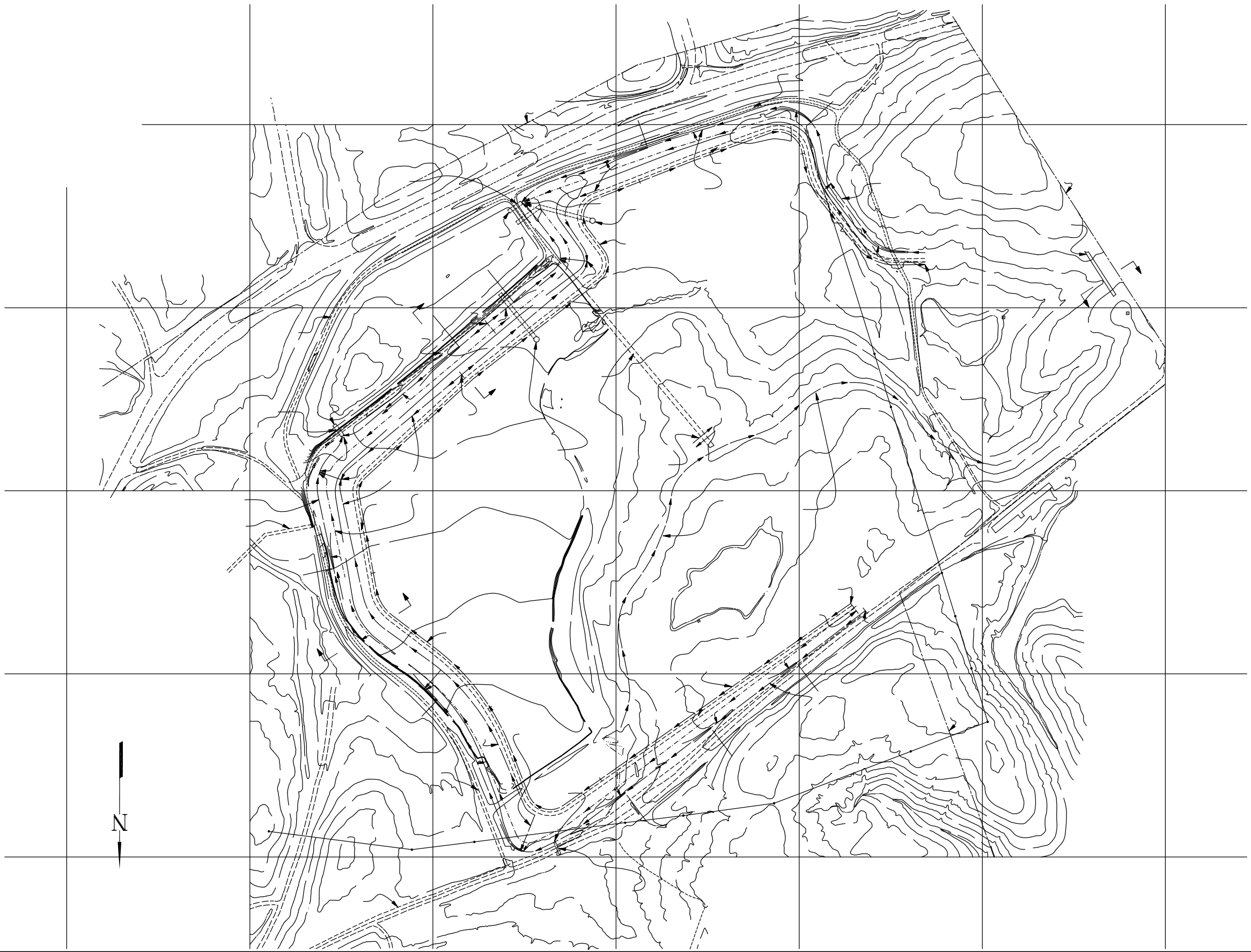
PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R12	DATE	64	C	10W4280-12	R 1

TASK COMPLETED BY:	REV NO.

PLOT FACTOR:2400
W-SIZE

C.A.D. DRAWING
DO NOT ALTER MANUALLY



TASK COMPLETED BY:	REV NO.

PLOT FACTOR:2400
W-SIZE

C.A.D. DRAWING
DO NOT ALTER MANUALLY

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	RELEASED BY	APPROVED BY	ISSUED BY

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R12 | DATE | 64 | C | 10W4280-13 | R 1

WET SCRUBBER SYSTEM
GYPSUM STACKING
PLAN - RIM DITCH L.P. @ EL 500±

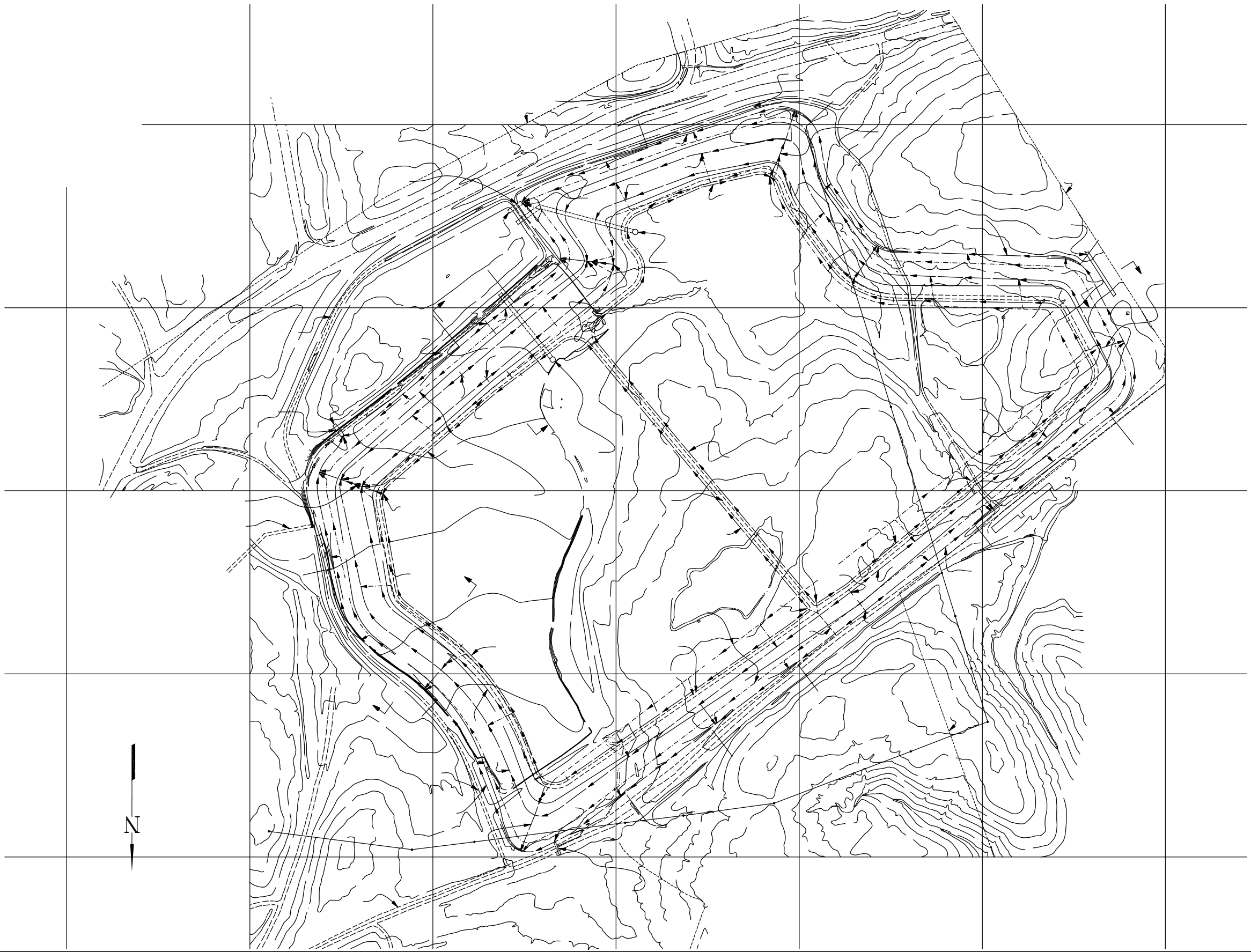
YARD: FGD SYSTEM
UNITS 1 & 2

SCALE: 1" = 200' EXCEPT AS NOTED

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APVD	ISSD	PROJECT ENGR	AS CONST	REV NO.
INITIAL ISSUE											
R 0	8-12-93	RDP	GCL	RDP	JLG	KWB	RGJ				0
COMPLETELY REDRAWN AND REVISED											
R 1		RDP	MGH	JLG	JLG	KWB	RGJ	WBH	42SF		0

DISPLINE
MEPAYAC

12	11	10	9	8	7	6	5	4	3	2	64	C	10W4280-13



REV NO.	TASK COMPLETED BY:

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R12	DATE	64	C	10W4280-14	R 0

PLOT FACTOR:2400
W-SIZE

C.A.D. DRAWING
DO NOT ALTER MANUALLY

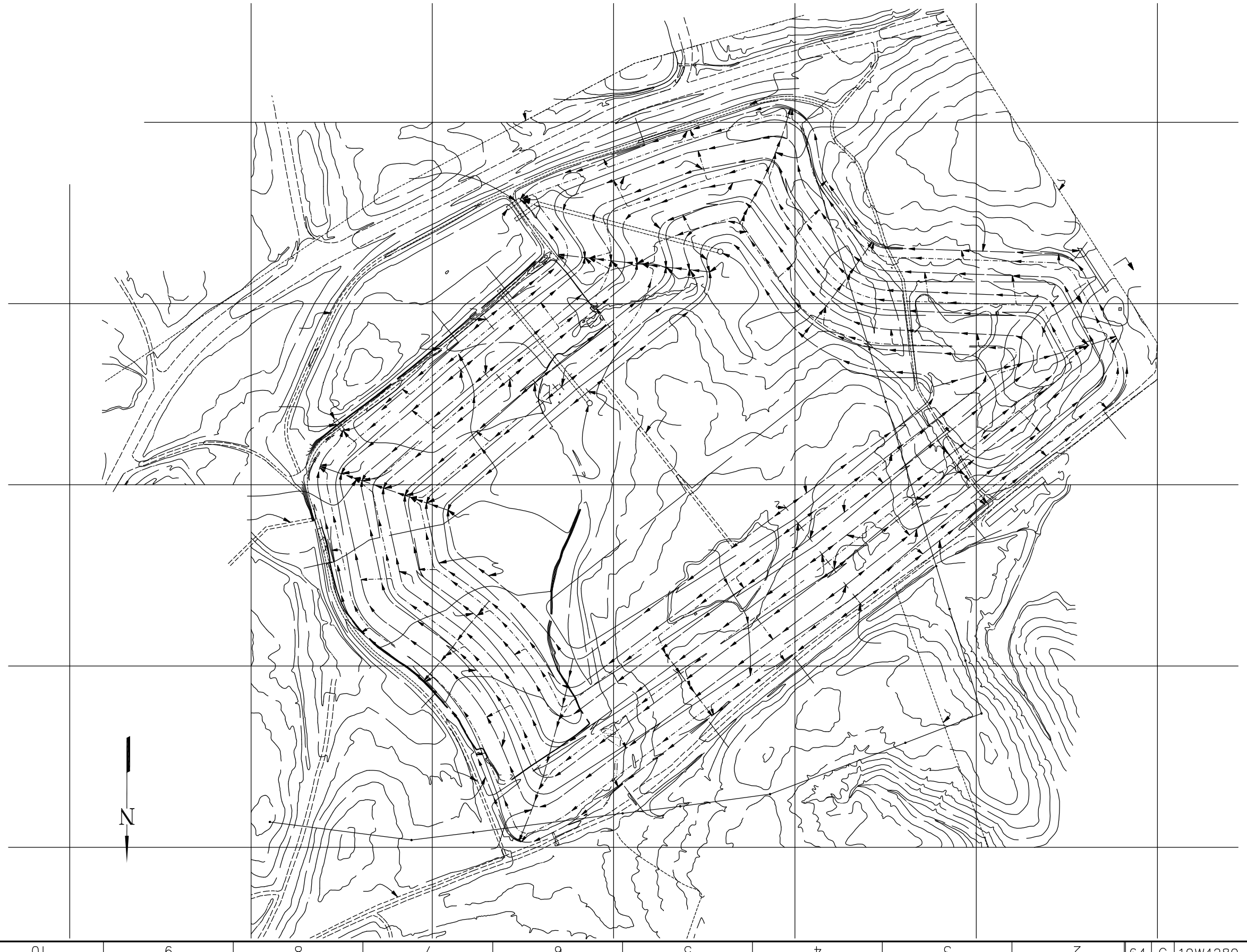
R													
R 0	INITIAL ISSUE		RPP	MGH	J.L.G.	J.L.G.	KWB	RGJ	MDH	423F			
REV NO.	REVISION NO.	DATE	DSGN	DRWN	CHKD	SUPV	REVD	APPD	ISSD	PROJECT ENGR	AS CONST	REV NO.	DESIGNATE METAFAC

SCALE: 1" = 200' EXCEPT AS NOTED

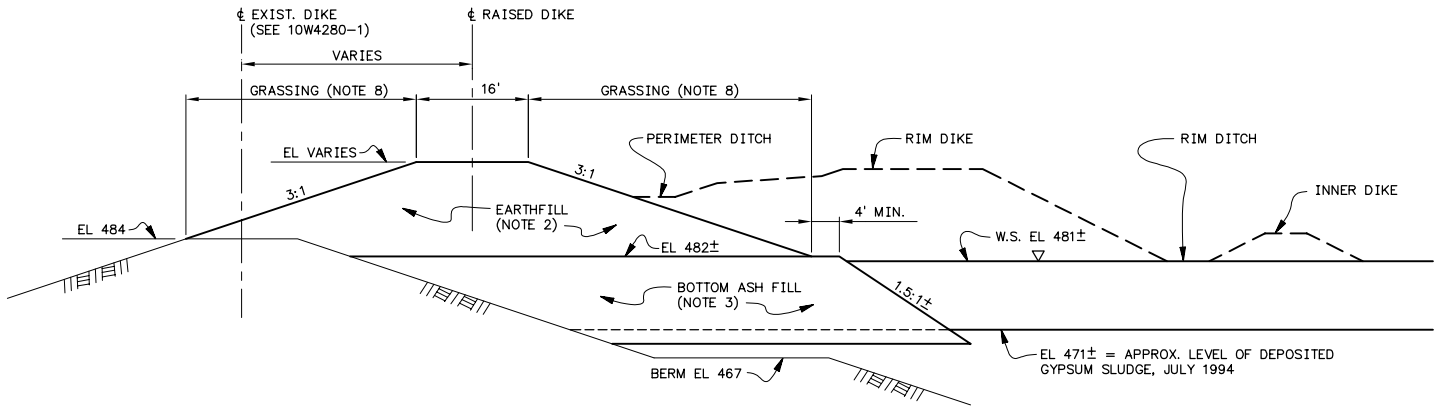
YARD: FGD SYSTEM
UNITS 1 & 2

WET SCRUBBER SYSTEM
GYPSUM STACKING
PLAN - RIM DITCH L.P. @ 550±

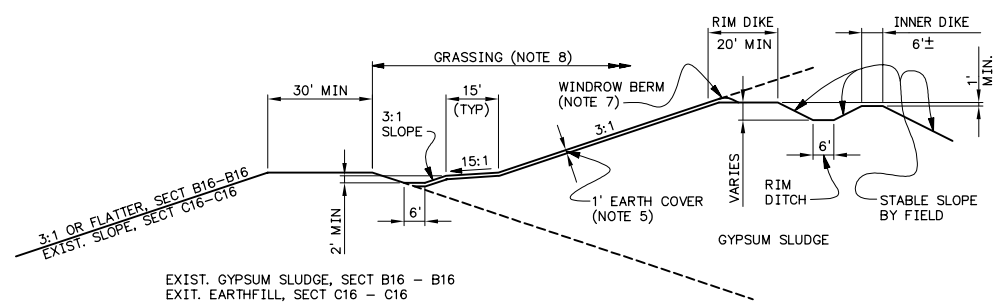
64	C	10W4280-14


N

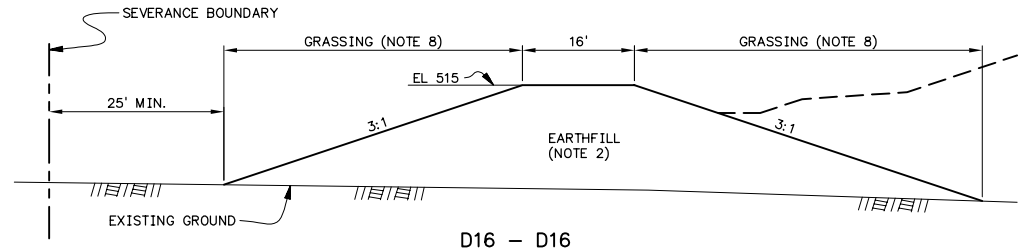
| | | |



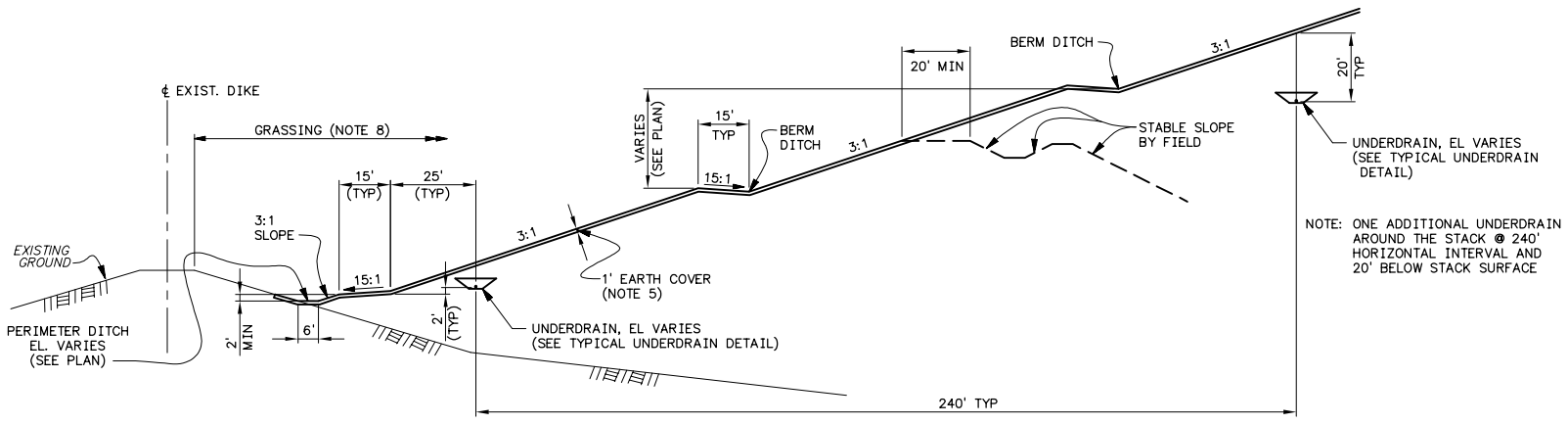
A16 – A16
RAISED SECTION OF PERIMETER DIKE
(SOUTHWEST END)
(10W4280-12)
1" = 10'



B16 – B16
C16 – C16

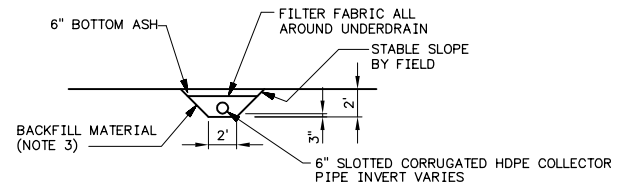


D16 – D16
TYPICAL SECTION-SADDLE DIKE
(10W4280-12)
1" = 10'



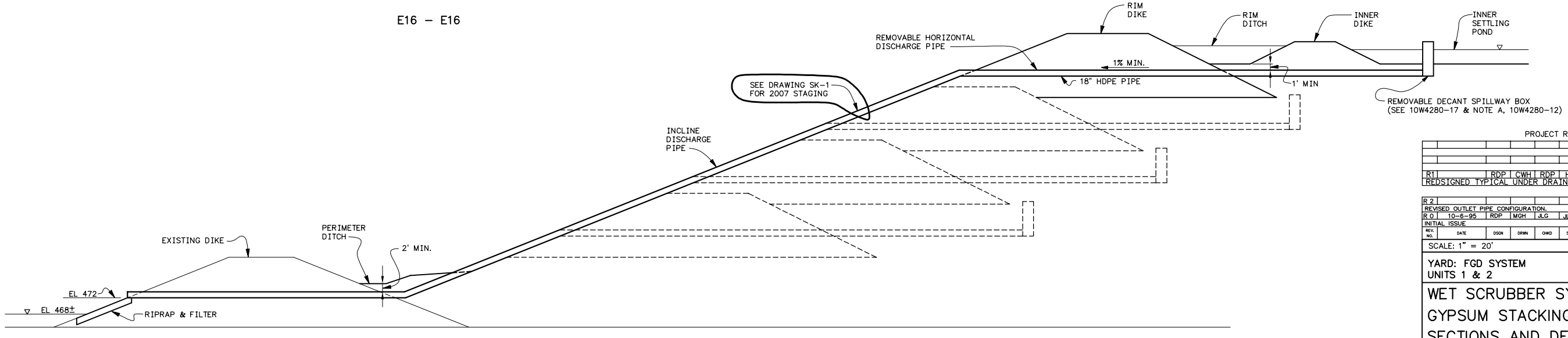
E16 – E16

NOTE: ONE ADDITIONAL UNDERDRAIN AROUND THE STACK @ 240' HORIZONTAL INTERVAL AND 20' BELOW STACK SURFACE



TYPICAL UNDERDRAIN DETAIL
1" = 5'

NOTES:
1. FOR GENERAL NOTES FOR GYPSUM STACK CONSTRUCTION SEE DRAWING 10W4280-12.



STAGE DECANT SPILLWAY SYSTEM
SEE NOTE A, 10W4280-12
NOT TO SCALE

PROJECT REVISION HISTORY

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	DISCIPLINE INTERFACE
R1		RDP	CWH	RDP	HLP	REP	JGA				D
REDESIGNED TYPICAL UNDER DRAIN DETAIL FROM COMMENTS IN FIELD.											
R 2											D
REVISED OUTLET PIPE CONFIGURATION.											
R 0	10-6-95	RDP	MGH	JLG	JLG	KWB	RGJ	WDH	423F		D
INITIAL ISSUE											

SCALE: 1" = 20' EXCEPT AS NOTED

YARD: FGD SYSTEM
UNITS 1 & 2

WET SCRUBBER SYSTEM
GYPSUM STACKING
SECTIONS AND DETAILS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
R.D.POWELL	M.G.HRANEK	J.L.GLOVER	J.L.GLOVER	K.W.BURNETT	R.G.JOHNSON	W.D.HALL

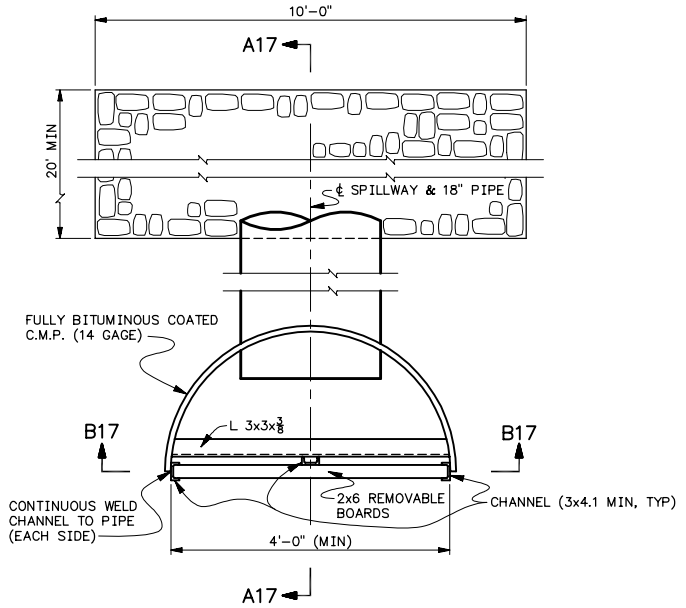
PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R12	DATE	64	C	10W4280-16	R 2

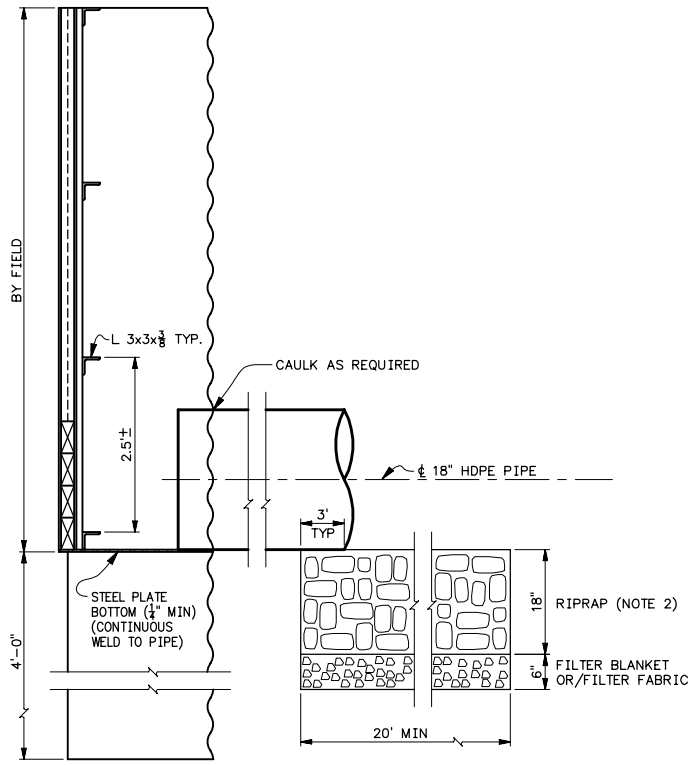
TASK COMPLETED BY: | REV NO.

PLOT FACTOR: 240
W-SIZE
FILENAME: PF428016.DWG

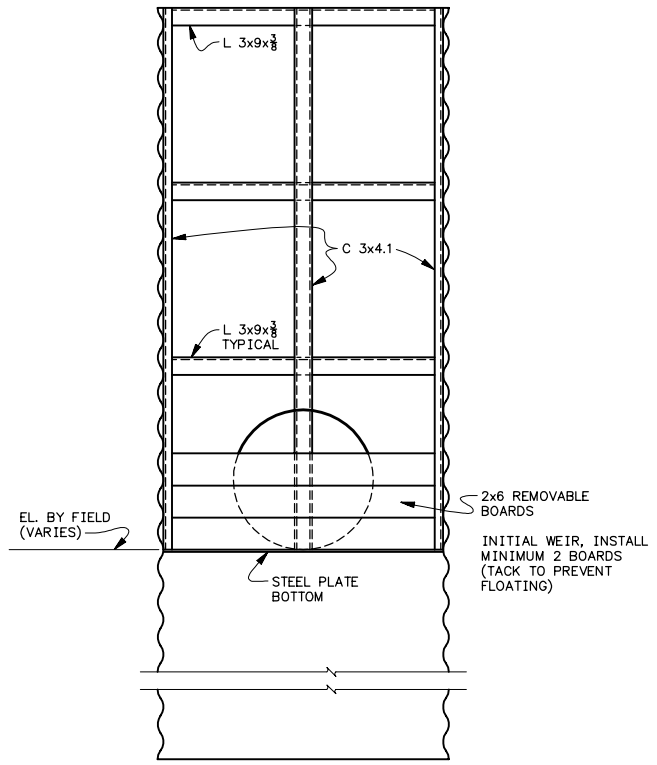
C.A.D. DRAWING
DO NOT ALTER MANUALLY



PLAN – METAL SPILLWAY
NOT TO SCALE



A17 – A17
NTS



B17 – B17
NTS

SUMMARY OF QUANTITIES

DESCRIPTION	QUANTITY	UNIT
METAL SPILLWAY		
CHANNEL (C3x4.1 MIN)	24	LF
ANGLE (L3x3x⅜ MIN)	16	LF
STEEL PLATE (¼" MIN)	64	LB
48"ø CMP	6	LF
2x6 BOARD	48	LF

* QUANTITIES GIVEN ARE FOR ONE SPILLWAY, MULTIPLY BY NUMBER OF SPILLWAYS REQUIRED FOR TOTAL QUANTITIES.

NOTES:
1. FOR GENERAL NOTES FOR GYPSUM STACK CONSTRUCTION SEE DRAWING 10W4280-12.
2. RIPRAP SHALL CONSIST OF 50% OF THE STONES WEIGHING 100 LBS EACH OR GREATER, PER SECTION 575.

SEE DRAWING SK-2 FOR 2007 SPILLLWAY DESIGN.

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	TECH SPEC
R 1	REVISED TO SHOWN NOTE FOR NEW SPILLWAY DRAWING LOCATION										
R 0	INITIAL ISSUE	RDP	MGH	JLG	JLG	KWB	RGJ	WDH	423F		D

DISCIPLINE INTERFACE

SCALE: NOTE TO SCALE — EXCEPT AS NOTED

YARD: FGD SYSTEM
UNITS 1 & 2

WET SCRUBBER SYSTEM
GYPSUM STACKING
SPILLWAY SECTIONS & DETAILS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
R.D.POWELL	M.G.HRANEK	J.L.GLOVER	J.L.GLOVER	K.W.BURNETT	R.G.JOHNSON	W.D.HALL

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

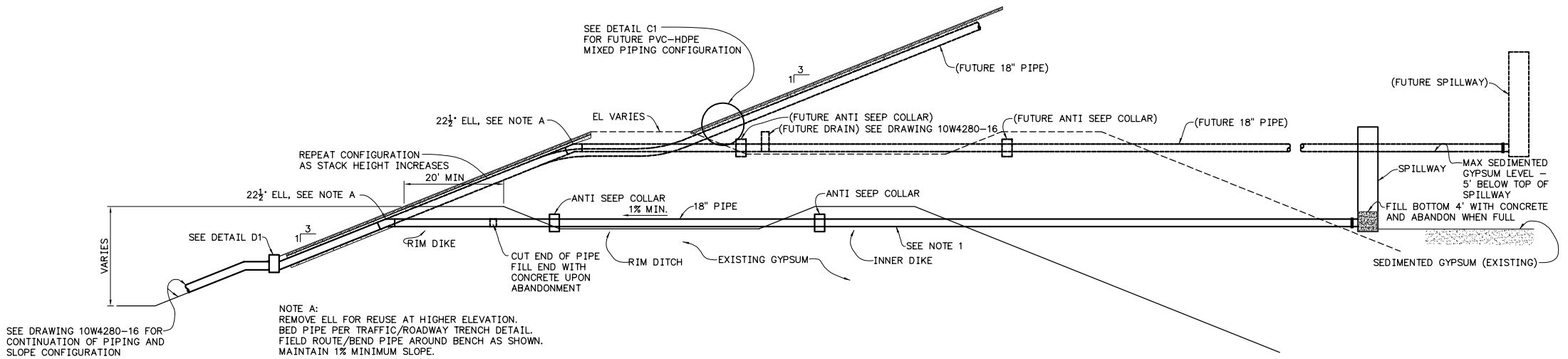
AUTOCAD R12	DATE	64	C	10W4280-17	R 1

TASK COMPLETED BY: | REV NO.

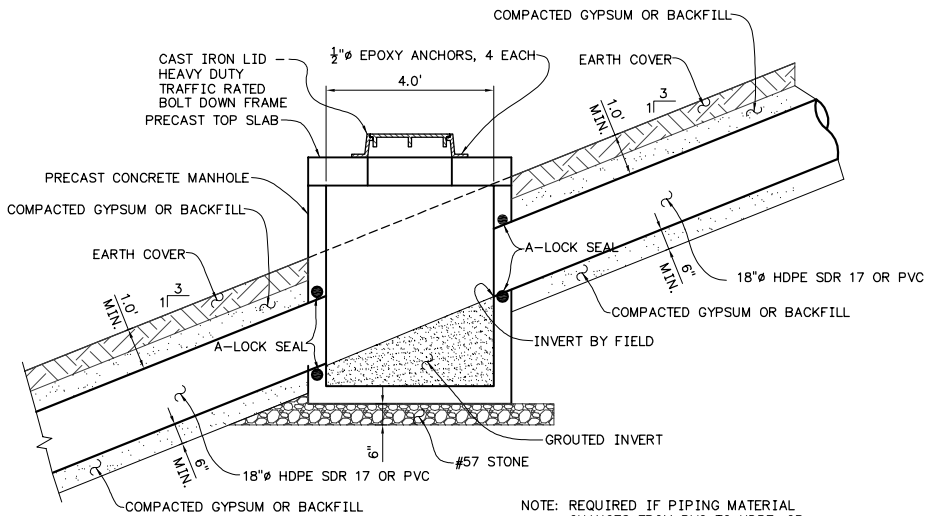
PLOT FACTOR:12
W_SIZE
FILENAME: PF428017.DWG

C.A.D. DRAWING
DO NOT ALTER MANUALLY

DRAWING CHANGE AUTHORIZATION

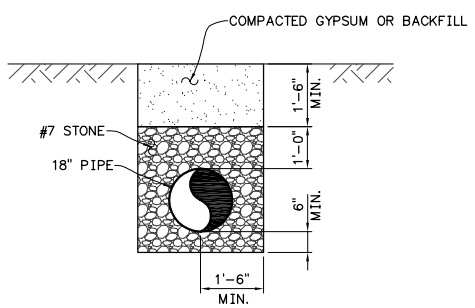


SECTION A1–A1
STAGE DECANT SPILLWAY SYSTEM
SCALE: 1"=10'

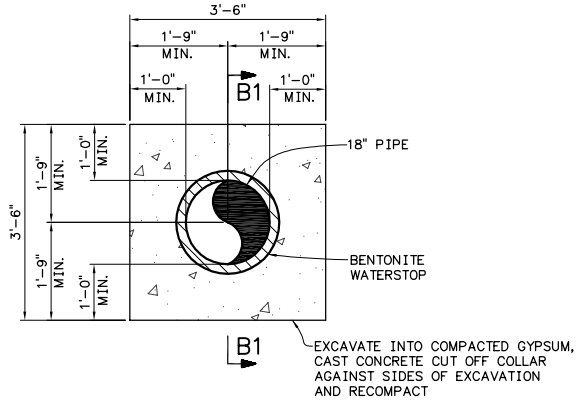


DETAIL C1
PIPE JUNCTION
SCALE: NTS

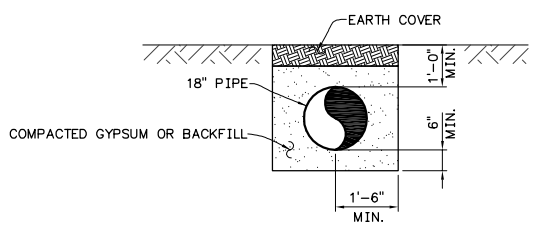
NOTE: REQUIRED IF PIPING MATERIAL CHANGES FROM PVC TO HDPE, OR IF PREFABRICATED FITTINGS NOT AVAILABLE



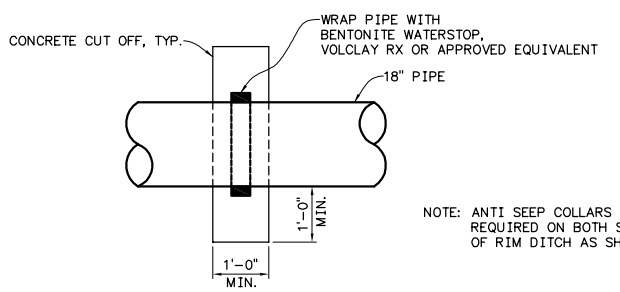
TRAFFIC/ROADWAY TRENCH DETAIL
SCALE: NTS



ANTI SEEP COLLAR
SCALE: NTS

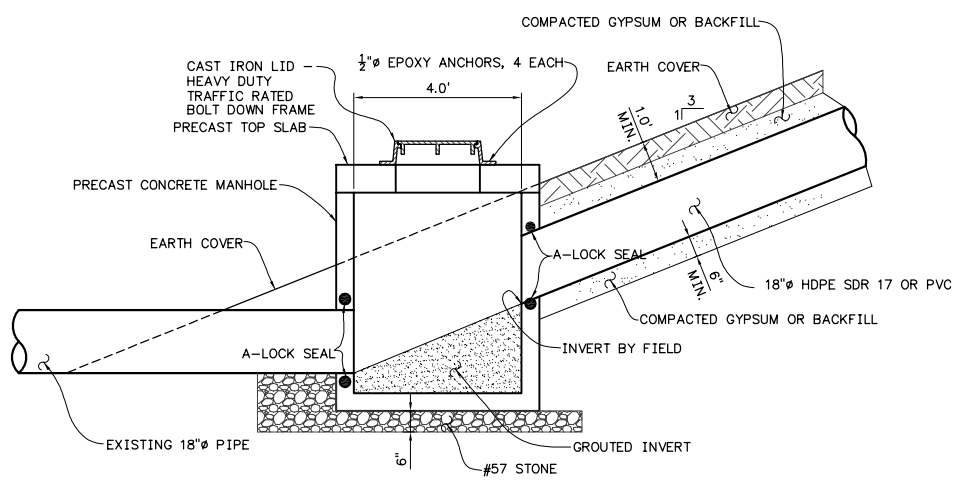


NON–TRAFFIC/SLOPE TRENCH DETAIL
SCALE: NTS



NOTE: ANTI SEEP COLLARS REQUIRED ON BOTH SIDES OF RIM DITCH AS SHOWN

SECTION B1–B1
SCALE: NTS

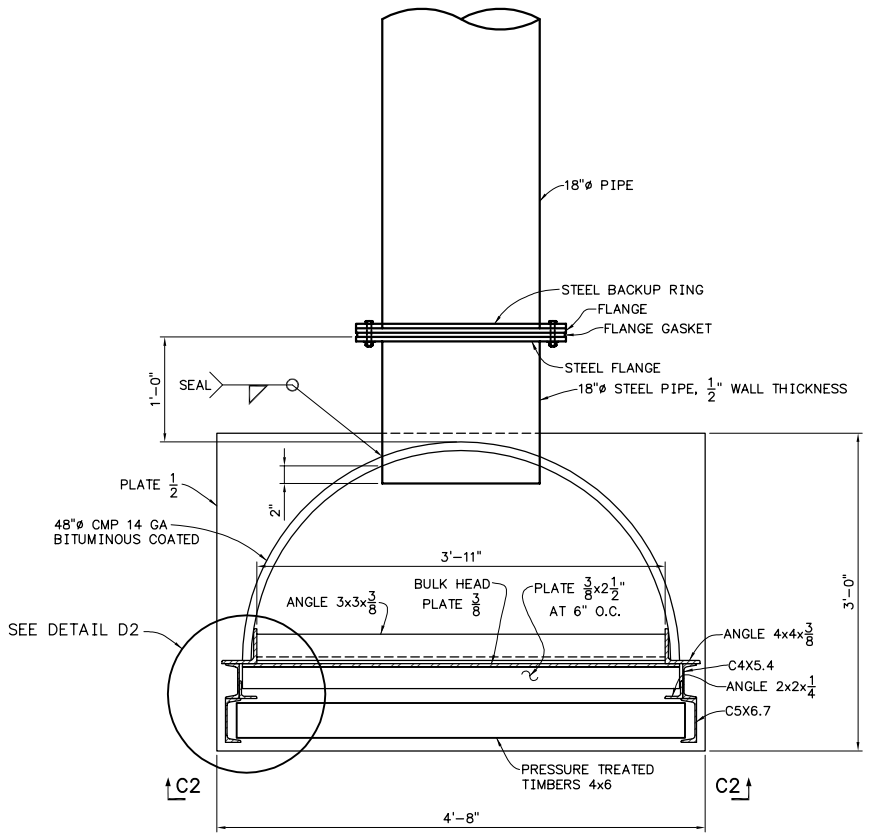


DETAIL D1
PIPE JUNCTION
SCALE: NTS

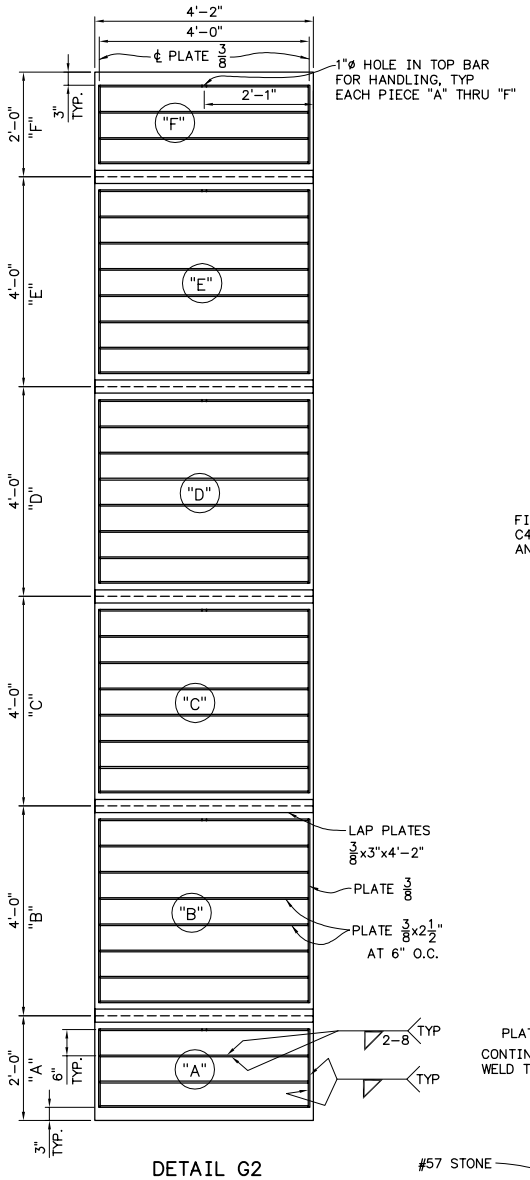
NOTES:
1. PIPE SHALL BE HDPE SDR 17 WITH BUTT FUSION WELDED JOINTS –OR– CORRUGATED PVC (CONTECH A2000), PUSH ON JOINTS WITH RUBBER GASKETS SUITABLE FOR SANITARY SEWER USAGE. FUTURE MIXED CONFIGURATION (HDPE AND PVC) IS ACCEPTABLE PROVIDED THAT THE INSTALLATION IS AS DETAILED ON DRAWING.
2. SEE DRAWING 10W4280–16 FOR GYPSUM STACKING SECTION AND DETAILS.

SCALE: 1"=10'			EXCEPT AS NOTED
YARD			
GYPSUM STACK SECTIONS & DETAILS			
		c	SK–1
0	CWH 06/26/2007	RLP 06/26/2007	
Rev.	Prepared/Date	Checked/Date	Change Reference
Contract No: N/A		Affected Base Drawing No.	Rev:
DCA Prerequisite: N/A		N/A	0
Ant. Dwg. No: SK–1	CAT: SEC	DCA No: DCA–PAF–	0
Discipline: CIVIL	UNIT N/A	PARADISE FOSSIL PLANT	

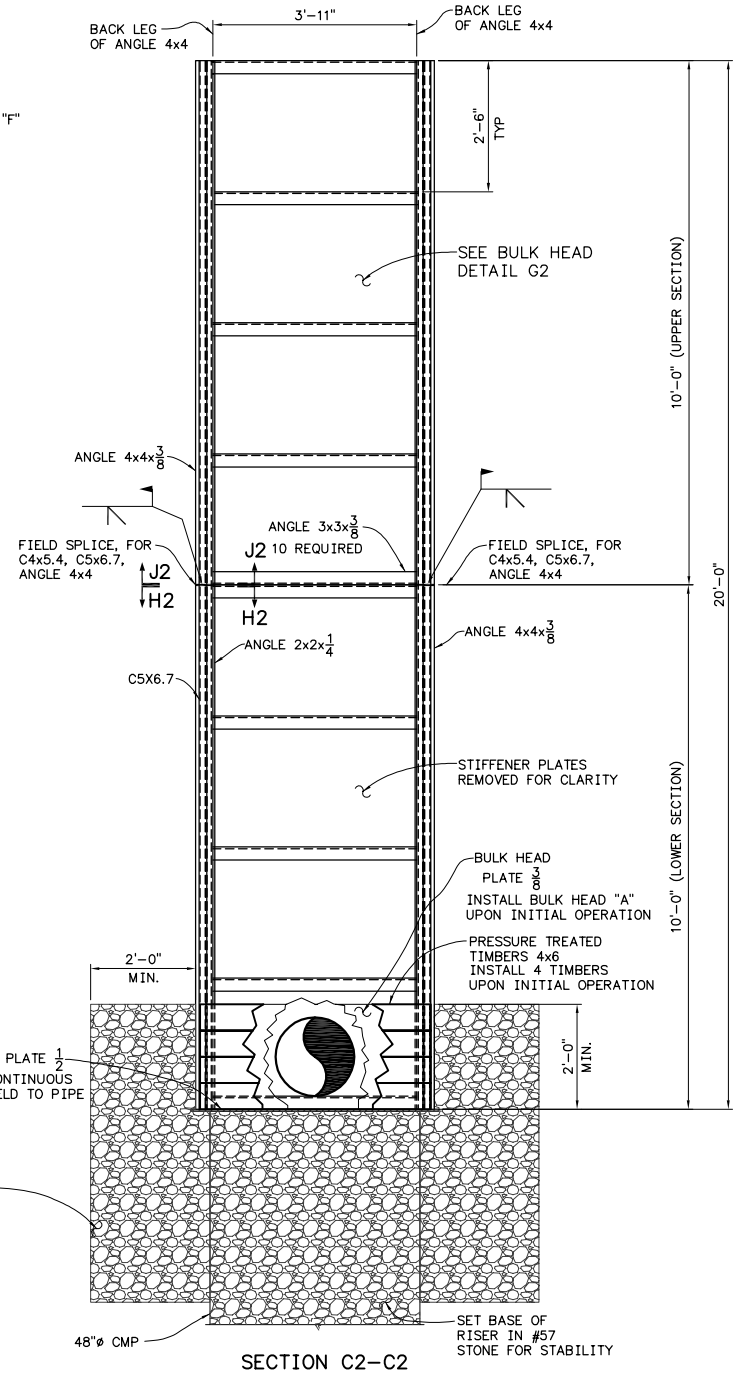
DRAWING CHANGE AUTHORIZATION



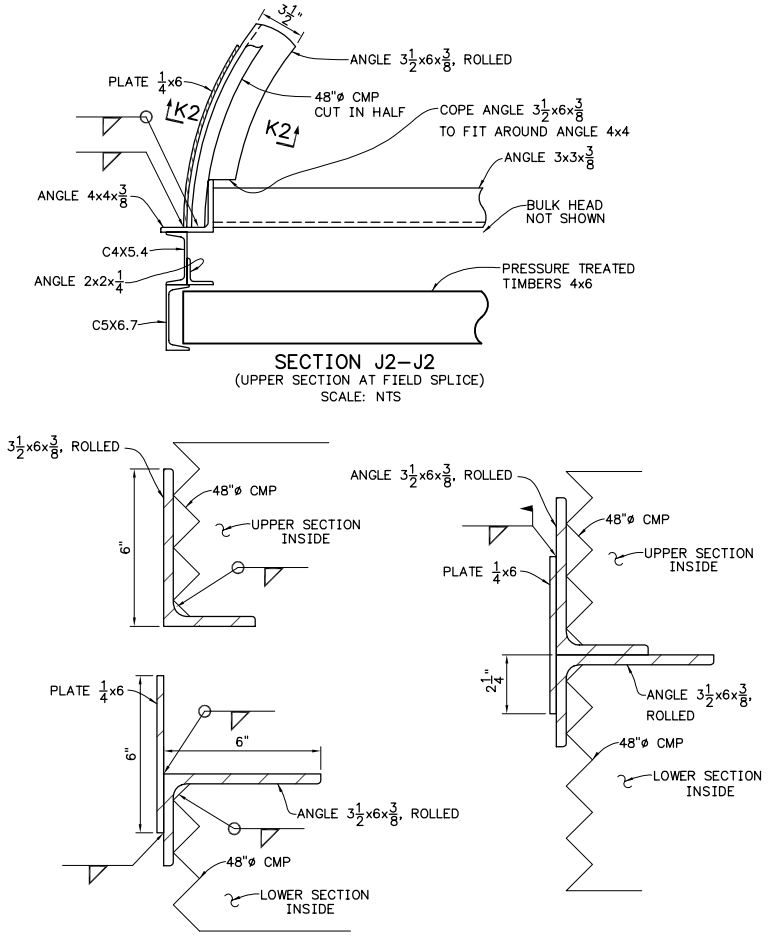
PLAN
SCALE: 1 1/2"=1'-0"



DETAIL G2
BULK HEAD
SCALE: 3/4"=1'-0"

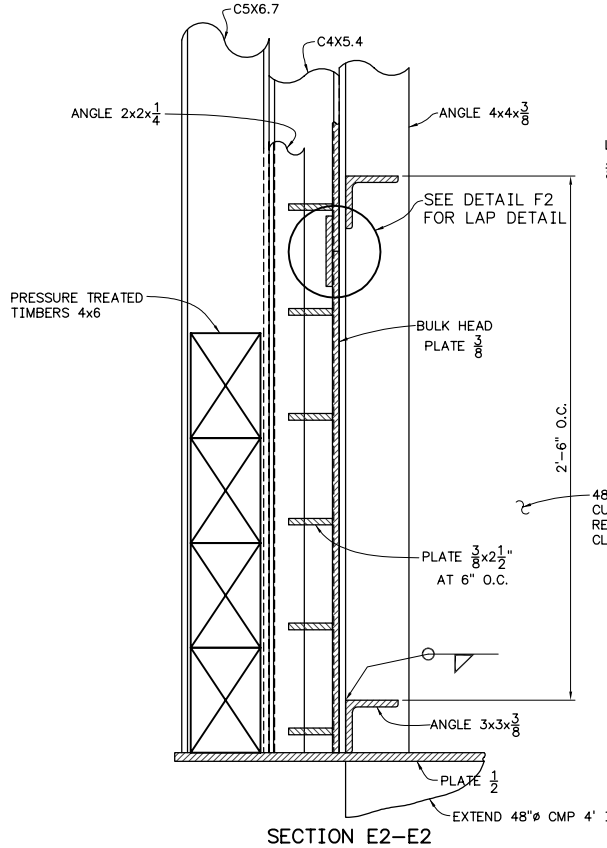


SECTION C2-C2
SCALE: 3/4"=1'-0"

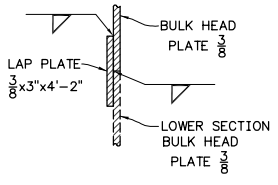


SECTION J2-J2
(UPPER SECTION AT FIELD SPLICE)
SCALE: NTS

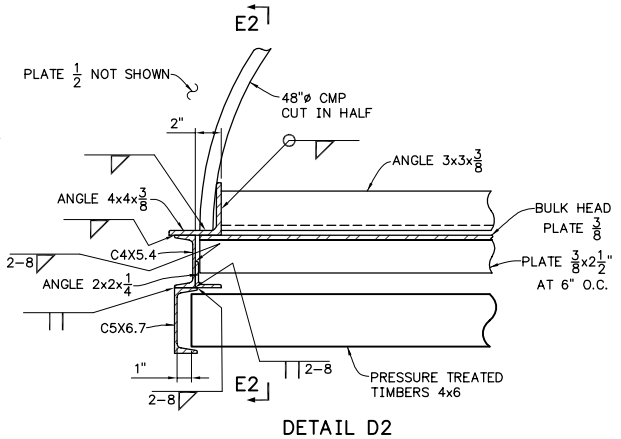
SECTION K2-K2
FIELD SPLICE TWO SECTIONS OUTSIDE
SCALE: NTS



SECTION E2-E2
SCALE: 3"=1'-0"



DETAIL F2
SCALE: 3"=1'-0"



DETAIL D2
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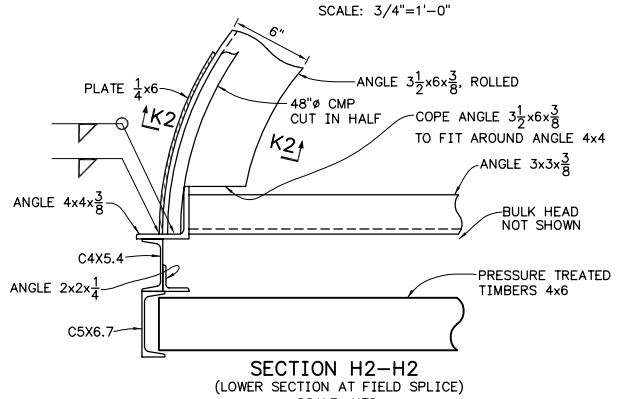

SECTION H2-H2
(LOWER SECTION AT FIELD SPLICE)
SCALE: NTS

NOTES:
1. FOR GENERAL NOTES FOR GYPSUM STACK CONSTRUCTION SEE DRAWING 10W4280-12.
2. 48" CORRUGATED METAL PIPE (CMP), 14 GAUGE, GALVANIZED AND BITUMINOUS COATED IN ACCORDANCE WITH AASHTO SPECIFICATIONS M36, M190, AND M232.
3. ALL STRUCTURAL STEEL SHALL CONFORM TO ASTM A36.
4. ALL WELDING SHALL UTILIZE E70 SERIES ELECTRODES IN ACCORDANCE WITH AWS D1.1.
5. ASSEMBLY SHALL BE COATED AFTER SHOP FABRICATION WITH 2 COATS COAL TAR EPOXY WITH SURFACE PREP PER COATING MANUFACTURER'S INSTRUCTIONS.

SCALE: 3/4"=1'-0"			EXCEPT AS NOTED
YARD			
GYPSUM STACK WEIR MODIFICATIONS			
		c	SK-2
0	CWH 06/26/2007	RLP 06/26/2007	
Rev.	Prepared/Date	Checked/Date	Change Reference
Contract No: N/A		Affected Base Drawing No.	Rev:
DCA Prerequisites: N/A		N/A	0
Asst. Dwg. No: SK-2	CAT: SEC	DCA No: DCA-PAF-	0
Discipline: CIVIL	UNIT N/A	PARADISE FOSSIL PLANT	

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CMM

Master File

May 3, 1996

H. C. Kolb, Paradise Fossil Plant

PARADISE FOSSIL PLANT (PAF) - ANNUAL INSPECTION OF WASTE DISPOSAL AREAS

Attached is a report from C. M. Minghini to K. W. Burnett dated May 1, 1996, concerning the joint inspection of PAF's waste disposal areas.

This report includes recommendations for corrective work. I concur with these recommendations.

RG Johnson

Ralph G. Johnson
Manager, Fossil Engineering
LP 2G-C

KWB:[redacted]RH
Attachments
cc (Attachments):
J. S. Baugh, LP 5H-C
RIMS, CST 13B-C

t:\PAFINSP.doc

May 2, 1996

K. W. Burnett, Manager, Site and Environmental Engineering, LP 2G-C

PARADISE FOSSIL PLANT - ANNUAL INSPECTION OF WASTE DISPOSAL AREAS

INTRODUCTION

An annual inspection of the waste disposal pond dikes and toe areas at PAF to ensure structural stability was conducted April 9 and 10, 1996. This inspection was conducted by Joel Paris and Cherie Minghini of Fossil Engineering, and Jim Huber and Missy Hedgecoth of Fossil Fuels. The previous stability inspection was conducted on May 17 and 18, 1995.

Our findings during this inspection were discussed with Gary Southerland of Paradise Fossil Plant.

Slag Areas 2A, 2B, and Stilling Pond

Boiler slag is sluiced into the south end of pond 2A and is reclaimed approximately once a day by Reed Minerals as part of a TVA marketing strategy. The sluice water flows into pond 2B through pipes and exits into the stilling pool to the east through a concrete flume. The concrete flume appeared to be in good condition and water was flowing freely into the stilling pool. From here, three standard spillways discharge the water into the Green River if it is environmentally acceptable. If not, the water is pumped to the Jacobs Creek fly ash pond. Water was discharging from all three outlet pipes at the time of inspection with no evidence of flow restriction. The riprap at the outlet end appeared to be in good condition. The spillways appeared to be in good condition and functioning properly.

The dikes appear to be stable and did not exhibit any notable changes since the last inspection. The interior slopes of the dikes appeared to have a good vegetative cover. The plant continues to monitor the survey controls installed on the exterior dike slope adjacent to the Green River for any indication of movement.

Redwater Ponds (Nos. 1, 2, 3, 4 & 5)

Redwater ponds # 1 and # 2 are located northwest of the powerhouse and adjacent to, but on opposite ends, of ponds 2A and 2B. Redwater pond # 3 is located southwest of the powerhouse along the south access road and redwater pond # 4 is located southeast of the medium and coarse coal wash refuse area. Pond # 5 is located south of the powerhouse and northeast of Pond # 3 and was under construction at the time of inspection. Pond # 4 accepts runoff from the medium and coarse refuse area and drains to # 3 via an eight inch pipe into an open riprap channel. An overflow structure drains excess runoff from heavy rainfall events to the Jacobs Creek fly ash pond. Pond # 3 collects additional runoff and discharges to

1 via a gravity drain with a manual valve. Three horizontal discharge pipes direct excess storage from # 3 to the Jacobs Creek active ash pond during periods of heavy rainfall. Water collected in redwater pond # 1 is pumped into the slag pond 2B. Runoff collected in redwater pond # 2 is pumped to slag pond 2B.

The pumps that lift water from redwater pond # 1 to slag pond 2B were working properly. The pump that discharges water from redwater pond # 2 to slag pond 2B was not in operation at the time of inspection. The spillway that discharges water from pond # 3 to pond # 1 was clear and functioning properly. The horizontal discharge pipes from pond #3 were not discharging water to the Jacobs Creek ash pond. The growth of vegetation around the pipe inlets noted in the previous inspection was removed; however vegetative growth persists in this area. The interiors of the pipes were clear of debris. The outlet from pond # 4 was in good condition. The ditch that accepts the outlet water had a good riprap cover. Water was not discharging in the channel at the time of inspection.

The dikes of all four ponds were generally in good condition and appeared stable with an excellent vegetative cover on the exterior slopes. A small surface sluff was observed on the interior slope of the east dike of redwater pond # 3. The sluff did not appear to threaten the structural integrity of the dike. A few small trees are beginning to grow on the interior dike slope of redwater pond # 3. There were also several small trees observed on the dikes of redwater pond # 1. A pipe coming from the plant which runs along the southern end of redwater pond # 1 had a leak and should be repaired.

Slag Area

The slag area is located southeast of the powerhouse. The slag in this area was placed here by the plant and is currently being reclaimed for commercial use by Reed Minerals personnel. The area contains a small surge pond to collect runoff and a larger area, called the beaver pond, which discharges over a spillway and down a riprap channel into Jacobs Creek. The riprap appears to be in good condition. Water was flowing without impediment to Jacobs Creek at the time of inspection.

The dikes appear to be stable with a good vegetative cover on them. The dike adjacent to the spillway that discharges water from the beaver pond was saturated due to recent heavy rainfall. The redwater seeps identified in earlier reports along the southwest dike in this area are still present. Some continue to have growing deposits of material. Plant personnel monitor these areas frequently. There are several erosion gullies and minor sliding areas located along the south dike. Some riprap had been placed in the eroded areas. There is an erosion gully at the end of the southwest dike just north of an existing drain pipe. Runoff should be redirected to the ditch on the other side of the road so the water can drain through the existing culvert.

Plant personnel have cleaned out the debris and vegetative growth which was blocking the spillway; however, vegetative growth persists in the area and should be removed if flow is restricted to Jacobs Creek.

Jacobs Creek Fly Ash Pond Area

This area is located south of the powerhouse. Fly ash is sluiced into the northern portion of the pond. At the time of inspection, the outlets of the sluice lines were still operating in a submerged condition. The water then flows through the pond to the southern end of this region and through a divider dike floating boom skimmer structure and into the stilling pond before being discharged into Jacobs Creek via three standard spillways. The floating boom at the divider dike was detached at the north end from the skimmer structure. There was still very little floating ash present in the stilling pool. The standard spillways were in good condition. The outlet pipes were clear of obstruction and discharging normally.

The dikes appear to be stable and did not exhibit any notable changes in the exterior dikes since the last inspection. The divider dike had an excellent cover of riprap on the slopes and was in good condition. The top of dike was covered with a good crushed stone surface. There was an area of rutting caused by heavy equipment on the north dike just west of the divider dike and along the south dike. These areas hold standing water and should be regraded to allow runoff to drain off the dike. There was a sluffing area noted on the south dike located just west of the divider dike. Several areas of minor erosion were noted along the south dike. The slides on the north exterior slope that were identified in the previous report are still present. These are surface sluffing failures caused by the road grader removing material at the toe of the dike. These areas are stable and are beginning to repair themselves. The plant access road that parallels the north dike has very poor drainage. This is causing water to pool up at the toe of the dike. A culvert exists to drain water to the ditch on the opposite side of the road, but it was covered and could not be located. Two of four drainage culverts located on the west side of the pond were discharging to the pond; however, the two culverts discharging contained much sediment. The sycamore tree identified in previous reports that is growing in the dike above the discharge structure was still present. The root system of this tree can cause damage to the outlet pipes.

Scrubber Waste Wet Ponding Area

This area is located in the southwest corner of the TVA reservation. Scrubber waste is sluiced into the northern end of this region. The area is being converted to stack the waste via the rim ditch method. The divider dike north of the stilling pool has been raised and the interior separator dike for the rim ditch has been constructed. The water head behind the divider dike has been reduced due to the development of the rim ditch method for this area. A separator dike has been constructed parallel to the northeastern exterior dike and the dike north of the stilling pool. Scrubber waste was being sluiced into the ditch formed by these two dikes. A sluice ditch has also been constructed along the northwestern edge of this area.

The standard spillway was operating and in good condition. The discharge pipes from the pond to the stilling pool were in good condition and were discharging water. The outlet was in good condition. Water was flowing freely from the pipe and being discharged via a ditch to the Jacobs Creek fly ash pond.

The exterior dikes in this area appear stable and did not exhibit any notable changes since the previous inspection. The slopes were in good condition with a good vegetative cover.

West Dredge Cell

This area, located just east of the scrubber wet ponding area, was constructed to accept dredged fly ash from the Jacobs Creek pond area. No material had been dredged into this cell at the time of the inspection.

The dikes appear stable and do not exhibit any notable changes since the last inspection. All exterior slopes have an excellent vegetative cover.

Plant personnel had installed a valve, at Fossil Engineering's request and in accordance with design drawings, on the outlet pipe for the underdrain system for this cell. This valve is used to drain the cell only during recovery operations. The valve was closed at the time of inspection. This is the only outlet for water in this cell because riser boards are installed all the way to the top of the splashboard riser spillway structure making it inoperable. Runoff water is now collecting in the cell.

East Dredge Cell

This area is located just south of the medium and coarse coal wash refuse area. This cell was also constructed to accept dredged fly ash from the Jacobs Creek ash pond area. The plant has ceased any dredging into the pond at this time.

The dikes in this area appear to be stable. An erosion ditch was identified beside the armored ditch at the northeast corner of the dike in the last inspection. This erosion area, caused by runoff which has bypassed the armored ditch, is still present and has gotten worse. An erosion ditch was also found at the southeast corner of the exterior dike. This appears to be caused by heavy sheet flow which concentrates to form the erosion gullies. The geotextile fabric that was placed to protect the ditch had been washed away by the erosive action of the water. The ditch was in good condition near the top of the slope due to placement of riprap on top of the geotextile. The berm ditch was not draining properly near the middle portion of the eastern dike. This did not affect the structural integrity of the dike.

The spillway was in good condition and was operating properly. The outlet pipe was clear of obstructions and was discharging. As mentioned in the previous report, the water at the outlet has eroded the riprap and has begun to form a pool at the exit of the pipe.

Medium and Coarse Coal Wash Refuse Area

The majority of this refuse has previously been transported by the BC-R3 conveyor belt, which was extended by Modification Services Currently, most of the material is transported from the silo to the stack. Heavy equipment transports the refuse to the northern portion of this region to be stacked in the final stacking configuration. The southeastern portion of this area has been graded and covered with a combination of soil from the redwater # 3 clean-out and scrubber material recovered from the scrubber wet ponding area. Runoff from the south side is collected in the original fines pond and discharged by drainage ditches and diverted to redwater pond # 3. The outlet that discharges water from the pond in the southern portion of this area was functioning well. Water was being discharged through a twelve inch pipe to a riprapped ditch where it was routed to redwater pond #4.

Vegetative growth is established in the southeastern portion of the area. There appears to be a good cover; however, some bare areas need to be reseeded to establish a lush vegetative cover. The erosion ditch on the saddle dam that was identified in the last report was still present. The ditch appears to have further eroded due to lack of vegetative growth in the ditch, which was identified to be present during the previous inspection. There were several other areas of erosion ditches identified along the southwest dike. There are also erosion gullies on the northwest end of the refuse area. A large erosion gully was observed on the north end of the refuse area adjacent to the overhead medium and coarse coal wash refuse conveyor.

Coal Wash Fines Pond No. 2

This disposal area, located west of the powerhouse, was completed in the late fall of 1987. The perimeter dike at the west end of this area was constructed by Modification Services as designed by Fossil Engineering. The top of the original dike was at elevation 455 feet. The plant raised the dike to approximately elevation 465 feet in 1990, and subsequently sluiced fines to this elevation. This area has not been active as a sluicing operation since fines pond #3 began in October 1992.

In January 1991, two, 2-foot sections of pipe were added to the spillway structure. The water has not reached the elevation of the top of the standpipe, so no flow is going to the stilling pool from the spillway.

All of the dikes in this area appeared stable and in good condition. The dikes appear to have a good vegetative cover; however, the west dike of this area has sparse vegetation.

The access road on the exterior dike on the south side of this area had very poor drainage. There was standing water in the road between the pond and the railroad from storm runoff. The culvert at the west end of the ditch was not draining.

Coal Wash Fines Pond # 3

Fines pond # 3 is located northwest of fines pond # 2. It was completed in October 1992 and all sluicing was diverted from fines pond #2 to this area. Fines are sluiced into the eastern end of area and the water flows to the west. An overflow discharge structure removes the water to a second pond before discharging through a standard spillway into a stilling basin. The basin does not have a discharge point, but water is pumped with a portable pump, into fines pond #2 when the water surface elevation in the basin rises. The spillway in the pond was not discharging due to the fact that the water surface in the stilling basin was at the same level as the pond surface. The overflow spillway had recently been raised 2 feet. Construction has raised some of the perimeter dikes to EL 452 in this area to provide for additional fines storage; however, the north side of the pond has not been raised and there is only an 18" freeboard in this area. A portion of the pond in the northeast corner has been diked off to form a storage cell. Future plans are to sluice fines into this area initially and allow sluice water to overflow through pipes into the fines pond.

A dike was constructed around the cemetery to the north of this area to protect it from pond water. These dikes had an excellent vegetative cover. A dike was also constructed in the northeast corner of this area extending from the southeast corner of the cemetery eastward to the exterior dike for pond # 3. This dike was constructed to preserve the aesthetics of the cemetery so it would not be surrounded by the future fines stack. All dikes in this area were stable and in good condition with a sound vegetative cover. There was an area of sluffing on the western divider dike of the coal fines pond.

Actions on Recommendations of Last Inspection

The plant has continued to monitor the survey controls on the exterior dike slope of ponds 2A and 2B adjacent to the Green River for any indication of slope movement.

Plant personnel have monitored the surface sluff on the interior slope of the east dike of redwater pond #3. The sluff is still present and Fossil Engineering should be notified if the condition changes.

The trees on the interior slope of the redwater #3 dike have not been removed and should be pulled to eliminate their root system.

The vegetative growth around the entrance to the overflow pipes in redwater pond #3 has been removed; however, vegetative growth persists in this area. This vegetation should continue to be removed so as not to inhibit flow into the pipes.

The spillway for the beaver pond in the slag area has been cleared of the debris that was blocking it; however, vegetative growth persists in this area and should be removed if flow is inhibited.

Plant personnel have continued to monitor the seeps along the slag area dike.

The roadway and ditch adjacent to the northeast dike of the Jacobs Creek pond area has not been graded to provide positive drainage. The culvert under the road is still clogged causing water to back up in the ditch.

The sycamore tree above the outlet structure on the Jacobs Creek pond dike has not been removed.

The wave erosion is still present on the southeast dike of the scrubber waste wet pond area. The water head will be reduced on this dike when additional material is added and the rim ditch is extended to this area in the near future.

The riser boards on the spillway structure for the west dredge cell have not been removed and are still installed to the top of the structure.

The erosion ditches of the east dredge cell exterior dike slope have not been repaired.

There has been some riprap placed at the discharge outlet for the east dredge cell; however, erosion is still present under the outlet and water is pooled up under the outlet.

The eroded ditch at the base of the west saddle dike in the medium and coarse coal wash refuse area has not been repaired.

The ditch and road between the railroad and fines pond # 2 has not been graded to improve drainage.

The west dike of the coal wash fines pond #2 has not been seeded to establish a good vegetative cover.

Plant personnel have monitored the spillway discharge and water levels in the stilling basin and fines pond # 3; however, water levels in the pond and stilling basin are at the same levels and the spillway is not discharging.

Plant personnel have monitored the abandoned hoppers west of the cemetery at fines pond #3 to insure that the fill material does not consolidate, especially after heavy rain events.

Recommendations

GENERAL

Plant personnel should continue to periodically mow grass and remove small trees and brush from all dike slopes. Plant personnel should also continue to maintain all dike roads.

Plant personnel should monitor the exterior dike slopes for seepages or wet soft spots or animal burrowing, etc. and notify Fossil Engineering of any changes.

AREA 2A AND 2B

Continue to monitor the survey controls installed on the exterior dike slope of Area 2B pond adjacent to Green River for any indication of slope movement.

REDWATER PONDS

The sluff on the interior slope of the redwater #3 east dike should be monitored by plant personnel and Fossil Engineering should be notified if the condition changes.

The trees on the interior slope of the redwater #3 dike should be removed by pulling to eliminate their root system.

Continue to remove the vegetative growth from the entrance to the horizontal discharge pipes in redwater pond #3 so that flow does not become inhibited.

Repair the leaking pipe which runs along the southern end of redwater pond #1.

SLAG AREA

Continue to monitor the seeps along the dike in the slag area and notify Fossil Engineering immediately of any increased adverse conditions, such as greatly increased seepage, dike movement, etc.

Continue to remove any vegetative growth that may be blocking the spillway from the beaver pond in the slag area. The adjacent dike should be monitored to insure that it is stable and that the area does not remain saturated. A minimum freeboard of 2 feet should be maintained.

The erosion gully at the southwest end of the dike in the slag area should be repaired by filling with earth, compacting, and establishing vegetation or placing riprap in the area to prevent any additional erosion. The runoff should be redirected to the ditch on the other side of the road so water can drain through the existing culvert. Additional riprap should be placed under the outlet of the existing drain pipe.

JACOBS CREEK

Coordinate with Muhlenberg County to grade the road and ditch adjacent to the northeast dike of the Jacobs Creek pond area to provide positive drainage. The ditch shall be located a

minimum of six feet off the toe of dike. Either locate and clean the culvert under the road or install a new one at a lower elevation to drain the water to the other side of the road.

Remove the sycamore tree above the discharge structure on the dike of the Jacobs Creek ash pond. Apply the proper herbicide to kill the root system.

Reattach the floating boom to the skimmer structure in the divider dike of Jacobs Creek ash pond

Regrade the areas of rutting along the Jacobs Creek ash pond dike to provide positive drainage.

Clean the sediment out of the drainage culverts on the west side of Jacobs Creek ash pond so as flow into the pond does not become restricted.

SCRUBBER WASTE POND
Monitor the wave erosion on the southeast dike of the scrubber waste wet pond area. Notify Fossil Engineering if the condition worsens.

WEST DREDGE CELL
Remove the riser boards on the spillway structure for the west dredge cell to a level that is 1 to 2 feet below the water level. Continue to remove the boards as the water level decreases until only four to six boards are remaining.

EAST DREDGE CELL
Fill the erosion ditches on the northeast and southwest corners of the east dredge cell exterior dike slope with compacted earth. The areas should then be lined with a non-woven filter fabric, and covered with riprap with 50% of the stones weighing 100 lb or more.

Place riprap with at least 50% of the stones weighing 100 pounds at the exit of the discharge pipe for the east dredge cell. This should be done before the pond is dredged into again.

MEDIUM AND COARSE COAL WASH REFUSE AREA
Repair the erosion ditch on the saddle dam and other areas of erosion identified in the medium and coarse coal wash refuse area. The areas should be filled with earth, compacted, and seeded to prevent further erosion.

The erosion gully adjacent to the overhead conveyor should be repaired so that the foundation of the conveyor is not undermined. The area should be filled with earth, compacted, and covered with riprap. This area should be monitored to assure that erosion does not persist and Fossil Engineering should be notified of any changes.

COAL FINES POND NO.2

Grade the access road and ditch between the railroad and fines pond # 2 to provide positive drainage. Borrow material may have to be hauled in and compacted to attain positive drainage.

The west dike of the coal wash fines pond #2 should be seeded to establish a good vegetative cover.

COAL FINES POND NO.3

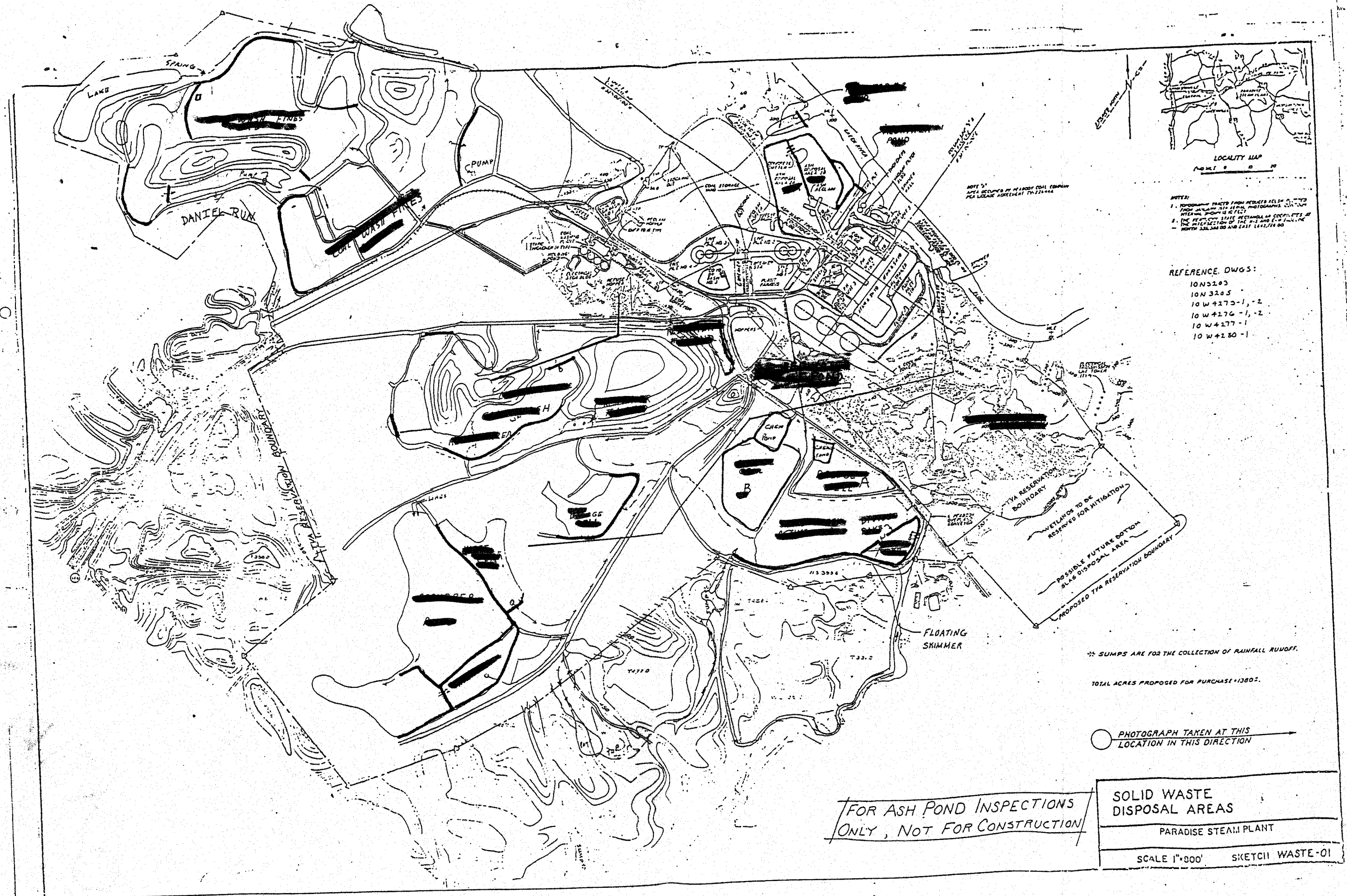
Plant personnel should monitor the spillway from the pond to the stilling basin in fines pond # 3 to insure that it is discharging during periods of heavy rain. If the spillway is not discharging and the pond water level is within 4 feet of the top of the dike, then plant personnel should begin pumping the stilling basin.

The abandoned hoppers west of the cemetery at fines pond # 3 should be monitored to insure that the fill material does not consolidate, especially after heavy rain events. Additional fill material should be placed in any consolidated areas.

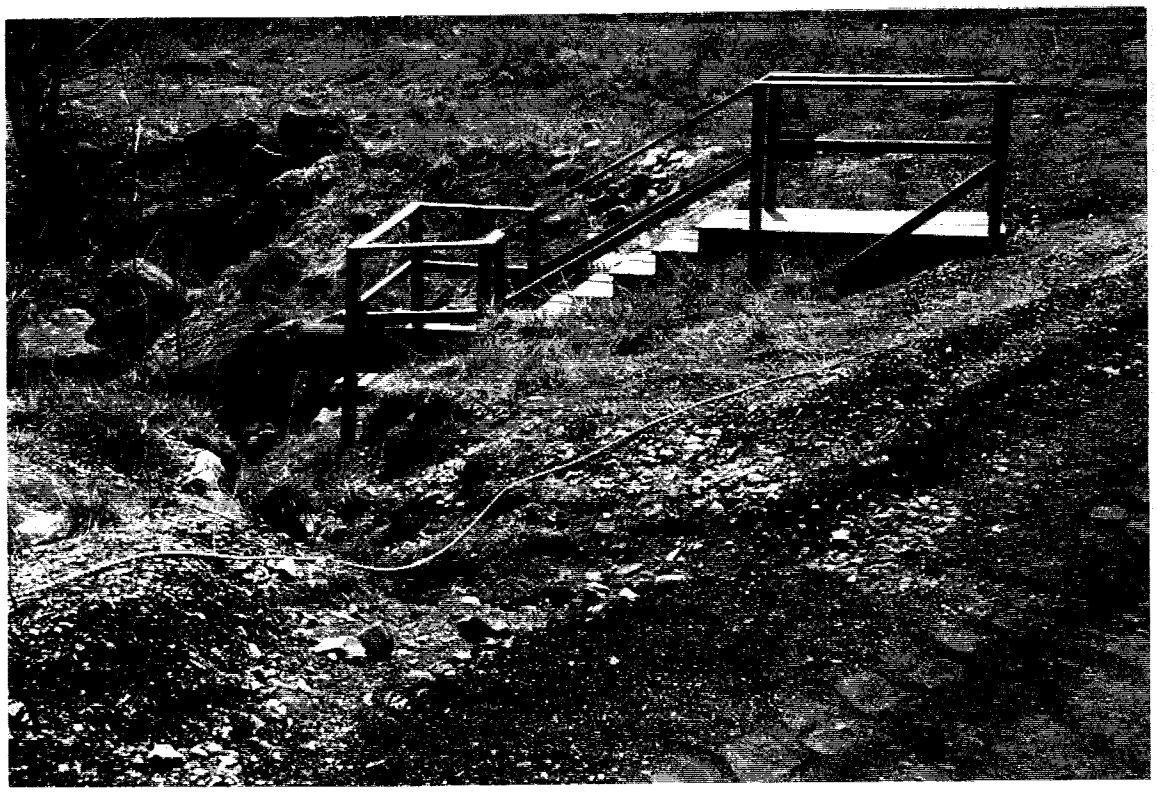
Cherie M Minghini

Cherie M. Minghini
Civil Engineer, Site and Environmental Engineering
LP 2G - C

CMM:cmm


SPRING
LAKE
DANIEL RUN
PUMP
COAL WASH FINES
ASH POND
ASH POND
ASH POND
CREW HOUSE
CREW HOUSE
ASH POND
ASH POND
ASH POND

PICTURE 1- SLIDE ON INTERIOR SLOPE OF REDWATER #3 POND DIKE.



PICTURE 2- EROSION DITCH LOCATED AT END OF SOUTHWEST DIKE OF SLAG AREA

PICTURE 3- LOOKING INTO STILLING POOL FROM DIVIDER DIKE - NOTE FLOATING BOOM HAS BECOME UNATTACHED.

PICTURE 4- CULVERTS DRAINING DITCH TO JACOBS CREEK FLY ASH POND - NOTE SEDIMENT BUILD-UP.

PICTURE 5- EROSION AT ARMORED DITCH AT NORTH END OF EAST DREDGE CELL

PICTURE 6- OUTLET OF EAST DREDGE CELL - NOTE RIPRAP THAT HAS BEEN ERODED.

PICTURE 7- EROSION ON SADDLE DAM OF OLD FINES POND NO. 1

PICTURE 8- EROSION GULLY ADJACENT TO MEDIUM AND COARSE COAL WASH REFUSE CONVEYOR

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Master File

May 12, 1997

H. C. Kolb, Paradise Fossil Plant

PARADISE FOSSIL PLANT (PAF) - ANNUAL INSPECTION OF WASTE DISPOSAL AREAS

Attached is a report prepared by C. M. Minghini dated May 12, 1997, concerning the inspection of the PAF waste disposal areas.

This report includes recommendations for corrective work. I concur with these recommendations.

Ralph G. Johnson
Manager, Fossil Engineering
LP 2G-C

KWB:CMM:SRH
Attachment
cc (Attachment):
J. S. Baugh, LP 5H-C
[redacted], LP 4H-C
RIMS, WR 4Q-C

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TENNESSEE VALLEY AUTHORITY
PARADISE FOSSIL PLANT

ANNUAL INSPECTION OF WASTE DISPOSAL AREAS

Prepared By: Cherie Minghini
Date: May 13, 1997

PARADISE FOSSIL PLANT
ANNUAL INSPECTION OF WASTE DISPOSAL AREAS

INTRODUCTION

An annual inspection of the waste disposal pond dikes and toe areas at PAF to ensure structural stability was conducted April 16 and 17, 1997. This inspection was conducted by Cherie Minghini of Fossil Engineering, and Jim Huber of Fossil Fuels and Ronnie Weathers of Paradise Fossil Plant. The previous stability inspection was conducted on April 9 and 10, 1995.

Slag Areas 2A, 2B, and Stilling Pond

Boiler slag is sluiced into the south end of pond 2A and is reclaimed approximately once a day by Reed Minerals as part of a TVA marketing strategy. The sluice water flows into pond 2B through pipes and then flows around a series of baffles which allow for a longer settling time. The sluice water then exits into the stilling pool to the east through a concrete flume. The concrete flume appeared to be in good condition and water was flowing freely into the stilling pool. From here, three standard spillways discharge the water into the Green River if it is environmentally acceptable. If not, the water is pumped to the Jacobs Creek fly ash pond. Water was discharging from all three outlet pipes at the time of inspection with no evidence of flow restriction. The riprap at the outlet end appeared to be in good condition. The spillways appeared to be in good condition and functioning properly.

The dikes appear to be stable and did not exhibit any notable changes since the last inspection. The interior slopes of the dikes appeared to have a good vegetative cover. The plant continues to monitor the survey controls installed on the exterior dike slope adjacent to the Green River for any indication of movement.

Redwater Ponds (Nos. 1, 2, 3, 4 & 5)

Redwater ponds # 1 and # 2 are located northwest of the powerhouse and adjacent to, but on opposite ends, of ponds 2A and 2B. Redwater pond # 3 is located southwest of the powerhouse along the south access road and redwater pond # 4 is located southeast of the medium and coarse coal wash refuse area. Pond # 5 is located south of the powerhouse and northeast of Pond # 3. Pond # 4 accepts runoff from the medium and coarse refuse area and drains to # 3 via an eight inch pipe into an open riprap channel. An overflow structure drains excess runoff from heavy rainfall events to the Jacobs Creek fly ash pond. Pond # 3 collects additional runoff and discharges to # 1 via a gravity drain with a manual valve. Three horizontal discharge pipes direct excess storage from # 3 to the Jacobs Creek active ash pond during periods of heavy rainfall. Water collected in redwater pond # 1 is pumped into the slag pond 2B. Runoff collected in redwater pond # 2 is pumped to slag pond 2B. Water collected in redwater pond #5 drains to pond #1 via a gravity drain.

The pumps that lift water from redwater pond # 1 to slag pond 2B were working properly. The pump that discharges water from redwater pond # 2 to slag pond 2B was not in operation at the time of inspection. The spillway that discharges water from pond # 3 to pond # 1 was clear and functioning properly. The horizontal discharge pipes from pond #3 were not discharging water to the Jacobs Creek ash pond. Vegetative growth persists around these pipe inlets. The outlet

from pond # 4 was in good condition. The ditch that accepts the outlet water had a good riprap cover. Water was not discharging in the channel at the time of inspection.

The dikes of all four ponds were generally in good condition and appeared stable with an excellent vegetative cover on the exterior slopes. The surface slough identified in the previous ash pond inspection report on the interior slope of the east dike of redwater pond # 3 was still present. The slough did not appear to threaten the structural integrity of the dike. There was also some sloughing observed on the exterior slope at the toe of the east dike. This appears to be caused by the cutting of the toe of dike from stormwater flow in the adjacent ditch. The small trees identified in the previous ash pond inspection report growing on the interior dike slope of redwater pond # 3 are still present. There was an erosion ditch observed on the east dike of redwater pond #2 caused from overflow of the impoundment into Green River after a recent excessive rainfall event. There were also several small trees observed on the interior dikes of redwater pond # 1 and #2.

Slag Area

The slag area is located southeast of the powerhouse. The slag in this area was placed here by the plant and is currently being reclaimed for commercial use by Reed Minerals personnel. The area contains a small surge pond to collect runoff and a larger area, called the beaver pond, which discharges over a spillway and down a riprap channel into Jacobs Creek. The riprap appears to be in good condition. A beaver dam was restricting flow to Jacobs Creek at the spillway at the time of inspection. Plant personnel should monitor this area and clean out any beaver dams to assure that water does not back up and spill over the dike adjacent to the spillway.

The dikes appear to be stable with a good vegetative cover on them. The dike adjacent to the spillway that discharges water from the beaver pond was saturated due to recent heavy rainfall. The redwater seeps identified in earlier reports along the southwest dike in this area are still present. Some continue to have growing deposits of material. Plant personnel monitor these areas frequently. The erosion gully observed on the previous inspection located at the end of the southwest dike just north of an existing drain pipe has worsened. Runoff should be redirected to the ditch on the other side of the road so the water can drain through the existing culvert. The eroded area should also be repaired with riprap. The existing culvert had debris blocking the inlet. The debris should be cleaned out so that flow can exit through the ditch.

Jacobs Creek Fly Ash Pond Area

This area is located south of the powerhouse. Fly ash is sluiced into the northern portion of the pond. At the time of inspection, the outlets of the sluice lines were still operating in a submerged condition. The water then flows through the pond to the southern end of this region and through a divider dike floating boom skimmer structure and into the stilling pond before being discharged into Jacobs Creek via three standard spillways. There was some floating ash present in the northeast corner of the stilling pool at the time of inspection. The standard spillways were in good condition. The outlet pipes were clear of obstruction and discharging normally.

The dikes appear to be stable and did not exhibit any notable changes in the exterior dikes since the last inspection. The divider dike had an excellent cover of riprap on the slopes and was in good condition. The interior slopes of the divider dike had recently been bushhogged to eliminate brush on the slope. There was a rutted area on top of the dike at the northeast end of the stilling pool. These areas hold standing water and should be regraded to allow runoff to drain off the dike. There was also a large rutted area on the east end of the dike between Dredge Cell A and the ash pond due to excessive rainfall and overtopping of the dike. The sloughing area noted in the previous ash pond inspection on the south dike just west of the divider dike was still present. Several areas of minor erosion were noted along the south dike. Eroded areas that have formed gullies from stormwater runoff should be filled with riprap to avoid any further erosion. There were several surface sloughing failures observed along the south dike due to removal of material at the toe of the dike. These areas will worsen as the toe of the dike is further encroached. Two of four drainage culverts located on the west side of the pond were discharging to the pond. The two discharging culverts noted in the previous ash pond inspection report have been cleared of the sediment which was restricting flow to the ash pond. The sycamore tree identified in previous reports that is growing in the dike above the discharge structure was still present. The root system of this tree can cause damage to the outlet pipes. There was beaver activity observed in the chemical pond north of Dredge Cell B.

Scrubber Waste Wet Ponding Area

This area is located in the southwest corner of the TVA reservation. Scrubber waste is sluiced into the northern end of this region. The area has been converted to stack the waste via the rim ditch method. The divider dike north of the stilling pool has been raised and was being graded at the time of inspection. The area will be seeded and mulched to establish a vegetative cover. The interior separator dike for the rim ditch has been constructed. A separator dike has been constructed parallel to the northeastern exterior dike and the dike north of the stilling pool. Scrubber waste was being sluiced into the ditch formed by these two dikes. A sluice ditch has also been constructed along the northwestern edge of this area.

The standard spillway was operating and in good condition. The discharge pipes from the pond to the stilling pool were in good condition and were discharging water. The outlet was in good condition. Water was flowing freely from the pipe and being discharged via a ditch to the Jacobs Creek fly ash pond.

The exterior dikes in this area appear stable and did not exhibit any notable changes since the previous inspection. There was a rutted area holding water observed on the top of the stilling pool dike in the southeastern area. The slopes were in good condition with a good vegetative cover. The tops of dike had a good crushed stone surface.

West Dredge Cell

This area, located just east of the scrubber wet ponding area, was constructed to accept dredged fly ash from the Jacobs Creek pond area. No material had been dredged into this cell at the time of the inspection.

The dikes appear stable and did not exhibit any notable changes since the last inspection. All exterior slopes have an excellent vegetative cover. There was some erosion observed on the dike slope due to rainfall runoff on the southeast end of the pond. There was also an erosion gully observed on the southwest end of the pond at the outlet of a pipe placed by plant personnel which drains the perimeter ditch of the scrubber pond into the west dredge cell.

Plant personnel had installed a valve, at Fossil Engineering's request and in accordance with design drawings, on the outlet pipe for the underdrain system for this cell. This valve is used to drain the cell only during recovery operations. The valve was closed at the time of inspection. This is the only outlet for water in this cell because riser boards are installed all the way to the top of the splashboard riser spillway structure making it inoperable. Runoff water is now collecting in the cell.

East Dredge Cell

This area is located just south of the medium and coarse coal wash refuse area. This cell was also constructed to accept dredged fly ash from the Jacobs Creek ash pond area. The plant has ceased any dredging into the pond at this time. The dredged ash has been seeded and vegetation is establishing itself over the area

The dikes in this area appear to be stable. The tops of dikes are covered with bottom ash and vegetation is establishing itself over them. Removal of vegetation is not warranted at this time. An erosion ditch was identified beside the armored ditch at the northeast corner of the dike in the last inspection. This erosion area, caused by runoff which has bypassed the armored ditch, is still present. An erosion ditch was also found at the southeast corner of the exterior dike. This appears to be caused by heavy sheet flow which concentrates to form the erosion gullies. The geotextile fabric that was placed to protect the ditch had been washed away by the erosive action of the water. The ditch was in good condition near the top of the slope due to placement of riprap on top of the geotextile. The berm ditch was not draining properly near the middle portion of the eastern dike. This did not affect the structural integrity of the dike.

The spillway was in good condition and was operating properly. The outlet pipe was clear of obstructions and was discharging. As mentioned in the previous report, the water at the outlet has eroded the riprap and has begun to form a pool, which has become fairly deep, at the exit of the pipe.

Medium and Coarse Coal Wash Refuse Area

The majority of this refuse has previously been transported by the BC-R3 conveyor belt, which was extended by Modification Services Currently, most of the material is transported from the silo to the stack. Heavy equipment transports the refuse to the northern portion of this region to be stacked in the final stacking configuration. The southeastern portion of this area has been graded and covered with a combination of soil from the redwater # 3 clean-out and scrubber material recovered from the scrubber wet ponding area. Runoff from the south side is collected in the original fines pond and discharged by drainage ditches and diverted to redwater pond # 3. The outlet that discharges water from the pond in the southern portion of this area was functioning well. Water was being discharged through a twelve inch pipe to a riprapped ditch where it was routed to redwater pond #4.

Vegetative growth is established in the southeastern portion of the area. There appears to be a good cover; however, some bare areas need to be reseeded to establish a lush vegetative cover. The erosion ditch on the saddle dam that was identified in the last report was still present. There were several other areas of erosion ditches identified along the southwest dike. There are also erosion gullies on the northwest end of the refuse area. There was a large erosion ditch on the eastern end of the area which has formed and bypasses the formed ditch to redwater pond #4. A large erosion gully observed during the previous inspection on the north end of the refuse area adjacent to the overhead medium and coarse coal wash refuse conveyor was still present and appears to have worsened.

Coal Wash Fines Pond No. 2

This disposal area, located west of the powerhouse, was completed in the late fall of 1987. The perimeter dike at the west end of this area was constructed by Modification Services as designed by Fossil Engineering. The top of the original dike was at elevation 455 feet. The plant raised the dike to approximately elevation 465 feet in 1990, and subsequently sluiced fines to this elevation. This area has not been active as a sluicing operation since fines pond #3 began in October 1992. Runoff water flows through a spillway structure into the stilling pool. Water in the stilling pool is pumped back to the coal wash plant for use in operations.

All of the dikes in this area appeared stable and in good condition. There was, however, a rut in the road observed on the south end of the stilling pool. The dikes appear to have a good vegetative cover; however, the west dike of this area has sparse vegetation.

Coal Wash Fines Pond # 3

Fines pond # 3 is located northwest of fines pond # 2. It was completed in October 1992 and all sluicing was diverted from fines pond #2 to this area. Fines are sluiced into the eastern end of area and the water flows to the west. An overflow discharge structure removes the water to a second pond before discharging through a standard spillway into a stilling basin. The basin does not have a discharge point, but water is pumped with a portable pump, into fines pond #2 when the water surface elevation in the basin rises. The pump was in operation at the time of inspection. The spillway in the pond was not discharging due to the fact that the water levels in

the pond and the stilling basin were equalized. Construction has raised all of the perimeter dikes to EL 452 in this area to provide for additional fines storage. The overflow discharge structure has been raised four feet after the perimeter dikes were raised. There is now approximately 6-8' available freeboard. A portion of the pond in the northeast corner has been diked off to form a storage cell. Fines had previously been sluiced into this area which is partially full. There was no sluice water flowing into the storage cell at the time of inspection. Future plans are to continue sluicing fines into this area in an effort to fill the cell completely.

A dike was constructed around the cemetery to the north of this area to protect it from pond water. A dike was also constructed in the northeast corner of this area extending from the southeast corner of the cemetery eastward to the exterior dike for pond # 3. This dike was constructed to preserve the aesthetics of the cemetery so it would not be surrounded by the future fines stack. All dikes in this area appear to be stable and in good condition. The dike on the north side has recently been raised and seeded and mulched. These areas should be reseeded and fertilized to establish a good vegetative cover on the dike slopes. There was a good crushed stone surface on all dike roads. There was some erosion observed on the interior dike due to wave action evident in the western portion of the area. Daniel Run water level was high at the time of the inspection. This is partially due to the several areas of blockages in the creek due to beaver dams, trees cut down by beavers, and sediment build-up. The creek should be cleaned out during the summer when the water level is low to assure that the adjacent dike does not become overtopped with water after a heavy rainfall.

Actions on Recommendations of Last Inspection

GENERAL
Plant personnel have continued to periodically mow grass and remove small trees and brush from all dike slopes. Plant personnel have continued to maintain all dike roads.

Plant personnel have monitored the exterior dike slopes for seepages or wet soft spots or animal burrowing, etc. and notify Fossil Engineering of any changes.

AREA 2A AND 2B
Plant personnel have monitored the survey controls installed on the exterior dike slope of Area 2B pond adjacent to Green River for any indication of slope movement.

REDWATER PONDS
The slough on the interior slope of the redwater #3 east dike has been monitored by plant personnel.

The trees on the interior slope of the redwater #3 dike have not been removed.

Plant personnel have continued to remove the vegetative growth from the entrance to the horizontal discharge pipes in redwater pond #3; however, vegetative growth persists in the area.

Plant personnel have repaired the leaking pipe which runs along the southern end of redwater pond #1.

SLAG AREA
Plant personnel have continued to monitor the seeps along the dike in the slag area and notify Fossil Engineering immediately of any increased adverse conditions, such as greatly increased seepage, dike movement, etc.

Plant personnel has continued to remove any vegetative growth that may be blocking the spillway from the beaver pond in the slag area; however, a beaver dam was blocking the spillway at the time of the inspection.

The erosion gully at the southwest end of the dike in the slag area has not been repaired. The area should be repaired by filling with earth, compacting, and establishing vegetation or placing riprap in the area to prevent any additional erosion. The runoff should be redirected to the ditch on the other side of the road so water can drain through the existing culvert. Additional riprap should be placed under the outlet of the existing drain pipe.

JACOBS CREEK
Plant personnel have coordinated with Muhlenberg County to grade the road and ditch adjacent to the northeast dike of the Jacobs Creek pond area to provide positive drainage.

Plant personnel have not removed the sycamore tree above the discharge structure on the dike of the Jacobs Creek ash pond. Apply the proper herbicide to kill the root system.

Plant personnel have reattached the floating boom to the skimmer structure in the divider dike of Jacobs Creek ash pond

The areas of rutting along the Jacobs Creek ash pond dike have been graded to provide positive drainage.

Plant personnel have cleaned the sediment out of the drainage culverts on the west side of Jacobs Creek ash pond so as flow into the pond does not become restricted.

SCRUBBER WASTE POND
Plant personnel have monitored the wave erosion on the southeast dike of the scrubber waste wet pond area.

WEST DREDGE CELL
Plant personnel have not removed the riser boards on the spillway structure for the west dredge cell to a level that is 1 to 2 feet below the water level.

EAST DREDGE CELL
Plant personnel have not filled the erosion ditches on the northeast and southwest corners of the east dredge cell exterior dike slope with compacted earth.

Plant personnel have not placed riprap at the exit of the discharge pipe for the east dredge cell.

MEDIUM AND COARSE COAL WASH REFUSE AREA
Plant personnel have not repaired the erosion ditch on the saddle dam and other areas of erosion identified in the medium and coarse coal wash refuse area.

Plant personnel have not repaired the erosion gully adjacent to the overhead conveyor.

COAL FINES POND NO.2
Plant personnel have graded the access road and ditch between the railroad and fines pond # 2 to provide positive drainage.

Plant personnel have not seeded the west dike of the coal wash fines pond #2.

COAL FINES POND NO.3
Plant personnel have monitored the spillway from the pond to the stilling basin in fines pond # 3 to insure that it is discharging during periods of heavy rain.

Plant personnel have monitored the abandoned hoppers west of the cemetery at fines pond # 3 to insure that the fill material does not consolidate, especially after heavy rain events.

Recommendations

GENERAL
Plant personnel should continue to periodically mow grass and remove small trees and brush from all dike slopes. Plant personnel should also continue to maintain all dike roads.

Plant personnel should monitor the exterior dike slopes for seepages or wet soft spots or animal burrowing, etc. and notify Fossil Engineering of any changes.

AREA 2A AND 2B
Continue to monitor the survey controls installed on the exterior dike slope of Area 2B pond adjacent to Green River for any indication of slope movement.

REDWATER PONDS
The slough on the interior slope of the RW #3 east dike should be monitored by plant personnel and Fossil Engineering should be notified if the condition changes.

The trees on the interior slopes of the redwater pond dikes should be removed by pulling to eliminate their root system.

Continue to remove the vegetative growth from the entrance to the horizontal discharge pipes in RW #3 so that flow does not become inhibited.

Plant personnel should repair the erosion ditch on the east dike of RW #2 by filling with riprap.

SLAG AREA
Continue to monitor the seeps along the dike in the slag area and notify Fossil Engineering of any increased adverse conditions, such as greatly increased seepage, dike movement, etc.

Continue to remove any vegetative growth and/or beaver dams that may be blocking the spillway from the beaver pond. The adjacent dike should be monitored to insure that it is stable and that the area does not remain saturated. A minimum freeboard of 2 feet should be maintained.

The erosion gully at the southwest end of the dike in the slag area should be repaired by placing riprap in the area to prevent any additional erosion. The runoff should be redirected to the ditch on the other side of the road so water can drain through the existing culvert. Additional riprap should be placed under the outlet of the existing drain pipe.

Plant personnel should clean the debris from the inlet of the existing culvert.

JACOBS CREEK
Remove the sycamore tree above the discharge structure on the dike of the Jacobs Creek ash pond. Apply the proper herbicide to kill the root system.

Regrade the areas of rutting along the Jacobs Creek ash pond dikes to provide positive drainage.

Plant personnel should monitor the south dike to assure that the toe of dike is not further encroached upon. The surface sloughing failures should be monitored and Fossil Engineering should be notified if the condition worsens.

SCRUBBER WASTE POND
Monitor the wave erosion on the southeast dike of the scrubber waste wet pond area. Notify Fossil Engineering if the condition worsens.

Plant personnel should fill the rutted area on the stilling pool dike with earth and grade to insure that water does not stand on the dike.

WEST DREDGE CELL
The erosion ditches should be repaired by placing riprap in the eroded areas.

EAST DREDGE CELL
Fill the erosion ditches on the northeast and southwest corners of the east dredge cell exterior dike slope with compacted earth. The areas should then be lined with a non-woven filter fabric, and covered with riprap with 50% of the stones weighing 100 lb. or more.

Place riprap with at least 50% of the stones weighing 100 lb. at the exit of the discharge pipe.

MEDIUM AND COARSE COAL WASH REFUSE AREA
Repair the erosion ditch on the saddle dam and other areas of erosion identified in the refuse area. The areas should be filled with earth, compacted, and seeded to prevent further erosion.

Repair the erosion gully adjacent to the overhead conveyor so that the foundation of the conveyor is not undermined. The erosion ditch on the east end of the area should also be repaired. These areas should be filled with earth, compacted, and covered with riprap. Monitor the areas to ensure that erosion does not persist and notify Fossil Engineering of any changes.

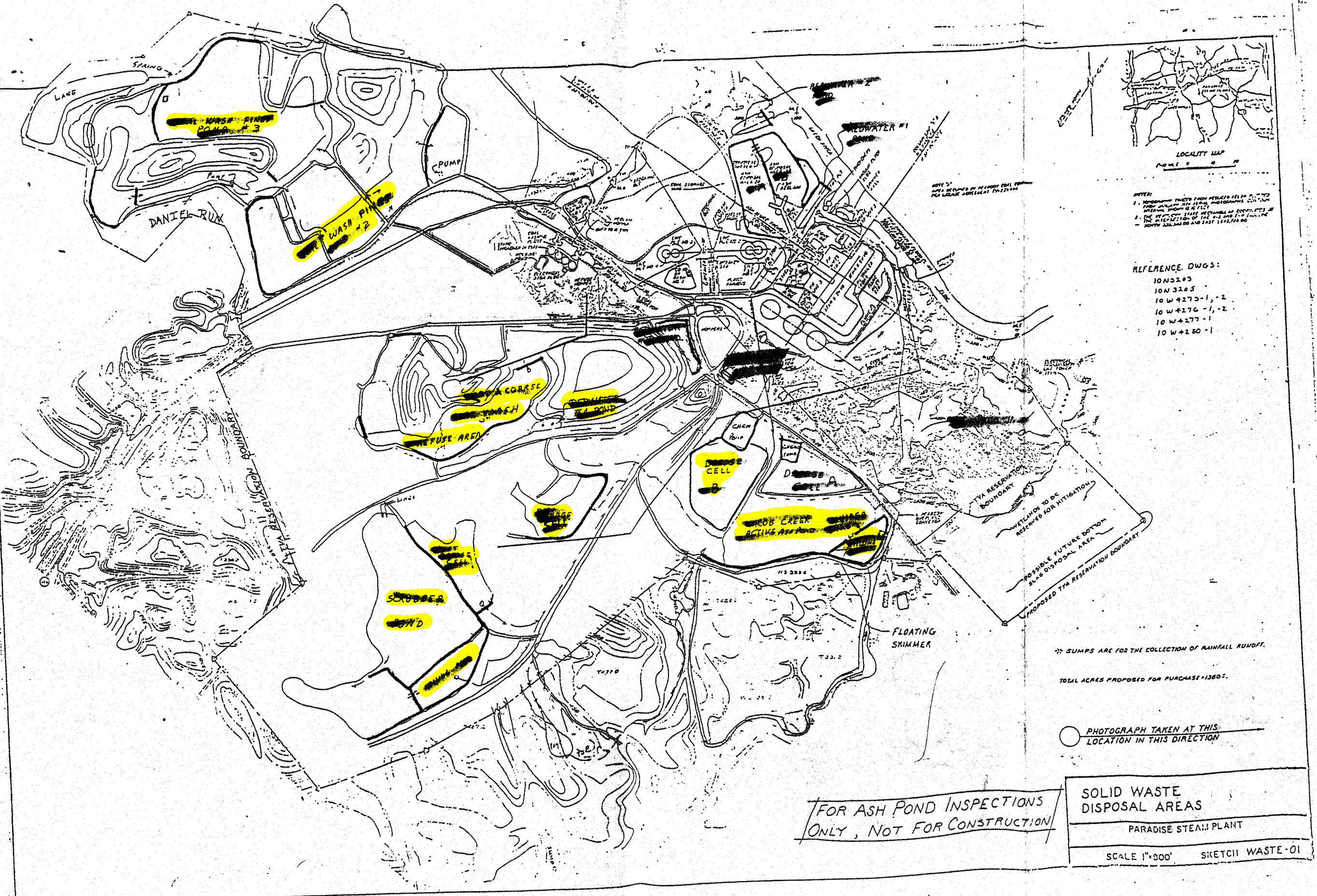
COAL FINES POND NO. 2
The west dike of the coal fines pond #2 should be seeded to establish a good vegetative cover.

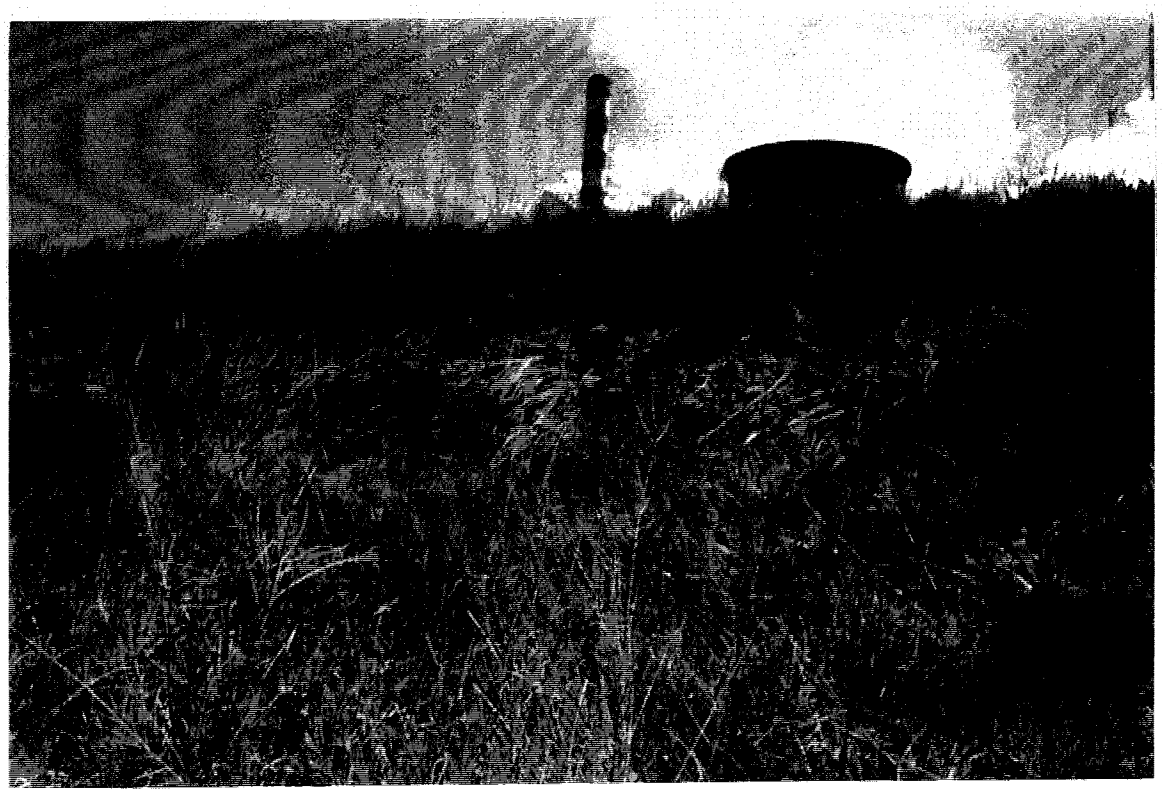
Plant personnel should regrade the rutted area on the south end of the stilling pool to provide positive drainage.

COAL FINES POND NO. 3
The abandoned hoppers west of the cemetery at fines pond # 3 should be monitored to insure that the fill material does not consolidate, especially after heavy rain events. Additional fill material should be placed in any consolidated areas.

The wave eroded areas on the western end of the pond should be repaired by placing riprap on the slopes. The area should be monitored to insure that erosion does not persist and Fossil Engineering should be notified of any changes.

The north dike slopes should be reseeded and fertilized to establish a good vegetative cover.

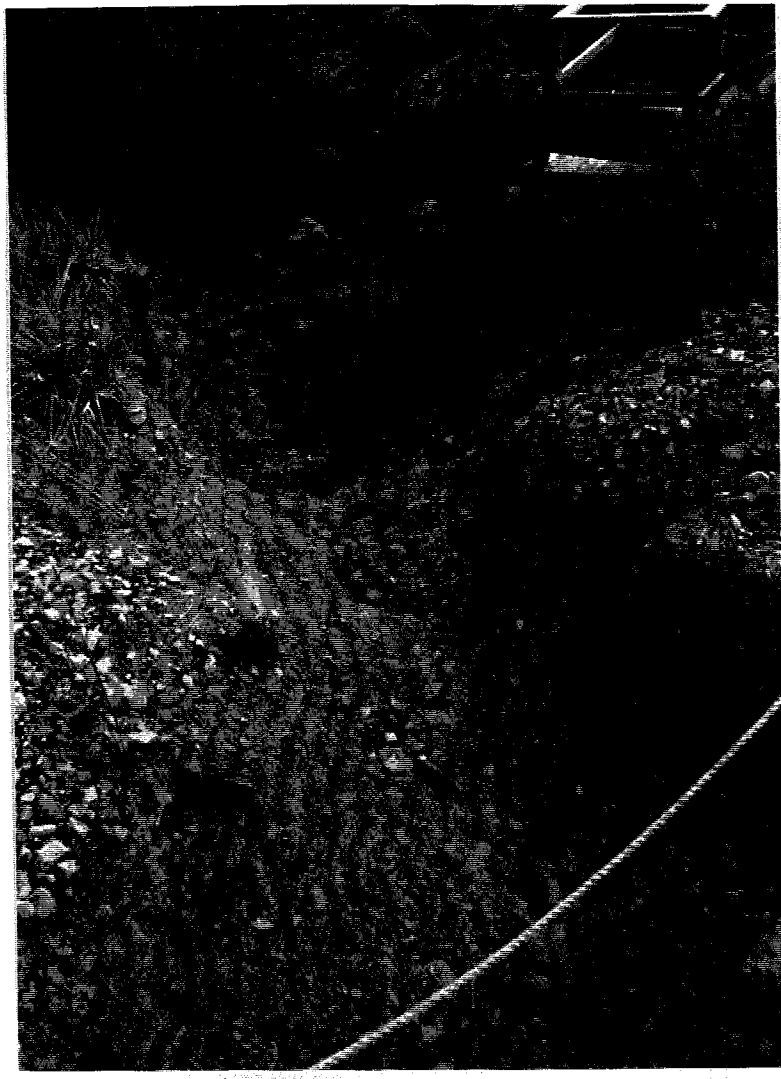

SPRING
LAKE
DANIEL RUN
PUMP
CHEMICAL TANKS
COAL STORAGE
FLOATING SKIMMER
TVA RESERVATION BOUNDARY
WETLANDS TO BE RESERVED FOR MITIGATION
POSSIBLE FUTURE BOTTOM ASH DISPOSAL AREA
PROPOSED TVA RESERVATION BOUNDARY
LOCALITY MAP
REFERENCE DWGS:
10N3203
10N3205
10W4273-1, -2
10W4276-1, -2
10W4277-1
10W4280-1
* SUMPS ARE FOR THE COLLECTION OF RAINFALL RUNOFF.
TOTAL ACRES PROPOSED FOR PURCHASE = 1380±.
PHOTOGRAPH TAKEN AT THIS LOCATION IN THIS DIRECTION
FOR ASH POND INSPECTIONS ONLY, NOT FOR CONSTRUCTION
SOLID WASTE DISPOSAL AREAS
PARADISE STEAM PLANT
SCALE 1"=800'
SKETCH WASTE-01

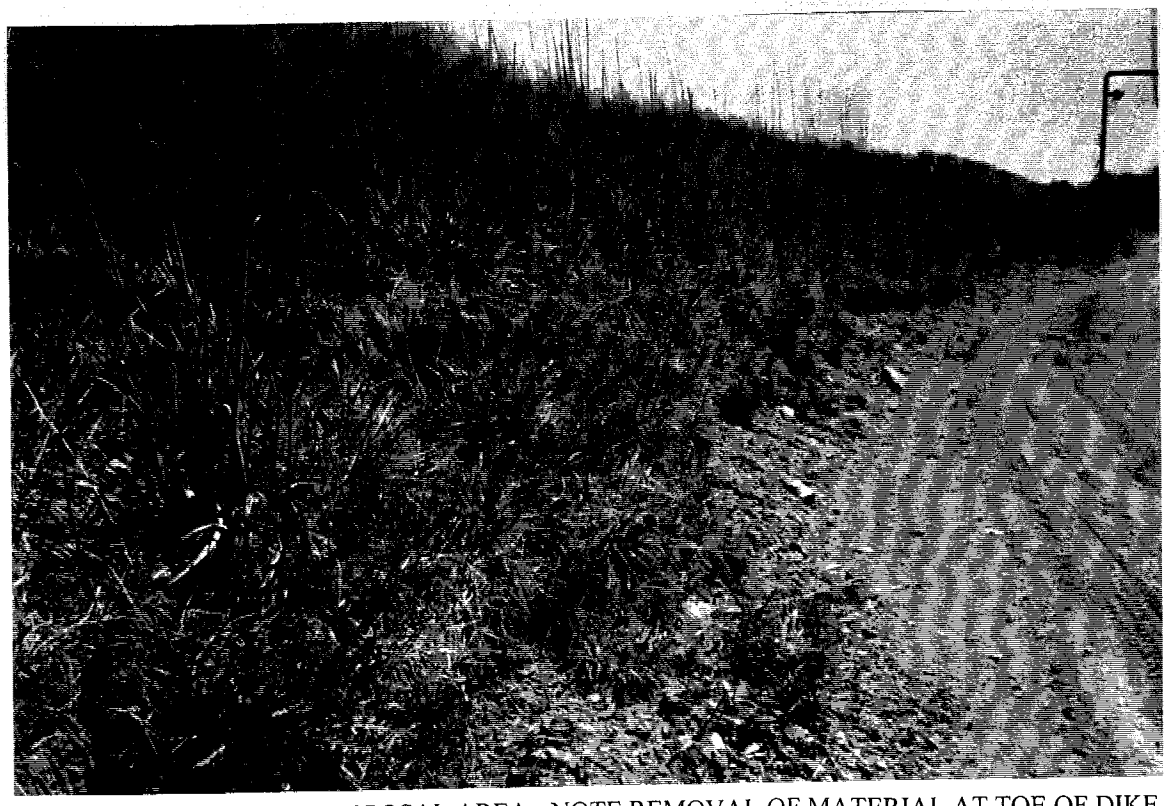


SLIDE ON INTERIOR SLOPE OF REDWATER POND #3 DIKE

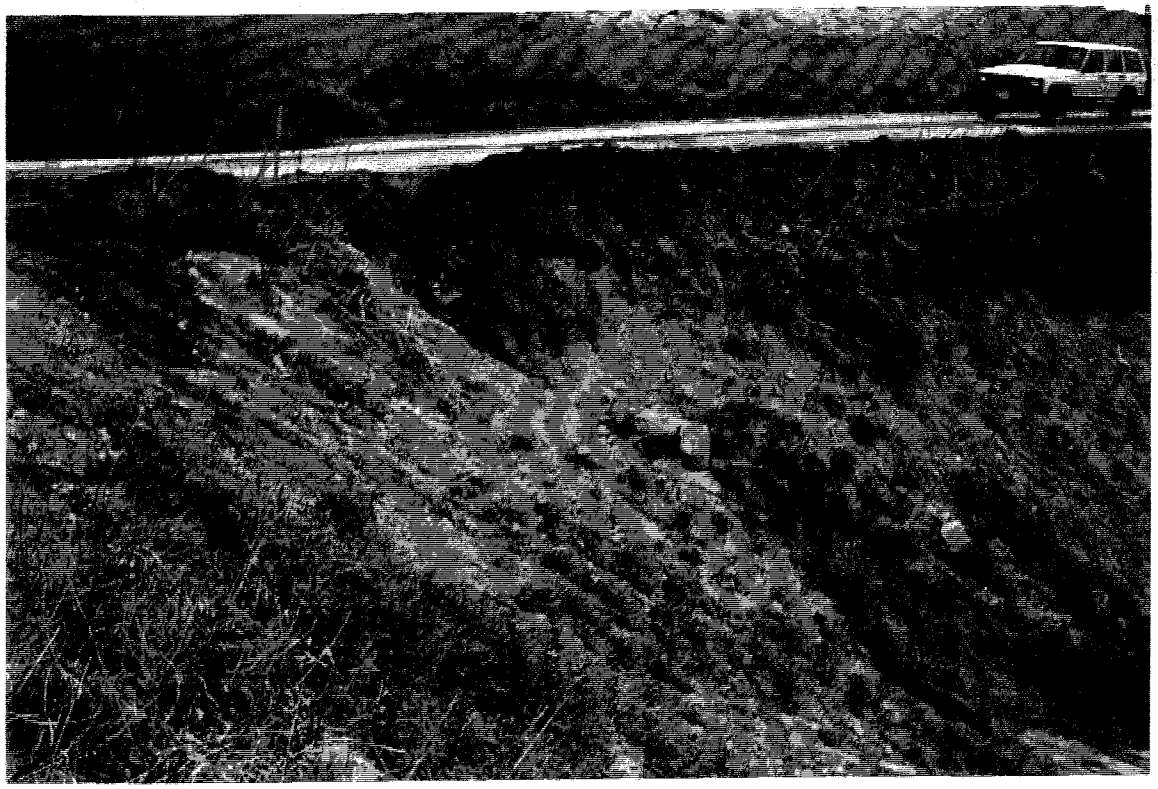
SLAG AREA - BEAVER DAM AT SPILLWAY

SLAG AREA - EROSION DITCH
AT END OF SOUTHWEST DIKE





JACOBS CREEK ASH DISPOSAL AREA - NOTE REMOVAL OF MATERIAL AT TOE OF DIKE



WEST DREDGE CELL - NOTE EROSION AT OUTLET PIPE FROM SCRUBBER POND DITCH

EAST DREDGE CELL-
NOTE EROSION AT OUTLET

FINES POND #3 - RAISED PERIMETER DIKE SEEDED AND MULCHED

FINES POND #3 -
NOTE WAVE EROSION

B65 980507 251

Master File

May 7, 1998

H. C. Kolb, PAF 1A-DRK

PARADISE FOSSIL PLANT (PAF) - ANNUAL INSPECTION OF WASTE DISPOSAL AREAS

The subject inspection was completed by representatives of Fossil Engineering, Fossil Fuels, and plant personnel. The observations from the inspection and recommendations for corrective work are in the attached report.

If you have any questions or need assistance, please contact Cherie Minghini at Chattanooga extension 6375.

RG Johnson

Ralph G. Johnson
Manager, Fossil Engineering
LP 2G-C

KWB:CMM:SRH
Attachment
cc (Attachment):
W. D. Hall, LP 1H-C
G. R. Macdonald, LP 5H-C
EDMS, WR 4Q-C

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PARADISE FOSSIL PLANT

ANNUAL INSPECTION OF WASTE DISPOSAL AREAS

Prepared By: Cherie Minghini
Date: May 6, 1998

PARADISE FOSSIL PLANT
ANNUAL INSPECTION OF WASTE DISPOSAL AREAS

INTRODUCTION

An annual inspection of the waste disposal pond dikes and toe areas at PAF to ensure structural stability was conducted April 8 and 9, 1998. This inspection was conducted by Cherie Minghini of Fossil Engineering. She was accompanied by Jim Huber of Fossil Fuels and Jimmy Ramage of Paradise Fossil Plant. The previous stability inspection was conducted on April 16 and 17, 1997.

Slag Areas 2A, 2B, and Stilling Pond

Boiler slag is sluiced into the south end of pond 2A and is reclaimed approximately once a day by Reed Minerals as part of a TVA marketing strategy. The sluice water flows into pond 2B through pipes and then flows around a series of baffles which allow for a longer settling time. The sluice water then exits into the stilling pool to the east through a concrete flume. Due to unit outages at the time of inspection, water was low in these areas. The concrete flume appeared to be in good condition. A shallow amount of water was flowing freely into the stilling pool. From here, three standard spillways discharge the water into the Green River if it is environmentally acceptable. If not, the water is pumped to the Jacobs Creek fly ash pond. Water was not discharging from the three outlet pipes at the time of inspection due to the low water level in the stilling pool. Water was being pumped back to Jacobs Creek fly ash pond. The riprap at the outlet end of the spillway discharge pipes appeared to be in good condition.

The dikes appear to be stable and did not exhibit any notable changes since the last inspection. However, there was a sluff observed on the north dike of Area 2B. The interior slopes of the dikes appeared to have a good vegetative cover. There was an access stairway built over the outlet end of the pipes into Area 2B. The plant continues to monitor the survey controls installed on the exterior dike slope adjacent to the Green River for any indication of movement.

Redwater Ponds (Nos. 1, 2, 3, 4 & 5)

Redwater ponds # 1 and # 2 are located northwest of the powerhouse and adjacent to, but on opposite ends, of ponds 2A and 2B. Redwater pond # 3 is located southwest of the powerhouse along the south access road and redwater pond # 4 is located southeast of the medium and coarse coal wash refuse area. Pond # 5 is located south of the powerhouse and northeast of Pond # 3. Pond # 4 accepts runoff from the medium and coarse refuse area and drains to # 3 via an eight inch pipe into an open riprap channel. An overflow structure drains excess runoff from heavy rainfall events to the Jacobs Creek fly ash pond. Pond # 3 collects additional runoff and discharges to # 1 via a gravity drain with a manual valve. Three horizontal discharge pipes direct excess storage from # 3 to the Jacobs Creek active ash pond during periods of heavy rainfall. Water collected in redwater pond # 1 is pumped into the slag pond 2B. Runoff collected in redwater pond # 2 is pumped to slag pond 2B. Water collected in redwater pond #5 drains to pond #1 via a gravity drain.

The pumps that lift water from redwater pond # 1 to slag pond 2B were working properly. The pump that discharges water from redwater pond # 2 to slag pond 2B was not in operation at the

time of inspection. The spillway that discharges water from pond # 3 to pond # 1 was clear and functioning properly. The horizontal discharge pipes from pond #3 were not discharging water to the Jacobs Creek ash pond. Vegetative growth persists around these pipe inlets. The overflow structure in Pond #4 was not discharging at the time of inspection. The outlet from pond # 4 was in good condition. The ditch that accepts the outlet water to redwater pond #3 had a good riprap cover; however, there was some sluffing areas observed where high water flow has eroded the slope of the ditch. Water was discharging in the channel at the time of inspection.

The dikes of all five ponds were generally in good condition and appeared stable with an excellent vegetative cover on the exterior slopes. The surface sluff identified in the previous ash pond inspection report on the interior slope of the east dike of redwater pond # 3 was still present. The sluff did not appear to threaten the structural integrity of the dike. There was also some sluffing observed on the exterior slope at the toe of the east dike. This appears to be caused by the cutting of the toe of dike from stormwater flow in the adjacent ditch. Water was flowing in the ditch at the time of inspection. The catch basin located in the southeast corner of the ditch was blocked with debris. The debris should be removed so as not to inhibit flow in the ditch. The small trees identified in the previous ash pond inspection report growing on the interior dike slope of redwater pond # 3 are still present. There were also small trees and brush observed on the top of the east dike. Rutted areas were evident along the top of the east dike and were holding water. The ruts appear to be caused by previous heavy equipment travel on the dike. The erosion ditch identified on the east dike of redwater pond #2 in the previous ash pond inspection report was repaired. There were also several small trees observed on the interior dikes of redwater pond # 1 and #2.

Slag Area

The slag area is located southeast of the powerhouse. The slag in this area was placed here by the plant and is currently being reclaimed for commercial use by Reed Minerals personnel. The area contains a small surge pond to collect runoff and a larger area, called the beaver pond, which discharges over a spillway and down a riprap channel into Jacobs Creek. The riprap appears to be in good condition. A beaver dam was restricting flow to Jacobs Creek at the spillway at the time of inspection. Plant personnel frequently monitor this area and clean out any beaver dams to assure that water does not back up and spill over the dike adjacent to the spillway.

The dikes appear to be stable with a good vegetative cover on them. The dike adjacent to the spillway that discharges water from the beaver pond was saturated because of a back up of water due to the beaver dam. The redwater seeps identified in earlier reports along the southwest dike in this area are still present. Some continue to have growing deposits of material. Plant personnel monitor these areas frequently. There was an area of erosion located on the east dike of the beaver pond. Riprap has been placed in this area to control erosion. The erosion gully, observed on previous inspections, located at the end of the southwest dike just north of an existing culvert has worsened. The eroded area has encroached upon the roadway and should be repaired before further encroachment occurs. Runoff has been redirected to the ditch on the other side of the road so the water can drain through the existing culvert. There was flow from the pipe at the time of inspection. The existing culvert had vegetation blocking the inlet, which

inhibited flow through the ditch.

Jacobs Creek Fly Ash Pond Area

This area is located south of the powerhouse. Fly ash is sluiced into the northern portion of the pond. At the time of inspection, the outlets of the sluice lines were still operating in a partially submerged condition. The water then flows through the pond to the southern end of this region. Previously, before the 1997 construction of the Fly Ash Pond Area Extension, water then flowed through a divider dike floating boom skimmer structure and into the stilling pond before being discharged into Jacobs Creek via three standard spillways. Water now flows through a dike breach in the southwest portion of the area and into the new ash disposal area. The skimmers and floating boom in the stilling pool have been removed.

The dikes appear to be stable and did not exhibit any notable changes in the exterior dikes since the last inspection. The divider dike had a satisfactory cover of riprap on the slopes and was in good condition. The sluffing area noted in previous ash pond inspections on the south dike just west of the divider dike was still present. There were several surface sluffing failures observed along the south dike due to removal of material at the toe of the dike. The toe of dike has been encroached upon due to heavy equipment travel on the dike, most of which occurred during the construction of the Fly Ash Pond Area Extension. The depth of cut is 18 inches in areas and the sluffs will worsen as the toe of the dike is further encroached upon. A portion of the toe of dike has been repaired at the northeast end of the stilling pool. Earthfill has been placed at the toe of ditch and compacted to a uniform slope. There was a 75' long sluffing area located on the northeast end of the dike. This was also caused by removal of material at the toe of the dike by the county while regrading the ditch. The drainage culverts located on the west side of the pond were discharging at the time of inspection. There was some vegetation blocking the inlets of the pipes which could restrict flow to the ash pond. There was also some vegetation blocking the outlet of the 42" pipe which drains excess runoff from heavy rainfall events to the ash pond.

The rutted areas identified in the previous ash pond inspection at the northeast end of the stilling pool and between the east end of the dike and Dredge Cell A have been repaired.

Fly Ash Pond Area Extension

This disposal area was put into operation in September 1997. The area is located adjacent to and south of the existing Jacobs Creek Fly Ash Disposal Area. Dikes in the southern and eastern portion of the area were raised from approximate El 400 to El 408. The existing dike of Jacobs Creek Fly Ash Disposal Area was breached at the west end of the pond to allow inflow into the new pond. Water flows through the breach and into a small pond of water in a high area. Flow is directed down a riprap channel into the pond. Water flows to a stilling pool in the northeast portion of the area through a divider dike and floating boom spillway structure at the south end of the stilling pool. Flow is then discharged through three spillway and skimmer structures and through three 36" diameter concrete pipes to Jacobs Creek.

Flow is uniform and non-eroding through the ash pond. Riprap in the breach and channel were

in good condition. There was a log observed in the divider dike flow-through spillway; however, it does not appear that the flow of water was being restricted. The spillway structures appear to be operating properly, although there was a log and some debris caught in the center spillway structure. All three outlets were discharging at the time of inspection. The riprap at the spillway discharge outlets appeared to be in good condition. There is stairway access from the top of dike to the discharge pipes for monitoring purposes.

Dikes were constructed in the southern and eastern portion of the area. The dike slopes have established vegetation; however, the slopes should be reseeded and fertilized this spring to establish a good vegetative cover over the area. The vegetation on the dike breach is also sparse and this area should also be reseeded and fertilized. The tops of dike have an excellent crushed stone surface. All exterior dikes appear to be in good condition with no visible signs of instability. There was a beaver lodge located on the north portion of the area. Plant personnel should monitor the dikes for beaver activity and notice any tunneling into the dikes. Wind and wave erosion is very evident on the interior slopes of the ash pond. Minor surface sluffing was also evident on the eastern side of the stilling pond and in the southeastern portion of the interior ash pond dike. Plant personnel should place riprap on the southern portion of the divider dike adjacent to the ash pond and in the southeastern portion of the ash pond. These areas exhibit major erosion problems.

Scrubber Waste Wet Ponding Area

This area is located in the southwest corner of the TVA reservation. Scrubber waste is sluiced into the northern end of this region and stacked via the rim ditch method. Scrubber waste was being sluiced into the ditch formed by the exterior dike and an interior separator dike. Sluice water had been directed to the western corner of the area to allow the area to fill with scrubber waste. Water is discharged from the scrubber pond to the stilling pool. Water then flows from the stilling pool through a spillway and is discharged via a ditch to the Jacobs Creek fly ash pond.

The discharge pipes from the scrubber pond to the stilling pool were in good condition. There was some erosion noted at the outlet. The standard spillway was in good condition. Two of the floating booms placed in the stilling pool since the last inspection have become unattached and were floating freely in the stilling pool. Two other floating booms had been placed on the bank to avoid obstruction of the spillway and restriction of the discharge flow. There was some erosion observed adjacent to the ditch which flows to Jacobs Creek fly ash pond.

The exterior dikes in this area appear stable and did not exhibit any notable changes since the previous inspection. The slopes were in good condition with a good vegetative cover. However, there were small trees and brush observed on the south dike. Several of the chimney drain outlets on the south dike of the stilling pool were blocked with vegetation. The tops of dike had a good crushed stone surface. There was some wind and wave erosion observed on the southeast end of the stilling pool dike.

West Dredge Cell

This area, located just east of the scrubber wet ponding area, was constructed to accept dredged fly ash from the Jacobs Creek pond area. No material has been dredged into this cell at the time of the inspection.

Plant personnel had installed a valve, at Fossil Engineering's request and in accordance with design drawings, on the outlet pipe for the underdrain system for this cell. This valve is used to drain the cell only during recovery operations. The valve was closed at the time of inspection. This is the only outlet for water in this cell because riser boards are installed all the way to the top of the splashboard riser spillway structure making it inoperable. Runoff water is now collecting in the cell.

The dikes appear stable and did not exhibit any notable changes since the last inspection. All exterior slopes have an excellent vegetative cover. The erosion observed on the dike slope on the previous inspection at the southeast end of the pond was still present. The erosion gully observed on the previous inspection at the southwest end of the pond at the pipe outlet which drains the perimeter ditch of the scrubber pond into the west dredge cell was still present but does not appear to have worsened.

East Dredge Cell

This area is located just south of the medium and coarse coal wash refuse area. This cell was also constructed to accept dredged fly ash from the Jacobs Creek ash pond area. The plant has ceased any dredging into the pond at this time.

The spillway appeared to be in good condition, but was not operating at the time of inspection. The outlet pipe was clear of obstructions. The discharge from the pipe has formed a large eroded hole at the exit.

The dikes in this area appear to be stable. The tops of dike surfaces are in satisfactory condition, although some vegetation has established itself over the area. Removal of vegetation is not warranted at this time. The dredged ash was seeded previous to the last ash pond inspection; however, vegetation is sparse over the area. An erosion ditch was identified beside the armored ditch at the northeast corner of the dike in previous inspections. This erosion area, caused by runoff which has bypassed the armored ditch, is still present. An erosion ditch was also observed at the southeast corner of the exterior dike. This appears to be caused by heavy sheet flow which concentrates to form the erosion gullies. The geotextile fabric that was placed to protect the ditch has been washed away by the erosive action of the water. The ditch was in good condition near the top of the slope due to placement of riprap on top of the geotextile. The berm ditch was not draining properly near the middle portion of the eastern dike due to some rutting on the dike. The east dike is also saturated in areas near the toe of dike.

Medium and Coarse Coal Wash Refuse Area

The majority of this refuse had previously been transported by the BC-R3 conveyor belt, which was extended by Modification Services Currently, all of the material is transported from the silo to the stack. Plant personnel transport the refuse daily to the northern portion of this region to be stacked in the final stacking configuration. It does not appear that the material is being stacked according to the engineering design drawings (steep side slopes, lack of compaction, and limited berms). The southeastern portion of this area has been graded and covered with a combination of soil from the redwater # 3 clean-out and scrubber material recovered from the scrubber wet ponding area. Runoff from the south side is collected in the original fines pond and discharged by drainage ditches and diverted to redwater pond # 3. The outlet that discharges water from the pond in the southern portion of this area was in good condition. Water is discharged through a twelve inch pipe to a riprapped ditch where it is routed to redwater pond #4.

A good vegetative cover is established in the southeastern portion of the area. The erosion ditch on the saddle dam that was identified in previous reports was still present and does not appear to have worsened. The large erosion gully observed during previous inspections on the north end of the refuse area adjacent to the overhead medium and coarse coal wash refuse conveyor was still present but does not appear to have worsened.

The erosion noted on the previous inspection in the northwest end of the area has been repaired by filling with riprap.

Coal Wash Fines Pond No. 2

This disposal area, located west of the powerhouse, was completed in the late fall of 1987. The perimeter dike at the west end of this area was constructed by Modification Services as designed by Fossil Engineering. The top of the original dike was at elevation 455 feet. The plant raised the dike to approximately elevation 465 feet in 1990, and subsequently sluiced fines to this elevation. This area has not been active as a sluicing operation since fines pond #3 began operation in October 1992. Runoff water flows through a spillway structure into the stilling pool. Water in the stilling pool is pumped back to the coal wash plant for use in operations. This is a closed-loop system. A new pump platform has been placed in the stilling pool since the last inspection.

All of the dikes in this area appeared stable and in good condition. The dikes appear to have a good vegetative cover. The west dike of this area has been noted in previous inspections to have sparse vegetation. The vegetative cover of this dike is now improving and establishing itself over the area. Several small pine trees were also observed on the west dike.

Coal Wash Fines Pond # 3

Fines pond # 3 is located northwest of fines pond # 2. It was completed in October 1992 and all sluicing was diverted from fines pond #2 to this area. Fines are sluiced into the eastern end of

area and the water flows to the west. An overflow discharge structure removes the water to a second pond, or temporary stilling basin, before discharging through a standard spillway into a stilling basin. The basin does not have a discharge point, but water is pumped with a portable pump, into fines pond #2 when the water surface elevation in the basin rises. The pump was in operation at the time of inspection. The spillway in the temporary stilling basin to the stilling pond was discharging. There was flow from the discharge pipe to the temporary stilling basin at the time of inspection; however, water was not flowing over the discharge structure in the pond. Therefore, there is an inadequate seal or crack in the structure. At the time of inspection, construction had just begun on raising the dike to El 475 for additional storage capacity. Currently, there is approximately only 1.5 feet available freeboard in places. A portion of the pond in the northeast corner has been diked off to form a storage cell. Fines had previously been sluiced into this area. Plans are to close the area out after the dike raisings are complete to allow runoff to drain back to the pond.

A dike was constructed around the cemetery to the north of this area to protect it from pond water. A dike was also constructed in the northeast corner of this area extending from the southeast corner of the cemetery eastward to the exterior dike for pond # 3. This dike was constructed to preserve the aesthetics of the cemetery so it would not be surrounded by the future fines stack. All dikes in this area appear to be stable and in good condition. Although, many of the pond dikes were lacking vegetative cover and a crushed stone surface due to ongoing dike construction. There was also a lack of vegetative cover on the north portion of the area at the toe of the dike adjacent to the perimeter ditch. Several erosion gullies have formed at the outlets of the dike drains on the north dike. Several beaver dams were noted in Daniels Run. Plant personnel clean the creek out frequently to assure that the adjacent dike does not become overtopped after a heavy rainfall.

The erosion observed on the interior dike in the western portion of the area during the previous inspection has been repaired by adding riprap.

Actions on Recommendations of Last Inspection

GENERAL
Plant personnel have continued to periodically mow grass and remove small trees and brush from all dike slopes. Plant personnel have continued to maintain all dike roads.

Plant personnel have monitored the exterior dike slopes for seepages or wet soft spots or animal burrowing, etc. and notified Fossil Engineering of any changes.

AREA 2A AND 2B
Plant personnel have monitored the survey controls installed on the exterior dike slope of Area 2B pond adjacent to Green River for any indication of slope movement.

REDWATER PONDS
The sluff on the interior slope of the redwater #3 east dike has been monitored by plant personnel.

The trees on the interior slope of the redwater #3 dike have not been removed.

Plant personnel have not removed the vegetative growth from the entrance to the horizontal discharge pipes in redwater pond #3.

Plant personnel have repaired the erosion ditch on the east dike of redwater pond #2 by filling with riprap.

SLAG AREA
Plant personnel have continued to monitor the seeps along the dike in the slag area and notify Fossil Engineering immediately of any increased adverse conditions, such as greatly increased seepage, dike movement, etc.

Plant personnel has continued to remove any vegetative growth that may be blocking the spillway from the beaver pond in the slag area; however, a beaver dam was blocking the spillway at the time of the inspection.

The erosion gully at the southwest end of the dike in the slag area has not been repaired.

Plant personnel have cleaned the debris from the existing catch basin inlet; however, vegetation is growing around the inlet.

JACOBS CREEK
Plant personnel have not removed the tree above the discharge structure on the dike of the Jacobs Creek ash pond.

The areas of rutting along the Jacobs Creek ash pond dike have been graded to provide positive drainage.

Plant personnel have repaired the toe of dike in the southeastern area of the pond by placing earthfill and compacting uniformly. However, the south dike has not been repaired.

SCRUBBER WASTE POND
Plant personnel have monitored the wave erosion on the southeast dike of the scrubber waste wet pond area.

Plant personnel have regraded the rutted area on the stilling pool dike.

WEST DREDGE CELL
The erosion ditches have not been repaired.

EAST DREDGE CELL
Plant personnel have not repaired the erosion ditches on the northeast and southwest corners of the east dredge cell exterior dike slope.

Plant personnel have not placed riprap at the exit of the discharge pipe for the east dredge cell.

MEDIUM AND COARSE COAL WASH REFUSE AREA
Plant personnel have not repaired the erosion ditch on the saddle dam.

Plant personnel have not repaired the erosion gully adjacent to the overhead conveyor.

COAL FINES POND NO.2
Plant personnel have not seeded the west dike of the coal wash fines pond #2; however, vegetation is establishing itself over the area.

Plant personnel have regraded the rutted area at the south end of the stilling pond.

COAL FINES POND NO.3
Plant personnel have monitored the abandoned hoppers west of the cemetery at fines pond # 3 to insure that the fill material does not consolidate, especially after heavy rain events.

Plant personnel have placed riprap on the interior dike at the western end of the temporary stilling basin.

Dike construction has limited the ability to reseed and fertilize the dike slopes. Slopes will be seeded and fertilized at the end of the construction.

Recommendations

GENERAL
Plant personnel should continue to periodically mow grass and remove small trees and brush from all dike slopes. Plant personnel should also continue to maintain all dike roads.

Plant personnel should monitor the exterior dike slopes for seepages or wet soft spots or animal burrowing, etc. and notify Fossil Engineering of any changes.

AREA 2A AND 2B
Continue to monitor the survey controls installed on the exterior dike slope of Area 2B pond adjacent to Green River for any indication of slope movement.

REDWATER PONDS
The sluff on the interior slope of the RW #3 east dike should be monitored by plant personnel and Fossil Engineering should be notified if the condition changes.

The small trees and brush on the interior slopes and tops of dike of the redwater ponds should be removed. Larger trees shall be removed by pulling to eliminate their root system.

Remove the vegetative growth from the entrance to the horizontal discharge pipes in RW #3 so that flow does not become inhibited during periods of heavy rainfall.

Plant personnel should repair the ruts on the top of redwater pond #3 dikes by filling with earthfill and regrading to provide positive drainage.

SLAG AREA
Continue to monitor the seeps along the dike in the slag area and notify Fossil Engineering of any increased adverse conditions, such as greatly increased seepage, dike movement, etc.

Continue to remove any vegetative growth and/or beaver dams that may be blocking the spillway from the beaver pond. The adjacent dike should be monitored to insure that it is stable and that the area does not remain saturated. A minimum freeboard of 2 feet is desirable.

The erosion gully at the southwest end of the dike in the slag area should be repaired by placing riprap in the area to prevent any additional erosion. Bottom ash should be placed and compacted at the edge of roadway to avoid further erosion and encroachment of road. Additional riprap should be placed under the outlet of the existing drain pie.

Plant personnel should clean the vegetation from the inlet of the existing catch basin.

JACOBS CREEK
Remove the tree above the discharge structure on the dike of the Jacobs Creek ash pond. Apply the proper herbicide to kill the root system.

Plant personnel should repair the south dike by replacing the excavated earthfill along the toe of

the dike and compacting to a uniform slope.

The surface sluffing failures on the south dike and the northeast dike should be monitored and Fossil Engineering should be notified if the condition worsens.

The culverts which drain to the pond should be occasionally cleaned out to assure that flow does not become inhibited to the ash pond.

FLY ASH POND AREA EXTENSION
Plant personnel should remove the debris from the divider dike flow-through spillway and in the center spillway structure to assure unrestricted flow through the system.

The dike slopes and dike breach shall be reseeded and fertilized to establish a good vegetative cover.

Plant personnel shall place riprap on the divider dike adjacent to the ash pond and on the interior slopes of the eastern dike immediately. Wind and wave erosion shall be monitored on the interior dikes of the ash pond and riprap shall be placed as needed.

SCRUBBER WASTE POND
Plant personnel should repair the eroded area at the discharge outlet to the stilling pool by placing riprap or a boulder from the borrow area at the outlet.

Plant personnel should reattach the floating booms or remove them from the stilling pool to avoid obstruction at the spillways.

Plant personnel should fill the eroded area adjacent to the ditch with compacted earthfill, line the area with a filter fabric, and cover with riprap.

Plant personnel should remove the vegetation from the chimney drain outlets to assure that water can drain from the dike.

Monitor the wave erosion on the southeast dike of the scrubber waste wet pond area. Notify Fossil Engineering if the condition worsens.

WEST DREDGE CELL
The erosion ditches should be repaired by placing riprap in the eroded areas.

EAST DREDGE CELL
Fill the erosion ditches on the northeast and southwest corners of the east dredge cell exterior dike slope with compacted earth. The areas should then be lined with a filter fabric, and covered with riprap.

Place riprap or a boulder from the borrow area at the exit of the discharge pipe.

MEDIUM AND COARSE COAL WASH REFUSE AREA
Repair the erosion ditch on the saddle dam by filling with earth, compacting, and seeding to prevent further erosion.

Repair the erosion gully adjacent to the overhead conveyor so that the foundation of the conveyor is not undermined. These areas should be filled with earth, compacted, and covered with riprap. Monitor the areas to ensure that erosion does not persist and notify Fossil Engineering of any changes.

Plant personnel should stack refuse according to engineering design drawings (sides slopes, berms, etc.).

COAL FINES POND NO. 2
The small pine trees on the west dike of the coal fines pond #2 should be removed.

COAL FINES POND NO. 3
The existing discharge structure from the fines pond will be plugged after the dikes are raised to El 475. Plant personnel shall ensure that no leakage exists through the abandoned structure.

Plant personnel should place riprap at the dike drain outlets on the north dike to prevent further erosion.

Dike slopes should be seeded and fertilized and crushed stone should be placed on the tops of dikes at completion of dike construction.

Cherie M. Minghini
Site & Environmental Engineering
LP 2G-C

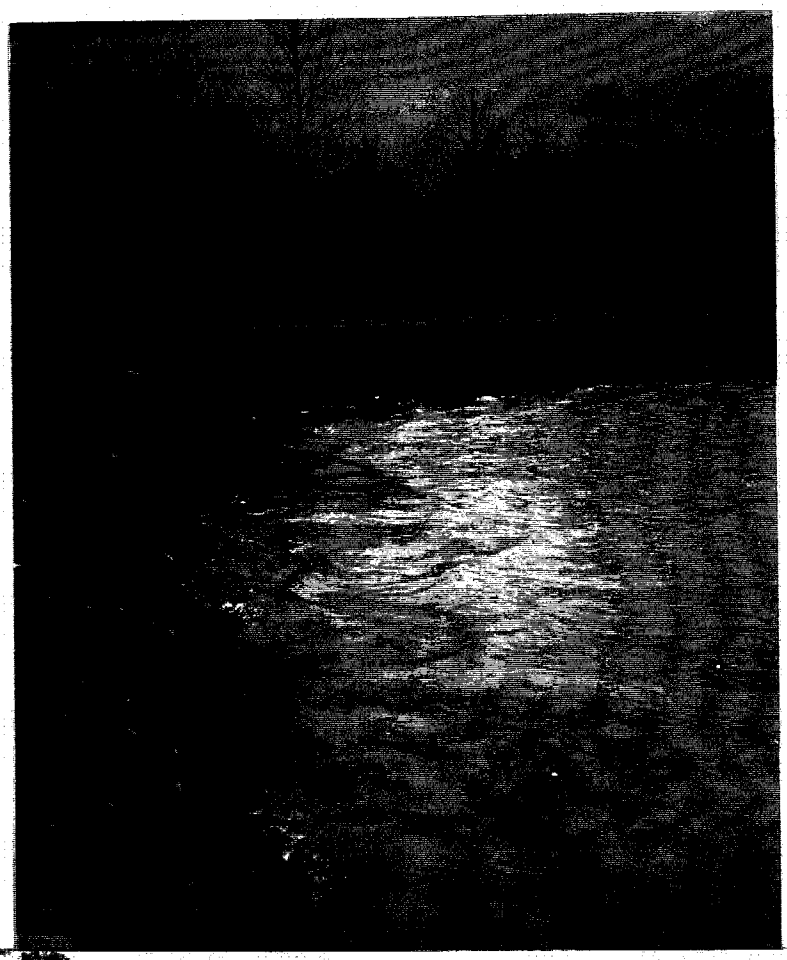
KWB:CMM

**SLAG AREA-
EROSION DITCH
AT END OF
SOUTHWEST DIKE**

**JACOBS CREEK ASH DISPOSAL AREA- REMOVAL OF MATERIAL AT TOE
NOTE REPAIRED AREA IN BACKGROUND**

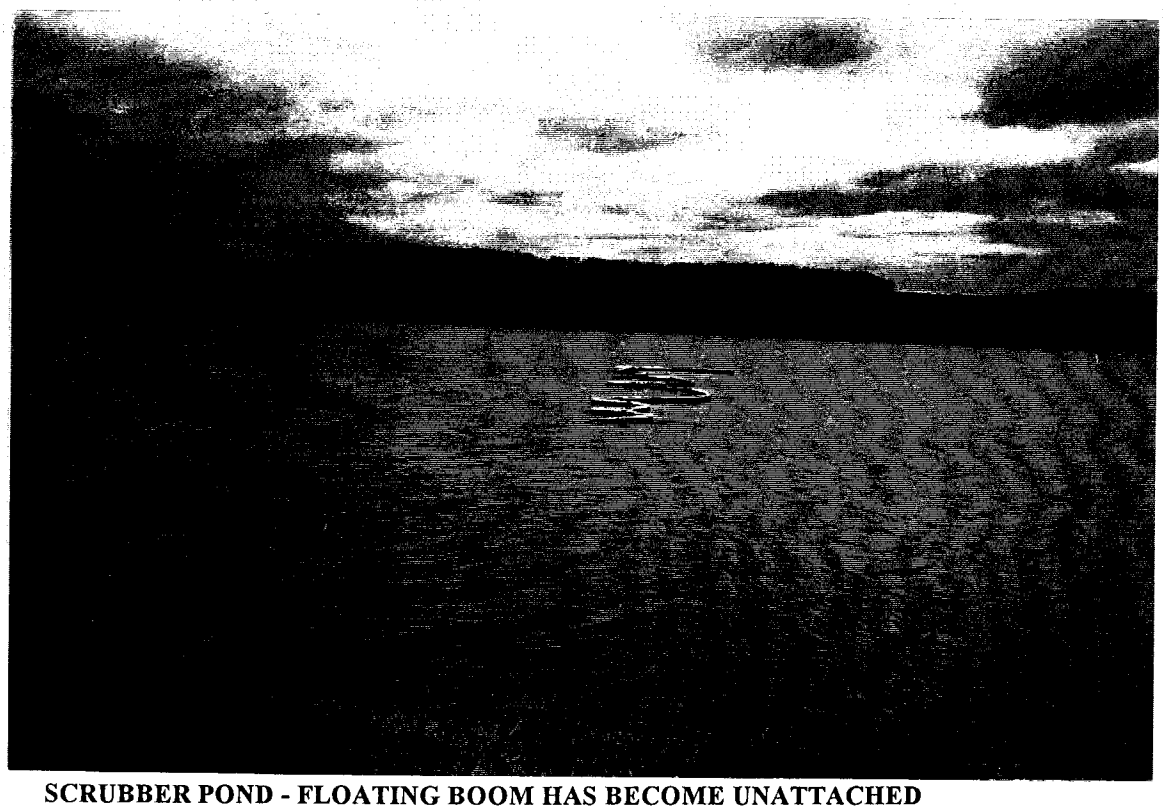
JACOBS CREEK ASH DISPOSAL AREA - NOTE SLUFFING AREA ON NORTHEAST END OF DIKE

FLY ASH POND AREA EXTENSION - SOUTHEAST CORNER OF DIKE
NOTE GOOD CRUSHED STONE SURFACE AND SPARSE VEGETATIVE COVER



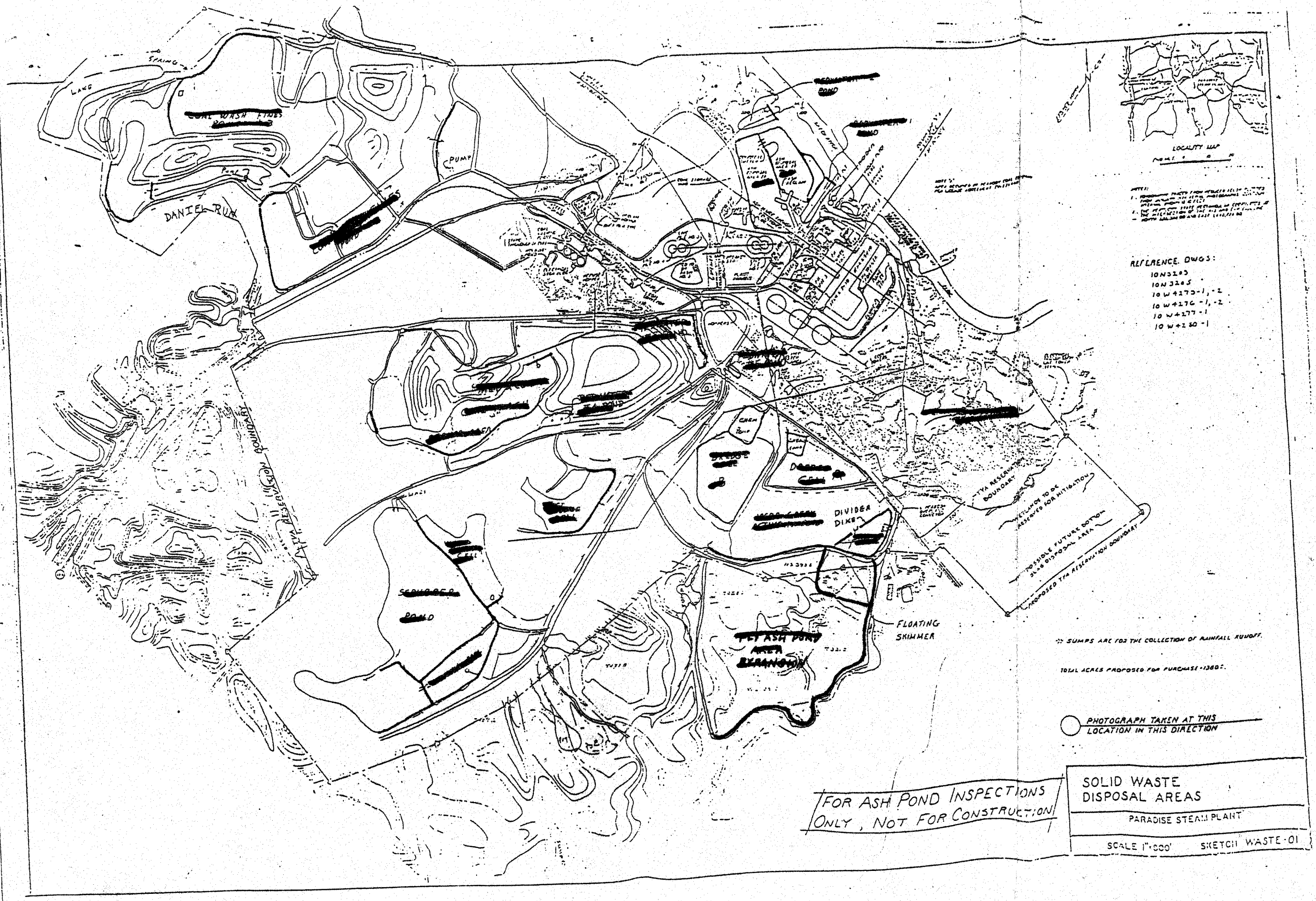
FLY ASH POND AREA EXTENSION - NOTE WIND AND WAVE EROSION

FLY ASH POND AREA EXTENSION - EASTERN PORTION OF DIKE NOTE WIND AND WAVE EROSION AND SLUFFING AREAS



SCRUBBER POND - FLOATING BOOM HAS BECOME UNATTACHED

**SCRUBBER POND-
EROSION ADJACENT
TO DITCH**



ATTACHMENT A

June 14, 1999

Victor Davis, LP 2T-C

PARADISE FOSSIL PLANT (PAF) - ANNUAL INSPECTION OF WASTE DISPOSAL AREAS

Attached is a report from Missy Hedgecoth concerning the inspection of Paradise Fossil Plant's ash disposal areas.

This report includes recommendations for corrective work. I concur with these recommendations.

Please make necessary copies and return originals to Missy for filing with other inspection reports.

H. 2. Pitt FOR
R. E. Purkey
Manager, Civil Engineering
LP 2G-C

REP:MAH

TENNESSEE VALLEY AUTHORITY
PARADISE FOSSIL PLANT

ANNUAL INSPECTION OF
WASTE DISPOSAL AREAS

Prepared By: Missy Hedgecoth
Date: June 14, 1999

PARADISE FOSSIL PLANT
ANNUAL INSPECTION OF WASTE DISPOSAL AREAS

Introduction

The waste disposal areas at Paradise Fossil Plant (PAF) were inspected for dike structural stability on April 19 and 20, 1999. The inspection was performed by Missy Hedgecoth of Fossil Engineering, and Jimmy Ramage of Paradise Fossil Plant. The previous annual inspection was conducted on April 8 and 9, 1998.

The results of the annual stability inspection are listed below according to location within the ash disposal area.

Slag Areas 2A, 2B, and Stilling Pond

Boiler slag is sluiced into the south end of pond 2A and is reclaimed approximately once a day by Reed Minerals as part of a TVA marketing strategy. The sluice water flows into pond 2B through pipes and then flows around a series of baffles which allow for a longer settling time. The sluice water then exits into the stilling pool to the east through a concrete flume. The concrete flume appeared to be in good condition. A shallow amount of water was flowing freely into the stilling pool. From here, three standard spillways discharge the water into the Green River if it is environmentally acceptable. If not, the water is pumped to the Jacobs Creek fly ash pond. The riprap at the outlet end of the spillway discharge pipes appeared to be in good condition.

The dikes appear to be stable and did not exhibit any notable changes since the last inspection. The interior slopes of the dikes appeared to have a good vegetative cover. There was an access stairway built over the outlet end of the pipes into Area 2B. The plant continues to monitor the survey controls installed on the exterior dike slope adjacent to the Green River for any indication of movement.

Redwater Ponds (Nos. 1, 2, 3, 4 & 5)

Redwater ponds #1 and #2 are located northwest of the powerhouse and adjacent to, but on opposite ends of, ponds 2A and 2B. Redwater pond #3 is located southwest of the powerhouse along the south access road and redwater pond #4 is located southeast of the medium and coarse coal wash refuse area. Pond #5 is located south of the powerhouse and northeast of Pond #3. Pond #4 accepts runoff from the medium and coarse refuse area and drains to #3 via an eight inch pipe into an open riprap channel. An overflow structure drains excess runoff from heavy rainfall events to the Jacobs Creek fly ash pond. Pond #3 collects additional runoff and discharges to #1 via a gravity drain with a manual valve. Three horizontal discharge pipes direct excess storage from #3 to the Jacobs Creek active ash pond during periods of heavy rainfall. Water collected in redwater pond #1 is pumped into slag pond 2B. Runoff collected in redwater pond #2 is pumped to slag pond 2B. Water collected in redwater pond #5 drains to pond #1 via a gravity drain.

PARADISE FOSSIL PLANT
ANNUAL INSPECTION OF WASTE DISPOSAL AREAS

The dikes of all five ponds were generally in good condition and appeared stable with an excellent vegetative cover on the exterior slopes. The surface sluff identified in the previous ash pond inspection report on the interior slope of the east dike of redwater pond #3 was still present. The sluff did not appear to threaten the structural integrity of the dike. There was also some minor sluffing observed on the exterior slope at the toe of the east dike. This appears to be caused by the cutting of the toe of dike from stormwater flow in the adjacent ditch. The catch basin located in the southeast corner of the ditch was blocked with debris. The debris should be removed so as not to inhibit flow in the ditch. The small trees identified in the previous ash pond inspection report growing on the interior dike slope of redwater pond #3 are still present. There were also small trees and brush observed on the top of the east dike. Rutted areas were evident along the top of the east dike and were holding water. The ruts appear to be caused by previous heavy equipment travel on the dike. Thick vegetative growth was choking the flow in the pipes which flow from pond #3 to Jacobs Creek ash pond (Picture no. 1). There were also several small trees observed on the interior dikes of redwater pond #1 and #2.

Sedimentation was building up in all five ponds, especially in pond #2 and pond #3 (Picture no. 2). The sedimentation in pond #2 was build up to the point that it was backing up water into coal yard drainage basin #2 (Pictures no. 3 and 4). Coal yard drainage basin #1 was also filling up with sedimentation (Picture no. 5). Several erosion gullies have developed around the perimeter of coal yard drainage basin no. 3, which is increasing the sedimentation washing into the basin (Picture 6). All the redwater ponds and all of the coal yard drainage basins need to be cleaned out.

Slag Area

The slag area is located southeast of the powerhouse. The slag in this area was placed here by the plant and is currently being reclaimed for commercial use by Reed Minerals personnel. The area contains a small surge pond to collect runoff and a larger area, called the beaver pond, which discharges over a spillway and down a riprap channel into Jacobs Creek. The riprap appears to be in good condition. A beaver dam was restricting flow to Jacobs Creek at the spillway at the time of inspection and was causing water to back up and spill over the dike adjacent to the spillway (Pictures no. 7 and 8). Plant personnel frequently monitor this area and clean out any beaver dams.

The dikes appear to be stable with a good vegetative cover on them. The dike adjacent to the spillway that discharges water from the beaver pond was saturated because of a back up of water due to the beaver dam. The redwater seeps identified in earlier reports along the southwest dike in this area are still present. Some continue to have growing deposits of material. Plant personnel monitor these areas frequently. There was an area of erosion located on the east dike of the beaver pond. Riprap has been placed in this area to control erosion. The erosion gully, observed on previous inspections, located at the end of the southwest dike just north of an existing culvert has worsened. The eroded area has encroached upon the roadway and should be repaired before further encroachment occurs. Runoff has been redirected to the ditch on the other side of the road so the water can drain through the existing culvert. There was flow from the pipe at the time of inspection. The existing culvert had vegetation blocking the inlet, which inhibited flow through the ditch.

PARADISE FOSSIL PLANT
ANNUAL INSPECTION OF WASTE DISPOSAL AREAS

Jacobs Creek Fly Ash Pond Area

This area is located south of the powerhouse. Fly ash is sluiced into the northern portion of the pond. The water then flows through the pond to the southern end of this region. Previously, before the 1997 construction of the Fly Ash Pond Area Extension, water then flowed through a divider dike floating boom skimmer structure and into the stilling pond before being discharged into Jacobs Creek via three standard spillways. Water now flows through a dike breach in the southwest portion of the area and into the new ash disposal area. The skimmers and floating boom in the stilling pool have been removed.

The dikes appear to be stable and did not exhibit any notable changes in the exterior dikes since the last inspection. The divider dike had a satisfactory cover of riprap on the slopes and was in good condition. The sluffing area noted in previous ash pond inspections on the south dike just west of the divider dike was still present. There were several surface sluffing failures observed along the south dike due to removal of material at the toe of the dike. The toe of dike has been encroached upon due to heavy equipment travel on the dike, most of which occurred during the construction of the Fly Ash Pond Area Extension. The depth of cut is 18 inches in areas and the sluffs will worsen as the toe of the dike is further encroached upon. A portion of the toe of dike has been repaired at the northeast end of the stilling pool. Earthfill has been placed at the toe of ditch and compacted to a uniform slope. There was a 75' long sluffing area located on the northeast end of the dike. This was also caused by removal of material at the toe of the dike by the county while regrading the ditch. The drainage culverts located on the west side of the pond were discharging at the time of inspection. There was some vegetation blocking the inlets of the pipes which could restrict flow to the ash pond. There was also some vegetation blocking the outlet of the 42" pipe which drains excess runoff from heavy rainfall events to the ash pond.
The rutted areas identified in the previous ash pond inspection at the northeast end of the stilling pool and between the east end of the dike and Dredge Cell A have been repaired.

Fly Ash Pond Area Extension

This disposal area was put into operation in September 1997. The area is located adjacent to and south of the existing Jacobs Creek Fly Ash Disposal Area. Dikes in the southern and eastern portion of the area were raised from approximate El 400 to El 408. The existing dike of Jacobs Creek Fly Ash Disposal Area was breached at the west end of the pond to allow inflow into the new pond. Water flows through the breach and into a small pond of water in a high area. Flow is directed down a riprap channel into the pond. Water flows to a stilling pool in the northeast portion of the area through a divider dike and floating boom spillway structure at the south end of the stilling pool. Flow is then discharged through three spillway and skimmer structures and through three 36" diameter concrete pipes to Jacobs Creek.

Flow is uniform and non-eroding through the ash pond. Riprap in the breach and channel were in good condition. The spillway structures appear to be operating properly, although there was some debris caught in the center spillway structure. All three outlets were discharging at the time of inspection. The riprap at the spillway discharge outlets appeared to be in good condition. There is stairway access from the top of dike to the discharge pipes for monitoring purposes. Dikes were constructed in the southern and eastern portion of the area. The dike slopes have established vegetation. The tops of dike have an excellent crushed stone surface. All exterior dikes appear to be in good condition with no visible signs of instability. There was a beaver lodge located on the north portion of the area. Plant personnel should monitor the dikes for beaver activity and notice any tunneling into the dikes. Plant personnel have repaired the wind and wave erosion identified in last years inspection report, by placing riprap on the interior dike slopes of the fly ash pond expansion (Picture no. 9).

Scrubber Waste Wet Ponding Area

This area is located in the southwest corner of the TVA reservation. Scrubber waste is sluiced into the northern end of this region and stacked via the rim ditch method. Scrubber waste was being sluiced into the ditch formed by the exterior dike and an interior separator dike. Sluice water had been directed to the western corner of the area to allow the area to fill with scrubber waste. Water is discharged from the scrubber pond to the stilling pool. Water then flows from the stilling pool through a spillway and is discharged via a ditch to the Jacobs Creek fly ash pond.

The gypsum stack has been raised and is nearing its first berm. The side slopes have been graded and prepared for temporary cover (Picture no. 10). The area needs to be slope staked to assure the berm elevation and drainage ditches are on grade before temporary cover is placed. The culvert under the road on the east side of the gypsum stack adjacent to the west dredge cell is not long enough to span the full width of the road. Water entering and exiting this pipe is eroding the road around the inlet and outlet of the culvert (Picture no. 11). This culvert should be replaced with a longer culvert and the road should be repaired.

The discharge pipes from the scrubber pond to the stilling pool were in good condition. The standard spillway was in good condition. There was some erosion noted at the discharge pipe outlet and adjacent to the ditch which flows to Jacobs Creek fly ash pond. The exterior dikes in this area appear stable and did not exhibit any notable changes since the previous inspection. The slopes were in good condition with a good vegetative cover. However, there were small trees and brush observed on the south dike. Several of the chimney drain outlets on the south dike of the stilling pool were blocked with vegetation. The tops of dike had a good crushed stone surface. There was some wind and wave erosion observed on the southeast end of the stilling pool dike.

PARADISE FOSSIL PLANT
ANNUAL INSPECTION OF WASTE DISPOSAL AREAS

West Dredge Cell

This area, located just east of the scrubber wet ponding area, was constructed to accept dredged fly ash from the Jacobs Creek pond area. No material has been dredged into this cell at the time of the inspection.

Plant personnel had installed a valve, at Fossil Engineering's request and in accordance with design drawings, on the outlet pipe for the underdrain system for this cell. This valve is used to drain the cell only during recovery operations. The valve was closed at the time of inspection. This is the only outlet for water in this cell because riser boards are installed all the way to the top of the splashboard riser spillway structure making it inoperable. Runoff water is now collecting in the cell.

The dikes appear stable and did not exhibit any notable changes since the last inspection. All exterior slopes have an excellent vegetative cover. The erosion observed on the dike slope on the previous inspection at the southeast end of the pond was still present. The erosion gully observed on the previous inspection at the southwest end of the pond at the pipe outlet which drains the perimeter ditch of the scrubber pond into the west dredge cell was still present but does not appear to have worsened.

East Dredge Cell

This area is located just south of the medium and coarse coal wash refuse area. This cell was also constructed to accept dredged fly ash from the Jacobs Creek ash pond area. The plant has ceased any dredging into the pond at this time.

The spillway appeared to be in good condition, but was not operating at the time of inspection. The outlet pipe was clear of obstructions. The discharge from the pipe has formed a large eroded hole at the exit.

The dikes in this area appear to be stable. The tops of dike surfaces are in satisfactory condition, although some vegetation has established itself over the area. Removal of vegetation is not warranted at this time. The dredged ash was seeded previous to the last ash pond inspection; however, vegetation is sparse over the area. An erosion ditch was identified beside the armored ditch at the northeast corner of the dike in previous inspections. This erosion area, caused by runoff which has bypassed the armored ditch, is still present. An erosion ditch was also observed at the southeast corner of the exterior dike. This appears to be caused by heavy sheet flow which concentrates to form the erosion gullies. The geotextile fabric that was placed to protect the ditch has been washed away by the erosive action of the water. The ditch was in good condition near the top of the slope due to placement of riprap on top of the geotextile. The berm ditch was not draining properly near the middle portion of the eastern dike due to some rutting on the dike.

Medium and Coarse Coal Wash Refuse Area

The majority of this refuse had previously been transported by the BC-R3 conveyor belt, which was extended by Modification Services. Currently, all of the material is transported from the silo to the stack. Plant personnel transport the refuse daily to the northern portion of this region to be stacked in the final stacking configuration. It does not appear that the material is being stacked according to the engineering design drawings (steep side slopes, lack of compaction, and limited berms). Plant personnel have made some improvements since the last inspection by flattening the slopes on the west side of the stacking area. The areas which are at or above design elevation need to be graded and covered. The southeastern portion of this area has been graded and covered with a combination of soil from the redwater #3 clean-out and scrubber material recovered from the scrubber wet ponding area. Runoff from the south side is collected in the original fines pond and discharged by drainage ditches and diverted to redwater pond #3. The outlet that discharges water from the pond in the southern portion of this area was in good condition. Water is discharged through a twelve inch pipe to a riprapped ditch where it is routed to redwater pond #4.

A good vegetative cover is established in the southeastern portion of the area. The erosion ditch on the saddle dam that was identified in previous reports was still present and does not appear to have worsened. The large erosion gully observed during previous inspections on the north end of the refuse area adjacent to the overhead medium and coarse coal wash refuse conveyor was still present but does not appear to have worsened (Picture no. 12). The erosion noted on the previous inspection in the northwest end of the area has been repaired by filling with riprap.

Coal Wash Fines Pond #2

This disposal area, located west of the powerhouse, was completed in the late fall of 1987. The perimeter dike at the west end of this area was constructed by Modification Services as designed by Fossil Engineering. The top of the original dike was at elevation 455. The plant raised the dike to approximately elevation 465 in 1990, and subsequently sluiced fines to this elevation. This area has not been active as a sluicing operation since fines pond #3 began operation in October 1992. Runoff water flows through a spillway structure into the stilling pool. Water in the stilling pool is pumped back to the coal wash plant for use in operations. This is a closed-loop system. A new pump platform has been placed in the stilling pool prior to the last inspection.

All of the dikes in this area appeared stable and in good condition. The dikes appear to have a good vegetative cover. The west dike of this area has been noted in previous inspections to have sparse vegetation. The vegetative cover of this dike is now improving and establishing itself over the area. Several small pine trees were also observed on the west dike.

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Coal Wash Fines Pond #3

Fines pond #3 is located northwest of fines pond #2. It was completed in October 1992 and all sluicing was diverted from fines pond #2 to this area. Fines are sluiced into the eastern end of the area and the water flows to the west. An overflow discharge structure removes the water to a second pond, or temporary stilling basin, before discharging through a standard spillway into a stilling basin. The basin does not have a discharge point, but water is pumped with a portable pump, into fines pond #2 when the water surface elevation in the basin rises. At the time of inspection, construction was taking place to raise the dike to El 475 for additional storage capacity. This work is schedule to be completed by October 1999.

A dike was constructed around the cemetery to the north of this area to protect it from pond water. A dike was also constructed in the northeast corner of this area extending from the southeast corner of the cemetery eastward to the exterior dike for pond #3. This dike was constructed to preserve the aesthetics of the cemetery so it would not be surrounded by the future fines stack. All dikes in this area appear to be stable and in good condition. Although, many of the pond dikes were lacking vegetative cover and a crushed stone surface due to ongoing dike construction. There was also a lack of vegetative cover on the north portion of the area at the toe of the dike adjacent to the perimeter ditch. Several erosion gullies have formed at the outlets of the dike drains on the north dike. Several beaver dams were noted in Daniels Run. Plant personnel clean the creek out frequently to assure that the adjacent dike does not become overtopped after a heavy rainfall. The erosion observed on the interior dike in the western portion of the area during the previous inspection has been repaired by adding riprap.

Recommendations

- Plant personnel should continue to periodically mow grass and remove small trees and brush from all dike slopes. Plant personnel should also continue to maintain all dike roads.
- Plant personnel should monitor the exterior dike slopes for seepages or wet soft spots or animal burrowing, etc. and notify Fossil Engineering of any changes.
- Continue to monitor the survey controls installed on the exterior dike slope of Area 2B slag pond adjacent to Green River for any indication of slope movement.
- The sluff on the interior slope of the RW #3 east dike should be monitored by plant personnel and Fossil Engineering should be notified if the condition changes.
- Remove the vegetative growth from the entrance to the horizontal discharge pipes in RW #3 so that flow does not become inhibited during periods of heavy rainfall.
- Plant personnel should repair the ruts on the top of redwater pond #3 dikes by filling with earthfill and regrading to provide positive drainage.
- Repair the perimeter of coal yard drainage basin #3, by compacting clay in the erosion gullies and seeding.
- Clean out the all of the coal yard drainage basins and all of the redwater ponds, especially ponds #2 and #3.
- Continue to remove any vegetative growth and/or beaver dams that may be blocking the spillway from the slag area beaver pond. The adjacent dike should be monitored to insure that it is stable and that the area does not remain saturated. A minimum freeboard of 2 feet is desirable.
- The erosion gully at the southwest end of the dike in the slag area should be repaired by placing riprap in the area to prevent any additional erosion. Bottom ash should be placed and compacted at the edge of roadway to avoid further erosion and encroachment of road. Additional riprap should be placed under the outlet of the existing drain pie.
- Plant personnel should repair the toe of the dikes around Jacobs Creek ash pond by replacing the excavated earthfill along the toe of the dike and compacting to a uniform slope.
- Plant personnel should repair the eroded area at the discharge outlet to the stilling pool by placing riprap or a boulder from the borrow area at the outlet.
- Slope stake the gypsum stack to identify berm location, finish grading per survey and place temporary cover on side slopes.
- Repair the road on the east side of the gypsum stack by replacing the existing culvert with a longer culvert and recompacting gypsum around the culvert.
- Plant personnel should repair the eroded area at the discharge outlet of the gypsum pond by placing riprap at the outlet; fill the eroded area adjacent to the ditch with compacted earthfill, line the area with a filter fabric, and cover with riprap.
- Repair the erosion gully adjacent to the overhead conveyor so that the foundation of the conveyor is not undermined. This area should be filled with earth, compacted, and covered with riprap.
- Plant personnel should stack coarse and medium coal wash refuse according to engineering design drawings (sides slopes, berms, etc.).
- Place cover on the coarse and medium coal wash refuse stack in areas which have reached final grade.

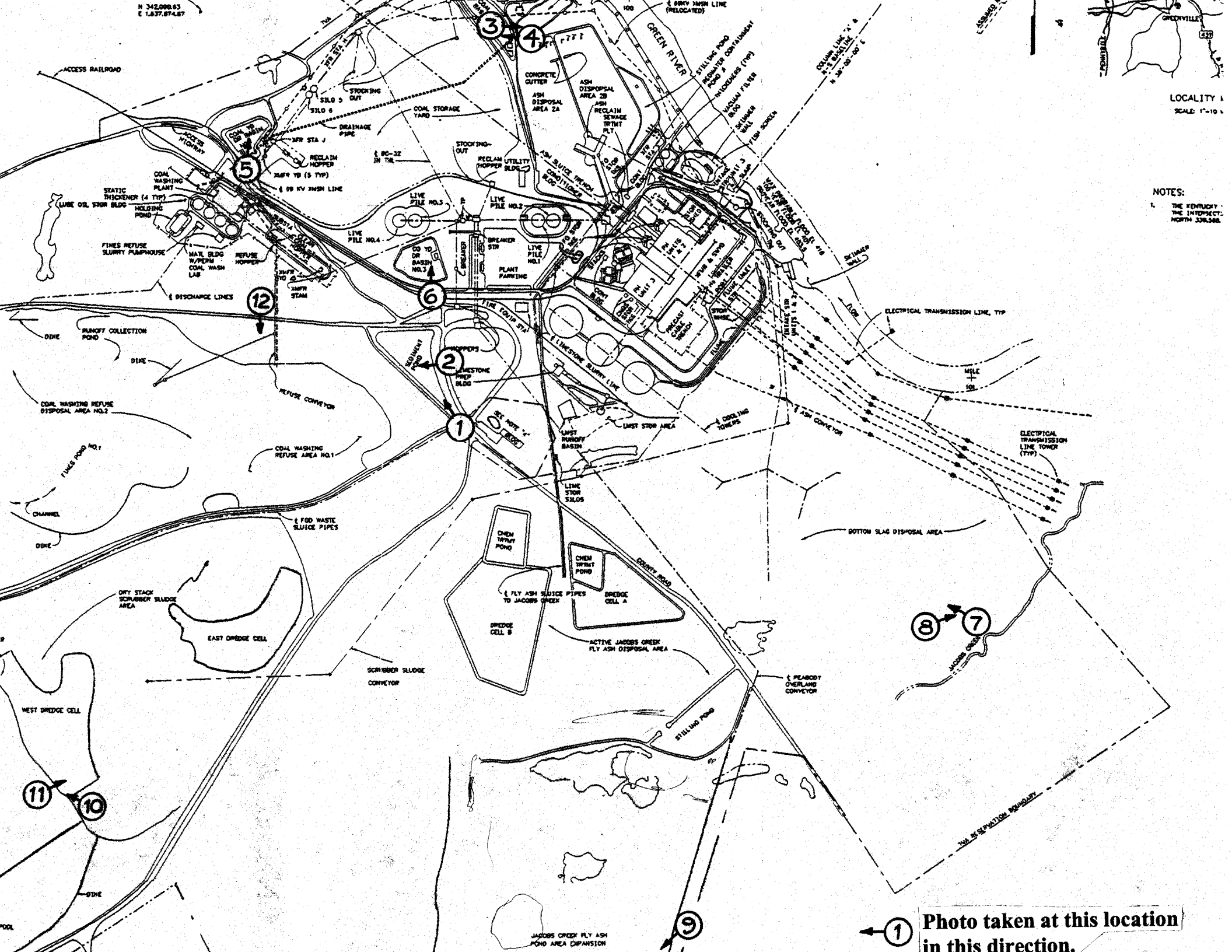
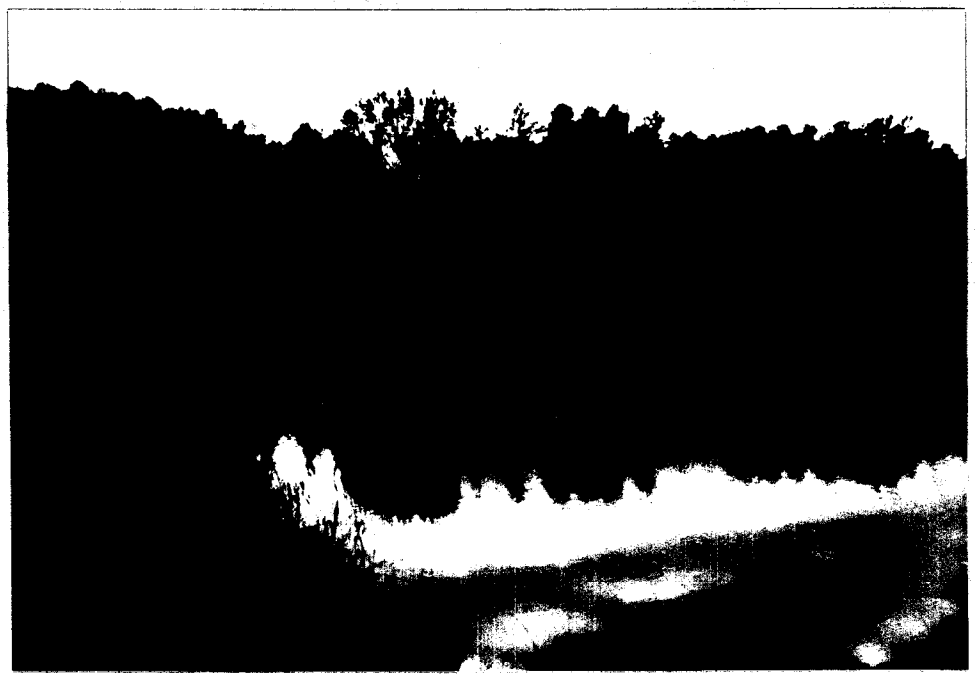


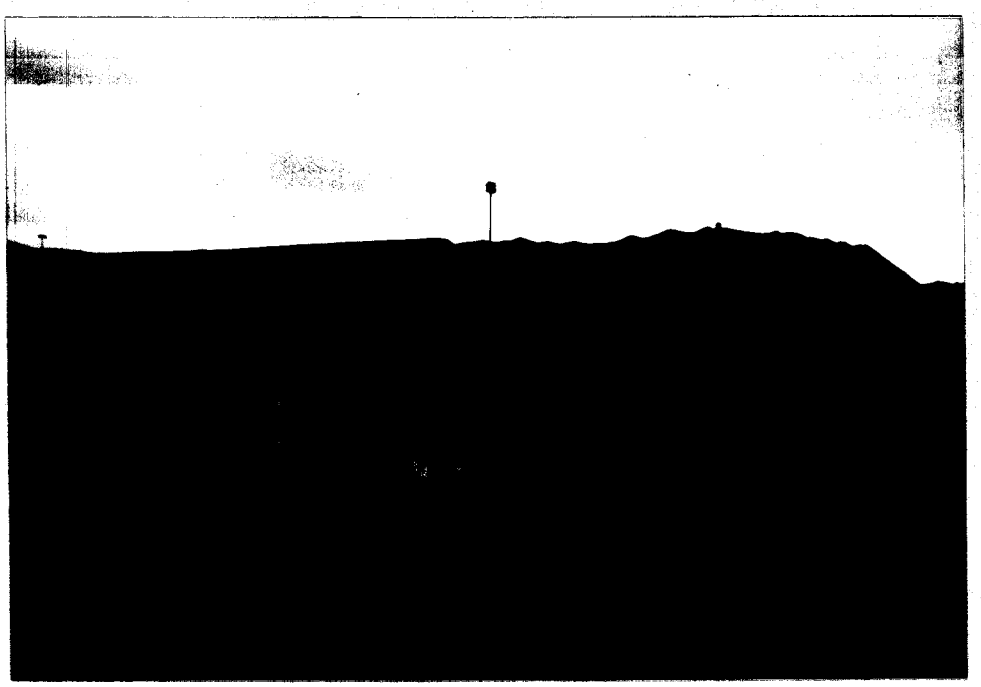
Photo taken at this location in this direction.

Picture no. 1. Thick vegetative growth blocking the flow in the pipes which flow from redwater #3 to Jacobs Creek ash pond.

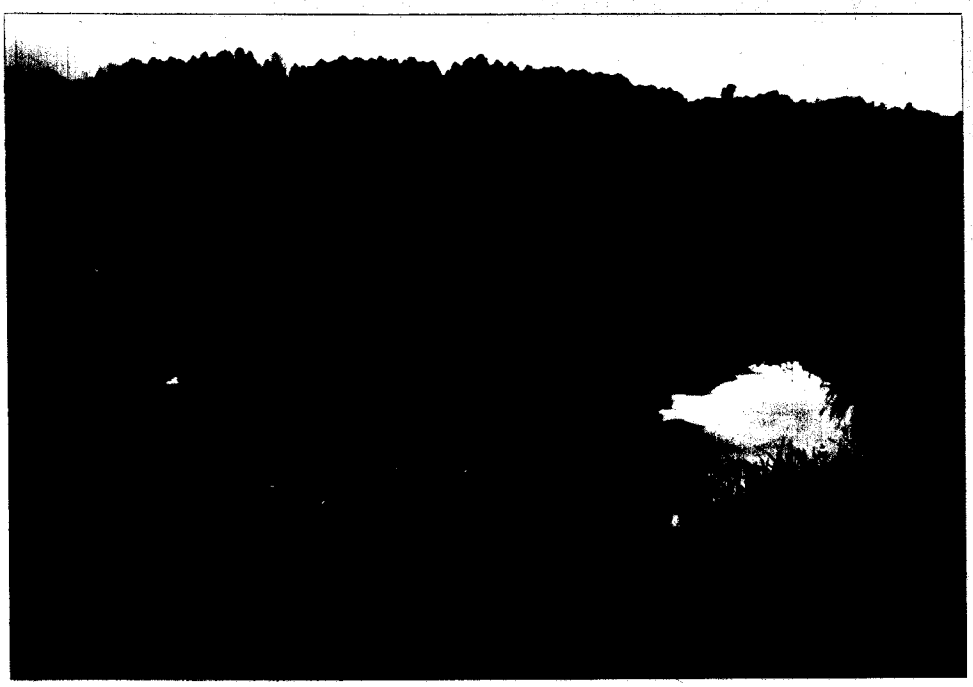


Picture no. 2. Sedimentation into redwater #3.

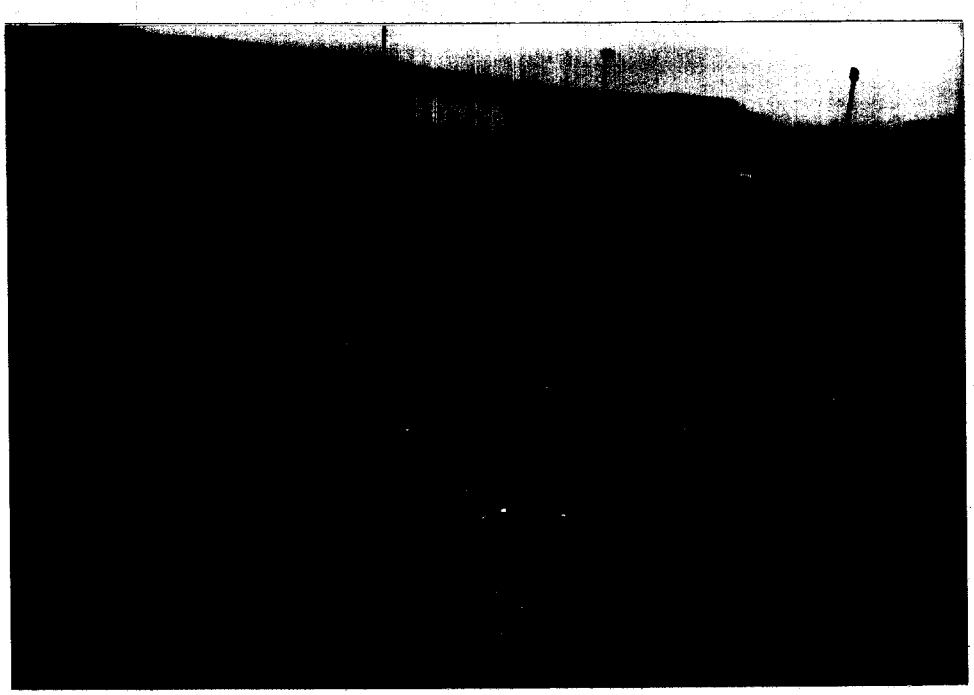
Picture no. 3. Coal yard drainage basin #2 is backed up because sedimentation in redwater #2 will not allow drainage into it.



Picture no. 4. Coal yard drainage basin #2 is backed up because sedimentation in redwater #2 will not allow drainage into it.



Picture no. 5. Sedimentation in coal yard drainage basin #1.

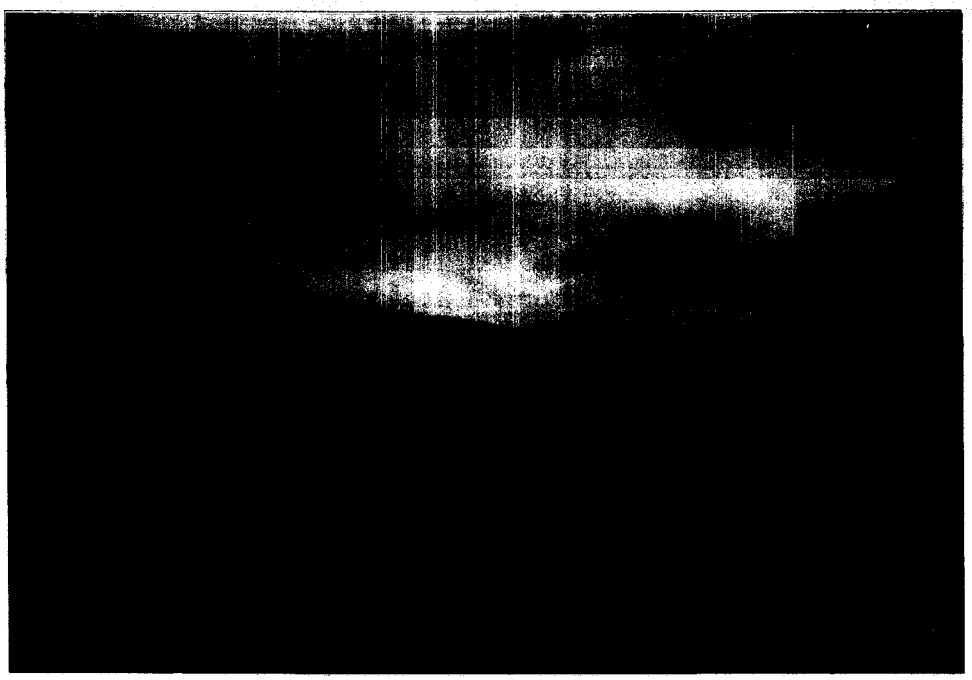


Picture no. 6. Erosion gullies around the perimeter of coal yard drainage basin #3.

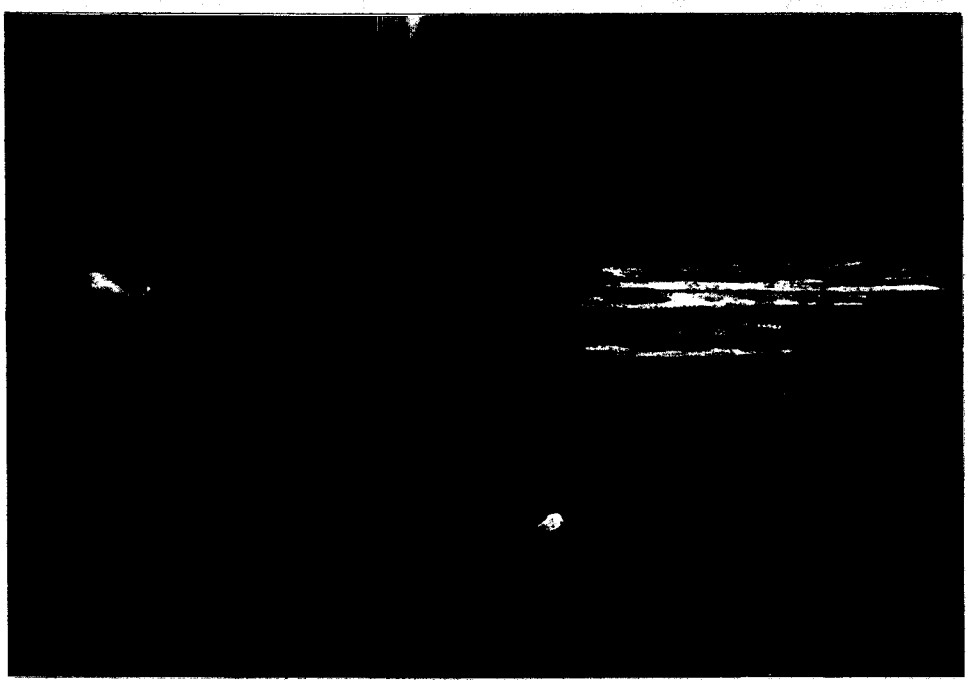
Picture no. 7. Beaver dam blocking the spillway of the slag area beaver pond.

Picture no. 8. The beaver dam is causing water to back up and spill over the dike adjacent to the spillway in the slag area beaver pond.

Picture no. 9. Riprap placed along the interior dike slope in the Jacobs Creek ash pond extension to repair wind and wave erosion.



Picture no. 10. Gypsum stack side slopes have been graded and are in need of temporary cover.



Picture no. 11. The culvert under the road on the east side of the gypsum stack adjacent to the west dredge cell is not long enough to span the full width of the road. Water entering and exiting the culvert is eroding the road around the inlet and outlet of the culvert.

Picture no. 12. Large erosion gully on the north end of the refuse area adjacent to the overhead medium and coarse coal wash conveyor.

TENNESSEE VALLEY AUTHORITY
PARADISE FOSSIL PLANT

ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Prepared By: Joel D. Paris
Date: June 13, 2000

June 13, 2000

Victor Davis, LP 2T-C

PARADISE FOSSIL PLANT (PAF) - ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Attached is a report from Joel Paris concerning the inspection of Paradise Fossil Plant's ash disposal areas.

This report includes recommendations for corrective work. I concur with these recommendations.

Please make necessary copies and return originals to Joel for filing with other inspection reports.

R. E. Purkey
Manager, Civil Engineering
LP 2G-C

REP:JDP

FOSSIL PLANT
ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Introduction

The waste disposal areas at Paradise Fossil Plant (PAF) were inspected for dike structural stability on March 23 and 24, 2000. The inspection was performed by Joel D. Paris of Fossil Engineering, John Albright of Systems Engineering and Steven Cary and Kimberly Dukes of Paradise Fossil Plant. The previous annual inspection was conducted on April 19 and 20, 1999.

The results of the annual stability inspection are listed below according to their location within the Paradise Fossil Plant Boundaries map attached.

Slag Areas 2A, 2B, and Stilling Pond

Boiler slag is sluiced into the south end of area 2A and is usually reclaimed once a day by Reed Minerals as part of a TVA marketing strategy. The sluice water then flows into pond 2B through pipes and around a series of baffles to lengthen the settling time. The sluice water enters the north end of the stilling pool through a concrete flume. The concrete flume appeared to be in good condition and only a shallow amount of water was flowing freely into the stilling pool. From here, three standard spillways (picture 1) discharge the water into the Green River if it is environmentally acceptable. If not, the water is pumped to the Jacob's Creek fly ash pond. The riprap at the outlet end of the spillway discharge pipes appeared to be in good condition.

The dikes appear to be stabile and did not exhibit any notable changes since the last inspection. A rut has developed from runoff from the road and needs to be repaired.(picture 2) The interior slopes of the dikes have a good vegetative cover. There was an access stairway built over the outlet end of the pipes into Area 2B. The plant continues to monitor the survey controls installed on the exterior dike slope adjacent to the Green River for any indication of movement.

Redwater Ponds (Nos. 1, 2, 3, 4 & 5)

Redwater pond #1

Redwater pond #1 is located northwest of and adjacent to the powerhouse. All pumps, slopes, dikes and discharge structures appear to be in good condition (picture 3). Water collected in redwater pond #1 is pumped into the slag pond within Area 2B. Slag lime is leaking into and adding slag.

Redwater pond #2

Redwater pond #2 is located northwest of and adjacent to Slag Areas 2A & 2B. The water from RW#2 is pumped from the center of the pond into the northwest end of slag ponds 2A. All slopes and dikes appear to be in good condition. However, the pond had sediment and a high level of standing water in it (picture 4). There is an estimated loss of 146,400 CF (3.4 Acre feet)from the designed storage.

The pond was designed for 188.5 acre feet of storm water runoff. The design was for Redwater Pond #2 to be a surge pond and have the empty water level maintained at or below elevation 385. This is two feet below the outlet of the 72" pipe. During this inspection, the water level was above elevation 390.

The Coal Yard Drainage Ponds #1 is a surge pond with a restrictive opening that empties into the 72" concrete pipe that feeds Redwater Pond #2.

Coal Yard Pond #2 now empties directly into Redwater Pond #2. This pond should never discharge any water into RW #2 excerpt during rains exceeding the standard 10 year - twenty-four hour rainfall event (See Coal Yard Drainage Ponds). This could cause dike over-topping and non compliance. Dike over-topping is the number one cause of dike failure.

Redwater Pond #3

Redwater Pond #3 is a settlement pond and is located southwest of the powerhouse and along the south side of the county road. This pond collects the runoff and sediment from the medium and course coal wash refuse areas and discharges to Jacobs Creek Ash Fly Pond.. A Redwater #4 settlement/surge pond was built to collect sediment and discharge only sediment free water to RW #3 to reduce filling the road ditches and redwater pond #3.

RW #3 can discharges to RW #1 via a gravity drain with a manual valve contained within the discharge structure. This valve is opened when the pond is to be cleaned out. Otherwise three horizontal discharge pipes direct excess storage from #3 to the Jacob's Creek active ash pond during periods of rainfall.

The sediment in the RW #3 pond needs to be cleaned out as it is above the clean out access road (picture 5). There may be problems with the clean out because a sampling well has been placed where the crane was designed to set (picture 5) during the cleanout operation. The weeds in front of the discharge pipes has raised the discharge elevation by six inches. These weeds need to be cleaned out (picture 6). The three discharge pipes are all discharging equally into the transition box (picture 8).

There are several trees on the inside of the dike that need to be pulled up and clay placed in the resulting hole and compacted (picture 7). This should be done during pond clean out while the water is lowered. There were also small trees and brush observed on the top of the east dike. Rutted areas were evident along the top of the east dike and were holding water. The ruts appear to be caused by previous heavy equipment travel on the dike.

Redwater Pond #4

Redwater Pond #4 is a surge/sediment pond located east of the medium and coarse Coal Wash Refuse Area. This is a serge pond that settles out the fines and drains to #3 via an eight inch pipe into an open riprap ditch beside the road. An overflow structure drains excess runoff during rains exceeding the standard 10 year - twenty-four hour rainfall event directly to the Jacob's Creek fly ash pond thereby bypassing RW #3. The pond was to be cleaned out when the sediment reached the invert of the 8" discharge pipe. The fines are now above the 8" pipe (picture 9)and filling up the ditch beside the road.

Redwater Pond #5

Redwater Pond #5 is located south of the powerhouse, east of the truck coal dumping area and west of the limestone storage area. It is a surge pond designed to delay enough water going to redwater #1 to give the pond #1 pumps time to lower the water level. An overflow structure drains excess runoff during rains exceeding the standard 10 year - twenty-four hour rainfall event directly to redwater pond #1. All water collected in redwater pond #5 drains to redwater pond #1 via a gravity drain and no water is stored in RW #5 pond.

Coal Yard Runoff Pond #1

Coal Yard Runoff Pond #1 is located north of and across the plant access road from the Coal Wash Plant. This is a surge/sedimentation storm water runoff pond that delays runoff to RW #2. Water and sediment is collected in the pond and clear water is discharged through a six inch hole cut in the side of the stand pipe into the seventy-two concrete pipe that empties into redwater #2. The water will discharge through the six inch hole until the elevation reaches the top of the stand pipe. This happens above the standard 10 year - twenty-four hour rainfall event. This hole was originally designed as an eight inch inverted triangle hole in the transition box two feet lower. The east side, where storm water enters the basin is filling up with sedimentation and needs to be scheduled for cleaned out.

Coal Yard Runoff Pond #2

Coal Yard Runoff Pond #2 is located southwest of and across an access road from Redwater #2 Pond. This pond was designed as a storm water sedimentation pond and all water was to be pumped to slag pond 2A with a four inch pump. This pond was full of water and sedimentation and was discharging through the emergency discharge pipe into RW #2 pond. Coal Yard Pond #2 was not originally designed as a surge pond but is now being operated as one. This pond is full and fines from this pond are discharging into RW #2.

There were three pumps on the platform but no power is hooked to any of them. The pumps are designed to pump all water from this pond to Pond 2A. The additional water into RW #2 pond will cause dike over topping, non compliance and danger of dike failure.

Coal Yard Runoff Pond #3

Coal Yard Runoff Pond #3 is located south of the coal transfer complex and north of and adjacent to the access road. This pond can discharge by gravity or be pumped to RW #1. Several erosion gullies have developed around the perimeter of the drainage basin.

All the redwater ponds and all of the coal yard drainage basins need to be cleaned out.

Slag Area

The slag area is located southeast of the powerhouse. The slag in this area was placed here by the plant and is currently being reclaimed for commercial use by Reed Minerals personnel. The area contains a small surge pond to collect runoff and a larger area, called the beaver pond, which discharges over a spillway and down a riprap channel into Jacobs Creek. The riprap appears to be in good condition. The beaver dam that was restricting flow to Jacobs Creek has been removed (photograph 10). Plant personnel frequently monitor this area and clean out any beaver dams.

The dikes appear to be stable with a good vegetative cover on them. The redwater seeps identified in earlier reports along the southwest dike in this area are still present. Some of the red water seeps continue to have growing deposits of material. Plant personnel monitor these areas frequently. The erosion gully, observed on previous inspections, located at the end of the southwest dike just north of an existing culvert has worsened. The eroded area has encroached upon the roadway and should be repaired before further encroachment occurs. Runoff has been redirected to the ditch on the other side of the road so the water can drain through the replaced culvert.

Jacobs Creek Fly Ash Pond Area

This area is located southeast of the powerhouse. Fly ash is sluiced into the northern portion of the original pond. Water flowed through a divider dike with a floating boom skimmer structure and into the stilling pond before being discharged into Jacobs Creek via three standard spillways. The skimmers and floating boom in the stilling pool have been removed and the opening in the divider dike filled. Water now flows through a dike breach in the southwest portion of the ash pond then into the Fly Ash Pond Area Extension (the new ash disposal area).

The divider dike had several trees that must be removed by pulling them up and compacting clay in the holes. The sluffing area that was noted in the previous ash pond inspections report on the south dike just west of the divider dike was still present.

The dikes appear to be stable and do not exhibit any notable changes in there exterior since the last inspection. There are several trees growing on the dikes (picture 11) that were listed in previous reports. The trees must be pulled up and earth compacted in the hole.

There were several surface slough failures observed along the south dike due to removal of material at the toe of the dike. The toe of the dike was cut back when the road was graded for heavy equipment travel during the construction of the Fly Ash Pond Area Extension. The depth of cut is 18 inches in places and the sluffs will worsen as the toe of the dike is further encroached on. A portion of the toe of the dike has been repaired at the northeast end of the stilling pool. Earth fill has been placed at the toe and compacted to make a uniform slope. There was a 75' long slough area located on the northeast end of the dike. This was also caused by removal of material at the toe of the dike by TVA while cleaning out the ditch along the county road.. There was flow from the pipe at the time of this inspection from seepage of the north dike of Jacobs Creek Fly Ash Pond.

There was also some vegetation blocking the outlet of the 42" pipe from redwater pond #3

Fly Ash Pond Area Extension

This disposal area was put into operation in September 1997. The area is located adjacent to and south of the existing Jacobs Creek Fly Ash Disposal Area. Dikes in the southern and eastern portion of the area were raised from approximate El 400 to El 408. The existing dike of Jacobs Creek Fly Ash Disposal Area was breached at the southwest end of the pond. This allows water to flow into the new pond and around the installed concrete pipe that maintained a water cover over the ash in the Jacobs Creek Fly Ash Disposal Area. Flow is uniform and non-eroding through the ash pond. Riprap in the

breach and channel were in good condition (picture 12). After the ash settles out, the water flows into a stilling pool in the northeast portion of the pond through a divider dike with a floating boom. Water is then discharged through three 48" vertical spillway, with skimmer structures, and out through three 36" diameter concrete pipes to Jacobs Creek.

The spillway structures appear to be operating properly. All three outlets were discharging at the time of inspection. The riprap at the spillway discharge outlets appeared to be in good condition. There is a stairway for access from the top of dike to the discharge pipes for monitoring purposes. Dikes were constructed in the southern and eastern portion of the area. The dike slopes have established vegetation. The road on top of the dike need additional crushed stone surfacing. All exterior dikes appear to be in good condition with no visible signs of instability.

There was a beaver lodge located on the north portion of the area. Plant personnel should monitor the dikes for beaver activity and notice any tunneling into the dikes.

Scrubber Waste Wet Ponding Area

This area is located in the southwest corner of the TVA reservation. Scrubber waste is sluiced into the northern end of this region and stacked by long reach track hoe via the rim ditch method. Scrubber waste is sluiced through the ditch formed by the exterior dike and an interior separator dike to the western corner of the area to allow that area to fill with scrubber waste. Water is discharged from the scrubber pond to a settling pond by vertical spillways. The stilling pool water discharges from the stilling pool through a vertical spillway into a ditch that empties into the Jacobs Creek Fly Ash Pond a half mile away.

The discharge pipes from the scrubber pond to the settling pond appear to be in good condition. The standard spillway out of the stilling pool was in good condition.

The exterior dikes in this area appear stable with a good vegetative cover and did not exhibit any notable changes since the previous inspection. However, there were small trees and brush observed on the south dike that need to be pulled up..

West Dredge Cell

This area, located just east of the scrubber wet ponding area, was constructed to accept dredged fly ash from the Jacobs Creek pond area. No material has been dredged into this cell at the time of the inspection.

Plant personnel had installed a valve, at Fossil Engineering's request and in accordance with design drawings, on the outlet pipe for the underdrain system for this cell. This valve is used to drain the cell only during recovery operations. The valve was closed at the time of this inspection. Runoff water is now collecting in the cell and leaking through the riser boards because they were installed all the way to the top of the splashboard riser.

The dikes appear stable and did not exhibit any notable changes since the last inspection. All exterior slopes have an excellent vegetative cover. The erosion observed on the dike slope on the previous

inspection at the southeast end of the pond was still present. The erosion gully observed on the previous inspection at the southwest end of the pond at the pipe outlet which drains the perimeter ditch of the scrubber pond into the west dredge cell was still present but does not appear to have worsened.

East Dredge Cell

This area is located just south of the medium and coarse coal wash refuse area. This cell was also constructed to accept dredged fly ash from the Jacobs Creek ash pond area. The plant has ceased all dredging into the pond at this time.

The spillway appeared to be in good condition (picture 13), but was not operating at the time of this inspection. The discharge pipe was clear of obstructions but had a large eroded hole(picture 14) 6' long. 3' wide by 3' deep. This hole needs to be filled with riprap.

The dikes in this area appear to be stable. The tops of dike surfaces are in satisfactory condition, although some vegetation has established itself over the area. Removal of vegetation is not warranted at this time. The dredged ash was seeded two years ago and vegetation is good south of the discharge structure but sparse north of the discharge structure.

An erosion ditch was identified beside the armored ditch at the northeast corner of the dike in previous inspections. This erosion area, caused by runoff which has bypassed the armored ditch, is now over 4feet deep, eight feet wide and one hundred plus feet long and is getting bigger with each rain (picture 15). The berm ditch was not draining properly near the middle portion of the eastern dike due to some rutting on the dike. Several erosion ditches were observed (picture 16). This appears to be caused by heavy sheet flow which concentrates to form the erosion gullies.

The geotextile fabric that was placed to protect the discharge ditch has been washed away by the erosive action of the water. The ditch was in good condition near the top of the slope due to placement of riprap on top of the geotextile. The berm ditch was not draining properly near the middle portion of the eastern dike due to some rutting on the dike.

Medium and Coarse Coal Wash Refuse Area

The majority of this refuse had previously been transported by the BC-R3 conveyor belt, which was extended by Modification Services. Currently, all of the material is transported from the silo to the stack by off-road vehicles. Plant personnel transport the refuse daily to the northwest portion of this region to be stacked. The material does not appear to be stacked according to the engineered final stacking configuration issued drawings. The material appears to lack compaction and has steeper side slopes(picture 17). Areas of the side slopes appear to be at the angle of repose and slides have occurred (picture 18). The eroding ditch on the west side needs some large rocks or other material placed in it to retard erosion(picture 19). The west side runoff is by drainage ditches to Redwater Pond #3.

The areas which are at or above the engineered final stacking configuration issued drawings need to be compacted and covered. Runoff from the east side is collected in the original fines pond and discharged through a twelve inch pipe to a riprapped ditch down to Redwater Pond #4.

A good vegetative cover is established in the southeastern portion of the area. The erosion ditch on the saddle dam that was identified in previous reports was still present and should be filled (picture 20).

Coal Wash Fines Pond #2

This disposal area is located in the northwest portion of the plant properties. The area is adjacent to the railroad and on the north side of the plant access road. The original pond was completed in the late fall of 1987. The perimeter dike at the west end of this area was constructed by Modification Services as designed by Fossil Engineering. The top of the original dike was at elevation 455. The plant raised the dike to approximately elevation 465 in 1990, and subsequently sluiced fines to this elevation. This area has not been active as a sluicing operation since Fines Pond #3 began operation in October 1992. Runoff water flows through a spillway structure into the stilling pool. Water in the stilling pool is pumped back to the coal wash plant for use in operations. This is a closed-loop system. A new pump platform has been placed in the stilling pool prior to the last inspection.

All of the dikes in this area appeared stable and in good condition. The west dike of this area has been noted in previous inspections to have sparse vegetation. The vegetative cover of this dike is now improving and establishing itself over the area. Several small pine trees were also observed on the west dike and need to be removed by pulling them up and compacting the holes with clay.

FOSSIL PLANT
ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Coal Wash Fines Pond #3

Fines Pond #3 is located northwest of Fines Pond #2. The first lift was completed in October 1992 and all sluicing was diverted from Fines Pond #2 to this area. The latest lift was finished in September 1999, and the sluice discharge was changed from the east to the west end of the pond. The discharged point was moved from the west end to the east end. The overflow discharge structure (picture21). removes the water and discharges into a riprapped ditch (pictures 22 &23) which flows into Fines Pond #2 and then into the stilling pool.

A dike was constructed around the cemetery to the north of this area to protect it from pond water. A dike was also constructed in the northeast corner of this area extending from the southeast corner of the cemetery eastward to the exterior dike for pond #3. This dike was constructed to preserve the aesthetics of the cemetery so it would not be surrounded by the future fines stack. All dikes in this area appear to be stable but have some seepage. There is no or little grass on the slopes or covered areas (pictures 24, 25, 26, 30, 31, 32 & 33).

The slopes and covered area are scheduled to be reseeded in April 2000.

Six seeps/wet areas were found adjacent to the west side of the cemetery. They are of equal elevation and two hundred feet long (pictures 26 - 30). Seeps 1,2 & 3 are flowing while 4 is soft over a large area and 5 is flowing. These were revisited on May 19, 2000 and a sixth seep was identified east of #1 seep. All of the seeps were flowing. There is a ramp between 3 and 4. Junior Brendle is to put in a sixty degree weir (location picture 26) to monitor the flow.

A slide 29.5 feet long and 10.3 feet high developed the first week of May. And a fix is being studied. This slide occurred the week of May 8, 2000 and was at the toe of the part of the dike that was designed and shown on the drawings as a 4:1 slope and constructed at 3:1 (picture 34).

Several of the new culverts were put in high (picture 31 - 33) and do not drain. This must be corrected or the grass cover will be killed after it is established by acidic water.

Erosion @ Pipe Dam - East of Pipe Discharge

Recommendations:

- Plant personnel should continue to periodically mow grass and remove small trees and brush from all dike slopes. Plant personnel should pull up all trees and compact soil back in the holes.
- Plant personnel should also continue to maintain all dike roads.
- Plant personnel should monitor the exterior dike slopes for seepages or wet soft spots or animal burrowing, etc. and notify Fossil Engineering of any changes.
- Continue to monitor the survey controls installed on the exterior dike slope of Area 2B slag pond adjacent to Green River for any indication of slope movement.
- The slough on the interior slope of the RW #3 east dike should be monitored by plant personnel and Fossil Engineering should be notified if the condition changes.
- Remove the vegetative growth from the entrance to the horizontal discharge pipes in RW #3 so that flow does not become inhibited during periods of heavy rainfall.
- Plant personnel should repair the ruts on the top of redwater pond #3 dikes by filling with earthfill and regrading to provide positive drainage.
- Repair the perimeter of coal yard drainage basin #3, by compacting clay in the erosion gullies and seeding.
- Clean out all of the coal yard drainage basins and all of the redwater ponds, especially RW #2, #3 & #4 ponds, repair the pumps in coal yard pond #2 so no water flows through the emergency overflow.
- Continue to remove any vegetative growth and/or beaver dams that may be blocking the spillway from the slag area beaver pond. The adjacent dike should be monitored to insure that it is stable and that the area does not remain saturated. A minimum freeboard of 2 feet is desirable.
- The erosion gully at the southwest end of the dike in the slag area should be repaired by placing riprap in the area to prevent any additional erosion. Bottom ash should be placed and compacted at the edge of roadway to avoid further erosion and encroachment of road. Additional riprap should be placed under the outlet of the existing drain pipe.
- Plant personnel should repair the toe of the dikes around Jacobs Creek ash pond by replacing the excavated earthfill along the toe of the dike and compacting to a uniform slope.
- Plant personnel should repair the eroded area from the borrow area at the storm water discharge outlet to the waters of the U. S. by placing riprap or boulders from the borrow area at the outlet.
- Slope stake the gypsum stack to identify berm location, finish grading per survey and place temporary cover on side slopes.
- Plant personnel should repair the eroded area at the discharge outlet of the east dredge cell pond by placing riprap at the outlet; fill the eroded area adjacent to the ditch with compacted earthfill, line the area with a filter fabric, and cover with riprap.
- Repair the erosion gully adjacent to the overhead conveyor so that the foundation of the conveyor is not undermined. This area should be filled with earth, compacted, and covered with riprap.
- Plant personnel should stack coarse and medium coal wash refuse according to engineering design drawings (sides slopes, berms, etc.).

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ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

- Place cover on all coarse and medium coal wash refuse areas which have reached final grade.
- Check the weir at the cemetery daily unless the seepage is constant, then at least twice a week. Report any increases to Joel D. Paris @ 751-3515 or John Albright 751-3981 in Chattanooga.

FOSSIL PLANT
ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

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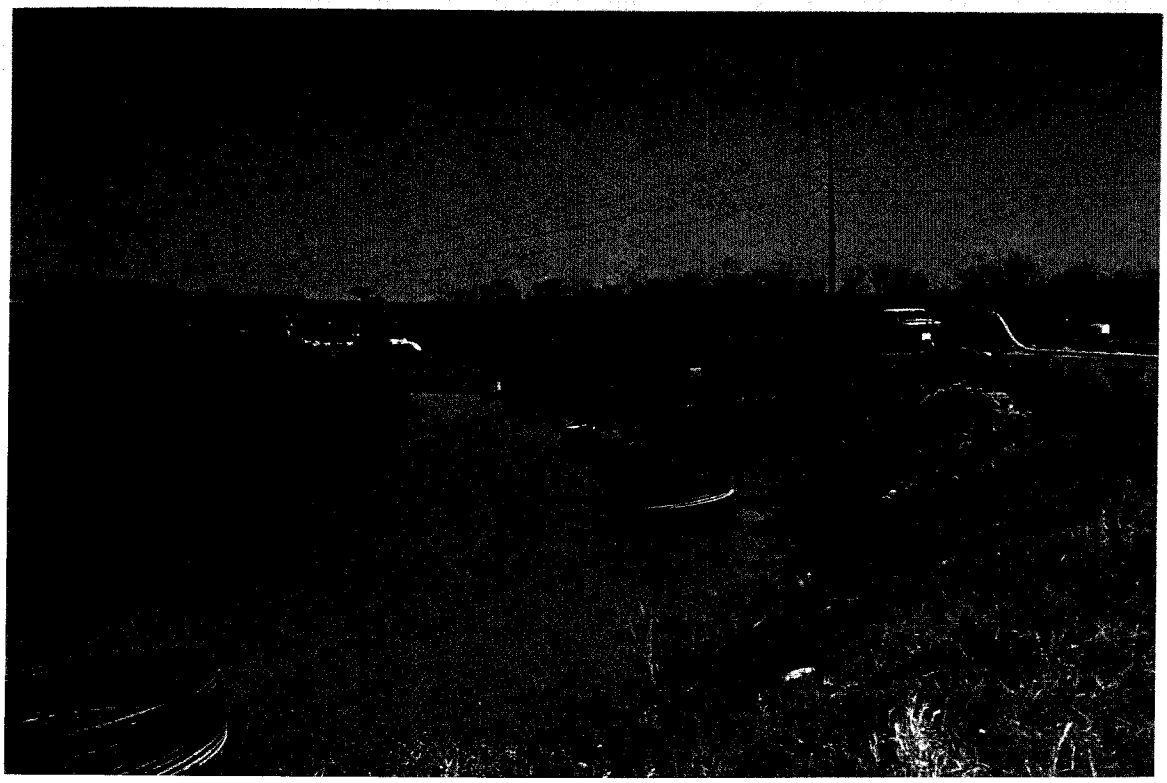
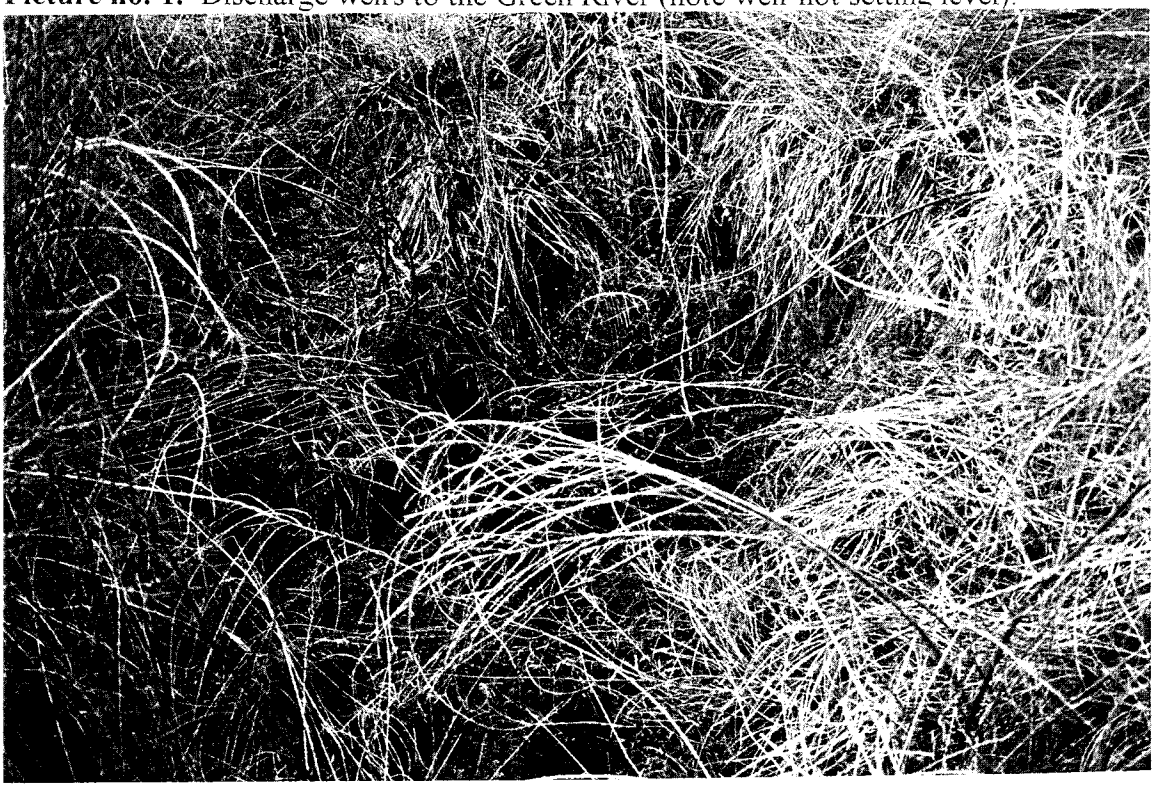
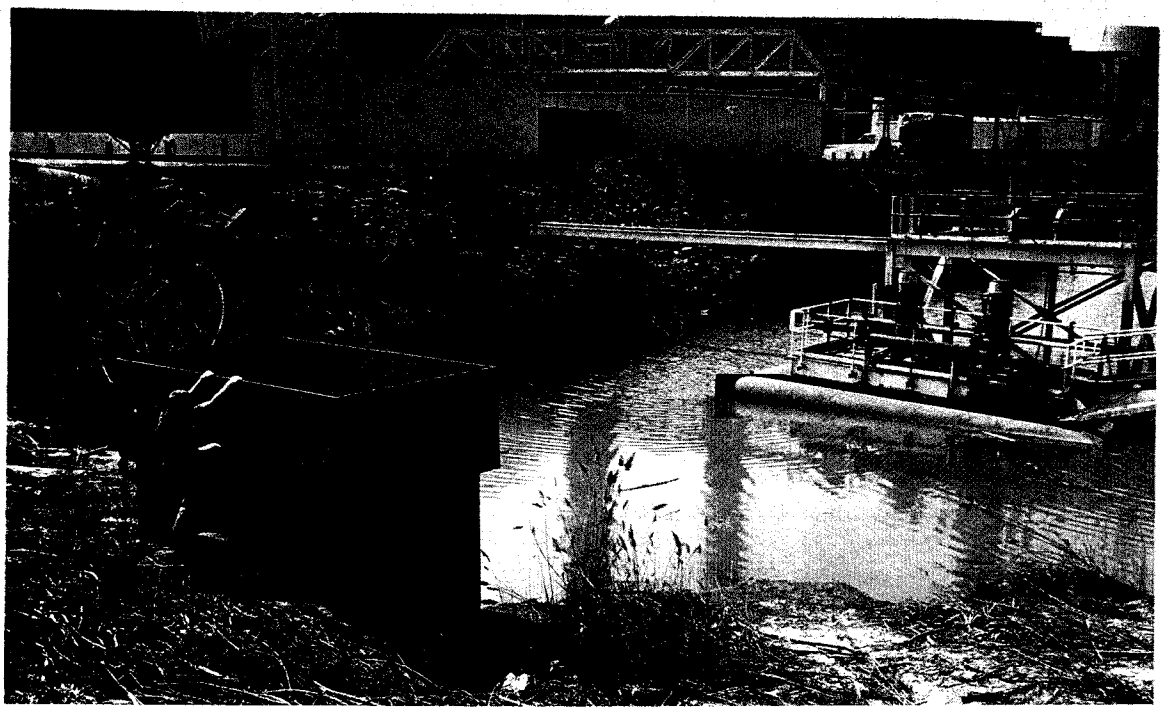


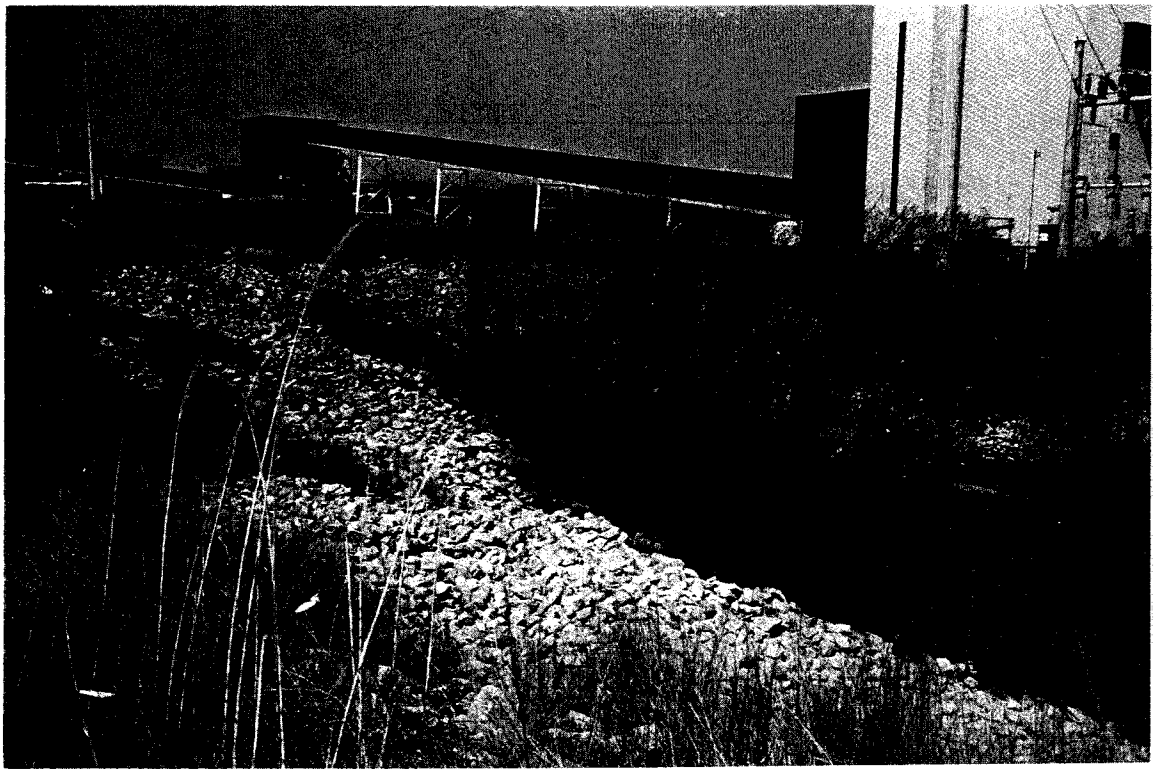
Picture no. 1. Discharge weirs to the Green River (note weir not setting level).



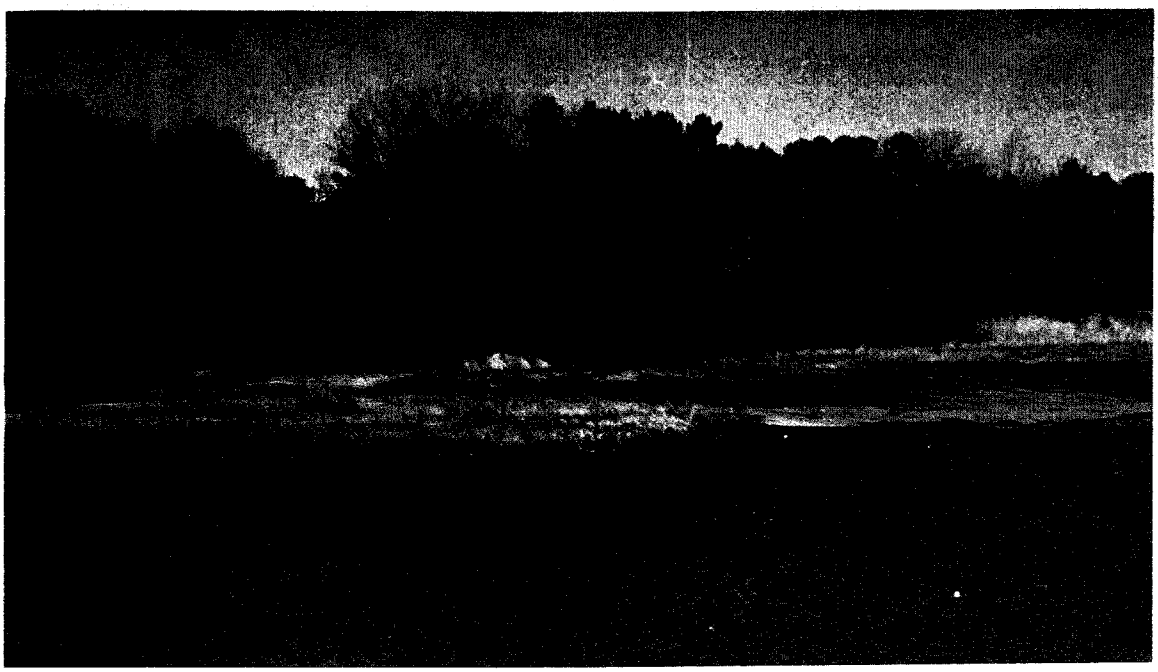
Picture no. 2. Rut river side of stilling pool.



Picture no. 3. Redwater Pond #1 & discharge structure.

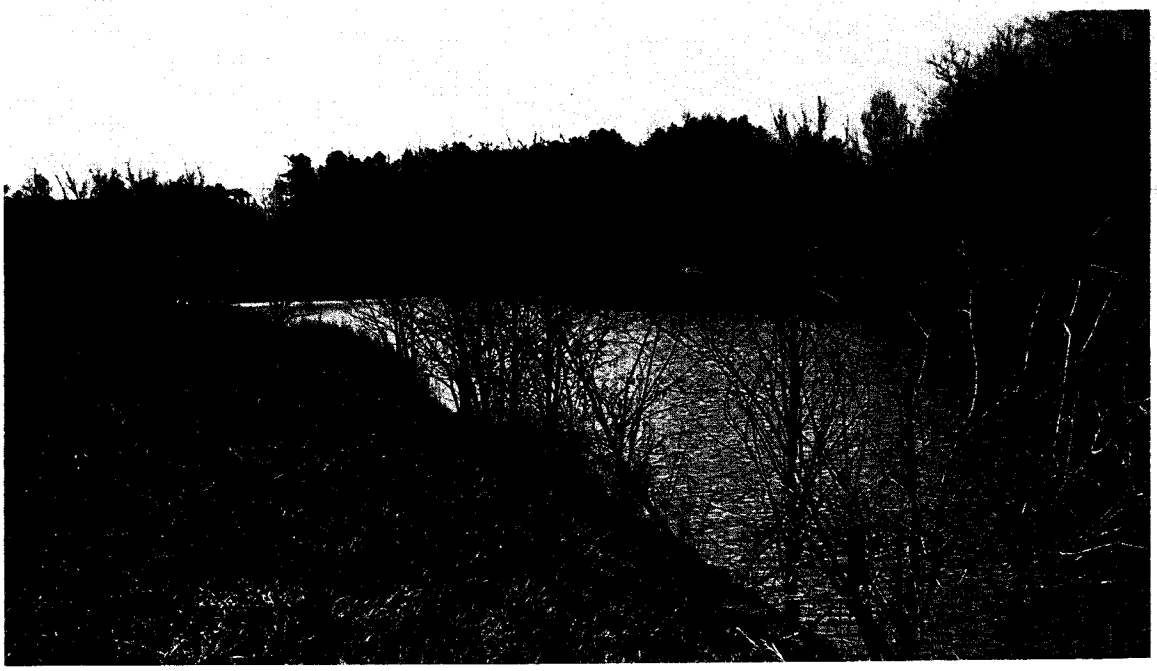


Picture no. 4. Redwater pond #2. Needs cleaning.

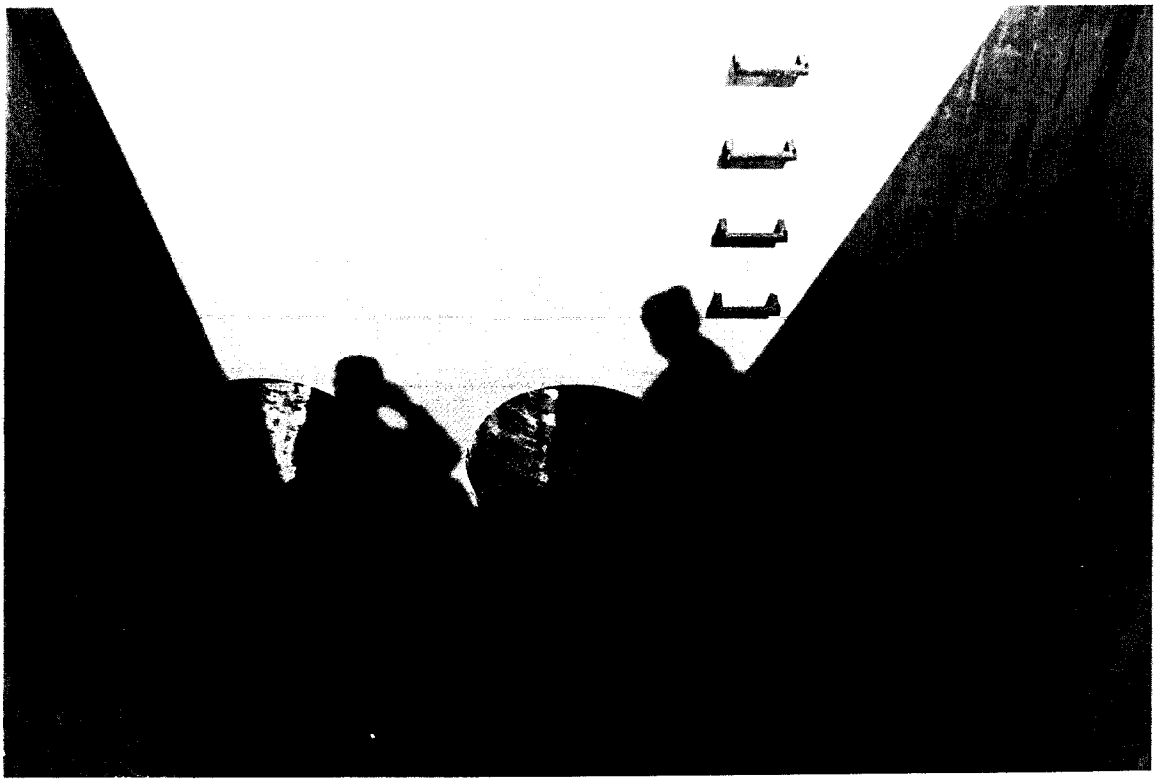


Picture no. 5. Sedimentation in redwater #3 that needs to be removed.

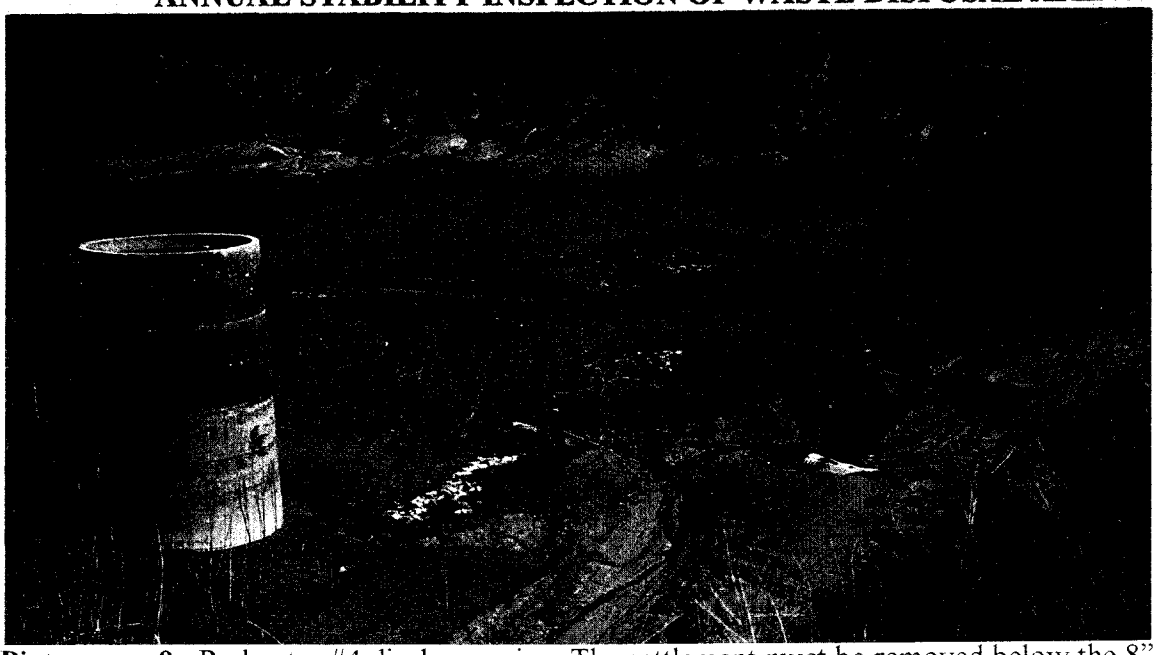
Picture no. 6. Thick vegetative growth blocking the flow in the pipes which flow from redwater #3 to Jacobs Creek ash pond.



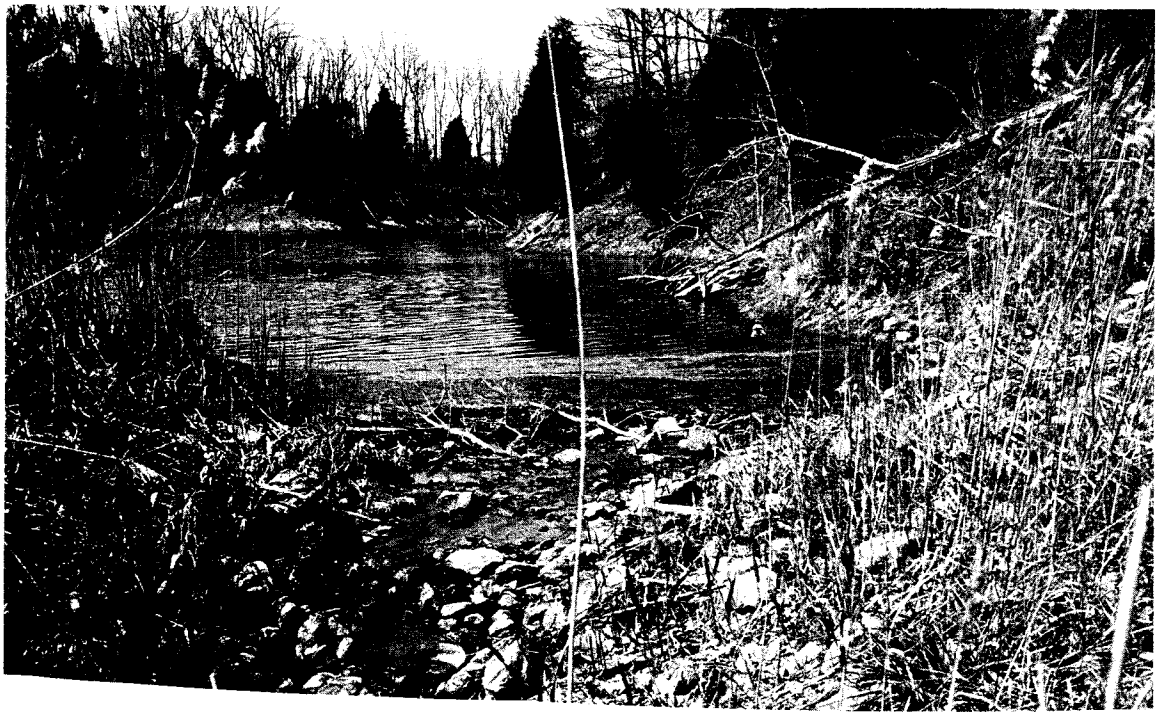
Picture no. 7. Trees on the inside of redwater pond #3 that needs to be removed.



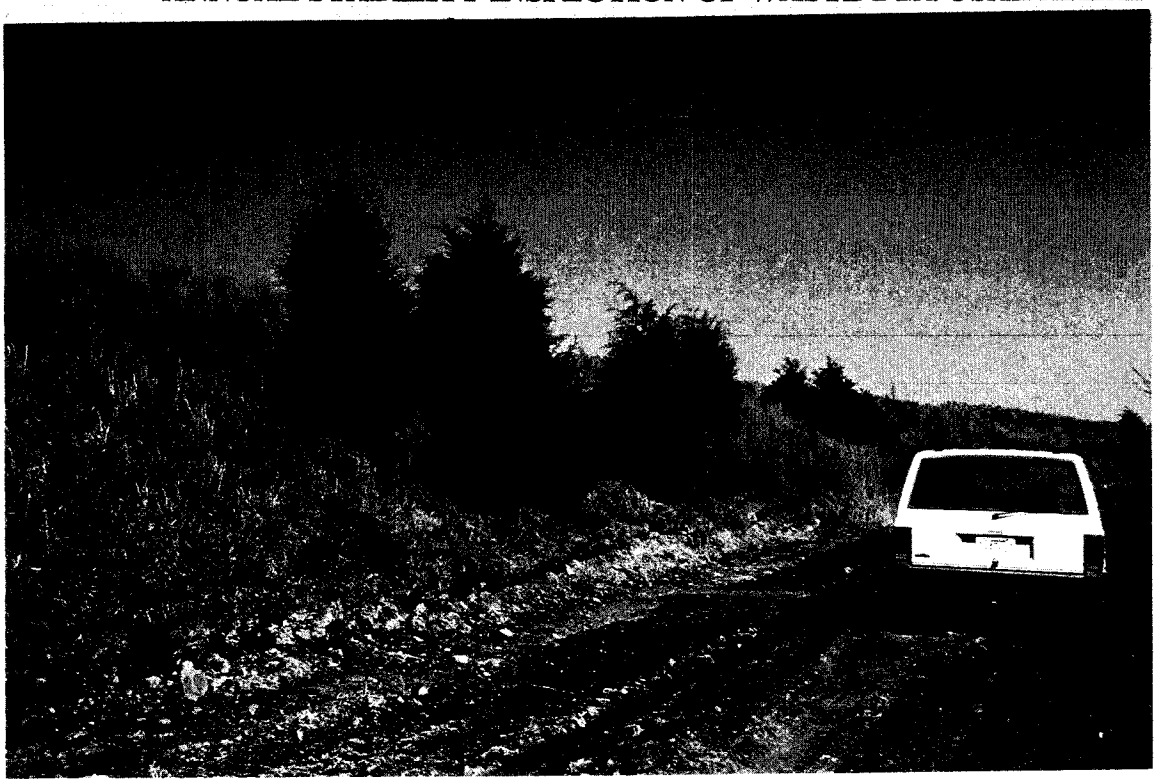
Picture no. 8. The three pipes from RW #3 into transition box.



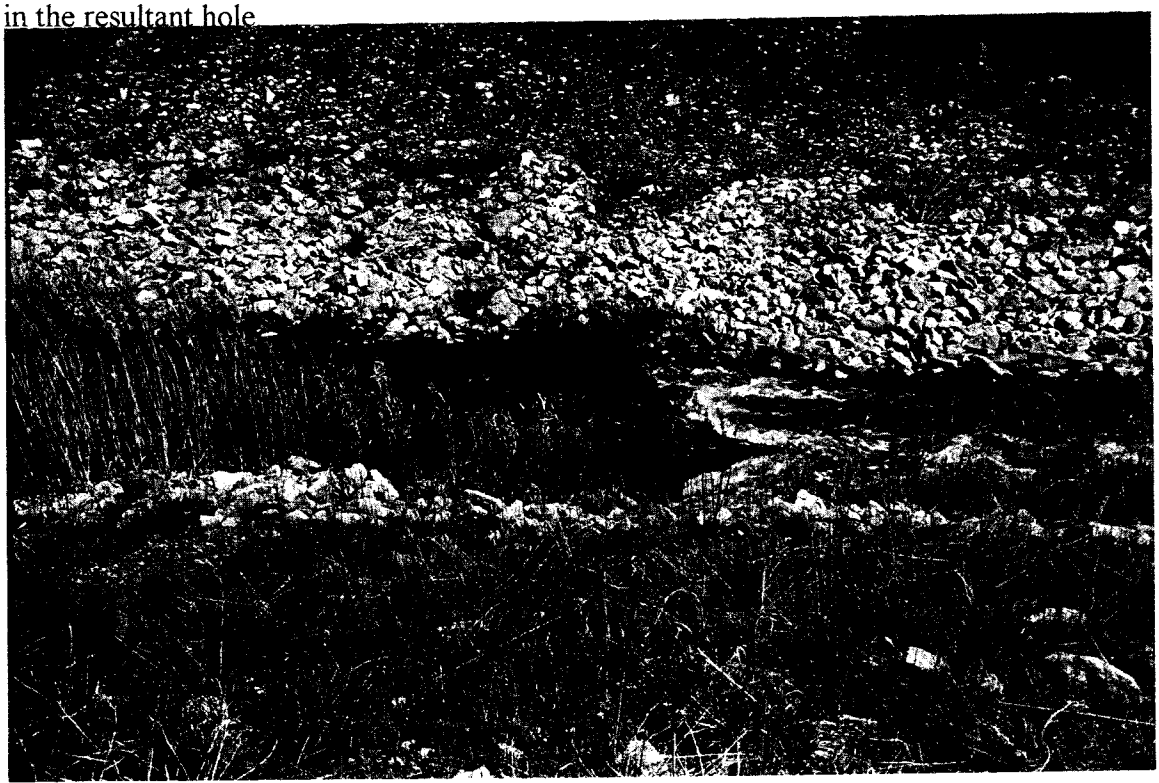
Picture no. 9. Redwater #4 discharge pipe. The settlement must be removed below the 8" pipe to stop the ditch from filling.



Picture no. 10. Slag area discharge. Note beaver dam removed.

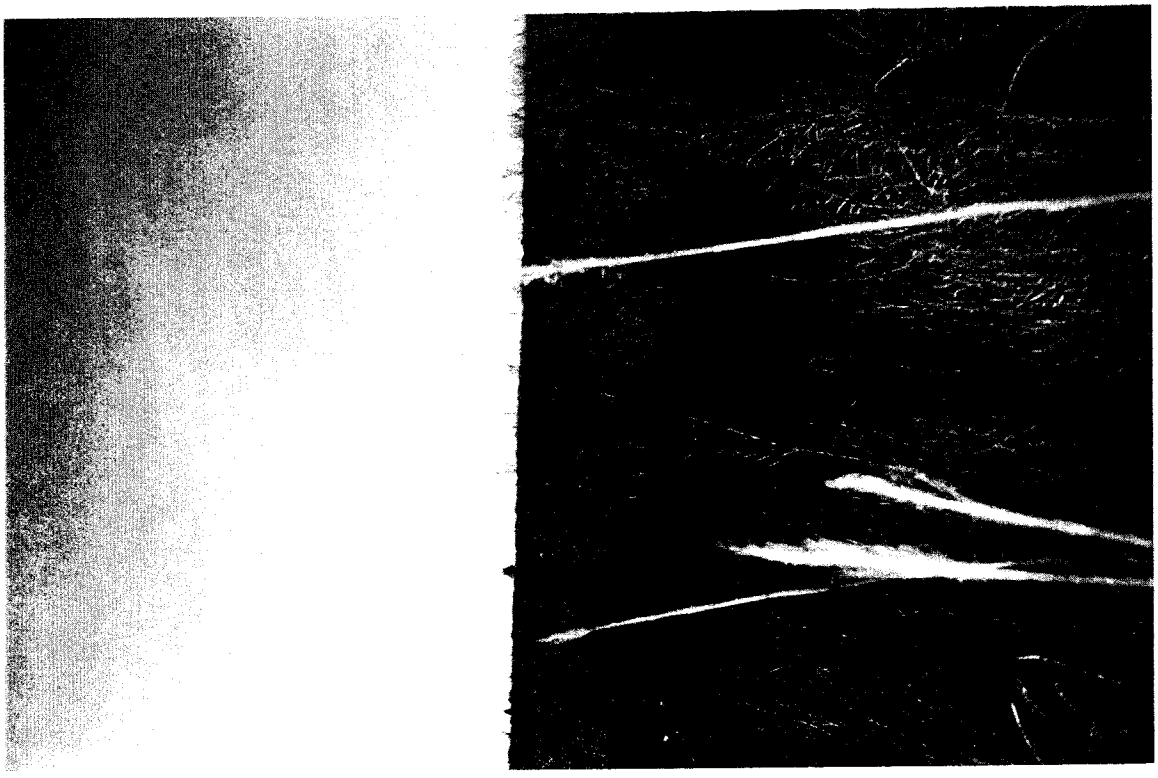


Picture no. 11. Jacob's Creek Ash Pond showing trees that need to be pulled up and earth compacted in the resultant hole.



Picture no. 12. Riprap drain from Jacob's Creek Ash Pond to Jacob's Creek Ash Pond Extinction Pond.

Picture no. 13. East Dredge Cell (note grass cover on ash).

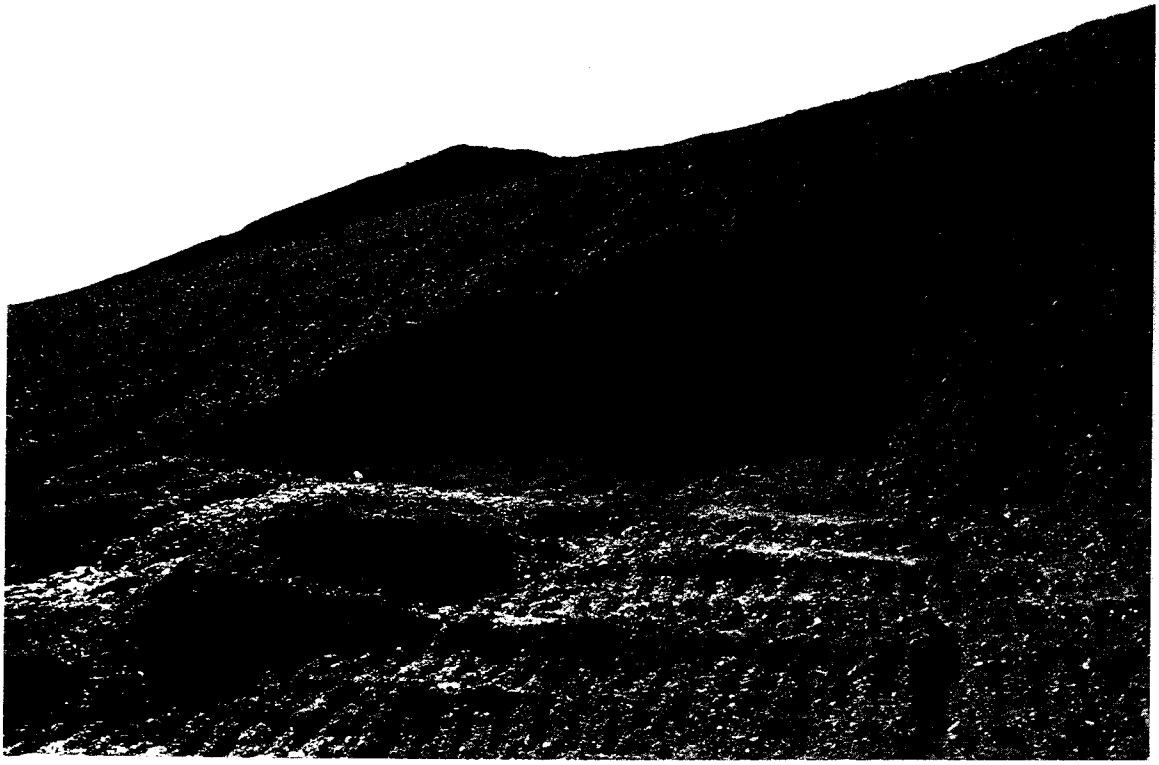


Picture no. 14. Large erosion gullies on the east side of east dredge cell and about the middle of the dike.

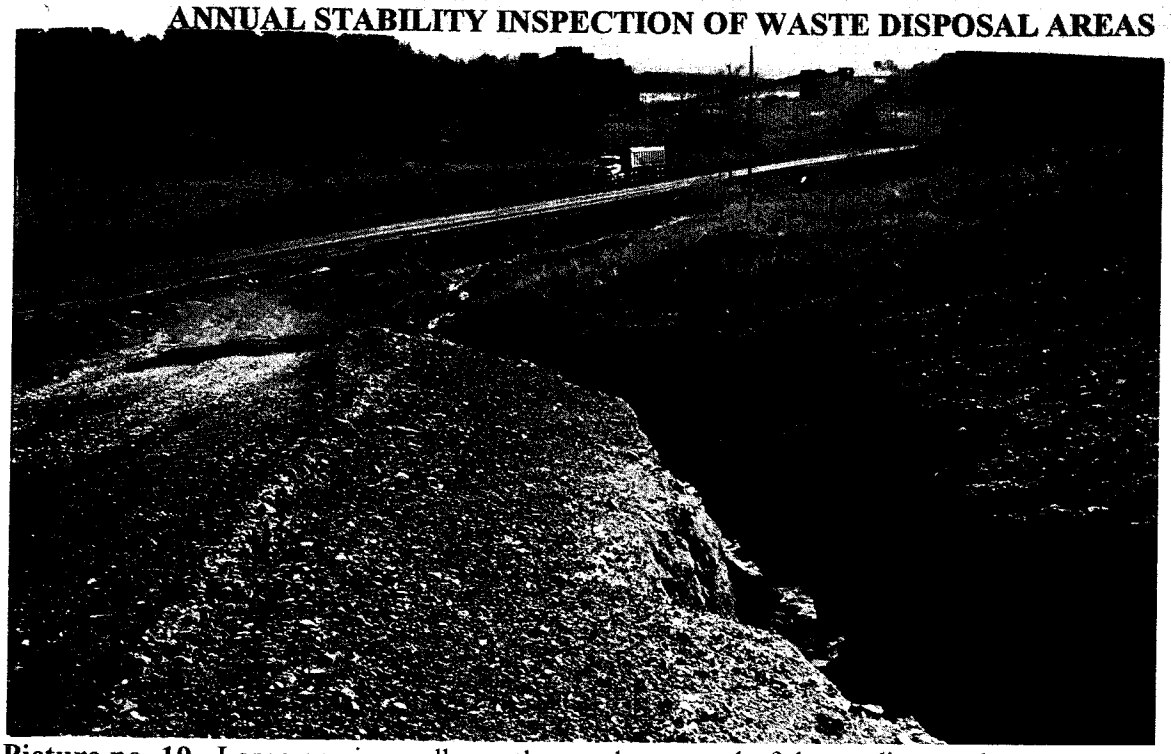
Picture no. 15. East Dredge Cell outlet showing wash out 3' wide 3' deep and 6' long.

Picture no. 16. Large erosion gully on the north end of the East Dredge Cell. This needs to be filled.

Picture no. 17. Southwest corner of medium and coarse coal wash refuge area showing steep slopes.

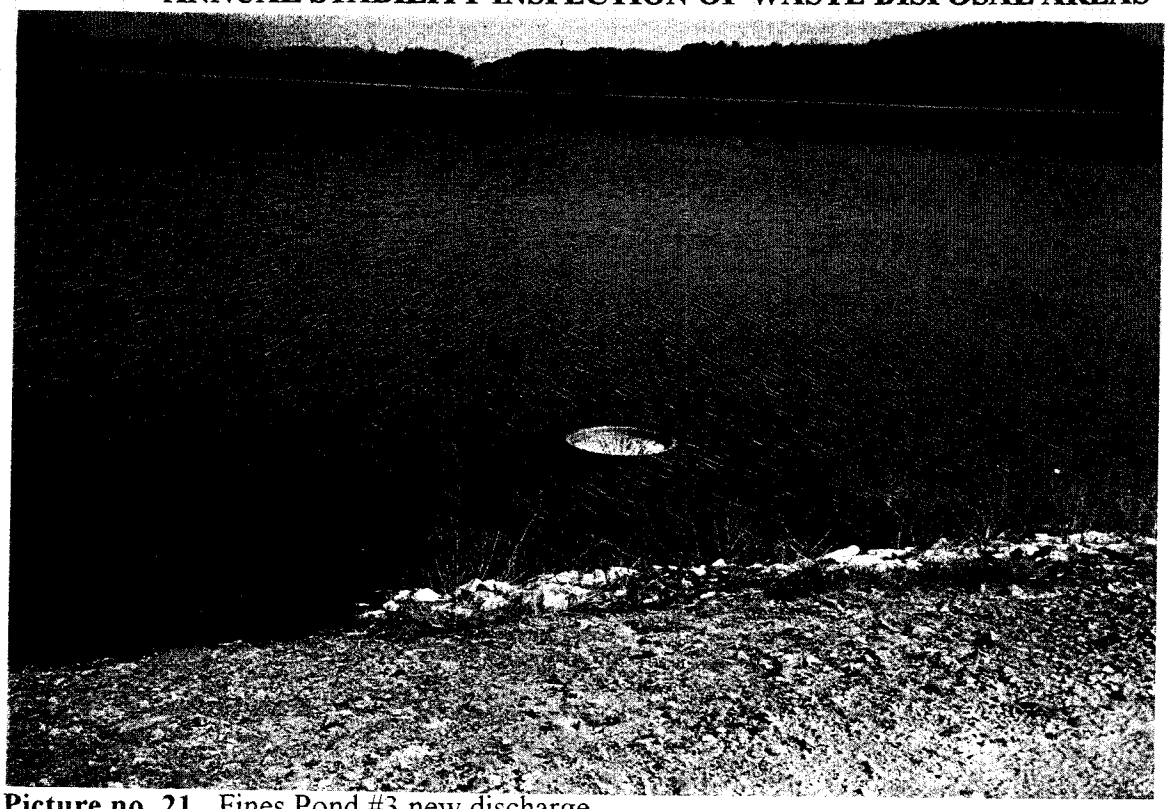


Picture no. 18. Southwest corner of medium and coarse coal wash refuge area showing failure due to steep slopes.



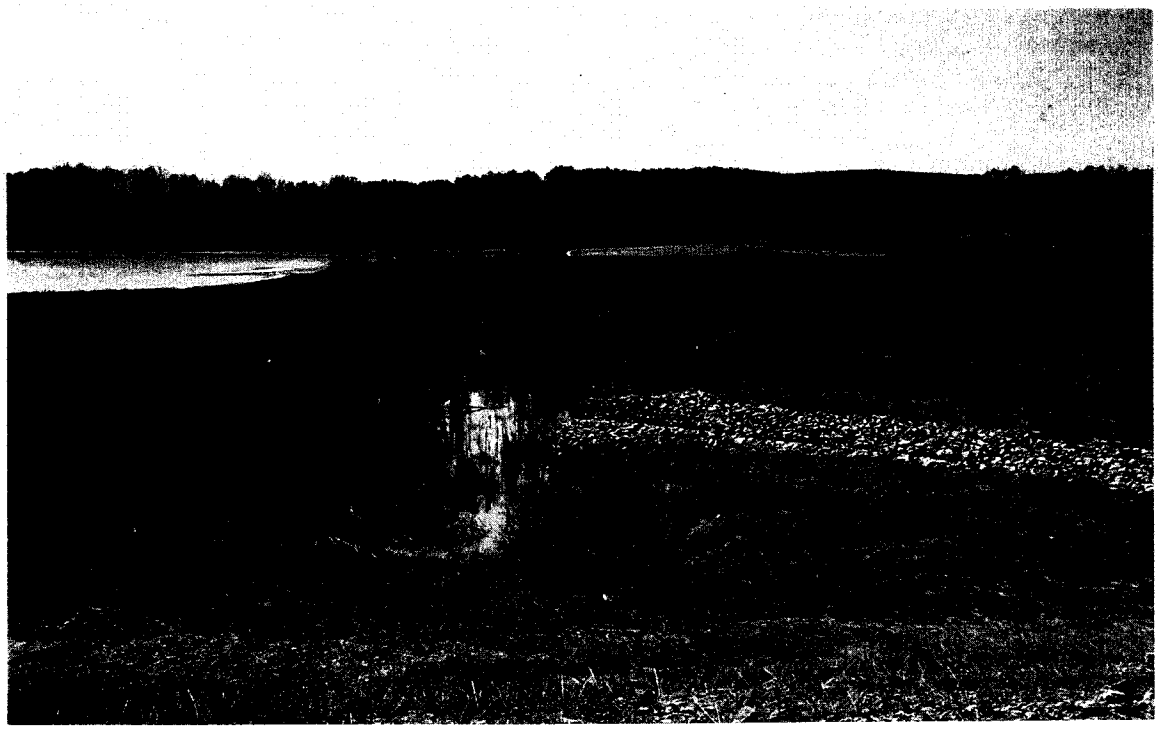
Picture no. 19. Large erosion gully on the northwest end of the medium and course.

Picture no. 20. Large erosion gully on the south side and about the middle of the saddle dam of the medium and coarse coal wash refuse area that needs to be repaired with 10 lb stones.

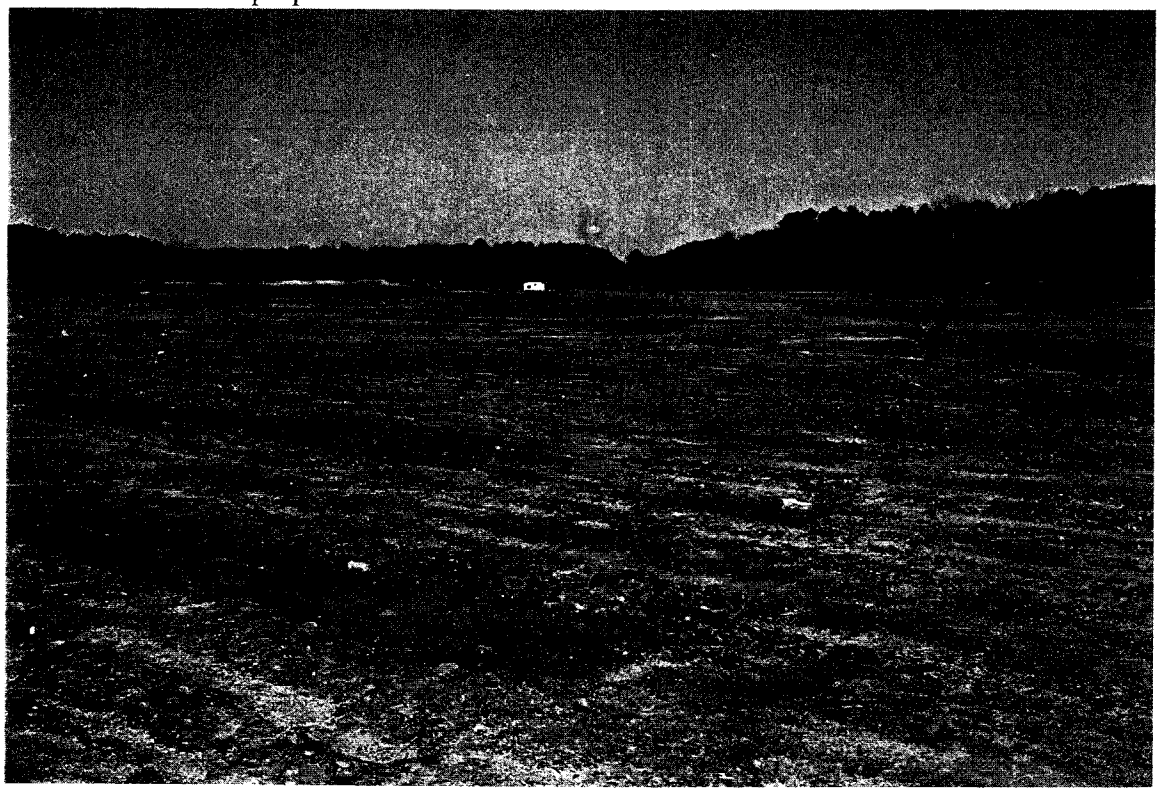


Picture no. 21. Fines Pond #3 new discharge.

Picture no. 22. Fines Pond #3 discharge.

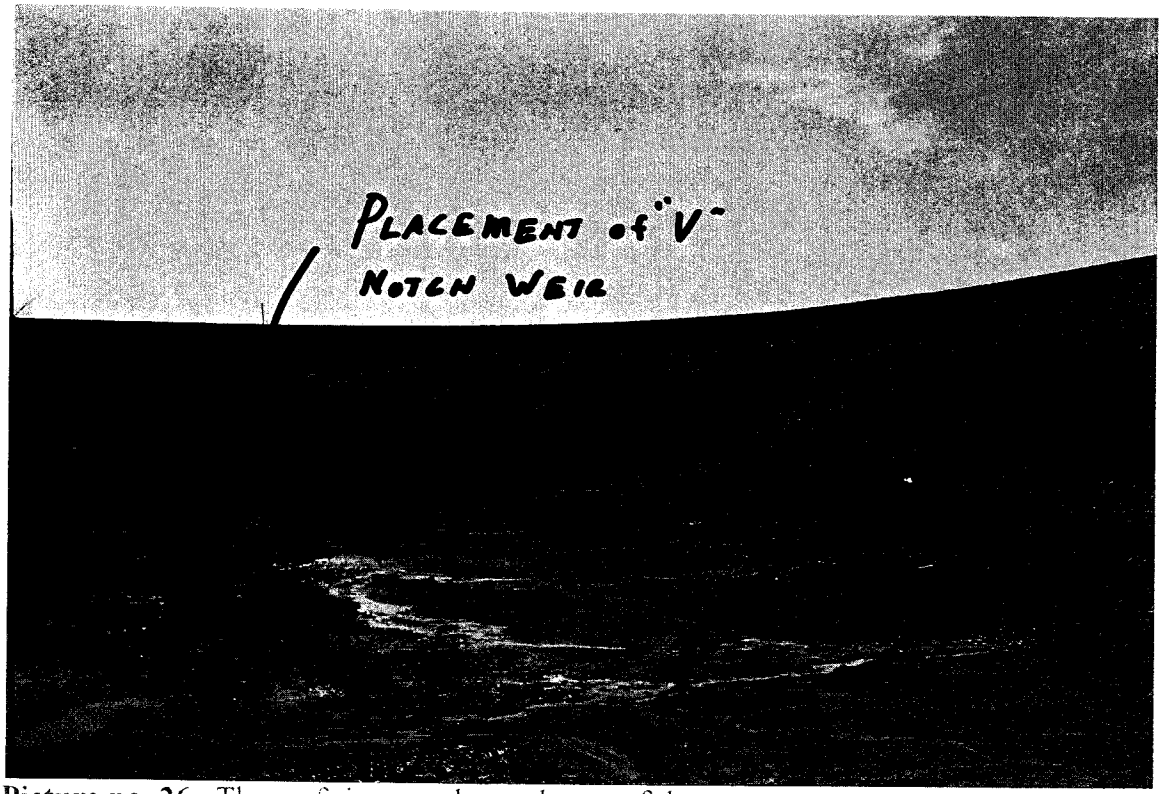


Picture no. 23. Riprap channel of Fines Pond #3.



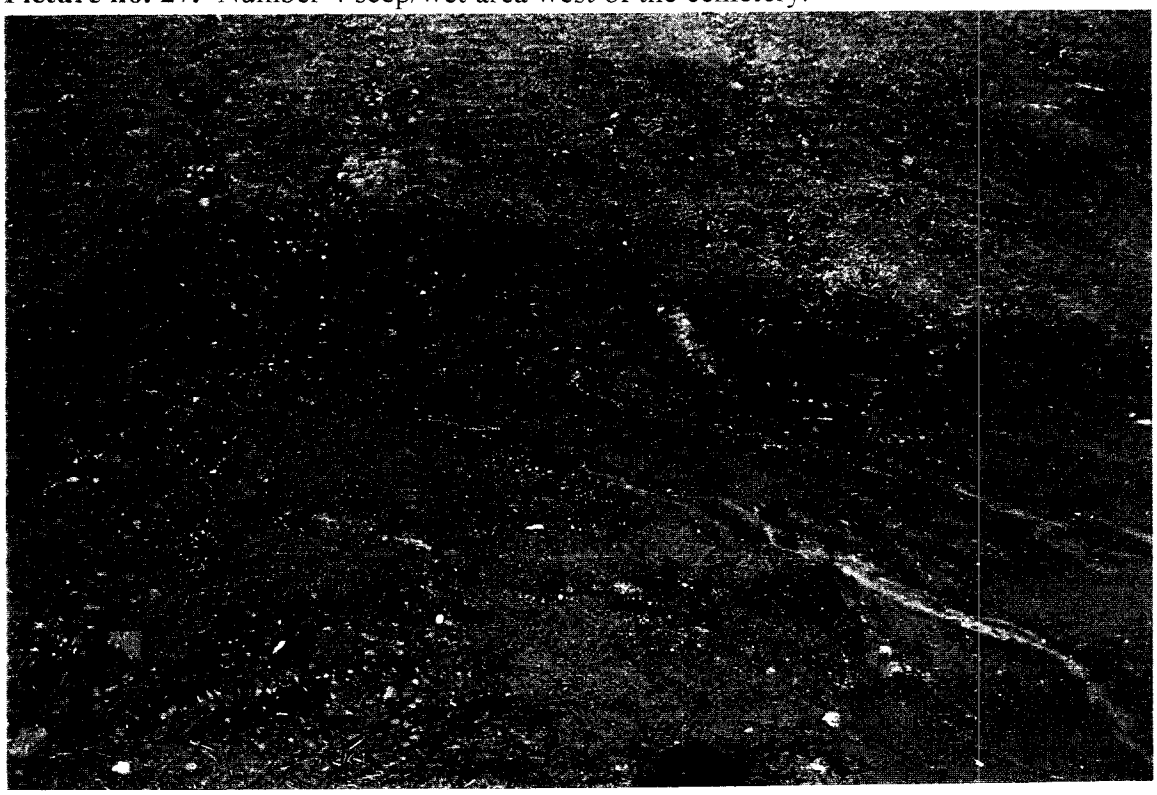
Picture no. 24. Capped area east of the cemetery showing lack of vegetation.

Picture no. 25. Typical grass cover of Fines Pond #3.



Picture no. 26. Three of six seeps located west of the cemetery.

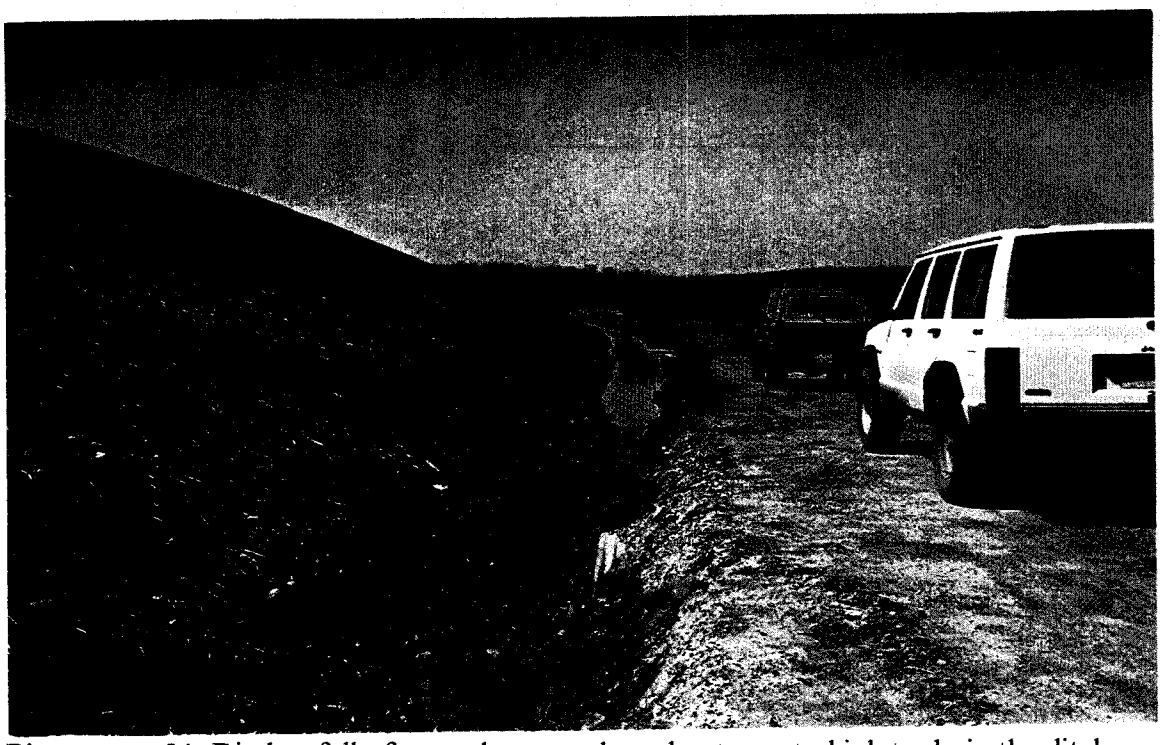
Picture no. 27. Number 4 seep/wet area west of the cemetery.



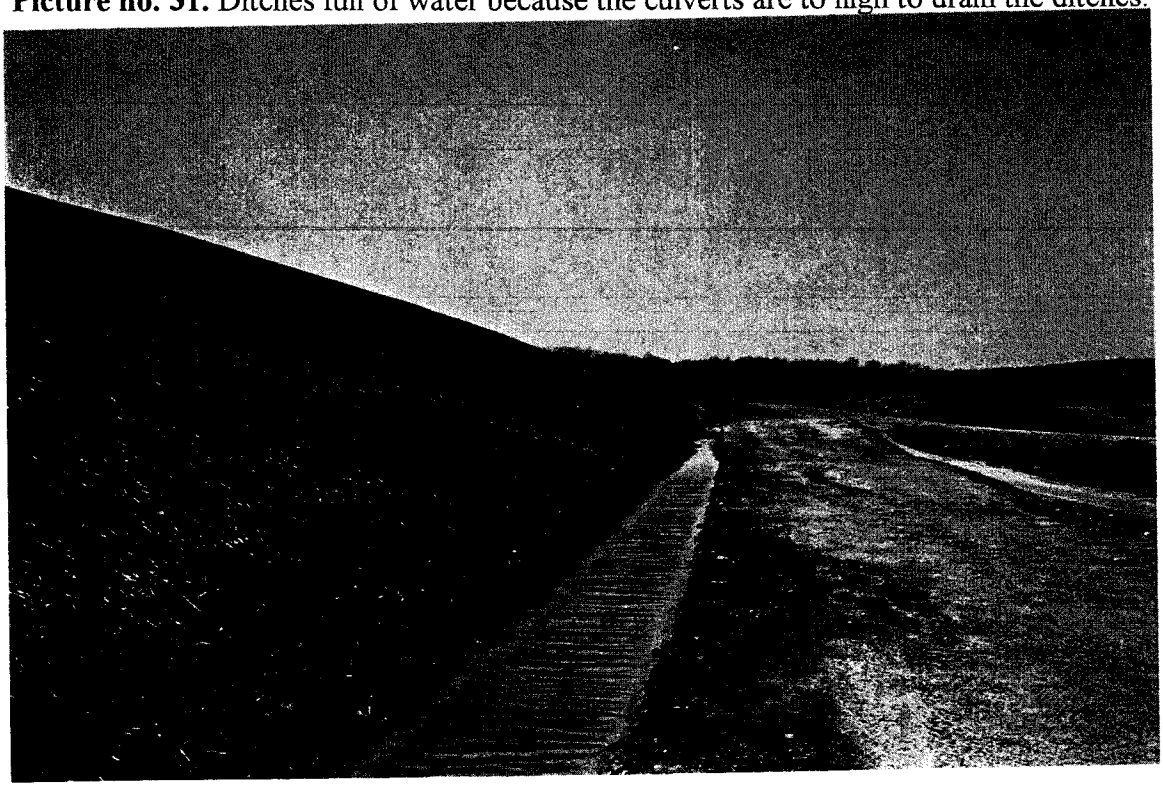
Picture no. 28. Number 5 seep area west of the cemetery.

Picture no. 29. Close up of seep #2 showing flow.

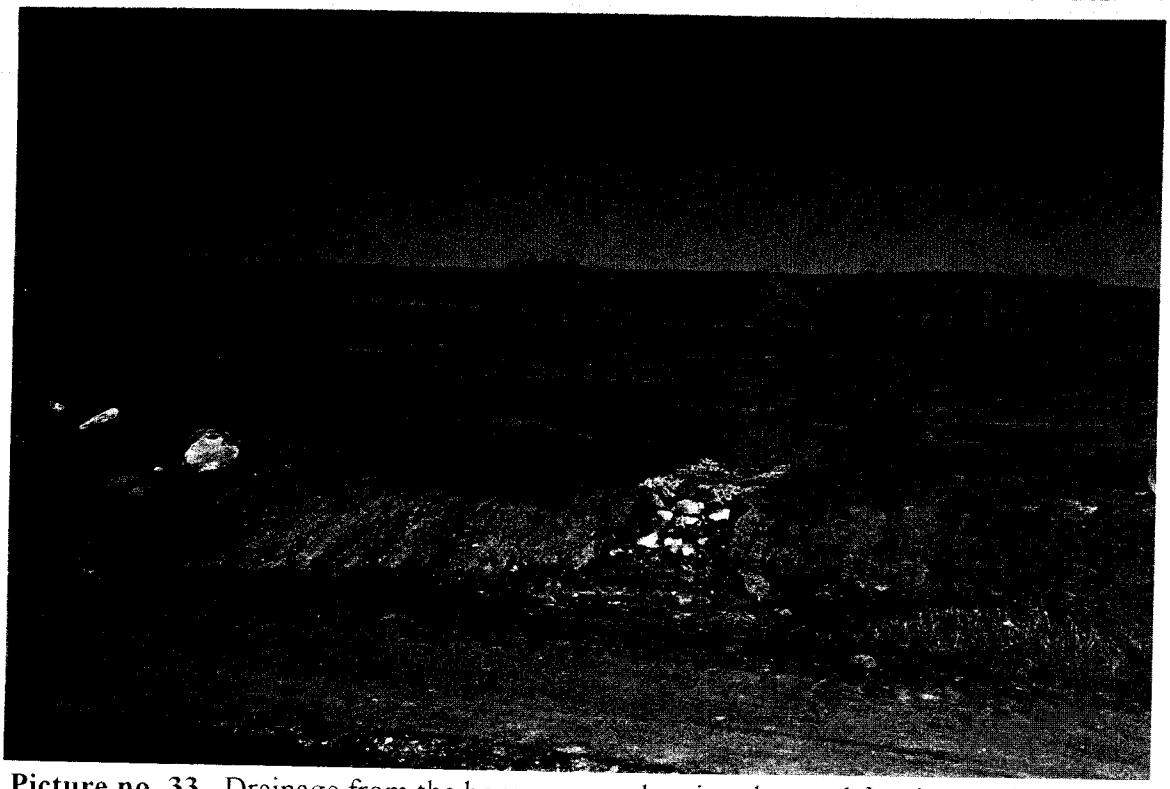
Picture no. 30. Ditches full of water because the culverts are to high to drain the ditches.



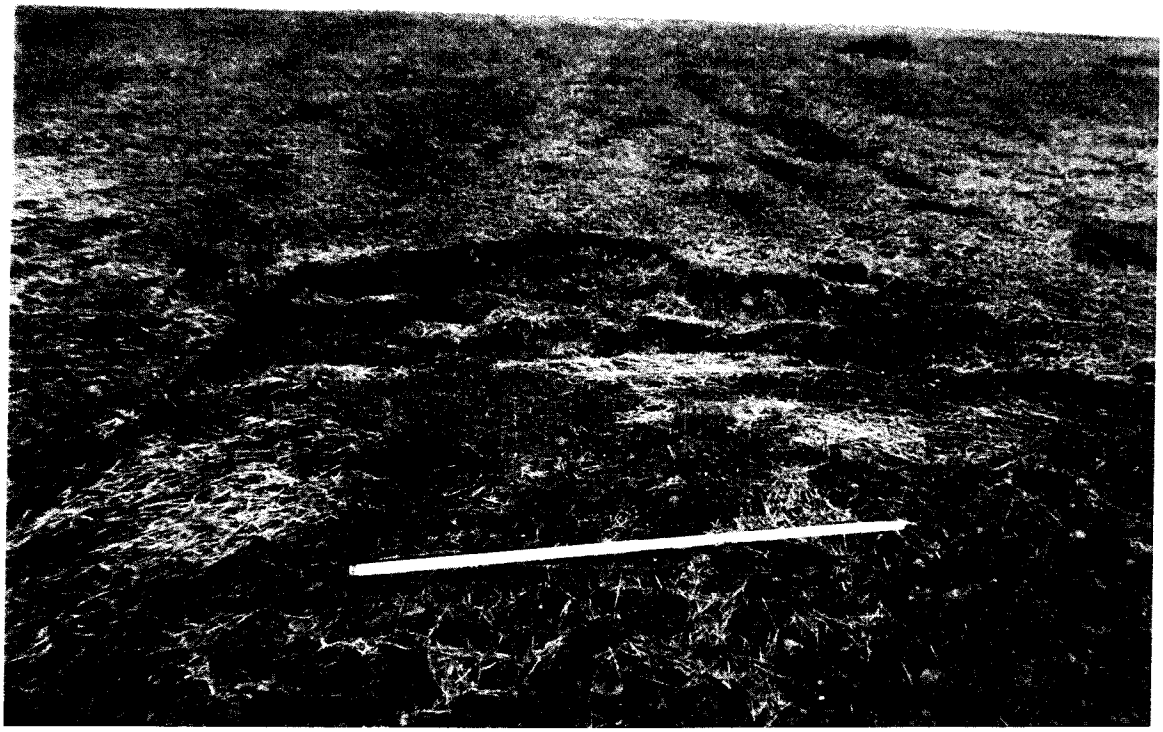
Picture no. 31. Ditches full of water because the culverts are to high to drain the ditches.



Picture no. 32. Ditches full of water because the culverts are to high to drain the ditches.



Picture no. 33. Drainage from the borrow area showing the need for riprap of 60% being 40 lb to 60 lb stones.



Picture no. 34. Slide 500 feet East of West end on the North Dike.

March 14, 2001

Gary R. MacDonald, Manager of Yard Operations
LP 5H-C

PARADISE FOSSIL PLANT - ANNUAL INSPECTION OF WASTE DISPOSAL AREAS

Attached is the annual inspection report from Civil Engineering on the Paradise disposal areas. The report includes a list of recommendations and we concur with those.

The plant Program Administrator (Environmental) will be provided a copy of this report in order to prepare a final report for certification by the Plant Manager and submission to the state as appropriate.

If you have questions or need additional information, please contact me at (423) 751-6846 or John Albright at (423) 751-3981.

Randall E. Johnson
Manager, Air, Gas And Water Systems
LP 2L-C

Attachments
jga:jga

cc(attachments):
J. G. Adair, LP 2L-C
Kimberly J. Dukes, PAF 1A-DRK
Gale A. Miarecki, PAF 1A-DRK
J. D. Preslar, LP 3K-C
Michael J. Tomes, PAF 1A-DRK
EDMS, EDMSVC

February 28, 2001

Randall E. Johnson, LP 5H-C

PARADISE FOSSIL PLANT (PAF) - ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Attached is a report from Joel Paris concerning the inspection of Paradise Fossil Plant's ash disposal areas.

This report includes recommendations for corrective work. I concur with these recommendations.

Please make necessary copies, forward to HED and others as needed, and return the originals to Joel Paris for filing with the other inspection reports.

R. E. Purkey
Manager, Civil Engineering
LP 2G-C

REP:JDP

TENNESSEE VALLEY AUTHORITY
PARADISE FOSSIL PLANT

ANNUAL STABILITY INSPECTION OF
WASTE DISPOSAL AREAS

Prepared By: Joel Paris
Date: February 28, 2001

PARADISE FOSSIL PLANT
ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Introduction

The waste disposal areas at Paradise Fossil Plant (PAF) were inspected for dike structural stability on January 8 and 9, 2001. The inspection was performed by Joel D. Paris of Fossil Engineering, John Albright of Systems Engineering and Steven Cary of Paradise Fossil Plant. The previous annual inspection was conducted on March 23 and 24, 2000.

The results of the annual stability inspection are listed below according to their location within the Paradise Fossil Plant Boundaries map attached.

Slag Areas 2A, 2B, and Stilling Pond

Boiler slag is sluiced into the south end of area 2A and is usually reclaimed once a day by Reed Minerals as part of a TVA marketing strategy. The sluice water then flows into pond 2B through pipes and around a series of baffles to lengthen the settling time. The sluice water enters the north end of the stilling pool through a concrete flume. The concrete flume appeared to be in good condition and only a shallow amount of water was flowing freely into the stilling pool. From here, three standard spillways (picture 1) discharge the water into the Green River if it is environmentally acceptable. If not, the water is pumped to the Jacob's Creek fly ash pond. The riprap at the outlet end of the spillway discharge pipes appeared to be in good condition.

The dikes appear to be stabile and did not exhibit any notable changes since the last inspection. A rut has developed from runoff from the road and needs to be repaired.(picture 2) The interior slopes of the dikes have a good vegetative cover. There was an access stairway built over the outlet end of the pipes into Area 2B. The plant continues to monitor the survey controls installed on the exterior dike slope adjacent to the Green River for any indication of movement.

Redwater Ponds (Nos. 1, 2, 3, 4 & 5)

Redwater Pond #1

Redwater pond #1 is located northwest of and adjacent to the powerhouse. All pumps, slopes, dikes and discharge structures appear to be in good condition (picture 3). Water collected in redwater pond #1 is pumped into the slag pond within Area 2B.

Redwater Pond #2

Redwater pond #2 (RW#2) is located northwest of and adjacent to Slag Areas 2A & 2B. The water from RW#2 is pumped from the center of the pond into the northwest end of slag ponds 2A. All slopes and dikes appear to be in good condition. However, the pond had sediment and a high level of standing water in it (picture 4). The Coal Yard Drainage Pond #1 drains into RW#2 via a 72" pipe. To function as designed, the water level in Redwater Pond #2 must be maintained at or below elevation 385, which is two feet below the outlet of the 72" pipe. During this inspection, the water level was above elevation 390. The submerged outlet of this pipe could cause a serious problem in RW#2 as well as up stream at Coal Yard Drainage Pond #1.

Redwater Pond #3

Redwater Pond #3 is a settlement pond and is located southwest of the powerhouse and along the south side of the county road. This pond collects the runoff and sediment from the medium and course coal wash refuse areas and discharges ~~to Jacobs Creek Ash Fly~~ Pond.

RW #3 can discharges to RW #1 via a gravity drain with a manual valve contained within the

discharge structure. This valve is opened when the pond is to be cleaned out. Otherwise three horizontal discharge pipes direct excess storage from #3 to the Jacob's Creek active ash pond during periods of rainfall.

The sediment in the RW #3 pond needs to be cleaned out as it is above the clean out access road (picture 5). There may be problems with the clean out because a sampling well has been placed where the crane was designed to set (picture 5) during the cleanout operation. The weeds in front of the discharge pipes have raised the discharge elevation by six inches. These weeds need to be cleaned out (picture 6). The three discharge pipes are all discharging equally into the transition box (picture 8).

There are several trees on the inside of the dike that need to be pulled up and clay placed in the resulting hole and compacted (picture 7). This should be done during pond clean out while the water is lowered. There were also small trees and brush observed on the top of the east dike. Rutted areas were evident along the top of the east dike and were holding water. The ruts appear to be caused by previous heavy equipment travel on the dike.

Redwater Pond #4
Redwater Pond #4 is a surge/sediment pond located east of the medium and coarse Coal Wash Refuse Area. This is a surge pond that settles out the fines and drains to #3 via an eight inch pipe into an open riprap ditch beside the road. An overflow structure drains runoff during rains exceeding the standard 10 year - twenty-four hour rainfall event directly to the Jacob's Creek fly ash pond thereby bypassing RW #3. The pond was to be cleaned out when the sediment reached the invert of the 8" discharge pipe. The fines are now above the 8" pipe (picture 9)and filling up the ditch beside the road.

Redwater Pond #5
Redwater Pond #5 is located south of the powerhouse, east of the truck coal dumping area and west of the limestone storage area. It is a surge pond designed to delay enough water going to redwater #1 to give the pond #1 pumps time to lower the water level. An overflow structure drains runoff during rains exceeding the standard 10 year - twenty-four hour rainfall event directly to redwater pond #1. All water collected in redwater pond #5 drains to redwater pond #1 via a gravity drain and no water is stored in RW #5 pond.

Coal Yard Runoff Pond #1
Coal Yard Runoff Pond #1 is located north of and across the plant access road from the Coal Wash Plant. This is a surge/sedimentation storm water runoff pond that delays runoff to RW #2. Water and sediment is collected in the pond and the decanted water is discharged through a six inch hole cut in the side of the stand pipe. This hole is not configured per the original design drawing.

Coal Yard Runoff Pond #2
Coal Yard Runoff Pond #2 is located southwest of and across an access road from Redwater #2 Pond. This pond was designed as a storm water sedimentation pond and all water from here to be pumped to slag pond 2A. CYRP#2 was full of water and sedimentation and was discharging through the emergency discharge pipe into RW #2 pond. Coal Yard Pond #2 was not originally designed as a surge pond but is now being operated as one. This pond is full and fines from this pond are discharging into RW #2. There were three pumps on the platform but no power is hooked to any of them. The pumps are designed to pump all water from this pond to Pond 2A. RW#2 was not designed to take this volume of water and sediment.

Coal Yard Runoff Pond #3
Coal Yard Runoff Pond #3 is located south of the coal transfer complex and north of and adjacent to the access road. This pond can discharge by gravity or be pumped to RW #1. Several erosion

2 NOT TRUE ?

gullies have developed around the perimeter of the drainage basin.

Slag Area

The slag area is located southeast of the powerhouse. The slag in this area was placed here by the plant and is currently being reclaimed for commercial use by Reed Minerals personnel. The area contains a small surge pond to collect runoff and a larger area, called the beaver pond, which discharges over a spillway and down a riprap channel into Jacobs Creek. The riprap appears to be in good condition. The beaver dam that was restricting flow to Jacobs Creek has been removed (photograph 10). Plant personnel have continued to frequently monitor this area and clean out any beaver dams.

The dikes appear to be stable with a good vegetative cover on them. The redwater seeps identified in earlier reports along the southwest dike in this area are still present. Some of the red water seeps continue to have growing deposits of material. Plant personnel monitor these areas frequently. The erosion gully, observed on previous inspections, located at the end of the southwest dike just north of an existing culvert has worsened. The eroded area has encroached upon the roadway and should be repaired before further encroachment occurs.

Jacobs Creek Fly Ash Pond Area

This area is located southeast of the powerhouse. Fly ash is sluiced into the northern portion of the original pond. Water flowed through a divider dike with a floating boom skimmer structure and into the stilling pond before being discharged into Jacobs Creek via three standard spillways. The skimmers and floating boom in the stilling pool have been removed and the opening in the divider dike filled. Water now flows through a dike breach in the southwest portion of the ash pond then into the Fly Ash Pond Area Extension (the new ash disposal area).

The divider dike had several trees that must be removed by pulling them up and compacting clay in the holes. The sloughing area that was noted in the previous ash pond inspection report on the south dike just west of the divider dike was still present.

The dikes appear to be stable and do not exhibit any notable changes in there exterior since the last inspection. There are several trees growing on the dikes (picture 11) that were listed in previous reports. The trees must be pulled up and earth compacted in the hole.

There were several surface slough failures observed along the south dike due to removal of material at the toe of the dike. The toe of the dike was cut back when the road was graded for heavy equipment travel during the construction of the Fly Ash Pond Area Extension. The depth of cut is 18 inches in places and the slough will worsen as the toe of the dike is further encroached on. A portion of the toe of the dike has been repaired at the northeast end of the stilling pool. Earth fill has been placed at the toe and compacted to make a uniform slope. There was a 75' long slough area located on the northeast end of the dike. This was also caused by removal of material at the toe of the dike by TVA while cleaning out the ditch along the county road. There was flow from the pipe at the time of this inspection from seepage of the north dike of Jacobs Creek Fly Ash Pond.

There was also some vegetation blocking the outlet of the 42" pipe from redwater pond #3

Fly Ash Pond Area Extension

This disposal area was put into operation in September 1997. The area is located adjacent to and south of the existing Jacobs Creek Fly Ash Disposal Area. Dikes in the southern and eastern portion of the area were raised from approximate El 400 to El 408. The existing dike of Jacobs Creek Fly Ash Disposal Area was breached at the southwest end of the pond. This allows water to flow into the new pond and around the installed concrete pipe that maintained a water cover over

the ash in the Jacobs Creek Fly Ash Disposal Area. Flow is uniform and non-eroding through the ash pond. Riprap in the breach and channel were in good condition (picture 12). After the ash settles out, the water flows into a stilling pool in the northeast portion of the pond through a divider dike with a floating boom. Water is then discharged through three 48" vertical spillways, with skimmer structures, and out through three 36" diameter concrete pipes to Jacobs Creek.

The spillway structures appear to be operating properly. All three outlets were discharging at the time of inspection. The riprap at the spillway discharge outlets appeared to be in good condition. There is a stairway for access from the top of dike to the discharge pipes for monitoring purposes. Dikes were constructed in the southern and eastern portion of the area. The dike slopes have established vegetation. The road on top of the dike needs additional crushed stone surfacing. All exterior dikes appear to be in good condition with no visible signs of instability.

There was a beaver lodge located on the north portion of the area. Plant personnel should monitor the dikes for beaver activity and take immediate corrective action.

Scrubber Waste Wet Ponding Area

This area is located in the southwest corner of the TVA reservation. Scrubber waste is sluiced into the northern end of this region and stacked by long reach track hoe via the rim ditch method. Scrubber waste is sluiced through the ditch formed by the exterior dike and an interior separator dike to the western corner of the area to allow that area to fill with scrubber waste. Water is discharged from the scrubber pond to a settling pond by a vertical spillways. The stilling pool water discharges from the stilling pool through a vertical spillway into a ditch that empties into the Jacobs Creek Fly Ash Pond a half mile away.

The discharge pipes from the scrubber pond to the settling pond appear to be in good condition. The standard spillway out of the stilling pool was in good condition.

The exterior dikes in this area appear stable with a good vegetative cover and did not exhibit any notable changes since the previous inspection. However, there were small trees and brush observed on the south dike that need to be pulled up.

West Dredge Cell

This area, located just east of the scrubber wet ponding area, was constructed to accept dredged fly ash from the Jacobs Creek pond area. No material has been dredged into this cell at the time of the inspection.

Plant personnel had installed a valve, at Fossil Engineering's request and in accordance with design drawings, on the outlet pipe for the underdrain system for this cell. This valve is used to drain the cell only during recovery operations. The valve was properly closed at the time of this inspection. Runoff water is now collecting in the cell because the riser boards were installed in the spillway riser. Water should not be allowed to stand in this cell.

The dikes appear stable and did not exhibit any notable changes since the last inspection. All exterior slopes have an excellent vegetative cover. The erosion observed on the dike slope on the previous inspection at the southeast end of the pond was still present. The erosion gully observed on the previous inspection at the southwest end of the pond at the pipe outlet which drains the perimeter ditch of the scrubber pond into the west dredge cell was still present but does not appear to have worsened.

East Dredge Cell

This area is located just south of the medium and coarse coal wash refuse area. This cell was also constructed to accept dredged fly ash from the Jacobs Creek ash pond area. The plant has ceased all dredging into the pond at this time.

The spillway appeared to be in good condition (picture 13), but was not operating at the time of this inspection. The discharge pipe was clear of obstructions but had a large eroded hole (picture 15) 6' long, 3' wide by 3' deep. This hole needs to be filled with filter stone and riprap.

The dikes in this area appear to be stable. The tops of dike surfaces are in satisfactory condition, although some vegetation has established itself over the area. Removal of vegetation is not warranted at this time. The dredged ash was seeded two years ago and vegetation is good south of the discharge structure but sparse north of the discharge structure.

An erosion ditch was identified beside the armored ditch at the northeast corner of the dike in previous inspections. This erosion area, caused by runoff which has bypassed the armored ditch, is now over 4 feet deep, eight feet wide and one hundred plus feet long and is getting bigger with each rain (picture 16). The berm ditch was not draining properly near the middle portion of the eastern dike due to some rutting on the dike. Several erosion ditches were observed (picture 14). This appears to be caused by heavy sheet flow which concentrates to form the erosion gullies.

Sections of the geotextile fabric that was placed to protect the discharge ditch have been washed away by the erosive action of the water. The ditch was in good condition near the top of the slope due to placement of riprap on top of the geotextile. The berm ditch was not draining properly near the middle portion of the eastern dike due to some rutting on the dike.

Medium and Coarse Coal Wash Refuse Area

Currently, all of the material is transported from the silo to the stack by off-road vehicles. Plant personnel transport the refuse daily to the northwest portion of this region to be stacked. The material does not appear to be stacked according to the engineered final stacking configuration issued drawings. The material appears to lack compaction and has steeper side slopes (picture 17). The material has been dumped from the top rather than placed from the bottom. Areas of the side slopes appear to be at the natural angle of repose and slides have occurred (picture 18). The eroding ditch on the west side needs some large rocks or other material placed in it to retard erosion(picture 19). The west side runoff is by drainage ditches to Redwater Pond #3.

The areas which are at or above the engineered final stacking configuration issued drawings need to be compacted and covered. Runoff from the east side is collected in the original fines pond and discharged through a twelve inch pipe to a riprapped ditch down to Redwater Pond #4.

A good vegetative cover is established in the southeastern portion of the area. The erosion ditch on the saddle dam that was identified in previous reports was still present and should be filled (picture 20).

(At the time of this inspection, HED personnel were beginning a project which was to put this area back into the design configuration. HED was in the process of correcting many of the items listed in the paragraphs above. Final cover is to be placed on the areas of the slope that match finished grade. Plant personnel have agreed to take more care in following the engineered issued drawings and stacking plan for this area.)

Coal Wash Fines Pond #2

This disposal area is located in the northwest portion of the plant properties. The area is adjacent to

the railroad and on the north side of the plant access road. The original pond was completed in the late fall of 1987. The top of the original dike was at elevation 455. The plant raised the dike to approximately elevation 465 in 1990, and subsequently sluiced fines to this elevation. This area has not been active as a sluicing operation since Fines Pond #3 began operation in October 1992.

All of the dikes in this area appeared stable and in good condition. The west dike of this area has been noted in previous inspections to have sparse vegetation. The vegetative cover of this dike is now improving and establishing itself over the area. Several small pine trees were also observed on the west dike and need to be removed by pulling them up and compacting the holes with clay.

Coal Wash Fines Pond #3

Fines Pond #3 is located northwest of Fines Pond #2. The first lift was completed in October 1992 and all sluicing was diverted from Fines Pond #2 to this area. The latest lift was finished in September 1999, and the sluice discharge was changed from the east to the west end of the pond. The discharged point was moved from the west end to the east end. The overflow discharge structure (picture21). removes the water and discharges into a rip rapped ditch (pictures 22 &23) which flows into Fines Pond #2 and then into the stilling pool.

A dike was constructed around the cemetery to the north of this area to protect it from pond water.

A dike was also constructed in the northeast corner of this area extending from the southeast corner of the cemetery eastward to the exterior dike for pond #3. This dike was constructed to preserve the aesthetics of the cemetery so it would not be surrounded by the future fines stack. All dikes in this area appear to be stable but have some seepage. There is little grass on the slopes (pictures 24, 25, 26, 30, 31, 32 & 33). Several of the new culverts that drain the berm ditches were put in high (pictures 31 - 33) and do not drain.

A slide 29.5 feet long and 10.3 feet high developed the first week of May, 2000 in an area that was seeping. At the time of the inspection HED was to begin implementing a fix. An area approximately 400 feet long was to be excavated, an underdrain installed, and riprap placed to stabilize this area of the dike. (The fix was completed by February 23, 2001 see supplemental photo #34).

Six seeps/wet areas were found adjacent to the cemetery. They are of equal elevation and cover a distance approximately 200 feet long (pictures 26-30) Seeps 1, 2, 3, 5 are flowing; 4 and 6 are soft areas. G*UB*MK was to have put in a sixty degree weir to assist in monitoring the flow from this area. No weir has yet been installed.

An erosion problem exists from the outlet of the borrow pit that was used to construct the last lift of Fines Pond #3.

Recommendations:

- Plant personnel should continue to periodically mow grass and remove small trees and brush from all dike slopes. Plant personnel should pull up all trees and compact soil back in the holes.
- Plant personnel should also continue to maintain all dike roads for all weather travel to facilitate daily inspections and routine O&M activities.
- Plant personnel should monitor the exterior dike slopes for seepage, wet or soft spots or animal burrowing, etc. and notify Fossil Engineering of any changes.
- Continue to monitor the survey controls installed on the exterior dike slope of Area 2B slag pond adjacent to Green River for any indication of slope movement.
- The slough on the interior slope of the RW #3 east dike should be monitored by plant personnel and Fossil Engineering should be notified if the condition changes.
- Remove the vegetative growth from the entrance to the horizontal discharge pipes in RW #3 so

that flow does not become inhibited during periods of heavy rainfall.

- Plant personnel should repair the ruts on the top of redwater pond #3 dikes by filling with earthfill and regrading to provide positive drainage. (estimated 8 CY soil)
- Reconnect the power to the pumps for Coal Yard Pond #2 and operate as designed.
- Repair the perimeter of coal yard drainage basin #3, by compacting clay in the erosion gullies and seeding.
- Clean out all of the coal yard drainage basins and all of the redwater ponds, especially RW #2, #3 & #4 ponds, repair the pumps in coal yard pond #2 so no water flows through the emergency overflow.
- Continue to remove any vegetative growth and/or beaver dams that may be blocking the spillway from the slag area beaver pond. The adjacent dike should be monitored to insure that it is stable and that the area does not remain saturated. A minimum freeboard of 2 feet is desirable.
- Near the Jacobs Creek Ash Pond, bottom ash should be placed and compacted at the edge of the county roadway to avoid further erosion and encroachment of the road. Additional riprap should be placed under the outlet of all existing drain pipes to stop erosion. (80% 40 lb or greater. Estimated 8 ton per pipe)
- Plant personnel should repair the toe of the dikes around Jacobs Creek ash pond by replacing the excavated earthfill along the toe of the dike, compacting and grassing to a uniform slope. (estimated 200 CY soil)
- Plant personnel should repair the eroded area from the borrow area for fines pond number 3, at the storm water discharge point by placing riprap or boulders (80% 60 lb or larger) from the borrow area at the outlet. (estimated 25 ton)
- Slope stake the gypsum stack to identify designed berm locations, finish grading per survey and place temporary cover on side slopes.
- Plant personnel should repair the eroded area at the discharge outlet of the east dredge cell pond by placing riprap in the washed out area at the outlet; (80% of 60 to 80 lb stones, estimated 8 tons) fill the eroded area adjacent to the ditch with compacted earthfill, line the area with a filter fabric, and cover with a filter blanket and riprap. (6"thick of 1032 (size 5 stone) with 12" of riprap of 6" stones on top. (estimated 40 ton).
- Near the East Dredge Cell, repair the erosion gully adjacent to the overhead conveyor so that the foundation of the conveyor is not undermined. This area should be filled with earth, compacted, and covered with riprap then walked in with a dozer to prevent erosion.
- Plant personnel should stack coarse and medium coal wash refuse according to engineering design drawings and not according to angle of repose. The design drawings must be used to determine grade during stacking to comply with TVA configuration management procedures. (see 10W4276-14).
- Place cover on all coarse and medium coal wash refuse areas which have reached final grade.
- Install and check the weir at the cemetery daily unless the seepage is constant, then at least twice a week. Report any increases to; Joel D. Paris @ 423/751-3515 or John Albright @423/751-3981 in Chattanooga
- Water should not be allowed to pond in the West Dredge Cell. A combination of removing the riser boards and/or installing 1" spacers near the bottom of the riser (within 2 FT +/- of the bottom) needs to be implemented as soon as possible.
- Plant personal should lower the drain pipes from the berm ditches of Fines Pond #3 to eliminate standing water in the berm ditches.

REDWATER #2 POND

REDWATER #1 POND

SLUDGE AREA 34

WASH POND #2

FINES

PUMP

COAL STORAGE YARD

ASH DISPOSAL AREA 2B

ASH DISPOSAL AREA 2A

2-A

28 ASH RECLAIM

ASH SLUICE TRENCH

COAL WASHING PLANT

STATIC THICKENER (4 TYP.)

RECLAIM HOPPER

CONVEYOR

ELECTRICAL STGA BLDG

REFUSE HOPPER

POND

HOPPERS

MED & COARSE COAL WASH REFUSE AREA

LINES

EAST DREDGE CELL

WEST DREDGE CELL

SLURRY SLUDGE

DREDGE CELL B

CHEM POND

DREDGE CELL A

ACTIVE ASH POND

DIVIDER DIKE

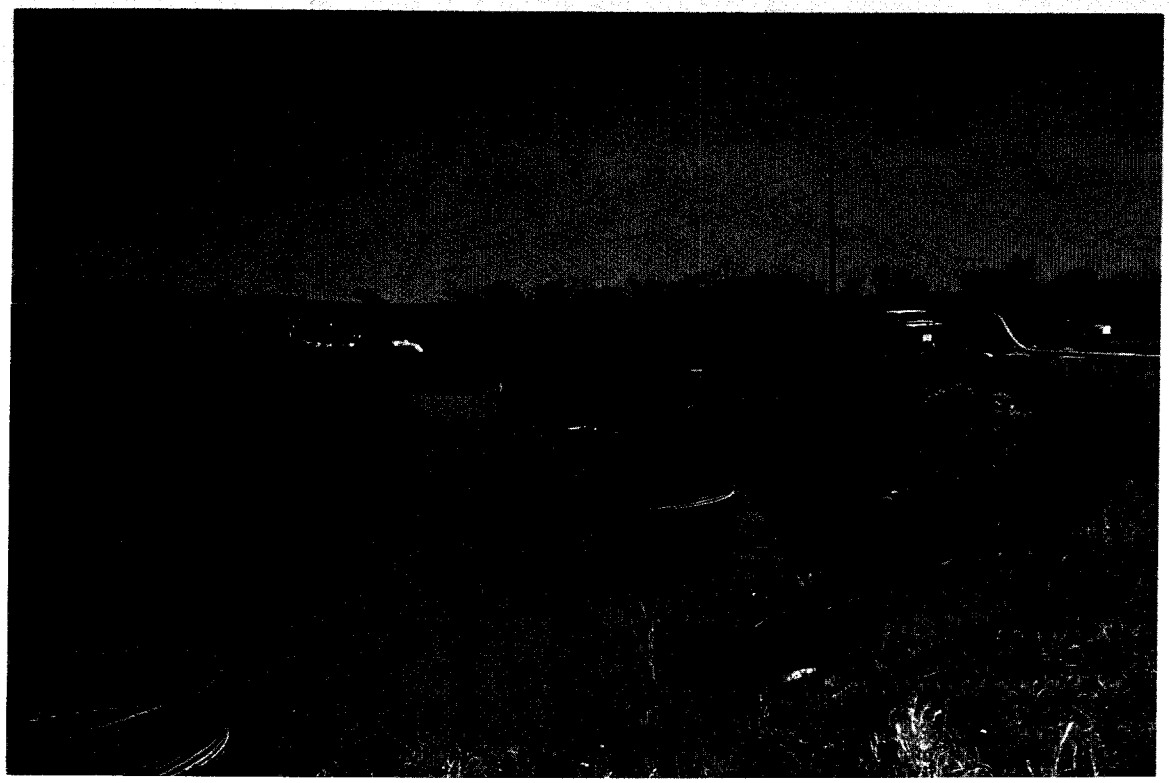
STILLING POND

RESERVATION BOUNDARY

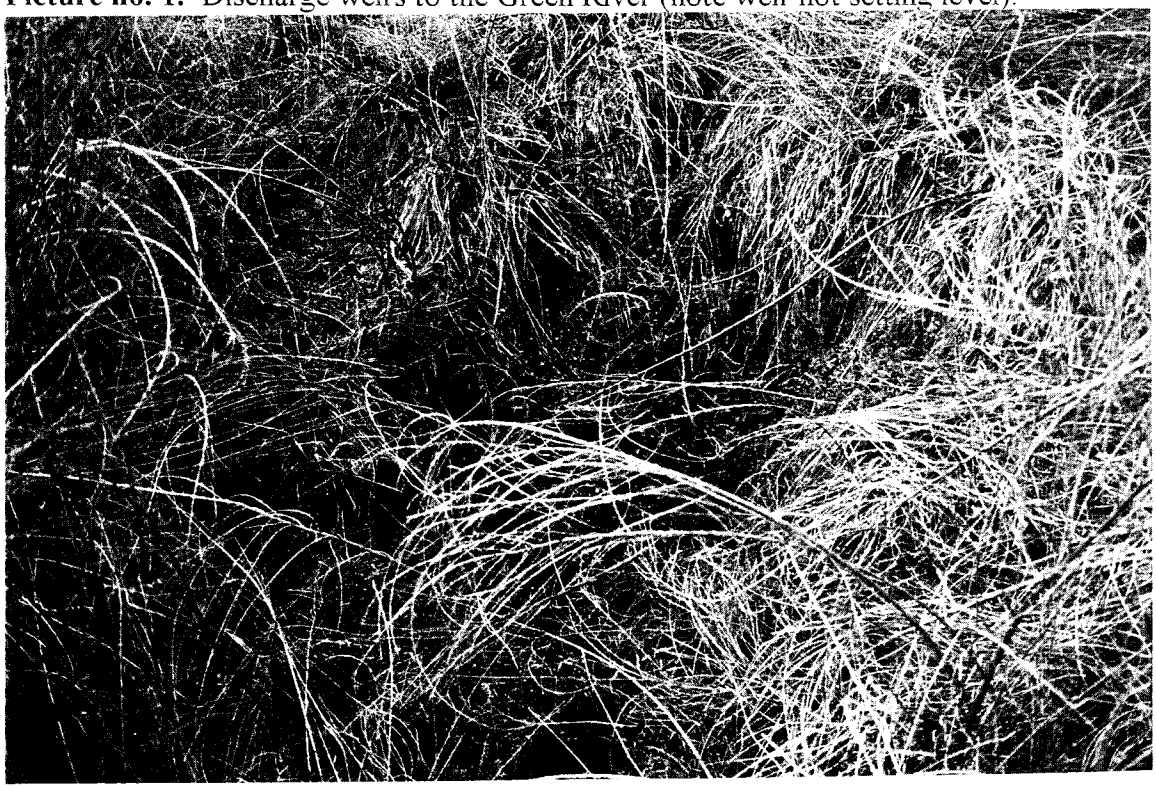
WETLANDS TO BE RESERVED FOR MITIGATION

FUTURE BOTTOM ASH AREA

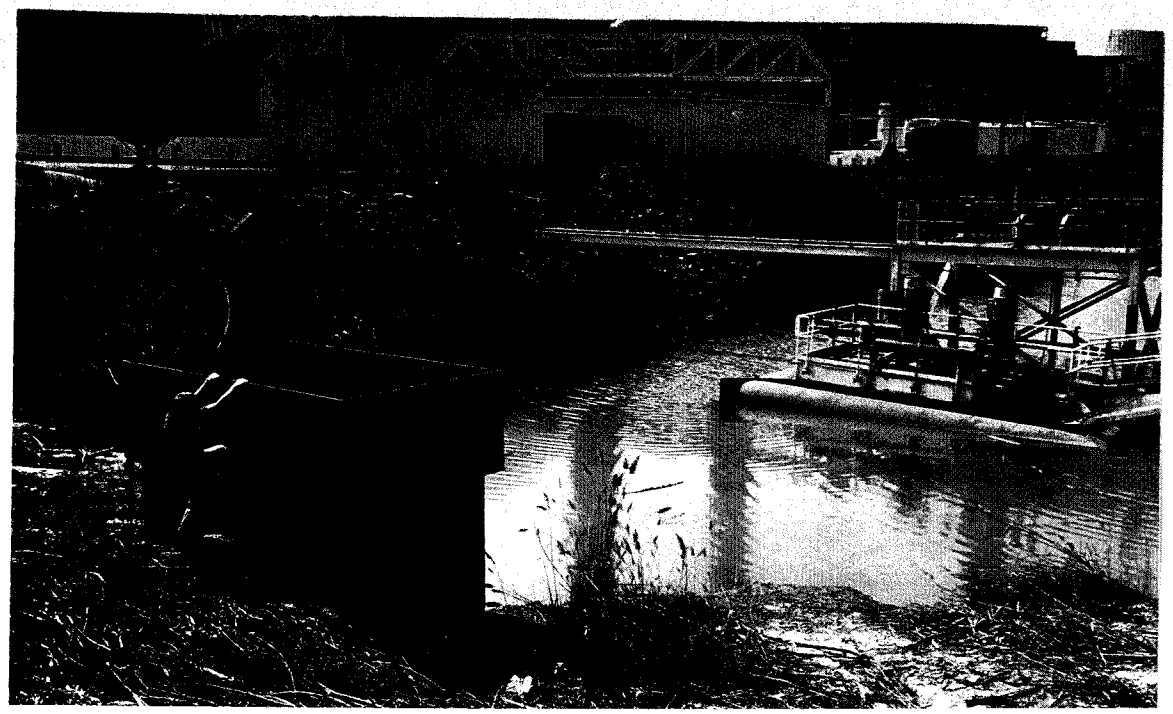
AREA OCCUPIED BY PEABODY COAL COMPANY PER LICENSE AGREEMENT TV-22644A



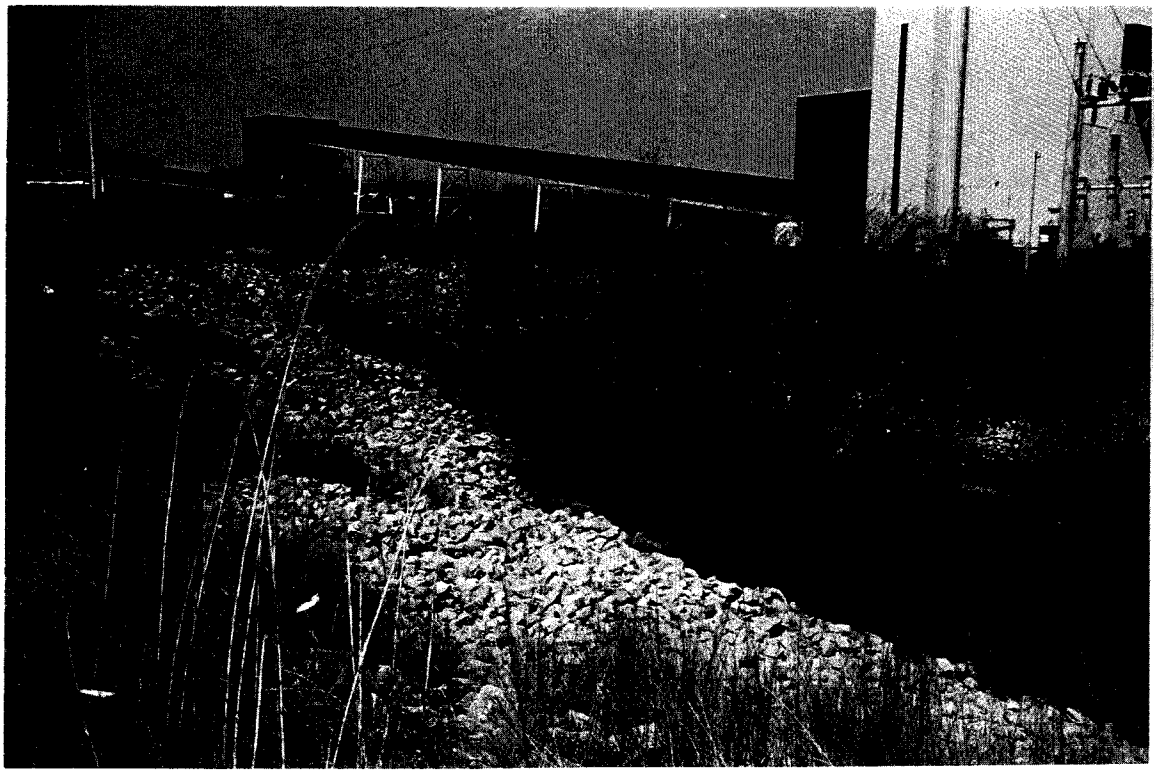
Picture no. 1. Discharge weirs to the Green River (note weir not setting level).



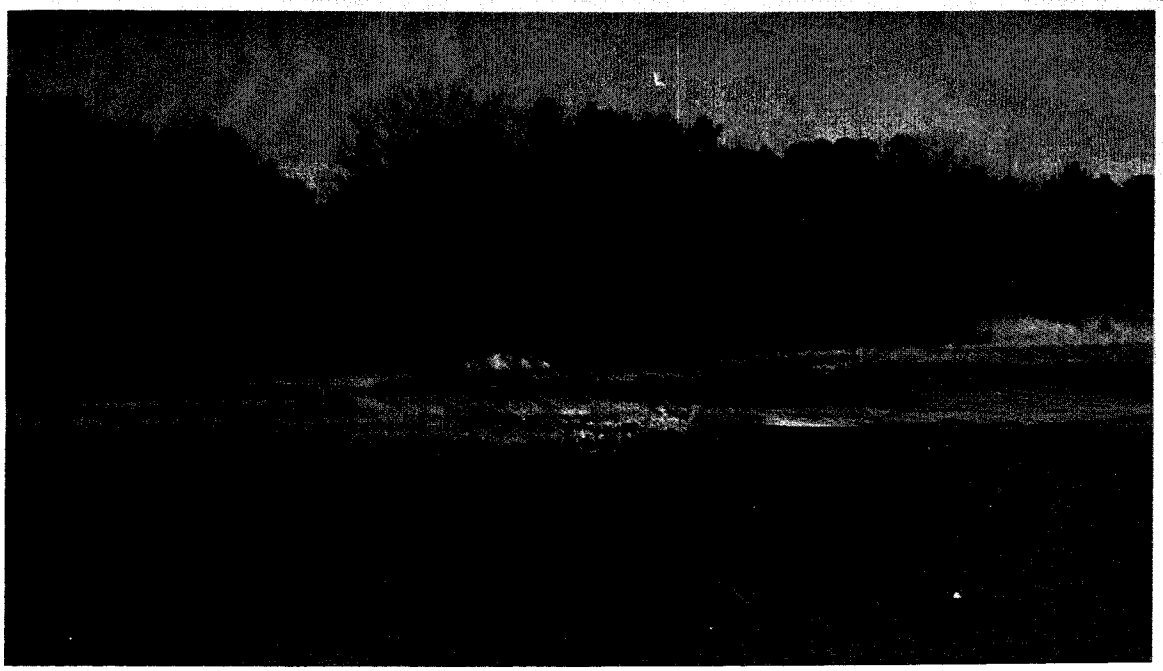
Picture no. 2. Rut river side of stilling pool.



Picture no. 3. Redwater Pond #1 & discharge structure.

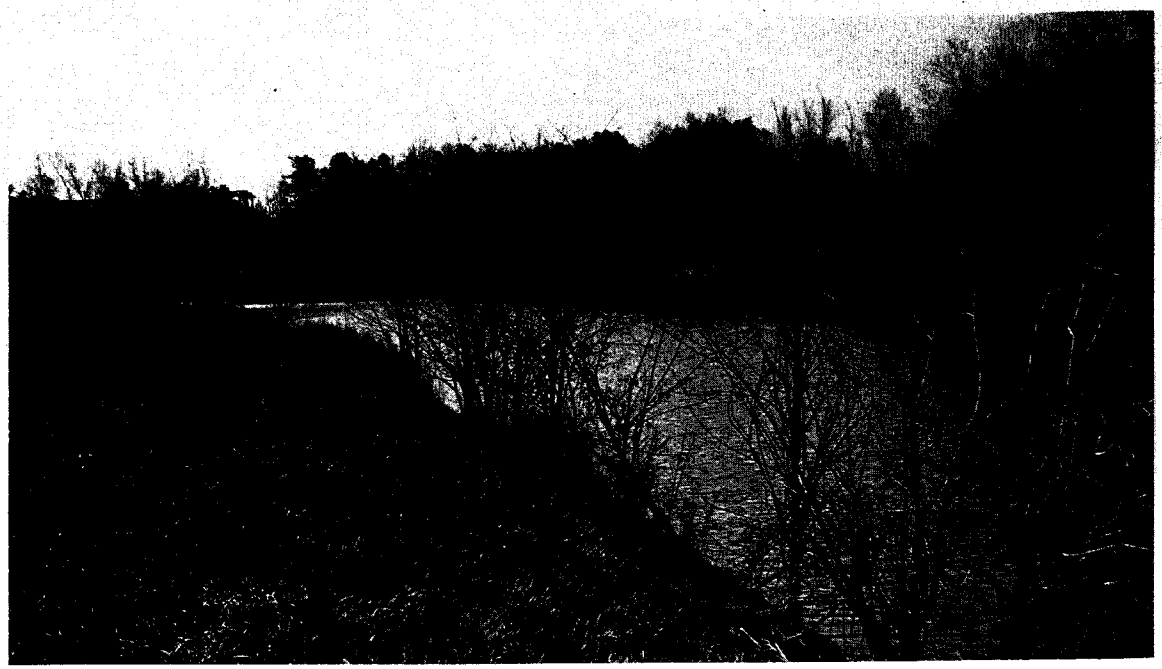


Picture no. 4. Redwater pond #2. Needs cleaning.



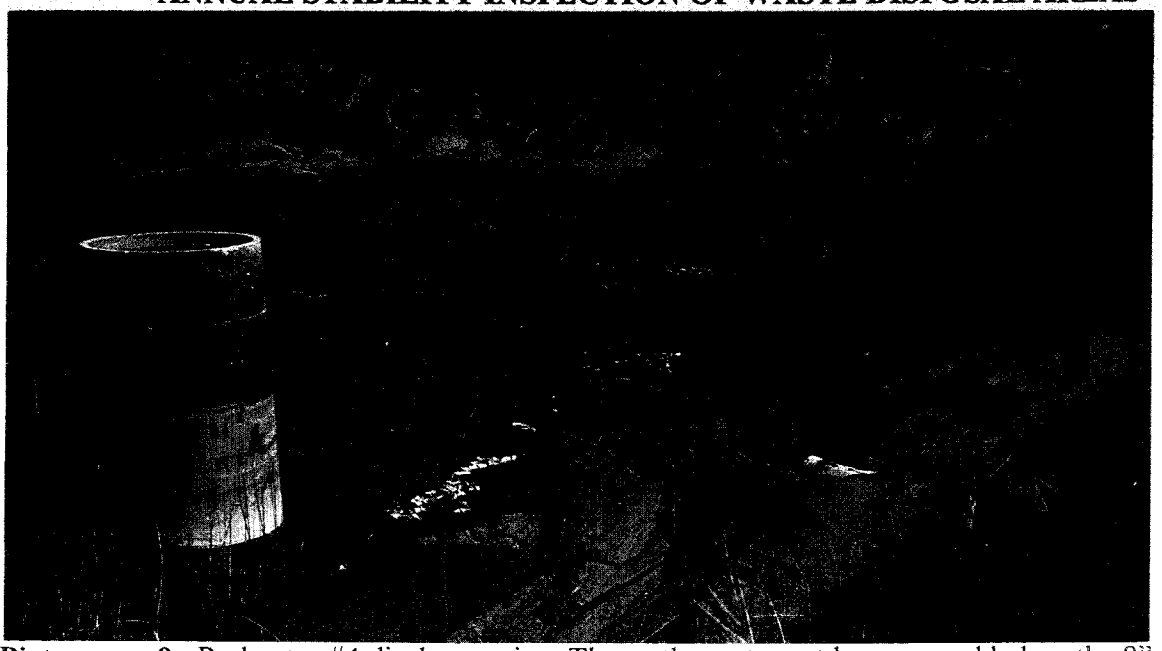
Picture no. 5. Sedimentation in redwater #3 that needs to be removed.

Picture no. 6. Thick vegetative growth blocking the flow in the pipes which flow from redwater #3 to Jacobs Creek ash pond.

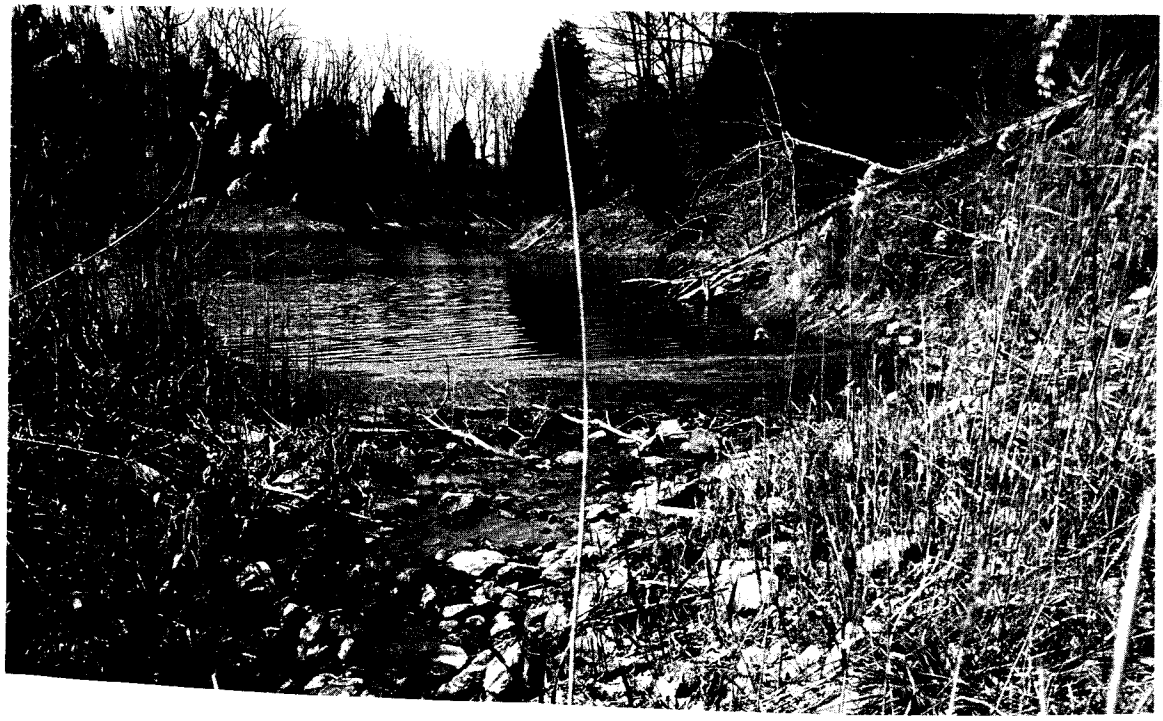


Picture no. 7. Trees on the inside of redwater pond #3 that needs to be removed.

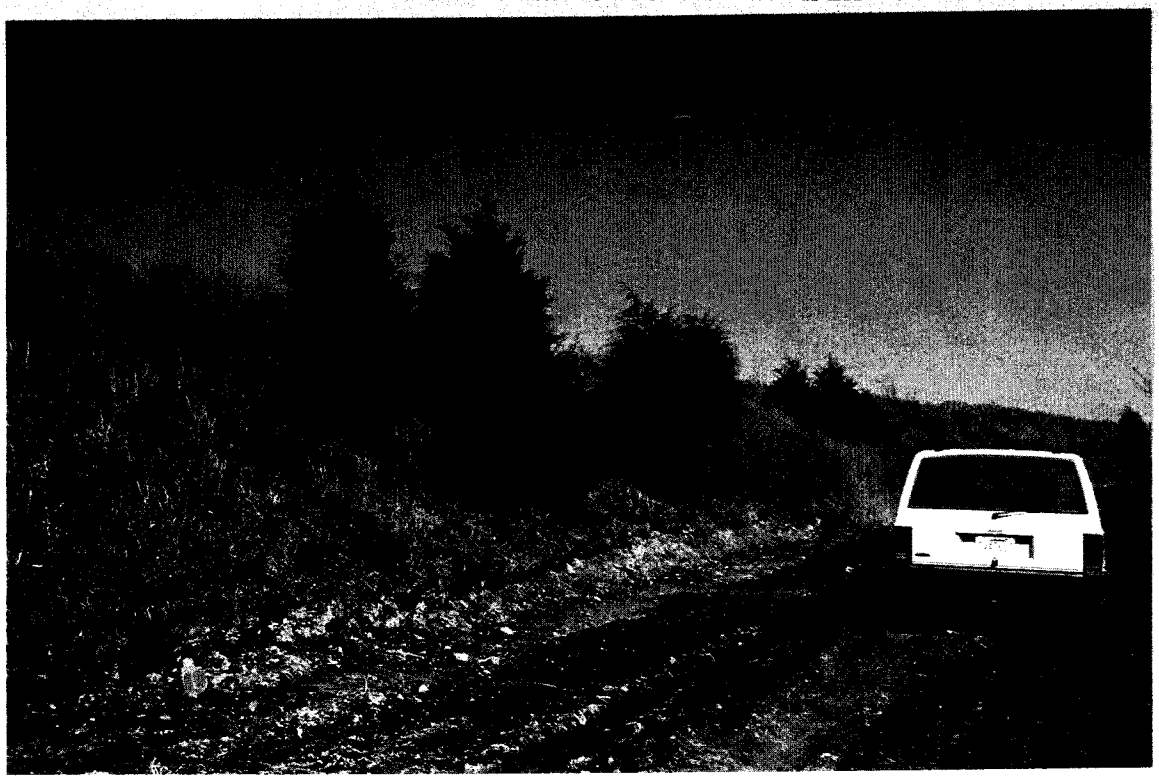
Picture no. 8. The three pipes from RW #3 into transition box.



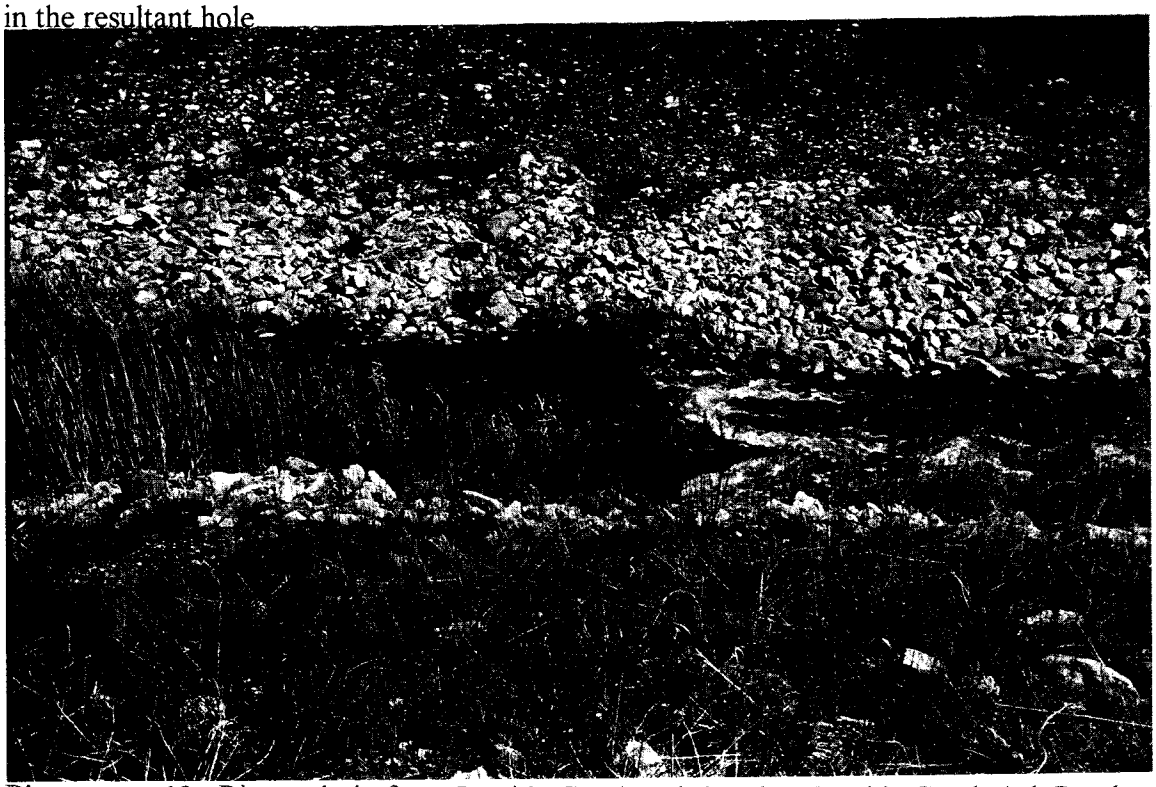
Picture no. 9. Redwater #4 discharge pipe. The settlement must be removed below the 8" pipe to stop the ditch from filling.



Picture no. 10. Slag area discharge. Note beaver dam removed.



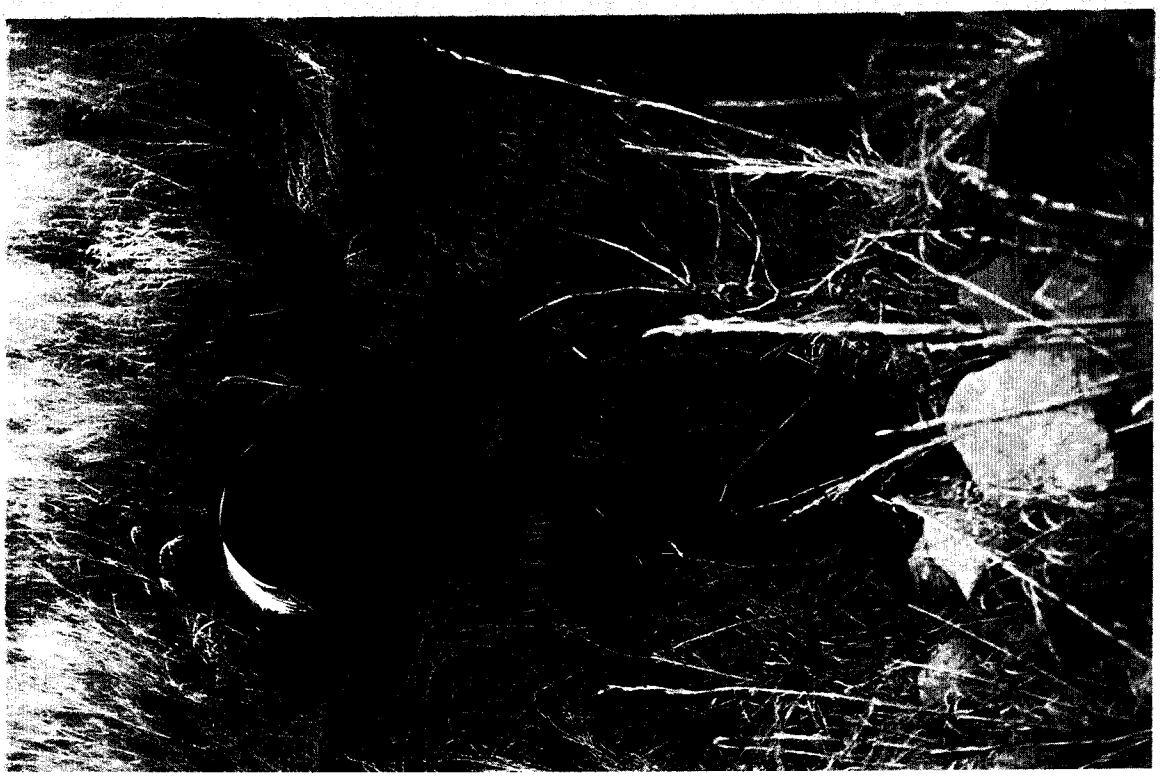
Picture no. 11. Jacob's Creek Ash Pond showing trees that need to be pulled up and earth compacted in the resultant hole



Picture no. 12. Riprap drain from Jacob's Creek Ash Pond to Jacob's Creek Ash Pond

Picture no. 13. East Dredge Cell (note grass cover on ash).

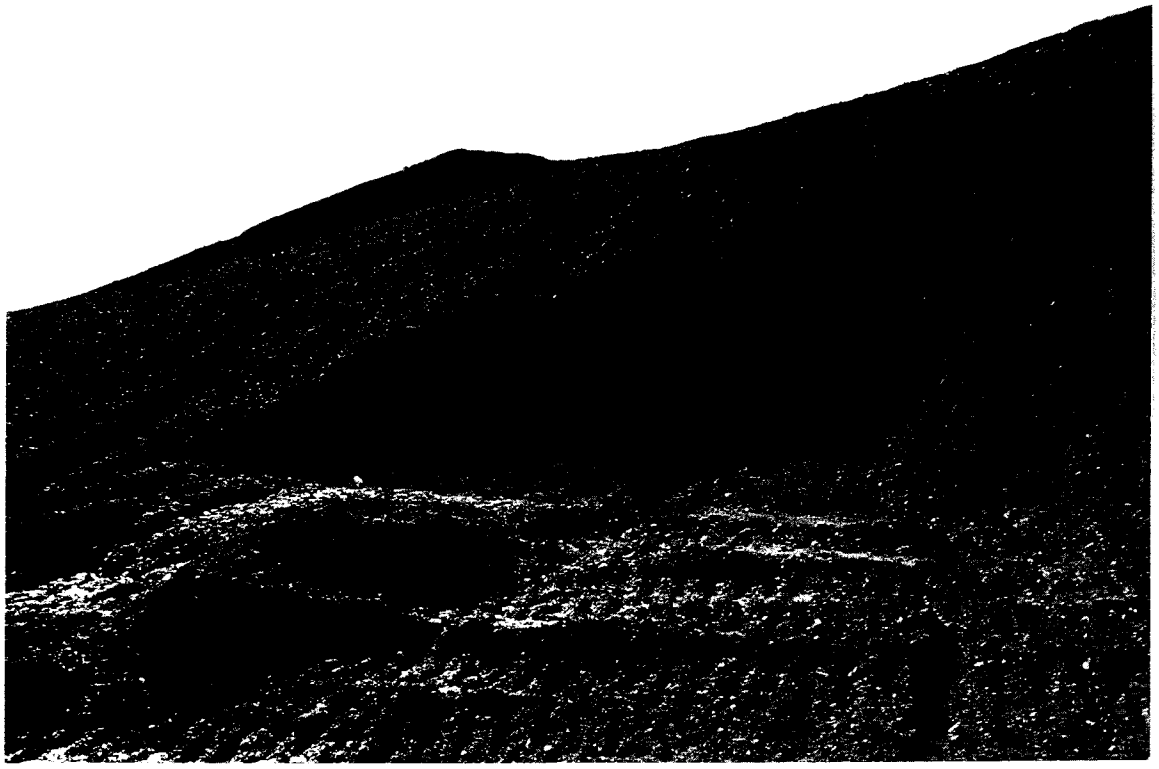
Picture no. 14. Large erosion gullies on the east side of east dredge cell and about the middle of the dike.



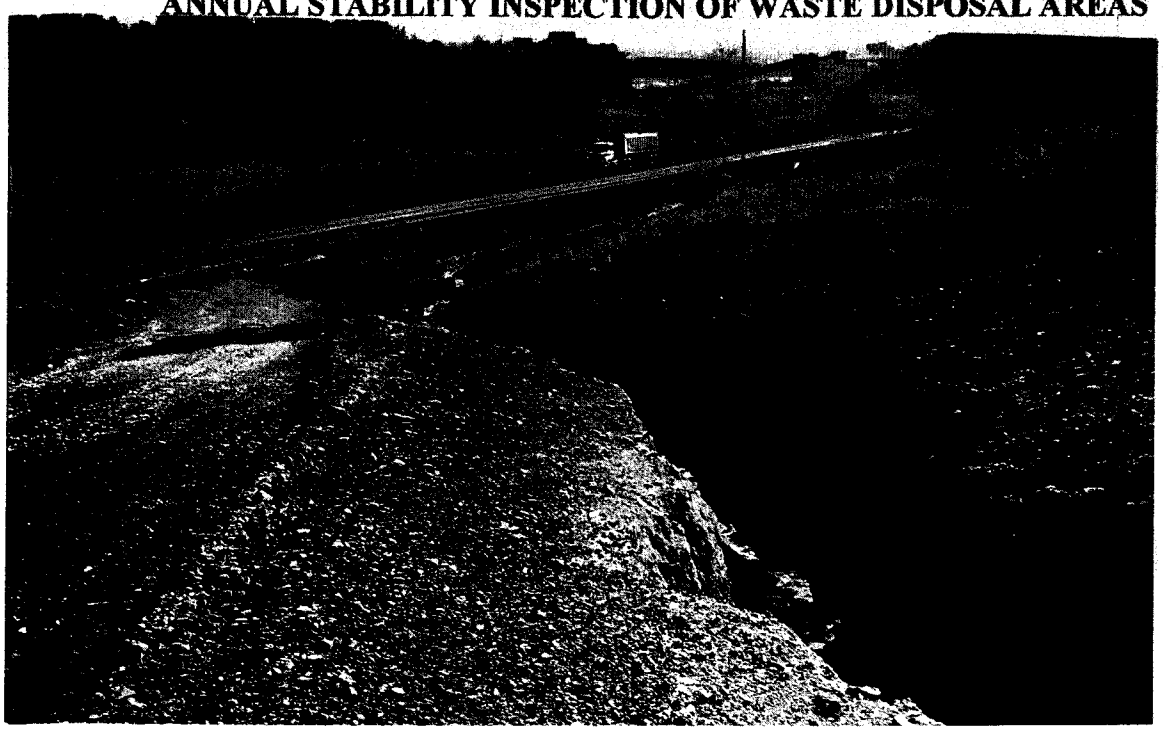
Picture no. 15. East Dredge Cell outlet showing wash out 3' wide 3' deep and 6' long.

Picture no. 16. Large erosion gully on the north end of the East Dredge Cell. This needs to be filled.

Picture no. 17. Southwest corner of medium and coarse coal wash refuge area showing steep slopes.



Picture no. 18. Southwest corner of medium and coarse coal wash refuge area showing failure due to steep slopes.



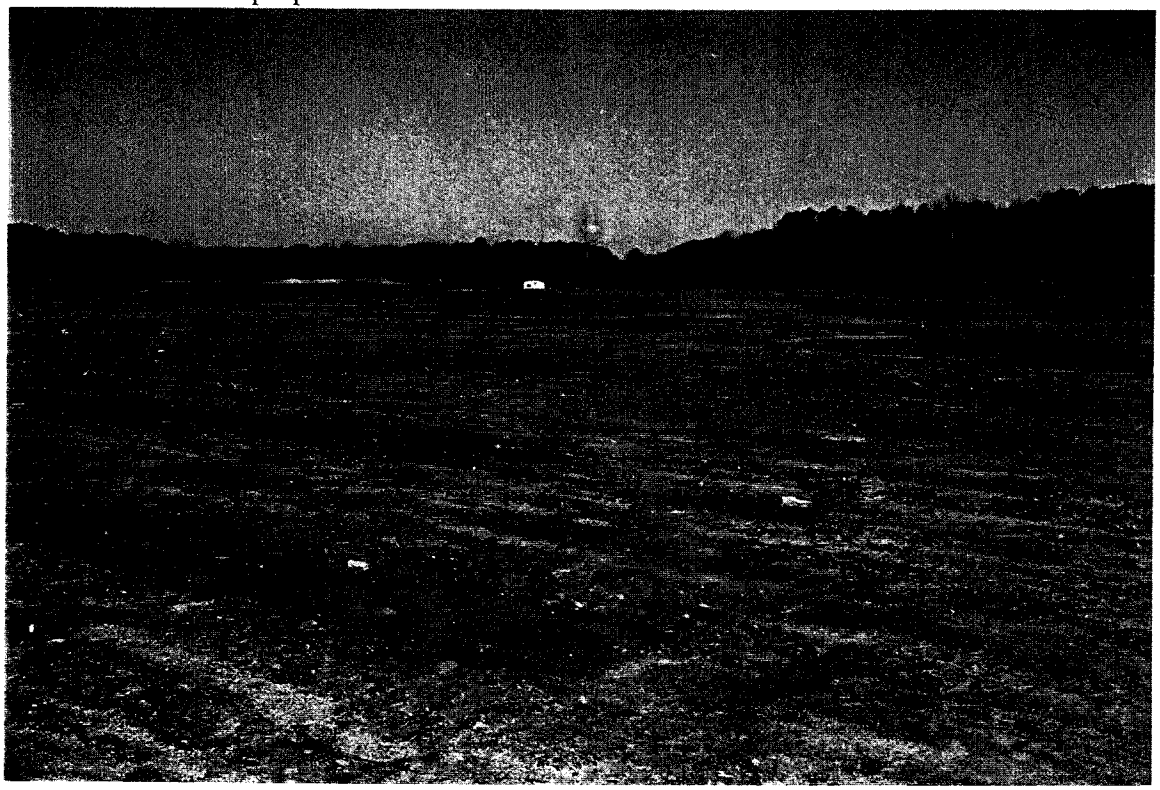
Picture no. 19. Large erosion gully on the northwest end of the medium and course.

Picture no. 20. Large erosion gully on the south side and about the middle of the saddle dam of the medium and coarse coal wash refuse area that needs to be repaired with 10 lb stones.

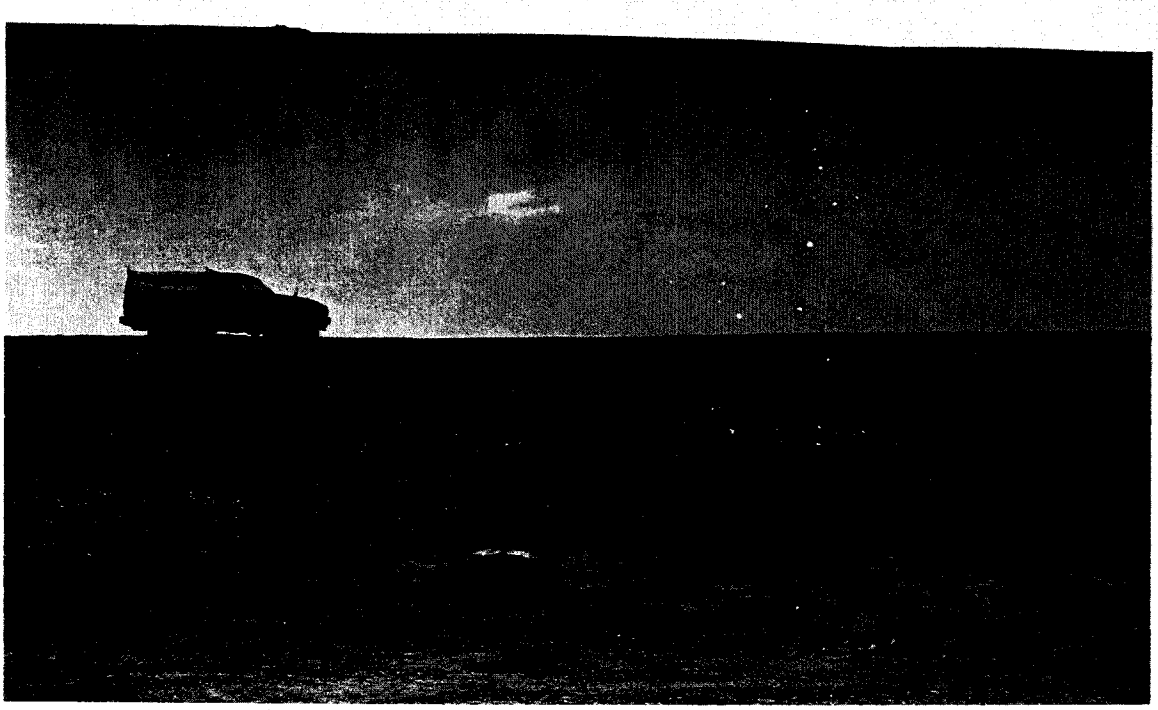
Picture no. 21. Fines Pond #3 new discharge.

Picture no. 22. Fines Pond #3 discharge.

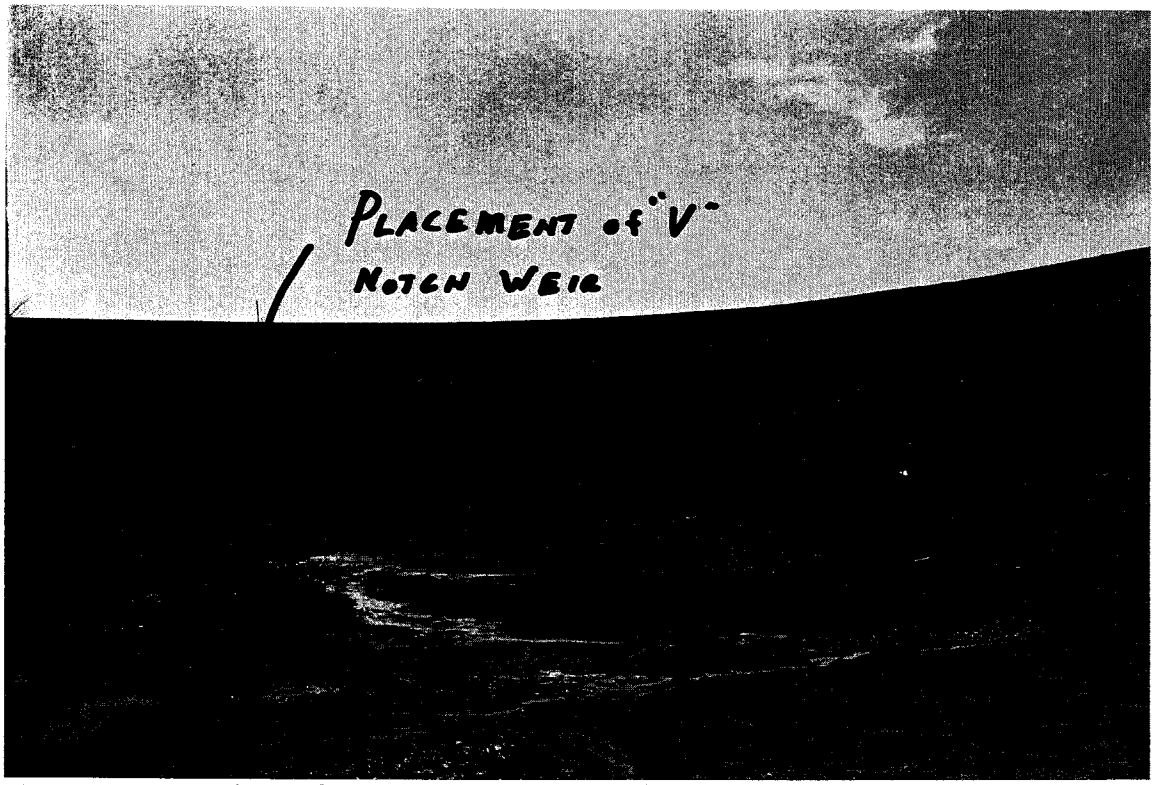
Picture no. 23. Riprap channel of Fines Pond #3.



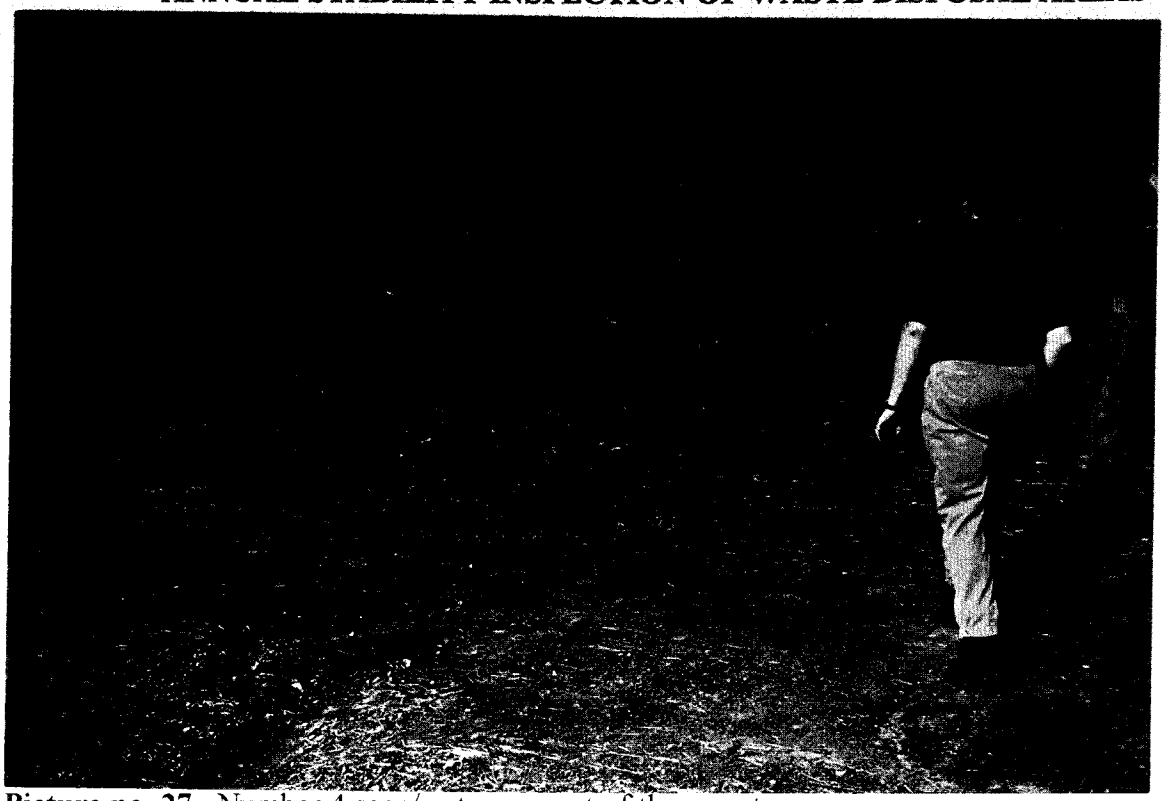
Picture no. 24. Capped area east of the cemetery showing lack of vegetation.



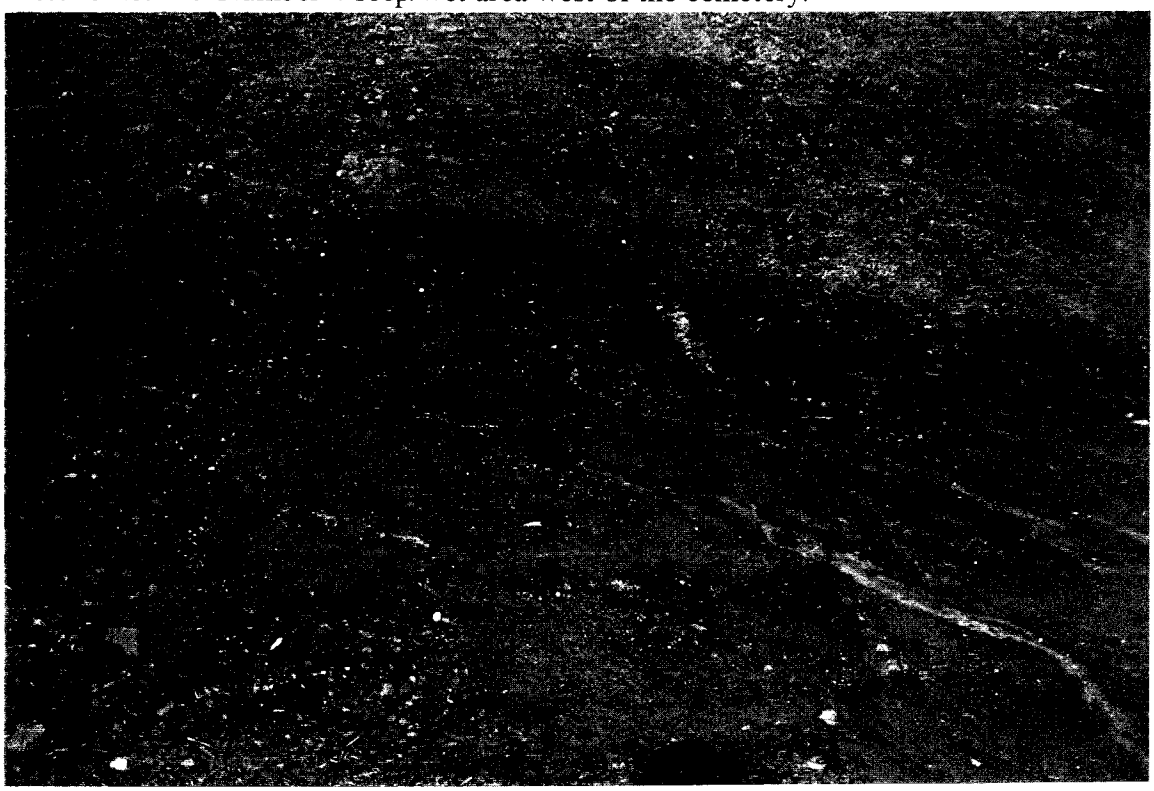
Picture no. 25. Typical grass cover of Fines Pond #3.



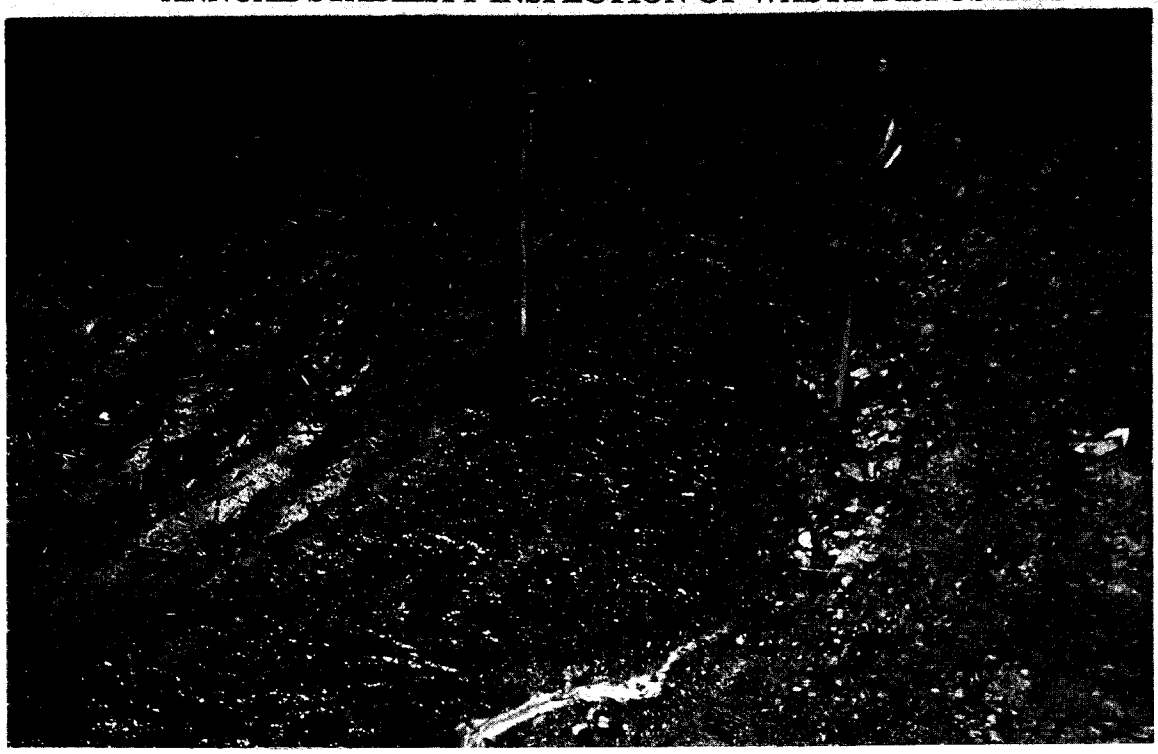
Picture no. 26. Three of six seeps located west of the cemetery.



Picture no. 27. Number 4 seep/wet area west of the cemetery.

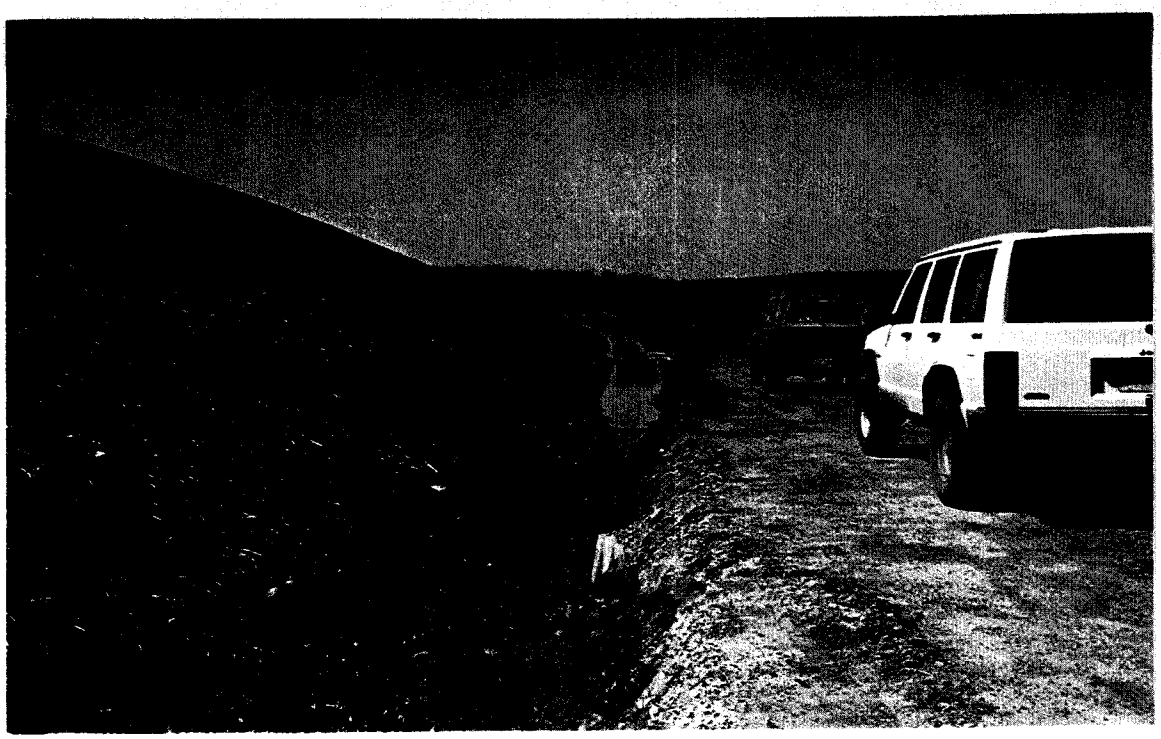


Picture no. 28. Number 5 seep area west of the cemetery.

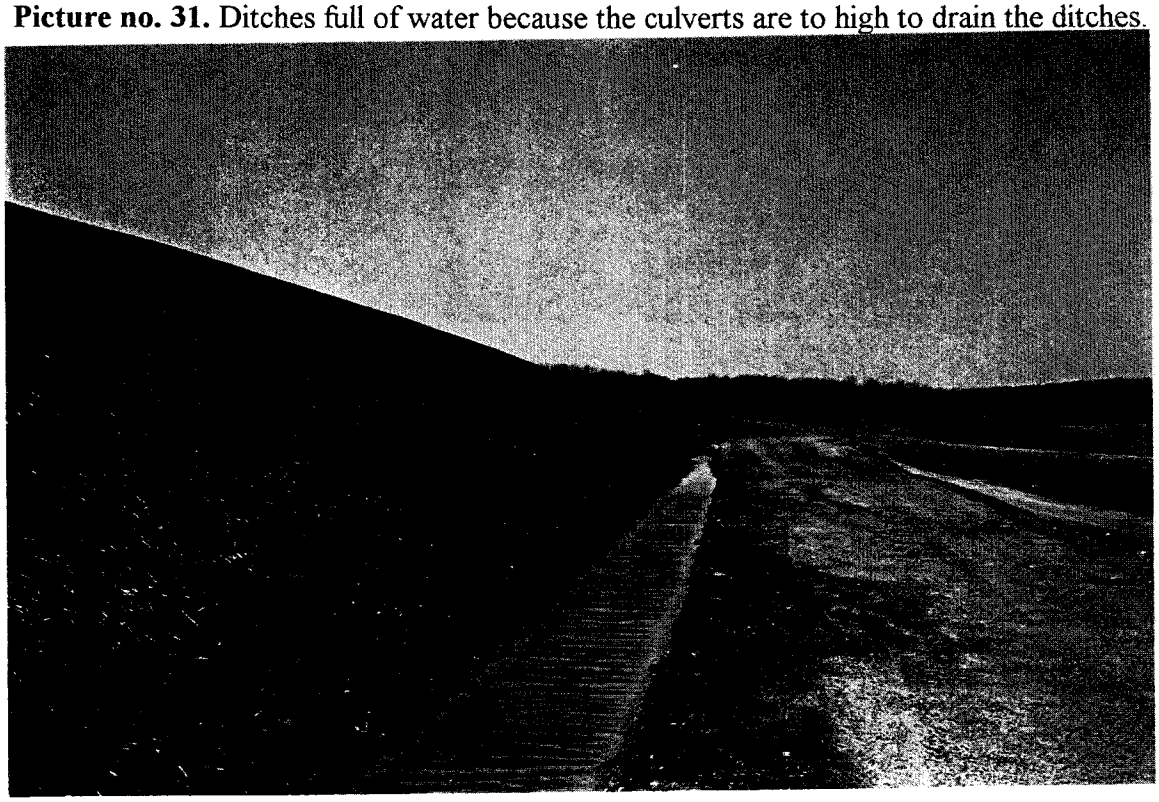


Picture no. 29. Close up of seep #2 showing flow.

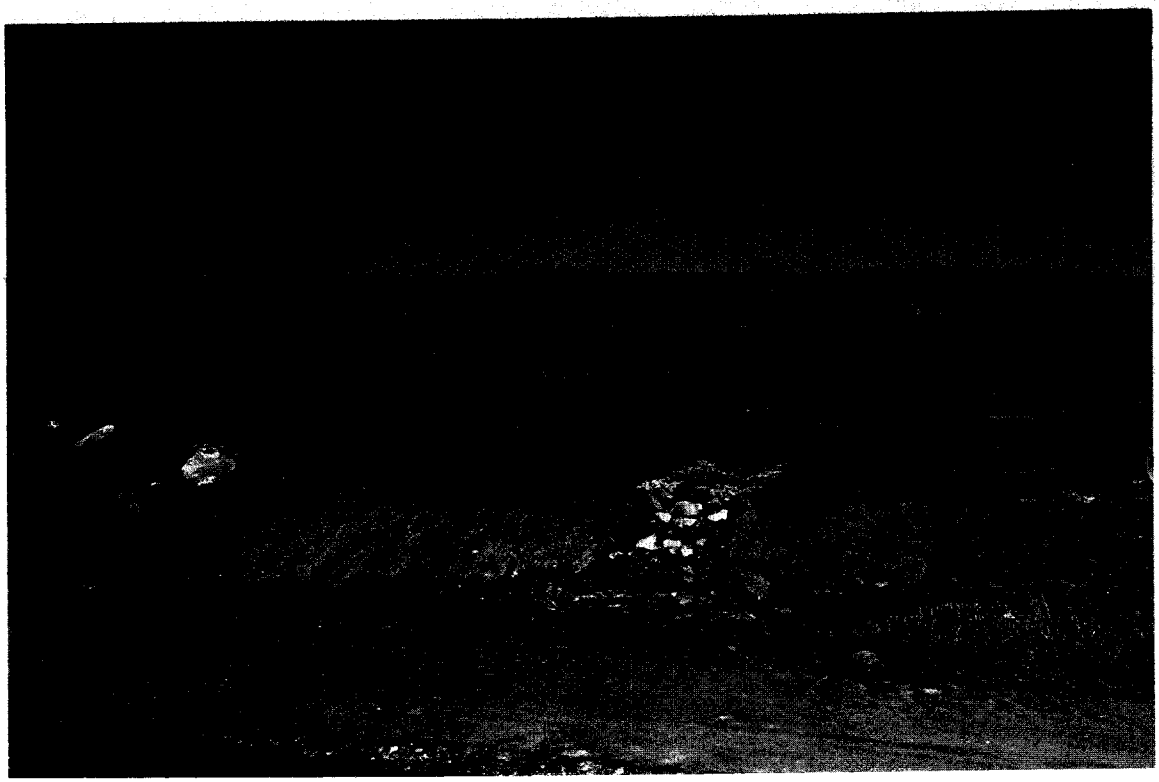
Picture no. 30. Ditches full of water because the culverts are to high to drain the ditches.



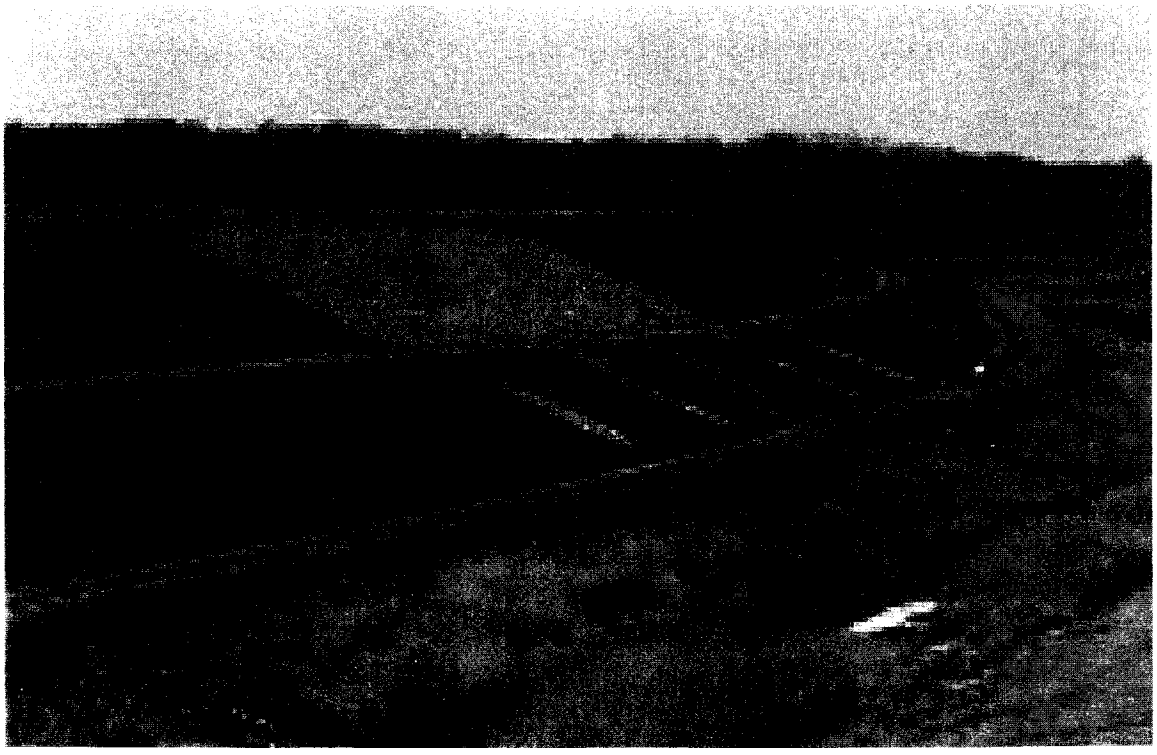
Picture no. 31. Ditches full of water because the culverts are to high to drain the ditches.



Picture no. 32. Ditches full of water because the culverts are to high to drain the ditches.



Picture No. 33. Drainage from the borrow area showing the need for riprap of 60% being 40lb to 60 lb stones.



Picture No. 34. Overview of the repaired area from the slide of May 2000.

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MASTER FILE

March 29, 2002

Travis E. Baker, PAF 1A-DRK

PARADISE FOSSIL PLANT (PAF) - ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Attached is a report from Joel Paris concerning the inspection of November 7 and 8, 2001, at PAF ash disposal areas.

The report includes recommendations for corrective work. I concur with those recommendations.

If you have questions, please contact Ron Purkey at Chattanooga extension 4820, or Joel Paris at Chattanooga extension 3515.

J. J. 2. P FOR

James G. Adair, Manager
Engineering Design Services
LP 2G-C

REP: [redacted].LMV
Attachment
cc (w/Attachment):
S. B. Brothers, PAF 1A-DRK
M. A. Cones, Dam Safety Files, LP 1H-C
K. J. Dukes, PAF 1A-DRK
R. L. Kassinger, PAF 1A-DRK
R. E. Johnson, LP 2L-C
G. R. MacDonald, LP 5E-C
EDMS, EB 5G-C

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TENNESSEE VALLEY AUTHORITY
PARADISE FOSSIL PLANT

ANNUAL STABILITY INSPECTION OF
WASTE DISPOSAL AREAS

Prepared By: Joel Paris
Date: March 19, 2002

PARADISE FOSSIL PLANT
ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Introduction

The waste disposal areas at Paradise Fossil Plant (PAF) were inspected for dike structural stability on November 7 & 8, 2001. The inspection was performed by Joel D. Paris and Chris Hensley of Fossil Engineering, and Steven Cary of Paradise Fossil Plant accompanied us on part of the inspection. The previous annual inspection was conducted on January 8 and 9, 2001.

The results of the annual stability inspection are listed below according to their location within the Paradise Fossil Plant Boundaries. A location map is attached with arrows showing directions of picture taken.

Slag Areas 2A, 2B, and Stilling Pond

Boiler slag is sluiced into the south end of area 2A and is usually reclaimed once a day by Reed Minerals as part of a TVA marketing strategy. The reclaim area is full and is being stacked with-in the pond. This has caused the other end of the pond 2A to be full and has greatly reduced the storage time in the pond (geese walking picture 1).

The sluice water then flows into pond 2B through pipes and around a series of baffles to lengthen the settling time. The sluice water enters the north end of the stilling pool through a concrete flume (picture 2). The concrete flume appeared to be in good condition and only a shallow amount of water was flowing freely into the stilling pool. From here, three standard spillways (picture 3 & 4) that discharge the water into the Green River if it is environmentally acceptable. If not, the water is pumped to the Jacob's Creek fly ash pond. The riprap at the outlet end of the spillway discharge pipes appeared to be in good condition.

The dikes appear to be stabile and did not exhibit any notable changes since the last inspection. A rut has developed from runoff from the road and needs to be repaired. The interior slopes of the dikes have a good vegetative cover. There was an access stairway built over the outlet end of the pipes into Area 2B. The plant continues to monitor the survey controls installed on the exterior dike slope adjacent to the Green River for any indication of movement.

Redwater Ponds (Nos. 1, 2, 3, 4 & 5)

Redwater Pond #1

Redwater pond #1 (RW#1) is located northwest of and adjacent to the powerhouse. All pumps, slopes, dikes and discharge structures appear to be in good condition (picture 5). Water collected in redwater pond #1 is pumped into the slag pond within Area 2B.

In the fall of 2001, Engineering Design conducted a study and determined that the pond capacity was adequate for rerouting the Reed Rejects process flow to the pond.

Redwater Pond #2

Redwater pond #2 (RW#2) is located northwest of and adjacent to Slag Areas 2A & 2B. The water from RW#2 is pumped from the center of the pond into the northwest end of slag ponds 2A (pictures 6 & 7). All slopes and dikes appear to be in good condition. However, the pond had sediment and a high level of standing water in it (picture 6). The Coal Yard Drainage Pond #1

drains into RW#2 via a 72" pipe. To function as designed, the water level in Redwater Pond #2 must be maintained at or below elevation 385, which is two feet below the outlet of the 72" pipe. During this inspection, the water level was above elevation 390. The submerged outlet of this pipe could cause a serious problem in RW#2 because of lack of rain water storage, an REE will happen. The pumps are not large enough to remove the water fast enough to stop an overflow of the dike. (See trash on the fence picture 8).This also causes problems up stream at Coal Yard Drainage Pond #1.

Redwater Pond #3

Redwater Pond #3 is a settlement pond and is located southwest of the powerhouse and along the south side of the county road. This pond collects the runoff and sediment from the medium and coarse coal wash refuse areas and decanted water from RW#4. RW#3 discharges to Jacobs Creek Fly Ash Pond.

RW #3 can discharges to RW #1 via a gravity drain with a manual valve contained within the discharge structure. This valve is opened only when the pond is to be cleaned out. Otherwise three horizontal discharge pipes direct excess storage from RWP #3 to the Jacob's Creek active ash pond during periods of rainfall.

The sediment in the RW #3 pond needs to be cleaned out as it is above the clean out access road (picture 9). There may be problems with the clean out because a sampling well has been placed where the crane was designed to set (picture 9) during the cleanout operation. The weeds in front of the discharge pipes have raised the discharge elevation by six inches. These weeds need to be cleaned out (picture 10). The three discharge pipes are all discharging equally into the transition box.

There are several trees on the inside of the dike that need to be pulled up and clay placed in the resulting hole and compacted. This should be done during pond clean out while the water is lowered. There were also small trees and brush observed on the top of the east dike. Rutted areas were evident along the top of the east dike and were holding water. The ruts appear to be caused by previous heavy equipment travel on the dike.

Redwater Pond #4

Redwater Pond #4 is a surge/sediment pond located east of the medium and coarse Coal Wash Refuse Area. This is a surge pond that settles out the fines so they can be cleaned out easier and cheaper and before the fines reach RWP #3. This serge pond drains to RWP #3 via an eight inch pipe into an open riprap ditch beside the road. An emergency overflow structure drains runoff during heavy rains, that exceeds the standard 10 year - twenty-four hour rainfall event, directly to the Jacob's Creek fly ash pond thereby bypassing RW #3. The pond was to be cleaned out when the sediment reached the invert of the 8" discharge pipe. The fines are now above the 8" pipe (picture 11) because the pond is full. There was red water seeping from the bank into the ditch below the 8" discharge where water had not been previously noted. The additional 8' head from RW#4 is a suspected cause of this.

Redwater Pond #5

Redwater Pond #5 is located south of the powerhouse, east of the truck coal dumping area and west of the limestone storage area. It is a surge pond designed to delay enough water going to

redwater #1 to give the pond #1 pumps time to lower the water level. An overflow structure drains runoff during rains exceeding the standard 10 year - twenty-four hour rainfall event directly to redwater pond #1. All water collected in redwater pond #5 drains to redwater pond #1 via a gravity drain and no water should ever be in RW #5 pond four hours after a rain.

Coal Yard Runoff Pond #1

Coal Yard Runoff Pond #1 9CYRP#1) is located north of and across the plant access road from the Coal Wash Plant. This is a surge/sedimentation storm water runoff pond that delays runoff to RW #2. Water and sediment is collected in the pond and the decanted water is discharged through a six inch hole cut in the side of the stand pipe (picture 12). This hole is not configured per the original design drawing in size, or elevation but is doing a fair job. A wall was built to keep the coal fines away from the discharge point but the fines have overtopped the dike due to the higher hole elevation and non removal of the fines. The fines must be cleaned out because this contributes to a decrease in storage of storm water.

Coal Yard Runoff Pond #2

Coal Yard Runoff Pond #2 (CYRP#2) is located southwest of and across an access road from Redwater #2 Pond. This pond was designed as a storm water sedimentation pond and all water from this pond is to be pumped to slag pond 2A. CYRP #2 was half full of water and sedimentation and was discharging through the emergency discharge pipe into RW #2 pond. Coal Yard Pond #2 was not originally designed as a surge pond but now should be operated as one. There were three pumps on the platform but there is no power to any of them. The pumps are designed to pump **all** water from this pond to Pond 2A. RW#2 can not take this volume of water and sediment without an REE.

Coal Yard Runoff Pond #3

Coal Yard Runoff Pond #3 is located south of the coal transfer complex and north of and adjacent to the access road. This pond can discharge by gravity or be pumped to RW #1. Several erosion gullies have developed around the perimeter of the drainage basin.

Slag Area aka. Slag Mountain Area

The slag area is located southeast of the powerhouse. The slag in this area was placed here by the plant during its early operations and is currently being reclaimed for commercial use by Reed Minerals personnel. The area contains a small surge pond to collect runoff and a larger area, called the beaver pond, which discharges over a spillway and down a riprap channel into Jacobs Creek. The riprap appears to be in good condition. The beaver dam that was restricting flow to Jacobs Creek has been removed. Plant personnel have continued to frequently monitor this area and clean out any beaver dams.

The dikes appear to be stable with a good vegetative cover on them. The redwater seeps identified in earlier reports along the southwest dike in this area are still present. Some of the red water seeps continue to have growing deposits of material. Plant personnel monitor these areas frequently. The erosion gully, observed on previous inspections, located at the end of the southwest dike just north of an existing culvert has worsened. The eroded area has encroached upon the roadway and should be repaired before further encroachment occurs.

Jacobs Creek Fly Ash Pond Area

This area is located southeast of the powerhouse. Fly ash is sluiced into the northern portion of the original pond. Water flowed through a divider dike with a floating boom skimmer structure and into the stilling pond before being discharged into Jacobs Creek via three standard spillways. The skimmers and floating boom in the stilling pool have been removed and the opening in the divider dike filled. Water now flows through a dike breach in the southwest portion of the ash pond then into the Fly Ash Pond Area Extension (the new ash disposal area).

The divider dike had several trees that must be removed by pulling them up and compacting bottom ash in the holes. The sloughing area that was noted in the previous two ash pond inspection reports on the south dike just west of the divider dike was still present. The road on top of the dike has several mud holes (picture 13) that need repairing. A requirement of these structures is that an all weather road be maintained for the inspection each shift.

The dikes appear to be stable and do not exhibit any notable changes in there exterior since the last inspection. There are several trees and other growth growing on the dikes that were listed in previous reports (picture 14). The trees must be pulled up and earth compacted in the hole. When a tree dies, the decaying roots cause piping.

There were several surface slough failures observed along the south dike last year due to removal of material at the toe of the dike. The toe of the dike was cut back when the road was graded for heavy equipment travel during the construction of the Fly Ash Pond Area Extension. The depth of cut is 18 inches in places and the slough will worsen as the toe of the dike is further encroached on. A portion of the toe of the dike has been repaired at the northeast end of the stilling pool. Earth fill has been placed at the toe and compacted to make a uniform slope. There was a 75' long slough area located on the northeast end of the dike. This was also caused by removal of material at the toe of the dike by TVA while cleaning out the ditch along the county road. There was flow from the pipe at the time of this inspection from seepage of the north dike of Jacobs Creek Fly Ash Pond.

There was also some vegetation blocking the outlet of the 42" pipe from redwater pond #3 (Picture 15).

Fly Ash Pond Area Extension

This disposal area was put into operation in September 1997. The area is located adjacent to and south of the existing Jacobs Creek Fly Ash Disposal Area. Dikes in the southern and eastern portion of the area were raised from approximate El 400 to El 408. The existing dike of Jacobs Creek Fly Ash Disposal Area was breached at the southwest end of the pond. This allows water to flow into the new pond and around the installed concrete pipe that maintained a water cover over the ash in the Jacobs Creek Fly Ash Disposal Area. Flow is uniform and non-eroding through the ash pond. Riprap in the breach and channel were in good condition. After the ash settles out, the water flows into a stilling pool in the northeast portion of the pond through a divider dike with a floating boom. Water is then discharged through three 48" vertical spillways, with skimmer structures, and out through three 36" diameter concrete pipes to Jacobs Creek.

The spillway structures appear to be operating properly. All three outlets were discharging at the

The spillway structures appear to be operating properly. All three outlets were discharging at the time of inspection. The riprap at the spillway discharge outlets appeared to be in good condition. There is a stairway for access from the top of dike to the discharge pipes for monitoring purposes. Dikes were constructed in the southern and eastern portion of the area. The dike slopes have established vegetation. The road on top of the dike needs additional crushed stone surfacing. All exterior dikes appear to be in good condition with no visible signs of instability.

There was a beaver lodge located on the north portion of the area. Plant personnel should monitor the dikes for beaver activity and take immediate corrective action as beavers like to tunnel below the waterline into dikes. A man can sit up or lay down in the area that material is removed from.

Scrubber Waste Wet Ponding Area

This area is located in the southwest corner of the TVA reservation. Scrubber waste is sluiced into the northern end of this region and stacked by long reach track hoe via the rim ditch method. Scrubber waste is sluiced through the ditch formed by the exterior dike and an interior separator dike to the western corner of the area to allow that area to fill with scrubber waste. Water is discharged from the scrubber pond to a settling pond by a vertical spillways. The stilling pool water discharges from the stilling pool through a vertical spillway into a ditch that empties into the Jacobs Creek Fly Ash Pond a half mile away.

The discharge pipes from the scrubber pond to the settling pond appear to be in good condition. The standard spillway out of the stilling pool was in good condition.

The exterior dikes in this area appear stable with a good vegetative cover and did not exhibit any notable changes since the previous inspection. However, there were small trees and brush observed on the south dike that need to be pulled up.

West Dredge Cell

This area, located just east of the scrubber wet ponding area, was constructed to accept dredged fly ash from the Jacobs Creek pond area. No material has been dredged into this cell at the time of the inspection.

Plant personnel had installed a valve, at Fossil Engineering's request and in accordance with design drawings, on the outlet pipe for the underdrain system for this cell. This valve is used to drain the cell only during recovery operations. The valve was properly closed at the time of this inspection. Runoff water is now collecting in the cell because the riser boards were installed in the spillway riser. Water should not be allowed to stand in this cell.

The dikes appear stable and did not exhibit any notable changes since the last inspection. All exterior slopes have an excellent vegetative cover. The erosion observed on the dike slope on the previous inspection at the southeast end of the pond was still present. The erosion gully observed on the previous inspection at the southwest end of the pond at the pipe outlet which drains the perimeter ditch of the scrubber pond into the west dredge cell was still present but does not appear to have worsened.

East Dredge Cell

This area is located just south of the medium and coarse coal wash refuse area. This cell was also constructed to accept dredged fly ash from the Jacobs Creek ash pond area. The plant has ceased all dredging into the pond at this time.

The spillway appeared to be in good condition, but was not operating at the time of this inspection. The discharge pipe was clear of obstructions but had a large eroded hole (picture 16) 6' long, 3.5' wide by 3' deep. This hole needs to be filled with filter stone and riprap of the 60 lb to 120 lb stone size (five ton).

The dikes in this area appear to be stable. The tops of dike surfaces are in satisfactory condition, although some vegetation has established itself over the area. Removal of vegetation is not warranted at this time. The dredged ash was seeded two years ago and vegetation is good south of the discharge structure but sparse north of the discharge structure.

An erosion ditch was identified beside the armored ditch in the 1994 inspection report that would have required 1000 lb of riprap at the northeast corner of the dike. This erosion area, caused by runoff which has bypassed the armored ditch, is now over 4 feet deep, eight feet wide and one hundred plus feet long and is getting bigger with each rain (picture 17). The repair will require over 400 tons of riprap now.

The berm ditch was not draining properly near the middle portion of the eastern dike due to some rutting on the dike. Several erosion ditches were observed (picture 18). This appears to be caused by heavy sheet flow which concentrates to form the erosion gullies.

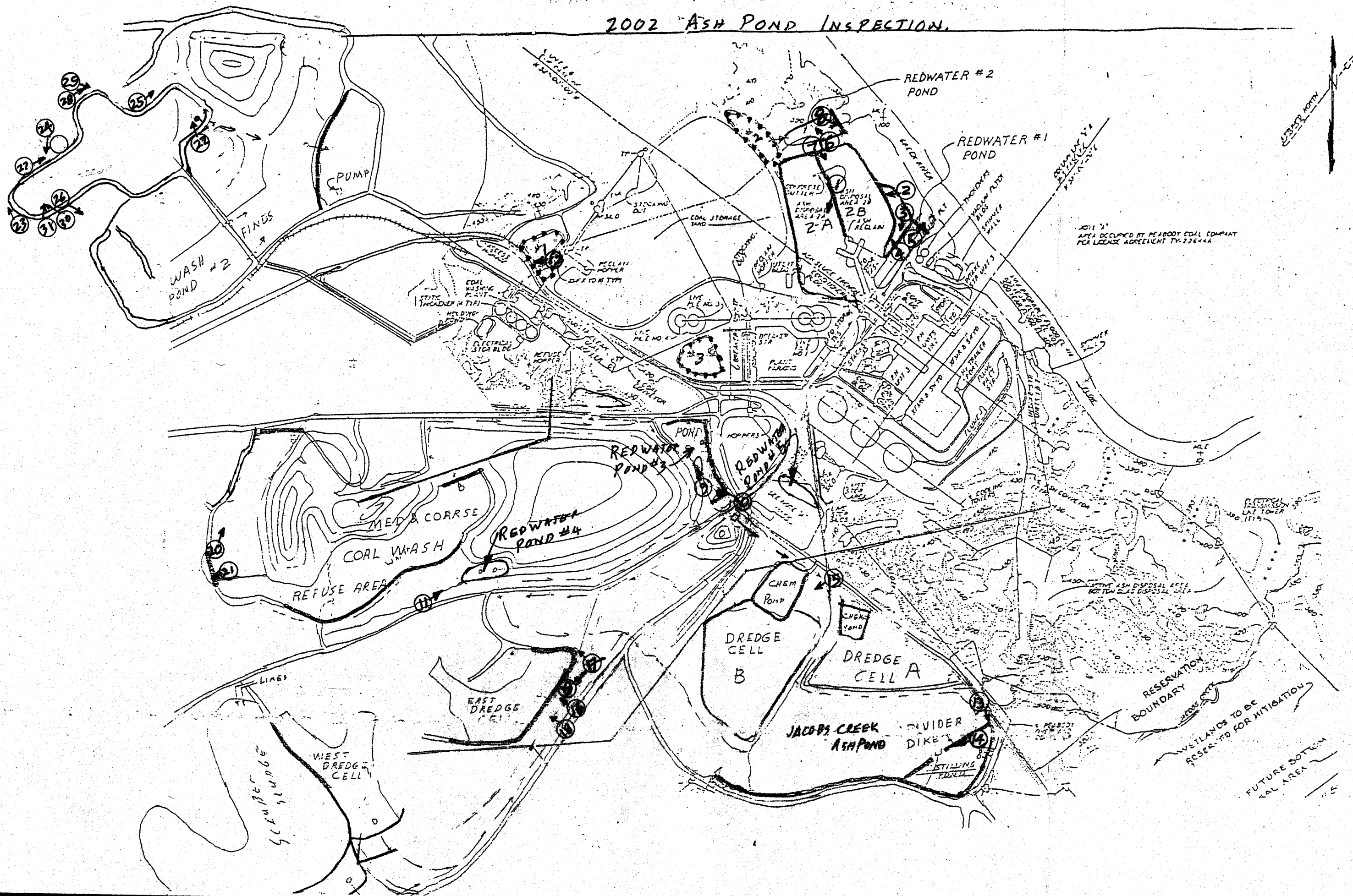
Sections of the geotextile fabric that was placed to protect the discharge ditch have been washed away by the erosive action of the water. The ditch was in good condition near the top of the slope due to placement of riprap on top of the geotextile. The berm ditch was not draining properly near the middle portion of the eastern dike due to some rutting on the dike (picture 19)

Medium and Coarse Coal Wash Refuse Area

Currently, all of the material is transported from the silo to the stack by off-road vehicles. Plant personnel transport the refuse daily to the northwest portion of this region to be stacked. The material appears to lack compaction (picture 20). The material was dumped from the top rather than placed from the bottom and compacted. This decreases the pH of the runoff water and kills the vegetation for this area. The eroding ditch on the west side needs some large rocks or other material placed in it to retard erosion. The west side runoff is by drainage ditches to Redwater Pond #3.

The areas which were at or above the engineered final stacking configuration issued drawings were compacted and covered by HED after this inspection. Runoff from the east side is directed by the berm ditches to the perimeter ditch which discharges into the collection ditch for Redwater Pond #4.

2002 ASH POND INSPECTION.



A good vegetative cover has been established in the southeastern portion of the area. The erosion ditch on the saddle dam that was identified in previous reports is now starting across the road and should be filled (picture 21).

Coal Wash Fines Pond #2

This disposal area is located in the northwest portion of the plant properties. The area is adjacent to the railroad and on the north side of the plant access road. The original pond was completed in the late fall of 1987. The top of the original dike was at elevation 455. The plant raised the dike to approximately elevation 465 in 1990, and subsequently sluiced fines to this elevation. This area has not been active as a sluicing operation since Fines Pond #3 began operation in October 1992.

All of the dikes in this area appeared stable and in good condition. The west dike of this area has been noted in previous inspections to have sparse vegetation. The vegetative cover of this dike is now improving and establishing itself over the area. Several of the small pine trees noted on the west dike in previous inspections are now 15' tall. These need to be removed by pulling them up and compacting the holes with clay.

Coal Wash Fines Pond #3

Fines Pond #3 is located northwest of Fines Pond #2. The first lift was completed in October 1992 and all sluicing was diverted from Fines Pond #2 to this area. The latest lift was finished in September 1999, and the sluice discharge was changed from the east to the west end of the pond. The discharged point was moved from the west end to the east end. The overflow discharge structure (picture22) removes the water and discharges it into a riprapped ditch which flows into Fines Pond #2 and then into the stilling pool.

A dike was constructed around the cemetery to the north of this area to protect it from pond water.

A dike was also constructed in the northeast corner of this area extending from the southeast corner of the cemetery eastward to the exterior dike for pond #3. This dike was constructed to preserve the aesthetics of the cemetery so it would not be surrounded by the future fines stack. All dikes in this area appear to be stable but have some seepage. There is little grass on the slopes (pictures 23, 24, 25, 26, 27, 28). Several of the new culverts that drain the berm ditches were put in high (pictures 27 - 28) and do not drain. When it rains, the full ditches flow across the roads because the culvert invert are above the road elevations.

A slide 29.5 feet long and 10.3 feet high developed the first week of May, 2000 in an area that was seeping. This has been fixed and appears to be working. An area approximately 400 feet long was excavated, an underdrain installed, and riprap placed to stabilize this area of the dike. (The fix was completed by February 23, 2001.

Six seeps/wet areas were found adjacent to the cemetery. They are of equal elevation and cover a distance approximately 200 feet long. Seeps 1, 2, 3, 5 are flowing; 4 and 6 are soft areas. G*UB*MK was to have put in a sixty degree weir to assist in monitoring the flow from this area in 2000. No weir has yet been installed.

This disposal area is located in the northwest portion of the plant properties. The area is adjacent to the railroad and on the north side of the plant access road. The original pond was completed in the late fall of 1987. The top of the original dike was at elevation 455. The plant raised the dike to approximately elevation 465 in 1990, and subsequently sluiced fines to this elevation. This area has not been active as a sluicing operation since Fines Pond #3 began operation in October 1992.

All of the dikes in this area appeared stable and in good condition. The west dike of this area has been noted in previous inspections to have sparse vegetation. The vegetative cover of this dike is now improving and establishing itself over the area. Several small pine trees were also observed on the west dike and need to be removed by pulling them up and compacting the holes with clay.

Coal Wash Fines Pond #3

Fines Pond #3 is located northwest of Fines Pond #2. The first lift was completed in October 1992 and all sluicing was diverted from Fines Pond #2 to this area. The latest lift was finished in September 1999, and the sluice discharge was changed from the east to the west end of the pond. The discharged point was moved from the west end to the east end. The overflow discharge structure (picture21). removes the water and discharges into a rip rapped ditch (pictures 22 &23) which flows into Fines Pond #2 and then into the stilling pool.

A dike was constructed around the cemetery to the north of this area to protect it from pond water.

A dike was also constructed in the northeast corner of this area extending from the southeast corner of the cemetery eastward to the exterior dike for pond #3. This dike was constructed to preserve the aesthetics of the cemetery so it would not be surrounded by the future fines stack. All dikes in this area appear to be stable but have some seepage. There is little grass on the slopes (pictures 24, 25, 26, 30, 31, 32 & 33). Several of the new culverts that drain the berm ditches were put in high (pictures 31 - 33) and do not drain.

A slide 29.5 feet long and 10.3 feet high developed the first week of May, 2000 in an area that was seeping. This has been fixed and appears to be working. An area approximately 400 feet long was excavated, an underdrain installed, and riprap placed to stabilize this area of the dike. (The fix was completed by February 23, 2001. The culverts in this area have not been lowered and the plant personal continue to think that water runs up hill. The full ditches flow across the roads because the culvert invert are above the road elevations.

Six seeps/wet areas were found adjacent to the cemetery. They are of equal elevation and cover a distance approximately 200 feet long (pictures 26-30) Seeps 1, 2, 3, 5 are flowing; 4 and 6 are soft areas. G*UB*MK was to have put in a sixty degree weir to assist in monitoring the flow from this area in 2000. No weir has yet been installed.

The riprap discharge from the area east of the cemetery that is located at the south east corner of the cemetery is rutted and material is filling up the ditch and filling the lower end of the cemetery.

An erosion problem that existed from the outlet of the borrow pit that was used to construct the last lift of Fines Pond #3 has been fixed and appears to be working fine.

The riprap discharge from the area east of the cemetery that is located at the south east corner of the cemetery is rutted (pictures 25 -29) and material is filling up the ditch and filling the lower end of the cemetery.

An erosion problem that existed from the outlet of the borrow pit that was used to construct the last lift of Fines Pond #3 has been fixed and appears to be working fine.

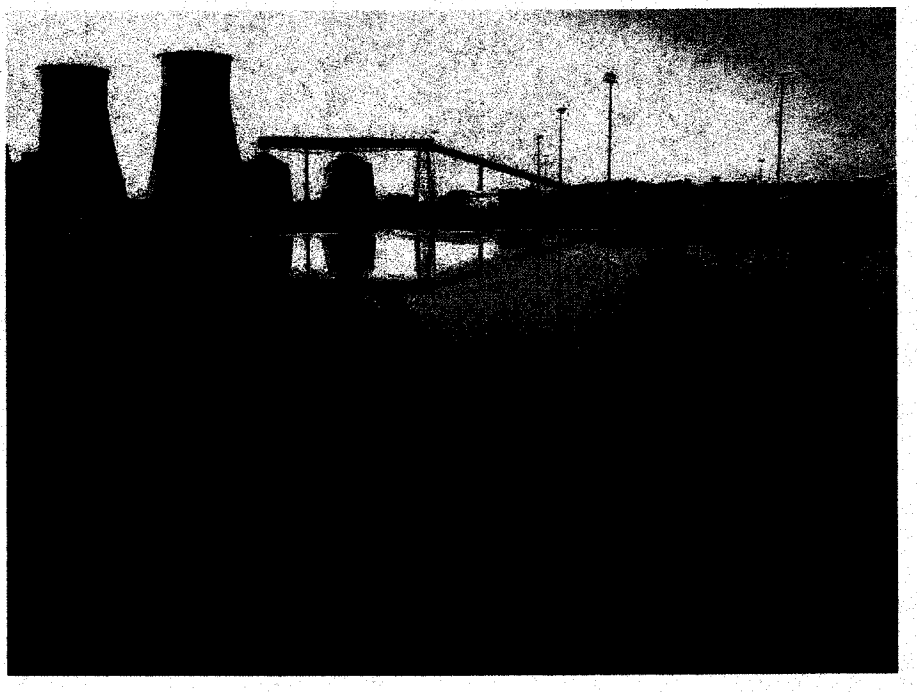
The southwest discharge structure has cavitated (pictures 30 - 31) to the point that it poses a safety hazard. The stand pipe joints should be sealed, then ash filled around the pipe.

Recommendations:

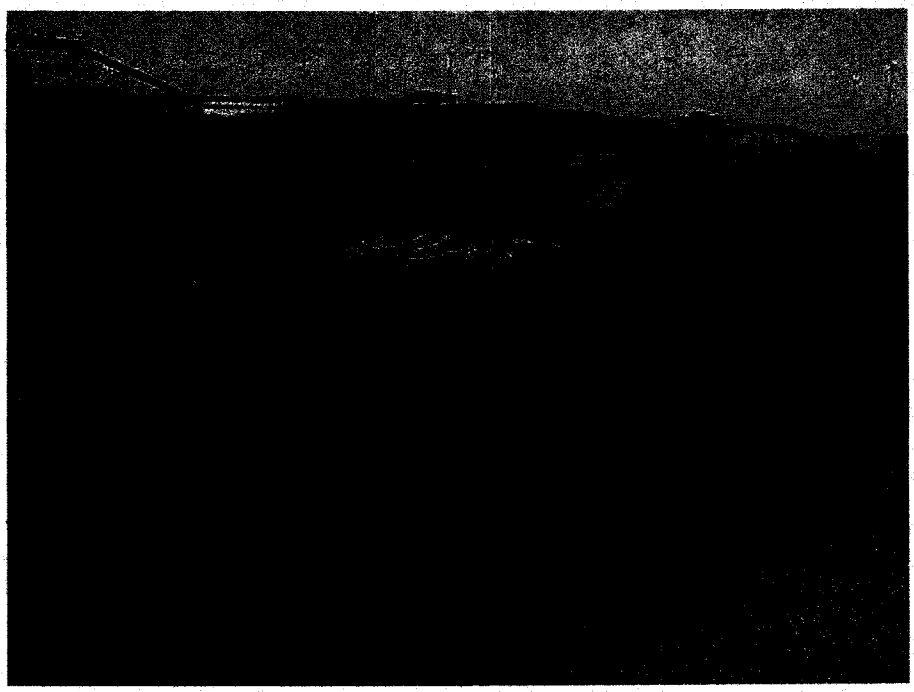
- Plant personnel should continue to periodically mow grass and remove small trees and brush from all dike slopes. Plant personnel should pull up all trees and compact soil back in the holes.
- Plant personnel should also continue to maintain all dike roads for all weather travel to facilitate the required daily inspections and routine O&M activities.
- Plant personnel should monitor the exterior dike slopes for seepage, wet or soft spots or animal burrowing, etc. and notify Fossil Engineering of any changes.
- Continue to monitor the survey controls installed on the exterior dike slope of Area 2B slag pond adjacent to Green River for any indication of slope movement.
- Remove the vegetative growth from the entrance to the horizontal discharge pipes in RW #3 so that flow does not become inhibited during periods of heavy rainfall.
- Plant personnel should repair the ruts on the top of redwater pond #3 dikes by filling with earthfill and regrading to provide positive drainage. (estimated 18 CY soil)
- Repair the perimeter of coal yard drainage basin #3, by compacting clay in the erosion gullies and seeding.
- Clean out all of the coal yard drainage basins and all of the redwater ponds, especially RW #2, #3 & #4 ponds, repair the pumps in coal yard pond #2 so no water flows through the emergency overflow.
- Continue to remove any vegetative growth and/or beaver dams that may be blocking the spillway from the slag area beaver pond. The adjacent dike should be monitored to insure that it is stable and that the area does not remain saturated. A minimum freeboard of 2 feet is desirable.
- Near the Jacobs Creek Ash Pond, bottom ash should be placed and compacted at the edge of the county roadway to avoid further erosion and encroachment of the road. Additional riprap should be placed under the outlet of all existing drain pipes to stop erosion. (80% 40 lb or greater. Estimated 8 ton per pipe)
- Plant personnel should repair the toe of the dikes around Jacobs Creek ash pond by replacing the excavated earthfill along the toe of the dike, compacting and grassing to a uniform slope. (estimated 200 CY soil)
- Plant personnel should repair the riprap discharge at the southeast corner of the cemetery and clean out the concrete ditch. (estimated 200 ton riprap)
- Slope stake the gypsum stack to identify designed berm locations, finish grading per survey and place temporary cover on side slopes.
- Plant personnel should repair the eroded area at the discharge outlet of the east dredge cell pond by placing riprap in the washed out area at the outlet; (80% of 60 to 80 lb stones, estimated 8 tons) fill the eroded area adjacent to the armored ditch with compacted earthfill, line the area with a filter fabric, and cover with a filter blanket and riprap. (6"thick of 1032 (size 5

stone) with 24" of riprap of 80% 60 to 80 pound stones. (estimated 156 ton riprap with 140 CY of compacted clay and 40 tons of #5 stone with 200SY of filter fabric).

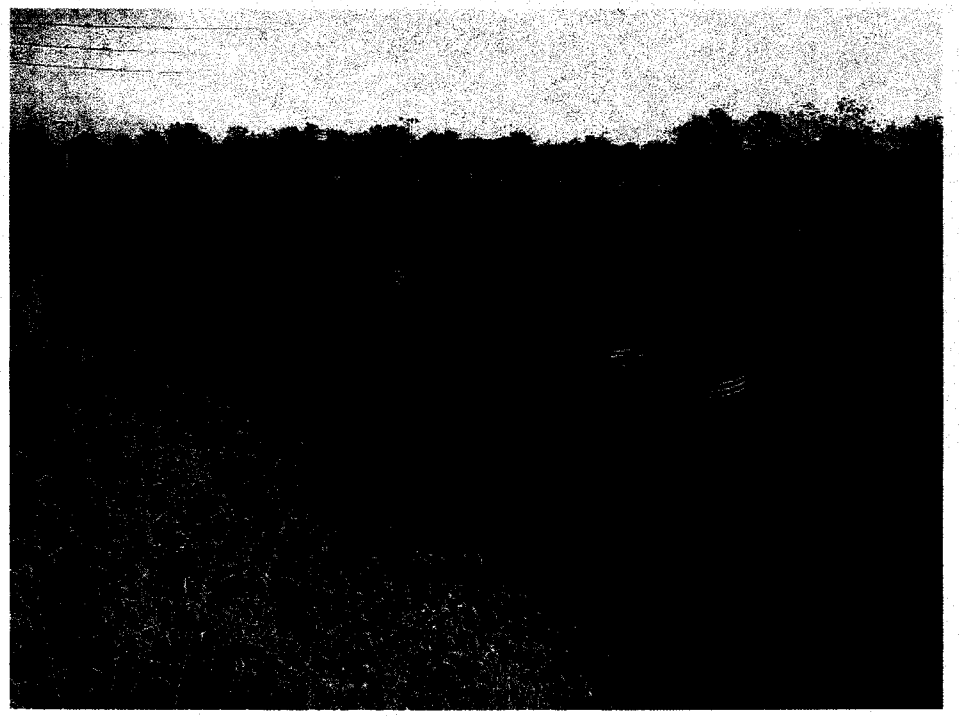
- Near the East Dredge Cell, repair the erosion gully adjacent to the overhead conveyor so that the foundation of the conveyor is not undermined. This area should be filled with earth, compacted, and covered with riprap then walked in with a dozer to prevent erosion.
- Repair the erosions from the berm on East Dredge Cell.
- Plant personnel should stack coarse and medium coal wash refuse according to engineering design drawings and not according to angle of repose. The design drawings must be used to determine grade during stacking to comply with TVA configuration management procedures. (see 10W4276-14).
- Place cover on all coarse and medium coal wash refuse areas which have reached final grade.
- Install and check the weir at the cemetery daily unless the seepage is constant, then at least twice a week. Report any increases to; Joel D. Paris @ 423/751-3515 or Lynn Petty @423/751-6704 in Chattanooga.
- Water should not be allowed to pond in the West Dredge Cell. A combination of removing the riser boards and/or installing 1" spacers near the bottom of the riser (within 2 FT +/- of the bottom) needs to be implemented as soon as possible.
- Plant personnel should lower the drain pipes from the berm ditches of Fines Pond #3 to eliminate standing water in the berm ditches.



Picture no. 1. Slag area 2A Note the geese are walking.

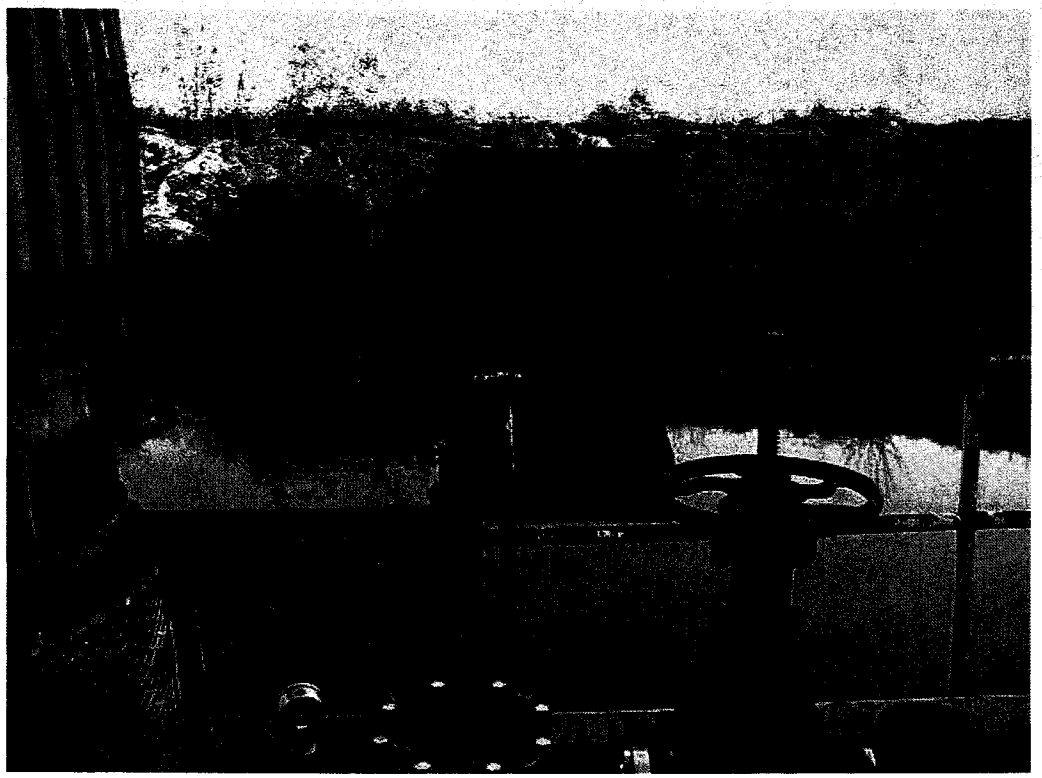


Picture no. 2. Flow from 2A into stilling pool.

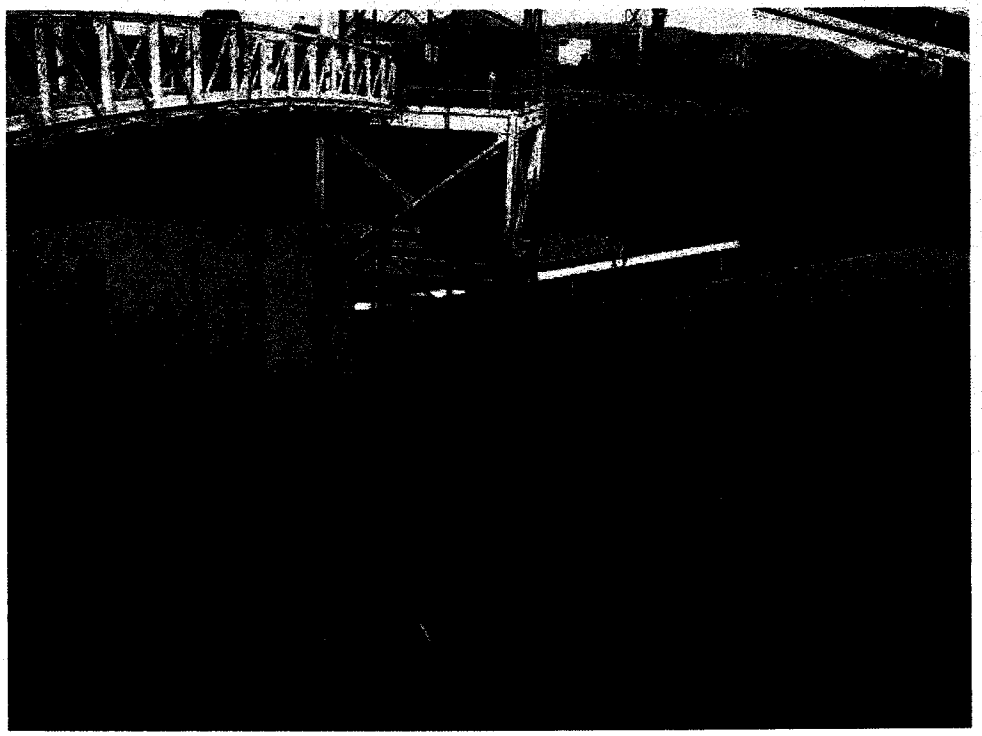


Picture no. 3. Stilling pool discharges.

Picture no. 4. Stilling pool and by pass hose intake.



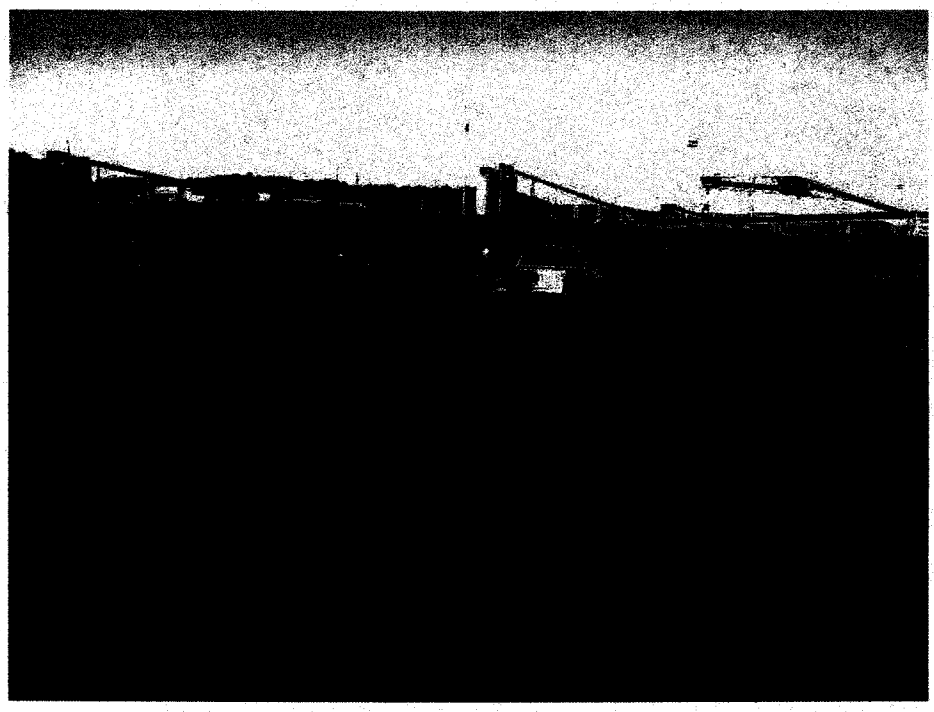
Picture no. 5. Discharge structure from red water #1 to the Green River.



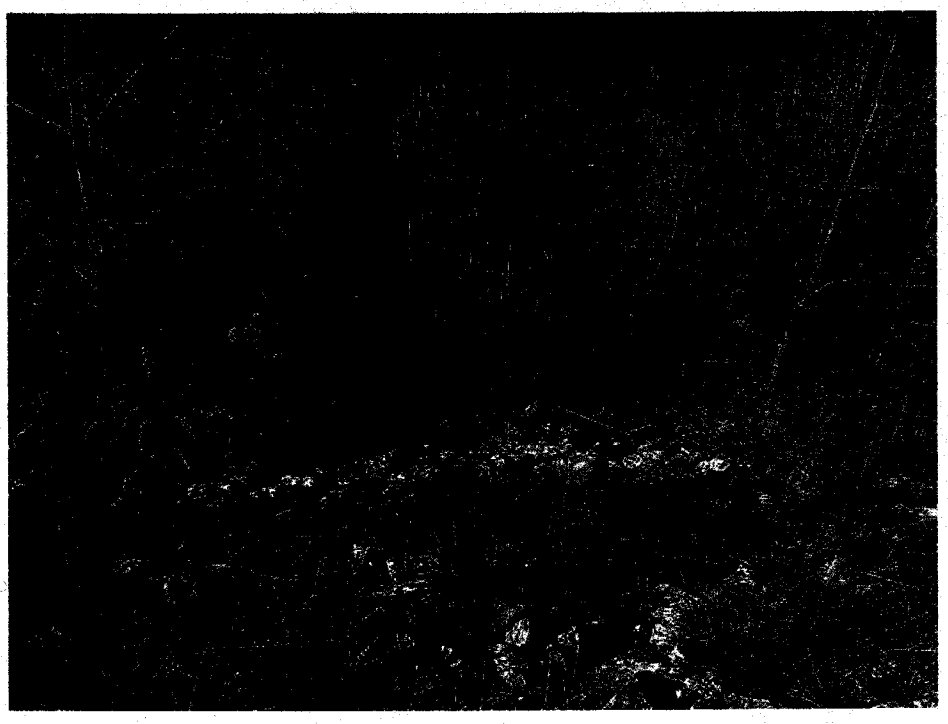
Picture no. 6. Red water Pond #2 (RWP#2) pump platform. Note high water in pond.

Picture no. 7. Pond 2A with pumping platform.

Picture no. 8. Fence on lower side of RWP#2 dike.
Note height of silt when water overtopped the dike.

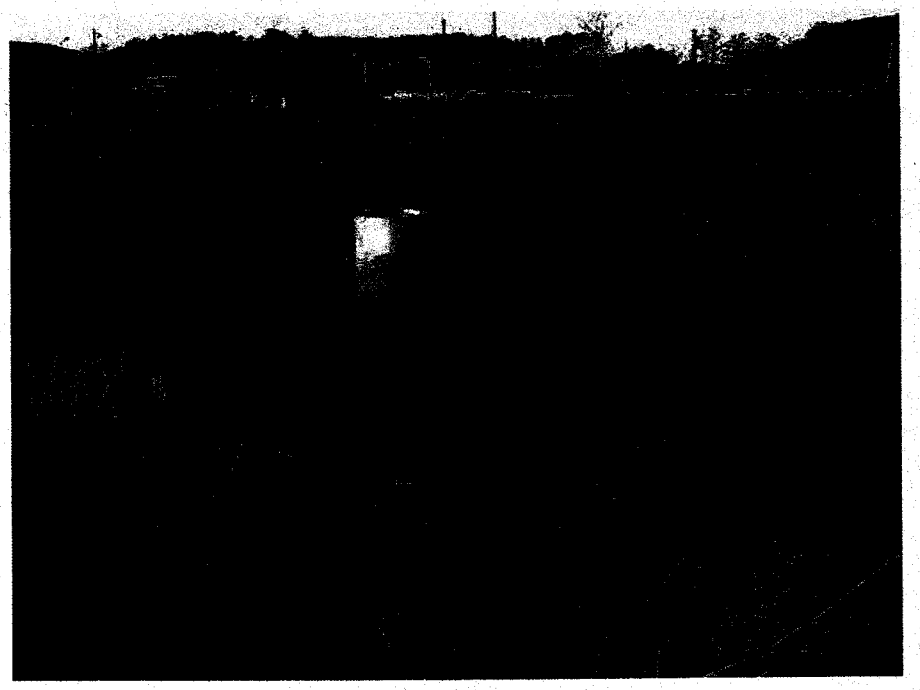


Picture no. 9. Redwater #3 Standing at the edge of the water that flows across the road.



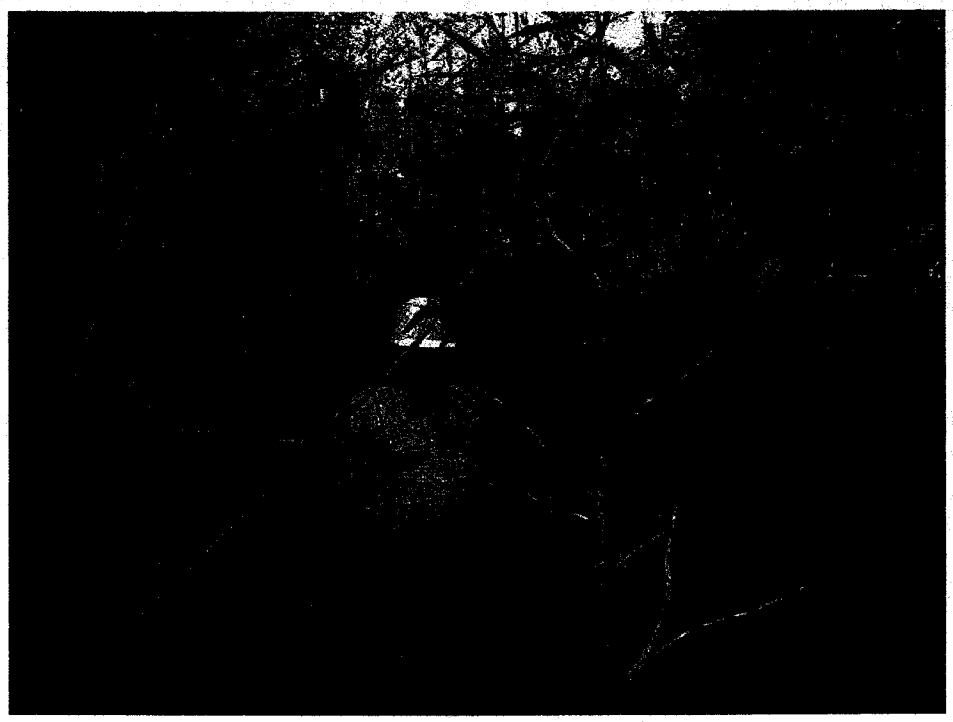
Picture no. 10. Discharge pipes from RWP#3 that need to be cleaned.

Picture no. 11. Red water pond #4.

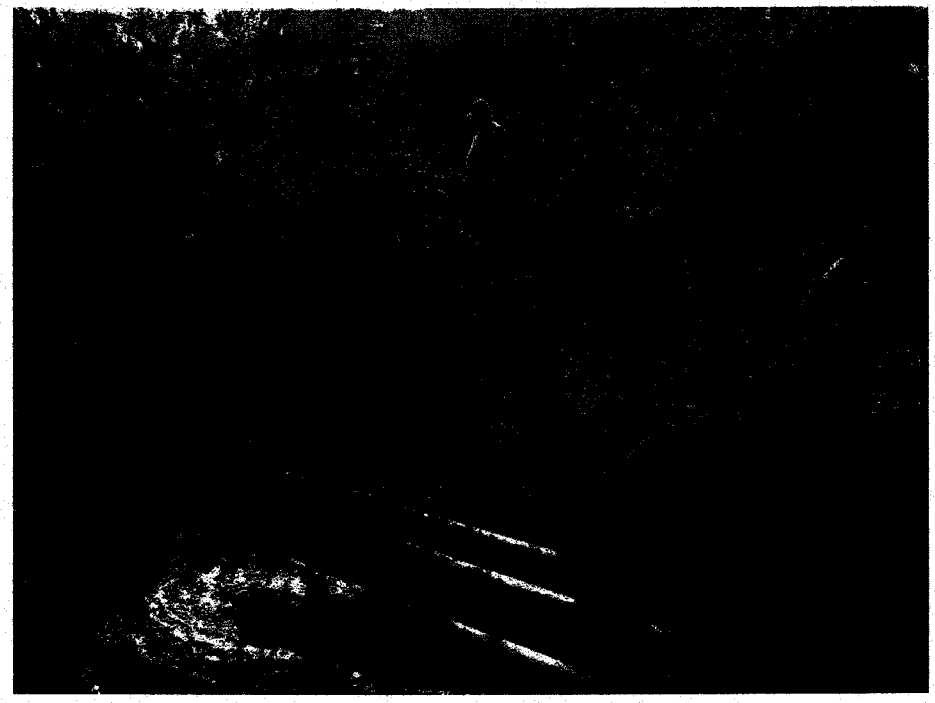


Picture no. 12. Coal yard runoff pond #1 Water flows from this pond through a hole in the bottom of the pipe to RWP#2.

Picture no. 13. Top of dike of Jacobs Creek Fly ash Pond.

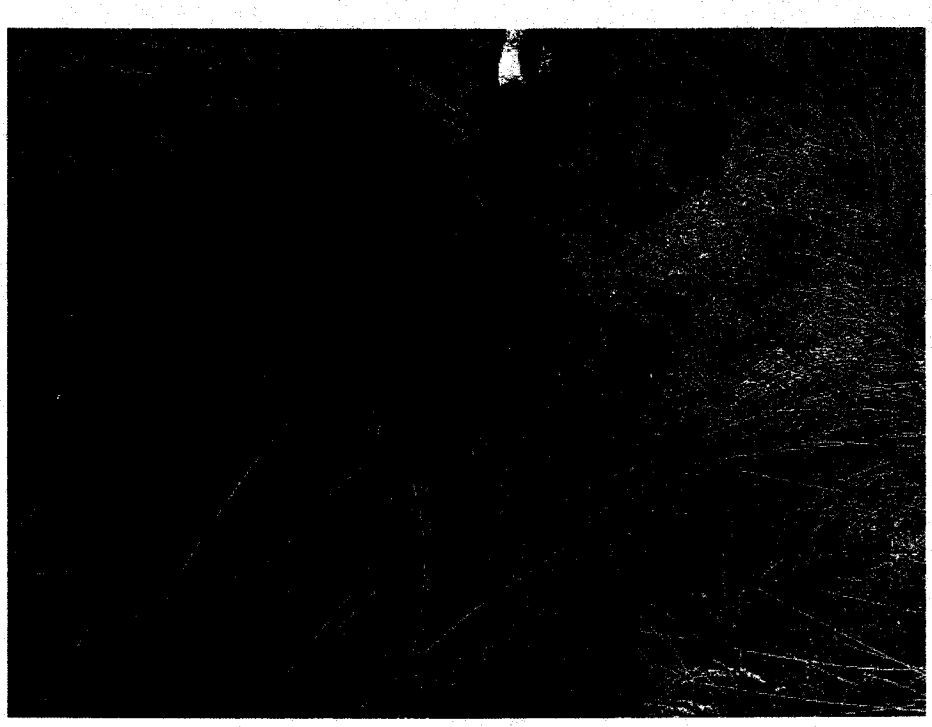


Picture no. 14. Growth on the dikes of Jacobs Creek Fly Ash Pond.



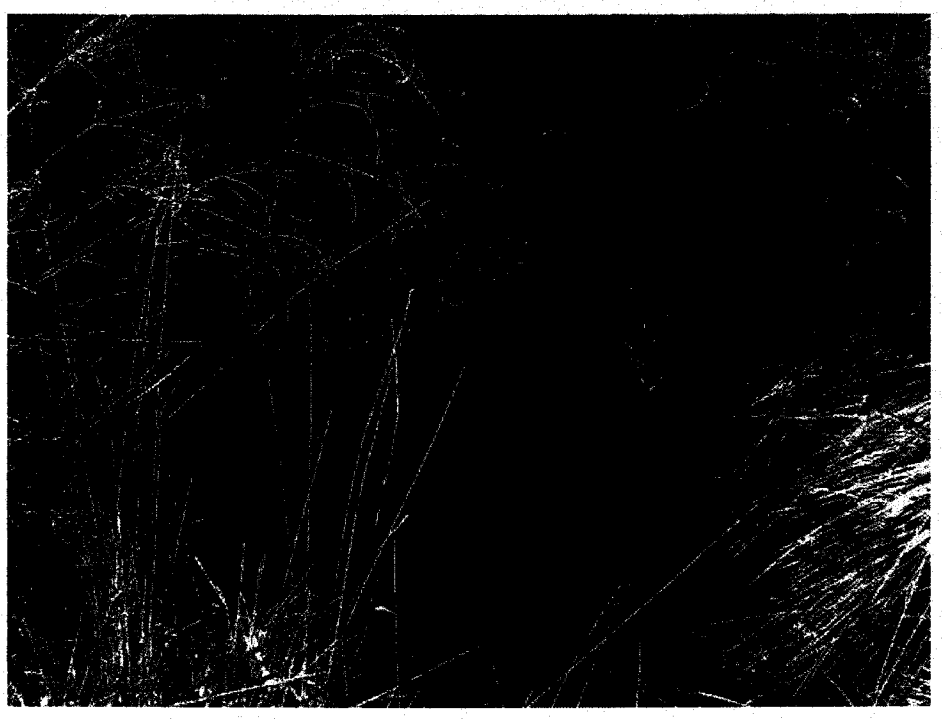
Picture no. 15. Discharges into Jacobs Creek Fly Ash Pond.
The 5' pipe from RWP#3 is not visible.

Picture no. 16. Erosion from water discharging from East Dredge Cell. This needs to be filled.

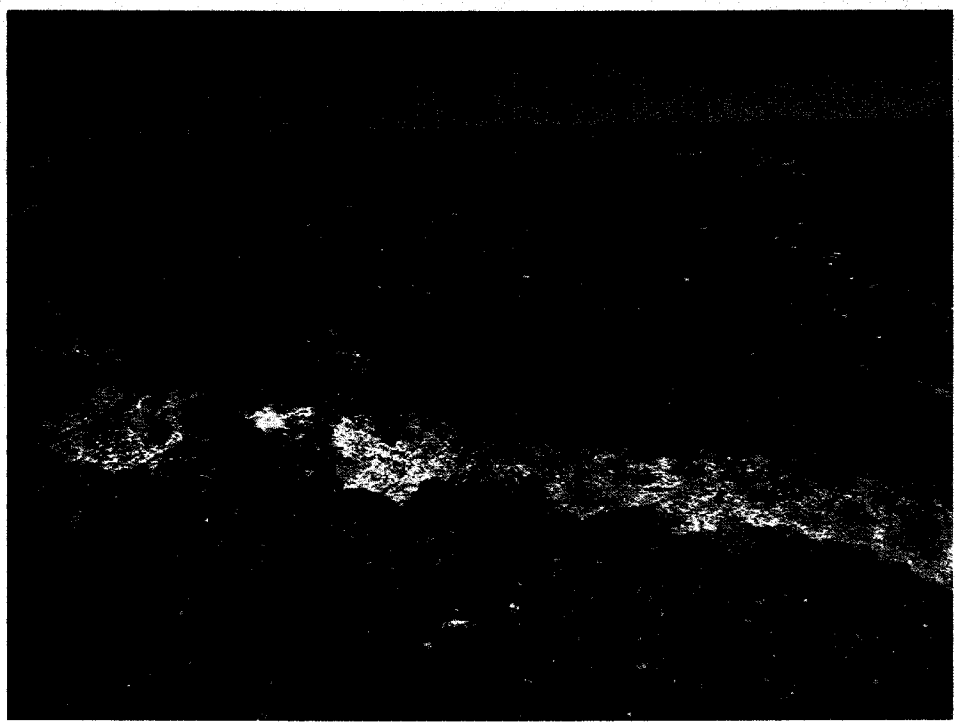


Picture no. 17. Erosion ditch at the northeast corner of East Dredge Cell beside the armored ditch.

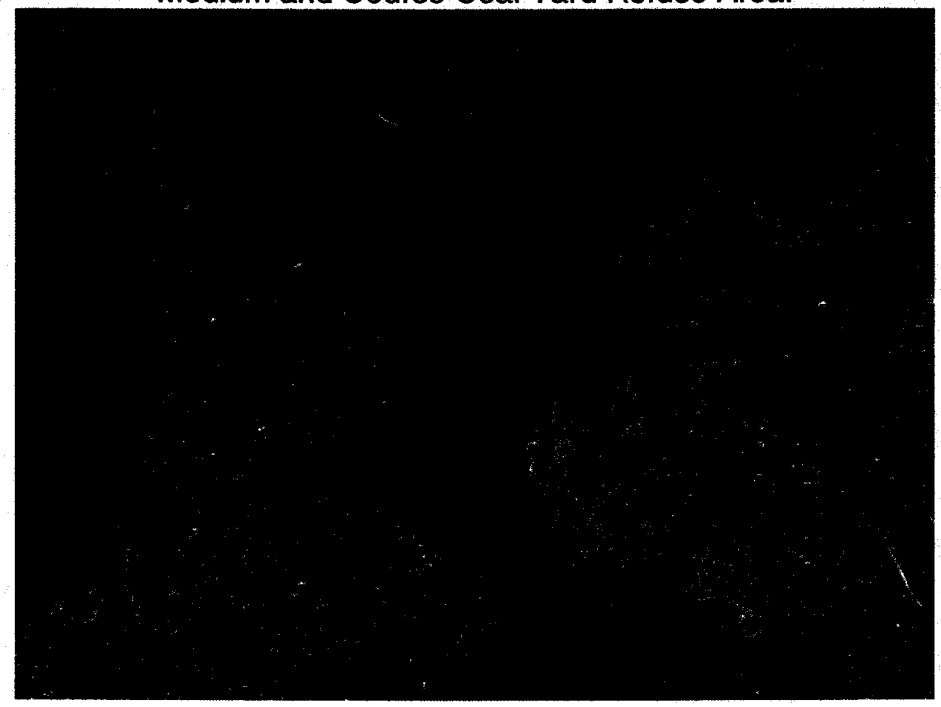
Picture no. 18. Erosion from East Dredge Cell berm ditch.



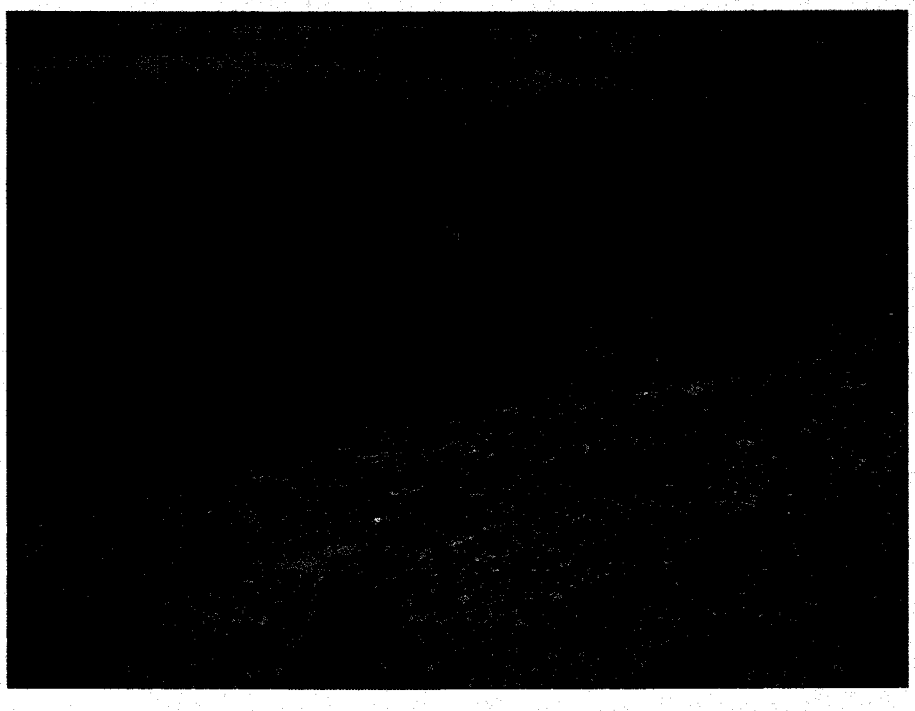
Picture no. 19. Damaged area of the discharge ditch from the East Dredge Cell.



Picture no. 20. Erosion gullies on the south end of the Medium and Course Coal Yard Refuse Area.



Picture no. 21. Wash out on the Saddle Dam at Refuse Area.



Picture no. 22. Fines Pond #3 discharge.

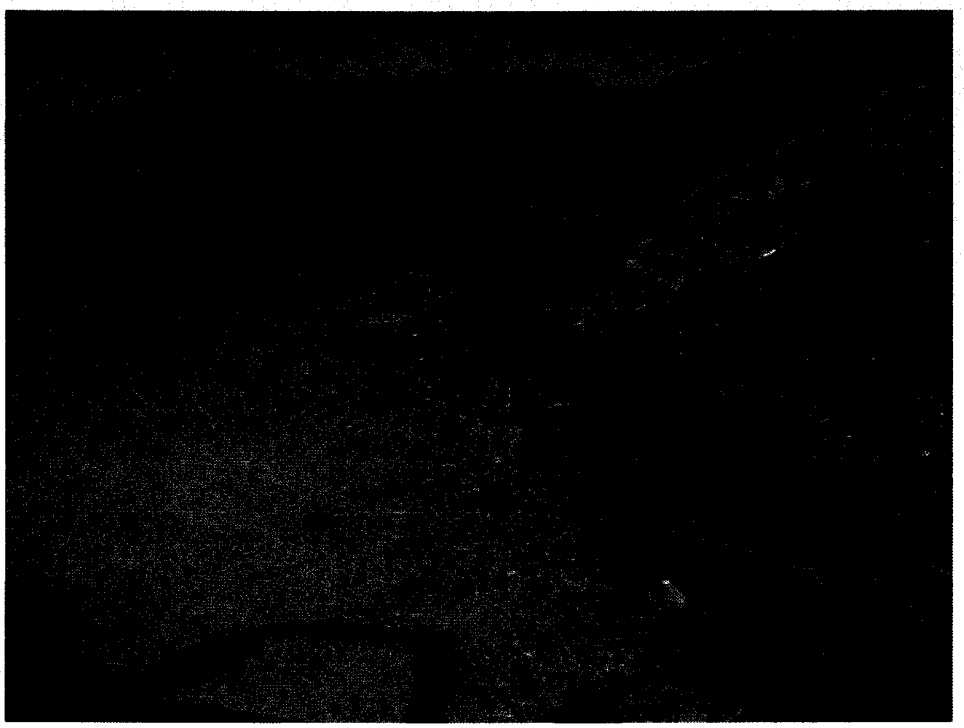
Picture no. 23. Typical Seepage and grass cover of Fines Pond #3.

Picture no. 24. Fines Pond #3 south dike.

Picture no. 25. Discharge from capped area east of cemetery.

Picture no. 26. Pond adjacent to Daniel Run.
South of Fines Pond #3.

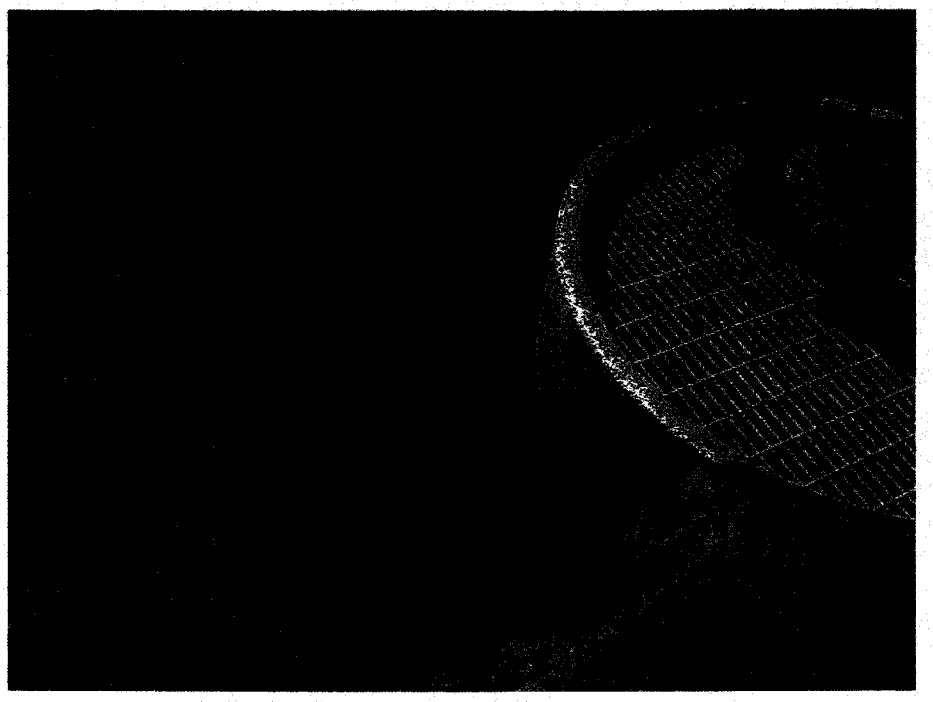
Picture no. 27. Ditch full of settlement because the Pipe Invert at the front of the truck is above the road 200' out.



Picture no. 28. Pipe inverts above access roads, sediment has filled ditch.

Picture no. 29. Close up Picture #25 showing damage .

Picture no. 30. Cavity at Fines Pond #3 old discharge.



Picture no. 31. Cavity at Fines Pond #3 old discharge.

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February 4, 2003

D. E. Gaston, PAF 1A-DRK

PARADISE FOSSIL PLANT (PAF) - ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Attached is a report from Joel Paris concerning the inspection of December 12 and 13, 2002, at PAF's ash disposal areas.

This report includes recommendations for corrective work. I concur with these recommendations.

If you have any questions, please contact Ron Purkey at Chattanooga extension 4820 or Joel Paris at Chattanooga extension 3515.

J G Adair

James G. Adair, Manager,
Engineering Design Services
LP 2G-C

JGA:REP:JDP:LMV
Attachment
cc(w/attachment):
S. B. Brothers, PAF 1A-DRK
[redacted]
M. D. Davis, LP 5E-C
K. J. Dukes, PAF 1A-DRK
R. E. Johnson, LP 2L-C
R. L. Kassinger, PAF 1A-DRK
G. R. MacDonald, LP 5E-C
EDMS, EB 5G-C

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TENNESSEE VALLEY AUTHORITY
PARADISE FOSSIL PLANT

ANNUAL STABILITY INSPECTION OF
WASTE DISPOSAL AREAS

Prepared By: Joel Paris
Date: January 29, 2003

PARADISE FOSSIL PLANT
ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Introduction

The waste disposal areas at Paradise Fossil Plant (PAF) were inspected for dike structural stability on December 11 & 12, 2002. The inspection was performed by Joel D. Paris of Fossil Engineering, and was accompanied by Diedre Nida and Bruce Yeager of the NEPA staff. The inspection and findings were discussed with Kimberly Dukes and David Brown of Paradise Fossil Plant. The previous annual inspection was conducted on November 7 and 8, 2001.

The results of the annual stability inspection are listed below according to their location within the Paradise Fossil Plant Boundaries. A location map is attached with arrows showing directions of picture taken.

Slag Areas 2A, 2B, and Stilling Pond

Boiler slag is sluiced into the south end of area 2A and is usually reclaimed once a day by Reed Minerals as part of a TVA marketing strategy. The reclaim area is full and is being stacked with-in the pond. This has caused the other end of the pond 2A to be full and has greatly reduced the storage time in the pond. The two ponds are to be cleaned out by the Heavy Equipment Division of TVA this spring.

The sluice water then flows into pond 2B through pipes and around a series of baffles to lengthen the settling time. The sluice water enters the north end of the stilling pool through a concrete flume (picture 1). A large concrete block has been placed in the concrete flume to temporary raise the water 24". The flume appeared to be in good condition and only a small amount of water was flowing freely around the block into the stilling pool. From here the water discharges through three standard spillways (picture 2) into the Green River if the water is environmentally acceptable. If not, the water is pumped to the Jacob's Creek fly ash pond. The riprap at the outlet end of the spillway discharge pipes appeared to be in good condition.

The dikes appear to be stabile and did not exhibit any notable changes since the last inspection. The rut that had developed from runoff from the road was repaired. The interior slopes of the dikes have a good vegetative cover. There was an access stairway built over the outlet end of the pipes into Area 2B. The plant continues to monitor the survey controls installed on the exterior dike slope adjacent to the Green River for any indication of movement. The security fence needs to be repaired (picture 3).

Redwater Ponds (Nos. 1, 2, 3, 4 & 5)

Redwater Pond #1

Redwater pond #1 (RW#1) is located northwest of and adjacent to the powerhouse. Considerable repairs, cleanout and bank reconstruction (picture 4) has been preformed by the plant due to the Ball Mill Flooding (picture 5). Plans are being developed to have HED excavate the pond to its original configuration (picture 6). The bottom ash pipes are breaking and discharging their contents into the red water pond. This discharge is filling up the pond and impeding the flow from the 72" storm water pipe. The muck has filled to six feet above the 84" brick lined pipe (72"). The muck is to the top of the riprap wall around the discharge pumps (picture 7).

All pumps, slopes, dikes and discharge structures appear to be working properly. Water collected in redwater pond #1 is pumped into the slag pond within Area 2B (picture 8).

Redwater Pond #2

Redwater pond #2 (RW#2) is located northwest of and adjacent to Slag Areas 2A & 2B. The water from RW#2 is pumped from the center of the pond and discharged into the northwest end of slag ponds 2A. All slopes and dikes appear to be in good condition. However, the pond had a high level of sediment in it (picture 9). The Coal Yard Drainage Pond #1 drains into RW#2 via a 72" pipe. To function as designed, the water level in Redwater Pond #2 must be maintained at or below elevation 385, which is two feet below the outlet of the 72" pipe. The submerged outlet of this pipe could cause a serious problem in RW#2 because of lack of rain water storage. The pumps are not large enough to remove the water fast enough to stop an overflow of the dike. (See trash on the fence picture 10).This also causes problems up stream at Coal Yard Drainage Pond #1.

Redwater Pond #3

Redwater Pond #3 is a settlement pond and is located southwest of the powerhouse and along the south side of the county road. This pond collects the runoff and sediment from the medium and coarse coal wash refuse areas and decanted water from RW#4. RW#3 discharges to Jacobs Creek Fly Ash Pond.

RW #3 was designed to discharge to RW #1 via a gravity drain with a manual valve contained within the discharge structure. Due to the high level of sediments in the pond, this valve cannot be opened. This valve is opened only when the pond is to be cleaned out. Otherwise three horizontal discharge pipes direct excess storage from RWP #3 to the Jacob's Creek active ash pond during periods of rainfall (picture 13).

The sediment in the RW #3 pond needs to be cleaned out as it is above the clean out access road (picture 11). There may be problems with the clean out because a sampling well has been placed where the crane was designed to set (picture 11) during the cleanout operation. The weeds in front of the discharge pipes have raised the discharge elevation by six inches. These weeds need to be cleaned out (picture 13). The three discharge pipes are all discharging equally into the transition box.

There are several trees on the inside of the dike that need to be pulled up and clay placed in the resulting hole and compacted. This should be done during pond clean out while the water is lowered. There were also small trees and brush observed on the top of the east dike. Rutted areas were evident along the top of the east dike and were holding water. The ruts appear to be caused by previous heavy equipment travel on the dike.

Redwater Pond #4

Redwater Pond #4 is a surge/sediment pond located east of the medium and coarse Coal Wash Refuse Area. This is a surge pond that settles out the fines so they can be cleaned out with a back hoe easier and cheaper and before the fines reach RWP #3. This surge pond was designed to drain to RWP #3 via an eight inch pipe into an open riprap ditch beside the road. The high water level in the pond shows that the sediment is over the end of the 8" pipe (picture 14). An emergency overflow structure drains runoff during heavy rains that exceeds the standard 10 year - twenty-four

hour rainfall event, directly to the Jacob's Creek fly ash pond there-by bypassing RW #3. The pond was to be cleaned out when the sediment reached the invert of the 8" discharge pipe. The fines are now above the 8" pipe (picture 14) because the pond is full of water to the top of the emergency overflow pipe. Red water seepage from the bank into the ditch below the 8" discharge is continuing as noted in last year's report The additional 8' head from RW#4 is a suspected cause of this.

Redwater Pond #5

Redwater Pond #5 is located south of the powerhouse, east of the truck coal dumping area and west of the limestone storage area. It is a surge pond designed to delay and hold enough water going to redwater #1 to give the pond #1 pumps time to lower the water level from any rains below a 10 year frequency. An overflow structure drains runoff during rains exceeding the standard 10 year - twenty-four hour rainfall event directly to redwater pond #1. All water collected in redwater pond #5 drains to redwater pond #1 via a gravity drain and no water should ever be in RW #5 pond four hours after a rain.

Coal Yard Runoff Pond #1

Coal Yard Runoff Pond #1 (CYRP#1) is located north of and across the plant access road from the Coal Wash Plant. This is a surge/sedimentation storm water runoff pond that delays runoff to RW #2. Water and sediment is collected in the pond and the decanted water is discharged through a six inch hole cut in the side of the stand pipe (picture 16). This hole is not configured per the original design drawing in size, or elevation but is doing a fair job. A wall was built to keep the coal fines away from the discharge point (picture 15). The fines have been cleaned out and the pond is operating as designed.

Coal Yard Runoff Pond #2

Coal Yard Runoff Pond #2 (CYRP#2) is located southwest of and across an access road from Redwater #2 Pond. This pond was designed as a storm water sedimentation pond and all water from this pond is to be pumped to slag pond 2A. Since the last inspection, CYRP #2 was cleaned of sediment and had a low water level. There were three pumps on the platform but there is no power to any of them. The pumps are designed to pump all water from this pond to Pond 2A.

Coal Yard Runoff Pond #3

Coal Yard Runoff Pond #3 is located south of the coal transfer complex and north of and adjacent to the access road. This pond can discharge by gravity or be pumped to RW #1. Several erosion gullies have developed around the perimeter of the drainage basin that should be repaired.

The emergency overflow is blocked or has been modified to the point that it does not operate (picture 17).

Slag Area

The slag area is located southeast of the powerhouse. The slag in this area was placed here by the plant during its early operations and is currently being reclaimed for commercial use by Reed Minerals personnel. The area contains a small surge pond to collect runoff and a larger area, called the beaver pond, which discharges over a spillway and down a riprap channel into Jacobs Creek.

The riprap appears to be in good condition. The beaver dam that was restricting flow to Jacobs Creek has been removed. Plant personnel have continued to frequently monitor this area and clean out any beaver dams (picture 18).

The dikes appear to be stable with a good vegetative cover on them. The redwater seeps identified in earlier reports along the southwest dike in this area are still present. Some of the red water seeps continue to have growing deposits of material. Plant personnel monitor these areas frequently. The erosion gully, observed on previous inspections, located at the end of the southwest dike just north of an existing culvert has worsened. The eroded area has encroached upon the roadway and should be repaired before further encroachment occurs.

Jacobs Creek Fly Ash Pond Area

This area is located southeast of the powerhouse. Fly ash is sluiced into the northern portion of the original pond (picture 19). Water flowed through a divider dike with a floating boom skimmer structure and into the stilling pond before being discharged into Jacobs Creek via three standard spillways. The skimmers and floating boom in the stilling pool have been removed and the opening in the divider dike filled. Water now flows through a dike breach in the southwest portion of the ash pond then into the Fly Ash Pond Area Extension (the new ash disposal area).

The divider dike had several trees that must be removed by pulling them up and compacting bottom ash in the holes. The sloughing area that was noted in the previous two ash pond inspection reports on the south dike just west of the divider dike was still present. The road on top of the dike has several mud holes that need repairing. A requirement of these structures is that an all weather road be maintained for a visual inspection each shift.

The dikes appear to be stable and do not exhibit any notable changes in there exterior since the last inspection. There are several trees and other growth growing on the dikes that were listed in previous reports. The trees must be pulled up and earth compacted in the hole. When a tree dies, the decaying roots cause piping.

There were no new slough failures observed along the south dike this year due to removal of material at the toe of the dike. A portion of the toe of the dike has been repaired at the northeast end of the stilling pool. Earth fill has been placed at the toe and compacted to make a uniform slope. There was a 75' long slough area located on the northeast end of the dike. This was caused by removal of material at the toe of the dike by TVA while cleaning out the ditch along the county road. There was flow from the pipe at the time of this inspection from seepage of the north dike of Jacobs Creek Fly Ash Pond. Vegetation in the discharge noted in last year's report has been removed.

Fly Ash Pond Area Extension

This disposal area was put into operation in September 1997. The area is located adjacent to and south of the existing Jacobs Creek Fly Ash Disposal Area. Dikes in the southern and eastern portion of the area were raised from approximate El 400 to El 408. The existing dike of Jacobs Creek Fly Ash Disposal Area was breached at the southwest end of the pond. This allows water to flow into the new pond and around the installed concrete pipe that maintained a water cover over the ash in the Jacobs Creek Fly Ash Disposal Area. Flow is uniform and non-eroding through the

ash pond. Riprap in the breach and channel were in good condition. After the ash settles out, the water flows into a stilling pool in the northeast portion of the pond through a divider dike with a floating boom. Water is then discharged through three 48" vertical spillways, with skimmer structures, and out through three 36" diameters concrete pipes to Jacobs Creek.

The spillway structures appear to be operating properly. All three outlets appear to be discharging equally at the time of this inspection. The riprap at the spillway discharge outlets appeared to be in good condition. There is a stairway for access from the top of dike to the discharge pipes for monitoring purposes. Dikes were constructed in the southern and eastern portion of the area. The dike slopes have established vegetation. The road on top of the dike needs additional crushed stone surfacing. All exterior dikes appear to be in good condition with no visible signs of instability.

There was a beaver lodge located on the north portion of the area. Plant personnel should monitor the dikes for beaver activity and take immediate corrective action as beavers like to tunnel below the waterline into dikes. A man can sit up or lay down in the area that the beavers have removed the material from. This was also noted in year's report.

Scrubber Waste Wet Ponding Area

This area is located in the southwest corner of the TVA reservation. Scrubber waste is sluiced into the northern end of this region and stacked by long reach track hoe via the rim ditch method. Scrubber waste is sluiced through the ditch formed by the exterior dike and an interior separator dike to the western corner of the area to allow that area to fill with scrubber waste. Water is discharged from the scrubber pond to a settling pond by vertical spillways. The stilling pool water discharges from the stilling pool through a vertical spillway into a ditch that empties into the Jacobs Creek Fly Ash Pond a half mile away.

The discharge pipes from the scrubber pond to the settling pond appear to be in good condition. The standard spillway out of the stilling pool was in good condition.

The exterior dikes on the south east side did not fair very well during tropical storm Isadora in October of 2002. There are three areas that the plant is in the process of repairing (pictures 20 through 25). The remainder of the area appears stable with a good vegetative cover and did not exhibit any notable changes since the previous inspection (picture 26). However, there were small trees and brush observed on the south dike that need to be pulled up.

West Dredge Cell

This area, located just east of the scrubber wet ponding area, was constructed to accept dredged fly ash from the Jacobs Creek pond area. No material has been dredged into this cell at the time of the inspection.

Plant personnel had installed a valve, at Fossil Engineering's request and in accordance with design drawings, on the outlet pipe for the underdrain system for this cell. This valve is used to drain the cell only during recovery operations. The valve was properly closed at the time of this inspection. Runoff water is now collecting in the cell because the riser boards were installed in the spillway riser. Water should not be allowed to stand in this cell.

The dikes appear stable and did not exhibit any notable changes since the last inspection. All exterior slopes have an excellent vegetative cover. The erosion observed on the dike slope on the previous inspection at the southeast end of the pond was still present. The erosion gully observed on the previous inspection at the southwest end of the pond at the pipe outlet which drains the perimeter ditch of the scrubber pond into the west dredge cell was still present but does not appear to have worsened.

East Dredge Cell

This area is located just south of the medium and coarse coal wash refuse area. This cell was also constructed to accept dredged fly ash from the Jacobs Creek ash pond area. The plant has ceased all dredging into the pond at this time.

The spillway appeared to be in good condition, but was not operating at the time of this inspection. The discharge pipe was clear of obstructions but had a large eroded hole 6' long, 3.5' wide by 3' deep. This hole needs to be filled with filter stone and riprap of the 60 lb to 120 lb stone size (five tons). This repair was recommended in last year's report.

The dikes in this area appear to be stable. The tops of dike surfaces are in satisfactory condition, although some vegetation has established itself over the area. Removal of vegetation is not warranted at this time. The dredged ash was seeded three years ago and vegetation is good south of the discharge structure and is improving north of the discharge structure.

An erosion ditch was identified beside the armored ditch in the 1994 inspection report that would have required 1000 lb of riprap at the northeast corner of the dike. This erosion area caused by runoff which has bypassed the armored ditch, is now over 4 feet deep, eight feet wide and one hundred plus feet long and is getting bigger with each rain. The repair will require over 400 tons of riprap now.

The berm ditch was not draining properly near the middle portion of the eastern dike due to some rutting on the dike. Several erosion ditches were observed. This appears to be caused by heavy sheet flow which concentrates to form the erosion gullies.

Sections of the geotextile fabric that were placed to protect the discharge ditch have been washed away by the erosive action of the water. The ditch was in good condition near the top of the slope due to placement of riprap on top of the geotextile. The berm ditch was not draining properly near the middle portion of the eastern dike due to some rutting on the dike.

Medium and Coarse Coal Wash Refuse Area

Currently, all of the material is transported from the silo to the stack by off-road vehicles. Plant personnel transport the refuse daily to the old fines pond #1 to be spread, stacked and compacted (picture 27). The compaction decreases the pH of the runoff water that kills the vegetation for this area. The eroding ditch on the west side (picture 28) needs some large rocks(80 to 160 lb est. 20 ton) or other material placed in it to retard erosion. The west side runoff is by drainage ditches to Redwater Pond #3.

The areas which were at or above the engineered final stacking configuration issued drawings were compacted and covered by HED before this inspection (picture 29, 30 & 31). Runoff from the east side is directed by the berm ditches to a perimeter ditch which discharges into the collection ditch for Redwater Pond #4. A good vegetative cover has been established in the southeastern portion of the area.

The erosion ditch on the saddle dam that was identified in previous reports is now starting across the road and should be filled (picture 28). The road needs to be re-graded to force all water to the inside of the stacking area.

Coal Wash Fines Pond #2

This disposal area is located in the northwest portion of the plant properties. The area is adjacent to the railroad and on the north side of the plant access road. The original pond was completed in the late fall of 1987. The top of the original dike was at elevation 455. The plant raised the dike to approximately elevation 465 in 1990, and subsequently sluiced fines to this elevation. This area has not been active as a sluicing operation since Fines Pond #3 began operation in October 1992.

All of the dikes in this area appeared stable and in good condition. The west dike of this area has been noted in previous inspections to have sparse vegetation. The vegetative cover of this dike is now improving and establishing itself over the area. Several of the small pine trees noted on the west dike in previous inspections are now 15' tall. These trees need to be removed by pulling them up and then compacting clay in the holes.

Coal Wash Fines Pond #3

Fines Pond #3 is located northwest of Fines Pond #2. The first lift was completed in October 1992 and all sluicing was diverted from Fines Pond #2 to this area. The latest lift was finished in September 1999, and the sluice discharge was changed from the east to the west end of the pond. The discharged point was moved from the west end to the east end (picture 32). The overflow discharge structure removes the water and discharges it into a riprapped ditch which flows into Fines Pond #2 and then into the stilling pool.

A dike was constructed around the cemetery to the north of this area to protect it from pond water.

A dike was also constructed in the northeast corner of this area extending from the southeast corner of the cemetery eastward to the exterior dike for pond #3. This dike was constructed to preserve the aesthetics of the cemetery so it would not be surrounded by the future fines stack. All dikes in this area appear to be stable but have some seepage. There is little grass on the slopes. Several of the new culverts that drain the berm ditches were put in high (picture 34) and do not drain. When it rains, the full ditches flow across the roads because the culvert inverts are above the road elevations.

A slide 29.5 feet long and 10.3 feet high developed the first week of May, 2000 in an area that was seeping. This has been fixed and appears to be working. An area approximately 400 feet long was excavated, an underdrain installed, and riprap placed to stabilize this area of the dike. The fix was completed by February 23, 2001. This area continues to seep but the area continues to be stable.

Six seeps/wet areas were found adjacent to the cemetery. They are of equal elevation and cover a

distance approximately 200 feet long. At the time of this inspection, seeps 1 & 2 are now flowing seeping, while #'s 4, 5 & 6 are only soft areas. All six areas continue to exist.

The repaired riprap discharge from the area east of the cemetery and located at the south east corner of the cemetery is in good shape. The eroded material has been removed from the ditch and cemetery.

This pond is over filled (picture 32) and material has been stacked on the inside of the existing dike (picture 33). The dike drainage ditches are full and are not working (picture 34).

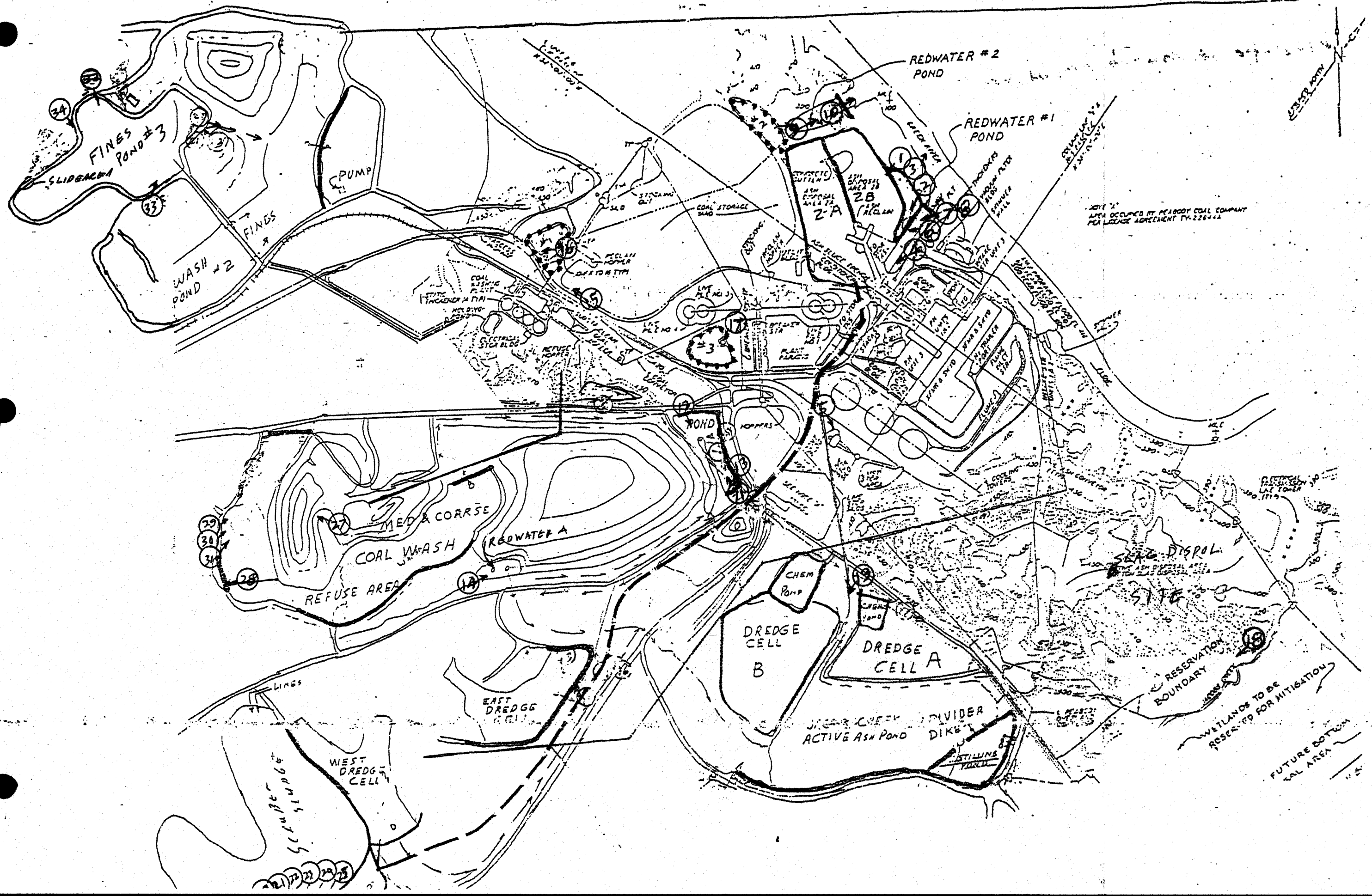
The southwest discharge structure has cavitated to the point that it poses a safety hazard. The stand pipe joints should be sealed, then ash filled around the pipe.

Recommendations:

- Plant personnel should continue to periodically mow grass and remove small trees and brush from all dike slopes. Plant personnel should pull up all trees and compact soil back in the holes.
- Plant personnel should also continue to maintain all dike roads for all weather travel to facilitate the required shift visual inspections and routine O&M activities.
- Plant personnel should monitor the exterior dike slopes for seepage, wet or soft spots or animal burrowing, etc. and notify Fossil Engineering of any changes.
- Continue to monitor the survey controls installed on the exterior dike slope of Area 2B slag pond adjacent to Green River for any indication of slope movement.
- Remove the vegetative growth from the entrance to the horizontal discharge pipes in RW #3 so that flow does not become inhibited during periods of heavy rainfall.
- Plant personnel should repair the ruts on the top of redwater pond #3 dikes by filling with earthfill and regrading to provide positive drainage. (estimated 18 CY soil)
- Repair the perimeter of coal yard drainage basin #3, by compacting clay in the erosion gullies and seeding.
- Continue to maintain in a clean state all of the coal yard drainage basins and all of the redwater ponds, especially RW #1, #2, #3 & #4 ponds. There is an O&M project to clean out RW#1 In FY03. Repair the pumps in coal yard pond #2 so no water flows through the emergency overflow.
- Continue to remove any vegetative growth and/or beaver dams that may be blocking the spillway from the slag area beaver pond. The adjacent dike should be monitored to insure that it is stable and that the area does not remain saturated. A minimum freeboard of 2 feet is desirable.
- Slope stake the gypsum stack to identify designed berm locations, finish grading per survey and place temporary cover on side slopes. The three large ditches caused by Isible can be repaired by placing a filter fabric in the eroded ditch and riprap of 60 to 120 lb stones added.
- Plant personnel should repair the eroded area at the discharge outlet of the east dredge cell pond by placing riprap in the washed out area at the outlet; (80% of 60 to 80 lb stones, estimated 8 tons) fill the eroded area adjacent to the armored ditch with compacted earthfill, line the area with a filter fabric, and cover with a filter blanket and riprap. (6"thick of 1032 (size 5 stone) with 24" of riprap of 80% 60 to 80 pound stones. (estimated 156 ton riprap with 140 CY of compacted clay and 40 tons of #5 stone with 200SY of filter fabric).
- Near the East Dredge Cell, repair the erosion gully adjacent to the overhead conveyor so that

the foundation of the conveyor is not undermined. This area should be filled with earth, compacted, and covered with riprap then walked in with a dozer to prevent erosion.

- Repair the erosions from the berm on East Dredge Cell.
- The design drawings must be used to determine grade during stacking to comply with TVA configuration management procedures. (see 10W4276-14).
- Place cover on all coarse and medium coal wash refuse areas which have reached final grade.
- Continue to check the cemetery seepage weekly and report any increases to; Joel D. Paris @ 423/751-3515 or Lynn Petty @423/751-6704 in Chattanooga.
- Water should not be allowed to pond in the West Dredge Cell. A combination of removing the riser boards and/or installing 1" spacers near the bottom of the riser (within 2 FT +/- of the bottom) needs to be implemented as soon as possible.
- Plant personnel should lower the drain pipes from the berm ditches and clean them out for Fines Pond #3 to eliminate standing water in the berm ditches.


FINES
SLUDGE
POND #3
PUMP
FINES
WASH
POND #2
REDWATER #2
POND
REDWATER #1
POND
ASH DISPOSAL AREA 2B
ASH DISPOSAL AREA 2A
ASH RECLAIM
2-A
2B
COAL STORAGE
ASH SLUICE SYSTEM
COAL WASHING PLANT
ELECTRICAL SUB STA BLDG
MAINTENANCE SHOPS
PLANT OFFICES
PLANT AREA
POND
HOPPERS
MED & COARSE
COAL WASH
REFUSE AREA
REDWATER A
LINES
EAST DREDGE CELL
WEST DREDGE CELL
SLUDGE LINES
CHEM POND
CHEM POND
DREDGE CELL B
DREDGE CELL A
ACTIVE ASH POND
DIVIDER DIKE
STILLING YARD
SEAL DISPOSAL
SITE
RESERVATION BOUNDARY
WETLANDS TO BE RESERVED FOR MITIGATION
FUTURE BOTTOM CAL AREA
JOINT USE AREA OCCUPIED BY PEABODY COAL COMPANY PER LICENSE AGREEMENT TV-22644A
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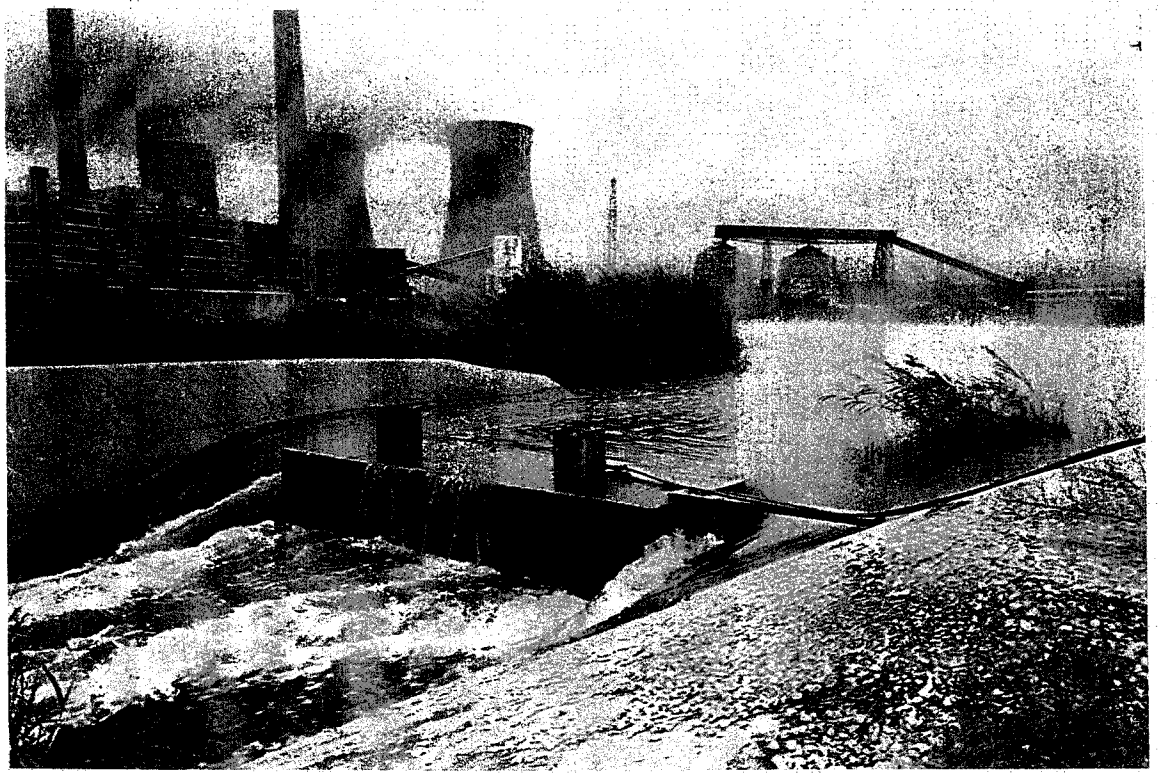
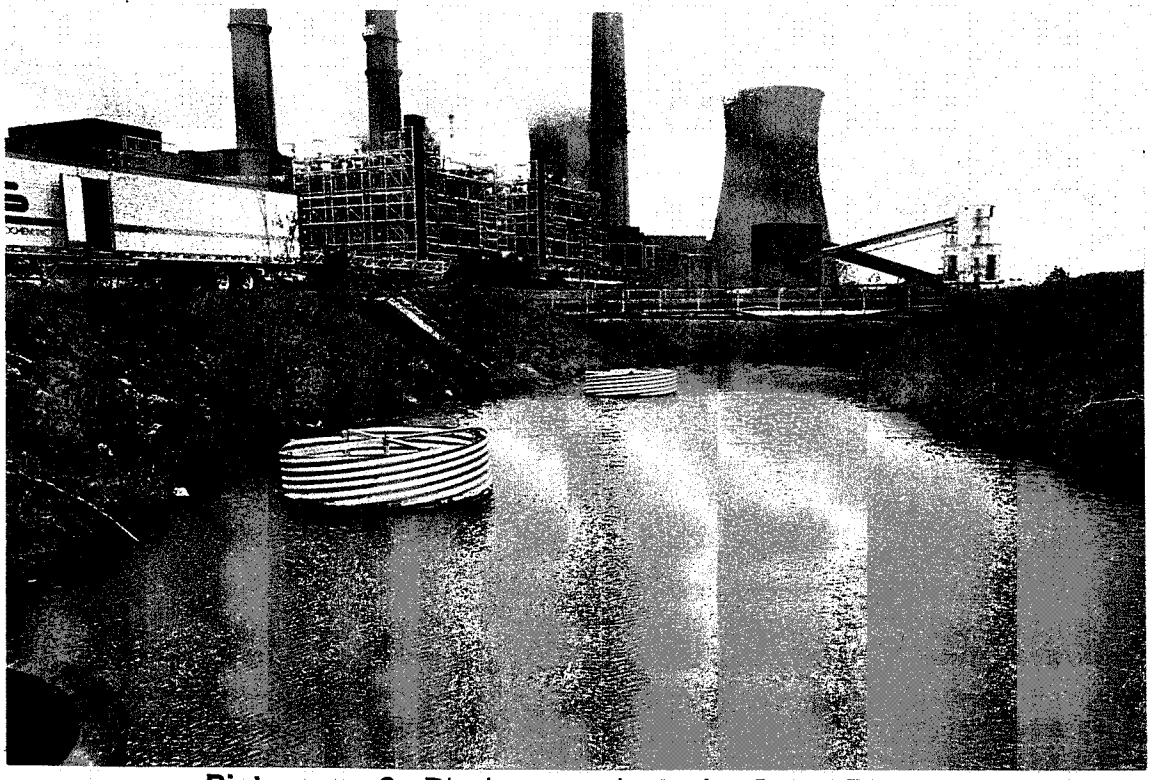
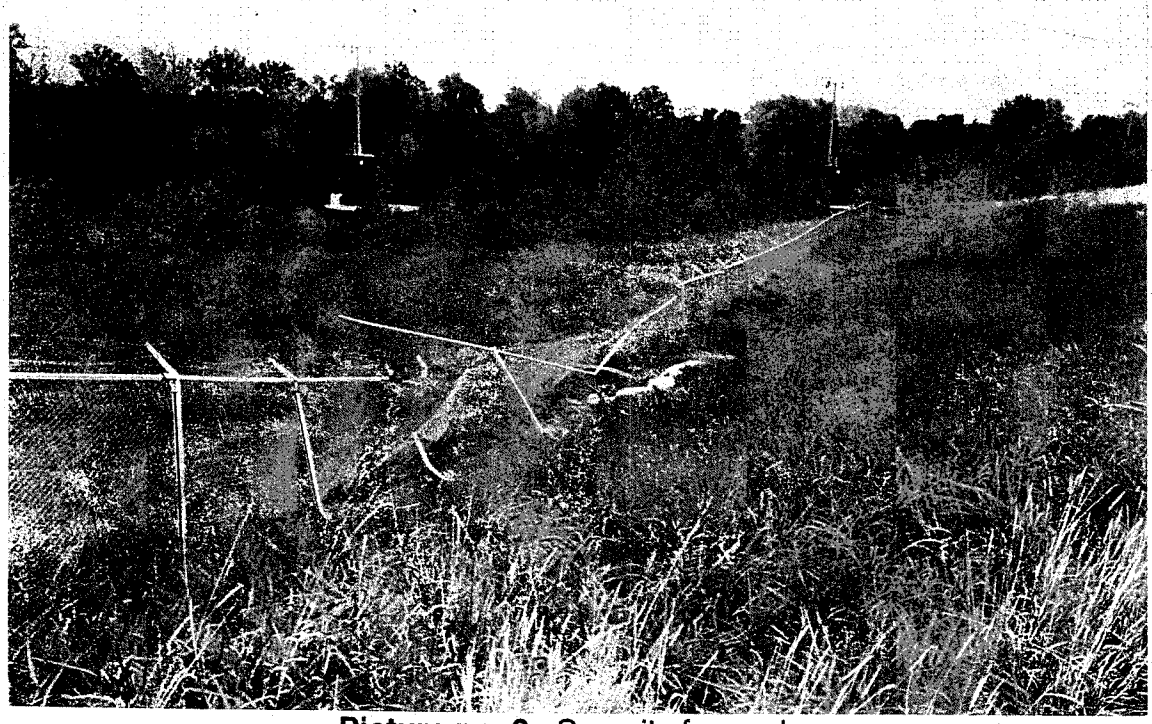


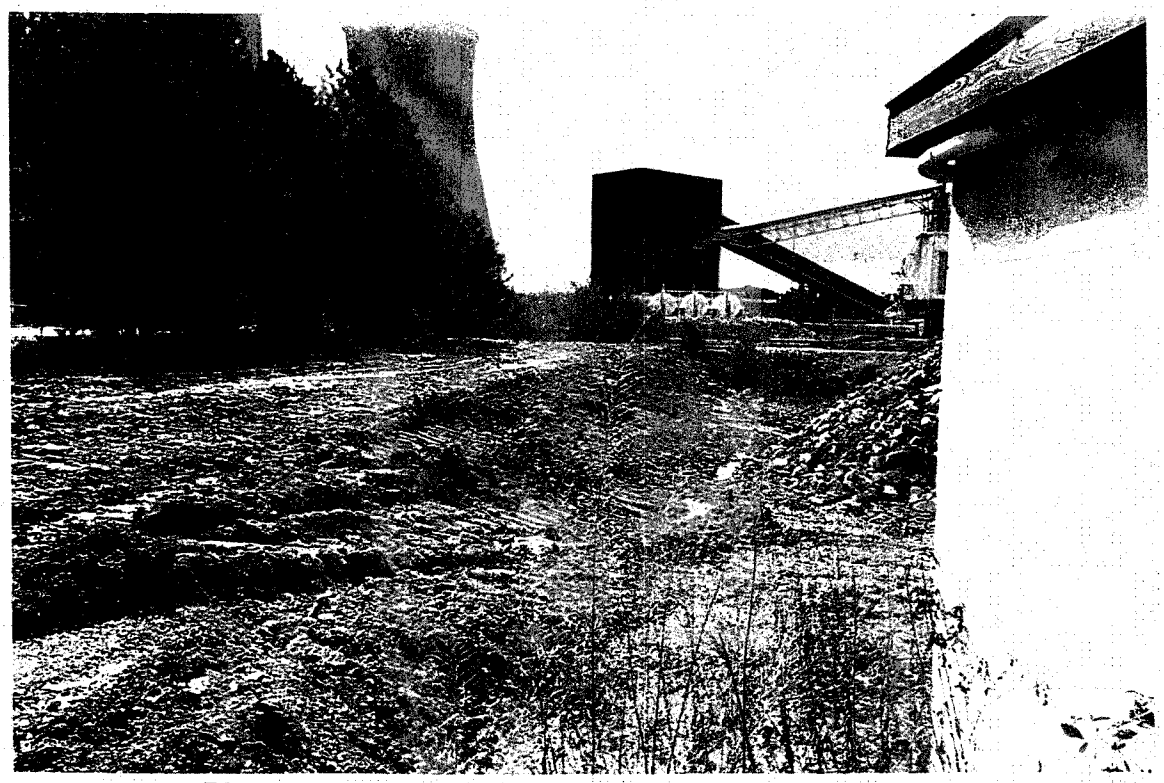
Picture no. 1. Concrete weir from slag pond (note temporary conc. block).



Picture no. 2. Discharge weirs to the Green River.



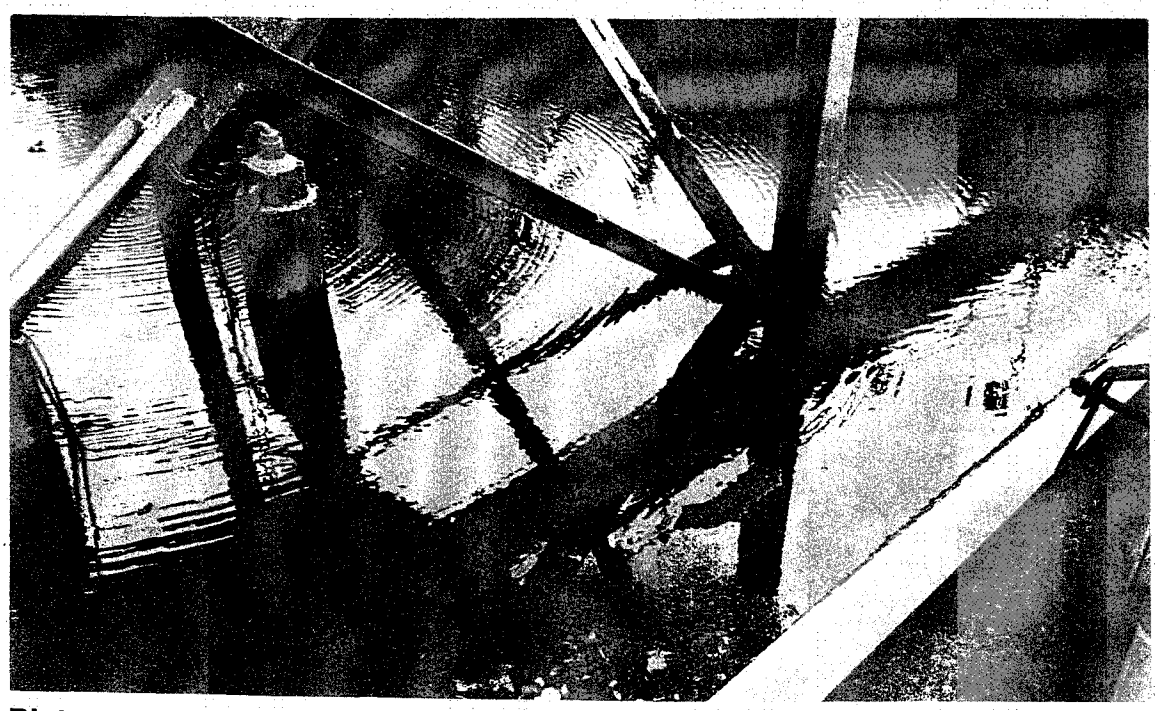
Picture no. 3. Security fence down.



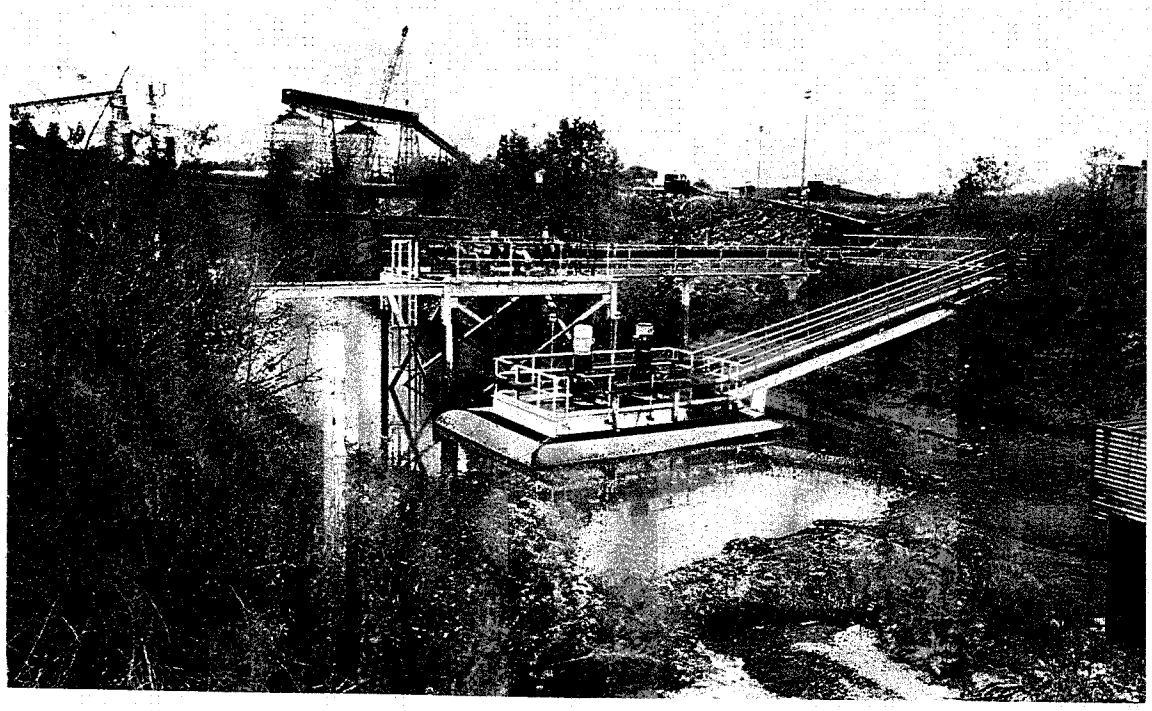
Picture no. 4. Material from Redwater pond #1 clean out.

Picture no. 5. Cleanup and repairs to 72" drain at Ball Mill

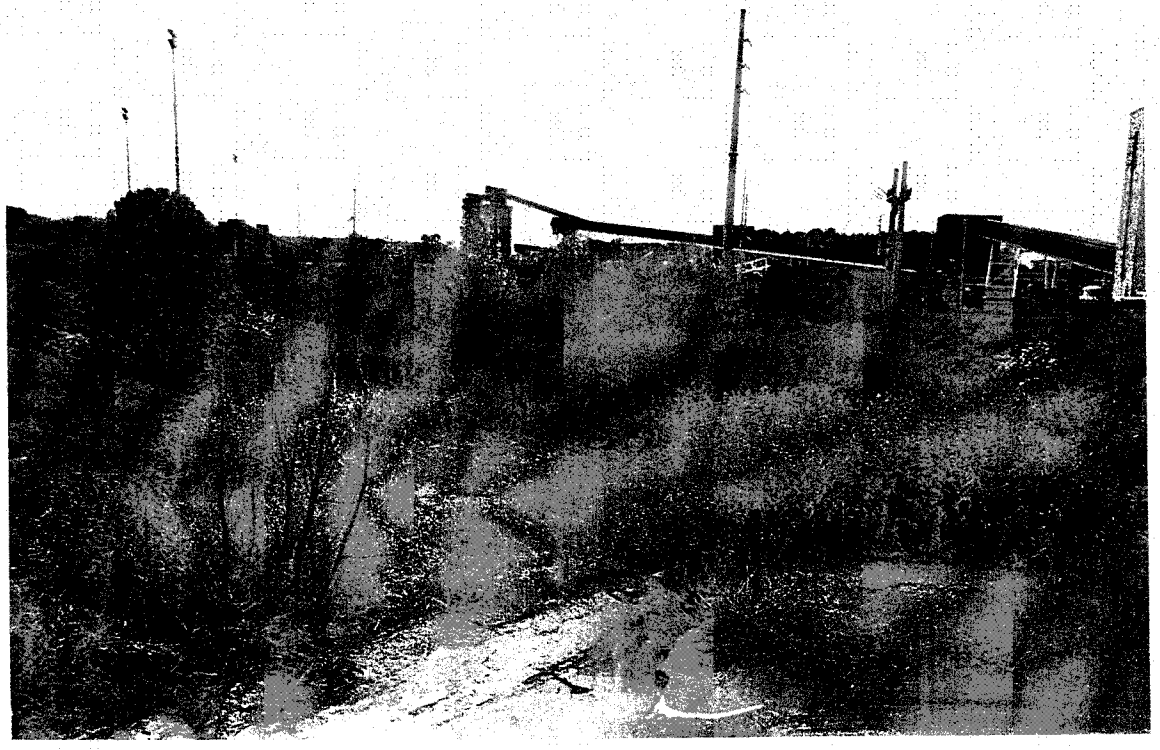
Picture no. 6. Sedimentation in redwater #1 that needs to be removed



Picture no. 7. Muck that needs to be removed from the Redwater pond #1 at the riprap dam



Picture no. 8. Pumps from Redwater #1 to Slag ponds.



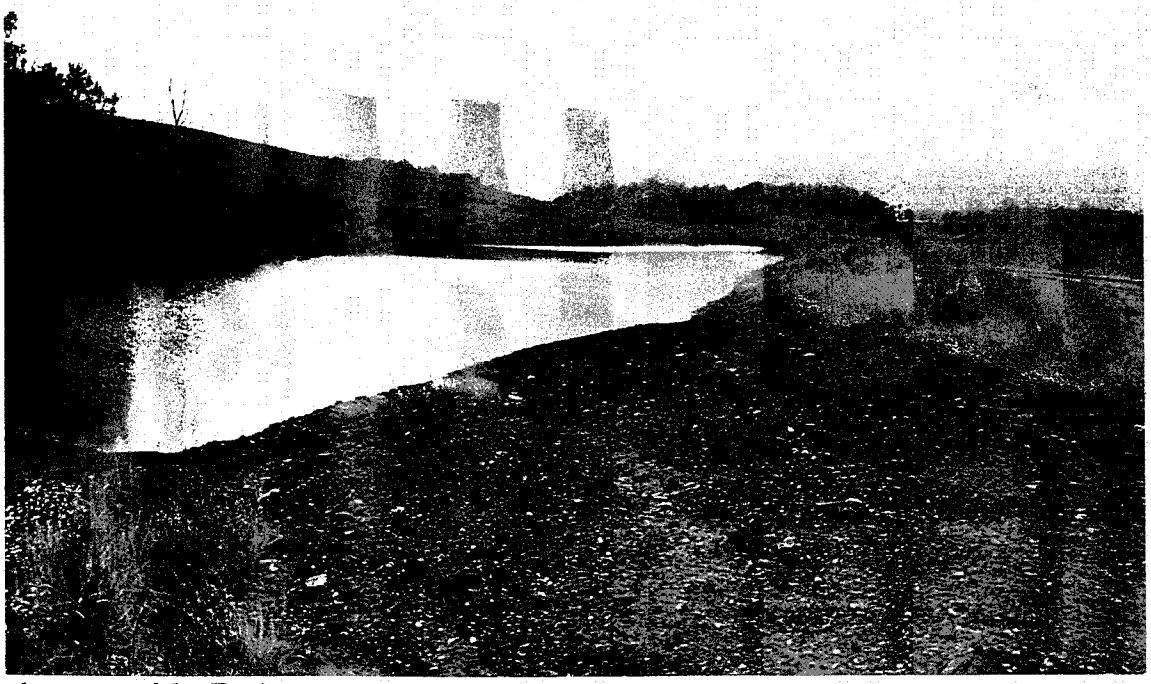
Picture no. 9. Redwater #2 Pond needs to be cleaned out.

Picture no. 10. Overflow across Redwater Pond #2 Dam.

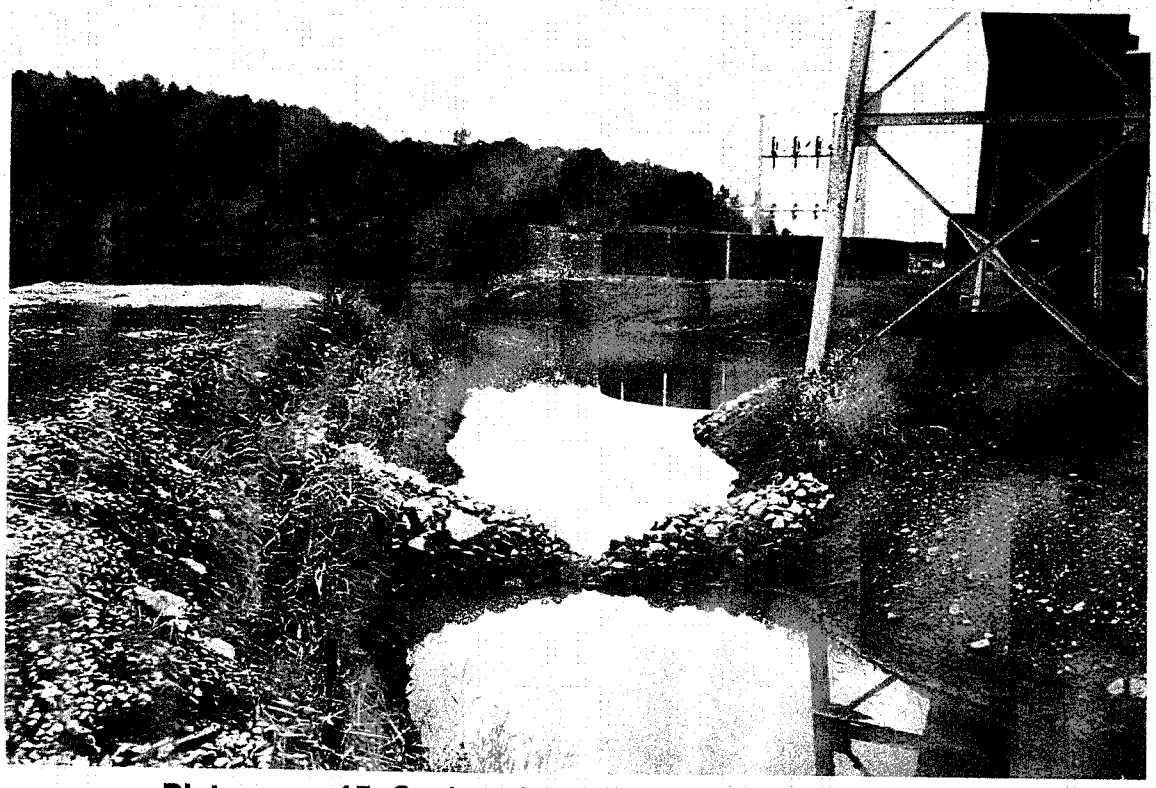
Picture no. 11. Sediment over the Redwater #3 Cleanout Access Road.

Picture no. 12. Redwater pond #3.

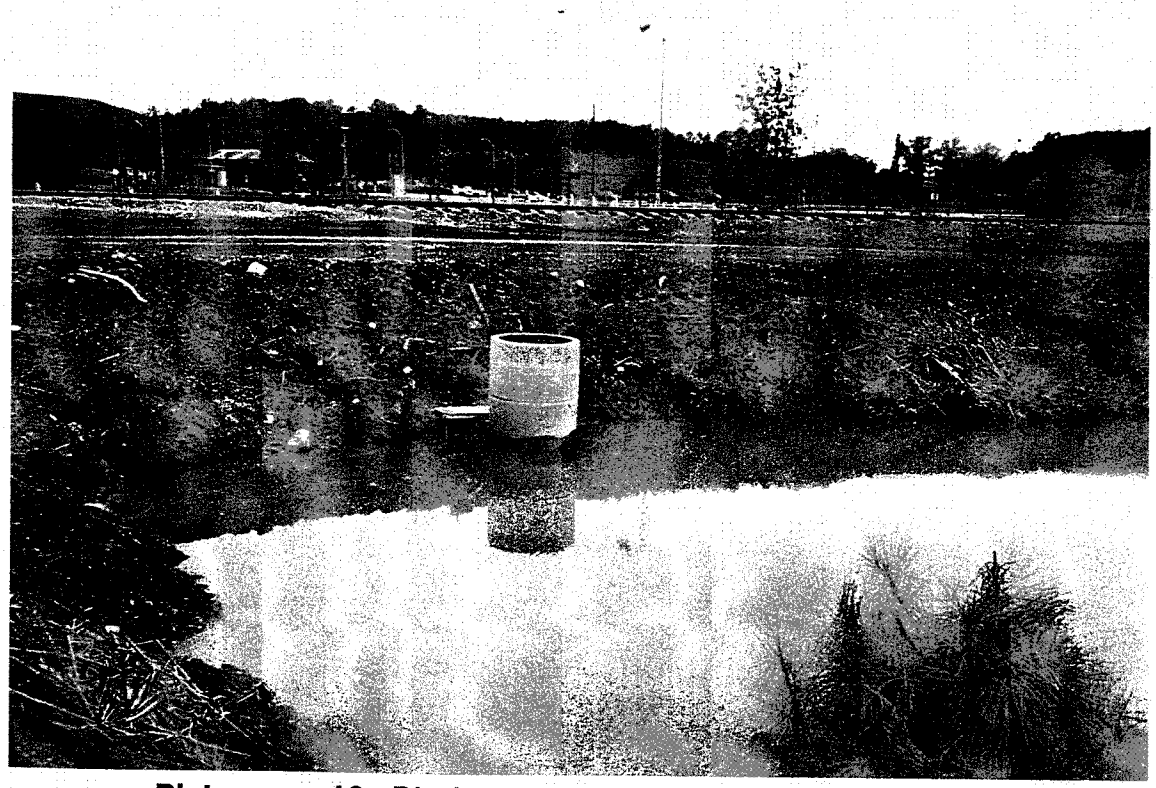
Picture no. 13. Thick vegetative growth blocking the flow in the pipes which flow from redwater #3 to Jacobs Creek ash pond.



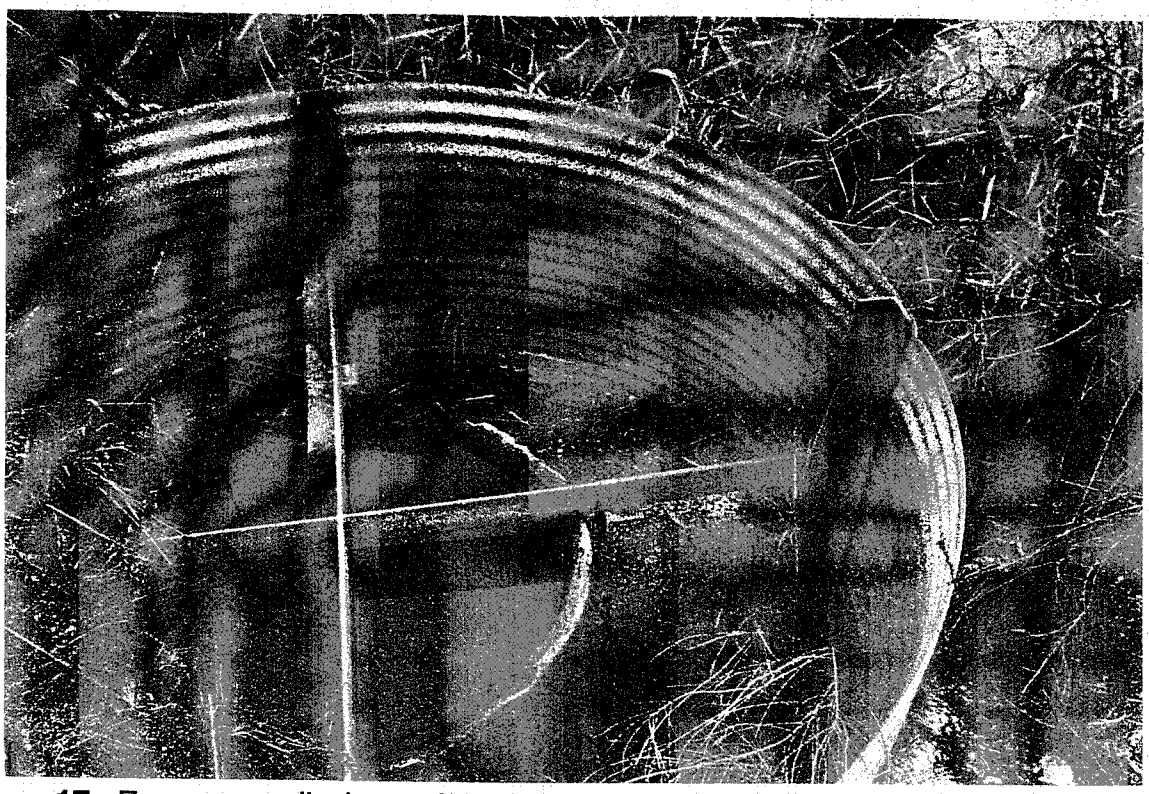
Picture no. 14. Red water #4. This pond should be full of water as it is only a surge pond.



Picture no. 15. Coal yard runoff pond #1 settlement dike.



Picture no. 16. Discharge structure of Coal Yard pond #1



Picture no. 17. Emergency discharge from Coal yard drainage pond #3.

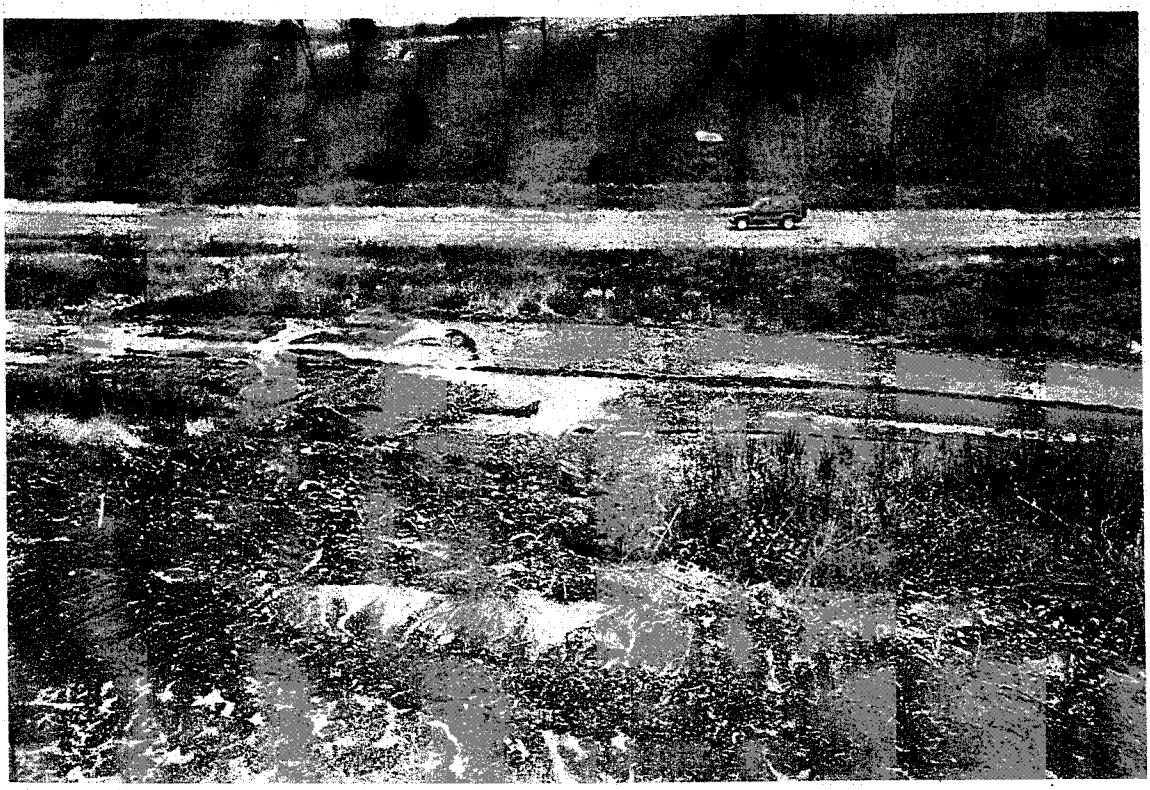
Picture no. 18. Where beavers build their dams in slag area.

Picture no. 19. Discharges into Jacobs's Creek Ash Pond.

Picture no. 20. Repairs to Scrubber waste Pond east dike.

Picture no. 21. Repairs to Scrubber waste Pond east dike.

Picture no. 22. Scrubber West Pond Dike.



Picture no. 23. Repairs to Scrubber waste Pond east dike.

Picture no. 24. Scrubber West Pond Dike.

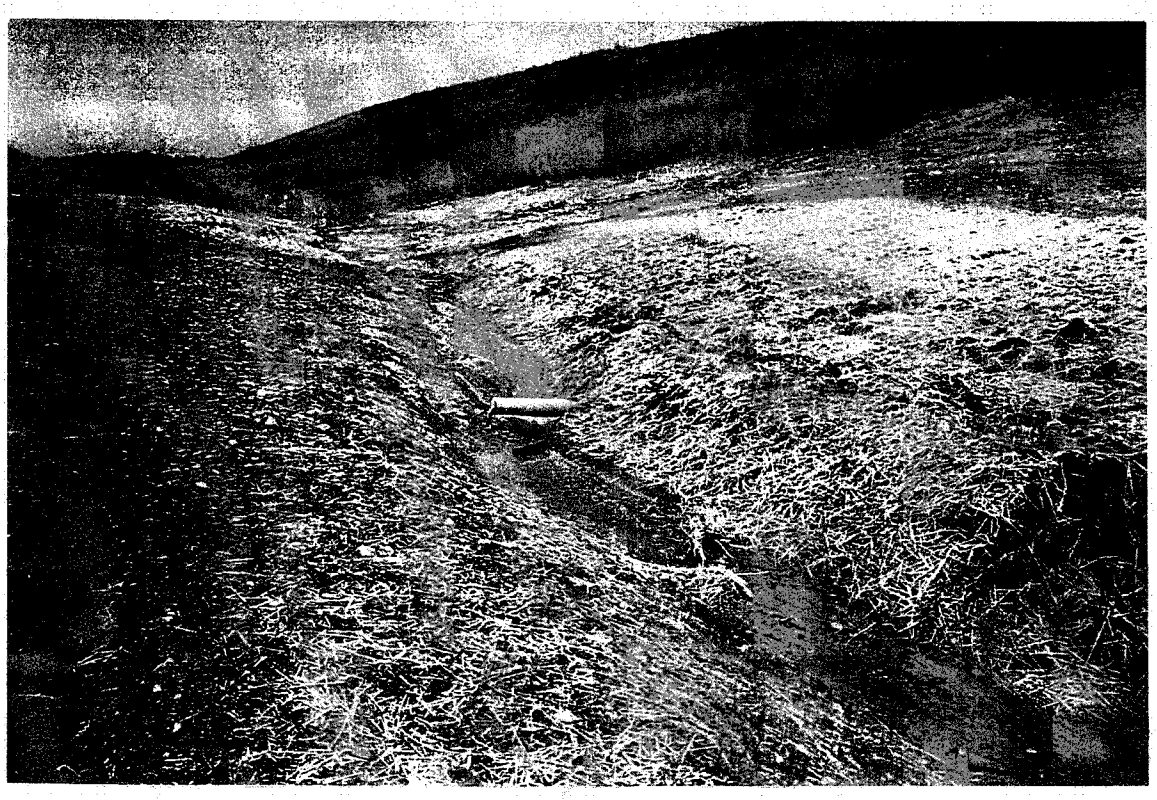
Picture no. 25. Scrubber West Pond Dike.

Picture no. 26. Scrubber West Pond Dike.

Picture no. 27. Medium and course reject area.

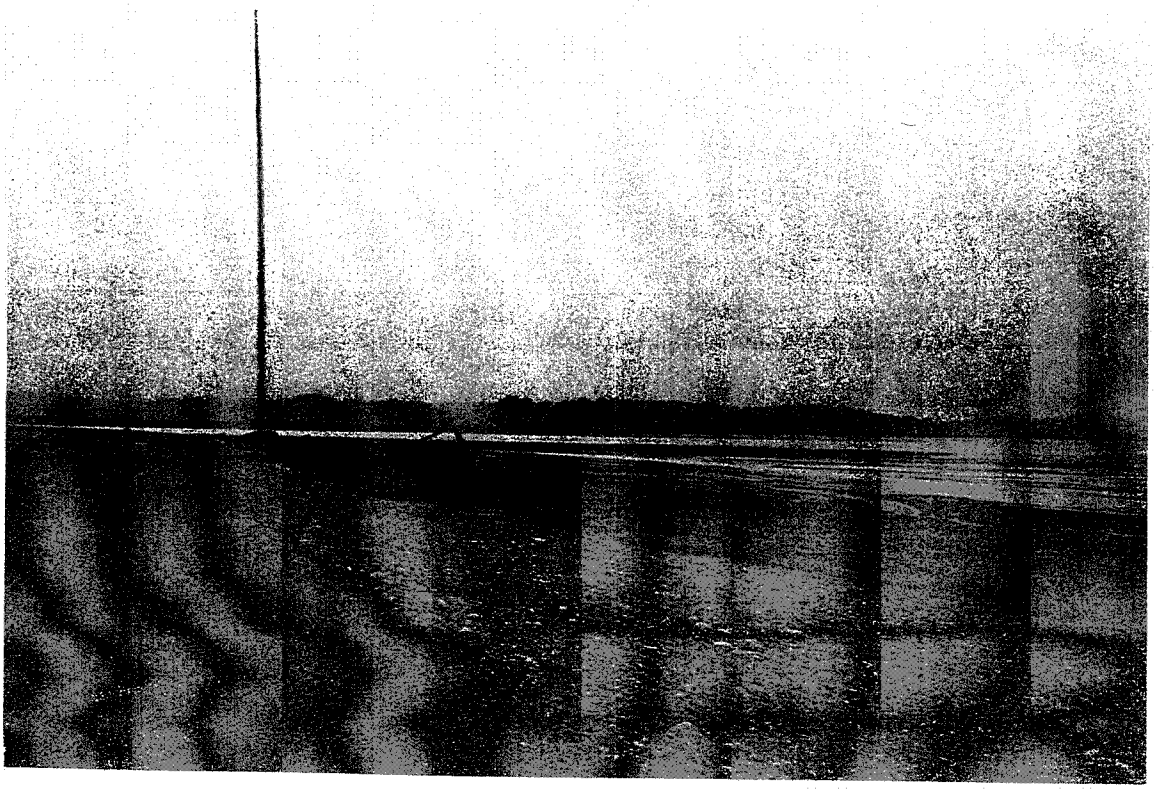
Picture no. 28. Ditch that keeps rutting deeper. (note depth of man standing in ditch)

Picture no. 29. Medium and course reject area.



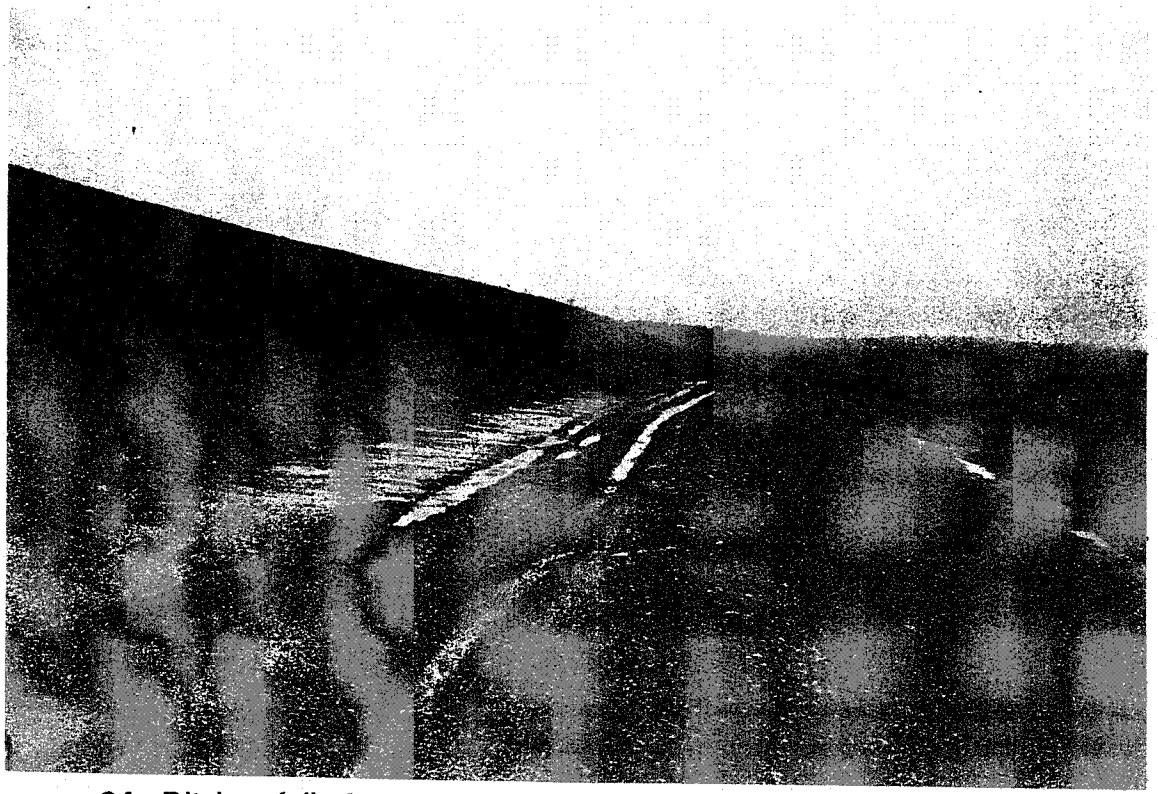
Picture no. 30. Medium and course reject area.

Picture no. 31. Medium and course reject area.



Picture no. 32. Fines Pond #3 Discharge

Picture no. 33. Material stacked inside the dikes of Fines Pond #3.



Picture no. 34. Ditches full of water because the culverts are too high to drain the ditches.

B65 040401 250

April 5, 2004

Donald E. Gaston, PAF 1A-DRK

PARADISE FOSSIL PLANT (PAF) - ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Attached is a report from Joel Paris concerning the inspection of October 29 and 30, 2003 at PAF's ash disposal areas.

The report includes recommendations for corrective work. I concur with those recommendations.

If you have any questions, please contact Ron Purkey at Chattanooga extension 4820 or Joel Paris at Chattanooga extension 3515.

for R E Purkey

James G. Adair, Manager
Engineering Design Services
LP 2G-C

REP:JDP:LMV
Attachment
cc (w/Attachment):
S. B. Brothers, PAF 1A-DRK
M. D. Davis, LP 5E-C
K. J. Dukes, PAF 1A-DRK
R. E. Johnson, LP 2L-C
R. L. Kassinger, PAF 1A-DRK
G. R. MacDonald, LP 5E-C
W. B. Wells, LP 5D-C
EDMS, WT CA-K

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TENNESSEE VALLEY AUTHORITY
PARADISE FOSSIL PLANT

ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Prepared By: Joel D. Paris
Date: March 10, 2004

PARADISE FOSSIL PLANT
ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Introduction

The waste disposal areas at Paradise Fossil Plant (PAF) were inspected for dike structural stability on October 29 & 30, 2003. The inspection was performed by Joel D. Paris and Chris Hensley of Fossil Engineering. The inspection and findings were discussed with Kimberly Dukes and David Brown of Paradise Fossil Plant. The previous annual inspection was conducted on December 11 & 12, 2003.

The results of the annual stability inspection are listed below according to their location within the Paradise Fossil Plant Boundaries. A location map is attached with arrows showing directions of the pictures taken.

Slag Areas 2A, 2B, and Stilling Pond

Boiler slag is sluiced into the south end of area 2A and is usually reclaimed once a day by Reed Minerals as part of a TVA marketing strategy (picture 1). The two ponds were cleaned out by the Heavy Equipment Division of TVA last spring. The reclaim area is neat with several small stacks within the pond. The operator was questioned as to the location of the Redwater Pond discharge pipes and was told that they were kept covered because the sudden discharge catches them unaware and can fill waiting truck cabs quickly. The bottom ash drops out quickly and is removed by Reed Minerals.

The sluice water then flows into 2A and is discharged into pond 2B through pipes and then around a series of baffles to lengthen the settling time. The sluice water enters the north end of the Stilling Pool through a concrete flume (picture 2). A large concrete block was placed in the concrete flume to temporarily raise the water approximately two feet. The flume appeared to be in good condition and only a small amount of water was flowing freely around the block into the Stilling Pool. (Post inspection note: The block was removed December 03, 2003.) The water discharges through three standard spillways (picture 3) into the Green River if the water is environmentally acceptable. At the time of this inspection, HED was in the process of cleaning out the Stilling Pool Area. The riprap at the outlet end of the spillway discharge pipes appeared to be in good condition.

If the water is not environmentally acceptable, it is pumped to Jacob's Creek Ash Pond. (Only unit two is on line so the stilling pool is empty.) Additional water is discharging into the Stilling Pool from a 30" and a 42" concrete pipe (picture 4). This water is from sumps, storm water pipes and dewatering pumps of construction jobs.

The dikes appear to be stabile and did not exhibit any notable changes since the last inspection. The interior slopes of the dikes have a good vegetative cover. There was an access stairway built over the outlet end of the pipes into Area 2B. The plant continues to monitor the survey controls installed on the exterior dike slope adjacent to the Green River for any indication of movement.

Redwater Ponds (Nos. 1, 2, 3, 4 & 5)

Redwater Pond #1

Redwater pond #1 (RW#1) is located southeast of and adjacent to Slag Pond 2B and the Slag Stilling Pool. Considerable repairs, cleanout and bank reconstruction (picture 5) is being preformed by HED to excavate the pond to its original configuration. The bottom ash pipes are breaking and

discharging their contents into the redwater pond. This discharge is filling up the pond and impeding the flow from the 72" storm water pipe. The muck in the north portion of the pond was to the top of the riprap under the floating pumps and the extended wall around the discharge pumps (EL 394) (pictures 6 & 7). The muck in the south portion was to El 396 and the water was at EL 404 until a hole was cut under the 30" concrete pipe at El 399.

No assessment could be made, due to HED construction work, to evaluate the condition of the pumps and the discharge structures. However, the slopes and dikes appear to be in good condition. No water collected in Redwater Pond #1 is pumped into the slag pond within Area 2B or 2A. A riprap barrier has been added to the west side of the sewage treatment plant to stabilize the bank (picture 8).

Redwater Pond #2

Redwater pond #2 (RW#2) is located northwest of and adjacent to Slag Pond Areas 2A & 2B. The water from RW#2 is pumped from the center of the pond and discharged into the northwest end of slag pond 2A. All slopes and dikes appear to be in good condition. However, the pond had a high level of sediment in it (picture 9). The upstream storm water and Coal Yard Drainage Pond #1 drains into RW#2 via a 72" pipe. Coal Yard Drainage Pond #2 drains into RW#2 via a 12" overflow pipe during storms. To function as designed, the water level in Redwater Pond #2 must be maintained at or below elevation 385, which is two feet below the outlet of the 72" pipe. If the outlet of this pipe is submerged it could cause a serious problem in RW#2 because of lack of rain water storage. The pumps are not large enough to remove the water fast enough to prevent an overflow of the dike.

Redwater Pond #3

Redwater Pond #3 is a settlement pond and is located southwest of the powerhouse and along the south side of the county road. This pond collects the runoff and sediment from the medium and coarse coal wash refuse areas as well as decanted water from RW#4. RW#3 presently discharges to Jacob's Creek Fly Ash Pond by way of three 18" gravity drains from the pond and into a 60" gravity drain.

RW #3 is designed to discharge to RW #1 via a gravity drain with a manual valve contained within the discharge structure. This valve is opened only when the pond is to be cleaned out. Due to the high level of sediments in the pond, this valve should not be opened.

The sediment in the RW #3 pond needs to be cleaned out as it is above the clean out access road (picture 10). There may be problems with the clean out because a sampling well has been placed where the crane was designed to set during the cleanout operation. The weeds in front of the discharge pipes have raised the discharge elevation by six inches. These weeds need to be cleaned out (picture 11). The three discharge pipes are all discharging equally into the transition box.

There are several trees on the inside of the dike that need to be pulled up and clay placed in the resulting hole and compacted. This should be done during pond clean out while the water is lowered. There were also small trees and brush observed on the top of the east dike. Rutted areas were evident along the top of the east dike and were holding water. The ruts appear to be caused by previous heavy equipment travel on the dike.

PARADISE FOSSIL PLANT
ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Redwater Pond #4

Redwater Pond #4 is a surge/sediment pond located east of the Medium and Coarse Coal Wash Refuse Area. This is a surge pond that settles out the fines so they can be cleaned out with a back hoe easier and cheaper and before the fines reach RW #3. This surge pond was designed to drain to RW #3 via an eight inch pipe into an open riprap ditch beside the road. The high water level in the pond shows that the sediment is over the end of the 8" pipe (picture 12). An emergency overflow structure drains runoff during heavy rains that exceed the standard 10 year - 24 hour rainfall event, directly to the Jacob's Creek Fly Ash Pond there-by bypassing RW #3. The pond was to be cleaned out when the sediment reached the invert of the 8" discharge pipe. The fines are now above the 8" pipe (picture 12), as evidenced by the pond being full of water to the top of the emergency overflow pipe. Redwater seepage from the dike into the ditch below the 8" discharge pipe is continuing as noted in last year's report. The additional 8' head on the RW#4 pond is a suspected cause of this.

Redwater Pond #5

Redwater Pond #5 is located south of the powerhouse, east of the truck coal dumping area and west of the limestone storage area. It is a surge pond designed to delay and hold enough water going to Redwater #1 to give the Redwater #1 pumps time to lower the water level from any rainfall event less than a 10 year – 24 hour return frequency. An overflow structure drains runoff during rains exceeding the 10 year - 24 hour rainfall event directly to Redwater Pond #1. All water collected in Redwater Pond #5 drains to Redwater Pond #1 via a gravity drain and no water should be in RW #5 pond more than approximately four hours after a rain. During this inspection HED was also in the process of cleaning and reconstruction to its original configuration (pictures 13, 14, & 15)

Coal Yard Runoff Pond #1

Coal Yard Runoff Pond #1 (CYRP#1) is located north of and across the plant access road from the Coal Wash Plant. This is a surge/sedimentation storm water runoff pond that delays runoff discharge to RW #2. Water and sediment is collected in the pond and the decanted water is discharged through a six inch hole cut in the side of the stand pipe. This hole is not configured per the original design drawing in size or elevation, but is doing a fair job. A riprap dike was built to keep the coal fines away from the discharge point. The fines have been cleaned out and the pond is operating as designed (pictures 16 & 17). The water depth in the pond is over 24".

Coal Yard Runoff Pond #2

Coal Yard Runoff Pond #2 (CYRP#2) is located southwest of and across an access road from Redwater Pond #2. This pond was designed as a storm water sedimentation pond and all water from this pond is pumped to Slag Pond 2A. Since the last inspection, CYRP #2 has filled with full sediment and has a high water level. There are three pumps on the platform but there is no power to any of them (pictures 18 & 19). The average water depth at the time of this inspection was 36".

Coal Yard Runoff Pond #3

Coal Yard Runoff Pond #3 is located south of the coal transfer complex and north of and adjacent to the access road. This pond can discharge by gravity or be pumped to RW #1. Several erosion gullies have developed around the perimeter of the drainage basin and should be repaired. The measured water depth at the time of this inspection was over 36" (pictures 20, 21, & 22).

The emergency overflow is blocked or has been modified to the point that it does not operate, as noted in the previous report.

PARADISE FOSSIL PLANT
ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Slag Area

The Slag Area is located southeast of the powerhouse. The slag in this area was placed here by the plant during its early operations and is currently being reclaimed for commercial use by Reed Minerals personnel. The area contains a small surge pond to collect runoff and a larger area, called the beaver pond, which discharges over a spillway and down a riprap channel into Jacob's Creek. The riprap appears to be in good condition. Plant personnel should continue to frequently monitor this area and clean out any beaver dams located. The discharge has been widened and ripraped (picture 23).

The dikes appear to be stable with a good vegetative cover on them. The redwater seeps identified in earlier reports along the southwest dike in this area are still present. Some of the red water seeps continue to have growing deposits of material. The erosion gully, observed on previous inspections, located at the end of the southwest dike just north of an existing culvert was repaired. Plant personnel should monitor these areas frequently.

Jacob's Creek Fly Ash Pond Area

This area is located southeast of the powerhouse. Fly ash is sluiced into a channel in the northern portion of the original pond area (picture 24). The sluice water flows southwest through a dike breach in the southwest portion of the original ash pond, then into the Fly Ash Pond Area Extension. Sluice water flow has not been routed into the original pond area since September, 1997.

The sloughing area that was noted in several of the previous ash pond inspection reports on the south dike just west of the divider dike was still present. The road on top of the dike has several mud holes that need repairing. A requirement of these structures is that an all weather road be maintained for a visual inspection of all dikes each shift. The dikes appear to be stable and do not exhibit any notable changes in their exterior slopes since the last inspection. Continue to remove all trees from the dike slopes.

There were no new slough failures observed along the south dike this year due to removal of material at the toe of the dike. Earth fill has been placed at the toe and compacted to make a uniform slope. There was flow from the pipe at the time of this inspection from seepage of the north dike of Jacob's Creek Fly Ash Pond.

Fly Ash Pond Area Extension

This disposal area was put into operation in September 1997. The area is located adjacent to and south of the original Jacob's Creek Fly Ash Disposal Area. Dikes in the southern and eastern portion of the area were raised from approximate El 400 to El 408. The existing dike of Jacob's Creek Fly Ash Disposal Area was breached at the southwest end of the pond. This allows sluice water to flow into the new pond and around the installed concrete pipe that maintained a water cover over the ash in the Jacob's Creek Fly Ash Disposal Area. Flow is uniform and non-eroding through the ash pond. Riprap in the breach and channel were in good condition. After the ash settles out, the water flows into a stilling pool in the northeast portion of the pond through a divider dike with a floating boom. Water is then discharged through three 48" vertical spillways, with skimmer structures, and out through three 36" diameter concrete pipes to Jacob's Creek (pictures 25 & 26).

The spillway structures appear to be operating properly. All three outlets appear to be discharging equally at the time of this inspection. The riprap at the spillway discharge outlets appeared to be in good condition. There is a stairway for access from the top of dike to the discharge pipes for monitoring purposes. Dikes were constructed in the southern and eastern portion of the area. The dike slopes have established vegetation. The road on top of the dike needs additional crushed stone surfacing. All exterior dikes appear to be in good condition with no visible signs of instability.

There was a beaver lodge located in the north portion of the area. Plant personnel should monitor the dikes for beaver activity and take immediate corrective action as beavers like to tunnel below the waterline into dikes.

Scrubber Waste Wet Ponding Area

This area is located in the southwest corner of the TVA reservation. Scrubber waste is sluiced into the northeast end of this region and stacked by long reach track hoe via the rim ditch method. Scrubber waste is alternately sluiced through one of two rim ditches to the western end of the area to allow that area to fill with scrubber waste (picture 27). Water is discharged from the scrubber pond into the stilling pool by vertical spillways. The Stilling Pool water discharges through a vertical spillway into a clarification pond that discharges through horizontal pipes into a ditch that flows into fly ash sluice water channel to the Fly Ash Pond Area Extension.

The discharge pipes from the scrubber pond to the Stilling Pool appear to be in good condition. The standard spillway out of the Stilling Pool was in good condition.

The exterior dikes of this area appear stable with a good vegetative cover and did not exhibit any notable changes since the previous inspection. However, there were small trees and brush observed on the south dike that need to be pulled up.

West Dredge Cell

This area, located just east of the scrubber wet ponding area, was constructed to accept dredged fly ash from the Jacob's Creek pond area. No material has been dredged into this cell at the time of the inspection.

Plant personnel had installed a valve, at Fossil Engineering's request and in accordance with design drawings, on the outlet pipe for the underdrain system for this cell. This valve is used to drain the cell only during recovery operations. The valve was properly closed at the time of this inspection. Runoff water is now collecting in the cell because the riser boards were installed in the spillway riser. Water should not be allowed to stand in this cell.

The dikes appear stable and did not exhibit any notable changes since the last inspection. All exterior slopes have an excellent vegetative cover. The erosion observed on the dike slope on previous inspections at the southeast end of the pond was still present. The erosion gully observed on previous inspections at the southwest end of the pond at the pipe outlet was still present but does not appear to have worsened.

East Dredge Cell

This area is located just south of the medium and coarse coal wash refuse area. This cell was also

constructed to accept dredged fly ash from the Jacob's Creek Ash Pond area and has been dredged full.

The spillway appeared to be in good condition, but was not operating at the time of this inspection. The discharge pipe was clear of obstructions but had a large eroded hole 6' long, 3.5' wide by 3' deep. This hole needs to be filled with filter stone and riprap of the 60 lb to 120 lb stone size (five tons). This repair was recommended in the two previous reports.

The dikes in this area appear to be stable. The tops of dike surfaces are in satisfactory condition, although some vegetation has established itself over the area. Removal of vegetation is not warranted at this time. The dredged ash was seeded four years ago and vegetation is good south of the discharge structure and is improving north of the discharge structure.

An erosion ditch was identified beside the armored ditch in the 1994 inspection report that would have required 1000 lb of riprap at the northeast corner of the dike. This erosion area caused by runoff which has bypassed the armored ditch, is now over 4 feet deep, eight feet wide and one hundred plus feet long and is getting bigger with each rain. The repair will require over 400 tons of riprap now.

The berm ditch was not draining properly near the middle portion of the eastern dike due to some rutting on the dike. Several erosion ditches were observed. This appears to be caused by heavy sheet flow which concentrates to form the erosion gullies.

Sections of the geotextile fabric that were placed to protect the discharge ditch have been washed away by the erosive action of the water. The ditch was in good condition near the top of the slope due to placement of riprap on top of the geotextile.

Medium and Coarse Coal Wash Refuse Area

Currently, all of the refuse material is transported from the silo to the stack by off-road vehicles. Plant personnel transport the refuse daily to this area to be spread, stacked and compacted. The eroding ditch on the west side needs some large rocks (80 to 160 lb est. 20 ton) or other material placed in it to retard erosion. Storm water runoff on the west side is drained by drainage ditches to Redwater Pond #3. Runoff from the east side is directed by the berm ditches to a perimeter ditch which discharges into the collection ditch for Redwater Pond #4.

The areas which were at or above the engineered final stacking configuration issued drawings have been covered and seeded by HED (picture 31, 32, & 33). A good vegetative cover has been established in the southeastern portion of the area.

The erosion ditch on the saddle dam that was identified in previous reports has been repaired. The road needs to be re-graded to force all water to the inside of the stacking area.

Coal Wash Fines Pond #2

This disposal area is located in the northwest portion of the plant properties. The area is adjacent to the railroad and on the north side of the plant access road. The original pond was completed in the late fall of 1987. The top of the original dike was at elevation 455. The plant raised the dike to approximately elevation 465 in 1990, and subsequently sluiced fines to this elevation. This area has

not been active as a sluicing operation since Fines Pond #3 began operation in October 1992.

All of the dikes in this area appeared stable and in good condition. The west dike of this area has been noted in previous inspections to have sparse vegetation. The vegetative cover of this dike is now improving and establishing itself over the area. Several of the small pine trees noted on the west dike in previous inspections are now 15' tall. These trees need to be removed by pulling them up and then compacting clay in the holes.

This area is in the contract for Parsons to do a closure plan on.

Coal Wash Fines Pond #3

Fines Pond #3 is located northwest of Fines Pond #2. The first lift was completed in October 1992 and all sluicing was diverted from Fines Pond #2 to this area. The latest lift was finished in September 1999, and the sluice discharge was changed from the east to the west end of the pond. The overflow discharge structure removes the water and discharges it into a riprapped ditch which flows into Fines Pond #2 and then into the stilling pool.

A dike was constructed around the cemetery to the north of this area to protect it from pond water. A dike was also constructed in the northeast corner of this area extending from the southeast corner of the cemetery eastward to the exterior dike for Pond #3. This dike was constructed to preserve the aesthetics of the cemetery so it would not be surrounded by the future fines stack. All dikes in this area appear to be stable but have some seepage. There is little grass on the slopes (pictures 34 & 35). Several of the new culverts that drain the berm ditches were put in high and do not drain. When it rains, the full ditches flow across the roads because the culvert inverts are above the road elevations.

A slide 29.5 feet long and 10.3 feet high developed the first week of May, 2000 in an area that was seeping. This has been fixed and appears to be working. An area approximately 400 feet long was excavated, an underdrain installed, and riprap placed to stabilize this area of the dike. The fix was completed by February 23, 2001. This area continues to seep but the area continues to be stable.

Six seeps/wet areas were found adjacent to the cemetery. They are of equal elevation and cover a distance approximately 200 feet long. At the time of this inspection, seeps 1 & 2 are now flowing seeping, while #'s 4, 5 & 6 are only soft areas. All six areas continue to exist.

The repaired riprap discharge from the area east of the cemetery and located at the southeast corner of the cemetery is in good shape. The eroded material has been removed from the ditch and cemetery.

At the time of this inspection, HED and Plant personnel has been using a rim ditch method to reclaim the fines to build a new dike lift inside the existing dike lift (pictures 36, 37, 38, & 39). This new lift is then being compacted and covered with soil for vegetative growth in order for the closure of this pond (picture 40).

HED also had constructed a new stilling pond for the water as it drains out of the fines pond to the existing stilling pool (picture 41).

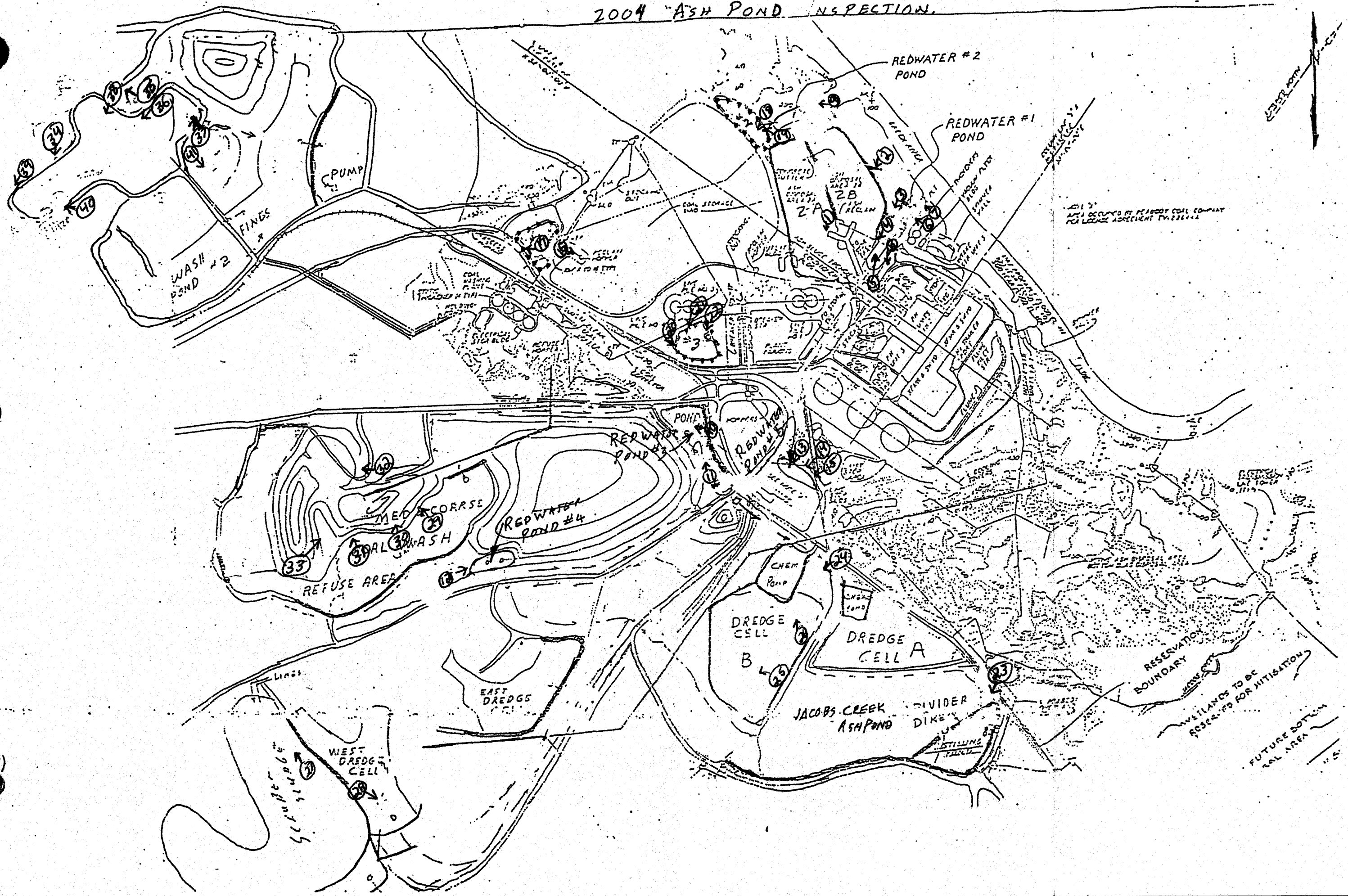
Post Inspection Note: The plant road west of Fines Pond #3 shall be graded and surfaced with six

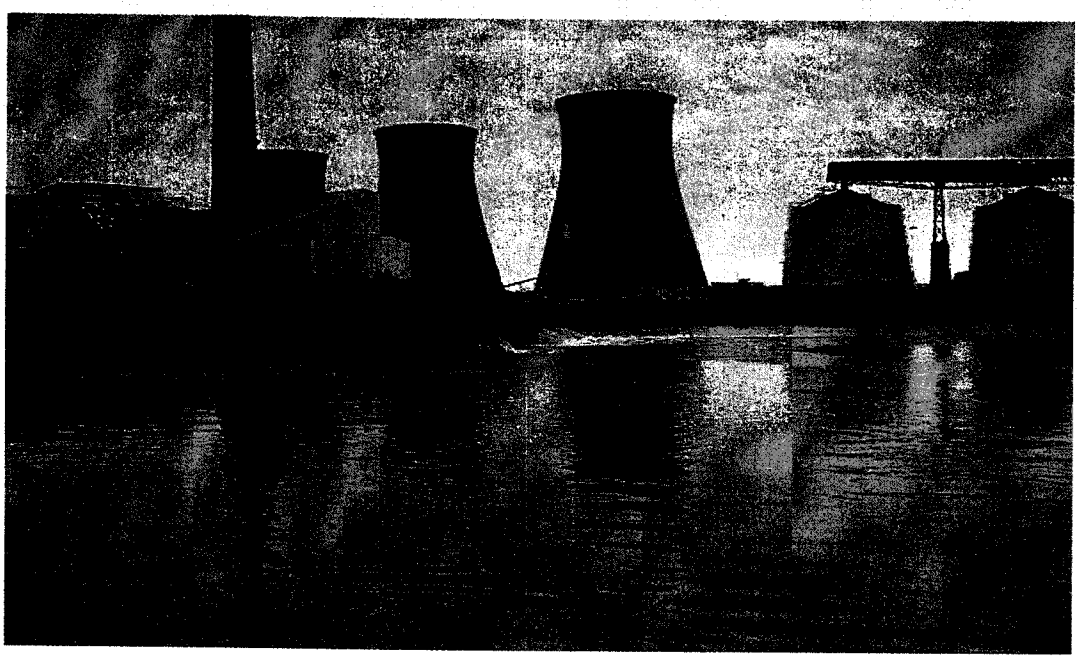
inches of crushed stone per section 1032. A silt fence shall be placed along the side of the road adjacent to Daniel Run Creek.

Recommendations:

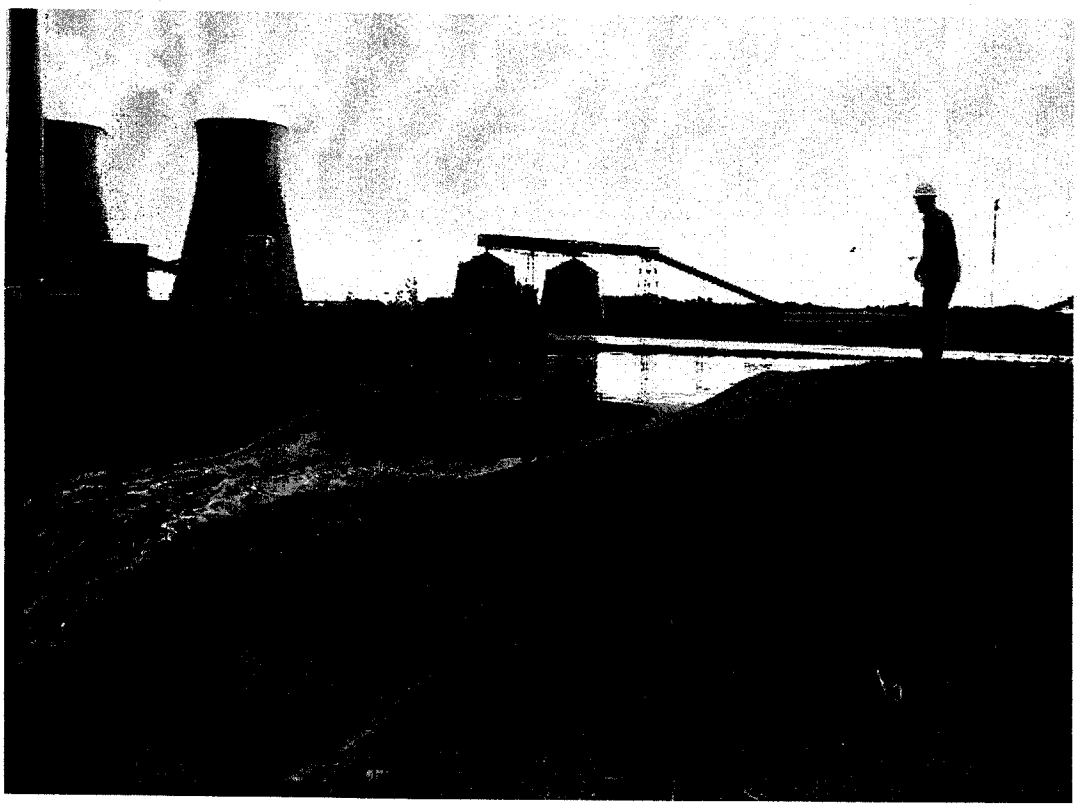
- Plant personnel should continue to periodically mow grass and remove small trees and brush from all dike slopes. Plant personnel should pull up all trees and compact soil back in the holes.
- Plant personnel should also continue to maintain all dike roads for all weather travel to facilitate the required shift visual inspections and routine O&M activities.
- Plant personnel should monitor the exterior dike slopes for seepage, wet or soft spots or animal burrowing, etc. and notify Fossil Engineering of any changes.
- Continue to monitor the survey controls installed on the exterior dike slope of Area 2B slag pond adjacent to Green River for any indication of slope movement.
- Remove the vegetative growth from the entrance to the horizontal discharge pipes in RW #3 so that flow does not become inhibited during periods of heavy rainfall.
- Continue to maintain in a clean state all of the coal yard drainage basins and all of the redwater ponds. Repair the pumps in Coal Yard Pond #2
- Continue to remove any vegetative growth and/or beaver dams that may be blocking the spillway from the slag area beaver pond.
- Plant personnel should repair the eroded area at the discharge outlet of the east dredge cell pond by placing riprap in the washed out area at the outlet; (80% of 60 to 80 lb stones, estimated 8 tons) fill the eroded area adjacent to the armored ditch with compacted earthfill, line the area with a filter fabric, and cover with a filter blanket and riprap. (6"thick of 1032 (size 5 stone) with 24" of riprap of 80% 60 to 80 pound stones. (Estimated 156 ton riprap with 140 CY of compacted clay and 40 tons of #5 stone with 200SY of filter fabric).
- Repair the erosions from the berm on East Dredge Cell.
- Place cover on all coarse and medium coal wash refuse areas which have reached final grade.
- Continue to check the cemetery seepage weekly and report any increases to; Joel D. Paris @ 423/751-3515 or Lynn Petty @ 423/751-6704 in Chattanooga.
- Water should not be allowed to pond in the West Dredge Cell. A combination of removing the riser boards and/or installing 1" spacers near the bottom of the riser (within 2 FT +/- of the bottom) needs to be implemented as soon as possible.
- Plant personnel should lower the drain pipes from the berm ditches and clean them out for Fines Pond #3 to eliminate standing water in the berm ditches.
- Begin a grassing and maintain on the dike slopes and retired areas as all grass has now died on Fines Pond #3 slopes.

2004 ASH POND INSPECTION.



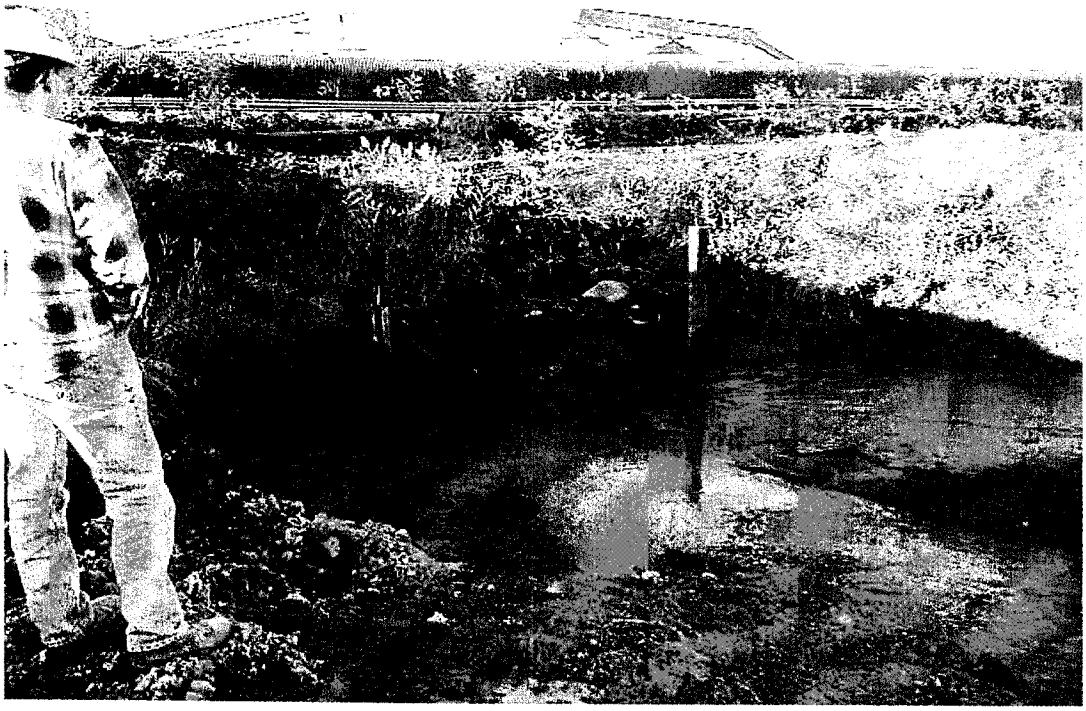


Picture no. 1. Boiler slag sluiced into Slag Pond 2A.

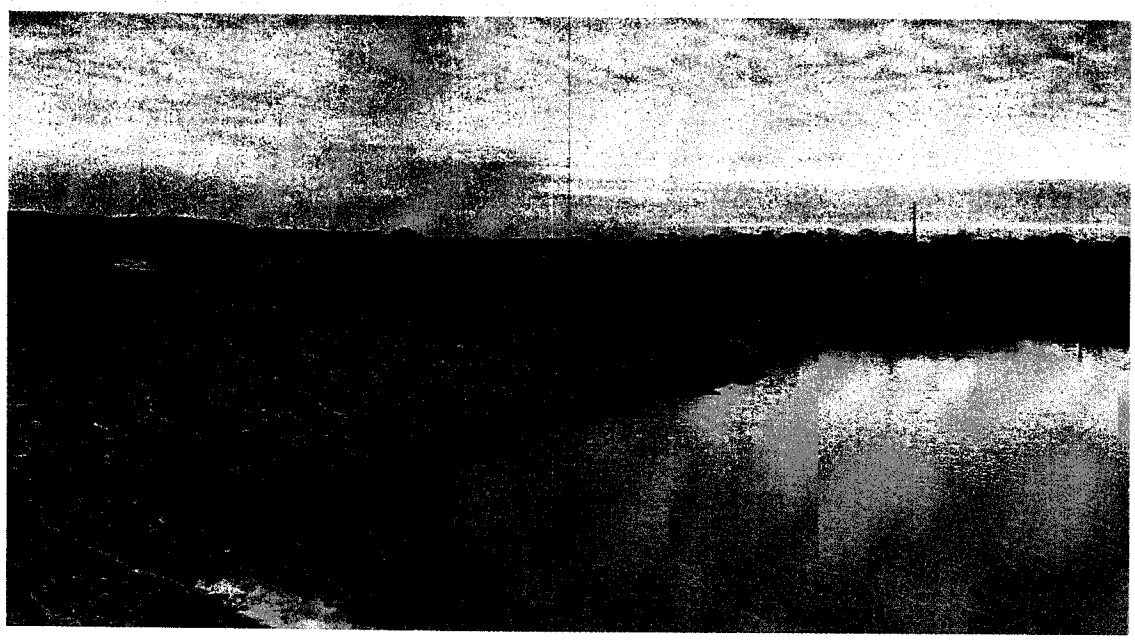


Picture no. 2. Concrete flume with Concrete Block in place.

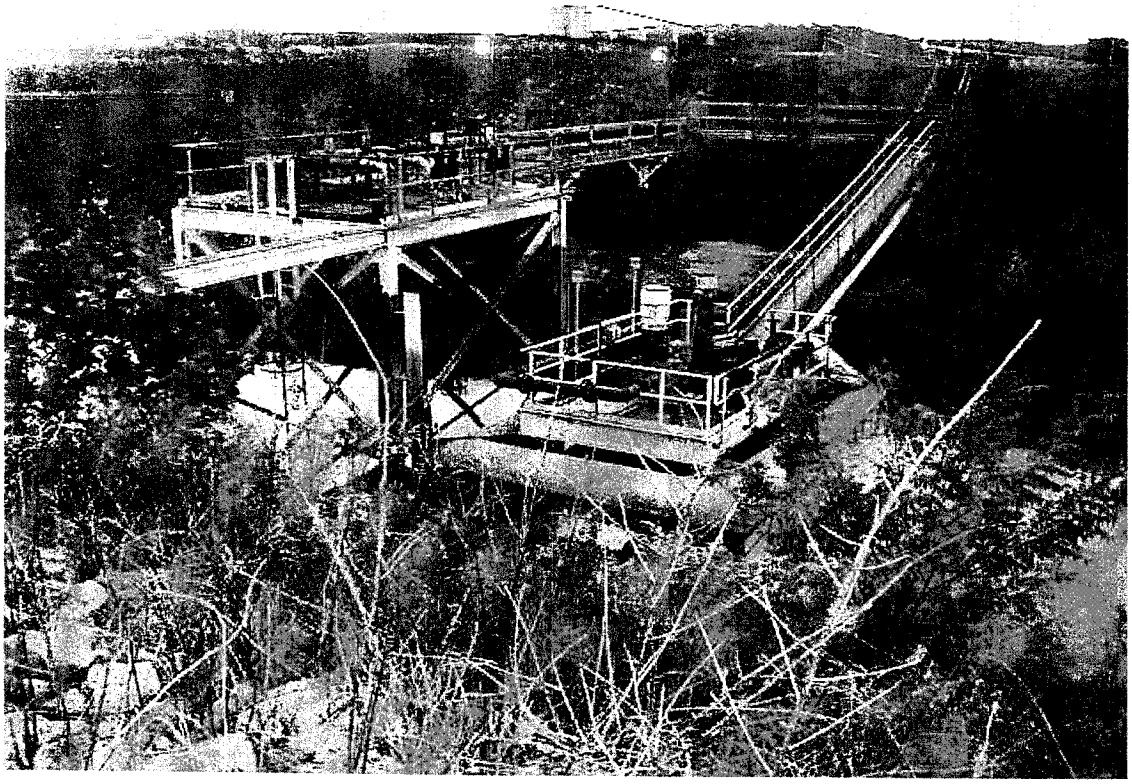
Picture no. 3. Standard spillways removed for cleaning out.



Picture no. 4. 30" and 42" pipes.

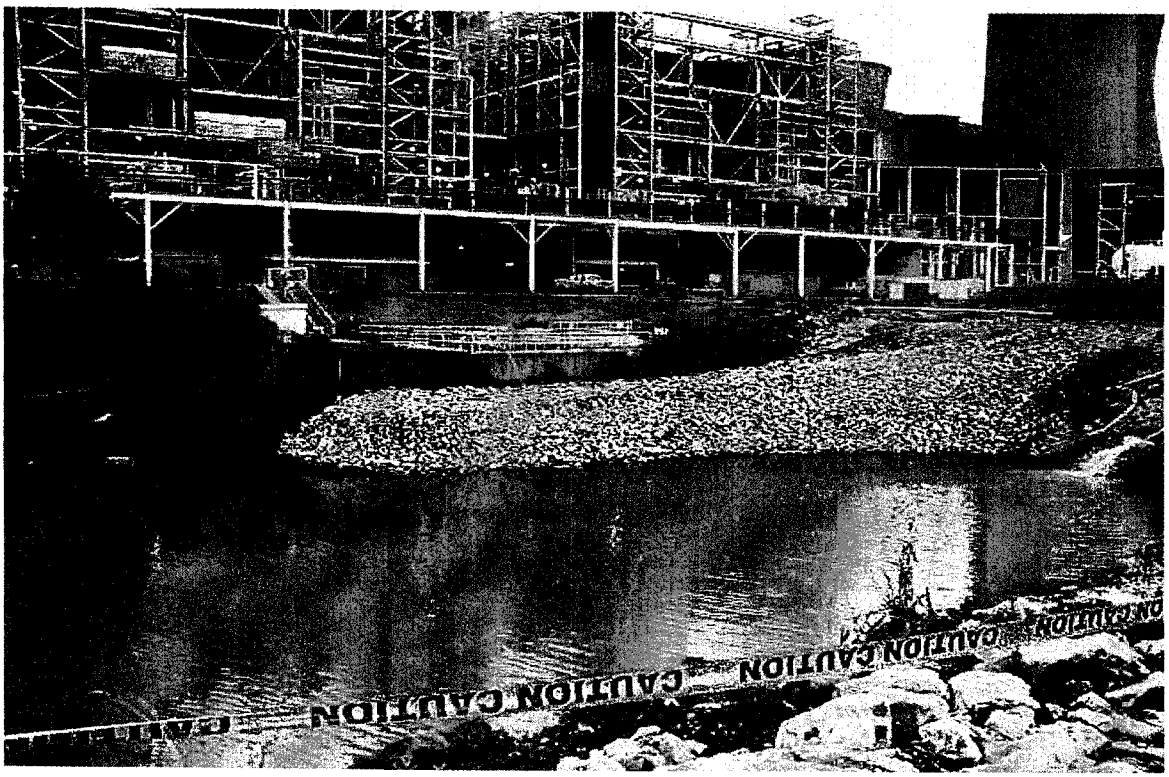


Picture no. 5. Redwater Pond #1 cleanout and bank reconstruction to original configuration.

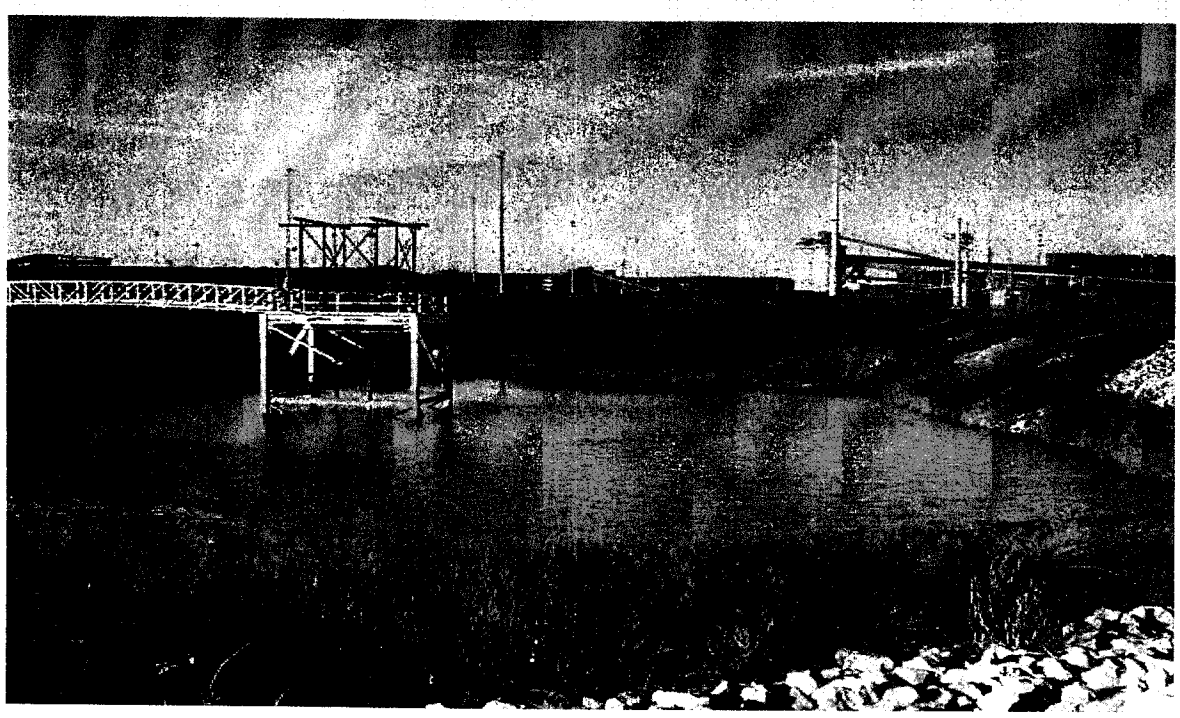


Picture no. 6. Pump platforms in Redwater Pond #1.

Picture no. 7. Discharge structure in Redwater Pond #1.



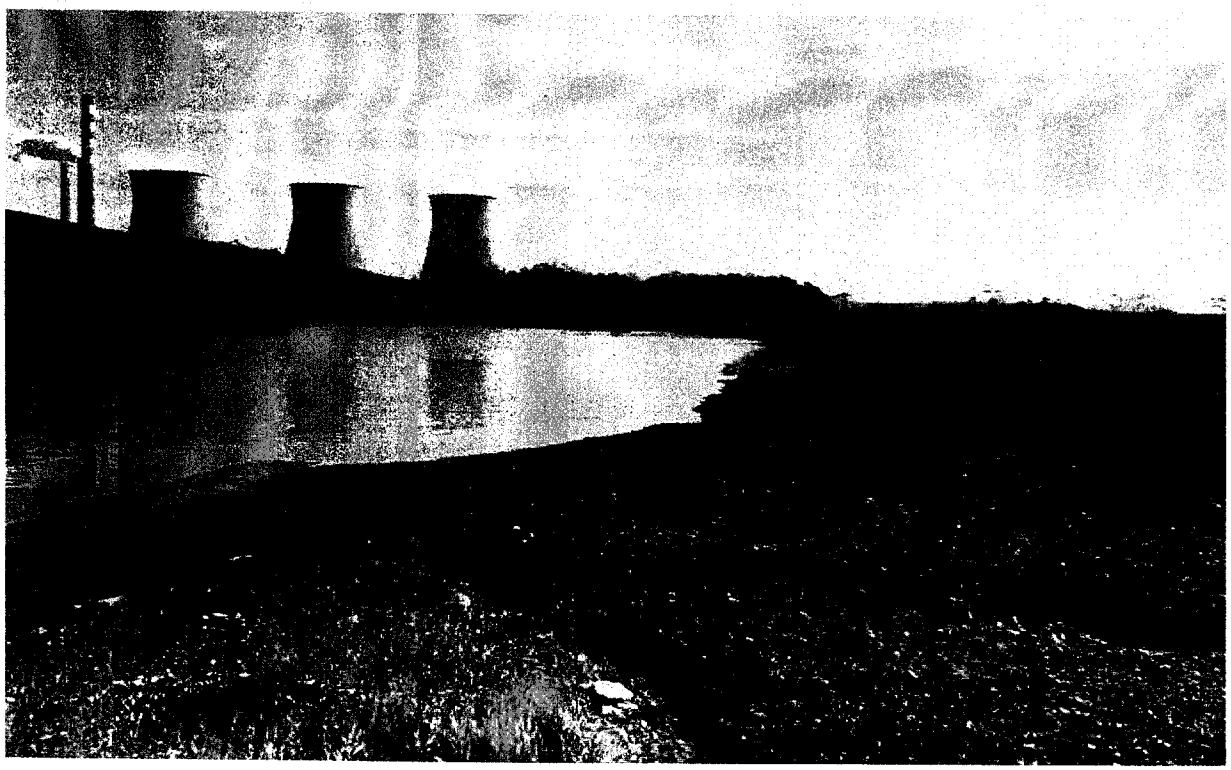
Picture no. 8. Riprap barrier to stabilize sewage treatment plant.



Picture no. 9. Redwater #2 Pond needs to be cleaned out.

Picture no. 10. Redwater Pond #3 needs to be cleaned out.

Picture no. 11. Thick vegetative growth blocking the flow in the pipes which flow from Redwater Pond #3 to Jacobs Creek Ash Pond.

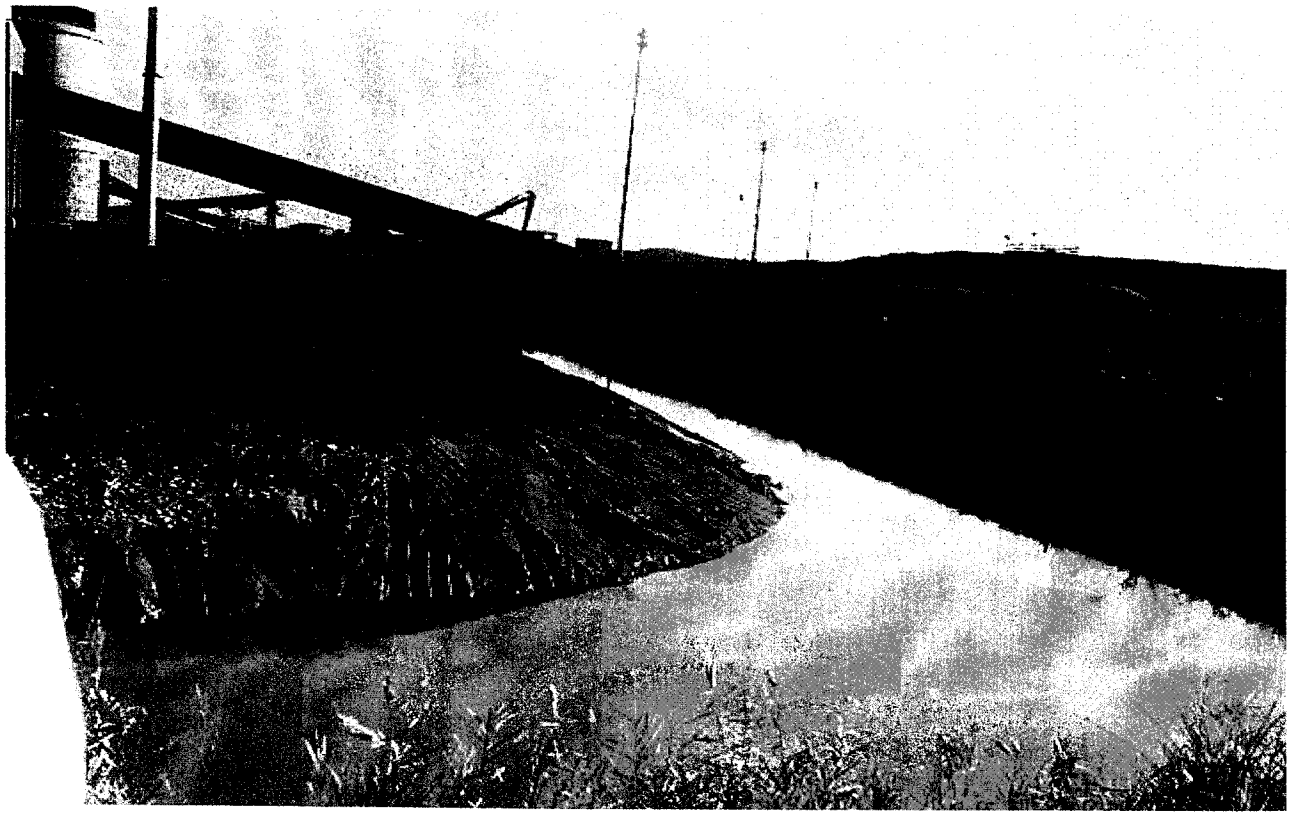


Picture no. 12. Redwater Pond #4. This pond should be full of water as it is only a surge pond.

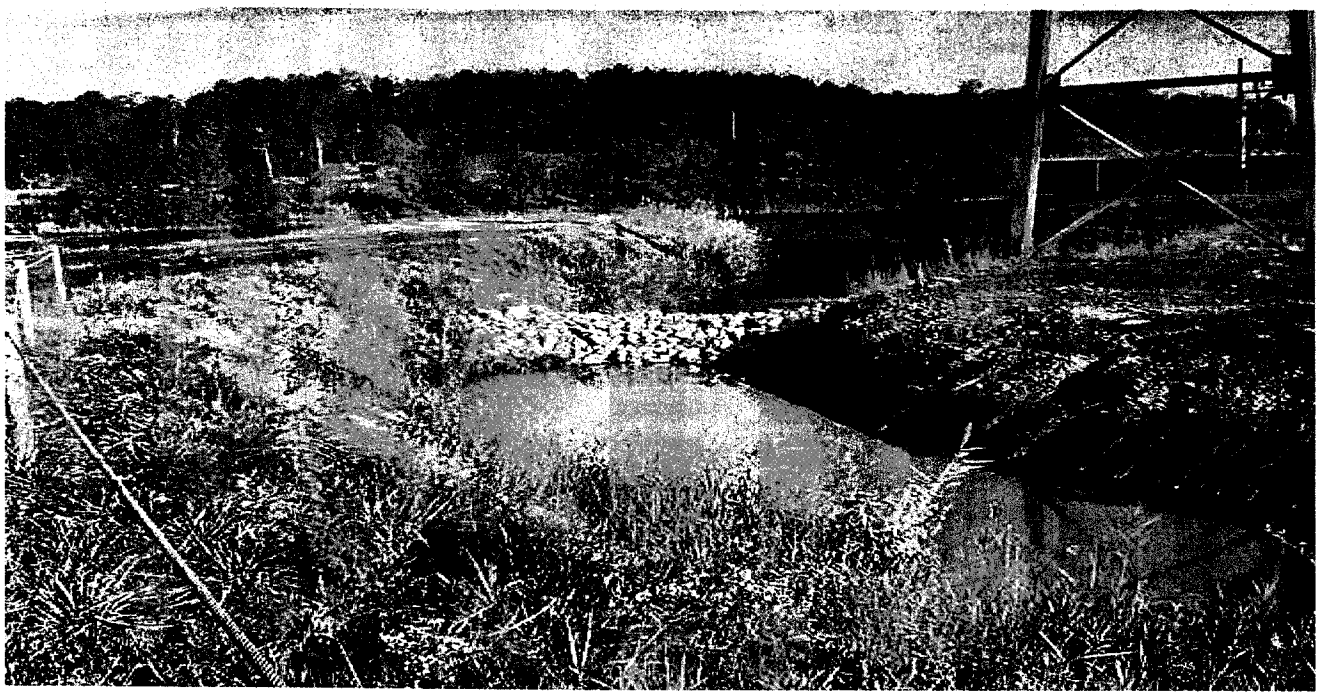
Picture no. 13. Redwater Pond #5 being cleaned out.

Picture no. 14. Redwater Pond #5 being cleaned out.

Picture no. 15. Redwater Pond #5 being cleaned out.

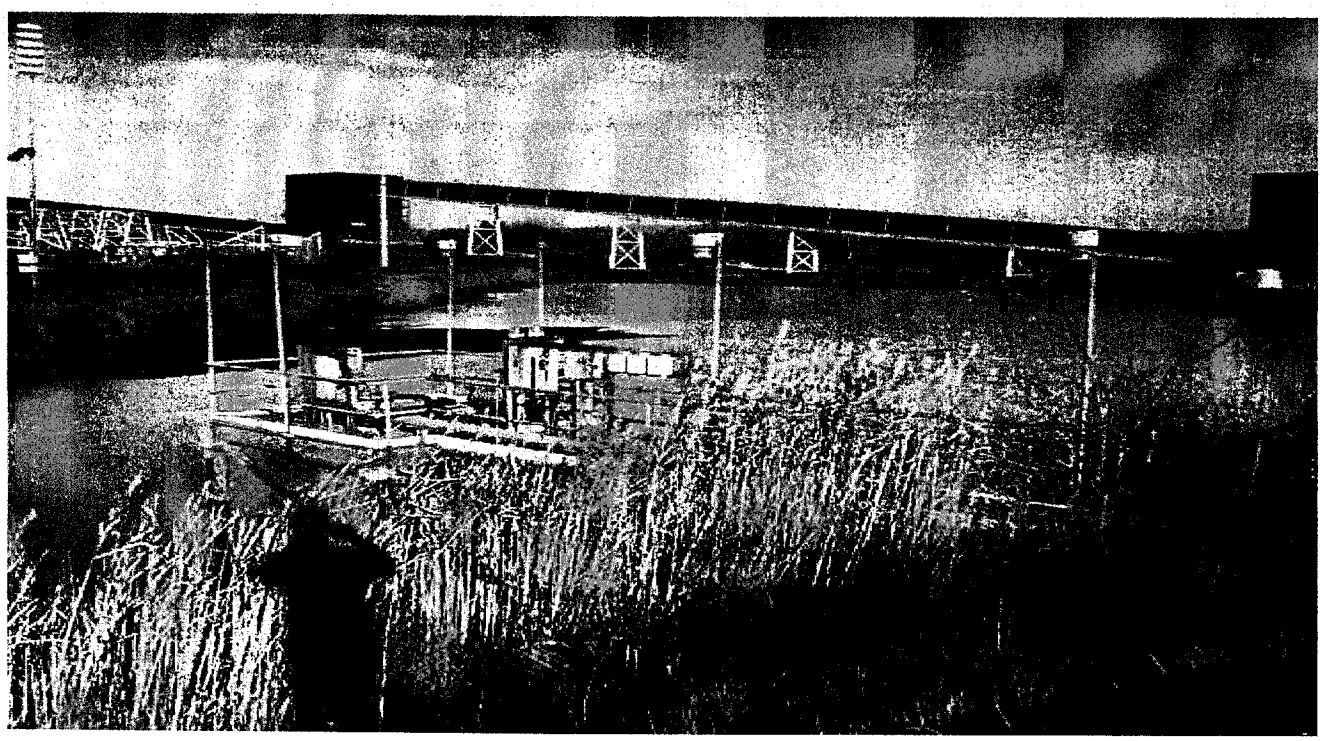


Picture no. 16. Coal Yard Pond #1 cleaned out.



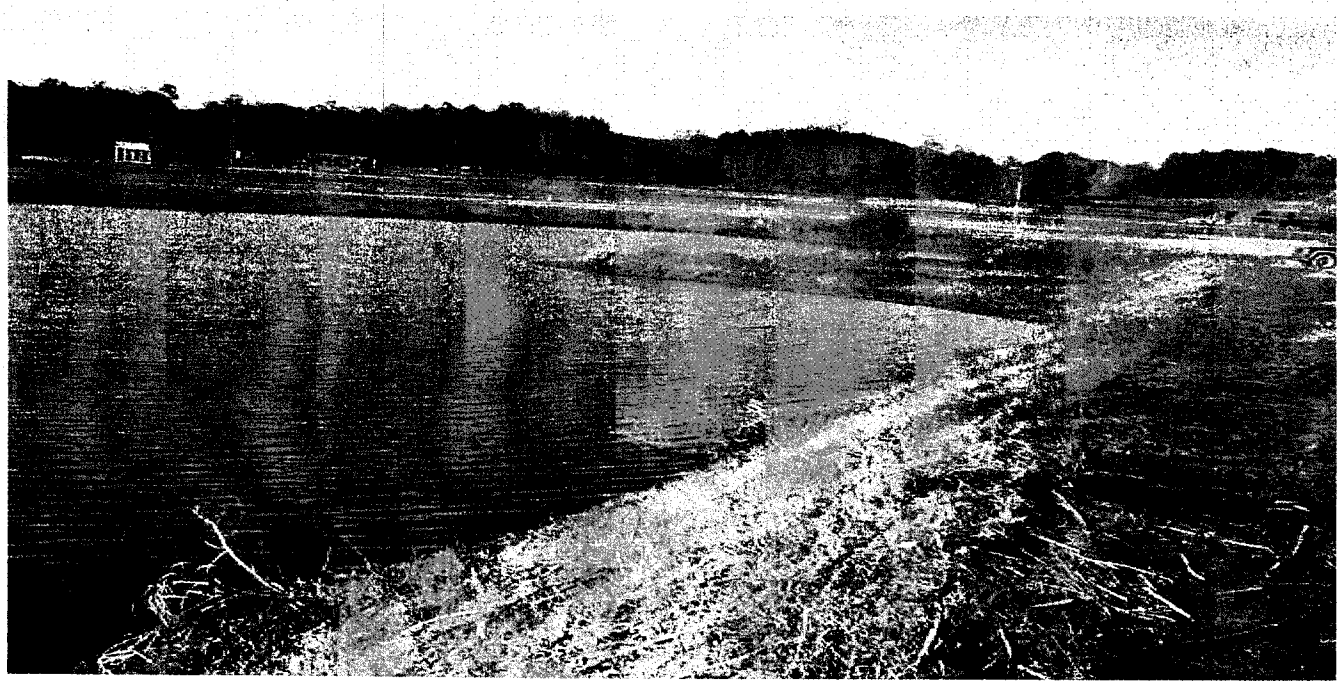
Picture no. 17. Coal Yard Runoff Pond #1 settlement dike.

Picture no. 18. Coal Yard Runoff Pond #2 pumps.



Picture no. 19. Coal Yard Runoff Pond #2 needs to be cleaned out.

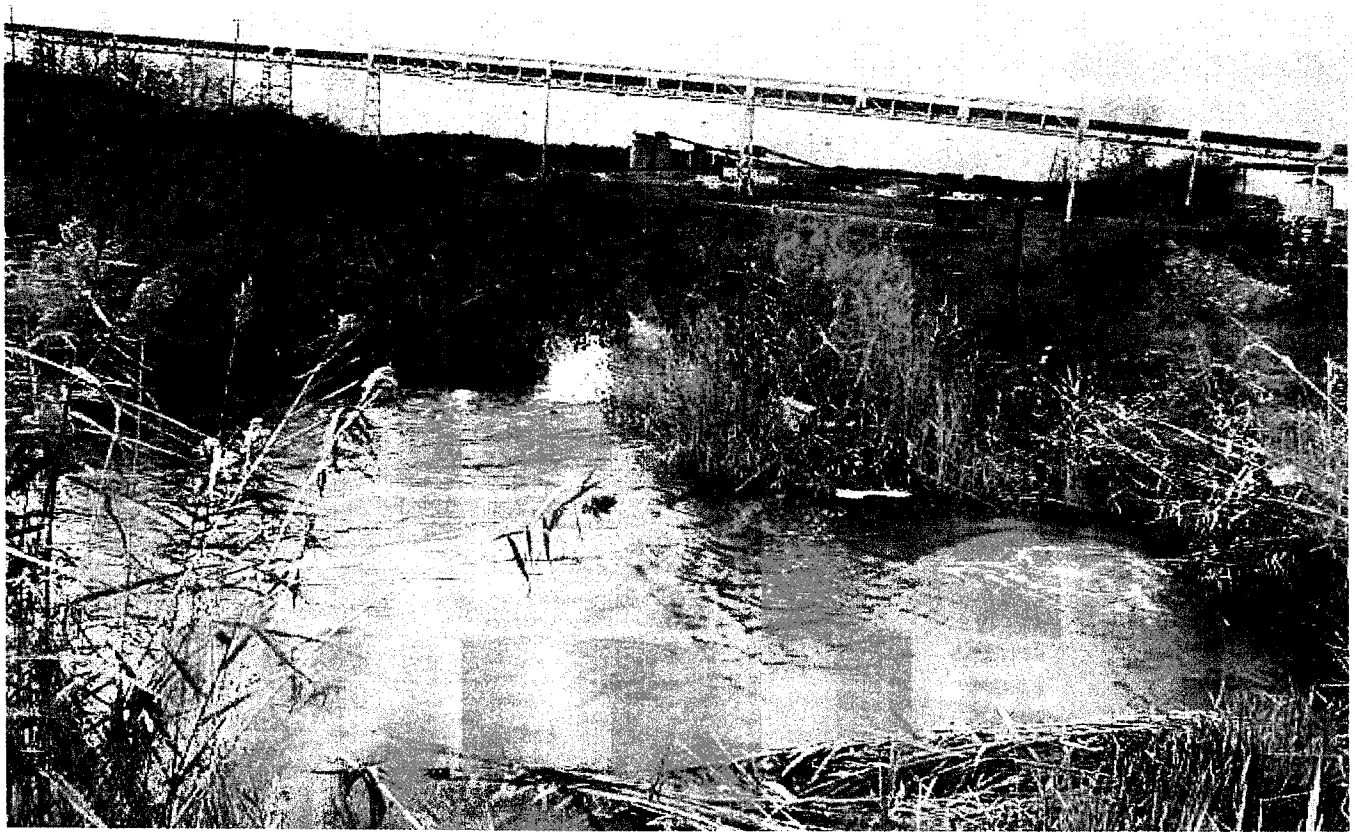
Picture no. 20. Coal Yard Runoff Pond #3.



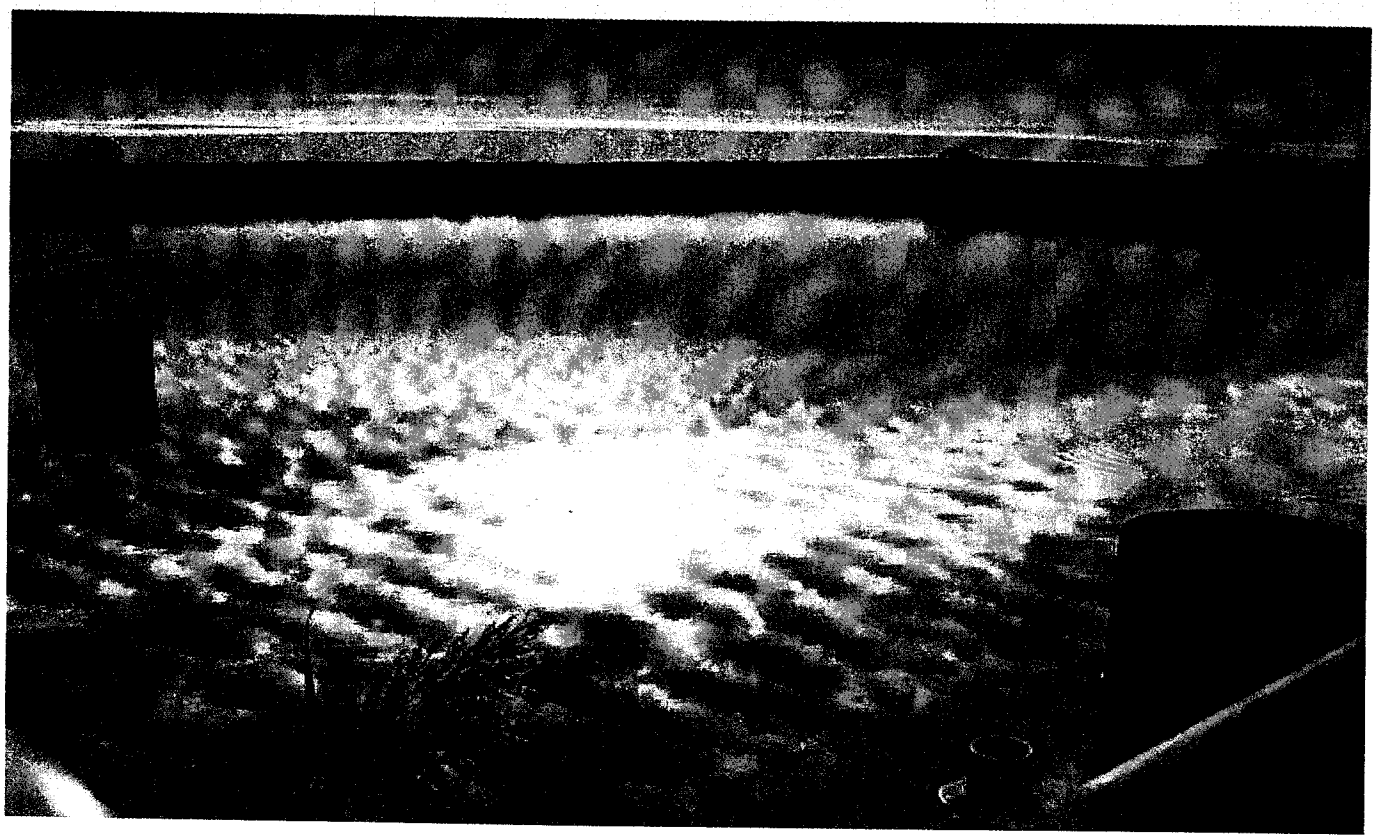
Picture no. 21. Coal Yard Runoff Pond #3. Gullies around perimeter of drainage basin.

Picture no. 22. Coal Yard Runoff Pond #3.

Picture no. 23. Discharge widened and ripraped.



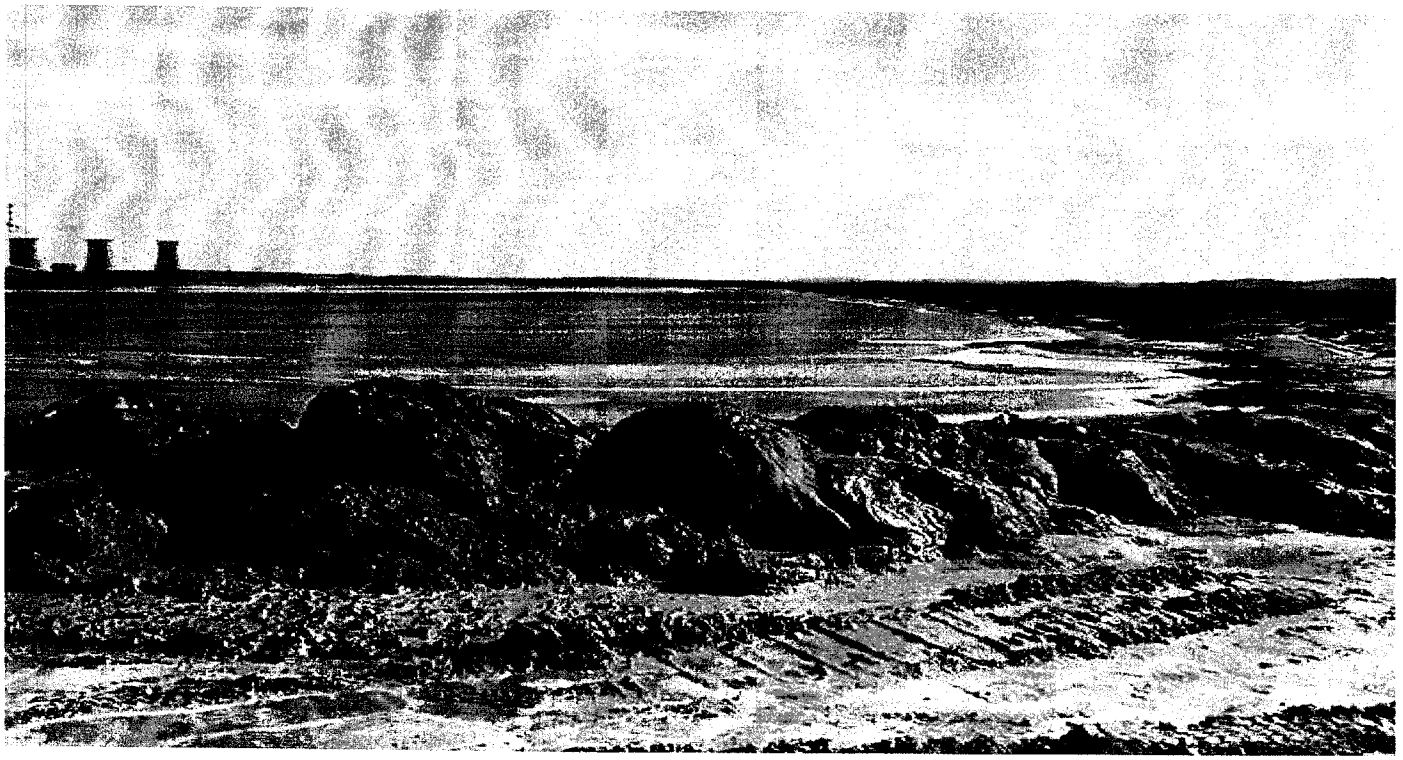
Picture no. 24. Discharges into Jacob's Creek Ash Pond.



Picture no. 25. Jacob's Creek Fly Ash Pond. Spillways with skimmer.

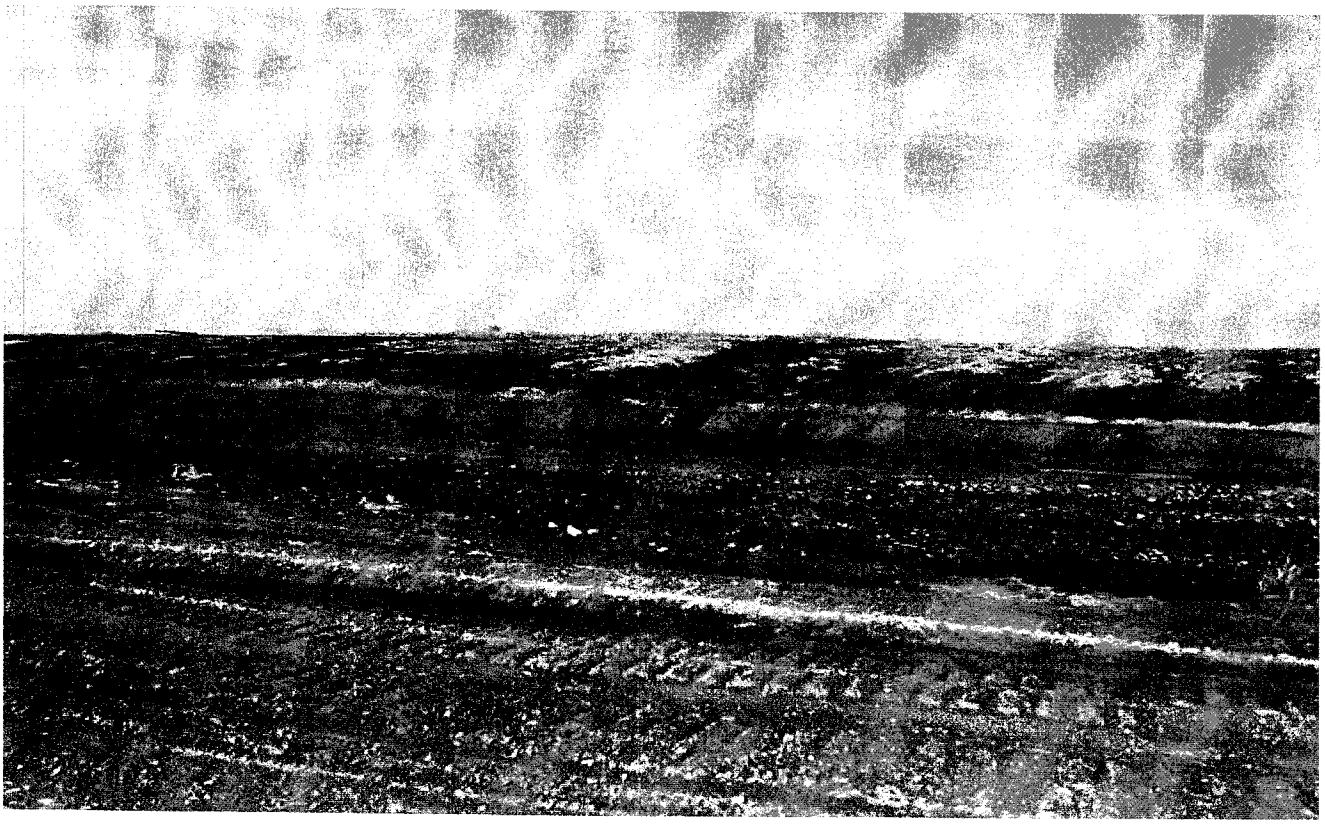
Picture no. 26. Jacob's Creek Fly Ash Pond. Spillway with skimmer.

Picture no. 27. Scrubber Waste Wet Pond.



Picture no. 28. Scrubber Waste Wet Pond.

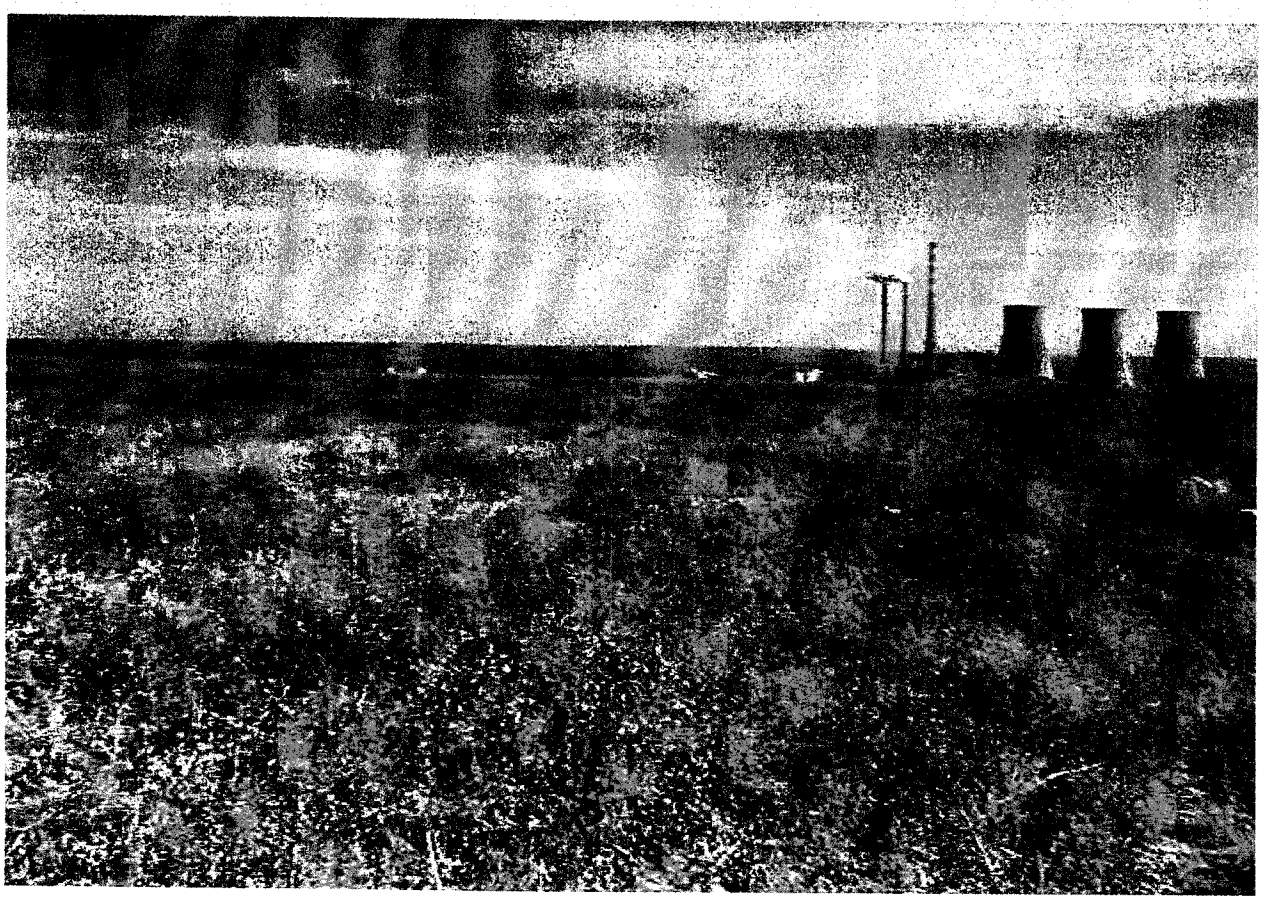
Picture no. 29. Medium and course reject area.



Picture no. 30. Medium and course reject area.

Picture no. 31. Medium and course reject area.

Picture no. 32. Medium and course reject area.



Picture no. 33. Medium and course reject area.

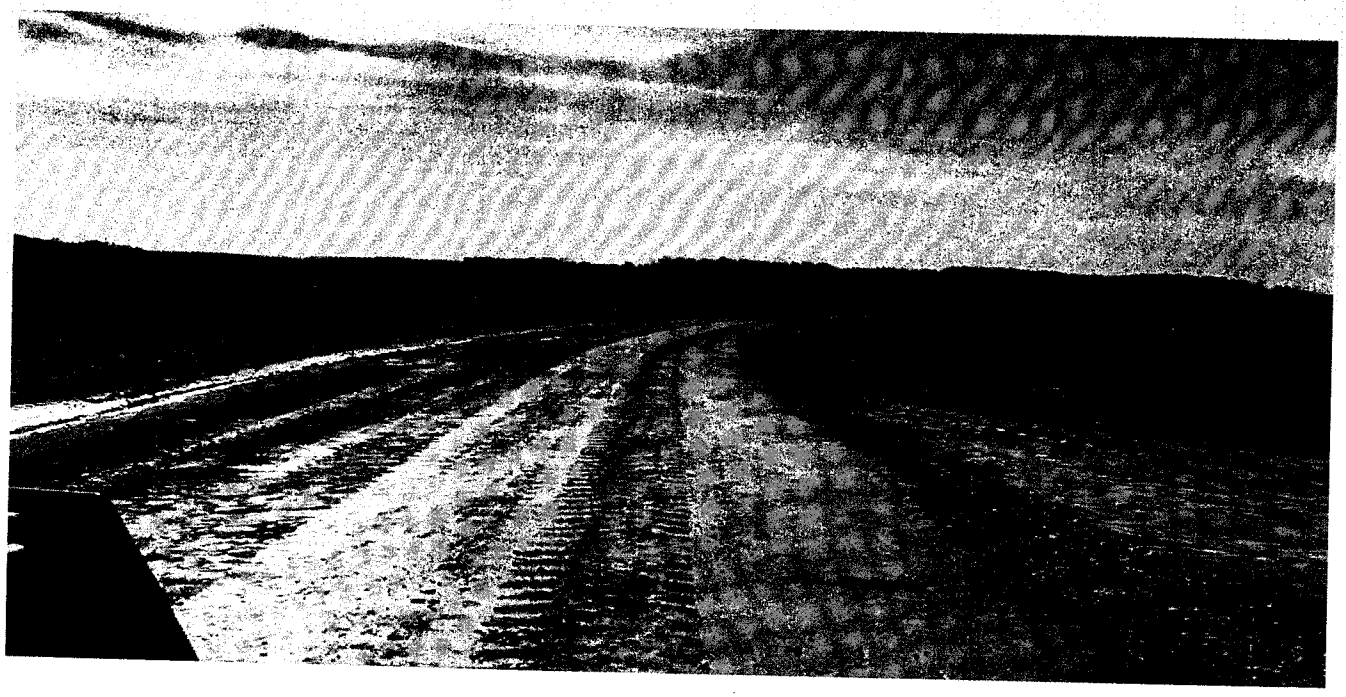
Picture no. 34. Coal Wash Fines Pond #3. Little to no grass on slopes.

Picture no. 35. Coal Wash Fines Pond #3. Little to no grass on slopes.

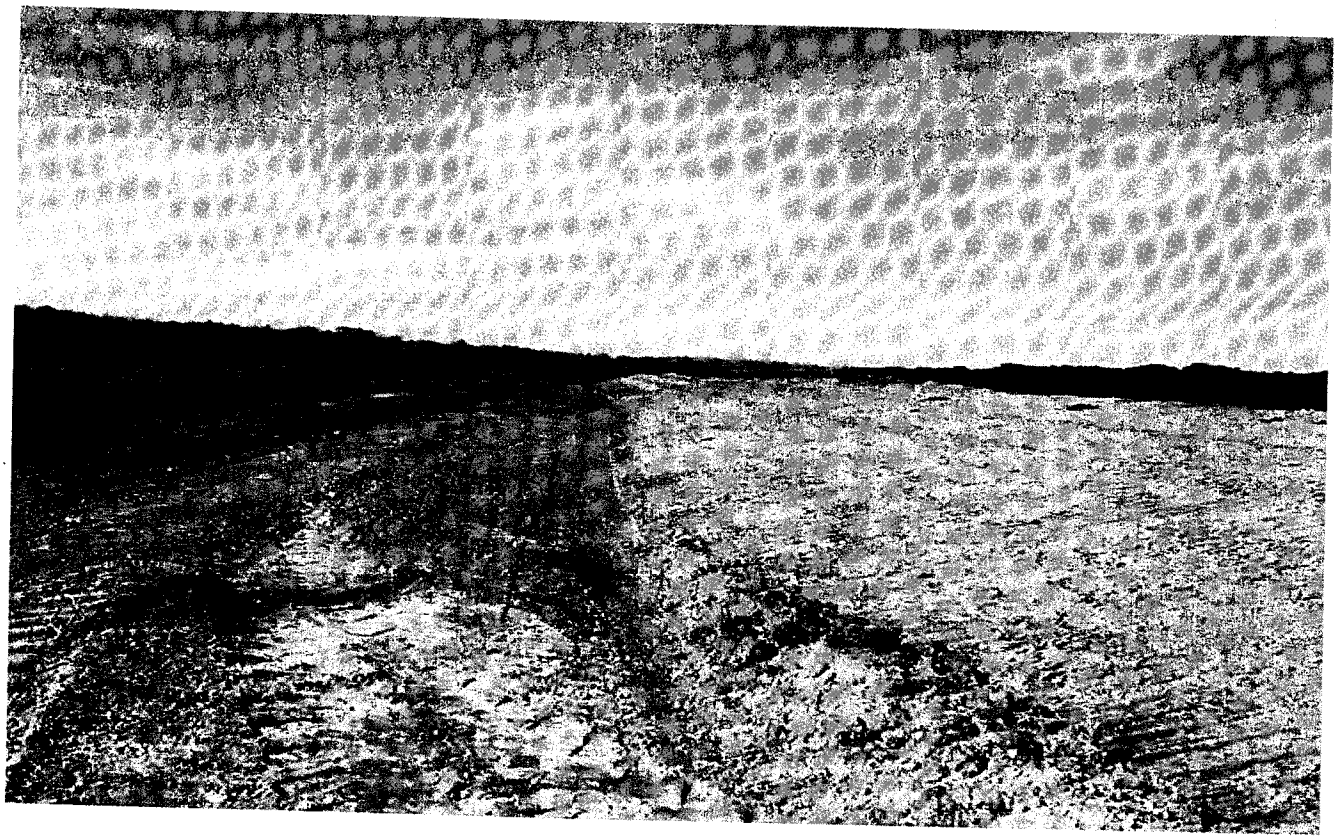
Picture no. 36. Coal Wash Fines Pond #3. Rim ditch stacking inside existing dike.

Picture no. 37. Coal Wash Fines Pond #3. Rim ditch stacking inside existing dike.

Picture no. 38. Coal Wash Fines Pond #3. Rim ditch stacking inside existing dike.



Picture no. 39. Coal Wash Fines Pond #3. Rim ditch stacking inside existing dike.



Picture no. 40. Coal Wash Fines Pond #3. Rim ditch stacking inside existing dike with soil cover for closure.

Picture no. 41. Coal Wash Fines Pond #3. New stilling pond.

January 20, 2005

Donald E. Gaston, Plant Manager
PAF 1A-DRK

PARADISE FOSSIL PLANT (PAF) - ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Attached is a report from Mike Hughes concerning the inspection of November 9 & 10, 2004 at Paradise Fossil Plant's ash disposal areas.

This report includes recommendations for corrective work. I concur with these recommendations.

Should you have any questions please contact Ron Purkey at extension 4820 in Chattanooga or Mike Hughes at Extension 2783 in Chattanooga.

Dennis Lundy
Manager, Civil Engineering
LP 2G-C

JGA:REP:JDP:JLV
Attachment

cc(w/attachment):
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TENNESSEE VALLEY AUTHORITY
PARADISE FOSSIL PLANT

ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Prepared By: Michael S. Hughes
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ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Introduction

The waste disposal areas at Paradise Fossil Plant (PAF) were inspected for dike structural stability on November 9 & 10, 2004. The inspection was performed by Ronald D. Powell, Michael S. Hughes, and Chris Hensley of Fossil Engineering. The previous annual inspection was conducted on October 29 & 30, 2003.

The results of the annual stability inspection are listed below according to their location within the Paradise Fossil Plant Boundaries. A location map is attached with arrows showing directions of the picture taken.

Slag Areas 2A, 2B, and Stilling Pond

Boiler slag is sluiced into the south end of area 2A and was being reclaimed by Reed Minerals at the time of this inspection as part of a TVA marketing strategy. The two ponds were cleaned out by the Heavy Equipment Division of TVA in the spring 2 years ago. The water elevation appeared to be approximately 6 inches less than observed in previous inspection The reclaim area is neat with several small stacks with-in the pond (Picture 1). The bottom ash drops out quickly and is removed by Trans Ash.

The sluice water then flows into2A, leaving the fines and is discharged into pond 2B through pipes and around a series of baffles to lengthen the settling time. A floating pump station has been placed at the north end of pond 2B to fill water trucks. The sluice water enters the north end of the stilling pond through a concrete flume (picture 2). A large concrete block had been placed in the concrete flume at one time to temporarily raise the water 24", but has since been removed. The flume appeared to be in good condition and water was flowing freely into the stilling pond. The water discharges through three standard spillways into the Green River. All three spillways were operating at the time of inspection (picture 3). One pump was operating at the time of inspection taking water to Jacob's Creek. The access gate was locked at the discharge point of the spillways so a close observation of the channel was not possible. However, there was no immediate evidence of erosion in the channel and the channel was well vegetated.

There is additional water coming into the stilling pond from a 30" & 42" concrete pipes. This water is from sumps, storm water pipes and dewatering pumps at construction areas.

The dikes appear to be stable and did not exhibit any notable changes since the last inspection. The interior slopes of the dikes have a good vegetative cover. There was an access stairway built over the outlet end of the pipes into Area 2B. The plant continues to monitor the survey controls installed on the exterior dike slope adjacent to the Green River for any indication of movement.

Redwater Ponds (Nos. 1, 2, 3, 4 & 5)

Redwater Pond #1

Redwater pond #1 (RW#1) is located southeast of and adjacent to 'Slag Pond 2B' and 'Slag Stilling Pond'. Considerable repairs, cleanout and bank reconstruction have been performed by HED to excavate the pond to its original configuration (picture 4). This pond has been mucked out and the current water depth is approximately 2 feet. The northern rip rap bank has sloughed and needs to be redone and some of the banks on the north side appear steep and likely to fall away also (see Picture 5). A rip rap barrier has been added to the west side of the sewage treatment plant and appears to have stabilized the bank as designed.

All pumps, slopes, dikes and discharge structures appear to be working properly. Water collected in redwater pond #1 is pumped into the slag pond within Area 2B or 2A.

Redwater Pond #2

Redwater pond #2 (RW#2) is located northwest of and adjacent to Slag Areas 2A & 2B. The water from RW#2 is pumped from the center of the pond and discharged into the northwest end of slag ponds 2A (Picture 6). This pond has been cleaned out since the last inspection report and the water level in the pond is now to about 3 feet below the 72" pipe which is the water level that must be maintained to function properly. The upstream Storm Water and Coal Yard Drainage Pond #1 drains into RW#2 via this 72" pipe. Coal Yard Drainage Pond #2 drains into RW#2 via a 12" overflow pipe during storms. There is a slide area at the 72" pipe approximately 200 feet by 4 feet, and another area at the southwest side about 7 to 12 feet by 100 feet(Picture 7). A dike has been built west of the pump station to contain silt. Three redwater seepage areas were also noted.

Redwater Pond #3

Redwater Pond #3 is a settlement pond and is located southwest of the powerhouse and along the south side of the county road. This pond collects the runoff and sediment from the medium and coarse coal wash refuse areas as well as decanted water from RW#4. RW#3 normally discharges to Jacobs Creek Fly Ash Pond by way of three 18" gravity drains from the pond and into a 60" gravity drain. At the time of this inspection, a temporary dike had been built to divert the flow away from the pond into 3 - 36" pipes that go under the road and into a drainage structure (Pictures 8 & 9)

RW #3 is designed to discharge to RW #5 via a gravity drain with a manual valve contained within the discharge structure. This valve is opened only when the pond is to be cleaned out. At the time of this inspection Heavy Equipment Division was cleaning out the pond and taking the sediment to the southwestern area of the coarse and medium refuse stack (Picture 10).

Redwater Pond #4

Redwater Pond #4 is a surge/sediment pond located east of the medium and coarse Coal Wash Refuse Area. This is a surge pond that settles out the fines so they can be cleaned out with a back hoe easier and cheaper and before the fines reach RWP #3. This surge pond was designed to drain to RWP #3 via an eight inch pipe into an open riprap ditch beside the road. The southwest side of this pond has been reconstructed with rip rap and has been reseeded and the vegetation removed (Picture 11). An emergency overflow structure drains runoff during heavy rains that exceeds the standard 10 year - twenty-four hour rainfall event, directly to the 'Jacob's Creek Fly Ash' pond there-by bypassing RW #3. The depth of water is now approximately 1 foot.

Redwater Pond #5

Redwater Pond #5 is located south of the powerhouse, east of the truck coal dumping area and west of the limestone storage area. It is a surge pond designed to delay and hold enough water going to Redwater #1 to give the pond #1 pumps time to lower the water level from any rains below a 10 year frequency. An overflow structure drains runoff during rains exceeding the standard 10 year - twenty-four hour rainfall event directly to redwater pond #1. All water collected in redwater pond #5 drains to redwater pond #1 via a gravity drain and no water should ever be in RW #5 pond four hours after a rain.

Coal Yard Runoff Pond #1

Coal Yard Runoff Pond #1 (CYRP#1) is located north of and across the plant access road from the Coal Wash Plant. This is a surge/sedimentation storm water runoff pond that delays runoff to RW #2. Water and sediment is collected in the pond and the decanted water is discharged through a six inch hole cut in the side of the stand pipe (Picture 12). This hole is not configured per the original design drawing in size, or elevation but is doing a fair job. A rip rap dike was built to keep the coal fines away from the discharge point (picture 13), at the time of this inspection, a portion of this dike had been removed due to the amount of fines that had accumulated. The water depth in the pond is over 24".

Coal Yard Runoff Pond #2

Coal Yard Runoff Pond #2 (CYRP#2) is located southwest of and across an access road from Redwater #2 Pond. This pond was designed as a storm water sedimentation pond and all water from this pond is to be pumped to slag pond 2A. As noted in the last inspection, CYRP #2 had been cleaned of sediment and had a low water level. At the time of this inspection, the depth of water was about 3 feet, and 2 islands were left in the pond (Picture 14). There are three pumps on the platform but there is no power to any of them. The pumps are designed to pump all water from this pond to Pond 2A.

Coal Yard Runoff Pond #3

Coal Yard Runoff Pond #3 is located south of the coal transfer complex and north of and adjacent to the access road. This pond can discharge by gravity or be pumped to RW #1. The inner banks of the basin seem to be well vegetated and are stable (Picture 15). The measured water depth is over 36".

The emergency overflow is blocked or has been modified to the point that it does not operate (picture 16).

Slag Disposal Area

The slag disposal area is located southeast of the powerhouse. The slag in this area was placed here by the plant during its early operations and is currently being reclaimed for commercial use by Reed Minerals personnel. The area contains a small surge pond to collect runoff and a larger area, called the beaver pond (Picture 17), which discharges over a spillway and down a riprap channel into Jacobs Creek. The riprap appears to be in good condition. The beaver built a dam that was restricting flow to Jacobs Creek that has been removed. Plant personnel have continued to frequently monitor this area and clean out any additional beaver dams. The discharge has been widened and rip rapped.

The dikes appear to be stable with a good vegetative cover on them. The redwater seeps identified in earlier reports along the southwest dike in this area are still present. Some of the red water seeps continue to have growing deposits of material. Plant personnel monitor these areas frequently. The erosion gully, observed on previous inspections, located at the end of the southwest dike just north of an existing culvert was not visible.

Jacobs Creek Fly Ash Pond Area

This area is located southeast of the powerhouse. Fly ash is sluiced into the northern portion of the original pond. This area had recently been cleared and a new channel reconstructed (Picture 18). The sluice lines are underwater. Water flows through a divider dike with a floating boom skimmer structure and into the stilling pond before being discharged into Jacobs Creek via three standard spillways. The skimmers and floating boom in the stilling pool have been removed and the opening in the divider dike filled. Water now flows through a dike breach in the southwest portion of the ash pond then into the Fly Ash Pond Area Extension (the new ash disposal area) (Picture 19).

The divider dike had several trees that were to be removed by pulling them up and compacting bottom ash in the holes. The sloughing area that was noted in the previous two ash pond inspection reports on the south dike just west of the divider dike was still present. The county road between the fly ash area and the slag disposal area has had new stone surfacing put down and silt fence put up at the edge of the road. The dikes appear to be stable and do not exhibit any notable changes in there exterior since the last inspection. Continue to remove all trees.

There were no new slough failures observed along the south dike. Earth fill has been placed at the toe and compacted to make a uniform slope. There was flow from the pipe at the time of this inspection from seepage of the north dike of Jacobs Creek Fly Ash Pond.

Fly Ash Pond Area Extension

This disposal area was put into operation in September 1997. The area is located adjacent to and south of the existing Jacobs Creek Fly Ash Disposal Area. Dikes in the southern and eastern portion of the area were raised from approximate El 400 to El 408. The existing dike of Jacobs Creek Fly Ash Disposal Area was breached at the southwest end of the pond. This allows water to flow into the new pond and around the installed concrete pipe that maintained a water cover over the ash in the Jacobs Creek Fly Ash Disposal Area. Flow is uniform and non-eroding through the ash pond . Riprap in the breach and channel were in good condition. After the ash settles out, the water flows into a stilling pool in the northeast portion of the pond through a divider dike with a floating boom. At the time of this inspection, carbon dioxide was being introduced into the water at the boom (Picture 20). Water is then discharged through three 48" vertical spillways, with skimmer structures, and out through three 36" diameters concrete pipes to Jacobs Creek (Picture 21).

The spillway structures appear to be operating properly. All three outlets appear to be discharging equally at the time of this inspection. The riprap at the spillway discharge outlets appeared to be in good condition. There is a stairway for access from the top of dike to the discharge pipes and the three new monitoring boxes above the pipes (Picture 22). Dikes were constructed in the southern and eastern portion of the area. The dike slopes have established vegetation. The road on top of the dike has had crushed stone surfacing added. All exterior dikes appear to be in good condition with no visible signs of instability.

Scrubber Waste Wet Ponding Area

This area is located in the southwest corner of the TVA reservation. Scrubber waste is sluiced into the northern end of this region and stacked by long reach track hoe via the rim ditch method . Scrubber waste is sluiced through the ditch formed by the exterior dike and an interior separator dike to the western corner of the area to allow that area to fill with scrubber waste. Water is discharged from the scrubber pond to a settling pond by vertical spillways (Picture 23). The stilling pool water discharges from the stilling pool through a vertical spillway into a ditch that empties into the Jacobs Creek Fly Ash Pond a half mile away.

The discharge pipes from the scrubber pond to the settling pond appear to be in good condition. The standard spillway out of the stilling pool was in good condition. The final clarification pond had been cleaned up and cattails removed from a portion of the bank (Picture 24). A saddle dike had been constructed at the south end of the ponding area to prevent water and waste from flowing to adjoining property (Picture 25).

The remainder of the area appears stable with a good vegetative cover and did not exhibit any notable changes since the previous inspection . Area drains and underdrain systems had been placed at the southeast portion of the dike and appear to be working as designed (Picture 26). No vegetation had been placed at this time. No signs of erosion were present.

West Dredge Cell

This area, located just east of the scrubber wet ponding area, was constructed to accept dredged fly ash from the Jacobs Creek pond area. No material has been dredged into the cell at the time of this inspection.

Plant personnel had installed a valve, at Fossil Engineering's request and in accordance with design drawings, on the outlet pipe for the underdrain system for this cell. This valve is used to drain the cell only during recovery operations. The valve was properly closed at the time of this inspection. Runoff water is now collecting in the cell because the riser boards were installed in the spillway riser. Water should not be allowed to stand in this cell.

The dikes appear stable and did not exhibit any notable changes since the last inspection. All exterior slopes have an excellent vegetative cover. The erosion observed on the dike slope on the previous inspection at the southeast end of the pond was still present. The erosion gully observed on the previous inspection at the southwest end of the pond at the pipe outlet which drains the perimeter ditch of the scrubber pond into the west dredge cell was still present but does not appear to have worsened.

East Dredge Cell

This area is located just south of the medium and coarse coal wash refuse area. This cell was also constructed to accept dredged fly ash from the Jacobs Creek ash pond area. The plant has ceased all dredging into the pond at this time.

The spillway appeared to be in good condition, but was not operating at the time of this inspection. The discharge pipe was clear of obstructions but had a large eroded hole 6' long, 3.5' wide by 3' deep. This hole has revegetated and appears to be in stable condition (Picture 27).

The dikes in this area appear to be stable. The tops of dike surfaces are in satisfactory condition, although some vegetation has established itself over the area. Removal of vegetation is not warranted at this time. The dredged ash was seeded four years ago and vegetation is good south of the discharge structure and is improving north of the discharge structure.

An erosion ditch was identified beside the armored ditch in the 1994 inspection report that would have required 1000 lb of riprap at the northeast corner of the dike. This erosion area caused by runoff which has bypassed the armored ditch, is now over 4 feet deep, eight feet wide and one hundred plus feet long. The drainage ditch has had rip rap put in and has good vegetation established and seems to have stabilized (see Picture 28)

Ditches, rutting and erosion gullies all have established vegetation and appear stable. (Picture 29)

Medium and Coarse Coal Wash Refuse Area

Currently, all of the material is transported from the silo to the stack by off-road vehicles. Plant personnel transport the refuse daily to the old fines pond #1 to be spread, stacked and compacted (picture xx). The compaction decreases the pH of the runoff water that kills the vegetation for this area. The eroding ditch on the northwest side (Picture 30) has had gabion and rock material placed in it to retard erosion. The west side runoff is by drainage ditches to Redwater Pond #3.

The areas which were at or above the engineered final stacking configuration issued drawings were compacted and have good vegetative cover established (Picture 31). Other areas will be brought to final grades and will be worked to correct slope steepness, covered and vegetated as part of the Stage 1 project. Runoff from the east side is directed by the berm ditches to a perimeter ditch which discharges into the collection ditch for Redwater Pond #4. A good vegetative cover has been established in the southeastern portion of the area.

The erosion ditch on the saddle dam that was identified in previous reports has been repaired. The road needs to be re-graded to force all water to the inside of the stacking area.

Coal Wash Fines Pond #2

This disposal area is located in the northwest portion of the plant properties. The area is adjacent to the railroad and on the north side of the plant access road. The original pond was completed in the late fall of 1987. The top of the original dike was at elevation 455. The plant raised the dike to approximately elevation 465 in 1990, and subsequently sluiced fines to this elevation. This area has not been active as a sluicing operation since Fines Pond #3 began operation in October 1992.

All of the dikes in this area appeared stable and in good condition. The west dike of this area has been noted in previous inspections to have sparse vegetation. The vegetative cover of this dike is now improving and establishing itself over the area. Several of the small pine trees noted on the west dike in previous inspections are now 15' tall. These trees need to be removed by pulling them up and then compacting clay in the holes.

This area is in the contract for Parsons to do a closure plan on.

Coal Wash Fines Pond #3

Fines Pond #3 is located northwest of Fines Pond #2. The first lift was completed in October 1992 and all sluicing was diverted from Fines Pond #2 to this area. The latest lift was finished in September 1999, and the sluice discharge was changed from the east to the west end of the pond. The discharged point was moved from the west end to the east end (picture 32). The overflow discharge structure removes the water and discharges it into a riprapped ditch which flows into Fines Pond #2 and then into the stilling pool.

A dike was constructed around the cemetery to the north of this area to protect it from pond water.

A dike was also constructed in the northeast corner of this area extending from the southeast corner of the cemetery eastward to the exterior dike for pond #3. This dike was constructed to preserve

the aesthetics of the cemetery so it would not be surrounded by the future fines stack. All dikes in this area appear to be stable but have some seepage. There is little grass on the slopes. Several of the new culverts that drain the berm ditches were put in high (picture 34) and do not drain. When it rains, the full ditches flow across the roads because the culvert inverts are above the road elevations.

A slide 29.5 feet long and 10.3 feet high developed the first week of May, 2000 in an area that was seeping. This has been fixed and appears to be working. An area approximately 400 feet long was excavated, an underdrain installed, and riprap placed to stabilize this area of the dike. The fix was completed by February 23, 2001. This area continues to seep but the area continues to be stable.

Six seeps/wet areas were found adjacent to the cemetery. They are of equal elevation and cover a distance approximately 200 feet long. At the time of this inspection, seeps 1 & 2 are now flowing seeping, while #'s 4, 5 & 6 are only soft areas. All six areas continue to exist.

The repaired riprap discharge from the area east of the cemetery and located at the south east corner of the cemetery is in good shape. The eroded material has been removed from the ditch and cemetery.

This pond is over filled (picture 32) and material has been stacked on the inside of the existing dike (picture 33). The dike drainage ditches are full and are not working (picture 34).

The southwest discharge structure has cavitated to the point that it poses a safety hazard. The stand pipe joints should be sealed, then ash filled around the pipe.

Recommendations:

- Plant personnel should continue to periodically mow grass and remove small trees and brush from all dike slopes. Plant personnel should pull up all trees and compact soil back in the holes.
- Plant personnel should also continue to maintain all dike roads for all weather travel to facilitate the required shift visual inspections and routine O&M activities.
- Plant personnel should monitor the exterior dike slopes for seepage, wet or soft spots or animal burrowing, etc. and notify Fossil Engineering of any changes.
- Continue to monitor the survey controls installed on the exterior dike slope of Area 2B slag pond adjacent to Green River for any indication of slope movement.
- Remove the vegetative growth from the entrance to the horizontal discharge pipes in RW #3 so that flow does not become inhibited during periods of heavy rainfall.
- Continue to maintain in a clean state all of the coal yard drainage basins and all of the redwater ponds, especially RW #1, #2, #3 & #4 ponds. Repair the pumps in coal yard pond

- Continue to remove any vegetative growth and/or beaver dams that may be blocking the spillway from the slag area beaver pond. .
- Plant personnel should repair the eroded area at the discharge outlet of the east dredge cell pond by placing riprap in the washed out area at the outlet; (80% of 60 to 80 lb stones, estimated 8 tons) fill the eroded area adjacent to the armored ditch with compacted earthfill, line the area with a filter fabric, and cover with a filter blanket and riprap. (6"thick of 1032 (size 5 stone) with 24" of riprap of 80% 60 to 80 pound stones. (estimated 156 ton riprap with 140 CY of compacted clay and 40 tons of #5 stone with 200SY of filter fabric).
- Repair the erosions from the berm on East Dredge Cell.
- Place cover on all coarse and medium coal wash refuse areas which have reached final grade.
- Continue to check the cemetery seepage weekly and report any increases to; Joel D. Paris @ 423/751-3515 or Lynn Petty @423/751-6704 in Chattanooga.
- Water should not be allowed to pond in the West Dredge Cell. A combination of removing the riser boards and/or installing 1" spacers near the bottom of the riser (within 2 FT +/- of the bottom) needs to be implemented as soon as possible.
- Plant personnel should lower the drain pipes from the berm ditches and clean them out for Fines Pond #3 to eliminate standing water in the berm ditches.
- Begin a grassing and maintenance on the dike slopes and retired areas as all grass has now died on Fines Pond #3 slopes.

PICTURE 1: Ash stacking in Slag Pond 2A

PICTURE 2: Concrete flume at north end of stilling pond

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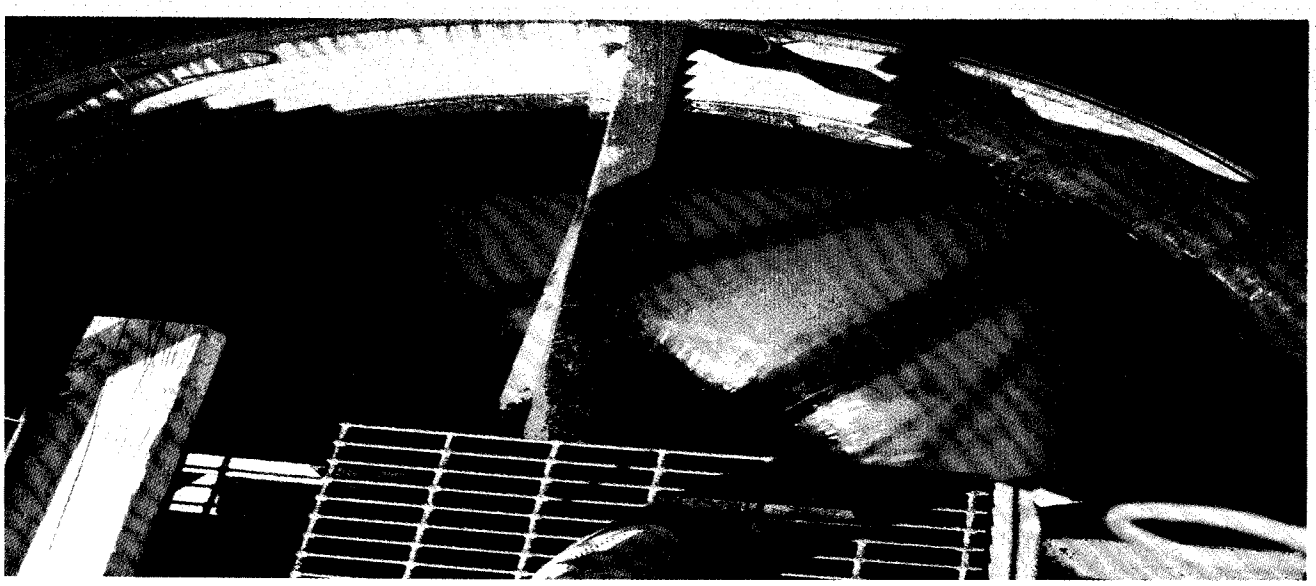
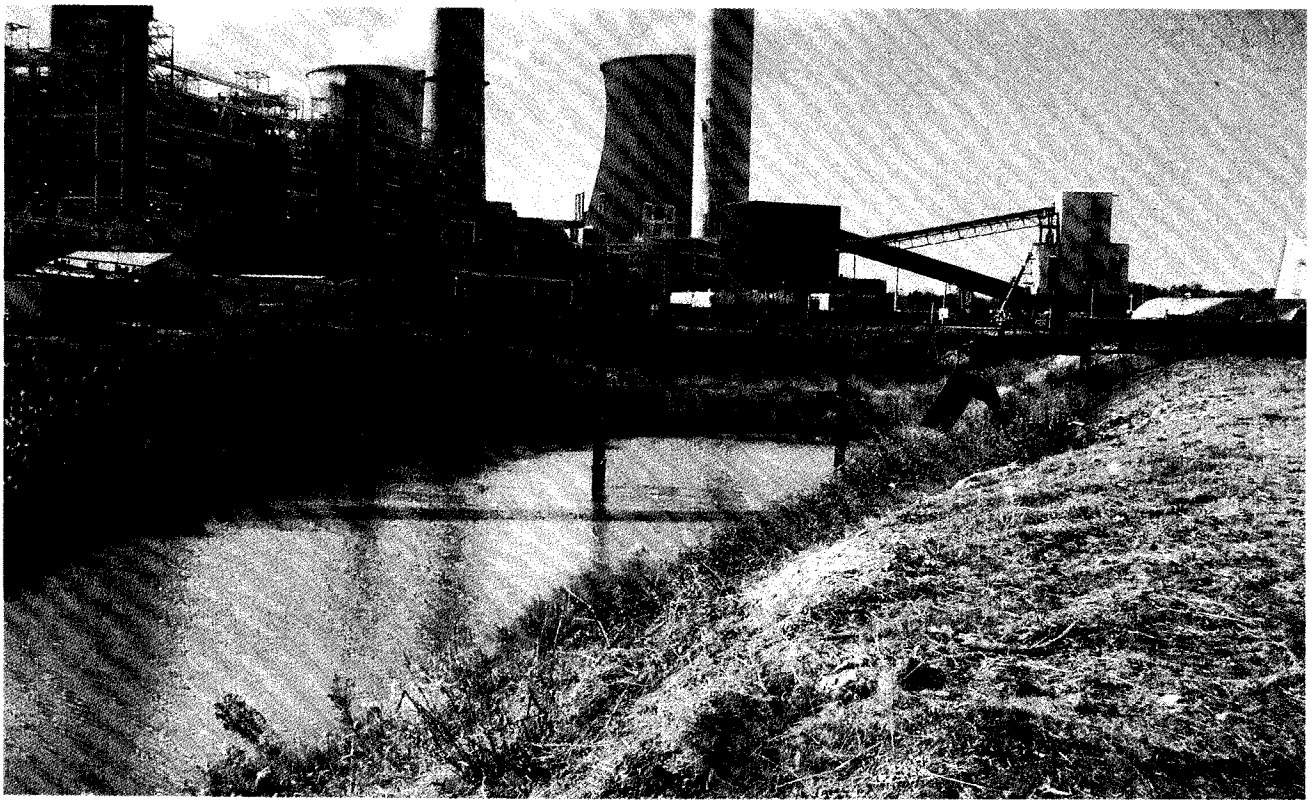
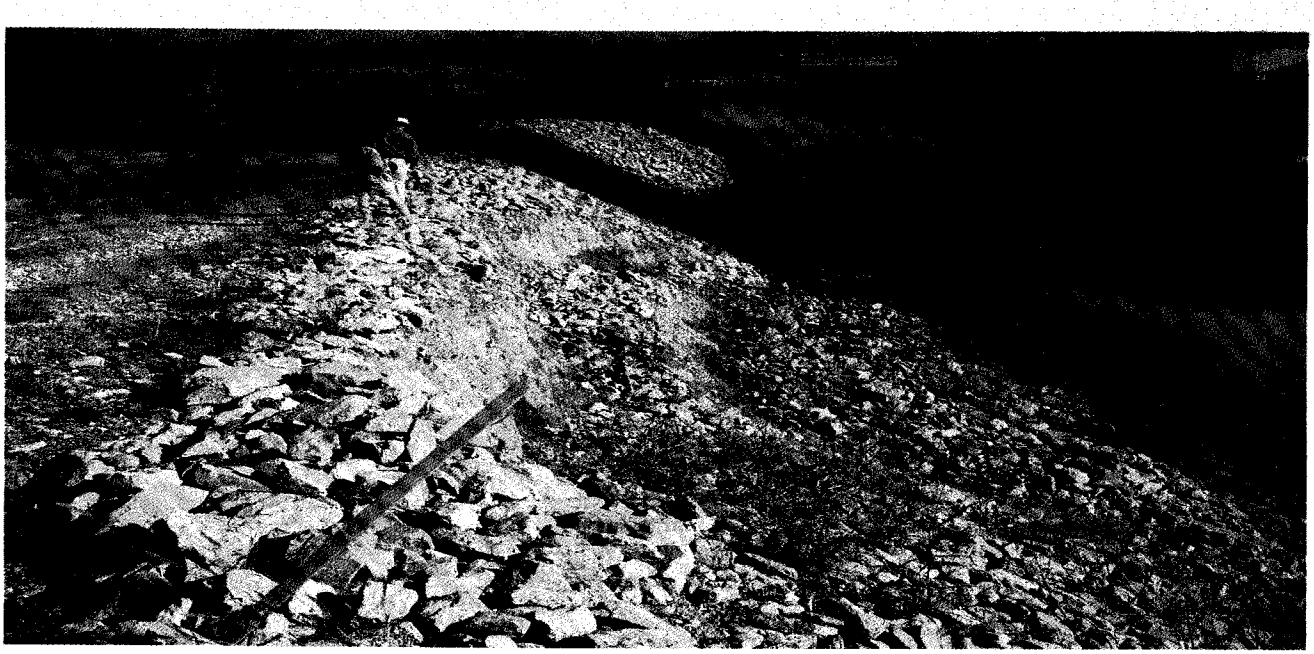


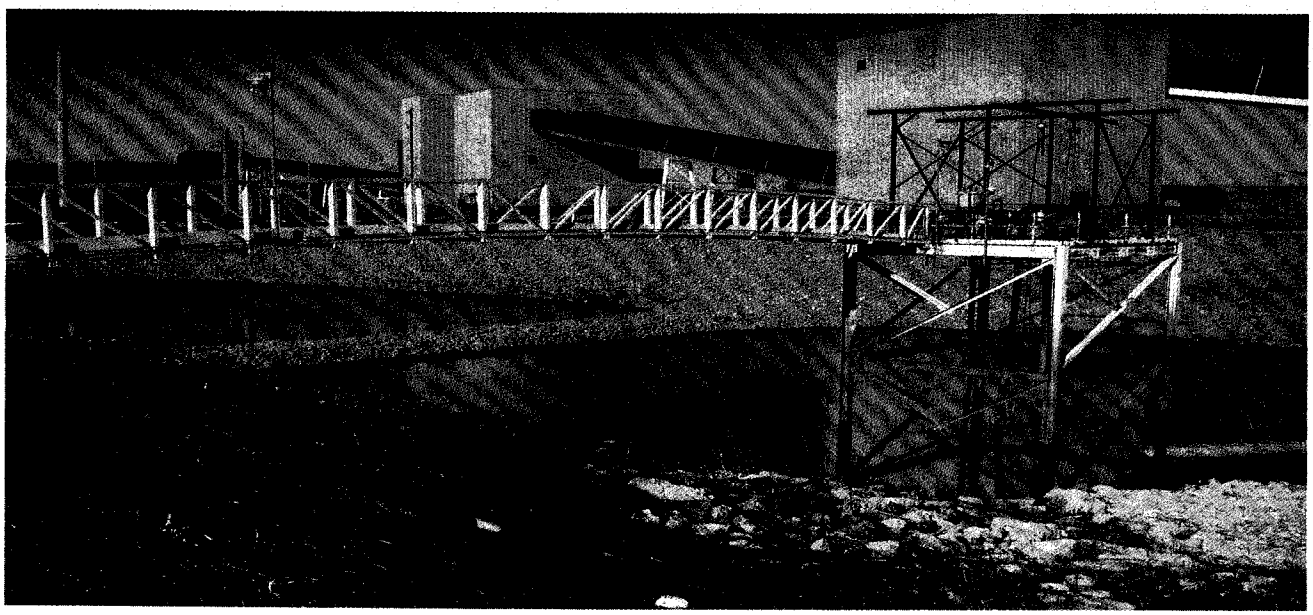
PICTURE 3: Spillway at stilling pond



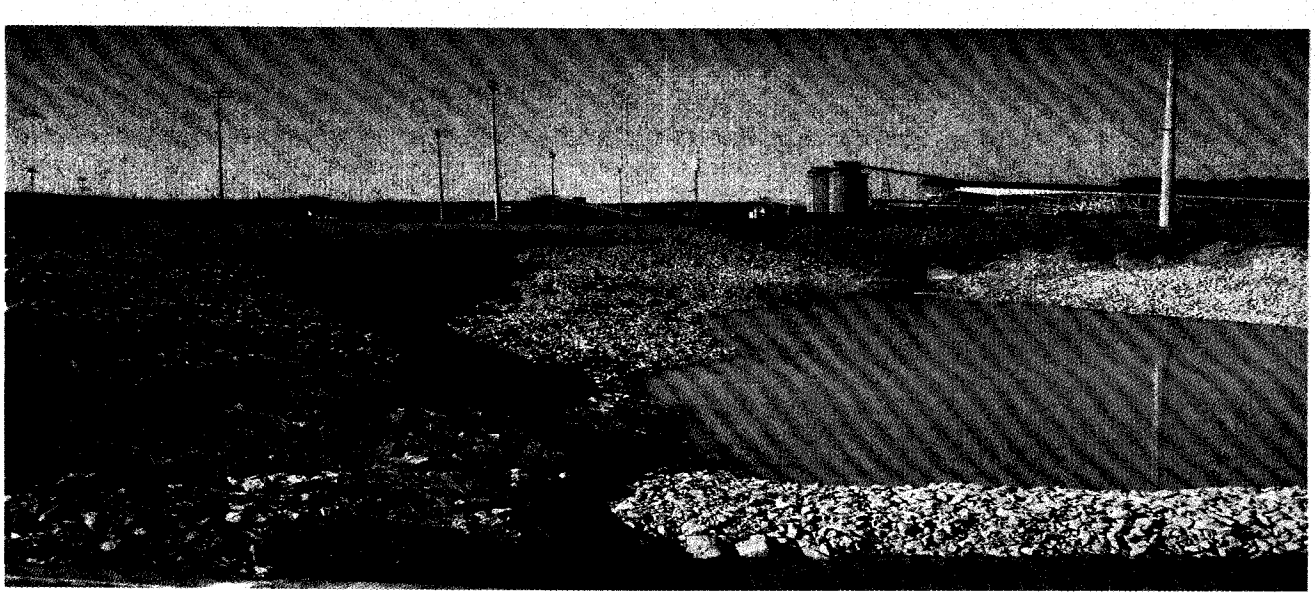
PICTURE 4: Redwater Pond #1



PICTURE 5: Sloughing of north bank, Redwater Pond #1

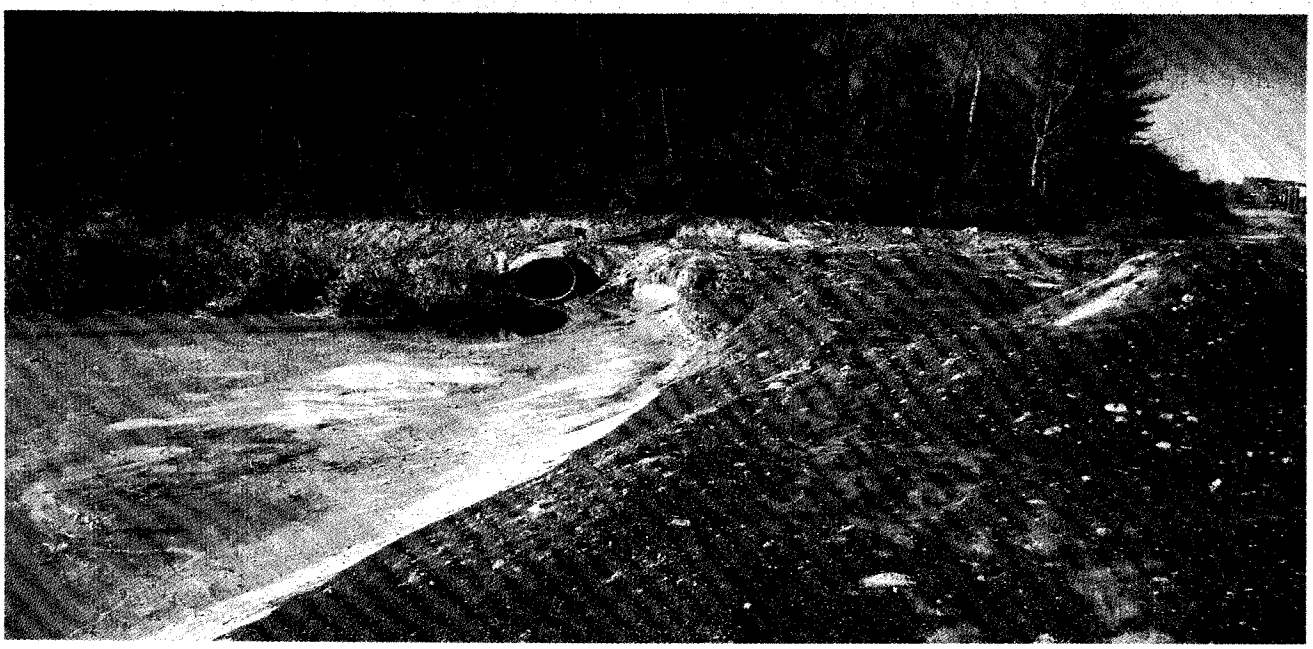


PICTURE 6: Redwater Pond #2



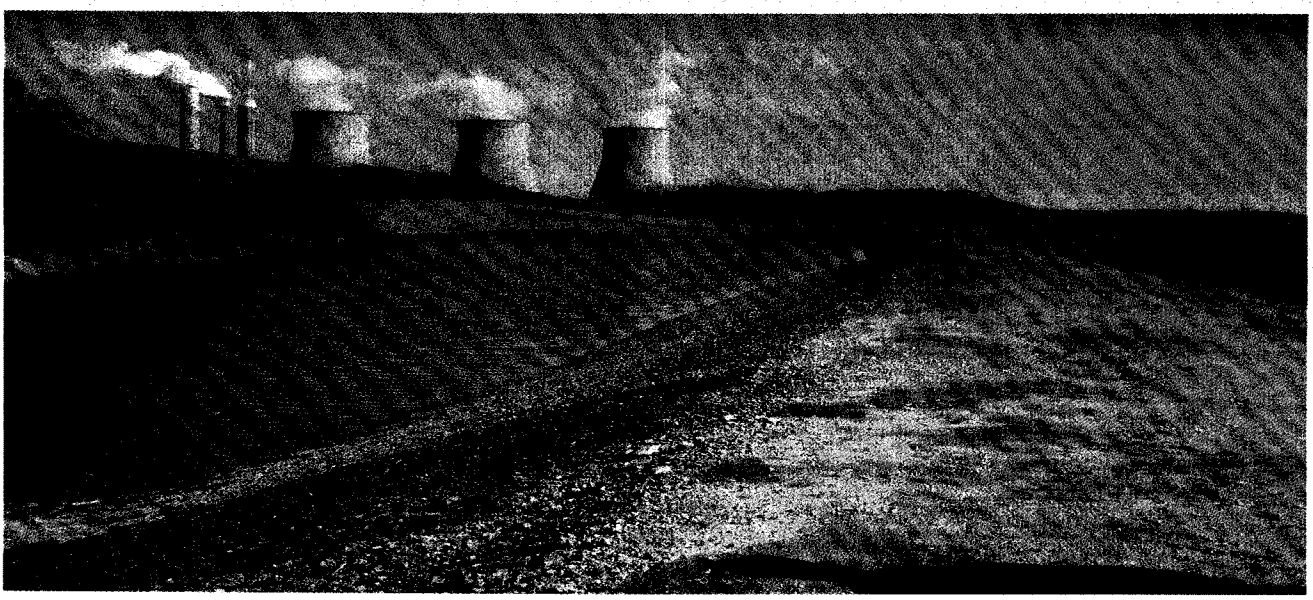
PICTURE 7: Redwater Pond #2, 72" RCP, sloughing at south bank

PICTURE 8: Outlet pipes at Redwater Pond #3



PICTURE 9: Temporary dike and inlet pipe, Redwater Pond #3

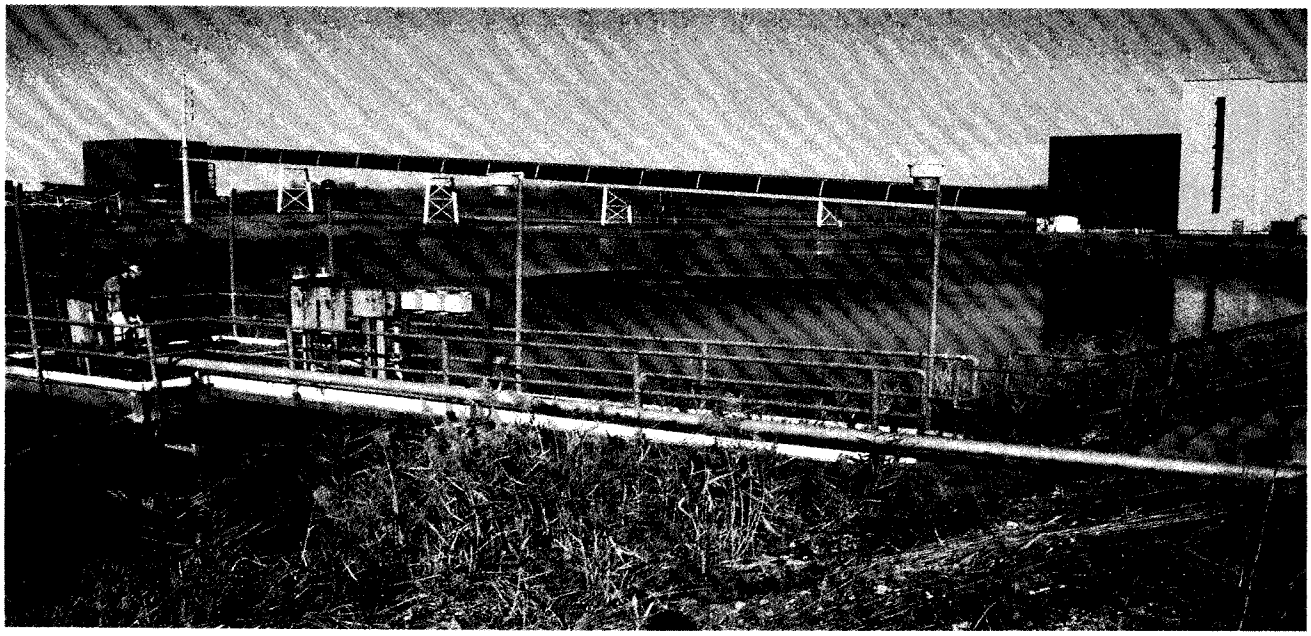
PICTURE 10: Cleanout operations at Redwater Pond #3



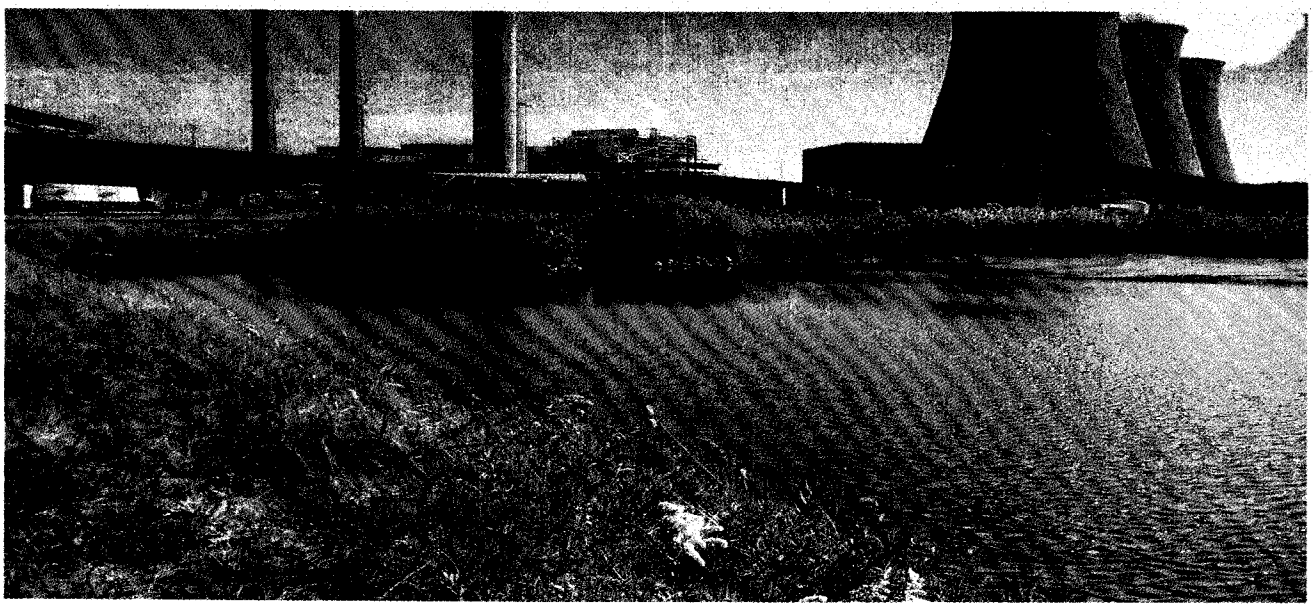
PICTURE 11: Redwater Pond #3, southwest bank reconstruction

PICTURE 12: Stand pipe at Coal Yard Runoff Pond #1

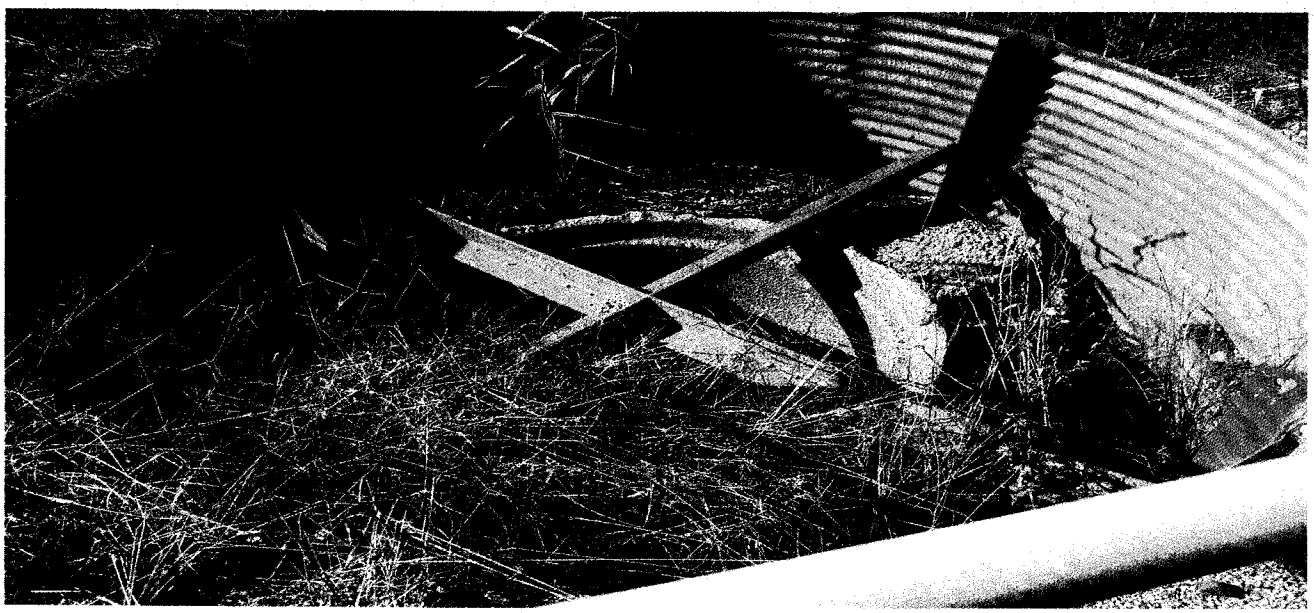
PICTURE 13: Rip Rap dike at Coal Yard Runoff Pond #1



PICTURE 14: Coal Yard runoff Pond #2



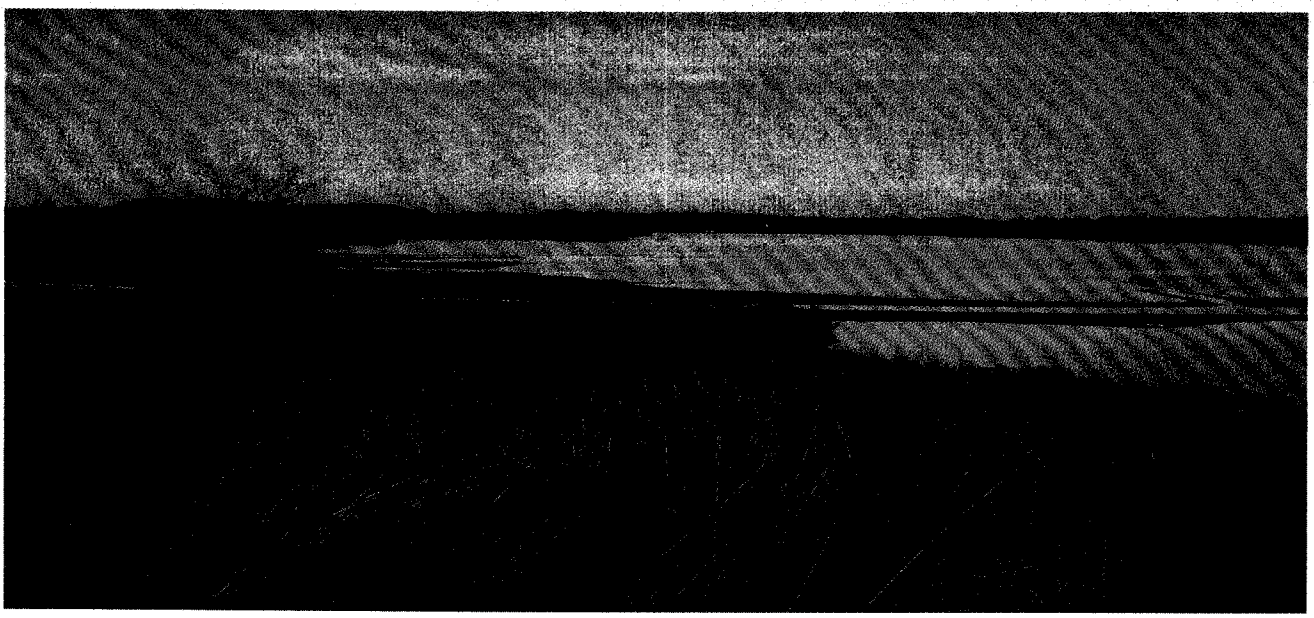
PICTURE 15: Coal Yard Runoff Pond #3



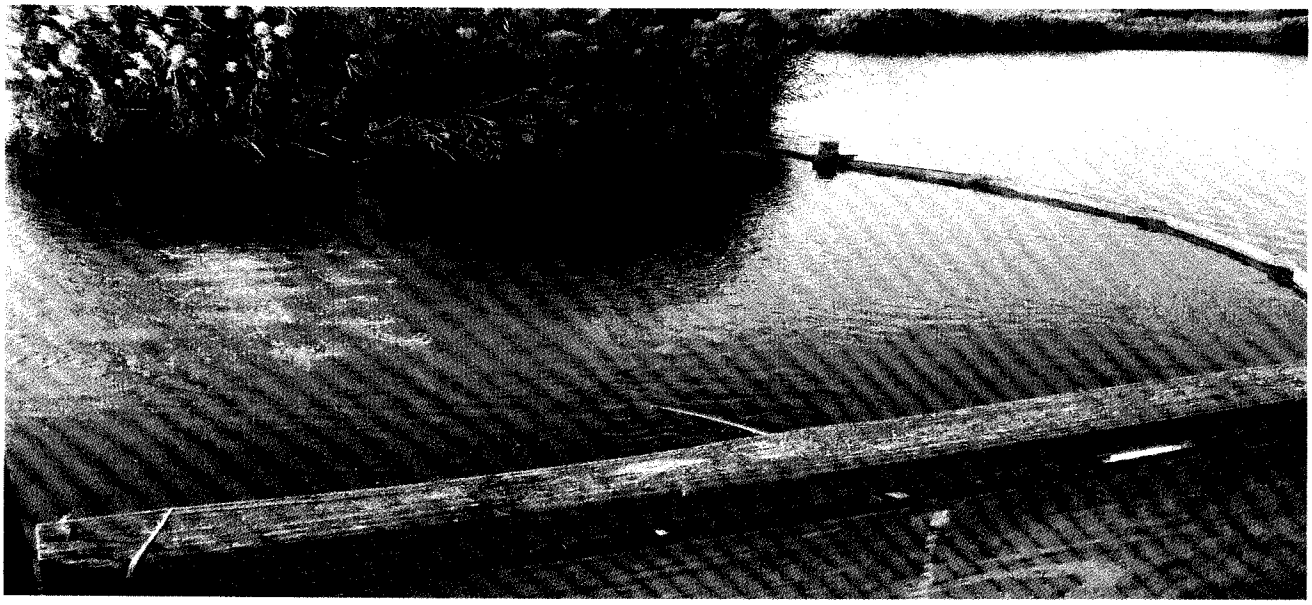
PICTURE 16: Coal Yard Runoff Pond #3, overflow inoperable

PICTURE 17: Beaver Pond

PICTURE 18: Fly Ash sluice inlet point, Jacobs Creek Fly Ash Pond



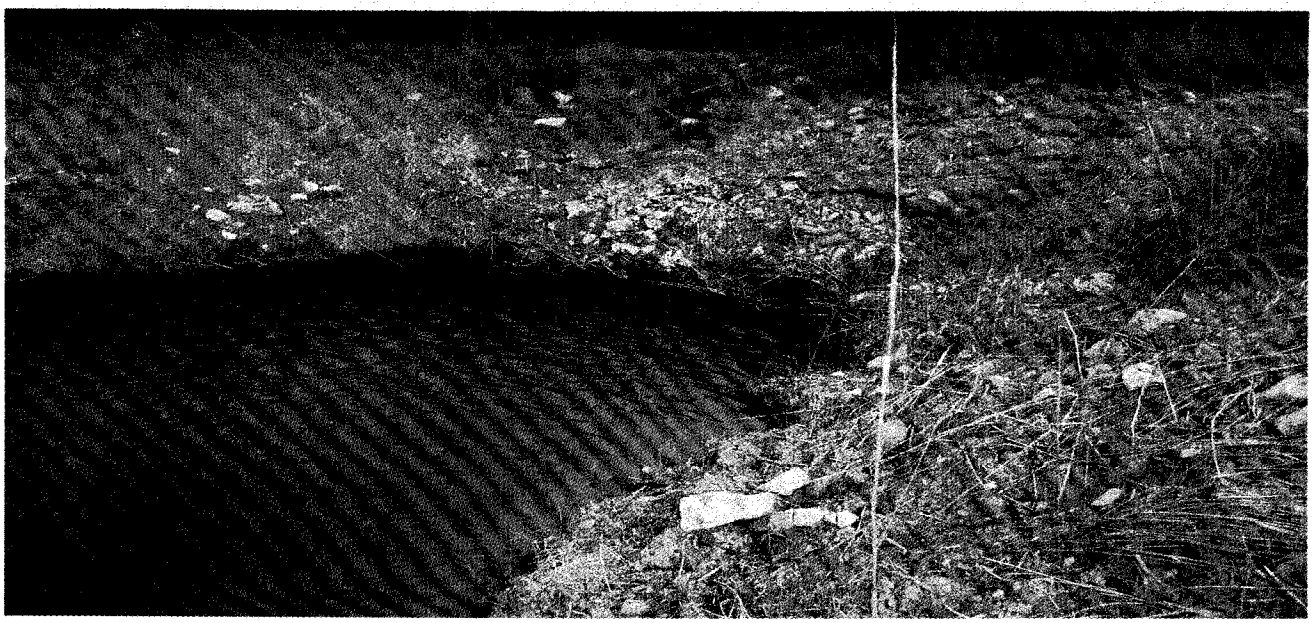
PICTURE 19: Sluice water channel into Jacobs Creek Ash Pond Extension



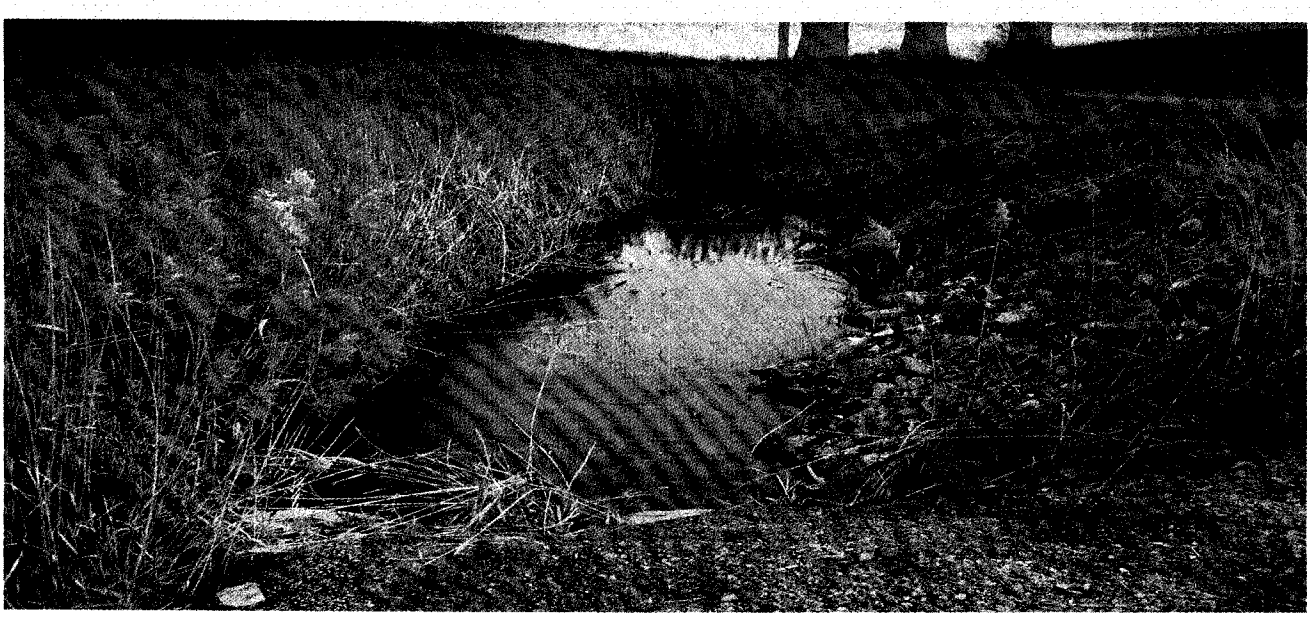
PICTURE 20: Floating boom, carbon dioxide introduction at entrance to stilling pool

PICTURE 21: Outlet pipes to Jacobs Creek

PICTURE 22: Monitoring boxes at discharge pipes



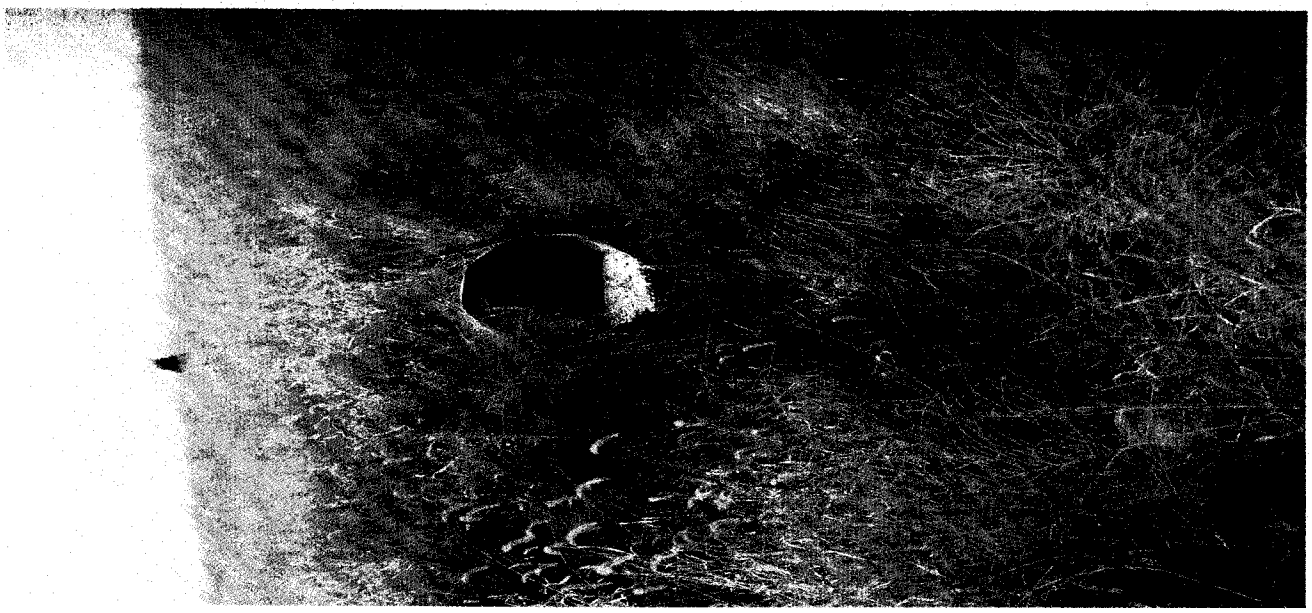
PICTURE 23: Outlet from Scrubber Pond to Stilling Pond



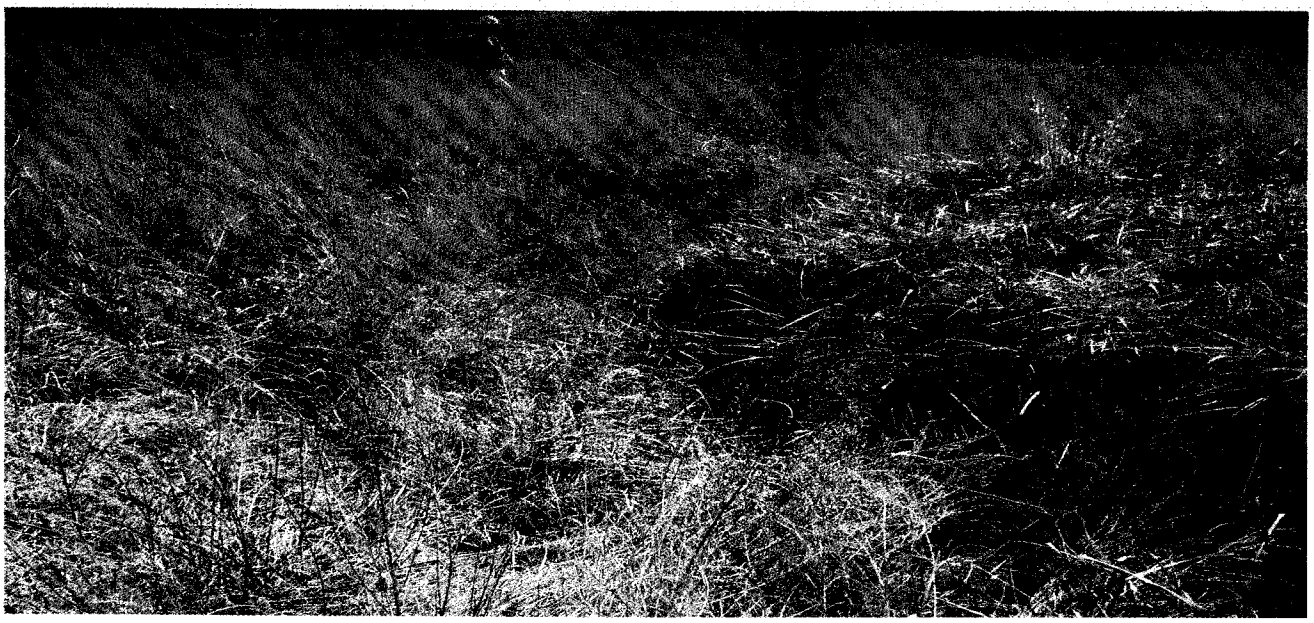
PICTURE 24: Stilling Pond at Scrubber Waste Pond

PICTURE 25: Saddle Dike at6 Scrubber Waste Pond Area

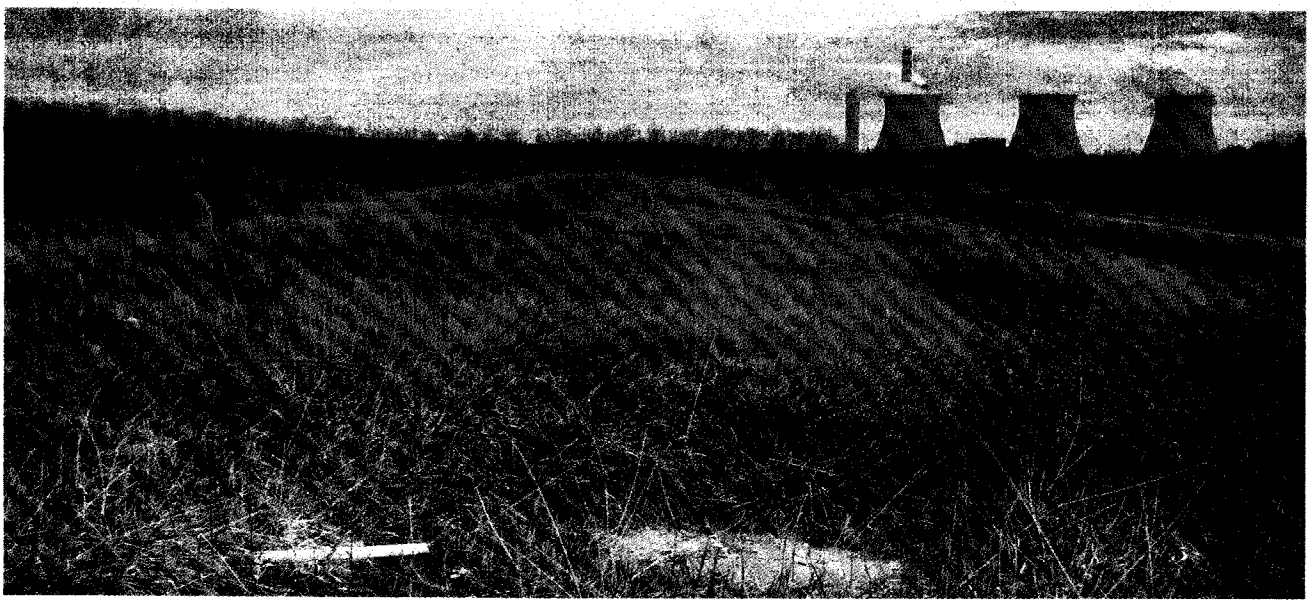
PICTURE 26: Southeast bank Scrubber Waste Area, upper portion of dark areas is area of underdrain installation



PICTURE 27: Discharge at East Dredge Cell

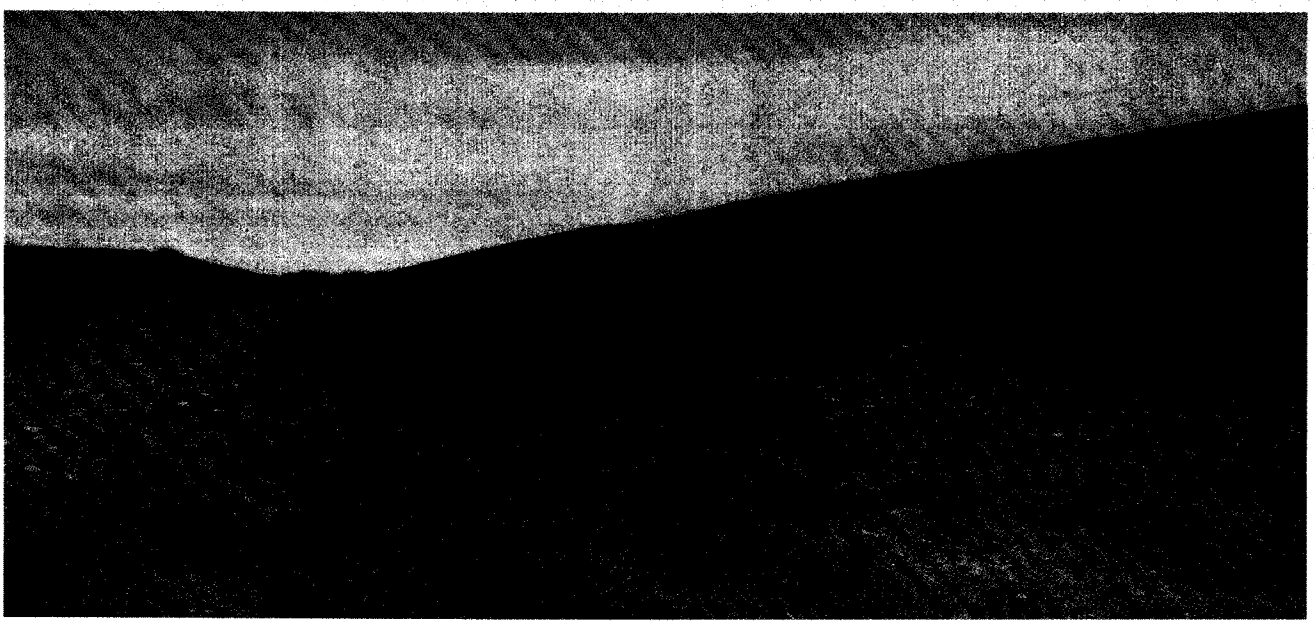


PICTURE 28: Drainage Ditch at tie in to armored ditch



PICTURE 29: East Dredge Cell, well vegetated bank

PICTURE 30: Coarse and Medium Refuse Area, eroded ditch with rock material placed, northwest side



PICTURE 31: Coarse and Medium Refuse Area, Final cover with vegetation, tie in point for Stage 1 project

PARADISE FOSSIL PLANT
ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

B65 060329 252

March 29, 2006

Donald E. Gaston, PAF 1A-DRK

PARADISE FOSSIL PLANT (PAF) - ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Attached is a report from Chris Hensley and John Albright concerning FY06 the inspection of PAF's ash disposal areas.

This report includes recommendations for corrective work. I concur with these recommendations.

If you have any questions, please contact Ron Purkey at Chattanooga extension 4820, Chris Hensley at Chattanooga extension 4413, or John Albright at extension 3981.

Dennis L. Lundy, Manager
Engineering Design Services
LP 2G-C

REP:CWH:JGA:SRF
Attachment
cc(w/attachment):
J. S. Baugh, LP 5G-C
L. C. Bowers, LP 5D-C
S. B. Brothers, PAF 1A-DRK
M. D. Davis, LP 5E-C
K. J. Dukes, PAF 1A-DRK
S. R. Kramer, LP 1F-C
G. R. MacDonald, LP 5E-C
W. B. Wells, LP 5D-C
EDMS, WT CA-K

TENNESSEE VALLEY AUTHORITY
PARADISE FOSSIL PLANT

ANNUAL STABILITY INSPECTION OF
WASTE DISPOSAL AREAS

Prepared By: Christopher W. Hensley
& John Albright
Date: March 31, 2006

PARADISE FOSSIL PLANT
ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Introduction

The waste disposal areas at Paradise Fossil Plant (PAF) were inspected for dike structural stability on September 28 and 29, 2005. The inspection was performed by John Albright, Chris Hensley, and Jeff Gray of Fossil Engineering Design Service. The previous annual inspection was conducted on November 9 and 10, 2004.

The results of the annual stability inspection are listed below according to their location within the Paradise Fossil Plant Boundaries. A location map is attached with arrows showing directions of the pictures taken.

Slag Areas 2A, 2B, and Stilling Pond

Boiler slag is sluiced into the south end of area 2A and was being reclaimed by Reed Minerals at the time of this inspection as part of a TVA marketing strategy. The two ponds were cleaned out by the Heavy Equipment Division of TVA in the spring 3 years ago. The water elevation appeared to be approximately 18 inches from the top of the dikes (Pictures 1, 2, & 3). The bottom ash drops out quickly and is removed by Reed Minerals.

The sluice water then flows into 2A, leaving the fines and is discharged into pond 2B through pipes and around a series of baffles to lengthen the settling time. A floating pump station has been placed at the north end of pond 2B to fill water trucks. The sluice water enters the north end of the stilling pond through a concrete flume (Picture 4). A large concrete block had been placed in the concrete flume at one time to temporarily raise the water 24", but has since been removed. The flume appeared to be in good condition and water was flowing freely into the stilling pond. The water discharges through three standard spillways into the Green River or is pumped to the Jacob's Creek Ash Pond. The pumps were not operating at the time of inspection. All three spillways were operating at the time of inspection (Picture 5). The walkway to one of the spillways was a safety hazard. The access had no end rails to prevent falls into the spillway (Picture 6). At the last spillway there was a walk board to the spillway from the bank. The access gate was locked at the discharge point of the spillways so a close observation of the channel was not possible. However, there was no immediate evidence of erosion in the channel and the channel was well vegetated.

There is additional water coming into the stilling pond from 30" & 42" concrete pipes. This water is from sumps, storm water pipes and dewatering pumps at construction areas. At the time of inspection these pipes were under water.

The dikes appear to be stable and did not exhibit any notable changes since the last inspection. The interior slopes of the dikes have a good vegetative cover. There was an access walkway built over the outlet end of the pipes into Area 2B.

Redwater Ponds (Nos. 1, 2, 3, 4 & 5)

Redwater Pond #1

Redwater pond #1 (RW#1) is located southeast of and adjacent to 'Slag Pond 2B' and 'Slag Stilling Pond'. Considerable repairs, cleanout and bank reconstruction have been performed by HED to try to return the pond to its original configuration (Pictures 7, 8, & 9). This pond has been mucked out and the current water depth is approximately 6 feet. The northern rip rap bank repaired in June of

2005 seems to be in good condition. A rip rap barrier has been added to the west side of the sewage treatment plant and appears to have stabilized the bank as designed. All pumps, slopes, dikes and discharge structures appear to be working. Water collected in redwater pond #1 is pumped into the slag pond. Two additional diesel pumps are kept at the pond to supplement the electric pumps so the pond's NPDES permit is not violated.

Redwater Pond #2

Redwater pond #2 (RW#2) is located northwest of and adjacent to Slag Ponds 2A & 2B. The water from RW#2 is pumped from the center of the pond and discharged into the northwest end of slag pond 2A. This pond has been cleaned out since the last inspection report and the water level in the pond is now to about 3 feet below the 72" pipe. This is the water level that must be maintained for proper function. The upstream Storm Water and Coal Yard Drainage Pond #1 drains into RW#2 via this 72" pipe. Coal Yard Drainage Pond #2 drains into RW#2 via a 12" overflow pipe during storms. There is a slough near the 72" pipe approximately 200 feet long by 3 feet deep, at the southwest side of the pond (Pictures 10 & 11). HED attempted to repair this area in 2005 however; this area at the time of inspection appeared to sloughed again. A dike has been built west of the pump station to contain silt. Four redwater seepage areas were also observed. These seeps have grown since last year's inspection (Picture 12).

Redwater Pond #3

Redwater Pond #3 is a settlement pond and is located southwest of the powerhouse and along the south side of the county road. This pond collects the runoff and sediment from the medium and coarse coal wash refuse areas as well as decanted water from RW#4. RW#3 normally discharges to RW #1 via RW #5. There are emergency over flows from the pond and into a 60" drain to Jacobs Creek Ash Pond. At the time of this inspection, the 3 - 36" pipes that go under the road and into a transition were blocked (Picture 13).

The discharge from RW #3 to RW #5 has a manual valve contained within the discharge structure. This valve is opened only when the pond is to be cleaned out. At the time of this inspection the valve was open; HED had completed the cleaning out of the pond (Picture 14).

Redwater Pond #4

Redwater Pond #4 is a surge/sediment pond located east of the medium and coarse Coal Wash Refuse Area. This is a surge pond that settles out the fines so they can be cleaned out with a back hoe before the fines reach RWP #3. This surge pond was designed to drain via an eight inch pipe and an open rip rap ditch beside the road to RW #3. The southwest side of this pond has been reconstructed and has been reseeded (Picture 15). An emergency overflow drains runoff that exceeds the 10 year - twenty-four hour rainfall event, directly to the Jacob's Creek Fly Ash pond. The depth of water is now approximately 1 foot.

Redwater Pond #5

Redwater Pond #5 is located south of the powerhouse, east of the truck coal dumping area and west of the limestone storage area. It is a surge pond designed to give the Redwater Pond #1 pumps time to lower the water level. An overflow structure drains runoff exceeding the 10 year - twenty-four hour rainfall event directly to Redwater Pond #1. All water collected in Redwater Pond #5 drains to Redwater Pond #1 via a gravity drain and no water should be held in Redwater Pond #5.

PARADISE FOSSIL PLANT
ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Coal Yard Runoff Pond #1

Coal Yard Runoff Pond #1 (CYRP#1) is located north of and across the plant access road from the Coal Wash Plant. This is a surge/sedimentation storm water runoff pond that delays runoff to RW #2. Water and sediment is collected in the pond and the decanted water is discharged through a six inch hole cut in the side of the stand pipe. This hole is not configured per the original design drawing in size, or elevation but is doing a fair job. A rip rap dike was built to keep the coal fines away from the discharge point (Pictures 16 & 17). At the time of this inspection, a portion of this dike had been removed due to the amount of fines that had accumulated. The water depth in the pond is over 24".

Coal Yard Runoff Pond #2

Coal Yard Runoff Pond #2 (CYRP#2) is located southwest of and across an access road from Redwater #2 Pond. This pond was designed as a storm water sedimentation pond and all water from this pond is pumped to Slag Pond 2A. As noted in the last inspection, CYRP #2 had been partially cleaned of sediment and had a low water level. At the time of this inspection, the depth of water was about 3 feet, and 2 islands were left in the pond (Picture 18). There are three pumps on the platform but there is no power to any of them. The pumps are designed to pump all water from this pond to Pond 2A. At time of inspection HED was pumping the pond down and was going to start dredging soon again to remove the 2 islands that were left from the cleaning in 2004.

Coal Yard Runoff Pond #3

Coal Yard Runoff Pond #3 is located south of the coal transfer complex and north of and adjacent to the access road. This pond can discharge by gravity or be pumped to RW #1. The inner banks of the basin seem to be well vegetated and are stable (Picture 19). The measured water depth is over 36". The emergency overflow is blocked or has been modified to the point that it does not operate (Picture 20).

Slag Disposal Area

The slag disposal area is located southeast of the powerhouse. The slag in this area was placed here by the plant during its early operations and is currently being reclaimed for commercial use by Reed Minerals. The area contains a small surge pond to collect runoff and a larger area, called the Beaver Pond, which discharges over a spillway and down a riprap channel into Jacobs Creek. The riprap appears to be in good condition. There was no beaver dam present at time of inspection. The discharge has been widened and rip rapped. At the time of inspection, no water was being discharged.

The dikes appear to be stable with a good vegetative cover on them. The redwater seeps identified in earlier reports along the southwest dike in this area are still present. Some of the red water seeps continue to have growing deposits of material. The erosion gully, observed on previous inspections, located at the end of the southwest dike, just north of an existing culvert, was not visible.

The southeast dike along Jacobs Creek did have noticeable erosion in the dike. The area of the erosion was about half way along the dike about 200 feet in length by length of the toe of the slope. The depth of the erosion was about 2 to 3 feet in depth. The erosion has caused trees to fall down with the root ball still intact.

PARADISE FOSSIL PLANT
ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Jacobs Creek Fly Ash Pond

This area is located southeast of the powerhouse. Fly ash is sluiced into the northern portion of the original pond. This area had recently been cleared in 2004 and a new channel constructed (Pictures 21 & 22). The sluice lines are underwater. Water flows through a dike breach in the southwest portion of the ash pond then into the Fly Ash Pond Area Extension (the new ash disposal area) (Picture 23).

The divider dike had several trees noted in previous reports that were to be removed by pulling them up and compacting bottom ash in the holes. This work was not completed at the time of this inspection. The sloughing that was noted in the previous two ash pond inspection reports on the south dike just west of the divider dike was still present. The county road between the fly ash pond and the slag disposal area has had new stone surfacing put down and silt fence put up at the edge of the road. The dikes appear to be stable and do not exhibit any notable changes in their exterior since the last inspection.

There were no new sloughs observed along the south dike. Earth fill has been placed at the toe and compacted to make a uniform slope.

HED was hauling and pushing material into Jacobs Creek Fly Ash Pond. In the process of the work HED cleared some of the vegetation off of the dike along the county road. HED had not put any cover material, seed and straw, or installed silt fence along the county road to keep material from going into the road (Picture 24 & 25).

Flow is uniform and non-eroding through the ash pond. Riprap in the breach and channel were in good condition. After the ash settles out, the water flows into a stilling pool in the northeast portion of the pond through a divider dike with a floating boom. At the time of this inspection, carbon dioxide was being introduced into the water at the boom. Water is then discharged through three 48" vertical spillways, with skimmer structures, and out through three 36" diameters concrete pipes to Jacobs Creek (Picture 26).

The scrubber project has added a new gravity ditch from the scrubber settling pond to this pond for the scrubber water to be discharged into through Jacobs Creek (Picture 27). At the time of inspection there was no water in the ditch and appeared that the scrubber discharge pipes from the settling pond were still being used and not changed to this new ditch.

The spillway structures appear to be operating properly. All three outlets appear to be discharging equally at the time of this inspection. The riprap at the spillway discharge outlets appeared to be in good condition. There is a stairway for access from the top of dike to the discharge pipes and the three new monitoring boxes above the pipes (Picture 28). Dikes were constructed in the southern and eastern portion of this area. The dike slopes have established vegetation. The road on top of the dike has had crushed stone surfacing added. All exterior dikes appear to be in good condition with no visible signs of instability.

Scrubber Pond

This pond is located in the southwest corner of the TVA reservation. Scrubber sludge is sluiced into the northern end of this region and stacked by the rim ditch method. Scrubber sludge is sluiced through a ditch formed by the exterior dike and an interior separator dike to the western corner of

the area to allow that area to fill with scrubber sludge. Water is discharged from the scrubber pond to a settling pond by vertical spillways (Picture 29). The stilling pool water discharges from the stilling pool through a vertical spillway into a ditch that empties into the Jacobs Creek Fly Ash Pond a half mile away.

The discharge pipes from the scrubber pond to the settling pond appear to be in good condition. The standard spillway out of the stilling pool was in good condition. The final clarification pond had been cleaned up and cattails removed from a portion of the bank. A saddle dike had been constructed at the south end of the ponding area to prevent water and scrubber sludge from flowing to adjoining property (Picture 30).

The remainder of the area appears stable with a good vegetative cover and did not exhibit any notable changes since the previous inspection. Area drains and underdrain systems had been placed at the southeast portion of the dike and appear to be working as designed. No vegetation had been placed at this time. No signs of erosion were present. The underdrain ditch needs to be cleaned out and graded to drain to prevent flow over the road (Pictures 31 & 32).

West Dredge Cell

This area, located just east of the scrubber wet ponding area, was constructed to accept dredged ash. No material has been dredged into the cell. Runoff water is now collecting in the cell because the riser boards were installed in the spillway riser (Picture 33).

The dikes appear stable and did not exhibit any notable changes since the last inspection. All exterior slopes have an excellent vegetative cover. The erosion observed on the dike slope on the previous inspection at the southeast end of the pond was still present. The erosion gully observed on the previous inspection at the southwest end of the pond was still present but does not appear to have worsened.

An erosion gully was seen in the corner of the dike east of the spillway riser side cell in the stilling pool side of the dredge cell. The gully is about 55 feet long with a 12 feet by 12 feet rectangle shape about 24" to 36" depth. Then the gully goes down to an 8 feet wide by length by about 24" depth (Pictures 34 & 35).

East Dredge Cell

This area is located just south of the medium and coarse Coal Wash Refuse Area. This cell was also constructed to accept dredged ash (Picture 36). The spillway appeared to be in good condition, but was not operating at the time of this inspection. The discharge pipe was clear of obstructions but had a large eroded hole 6' long, 3.5' wide by 3' deep. This hole has revegetated and appears to be in stable condition.

The dikes in this area appear to be stable. The tops of dike surfaces are in satisfactory condition, although some vegetation has established itself over the area. Removal of vegetation is not warranted at this time. The dredged ash was seeded four years ago and vegetation is good south of the discharge structure and is improving north of the discharge structure.

An erosion ditch was identified beside the armored ditch in the 1994 inspection report that would have required 1000 lb of riprap at the northeast corner of the dike. This erosion caused by runoff

bypassing the armored, ditch is now over 4 feet deep, eight feet wide and one hundred plus feet long. The drainage ditch has had rip rap put in and has good vegetation established and seems to have stabilized.

Ditches, rutting and erosion gullies all have established vegetation and appear stable (Picture 37).

Medium and Coarse Coal Wash Refuse Stack

Currently, HED is working to cover the Coarse and Medium Stack. The area appeared to be covered in accordance of the design drawings. At the time of inspection, HED is expecting to complete the cover by end of October 2005 (Pictures 38, 39, 40, 41, 42, & 43). The areas which were at or above the final stacking configuration were compacted and have good vegetative cover (Picture 44). Other areas will be brought to final grades and will be worked to correct slope steepness, covered and vegetated as part of the Stage 1 project. Runoff from the east side is directed by the berm ditches to a perimeter ditch which discharges into the collection ditch for Redwater Pond #4. A good vegetative cover has been established in the southeastern portion of the area.

The erosion ditch on the saddle dam that was identified in previous reports has been repaired. The road needs to be re-graded to force all water to the inside of the stacking area.

Coal Wash Fines Pond #2

This disposal area is located in the northwest portion of the plant properties. This area is adjacent to the railroad and on the north side of the plant access road. The original pond was completed in the late fall of 1987. The top of the original dike was at elevation 455. The plant raised the dike to approximately elevation 465 in 1990, and subsequently sluiced fines to this elevation. This area has not been active as a sluicing operation since Fines Pond #3 began operation in October 1992.

All of the dikes in this area appeared stable and in good condition. The west dike of this area has been noted in previous inspections to have sparse vegetation. The vegetative cover of this dike is now improving and establishing itself over the area. Several of the small pine trees noted on the west dike in previous inspections are now 15' tall (Pictures 45 & 46).

Coal Wash Fines Pond #3

Fines Pond #3 is located northwest of Fines Pond #2. The first lift was completed in October 1992 and all sluicing was diverted from Fines Pond #2 to this area. The latest lift was finished in September 1999, and the sluice discharge was changed from the east to the west end of the pond. The discharged point was moved from the west end to the east end. The overflow discharge structure removes the water and discharges it into a riprapped ditch which flows into Fines Pond #2 and then into the stilling pool. A dike was constructed around the cemetery to the north of this area to protect it from pond water.

A dike was also constructed in the northeast corner of this area extending from the southeast corner of the cemetery eastward to the exterior dike for pond #3. This dike was constructed to preserve the aesthetics of the cemetery so it would not be surrounded by the future fines stack. All dikes in this area appear to be stable but have some seepage. There is little grass on the slopes. Several of the new culverts that drain the berm ditches were put in high and do not drain. In addition the

ditches are full of sediment. When it rains, water flows across the roads because the culvert inverts are above the road elevations (Pictures 47 & 48). All of the culverts are eroding the dike below them due to the amount of water flowing adjacent to the culverts instead of thru them. The dikes are washing out to the point that there are gullies 2 to 3 feet deep in the dike (Pictures 49, 50, & 51).

A slide 29.5 feet long and 10.3 feet high developed the first week of May, 2000 in an area that was seeping. This has been fixed and appears to be working. An area approximately 400 feet long was excavated, an underdrain installed, and riprap placed to stabilize this area of the dike. The fix was completed by February 23, 2001. This area continues to seep but continues to be stable.

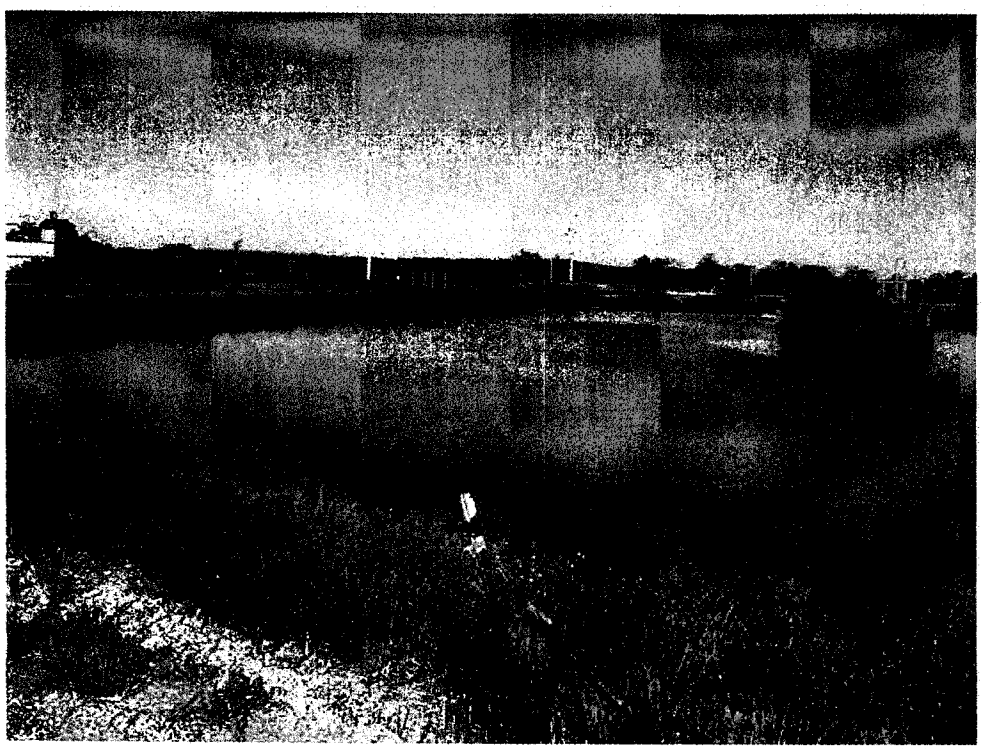
Six seeps/wet areas were found adjacent to the cemetery. They are of equal elevation and cover a distance approximately 200 feet long. At the time of this inspection, all seeps were not flowing. All six areas continue to exist.

The repaired riprap discharge from the area east of the cemetery at the south east corner of the cemetery is in good shape. The eroded material has been removed from the ditch and cemetery.

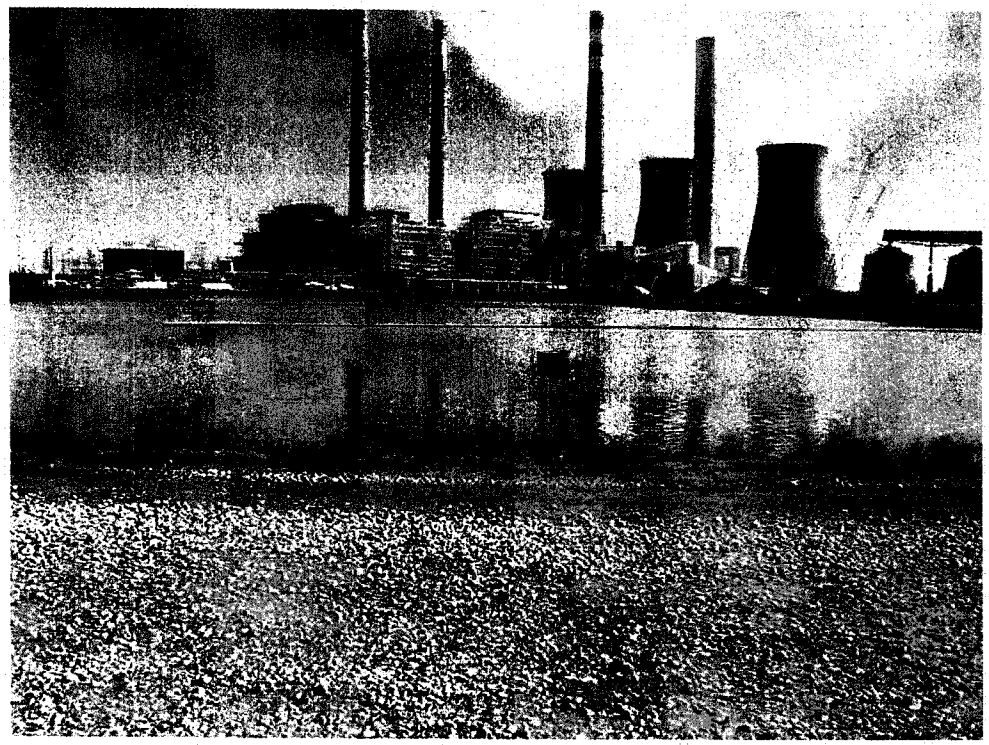
A fines reburn project is underway to use the coal fines to produce power.

Recommendations:

- Mow grass and remove small trees and brush from all dike slopes. Pull up all trees and compact soil back in the holes.
- Continue to maintain all dike roads for all weather travel to facilitate the required shift visual inspections and routine O&M activities.
- Monitor the exterior dike slopes for seepage, wet or soft spots or animal burrowing, etc. and notify Fossil Engineering of any changes.
- Monitor the survey controls installed on the exterior dike slope of Area 2B slag pond adjacent to Green River for any indication of slope movement.
- Remove the fines and vegetative growth from the entrance to the horizontal discharge pipes in RW #3 so that flow does not become inhibited during periods of heavy rainfall and replace the ends to these pipes.
- Continue to remove fines from all of the coal yard drainage basins and all of the redwater ponds, especially RW #1, #2, #3 & #4 ponds. Repair the pumps in coal yard pond #2.
- Continue to remove any vegetative growth and/or beaver dams that may be blocking the spillway from the slag area to the beaver pond.
- Continue to check the cemetery seepage weekly and report any increases to; John Albright at 423/751-3981 or Lynn Petty at 423/751-6704 in Chattanooga.
- Lower the drain pipes from the berm ditches and clean them out for Fines Pond #3 to eliminate standing water in the berm ditches.
- Begin a grassing and maintenance project on the dike slopes and retired areas as all grass has now died on Fines Pond #3 slopes.
- Repair the eroded slopes of the Coal Wash Fines Ponds.
- Install silt fence along county road at the Jacob's Creek Ash Pond. Grade, slope, cover dike with soil and vegetative cover to control erosion. Call Civil Site Engineering for assistance if needed.
- Repair slough in Redwater #2. On the bench inside Redwater #2 place riprap berm. The berm would be 10 ft wide x 5 ft heigh x 250 ft long. This requires 780 Tons of riprap, 50% greater than 125 pounds.



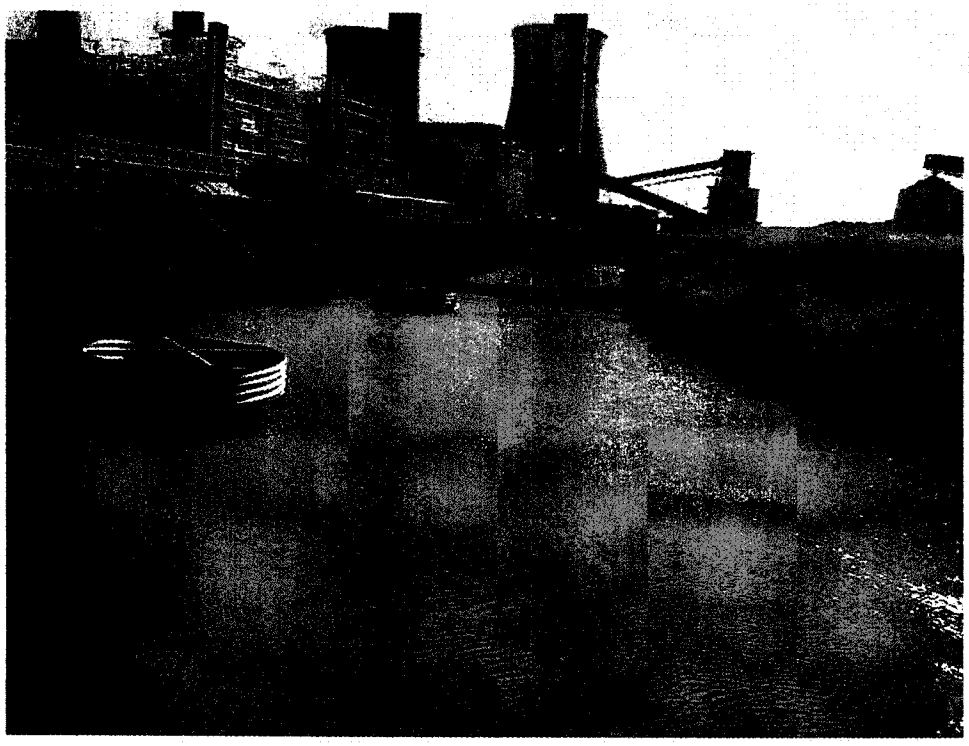
Picture 1. Slag Pond 2A Looking Towards Slag Pond 2B.



Picture 2. Slag Pond 2B

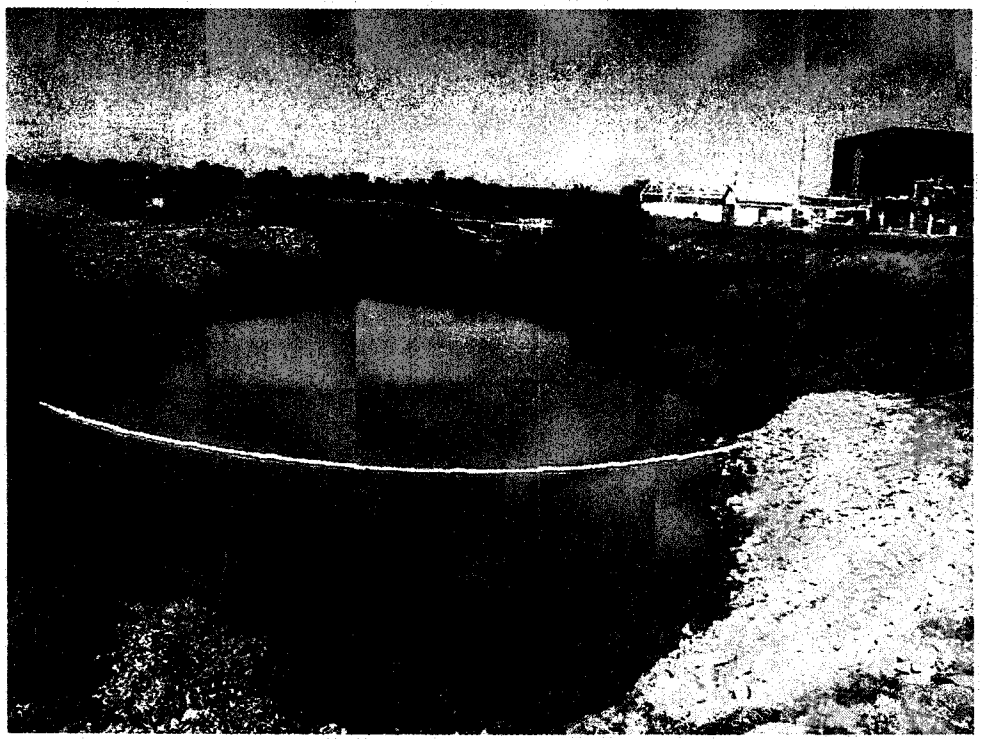
Picture 3. Slag Pond 2A Looking at Pipes to Slag Pond 2B.

Picture 4. Slag Pond 2B Concrete Flume to Stilling Pond.



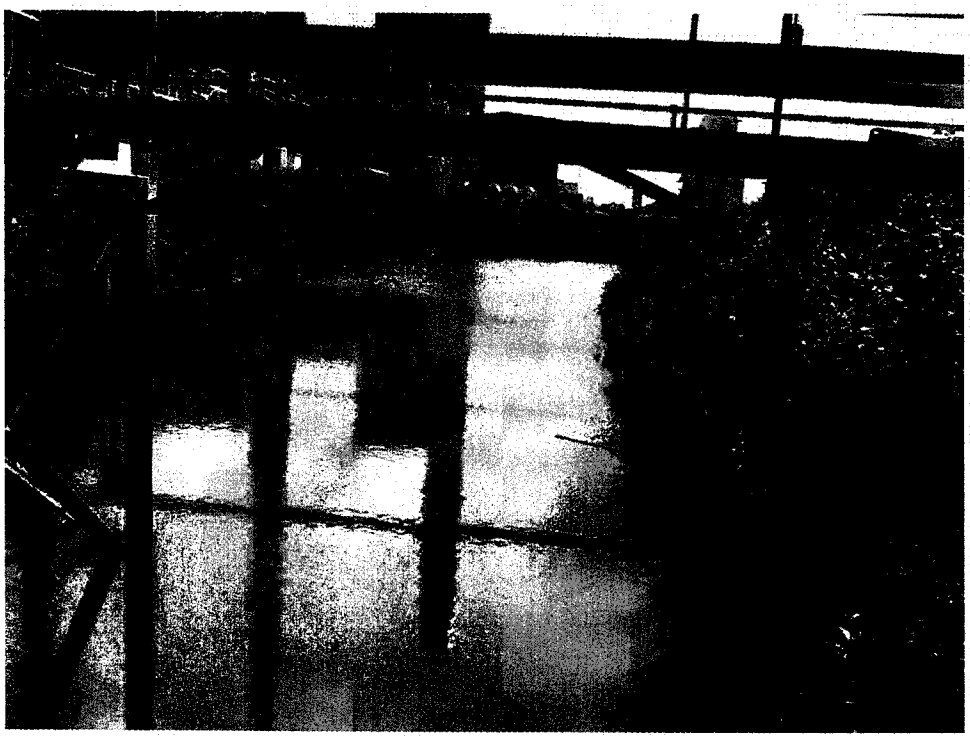
Picture 5. Spillways Discharge to Green River.

Picture 6. Walkway with No Handrail off into Spillway.

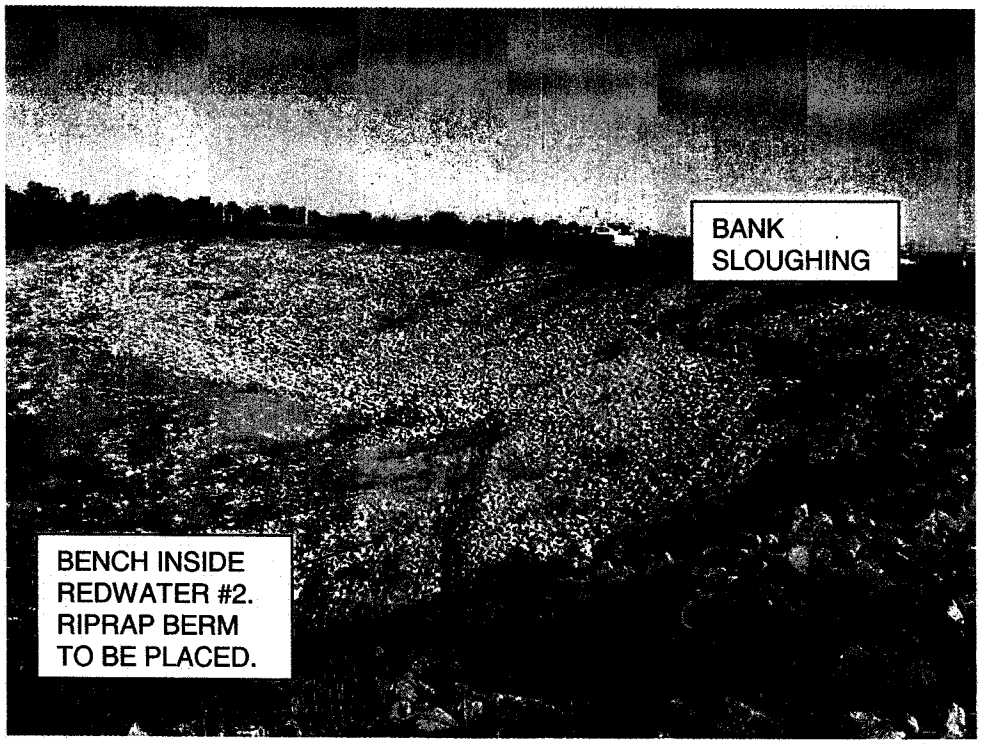


Picture 7. Redwater No. 1.

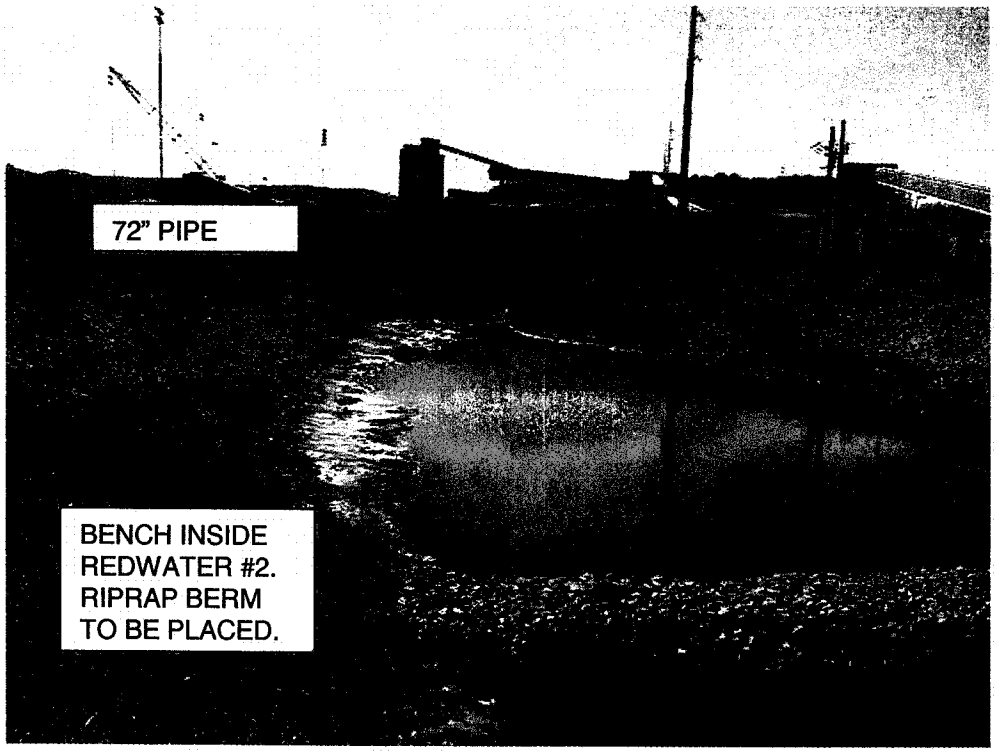
Picture 8. Redwater No. 1.



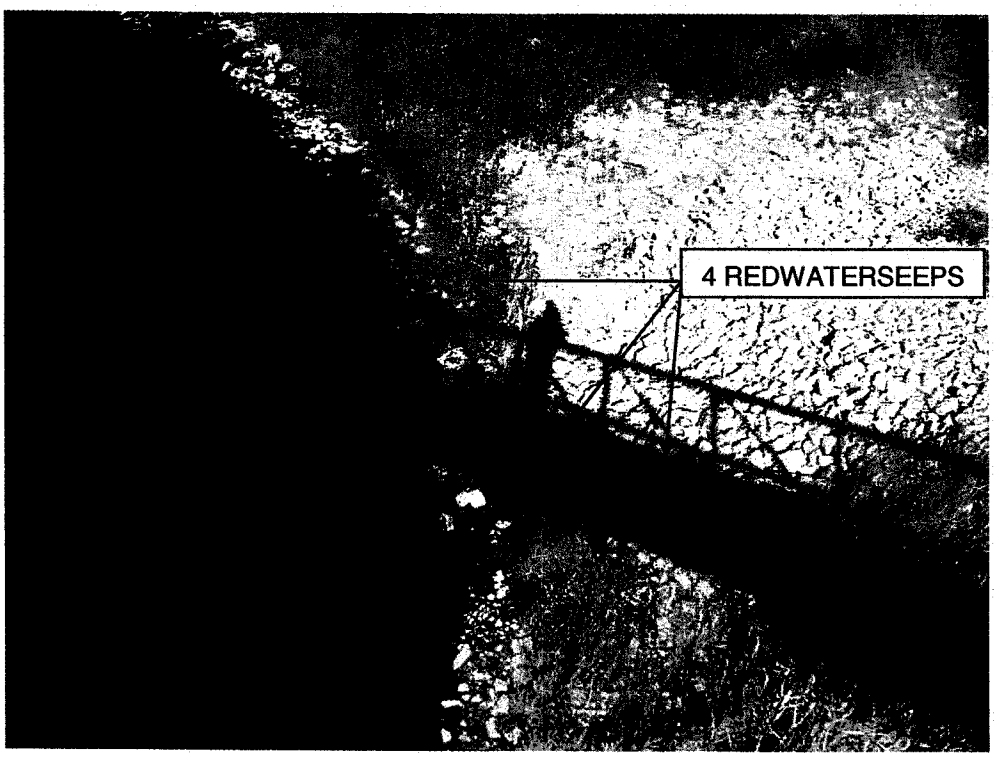
Picture 9. Redwater No. 1.



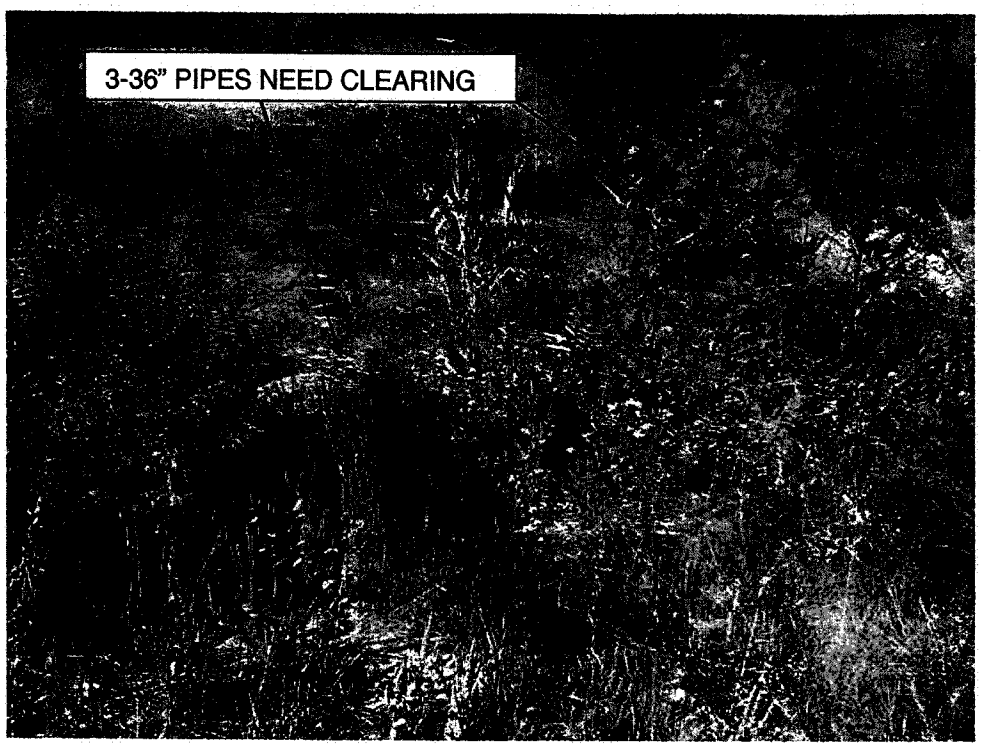
Picture 10. Redwater No. 2. Slide of Repair of this year repairs.



Picture 11. Redwater No. 2. Looking at 72" Pipe to Coal Yard Pond #2.



Picture 12. Redwater No. 2. Four Redwater Seeps.

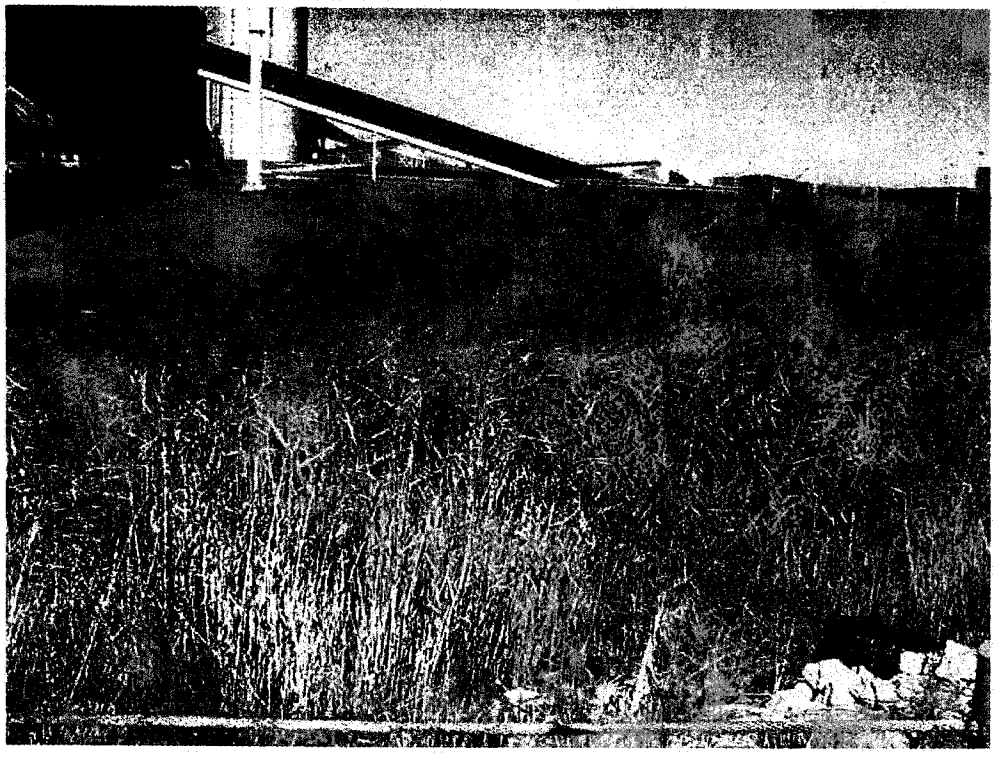


Picture 13. Redwater No. 3. 3 - 36" Pipes Needing Clearing.

Picture 14. Redwater No. 3. Gravity Drain & Clean out of Pond.

Picture 15. Redwater No. 4. Clean out of Pond.

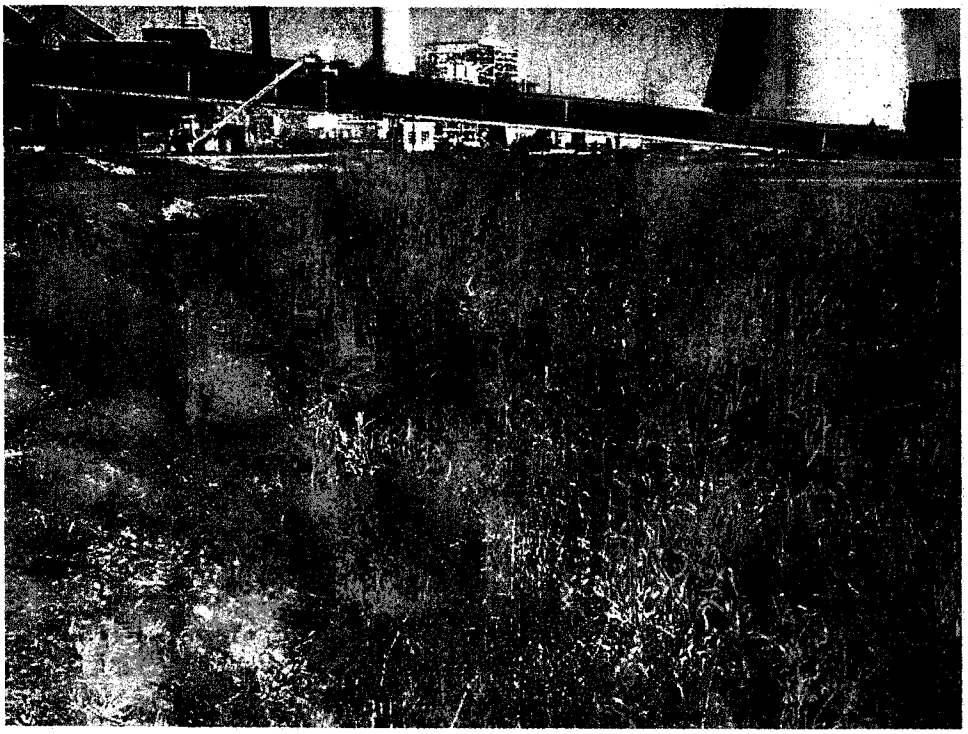
Picture 16. Coal Yard Runoff Pond No. 1.



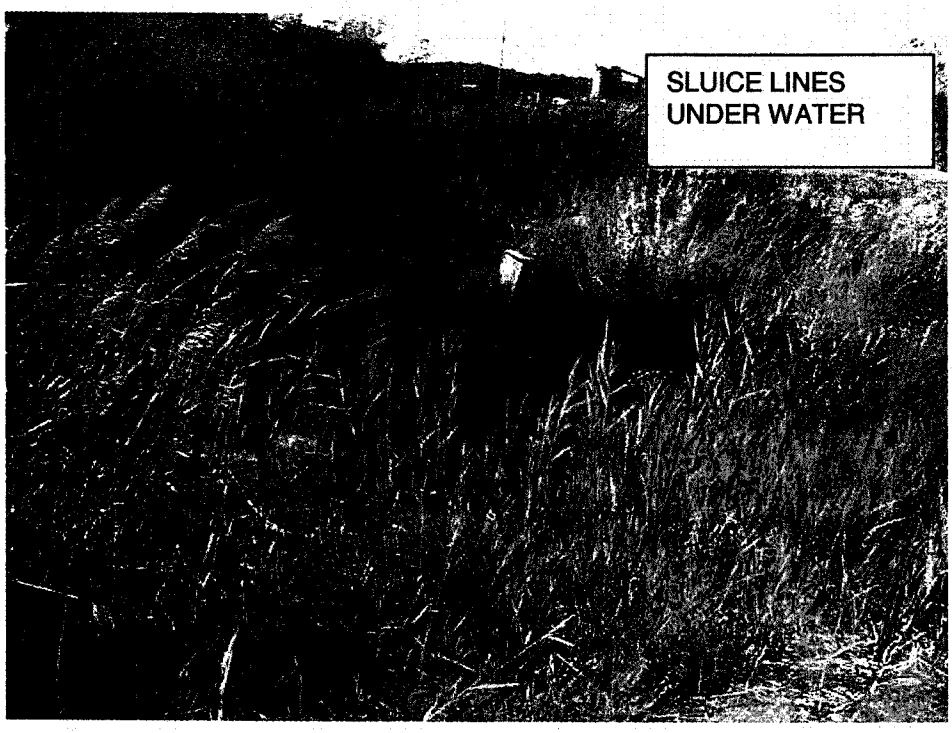
Picture 17. Coal Yard Runoff Pond No. 1.

Picture 18. Coal Yard Runoff Pond No. 2.

Picture 19. Coal Yard Runoff Pond No. 3.

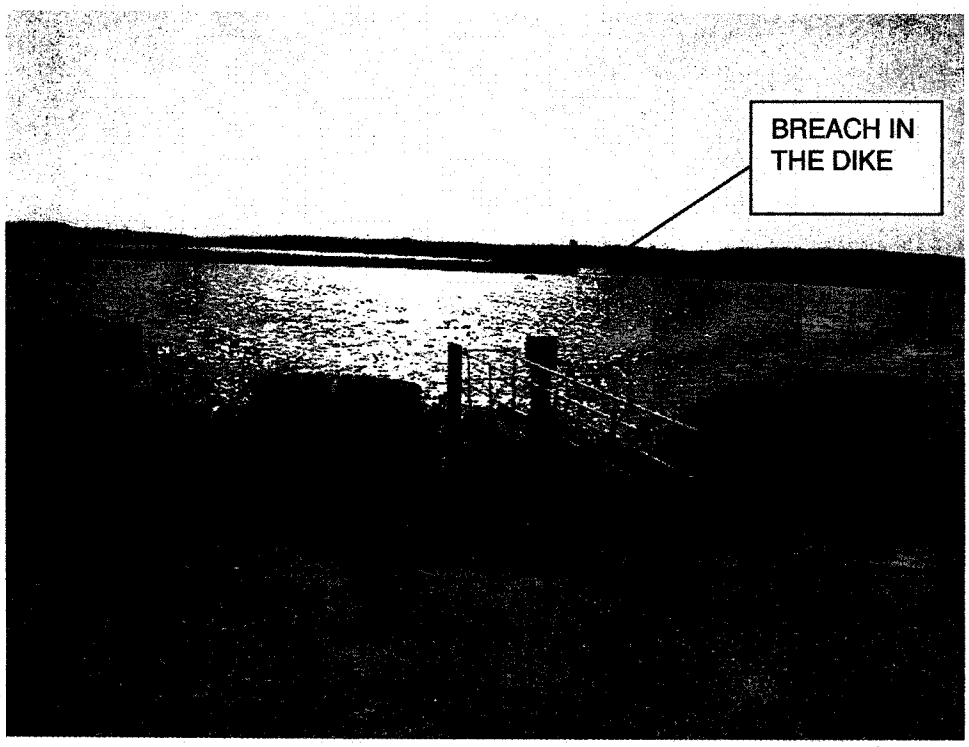


Picture 20. Coal Yard Runoff Pond No. 3.



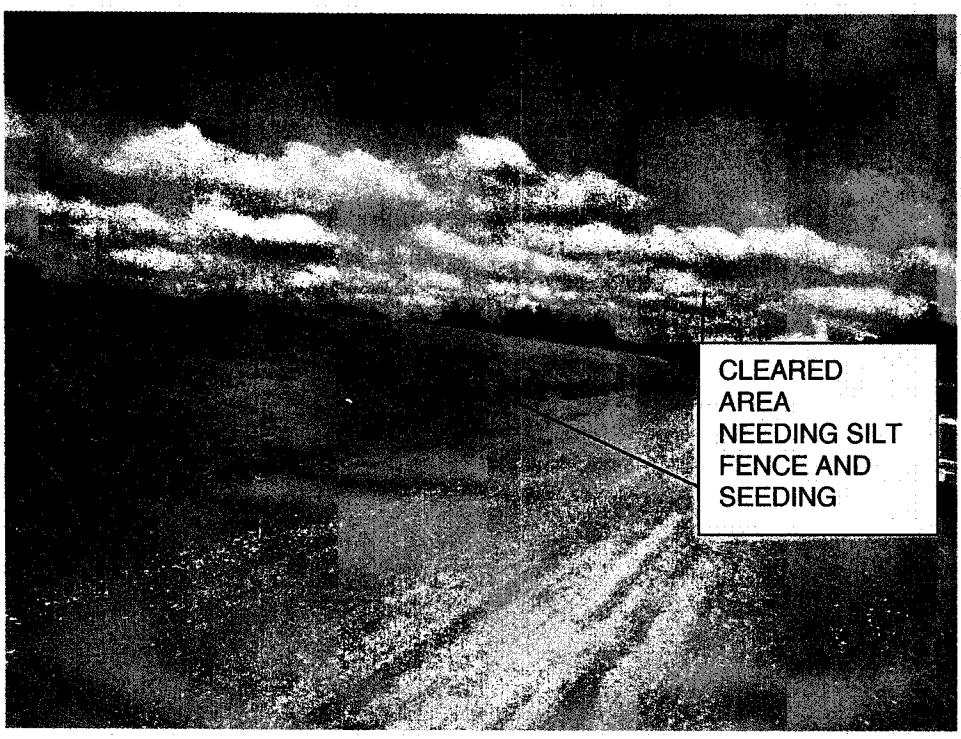
Picture 21. Jacob's Creek Ash Pond. Sluice Lines Under Water.

Picture 22. Jacob's Creek Ash Pond. New Channel Construction.

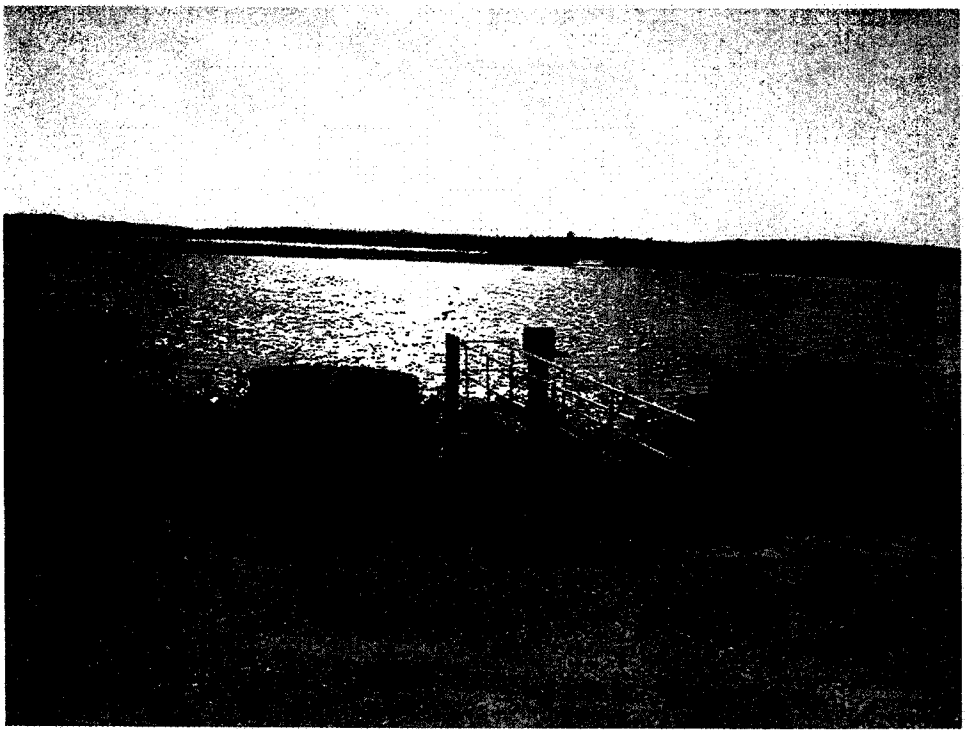


Picture 23. Jacob's Creek Ash Pond. Breach in the Dike.

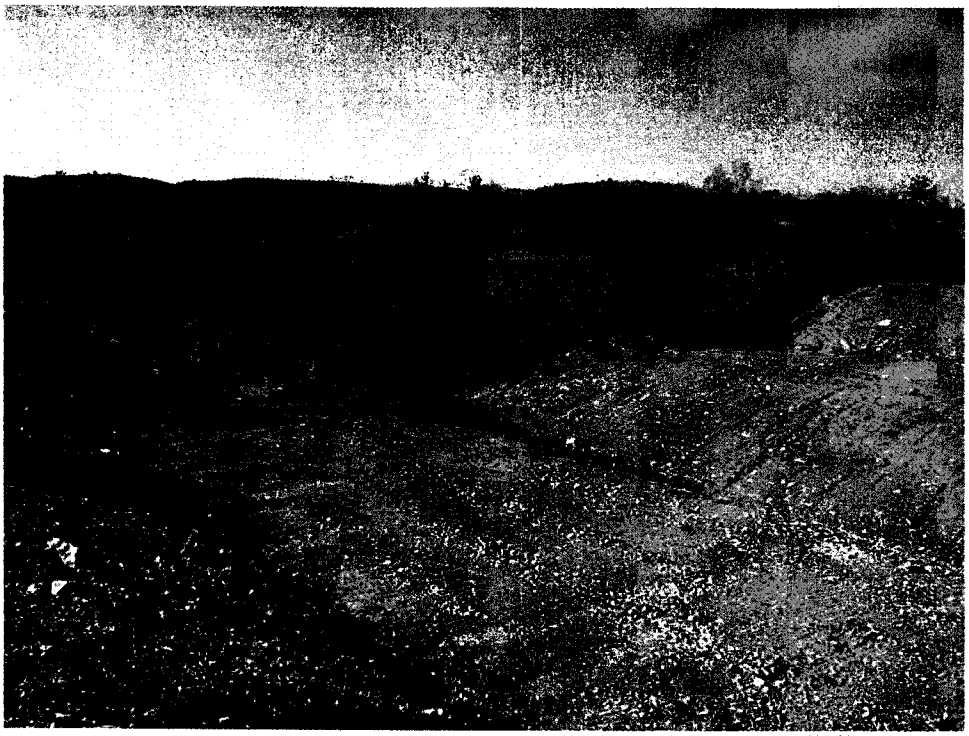
Picture 24. Jacob's Creek Ash Pond. HED Adding more Ash to Pond.



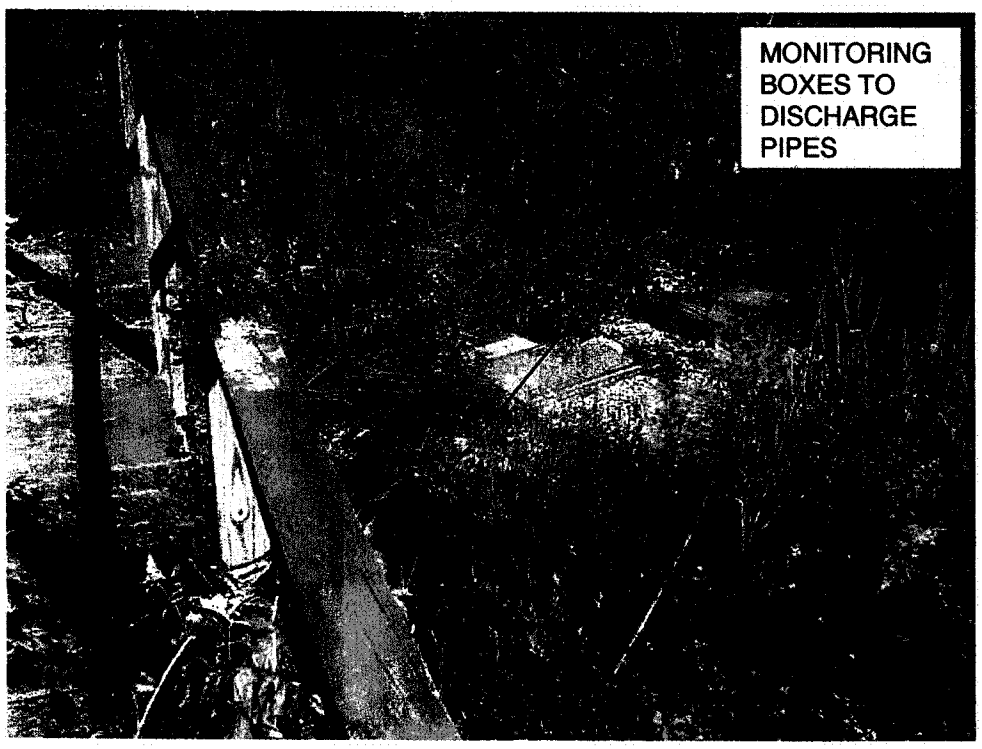
Picture 25. Jacob's Creek Ash Pond. HED Clear Dike With no Cover or Silt Fence Replaced.



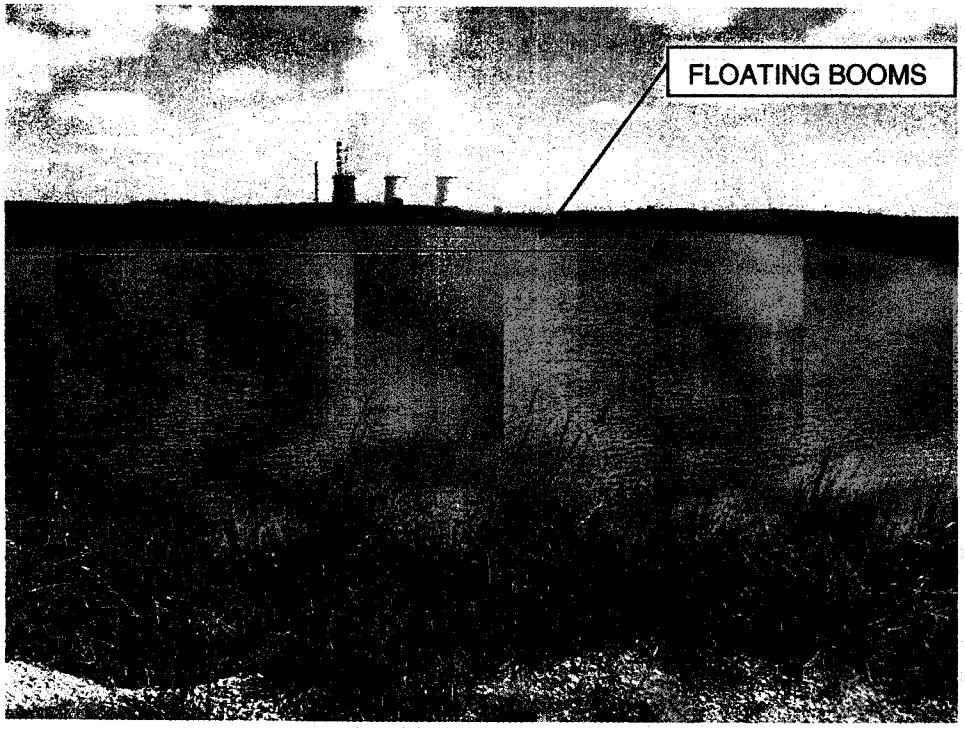
Picture 26. Jacob's Creek Ash Pond. Spillways with Skimmer Structures.



Picture 27. Jacob's Creek Ash Pond. New Ditch Installed by the Scrubber Group to Jacobs Creek.

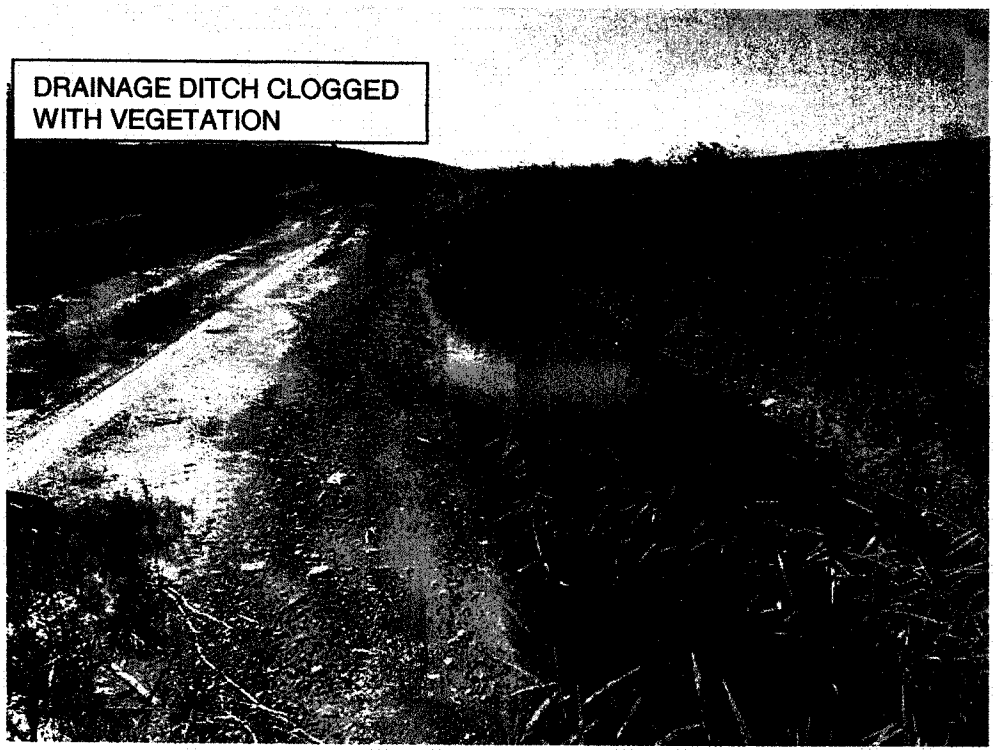


Picture 28. Jacob's Creek Ash Pond. Monitoring Boxes to Discharge Pipes.

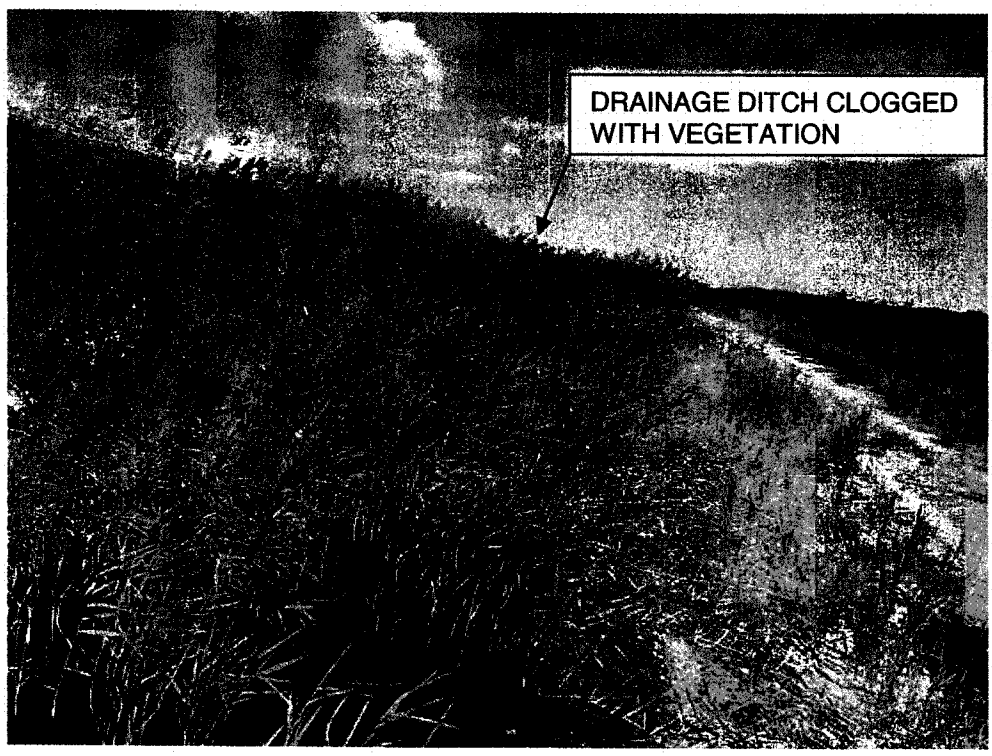


Picture 29. Scrubber Pond. Settling Pond with Floating Booms in it.

Picture 30. Scrubber Pond. Saddle Dike.

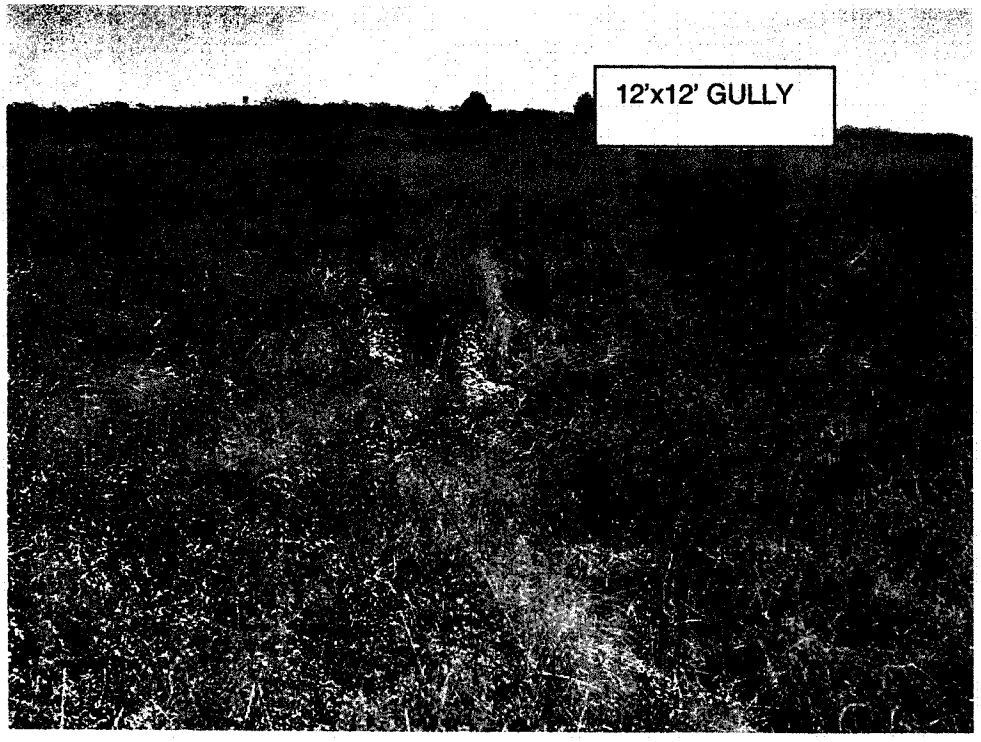


Picture 31. Scrubber Pond. Clogged with Vegetation.

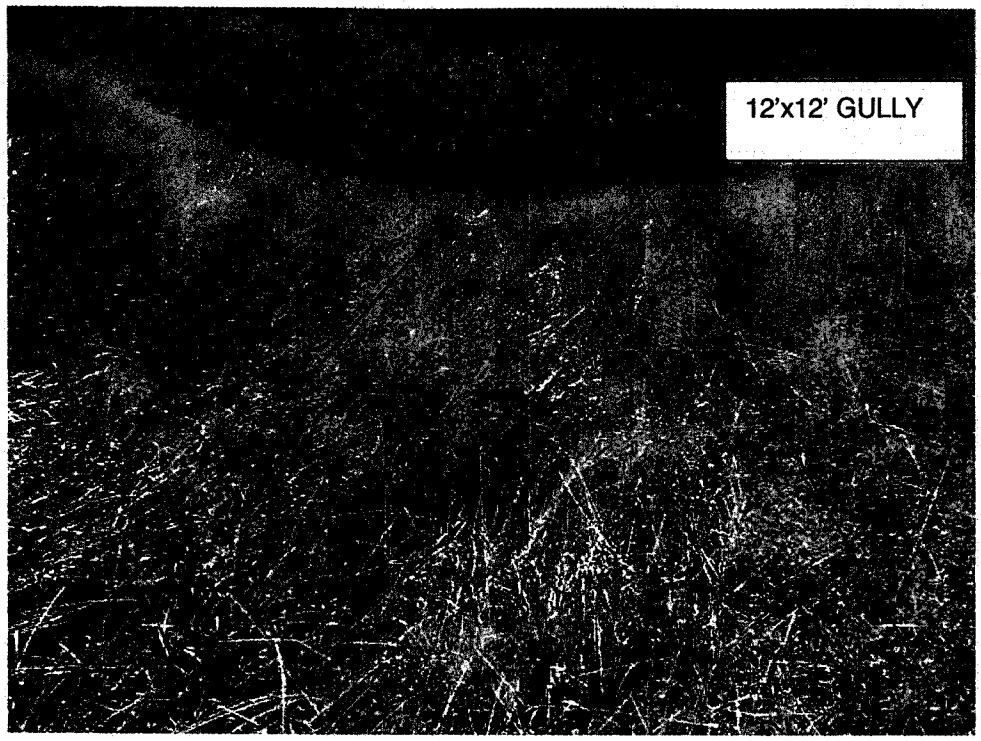


Picture 32. Scrubber Pond. Underdrain Ditch Clogged with Vegetation.

Picture 33. West Dredge Cell. Water in the Cell.

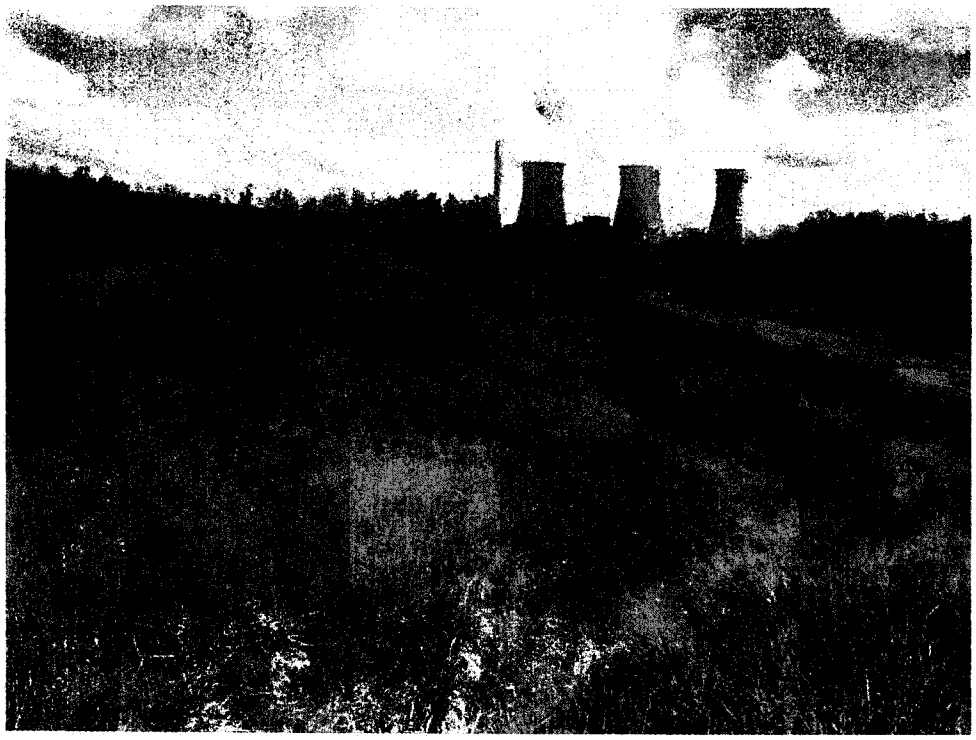


Picture 34. West Dredge Cell. 12'x12' Gully.



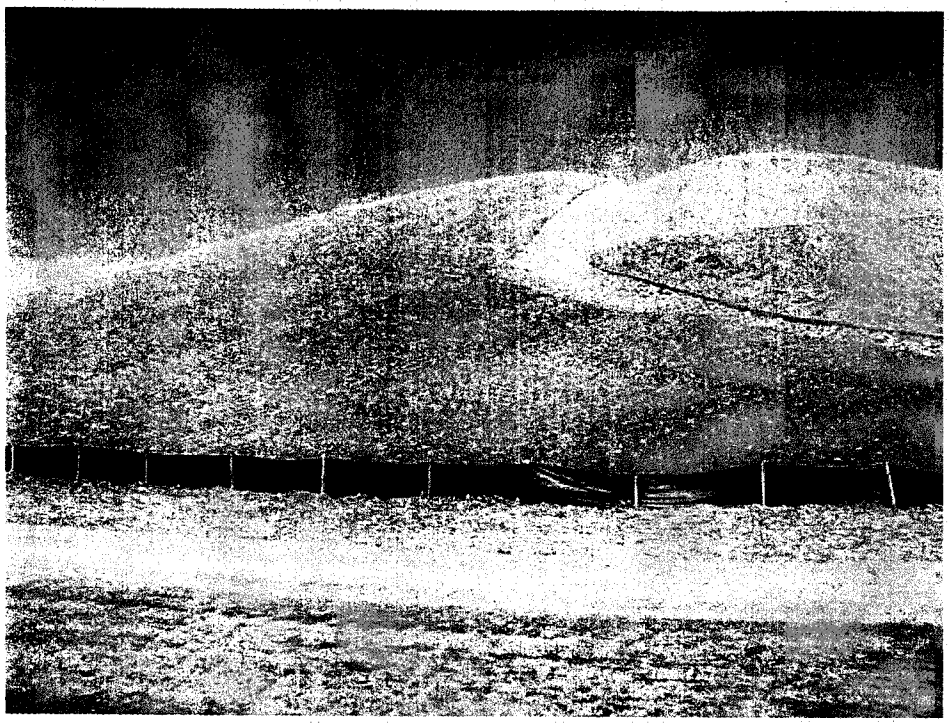
Picture 35. West Dredge Cell. Gully to the Bottom of Dike.

Picture 36. East Dredge Cell.



Picture 37. East Dredge Cell.

Picture 38. Coarse and Medium Refuse Area.



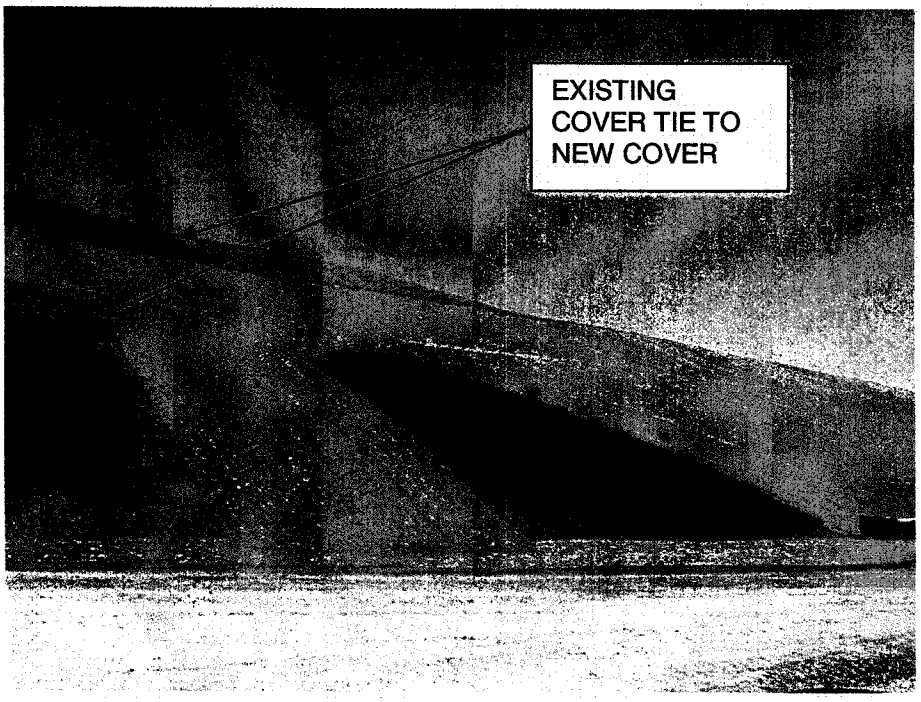
Picture 39. Coarse and Medium Refuse Area.

Picture 40. Coarse and Medium Refuse Area.

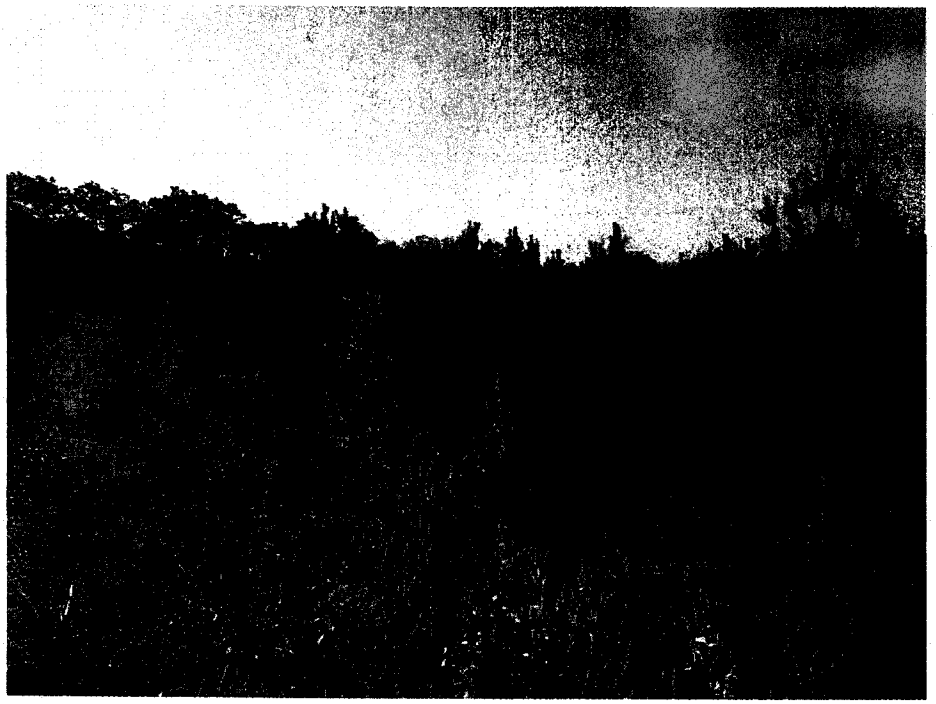
Picture 41. Coarse and Medium Refuse Area.

Picture 42. Coarse and Medium Refuse Area.

Picture 43. Coarse and Medium Refuse Area.

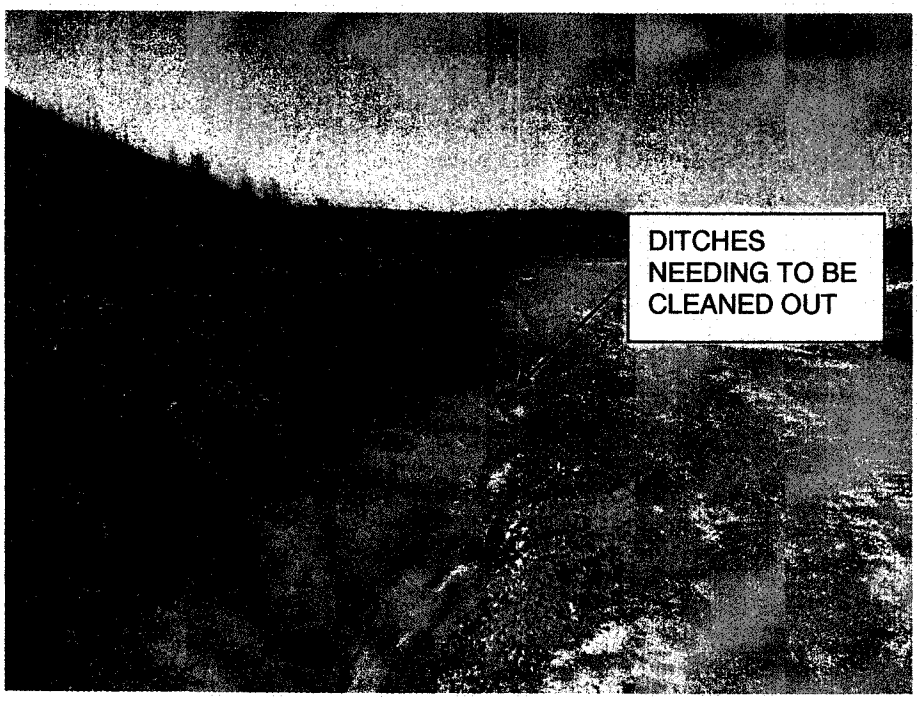


Picture 44. Coarse and Medium Refuse Area. Existing Cover Tie into New Cover.

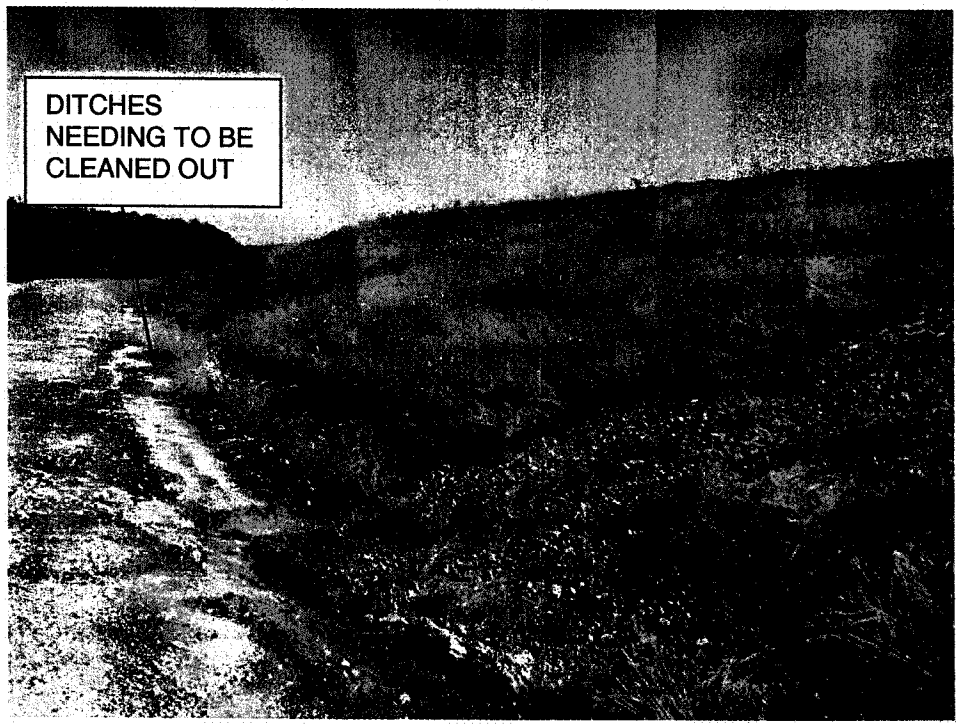


Picture 45. Coal Wash Fines Pond No. 2.

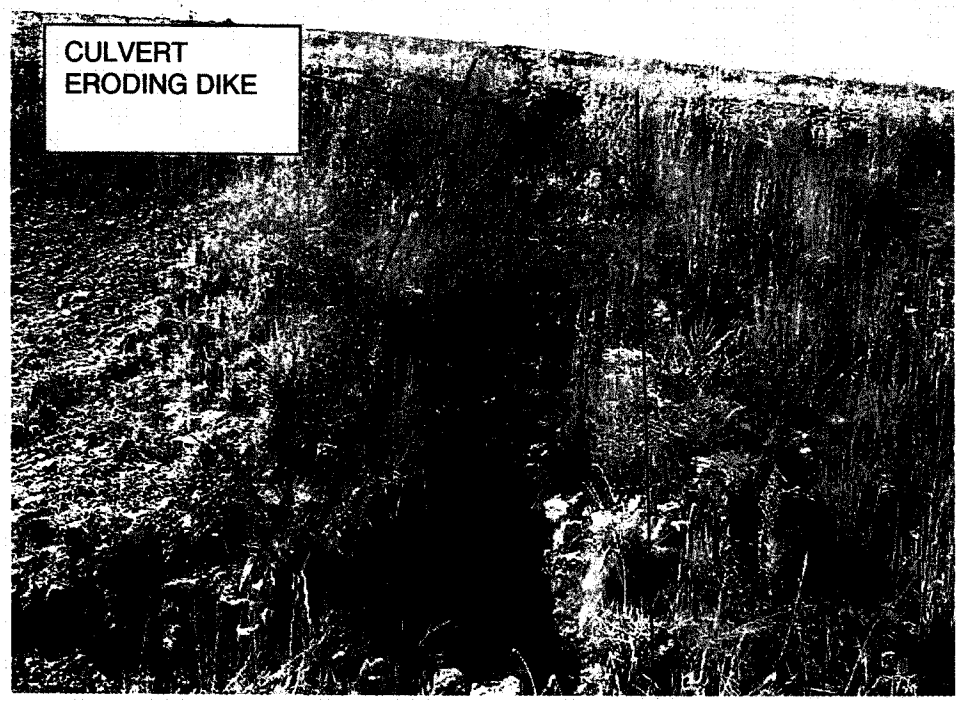
Picture 46. Coal Wash Fines Pond No. 2. West Side of Fines Pond #2.



Picture 47. Coal Wash Fines Pond No. 3. Ditches needing to be Cleaned Out.

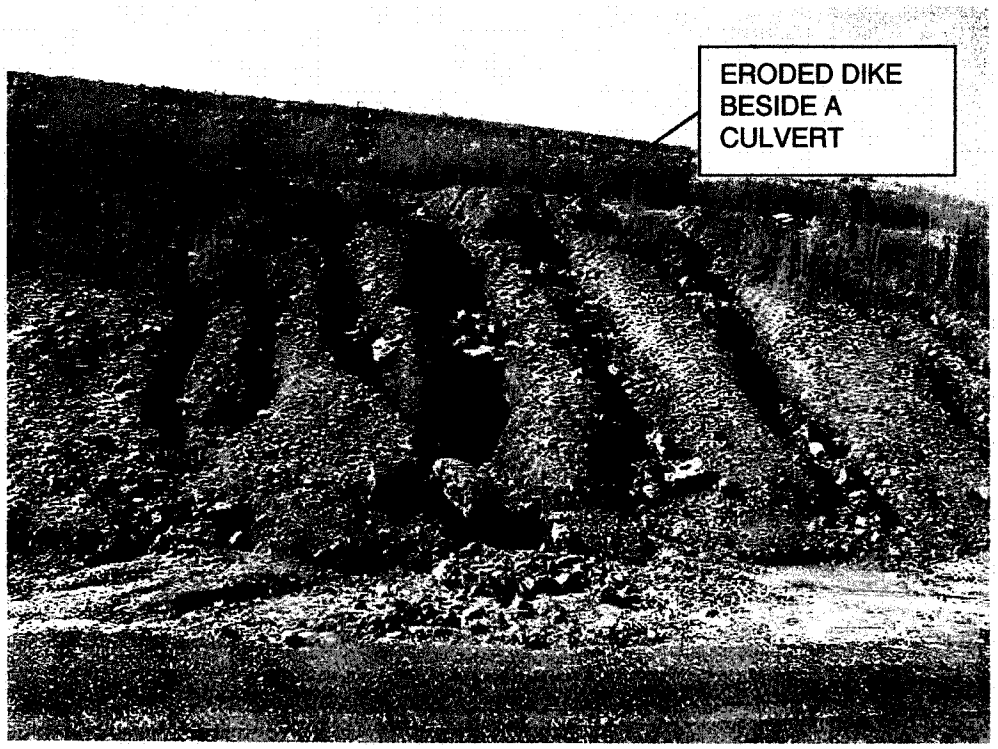


Picture 48. Coal Wash Fines Pond No. 3. Ditches needing to be Cleaned Out.



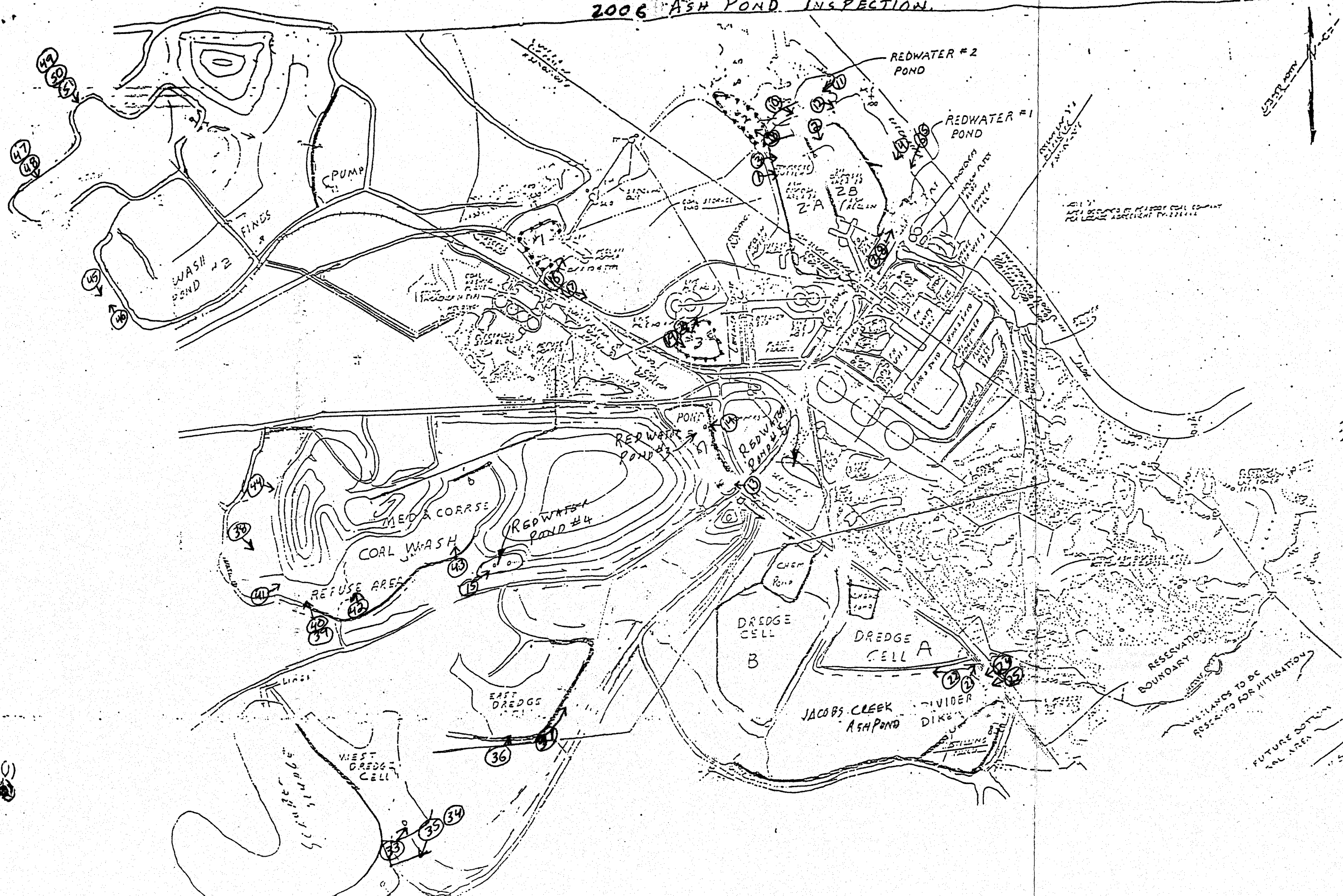
Picture 49. Coal Wash Fines Pond No. 3. Eroded dike at culvert.

Picture 50. Coal Wash Fines Pond No. 3. Eroded dike at culvert.



Picture 51. Coal Wash Fines Pond No. 3. Eroded dike beside a culvert.

2006 Ash Pond Inspection



TENNESSEE VALLEY AUTHORITY
PARADISE FOSSIL PLANT

Paradise Dike Stabilization
Fines Pond #3
Grass Test Plots

Prepared By: Christopher W. Hensley
Date: January 23, 2006

Paradise Dike Stabilization
Fines Pond #3
Grass Test Plots

Introduction

The following report is a summary of the study of grass test plots at Paradise Fossil Plant. The purpose of the study was to determine best seed mixture for a vegetative cover for dike stabilization on Fines Pond #3. The study covers three lifts of the pond. The first lift was completed in October 1992. The second lift was completed in September 1999. The last lift is still under construction. There has been little to no vegetative cover on the dikes since the completion of the first two lifts. The decision was made in a project meeting in January of 2005, to use grass test plots to determine a good seed mixture for a vegetative cover.

The test plot project was a joint venture between HED and Fossil Engineering Design Services. This project was to locate tests plots (50 feet wide x down length slope of dike) for a seed mixture for a vegetative cover on the dike slopes. Fossil Engineering Design provided a sketch of the locations around the Fines Pond for HED to hand excavate material for soil samples (See Attachment C). These soil samples were then sent to an independent lab for test of the soil chemistry. The lab results showed what chemicals are in the soil and the recommend amount of chemical to be added back to the soil, so the soil would support a vegetative cover. From the lab test data a mixture of seeds and the amount of chemicals (fertilizer, lime, etc.) recommended would be compiled. HED and Fossil Engineering Design worked to establish a seed bed in the test plot locations and seed the different mixtures in different locations around the dikes to determine the best seed mixture and least required maintenance vegetation cover compiled. When this mixture is determined then a plan will be evaluated for putting a vegetative cover around the entire Fines Pond #3.

Lab Results

In the February 2005 a drawing of the grass test plots was given to HED to locate, stake, and label each test plot around Fines Pond #3. There were a total of 12 test plots. HED also took soil samples from these test plots and sent them to the independent lab. On March 4, 2005, the lab results were returned with the recommendations to support a vegetative cover. The following is the summary of the lab results. The lab results in Attachment B. The general recommendation for all 12 of the test plots were about the same. Lime and a good starter fertilizer were needed to establish a vegetative cover (Table 1).

Table 1. Lime and Fertilizer for Spring Planting

Lime lbs. per 1,000 sq. ft. (Pellets)	Fertilizer lbs. per 1,000 sq. ft. (18-24-12)
3 lbs	4 lbs

The lime and fertilizer recommendations are to start the grass for this spring planting. In Table 2 are recommendations for the fertilizer needing to be applied in lbs. per 1,000 sq. ft.

Table 2. Fertilizer recommendations in lbs. per 1,000 sq. ft.

Nitrogen (N)	App. Freq.	Phosphate (P2O5)	Potash (K20)
0.75-1.0	Twice a year	6.0	4.5

For each of the test plots the same amount of lime and fertilizer were applied at the same rate during the study.

Seed Bed Preparation

The seed bed preparation is an important part to the process of establishing a good vegetative cover. To start the seed bed HED loosened the soil to a depth of at least 3 inches to 4 inches. HED picked out any big rock and trash that disturbed the seed bed. Then HED spread the test plot with the rate of lime and fertilizer listed in Table 1 of this report. The test plot was seeded after the lime and fertilizer was spread. The following section shows the test plot label number and the rate of seed and mixture sown in each test plot. HED covered the test plots with a thin layer cover of straw after the area was sown.

Seed Mixtures

In the following are the list of test plot labels, seed mixture, and rate for each.

Seed Mixture Type 1 - Bermudagrass, NK-37 2 lbs/per 1,000 sq. ft.

• Test Plot Locations - PAF-FP3-TP2, PAF-FP3-TP11

Seed Mixture Type 2 - Kentucky 31 Tall Fescue 6 lbs/per 1,000 sq.ft.

• Test Plot Locations - PAF-FP3-TP7, PAF-FP3-TP10

Seed Mixture Type 3 - Kentucky 31 Tall Fescue 4 lbs/per 1,000 sq.ft.
Crownvetch 2 lb/per 1,000 sq.ft.

• Test Plot Locations - PAF-FP3-TP6, PAF-FP3-TP12, PAF-FP3-TP8

Seed Mixture Type 4 - Orchard Grass 1 lb/per 1,000 sq.ft.
Alpha Fa 1 lb/per 1,000 sq.ft.
Timothy 1 lb/per 1,000 sq.ft.
Birds Foot Trefoil 1 lb/per 1,000 sq.ft.
Kentucky 31 Tall Fescue 2 lbs/per 1,000 sq.ft.

• Test Plot Locations - PAF-FP3-TP5, PAF-FP3-TP9

Seed Mixture Type 5 - Good Value Mine Mix: ERNMX-103 / Reclamation Mixtures
Find at www.ernstseed.com

30% Tall Fescue
24% Annual Ryegrass
16% Climax Timothy
14% Birds Foot Trefoil
10% White Clover
2% Redtop

• Test Plot Locations - PAF-FP3-TP3, PAF-FP3-TP1, PAF-FP3-TP4

Note: Seed PAF-FP3-TP3 & PAF-FP3-TP1 at 2 lbs/per 1,000 sq.ft.
Seed PAF-FP3-TP4 at 4 lbs/per 1,000 sq.ft.

Note: Per telephone conversation, HED substituted Good Value Mine Mix with the seed percentage listed above for seed mixture type 5.

Trip to Site 1

The first trip to the site was made on May 3, 2005, to check the work and the results of the test plots. At the time of the visit test plots PAF-FP3-TP7 and PAF-FP3-TP10 had been planted since April 19, 2005. Both of these test plots were planted with seed mixture type 2. The results at these test plots were equal. At both test plots the middle (first) dike lift had a vegetative growth (Pictures 1 & 2 PAF-FP3-TP7, Pictures 3, 4, 5, & 6 PAF-FP3-TP10). However, the last lift at both test plots had very little to no sign of grass cover at this time (Pictures 7 & 8 PAF-FP3-TP7, Pictures 9 &10 PAF-FP3-TP10). After discussing the results with HED's William Perry, the foreman, we decide that the fines in behind the soil were causing a chemical reaction with the soil and the grass seed. The thickness of the soil on this lift is not at great depth. The cover is about 4 to 6 inches thick. If the assumption about the chemical reaction is true then the little grass cover would be the same in the other test plots around the fines pond in the top lift.

At time of visit test plots PAF-FP3-TP1, PAF-FP3-TP2, PAF-FP3-TP3, and PAF-FP3-TP12 were not done nor had any seed bed preparation. These plots would be finished later that week or the first of the following week. The remaining test plots were in some working state at this time.

The importance of this site visit was to see how HED was preparing the seed beds, sowing of the seed, fertilizer, and lime, then strawing the test plots. The test plots that show this work progress are test plots PAF-FP3-TP4, PAF-FP3-TP5, and PAF-FP3-TP6. Test plot PAF-FP3-TP4 was were the dozer was grading the first dike side when Fossil Engineering Design arrived for visit to the site. Fossil Engineering watched as the dozer operator graded the slope. First the dozer operator used the blade to loosen the

compacted soil on the slope. Then the dozer operator used the tracks of the dozer to walk the soil back to stabilize the loose soil by working the slope up and down (Pictures 11, 12, 13, & 14). This is how the seed bed was left for the labors to seed, fertilizer, and lime the test plot. This practice was observed at test plot PAF-FP3-TP5 (Pictures 15, 16, 17, 18, & 19). After the labors had spread the seed, fertilizer, and lime then the dozer operator hooked an old heavy fence gate to the back of the dozer (Picture 20). The fence gate was used to spread loose soil over the seed so the seed would be in contact with the soil (Pictures 21, 22, & 23). The labors then spread a thin cover of straw by hand over the test plot as shown in test plot PAF-FP3-TP6 (Pictures 24 & 25).

Fossil Engineering did approve HED's practice of preparing the seed bed, sowing, and strawing of the test plots. Fossil Engineering would have preferred that HED throw some of the big rocks out of the seed bed but did not make recommendation to HED (Pictures 26, 27, & 28). Fossil Engineering made additional site visits in June, September, and November to look at the test plots.

Trip to Site 2

The second trip to the site was on June 29, 2005. The summer months had been hot and dry so the results of this trip were not too surprising. As noted from trip 1 the grass was not able to grow on the last lift. These results have stayed consistent in the subsequent visits. During this visit there was a noticeable amount of a white powder on the ground that appeared to be the sulfur from the coal fines in the pond on the last lift. This supported the idea that there is not enough cover over the coal fines to protect the grass roots from the material in the dike. Another observation was the soil was packed hard as concrete. A recommendation to help in this is to add a water additive to the soil, to help the soil to absorb water.

The first dike lift of the pond grass had started to dry out. This was noted and plans made to specifically observe during the next trip if the grass returned with fall weather. The majority of grass that did come up and was visible was the Tall Fescue; all other types/mixes were not visible. See pictures in Attachment A at end of this report for this site visit (Pictures 29 thru 50).

Trip to Site 3

The third trip to the site was on September 28, 2005. The summer months had been dry, but during the time of this trip and last Trip 2 the grasses had come back and grew to be about 6 to 8 inches tall. It had also spread to cover most of the test plot areas. This result is still only true to the first dike lift that was completed in October of 1992. The other dike lift was still showing signs of the sulfur on the soil and no grass that was planted in the test plots was noted. However, grass and weeds were growing on the dike lift that was spread by wind or animals in the area. See pictures in Attachment A at end of this report for this site visit (Pictures 51 thru 57).

Trip to Site 4

The last site visit was on November 3, 2005. The test plots have all done well this year under all of the weather conditions and lack of rain. At the time of this trip Paradise has had their first frost. The grasses have all gone dormant for the winter. As before the first dike lift was the most active test area of the two dike lifts. See pictures in Attachment A at end of this report for this site visit (Pictures 58 thru 72).

Final Recommendations

The final recommendation is to use Seed Mixture Type 4 with the same lime and fertilizer rate as in the test plots study. This seed mixture seemed to have done the best in their locations and the weather condition. Engineering also recommends to plant the grass seed in the spring of 2006 and to start a fertilizing/lime program to fertilize/lime in the spring and again in the fall. This will be an important step to keep the grass growing.

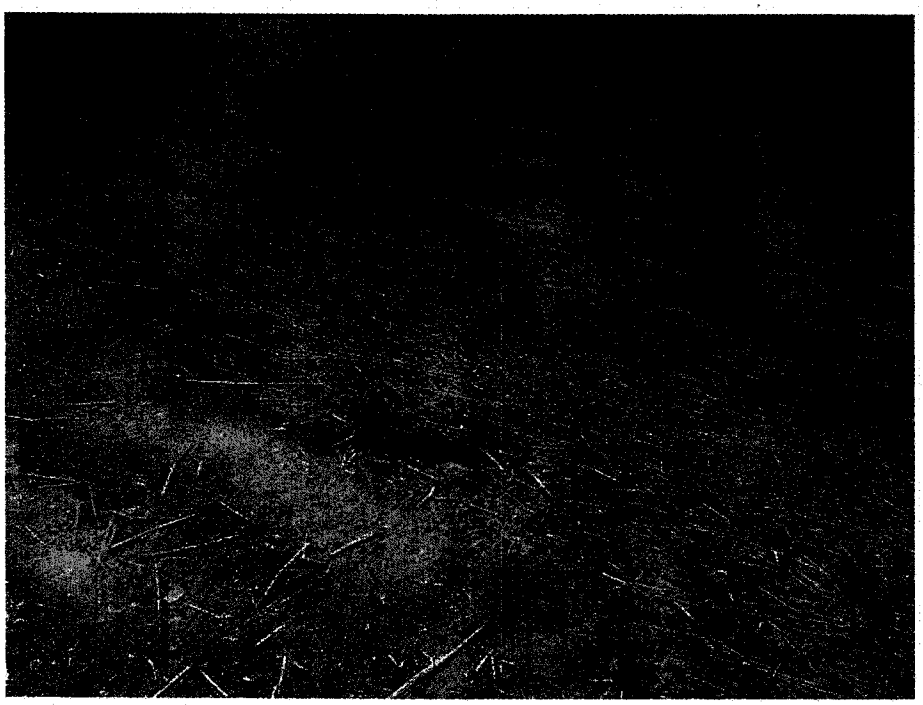
Post Final Note of Recommendation

In the dike lifts work will need to be done relating to the drainage culverts and downdrains. At all of the drains for the roads, the dike has been washed out and starting to dig its way back into the slope. Some of the road drains have washed the dike out to about 3 to 4 foot depth into the dike toe. These areas will need to be repaired before planting of seed. For more information see the Paradise Ash Pond Inspection Report for 2006.

Attachment A

Pictures

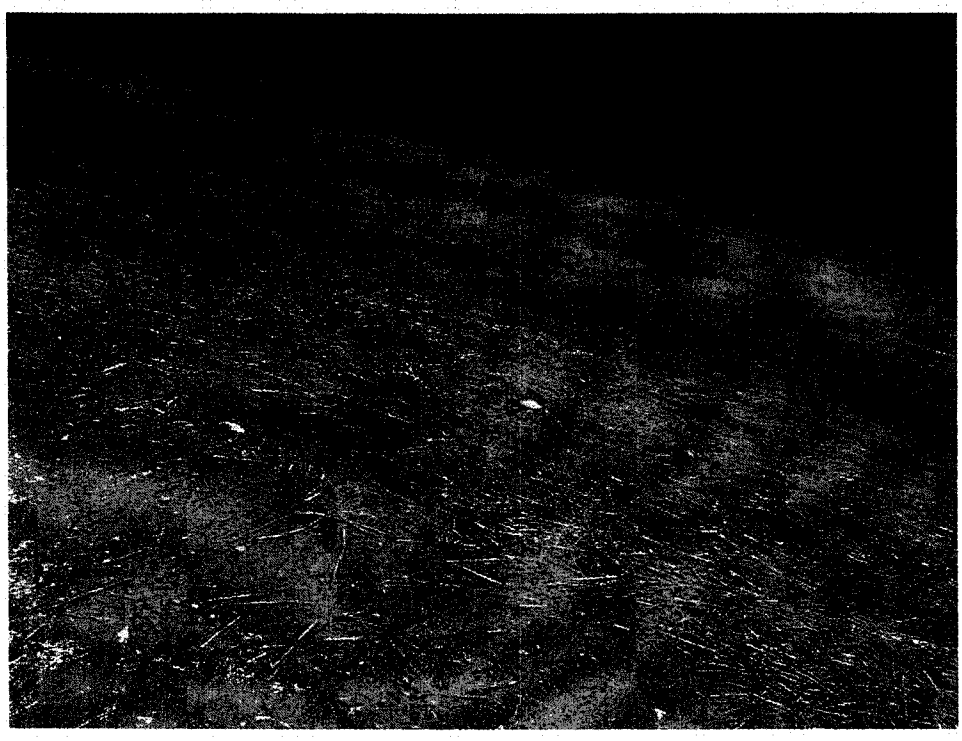
Attachment A



Picture 1. Test Plot PAF-FP3-TP7 First Dike Lift

Picture 2. Test Plot PAF-FP3-TP7 First Dike Lift

Attachment A

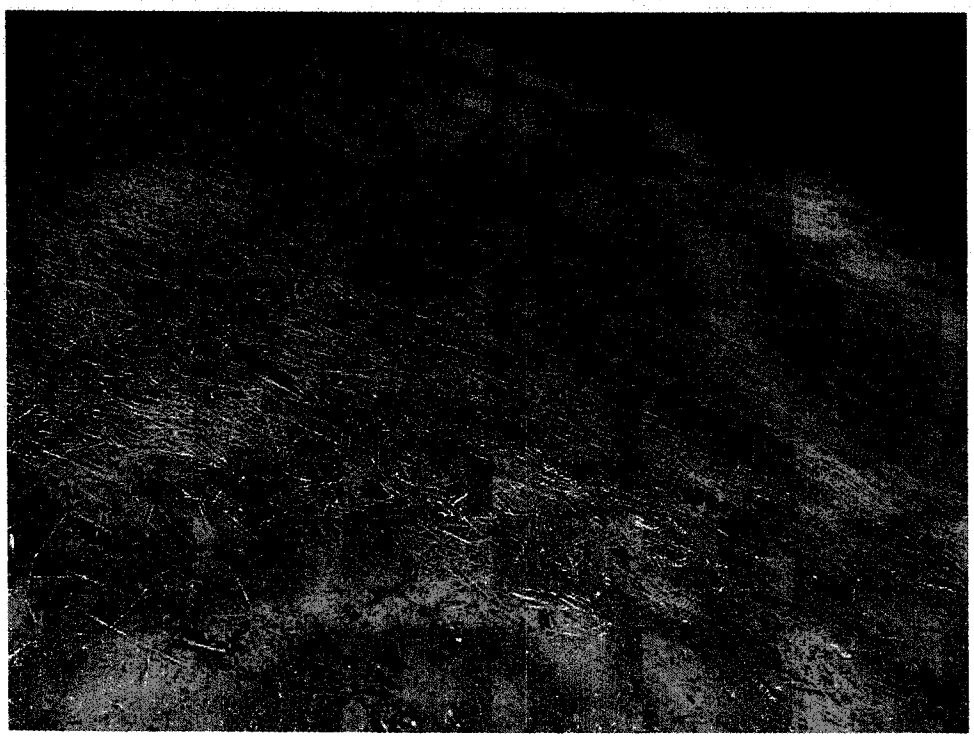


Picture 3. Test Plot PAF-FP3-TP10 First Dike Lift

Picture 4. Test Plot PAF-FP3-TP10 First Dike Lift

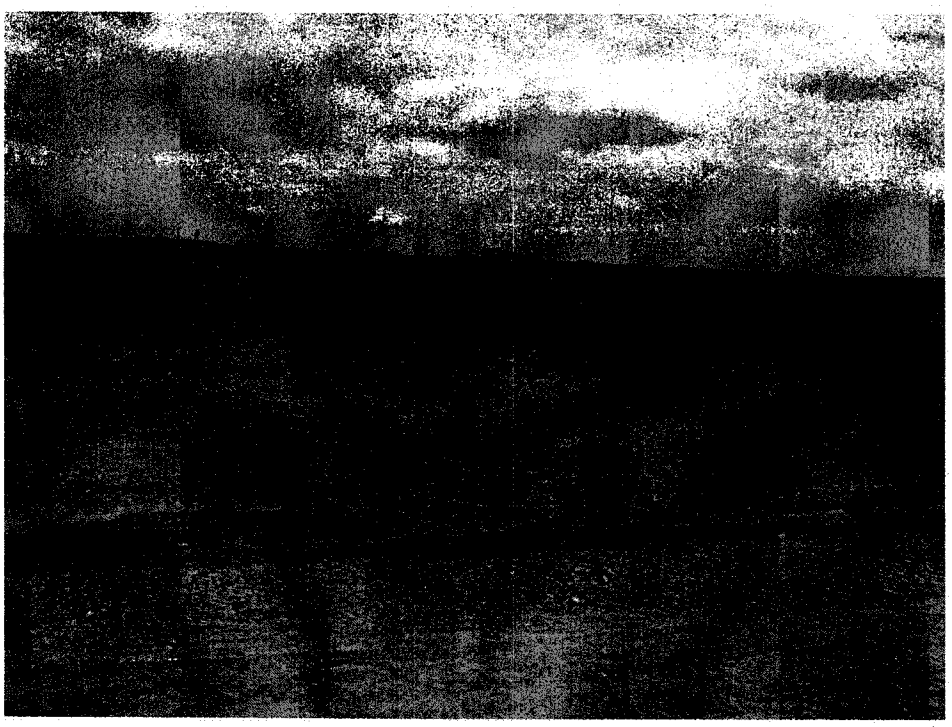
Attachment A

Picture 5. Test Plot PAF-FP3-TP10 First Dike Lift



Picture 6. Test Plot PAF-FP3-TP10 First Dike Lift

Attachment A



Picture 7. Test Plot PAF-FP3-TP7 Last Dike Lift

Picture 8. Test Plot PAF-FP3-TP7 Last Dike Lift

Attachment A

Picture 9. Test Plot PAF-FP3-TP10 Last Dike Lift

Picture 10. Test Plot PAF-FP3-TP10 Last Dike Lift

Attachment A

Picture 11. Dozer working on PAF-FP3-TP4

Picture 12. Dozer working on PAF-FP3-TP4

Attachment A

Picture 13. Dozer working on PAF-FP3-TP4 Last Lift

Picture 14. Dozer working on PAF-FP3-TP4 Last Lift

Attachment A

Picture 15. Test Plot PAF-FP3-TP5 Last Lift Seed Sowed

Picture 16. Test Plot PAF-FP3-TP5 Last Lift Seed Sowed

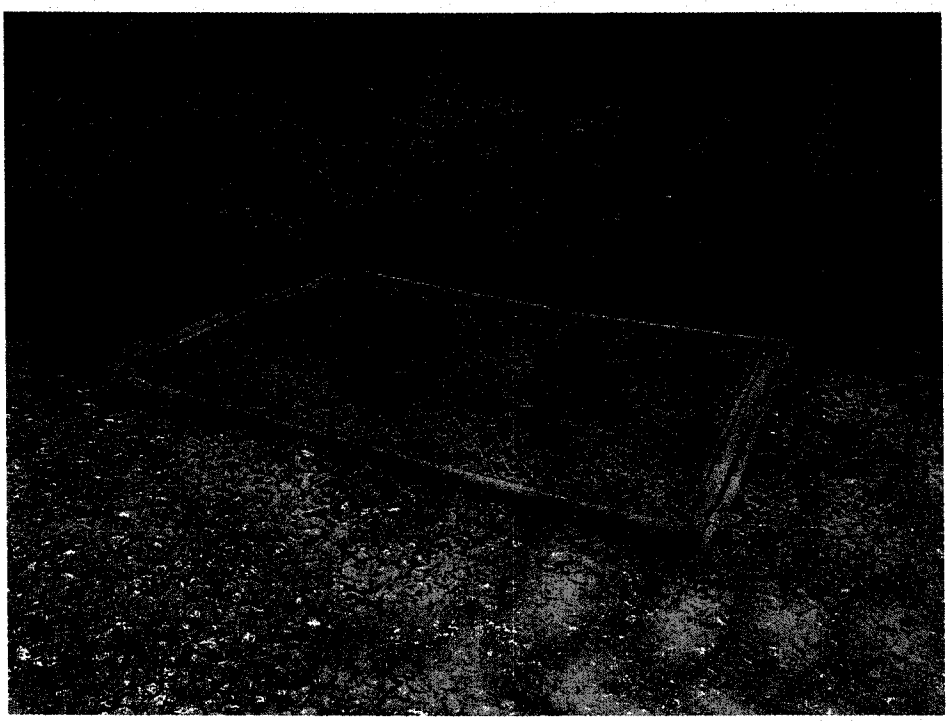
Attachment A

Picture 17. Test Plot PAF-FP3-TP5 First Lift Seed Sowed

Picture 18. Test Plot PAF-FP3-TP5 First Lift Seed Sowed

Attachment A

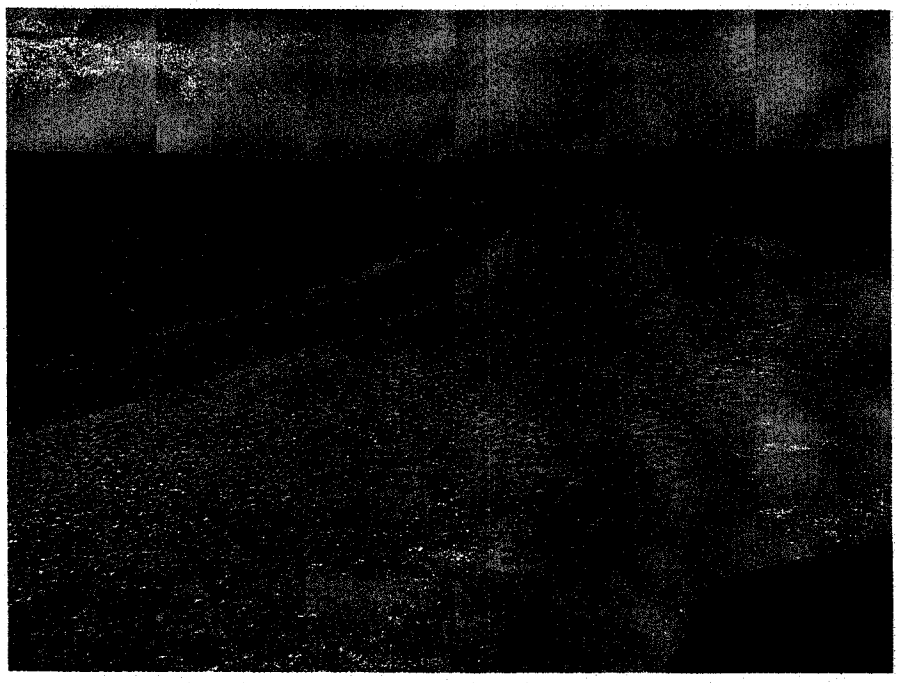
Picture 19. Test Plot PAF-FP3-TP5 First Lift Seed Sowed



Picture 20. Old Heavy Fence Gate

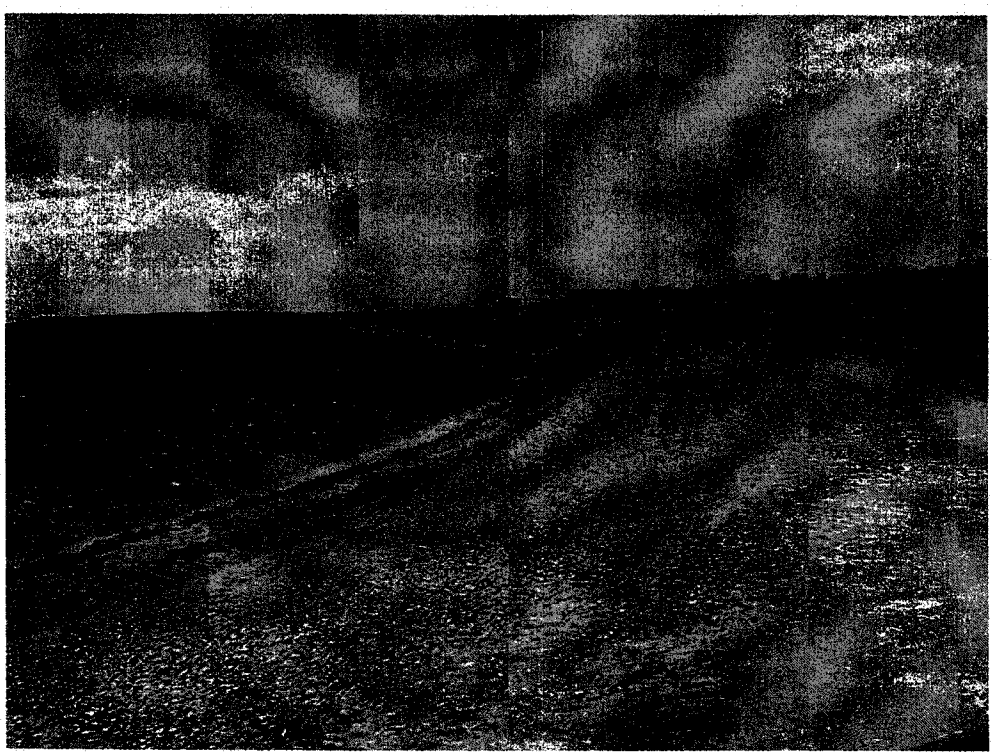
Attachment A

Picture 21. The dozer pulling the old heavy fence gate to cover the seed

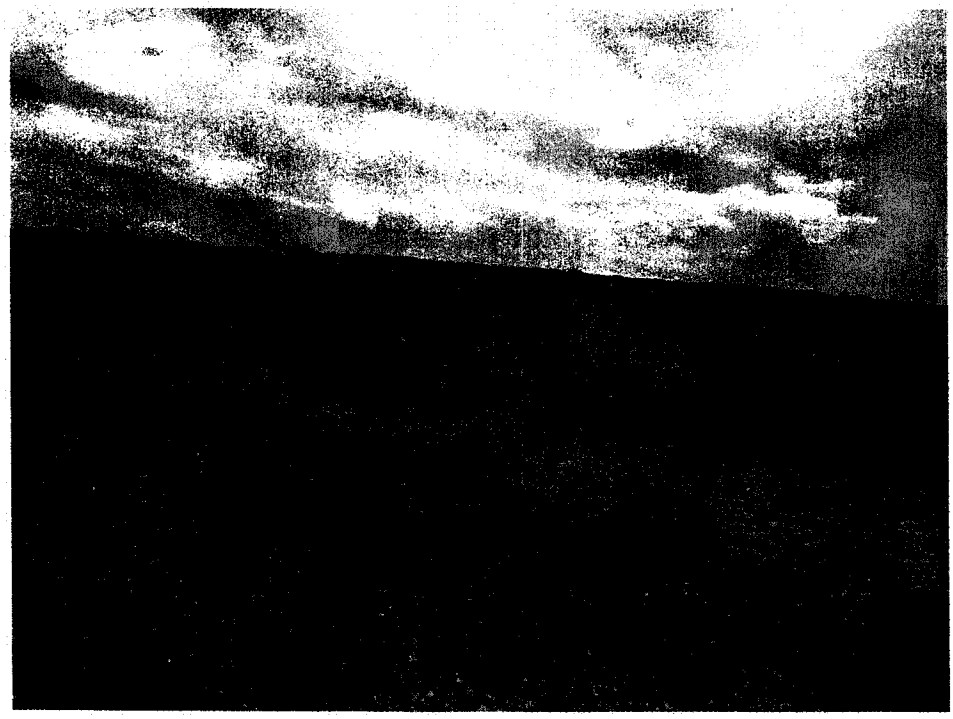


Picture 22. The dozer pulling the old heavy fence gate to cover the seed

Attachment A

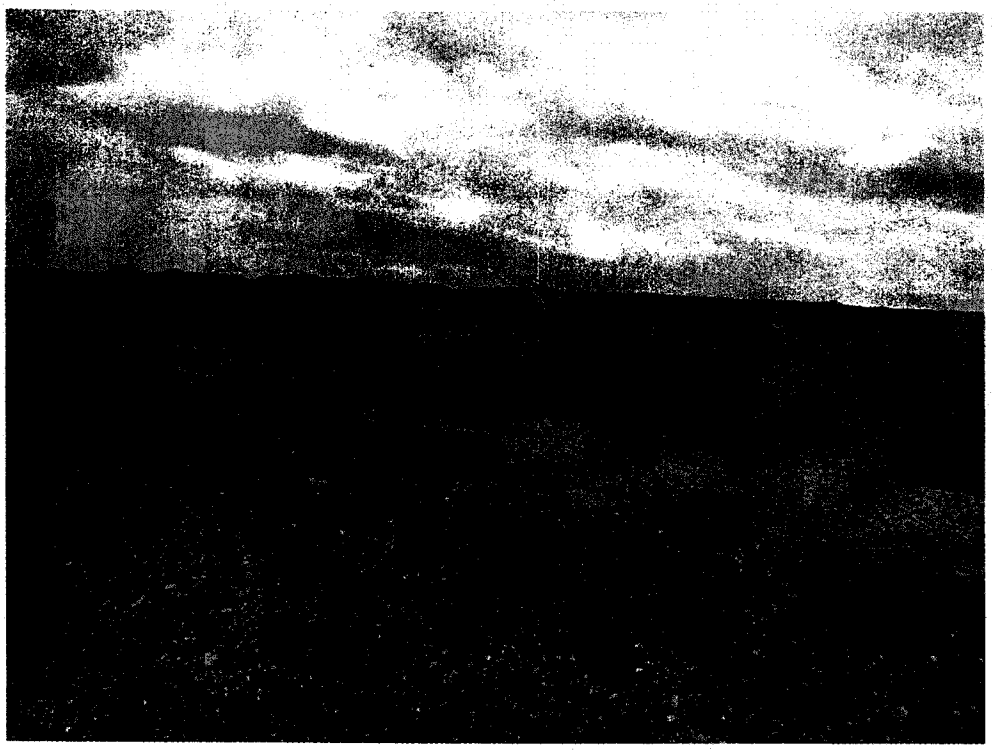


Picture 23. The dozer pulling the old heavy fence gate to cover the seed



Picture 24. Labors hand spreading straw on test plot PAF-FP3-TP6

Attachment A



Picture 25. Labors hand spreading straw on test plot PAF-FP3-TP6

Picture 26. Big rocks left in the seed bed

Attachment A

Picture 27. Big rocks left in the seed bed

Picture 28. Big rocks left in the seed bed

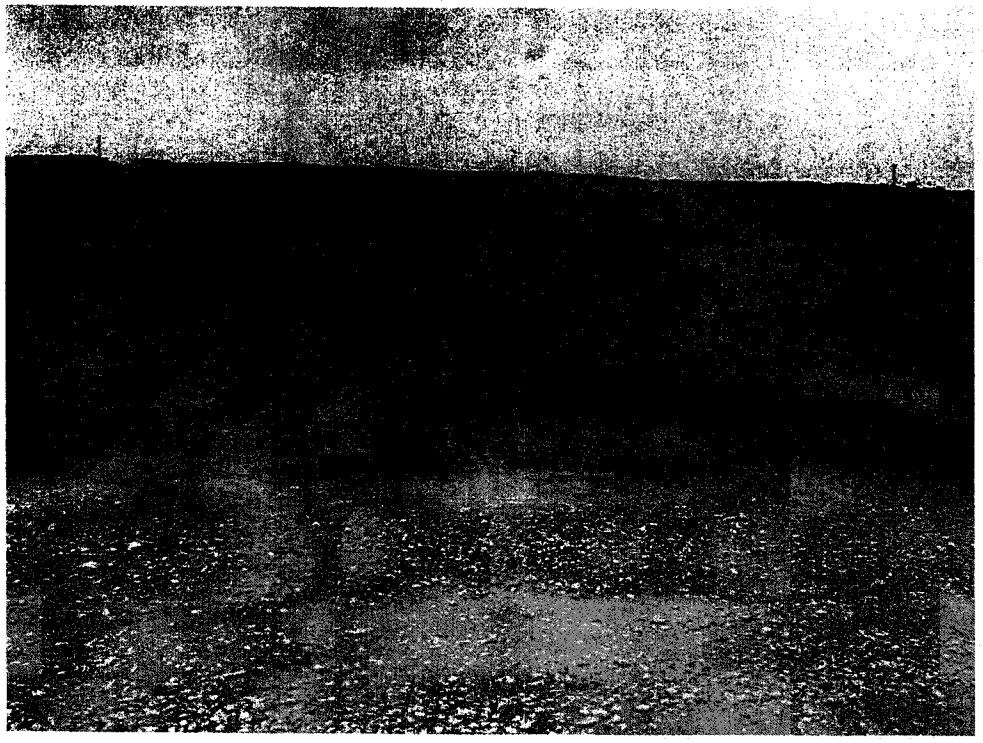
Attachment A

Picture 29. PAF-FP3-TP5 First Dike Lift

Picture 30. PAF-FP3-TP5 Top Dike Lift

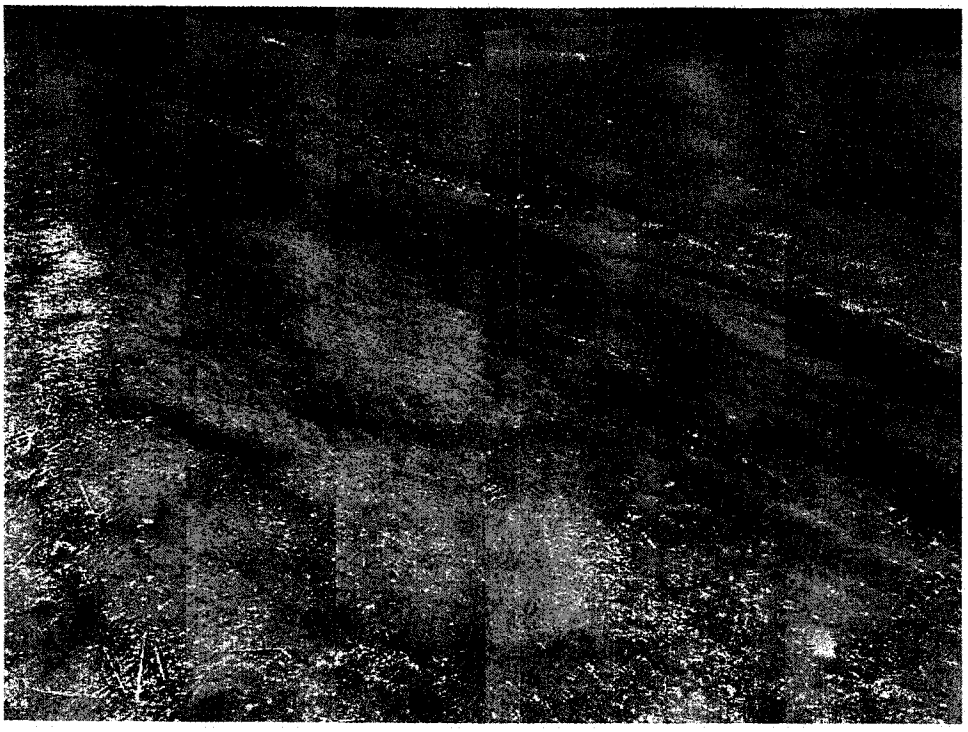
Attachment A

Picture 31. PAF-FP3-TP6 First Dike Lift



Picture 32. PAF-FP3-TP6 Top Dike Lift

Attachment A

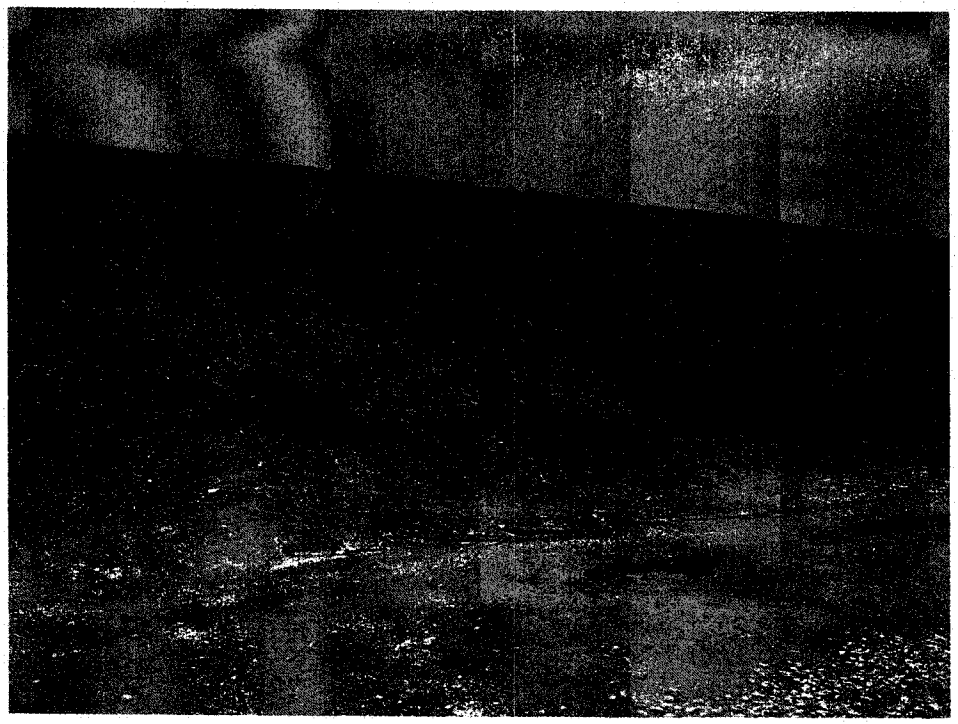


Picture 33. PAF-FP3-TP7 First Dike Lift

Picture 34. PAF-FP3-TP7 Top Dike Lift

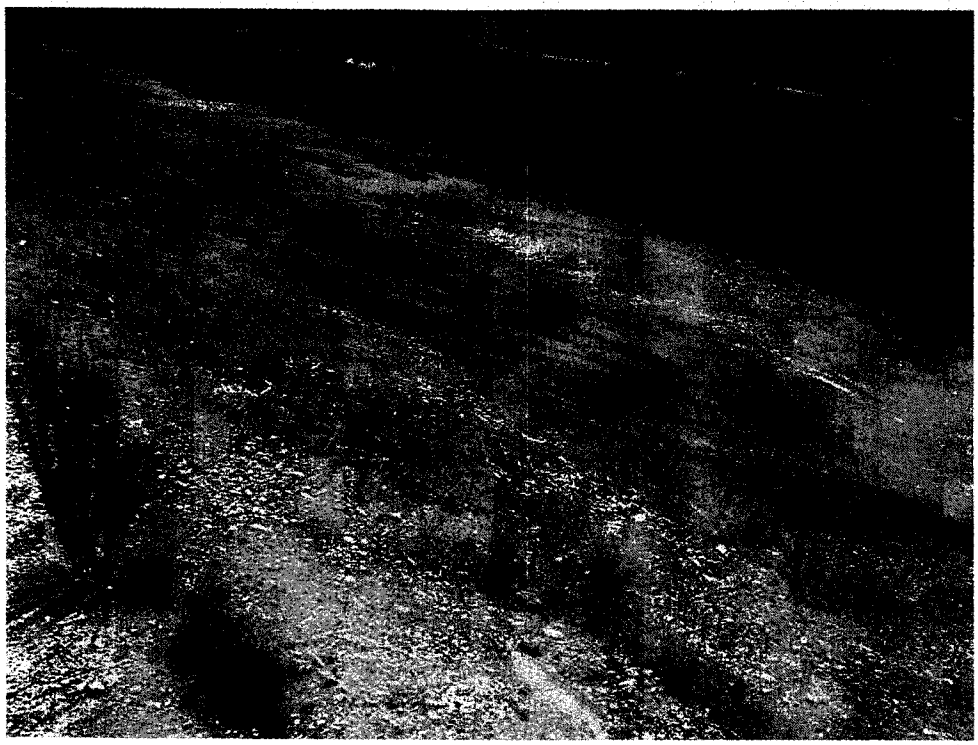
Attachment A

Picture 35. PAF-FP3-TP8 First Dike Lift

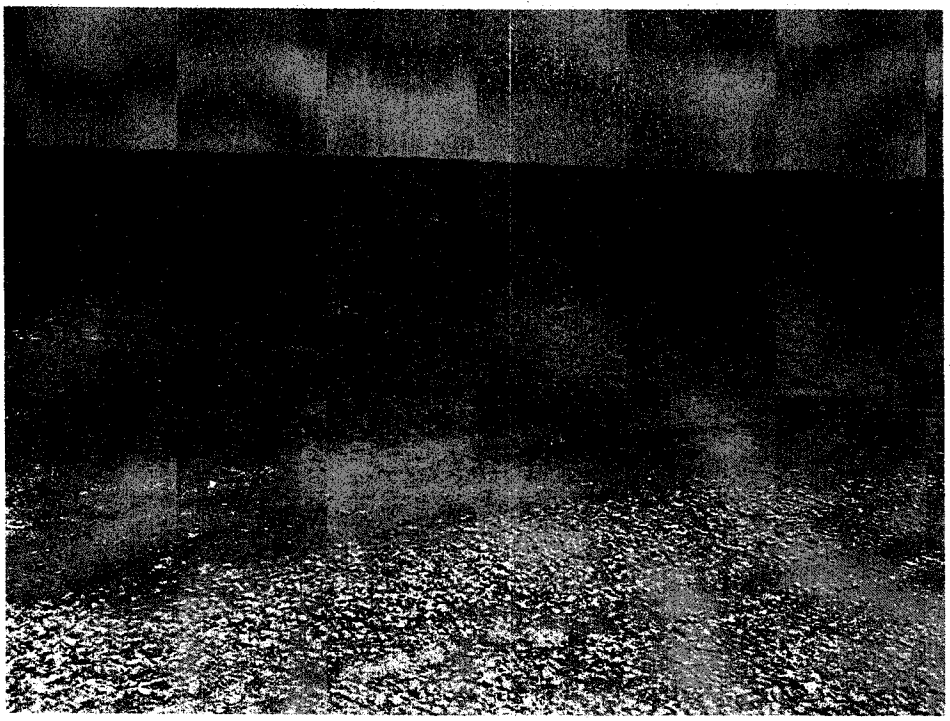


Picture 36. PAF-FP3-TP8 Top Dike Lift

Attachment A



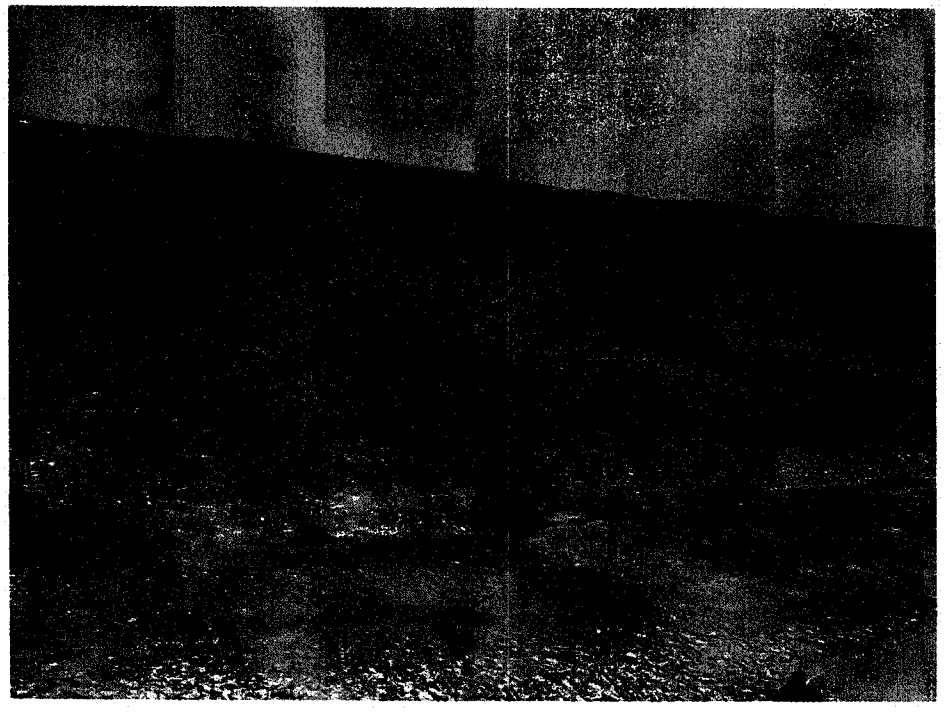
Picture 37. PAF-FP3-TP9 First Dike Lift



Picture 38. PAF-FP3-TP9 Top Dike Lift

Attachment A

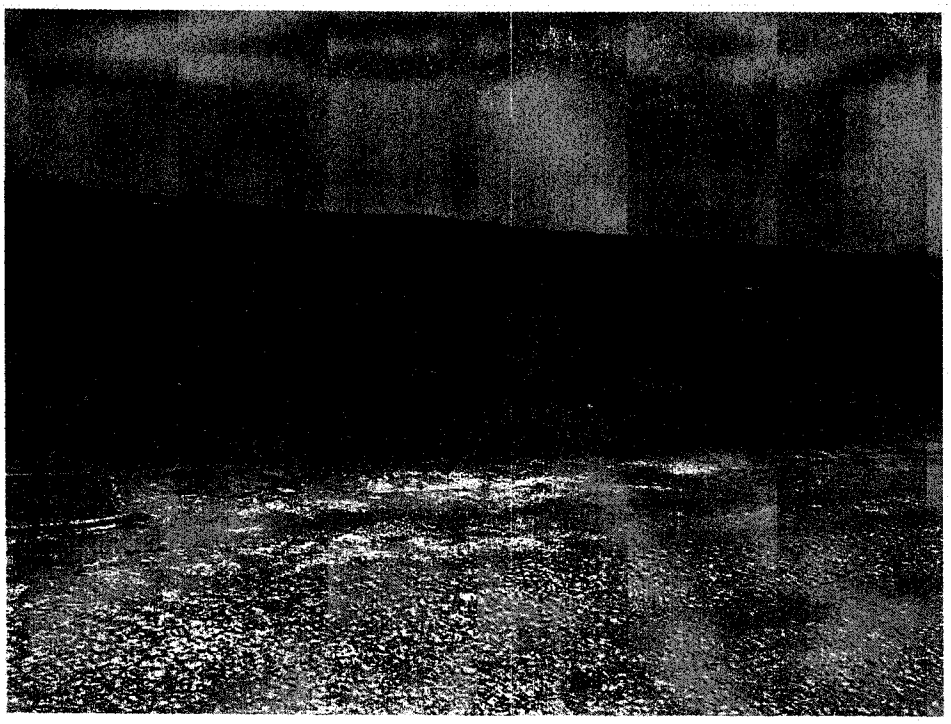
Picture 39. PAF-FP3-TP11 First Dike Lift



Picture 40. PAF-FP3-TP11 Top Dike Lift

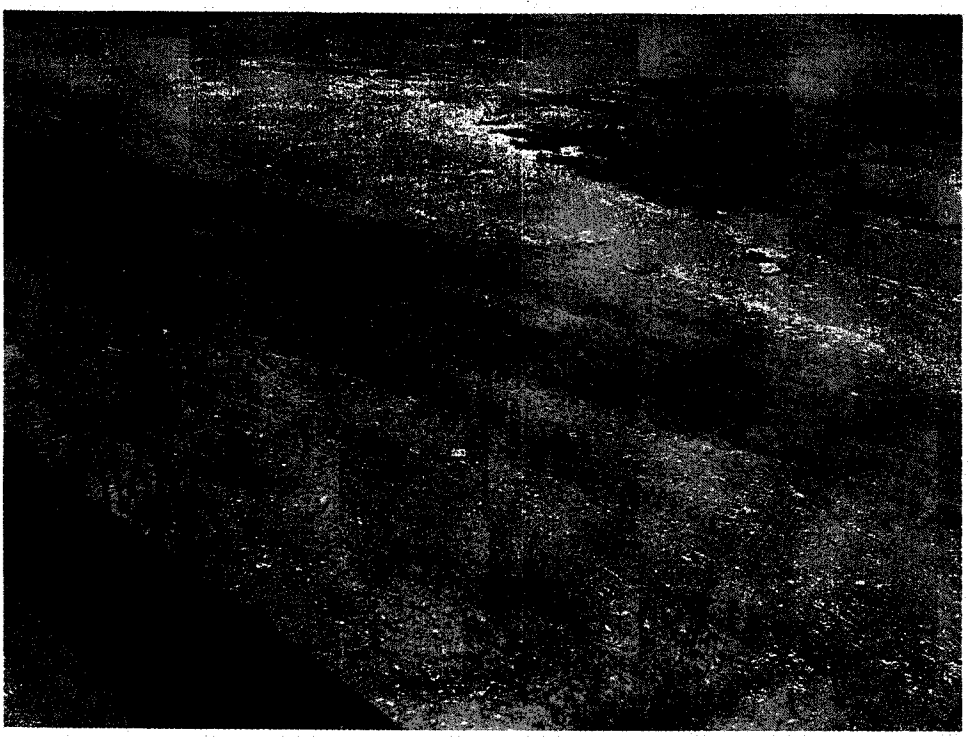
Attachment A

Picture 41. PAF-FP3-TP12 First Dike Lift

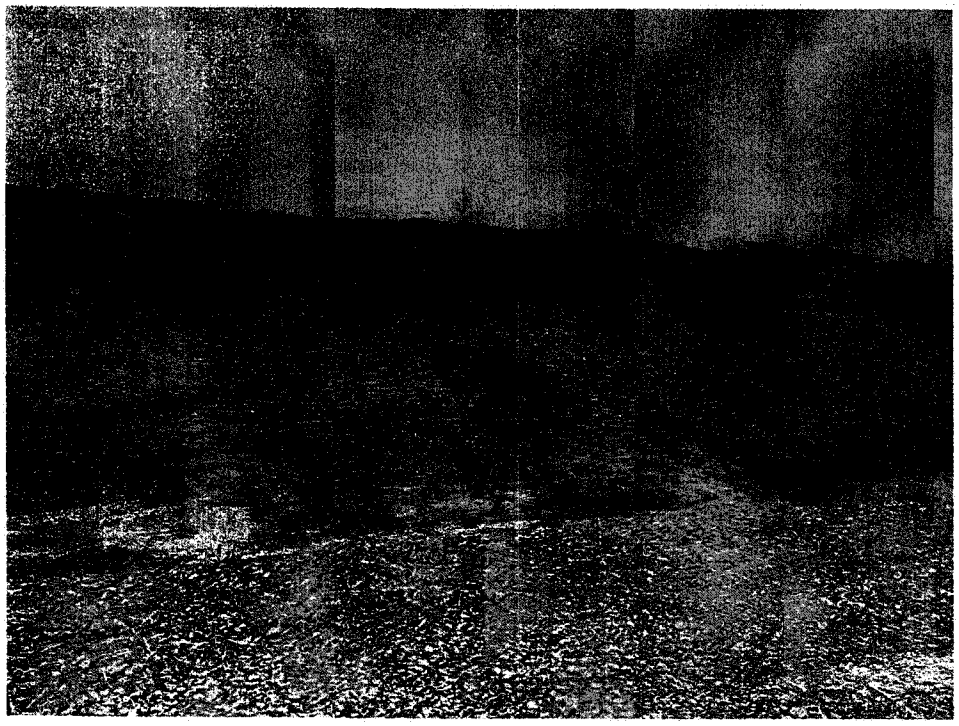


Picture 42. PAF-FP3-TP12 Top Dike Lift

Attachment A

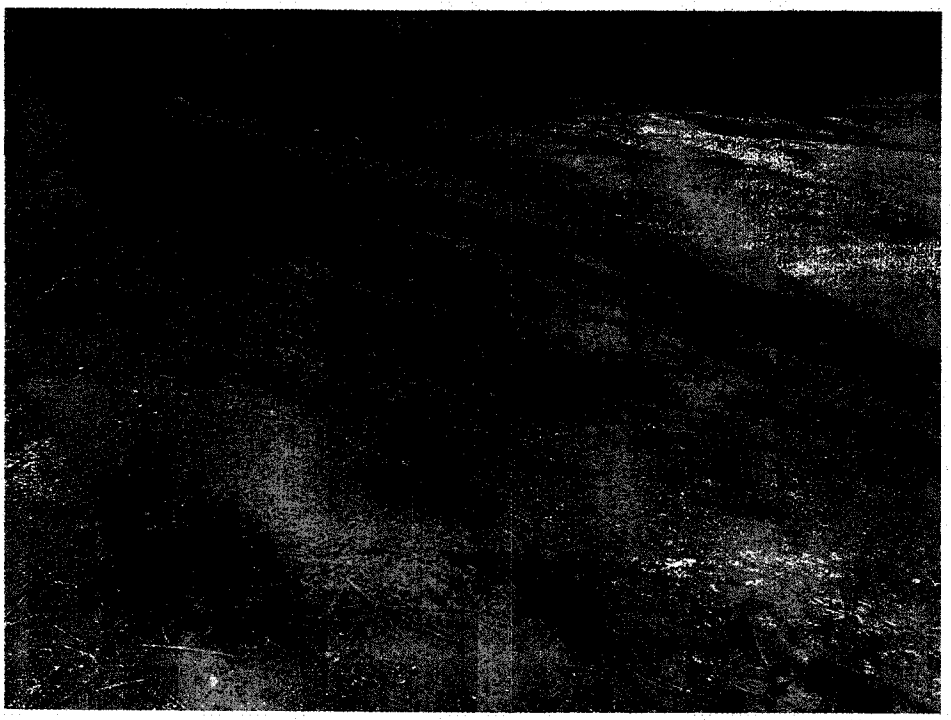


Picture 43. PAF-FP3-TP1 First Dike Lift

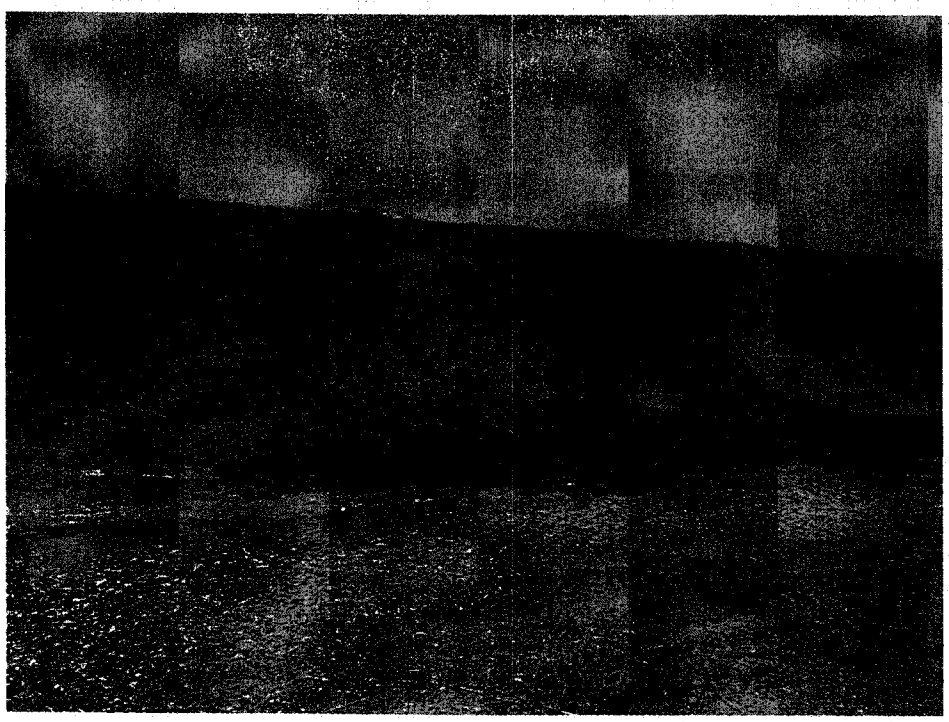


Picture 44. PAF-FP3-TP1 Top Dike Lift

Attachment A



Picture 45. PAF-FP3-TP2 First Dike Lift



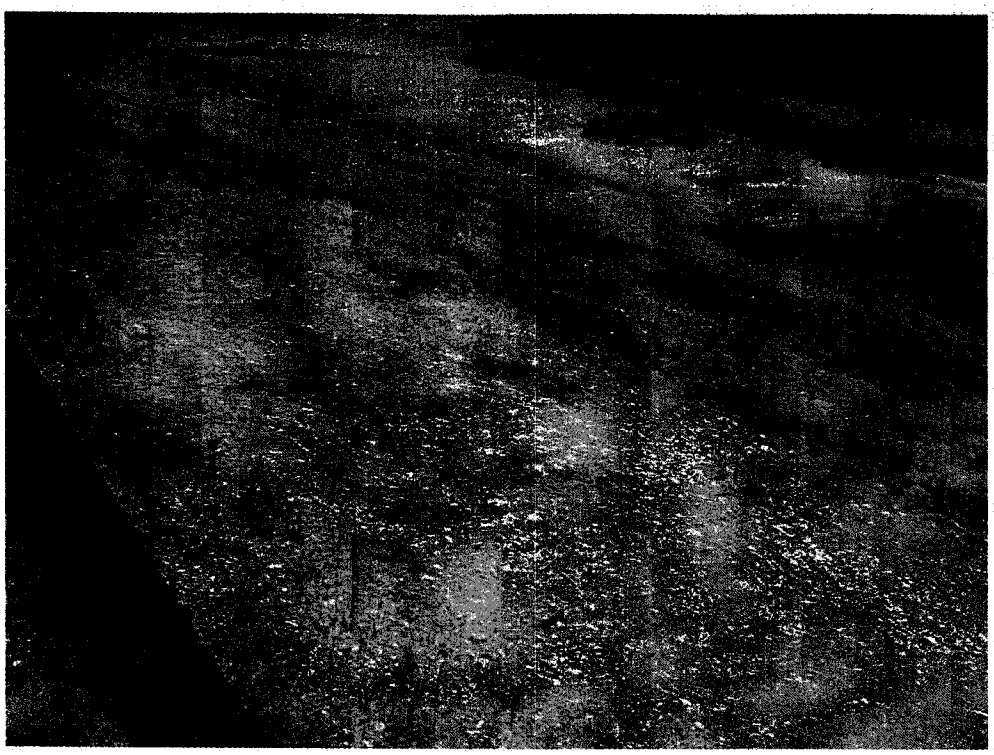
Picture 46. PAF-FP3-TP2 Top Dike Lift

Attachment A

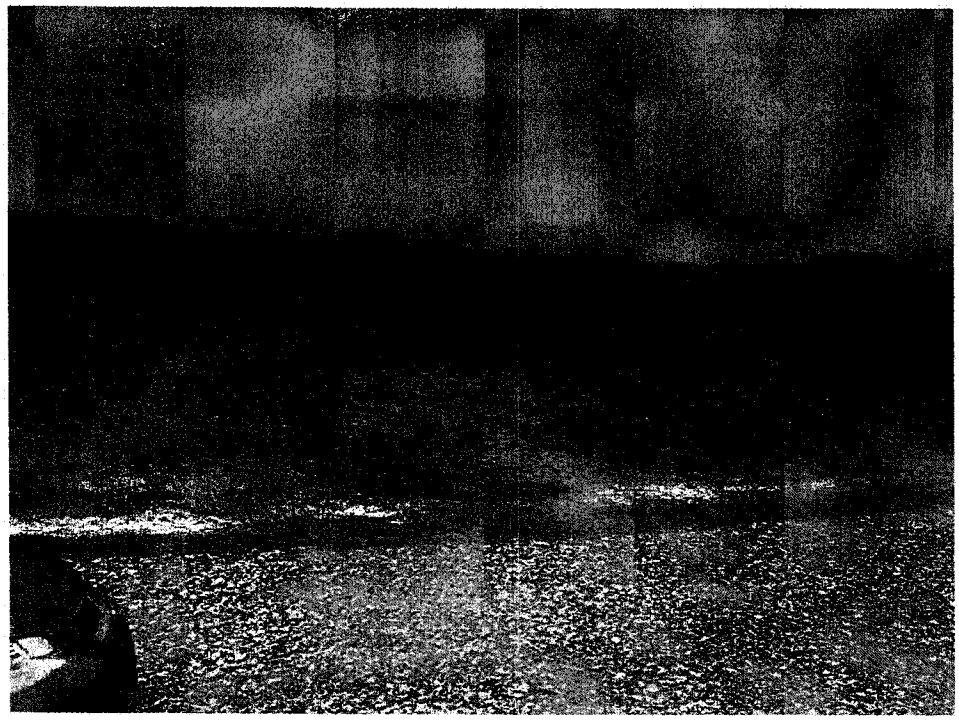
Picture 47. PAF-FP3-TP3 First Dike Lift

Picture 48. PAF-FP3-TP3 Top Dike Lift

Attachment A



Picture 49. PAF-FP3-TP4 First Dike Lift



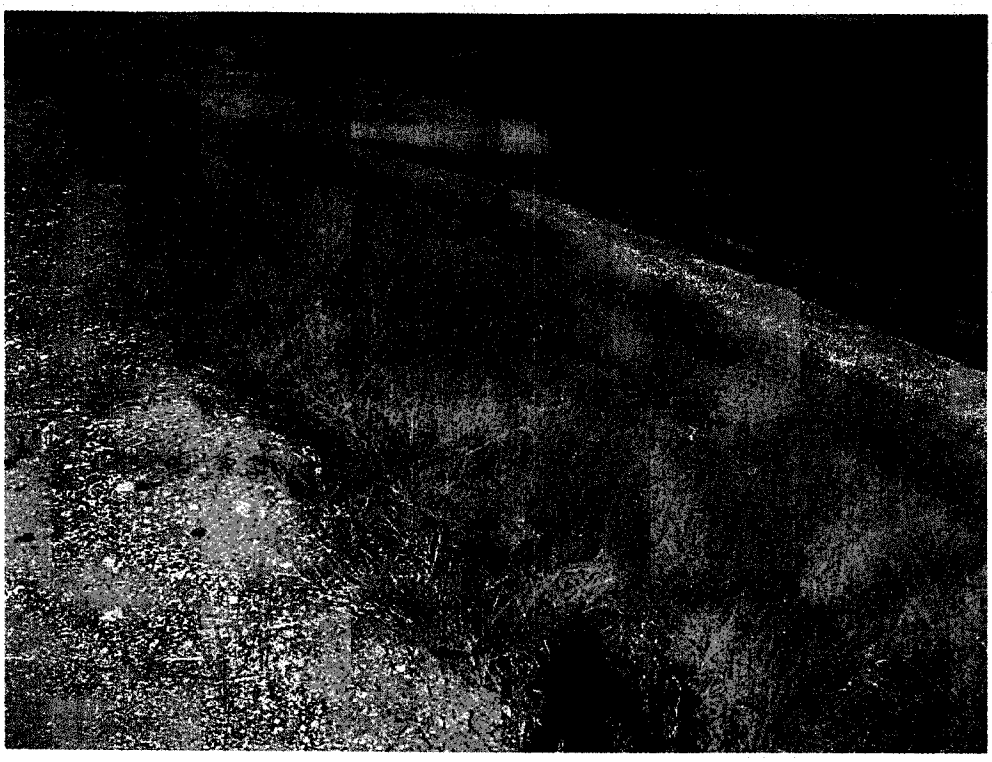
Picture 50. PAF-FP3-TP4 Top Dike Lift

Attachment A

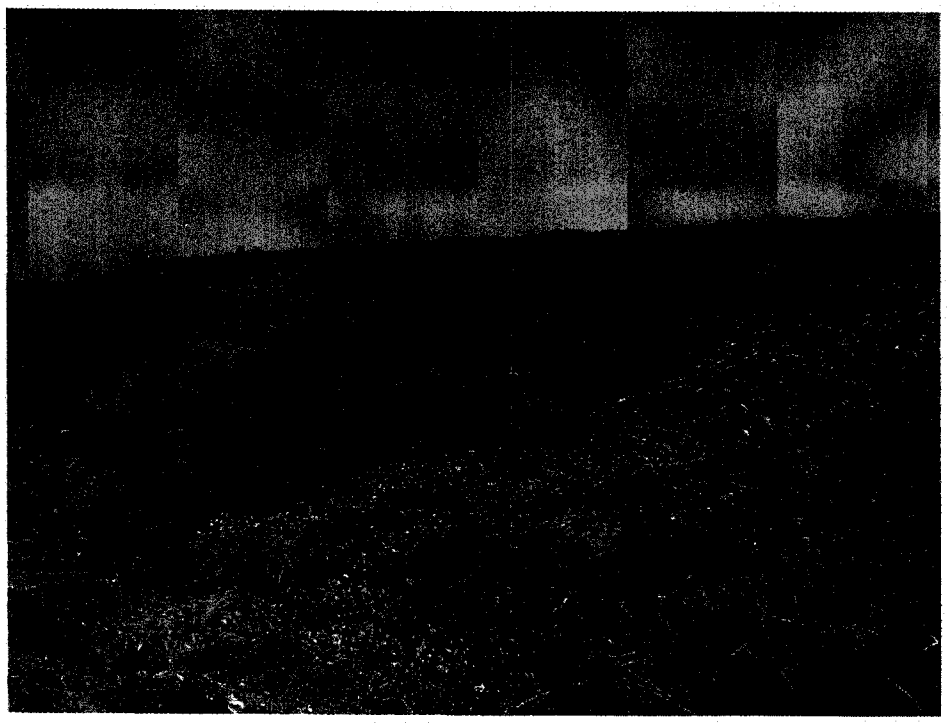
Picture 51. PAF-FP3-TP5 First Dike Lift

Picture 52. PAF-FP3-TP5 Top Dike Lift

Attachment A

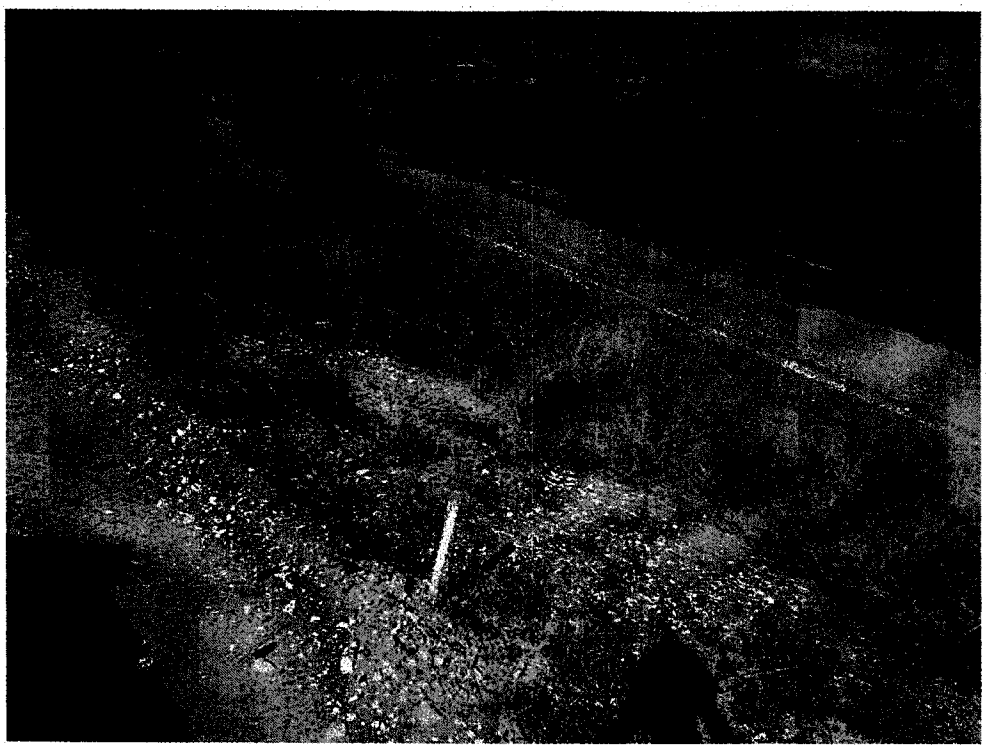


Picture 53. PAF-FP3-TP6 First Dike Lift

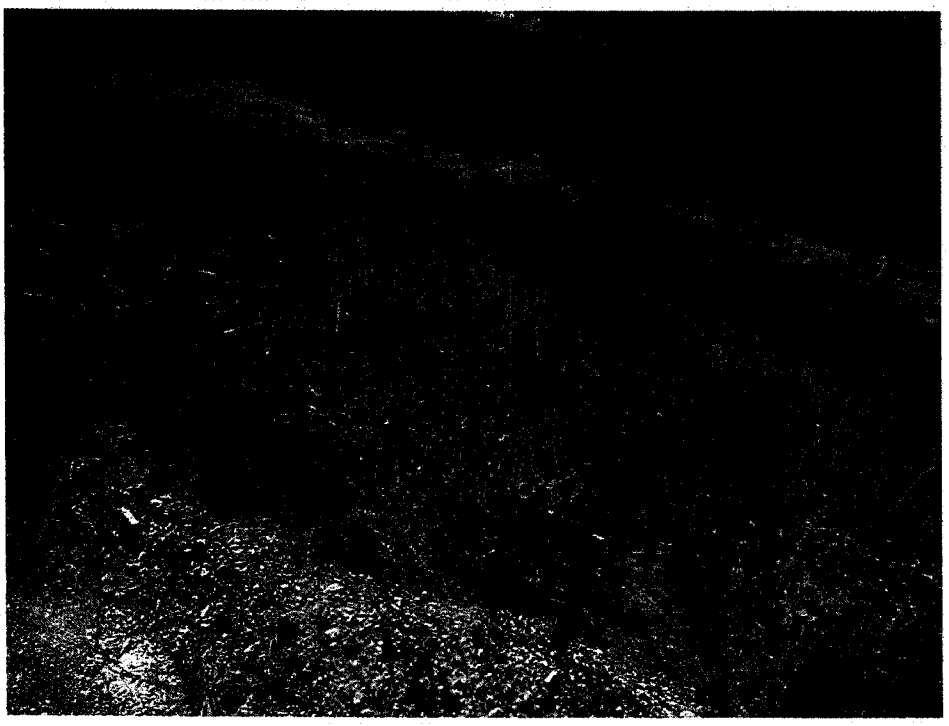


Picture 54. PAF-FP3-TP7 First Dike Lift

Attachment A



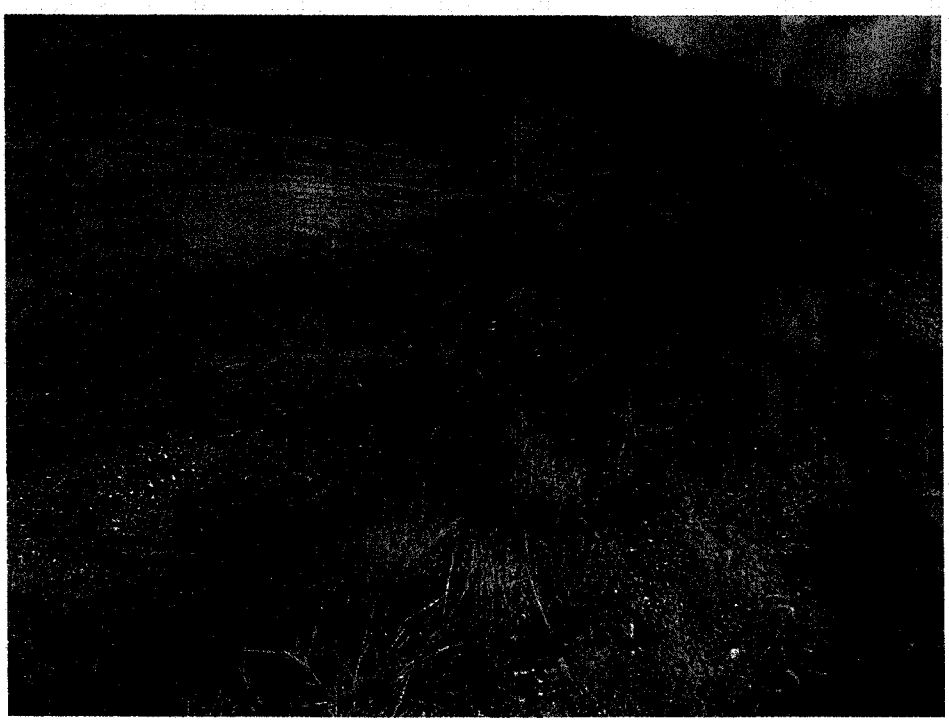
Picture 55. PAF-FP3-TP8 First Dike Lift



Picture 56. PAF-FP3-TP9 First Dike Lift

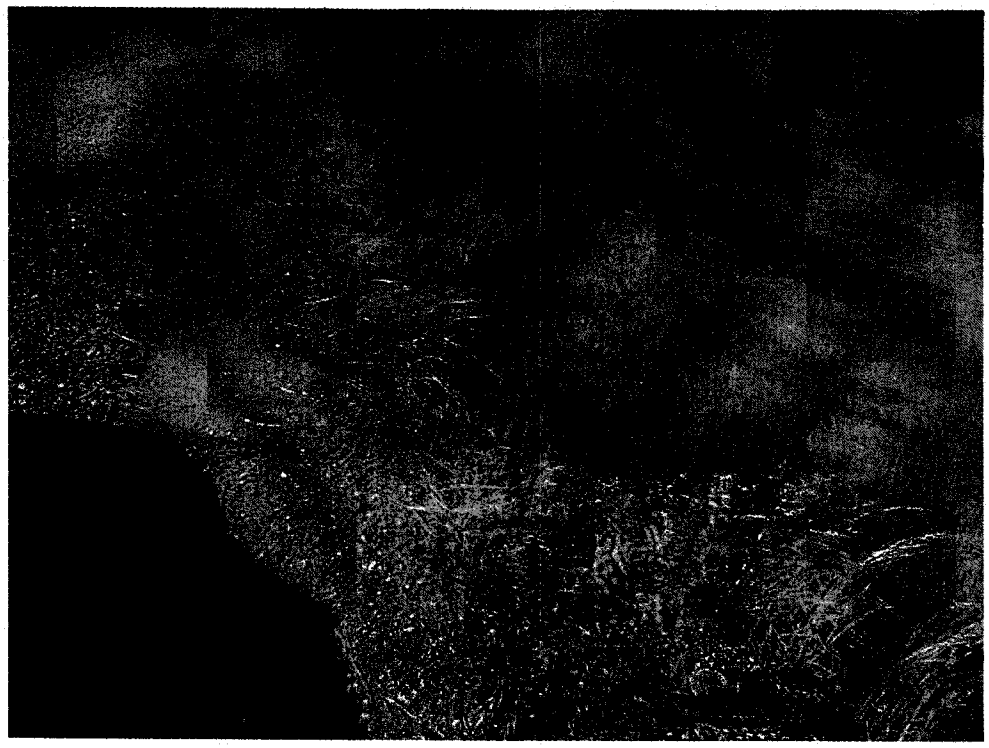
Attachment A

Picture 57. Area were the grass has come up wild in Top Dike Lift



Picture 58. PAF-FP3-TP1 First Dike Lift

Attachment A



Picture 59. PAF-FP3-TP2 First Dike Lift

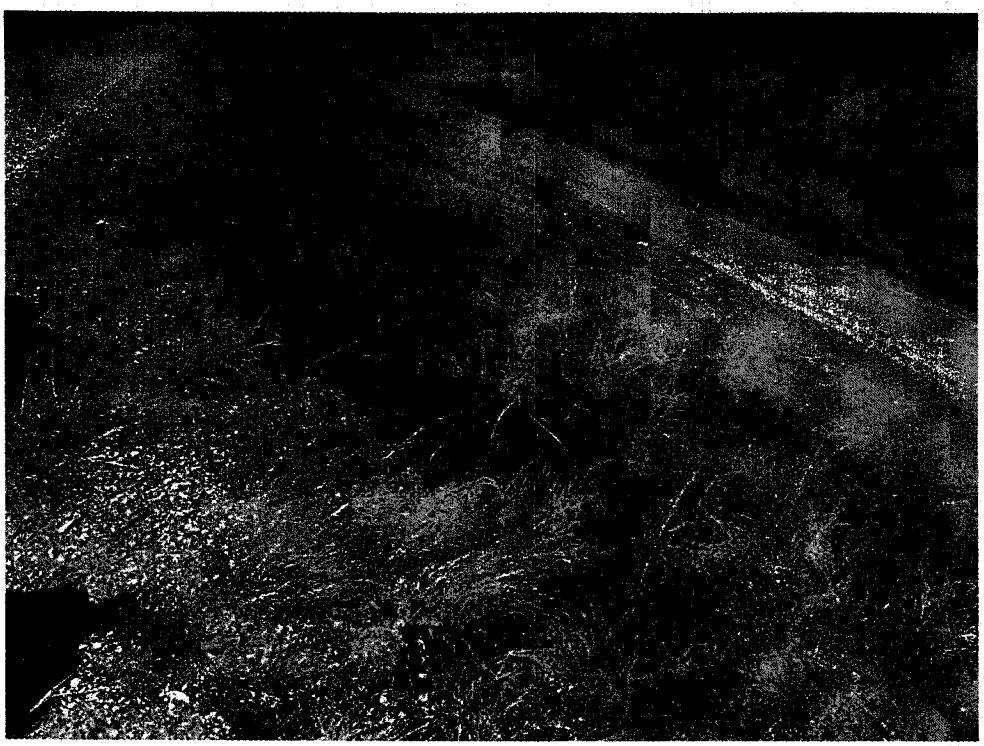
Picture 60. PAF-FP3-TP2 Last Dike Lift

Attachment A

Picture 61. PAF-FP3-TP3 First Dike Lift

Picture 62. PAF-FP3-TP4 First Dike Lift

Attachment A

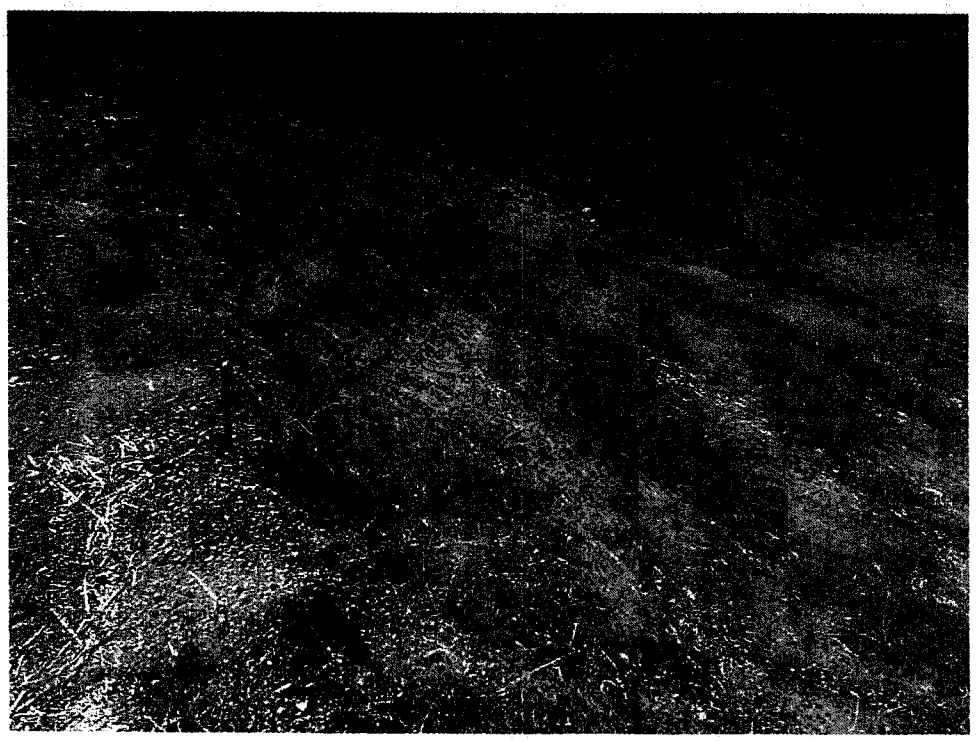


Picture 63. PAF-FP3-TP5 First Dike Lift

Picture 64. PAF-FP3-TP5 First Dike Lift

Attachment A

Picture 65. PAF-FP3-TP6 First Dike Lift



Picture 66. PAF-FP3-TP7 First Dike Lift

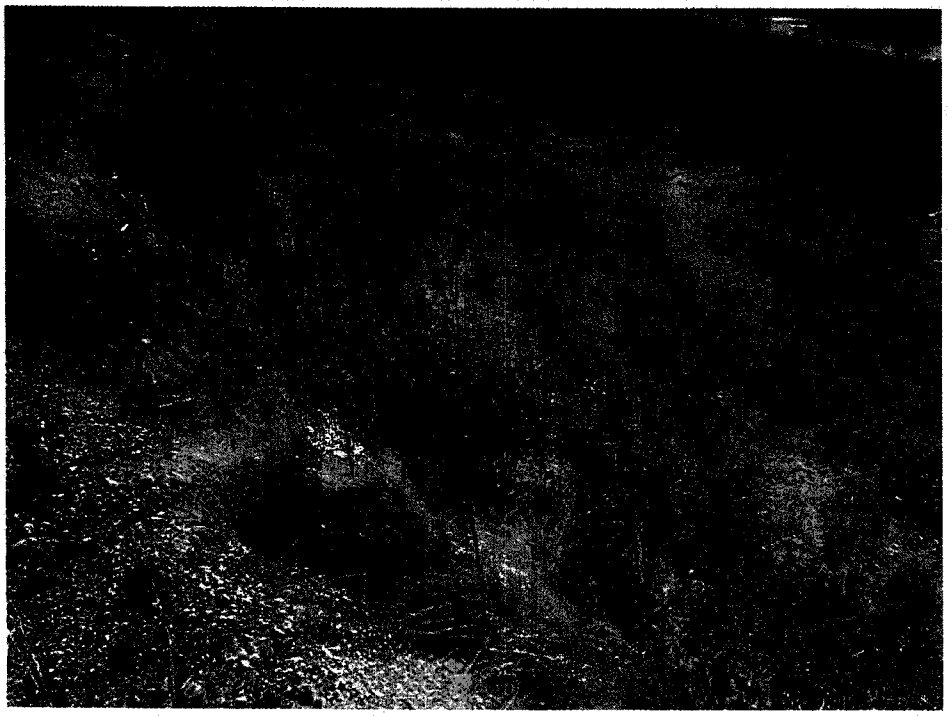
Attachment A

Picture 67. PAF-FP3-TP8 First Dike Lift

Picture 68. PAF-FP3-TP9 First Dike Lift

Attachment A

Picture 69. PAF-FP3-TP10 First Dike Lift



Picture 70. PAF-FP3-TP11 First Dike Lift

Attachment A

Picture 71. PAF-FP3-TP11 First Dike Lift

Picture 72. PAF-FP3-TP12 First Dike Lift

Attachment B

Lab Test Results

746. 050

REPORT TO: 11473
LESCO SERVICE CENTER #473
1339 EAST WEISGERBER
KNOXVILLE, TN 37909

TURF AND ORNAMENTAL SOIL TEST AND RECOMMENDATION REPORT

SUBMITTED BY/FOR: HENSLEY 201439

02/2[illegible]/05

CLC LABS
325 VENTURE DRIVE
WESTERVILLE, OHIO 43081
614 888-1663

REPORT REF. NUMBER	RESULTS OF ANALYSIS						CALCULATED VALUES						RESULTS OF ANALYSIS									
		Soil	Buffer	Pounds per Acre Available Nutrient				Cation Exchange Capacity	% Base Saturation					Pounds per Acre Available Nutrient								
	LAB NO.	pH	pH	P	K	Ca	Mg		K	Ca	Mg	H	Na	Fe	Mn	Zn	Cu					
1	50Z	4.1	7.02	5	34	808	144	2.7	1.6	75	22											
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11	AVERAGE RESULTS →			5	34	808	144	2.7	1.6	75	22											

DISPLAY OF AVERAGE RESULTS

SURPLUS																						
HIGH																						
MEDIUM																						
LOW	*	*	*	*	*	*	*	*	*	*	*	*										

REPORT REF. NUMBER	SAMPLE INFORMATION					FERTILIZER RECOMMENDATIONS IN LBS. PER 1,000 SQ. FT.								
	SAMPLE IDENTIFICATION	PLANT TYPE	AREA TYPE		FERT/ MAINT. LEVEL	LIME LBS/M	LIME TYPE	NITROGEN	APP. FREQ	P_2O_5	K_2O	Mg		COMMENTS
1	PAF-FP3-TP1	TALL FESCUE	RESID.	LAWN	EST.	35	Mg	0.75-1.0	M	6.0	4.5			See All
2														
3														
4														
5														
6														
7														
8														
9														
10														
11	RECOMMENDATIONS FOR AVERAGE RESULTS →							0.75-1.0	M	6.0	4.5			See All

SEE COMMENTS ON REVERSE SIDE

DUE TO VARIATIONS IN WEATHER, SOIL CONDITIONS AND CULTURAL PRACTICES, NO WARRANTY EITHER EXPRESSED OR IMPLIED IS MADE WITH RESPECT TO PLANT PERFORMANCE.

746.051

REPORT TO: 11473
LESCO SERVICE CENTER #473
1339 EAST WEISGERBER
KNOXVILLE, TN 37909

TURF AND ORNAMENTAL SOIL TEST AND RECOMMENDATION REPORT

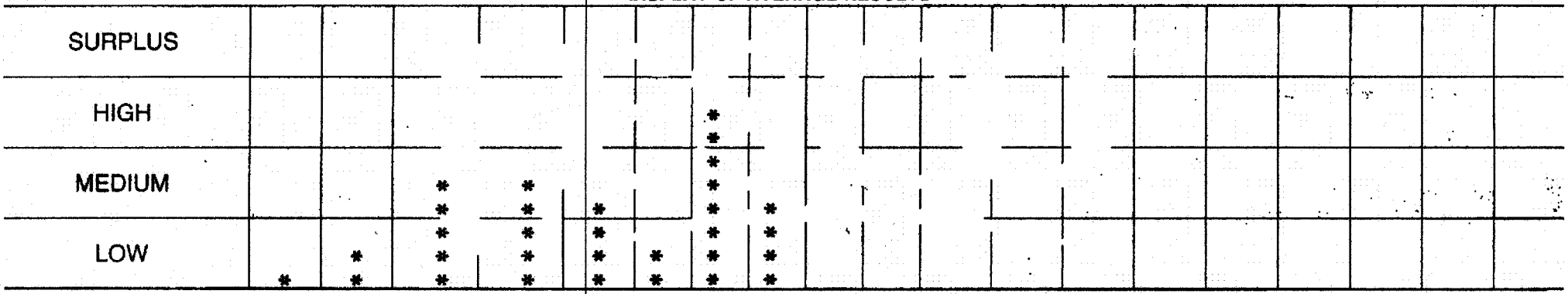
SUBMITTED BY/FOR: HENSLEY 201439

02/2[illegible]/05

CLC LABS
325 VENTURE DRIVE
WESTERVILLE, OHIO 43081
614 888-1663

REPORT REF. NUMBER / LAB NO.	RESULTS OF ANALYSIS: Soil pH	Buffer pH	Pounds per Acre Available Nutrient: P	K	Ca	Mg	CALCULATED VALUES: Cation Exchange Capacity	% Base Saturation: K	Ca	Mg	H	Na	RESULTS OF ANALYSIS: Pounds per Acre Available Nutrient: Fe	Mn	Zn	Cu
1 51Z	6.7		5	78	4504	460	13.3	0.8	85	14						
2																
3																
4																
5																
6																
7																
8																
9																
10																
11 AVERAGE RESULTS →			5	78	4504	460	13.3	0.8	85	14						

DISPLAY OF AVERAGE RESULTS



REPORT REF. NUMBER / SAMPLE IDENTIFICATION	SAMPLE INFORMATION: PLANT TYPE	AREA TYPE		FERT/ MAINT. LEVEL	FERTILIZER RECOMMENDATIONS IN LBS. PER 1,000 SQ. FT.: LIME LBS/M	LIME TYPE	NITROGEN	APP. FREQ	P_2O_5	K_2O	Mg	COMMENTS
1 PAF-FP3-TP2	TALL FESCUE	RESID.	LAWN	EST.			0.75-1.0	M	6.0	3.0		See All
2												
3												
4												
5												
6												
7												
8												
9												
10												
11 RECOMMENDATIONS FOR AVERAGE RESULTS →							0.75-1.0	M	6.0	3.0		See All

SEE COMMENTS ON REVERSE SIDE

DUE TO VARIATIONS IN WEATHER, SOIL CONDITIONS AND CULTURAL PRACTICES, NO WARRANTY EITHER EXPRESSED OR IMPLIED IS MADE WITH RESPECT TO PLANT PERFORMANCE.

746. 052

REPORT TO: 11473
LESCO SERVICE CENTER #473
1339 EAST WEISGERBER
KNOXVILLE, TN 37909

TURF AND ORNAMENTAL SOIL TEST AND RECOMMENDATION REPORT

SUBMITTED BY/FOR: HENSLEY 201439

02/25/05

CLC LAB
325 VENTURE DRIVE
WESTERVILLE, OHIO 43081
614 888-1663

REPORT REF. NUMBER	RESULTS OF ANALYSIS						CALCULATED VALUES						RESULTS OF ANALYSIS									
		Soil	Buffer	Pounds per Acre Available Nutrient				Cation Exchange Capacity	% Base Saturation					Pounds per Acre Available Nutrient								
	LAB NO.	pH	pH	P	K	Ca	Mg		K	Ca	Mg	H	Na	Fe	Mn	Zn	Cu					
1	52Z	7.3		5	92	7711	421	21.1	0.6	91	8											
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11	AVERAGE RESULTS →			5	92	7711	421	21.1	0.6	91	8											

DISPLAY OF AVERAGE RESULTS

SURPLUS										*												
HIGH				*						*												
MEDIUM				*		*		*		*												
				*		*		*		*												
LOW				*		*		*		*												
		*		*		*		*	*	*	*											
	*		*		*		*		*		*											

REPORT REF. NUMBER	SAMPLE INFORMATION					FERTILIZER RECOMMENDATIONS IN LBS. PER 1,000 SQ. FT.																
	SAMPLE IDENTIFICATION	PLANT TYPE	AREA TYPE		FERT/ MAINT. LEVEL	LIME LBS/M	LIME TYPE	NITROGEN	APP. FREQ	P_2O_5	K_2O	Mg										COMMENTS
1	PAF-FP3-TP3	TALL FESCUE	RESID.	LAWN	EST.			0.75-1.0	M	6.0	3.25	3.0										See All
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11	RECOMMENDATIONS FOR AVERAGE RESULTS →							0.75-1.0	M	6.0	3.25	3.0										See All

SEE COMMENTS ON REVERSE SIDE

DUE TO VARIATIONS IN WEATHER, SOIL CONDITIONS AND CULTURAL PRACTICES, NO WARRANTY EITHER EXPRESSED OR IMPLIED IS MADE WITH RESPECT TO PLANT PERFORMANCE.

746. 053

REPORT TO: 11473
LESCO SERVICE CENTER #473
1339 EAST WEISGERBER
KNOXVILLE, TN 37909

TURF AND ORNAMENTAL SOIL TEST AND RECOMMENDATION REPORT

SUBMITTED BY/FOR: HENSLEY 201439

02/2[illegible]05

CLC LABS
325 VENTURE DRIVE
WESTERVILLE, OHIO 43081
614 888-1663

REPORT REF. NUMBER	RESULTS OF ANALYSIS						CALCULATED VALUES						RESULTS OF ANALYSIS			
			Pounds per Acre Available Nutrient				Cation Exchange Capacity	% Base Saturation					Pounds per Acre Available Nutrient			
LAB NO.	Soil pH	Buffer pH	P	K	Ca	Mg		K	Ca	Mg	H	Na	Fe	Mn	Zn	Cu
1 53Z	2.9	6.33	5	41	2203	382	15.2	0.3	36	10	52.9					
2																
3																
4																
5																
6																
7																
8																
9																
10																
11 AVERAGE RESULTS →			5	41	2203	382	15.2	0.3	36	10	52.9					

DISPLAY OF AVERAGE RESULTS

	P	K	Ca	Mg	CEC	K	Ca	Mg	H	Na
SURPLUS									*	
HIGH									*	
MEDIUM			*	*					*	
			*	*	*			*	*	
LOW			*	*	*		*	*	*	
	*	*	*	*	*	*	*	*	*	

REPORT REF. NUMBER	SAMPLE INFORMATION				FERTILIZER RECOMMENDATIONS IN LBS. PER 1,000 SQ. FT.							
	SAMPLE IDENTIFICATION	PLANT TYPE	AREA TYPE	FERT/ MAINT. LEVEL	LIME LBS/M	LIME TYPE	NITROGEN	APP. FREQ	P_2O_5	K_2O	Mg	COMMENTS
1	PAF-FP3-TP4	TALL FESCUE	RESID. LAWN	EST.	125	Mg	0.75-1.0	M	6.0	4.0		See All
2												
3												
4												
5												
6												
7												
8												
9												
10												
11 RECOMMENDATIONS FOR AVERAGE RESULTS →							0.75-1.0	M	6.0	4.0		See All

SEE COMMENTS ON REVERSE SIDE

DUE TO VARIATIONS IN WEATHER, SOIL CONDITIONS AND CULTURAL PRACTICES, NO WARRANTY EITHER EXPRESSED OR IMPLIED IS MADE WITH RESPECT TO PLANT PERFORMANCE.

746.054

REPORT TO: 11473
LESCO SERVICE CENTER #473
1339 EAST WEISGERBER
KNOXVILLE, TN 37909

TURF AND ORNAMENTAL SOIL TEST AND RECOMMENDATION REPORT

SUBMITTED BY/FOR: HENSLEY 201439

02/25/05

CLC LAB
325 VENTURE DRIVE
WESTERVILLE, OHIO 43081
614 888-1663

REPORT REF. NUMBER / LAB NO.	RESULTS OF ANALYSIS: Soil pH	Buffer pH	Pounds per Acre Available Nutrient: P	K	Ca	Mg	CALCULATED VALUES: Cation Exchange Capacity	% Base Saturation: K	Ca	Mg	H	Na	RESULTS OF ANALYSIS: Pounds per Acre Available Nutrient: Fe	Mn	Zn	Cu
1 54Z	7.3		5	92	5092	157	13.5	0.9	94	5						
2																
3																
4																
5																
6																
7																
8																
9																
10																
11 AVERAGE RESULTS →			5	92	5092	157	13.5	0.9	94	5						

DISPLAY OF AVERAGE RESULTS

	P	K	Ca	Mg	Cation Exchange Capacity	K	Ca	Mg
SURPLUS							*	
HIGH							*	
MEDIUM			*				*	
			*	*	*		*	
LOW			*	*	*		*	
		*	*	*	*	*	*	*
	*	*	*	*	*	*	*	*

REPORT REF. NUMBER / SAMPLE IDENTIFICATION	SAMPLE INFORMATION: PLANT TYPE	AREA TYPE		FERT/ MAINT. LEVEL	LIME LBS/M	LIME TYPE	FERTILIZER RECOMMENDATIONS IN LBS. PER 1,000 SQ. FT.: NITROGEN	APP. FREQ	P_2O_5	K_2O	Mg	COMMENTS
1 PAF-FP3-TP5	TALL FESCUE	RESID.	LAWN	EST.			0.75-1.0	M	6.0	3.0	4.5	See All
2												
3												
4												
5												
6												
7												
8												
9												
10												
11 RECOMMENDATIONS FOR AVERAGE RESULTS →							0.75-1.0	M	6.0	3.0	4.5	See All

SEE COMMENTS ON REVERSE SIDE

DUE TO VARIATIONS IN WEATHER, SOIL CONDITIONS AND CULTURAL PRACTICES, NO WARRANTY EITHER EXPRESSED OR IMPLIED IS MADE WITH RESPECT TO PLANT PERFORMANCE.

746. 055

REPORT TO: 11473
LESCO SERVICE CENTER #473
1339 EAST WEISGERBER
KNOXVILLE, TN 37909

TURF AND ORNAMENTAL SOIL TEST AND RECOMMENDATION REPORT

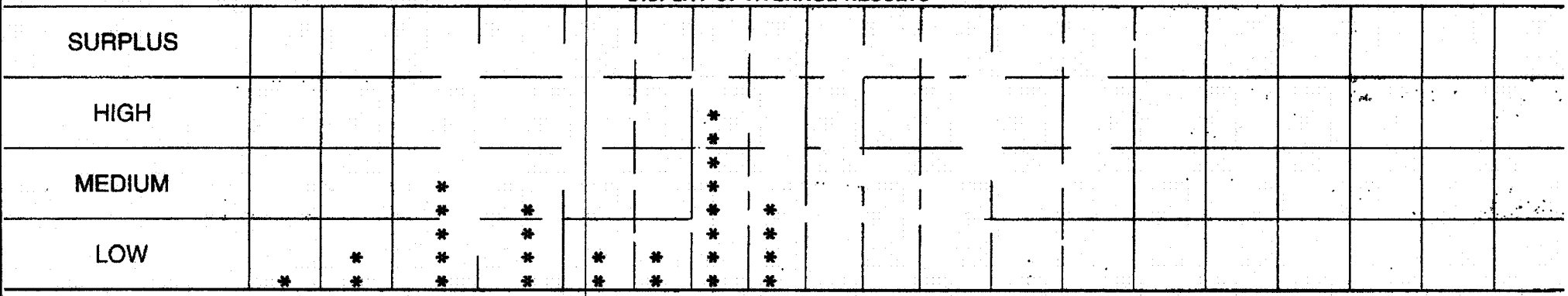
SUBMITTED BY/FOR: HENSLEY 201439

02/25/05

CLC LAB
325 VENTURE DRIVE
WESTERVILLE, OHIO 43081
614 888-1663

REPORT REF. NUMBER	RESULTS OF ANALYSIS						CALCULATED VALUES						RESULTS OF ANALYSIS				
			Pounds per Acre Available Nutrient				Cation Exchange Capacity	% Base Saturation					Pounds per Acre Available Nutrient				
LAB NO.	Soil pH	Buffer pH	P	K	Ca	Mg		K	Ca	Mg	H	Na	Fe	Mn	Zn	Cu	
1 55Z	6.3		6	74	3280	282	9.5	1.0	86	12							
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11 AVERAGE RESULTS →			6	74	3280	282	9.5	1.0	86	12							

DISPLAY OF AVERAGE RESULTS



REPORT REF. NUMBER	SAMPLE INFORMATION				FERTILIZER RECOMMENDATIONS IN LBS. PER 1,000 SQ. FT.							
SAMPLE IDENTIFICATION	PLANT TYPE	AREA TYPE		FERT/ MAINT. LEVEL	LIME LBS/M	LIME TYPE	NITROGEN	APP. FREQ	P_2O_5	K_2O	Mg	COMMENTS
1 PAF-FP3-TP6	TALL FESCUE	RESID.	LAWN	EST.			0.75-1.0	M	6.0	3.0		See All
2												
3												
4												
5												
6												
7												
8												
9												
10												
11 RECOMMENDATIONS FOR AVERAGE RESULTS →							0.75-1.0	M	6.0	3.0		See All

SEE COMMENTS ON REVERSE SIDE

DUE TO VARIATIONS IN WEATHER, SOIL CONDITIONS AND CULTURAL PRACTICES, NO WARRANTY EITHER EXPRESSED OR IMPLIED IS MADE WITH RESPECT TO PLANT PERFORMANCE.

746.056

REPORT TO: 11473
LESCO SERVICE CENTER #473
1339 EAST WEISGERBER
KNOXVILLE, TN 37909

TURF AND ORNAMENTAL SOIL TEST AND RECOMMENDATION REPORT

SUBMITTED BY/FOR: HENSLEY 201439

02/2[illegible]05

CLC LABS
325 VENTURE DRIVE
WESTERVILLE, OHIO 43081
614 888-1663

REPORT REF. NUMBER	RESULTS OF ANALYSIS						CALCULATED VALUES						RESULTS OF ANALYSIS									
			Pounds per Acre Available Nutrient					% Base Saturation					Pounds per Acre Available Nutrient									
LAB NO.	Soil pH	Buffer pH	P	K	Ca	Mg	Cation Exchange Capacity	K	Ca	Mg	H	Na	Fe	Mn	Zn	Cu						
1 56Z	4.1	6.33	15	44	6463	306	25.5	0.2	63		531.5											
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11 AVERAGE RESULTS →			15	44	6463	306	25.5	0.2	63		531.5											

DISPLAY OF AVERAGE RESULTS

	P	K	Ca	Mg	CEC	K	Ca	Mg	H	Na
SURPLUS									*	
HIGH			*		*				*	
MEDIUM			*		*				*	
			*	*	*		*		*	
LOW			*	*	*		*		*	
	*		*	*	*		*	*	*	
	*	*	*	*	*	*	*	*	*	

REPORT REF. NUMBER	SAMPLE INFORMATION				FERTILIZER RECOMMENDATIONS IN LBS. PER 1,000 SQ. FT.							
SAMPLE IDENTIFICATION	PLANT TYPE	AREA TYPE	FERT/ MAINT. LEVEL	LIME LBS/M	LIME TYPE	NITROGEN	APP. FREQ	P_2O_5	K_2O	Mg		COMMENTS
1 PAF-FP3-TP7	TALL FESCUE	RESID. LAWN	EST.	125	Mg	0.75-1.0	M	6.0	4.5			See All
2												
3												
4												
5												
6												
7												
8												
9												
10												
11 RECOMMENDATIONS FOR AVERAGE RESULTS →						0.75-1.0	M	6.0	4.5			See All

SEE COMMENTS ON REVERSE SIDE

DUE TO VARIATIONS IN WEATHER, SOIL CONDITIONS AND CULTURAL PRACTICES, NO WARRANTY EITHER EXPRESSED OR IMPLIED IS MADE WITH RESPECT TO PLANT PERFORMANCE.

746.045

REPORT TO: 11473
LESCO SERVICE CENTER #473
1339 EAST WEISGERBER
KNOXVILLE, TN 37909

TURF AND ORNAMENTAL SOIL TEST AND RECOMMENDATION REPORT

SUBMITTED BY/FOR: HENSLEY 201439

02/2[illegible]/05

CLC LABS
325 VENTURE DRIVE
WESTERVILLE, OHIO 43081
614 888-1663

REPORT REF. NUMBER	RESULTS OF ANALYSIS						CALCULATED VALUES						RESULTS OF ANALYSIS			
			Pounds per Acre Available Nutrient					% Base Saturation					Pounds per Acre Available Nutrient			
LAB NO.	Soil pH	Buffer pH	P	K	Ca	Mg	Cation Exchange Capacity	K	Ca	Mg	H	Na	Fe	Mn	Zn	Cu
1 452	3.7	6.42	5	98	1322	196	11.2	1.1	30		762.1					
2																
3																
4																
5																
6																
7																
8																
9																
10																
11 AVERAGE RESULTS →			5	98	1322	196	11.2	1.1	30		762.1					

DISPLAY OF AVERAGE RESULTS

	P	K	Ca	Mg					H										
SURPLUS									*										
HIGH									*										
MEDIUM			*	*	*				*										
LOW		*	*	*	*	*	*	*	*										
	*	*	*	*	*	*	*	*	*										

REPORT REF. NUMBER	SAMPLE INFORMATION				FERTILIZER RECOMMENDATIONS IN LBS. PER 1,000 SQ. FT.								
SAMPLE IDENTIFICATION	PLANT TYPE	AREA TYPE		FERT/ MAINT. LEVEL	LIME LBS/M	LIME TYPE	NITROGEN	APP. FREQ	P_2O_5	K_2O	Mg		COMMENTS
1 PAF-FP3-TP8	TALL FESCUE	RESID.	LAWN	EST.	100	Mg	0.75-1.0	M	6.0	3.0			See All
2													
3													
4													
5													
6													
7													
8													
9													
10													
11 RECOMMENDATIONS FOR AVERAGE RESULTS →							0.75-1.0	M	6.0	3.0			See All

SEE COMMENTS ON REVERSE SIDE

DUE TO VARIATIONS IN WEATHER, SOIL CONDITIONS AND CULTURAL PRACTICES, NO WARRANTY EITHER EXPRESSED OR IMPLIED IS MADE WITH RESPECT TO PLANT PERFORMANCE.

746.046

REPORT TO: 11473
LESCO SERVICE CENTER #473
1339 EAST WEISGERBER
KNOXVILLE, TN 37909

TURF AND ORNAMENTAL SOIL TEST AND RECOMMENDATION REPORT

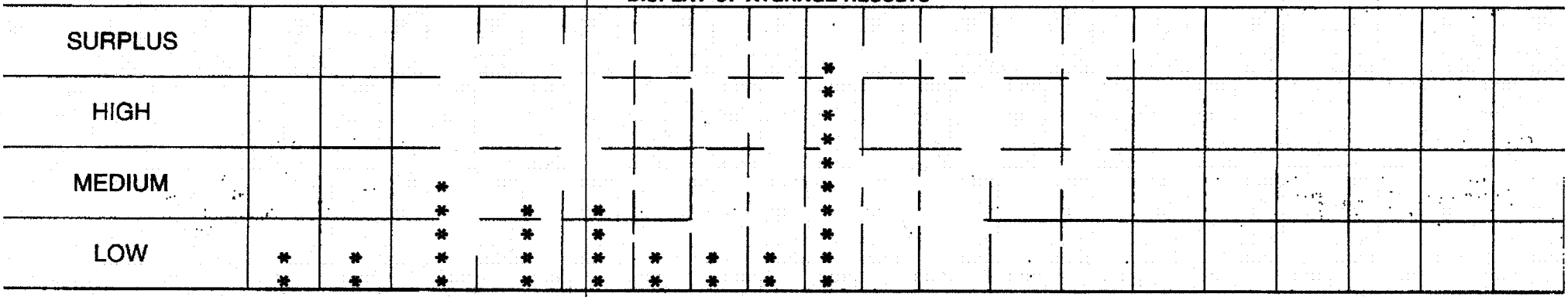
SUBMITTED BY/FOR: HENSLEY 201439

02/2[illegible]05

CLC LABS
325 VENTURE DRIVE
WESTERVILLE, OHIO 43081
614 888-1663

REPORT REF. NUMBER / LAB NO.	RESULTS OF ANALYSIS: Soil pH	Buffer pH	Pounds per Acre Available Nutrient: P	K	Ca	Mg	CALCULATED VALUES: Cation Exchange Capacity	% Base Saturation: K	Ca	Mg	H	Na	RESULTS OF ANALYSIS: Pounds per Acre Available Nutrient: Fe	Mn	Zn	Cu
1 46Z	3.8	6.53	12	62	3329	215	14.9	0.5	56		637.9					
2																
3																
4																
5																
6																
7																
8																
9																
10																
11 AVERAGE RESULTS →			12	62	3329	215	14.9	0.5	56		637.9					

DISPLAY OF AVERAGE RESULTS



REPORT REF. NUMBER / SAMPLE IDENTIFICATION	SAMPLE INFORMATION: PLANT TYPE	AREA TYPE		FERT/ MAINT. LEVEL	LIME LBS/M	LIME TYPE	FERTILIZER RECOMMENDATIONS IN LBS. PER 1,000 SQ. FT.: NITROGEN	APP. FREQ	P_2O_5	K_2O	Mg	COMMENTS
1 PAF-FP3-TP9	TALL FESCUE	RESID.	LAWN	EST.	85	Mg	0.75-1.0	M	6.0	3.0		See All
2												
3												
4												
5												
6												
7												
8												
9												
10												
11 RECOMMENDATIONS FOR AVERAGE RESULTS →							0.75-1.0	M	6.0	3.0		See All

SEE COMMENTS ON REVERSE SIDE

DUE TO VARIATIONS IN WEATHER, SOIL CONDITIONS AND CULTURAL PRACTICES, NO WARRANTY EITHER EXPRESSED OR IMPLIED IS MADE WITH RESPECT TO PLANT PERFORMANCE.

746.047

REPORT TO: 11473
LESCO SERVICE CENTER #473
1339 EAST WEISGERBER
KNOXVILLE, TN 37909

TURF AND ORNAMENTAL SOIL TEST AND RECOMMENDATION REPORT

SUBMITTED BY/FOR: HENSLEY 201439

02/25/05

CLC LABS
325 VENTURE DRIVE
WESTERVILLE, OHIO 43081
614 888-1663

REPORT REF. NUMBER / LAB NO.	RESULTS OF ANALYSIS: Soil pH	Buffer pH	Pounds per Acre Available Nutrient: P	K	Ca	Mg	CALCULATED VALUES: Cation Exchange Capacity	% Base Saturation: K	Ca	Mg	H	Na	RESULTS OF ANALYSIS: Pounds per Acre Available Nutrient: Fe	Mn	Zn	Cu
1 47Z	5.0	6.81	5	93	3354	419	12.5	1.0	67	14	18.2					
2																
3																
4																
5																
6																
7																
8																
9																
10																
11 AVERAGE RESULTS →			5	93	3354	419	12.5	1.0	67	14	18.2					

DISPLAY OF AVERAGE RESULTS

	P	K	Ca	Mg	Cation Exchange Capacity	K	Ca	Mg	H	Na
SURPLUS										
HIGH									*	
MEDIUM			*	*					*	
			*	*	*		*	*	*	
LOW			*	*	*		*	*	*	
		*	*	*	*	*	*	*	*	
	*	*	*	*	*	*	*	*	*	

REPORT REF. NUMBER / SAMPLE IDENTIFICATION	SAMPLE INFORMATION: PLANT TYPE	AREA TYPE	FERT/ MAINT. LEVEL	LIME LBS/M	LIME TYPE	FERTILIZER RECOMMENDATIONS IN LBS. PER 1,000 SQ. FT.: NITROGEN	APP. FREQ	P_2O_5	K_2O	Mg	COMMENTS
1 PAF-FP3-TP10	TALL FESCUE	RESID. LAWN	EST.	25	Ca	0.75-1.0	M	6.0	3.0		See All
2											
3											
4											
5											
6											
7											
8											
9											
10											
11 RECOMMENDATIONS FOR AVERAGE RESULTS →						0.75-1.0	M	6.0	3.0		See All

SEE COMMENTS ON REVERSE SIDE

DUE TO VARIATIONS IN WEATHER, SOIL CONDITIONS AND CULTURAL PRACTICES, NO WARRANTY EITHER EXPRESSED OR IMPLIED IS MADE WITH RESPECT TO PLANT PERFORMANCE.

746.048

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KNOXVILLE, TN 37909

TURF AND ORNAMENTAL SOIL TEST AND RECOMMENDATION REPORT

SUBMITTED BY/FOR: HENSLEY 201439

02/25/05

CLC LAB
325 VENTURE DRIVE
WESTERVILLE, OHIO 43081
614 888-1663

REPORT REF. NUMBER	RESULTS OF ANALYSIS						CALCULATED VALUES						RESULTS OF ANALYSIS			
		Soil	Buffer	Pounds per Acre Available Nutrient				Cation Exchange	% Base Saturation					Pounds per Acre Available Nutrient			
	LAB NO.	pH	pH	P	K	Ca	Mg	Capacity	K	Ca	Mg	H	Na	Fe	Mn	Zn	Cu
1	48Z	4.7	6.91	11	97	1665	286	6.6	1.9	63	18	16.4					
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11	AVERAGE RESULTS →			11	97	1665	286	6.6	1.9	63	18	16.4					

DISPLAY OF AVERAGE RESULTS

	P	K	Ca	Mg		K	Ca	Mg	H	Na
SURPLUS										
HIGH									*	
MEDIUM			*	*			*	*	*	
LOW	*	*	*	*	*	*	*	*	*	
	*	*	*	*	*	*	*	*	*	

REPORT REF. NUMBER	SAMPLE INFORMATION					FERTILIZER RECOMMENDATIONS IN LBS. PER 1,000 SQ. FT.								
	SAMPLE IDENTIFICATION	PLANT TYPE	AREA TYPE		FERT/ MAINT. LEVEL	LIME LBS/M	LIME TYPE	NITROGEN	APP. FREQ	P_2O_5	K_2O	Mg		COMMENTS
1	PAF-FP3-TP11	TALL FESCUE	RESID.	LAWN	EST.	15	Ca	0.75-1.0	M	6.0	3.0			See All
2														
3														
4														
5														
6														
7														
8														
9														
10														
11	RECOMMENDATIONS FOR AVERAGE RESULTS →							0.75-1.0	M	6.0	3.0			See All

SEE COMMENTS ON REVERSE SIDE

DUE TO VARIATIONS IN WEATHER, SOIL CONDITIONS AND CULTURAL PRACTICES, NO WARRANTY EITHER EXPRESSED OR IMPLIED IS MADE WITH RESPECT TO PLANT PERFORMANCE.

746.049

REPORT TO: 11473
LESCO SERVICE CENTER #473
1339 EAST WEISGERBER
KNOXVILLE, TN 37909

TURF AND ORNAMENTAL SOIL TEST AND RECOMMENDATION REPORT

SUBMITTED BY/FOR: HENSLEY 201439

02/25/05

CLC LAB
325 VENTURE DRIVE
WESTERVILLE, OHIO 43081
614 888-1663

REPORT REF. NUMBER	RESULTS OF ANALYSIS						CALCULATED VALUES						RESULTS OF ANALYSIS			
			Pounds per Acre Available Nutrient				Cation Exchange Capacity	% Base Saturation					Pounds per Acre Available Nutrient			
LAB NO.	Soil pH	Buffer pH	P	K	Ca	Mg		K	Ca	Mg	H	Na	Fe	Mn	Zn	Cu
1 49Z	4.4	6.50	5	82	3476	575	17.2	0.6	51	14	34.9					
2																
3																
4																
5																
6																
7																
8																
9																
10																
11 AVERAGE RESULTS →			5	82	3476	575	17.2	0.6	51	14	34.9					

DISPLAY OF AVERAGE RESULTS

	P	K	Ca	Mg	Cation Exchange Capacity	K	Ca	Mg	H	Na
SURPLUS									*	
HIGH									*	
MEDIUM			*	*	*				*	
			*	*	*			*	*	
LOW			*	*	*			*	*	
		*	*	*	*	*	*	*	*	
	*	*	*	*	*	*	*	*	*	

REPORT REF. NUMBER	SAMPLE INFORMATION					FERTILIZER RECOMMENDATIONS IN LBS. PER 1,000 SQ. FT.							
	SAMPLE IDENTIFICATION	PLANT TYPE	AREA TYPE		FERT/ MAINT. LEVEL	LIME LBS/M	LIME TYPE	NITROGEN	APP. FREQ	P_2O_5	K_2O	Mg	COMMENTS
1	PAF-FP3-TP12	TALL FESCUE	RESID.	LAWN	EST.	85	Ca	0.75-1.0	M	6.0	3.0		See All
2													
3													
4													
5													
6													
7													
8													
9													
10													
11 RECOMMENDATIONS FOR AVERAGE RESULTS →								0.75-1.0	M	6.0	3.0		See All

SEE COMMENTS ON REVERSE SIDE

DUE TO VARIATIONS IN WEATHER, SOIL CONDITIONS AND CULTURAL PRACTICES, NO WARRANTY EITHER EXPRESSED OR IMPLIED IS MADE WITH RESPECT TO PLANT PERFORMANCE.

UNDERSTANDING YOUR SOIL TEST REPORT

SOIL TEST RESULTS

SOIL pH: A measure of active acidity or alkalinity in a soil/water slurry. pH 7.0 is neutral, pH <7.0 is acidic and pH >7.0 is alkaline. Most turf and ornamentals prefer a pH of 6.5-7.5. Certain acid-loving plants prefer a pH <6.0.

BUFFER pH: A measure of the soil's ability to acidify a buffered solution. Used to determine the resistance to change in pH (acidic buffer capacity), when the soil pH is below 6.3. The buffer pH (not soil pH) is used determine the lime requirement in most soils.

PHOSPHORUS (P): A measure of the available phosphorus (Bray 1) expressed in pounds per acre.

POTASSIUM (K): A measure of the available (exchangeable) potassium expressed in pounds per acre.

CALCIUM (Ca) and MAGNESIUM (Mg): A measure of the available (exchangeable) calcium and magnesium. Optimum soil test levels may vary depending on the cation exchange capacity and percent base saturation.

CATION EXCHANGE CAPACITY (CEC): A calculated value used to determine the relative nutrient holding capacity of the soil for the cations K^+, Ca^{++}, Mg^{++}, H^+ (hydrogen) & Na^+ (sodium), if a sodium test is requested. CEC values are expressed as milliequivalents per 100 grams (meq/100g) of soil.

Typical CEC Ranges	Soil Texture	Relative Nutrient Holding Capacity CEC
0-12	Coarse (sandy)	Very Low < 5
8-25	Medium (loamy)	Low < 10
22-40+	Fine (clayey)*	Medium 10-22
30-50+	Organic	High > 22

* Certain types of clay soils have lower CEC ranging from 3 to 12.

PERCENT BASE SATURATION: Calculated values showing the percentage of the CEC occupied by each tested cation. Most turfgrasses and ornamentals perform best when the cations are in balance in the ranges shown below:

POTASSIUM	- K	2-7%	
CALCIUM	- Ca	65-85%	
MAGNESIUM	- Mg	10-20%	
HYDROGEN	- H	0-5%*	(when present)
SODIUM	- Na	0-5%	(when tested)

* Higher hydrogen saturations (5-25%) may be acceptable for certain acid-loving plants. Calculated base saturations and CEC may be lower than normal when hydrogen saturation exceeds 20%.

ANALYTICAL RESULTS

MICRO & SECONDARY NUTRIENTS: Available micro and secondary nutrients can be interpreted according to the table below. Response to available micro and secondary nutrients may differ according to turf or ornamental plant type.

RELATIVE VALUE	IRON (Fe)	MANGANESE (Mn)	ZINC (Zn)	COPPER (Cu)	BORON (B)	SULFUR (S)
	lbs./acre					
LOW	<15	<10	<2	<0.5	<0.5	<20
MEDIUM	15-120	10-50	2-5	0.5-5.0	0.5-3.0	20-80
HIGH	>120	>50	>5	>5.0	>3.0	>80

ORGANIC MATTER (OM3): An estimate of the organic matter content of the soil reported as percent by weight. Organic matter is determined by combustion at 440°C using United States Golf Assoc. methods.

SOLUBLE SALTS (SS): A measure of the salt concentration in the soil from both fertilizer and non-fertilizer sources.

Potential for Plant Injury	Soluble Salts (mhos X 10^{-5})
VERY LOW	< 25
LOW	26-100
MEDIUM (Sensitive plants may be injured)	101-200
HIGH	201-300
VERY HIGH (Most plants injured)	> 300

DISPLAY OF AVERAGE RESULTS: Line 11 on the report shows the average value for the tested nutrient. The average value for each nutrient is displayed graphically in the center section of the report. This provides an easy to interpret guide to the nutrient status of the soil.

NOTES:

1. Optimum levels of plant nutrients vary with plant type, its use and fertility management level. These factors along with soil test information are used to make specific fertilizer recommendations.
2. To convert pounds of nutrient per acre to parts per million divide reported values by 2.
3. To convert soluble salt values to millimohs (mmohs) divide reported values by 100.
4. Results followed by a "+" are outside the normal test range. Actual values are higher than shown and can be determined upon request.

LIME AND FERTILIZER RECOMMENDATION COMMENTS

CAUTION! To avoid plant injury consult a professional in the turf and ornamentals industry or your County Cooperative Extension Service before using recommended fertilizers or lime.

ALL RECOMMENDATIONS represent a typical amount for the plant type, its use and fertility management level as determined by the sample information provided and the soil test results. Actual fertility management may vary with different cultural practices, i.e. rate and timing of application, nutrient source, application method, etc.

LIME RECOMMENDATIONS are given in pounds per 1,000 sq. ft. (LBS/M) or tons per acre (TON/A) of ground limestone (TNP>90%). Recommendations are for the amount needed to correct acid soil conditions for the specific plant types. Do not over apply lime to established turf areas. Incorporate recommended amounts into the root zone at establishment.

LIME TYPE: When calcium and magnesium tests are performed, the lime type recommended will be indicated as high calcium **(Ca)** or high magnesium/dolomitic lime **(Mg)**.

NITROGEN RECOMMENDATIONS are given in lbs. per 1,000 sq. ft. or lbs. per acre of actual nitrogen **(N). APP. FREQ:** Recommendations for application frequency given on a per season **(S)** basis should be split into multiple applications. Recommendations may also be given on a per month **(M)** of growing season or month of establishment basis. When **NEW/ESTB.** is selected as the fertility management level, nutrient recommendations are for incorporation into the soil at the time of planting (preferred) or for surface application during the first three months or more of establishment.

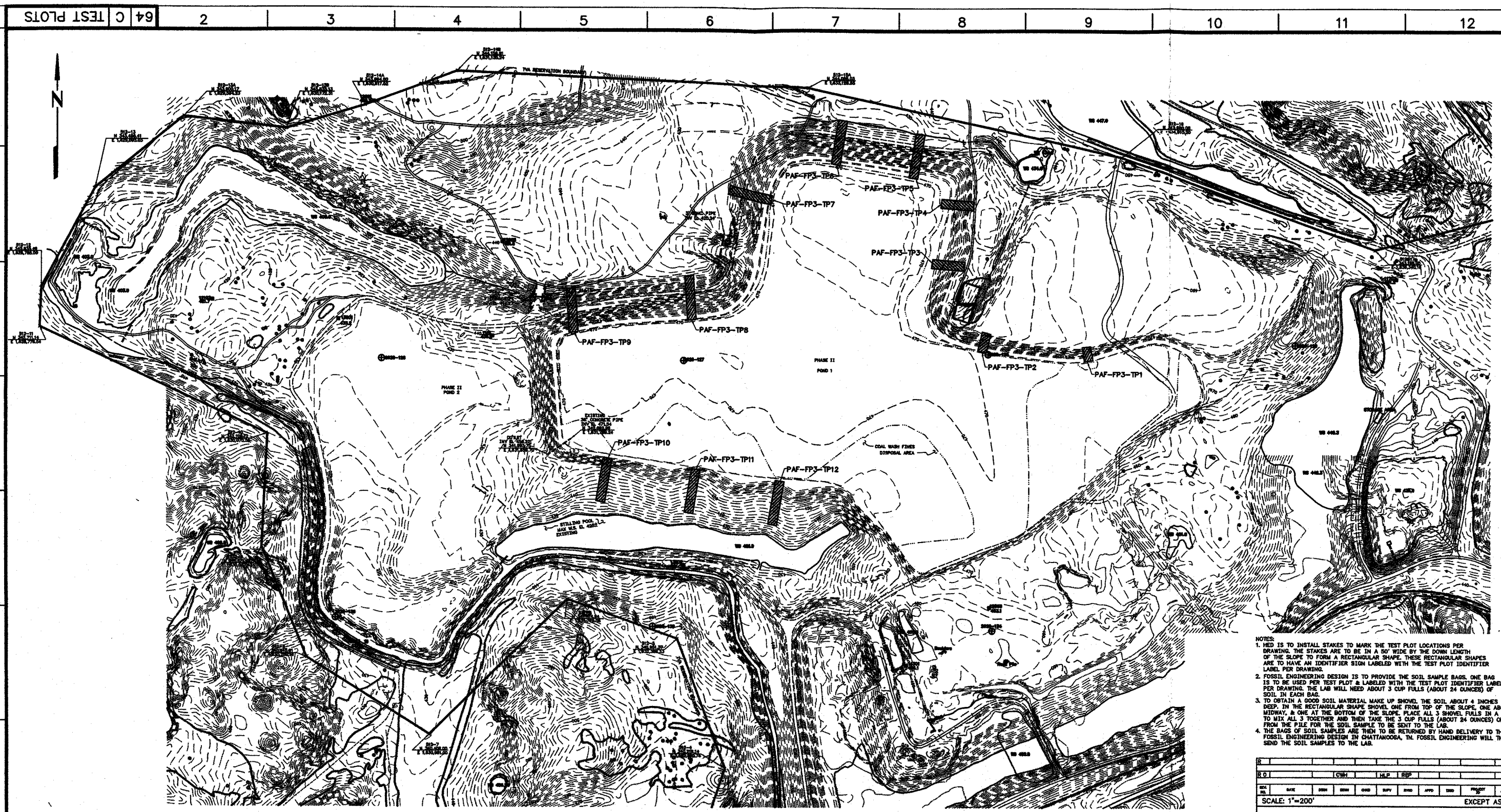
PHOSPHATE RECOMMENDATIONS are given in lbs. per 1,000 sq. ft. or lbs. per acre of P_2O_5. Recommendations are given as the annual requirement for maintenance, if soil test values are medium to high; the corrective amount, if soil test values are low; or the amount to be used during the establishment phase.

POTASSIUM RECOMMENDATIONS are given in lbs. per 1,000 sq. ft. or lbs. per acre of K_2O. Recommendations are given as the annual requirement for maintenance, if soil test values are medium to high; the corrective amount, if soil test values are low; or the amount to be used during the establishment phase.

OTHER NUTRIENT RECOMMENDATIONS are given in lbs. per 1,000 sq. ft. or lbs. per acre of elemental magnesium **(Mg)**, iron **(Fe)**, manganese **(Mn)**, or zinc **(Zn)**. Recommendations are given as the corrective amount for maintenance or the amount to be used during the establishment phase. Do not over apply micronutrients.

Attachment C

Test Plot Location Drawing



NOTES:
1. NED IS TO INSTALL STAKES TO MARK THE TEST PLOT LOCATIONS PER DRAWING. THE STAKES ARE TO BE IN A 50' WIDE BY THE DOWN LENGTH OF THE SLOPE TO FORM A RECTANGULAR SHAPE. THESE RECTANGULAR SHAPES ARE TO HAVE AN IDENTIFIER SIGN LABELED WITH THE TEST PLOT IDENTIFIER LABEL PER DRAWING.
2. FOSSIL ENGINEERING DESIGN IS TO PROVIDE THE SOIL SAMPLE BAGS. ONE BAG IS TO BE USED PER TEST PLOT & LABELED WITH THE TEST PLOT IDENTIFIER LABEL PER DRAWING. THE LAB WILL NEED ABOUT 3 CUP FULLS (ABOUT 24 OUNCES) OF SOIL IN EACH BAG.
3. TO OBTAIN A GOOD SOIL MATERIAL MAKE UP SHOVEL THE SOIL ABOUT 4 INCHES DEEP. IN THE RECTANGULAR SHAPE SHOVEL ONE FROM TOP OF THE SLOPE, ONE ABOUT MIDWAY, & ONE AT THE BOTTOM OF THE SLOPE. PLACE ALL 3 SHOVEL FULLS IN A PILE TO MIX ALL 3 TOGETHER AND THEN TAKE THE 3 CUP FULLS (ABOUT 24 OUNCES) OF SOIL FROM THE PILE FOR THE SOIL SAMPLE TO BE SENT TO THE LAB.
4. THE BAGS OF SOIL SAMPLES ARE THEN TO BE RETURNED BY HAND DELIVERY TO THE FOSSIL ENGINEERING DESIGN IN CHATTANOOGA, TN. FOSSIL ENGINEERING WILL THEN SEND THE SOIL SAMPLES TO THE LAB.

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ENGR	AS CONST
R 0		CWH			HLP	REP				

DISCIPLINE DESIGNATOR: D

SCALE: 1"=200' EXCEPT AS NOTED

YARD

GENERAL PLAN
TEST PLOTS & SOIL SAMPLES LOCATION

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
	C.W. HENSLEY		H.L. PETTY	R.E. PURKEY		

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14	DATE	64	C	TEST PLOTS	R 0

TASK COMPLETED BY: | REV NO.

PLOT FACTOR:2400
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

B65 070129 265

January 29, 2007

Gregory K. Nunley, PAF 1A-DRK

PARADISE FOSSIL PLANT (PAF) - ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Attached is a report from Chris Hensley and John Albright concerning the FY07 inspection of Paradise Fossil Plant's ash disposal areas.

This report includes recommendations for corrective work. I concur with these recommendations.

Should you have any questions please contact Ron Purkey at extension 4820 in Chattanooga, Chris Hensley at extension 4413, or John Albright at extension 3981 in Chattanooga.

R E Purkey

John C. Kammeyer, Manager
Engineering Design Services
LP 2G-C

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Mike Davis, LP 5E-C
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Scott Kramer, Dam Safety Files, LP 1H-C
Gary R. MacDonald, LP 5E-C
Bryan Wells, LP 5D-C
Steve West, PAF 1A-DRK
EDMS, WT CA-K

TENNESSEE VALLEY AUTHORITY
PARADISE FOSSIL PLANT

ANNUAL STABILITY INSPECTION
OF
WASTE DISPOSAL AREAS

Prepared By: Christopher W. Hensley
& John Albright
Date: January 22, 2007

PARADISE FOSSIL PLANT
ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Introduction

The waste disposal areas at Paradise Fossil Plant (PAF) were inspected for dike structural stability on October 25 and 26, 2006. The inspection was performed by John Albright, Chris Hensley, and Jeff Gray of Fossil Engineering Design Service. The previous annual inspection was conducted on September 28 and 29, 2005.

The results of the annual stability inspection are listed below according to their location within the Paradise Fossil Plant Boundaries. A location map is attached with arrows showing directions of the pictures taken.

Slag Areas 2A, 2B, and Stilling Pond

Boiler slag is sluiced into the south end of area 2A and is reclaimed by Reed Minerals as part of a TVA marketing strategy. The water elevation appeared to be approximately 18 inches from the top of the dikes (Picture 1). The bottom ash drops out quickly and is removed by Reed Minerals.

The sluice water then flows into 2A, leaving the fines and is discharged into pond 2B through pipes and around a series of baffles to lengthen the settling time. A floating pump station has been placed at the north end of pond 2B to fill water trucks. The sluice water enters the north end of the stilling pond through a concrete flume (Picture 2). A large concrete block had been placed in the concrete flume at one time to temporarily raise the water 24", but has since been removed. The flume appeared to be in good condition and water was flowing freely into the stilling pond. The water discharges through three standard spillways into the Green River or is pumped to the Jacob's Creek Ash Pond. The pumps were operating at the time of inspection. All three spillways were operating at the time of inspection. The walkway to one of the spillways that was reported as a safety hazard in last year inspection has been repaired (Picture 3). Last year inspection also noted at the last spillway there was a walk board to the spillway from the bank (Picture 4). During this inspection the walk board was under water. This walk board needs to be removed or a permanent walkway installed to this spillway. The access gate was locked at the discharge point of the spillways however; the area had been mowed so a close observation of the channel was possible. There was no immediate evidence of erosion in the channel and the channel was well vegetated.

There is additional water coming into the stilling pond from 30" & 42" concrete pipes. This water is from sumps, storm water pipes and dewatering pumps at construction areas. At the time of inspection these pipes were under water.

The dikes appear to be stable and did not exhibit any notable changes since the last inspection. The interior slopes of the dikes have a good vegetative cover and mowed. There was an access walkway built over the outlet end of the pipes into Area 2B. This walkway is associated with the truck water loading operation.

Redwater Ponds (Nos. 1, 2, 3, 4 & 5)

Redwater Pond #1

Redwater pond #1 (RW #1) is located southeast of and adjacent to 'Slag Pond 2B' and 'Slag Stilling Pond'. Considerable repairs, cleanout and bank reconstruction have been performed by HED to try to return the pond to its original configuration (Pictures 5 & 6). This pond has been mucked out and

the current water depth is approximately 6 feet. The northern rip rap bank repaired in June of 2005 seems to be in good condition. A rip rap barrier has been added to the west side of the sewage treatment plant and appears to have stabilized the bank as designed. All pumps, slopes, dikes and discharge structures appear to be working. Water collected in redwater pond #1 is pumped into the slag pond. Three additional diesel pumps are kept at the pond to supplement the electric pumps so the pond's NPDES permit is not violated.

Redwater Pond #2

Redwater pond #2 (RW #2) is located northwest of and adjacent to Slag Ponds 2A & 2B. The water from RW #2 is pumped from the center of the pond and discharged into the northwest end of slag pond 2B. The water level was higher then the 72" pipe. The upstream Storm Water and Coal Yard Drainage Pond #1 drain into RW #2 via this 72" pipe (Picture 7). Coal Yard Drainage Pond #2 drains into RW #2 via a 12" overflow pipe during storms. The slough near the 72" pipe has been repaired but sloughed again since the repair but seem to be stable (Picture 8). A dike has been built west of the pump station to contain silt. Four redwater seepage areas were also observed. These seeps appear to be the same since last year's inspection (Picture 9).

Redwater Pond #3

Redwater Pond #3 is a settlement pond and is located southwest of the powerhouse and along the south side of the county road (Picture 10). This pond collects the runoff and sediment from the medium and coarse coal wash refuse areas as well as decanted water from RW #4. RW #3 normally discharges to RW #1 via RW #5. There are emergency over flows from the pond and into a 60" drain to Jacobs Creek Ash Pond. The 3 - 36" pipes that go under the road and into a transition were cleared. The transition box had sediment about 18" deep that needs to be cleaned out (Picture 11).

The discharge from RW #3 to RW #5 has a manual valve contained within the discharge structure. This valve is closed only when the pond is to be cleaned out. At the time of this inspection the valve was open; HED had completed the cleaning out of the pond in 2005 (Picture 12). It remains in good condition since the cleanout.

Redwater Pond #4

Redwater Pond #4 is a surge/sediment pond located east of the medium and coarse Coal Wash Refuse Area. This is a surge pond that settles out the fines before they reach RW #3. This surge pond was designed to drain via an eight inch pipe and an open rip rap ditch beside the road to RW #3. The eight inch pipe had brush around it restricting the flow of water (Picture 13). The road ditch beside this pond needs to be cleaned out of sediment (Picture 14). The southwest side of this pond has been reconstructed and has been reseeded. An emergency overflow drains runoff that exceeds the 10 year - twenty-four hour rainfall event, directly to the Jacob's Creek Fly Ash pond. The depth of water is now approximately 2 feet.

Redwater Pond #5

Redwater Pond #5 is located south of the powerhouse, east of the truck coal dumping area and west of the limestone storage area. It is a surge pond designed to give the Redwater Pond #1 pumps time to lower the water level. An overflow structure drains runoff exceeding the 10 year - twenty-four hour rainfall event directly to Redwater Pond #1. All water collected in Redwater Pond #5 drains to Redwater Pond #1 via a gravity drain and no water should be held in Redwater Pond #5. At time of inspection the water that flows thought the structure to Redwater Pond #1 was clear and flowing well.

Coal Yard Runoff Pond #1

Coal Yard Runoff Pond #1 (CYRP#1) is located north of and across the plant access road from the Coal Wash Plant. This is a surge/sedimentation storm water runoff pond that delays runoff to RW #2. Water and sediment is collected in the pond and the decanted water is discharged through a six inch hole cut in the side of the stand pipe. This hole is not configured per the original design drawing in size, or elevation but is doing a fair job. A rip rap dike was built to keep the coal fines away from the discharge point. At the time of this inspection, a portion of this dike had been removed due to the amount of fines that had accumulated. The coal fines are building up at the end of the ditch (Picture 15). These fines should be cleaned out before blocking the stand pipe.

Coal Yard Runoff Pond #2

Coal Yard Runoff Pond #2 (CYRP#2) is located southwest of and across an access road from Redwater Pond #2. This pond was designed as a storm water sedimentation pond and all water from this pond is pumped to Slag Pond 2A. This pond had been cleaned out this year and a rock check dam built at the westside of the platform to keep fines from entering the pumps. There are three pumps on the platform. The pumps are designed to pump all water from this pond to Pond 2A.

Coal Yard Runoff Pond #3

Coal Yard Runoff Pond #3 is located south of the coal transfer complex and north of and adjacent to the access road. This pond can discharge by gravity or be pumped to RW #1. The inner banks of the basin seem to be well vegetated and are stable. At time of inspection the water level in this pond was high. This pond should be cleaned out (Picture 16). The emergency overflow is blocked or has been modified to the point that it does not operate (Picture 17).

Slag Disposal Area

The slag disposal area is located southeast of the powerhouse. The slag in this area was placed here by the plant during its early operations and is currently being reclaimed for commercial use by Reed Minerals. The area contains a small surge pond to collect runoff and a larger area, called the Beaver Pond, which discharges over a spillway and down a rip rap channel into Jacobs Creek. The riprap appears to be in good condition. There was no beaver dam present at time of inspection. At the time of inspection, no water was being discharged. The surge pond needs to be cleaned out. The water level was about even with the road (Picture 18).

The entrance road to the slag disposal area had signs of erosion. The existing silt fencing was torn down along Jacob's Creek. New silt fencing should be installed to protect Jacob's Creek.

The banks appear to be stable with a good vegetative cover on them. The redwater seeps identified in earlier reports along the southwest dike in this area are still present. Some of the red water seeps continue to have growing deposits of material. The erosion gully, observed on previous inspections, located at the end of the southwest dike and just north of an existing culvert, was not visible.

The southeast dike along Jacob's Creek at beaver pond did have noticeable erosion in the dike. The area of the erosion was about half way along the dike about 200 feet in length by length of the toe of the slope. The depth of the erosion was about 2 to 3 feet in depth. The erosion has caused trees to fall down with the root ball still intact.

Jacob's Creek Fly Ash Pond

This area is located southeast of the powerhouse. Fly ash is sluiced into the northern portion of the original pond. This area had recently been cleared in 2004 and a new channel constructed. The sluice lines are underwater (Picture 19). Water flows through a dike breach in the southwest portion of the ash pond then into the Fly Ash Pond Area Extension (the new ash disposal area).

HED was hauling and pushing material into Jacob's Creek Fly Ash Pond. In the process of the work HED cleared some of the vegetation off of the dike along the county road. Since last year HED repaired the dike and seeded and strawed the slope. This slope had good vegetative cover (Picture 20).

Flow is uniform and non-eroding through the ash pond. Rip rap in the breach and channel were in good condition. After the ash settles out, the water flows into a stilling pool in the northeast portion of the pond through a divider dike with a floating boom. At the time of this inspection, carbon dioxide was being introduced into the water at the boom. Water is then discharged through three 48" vertical spillways, with skimmer structures, and out through three 36" diameters concrete pipes to Jacob's Creek (Picture 21).

The spillway structures appear to be operating properly. All three outlets appeared to be discharging equally at the time of this inspection. The rip rap at the spillway discharge outlets appeared to be in good condition. There is a stairway for access from the top of dike to the discharge pipes and the three new monitoring boxes above the pipes (Picture 22). Dikes were constructed in the southern and eastern portion of this area. The dike slopes have established vegetation. The road on top of the dike had crushed stone surfacing added. All exterior dikes appear to be in good condition with no visible signs of instability.

The scrubber project had added a new ditch from the scrubber settling pond to this pond for the scrubber discharge. At the time of inspection there was no water in the ditch and appeared that the scrubber discharge pipes from the settling pond were still being used. (Note: There was some scrubber material in this pond at the end of the ditch).

Scrubber Pond

This pond is located in the southwest corner of the TVA reservation. Scrubber sludge is sluiced into the northern end of this region and stacked by the rim ditch method. Scrubber sludge is sluiced through a ditch formed by the exterior dike and an interior separator dike to the western corner of the area to allow that area to fill with scrubber sludge. Water is discharged from the scrubber pond to a settling pond by vertical spillways. The stilling pool water discharges from the stilling pool through a vertical spillway into a ditch that empties into the Jacob's Creek Fly Ash Pond a half mile away.

The discharge pipes from the scrubber pond to the settling pond appear to be in good condition. The standard spillway out of the stilling pool was in good condition. The final clarification pond had been cleaned out and cattails removed from a portion of the bank. A saddle dike had been constructed at the south end of the ponding area to prevent water and scrubber sludge from flowing to adjoining property.

The remainder of the area appears stable with a good vegetative cover and did not exhibit any notable changes since the previous inspection. Area drains and underdrain systems have been placed at the southeast portion of the dike and appear to be working as designed. HED finished seeding and strawing this portion of the dike (Pictures 23 & 24). No signs of erosion were present. The underdrain ditch needs to be cleaned out and graded to drain to prevent flow over the road.

West Dredge Cell

This area, located just east of the scrubber wet ponding area, was constructed to accept dredged ash. No material has been dredged into the cell. Runoff water is now collecting in the cell because the riser boards were installed in the spillway riser.

The dikes appear stable and did not exhibit any notable changes since the last inspection. All exterior slopes have an excellent vegetative cover. The erosion observed on the dike slope on the previous inspection at the southeast end of the pond was still present. The erosion gully observed on the previous inspection at the southwest end of the pond was still present but does not appear to have worsened. As noted in last year inspection an erosion gully was seen in the corner of the dike east of the spillway riser side cell in the stilling pool side of the dredge cell. The gully is about 55 feet long with 12 feet by 12 feet rectangular shape 24" to 36" depth near the top reducing to 8 feet by 24" near the bottom (Picture25). The erosion does not appear to have worsened.

East Dredge Cell

This area is located just south of the medium and coarse Coal Wash Refuse Area. This cell was also constructed to accept dredged ash (Picture 26). The spillway appeared to be in good condition, but was not operating at the time of this inspection. The discharge pipe was clear of obstructions but had a large eroded hole 6' long, 3.5' wide by 3' deep. This hole has revegetated and appears to be in stable condition.

The dikes in this area appear to be stable. The tops of dike surfaces are in satisfactory condition, although some vegetation has established itself over the area. Removal of vegetation is not warranted at this time. The dredged ash was seeded in 2002; vegetation is good south of the discharge structure and is improving north of the discharge structure.

An erosion ditch was identified beside the armored ditch in the 1994 inspection report that would have required 1000 lb of riprap at the northeast corner of the dike. This erosion caused by runoff bypassing the armored, ditch is now over 4 feet deep, eight feet wide and one hundred plus feet long. The drainage ditch has had rip rap put in and has good vegetation established and seems to have stabilized.

Ditches, rutting and erosion gullies all have established vegetation.

Medium and Coarse Coal Wash Refuse Stack

HED has finished covering the Coarse and Medium Stack. The area appeared to be covered in accordance of the design drawings. The areas which were at or above the final stacking configuration were compacted and have good vegetative cover (Pictures 27, 28, & 29). Runoff from the east side is directed by the berm ditches to a perimeter ditch which discharges into the collection ditch for Redwater Pond #4and Redwater Pond #3 on the north side. A good vegetative cover has

been established in the southeastern portion of the area; however, significant erosion ditches exist along the north side of the stack.

Coal Wash Fines Pond #2

This disposal area is located in the northwest portion of the plant properties. This area is adjacent to the railroad and on the north side of the plant access road. The original pond was completed in the late fall of 1987. The top of the original dike was at elevation 455. The plant raised the dike to approximately elevation 465 in 1990, and subsequently sluiced fines to this elevation. This area has not been active as a sluicing operation since Fines Pond #3 began operation in October 1992 (Picture 30).

All of the dikes in this area appeared stable and in good condition. The west dike of this area has been noted in previous inspections to have sparse vegetation. The vegetative cover of this dike is now improving and establishing itself over the area.

Coal Wash Fines Pond #3

Fines Pond #3 is located northwest of Fines Pond #2. The first lift was completed in October 1992 and all sluicing was diverted from Fines Pond #2 to this area. The latest lift was finished in September 1999, and the sluice discharge was changed from the east to the west end of the pond. The discharged point was moved from the west end to the east end. The overflow discharge structure removes the water and discharges it into a riprapped ditch which flows into Fines Pond #2 and then into the stilling pool (Picture 31). A dike was constructed around the cemetery to the north of this area to protect it from pond water.

A dike was also constructed in the northeast corner of this area extending from the southeast corner of the cemetery eastward to the exterior dike for pond #3. This dike was constructed to preserve the aesthetics of the cemetery so it would not be surrounded by the future fines stack. All dikes in this area appear to be stable but have some seepage. There is little grass on the slopes. Several of the new culverts that drain the berm ditches were put in high and do not drain (Picture 32). In addition the ditches are full of sediment (Pictures 33 & 34). When it rains, water flows across the roads because the culvert inverts are above the road elevations. The water flowing adjacent to the culverts is eroding the slope below the road. The dikes are washing out to the point that there are gullies 2 to 3 feet deep in the dike (Pictures 35 & 36).

A slide 29.5 feet long and 10.3 feet high developed the first week of May, 2000 in an area that was seeping. This has been fixed and appears to be working. An area approximately 400 feet long was excavated, an underdrain installed, and rip rap placed to stabilize this area of the dike. The fix was completed by February 23, 2001. This area continues to seep but continues to be stable (Picture 37).

Six seeps/wet areas were found adjacent to the cemetery. They are of equal elevation and cover a distance approximately 200 feet long. At the time of this inspection, all seeps were not flowing. All six areas continue to exist.

The repaired rip rap discharge from the area east of the cemetery at the south east corner of the cemetery is in good shape. The eroded material has been removed from the ditch and cemetery.

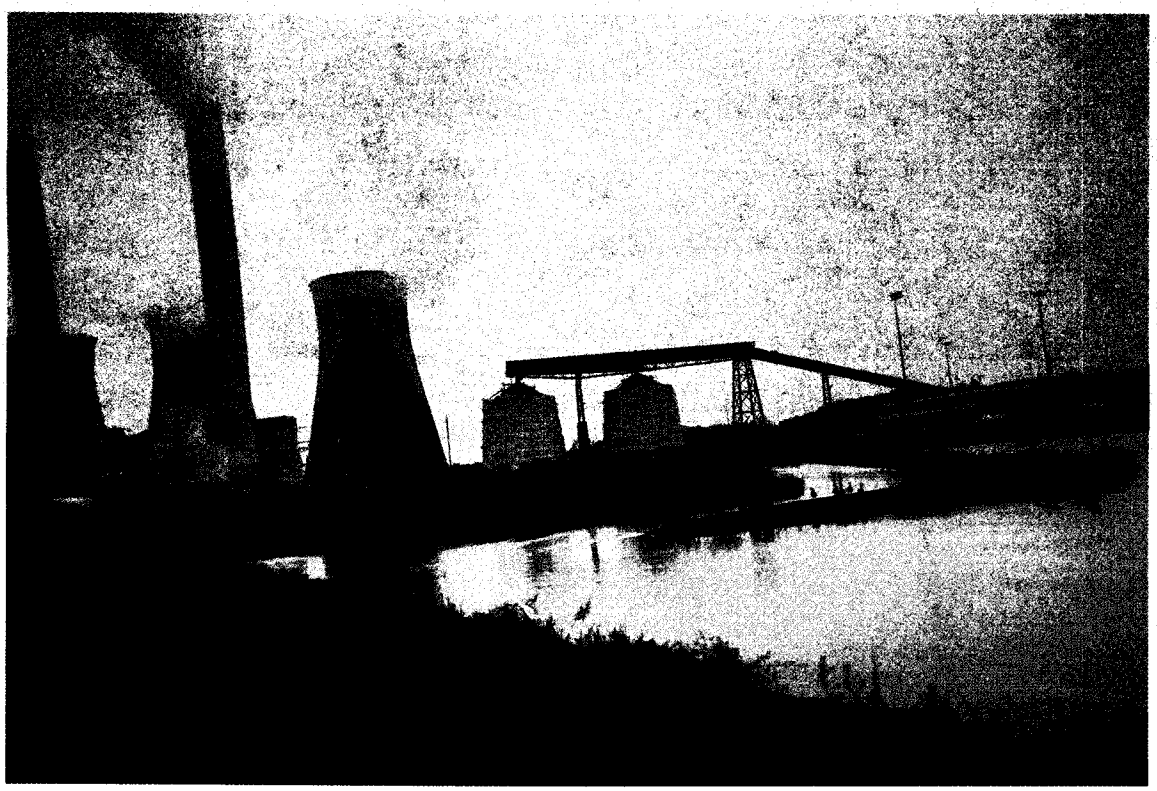
HED is working to close the borrow area beside the cemetery and construct a sediment pond to protect the cemetery from water and sediment runoff.

A fines reburn project is underway to use the coal fines to produce power. HED is hauling the fines to a pile beside the coal piles (Pictures 39 & 40).

This fall an erosion and sediment control plan was issued by Engineering in response to an Environment audit finding. This plan is to control and repair erosion on and around the Fines Pond #3. Attached to this report is a copy of the Erosion Control Plan.

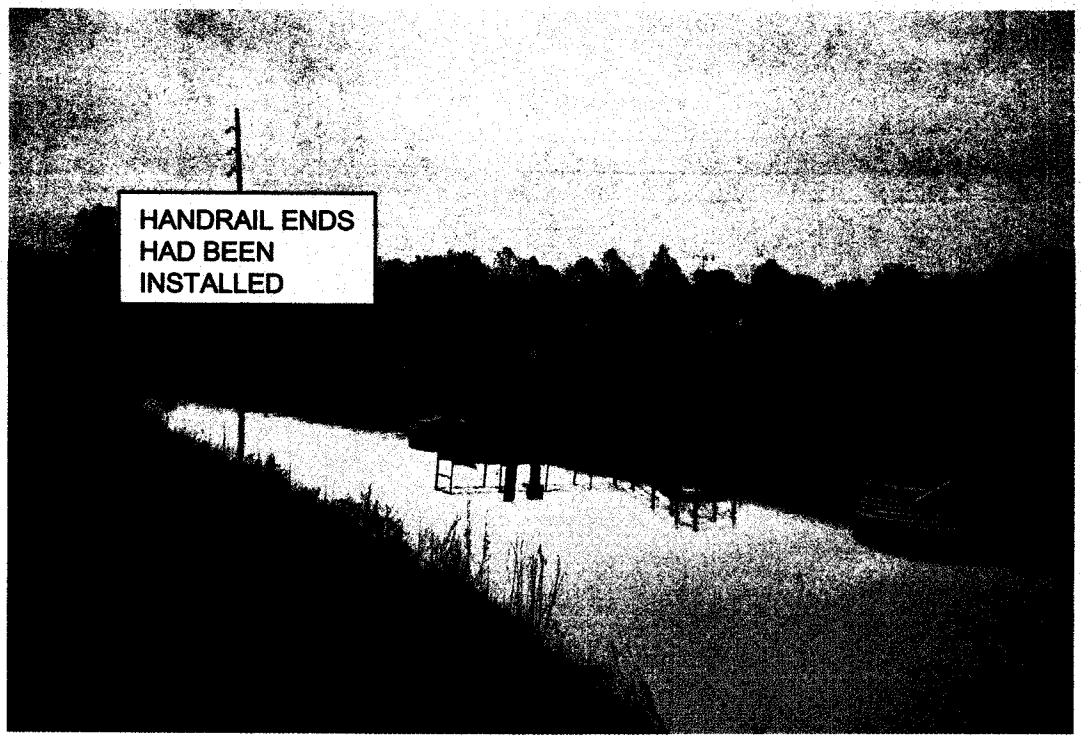
Recommendations:

- Mow grass and remove small trees and brush from all dike slopes. Pull up all trees and compact soil back in the holes.
- Maintain all dike roads for all weather travel to facilitate the required shift visual inspections and routine O&M activities.
- Monitor the exterior dike slopes for seepage, wet or soft spots or animal burrowing, etc. and notify Fossil Engineering of any changes.
- Monitor the survey controls installed on the exterior dike slope of Area 2B slag pond adjacent to Green River for any indication of slope movement.
- Remove the sediment from the transition box at RW #3 discharge pipes to Jacob's Creek Ash Pond so that flow does not become inhibited during periods of heavy rainfall.
- Remove fines from all of the coal yard drainage basins and all of the redwater ponds, especially RW #1, #2, #3 & #4 ponds.
- Remove any vegetative growth and/or beaver dams that may be blocking the spillway from the slag area to the beaver pond.
- Check the cemetery seepage weekly and report any increases to; John Albright at 423/751-3981 or Lynn Petty at 423/751-6704 in Chattanooga.
- Lower the drain pipes from the berm ditches and clean them out for Fines Pond #3 to eliminate standing water in the berm ditches.
- Implement an erosion and sediment control plan on the area around the Fines Pond #3 and retired borrow areas around the Fines Pond #3.
- Until grass is established on the slopes of Fines Pond #3, follow the Interim Administrative Controls included in the Interim Site Erosion Control Plan.
- Remove the silt fencing material by the road beside Daniel Run out around the Fines Pond #3 since it is not needed
- Remove old silt fencing at the Slag Disposal Area entrance and replace with new silt fencing.
- Repair erosion ditches and gullies around the Coarse and Medium Refuse Stack and East Dredge Cell.
- Monitor south slope of Redwater Pond #2 for additional movement.

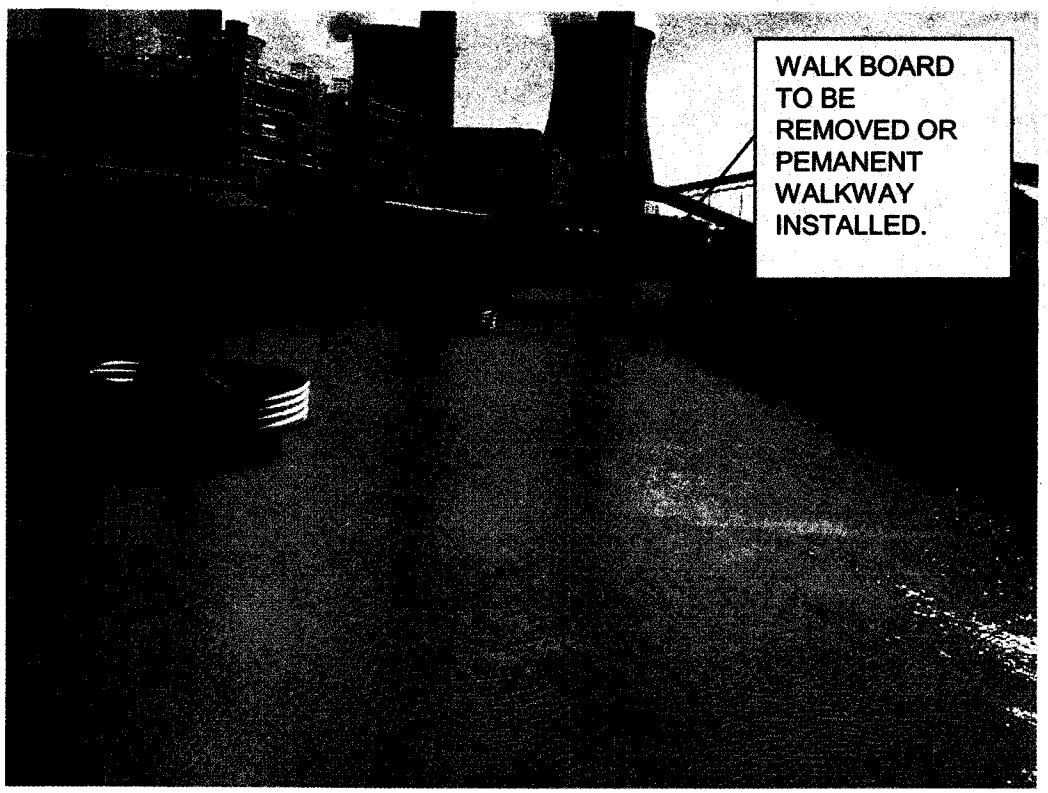


Picture 1. Slag Pond 2A.

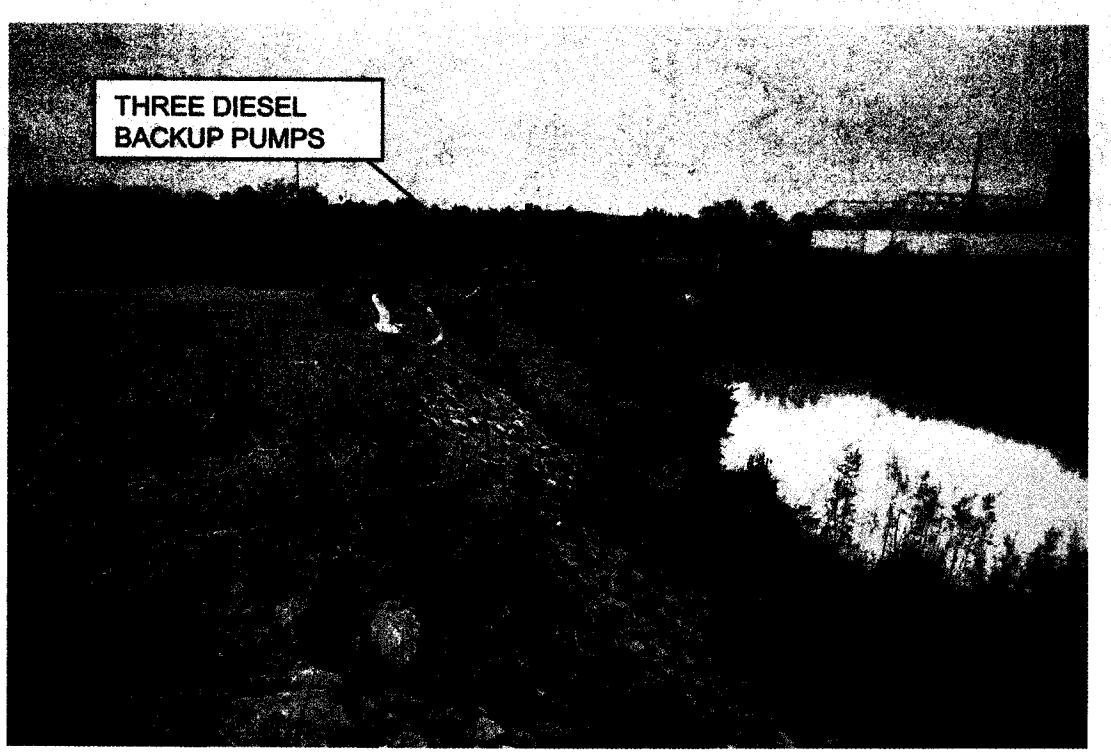
Picture 2. Slag Pond 2B concrete flume to Stilling Pond.



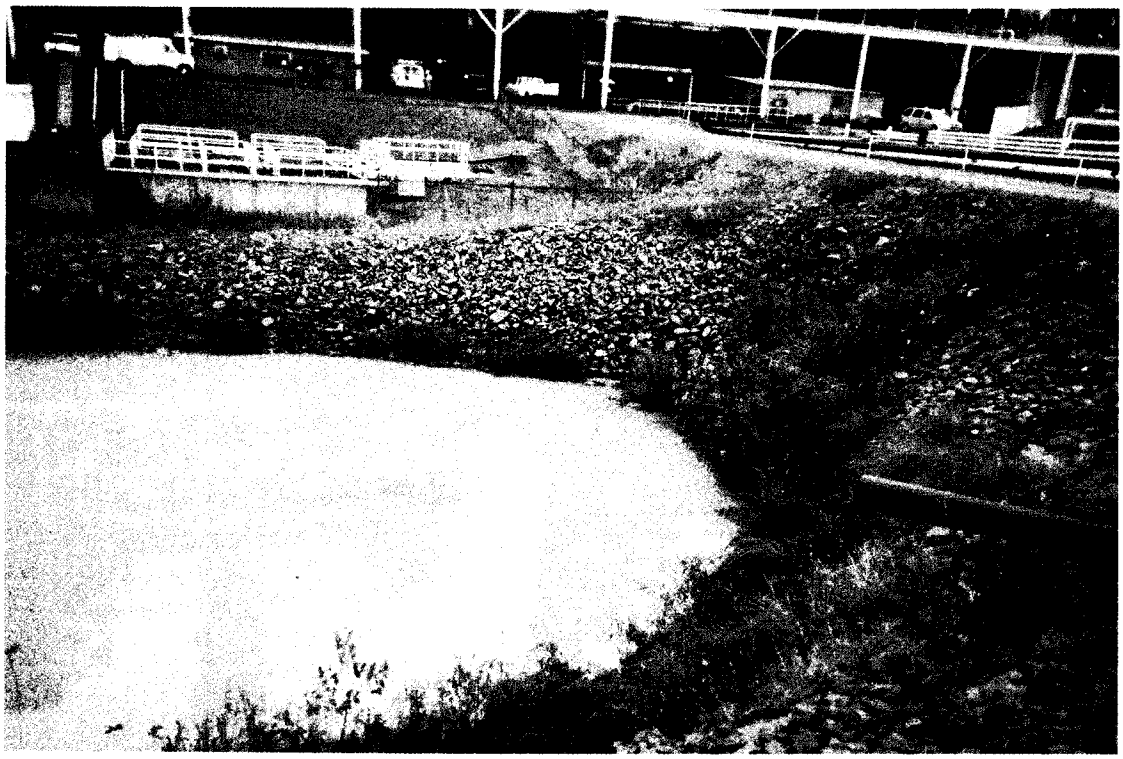
Picture 3. Walkway with handrail into spillway.



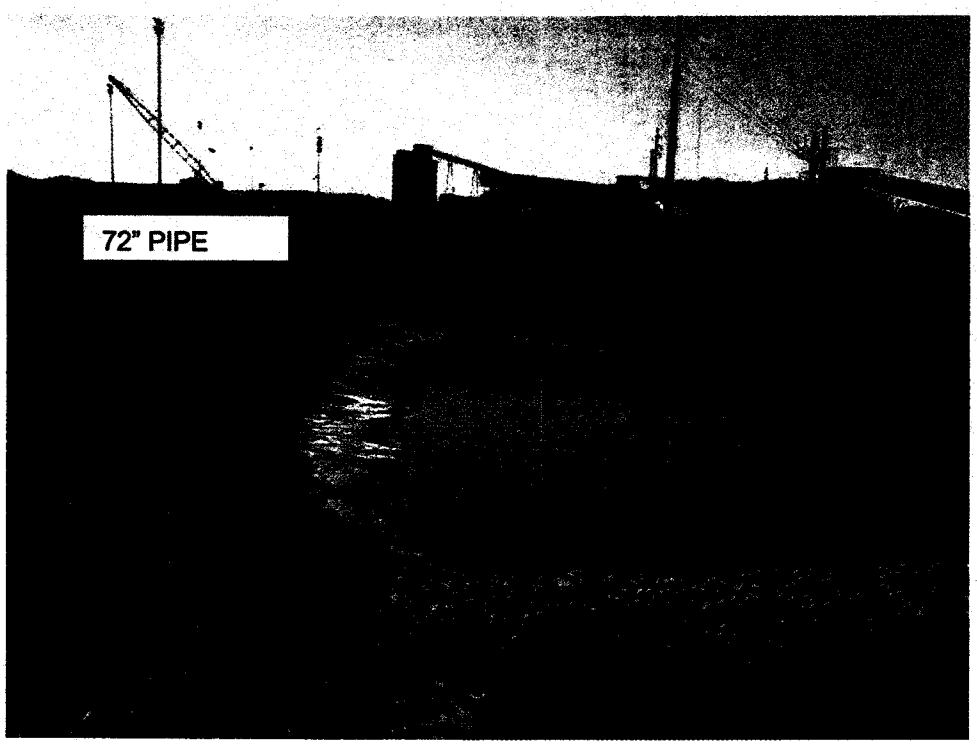
Picture 4. Walk board out to a spillway. (File Photo)



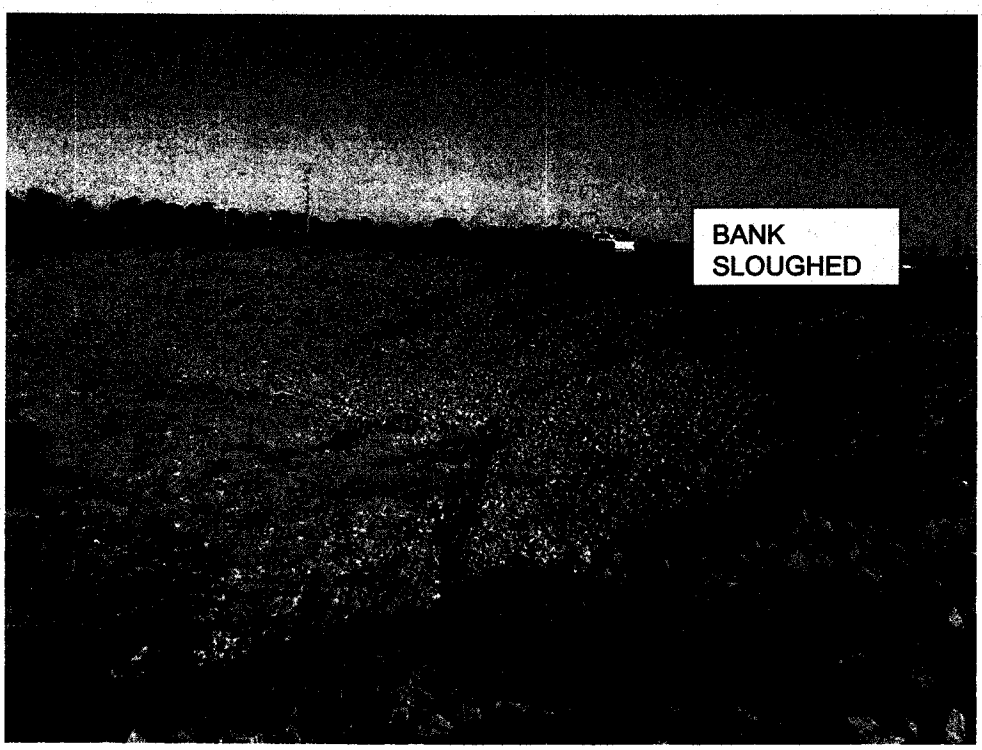
Picture 5. Redwater No. 1. Three backup pumps.



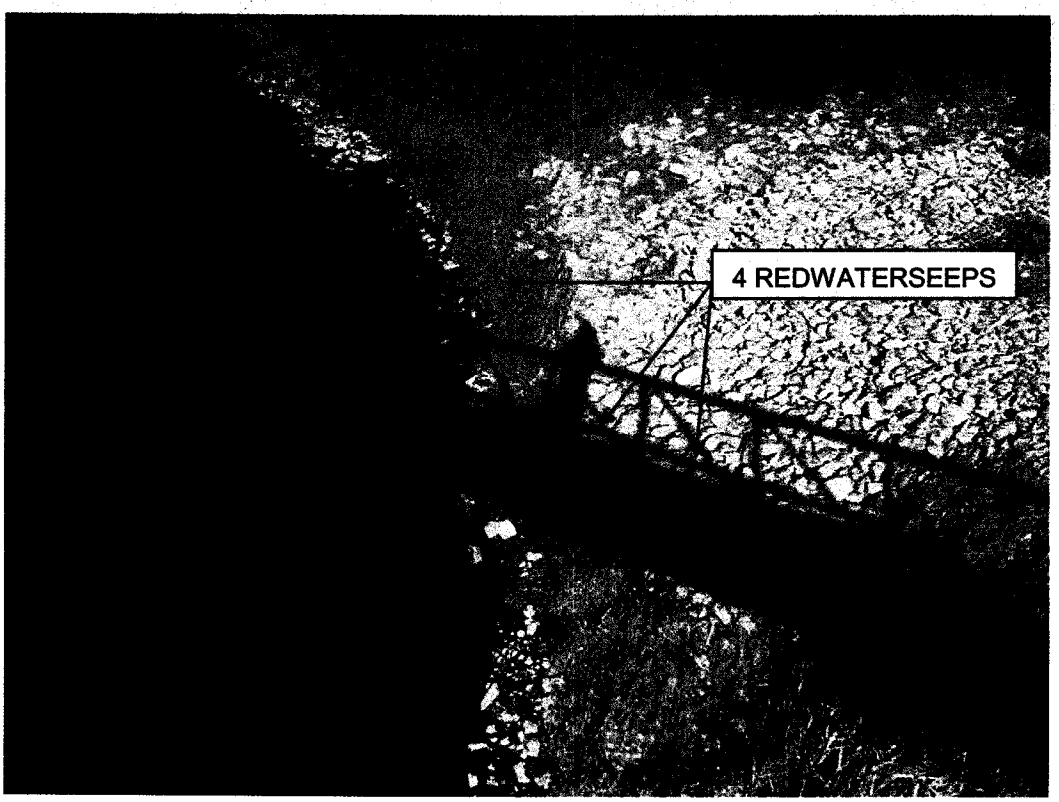
Picture 6. Redwater No. 1.



Picture 7. Redwater No. 2. Looking at 72" Pipe to Coal Yard Pond #2. (File Photo)

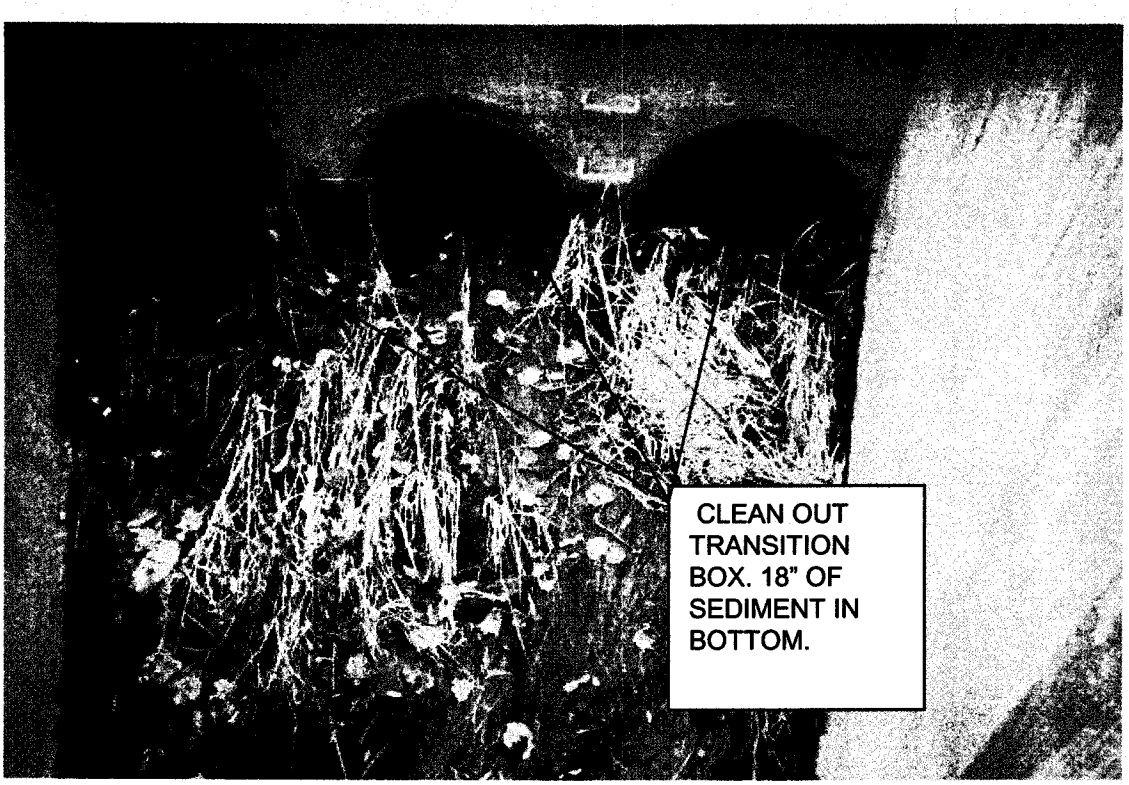


Picture 8. Redwater No. 2. Slough repaired area. (File Photo)



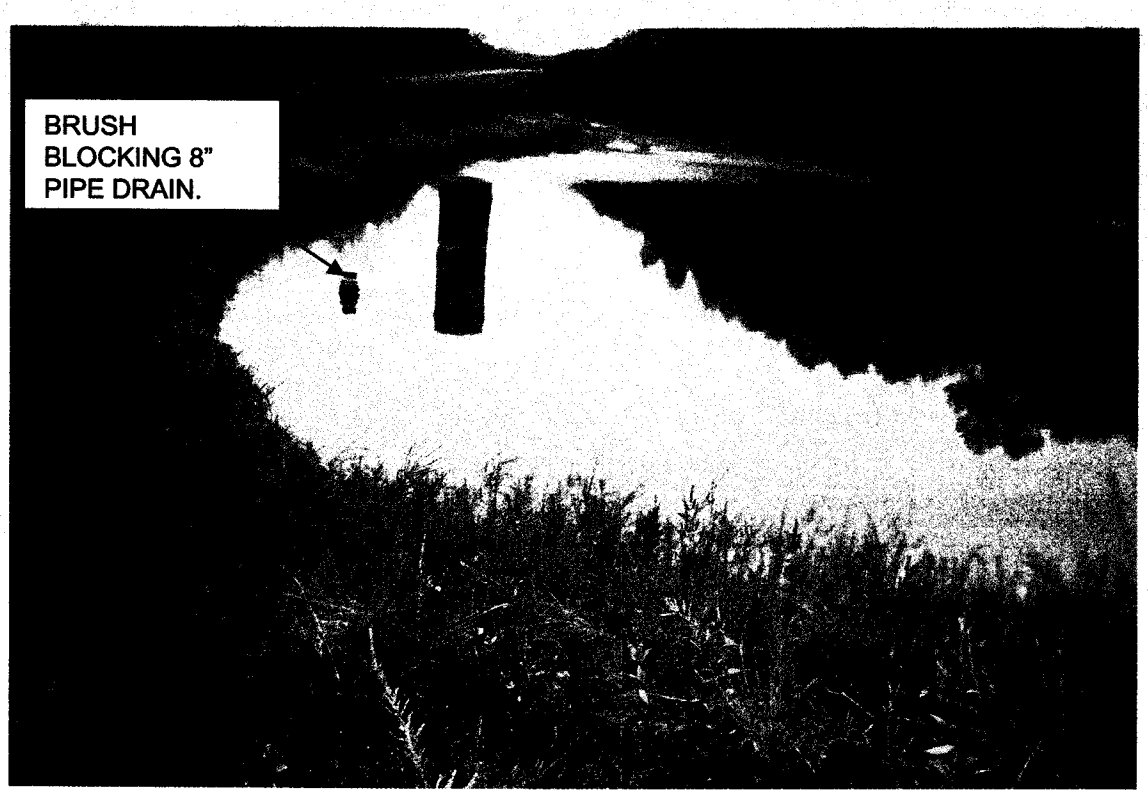
Picture 9. Redwater No. 2. Four Redwater Seeps. (File Photo)

Picture 10. Redwater No. 3. Cleaned out of pond.

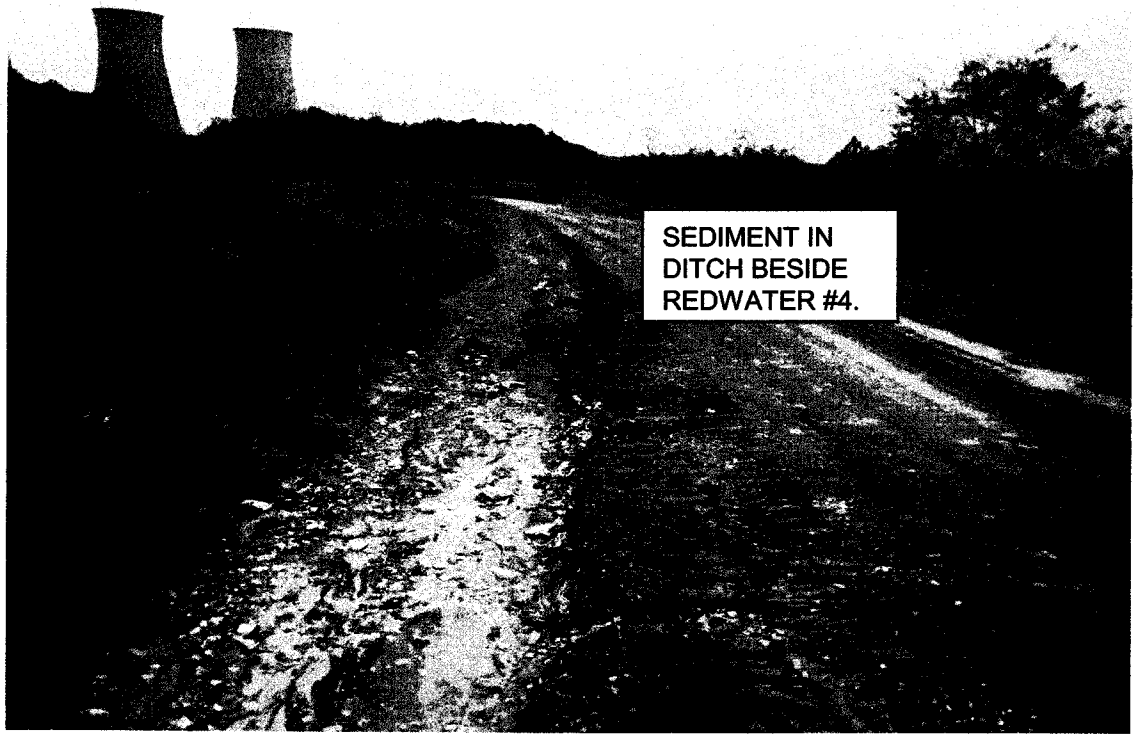


Picture 11. Redwater No. 3. Transition Box needs to be cleaned out.

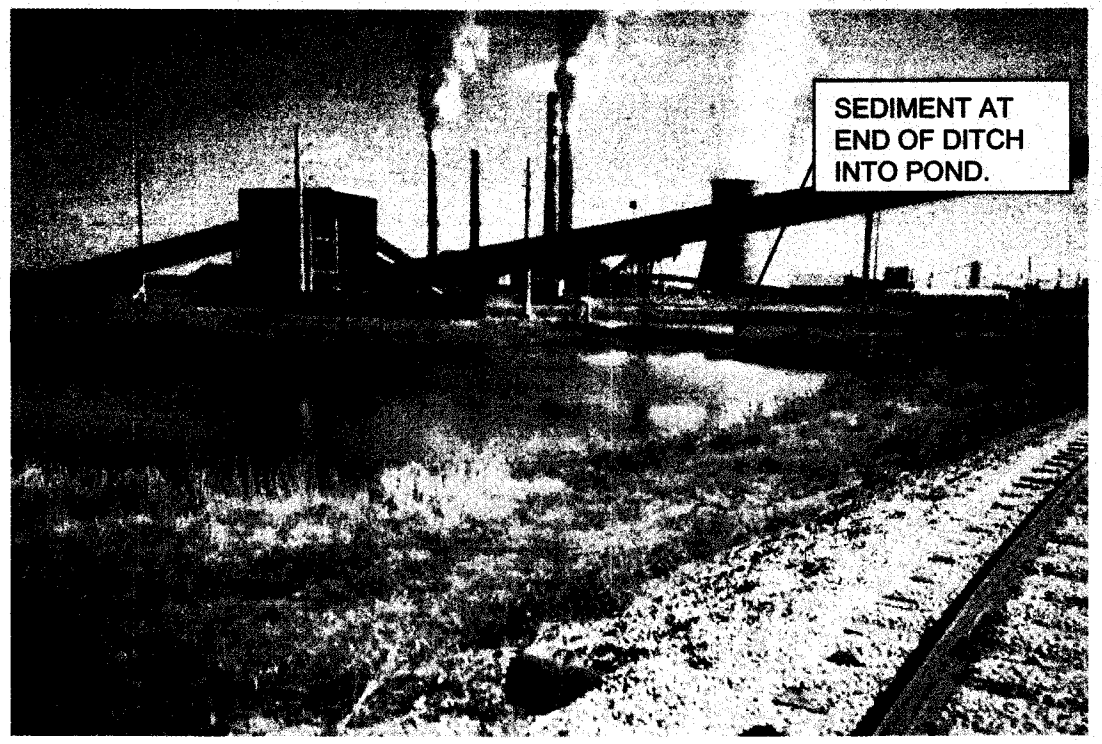
Picture 12. Redwater No. 3. Gravity drain & cleaned out of pond. (File Photo)



Picture 13. Redwater No. 4. Blocked 8" Pipe.

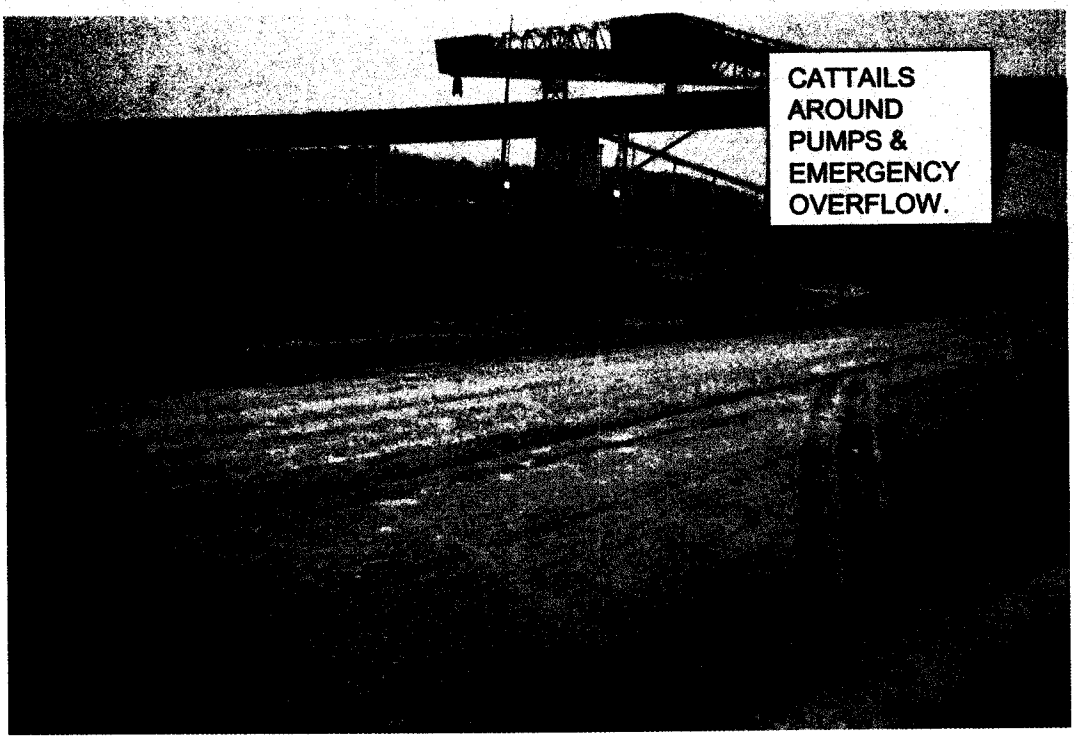


Picture 14. Redwater No. 4. Clean sediment out of ditch.

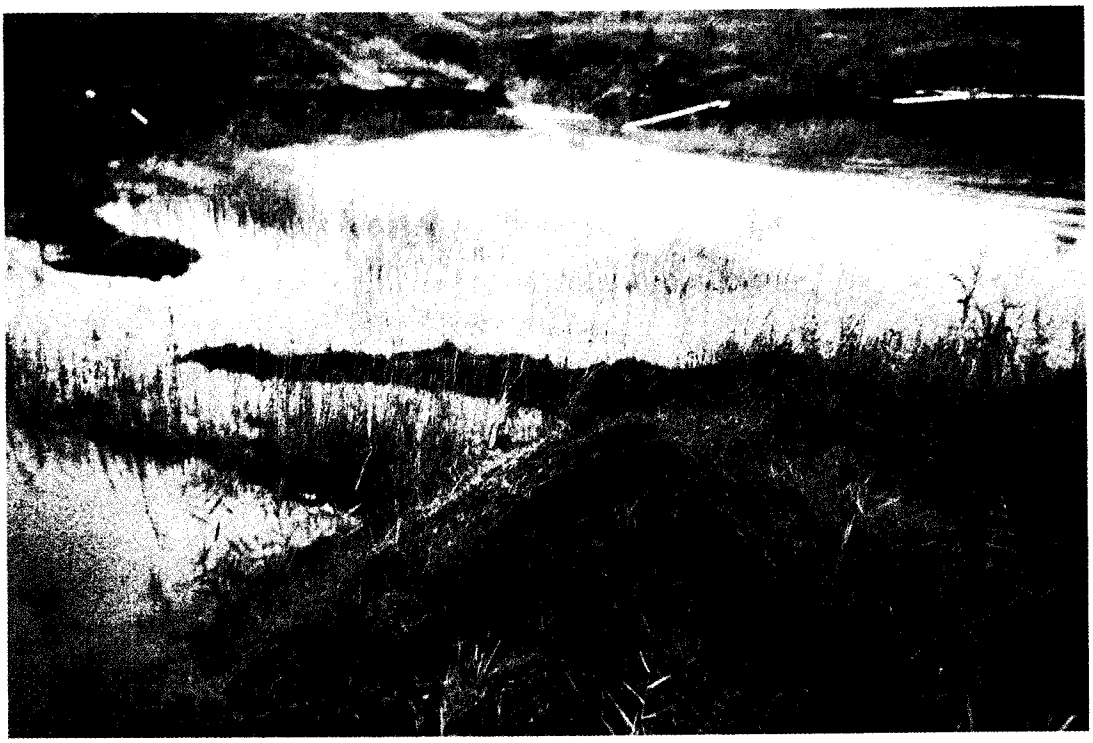


Picture 15. Coal Yard Runoff Pond No. 1. Sediment in ditch.

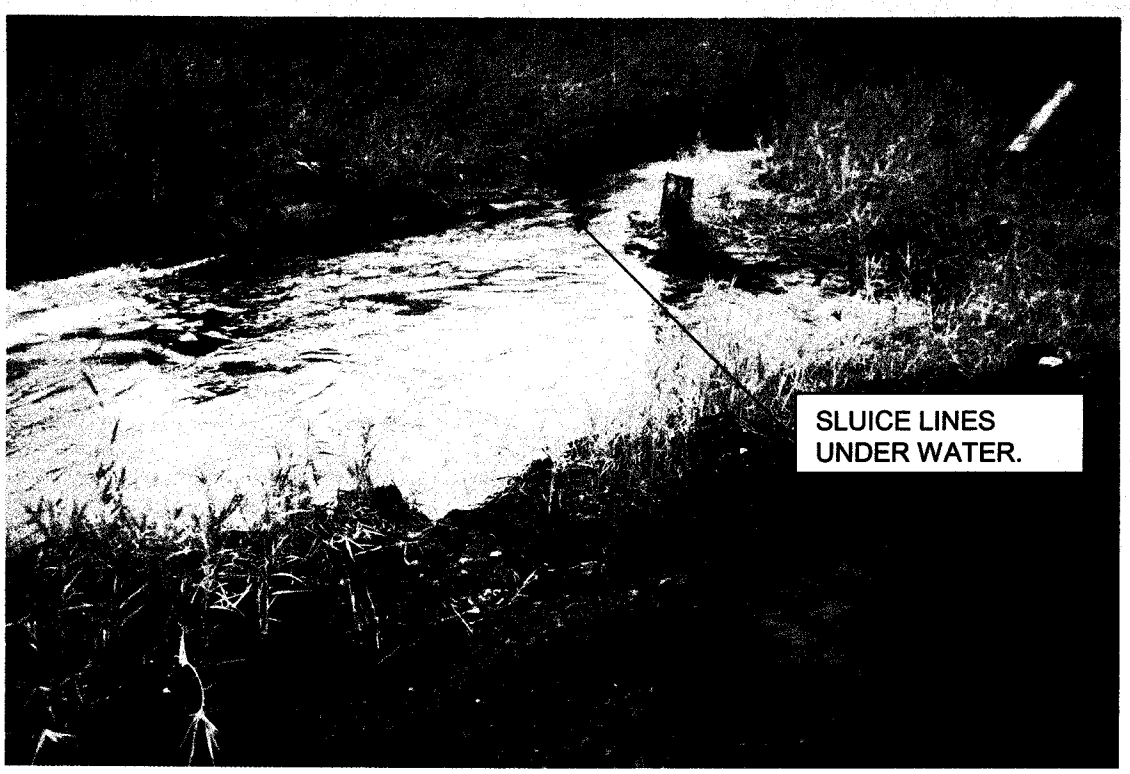
Picture 16. Coal Yard Runoff Pond No. 3. Large amount of sediment in pond.



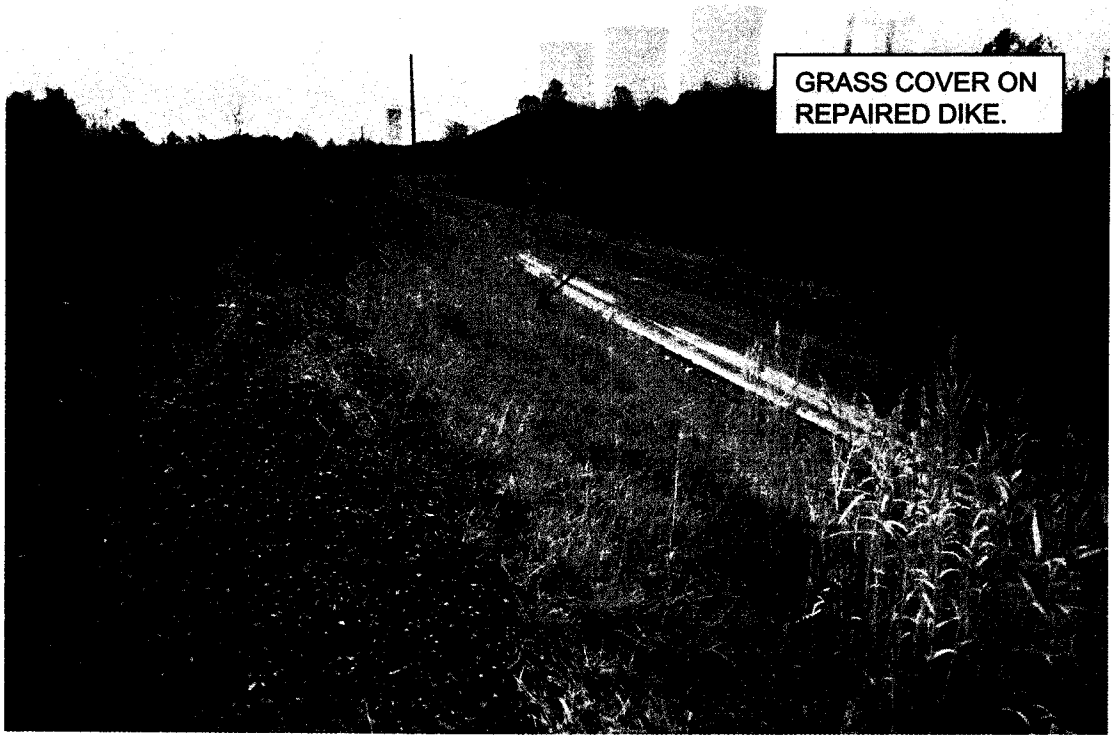
Picture 17. Coal Yard Runoff Pond No. 3. Cattails around pumps and emergency overflow.



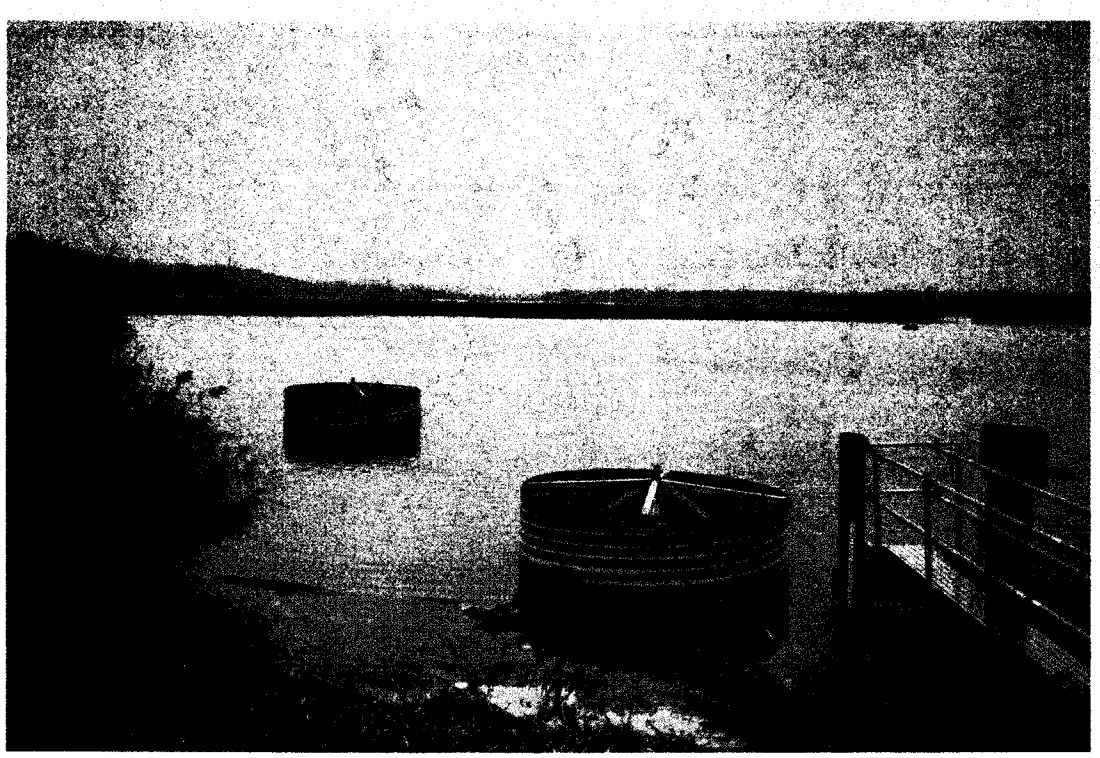
Picture 18. Slag Disposal Area. Small surge pond needs to be cleaned out.



Picture 19. Jacob's Creek Ash Pond. Sluice lines under water.

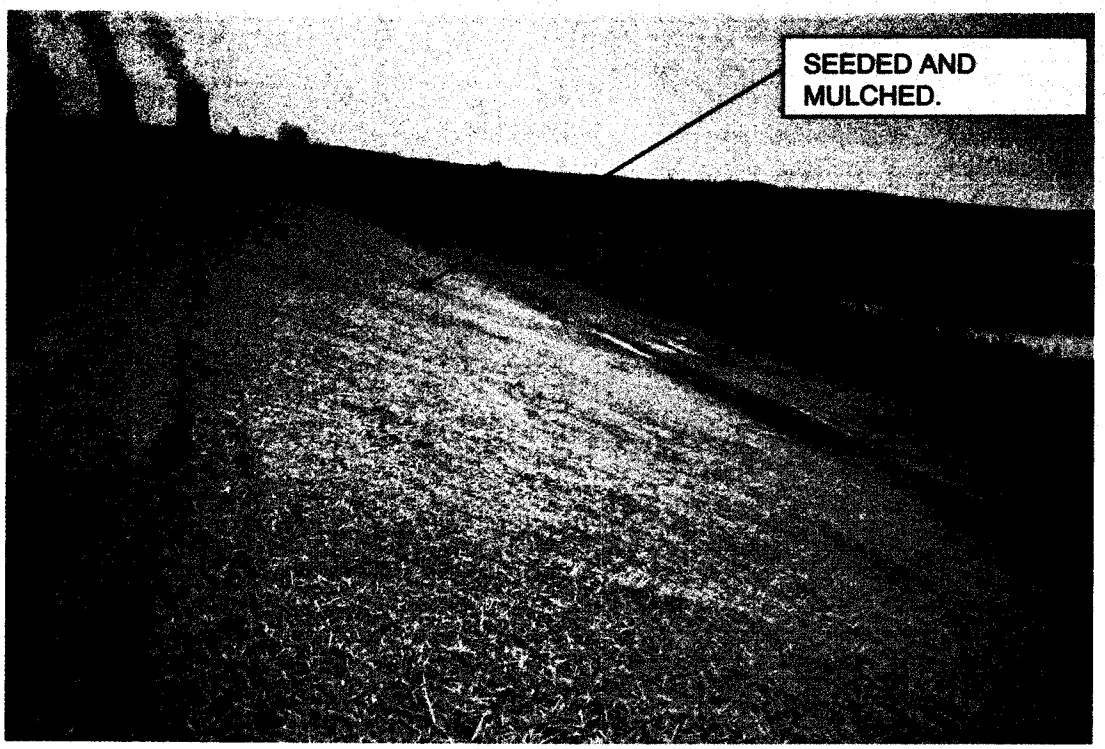


Picture 20. Jacob's Creek Ash Pond. Repair of dike cover from last year inspection.

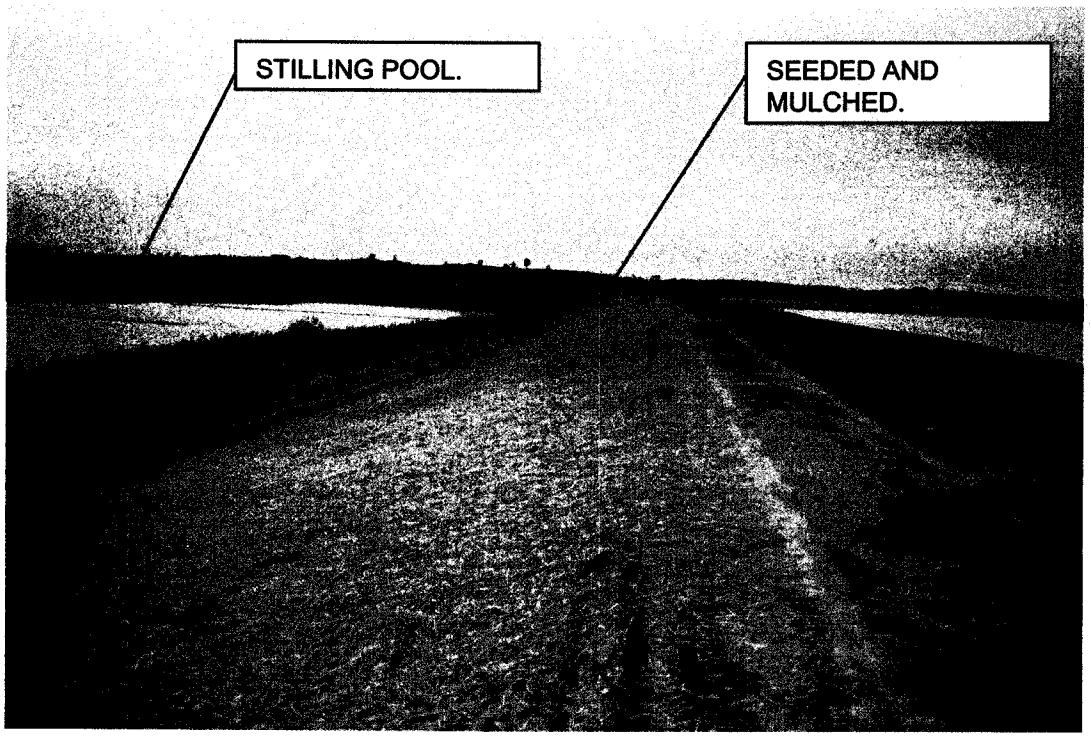


Picture 21. Jacob's Creek Ash Pond. Spillways looking towards CO2 system.

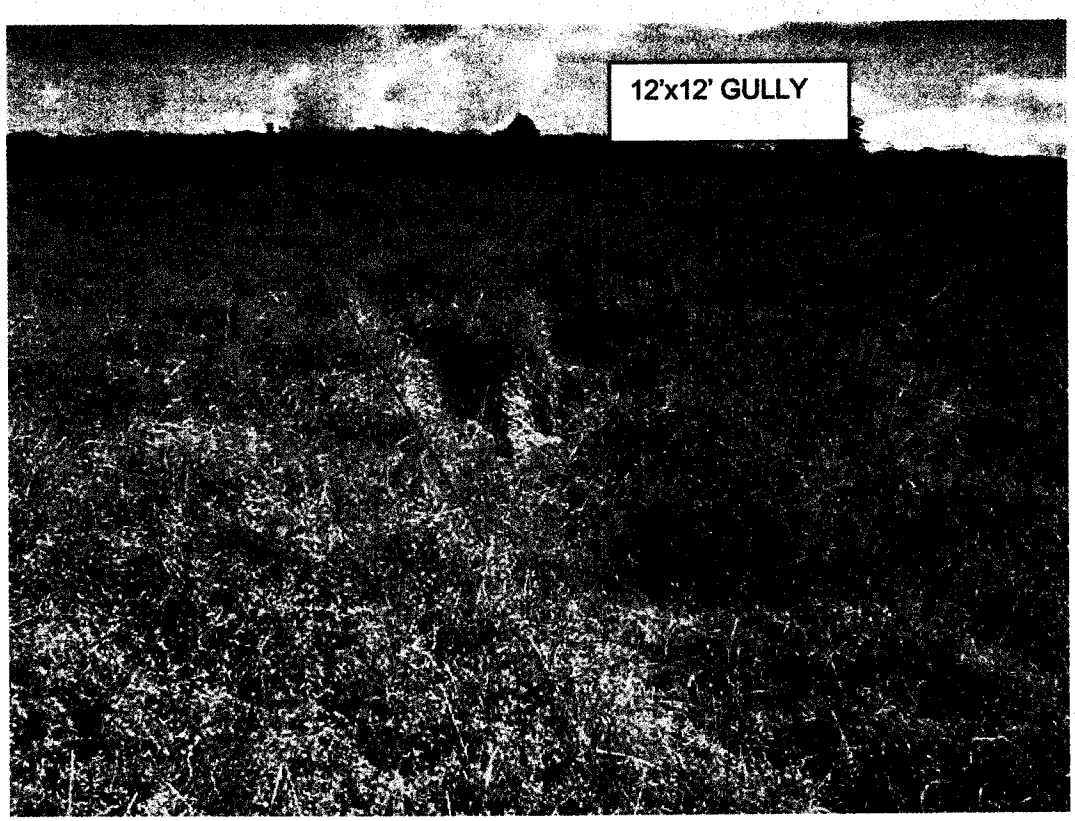
Picture 22. Jacob's Creek Ash Pond. Spillway discharge point.



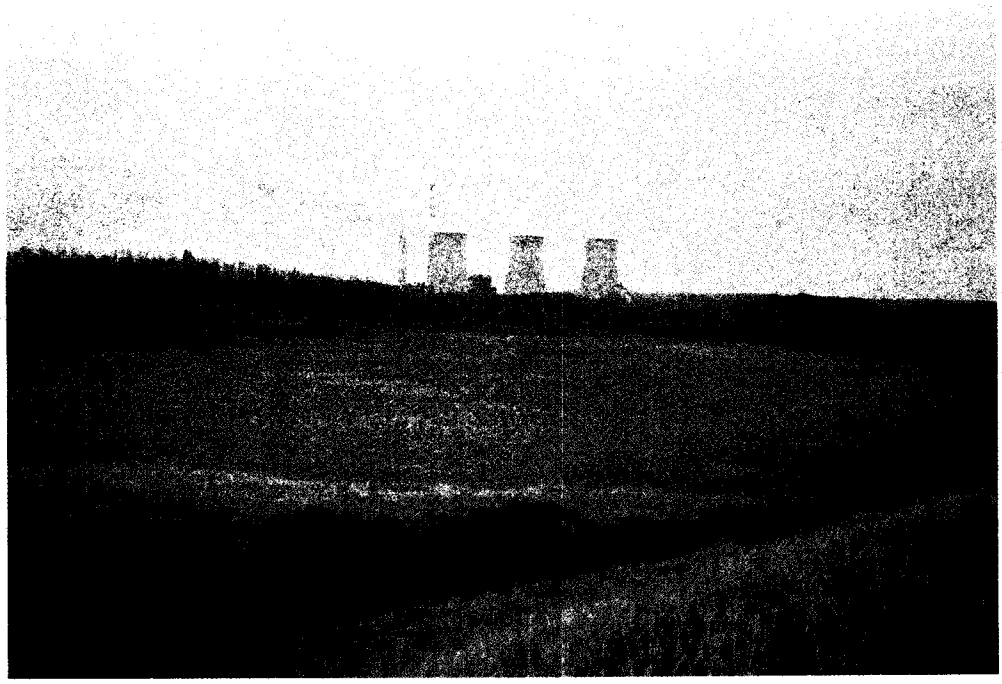
Picture 23. Scrubber Pond. HED finished seeding & strawing dike lift cover.



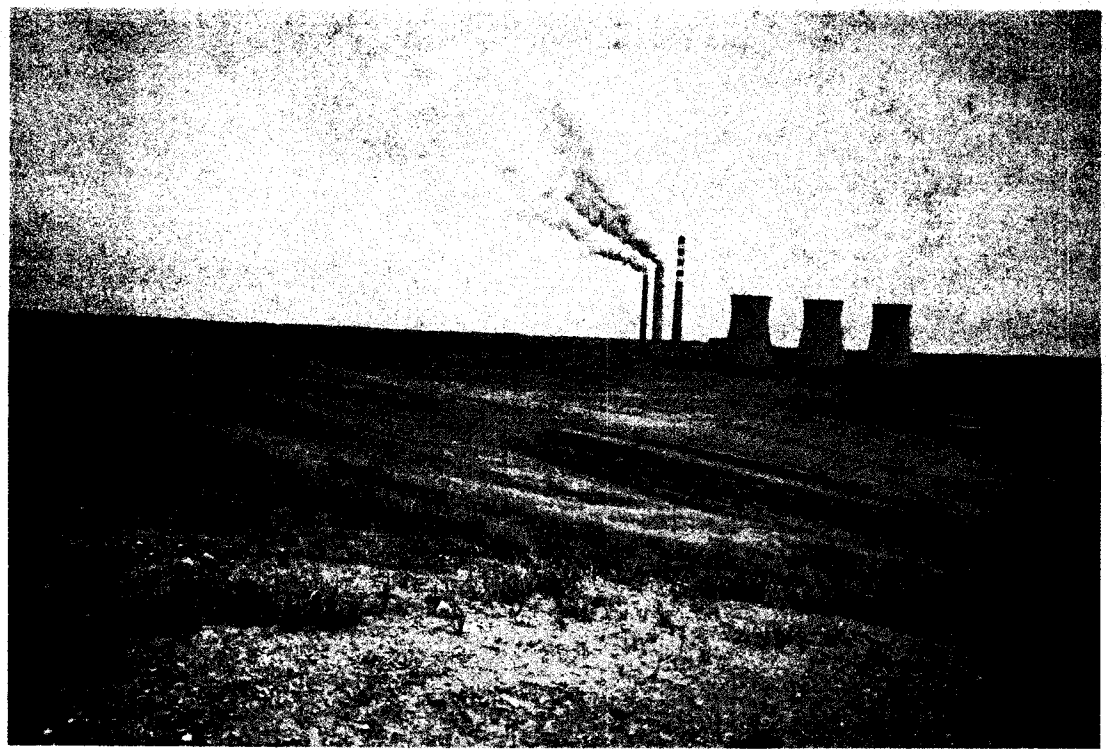
Picture 24. Scrubber Pond. HED finished seeding & strawing dike lift cover.



Picture 25. West Dredge Cell. 12'x12' Gully. (File Photo)

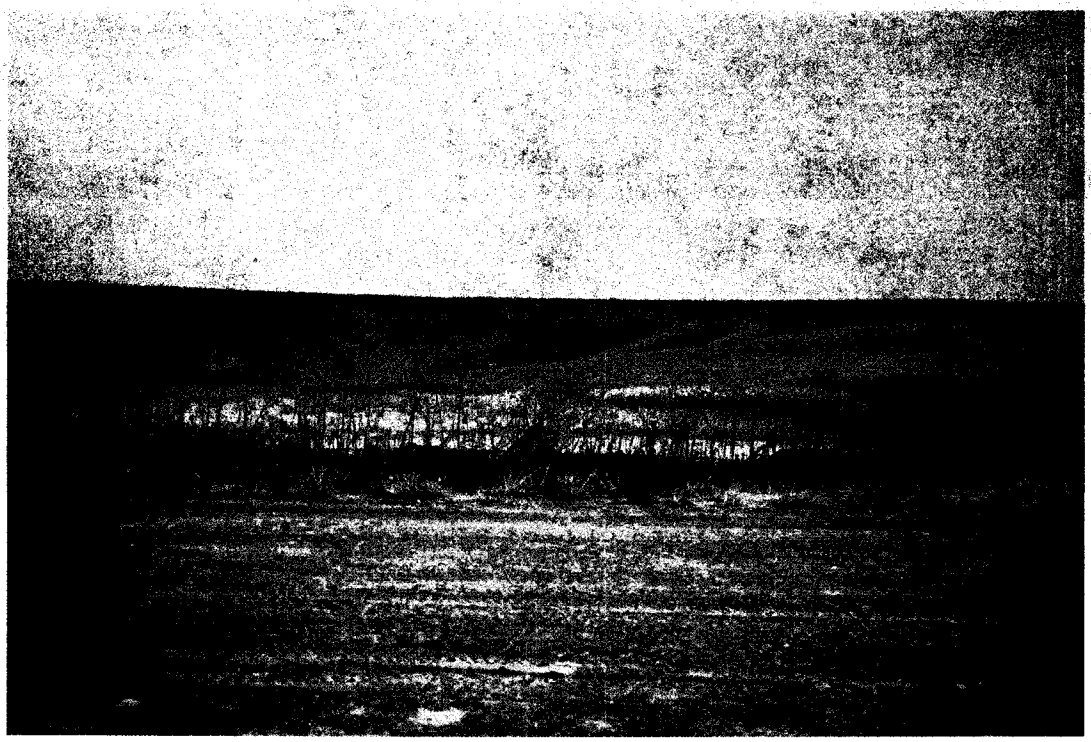


Picture 26. East Dredge Cell.

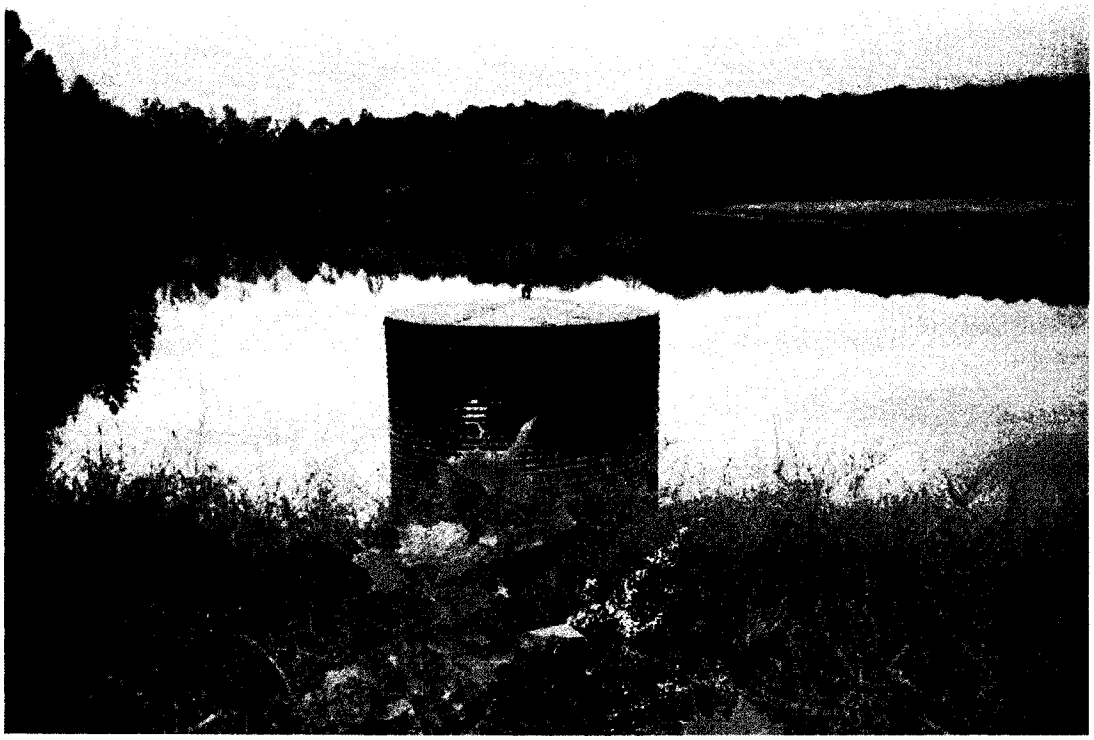


Picture 27. Medium and Coarse Refuse Area.

Picture 28. Medium and Coarse Refuse Area.



Picture 29. Medium and Coarse Refuse Area.

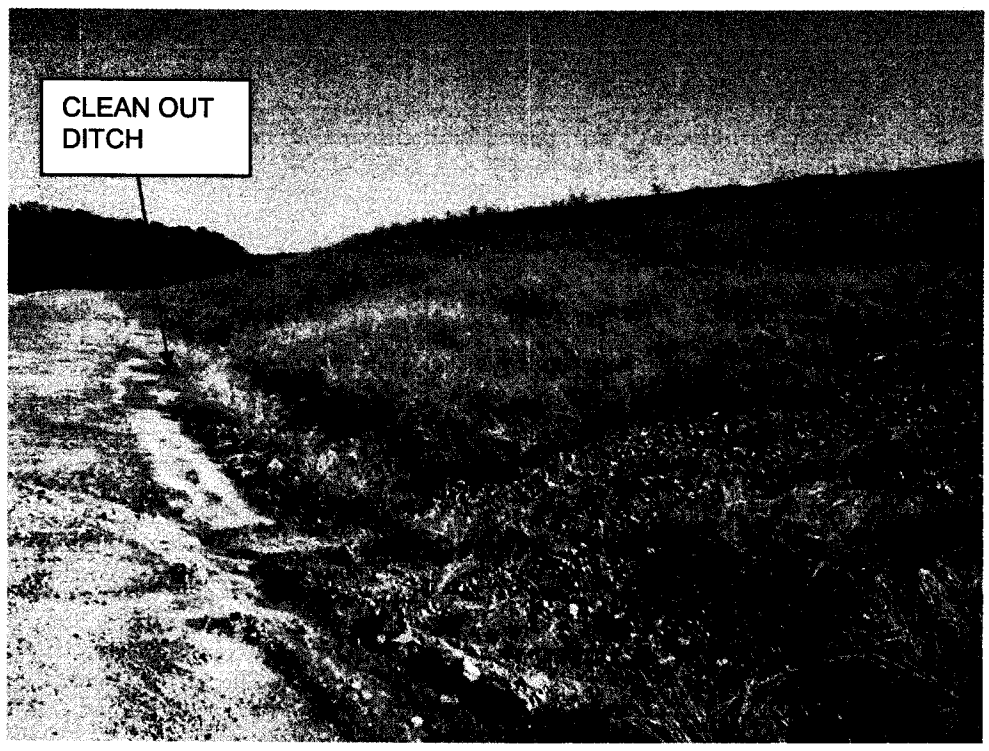


Picture 30. Fines Pond #2.

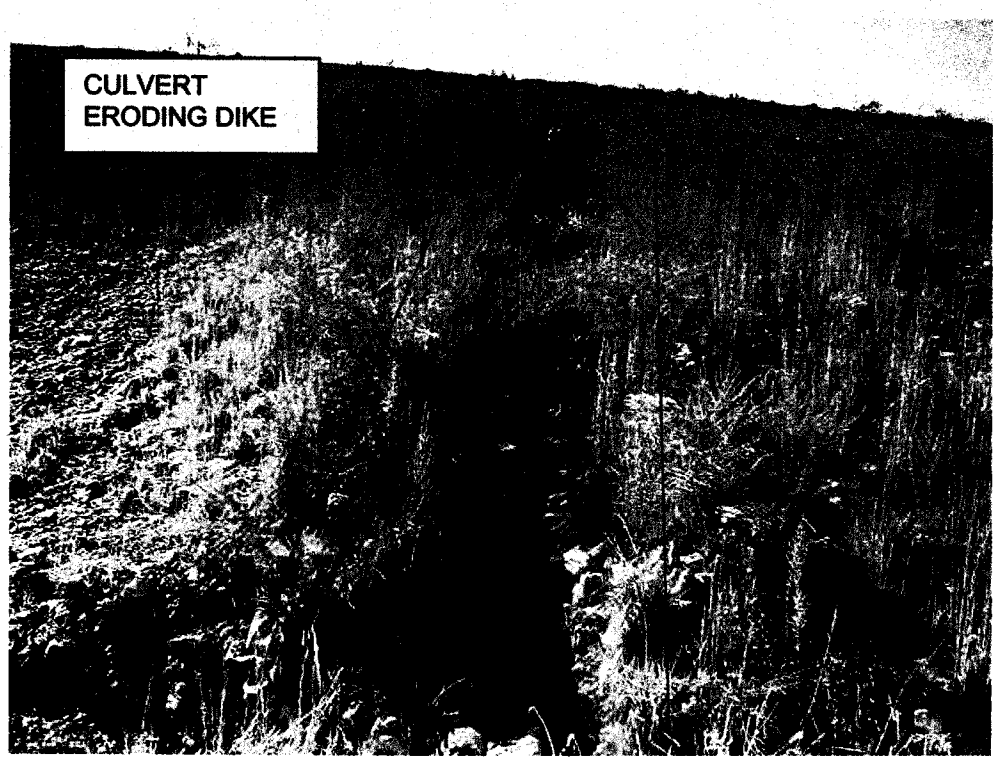
Picture 31. Fines Pond #3. Fines Pond #3 discharge channel to Fines Pond #2.

Picture 32. Fines Pond #3. Erosion at down drain.

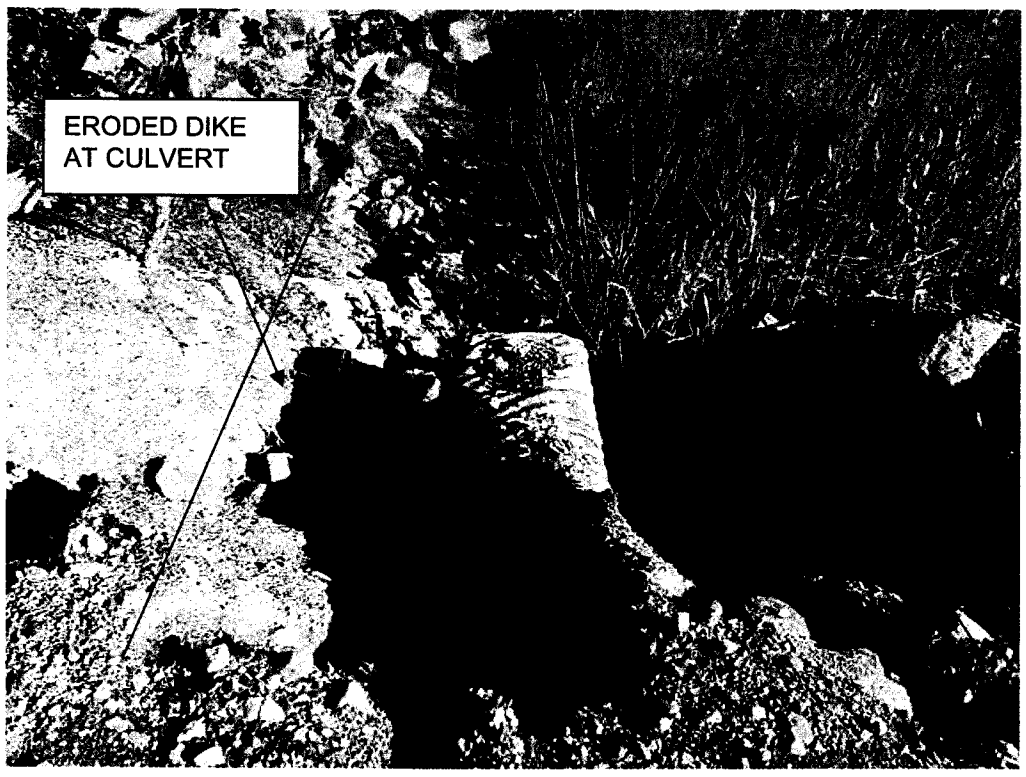
Picture 33. Coal Wash Fines Pond No. 3. Ditches needing to be cleaned out. (File Photo)



Picture 34. Coal Wash Fines Pond No. 3. Ditches needing to be cleaned out. (File Photo)

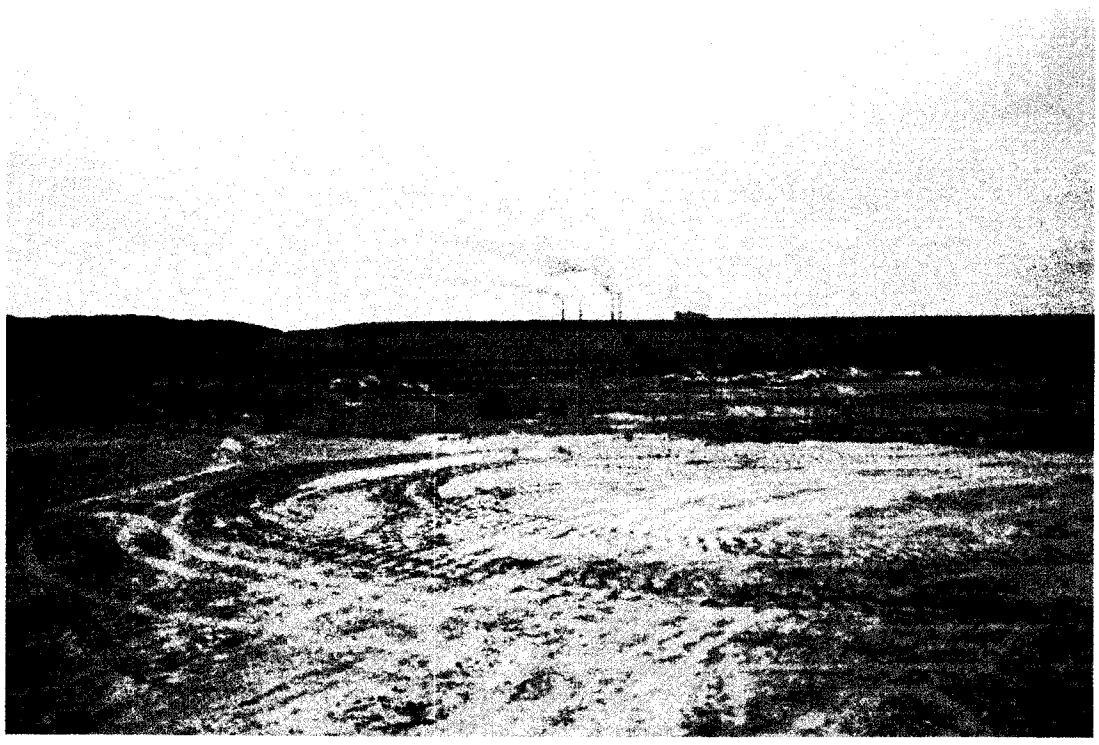


Picture 35. Coal Wash Fines Pond No. 3. Eroded dike at culvert. (File Photo)



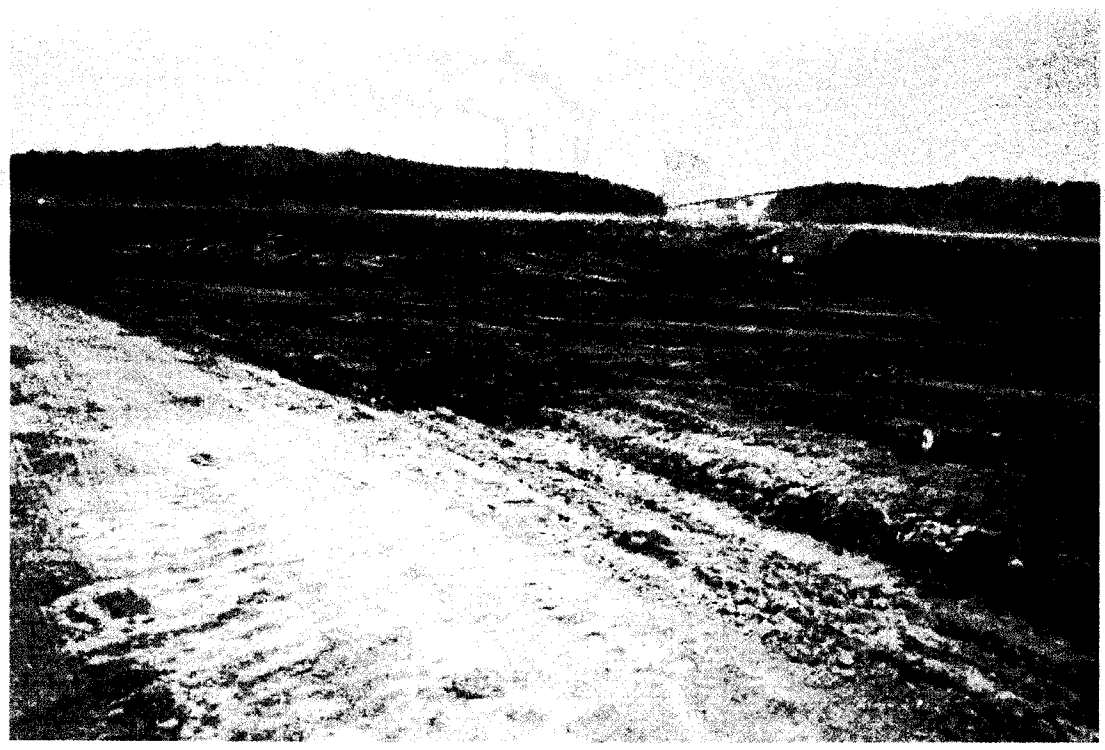
Picture 36. Coal Wash Fines Pond No. 3. Eroded dike at culvert. (File Photo)

Picture 37. Fines Pond #3. Looking east side.



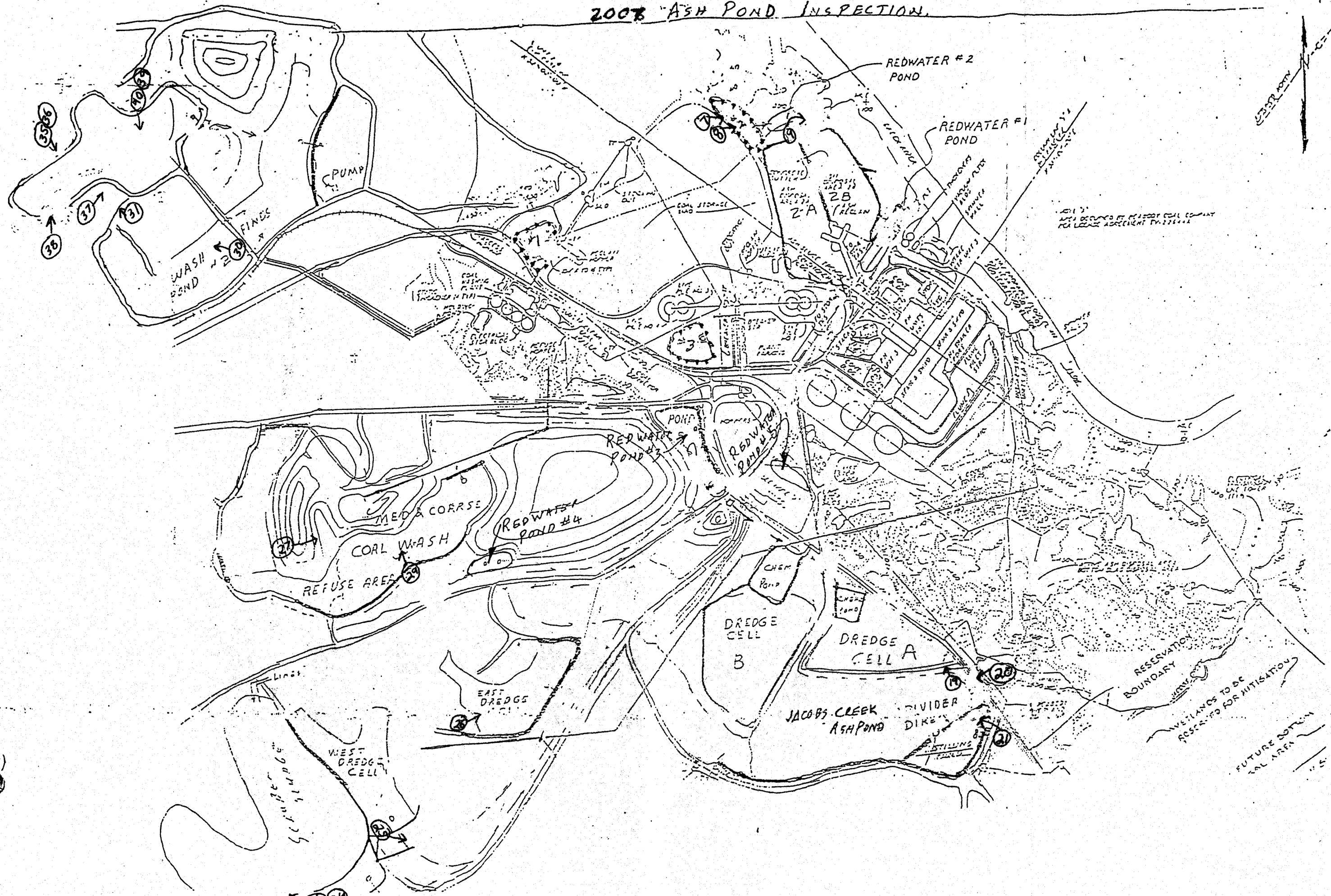
Picture 38. Fines Pond #3. Looking northeast side.

Picture 39. Fines Pond #3. HED collecting fines for the reburn project.



Picture 40. Fines Pond #3. HED collecting fines for the reburn project.

2007 ASH POND INSPECTION.



PARADISE FOSSIL PLANT
FINES POND COMPLEX

INTERIM SITE EROSION CONTROL PLAN

FALL 2006

Part I—Scope, Sequence & Inspection and Maintenance
Part II—Sketches A thru K

TVA

PAF - FINES POND AREA - SEDIMENT CONTROL - FALL 2006

SCOPE AND SEQUENCE OF CONSTRUCTION INSPECTION AND MAINTENANCE

Reference **Sketch A** - Location Map

1. Construct Rock Check Dam - 150 FT downstream of pipe outlet. See **Sketch B.** (Do before any other work)

Quantities (Rough Estimate)
Structural Excavation (Key - 5 CY)
30 CY of Riprap (6 to 18 Inch Diameter Varying Sizes)
75 SY of Class C Filter Fabric

2. Reconstruct crossing (No Traffic in Future) See **Sketch C.**

Reconstruct crossing (to reduce size of slope faces), removing material and placing it (Need Location?). Place Filter and Riprap on both sides of the reconstructed Crossing.

Quantities (Rough Estimate)
Earth and Rock Removal: 4500 CY
1081 Stone (Filter): 60 CY
Class C Filter Fabric: 300 CY

3. Reconstruct Berm and Side Slope of NW side of Fines Pond. See **Sketches D and E.** Reshape Berm to slope to the inside. Reconstruct Ditch. Construct pipe crossing of berm into new down drains. Construct Down Drains of Riprap.

Distance - 400 LF

Quantities (Rough Estimate)
Machine Re-Grading - Shaping of Berm (LS)
Ditching (400 LF)
Structural Excavation (Pipes): 12 CY
2 - 12" HDPE Pipes @ 20 FT Ea
RipRap Down Drains (12 CY of 9" Dia. Riprap)
Place 4" layer of 1032 Cr Stone (300TN)

4. Stabilize Northwest Borrow Area. See **Sketches F, G & H.** Construct sediment pond per Sketch G. Spread ball mill runoff pond cleanout material; blend in, seed and mulch. Construct Stone Check Dams per Sketch H.

Quantities (Rough Estimate)
Spread Ball Mill Clean out and mix in (by field)

Seed and Mulch (33 Acres) November Mix
Ceresa: 50 lbs per acre
Annual Rye: 75 lbs per acre
Perennial Rye: 75 lbs per acre
Korean Lespodiza: 100 lbs per acre
Lime: 4 tons per acre
Fertilizer: 600 lbs per acre
Stone Check Dams
1.5 Tons each of # 4R/R Ballast
3.5 SY of Class C Filter Fabric Each
Say build 7
11 Tons #4 R/R Ballast
25 SY of Class C Filter Fabric
Sediment Pond
Excavate - 8500 CY
#57 Stone - 90 CY
Riprap (Class IA) - 110CY
Class C (Nonwoven) Filter Fabric - 615 SY
18" Diameter HDPE Pipe -280 LF
Precast CONC Riser - 1 48" by 48" RCP w/base & 3 - 6" diameter Orifices.

5. Stabilize Northeast Borrow Area. See **Sketches I, J & K.** Construct Sack Crete Check Dams per Sketch J. Construct sediment pond per Sketch K. Seed and Mulch area.

Quantities (Rough Estimate)
Seed and Mulch (29 Acres) November Mix
Ceresa: 50 lbs per acre
Annual Rye: 75 lbs per acre
Perennial Rye: 75 lbs per acre
Korean Lespodiza: 100 lbs per acre
Lime: 4 tons per acre
Fertilizer: 600 lbs per acre
Sack Crete Check Dams
40 Bags Each
#4 Rebar By Field
Say build two evenly spaced
Total: 80 Bags
Sediment Pond
Excavate - 7200 CY
#57 Stone - 60 CY
Riprap (Class IA) - 90 CY
Class C (Nonwoven) Filter Fabric - 475 SY
18" Diameter HDPE Pipe - 110 LF
Precast CONC Riser - 1 48" by 48" RCP w/base & 3 - 6" diameter Orifices.

INSPECTION AND MAINTENANCE

Riprap, Stone, and "Sack Crete" Check Dams

Inspection: Inspections should be made before anticipated storm events (or series of storm events such as intermittent showers over one or more days) and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every fourteen calendar days.

Maintenance: Sediment should be removed from behind a check dam before it reaches a depth of one-half the original dam height. The sediment shall not be deposited downstream from the structure or adjacent to a stream or channel.

Sediment Basins

Inspection: Same as Check Dams. In addition the embankment should be checked periodically to ensure it remains structurally sound and has not been damaged by erosion or construction equipment. The emergency spillway should be checked to ensure is remains open and the rip rap is in satisfactory condition.

Maintenance: Sediment should be removed from the basin before it reaches a depth of one foot measured from the bottom of the pond. The sediment shall not be deposited downstream from the structure or adjacent to a stream or channel.

Paradise Fines Pond #3
Grassing - Erosion - Slope Stability
Interim Administrative Controls

Difficulties have been encountered on Fines Pond #3 in establishing a thorough vegetative cover; as is standard practice to stabilize the side slopes of disposal areas. Such vegetative cover prevents erosion from creating channels which set up the mechanism for rainwater to "eat" into the side slope and cause a slope failure. A high percentage of the dike fill for the fines pond is broken chert and large rocks. The rock mixture is one reason for the difficulty in getting grass established. The rock mixture is also relatively stable against wholesale erosion. Witness the fact the stack has been at its current height approximately 5 years and there has been no catastrophic failure.

As in interim plan, until a vegetative cover can be established, administrative controls to ensure stability of the stack are appropriate. These controls include aggressively monitoring the slope, criteria for repair, and records of implementation for repair.

1. **Weekly monitor the slopes.** A specific inspection to observe and note the condition of the stack on all sides will be performed. Notes are to be taken of areas of significant erosion.

2. **Criteria for repair.** Riprapped down drains and channels that show signs of erosion (i.e. - water getting outside the riprap and cutting a parallel channel) are to be repaired immediately with additional riprap.

Erosion Gullies at locations other than a channel or a down drain are to be monitored. If a gully is more than 7" X 9" in cross sectional area, it is to be repaired immediately. Smaller, specific gullies that are of concern are to be noted on the report form and observed at the next inspection.

Rill erosion is to be monitored and observed. Areas of rill erosion larger than 100 Ft by 15 Ft are to be noted and corrective action taken. Areas if rill erosion larger than 50 FT by 15 Ft, but smaller than the 100 FT by 15 FT action criteria, are to be noted on the inspection form and monitored.

3. **Implementation.** Areas where corrective action have been taken are to be noted on the first report form after that action was taken. This is for future reference to note trends, and areas where problems may be reoccurring.

4. Copies of the forms are to be maintained on site and available for inspection.

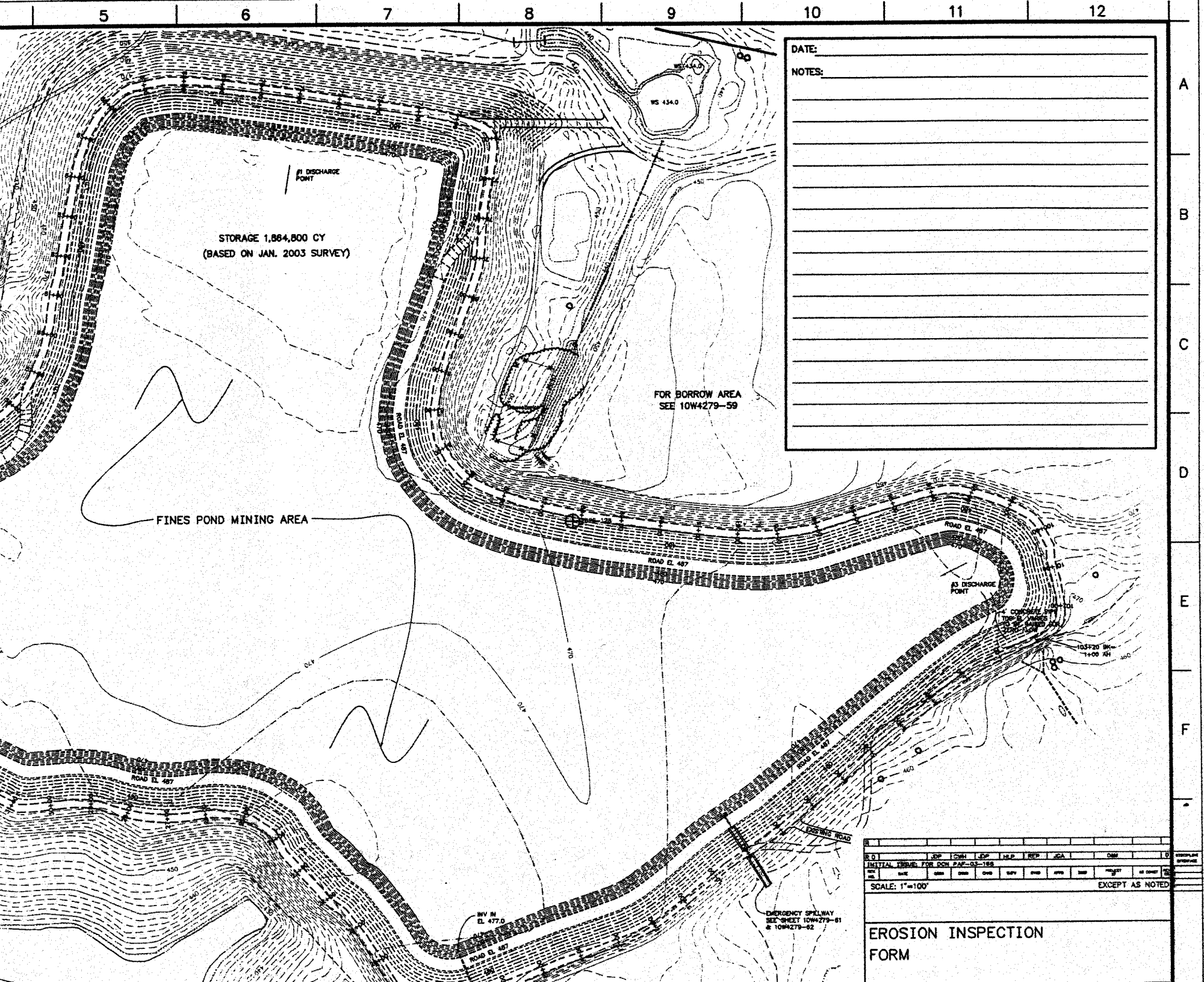
RADISE FOSSIL PLANT

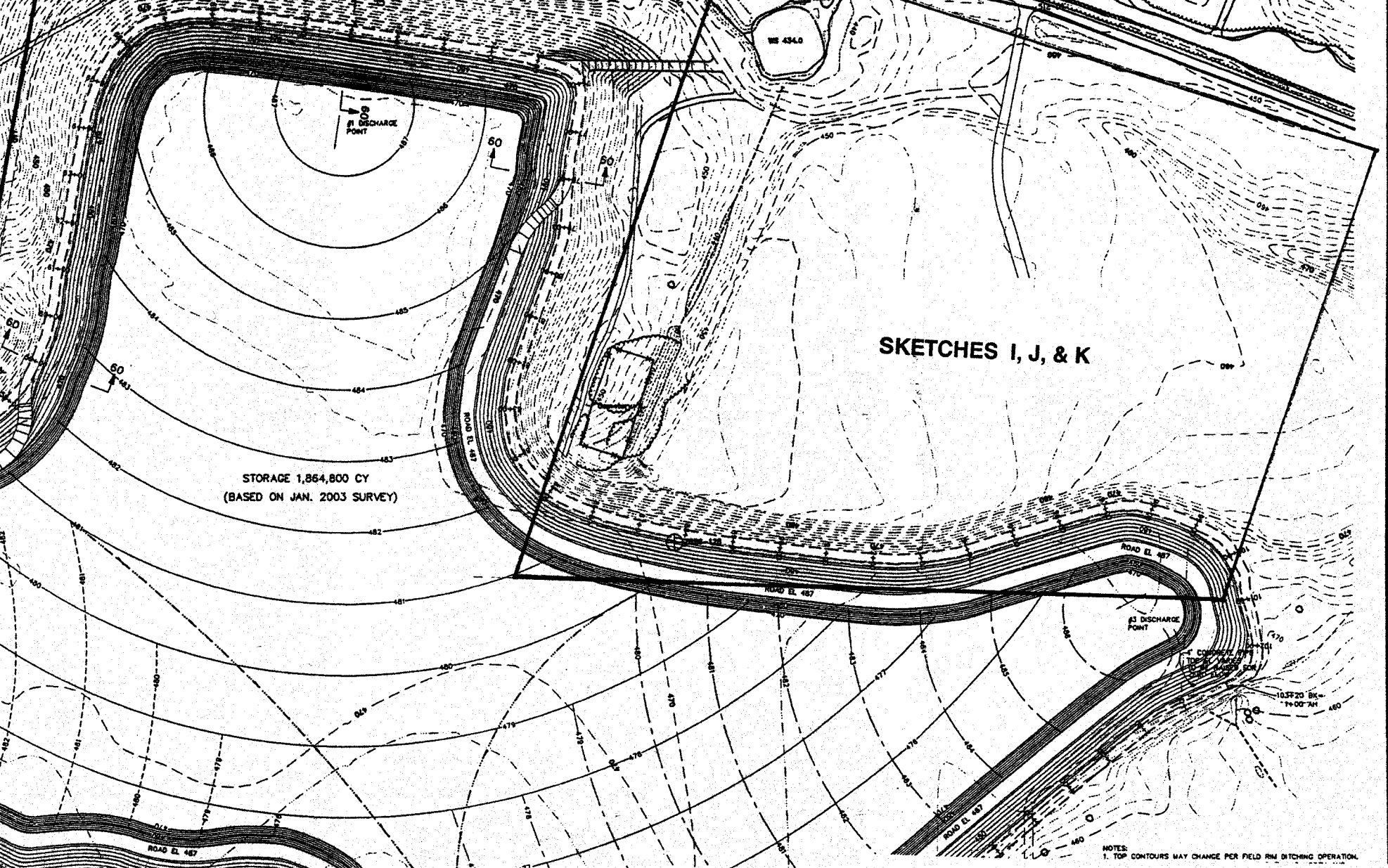
INES POND COMPLEX

SITE EROSION CONTROL PLAN

FALL 2006

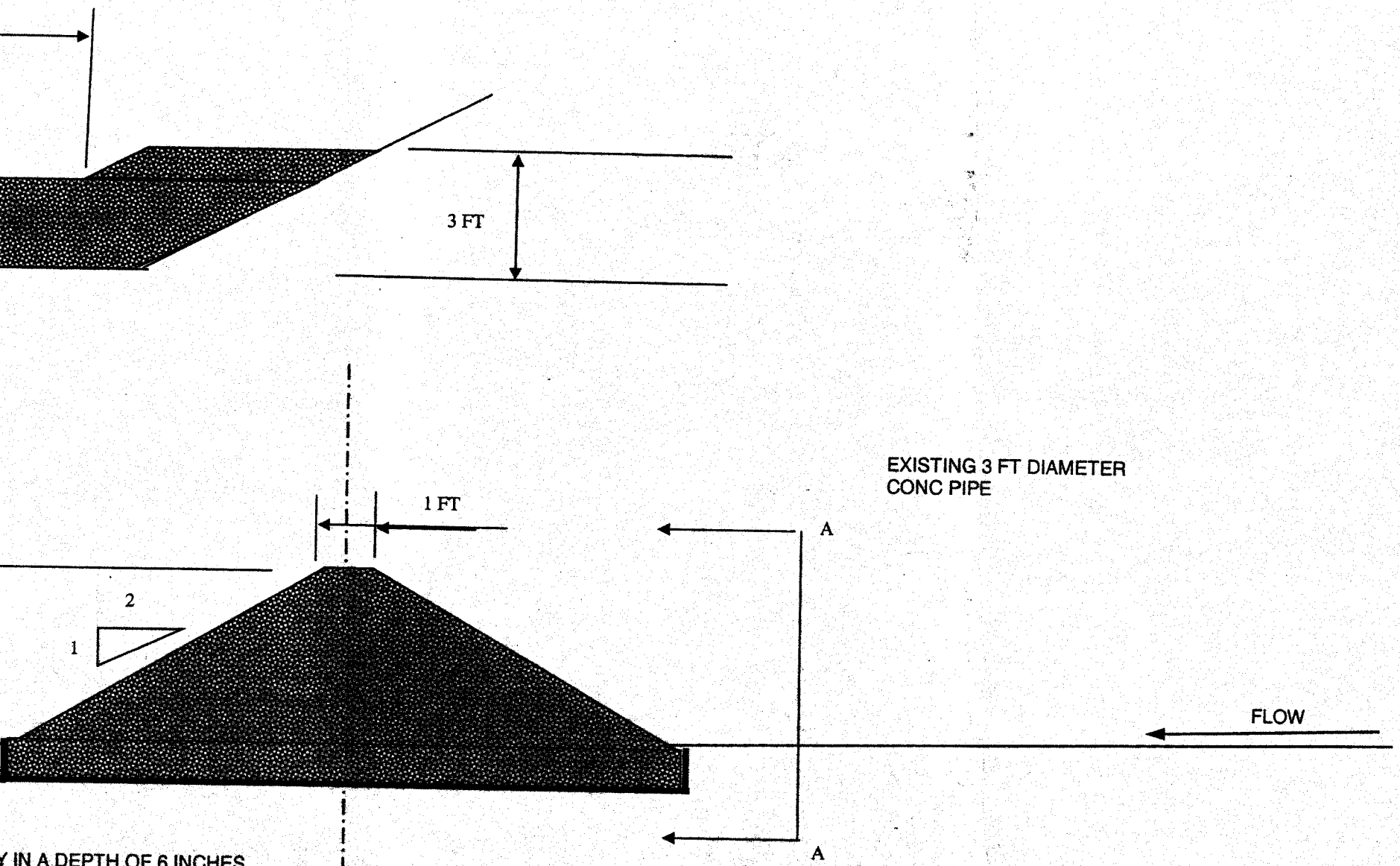
TVA


5
6
7
8
9
10
11
12
A
B
C
D
E
F
DATE:
NOTES:
STORAGE 1,864,800 CY
(BASED ON JAN. 2003 SURVEY)
#1 DISCHARGE POINT
FOR BORROW AREA
SEE 10W4279-59
FINES POND MINING AREA
ROAD EL 487
#3 DISCHARGE POINT
EXISTING ROAD
INV IN
EL 477.0
EMERGENCY SPILLWAY
SEE SHEET 10W4279-61
& 10W4279-62
INITIAL ISSUE FOR DCN PAF-03-168
SCALE: 1"=100'
EXCEPT AS NOTED
EROSION INSPECTION
FORM



LOCATION MAP

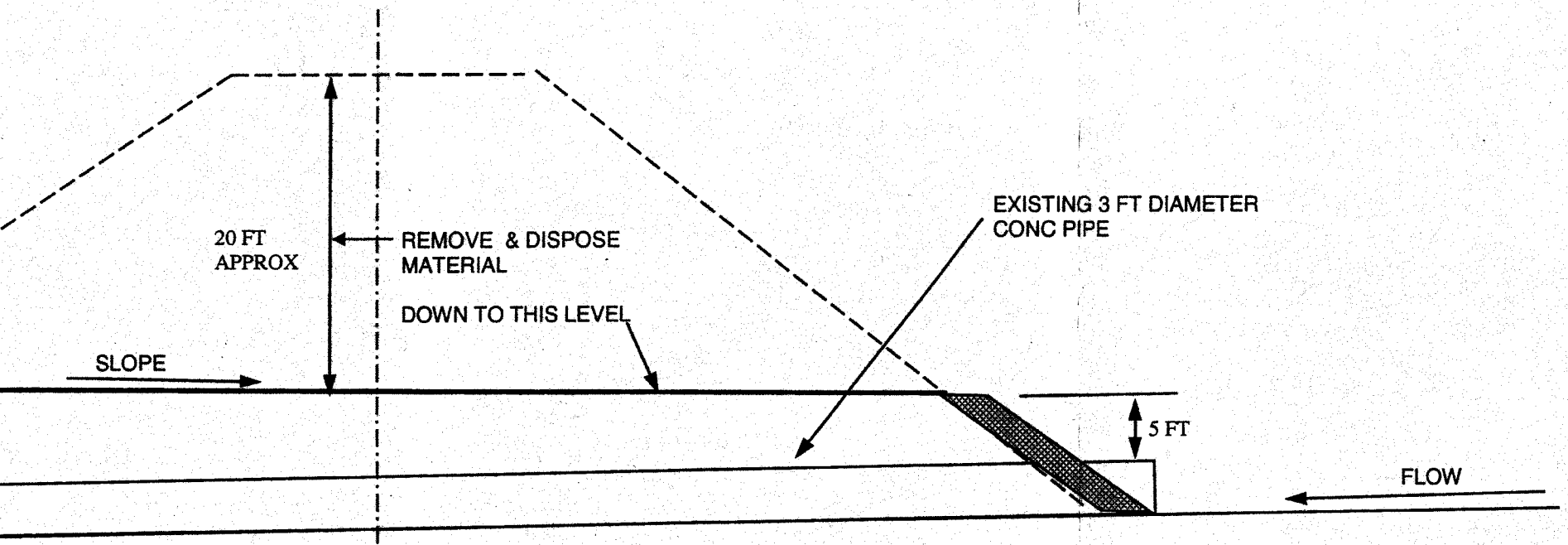
SKETCH A



Y IN A DEPTH OF 6 INCHES
O PLACE CLASS C FILTER
BRIC

ROCK CHECK DAM

150 FT DOWNSTREAM OF PIPE OUTLET



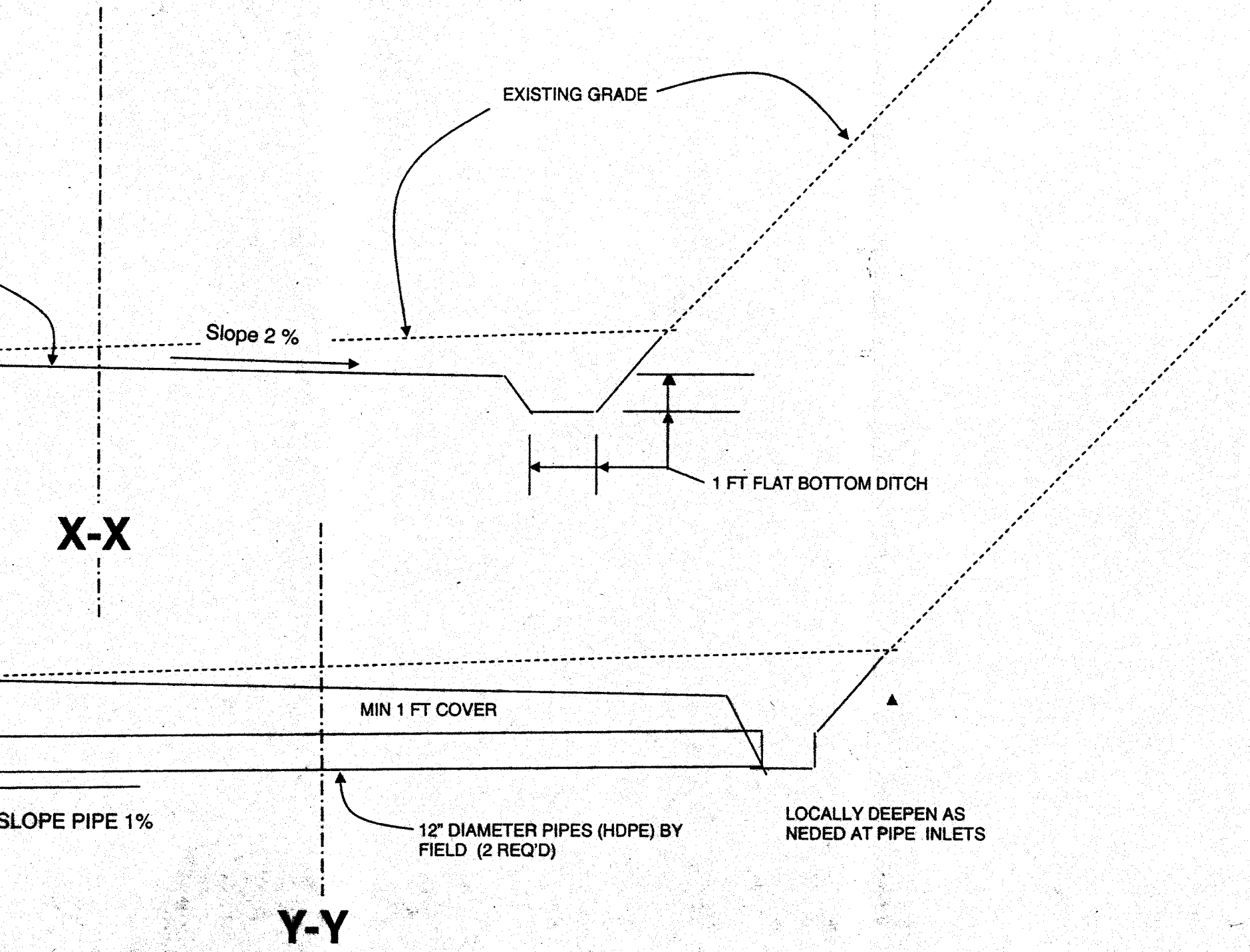
I STONE TO
RFACE
FABRIC
RAP

SECTION AT ROAD CROSSING LOOKING NORTH

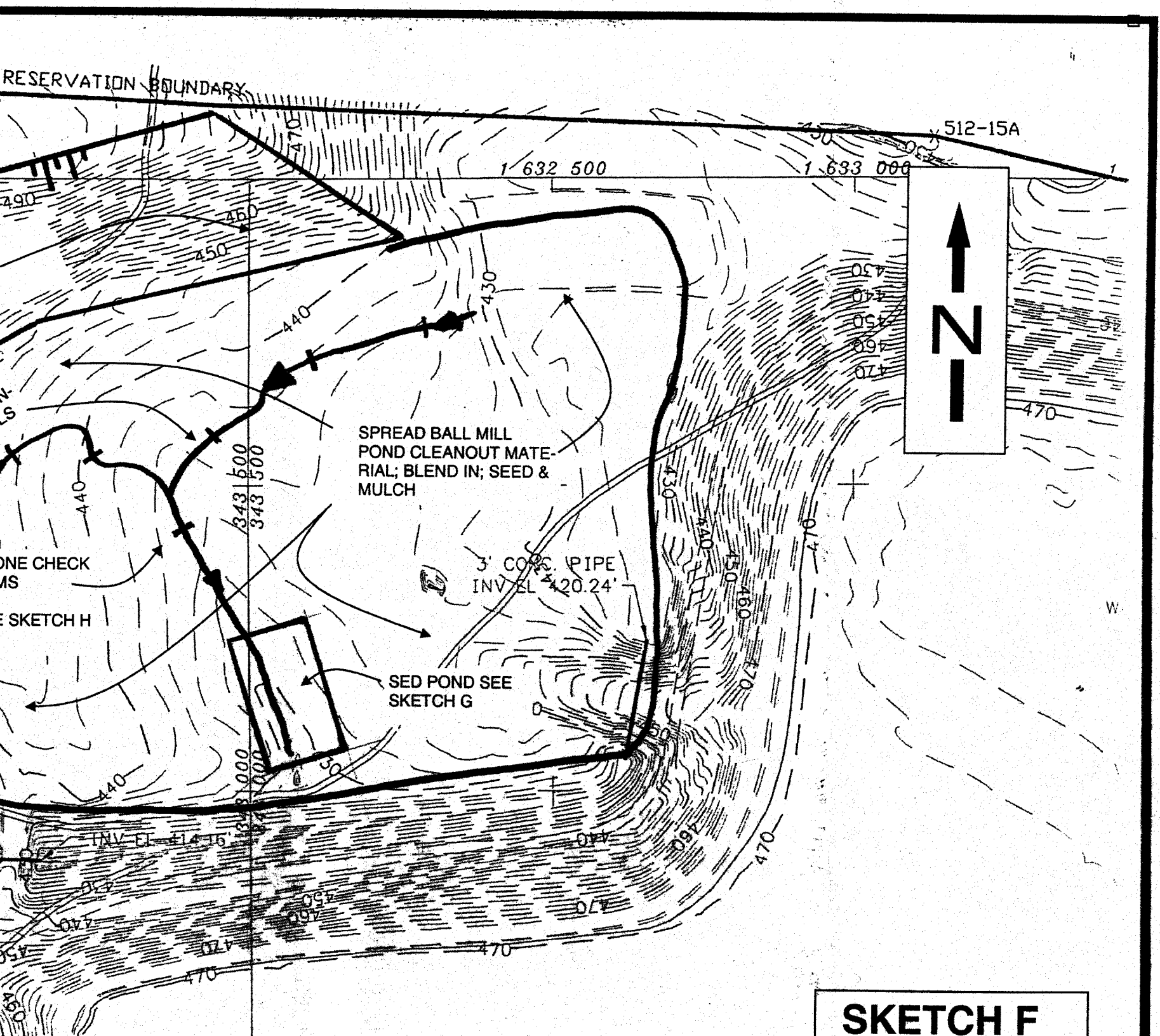
NOT SURVEYED AND NOT TO SCALE

SKETCH C

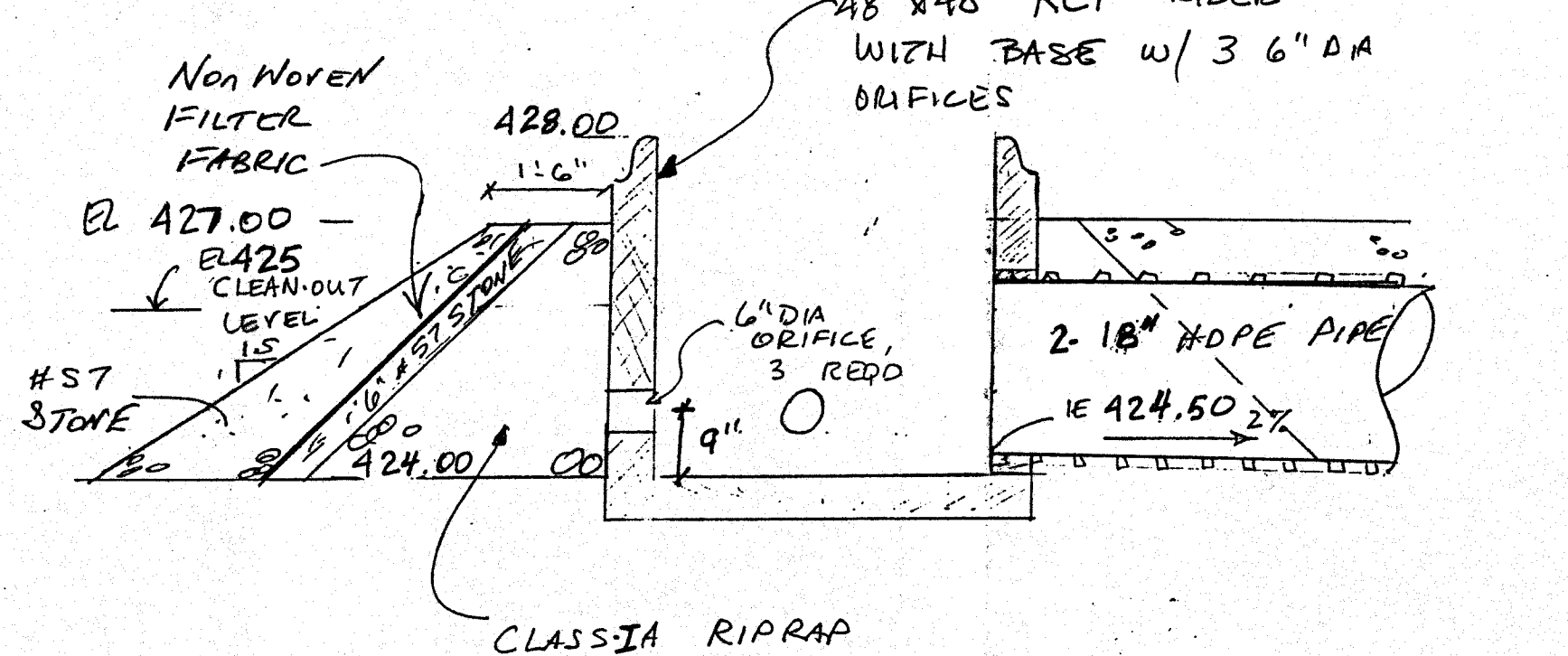
N
ROAD EL 487
INV EL 420.24'
Ditch
New Pipe Drain + Down Drain
Proposed Access Road
2626-127
60
470
480
482
481
483
484
485
486
487
476
460
450
440
430
50+00
51+00
52+00
53+00
54+00
55+00
56+00
57+00
58+00
59+00


EXISTING GRADE
Slope 2 %
1 FT FLAT BOTTOM DITCH
X-X
MIN 1 FT COVER
SLOPE PIPE 1%
12" DIAMETER PIPES (HDPE) BY FIELD (2 REQ'D)
LOCALLY DEEPEN AS NEDED AT PIPE INLETS
Y-Y

SKETCH E

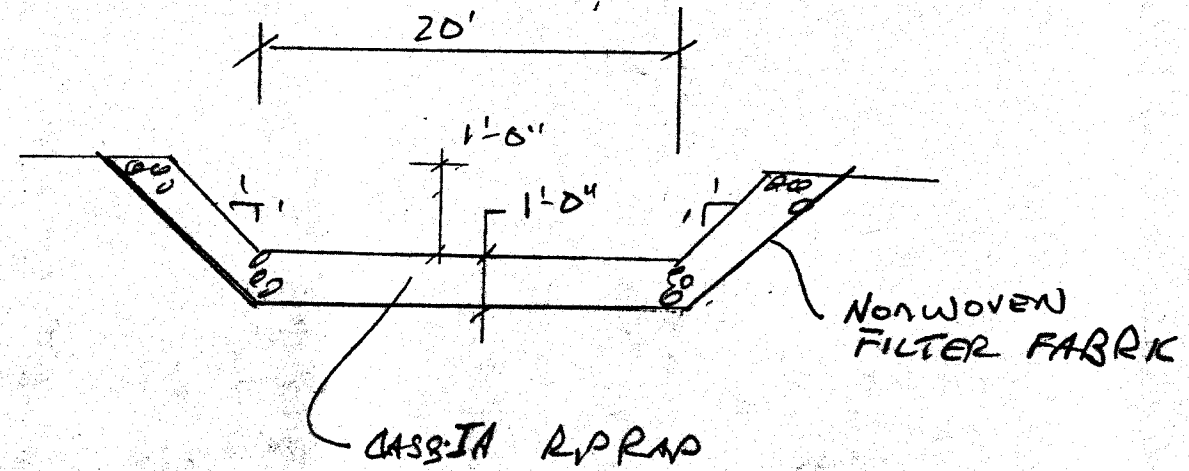

RESERVATION BOUNDARY
512-15A
1 632 500
1 633 000
N
SPREAD BALL MILL POND CLEANOUT MATERIAL; BLEND IN; SEED & MULCH
3' CORR. PIPE INV EL 420.24'
SED POND SEE SKETCH G
ONE CHECK
MS
E SKETCH H
INV EL 414.16'
343 500
343 000

SKETCH F



SECTION C-C

NTS

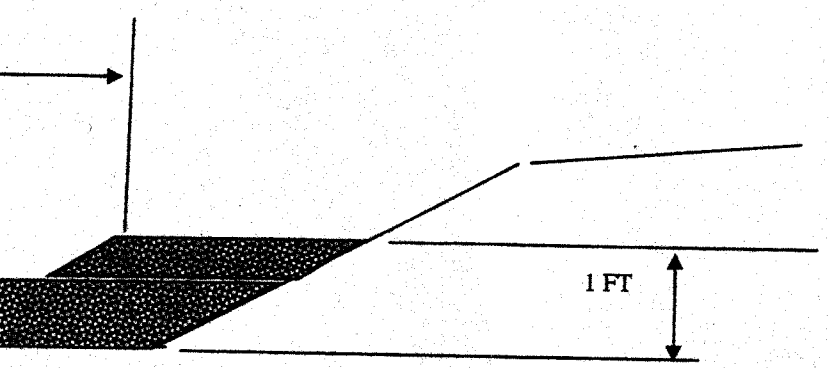


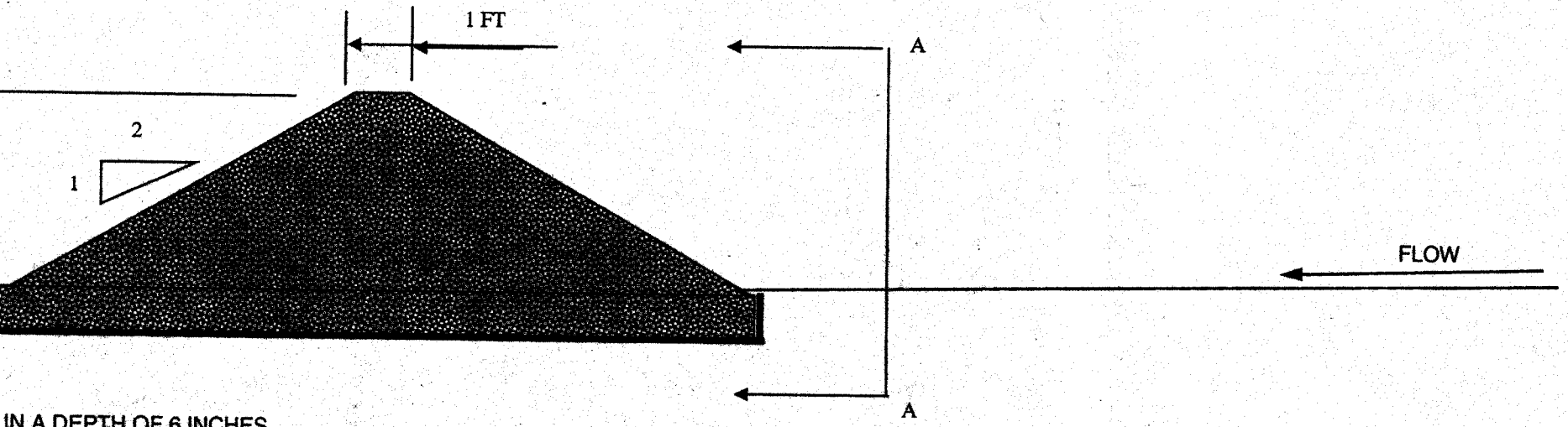
SECTION A-A

NTS

CLASS-IA RIPRAP - CRUSHED STONE WITH 100% PASSING 5" SIEVE AND NO MORE THAN 20% PASSING 1½x1½ SIEVE REF SECTION 805.13.03, STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, KENTUCKY TRANSPORTATION CABINET

SKETCH C



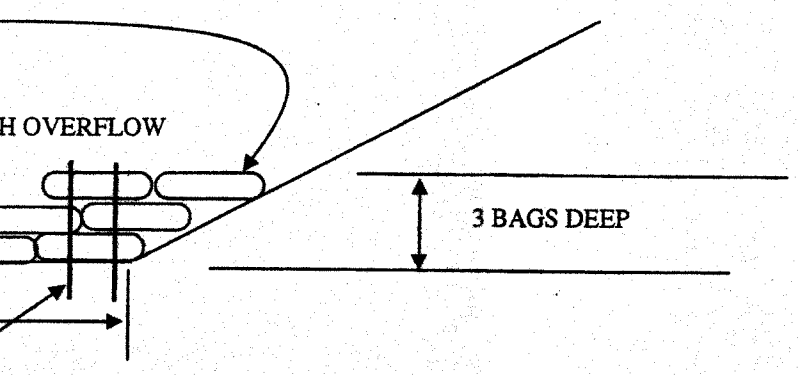


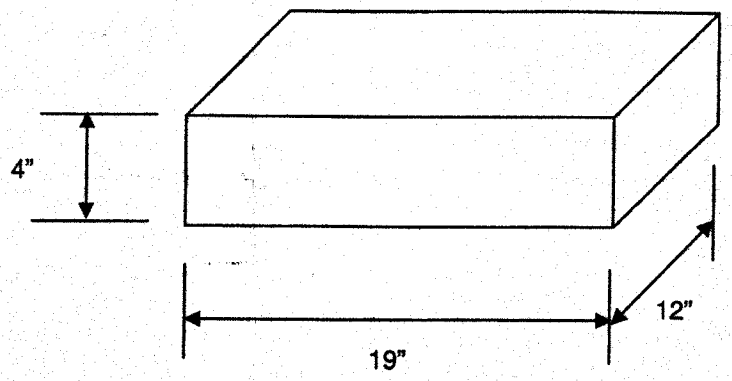
IN A DEPTH OF 6 INCHES
PLACE CLASS C FILTER
RIC

STONE CHECK DAM

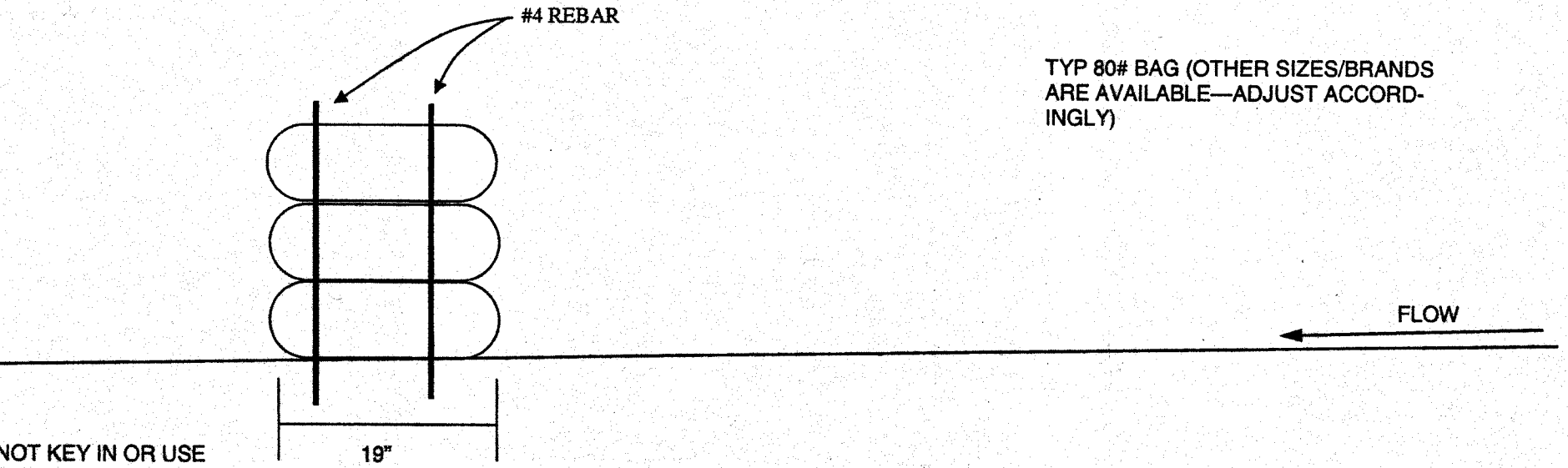
200 FT INTERVALS IN NATURAL CHANNELS FORMED IN WEST BORROW AREA

SKETCH H





TYP 80# BAG (OTHER SIZES/BRANDS ARE AVAILABLE—ADJUST ACCORDINGLY)

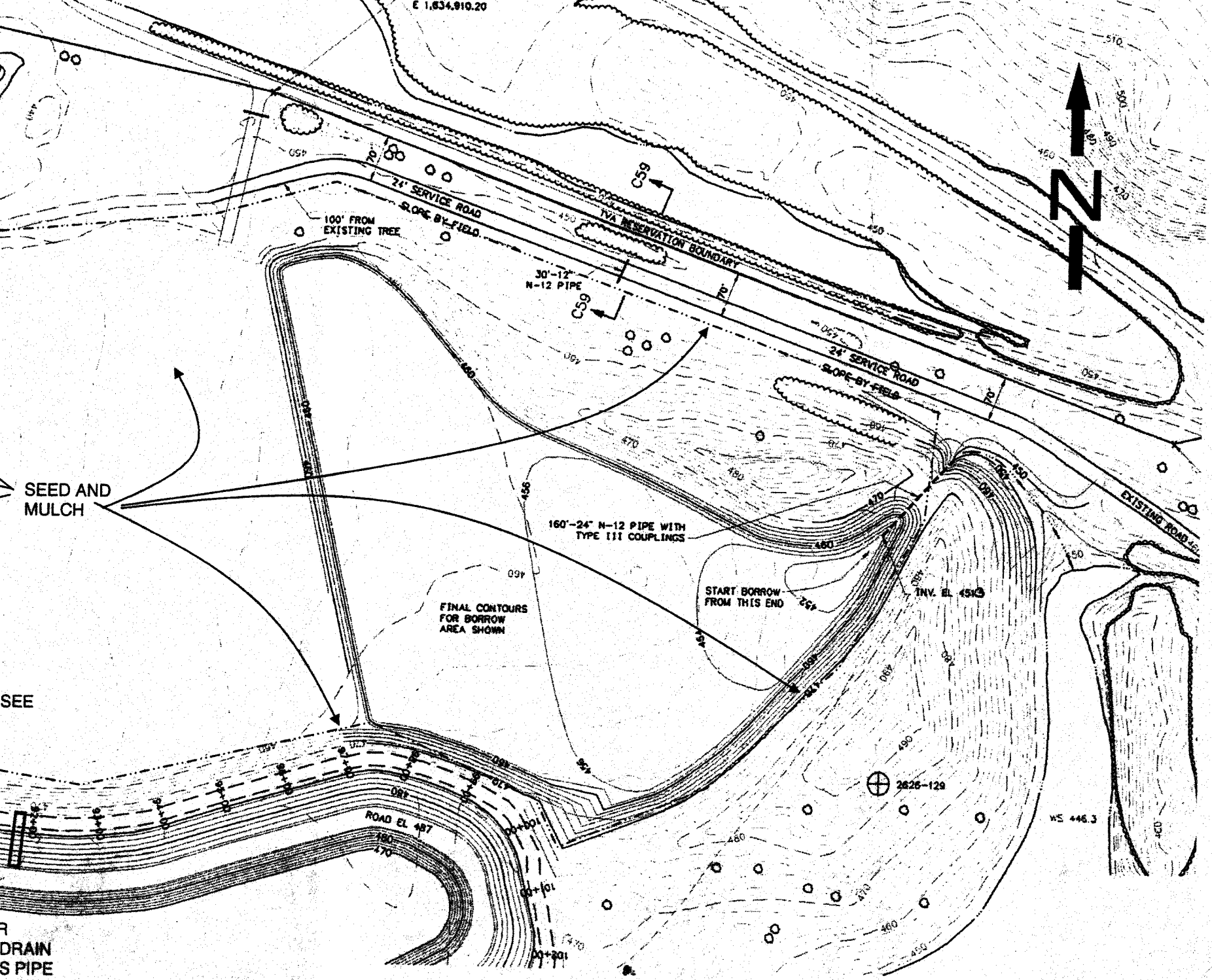


SACK CRETE CHECK DAM

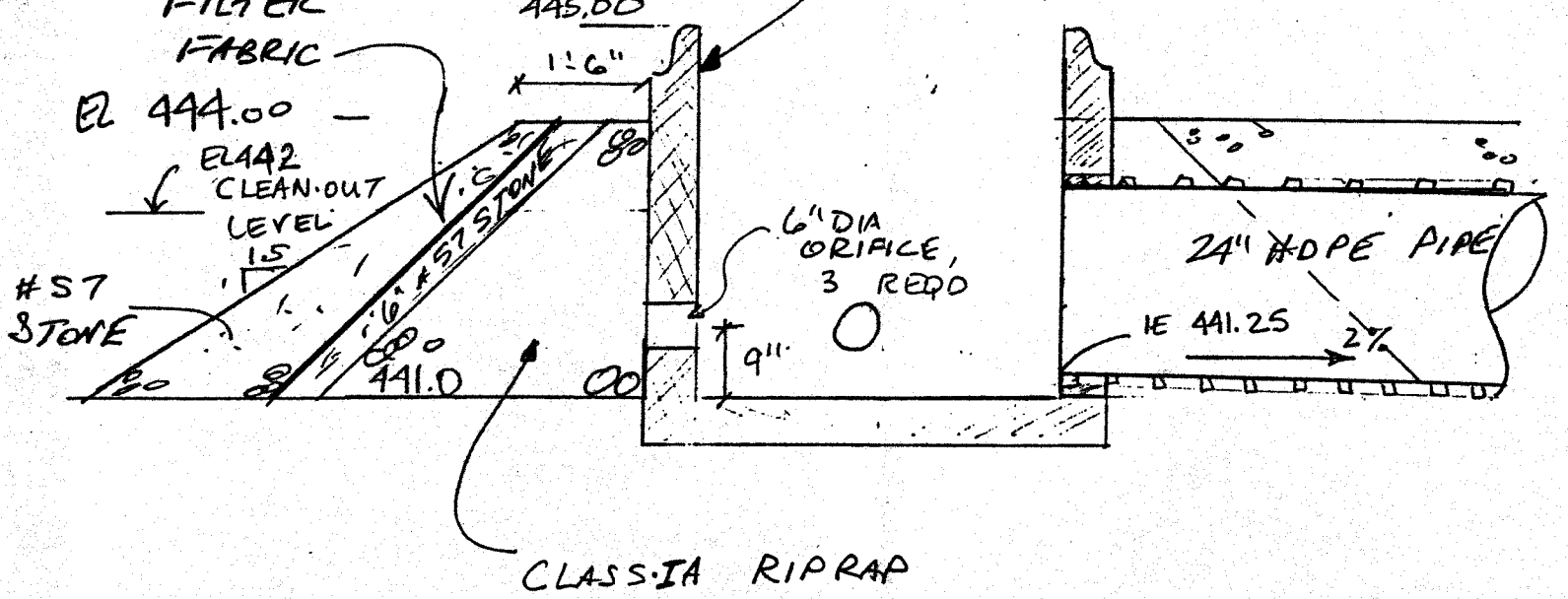
TYPICAL (2 REQUIRED)

FOR LOCATION SEE SKETCH J

SKETCH I


E 1,634,910.20
24' SERVICE ROAD
SLOPE BY FIELD
100' FROM EXISTING TREE
TVA RESERVATION BOUNDARY
30'-12" N-12 PIPE
C59
24' SERVICE ROAD
SLOPE BY FIELD
EXISTING ROAD
SEED AND MULCH
160'-24" N-12 PIPE WITH TYPE III COUPLINGS
START BORROW FROM THIS END
INV. EL 451.3
FINAL CONTOURS FOR BORROW AREA SHOWN
ROAD EL 487
2626-129
WS 446.3
N
SEE
DRAIN
S PIPE

SKETCH J



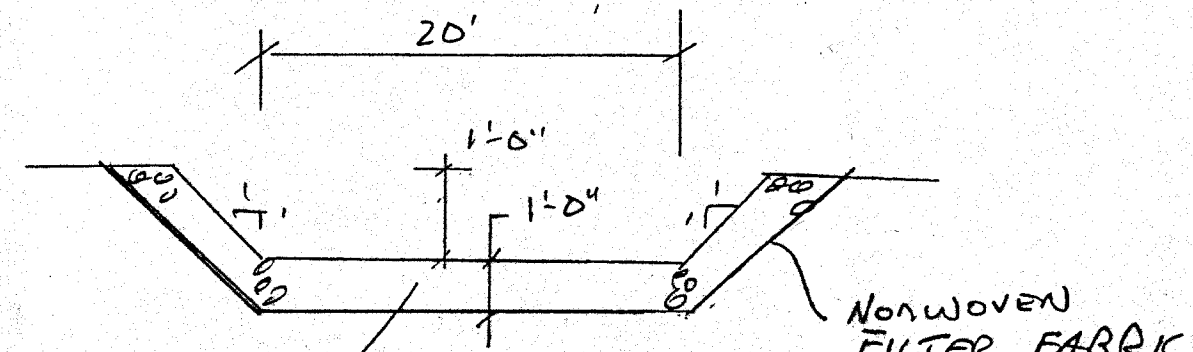
CLASS-IA RIPRAP

SECTION B-B

NTS

PLAN

NTS



SECTION A-A

NTS

CLASS-IA RIPRAP. CRUSHED STONE WITH 100% PASSING 5" SIEVE AND NO MORE THAN 20% PASSING 1½ x 1½ SIEVE PER SECTION 805.13.03 STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE

EL 447, MIN

Y SHEET OF

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Paradise Fossil Plant – Summary of FY 2008 Inspection Report

The Paradise Fossil Plant has multiple run-off ponds, surge basins, ash ponds, disposal stacks, and dredge cells. A summary of each area is provided below.

REDWATER PONDS (Nos. 1, 2, 3, 4 & 5)

There are five red water ponds which collect run-off from various disposal sites and plant storm water. These are collection points to allow for detention. Red water ponds 1 and 2 are pumped to Slag Pond #2 that discharges to a stilling pond and through a permitted discharge point. Red water ponds 3, 4, and 5 drain to red water pond #1 or another ash disposal pond (Jacobs Creek Fly Ash Pond) with is then discharged through another permitted discharge point.

Recommendations focused on cleaning out ponds and some erosion and sediment clean-up. A slough of the internal slope of red water pond #2 had been repaired and was in good condition but was to be monitored by the site.

COAL YARD RUNOFF PONDS (Nos 1,2, and 3)

There are three coal yard runoff ponds. These ponds collect runoff from areas of coal storage and then drain to either red water pond #1 or #2.

Recommendations focused on cleaning out ponds

SLAG AREAS 2A, 2B and STILLING POND

Slag ponds 2A and 2B receive sluiced slag from the plant. The bottom ash settles shortly after the sluice pipe and is reclaimed by Reed Minerals to sale. Water from these ponds enter a stilling pond that discharges thorough a permitted discharge point. Pond 2A is excavated below grade. Slag Pond 2B is a dike built from ash material from several years back in the plant life. The major area of ash material for dike construction is the north end of the pond back to the southeast end of the pond (as the Stilling Pond Area) along the Green River side. This dike area appears to be stable and did not exhibit any notable changes.

Survey control points are set along exterior slope of slag pond 2B adjacent to the Green River. The recommendations state that these control points be monitored for indication of slope movement.

SLAG DISPOSAL AREA (Not an active sluicing pond)

The slag disposal area is located southeast of the powerhouse. The slag in this area was placed here by the plant during its early operations and is currently being reclaimed for commercial use by Reed Minerals. The area contains a small surge pond to collect runoff and a larger area, called the Beaver Pond, which discharges over a spillway and down a rip rap channel into Jacobs Creek. The rip rap was in good condition. There was no beaver dam present at time of inspection. At the time of inspection, no water was being discharged. The surge pond was cleaned out this year.

The banks appear to be stable with a good vegetative cover on them. The redwater seeps identified in earlier reports along the southwest dike in this area are still present. Some of the red water seeps continue to have growing deposits of material. The erosion gully located at the end of the southwest dike and just north of an existing culvert, was not visible.

A closure plan is currently being developed for this area.

The southeast dike of the Beaver Pond along Jacob's Creek, had noticeable erosion. The erosion was about 200 feet in length along the toe of the slope. The depth was about 2 to 3 feet. The erosion has caused trees to fall with the root ball still intact.

The recommendations focused on erosion control/repairs and monitoring of existing seeps from the disposed material.

JACOB'S CREEKFLY ASH POND (Active)

This area is located southeast of the powerhouse. Fly ash is sluiced into the northern portion of the original pond. One of the sluice lines was underwater while the other lines were flowing well. Water flows through a dike breach in the southwest portion of the ash pond then into the Fly Ash Pond Extension (the new ash disposal area).

Flow is uniform and non-eroding through the ash pond. Rip rap in the breach and channel were in good condition. After the ash settles out, the water flows into a stilling pool in the northeast portion of the pond through a divider dike with a floating boom. Carbon dioxide is injected into the water at the boom. The wooden platform for access to the carbon dioxide lines and water sampling is in need of repairs. Floor boards and handrails are broken. Water is then discharged through three 48" standard spillways to Jacob's Creek.

The dike slopes have established vegetation. The road on top of the dike had a good crushed stone surface. All exterior dikes appear to be in good condition with no visible signs of instability.

Recommendations focused on routine maintenance and erosion control. Repairs of access walkways and platforms for CO2 system and the stilling pond discharge pipes were also recommended.

SCRUBBER POND (Active)

This pond is located in the southwest corner of the TVA reservation. Scrubber sludge is sluiced into the northern end of the pond and stacked by the rim ditch method. Water is discharged from the scrubber pond to a settling pond by vertical spillways. The stilling pool water discharges from the stilling pool through a vertical spillway into a ditch that empties into the Jacob's Creek Fly Ash Pond a half mile away.

The discharge pipes from the scrubber pond to the settling pond appear to be in good condition. The standard spillway out of the stilling pool was in good condition. The final clarification pond had been cleaned out and cattails removed from a portion of the bank last year. A saddle dike had been constructed at the south end of the Scrubber Pond area to prevent water and scrubber sludge from flowing to adjoining property.

The remainder of the area appears stable with a good vegetative cover and did not exhibit any notable changes since the previous inspection. Area drains and underdrain systems have been placed at the southeast portion of the dike and appear to be working as designed. HED finished seeding and strawing this portion of the dike last year. No signs of erosion were present. The underdrain ditch needs to be cleaned out and graded to drain to prevent flow over the road.

Recommendations included general Best Management Practices for erosion control.

WEST DREDGE CELL (Inactive)

This area, located just east of the Scrubber Pond was constructed to accept dredged ash. No material has been dredged into the cell. Runoff is collecting in the cell because riser boards were installed in the spillway. At time of inspection, water was flowing through the spillway into the drainage ditch.

The dikes appear stable and did not exhibit any notable changes since the last inspection. All exterior slopes have an excellent vegetative cover. The erosion observed in the previous inspection at the southeast end of the pond was still present. The erosion gully observed in the previous inspection at the southwest end of the pond was still present, but does not appear to have worsened. As noted in the last two inspections there is an erosion gully in the corner of the dike, east of the spillway. The gully is about 55 feet long with an 12 feet by 12 feet rectangular shape at the top of the slope with 24" to 36" depth reducing to 8 feet by 24" depth near the bottom. The erosion does not appear to have worsened.

Recommendations included general Best Management Practices for erosion control and repairs.

EAST DREDGE CELL (Inactive)

This area is located just south of the medium and coarse Coal Wash Refuse Area. This cell was also constructed to accept dredged ash. The spillway appeared to be in good condition. The discharge pipe was clear of obstructions but had a large eroded hole 6' long, 3.5' wide by 3' deep at the end of the pipe. This hole has revegetated and appears to be in stable condition. The dikes in this area appear to be stable. The tops of dike are in satisfactory condition, although some vegetation has established itself over the area. Removal of vegetation is not warranted at this time. The dredged ash was seeded in 2002; vegetation is good south of the discharge structure and is improving north of the discharge structure.

The erosion ditch beside the armored ditch at the northeast corner of the dike, caused by runoff bypassing the armored ditch, is now over 4 feet deep, eight feet wide and one hundred feet long. The drainage ditch has had rip rap put in and has good vegetation established and seems to have stabilized.

Recommendations included general Best Management Practices for erosion control and repairs.

MEDIUM AND COARSE COAL WASH REFUSE STACK (Inactive due to Coal Wash Plant Closure ~3 years ago)

The area appeared to be covered in accordance of the design drawings. The areas which were at or above the final stacking configuration were compacted and have good vegetative cover. Runoff from the east side is directed by the berm ditches to a perimeter ditch. The perimeter ditch discharges into the collection ditch for Redwater Pond #4 on the west side and Redwater Pond #3 on the north side. A good vegetative cover has been established in the southeastern portion of the area; however, significant erosion ditches exist along the north side of the stack.

Recommendations included general Best Management Practices for erosion control and repairs.

COAL WASH FINES POND #2 (Inactive)

Fines Pond #2 is located in the northwest portion of the plant properties. This area is adjacent to the railroad and on the north side of the plant access road. The original pond was completed in the late fall of 1987. The top of the original dike was at elevation 455. The plant raised the dike to approximately elevation 465 in 1990, and subsequently sluiced fines to this elevation. This area has not been active as a sluicing operation since Fines Pond #3 began operation in October 1992. In recent inspections the plant has placed coal fines into this area and spread it out over the area.

All of the dikes in this area appeared stable and in good condition. The west dike has been noted in previous inspections to have sparse vegetation. The vegetative cover is now improving.

Recommendations included general Best Management Practices for erosion control and repairs.

COAL WASH FINES POND #3 (Inactive due to Coal Wash Plant Closure ~3 years ago - Plant is currently reclaiming this material to burn for power production)

Fines Pond #3 is located northwest of Fines Pond #2. The first lift was completed in October 1992 and all sluicing was diverted from Fines Pond #2 to this area. The latest lift was finished in September 1999, and the sluice discharge was changed from the east to the west end of the pond. The discharged point was moved from the west end to the east end. The discharge structure flows into a rip rapped ditch that flows into Fines Pond #2 and then into the stilling pool. The dike was constructed around the cemetery to the north of this area to protect it.

All dikes in this area appear to be stable but have some seepage. There is little grass on the slopes. Several of the new culverts that drain the berm ditches were put in high and do not drain. This year HED regraded the slopes and filled in all the eroded areas.

A slide 29.5 feet long and 10.3 feet high developed the first week of May, 2000 in an area that was seeping. This was repaired in 2001 utilized rip rap and under drains which allows controlled seepage while stabilizing the slope. This area continues to seep but is stable.

Existing seeps/wet areas adjacent to the cemetery were inspected. They are of equal elevation and cover a distance approximately 200 feet long. At the time of this inspection, all seeps were not flowing. All six areas continue to exist.

Recommendations included general Best Management Practices for erosion control /repairs, reseeding slopes, and lowering of drains under the berms to eliminate standing water.

BORROW AREAS

HED worked this year to close the borrow area beside the cemetery and construct a sediment pond to protect the cemetery from water and sediment runoff. HED also worked to close the borrow area northwest of the Fines Pond #3. HED regraded the slopes and graded the floor to drain to a sediment pond built to control water runoff. Both of the borrow areas have good vegetation.

The plant is now burning the coal fines to produce power. HED is hauling the fines to a separate pile beside the coal pile. They have removed material to a depth of about 35 feet from Fines Pond #3.

Recommendations included general Best Management Practices for erosion control /repairs, reseeding slopes, and removal of sediment from the sediment ponds.

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February 19, 2008

Gregory K. Nunley, PAF 1A-DRK

PARADISE FOSSIL PLANT (PAF) - ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Attached is a report from Chris Hensley concerning the FY07 inspection of Paradise Fossil Plant ash disposal areas.

This report includes recommendations for corrective work. I concur with these recommendations.

If you have any questions, please contact Lynn Petty at extension 751-6704 or Chris Hensley at extension 751-4413.

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TENNESSEE VALLEY AUTHORITY
PARADISE FOSSIL PLANT

ANNUAL STABILITY INSPECTION OF
WASTE DISPOSAL AREAS

Prepared By: Christopher W. Hensley
Date: February 19, 2008

PARADISE FOSSIL PLANT
ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

Introduction

The waste disposal areas at Paradise Fossil Plant (PAF) were inspected for dike structural stability on November 6 and 7, 2007. The inspection was performed by Chris Hensley of Fossil Engineering Design Service. The previous annual inspection was conducted on October 25 and 26, 2006.

The results of the annual stability inspection are listed below according to their location within the Paradise Fossil Plant Boundaries. A location map is attached with arrows showing directions of the pictures taken.

Slag Areas 2A, 2B, and Stilling Pond

Boiler slag is sluiced into the south end of area 2A and is reclaimed by Reed Minerals as part of a TVA marketing strategy. The water elevation appeared to be approximately 24 inches from the top of the dikes. The bottom ash drops out quickly and is removed by Reed Minerals (Picture 1).

The sluice water then flows into 2A through a series of dike baffles then into pond 2B through pipes and around a series of floating baffles to lengthen the settling time. A floating pump station has been placed at the north end of pond 2B to fill water trucks. The sluice water enters the north end of the stilling pond through a concrete flume (Picture 2). The flume appeared to be in fair condition. However, large cracks were noted in the upstream side of the flume (Picture 3). We, recommend the plant to clean the cracks and install a water tight grout in these cracks to keep water from freezing and causing more damage. Water was flowing freely into the stilling pond. The water discharges through three standard spillways into the Green River or is pumped to the Jacob's Creek Ash Pond. One pump was operating at the time of inspection. All three spillways were operating at the time of inspection. Last year's inspection noted the last spillway had a walk board from the bank (Picture 4). This year the walk board was under water. It is a safety hazard and should be removed. A permanent walkway may be installed to this spillway. The access gate was locked at the discharge point of the spillways. However, the area had been mowed so a close observation of the channel was possible. There was no visible evidence of erosion in the channel and the channel was well vegetated.

There is additional water coming into the stilling pond from the south end via 30" & 42" concrete pipes. This water is from sumps, storm water pipes and dewatering pumps in construction areas. At the time of inspection these pipes were under water.

The dikes appear to be stable and did not exhibit any notable changes since the last inspection. The interior slopes of the dikes have a good vegetative cover and mowed. There was an access walkway built over the outlet end of the pipes into Area 2B. This walkway is associated with the truck water loading operation.

Redwater Ponds (Nos. 1, 2, 3, 4 & 5)

Redwater Pond #1

Redwater Pond #1 (RW #1) is located southeast of and adjacent to "Slag Pond 2B" and "Slag Stilling Pond". Considerable repairs, cleanout and bank reconstruction have been performed by HED to try to return the pond to its original configuration (Picture 5). The current water depth is approximately 4 feet. The northern rip rap bank repaired in June of 2005 seems to be in good condition. A rip rap barrier has been added to the west side of the sewage treatment plant and appears to have

stabilized the bank as designed. All pumps, slopes, dikes and discharge structures appear to be working. Recently the plant has repaired the stairs down to the walk boards to the pump platforms. Water collected in Redwater Pond #1 is pumped into the Slag Pond. At this time the pond water elevation was low so the pumps were not running. Two additional diesel pumps are kept at the pond to supplement the electric pumps so the pond's NPDES permit is not violated.

Redwater Pond #2

Redwater Pond #2 (RW #2) is located northwest of and adjacent to Slag Ponds 2A & 2B. The water from RW #2 is pumped from the center of the pond and discharged into the northwest end of Slag Pond 2B. The water level was higher than the 72" pipe. The upstream Storm Water and Coal Yard Drainage Pond #1 drains into RW #2 via this 72" pipe. Coal Yard Drainage Pond #2 drains into RW #2 via a 12" overflow pipe during storms. The sloughs near the 72" pipe have been repaired and seem to be stable (Picture 6). A rock dike is in place west of the pump station to prevent silt from entering into the pumps. The four redwater seepage areas observed in past inspections were not found. However, the flowing sound of the redwater seeps was present.

Redwater Pond #3

Redwater Pond #3 (RW #3) is a settlement pond and is located southwest of the powerhouse and along the south side of the county road (Picture 7). This pond collects the runoff and sediment from the medium and coarse Coal Wash Refuse Areas as well as decanted water from RW #4. RW #3 normally discharges to RW #1 via a junction box arrangement at the discharge from RW #5. Otherwise, there are emergency over flows from RW #3 into a 60" drain to Jacobs Creek Ash Pond. This overflow is made of 3 - 36" pipes that go under the road and into a transition box. They were clear at the time of the inspection. The transition box has sediment about 18" deep that needs to be cleaned out (Picture 8). The grout around the three 36" pipes is falling out and needs to be regrouted around the pipes at the transition box (Picture 9). In the first pipe closest to the county road there is a slit 4" long in the pipe about 4' from the transition box that needs to be repaired (Picture 10).

Now that the pond has been cleaned out the operation of RW #3 has changed. The non-emergency discharge from RW #3 to RW #1 (via the junction box at RW#5) has a manual valve contained within the discharge structure. This valve has closed for several years due to the sediment build up in RW#3. At the time of this inspection the valve was open; HED had completed the cleaning out of the pond in 2005. It remains in good condition since the cleanout.

Redwater Pond #4

Redwater Pond #4 (RW #4) is a surge/sediment pond located east of the medium and coarse Coal Wash Refuse Area. This is a surge pond that settles out the fines before they reach RW #3. This surge pond was designed to drain via an eight inch pipe and an open rip rap ditch beside the road to RW #3. The eight inch pipe was clear of debris (Picture 11). The road beside this pond has been cleaned of sediment. The southwest side of this pond has been reconstructed reseeded, but no vegetation has established. The inlet pipe from the coarse and medium stack has erosion present (Picture 12). The inlet should have rip rap placed to fill in the erosion and protect the bank slope around the pipe. An erosion ditch was noticed about 60 feet from the inlet pipe in the west side of the Coal Wash Refuse Area (Picture 13). This erosion should be repaired before it worsens. RW #4 has an emergency overflow for runoff that exceeds the 10 year - twenty-four hour rainfall event. It drains directly to the Jacob's Creek Fly Ash Pond. The depth of water is now approximately 1 foot.

Redwater Pond #5

Redwater Pond #5 (RW #5) is located south of the powerhouse, east of the truck coal dumping area and west of the limestone storage area. It is a surge pond designed to give the Redwater Pond #1 pumps time to lower the water level. An overflow structure drains runoff exceeding the 10 year - twenty-four hour rainfall event directly to Redwater Pond #1. All water collected in Redwater Pond #5 drains to Redwater Pond #1 via a gravity drain and no water should be held in Redwater Pond #5. At time of inspection the discharge structure could not be found for the cattails around the structure (Picture 14). Water was standing in the east end of the pond (Picture 15). We recommend cleaning out this pond.

Coal Yard Runoff Pond #1

Coal Yard Runoff Pond #1 (CYRP #1) is located north of and across the plant access road from the Coal Wash Plant. This is a surge/sedimentation storm water runoff pond that delays runoff to RW #2. Water and sediment is collected in the pond and the decanted water is discharged through a six inch hole cut in the side of the stand pipe. This hole is not configured per the original design drawing in size, or elevation but is doing a fair job. A rip rap dike was built to keep the coal fines away from the discharge point. At the time of this inspection, a portion of this dike had been removed due to the amount of fines that had accumulated. The coal fines are building up at the end of the ditch (Picture 16). These fines should be cleaned out before blocking the stand pipe.

Coal Yard Runoff Pond #2

Coal Yard Runoff Pond #2 (CYRP #2) is located southwest of and across an access road from Redwater Pond #2. This pond was designed as a storm water sedimentation pond and all water from this pond is pumped to Slag Pond 2A. This pond was cleaned out last year and a rock check dam built at the westside of the platform to keep fines from entering the pumps (Picture 17). There are two pumps on the platform.

Coal Yard Runoff Pond #3

Coal Yard Runoff Pond #3 (CYRP #3) is located south of the coal transfer complex and north of the access road. This pond can discharge by gravity to or be pumped to RW #1. The inner banks of the basin seem to be well vegetated and are stable. At time of inspection the water level in this pond was high due to the amount of sediment. This pond should be cleaned out (Picture 18). The emergency overflow in past has been blocked or modified to the point that it does not operate, however the water level was high this year so the emergency overflow had water running into it (Picture 19).

Slag Disposal Area

The slag disposal area is located southeast of the powerhouse. The slag in this area was placed here by the plant during its early operations and is currently being reclaimed for commercial use by Reed Minerals. The area contains a small surge pond to collect runoff and a larger area, called the Beaver Pond, which discharges over a spillway and down a rip rap channel into Jacobs Creek. The rip rap appears to be in good condition. There was no beaver dam present at time of inspection. At the time of inspection, no water was being discharged. The surge pond was cleaned out this year.

The entrance road to the slag disposal area had signs of erosion. The silt fencing along Jacob's Creek was torn down. New silt fencing should be installed to protect Jacob's Creek.
The banks appear to be stable with a good vegetative cover on them. The redwater seeps identified in earlier reports along the southwest dike in this area are still present. Some of the red water seeps continue to have growing deposits of material. The erosion gully located at the end of the southwest

dike and just north of an existing culvert, was not visible.

A closure plan is being developed for this area (Picture 20).

The southeast dike of the Beaver Pond along Jacob's Creek, had noticeable erosion. The erosion was about 200 feet in length along the toe of the slope. The depth was about 2 to 3 feet. The erosion has caused trees to fall with the root ball still intact.

Jacob's Creek Fly Ash Pond

This area is located southeast of the powerhouse. Fly ash is sluiced into the northern portion of the original pond. One of the sluice lines was underwater while the other lines were flowing well (Picture 21). Water flows through a dike breach in the southwest portion of the ash pond then into the Fly Ash Pond Extension (the new ash disposal area).

Last year HED hauled and pushed material into the pond. The work cleared some of the vegetation off of the dike along the county road. Since last year, HED repaired the dike and seeded and strawed the slope. This slope had good vegetative cover (Picture 22).

Flow is uniform and non-eroding through the ash pond. Rip rap in the breach and channel were in good condition. After the ash settles out, the water flows into a stilling pool in the northeast portion of the pond through a divider dike with a floating boom. Carbon dioxide is injected into the water at the boom. The wooden platform for access to the carbon dioxide lines and water sampling is in need of repairs. Floor boards and handrails are broken. Water is then discharged through three 48" standard spillways to Jacob's Creek (Picture 23).

The spillway structures appear to be operating properly. All three outlets appeared to be discharging equally at the time of this inspection. The rip rap at the spillway outlets appeared to be in good condition. There is a stairway for access from the top of dike to the discharge pipes and the three new monitoring boxes above the pipes (Picture 24). The stairway is unsafe and is in need of major repairs or replacement (Picture 25). The dike slopes have established vegetation. The road on top of the dike had a good crushed stone surface. All exterior dikes appear to be in good condition with no visible signs of instability.

The scrubber project added a new ditch from the scrubber settling pond to this pond for the scrubber discharge. At the time of inspection there was no water in the ditch and appeared that the scrubber discharge pipes from the settling pond were still being used. (Note: There was some scrubber material in this pond at the end of the ditch).

Scrubber Pond

This pond is located in the southwest corner of the TVA reservation. Scrubber sludge is sluiced into the northern end of the pond and stacked by the rim ditch method. Water is discharged from the scrubber pond to a settling pond by vertical spillways. This year a design for new vertical spillways was produced and installed as designed (Picture 26). The stilling pool water discharges from the stilling pool through a vertical spillway into a ditch that empties into the Jacob's Creek Fly Ash Pond a half mile away.
The discharge pipes from the scrubber pond to the settling pond appear to be in good condition. The standard spillway out of the stilling pool was in good condition. The final clarification pond had

been cleaned out and cattails removed from a portion of the bank last year. A saddle dike had been constructed at the south end of the Scrubber Pond area to prevent water and scrubber sludge from flowing to adjoining property.

The remainder of the area appears stable with a good vegetative cover and did not exhibit any notable changes since the previous inspection. Area drains and underdrain systems have been placed at the southeast portion of the dike and appear to be working as designed. HED finished seeding and strawing this portion of the dike last year (Picture 27). No signs of erosion were present. The underdrain ditch needs to be cleaned out and graded to drain to prevent flow over the road.

West Dredge Cell

This area, located just east of the Scrubber Pond was constructed to accept dredged ash. No material has been dredged into the cell. Runoff is collecting in the cell because riser boards were installed in the spillway. At time of inspection, water was flowing through the spillway into the drainage ditch (Picture 28).

The dikes appear stable and did not exhibit any notable changes since the last inspection. All exterior slopes have an excellent vegetative cover. The erosion observed in the previous inspection at the southeast end of the pond was still present. The erosion gully observed in the previous inspection at the southwest end of the pond was still present, but does not appear to have worsened. As noted in last two inspections there is an erosion gully in the corner of the dike, east of the spillway. The gully is about 55 feet long with an 12 feet by 12 feet rectangular shape at the top of the slope with 24” to 36” depth reducing to 8 feet by 24” depth near the bottom. The erosion does not appear to have worsened.

East Dredge Cell

This area is located just south of the medium and coarse Coal Wash Refuse Area. This cell was also constructed to accept dredged ash (Picture 29). The spillway appeared to be in good condition. The discharge pipe was clear of obstructions but had a large eroded hole 6’ long, 3.5’ wide by 3’ deep at the end of the pipe. This hole has revegetated and appears to be in stable condition. The dikes in this area appear to be stable. The tops of dike are in satisfactory condition, although some vegetation has established itself over the area. Removal of vegetation is not warranted at this time. The dredged ash was seeded in 2002; vegetation is good south of the discharge structure and is improving north of the discharge structure.

The erosion ditch beside the armored ditch at the northeast corner of the dike, caused by runoff bypassing the armored ditch, is now over 4 feet deep, eight feet wide and one hundred feet long. The drainage ditch has had rip rap put in and has good vegetation established and seems to have stabilized.

Ditches, rutting and erosion gullies all have established vegetation and no changes.

Medium and Coarse Coal Wash Refuse Stack

The area appeared to be covered in accordance of the design drawings. The areas which were at or above the final stacking configuration were compacted and have good vegetative cover (Picture 30). Runoff from the east side is directed by the berm ditches to a perimeter ditch. The perimeter ditch discharges into the collection ditch for Redwater Pond #4 on the west side and Redwater Pond #3 on the north side. A good vegetative cover has been established in the southeastern portion of the area; however, significant erosion ditches exist along the north side of the stack (Picture 31).

Coal Wash Fines Pond #2

Fines Pond #2 is located in the northwest portion of the plant properties. This area is adjacent to the railroad and on the north side of the plant access road. The original pond was completed in the late fall of 1987. The top of the original dike was at elevation 455. The plant raised the dike to approximately elevation 465 in 1990, and subsequently sluiced fines to this elevation. This area has not been active as a sluicing operation since Fines Pond #3 began operation in October 1992 (Picture 32). In recent inspections the plant has placed coal fines into this area and spread it out over the area.

All of the dikes in this area appeared stable and in good condition. The west dike has been noted in previous inspections to have sparse vegetation. The vegetative cover is now improving.

The stilling pond for the coal wash fine ponds was at high water level. The walkway out to the pumps needs four of the floats under it replaced (Picture 33).

Coal Wash Fines Pond #3

Fines Pond #3 is located northwest of Fines Pond #2. The first lift was completed in October 1992 and all sluicing was diverted from Fines Pond #2 to this area. The latest lift was finished in September 1999, and the sluice discharge was changed from the east to the west end of the pond. The discharged point was moved from the west end to the east end. The discharge structure flows into a rip rapped ditch that flows into Fines Pond #2 and then into the stilling pool (Picture 34). The dike was constructed around the cemetery to the north of this area to protect it.

All dikes in this area appear to be stable but have some seepage. There is little grass on the slopes. Several of the new culverts that drain the berm ditches were put in high and do not drain. This year HED regraded the slopes and filled in all the eroded areas (Picture 35). They have tried twice to seed and establish vegetation on the slopes with no success.

A slide 29.5 feet long and 10.3 feet high developed the first week of May, 2000 in an area that was seeping. This has been fixed and appears to be working. An area approximately 400 feet long was excavated, an underdrain installed, and rip rap placed to stabilize this area of the dike. The fix was completed by February 23, 2001. This area continues to seep but appears to be stable.

Six seeps/wet areas were found adjacent to the cemetery. They are of equal elevation and cover a distance approximately 200 feet long. At the time of this inspection, all seeps were not flowing. All six areas continue to exist.

The repaired rip rap ditch east of the cemetery is in good shape.

PARADISE FOSSIL PLANT
ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

HED worked this year to close the borrow area beside the cemetery and construct a sediment pond to protect the cemetery from water and sediment runoff. This sediment pond needs to be cleaned out of sediment for drainage (Picture36). HED also worked to close the borrow area northwest of the Fines Pond #3. HED regraded the slopes and graded the floor to drain to a sediment pond built to control water runoff (Picture 37). Both of the borrow areas has good vegetation.
The plant is now burning the coal fines to produce power. HED is hauling the fines to a separate pile beside the coal pile. They have removed material to a depth of about 35 feet from Fines Pond #3.

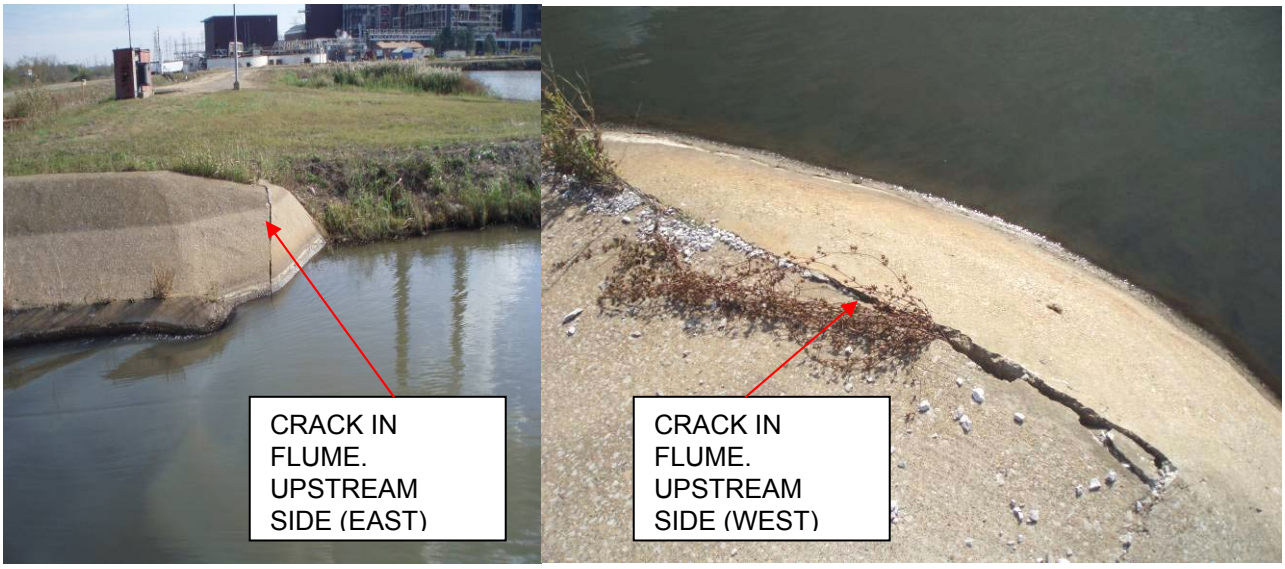
Last year an erosion and sediment control plan was issued by Engineering Design Services in response to an Environment Audit finding. All of the erosion control plan work has been completed and in good condition.

Recommendations:

- Mow grass and remove small trees and brush from all dike slopes. Pull up all trees and compact soil back in the holes.
- Maintain all dike roads for all weather travel to facilitate the required shift visual inspections and routine O&M activities.
- Monitor the exterior dike slopes for seepage, wet or soft spots or animal burrowing, etc. and notify Engineering Design Services of any changes.
- Monitor the survey controls installed on the exterior dike slope of Area 2B slag pond adjacent to Green River for any indication of slope movement.
- Remove the sediment from the transition box at RW #3 discharge pipes to Jacob's Creek Ash Pond so that flow does not become inhibited during periods of heavy rainfall.
- Regrout the three 36" pipes into the transition box. Remove sediment from around the pipes and repair the 4 inch slit in the first pipe closes to the county road.
- Remove fines from all of the coal yard drainage basins and all of the redwater ponds, especially RW #1, #2, #3 & #4 ponds.
- Clean out Redwater #5 so water is not standing in this pond.
- Check the cemetery seepage weekly and report any increases to; John Albright at 423/751-3981 or Lynn Petty at 423/751-6704 in Chattanooga.
- Lower the drains under the berms of the Fines Pond #3 to eliminate standing water in the ditches.
- Continue Fines Pond #3 erosion and sediment control plan.
- Until grass is established on the slopes of Fines Pond #3, follow the Interim Administrative Controls included in the Interim Site Erosion Control Plan.
- Remove old silt fencing at the Slag Disposal Area entrance and replace with new silt fencing.
- Repair erosion ditches and gullies around the Coarse and Medium Refuse Stack and East Dredge Cell.
- Monitor south slope of Redwater Pond #2 for additional movement.
- Repair the stairway/platform at the carbon dioxide unit in Jacob's Creek stilling pond.
- Repair or replace the stairway to the discharge pipes from the Jacob's Creek Ash Pond.
- Remove the walk board from the bank to the spillway in the Slag Pond Stilling Pond.
- Install rip rap around the inlet pipe to Redwater Pond #4. Also into the channel from the pipe.
- Repair the eroded ditch in the west slope of Coal Wash Stack.
- Check for beaver dams in Jacob's Creek along the Fly Ash Pond.

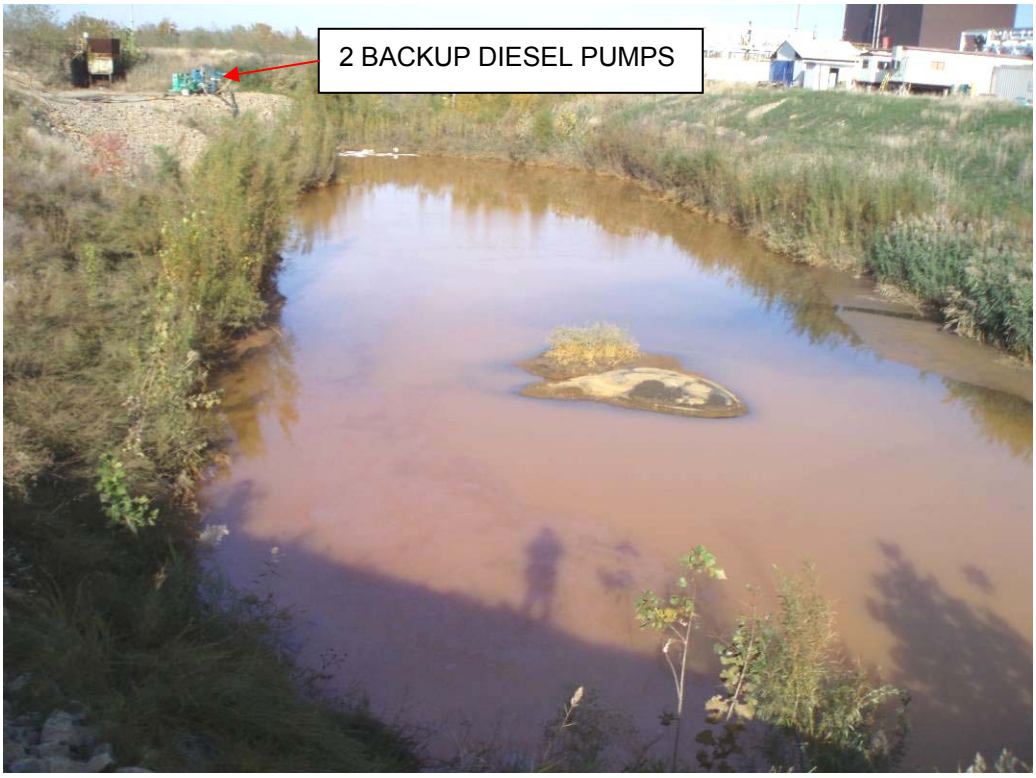
Picture 1. Slag Pond 2A & 2B.

Picture 2. Slag Pond 2B concrete flume to Stilling Pond.

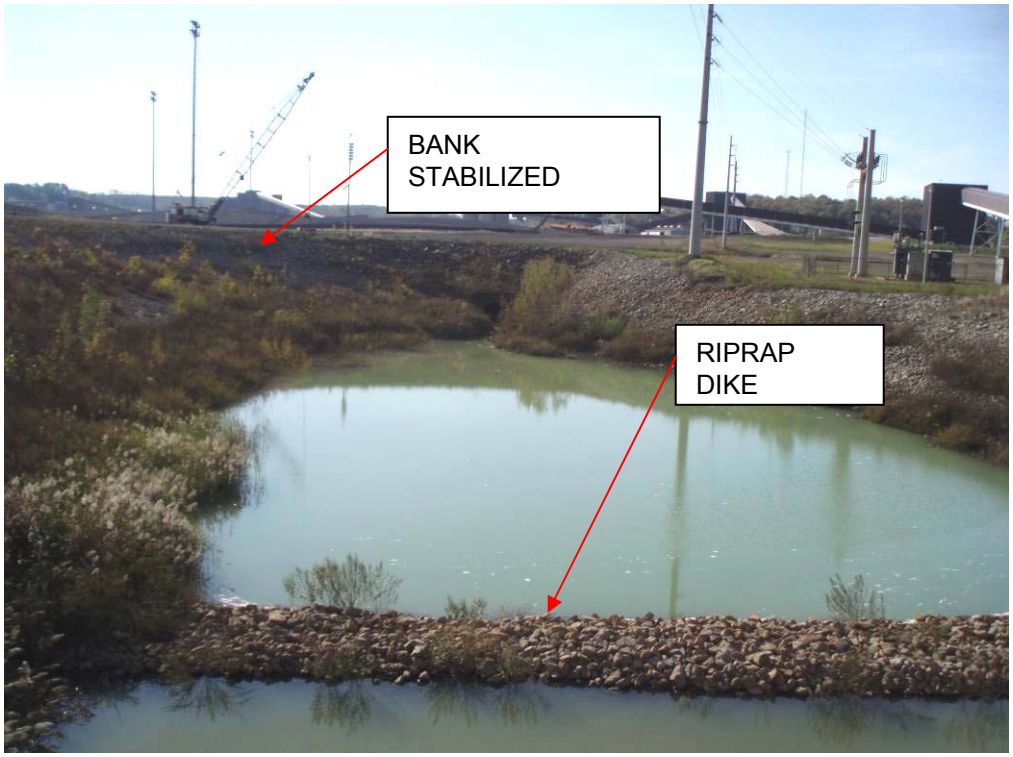


Picture 3. Concrete Flume to Stilling Pond.

Picture 4. Walk board out to a spillway.

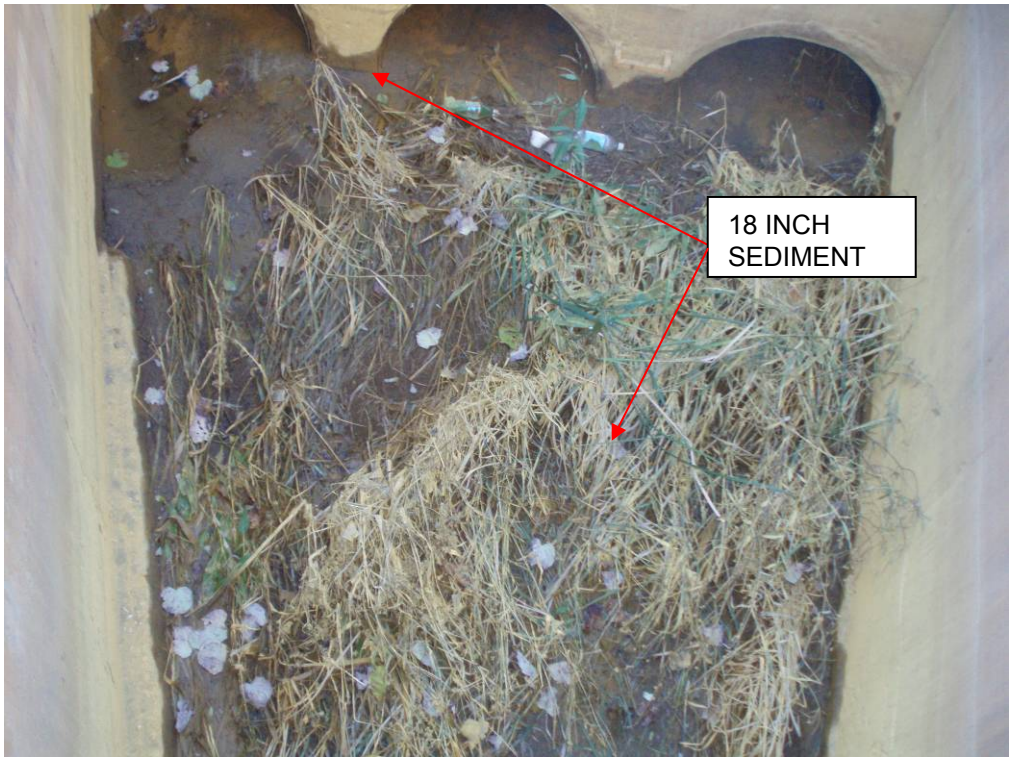


Picture 5. Redwater No. 1.



Picture 6. Redwater No. 2. Bank stabilized.

Picture 7. Redwater No. 3.



Picture 8. Redwater No. 3. Transition Box Inside.

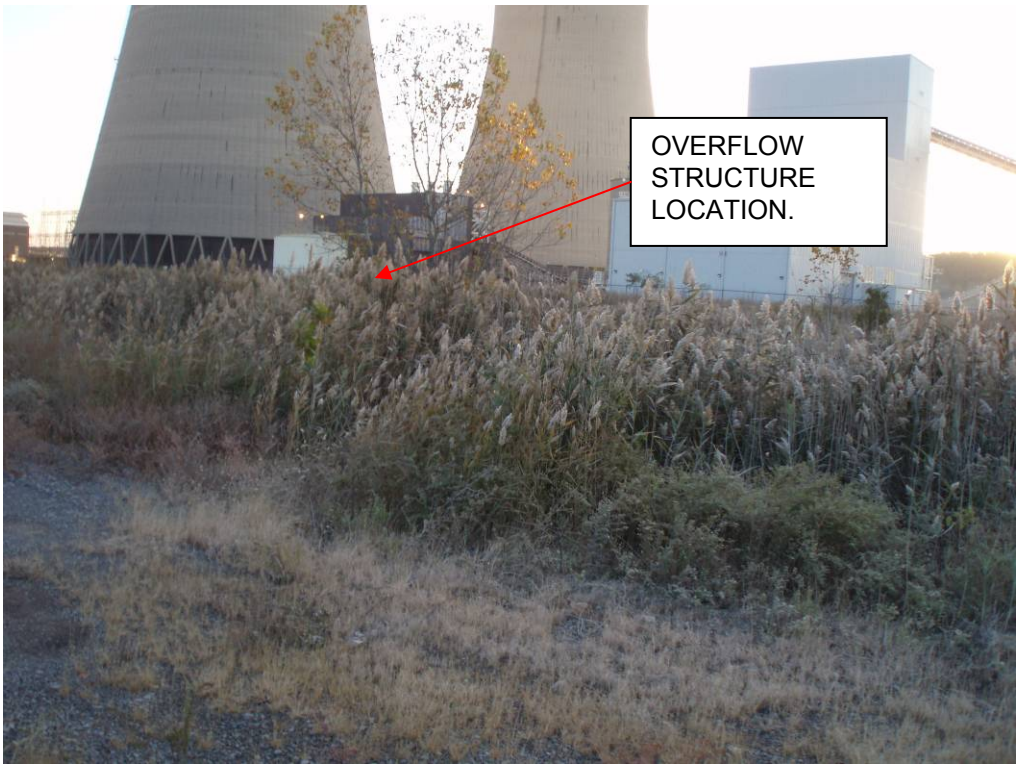
Picture 9. Redwater No. 3. Pipes into Transition Box.

Picture 10. Redwater No. 3. 4 inch slit in 36" pipe.

Picture 11. Redwater No. 4.

Picture 12. Redwater No. 4. Eroded inlet pipe and ditch.

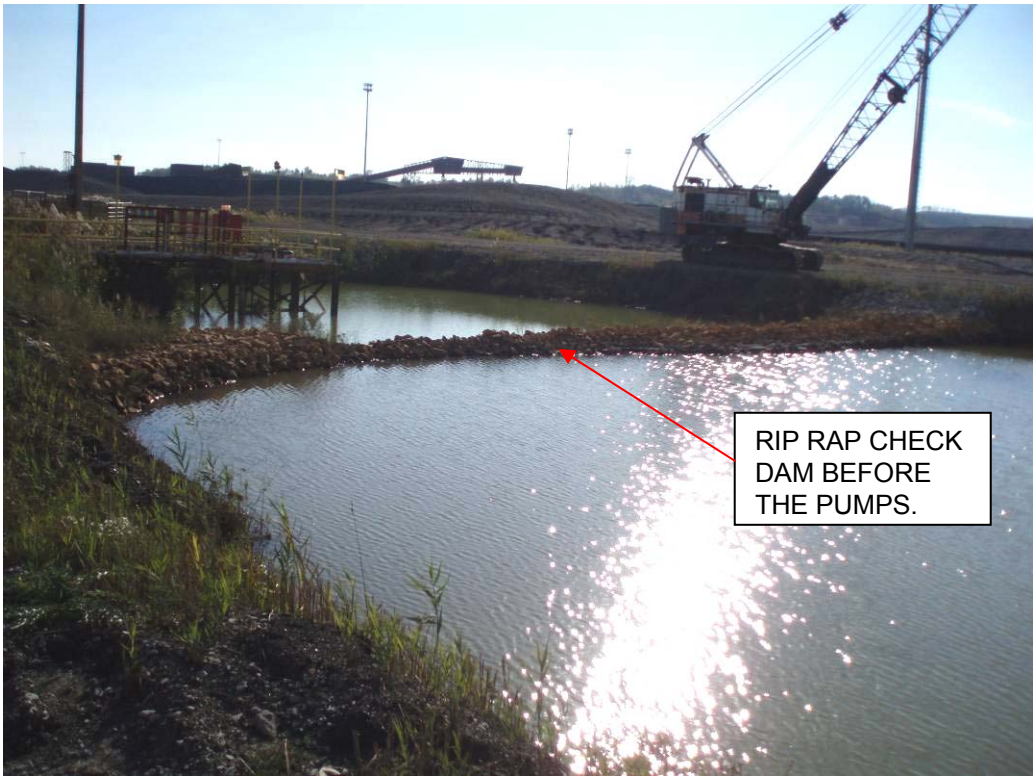
Picture 13. Redwater No. 4. Eroded slope from the Coal Wash Refuse Area.



Picture 14. Redwater No. 5. Overflow Structure.

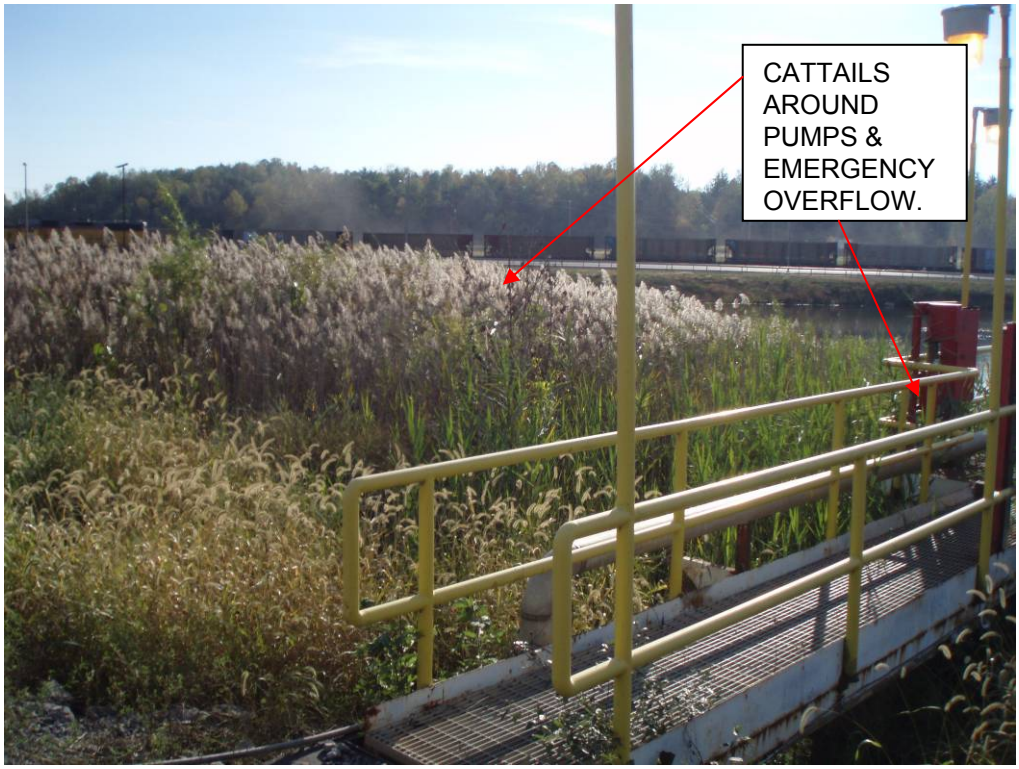
Picture 15. Redwater No. 5. Water standing in east end.

Picture 16. Coal Yard Runoff Pond No. 1. Clean sediment out of ditch.



Picture 17. Coal Yard Runoff Pond No. 2. Riprap check dam.

Picture 18. Coal Yard Runoff Pond No. 3. Large amount of sediment in pond.



Picture 19. Coal Yard Runoff Pond No. 3. Cattails around pumps and emergency overflow.

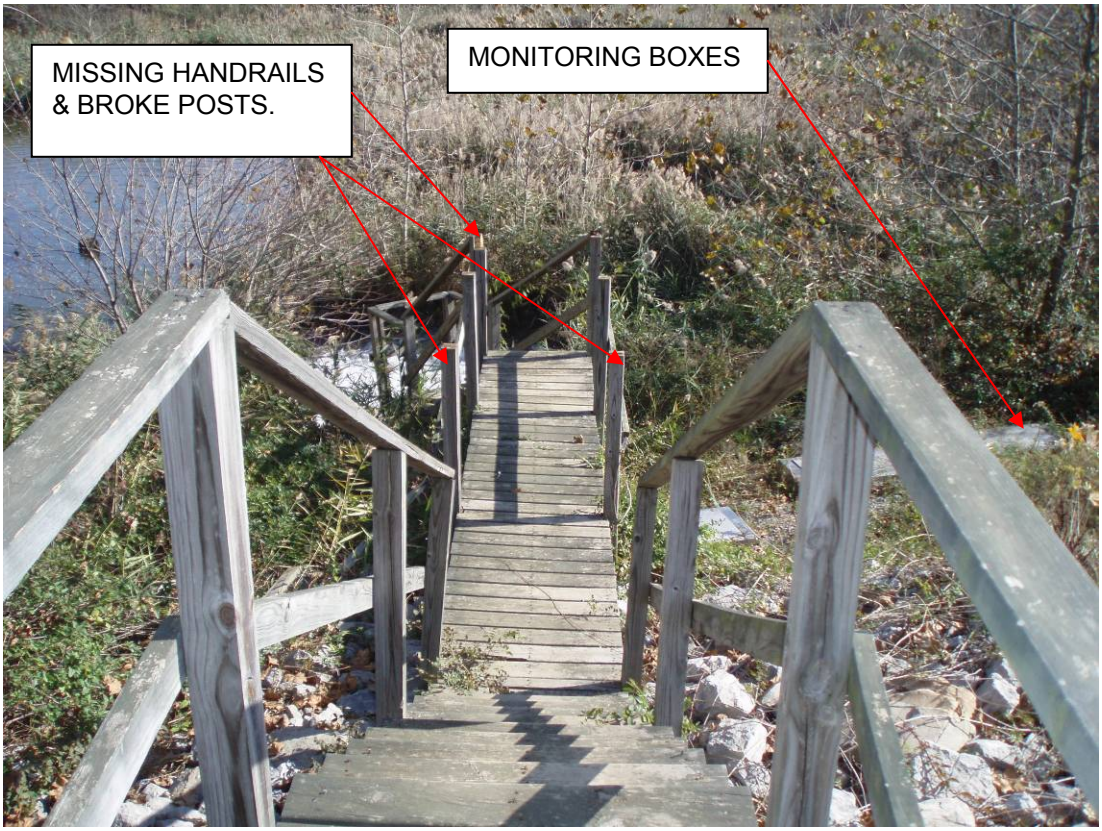
Picture 20. Slag Disposal Area.

Picture 21. Jacob's Creek Ash Pond. Sluice Lines.

Picture 22. Jacob's Creek Ash Pond. Dike along county road.

Picture 23. Jacob's Creek Ash Pond. Spillway structures.

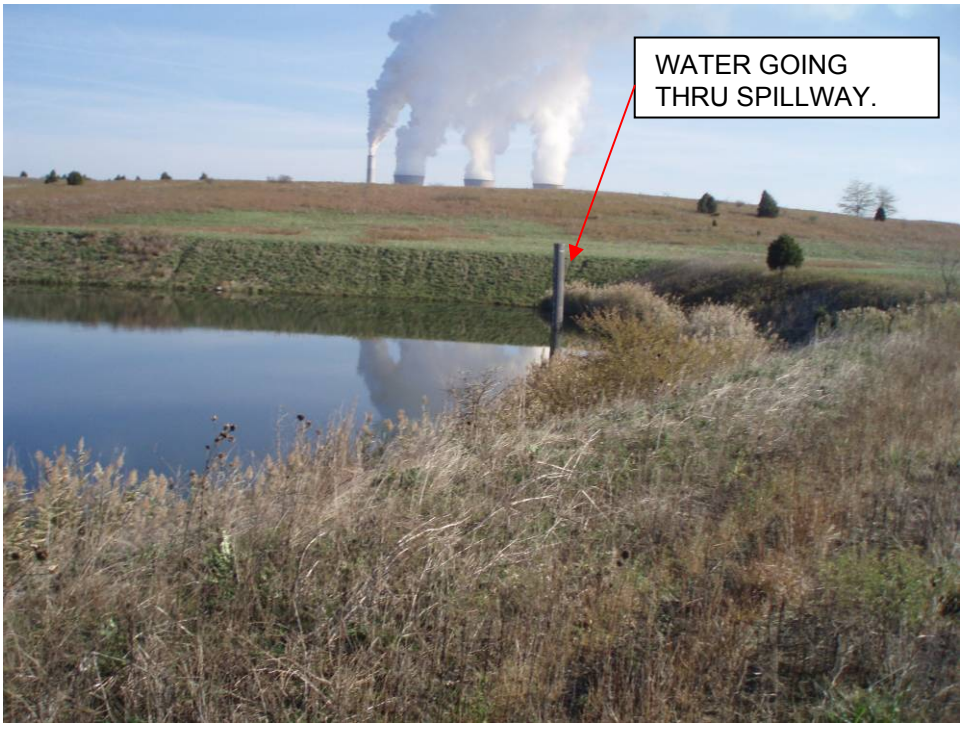
Picture 24. Jacob's Creek Ash Pond. Discharge Pipes.



Picture 25. Jacob's Creek Ash Pond. Stairway to Discharge Pipes & Monitoring Boxes.

Picture 26. Scrubber Pond. New Vertical Spillways Installed.

Picture 27. Scrubber Pond. HED finished seeding & strawing dike lift cover.



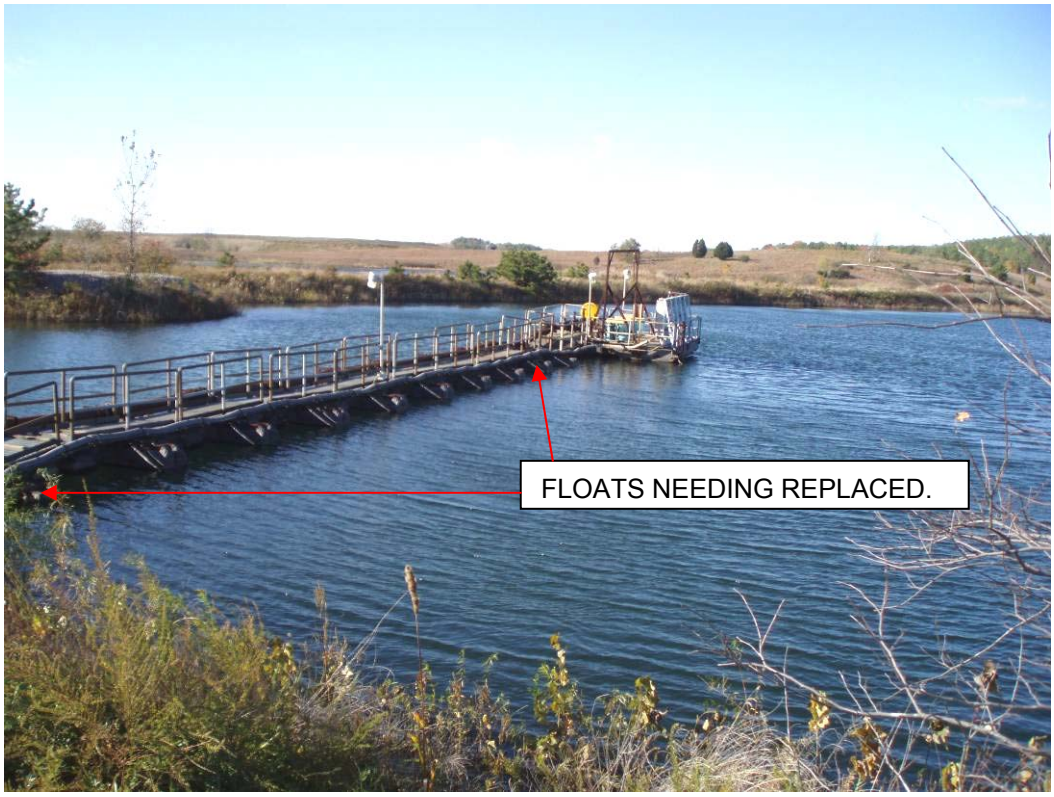
Picture 28. West Dredge Cell. Water standing in West Dredge Cell.

Picture 29. East Dredge Cell.

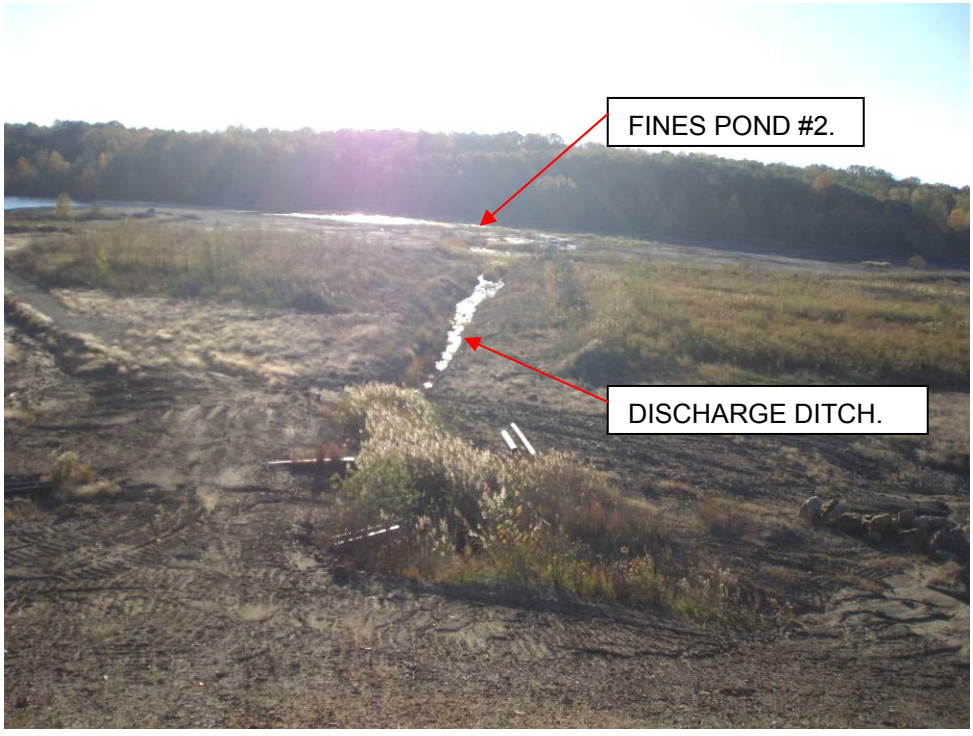
Picture 30. Medium & Coarse Coal Wash Refuse Stack.

Picture 31. Medium & Coarse Coal Wash Refuse Stack. Erosion Along Haul Road.

Picture 32. Coal Wash Fines Pond No. 2. Material Added to Pond.

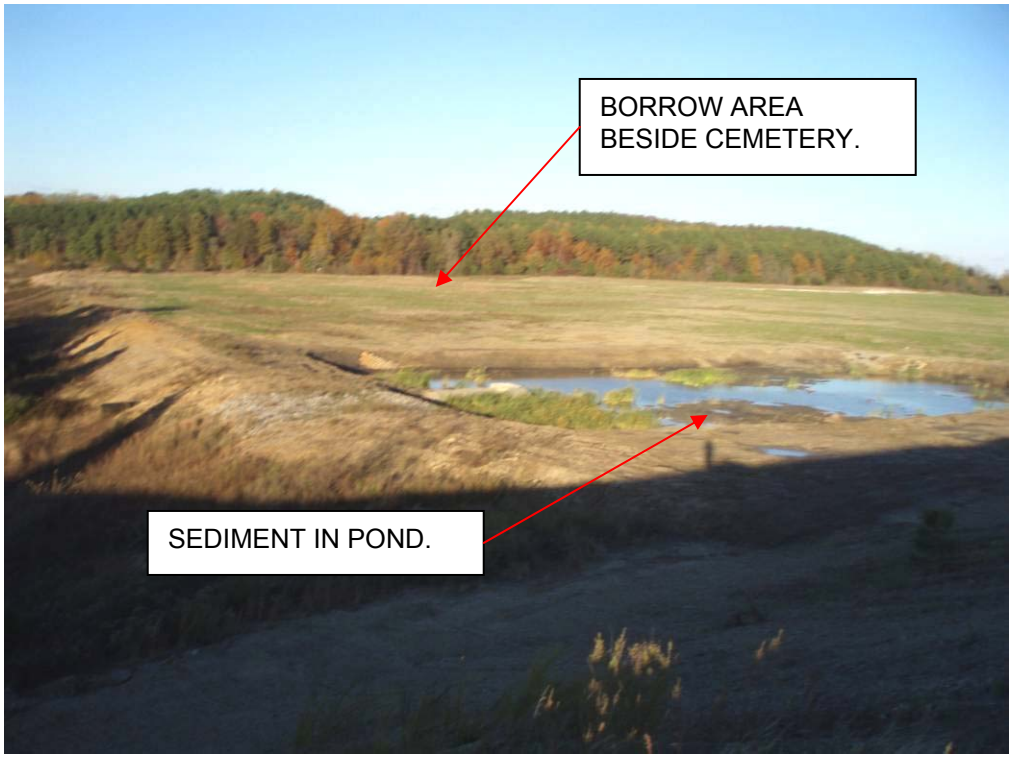


Picture 33. Coal Wash Fines Pond No. 2. Stilling Pond.



Picture 34. Coal Wash Fines Pond No. 3. Discharge into ditch to Fines Pond #2.

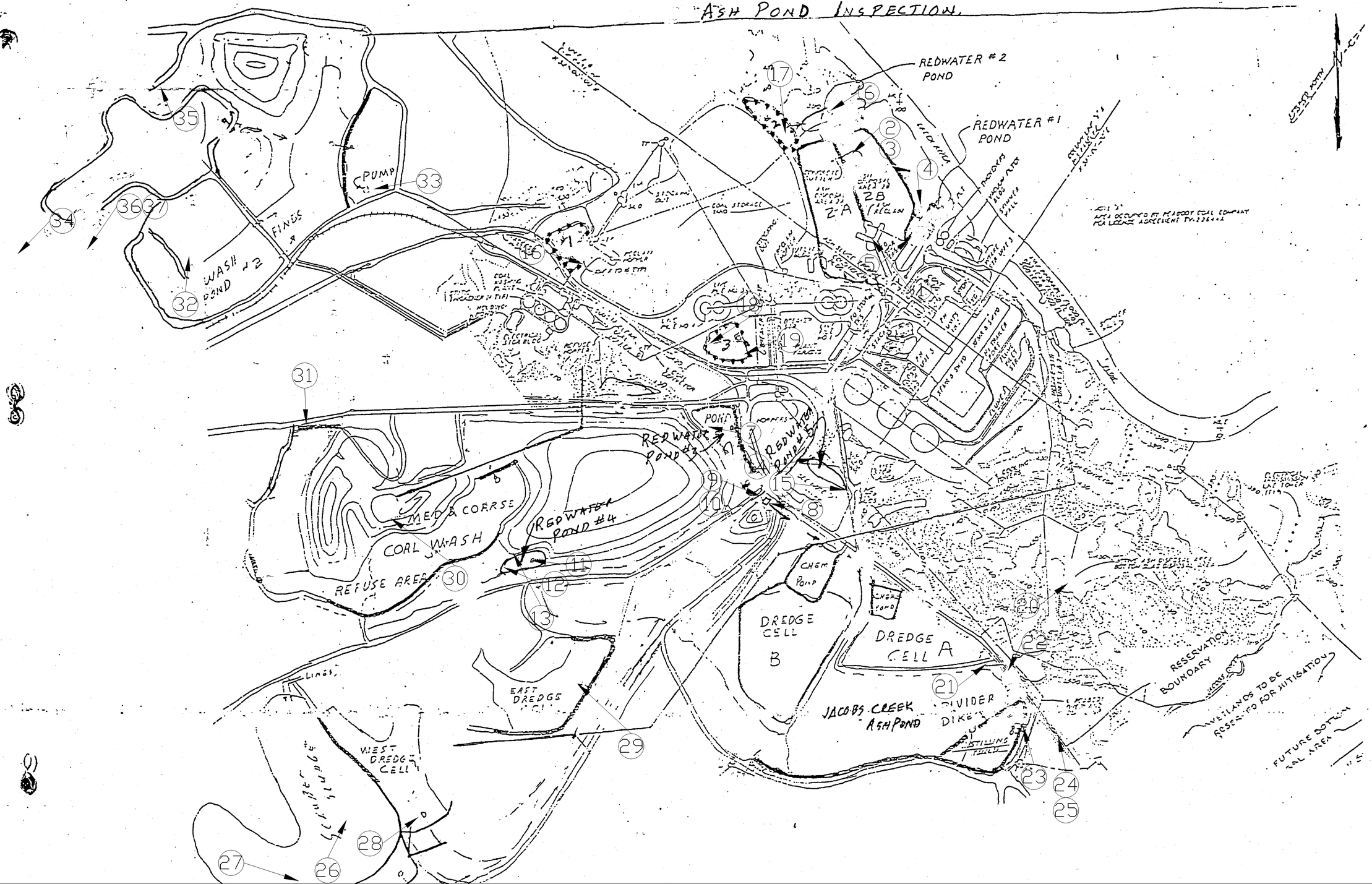
Picture 35. Coal Wash Fines Pond No. 3. Regraded slopes.



Picture 36. Coal Wash Fines Pond No. 3. Sediment Pond needs cleaning out.

Picture 37. Coal Wash Fines Pond No. 3. Borrow area northwest of Fines Pond #3.

ASH POND INSPECTION.



TENNESSEE VALLEY AUTHORITY
PARADISE FOSSIL PLANT

ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

DRAFT

Prepared By: Christopher W. Hensley
Date: December 15, 2008

PARADISE FOSSIL PLANT
ANNUAL STABILITY INSPECTION OF WASTE DISPOSAL AREAS

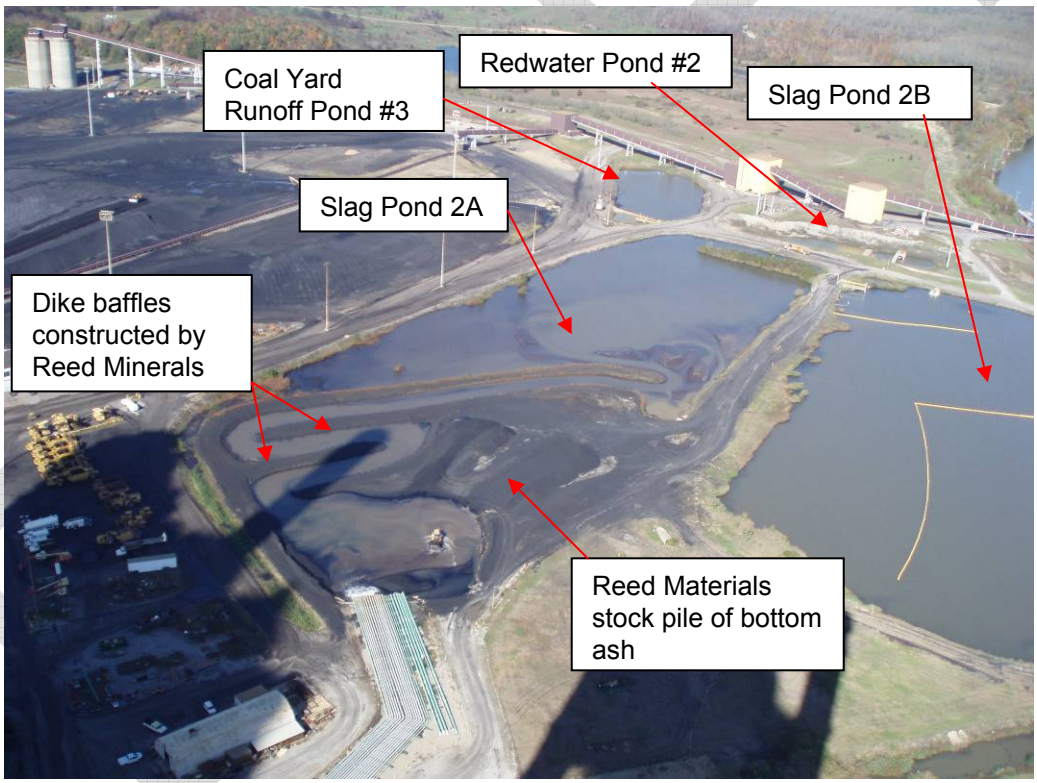
Introduction

The waste disposal areas at Paradise Fossil Plant (PAF) were inspected for dike structural stability on October 22 and 23, 2008. The inspection was performed by Chris Hensley of Fossil Engineering Design Service. The initial results of this inspection were discussed with Greg Evans. The previous annual inspection was conducted on November 6 and 7, 2007.

The results of the annual stability inspection are listed below according to their location within the Paradise Fossil Plant Boundaries. A location map is attached with arrows showing directions of the pictures taken.

Slag Areas 2A, 2B, and Stilling Pond

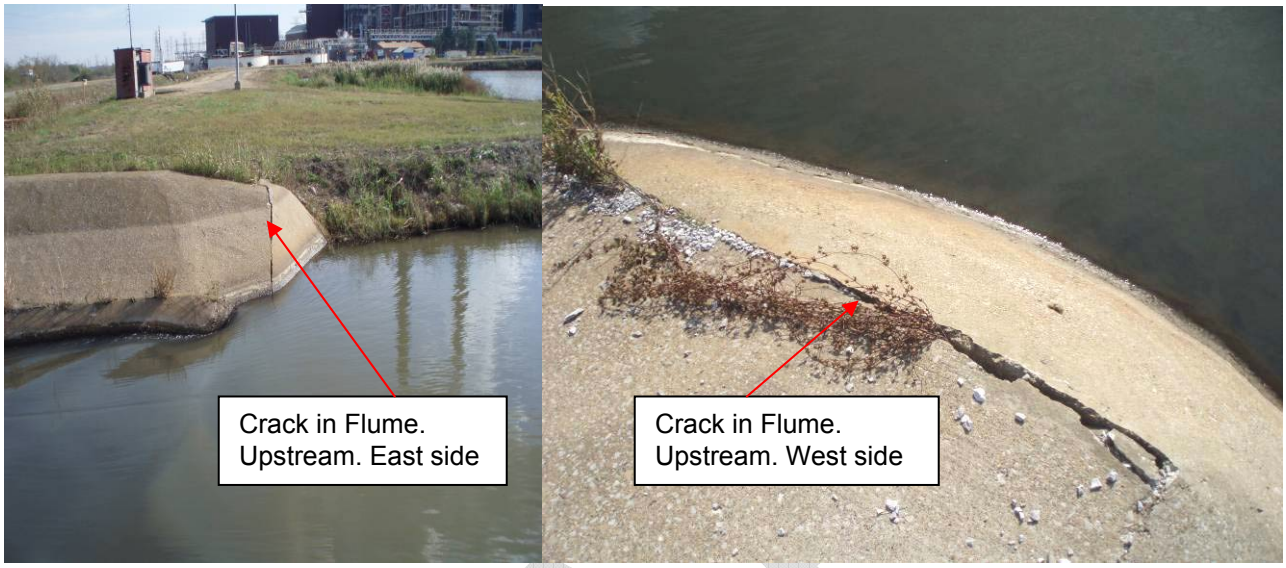
Boiler slag is sluiced into the south end of area 2A and is reclaimed by Reed Minerals as part of a TVA marketing strategy. The water elevation appeared to be approximately 30 inches from the top of the dikes. The bottom ash drops out quickly and is removed by Reed Minerals (Picture 1).



Picture 1. Slag Pond 2A & 2B.

The sluice water then flows into Slag Pond 2A through a series of dike baffles. From Slag Pond 2A the Sluice water flows into Slag Pond 2B through pipes and around a series of floating baffles to lengthen the settling time. A floating pump station has been placed at the north end of pond 2B to fill water trucks. An access walkway was built over the outlet end of the pipes into Area 2B. This walkway is associated with the truck water loading operation. The sluice water enters the north end of the stilling pond through a concrete flume. Large cracks were noted in the upstream side of the

flume (Picture 2). We recommend the plant clean the cracks and install a water tight grout in these cracks to prevent freeze thaw damage.



Picture 2. Concrete Flume to Stilling Pond.

Water was flowing freely into the stilling pond. The water discharges through three standard spillways into the Green River or is pumped to the Jacob's Creek Ash Pond. One pump was operating at the time of inspection. All three spillways were operating at the time of inspection. The last two inspections have noted the last spillway had a walk board from the bank (Picture 3). This year the walk board was under water. It is a safety hazard and should be removed. A permanent walkway may be installed to this spillway.

Picture 3. Walk board out to a spillway.

The access gate was locked at the discharge point of the spillways into the Green River. The area could not be observed as closely as in previous inspections. The discharge pipe did appear to have holes at the wye. These holes should be repaired.

There is additional water coming into the stilling pond from the south end via 30" & 42" concrete pipes. This water is from sumps, storm water pipes and dewatering pumps in construction areas. At the time of inspection these pipes were under water.

The dikes appear to be stable and did not exhibit any notable changes since the last inspection. The interior slopes of the dikes have a good vegetative cover. The dike slopes have been mowed.

Redwater Ponds (Nos. 1, 2, 3, 4 & 5)

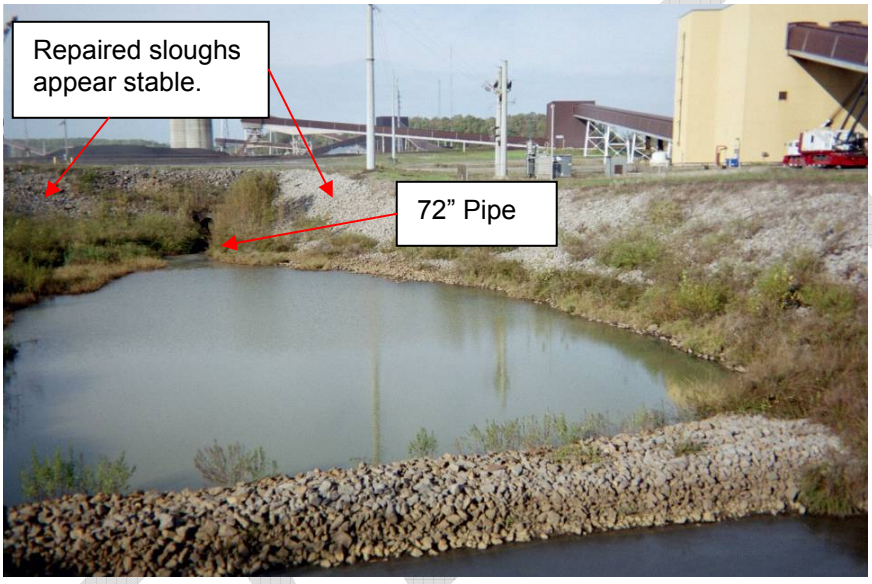
Redwater Pond #1

Redwater Pond #1 (RW #1) is located southeast of and adjacent to "Slag Pond 2B" and the "Slag Stilling Pond". Considerable repairs, cleanout and bank reconstruction have been performed by CSR to try to return the pond to its original configuration in 2005 (Picture 4). The current water depth is approximately 2 feet. The northern rip rap bank repaired in June of 2005 seems to be in good condition. A rip rap barrier has been added to the west side of the sewage treatment plant and appears to have stabilized the bank as designed. All pumps, slopes, dikes and discharge structures appear to be working. Water collected in Redwater Pond #1 is pumped into the Slag Ponds. At this time the pond water elevation was low so the pumps were not running. Four additional diesel pumps are kept at the pond to supplement the electric pumps so the pond's NPDES permit is not violated. Since the last inspection the plant has rerouted the diesel pumps discharge lines. Two of the pumps are jointed at a new 12" diameter pipe located in the north bank slope. This pipe then runs under the gravel road to the plant discharge lines into Slag Pond 2A. The other two pumps are routed on top of the ground to the northeast end of Slag Pond 2B.

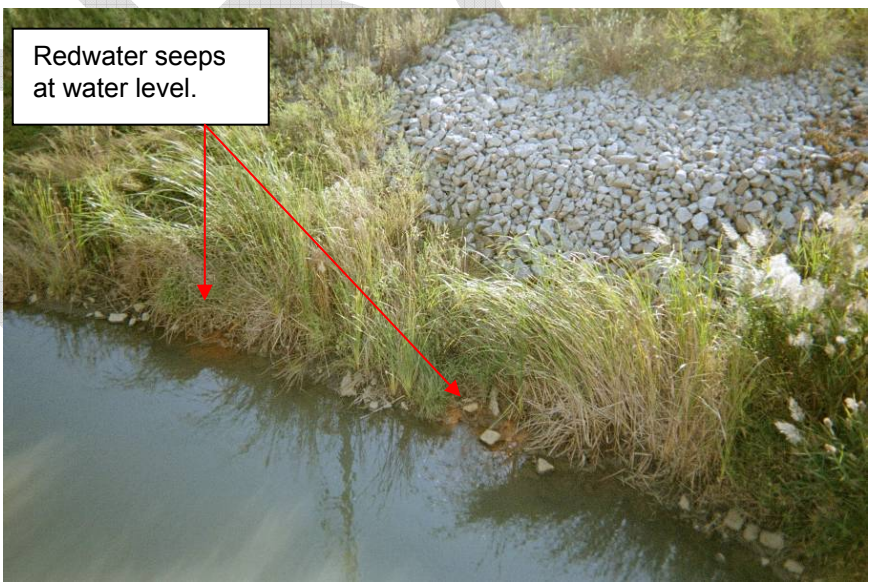
Picture 4. Redwater Pond #1.

Redwater Pond #2

Redwater Pond #2 (RW #2) is located northwest of and adjacent to Slag Ponds 2A & 2B. The water from RW #2 is pumped from the center of the pond and discharged into the northwest end of Slag Pond 2B. The upstream Storm Water and Coal Yard Drainage Pond #1 drain into RW #2 via a 72" pipe. The water level was lower than the 72" pipe. Coal Yard Drainage Pond #2 drains into RW #2 via a 12" overflow pipe during storms and high water level in Coal Yard Drainage Pond #2. The sloughs near the 72" pipe seem to be stable (Picture 5).



Picture 5. Redwater Pond #2.

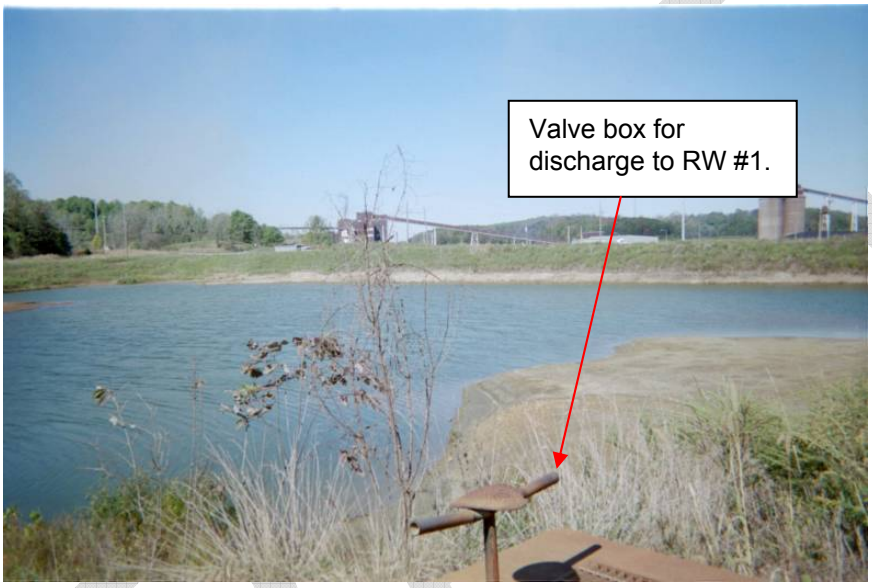


Picture 6. Redwater Pond #2. Seeps in northeast corner.

A rock dike is in place west of the pump station to prevent silt from entering into the pumps. The four redwater seepage areas observed in past inspections were found and flowing at the current water level (Picture 6).

Redwater Pond #3

Redwater Pond #3 (RW #3) is a settlement pond and is located southwest of the powerhouse and along the south side of the county road (Picture 7).



Picture 7. Redwater Pond #3. Pond & valve box.

This pond collects the runoff and sediment from the medium and coarse Coal Wash Refuse Areas as well as decanted water from RW #4. RW #3 normally discharges to RW #1 via a junction box arrangement at the discharge from RW #5. Otherwise, there are emergency over flows from RW #3 into a 60" drain to Jacobs Creek Ash Pond. This overflow is made of 3 - 36" pipes that go under the road and into a transition box (Picture 8). They were blocked at the time of the inspection.

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Picture 8. Redwater Pond #3. 3 – 36” Pipes.

The transition box has sediment about 18” deep that needs to be cleaned out. The grout around the three 36” pipes is falling out and needs to be regrouted around the pipes at the transition box. In the first pipe closest to the county road there is a slit 7” long in the pipe about 4’ from the transition box that needs to be repaired (Picture 9). This slit has increased in length since last inspection.

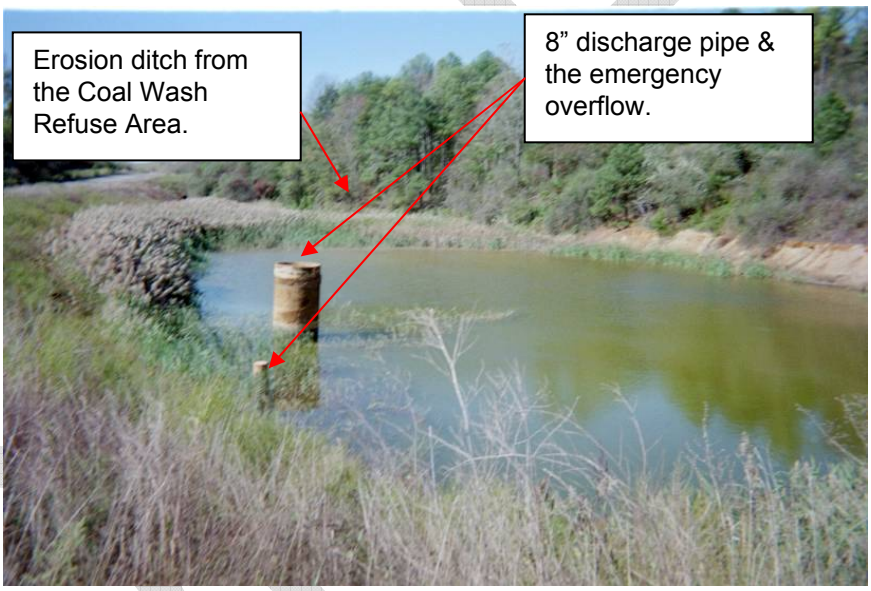
Picture 9. Redwater Pond #3. Slit in 36” pipe in the transition box.

Now that the pond has been cleaned out the operation of RW #3 has changed. The non-emergency discharge from RW #3 to RW #1 (via the junction box at RW #5) has a manual valve contained within the discharge structure. This valve was closed for several years due to the sediment build up in RW #3. CSR completed the cleaning out of the pond in 2005. The valve remains open to

discharge to RW #1. It remains in good condition since the cleanout.

Redwater Pond #4

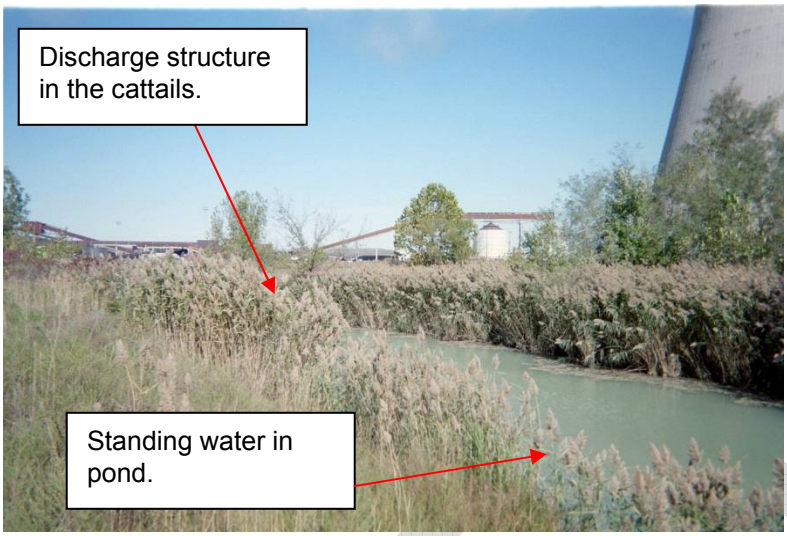
Redwater Pond #4 (RW #4) is a surge/sediment pond located east of the medium and coarse Coal Wash Refuse Area. This is a surge pond that settles out the fines before they reach RW #3. This surge pond was designed to drain via an eight inch pipe and an open rip rap ditch beside the road to RW #3. The eight inch pipe was clear of debris (Picture 10). The ditch beside this pond has been cleaned of sediment. The southwest side of this pond has been reconstructed and reseeded, but little vegetation has been established. The discharge outlet pipe from the coarse and medium stack has erosion present. The inlet should have rip rap placed to fill in the erosion and protect the bank slope around the pipe. A ditch has eroded about 60 feet from the discharge outlet pipe from the coarse and medium stack in the west side of the Coal Wash Refuse Area. This erosion should be repaired with rip rap before it worsens. RW #4 has an emergency overflow for runoff that exceeds the 10 year - twenty-four hour rainfall event. It drains directly to the Jacob's Creek Fly Ash Pond. The depth of water is now approximately 1 foot.



Picture 10. Redwater Pond #4. Discharge pipes.

Redwater Pond #5

Redwater Pond #5 (RW #5) is located south of the powerhouse, east of the truck coal dumping area and west of the limestone storage area. It is a surge pond designed to give the Redwater Pond #1 pumps time to lower the water level. An overflow structure drains runoff exceeding the 10 year - twenty-four hour rainfall event directly to Redwater Pond #1. All water collected in Redwater Pond #5 drains to Redwater Pond #1 via a gravity drain and no water should be held in RW #5. At the time of this inspection the discharge structure could not be found due to cattails around the structure (Picture 11). Water was standing in the east end of the pond (Picture 11). The water standing in RW #5 is from the limestone surge pond just east. We recommend cleaning out this pond for drainage of storm water flow and the water pumped from the limestone surge pond.



Picture 11. Redwater Pond #5.

Coal Yard Runoff Pond #1

Coal Yard Runoff Pond #1 (CYRP #1) is located north of and across the plant access road from the Coal Wash Plant. This is a surge/sedimentation storm water runoff pond that delays runoff to RW #2. Water and sediment is collected in the pond and the decanted water is discharged through a six inch hole cut in the side of the stand pipe. This hole is not configured per the original design drawing in size, or elevation but is functioning satisfactory (Picture 12). A rip rap dike was built to keep the coal fines away from the discharge point. At the time of this inspection, a portion of this dike had been removed due to the amount of fines that had accumulated. The coal fines are building up at the end of the ditch (Picture 13). These fines should be cleaned out before blocking the stand pipe.

Picture 12. Coal Yard Runoff Pond #1.

Picture 13. Coal Yard Runoff Pond #1. Runoff ditch into the pond.

Coal Yard Runoff Pond #2

Coal Yard Runoff Pond #2 (CYRP #2) is located southwest of and across an access road from RW #2. This pond was designed as a storm water sedimentation pond and all water from this pond is pumped to Slag Pond 2A. This pond was cleaned out two years ago and a rock check dam built at the westside of the platform to keep fines from entering the pumps (Picture 14). There are two pumps on the platform.

Picture 14. Coal Yard Runoff Pond #2.

Coal Yard Runoff Pond #3

Coal Yard Runoff Pond #3 (CYRP #3) is located south of the coal transfer complex and north of the access road. This pond can discharge by gravity or pumped to RW #1. The inner banks of the basin seem to be well vegetated and are stable. At the time of this inspection the water level in this pond was high. The emergency overflow in past has been blocked or modified to the point that it does not operate, however the water level was high enough this year so the emergency overflow had water running into it (Picture 15).

Picture 15. Coal Yard Runoff Pond #3.

Slag Disposal Area

The slag disposal area is located southeast of the powerhouse. The slag in this area was placed here by the plant during its early operations and is currently being reclaimed for commercial use by Reed Minerals. The area contains a small surge pond to collect runoff and a larger area, called the Beaver Pond, which discharges over a spillway and down a rip rap channel into Jacobs Creek. The rip rap appears to be in good condition. There was no beaver dam present at time of inspection. Also no water was being discharged. The surge pond was cleaned out last year.

The entrance road to the slag disposal area had signs of erosion. The silt fencing along the east side of the entrance road noted in the last inspection to be replaced has been replaced. The silt fencing seems to be helping in the erosion of the bank and sediment from going over the bank.

The banks appear to be stable with a good vegetative cover on them. The redwater seeps identified in earlier reports along the southwest dike in this area are still present. Some of the red water seeps continue to have growing deposits of material. The erosion gully located at the end of the southwest dike and just north of an existing culvert, was not visible.

A closure plan is being developed for this area. This area is to be closed within the next five years based on information provided from Reed Minerals (Picture 16).

Picture 16. Slag Disposal Area.

The southeast dike of the Beaver Pond along Jacob's Creek had noticeable erosion. The erosion was about 200 feet in length along the toe of the slope. The depth was about 2 to 3 feet. The erosion has caused trees to fall with the root ball still intact.

Jacob's Creek Fly Ash Pond

This area is located southeast of the powerhouse. Fly ash is sluiced into the northern portion of the original pond. One of the sluice lines was underwater while the other lines were flowing well. Water flows through a dike breach in the southwest portion of the ash pond then into the Fly Ash Pond Extension (the new ash disposal area).

Last year CSR and the plant have hauled and pushed material into the pond. The work from last year required clearing some of the vegetation off of the dike along the county road. Since last year, CSR repaired the dike and seeded and strawed the slope. This slope had good vegetative cover.

Flow is uniform and non-eroding through the ash pond. Rip rap in the breach and channel were in good condition. After the ash settles out, the water flows into a stilling pool in the northeast portion of the pond through a divider dike with a floating boom. Carbon dioxide is injected into the water at the boom. The wooden platform for access to the carbon dioxide lines and water sampling is in need of repairs. Floor boards and handrails are broken. Water is then discharged through three 48" standard spillways to Jacob's Creek (Picture 17).

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Picture 17. Jacob's Creek Ash Pond. Stairs to the CO2 probes.

Picture 18. Jacob's Creek Ash Pond. Stairs to the discharge pipes.

The spillway structures appear to be operating properly. All three outlets appeared to be discharging equally at the time of this inspection. The rip rap at the spillway outlets appeared to be in good condition. There is a stairway for access from the top of dike to the discharge pipes and the three new monitoring boxes above the pipes. The stairway is unsafe and is in need of major repairs or replacement (Picture 18). The dike slopes have established vegetation. The road on top of the dike had a good crushed stone surface. All exterior dikes appear to be in good condition with no visible signs of instability.

The scrubber project in 2006 added a new ditch from the scrubber settling pond to this pond for the scrubber discharge. At the time of inspection there was water in the ditch and it appeared that the

scrubber discharge pipes from the settling pond were still being used. There was a large amount of scrubber material in this pond at the end of the ditch.

Scrubber Pond

This pond is located in the southwest corner of the TVA reservation. Scrubber sludge is sluiced into the northern end of the pond and stacked by the rim ditch method. Water is discharged from the scrubber pond to a settling pond by vertical spillways. The new vertical spillways seem to be working as designed (Picture 19).

Picture 19. Scrubber Pond. Vertical spillway.

The stilling pool water discharges from the stilling pool through the vertical spillway into a ditch that empties into the Jacob's Creek Fly Ash Pond a half mile away. The discharge pipes from the scrubber pond to the settling pond appear to be in good condition. The standard spillway out of the stilling pool was in good condition. The final clarification pond needs cattails removed. A saddle dike had been constructed at the south end of the Scrubber Pond area to prevent water and scrubber sludge from flowing to adjoining property. The Scrubber Pond has expanded to the saddle dike and appears stable. The pond had not extended to the saddle dike in previous inspections.

The remainder of the area appears stable with a good vegetative cover and did not exhibit any notable changes since the previous inspection. Area drains and underdrain systems have been placed at the southeast portion of the dike and appear to be working as designed. CSR finished seeding and strawing this portion of the dike last year. However, this year on the southeast portion there was a blow out in the dike. A 15 feet height by 250 feet length of rip rap been has placed on the slope (Picture 20). No signs of erosion were present. The underdrain ditch needs to be cleaned out and graded to drain to prevent flow over the road.

Picture 20. Scrubber Pond. Blow in the dike.

West Dredge Cell

This area, located just east of the Scrubber Pond was constructed to accept dredged ash. No material has been dredged into the cell. Runoff is collecting in the cell because riser boards were installed in the spillway. At time of inspection, water was flowing through the spillway into the drainage ditch (Picture 21).

Picture 21. West Dredge Cell. Spillway in the West Dredge Cell.

The dikes appear stable and did not exhibit any notable changes since the last inspection. All exterior slopes have an excellent vegetative cover. The erosion observed in the previous inspection

at the southeast end of the pond was still present. The erosion gully observed in the previous inspection at the southwest end of the pond was still present, but does not appear to have worsened. As noted in last three inspections there is an erosion gully in the corner of the dike, east of the spillway. The gully is about 55 feet long with 12 feet by 12 feet rectangular shape at the top of the slope with 24" to 36" depth reducing to 8 feet by 24" depth near the bottom. The erosion does not appear to have worsened and has established vegetation.

East Dredge Cell

This area is located just south of the medium and coarse Coal Wash Refuse Area. This cell was also constructed to accept dredged ash (Picture 22). The spillway appeared to be in good condition. The discharge pipe was clear of obstructions but had a large eroded hole 6' long, 3.5' wide by 3' deep at the end of the pipe. This hole has revegetated and appears to be in stable condition. The dikes in this area appear to be stable. The tops of dike are in satisfactory condition, although some vegetation has established itself over the area. Removal of vegetation is not warranted at this time. The dredged ash was seeded in 2002; vegetation is good south of the discharge structure and is improving north of the discharge structure.

The eroded ditch beside the armored ditch at the northeast corner of the dike, caused by runoff bypassing the armored ditch, is now over 4 feet deep, eight feet wide and one hundred feet long. The drainage ditch has had rip rap put in and has good vegetation established and seems to have stabilized.

Ditches, rutting and erosion gullies all have established vegetation and no changes.

Picture 22. East Dredge Cell.

Medium and Coarse Coal Wash Refuse Stack

The area appeared to be covered in accordance of the design drawings. The areas which were at or above the final stacking configuration were compacted and have good vegetative cover (Picture

23). Runoff from the east side is directed by the berm ditches to a perimeter ditch. The perimeter ditch discharges into the collection ditch for Redwater Pond #4 on the west side and Redwater Pond #3 on the north side. A good vegetative cover has been established in the southeastern portion of the area. The erosion ditches noted in last inspection along the north side of the stack have been repaired but no vegetation is present (Picture 24).

Picture 23. Medium and Coarse Coal Wash Refuse Stack.

Picture 24. Medium and Coarse Coal Wash Refuse Stack.

Coal Wash Fines Pond #2

Fines Pond #2 is located in the northwest portion of the plant properties. This area is adjacent to the railroad and on the north side of the plant access road. The original pond was completed in the late

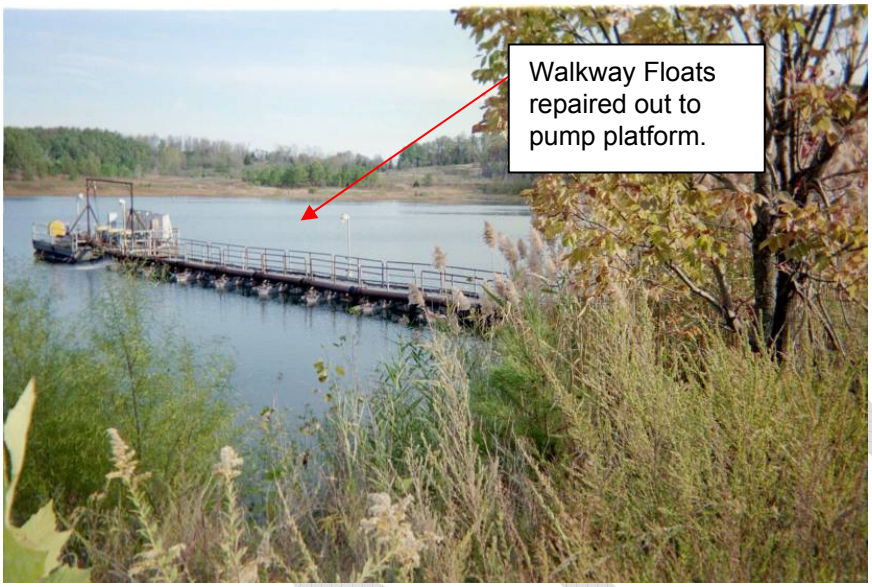
fall of 1987. The top of the original dike was at elevation 455. The plant raised the dike to approximately elevation 465 in 1990, and subsequently sluiced fines to this elevation. This area has not been active as a sluicing operation since Fines Pond #3 began operation in October 1992. In recent inspections the plant has placed coal fines into this area and spread it out over the area. All of the dikes in this area appeared stable and in good condition. The west dike has been noted in previous inspections to have sparse vegetation. The vegetative cover is now improving (Picture 25).

Picture 25. Vegetation on the west dikes.

The west dike in the first lift of the pond has been growing with pine trees. This has not been an issue until this inspection. This year some of the trees had been broken or up rooted in the last weather storm. The up rooted trees should be removed and compact clay soil back filled into the holes and reseeds them as needed (Picture 26).

Picture 26. Pine trees along Daniel Run Creek.

The stilling pond for the coal wash fine ponds was at high water level (Picture 27). The plant had repaired the floating walkway this year that was noted to be repaired in the last inspection.



Picture 27. Stilling Pond. High water level.

Coal Wash Fines Pond #3

Fines Pond #3 is located northwest of Fines Pond #2. The first lift was completed in October 1992 and all sluicing was diverted from Fines Pond #2 to this area. The latest lift was finished in September 1999, and the sluice discharge was changed from the east to the west end of the pond. The discharge structure flows into a rip rapped ditch that flows into Fines Pond #2 and then into the stilling pool. The dike was constructed around the cemetery to the north of this area to protect it.

All dikes in this area appear to be stable but have some seepage. There is little grass on the slopes. Several of the new culverts that drain the berm ditches have been repaired to drain. At the drains on the north side of the stack small trees were starting to grow on the slope (Picture 28). It is recommended to remove them before they are too large.

DRAFT

Picture 28. Fines Pond #3. North side trees in the drains.

This year CSR regraded the slopes and filled in all the eroded areas (Pictures 29 & 30). They have tried three times to seed and establish vegetation on the slopes with little success.

Picture 29. Fines Pond #3. Slopes regarded and erosion.

Picture 30. Fines Pond #3. Southeast side.

A slide 29.5 feet long and 10.3 feet high developed the first week of May, 2000 in an area that was seeping. This has been fixed and appears to be working. An area approximately 400 feet long was excavated, an underdrain installed, and rip rap placed to stabilize this area of the dike. The fix was completed by February 23, 2001. This area appears to be stable with no seeping (Picture 31).

Picture 31. Fines Pond #3. Southeast side.

Six seeps/wet areas were found adjacent to the cemetery. They are of equal elevation and cover a distance approximately 200 feet long. At the time of this inspection, all seeps were not flowing. All six areas continue to exist.

The repaired rip rap ditch east of the cemetery is in good shape. However, the cattails and sediment are filling in the ditch. We recommend clean the ditch and cut the cattails down.

CSR worked this year to close the borrow area beside the cemetery and construct a sediment pond to protect the cemetery from water and sediment runoff. This sediment pond needs to be cleaned out for drainage. CSR also worked to close the borrow area northwest of the Fines Pond #3. CSR regraded the slopes and graded the floor to drain to a sediment pond built to control water runoff. Both of the borrow areas have good vegetation.

The plant is now burning the coal fines to produce power. CSR has stopped hauling the fines to a separate pile beside the coal pile this year. They have removed material to a depth of about 35 feet from Fines Pond #3.

Two years ago an erosion and sediment control plan was issued by Engineering Design Services in response to an Environment Audit finding. All of the erosion control plan work has been completed and in good condition.

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Recommendations:

- Mow grass and remove small trees and brush from all dike slopes. Pull up all broken trees and compact soil back in the holes.
- Maintain all dike roads for all weather travel to facilitate the required shift visual inspections and routine O&M activities.
- Monitor the exterior dike slopes for seepage, wet or soft spots or animal burrowing, etc. and notify Engineering Design Services of any changes.
- Remove the sediment from the transition box at RW #3 discharge pipes to Jacob's Creek Ash Pond so that flow does not become inhibited during periods of heavy rainfall.
- Remove the brush in front of the overflow drains three 36" pipes from RW#3 to the transition box
- Regrout the three 36" pipes into the transition box. Remove sediment from around the pipes and repair the 7 inch slit in the first pipe closes to the county road.
- Remove fines from all of the coal yard drainage basins and all of the redwater ponds, especially RW #1, #2, #3 & #4 ponds.
- Clean out Redwater #5 so water is not standing in this pond.
- Check the cemetery seepage weekly and report any increases to; John Albright at 423/751-3981 in Chattanooga.
- Continue ditch cleaning out of Fines Pond #3 to eliminate standing water in the ditches.
- Continue Fines Pond #3 erosion and sediment control plan.
- Remove trees from Fines Pond #2 on the west side that are pulled up by the root ball and broke trees.
- Remove trees from Fines Pond #3 on the north side that are growing in the drainage down drains of the stack.
- Until grass is established on the slopes of Fines Pond #3, follow the Interim Administrative Controls included in the Interim Site Erosion Control Plan.
- Repair erosion ditches and gullies around the Coarse and Medium Refuse Stack and East Dredge Cell.
- Monitor south slope of Redwater Pond #2 for additional movement.
- Repair the stairway at the carbon dioxide unit in Jacob's Creek stilling pond.
- Repair or replace the stairway to the discharge pipes from the Jacob's Creek Ash Pond.
- Remove the walk board from the bank to the spillway in the Slag Pond Stilling Pond.
- Install rip rap around the discharge outlet pipe to Redwater Pond #4. Also into the channel from the pipe.
- Install rip rap in the erosion ditch on the west side of the Coarse and Medium Stack into Redwater #4.
- Check for beaver dams in Jacob's Creek along the Fly Ash Pond.
- Seal cracks in the concrete flume discharging into the Slag Stilling Pond.
- Clean out drainage ditch along the road on the Scrubber Pond on the southeast side of the pond.

DRAFT

ASH POND INSPECTION.

REDWATER #2 POND

REDWATER #1 POND

PUMP

FINES

WASH POND #2

REDWATER POND #3

REDWATER POND #5

REDWATER POND #4

MEDIA COARSE

CORL WASH

REFUSE AREA

CHEM POND

DREDGE CELL B

DREDGE CELL A

EAST DREDGE CELL

WEST DREDGE CELL

JACOBS CREEK ASH POND

DIVIDER DIKE

RESERVATION BOUNDARY

WETLANDS TO BE RESERVED FOR MITIGATION

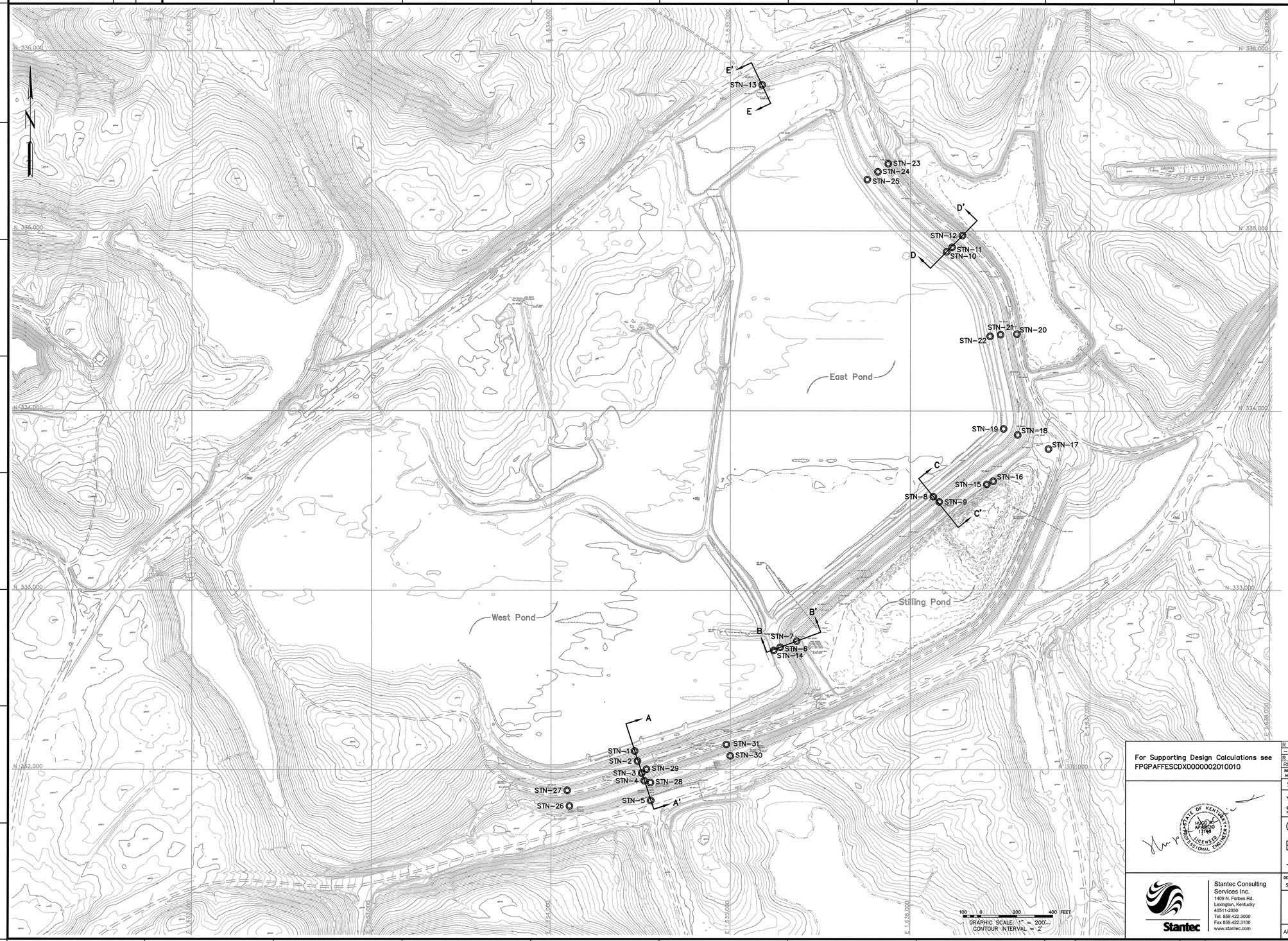
FUTURE SOUTH CAL AREA

COAL STORAGE YARD

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Appendix B

Geotechnical Drawings



NOTES:

1. The topographic mapping shown on this drawing was developed by Stantec using an electronic drawing titled "484313DTM.dwg" provided by TVA in March, 2009. The information is believed to be approximate and should not be used for construction purposes.
2. 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 there-from. 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.
3. Borings advanced during this exploration were drilled between 1/30/09 and 2/27/09 except STN-15 and STN-16 which were drilled during May 2009. Survey information shown is taken from surveys performed by TVA on February 2 and 3, 2009 and by Stantec on February 12 and 13, 2009.
4. Borings STN-17 through STN-25 were drilled on November, 2010 as part of East Pond East Slope Buttress Project. Boring STN-26 through STN-31 were drilled in December, 2010 as part of West Pond Slope Exploration project.

BORING LOCATION TABLE

BORING	NORTHING	EASTING	ELEV. (FT.)
STN-1	332,102.89	1,634,466.78	509.9
STN-1A	*	*	*
STN-2	332,046.91	1,634,482.61	494.3
STN-3	331,980.02	1,634,505.77	483.5
STN-4	331,937.06	1,634,520.16	467.6
STN-5	331,826.79	1,634,555.94	452.0
STN-6	332,682.25	1,635,277.08	510.9
STN-6A	332,677.36	1,635,279.66	511.0
STN-7	332,716.17	1,635,368.06	486.7
STN-7A	*	*	*
STN-7B	332,721.84	1,635,366.07	486.8
STN-8	333,522.45	1,636,128.32	510.2
STN-8A	333,519.21	1,636,124.51	510.2
STN-9	333,493.26	1,636,160.82	497.5
STN-9A	*	*	*
STN-9B	333,490.39	1,636,156.12	497.5
STN-10	334,884.95	1,636,200.27	514.0
STN-10A	334,881.85	1,636,204.33	514.0
STN-11	334,909.50	1,636,230.61	504.5
STN-11A	*	*	*
STN-12	334,974.78	1,636,288.23	494.4
STN-13	335,811.89	1,635,175.12	525.1
STN-13A	335,811.89	1,635,182.62	525.1
STN-14	332,664.43	1,635,241.22	510.9
STN-15	333,588.73	1,636,423.97	480.9
STN-16	333,609.25	1,636,462.16	481.1
STN-17	333,788.05	1,636,769.67	483.5
STN-18	333,866.57	1,636,598.52	501.5
STN-19	333,900.29	1,636,519.81	519.7
STN-20	334,427.13	1,636,593.39	489.3
STN-20A	334,433.28	1,636,592.28	489.7
STN-21	334,423.95	1,636,502.53	506.5
STN-21A	334,418.40	1,636,509.40	506.6
STN-22	334,414.92	1,636,444.01	519.1
STN-22A	334,417.64	1,636,443.36	519.4
STN-23	335,373.98	1,635,876.30	502.0
STN-23A	335,379.92	1,635,873.53	501.8
STN-24	335,328.75	1,635,818.39	508.7
STN-25	335,285.26	1,635,759.82	522.7
STN-25A	335,289.98	1,635,757.90	523.3
STN-26	331,796.36	1,634,102.97	471.6
STN-26A	331,793.93	1,634,096.71	471.4
STN-27	331,883.49	1,634,090.33	491.9
STN-27A	331,883.02	1,634,087.66	492.2
STN-28	331,927.03	1,634,554.22	470.4
STN-28A	331,923.81	1,634,548.50	470.2
STN-29	332,001.60	1,634,532.39	488.8
STN-29A	332,002.47	1,634,527.27	489.1
STN-30	332,075.76	1,634,999.32	470.7
STN-30A	332,073.81	1,634,994.87	470.5
STN-31	332,139.53	1,634,977.80	486.6
STN-31A	332,138.48	1,634,971.66	487.0

* Borings designated as "A" or "B" are offset borings (less than 10 feet away) to the corresponding boring number and are not shown for clarity.

LEGEND

STN-1 ◎ Soil Boring with Standard Penetration Tests and/or Undisturbed (Shelby) Tube Samples

RECORD DRAWING

For Supporting Design Calculations see FPGPAFFESCDX0000002010010

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R –	–	–	–	–	–	–	–	–	–	–
R 0	06/11/10	SV	DMG	SV	SV	SV	HRA	TJ	–	–

RECORD DRAWING

SCALE: 1"=200' EXCEPT AS NOTED

YARD
SCRUBBER SLUDGE COMPLEX

GEOTECHNICAL EXPLORATION
BORING LAYOUT

—

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	D. GRAHAM	S. VEMURI	S. VEMURI	S. VEMURI	H. APARICIO	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 06/11/10 | 64 | C | 10W713-01 | R 0

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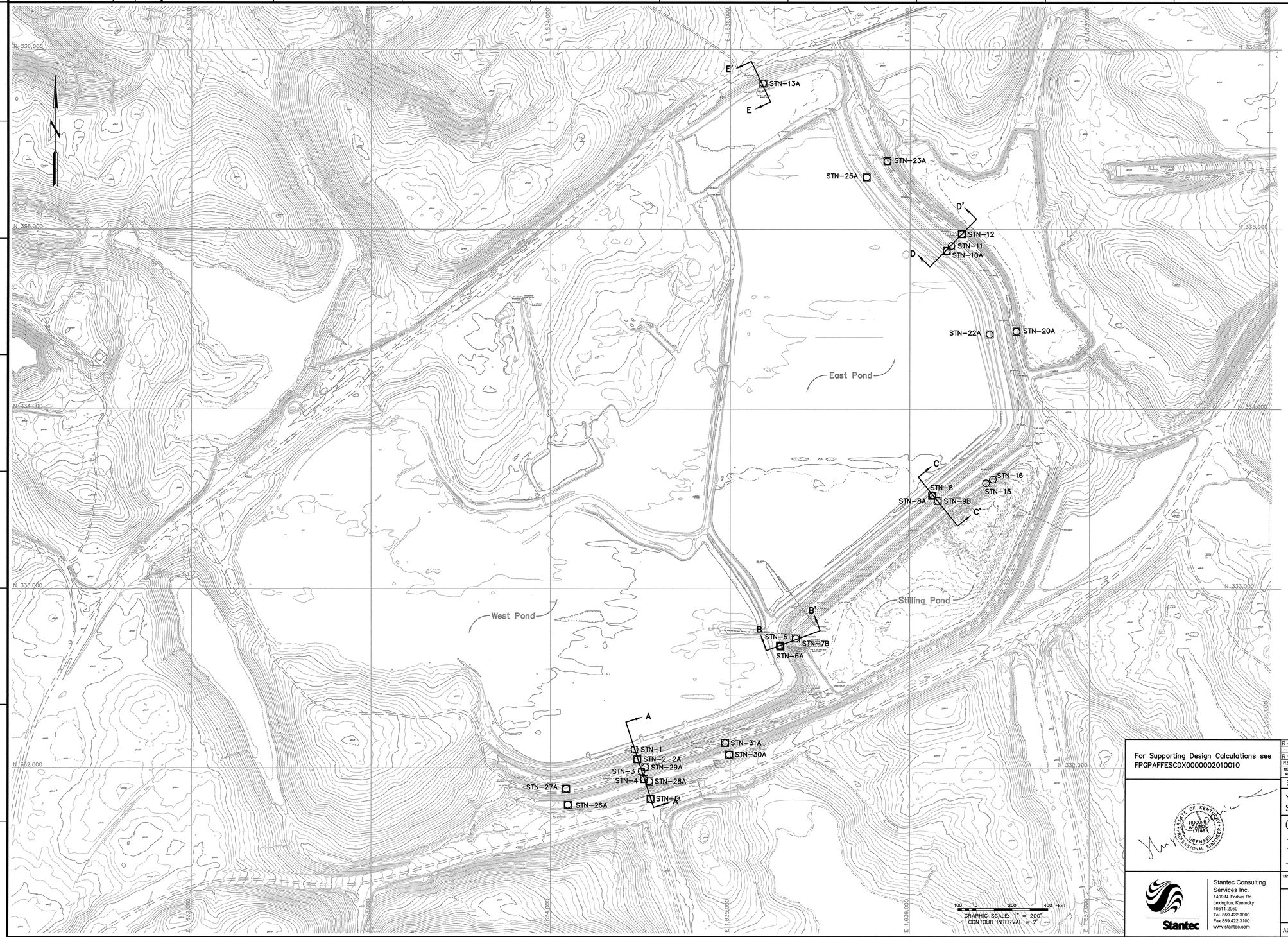

NOTES:

1. The topographic basemap shown on this drawing was developed by Stantec using an electronic drawing titled "484313DTM.dwg" provided by TVA in March, 2009. The information is believed to be approximate and should not be used for construction purposes.
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INSTRUMENTATION LOCATION TABLE

BORING	NORTHING	EASTING	ELEV. (FT.)
STN-1	332,102.89	1,634,466.78	509.9
STN-2	332,046.91	1,634,482.61	494.3
STN-2A	332,046.91	1,634,482.61	494.3
STN-3	331,980.02	1,634,505.77	483.5
STN-4	331,937.08	1,634,520.16	467.6
STN-5	331,826.79	1,634,555.94	452.0
STN-6	332,682.25	1,635,277.08	510.9
STN-6A	332,677.36	1,635,279.66	511.0
STN-7B	332,721.84	1,635,366.07	486.8
STN-8	333,522.45	1,636,128.32	510.2
STN-8A	333,519.21	1,636,124.51	510.2
STN-9B	333,490.39	1,636,156.12	497.5
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STN-11	334,909.50	1,636,230.61	504.5
STN-12	334,974.78	1,636,288.23	494.4
STN-13A	335,811.89	1,635,182.62	525.1
STN-15	333,588.73	1,636,423.97	480.9
STN-16	333,609.25	1,636,462.16	481.1
STN-20A	334,433.28	1,636,592.28	489.7
STN-22A	334,417.64	1,636,443.36	519.4
STN-23A	335,379.92	1,635,873.53	501.8
STN-25A	335,289.98	1,635,757.90	523.3
STN-26A	331,796.20	1,634,106.29	471.4
STN-27A	331,884.74	1,634,097.38	492.2
STN-28A	331,927.41	1,634,557.82	470.2
STN-29A	332,004.37	1,634,537.00	489.1
STN-30A	332,077.28	1,635,004.16	470.5
STN-31A	332,141.29	1,634,981.22	487.0

LEGEND

STN-2 ☐ Piezometer Location
STN-1 ☐ Slope Inclinometer Location

RECORD DRAWING

For Supporting Design Calculations see FPGPAFFESCDX0000002010010

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV. NO.
R 0	06/11/10	SV	DMG	SV	SV	SV	HRA	TJ	–	–	R 0
RECORD DRAWING											

DISCIPLINE INTERFACE

SCALE: 1"=200' EXCEPT AS NOTED

YARD
SCRUBBER SLUDGE COMPLEX

GEOTECHNICAL EXPLORATION
INSTRUMENTATION PLAN

—

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DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
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PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE: 06/11/10	64	C	10W713-02	R 0

PLOT FACTOR:XX
W_TVA

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TASK COMPLETED BY:	REV. NO.

PLOT DATE: 06/10/2010 USER: GRAHAM, DAVE
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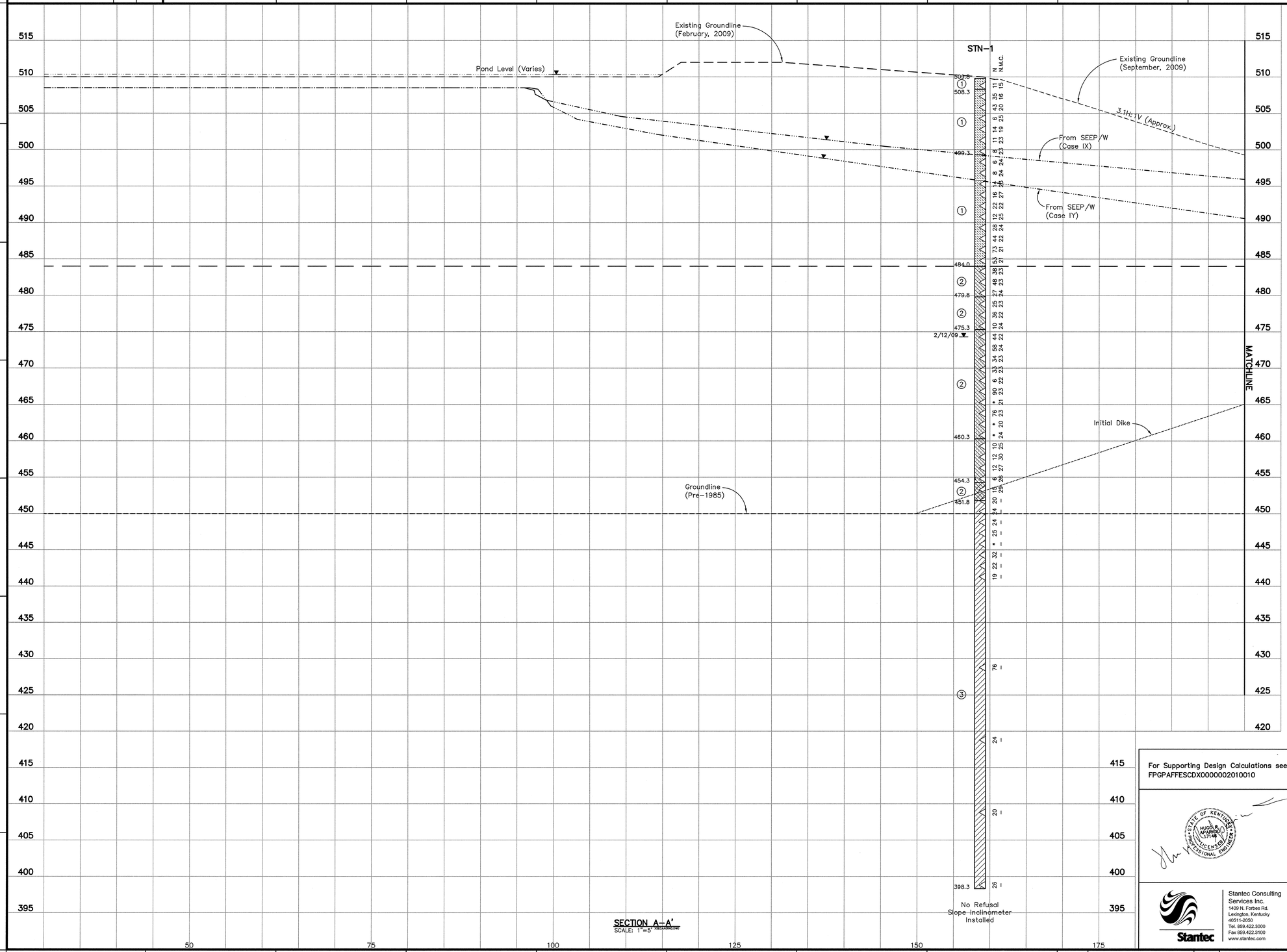

SECTION A-A'
SCALE: 1"=5'

LEGEND

- ① Gypsum – Fly Ash: Light gray to dark gray, moist to wet and very loose to very dense
- ② Gypsum: Light gray to dark gray, moist to wet and very loose to very dense
- ③ Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone and siltstone fragments
- ④ Sand: Intermediate layers of clay and gravel, brown, moist to wet, very loose to dense
- Denotes location of Piezometer Tip
- WH Weight of Hammer
- WR Weight of Rods
- Standard Penetration Test Interval
- Undisturbed Thin-Walled (Shelby) Tube Sample
- N Standard Penetration Test Blow Count (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.)
- 02/01/10 Water Level and Date Recorded
- No Refusal No Refusal Encountered
- * Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

NOTE:

1. Natural Moisture Content testing of samples containing gypsum flyash material were conducted at 40°C and 200°C. For clarity only the 40°C have been reported on the drawings. The results from 200°C tests can be found in the geotechnical report. Natural Moisture Content testing of samples containing residual clay material were conducted at 110°C, only.
2. February, 2009 groundline is based on aerial survey by TVA.
3. September, 2009 groundline is based on as-built survey by Stantec.
4. Pre-1985 groundline was developed by Stantec using a scanned historic drawing numbered '10W4280-1 R1' provided by TVA.
5. Initial Dike groundline was developed by Stantec using scanned historic drawing numbers '10W4280-1 R1' and '10W4280-3 R1' provided by TVA.
6. Piezometer Construction: For detailed information regarding the construction of piezometers, please refer to Appendix D of the draft report of geotechnical exploration dated August 24, 2009.
7. Offset borings (where applicable) are not shown for clarity. Refer to logs of borings and boring layout for additional data.

RECORD DRAWING

For Supporting Design Calculations see FPGPAFFESCDX0000002010010

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV. ID
R 0	06/11/10	SV	DMG	SV	SV	SV	HRA	TJ	–	–	–
RECORD DRAWING											

SCALE: 1"=5' EXCEPT AS NOTED

YARD
SCRUBBER SLUDGE COMPLEX

GEOTECHNICAL EXPLORATION
CROSS SECTION A-A'

–

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
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PARADISE FOSSIL PLANT
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FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 06/11/10	64	C	10W713-03	R 0

STANTEC	0
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PLOT FACTOR: XX
W_TVA

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PLOT DATE: 06/16/2010 USER: GRAHAM, DAVE
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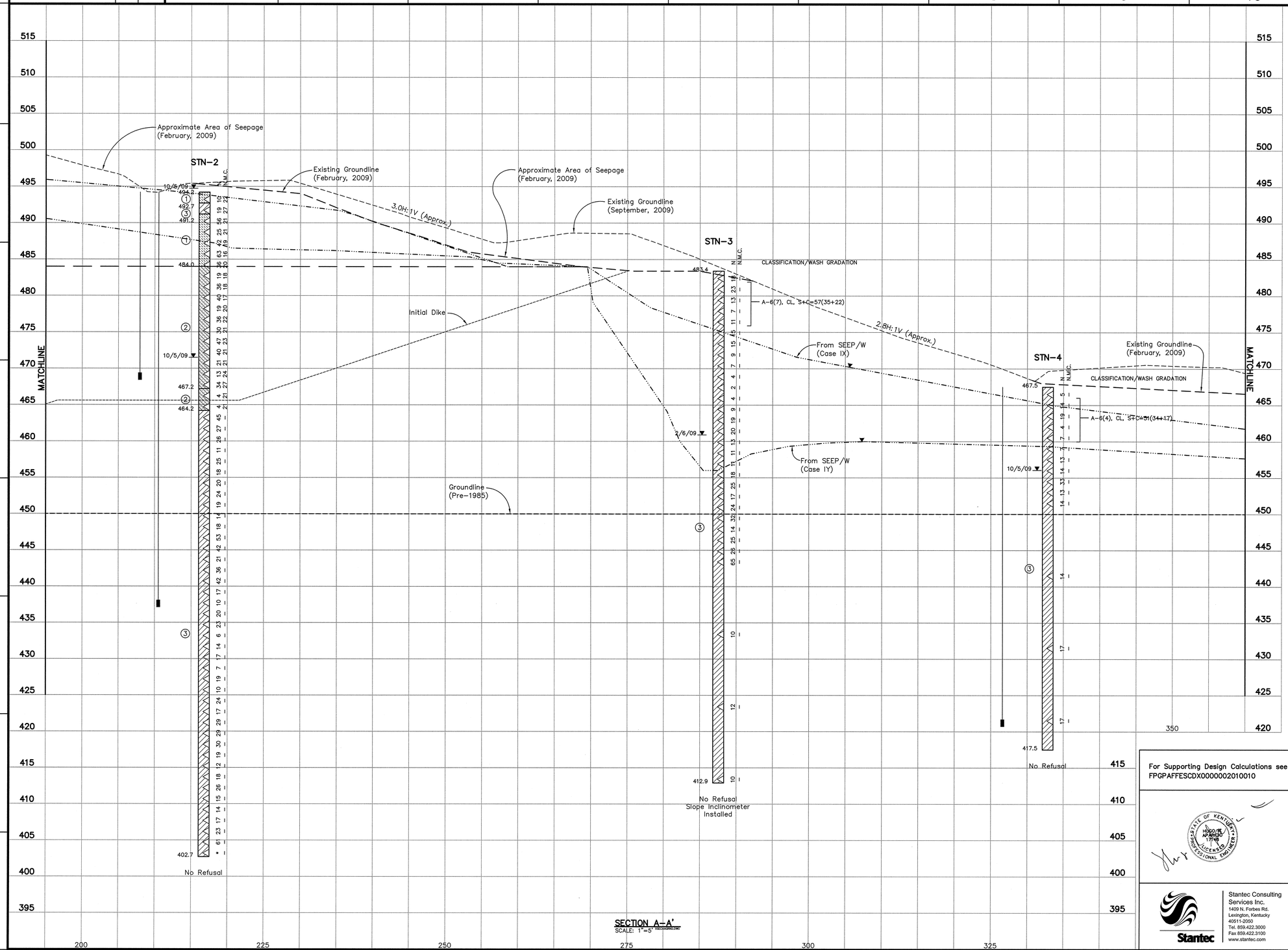

SECTION A-A'
SCALE: 1"=5' HORIZONTAL

LEGEND

①	Gypsum – Fly Ash: Light gray to dark gray, moist to wet and very loose to very dense
②	Gypsum: Light gray to dark gray, moist to wet and very loose to very dense
③	Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone and siltstone fragments
④	Sand: Intermediate layers of clay and gravel, brown, moist to wet, very loose to dense
	Denotes location of Piezometer Tip
WH	Weight of Hammer
WR	Weight of Rods
◁	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N	Standard Penetration Test Blow Count (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.)
02/01/10 ▼	Water Level and Date Recorded
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

NOTE:

1. Natural Moisture Content testing of samples containing gypsum flyash material were conducted at 40°C and 200°C. For clarity only the 40°C have been reported on the drawings. The results from 200°C tests can be found in the geotechnical report. Natural Moisture Content testing of samples containing residual clay material were conducted at 110°C, only.
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5. Initial Dike groundline was developed by Stantec using scanned historic drawing numbers '10W4280-1 R1' and '10W4280-3 R1' provided by TVA.
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7. Offset borings (where applicable) are not shown for clarity. Refer to logs of borings and boring layout for additional data.

RECORD DRAWING

For Supporting Design Calculations see FPGPAFFESCDX0000002010010

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV ID
R 0	06/11/10	SV	DMG	SV	SV	SV	HRA	TJ	–	–	–
RECORD DRAWING											

SCALE: 1"=5' EXCEPT AS NOTED

YARD
SCRUBBER SLUDGE COMPLEX

SCRUBBER SLUDGE COMPLEX
CROSS SECTION A-A'

–

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	P. BOND	S. VEMURI	S. VEMURI	S. VEMURI	H. APARICIO	T. JOHNSON

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PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

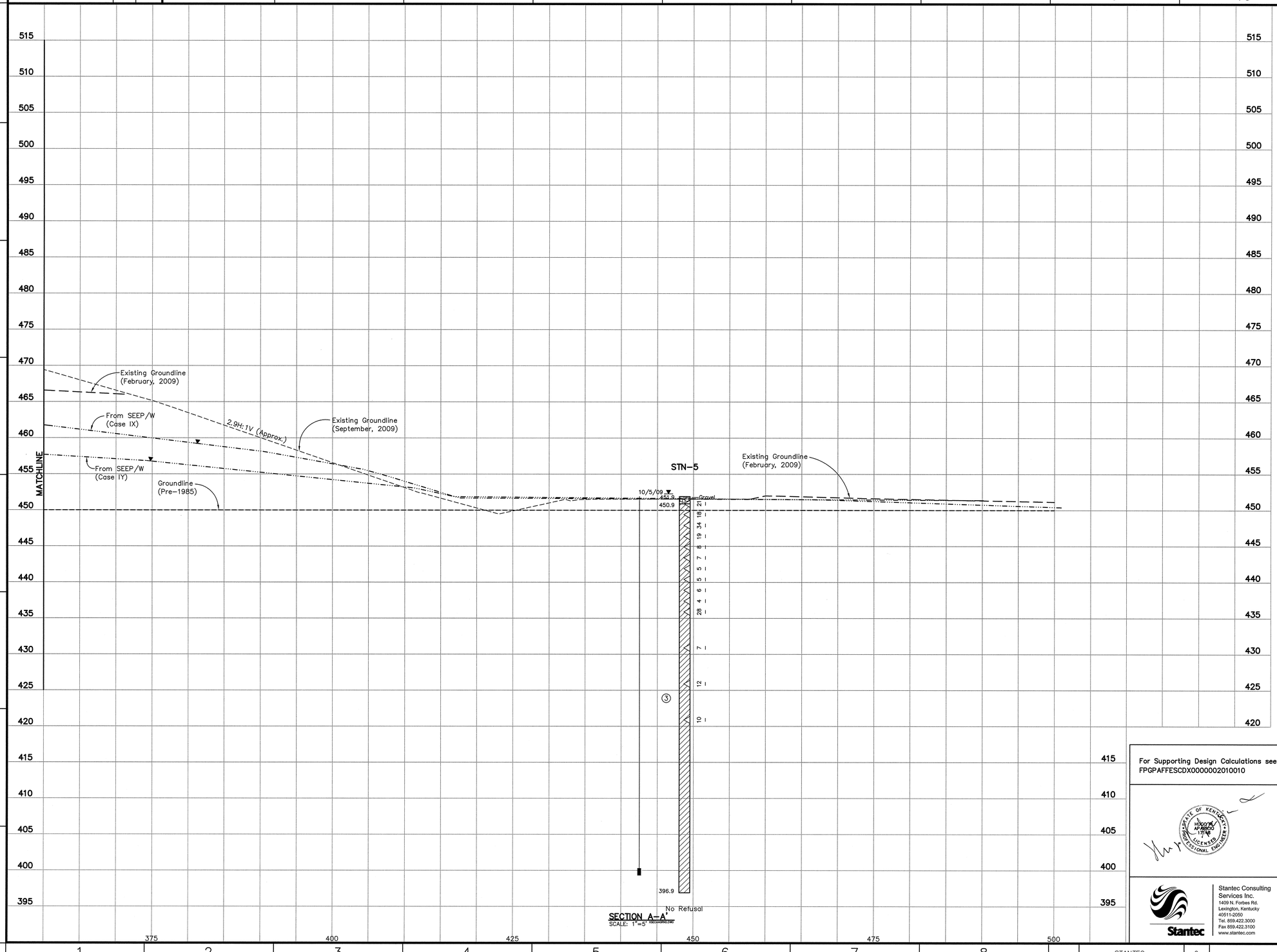
AUTOCAD R 2000 | DATE 06/11/10 | 64 | C | 10W713-04 | R 0

STANTEC | 0
TASK COMPLETED BY: | REV. NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 06/15/2010 USER: GRAHAM, DAVE
V:\1735\ACTIVE\TVS565040\GEOTECHNICAL\DRAWINGS\SCRUBBER_SLUDGE_COMPLEX\GEOTECH\REVG_RECORD\10W713-04-RG.DWG



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RECORD DRAWING

PLOT DATE: 06/11/2010 USER: GRAHAM, DAVE
V:\1755\ACTIVE\175566040\GEOTECHNICAL\DRAWING\SCRUBBER_SLUDGE_COMPLEX\GEOTECH\VEMURI_RECORD\10W713-05-R0.DWG

For Supporting Design Calculations see FPGPAFFESCDX0000002010010

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT 10	AS CONST	REV CO
R-	–	–	–	–	–	–	–	–	–	–	–
R 0	06/11/10	SV	DMG	SV	SV	SV	HRA	TJ	–	–	–

RECORD DRAWING

DISCIPLINE INTERFACE

SCALE: 1"=5' EXCEPT AS NOTED

YARD
SCRUBBER SLUDGE COMPLEX

GEOTECHNICAL EXPLORATION
CROSS SECTION A-A'

–

STATE OF KENTUCKY – HENRY W. APARICIO – 17748 – LICENSED PROFESSIONAL ENGINEER

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DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	D. GRAHAM	S. VEMURI	S. VEMURI	S. VEMURI	H. APARICIO	T. JOHNSON

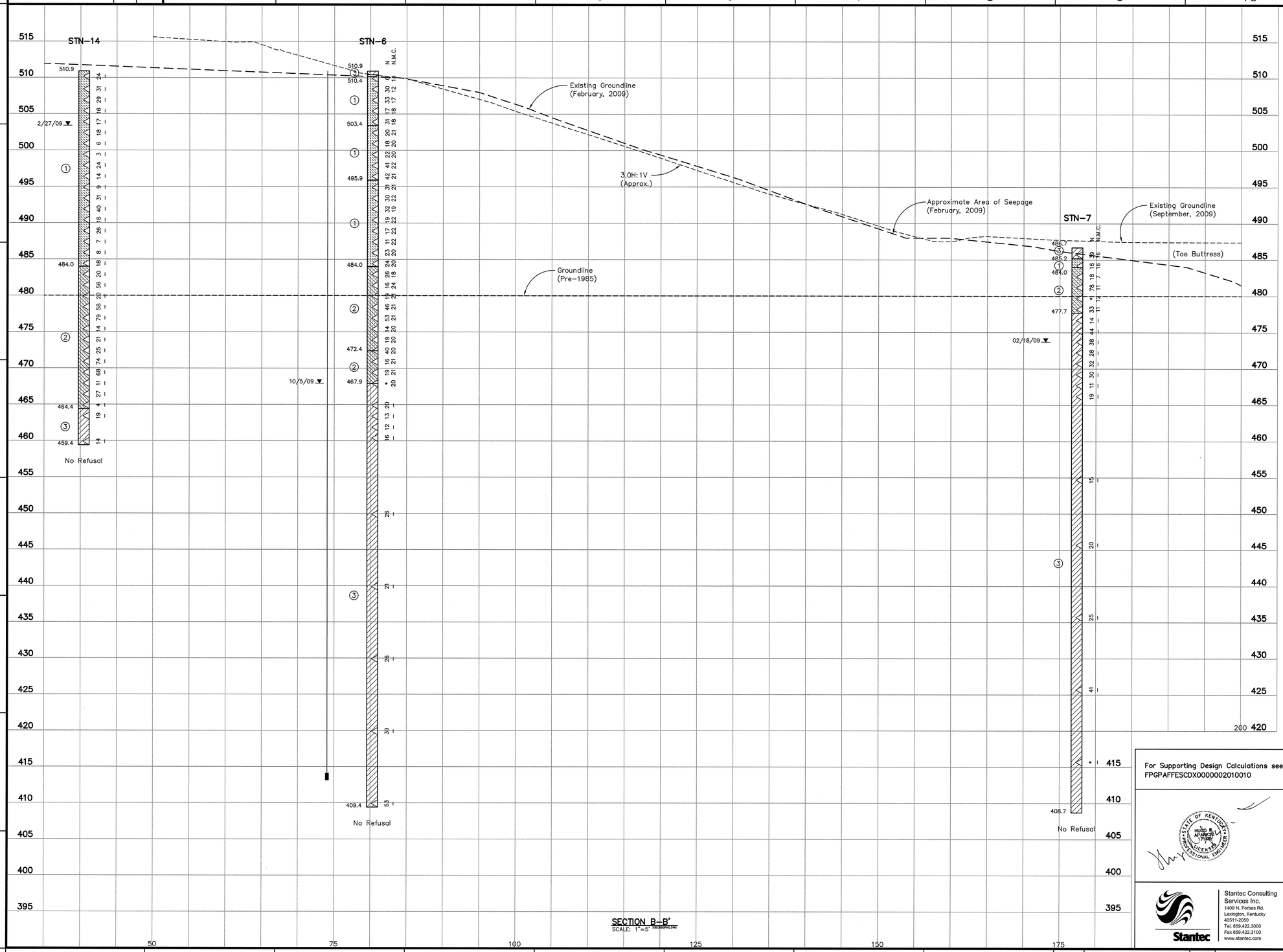
PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 06/11/10	64	C	10W713-05	R 0

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY



LEGEND

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RECORD DRAWING

PLOT DATE: 06/11/2010 USER: GRAHAM, DAVE
V:\1750\ACTIVE\172569649\GEOTECHNICAL\DRAWING\SCRUBBER_SLUDGE_COMPLEX\GEOTECH\VEVO_RECORD\10W713-06-R0.DWG

For Supporting Design Calculations see FPGPAFFESCDX0000002010010

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT 10	AS CONST	REV GD
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	06/11/10	SV	DMG	SV	SV	SV	HRA	TJ	–	–	–

RECORD DRAWING

DISCIPLINE INTERFACE: 1 – 2 – 3 – 4 –

SCALE: 1"=5' EXCEPT AS NOTED

YARD
SCRUBBER SLUDGE COMPLEX

GEOTECHNICAL EXPLORATION
CROSS SECTION B-B'

–

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S. VEMURI	D. GRAHAM	S. VEMURI	S. VEMURI	S. VEMURI	H. APARICIO	T. JOHNSON

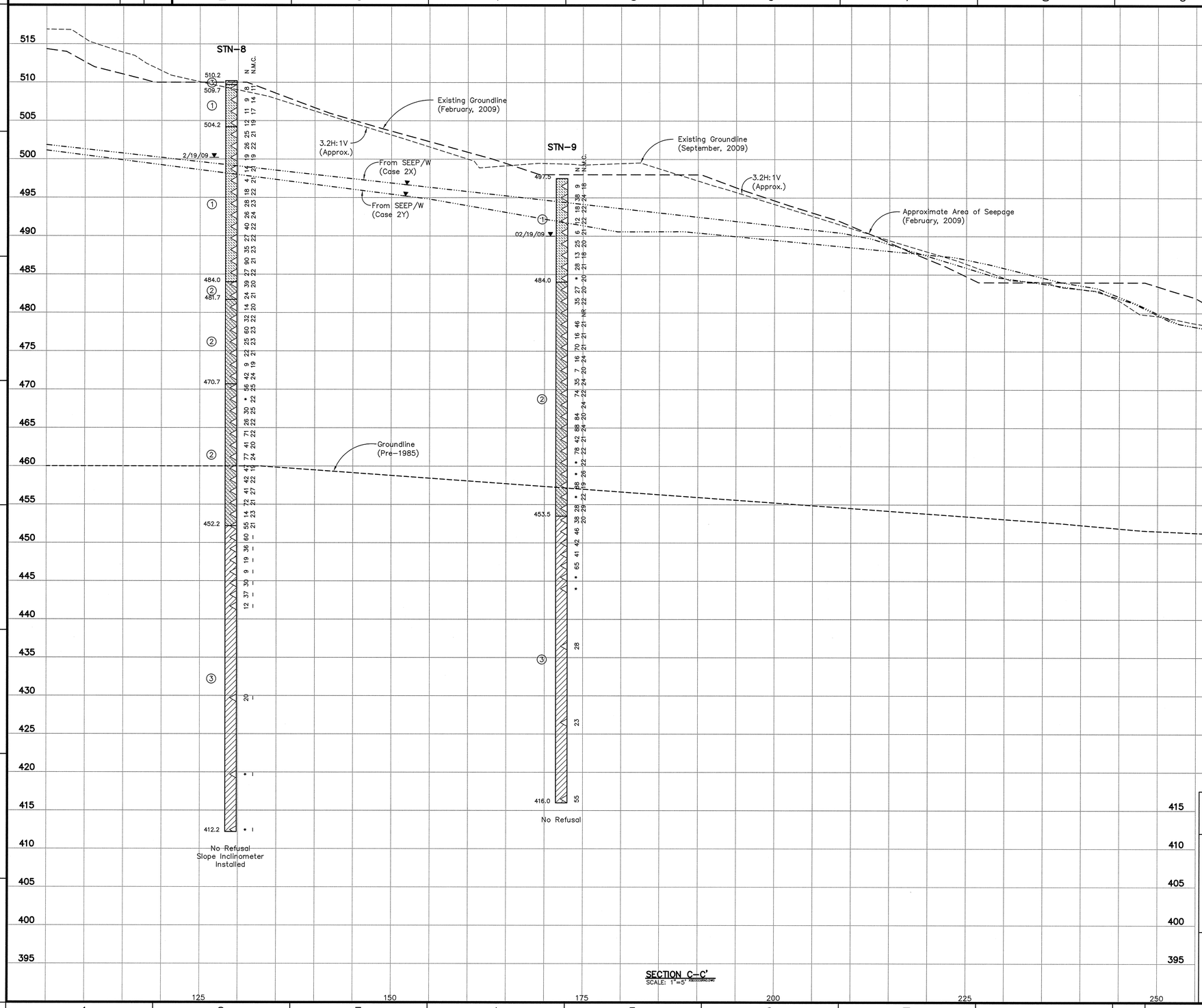
PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 06/11/10	64	C	10W713-06	R 0

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY



SECTION C-C'
SCALE: 1"=5'

LEGEND

①	Gypsum – Fly Ash: Light gray to dark gray, moist to wet and very loose to very dense
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N.M.C.	Natural Moisture Content (%)
U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
02/01/10 ▼	Water Level and Date Recorded
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RECORD DRAWING

For Supporting Design Calculations see FPGPAFFESCDX0000002010010

STATE OF KENTUCKY · HUGO M. APARICIO · 17148 · LICENSED PROFESSIONAL ENGINEER

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REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV. ID
–	–	–	–	–	–	–	–	–	–	–	–
R 0	06/11/10	SV	DMG	SV	SV	SV	HRA	TJ	–	–	–
RECORD DRAWING											

SCALE: 1"=5' EXCEPT AS NOTED

YARD
SCRUBBER SLUDGE COMPLEX

GEOTECHNICAL EXPLORATION
CROSS SECTION C-C'

–

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	D. GRAHAM	S. VEMURI	S. VEMURI	S. VEMURI	H. APARICIO	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

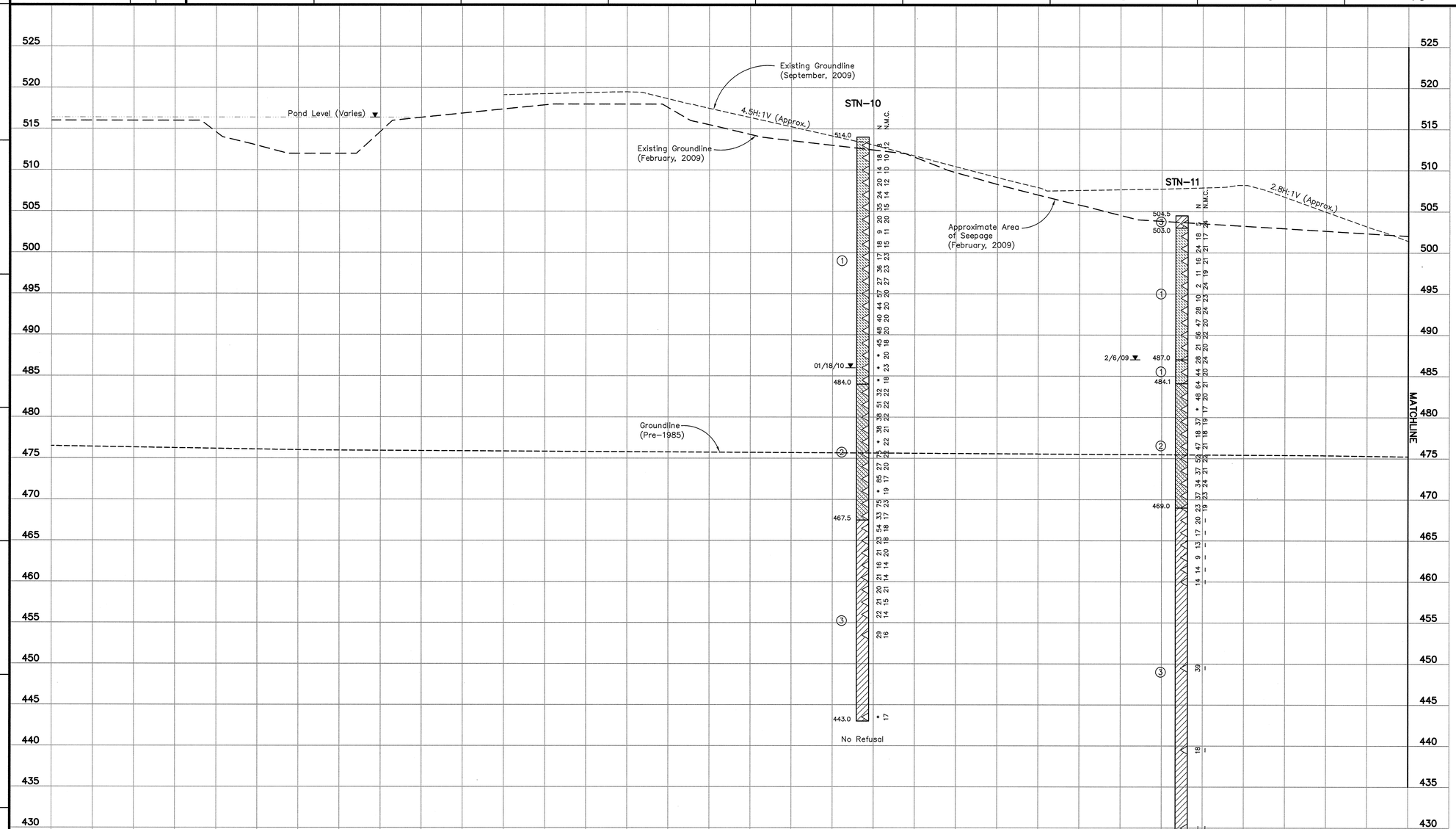
AUTOCAD R 2000 | DATE 06/11/10 | 64 | C | 10W713-07 | R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 06/15/2010 USER: GRAHAM, DAVE
V:\1755\ACTIVE\175504040\GEOTECHNICAL\DRAWINGS\SCRUBBER_SLUDGE_COMPLEX\GEOTECH\REVG_RECORD\10W713-07-R0.DWG



LEGEND

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RECORD DRAWING

For Supporting Design Calculations see FPGPAFFESCDX0000002010010

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ED	AS CONST	REV. CD
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	06/11/10	SV	DMG	SV	SV	SV	HRA	TJ	–	–	–
RECORD DRAWING											

DISCIPLINE INTERFACE: 1 2 3 4

SCALE: 1"=5' EXCEPT AS NOTED

YARD
SCRUBBER SLUDGE COMPLEX

GEOTECHNICAL EXPLORATION
CROSS SECTION D-D'

–

HUGO H. APARICIO 17768 LICENSED PROFESSIONAL ENGINEER STATE OF KENTUCKY

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S. VEMURI	D. GRAHAM	S. VEMURI	S. VEMURI	S. VEMURI	H. APARICIO	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

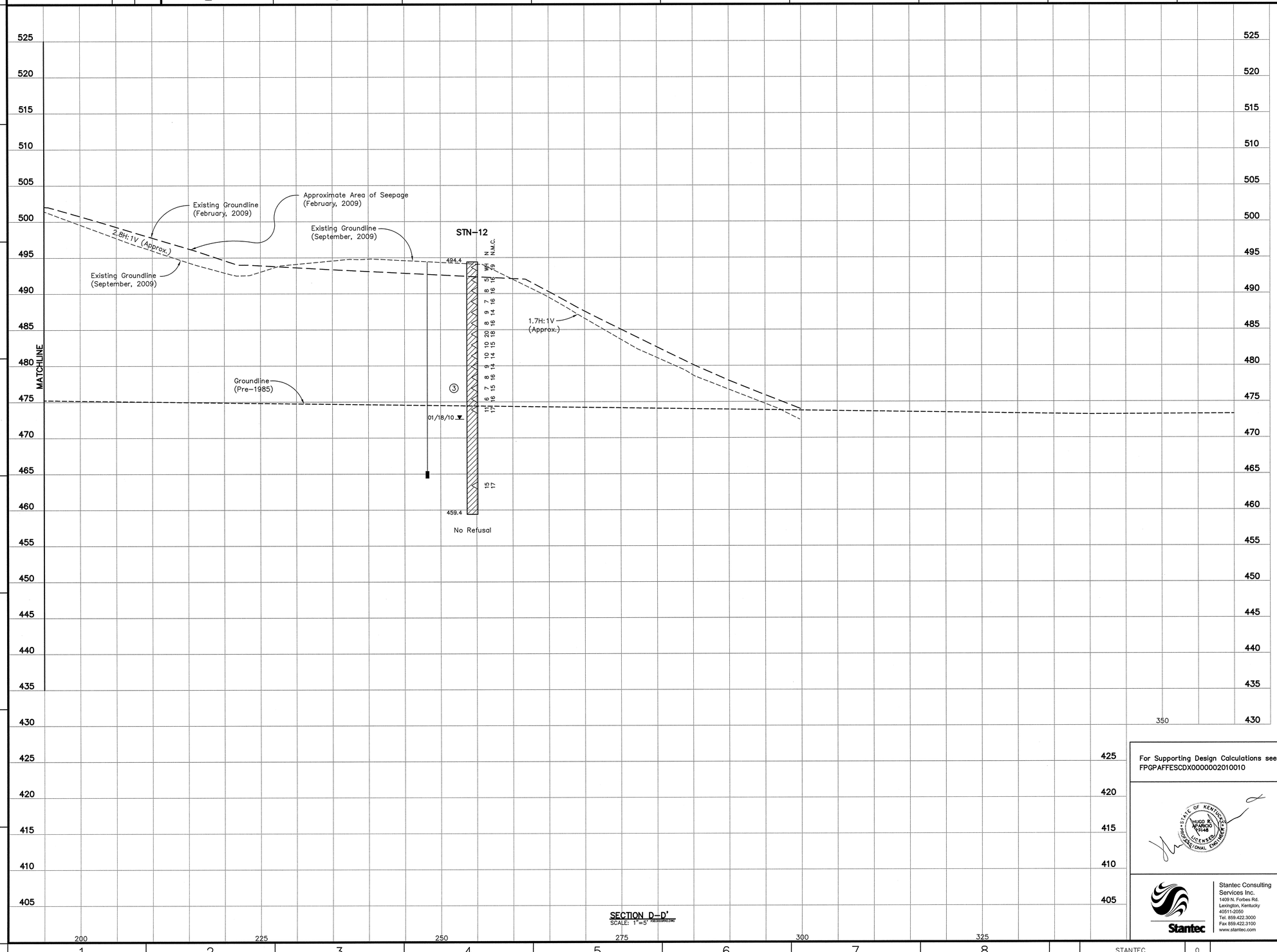
AUTOCAD R 2000	DATE 06/11/10	64	C	10W713-08	R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 06/14/2010 USER: GRAHAM, DAVE
V:\1755\ACTIVE\175500640\GEOTECHNICAL\DRAWING\SCRUBBER_SLUDGE_COMPLEX\GEOTECH\REVA_RECORD\10W713-08-R0.DWG



LEGEND

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RECORD DRAWING

For Supporting Design Calculations see FPGPAFFESCDX0000002010010

HUGO R. APARICIO 23148 LICENSED PROFESSIONAL ENGINEER STATE OF KENTUCKY

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT 10	AS CONST	REV 00
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	06/11/10	SV	DMG	SV	SV	SV	HRA	TJ	–	–	–

RECORD DRAWING

SCALE: 1"=5' EXCEPT AS NOTED

YARD
SCRUBBER SLUDGE COMPLEX

GEOTECHNICAL EXPLORATION
CROSS SECTION D-D'

–

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DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	D. GRAHAM	S. VEMURI	S. VEMURI	S. VEMURI	H. APARICIO	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

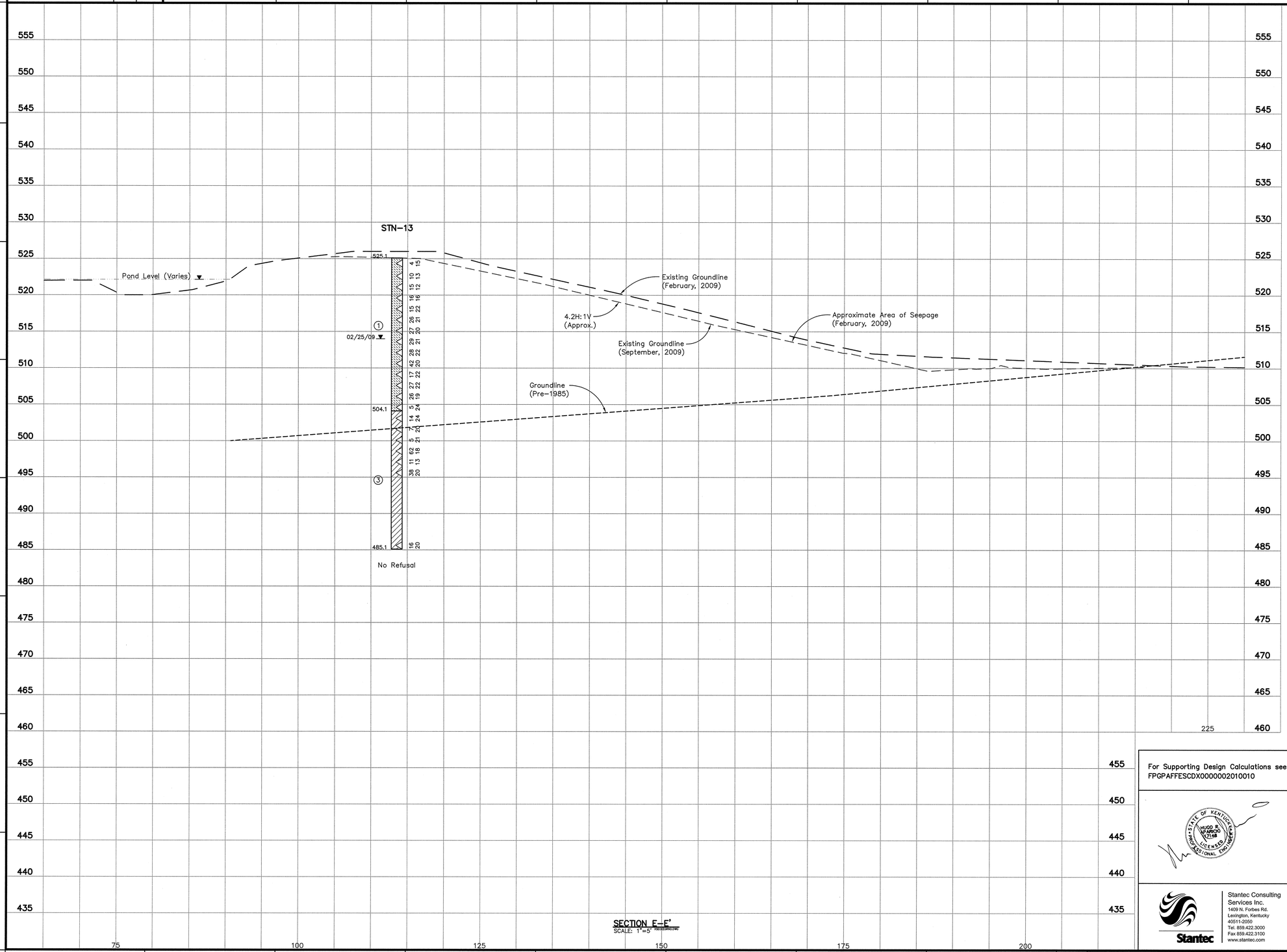
AUTOCAD R 2000	DATE 06/11/10	64	C	10W713-09	R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 06/04/2010 USER: GRAHAM, DAVE
V:\1750\ACTIVE\175066640\GEOTECHNICAL\DRAWING\SCRUBBER_SLUDGE_COMPLEX\GEOTECH\NEW\G_RECORD\10W713-09-R0.DWG



SECTION E-E'
SCALE: 1"=5' HORIZONTAL

LEGEND

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2. February, 2009 groundline is based on aerial survey by TVA.
3. September, 2009 groundline is based on as-built survey by Stantec.
4. Pre-1985 groundline was developed by Stantec using a scanned historic drawing numbered '10W4280-1 R1' provided by TVA.
5. Piezometer Construction: For detailed information regarding the construction of piezometers, please refer to Appendix D of the draft report of geotechnical exploration dated August 24, 2009.
6. Offset borings (where applicable) are not shown for clarity. Refer to logs of borings and boring layout for additional data.

RECORD DRAWING

PLOT DATE: 06/14/2010 USER: GRAHAM, DAVE
V:\1755\ACTIVE\175500640\GEOTECHNICAL\DRAWING\SCRUBBER_SLUDGE_COMPLEX\GEOTECH\REVA_RECORD\10W713-10-R0.DWG

For Supporting Design Calculations see FPGPAFFESCDX0000002010010

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ED	AS CONST	REV. CD
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	06/11/10	SV	DMG	SV	SV	SV	HRA	TJ	–	–	–
RECORD DRAWING											

DISCIPLINE INTERFACE

SCALE: 1"=5' EXCEPT AS NOTED

YARD
SCRUBBER SLUDGE COMPLEX

GEOTECHNICAL EXPLORATION
CROSS SECTION E-E'

–

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
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www.stantec.com

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	P. BOND	S. VEMURI	S. VEMURI	S. VEMURI	H. APARICIO	T. JOHNSON

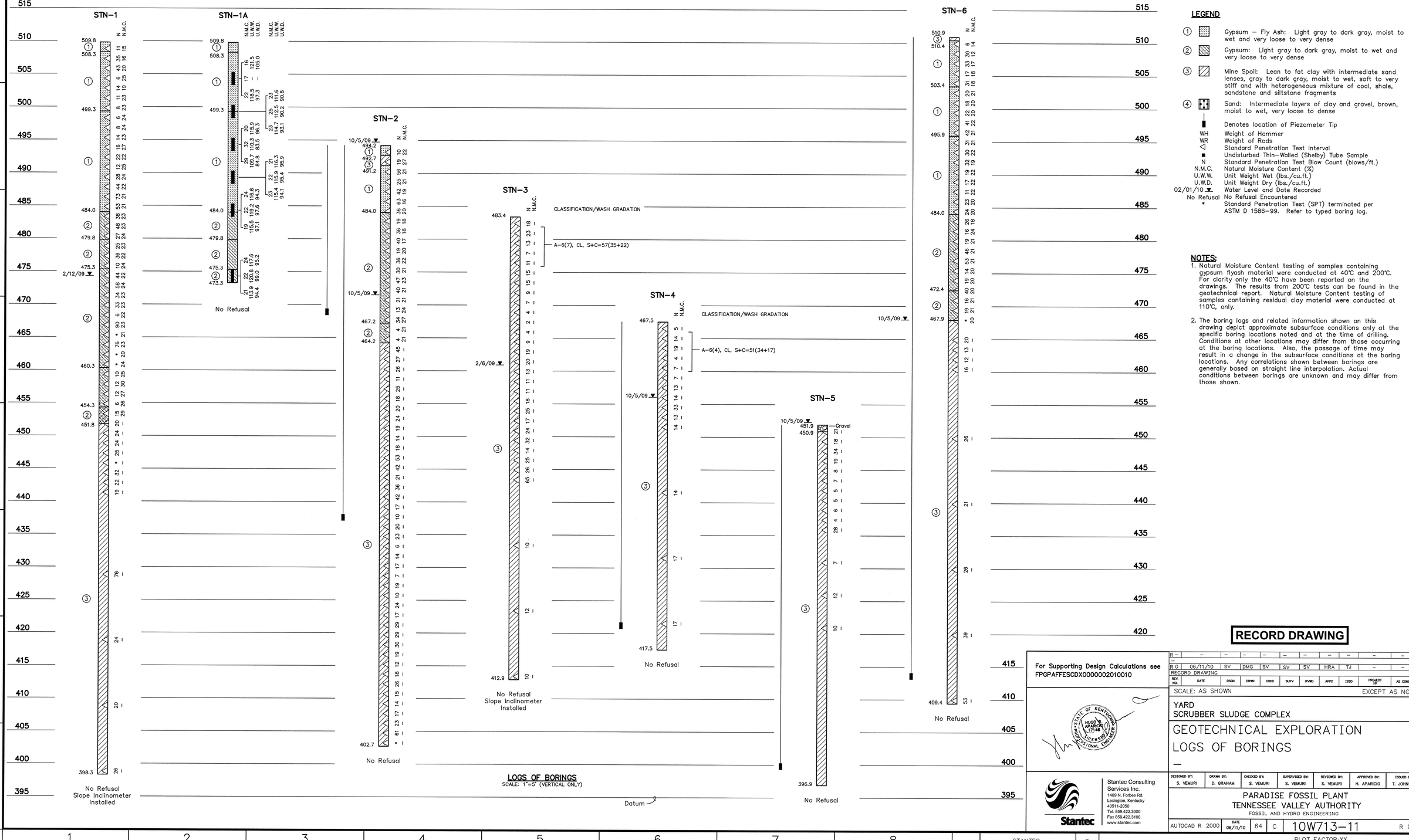
PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 06/11/10	64	C	10W713-10	R 0

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY



LEGEND

①	Gypsum – Fly Ash: Light gray to dark gray, moist to wet and very loose to very dense
②	Gypsum: Light gray to dark gray, moist to wet and very loose to very dense
③	Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone and siltstone fragments
④	Sand: Intermediate layers of clay and gravel, brown, moist to wet, very loose to dense
▮	Denotes location of Piezometer Tip
WH	Weight of Hammer
WR	Weight of Rods
△	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N	Standard Penetration Test Blow Count (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.)
02/01/10 ▼	Water Level and Date Recorded
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

NOTES:

1. Natural Moisture Content testing of samples containing gypsum flyash material were conducted at 40°C and 200°C. For clarity only the 40°C have been reported on the drawings. The results from 200°C tests can be found in the geotechnical report. Natural Moisture Content testing of samples containing residual clay material were conducted at 110°C, only.
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

For Supporting Design Calculations see FPGPAFFESCDX0000002010010

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REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 0	06/11/10	SV	DMG	SV	SV	SV	HRA	TJ	–	–
RECORD DRAWING										

SCALE: AS SHOWN EXCEPT AS NOTED

YARD
SCRUBBER SLUDGE COMPLEX

GEOTECHNICAL EXPLORATION
LOGS OF BORINGS

—

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	D. GRAHAM	S. VEMURI	S. VEMURI	S. VEMURI	H. APARICIO	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

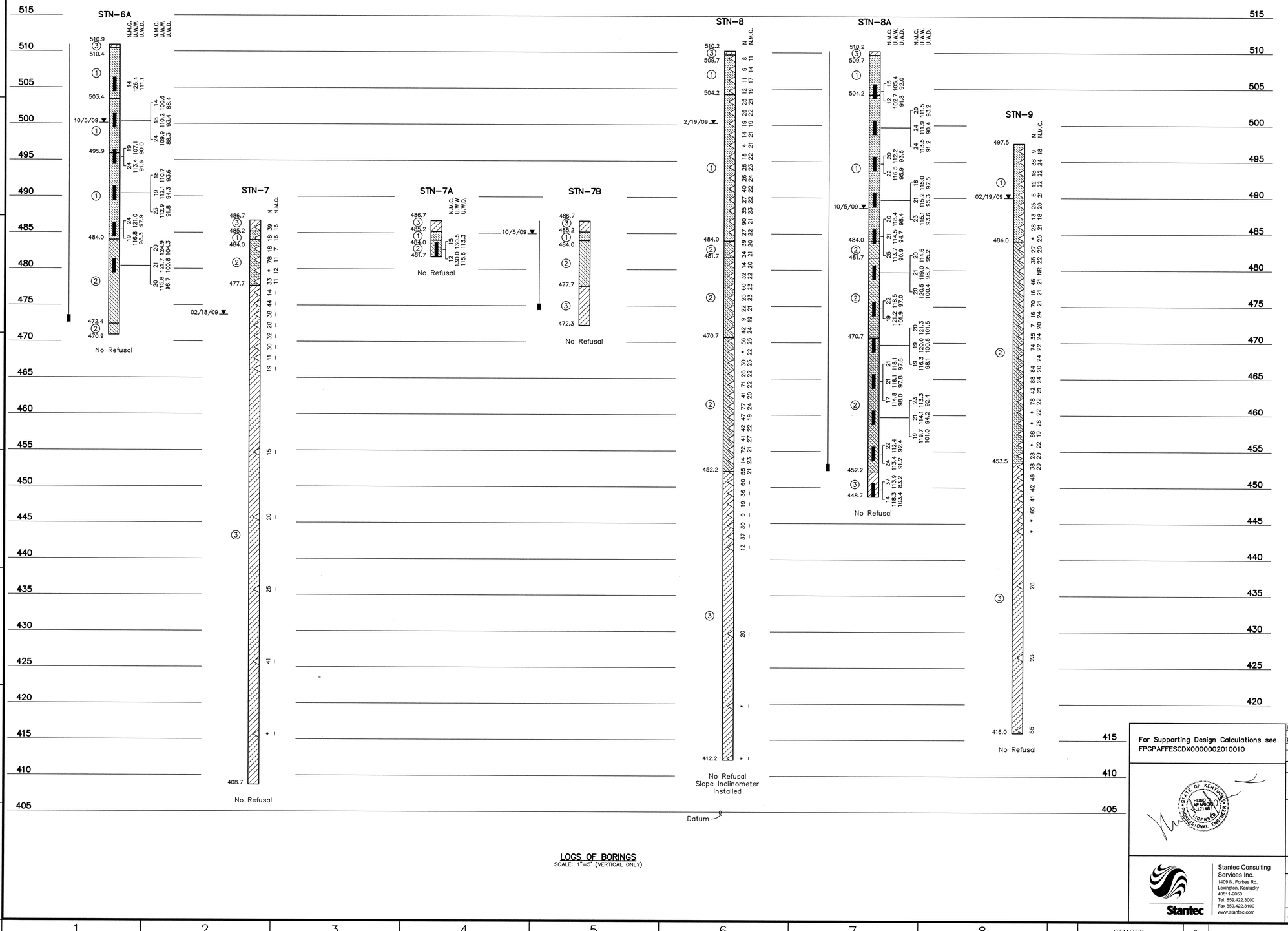
AUTOCAD R 2000 | DATE 06/11/10 | 64 | C | 10W713-11 | R 0

PLOT DATE: 06/15/2010 USER: GRAHAM, DAVE
V:\1735\ACTIVE\175550040\GEOTECHNICAL\DRAWINGS\SCRUBBER_SLUDGE_COMPLEX\GEOTECH\REVG_RECORD\10W713-11-REVG.DWG

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY



LOGS OF BORINGS
SCALE: 1"=5' (VERTICAL ONLY)

LEGEND

① Gypsum – Fly Ash: Light gray to dark gray, moist to wet and very loose to very dense

② Gypsum: Light gray to dark gray, moist to wet and very loose to very dense

③ Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone and siltstone fragments

④ Sand: Intermediate layers of clay and gravel, brown, moist to wet, very loose to dense

Denotes location of Piezometer Tip

WH	Weight of Hammer
WR	Weight of Rods
	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N	Standard Penetration Test Blow Count (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.)
02/01/10 ▼	Water Level and Date Recorded
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 FPGPAFFESCDX0000002010010

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV. CD
R 0	06/11/10	SV	DMC	SV	SV	SV	HRA	TJ	–	–	–
RECORD DRAWING											

SCALE: 1"=5' EXCEPT AS NOTED

YARD
SCRUBBER SLUDGE COMPLEX

GEOTECHNICAL EXPLORATION
LOGS OF BORINGS
–

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	R. ELLISON	S. VEMURI	S. VEMURI	S. VEMURI	H. APARICIO	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 06/11/10 | 64 | C | 10W713-12 | R 0

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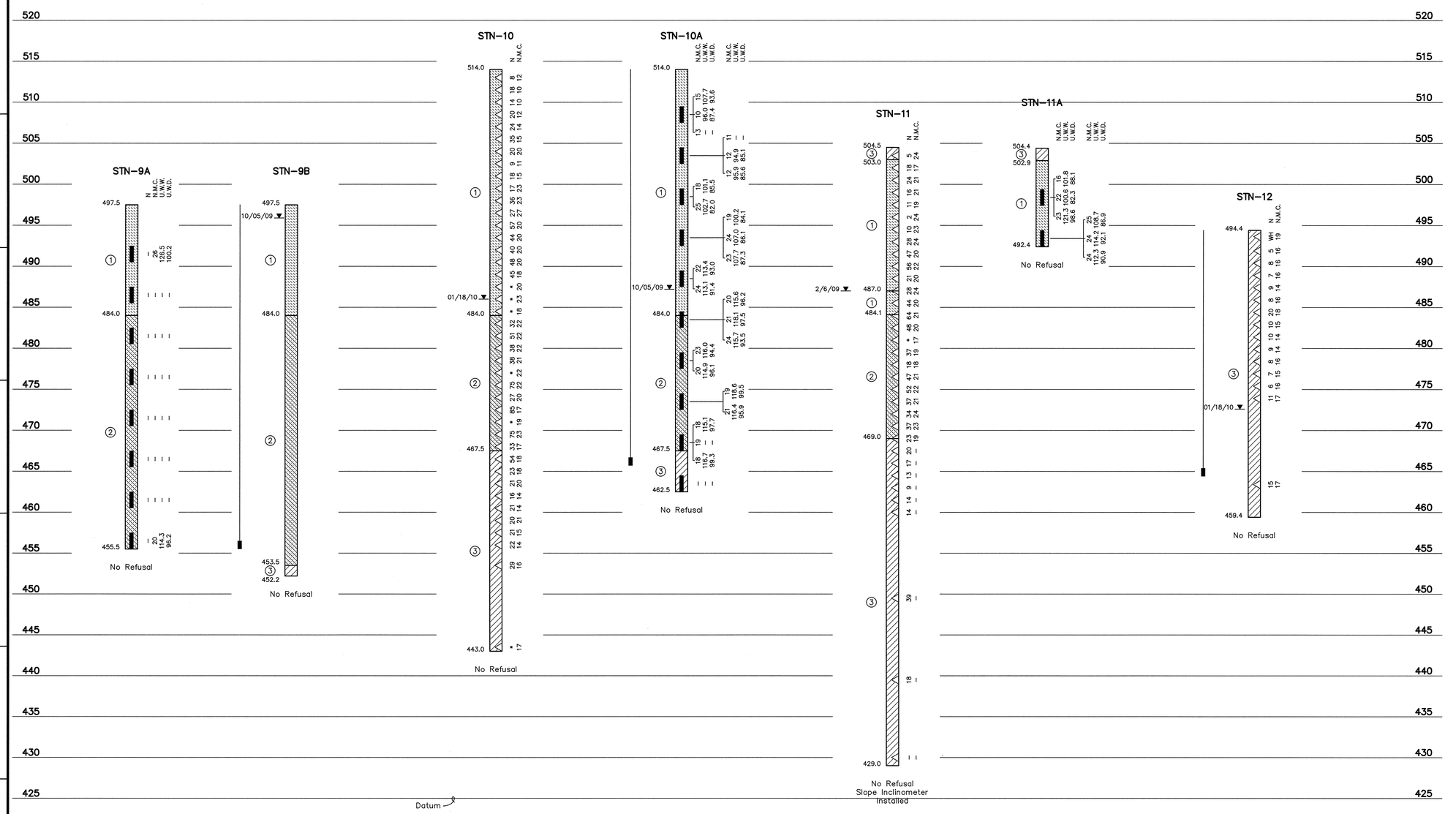
STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR: XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 06/11/2010 USER: GRAHAM, DAVE
V:\1705\ACTIVE\175585040\GEOTECHNICAL\DRAWING\SCRUBBER_SLUDGE_COMPLEX\GEOTECH\REVD_RECORD\10W713-12-RD.DWG

DISCIPLINE INTERFACE



LEGEND

①	Gypsum – Fly Ash: Light gray to dark gray, moist to wet and very loose to very dense
②	Gypsum: Light gray to dark gray, moist to wet and very loose to very dense
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▼	Denotes location of Piezometer Tip
WH	Weight of Hammer
WR	Weight of Rods
◁	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N	Standard Penetration Test Blow Count (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.)
02/01/10 ▼	Water Level and Date Recorded
No Refusal	No Refusal Encountered
*	Standard Penetration Test (SPT) terminated per ASTM D 1586–99. Refer to typed boring log.

NOTES:

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RECORD DRAWING

PLOT DATE: 06/04/2010 USER: GRAHAM DANE
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For Supporting Design Calculations see FPGPAFFESCDX0000002010010

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV. CD
R 0	06/11/10	SV	DMG	SV	SV	SV	HRA	TJ	–	–	–
RECORD DRAWING											

DISCIPLINE INTERFACE

SCALE: 1"=5' EXCEPT AS NOTED

YARD
SCRUBBER SLUDGE COMPLEX

GEOTECHNICAL EXPLORATION
LOGS OF BORINGS

–

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S.VEMURI	R. ELLISON	S.VEMURI	S.VEMURI	S.VEMURI	H. APARICIO	T. JOHNSON

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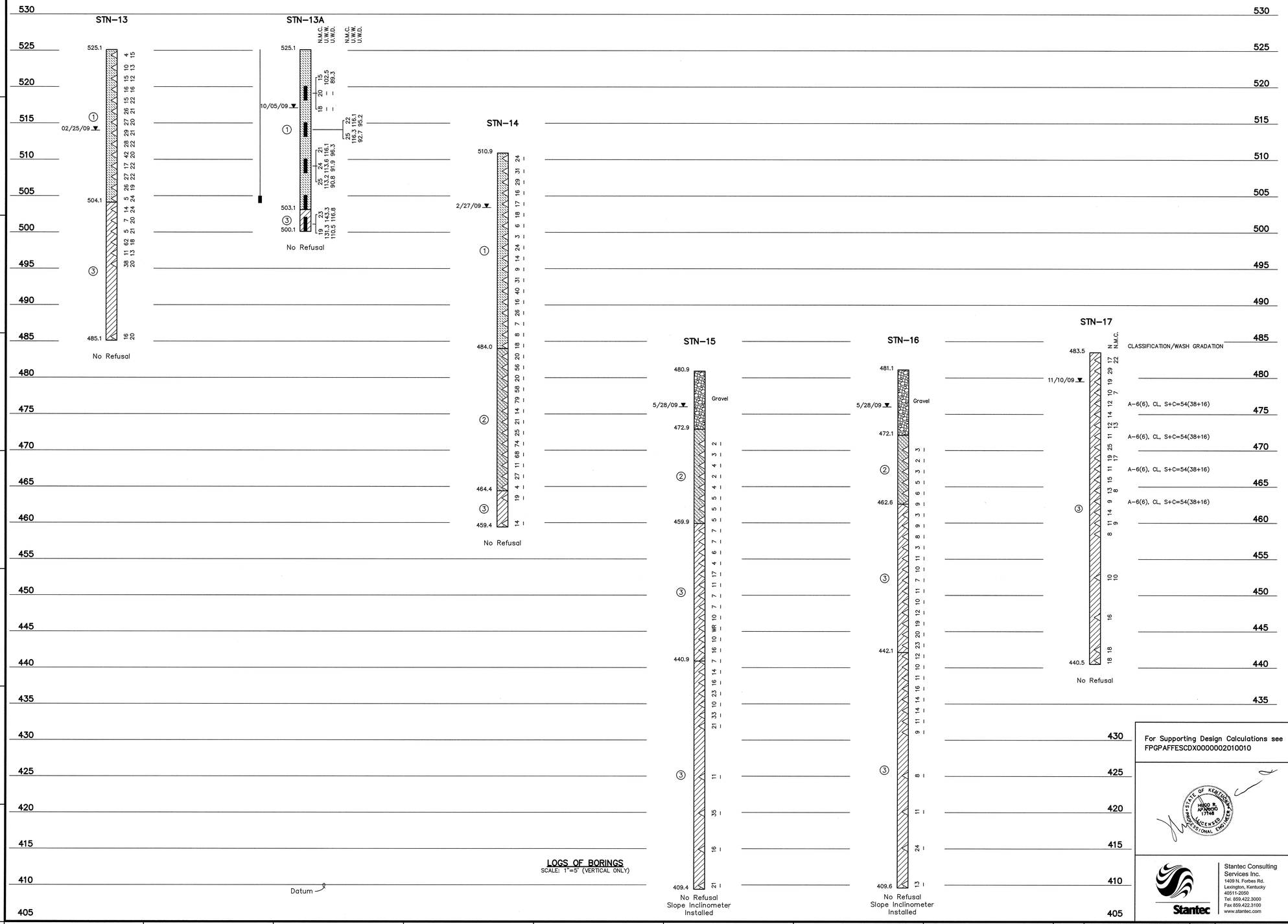
PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 06/11/10	64	C	10W713–13	R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY



LOGS OF BORINGS
SCALE: 1"=5' (VERTICAL ONLY)

Datum

LEGEND

①	Gypsum – Fly Ash: Light gray to dark gray, moist to wet and very loose to very dense
②	Gypsum: Light gray to dark gray, moist to wet and very loose to very dense
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WH	Weight of Hammer
WR	Weight of Rods
△	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N	Standard Penetration Test Blow Count (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.)
02/01/10 ▼	Water Level and Date Recorded
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 FPGPAFFESCDX0000002010010

COMMONWEALTH OF KENTUCKY — MICO D. ALVARADO — 17748 — LICENSED PROFESSIONAL ENGINEER

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV ID
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	06/11/10	SV	DMG	SV	SV	SV	HRA	TJ	–	–	–

ISSUED FOR REVIEW

DISCIPLINE INTERFACE

SCALE: 1"=5' EXCEPT AS NOTED

YARD
SCRUBBER SLUDGE COMPLEX

GEOTECHNICAL EXPLORATION
LOGS OF BORINGS

–

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DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	D. GRAHAM	S. VEMURI	S. VEMURI	S. VEMURI	H. APARICIO	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 06/11/10	64	C	10W713-14	R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 06/16/2010 USER: GRAHAM, DAVE
V:\1752\ACTIVE\175299949\GEOTECHNICAL\DRAWING\SSB\SSB2PL_SLUDGE_COMPLEX\GEOTECH\NEW_RECORD\10W713-14-RO.DWG

Appendix C

Boring Logs

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-1** Total Depth 111.5 ft
County	Muhlenberg, KY	Surface Elevation	509.8 ft
Project Type	Geotechnical Exploration	Date Started	2/10/09 Completed 2/11/09
Supervisor	T. Marshall Driller K. Clements	Depth to Water	35.5 ft Date/Time 2/12/09
Logged By	T. Marshall	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
509.8	0.0	Top of Hole							
508.3	1.5	Gypsum-Fly Ash: Light gray, damp and medium loose.		SPT-1	0.0 - 1.5	1.0	2-5-6	--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers. Slope Inclinometer Installed. See Figure in Appendix D
				SPT-2	1.5 - 3.0	1.2	9-15-20	--	
		Gypsum-Fly Ash: Dark gray, mottled, moist and very loose to dense.		SPT-3	3.0 - 4.5	1.5	20-19-24	--	
				SPT-4	4.5 - 6.0	1.3	6-3-3	--	
				SPT-5	6.0 - 7.5	1.5	5-6-8	--	
				SPT-6	7.5 - 9.0	1.5	8-5-6	--	
499.3	10.5			SPT-7	9.0 - 10.5	1.5	3-4-4	--	
		Gypsum-Fly Ash: Dark gray, moist and very loose to very dense.		SPT-8	10.5 - 12.0	1.5	2-3-3	--	
				SPT-9	12.0 - 13.5	1.5	5-4-4	--	
				SPT-10	13.5 - 15.0	1.5	4-7-7	--	
				SPT-11	15.0 - 16.5	1.5	6-7-9	--	
				SPT-12	16.5 - 18.0	1.5	9-10-12	--	
				SPT-13	18.0 - 19.5	1.5	3-6-6	--	
				SPT-14	19.5 - 21.0	1.5	9-12-16	--	
				SPT-15	21.0 - 22.5	1.0	17-20-24	--	
				SPT-16	22.5 - 24.0	1.5	33-38-35	--	
484.0	25.8			SPT-17	24.0 - 25.5	1.5	19-25-28	--	
		Gypsum: Light gray, moist and medium loose to dense.		SPT-18	25.5 - 27.0	1.5	14-16-22	--	
				SPT-19	27.0 - 28.5	1.5	22-22-26	--	
479.8	30.0			SPT-20	28.5 - 30.0	1.5	6-12-15	--	
		Gypsum: Dark gray, moist and medium loose to dense.		SPT-21	30.0 - 31.5	1.5	4-10-15	--	
				SPT-22	31.5 - 33.0	1.5	14-17-19	--	
475.3	34.5			SPT-23	33.0 - 34.5	1.0	4-5-5	--	
				SPT-24	34.5 - 36.0	1.0	17-24-20	--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

Project Number 175569040 Location Drakesboro, Ky

Project Name PAF: Phase 2 Boring No. **STN-1** Total Depth 111.5 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		Gypsum: Light gray, moist to wet and medium loose to very dense. *(Continued)*		SPT-25	36.0 - 37.5	1.5	17-26-32	--	
				SPT-26	37.5 - 39.0	1.5	12-17-17	--	
				SPT-27	39.0 - 40.5	1.0	9-10-23	--	
				SPT-28	40.5 - 42.0	1.0	2-2-4	--	
				SPT-29	42.0 - 43.5	1.5	36-41-49	--	
				SPT-30	43.5 - 45.0	1.5	50-50+	--	
				SPT-31	45.0 - 46.5	1.5	21-30-46	--	
				SPT-32	46.5 - 48.0	1.5	50-50+	--	
460.3	49.5			SPT-33	48.0 - 49.5	1.5	50-50+	--	
		Gypsum: Light brown, moist to wet and loose to medium loose.		SPT-34	49.5 - 51.0	1.5	3-4-6	--	
				SPT-35	51.0 - 52.5	1.5	5-6-6	--	
				SPT-36	52.5 - 54.0	1.0	8-4-8	--	
454.3	55.5			SPT-37	54.0 - 55.5	1.0	2-3-3	--	
		Gypsum and Mine Spoil (Mixed):		SPT-38	55.5 - 57.0	1.0	5-6-9	--	
451.8	58.0	Light brown to dark gray, moist to wet and medium loose.		SPT-39	57.0 - 58.5	1.0	9-9-11	--	
				SPT-40	58.5 - 60.0	1.0	10-11-13	--	
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.		SPT-41	60.0 - 61.5	1.5	8-10-14	--	
				SPT-42	61.5 - 63.0	0.5	10-12-13	--	
				SPT-43	63.0 - 64.5	0.5	26-50+	--	
				SPT-44	64.5 - 66.0	1.5	17-12-20	--	
				SPT-45	66.0 - 67.5	0.3	9-11-11	--	
				SPT-46	67.5 - 69.0	1.0	9-11-8	--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, Ky

Project Name PAF: Phase 2 | Boring No. **STN-1** | Total Depth 111.5 ft

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments. *(Continued)*		SPT-47	80.0 - 81.5	1.5	44-36-40	--	
				SPT-48	90.0 - 91.5	0.5	11-12-12	--	
				SPT-49	100.0 - 101.5	1.0	10-9-11	--	
398.3	111.5			SPT-50	110.0 - 111.5	0.8	11-14-12	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT- GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-1A** Total Depth 36.5 ft
County	Muhlenberg, KY	Surface Elevation	509.8 ft
Project Type	Geotechnical Exploration	Date Started	2/12/09 Completed 2/12/09
Supervisor	T. Marshall Driller K. Clements	Depth to Water	Dry Date/Time 2/12/09
Logged By	T. Marshall	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
509.8	0.0	Top of Hole							
508.3	1.5	Gypsum-Fly Ash: Light gray, damp and medium loose.							Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
		Gypsum-Fly Ash: Dark gray, mottled, moist and very loose to dense.		ST-1	4.5 - 6.5	1.8		--	Boring grouted from 0 to 36.5 feet.
499.3	10.5			ST-2	9.5 - 11.5	2.0		--	
		Gypsum-Fly Ash: Dark gray, moist and very loose to very dense.		ST-3	14.5 - 16.5	2.0		--	
				ST-4	19.5 - 21.5	2.0		--	
484.0	25.8			ST-5	24.5 - 26.5	2.0		--	
479.8	30.0	Gypsum Light gray, moist and medium loose to dense.							
475.3	34.5	Gypsum: Dark gray, moist and medium loose to dense.							
473.3	36.5	Gypsum: Light gray, moist to wet		ST-6	34.5 - 36.5	2.0		--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

8/5/09

SUBSURFACE LOG

Project Number 175569040 Location Drakesboro, Ky

Project Name PAF: Phase 2 Boring No. **STN-1A** Total Depth 36.5 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		and medium loose to very dense.							
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT- GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-2** Total Depth 91.5 ft
County	Muhlenberg, KY	Surface Elevation	494.2 ft
Project Type	Geotechnical Exploration	Date Started	1/30/09 Completed 2/3/09
Supervisor	B. Evans Driller K. Clements	Depth to Water	24.5 ft Date/Time 2/2/09
Logged By	B. Evans/S. Vemuri	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
494.2	0.0	Top of Hole							
492.7	1.5	Gypsum-Fly Ash: Dark gray, moist and medium loose.		SPT-1	0.0 - 1.5	1.0	2-4-6	--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
491.2	3.0	Mine Spoil: Fat clay with gravels, dark gray, moist and stiff.		SPT-2	1.5 - 3.0	1.0	4-6-13	--	
		Gypsum-Fly Ash: Dark gray, mottled, moist to wet and medium loose to dense.		SPT-3	3.0 - 4.5	1.5	19-31-25	--	
				SPT-4	4.5 - 6.0	1.5	7-11-14	--	Piezometer Installed. See Figure in Appendix D.
				SPT-5	6.0 - 7.5	1.5	13-19-23	--	
				SPT-6	7.5 - 9.0	1.5	20-32-31	--	
484.0	10.2			SPT-7	9.0 - 10.5	1.5	6-19-17	--	
		Gypsum: Dark gray, mottled, moist to wet and medium loose to dense.		SPT-8	10.5 - 12.0	1.5	3-9-10	--	
				SPT-9	12.0 - 13.5	1.5	11-14-22	--	
				SPT-10	13.5 - 15.0	1.5	8-19-21	--	
				SPT-11	15.0 - 16.5	1.5	4-7-12	--	
				SPT-12	16.5 - 18.0	1.5	7-16-20	--	
				SPT-13	18.0 - 19.5	1.5	6-13-17	--	
				SPT-14	19.5 - 21.0	1.5	8-20-27	--	
				SPT-15	21.0 - 22.5	1.5	21-24-16	--	
				SPT-16	22.5 - 24.0	1.5	10-14-7	--	
				SPT-17	24.0 - 25.5	1.0	2-1-12	--	
467.2	27.0			SPT-18	25.5 - 27.0	1.5	12-17-17	--	
		Gypsum: Dark brown, moist to wet and very loose to loose.		SPT-19	27.0 - 28.5	1.5	5-3-1	--	
464.2	30.0			SPT-20	28.5 - 30.0	1.5	2-2-2	--	
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.		SPT-21	30.0 - 31.5	0.5	44-28-17	--	
				SPT-22	31.5 - 33.0	1.0	10-13-14	--	
				SPT-23	33.0 - 34.5	0.5	8-13-13	--	
				SPT-24	34.5 - 36.0	0.8	5-5-6	--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

Project Number 175569040 Location Drakesboro, Ky

Project Name PAF: Phase 2 Boring No. **STN-2** Total Depth 91.5 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments. *(Continued)*		SPT-25	36.0 - 37.5	0.5	13-13-12	--	
				SPT-26	37.5 - 39.0	0.5	6-8-10	--	
				SPT-27	39.0 - 40.5	1.0	2-4-16	--	
				SPT-28	40.5 - 42.0	1.0	8-10-14	--	
				SPT-29	42.0 - 43.5	0.5	8-8-11	--	
				SPT-30	43.5 - 45.0	1.0	6-5-9	--	
				SPT-31	45.0 - 46.5	1.5	11-10-8	--	
				SPT-32	46.5 - 48.0	1.5	17-22-31	--	
				SPT-33	48.0 - 49.5	0.5	16-19-23	--	
				SPT-34	49.5 - 51.0	0.8	7-9-12	--	
				SPT-35	51.0 - 52.5	1.0	12-16-20	--	
				SPT-36	52.5 - 54.0	0.8	13-15-27	--	
				SPT-37	54.0 - 55.5	1.5	7-8-9	--	
				SPT-38	55.5 - 57.0	0.8	3-4-6	--	
				SPT-39	57.0 - 58.5	1.0	9-10-10	--	
				SPT-40	58.5 - 60.0	1.0	16-13-10	--	
				SPT-41	60.0 - 61.5	1.0	1-3-3	--	
				SPT-42	61.5 - 63.0	1.0	4-8-6	--	
				SPT-43	63.0 - 64.5	0.5	3-7-10	--	
				SPT-44	64.5 - 66.0	0.5	1-3-4	--	
				SPT-45	66.0 - 67.5	1.5	4-9-10	--	
				SPT-46	67.5 - 69.0	0.5	1-3-7	--	
				SPT-47	69.0 - 70.5	0.5	14-16-8	--	
				SPT-48	70.5 - 72.0	0.5	4-8-9	--	
				SPT-49	72.0 - 73.5	0.8	11-11-18	--	
				SPT-50	73.5 - 75.0	0.8	11-11-18	--	
				SPT-51	75.0 - 76.5	0.8	17-16-14	--	
				SPT-52	76.5 - 78.0	0.4	10-11-8	--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, Ky

Project Name PAF: Phase 2 | Boring No. **STN-2** | Total Depth 91.5 ft

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
Elevation	Depth								
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments. *(Continued)*		SPT-53	78.0 - 79.5	0.5	6-6-6	--	
				SPT-54	79.5 - 81.0	1.0	8-9-9	--	
				SPT-55	81.0 - 82.5	0.8	8-13-13	--	
				SPT-56	82.5 - 84.0	0.8	6-6-9	--	
				SPT-57	84.0 - 85.5	1.0	8-7-7	--	
				SPT-58	85.5 - 87.0	0.8	8-7-10	--	
				SPT-59	87.0 - 88.5	1.0	7-17-6	--	
				SPT-60	88.5 - 90.0	0.8	28-29-32	--	
402.7	91.5			SPT-61	90.0 - 91.5	0.8	50+	--	
		Auger Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT- GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-3** Total Depth 70.5 ft
County	Muhlenberg, KY	Surface Elevation	483.4 ft
Project Type	Geotechnical Exploration	Date Started	2/5/09 Completed 2/6/09
Supervisor	B. Evans Driller K. Clements	Depth to Water	67.5 ft Date/Time 2/5/09
Logged By	B. Evans	Depth to Water	22.5 ft Date/Time 2/6/09

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
483.4	0.0	Top of Hole							
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.		SPT-1	0.0 - 1.5	0.8	7-9-9	--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers. Slope Inclinometer Installed. See Figure in Appendix D
				SPT-2	1.5 - 3.0	0.8	9-11-12	--	
				SPT-3	3.0 - 4.5	0.5	5-6-7	--	
				SPT-4	4.5 - 6.0	0.5	11-4-3	--	
				SPT-5	6.0 - 7.5	0.5	9-5-6	--	
				SPT-6	7.5 - 9.0	1.5	6-7-8	--	
				SPT-7	9.0 - 10.5	1.5	10-9-6	--	
				SPT-8	10.5 - 12.0	0.5	4-4-5	--	
				SPT-9	12.0 - 13.5	0.5	3-4-3	--	
				SPT-10	13.5 - 15.0	0.8	3-2-2	--	
				SPT-11	15.0 - 16.5	0.8	2-1-1	--	
				SPT-12	16.5 - 18.0	0.5	2-1-3	--	
				SPT-13	18.0 - 19.5	0.5	2-4-5	--	
				SPT-14	19.5 - 21.0	1.5	6-9-10	--	
				SPT-15	21.0 - 22.5	0.0	10-10-10	--	
				SPT-16	22.5 - 24.0	0.2	8-6-7	--	
				SPT-17	24.0 - 25.5	0.5	4-6-5	--	
				SPT-18	25.5 - 27.0	1.5	5-5-6	--	
				SPT-19	27.0 - 28.5	1.0	6-8-10	--	
				SPT-20	28.5 - 30.0	1.0	9-11-14	--	
				SPT-21	30.0 - 31.5	1.5	12-8-9	--	
				SPT-22	31.5 - 33.0	1.1	10-12-12	--	
				SPT-23	33.0 - 34.5	1.5	14-15-17	--	
				SPT-24	34.5 - 36.0	1.5	6-6-8	--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, Ky

Project Name PAF: Phase 2 | Boring No. **STN-3** | Total Depth 70.5 ft

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
Elevation	Depth								
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments. *(Continued)*		SPT-25	36.0 - 37.5	1.5	8-13-12	--	
				SPT-26	37.5 - 39.0	1.5	13-12-14	--	
				SPT-27	39.0 - 40.5	1.5	15-40-25	--	
				SPT-28	49.0 - 50.5	1.5	3-4-6	--	
				SPT-29	59.0 - 60.5	1.5	4-5-7	--	
412.9	70.5			SPT-30	69.0 - 70.5	1.5	5-5-5	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT- GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-4** Total Depth 50.0 ft
County	Muhlenberg, KY	Surface Elevation	467.5 ft
Project Type	Geotechnical Exploration	Date Started	2/17/09 Completed 2/17/09
Supervisor	S. Vemuri Driller K. Clements	Depth to Water	Dry Date/Time 2/17/09
Logged By	S. Vemuri	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
467.5	0.0	Top of Hole							
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.		SPT-1	0.0 - 1.5	0.6	1-3-2	--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
				SPT-2	1.5 - 3.0	0.9	1-2-12	--	
				SPT-3	3.0 - 4.5	0.5	7-9-10	--	
				SPT-4	4.5 - 6.0	1.5	2-2-2	--	Piezometer Installed. See Figure in Appendix D.
				SPT-5	6.0 - 7.5	1.0	3-5-2	--	
				SPT-6	7.5 - 9.0	0.8	2-2-5	--	
				SPT-7	9.0 - 10.5	1.5	6-6-7	--	Thin hair like roots from 4.5'-5.0' and 35.0-36.5' Perched water table at 13.0'
				SPT-8	10.5 - 12.0	0.4	9-8-6	--	
				SPT-9	12.0 - 13.5	1.0	17-23-10	--	
				SPT-10	13.5 - 15.0	0.7	5-5-8	--	
				SPT-11	15.0 - 16.5	0.8	4-10-4	--	
				SPT-12	25.0 - 26.5	1.5	11-7-7	--	
				SPT-13	35.0 - 36.5	1.5	12-8-9	--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 Location Drakesboro, Ky

Project Name PAF: Phase 2 Boring No. **STN-4** 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
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments. *(Continued)*							
				SPT-14	45.0 - 46.5	1.5	6-8-9	--	
417.5	50.0	No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT- GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040		Location	Drakesboro, Ky	
Project Name	PAF: Phase 2		Boring No.	**STN-5**	Total Depth 55.0 ft
County	Muhlenberg, KY		Surface Elevation	451.9 ft	
Project Type	Geotechnical Exploration		Date Started	2/9/09	Completed 2/9/09
Supervisor	S. Vemuri	Driller K. Clements	Depth to Water	40.0 ft	Date/Time 2/9/09
Logged By	T. Marshall		Depth to Water	14.4 ft	Date/Time 2/10/09

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
451.9	0.0	Top of Hole							
450.9	1.0	Gravel		SPT-1	0.0 - 1.5	0.6	7-14-7	--	
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.		SPT-2	1.5 - 3.0	0.8	8-8-10	--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
				SPT-3	3.0 - 4.5	0.7	10-14-20	--	
				SPT-4	4.5 - 6.0	0.5	11-13-6	--	
				SPT-5	6.0 - 7.5	1.0	4-5-3	--	Piezometer Installed. See Figure in Appendix D.
				SPT-6	7.5 - 9.0	1.0	4-4-3	--	
				SPT-7	9.0 - 10.5	0.6	2-2-3	--	
				SPT-8	10.5 - 12.0	1.0	1-2-3	--	
				SPT-9	12.0 - 13.5	0.0	2-3-3	--	
				SPT-10	13.5 - 15.0	1.5	2-2-2	--	
				BAG-1	5.0 - 25.0			--	
				SPT-11	15.0 - 16.5	0.6	10-19-9	--	
				SPT-12	20.0 - 21.5	0.6	1-3-4	--	
				SPT-13	25.0 - 26.5	1.2	5-8-4	--	
				SPT-14	30.0 - 31.5	0.0	3-4-6	--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 Location Drakesboro, Ky

Project Name PAF: Phase 2 Boring No. **STN-5** Total Depth 55.0 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments. *(Continued)*							
396.9	55.0	No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT- GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-6** Total Depth 101.5 ft
County	Muhlenberg, KY	Surface Elevation	510.9 ft
Project Type	Geotechnical Exploration	Date Started	2/17/09 Completed 2/18/09
Supervisor	S. Vemuri Driller K. Clements	Depth to Water	Dry Date/Time 2/18/09
Logged By	B. Evans	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
510.9	0.0	Top of Hole							
510.4	0.5	Mine Spoil: Fat clay with gravels, dark gray, moist and stiff.		SPT-1	0.0 - 1.5	0.8	2-3-3	--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
				SPT-2	1.5 - 3.0	1.0	8-14-16	--	
		Gypsum-Fly Ash: Light gray, moist and medium loose to dense.		SPT-3	3.0 - 4.5	1.2	12-18-15	--	
				SPT-4	4.5 - 6.0	1.0	10-8-9	--	
503.4	7.5			SPT-5	6.0 - 7.5	1.5	11-13-18	--	Piezometer Installed. See Figure in Appendix D.
		Gypsum-Fly Ash: Dark gray, moist to wet and medium loose to dense.		SPT-6	7.5 - 9.0	1.5	8-9-11	--	
				SPT-7	9.0 - 10.5	1.5	5-8-10	--	
				SPT-8	10.5 - 12.0	1.2	7-10-12	--	
				SPT-9	12.0 - 13.5	1.5	9-23-18	--	
495.9	15.0			SPT-10	13.5 - 15.0	1.5	14-19-23	--	
		Gypsum-Fly Ash: Dark brown to dark gray, moist to wet and medium loose to dense.		SPT-11	15.0 - 16.5	1.2	9-14-17	--	
				SPT-12	16.5 - 18.0	1.2	15-16-14	--	
				SPT-13	18.0 - 19.5	1.5	19-17-15	--	
				SPT-14	19.5 - 21.0	1.5	4-6-13	--	
				SPT-15	21.0 - 22.5	1.0	5-6-11	--	
				SPT-16	22.5 - 24.0	1.5	5-5-6	--	
				SPT-17	24.0 - 25.5	1.5	8-9-14	--	
484.0	26.9			SPT-18	25.5 - 27.0	1.5	4-6-18	--	
		Gypsum: Dark brown to dark gray, moist to wet and medium loose to dense.		SPT-19	27.0 - 28.5	1.5	13-14-12	--	
				SPT-20	28.5 - 30.0	1.5	10-10-16	--	
				SPT-21	30.0 - 31.5	1.5	5-12-17	--	
				SPT-22	31.5 - 33.0	1.5	9-21-25	--	
				SPT-23	33.0 - 34.5	0.8	18-23-30	--	
				SPT-24	34.5 - 36.0	1.5	5-2-12	--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

Project Number 175569040 Location Drakesboro, Ky

Project Name PAF: Phase 2 Boring No. **STN-6** Total Depth 101.5 ft

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
Elevation	Depth								
				SPT-25	36.0 - 37.5	1.5	12-12-7	--	
472.4	38.5			SPT-26	37.5 - 39.0	1.5	10-28-12	--	
		Gypsum: Light gray, wet and medium loose.		SPT-27	39.0 - 40.5	1.0	7-7-9	--	
				SPT-28	40.5 - 42.0	1.2	5-8-11	--	
467.9	43.0			SPT-29	42.0 - 43.5	1.5	6-50+	--	
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.		SPT-30	45.0 - 46.5	0.9	17-9-11	--	
				SPT-31	46.5 - 48.0	0.5	5-6-7	--	
				SPT-32	48.0 - 49.5	1.5	5-6-6	--	
				SPT-33	49.5 - 51.0	0.9	5-7-9	--	
				SPT-34	60.0 - 61.5	1.0	9-16-10	--	
				SPT-35	70.0 - 71.5	1.0	8-11-10	--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

Project Number 175569040 Location Drakesboro, Ky

Project Name PAF: Phase 2 Boring No. **STN-6** Total Depth 101.5 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments. *(Continued)*		SPT-36	80.0 - 81.5	1.0	10-13-13	--	
				SPT-37	90.0 - 91.5	1.5	15-19-20	--	
409.4	101.5			SPT-38	100.0 - 101.5	1.5	37-14-39	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT- GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-6A** Total Depth 40.0 ft
County	Muhlenberg, KY	Surface Elevation	510.9 ft
Project Type	Geotechnical Exploration	Date Started	2/18/09 Completed 2/18/09
Supervisor	S. Vemuri Driller K. Clements	Depth to Water	Dry Date/Time 2/18/09
Logged By	B. Evans	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
510.9	0.0	Top of Hole							
510.4	0.5	Mine Spoil: Fat clay with gravels, dark gray, moist and stiff.							
		Gypsum-Fly Ash: Light gray, moist and medium loose to dense.		ST-1	4.5 - 6.5	2.0		--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers. Piezometer Installed. See Figure in Appendix D.
503.4	7.5								
		Gypsum-Fly Ash: Dark gray, moist to wet and medium loose to dense.		ST-2	9.5 - 11.5	2.0		--	
495.9	15.0								
		Gypsum-Fly Ash: Dark brown to dark gray, moist to wet and medium loose to dense.		ST-3	14.5 - 16.5	2.0		--	
				ST-4	19.5 - 21.5	2.0		--	
				ST-5	24.5 - 26.5	2.0		--	
484.0	26.9								
		Gypsum: Dark brown to dark gray, moist to wet and medium loose to dense.		ST-6	29.5 - 31.5	2.0		--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 Location Drakesboro, Ky

Project Name PAF: Phase 2 Boring No. **STN-6A** Total Depth 40.0 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
472.4	38.5								
470.9	40.0	Gypsum: Light gray, wet and medium loose.							
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-7** Total Depth 78.0 ft
County	Muhlenberg, KY	Surface Elevation	486.7 ft
Project Type	Geotechnical Exploration	Date Started	2/17/09 Completed 2/18/09
Supervisor	S. Vemuri Driller J. Wethington	Depth to Water	13.0 ft Date/Time 2/18/09
Logged By	D. West	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
486.7	0.0	Top of Hole							
485.2	1.5	Mine Spoil: Fat clay with gravels, dark gray, moist and stiff.		SPT-1	0.0 - 1.5	1.5	9-20-19	--	
484.0	2.7			SPT-2	1.5 - 3.0	1.5	18-10-8	--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
		Gypsum-Fly Ash: Dark gray, moist and medium loose to very dense.		SPT-3	3.0 - 4.5	0.3	10-8-14	--	
				SPT-4	4.5 - 6.0	1.4	18-30-48	--	
		Gypsum: Dark gray, moist and medium loose to very dense.		SPT-5	6.0 - 7.5	0.7	50+	--	Boring grouted from 0 to 78.0 feet.
477.7	9.0			SPT-6	7.5 - 9.0	1.5	12-18-15	--	
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.		SPT-7	9.0 - 10.5	1.2	8-6-8	--	
				SPT-8	10.5 - 12.0	1.5	10-26-18	--	
				SPT-9	12.0 - 13.5	1.5	10-16-22	--	
				SPT-10	13.5 - 15.0	1.5	6-12-16	--	
				SPT-11	15.0 - 16.5	1.5	8-16-16	--	
				SPT-12	16.5 - 18.0	1.5	18-12-18	--	
				SPT-13	18.0 - 19.5	1.5	9-6-5	--	
				SPT-14	19.5 - 21.0	1.5	6-8-11	--	
				SPT-15	31.0 - 32.5	1.5	12-8-7	--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, Ky

Project Name PAF: Phase 2 | Boring No. **STN-7** | Total Depth 78.0 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments. *(Continued)*		SPT-16	40.0 - 41.5	1.2	16-9-11	--	
				SPT-17	50.0 - 51.5	1.5	14-10-15	--	
				SPT-18	60.0 - 61.5	1.5	18-20-21	--	
				SPT-19	70.0 - 71.5	1.5	35-30-50+	--	
408.7	78.0								

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 Location Drakesboro, Ky

Project Name PAF: Phase 2 Boring No. **STN-7** Total Depth 78.0 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-7A** Total Depth 5.0 ft
County	Muhlenberg, KY	Surface Elevation	486.7 ft
Project Type	Geotechnical Exploration	Date Started	2/18/09 Completed 2/18/09
Supervisor	S. Vemuri Driller J. Wethington	Depth to Water	Dry Date/Time 2/18/09
Logged By	D. West	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
486.7	0.0	Top of Hole							
485.2	1.5	Mine Spoil: Fat clay with gravels, dark gray, moist and stiff.							
484.0	2.7	Gypsum-Fly Ash: Dark gray, moist and medium loose to very dense.		ST-1	3.0 - 5.0	2.0		--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
481.7	5.0	Gypsum: Dark gray, moist and medium loose to very dense.							Boring grouted from 0 to 5.0 feet.
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT- GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky		
Project Name	PAF: Phase 2	Boring No.	**STN-7B**	Total Depth	14.4 ft
County	Muhlenberg, KY	Surface Elevation	486.7 ft		
Project Type	Geotechnical Exploration	Date Started	2/26/09	Completed	2/26/09
Supervisor	R. Riker	Driller K. Clements	Depth to Water	Dry	Date/Time 2/26/09
Logged By	R. Riker		Depth to Water	--	Date/Time --

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
486.7	0.0	Top of Hole							
485.2	1.5	Mine Spoil: Fat clay with gravels, dark gray, moist and stiff.							Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
484.0	2.7	Gypsum-Fly Ash: Dark gray, moist and medium loose to very dense.							
477.7	9.0	Gypsum: Dark gray, moist and medium loose to very dense.							Piezometer Installed. See Figure in Appendix D.
472.3	14.4	Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.							
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT- GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-8** Total Depth 98.0 ft
County	Muhlenberg, KY	Surface Elevation	510.2 ft
Project Type	Geotechnical Exploration	Date Started	2/19/09 Completed 2/20/09
Supervisor	S. Vemuri Driller K. Clements	Depth to Water	10.0 ft Date/Time 2/19/09
Logged By	B. Evans	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
510.2	0.0	Top of Hole							
509.7	0.5	Mine Spoil: Clay, brownish gray, damp and medium stiff.		SPT-1	0.0 - 1.5	1.0	2-3-5	--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
				SPT-2	1.5 - 3.0	1.2	5-5-4	--	
		Gypsum-Fly Ash: Light gray, damp and medium loose.		SPT-3	3.0 - 4.5	1.0	3-4-7	--	
				SPT-4	4.5 - 6.0	1.5	8-5-7	--	
504.2	6.0								Slope Inclinometer Installed. See Figure in Appendix D
		Gypsum-Fly Ash: Dark gray, moist to wet and medium loose to very dense.		SPT-5	6.0 - 7.5	1.2	9-11-14	--	
				SPT-6	7.5 - 9.0	1.5	13-11-15	--	
				SPT-7	9.0 - 10.5	1.5	5-8-11	--	
				SPT-8	10.5 - 12.0	1.2	4-5-9	--	
				SPT-9	12.0 - 13.5	1.5	2-1-3	--	
				SPT-10	13.5 - 15.0	1.0	7-8-10	--	
				SPT-11	15.0 - 16.5	1.5	11-14-14	--	
				SPT-12	16.5 - 18.0	1.5	6-12-14	--	
				SPT-13	18.0 - 19.5	1.5	10-20-20	--	
				SPT-14	19.5 - 21.0	1.4	20-13-14	--	
				SPT-15	21.0 - 22.5	1.5	9-22-13	--	
				SPT-16	22.5 - 24.0	1.5	33-44-46	--	
				SPT-17	24.0 - 25.5	1.5	9-12-15	--	
484.0	26.2								
		Gypsum: Dark gray, moist to wet and medium loose to very dense.		SPT-18	25.5 - 27.0	1.5	16-19-20	--	
481.7	28.5			SPT-19	27.0 - 28.5	1.5	8-10-14	--	
				SPT-20	28.5 - 30.0	1.5	7-7-7	--	
		Gypsum: Dark brown, saturated to wet and medium loose to dense.		SPT-21	30.0 - 31.5	1.5	15-15-17	--	
				SPT-22	31.5 - 33.0	1.5	27-28-32	--	
				SPT-23	33.0 - 34.5	1.5	7-11-14	--	
				SPT-24	34.5 - 36.0	1.5	6-12-10	--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

Project Number 175569040 Location Drakesboro, Ky

Project Name PAF: Phase 2 Boring No. **STN-8** Total Depth 98.0 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
				SPT-25	36.0 - 37.5	1.5	8-4-5	--	
				SPT-26	37.5 - 39.0	1.5	17-21-21	--	
470.7	39.5								
		Gypsum: Light gray to light brown, wet and dense to very dense.		SPT-27	39.0 - 40.5	1.5	13-22-34	--	
				SPT-28	40.5 - 42.0	1.5	22-43-50+	--	
				SPT-29	42.0 - 43.5	1.5	14-16-14	--	
				SPT-30	43.5 - 45.0	1.5	9-11-15	--	
				SPT-31	45.0 - 46.5	1.2	30-34-37	--	
				SPT-32	46.5 - 48.0	1.5	33-24-17	--	
				SPT-33	48.0 - 49.5	1.0	18-37-40	--	
				SPT-34	49.5 - 51.0	1.5	9-25-22	--	
				SPT-35	51.0 - 52.5	1.5	13-15-27	--	
				SPT-36	52.5 - 54.0	0.8	11-17-24	--	
				SPT-37	54.0 - 55.5	1.5	26-33-39	--	
				SPT-38	55.5 - 57.0	1.5	7-4-10	--	
452.2	58.0			SPT-39	57.0 - 58.5	1.5	9-20-35	--	
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.		SPT-40	58.5 - 60.0	0.5	50+-36-24	--	
				SPT-41	60.0 - 61.5	0.5	20-25-11	--	
				SPT-42	61.5 - 63.0	1.5	8-9-10	--	
				SPT-43	63.0 - 64.5	1.0	3-4-5	--	
				SPT-44	64.5 - 66.0	1.0	6-9-21	--	
				SPT-45	66.0 - 67.5	1.5	22-23-14	--	
				SPT-46	67.5 - 69.0	0.8	3-5-7	--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

Project Number 175569040 Location Drakesboro, Ky

Project Name PAF: Phase 2 Boring No. **STN-8** Total Depth 98.0 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments. *(Continued)*		SPT-47	79.5 - 81.0	1.2	10-10-10	--	
				SPT-48	89.5 - 91.0	1.5	14-23-50+	--	
412.2	98.0			SPT-49	97.5 - 98.0	0.5	50+	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT- GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-8A** Total Depth 61.5 ft
County	Muhlenberg, KY	Surface Elevation	510.2 ft
Project Type	Geotechnical Exploration	Date Started	2/20/09 Completed 2/20/09
Supervisor	S. Vemuri Driller K. Clements	Depth to Water	Dry Date/Time 2/20/09
Logged By	B. Evans	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
510.2	0.0	Top of Hole							
509.7	0.5	Mine Spoil: Clay, brownish gray, damp and medium stiff.							Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
		Gypsum-Fly Ash: Light gray, damp and medium loose.		ST-1	4.5 - 6.5	2.0		--	
504.2	6.0	Gypsum-Fly Ash: Dark gray, moist to wet and medium loose to very dense.							Piezometer Installed. See Figure in Appendix D.
				ST-2	9.5 - 11.5	2.0		--	
				ST-3	14.5 - 16.5	2.0		--	
				ST-4	19.5 - 21.5	2.0		--	
484.0	26.2			ST-5	24.5 - 26.5	2.0		--	
481.7	28.5	Gypsum: Dark gray, moist to wet and medium loose to very dense.							
		Gypsum: Dark brown, saturated to wet and medium loose to dense.		ST-6	29.5 - 31.5	2.0		--	
				ST-7	34.5 - 36.5	2.0		--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 Location Drakesboro, Ky

Project Name PAF: Phase 2 Boring No. **STN-8A** Total Depth 61.5 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
470.7	39.5								
		Gypsum: Light gray to light brown, wet and dense to very dense.		ST-8	39.5 - 41.5	2.0		--	
				ST-9	44.5 - 46.5	2.0		--	
				ST-10	49.5 - 51.5	2.0		--	
				ST-11	54.5 - 56.5	2.0		--	
452.2	58.0								
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.		ST-12	59.5 - 61.5	2.0		--	
448.7	61.5	No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT- GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky		
Project Name	PAF: Phase 2	Boring No.	**STN-9**	Total Depth	81.5 ft
County	Muhlenberg, KY	Surface Elevation	497.5 ft		
Project Type	Geotechnical Exploration	Date Started	2/19/09	Completed	2/20/09
Supervisor	B. Evans Driller J. Wethington	Depth to Water	7.5 ft	Date/Time	2/19/09
Logged By	D. West	Depth to Water	--	Date/Time	--

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
497.5	0.0	Top of Hole							
		Gypsum-Fly Ash: Dark gray to light gray, moist to wet and medium loose to very dense.		SPT-1	0.0 - 1.5	0.5	WOH-7-2	--	
				SPT-2	1.5 - 3.0	1.5	7-21-17	--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
				SPT-3	3.0 - 4.5	1.5	7-9-9	--	
				SPT-4	4.5 - 6.0	1.5	8-7-5	--	
				SPT-5	6.0 - 7.5	1.4	9-3-3	--	Boring grouted from 0 to 81.5 feet.
				SPT-6	7.5 - 9.0	1.5	5-13-12	--	
				SPT-7	9.0 - 10.5	1.0	13-10-3	--	
				SPT-8	10.5 - 12.0	1.5	9-12-16	--	
				SPT-9	12.0 - 13.5	1.5	22-50+	--	
484.0	13.5								
		Gypsum: Dark gray to light gray, moist to wet and medium loose to very dense.		SPT-10	13.5 - 15.0	1.5	6-12-15	--	
				SPT-11	15.0 - 16.5	1.5	10-21-14	--	
				SPT-12	16.5 - 18.0	0.0	-----	--	Lost sample from SPT 12
				SPT-13	18.0 - 19.5	1.4	14-27-19	--	
				SPT-14	19.5 - 21.0	1.5	8-7-9	--	
				SPT-15	21.0 - 22.5	1.0	15-39-31	--	
				SPT-16	22.5 - 24.0	1.5	8-7-9	--	
				SPT-17	24.0 - 25.5	1.5	21-3-4	--	
				SPT-18	25.5 - 27.0	1.5	10-21-14	--	
				SPT-19	27.0 - 28.5	1.5	13-24-50	--	
				SPT-20	28.5 - 30.0	1.0	-----	--	
				SPT-21	30.0 - 31.5	1.5	8-34-50	--	
				SPT-22	31.5 - 33.0	1.0	21-38-50	--	
				SPT-23	33.0 - 34.5	1.0	13-28-14	--	
				SPT-24	34.5 - 36.0	1.5	8-28-50	--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, Ky

Project Name PAF: Phase 2 | Boring No. **STN-9** | Total Depth 81.5 ft

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
		Gypsum: Dark gray to light gray, moist to wet and medium loose to very dense. *(Continued)*		SPT-25	36.0 - 37.5	1.2	50+	--	
				SPT-26	37.5 - 39.0	0.5	50+	--	
				SPT-27	39.0 - 40.5	1.5	17-38-50	--	
				SPT-28	40.5 - 42.0	0.8	28-50+	--	
				SPT-29	42.0 - 43.5	1.5	43-18-10	--	
453.5	44.0								
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.		SPT-30	43.5 - 45.0	1.3	9-14-24	--	
				SPT-31	45.0 - 46.5	1.0	18-28-18	--	
				SPT-32	46.5 - 48.0	1.0	17-24-18	--	
				SPT-33	48.0 - 49.5	0.8	11-23-18	--	
				SPT-34	49.5 - 51.0	1.5	13-15-50	--	
				SPT-35	51.0 - 52.5	0.8	8-50+	--	
				SPT-36	52.5 - 54.0	0.5	50+	--	
				SPT-37	60.0 - 61.5	1.3	8-12-16	--	
				SPT-38	70.0 - 71.5	1.3	16-12-11	--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT- GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 Location Drakesboro, Ky

Project Name PAF: Phase 2 Boring No. **STN-9** Total Depth 81.5 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
416.0	81.5			SPT-39	80.0 - 81.5	1.3	12-15-40	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky		
Project Name	PAF: Phase 2	Boring No.	**STN-9A**	Total Depth	42.0 ft
County	Muhlenberg, KY	Surface Elevation	497.5 ft		
Project Type	Geotechnical Exploration	Date Started	2/20/09	Completed	2/20/09
Supervisor	B. Evans Driller J. Wethington	Depth to Water	Dry	Date/Time	2/20/09
Logged By	D. West	Depth to Water	--	Date/Time	--

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
497.5	0.0	Top of Hole							
		Gypsum-Fly Ash: Dark gray to light gray, moist to wet and medium loose to very dense.							Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
				ST-1	5.0 - 7.0	2.0		--	Boring grouted from 0 to 42.0 feet.
				ST-2	10.0 - 12.0	2.0		--	
484.0	13.5								
		Gypsum: Dark gray to light gray, moist to wet and medium loose to very dense.		ST-3	15.0 - 17.0	2.0		--	
				ST-4	20.0 - 22.0	2.0		--	
				ST-5	25.0 - 27.0	2.0		--	
				ST-6	30.0 - 32.0	2.0		--	
				ST-7	35.0 - 37.0	2.0		--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 Location Drakesboro, Ky

Project Name PAF: Phase 2 Boring No. **STN-9A** Total Depth 42.0 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
455.5	42.0	Gypsum: Dark gray to light gray, moist to wet and medium loose to very dense. *(Continued)*		ST-8	40.0 - 42.0	2.0		--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT- GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky		
Project Name	PAF: Phase 2	Boring No.	**STN-9B**	Total Depth	45.3 ft
County	Muhlenberg, KY	Surface Elevation	497.5 ft		
Project Type	Geotechnical Exploration	Date Started	2/27/09	Completed	2/27/09
Supervisor	R. Riker	Driller K. Clements	Depth to Water	1.6 ft	Date/Time 2/27/09
Logged By	R. Riker		Depth to Water	--	Date/Time --

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
497.5	0.0	Top of Hole							
		Gypsum-Fly Ash: Dark gray to light gray, moist to wet and medium loose to very dense.							Boring advanced with 4-1/4 I.D. Hollow Stem Augers. Piezometer Installed. See Figure in Appendix D.
484.0	13.5								
		Gypsum: Dark gray to light gray, moist to wet and medium loose to very dense.							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, Ky

Project Name PAF: Phase 2 | Boring No. **STN-9B** | Total Depth 45.3 ft

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
Elevation	Depth								
453.5	44.0	Gypsum: Dark gray to light gray, moist to wet and medium loose to very dense. *(Continued)*							
452.2	45.3	Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.							
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT- GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-10** Total Depth 71.0 ft
County	Muhlenberg, KY	Surface Elevation	514.0 ft
Project Type	Geotechnical Exploration	Date Started	2/23/09 Completed 2/23/09
Supervisor	R. Riker Driller K. Clements	Depth to Water	15.0 ft Date/Time 2/23/09
Logged By	R. Riker	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
514.0	0.0	Top of Hole							
		Gypsum-Fly Ash: Dark gray to gray, moist to wet and medium loose to very dense		SPT-1	0.0 - 1.5	1.2	2-3-5	--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers. Boring grouted from 0 to 71.0 feet.
				SPT-2	1.5 - 3.0	1.2	7-10-8	--	
				SPT-3	3.0 - 4.5	1.2	6-6-8	--	
				SPT-4	4.5 - 6.0	1.5	5-6-14	--	
				SPT-5	6.0 - 7.5	1.3	11-11-13	--	
				SPT-6	7.5 - 9.0	1.2	14-19-16	--	
				SPT-7	9.0 - 10.5	0.9	8-9-11	--	
				SPT-8	10.5 - 12.0	1.2	12-5-4	--	
				SPT-9	12.0 - 13.5	0.9	8-9-9	--	
				SPT-10	13.5 - 15.0	1.5	11-12-5	--	
				SPT-11	15.0 - 16.5	1.5	14-19-17	--	
				SPT-12	16.5 - 18.0	1.2	12-12-15	--	
				SPT-13	18.0 - 19.5	1.5	23-30-27	--	
				SPT-14	19.5 - 21.0	1.5	12-21-23	--	
				SPT-15	21.0 - 22.5	1.5	15-20-20	--	
				SPT-16	22.5 - 24.0	1.5	15-25-23	--	
				SPT-17	24.0 - 25.5	1.5	9-20-25	--	
				SPT-18	25.5 - 27.0	1.5	50+	--	
				SPT-19	27.0 - 28.5	1.0	30-50+	--	
484.0	30.0			SPT-20	28.5 - 30.0	1.5	34-50+	--	
		Gypsum: Dark gray to gray, moist to wet and medium loose to very dense		SPT-21	30.0 - 31.5	1.3	12-15-17	--	
				SPT-22	31.5 - 33.0	1.4	17-30-21	--	
				SPT-23	33.0 - 34.5	1.3	17-17-21	--	
				SPT-24	34.5 - 36.0	1.5	10-18-20	--	

STANTEC/FMSM_LEGACY_PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, Ky

Project Name PAF: Phase 2 | Boring No. **STN-10** | Total Depth 71.0 ft

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
		Gypsum: Dark gray to gray, moist to wet and medium loose to very dense *(Continued)*		SPT-25	36.0 - 37.5	1.5	12-36-50+	--	
				SPT-26	37.5 - 39.0	1.5	17-36-39	--	
				SPT-27	39.0 - 40.5	1.5	10-14-13	--	
				SPT-28	40.5 - 42.0	1.5	34-35-50	--	
				SPT-29	42.0 - 43.5	1.5	30-50+	--	
				SPT-30	43.5 - 45.0	1.3	12-30-45	--	
467.5	46.5			SPT-31	45.0 - 46.5	1.4	6-7-26	--	
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.		SPT-32	46.5 - 48.0	1.0	20-25-29	--	
				SPT-33	48.0 - 49.5	0.6	10-12-11	--	
				SPT-34	49.5 - 51.0	0.5	8-8-13	--	
				SPT-35	51.0 - 52.5	0.5	6-6-10	--	
				SPT-36	52.5 - 54.0	0.8	6-10-11	--	
				SPT-37	54.0 - 55.5	0.9	7-8-12	--	
				SPT-38	55.5 - 57.0	0.8	6-9-12	--	
				SPT-39	57.0 - 58.5	1.0	8-10-12	--	
				SPT-40	59.5 - 61.0	0.7	4-19-10	--	
443.0	71.0			SPT-41	69.5 - 71.0	0.9	50+	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT- GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky		
Project Name	PAF: Phase 2	Boring No.	**STN-10A**	Total Depth	51.5 ft
County	Muhlenberg, KY	Surface Elevation	514.0 ft		
Project Type	Geotechnical Exploration	Date Started	2/23/09	Completed	2/24/09
Supervisor	R. Riker Driller K. Clements	Depth to Water	26.8 ft	Date/Time	2/24/09
Logged By	R. Riker	Depth to Water	--	Date/Time	--

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
514.0	0.0	Top of Hole							
		Gypsum-Fly Ash: Dark gray to gray, moist to wet and medium loose to very dense		ST-1	4.5 - 6.5	2.0		--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers. Piezometer Installed. See Figure in Appendix D.
				ST-2	9.5 - 11.5	2.0		--	
				ST-3	14.5 - 16.5	1.7		--	
				ST-4	19.5 - 21.5	2.0		--	
				ST-5	24.5 - 26.5	2.0		--	
484.0	30.0								
		Gypsum: Dark gray to gray, moist to wet and medium loose to very dense		ST-6	29.5 - 31.5	1.8		--	
				ST-7	34.5 - 36.5	1.5		--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 Location Drakesboro, Ky

Project Name PAF: Phase 2 Boring No. **STN-10A** Total Depth 51.5 ft

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
Elevation	Depth								
		Gypsum: Dark gray to gray, moist to wet and medium loose to very dense *(Continued)*		ST-8	39.5 - 41.5	1.3		--	
				ST-9	44.5 - 46.5	2.0		--	
467.5	46.5								
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.		ST-10	49.5 - 51.5	0.0		--	
462.5	51.5								
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT- GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-11** Total Depth 75.5 ft
County	Muhlenberg, KY	Surface Elevation	504.5 ft
Project Type	Geotechnical Exploration	Date Started	2/3/09 Completed 2/6/09
Supervisor	B. Evans Driller K. Clements	Depth to Water	25.1 ft Date/Time 2/4/09
Logged By	B. Evans	Depth to Water	17.5 ft Date/Time 2/6/09

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
504.5	0.0	Top of Hole							
503.0	1.5	Mine Spoil: Clay, brownish gray, damp and soft.		SPT-1	0.0 - 1.5	1.0	2-2-3	--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
				SPT-2	1.5 - 3.0	0.2	7-8-10	--	
		Gypsum-Fly Ash: Gray to brown, moist to saturated and very loose to dense.		SPT-3	3.0 - 4.5	1.2	9-12-12	--	
				SPT-4	4.5 - 6.0	1.5	6-7-9	--	
				SPT-5	6.0 - 7.5	1.5	5-5-6	--	Slope Inclinometer Installed. See Figure in Appendix D
				SPT-6	7.5 - 9.0	1.0	2-1-1	--	
				SPT-7	9.0 - 10.5	1.5	3-6-4	--	
				SPT-8	10.5 - 12.0	1.5	9-14-14	--	
				SPT-9	12.0 - 13.5	1.5	22-22-25	--	
				SPT-10	13.5 - 15.0	1.5	28-26-30	--	
				SPT-11	15.0 - 16.5	1.5	3-9-12	--	
487.0	17.5			SPT-12	16.5 - 18.0	1.5	12-14-14	--	
		Gypsum-Fly Ash: Dark brown to dark gray, wet and dense to very dense.		SPT-13	18.0 - 19.5	1.5	17-20-24	--	
484.1	20.4			SPT-14	19.5 - 21.0	1.5	5-34-30	--	
		Gypsum: Dark brown to dark gray, wet and dense to very dense.		SPT-15	21.0 - 22.5	1.5	5-23-25	--	
				SPT-16	22.5 - 24.0	1.5	50+	--	
				SPT-17	24.0 - 25.5	1.5	8-16-21	--	
				SPT-18	25.5 - 27.0	1.5	3-6-12	--	
				SPT-19	27.0 - 28.5	1.5	16-20-27	--	
				SPT-20	28.5 - 30.0	0.8	18-20-32	--	
				SPT-21	30.0 - 31.5	1.5	9-21-16	--	
				SPT-22	31.5 - 33.0	1.5	16-20-14	--	
				SPT-23	33.0 - 34.5	0.5	17-17-20	--	
469.0	35.5			SPT-24	34.5 - 36.0	1.5	9-13-10	--	

STANTEC/FMSM_LEGACY_PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, Ky

Project Name PAF: Phase 2 | Boring No. **STN-11** | Total Depth 75.5 ft

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
Elevation	Depth								
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments. *(Continued)*		SPT-25	36.0 - 37.5	0.5	10-11-9	--	
				SPT-26	37.5 - 39.0	0.8	8-8-9	--	
				SPT-27	39.0 - 40.5	0.5	7-6-7	--	
				SPT-28	40.5 - 42.0	0.8	3-4-5	--	
				SPT-29	42.0 - 43.5	1.0	5-6-8	--	
				SPT-30	43.5 - 45.0	1.0	7-7-7	--	
				SPT-31	54.0 - 55.5	1.0	15-22-17	--	
				SPT-32	64.0 - 65.5	1.5	10-10-8	--	
				SPT-33	74.0 - 75.0	1.5	-----	--	
429.0	75.5	No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-11A** Total Depth 12.0 ft
County	Muhlenberg, KY	Surface Elevation	504.4 ft
Project Type	Geotechnical Exploration	Date Started	2/6/09 Completed 2/6/09
Supervisor	B. Evans Driller K. Clements	Depth to Water	Dry Date/Time 2/6/09
Logged By	B. Evans	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
504.4	0.0	Top of Hole							
502.9	1.5	Mine Spoil: Clay, brownish gray, damp and soft.							Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
		Gypsum-Fly Ash: Gray to brown, moist to saturated and very loose to dense.		ST-1	5.0 - 7.0	2.0		--	Boring grouted from 0 to12.0 feet.
492.4	12.0			ST-2	10.0 - 12.0	2.0		--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT- GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

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SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky		
Project Name	PAF: Phase 2	Boring No.	**STN-12**	Total Depth	35.0 ft
County	Muhlenberg, KY	Surface Elevation	494.4 ft		
Project Type	Geotechnical Exploration	Date Started	2/26/09	Completed	2/26/09
Supervisor	R. Riker Driller K. Clements	Depth to Water	20.8 ft	Date/Time	2/27/09
Logged By	R. Riker	Depth to Water	--	Date/Time	--

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
494.4	0.0	Top of Hole							
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.		SPT-1	0.0 - 1.5	0.6	WOH-WOH-2	--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers. Piezometer Installed. See Figure in Appendix D.
				SPT-2	1.5 - 3.0	0.8	2-2-3	--	
				SPT-3	3.0 - 4.5	0.9	2-4-4	--	
				SPT-4	4.5 - 6.0	0.9	2-3-4	--	
				SPT-5	6.0 - 7.5	0.6	3-4-5	--	
				SPT-6	7.5 - 9.0	1.1	2-5-3	--	
				SPT-7	9.0 - 10.5	1.5	4-9-11	--	
				SPT-8	10.5 - 12.0	1.3	5-5-5	--	
				SPT-9	12.0 - 13.5	1.0	5-5-5	--	
				SPT-10	13.5 - 15.0	0.7	5-5-4	--	
				SPT-11	15.0 - 16.5	1.2	3-4-4	--	
				SPT-12	16.5 - 18.0	0.6	6-4-3	--	
				SPT-13	18.0 - 19.5	1.2	4-3-3	--	
				SPT-14	19.5 - 21.0	1.4	3-4-7	--	
				SPT-15	30.0 - 31.5	1.3	6-7-8	--	
459.4	35.0	No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-13** Total Depth 40.0 ft
County	Muhlenberg, KY	Surface Elevation	525.1 ft
Project Type	Geotechnical Exploration	Date Started	2/25/09 Completed 2/26/09
Supervisor	R. Riker Driller K. Clements	Depth to Water	11.1 ft Date/Time 2/25/09
Logged By	R. Riker	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
525.1	0.0	Top of Hole							
		Gypsum-Fly Ash: Dark gray to gray, damp to wet and very loose to medium loose		SPT-1	0.0 - 1.5	1.0	2-1-3	--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
				SPT-2	1.5 - 3.0	0.9	2-5-5	--	
				SPT-3	3.0 - 4.5	0.5	6-8-7	--	
				SPT-4	4.5 - 6.0	1.5	12-7-9	--	Boring grouted from 0 to 40.0 feet.
				SPT-5	6.0 - 7.5	1.0	5-6-9	--	
				SPT-6	7.5 - 9.0	1.5	8-14-12	--	
				SPT-7	9.0 - 10.5	1.5	6-12-15	--	
				SPT-8	10.5 - 12.0	1.3	6-14-15	--	
				SPT-9	12.0 - 13.5	1.4	14-14-14	--	
				SPT-10	13.5 - 15.0	1.5	13-15-27	--	
				SPT-11	15.0 - 16.5	1.5	2-5-12	--	
				SPT-12	16.5 - 18.0	1.1	10-12-15	--	
				SPT-13	18.0 - 19.5	1.5	9-12-14	--	
				SPT-14	19.5 - 21.0	0.9	WOH-2-3	--	
504.1	21.0								
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.		SPT-15	21.0 - 22.5	1.2	3-6-8	--	
				SPT-16	22.5 - 24.0	0.5	WOH-3-4	--	
				SPT-17	24.0 - 25.5	0.8	2-2-3	--	
				SPT-18	25.5 - 27.0	1.2	12-30-32	--	
				SPT-19	27.0 - 28.5	0.6	6-6-5	--	
				SPT-20	28.5 - 30.0	0.6	2-18-20	--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 Location Drakesboro, Ky

Project Name PAF: Phase 2 Boring No. **STN-13** Total Depth 40.0 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
485.1	40.0			SPT-21	38.5 - 40.0	1.1	4-7-9	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT- GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040		Location	Drakesboro, Ky	
Project Name	PAF: Phase 2		Boring No.	**STN-13A**	Total Depth 25.0 ft
County	Muhlenberg, KY		Surface Elevation	525.1 ft	
Project Type	Geotechnical Exploration		Date Started	2/25/09	Completed 2/26/09
Supervisor	R. Riker	Driller K. Clements	Depth to Water	9.2 ft	Date/Time 2/25/09
Logged By	R. Riker		Depth to Water	8.0 ft	Date/Time 2/26/09

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
525.1	0.0	Top of Hole							
		Gypsum-Fly Ash: Dark gray to dray, moist to wet and very loose to medium loose							Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
				ST-1	5.0 - 7.0	2.0		--	Piezometer Installed. See Figure in Appendix D.
				ST-2	10.0 - 12.0	1.8		--	
				ST-3	15.0 - 17.0	2.0		--	
503.1	22.0			ST-4	20.0 - 22.0	0.0		--	
500.1	25.0	Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.		ST-5	23.0 - 25.0	0.9		--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-14** Total Depth 51.5 ft
County	Muhlenberg, KY	Surface Elevation	510.9 ft
Project Type	Geotechnical Exploration	Date Started	2/27/09 Completed 2/27/09
Supervisor	R. Riker Driller K. Clements	Depth to Water	7.5 ft Date/Time 2/27/09
Logged By	R. Riker	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
510.9	0.0	Top of Hole							
		Gypsum-Fly Ash: Dark gray to gray, moist to wet and very loose to very dense		SPT-1	0.0 - 1.5	1.4	1-10-14	--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers. Boring grouted from 0 to 51.5 feet.
				SPT-2	1.5 - 3.0	1.5	14-15-16	--	
				SPT-3	3.0 - 4.5	1.3	14-17-12	--	
				SPT-4	4.5 - 6.0	1.4	10-6-10	--	
				SPT-5	6.0 - 7.5	1.1	5-6-11	--	
				SPT-6	7.5 - 9.0	1.5	11-11-7	--	
				SPT-7	9.0 - 10.5	1.3	3-1-5	--	
				SPT-8	10.5 - 12.0	1.0	WOH-1-2	--	
				SPT-9	12.0 - 13.5	1.0	WOH-9-15	--	
				SPT-10	13.5 - 15.0	1.4	8-8-6	--	
				SPT-11	15.0 - 16.5	1.2	6-5-4	--	
				SPT-12	16.5 - 18.0	1.3	16-17-14	--	
				SPT-13	18.0 - 19.5	1.5	15-20-20	--	
				SPT-14	19.5 - 21.0	1.4	3-4-12	--	
				SPT-15	21.0 - 22.5	1.0	10-13-13	--	
				SPT-16	22.5 - 24.0	1.2	3-4-3	--	
				SPT-17	24.0 - 25.5	1.3	2-3-5	--	
484.0	26.9			SPT-18	25.5 - 27.0	1.5	3-8-10	--	
		Gypsum: Dark gray to gray, moist to wet and very loose to very dense		SPT-19	27.0 - 28.5	1.5	5-9-11	--	
				SPT-20	28.5 - 30.0	1.5	20-30-26	--	
				SPT-21	30.0 - 31.5	1.3	5-9-11	--	
				SPT-22	31.5 - 33.0	1.5	21-23-35	--	
				SPT-23	33.0 - 34.5	0.9	28-44-35	--	
				SPT-24	34.5 - 36.0	1.2	5-9-5	--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, Ky

Project Name PAF: Phase 2 | Boring No. **STN-14** | Total Depth 51.5 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		Gypsum: Dark gray to gray, moist to wet and very loose to very dense *(Continued)*		SPT-25	36.0 - 37.5	1.2	5-10-11	--	
				SPT-26	37.5 - 39.0	1.0	14-14-11	--	
				SPT-27	39.0 - 40.5	0.9	12-34-40	--	
				SPT-28	40.5 - 42.0	1.2	12-33-35	--	
				SPT-29	42.0 - 43.5	0.9	1-3-8	--	
				SPT-30	43.5 - 45.0	1.2	7-11-16	--	
464.4	46.5			SPT-31	45.0 - 46.5	1.3	5-2-2	--	
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.		SPT-32	46.5 - 48.0	0.6	9-18-1	--	
459.4	51.5			SPT-33	50.0 - 51.5	0.2	4-6-8	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT- GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-15** Total Depth 71.5 ft
County	Muhlenberg, KY	Surface Elevation	480.9 ft
Project Type	Geotechnical Exploration	Date Started	5/28/09 Completed 5/28/09
Supervisor	Z. Massey Driller K. Clements	Depth to Water	4.9 ft Date/Time 5/28/09
Logged By	Z. Massey	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
480.9	0.0	Top of Hole							
		Class III Channel Lining							Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
472.9	8.0								Slope Inclinometer Installed. See Figure in Appendix D
		Gypsum: Light gray to dark gray, moist to wet and very loose to loose.		SPT-1	9.0 - 10.5	0.3	WOH-1-1	--	
				SPT-2	10.5 - 12.0	0.7	WOH-1-2	--	
				SPT-3	12.0 - 13.5	0.7	1-2-2	--	
				SPT-4	13.5 - 15.0	0.8	1-1-1	--	
				SPT-5	15.0 - 16.5	0.5	1-2-2	--	Boring location at sta 10+59 feet, offset 18.5 feet right.
				SPT-6	16.5 - 18.0	1.0	1-2-3	--	
				SPT-7	18.0 - 19.5	0.9	1-2-3	--	
459.9	21.0			SPT-8	19.5 - 21.0	1.4	2-2-3	--	
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, very soft to very stiff and with heterogeneous mixture of coal, shale, sandstone and siltstone fragments.		SPT-9	21.0 - 22.5	0.6	2-4-3	--	
				SPT-10	22.5 - 24.0	1.5	2-3-4	--	
				SPT-11	24.0 - 25.5	1.5	4-3-3	--	
				SPT-12	25.5 - 27.0	0.1	1-1-3	--	
				SPT-13	27.0 - 28.5	1.5	5-13-4	--	
				SPT-14	28.5 - 30.0	1.5	5-6-5	--	
				SPT-15	30.0 - 31.5	0.8	3-4-3	--	
				SPT-16	31.5 - 33.0	1.2	4-3-4	--	
				SPT-17	33.0 - 34.5	1.5	6-5-5	--	
				SPT-18	34.5 - 36.0	0.9	WOR-WOR-2	--	

STANTEC/FMSM_LEGACY_PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, Ky

Project Name PAF: Phase 2 | Boring No. **STN-15** | Total Depth 71.5 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-19	36.0 - 37.5	1.4	5-6-4	--	
				SPT-20	37.5 - 39.0	1.5	6-8-8	--	
440.9	40.0			SPT-21	39.0 - 40.5	1.2	1-3-4	--	
		Mine Spoil: Lean to fat clay with intermediate sand lenses, dark gray to black, moist to wet, medium stiff to very stiff, with heterogeneous mixture of coal, shale, sandstone and siltstone fragments and organics.		SPT-22	40.5 - 42.0	1.0	5-6-8	--	
				SPT-23	42.0 - 43.5	1.5	9-8-8	--	
				SPT-24	43.5 - 45.0	1.5	11-9-14	--	
				SPT-25	45.0 - 46.5	1.5	4-4-6	--	
				SPT-26	46.5 - 48.0	1.4	7-12-21	--	
				SPT-27	48.0 - 49.5	1.5	5-7-14	--	
				SPT-28	55.0 - 56.5	1.5	3-4-7	--	
				SPT-29	60.0 - 61.5	0.8	65-21-14	--	
				SPT-30	65.0 - 66.5	1.0	6-6-10	--	
409.4	71.5			SPT-31	70.0 - 71.5	0.9	3-7-14	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-16** Total Depth 71.5 ft
County	Muhlenberg, KY	Surface Elevation	481.1 ft
Project Type	Geotechnical Exploration	Date Started	5/28/09 Completed 5/29/09
Supervisor	Z. Massey Driller K. Clements	Depth to Water	5.1 ft Date/Time 5/28/09
Logged By	Z. Massey	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
481.1	0.0	Top of Hole							
		Class III Channel Lining							Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
472.1	9.0								Slope Inclinometer Installed. See Figure in Appendix D
		Gypsum: Light gray to dark gray, moist to wet and very loose to loose.		SPT-1	10.0 - 11.5	1.0	WOR-1-2	--	
				SPT-2	11.5 - 13.0	0.7	1-1-1	--	
				SPT-3	13.0 - 14.5	1.1	WOH-1-2	--	
				SPT-4	14.5 - 16.0	1.0	WOH-2-3	--	
				SPT-5	16.0 - 17.5	1.1	4-3-3	--	Boring location at sta 10+99 feet, offset 23.0 feet right.
462.6	18.5			SPT-6	17.5 - 19.0	1.5	5-4-5	--	
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone and siltstone fragments.		SPT-7	19.0 - 20.5	0.7	3-1-2	--	
				SPT-8	20.5 - 22.0	1.2	4-4-5	--	
				SPT-9	22.0 - 23.5	1.5	2-3-5	--	
				SPT-10	23.5 - 25.0	0.4	WOH-1-2	--	
				SPT-11	25.0 - 26.5	0.7	2-3-8	--	
				SPT-12	26.5 - 28.0	0.8	5-3-7	--	
				SPT-13	28.0 - 29.5	1.0	2-3-4	--	
				SPT-14	29.5 - 31.0	0.2	13-5-6	--	
				SPT-15	31.0 - 32.5	0.3	3-5-5	--	
				SPT-16	32.5 - 34.0	1.2	3-5-7	--	
				SPT-17	34.0 - 35.5	0.2	14-12-7	--	
				SPT-18	35.5 - 37.0	0.8	10-9-11	--	

STANTEC/FMSM_LEGACY_PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, Ky

Project Name PAF: Phase 2 | Boring No. **STN-16** | Total Depth 71.5 ft

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
Elevation	Depth								
				SPT-19	37.0 - 38.5	0.9	11-11-12	--	
442.1	39.0								
		Mine Spoil: Lean to fat clay with intermediate sand lenses, dark gray to black, moist to wet, medium stiff to very stiff, with heterogeneous mixture of coal, shale, sandstone and siltstone fragments and organics.		SPT-20	38.5 - 40.0	1.2	4-5-7	--	
				SPT-21	40.0 - 41.5	1.5	3-4-6	--	
				SPT-22	41.5 - 43.0	1.5	5-5-6	--	
				SPT-23	43.0 - 44.5	1.5	3-6-10	--	
				SPT-24	44.5 - 46.0	1.3	5-7-7	--	
				SPT-25	46.0 - 47.5	1.5	3-5-9	--	
				SPT-26	47.5 - 49.0	1.5	4-4-7	--	
				SPT-27	49.0 - 50.5	1.5	3-4-5	--	
				SPT-28	55.0 - 56.5	1.5	3-2-6	--	
				SPT-29	60.0 - 61.5	1.0	4-4-7	--	
				SPT-30	65.0 - 66.5	1.5	5-9-15	--	
				SPT-31	70.0 - 71.5	1.0	5-5-8	--	
409.6	71.5								
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN-17** Total Depth 43.0 ft
County	Muhlenberg	Surface Elevation	483.5 ft
Project Type	Geotechnical Exploration	Date Started	11/10/09 Completed 11/10/09
Supervisor	AKS Driller Mark Martin	Depth to Water	4.0 ft Date/Time 11/10/09
Logged By	AKS	Depth to Water	-- Date/Time --

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
483.5'	0.0'	Top of Hole							
		Mine Spoil: Lean to Sandy Lean Clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-1	0.0' - 1.5'	0.7'	4-9-8	22	
				SPT-2	1.5' - 3.0'	1.0'	6-13-16	--	
				SPT-3	3.0' - 4.5'	0.4'	9-13-6	--	
				SPT-4	4.5' - 6.0'	0.3'	6-6-4	7	
				SPT-5	6.0' - 7.5'	1.2'	9-6-6	--	
				SPT-6	7.5' - 9.0'	1.2'	10-8-6	--	
				SPT-7	9.0' - 10.5'	0.7'	3-6-6	13	
				SPT-8	10.5' - 12.0'	0.6'	6-6-5	--	
				SPT-9	12.0' - 13.5'	0.5'	17-16-9	--	
				SPT-10	13.5' - 15.0'	0.2'	7-9-10	17	Cobble block at 13.7 ft.
				SPT-11	15.0' - 16.5'	1.2'	5-6-5	--	
				SPT-12	16.5' - 18.0'	0.5'	6-8-7	--	
				SPT-13	18.0' - 19.5'	0.7'	6-6-7	8	
				SPT-14	19.5' - 21.0'	0.7'	4-4-5	--	
				SPT-15	21.0' - 22.5'	1.3'	9-8-6	--	
				SPT-16	22.5' - 24.0'	1.2'	3-4-7	9	
				SPT-17	24.0' - 25.5'	0.3'	9-3-5	--	Cobble block at 24.3 ft.
				SPT-18	30.0' - 31.5'	1.5'	5-5-5	10	
				SPT-19	35.5' - 37.0'	1.0'	11-6-10	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, KY

Project Name Scrubber Sludge Complex | Boring No. **STN-17** | Total Depth 43.0 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
									Water at 37.8
									Backfilled from 43.0 to 0.0 Bentonite grout
				SPT-20	40.0' - 41.5'	0.6'	9-9-9	--	
440.5'	43.0'			SPT-21	41.5' - 43.0'	0.2'	9-10-8	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN-18** Total Depth 61.5 ft
County	Muhlenberg	Surface Elevation	501.5 ft
Project Type	Geotechnical Exploration	Date Started	11/10/09 Completed 11/11/09
Supervisor	AKS Driller Mark Martin	Depth to Water	26.6 ft Date/Time 11/11/09
Logged By	AKS	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
501.5'	0.0'	Top of Hole							
		Mine Spoil: Lean to Sandy Lean Clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-1	0.0' - 1.5'	1.1'	9-9-13	9	
				SPT-2	1.5' - 3.0'	1.2'	16-20-20	--	
498.0'	3.5'			SPT-3	3.0' - 4.5'	1.5'	5-16-25	11	
				SPT-4	4.5' - 6.0'	1.3'	5-17-25	--	
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense		SPT-5	6.0' - 7.5'	1.4'	17-21-25	--	
				SPT-6	7.5' - 9.0'	1.5'	11-15-16	21	
				SPT-7	9.0' - 10.5'	1.5'	7-6-5	--	
				SPT-8	10.5' - 12.0'	1.5'	5-9-10	--	
				SPT-9	12.0' - 13.5'	1.5'	5-11-11	23	
				SPT-10	13.5' - 15.0'	1.5'	5-17-10	--	
				SPT-11	15.0' - 16.5'	1.5'	10-20-20	--	
483.9'	17.6'			SPT-12	16.5' - 18.0'	1.5'	15-16-26	21	
		Gypsum: Dark gray to gray, moist to wet, medium loose to dense		SPT-13	18.0' - 19.5'	1.5'	11-34-24	--	
				SPT-14	19.5' - 21.0'	1.5'	8-19-36	--	
				SPT-15	21.0' - 22.5'	1.5'	26-40-49	28	
				SPT-16	22.5' - 24.0'	1.4'	11-30-36	--	
				SPT-17	24.0' - 25.5'	1.4'	20-20-20	--	
				SPT-18	25.5' - 27.0'	1.5'	11-9-17	25	
				SPT-19	27.0' - 28.5'	1.5'	7-10-15	--	
				SPT-20	28.5' - 30.0'	1.4'	25-27-50+	--	
				SPT-21	30.0' - 31.5'	1.5'	20-10-20	26	
				SPT-22	31.5' - 33.0'	1.3'	5-7-9	--	
467.0'	34.5'			SPT-23	33.0' - 34.5'	1.2'	3-4-6	--	
				SPT-24	34.5' - 36.0'	1.5'	3-6-8	18	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN-18** Total Depth 61.5 ft

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
		Mine Spoil: Lean to Sandy Lean Clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments. *(Continued)*		SPT-25	36.0' - 37.5'	1.0'	6-6-8	--	
				SPT-26	37.5' - 39.0'	1.1'	3-5-7	--	
				SPT-27	39.0' - 40.5'	1.2'	3-6-7	19	
				SPT-28	40.5' - 42.0'	1.0'	2-3-7	--	
				SPT-29	45.0' - 46.5'	1.1'	16-9-7	14	
				SPT-30	50.0' - 51.5'	1.3'	10-9-11	--	
				SPT-31	55.0' - 56.5'	1.4'	25-22-18	--	
				SPT-32	59.5' - 59.7'	0.2'	50+	--	Backfilled with Bentonite Grout 61.5-0.0
440.0'	61.5'	No Refusal / Bottom of Hole		SPT-33	60.0' - 61.5'	1.5'	17-16-13	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN-19** Total Depth 78.5 ft
County	Muhlenberg	Surface Elevation	519.7 ft
Project Type	Geotechnical Exploration	Date Started	11/12/09 Completed 11/17/09
Supervisor	AKS Driller Steve Bradford	Depth to Water	12.0 ft Date/Time 11/17/09
Logged By	AKS	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
519.7'	0.0'	Top of Hole							
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense		SPT-1	0.0' - 1.5'	1.3'	5-7-8	13	
				SPT-2	1.5' - 3.0'	1.4'	3-5-7	--	
				SPT-3	3.0' - 4.5'	1.3'	3-2-6	--	
				SPT-4	4.5' - 6.0'	1.4'	2-4-8	15	
				SPT-5	6.0' - 7.5'	1.5'	5-6-7	--	
				SPT-6	7.5' - 9.0'	0.9'	6-7-8	--	
				SPT-7	9.0' - 10.5'	1.4'	7-14-17	18	
				SPT-8	10.5' - 12.0'	1.3'	11-12-13	--	
				SPT-9	12.0' - 13.5'	1.4'	10-9-12	--	
				SPT-10	13.5' - 15.0'	1.5'	4-3-4	39	
				SPT-11	15.0' - 16.5'	1.4'	1-WH-WH	--	
				SPT-12	16.5' - 18.0'	1.0'	WH-8-11	--	
				SPT-13	18.0' - 19.5'	1.3'	8-7-6	21	
				SPT-14	19.5' - 21.0'	1.0'	WH-11-17	--	
				SPT-15	21.0' - 22.5'	1.5'	12-28-26	--	
				SPT-16	22.5' - 24.0'	1.4'	22-25-30	22	
				SPT-17	24.0' - 25.5'	1.4'	4-9-17	--	
				SPT-18	25.5' - 27.0'	1.3'	4-10-11	--	
				SPT-19	27.0' - 28.5'	1.2'	6-26-22	19	
				SPT-20	28.5' - 30.0'	1.5'	6-11-13	--	
				SPT-21	30.0' - 31.5'	1.3'	4-7-9	--	
				SPT-22	31.5' - 33.0'	1.4'	9-12-13	21	
485.2'	34.5'			SPT-23	33.0' - 34.5'	1.2'	9-10-21	--	
		Gypsum: Dark gray to gray, moist to wet, medium loose to dense		SPT-24	34.5' - 36.0'	1.0'	9-14-19	--	
				SPT-25	36.0' - 37.5'	1.1'	14-18-28	21	
				SPT-26	37.5' - 39.0'	1.0'	17-20-36	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, KY

Project Name Scrubber Sludge Complex | Boring No. **STN-19** | Total Depth 78.5 ft

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
		Gypsum: Dark gray to gray, moist to wet, medium loose to dense *(Continued)*		SPT-27	39.0' - 40.5'	1.0'	6-45-36	--	
				SPT-28	40.5' - 42.0'	0.8'	59-100+	22	
				SPT-29	42.0' - 43.5'	1.2'	7-14-10	--	
				SPT-30	43.5' - 45.0'	1.0'	8-28-38	--	
				SPT-31	45.0' - 46.5'	1.2'	4-16-12	25	
				SPT-32	46.5' - 48.0'	1.3'	14-22-20	--	
				SPT-33	48.0' - 49.5'	1.0'	9-15-22	--	
				SPT-34	49.5' - 51.0'	1.1'	9-32-43	24	
				SPT-35	51.0' - 52.5'	1.4'	30-18-35	--	
				SPT-36	52.5' - 54.0'	1.5'	16-22-62	--	
				SPT-37	54.0' - 55.5'	0.9'	6-7-18	20	
				SPT-38	55.5' - 57.0'	1.1'	30-43-64	--	
				SPT-39	57.0' - 58.5'	0.5'	18-14-23	--	
				SPT-40	60.0' - 61.5'	1.1'	19-40-35	19	
				SPT-41	65.0' - 66.5'	0.8'	30-100+	15	
449.7'	70.0'								
		Mine Spoil: Lean to Sandy Lean Clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-42	70.0' - 71.5'	0.6'	6-24-13	--	
				SPT-43	75.0' - 76.5'	1.1'	9-8-11	--	Backfilled with Bentonite grout 78.5-0.0
441.2'	78.5'			SPT-44	77.0' - 78.5'	1.2'	6-10-16	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040		Location	Drakesboro, KY	
Project Name	Scrubber Sludge Complex		Boring No.	**STN -20**	Total Depth 51.5 ft
County	Muhlenberg		Surface Elevation	489.3 ft	
Project Type	Geotechnical Exploration		Date Started	12/3/09	Completed 12/3/09
Supervisor	R. Riker	Driller Steve Bradford	Depth to Water	18.0 ft	Date/Time 12/3/09
Logged By	R. Riker		Depth to Water	--	Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
489.3'	0.0'	Top of Hole							
487.8'	1.5'	Mine Spoil: Lean to Sandy Lean Clay, brown, wet, very stiff, heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-1	0.0' - 1.5'	0.8'	10-11-10	15	
				SPT-2	1.5' - 3.0'	0.9'	9-18-22	--	
				SPT-3	3.0' - 4.5'	0.8'	10-12-18	--	
483.8'	5.5'	Gypsum-Fly Ash: Dark gray to gray, moist to wet, dense		SPT-4	4.5' - 6.0'	0.5'	8-17-8	12	Top cover by Minespoil and DGA road way
				SPT-5	6.0' - 7.5'	1.0'	8-10-8	--	
		Mine Spoil: Lean to Sandy Lean Clay, brown to dark gray, moist to wet, stiff to hard, heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-6	7.5' - 9.0'	0.6'	10-10-10	--	
				SPT-7	9.0' - 10.5'	0.9'	5-4-6	11	
				SPT-8	10.5' - 12.0'	0.5'	11-6-8	--	
				SPT-9	12.0' - 13.5'	1.0'	4-5-18	--	
				SPT-10	13.5' - 15.0'	1.1'	8-4-6	13	
				SPT-11	15.0' - 16.5'	1.0'	6-8-12	--	
				SPT-12	16.5' - 18.0'	0.1'	4-12-12	--	
				SPT-13	18.0' - 19.5'	0.6'	8-10-8	22	Wet From 18.0 to 21.0
				SPT-14	19.5' - 21.0'	0.4'	3-7-7	--	
				SPT-15	21.0' - 22.5'	1.1'	3-6-8	--	
				SPT-16	22.5' - 24.0'	1.4'	10-12-11	16	
				SPT-17	24.0' - 25.5'	1.1'	5-7-8	--	
				SPT-18	25.5' - 27.0'	1.3'	8-18-26	--	
				SPT-19	27.0' - 28.5'	1.2'	17-21-36	11	
				SPT-20	28.5' - 30.0'	1.0'	21-28-27	--	
				SPT-21	30.0' - 31.5'	0.7'	11-12-10	--	
				SPT-22	35.0' - 36.5'	1.0'	7-8-7	10	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN -20** Total Depth 51.5 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		Mine Spoil: Lean to Sandy Lean Clay, brown to dark gray, moist to wet, stiff to hard, heterogeneous mixture of coal, shale, sandstone, and siltstone fragments. *(Continued)*		SPT-23	40.0' - 41.5'	1.5'	7-9-10	--	
				SPT-24	45.0' - 46.5'	1.4'	6-6-10	--	Backfilled with 2 bags quikgrout and 1 bag portland cement
437.8'	51.5'			SPT-25	50.0' - 51.5'	0.9'	8-12-8	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN-21** Total Depth 67.0 ft
County	Muhlenberg	Surface Elevation	506.6 ft
Project Type	Geotechnical Exploration	Date Started	11/11/09 Completed 11/12/09
Supervisor	AKS Driller Mark Martin	Depth to Water	22.3 ft Date/Time 11/12/09
Logged By	BT	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
506.6'	0.0'	Top of Hole							
		Mine Spoil: Lean to Sandy Lean Clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-1	0.0' - 1.5'	0.6'	5-7-9	8	
				SPT-2	1.5' - 3.0'	1.1'	9-12-12	--	
				SPT-3	3.0' - 4.5'	1.1'	10-5-7	--	
500.6'	6.0'			SPT-4	4.5' - 6.0'	0.9'	5-5-5	17	
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense		SPT-5	6.0' - 7.5'	1.0'	7-17-15	--	
				SPT-6	7.5' - 9.0'	0.8'	5-12-15	--	
				SPT-7	9.0' - 10.5'	1.3'	6-8-8	19	
				SPT-8	10.5' - 12.0'	1.5'	4-4-6	--	
				SPT-9	12.0' - 13.5'	1.5'	9-20-20	--	
				SPT-10	13.5' - 15.0'	1.5'	7-17-26	25	
				SPT-11	15.0' - 16.5'	1.5'	6-16-24	--	
				SPT-12	16.5' - 18.0'	1.4'	7-21-21	--	
				SPT-13	18.0' - 19.5'	1.5'	8-12-20	27	
				SPT-14	19.5' - 21.0'	1.5'	5-7-13	--	
				SPT-15	21.0' - 22.5'	1.4'	8-13-17	--	
483.9'	22.7'								
		Gypsum: Dark gray to gray, moist to wet, medium loose to dense		SPT-16	22.5' - 24.0'	1.5'	9-16-20	26	
				SPT-17	24.0' - 25.5'	1.5'	12-21-30	--	
				SPT-18	25.5' - 27.0'	1.4'	5-13-19	--	
				SPT-19	27.0' - 28.5'	1.5'	5-19-50	26	
				SPT-20	28.5' - 30.0'	1.5'	5-19-32	--	
				SPT-21	30.0' - 31.5'	1.5'	10-12-12	--	
				SPT-22	31.5' - 33.0'	1.5'	10-12-25	24	
				SPT-23	33.0' - 34.5'	1.5'	3-7-13	--	
				SPT-24	34.5' - 36.0'	1.5'	6-10-16	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, KY

Project Name Scrubber Sludge Complex | Boring No. **STN-21** | Total Depth 67.0 ft

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
		Gypsum: Dark gray to gray, moist to wet, medium loose to dense *(Continued)*		SPT-25	36.0' - 37.5'	1.3'	21-34-34	24	
				SPT-26	37.5' - 39.0'	1.5'	11-21-40	--	
				SPT-27	39.0' - 40.5'	1.5'	5-17-40	--	
				SPT-28	40.5' - 42.0'	1.5'	19-31-35	27	
				SPT-29	42.0' - 43.5'	1.5'	5-19-25	--	
				SPT-30	43.5' - 45.0'	1.4'	18-19-13	--	
				SPT-31	45.0' - 46.5'	1.4'	8-18-45	27	
459.3'	47.3'			SPT-32	46.5' - 47.3'	0.6'	30-50+	--	
		Mine Spoil: Lean to Sandy Lean Clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-33	50.0' - 51.5'	1.3'	7-10-10	18	
				SPT-34	55.0' - 56.5'	1.4'	20-17-21	--	
				SPT-35	60.0' - 61.5'	1.5'	11-14-15	--	
439.6'	67.0'			SPT-36	65.5' - 67.0'	1.5'	7-9-10	--	Backfilled with Bentonite Grout 67.0-0.0
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN-22** Total Depth 79.5 ft
County	Muhlenberg	Surface Elevation	519.1 ft
Project Type	Geotechnical Exploration	Date Started	11/17/09 Completed 11/18/09
Supervisor	AKS Driller Steve Bradford	Depth to Water	11.5 ft Date/Time 11/18/09
Logged By	AKS	Depth to Water	-- Date/Time --

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
519.1'	0.0'	Top of Hole							
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense		SPT-1	0.0' - 1.5'	1.4'	3-5-5	15	
				SPT-2	1.5' - 3.0'	0.9'	9-12-11	--	
				SPT-3	3.0' - 4.5'	1.1'	12-17-18	--	
				SPT-4	4.5' - 6.0'	0.8'	5-12-13	12	
				SPT-5	6.0' - 7.5'	0.9'	10-8-7	--	
				SPT-6	7.5' - 9.0'	1.1'	4-4-4	--	
				SPT-7	9.0' - 10.5'	1.5'	7-12-13	23	
				SPT-8	10.5' - 12.0'	1.0'	14-16-21	--	
				SPT-9	12.0' - 13.5'	0.9'	12-7-8	--	
				SPT-10	13.5' - 15.0'	1.2'	7-8-6	33	
				SPT-11	15.0' - 16.5'	1.5'	1-WH-1	--	
				SPT-12	16.5' - 18.0'	1.3'	5-9-7	--	
				SPT-13	18.0' - 19.5'	1.4'	WH-1-1	30	
				SPT-14	19.5' - 21.0'	1.3'	6-4-5	--	
				SPT-15	21.0' - 22.5'	1.2'	8-12-12	--	
				SPT-16	22.5' - 24.0'	1.4'	16-25-32	22	
				SPT-17	24.0' - 25.5'	1.1'	8-23-39	--	
				SPT-18	25.5' - 27.0'	0.8'	56-100+	--	
				SPT-19	27.0' - 28.5'	1.5'	43-26-35	23	
				SPT-20	28.5' - 30.0'	1.3'	8-10-10	--	
				SPT-21	30.0' - 31.5'	0.9'	4-8-13	--	
				SPT-22	31.5' - 33.0'	1.2'	10-12-13	22	
				SPT-23	33.0' - 34.5'	1.0'	13-25-31	--	
484.0'	35.1'			SPT-24	34.5' - 36.0'	1.1'	15-29-38	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, KY

Project Name Scrubber Sludge Complex | Boring No. **STN-22** | Total Depth 79.5 ft

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
Elevation	Depth								
		Gypsum: Dark gray to gray, moist to wet, medium loose to dense *(Continued)*		SPT-25	36.0' - 37.5'	1.3'	28-41-57	21	
				SPT-26	37.5' - 39.0'	1.2'	51-90-100+	--	
				SPT-27	39.0' - 40.5'	1.5'	27-31-43	--	
				SPT-28	40.5' - 42.0'	1.2'	20-14-30	25	
				SPT-29	42.0' - 43.5'	0.9'	21-13-24	--	
				SPT-30	43.5' - 45.0'	0.8'	26-31-49	--	
				SPT-31	45.0' - 46.5'	1.5'	19-19-34	19	
				SPT-32	46.5' - 48.0'	1.4'	28-32-42	--	
				SPT-33	48.0' - 49.5'	1.3'	39-44-50	--	
				SPT-34	49.5' - 51.0'	1.3'	30-42-50+	20	
				SPT-35	51.0' - 52.5'	1.2'	39-48-50+	--	
				SPT-36	52.5' - 54.0'	1.2'	28-48-50+	--	
				SPT-37	54.0' - 55.5'	0.8'	49-50+	23	
				SPT-38	55.5' - 57.0'	1.1'	48-37-27	--	
				SPT-39	57.0' - 58.5'	0.9'	35-50+	--	
				SPT-40	58.5' - 60.0'	0.7'	9-18-49	16	
				SPT-41	65.0' - 66.5'	0.9'	25-50+	17	
				SPT-42	70.0' - 71.5'	0.6'	31-50+	--	
444.1'	75.0'								
				SPT-43	75.0' - 76.5'	1.1'	10-11-13	--	Backfilled with Bentonite Grout from 79.5-0.0

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN-22** Total Depth 79.5 ft

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
439.6'	79.5'	Mine Spoil: Lean to Sandy Lean Clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments. *(Continued)*		SPT-44	78.0' - 79.5'	1.0'	16-11-11	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY		
Project Name	Scrubber Sludge Complex	Boring No.	**STN-23**	Total Depth	63.0 ft
County	Muhlenberg	Surface Elevation	502.0 ft		
Project Type	Geotechnical Exploration	Date Started	12/7/09	Completed	12/8/09
Supervisor	B. Taylor Driller Steve Bradford	Depth to Water	28.9 ft	Date/Time	12/8/09
Logged By	B. Taylor	Depth to Water	--	Date/Time	--

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
502.0'	0.0'	Top of Hole							
		Mine spoil: Lean to Sandy Lean Clay with mixture of coal, shale, sandstone and siltstone fragments and lenses of gypsum/fly ash, brown to dark brown, gray to dark gray, moist to wet, soft to very stiff		SPT-1	0.0' - 1.5'	1.1'	3-8-12	16	
				SPT-2	1.5' - 3.0'	1.2'	10-16-14	--	
				SPT-3	3.0' - 4.5'	1.0'	14-19-15	--	
				SPT-4	4.5' - 6.0'	0.7'	3-4-5	17	Cobble Block at 5.2 ft.
				SPT-5	6.0' - 7.5'	0.6'	5-10-8	--	
				SPT-6	7.5' - 9.0'	0.9'	4-4-7	--	
				SPT-7	9.0' - 10.5'	0.9'	2-2-3	9	
				SPT-8	10.5' - 12.0'	1.2'	2-4-7	--	
				SPT-9	12.0' - 13.5'	1.3'	7-10-9	--	
				SPT-10	13.5' - 15.0'	0.7'	8-7-6	16	
				SPT-11	15.0' - 16.5'	0.2'	2-2-3	--	
				SPT-12	16.5' - 18.0'	0.7'	6-6-8	--	
				SPT-13	18.0' - 19.5'	1.5'	9-10-13	15	
				SPT-14	19.5' - 21.0'	1.5'	5-5-9	--	
				SPT-15	21.0' - 22.5'	1.0'	12-14-18	--	
				SPT-16	22.5' - 24.0'	1.4'	15-15-21	16	
				SPT-17	24.0' - 25.5'	0.7'	9-15-8	--	
				SPT-18	25.5' - 27.0'	1.1'	15-11-9	--	
				SPT-19	27.0' - 28.5'	0.8'	9-11-46	5	Cobbles at 27.0 ft
				SPT-20	28.5' - 30.0'	1.4'	33-14-10	--	
				SPT-21	30.0' - 31.5'	1.3'	10-10-33	--	
				SPT-22	31.5' - 33.0'	1.0'	24-14-19	7	
				SPT-23	33.0' - 34.5'	0.6'	15-13-11	--	
				SPT-24	34.5' - 36.0'	1.5'	7-11-8	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, KY

Project Name Scrubber Sludge Complex | Boring No. **STN-23** | Total Depth 63.0 ft

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
		Mine spoil: Lean to Sandy Lean Clay with mixture of coal, shale, sandstone and siltstone fragments and lenses of gypsum/fly ash, brown to dark brown, gray to dark gray, moist to wet, soft to very stiff *(Continued)*		SPT-25	36.0' - 37.5'	0.5'	50+	21	
				SPT-26	37.5' - 39.0'	0.3'	50+	--	
				SPT-27	39.0' - 40.5'	1.3'	5-10-8	--	
				SPT-28	40.5' - 42.0'	1.0'	5-18-15	19	
				SPT-29	45.0' - 46.5'	0.4'	50+	8	
				SPT-30	50.0' - 51.5'	1.5'	14-16-23	--	
				SPT-31	55.0' - 56.5'	1.2'	12-15-22	--	
				SPT-32	60.0' - 61.5'	1.2'	15-17-12	--	
439.0'	63.0'			SPT-33	61.5' - 63.0'	0.6'	14-12-10	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN-24** Total Depth 69.5 ft
County	Muhlenberg	Surface Elevation	508.7 ft
Project Type	Geotechnical Exploration	Date Started	11/11/09 Completed 11/11/09
Supervisor	AKS Driller Steve Bradford	Depth to Water	32.1 ft Date/Time 11/11/09
Logged By	AKS	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
508.7'	0.0'	Top of Hole							
		Mine Spoil: Lean to Sandy Lean Clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-1	0.0' - 1.5'	0.9'	5-5-10	14	
				SPT-2	1.5' - 3.0'	1.1'	10-12-16	--	
504.2'	4.5'			SPT-3	3.0' - 4.5'	1.0'	10-9-6	--	
				SPT-4	4.5' - 6.0'	0.4'	7-4-6	18	
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense		SPT-5	6.0' - 7.5'	1.2'	9-6-6	--	
				SPT-6	7.5' - 9.0'	1.1'	9-9-7	--	
				SPT-7	9.0' - 10.5'	0.6'	6-8-12	22	
				SPT-8	10.5' - 12.0'	1.5'	5-7-12	--	
				SPT-9	12.0' - 13.5'	1.2'	12-26-36	--	
				SPT-10	13.5' - 15.0'	1.3'	28-55-59	16	
				SPT-11	15.0' - 16.5'	1.4'	6-21-24	--	
				SPT-12	16.5' - 18.0'	1.5'	6-19-24	--	
				SPT-13	18.0' - 19.5'	1.5'	47-73-84	11	
				SPT-14	19.5' - 21.0'	1.3'	4-19-42	--	
				SPT-15	21.0' - 22.5'	1.4'	23-12-33	--	
				SPT-16	22.5' - 24.0'	1.5'	47-37-34	16	
483.9'	24.8'			SPT-17	24.0' - 25.5'	1.0'	4-7-11	--	
		Gypsum: Dark gray to gray, moist to wet, medium loose to dense		SPT-18	25.5' - 27.0'	1.5'	4-5-7	--	
480.2'	28.5'			SPT-19	27.0' - 28.5'	1.2'	3-3-6	23	
		Mine Spoil: Lean to Sandy Lean Clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-20	28.5' - 30.0'	1.1'	3-3-6	--	
				SPT-21	30.0' - 31.5'	1.4'	6-9-9	--	
				SPT-22	31.5' - 33.0'	1.1'	10-18-12	12	
				SPT-23	33.0' - 34.5'	0.8'	9-15-22	--	
				SPT-24	34.5' - 36.0'	1.2'	7-10-10	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, KY

Project Name Scrubber Sludge Complex | Boring No. **STN-24** | Total Depth 69.5 ft

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
Elevation	Depth								
		Mine Spoil: Lean to Sandy Lean Clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments. *(Continued)*		SPT-25	36.0' - 37.5'	1.4'	3-4-6	14	
				SPT-26	37.5' - 39.0'	1.3'	3-5-7	--	
				SPT-27	39.0' - 40.5'	1.2'	5-6-8	--	
				SPT-28	40.5' - 42.0'	1.2'	3-3-7	18	
				SPT-29	42.0' - 43.5'	1.0'	4-6-4	--	
				SPT-30	43.5' - 45.0'	1.1'	12-12-6	--	
				SPT-31	45.0' - 46.5'	1.2'	14-12-12	12	
				SPT-32	46.5' - 48.0'	0.7'	3-3-3	--	
				SPT-33	48.0' - 49.5'	0.4'	7-8-5	--	
				SPT-34	50.0' - 51.5'	1.5'	7-9-6	16	
				SPT-35	55.0' - 56.5'	1.4'	6-7-11	15	
				SPT-36	60.0' - 61.5'	1.1'	5-7-8	--	
				SPT-37	65.0' - 66.5'	1.4'	7-6-5	--	Backfilled with Bentonite Grout 69.5-0.0
439.2'	69.5'			SPT-38	68.0' - 69.5'	1.3'	6-7-6	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN-25** Total Depth 83.0 ft
County	Muhlenberg	Surface Elevation	522.7 ft
Project Type	Geotechnical Exploration	Date Started	11/19/09 Completed 11/20/09
Supervisor	AKS Driller Steve Bradford	Depth to Water	12.2 ft Date/Time 11/20/09
Logged By	AKS	Depth to Water	-- Date/Time --

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
522.7'	0.0'	Top of Hole							
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense		SPT-1	0.0' - 1.5'	1.0'	3-5-6	11	
				SPT-2	1.5' - 3.0'	1.2'	9-13-14	--	
				SPT-3	3.0' - 4.5'	1.5'	8-12-15	--	
				SPT-4	4.5' - 6.0'	0.9'	9-13-15	8	
				SPT-5	6.0' - 7.5'	1.4'	16-11-11	--	
				SPT-6	7.5' - 9.0'	1.4'	10-11-15	--	
				SPT-7	9.0' - 10.5'	1.1'	14-11-11	20	
				SPT-8	10.5' - 12.0'	1.4'	6-7-7	--	
				SPT-9	12.0' - 13.5'	1.1'	6-7-8	--	
				SPT-10	13.5' - 15.0'	1.4'	6-7-12	25	
				SPT-11	15.0' - 16.5'	1.5'	8-15-12	--	
				SPT-12	16.5' - 18.0'	1.5'	12-12-6	--	
				SPT-13	18.0' - 19.5'	1.5'	8-5-6	33	
				SPT-14	19.5' - 21.0'	1.3'	7-10-23	--	
				SPT-15	21.0' - 22.5'	0.6'	26-50+	--	
				SPT-16	22.5' - 24.0'	1.3'	20-25-26	23	
				SPT-17	24.0' - 25.5'	1.0'	14-19-28	--	
				SPT-18	25.5' - 27.0'	1.4'	27-26-22	--	
				SPT-19	27.0' - 28.5'	1.5'	32-23-27	19	
				SPT-20	28.5' - 30.0'	1.3'	28-32-50+	--	
				SPT-21	30.0' - 31.5'	0.7'	26-50+	--	
				SPT-22	31.5' - 33.0'	0.8'	49-50+	23	
				SPT-23	33.0' - 34.5'	0.3'	50+	--	
				SPT-24	34.5' - 36.0'	0.7'	30-50+	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, KY

Project Name Scrubber Sludge Complex | Boring No. **STN-25** | Total Depth 83.0 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
				SPT-25	36.0' - 37.5'	0.4'	50+	21	
				SPT-26	37.5' - 39.0'	0.5'	50+	--	
483.7'	39.0'								
		Gypsum: Dark gray to gray, moist to wet, medium loose to dense		SPT-27	39.0' - 40.5'	1.0'	31-40-50+	--	
				SPT-28	40.5' - 42.0'	0.4'	50+	19	
				SPT-29	42.0' - 43.5'	0.4'	50+	--	
				SPT-30	43.5' - 45.0'	0.9'	28-50+	--	
				SPT-31	45.0' - 46.5'	1.1'	36-49-50+	20	
				SPT-32	46.5' - 48.0'	0.5'	50+	--	
473.2'	49.5'			SPT-33	48.0' - 49.5'	1.0'	29-50+	--	
		Mine Spoil: Lean to Sandy Lean Clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-34	49.5' - 51.0'	1.1'	5-6-9	18	
				SPT-35	51.0' - 52.5'	0.8'	7-10-9	--	
				SPT-36	52.5' - 54.0'	1.2'	4-4-7	--	
				SPT-37	54.0' - 55.5'	1.5'	5-7-7	22	
				SPT-38	55.5' - 57.0'	1.5'	7-7-7	--	
				SPT-39	57.0' - 58.5'	1.3'	4-9-22	15	
				SPT-40	58.5' - 60.0'	0.4'	8-8-10	--	
				SPT-41	60.0' - 61.5'	1.1'	3-5-11	--	
				SPT-42	61.5' - 63.0'	1.4'	3-5-11	22	
				SPT-43	65.0' - 66.5'	1.1'	5-7-8	20	
				SPT-44	70.0' - 71.5'	1.4'	7-10-9	20	
				SPT-45	75.0' - 76.5'	1.3'	10-8-9	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, KY

Project Name Scrubber Sludge Complex | Boring No. **STN-25** | Total Depth 83.0 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
				SPT-46	80.0' - 81.5'	1.1'	2-7-10	--	Backfilled with Bentonite Grout 83.0-0.0
439.7'	83.0'			SPT-47	81.5' - 83.0'	1.2'	5-8-9	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY		
Project Name	Scrubber Sludge Complex	Boring No.	**STN-26**	Total Depth	43.0 ft
County	Muhlenberg	Surface Elevation	471.6 ft		
Project Type	Geotechnical Exploration	Date Started	1/5/10	Completed	1/6/10
Supervisor	B. Taylor Driller Steve Bradford	Depth to Water	Dry	Date/Time	1/6/10
Logged By	B. Taylor	Depth to Water	--	Date/Time	--

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
471.6'	0.0'	Top of Hole							
		Mine spoil, Clayey Sand brown to dark gray, moist to wet, medium stiff to very stiff, with siltstone, sandstone, shale and coal fragments		SPT-1	0.0' - 1.5'	0.7'	5-7-7	18	
				SPT-2	1.5' - 3.0'	1.5'	6-8-6	12	
				SPT-3	3.0' - 4.5'	0.7'	32-22-12	6	Sandstone observed in SPT
				SPT-4	4.5' - 6.0'	1.5'	6-5-6	13	
				SPT-5	6.0' - 7.5'	0.9'	6-8-9	13	
				SPT-6	7.5' - 9.0'	0.8'	10-12-14	9	
				SPT-7	9.0' - 10.5'	0.2'	11-13-16	6	Cobble blocked SPT
				SPT-8	10.5' - 12.0'	0.1'	8-8-8	3	Cobble blocked SPT
				SPT-9	12.0' - 13.5'	1.2'	9-10-10	10	
				SPT-10	13.5' - 15.0'	1.3'	10-12-11	12	
				SPT-11	15.0' - 16.5'	0.3'	7-9-12	7	Cobble blocked SPT
				SPT-12	16.5' - 18.0'	0.5'	16-17-18	11	Rock fragments in SPT
				SPT-13	18.0' - 19.5'	1.5'	15-20-13	9	
				SPT-14	19.5' - 21.0'	1.2'	6-7-8	9	
				SPT-15	21.0' - 22.5'	1.3'	10-10-12	15	
				SPT-16	25.0' - 26.5'	0.2'	2-3-3	--	Cobble blocked SPT at 25.2'
				SPT-17	30.0' - 31.5'	1.5'	12-12-13	14	
				SPT-18	35.0' - 36.5'	1.5'	4-6-7	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN-26** Total Depth 43.0 ft

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
Elevation	Depth								
		Mine spoil, Clayey Sand brown to dark gray, moist to wet, medium stiff to very stiff, with siltstone, sandstone, shale and coal fragments *(Continued)*		SPT-19	40.0' - 41.5'	1.3'	6-5-4	17	SPT sample was saturated
428.6'	43.0'			SPT-20	41.5' - 43.0'	1.5'	3-4-5	--	SPT sample was saturated
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN-27** Total Depth 63.0 ft
County	Muhlenberg	Surface Elevation	491.9 ft
Project Type	Geotechnical Exploration	Date Started	12/10/09 Completed 12/11/09
Supervisor	B. Taylor Driller Steve Bradford	Depth to Water	5.4 ft Date/Time 12/11/09
Logged By	B. Taylor	Depth to Water	-- Date/Time --

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
491.9'	0.0'	Top of Hole							
		Mine spoil, Lean Clay brown to dark gray, moist to wet, soft to stiff, with siltstone, sandstone, shale and coal fragments		SPT-1	0.0' - 1.5'	0.6'	2-4-7	--	
				SPT-2	1.5' - 3.0'	1.0'	7-9-14	15	
				SPT-3	3.0' - 4.5'	1.2'	14-20-18	13	
				SPT-4	4.5' - 6.0'	1.3'	4-5-7	16	
				SPT-5	6.0' - 7.5'	0.6'	4-4-3	--	
482.9'	9.0'			SPT-6	7.5' - 9.0'	0.8'	9-9-10	16	
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense		SPT-7	9.0' - 10.5'	1.0'	7-9-10	19	Gypsum
				SPT-8	10.5' - 12.0'	1.0'	11-14-21	19	
				SPT-9	12.0' - 13.5'	1.0'	21-33-34	15	
				SPT-10	13.5' - 15.0'	1.3'	9-9-12	21	
475.4'	16.5'			SPT-11	15.0' - 16.5'	0.6'	3-4-3	19	
		Mine spoil, Clayey Sand brown to dark gray, moist to wet, soft to stiff, with siltstone, sandstone, shale and coal fragments		SPT-12	16.5' - 18.0'	1.0'	3-4-6	18	
				SPT-13	18.0' - 19.5'	1.0'	6-6-7	23	
				SPT-14	19.5' - 21.0'	1.0'	4-7-9	15	
				SPT-15	21.0' - 22.5'	0.8'	8-8-9	13	
				SPT-16	22.5' - 24.0'	1.1'	5-5-10	24	
				SPT-17	24.0' - 25.5'	1.5'	5-7-11	--	
				SPT-18	25.5' - 27.0'	0.8'	15-15-15	15	
				SPT-19	27.0' - 28.5'	0.6'	15-18-10	--	
				SPT-20	28.5' - 30.0'	1.0'	14-11-11	12	
				SPT-21	30.0' - 31.5'	1.5'	12-14-10	--	
				SPT-22	31.5' - 33.0'	0.9'	13-14-18	16	
				SPT-23	33.0' - 34.5'	0.9'	20-18-14	--	
				SPT-24	34.5' - 36.0'	0.5'	9-11-17	15	Cobble block

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, KY

Project Name Scrubber Sludge Complex | Boring No. **STN-27** | Total Depth 63.0 ft

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
		Mine spoil, Clayey Sand brown to dark gray, moist to wet, soft to stiff, with siltstone, sandstone, shale and coal fragments *(Continued)*		SPT-25	36.0' - 37.5'	1.1'	14-20-22	--	
				SPT-26	37.5' - 39.0'	0.5'	15-15-17	12	
				SPT-27	39.0' - 40.5'	0.9'	9-12-12	--	
				SPT-28	40.5' - 42.0'	1.0'	9-11-10	16	
				SPT-29	45.0' - 46.5'	0.5'	13-13-12	--	
				SPT-30	50.0' - 51.5'	0.9'	13-10-11	14	
				SPT-31	55.0' - 56.5'	1.0'	10-18-18	--	
				SPT-32	60.0' - 61.5'	1.0'	8-9-10	18	
428.9'	63.0'			SPT-33	61.5' - 63.0'	1.2'	15-21-22	19	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY		
Project Name	Scrubber Sludge Complex	Boring No.	**STN-28**	Total Depth	41.5 ft
County	Muhlenberg	Surface Elevation	470.4 ft		
Project Type	Geotechnical Exploration	Date Started	1/4/10	Completed	1/5/10
Supervisor	B. Taylor Driller Steve Bradford	Depth to Water	Dry	Date/Time	1/5/10
Logged By	B. Taylor	Depth to Water	--	Date/Time	--

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
470.4'	0.0'	Top of Hole							
		Mine Spoil: Lean to Fat Clay with intermediate sand lenses, brown to dark gray, moist to wet, medium stiff to vey stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-1	0.0' - 1.5'	1.0'	2-4-4	--	
				SPT-2	1.5' - 3.0'	0.9'	6-6-5	--	
				SPT-3	3.0' - 4.5'	1.5'	10-8-12	--	
				SPT-4	4.5' - 6.0'	1.5'	3-4-5	--	
				SPT-5	6.0' - 7.5'	1.4'	7-8-10	--	
				SPT-6	7.5' - 9.0'	1.2'	11-15-9	--	
				SPT-7	9.0' - 10.5'	1.3'	2-3-3	--	
				SPT-8	10.5' - 12.0'	1.4'	4-11-8	--	
				SPT-9	12.0' - 13.5'	1.0'	11-15-11	--	
				SPT-10	13.5' - 15.0'	1.3'	7-8-11	--	
				SPT-11	15.0' - 16.5'	1.3'	6-13-35	--	
				SPT-12	16.5' - 18.0'	0.8'	11-50+	--	
				SPT-13	18.0' - 19.5'	0.9'	11-15-12	--	
				SPT-14	20.0' - 21.5'	1.5'	16-7-11	--	
				SPT-15	25.0' - 26.5'	0.4'	12-15-13	--	Cobble blocked SPT at 25.4'
				SPT-16	30.0' - 31.5'	0.2'	11-12-10	--	
				SPT-17	35.0' - 36.5'	1.1'	21-22-21	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number 175569040 Location Drakesboro, KY

Project Name Scrubber Sludge Complex Boring No. **STN-28** Total Depth 41.5 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
428.9'	41.5'			SPT-18	40.0' - 41.5'	0.2'	15-26-36	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY		
Project Name	Scrubber Sludge Complex	Boring No.	**STN-29**	Total Depth	59.5 ft
County	Muhlenberg	Surface Elevation	488.8 ft		
Project Type	Geotechnical Exploration	Date Started	12/14/09	Completed	12/15/09
Supervisor	B. Taylor Driller Steve Bradford	Depth to Water	Dry	Date/Time	12/16/09
Logged By	B. Taylor	Depth to Water	--	Date/Time	--

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
488.8'	0.0'	Top of Hole							
		Mine Spoil: Lean to Fat Clay with intermediate sand lenses, brown to dark gray, moist to wet, medium stiff to vey stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-1	0.0' - 1.5'	0.6'	2-3-4	13	
				SPT-2	1.5' - 3.0'	0.9'	1-2-5	16	
				SPT-3	3.0' - 4.5'	1.5'	5-5-7	16	
				SPT-4	4.5' - 6.0'	1.3'	5-6-7	16	
				SPT-5	6.0' - 7.5'	1.0'	7-12-13	18	
				SPT-6	7.5' - 9.0'	0.9'	14-15-18	13	
				SPT-7	9.0' - 10.5'	1.1'	4-6-7	14	
				SPT-8	10.5' - 12.0'	1.5'	8-9-9	12	
				SPT-9	12.0' - 13.5'	1.1'	14-17-16	11	
				SPT-10	13.5' - 15.0'	1.1'	22-14-17	14	
				SPT-11	15.0' - 16.5'	0.5'	4-4-8	12	Cobble blocked SPT at 15.5'
				SPT-12	16.5' - 18.0'	0.9'	8-8-22	12	
				SPT-13	18.0' - 19.5'	1.0'	32-13-11	15	
				SPT-14	19.5' - 21.0'	1.0'	8-8-12	14	
				SPT-15	21.0' - 22.5'	1.5'	12-11-10	15	
				SPT-16	22.5' - 24.0'	0.3'	8-9-10	--	
				SPT-17	24.0' - 25.5'	1.5'	8-13-17	12	
				SPT-18	25.5' - 27.0'	0.7'	11-15-20	9	Cobble blocked SPT at 25.8'
				SPT-19	27.0' - 28.5'	1.2'	14-15-15	16	
				SPT-20	28.5' - 30.0'	0.6'	9-10-5	14	
				SPT-21	30.0' - 31.5'	1.5'	2-5-5	11	
				SPT-22	31.5' - 33.0'	1.4'	6-6-5	13	
				SPT-23	33.0' - 34.5'	1.5'	3-6-6	19	
				SPT-24	34.5' - 36.0'	0.7'	5-4-5	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, KY

Project Name Scrubber Sludge Complex | Boring No. **STN-29** | Total Depth 59.5 ft

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
Elevation	Depth								
		Mine Spoil: Lean to Fat Clay with intermediate sand lenses, brown to dark gray, moist to wet, medium stiff to vey stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments. *(Continued)*		SPT-25	36.0' - 37.5'	0.7'	5-18-14	13	
				SPT-26	37.5' - 39.0'	1.3'	14-16-19	12	
				SPT-27	40.0' - 41.5'	1.5'	15-15-17	--	
				SPT-28	45.0' - 46.5'	0.4'	14-23-24	--	Cobble blocked SPT at 45.4'
				SPT-29	50.0' - 51.5'	1.1'	16-17-15	12	
				SPT-30	55.0' - 56.5'	1.3'	6-6-9	--	
				SPT-31	56.5' - 58.0'	1.5'	15-15-19	18	
429.3'	59.5'			SPT-32	58.0' - 59.5'	1.4'	11-13-13	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040		Location	Drakesboro, KY	
Project Name	Scrubber Sludge Complex		Boring No.	**STN-30**	Total Depth 39.5 ft
County	Muhlenberg		Surface Elevation	470.7 ft	
Project Type	Geotechnical Exploration		Date Started	12/17/09	Completed 12/18/09
Supervisor	B. Taylor	Driller Steve Bradford	Depth to Water	Dry	Date/Time 12/18/09
Logged By	B. Taylor		Depth to Water	--	Date/Time --

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
470.7'	0.0'	Top of Hole							
		Mine Spoil: Lean Clay to Clayey sand with intermediate sand lenses, brown to dark gray, moist to wet, stiff to very stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-1	0.0' - 1.5'	1.5'	2-2-6	17	
				SPT-2	1.5' - 3.0'	0.7'	7-6-6	29	
				SPT-3	3.0' - 4.5'	0.1'	5-4-6	--	
				SPT-4	4.5' - 6.0'	1.5'	3-5-5	16	
				SPT-5	6.0' - 7.5'	1.0'	5-7-7	15	
				SPT-6	7.5' - 9.0'	0.1'	6-7-8	--	Cobble blocked SPT at 7.6'
				SPT-7	9.0' - 10.5'	1.2'	7-9-9	10	
				SPT-8	10.5' - 12.0'	1.4'	8-10-11	12	
				SPT-9	12.0' - 13.5'	1.3'	11-11-11	12	
				SPT-10	13.5' - 15.0'	1.5'	9-7-11	13	
				SPT-11	15.0' - 16.5'	1.5'	3-6-6	12	
				SPT-12	16.5' - 18.0'	1.5'	7-9-11	13	
				SPT-13	18.0' - 19.5'	1.5'	10-10-11	15	
				SPT-14	25.0' - 26.5'	1.0'	11-11-9	5	
				SPT-15	30.0' - 31.5'	1.2'	11-10-9	9	
				SPT-16	35.0' - 36.5'	1.3'	5-6-9	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN-30** Total Depth 39.5 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
				SPT-17	36.5' - 38.0'	1.5'	9-14-13	--	
431.2'	39.5'			SPT-18	38.0' - 39.5'	1.5'	11-12-11	12	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN-31** Total Depth 58.0 ft
County	Muhlenberg	Surface Elevation	486.6 ft
Project Type	Geotechnical Exploration	Date Started	12/16/09 Completed 12/16/09
Supervisor	B. Taylor Driller Steve Bradford	Depth to Water	Dry Date/Time 12/16/09
Logged By	B. Taylor	Depth to Water	-- Date/Time --

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
486.6'	0.0'	Top of Hole							
		Mine Spoil: Lean to Fat Clay with intermediate sand lenses, brown to dark gray, moist to wet, medium stiff to very stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-1	0.0' - 1.5'	0.8'	2-2-3	--	
				SPT-2	1.5' - 3.0'	1.5'	3-5-5	14	
				SPT-3	3.0' - 4.5'	1.0'	6-10-9	13	
				SPT-4	4.5' - 6.0'	1.4'	5-6-6	15	
				SPT-5	6.0' - 7.5'	1.3'	6-10-11	12	
				SPT-6	7.5' - 9.0'	0.6'	10-10-11	--	Cobble blocked SPT at 8.1'
476.1'	10.5'			SPT-7	9.0' - 10.5'	1.2'	4-6-9	12	
		Sand with intermediate layers of clay and gravel, brown, moist to wet, very loose to dense		SPT-8	10.5' - 12.0'	1.2'	14-12-11	8	
				SPT-9	12.0' - 13.5'	1.0'	8-7-6	8	
				SPT-10	13.5' - 15.0'	1.5'	8-9-6	8	
				SPT-11	15.0' - 16.5'	1.2'	3-2-2	5	
				SPT-12	16.5' - 18.0'	1.5'	1-2-1	5	
				SPT-13	18.0' - 19.5'	1.3'	1-5-16	4	
				SPT-14	19.5' - 21.0'	1.5'	15-19-16	5	
				SPT-15	21.0' - 22.5'	1.4'	11-9-9	4	
				SPT-16	22.5' - 24.0'	1.5'	5-5-5	5	
				SPT-17	24.0' - 25.5'	1.5'	2-3-3	5	
				SPT-18	25.5' - 27.0'	1.4'	2-2-5	7	
				SPT-19	27.0' - 28.5'	1.3'	2-2-3	4	
				SPT-20	28.5' - 30.0'	1.2'	1-2-2	6	
				SPT-21	30.0' - 31.5'	1.3'	2-8-13	7	
				SPT-22	31.5' - 33.0'	1.4'	8-7-6	6	
452.1'	34.5'			SPT-23	33.0' - 34.5'	1.4'	4-6-8	14	
				SPT-24	34.5' - 36.0'	1.0'	4-4-6	19	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, KY

Project Name Scrubber Sludge Complex | Boring No. **STN-31** | Total Depth 58.0 ft

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
Elevation	Depth								
		Mine Spoil: Lean to Fat Clay with intermediate sand lenses, brown to dark gray, moist to wet, stiff to very stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments. *(Continued)*		SPT-25	36.0' - 37.5'	0.9'	8-9-11	17	
				SPT-26	40.0' - 41.5'	1.1'	3-9-9	15	
				SPT-27	45.0' - 46.5'	1.0'	5-5-5	--	
				SPT-28	50.0' - 51.5'	0.7'	9-10-12	10	
				SPT-29	55.0' - 56.5'	1.4'	7-7-8	15	
428.6'	58.0'			SPT-30	56.5' - 58.0'	1.5'	9-10-12	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040		Location	Drakesboro, KY	
Project Name	Scrubber Sludge Complex		Boring No.	**STN-20A**	Total Depth 27.0 ft
County	Muhlenberg		Surface Elevation	489.7 ft	
Project Type	Geotechnical Exploration		Date Started	12/3/09	Completed 12/3/09
Supervisor	R. Riker	Driller Steve Bradford	Depth to Water	Dry	Date/Time 12/3/09
Logged By	R. Riker		Depth to Water	--	Date/Time --

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
489.7'	0.0'	Top of Hole							
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, dense							
484.2'	5.5'								Top cover Mine spoil
		Mine Spoil: Lean to Sandy Lean Clay, brown to dark gray, moist to wet, stiff to very stiff, heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		ST-1	5.0' - 7.0'	1.4'		12	
				ST-2	10.0' - 12.0'	1.4'		12	
				ST-3	15.0' - 17.0'	1.2'		13	
									Boulder zone from 18.0 to 27.0(BOH)
				ST-4	20.0' - 22.0'	0.0'		--	
				ST-5	23.0' - 25.0'	0.0'		--	
									PZ Installed
462.7'	27.0'			ST-6	25.0' - 27.0'	0.0'		--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040		Location	Drakesboro, KY	
Project Name	Scrubber Sludge Complex		Boring No.	**STN-21A**	Total Depth 27.0 ft
County	Muhlenberg		Surface Elevation	506.5 ft	
Project Type	Geotechnical Exploration		Date Started	12/1/09	Completed 12/1/09
Supervisor	R. Riker	Driller Steve Bradford	Depth to Water	10.0 ft	Date/Time 12/1/09
Logged By	R. Riker		Depth to Water	--	Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
506.5'	0.0'	Top of Hole							
		Mine Spoil: Lean to Sandy Lean Clay, brown to dark gray, moist to wet, stiff to very stiff, heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.							
501.5'	5.0'	Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense(Est.)		ST-1	5.0' - 7.0'	1.7'		16	Top Cover by minespoil roadway
				ST-2	10.0' - 12.0'	1.1'		24	
				ST-3	15.0' - 17.0'	1.6'		24	
				ST-4	20.0' - 22.0'	1.0'		24	Backfilled by 2 bags Quikgrout, and 1 bag Portland Cement
483.8'	22.7'	Gypsum: Dark gray to gray, moist to wet, medium loose to dense							
				ST-5	25.0' - 27.0'	1.5'		23	
479.5'	27.0'	No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040		Location	Drakesboro, KY	
Project Name	Scrubber Sludge Complex		Boring No.	**STN-22A**	Total Depth 32.0 ft
County	Muhlenberg		Surface Elevation	519.4 ft	
Project Type	Geotechnical Exploration		Date Started	11/18/09	Completed 11/19/09
Supervisor	AKS	Driller Steve Bradford	Depth to Water	12.7 ft	Date/Time 11/19/09
Logged By	AKS		Depth to Water	--	Date/Time --

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
519.4'	0.0'	Top of Hole							
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense		ST-1	5.0' - 7.0'	1.8'		17	
				ST-2	10.0' - 12.0'	1.7'		21	
				ST-3	15.0' - 17.0'	2.0'		35	
				ST-4	20.0' - 22.0'	2.0'		28	
				ST-5	25.0' - 26.0'	1.0'		25	
									Piezeometer tip set at 29.0 ft.
487.4'	32.0'	No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040		Location	Drakesboro, KY	
Project Name	Scrubber Sludge Complex		Boring No.	**STN-23A**	Total Depth 35.0 ft
County	Muhlenberg		Surface Elevation	501.8 ft	
Project Type	Geotechnical Exploration		Date Started	12/9/09	Completed 12/9/09
Supervisor	B. Taylor	Driller Steve Bradford	Depth to Water	Dry	Date/Time 12/9/09
Logged By	B. Taylor		Depth to Water	--	Date/Time --

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
501.8'	0.0'	Top of Hole							
		Mine spoil: Lean to Sandy Lean Clay with mixture of coal, shale, sandstone and siltstone fragments and lenses of gypsum/fly ash, brown to dark brown, gray to dark gray, moist to wet, soft to very stiff		ST-1	5.0' - 7.0'	1.7'		16	
				ST-2	10.0' - 12.0'	1.7'		15	
				ST-3	15.0' - 17.0'	1.2'		17	
				ST-4	20.0' - 22.0'	1.4'		15	
466.8'	35.0'								
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040		Location	Drakesboro, KY	
Project Name	Scrubber Sludge Complex		Boring No.	**STN-24A**	Total Depth 22.0 ft
County	Muhlenberg		Surface Elevation	508.7 ft	
Project Type	Geotechnical Exploration		Date Started	11/12/09	Completed 11/12/09
Supervisor	AKS	Driller Steve Bradford	Depth to Water	Dry	Date/Time 11/12/09
Logged By	AKS		Depth to Water	--	Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
508.7'	0.0'	Top of Hole							
505.7'	3.0'	Mine Spoil: Lean to Sandy Lean Clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		ST-1	5.0' - 7.0'	2.0'		18	
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense		ST-2	10.0' - 12.0'	1.8'		22	
				ST-3	15.0' - 17.0'	1.1'		20	
486.7'	22.0'			ST-4	20.0' - 22.0'	1.7'		21	Backfilled with Bentonite Grout 22.0-0.0
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040		Location	Drakesboro, KY	
Project Name	Scrubber Sludge Complex		Boring No.	**STN-25A**	Total Depth 36.0 ft
County	Muhlenberg		Surface Elevation	523.3 ft	
Project Type	Geotechnical Exploration		Date Started	12/1/09	Completed 12/1/09
Supervisor	R. Riker	Driller Steve Bradford	Depth to Water	20.0 ft	Date/Time 12/1/09
Logged By	R. Riker		Depth to Water	--	Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
523.3'	0.0'	Top of Hole							
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense(Est.)							
				ST-1	5.0' - 7.0'	2.0'		--	Top cover Gypsum ash. CME 85 Truck used W/ 4 1/4 HSA and 2.5' shelby tube
				ST-2	10.0' - 12.0'	1.9'		11	
				ST-3	15.0' - 17.0'	2.0'		28	
				ST-4	20.0' - 22.0'	2.0'		26	ST-4 refused and was crushed, no recovery
				ST-5	25.0' - 27.0'	0.0'		--	PZ installed
487.3'	36.0'								
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040		Location	Drakesboro, KY	
Project Name	Scrubber Sludge Complex		Boring No.	**STN-26A**	Total Depth 19.9 ft
County	Muhlenberg		Surface Elevation	471.4 ft	
Project Type	Geotechnical Exploration		Date Started	1/6/10	Completed 1/6/10
Supervisor	B. Taylor	Driller Steve Bradford	Depth to Water	Dry	Date/Time 1/6/10
Logged By	B. Taylor		Depth to Water	--	Date/Time --

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
471.4'	0.0'	Top of Hole							
		Mine spoil, brown to dark gray, moist to wet, medium stiff to very stiff, with siltstone, sandstone, shale and coal fragments		ST-1	5.0' - 7.0'	1.5'		13	
				ST-2	10.0' - 12.0'	1.4'		15	
451.5'	19.9'								
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040		Location	Drakesboro, KY	
Project Name	Scrubber Sludge Complex		Boring No.	**STN-27A**	Total Depth 27.0 ft
County	Muhlenberg		Surface Elevation	492.2 ft	
Project Type	Geotechnical Exploration		Date Started	12/10/09	Completed 12/10/09
Supervisor	B. Taylor	Driller Steve Bradford	Depth to Water	6.3 ft	Date/Time 12/11/09
Logged By	B. Taylor		Depth to Water	--	Date/Time --

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
492.2'	0.0'	Top of Hole							
		Mine spoil, brown to dark gray, moist to wet, soft to stiff, with siltstone, sandstone, shale and coal fragments		ST-1	5.0' - 7.0'	1.3'		15	
				ST-2	10.0' - 12.0'	0.6'		--	
				ST-3	15.0' - 17.0'	1.2'		25	
				ST-4	20.0' - 22.0'	0.0'		--	
				ST-5	25.0' - 27.0'	0.2'		--	
465.2'	27.0'	No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040		Location	Drakesboro, KY	
Project Name	Scrubber Sludge Complex		Boring No.	**STN-28A**	Total Depth 19.8 ft
County	Muhlenberg		Surface Elevation	470.2 ft	
Project Type	Geotechnical Exploration		Date Started	1/5/10	Completed 1/5/10
Supervisor	B. Taylor	Driller Steve Bradford	Depth to Water	Dry	Date/Time 1/5/10
Logged By	B. Taylor		Depth to Water	--	Date/Time --

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
470.2'	0.0'	Top of Hole							
		Mine Spoil: Lean to Fat Clay with intermediate sand lenses, brown to dark gray, moist to wet, medium stiff to vey stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		ST-1	5.0' - 7.0'	1.3'		--	
				ST-2	10.0' - 12.0'	1.1'		--	
450.4'	19.8'								
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040		Location	Drakesboro, KY	
Project Name	Scrubber Sludge Complex		Boring No.	**STN-29A**	Total Depth 22.0 ft
County	Muhlenberg		Surface Elevation	489.1 ft	
Project Type	Geotechnical Exploration		Date Started	12/15/09	Completed 12/16/09
Supervisor	B. Taylor	Driller Steve Bradford	Depth to Water	Dry	Date/Time 12/16/09
Logged By	B. Taylor		Depth to Water	--	Date/Time --

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
489.1'	0.0'	Top of Hole							
		Mine Spoil: Lean to Fat Clay with intermediate sand lenses, brown to dark gray, moist to wet, medium stiff to vey stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		ST-1	5.0' - 7.0'	1.1'		17	
				ST-2	10.0' - 12.0'	1.1'		20	
				ST-3	15.0' - 17.0'	0.3'		--	
467.1'	22.0'			ST-4	20.0' - 22.0'	0.8'		--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

Project Number	175569040		Location	Drakesboro, KY	
Project Name	Scrubber Sludge Complex		Boring No.	**STN-30A**	Total Depth 18.0 ft
County	Muhlenberg		Surface Elevation	470.5 ft	
Project Type	Geotechnical Exploration		Date Started	1/4/10	Completed 1/4/10
Supervisor	B. Taylor	Driller Steve Bradford	Depth to Water	Dry	Date/Time 1/4/10
Logged By	B. Taylor		Depth to Water	--	Date/Time --

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
470.5'	0.0'	Top of Hole							
		Mine Spoil: Lean to Fat Clay with intermediate sand lenses, brown to dark gray, moist to wet, stiff to very stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		ST-1	5.0' - 7.0'	1.4'		--	
				ST-2	10.0' - 12.0'	1.4'		--	
452.5'	18.0'								
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

SUBSURFACE LOG

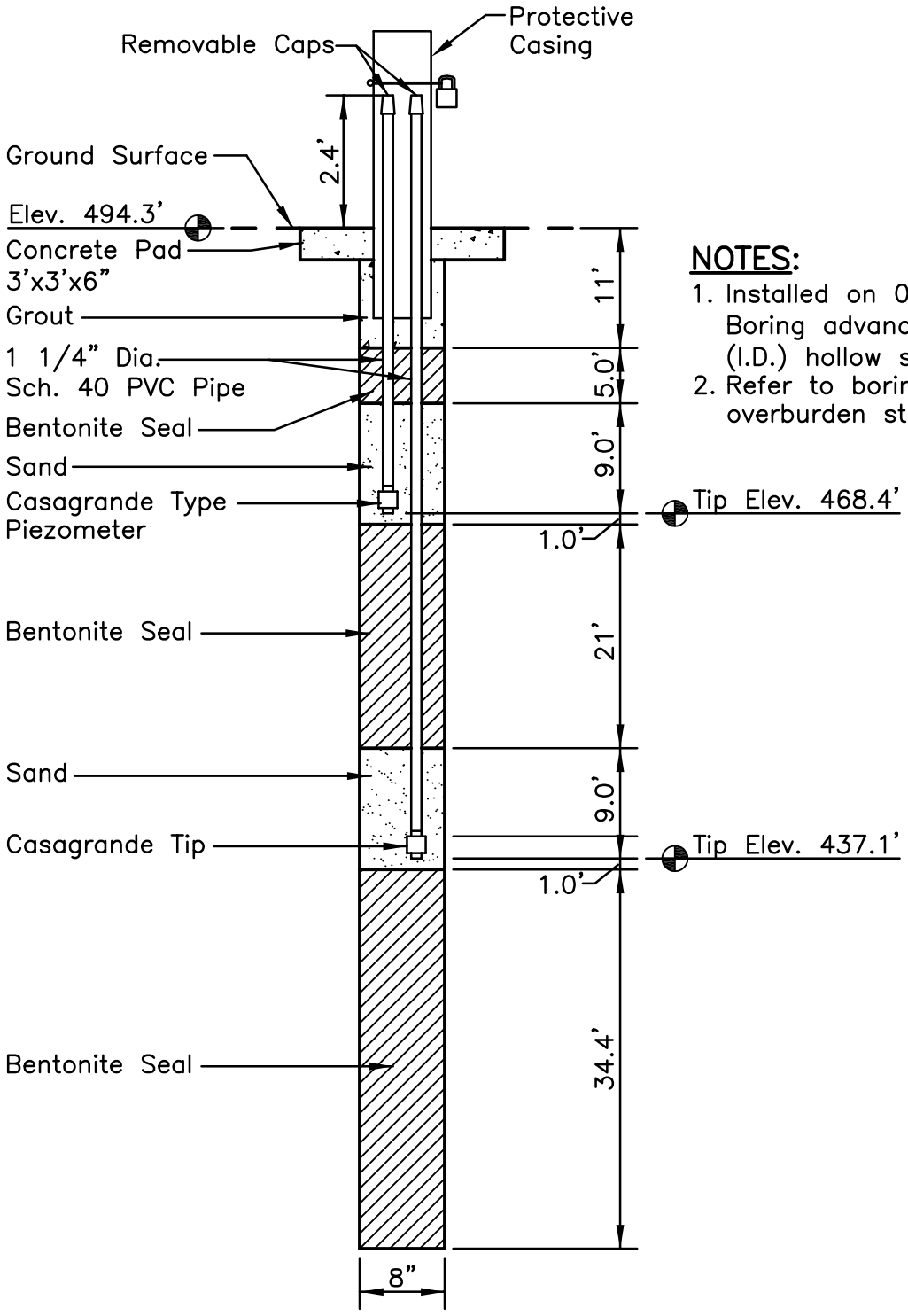
Project Number	175569040		Location	Drakesboro, KY	
Project Name	Scrubber Sludge Complex		Boring No.	**STN-31A**	Total Depth 22.0 ft
County	Muhlenberg		Surface Elevation	487.0 ft	
Project Type	Geotechnical Exploration		Date Started	12/17/09	Completed 12/17/09
Supervisor	B. Taylor	Driller Steve Bradford	Depth to Water	Dry	Date/Time 12/17/09
Logged By	B. Taylor		Depth to Water	--	Date/Time --

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
487.0'	0.0'	Top of Hole							
		Mine Spoil: Lean to Fat Clay with intermediate sand lenses, brown to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone, and siltstone fragments.		ST-1	5.0' - 7.0'	1.4'		9	
				ST-2	10.0' - 12.0'	1.2'		17	
				ST-3	15.0' - 17.0'	0.9'		12	
467.0'	20.0'								
465.0'	22.0'	Sand with intermediate layers of clay and gravel, browm, moist to wet, medium dense to dense		ST-4	20.0' - 22.0'	1.6'		8	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 3/2/10

Appendix D

Instrumentation Logs



NOTES:

1. Installed on 02/02/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 332,046.91
Easting: 1,634,482.61
Ground Elevation: 494.3 feet

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

PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
V:\1755\ACTIVE\175569040\GEOTECHNICAL\DRAWING\SCRUBBER\69040C-PAF-101-PZ02.DWG

PIEZOMETER STN-2
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
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www.stantec.com

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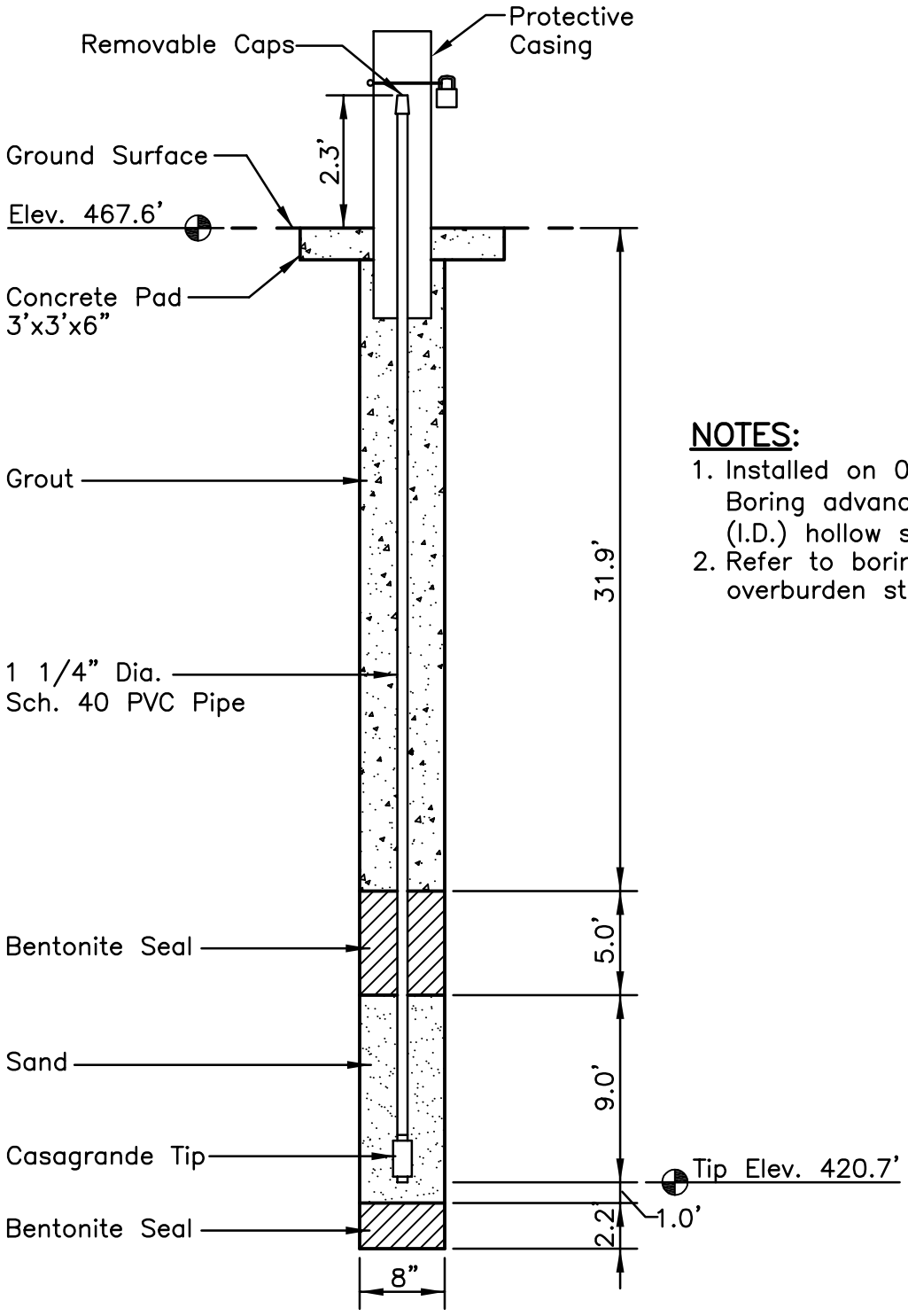
CHECKED BY	SV	SCALE	NTS	2.	4.	



NOTES:

1. Installed on 02/17/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 331,937.06
Easting: 1,634,520.16
Ground Elevation: 467.6 feet

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

PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
V:\1755\ACTIVE\175569040\GEOTECHNICAL\DRAWING\SCRUBBER\69040C-PAF-101-PZ04.DWG

PIEZOMETER STN-4
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

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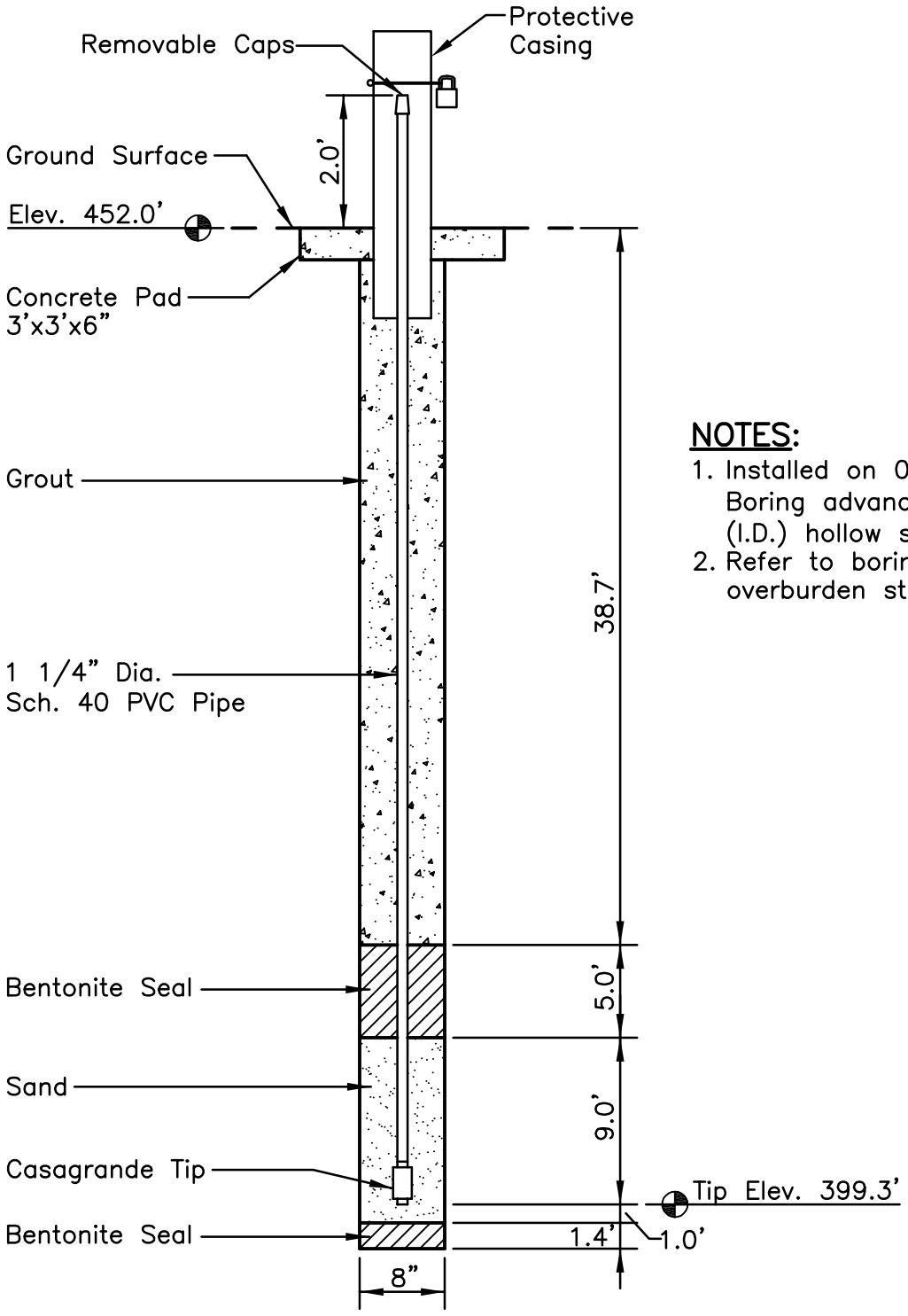

NOTES:

1. Installed on 02/09/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 331,826.79
Easting: 1,634,555.94
Ground Elevation: 452.0 feet

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

PIEZOMETER STN-5
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

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CHECKED BY	SV	SCALE	NTS	2. 4.	

PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
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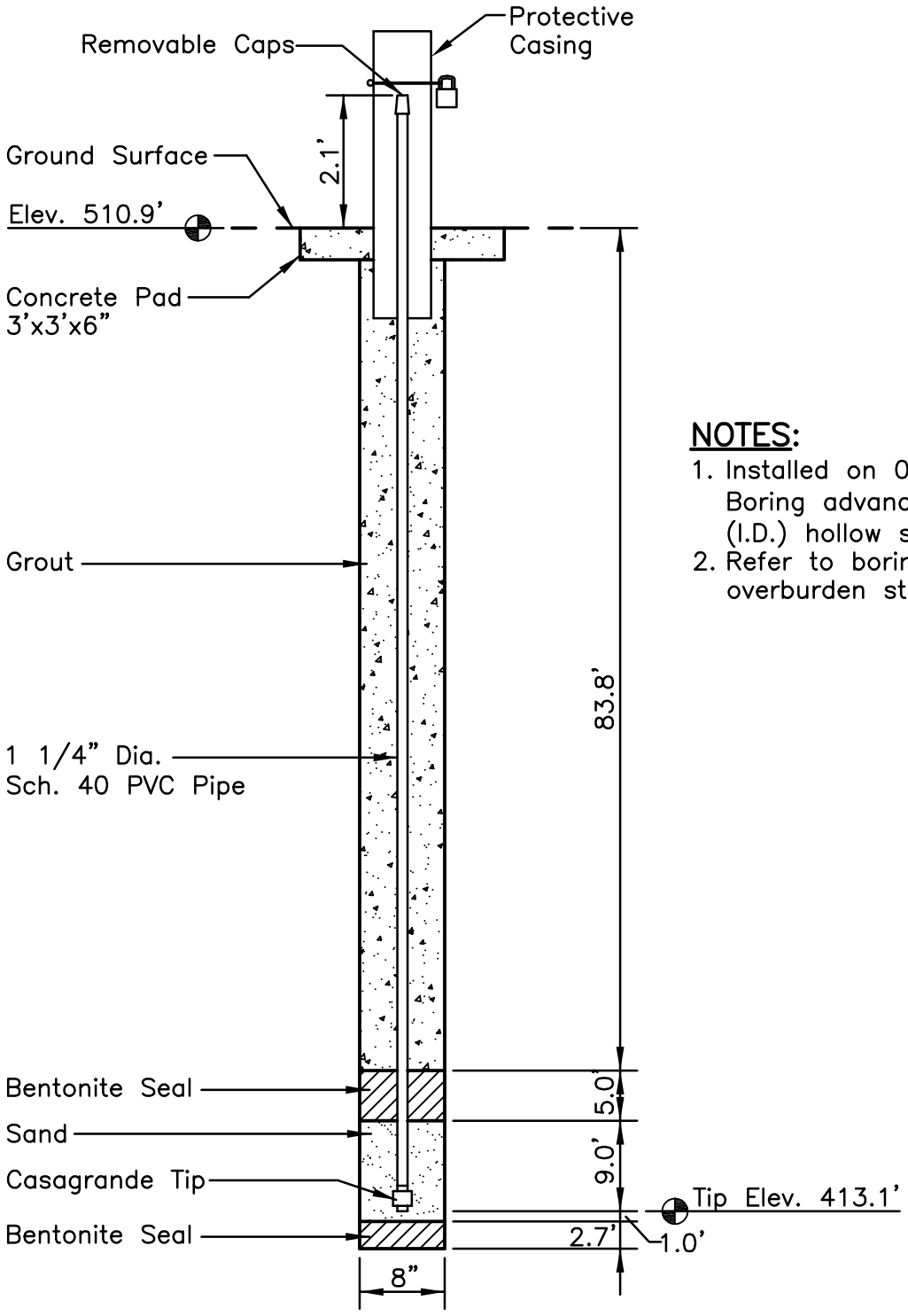

NOTES:

1. Installed on 02/17/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 332,677.36
Easting: 1,635,279.66
Ground Elevation: 510.9 feet

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

PIEZOMETER STN-6
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

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CHECKED BY	SV	SCALE	NTS	2. 4.	

PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
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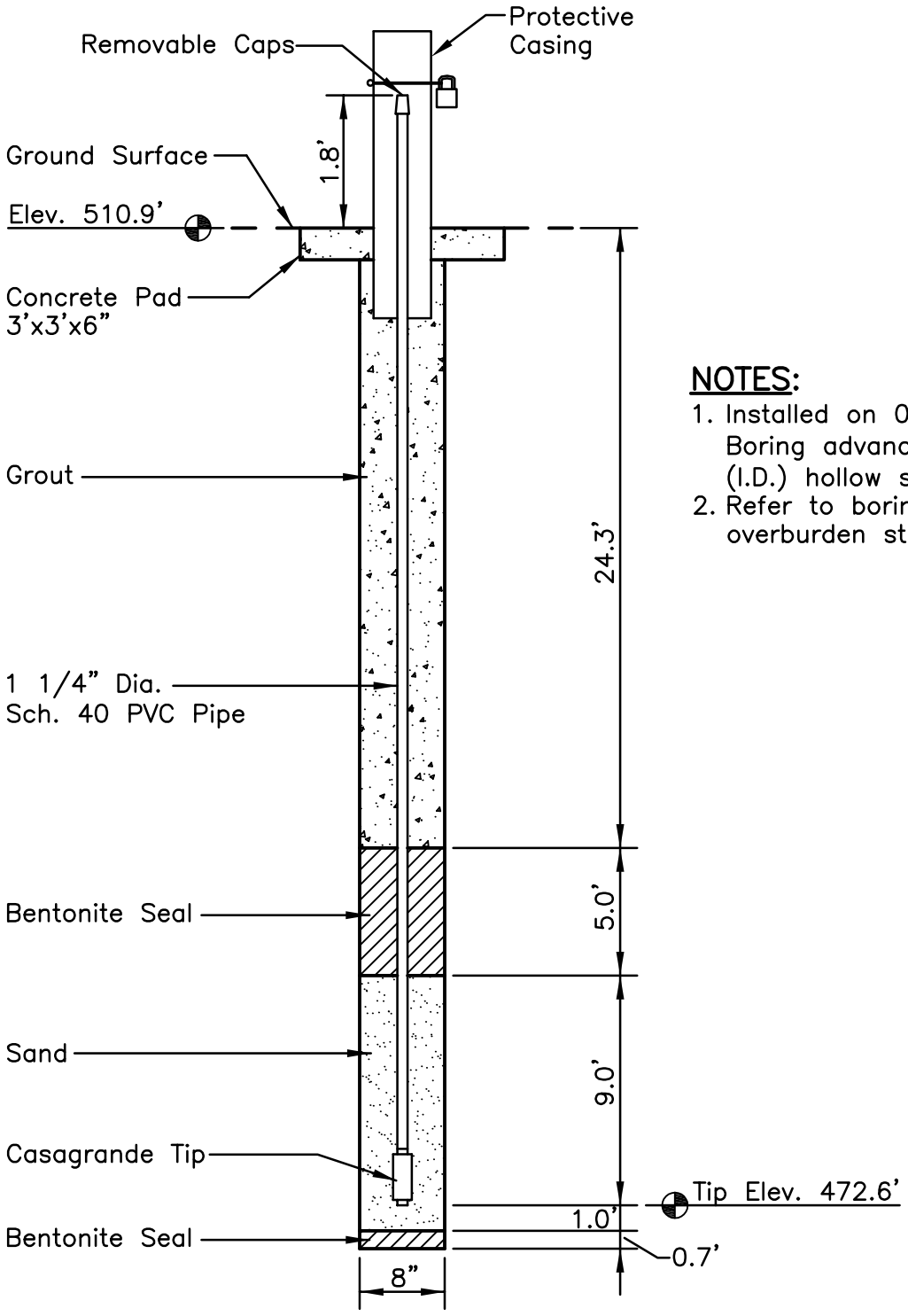

NOTES:

1. Installed on 02/18/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 332,677.36*
Easting: 1,635,279.66*
Ground Elevation: 510.9 feet*

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

PIEZOMETER STN-6A
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

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CHECKED BY	SV	SCALE	NTS	2. 4.	

PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
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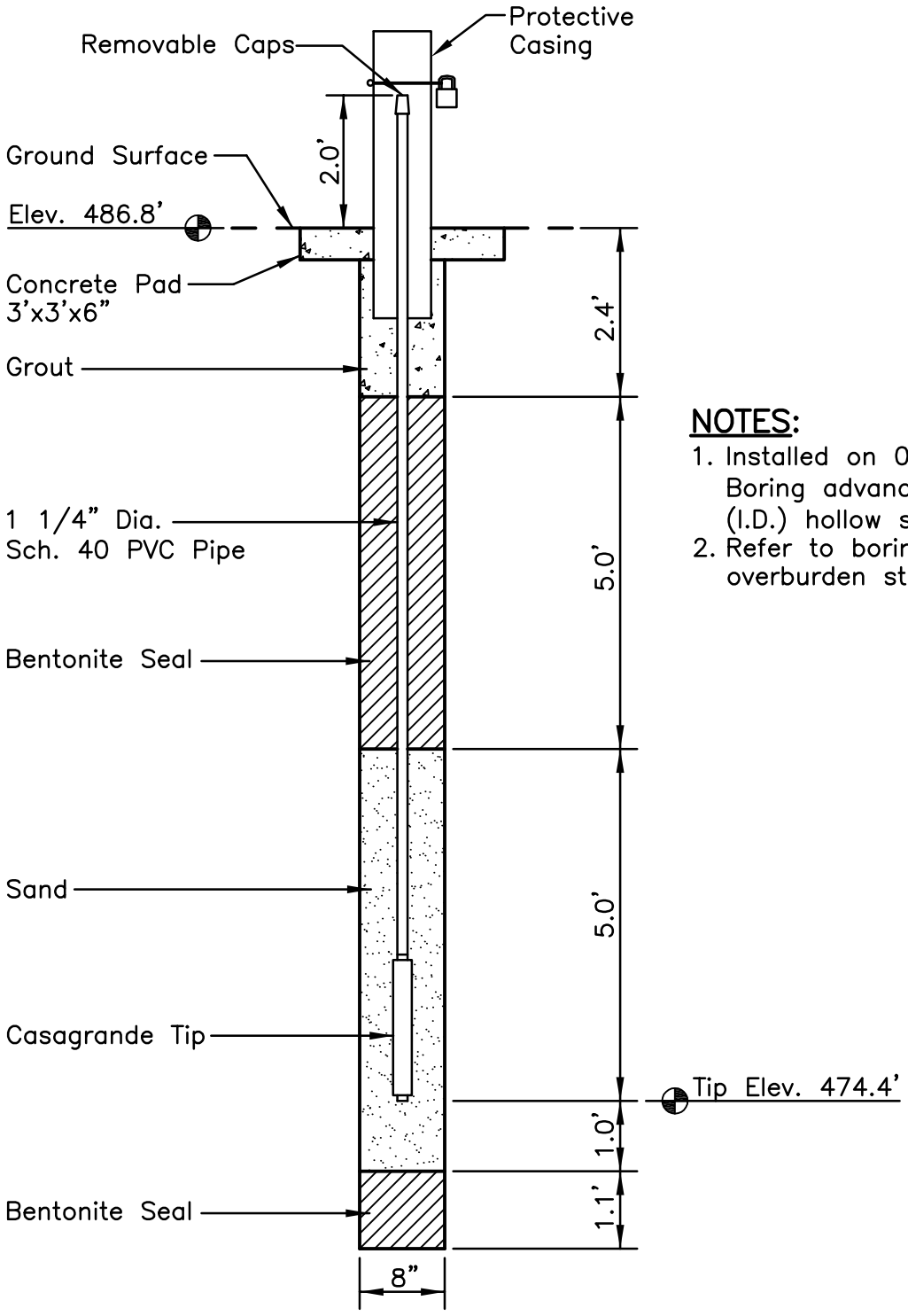

NOTES:

1. Installed on 02/18/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 332,721.84*
Easting: 1,635,366.07*
Ground Elevation: 486.8 feet*

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

PIEZOMETER STN-7B
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

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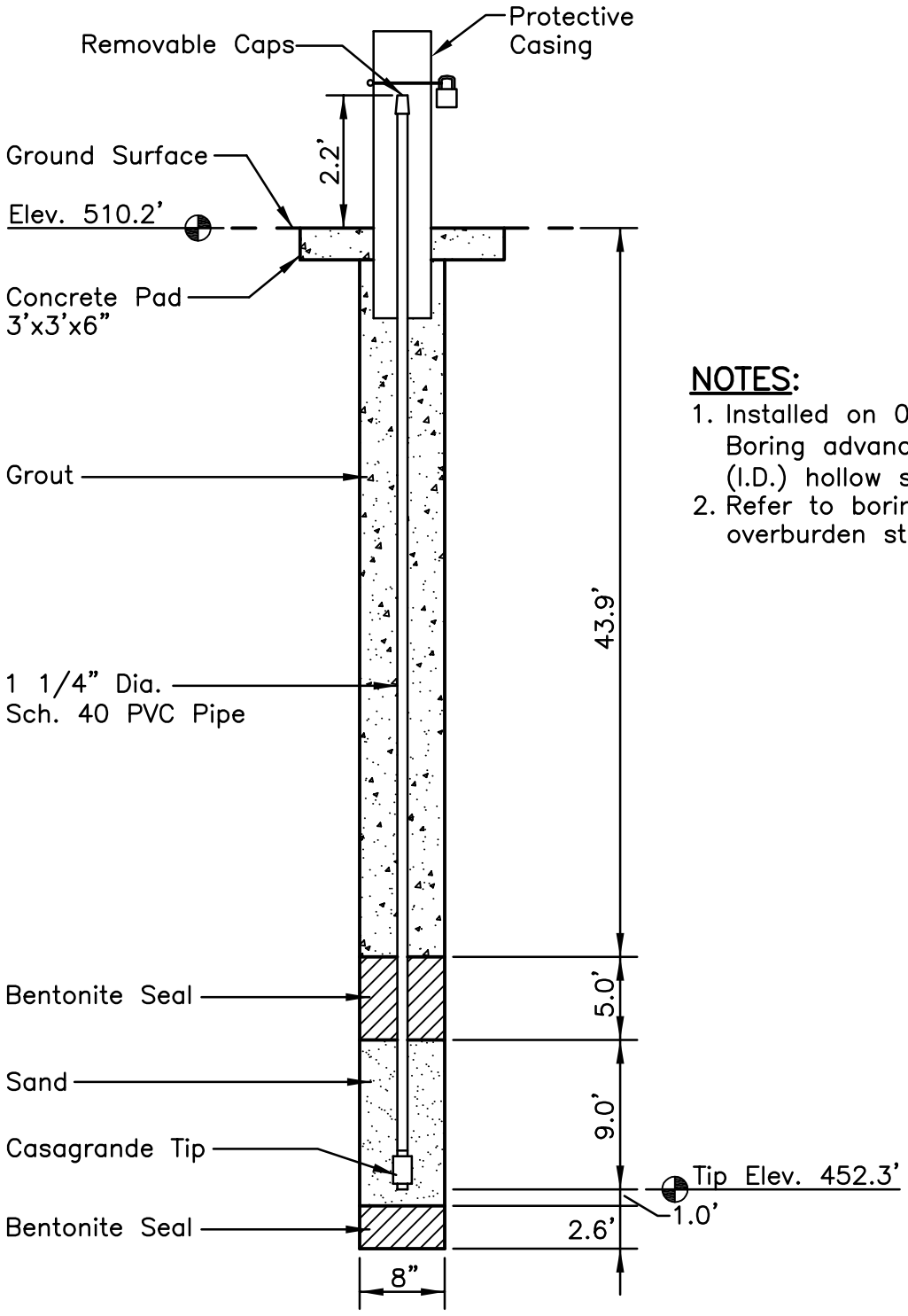
CHECKED BY	SV	SCALE	NTS	2. 4.	

PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
V:\1755\ACTIVE\175569040\GEOTECHNICAL\DRAWING\SCRUBBER\69040C-PAF-101-PZ07B.DWG



NOTES:

1. Installed on 02/20/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 333,522.45
Easting: 1,636,128.32
Ground Elevation: 510.2 feet

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

PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
V:\1755\ACTIVE\175569040\GEOTECHNICAL\DRAWING\SCRUBBER\69040C-PAF-101-PZ08A.DWG

PIEZOMETER STN-8A
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

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Lexington, Kentucky
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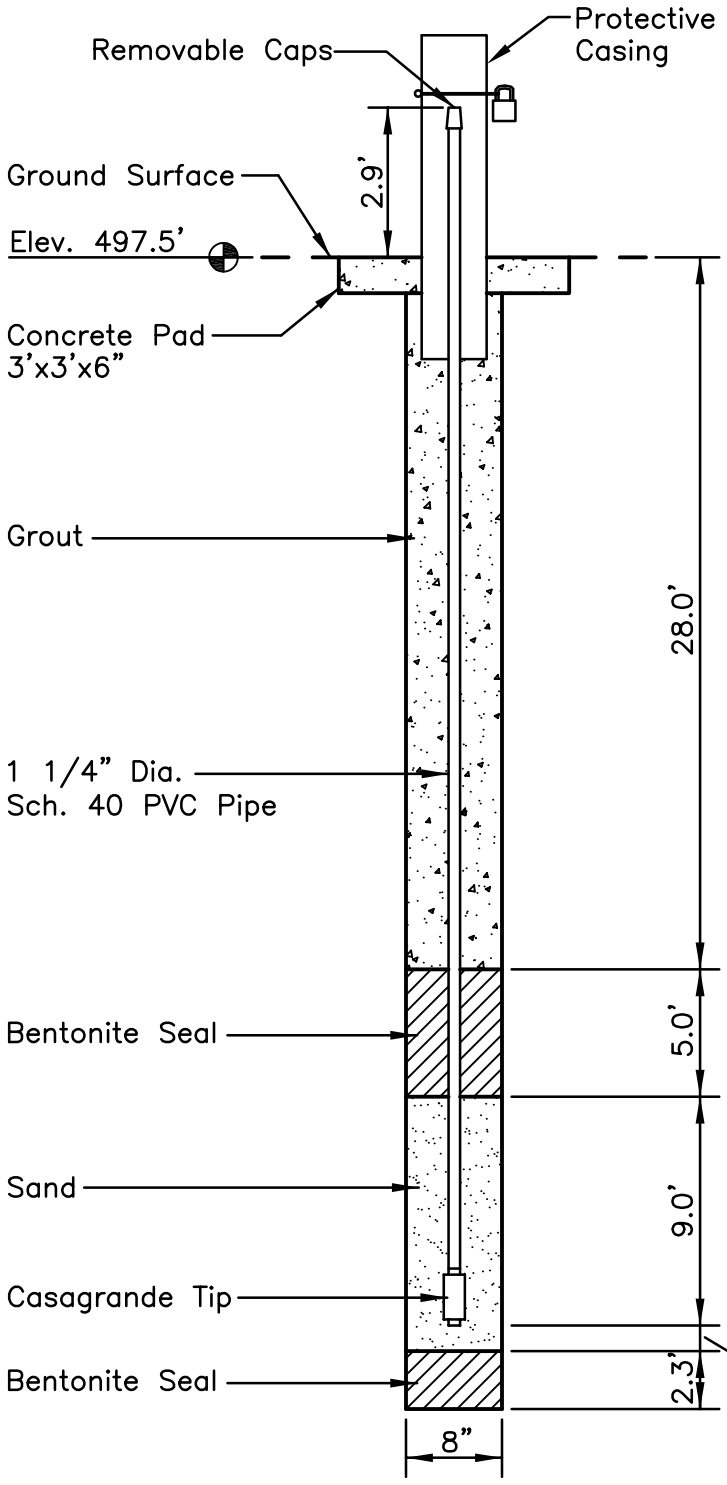
CHECKED BY	SV	SCALE	NTS	2. 4.	



NOTES:

1. Installed on 02/27/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 333,490.39*
Easting: 1,636,156.12*
Ground Elevation: 497.5 feet*

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

PIEZOMETER STN-9B
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

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CHECKED BY	SV	SCALE	NTS	2. 4.	

PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
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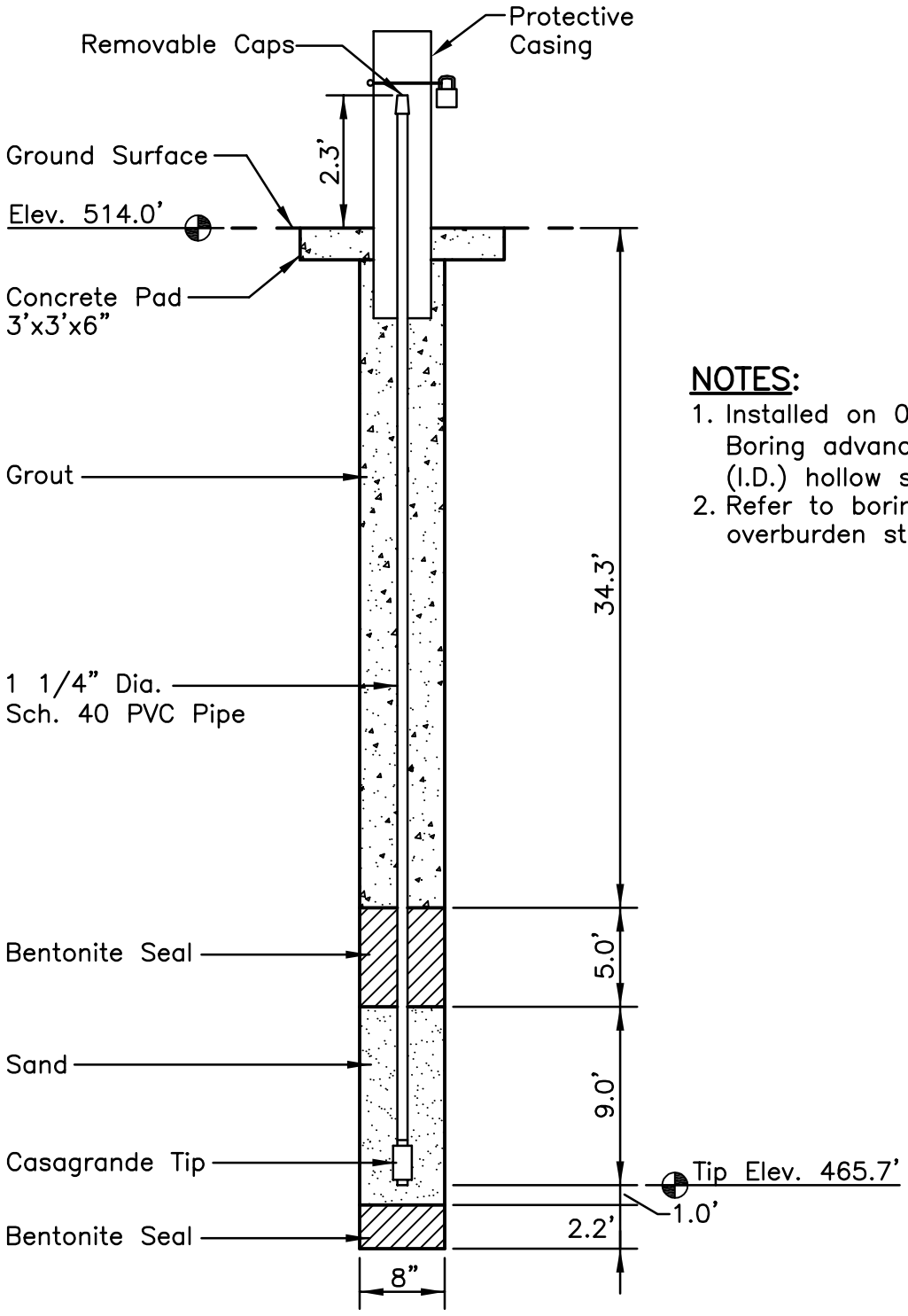

NOTES:

1. Installed on 02/24/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 333,881.85*
Easting: 1,634,204.33*
Ground Elevation: 514.0 feet*

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

PIEZOMETER STN-10A
GEOTECHNICAL EXPLORATION
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CHECKED BY	SV	PROJ. NO.	175569040	1. 3.	1 OF 1
CHECKED BY	SV	SCALE	NTS	2. 4.	

PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
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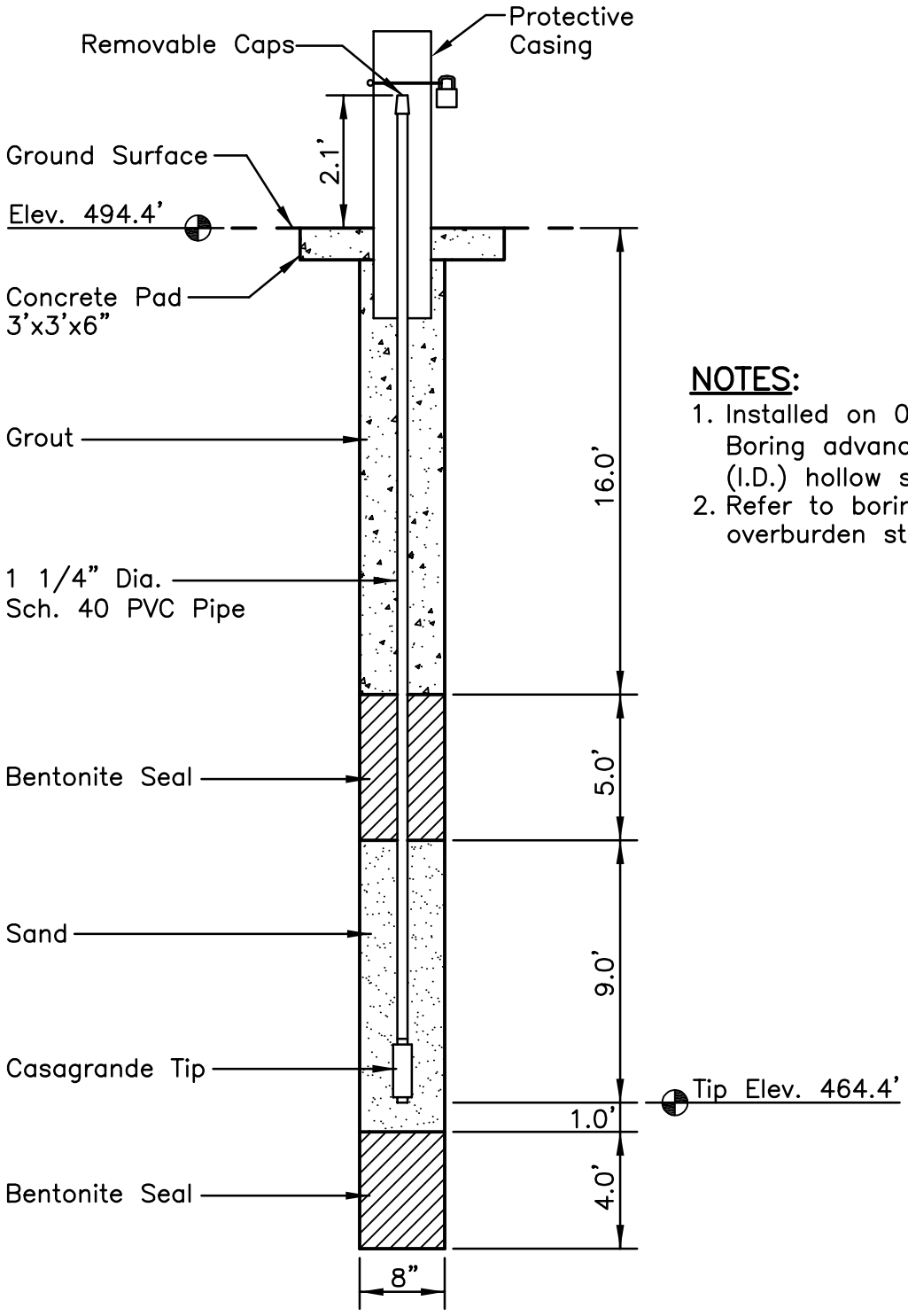

NOTES:

1. Installed on 02/27/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 334,974.78
Easting: 1,636,288.23
Ground Elevation: 494.4 feet

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

PIEZOMETER STN-12
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

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CHECKED BY	SV	SCALE	NTS	2. 4.	

PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
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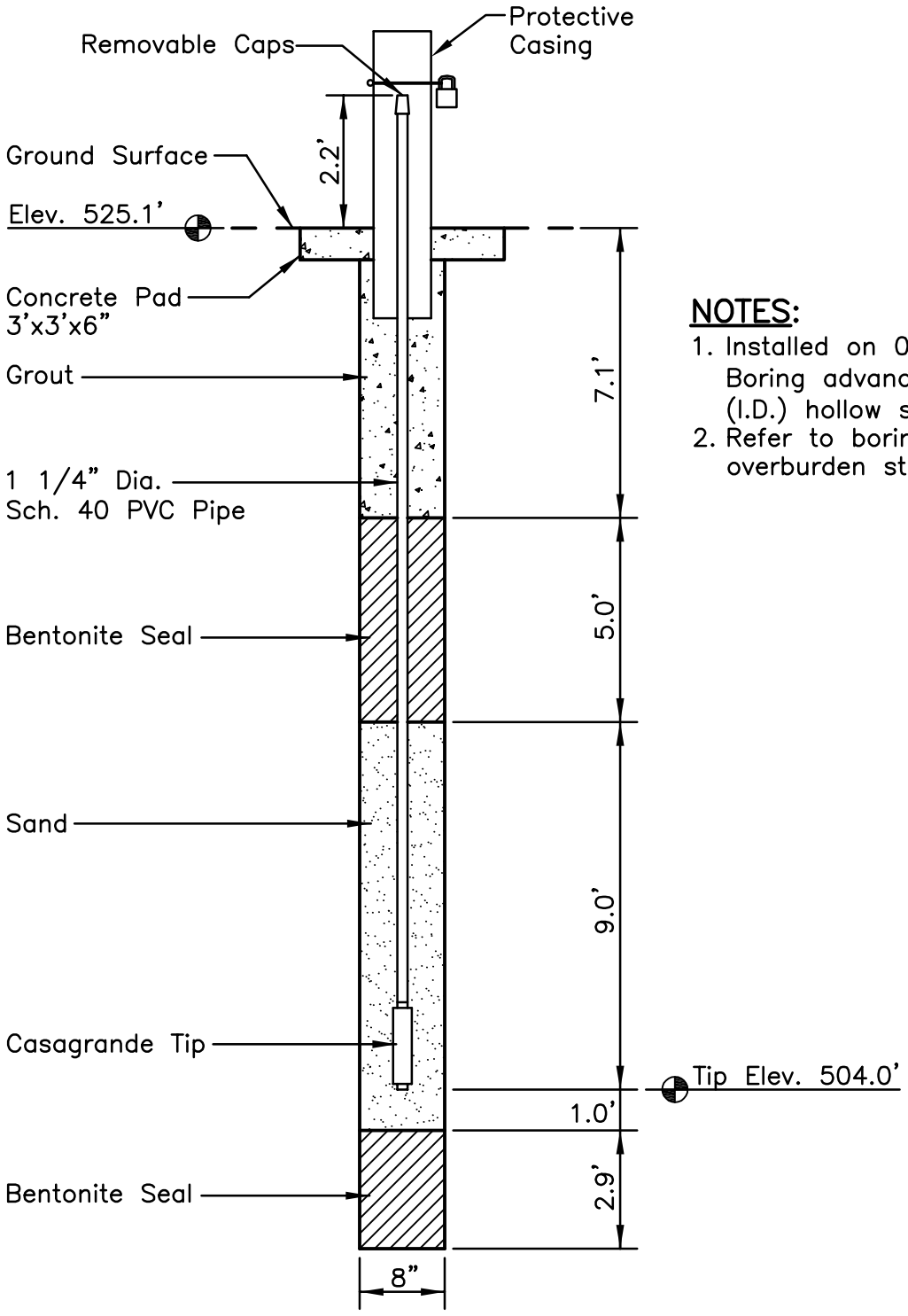

NOTES:

1. Installed on 02/25/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 335,811.89*
Easting: 1,635,175.12*
Ground Elevation: 525.1 feet*

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

PIEZOMETER STN-13A
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

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CHECKED BY	SV	PROJ. NO.	175569040	1.	3.	1 OF 1
CHECKED BY	SV	SCALE	NTS	2.	4.	

PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
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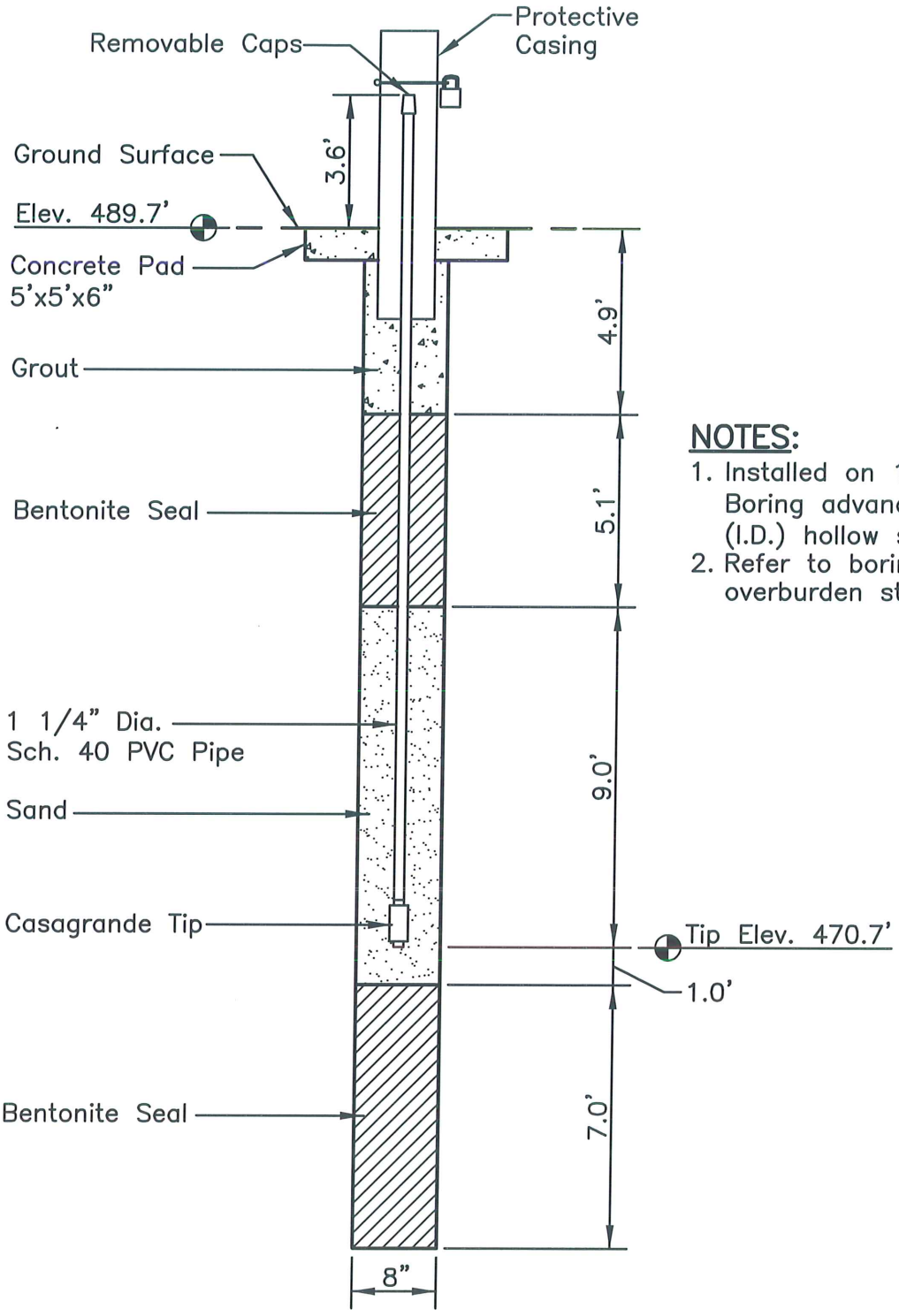

NOTES:

1. Installed on 12/03/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 334,433.28
Easting: 1,636,592.28
Ground Elevation: 489.7 feet

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

PIEZOMETER STN-20A
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

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PLOT DATE: 01/11/2010 USER: ELLISON, DOC
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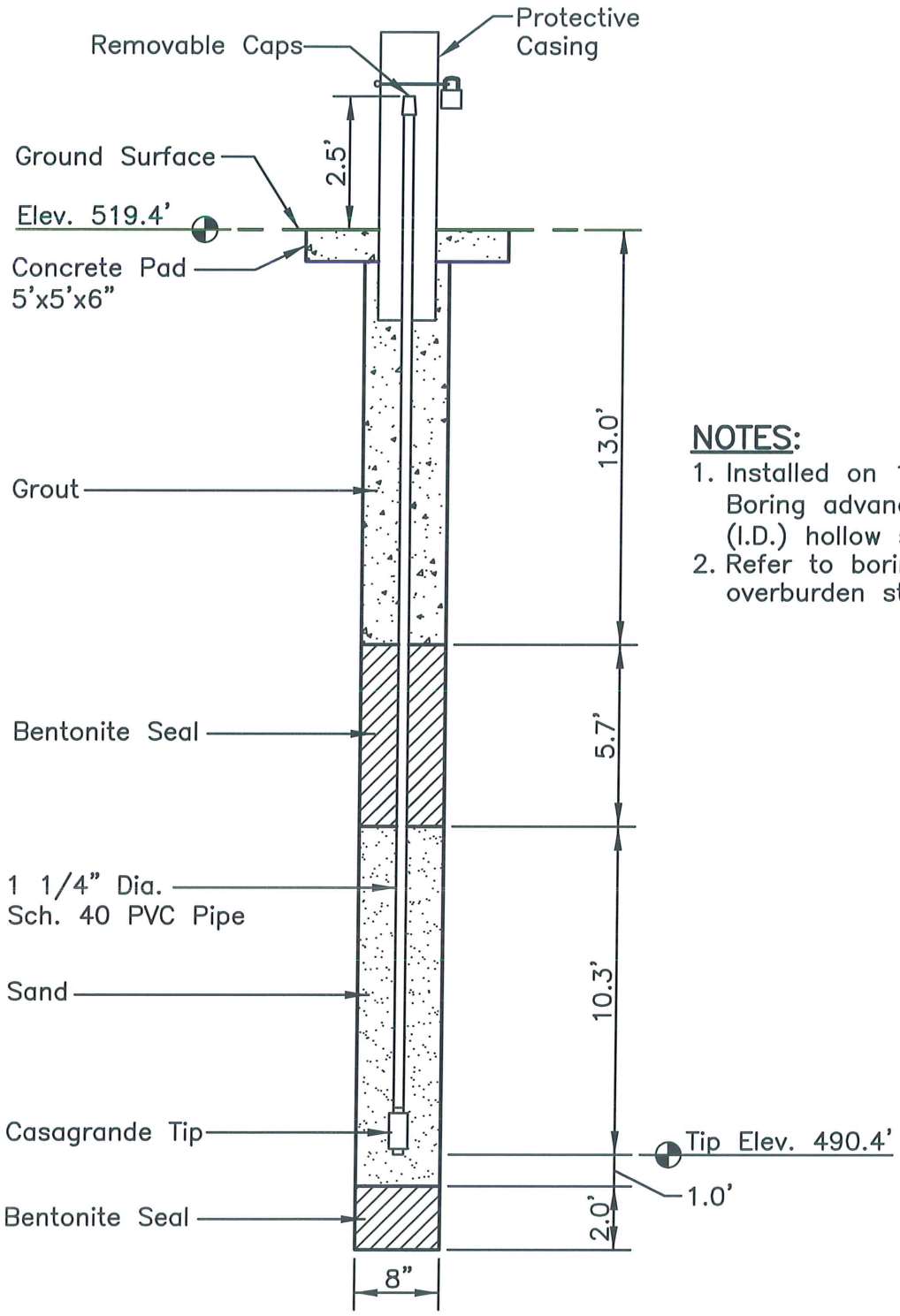

NOTES:

1. Installed on 11/18/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 334,417.64
Easting: 1,636,443.36
Ground Elevation: 519.4 feet

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

PIEZOMETER STN-22A
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

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PLOT DATE: 01/19/2010 USER: ELLISON, DOC
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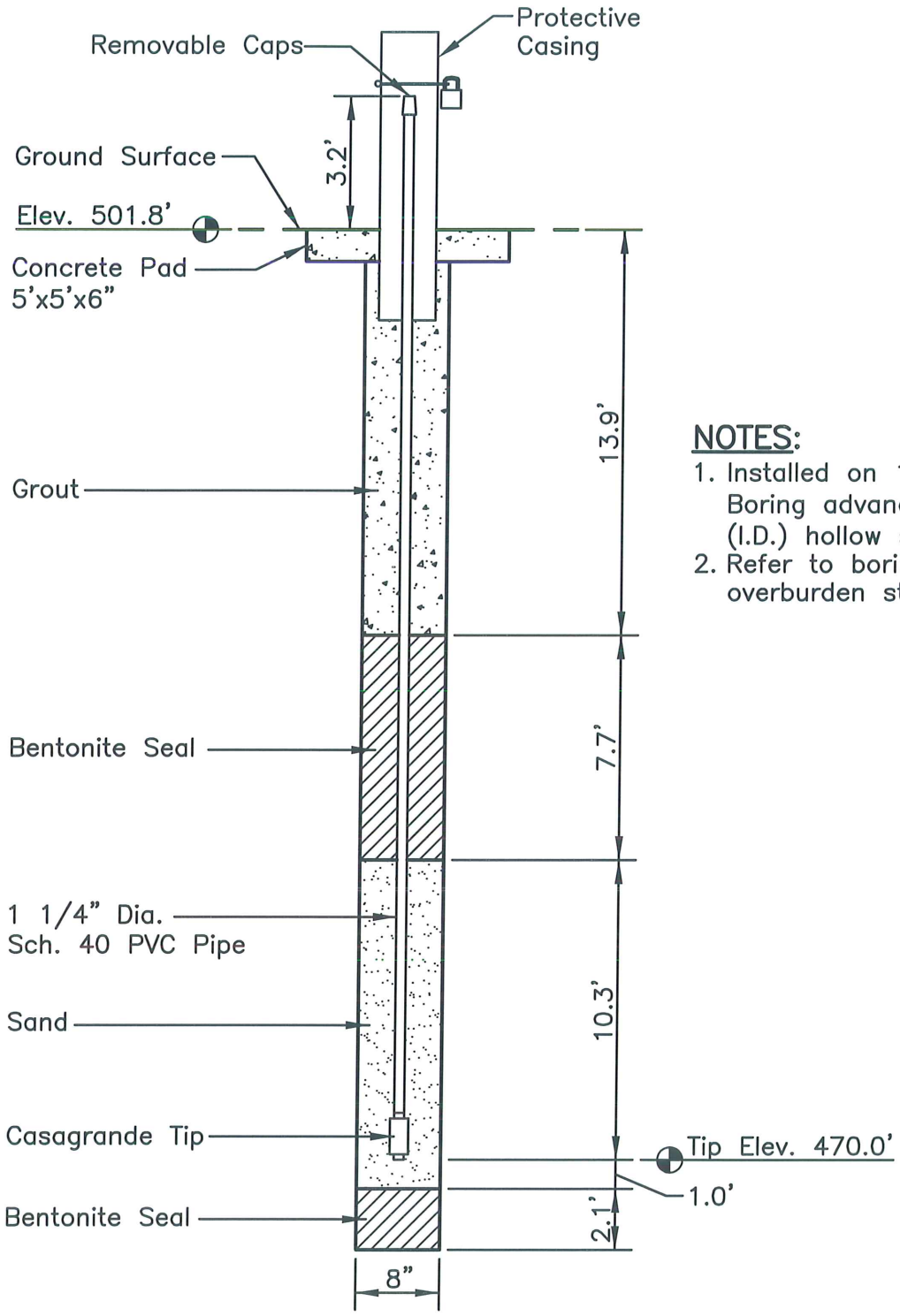

NOTES:

1. Installed on 12/09/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 335,379.92
Easting: 1,635,873.53
Ground Elevation: 501.8 feet

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

PLOT DATE: 01/19/2010 USER: ELLISON, DOC
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PIEZOMETER STN-23A
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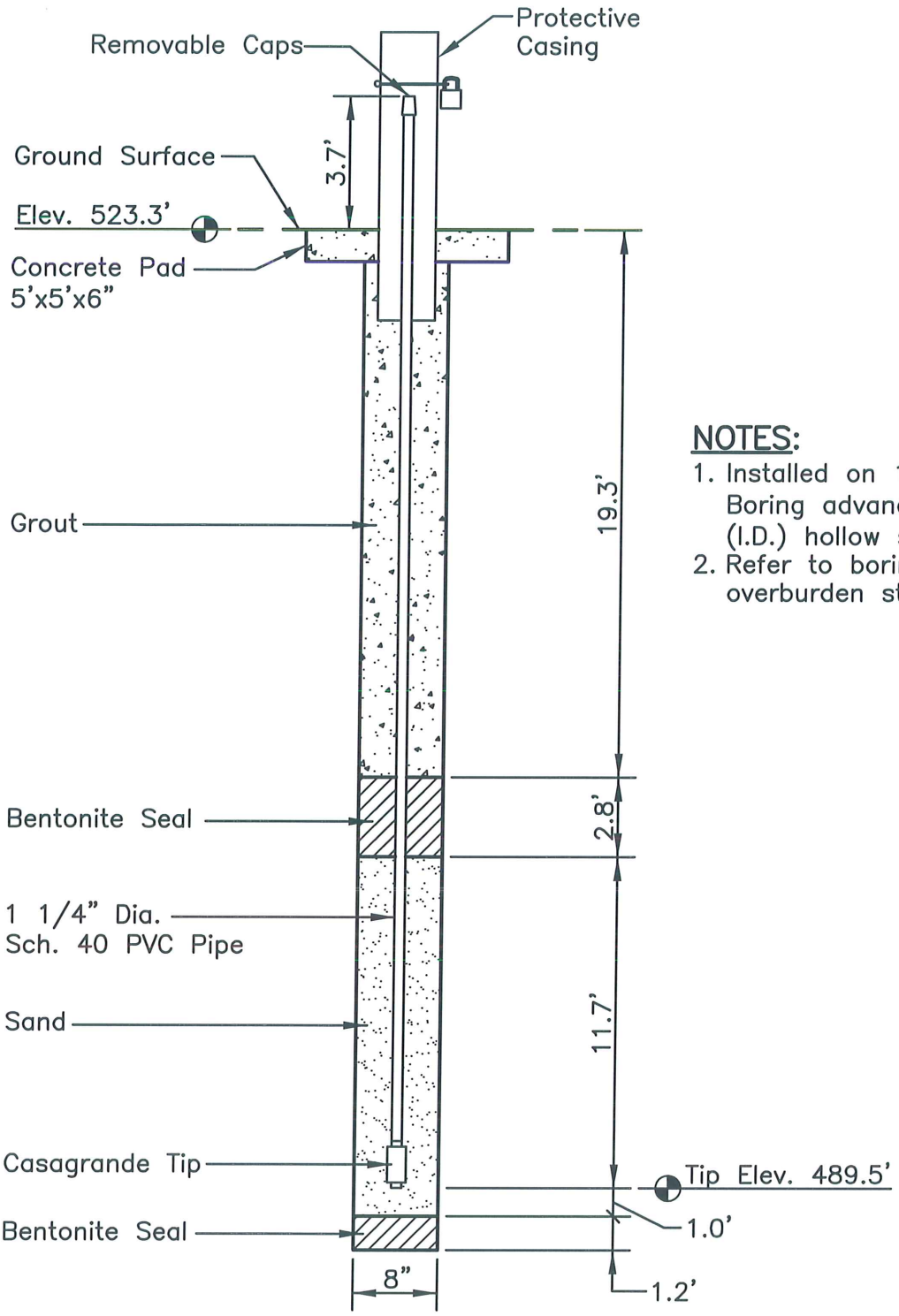
CHECKED BY	SV	SCALE	NTS	2.	4.	



NOTES:

1. Installed on 12/01/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 335,289.98
Easting: 1,635,757.90
Ground Elevation: 523.3 feet

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

PIEZOMETER STN-25A
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

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CHECKED BY	SV	SCALE	NTS	2. 4.	

PLOT DATE: 01/19/2010 USER: ELLISON, DOC
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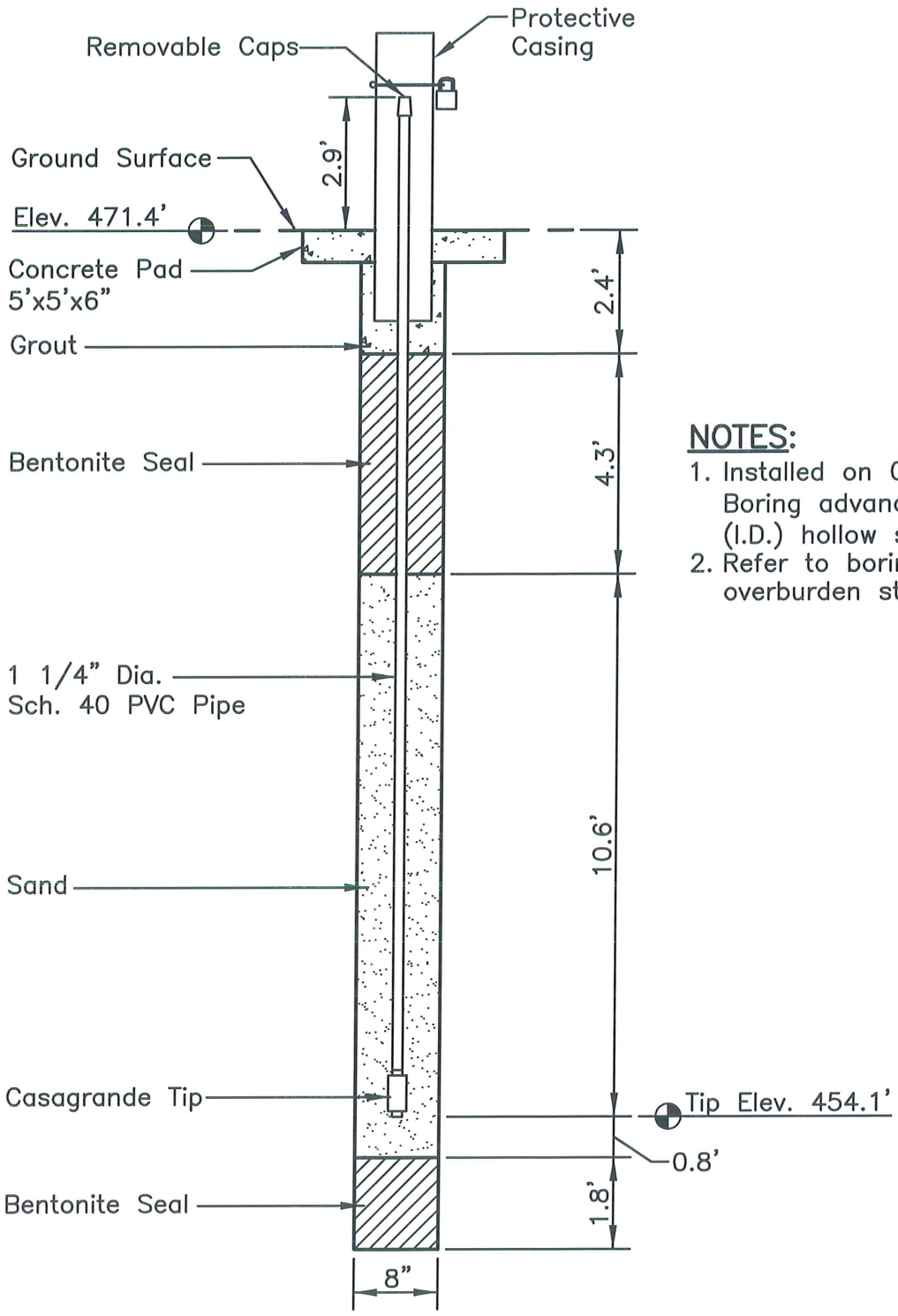

NOTES:

1. Installed on 01/06/2010. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 331,796.20
Easting: 1,634,106.29
Ground Elevation: 471.4 feet

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

PIEZOMETER STN-26A
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

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PLOT DATE: 01/19/2010 USER: ELLISON, DOC
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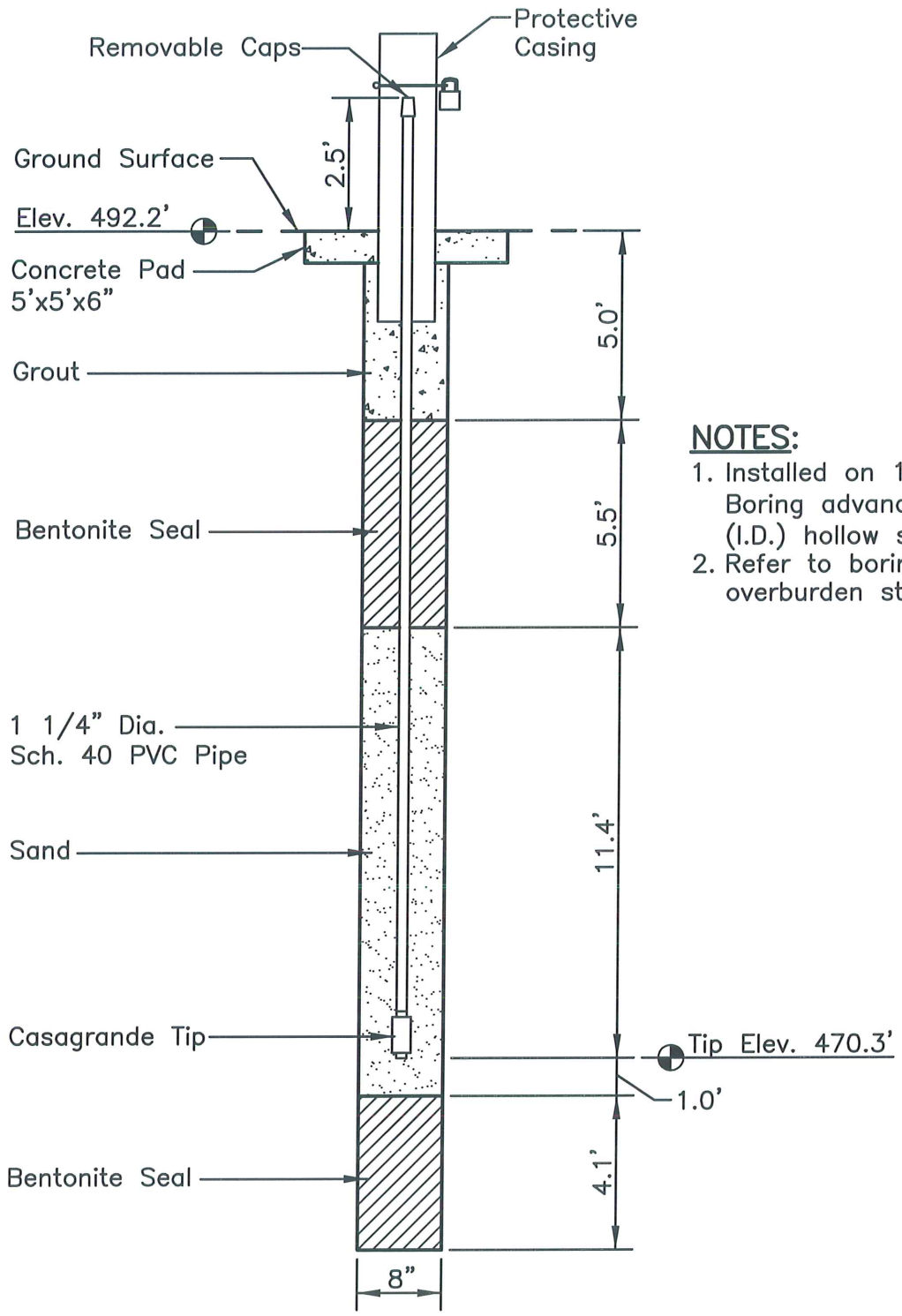

NOTES:

1. Installed on 12/11/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 331,884.74
Easting: 1,634,097.38
Ground Elevation: 492.2 feet

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

PIEZOMETER STN-27A
GEOTECHNICAL EXPLORATION
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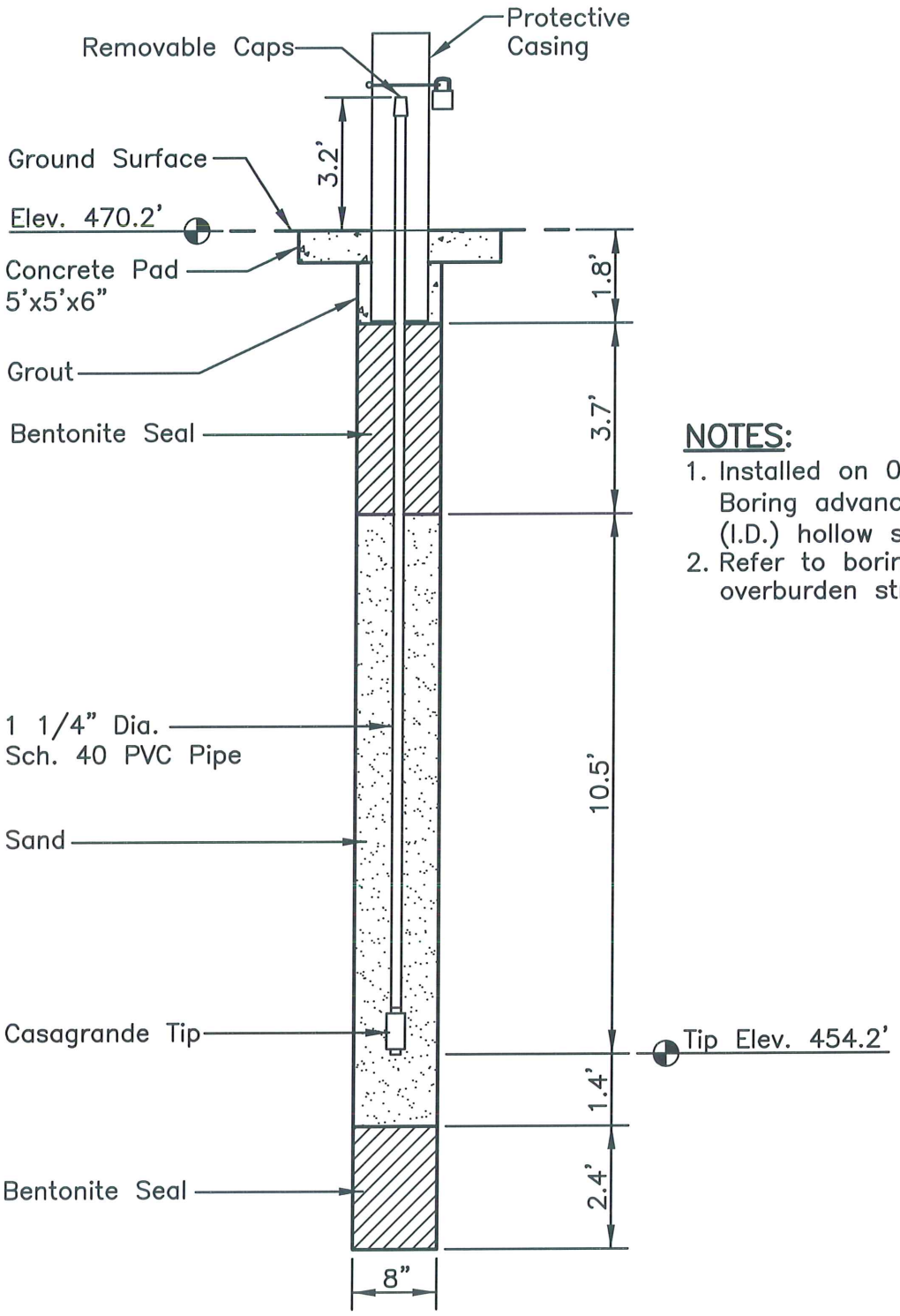

NOTES:

1. Installed on 01/05/2010. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 331,927.41
Easting: 1,634,557.82
Ground Elevation: 470.2 feet

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

PIEZOMETER STN-28A
GEOTECHNICAL EXPLORATION
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PLOT DATE: 01/08/2010 USER: ELLISON, DOC
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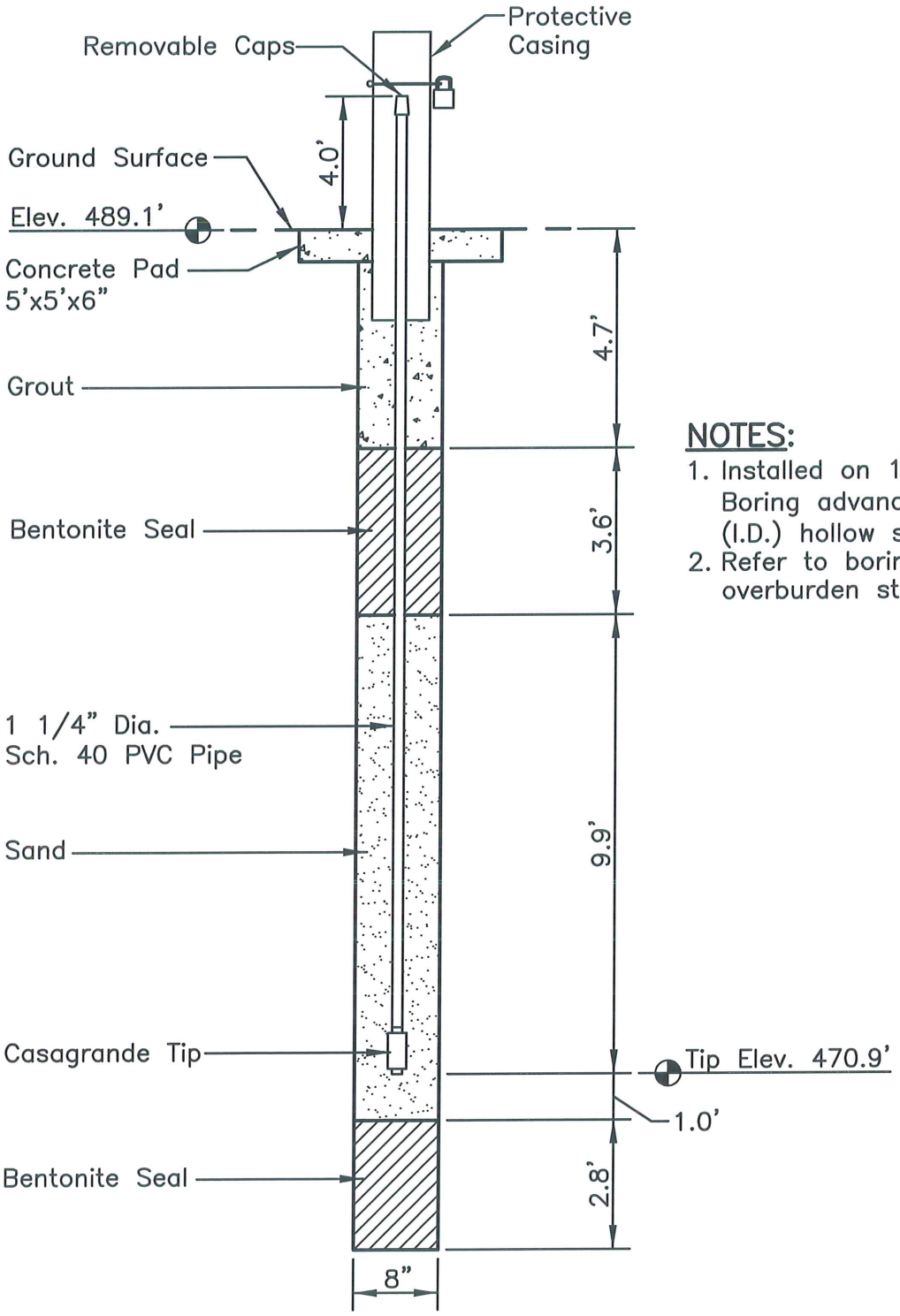

NOTES:

1. Installed on 12/16/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 332,004.37
Easting: 1,634,537.00
Ground Elevation: 489.1 feet

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

PIEZOMETER STN-29A
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

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PLOT DATE: 01/11/2010 USER: ELLISON, DOC
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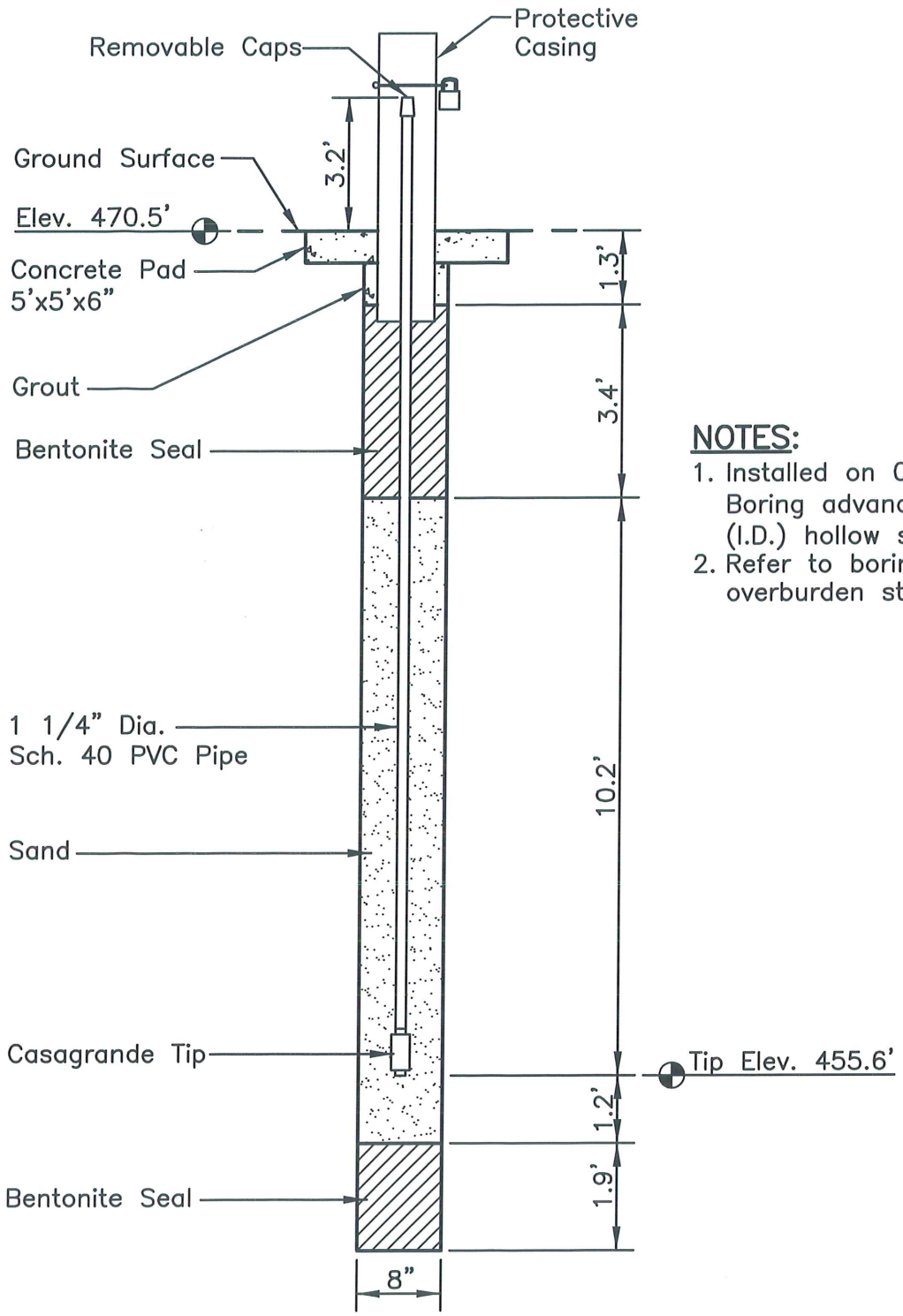

NOTES:

1. Installed on 01/04/2010. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 332,077.28
Easting: 1,635,004.16
Ground Elevation: 470.5 feet
Locations provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

PIEZOMETER STN-30A
GEOTECHNICAL EXPLORATION
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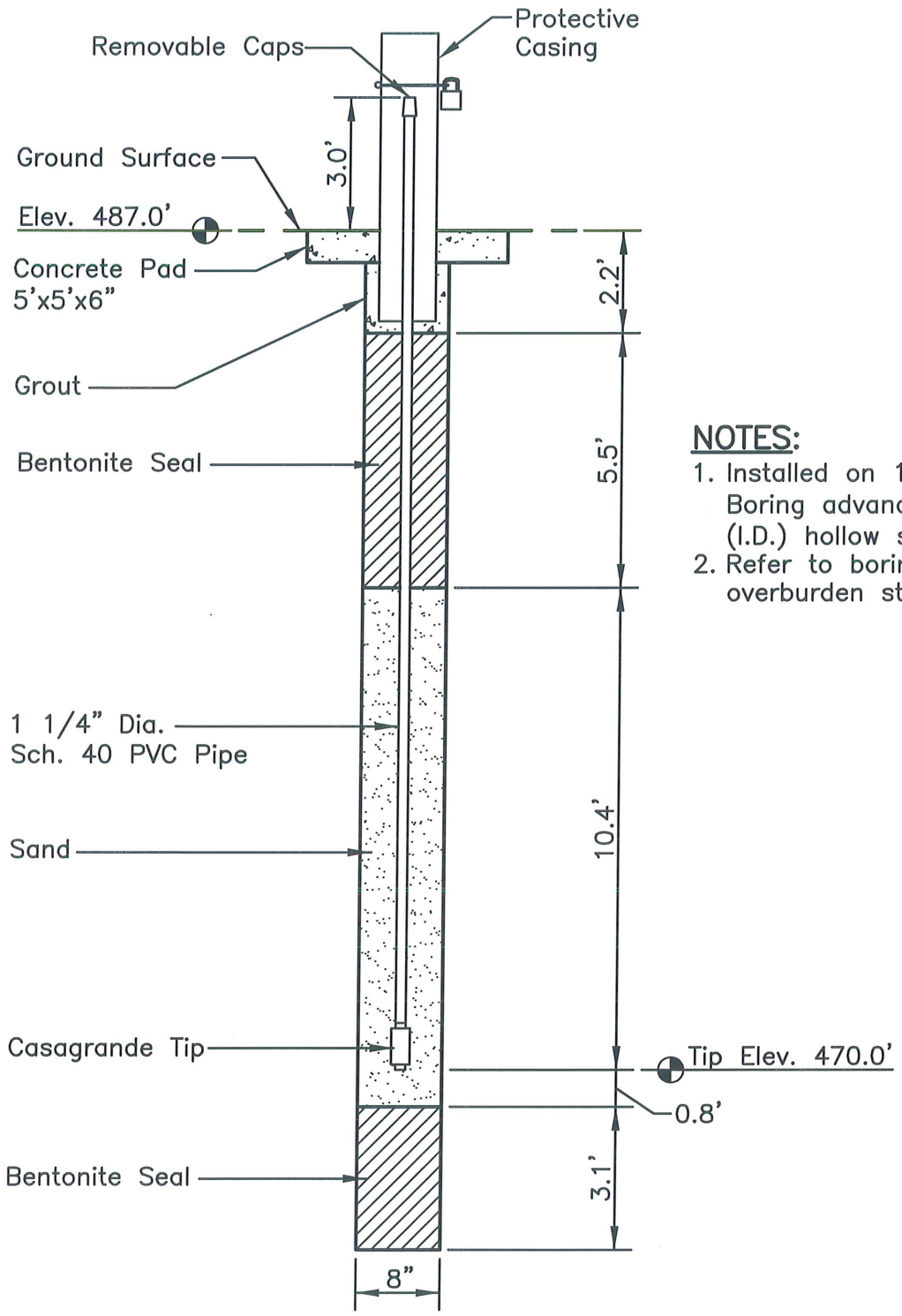

NOTES:

1. Installed on 12/17/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 332,141.29
Easting: 1,634,981.22
Ground Elevation: 487.0 feet

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

PIEZOMETER STN-31A
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

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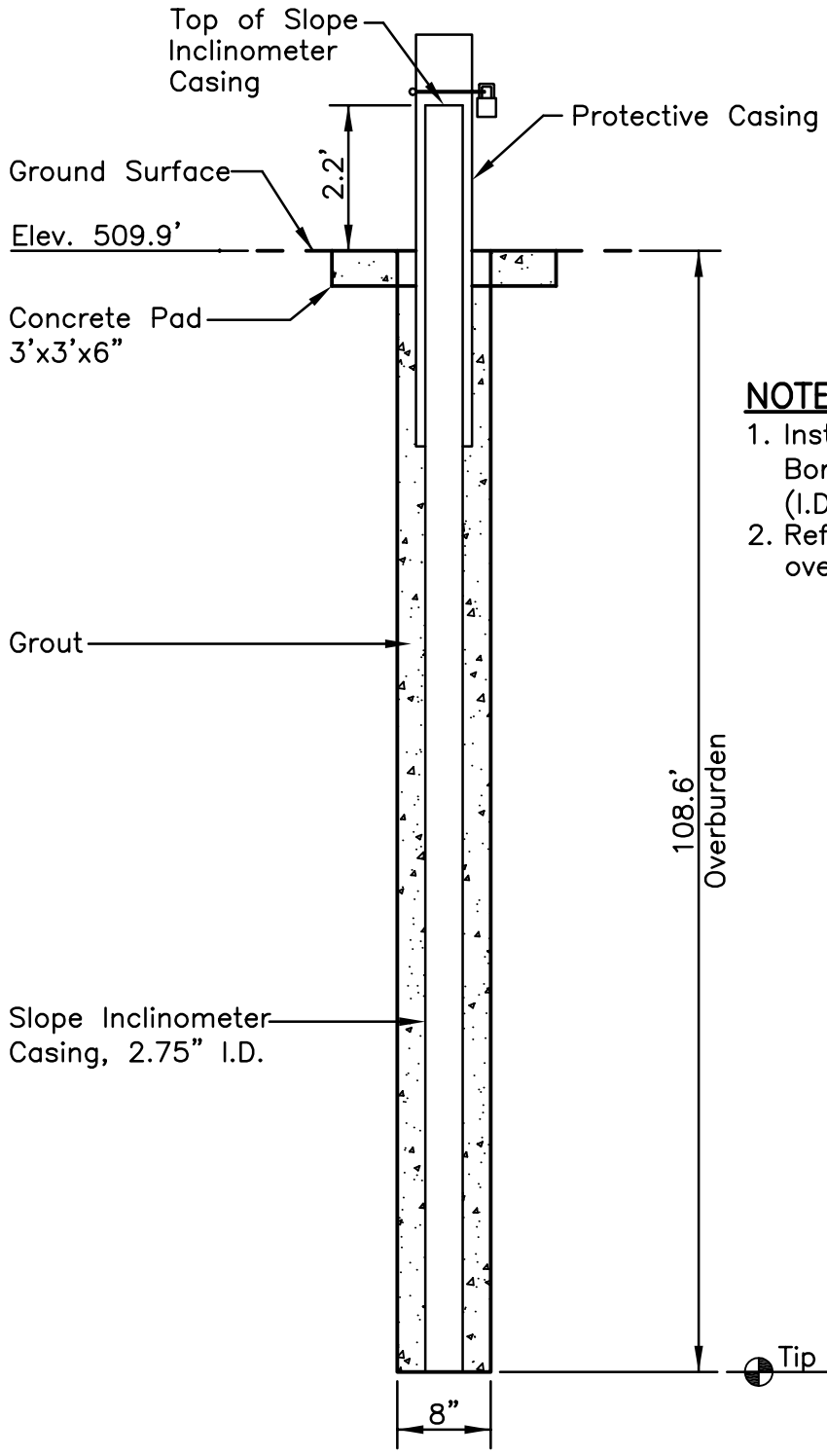

NOTES:

1. Installed on 02/12/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 332,102.89
Easting: 1,634,466.78
Ground Elevation: 509.9 feet

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

SLOPE INCLINOMETER STN-1
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

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PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
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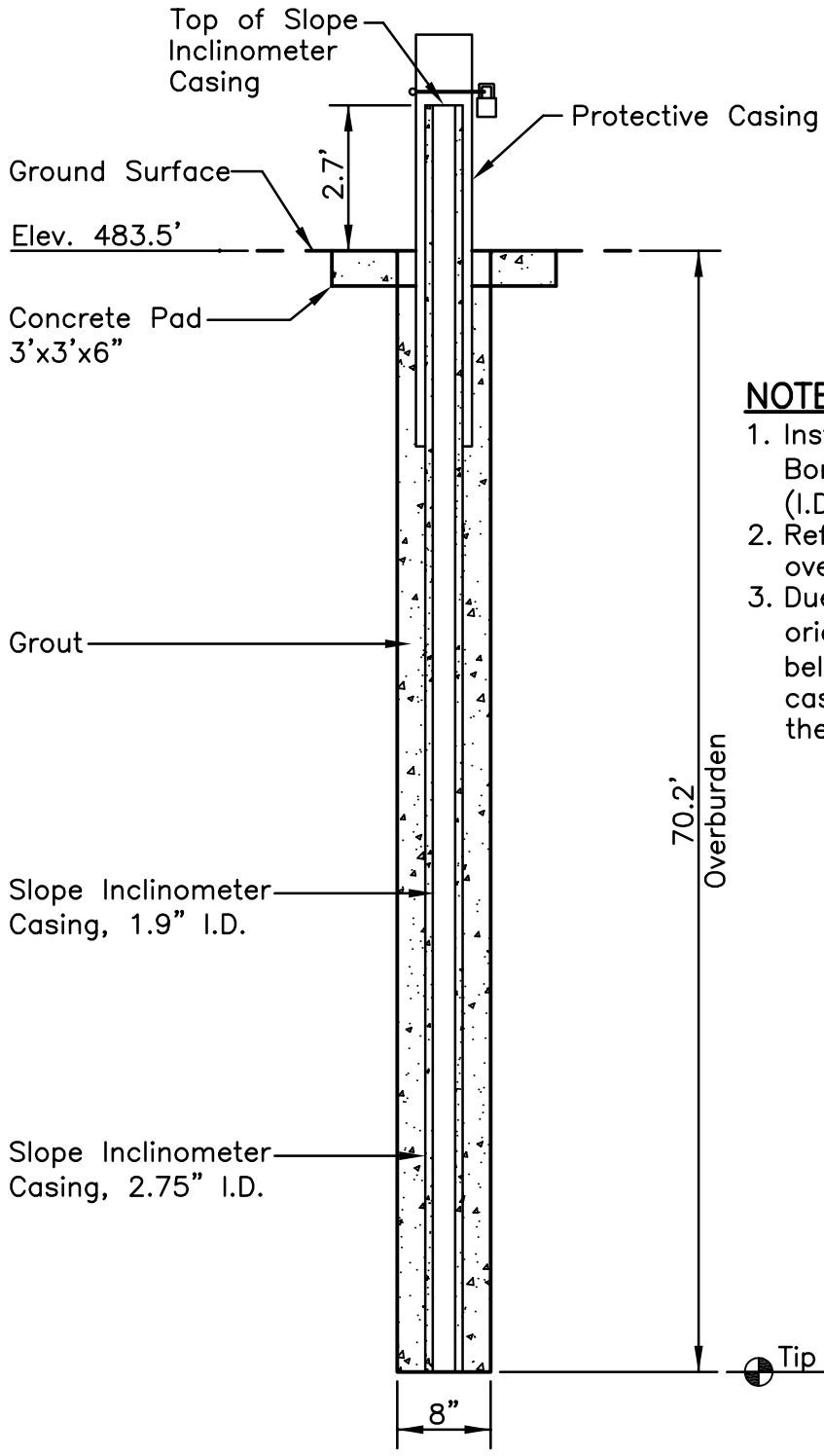

NOTES:

1. Installed on 02/05/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.
3. Due to the mis–alignment of original casing (2.75" I.D.) below ground, a 1.9" I.D. casing was later inserted and the annulus grouted.

LOCATION:

Northing: 331,980.02
Easting: 1,634,505.77
Ground Elevation: 483.5 feet

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

SLOPE INCLINOMETER STN-3
GEOTECHNICAL EXPLORATION
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PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
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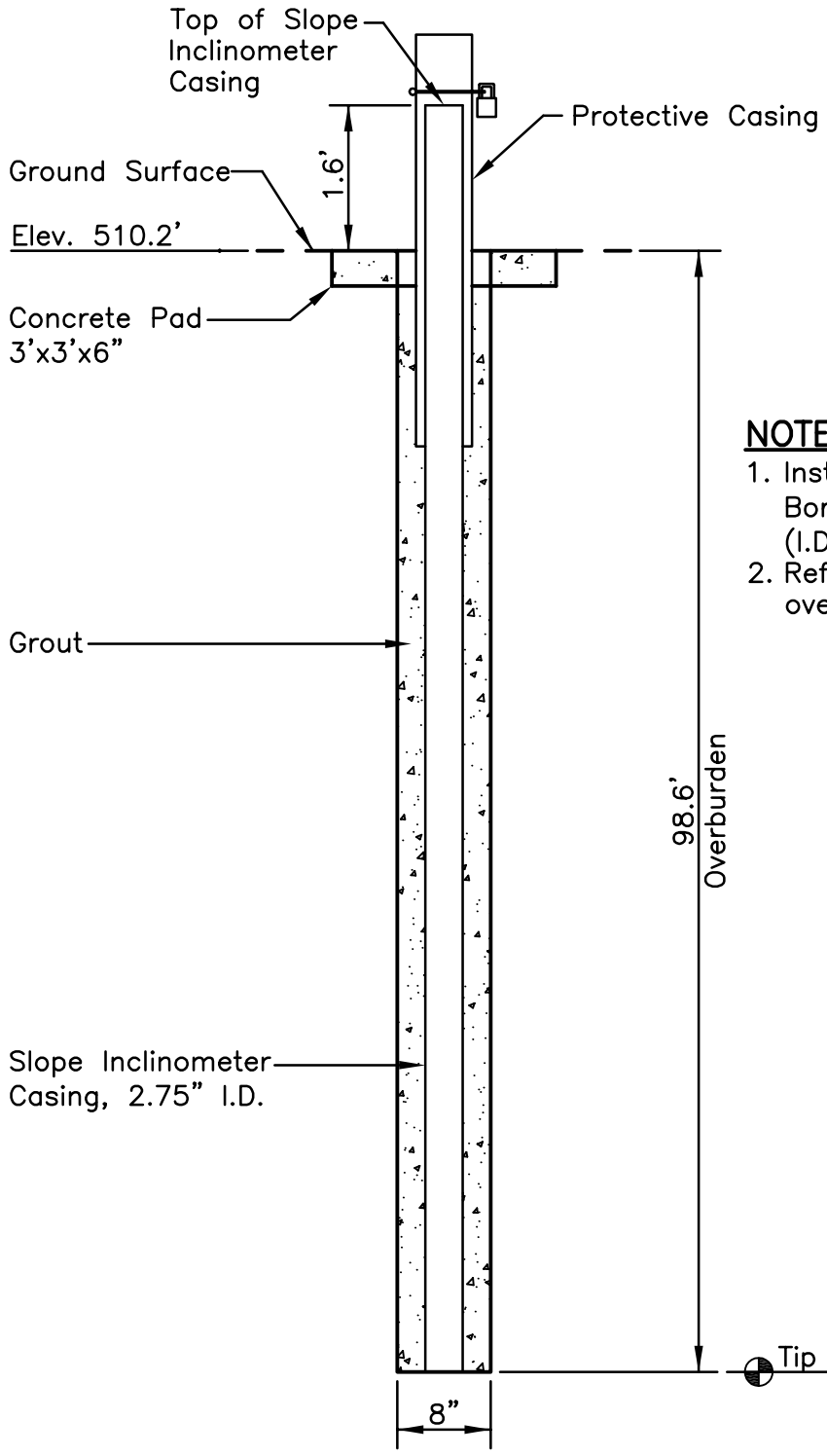

NOTES:

1. Installed on 02/19/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 333,522.45
Easting: 1,636,128.32
Ground Elevation: 510.2 feet

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

SLOPE INCLINOMETER STN-8
GEOTECHNICAL EXPLORATION
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PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
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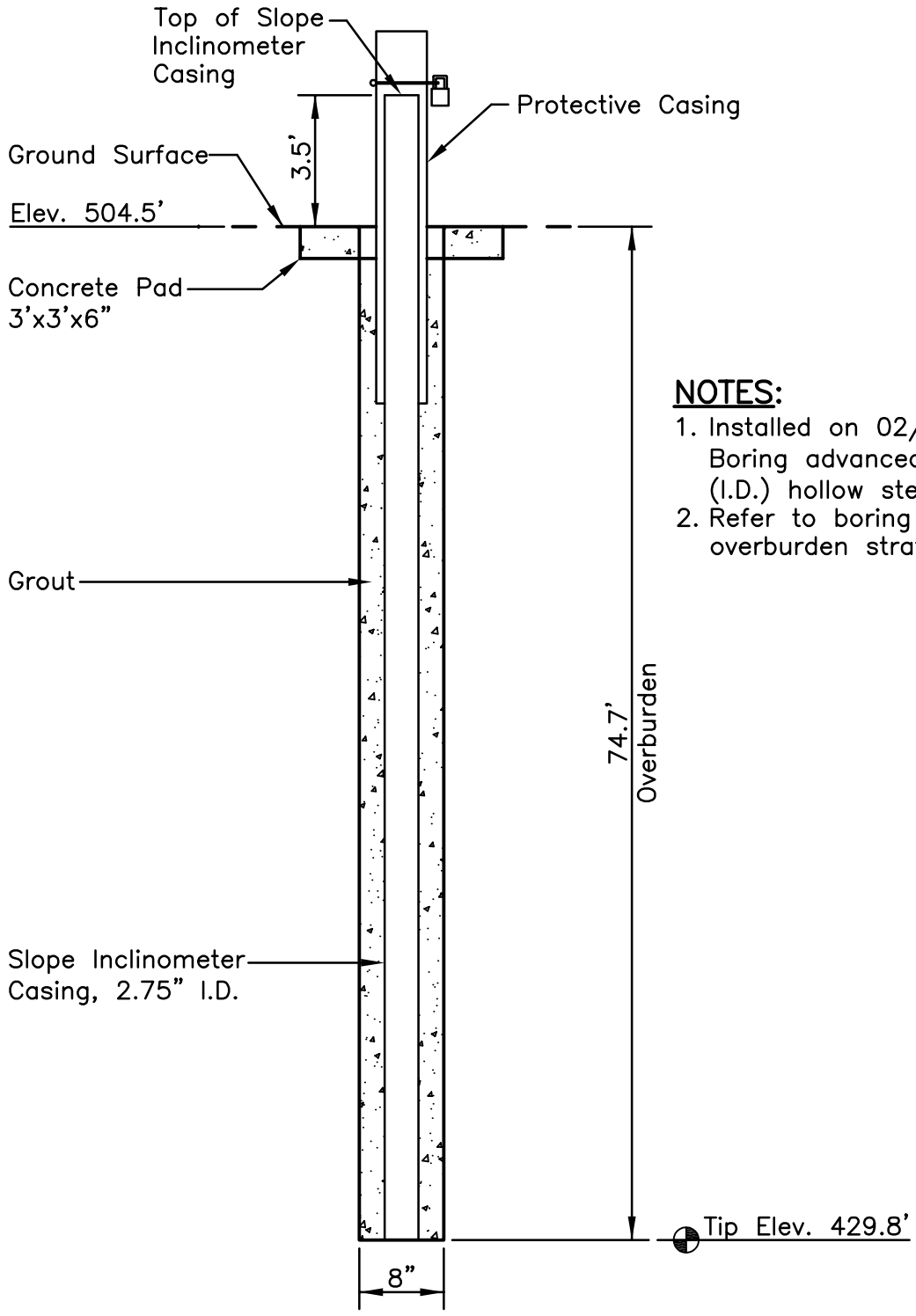

NOTES:

1. Installed on 02/04/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 334,909.50
Easting: 1,636,230.61
Ground Elevation: 504.5 feet

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

SLOPE INCLINOMETER STN-11
GEOTECHNICAL EXPLORATION
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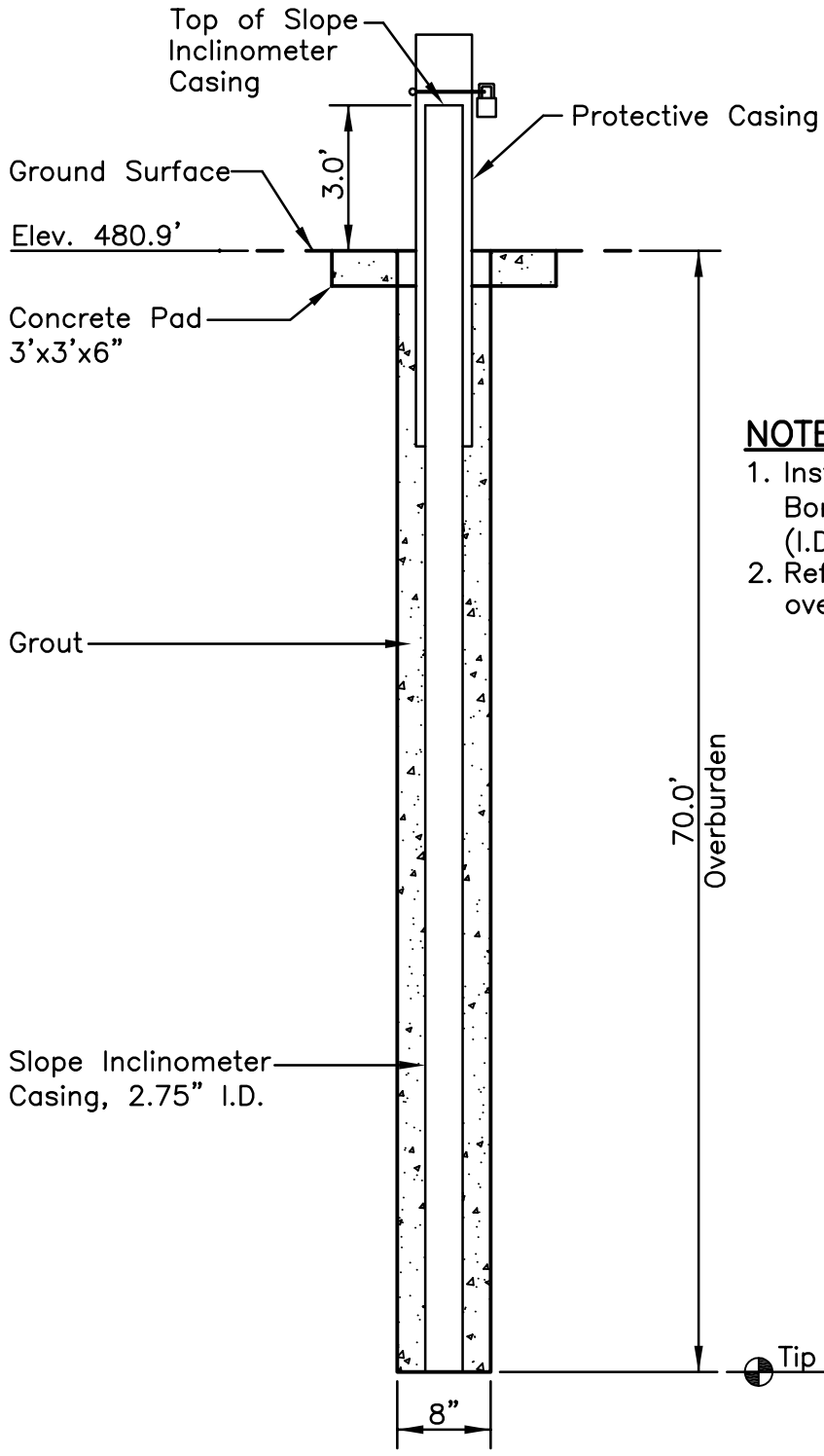
CHECKED BY	SV	SCALE	NTS	2. 4.	

PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
V:\1755\ACTIVE\175569040\GEOTECHNICAL\DRAWING\SCRUBBER\690400-PAF-101-SI11.DWG



NOTES:

1. Installed on 05/28/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 333,591.39*
Easting: 1,636,426.18*
Ground Elevation: 480.9 feet*

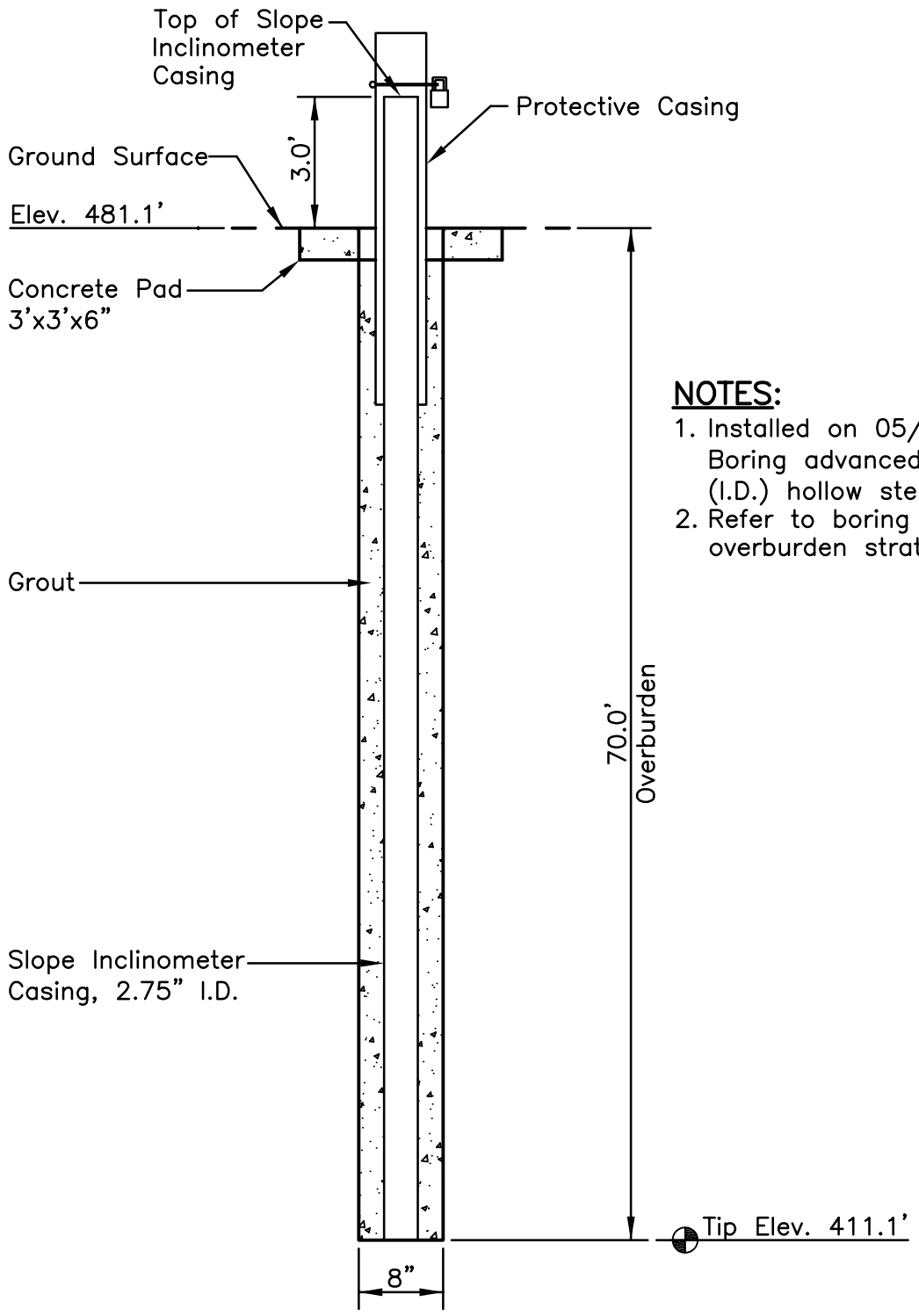
*Approximate. Locations provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

SLOPE INCLINOMETER STN-15
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000
www.stantec.com

DRAWN BY	BFS	DATE AUG., 2009	REVISED		SHEET
CHECKED BY	SV	PROJ. NO. 175569040	1.	3.	1 OF 1
CHECKED BY	SV	SCALE NTS	2.	4.	

PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
V:\1755\ACTIVE\175569040\GEOTECHNICAL\DRAWING\SCRUBBER\69040C-PAF-101-SI15.DWG



NOTES:

1. Installed on 05/29/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 333,609.25*
Easting: 1,636,462.16*
Ground Elevation: 481.1 feet*

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

SLOPE INCLINOMETER STN-16
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000
www.stantec.com

DRAWN BY	BFS	DATE	AUG., 2009	REVISED	SHEET
CHECKED BY	SV	PROJ. NO.	175569040	1. 3.	1 OF 1
CHECKED BY	SV	SCALE	NTS	2. 4.	

PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
V:\1755\ACTIVE\175569040\GEOTECHNICAL\DRAWING\SCRUBBER\690400-PAF-101-SI16.DWG

Appendix E

Slope Monitoring Data

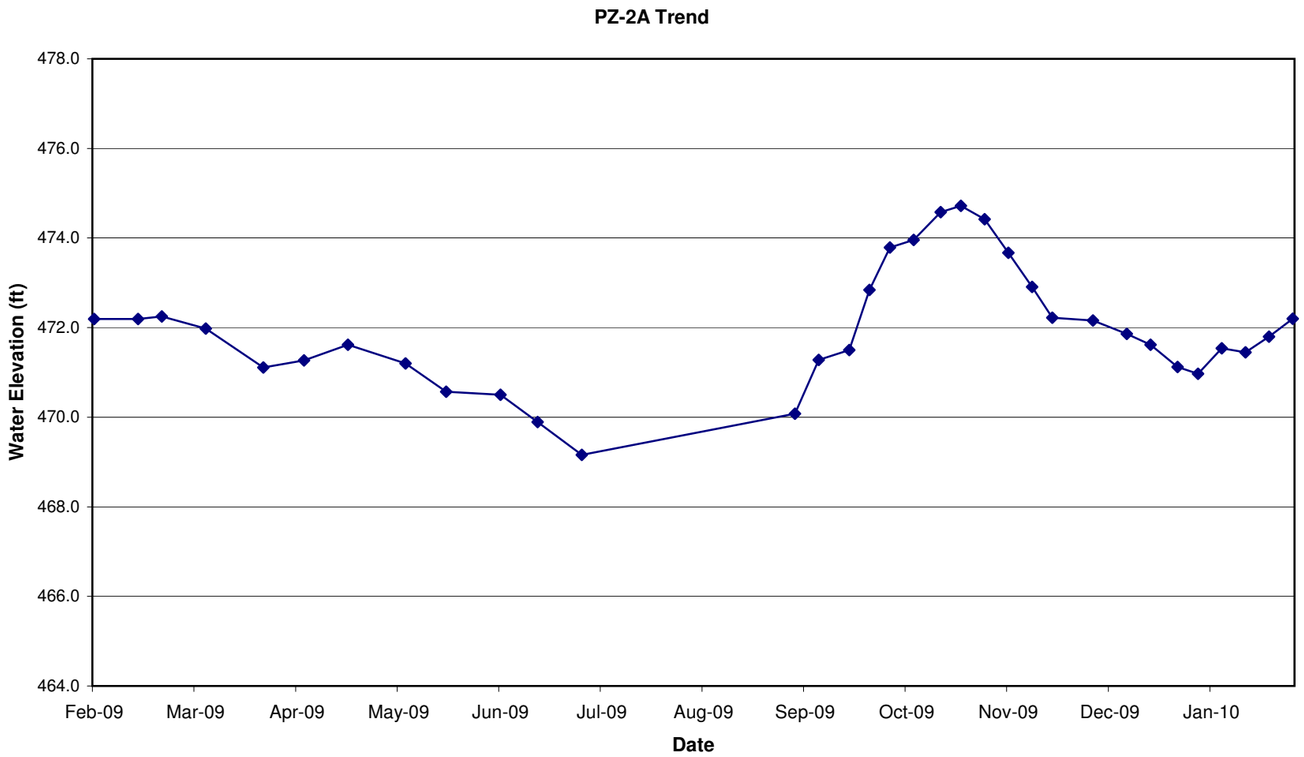
PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-2A
Piezometer Installation Date 2/2/2009
Project No. 175569040

Surface Elevation (ft) 494.2
Tip Elevation (ft) 437.1
Location West Pond South Slope

Date	Water Elev (ft)
2/26/2009	472.2
3/6/2009	468.4*
3/11/2009	472.2
3/18/2009	472.3
3/31/2009	472.0
4/17/2009	471.1
4/29/2009	471.3
5/12/2009	471.6
5/29/2009	471.2
6/10/2009	470.6
6/26/2009	470.5
7/7/2009	469.9
7/20/2009	469.2
9/21/2009	470.1
9/28/2009	471.3
10/7/2009	471.5
10/13/2009	472.8
10/19/2009	473.8
10/26/2009	474.0
11/3/2009	474.6
11/9/2009	474.7
11/16/2009	474.4
11/23/2009	473.7
11/30/2009	472.9
12/6/2009	472.2
12/18/2009	472.2
12/28/2009	471.9
1/4/2010	471.6
1/12/2010	471.1
1/18/2010	471.0
1/25/2010	471.5
2/1/2010	471.5
2/8/2010	471.8
2/15/2010	472.2

Date	Water Elev (ft)



* Reading not plotted
Notes: See attached instrumentation schematics for tip elevation and other pertinent data

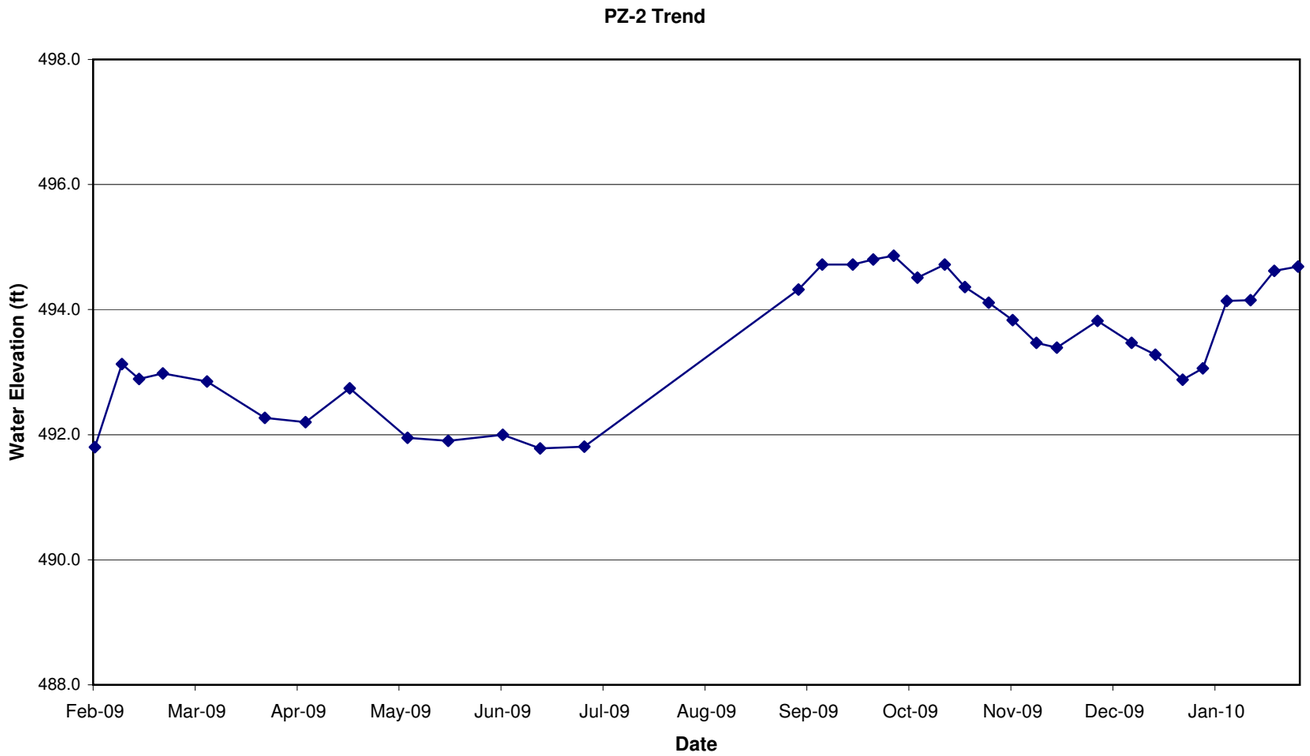
PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-2
Piezometer Installation Date 2/2/2009
Project No. 175569040

Surface Elevation (ft) 494.2
Tip Elevation (ft) 468.4
Location West Pond South Slope

Date	Water Elev (ft)
2/26/2009	491.8
3/6/2009	493.1
3/11/2009	492.9
3/18/2009	493.0
3/31/2009	492.9
4/17/2009	492.3
4/29/2009	492.2
5/12/2009	492.7
5/29/2009	492.0
6/10/2009	491.9
6/26/2009	492.0
7/7/2009	491.8
7/20/2009	491.8
9/21/2009	494.3
9/28/2009	494.7
10/7/2009	494.7
10/13/2009	494.8
10/19/2009	494.9
10/26/2009	494.5
11/3/2009	494.7
11/9/2009	494.4
11/16/2009	494.1
11/23/2009	493.8
11/30/2009	493.5
12/6/2009	493.4
12/18/2009	493.8
12/28/2009	493.5
1/4/2010	493.3
1/12/2010	492.9
1/18/2010	493.1
1/25/2010	494.1
2/1/2010	494.2
2/8/2010	494.6
2/15/2010	494.7

Date	Water Elev (ft)



Notes: See attached instrumentation schematics for additional pertinent data

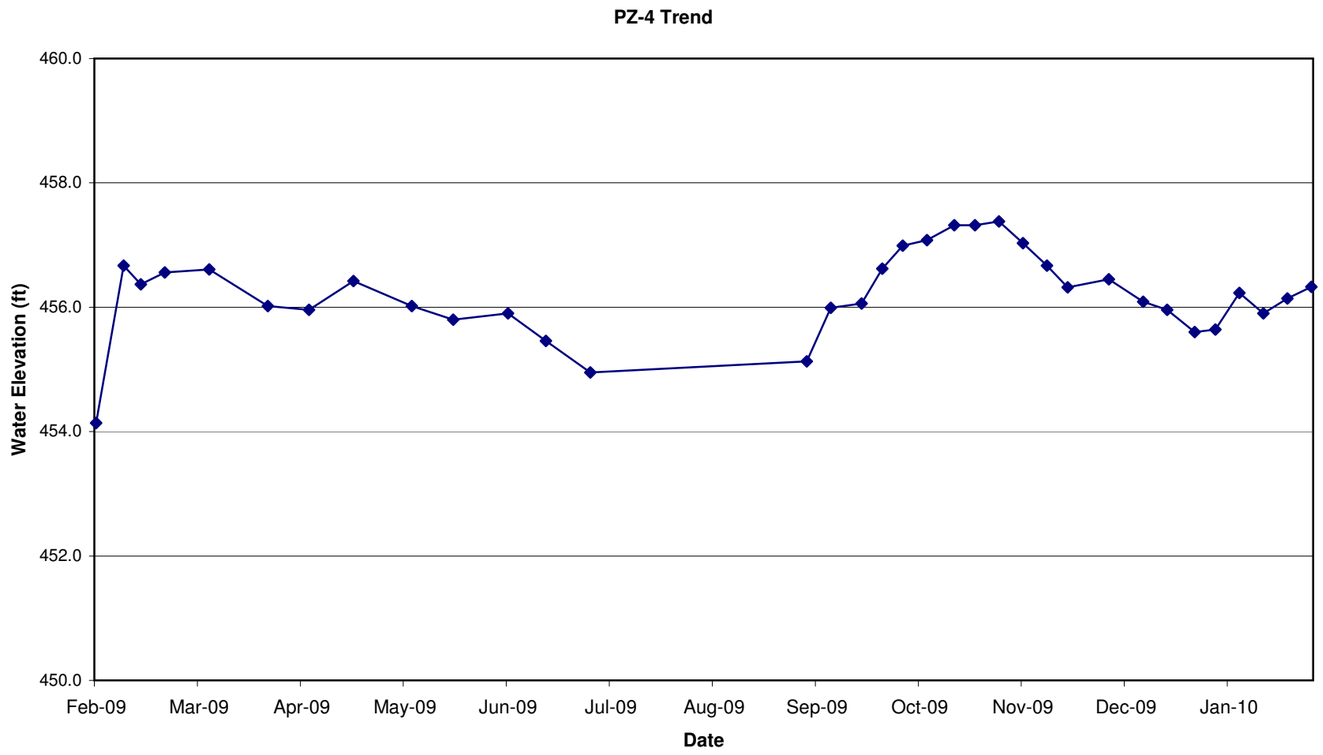
PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-4
Piezometer Installation Date 2/17/2009
Project No. 175569040

Surface Elevation (ft) 467.5
Tip Elevation (ft) 420.7
Location West Pond South Slope

Date	Water Elev (ft)
2/26/2009	454.1
3/6/2009	456.7
3/11/2009	456.4
3/18/2009	456.6
3/31/2009	456.6
4/17/2009	456.0
4/29/2009	456.0
5/12/2009	456.4
5/29/2009	456.0
6/10/2009	455.8
6/26/2009	455.9
7/7/2009	455.5
7/20/2009	455.0
9/21/2009	455.1
9/28/2009	456.0
10/7/2009	456.1
10/13/2009	456.6
10/19/2009	457.0
10/26/2009	457.1
11/3/2009	457.3
11/9/2009	457.3
11/16/2009	457.4
11/23/2009	457.0
11/30/2009	456.7
12/6/2009	456.3
12/18/2009	456.5
12/28/2009	456.1
1/4/2010	456.0
1/12/2010	455.6
1/18/2010	455.6
1/25/2010	456.2
2/1/2010	455.9
2/8/2010	456.1
2/15/2010	456.3

Date	Water Elev (ft)



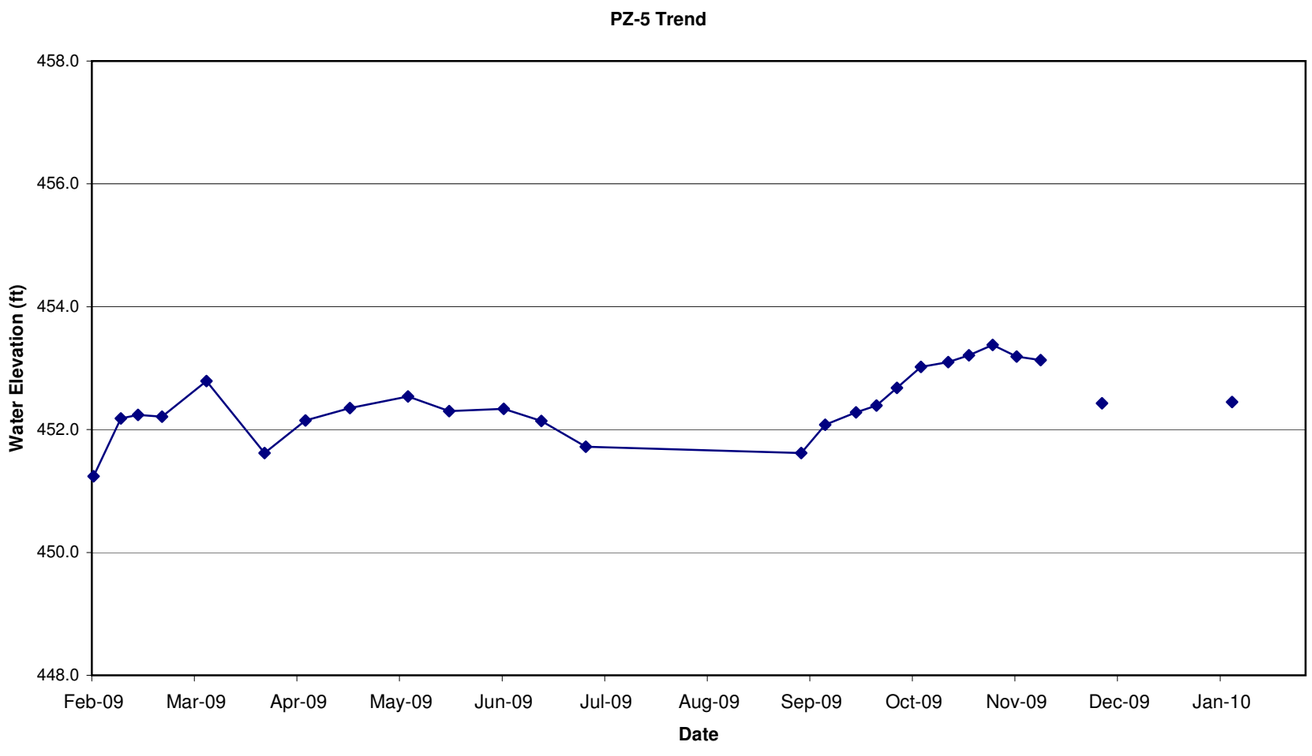
Notes: See attached instrumentation schematics for additional pertinent data

PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-5
Piezometer Installation Date 2/9/2009
Project No. 175569040

Surface Elevation (ft) 451.9
Tip Elevation (ft) 399.3
Location West Pond South Slope

Date	Water Elev (ft)		Date	Water Elev (ft)
2/26/2009	451.2			
3/6/2009	452.2			
3/11/2009	452.2			
3/18/2009	452.2			
3/31/2009	452.8			
4/17/2009	451.6			
4/29/2009	452.2			
5/12/2009	452.4			
5/29/2009	452.5			
6/10/2009	452.3			
6/26/2009	452.3			
7/7/2009	452.1			
7/20/2009	451.7			
9/21/2009	451.6			
9/28/2009	452.1			
10/7/2009	452.3			
10/13/2009	452.4			
10/19/2009	452.7			
10/26/2009	453.0			
11/3/2009	453.1			
11/9/2009	453.2			
11/16/2009	453.4			
11/23/2009	453.2			
11/30/2009	453.1			
12/6/2009		(frozen)		
12/18/2009	452.4			
12/28/2009		(frozen)		
1/4/2010		(frozen)		
1/12/2010		(frozen)		
1/18/2010		(frozen)		
1/25/2010	452.5			
2/1/2010		(frozen)		
2/8/2010		(frozen)		
2/15/2010		(frozen)		



Notes: See attached instrumentation schematics for additional pertinent data

PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

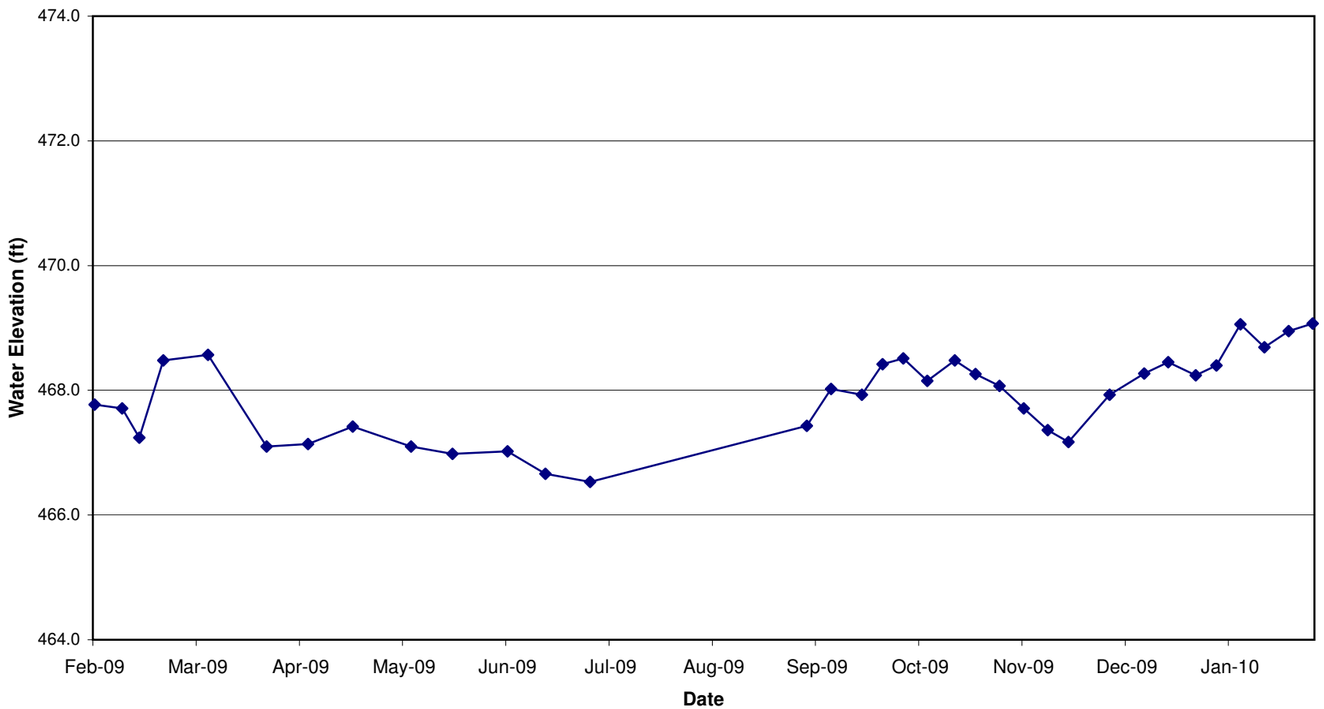
Piezometer No. PZ-6
Piezometer Installation Date 2/17/2009
Project No. 175569040

Surface Elevation (ft) 510.9
Tip Elevation (ft) 413.1
Location West Pond East Slope

Date	Water Elev (ft)
2/26/2009	467.8
3/6/2009	467.7
3/11/2009	467.2
3/18/2009	468.5
3/31/2009	468.6
4/17/2009	467.1
4/29/2009	467.1
5/12/2009	467.4
5/29/2009	467.1
6/10/2009	467.0
6/26/2009	467.0
7/7/2009	466.7
7/20/2009	466.5
9/21/2009	467.4
9/28/2009	468.0
10/7/2009	467.9
10/13/2009	468.4
10/19/2009	468.5
10/26/2009	468.2
11/3/2009	468.5
11/9/2009	468.3
11/16/2009	468.1
11/23/2009	467.7
11/30/2009	467.4
12/6/2009	467.2
12/18/2009	467.9
12/28/2009	468.3
1/4/2010	468.5
1/12/2010	468.2
1/18/2010	468.4
1/25/2010	469.1
2/1/2010	468.7
2/8/2010	469.0
2/15/2010	469.1

Date	Water Elev (ft)

PZ-6 Trend



Notes: See attached instrumentation schematics for additional pertinent data

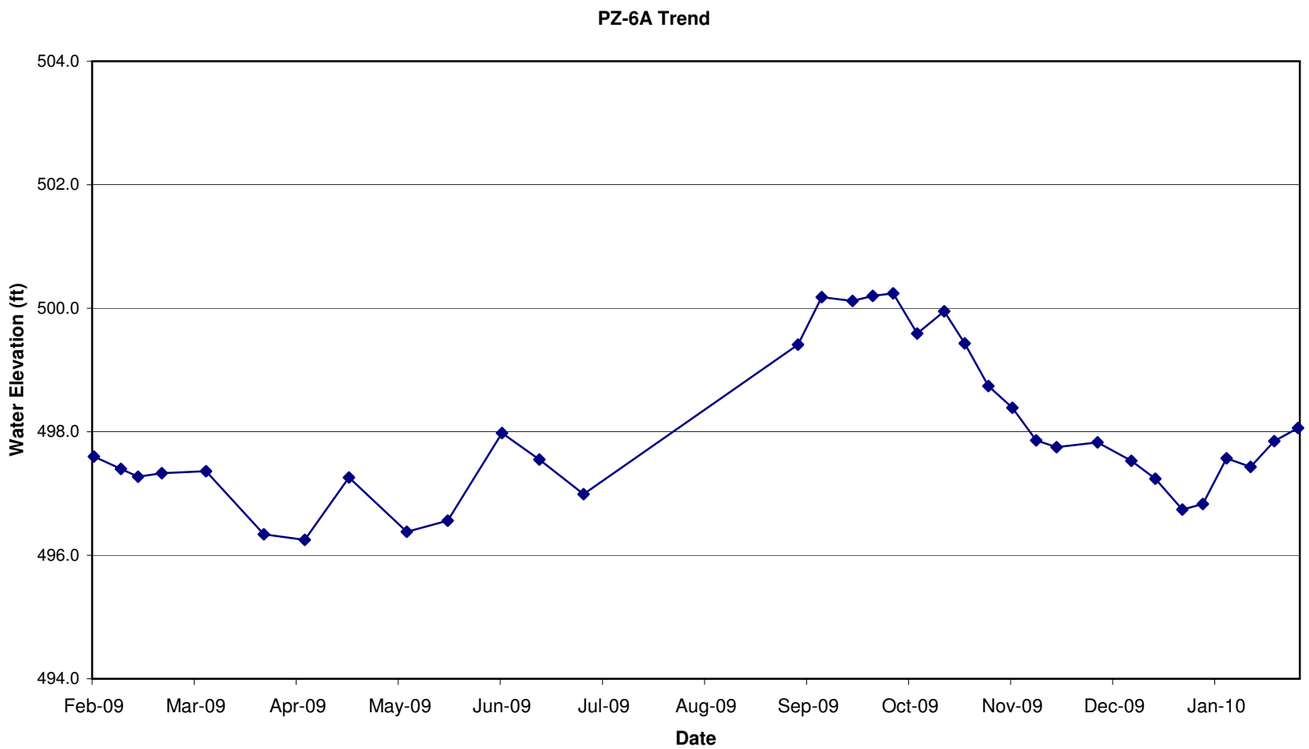
PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-6A
Piezometer Installation Date 2/18/2009
Project No. 175569040

Surface Elevation (ft) 510.9
Tip Elevation (ft) 472.6
Location West Pond East Slope

Date	Water Elev (ft)
2/26/2009	497.6
3/6/2009	497.4
3/11/2009	497.3
3/18/2009	497.3
3/31/2009	497.4
4/17/2009	496.3
4/29/2009	496.3
5/12/2009	497.3
5/29/2009	496.4
6/10/2009	496.6
6/26/2009	498.0
7/7/2009	497.6
7/20/2009	497.0
9/21/2009	499.4
9/28/2009	500.2
10/7/2009	500.1
10/13/2009	500.2
10/19/2009	500.2
10/26/2009	499.6
11/3/2009	500.0
11/9/2009	499.4
11/16/2009	498.7
11/23/2009	498.4
11/30/2009	497.9
12/6/2009	497.8
12/18/2009	497.8
12/28/2009	497.5
1/4/2010	497.2
1/12/2010	496.7
1/18/2010	496.8
1/25/2010	497.6
2/1/2010	497.4
2/8/2010	497.9
2/15/2010	498.1

Date	Water Elev (ft)



Notes: See attached instrumentation schematics for additional pertinent data

PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-7
Piezometer Installation Date 2/18/2009
Project No. 175569040

Surface Elevation (ft) 486.7
Tip Elevation (ft) 474.4
Location West Pond East Slope

Date	Water Elev (ft)
2/26/2009	486.7*
3/6/2009	484.0
3/11/2009	483.6
3/18/2009	484.0
3/31/2009	484.1
4/17/2009	483.9
4/29/2009	484.1
5/12/2009	484.3
5/29/2009	484.3
6/10/2009	484.5
6/26/2009	484.6
7/7/2009	484.6
7/20/2009	484.5
9/21/2009	485.0
9/28/2009	485.2
10/7/2009	484.9
10/13/2009	485.0
10/19/2009	485.1
10/26/2009	485.0
11/3/2009	484.9
11/9/2009	484.9
11/16/2009	485.0
11/23/2009	484.9
11/30/2009	484.7
12/6/2009	485.5
12/18/2009	485.1
12/28/2009	484.5
1/4/2010	484.6
1/12/2010	484.3
1/18/2010	484.7
1/25/2010	485.1
2/1/2010	484.6
2/8/2010	484.8
2/15/2010	485.1

Date	Water Elev (ft)

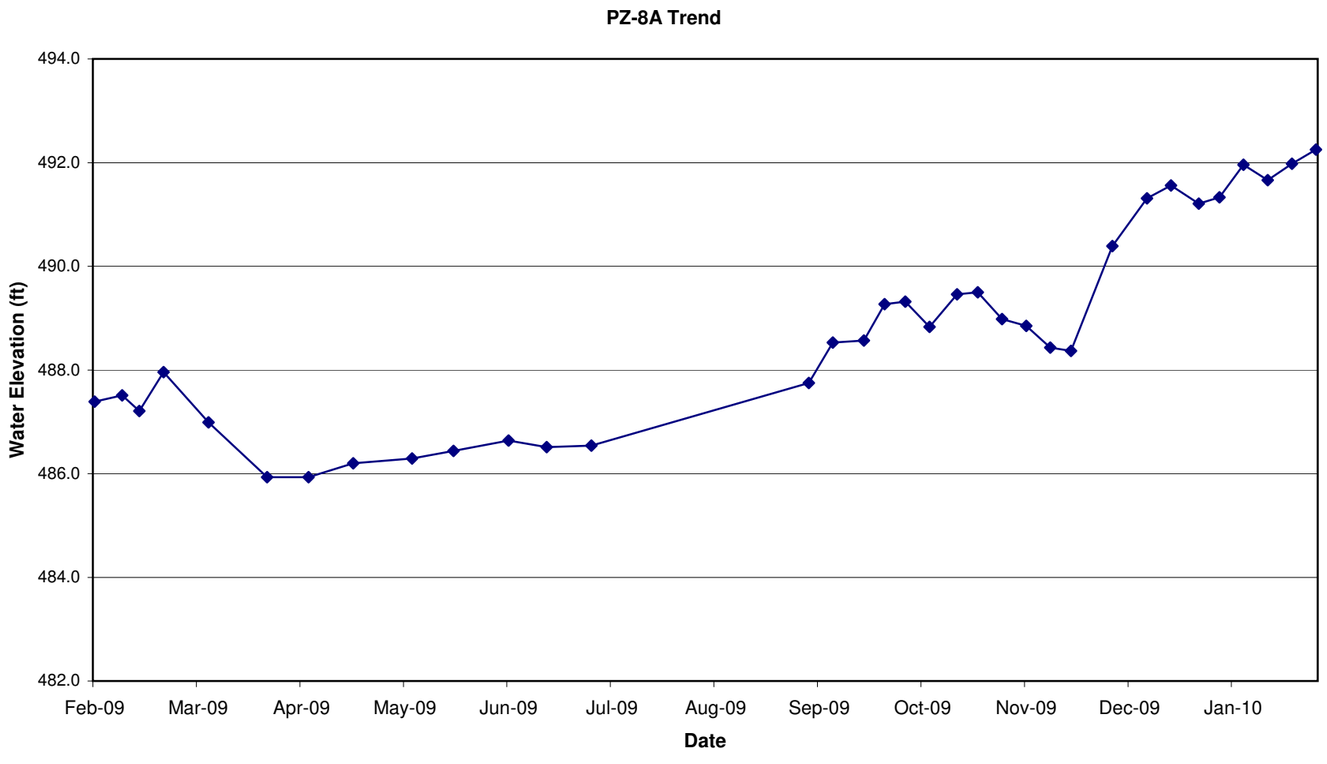
PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-8A
Piezometer Installation Date 2/20/2009
Project No. 175569040

Surface Elevation (ft) 510.2
Tip Elevation (ft) 452.3
Location East Pond South Slope

Date	Water Elev (ft)
2/26/2009	487.4
3/6/2009	487.5
3/11/2009	487.2
3/18/2009	488.0
3/31/2009	487.0
4/17/2009	485.9
4/29/2009	485.9
5/12/2009	486.2
5/29/2009	486.3
6/10/2009	486.4
6/26/2009	486.6
7/7/2009	486.5
7/20/2009	486.5
9/21/2009	487.8
9/28/2009	488.5
10/7/2009	488.6
10/13/2009	489.3
10/19/2009	489.3
10/26/2009	488.8
11/3/2009	489.5
11/9/2009	489.5
11/16/2009	489.0
11/23/2009	488.9
11/30/2009	488.4
12/6/2009	488.4
12/18/2009	490.4
12/28/2009	491.3
1/4/2010	491.6
1/12/2010	491.2
1/18/2010	491.3
1/25/2010	492.0
2/1/2010	491.7
2/8/2010	492.0
2/15/2010	492.3

Date	Water Elev (ft)



Notes: See attached instrumentation schematics for additional pertinent data

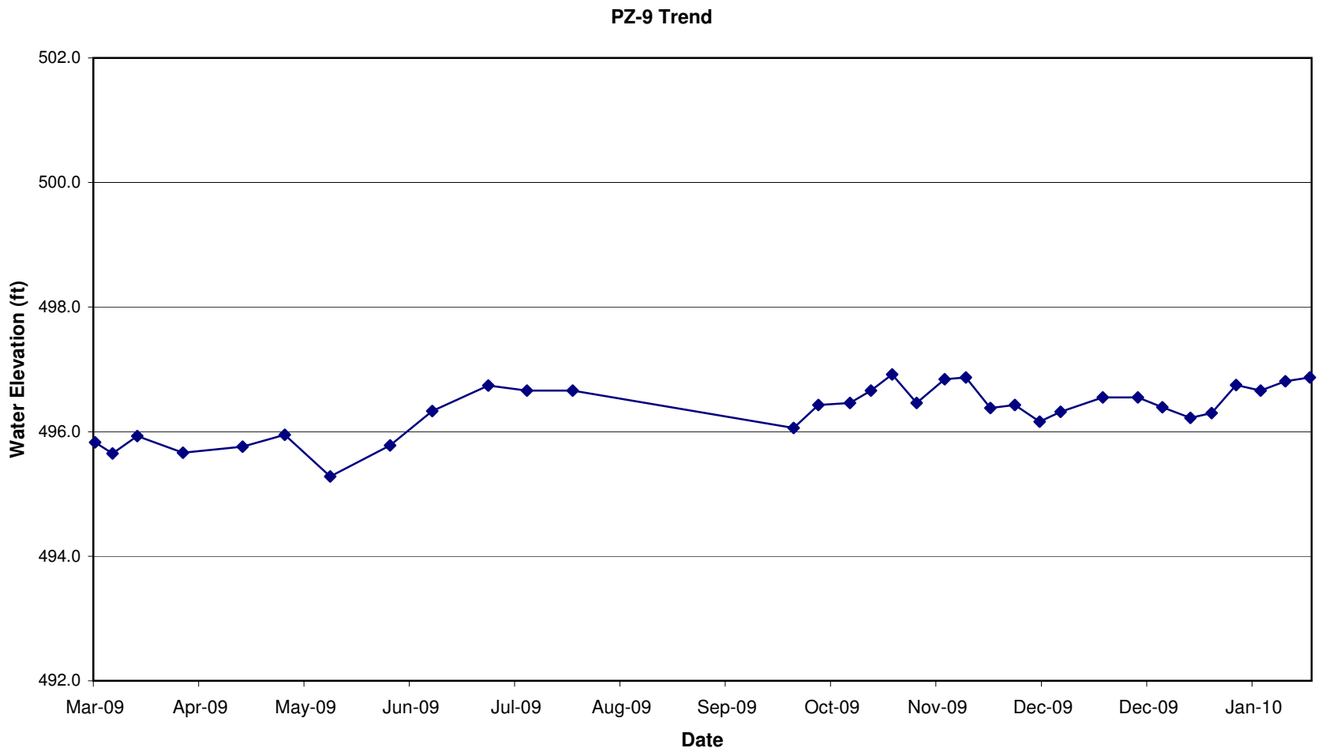
PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-9
Piezometer Installation Date 2/27/2009
Project No. 175569040

Surface Elevation (ft) 497.5
Tip Elevation (ft) 455.5
Location East Pond South Slope

Date	Water Elev (ft)
2/26/2009	497.5
3/6/2009	495.8
3/11/2009	495.7
3/18/2009	495.9
3/31/2009	495.7
4/17/2009	495.8
4/29/2009	496.0
5/12/2009	495.3
5/29/2009	495.8
6/10/2009	496.3
6/26/2009	496.7
7/7/2009	496.7
7/20/2009	496.7
9/21/2009	496.1
9/28/2009	496.4
10/7/2009	496.5
10/13/2009	496.7
10/19/2009	496.9
10/26/2009	496.5
11/3/2009	496.8
11/9/2009	496.9
11/16/2009	496.4
11/23/2009	496.4
11/30/2009	496.2
12/6/2009	496.3
12/18/2009	496.6
12/28/2009	496.6
1/4/2010	496.4
1/12/2010	496.2
1/18/2010	496.3
1/25/2010	496.8
2/1/2010	496.7
2/8/2010	496.8
2/15/2010	496.9

Date	Water Elev (ft)



Notes: See attached instrumentation schematics for additional pertinent data

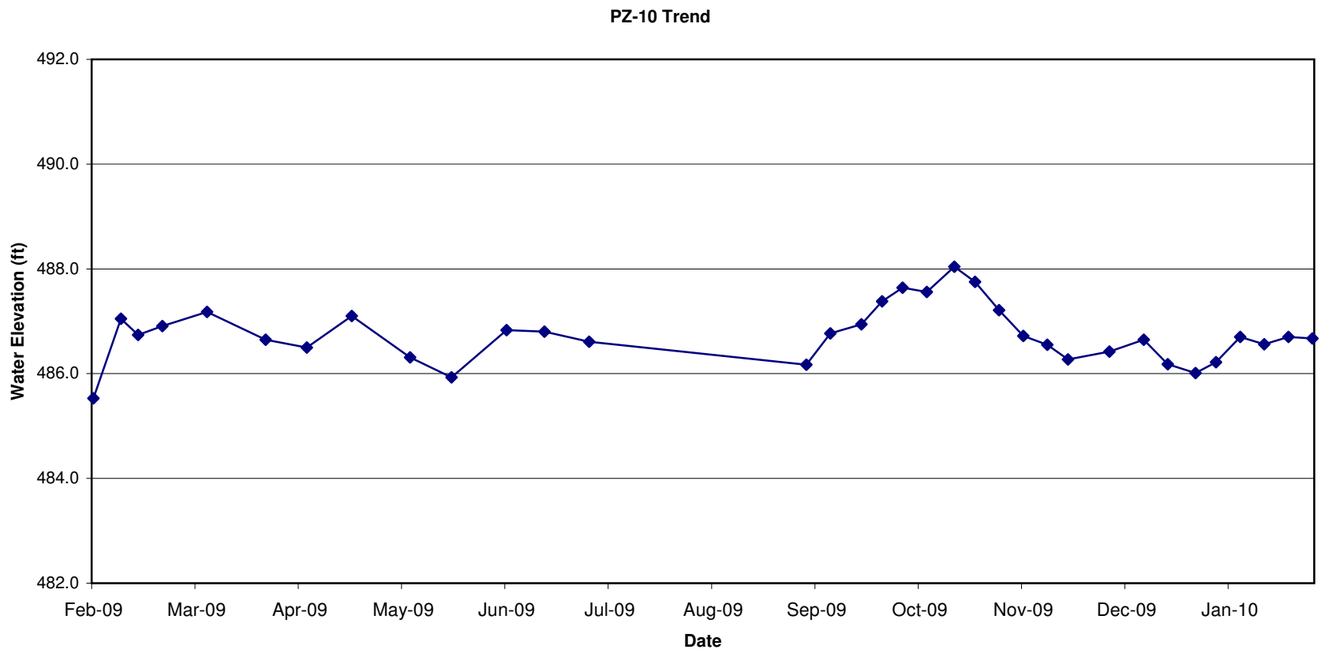
PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-10
Piezometer Installation Date 2/24/2009
Project No. 175569040

Surface Elevation (ft) 514
Tip Elevation (ft) 465.7
Location East Pond East Slope

Date	Water Elev (ft)
2/26/2009	485.5
3/6/2009	487.1
3/11/2009	486.7
3/18/2009	486.9
3/31/2009	487.2
4/17/2009	486.7
4/29/2009	486.5
5/12/2009	487.1
5/29/2009	486.3
6/10/2009	485.9
6/26/2009	486.8
7/7/2009	486.8
7/20/2009	486.6
9/21/2009	486.2
9/28/2009	486.8
10/7/2009	486.9
10/13/2009	487.4
10/19/2009	487.6
10/26/2009	487.6
11/3/2009	488.0
11/9/2009	487.8
11/16/2009	487.2
11/23/2009	486.7
11/30/2009	486.6
12/6/2009	486.3
12/18/2009	486.4
12/28/2009	486.7
1/4/2010	486.2
1/12/2010	486.0
1/18/2010	486.2
1/25/2010	486.7
2/1/2010	486.6
2/8/2010	486.7
2/15/2010	486.7

Date	Water Elev (ft)



Notes: See attached instrumentation schematics for additional pertinent data

PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

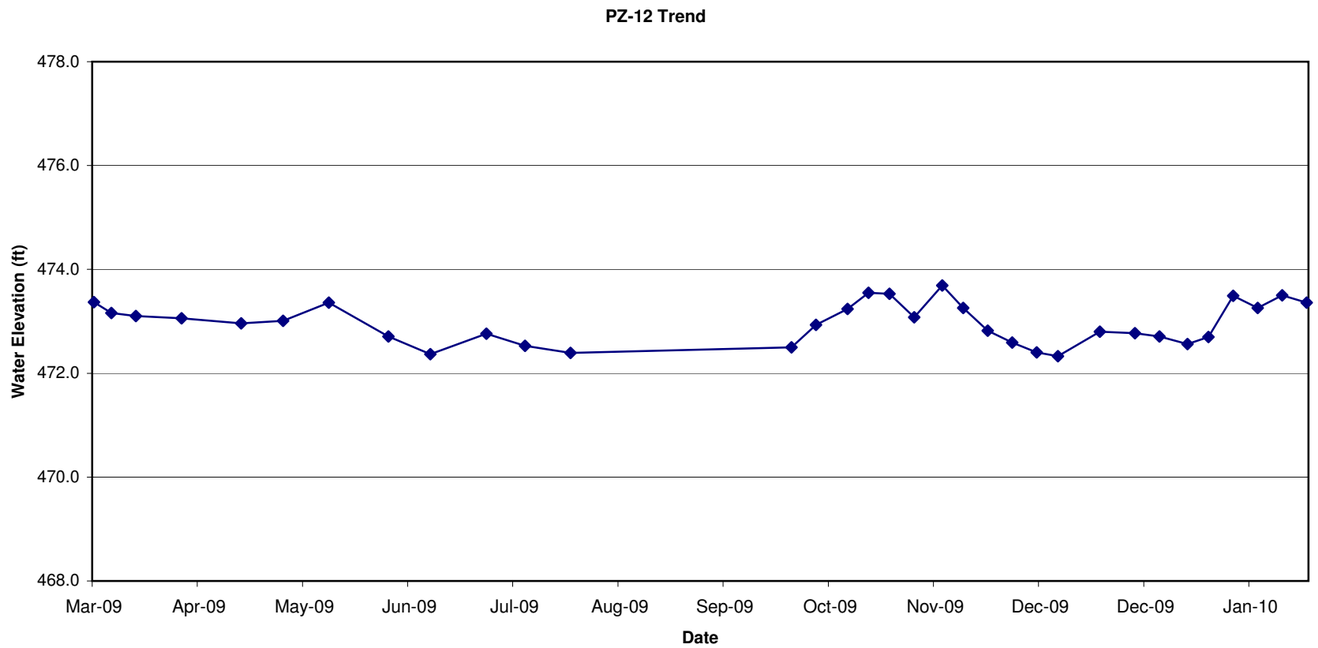
Piezometer No. PZ-12
Piezometer Installation Date 2/27/2009
Project No. 175569040

Surface Elevation (ft) 494.4
Tip Elevation (ft) 464.4
Location East Pond East Slope

Date	Water Elev (ft)
2/26/2009	494.4*
3/6/2009	473.4
3/11/2009	473.2
3/18/2009	473.1
3/31/2009	473.1
4/17/2009	473.0
4/29/2009	473.0
5/12/2009	473.4
5/29/2009	472.7
6/10/2009	472.4
6/26/2009	472.8
7/7/2009	472.5
7/20/2009	472.4
9/21/2009	472.5
9/28/2009	472.9
10/7/2009	473.2
10/13/2009	473.6
10/19/2009	473.5
10/26/2009	473.1
11/3/2009	473.7
11/9/2009	473.3
11/16/2009	472.8
11/23/2009	472.6
11/30/2009	472.4
12/6/2009	472.3
12/18/2009	472.8
12/28/2009	472.8
1/4/2010	472.7
1/12/2010	472.6
1/18/2010	472.7
1/25/2010	473.5
2/1/2010	473.3
2/8/2010	473.5
2/15/2010	473.4

Date	Water Elev (ft)

* Readings Not Plotted



Notes: See attached instrumentation schematics for additional pertinent data

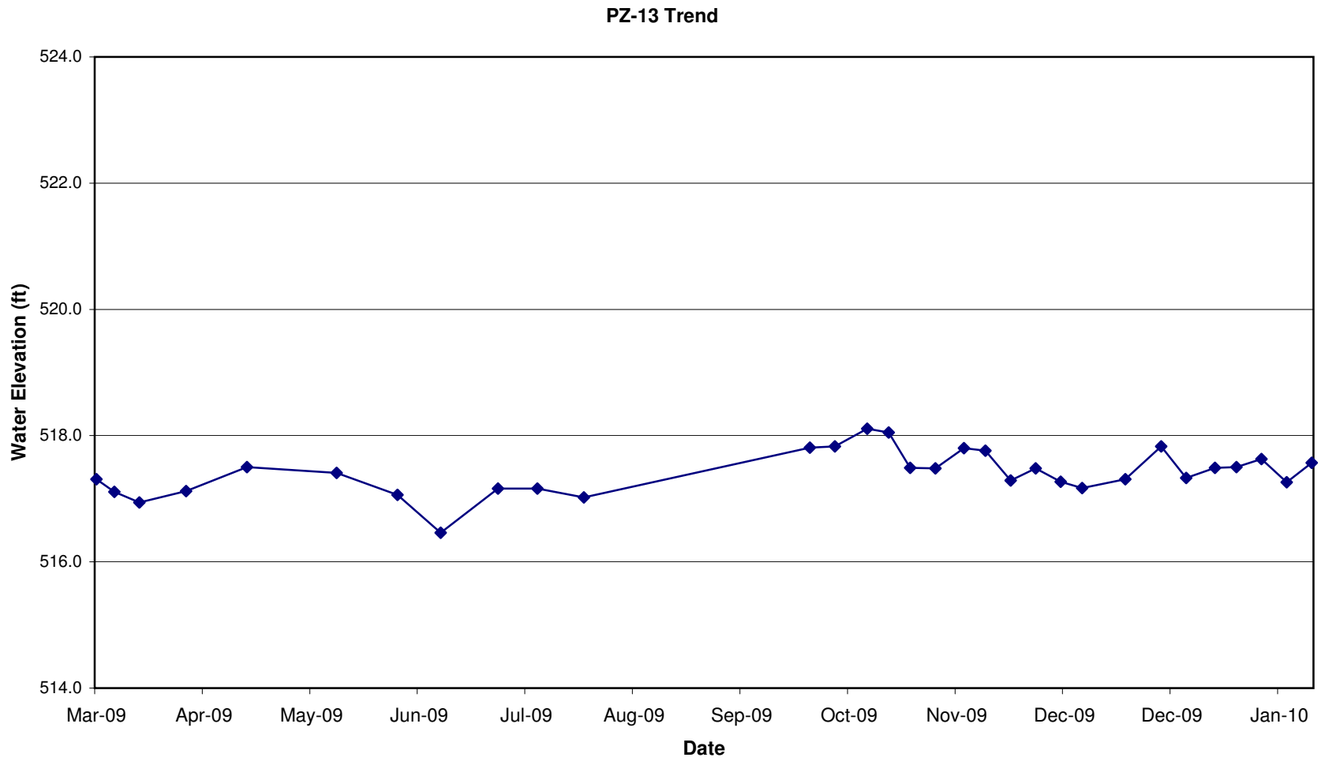
PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-13
Piezometer Installation Date 2/25/2009
Project No. 175569040

Surface Elevation (ft) 525.1
Tip Elevation (ft) 504
Location East Pond North Slope

Date	Water Elev (ft)
2/26/2009	525.1*
3/6/2009	517.3
3/11/2009	517.1
3/18/2009	516.9
3/31/2009	517.1
4/17/2009	517.5
4/29/2009	520.8*
5/12/2009	517.4
5/29/2009	517.1
6/10/2009	516.5
6/26/2009	517.2
7/7/2009	517.2
7/20/2009	517.0
9/21/2009	517.8
9/28/2009	517.8
10/7/2009	518.1
10/13/2009	518.1
10/19/2009	517.5
10/26/2009	517.5
11/3/2009	517.8
11/9/2009	517.8
11/16/2009	517.3
11/23/2009	517.5
11/30/2009	517.3
12/6/2009	517.2
12/18/2009	517.3
12/28/2009	517.8
1/4/2010	517.3
1/12/2010	517.5
1/18/2010	517.5
1/25/2010	517.6
2/1/2010	517.3
2/8/2010	517.6
2/15/2010	517.2

Date	Water Elev (ft)



* Readings Not Plotted

Notes: See attached instrumentation schematics for additional pertinent data

PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-20A
Piezometer Installation Date 12/3/2009
Project No. 175569040

Surface Elevation (ft) 489.7
Tip Elevation (ft) 470.7
Location East Pond East Slope

Date	Water Elev (ft)
1/4/2010	471.1
1/12/2010	471.1
1/18/2010	471.1
1/25/2010	472.2
2/1/2010	473.1
2/8/2010	473.8
2/15/2010	474.4

PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-22A
Piezometer Installation Date 11/18/2009
Project No. 175569040

Surface Elevation (ft) 519.4
Tip Elevation (ft) 490.4
Location East Pond East Slope

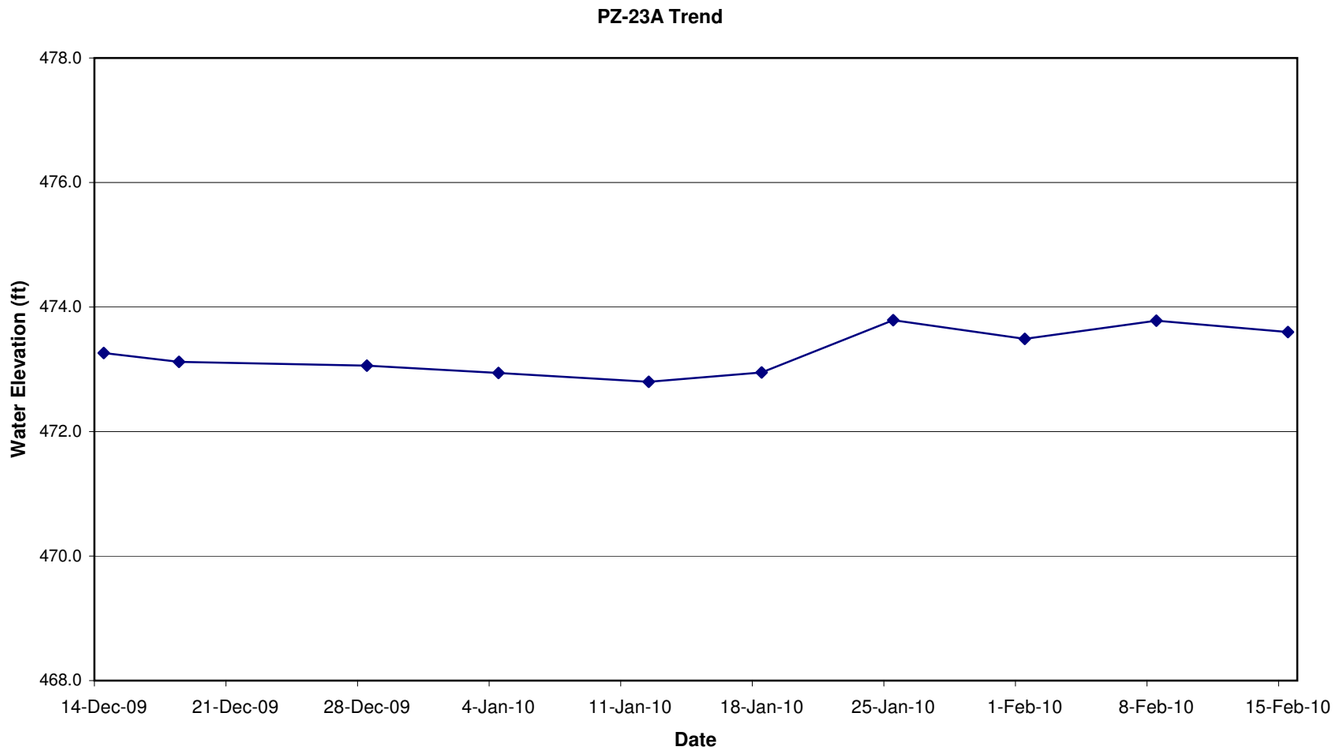
Date	Water Elev (ft)
12/14/2009	507.2
12/18/2009	506.9
12/28/2009	507.6
1/4/2010	506.6
1/12/2010	507.2
1/18/2010	507.2
1/25/2010	507.5
2/1/2010	507.9
2/8/2010	507.9
2/15/2010	507.6

PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-23A
Piezometer Installation Date 12/9/2009
Project No. 175569040

Surface Elevation (ft) 501.8
Tip Elevation (ft) 470
Location East Pond East Slope

Date	Water Elev (ft)
12/14/2009	473.3
12/18/2009	473.1
12/28/2009	473.1
1/4/2010	472.9
1/12/2010	472.8
1/18/2010	473.0
1/25/2010	473.8
2/1/2010	473.5
2/8/2010	473.8
2/15/2010	473.6



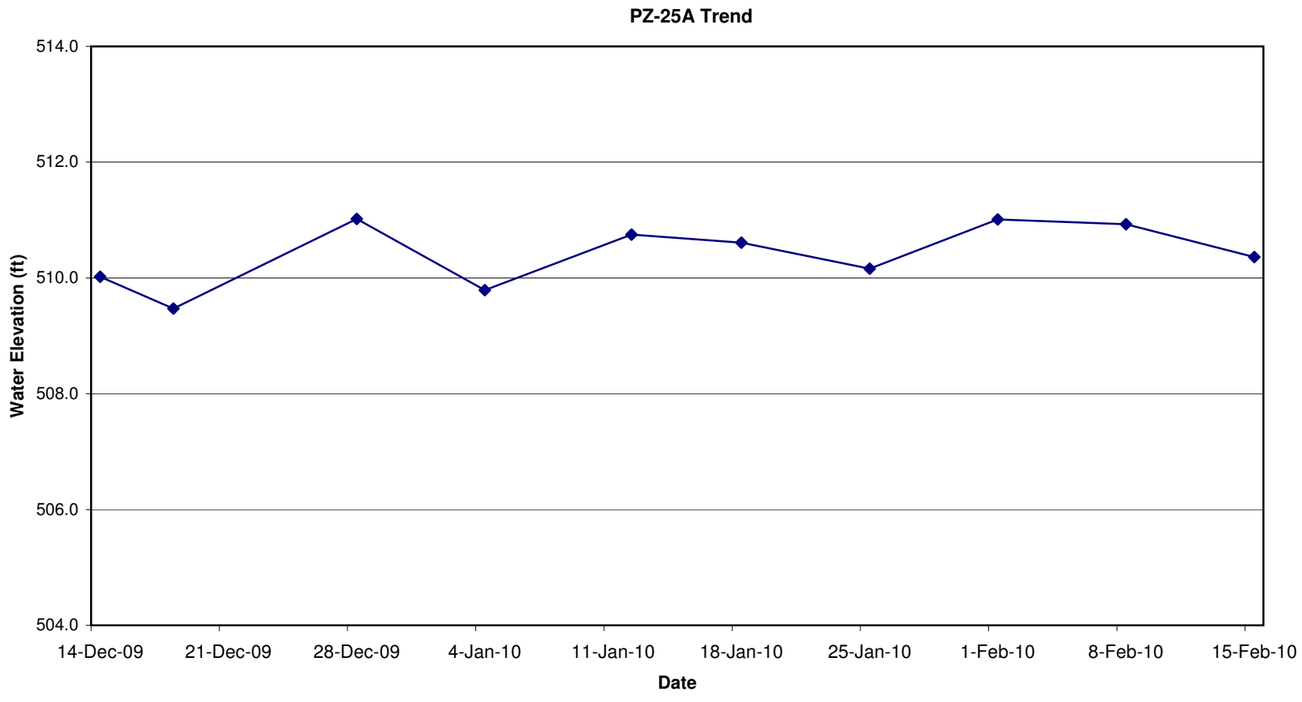
Notes: See attached instrumentation schematics for additional pertinent data

PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-25A
Piezometer Installation Date 12/1/2009
Project No. 175569040

Surface Elevation (ft) 523.3
Tip Elevation (ft) 489.3
Location East Pond East Slope

Date	Water Elev (ft)
12/14/2009	510.0
12/18/2009	509.5
12/28/2009	511.0
1/4/2010	509.8
1/12/2010	510.8
1/18/2010	510.6
1/25/2010	510.2
2/1/2010	511.0
2/8/2010	510.9
2/15/2010	510.4



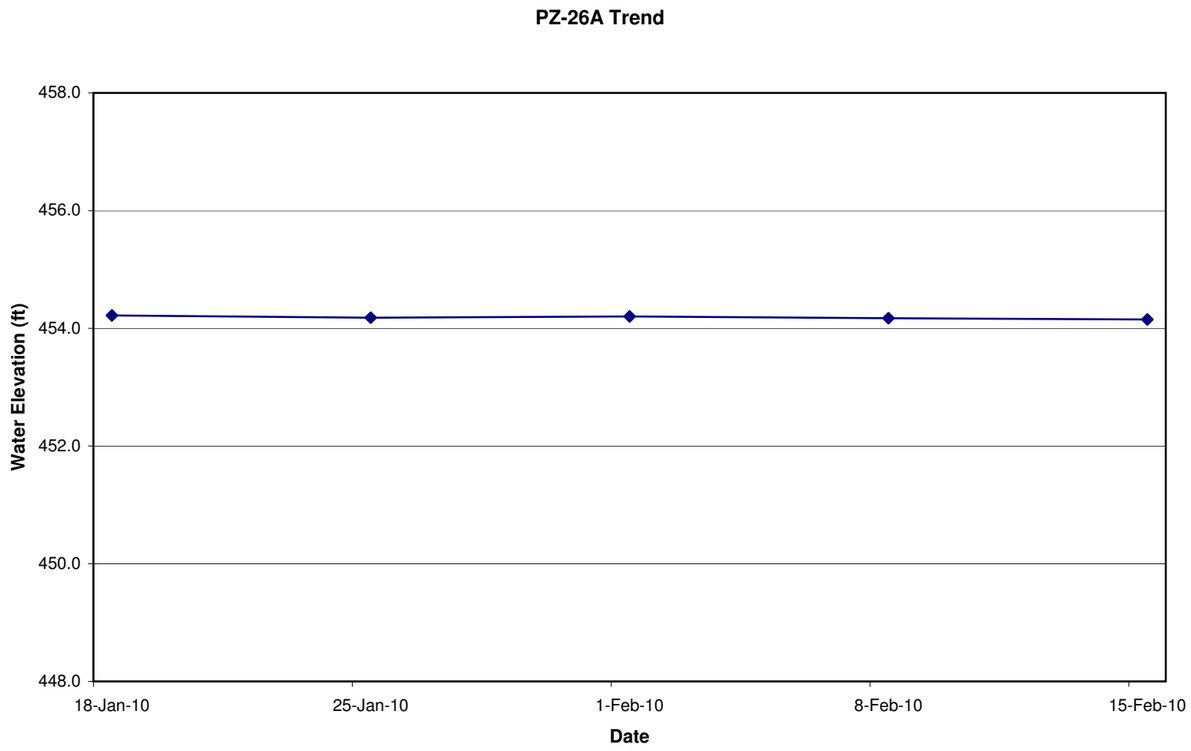
Notes: See attached instrumentation schematics for additional pertinent data

PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-26A
Piezometer Installation Date 1/6/2010
Project No. 175569040

Surface Elevation (ft) 471.4
Tip Elevation (ft) 454.7
Location West Pond South Slope

Date	Water Elev (ft)
1/18/2010	454.2
1/25/2010	454.2
2/1/2010	454.2
2/8/2010	454.2
2/15/2010	454.2



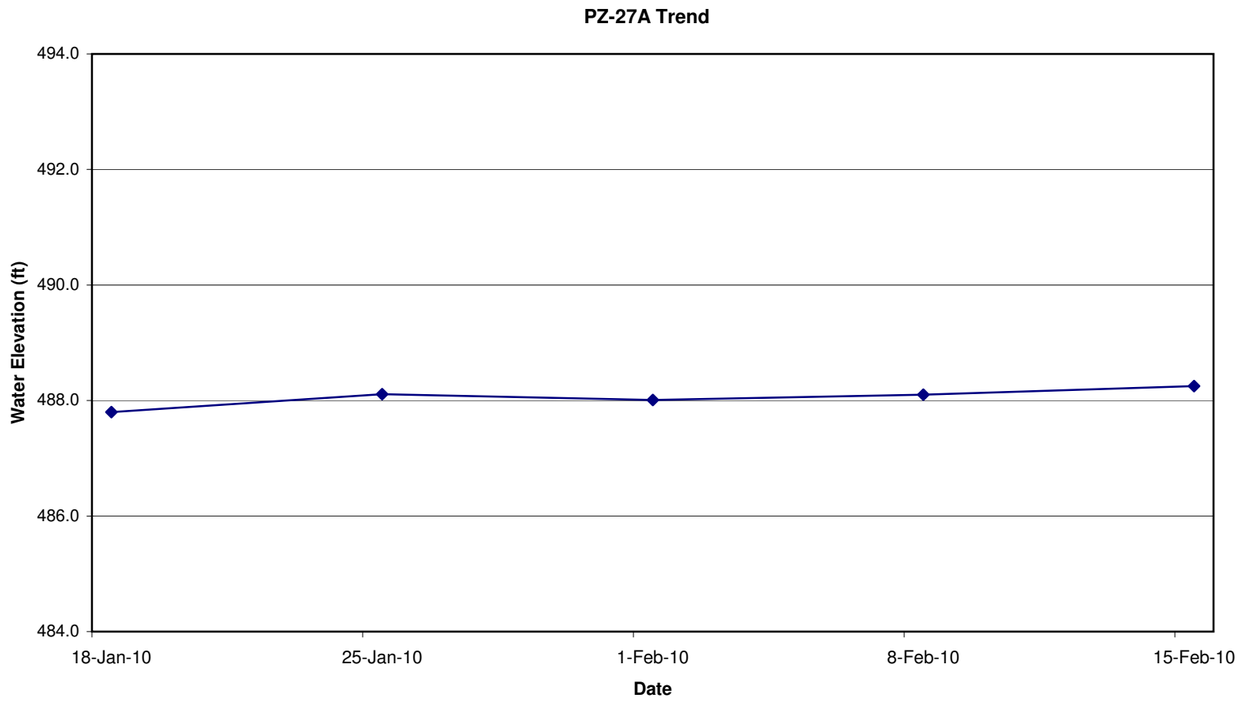
Notes: See attached instrumentation schematics for additional pertinent data

PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-27A
Piezometer Installation Date 12/11/2009
Project No. 175569040

Surface Elevation (ft) 492.2
Tip Elevation (ft) 470.2
Location West Pond South Slope

Date	Water Elev (ft)
1/18/2010	487.8
1/25/2010	488.1
2/1/2010	488.0
2/8/2010	488.1
2/15/2010	488.3



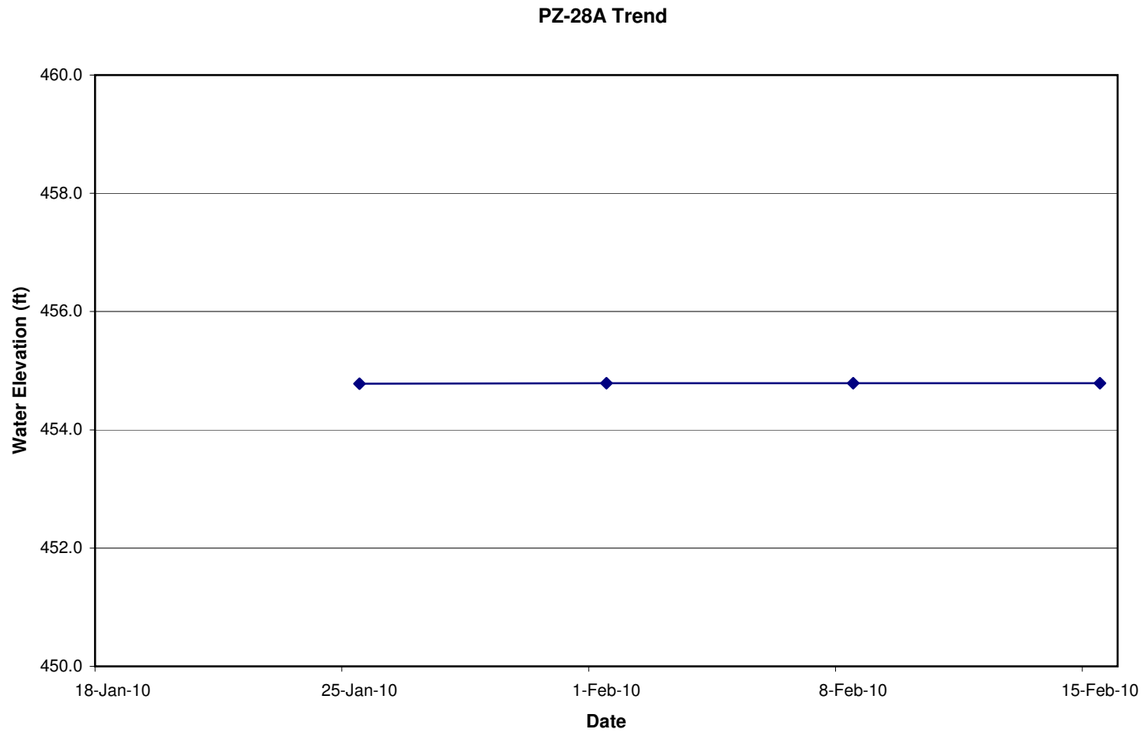
Notes: See attached instrumentation schematics for additional pertinent data

PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-28A
Piezometer Installation Date 1/5/2010
Project No. 175569040

Surface Elevation (ft) 470.2
Tip Elevation (ft) 454.5
Location West Pond South Slope

Date	Water Elev (ft)	
1/18/2010		(Dry)
1/25/2010	454.8	
2/1/2010	454.8	
2/8/2010	454.8	
2/15/2010	454.8	



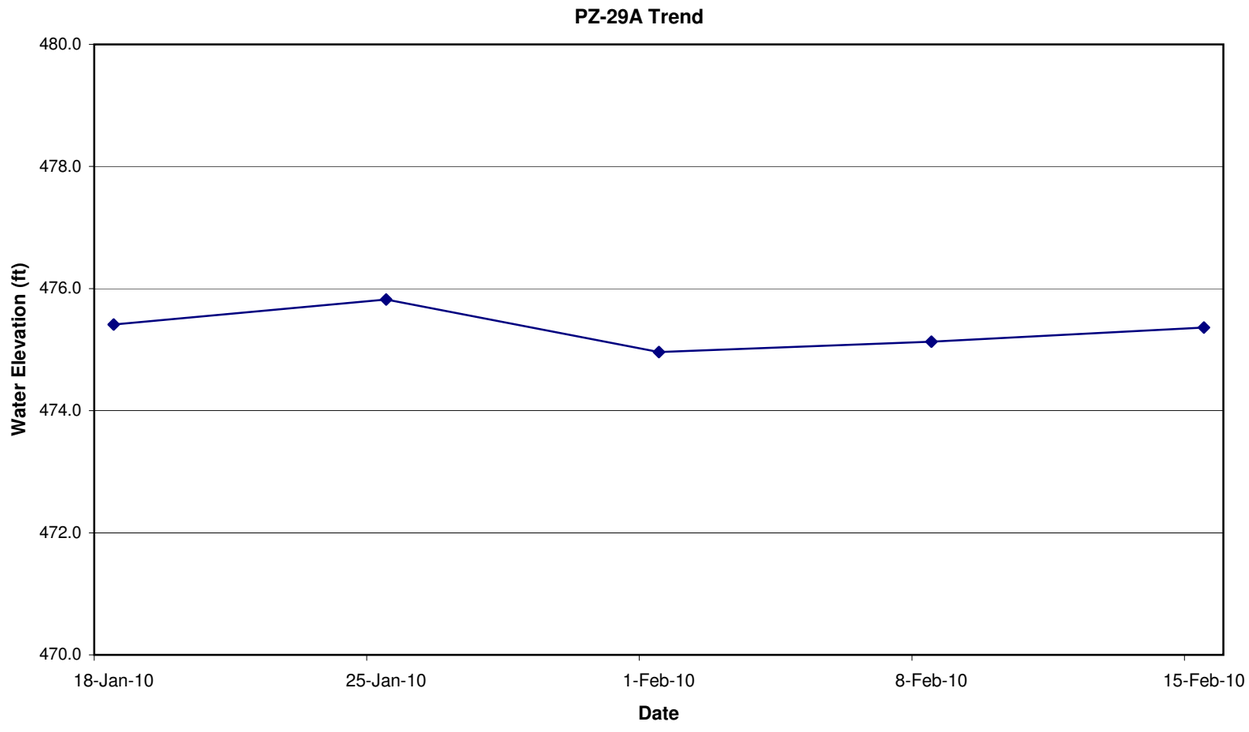
Notes: See attached instrumentation schematics for additional pertinent data

PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-29A
Piezometer Installation Date 12/16/2009
Project No. 175569040

Surface Elevation (ft) 489.1
Tip Elevation (ft) 470.7
Location West Pond South Slope

Date	Water Elev (ft)
1/18/2010	475.4
1/25/2010	475.8
2/1/2010	475.0
2/8/2010	475.1
2/15/2010	475.4



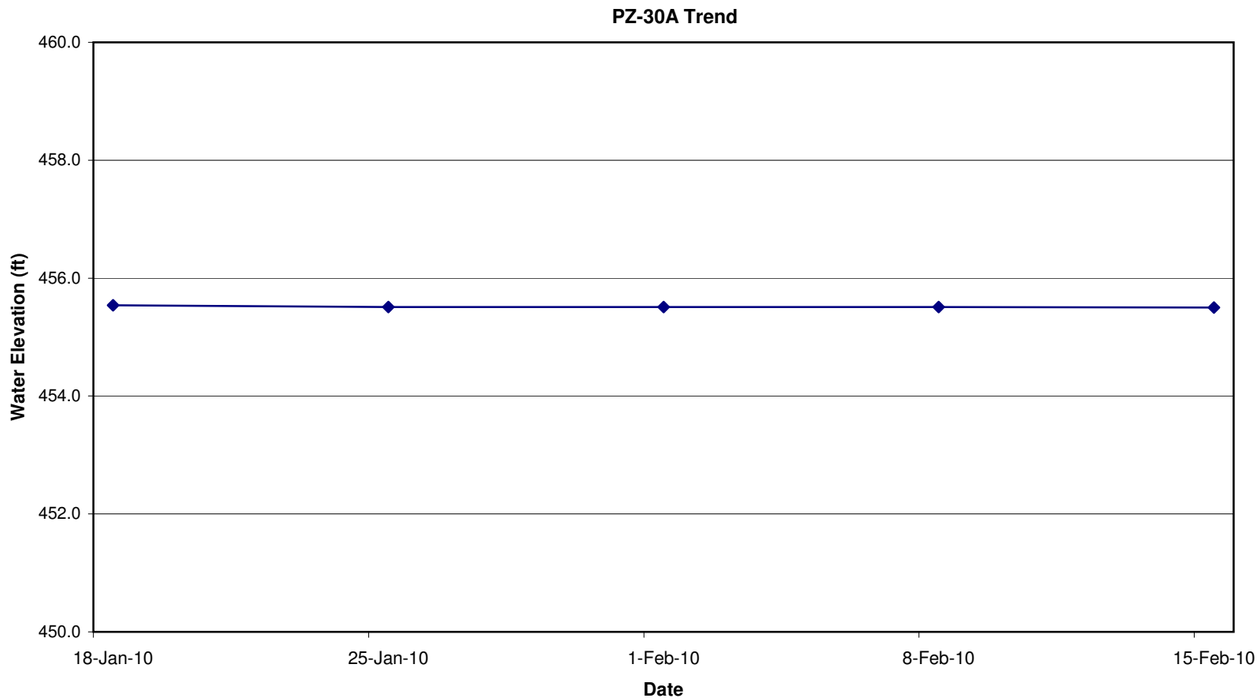
Notes: See attached instrumentation schematics for additional pertinent data

PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-30A
Piezometer Installation Date 1/4/2010
Project No. 175569040

Surface Elevation (ft) 470.5
Tip Elevation (ft) 454.9
Location West Pond South Slope

Date	Water Elev (ft)
1/18/2010	455.5
1/25/2010	455.5
2/1/2010	455.5
2/8/2010	455.5
2/15/2010	455.5



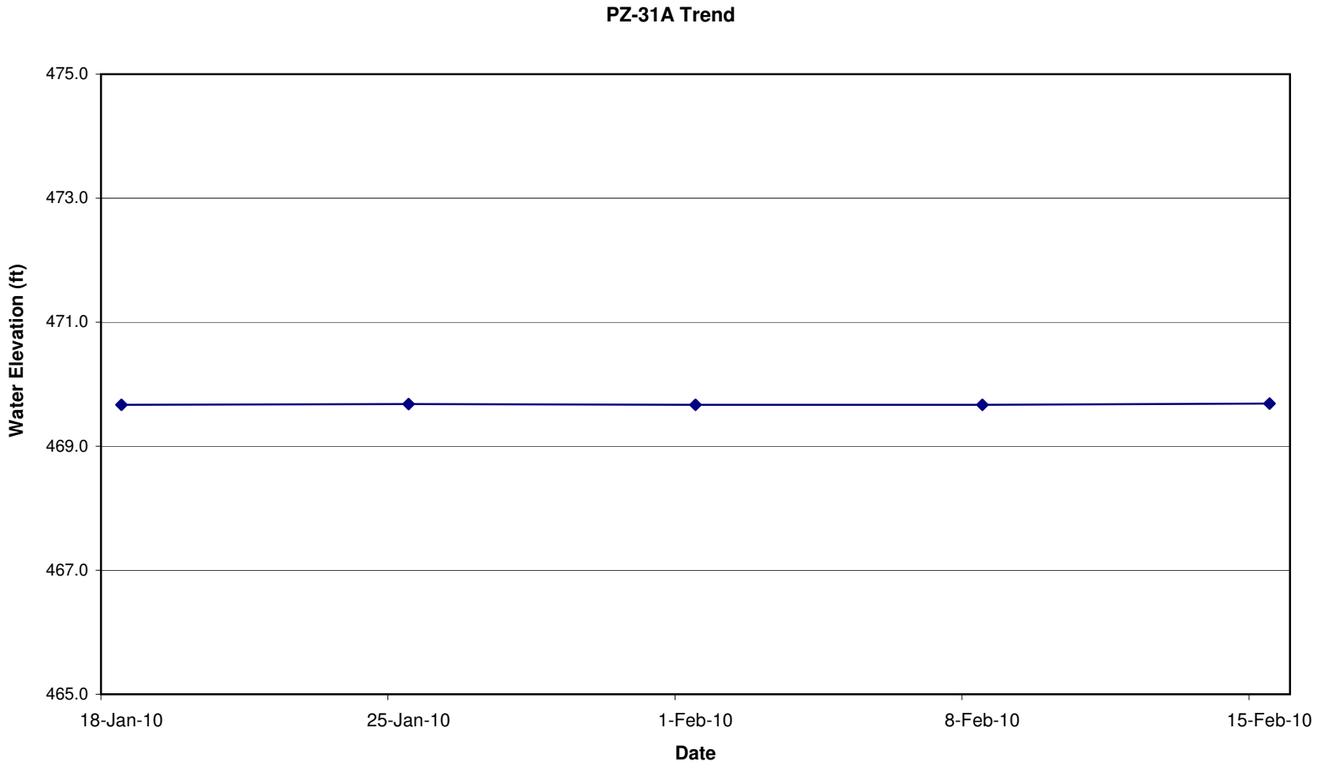
Notes: See attached instrumentation schematics for additional pertinent data

PIEZOMETER READINGS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No. PZ-31A
Piezometer Installation Date 12/17/2009
Project No. 175569040

Surface Elevation (ft) 487.0
Tip Elevation (ft) 470.4
Location West Pond South Slope

Date	Water Elev (ft)
1/18/2010	469.7
1/25/2010	469.7
2/1/2010	469.7
2/8/2010	469.7
2/15/2010	469.7



Notes: See attached instrumentation schematics for additional pertinent data

Stantec

PIEZOMETER

Paradise Fossil Plant
13246 State Route 176
175569040

		2/26/2009				3/6/2009				3/11/2009			
Location	Piezometer	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)
B-2	PZ-2A	494.2	2.4	24.4	472.2	494.2	2.4	28.2	468.4	494.2	2.4	24.4	472.2
B-2	PZ-2	494.2	2.4	4.8	491.8	494.2	2.4	3.5	493.1	494.2	2.4	3.7	492.9
B-4	PZ-4	467.5	2.3	15.7	454.1	467.5	2.3	13.2	456.7	467.5	2.3	13.5	456.4
B-5	PZ-5	451.9	2.0	2.7	451.2	451.9	2.0	1.7	452.2	451.9	2.0	1.7	452.2
B-6	PZ-6	510.9	2.3	45.4	467.8	510.9	2.1	45.3	467.7	510.9	2.1	45.7	467.2
B-6A	PZ-6A	510.9	2.0	15.3	497.6	510.9	1.8	15.3	497.4	510.9	1.8	15.4	497.3
B-7	PZ-7	486.7	0.0	0.0	486.7	486.7	2.0	4.7	484.0	486.7	2.0	5.1	483.6
B-8A	PZ-8A	510.2	2.3	25.1	487.4	510.2	2.2	24.9	487.5	510.2	2.2	25.2	487.2
B-9	PZ-9	497.5	0.0	0.0	497.5	497.5	2.9	4.6	495.8	497.5	2.9	4.7	495.7
B-10	PZ-10	514.0	2.5	31.0	485.5	514.0	2.3	29.3	487.1	514.0	2.3	29.6	486.7
B-12	PZ-12	494.4	0.0	0.0	494.4	494.4	2.1	23.1	473.4	494.4	2.1	23.4	473.2
B-13	PZ-13	525.1	0.0	0.0	525.1	525.1	2.2	10.0	517.3	525.1	2.2	10.2	517.1
B-20A	STN-20A	Not Installed				Not Installed				Not Installed			
B-22A	STN-22A	Not Installed				Not Installed				Not Installed			
B-23A	STN-23A	Not Installed				Not Installed				Not Installed			
B-25A	STN-25A	Not Installed				Not Installed				Not Installed			
B-26A	STN-26A	Not Installed				Not Installed				Not Installed			
B-27A	STN-27A	Not Installed				Not Installed				Not Installed			
B-28A	STN-28A	Not Installed				Not Installed				Not Installed			
B-29A	STN-29A	Not Installed				Not Installed				Not Installed			
B-30A	STN-30A	Not Installed				Not Installed				Not Installed			
B-31A	STN-31A	Not Installed				Not Installed				Not Installed			
STN-33A	PZ-33	Not Installed				Not Installed				Not Installed			
STN-34A	PZ-34	Not Installed				Not Installed				Not Installed			
STN-35A	PZ-35	Not Installed				Not Installed				Not Installed			
STN-42A	PZ-42U	Not Installed				Not Installed				Not Installed			
STN-42B	PZ-42L	Not Installed				Not Installed				Not Installed			
STN-43	PZ-43	Not Installed				Not Installed				Not Installed			

*** Change from previous reading**

Stantec

PIEZOMETER

Paradise Fossil Plant
13246 State Route 176
175569040

		3/18/2009				3/31/2009				4/17/2009			
Location	Piezometer	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)
B-2	PZ-2A	494.2	2.4	24.4	472.3	494.2	2.4	24.6	472.0	494.2	2.4	25.5	471.1
B-2	PZ-2	494.2	2.4	3.6	493.0	494.2	2.4	3.8	492.9	494.2	2.4	4.3	492.3
B-4	PZ-4	467.5	2.3	13.3	456.6	467.5	2.3	13.2	456.6	467.5	2.3	13.8	456.0
B-5	PZ-5	451.9	2.0	1.7	452.2	451.9	2.0	1.1	452.8	451.9	2.0	2.3	451.6
B-6	PZ-6	510.9	2.1	44.5	468.5	510.9	2.1	44.4	468.6	510.9	2.1	45.9	467.1
B-6A	PZ-6A	510.9	1.8	15.4	497.3	510.9	1.8	15.3	497.4	510.9	1.8	16.3	496.3
B-7	PZ-7	486.7	2.0	4.7	484.0	486.7	2.0	4.6	484.1	486.7	2.0	4.9	483.9
B-8A	PZ-8A	510.2	2.2	24.5	488.0	510.2	2.2	25.4	487.0	510.2	2.2	26.5	485.9
B-9	PZ-9	497.5	2.9	4.5	495.9	497.5	2.9	4.7	495.7	497.5	2.9	4.6	495.8
B-10	PZ-10	514.0	2.3	29.4	486.9	514.0	2.3	29.1	487.2	514.0	2.3	29.7	486.7
B-12	PZ-12	494.4	2.1	23.4	473.1	494.4	2.1	23.5	473.1	494.4	2.1	23.6	473.0
B-13	PZ-13	525.1	2.2	10.3	516.9	525.1	2.2	10.1	517.1	525.1	2.2	9.8	517.5
B-20A	STN-20A	Not Installed				Not Installed				Not Installed			
B-22A	STN-22A	Not Installed				Not Installed				Not Installed			
B-23A	STN-23A	Not Installed				Not Installed				Not Installed			
B-25A	STN-25A	Not Installed				Not Installed				Not Installed			
B-26A	STN-26A	Not Installed				Not Installed				Not Installed			
B-27A	STN-27A	Not Installed				Not Installed				Not Installed			
B-28A	STN-28A	Not Installed				Not Installed				Not Installed			
B-29A	STN-29A	Not Installed				Not Installed				Not Installed			
B-30A	STN-30A	Not Installed				Not Installed				Not Installed			
B-31A	STN-31A	Not Installed				Not Installed				Not Installed			
STN-33A	PZ-33	Not Installed				Not Installed				Not Installed			
STN-34A	PZ-34	Not Installed				Not Installed				Not Installed			
STN-35A	PZ-35	Not Installed				Not Installed				Not Installed			
STN-42A	PZ-42U	Not Installed				Not Installed				Not Installed			
STN-42B	PZ-42L	Not Installed				Not Installed				Not Installed			
STN-43	PZ-43	Not Installed				Not Installed				Not Installed			

*** Change from previous reading**

Stantec

PIEZOMETER

Paradise Fossil Plant
13246 State Route 176
175569040

		4/29/2009				5/12/2009				5/29/2009			
Location	Piezometer	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)
B-2	PZ-2A	494.2	2.4	25.3	471.3	494.2	2.4	25.0	471.6	494.2	2.4	25.4	471.2
B-2	PZ-2	494.2	2.4	4.4	492.2	494.2	2.4	3.9	492.7	494.2	2.4	4.7	492.0
B-4	PZ-4	467.5	2.3	13.9	456.0	467.5	2.3	13.4	456.4	467.5	2.3	13.8	456.0
B-5	PZ-5	451.9	2.0	1.8	452.2	451.9	2.0	1.6	452.4	451.9	2.0	1.4	452.5
B-6	PZ-6	510.9	2.1	45.8	467.1	510.9	2.1	45.6	467.4	510.9	2.1	45.9	467.1
B-6A	PZ-6A	510.9	1.8	16.4	496.3	510.9	1.8	15.4	497.3	510.9	1.8	16.3	496.4
B-7	PZ-7	486.7	2.0	4.7	484.1	486.7	2.0	4.4	484.3	486.7	2.0	4.5	484.3
B-8A	PZ-8A	510.2	2.2	26.5	485.9	510.2	2.2	26.2	486.2	510.2	2.2	26.1	486.3
B-9	PZ-9	497.5	2.9	4.4	496.0	497.5	2.9	5.1	495.3	497.5	2.9	4.6	495.8
B-10	PZ-10	514.0	2.3	29.8	486.5	514.0	2.3	29.2	487.1	514.0	2.3	30.0	486.3
B-12	PZ-12	494.4	2.1	23.5	473.0	494.4	2.1	23.2	473.4	494.4	2.1	23.8	472.7
B-13	PZ-13	525.1	2.2	6.4	520.8	525.1	2.2	9.9	517.4	525.1	2.2	10.2	517.1
B-20A	STN-20A	Not Installed				Not Installed				Not Installed			
B-22A	STN-22A	Not Installed				Not Installed				Not Installed			
B-23A	STN-23A	Not Installed				Not Installed				Not Installed			
B-25A	STN-25A	Not Installed				Not Installed				Not Installed			
B-26A	STN-26A	Not Installed				Not Installed				Not Installed			
B-27A	STN-27A	Not Installed				Not Installed				Not Installed			
B-28A	STN-28A	Not Installed				Not Installed				Not Installed			
B-29A	STN-29A	Not Installed				Not Installed				Not Installed			
B-30A	STN-30A	Not Installed				Not Installed				Not Installed			
B-31A	STN-31A	Not Installed				Not Installed				Not Installed			
STN-33A	PZ-33	Not Installed				Not Installed				Not Installed			
STN-34A	PZ-34	Not Installed				Not Installed				Not Installed			
STN-35A	PZ-35	Not Installed				Not Installed				Not Installed			
STN-42A	PZ-42U	Not Installed				Not Installed				Not Installed			
STN-42B	PZ-42L	Not Installed				Not Installed				Not Installed			
STN-43	PZ-43	Not Installed				Not Installed				Not Installed			

*** Change from previous reading**

Stantec

PIEZOMETER

Paradise Fossil Plant
13246 State Route 176
175569040

		6/10/2009				6/26/2009				7/7/2009			
Location	Piezometer	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)
B-2	PZ-2A	494.2	2.4	26.0	470.6	494.2	2.4	26.1	470.5	494.2	2.4	26.7	469.9
B-2	PZ-2	494.2	2.4	4.7	491.9	494.2	2.4	4.6	492.0	494.2	2.4	4.8	491.8
B-4	PZ-4	467.5	2.3	14.0	455.8	467.5	2.3	13.9	455.9	467.5	2.3	14.4	455.5
B-5	PZ-5	451.9	2.0	1.6	452.3	451.9	2.0	1.6	452.3	451.9	2.0	1.8	452.1
B-6	PZ-6	510.9	2.1	46.0	467.0	510.9	2.1	46.0	467.0	510.9	2.1	46.3	466.7
B-6A	PZ-6A	510.9	1.8	16.1	496.6	510.9	1.8	14.7	498.0	510.9	1.8	15.1	497.6
B-7	PZ-7	486.7	2.0	4.2	484.5	486.7	2.0	4.1	484.6	486.7	2.0	4.1	484.6
B-8A	PZ-8A	510.2	2.2	26.0	486.4	510.2	2.2	25.8	486.6	510.2	2.2	25.9	486.5
B-9	PZ-9	497.5	2.9	4.1	496.3	497.5	2.9	3.6	496.7	497.5	2.9	3.7	496.7
B-10	PZ-10	514.0	2.3	30.4	485.9	514.0	2.3	29.5	486.8	514.0	2.3	29.5	486.8
B-12	PZ-12	494.4	2.1	24.1	472.4	494.4	2.1	23.8	472.8	494.4	2.1	24.0	472.5
B-13	PZ-13	525.1	2.2	10.8	516.5	525.1	2.2	10.1	517.2	525.1	2.2	10.1	517.2
B-20A	STN-20A	Not Installed				Not Installed				Not Installed			
B-22A	STN-22A	Not Installed				Not Installed				Not Installed			
B-23A	STN-23A	Not Installed				Not Installed				Not Installed			
B-25A	STN-25A	Not Installed				Not Installed				Not Installed			
B-26A	STN-26A	Not Installed				Not Installed				Not Installed			
B-27A	STN-27A	Not Installed				Not Installed				Not Installed			
B-28A	STN-28A	Not Installed				Not Installed				Not Installed			
B-29A	STN-29A	Not Installed				Not Installed				Not Installed			
B-30A	STN-30A	Not Installed				Not Installed				Not Installed			
B-31A	STN-31A	Not Installed				Not Installed				Not Installed			
STN-33A	PZ-33	Not Installed				Not Installed				Not Installed			
STN-34A	PZ-34	Not Installed				Not Installed				Not Installed			
STN-35A	PZ-35	Not Installed				Not Installed				Not Installed			
STN-42A	PZ-42U	Not Installed				Not Installed				Not Installed			
STN-42B	PZ-42L	Not Installed				Not Installed				Not Installed			
STN-43	PZ-43	Not Installed				Not Installed				Not Installed			

*** Change from previous reading**

Stantec

PIEZOMETER

Paradise Fossil Plant
13246 State Route 176
175569040

		7/20/2009				9/21/2009				9/28/2009			
Location	Piezometer	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)
B-2	PZ-2A	494.2	2.4	27.4	469.2	494.2	2.4	26.5	470.1	494.2	2.4	25.3	471.3
B-2	PZ-2	494.2	2.4	4.8	491.8	494.2	2.4	2.3	494.3	494.2	2.4	1.9	494.7
B-4	PZ-4	467.5	2.3	14.9	455.0	467.5	2.3	14.7	455.1	467.5	2.3	13.8	456.0
B-5	PZ-5	451.9	2.0	2.2	451.7	451.9	2.0	2.3	451.6	451.9	2.0	1.8	452.1
B-6	PZ-6	510.9	2.1	46.5	466.5	510.9	2.1	45.6	467.4	510.9	2.1	45.0	468.0
B-6A	PZ-6A	510.9	1.8	15.7	497.0	510.9	1.8	13.3	499.4	510.9	1.8	12.5	500.2
B-7	PZ-7	486.7	2.0	4.2	484.5	486.7	2.0	3.8	485.0	486.7	2.0	3.5	485.2
B-8A	PZ-8A	510.2	2.2	25.9	486.5	510.2	2.2	24.7	487.8	510.2	2.2	23.9	488.5
B-9	PZ-9	497.5	2.9	3.7	496.7	497.5	2.9	4.3	496.1	497.5	2.9	4.0	496.4
B-10	PZ-10	514.0	2.3	29.7	486.6	514.0	2.3	30.1	486.2	514.0	2.3	29.5	486.8
B-12	PZ-12	494.4	2.1	24.1	472.4	494.4	2.1	24.0	472.5	494.4	2.1	23.6	472.9
B-13	PZ-13	525.1	2.2	10.2	517.0	525.1	2.2	9.5	517.8	525.1	2.2	9.4	517.8
B-20A	STN-20A	Not Installed				Not Installed				Not Installed			
B-22A	STN-22A	Not Installed				Not Installed				Not Installed			
B-23A	STN-23A	Not Installed				Not Installed				Not Installed			
B-25A	STN-25A	Not Installed				Not Installed				Not Installed			
B-26A	STN-26A	Not Installed				Not Installed				Not Installed			
B-27A	STN-27A	Not Installed				Not Installed				Not Installed			
B-28A	STN-28A	Not Installed				Not Installed				Not Installed			
B-29A	STN-29A	Not Installed				Not Installed				Not Installed			
B-30A	STN-30A	Not Installed				Not Installed				Not Installed			
B-31A	STN-31A	Not Installed				Not Installed				Not Installed			
STN-33A	PZ-33	Not Installed				Not Installed				Not Installed			
STN-34A	PZ-34	Not Installed				Not Installed				Not Installed			
STN-35A	PZ-35	Not Installed				Not Installed				Not Installed			
STN-42A	PZ-42U	Not Installed				Not Installed				Not Installed			
STN-42B	PZ-42L	Not Installed				Not Installed				Not Installed			
STN-43	PZ-43	Not Installed				Not Installed				Not Installed			

*** Change from previous reading**

Stantec

PIEZOMETER

Paradise Fossil Plant
13246 State Route 176
175569040

		10/7/2009				10/13/2009				10/19/2009			
Location	Piezometer	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)
B-2	PZ-2A	494.2	2.4	25.1	471.5	494.2	2.4	23.8	472.8	494.2	2.4	22.8	473.8
B-2	PZ-2	494.2	2.4	1.9	494.7	494.2	2.4	1.8	494.8	494.2	2.4	1.7	494.9
B-4	PZ-4	467.5	2.3	13.8	456.1	467.5	2.3	13.2	456.6	467.5	2.3	12.8	457.0
B-5	PZ-5	451.9	2.0	1.6	452.3	451.9	2.0	1.5	452.4	451.9	2.0	1.2	452.7
B-6	PZ-6	510.9	2.1	45.1	467.9	510.9	2.1	44.6	468.4	510.9	2.1	44.5	468.5
B-6A	PZ-6A	510.9	1.8	12.6	500.1	510.9	1.8	12.5	500.2	510.9	1.8	12.4	500.2
B-7	PZ-7	486.7	2.0	3.8	484.9	486.7	2.0	3.7	485.0	486.7	2.0	3.6	485.1
B-8A	PZ-8A	510.2	2.2	23.8	488.6	510.2	2.2	23.1	489.3	510.2	2.2	23.1	489.3
B-9	PZ-9	497.5	2.9	3.9	496.5	497.5	2.9	3.7	496.7	497.5	2.9	3.5	496.9
B-10	PZ-10	514.0	2.3	29.4	486.9	514.0	2.3	28.9	487.4	514.0	2.3	28.7	487.6
B-12	PZ-12	494.4	2.1	23.3	473.2	494.4	2.1	23.0	473.6	494.4	2.1	23.0	473.5
B-13	PZ-13	525.1	2.2	9.2	518.1	525.1	2.2	9.2	518.1	525.1	2.2	9.8	517.5
B-20A	STN-20A	Not Installed				Not Installed				Not Installed			
B-22A	STN-22A	Not Installed				Not Installed				Not Installed			
B-23A	STN-23A	Not Installed				Not Installed				Not Installed			
B-25A	STN-25A	Not Installed				Not Installed				Not Installed			
B-26A	STN-26A	Not Installed				Not Installed				Not Installed			
B-27A	STN-27A	Not Installed				Not Installed				Not Installed			
B-28A	STN-28A	Not Installed				Not Installed				Not Installed			
B-29A	STN-29A	Not Installed				Not Installed				Not Installed			
B-30A	STN-30A	Not Installed				Not Installed				Not Installed			
B-31A	STN-31A	Not Installed				Not Installed				Not Installed			
STN-33A	PZ-33	Not Installed				Not Installed				Not Installed			
STN-34A	PZ-34	Not Installed				Not Installed				Not Installed			
STN-35A	PZ-35	Not Installed				Not Installed				Not Installed			
STN-42A	PZ-42U	Not Installed				Not Installed				Not Installed			
STN-42B	PZ-42L	Not Installed				Not Installed				Not Installed			
STN-43	PZ-43	Not Installed				Not Installed				Not Installed			

*** Change from previous reading**

Stantec

PIEZOMETER

Paradise Fossil Plant
13246 State Route 176
175569040

		10/26/2009				11/3/2009				11/9/2009			
Location	Piezometer	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)
B-2	PZ-2A	494.2	2.4	22.6	474.0	494.2	2.4	22.0	474.6	494.2	2.4	21.9	474.7
B-2	PZ-2	494.2	2.4	2.1	494.5	494.2	2.4	1.9	494.7	494.2	2.4	2.2	494.4
B-4	PZ-4	467.5	2.3	12.7	457.1	467.5	2.3	12.5	457.3	467.5	2.3	12.5	457.3
B-5	PZ-5	451.9	2.0	0.9	453.0	451.9	2.0	0.8	453.1	451.9	2.0	0.7	453.2
B-6	PZ-6	510.9	2.1	44.8	468.2	510.9	2.1	44.5	468.5	510.9	2.1	44.7	468.3
B-6A	PZ-6A	510.9	1.8	13.1	499.6	510.9	1.8	12.7	500.0	510.9	1.8	13.3	499.4
B-7	PZ-7	486.7	2.0	3.7	485.0	486.7	2.0	3.8	484.9	486.7	2.0	3.8	484.9
B-8A	PZ-8A	510.2	2.2	23.6	488.8	510.2	2.2	23.0	489.5	510.2	2.2	22.9	489.5
B-9	PZ-9	497.5	2.9	3.9	496.5	497.5	2.9	3.5	496.8	497.5	5.7	6.4	496.9
B-10	PZ-10	514.0	2.3	28.8	487.6	514.0	2.3	28.3	488.0	514.0	2.3	28.6	487.8
B-12	PZ-12	494.4	2.1	23.4	473.1	494.4	2.1	22.8	473.7	494.4	2.1	23.3	473.3
B-13	PZ-13	525.1	2.2	9.8	517.5	525.1	2.2	9.5	517.8	525.1	2.2	9.5	517.8
B-20A	STN-20A	Not Installed				Not Installed				Not Installed			
B-22A	STN-22A	Not Installed				Not Installed				Not Installed			
B-23A	STN-23A	Not Installed				Not Installed				Not Installed			
B-25A	STN-25A	Not Installed				Not Installed				Not Installed			
B-26A	STN-26A	Not Installed				Not Installed				Not Installed			
B-27A	STN-27A	Not Installed				Not Installed				Not Installed			
B-28A	STN-28A	Not Installed				Not Installed				Not Installed			
B-29A	STN-29A	Not Installed				Not Installed				Not Installed			
B-30A	STN-30A	Not Installed				Not Installed				Not Installed			
B-31A	STN-31A	Not Installed				Not Installed				Not Installed			
STN-33A	PZ-33	Not Installed				Not Installed				Not Installed			
STN-34A	PZ-34	Not Installed				Not Installed				Not Installed			
STN-35A	PZ-35	Not Installed				Not Installed				Not Installed			
STN-42A	PZ-42U	Not Installed				Not Installed				Not Installed			
STN-42B	PZ-42L	Not Installed				Not Installed				Not Installed			
STN-43	PZ-43	Not Installed				Not Installed				Not Installed			

*** Change from previous reading**

Stantec

PIEZOMETER

Paradise Fossil Plant
13246 State Route 176
175569040

		11/16/2009				11/23/2009				11/30/2009			
Location	Piezometer	Surface Elevation (ft)	Stickup (ft)	Depth Measurement(ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)
B-2	PZ-2A	494.2	2.4	22.2	474.4	494.2	2.4	22.9	473.7	494.2	2.4	23.7	472.9
B-2	PZ-2	494.2	2.4	2.5	494.1	494.2	2.4	2.8	493.8	494.2	2.4	3.1	493.5
B-4	PZ-4	467.5	2.3	12.4	457.4	467.5	2.3	12.8	457.0	467.5	2.3	13.2	456.7
B-5	PZ-5	451.9	2.0	0.5	453.4	451.9	2.0	0.7	453.2	451.9	2.0	0.8	453.1
B-6	PZ-6	510.9	2.1	44.9	468.1	510.9	2.1	45.3	467.7	510.9	2.1	45.6	467.4
B-6A	PZ-6A	510.9	1.8	13.9	498.7	510.9	1.8	14.3	498.4	510.9	1.8	14.8	497.9
B-7	PZ-7	486.7	2.0	3.7	485.0	486.7	2.0	3.9	484.9	486.7	2.0	4.0	484.7
B-8A	PZ-8A	510.2	2.2	23.4	489.0	510.2	2.2	23.6	488.9	510.2	2.2	24.0	488.4
B-9	PZ-9	497.5	5.7	6.8	496.4	497.5	5.7	6.8	496.4	497.5	5.7	7.1	496.2
B-10	PZ-10	514.0	2.3	29.1	487.2	514.0	2.3	29.6	486.7	514.0	2.3	29.8	486.6
B-12	PZ-12	494.4	2.1	23.7	472.8	494.4	2.1	23.9	472.6	494.4	2.1	24.1	472.4
B-13	PZ-13	525.1	2.2	10.0	517.3	525.1	2.2	9.8	517.5	525.1	2.2	10.0	517.3
B-20A	STN-20A	Not Installed				Not Installed				Not Installed			
B-22A	STN-22A	Not Installed				Not Installed				Not Installed			
B-23A	STN-23A	Not Installed				Not Installed				Not Installed			
B-25A	STN-25A	Not Installed				Not Installed				Not Installed			
B-26A	STN-26A	Not Installed				Not Installed				Not Installed			
B-27A	STN-27A	Not Installed				Not Installed				Not Installed			
B-28A	STN-28A	Not Installed				Not Installed				Not Installed			
B-29A	STN-29A	Not Installed				Not Installed				Not Installed			
B-30A	STN-30A	Not Installed				Not Installed				Not Installed			
B-31A	STN-31A	Not Installed				Not Installed				Not Installed			
STN-33A	PZ-33	Not Installed				Not Installed				Not Installed			
STN-34A	PZ-34	Not Installed				Not Installed				Not Installed			
STN-35A	PZ-35	Not Installed				Not Installed				Not Installed			
STN-42A	PZ-42U	Not Installed				Not Installed				Not Installed			
STN-42B	PZ-42L	Not Installed				Not Installed				Not Installed			
STN-43	PZ-43	Not Installed				Not Installed				Not Installed			

*** Change from previous reading**

Stantec

PIEZOMETER

Paradise Fossil Plant
13246 State Route 176
175569040

		12/6/2009				1/4/2010				1/12/2010			
Location	Piezometer	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)
B-2	PZ-2A	494.2	2.4	24.4	472.2	494.2	2.4	25.0	471.6	494.2	2.4	25.5	471.1
B-2	PZ-2	494.2	2.4	3.2	493.4	494.2	2.4	3.3	493.3	494.2	2.4	3.7	492.9
B-4	PZ-4	467.5	2.3	13.5	456.3	467.5	2.3	13.9	456.0	467.5	2.3	14.2	455.6
B-5	PZ-5	451.9	2.0	NA*	NA	451.9	2.0	NA*	NA	451.9	2.0	NA*	NA
B-6	PZ-6	510.9	2.1	45.8	467.2	510.9	2.1	44.5	468.5	510.9	2.1	44.7	468.2
B-6A	PZ-6A	510.9	1.8	14.9	497.8	510.9	1.8	15.4	497.2	510.9	1.8	15.9	496.7
B-7	PZ-7	486.7	2.0	4.2	484.5	486.7	2.0	4.1	484.6	486.7	2.0	4.4	484.3
B-8A	PZ-8A	510.2	2.2	24.0	488.4	510.2	2.2	20.9	491.6	510.2	2.2	21.2	491.2
B-9	PZ-9	497.5	5.7	6.9	496.3	497.5	5.7	6.8	496.4	497.5	5.7	7.0	496.2
B-10	PZ-10	514.0	2.3	30.0	486.3	514.0	2.3	30.1	486.2	514.0	2.3	30.3	486.0
B-12	PZ-12	494.4	2.1	24.2	472.3	494.4	2.1	23.8	472.7	494.4	2.1	24.0	472.6
B-13	PZ-13	525.1	2.2	10.1	517.2	525.1	2.2	9.9	517.3	525.1	2.2	9.8	517.5
B-20A	STN-20A	Not Installed				Not Installed				Not Installed			
B-22A	STN-22A	Not Installed				Not Installed				Not Installed			
B-23A	STN-23A	Not Installed				Not Installed				Not Installed			
B-25A	STN-25A	Not Installed				Not Installed				Not Installed			
B-26A	STN-26A	Not Installed				Not Installed				Not Installed			
B-27A	STN-27A	Not Installed				Not Installed				Not Installed			
B-28A	STN-28A	Not Installed				Not Installed				Not Installed			
B-29A	STN-29A	Not Installed				Not Installed				Not Installed			
B-30A	STN-30A	Not Installed				Not Installed				Not Installed			
B-31A	STN-31A	Not Installed				Not Installed				Not Installed			
STN-33A	PZ-33	Not Installed				Not Installed				Not Installed			
STN-34A	PZ-34	Not Installed				Not Installed				Not Installed			
STN-35A	PZ-35	Not Installed				Not Installed				Not Installed			
STN-42A	PZ-42U	Not Installed				Not Installed				Not Installed			
STN-42B	PZ-42L	Not Installed				Not Installed				Not Installed			
STN-43	PZ-43	Not Installed				Not Installed				Not Installed			

*** Change from previous reading** *Instrument frozen

Stantec

PIEZOMETER

Paradise Fossil Plant
13246 State Route 176
175569040

		1/18/2010				1/25/2010				2/1/2010			
Location	Piezometer	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)
B-2	PZ-2A	494.2	2.4	25.6	471.0	494.2	2.4	25.1	471.5	494.2	2.4	25.2	471.5
B-2	PZ-2	494.2	2.4	3.5	493.1	494.2	2.4	2.5	494.1	494.2	2.4	2.5	494.2
B-4	PZ-4	467.5	2.3	14.2	455.6	467.5	2.3	13.6	456.2	467.5	2.3	13.9	455.9
B-5	PZ-5	451.9	2.0	NA*	NA	451.9	2.0	1.5	452.4	451.9	2.0	NA*	NA
B-6	PZ-6	510.9	2.1	44.6	468.4	510.9	2.1	43.9	469.1	510.9	2.1	44.3	468.7
B-6A	PZ-6A	510.9	1.8	15.9	496.8	510.9	1.8	15.1	497.6	510.9	1.8	15.3	497.4
B-7	PZ-7	486.7	2.0	4.1	484.7	486.7	2.0	3.7	485.1	486.7	2.0	4.1	484.6
B-8A	PZ-8A	510.2	2.2	21.1	491.3	510.2	2.2	20.5	492.0	510.2	2.2	20.8	491.7
B-9	PZ-9	497.5	5.7	6.9	496.3	497.5	5.7	6.5	496.8	497.5	5.7	6.6	496.7
B-10	PZ-10	514.0	2.3	30.1	486.2	514.0	2.3	29.6	486.7	514.0	2.3	29.8	486.6
B-12	PZ-12	494.4	2.1	23.8	472.7	494.4	2.1	23.0	473.5	494.4	2.1	23.3	473.3
B-13	PZ-13	525.1	2.2	9.8	517.5	525.1	2.2	9.6	517.6	525.1	2.2	10.0	517.3
B-20A	STN-20A	489.7	3.6	22.2	471.1	489.7	3.6	21.0	472.2	489.7	3.6	20.2	473.1
B-22A	STN-22A	519.4	2.5	14.7	507.2	519.4	2.5	14.4	507.5	519.4	2.5	14.0	507.9
B-23A	STN-23A	501.8	3.2	32.0	473.0	501.8	3.2	31.2	473.8	501.8	3.2	31.5	473.5
B-25A	STN-25A	523.3	3.7	16.3	510.6	523.3	3.7	16.8	510.2	523.3	3.7	15.9	511.0
B-26A	STN-26A	471.4	2.9	20.1	454.2	471.4	2.9	20.2	454.2	471.4	2.9	20.2	454.2
B-27A	STN-27A	492.2	2.6	6.9	487.8	492.2	2.6	6.6	488.1	492.2	2.6	6.7	488.0
B-28A	STN-28A	470.2	3.2	NA**	NA	470.2	3.2	18.7	454.8	470.2	3.2	18.6	454.8
B-29A	STN-29A	489.1	4.0	17.8	475.4	489.1	4.0	17.9	475.2	489.1	4.0	18.2	475.0
B-30A	STN-30A	470.5	3.2	18.2	455.5	470.5	3.2	18.2	455.5	470.5	3.2	18.2	455.5
B-31A	STN-31A	487.0	3.0	20.3	469.7	487.0	3.0	20.3	469.7	487.0	3.0	20.3	469.7
STN-33A	PZ-33	Not Installed				Not Installed				Not Installed			
STN-34A	PZ-34	Not Installed				Not Installed				Not Installed			
STN-35A	PZ-35	Not Installed				Not Installed				Not Installed			
STN-42A	PZ-42U	Not Installed				Not Installed				Not Installed			
STN-42B	PZ-42L	Not Installed				Not Installed				Not Installed			
STN-43	PZ-43	Not Installed				Not Installed				Not Installed			

*** Change from previous reading** *Frozen

Stantec

PIEZOMETER

Paradise Fossil Plant
13246 State Route 176
175569040

		2/8/2010				2/15/2010				2/23/2010			
Location	Piezometer	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)
B-2	PZ-2A	494.2	2.4	24.8	471.8	494.2	2.4	24.4	472.2	494.2	2.4	24.6	472.0
B-2	PZ-2	494.2	2.4	2.0	494.6	494.2	2.4	1.2	495.4	494.2	2.4	2.2	494.4
B-4	PZ-4	467.5	2.3	13.7	456.1	467.5	2.3	13.5	456.3	467.5	2.3	13.6	456.2
B-5	PZ-5	451.9	2.0	NA*	NA	451.9	2.0	NA*	NA	451.9	2.0	2.5	451.4
B-6	PZ-6	510.9	2.1	44.0	469.0	510.9	2.1	43.9	469.1	510.9	2.1	44.1	468.9
B-6A	PZ-6A	510.9	1.8	14.8	497.9	510.9	1.8	14.6	498.1	510.9	1.8	14.9	497.8
B-7	PZ-7	486.7	2.0	3.9	484.8	486.7	2.0	3.6	485.1	486.7	2.0	3.9	484.9
B-8A	PZ-8A	510.2	2.2	20.4	492.0	510.2	2.2	20.2	492.3	510.2	2.2	20.4	492.0
B-9	PZ-9	497.5	5.7	6.4	496.8	497.5	5.7	6.4	496.9	497.5	5.7	6.5	496.8
B-10	PZ-10	514.0	2.3	29.6	486.7	514.0	2.3	29.6	486.7	514.0	2.3	29.8	486.5
B-12	PZ-12	494.4	2.1	23.0	473.5	494.4	2.1	23.2	473.4	494.4	2.1	23.3	473.2
B-13	PZ-13	525.1	2.2	9.7	517.6	525.1	2.2	10.1	517.2	525.1	2.2	10.2	517.1
B-20A	STN-20A	489.7	3.6	19.5	473.8	489.7	3.6	18.8	474.4	489.7	3.6	18.4	474.9
B-22A	STN-22A	519.4	2.5	14.0	507.9	519.4	2.5	14.3	507.6	519.4	2.5	14.3	507.6
B-23A	STN-23A	501.8	3.2	31.2	473.8	501.8	3.2	31.4	473.6	501.8	3.2	31.5	473.5
B-25A	STN-25A	523.3	3.7	16.0	510.9	523.3	3.7	16.6	510.4	523.3	3.7	16.6	510.3
B-26A	STN-26A	471.4	2.9	20.2	454.2	471.4	2.9	20.2	454.2	471.4	2.9	20.2	454.2
B-27A	STN-27A	492.2	2.6	6.6	488.1	492.2	2.6	6.5	488.3	492.2	2.6	6.6	488.1
B-28A	STN-28A	470.2	3.2	18.6	454.8	470.2	3.2	18.6	454.8	470.2	3.2	18.6	454.8
B-29A	STN-29A	489.1	4.0	18.0	475.1	489.1	4.0	17.8	475.4	489.1	4.0	18.0	475.2
B-30A	STN-30A	470.5	3.2	18.2	455.5	470.5	3.2	18.2	455.5	470.5	3.2	18.2	455.5
B-31A	STN-31A	487.0	3.0	20.3	469.7	487.0	3.0	20.3	469.7	487.0	3.0	20.3	469.7
STN-33A	PZ-33	Not Installed				Not Installed				Not Installed			
STN-34A	PZ-34	Not Installed				Not Installed				Not Installed			
STN-35A	PZ-35	Not Installed				Not Installed				Not Installed			
STN-42A	PZ-42U	Not Installed				Not Installed				Not Installed			
STN-42B	PZ-42L	Not Installed				Not Installed				Not Installed			
STN-43	PZ-43	Not Installed				Not Installed				Not Installed			

*** Change from previous reading** *Frozen

Stantec

PIEZOMETER

Paradise Fossil Plant
13246 State Route 176
175569040

		3/1/2010				3/8/2010				3/17/2010			
Location	Piezometer	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)
B-2	PZ-2A	494.2	2.4	24.9	471.7	494.2	2.4	25.0	471.6	494.2	2.4	25.5	471.1
B-2	PZ-2	494.2	2.4	2.6	494.0	494.2	2.4	2.3	494.3	494.2	2.4	2.0	494.6
B-4	PZ-4	467.5	2.3	13.8	456.1	467.5	2.3	13.9	455.9	467.5	2.3	14.1	455.8
B-5	PZ-5	451.9	2.0	1.6	452.3	451.9	2.0	1.8	452.1	451.9	2.0	1.9	452.0
B-6	PZ-6	510.9	2.1	44.4	468.6	510.9	2.1	43.9	469.1	510.9	2.1	29.6***	483.4
B-6A	PZ-6A	510.9	1.8	15.0	497.7	510.9	1.8	15.1	497.6	510.9	1.8	15.2	497.5
B-7	PZ-7	486.7	2.0	4.0	484.7	486.7	2.0	3.9	484.8	486.7	2.0	3.9	484.8
B-8A	PZ-8A	510.2	2.2	20.8	491.6	510.2	2.2	20.9	491.5	510.2	2.2	10.3***	502.1
B-9	PZ-9	497.5	5.7	6.6	496.6	497.5	5.7	6.6	496.6	497.5	5.7	6.7	496.5
B-10	PZ-10	514.0	2.3	30.0	486.3	514.0	2.3	30.2	486.1	514.0	2.3	30.1	486.2
B-12	PZ-12	494.4	2.1	23.5	473.0	494.4	2.1	23.7	472.8	494.4	2.1	23.8	472.8
B-13	PZ-13	525.1	2.2	9.5	517.7	525.1	2.2	9.9	517.3	525.1	2.2	9.7	517.5
B-20A	STN-20A	489.7	3.6	18.0	475.2	489.7	3.6	17.8	475.5	489.7	3.6	17.4	475.8
B-22A	STN-22A	519.4	2.5	14.1	507.8	519.4	2.5	14.4	507.5	519.4	2.5	14.3	507.6
B-23A	STN-23A	501.8	3.2	31.7	473.3	501.8	3.2	32.0	473.0	501.8	3.2	31.9	473.1
B-25A	STN-25A	523.3	3.7	15.9	511.1	523.3	3.7	16.2	510.7	523.3	3.7	15.5	511.4
B-26A	STN-26A	471.4	2.9	20.2	454.2	471.4	2.9	20.2	454.2	471.4	2.9	18.2***	456.2
B-27A	STN-27A	492.2	2.6	6.7	488.0	492.2	2.6	6.7	488.1	492.2	2.6	6.7	488.0
B-28A	STN-28A	470.2	3.2	18.6	454.8	470.2	3.2	18.6	454.8	470.2	3.2	16.6***	456.8
B-29A	STN-29A	489.1	4.0	18.2	474.9	489.1	4.0	18.1	475.0	489.1	4.0	18.4	474.8
B-30A	STN-30A	470.5	3.2	18.2	455.5	470.5	3.2	18.2	455.5	470.5	3.2	16.1***	457.6
B-31A	STN-31A	487.0	3.0	20.3	469.7	487.0	3.0	20.3	469.7	487.0	3.0	18.3***	471.7
STN-33A	PZ-33	**Not Installed**				**Not Installed**				**Not Installed**			
STN-34A	PZ-34	**Not Installed**				**Not Installed**				**Not Installed**			
STN-35A	PZ-35	**Not Installed**				**Not Installed**				**Not Installed**			
STN-42A	PZ-42U	**Not Installed**				**Not Installed**				**Not Installed**			
STN-42B	PZ-42L	**Not Installed**				**Not Installed**				**Not Installed**			
STN-43	PZ-43	**Not Installed**				**Not Installed**				**Not Installed**			

*** Change from previous reading** *** Probe stopped; no water indicated

Stantec

PIEZOMETER

Paradise Fossil Plant
13246 State Route 176
175569040

		3/31/2010				4/13/2010				4/28/2010			
Location	Piezometer	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)	Surface Elevation (ft)	Stickup (ft)	Depth Measurement (ft)	Water Elevation (ft)
B-2	PZ-2A	494.2	2.4	25.5	471.1	494.2	2.4	25.5	471.1	494.2	2.4	25.5	471.1
B-2	PZ-2	494.2	2.4	2.3	494.3	494.2	2.4	2.3	494.3	494.2	2.4	2.8	493.8
B-4	PZ-4	467.5	2.3	13.9	455.9	467.5	2.3	14.0	455.8	467.5	2.3	14.0	455.8
B-5	PZ-5	451.9	2.0	1.8	452.1	451.9	2.0	2.0	452.0	451.9	2.0	1.6	452.3
B-6	PZ-6	510.9	2.1	***	513.0	510.9	2.1	43.5	469.5	510.9	2.1	43.7	469.2
B-6A	PZ-6A	510.9	1.8	15.2	497.5	510.9	1.8	15.2	497.5	510.9	1.8	15.3	497.4
B-7	PZ-7	486.7	2.0	3.8	484.9	486.7	2.0	3.8	484.9	486.7	2.0	3.9	484.8
B-8A	PZ-8A	510.2	2.2	21.2	491.2	510.2	2.2	21.0	491.4	510.2	2.2	20.8	491.6
B-9	PZ-9	497.5	5.7	6.7	496.5	497.5	5.7	6.7	496.5	497.5	5.7	6.7	496.6
B-10	PZ-10	514.0	2.3	29.9	486.4	514.0	2.3	30.0	486.3	514.0	2.3	30.3	486.1
B-12	PZ-12	494.4	2.1	23.7	472.8	494.4	2.1	23.8	472.8	494.4	2.1	23.9	472.7
B-13	PZ-13	525.1	2.2	9.8	517.5	525.1	2.2	9.8	517.4	525.1	2.2	9.7	517.6
B-20A	STN-20A	489.7	0.0	13.1	476.6	489.7	0.0	14.2	475.5	489.7	0.0	13.2	476.4
B-22A	STN-22A	519.4	0.0	11.6	507.8	519.4	0.0	11.9	507.5	519.4	0.0	11.8	507.7
B-23A	STN-23A	501.8	3.2	28.9	476.1	501.8	0.0	29.0	472.9	501.8	0.0	29.1	472.7
B-25A	STN-25A	523.3	0.0	13.8	509.5	523.3	0.0	14.1	509.2	523.3	0.0	15.1	508.2
B-26A	STN-26A	471.4	2.9	15.2	459.2	471.4	0.0	16.6	454.9	471.4	0.0	15.2	456.3
B-27A	STN-27A	492.2	0.0	3.9	488.3	492.2	0.0	3.9	488.3	492.2	0.0	4.0	488.1
B-28A	STN-28A	470.2	0.0	13.6	456.6	470.2	0.0	13.6**	456.6	470.2	0.0	13.6**	456.6
B-29A	STN-29A	489.1	0.0	14.7	474.4	489.1	0.0	15.0	474.1	489.1	0.0	14.7	474.4
B-30A	STN-30A	470.5	0.0	13.0	457.5	470.5	0.0	13.0**	457.5	470.5	0.0	13.0**	457.5
B-31A	STN-31A	487.0	0.0	15.6	471.4	487.0	0.0	15.6**	471.4	487.0	0.0	15.6**	471.4
STN-33A	PZ-33	Not Installed				Not Installed				527.9	3.0	27.0	504.0
STN-34A	PZ-34	Not Installed				Not Installed				511.5	2.8	24.7	489.6
STN-35A	PZ-35	Not Installed				Not Installed				520.6	3.0	19.0	504.6
STN-42A	PZ-42U	Not Installed				Not Installed				515.7	3.7	13.6	505.8
STN-42B	PZ-42L	Not Installed				Not Installed				515.7	3.7	14.2	505.2
STN-43	PZ-43	Not Installed				Not Installed				512.9	3.1	10.6	505.4

*** Change from previous reading** *** Probe stopped; no water indicated

Stantec

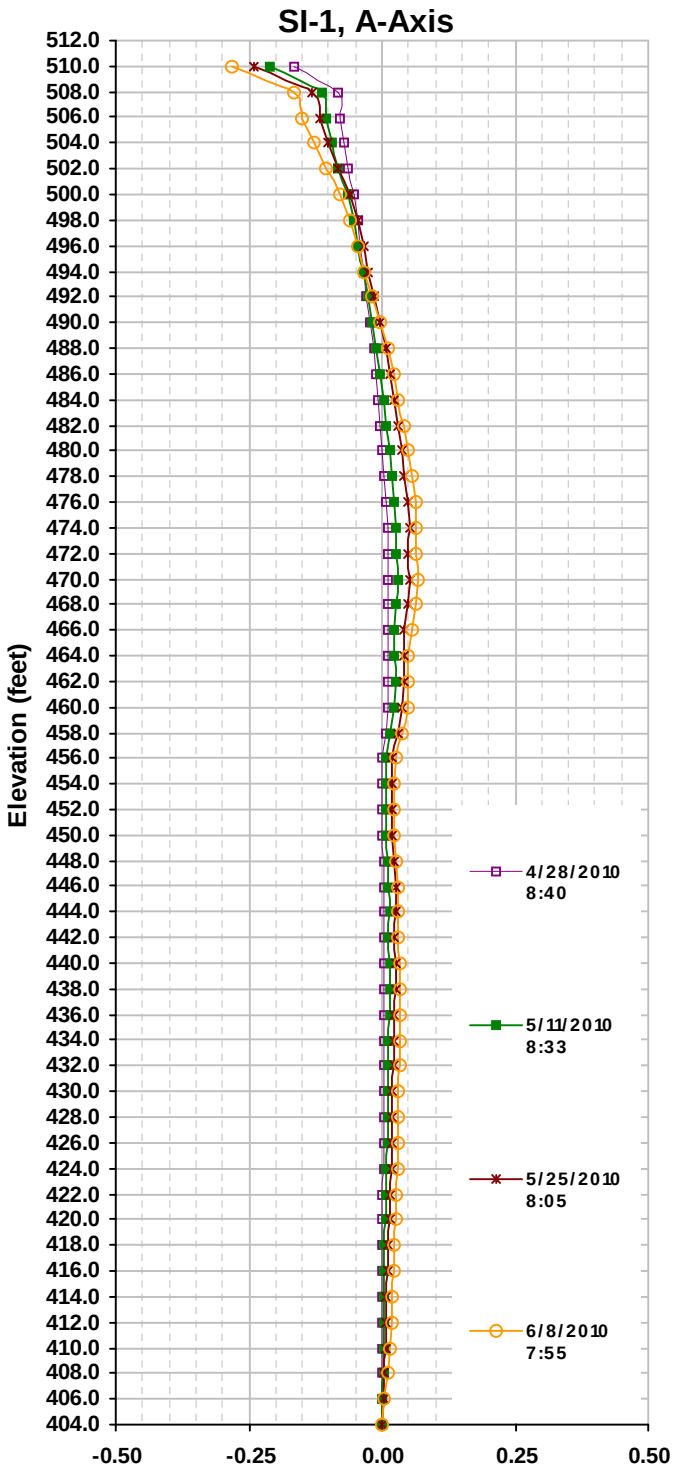
PIEZOMETER

Paradise Fossil Plant
13246 State Route 176
175569040

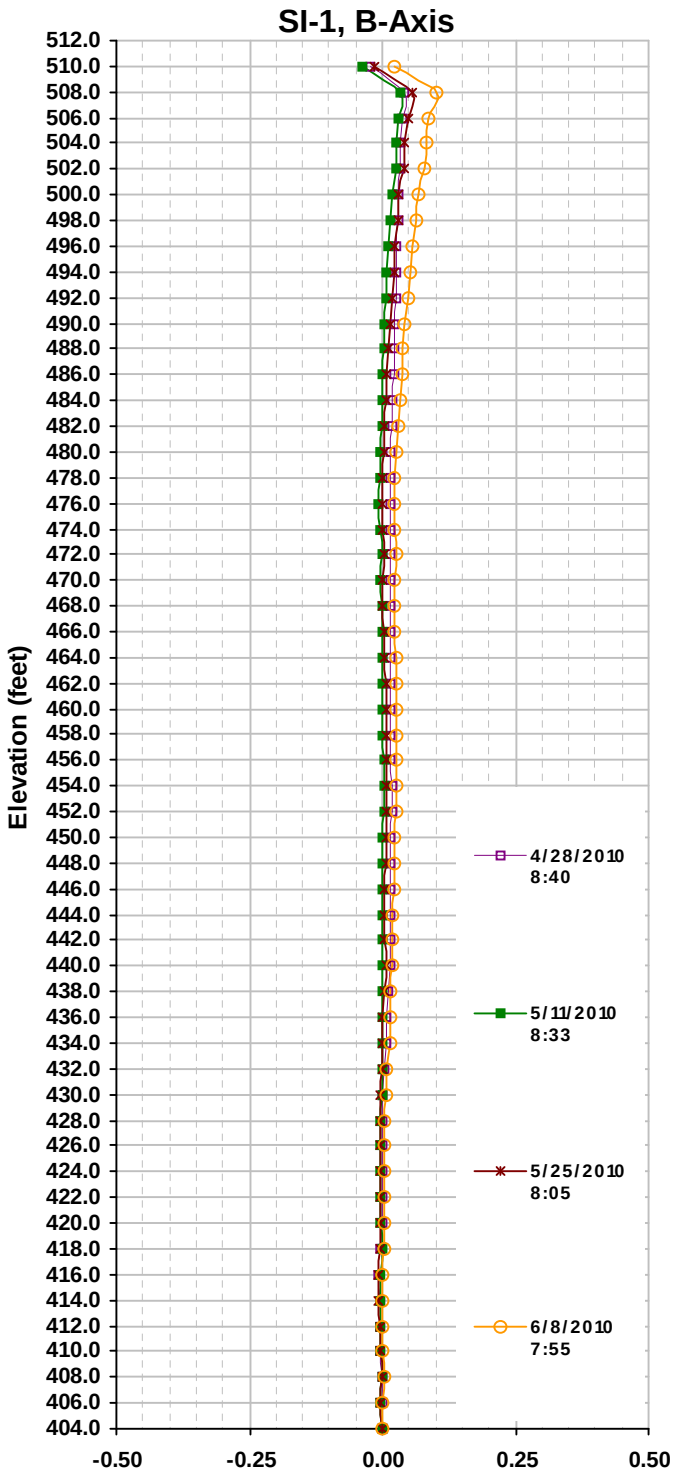
		5/11/2010			
Location	**Piezometer**	**Surface Elevation (ft)**	**Stickup (ft)**	**Depth Measurement (ft)**	**Water Elevation (ft)**
B-2	PZ-2A	494.2	2.4	21.8	474.8
B-2	PZ-2	494.2	2.4	2.3	494.3
B-4	PZ-4	467.5	2.3	12.5	457.4
B-5	PZ-5	451.9	2.0	1.1	452.9
B-6	PZ-6	510.9	2.1	29.5	483.5
B-6A	PZ-6A	510.9	1.8	14.7	498.0
B-7	PZ-7	486.7	2.0	3.4	485.3
B-8A	PZ-8A	510.2	2.2	19.0	493.4
B-9	PZ-9	497.5	5.7	6.3	496.9
B-10	PZ-10	514.0	2.3	29.3	487.0
B-12	PZ-12	494.4	2.1	23.2	473.3
B-13	PZ-13	525.1	2.2	10.5	516.7
B-20A	STN-20A	489.7	0.0	13.9	475.8
B-22A	STN-22A	519.4	0.0	11.5	507.9
B-23A	STN-23A	501.8	0.0	28.6	473.3
B-25A	STN-25A	523.3	0.0	14.1	509.2
B-26A	STN-26A	471.4	0.0	14.0	457.5
B-27A	STN-27A	492.2	0.0	3.7	488.5
B-28A	STN-28A	470.2	0.0	13.6**	456.6
B-29A	STN-29A	489.1	0.0	14.5	474.6
B-30A	STN-30A	470.5	0.0	13.0**	457.5
B-31A	STN-31A	487.0	0.0	15.6**	471.4
STN-33A	PZ-33	527.9	3.0	24.9	506.0
STN-34A	PZ-34	511.5	2.8	16.9	497.4
STN-35A	PZ-35	520.6	3.0	17.0*	506.7
STN-42A	PZ-42U	515.7	3.7	12.4	507.0
STN-42B	PZ-42L	515.7	3.7	13.3	506.0
STN-43	PZ-43	512.9	3.1	10.8	505.2

*** Change from previous reading**

* Pad settled 2"

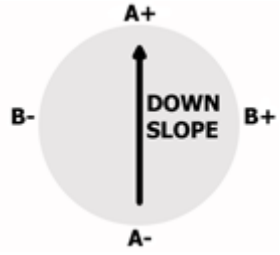


Cumulative Displacement (in) from 4/13/2010



Cumulative Displacement (in) from 4/13/2010

Stantec



Paradise Fossil Plant

Drakesboro, KY

175569040

6/8/2010

SITE PAFTVA

INSTALLATION SI-1

DESCRIPTION From DataMate

CURRENT SURVEY 4/28/2010 8:40:19 AM

INITIAL SURVEY 4/13/2010 8:50:15 AM

DATE PRINTED 6/8/2010 12:36:42 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
2	657	-671	0.7968	595	-594	0.7134	-0.0834	-0.1656
4	12	-15	0.0162	10	-11	0.0126	-0.0036	-0.0822
6	102	-97	0.1194	95	-92	0.1122	-0.0072	-0.0786
8	73	-66	0.0834	67	-61	0.0768	-0.0066	-0.0714
10	94	-90	0.1104	84	-81	0.0990	-0.0114	-0.0648
12	179	-171	0.2100	171	-166	0.2022	-0.0078	-0.0534
14	194	-189	0.2298	188	-185	0.2238	-0.0060	-0.0456
16	216	-210	0.2556	211	-206	0.2502	-0.0054	-0.0396
18	372	-367	0.4434	367	-362	0.4374	-0.0060	-0.0342
20	420	-416	0.5016	415	-412	0.4962	-0.0054	-0.0282
22	471	-468	0.5634	465	-463	0.5568	-0.0066	-0.0228
24	463	-455	0.5508	459	-453	0.5472	-0.0036	-0.0162
26	269	-264	0.3198	265	-261	0.3156	-0.0042	-0.0126
28	204	-198	0.2412	199	-195	0.2364	-0.0048	-0.0084
30	193	-188	0.2286	190	-186	0.2256	-0.0030	-0.0036
32	100	-96	0.1176	96	-93	0.1134	-0.0042	-0.0006
34	54	-48	0.0612	50	-46	0.0576	-0.0036	0.0036
36	145	-141	0.1716	142	-139	0.1686	-0.0030	0.0072
38	205	-203	0.2448	203	-203	0.2436	-0.0012	0.0102
40	183	-170	0.2118	181	-171	0.2112	-0.0006	0.0114
42	144	-140	0.1704	143	-141	0.1704	0.0000	0.0120
44	109	-102	0.1266	110	-104	0.1284	0.0018	0.0120
46	90	-85	0.1050	89	-85	0.1044	-0.0006	0.0102
48	52	-46	0.0588	50	-46	0.0576	-0.0012	0.0108
50	9	-3	0.0072	9	-5	0.0084	0.0012	0.0120
52	259	-256	0.3090	261	-260	0.3126	0.0036	0.0108
54	360	-354	0.4284	364	-360	0.4344	0.0060	0.0072
56	296	-292	0.3528	296	-294	0.3540	0.0012	0.0012
58	374	-368	0.4452	373	-368	0.4446	-0.0006	0.0000
60	425	-421	0.5076	423	-421	0.5064	-0.0012	0.0006
62	328	-322	0.3900	325	-322	0.3882	-0.0018	0.0018
64	197	-190	0.2322	195	-190	0.2310	-0.0012	0.0036
66	97	-89	0.1116	95	-91	0.1116	0.0000	0.0048
68	-16	24	-0.0240	-16	23	-0.0234	0.0006	0.0048
70	-225	229	-0.2724	-227	228	-0.2730	-0.0006	0.0042
72	-339	345	-0.4104	-341	343	-0.4104	0.0000	0.0048
74	-446	453	-0.5394	-447	452	-0.5394	0.0000	0.0048
76	-565	571	-0.6816	-566	569	-0.6810	0.0006	0.0048
78	-678	686	-0.8184	-679	685	-0.8184	0.0000	0.0042

SITE PAFTVA

INSTALLATION SI-1

DESCRIPTION From DataMate

CURRENT SURVEY 4/28/2010 8:40:19 AM

INITIAL SURVEY 4/13/2010 8:50:15 AM

DATE PRINTED 6/8/2010 12:36:42 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
80	-782	784	-0.9396	-783	782	-0.9390	0.0006	0.0042
82	-861	866	-1.0362	-862	865	-1.0362	0.0000	0.0036
84	-917	923	-1.1040	-918	921	-1.1034	0.0006	0.0036
86	-951	957	-1.1448	-952	956	-1.1448	0.0000	0.0030
88	-957	965	-1.1532	-957	963	-1.1520	0.0012	0.0030
90	-1017	1015	-1.2192	-1017	1014	-1.2186	0.0006	0.0018
92	-1005	1011	-1.2096	-1006	1009	-1.2090	0.0006	0.0012
94	-946	952	-1.1388	-946	950	-1.1376	0.0012	0.0006
96	-851	855	-1.0236	-851	854	-1.0230	0.0006	-0.0006
98	-739	749	-0.8928	-740	748	-0.8928	0.0000	-0.0012
100	-559	559	-0.6708	-561	557	-0.6708	0.0000	-0.0012
102	-266	270	-0.3216	-267	270	-0.3222	-0.0006	-0.0012
104	98	-94	0.1152	97	-94	0.1146	-0.0006	-0.0006
106	465	-461	0.5556	465	-461	0.5556	0.0000	0.0000
108	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-1

DESCRIPTION From DataMate

CURRENT SURVEY 5/11/2010 8:33:22 AM

INITIAL SURVEY 4/13/2010 8:50:15 AM

DATE PRINTED 6/8/2010 12:36:42 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
2	657	-671	0.7968	582	-585	0.7002	-0.0966	-0.2106
4	12	-15	0.0162	6	-6	0.0072	-0.0090	-0.1140
6	102	-97	0.1194	91	-87	0.1068	-0.0126	-0.1050
8	73	-66	0.0834	63	-57	0.0720	-0.0114	-0.0924
10	94	-90	0.1104	79	-76	0.0930	-0.0174	-0.0810
12	179	-171	0.2100	169	-163	0.1992	-0.0108	-0.0636
14	194	-189	0.2298	186	-182	0.2208	-0.0090	-0.0528
16	216	-210	0.2556	208	-204	0.2472	-0.0084	-0.0438
18	372	-367	0.4434	365	-360	0.4350	-0.0084	-0.0354
20	420	-416	0.5016	412	-410	0.4932	-0.0084	-0.0270
22	471	-468	0.5634	463	-461	0.5544	-0.0090	-0.0186
24	463	-455	0.5508	457	-450	0.5442	-0.0066	-0.0096
26	269	-264	0.3198	264	-260	0.3144	-0.0054	-0.0030
28	204	-198	0.2412	198	-193	0.2346	-0.0066	0.0024
30	193	-188	0.2286	188	-185	0.2238	-0.0048	0.0090
32	100	-96	0.1176	95	-92	0.1122	-0.0054	0.0138
34	54	-48	0.0612	50	-45	0.0570	-0.0042	0.0192
36	145	-141	0.1716	142	-139	0.1686	-0.0030	0.0234
38	205	-203	0.2448	204	-203	0.2442	-0.0006	0.0264
40	183	-170	0.2118	181	-170	0.2106	-0.0012	0.0270
42	144	-140	0.1704	145	-142	0.1722	0.0018	0.0282
44	109	-102	0.1266	111	-105	0.1296	0.0030	0.0264
46	90	-85	0.1050	90	-86	0.1056	0.0006	0.0234
48	52	-46	0.0588	49	-46	0.0570	-0.0018	0.0228
50	9	-3	0.0072	9	-6	0.0090	0.0018	0.0246
52	259	-256	0.3090	264	-262	0.3156	0.0066	0.0228
54	360	-354	0.4284	367	-362	0.4374	0.0090	0.0162
56	296	-292	0.3528	296	-294	0.3540	0.0012	0.0072
58	374	-368	0.4452	372	-368	0.4440	-0.0012	0.0060
60	425	-421	0.5076	423	-422	0.5070	-0.0006	0.0072
62	328	-322	0.3900	325	-321	0.3876	-0.0024	0.0078
64	197	-190	0.2322	194	-189	0.2298	-0.0024	0.0102
66	97	-89	0.1116	95	-90	0.1110	-0.0006	0.0126
68	-16	24	-0.0240	-16	23	-0.0234	0.0006	0.0132
70	-225	229	-0.2724	-228	228	-0.2736	-0.0012	0.0126
72	-339	345	-0.4104	-340	344	-0.4104	0.0000	0.0138
74	-446	453	-0.5394	-447	452	-0.5394	0.0000	0.0138
76	-565	571	-0.6816	-565	569	-0.6804	0.0012	0.0138
78	-678	686	-0.8184	-678	685	-0.8178	0.0006	0.0126

SITE PAFTVA

INSTALLATION SI-1

DESCRIPTION From DataMate

CURRENT SURVEY 5/11/2010 8:33:22 AM

INITIAL SURVEY 4/13/2010 8:50:15 AM

DATE PRINTED 6/8/2010 12:36:42 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
80	-782	784	-0.9396	-782	782	-0.9384	0.0012	0.0120
82	-861	866	-1.0362	-862	865	-1.0362	0.0000	0.0108
84	-917	923	-1.1040	-917	921	-1.1028	0.0012	0.0108
86	-951	957	-1.1448	-951	956	-1.1442	0.0006	0.0096
88	-957	965	-1.1532	-957	963	-1.1520	0.0012	0.0090
90	-1017	1015	-1.2192	-1016	1014	-1.2180	0.0012	0.0078
92	-1005	1011	-1.2096	-1005	1009	-1.2084	0.0012	0.0066
94	-946	952	-1.1388	-946	950	-1.1376	0.0012	0.0054
96	-851	855	-1.0236	-851	854	-1.0230	0.0006	0.0042
98	-739	749	-0.8928	-739	748	-0.8922	0.0006	0.0036
100	-559	559	-0.6708	-560	559	-0.6714	-0.0006	0.0030
102	-266	270	-0.3216	-266	269	-0.3210	0.0006	0.0036
104	98	-94	0.1152	99	-96	0.1170	0.0018	0.0030
106	465	-461	0.5556	466	-462	0.5568	0.0012	0.0012
108	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-1

DESCRIPTION From DataMate

CURRENT SURVEY 5/25/2010 8:05:10 AM

INITIAL SURVEY 4/13/2010 8:50:15 AM

DATE PRINTED 6/8/2010 12:36:42 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
2	657	-671	0.7968	569	-575	0.6864	-0.1104	-0.2406
4	12	-15	0.0162	3	-3	0.0036	-0.0126	-0.1302
6	102	-97	0.1194	88	-82	0.1020	-0.0174	-0.1176
8	73	-66	0.0834	59	-51	0.0660	-0.0174	-0.1002
10	94	-90	0.1104	76	-71	0.0882	-0.0222	-0.0828
12	179	-171	0.2100	167	-160	0.1962	-0.0138	-0.0606
14	194	-189	0.2298	184	-180	0.2184	-0.0114	-0.0468
16	216	-210	0.2556	207	-202	0.2454	-0.0102	-0.0354
18	372	-367	0.4434	364	-358	0.4332	-0.0102	-0.0252
20	420	-416	0.5016	411	-407	0.4908	-0.0108	-0.0150
22	471	-468	0.5634	462	-458	0.5520	-0.0114	-0.0042
24	463	-455	0.5508	456	-448	0.5424	-0.0084	0.0072
26	269	-264	0.3198	263	-258	0.3126	-0.0072	0.0156
28	204	-198	0.2412	197	-191	0.2328	-0.0084	0.0228
30	193	-188	0.2286	188	-184	0.2232	-0.0054	0.0312
32	100	-96	0.1176	95	-90	0.1110	-0.0066	0.0366
34	54	-48	0.0612	50	-44	0.0564	-0.0048	0.0432
36	145	-141	0.1716	143	-138	0.1686	-0.0030	0.0480
38	205	-203	0.2448	206	-204	0.2460	0.0012	0.0510
40	183	-170	0.2118	181	-169	0.2100	-0.0018	0.0498
42	144	-140	0.1704	147	-142	0.1734	0.0030	0.0516
44	109	-102	0.1266	114	-106	0.1320	0.0054	0.0486
46	90	-85	0.1050	93	-87	0.1080	0.0030	0.0432
48	52	-46	0.0588	52	-46	0.0588	0.0000	0.0402
50	9	-3	0.0072	11	-5	0.0096	0.0024	0.0402
52	259	-256	0.3090	265	-261	0.3156	0.0066	0.0378
54	360	-354	0.4284	370	-364	0.4404	0.0120	0.0312
56	296	-292	0.3528	298	-293	0.3546	0.0018	0.0192
58	374	-368	0.4452	373	-368	0.4446	-0.0006	0.0174
60	425	-421	0.5076	423	-420	0.5058	-0.0018	0.0180
62	328	-322	0.3900	325	-320	0.3870	-0.0030	0.0198
64	197	-190	0.2322	194	-188	0.2292	-0.0030	0.0228
66	97	-89	0.1116	96	-90	0.1116	0.0000	0.0258
68	-16	24	-0.0240	-14	23	-0.0222	0.0018	0.0258
70	-225	229	-0.2724	-227	229	-0.2736	-0.0012	0.0240
72	-339	345	-0.4104	-339	344	-0.4098	0.0006	0.0252
74	-446	453	-0.5394	-446	452	-0.5388	0.0006	0.0246
76	-565	571	-0.6816	-564	569	-0.6798	0.0018	0.0240
78	-678	686	-0.8184	-677	686	-0.8178	0.0006	0.0222

SITE PAFTVA

INSTALLATION SI-1

DESCRIPTION From DataMate

CURRENT SURVEY 5/25/2010 8:05:10 AM

INITIAL SURVEY 4/13/2010 8:50:15 AM

DATE PRINTED 6/8/2010 12:36:42 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
80	-782	784	-0.9396	-781	782	-0.9378	0.0018	0.0216
82	-861	866	-1.0362	-861	866	-1.0362	0.0000	0.0198
84	-917	923	-1.1040	-916	922	-1.1028	0.0012	0.0198
86	-951	957	-1.1448	-950	956	-1.1436	0.0012	0.0186
88	-957	965	-1.1532	-956	963	-1.1514	0.0018	0.0174
90	-1017	1015	-1.2192	-1015	1014	-1.2174	0.0018	0.0156
92	-1005	1011	-1.2096	-1004	1009	-1.2078	0.0018	0.0138
94	-946	952	-1.1388	-944	951	-1.1370	0.0018	0.0120
96	-851	855	-1.0236	-849	854	-1.0218	0.0018	0.0102
98	-739	749	-0.8928	-738	749	-0.8922	0.0006	0.0084
100	-559	559	-0.6708	-558	559	-0.6702	0.0006	0.0078
102	-266	270	-0.3216	-264	269	-0.3198	0.0018	0.0072
104	98	-94	0.1152	101	-96	0.1182	0.0030	0.0054
106	465	-461	0.5556	468	-462	0.5580	0.0024	0.0024
108	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-1

DESCRIPTION From DataMate

CURRENT SURVEY 6/8/2010 7:55:11 AM

INITIAL SURVEY 4/13/2010 8:50:15 AM

DATE PRINTED 6/8/2010 12:36:42 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
2	657	-671	0.7968	567	-569	0.6816	-0.1152	-0.2808
4	12	-15	0.0162	0	0	0.0000	-0.0162	-0.1656
6	102	-97	0.1194	85	-80	0.0990	-0.0204	-0.1494
8	73	-66	0.0834	55	-47	0.0612	-0.0222	-0.1290
10	94	-90	0.1104	70	-66	0.0816	-0.0288	-0.1068
12	179	-171	0.2100	164	-157	0.1926	-0.0174	-0.0780
14	194	-189	0.2298	181	-177	0.2148	-0.0150	-0.0606
16	216	-210	0.2556	205	-199	0.2424	-0.0132	-0.0456
18	372	-367	0.4434	361	-355	0.4296	-0.0138	-0.0324
20	420	-416	0.5016	408	-404	0.4872	-0.0144	-0.0186
22	471	-468	0.5634	459	-456	0.5490	-0.0144	-0.0042
24	463	-455	0.5508	454	-446	0.5400	-0.0108	0.0102
26	269	-264	0.3198	261	-256	0.3102	-0.0096	0.0210
28	204	-198	0.2412	195	-189	0.2304	-0.0108	0.0306
30	193	-188	0.2286	187	-182	0.2214	-0.0072	0.0414
32	100	-96	0.1176	93	-89	0.1092	-0.0084	0.0486
34	54	-48	0.0612	49	-43	0.0552	-0.0060	0.0570
36	145	-141	0.1716	143	-139	0.1692	-0.0024	0.0630
38	205	-203	0.2448	206	-205	0.2466	0.0018	0.0654
40	183	-170	0.2118	180	-168	0.2088	-0.0030	0.0636
42	144	-140	0.1704	147	-144	0.1746	0.0042	0.0666
44	109	-102	0.1266	115	-108	0.1338	0.0072	0.0624
46	90	-85	0.1050	94	-89	0.1098	0.0048	0.0552
48	52	-46	0.0588	52	-46	0.0588	0.0000	0.0504
50	9	-3	0.0072	11	-6	0.0102	0.0030	0.0504
52	259	-256	0.3090	266	-263	0.3174	0.0084	0.0474
54	360	-354	0.4284	372	-366	0.4428	0.0144	0.0390
56	296	-292	0.3528	298	-293	0.3546	0.0018	0.0246
58	374	-368	0.4452	374	-368	0.4452	0.0000	0.0228
60	425	-421	0.5076	425	-421	0.5076	0.0000	0.0228
62	328	-322	0.3900	325	-319	0.3864	-0.0036	0.0228
64	197	-190	0.2322	194	-187	0.2286	-0.0036	0.0264
66	97	-89	0.1116	96	-88	0.1104	-0.0012	0.0300
68	-16	24	-0.0240	-15	24	-0.0234	0.0006	0.0312
70	-225	229	-0.2724	-228	230	-0.2748	-0.0024	0.0306
72	-339	345	-0.4104	-339	345	-0.4104	0.0000	0.0330
74	-446	453	-0.5394	-446	453	-0.5394	0.0000	0.0330
76	-565	571	-0.6816	-565	570	-0.6810	0.0006	0.0330
78	-678	686	-0.8184	-678	686	-0.8184	0.0000	0.0324

SITE PAFTVA

INSTALLATION SI-1

DESCRIPTION From DataMate

CURRENT SURVEY 6/8/2010 7:55:11 AM

INITIAL SURVEY 4/13/2010 8:50:15 AM

DATE PRINTED 6/8/2010 12:36:42 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
80	-782	784	-0.9396	-781	784	-0.9390	0.0006	0.0324
82	-861	866	-1.0362	-860	866	-1.0356	0.0006	0.0318
84	-917	923	-1.1040	-917	922	-1.1034	0.0006	0.0312
86	-951	957	-1.1448	-950	956	-1.1436	0.0012	0.0306
88	-957	965	-1.1532	-956	963	-1.1514	0.0018	0.0294
90	-1017	1015	-1.2192	-1015	1014	-1.2174	0.0018	0.0276
92	-1005	1011	-1.2096	-1004	1009	-1.2078	0.0018	0.0258
94	-946	952	-1.1388	-944	950	-1.1364	0.0024	0.0240
96	-851	855	-1.0236	-849	853	-1.0212	0.0024	0.0216
98	-739	749	-0.8928	-738	747	-0.8910	0.0018	0.0192
100	-559	559	-0.6708	-558	557	-0.6690	0.0018	0.0174
102	-266	270	-0.3216	-263	266	-0.3174	0.0042	0.0156
104	98	-94	0.1152	103	-100	0.1218	0.0066	0.0114
106	465	-461	0.5556	469	-465	0.5604	0.0048	0.0048
108	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-1

DESCRIPTION From DataMate

CURRENT SURVEY 4/28/2010 8:40:19 AM

INITIAL SURVEY 4/13/2010 8:50:15 AM

DATE PRINTED 6/8/2010 12:36:53 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
2	1072	-1063	1.2810	1025	-1003	1.2168	-0.0642	-0.0228
4	171	-180	0.2106	175	-184	0.2154	0.0048	0.0414
6	148	-170	0.1908	150	-170	0.1920	0.0012	0.0366
8	145	-169	0.1884	146	-169	0.1890	0.0006	0.0354
10	175	-194	0.2214	179	-197	0.2256	0.0042	0.0348
12	67	-90	0.0942	71	-89	0.0960	0.0018	0.0306
14	-14	1	-0.0090	-12	-1	-0.0066	0.0024	0.0288
16	-128	103	-0.1386	-127	104	-0.1386	0.0000	0.0264
18	-183	158	-0.2046	-182	158	-0.2040	0.0006	0.0264
20	-278	258	-0.3216	-278	255	-0.3198	0.0018	0.0258
22	-306	285	-0.3546	-305	283	-0.3528	0.0018	0.0240
24	-318	297	-0.3690	-317	296	-0.3678	0.0012	0.0222
26	-298	276	-0.3444	-297	274	-0.3426	0.0018	0.0210
28	-288	266	-0.3324	-286	265	-0.3306	0.0018	0.0192
30	-295	277	-0.3432	-293	277	-0.3420	0.0012	0.0174
32	-330	308	-0.3828	-329	307	-0.3816	0.0012	0.0162
34	-360	341	-0.4206	-359	342	-0.4206	0.0000	0.0150
36	-406	383	-0.4734	-406	385	-0.4746	-0.0012	0.0150
38	-466	446	-0.5472	-467	446	-0.5478	-0.0006	0.0162
40	-415	396	-0.4866	-414	395	-0.4854	0.0012	0.0168
42	-393	371	-0.4584	-391	370	-0.4566	0.0018	0.0156
44	-364	345	-0.4254	-364	345	-0.4254	0.0000	0.0138
46	-301	279	-0.3480	-301	280	-0.3486	-0.0006	0.0138
48	-258	234	-0.2952	-261	234	-0.2970	-0.0018	0.0144
50	-198	177	-0.2250	-199	177	-0.2256	-0.0006	0.0162
52	-221	196	-0.2502	-220	197	-0.2502	0.0000	0.0168
54	-237	216	-0.2718	-237	216	-0.2718	0.0000	0.0168
56	-246	223	-0.2814	-247	223	-0.2820	-0.0006	0.0168
58	-268	243	-0.3066	-267	244	-0.3066	0.0000	0.0174
60	-250	234	-0.2904	-248	233	-0.2886	0.0018	0.0174
62	-209	185	-0.2364	-208	185	-0.2358	0.0006	0.0156
64	-174	156	-0.1980	-174	156	-0.1980	0.0000	0.0150
66	-165	144	-0.1854	-165	143	-0.1848	0.0006	0.0150
68	-152	128	-0.1680	-150	129	-0.1674	0.0006	0.0144
70	-111	95	-0.1236	-110	95	-0.1230	0.0006	0.0138
72	-93	71	-0.0984	-93	67	-0.0960	0.0024	0.0132
74	-71	58	-0.0774	-72	53	-0.0750	0.0024	0.0108
76	-79	60	-0.0834	-80	55	-0.0810	0.0024	0.0084
78	-86	67	-0.0918	-86	66	-0.0912	0.0006	0.0060

SITE PAFTVA

INSTALLATION SI-1

DESCRIPTION From DataMate

CURRENT SURVEY 4/28/2010 8:40:19 AM

INITIAL SURVEY 4/13/2010 8:50:15 AM

DATE PRINTED 6/8/2010 12:36:53 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
80	-110	104	-0.1284	-107	101	-0.1248	0.0036	0.0054
82	-135	112	-0.1482	-132	112	-0.1464	0.0018	0.0018
84	-203	191	-0.2364	-203	192	-0.2370	-0.0006	0.0000
86	-267	250	-0.3102	-266	249	-0.3090	0.0012	0.0006
88	-296	279	-0.3450	-295	278	-0.3438	0.0012	-0.0006
90	-335	330	-0.3990	-336	329	-0.3990	0.0000	-0.0018
92	-362	340	-0.4212	-362	339	-0.4206	0.0006	-0.0018
94	-349	330	-0.4074	-345	327	-0.4032	0.0042	-0.0024
96	-320	302	-0.3732	-323	303	-0.3756	-0.0024	-0.0066
98	-234	227	-0.2766	-235	229	-0.2784	-0.0018	-0.0042
100	-95	85	-0.1080	-95	85	-0.1080	0.0000	-0.0024
102	48	-57	0.0630	48	-54	0.0612	-0.0018	-0.0024
104	224	-238	0.2772	228	-236	0.2784	0.0012	-0.0006
106	419	-432	0.5106	418	-430	0.5088	-0.0018	-0.0018
108	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-1

DESCRIPTION From DataMate

CURRENT SURVEY 5/11/2010 8:33:22 AM

INITIAL SURVEY 4/13/2010 8:50:15 AM

DATE PRINTED 6/8/2010 12:36:53 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
2	1072	-1063	1.2810	1017	-998	1.2090	-0.0720	-0.0390
4	171	-180	0.2106	174	-185	0.2154	0.0048	0.0330
6	148	-170	0.1908	151	-171	0.1932	0.0024	0.0282
8	145	-169	0.1884	147	-169	0.1896	0.0012	0.0258
10	175	-194	0.2214	182	-198	0.2280	0.0066	0.0246
12	67	-90	0.0942	72	-90	0.0972	0.0030	0.0180
14	-14	1	-0.0090	-10	-1	-0.0054	0.0036	0.0150
16	-128	103	-0.1386	-123	104	-0.1362	0.0024	0.0114
18	-183	158	-0.2046	-179	158	-0.2022	0.0024	0.0090
20	-278	258	-0.3216	-277	256	-0.3198	0.0018	0.0066
22	-306	285	-0.3546	-304	283	-0.3522	0.0024	0.0048
24	-318	297	-0.3690	-316	296	-0.3672	0.0018	0.0024
26	-298	276	-0.3444	-296	275	-0.3426	0.0018	0.0006
28	-288	266	-0.3324	-287	266	-0.3318	0.0006	-0.0012
30	-295	277	-0.3432	-291	278	-0.3414	0.0018	-0.0018
32	-330	308	-0.3828	-328	308	-0.3816	0.0012	-0.0036
34	-360	341	-0.4206	-357	342	-0.4194	0.0012	-0.0048
36	-406	383	-0.4734	-406	386	-0.4752	-0.0018	-0.0060
38	-466	446	-0.5472	-469	447	-0.5496	-0.0024	-0.0042
40	-415	396	-0.4866	-413	397	-0.4860	0.0006	-0.0018
42	-393	371	-0.4584	-393	372	-0.4590	-0.0006	-0.0024
44	-364	345	-0.4254	-364	346	-0.4260	-0.0006	-0.0018
46	-301	279	-0.3480	-300	280	-0.3480	0.0000	-0.0012
48	-258	234	-0.2952	-261	234	-0.2970	-0.0018	-0.0012
50	-198	177	-0.2250	-197	177	-0.2244	0.0006	0.0006
52	-221	196	-0.2502	-220	198	-0.2508	-0.0006	0.0000
54	-237	216	-0.2718	-238	218	-0.2736	-0.0018	0.0006
56	-246	223	-0.2814	-245	224	-0.2814	0.0000	0.0024
58	-268	243	-0.3066	-267	244	-0.3066	0.0000	0.0024
60	-250	234	-0.2904	-248	234	-0.2892	0.0012	0.0024
62	-209	185	-0.2364	-208	187	-0.2370	-0.0006	0.0012
64	-174	156	-0.1980	-174	155	-0.1974	0.0006	0.0018
66	-165	144	-0.1854	-165	144	-0.1854	0.0000	0.0012
68	-152	128	-0.1680	-150	129	-0.1674	0.0006	0.0012
70	-111	95	-0.1236	-111	97	-0.1248	-0.0012	0.0006
72	-93	71	-0.0984	-92	69	-0.0966	0.0018	0.0018
74	-71	58	-0.0774	-71	55	-0.0756	0.0018	0.0000
76	-79	60	-0.0834	-81	60	-0.0846	-0.0012	-0.0018
78	-86	67	-0.0918	-86	67	-0.0918	0.0000	-0.0006

SITE PAFTVA

INSTALLATION SI-1

DESCRIPTION From DataMate

CURRENT SURVEY 5/11/2010 8:33:22 AM

INITIAL SURVEY 4/13/2010 8:50:15 AM

DATE PRINTED 6/8/2010 12:36:53 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
80	-110	104	-0.1284	-108	104	-0.1272	0.0012	-0.0006
82	-135	112	-0.1482	-132	112	-0.1464	0.0018	-0.0018
84	-203	191	-0.2364	-203	193	-0.2376	-0.0012	-0.0036
86	-267	250	-0.3102	-266	251	-0.3102	0.0000	-0.0024
88	-296	279	-0.3450	-295	279	-0.3444	0.0006	-0.0024
90	-335	330	-0.3990	-335	330	-0.3990	0.0000	-0.0030
92	-362	340	-0.4212	-363	341	-0.4224	-0.0012	-0.0030
94	-349	330	-0.4074	-345	328	-0.4038	0.0036	-0.0018
96	-320	302	-0.3732	-320	305	-0.3750	-0.0018	-0.0054
98	-234	227	-0.2766	-233	229	-0.2772	-0.0006	-0.0036
100	-95	85	-0.1080	-95	86	-0.1086	-0.0006	-0.0030
102	48	-57	0.0630	49	-54	0.0618	-0.0012	-0.0024
104	224	-238	0.2772	228	-237	0.2790	0.0018	-0.0012
106	419	-432	0.5106	420	-426	0.5076	-0.0030	-0.0030
108	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-1

DESCRIPTION From DataMate

CURRENT SURVEY 5/25/2010 8:05:10 AM

INITIAL SURVEY 4/13/2010 8:50:15 AM

DATE PRINTED 6/8/2010 12:36:53 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
2	1072	-1063	1.2810	1016	-1001	1.2102	-0.0708	-0.0144
4	171	-180	0.2106	177	-188	0.2190	0.0084	0.0564
6	148	-170	0.1908	152	-174	0.1956	0.0048	0.0480
8	145	-169	0.1884	148	-170	0.1908	0.0024	0.0432
10	175	-194	0.2214	184	-200	0.2304	0.0090	0.0408
12	67	-90	0.0942	71	-92	0.0978	0.0036	0.0318
14	-14	1	-0.0090	-10	-3	-0.0042	0.0048	0.0282
16	-128	103	-0.1386	-125	104	-0.1374	0.0012	0.0234
18	-183	158	-0.2046	-180	156	-0.2016	0.0030	0.0222
20	-278	258	-0.3216	-274	255	-0.3174	0.0042	0.0192
22	-306	285	-0.3546	-303	281	-0.3504	0.0042	0.0150
24	-318	297	-0.3690	-316	296	-0.3672	0.0018	0.0108
26	-298	276	-0.3444	-295	274	-0.3414	0.0030	0.0090
28	-288	266	-0.3324	-287	265	-0.3312	0.0012	0.0060
30	-295	277	-0.3432	-292	277	-0.3414	0.0018	0.0048
32	-330	308	-0.3828	-327	307	-0.3804	0.0024	0.0030
34	-360	341	-0.4206	-359	341	-0.4200	0.0006	0.0006
36	-406	383	-0.4734	-405	384	-0.4734	0.0000	0.0000
38	-466	446	-0.5472	-469	447	-0.5496	-0.0024	0.0000
40	-415	396	-0.4866	-413	396	-0.4854	0.0012	0.0024
42	-393	371	-0.4584	-393	371	-0.4584	0.0000	0.0012
44	-364	345	-0.4254	-365	347	-0.4272	-0.0018	0.0012
46	-301	279	-0.3480	-301	281	-0.3492	-0.0012	0.0030
48	-258	234	-0.2952	-261	235	-0.2976	-0.0024	0.0042
50	-198	177	-0.2250	-197	177	-0.2244	0.0006	0.0066
52	-221	196	-0.2502	-221	198	-0.2514	-0.0012	0.0060
54	-237	216	-0.2718	-237	218	-0.2730	-0.0012	0.0072
56	-246	223	-0.2814	-245	223	-0.2808	0.0006	0.0084
58	-268	243	-0.3066	-267	244	-0.3066	0.0000	0.0078
60	-250	234	-0.2904	-247	234	-0.2886	0.0018	0.0078
62	-209	185	-0.2364	-208	186	-0.2364	0.0000	0.0060
64	-174	156	-0.1980	-174	155	-0.1974	0.0006	0.0060
66	-165	144	-0.1854	-165	143	-0.1848	0.0006	0.0054
68	-152	128	-0.1680	-150	130	-0.1680	0.0000	0.0048
70	-111	95	-0.1236	-111	97	-0.1248	-0.0012	0.0048
72	-93	71	-0.0984	-93	67	-0.0960	0.0024	0.0060
74	-71	58	-0.0774	-72	54	-0.0756	0.0018	0.0036
76	-79	60	-0.0834	-80	59	-0.0834	0.0000	0.0018
78	-86	67	-0.0918	-80	67	-0.0882	0.0036	0.0018

SITE PAFTVA

INSTALLATION SI-1

DESCRIPTION From DataMate

CURRENT SURVEY 5/25/2010 8:05:10 AM

INITIAL SURVEY 4/13/2010 8:50:15 AM

DATE PRINTED 6/8/2010 12:36:53 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
80	-110	104	-0.1284	-108	103	-0.1266	0.0018	-0.0018
82	-135	112	-0.1482	-132	112	-0.1464	0.0018	-0.0036
84	-203	191	-0.2364	-204	193	-0.2382	-0.0018	-0.0054
86	-267	250	-0.3102	-268	249	-0.3102	0.0000	-0.0036
88	-296	279	-0.3450	-295	278	-0.3438	0.0012	-0.0036
90	-335	330	-0.3990	-336	329	-0.3990	0.0000	-0.0048
92	-362	340	-0.4212	-363	339	-0.4212	0.0000	-0.0048
94	-349	330	-0.4074	-345	329	-0.4044	0.0030	-0.0048
96	-320	302	-0.3732	-321	304	-0.3750	-0.0018	-0.0078
98	-234	227	-0.2766	-233	230	-0.2778	-0.0012	-0.0060
100	-95	85	-0.1080	-95	87	-0.1092	-0.0012	-0.0048
102	48	-57	0.0630	48	-52	0.0600	-0.0030	-0.0036
104	224	-238	0.2772	229	-236	0.2790	0.0018	-0.0006
106	419	-432	0.5106	420	-427	0.5082	-0.0024	-0.0024
108	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-1

DESCRIPTION From DataMate

CURRENT SURVEY 6/8/2010 7:55:11 AM

INITIAL SURVEY 4/13/2010 8:50:15 AM

DATE PRINTED 6/8/2010 12:36:53 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
2	1072	-1063	1.2810	1012	-991	1.2018	-0.0792	0.0216
4	171	-180	0.2106	181	-191	0.2232	0.0126	0.1008
6	148	-170	0.1908	153	-176	0.1974	0.0066	0.0882
8	145	-169	0.1884	148	-171	0.1914	0.0030	0.0816
10	175	-194	0.2214	186	-204	0.2340	0.0126	0.0786
12	67	-90	0.0942	71	-92	0.0978	0.0036	0.0660
14	-14	1	-0.0090	-9	-6	-0.0018	0.0072	0.0624
16	-128	103	-0.1386	-125	103	-0.1368	0.0018	0.0552
18	-183	158	-0.2046	-179	155	-0.2004	0.0042	0.0534
20	-278	258	-0.3216	-274	252	-0.3156	0.0060	0.0492
22	-306	285	-0.3546	-303	280	-0.3498	0.0048	0.0432
24	-318	297	-0.3690	-317	295	-0.3672	0.0018	0.0384
26	-298	276	-0.3444	-295	273	-0.3408	0.0036	0.0366
28	-288	266	-0.3324	-286	263	-0.3294	0.0030	0.0330
30	-295	277	-0.3432	-291	276	-0.3402	0.0030	0.0300
32	-330	308	-0.3828	-327	305	-0.3792	0.0036	0.0270
34	-360	341	-0.4206	-358	341	-0.4194	0.0012	0.0234
36	-406	383	-0.4734	-407	383	-0.4740	-0.0006	0.0222
38	-466	446	-0.5472	-470	446	-0.5496	-0.0024	0.0228
40	-415	396	-0.4866	-412	396	-0.4848	0.0018	0.0252
42	-393	371	-0.4584	-393	370	-0.4578	0.0006	0.0234
44	-364	345	-0.4254	-365	346	-0.4266	-0.0012	0.0228
46	-301	279	-0.3480	-301	280	-0.3486	-0.0006	0.0240
48	-258	234	-0.2952	-262	234	-0.2976	-0.0024	0.0246
50	-198	177	-0.2250	-197	176	-0.2238	0.0012	0.0270
52	-221	196	-0.2502	-221	197	-0.2508	-0.0006	0.0258
54	-237	216	-0.2718	-238	216	-0.2724	-0.0006	0.0264
56	-246	223	-0.2814	-246	224	-0.2820	-0.0006	0.0270
58	-268	243	-0.3066	-266	243	-0.3054	0.0012	0.0276
60	-250	234	-0.2904	-247	232	-0.2874	0.0030	0.0264
62	-209	185	-0.2364	-208	185	-0.2358	0.0006	0.0234
64	-174	156	-0.1980	-173	154	-0.1962	0.0018	0.0228
66	-165	144	-0.1854	-164	143	-0.1842	0.0012	0.0210
68	-152	128	-0.1680	-151	129	-0.1680	0.0000	0.0198
70	-111	95	-0.1236	-110	96	-0.1236	0.0000	0.0198
72	-93	71	-0.0984	-92	67	-0.0954	0.0030	0.0198
74	-71	58	-0.0774	-71	54	-0.0750	0.0024	0.0168
76	-79	60	-0.0834	-80	59	-0.0834	0.0000	0.0144
78	-86	67	-0.0918	-79	65	-0.0864	0.0054	0.0144

SITE PAFTVA

INSTALLATION SI-1

DESCRIPTION From DataMate

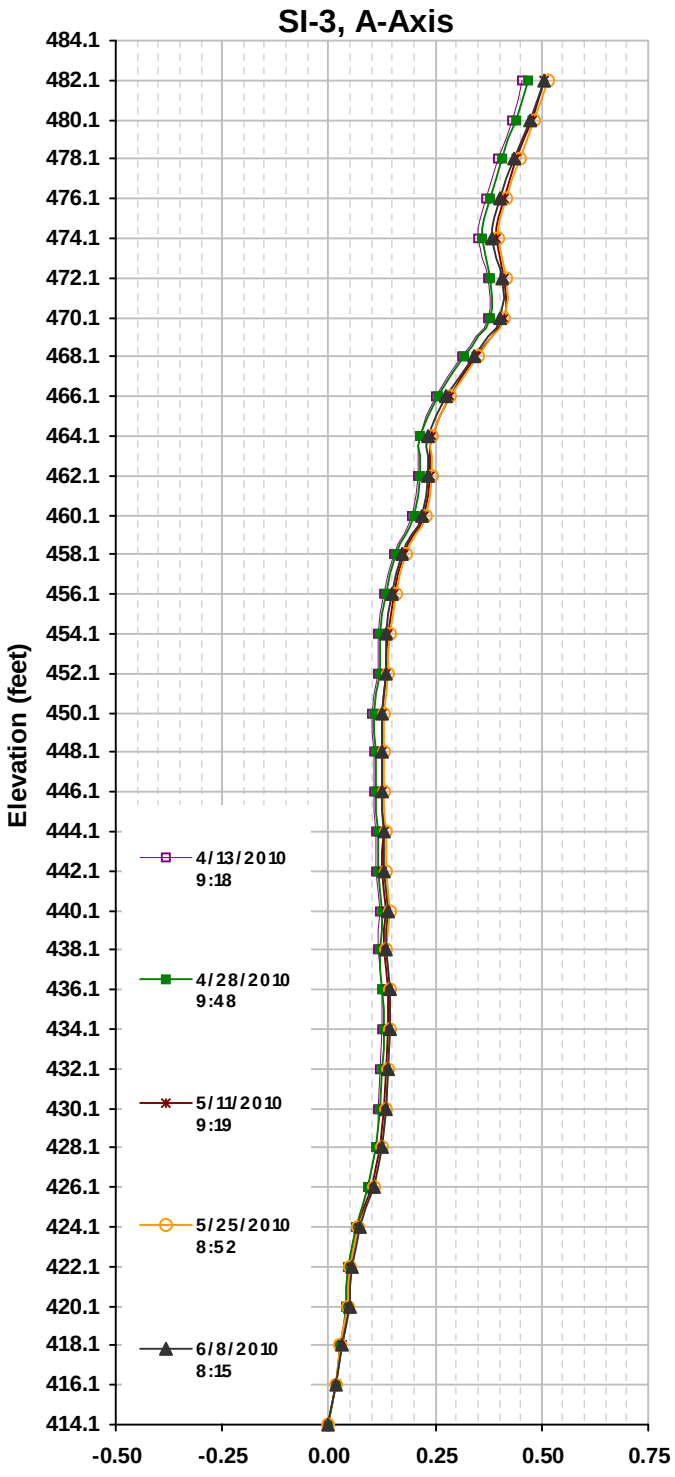
CURRENT SURVEY 6/8/2010 7:55:11 AM

INITIAL SURVEY 4/13/2010 8:50:15 AM

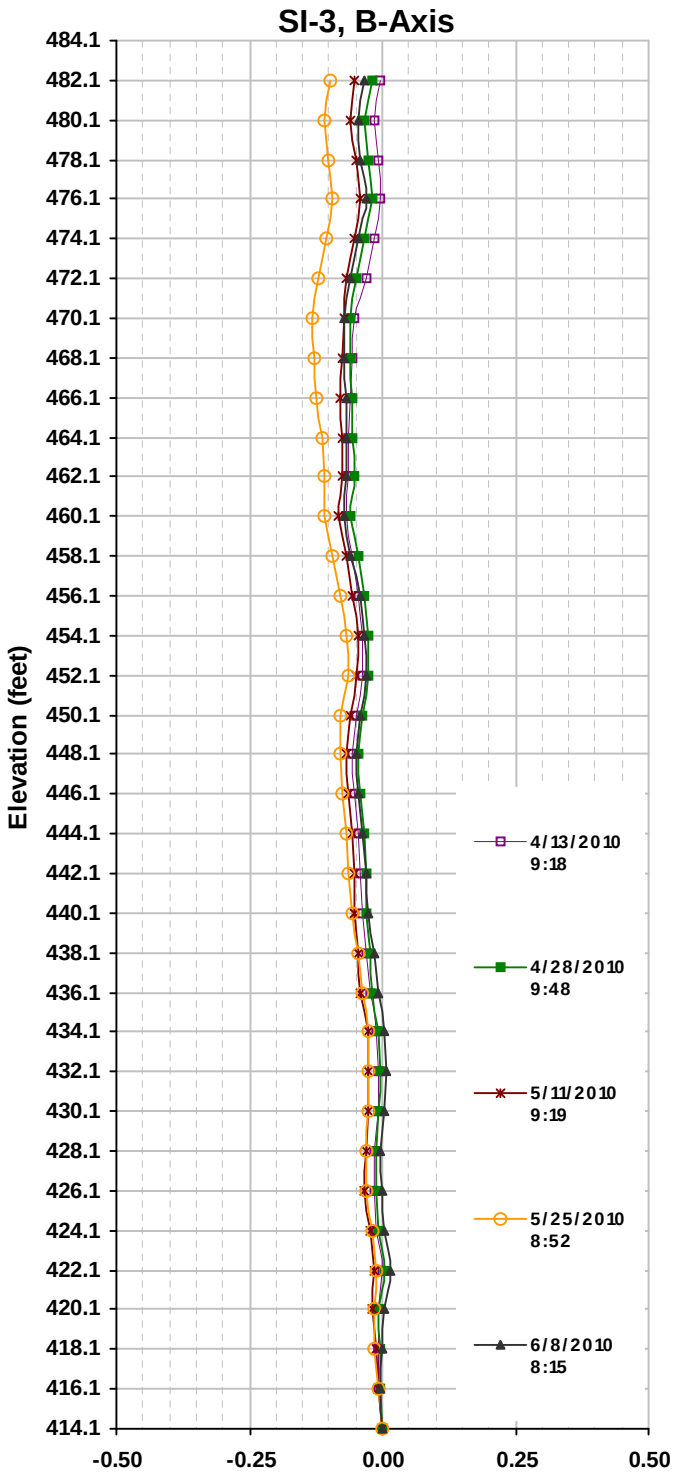
DATE PRINTED 6/8/2010 12:36:54 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
80	-110	104	-0.1284	-109	102	-0.1266	0.0018	0.0090
82	-135	112	-0.1482	-132	111	-0.1458	0.0024	0.0072
84	-203	191	-0.2364	-203	192	-0.2370	-0.0006	0.0048
86	-267	250	-0.3102	-268	249	-0.3102	0.0000	0.0054
88	-296	279	-0.3450	-295	278	-0.3438	0.0012	0.0054
90	-335	330	-0.3990	-336	328	-0.3984	0.0006	0.0042
92	-362	340	-0.4212	-362	338	-0.4200	0.0012	0.0036
94	-349	330	-0.4074	-345	327	-0.4032	0.0042	0.0024
96	-320	302	-0.3732	-320	303	-0.3738	-0.0006	-0.0018
98	-234	227	-0.2766	-232	234	-0.2796	-0.0030	-0.0012
100	-95	85	-0.1080	-94	84	-0.1068	0.0012	0.0018
102	48	-57	0.0630	49	-52	0.0606	-0.0024	0.0006
104	224	-238	0.2772	230	-237	0.2802	0.0030	0.0030
106	419	-432	0.5106	420	-431	0.5106	0.0000	0.0000
108	0	0	0.0000	0	0	0.0000	0.0000	0.0000

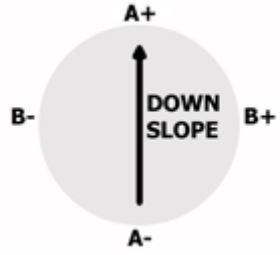


Cumulative Displacement (in) from 3/6/2009



Cumulative Displacement (in) from 3/6/2009

Stantec



Paradise Fossil Plant

Drakesboro, KY

175569040

6/8/2010

SITE PAFTVA

INSTALLATION SI-3

DESCRIPTION From DataMate

CURRENT SURVEY 4/13/2010 9:18:21 AM

INITIAL SURVEY 3/6/2009 10:03:35 AM

DATE PRINTED 6/8/2010 12:42:00 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-133	154	-0.1722	-115	126	-0.1446	0.0276	0.4560
6	-175	201	-0.2256	-154	170	-0.1944	0.0312	0.4284
8	-217	245	-0.2772	-199	217	-0.2496	0.0276	0.3972
10	-201	218	-0.2514	-193	198	-0.2346	0.0168	0.3696
12	-189	217	-0.2436	-214	229	-0.2658	-0.0222	0.3528
14	-134	154	-0.1728	-140	146	-0.1716	0.0012	0.3750
16	-112	138	-0.1500	-69	80	-0.0894	0.0606	0.3738
18	-70	99	-0.1014	-27	41	-0.0408	0.0606	0.3132
20	-67	90	-0.0942	-42	48	-0.0540	0.0402	0.2526
22	-93	113	-0.1236	-96	104	-0.1200	0.0036	0.2124
24	-119	145	-0.1584	-116	128	-0.1464	0.0120	0.2088
26	-118	141	-0.1554	-86	99	-0.1110	0.0444	0.1968
28	-107	135	-0.1452	-93	111	-0.1224	0.0228	0.1524
30	-81	102	-0.1098	-76	83	-0.0954	0.0144	0.1296
32	-33	59	-0.0552	-39	51	-0.0540	0.0012	0.1152
34	-75	97	-0.1032	-73	81	-0.0924	0.0108	0.1140
36	-70	97	-0.1002	-80	91	-0.1026	-0.0024	0.1032
38	-98	124	-0.1332	-105	120	-0.1350	-0.0018	0.1056
40	-142	163	-0.1830	-153	159	-0.1872	-0.0042	0.1074
42	-134	162	-0.1776	-143	155	-0.1788	-0.0012	0.1116
44	-89	109	-0.1188	-102	110	-0.1272	-0.0084	0.1128
46	-75	99	-0.1044	-77	89	-0.0996	0.0048	0.1212
48	-76	104	-0.1080	-91	104	-0.1170	-0.0090	0.1164
50	-94	116	-0.1260	-103	108	-0.1266	-0.0006	0.1254
52	-72	98	-0.1020	-77	86	-0.0978	0.0042	0.1260
54	-49	71	-0.0720	-50	62	-0.0672	0.0048	0.1218
56	-70	97	-0.1002	-72	84	-0.0936	0.0066	0.1170
58	-89	118	-0.1242	-81	98	-0.1074	0.0168	0.1104
60	5	14	-0.0054	24	-19	0.0258	0.0312	0.0936
62	120	-95	0.1290	128	-118	0.1476	0.0186	0.0624
64	263	-239	0.3012	259	-247	0.3036	0.0024	0.0438
66	374	-350	0.4344	381	-369	0.4500	0.0156	0.0414
68	470	-444	0.5484	473	-457	0.5580	0.0096	0.0258
70	503	-480	0.5898	508	-502	0.6060	0.0162	0.0162
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-3

DESCRIPTION From DataMate

CURRENT SURVEY 4/28/2010 9:48:48 AM

INITIAL SURVEY 3/6/2009 10:03:35 AM

DATE PRINTED 6/8/2010 12:42:00 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-133	154	-0.1722	-115	122	-0.1422	0.0300	0.4698
6	-175	201	-0.2256	-154	165	-0.1914	0.0342	0.4398
8	-217	245	-0.2772	-201	214	-0.2490	0.0282	0.4056
10	-201	218	-0.2514	-194	195	-0.2334	0.0180	0.3774
12	-189	217	-0.2436	-215	227	-0.2652	-0.0216	0.3594
14	-134	154	-0.1728	-142	144	-0.1716	0.0012	0.3810
16	-112	138	-0.1500	-71	77	-0.0888	0.0612	0.3798
18	-70	99	-0.1014	-28	38	-0.0396	0.0618	0.3186
20	-67	90	-0.0942	-43	45	-0.0528	0.0414	0.2568
22	-93	113	-0.1236	-100	101	-0.1206	0.0030	0.2154
24	-119	145	-0.1584	-119	125	-0.1464	0.0120	0.2124
26	-118	141	-0.1554	-88	97	-0.1110	0.0444	0.2004
28	-107	135	-0.1452	-95	108	-0.1218	0.0234	0.1560
30	-81	102	-0.1098	-81	81	-0.0972	0.0126	0.1326
32	-33	59	-0.0552	-42	49	-0.0546	0.0006	0.1200
34	-75	97	-0.1032	-75	78	-0.0918	0.0114	0.1194
36	-70	97	-0.1002	-82	88	-0.1020	-0.0018	0.1080
38	-98	124	-0.1332	-107	116	-0.1338	-0.0006	0.1098
40	-142	163	-0.1830	-155	156	-0.1866	-0.0036	0.1104
42	-134	162	-0.1776	-145	154	-0.1794	-0.0018	0.1140
44	-89	109	-0.1188	-105	106	-0.1266	-0.0078	0.1158
46	-75	99	-0.1044	-79	86	-0.0990	0.0054	0.1236
48	-76	104	-0.1080	-93	102	-0.1170	-0.0090	0.1182
50	-94	116	-0.1260	-106	105	-0.1266	-0.0006	0.1272
52	-72	98	-0.1020	-80	83	-0.0978	0.0042	0.1278
54	-49	71	-0.0720	-53	58	-0.0666	0.0054	0.1236
56	-70	97	-0.1002	-74	81	-0.0930	0.0072	0.1182
58	-89	118	-0.1242	-84	95	-0.1074	0.0168	0.1110
60	5	14	-0.0054	21	-22	0.0258	0.0312	0.0942
62	120	-95	0.1290	125	-121	0.1476	0.0186	0.0630
64	263	-239	0.3012	256	-250	0.3036	0.0024	0.0444
66	374	-350	0.4344	378	-372	0.4500	0.0156	0.0420
68	470	-444	0.5484	471	-460	0.5586	0.0102	0.0264
70	503	-480	0.5898	506	-504	0.6060	0.0162	0.0162
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-3

DESCRIPTION From DataMate

CURRENT SURVEY 5/11/2010 9:19:47 AM

INITIAL SURVEY 3/6/2009 10:03:35 AM

DATE PRINTED 6/8/2010 12:42:01 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-133	154	-0.1722	-113	124	-0.1422	0.0300	0.5070
6	-175	201	-0.2256	-151	166	-0.1902	0.0354	0.4770
8	-217	245	-0.2772	-197	214	-0.2466	0.0306	0.4416
10	-201	218	-0.2514	-192	196	-0.2328	0.0186	0.4110
12	-189	217	-0.2436	-213	228	-0.2646	-0.0210	0.3924
14	-134	154	-0.1728	-139	145	-0.1704	0.0024	0.4134
16	-112	138	-0.1500	-67	78	-0.0870	0.0630	0.4110
18	-70	99	-0.1014	-25	39	-0.0384	0.0630	0.3480
20	-67	90	-0.0942	-41	47	-0.0528	0.0414	0.2850
22	-93	113	-0.1236	-96	102	-0.1188	0.0048	0.2436
24	-119	145	-0.1584	-116	125	-0.1446	0.0138	0.2388
26	-118	141	-0.1554	-84	97	-0.1086	0.0468	0.2250
28	-107	135	-0.1452	-92	109	-0.1206	0.0246	0.1782
30	-81	102	-0.1098	-75	82	-0.0942	0.0156	0.1536
32	-33	59	-0.0552	-38	50	-0.0528	0.0024	0.1380
34	-75	97	-0.1032	-73	80	-0.0918	0.0114	0.1356
36	-70	97	-0.1002	-79	90	-0.1014	-0.0012	0.1242
38	-98	124	-0.1332	-104	118	-0.1332	0.0000	0.1254
40	-142	163	-0.1830	-152	158	-0.1860	-0.0030	0.1254
42	-134	162	-0.1776	-142	152	-0.1764	0.0012	0.1284
44	-89	109	-0.1188	-102	109	-0.1266	-0.0078	0.1272
46	-75	99	-0.1044	-77	88	-0.0990	0.0054	0.1350
48	-76	104	-0.1080	-90	104	-0.1164	-0.0084	0.1296
50	-94	116	-0.1260	-103	108	-0.1266	-0.0006	0.1380
52	-72	98	-0.1020	-76	86	-0.0972	0.0048	0.1386
54	-49	71	-0.0720	-50	61	-0.0666	0.0054	0.1338
56	-70	97	-0.1002	-71	83	-0.0924	0.0078	0.1284
58	-89	118	-0.1242	-81	97	-0.1068	0.0174	0.1206
60	5	14	-0.0054	25	-21	0.0276	0.0330	0.1032
62	120	-95	0.1290	129	-119	0.1488	0.0198	0.0702
64	263	-239	0.3012	260	-249	0.3054	0.0042	0.0504
66	374	-350	0.4344	382	-371	0.4518	0.0174	0.0462
68	470	-444	0.5484	474	-459	0.5598	0.0114	0.0288
70	503	-480	0.5898	509	-503	0.6072	0.0174	0.0174
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-3

DESCRIPTION From DataMate

CURRENT SURVEY 5/25/2010 8:52:50 AM

INITIAL SURVEY 3/6/2009 10:03:35 AM

DATE PRINTED 6/8/2010 12:42:01 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-133	154	-0.1722	-112	124	-0.1416	0.0306	0.5136
6	-175	201	-0.2256	-150	166	-0.1896	0.0360	0.4830
8	-217	245	-0.2772	-195	214	-0.2454	0.0318	0.4470
10	-201	218	-0.2514	-190	196	-0.2316	0.0198	0.4152
12	-189	217	-0.2436	-212	229	-0.2646	-0.0210	0.3954
14	-134	154	-0.1728	-138	146	-0.1704	0.0024	0.4164
16	-112	138	-0.1500	-65	79	-0.0864	0.0636	0.4140
18	-70	99	-0.1014	-24	39	-0.0378	0.0636	0.3504
20	-67	90	-0.0942	-41	46	-0.0522	0.0420	0.2868
22	-93	113	-0.1236	-96	103	-0.1194	0.0042	0.2448
24	-119	145	-0.1584	-115	128	-0.1458	0.0126	0.2406
26	-118	141	-0.1554	-85	98	-0.1098	0.0456	0.2280
28	-107	135	-0.1452	-91	110	-0.1206	0.0246	0.1824
30	-81	102	-0.1098	-75	82	-0.0942	0.0156	0.1578
32	-33	59	-0.0552	-38	51	-0.0534	0.0018	0.1422
34	-75	97	-0.1032	-72	80	-0.0912	0.0120	0.1404
36	-70	97	-0.1002	-79	91	-0.1020	-0.0018	0.1284
38	-98	124	-0.1332	-104	119	-0.1338	-0.0006	0.1302
40	-142	163	-0.1830	-151	159	-0.1860	-0.0030	0.1308
42	-134	162	-0.1776	-142	156	-0.1788	-0.0012	0.1338
44	-89	109	-0.1188	-101	109	-0.1260	-0.0072	0.1350
46	-75	99	-0.1044	-76	87	-0.0978	0.0066	0.1422
48	-76	104	-0.1080	-89	104	-0.1158	-0.0078	0.1356
50	-94	116	-0.1260	-101	108	-0.1254	0.0006	0.1434
52	-72	98	-0.1020	-76	87	-0.0978	0.0042	0.1428
54	-49	71	-0.0720	-49	61	-0.0660	0.0060	0.1386
56	-70	97	-0.1002	-69	83	-0.0912	0.0090	0.1326
58	-89	118	-0.1242	-79	96	-0.1050	0.0192	0.1236
60	5	14	-0.0054	26	-21	0.0282	0.0336	0.1044
62	120	-95	0.1290	130	-119	0.1494	0.0204	0.0708
64	263	-239	0.3012	261	-248	0.3054	0.0042	0.0504
66	374	-350	0.4344	384	-370	0.4524	0.0180	0.0462
68	470	-444	0.5484	475	-459	0.5604	0.0120	0.0282
70	503	-480	0.5898	507	-503	0.6060	0.0162	0.0162
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-3

DESCRIPTION From DataMate

CURRENT SURVEY 6/8/2010 8:15:27 AM

INITIAL SURVEY 3/6/2009 10:03:35 AM

DATE PRINTED 6/8/2010 12:42:01 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-133	154	-0.1722	-110	121	-0.1386	0.0336	0.5076
6	-175	201	-0.2256	-149	165	-0.1884	0.0372	0.4740
8	-217	245	-0.2772	-195	212	-0.2442	0.0330	0.4368
10	-201	218	-0.2514	-191	195	-0.2316	0.0198	0.4038
12	-189	217	-0.2436	-214	229	-0.2658	-0.0222	0.3840
14	-134	154	-0.1728	-139	145	-0.1704	0.0024	0.4062
16	-112	138	-0.1500	-66	77	-0.0858	0.0642	0.4038
18	-70	99	-0.1014	-25	39	-0.0384	0.0630	0.3396
20	-67	90	-0.0942	-41	46	-0.0522	0.0420	0.2766
22	-93	113	-0.1236	-97	103	-0.1200	0.0036	0.2346
24	-119	145	-0.1584	-117	126	-0.1458	0.0126	0.2310
26	-118	141	-0.1554	-86	98	-0.1104	0.0450	0.2184
28	-107	135	-0.1452	-93	110	-0.1218	0.0234	0.1734
30	-81	102	-0.1098	-78	82	-0.0960	0.0138	0.1500
32	-33	59	-0.0552	-39	51	-0.0540	0.0012	0.1362
34	-75	97	-0.1032	-74	79	-0.0918	0.0114	0.1350
36	-70	97	-0.1002	-80	90	-0.1020	-0.0018	0.1236
38	-98	124	-0.1332	-105	119	-0.1344	-0.0012	0.1254
40	-142	163	-0.1830	-153	159	-0.1872	-0.0042	0.1266
42	-134	162	-0.1776	-143	152	-0.1770	0.0006	0.1308
44	-89	109	-0.1188	-103	112	-0.1290	-0.0102	0.1302
46	-75	99	-0.1044	-78	87	-0.0990	0.0054	0.1404
48	-76	104	-0.1080	-91	104	-0.1170	-0.0090	0.1350
50	-94	116	-0.1260	-103	108	-0.1266	-0.0006	0.1440
52	-72	98	-0.1020	-77	85	-0.0972	0.0048	0.1446
54	-49	71	-0.0720	-50	61	-0.0666	0.0054	0.1398
56	-70	97	-0.1002	-71	83	-0.0924	0.0078	0.1344
58	-89	118	-0.1242	-81	95	-0.1056	0.0186	0.1266
60	5	14	-0.0054	27	-22	0.0294	0.0348	0.1080
62	120	-95	0.1290	129	-121	0.1500	0.0210	0.0732
64	263	-239	0.3012	259	-250	0.3054	0.0042	0.0522
66	374	-350	0.4344	382	-372	0.4524	0.0180	0.0480
68	470	-444	0.5484	474	-459	0.5598	0.0114	0.0300
70	503	-480	0.5898	510	-504	0.6084	0.0186	0.0186
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-3

DESCRIPTION From DataMate

CURRENT SURVEY 4/13/2010 9:18:21 AM

INITIAL SURVEY 3/6/2009 10:03:35 AM

DATE PRINTED 6/8/2010 12:42:12 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-393	427	-0.4920	-397	405	-0.4812	0.0108	-0.0024
6	-370	401	-0.4626	-398	383	-0.4686	-0.0060	-0.0132
8	-374	395	-0.4614	-395	382	-0.4662	-0.0048	-0.0072
10	-285	315	-0.3600	-291	288	-0.3474	0.0126	-0.0024
12	-149	180	-0.1974	-154	147	-0.1806	0.0168	-0.0150
14	-65	95	-0.0960	-66	62	-0.0768	0.0192	-0.0318
16	17	14	0.0018	8	-6	0.0084	0.0066	-0.0510
18	75	-52	0.0762	69	-64	0.0798	0.0036	-0.0576
20	170	-139	0.1854	153	-159	0.1872	0.0018	-0.0612
22	217	-192	0.2454	201	-207	0.2448	-0.0006	-0.0630
24	235	-207	0.2652	228	-224	0.2712	0.0060	-0.0624
26	266	-231	0.2982	236	-242	0.2868	-0.0114	-0.0684
28	219	-192	0.2466	189	-200	0.2334	-0.0132	-0.0570
30	173	-140	0.1878	148	-157	0.1830	-0.0048	-0.0438
32	147	-115	0.1572	124	-134	0.1548	-0.0024	-0.0390
34	113	-90	0.1218	105	-119	0.1344	0.0126	-0.0366
36	155	-123	0.1668	140	-150	0.1740	0.0072	-0.0492
38	159	-132	0.1746	134	-148	0.1692	-0.0054	-0.0564
40	122	-89	0.1266	93	-111	0.1224	-0.0042	-0.0510
42	47	-29	0.0456	27	-39	0.0396	-0.0060	-0.0468
44	-15	45	-0.0360	-36	30	-0.0396	-0.0036	-0.0408
46	-33	61	-0.0564	-61	46	-0.0642	-0.0078	-0.0372
48	-70	98	-0.1008	-97	83	-0.1080	-0.0072	-0.0294
50	-93	125	-0.1308	-130	108	-0.1428	-0.0120	-0.0222
52	-162	173	-0.2010	-173	167	-0.2040	-0.0030	-0.0102
54	-190	223	-0.2478	-208	204	-0.2472	0.0006	-0.0072
56	-179	207	-0.2316	-194	180	-0.2244	0.0072	-0.0078
58	-202	203	-0.2430	-204	202	-0.2436	-0.0006	-0.0150
60	-188	217	-0.2430	-208	204	-0.2472	-0.0042	-0.0144
62	-199	201	-0.2400	-214	204	-0.2508	-0.0108	-0.0102
64	-218	251	-0.2814	-232	221	-0.2718	0.0096	0.0006
66	-183	212	-0.2370	-205	192	-0.2382	-0.0012	-0.0090
68	-113	134	-0.1482	-126	124	-0.1500	-0.0018	-0.0078
70	-49	78	-0.0762	-75	62	-0.0822	-0.0060	-0.0060
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-3

DESCRIPTION From DataMate

CURRENT SURVEY 4/28/2010 9:48:48 AM

INITIAL SURVEY 3/6/2009 10:03:35 AM

DATE PRINTED 6/8/2010 12:42:12 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-393	427	-0.4920	-396	402	-0.4788	0.0132	-0.0204
6	-370	401	-0.4626	-398	383	-0.4686	-0.0060	-0.0336
8	-374	395	-0.4614	-398	383	-0.4686	-0.0072	-0.0276
10	-285	315	-0.3600	-291	286	-0.3462	0.0138	-0.0204
12	-149	180	-0.1974	-160	145	-0.1830	0.0144	-0.0342
14	-65	95	-0.0960	-78	62	-0.0840	0.0120	-0.0486
16	17	14	0.0018	-3	-8	0.0030	0.0012	-0.0606
18	75	-52	0.0762	55	-65	0.0720	-0.0042	-0.0618
20	170	-139	0.1854	148	-158	0.1836	-0.0018	-0.0576
22	217	-192	0.2454	198	-207	0.2430	-0.0024	-0.0558
24	235	-207	0.2652	225	-227	0.2712	0.0060	-0.0534
26	266	-231	0.2982	232	-242	0.2844	-0.0138	-0.0594
28	219	-192	0.2466	188	-201	0.2334	-0.0132	-0.0456
30	173	-140	0.1878	148	-157	0.1830	-0.0048	-0.0324
32	147	-115	0.1572	124	-134	0.1548	-0.0024	-0.0276
34	113	-90	0.1218	103	-121	0.1344	0.0126	-0.0252
36	155	-123	0.1668	141	-149	0.1740	0.0072	-0.0378
38	159	-132	0.1746	133	-151	0.1704	-0.0042	-0.0450
40	122	-89	0.1266	93	-108	0.1206	-0.0060	-0.0408
42	47	-29	0.0456	27	-42	0.0414	-0.0042	-0.0348
44	-15	45	-0.0360	-35	29	-0.0384	-0.0024	-0.0306
46	-33	61	-0.0564	-58	45	-0.0618	-0.0054	-0.0282
48	-70	98	-0.1008	-97	79	-0.1056	-0.0048	-0.0228
50	-93	125	-0.1308	-128	108	-0.1416	-0.0108	-0.0180
52	-162	173	-0.2010	-176	165	-0.2046	-0.0036	-0.0072
54	-190	223	-0.2478	-207	202	-0.2454	0.0024	-0.0036
56	-179	207	-0.2316	-195	181	-0.2256	0.0060	-0.0060
58	-202	203	-0.2430	-205	202	-0.2442	-0.0012	-0.0120
60	-188	217	-0.2430	-206	204	-0.2460	-0.0030	-0.0108
62	-199	201	-0.2400	-216	203	-0.2514	-0.0114	-0.0078
64	-218	251	-0.2814	-232	221	-0.2718	0.0096	0.0036
66	-183	212	-0.2370	-206	192	-0.2388	-0.0018	-0.0060
68	-113	134	-0.1482	-122	123	-0.1470	0.0012	-0.0042
70	-49	78	-0.0762	-75	61	-0.0816	-0.0054	-0.0054
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-3

DESCRIPTION From DataMate

CURRENT SURVEY 5/11/2010 9:19:47 AM

INITIAL SURVEY 3/6/2009 10:03:35 AM

DATE PRINTED 6/8/2010 12:42:12 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-393	427	-0.4920	-404	400	-0.4824	0.0096	-0.0522
6	-370	401	-0.4626	-407	387	-0.4764	-0.0138	-0.0618
8	-374	395	-0.4614	-397	384	-0.4686	-0.0072	-0.0480
10	-285	315	-0.3600	-293	290	-0.3498	0.0102	-0.0408
12	-149	180	-0.1974	-156	147	-0.1818	0.0156	-0.0510
14	-65	95	-0.0960	-78	73	-0.0906	0.0054	-0.0666
16	17	14	0.0018	7	0	0.0042	0.0024	-0.0720
18	75	-52	0.0762	69	-63	0.0792	0.0030	-0.0744
20	170	-139	0.1854	154	-153	0.1842	-0.0012	-0.0774
22	217	-192	0.2454	203	-205	0.2448	-0.0006	-0.0762
24	235	-207	0.2652	224	-228	0.2712	0.0060	-0.0756
26	266	-231	0.2982	235	-239	0.2844	-0.0138	-0.0816
28	219	-192	0.2466	190	-202	0.2352	-0.0114	-0.0678
30	173	-140	0.1878	147	-150	0.1782	-0.0096	-0.0564
32	147	-115	0.1572	136	-130	0.1596	0.0024	-0.0468
34	113	-90	0.1218	101	-119	0.1320	0.0102	-0.0492
36	155	-123	0.1668	143	-148	0.1746	0.0078	-0.0594
38	159	-132	0.1746	134	-151	0.1710	-0.0036	-0.0672
40	122	-89	0.1266	95	-106	0.1206	-0.0060	-0.0636
42	47	-29	0.0456	29	-39	0.0408	-0.0048	-0.0576
44	-15	45	-0.0360	-28	32	-0.0360	0.0000	-0.0528
46	-33	61	-0.0564	-56	49	-0.0630	-0.0066	-0.0528
48	-70	98	-0.1008	-97	80	-0.1062	-0.0054	-0.0462
50	-93	125	-0.1308	-128	114	-0.1452	-0.0144	-0.0408
52	-162	173	-0.2010	-171	163	-0.2004	0.0006	-0.0264
54	-190	223	-0.2478	-204	209	-0.2478	0.0000	-0.0270
56	-179	207	-0.2316	-196	182	-0.2268	0.0048	-0.0270
58	-202	203	-0.2430	-203	199	-0.2412	0.0018	-0.0318
60	-188	217	-0.2430	-216	206	-0.2532	-0.0102	-0.0336
62	-199	201	-0.2400	-211	204	-0.2490	-0.0090	-0.0234
64	-218	251	-0.2814	-232	232	-0.2784	0.0030	-0.0144
66	-183	212	-0.2370	-204	201	-0.2430	-0.0060	-0.0174
68	-113	134	-0.1482	-128	125	-0.1518	-0.0036	-0.0114
70	-49	78	-0.0762	-75	65	-0.0840	-0.0078	-0.0078
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-3

DESCRIPTION From DataMate

CURRENT SURVEY 5/25/2010 8:52:50 AM

INITIAL SURVEY 3/6/2009 10:03:35 AM

DATE PRINTED 6/8/2010 12:42:12 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-393	427	-0.4920	-397	401	-0.4788	0.0132	-0.0966
6	-370	401	-0.4626	-401	384	-0.4710	-0.0084	-0.1098
8	-374	395	-0.4614	-398	385	-0.4698	-0.0084	-0.1014
10	-285	315	-0.3600	-291	289	-0.3480	0.0120	-0.0930
12	-149	180	-0.1974	-158	146	-0.1824	0.0150	-0.1050
14	-65	95	-0.0960	-79	63	-0.0852	0.0108	-0.1200
16	17	14	0.0018	-7	-7	0.0000	-0.0018	-0.1308
18	75	-52	0.0762	56	-62	0.0708	-0.0054	-0.1290
20	170	-139	0.1854	135	-157	0.1752	-0.0102	-0.1236
22	217	-192	0.2454	195	-209	0.2424	-0.0030	-0.1134
24	235	-207	0.2652	213	-228	0.2646	-0.0006	-0.1104
26	266	-231	0.2982	226	-242	0.2808	-0.0174	-0.1098
28	219	-192	0.2466	190	-199	0.2334	-0.0132	-0.0924
30	173	-140	0.1878	136	-157	0.1758	-0.0120	-0.0792
32	147	-115	0.1572	125	-133	0.1548	-0.0024	-0.0672
34	113	-90	0.1218	103	-121	0.1344	0.0126	-0.0648
36	155	-123	0.1668	130	-149	0.1674	0.0006	-0.0774
38	159	-132	0.1746	133	-151	0.1704	-0.0042	-0.0780
40	122	-89	0.1266	94	-108	0.1212	-0.0054	-0.0738
42	47	-29	0.0456	28	-41	0.0414	-0.0042	-0.0684
44	-15	45	-0.0360	-46	29	-0.0450	-0.0090	-0.0642
46	-33	61	-0.0564	-65	46	-0.0666	-0.0102	-0.0552
48	-70	98	-0.1008	-98	80	-0.1068	-0.0060	-0.0450
50	-93	125	-0.1308	-130	109	-0.1434	-0.0126	-0.0390
52	-162	173	-0.2010	-172	161	-0.1998	0.0012	-0.0264
54	-190	223	-0.2478	-212	204	-0.2496	-0.0018	-0.0276
56	-179	207	-0.2316	-200	181	-0.2286	0.0030	-0.0258
58	-202	203	-0.2430	-202	204	-0.2436	-0.0006	-0.0288
60	-188	217	-0.2430	-219	204	-0.2538	-0.0108	-0.0282
62	-199	201	-0.2400	-210	201	-0.2466	-0.0066	-0.0174
64	-218	251	-0.2814	-239	221	-0.2760	0.0054	-0.0108
66	-183	212	-0.2370	-204	192	-0.2376	-0.0006	-0.0162
68	-113	134	-0.1482	-136	125	-0.1566	-0.0084	-0.0156
70	-49	78	-0.0762	-77	62	-0.0834	-0.0072	-0.0072
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-3

DESCRIPTION From DataMate

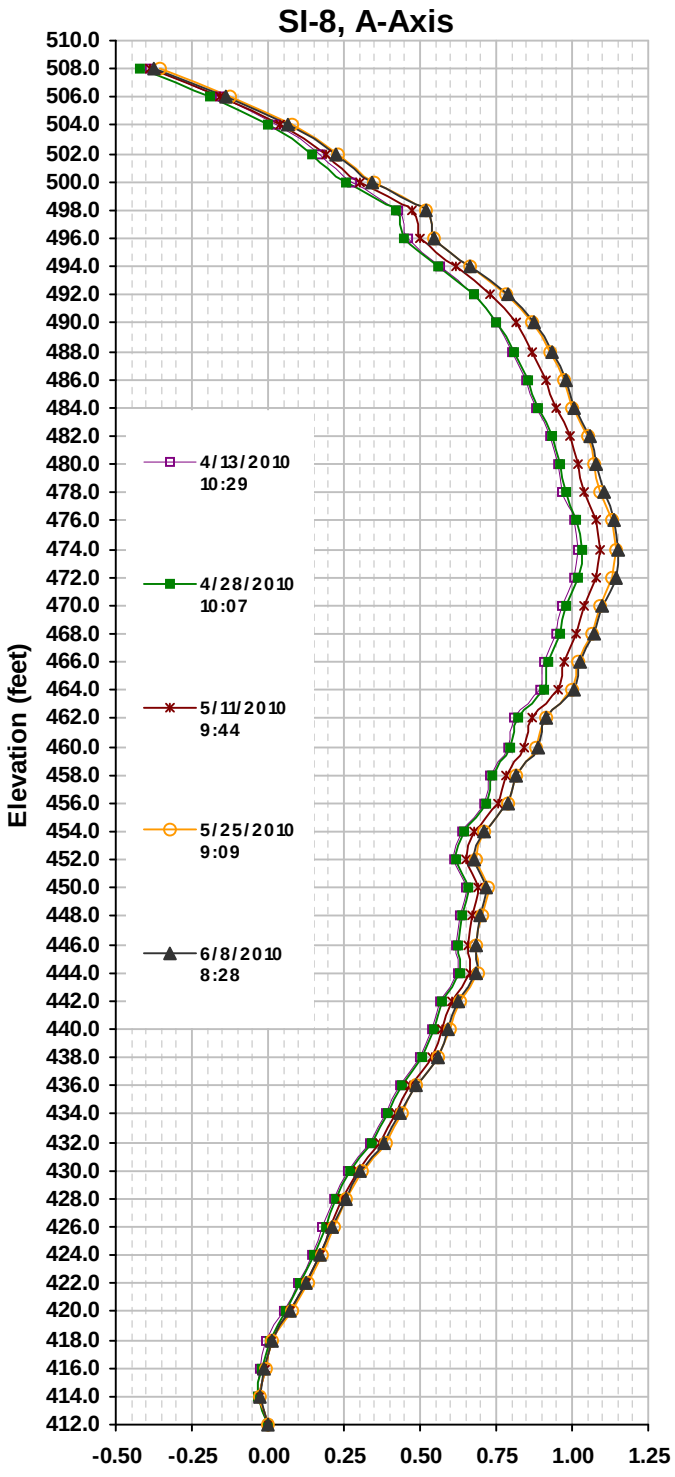
CURRENT SURVEY 6/8/2010 8:15:27 AM

INITIAL SURVEY 3/6/2009 10:03:35 AM

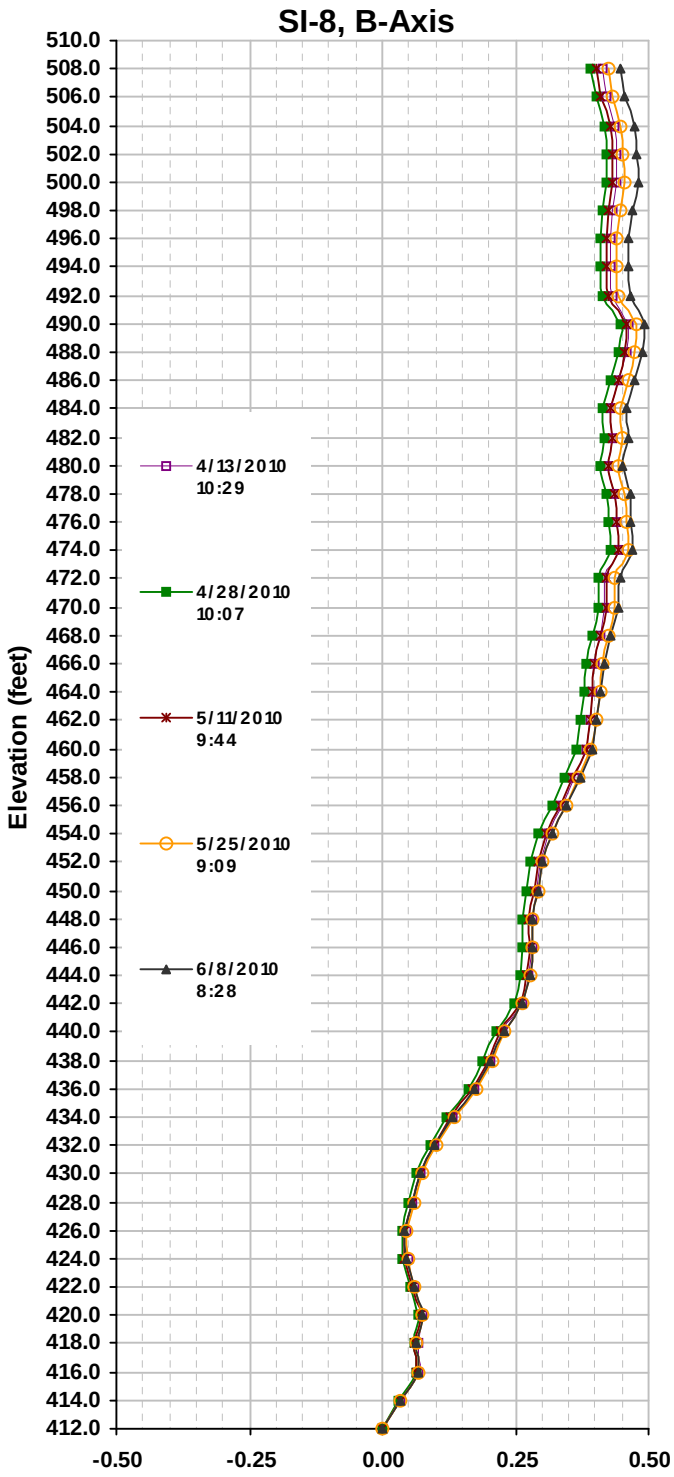
DATE PRINTED 6/8/2010 12:42:12 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-393	427	-0.4920	-399	400	-0.4794	0.0126	-0.0342
6	-370	401	-0.4626	-400	383	-0.4698	-0.0072	-0.0468
8	-374	395	-0.4614	-398	384	-0.4692	-0.0078	-0.0396
10	-285	315	-0.3600	-291	288	-0.3474	0.0126	-0.0318
12	-149	180	-0.1974	-158	145	-0.1818	0.0156	-0.0444
14	-65	95	-0.0960	-79	63	-0.0852	0.0108	-0.0600
16	17	14	0.0018	-4	-9	0.0030	0.0012	-0.0708
18	75	-52	0.0762	58	-64	0.0732	-0.0030	-0.0720
20	170	-139	0.1854	148	-158	0.1836	-0.0018	-0.0690
22	217	-192	0.2454	198	-210	0.2448	-0.0006	-0.0672
24	235	-207	0.2652	224	-227	0.2706	0.0054	-0.0666
26	266	-231	0.2982	231	-244	0.2850	-0.0132	-0.0720
28	219	-192	0.2466	188	-197	0.2310	-0.0156	-0.0588
30	173	-140	0.1878	141	-157	0.1788	-0.0090	-0.0432
32	147	-115	0.1572	123	-134	0.1542	-0.0030	-0.0342
34	113	-90	0.1218	101	-122	0.1338	0.0120	-0.0312
36	155	-123	0.1668	137	-151	0.1728	0.0060	-0.0432
38	159	-132	0.1746	133	-150	0.1698	-0.0048	-0.0492
40	122	-89	0.1266	92	-108	0.1200	-0.0066	-0.0444
42	47	-29	0.0456	25	-35	0.0360	-0.0096	-0.0378
44	-15	45	-0.0360	-39	27	-0.0396	-0.0036	-0.0282
46	-33	61	-0.0564	-64	46	-0.0660	-0.0096	-0.0246
48	-70	98	-0.1008	-98	80	-0.1068	-0.0060	-0.0150
50	-93	125	-0.1308	-130	108	-0.1428	-0.0120	-0.0090
52	-162	173	-0.2010	-176	165	-0.2046	-0.0036	0.0030
54	-190	223	-0.2478	-205	202	-0.2442	0.0036	0.0066
56	-179	207	-0.2316	-195	180	-0.2250	0.0066	0.0030
58	-202	203	-0.2430	-205	203	-0.2448	-0.0018	-0.0036
60	-188	217	-0.2430	-212	203	-0.2490	-0.0060	-0.0018
62	-199	201	-0.2400	-216	204	-0.2520	-0.0120	0.0042
64	-218	251	-0.2814	-232	217	-0.2694	0.0120	0.0162
66	-183	212	-0.2370	-199	191	-0.2340	0.0030	0.0042
68	-113	134	-0.1482	-116	122	-0.1428	0.0054	0.0012
70	-49	78	-0.0762	-73	61	-0.0804	-0.0042	-0.0042
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

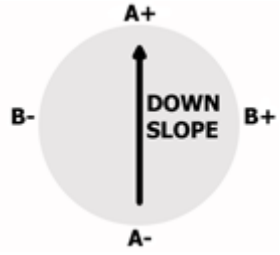


Cumulative Displacement (in) from 2/26/2009



Cumulative Displacement (in) from 2/26/2009

Stantec



Paradise Fossil Plant

Drakesboro, KY

175569040

6/8/2010

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

CURRENT SURVEY 4/13/2010 10:29:17 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

DATE PRINTED 6/8/2010 12:45:05 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-622	642	-0.7584	-816	823	-0.9834	-0.2250	-0.3858
6	-603	627	-0.7380	-769	778	-0.9282	-0.1902	-0.1608
8	-597	620	-0.7302	-721	729	-0.8700	-0.1398	0.0294
10	-590	611	-0.7206	-683	693	-0.8256	-0.1050	0.1692
12	-554	576	-0.6780	-692	699	-0.8346	-0.1566	0.2742
14	-441	461	-0.5412	-471	476	-0.5682	-0.0270	0.4308
16	-307	330	-0.3822	-406	414	-0.4920	-0.1098	0.4578
18	-216	238	-0.2724	-314	322	-0.3816	-0.1092	0.5676
20	-184	205	-0.2334	-253	261	-0.3084	-0.0750	0.6768
22	-129	151	-0.1680	-180	190	-0.2220	-0.0540	0.7518
24	-110	131	-0.1446	-154	163	-0.1902	-0.0456	0.8058
26	-141	165	-0.1836	-176	182	-0.2148	-0.0312	0.8514
28	-224	247	-0.2826	-268	277	-0.3270	-0.0444	0.8826
30	-230	253	-0.2898	-259	265	-0.3144	-0.0246	0.9270
32	-155	178	-0.1998	-175	186	-0.2166	-0.0168	0.9516
34	-158	179	-0.2022	-194	202	-0.2376	-0.0354	0.9684
36	-171	194	-0.2190	-190	198	-0.2328	-0.0138	1.0038
38	-168	190	-0.2148	-164	173	-0.2022	0.0126	1.0176
40	-159	181	-0.2040	-135	144	-0.1674	0.0366	1.0050
42	-159	180	-0.2034	-147	157	-0.1824	0.0210	0.9684
44	-155	177	-0.1992	-131	137	-0.1608	0.0384	0.9474
46	-139	161	-0.1800	-134	141	-0.1650	0.0150	0.9090
48	-130	153	-0.1698	-68	79	-0.0882	0.0816	0.8940
50	-109	130	-0.1434	-96	103	-0.1194	0.0240	0.8124
52	-102	123	-0.1350	-60	69	-0.0774	0.0576	0.7884
54	-99	119	-0.1308	-87	95	-0.1092	0.0216	0.7308
56	-49	71	-0.0720	2	5	-0.0018	0.0702	0.7092
58	-22	45	-0.0402	-10	17	-0.0162	0.0240	0.6390
60	-7	29	-0.0216	-45	53	-0.0588	-0.0372	0.6150
62	57	-37	0.0564	70	-58	0.0768	0.0204	0.6522
64	110	-89	0.1194	114	-106	0.1320	0.0126	0.6318
66	117	-94	0.1266	105	-99	0.1224	-0.0042	0.6192
68	106	-83	0.1134	146	-136	0.1692	0.0558	0.6234
70	117	-94	0.1266	133	-127	0.1560	0.0294	0.5676
72	127	-105	0.1392	149	-142	0.1746	0.0354	0.5382
74	152	-129	0.1686	201	-194	0.2370	0.0684	0.5028
76	167	-144	0.1866	196	-189	0.2310	0.0444	0.4344
78	211	-187	0.2388	246	-240	0.2916	0.0528	0.3900
80	312	-289	0.3606	362	-359	0.4326	0.0720	0.3372

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

CURRENT SURVEY 4/13/2010 10:29:17 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

DATE PRINTED 6/8/2010 12:45:05 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
82	438	-416	0.5124	471	-462	0.5598	0.0474	0.2652
84	537	-513	0.6300	558	-555	0.6678	0.0378	0.2178
86	622	-598	0.7320	643	-638	0.7686	0.0366	0.1800
88	690	-665	0.8130	718	-712	0.8580	0.0450	0.1434
90	789	-762	0.9306	818	-814	0.9792	0.0486	0.0984
92	890	-869	1.0554	929	-921	1.1100	0.0546	0.0498
94	893	-867	1.0560	900	-895	1.0770	0.0210	-0.0048
96	709	-683	0.8352	709	-699	0.8448	0.0096	-0.0258
98	329	-303	0.3792	292	-281	0.3438	-0.0354	-0.0354
100	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

CURRENT SURVEY 4/28/2010 10:07:55 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

DATE PRINTED 6/8/2010 12:45:05 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-622	642	-0.7584	-822	826	-0.9888	-0.2304	-0.4230
6	-603	627	-0.7380	-774	781	-0.9330	-0.1950	-0.1926
8	-597	620	-0.7302	-726	732	-0.8748	-0.1446	0.0024
10	-590	611	-0.7206	-689	696	-0.8310	-0.1104	0.1470
12	-554	576	-0.6780	-698	703	-0.8406	-0.1626	0.2574
14	-441	461	-0.5412	-470	476	-0.5676	-0.0264	0.4200
16	-307	330	-0.3822	-411	416	-0.4962	-0.1140	0.4464
18	-216	238	-0.2724	-320	325	-0.3870	-0.1146	0.5604
20	-184	205	-0.2334	-257	262	-0.3114	-0.0780	0.6750
22	-129	151	-0.1680	-183	190	-0.2238	-0.0558	0.7530
24	-110	131	-0.1446	-157	163	-0.1920	-0.0474	0.8088
26	-141	165	-0.1836	-178	181	-0.2154	-0.0318	0.8562
28	-224	247	-0.2826	-271	277	-0.3288	-0.0462	0.8880
30	-230	253	-0.2898	-261	264	-0.3150	-0.0252	0.9342
32	-155	178	-0.1998	-178	187	-0.2190	-0.0192	0.9594
34	-158	179	-0.2022	-197	202	-0.2394	-0.0372	0.9786
36	-171	194	-0.2190	-193	198	-0.2346	-0.0156	1.0158
38	-168	190	-0.2148	-166	173	-0.2034	0.0114	1.0314
40	-159	181	-0.2040	-135	141	-0.1656	0.0384	1.0200
42	-159	180	-0.2034	-149	156	-0.1830	0.0204	0.9816
44	-155	177	-0.1992	-131	135	-0.1596	0.0396	0.9612
46	-139	161	-0.1800	-134	139	-0.1638	0.0162	0.9216
48	-130	153	-0.1698	-68	77	-0.0870	0.0828	0.9054
50	-109	130	-0.1434	-97	101	-0.1188	0.0246	0.8226
52	-102	123	-0.1350	-59	66	-0.0750	0.0600	0.7980
54	-99	119	-0.1308	-88	93	-0.1086	0.0222	0.7380
56	-49	71	-0.0720	3	1	0.0012	0.0732	0.7158
58	-22	45	-0.0402	-11	15	-0.0156	0.0246	0.6426
60	-7	29	-0.0216	-47	53	-0.0600	-0.0384	0.6180
62	57	-37	0.0564	68	-59	0.0762	0.0198	0.6564
64	110	-89	0.1194	112	-108	0.1320	0.0126	0.6366
66	117	-94	0.1266	103	-99	0.1212	-0.0054	0.6240
68	106	-83	0.1134	144	-138	0.1692	0.0558	0.6294
70	117	-94	0.1266	132	-128	0.1560	0.0294	0.5736
72	127	-105	0.1392	147	-143	0.1740	0.0348	0.5442
74	152	-129	0.1686	199	-196	0.2370	0.0684	0.5094
76	167	-144	0.1866	194	-191	0.2310	0.0444	0.4410
78	211	-187	0.2388	244	-241	0.2910	0.0522	0.3966
80	312	-289	0.3606	360	-360	0.4320	0.0714	0.3444

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

CURRENT SURVEY 4/28/2010 10:07:55 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

DATE PRINTED 6/8/2010 12:45:05 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
82	438	-416	0.5124	469	-464	0.5598	0.0474	0.2730
84	537	-513	0.6300	556	-556	0.6672	0.0372	0.2256
86	622	-598	0.7320	641	-639	0.7680	0.0360	0.1884
88	690	-665	0.8130	716	-713	0.8574	0.0444	0.1524
90	789	-762	0.9306	817	-815	0.9792	0.0486	0.1080
92	890	-869	1.0554	928	-922	1.1100	0.0546	0.0594
94	893	-867	1.0560	899	-897	1.0776	0.0216	0.0048
96	709	-683	0.8352	710	-704	0.8484	0.0132	-0.0168
98	329	-303	0.3792	295	-287	0.3492	-0.0300	-0.0300
100	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

CURRENT SURVEY 5/11/2010 9:44:42 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

DATE PRINTED 6/8/2010 12:45:05 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-622	642	-0.7584	-821	827	-0.9888	-0.2304	-0.3858
6	-603	627	-0.7380	-775	783	-0.9348	-0.1968	-0.1554
8	-597	620	-0.7302	-728	736	-0.8784	-0.1482	0.0414
10	-590	611	-0.7206	-691	700	-0.8346	-0.1140	0.1896
12	-554	576	-0.6780	-702	708	-0.8460	-0.1680	0.3036
14	-441	461	-0.5412	-471	478	-0.5694	-0.0282	0.4716
16	-307	330	-0.3822	-411	419	-0.4980	-0.1158	0.4998
18	-216	238	-0.2724	-321	329	-0.3900	-0.1176	0.6156
20	-184	205	-0.2334	-258	264	-0.3132	-0.0798	0.7332
22	-129	151	-0.1680	-183	192	-0.2250	-0.0570	0.8130
24	-110	131	-0.1446	-156	164	-0.1920	-0.0474	0.8700
26	-141	165	-0.1836	-177	181	-0.2148	-0.0312	0.9174
28	-224	247	-0.2826	-270	279	-0.3294	-0.0468	0.9486
30	-230	253	-0.2898	-260	265	-0.3150	-0.0252	0.9954
32	-155	178	-0.1998	-177	188	-0.2190	-0.0192	1.0206
34	-158	179	-0.2022	-196	202	-0.2388	-0.0366	1.0398
36	-171	194	-0.2190	-191	198	-0.2334	-0.0144	1.0764
38	-168	190	-0.2148	-165	173	-0.2028	0.0120	1.0908
40	-159	181	-0.2040	-132	140	-0.1632	0.0408	1.0788
42	-159	180	-0.2034	-146	156	-0.1812	0.0222	1.0380
44	-155	177	-0.1992	-128	134	-0.1572	0.0420	1.0158
46	-139	161	-0.1800	-131	137	-0.1608	0.0192	0.9738
48	-130	153	-0.1698	-66	76	-0.0852	0.0846	0.9546
50	-109	130	-0.1434	-94	100	-0.1164	0.0270	0.8700
52	-102	123	-0.1350	-56	65	-0.0726	0.0624	0.8430
54	-99	119	-0.1308	-85	93	-0.1068	0.0240	0.7806
56	-49	71	-0.0720	6	-1	0.0042	0.0762	0.7566
58	-22	45	-0.0402	-8	15	-0.0138	0.0264	0.6804
60	-7	29	-0.0216	-47	55	-0.0612	-0.0396	0.6540
62	57	-37	0.0564	70	-59	0.0774	0.0210	0.6936
64	110	-89	0.1194	115	-107	0.1332	0.0138	0.6726
66	117	-94	0.1266	105	-99	0.1224	-0.0042	0.6588
68	106	-83	0.1134	147	-138	0.1710	0.0576	0.6630
70	117	-94	0.1266	134	-128	0.1572	0.0306	0.6054
72	127	-105	0.1392	150	-143	0.1758	0.0366	0.5748
74	152	-129	0.1686	203	-196	0.2394	0.0708	0.5382
76	167	-144	0.1866	197	-191	0.2328	0.0462	0.4674
78	211	-187	0.2388	247	-241	0.2928	0.0540	0.4212
80	312	-289	0.3606	363	-360	0.4338	0.0732	0.3672

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

CURRENT SURVEY 5/11/2010 9:44:42 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

DATE PRINTED 6/8/2010 12:45:06 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
82	438	-416	0.5124	471	-464	0.5610	0.0486	0.2940
84	537	-513	0.6300	560	-556	0.6696	0.0396	0.2454
86	622	-598	0.7320	644	-639	0.7698	0.0378	0.2058
88	690	-665	0.8130	719	-713	0.8592	0.0462	0.1680
90	789	-762	0.9306	820	-815	0.9810	0.0504	0.1218
92	890	-869	1.0554	931	-923	1.1124	0.0570	0.0714
94	893	-867	1.0560	902	-898	1.0800	0.0240	0.0144
96	709	-683	0.8352	715	-706	0.8526	0.0174	-0.0096
98	329	-303	0.3792	299	-288	0.3522	-0.0270	-0.0270
100	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

CURRENT SURVEY 5/25/2010 9:09:38 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

DATE PRINTED 6/8/2010 12:45:06 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-622	642	-0.7584	-823	833	-0.9936	-0.2352	-0.3582
6	-603	627	-0.7380	-777	788	-0.9390	-0.2010	-0.1230
8	-597	620	-0.7302	-728	740	-0.8808	-0.1506	0.0780
10	-590	611	-0.7206	-692	704	-0.8376	-0.1170	0.2286
12	-554	576	-0.6780	-704	713	-0.8502	-0.1722	0.3456
14	-441	461	-0.5412	-469	479	-0.5688	-0.0276	0.5178
16	-307	330	-0.3822	-412	422	-0.5004	-0.1182	0.5454
18	-216	238	-0.2724	-324	333	-0.3942	-0.1218	0.6636
20	-184	205	-0.2334	-258	267	-0.3150	-0.0816	0.7854
22	-129	151	-0.1680	-182	194	-0.2256	-0.0576	0.8670
24	-110	131	-0.1446	-154	165	-0.1914	-0.0468	0.9246
26	-141	165	-0.1836	-174	182	-0.2136	-0.0300	0.9714
28	-224	247	-0.2826	-270	281	-0.3306	-0.0480	1.0014
30	-230	253	-0.2898	-258	266	-0.3144	-0.0246	1.0494
32	-155	178	-0.1998	-176	190	-0.2196	-0.0198	1.0740
34	-158	179	-0.2022	-195	204	-0.2394	-0.0372	1.0938
36	-171	194	-0.2190	-189	199	-0.2328	-0.0138	1.1310
38	-168	190	-0.2148	-163	175	-0.2028	0.0120	1.1448
40	-159	181	-0.2040	-128	140	-0.1608	0.0432	1.1328
42	-159	180	-0.2034	-143	157	-0.1800	0.0234	1.0896
44	-155	177	-0.1992	-125	134	-0.1554	0.0438	1.0662
46	-139	161	-0.1800	-127	136	-0.1578	0.0222	1.0224
48	-130	153	-0.1698	-62	76	-0.0828	0.0870	1.0002
50	-109	130	-0.1434	-90	100	-0.1140	0.0294	0.9132
52	-102	123	-0.1350	-52	63	-0.0690	0.0660	0.8838
54	-99	119	-0.1308	-82	93	-0.1050	0.0258	0.8178
56	-49	71	-0.0720	11	-3	0.0084	0.0804	0.7920
58	-22	45	-0.0402	-5	15	-0.0120	0.0282	0.7116
60	-7	29	-0.0216	-46	57	-0.0618	-0.0402	0.6834
62	57	-37	0.0564	74	-58	0.0792	0.0228	0.7236
64	110	-89	0.1194	118	-106	0.1344	0.0150	0.7008
66	117	-94	0.1266	107	-99	0.1236	-0.0030	0.6858
68	106	-83	0.1134	149	-137	0.1716	0.0582	0.6888
70	117	-94	0.1266	137	-127	0.1584	0.0318	0.6306
72	127	-105	0.1392	153	-142	0.1770	0.0378	0.5988
74	152	-129	0.1686	205	-195	0.2400	0.0714	0.5610
76	167	-144	0.1866	200	-190	0.2340	0.0474	0.4896
78	211	-187	0.2388	250	-241	0.2946	0.0558	0.4422
80	312	-289	0.3606	368	-360	0.4368	0.0762	0.3864

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

CURRENT SURVEY 5/25/2010 9:09:38 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

DATE PRINTED 6/8/2010 12:45:06 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
82	438	-416	0.5124	475	-463	0.5628	0.0504	0.3102
84	537	-513	0.6300	564	-556	0.6720	0.0420	0.2598
86	622	-598	0.7320	648	-638	0.7716	0.0396	0.2178
88	690	-665	0.8130	724	-713	0.8622	0.0492	0.1782
90	789	-762	0.9306	824	-815	0.9834	0.0528	0.1290
92	890	-869	1.0554	936	-923	1.1154	0.0600	0.0762
94	893	-867	1.0560	906	-897	1.0818	0.0258	0.0162
96	709	-683	0.8352	718	-704	0.8532	0.0180	-0.0096
98	329	-303	0.3792	300	-286	0.3516	-0.0276	-0.0276
100	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

CURRENT SURVEY 6/8/2010 8:28:03 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

DATE PRINTED 6/8/2010 12:45:06 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-622	642	-0.7584	-826	833	-0.9954	-0.2370	-0.3750
6	-603	627	-0.7380	-781	790	-0.9426	-0.2046	-0.1380
8	-597	620	-0.7302	-733	741	-0.8844	-0.1542	0.0666
10	-590	611	-0.7206	-695	706	-0.8406	-0.1200	0.2208
12	-554	576	-0.6780	-709	716	-0.8550	-0.1770	0.3408
14	-441	461	-0.5412	-470	478	-0.5688	-0.0276	0.5178
16	-307	330	-0.3822	-415	422	-0.5022	-0.1200	0.5454
18	-216	238	-0.2724	-327	335	-0.3972	-0.1248	0.6654
20	-184	205	-0.2334	-261	268	-0.3174	-0.0840	0.7902
22	-129	151	-0.1680	-184	193	-0.2262	-0.0582	0.8742
24	-110	131	-0.1446	-155	164	-0.1914	-0.0468	0.9324
26	-141	165	-0.1836	-175	180	-0.2130	-0.0294	0.9792
28	-224	247	-0.2826	-272	281	-0.3318	-0.0492	1.0086
30	-230	253	-0.2898	-259	264	-0.3138	-0.0240	1.0578
32	-155	178	-0.1998	-178	190	-0.2208	-0.0210	1.0818
34	-158	179	-0.2022	-196	204	-0.2400	-0.0378	1.1028
36	-171	194	-0.2190	-190	198	-0.2328	-0.0138	1.1406
38	-168	190	-0.2148	-165	175	-0.2040	0.0108	1.1544
40	-159	181	-0.2040	-128	137	-0.1590	0.0450	1.1436
42	-159	180	-0.2034	-145	155	-0.1800	0.0234	1.0986
44	-155	177	-0.1992	-125	131	-0.1536	0.0456	1.0752
46	-139	161	-0.1800	-126	133	-0.1554	0.0246	1.0296
48	-130	153	-0.1698	-62	73	-0.0810	0.0888	1.0050
50	-109	130	-0.1434	-90	98	-0.1128	0.0306	0.9162
52	-102	123	-0.1350	-50	60	-0.0660	0.0690	0.8856
54	-99	119	-0.1308	-83	92	-0.1050	0.0258	0.8166
56	-49	71	-0.0720	13	-6	0.0114	0.0834	0.7908
58	-22	45	-0.0402	-5	13	-0.0108	0.0294	0.7074
60	-7	29	-0.0216	-48	57	-0.0630	-0.0414	0.6780
62	57	-37	0.0564	73	-60	0.0798	0.0234	0.7194
64	110	-89	0.1194	116	-107	0.1338	0.0144	0.6960
66	117	-94	0.1266	106	-100	0.1236	-0.0030	0.6816
68	106	-83	0.1134	148	-138	0.1716	0.0582	0.6846
70	117	-94	0.1266	136	-129	0.1590	0.0324	0.6264
72	127	-105	0.1392	152	-143	0.1770	0.0378	0.5940
74	152	-129	0.1686	205	-196	0.2406	0.0720	0.5562
76	167	-144	0.1866	198	-191	0.2334	0.0468	0.4842
78	211	-187	0.2388	250	-242	0.2952	0.0564	0.4374
80	312	-289	0.3606	366	-362	0.4368	0.0762	0.3810

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

CURRENT SURVEY 6/8/2010 8:28:03 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

DATE PRINTED 6/8/2010 12:45:06 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
82	438	-416	0.5124	474	-465	0.5634	0.0510	0.3048
84	537	-513	0.6300	563	-557	0.6720	0.0420	0.2538
86	622	-598	0.7320	647	-639	0.7716	0.0396	0.2118
88	690	-665	0.8130	722	-714	0.8616	0.0486	0.1722
90	789	-762	0.9306	823	-816	0.9834	0.0528	0.1236
92	890	-869	1.0554	934	-923	1.1142	0.0588	0.0708
94	893	-867	1.0560	904	-898	1.0812	0.0252	0.0120
96	709	-683	0.8352	713	-704	0.8502	0.0150	-0.0132
98	329	-303	0.3792	299	-286	0.3510	-0.0282	-0.0282
100	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

CURRENT SURVEY 4/13/2010 10:29:17 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

DATE PRINTED 6/8/2010 12:45:16 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	331	-305	0.3816	302	-323	0.3750	-0.0066	0.4146
6	271	-245	0.3096	235	-257	0.2952	-0.0144	0.4212
8	227	-197	0.2544	200	-219	0.2514	-0.0030	0.4356
10	247	-230	0.2862	225	-248	0.2838	-0.0024	0.4386
12	240	-217	0.2742	226	-246	0.2832	0.0090	0.4410
14	180	-156	0.2016	162	-178	0.2040	0.0024	0.4320
16	117	-90	0.1242	93	-117	0.1260	0.0018	0.4296
18	79	-49	0.0768	49	-74	0.0738	-0.0030	0.4278
20	38	-17	0.0330	0	-23	0.0000	-0.0330	0.4308
22	28	-2	0.0180	8	-29	0.0222	0.0042	0.4638
24	39	-10	0.0294	26	-48	0.0444	0.0150	0.4596
26	63	-34	0.0582	50	-71	0.0726	0.0144	0.4446
28	95	-67	0.0972	68	-89	0.0942	-0.0030	0.4302
30	86	-72	0.0948	81	-94	0.1050	0.0102	0.4332
32	10	13	-0.0018	-23	-1	-0.0132	-0.0114	0.4230
34	-17	46	-0.0378	-46	24	-0.0420	-0.0042	0.4344
36	-54	82	-0.0816	-82	60	-0.0852	-0.0036	0.4386
38	-83	113	-0.1176	-88	68	-0.0936	0.0240	0.4422
40	-25	42	-0.0402	-46	21	-0.0402	0.0000	0.4182
42	-26	53	-0.0474	-42	20	-0.0372	0.0102	0.4182
44	-19	49	-0.0408	-39	14	-0.0318	0.0090	0.4080
46	-21	51	-0.0432	-46	22	-0.0408	0.0024	0.3990
48	-34	63	-0.0582	-54	33	-0.0522	0.0060	0.3966
50	-53	74	-0.0762	-68	44	-0.0672	0.0090	0.3906
52	-67	94	-0.0966	-74	52	-0.0756	0.0210	0.3816
54	-27	57	-0.0504	-31	14	-0.0270	0.0234	0.3606
56	31	-2	0.0198	25	-50	0.0450	0.0252	0.3372
58	86	-58	0.0864	73	-95	0.1008	0.0144	0.3120
60	69	-65	0.0804	66	-84	0.0900	0.0096	0.2976
62	106	-78	0.1104	88	-109	0.1182	0.0078	0.2880
64	95	-65	0.0960	69	-90	0.0954	-0.0006	0.2802
66	85	-57	0.0852	64	-86	0.0900	0.0048	0.2808
68	111	-82	0.1158	99	-116	0.1290	0.0132	0.2760
70	174	-150	0.1944	184	-201	0.2310	0.0366	0.2628
72	255	-229	0.2904	251	-272	0.3138	0.0234	0.2262
74	313	-288	0.3606	321	-328	0.3894	0.0288	0.2028
76	398	-372	0.4620	414	-427	0.5046	0.0426	0.1740
78	468	-440	0.5448	470	-491	0.5766	0.0318	0.1314
80	565	-549	0.6684	573	-585	0.6948	0.0264	0.0996

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

CURRENT SURVEY 4/13/2010 10:29:17 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

DATE PRINTED 6/8/2010 12:45:16 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
82	662	-639	0.7806	656	-670	0.7956	0.0150	0.0732
84	757	-732	0.8934	746	-766	0.9072	0.0138	0.0582
86	822	-797	0.9714	798	-816	0.9684	-0.0030	0.0444
88	849	-821	1.0020	814	-833	0.9882	-0.0138	0.0474
90	860	-848	1.0248	837	-849	1.0116	-0.0132	0.0612
92	877	-850	1.0362	861	-880	1.0446	0.0084	0.0744
94	875	-849	1.0344	851	-871	1.0332	-0.0012	0.0660
96	929	-903	1.0992	942	-947	1.1334	0.0342	0.0672
98	1029	-1003	1.2192	1035	-1052	1.2522	0.0330	0.0330
100	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

CURRENT SURVEY 4/28/2010 10:07:55 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

DATE PRINTED 6/8/2010 12:45:16 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	331	-305	0.3816	300	-321	0.3726	-0.0090	0.3918
6	271	-245	0.3096	233	-256	0.2934	-0.0162	0.4008
8	227	-197	0.2544	200	-220	0.2520	-0.0024	0.4170
10	247	-230	0.2862	227	-248	0.2850	-0.0012	0.4194
12	240	-217	0.2742	223	-246	0.2814	0.0072	0.4206
14	180	-156	0.2016	162	-180	0.2052	0.0036	0.4134
16	117	-90	0.1242	93	-116	0.1254	0.0012	0.4098
18	79	-49	0.0768	48	-73	0.0726	-0.0042	0.4086
20	38	-17	0.0330	0	-22	0.0000	-0.0330	0.4128
22	28	-2	0.0180	7	-29	0.0216	0.0036	0.4458
24	39	-10	0.0294	25	-47	0.0432	0.0138	0.4422
26	63	-34	0.0582	50	-72	0.0732	0.0150	0.4284
28	95	-67	0.0972	66	-87	0.0918	-0.0054	0.4134
30	86	-72	0.0948	80	-95	0.1050	0.0102	0.4188
32	10	13	-0.0018	-21	1	-0.0132	-0.0114	0.4086
34	-17	46	-0.0378	-47	24	-0.0426	-0.0048	0.4200
36	-54	82	-0.0816	-83	59	-0.0852	-0.0036	0.4248
38	-83	113	-0.1176	-89	68	-0.0942	0.0234	0.4284
40	-25	42	-0.0402	-45	22	-0.0402	0.0000	0.4050
42	-26	53	-0.0474	-41	19	-0.0360	0.0114	0.4050
44	-19	49	-0.0408	-35	14	-0.0294	0.0114	0.3936
46	-21	51	-0.0432	-45	23	-0.0408	0.0024	0.3822
48	-34	63	-0.0582	-54	32	-0.0516	0.0066	0.3798
50	-53	74	-0.0762	-68	44	-0.0672	0.0090	0.3732
52	-67	94	-0.0966	-73	51	-0.0744	0.0222	0.3642
54	-27	57	-0.0504	-31	14	-0.0270	0.0234	0.3420
56	31	-2	0.0198	25	-49	0.0444	0.0246	0.3186
58	86	-58	0.0864	73	-96	0.1014	0.0150	0.2940
60	69	-65	0.0804	65	-83	0.0888	0.0084	0.2790
62	106	-78	0.1104	88	-110	0.1188	0.0084	0.2706
64	95	-65	0.0960	68	-90	0.0948	-0.0012	0.2622
66	85	-57	0.0852	64	-85	0.0894	0.0042	0.2634
68	111	-82	0.1158	96	-116	0.1272	0.0114	0.2592
70	174	-150	0.1944	182	-200	0.2292	0.0348	0.2478
72	255	-229	0.2904	251	-272	0.3138	0.0234	0.2130
74	313	-288	0.3606	321	-327	0.3888	0.0282	0.1896
76	398	-372	0.4620	412	-426	0.5028	0.0408	0.1614
78	468	-440	0.5448	469	-490	0.5754	0.0306	0.1206
80	565	-549	0.6684	572	-585	0.6942	0.0258	0.0900

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

CURRENT SURVEY 4/28/2010 10:07:55 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

DATE PRINTED 6/8/2010 12:45:16 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
82	662	-639	0.7806	654	-671	0.7950	0.0144	0.0642
84	757	-732	0.8934	746	-766	0.9072	0.0138	0.0498
86	822	-797	0.9714	798	-816	0.9684	-0.0030	0.0360
88	849	-821	1.0020	812	-833	0.9870	-0.0150	0.0390
90	860	-848	1.0248	836	-848	1.0104	-0.0144	0.0540
92	877	-850	1.0362	860	-881	1.0446	0.0084	0.0684
94	875	-849	1.0344	850	-870	1.0320	-0.0024	0.0600
96	929	-903	1.0992	937	-947	1.1304	0.0312	0.0624
98	1029	-1003	1.2192	1034	-1050	1.2504	0.0312	0.0312
100	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

CURRENT SURVEY 5/11/2010 9:44:42 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

DATE PRINTED 6/8/2010 12:45:16 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	331	-305	0.3816	301	-318	0.3714	-0.0102	0.4008
6	271	-245	0.3096	235	-251	0.2916	-0.0180	0.4110
8	227	-197	0.2544	200	-220	0.2520	-0.0024	0.4290
10	247	-230	0.2862	227	-246	0.2838	-0.0024	0.4314
12	240	-217	0.2742	225	-244	0.2814	0.0072	0.4338
14	180	-156	0.2016	164	-179	0.2058	0.0042	0.4266
16	117	-90	0.1242	97	-113	0.1260	0.0018	0.4224
18	79	-49	0.0768	49	-71	0.0720	-0.0048	0.4206
20	38	-17	0.0330	0	-19	0.0000	-0.0330	0.4254
22	28	-2	0.0180	7	-26	0.0198	0.0018	0.4584
24	39	-10	0.0294	26	-45	0.0426	0.0132	0.4566
26	63	-34	0.0582	50	-72	0.0732	0.0150	0.4434
28	95	-67	0.0972	67	-86	0.0918	-0.0054	0.4284
30	86	-72	0.0948	83	-92	0.1050	0.0102	0.4338
32	10	13	-0.0018	-21	2	-0.0138	-0.0120	0.4236
34	-17	46	-0.0378	-45	25	-0.0420	-0.0042	0.4356
36	-54	82	-0.0816	-82	62	-0.0864	-0.0048	0.4398
38	-83	113	-0.1176	-87	68	-0.0930	0.0246	0.4446
40	-25	42	-0.0402	-45	22	-0.0402	0.0000	0.4200
42	-26	53	-0.0474	-41	21	-0.0372	0.0102	0.4200
44	-19	49	-0.0408	-35	16	-0.0306	0.0102	0.4098
46	-21	51	-0.0432	-44	23	-0.0402	0.0030	0.3996
48	-34	63	-0.0582	-53	33	-0.0516	0.0066	0.3966
50	-53	74	-0.0762	-67	46	-0.0678	0.0084	0.3900
52	-67	94	-0.0966	-71	52	-0.0738	0.0228	0.3816
54	-27	57	-0.0504	-30	15	-0.0270	0.0234	0.3588
56	31	-2	0.0198	28	-49	0.0462	0.0264	0.3354
58	86	-58	0.0864	75	-95	0.1020	0.0156	0.3090
60	69	-65	0.0804	67	-81	0.0888	0.0084	0.2934
62	106	-78	0.1104	90	-109	0.1194	0.0090	0.2850
64	95	-65	0.0960	69	-89	0.0948	-0.0012	0.2760
66	85	-57	0.0852	66	-85	0.0906	0.0054	0.2772
68	111	-82	0.1158	100	-115	0.1290	0.0132	0.2718
70	174	-150	0.1944	185	-199	0.2304	0.0360	0.2586
72	255	-229	0.2904	253	-270	0.3138	0.0234	0.2226
74	313	-288	0.3606	323	-327	0.3900	0.0294	0.1992
76	398	-372	0.4620	415	-425	0.5040	0.0420	0.1698
78	468	-440	0.5448	471	-489	0.5760	0.0312	0.1278
80	565	-549	0.6684	574	-584	0.6948	0.0264	0.0966

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

CURRENT SURVEY 5/11/2010 9:44:42 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

DATE PRINTED 6/8/2010 12:45:16 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
82	662	-639	0.7806	656	-669	0.7950	0.0144	0.0702
84	757	-732	0.8934	750	-765	0.9090	0.0156	0.0558
86	822	-797	0.9714	800	-816	0.9696	-0.0018	0.0402
88	849	-821	1.0020	815	-832	0.9882	-0.0138	0.0420
90	860	-848	1.0248	837	-848	1.0110	-0.0138	0.0558
92	877	-850	1.0362	861	-880	1.0446	0.0084	0.0696
94	875	-849	1.0344	852	-869	1.0326	-0.0018	0.0612
96	929	-903	1.0992	938	-945	1.1298	0.0306	0.0630
98	1029	-1003	1.2192	1037	-1049	1.2516	0.0324	0.0324
100	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

CURRENT SURVEY 5/25/2010 9:09:38 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

DATE PRINTED 6/8/2010 12:45:16 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	331	-305	0.3816	301	-320	0.3726	-0.0090	0.4230
6	271	-245	0.3096	234	-255	0.2934	-0.0162	0.4320
8	227	-197	0.2544	200	-217	0.2502	-0.0042	0.4482
10	247	-230	0.2862	225	-246	0.2826	-0.0036	0.4524
12	240	-217	0.2742	225	-246	0.2826	0.0084	0.4560
14	180	-156	0.2016	166	-180	0.2076	0.0060	0.4476
16	117	-90	0.1242	94	-114	0.1248	0.0006	0.4416
18	79	-49	0.0768	51	-72	0.0738	-0.0030	0.4410
20	38	-17	0.0330	0	-20	0.0000	-0.0330	0.4440
22	28	-2	0.0180	7	-26	0.0198	0.0018	0.4770
24	39	-10	0.0294	26	-46	0.0432	0.0138	0.4752
26	63	-34	0.0582	49	-73	0.0732	0.0150	0.4614
28	95	-67	0.0972	67	-86	0.0918	-0.0054	0.4464
30	86	-72	0.0948	82	-92	0.1044	0.0096	0.4518
32	10	13	-0.0018	-22	1	-0.0138	-0.0120	0.4422
34	-17	46	-0.0378	-45	24	-0.0414	-0.0036	0.4542
36	-54	82	-0.0816	-82	61	-0.0858	-0.0042	0.4578
38	-83	113	-0.1176	-87	68	-0.0930	0.0246	0.4620
40	-25	42	-0.0402	-44	21	-0.0390	0.0012	0.4374
42	-26	53	-0.0474	-40	20	-0.0360	0.0114	0.4362
44	-19	49	-0.0408	-34	14	-0.0288	0.0120	0.4248
46	-21	51	-0.0432	-44	22	-0.0396	0.0036	0.4128
48	-34	63	-0.0582	-53	32	-0.0510	0.0072	0.4092
50	-53	74	-0.0762	-67	44	-0.0666	0.0096	0.4020
52	-67	94	-0.0966	-71	52	-0.0738	0.0228	0.3924
54	-27	57	-0.0504	-30	14	-0.0264	0.0240	0.3696
56	31	-2	0.0198	29	-49	0.0468	0.0270	0.3456
58	86	-58	0.0864	75	-96	0.1026	0.0162	0.3186
60	69	-65	0.0804	67	-82	0.0894	0.0090	0.3024
62	106	-78	0.1104	91	-110	0.1206	0.0102	0.2934
64	95	-65	0.0960	70	-90	0.0960	0.0000	0.2832
66	85	-57	0.0852	66	-85	0.0906	0.0054	0.2832
68	111	-82	0.1158	100	-115	0.1290	0.0132	0.2778
70	174	-150	0.1944	185	-197	0.2292	0.0348	0.2646
72	255	-229	0.2904	252	-272	0.3144	0.0240	0.2298
74	313	-288	0.3606	324	-328	0.3912	0.0306	0.2058
76	398	-372	0.4620	415	-424	0.5034	0.0414	0.1752
78	468	-440	0.5448	472	-488	0.5760	0.0312	0.1338
80	565	-549	0.6684	575	-584	0.6954	0.0270	0.1026

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

CURRENT SURVEY 5/25/2010 9:09:38 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

DATE PRINTED 6/8/2010 12:45:16 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
82	662	-639	0.7806	657	-670	0.7962	0.0156	0.0756
84	757	-732	0.8934	749	-766	0.9090	0.0156	0.0600
86	822	-797	0.9714	798	-816	0.9684	-0.0030	0.0444
88	849	-821	1.0020	813	-833	0.9876	-0.0144	0.0474
90	860	-848	1.0248	838	-849	1.0122	-0.0126	0.0618
92	877	-850	1.0362	862	-881	1.0458	0.0096	0.0744
94	875	-849	1.0344	853	-868	1.0326	-0.0018	0.0648
96	929	-903	1.0992	940	-945	1.1310	0.0318	0.0666
98	1029	-1003	1.2192	1038	-1052	1.2540	0.0348	0.0348
100	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

CURRENT SURVEY 6/8/2010 8:28:03 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

DATE PRINTED 6/8/2010 12:45:16 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	331	-305	0.3816	299	-320	0.3714	-0.0102	0.4458
6	271	-245	0.3096	234	-251	0.2910	-0.0186	0.4560
8	227	-197	0.2544	200	-219	0.2514	-0.0030	0.4746
10	247	-230	0.2862	226	-248	0.2844	-0.0018	0.4776
12	240	-217	0.2742	225	-246	0.2826	0.0084	0.4794
14	180	-156	0.2016	165	-183	0.2088	0.0072	0.4710
16	117	-90	0.1242	95	-114	0.1254	0.0012	0.4638
18	79	-49	0.0768	50	-71	0.0726	-0.0042	0.4626
20	38	-17	0.0330	-4	-18	0.0084	-0.0246	0.4668
22	28	-2	0.0180	8	-27	0.0210	0.0030	0.4914
24	39	-10	0.0294	27	-47	0.0444	0.0150	0.4884
26	63	-34	0.0582	50	-73	0.0738	0.0156	0.4734
28	95	-67	0.0972	65	-87	0.0912	-0.0060	0.4578
30	86	-72	0.0948	81	-95	0.1056	0.0108	0.4638
32	10	13	-0.0018	-23	1	-0.0144	-0.0126	0.4530
34	-17	46	-0.0378	-44	23	-0.0402	-0.0024	0.4656
36	-54	82	-0.0816	-82	60	-0.0852	-0.0036	0.4680
38	-83	113	-0.1176	-87	67	-0.0924	0.0252	0.4716
40	-25	42	-0.0402	-42	20	-0.0372	0.0030	0.4464
42	-26	53	-0.0474	-37	19	-0.0336	0.0138	0.4434
44	-19	49	-0.0408	-33	14	-0.0282	0.0126	0.4296
46	-21	51	-0.0432	-42	21	-0.0378	0.0054	0.4170
48	-34	63	-0.0582	-53	31	-0.0504	0.0078	0.4116
50	-53	74	-0.0762	-68	44	-0.0672	0.0090	0.4038
52	-67	94	-0.0966	-71	51	-0.0732	0.0234	0.3948
54	-27	57	-0.0504	-30	13	-0.0258	0.0246	0.3714
56	31	-2	0.0198	30	-51	0.0486	0.0288	0.3468
58	86	-58	0.0864	75	-97	0.1032	0.0168	0.3180
60	69	-65	0.0804	65	-82	0.0882	0.0078	0.3012
62	106	-78	0.1104	91	-111	0.1212	0.0108	0.2934
64	95	-65	0.0960	69	-90	0.0954	-0.0006	0.2826
66	85	-57	0.0852	66	-85	0.0906	0.0054	0.2832
68	111	-82	0.1158	99	-116	0.1290	0.0132	0.2778
70	174	-150	0.1944	184	-201	0.2310	0.0366	0.2646
72	255	-229	0.2904	252	-271	0.3138	0.0234	0.2280
74	313	-288	0.3606	323	-328	0.3906	0.0300	0.2046
76	398	-372	0.4620	415	-427	0.5052	0.0432	0.1746
78	468	-440	0.5448	472	-491	0.5778	0.0330	0.1314
80	565	-549	0.6684	575	-585	0.6960	0.0276	0.0984

SITE PAFTVA

INSTALLATION SI-8

DESCRIPTION From DataMate

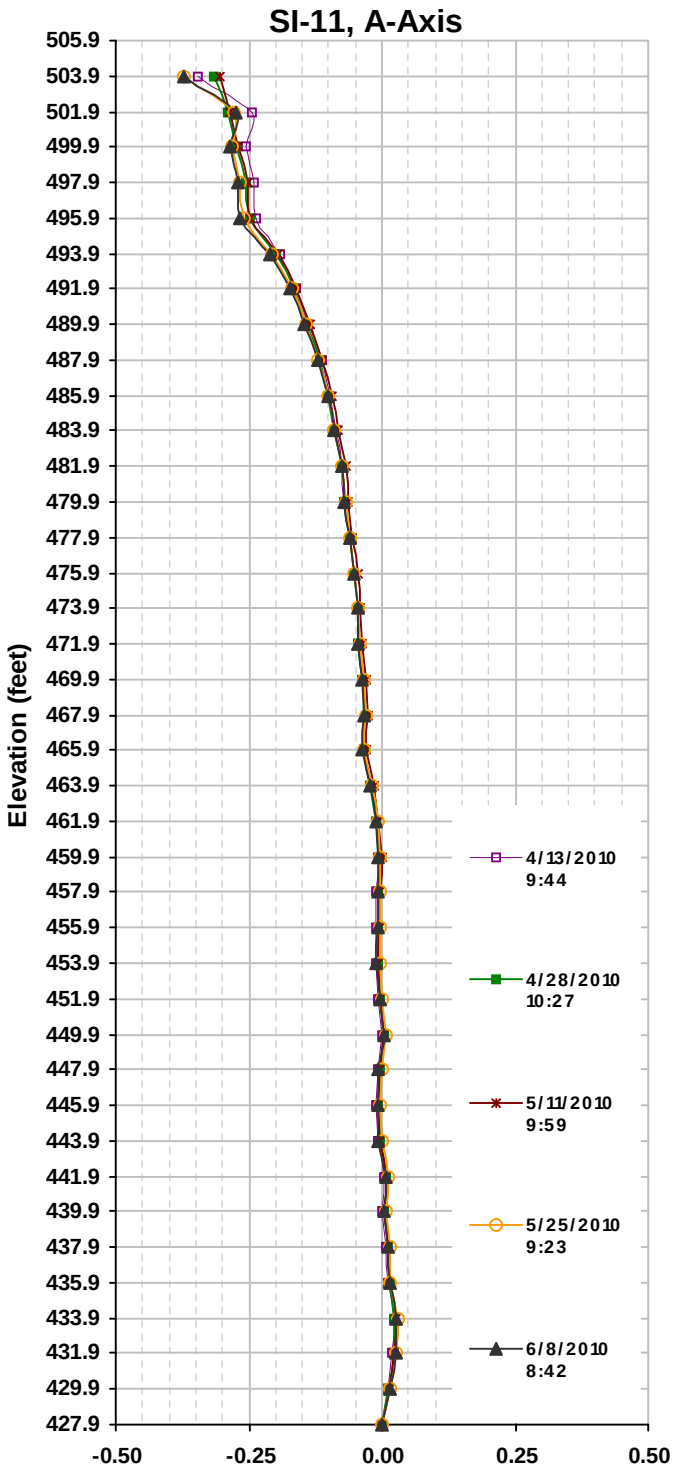
CURRENT SURVEY 6/8/2010 8:28:03 AM

INITIAL SURVEY 2/26/2009 11:50:18 AM

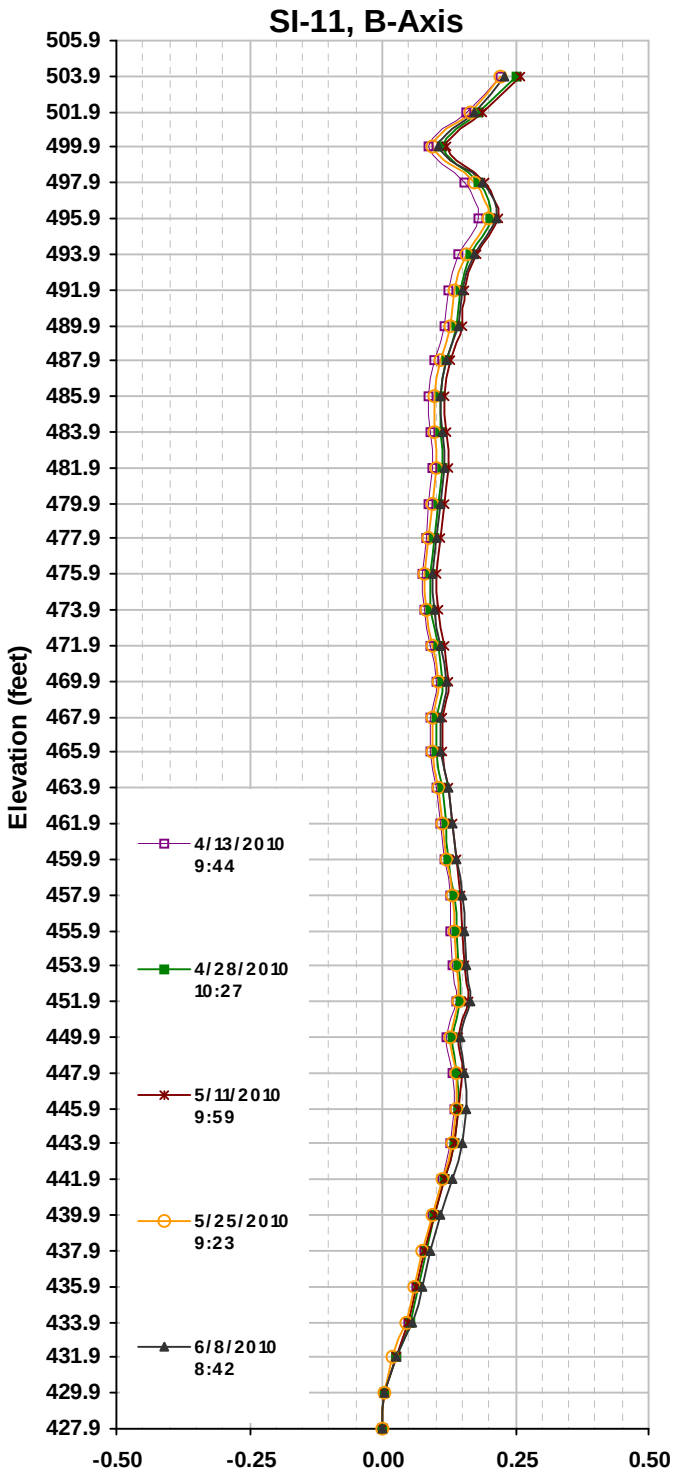
DATE PRINTED 6/8/2010 12:45:17 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
82	662	-639	0.7806	655	-670	0.7950	0.0144	0.0708
84	757	-732	0.8934	749	-764	0.9078	0.0144	0.0564
86	822	-797	0.9714	798	-816	0.9684	-0.0030	0.0420
88	849	-821	1.0020	813	-832	0.9870	-0.0150	0.0450
90	860	-848	1.0248	836	-848	1.0104	-0.0144	0.0600
92	877	-850	1.0362	862	-881	1.0458	0.0096	0.0744
94	875	-849	1.0344	852	-870	1.0332	-0.0012	0.0648
96	929	-903	1.0992	939	-947	1.1316	0.0324	0.0660
98	1029	-1003	1.2192	1036	-1052	1.2528	0.0336	0.0336
100	0	0	0.0000	0	0	0.0000	0.0000	0.0000

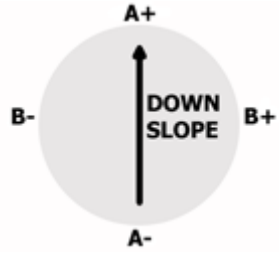


Cumulative Displacement (in) from 11/4/2009



Cumulative Displacement (in) from 11/4/2009

Stantec



Paradise Fossil Plant

Drakesboro, KY

175569040

6/8/2010

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

CURRENT SURVEY 4/13/2010 9:44:33 AM

INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 6/8/2010 12:38:23 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-2554	2551	-3.0630	-2634	2642	-3.1656	-0.1026	-0.3474
6	-1717	1723	-2.0640	-1706	1718	-2.0544	0.0096	-0.2448
8	-221	225	-0.2676	-236	232	-0.2808	-0.0132	-0.2544
10	107	-97	0.1224	106	-91	0.1182	-0.0042	-0.2412
12	468	-458	0.5556	428	-421	0.5094	-0.0462	-0.2370
14	646	-636	0.7692	621	-611	0.7392	-0.0300	-0.1908
16	298	-292	0.3540	279	-272	0.3306	-0.0234	-0.1608
18	99	-88	0.1122	78	-70	0.0888	-0.0234	-0.1374
20	110	-100	0.1260	96	-88	0.1104	-0.0156	-0.1140
22	86	-76	0.0972	76	-68	0.0864	-0.0108	-0.0984
24	69	-62	0.0786	58	-51	0.0654	-0.0132	-0.0876
26	63	-52	0.0690	58	-49	0.0642	-0.0048	-0.0744
28	-10	20	-0.0180	-19	27	-0.0276	-0.0096	-0.0696
30	-39	49	-0.0528	-46	54	-0.0600	-0.0072	-0.0600
32	-19	31	-0.0300	-26	34	-0.0360	-0.0060	-0.0528
34	-25	33	-0.0348	-27	35	-0.0372	-0.0024	-0.0468
36	9	2	0.0042	1	7	-0.0036	-0.0078	-0.0444
38	28	-17	0.0270	22	-13	0.0210	-0.0060	-0.0366
40	-29	39	-0.0408	-28	35	-0.0378	0.0030	-0.0306
42	-115	127	-0.1452	-126	136	-0.1572	-0.0120	-0.0336
44	-91	98	-0.1134	-99	106	-0.1230	-0.0096	-0.0216
46	-31	42	-0.0438	-36	44	-0.0480	-0.0042	-0.0120
48	3	7	-0.0024	0	7	0.0000	0.0024	-0.0078
50	15	-4	0.0114	14	-5	0.0114	0.0000	-0.0102
52	47	-37	0.0504	47	-39	0.0516	0.0012	-0.0102
54	45	-34	0.0474	40	-32	0.0432	-0.0042	-0.0114
56	-2	12	-0.0084	-10	17	-0.0162	-0.0078	-0.0072
58	36	-26	0.0372	43	-35	0.0468	0.0096	0.0006
60	28	-17	0.0270	27	-19	0.0276	0.0006	-0.0090
62	-35	46	-0.0486	-39	48	-0.0522	-0.0036	-0.0096
64	-86	92	-0.1068	-94	101	-0.1170	-0.0102	-0.0060
66	-146	157	-0.1818	-145	154	-0.1794	0.0024	0.0042
68	-234	244	-0.2868	-240	247	-0.2922	-0.0054	0.0018
70	-362	374	-0.4416	-367	374	-0.4446	-0.0030	0.0072
72	-524	534	-0.6348	-537	540	-0.6462	-0.0114	0.0102
74	-585	598	-0.7098	-586	594	-0.7080	0.0018	0.0216
76	-578	594	-0.7032	-576	582	-0.6948	0.0084	0.0198
78	-611	622	-0.7398	-605	609	-0.7284	0.0114	0.0114
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

CURRENT SURVEY 4/28/2010 10:27:35 AM

INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 6/8/2010 12:38:23 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-2554	2551	-3.0630	-2575	2573	-3.0888	-0.0258	-0.3162
6	-1717	1723	-2.0640	-1727	1742	-2.0814	-0.0174	-0.2904
8	-221	225	-0.2676	-244	234	-0.2868	-0.0192	-0.2730
10	107	-97	0.1224	106	-90	0.1176	-0.0048	-0.2538
12	468	-458	0.5556	423	-418	0.5046	-0.0510	-0.2490
14	646	-636	0.7692	618	-609	0.7362	-0.0330	-0.1980
16	298	-292	0.3540	279	-272	0.3306	-0.0234	-0.1650
18	99	-88	0.1122	76	-70	0.0876	-0.0246	-0.1416
20	110	-100	0.1260	94	-88	0.1092	-0.0168	-0.1170
22	86	-76	0.0972	75	-68	0.0858	-0.0114	-0.1002
24	69	-62	0.0786	57	-51	0.0648	-0.0138	-0.0888
26	63	-52	0.0690	57	-50	0.0642	-0.0048	-0.0750
28	-10	20	-0.0180	-19	26	-0.0270	-0.0090	-0.0702
30	-39	49	-0.0528	-48	54	-0.0612	-0.0084	-0.0612
32	-19	31	-0.0300	-27	34	-0.0366	-0.0066	-0.0528
34	-25	33	-0.0348	-27	34	-0.0366	-0.0018	-0.0462
36	9	2	0.0042	1	7	-0.0036	-0.0078	-0.0444
38	28	-17	0.0270	21	-14	0.0210	-0.0060	-0.0366
40	-29	39	-0.0408	-28	34	-0.0372	0.0036	-0.0306
42	-115	127	-0.1452	-128	136	-0.1584	-0.0132	-0.0342
44	-91	98	-0.1134	-101	107	-0.1248	-0.0114	-0.0210
46	-31	42	-0.0438	-36	44	-0.0480	-0.0042	-0.0096
48	3	7	-0.0024	0	7	0.0000	0.0024	-0.0054
50	15	-4	0.0114	13	-6	0.0114	0.0000	-0.0078
52	47	-37	0.0504	46	-40	0.0516	0.0012	-0.0078
54	45	-34	0.0474	40	-32	0.0432	-0.0042	-0.0090
56	-2	12	-0.0084	-11	18	-0.0174	-0.0090	-0.0048
58	36	-26	0.0372	42	-36	0.0468	0.0096	0.0042
60	28	-17	0.0270	27	-20	0.0282	0.0012	-0.0054
62	-35	46	-0.0486	-40	47	-0.0522	-0.0036	-0.0066
64	-86	92	-0.1068	-95	101	-0.1176	-0.0108	-0.0030
66	-146	157	-0.1818	-145	153	-0.1788	0.0030	0.0078
68	-234	244	-0.2868	-241	247	-0.2928	-0.0060	0.0048
70	-362	374	-0.4416	-367	373	-0.4440	-0.0024	0.0108
72	-524	534	-0.6348	-537	539	-0.6456	-0.0108	0.0132
74	-585	598	-0.7098	-586	593	-0.7074	0.0024	0.0240
76	-578	594	-0.7032	-576	581	-0.6942	0.0090	0.0216
78	-611	622	-0.7398	-604	608	-0.7272	0.0126	0.0126
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

CURRENT SURVEY 5/11/2010 9:59:16 AM

INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 6/8/2010 12:38:23 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-2554	2551	-3.0630	-2566	2571	-3.0822	-0.0192	-0.3060
6	-1717	1723	-2.0640	-1731	1738	-2.0814	-0.0174	-0.2868
8	-221	225	-0.2676	-241	234	-0.2850	-0.0174	-0.2694
10	107	-97	0.1224	107	-89	0.1176	-0.0048	-0.2520
12	468	-458	0.5556	423	-415	0.5028	-0.0528	-0.2472
14	646	-636	0.7692	618	-607	0.7350	-0.0342	-0.1944
16	298	-292	0.3540	279	-272	0.3306	-0.0234	-0.1602
18	99	-88	0.1122	76	-69	0.0870	-0.0252	-0.1368
20	110	-100	0.1260	95	-86	0.1086	-0.0174	-0.1116
22	86	-76	0.0972	75	-67	0.0852	-0.0120	-0.0942
24	69	-62	0.0786	57	-51	0.0648	-0.0138	-0.0822
26	63	-52	0.0690	58	-49	0.0642	-0.0048	-0.0684
28	-10	20	-0.0180	-19	26	-0.0270	-0.0090	-0.0636
30	-39	49	-0.0528	-47	55	-0.0612	-0.0084	-0.0546
32	-19	31	-0.0300	-26	34	-0.0360	-0.0060	-0.0462
34	-25	33	-0.0348	-26	34	-0.0360	-0.0012	-0.0402
36	9	2	0.0042	1	7	-0.0036	-0.0078	-0.0390
38	28	-17	0.0270	22	-14	0.0216	-0.0054	-0.0312
40	-29	39	-0.0408	-27	35	-0.0372	0.0036	-0.0258
42	-115	127	-0.1452	-127	136	-0.1578	-0.0126	-0.0294
44	-91	98	-0.1134	-100	107	-0.1242	-0.0108	-0.0168
46	-31	42	-0.0438	-36	44	-0.0480	-0.0042	-0.0060
48	3	7	-0.0024	0	7	0.0000	0.0024	-0.0018
50	15	-4	0.0114	14	-6	0.0120	0.0006	-0.0042
52	47	-37	0.0504	47	-40	0.0522	0.0018	-0.0048
54	45	-34	0.0474	41	-32	0.0438	-0.0036	-0.0066
56	-2	12	-0.0084	-10	18	-0.0168	-0.0084	-0.0030
58	36	-26	0.0372	43	-36	0.0474	0.0102	0.0054
60	28	-17	0.0270	27	-20	0.0282	0.0012	-0.0048
62	-35	46	-0.0486	-39	47	-0.0516	-0.0030	-0.0060
64	-86	92	-0.1068	-94	102	-0.1176	-0.0108	-0.0030
66	-146	157	-0.1818	-145	154	-0.1794	0.0024	0.0078
68	-234	244	-0.2868	-240	248	-0.2928	-0.0060	0.0054
70	-362	374	-0.4416	-367	373	-0.4440	-0.0024	0.0114
72	-524	534	-0.6348	-537	540	-0.6462	-0.0114	0.0138
74	-585	598	-0.7098	-586	594	-0.7080	0.0018	0.0252
76	-578	594	-0.7032	-575	581	-0.6936	0.0096	0.0234
78	-611	622	-0.7398	-602	608	-0.7260	0.0138	0.0138
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

CURRENT SURVEY 5/25/2010 9:23:53 AM

INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 6/8/2010 12:38:23 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-2554	2551	-3.0630	-2628	2636	-3.1584	-0.0954	-0.3732
6	-1717	1723	-2.0640	-1712	1722	-2.0604	0.0036	-0.2778
8	-221	225	-0.2676	-239	234	-0.2838	-0.0162	-0.2814
10	107	-97	0.1224	108	-88	0.1176	-0.0048	-0.2652
12	468	-458	0.5556	422	-412	0.5004	-0.0552	-0.2604
14	646	-636	0.7692	617	-605	0.7332	-0.0360	-0.2052
16	298	-292	0.3540	278	-271	0.3294	-0.0246	-0.1692
18	99	-88	0.1122	77	-67	0.0864	-0.0258	-0.1446
20	110	-100	0.1260	95	-85	0.1080	-0.0180	-0.1188
22	86	-76	0.0972	76	-66	0.0852	-0.0120	-0.1008
24	69	-62	0.0786	58	-49	0.0642	-0.0144	-0.0888
26	63	-52	0.0690	58	-48	0.0636	-0.0054	-0.0744
28	-10	20	-0.0180	-18	28	-0.0276	-0.0096	-0.0690
30	-39	49	-0.0528	-46	56	-0.0612	-0.0084	-0.0594
32	-19	31	-0.0300	-26	36	-0.0372	-0.0072	-0.0510
34	-25	33	-0.0348	-25	34	-0.0354	-0.0006	-0.0438
36	9	2	0.0042	2	9	-0.0042	-0.0084	-0.0432
38	28	-17	0.0270	23	-13	0.0216	-0.0054	-0.0348
40	-29	39	-0.0408	-26	35	-0.0366	0.0042	-0.0294
42	-115	127	-0.1452	-127	138	-0.1590	-0.0138	-0.0336
44	-91	98	-0.1134	-100	108	-0.1248	-0.0114	-0.0198
46	-31	42	-0.0438	-35	45	-0.0480	-0.0042	-0.0084
48	3	7	-0.0024	1	8	-0.0042	-0.0018	-0.0042
50	15	-4	0.0114	14	-5	0.0114	0.0000	-0.0024
52	47	-37	0.0504	48	-39	0.0522	0.0018	-0.0024
54	45	-34	0.0474	41	-31	0.0432	-0.0042	-0.0042
56	-2	12	-0.0084	-10	19	-0.0174	-0.0090	0.0000
58	36	-26	0.0372	44	-35	0.0474	0.0102	0.0090
60	28	-17	0.0270	29	-18	0.0282	0.0012	-0.0012
62	-35	46	-0.0486	-38	49	-0.0522	-0.0036	-0.0024
64	-86	92	-0.1068	-93	103	-0.1176	-0.0108	0.0012
66	-146	157	-0.1818	-143	154	-0.1782	0.0036	0.0120
68	-234	244	-0.2868	-239	249	-0.2928	-0.0060	0.0084
70	-362	374	-0.4416	-365	374	-0.4434	-0.0018	0.0144
72	-524	534	-0.6348	-536	542	-0.6468	-0.0120	0.0162
74	-585	598	-0.7098	-584	594	-0.7068	0.0030	0.0282
76	-578	594	-0.7032	-574	581	-0.6930	0.0102	0.0252
78	-611	622	-0.7398	-601	607	-0.7248	0.0150	0.0150
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

CURRENT SURVEY 6/8/2010 8:42:07 AM

INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 6/8/2010 12:38:23 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-2554	2551	-3.0630	-2628	2640	-3.1608	-0.0978	-0.3726
6	-1717	1723	-2.0640	-1704	1719	-2.0538	0.0102	-0.2748
8	-221	225	-0.2676	-237	234	-0.2826	-0.0150	-0.2850
10	107	-97	0.1224	110	-88	0.1188	-0.0036	-0.2700
12	468	-458	0.5556	420	-411	0.4986	-0.0570	-0.2664
14	646	-636	0.7692	616	-604	0.7320	-0.0372	-0.2094
16	298	-292	0.3540	278	-271	0.3294	-0.0246	-0.1722
18	99	-88	0.1122	76	-67	0.0858	-0.0264	-0.1476
20	110	-100	0.1260	95	-85	0.1080	-0.0180	-0.1212
22	86	-76	0.0972	75	-65	0.0840	-0.0132	-0.1032
24	69	-62	0.0786	58	-50	0.0648	-0.0138	-0.0900
26	63	-52	0.0690	58	-48	0.0636	-0.0054	-0.0762
28	-10	20	-0.0180	-18	28	-0.0276	-0.0096	-0.0708
30	-39	49	-0.0528	-46	55	-0.0606	-0.0078	-0.0612
32	-19	31	-0.0300	-26	36	-0.0372	-0.0072	-0.0534
34	-25	33	-0.0348	-25	34	-0.0354	-0.0006	-0.0462
36	9	2	0.0042	2	8	-0.0036	-0.0078	-0.0456
38	28	-17	0.0270	23	-13	0.0216	-0.0054	-0.0378
40	-29	39	-0.0408	-26	35	-0.0366	0.0042	-0.0324
42	-115	127	-0.1452	-128	138	-0.1596	-0.0144	-0.0366
44	-91	98	-0.1134	-99	108	-0.1242	-0.0108	-0.0222
46	-31	42	-0.0438	-35	45	-0.0480	-0.0042	-0.0114
48	3	7	-0.0024	1	7	-0.0036	-0.0012	-0.0072
50	15	-4	0.0114	15	-5	0.0120	0.0006	-0.0060
52	47	-37	0.0504	49	-40	0.0534	0.0030	-0.0066
54	45	-34	0.0474	42	-30	0.0432	-0.0042	-0.0096
56	-2	12	-0.0084	-10	19	-0.0174	-0.0090	-0.0054
58	36	-26	0.0372	45	-36	0.0486	0.0114	0.0036
60	28	-17	0.0270	28	-19	0.0282	0.0012	-0.0078
62	-35	46	-0.0486	-38	48	-0.0516	-0.0030	-0.0090
64	-86	92	-0.1068	-95	105	-0.1200	-0.0132	-0.0060
66	-146	157	-0.1818	-144	154	-0.1788	0.0030	0.0072
68	-234	244	-0.2868	-240	249	-0.2934	-0.0066	0.0042
70	-362	374	-0.4416	-367	374	-0.4446	-0.0030	0.0108
72	-524	534	-0.6348	-538	543	-0.6486	-0.0138	0.0138
74	-585	598	-0.7098	-585	595	-0.7080	0.0018	0.0276
76	-578	594	-0.7032	-573	582	-0.6930	0.0102	0.0258
78	-611	622	-0.7398	-600	607	-0.7242	0.0156	0.0156
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

CURRENT SURVEY 4/13/2010 9:44:33 AM

INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 6/8/2010 12:38:36 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-529	595	-0.6744	-502	516	-0.6108	0.0636	0.2220
6	-416	451	-0.5202	-375	375	-0.4500	0.0702	0.1584
8	-138	173	-0.1866	-218	203	-0.2526	-0.0660	0.0882
10	-219	270	-0.2934	-273	258	-0.3186	-0.0252	0.1542
12	-264	315	-0.3474	-272	248	-0.3120	0.0354	0.1794
14	-210	262	-0.2832	-229	209	-0.2628	0.0204	0.1440
16	-108	155	-0.1578	-129	122	-0.1506	0.0072	0.1236
18	3	59	-0.0336	-24	1	-0.0150	0.0186	0.1164
20	39	22	0.0102	7	-29	0.0216	0.0114	0.0978
22	68	-21	0.0534	30	-50	0.0480	-0.0054	0.0864
24	69	-4	0.0438	23	-44	0.0402	-0.0036	0.0918
26	51	15	0.0216	12	-36	0.0288	0.0072	0.0954
28	83	-16	0.0594	44	-64	0.0648	0.0054	0.0882
30	97	-31	0.0768	59	-82	0.0846	0.0078	0.0828
32	95	-49	0.0864	58	-80	0.0828	-0.0036	0.0750
34	108	-45	0.0918	56	-76	0.0792	-0.0126	0.0786
36	38	23	0.0090	-8	-8	0.0000	-0.0090	0.0912
38	-27	95	-0.0732	-64	41	-0.0630	0.0102	0.1002
40	0	63	0.0000	-42	18	-0.0360	0.0000	0.0900
42	1	47	-0.0276	-42	23	-0.0390	-0.0114	0.0900
44	-27	90	-0.0702	-74	56	-0.0780	-0.0078	0.1014
46	-36	101	-0.0822	-85	64	-0.0894	-0.0072	0.1092
48	-38	103	-0.0846	-89	69	-0.0948	-0.0102	0.1164
50	-63	126	-0.1134	-108	86	-0.1164	-0.0030	0.1266
52	-94	142	-0.1416	-128	111	-0.1434	-0.0018	0.1296
54	-91	154	-0.1470	-139	118	-0.1542	-0.0072	0.1314
56	-47	90	-0.0822	-58	51	-0.0654	0.0168	0.1386
58	31	33	-0.0012	-16	2	-0.0108	-0.0096	0.1218
60	-2	49	-0.0306	-42	17	-0.0354	-0.0048	0.1314
62	91	-51	0.0852	70	-84	0.0924	0.0072	0.1362
64	176	-119	0.1770	157	-162	0.1914	0.0144	0.1290
66	306	-247	0.3318	285	-301	0.3516	0.0198	0.1146
68	411	-355	0.4596	389	-403	0.4752	0.0156	0.0948
70	530	-493	0.6138	523	-524	0.6282	0.0144	0.0792
72	724	-687	0.8466	718	-718	0.8616	0.0150	0.0648
74	905	-857	1.0572	899	-905	1.0824	0.0252	0.0498
76	1076	-1020	1.2576	1057	-1073	1.2780	0.0204	0.0246
78	1201	-1143	1.4064	1164	-1187	1.4106	0.0042	0.0042
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

CURRENT SURVEY 4/28/2010 10:27:35 AM

INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 6/8/2010 12:38:36 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-529	595	-0.6744	-492	514	-0.6036	0.0708	0.2508
6	-416	451	-0.5202	-377	376	-0.4518	0.0684	0.1800
8	-138	173	-0.1866	-222	204	-0.2556	-0.0690	0.1116
10	-219	270	-0.2934	-270	259	-0.3174	-0.0240	0.1806
12	-264	315	-0.3474	-270	246	-0.3096	0.0378	0.2046
14	-210	262	-0.2832	-227	210	-0.2622	0.0210	0.1668
16	-108	155	-0.1578	-132	121	-0.1518	0.0060	0.1458
18	3	59	-0.0336	-23	-1	-0.0132	0.0204	0.1398
20	39	22	0.0102	7	-29	0.0216	0.0114	0.1194
22	68	-21	0.0534	32	-53	0.0510	-0.0024	0.1080
24	69	-4	0.0438	24	-44	0.0408	-0.0030	0.1104
26	51	15	0.0216	13	-37	0.0300	0.0084	0.1134
28	83	-16	0.0594	46	-65	0.0666	0.0072	0.1050
30	97	-31	0.0768	59	-83	0.0852	0.0084	0.0978
32	95	-49	0.0864	59	-81	0.0840	-0.0024	0.0894
34	108	-45	0.0918	56	-76	0.0792	-0.0126	0.0918
36	38	23	0.0090	-6	-8	0.0012	-0.0078	0.1044
38	-27	95	-0.0732	-63	41	-0.0624	0.0108	0.1122
40	0	63	0.0000	-41	17	-0.0348	0.0000	0.1014
42	1	47	-0.0276	-41	23	-0.0384	-0.0108	0.1014
44	-27	90	-0.0702	-73	56	-0.0774	-0.0072	0.1122
46	-36	101	-0.0822	-84	63	-0.0882	-0.0060	0.1194
48	-38	103	-0.0846	-89	70	-0.0954	-0.0108	0.1254
50	-63	126	-0.1134	-109	87	-0.1176	-0.0042	0.1362
52	-94	142	-0.1416	-129	110	-0.1434	-0.0018	0.1404
54	-91	154	-0.1470	-138	117	-0.1530	-0.0060	0.1422
56	-47	90	-0.0822	-59	50	-0.0654	0.0168	0.1482
58	31	33	-0.0012	-14	0	-0.0084	-0.0072	0.1314
60	-2	49	-0.0306	-41	17	-0.0348	-0.0042	0.1386
62	91	-51	0.0852	70	-83	0.0918	0.0066	0.1428
64	176	-119	0.1770	159	-167	0.1956	0.0186	0.1362
66	306	-247	0.3318	286	-302	0.3528	0.0210	0.1176
68	411	-355	0.4596	388	-404	0.4752	0.0156	0.0966
70	530	-493	0.6138	522	-524	0.6276	0.0138	0.0810
72	724	-687	0.8466	719	-719	0.8628	0.0162	0.0672
74	905	-857	1.0572	900	-906	1.0836	0.0264	0.0510
76	1076	-1020	1.2576	1056	-1073	1.2774	0.0198	0.0246
78	1201	-1143	1.4064	1165	-1187	1.4112	0.0048	0.0048
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

CURRENT SURVEY 5/11/2010 9:59:16 AM

INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 6/8/2010 12:38:36 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-529	595	-0.6744	-491	513	-0.6024	0.0720	0.2598
6	-416	451	-0.5202	-378	374	-0.4512	0.0690	0.1878
8	-138	173	-0.1866	-223	208	-0.2586	-0.0720	0.1188
10	-219	270	-0.2934	-274	259	-0.3198	-0.0264	0.1908
12	-264	315	-0.3474	-268	245	-0.3078	0.0396	0.2172
14	-210	262	-0.2832	-226	210	-0.2616	0.0216	0.1776
16	-108	155	-0.1578	-129	122	-0.1506	0.0072	0.1560
18	3	59	-0.0336	-23	0	-0.0138	0.0198	0.1488
20	39	22	0.0102	8	-28	0.0216	0.0114	0.1290
22	68	-21	0.0534	33	-52	0.0510	-0.0024	0.1176
24	69	-4	0.0438	23	-44	0.0402	-0.0036	0.1200
26	51	15	0.0216	13	-35	0.0288	0.0072	0.1236
28	83	-16	0.0594	45	-64	0.0654	0.0060	0.1164
30	97	-31	0.0768	60	-83	0.0858	0.0090	0.1104
32	95	-49	0.0864	60	-79	0.0834	-0.0030	0.1014
34	108	-45	0.0918	57	-75	0.0792	-0.0126	0.1044
36	38	23	0.0090	-5	-7	0.0012	-0.0078	0.1170
38	-27	95	-0.0732	-63	42	-0.0630	0.0102	0.1248
40	0	63	0.0000	-40	19	-0.0354	0.0000	0.1146
42	1	47	-0.0276	-38	24	-0.0372	-0.0096	0.1146
44	-27	90	-0.0702	-72	57	-0.0774	-0.0072	0.1242
46	-36	101	-0.0822	-83	65	-0.0888	-0.0066	0.1314
48	-38	103	-0.0846	-88	70	-0.0948	-0.0102	0.1380
50	-63	126	-0.1134	-107	88	-0.1170	-0.0036	0.1482
52	-94	142	-0.1416	-127	111	-0.1428	-0.0012	0.1518
54	-91	154	-0.1470	-137	120	-0.1542	-0.0072	0.1530
56	-47	90	-0.0822	-57	51	-0.0648	0.0174	0.1602
58	31	33	-0.0012	-13	2	-0.0090	-0.0078	0.1428
60	-2	49	-0.0306	-21	18	-0.0234	0.0072	0.1506
62	91	-51	0.0852	72	-83	0.0930	0.0078	0.1434
64	176	-119	0.1770	160	-166	0.1956	0.0186	0.1356
66	306	-247	0.3318	287	-300	0.3522	0.0204	0.1170
68	411	-355	0.4596	392	-404	0.4776	0.0180	0.0966
70	530	-493	0.6138	523	-523	0.6276	0.0138	0.0786
72	724	-687	0.8466	720	-716	0.8616	0.0150	0.0648
74	905	-857	1.0572	898	-905	1.0818	0.0246	0.0498
76	1076	-1020	1.2576	1058	-1072	1.2780	0.0204	0.0252
78	1201	-1143	1.4064	1165	-1187	1.4112	0.0048	0.0048
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

CURRENT SURVEY 5/25/2010 9:23:53 AM

INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 6/8/2010 12:38:36 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-529	595	-0.6744	-507	524	-0.6186	0.0558	0.2208
6	-416	451	-0.5202	-375	376	-0.4506	0.0696	0.1650
8	-138	173	-0.1866	-230	212	-0.2652	-0.0786	0.0954
10	-219	270	-0.2934	-274	259	-0.3198	-0.0264	0.1740
12	-264	315	-0.3474	-267	243	-0.3060	0.0414	0.2004
14	-210	262	-0.2832	-227	207	-0.2604	0.0228	0.1590
16	-108	155	-0.1578	-129	121	-0.1500	0.0078	0.1362
18	3	59	-0.0336	-24	-2	-0.0132	0.0204	0.1284
20	39	22	0.0102	7	-30	0.0222	0.0120	0.1080
22	68	-21	0.0534	30	-54	0.0504	-0.0030	0.0960
24	69	-4	0.0438	22	-46	0.0408	-0.0030	0.0990
26	51	15	0.0216	12	-36	0.0288	0.0072	0.1020
28	83	-16	0.0594	44	-66	0.0660	0.0066	0.0948
30	97	-31	0.0768	59	-84	0.0858	0.0090	0.0882
32	95	-49	0.0864	58	-80	0.0828	-0.0036	0.0792
34	108	-45	0.0918	56	-76	0.0792	-0.0126	0.0828
36	38	23	0.0090	-7	-8	0.0006	-0.0084	0.0954
38	-27	95	-0.0732	-64	40	-0.0624	0.0108	0.1038
40	0	63	0.0000	-42	17	-0.0354	0.0000	0.0930
42	1	47	-0.0276	-41	24	-0.0390	-0.0114	0.0930
44	-27	90	-0.0702	-76	56	-0.0792	-0.0090	0.1044
46	-36	101	-0.0822	-86	63	-0.0894	-0.0072	0.1134
48	-38	103	-0.0846	-89	69	-0.0948	-0.0102	0.1206
50	-63	126	-0.1134	-110	86	-0.1176	-0.0042	0.1308
52	-94	142	-0.1416	-130	110	-0.1440	-0.0024	0.1350
54	-91	154	-0.1470	-139	118	-0.1542	-0.0072	0.1374
56	-47	90	-0.0822	-59	52	-0.0666	0.0156	0.1446
58	31	33	-0.0012	-16	1	-0.0102	-0.0090	0.1290
60	-2	49	-0.0306	-34	17	-0.0306	0.0000	0.1380
62	91	-51	0.0852	69	-84	0.0918	0.0066	0.1380
64	176	-119	0.1770	158	-166	0.1944	0.0174	0.1314
66	306	-247	0.3318	287	-302	0.3534	0.0216	0.1140
68	411	-355	0.4596	389	-405	0.4764	0.0168	0.0924
70	530	-493	0.6138	523	-526	0.6294	0.0156	0.0756
72	724	-687	0.8466	718	-720	0.8628	0.0162	0.0600
74	905	-857	1.0572	900	-904	1.0824	0.0252	0.0438
76	1076	-1020	1.2576	1061	-1061	1.2732	0.0156	0.0186
78	1201	-1143	1.4064	1163	-1186	1.4094	0.0030	0.0030
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

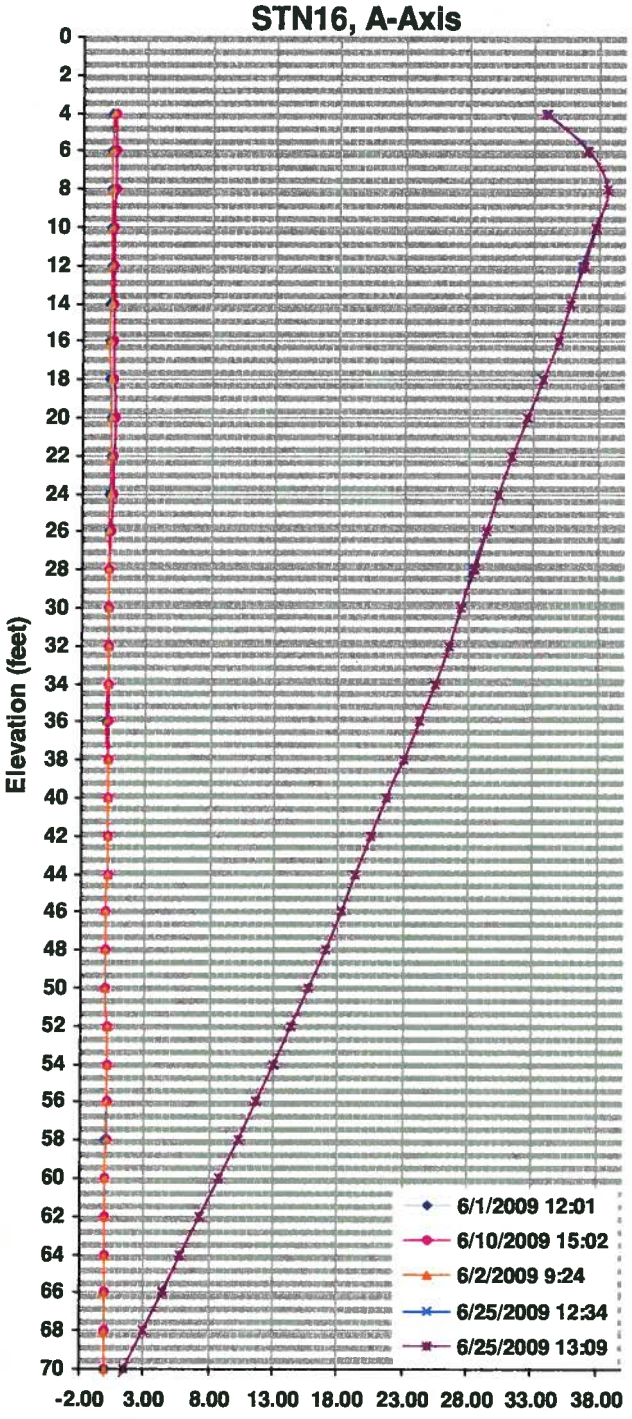
CURRENT SURVEY 6/8/2010 8:42:07 AM

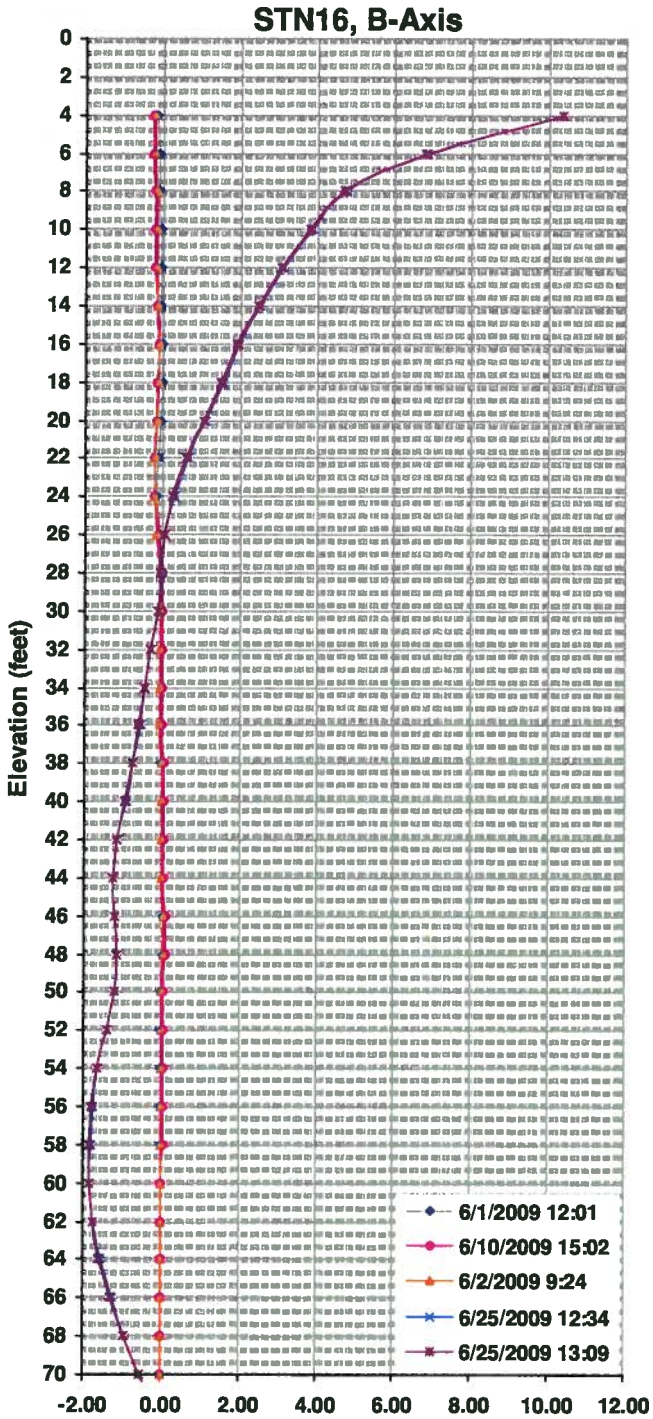
INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 6/8/2010 12:38:36 PM

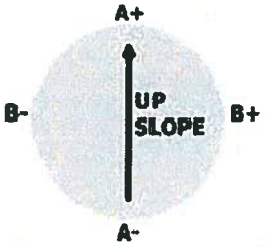
Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-529	595	-0.6744	-511	520	-0.6186	0.0558	0.2304
6	-416	451	-0.5202	-377	374	-0.4506	0.0696	0.1746
8	-138	173	-0.1866	-234	215	-0.2694	-0.0828	0.1050
10	-219	270	-0.2934	-276	260	-0.3216	-0.0282	0.1878
12	-264	315	-0.3474	-266	242	-0.3048	0.0426	0.2160
14	-210	262	-0.2832	-226	206	-0.2592	0.0240	0.1734
16	-108	155	-0.1578	-130	121	-0.1506	0.0072	0.1494
18	3	59	-0.0336	-24	-2	-0.0132	0.0204	0.1422
20	39	22	0.0102	9	-30	0.0234	0.0132	0.1218
22	68	-21	0.0534	31	-53	0.0504	-0.0030	0.1086
24	69	-4	0.0438	22	-44	0.0396	-0.0042	0.1116
26	51	15	0.0216	12	-36	0.0288	0.0072	0.1158
28	83	-16	0.0594	45	-66	0.0666	0.0072	0.1086
30	97	-31	0.0768	58	-83	0.0846	0.0078	0.1014
32	95	-49	0.0864	59	-79	0.0828	-0.0036	0.0936
34	108	-45	0.0918	55	-76	0.0786	-0.0132	0.0972
36	38	23	0.0090	-9	-8	-0.0006	-0.0096	0.1104
38	-27	95	-0.0732	-64	40	-0.0624	0.0108	0.1200
40	0	63	0.0000	-42	18	-0.0360	0.0000	0.1092
42	1	47	-0.0276	-43	25	-0.0408	-0.0132	0.1092
44	-27	90	-0.0702	-74	58	-0.0792	-0.0090	0.1224
46	-36	101	-0.0822	-84	65	-0.0894	-0.0072	0.1314
48	-38	103	-0.0846	-89	71	-0.0960	-0.0114	0.1386
50	-63	126	-0.1134	-109	87	-0.1176	-0.0042	0.1500
52	-94	142	-0.1416	-128	112	-0.1440	-0.0024	0.1542
54	-91	154	-0.1470	-140	119	-0.1554	-0.0084	0.1566
56	-47	90	-0.0822	-56	49	-0.0630	0.0192	0.1650
58	31	33	-0.0012	-16	1	-0.0102	-0.0090	0.1458
60	-2	49	-0.0306	-36	18	-0.0324	-0.0018	0.1548
62	91	-51	0.0852	70	-84	0.0924	0.0072	0.1566
64	176	-119	0.1770	159	-168	0.1962	0.0192	0.1494
66	306	-247	0.3318	285	-303	0.3528	0.0210	0.1302
68	411	-355	0.4596	390	-405	0.4770	0.0174	0.1092
70	530	-493	0.6138	524	-529	0.6318	0.0180	0.0918
72	724	-687	0.8466	721	-722	0.8658	0.0192	0.0738
74	905	-857	1.0572	904	-905	1.0854	0.0282	0.0546
76	1076	-1020	1.2576	1061	-1074	1.2810	0.0234	0.0264
78	1201	-1143	1.4064	1162	-1187	1.4094	0.0030	0.0030
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000





Stantec



Paradise Fossil Plant
Drakesboro, KY
175569040
6/26/2009

SITE PAFTVA

INSTALLATION STN16

DESCRIPTION From DataMate

CURRENT SURVEY 6/1/2009 12:01:36 PM

INITIAL SURVEY 5/29/2009 3:07:30 PM

DATE PRINTED 6/26/2009 10:17:49 AM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-411	427	-0.5028	-361	377	-0.4428	0.0600	0.3042
6	-374	397	-0.4626	-362	391	-0.4518	0.0108	0.2442
8	-412	430	-0.5052	-397	418	-0.4890	0.0162	0.2334
10	-418	438	-0.5136	-400	425	-0.4950	0.0186	0.2172
12	-402	422	-0.4944	-378	400	-0.4668	0.0276	0.1986
14	-397	414	-0.4866	-367	387	-0.4524	0.0342	0.1710
16	-434	454	-0.5328	-451	477	-0.5568	-0.0240	0.1368
18	-472	490	-0.5772	-499	523	-0.6132	-0.0360	0.1608
20	-501	522	-0.6138	-500	523	-0.6138	0.0000	0.1968
22	-501	521	-0.6132	-473	497	-0.5820	0.0312	0.1968
24	-479	495	-0.5844	-445	462	-0.5442	0.0402	0.1656
26	-443	466	-0.5454	-402	428	-0.4980	0.0474	0.1254
28	-402	423	-0.4950	-378	402	-0.4680	0.0270	0.0780
30	-396	416	-0.4872	-377	400	-0.4662	0.0210	0.0510
32	-445	464	-0.5454	-441	465	-0.5436	0.0018	0.0300
34	-499	515	-0.6084	-490	508	-0.5988	0.0096	0.0282
36	-508	532	-0.6240	-512	539	-0.6306	-0.0066	0.0186
38	-514	534	-0.6288	-514	538	-0.6312	-0.0024	0.0252
40	-500	518	-0.6108	-505	527	-0.6192	-0.0084	0.0276
42	-470	489	-0.5754	-470	494	-0.5784	-0.0030	0.0360
44	-483	498	-0.5886	-454	473	-0.5562	0.0324	0.0390
46	-505	527	-0.6192	-472	498	-0.5820	0.0372	0.0066
48	-521	539	-0.6360	-542	564	-0.6636	-0.0276	-0.0306
50	-557	576	-0.6798	-579	601	-0.7080	-0.0282	-0.0030
52	-552	573	-0.6750	-554	577	-0.6786	-0.0036	0.0252
54	-554	570	-0.6744	-553	572	-0.6750	-0.0006	0.0288
56	-573	594	-0.7002	-567	591	-0.6948	0.0054	0.0294
58	-596	615	-0.7266	-591	614	-0.7230	0.0036	0.0240
60	-610	629	-0.7434	-599	622	-0.7326	0.0108	0.0204
62	-606	626	-0.7392	-607	631	-0.7428	-0.0036	0.0096
64	-598	613	-0.7266	-598	615	-0.7278	-0.0012	0.0132
66	-588	611	-0.7194	-580	606	-0.7116	0.0078	0.0144
68	-606	626	-0.7392	-605	627	-0.7392	0.0000	0.0066
70	-618	636	-0.7524	-611	632	-0.7458	0.0066	0.0066
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION STN16

DESCRIPTION From DataMate

CURRENT SURVEY 6/2/2009 9:24:16 AM

INITIAL SURVEY 5/29/2009 3:07:30 PM

DATE PRINTED 6/26/2009 10:17:49 AM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-411	427	-0.5028	-358	362	-0.4320	0.0708	0.3528
6	-374	397	-0.4626	-362	387	-0.4494	0.0132	0.2820
8	-412	430	-0.5052	-395	416	-0.4866	0.0186	0.2688
10	-418	438	-0.5136	-400	423	-0.4938	0.0198	0.2502
12	-402	422	-0.4944	-378	401	-0.4674	0.0270	0.2304
14	-397	414	-0.4866	-369	388	-0.4542	0.0324	0.2034
16	-434	454	-0.5328	-458	482	-0.5640	-0.0312	0.1710
18	-472	490	-0.5772	-499	519	-0.6108	-0.0336	0.2022
20	-501	522	-0.6138	-498	520	-0.6108	0.0030	0.2358
22	-501	521	-0.6132	-471	493	-0.5784	0.0348	0.2328
24	-479	495	-0.5844	-438	458	-0.5376	0.0468	0.1980
26	-443	466	-0.5454	-396	422	-0.4908	0.0546	0.1512
28	-402	423	-0.4950	-377	398	-0.4650	0.0300	0.0966
30	-396	416	-0.4872	-374	398	-0.4632	0.0240	0.0666
32	-445	464	-0.5454	-438	459	-0.5382	0.0072	0.0426
34	-499	515	-0.6084	-488	507	-0.5970	0.0114	0.0354
36	-508	532	-0.6240	-513	538	-0.6306	-0.0066	0.0240
38	-514	534	-0.6288	-515	536	-0.6306	-0.0018	0.0306
40	-500	518	-0.6108	-505	526	-0.6186	-0.0078	0.0324
42	-470	489	-0.5754	-474	495	-0.5814	-0.0060	0.0402
44	-483	498	-0.5886	-453	473	-0.5556	0.0330	0.0462
46	-505	527	-0.6192	-469	493	-0.5772	0.0420	0.0132
48	-521	539	-0.6360	-542	561	-0.6618	-0.0258	-0.0288
50	-557	576	-0.6798	-581	601	-0.7092	-0.0294	-0.0030
52	-552	573	-0.6750	-555	578	-0.6798	-0.0048	0.0264
54	-554	570	-0.6744	-553	571	-0.6744	0.0000	0.0312
56	-573	594	-0.7002	-567	591	-0.6948	0.0054	0.0312
58	-596	615	-0.7266	-591	612	-0.7218	0.0048	0.0258
60	-610	629	-0.7434	-600	621	-0.7326	0.0108	0.0210
62	-606	626	-0.7392	-608	631	-0.7434	-0.0042	0.0102
64	-598	613	-0.7266	-598	616	-0.7284	-0.0018	0.0144
66	-588	611	-0.7194	-580	605	-0.7110	0.0084	0.0162
68	-606	626	-0.7392	-605	626	-0.7386	0.0006	0.0078
70	-618	636	-0.7524	-611	631	-0.7452	0.0072	0.0072
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION STN16

DESCRIPTION From DataMate

CURRENT SURVEY 6/10/2009 3:02:09 PM

INITIAL SURVEY 5/29/2009 3:07:30 PM

DATE PRINTED 6/26/2009 10:17:49 AM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-411	427	-0.5028	-357	372	-0.4374	0.0654	0.5658
6	-374	397	-0.4626	-351	378	-0.4374	0.0252	0.5004
8	-412	430	-0.5052	-384	405	-0.4734	0.0318	0.4752
10	-418	438	-0.5136	-393	416	-0.4854	0.0282	0.4434
12	-402	422	-0.4944	-373	395	-0.4608	0.0336	0.4152
14	-397	414	-0.4866	-378	399	-0.4662	0.0204	0.3816
16	-434	454	-0.5328	-503	527	-0.6180	-0.0852	0.3612
18	-472	490	-0.5772	-497	517	-0.6084	-0.0312	0.4464
20	-501	522	-0.6138	-459	482	-0.5646	0.0492	0.4776
22	-501	521	-0.6132	-426	450	-0.5256	0.0876	0.4284
24	-479	495	-0.5844	-391	411	-0.4812	0.1032	0.3408
26	-443	466	-0.5454	-364	389	-0.4518	0.0936	0.2376
28	-402	423	-0.4950	-363	385	-0.4488	0.0462	0.1440
30	-396	416	-0.4872	-370	392	-0.4572	0.0300	0.0978
32	-445	464	-0.5454	-434	455	-0.5334	0.0120	0.0678
34	-499	515	-0.6084	-482	502	-0.5904	0.0180	0.0558
36	-508	532	-0.6240	-515	541	-0.6336	-0.0096	0.0378
38	-514	534	-0.6288	-513	535	-0.6288	0.0000	0.0474
40	-500	518	-0.6108	-502	524	-0.6156	-0.0048	0.0474
42	-470	489	-0.5754	-472	495	-0.5802	-0.0048	0.0522
44	-483	498	-0.5886	-450	470	-0.5520	0.0366	0.0570
46	-505	527	-0.6192	-466	490	-0.5736	0.0456	0.0204
48	-521	539	-0.6360	-546	566	-0.6672	-0.0312	-0.0252
50	-557	576	-0.6798	-581	602	-0.7098	-0.0300	0.0060
52	-552	573	-0.6750	-551	573	-0.6744	0.0006	0.0360
54	-554	570	-0.6744	-552	572	-0.6744	0.0000	0.0354
56	-573	594	-0.7002	-566	590	-0.6936	0.0066	0.0354
58	-596	615	-0.7266	-591	613	-0.7224	0.0042	0.0288
60	-610	629	-0.7434	-597	620	-0.7302	0.0132	0.0246
62	-606	626	-0.7392	-608	631	-0.7434	-0.0042	0.0114
64	-598	613	-0.7266	-595	617	-0.7272	-0.0006	0.0156
66	-588	611	-0.7194	-580	606	-0.7116	0.0078	0.0162
68	-606	626	-0.7392	-604	626	-0.7380	0.0012	0.0084
70	-618	636	-0.7524	-610	632	-0.7452	0.0072	0.0072
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION STN16

DESCRIPTION From DataMate

CURRENT SURVEY 6/25/2009 12:34:07 PM

INITIAL SURVEY 5/29/2009 3:07:30 PM

DATE PRINTED 6/26/2009 10:17:49 AM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-411	427	-0.5028	-3071	2963	-3.6204	-3.1176	34.0542
6	-374	397	-0.4626	-1611	1527	-1.8828	-1.4202	37.1718
8	-412	430	-0.5052	310	-315	0.3750	0.8802	38.5920
10	-418	438	-0.5136	353	-357	0.4260	0.9396	37.7118
12	-402	422	-0.4944	362	-370	0.4392	0.9336	36.7722
14	-397	414	-0.4866	355	-361	0.4296	0.9162	35.8386
16	-434	454	-0.5328	542	-545	0.6522	1.1850	34.9224
18	-472	490	-0.5772	538	-545	0.6498	1.2270	33.7374
20	-501	522	-0.6138	455	-461	0.5496	1.1634	32.5104
22	-501	521	-0.6132	373	-380	0.4518	1.0650	31.3470
24	-479	495	-0.5844	319	-329	0.3888	0.9732	30.2820
26	-443	466	-0.5454	328	-331	0.3954	0.9408	29.3088
28	-402	423	-0.4950	358	-364	0.4332	0.9282	28.3680
30	-396	416	-0.4872	369	-374	0.4458	0.9330	27.4398
32	-445	464	-0.5454	434	-440	0.5244	1.0698	26.5068
34	-499	515	-0.6084	483	-491	0.5844	1.1928	25.4370
36	-508	532	-0.6240	526	-528	0.6324	1.2564	24.2442
38	-514	534	-0.6288	518	-523	0.6246	1.2534	22.9878
40	-500	518	-0.6108	507	-512	0.6114	1.2222	21.7344
42	-470	489	-0.5754	482	-486	0.5808	1.1562	20.5122
44	-483	498	-0.5886	453	-461	0.5484	1.1370	19.3560
46	-505	527	-0.6192	470	-473	0.5658	1.1850	18.2190
48	-521	539	-0.6360	555	-561	0.6696	1.3056	17.0340
50	-557	576	-0.6798	589	-595	0.7104	1.3902	15.7284
52	-552	573	-0.6750	555	-562	0.6702	1.3452	14.3382
54	-554	570	-0.6744	559	-565	0.6744	1.3488	12.9930
56	-573	594	-0.7002	574	-579	0.6918	1.3920	11.6442
58	-596	615	-0.7266	598	-603	0.7206	1.4472	10.2522
60	-610	629	-0.7434	604	-610	0.7284	1.4718	8.8050
62	-606	626	-0.7392	615	-621	0.7416	1.4808	7.3332
64	-598	613	-0.7266	602	-607	0.7254	1.4520	5.8524
66	-588	611	-0.7194	590	-593	0.7098	1.4292	4.4004
68	-606	626	-0.7392	611	-617	0.7368	1.4760	2.9712
70	-618	636	-0.7524	616	-622	0.7428	1.4952	1.4952
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION STN16

DESCRIPTION From DataMate

CURRENT SURVEY 6/25/2009 1:09:52 PM

INITIAL SURVEY 5/29/2009 3:07:30 PM

DATE PRINTED 6/26/2009 10:17:49 AM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-411	427	-0.5028	-3187	3123	-3.7860	-3.2832	33.8004
6	-374	397	-0.4626	-1714	1603	-1.9902	-1.5276	37.0836
8	-412	430	-0.5052	308	-314	0.3732	0.8784	38.6112
10	-418	438	-0.5136	354	-357	0.4266	0.9402	37.7328
12	-402	422	-0.4944	361	-369	0.4380	0.9324	36.7926
14	-397	414	-0.4866	356	-363	0.4314	0.9180	35.8602
16	-434	454	-0.5328	543	-547	0.6540	1.1868	34.9422
18	-472	490	-0.5772	540	-545	0.6510	1.2282	33.7554
20	-501	522	-0.6138	455	-461	0.5496	1.1634	32.5272
22	-501	521	-0.6132	373	-379	0.4512	1.0644	31.3638
24	-479	495	-0.5844	318	-325	0.3858	0.9702	30.2994
26	-443	466	-0.5454	329	-332	0.3966	0.9420	29.3292
28	-402	423	-0.4950	358	-365	0.4338	0.9288	28.3872
30	-396	416	-0.4872	370	-375	0.4470	0.9342	27.4584
32	-445	464	-0.5454	435	-441	0.5256	1.0710	26.5242
34	-499	515	-0.6084	485	-493	0.5868	1.1952	25.4532
36	-508	532	-0.6240	527	-529	0.6336	1.2576	24.2580
38	-514	534	-0.6288	519	-525	0.6264	1.2552	23.0004
40	-500	518	-0.6108	507	-514	0.6126	1.2234	21.7452
42	-470	489	-0.5754	482	-487	0.5814	1.1568	20.5218
44	-483	498	-0.5886	454	-461	0.5490	1.1376	19.3650
46	-505	527	-0.6192	471	-474	0.5670	1.1862	18.2274
48	-521	539	-0.6360	557	-562	0.6714	1.3074	17.0412
50	-557	576	-0.6798	590	-595	0.7110	1.3908	15.7338
52	-552	573	-0.6750	555	-562	0.6702	1.3452	14.3430
54	-554	570	-0.6744	559	-565	0.6744	1.3488	12.9978
56	-573	594	-0.7002	575	-578	0.6918	1.3920	11.6490
58	-596	615	-0.7266	598	-603	0.7206	1.4472	10.2570
60	-610	629	-0.7434	605	-610	0.7290	1.4724	8.8098
62	-606	626	-0.7392	616	-620	0.7416	1.4808	7.3374
64	-598	613	-0.7266	602	-608	0.7260	1.4526	5.8566
66	-588	611	-0.7194	591	-594	0.7110	1.4304	4.4040
68	-606	626	-0.7392	612	-618	0.7380	1.4772	2.9736
70	-618	636	-0.7524	618	-622	0.7440	1.4964	1.4964
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION STN16

DESCRIPTION From DataMate

CURRENT SURVEY 6/1/2009 12:01:36 PM

INITIAL SURVEY 5/29/2009 3:07:30 PM

DATE PRINTED 6/26/2009 10:18:10 AM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-440	458	-0.5388	-459	482	-0.5646	-0.0258	-0.1308
6	-387	405	-0.4752	-398	412	-0.4860	-0.0108	-0.1050
8	-321	339	-0.3960	-351	346	-0.4182	-0.0222	-0.0942
10	-281	306	-0.3522	-286	305	-0.3546	-0.0024	-0.0720
12	-218	221	-0.2634	-243	243	-0.2916	-0.0282	-0.0696
14	-173	200	-0.2238	-201	207	-0.2448	-0.0210	-0.0414
16	-181	189	-0.2220	-189	181	-0.2220	0.0000	-0.0204
18	-200	219	-0.2514	-175	170	-0.2070	0.0444	-0.0204
20	-186	216	-0.2412	-142	160	-0.1812	0.0600	-0.0648
22	-114	122	-0.1416	-107	118	-0.1350	0.0066	-0.1248
24	-29	53	-0.0492	-87	97	-0.1104	-0.0612	-0.1314
26	-3	-8	0.0030	-55	37	-0.0552	-0.0582	-0.0702
28	-15	17	-0.0192	-41	23	-0.0384	-0.0192	-0.0120
30	-66	83	-0.0894	-77	74	-0.0906	-0.0012	0.0072
32	-62	67	-0.0774	-63	59	-0.0732	0.0042	0.0084
34	-51	66	-0.0702	-66	39	-0.0630	0.0072	0.0042
36	-60	67	-0.0762	-94	77	-0.1026	-0.0264	-0.0030
38	-61	68	-0.0774	-68	72	-0.0840	-0.0066	0.0234
40	-89	113	-0.1212	-97	98	-0.1170	0.0042	0.0300
42	-38	31	-0.0414	-55	46	-0.0606	-0.0192	0.0258
44	26	-19	0.0270	11	-6	0.0102	-0.0168	0.0450
46	38	-18	0.0336	44	-30	0.0444	0.0108	0.0618
48	-41	33	-0.0444	-3	8	-0.0066	0.0378	0.0510
50	-88	103	-0.1146	-67	82	-0.0894	0.0252	0.0132
52	-93	87	-0.1080	-106	94	-0.1200	-0.0120	-0.0120
54	-53	66	-0.0714	-57	69	-0.0756	-0.0042	0.0000
56	-18	37	-0.0330	-26	33	-0.0354	-0.0024	0.0042
58	-19	15	-0.0204	-6	9	-0.0090	0.0114	0.0066
60	41	-19	0.0360	31	-18	0.0294	-0.0066	-0.0048
62	76	-75	0.0906	73	-82	0.0930	0.0024	0.0018
64	133	-115	0.1488	126	-134	0.1560	0.0072	-0.0006
66	153	-140	0.1758	126	-145	0.1626	-0.0132	-0.0078
68	172	-159	0.1986	170	-156	0.1956	-0.0030	0.0054
70	215	-209	0.2544	210	-228	0.2628	0.0084	0.0084
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION STN16

DESCRIPTION From DataMate

CURRENT SURVEY 6/2/2009 9:24:16 AM

INITIAL SURVEY 5/29/2009 3:07:30 PM

DATE PRINTED 6/26/2009 10:18:10 AM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-440	458	-0.5388	-453	479	-0.5592	-0.0204	-0.2082
6	-387	405	-0.4752	-391	425	-0.4896	-0.0144	-0.1878
8	-321	339	-0.3960	-327	356	-0.4098	-0.0138	-0.1734
10	-281	306	-0.3522	-274	306	-0.3480	0.0042	-0.1596
12	-218	221	-0.2634	-238	245	-0.2898	-0.0264	-0.1638
14	-173	200	-0.2238	-195	226	-0.2526	-0.0288	-0.1374
16	-181	189	-0.2220	-170	201	-0.2226	-0.0006	-0.1086
18	-200	219	-0.2514	-172	193	-0.2190	0.0324	-0.1080
20	-186	216	-0.2412	-138	171	-0.1854	0.0558	-0.1404
22	-114	122	-0.1416	-111	129	-0.1440	-0.0024	-0.1962
24	-29	53	-0.0492	-79	113	-0.1152	-0.0660	-0.1938
26	-3	-8	0.0030	-44	63	-0.0642	-0.0672	-0.1278
28	-15	17	-0.0192	-26	45	-0.0426	-0.0234	-0.0606
30	-66	83	-0.0894	-64	99	-0.0978	-0.0084	-0.0372
32	-62	67	-0.0774	-54	72	-0.0756	0.0018	-0.0288
34	-51	66	-0.0702	-35	66	-0.0606	0.0096	-0.0306
36	-60	67	-0.0762	-94	93	-0.1122	-0.0360	-0.0402
38	-61	68	-0.0774	-59	87	-0.0876	-0.0102	-0.0042
40	-89	113	-0.1212	-89	114	-0.1218	-0.0006	0.0060
42	-38	31	-0.0414	-39	53	-0.0552	-0.0138	0.0066
44	26	-19	0.0270	25	12	0.0078	-0.0192	0.0204
46	38	-18	0.0336	47	-18	0.0390	0.0054	0.0396
48	-41	33	-0.0444	-2	30	-0.0192	0.0252	0.0342
50	-88	103	-0.1146	-65	98	-0.0978	0.0168	0.0090
52	-93	87	-0.1080	-80	102	-0.1092	-0.0012	-0.0078
54	-53	66	-0.0714	-64	82	-0.0876	-0.0162	-0.0066
56	-18	37	-0.0330	-15	34	-0.0294	0.0036	0.0096
58	-19	15	-0.0204	13	18	-0.0030	0.0174	0.0060
60	41	-19	0.0360	42	-9	0.0306	-0.0054	-0.0114
62	76	-75	0.0906	79	-71	0.0900	-0.0006	-0.0060
64	133	-115	0.1488	132	-114	0.1476	-0.0012	-0.0054
66	153	-140	0.1758	151	-122	0.1638	-0.0120	-0.0042
68	172	-159	0.1986	174	-150	0.1944	-0.0042	0.0078
70	215	-209	0.2544	229	-215	0.2664	0.0120	0.0120
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION STN16

DESCRIPTION From DataMate

CURRENT SURVEY 6/10/2009 3:02:09 PM

INITIAL SURVEY 5/29/2009 3:07:30 PM

DATE PRINTED 6/26/2009 10:18:10 AM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-440	458	-0.5388	-453	490	-0.5658	-0.0270	-0.2604
6	-387	405	-0.4752	-409	428	-0.5022	-0.0270	-0.2334
8	-321	339	-0.3960	-334	369	-0.4218	-0.0258	-0.2064
10	-281	306	-0.3522	-273	309	-0.3492	0.0030	-0.1806
12	-218	221	-0.2634	-236	263	-0.2994	-0.0360	-0.1836
14	-173	200	-0.2238	-193	230	-0.2538	-0.0300	-0.1476
16	-181	189	-0.2220	-154	186	-0.2040	0.0180	-0.1176
18	-200	219	-0.2514	-160	194	-0.2124	0.0390	-0.1356
20	-186	216	-0.2412	-153	188	-0.2046	0.0366	-0.1746
22	-114	122	-0.1416	-121	147	-0.1608	-0.0192	-0.2112
24	-29	53	-0.0492	-98	134	-0.1392	-0.0900	-0.1920
26	-3	-8	0.0030	-45	80	-0.0750	-0.0780	-0.1020
28	-15	17	-0.0192	-27	62	-0.0534	-0.0342	-0.0240
30	-66	83	-0.0894	-67	103	-0.1020	-0.0126	0.0102
32	-62	67	-0.0774	-56	76	-0.0792	-0.0018	0.0228
34	-51	66	-0.0702	-31	66	-0.0582	0.0120	0.0246
36	-60	67	-0.0762	-71	106	-0.1062	-0.0300	0.0126
38	-61	68	-0.0774	-57	90	-0.0882	-0.0108	0.0426
40	-89	113	-0.1212	-79	113	-0.1152	0.0060	0.0534
42	-38	31	-0.0414	-28	50	-0.0468	-0.0054	0.0474
44	26	-19	0.0270	22	14	0.0048	-0.0222	0.0528
46	38	-18	0.0336	43	-10	0.0318	-0.0018	0.0750
48	-41	33	-0.0444	3	30	-0.0162	0.0282	0.0768
50	-88	103	-0.1146	-63	93	-0.0936	0.0210	0.0486
52	-93	87	-0.1080	-78	105	-0.1098	-0.0018	0.0276
54	-53	66	-0.0714	-48	82	-0.0780	-0.0066	0.0294
56	-18	37	-0.0330	-2	35	-0.0222	0.0108	0.0360
58	-19	15	-0.0204	17	13	0.0024	0.0228	0.0252
60	41	-19	0.0360	41	-8	0.0294	-0.0066	0.0024
62	76	-75	0.0906	93	-77	0.1020	0.0114	0.0090
64	133	-115	0.1488	142	-110	0.1512	0.0024	-0.0024
66	153	-140	0.1758	155	-123	0.1668	-0.0090	-0.0048
68	172	-159	0.1986	179	-149	0.1968	-0.0018	0.0042
70	215	-209	0.2544	229	-205	0.2604	0.0060	0.0060
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION STN16

DESCRIPTION From DataMate

CURRENT SURVEY 6/25/2009 12:34:07 PM

INITIAL SURVEY 5/29/2009 3:07:30 PM

DATE PRINTED 6/26/2009 10:18:10 AM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-440	458	-0.5388	2469	-2467	2.9616	3.5004	10.3686
6	-387	405	-0.4752	1269	-1429	1.6188	2.0940	6.8682
8	-321	339	-0.3960	465	-410	0.5250	0.9210	4.7742
10	-281	306	-0.3522	364	-298	0.3972	0.7494	3.8532
12	-218	221	-0.2634	322	-270	0.3552	0.6186	3.1038
14	-173	200	-0.2238	271	-209	0.2880	0.5118	2.4852
16	-181	189	-0.2220	187	-130	0.1902	0.4122	1.9734
18	-200	219	-0.2514	200	-137	0.2022	0.4536	1.5612
20	-186	216	-0.2412	218	-149	0.2202	0.4614	1.1076
22	-114	122	-0.1416	182	-133	0.1890	0.3306	0.6462
24	-29	53	-0.0492	172	-156	0.1968	0.2460	0.3156
26	-3	-8	0.0030	103	-44	0.0882	0.0852	0.0696
28	-15	17	-0.0192	80	-19	0.0594	0.0786	-0.0156
30	-66	83	-0.0894	118	-53	0.1026	0.1920	-0.0942
32	-62	67	-0.0774	87	-46	0.0798	0.1572	-0.2862
34	-51	66	-0.0702	79	-17	0.0576	0.1278	-0.4434
36	-60	67	-0.0762	122	-62	0.1104	0.1866	-0.5712
38	-61	68	-0.0774	102	-39	0.0846	0.1620	-0.7578
40	-89	113	-0.1212	129	-64	0.1158	0.2370	-0.9198
42	-38	31	-0.0414	59	-13	0.0432	0.0846	-1.1568
44	26	-19	0.0270	26	37	-0.0066	-0.0336	-1.2414
46	38	-18	0.0336	4	58	-0.0324	-0.0660	-1.2078
48	-41	33	-0.0444	44	20	0.0144	0.0588	-1.1418
50	-88	103	-0.1146	113	-47	0.0960	0.2106	-1.2006
52	-93	87	-0.1080	113	-67	0.1080	0.2160	-1.4112
54	-53	66	-0.0714	94	-29	0.0738	0.1452	-1.6272
56	-18	37	-0.0330	41	14	0.0162	0.0492	-1.7724
58	-19	15	-0.0204	27	35	-0.0048	0.0156	-1.8216
60	41	-19	0.0360	4	60	-0.0336	-0.0696	-1.8372
62	76	-75	0.0906	-65	108	-0.1038	-0.1944	-1.7676
64	133	-115	0.1488	-94	158	-0.1512	-0.3000	-1.5732
66	153	-140	0.1758	-111	172	-0.1698	-0.3456	-1.2732
68	172	-159	0.1986	-137	199	-0.2016	-0.4002	-0.9276
70	215	-209	0.2544	-210	245	-0.2730	-0.5274	-0.5274
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION STN16

DESCRIPTION From DataMate

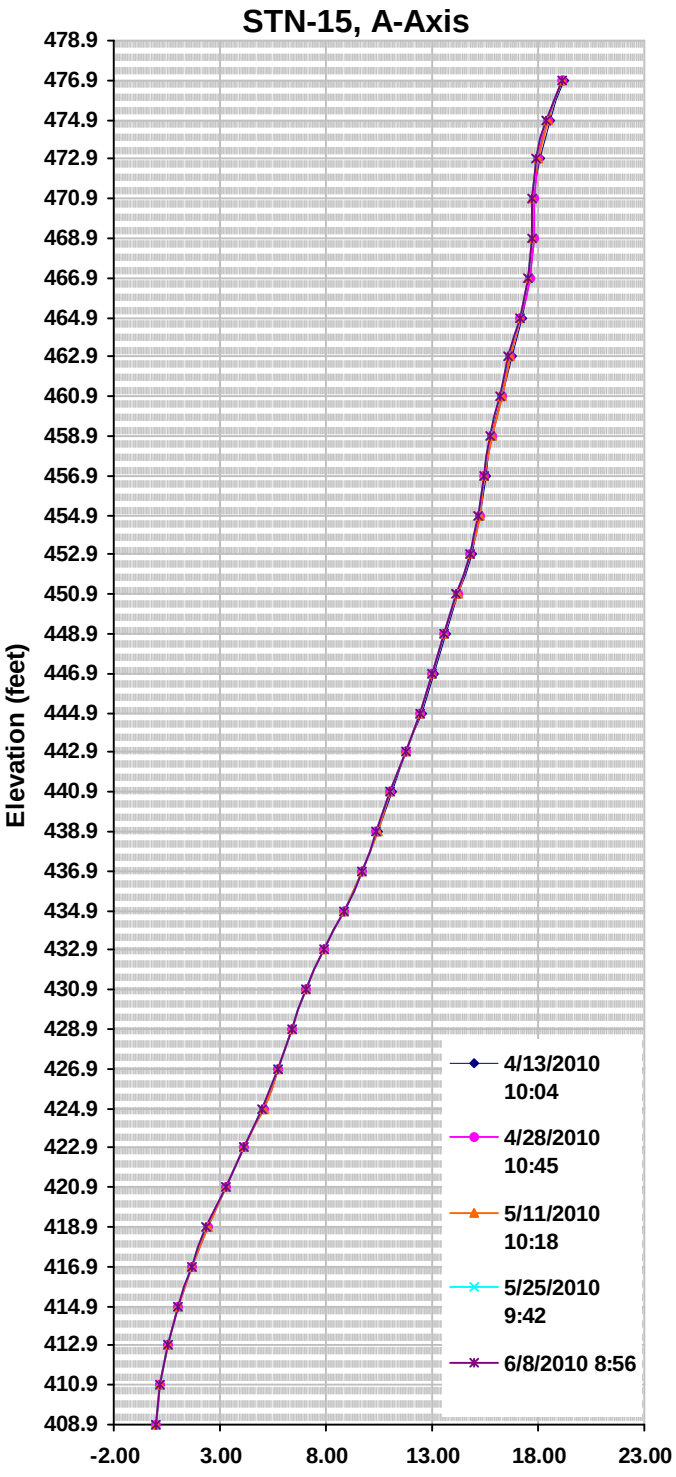
CURRENT SURVEY 6/25/2009 1:09:52 PM

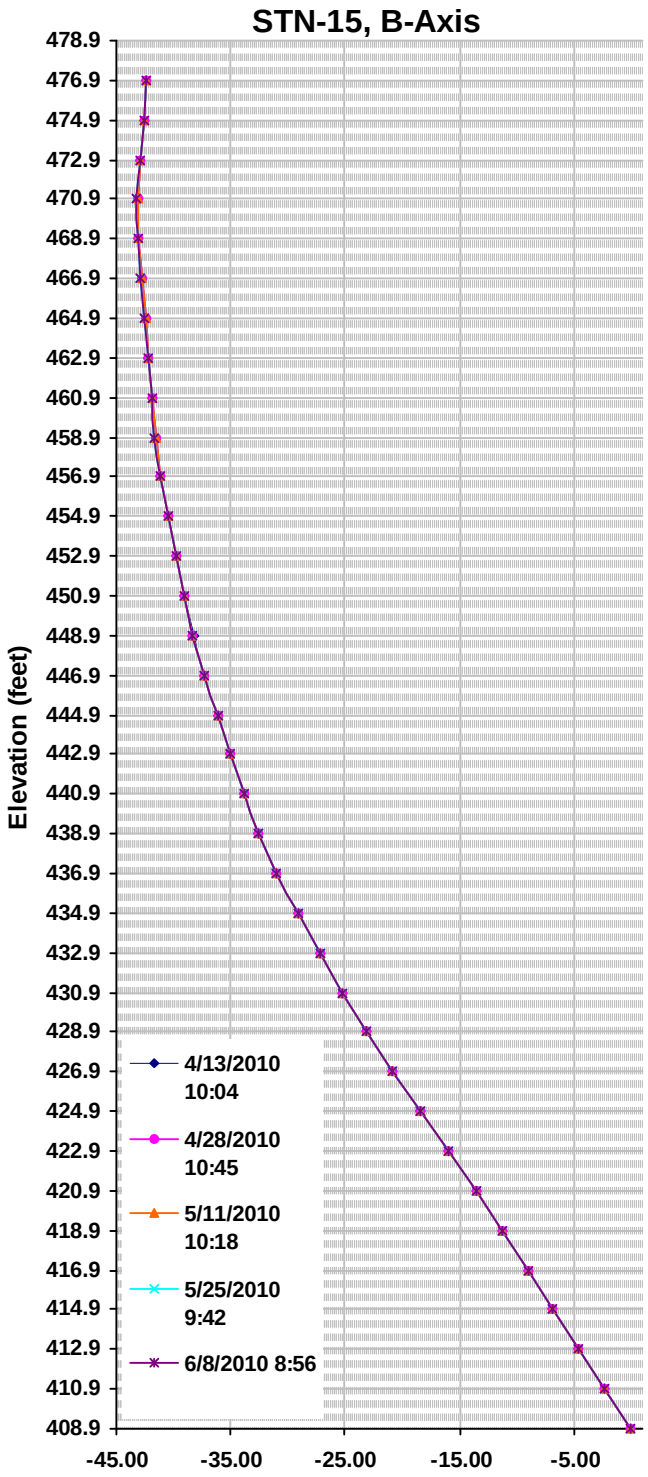
INITIAL SURVEY 5/29/2009 3:07:30 PM

DATE PRINTED 6/26/2009 10:18:10 AM

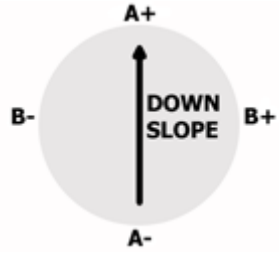
Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-440	458	-0.5388	2550	-2489	3.0234	3.5622	10.3566
6	-387	405	-0.4752	1231	-1438	1.6014	2.0766	6.7944
8	-321	339	-0.3960	465	-408	0.5238	0.9198	4.7178
10	-281	306	-0.3522	364	-297	0.3966	0.7488	3.7980
12	-218	221	-0.2634	322	-269	0.3546	0.6180	3.0492
14	-173	200	-0.2238	271	-210	0.2886	0.5124	2.4312
16	-181	189	-0.2220	186	-128	0.1884	0.4104	1.9188
18	-200	219	-0.2514	201	-135	0.2016	0.4530	1.5084
20	-186	216	-0.2412	217	-148	0.2190	0.4602	1.0554
22	-114	122	-0.1416	182	-131	0.1878	0.3294	0.5952
24	-29	53	-0.0492	171	-107	0.1668	0.2160	0.2658
26	-3	-8	0.0030	101	-45	0.0876	0.0846	0.0498
28	-15	17	-0.0192	80	-16	0.0576	0.0768	-0.0348
30	-66	83	-0.0894	118	-53	0.1026	0.1920	-0.1116
32	-62	67	-0.0774	86	-45	0.0786	0.1560	-0.3036
34	-51	66	-0.0702	80	-17	0.0582	0.1284	-0.4596
36	-60	67	-0.0762	121	-61	0.1092	0.1854	-0.5880
38	-61	68	-0.0774	101	-39	0.0840	0.1614	-0.7734
40	-89	113	-0.1212	130	-65	0.1170	0.2382	-0.9348
42	-38	31	-0.0414	58	-10	0.0408	0.0822	-1.1730
44	26	-19	0.0270	26	39	-0.0078	-0.0348	-1.2552
46	38	-18	0.0336	5	59	-0.0324	-0.0660	-1.2204
48	-41	33	-0.0444	44	20	0.0144	0.0588	-1.1544
50	-88	103	-0.1146	111	-45	0.0936	0.2082	-1.2132
52	-93	87	-0.1080	113	-65	0.1068	0.2148	-1.4214
54	-53	66	-0.0714	91	-29	0.0720	0.1434	-1.6362
56	-18	37	-0.0330	42	16	0.0156	0.0486	-1.7796
58	-19	15	-0.0204	27	36	-0.0054	0.0150	-1.8282
60	41	-19	0.0360	2	61	-0.0354	-0.0714	-1.8432
62	76	-75	0.0906	-64	105	-0.1014	-0.1920	-1.7718
64	133	-115	0.1488	-95	159	-0.1524	-0.3012	-1.5798
66	153	-140	0.1758	-115	173	-0.1728	-0.3486	-1.2786
68	172	-159	0.1986	-139	201	-0.2040	-0.4026	-0.9300
70	215	-209	0.2544	-209	246	-0.2730	-0.5274	-0.5274
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000





Stantec



Paradise Fossil Plant
Drakesboro, KY
175569040
6/8/2010

SITE PAFTVA

INSTALLATION STN-15

DESCRIPTION From DataMate

CURRENT SURVEY 4/13/2010 10:04:16 AM

INITIAL SURVEY 5/28/2009 7:29:24 PM

DATE PRINTED 6/8/2010 12:46:50 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-487	477	-0.5784	101	-103	0.1224	0.7008	19.2486
6	-337	361	-0.4188	61	-55	0.0696	0.4884	18.5478
8	-212	231	-0.2658	-28	33	-0.0366	0.2292	18.0594
10	-133	154	-0.1722	-138	144	-0.1692	0.0030	17.8302
12	-183	205	-0.2328	-31	36	-0.0402	0.1926	17.8272
14	-218	232	-0.2700	103	-100	0.1218	0.3918	17.6346
16	-229	250	-0.2874	175	-169	0.2064	0.4938	17.2428
18	-249	270	-0.3114	107	-101	0.1248	0.4362	16.7490
20	-284	303	-0.3522	88	-83	0.1026	0.4548	16.3128
22	-299	320	-0.3714	-31	36	-0.0402	0.3312	15.8580
24	-300	314	-0.3684	-111	114	-0.1350	0.2334	15.5268
26	-327	349	-0.4056	44	-36	0.0480	0.4536	15.2934
28	-334	354	-0.4128	173	-167	0.2040	0.6168	14.8398
30	-317	335	-0.3912	172	-165	0.2022	0.5934	14.2230
32	-307	329	-0.3816	142	-140	0.1692	0.5508	13.6296
34	-302	316	-0.3708	175	-172	0.2082	0.5790	13.0788
36	-322	343	-0.3990	251	-244	0.2970	0.6960	12.4998
38	-329	349	-0.4068	270	-266	0.3216	0.7284	11.8038
40	-329	347	-0.4056	198	-192	0.2340	0.6396	11.0754
42	-362	383	-0.4470	220	-218	0.2628	0.7098	10.4358
44	-377	390	-0.4602	330	-327	0.3942	0.8544	9.7260
46	-362	382	-0.4464	419	-413	0.4992	0.9456	8.8716
48	-322	340	-0.3972	369	-362	0.4386	0.8358	7.9260
50	-294	312	-0.3636	263	-258	0.3126	0.6762	7.0902
52	-308	330	-0.3828	209	-210	0.2514	0.6342	6.4140
54	-320	334	-0.3924	286	-282	0.3408	0.7332	5.7798
56	-357	378	-0.4410	374	-367	0.4446	0.8856	5.0466
58	-393	412	-0.4830	348	-343	0.4146	0.8976	4.1610
60	-379	398	-0.4662	337	-328	0.3990	0.8652	3.2634
62	-319	342	-0.3966	287	-277	0.3384	0.7350	2.3982
64	-269	285	-0.3324	241	-237	0.2868	0.6192	1.6632
66	-225	245	-0.2820	213	-207	0.2520	0.5340	1.0440
68	-153	174	-0.1962	113	-106	0.1314	0.3276	0.5100
70	-78	97	-0.1050	68	-61	0.0774	0.1824	0.1824
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION STN-15

DESCRIPTION From DataMate

CURRENT SURVEY 4/28/2010 10:45:55 AM

INITIAL SURVEY 5/28/2009 7:29:24 PM

DATE PRINTED 6/8/2010 12:46:50 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-487	477	-0.5784	98	-101	0.1194	0.6978	19.1778
6	-337	361	-0.4188	60	-52	0.0672	0.4860	18.4800
8	-212	231	-0.2658	-29	35	-0.0384	0.2274	17.9940
10	-133	154	-0.1722	-139	146	-0.1710	0.0012	17.7666
12	-183	205	-0.2328	-34	39	-0.0438	0.1890	17.7654
14	-218	232	-0.2700	102	-98	0.1200	0.3900	17.5764
16	-229	250	-0.2874	177	-170	0.2082	0.4956	17.1864
18	-249	270	-0.3114	105	-98	0.1218	0.4332	16.6908
20	-284	303	-0.3522	86	-81	0.1002	0.4524	16.2576
22	-299	320	-0.3714	-35	40	-0.0450	0.3264	15.8052
24	-300	314	-0.3684	-114	118	-0.1392	0.2292	15.4788
26	-327	349	-0.4056	42	-35	0.0462	0.4518	15.2496
28	-334	354	-0.4128	173	-166	0.2034	0.6162	14.7978
30	-317	335	-0.3912	172	-164	0.2016	0.5928	14.1816
32	-307	329	-0.3816	142	-138	0.1680	0.5496	13.5888
34	-302	316	-0.3708	174	-170	0.2064	0.5772	13.0392
36	-322	343	-0.3990	250	-242	0.2952	0.6942	12.4620
38	-329	349	-0.4068	270	-264	0.3204	0.7272	11.7678
40	-329	347	-0.4056	196	-190	0.2316	0.6372	11.0406
42	-362	383	-0.4470	218	-216	0.2604	0.7074	10.4034
44	-377	390	-0.4602	329	-324	0.3918	0.8520	9.6960
46	-362	382	-0.4464	418	-411	0.4974	0.9438	8.8440
48	-322	340	-0.3972	368	-359	0.4362	0.8334	7.9002
50	-294	312	-0.3636	262	-255	0.3102	0.6738	7.0668
52	-308	330	-0.3828	208	-208	0.2496	0.6324	6.3930
54	-320	334	-0.3924	285	-280	0.3390	0.7314	5.7606
56	-357	378	-0.4410	373	-365	0.4428	0.8838	5.0292
58	-393	412	-0.4830	347	-340	0.4122	0.8952	4.1454
60	-379	398	-0.4662	335	-325	0.3960	0.8622	3.2502
62	-319	342	-0.3966	286	-275	0.3366	0.7332	2.3880
64	-269	285	-0.3324	240	-233	0.2838	0.6162	1.6548
66	-225	245	-0.2820	213	-204	0.2502	0.5322	1.0386
68	-153	174	-0.1962	113	-102	0.1290	0.3252	0.5064
70	-78	97	-0.1050	68	-59	0.0762	0.1812	0.1812
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION STN-15

DESCRIPTION From DataMate

CURRENT SURVEY 5/11/2010 10:18:49 AM

INITIAL SURVEY 5/28/2009 7:29:24 PM

DATE PRINTED 6/8/2010 12:46:50 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-487	477	-0.5784	102	-100	0.1212	0.6996	19.1688
6	-337	361	-0.4188	58	-50	0.0648	0.4836	18.4692
8	-212	231	-0.2658	-31	37	-0.0408	0.2250	17.9856
10	-133	154	-0.1722	-140	148	-0.1728	-0.0006	17.7606
12	-183	205	-0.2328	-35	41	-0.0456	0.1872	17.7612
14	-218	232	-0.2700	102	-97	0.1194	0.3894	17.5740
16	-229	250	-0.2874	178	-171	0.2094	0.4968	17.1846
18	-249	270	-0.3114	104	-97	0.1206	0.4320	16.6878
20	-284	303	-0.3522	86	-80	0.0996	0.4518	16.2558
22	-299	320	-0.3714	-37	44	-0.0486	0.3228	15.8040
24	-300	314	-0.3684	-116	121	-0.1422	0.2262	15.4812
26	-327	349	-0.4056	43	-34	0.0462	0.4518	15.2550
28	-334	354	-0.4128	173	-167	0.2040	0.6168	14.8032
30	-317	335	-0.3912	172	-164	0.2016	0.5928	14.1864
32	-307	329	-0.3816	142	-138	0.1680	0.5496	13.5936
34	-302	316	-0.3708	173	-169	0.2052	0.5760	13.0440
36	-322	343	-0.3990	250	-242	0.2952	0.6942	12.4680
38	-329	349	-0.4068	270	-264	0.3204	0.7272	11.7738
40	-329	347	-0.4056	195	-189	0.2304	0.6360	11.0466
42	-362	383	-0.4470	218	-215	0.2598	0.7068	10.4106
44	-377	390	-0.4602	330	-327	0.3942	0.8544	9.7038
46	-362	382	-0.4464	418	-412	0.4980	0.9444	8.8494
48	-322	340	-0.3972	368	-359	0.4362	0.8334	7.9050
50	-294	312	-0.3636	263	-256	0.3114	0.6750	7.0716
52	-308	330	-0.3828	208	-207	0.2490	0.6318	6.3966
54	-320	334	-0.3924	285	-281	0.3396	0.7320	5.7648
56	-357	378	-0.4410	374	-366	0.4440	0.8850	5.0328
58	-393	412	-0.4830	347	-341	0.4128	0.8958	4.1478
60	-379	398	-0.4662	334	-324	0.3948	0.8610	3.2520
62	-319	342	-0.3966	286	-275	0.3366	0.7332	2.3910
64	-269	285	-0.3324	240	-235	0.2850	0.6174	1.6578
66	-225	245	-0.2820	212	-205	0.2502	0.5322	1.0404
68	-153	174	-0.1962	113	-103	0.1296	0.3258	0.5082
70	-78	97	-0.1050	68	-61	0.0774	0.1824	0.1824
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION STN-15

DESCRIPTION From DataMate

CURRENT SURVEY 5/25/2010 9:42:11 AM

INITIAL SURVEY 5/28/2009 7:29:24 PM

DATE PRINTED 6/8/2010 12:46:50 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-487	477	-0.5784	104	-97	0.1206	0.6990	19.1052
6	-337	361	-0.4188	58	-49	0.0642	0.4830	18.4062
8	-212	231	-0.2658	-31	39	-0.0420	0.2238	17.9232
10	-133	154	-0.1722	-140	150	-0.1740	-0.0018	17.6994
12	-183	205	-0.2328	-35	44	-0.0474	0.1854	17.7012
14	-218	232	-0.2700	103	-96	0.1194	0.3894	17.5158
16	-229	250	-0.2874	180	-171	0.2106	0.4980	17.1264
18	-249	270	-0.3114	104	-96	0.1200	0.4314	16.6284
20	-284	303	-0.3522	86	-77	0.0978	0.4500	16.1970
22	-299	320	-0.3714	-39	47	-0.0516	0.3198	15.7470
24	-300	314	-0.3684	-119	126	-0.1470	0.2214	15.4272
26	-327	349	-0.4056	42	-32	0.0444	0.4500	15.2058
28	-334	354	-0.4128	174	-165	0.2034	0.6162	14.7558
30	-317	335	-0.3912	172	-162	0.2004	0.5916	14.1396
32	-307	329	-0.3816	141	-135	0.1656	0.5472	13.5480
34	-302	316	-0.3708	172	-166	0.2028	0.5736	13.0008
36	-322	343	-0.3990	250	-240	0.2940	0.6930	12.4272
38	-329	349	-0.4068	270	-261	0.3186	0.7254	11.7342
40	-329	347	-0.4056	194	-185	0.2274	0.6330	11.0088
42	-362	383	-0.4470	217	-211	0.2568	0.7038	10.3758
44	-377	390	-0.4602	330	-323	0.3918	0.8520	9.6720
46	-362	382	-0.4464	418	-409	0.4962	0.9426	8.8200
48	-322	340	-0.3972	367	-356	0.4338	0.8310	7.8774
50	-294	312	-0.3636	262	-253	0.3090	0.6726	7.0464
52	-308	330	-0.3828	207	-204	0.2466	0.6294	6.3738
54	-320	334	-0.3924	285	-277	0.3372	0.7296	5.7444
56	-357	378	-0.4410	374	-363	0.4422	0.8832	5.0148
58	-393	412	-0.4830	346	-338	0.4104	0.8934	4.1316
60	-379	398	-0.4662	334	-321	0.3930	0.8592	3.2382
62	-319	342	-0.3966	285	-272	0.3342	0.7308	2.3790
64	-269	285	-0.3324	239	-231	0.2820	0.6144	1.6482
66	-225	245	-0.2820	212	-202	0.2484	0.5304	1.0338
68	-153	174	-0.1962	113	-100	0.1278	0.3240	0.5034
70	-78	97	-0.1050	67	-57	0.0744	0.1794	0.1794
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION STN-15

DESCRIPTION From DataMate

CURRENT SURVEY 6/8/2010 8:56:52 AM

INITIAL SURVEY 5/28/2009 7:29:24 PM

DATE PRINTED 6/8/2010 12:46:50 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-487	477	-0.5784	100	-95	0.1170	0.6954	19.0902
6	-337	361	-0.4188	57	-48	0.0630	0.4818	18.3948
8	-212	231	-0.2658	-32	39	-0.0426	0.2232	17.9130
10	-133	154	-0.1722	-141	149	-0.1740	-0.0018	17.6898
12	-183	205	-0.2328	-39	45	-0.0504	0.1824	17.6916
14	-218	232	-0.2700	101	-95	0.1176	0.3876	17.5092
16	-229	250	-0.2874	181	-173	0.2124	0.4998	17.1216
18	-249	270	-0.3114	103	-96	0.1194	0.4308	16.6218
20	-284	303	-0.3522	84	-77	0.0966	0.4488	16.1910
22	-299	320	-0.3714	-43	49	-0.0552	0.3162	15.7422
24	-300	314	-0.3684	-123	128	-0.1506	0.2178	15.4260
26	-327	349	-0.4056	41	-32	0.0438	0.4494	15.2082
28	-334	354	-0.4128	174	-167	0.2046	0.6174	14.7588
30	-317	335	-0.3912	172	-163	0.2010	0.5922	14.1414
32	-307	329	-0.3816	140	-136	0.1656	0.5472	13.5492
34	-302	316	-0.3708	171	-166	0.2022	0.5730	13.0020
36	-322	343	-0.3990	250	-241	0.2946	0.6936	12.4290
38	-329	349	-0.4068	269	-262	0.3186	0.7254	11.7354
40	-329	347	-0.4056	192	-185	0.2262	0.6318	11.0100
42	-362	383	-0.4470	215	-211	0.2556	0.7026	10.3782
44	-377	390	-0.4602	329	-325	0.3924	0.8526	9.6756
46	-362	382	-0.4464	418	-411	0.4974	0.9438	8.8230
48	-322	340	-0.3972	366	-357	0.4338	0.8310	7.8792
50	-294	312	-0.3636	261	-253	0.3084	0.6720	7.0482
52	-308	330	-0.3828	206	-205	0.2466	0.6294	6.3762
54	-320	334	-0.3924	285	-279	0.3384	0.7308	5.7468
56	-357	378	-0.4410	374	-366	0.4440	0.8850	5.0160
58	-393	412	-0.4830	345	-339	0.4104	0.8934	4.1310
60	-379	398	-0.4662	332	-322	0.3924	0.8586	3.2376
62	-319	342	-0.3966	284	-273	0.3342	0.7308	2.3790
64	-269	285	-0.3324	238	-232	0.2820	0.6144	1.6482
66	-225	245	-0.2820	211	-203	0.2484	0.5304	1.0338
68	-153	174	-0.1962	112	-101	0.1278	0.3240	0.5034
70	-78	97	-0.1050	66	-58	0.0744	0.1794	0.1794
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION STN-15

DESCRIPTION From DataMate

CURRENT SURVEY 4/13/2010 10:04:16 AM

INITIAL SURVEY 5/28/2009 7:29:24 PM

DATE PRINTED 6/8/2010 12:47:02 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-63	77	-0.0840	82	-107	0.1134	0.1974	-42.3672
6	-124	119	-0.1458	131	-156	0.1722	0.3180	-42.5646
8	-78	99	-0.1062	99	-110	0.1254	0.2316	-42.8826
10	26	-15	0.0246	-24	10	-0.0204	-0.0450	-43.1142
12	113	-114	0.1362	-146	119	-0.1590	-0.2952	-43.0692
14	138	-153	0.1746	-155	128	-0.1698	-0.3444	-42.7740
16	102	-93	0.1170	-151	125	-0.1656	-0.2826	-42.4296
18	92	-86	0.1068	-157	130	-0.1722	-0.2790	-42.1470
20	109	-96	0.1230	-164	134	-0.1788	-0.3018	-41.8680
22	163	-162	0.1950	-237	240	-0.2862	-0.4812	-41.5662
24	228	-226	0.2724	-319	290	-0.3654	-0.6378	-41.0850
26	259	-278	0.3222	-312	288	-0.3600	-0.6822	-40.4472
28	269	-267	0.3216	-308	287	-0.3570	-0.6786	-39.7650
30	282	-286	0.3408	-407	393	-0.4800	-0.8208	-39.0864
32	327	-347	0.4044	-517	486	-0.6018	-1.0062	-38.2656
34	426	-437	0.5178	-507	482	-0.5934	-1.1112	-37.2594
36	482	-487	0.5814	-471	445	-0.5496	-1.1310	-36.1482
38	535	-540	0.6450	-473	448	-0.5526	-1.1976	-35.0172
40	610	-583	0.7158	-486	466	-0.5712	-1.2870	-33.8196
42	658	-660	0.7908	-629	635	-0.7584	-1.5492	-32.5326
44	712	-709	0.8526	-848	829	-1.0062	-1.8588	-30.9834
46	760	-743	0.9018	-892	866	-1.0548	-1.9566	-29.1246
48	787	-787	0.9444	-850	826	-1.0056	-1.9500	-27.1680
50	846	-819	0.9990	-857	844	-1.0206	-2.0196	-25.2180
52	939	-935	1.1244	-973	969	-1.1652	-2.2896	-23.1984
54	1014	-1016	1.2180	-1033	1003	-1.2216	-2.4396	-20.9088
56	1030	-1012	1.2252	-1036	1009	-1.2270	-2.4522	-18.4692
58	1025	-1004	1.2174	-1038	1013	-1.2306	-2.4480	-16.0170
60	986	-960	1.1676	-979	951	-1.1580	-2.3256	-13.5690
62	936	-930	1.1196	-930	907	-1.1022	-2.2218	-11.2434
64	894	-906	1.0800	-924	898	-1.0932	-2.1732	-9.0216
66	911	-909	1.0920	-930	905	-1.1010	-2.1930	-6.8484
68	942	-927	1.1214	-956	940	-1.1376	-2.2590	-4.6554
70	993	-976	1.1814	-1023	1002	-1.2150	-2.3964	-2.3964
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION STN-15

DESCRIPTION From DataMate

CURRENT SURVEY 4/28/2010 10:45:55 AM

INITIAL SURVEY 5/28/2009 7:29:24 PM

DATE PRINTED 6/8/2010 12:47:02 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-63	77	-0.0840	91	-112	0.1218	0.2058	-42.4014
6	-124	119	-0.1458	131	-153	0.1704	0.3162	-42.6072
8	-78	99	-0.1062	97	-109	0.1236	0.2298	-42.9234
10	26	-15	0.0246	-25	13	-0.0228	-0.0474	-43.1532
12	113	-114	0.1362	-149	122	-0.1626	-0.2988	-43.1058
14	138	-153	0.1746	-156	132	-0.1728	-0.3474	-42.8070
16	102	-93	0.1170	-151	128	-0.1674	-0.2844	-42.4596
18	92	-86	0.1068	-159	135	-0.1764	-0.2832	-42.1752
20	109	-96	0.1230	-166	138	-0.1824	-0.3054	-41.8920
22	163	-162	0.1950	-237	243	-0.2880	-0.4830	-41.5866
24	228	-226	0.2724	-317	291	-0.3648	-0.6372	-41.1036
26	259	-278	0.3222	-314	291	-0.3630	-0.6852	-40.4664
28	269	-267	0.3216	-308	288	-0.3576	-0.6792	-39.7812
30	282	-286	0.3408	-407	395	-0.4812	-0.8220	-39.1020
32	327	-347	0.4044	-517	489	-0.6036	-1.0080	-38.2800
34	426	-437	0.5178	-506	484	-0.5940	-1.1118	-37.2720
36	482	-487	0.5814	-471	446	-0.5502	-1.1316	-36.1602
38	535	-540	0.6450	-473	448	-0.5526	-1.1976	-35.0286
40	610	-583	0.7158	-483	466	-0.5694	-1.2852	-33.8310
42	658	-660	0.7908	-629	635	-0.7584	-1.5492	-32.5458
44	712	-709	0.8526	-847	831	-1.0068	-1.8594	-30.9966
46	760	-743	0.9018	-892	868	-1.0560	-1.9578	-29.1372
48	787	-787	0.9444	-850	827	-1.0062	-1.9506	-27.1794
50	846	-819	0.9990	-857	844	-1.0206	-2.0196	-25.2288
52	939	-935	1.1244	-973	971	-1.1664	-2.2908	-23.2092
54	1014	-1016	1.2180	-1035	1008	-1.2258	-2.4438	-20.9184
56	1030	-1012	1.2252	-1037	1011	-1.2288	-2.4540	-18.4746
58	1025	-1004	1.2174	-1037	1013	-1.2300	-2.4474	-16.0206
60	986	-960	1.1676	-978	952	-1.1580	-2.3256	-13.5732
62	936	-930	1.1196	-931	908	-1.1034	-2.2230	-11.2476
64	894	-906	1.0800	-926	901	-1.0962	-2.1762	-9.0246
66	911	-909	1.0920	-929	906	-1.1010	-2.1930	-6.8484
68	942	-927	1.1214	-955	941	-1.1376	-2.2590	-4.6554
70	993	-976	1.1814	-1022	1003	-1.2150	-2.3964	-2.3964
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION STN-15

DESCRIPTION From DataMate

CURRENT SURVEY 5/11/2010 10:18:49 AM

INITIAL SURVEY 5/28/2009 7:29:24 PM

DATE PRINTED 6/8/2010 12:47:03 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-63	77	-0.0840	84	-110	0.1164	0.2004	-42.3954
6	-124	119	-0.1458	132	-153	0.1710	0.3168	-42.5958
8	-78	99	-0.1062	98	-108	0.1236	0.2298	-42.9126
10	26	-15	0.0246	-27	14	-0.0246	-0.0492	-43.1424
12	113	-114	0.1362	-147	123	-0.1620	-0.2982	-43.0932
14	138	-153	0.1746	-154	131	-0.1710	-0.3456	-42.7950
16	102	-93	0.1170	-151	127	-0.1668	-0.2838	-42.4494
18	92	-86	0.1068	-157	133	-0.1740	-0.2808	-42.1656
20	109	-96	0.1230	-165	138	-0.1818	-0.3048	-41.8848
22	163	-162	0.1950	-239	243	-0.2892	-0.4842	-41.5800
24	228	-226	0.2724	-318	292	-0.3660	-0.6384	-41.0958
26	259	-278	0.3222	-313	290	-0.3618	-0.6840	-40.4574
28	269	-267	0.3216	-306	288	-0.3564	-0.6780	-39.7734
30	282	-286	0.3408	-409	394	-0.4818	-0.8226	-39.0954
32	327	-347	0.4044	-517	492	-0.6054	-1.0098	-38.2728
34	426	-437	0.5178	-506	484	-0.5940	-1.1118	-37.2630
36	482	-487	0.5814	-469	446	-0.5490	-1.1304	-36.1512
38	535	-540	0.6450	-471	447	-0.5508	-1.1958	-35.0208
40	610	-583	0.7158	-483	466	-0.5694	-1.2852	-33.8250
42	658	-660	0.7908	-627	638	-0.7590	-1.5498	-32.5398
44	712	-709	0.8526	-848	831	-1.0074	-1.8600	-30.9900
46	760	-743	0.9018	-892	869	-1.0566	-1.9584	-29.1300
48	787	-787	0.9444	-849	827	-1.0056	-1.9500	-27.1716
50	846	-819	0.9990	-857	844	-1.0206	-2.0196	-25.2216
52	939	-935	1.1244	-972	971	-1.1658	-2.2902	-23.2020
54	1014	-1016	1.2180	-1033	1006	-1.2234	-2.4414	-20.9118
56	1030	-1012	1.2252	-1035	1010	-1.2270	-2.4522	-18.4704
58	1025	-1004	1.2174	-1036	1013	-1.2294	-2.4468	-16.0182
60	986	-960	1.1676	-977	952	-1.1574	-2.3250	-13.5714
62	936	-930	1.1196	-932	907	-1.1034	-2.2230	-11.2464
64	894	-906	1.0800	-926	901	-1.0962	-2.1762	-9.0234
66	911	-909	1.0920	-929	906	-1.1010	-2.1930	-6.8472
68	942	-927	1.1214	-954	941	-1.1370	-2.2584	-4.6542
70	993	-976	1.1814	-1021	1003	-1.2144	-2.3958	-2.3958
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION STN-15

DESCRIPTION From DataMate

CURRENT SURVEY 5/25/2010 9:42:11 AM

INITIAL SURVEY 5/28/2009 7:29:24 PM

DATE PRINTED 6/8/2010 12:47:03 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-63	77	-0.0840	86	-110	0.1176	0.2016	-42.4248
6	-124	119	-0.1458	131	-155	0.1716	0.3174	-42.6264
8	-78	99	-0.1062	96	-107	0.1218	0.2280	-42.9438
10	26	-15	0.0246	-29	13	-0.0252	-0.0498	-43.1718
12	113	-114	0.1362	-149	121	-0.1620	-0.2982	-43.1220
14	138	-153	0.1746	-158	128	-0.1716	-0.3462	-42.8238
16	102	-93	0.1170	-155	125	-0.1680	-0.2850	-42.4776
18	92	-86	0.1068	-161	133	-0.1764	-0.2832	-42.1926
20	109	-96	0.1230	-166	139	-0.1830	-0.3060	-41.9094
22	163	-162	0.1950	-240	244	-0.2904	-0.4854	-41.6034
24	228	-226	0.2724	-321	292	-0.3678	-0.6402	-41.1180
26	259	-278	0.3222	-316	288	-0.3624	-0.6846	-40.4778
28	269	-267	0.3216	-306	288	-0.3564	-0.6780	-39.7932
30	282	-286	0.3408	-411	398	-0.4854	-0.8262	-39.1152
32	327	-347	0.4044	-521	491	-0.6072	-1.0116	-38.2890
34	426	-437	0.5178	-506	483	-0.5934	-1.1112	-37.2774
36	482	-487	0.5814	-471	443	-0.5484	-1.1298	-36.1662
38	535	-540	0.6450	-472	445	-0.5502	-1.1952	-35.0364
40	610	-583	0.7158	-482	465	-0.5682	-1.2840	-33.8412
42	658	-660	0.7908	-627	636	-0.7578	-1.5486	-32.5572
44	712	-709	0.8526	-850	834	-1.0104	-1.8630	-31.0086
46	760	-743	0.9018	-893	870	-1.0578	-1.9596	-29.1456
48	787	-787	0.9444	-852	828	-1.0080	-1.9524	-27.1860
50	846	-819	0.9990	-857	846	-1.0218	-2.0208	-25.2336
52	939	-935	1.1244	-974	970	-1.1664	-2.2908	-23.2128
54	1014	-1016	1.2180	-1035	1006	-1.2246	-2.4426	-20.9220
56	1030	-1012	1.2252	-1037	1010	-1.2282	-2.4534	-18.4794
58	1025	-1004	1.2174	-1036	1014	-1.2300	-2.4474	-16.0260
60	986	-960	1.1676	-978	953	-1.1586	-2.3262	-13.5786
62	936	-930	1.1196	-934	908	-1.1052	-2.2248	-11.2524
64	894	-906	1.0800	-927	900	-1.0962	-2.1762	-9.0276
66	911	-909	1.0920	-931	906	-1.1022	-2.1942	-6.8514
68	942	-927	1.1214	-955	941	-1.1376	-2.2590	-4.6572
70	993	-976	1.1814	-1023	1005	-1.2168	-2.3982	-2.3982
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION STN-15

DESCRIPTION From DataMate

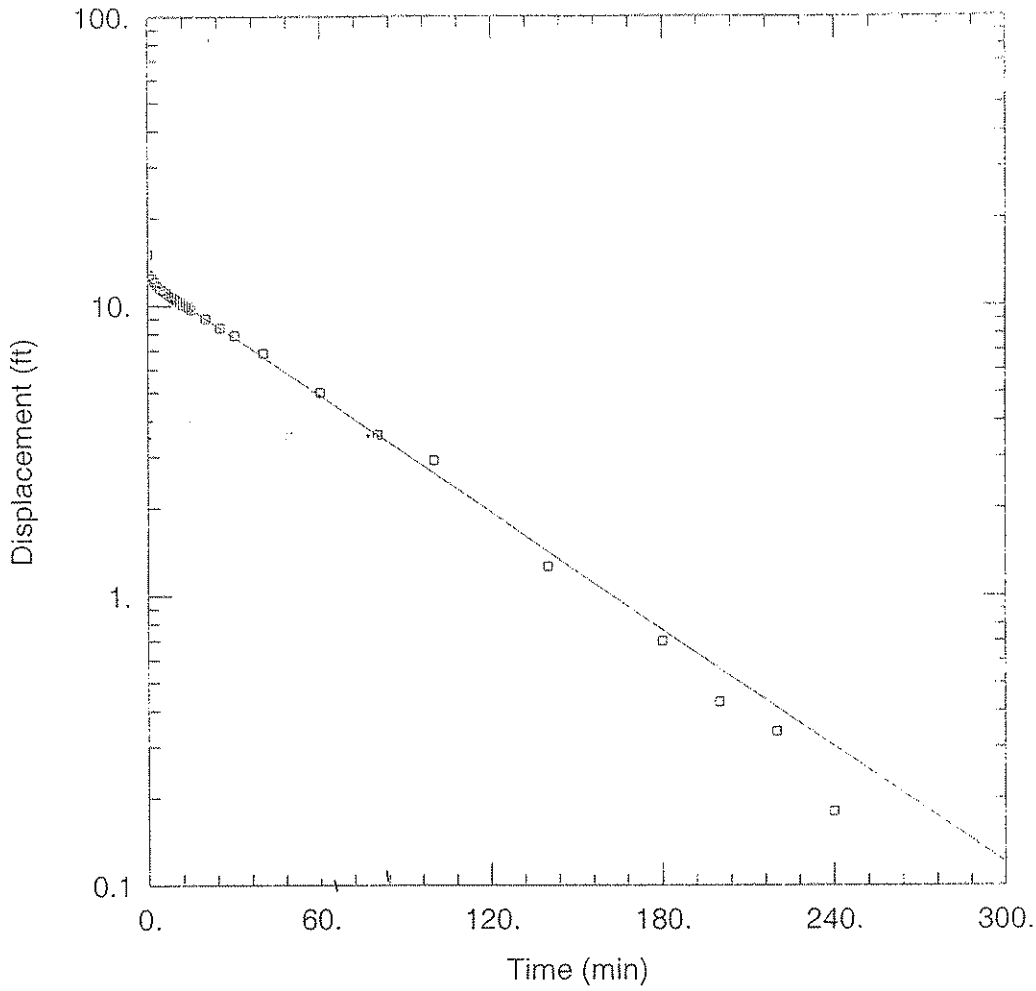
CURRENT SURVEY 6/8/2010 8:56:52 AM

INITIAL SURVEY 5/28/2009 7:29:24 PM

DATE PRINTED 6/8/2010 12:47:03 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-63	77	-0.0840	90	-115	0.1230	0.2070	-42.4314
6	-124	119	-0.1458	129	-155	0.1704	0.3162	-42.6384
8	-78	99	-0.1062	95	-109	0.1224	0.2286	-42.9546
10	26	-15	0.0246	-29	13	-0.0252	-0.0498	-43.1832
12	113	-114	0.1362	-151	122	-0.1638	-0.3000	-43.1334
14	138	-153	0.1746	-159	131	-0.1740	-0.3486	-42.8334
16	102	-93	0.1170	-155	126	-0.1686	-0.2856	-42.4848
18	92	-86	0.1068	-162	134	-0.1776	-0.2844	-42.1992
20	109	-96	0.1230	-169	140	-0.1854	-0.3084	-41.9148
22	163	-162	0.1950	-242	246	-0.2928	-0.4878	-41.6064
24	228	-226	0.2724	-320	293	-0.3678	-0.6402	-41.1186
26	259	-278	0.3222	-314	290	-0.3624	-0.6846	-40.4784
28	269	-267	0.3216	-309	286	-0.3570	-0.6786	-39.7938
30	282	-286	0.3408	-414	399	-0.4878	-0.8286	-39.1152
32	327	-347	0.4044	-523	492	-0.6090	-1.0134	-38.2866
34	426	-437	0.5178	-506	483	-0.5934	-1.1112	-37.2732
36	482	-487	0.5814	-469	444	-0.5478	-1.1292	-36.1620
38	535	-540	0.6450	-469	444	-0.5478	-1.1928	-35.0328
40	610	-583	0.7158	-481	463	-0.5664	-1.2822	-33.8400
42	658	-660	0.7908	-629	635	-0.7584	-1.5492	-32.5578
44	712	-709	0.8526	-853	835	-1.0128	-1.8654	-31.0086
46	760	-743	0.9018	-897	870	-1.0602	-1.9620	-29.1432
48	787	-787	0.9444	-851	827	-1.0068	-1.9512	-27.1812
50	846	-819	0.9990	-859	846	-1.0230	-2.0220	-25.2300
52	939	-935	1.1244	-974	972	-1.1676	-2.2920	-23.2080
54	1014	-1016	1.2180	-1034	1007	-1.2246	-2.4426	-20.9160
56	1030	-1012	1.2252	-1037	1011	-1.2288	-2.4540	-18.4734
58	1025	-1004	1.2174	-1037	1011	-1.2288	-2.4462	-16.0194
60	986	-960	1.1676	-978	951	-1.1574	-2.3250	-13.5732
62	936	-930	1.1196	-930	907	-1.1022	-2.2218	-11.2482
64	894	-906	1.0800	-925	900	-1.0950	-2.1750	-9.0264
66	911	-909	1.0920	-931	906	-1.1022	-2.1942	-6.8514
68	942	-927	1.1214	-956	940	-1.1376	-2.2590	-4.6572
70	993	-976	1.1814	-1024	1004	-1.2168	-2.3982	-2.3982
72	0	0	0.0000	0	0	0.0000	0.0000	0.0000



PZ-2

Data Set: V:\...\PZ-2.aqt
Date: 03/25/09 Time: 16:05:34

PROJECT INFORMATION

Company: Stantec
Client: TVA
Project: 171468118
Test Well: PZ-2
Test Date: 3/19/09

AQUIFER DATA

Saturated Thickness: 5.57 ft Anisotropy Ratio (Kz/Kr): 0.33

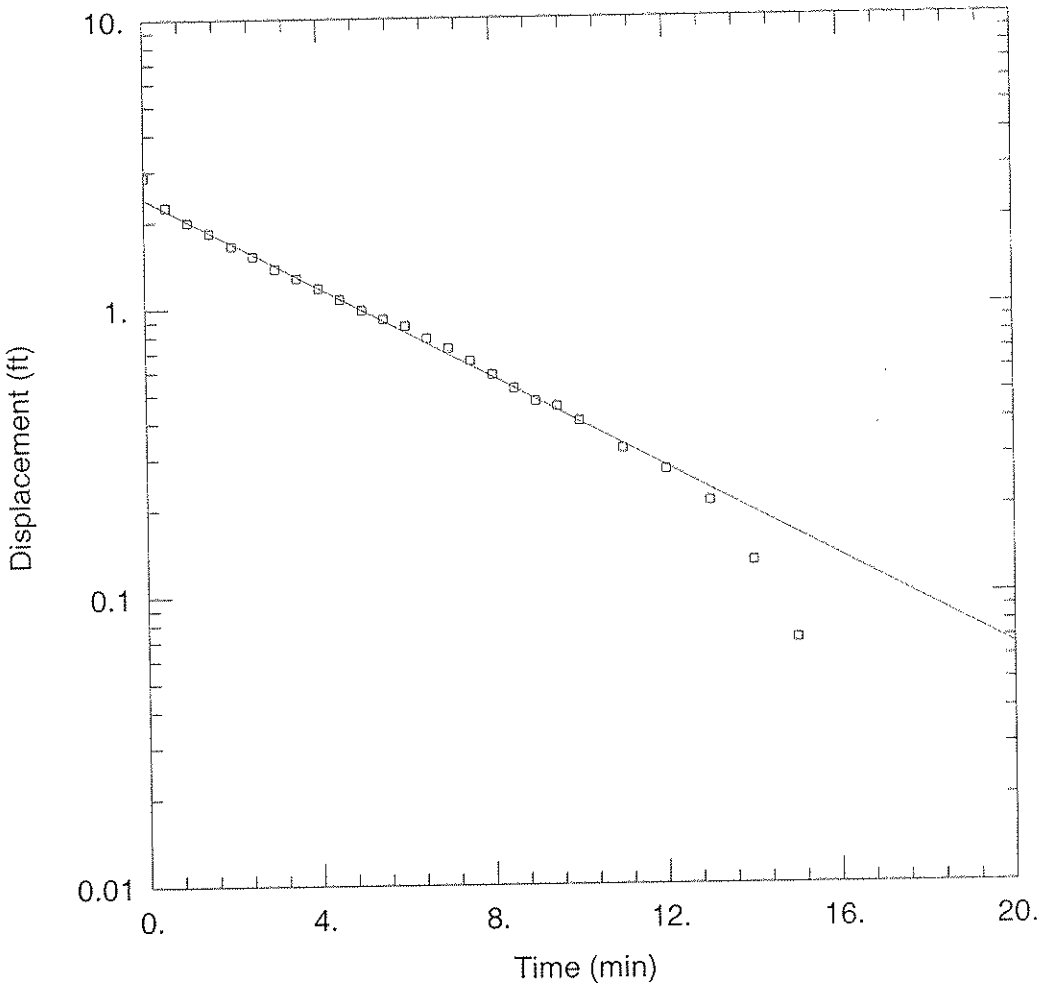
WELL DATA (PZ-2)

Initial Displacement: 15.01 ft
Total Well Penetration Depth: 3.79 ft
Casing Radius: 0.0301 ft
Static Water Column Height: 3.79 ft
Screen Length: 2. ft
Well Radius: 0.0251 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 6.685E-6 cm/sec y0 = 12.32 ft



PZ-2A

Data Set: V:\...\PZ-2A.aqt
Date: 03/25/09
Time: 16:04:51

PROJECT INFORMATION

Company: Stantec
Client: TVA
Project: 171468118
Test Well: PZ-2A
Test Date: 3/19/09

AQUIFER DATA

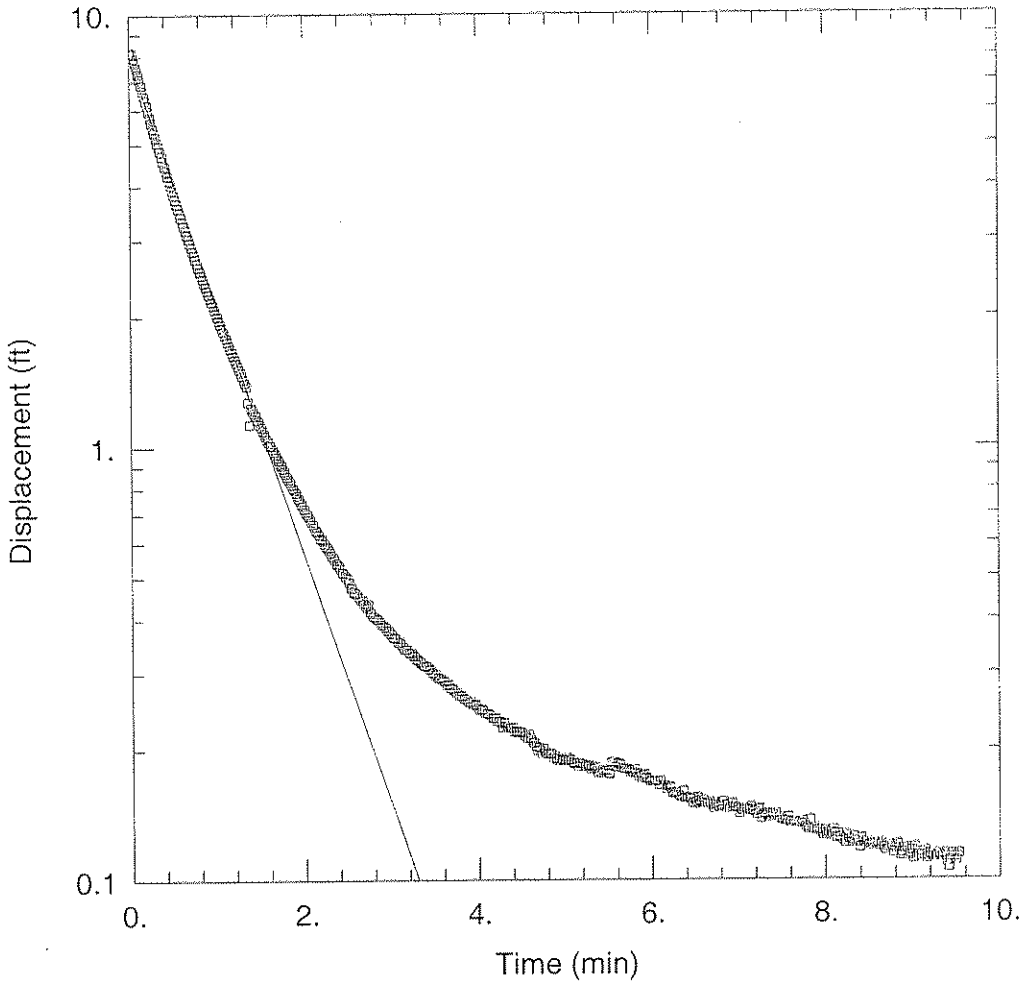
Saturated Thickness: 61.5 ft
Anisotropy Ratio (Kz/Kr): 0.33

WELL DATA (PZ-2A)

Initial Displacement: 2.86 ft
Total Well Penetration Depth: 31.6 ft
Casing Radius: 0.0301 ft
Static Water Column Height: 55.8 ft
Screen Length: 2. ft
Well Radius: 0.0251 ft

SOLUTION

Aquifer Model: Confined
K = 9.45E-5 cm/sec
Solution Method: Bouwer-Rice
y0 = 2.412 ft



PZ-4

Data Set: V:\...\PZ-4.aqt
Date: 03/25/09 Time: 16:23:16

PROJECT INFORMATION

Company: Stantec
Client: TVA
Project: 171468118
Test Well: PZ-4
Test Date: 3/19/09

AQUIFER DATA

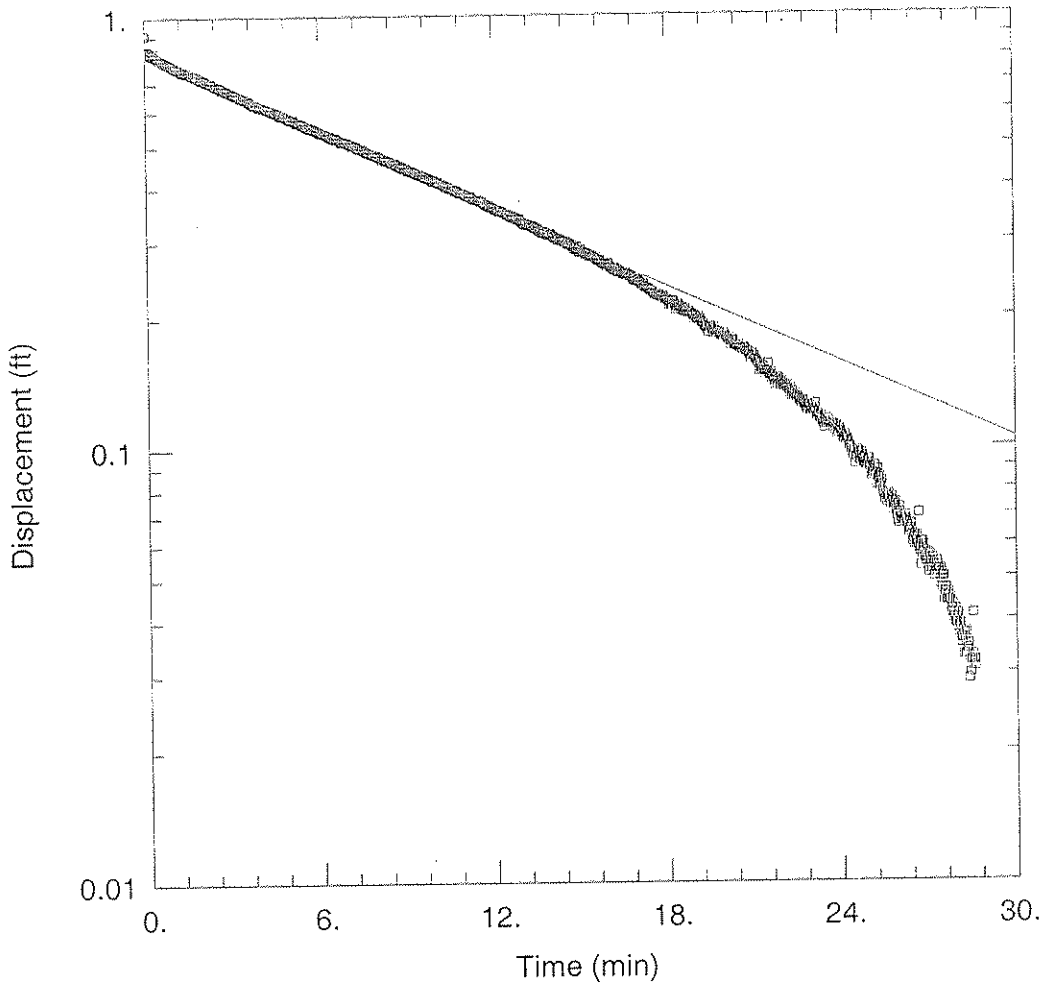
Saturated Thickness: 67.77 ft Anisotropy Ratio (Kz/Kr): 0.33

WELL DATA (PZ-4)

Initial Displacement: 8.22 ft
Total Well Penetration Depth: 41.07 ft
Casing Radius: 0.0335 ft
Static Water Column Height: 41.07 ft
Screen Length: 2. ft
Well Radius: 0.0251 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0007822 cm/sec
y0 = 7.94 ft



WELL TEST ANALYSIS

Data Set: V:\...\PZ-5.aqt
Date: 03/30/09
Time: 17:12:58

PROJECT INFORMATION

Company: Stantec
Client: TVA
Project: 171468118
Test Well: PZ-5
Test Date: 3/19/09

AQUIFER DATA

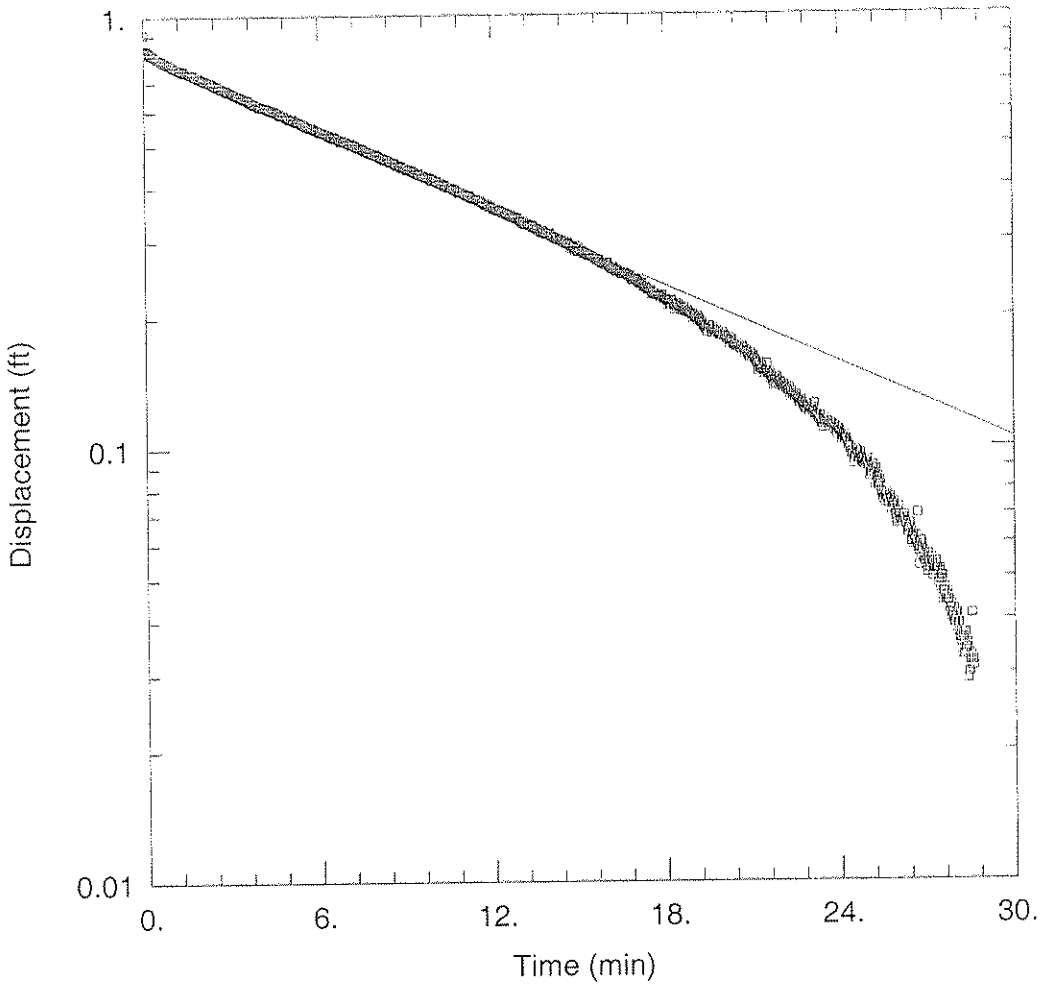
Saturated Thickness: 53.39 ft
Anisotropy Ratio (Kz/Kr): 0.33

WELL DATA (PZ-5)

Initial Displacement: 0.911 ft
Total Well Penetration Depth: 53.39 ft
Casing Radius: 0.0335 ft
Static Water Column Height: 53.08 ft
Screen Length: 2. ft
Well Radius: 0.0251 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 4.973E-5 cm/sec
y0 = 0.8053 ft



PZ-5

Data Set: V:\...\PZ-5.aqt
Date: 03/30/09
Time: 17:13:13

PROJECT INFORMATION

Company: Stantec
Client: TVA
Project: 171468118
Test Well: PZ-5
Test Date: 3/19/09

AQUIFER DATA

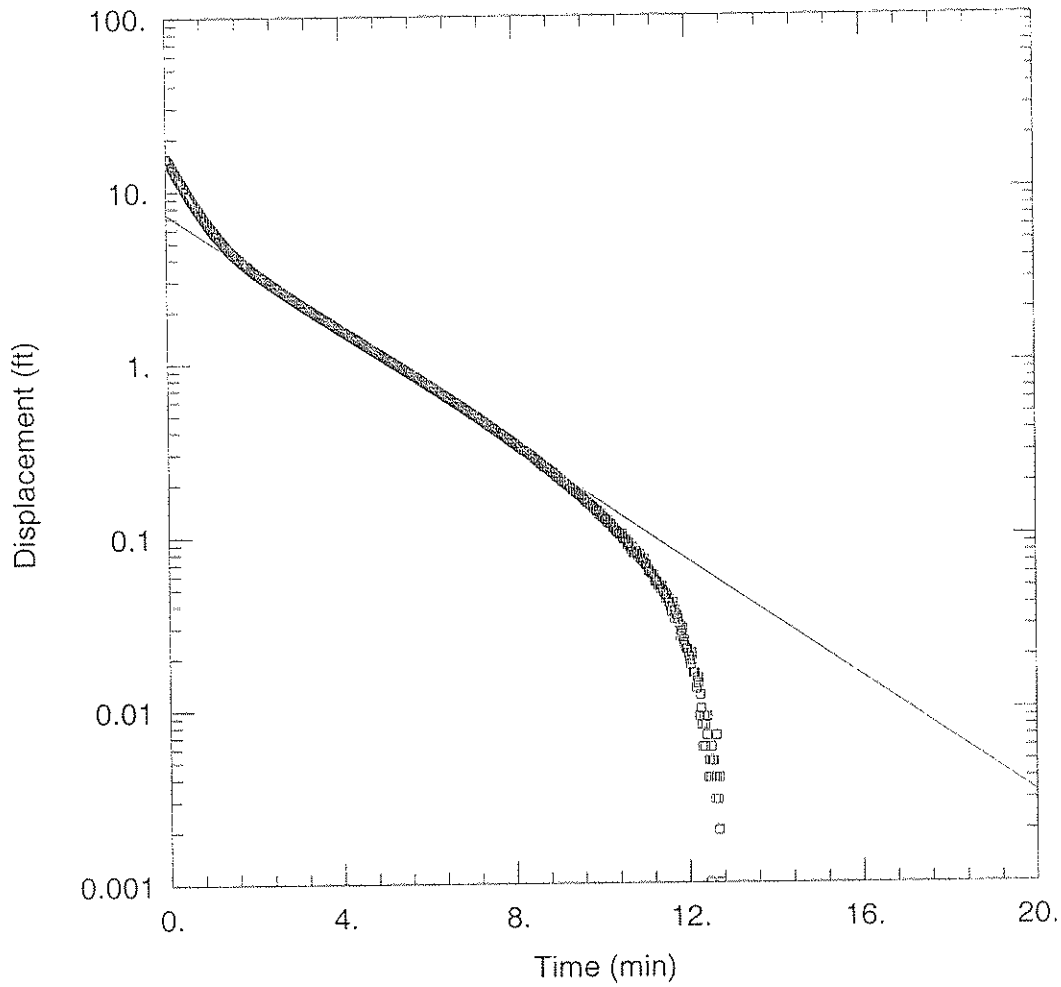
Saturated Thickness: 53.39 ft
Anisotropy Ratio (Kz/Kr): 0.33

WELL DATA (PZ-5)

Initial Displacement: 0.911 ft
Total Well Penetration Depth: 53.39 ft
Casing Radius: 0.0335 ft
Static Water Column Height: 53.08 ft
Screen Length: 2. ft
Well Radius: 0.0251 ft

SOLUTION

Aquifer Model: Unconfined
K = 4.973E-5 cm/sec
Solution Method: Bouwer-Rice
y0 = 0.8053 ft



PZ-6

Data Set: V:\...\PZ-6.aqt
Date: 03/30/09 Time: 17:19:12

PROJECT INFORMATION

Company: Stantec
Client: TVA
Project: 171468118
Test Well: PZ-6
Test Date: 3/19/09

AQUIFER DATA

Saturated Thickness: 58.5 ft Anisotropy Ratio (Kz/Kr): 0.33

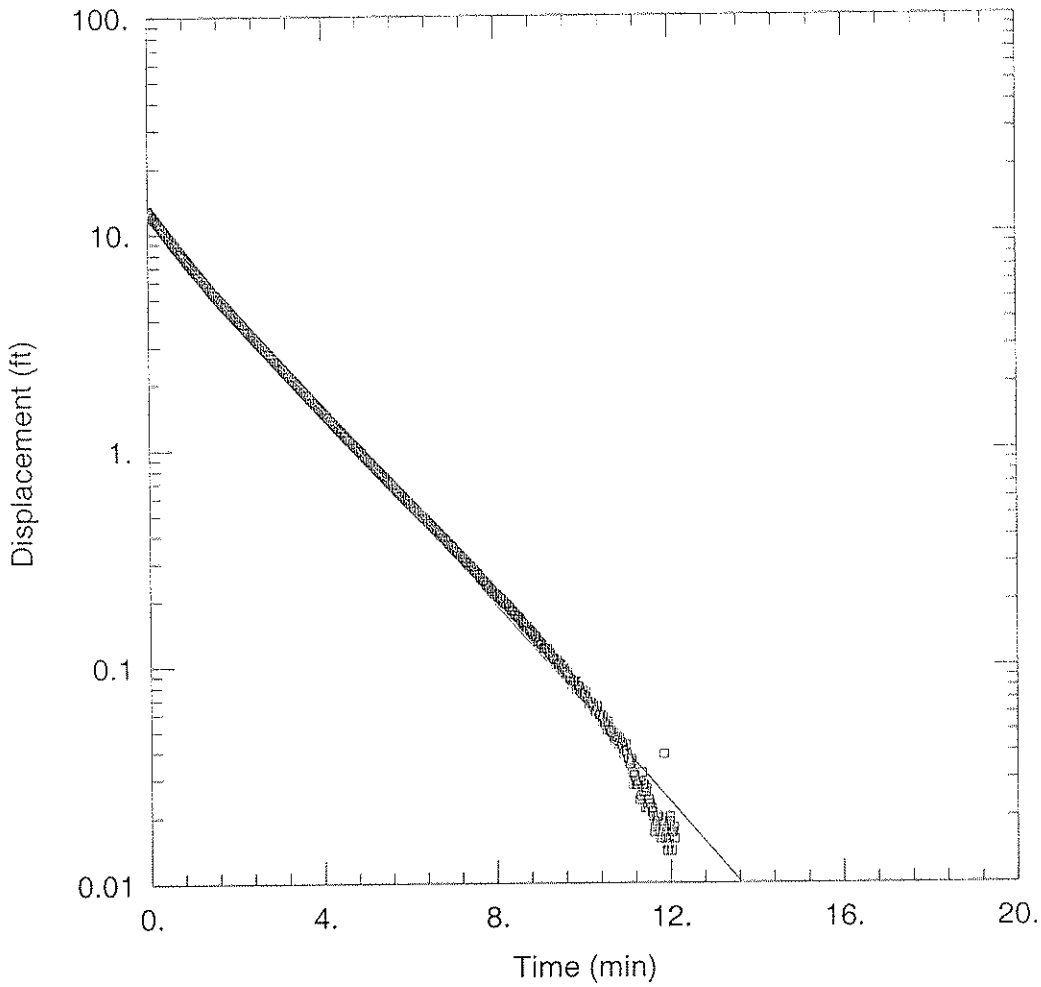
WELL DATA (PZ-6)

Initial Displacement: 15.52 ft
Total Well Penetration Depth: 56.89 ft
Casing Radius: 0.0335 ft
Static Water Column Height: 54.39 ft
Screen Length: 2. ft
Well Radius: 0.0251 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.000243 cm/sec
y0 = 7.4 ft



PZ-6A

Data Set: V:\...\PZ-6A.aqt
Date: 03/30/09 Time: 17:24:56

PROJECT INFORMATION

Company: Stantec
Client: TVA
Project: 171468118
Test Well: PZ-6A
Test Date: 3/19/09

AQUIFER DATA

Saturated Thickness: 27.51 ft Anisotropy Ratio (Kz/Kr): 0.33

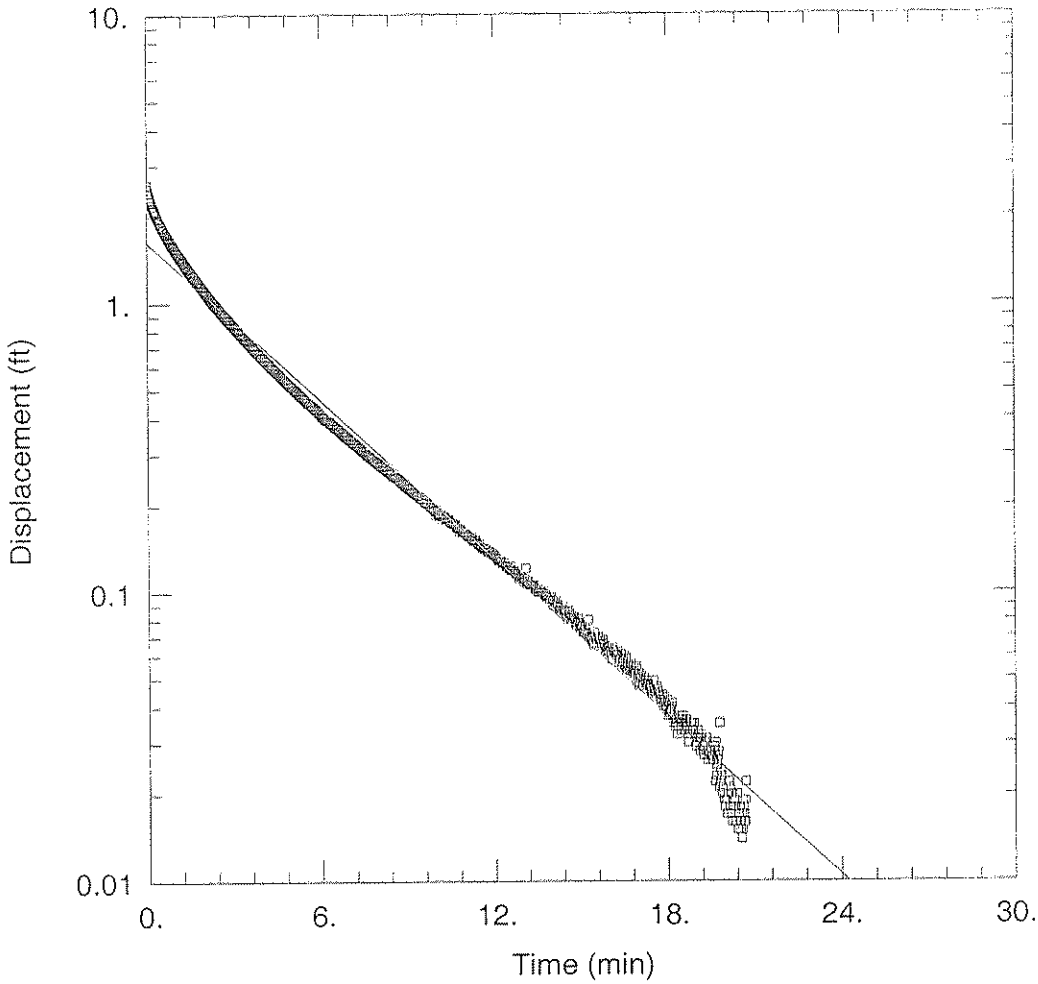
WELL DATA (PZ-6A)

Initial Displacement: 12.88 ft
Total Well Penetration Depth: 24.62 ft
Casing Radius: 0.0335 ft
Static Water Column Height: 24.62 ft
Screen Length: 2. ft
Well Radius: 0.0251 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.000301 cm/sec
y0 = 12.45 ft



PZ-7

Data Set: V:\...\PZ-7.aqt
Date: 03/30/09 Time: 17:28:52

PROJECT INFORMATION

Company: Stantec
Client: TVA
Project: 171468118
Test Well: PZ-7
Test Date: 3/19/09

AQUIFER DATA

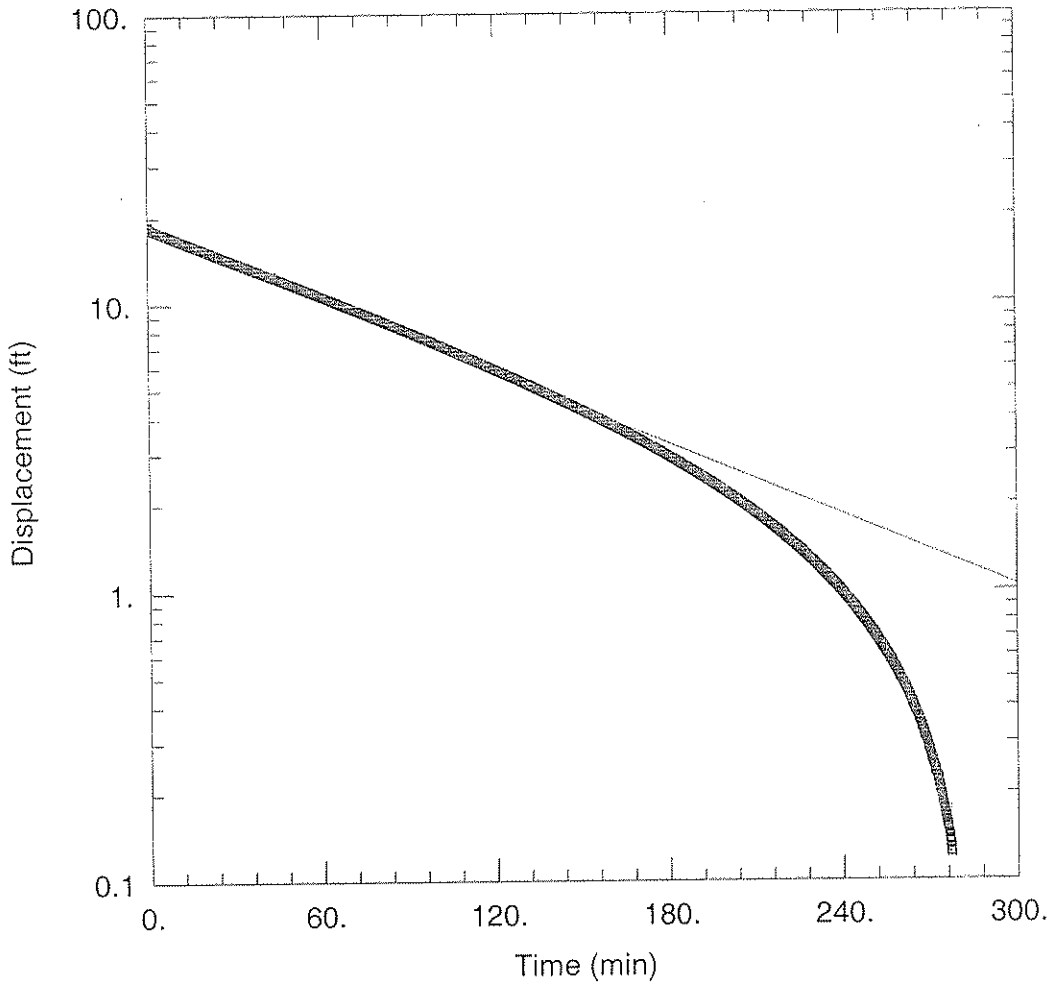
Saturated Thickness: 35.51 ft Anisotropy Ratio (Kz/Kr): 0.33

WELL DATA (PZ-7)

Initial Displacement: 2.588 ft
Total Well Penetration Depth: 9.85 ft
Casing Radius: 0.0335 ft
Static Water Column Height: 9.85 ft
Screen Length: 2. ft
Well Radius: 0.0251 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0001086 cm/sec
y0 = 1.629 ft



PZ-8A

Data Set: V:\...\PZ-8A.aqt
Date: 03/30/09 Time: 17:38:04

PROJECT INFORMATION

Company: Stantec
Client: TVA
Project: 171468118
Test Well: PZ-8A
Test Date: 3/19/09

AQUIFER DATA

Saturated Thickness: 35.02 ft Anisotropy Ratio (Kz/Kr): 0.33

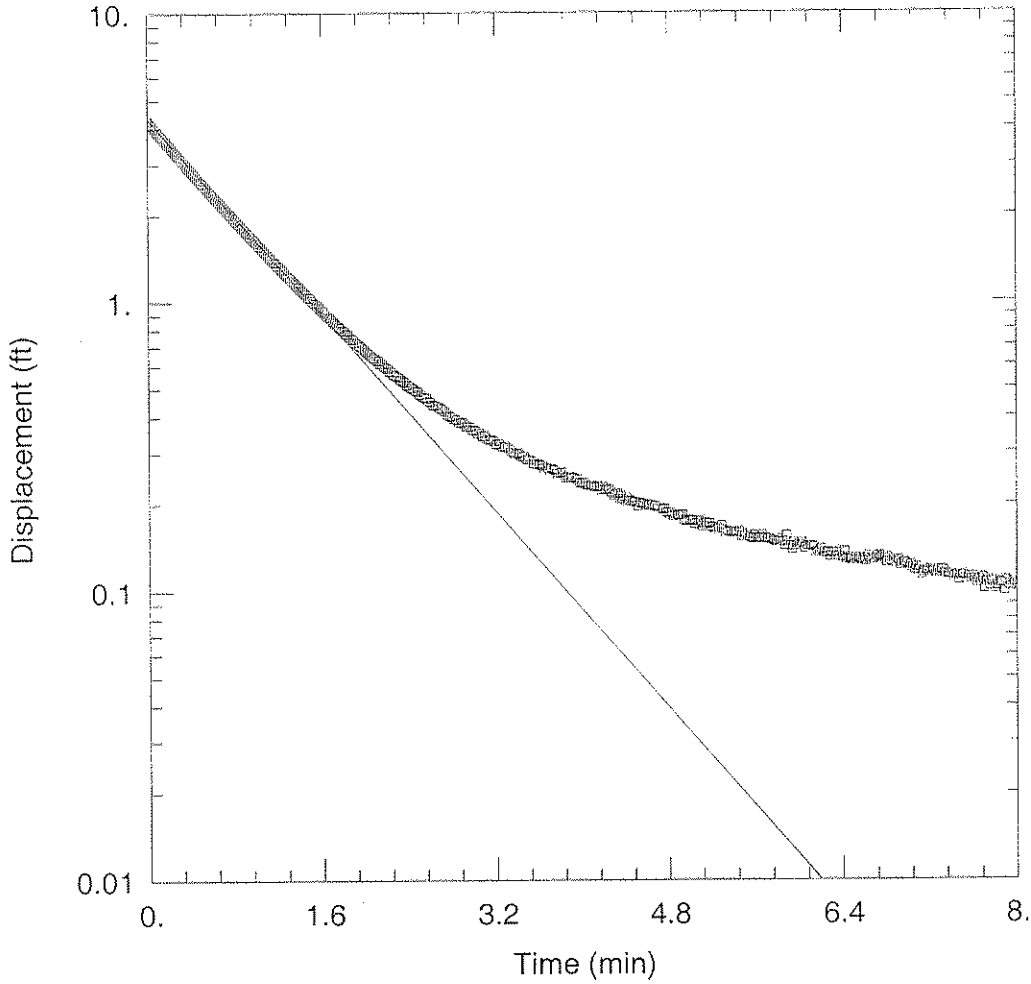
WELL DATA (PZ-8A)

Initial Displacement: 18.79 ft
Total Well Penetration Depth: 33.59 ft
Casing Radius: 0.0335 ft
Static Water Column Height: 33.59 ft
Screen Length: 2. ft
Well Radius: 0.0251 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 5.739E-6 cm/sec
y0 = 17.9 ft



PZ-9

Data Set: V:\...\PZ-9.aqt
Date: 03/30/09 Time: 17:43:25

PROJECT INFORMATION

Company: Stantec
Client: TVA
Project: 171468118
Test Well: PZ-9
Test Date: 3/19/09

AQUIFER DATA

Saturated Thickness: 40.56 ft Anisotropy Ratio (Kz/Kr): 0.33

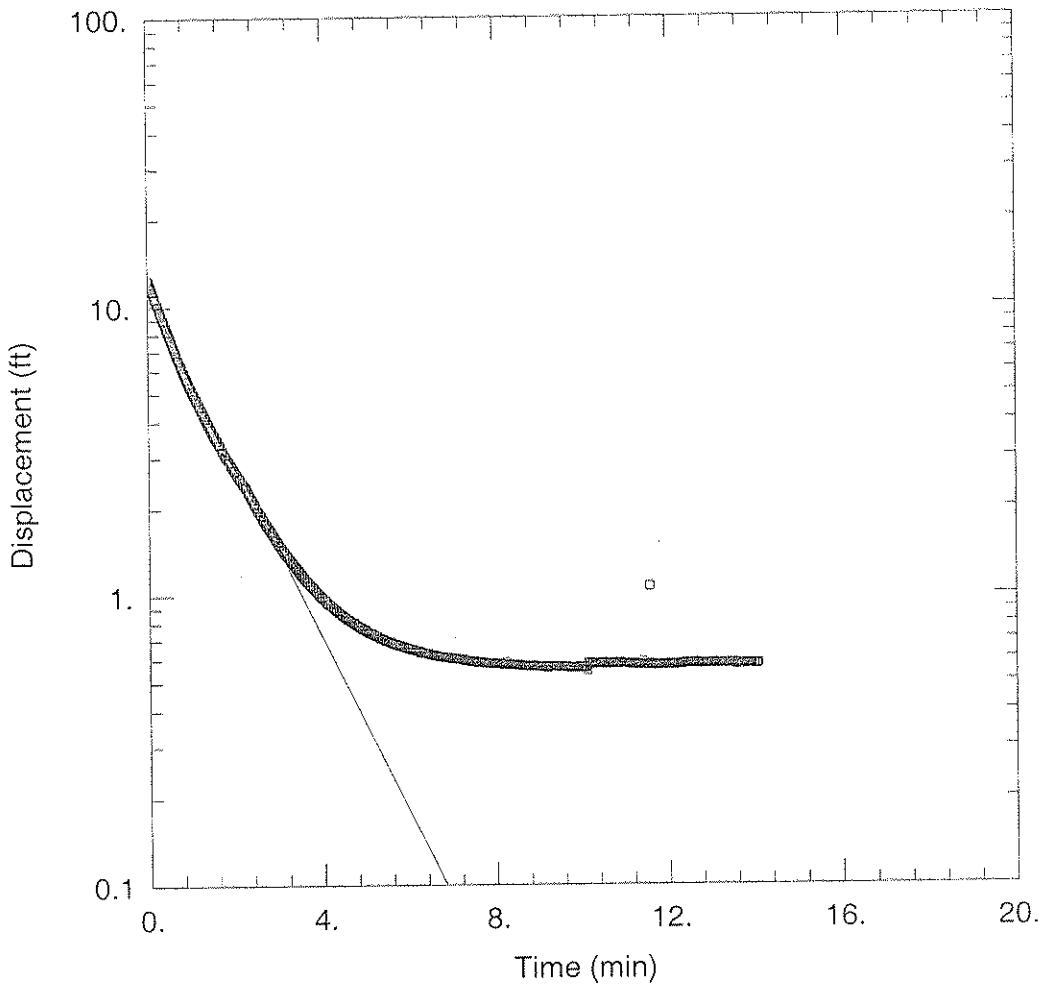
WELL DATA (PZ-9)

Initial Displacement: 4.264 ft
Total Well Penetration Depth: 40.52 ft
Casing Radius: 0.0335 ft
Static Water Column Height: 40.52 ft
Screen Length: 2. ft
Well Radius: 0.0251 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0006786 cm/sec
y0 = 4.336 ft



PZ-10

Data Set: V:\...\PZ-10.aqt
Date: 03/30/09 Time: 17:50:37

PROJECT INFORMATION

Company: Stantec
Client: TVA
Project: 171468118
Test Well: PZ-10
Test Date: 3/19/09

AQUIFER DATA

Saturated Thickness: 24.5 ft Anisotropy Ratio (Kz/Kr): 0.33

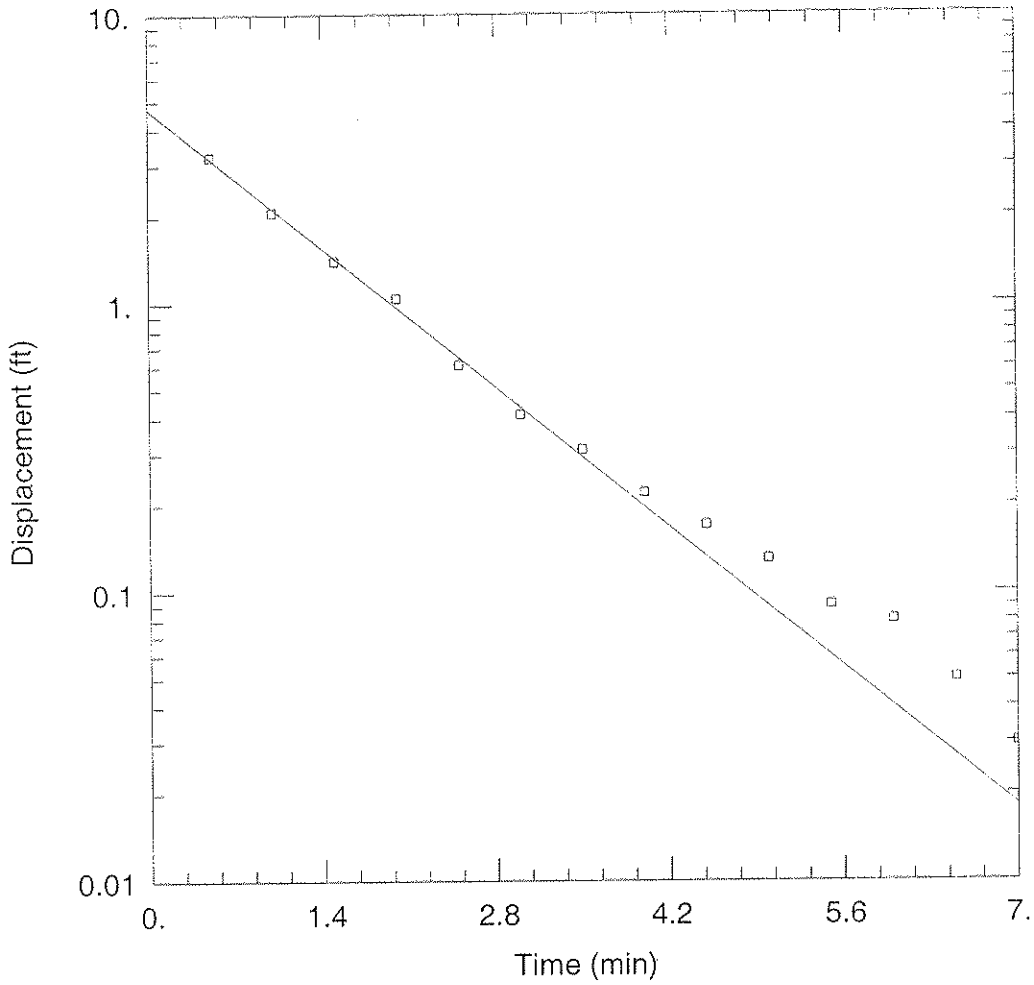
WELL DATA (PZ-10)

Initial Displacement: 12.43 ft
Total Well Penetration Depth: 4.14 ft
Casing Radius: 0.0335 ft
Static Water Column Height: 21.41 ft
Screen Length: 2. ft
Well Radius: 0.0251 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.0003242 cm/sec y0 = 11.33 ft



PZ-12

Data Set: V:\...\PZ-12.aqt
Date: 03/30/09 Time: 17:55:50

PROJECT INFORMATION

Company: Stantec
Client: TVA
Project: 171468118
Test Well: PZ-12
Test Date: 3/19/09

AQUIFER DATA

Saturated Thickness: 11.61 ft Anisotropy Ratio (Kz/Kr): 0.33

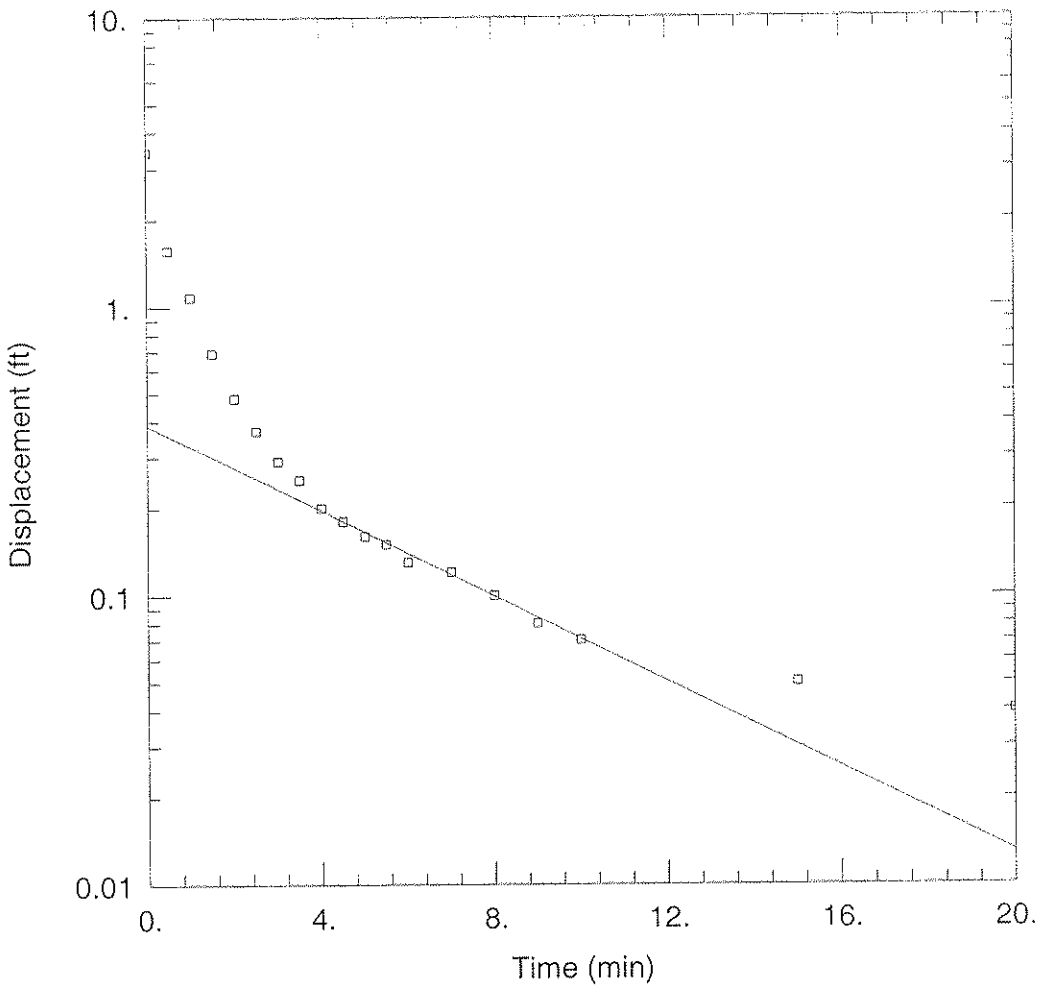
WELL DATA (PZ-12)

Initial Displacement: 14.06 ft
Total Well Penetration Depth: 8.74 ft
Casing Radius: 0.0301 ft
Static Water Column Height: 8.74 ft
Screen Length: 2. ft
Well Radius: 0.0251 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.000376 cm/sec
y0 = 4.729 ft



PZ-13

Data Set: V:\...\PZ-13.aqt
Date: 03/30/09 Time: 18:00:10

PROJECT INFORMATION

Company: Stantec
Client: TVA
Project: 171468118
Test Well: PZ-13
Test Date: 3/19/09

AQUIFER DATA

Saturated Thickness: 29.77 ft Anisotropy Ratio (Kz/Kr): 0.33

WELL DATA (PZ-13)

Initial Displacement: 3.42 ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.0301 ft
Static Water Column Height: 13. ft
Screen Length: 2. ft
Well Radius: 0.0251 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 8.218E-5 cm/sec
y0 = 0.387 ft

Appendix F

Results of Laboratory Testing

Stantec

Moisture Content of Soil

Dried at 40°C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-1, 0.0'-1.5'	160	2/25/09	Hom	3/4"	2	3/4"	No	20.75	120.17	107.24	14.9
B-1, 1.5'-3.0'	161	2/25/09	Hom	No. 10			Yes	18.46	83.66	74.63	16.1
B-1, 3.0'-4.5'	162	2/25/09	Hom	No. 10			Yes	20.80	110.34	95.70	19.5
B-1, 4.5'-6.0'	163	2/25/09	Hom	No. 10			Yes	20.42	117.93	98.67	24.6
B-1, 6.0'-7.5'	164	2/25/09	Hom	3/4"	1	3/4"	No	19.33	111.72	96.91	19.1
B-1, 7.5'-9.0'	165	2/25/09	Hom	No. 10			Yes	21.43	130.34	110.30	22.5
B-1, 9.0'-10.5'	166	2/25/09	Hom	3/4"			No	21.13	121.28	102.40	23.2
B-1, 10.5'-12.0'	167	2/25/09	Hom	No. 10			Yes	21.17	131.38	110.14	23.9
B-1, 12.0'-13.5'	168	2/25/09	Hom	3/8"			No	21.54	131.19	110.12	23.8
B-1, 13.5'-15.0'	169	2/25/09	Hom	No. 10			Yes	20.61	107.06	91.01	22.8
B-1, 15.0'-16.5'	170	2/25/09	Hom	No. 10			Yes	20.57	117.01	96.80	26.5
B-1, 16.5'-18.0'	171	2/25/09	Hom	No. 10			Yes	21.04	124.65	105.85	22.2
B-1, 18.0'-19.5'	172	2/25/09	Hom	No. 10			Yes	20.84	135.47	112.69	24.8
B-1, 19.5'-21.0'	173	2/25/09	Hom	3/8"			No	21.29	144.72	120.96	23.8
B-1, 21.0'-22.5'	174	2/25/09	Hom	No. 10			Yes	20.37	114.03	97.13	22.0
B-1, 22.5'-24.0'	175	2/25/09	Hom	No. 10			Yes	19.99	110.12	94.72	20.6
B-1, 24.0'-25.5'	176	2/25/09	Hom	No. 10			Yes	21.12	124.82	106.59	21.3
B-1, 25.5'-27.0'	177	2/25/09	Hom	No. 10			Yes	21.10	135.09	113.75	23.0
B-1, 27.0'-28.5'	178	2/25/09	Hom	No. 10			Yes	21.00	116.03	98.19	23.1
B-1, 28.5'-30.0'	179	2/25/09	Hom	No. 10			Yes	19.50	120.64	100.87	24.3
B-1, 30.0'-31.5'	180	2/25/09	Hom	No. 10			Yes	20.33	118.40	99.86	23.3
B-1, 31.5'-33.0'	181	2/25/09	Hom	No. 10			Yes	18.52	104.22	89.02	21.6
B-1, 33.0'-34.5'	182	2/25/09	Hom	No. 10			Yes	20.43	109.39	92.31	23.8
B-1, 34.5'-36.0'	183	2/25/09	Hom	No. 10			Yes	20.51	118.67	100.75	22.3
B-1, 36.0'-37.5'	184	2/25/09	Hom	No. 10			Yes	18.61	111.77	93.66	24.1
B-1, 37.5'-39.0'	185	2/25/09	Hom	No. 10			Yes	20.34	106.63	90.59	22.8
B-1, 39.0'-40.5'	186	2/25/09	Hom	No. 10			Yes	23.66	149.75	125.88	23.4
B-1, 40.5'-42.0'	187	2/25/09	Hom	No. 10			Yes	21.12	118.92	101.09	22.3

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Moisture Content of Soil

Dried at 40°C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-1, 42.0'-43.5'	188	2/25/09	Hom	No. 10			Yes	21.16	127.59	107.57	23.2
B-1, 43.5'-45.0'	189	2/25/09	Len	No. 10			Yes	23.41	140.27	120.34	20.6
B-1, 45.0'-46.5'	190	2/25/09	Hom	No. 10			Yes	20.46	113.94	96.22	23.4
B-1, 46.5'-48.0'	191	2/25/09	Hom	No. 10			Yes	20.79	118.89	102.52	20.0
B-1, 48.0'-49.5'	192	2/25/09	Hom	No. 10			Yes	21.35	124.59	104.64	24.0
B-1, 49.5'-51.0'	193	2/25/09	Hom	No. 10			Yes	13.72	131.37	108.19	24.5
B-1, 51.0'-52.5'	194	2/25/09	Hom	No. 10			Yes	20.15	117.27	94.87	30.0
B-1, 52.5'-54.0'	195	2/25/09	Hom	No. 10			Yes	21.33	137.31	112.47	27.3
B-1, 54.0'-55.5'	196	2/25/09	Hom	No. 10			Yes	20.70	144.30	118.58	26.3
B-1, 55.5'-57.0'	197	2/25/09	Hom	No. 10			Yes	19.30	131.02	106.16	28.6
B-1, 57.0'-58.5'	198	3/30/09									
B-1, 58.5'-60.0'	199	3/30/09									
B-1, 60.0'-61.5'	200	3/30/09									
B-1, 61.5'-63.0'	201	3/30/09									
B-1, 63.0'-64.5'	202	3/30/09									
B-1, 64.5'-66.0'	203	3/30/09									
B-1, 66.0'-67.5'	204	3/30/09									
B-1, 67.5'-69.0'	205	3/30/09									
B-1, 80.0'-81.5'	206	3/30/09									
B-1, 90.0'-91.5'	207	3/30/09									
B-1, 100.0'-101.5'	208	3/30/09									
B-1, 110.0'-111.5'	209	3/30/09									
B-2, 0.0'-1.5'	210	2/25/09	Hom	3/8"			No	22.37	136.78	115.92	22.3
B-2, 1.5'-3.0'	211	2/25/09	Hom	1 1/2"	1	1 1/2"	No	18.83	111.42	91.61	27.2
B-2, 3.0'-4.5'	212	2/25/09	Hom	No. 10			Yes	21.06	123.72	106.02	20.8
B-2, 4.5'-6.0'	213	2/25/09	Lam	No. 10			Yes	21.51	138.68	118.40	20.9
B-2, 6.0'-7.5'	214	2/25/09	Hom	No. 10			Yes	20.99	117.69	102.10	19.2
B-2, 7.5'-9.0'	215	2/25/09	Hom	No. 10			Yes	21.39	125.31	110.77	16.3
B-2, 9.0'-10.5'	216	2/25/09	Hom	No. 10			Yes	21.20	122.98	105.89	20.2
B-2, 10.5'-12.0'	217	2/25/09	Hom	No. 10			Yes	21.15	119.91	104.77	18.1
B-2, 12.0'-13.5'	218	2/25/09	Hom	No. 10			Yes	21.45	134.80	117.56	17.9

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Moisture Content of Soil

Dried at 40°C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-2, 13.5'-15.0'	219	2/25/09	Hom	No. 10			Yes	20.27	134.23	117.95	16.7
B-2, 15.0'-16.5'	220	2/25/09	Lam	No. 10			Yes	20.78	129.44	111.24	20.1
B-2, 16.5'-18.0'	221	2/25/09	Lam	No. 10			Yes	21.73	119.01	101.48	22.0
B-2, 18.0'-19.5'	222	2/25/09	Hom	No. 10			Yes	20.60	118.98	102.15	20.6
B-2, 19.5'-21.0'	223	2/25/09	Hom	No. 10			Yes	19.07	108.63	91.84	23.1
B-2, 21.0'-22.5'	224	2/25/09	Hom	No. 10			Yes	20.34	118.86	101.89	20.8
B-2, 22.5'-24.0'	225	2/25/09	Lam	No. 10			Yes	21.88	122.79	105.06	21.3
B-2, 24.0'-25.5'	226	2/25/09	Hom	No. 10			Yes	20.32	124.08	103.77	24.3
B-2, 25.5'-27.0'	227	2/25/09	Lam	No. 10			Yes	20.56	142.74	117.09	26.6
B-2, 27.0'-28.5'	228	2/25/09	Lam	No. 10			Yes	21.09	120.71	103.14	21.4
B-2, 28.5'-30.0'	229	2/25/09	Lam	No. 10			Yes	21.17	130.16	110.97	21.4
B-2, 30.0'-31.5'	230	3/30/09									
B-2, 31.5'-33.0'	231	3/30/09									
B-2, 33.0'-34.5'	232	3/30/09									
B-2, 34.5'-36.0'	233	3/30/09									
B-2, 36.0'-37.5'	234	3/30/09									
B-2, 37.5'-39.0'	235	3/30/09									
B-2, 39.0'-40.5'	236	3/30/09									
B-2, 40.5'-42.0'	237	3/30/09									
B-2, 42.0'-43.5'	238	3/30/09									
B-2, 43.5'-45.0'	239	3/30/09									
B-2, 45.0'-46.5'	240	3/30/09									
B-2, 46.5'-48.0'	241	3/30/09									
B-2, 48.0'-49.5'	242	3/30/09									
B-2, 49.5'-51.0'	243	3/30/09									
B-2, 51.0'-52.5'	244	3/30/09									
B-2, 52.5'-54.0'	245	3/30/09									
B-2, 54.0'-55.5'	246	3/30/09									
B-2, 55.5'-57.0'	247	3/30/09									
B-2, 57.0'-58.5'	248	3/30/09									
B-2, 58.5'-60.0'	249	3/30/09									

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Moisture Content of Soil

Dried at 40°C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-2, 60.0'-61.5'	250	3/30/09									
B-2, 61.5'-63.0'	251	3/30/09									
B-2, 63.0'-64.5'	252	3/30/09									
B-2, 64.5'-66.0'	253	3/30/09									
B-2, 66.0'-67.5'	254	3/30/09									
B-2, 67.5'-69.0'	255	3/30/09									
B-2, 69.0'-70.5'	256	3/30/09									
B-2, 70.5'-72.0'	257	3/30/09									
B-2, 72.0'-73.5'	258	3/30/09									
B-2, 73.5'-75.0'	259	3/30/09									
B-2, 75.0'-76.5'	260	3/30/09									
B-2, 76.5'-78.0'	261	3/30/09									
B-2, 78.0'-79.5'	262	3/30/09									
B-2, 79.5'-81.0'	263	3/30/09									
B-2, 81.0'-82.5'	264	3/30/09									
B-2, 82.5'-84.0'	265	3/30/09									
B-2, 84.0'-85.5'	266	3/30/09									
B-2, 85.5'-87.0'	267	3/30/09									
B-2, 87.0'-88.5'	268	3/30/09									
B-2, 88.5'-90.0'	269	3/30/09									
B-2, 90.0'-91.5'	270	3/30/09									
B-3, 0.0'-1.5'	271	3/30/09									
B-3, 1.5'-3.0'	272	3/30/09									
B-3, 3.0'-4.5'	273	3/30/09									
B-3, 4.5'-6.0'	274	3/30/09									
B-3, 6.0'-7.5'	275	3/30/09									
B-3, 7.5'-9.0'	276	3/30/09									
B-3, 9.0'-10.5'	277	3/30/09									
B-3, 10.5'-12.0'	278	3/30/09									
B-3, 12.0'-13.5'	279	3/30/09									
B-3, 13.5'-15.0'	280	3/30/09									

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Moisture Content of Soil

Dried at 40°C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded		Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
					Amount	Size					
B-3, 15.0'-16.5'	281	3/30/09									
B-3, 16.5'-18.0'	282	3/30/09									
B-3, 18.0'-19.5'	283	3/30/09									
B-3, 19.5'-21.0'	284	3/30/09									
B-3, 21.0'-22.5'	285	3/30/09									
B-3, 22.5'-24.0'	286	3/30/09									
B-3, 24.0'-25.5'	287	3/30/09									
B-3, 25.5'-27.0'	288	3/30/09									
B-3, 27.0'-28.5'	289	3/30/09									
B-3, 28.5'-30.0'	290	3/30/09									
B-3, 30.0'-31.5'	291	3/30/09									
B-3, 31.5'-33.0'	292	3/30/09									
B-3, 33.0'-34.5'	293	3/30/09									
B-3, 34.5'-36.0'	294	3/30/09									
B-3, 36.0'-37.5'	295	3/30/09									
B-3, 37.5'-39.0'	296	3/30/09									
B-3, 39.0'-40.5'	297	3/30/09									
B-3, 49.0'-50.5'	298	3/30/09									
B-3, 59.0'-60.5'	299	3/30/09									
B-3, 69.0'-70.5'	300	3/30/09									
B-5, 0.0'-1.5'	301	3/30/09									
B-5, 1.5'-3.0'	302	3/30/09									
B-5, 3.0'-4.5'	303	3/30/09									
B-5, 4.5'-6.0'	304	3/30/09									
B-5, 6.0'-7.5'	305	3/30/09									
B-5, 7.5'-9.0'	306	3/30/09									
B-5, 9.0'-10.5'	307	3/30/09									
B-5, 10.5'-12.0'	308	3/30/09									
B-5, 12.0'-13.5'	309	3/30/09									
B-5, 13.5'-15.0'	310	3/30/09									
B-5, 15.0'-16.5'	311	3/30/09									

Stantec

Moisture Content of Soil

Dried at 40°C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-5, 20.0'-21.5'	312	3/30/09									
B-5, 25.0'-26.5'	313	3/30/09									
B-5, 30.0'-31.5'	314	3/30/09									
B-11, 0.0'-1.5'	315	3/3/09	Hom	3/4"			No	43.52	212.93	180.45	23.7
B-11, 1.5'-3.0'	316	3/3/09	Hom	No. 10			Yes	44.11	103.95	95.09	17.4
B-11, 3.0'-4.5'	317	3/3/09	Hom	No. 10			Yes	44.05	209.98	181.00	21.2
B-11, 4.5'-6.0'	318	3/3/09	Hom	3/8"			No	44.15	273.68	234.64	20.5
B-11, 6.0'-7.5'	319	3/3/09	Hom	1 1/2"			No	43.92	242.26	210.09	19.4
B-11, 7.5'-9.0'	320	3/3/09	Hom	No. 10			Yes	42.80	244.44	205.63	23.8
B-11, 9.0'-10.5'	321	3/3/09	Hom	No. 10			Yes	46.32	240.32	204.67	22.5
B-11, 10.5'-12.0'	322	3/3/09	Hom	No. 10			Yes	43.87	242.23	203.71	24.1
B-11, 12.0'-13.5'	323	3/3/09	Hom	No. 10			Yes	43.90	262.01	226.45	19.5
B-11, 13.5'-15.0'	324	3/3/09	Hom	No. 10			Yes	43.43	241.10	205.18	22.2
B-11, 15.0'-16.5'	325	3/3/09	Hom	No. 10			Yes	43.71	301.10	258.31	19.9
B-11, 16.5'-18.0'	326	3/3/09	Hom	No. 10			Yes	43.61	266.37	222.87	24.3
B-11, 18.0'-19.5'	327	3/3/09	Hom	No. 10			Yes	47.87	254.91	220.59	19.9
B-11, 19.5'-21.0'	328	3/3/09	Hom	No. 10			Yes	43.51	288.40	245.46	21.3
B-11, 21.0'-22.5'	329	3/3/09	Hom	No. 10			Yes	43.44	281.40	241.54	20.1
B-11, 22.5'-24.0'	330	3/3/09	Hom	No. 10			Yes	45.82	247.10	218.46	16.6
B-11, 24.0'-25.5'	331	3/3/09	Hom	No. 10			Yes	48.04	300.67	261.30	18.5
B-11, 25.5'-27.0'	332	3/3/09	Hom	No. 10			Yes	48.87	336.30	292.68	17.9
B-11, 27.0'-28.5'	333	3/3/09	Hom	No. 10			Yes	43.48	276.98	237.32	20.5
B-11, 28.5'-30.0'	334	3/3/09	Hom	No. 10			Yes	38.17	207.68	176.83	22.2
B-11, 30.0'-31.5'	335	3/3/09	Hom	No. 10			Yes	43.26	295.80	252.36	20.8
B-11, 31.5'-33.0'	336	3/3/09	Hom	No. 10			Yes	45.67	286.00	240.16	23.6
B-11, 33.0'-34.5'	337	3/3/09	Hom	No. 10			Yes	43.37	223.44	189.61	23.1
B-11, 34.5'-36.0'	338	3/3/09	Hom	No. 10			Yes	43.46	246.19	213.43	19.3
B-11, 36.0'-37.5'	339	3/30/09									
B-11, 37.5'-39.0'	340	3/30/09									
B-11, 39.0'-40.5'	341	3/30/09									
B-11, 40.5'-42.0'	342	3/30/09									

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Moisture Content of Soil

Dried at 40°C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-11, 42.0'-43.5'	343	3/30/09									
B-11, 43.5'-45.0'	344	3/30/09									

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Moisture Content of Soil

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Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-4, 0.0'-1.5'	402	3/25/09									
B-4, 1.5'-3.0'	403	3/25/09									
B-4, 3.0'-4.5'	404	3/25/09									
B-4, 4.5'-6.0'	405	3/25/09									
B-4, 6.0'-7.5'	406	3/25/09									
B-4, 7.5'-9.0'	407	3/25/09									
B-4, 9.0'-10.5'	408	3/25/09									
B-4, 10.5'-12.0'	409	3/25/09									
B-4, 12.0'-13.5'	410	3/25/09									
B-4, 13.5'-15.0'	411	3/25/09									
B-4, 15.0'-16.5'	412	3/25/09									
B-4, 25.0'-26.5'	413	3/25/09									
B-4, 35.0'-36.5'	414	3/25/09									
B-4, 45.0'-46.5'	415	3/25/09									
B-6, 0.0'-1.5'	416	3/5/09	Hom	3/8"			No	20.88	95.27	86.04	14.2
B-6, 1.5'-3.0'	417	3/5/09	Hom	No. 10			Yes	21.02	87.57	80.59	11.7
B-6, 3.0'-4.5'	418	3/5/09	Hom	No. 10			Yes	21.04	85.45	76.06	17.1
B-6, 4.5'-6.0'	419	3/5/09	Hom	No. 4			No	21.08	92.89	81.84	18.2
B-6, 6.0'-7.5'	420	3/5/09	Hom	No. 10			Yes	20.77	90.93	80.03	18.4
B-6, 7.5'-9.0'	421	3/5/09	Hom	No. 10			Yes	21.73	108.05	93.18	20.8
B-6, 9.0'-10.5'	422	3/5/09	Hom	No. 10			Yes	21.17	104.34	90.42	20.1
B-6, 10.5'-12.0'	423	3/5/09	Hom	No. 10			Yes	21.29	97.71	84.93	20.1
B-6, 12.0'-13.5'	424	3/5/09	Hom	No. 10			Yes	20.83	119.51	102.06	21.5
B-6, 13.5'-15.0'	425	3/5/09	Hom	No. 10			Yes	21.12	99.54	85.80	21.2
B-6, 15.0'-16.5'	426	3/5/09	Hom	No. 10			Yes	22.31	108.68	93.83	20.8
B-6, 16.5'-18.0'	427	3/5/09	Str	No. 10			Yes	21.42	102.22	87.51	22.3
B-6, 18.0'-19.5'	428	3/5/09	Str	No. 10			Yes	20.54	119.05	103.48	18.8
B-6, 19.5'-21.0'	429	3/5/09	Str	No. 10			Yes	20.27	111.79	95.24	22.1

Stantec

Moisture Content of Soil

Dried @ 40° C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-6, 21.0'-22.5'	430	3/5/09	Str	No. 10			Yes	21.78	118.39	101.16	21.7
B-6, 22.5'-24.0'	431	3/5/09	Hom	No. 10			Yes	20.24	105.20	89.91	21.9
B-6, 24.0'-25.5'	432	3/5/09	Hom	No. 10			Yes	20.06	116.91	100.73	20.1
B-6, 25.5'-27.0'	433	3/5/09	Hom	No. 10			Yes	20.79	113.01	97.48	20.3
B-6, 27.0'-28.5'	434	3/5/09	Hom	No. 10			Yes	18.60	71.92	63.93	17.6
B-6, 28.5'-30.0'	435	3/11/09	Hom	No. 10			Yes	43.64	274.47	229.74	24.0
B-6, 30.0'-31.5'	436	3/5/09	Str	No. 10			Yes	20.27	90.91	78.75	20.8
B-6, 31.5'-33.0'	437	3/5/09	Str	No. 10			Yes	18.40	80.95	70.25	20.6
B-6, 33.0'-34.5'	438	3/5/09	Str	No. 10			Yes	20.44	86.28	75.01	20.7
B-6, 34.5'-36.0'	439	3/18/09	Hom	No. 10			Yes	43.58	262.76	226.23	20.0
B-6, 36.0'-37.5'	440	3/18/09	Hom	No. 10			Yes	46.87	291.97	251.69	19.7
B-6, 37.5'-39.0'	441	3/18/09	Hom	No. 10			Yes	43.60	294.49	252.30	20.2
B-6, 39.0'-40.5'	442	3/18/09	Hom	No. 10			Yes	43.37	261.14	224.13	20.5
B-6, 40.5'-42.0'	443	3/18/09	Hom	No. 10			Yes	48.88	312.37	267.60	20.5
B-6, 42.0'-43.5'	444	3/18/09	Hom	1 1/2"			No	43.46	248.87	214.91	19.8
B-6, 43.5'-45.0'	445	3/25/09									
B-6, 45.0'-46.5'	446	3/25/09									
B-6, 46.5'-48.0'	447	3/25/09									
B-6, 48.0'-49.5'	448	3/25/09									
B-6, 49.5'-51.0'	449	3/25/09									
B-6, 60.0'-61.5'	450	3/25/09									
B-6, 70.0'-71.5'	451	3/25/09									
B-6, 80.0'-81.5'	452	3/25/09									
B-6, 90.0'-91.5'	453	3/25/09									
B-6, 100.0'-101.5'	454	3/25/09									
B-7, 0.0'-1.5'	455	3/10/09	Hom	No. 10			Yes	18.54	100.97	89.83	15.6
B-7, 1.5'-3.0'	456	3/10/09	Hom	No. 10			Yes	20.42	101.15	89.81	16.3
B-7, 3.0'-4.5'	457	3/10/09	Hom	3/8"			No	20.52	51.75	49.67	7.1
B-7, 4.5'-6.0'	458	3/10/09	Hom	No. 10			Yes	18.36	95.30	87.57	11.2
B-7, 6.0'-7.5'	459	3/10/09	Hom	No. 10			Yes	18.98	91.26	83.57	11.9
B-7, 7.5'-9.0'	460	3/10/09	Hom	No. 10			Yes	20.53	93.01	85.99	10.7

Stantec

Moisture Content of Soil

Dried @ 40° C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded		Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
					Amount	Size					
B-7, 9.0'-10.5'	461	3/25/09									
B-7, 10.5'-12.0'	462	3/25/09									
B-7, 12.0'-13.5'	463	3/25/09									
B-7, 13.5'-15.0'	464	3/25/09									
B-7, 15.0'-16.5'	465	3/25/09									
B-7, 16.5'-18.0'	466	3/25/09									
B-7, 18.0'-19.5'	467	3/25/09									
B-7, 19.5'-21.0'	468	3/25/09									
B-7, 31.0'-32.5'	469	3/25/09									
B-7, 40.0'-41.5'	470	3/25/09									
B-7, 50.0'-51.5'	471	3/25/09									
B-7, 60.0'-61.5'	472	3/25/09									
B-7, 70.0'-71.5'	473	3/25/09									
B-8, 0.0'-1.5'	474	3/11/09	Hom	No. 10			Yes	18.81	79.36	73.37	11.0
B-8, 1.5'-3.0'	475	3/11/09	Hom	No. 10			Yes	20.35	89.80	81.10	14.3
B-8, 3.0'-4.5'	476	3/11/09	Hom	No. 10			Yes	20.68	89.56	79.48	17.1
B-8, 4.5'-6.0'	477	3/11/09	Hom	No. 10			Yes	20.48	87.52	76.98	18.7
B-8, 6.0'-7.5'	478	3/11/09	Hom	No. 10			Yes	21.02	117.29	100.84	20.6
B-8, 7.5'-9.0'	479	3/11/09	Hom	No. 10			Yes	20.05	104.32	89.10	22.0
B-8, 9.0'-10.5'	480	3/11/09	Hom	No. 10			Yes	20.15	114.72	99.54	19.1
B-8, 10.5'-12.0'	481	3/11/09	Hom	No. 10			Yes	21.53	113.15	97.22	21.0
B-8, 12.0'-13.5'	482	3/11/09	Hom	No. 10			Yes	18.62	104.30	89.26	21.3
B-8, 13.5'-15.0'	483	3/11/09	Hom	No. 10			Yes	21.37	116.64	99.50	21.9
B-8, 15.0'-16.5'	484	3/11/09	Hom	No. 10			Yes	23.45	133.21	112.54	23.2
B-8, 16.5'-18.0'	485	3/11/09	Hom	No. 10			Yes	19.17	116.60	97.93	23.7
B-8, 18.0'-19.5'	486	3/11/09	Hom	No. 10			Yes	18.54	114.04	96.93	21.8
B-8, 19.5'-21.0'	487	3/11/09	Hom	No. 10			Yes	21.70	123.29	105.28	21.5
B-8, 21.0'-22.5'	488	3/11/09	Hom	No. 10			Yes	20.45	125.86	106.20	22.9
B-8, 22.5'-24.0'	489	3/11/09	Hom	No. 10			Yes	14.99	106.41	90.52	21.0
B-8, 24.0'-25.5'	490	3/11/09	Hom	No. 10			Yes	14.81	111.35	93.90	22.1
B-8, 25.5'-27.0'	491	3/11/09	Hom	No. 10			Yes	38.21	231.76	199.76	19.8

Stantec

Moisture Content of Soil

Dried @ 40° C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-8, 27.0'-28.5'	492	3/11/09	Hom	No. 10			Yes	43.83	304.95	260.57	20.5
B-8, 28.5'-30.0'	493	3/11/09	Hom	No. 10			Yes	44.22	272.50	234.36	20.1
B-8, 30.0'-31.5'	494	3/11/09	Hom	No. 10			Yes	43.54	281.88	238.51	22.2
B-8, 31.5'-33.0'	495	3/11/09	Hom	No. 10			Yes	44.03	254.46	214.84	23.2
B-8, 33.0'-34.5'	496	3/11/09	Hom	No. 10			Yes	46.55	265.65	225.42	22.5
B-8, 34.5'-36.0'	497	3/11/09	Hom	No. 10			Yes	38.15	241.14	205.80	21.1
B-8, 36.0'-37.5'	498	3/11/09	Hom	No. 10			Yes	20.39	124.94	108.29	18.9
B-8, 37.5'-39.0'	499	3/11/09	Hom	No. 10			Yes	20.76	139.69	116.69	24.0
B-8, 39.0'-40.5'	500	3/11/09	Hom	No. 10			Yes	20.76	115.44	96.72	24.6
B-8, 40.5'-42.0'	501	3/11/09	Hom	No. 10			Yes	20.63	120.61	102.31	22.4
B-8, 42.0'-43.5'	502	3/11/09	Hom	No. 10			Yes	21.48	121.46	101.69	24.6
B-8, 43.5'-45.0'	503	3/11/09	Hom	No. 10			Yes	19.35	114.20	96.82	22.4
B-8, 45.0'-46.5'	504	3/11/09	Hom	No. 10			Yes	20.74	107.55	91.92	22.0
B-8, 46.5'-48.0'	505	3/11/09	Hom	No. 10			Yes	19.47	99.81	86.52	19.8
B-8, 48.0'-49.5'	506	3/11/09	Hom	No. 10			Yes	19.43	128.34	107.34	23.9
B-8, 49.5'-51.0'	507	3/11/09	Hom	No. 10			Yes	21.57	122.09	105.96	19.1
B-8, 51.0'-52.5'	508	3/11/09	Hom	No. 10			Yes	20.55	113.60	97.06	21.6
B-8, 52.5'-54.0'	509	3/11/09	Hom	No. 10			Yes	20.49	114.06	94.29	26.8
B-8, 54.0'-55.5'	510	3/11/09	Hom	No. 10			Yes	21.24	123.50	105.54	21.3
B-8, 55.5'-57.0'	511	3/11/09	Hom	No. 10			Yes	18.58	113.31	95.39	23.3
B-8, 57.0'-58.5'	512	3/11/09	Hom	1 1/2"	2	1 1/2"	No	21.74	130.76	111.99	20.8
B-8, 58.5'-60.0'	513	3/25/09									
B-8, 60.0'-61.5'	514	3/25/09									
B-8, 61.5'-63.0'	515	3/25/09									
B-8, 63.0'-64.5'	516	3/25/09									
B-8, 64.5'-66.0'	517	3/25/09									
B-8, 66.0'-67.5'	518	3/25/09									
B-8, 67.5'-69.0'	519	3/25/09									
B-8, 79.5'-81.0'	520	3/25/09									
B-8, 89.5'-91.0'	521	3/25/09									
B-8, 97.5'-98.0'	522	3/25/09									

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Moisture Content of Soil

Dried @ 40° C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-9, 0.0'-1.5'	523	3/11/09	Len	No. 10			Yes	20.98	91.20	80.52	17.9
B-9, 1.5'-3.0'	524	3/11/09	Hom	No. 10			Yes	19.01	90.21	76.66	23.5
B-9, 3.0'-4.5'	525	3/11/09	Hom	No. 10			Yes	21.70	94.36	81.20	22.1
B-9, 4.5'-6.0'	526	3/11/09	Hom	No. 10			Yes	21.16	85.57	74.08	21.7
B-9, 6.0'-7.5'	527	3/11/09	Hom	No. 10			Yes	18.46	72.26	62.95	20.9
B-9, 7.5'-9.0'	528	3/11/09	Hom	No. 10			Yes	21.95	120.60	103.87	20.4
B-9, 9.0'-10.5'	529	3/11/09	Hom	No. 10			Yes	20.29	92.25	81.11	18.3
B-9, 10.5'-12.0'	530	3/11/09	Hom	No. 10			Yes	21.37	92.67	80.26	21.1
B-9, 12.0'-13.5'	531	3/11/09	Hom	No. 10			Yes	22.04	97.25	84.87	19.7
B-9, 13.5'-15.0'	532	3/11/09	Hom	No. 10			Yes	20.79	103.06	89.37	20.0
B-9, 15.0'-16.5'	533	3/11/09	Hom	No. 10			Yes	20.89	94.86	81.50	22.0
B-9, 16.5'-18.0' NO RECOVERY	534	3/16/09									
B-9, 18.0'-19.5'	535	3/11/09	Hom	No. 10			Yes	20.58	89.19	77.50	20.5
B-9, 19.5'-21.0'	536	3/11/09	Hom	No. 10			Yes	18.57	87.18	75.23	21.1
B-9, 21.0'-22.5'	537	3/11/09	Hom	No. 10			Yes	21.40	98.53	85.37	20.6
B-9, 22.5'-24.0'	538	3/11/09	Hom	No. 10			Yes	22.43	95.86	81.90	23.5
B-9, 24.0'-25.5'	539	3/11/09	Hom	No. 10			Yes	18.86	98.91	85.78	19.6
B-9, 25.5'-27.0'	540	3/11/09	Hom	No. 10			Yes	21.18	131.37	109.73	24.4
B-9, 27.0'-28.5'	541	3/11/09	Hom	No. 10			Yes	18.78	104.13	88.75	22.0
B-9, 28.5'-30.0'	542	3/11/09	Hom	No. 10			Yes	19.15	111.81	94.13	23.6
B-9, 30.0'-31.5'	543	3/11/09	Hom	No. 10			Yes	21.71	138.26	118.58	20.3
B-9, 31.5'-33.0'	544	3/11/09	Hom	No. 10			Yes	19.80	98.44	83.45	23.6
B-9, 33.0'-34.5'	545	3/11/09	Hom	No. 10			Yes	19.07	106.80	91.79	20.6
B-9, 34.5'-36.0'	546	3/11/09	Hom	No. 10			Yes	21.16	125.27	106.49	22.0
B-9, 36.0'-37.5'	547	3/11/09	Hom	No. 10			Yes	21.43	122.57	104.58	21.6
B-9, 37.5'-39.0'	548	3/11/09	Hom	No. 10			Yes	21.98	88.28	74.78	25.6
B-9, 39.0'-40.5'	549	3/11/09	Hom	No. 10			Yes	21.64	113.30	99.01	18.5
B-9, 40.5'-42.0'	550	3/11/09	Hom	No. 10			Yes	21.77	128.39	109.19	22.0
B-9, 42.0'-43.5'	551	3/11/09	Hom	No. 10			Yes	21.70	130.80	106.53	28.6
B-9, 43.5'-45.0'	552	3/11/09	Lam	3/4"			No	23.78	132.22	113.83	20.4
B-9, 45.0'-46.5'	553	3/25/09									

Stantec

Moisture Content of Soil

Dried @ 40° C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded		Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
					Amount	Size					
B-9, 46.5'-48.0'	554	3/25/09									
B-9, 48.0'-49.5'	555	3/25/09									
B-9, 49.5'-51.0'	556	3/25/09									
B-9, 51.0'-52.5'	557	3/25/09									
B-9, 52.5'-54.0'	558	3/25/09									
B-9, 60.0'-61.5'	559	3/25/09									
B-9, 70.0'-71.5'	560	3/25/09									

Stantec

Moisture Content of Soil

Dried @ 40° C AASHTO T 265

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ODOT

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded		Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
					Amount	Size					
B-10, 0.0'-1.5'	646	3/16/09	Hom	No. 10			Yes	20.58	87.94	80.61	12.2
B-10, 1.5'-3.0'	647	3/16/09	Hom	No. 10			Yes	22.28	98.84	91.78	10.2
B-10, 3.0'-4.5'	648	3/16/09	Hom	No. 10			Yes	23.84	106.74	99.14	10.1
B-10, 4.5'-6.0'	649	3/16/09	Hom	No. 10			Yes	21.21	95.69	87.68	12.1
B-10, 6.0'-7.5'	650	3/16/09	Hom	No. 10			Yes	21.97	104.22	94.28	13.7
B-10, 7.5'-9.0'	651	3/16/09	Hom	No. 10			Yes	19.29	91.85	82.56	14.7
B-10, 9.0'-10.5'	652	3/16/09	Hom	No. 10			Yes	18.99	87.62	76.37	19.6
B-10, 10.5'-12.0'	653	3/16/09	Hom	No. 10			Yes	21.36	96.41	89.14	10.7
B-10, 12.0'-13.5'	654	3/16/09	Hom	No. 10			Yes	21.76	109.52	97.97	15.2
B-10, 13.5'-15.0'	655	3/16/09	Hom	No. 10			Yes	18.63	103.10	87.52	22.6
B-10, 15.0'-16.5'	656	3/16/09	Hom	No. 10			Yes	20.76	111.08	93.97	23.4
B-10, 16.5'-18.0'	657	3/16/09	Hom	No. 10			Yes	19.23	105.33	87.14	26.8
B-10, 18.0'-19.5'	658	3/16/09	Hom	No. 10			Yes	18.83	109.49	94.31	20.1
B-10, 19.5'-21.0'	659	3/16/09	Hom	No. 10			Yes	19.62	102.54	89.01	19.5
B-10, 21.0'-22.5'	660	3/16/09	Hom	No. 10			Yes	19.18	98.73	85.56	19.8
B-10, 22.5'-24.0'	661	3/16/09	Hom	No. 10			Yes	19.36	114.24	98.38	20.1
B-10, 24.0'-25.5'	662	3/16/09	Hom	No. 10			Yes	21.04	125.41	109.20	18.4
B-10, 25.5'-27.0'	663	3/16/09	Hom	No. 10			Yes	20.79	116.85	100.85	20.0
B-10, 27.0'-28.5'	664	3/16/09	Hom	No. 10			Yes	19.04	113.38	95.86	22.8
B-10, 28.5'-30.0'	665	3/16/09	Hom	No. 10			Yes	20.47	110.52	96.87	17.9
B-10, 30.0'-31.5'	666	3/16/09	Hom	No. 10			Yes	22.14	131.43	111.60	22.2
B-10, 31.5'-33.0'	667	3/16/09	Hom	No. 10			Yes	21.48	122.67	104.45	22.0
B-10, 33.0'-34.5'	668	3/16/09	Hom	No. 10			Yes	21.99	132.26	112.28	22.1
B-10, 34.5'-36.0'	669	3/16/09	Hom	No. 10			Yes	19.38	108.31	92.86	21.0
B-10, 36.0'-37.5'	670	3/16/09	Hom	No. 10			Yes	22.22	129.42	110.47	21.5
B-10, 37.5'-39.0'	671	3/16/09	Hom	No. 10			Yes	18.88	110.45	93.87	22.1
B-10, 39.0'-40.5'	672	3/16/09	Hom	No. 10			Yes	22.80	139.60	120.52	19.5
B-10, 40.5'-42.0'	673	3/16/09	Hom	No. 10			Yes	20.40	113.25	99.65	17.2

Stantec

Moisture Content of Soil

Dried @ 40° C AASHTO T 265

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ODOT

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded		Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
					Amount	Size					
B-10, 42.0'-43.5'	674	3/15/09	Hom	No. 10			Yes	18.85	106.19	92.42	18.7
B-10, 43.5'-45.0'	675	3/15/09	Hom	No. 10			Yes	21.11	118.30	100.07	23.1
B-10, 45.0'-46.5'	676	3/15/09	Hom	No. 10			Yes	22.51	138.77	121.53	17.4
B-10, 46.5'-48.0'	677	3/22/09									
B-10, 48.0'-49.5'	678	3/22/09									
B-10, 49.5'-51.0'	679	3/22/09									
B-10, 51.0'-52.5'	680	3/22/09									
B-10, 52.5'-54.0'	681	3/22/09									
B-10, 54.0'-55.5'	682	3/22/09									
B-10, 55.5'-57.0'	683	3/22/09									
B-10, 57.0'-58.5'	684	3/22/09									
B-10, 59.5'-61.0'	685	3/22/09									
B-10, 69.5'-71.0'	686	3/22/09									
B-12, 0.0'-1.5'	687	3/22/09									
B-12, 1.5'-3.0'	688	3/22/09									
B-12, 3.0'-4.5'	689	3/22/09									
B-12, 4.5'-6.0'	690	3/22/09									
B-12, 6.0'-7.5'	691	3/22/09									
B-12, 7.5'-9.0'	692	3/22/09									
B-12, 9.0'-10.5'	693	3/22/09									
B-12, 10.5'-12.0'	694	3/22/09									
B-12, 12.0'-13.5'	695	3/22/09									
B-12, 13.5'-15.0'	696	3/22/09									
B-12, 15.0'-16.5'	697	3/22/09									
B-12, 16.5'-18.0'	698	3/22/09									
B-12, 18.0'-19.5'	699	3/22/09									
B-12, 19.5'-21.0'	700	3/22/09									
B-12, 30.0'-31.5'	701	3/22/09									
B-13, 0.0'-1.5'	702	3/17/09	Hom	No. 10			Yes	45.65	181.33	163.47	15.2
B-13, 1.5'-3.0'	703	3/17/09	Hom	No. 10			Yes	46.73	140.09	129.27	13.1
B-13, 3.0'-4.5'	704	3/17/09	Hom	No. 10			Yes	44.19	158.13	146.38	11.5

Stantec

Moisture Content of Soil

Dried @ 40° C AASHTO T 265

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ODOT

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded		Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
					Amount	Size					
B-13, 4.5'-6.0'	705	3/17/09	Hom	No. 4			Yes	44.22	234.16	207.83	16.1
B-13, 6.0'-7.5'	706	3/17/09	Hom	No. 10			Yes	48.03	224.13	192.87	21.6
B-13, 7.5'-9.0'	707	3/17/09	Hom	No. 10			Yes	48.67	218.48	188.68	21.3
B-13, 9.0'-10.5'	708	3/17/09	Hom	No. 10			Yes	48.10	214.80	187.56	19.5
B-13, 10.5'-12.0'	709	3/17/09	Hom	No. 10			Yes	43.58	253.73	216.94	21.2
B-13, 12.0'-13.5'	710	3/17/09	Hom	No. 10			Yes	43.37	264.68	224.67	22.1
B-13, 13.5'-15.0'	711	3/17/09	Hom	No. 10			Yes	44.91	248.44	213.91	20.4
B-13, 15.0'-16.5'	712	3/17/09	Hom	No. 10			Yes	46.96	213.66	183.89	21.7
B-13, 16.5'-18.0'	713	3/17/09	Hom	No. 10			Yes	38.20	205.26	174.76	22.3
B-13, 18.0'-19.5'	714	3/17/09	Hom	No. 10			Yes	43.42	186.90	164.39	18.6
B-13, 19.5'-21.0'	715	3/17/09	Hom	No. 10			Yes	38.37	217.18	183.05	23.6
B-13, 21.0'-22.5'	716	6/23/09									
B-13, 22.5'-24.0'	717	6/23/09									
B-13, 24.0'-25.5'	718	6/23/09									
B-13, 25.5'-27.0'	719	6/23/09									
B-13, 27.0'-28.5'	720	6/23/09									
B-13, 28.5'-30.0'	721	6/23/09									
B-13, 38.5'-40.0'	722	6/23/09									
B-14, 0.0'-1.5'	723	6/23/09									
B-14, 1.5'-3.0'	724	6/23/09									
B-14, 3.0'-4.5'	725	6/23/09									
B-14, 4.5'-6.0'	726	6/23/09									
B-14, 6.0'-7.5'	727	6/23/09									
B-14, 7.5'-9.0'	728	6/23/09									
B-14, 9.0'-10.5'	729	6/23/09									
B-14, 10.5'-12.0'	730	6/23/09									
B-14, 12.0'-13.5'	731	6/23/09									
B-14, 13.5'-15.0'	732	6/23/09									
B-14, 15.0'-16.5'	733	6/23/09									
B-14, 16.5'-18.0'	734	6/23/09									
B-14, 18.0'-19.5'	735	6/23/09									

Stantec

Moisture Content of Soil

Dried @ 40° C AASHTO T 265

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ODOT

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-14, 19.5'-21.0'	736	6/23/09									
B-14, 21.0'-22.5'	737	6/23/09									
B-14, 22.5'-24.0'	738	6/23/09									
B-14, 24.0'-25.5'	739	6/23/09									
B-14, 25.5'-27.0'	740	6/23/09									
B-14, 27.0'-28.5'	741	6/23/09									
B-14, 28.5'-30.0'	742	6/23/09									
B-14, 30.0'-31.5'	743	6/23/09									
B-14, 31.5'-33.0'	744	6/23/09									
B-14, 33.0'-34.5'	745	6/23/09									
B-14, 34.5'-36.0'	746	6/23/09									
B-14, 36.0'-37.5'	747	6/23/09									
B-14, 37.5'-39.0'	748	6/23/09									
B-14, 39.0'-40.5'	749	6/23/09									
B-14, 40.5'-42.0'	750	6/23/09									
B-14, 42.0'-43.5'	751	6/23/09									
B-14, 43.5'-45.0'	752	6/23/09									
B-14, 45.0'-46.5'	753	6/23/09									
B-14, 46.5'-48.0'	754	6/23/09									
B-14, 50.0'-51.5'	755	6/23/09									

Stantec

Moisture Content of Soil

Dried @ 200° C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-1, 0.0'-1.5'	160	2/25/09	Hom	3/4"	2	3/4"	No	20.75	120.17	100.10	25.3
B-1, 1.5'-3.0'	161	2/25/09	Hom	No. 10			Yes	18.46	83.66	65.79	37.8
B-1, 3.0'-4.5'	162	2/25/09	Hom	No. 10			Yes	20.80	110.34	84.52	40.5
B-1, 4.5'-6.0'	163	2/25/09	Hom	No. 10			Yes	20.42	117.93	88.48	43.3
B-1, 6.0'-7.5'	164	2/25/09	Hom	3/4"	1	3/4"	No	19.33	111.72	90.46	29.9
B-1, 7.5'-9.0'	165	2/25/09	Hom	No. 10			Yes	21.43	130.34	98.60	41.1
B-1, 9.0'-10.5'	166	2/25/09	Hom	3/4"			No	21.13	121.28	93.59	38.2
B-1, 10.5'-12.0'	167	2/25/09	Hom	No. 10			Yes	21.17	131.38	98.39	42.7
B-1, 12.0'-13.5'	168	2/25/09	Hom	3/8"			No	21.54	131.19	99.02	41.5
B-1, 13.5'-15.0'	169	2/25/09	Hom	No. 10			Yes	20.61	107.06	80.18	45.1
B-1, 15.0'-16.5'	170	2/25/09	Hom	No. 10			Yes	20.57	117.01	86.21	46.9
B-1, 16.5'-18.0'	171	2/25/09	Hom	No. 10			Yes	21.04	124.65	93.82	42.4
B-1, 18.0'-19.5'	172	2/25/09	Hom	No. 10			Yes	20.84	135.47	100.23	44.4
B-1, 19.5'-21.0'	173	2/25/09	Hom	3/8"			Yes	21.29	144.72	109.97	39.2
B-1, 21.0'-22.5'	174	2/25/09	Hom	No. 10			Yes	20.37	114.03	86.32	42.0
B-1, 22.5'-24.0'	175	2/25/09	Hom	No. 10			Yes	19.99	110.12	83.48	42.0
B-1, 24.0'-25.5'	176	2/25/09	Hom	No. 10			Yes	21.12	124.82	93.85	42.6
B-1, 25.5'-27.0'	177	2/25/09	Hom	No. 10			Yes	21.10	135.09	99.55	45.3
B-1, 27.0'-28.5'	178	2/25/09	Hom	No. 10			Yes	21.00	116.03	85.81	46.6
B-1, 28.5'-30.0'	179	2/25/09	Hom	No. 10			Yes	19.50	120.64	90.54	42.4
B-1, 30.0'-31.5'	180	2/25/09	Hom	No. 10			Yes	20.33	118.40	87.24	46.6
B-1, 31.5'-33.0'	181	2/25/09	Hom	No. 10			Yes	18.52	104.22	78.24	43.5
B-1, 33.0'-34.5'	182	2/25/09	Hom	No. 10			Yes	20.43	109.39	82.29	43.8
B-1, 34.5'-36.0'	183	2/25/09	Hom	No. 10			Yes	20.51	118.67	86.58	48.6
B-1, 36.0'-37.5'	184	2/25/09	Hom	No. 10			Yes	18.61	111.77	81.01	49.3
B-1, 37.5'-39.0'	185	2/25/09	Hom	No. 10			Yes	20.34	106.63	77.75	50.3
B-1, 39.0'-40.5'	186	2/25/09	Hom	No. 10			Yes	23.66	149.75	110.23	45.7
B-1, 40.5'-42.0'	187	2/25/09	Hom	No. 10			Yes	21.12	118.92	86.25	50.2

Stantec

Moisture Content of Soil

Dried @ 200° C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-1, 42.0'-43.5'	188	2/25/09	Hom	No. 10			Yes	21.16	127.59	94.15	45.8
B-1, 43.5'-45.0'	189	2/25/09	Len	No. 10			Yes	23.41	140.27	103.93	45.1
B-1, 45.0'-46.5'	190	2/25/09	Hom	No. 10			Yes	20.46	113.94	83.89	47.4
B-1, 46.5'-48.0'	191	2/25/09	Hom	No. 10			Yes	20.79	118.89	88.19	45.5
B-1, 48.0'-49.5'	192	2/25/09	Hom	No. 10			Yes	21.35	124.59	89.15	52.3
B-1, 49.5'-51.0'	193	2/25/09	Hom	No. 10			Yes	13.72	131.37	92.71	48.9
B-1, 51.0'-52.5'	194	2/25/09	Hom	No. 10			Yes	20.15	117.27	85.93	47.6
B-1, 52.5'-54.0'	195	2/25/09	Hom	No. 10			Yes	21.33	137.31	99.83	47.7
B-1, 54.0'-55.5'	196	2/25/09	Hom	No. 10			Yes	20.70	144.30	106.19	44.6
B-1, 55.5'-57.0'	197	2/25/09	Hom	No. 10			Yes	19.30	131.02	95.41	46.8
B-1, 57.0'-58.5'	198	3/30/09									
B-1, 58.5'-60.0'	199	3/30/09									
B-1, 60.0'-61.5'	200	3/30/09									
B-1, 61.5'-63.0'	201	3/30/09									
B-1, 63.0'-64.5'	202	3/30/09									
B-1, 64.5'-66.0'	203	3/30/09									
B-1, 66.0'-67.5'	204	3/30/09									
B-1, 67.5'-69.0'	205	3/30/09									
B-1, 80.0'-81.5'	206	3/30/09									
B-1, 90.0'-91.5'	207	3/30/09									
B-1, 100.0'-101.5'	208	3/30/09									
B-1, 110.0'-111.5'	209	3/30/09									
B-2, 0.0'-1.5'	210	2/25/09	Hom	3/8"			No	22.37	136.78	105.06	38.4
B-2, 1.5'-3.0'	211	2/25/09	Hom	1 1/2"	1	1 1/2"	No	18.83	111.42	86.89	36.0
B-2, 3.0'-4.5'	212	2/25/09	Hom	No. 10			Yes	21.06	123.72	93.05	42.6
B-2, 4.5'-6.0'	213	2/25/09	Lam	No. 10			Yes	21.51	138.68	105.80	39.0
B-2, 6.0'-7.5'	214	2/25/09	Hom	No. 10			Yes	20.99	117.69	90.03	40.1
B-2, 7.5'-9.0'	215	2/25/09	Hom	No. 10			Yes	21.39	125.31	96.55	38.3
B-2, 9.0'-10.5'	216	2/25/09	Hom	No. 10			Yes	21.20	122.98	92.25	43.3
B-2, 10.5'-12.0'	217	2/25/09	Hom	No. 10			Yes	21.15	119.91	92.45	38.5
B-2, 12.0'-13.5'	218	2/25/09	Hom	No. 10			Yes	21.45	134.80	103.48	38.2

Stantec

Moisture Content of Soil

Dried @ 200° C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-2, 13.5'-15.0'	219	2/25/09	Hom	No. 10			Yes	20.27	134.23	101.96	39.5
B-2, 15.0'-16.5'	220	2/25/09	Lam	No. 10			Yes	20.78	129.44	97.67	41.3
B-2, 16.5'-18.0'	221	2/25/09	Lam	No. 10			Yes	21.73	119.01	92.56	37.3
B-2, 18.0'-19.5'	222	2/25/09	Hom	No. 10			Yes	20.60	118.98	88.14	45.7
B-2, 19.5'-21.0'	223	2/25/09	Hom	No. 10			Yes	19.07	108.63	77.92	52.2
B-2, 21.0'-22.5'	224	2/25/09	Hom	No. 10			Yes	20.34	118.86	87.16	47.4
B-2, 22.5'-24.0'	225	2/25/09	Lam	No. 10			Yes	21.88	122.79	92.83	42.2
B-2, 24.0'-25.5'	226	2/25/09	Hom	No. 10			Yes	20.32	124.08	89.29	50.4
B-2, 25.5'-27.0'	227	2/25/09	Lam	No. 10			Yes	20.56	142.74	102.80	48.6
B-2, 27.0'-28.5'	228	2/25/09	Lam	No. 10			Yes	21.09	120.71	89.03	46.6
B-2, 28.5'-30.0'	229	2/25/09	Lam	No. 10			Yes	21.17	130.16	96.79	44.1
B-2, 30.0'-31.5'	230	3/30/09									
B-2, 31.5'-33.0'	231	3/30/09									
B-2, 33.0'-34.5'	232	3/30/09									
B-2, 34.5'-36.0'	233	3/30/09									
B-2, 36.0'-37.5'	234	3/30/09									
B-2, 37.5'-39.0'	235	3/30/09									
B-2, 39.0'-40.5'	236	3/30/09									
B-2, 40.5'-42.0'	237	3/30/09									
B-2, 42.0'-43.5'	238	3/30/09									
B-2, 43.5'-45.0'	239	3/30/09									
B-2, 45.0'-46.5'	240	3/30/09									
B-2, 46.5'-48.0'	241	3/30/09									
B-2, 48.0'-49.5'	242	3/30/09									
B-2, 49.5'-51.0'	243	3/30/09									
B-2, 51.0'-52.5'	244	3/30/09									
B-2, 52.5'-54.0'	245	3/30/09									
B-2, 54.0'-55.5'	246	3/30/09									
B-2, 55.5'-57.0'	247	3/30/09									
B-2, 57.0'-58.5'	248	3/30/09									
B-2, 58.5'-60.0'	249	3/30/09									

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Moisture Content of Soil

Dried @ 200° C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded		Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
					Amount	Size					
B-2, 60.0'-61.5'	250	3/30/09									
B-2, 61.5'-63.0'	251	3/30/09									
B-2, 63.0'-64.5'	252	3/30/09									
B-2, 64.5'-66.0'	253	3/30/09									
B-2, 66.0'-67.5'	254	3/30/09									
B-2, 67.5'-69.0'	255	3/30/09									
B-2, 69.0'-70.5'	256	3/30/09									
B-2, 70.5'-72.0'	257	3/30/09									
B-2, 72.0'-73.5'	258	3/30/09									
B-2, 73.5'-75.0'	259	3/30/09									
B-2, 75.0'-76.5'	260	3/30/09									
B-2, 76.5'-78.0'	261	3/30/09									
B-2, 78.0'-79.5'	262	3/30/09									
B-2, 79.5'-81.0'	263	3/30/09									
B-2, 81.0'-82.5'	264	3/30/09									
B-2, 82.5'-84.0'	265	3/30/09									
B-2, 84.0'-85.5'	266	3/30/09									
B-2, 85.5'-87.0'	267	3/30/09									
B-2, 87.0'-88.5'	268	3/30/09									
B-2, 88.5'-90.0'	269	3/30/09									
B-2, 90.0'-91.5'	270	3/30/09									
B-3, 0.0'-1.5'	271	3/30/09									
B-3, 1.5'-3.0'	272	3/30/09									
B-3, 3.0'-4.5'	273	3/30/09									
B-3, 4.5'-6.0'	274	3/30/09									
B-3, 6.0'-7.5'	275	3/30/09									
B-3, 7.5'-9.0'	276	3/30/09									
B-3, 9.0'-10.5'	277	3/30/09									
B-3, 10.5'-12.0'	278	3/30/09									
B-3, 12.0'-13.5'	279	3/30/09									
B-3, 13.5'-15.0'	280	3/30/09									

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Moisture Content of Soil

Dried @ 200° C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-3, 15.0'-16.5'	281	3/30/09									
B-3, 16.5'-18.0'	282	3/30/09									
B-3, 18.0'-19.5'	283	3/30/09									
B-3, 19.5'-21.0'	284	3/30/09									
B-3, 21.0'-22.5'	285	3/30/09									
B-3, 22.5'-24.0'	286	3/30/09									
B-3, 24.0'-25.5'	287	3/30/09									
B-3, 25.5'-27.0'	288	3/30/09									
B-3, 27.0'-28.5'	289	3/30/09									
B-3, 28.5'-30.0'	290	3/30/09									
B-3, 30.0'-31.5'	291	3/30/09									
B-3, 31.5'-33.0'	292	3/30/09									
B-3, 33.0'-34.5'	293	3/30/09									
B-3, 34.5'-36.0'	294	3/30/09									
B-3, 36.0'-37.5'	295	3/30/09									
B-3, 37.5'-39.0'	296	3/30/09									
B-3, 39.0'-40.5'	297	3/30/09									
B-3, 49.0'-50.5'	298	3/30/09									
B-3, 59.0'-60.5'	299	3/30/09									
B-3, 69.0'-70.5'	300	3/30/09									
B-5, 0.0'-1.5'	301	3/30/09									
B-5, 1.5'-3.0'	302	3/30/09									
B-5, 3.0'-4.5'	303	3/30/09									
B-5, 4.5'-6.0'	304	3/30/09									
B-5, 6.0'-7.5'	305	3/30/09									
B-5, 7.5'-9.0'	306	3/30/09									
B-5, 9.0'-10.5'	307	3/30/09									
B-5, 10.5'-12.0'	308	3/30/09									
B-5, 12.0'-13.5'	309	3/30/09									
B-5, 13.5'-15.0'	310	3/30/09									
B-5, 15.0'-16.5'	311	3/30/09									

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Moisture Content of Soil

Dried @ 200° C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-5, 20.0'-21.5'	312	3/30/09									
B-5, 25.0'-26.5'	313	3/30/09									
B-5, 30.0'-31.5'	314	3/30/09									
B-11, 0.0'-1.5'	315	3/3/09	Hom	3/4"			No	43.52	212.93	170.85	33.0
B-11, 1.5'-3.0'	316	3/3/09	Hom	No. 10			Yes	44.11	103.95	86.90	39.8
B-11, 3.0'-4.5'	317	3/3/09	Hom	No. 10			Yes	44.05	209.98	160.02	43.1
B-11, 4.5'-6.0'	318	3/3/09	Hom	3/8"			No	44.15	273.68	210.13	38.3
B-11, 6.0'-7.5'	319	3/3/09	Hom	1 1/2"			No	43.92	242.26	194.70	31.5
B-11, 7.5'-9.0'	320	3/3/09	Hom	No. 10			Yes	42.80	244.44	186.01	40.8
B-11, 9.0'-10.5'	321	3/3/09	Hom	No. 10			Yes	46.32	240.32	178.40	46.9
B-11, 10.5'-12.0'	322	3/3/09	Hom	No. 10			Yes	43.87	242.23	175.54	50.6
B-11, 12.0'-13.5'	323	3/3/09	Hom	No. 10			Yes	43.90	262.01	195.50	43.9
B-11, 13.5'-15.0'	324	3/3/09	Hom	No. 10			Yes	43.43	241.10	176.00	49.1
B-11, 15.0'-16.5'	325	3/3/09	Hom	No. 10			Yes	43.71	301.10	225.12	41.9
B-11, 16.5'-18.0'	326	3/3/09	Hom	No. 10			Yes	43.61	266.37	195.75	46.4
B-11, 18.0'-19.5'	327	3/3/09	Hom	No. 10			Yes	47.87	254.91	194.00	41.7
B-11, 19.5'-21.0'	328	3/3/09	Hom	No. 10			Yes	43.51	288.40	211.34	45.9
B-11, 21.0'-22.5'	329	3/3/09	Hom	No. 10			Yes	43.44	281.40	207.21	45.3
B-11, 22.5'-24.0'	330	3/3/09	Hom	No. 10			Yes	45.82	247.10	191.46	38.2
B-11, 24.0'-25.5'	331	3/3/09	Hom	No. 10			Yes	48.04	300.67	229.01	39.6
B-11, 25.5'-27.0'	332	3/3/09	Hom	No. 10			Yes	48.87	336.30	253.03	40.8
B-11, 27.0'-28.5'	333	3/3/09	Hom	No. 10			Yes	43.48	276.98	205.69	43.9
B-11, 28.5'-30.0'	334	3/3/09	Hom	No. 10			Yes	38.17	207.68	155.10	45.0
B-11, 30.0'-31.5'	335	3/3/09	Hom	No. 10			Yes	43.26	295.80	217.70	44.8
B-11, 31.5'-33.0'	336	3/3/09	Hom	No. 10			Yes	45.67	286.00	209.95	46.3
B-11, 33.0'-34.5'	337	3/3/09	Hom	No. 10			Yes	43.37	223.44	164.75	48.4
B-11, 34.5'-36.0'	338	3/3/09	Hom	No. 10			Yes	43.46	246.19	184.57	43.7
B-11, 36.0'-37.5'	339	3/30/09									
B-11, 37.5'-39.0'	340	3/30/09									
B-11, 39.0'-40.5'	341	3/30/09									
B-11, 40.5'-42.0'	342	3/30/09									

Stantec

Moisture Content of Soil

Dried @ 200° C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-11, 42.0'-43.5'	343	3/30/09									
B-11, 43.5'-45.0'	344	3/30/09									

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Moisture Content of Soil

Dried @ 200° C ASTM D 2216

Project Name TVA Cumberland Fossil Plant

Project Number 171468118

Tested By

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-4, 0.0'-1.5'	402										
B-4, 1.5'-3.0'	403										
B-4, 3.0'-4.5'	404										
B-4, 4.5'-6.0'	405										
B-4, 6.0'-7.5'	406										
B-4, 7.5'-9.0'	407										
B-4, 9.0'-10.5'	408										
B-4, 10.5'-12.0'	409										
B-4, 12.0'-13.5'	410										
B-4, 13.5'-15.0'	411										
B-4, 15.0'-16.5'	412										
B-4, 25.0'-26.5'	413										
B-4, 35.0'-36.5'	414										
B-4, 45.0'-46.5'	415										
B-6, 0.0'-1.5'	416	3/5/09	Hom	3/8"			No	20.88	95.27	83.67	18.5
B-6, 1.5'-3.0'	417	3/5/09	Hom	No. 10			Yes	21.02	87.57	71.72	31.3
B-6, 3.0'-4.5'	418	3/5/09	Hom	No. 10			Yes	21.04	85.45	67.75	37.9
B-6, 4.5'-6.0'	419	3/5/09	Hom	No. 4			No	21.08	92.89	75.62	31.7
B-6, 6.0'-7.5'	420	3/5/09	Hom	No. 10			Yes	20.77	90.93	71.63	37.9
B-6, 7.5'-9.0'	421	3/5/09	Hom	No. 10			Yes	21.73	108.05	83.56	39.6
B-6, 9.0'-10.5'	422	3/5/09	Hom	No. 10			Yes	21.17	104.34	80.62	39.9
B-6, 10.5'-12.0'	423	3/5/09	Hom	No. 10			Yes	21.29	97.71	75.66	40.6
B-6, 12.0'-13.5'	424	3/5/09	Hom	No. 10			Yes	20.83	119.51	90.91	40.8
B-6, 13.5'-15.0'	425	3/5/09	Hom	No. 10			Yes	21.12	99.54	76.12	42.6
B-6, 15.0'-16.5'	426	3/5/09	Hom	No. 10			Yes	22.31	108.68	84.55	38.8
B-6, 16.5'-18.0'	427	3/5/09	Str	No. 10			Yes	21.42	102.22	77.87	43.1
B-6, 18.0'-19.5'	428	3/5/09	Str	No. 10			Yes	20.54	119.05	90.78	40.2
B-6, 19.5'-21.0'	429	3/5/09	Str	No. 10			Yes	20.27	111.79	85.62	40.0

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Moisture Content of Soil

Dried @ 200° C ASTM D 2216

Project Name TVA Cumberland Fossil Plant

Project Number 171468118

Tested By

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-6, 21.0'-22.5'	430	3/5/09	Str	No. 10			Yes	21.78	118.39	88.35	45.1
B-6, 22.5'-24.0'	431	3/5/09	Hom	No. 10			Yes	20.24	105.20	82.08	37.4
B-6, 24.0'-25.5'	432	3/5/09	Hom	No. 10			Yes	20.06	116.91	89.79	38.9
B-6, 25.5'-27.0'	433	3/5/09	Hom	No. 10			Yes	20.79	113.01	88.04	37.1
B-6, 27.0'-28.5'	434	3/5/09	Hom	No. 10			Yes	18.60	71.92	57.13	38.4
B-6, 28.5'-30.0'	435	3/10/09	Hom	No. 10			Yes	43.64	274.47	214.98	34.7
B-6, 30.0'-31.5'	436	3/5/09	Str	No. 10			Yes	20.27	90.91	70.04	41.9
B-6, 31.5'-33.0'	437	3/5/09	Str	No. 10			Yes	18.40	80.95	61.84	44.0
B-6, 33.0'-34.5'	438	3/5/09	Str	No. 10			Yes	20.44	86.28	66.95	41.6
B-6, 34.5'-36.0'	439										
B-6, 36.0'-37.5'	440										
B-6, 37.5'-39.0'	441										
B-6, 39.0'-40.5'	442										
B-6, 40.5'-42.0'	443										
B-6, 42.0'-43.5'	444										
B-6, 43.5'-45.0'	445										
B-6, 45.0'-46.5'	446										
B-6, 46.5'-48.0'	447										
B-6, 48.0'-49.5'	448										
B-6, 49.5'-51.0'	449										
B-6, 60.0'-61.5'	450										
B-6, 70.0'-71.5'	451										
B-6, 80.0'-81.5'	452										
B-6, 90.0'-91.5'	453										
B-6, 100.0'-101.5'	454										
B-7, 0.0'-1.5'	455	3/10/09	Hom	No. 10			Yes	18.54	100.97	82.04	29.8
B-7, 1.5'-3.0'	456	3/10/09	Hom	No. 10			Yes	20.42	101.15	81.39	32.4
B-7, 3.0'-4.5'	457	3/10/09	Hom	3/8"			No	20.52	51.75	47.35	16.4
B-7, 4.5'-6.0'	458	3/10/09	Hom	No. 10			Yes	18.36	95.30	79.49	25.9
B-7, 6.0'-7.5'	459	3/10/09	Hom	No. 10			Yes	18.98	91.26	74.84	29.4

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Moisture Content of Soil

Dried @ 200° C ASTM D 2216

Project Name TVA Cumberland Fossil Plant

Project Number 171468118

Tested By

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-7, 7.5'-9.0'	460	3/10/09	Hom	No. 10			Yes	20.53	93.01	78.66	24.7
B-7, 9.0'-10.5'	461										
B-7, 10.5'-12.0'	462										
B-7, 12.0'-13.5'	463										
B-7, 13.5'-15.0'	464										
B-7, 15.0'-16.5'	465										
B-7, 16.5'-18.0'	466										
B-7, 18.0'-19.5'	467										
B-7, 19.5'-21.0'	468										
B-7, 31.0'-32.5'	469										
B-7, 40.0'-41.5'	470										
B-7, 50.0'-51.5'	471										
B-7, 60.0'-61.5'	472										
B-7, 70.0'-71.5'	473										
B-8, 0.0'-1.5'	474	3/11/09	Hom	No. 10			Yes	18.81	79.36	65.28	30.3
B-8, 1.5'-3.0'	475	3/11/09	Hom	No. 10			Yes	20.35	89.80	71.94	34.6
B-8, 3.0'-4.5'	476	3/11/09	Hom	No. 10			Yes	20.68	89.56	70.07	39.5
B-8, 4.5'-6.0'	477	3/11/09	Hom	No. 10			Yes	20.48	87.52	68.07	40.9
B-8, 6.0'-7.5'	478	3/11/09	Hom	No. 10			Yes	21.02	117.29	89.51	40.6
B-8, 7.5'-9.0'	479	3/11/09	Hom	No. 10			Yes	20.05	104.32	77.61	46.4
B-8, 9.0'-10.5'	480	3/11/09	Hom	No. 10			Yes	20.15	114.72	88.44	38.5
B-8, 10.5'-12.0'	481	3/11/09	Hom	No. 10			Yes	21.53	113.15	86.38	41.3
B-8, 12.0'-13.5'	482	3/11/09	Hom	No. 10			Yes	18.62	104.30	79.18	41.5
B-8, 13.5'-15.0'	483	3/11/09	Hom	No. 10			Yes	21.37	116.64	87.51	44.0
B-8, 15.0'-16.5'	484	3/11/09	Hom	No. 10			Yes	23.45	133.21	97.16	48.9
B-8, 16.5'-18.0'	485	3/11/09	Hom	No. 10			Yes	19.17	116.60	85.91	46.0
B-8, 18.0'-19.5'	486	3/11/09	Hom	No. 10			Yes	18.54	114.04	84.86	44.0
B-8, 19.5'-21.0'	487	3/11/09	Hom	No. 10			Yes	21.70	123.29	92.53	43.4
B-8, 21.0'-22.5'	488	3/11/09	Hom	No. 10			Yes	20.45	125.86	92.44	46.4
B-8, 22.5'-24.0'	489	3/11/09	Hom	No. 10			Yes	14.99	106.41	77.12	47.1

Stantec

Moisture Content of Soil

Dried @ 200° C ASTM D 2216

Project Name TVA Cumberland Fossil Plant

Project Number 171468118

Tested By

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-8, 24.0'-25.5'	490	3/11/09	Hom	No. 10			Yes	14.81	111.35	80.31	47.4
B-8, 25.5'-27.0'	491	3/11/09	Hom	No. 10			Yes	38.21	231.76	173.15	43.4
B-8, 27.0'-28.5'	492	3/11/09	Hom	No. 10			Yes	43.83	304.95	231.48	39.2
B-8, 28.5'-30.0'	493	3/11/09	Hom	No. 10			Yes	44.22	272.50	215.86	33.0
B-8, 30.0'-31.5'	494	3/11/09	Hom	No. 10			Yes	43.54	281.88	207.16	45.7
B-8, 31.5'-33.0'	495	3/11/09	Hom	No. 10			Yes	44.03	254.46	185.72	48.5
B-8, 33.0'-34.5'	496	3/11/09	Hom	No. 10			Yes	46.55	265.65	194.55	48.0
B-8, 34.5'-36.0'	497	3/11/09	Hom	No. 10			Yes	38.15	241.14	179.50	43.6
B-8, 36.0'-37.5'	498	3/11/09	Hom	No. 10			Yes	20.39	124.94	94.82	40.5
B-8, 37.5'-39.0'	499	3/11/09	Hom	No. 10			Yes	20.76	139.69	102.06	46.3
B-8, 39.0'-40.5'	500	3/11/09	Hom	No. 10			Yes	20.76	115.44	84.55	48.4
B-8, 40.5'-42.0'	501	3/11/09	Hom	No. 10			Yes	20.63	120.61	88.88	46.5
B-8, 42.0'-43.5'	502	3/11/09	Hom	No. 10			Yes	21.48	121.46	88.76	48.6
B-8, 43.5'-45.0'	503	3/11/09	Hom	No. 10			Yes	19.35	114.20	83.58	47.7
B-8, 45.0'-46.5'	504	3/11/09	Hom	No. 10			Yes	20.74	107.55	78.56	50.1
B-8, 46.5'-48.0'	505	3/11/09	Hom	No. 10			Yes	19.47	99.81	75.08	44.5
B-8, 48.0'-49.5'	506	3/11/09	Hom	No. 10			Yes	19.43	128.34	93.58	46.9
B-8, 49.5'-51.0'	507	3/11/09	Hom	No. 10			Yes	21.57	122.09	90.78	45.2
B-8, 51.0'-52.5'	508	3/11/09	Hom	No. 10			Yes	20.55	113.60	83.82	47.1
B-8, 52.5'-54.0'	509	3/11/09	Hom	No. 10			Yes	20.49	114.06	83.52	48.5
B-8, 54.0'-55.5'	510	3/11/09	Hom	No. 10			Yes	21.24	123.50	90.03	48.7
B-8, 55.5'-57.0'	511	3/11/09	Hom	No. 10			Yes	18.58	113.31	81.24	51.2
B-8, 57.0'-58.5'	512	3/11/09	Hom	1 1/2"	2	1 1/2"	No	21.74	130.76	100.69	38.1
B-8, 58.5'-60.0'	513										
B-8, 60.0'-61.5'	514										
B-8, 61.5'-63.0'	515										
B-8, 63.0'-64.5'	516										
B-8, 64.5'-66.0'	517										
B-8, 66.0'-67.5'	518										
B-8, 67.5'-69.0'	519										

Stantec

Moisture Content of Soil

Dried @ 200° C ASTM D 2216

Project Name TVA Cumberland Fossil Plant

Project Number 171468118

Tested By

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-8, 79.5'-81.0'	520										
B-8, 89.5'-91.0'	521										
B-8, 97.5'-98.0'	522										
B-9, 0.0'-1.5'	523	3/11/09	Len					20.98	91.20	72.87	35.3
B-9, 1.5'-3.0'	524	3/11/09	Hom					19.01	90.21	66.70	49.3
B-9, 3.0'-4.5'	525	3/11/09	Hom					21.70	94.36	74.48	37.7
B-9, 4.5'-6.0'	526	3/11/09	Hom					21.16	85.57	66.33	42.6
B-9, 6.0'-7.5'	527	3/11/09	Hom					18.46	72.26	56.88	40.0
B-9, 7.5'-9.0'	528	3/11/09	Hom					21.95	120.60	91.07	42.7
B-9, 9.0'-10.5'	529	3/11/09	Hom					20.29	92.25	72.18	38.7
B-9, 10.5'-12.0'	530	3/11/09	Hom					21.37	92.67	72.16	40.4
B-9, 12.0'-13.5'	531	3/11/09	Hom					22.04	97.25	74.30	43.9
B-9, 13.5'-15.0'	532	3/11/09	Hom					20.79	103.06	78.47	42.6
B-9, 15.0'-16.5'	533	3/11/09	Hom					20.89	94.80	70.42	49.2
B-9, 16.5'-18.0' NO RECOVERY	534	3/17/09									
B-9, 18.0'-19.5'	535	3/11/09	Hom					20.58	89.19	67.26	47.0
B-9, 19.5'-21.0'	536	3/11/09	Hom					18.57	87.18	65.67	45.7
B-9, 21.0'-22.5'	537	3/11/09	Hom					21.40	98.53	74.58	45.0
B-9, 22.5'-24.0'	538	3/11/09	Hom					22.43	95.86	72.61	46.3
B-9, 24.0'-25.5'	539	3/11/09	Hom					18.86	98.91	75.60	41.1
B-9, 25.5'-27.0'	540	3/11/09	Hom					21.18	131.37	97.15	45.0
B-9, 27.0'-28.5'	541	3/11/09	Hom					18.78	104.13	76.73	47.3
B-9, 28.5'-30.0'	542	3/11/09	Hom					19.15	111.81	82.70	45.8
B-9, 30.0'-31.5'	543	3/11/09	Hom					21.71	138.26	102.77	43.8
B-9, 31.5'-33.0'	544	3/11/09	Hom					19.80	98.44	71.01	53.6
B-9, 33.0'-34.5'	545	3/11/09	Hom					19.07	106.80	78.73	47.0
B-9, 34.5'-36.0'	546	3/11/09	Hom					21.16	125.27	90.93	49.2
B-9, 36.0'-37.5'	547	3/11/09	Hom					21.43	122.57	90.09	47.3
B-9, 37.5'-39.0'	548	3/11/09	Hom					21.98	88.28	64.44	56.1
B-9, 39.0'-40.5'	549	3/11/09	Hom					21.64	113.30	84.41	46.0

Stantec

Moisture Content of Soil

Dried @ 200° C ASTM D 2216

Project Name TVA Cumberland Fossil Plant

Project Number 171468118

Tested By

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-9, 40.5'-42.0'	550	3/11/09	Hom					21.77	128.39	93.81	48.0
B-9, 42.0'-43.5'	551	3/11/09	Hom					21.70	130.80	93.58	51.8
B-9, 43.5'-45.0'	552	3/11/09	Lam					23.78	132.22	109.77	26.1
B-9, 45.0'-46.5'	553										
B-9, 46.5'-48.0'	554										
B-9, 48.0'-49.5'	555										
B-9, 49.5'-51.0'	556										
B-9, 51.0'-52.5'	557										
B-9, 52.5'-54.0'	558										
B-9, 60.0'-61.5'	559										
B-9, 70.0'-71.5'	560										

Stantec

Moisture Content of Soil

Dried @ 200° C AASHTO T 265

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ODOT

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded		Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight . (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
					Amount	Size					
B-10, 0.0'-1.5'	646	3/16/09	Hom	No. 10			Yes	20.58	87.94	75.52	22.6
B-10, 1.5'-3.0'	647	3/16/09	Hom	No. 10			Yes	22.28	98.84	81.26	29.8
B-10, 3.0'-4.5'	648	3/16/09	Hom	No. 10			Yes	23.84	106.74	87.92	29.4
B-10, 4.5'-6.0'	649	3/16/09	Hom	No. 10			Yes	21.21	95.69	78.60	29.8
B-10, 6.0'-7.5'	650	3/16/09	Hom	No. 10			Yes	21.97	104.22	84.54	31.5
B-10, 7.5'-9.0'	651	3/16/09	Hom	No. 10			Yes	19.29	91.85	74.08	32.4
B-10, 9.0'-10.5'	652	3/16/09	Hom	No. 10			Yes	18.99	87.62	69.19	36.7
B-10, 10.5'-12.0'	653	3/16/09	Hom	No. 10			Yes	21.36	96.41	78.59	31.1
B-10, 12.0'-13.5'	654	3/16/09	Hom	No. 10			Yes	21.76	109.52	86.34	35.9
B-10, 13.5'-15.0'	655	3/16/09	Hom	No. 10			Yes	18.63	103.10	76.79	45.2
B-10, 15.0'-16.5'	656	3/16/09	Hom	No. 10			Yes	20.76	111.08	81.96	47.6
B-10, 16.5'-18.0'	657	3/16/09	Hom	No. 10			Yes	19.23	105.33	76.99	49.1
B-10, 18.0'-19.5'	658	3/16/09	Hom	No. 10			Yes	18.83	109.49	82.22	43.0
B-10, 19.5'-21.0'	659	3/16/09	Hom	No. 10			Yes	19.62	102.54	78.95	39.8
B-10, 21.0'-22.5'	660	3/16/09	Hom	No. 10			Yes	19.18	98.73	75.22	42.0
B-10, 22.5'-24.0'	661	3/16/09	Hom	No. 10			Yes	19.36	114.24	86.04	42.3
B-10, 24.0'-25.5'	662	3/16/09	Hom	No. 10			Yes	21.04	125.41	95.51	40.2
B-10, 25.5'-27.0'	663	3/16/09	Hom	No. 10			Yes	20.79	116.85	87.48	44.0
B-10, 27.0'-28.5'	664	3/16/09	Hom	No. 10			Yes	19.04	113.38	83.57	46.2
B-10, 28.5'-30.0'	665	3/16/09	Hom	No. 10			Yes	20.47	110.52	84.27	41.1
B-10, 30.0'-31.5'	666	3/16/09	Hom	No. 10			Yes	22.14	131.43	97.12	45.8
B-10, 31.5'-33.0'	667	3/16/09	Hom	No. 10			Yes	21.48	122.67	90.98	45.6
B-10, 33.0'-34.5'	668	3/16/09	Hom	No. 10			Yes	21.99	132.26	97.65	45.7
B-10, 34.5'-36.0'	669	3/16/09	Hom	No. 10			Yes	19.38	108.31	80.17	46.3
B-10, 36.0'-37.5'	670	3/16/09	Hom	No. 10			Yes	22.22	129.42	94.88	47.5
B-10, 37.5'-39.0'	671	3/16/09	Hom	No. 10			Yes	18.88	110.45	81.34	46.6
B-10, 39.0'-40.5'	672	3/16/09	Hom	No. 10			Yes	22.80	139.60	104.43	43.1
B-10, 40.5'-42.0'	673	3/16/09	Hom	No. 10			Yes	20.40	113.25	86.39	40.7

Stantec

Moisture Content of Soil

Dried @ 200° C AASHTO T 265

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ODOT

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-10, 42.0'-43.5'	674	3/15/09	Hom	No. 10			Yes	18.85	106.19	79.98	42.9
B-10, 43.5'-45.0'	675	3/15/09	Hom	No. 10			Yes	21.11	118.30	87.46	46.5
B-10, 45.0'-46.5'	676	3/15/09	Hom	No. 10			Yes	22.51	138.77	104.19	42.3
B-10, 46.5'-48.0'	677	6/23/09									
B-10, 48.0'-49.5'	678	6/23/09									
B-10, 49.5'-51.0'	679	6/23/09									
B-10, 51.0'-52.5'	680	6/23/09									
B-10, 52.5'-54.0'	681	6/23/09									
B-10, 54.0'-55.5'	682	6/23/09									
B-10, 55.5'-57.0'	683	6/23/09									
B-10, 57.0'-58.5'	684	6/23/09									
B-10, 59.5'-61.0'	685	6/23/09									
B-10, 69.5'-71.0'	686	6/23/09									
B-12, 0.0'-1.5'	687	6/23/09									
B-12, 1.5'-3.0'	688	6/23/09									
B-12, 3.0'-4.5'	689	6/23/09									
B-12, 4.5'-6.0'	690	6/23/09									
B-12, 6.0'-7.5'	691	6/23/09									
B-12, 7.5'-9.0'	692	6/23/09									
B-12, 9.0'-10.5'	693	6/23/09									
B-12, 10.5'-12.0'	694	6/23/09									
B-12, 12.0'-13.5'	695	6/23/09									
B-12, 13.5'-15.0'	696	6/23/09									
B-12, 15.0'-16.5'	697	6/23/09									
B-12, 16.5'-18.0'	698	6/23/09									
B-12, 18.0'-19.5'	699	6/23/09									
B-12, 19.5'-21.0'	700	6/23/09									
B-12, 30.0'-31.5'	701	6/23/09									
B-13, 0.0'-1.5'	702	3/17/09	Hom	No. 10			Yes	45.65	181.33	147.81	32.8
B-13, 1.5'-3.0'	703	3/17/09	Hom	No. 10			Yes	46.73	140.09	120.38	26.8
B-13, 3.0'-4.5'	704	3/17/09	Hom	No. 10			Yes	44.19	158.13	134.41	26.3

Stantec

Moisture Content of Soil

Dried @ 200° C AASHTO T 265

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ODOT

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-13, 4.5'-6.0'	705	3/17/09	Hom	No. 4			Yes	44.22	234.16	188.40	31.7
B-13, 6.0'-7.5'	706	3/17/09	Hom	No. 10			Yes	48.03	224.13	174.46	39.3
B-13, 7.5'-9.0'	707	3/17/09	Hom	No. 10			Yes	48.67	218.48	169.05	41.1
B-13, 9.0'-10.5'	708	3/17/09	Hom	No. 10			Yes	48.10	214.80	168.58	38.4
B-13, 10.5'-12.0'	709	3/17/09	Hom	No. 10			Yes	43.58	253.73	191.74	41.8
B-13, 12.0'-13.5'	710	3/17/09	Hom	No. 10			Yes	43.37	264.68	200.35	41.0
B-13, 13.5'-15.0'	711	3/17/09	Hom	No. 10			Yes	44.91	248.44	190.25	40.0
B-13, 15.0'-16.5'	712	3/17/09	Hom	No. 10			Yes	46.96	213.66	163.62	42.9
B-13, 16.5'-18.0'	713	3/17/09	Hom	No. 10			Yes	38.20	205.26	155.09	42.9
B-13, 18.0'-19.5'	714	3/17/09	Hom	No. 10			Yes	43.42	186.90	148.44	36.6
B-13, 19.5'-21.0'	715	3/17/09	Hom	No. 10			Yes	38.37	217.18	160.55	46.3
B-13, 21.0'-22.5'	716	6/23/09									
B-13, 22.5'-24.0'	717	6/23/09									
B-13, 24.0'-25.5'	718	6/23/09									
B-13, 25.5'-27.0'	719	6/23/09									
B-13, 27.0'-28.5'	720	6/23/09									
B-13, 28.5'-30.0'	721	6/23/09									
B-13, 38.5'-40.0'	722	6/23/09									
B-14, 0.0'-1.5'	723	6/23/09									
B-14, 1.5'-3.0'	724	6/23/09									
B-14, 3.0'-4.5'	725	6/23/09									
B-14, 4.5'-6.0'	726	6/23/09									
B-14, 6.0'-7.5'	727	6/23/09									
B-14, 7.5'-9.0'	728	6/23/09									
B-14, 9.0'-10.5'	729	6/23/09									
B-14, 10.5'-12.0'	730	6/23/09									
B-14, 12.0'-13.5'	731	6/23/09									
B-14, 13.5'-15.0'	732	6/23/09									
B-14, 15.0'-16.5'	733	6/23/09									
B-14, 16.5'-18.0'	734	6/23/09									
B-14, 18.0'-19.5'	735	6/23/09									

Stantec

Moisture Content of Soil

Dried @ 200° C AASHTO T 265

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ODOT

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded		Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
					Amount	Size					
B-14, 19.5'-21.0'	736	6/23/09									
B-14, 21.0'-22.5'	737	6/23/09									
B-14, 22.5'-24.0'	738	6/23/09									
B-14, 24.0'-25.5'	739	6/23/09									
B-14, 25.5'-27.0'	740	6/23/09									
B-14, 27.0'-28.5'	741	6/23/09									
B-14, 28.5'-30.0'	742	6/23/09									
B-14, 30.0'-31.5'	743	6/23/09									
B-14, 31.5'-33.0'	744	6/23/09									
B-14, 33.0'-34.5'	745	6/23/09									
B-14, 34.5'-36.0'	746	6/23/09									
B-14, 36.0'-37.5'	747	6/23/09									
B-14, 37.5'-39.0'	748	6/23/09									
B-14, 39.0'-40.5'	749	6/23/09									
B-14, 40.5'-42.0'	750	6/23/09									
B-14, 42.0'-43.5'	751	6/23/09									
B-14, 43.5'-45.0'	752	6/23/09									
B-14, 45.0'-46.5'	753	6/23/09									
B-14, 46.5'-48.0'	754	6/23/09									
B-14, 50.0'-51.5'	755	6/23/09									

Stantec

Moisture Content of Soil

Dried @ 110°C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-1, 57.0'-58.5'	198	2/24/09	Hom	1 1/2"			No	21.31	129.26	111.30	20.0
B-1, 58.5'-60.0'	199	2/24/09	Hom	3/4"			No	21.00	107.79	93.84	19.2
B-1, 60.0'-61.5'	200	2/24/09	Hom	1 1/2"			No	20.81	136.72	117.03	20.5
B-1, 61.5'-63.0'	201	2/24/09	Hom	1 1/2"			No	18.72	111.58	93.90	23.5
B-1, 63.0'-64.5'	202	2/24/09	Hom	1 1/2"			No	19.16	90.74	77.62	22.4
B-1, 64.5'-66.0'	203	2/24/09	Hom	1 1/2"			No	20.88	116.86	104.16	15.2
B-1, 66.0'-67.5'	204	2/24/09	Hom	3/4"			No	20.27	91.09	79.02	20.5
B-1, 67.5'-69.0'	205	2/24/09	Hom	1 1/2"			No	18.62	108.33	95.90	16.1
B-1, 80.0'-81.5'	206	2/24/09	Hom	1 1/2"			No	19.90	110.76	95.09	20.8
B-1, 90.0'-91.5'	207	2/24/09	Hom	1 1/2"			No	19.28	123.99	105.94	20.8
B-1, 100.0'-101.5'	208	2/24/09	Hom	1 1/2"			No	21.36	145.87	125.93	19.1
B-1, 110.0'-111.5'	209	2/24/09	Hom	1 1/2"			No	18.30	108.78	91.19	24.1

Stantec

Moisture Content of Soil

Dried @ 110°C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-2, 30.0'-31.5'	230	2/25/09	Hom	3/4"			No	20.38	123.54	101.02	27.9
B-2, 31.5'-33.0'	231	2/25/09	Lam	3/4"			No	21.02	129.70	104.93	29.5
B-2, 33.0'-34.5'	232	2/25/09	Lam	3/4"			No	21.40	117.27	105.89	13.5
B-2, 34.5'-36.0'	233	2/25/09	Lam	3/4"			No	21.05	130.34	113.28	18.5
B-2, 36.0'-37.5'	234	2/25/09	Hom	3/4"			No	27.17	137.76	121.73	17.0
B-2, 37.5'-39.0'	235	2/25/09	Hom	3/8"			No	21.09	121.88	105.44	19.5
B-2, 39.0'-40.5'	236	2/25/09	Hom	3/4"			No	21.09	125.28	107.81	20.1
B-2, 40.5'-42.0'	237	2/25/09	Hom	3/4"			No	17.21	122.86	107.46	17.1
B-2, 42.0'-43.5'	238	2/25/09	Hom	1 1/2"			No	29.44	123.90	111.27	15.4
B-2, 43.5'-45.0'	239	2/25/09	Hom	1 1/2"	2	1 1/2"	No	21.15	103.41	91.38	17.1
B-2, 45.0'-46.5'	240	2/25/09	Hom	1 1/2"			No	20.77	115.71	102.54	16.1
B-2, 46.5'-48.0'	241	2/25/09	Lam	3/4"			No	21.09	101.90	90.57	16.3
B-2, 48.0'-49.5'	242	2/25/09	Hom	3/4"			No	20.83	106.17	92.97	18.3
B-2, 49.5'-51.0'	243	2/25/09	Lam	1 1/2"			No	21.36	116.54	100.91	19.6
B-2, 51.0'-52.5'	244	2/25/09	Lam	3/4"			No	18.43	87.57	77.80	16.5
B-2, 52.5'-54.0'	245	2/25/09	Hom	3/4"			No	28.85	129.57	114.76	17.2
B-2, 54.0'-55.5'	246	2/25/09	Hom	3/4"			No	19.87	123.73	107.65	18.3
B-2, 55.5'-57.0'	247	2/25/09	Hom	1 1/2"			No	18.40	97.98	85.03	19.4
B-2, 57.0'-58.5'	248	2/25/09	Hom	3/4"			No	18.64	106.41	92.13	19.4
B-2, 58.5'-60.0'	249	2/25/09	Len	3/4"			No	22.17	127.82	108.50	22.4
B-2, 60.0'-61.5'	250	3/2/09	Hom	3/4"			No	22.31	116.51	100.32	20.8
B-2, 61.5'-63.0'	251	3/2/09	Hom	3/8"			No	21.90	115.31	98.67	21.7
B-2, 63.0'-64.5'	252	3/2/09	Len	3/8"			No	20.59	101.90	86.23	23.9
B-2, 64.5'-66.0'	253	3/2/09	Hom	3/8"			No	21.72	119.69	100.53	24.3
B-2, 66.0'-67.5'	254	3/2/09	Hom	3/8"			No	20.65	117.49	102.42	18.4
B-2, 67.5'-69.0'	255	3/2/09	Hom	1 1/2"			No	20.38	124.71	108.76	18.0
B-2, 69.0'-70.5'	256	3/2/09	Hom	3/4"			No	18.62	108.06	91.42	22.9
B-2, 70.5'-72.0'	257	3/2/09	Hom	3/4"			No	20.71	103.51	91.83	16.4
B-2, 72.0'-73.5'	258	3/2/09	Hom	3/4"			No	18.78	100.35	88.57	16.9
B-2, 73.5'-75.0'	259	3/2/09	Hom	1 1/2"			No	20.88	110.53	94.94	21.1
B-2, 75.0'-76.5'	260	3/2/09	Hom	3/4"			No	19.68	99.88	86.99	19.2

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Moisture Content of Soil

Dried @ 110°C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-2, 76.5'-78.0'	261	3/2/09	Hom	1 1/2"			No	19.87	99.14	86.29	19.3
B-2, 78.0'-79.5'	262	3/2/09	Hom	1 1/2"			No	38.04	184.64	162.17	18.1
B-2, 79.5'-81.0'	263	3/2/09	Hom	1 1/2"			No	38.31	173.27	154.16	16.5
B-2, 81.0'-82.5'	264	3/2/09	Hom	1 1/2"			No	46.00	193.06	168.57	20.0
B-2, 82.5'-84.0'	265	3/2/09	Hom	3/4"			No	46.56	160.78	145.60	15.3
B-2, 84.0'-85.5'	266	3/2/09	Hom	3/4"			No	38.05	165.15	148.76	14.8
B-2, 85.5'-87.0'	267	3/2/09	Hom	3/4"			No	37.79	160.17	141.79	17.7
B-2, 87.0'-88.5'	268	3/2/09	Hom	1 1/2"			No	42.90	167.95	152.56	14.0
B-2, 88.5'-90.0'	269	3/2/09	Hom	3/4"			No	43.97	174.92	159.74	13.1
B-2, 90.0'-91.5'	270	3/2/09	Hom	3/4"			No	45.63	197.74	175.60	17.0
B-3, 0.0'-1.5'	271	3/2/09	Hom	1 1/2"			No	47.91	159.05	144.81	14.7
B-3, 1.5'-3.0'	272	3/2/09	Hom	3/4"			No	44.18	156.44	141.98	14.8
B-3, 3.0'-4.5'	273	3/2/09	Hom	3/8"			No	43.70	173.88	155.90	16.0
B-3, 4.5'-6.0'	274	3/2/09	Hom	3/4"			No	43.59	196.77	176.13	15.6
B-3, 6.0'-7.5'	275	3/2/09	Hom	3/4"			No	43.58	186.39	168.35	14.5
B-3, 7.5'-9.0'	276	3/2/09	Hom	1 1/2"			No	43.42	188.69	171.01	13.9
B-3, 9.0'-10.5'	277	3/2/09	Hom	1 1/2"			No	43.48	206.75	185.47	15.0
B-3, 10.5'-12.0'	278	3/2/09	Hom	1 1/2"			No	47.36	142.92	132.14	12.7
B-3, 12.0'-13.5'	279	3/2/09	Hom	3/4"			No	43.65	171.48	154.78	15.0
B-3, 13.5'-15.0'	280	3/2/09	Hom	1 1/2"			No	43.31	182.29	162.26	16.8
B-3, 15.0'-16.5'	281	3/2/09	Hom	3/4"			No	43.61	191.04	170.32	16.4
B-3, 16.5'-18.0'	282	3/2/09	Hom	3/4"			No	48.32	166.04	148.99	16.9
B-3, 18.0'-19.5'	283	3/2/09	Hom	1 1/2"			No	47.86	152.82	137.63	16.9
B-3, 19.5'-21.0'	284	3/2/09	Hom	1 1/2"			No	43.75	156.94	141.12	16.2
B-3, 21.0'-22.5'	285	3/2/09									
B-3, 22.5'-24.0'	286	3/2/09	Hom	1 1/2"			No	43.32	131.74	121.21	13.5
B-3, 24.0'-25.5'	287	3/2/09	Hom	3/4"			No	43.56	170.75	154.24	14.9
B-3, 25.5'-27.0'	288	3/2/09	Hom	3/4"			No	46.88	177.68	162.88	12.8
B-3, 27.0'-28.5'	289	3/2/09	Hom	1 1/2"			No	48.70	165.92	152.42	13.0
B-3, 28.5'-30.0'	290	3/2/09	Hom	1 1/2"			No	43.30	170.38	153.73	15.1
B-3, 30.0'-31.5'	291	3/2/09	Hom	1 1/2"			No	44.80	191.59	174.15	13.5

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Moisture Content of Soil

Dried @ 110°C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-3, 31.5'-33.0'	292	3/2/09	Hom	3/4"			No	46.15	194.27	176.08	14.0
B-3, 33.0'-34.5'	293	3/2/09	Hom	1 1/2"			No	43.69	166.53	151.59	13.8
B-3, 34.5'-36.0'	294	3/2/09	Hom	3/4"			No	43.76	189.41	171.19	14.3
B-3, 36.0'-37.5'	295	3/2/09	Hom	3/4"			No	37.68	147.05	132.82	15.0
B-3, 37.5'-39.0'	296	3/2/09	Hom	3/4"			No	44.10	177.52	162.55	12.6
B-3, 39.0'-40.5'	297	3/2/09	Hom	1 1/2"			No	44.00	198.76	179.75	14.0
B-3, 49.0'-50.5'	298	3/2/09	Hom	3/4"			No	43.89	204.43	180.91	17.2
B-3, 59.0'-60.5'	299	3/2/09	Hom	1 1/2"			No	44.87	254.16	226.02	15.5
B-3, 69.0'-70.5'	300	3/2/09	Hom	3/4"			No	43.55	222.82	194.81	18.5
B-5, 0.0'-1.5'	301	3/2/09	Hom	1 1/2"			No	43.68	178.50	170.49	6.3
B-5, 1.5'-3.0'	302	3/2/09	Hom	1 1/2"			No	47.31	174.13	159.45	13.1
B-5, 3.0'-4.5'	303	3/2/09	Hom	3/4"			No	43.02	187.98	169.31	14.8
B-5, 4.5'-6.0'	304	3/2/09	Hom	3/4"			No	43.79	171.25	162.24	7.6
B-5, 6.0'-7.5'	305	3/2/09	Hom	1 1/2"			No	43.95	214.19	194.11	13.4
B-5, 7.5'-9.0'	306	3/2/09	Hom	3/4"			No	46.59	199.64	181.50	13.4
B-5, 9.0'-10.5'	307	3/2/09	Hom	3/4"			No	43.15	217.22	190.09	18.5
B-5, 10.5'-12.0'	308	3/2/09	Hom	1 1/2"			No	44.27	223.67	196.69	17.7
B-5, 12.0'-13.5'	309	3/2/09	Hom	1 1/2"			No	43.67	240.47	208.26	19.6
B-5, 13.5'-15.0'	310	3/2/09	Hom	1 1/2"			No	43.70	227.38	197.54	19.4
B-5, 15.0'-16.5'	311	3/2/09	Hom	3/4"			No	48.54	260.87	221.77	22.6
B-5, 20.0'-21.5'	312	3/2/09	Hom	3/4"			No	44.12	192.22	165.46	22.1
B-5, 25.0'-26.5'	313	3/2/09	Hom	3/4"			No	46.72	242.22	210.40	19.4

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Moisture Content of Soil

Dried @ 110°C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-11, 36.0'-37.5'	339	3/3/09	Hom	1 1/2"			No	43.41	171.72	154.95	15.0
B-11, 37.5'-39.0'	340	3/3/09	Hom	1 1/2"			No	44.06	232.75	206.24	16.3
B-11, 39.0'-40.5'	341	3/3/09	Hom	1 1/2"			No	43.92	214.53	186.68	19.5
B-11, 40.5'-42.0'	342	3/3/09	Hom	3/4"			No	43.62	277.35	243.07	17.2
B-11, 42.0'-43.5'	343	3/3/09	Hom	3/4"			No	46.87	255.91	223.88	18.1
B-11, 43.5'-45.0'	344	3/3/09	Hom	1 1/2"			No	43.67	239.58	212.51	16.0

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Moisture Content of Soil

Dried @ 110° C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded		Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
					Amount	Size					
B-4, 0.0'-1.5'	402	3/5/09	Hom	3/8"			No	46.78	212.24	189.12	16.2
, 1.5'-3.0'	403	3/5/09	Len	3/4"			No	43.50	124.06	113.00	15.9
, 3.0'-4.5'	404	3/5/09	Hom	3/4"			No	44.07	114.40	111.46	4.4
, 4.5'-6.0'	405	3/5/09	Hom	3/4"			No	48.03	197.73	178.46	14.8
, 6.0'-7.5'	406	3/5/09	Hom	3/4"			No	43.27	117.83	109.68	12.3
, 7.5'-9.0'	407	3/5/09	Len	3/4"			No	43.95	126.17	113.59	18.1
, 9.0'-10.5'	408	3/5/09	Hom	3/8"			No	43.54	177.03	157.33	17.3
, 10.5'-12.0'	409	3/5/09	Hom	3/8"			No	43.79	109.05	100.57	14.9
, 12.0'-13.5'	410	3/5/09	Hom	3/4"			No	38.41	141.10	132.88	8.7
, 13.5'-15.0'	411	3/5/09	Hom	3/8"			No	44.08	217.37	189.06	19.5
, 15.0'-16.5'	412	3/5/09	Len	3/4"			No	43.09	161.71	145.77	15.5
, 25.0'-26.5'	413	3/5/09	Hom	3/8"			No	46.83	213.15	188.17	17.7
, 35.0'-36.5'	414	3/5/09	Hom	3/4"			No	46.35	192.84	172.80	15.8
, 45.0'-46.5'	415	3/5/09	Len	3/4"			No	43.74	215.98	193.15	15.3
B-6, 0.0'-1.5'	416										
, 1.5'-3.0'	417										
, 3.0'-4.5'	418										
, 4.5'-6.0'	419										
, 6.0'-7.5'	420										
, 7.5'-9.0'	421										
, 9.0'-10.5'	422										
, 10.5'-12.0'	423										
, 12.0'-13.5'	424										
, 13.5'-15.0'	425										
, 15.0'-16.5'	426										
, 16.5'-18.0'	427										
, 18.0'-19.5'	428										
, 19.5'-21.0'	429										

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Moisture Content of Soil

Dried @ 110° C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
, 21.0'-22.5'	430										
, 22.5'-24.0'	431										
, 24.0'-25.5'	432										
, 25.5'-27.0'	433										
, 27.0'-28.5'	434										
, 28.5'-30.0'	435										
, 30.0'-31.5'	436										
, 31.5'-33.0'	437										
, 33.0'-34.5'	438										
, 34.5'-36.0'	439	3/9/09	Hom	No. 10			Yes	21.18	102.75	82.74	32.5
, 36.0'-37.5'	440	3/9/09	Hom	No. 10			Yes	21.92	110.65	88.68	32.9
, 37.5'-39.0'	441	3/9/09	Str	No. 10			Yes	18.44	83.75	67.15	34.1
, 39.0'-40.5'	442	3/9/09	Str	No. 10			Yes	20.58	117.84	91.64	36.9
, 40.5'-42.0'	443	3/9/09	Str	No. 10			Yes	21.43	102.10	82.85	31.3
, 42.0'-43.5'	444	3/9/09	Len	3/8"			No	20.97	115.65	96.01	26.2
, 43.5'-45.0' NO SAMPLE	445	3/10/09									
, 45.0'-46.5'	446	3/9/09	Len	3/8"			No	22.15	109.02	97.78	14.9
, 46.5'-48.0'	447	3/9/09	Len	3/8"			No	21.41	104.44	93.28	15.5
, 48.0'-49.5'	448	3/9/09	Len	3/8"			No	21.74	129.21	108.89	23.3
, 49.5'-51.0'	449	3/9/09	Len	3/8"			No	21.53	106.58	92.38	20.0
, 60.0'-61.5'	450	3/9/09	Len	3/4"			No	21.46	112.59	100.36	15.5
, 70.0'-71.5'	451	3/9/09	Len	3/4"			No	21.12	114.28	103.77	12.7
, 80.0'-81.5'	452	3/9/09	Len	3/4"			No	21.20	117.47	104.63	15.4
, 90.0'-91.5'	453	3/9/09	Len	3/8"			No	21.54	101.67	89.18	18.5
, 100.0'-101.5'	454	3/9/09	Len	3/8"			No	21.06	109.49	96.34	17.5
B-7, 0.0'-1.5'	455	3/10/09	Hom	No. 10			Yes	18.54	100.97	82.04	29.8
, 1.5'-3.0'	456	3/10/09	Hom	No. 10			Yes	20.42	101.15	81.39	32.4
, 3.0'-4.5'	457	3/10/09	Hom	3/8"			No	20.52	51.75	47.35	16.4
, 4.5'-6.0'	458	3/10/09	Hom	No. 10			Yes	18.36	95.30	79.49	25.9
, 6.0'-7.5'	459	3/10/09	Hom	No. 10			Yes	18.98	91.26	74.84	29.4

Stantec

Moisture Content of Soil

Dried @ 110° C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
, 7.5'-9.0'	460	3/10/09	Hom	No. 10			Yes	20.53	93.01	78.66	24.7
, 9.0'-10.5'	461	3/11/09	Len	3/4"			No	21.30	112.84	100.34	15.8
, 10.5'-12.0'	462	3/11/09	Hom	3/4"			No	19.00	101.58	86.33	22.6
, 12.0'-13.5'	463	3/11/09	Hom	3/4"			No	20.97	138.70	113.25	27.6
, 13.5'-15.0'	464	3/11/09	Lam	1 1/2"			No	21.20	103.56	91.43	17.3
, 15.0'-16.5'	465	3/11/09	Lam	1 1/2"			No	18.64	92.13	80.36	19.1
, 16.5'-18.0'	466	3/11/09	Lam	1 1/2"			No	21.08	108.72	97.23	15.1
, 18.0'-19.5'	467	3/11/09	Hom	3/4"			No	21.60	110.41	99.67	13.8
, 19.5'-21.0'	468	3/11/09	Hom	3/4"			No	21.35	112.45	103.29	11.2
, 31.0'-32.5'	469	3/11/09	Lam	1 1/2"			No	21.07	127.16	110.27	18.9
, 40.0'-41.5'	470	3/11/09	Lam	3/4"			No	21.17	116.94	102.22	18.2
, 50.0'-51.5'	471	3/11/09	Hom	3/4"			No	20.48	121.56	106.55	17.4
, 60.0'-61.5'	472	3/11/09	Hom	3/4"			No	21.60	140.72	120.61	20.3
, 70.0'-71.5'	473	3/11/09	Hom	1 1/2"			No	18.69	113.32	97.90	19.5
B-8, 0.0'-1.5'	474	3/11/09	Hom	No. 10			Yes	18.81	79.36	65.28	30.3
, 1.5'-3.0'	475	3/11/09	Hom	No. 10			Yes	20.35	89.80	71.94	34.6
, 3.0'-4.5'	476	3/11/09	Hom	No. 10			Yes	20.68	89.56	70.07	39.5
, 4.5'-6.0'	477	3/11/09	Hom	No. 10			Yes	20.48	87.52	68.07	40.9
, 6.0'-7.5'	478	3/11/09	Hom	No. 10			Yes	21.02	117.29	89.51	40.6
, 7.5'-9.0'	479	3/11/09	Hom	No. 10			Yes	20.05	104.32	77.61	46.4
, 9.0'-10.5'	480	3/11/09	Hom	No. 10			Yes	20.15	114.72	88.44	38.5
, 10.5'-12.0'	481	3/11/09	Hom	No. 10			Yes	21.53	113.15	86.38	41.3
, 12.0'-13.5'	482	3/11/09	Hom	No. 10			Yes	18.62	104.30	79.18	41.5
, 13.5'-15.0'	483	3/11/09	Hom	No. 10			Yes	21.37	116.64	87.51	44.0
, 15.0'-16.5'	484	3/11/09	Hom	No. 10			Yes	23.45	133.21	97.16	48.9
, 16.5'-18.0'	485	3/11/09	Hom	No. 10			Yes	19.17	116.60	85.91	46.0
, 18.0'-19.5'	486	3/11/09	Hom	No. 10			Yes	18.54	114.04	84.86	44.0
, 19.5'-21.0'	487	3/11/09	Hom	No. 10			Yes	21.70	123.29	92.53	43.4
, 21.0'-22.5'	488	3/11/09	Hom	No. 10			Yes	20.45	125.86	92.44	46.4
, 22.5'-24.0'	489	3/11/09	Hom	No. 10			Yes	14.99	106.41	77.12	47.1

Stantec

Moisture Content of Soil

Dried @ 110° C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
, 24.0'-25.5'	490	3/11/09	Hom	No. 10			Yes	14.81	111.35	80.31	47.4
, 25.5'-27.0'	491	3/11/09	Hom	No. 10			Yes	38.21	231.76	173.15	43.4
, 27.0'-28.5'	492	3/11/09	Hom	No. 10			Yes	43.83	304.95	231.48	39.2
, 28.5'-30.0'	493	3/11/09	Hom	No. 10			Yes	44.22	272.50	215.86	33.0
, 30.0'-31.5'	494	3/11/09	Hom	No. 10			Yes	43.54	281.88	207.16	45.7
, 31.5'-33.0'	495	3/11/09	Hom	No. 10			Yes	44.03	254.46	185.72	48.5
, 33.0'-34.5'	496	3/11/09	Hom	No. 10			Yes	46.55	265.65	194.55	48.0
, 34.5'-36.0'	497	3/11/09	Hom	No. 10			Yes	38.15	241.14	179.50	43.6
, 36.0'-37.5'	498	3/11/09	Hom	No. 10			Yes	20.39	124.94	94.82	40.5
, 37.5'-39.0'	499	3/11/09	Hom	No. 10			Yes	20.76	139.69	102.06	46.3
, 39.0'-40.5'	500	3/11/09	Hom	No. 10			Yes	20.76	115.44	84.55	48.4
, 40.5'-42.0'	501	3/11/09	Hom	No. 10			Yes	20.63	120.61	88.88	46.5
, 42.0'-43.5'	502	3/11/09	Hom	No. 10			Yes	21.48	121.46	88.76	48.6
, 43.5'-45.0'	503	3/11/09	Hom	No. 10			Yes	19.35	114.20	83.58	47.7
, 45.0'-46.5'	504	3/11/09	Hom	No. 10			Yes	20.74	107.55	78.56	50.1
, 46.5'-48.0'	505	3/11/09	Hom	No. 10			Yes	19.47	99.81	75.08	44.5
, 48.0'-49.5'	506	3/11/09	Hom	No. 10			Yes	19.43	128.34	93.58	46.9
, 49.5'-51.0'	507	3/11/09	Hom	No. 10			Yes	21.57	122.09	90.78	45.2
, 51.0'-52.5'	508	3/11/09	Hom	No. 10			Yes	20.55	113.60	83.82	47.1
, 52.5'-54.0'	509	3/11/09	Hom	No. 10			Yes	20.49	114.06	83.52	48.5
, 54.0'-55.5'	510	3/11/09	Hom	No. 10			Yes	21.24	123.50	90.03	48.7
, 55.5'-57.0'	511	3/11/09	Hom	No. 10			Yes	18.58	113.31	81.24	51.2
, 57.0'-58.5'	512	3/11/09	Hom	1 1/2"	2	1 1/2"	No	21.74	130.76	100.69	38.1
B-8, 58.5'-60.0'	513	3/12/09	Hom	3/4"			No	21.04	116.56	105.21	13.5
B-8, 60.0'-61.5'	514	3/12/09	Hom	1 1/2"			No	19.96	122.71	103.82	22.5
B-8, 61.5'-63.0'	515	3/12/09	Lam	3/4"			No	22.33	123.03	106.33	19.9
B-8, 63.0'-64.5'	516	3/12/09	Hom	1 1/2"			No	22.29	170.88	145.82	20.3
B-8, 64.5'-66.0'	517	3/12/09	Hom	1 1/2"			No	22.09	130.33	113.97	17.8
B-8, 66.0'-67.5'	518	3/12/09	Lam	3/4"			No	21.14	138.96	119.47	19.8
B-8, 67.5'-69.0'	519	3/12/09	Lam	3/4"			No	21.09	136.58	114.43	23.7

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Moisture Content of Soil

Dried @ 110° C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-8, 79.5'-81.0'	520	3/12/09	Lam	3/4"			No	20.61	122.00	106.52	18.0
B-8, 89.5'-91.0'	521	3/12/09	Lam	3/4"			No	21.13	139.61	122.15	17.3
B-8, 97.5'-98.0'	522	3/12/09	Hom	1 1/2"			No	20.39	96.49	87.95	12.6
B-9, 0.0'-1.5'	523										
, 1.5'-3.0'	524										
, 3.0'-4.5'	525										
, 4.5'-6.0'	526										
, 6.0'-7.5'	527										
, 7.5'-9.0'	528										
, 9.0'-10.5'	529										
, 10.5'-12.0'	530										
, 12.0'-13.5'	531										
, 13.5'-15.0'	532										
, 15.0'-16.5'	533										
, 16.5'-18.0'	534										
, 18.0'-19.5'	535										
, 19.5'-21.0'	536										
, 21.0'-22.5'	537										
, 22.5'-24.0'	538										
, 24.0'-25.5'	539										
, 25.5'-27.0'	540										
, 27.0'-28.5'	541										
, 28.5'-30.0'	542										
, 30.0'-31.5'	543										
, 31.5'-33.0'	544										
, 33.0'-34.5'	545										
, 34.5'-36.0'	546										
, 36.0'-37.5'	547										
, 37.5'-39.0'	548										
, 39.0'-40.5'	549										

Stantec

Moisture Content of Soil

Dried @ 110° C ASTM D 2216

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
, 40.5'-42.0'	550										
, 42.0'-43.5'	551										
, 43.5'-45.0'	552										
B-9, 45.0'-46.5'	553	3/12/09	Hom	3/4"			No	20.31	112.23	94.95	23.2
B-9, 46.5'-48.0'	554	3/12/09	Lam	3/4"			No	18.25	101.49	91.02	14.4
B-9, 48.0'-49.5'	555	3/12/09	Lam	3/4"			No	21.69	118.93	105.55	16.0
B-9, 49.5'-51.0'	556	3/12/09	Hom	1 1/2"			No	20.75	119.23	106.26	15.2
B-9, 51.0'-52.5'	557	3/12/09	Hom	3/4"			No	20.73	128.60	110.85	19.7
B-9, 52.5'-54.0'	558	3/12/09	Hom	3/4"			No	22.26	160.18	138.19	19.0
B-9, 60.0'-61.5'	559	3/12/09	Hom	1 1/2"			No	20.22	118.67	104.83	16.4
B-9, 70.0'-71.5'	560	3/12/09	Lam	1 1/2"			No	19.20	122.92	107.97	16.8
B-9, 80.0'-81.5		3/12/09	Hom	1 1/2"			No	14.07	145.80	124.00	19.8

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Moisture Content of Soil

AASHTO T 265

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ODOT

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-10, 0.0'-1.5'	646	6/23/09									
B-10, 1.5'-3.0'	647	6/23/09									
B-10, 3.0'-4.5'	648	6/23/09									
B-10, 4.5'-6.0'	649	6/23/09									
B-10, 6.0'-7.5'	650	6/23/09									
B-10, 7.5'-9.0'	651	6/23/09									
B-10, 9.0'-10.5'	652	6/23/09									
B-10, 10.5'-12.0'	653	6/23/09									
B-10, 12.0'-13.5'	654	6/23/09									
B-10, 13.5'-15.0'	655	6/23/09									
B-10, 15.0'-16.5'	656	6/23/09									
B-10, 16.5'-18.0'	657	6/23/09									
B-10, 18.0'-19.5'	658	6/23/09									
B-10, 19.5'-21.0'	659	6/23/09									
B-10, 21.0'-22.5'	660	6/23/09									
B-10, 22.5'-24.0'	661	6/23/09									
B-10, 24.0'-25.5'	662	6/23/09									
B-10, 25.5'-27.0'	663	6/23/09									
B-10, 27.0'-28.5'	664	6/23/09									
B-10, 28.5'-30.0'	665	6/23/09									
B-10, 30.0'-31.5'	666	6/23/09									
B-10, 31.5'-33.0'	667	6/23/09									
B-10, 33.0'-34.5'	668	6/23/09									
B-10, 34.5'-36.0'	669	6/23/09									
B-10, 36.0'-37.5'	670	6/23/09									
B-10, 37.5'-39.0'	671	6/23/09									
B-10, 39.0'-40.5'	672	6/23/09									
B-10, 40.5'-42.0'	673	6/23/09									

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Moisture Content of Soil

AASHTO T 265

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ODOT

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-10, 42.0'-43.5'	674	6/23/09									
B-10, 43.5'-45.0'	675	6/23/09									
B-10, 45.0'-46.5'	676	6/23/09									
B-10, 46.5'-48.0'	677	3/15/09	Hom	3/4"			No	21.22	106.18	93.21	18.0
B-10, 48.0'-49.5'	678	3/15/09	Len	3/4"			No	20.83	106.74	93.36	18.4
B-10, 49.5'-51.0'	679	3/15/09	Hom	1 1/2"			No	19.93	114.94	99.34	19.6
B-10, 51.0'-52.5'	680	3/15/09	Lam	1 1/2"			No	19.00	119.37	107.12	13.9
B-10, 52.5'-54.0'	681	3/15/09	Lam	3/4"			No	19.55	110.83	99.41	14.3
B-10, 54.0'-55.5'	682	3/15/09	Hom	1 1/2"			No	17.57	117.32	99.94	21.1
B-10, 55.5'-57.0'	683	3/15/09	Lam	3/4"			No	21.38	109.99	98.43	15.0
B-10, 57.0'-58.5'	684	3/15/09	Lam	1 1/2"			No	23.74	119.94	108.50	13.5
B-10, 59.5'-61.0'	685	3/15/09	Lam	3/4"			No	20.89	119.65	106.24	15.7
B-10, 69.5'-71.0'	686	3/15/09	Lam	1 1/2"			No	21.11	105.57	93.08	17.4
B-12, 0.0'-1.5'	687	3/15/09	Hom	3/8"			No	20.99	96.86	84.66	19.2
B-12, 1.5'-3.0'	688	3/15/09	Hom	3/4"			No	20.85	112.07	99.78	15.6
B-12, 3.0'-4.5'	689	3/15/09	Hom	3/4"			No	20.65	103.65	92.14	16.1
B-12, 4.5'-6.0'	690	3/15/09	Hom	3/4"			No	21.17	104.76	93.35	15.8
B-12, 6.0'-7.5'	691	3/15/09	Hom	3/4"			No	20.86	105.14	94.66	14.2
B-12, 7.5'-9.0'	692	3/15/09	Lam	1 1/2"			No	21.39	116.04	103.31	15.5
B-12, 9.0'-10.5'	693	3/15/09	Hom	3/4"			No	20.60	101.19	88.77	18.2
B-12, 10.5'-12.0'	694	3/15/09	Hom	3/4"			No	21.26	107.17	95.79	15.3
B-12, 12.0'-13.5'	695	3/15/09	Hom	1 1/2"			No	19.29	108.29	97.30	14.1
B-12, 13.5'-15.0'	696	3/15/09	Hom	1 1/2"			No	19.11	98.04	88.08	14.4
B-12, 15.0'-16.5'	697	3/15/09	Hom	3/4"			No	18.76	105.24	93.46	15.8
B-12, 16.5'-18.0'	698	3/15/09	Hom	3/4"			No	19.25	96.76	86.89	14.6
B-12, 18.0'-19.5'	699	3/15/09	Lam	1 1/2"			No	19.05	107.79	95.46	16.1
B-12, 19.5'-21.0'	700	3/15/09	Hom	3/4"			No	22.69	121.85	107.83	16.5
B-12, 30.0'-31.5'	701	3/15/09	Hom	3/4"			No	19.64	109.86	96.70	17.1
B-13, 0.0'-1.5'	702	6/23/09									
B-13, 1.5'-3.0'	703	6/23/09									
B-13, 3.0'-4.5'	704	6/23/09									

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Moisture Content of Soil

AASHTO T 265

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ODOT

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-13, 4.5'-6.0'	705	6/23/09									
B-13, 6.0'-7.5'	706	6/23/09									
B-13, 7.5'-9.0'	707	6/23/09									
B-13, 9.0'-10.5'	708	6/23/09									
B-13, 10.5'-12.0'	709	6/23/09									
B-13, 12.0'-13.5'	710	6/23/09									
B-13, 13.5'-15.0'	711	6/23/09									
B-13, 15.0'-16.5'	712	6/23/09									
B-13, 16.5'-18.0'	713	6/23/09									
B-13, 18.0'-19.5'	714	6/23/09									
B-13, 19.5'-21.0'	715	6/23/09									
B-13, 21.0'-22.5'	716	3/17/09	Lam	3/4"			No	45.47	234.78	198.33	23.8
B-13, 22.5'-24.0'	717	3/17/09	Lam	3/4"			No	43.67	213.83	185.64	19.9
B-13, 24.0'-25.5'	718	3/17/09	Lam	3/4"			No	20.82	107.14	92.08	21.1
B-13, 25.5'-27.0'	719	3/17/09	Lam	3/4"			No	46.62	207.94	183.47	17.9
B-13, 27.0'-28.5'	720	3/17/09	Hom	1 1/2"			No	45.36	172.13	157.24	13.3
B-13, 28.5'-30.0'	721	3/17/09	Hom	3/4"			No	45.22	271.48	234.56	19.5
B-13, 38.5'-40.0'	722	3/17/09	Lam	3/4"			No	18.91	99.96	86.35	20.2
B-14, 0.0'-1.5'	723	6/23/09									
B-14, 1.5'-3.0'	724	6/23/09									
B-14, 3.0'-4.5'	725	6/23/09									
B-14, 4.5'-6.0'	726	6/23/09									
B-14, 6.0'-7.5'	727	6/23/09									
B-14, 7.5'-9.0'	728	6/23/09									
B-14, 9.0'-10.5'	729	6/23/09									
B-14, 10.5'-12.0'	730	6/23/09									
B-14, 12.0'-13.5'	731	6/23/09									
B-14, 13.5'-15.0'	732	6/23/09									
B-14, 15.0'-16.5'	733	6/23/09									
B-14, 16.5'-18.0'	734	6/23/09									
B-14, 18.0'-19.5'	735	6/23/09									

Stantec

Moisture Content of Soil

AASHTO T 265

Project Name TVA Facilities Assessment - PAF Phase 2

Project Number 171468118

Tested By RJ

Test Method ODOT

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-14, 19.5'-21.0'	736	6/23/09									
B-14, 21.0'-22.5'	737	6/23/09									
B-14, 22.5'-24.0'	738	6/23/09									
B-14, 24.0'-25.5'	739	6/23/09									
B-14, 25.5'-27.0'	740	6/23/09									
B-14, 27.0'-28.5'	741	6/23/09									
B-14, 28.5'-30.0'	742	6/23/09									
B-14, 30.0'-31.5'	743	6/23/09									
B-14, 31.5'-33.0'	744	6/23/09									
B-14, 33.0'-34.5'	745	6/23/09									
B-14, 34.5'-36.0'	746	6/23/09									
B-14, 36.0'-37.5'	747	6/23/09									
B-14, 37.5'-39.0'	748	6/23/09									
B-14, 39.0'-40.5'	749	6/23/09									
B-14, 40.5'-42.0'	750	6/23/09									
B-14, 42.0'-43.5'	751	6/23/09									
B-14, 43.5'-45.0'	752	6/23/09									
B-14, 45.0'-46.5'	753	6/23/09									
B-14, 46.5'-48.0'	754	6/23/09									
B-14, 50.0'-51.5'	755	6/23/09									

Boring No. STN-1
Also referred to as: B-1

Indicates composite sample for
Sieve Analysis
Chemical Composition Testing

Summary of Moisture Content (ω) Vs Gypsum Content

Boring	SPT Sample Depth (ft)		SPT Sample Elevation (ft)		ω_{40}	ω_{200}	$\Delta\omega$	Gypsum	Non-Gypsum
	Begin	End	Begin	End					
B-1	0.0	1.5	509.8	508.3	14.9	25.3	10.4	50%	50%
B-1	1.5	3.0	508.3	506.8	16.1	37.8	21.7	100%	0%
B-1	3.0	4.5	506.8	505.3	19.5	40.5	21.0	100%	0%
B-1	4.5	6.0	505.3	503.8	24.6	43.3	18.7	89%	11%
B-1	6.0	7.5	503.8	502.3	19.1	29.9	10.8	52%	48%
B-1	7.5	9.0	502.3	500.8	22.5	41.1	18.6	89%	11%
B-1	9.0	10.5	500.8	499.3	23.2	38.2	15.0	72%	28%
B-1	10.5	12.0	499.3	497.8	23.9	42.7	18.8	90%	10%
B-1	12.0	13.5	497.8	496.3	23.8	41.5	17.7	85%	15%
B-1	13.5	15.0	496.3	494.8	22.8	45.1	22.3	100%	0%
B-1	15.0	16.5	494.8	493.3	26.5	46.9	20.4	98%	2%
B-1	16.5	18.0	493.3	491.8	22.2	42.4	20.2	97%	3%
B-1	18.0	19.5	491.8	490.3	24.8	44.4	19.6	94%	6%
B-1	19.5	21.0	490.3	488.8	23.8	39.2	15.4	74%	26%
B-1	21.0	22.5	488.8	487.3	22.0	42.0	20.0	96%	4%
B-1	22.5	24.0	487.3	485.8	20.6	42.0	21.4	100%	0%
B-1	24.0	25.5	485.8	484.3	21.3	42.6	21.3	100%	0%
B-1	25.5	27.0	484.3	482.8	23.0	45.3	22.3	100%	0%
B-1	27.0	28.5	482.8	481.3	23.1	46.6	23.5	100%	0%
B-1	28.5	30.0	481.3	479.8	24.3	42.4	18.1	87%	13%
B-1	30.0	31.5	479.8	478.3	23.3	46.6	23.3	100%	0%
B-1	31.5	33.0	478.3	476.8	21.6	43.5	21.9	100%	0%
B-1	33.0	34.5	476.8	475.3	23.8	43.8	20.0	96%	4%
B-1	34.5	36.0	475.3	473.8	22.3	48.6	26.3	100%	0%
B-1	36.0	37.5	473.8	472.3	24.1	49.3	25.2	100%	0%
B-1	37.5	39.0	472.3	470.8	22.8	50.3	27.5	100%	0%
B-1	39.0	40.5	470.8	469.3	23.4	45.7	22.3	100%	0%
B-1	40.5	42.0	469.3	467.8	22.3	50.2	27.9	100%	0%
B-1	42.0	43.5	467.8	466.3	23.2	45.8	22.6	100%	0%
B-1	43.5	45.0	466.3	464.8	20.6	45.1	24.5	100%	0%
B-1	45.0	46.5	464.8	463.3	23.4	47.4	24.0	100%	0%
B-1	46.5	48.0	463.3	461.8	20.0	45.5	25.5	100%	0%
B-1	48.0	49.5	461.8	460.3	24.0	52.3	28.3	100%	0%
B-1	49.5	51.0	460.3	458.8	24.5	48.9	24.4	100%	0%
B-1	51.0	52.5	458.8	457.3	30.0	47.6	17.6	84%	16%
B-1	52.5	54.0	457.3	455.8	27.3	47.7	20.4	98%	2%
B-1	54.0	55.5	455.8	454.3	26.3	44.6	18.3	87%	13%
B-1	55.5	57.0	454.3	452.8	28.6	46.8	18.2	87%	13%

Boring No. STN-2
Also referred to as: B-2

Indicates composite sample for
Sieve Analysis
Chemical Composition Testing

Summary of Moisture Content (ω) Vs Gypsum Content

Boring	SPT Sample Depth		SPT Sample						Non-
	Begin	End	Begin	End	ω_{40}	ω_{200}	$\Delta\omega$	Gypsum	Gypsum
B-2	0.0	1.5	494.2	492.7	22.3	38.4	16.1	77%	23%
B-2	1.5	3.0	492.7	491.2	27.2	36.0	8.8	42%	58%
B-2	3.0	4.5	491.2	489.7	20.8	42.6	21.8	100%	0%
B-2	4.5	6.0	489.7	488.2	20.9	39.0	18.1	87%	13%
B-2	6.0	7.5	488.2	486.7	19.2	40.1	20.9	100%	0%
B-2	7.5	9.0	486.7	485.2	16.3	38.3	22.0	100%	0%
B-2	9.0	10.5	485.2	483.7	20.2	43.3	23.1	100%	0%
B-2	10.5	12.0	483.7	482.2	18.1	38.5	20.4	98%	2%
B-2	12.0	13.5	482.2	480.7	17.9	38.2	20.3	97%	3%
B-2	13.5	15.0	480.7	479.2	16.7	39.5	22.8	100%	0%
B-2	15.0	16.5	479.2	477.7	20.1	41.3	21.2	100%	0%
B-2	16.5	18.0	477.7	476.2	22.0	37.3	15.3	73%	27%
B-2	18.0	19.5	476.2	474.7	20.6	45.7	25.1	100%	0%
B-2	19.5	21.0	474.7	473.2	23.1	52.2	29.1	100%	0%
B-2	21.0	22.5	473.2	471.7	20.8	47.4	26.6	100%	0%
B-2	22.5	24.0	471.7	470.2	21.3	42.2	20.9	100%	0%
B-2	24.0	25.5	470.2	468.7	24.3	50.4	26.1	100%	0%
B-2	25.5	27.0	468.7	467.2	26.6	48.6	22.0	100%	0%
B-2	27.0	28.5	467.2	465.7	21.4	46.6	25.2	100%	0%
B-2	28.5	30.0	465.7	464.2	21.4	44.1	22.7	100%	0%

Boring No. STN-6
Also referred to as: B-6

Indicates composite sample for
Sieve Analysis
Chemical Composition Testing

Summary of Moisture Content (ω) Vs Gypsum Content

Boring	SPT Sample Depth		SPT Sample						Non-
	Begin	End	Begin	End	ω_{40}	ω_{200}	Δω	Gypsum	Gypsum
B-6	0.0	1.5	510.9	509.4	14.2	18.5	4.3	21%	79%
B-6	1.5	3.0	509.4	507.9	11.7	31.3	19.6	94%	6%
B-6	3.0	4.5	507.9	506.4	17.1	37.9	20.8	99%	1%
B-6	4.5	6.0	506.4	504.9	18.2	31.7	13.5	65%	35%
B-6	6.0	7.5	504.9	503.4	18.4	37.9	19.5	93%	7%
B-6	7.5	9.0	503.4	501.9	20.8	39.6	18.8	90%	10%
B-6	9.0	10.5	501.9	500.4	20.1	39.9	19.8	95%	5%
B-6	10.5	12.0	500.4	498.9	20.1	40.6	20.5	98%	2%
B-6	12.0	13.5	498.9	497.4	21.5	40.8	19.3	92%	8%
B-6	13.5	15.0	497.4	495.9	21.2	42.6	21.4	100%	0%
B-6	15.0	16.5	495.9	494.4	20.8	38.8	18.0	86%	14%
B-6	16.5	18.0	494.4	492.9	22.3	43.1	20.8	99%	1%
B-6	18.0	19.5	492.9	491.4	18.8	40.2	21.4	100%	0%
B-6	19.5	21.0	491.4	489.9	22.1	40.0	17.9	86%	14%
B-6	21.0	22.5	489.9	488.4	21.7	45.1	23.4	100%	0%
B-6	22.5	24.0	488.4	486.9	21.9	37.4	15.5	74%	26%
B-6	24.0	25.5	486.9	485.4	20.1	38.9	18.8	90%	10%
B-6	25.5	27.0	485.4	483.9	20.3	37.1	16.8	80%	20%
B-6	27.0	28.5	483.9	482.4	17.6	38.4	20.8	99%	1%
B-6	28.5	30.0	482.4	480.9	24.0	34.7	10.7	51%	49%
B-6	30.0	31.5	480.9	479.4	20.8	41.9	21.1	100%	0%
B-6	31.5	33.0	479.4	477.9	20.6	44.0	23.4	100%	0%
B-6	33.0	34.5	477.9	476.4	20.7	41.6	20.9	100%	0%

Boring No. STN-7
Also referred to as: B-7

Indicates composite sample for
Sieve Analysis
Chemical Composition Testing

Summary of Moisture Content (ω) Vs Gypsum Content

Boring	SPT Sample Depth		SPT Sample						Non-
	Begin	End	Begin	End	ω_{40}	ω_{200}	Δω	Gypsum	Gypsum
B-7	0.0	1.5	486.7	485.2	15.6	29.8	14.2	68%	32%
B-7	1.5	3.0	485.2	483.7	16.3	32.4	16.1	77%	23%
B-7	3.0	4.5	483.7	482.2	7.1	16.4	9.3	44%	56%
B-7	4.5	6.0	482.2	480.7	11.2	25.9	14.7	70%	30%
B-7	6.0	7.5	480.7	479.2	11.9	29.4	17.5	84%	16%
B-7	7.5	9.0	479.2	477.7	10.7	24.7	14.0	67%	33%

Boring No. STN-8
Also referred to as: B-8

Indicates composite sample for
Sieve Analysis
Chemical Composition Testing

Summary of Moisture Content (ω) Vs Gypsum Content

Boring	SPT Sample Depth		SPT Sample						Non-
	Begin	End	Begin	End	ω_{40}	ω_{200}	$\Delta\omega$	Gypsum	Gypsum
B-8	0.0	1.5	510.2	508.7	11.0	30.3	19.3	92%	8%
B-8	1.5	3.0	508.7	507.2	14.3	34.6	20.3	97%	3%
B-8	3.0	4.5	507.2	505.7	17.1	39.5	22.4	100%	0%
B-8	4.5	6.0	505.7	504.2	18.7	40.9	22.2	100%	0%
B-8	6.0	7.5	504.2	502.7	20.6	40.6	20.0	96%	4%
B-8	7.5	9.0	502.7	501.2	22.0	46.4	24.4	100%	0%
B-8	9.0	10.5	501.2	499.7	19.1	38.5	19.4	93%	7%
B-8	10.5	12.0	499.7	498.2	21.0	41.3	20.3	97%	3%
B-8	12.0	13.5	498.2	496.7	21.3	41.5	20.2	97%	3%
B-8	13.5	15.0	496.7	495.2	21.9	44.0	22.1	100%	0%
B-8	15.0	16.5	495.2	493.7	23.2	48.9	25.7	100%	0%
B-8	16.5	18.0	493.7	492.2	23.7	46.0	22.3	100%	0%
B-8	18.0	19.5	492.2	490.7	21.8	44.0	22.2	100%	0%
B-8	19.5	21.0	490.7	489.2	21.5	43.4	21.9	100%	0%
B-8	21.0	22.5	489.2	487.7	22.9	46.4	23.5	100%	0%
B-8	22.5	24.0	487.7	486.2	21.0	47.1	26.1	100%	0%
B-8	24.0	25.5	486.2	484.7	22.1	47.4	25.3	100%	0%
B-8	25.5	27.0	484.7	483.2	19.8	43.4	23.6	100%	0%
B-8	27.0	28.5	483.2	481.7	20.5	39.2	18.7	89%	11%
B-8	28.5	30.0	481.7	480.2	20.1	33.0	12.9	62%	38%
B-8	30.0	31.5	480.2	478.7	22.2	45.7	23.5	100%	0%
B-8	31.5	33.0	478.7	477.2	23.2	48.5	25.3	100%	0%
B-8	33.0	34.5	477.2	475.7	22.5	48.0	25.5	100%	0%
B-8	34.5	36.0	475.7	474.2	21.1	43.6	22.5	100%	0%
B-8	36.0	37.5	474.2	472.7	18.9	40.5	21.6	100%	0%
B-8	37.5	39.0	472.7	471.2	24.0	46.3	22.3	100%	0%
B-8	39.0	40.5	471.2	469.7	24.6	48.4	23.8	100%	0%
B-8	40.5	42.0	469.7	468.2	22.4	46.5	24.1	100%	0%
B-8	42.0	43.5	468.2	466.7	24.6	48.6	24.0	100%	0%
B-8	43.5	45.0	466.7	465.2	22.4	47.7	25.3	100%	0%
B-8	45.0	46.5	465.2	463.7	22.0	50.1	28.1	100%	0%
B-8	46.5	48.0	463.7	462.2	19.8	44.5	24.7	100%	0%
B-8	48.0	49.5	462.2	460.7	23.9	46.9	23.0	100%	0%
B-8	49.5	51.0	460.7	459.2	19.1	45.2	26.1	100%	0%
B-8	51.0	52.5	459.2	457.7	21.6	47.1	25.5	100%	0%
B-8	52.5	54.0	457.7	456.2	26.8	48.5	21.7	100%	0%
B-8	54.0	55.5	456.2	454.7	21.3	48.7	27.4	100%	0%
B-8	55.5	57.0	454.7	453.2	23.3	51.2	27.9	100%	0%
B-8	57.0	58.5	453.2	451.7	20.8	38.1	17.3	83%	17%

Boring No. STN-9
Also referred to as: B-9

Indicates composite sample for
Sieve Analysis
Chemical Composition Testing

Summary of Moisture Content (ω) Vs Gypsum Content

Boring	SPT Sample Depth		SPT Sample						Non-
	Begin	End	Begin	End	ω_{40}	ω_{200}	Δω	Gypsum	Gypsum
B-9	0.0	1.5	497.5	496.0	17.9	35.3	17.4	83%	17%
B-9	1.5	3.0	496.0	494.5	23.5	49.3	25.8	100%	0%
B-9	3.0	4.5	494.5	493.0	22.1	37.7	15.6	75%	25%
B-9	4.5	6.0	493.0	491.5	21.7	42.6	20.9	100%	0%
B-9	6.0	7.5	491.5	490.0	20.9	40.0	19.1	91%	9%
B-9	7.5	9.0	490.0	488.5	20.4	42.7	22.3	100%	0%
B-9	9.0	10.5	488.5	487.0	18.3	38.7	20.4	98%	2%
B-9	10.5	12.0	487.0	485.5	21.1	40.4	19.3	92%	8%
B-9	12.0	13.5	485.5	484.0	19.7	43.9	24.2	100%	0%
B-9	13.5	15.0	484.0	482.5	20.0	42.6	22.6	100%	0%
B-9	15.0	16.5	482.5	481.0	22.0	49.2	27.2	100%	0%
B-9	16.5	18.0	481.0	479.5					
B-9	18.0	19.5	479.5	478.0	20.5	47.0	26.5	100%	0%
B-9	19.5	21.0	478.0	476.5	21.1	45.7	24.6	100%	0%
B-9	21.0	22.5	476.5	475.0	20.6	45.0	24.4	100%	0%
B-9	22.5	24.0	475.0	473.5	23.5	46.3	22.8	100%	0%
B-9	24.0	25.5	473.5	472.0	19.6	41.1	21.5	100%	0%
B-9	25.5	27.0	472.0	470.5	24.4	45.0	20.6	98%	2%
B-9	27.0	28.5	470.5	469.0	22.0	47.3	25.3	100%	0%
B-9	28.5	30.0	469.0	467.5	23.6	45.8	22.2	100%	0%
B-9	30.0	31.5	467.5	466.0	20.3	43.8	23.5	100%	0%
B-9	31.5	33.0	466.0	464.5	23.6	53.6	30.0	100%	0%
B-9	33.0	34.5	464.5	463.0	20.6	47.0	26.4	100%	0%
B-9	34.5	36.0	463.0	461.5	22.0	49.2	27.2	100%	0%
B-9	36.0	37.5	461.5	460.0	21.6	47.3	25.7	100%	0%
B-9	37.5	39.0	460.0	458.5	25.6	56.1	30.5	100%	0%
B-9	39.0	40.5	458.5	457.0	18.5	46.0	27.5	100%	0%
B-9	40.5	42.0	457.0	455.5	22.0	48.0	26.0	100%	0%
B-9	42.0	43.5	455.5	454.0	28.6	51.8	23.2	100%	0%
B-9	43.5	45.0	454.0	452.5	20.4	26.1	5.7	27%	73%

Boring No. STN-10
Also referred to as: B-10

Indicates composite sample for
Sieve Analysis
Chemical Composition Testing

Summary of Moisture Content (ω) Vs Gypsum Content

Boring	SPT Sample Depth		SPT Sample						Non-
	Begin	End	Begin	End	ω_{40}	ω_{200}	$\Delta\omega$	Gypsum	Gypsum
B-10	0.0	1.5	514.0	512.5	12.2	22.6	10.4	50%	50%
B-10	1.5	3.0	512.5	511.0	10.2	29.8	19.6	94%	6%
B-10	3.0	4.5	511.0	509.5	10.1	29.4	19.3	92%	8%
B-10	4.5	6.0	509.5	508.0	12.1	29.8	17.7	85%	15%
B-10	6.0	7.5	508.0	506.5	13.7	31.5	17.8	85%	15%
B-10	7.5	9.0	506.5	505.0	14.7	32.4	17.7	85%	15%
B-10	9.0	10.5	505.0	503.5	19.6	36.7	17.1	82%	18%
B-10	10.5	12.0	503.5	502.0	10.7	31.1	20.4	98%	2%
B-10	12.0	13.5	502.0	500.5	15.2	35.9	20.7	99%	1%
B-10	13.5	15.0	500.5	499.0	22.6	45.2	22.6	100%	0%
B-10	15.0	16.5	499.0	497.5	23.4	47.6	24.2	100%	0%
B-10	16.5	18.0	497.5	496.0	26.8	49.1	22.3	100%	0%
B-10	18.0	19.5	496.0	494.5	20.1	43.0	22.9	100%	0%
B-10	19.5	21.0	494.5	493.0	19.5	39.8	20.3	97%	3%
B-10	21.0	22.5	493.0	491.5	19.8	42.0	22.2	100%	0%
B-10	22.5	24.0	491.5	490.0	20.1	42.3	22.2	100%	0%
B-10	24.0	25.5	490.0	488.5	18.4	40.2	21.8	100%	0%
B-10	25.5	27.0	488.5	487.0	20.0	44.0	24.0	100%	0%
B-10	27.0	28.5	487.0	485.5	22.8	46.2	23.4	100%	0%
B-10	28.5	30.0	485.5	484.0	17.9	41.1	23.2	100%	0%
B-10	30.0	31.5	484.0	482.5	22.2	45.8	23.6	100%	0%
B-10	31.5	33.0	482.5	481.0	22.0	45.6	23.6	100%	0%
B-10	33.0	34.5	481.0	479.5	22.1	45.7	23.6	100%	0%
B-10	34.5	36.0	479.5	478.0	21.0	46.3	25.3	100%	0%
B-10	36.0	37.5	478.0	476.5	21.5	47.5	26.0	100%	0%
B-10	37.5	39.0	476.5	475.0	22.1	46.6	24.5	100%	0%
B-10	39.0	40.5	475.0	473.5	19.5	43.1	23.6	100%	0%
B-10	40.5	42.0	473.5	472.0	17.2	40.7	23.5	100%	0%
B-10	42.0	43.5	472.0	470.5	18.7	42.9	24.2	100%	0%
B-10	43.5	45.0	470.5	469.0	23.1	46.5	23.4	100%	0%
B-10	45.0	46.5	469.0	467.5	17.4	42.3	24.9	100%	0%

Boring No. STN-11
Also referred to as: B-11

Indicates composite sample for
Sieve Analysis
Chemical Composition Testing

Summary of Moisture Content (ω) Vs Gypsum Content

Boring	SPT Sample Depth		SPT Sample						Non-
	Begin	End	Begin	End	ω_{40}	ω_{200}	$\Delta\omega$	Gypsum	Gypsum
B-11	0.0	1.5	504.4	502.9	23.7	33.0	9.3	44%	56%
B-11	1.5	3.0	502.9	501.4	17.4	39.8	22.4	100%	0%
B-11	3.0	4.5	501.4	499.9	21.2	43.1	21.9	100%	0%
B-11	4.5	6.0	499.9	498.4	20.5	38.3	17.8	85%	15%
B-11	6.0	7.5	498.4	496.9	19.4	31.5	12.1	58%	42%
B-11	7.5	9.0	496.9	495.4	23.8	40.8	17.0	81%	19%
B-11	9.0	10.5	495.4	493.9	22.5	46.9	24.4	100%	0%
B-11	10.5	12.0	493.9	492.4	24.1	50.6	26.5	100%	0%
B-11	12.0	13.5	492.4	490.9	19.5	43.9	24.4	100%	0%
B-11	13.5	15.0	490.9	489.4	22.2	49.1	26.9	100%	0%
B-11	15.0	16.5	489.4	487.9	19.9	41.9	22.0	100%	0%
B-11	16.5	18.0	487.9	486.4	24.3	46.4	22.1	100%	0%
B-11	18.0	19.5	486.4	484.9	19.9	41.7	21.8	100%	0%
B-11	19.5	21.0	484.9	483.4	21.3	45.9	24.6	100%	0%
B-11	21.0	22.5	483.4	481.9	20.1	45.3	25.2	100%	0%
B-11	22.5	24.0	481.9	480.4	16.6	38.2	21.6	100%	0%
B-11	24.0	25.5	480.4	478.9	18.5	39.6	21.1	100%	0%
B-11	25.5	27.0	478.9	477.4	17.9	40.8	22.9	100%	0%
B-11	27.0	28.5	477.4	475.9	20.5	43.9	23.4	100%	0%
B-11	28.5	30.0	475.9	474.4	22.2	45.0	22.8	100%	0%
B-11	30.0	31.5	474.4	472.9	20.8	44.8	24.0	100%	0%
B-11	31.5	33.0	472.9	471.4	23.6	46.3	22.7	100%	0%
B-11	33.0	34.5	471.4	469.9	23.1	48.4	25.3	100%	0%
B-11	34.5	36.0	469.9	468.4	19.3	43.7	24.4	100%	0%

Boring No. STN-13
Also referred to as: B-13

Indicates composite sample for
Sieve Analysis
Chemical Composition Testing

Summary of Moisture Content (ω) Vs Gypsum Content

Boring	SPT Sample Depth		SPT Sample						Non-
	Begin	End	Begin	End	ω_{40}	ω_{200}	$\Delta\omega$	Gypsum	Gypsum
B-13	0.0	1.5	525.1	523.6	15.2	32.8	17.6	84%	16%
B-13	1.5	3.0	523.6	522.1	13.1	26.8	13.7	65%	35%
B-13	3.0	4.5	522.1	520.6	11.5	26.3	14.8	71%	29%
B-13	4.5	6.0	520.6	519.1	16.1	31.7	15.6	75%	25%
B-13	6.0	7.5	519.1	517.6	21.6	39.3	17.7	85%	15%
B-13	7.5	9.0	517.6	516.1	21.3	41.1	19.8	95%	5%
B-13	9.0	10.5	516.1	514.6	19.5	38.4	18.9	90%	10%
B-13	10.5	12.0	514.6	513.1	21.2	41.8	20.6	98%	2%
B-13	12.0	13.5	513.1	511.6	22.1	41.0	18.9	90%	10%
B-13	13.5	15.0	511.6	510.1	20.4	40.0	19.6	94%	6%
B-13	15.0	16.5	510.1	508.6	21.7	42.9	21.2	100%	0%
B-13	16.5	18.0	508.6	507.1	22.3	42.9	20.6	98%	2%
B-13	18.0	19.5	507.1	505.6	18.6	36.6	18.0	86%	14%
B-13	19.5	21.0	505.6	504.1	23.6	46.3	22.7	100%	0%

Data Report Number: 090512-161609
Report of Results: STD_ANL

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Location Code: PAF
Field ID: PAF B-14
Sample Description: 39.0-45.0 SPT COMP

Sample ID: AK18716 **LRF ID:** 09030110
Matrix: Solids **Reg:** None
Date Collected: 03/11/2009
Time Collected: 0:00 CST
Date Received: 03/11/2009
Time Received: 8:00
Project Manager: Ricardo I. Gilbert

Analyte	CAS Number[1]	Result	Units	MDL[2]	Analysis Date	Analysis Time	Analyst	Method Reference
Miscellaneous Test (Narrative)		L5856438.NT			04/15/2009	16:00	CLS	
%CO3 = 5.63								
Calcium Percent	7440-70-2	18.25	%	0.01	04/15/2009	16:19	AJH	Titration
Magnesium Percent	7439-95-4	0.0	%	0.01	04/15/2009	16:19	AJH	Titration
Acid Insoluble		30.79	%	0.1	04/15/2009	16:19	AJH	Gravimetric
SO3 Percent	14265-45-3	0.0	%	0.01	04/15/2009	16:19	AJH	Titration
Total S as % SO4		33.20	%	0.01	04/15/2009	16:23	AJH	Titration

Sample Comments: None

[1] Chemical Abstracts Service Registry Number [2] Method Detection Limit

Data Report Number: 090512-161609
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Location Code: PAF
Field ID: PAF B-13
Sample Description: 6.0-12.0 SPT COMP

Sample ID: AK18717 **LRF ID:** 09030110
Matrix: Solids **Reg:** None
Date Collected: 03/11/2009
Time Collected: 0:00 CST
Date Received: 03/11/2009
Time Received: 8:00
Project Manager: Ricardo I. Gilbert

Analyte	CAS Number[1]	Result	Units	MDL[2]	Analysis Date	Analysis Time	Analyst	Method Reference
Miscellaneous Test (Narrative)		L5856456.NT			04/23/2009	9:10	CLS	
%CO3 = 7.55								
Calcium Percent	7440-70-2	20.55	%	0.01	04/15/2009	16:19	AJH	Titration
Magnesium Percent	7439-95-4	0.37	%	0.01	04/15/2009	16:19	AJH	Titration
Acid Insoluble		18.38	%	0.1	04/15/2009	16:19	AJH	Gravimetric
SO3 Percent	14265-45-3	0.0	%	0.01	04/15/2009	16:19	AJH	Titration
Total S as % SO4		38.65	%	0.01	04/15/2009	16:23	AJH	Titration

Sample Comments: None

[1] Chemical Abstracts Service Registry Number [2] Method Detection Limit

Data Report Number: 090512-161609
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Location Code: PAF
Field ID: PAF B-11
Sample Description: 24.0-30.0 SPT COMP

Sample ID: AK18718 **LRF ID:** 09030110
Matrix: Solids **Reg:** None
Date Collected: 03/11/2009
Time Collected: 0:00 CST
Date Received: 03/11/2009
Time Received: 8:00
Project Manager: Ricardo I. Gilbert

Analyte	CAS Number[1]	Result	Units	MDL[2]	Analysis Date	Analysis Time	Analyst	Method Reference
Miscellaneous Test (Narrative)		L5856467.NT			04/23/2009	9:10	CLS	
%CO3 = 0.33								
Calcium Percent	7440-70-2	18.96	%	0.01	04/15/2009	16:19	AJH	Titration
Magnesium Percent	7439-95-4	0.14	%	0.01	04/15/2009	16:19	AJH	Titration
Acid Insoluble		18.02	%	0.1	04/15/2009	16:19	AJH	Gravimetric
SO3 Percent	14265-45-3	0.0	%	0.01	04/15/2009	16:19	AJH	Titration
Total S as % SO4		45.49	%	0.01	04/15/2009	16:23	AJH	Titration

Sample Comments: None

[1] Chemical Abstracts Service Registry Number [2] Method Detection Limit

Data Report Number: 090512-161609
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Location Code: PAF
Field ID: PAF B-10
Sample Description: 6.0-12.0 SPT COMP

Sample ID: AK18719 **LRF ID:** 09030110
Matrix: Solids **Reg:** None
Date Collected: 03/11/2009
Time Collected: 0:00 CST
Date Received: 03/11/2009
Time Received: 8:00
Project Manager: Ricardo I. Gilbert

Analyte	CAS Number[1]	Result	Units	MDL[2]	Analysis Date	Analysis Time	Analyst	Method Reference
Miscellaneous Test (Narrative)		L5856474.NT			04/23/2009	9:11	CLS	
%CO3 = 0.77								
Calcium Percent	7440-70-2	17.50	%	0.01	04/15/2009	16:19	AJH	Titration
Magnesium Percent	7439-95-4	0.43	%	0.01	04/15/2009	16:19	AJH	Titration
Acid Insoluble		22.86	%	0.1	04/15/2009	16:19	AJH	Gravimetric
SO3 Percent	14265-45-3	0.0	%	0.01	04/15/2009	16:19	AJH	Titration
Total S as % SO4		42.47	%	0.01	04/15/2009	16:23	AJH	Titration

Sample Comments: None

[1] Chemical Abstracts Service Registry Number [2] Method Detection Limit

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Location Code: PAF
Field ID: PAF B-9
Sample Description: 36.0-42.0 SPT COMP

Sample ID: AK18720 **LRF ID:** 09030110
Matrix: Solids **Reg:** None
Date Collected: 03/11/2009
Time Collected: 0:00 CST
Date Received: 03/11/2009
Time Received: 8:00
Project Manager: Ricardo I. Gilbert

Analyte	CAS Number[1]	Result	Units	MDL[2]	Analysis Date	Analysis Time	Analyst	Method Reference
Miscellaneous Test (Narrative)		L5856480.NT			04/23/2009	9:11	CLS	
%CO3 = 0.60								
Calcium Percent	7440-70-2	20.42	%	0.01	04/15/2009	16:19	AJH	Titration
Magnesium Percent	7439-95-4	0.40	%	0.01	04/15/2009	16:19	AJH	Titration
Acid Insoluble		10.35	%	0.1	04/15/2009	16:19	AJH	Gravimetric
SO3 Percent	14265-45-3	0.0	%	0.01	04/15/2009	16:19	AJH	Titration
Total S as % SO4		49.58	%	0.01	04/15/2009	16:23	AJH	Titration

Sample Comments: None

[1] Chemical Abstracts Service Registry Number [2] Method Detection Limit

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Location Code: PAF
Field ID: PAF B-8
Sample Description: 9.0-15.0 SPT COMP

Sample ID: AK18721 **LRF ID:** 09030110
Matrix: Solids **Reg:** None
Date Collected: 03/11/2009
Time Collected: 0:00 CST
Date Received: 03/11/2009
Time Received: 8:00
Project Manager: Ricardo I. Gilbert

Analyte	CAS Number[1]	Result	Units	MDL[2]	Analysis Date	Analysis Time	Analyst	Method Reference
Miscellaneous Test (Narrative)		L5856488.NT			04/23/2009	9:11	CLS	
%CO3 = 3.04								
Calcium Percent	7440-70-2	19.76	%	0.01	04/15/2009	16:19	AJH	Titration
Magnesium Percent	7439-95-4	0.0	%	0.01	04/15/2009	16:19	AJH	Titration
Acid Insoluble		19.01	%	0.1	04/15/2009	16:19	AJH	Gravimetric
SO3 Percent	14265-45-3	0.0	%	0.01	04/15/2009	16:19	AJH	Titration
Total S as % SO4		42.32	%	0.01	04/15/2009	16:23	AJH	Titration

Sample Comments: None

[1] Chemical Abstracts Service Registry Number [2] Method Detection Limit

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Location Code: PAF
Field ID: PAF B-7
Sample Description: 1.5-6.0 SPT COMP

Sample ID: AK18722 **LRF ID:** 09030110
Matrix: Solids **Reg:** None
Date Collected: 03/11/2009
Time Collected: 0:00 CST
Date Received: 03/11/2009
Time Received: 8:00
Project Manager: Ricardo I. Gilbert

Analyte	CAS Number[1]	Result	Units	MDL[2]	Analysis Date	Analysis Time	Analyst	Method Reference
Miscellaneous Test (Narrative)		L5856494.NT			04/23/2009	9:11	CLS	
%CO3 = 3.75								
Calcium Percent	7440-70-2	17.10	%	0.01	04/15/2009	16:19	AJH	Titration
Magnesium Percent	7439-95-4	0.42	%	0.01	04/15/2009	16:19	AJH	Titration
Acid Insoluble		28.30	%	0.1	04/15/2009	16:19	AJH	Gravimetric
SO3 Percent	14265-45-3	0.0	%	0.01	04/15/2009	16:19	AJH	Titration
Total S as % SO4		36.67	%	0.01	04/15/2009	16:23	AJH	Titration

Sample Comments: None

[1] Chemical Abstracts Service Registry Number [2] Method Detection Limit

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Location Code: PAF
Field ID: PAF B-6
Sample Description: 7.5-13.5 SPT COMP

Sample ID: AK18723 **LRF ID:** 09030110
Matrix: Solids **Reg:** None
Date Collected: 03/11/2009
Time Collected: 0:00 CST
Date Received: 03/11/2009
Time Received: 8:00
Project Manager: Ricardo I. Gilbert

Analyte	CAS Number[1]	Result	Units	MDL[2]	Analysis Date	Analysis Time	Analyst	Method Reference
Miscellaneous Test (Narrative)		L5856500.NT			04/23/2009	9:12	CLS	
%CO3 = 6.05								
Calcium Percent	7440-70-2	19.09	%	0.01	04/15/2009	16:19	AJH	Titration
Magnesium Percent	7439-95-4	0.84	%	0.01	04/15/2009	16:19	AJH	Titration
Acid Insoluble		19.82	%	0.1	04/15/2009	16:19	AJH	Gravimetric
SO3 Percent	14265-45-3	0.0	%	0.01	04/15/2009	16:19	AJH	Titration
Total S as % SO4		39.41	%	0.01	04/15/2009	16:23	AJH	Titration

Sample Comments: None

[1] Chemical Abstracts Service Registry Number [2] Method Detection Limit

Data Report Number: 090512-161609
Report of Results: STD_ANL

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Location Code: PAF
Field ID: PAF B-2
Sample Description: 22.5-28.5 SPT COMP

Sample ID: AK18724 **LRF ID:** 09030110
Matrix: Solids **Reg:** None
Date Collected: 03/11/2009
Time Collected: 0:00 CST
Date Received: 03/11/2009
Time Received: 8:00
Project Manager: Ricardo I. Gilbert

Analyte	CAS Number[1]	Result	Units	MDL[2]	Analysis Date	Analysis Time	Analyst	Method Reference
Miscellaneous Test (Narrative)		L5856508.NT			04/23/2009	9:12	CLS	
%CO3 = 0.00								
Calcium Percent	7440-70-2	19.30	%	0.01	04/15/2009	16:19	AJH	Titration
Magnesium Percent	7439-95-4	0.19	%	0.01	04/15/2009	16:19	AJH	Titration
Acid Insoluble		14.08	%	0.1	04/15/2009	16:19	AJH	Gravimetric
SO3 Percent	14265-45-3	0.0	%	0.01	04/15/2009	16:19	AJH	Titration
Total S as % SO4		49.37	%	0.01	04/15/2009	16:23	AJH	Titration

Sample Comments: None

[1] Chemical Abstracts Service Registry Number [2] Method Detection Limit

Data Report Number: 090512-161609
Report of Results: STD_ANL

TENNESSEE VALLEY AUTHORITY
CENTRAL LABORATORIES SERVICES
1101 Market Street, PSC 1B-C
Chattanooga, Tennessee 37402-2801

Phone: (423) 876 - 4318 • Fax: (423) 876 - 4137

Shipping Address:
Chickamauga Power Service Center
North Side Chickamauga Reservation
Chattanooga, Tennessee 37415

Customer Address: Sharath Vemuri
1409 N. Forbes Rd., Lexington, KY 40511
Phone: Not Available
Fax : Not Available
E-Mail: sharath.vemuri@stantec.com; EDM

Location Code: PAF
Field ID: PAF B-1
Sample Description: 9-15.0 SPT COMP

Sample ID: AK18725 **LRF ID:** 09030110
Matrix: Solids **Reg:** None
Date Collected: 03/11/2009
Time Collected: 0:00 CST
Date Received: 03/11/2009
Time Received: 8:00
Project Manager: Ricardo I. Gilbert

Analyte	CAS Number[1]	Result	Units	MDL[2]	Analysis Date	Analysis Time	Analyst	Method Reference
Miscellaneous Test (Narrative)		L5856514.NT			04/23/2009	9:12	CLS	
%CO3 = 2.63								
Calcium Percent	7440-70-2	16.47	%	0.01	04/15/2009	16:19	AJH	Titration
Magnesium Percent	7439-95-4	0.57	%	0.01	04/15/2009	16:19	AJH	Titration
Acid Insoluble		29.68	%	0.1	04/15/2009	16:19	AJH	Gravimetric
SO3 Percent	14265-45-3	0.0	%	0.01	04/15/2009	16:19	AJH	Titration
Total S as % SO4		37.53	%	0.01	04/15/2009	16:23	AJH	Titration

Sample Comments: None

[1] Chemical Abstracts Service Registry Number [2] Method Detection Limit

Central Laboratories Services data report number 090512-161609 was electronically approved using Labworks Enterprise Version 5.8, Build 311 on **05/12/2009 at 4:11:00 PM by Rebecca H. Mott**

Lisa Ortiz Department Manager
Rebecca Mott Project Manager
Tim Cofer Supv, CLS Chemistry Lab
Teresa Casner Supv, CLS Metallurgy Program

This report contains sample results for the following samples, Login Reference File number: **09030110**

Sample ID	Field ID
AK18716	PAF B-14
AK18717	PAF B-13
AK18718	PAF B-11
AK18719	PAF B-10
AK18720	PAF B-9
AK18721	PAF B-8
AK18722	PAF B-7
AK18723	PAF B-6
AK18724	PAF B-2
AK18725	PAF B-1

[1] Chemical Abstracts Service Registry Number [2] Method Detection Limit

Stantec

Particle-Size Analysis of Soils

ASTM D 422

Project Name: TVA Facilities Assessment - PAF Phase 2
Project Number: 171468118
Source: B-1, 3.0'-4.5', 4.5'-6.0', 6.0'-7.5', 7.5'-9.0'
Lab ID: 588

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: DRB
Test Date: 03-16-2009
Date Received 03-04-2009

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	100.0
3/8"	98.5
No. 4	97.2
No. 10	95.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

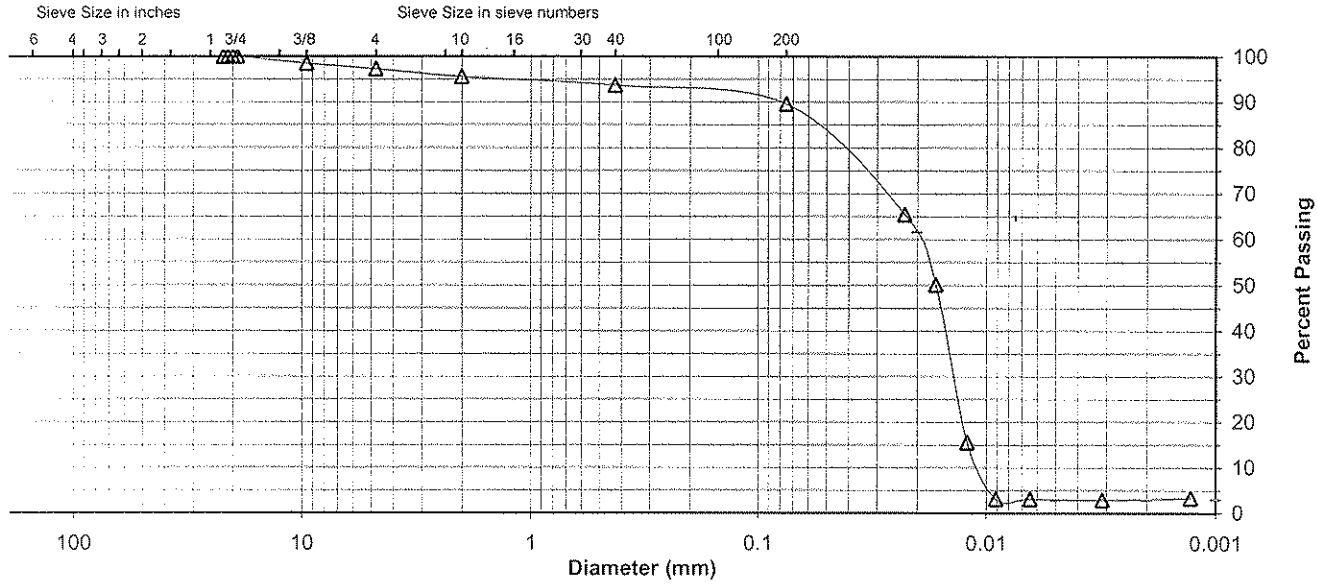
Specific Gravity 2.7

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	93.7
No. 200	89.6
0.02 mm	61.6
0.005 mm	2.9
0.002 mm	2.9
0.001 mm	3.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	2.8	1.6	1.9	4.1	86.7	2.9
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	4.4			1.9	4.1	86.7	2.9



Comments: Gypsum water used for testing instead of distilled water

Reviewed By

Stantec

Particle-Size Analysis of Soils

ASTM D 422

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Source	B-2, 16.5'-18.0', 18.0'-19.5', 19.5'-21.0', 21.0'-22.5'	Lab ID	593

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: DRB
Test Date: 03-16-2009
Date Received 03-04-2009

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 2.7

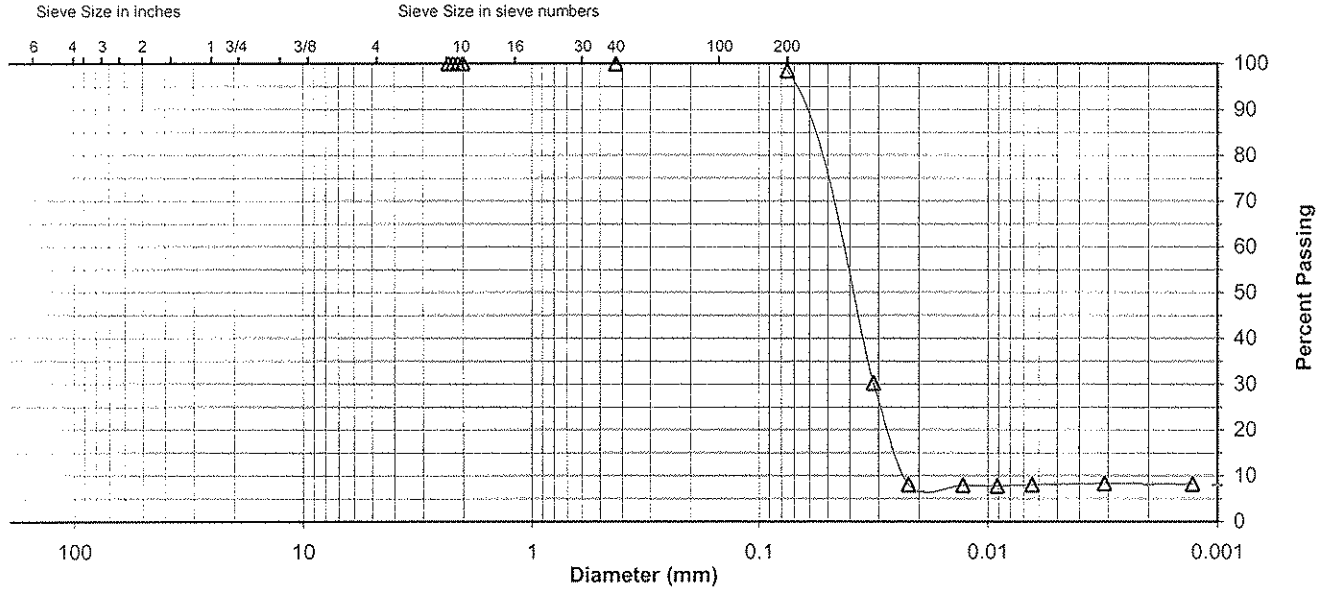
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	99.9
No. 200	98.4
0.02 mm	6.5
0.005 mm	8.1
0.002 mm	8.1
0.001 mm	8.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.1	1.5	90.3	8.1

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	0.1	1.5	90.3	8.1



Comments Gypsum water used for testing instead of distilled water

Reviewed By

Stantec

Particle-Size Analysis of Soils

ASTM D 422

Project Name: TVA Facilities Assessment - PAF Phase 2
Project Number: 171468118
Source: B-6, 1.5'-3.0', 3.0'-4.5', 4.5'-6.0', 6.0'-7.5'
Lab ID: 598

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: Weathered and Friable

Tested By: DRB
Test Date: 03-16-2009
Date Received: 03-04-2009

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	96.8
No. 10	96.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

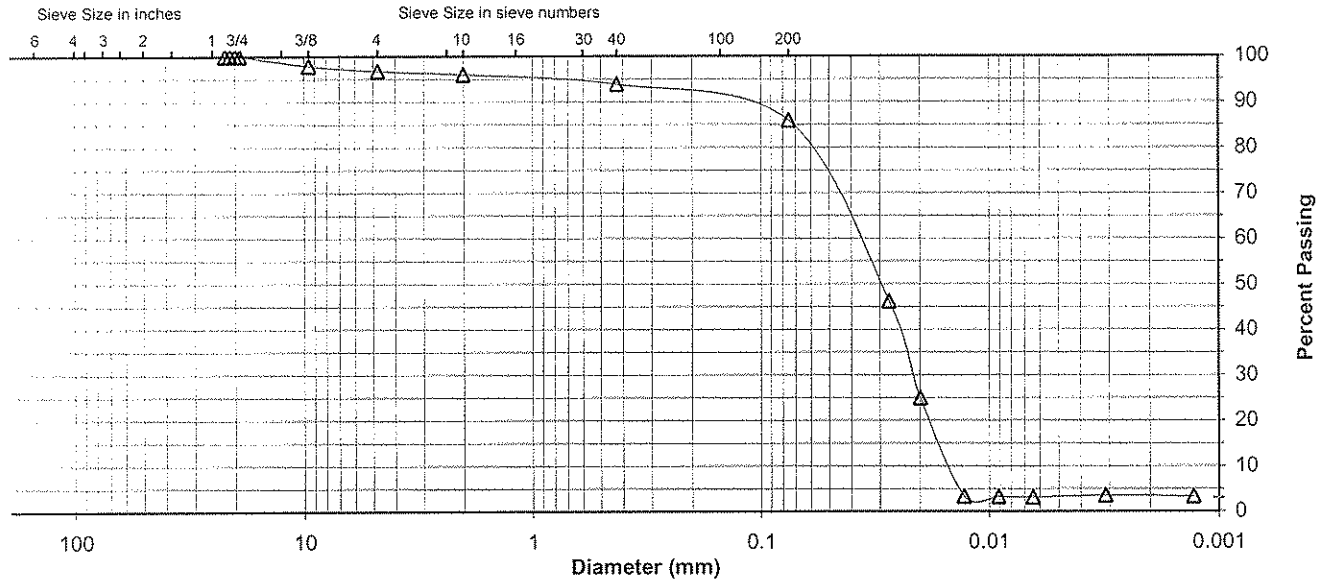
Specific Gravity: 2.7

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	93.9
No. 200	85.9
0.02 mm	24.9
0.005 mm	3.3
0.002 mm	3.5
0.001 mm	3.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	3.2	0.8	2.1	8.0	82.6	3.3
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	4.0			2.1	8.0	82.4	3.5



Comments: gypsum water used for testing instead of distilled water

Reviewed By:

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: TVA Facilities Assessment - PAF Phase 2
Project Number: 171468118
Source: B-7, 6.0'-7.5', 7.5'-9.0'
Lab ID: 603

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: Weathered and Friable

Tested By: DRB
Test Date: 03-16-2009
Date Received: 03-04-2009

Maximum Particle size: 1" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	100.0
3/4"	98.9
3/8"	96.9
No. 4	96.0
No. 10	94.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

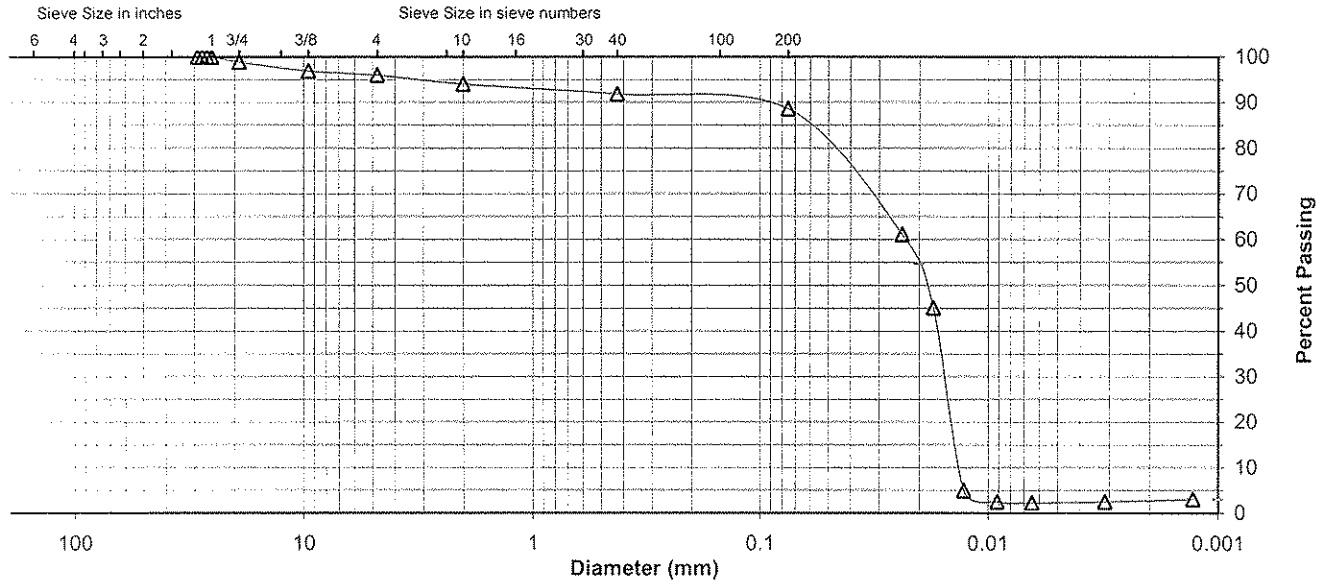
Specific Gravity: 2.7

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	91.8
No. 200	88.6
0.02 mm	54.7
0.005 mm	2.3
0.002 mm	2.7
0.001 mm	3.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	1.1	2.9	2.0	2.2	3.2	86.3	2.3
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	6.0			2.2	3.2	85.9	2.7



Comments: Gypsum water used for testing instead of distilled water

Reviewed By: _____

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: TVA Facilities Assessment - PAF Phase 2
Project Number: 171468118
Source: B-8, 3.0'-4.5', 4.5'-6.0', 6.0'-7.5', 7.5'-9.0'
Lab ID: 606a

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: Weathered and Friable

Tested By: DRB
Test Date: 03-16-2009
Date Received: 03-04-2009

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	100.0
3/8"	99.8
No. 4	99.3
No. 10	98.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

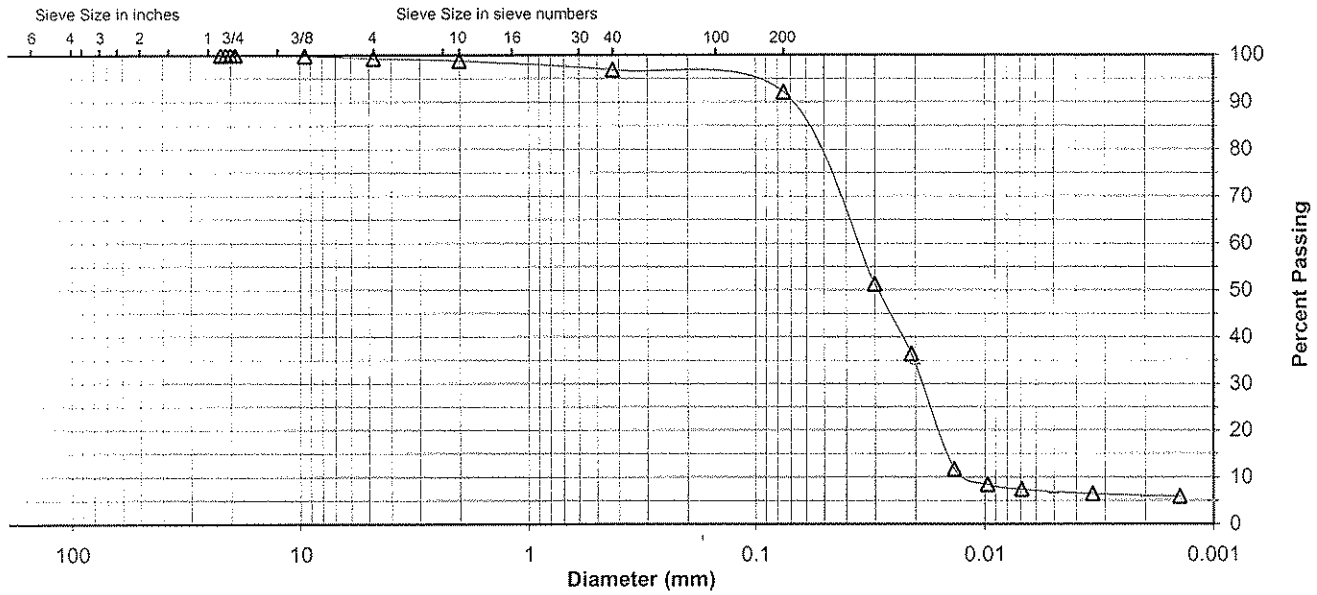
Specific Gravity: 2.45

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	96.9
No. 200	92.2
0.02 mm	34.2
0.005 mm	6.7
0.002 mm	6.0
0.001 mm	5.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.7	0.5	1.9	4.7	85.5	6.7
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	1.2			1.9	4.7	86.2	6.0



Comments

Reviewed By

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: TVA Facilities Assessment - PAF Phase 2
Project Number: 171468118
Source: B-8, 3.0'-4.5', 4.5'-6.0', 6.0'-7.5', 7.5'-9.0'
Lab ID: 606b

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: Weathered and Friable

Tested By: DRB
Test Date: 03-16-2009
Date Received 03-04-2009

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	100.0
3/8"	99.8
No. 4	99.3
No. 10	98.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

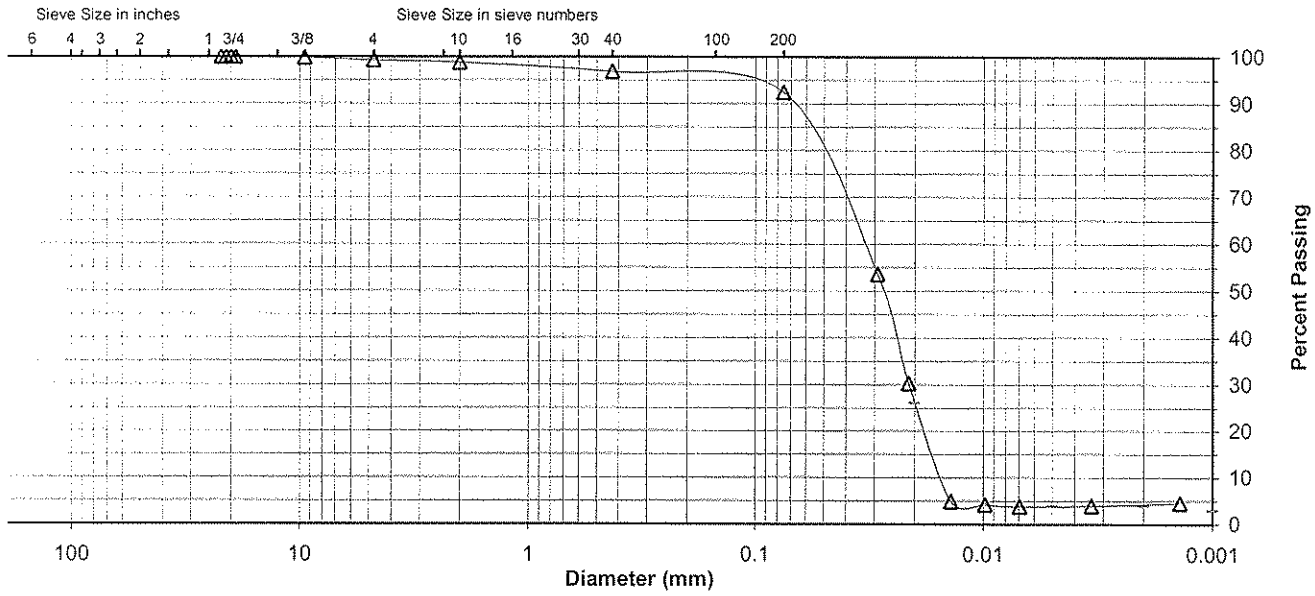
Specific Gravity 2.45

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	96.9
No. 200	92.5
0.02 mm	26.1
0.005 mm	3.9
0.002 mm	3.9
0.001 mm	3.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.7	0.5	1.9	4.4	88.6	3.9
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	1.2			1.9	4.4	88.6	3.9



Comments: Gypsum water used instead of distilled water for testing

Reviewed By

Stantec

Particle-Size Analysis of Soils

ASTM D 422

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Source	B-9, 30.0'-31.5', 31.5'-33.0', 33.0'-34.5', 34.5'-36.0'	Lab ID	611A

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: BWT
Test Date: 03-16-2009
Date Received 03-04-2009

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	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

Specific Gravity 2.45

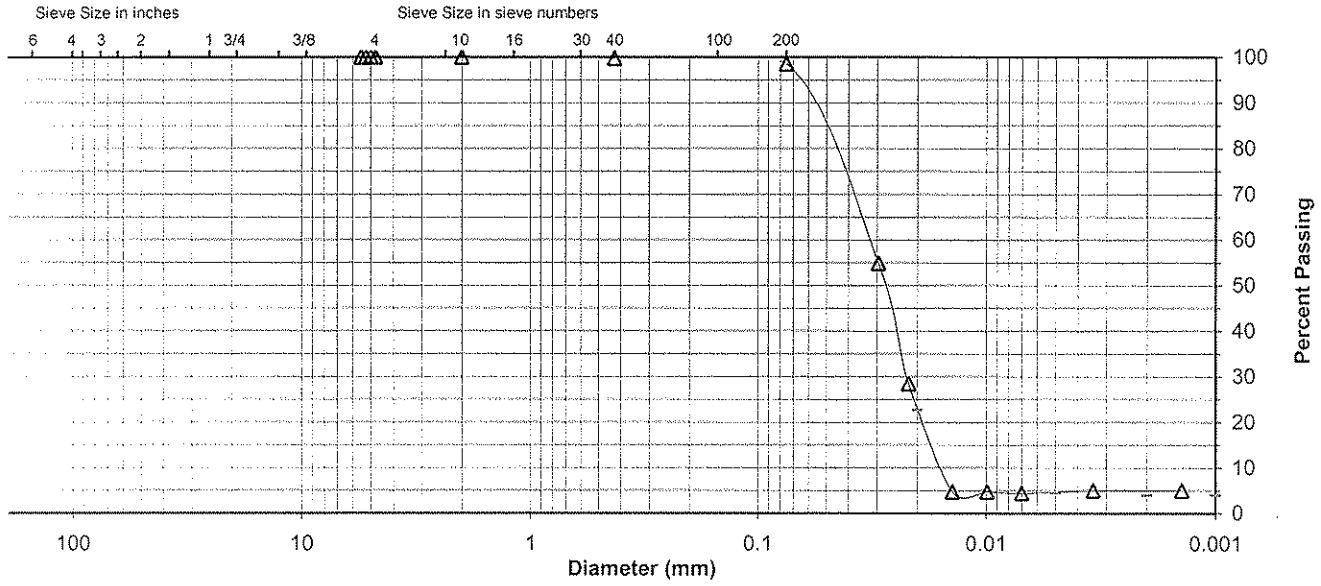
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	99.7
No. 200	98.5
0.02 mm	22.7
0.005 mm	4.5
0.002 mm	4.0
0.001 mm	4.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.3	1.2	94.0	4.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	0.3	1.2	94.5	4.0



Comments

Reviewed By

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: TVA Facilities Assessment - PAF Phase 2
Project Number: 171468118
Source: B-9, 30.0'-31.5', 31.5'-33.0', 33.0'-34.5', 34.5'-36.0'
Lab ID: 611b

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: BWT
Test Date: 03-16-2009
Date Received: 03-04-2009

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	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

Specific Gravity: 2.7

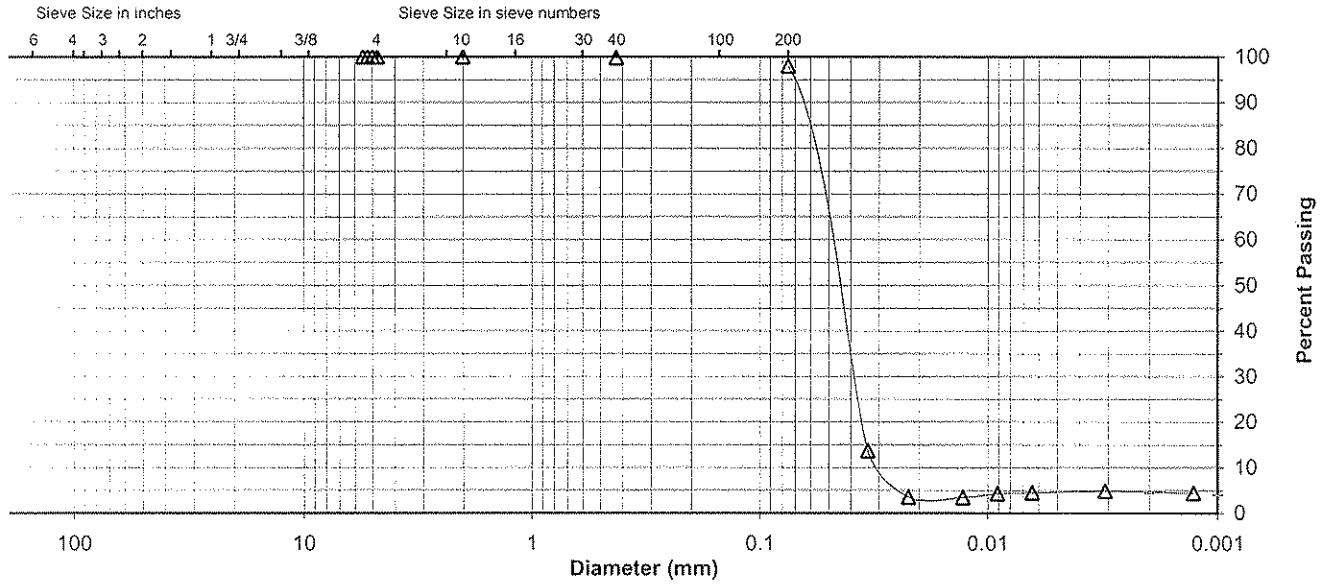
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	99.8
No. 200	98.0
0.02 mm	2.9
0.005 mm	4.7
0.002 mm	4.5
0.001 mm	4.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.2	1.8	93.3	4.7

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	0.2	1.8	93.5	4.5



Comments: Gypsum water used for testing instead of distilled water

Reviewed By:

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: TVA Facilities Assessment - PAF Phase 2
Project Number: 171468118
Source: B-10, 0.0'-1.5', 1.5'-3.0', 3.0'-4.5', 4.5'-6.0'
Lab ID: 616a

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: BWT
Test Date: 03-16-2009
Date Received 03-04-2009

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	
3/8"	100.0
No. 4	99.5
No. 10	98.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

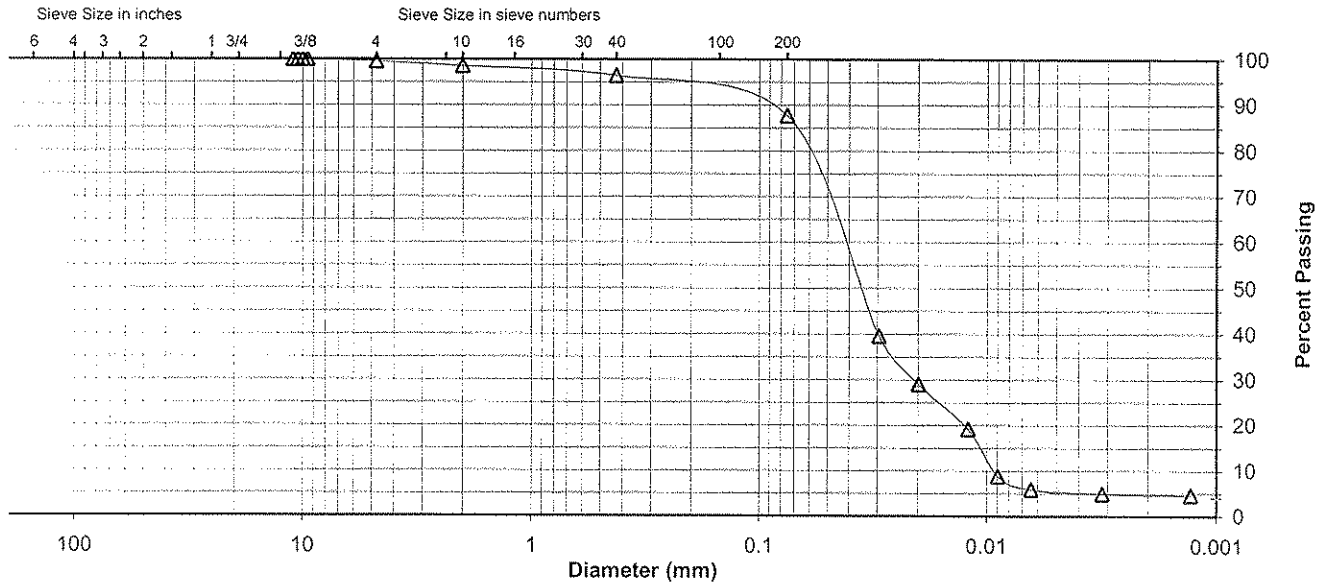
Specific Gravity 2.7

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	96.4
No. 200	87.7
0.02 mm	28.7
0.005 mm	5.3
0.002 mm	4.7
0.001 mm	4.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.5	1.0	2.1	8.7	82.4	5.3
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	1.5			2.1	8.7	83.0	4.7



Comments

Reviewed By

Stantec

Particle-Size Analysis of Soils

ASTM D 422

Project Name: TVA Facilities Assessment - PAF Phase 2
Project Number: 171468118
Source: B-10, 0.0'-1.5', 1.5'-3.0', 3.0'-4.5', 4.5'-6.0'
Lab ID: 616b

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: BWT
Test Date: 03-16-2009
Date Received 03-04-2009

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	
3/8"	100.0
No. 4	99.5
No. 10	98.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

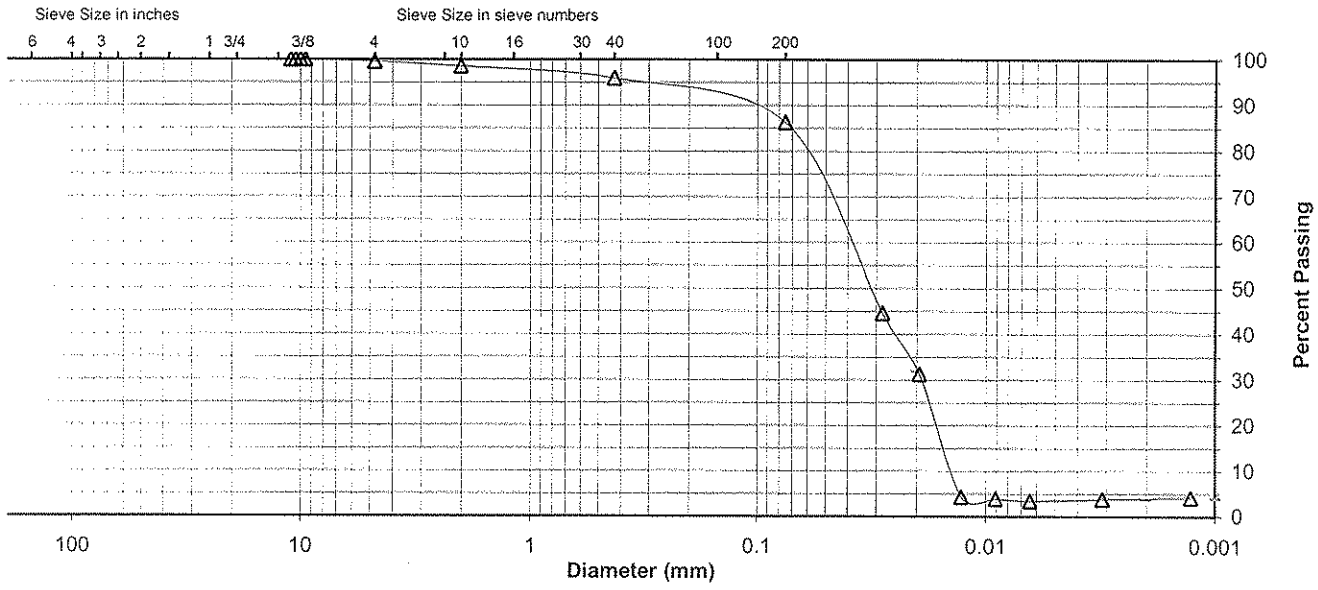
Specific Gravity 2.7

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	95.9
No. 200	86.3
0.02 mm	31.9
0.005 mm	3.5
0.002 mm	3.7
0.001 mm	4.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.5	1.0	2.6	9.6	82.8	3.5
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	1.5			2.6	9.6	82.6	3.7



Comments: Gypsum water used for testing instead of distilled water

Reviewed By

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: TVA Facilities Assessment - PAF Phase 2
Project Number: 171468118
Source: B-11, 30.0'-31.5', 31.5'-33.0', 33.0'-34.5', 34.5'-36.0'
Lab ID: 621

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: Weathered and Friable

Tested By: DRB
Test Date: 03-16-2009
Date Received: 03-04-2009

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	
3/8"	100.0
No. 4	99.3
No. 10	98.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

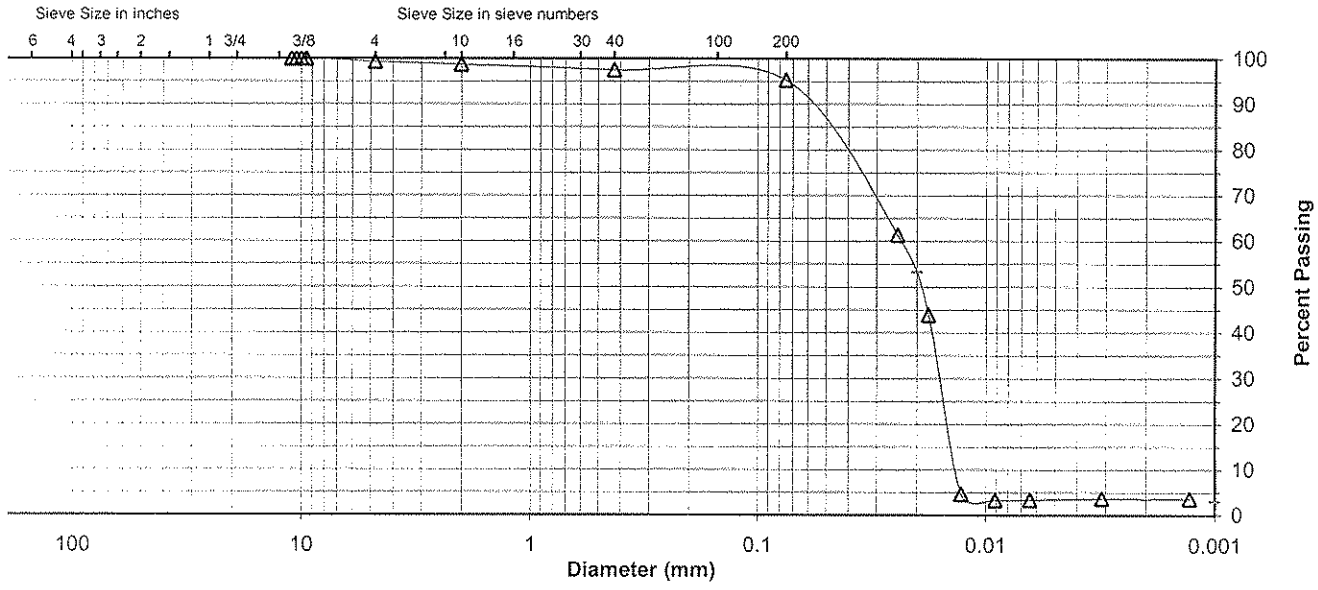
Specific Gravity: 2.7

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	97.5
No. 200	95.3
0.02 mm	53.3
0.005 mm	3.5
0.002 mm	3.5
0.001 mm	3.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.7	0.6	1.2	2.2	91.8	3.5
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	1.3			1.2	2.2	91.8	3.5



Comments: Gypsum water used for testing instead of distilled water

Reviewed By: _____

Stantec

Particle-Size Analysis of Soils

ASTM D 422

Project Name: TVA Facilities Assessment - PAF Phase 2
Project Number: 171468118
Source: B-13, 0.0'-1.5', 1.5'-3.0', 3.0'-4.5', 4.5'-6.0'
Lab ID: 626

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: Weathered and Friable

Tested By: DRB
Test Date: 03-16-2009
Date Received: 03-04-2009

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	100.0
3/8"	99.2
No. 4	97.8
No. 10	96.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

Specific Gravity: 2.7

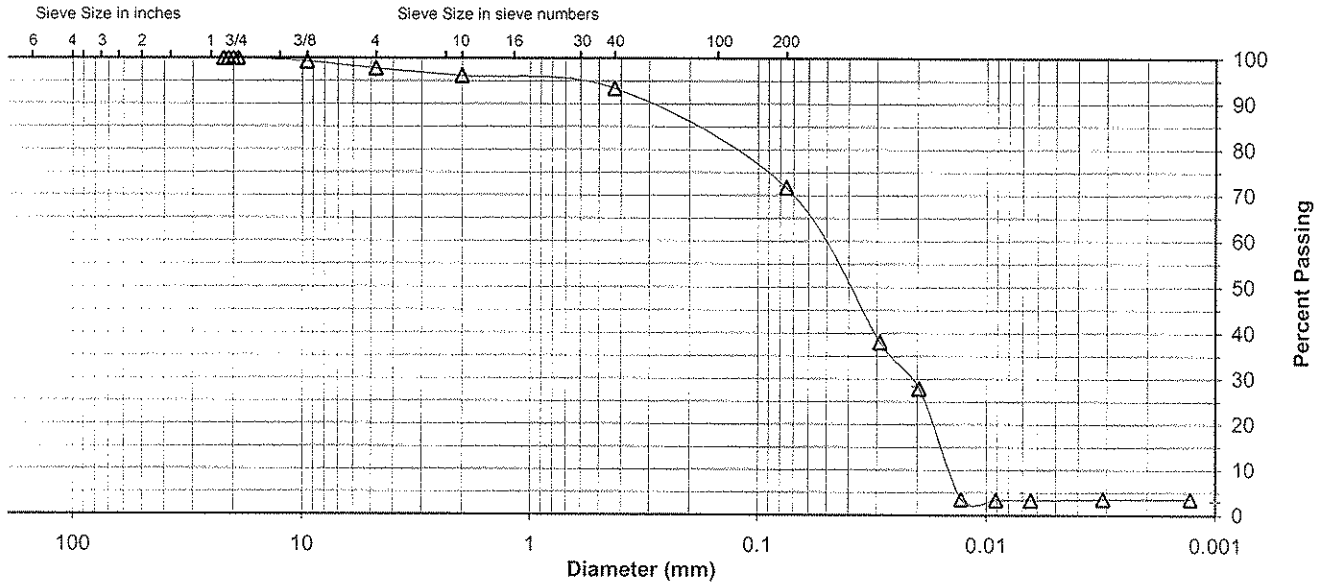
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	93.4
No. 200	71.6
0.02 mm	28.4
0.005 mm	3.3
0.002 mm	3.5
0.001 mm	3.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	2.2	1.7	2.7	21.8	68.3	3.3

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	3.9	2.7	21.8	68.1	3.5



Comments: Gypsum water used for testing instead of distilled water

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

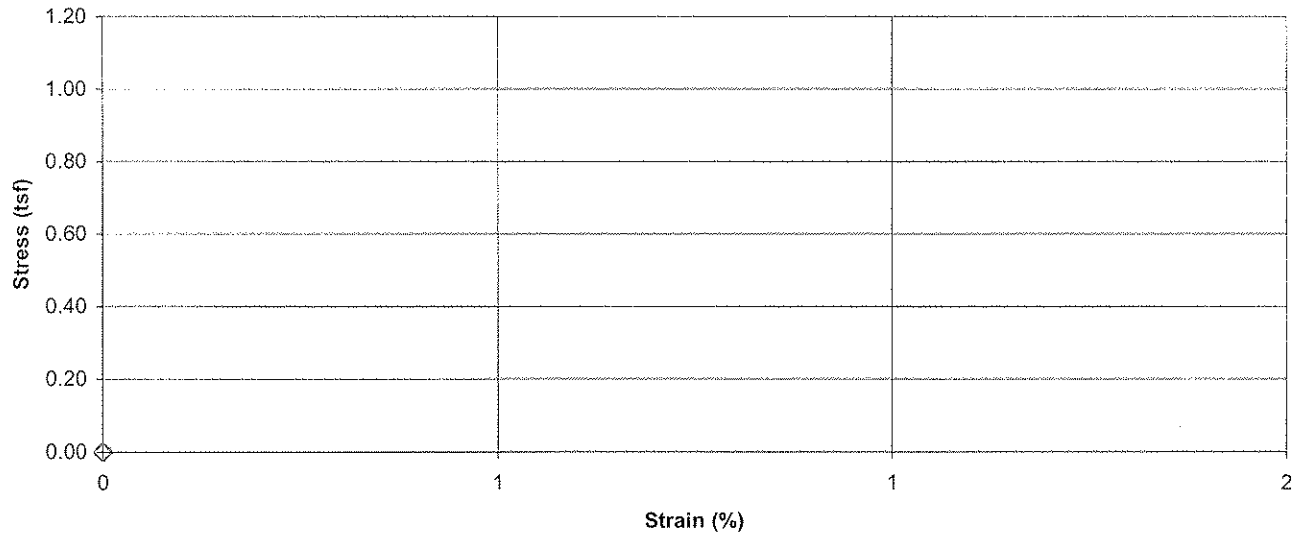
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-1, 4.5'-6.3' | Lab ID: 345A
Visual Description: Sandy Lean Clay (CL), gray brown, moist, firm, pockets of coal
Recovered: 1.9'
Test Interval: 4.5' - 5.0'

Specimen Type: Undisturbed

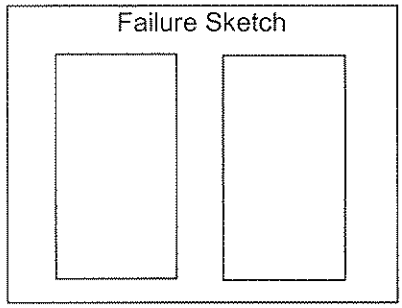
LL	N/A		
PL	N/A	Date Extruded	02/24/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	121.5		
Initial Dry Density (pcf)	105.0		
Initial Moisture Content (%)	15.7	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.613	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.896	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	1.9	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

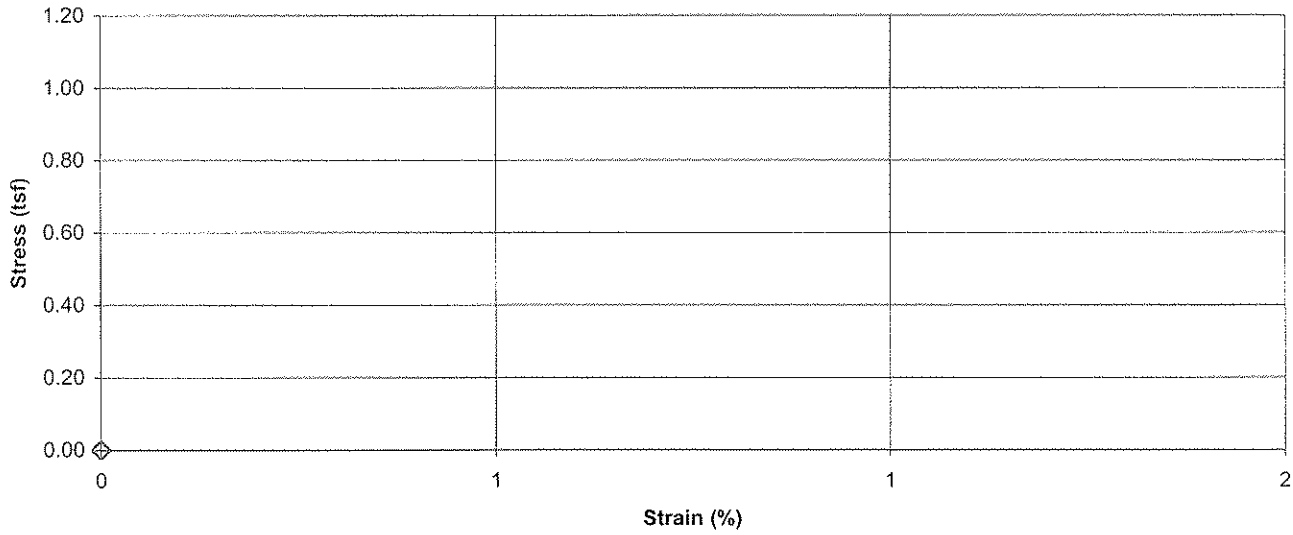
ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-1, 4.5'-6.3' | Lab ID: 345B
Visual Description: Sandy Lean Clay (CL), gray brown, moist, firm, pockets of coal and fly ash
Recovered: 1.9'
Test Interval: 5.4' - 5.7'

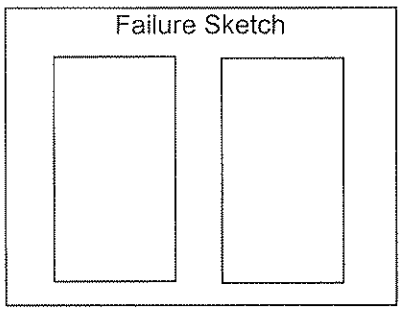
Specimen Type: Undisturbed

LL	N/A		
PL	N/A	Date Extruded	02/24/2009
PI	N/A	Date Tested	N/A
Initial Wet Density (pcf)			
Initial Dry Density (pcf)	N/A		
Initial Moisture Content (%)	17.0	Initial MC Taken	Before Test, From Center of Specimen
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	N/A	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	N/A	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	N/A	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

PAF

Project Name TVA ~~Gumberland Fossil Plant~~ Project Number 171468118

Source B-1, 4.5'-6.3' Lab ID 345C

Visual Description Silt (ML), (fly ash), gray to dark gray, moist, soft

Recovered 1.9'

Test Interval 6.0' - 6.2'

Specimen Type: Undisturbed

LL N/A

PL N/A

PI N/A

Date Extruded 02/23/2009

Date Tested N/A

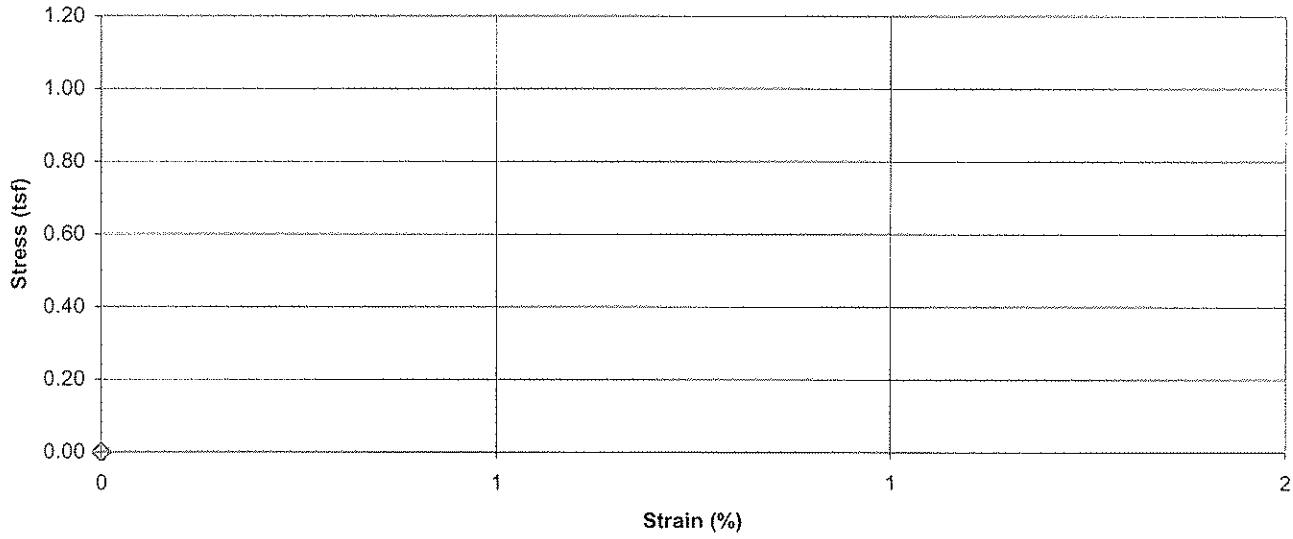
Initial Wet Density (pcf)	118.5
Initial Dry Density (pcf)	97.3
Initial Moisture Content (%)	21.8
At Test Moisture Content (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	3.108
Average Diameter (in)	2.871
Height to Diameter Ratio	1.1

Initial MC Taken Before Test, From Trimmings

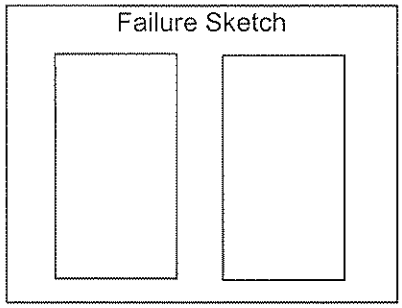
At Test MC Taken N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A

Torvane Reading (kg/cm^2) N/A

Comments Dried at 40° C.

Weight of cylinder and material - 2073.69 g.

Average height of cut cylinder - 7.925"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

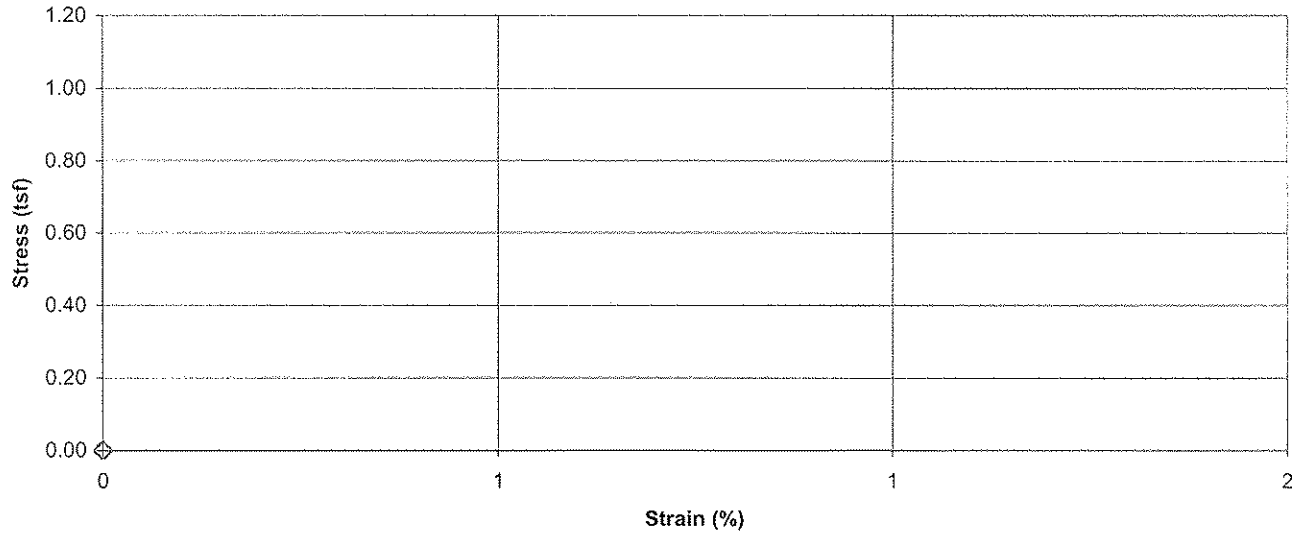
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-1, 9.5'-11.5' | Lab ID: 346A
Visual Description: Silt (ML), (fly ash), gray to dark gray, moist, soft
Recovered: 2.1'
Test Interval: 9.7' - 10.2'

Specimen Type: Undisturbed

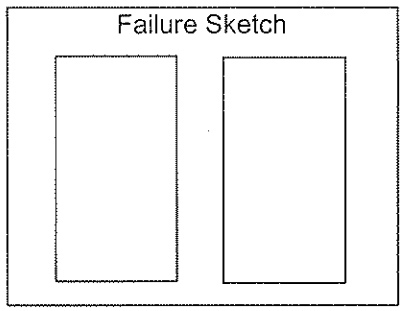
LL	N/A		
PL	N/A	Date Extruded	02/24/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	111.6		
Initial Dry Density (pcf)	90.8		
Initial Moisture Content (%)	22.8	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.136	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.854	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C
Weight of cylinder and sample - 1865.02 g
Average height of cylinder 7.1138"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

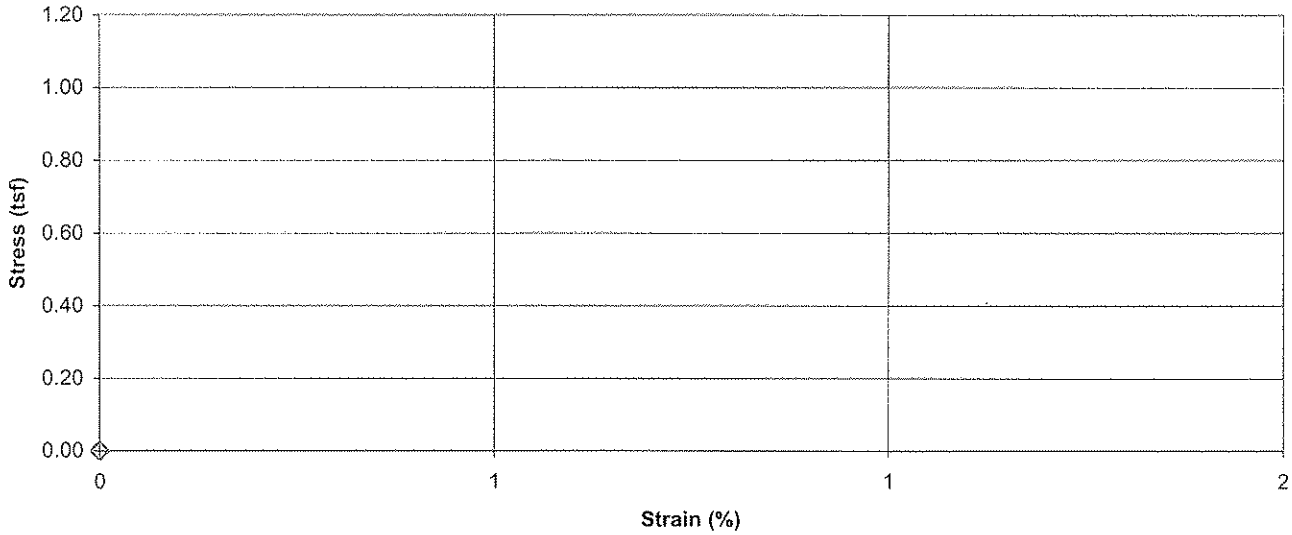
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-1, 9.5'-11.5' | Lab ID: 346B
Visual Description: Silt (ML), (fly ash), gray to dark gray, moist, soft
Recovered: 2.1'
Test Interval: 10.4' - 10.9'

Specimen Type: Undisturbed

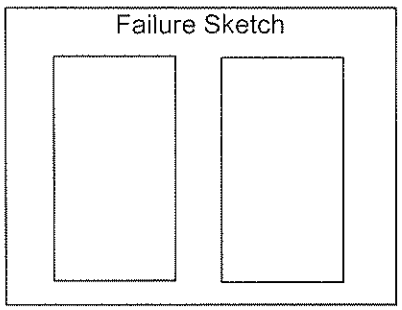
LL	N/A		
PL	N/A	Date Extruded	02/24/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	112.5		
Initial Dry Density (pcf)	90.2		
Initial Moisture Content (%)	24.8	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.105	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.880	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.
Weight of cylinder and sample - 1912.78 g
Average height of cylinder - 7.1897"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name TVA Facilities Assessment - PAF Phase 2 | Project Number 171468118
Source B-1, 9.5'-11.5' | Lab ID 346C
Visual Description Silt (ML), (fly ash), gray to dark gray, moist, soft
Recovered 2.1'
Test Interval 11.0' - 11.5'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

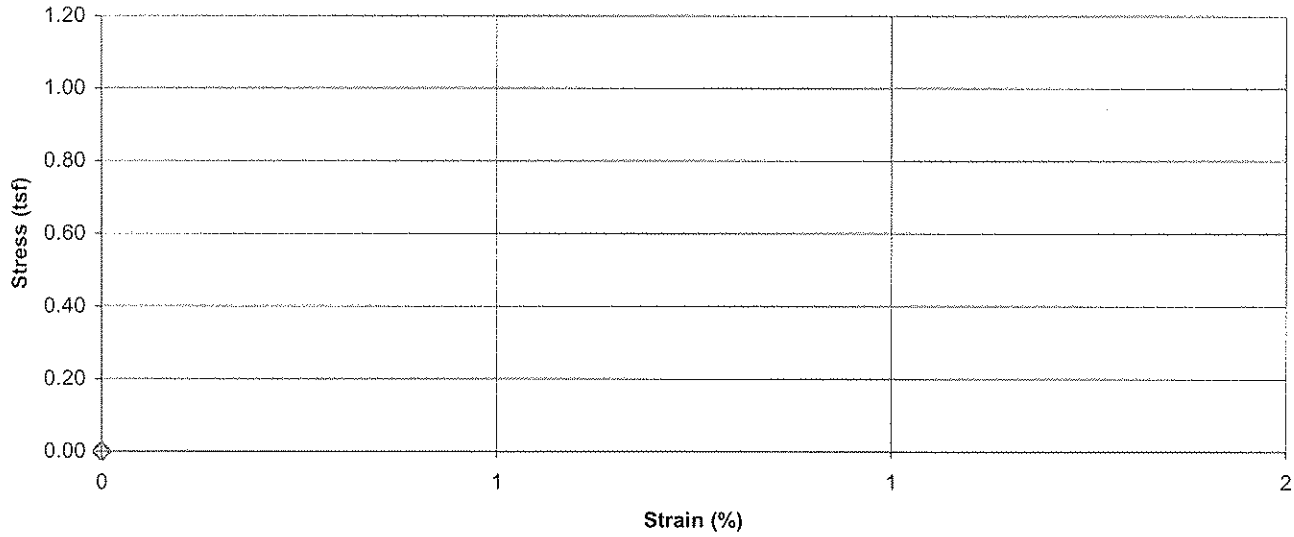
Date Extruded 02/24/2009
Date Tested N/A

Initial Wet Density (pcf)	114.7
Initial Dry Density (pcf)	93.1
Initial Moisture Content (%)	23.1
At Test Moisture Content (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.084
Average Diameter (in)	2.866
Height to Diameter Ratio	2.1

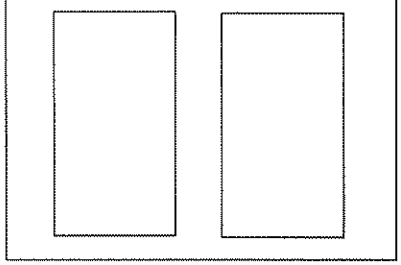
Initial MC Taken Before Test, From Trimmings
At Test MC Taken N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A
Torvane Reading (kg/cm^2) N/A

Comments Dried at 40° C
Weight of cylinder and sample - 1871.97 g
Average height of cylinder - 7.0585"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

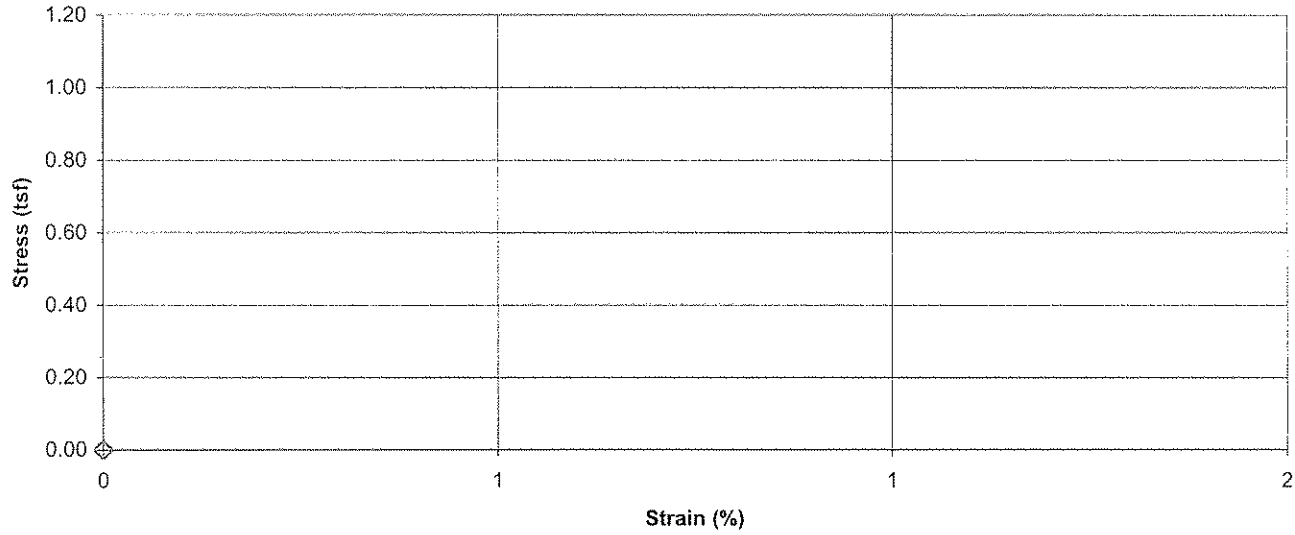
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-1, 14.5'-16.5' | Lab ID: 347A
Visual Description: Silt (ML), (fly ash), gray to dark gray, moist, soft
Recovered: 1.9'
Test Interval: 14.7' - 15.2'

Specimen Type: Undisturbed

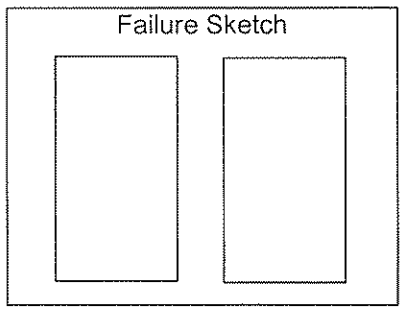
LL	N/A		
PL	N/A	Date Extruded	02/24/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	115.9		
Initial Dry Density (pcf)	96.3		
Initial Moisture Content (%)	20.4	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.926	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.866	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C
Weight of cylinder and sample - 1892.94 g
Average height of cylinder - 7.0388"

Reviewed By:

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-1, 14.5'-16.5' | Lab ID: 347B
Visual Description: Silt (ML), (fly ash), dark gray, wet, soft

Recovered: 1.9'
Test Interval: 15.3' - 15.8'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

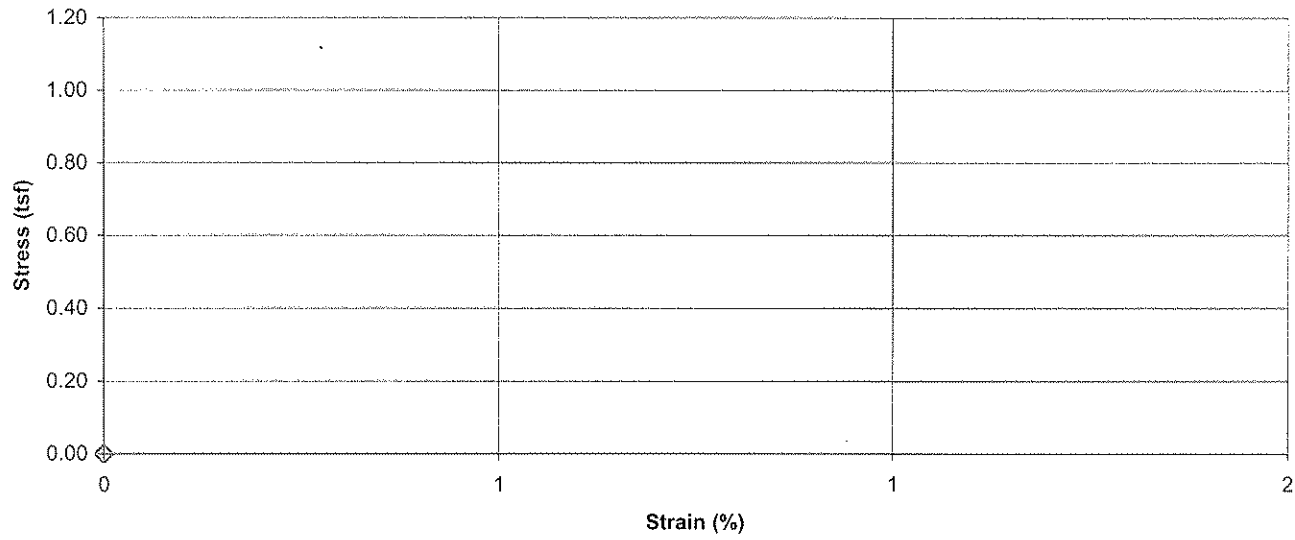
Date Extruded: 02/24/2009
Date Tested: N/A

Initial Wet Density (pcf)	110.3
Initial Dry Density (pcf)	83.5
Initial Moisture Content (%)	32.2
At Test Moisture Content (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.980
Average Diameter (in)	2.878
Height to Diameter Ratio	2.1

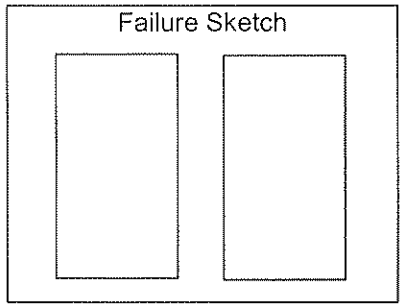
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C
Weight of cylinder and sample - 1854.18 g
Average height of cylinder - 7.1545"

Reviewed By:

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name TVA Facilities Assessment - PAF Phase 2 | Project Number 171468118
Source B-1, 14.5'-16.5' | Lab ID 347C
Visual Description Silt (ML), (fly ash), dark gray, moist, soft

Recovered 2'
Test Interval 16.0' - 16.5'

Specimen Type: Undisturbed

LL N/A
PL N/A
PI N/A

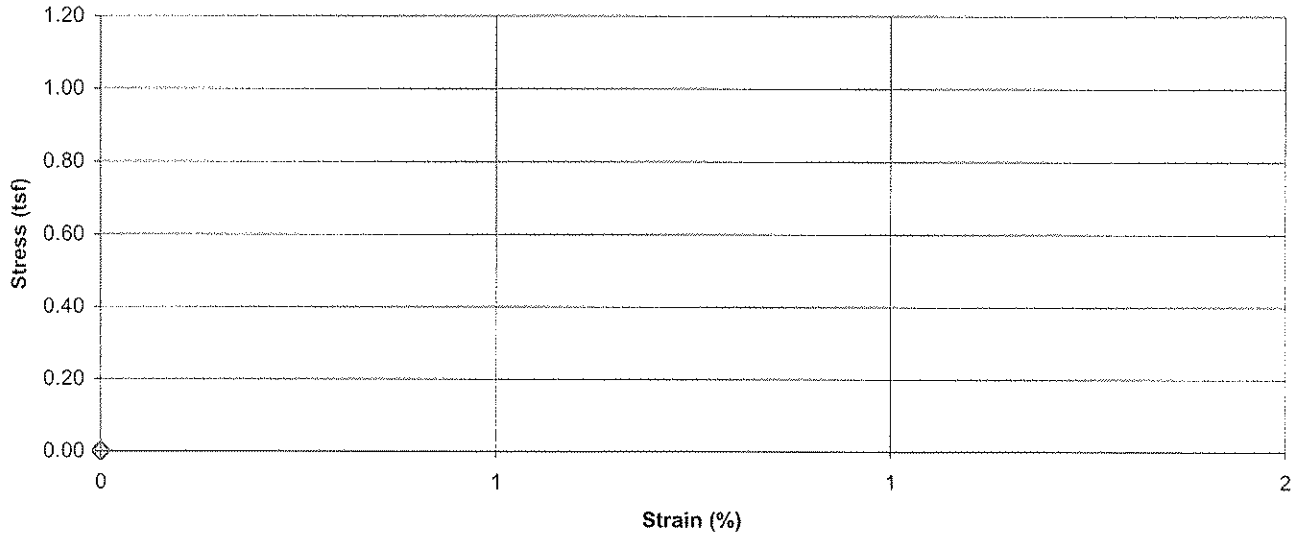
Date Extruded 02/25/2009
Date Tested N/A

Initial Wet Density (pcf)	109.7
Initial Dry Density (pcf)	84.8
Initial Moisture Content (%)	29.3
At Test Moisture Content (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.004
Average Diameter (in)	2.851
Height to Diameter Ratio	2.1

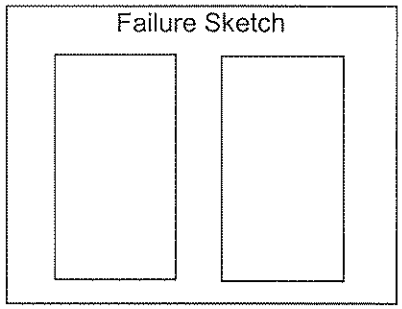
Initial MC Taken Before Test, From Trimmings
At Test MC Taken N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A
Torvane Reading (kg/cm^2) N/A

Comments Dried at 40° C
Weight of cylinder and sample - 1894.74 g
Average height of cylinder - 7.223"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

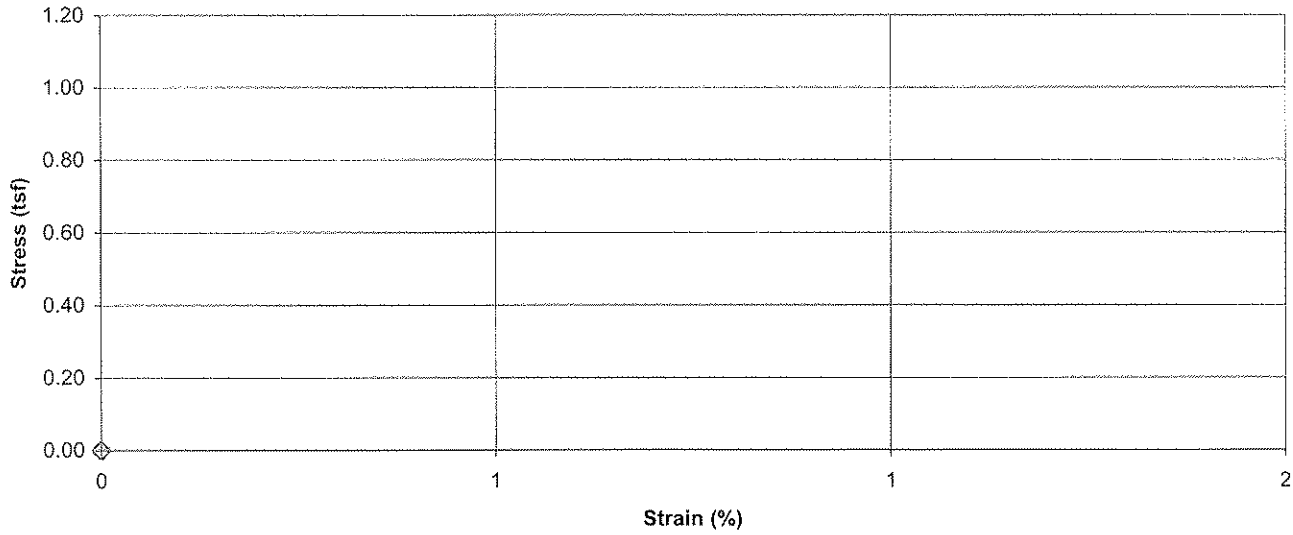
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-1, 19.5'-21.5' | Lab ID: 348A
Visual Description: Silt (ML), (fly ash), dark gray, moist, soft
Recovered: 2'
Test Interval: 19.8' - 20.3'

Specimen Type: Undisturbed

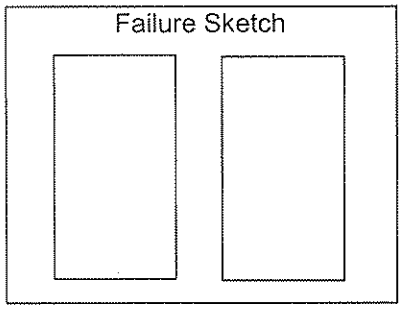
LL	N/A		
PL	N/A	Date Extruded	02/25/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	116.3		
Initial Dry Density (pcf)	95.9		
Initial Moisture Content (%)	21.4	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.978	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.873	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C
Weight of cylinder and material - 1926.62 g
Average height of cylinder - 7.2045"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

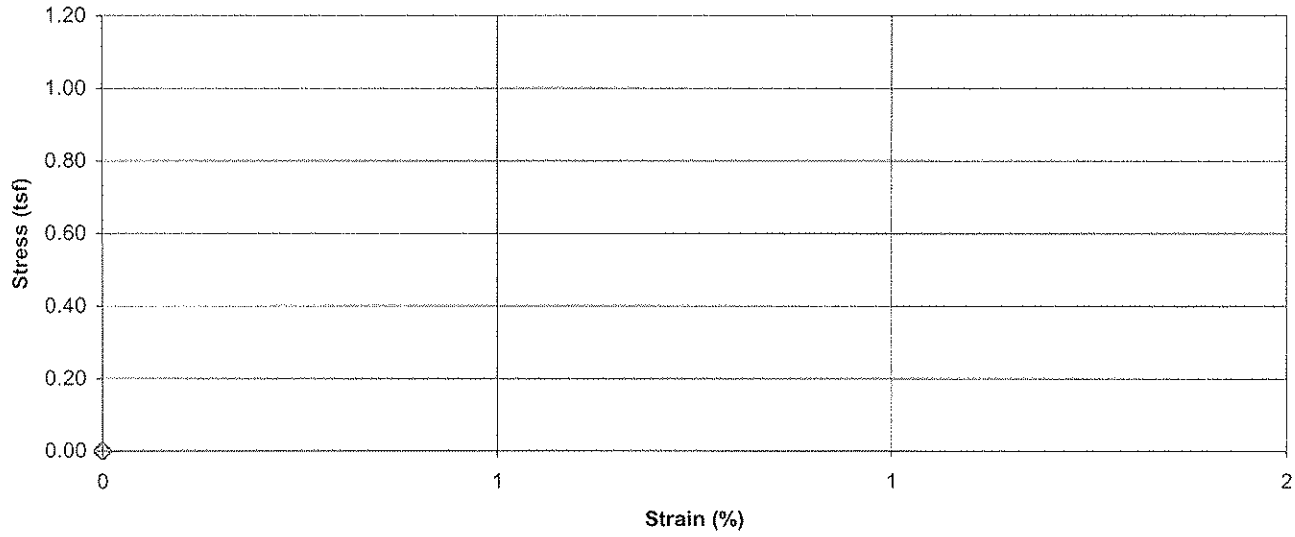
ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-1, 19.5'-21.5' | Lab ID: 348B
Visual Description: Silt (ML), (fly ash), dark gray, moist, soft
Recovered: 2'
Test Interval: 20.4' - 20.9'

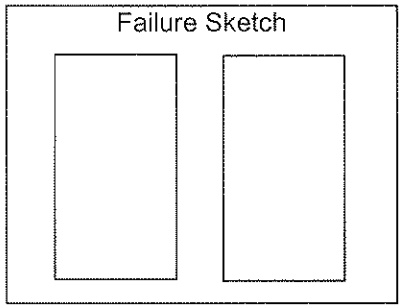
Specimen Type: Undisturbed

LL	N/A		
PL	N/A	Date Extruded	02/25/2009
PI	N/A	Date Tested	N/A
Initial Wet Density (pcf)	115.9		
Initial Dry Density (pcf)	95.4		
Initial Moisture Content (%)	21.5	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.941	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.848	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C
Weight of cylinder and material - 1922.16 g
Average height of cylinder - 7.1953"

Reviewed By:

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-1, 19.5'-21.5' | Lab ID: 348C
Visual Description: Silt (ML), (fly ash), gray to dark gray, moist, soft

Recovered: 2'
Test Interval: 21.0' - 21.5'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

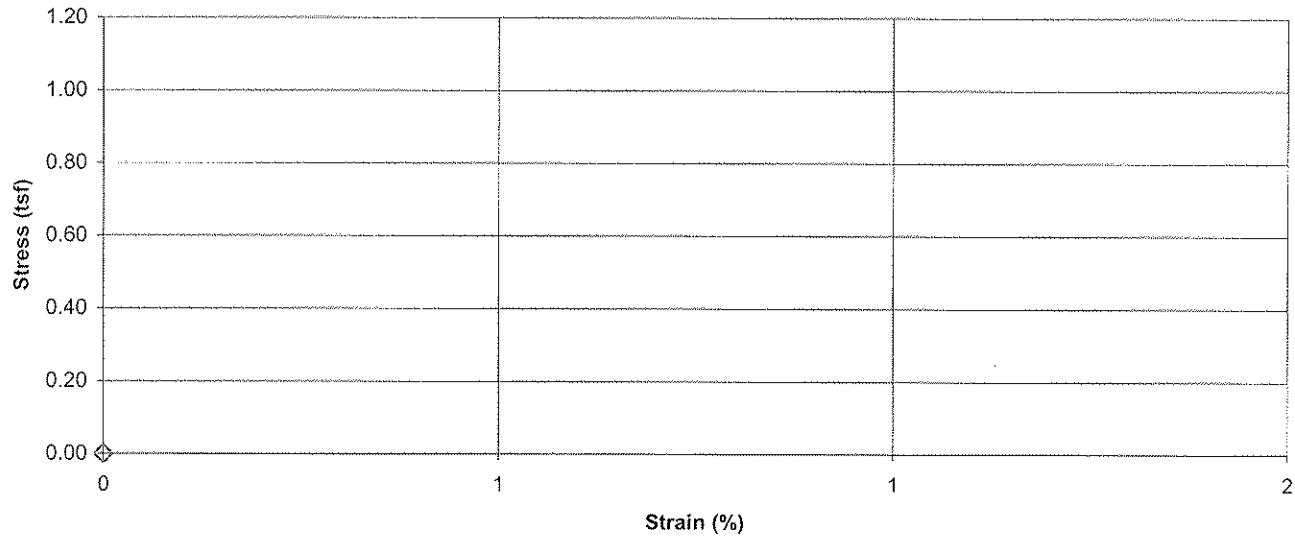
Date Extruded: 02/25/2009
Date Tested: N/A

Initial Wet Density (pcf)	115.4
Initial Dry Density (pcf)	94.1
Initial Moisture Content (%)	22.6
At Test Moisture Content (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.089
Average Diameter (in)	2.865
Height to Diameter Ratio	2.1

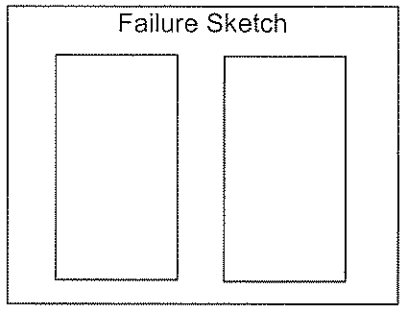
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C
Weight of cylinder and material - 1970.62 g
Average height of cylinder - 7.2232"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

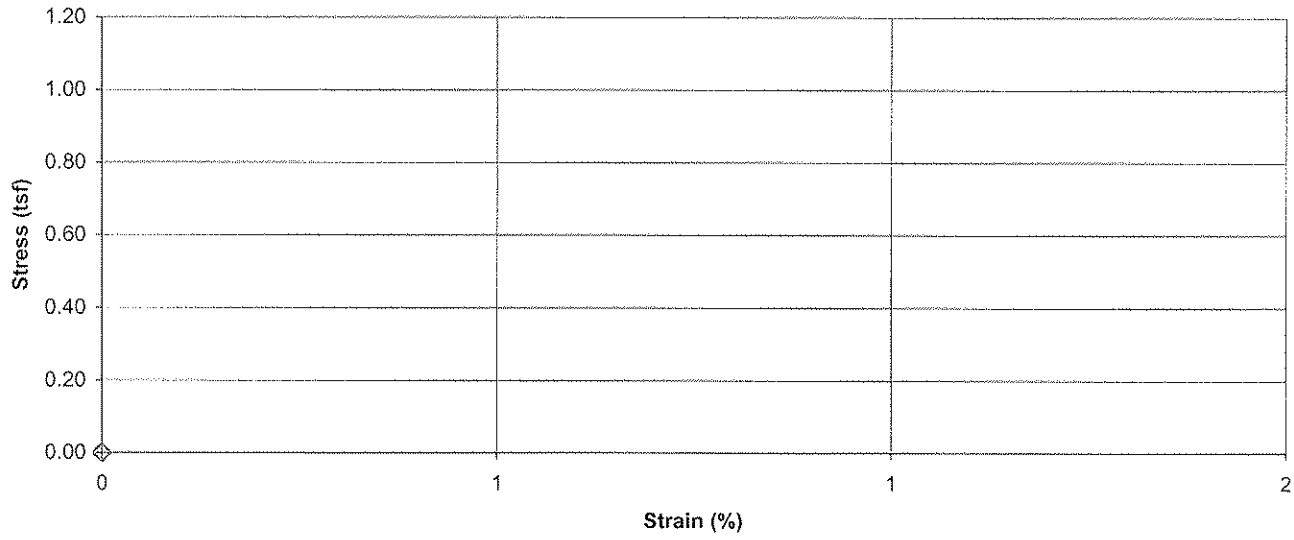
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-1, 24.5'-26.5' | Lab ID: 349A
Visual Description: Silt (ML), (fly ash), black, wet, very soft, pockets of gypsum
Recovered: 1.9'
Test Interval: 24.8' - 25.3'

Specimen Type: Undisturbed

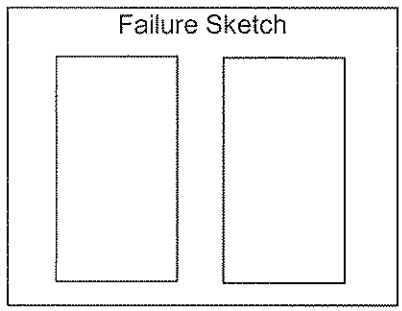
LL	N/A		
PL	N/A	Date Extruded	02/25/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	116.6		
Initial Dry Density (pcf)	94.3		
Initial Moisture Content (%)	23.6	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.854	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.902	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.0	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

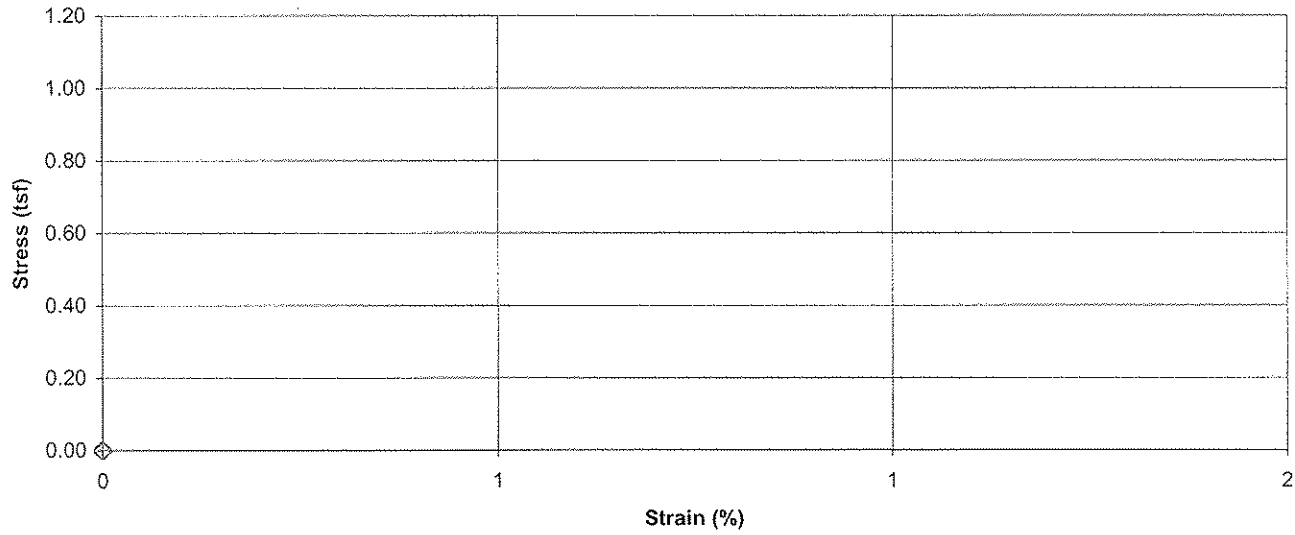
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-1, 24.5'-26.5' | Lab ID: 349B
Visual Description: Silt (ML), (fly ash), dark gray, wet, very soft, pockets of gypsum
Recovered: 1.9'
Test Interval: 25.3' - 25.8'

Specimen Type: Undisturbed

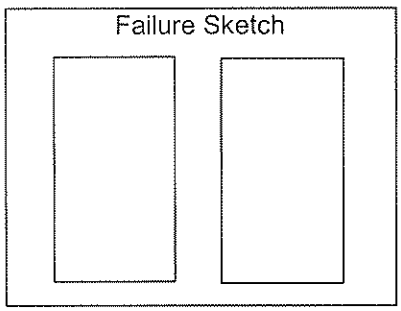
LL	N/A		
PL	N/A	Date Extruded	02/25/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	119.2		
Initial Dry Density (pcf)	97.6		
Initial Moisture Content (%)	22.1	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.894	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.870	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C
Weight of cylinder and sample - 1960.60 g
Average height of cylinder - 7.153"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

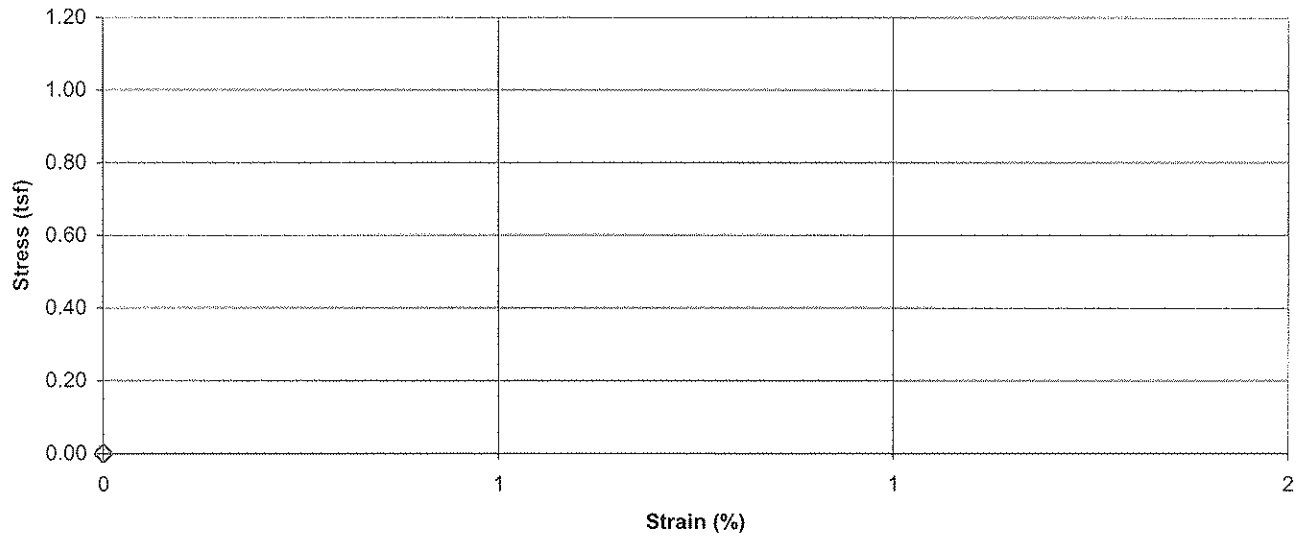
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-1, 24.5'-26.5' | Lab ID: 349C
Visual Description: Silt (ML), (fly ash), gray to dark gray, moist, firm
Recovered: 1.9'
Test Interval: 25.9' - 26.4'

Specimen Type: Undisturbed

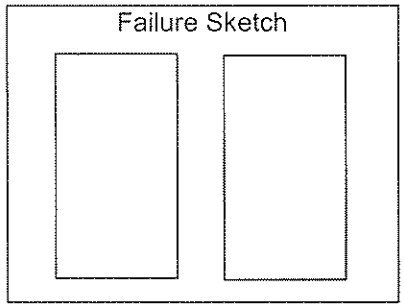
LL	N/A		
PL	N/A	Date Extruded	02/25/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	115.5		
Initial Dry Density (pcf)	97.1		
Initial Moisture Content (%)	18.8	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.063	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.835	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.
Weight of cylinder and sample - 2003.47 g
Average height of cylinder - 7.33 "

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

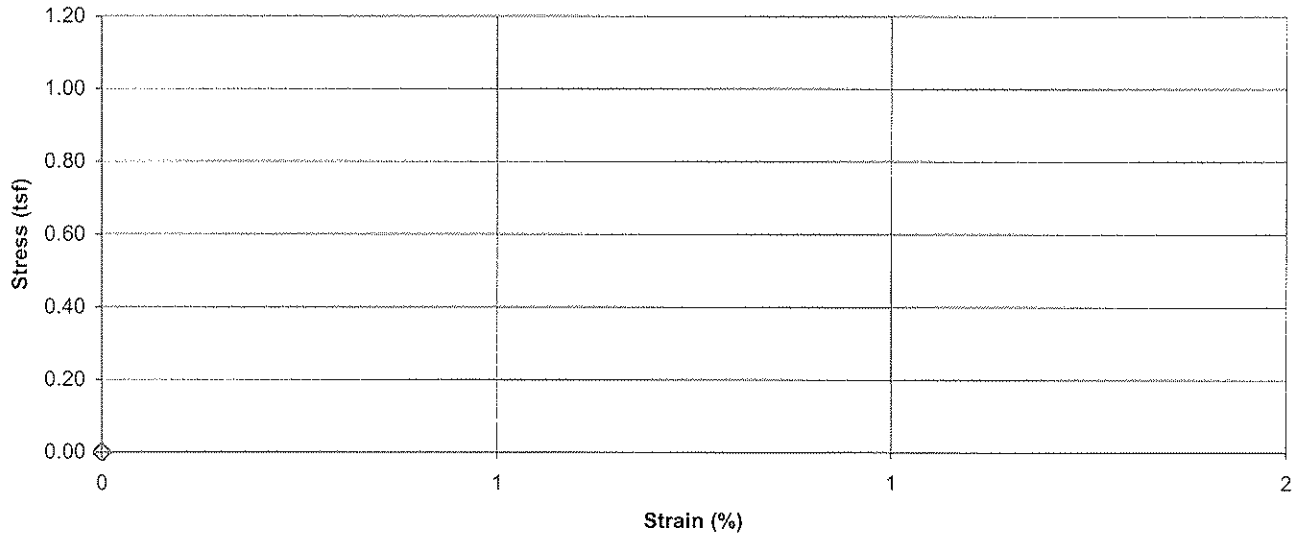
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-1, 34.5'-36.5' | Lab ID: 350A
Visual Description: Silt (ML), (fly ash), black, wet, very soft, pockets of gypsum
Recovered: 2'
Test Interval: 34.7' - 35.2'

Specimen Type: Undisturbed

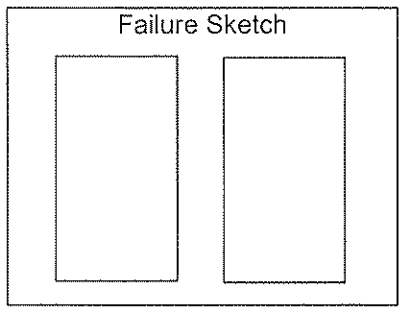
LL	N/A		
PL	N/A	Date Extruded	02/25/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	117.6		
Initial Dry Density (pcf)	95.2		
Initial Moisture Content (%)	23.6	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.606	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.886	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	1.9	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C
Weight of cylinder and sample - 1964.33 g
Average height of cylinder - 7.2730"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-1, 34.5'-36.5' | Lab ID: 350B
Visual Description: Silt (ML), (fly ash), dark gray, wet, very soft, pockets of gypsum
Recovered: 2'
Test Interval: 35.3' - 35.8'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

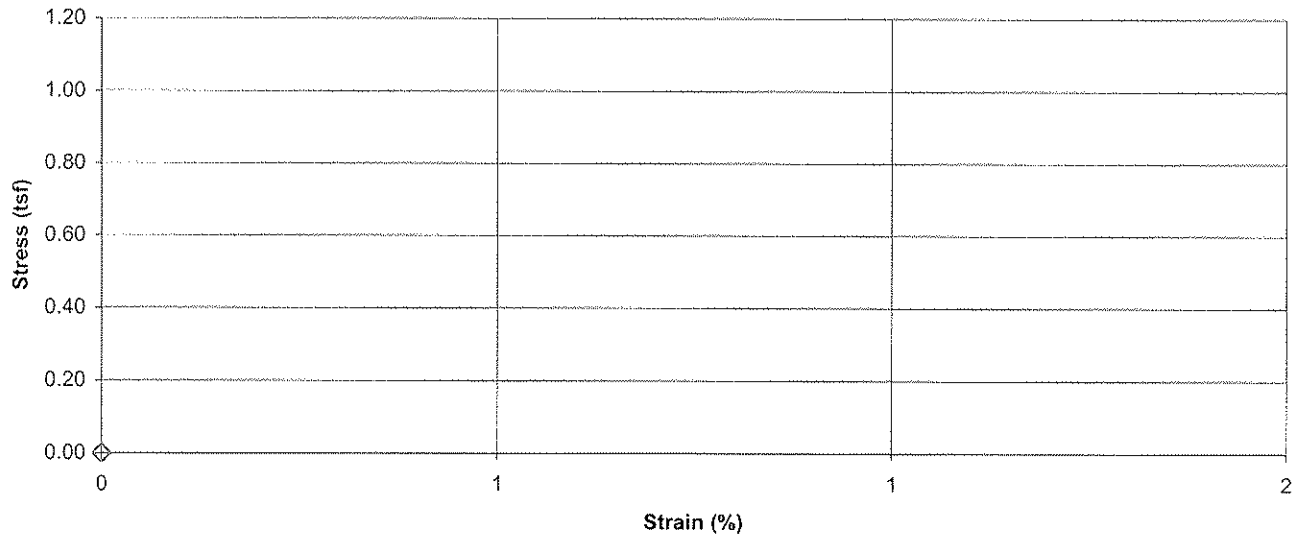
Date Extruded: 02/25/2009
Date Tested: N/A

Initial Wet Density (pcf)	120.8
Initial Dry Density (pcf)	99.0
Initial Moisture Content (%)	22.1
At Test Moisture Content (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.888
Average Diameter (in)	2.898
Height to Diameter Ratio	2.0

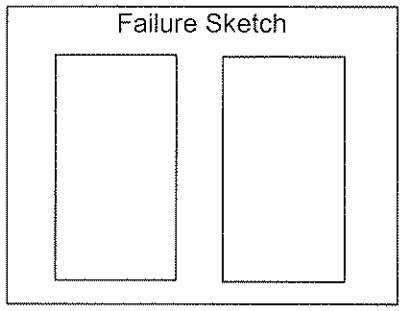
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C
Weight of cylinder and sample - 1967.89 g
Average height of cylinder - 7.104"

Reviewed By:

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name TVA Facilities Assessment - PAF Phase 2 | Project Number 171468118
Source B-1, 34.5'-36.5' | Lab ID 350C
Visual Description Silt (ML), (fly ash), gray and dark gray, moist, firm

Recovered 2'
Test Interval 36.0' - 36.5'

Specimen Type: Undisturbed

LL N/A
PL N/A
PI N/A

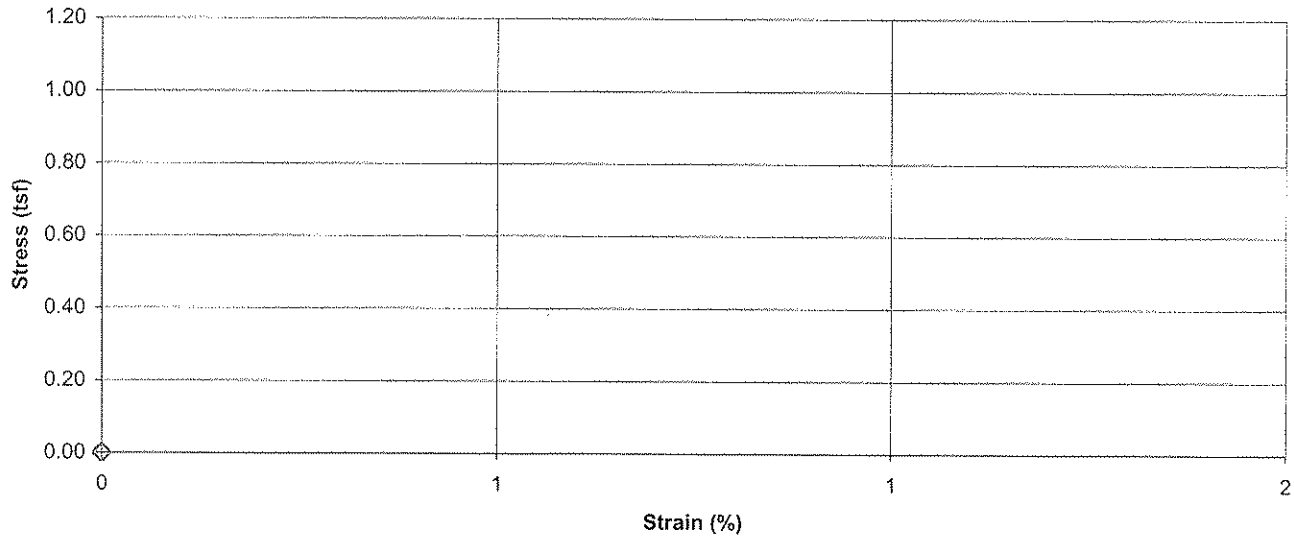
Date Extruded 02/25/2009
Date Tested N/A

Initial Wet Density (pcf)	113.9
Initial Dry Density (pcf)	94.4
Initial Moisture Content (%)	20.7
At Test Moisture Content (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.055
Average Diameter (in)	2.855
Height to Diameter Ratio	2.1

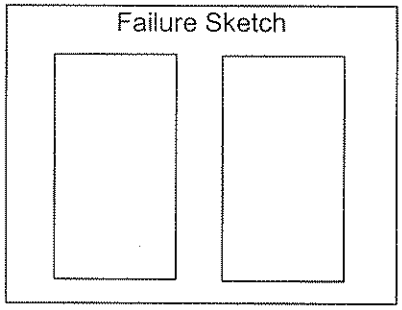
Initial MC Taken Before Test, From Trimmings
At Test MC Taken N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A
Torvane Reading (kg/cm^2) N/A

Comments Dried at 40° C
Weight of cylinder and sample - 1961.50 g
Average height of cylinder - 7.2105"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

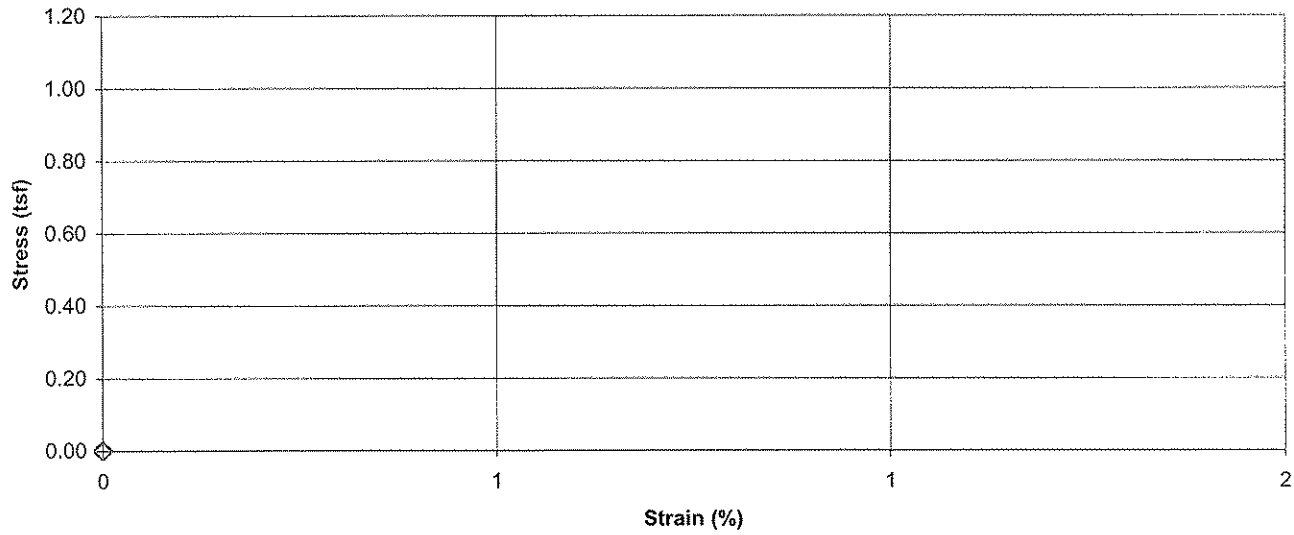
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-6A, 4.5'-6.5' | Lab ID: 561A
Visual Description: Lean Clay (CL), tan, moist, firm, gypsum with pockets of coal
Recovered: 0.6'
Test Interval: 4.7' - 5.2'

Specimen Type: Undisturbed

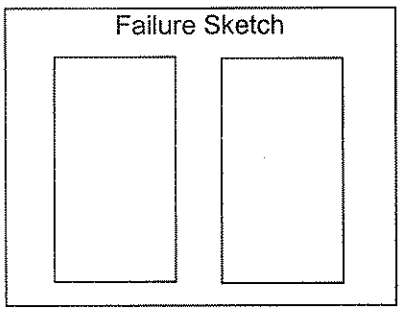
LL	N/A		
PL	N/A	Date Extruded	02/27/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	126.4		
Initial Dry Density (pcf)	111.1		
Initial Moisture Content (%)	13.8	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.546	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.899	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	1.9	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.
200° C MC - 15.8%

Reviewed By: \

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

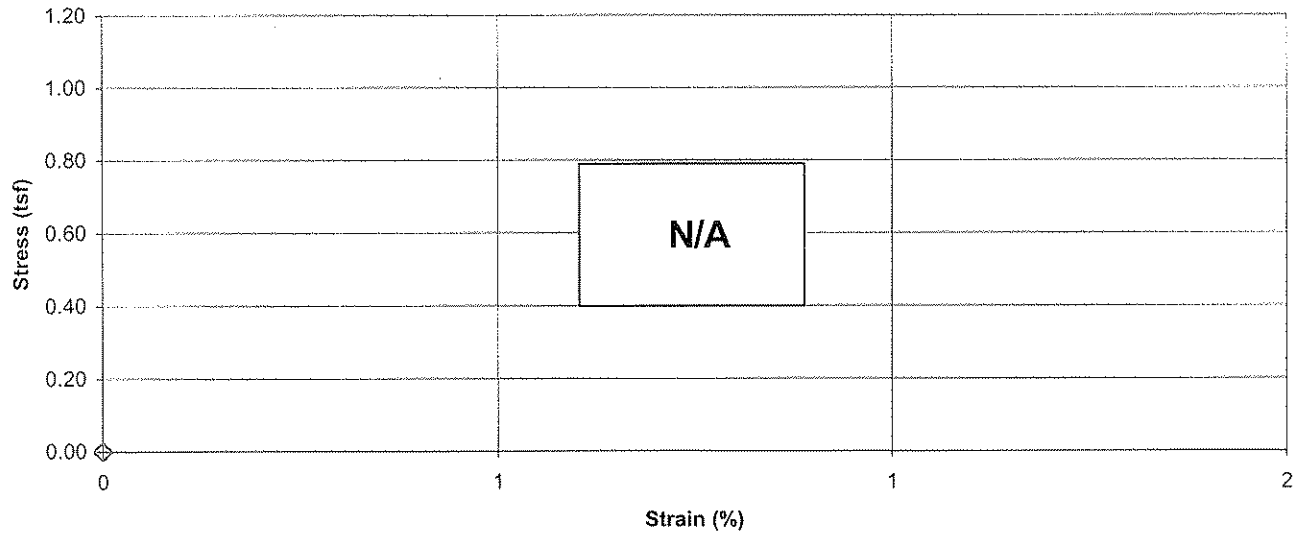
Project Name TVA Facilities Assessment - PAF Phase 2 | Project Number 171468118
Source B-6A, 9.5'-11.5' | Lab ID 562A
Visual Description Silt (ML), gray, moist, soft, fly ash
Recovered 0.6'
Test Interval 9.8' - 10.3'

Specimen Type: Undisturbed

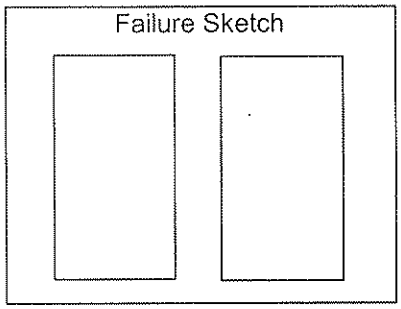
LL	N/A		
PL	N/A	Date Extruded	02/27/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	100.6		
Initial Dry Density (pcf)	88.4		
Initial Moisture Content (%)	13.8	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.112	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.865	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A
Torvane Reading (kg/cm^2) N/A

Comments Dried at 40° C.
Weight of cylinder and material - 1780.75 g.
Average height of cut cylinder - 7.114"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

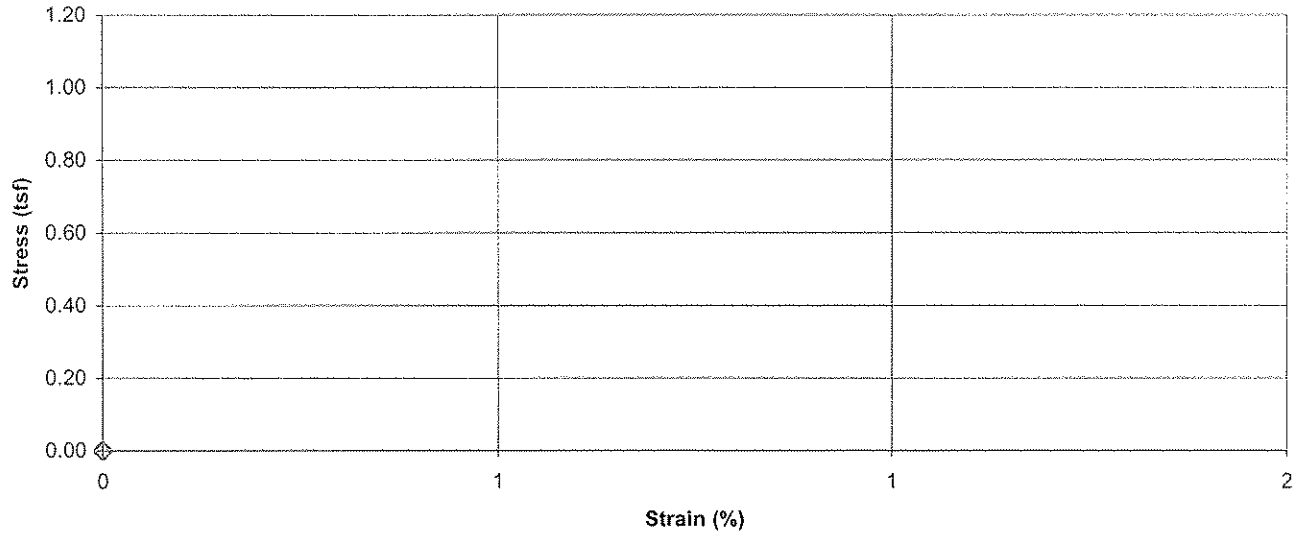
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-6A, 9.5'-11.5' | Lab ID: 562B
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 10.4' - 10.9'

Specimen Type: Undisturbed

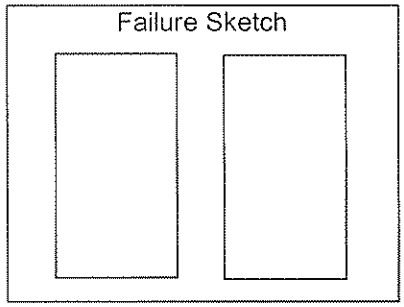
LL	N/A		
PL	N/A	Date Extruded	02/27/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	110.2		
Initial Dry Density (pcf)	93.4		
Initial Moisture Content (%)	18.0	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.042	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.874	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40°C.
Weight of cylinder and material - 1899.94 g.
Average height of cut cylinder - 7.2045"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

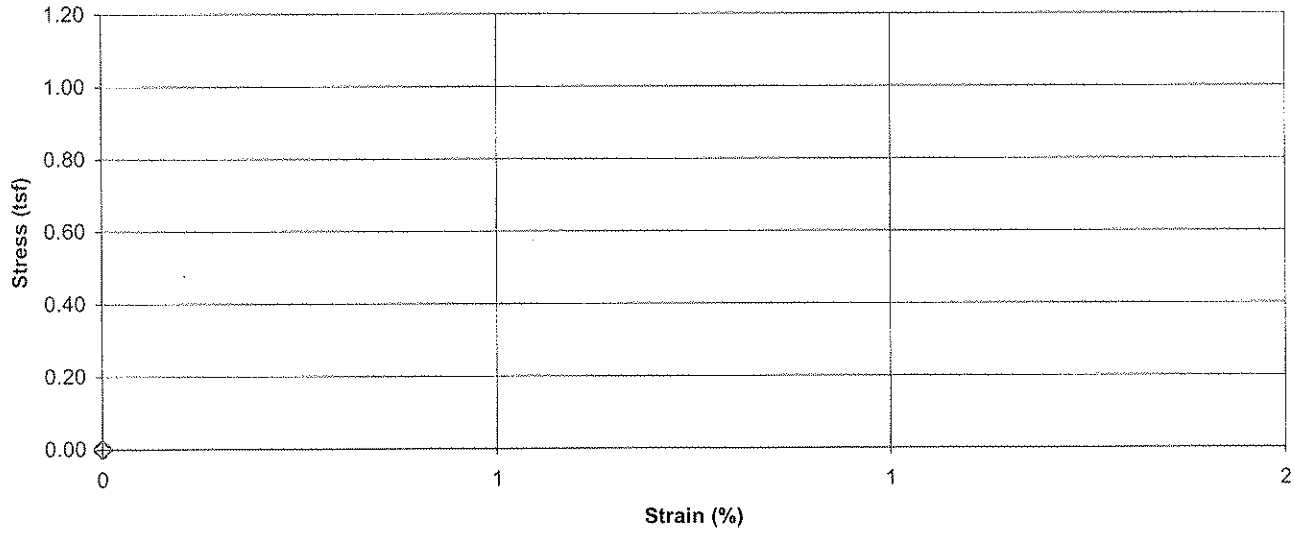
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-6A, 9.5'-11.5' | Lab ID: 562C
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 11.0' - 11.5'

Specimen Type: Undisturbed

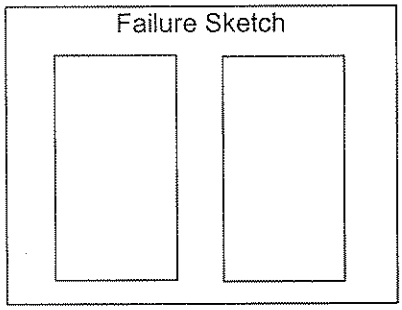
LL	N/A		
PL	N/A	Date Extruded	02/27/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	109.9		
Initial Dry Density (pcf)	88.3		
Initial Moisture Content (%)	24.4	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.975	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.850	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40°C.
Weight of cylinder and material - 1901.16 g.
Average height of cut cylinder - 7.1863"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

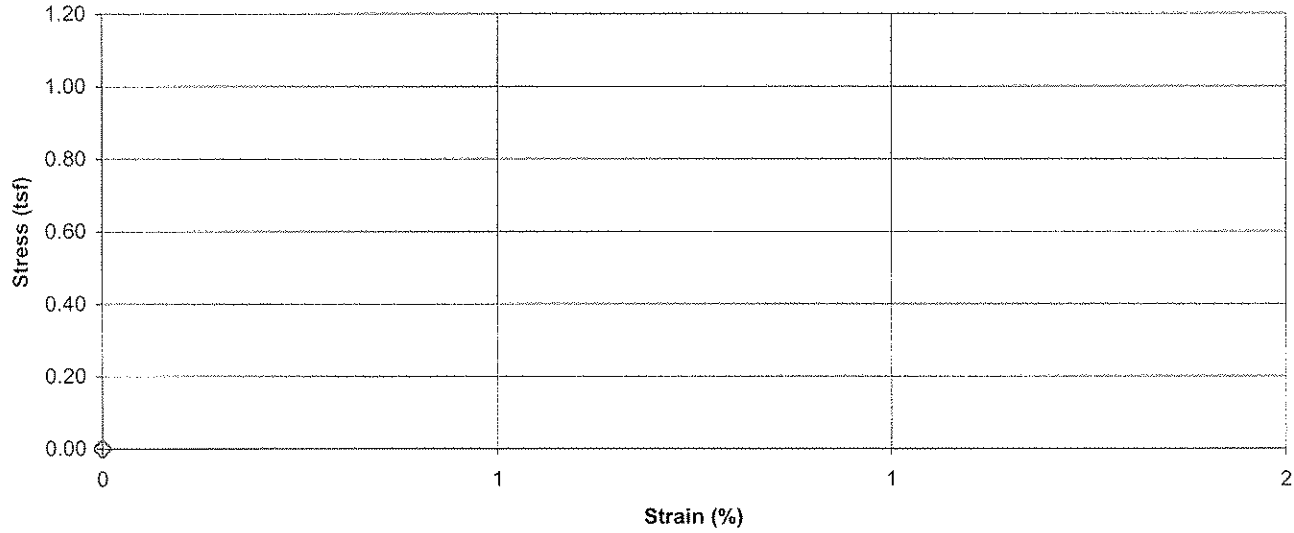
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-6A, 14.5'-16.5' | Lab ID: 563A
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 14.6' - 15.1'

Specimen Type: Undisturbed

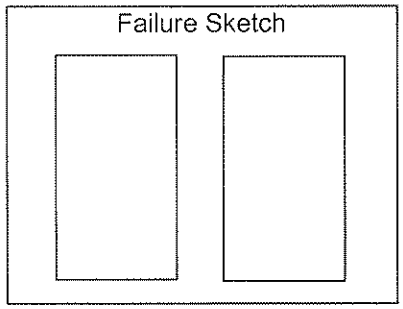
LL	N/A		
PL	N/A	Date Extruded	02/27/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	107.1		
Initial Dry Density (pcf)	90.0		
Initial Moisture Content (%)	19.0	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.054	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.802	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.2	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.
Weight of cylinder and material - 1658.90 g.
Average height of cut cylinder - 6.605"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

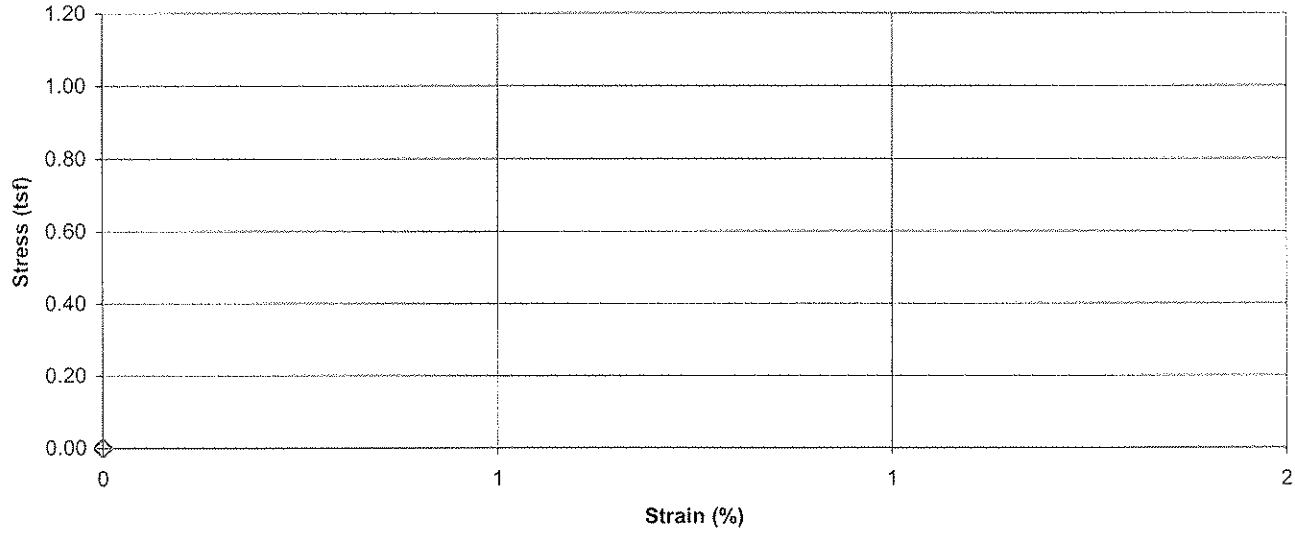
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-6A, 14.5'-16.5' | Lab ID: 563B
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 15.2' - 15.7'

Specimen Type: Undisturbed

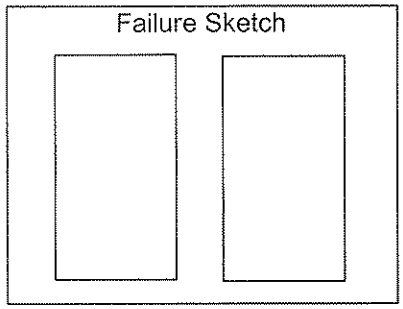
LL	N/A		
PL	N/A	Date Extruded	02/27/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	113.4		
Initial Dry Density (pcf)	91.6		
Initial Moisture Content (%)	23.8	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.094	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.855	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.
Weight of cylinder and material - 1902.48 g.
Average height of cut cylinder - 7.136"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

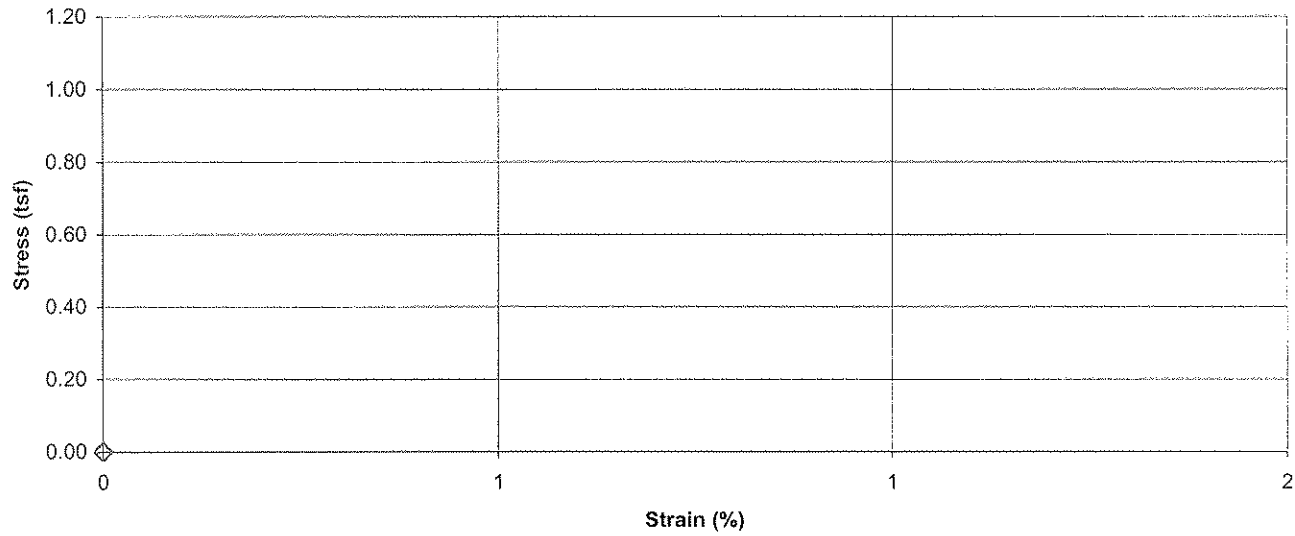
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-6A, 19.5'-21.5' | Lab ID: 564A
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.5'
Test Interval: 19.6' - 20.1'

Specimen Type: Undisturbed

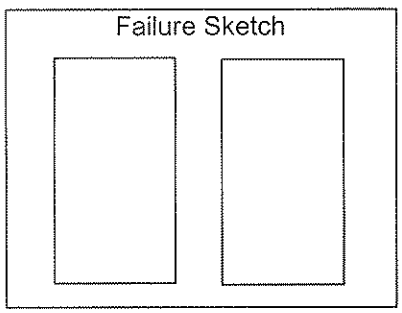
LL	N/A		
PL	N/A	Date Extruded	02/27/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	110.7		
Initial Dry Density (pcf)	93.6		
Initial Moisture Content (%)	18.3	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.432	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.885	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	1.9	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.
Weight of cylinder and material - 1557.82 g.
Average height of cut cylinder - 5.9483"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

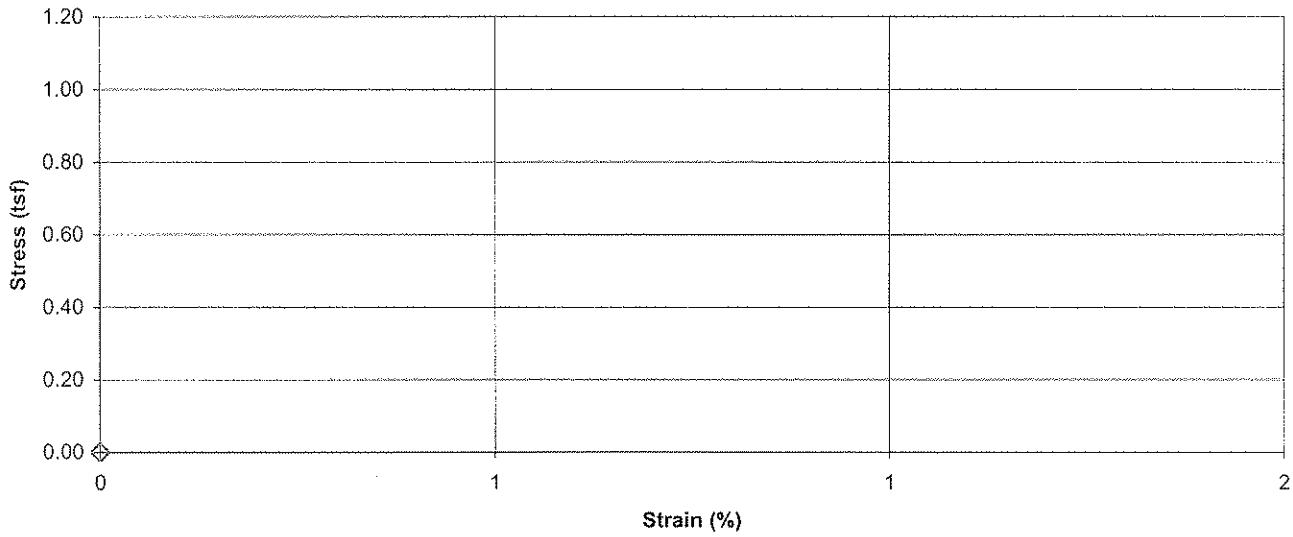
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-6A, 19.5'-21.5' | Lab ID: 564B
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 20.2' - 20.7'

Specimen Type: Undisturbed

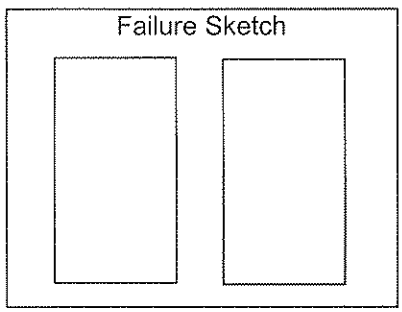
LL	N/A		
PL	N/A	Date Extruded	02/27/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	112.1		
Initial Dry Density (pcf)	94.3		
Initial Moisture Content (%)	18.9	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.095	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.866	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.
Weight of cylinder and material - 1900.99 g.
Average height of cut cylinder - 7.1435"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

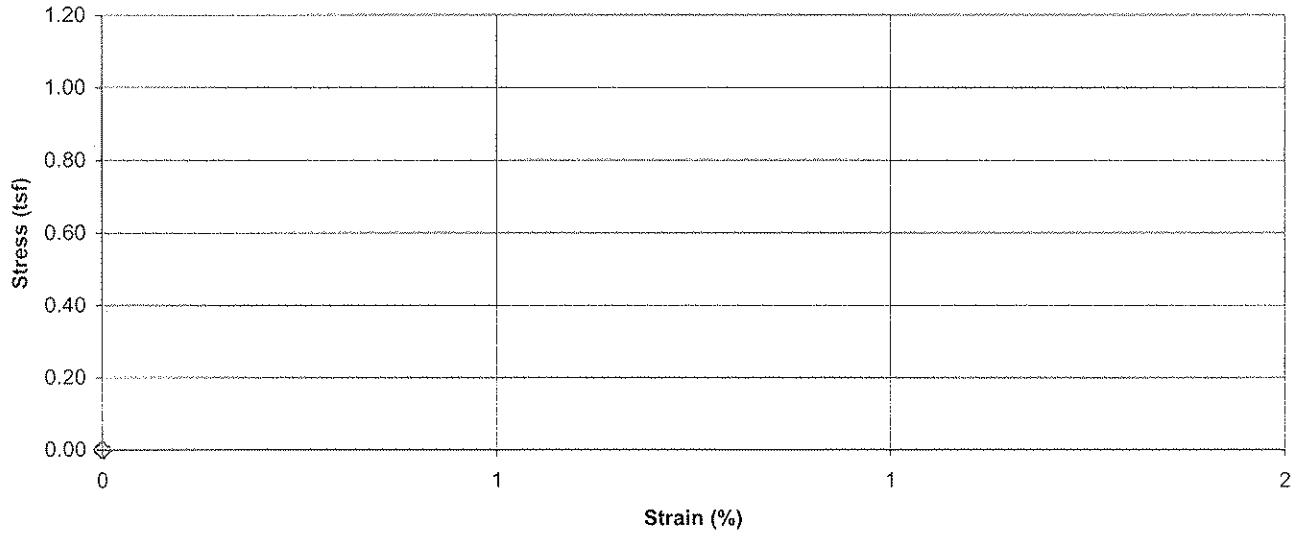
ASTM D 2166

Project Name TVA Facilities Assessment - PAF Phase 2 Project Number 171468118
Source B-6A, 19.5'-21.5' Lab ID 564C
Visual Description Silt (ML), gray to dark gray, moist, soft, fly ash
Recovered 0.6'
Test Interval 20.8' - 21.3'

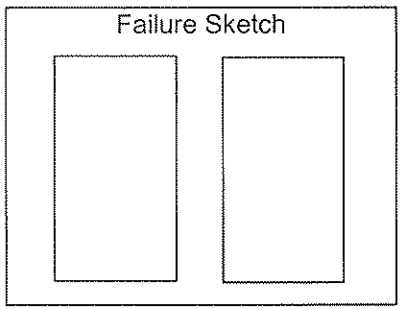
Specimen Type: Undisturbed
LL N/A
PL N/A
PI N/A
Date Extruded 03/03/2009
Date Tested N/A

Initial Wet Density (pcf)	112.9	Initial MC Taken	Before Test, From Trimmings
Initial Dry Density (pcf)	91.8		
Initial Moisture Content (%)	22.9		
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.009	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.876	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A
Torvane Reading (kg/cm^2) N/A

Comments Dried at 40° C.
Weight of cylinder and material - 1903.16 g.
Average height of cut cylinder - 7.1128"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

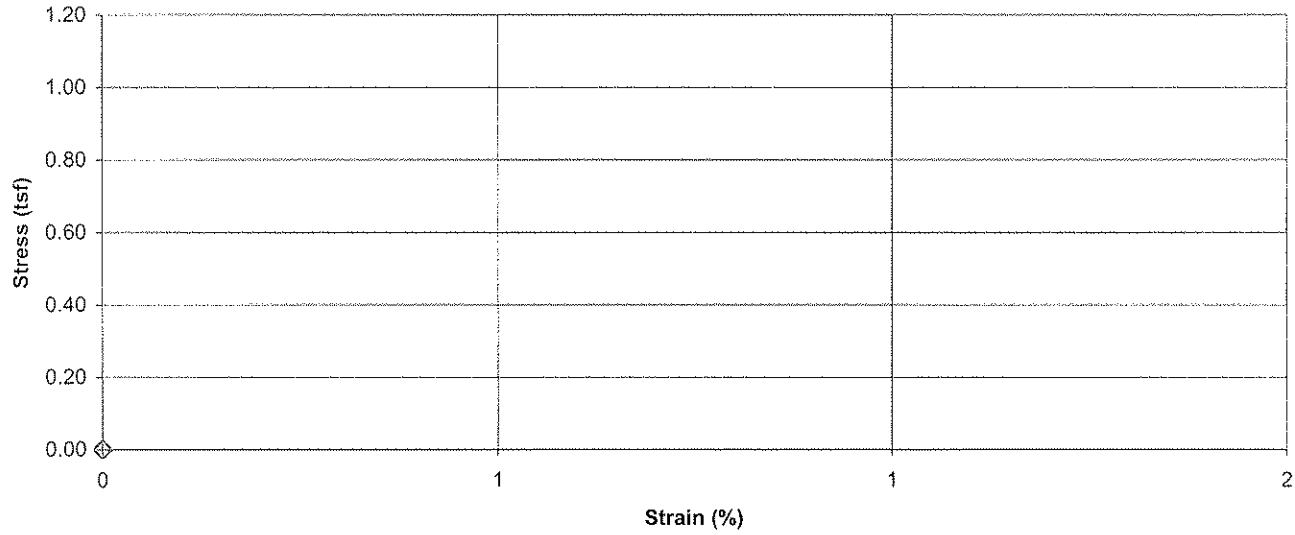
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-6A, 24.5'-26.5' | Lab ID: 565A
Visual Description: Silt (ML), dark gray, moist, soft, fly ash
Recovered: 0.5'
Test Interval: 24.5' - 25.0'

Specimen Type: Undisturbed

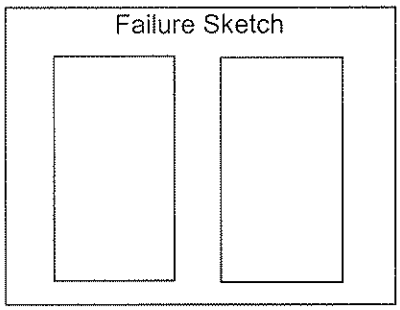
LL	N/A		
PL	N/A	Date Extruded	03/03/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	121.0		
Initial Dry Density (pcf)	97.9		
Initial Moisture Content (%)	23.6	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.578	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.894	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	1.9	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.
Weight of cylinder and material - 1631.77 g.
Average height of cut cylinder - 5.932"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

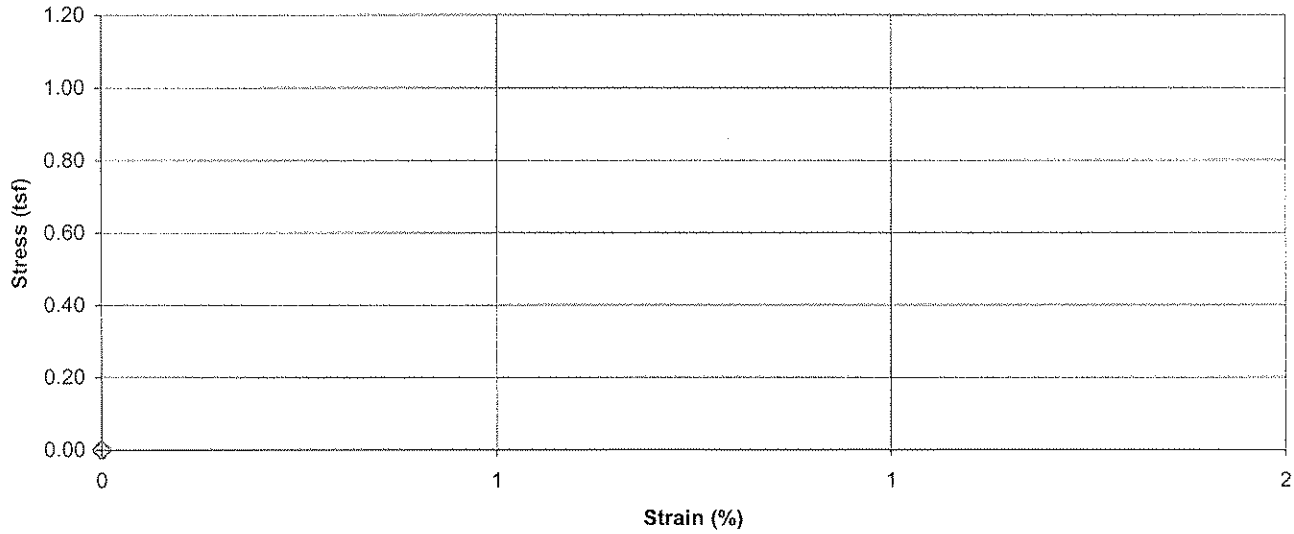
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-6A, 24.5'-26.5' | Lab ID: 565B
Visual Description: Silt (ML), gray to dark gray, moist soft, fly ash
Recovered: 0.6'
Test Interval: 25.1' - 25.6'

Specimen Type: Undisturbed

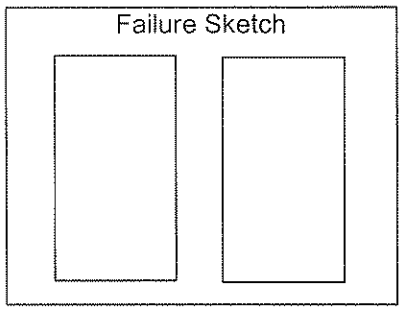
LL	N/A		
PL	N/A	Date Extruded	03/03/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	116.8		
Initial Dry Density (pcf)	98.3		
Initial Moisture Content (%)	18.9	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.091	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.845	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.
Weight of cylinder and material - 1940.83 g.
Average height of cut cylinder - 7.074"

Reviewed By

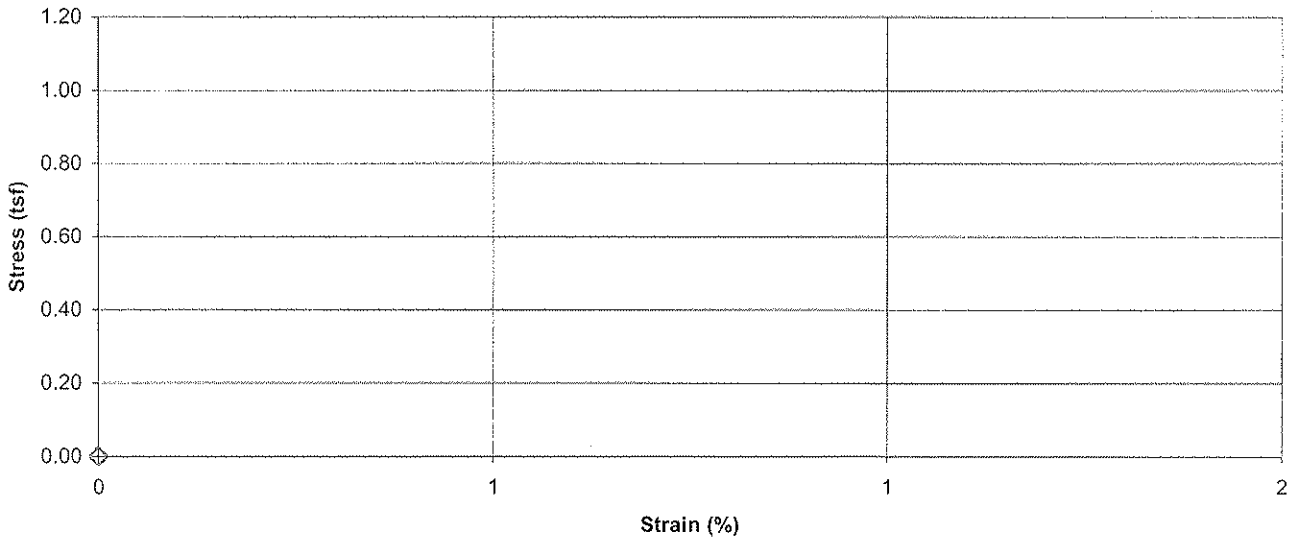
Stantec

Unconfined Compressive Strength of Cohesive Soil

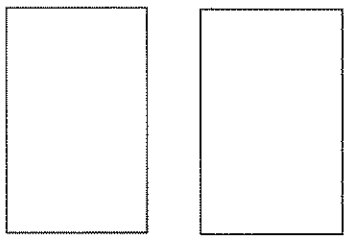
ASTM D 2166

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Source	B-6A, 29.5'-31.5'	Lab ID	566A
Visual Description	Silt (ML), gray to dark gray, moist, soft, fly ash		
		Recovered	0.6'
		Test Interval	29.7' - 30.2'
Specimen Type:	Undisturbed	LL	N/A
		PL	N/A
		PI	N/A
		Date Extruded	03/04/2009
		Date Tested	N/A
Initial Wet Density (pcf)	124.9		
Initial Dry Density (pcf)	104.3		
Initial Moisture Content, 40°C (%)	19.7	Initial MC Taken	Before Test, From Trimmings
Initial Moisture Content, 200°C (%)	39.2		
At Test Moisture Content, 40°C (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.991	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.851	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A

Torvane Reading (kg/cm^2) N/A

Comments Unit weight determined by 40° C mc

Weight of cylinder and material 1912.08 g.

Average height of cut cylinder 7.1753"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-6A, 29.5'-31.5' | Lab ID: 566B
Visual Description: Silt (ML), dark gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 30.3' - 30.8'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

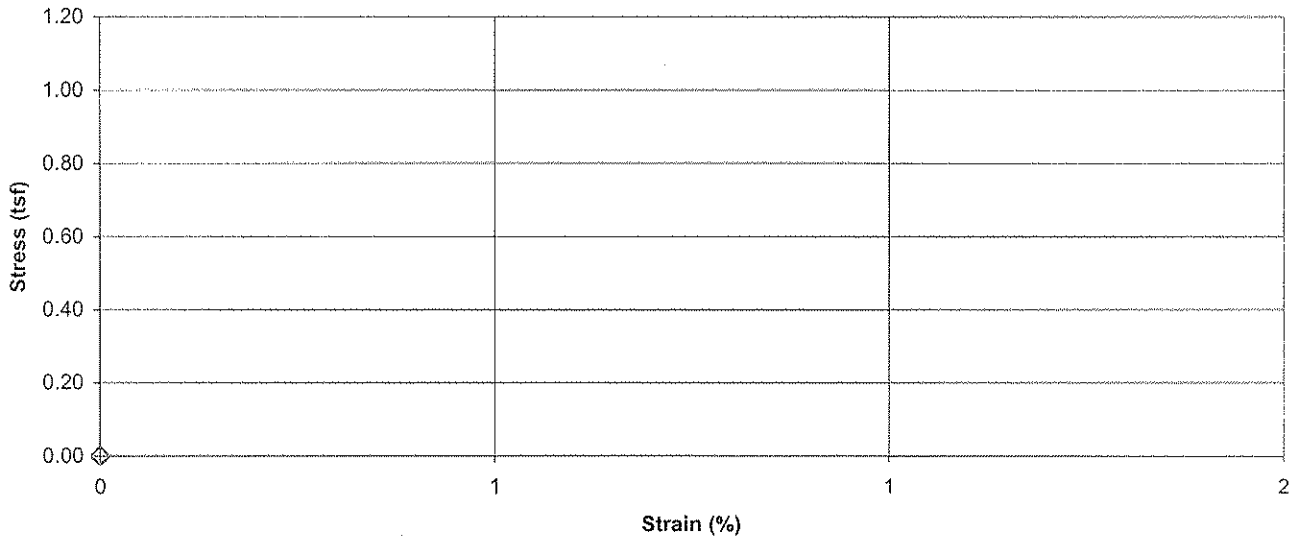
Date Extruded: 03/04/2009
Date Tested: N/A

Initial Wet Density (pcf)	121.7
Initial Dry Density (pcf)	100.8
Initial Moisture Content, 40°C (%)	20.8
Initial Moisture Content, 200°C (%)	39.9
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.851
Average Diameter (in)	2.925
Height to Diameter Ratio	2.0

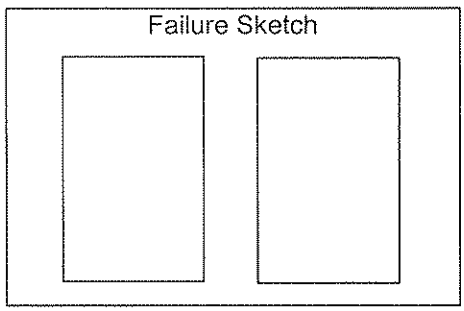
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Unit Weight determined using 40° C mc
Weight of cylinder and material 1974.16 g.
Average height of cut cylinder 7.1907"

Reviewed By:

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

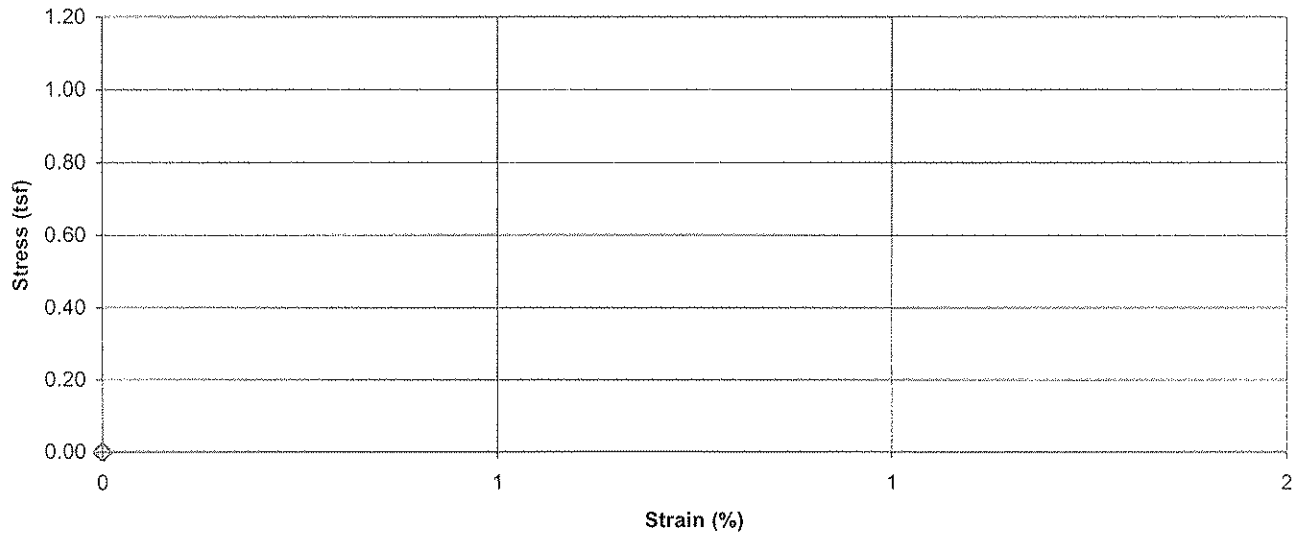
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-6A, 29.5'-31.5' | Lab ID: 566C
Visual Description: Silt (ML), gray to dark gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 30.9' - 31.4'

Specimen Type: Undisturbed

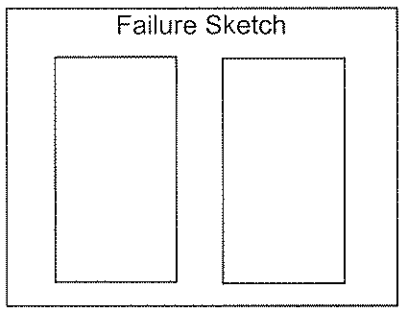
LL	N/A		
PL	N/A	Date Extruded	03/01/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	115.8		
Initial Dry Density (pcf)	96.7		
Initial Moisture Content (%)	19.8	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.038	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.881	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.
Weight of cylinder and material - 1987.15 g.
Average height of cut cylinder - 7.2357"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

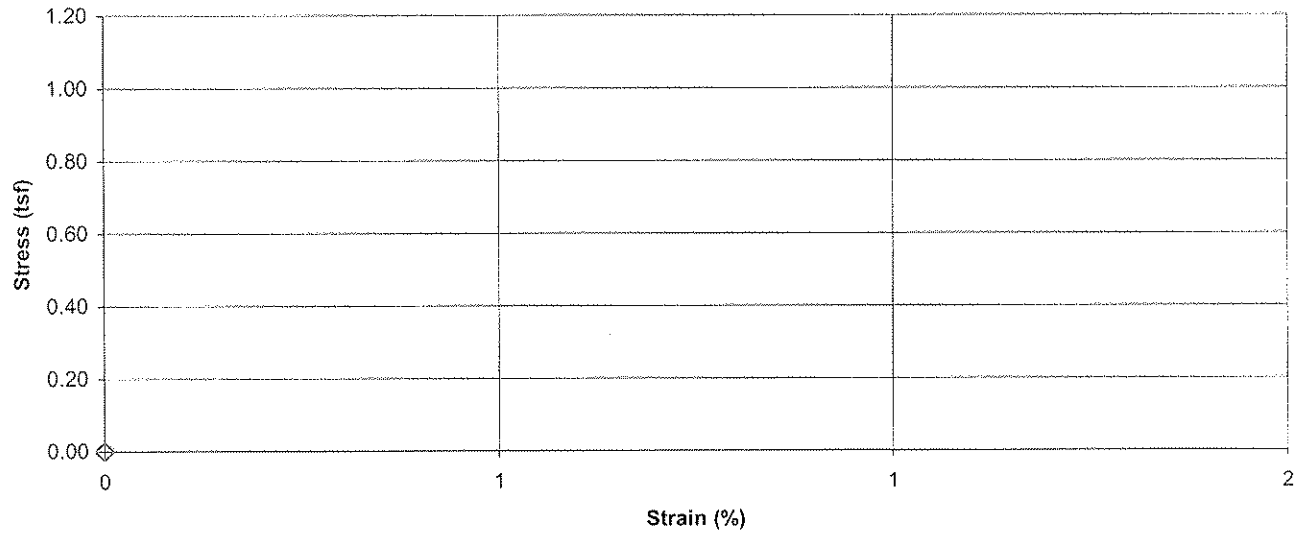
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-7A, 3.0'-5.0' | Lab ID: 567A
Visual Description: Lean Clay with Sand (CL), gray, moist, firm, pockets of shale, coal, and sandstone | Recovered: 0.6'
Test Interval: 3.3' - 3.8'

Specimen Type: Undisturbed

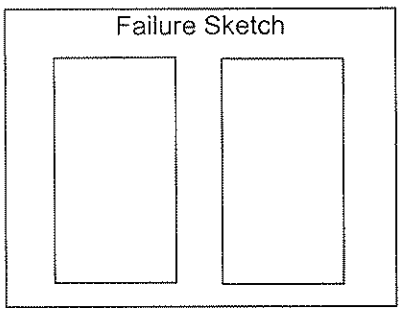
LL	N/A		
PL	N/A	Date Extruded	03/03/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	130.5		
Initial Dry Density (pcf)	113.3		
Initial Moisture Content (%)	15.1	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.087	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.887	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.
Weight of cylinder and material - 2049.30 g.
Average height of cylinder - 7.0870"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-7A, 3.0'-5.0' | Lab ID: 567B
Visual Description: Lean Clay with Sand (CL), gray, moist, firm, sandstone, shale, and coal fragments
Recovered: 0.6'
Test Interval: 4.0' - 4.5'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

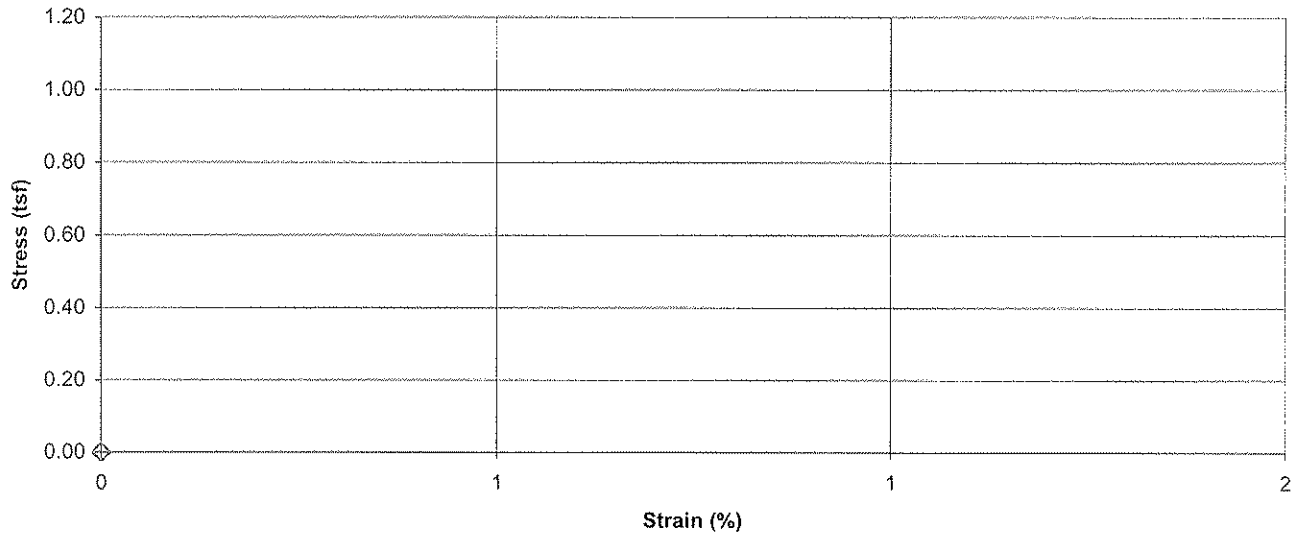
Date Extruded: 03/03/2009
Date Tested: N/A

Initial Wet Density (pcf)	130.0
Initial Dry Density (pcf)	115.6
Initial Moisture Content (%)	12.4
At Test Moisture Content (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.091
Average Diameter (in)	2.891
Height to Diameter Ratio	2.1

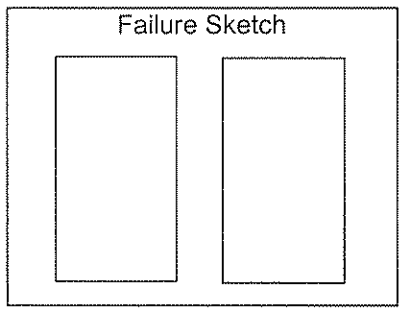
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

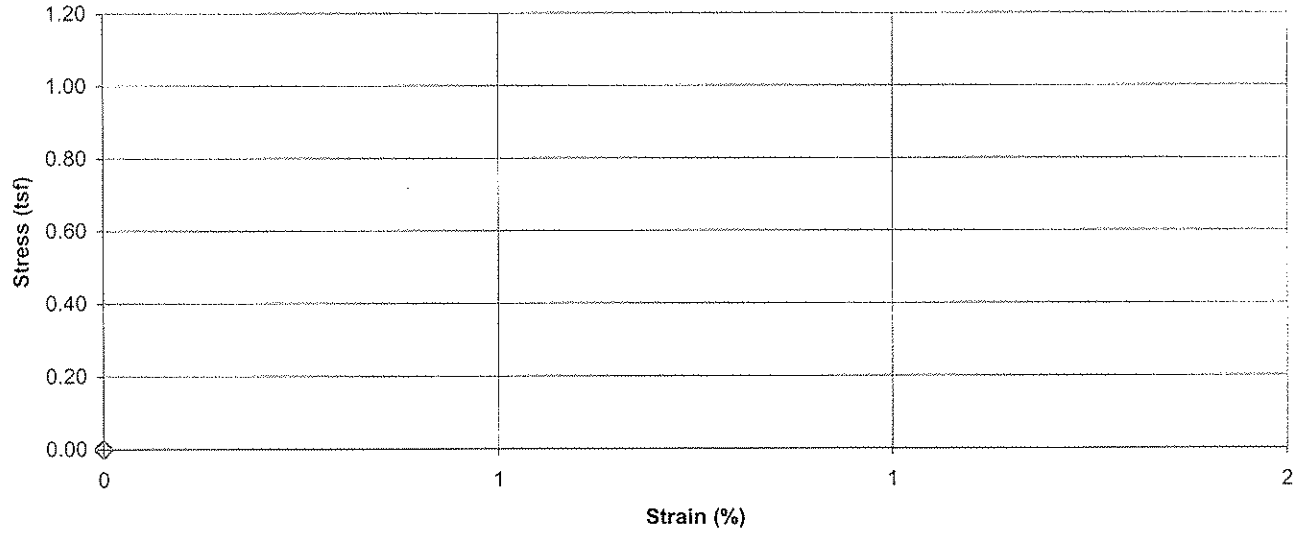
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 4.5'-6.5' | Lab ID: 568A
Visual Description: Sandy Lean Clay (CL), gray to dark gray, moist, firm, layers of gypsum, coal fragments, and sandstone | Recovered: 0.6' | Test Interval: 4.7' - 5.2'

Specimen Type: Undisturbed

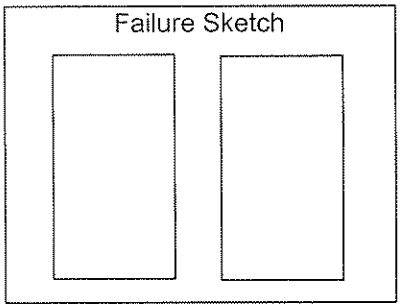
LL	N/A		
PL	N/A	Date Extruded	03/03/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	105.4		
Initial Dry Density (pcf)	92.0		
Initial Moisture Content (%)	14.6	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.072	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.886	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.
Weight of cylinder and material - 1919.08g.
Average height of cylinder - 7.1305"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name TVA Facilities Assessment - PAF Phase 2 Project Number 171468118

Source B-8A, 4.5'-6.5' Lab ID 568B

Visual Description Silt (ML), gray to dark gray, moist, soft, gypsum with layers of weathered shale and coal fragments

Recovered 0.6'

Test Interval 5.3' - 5.8'

Specimen Type: Undisturbed

LL N/A

PL N/A

PI N/A

Date Extruded 03/03/2009

Date Tested N/A

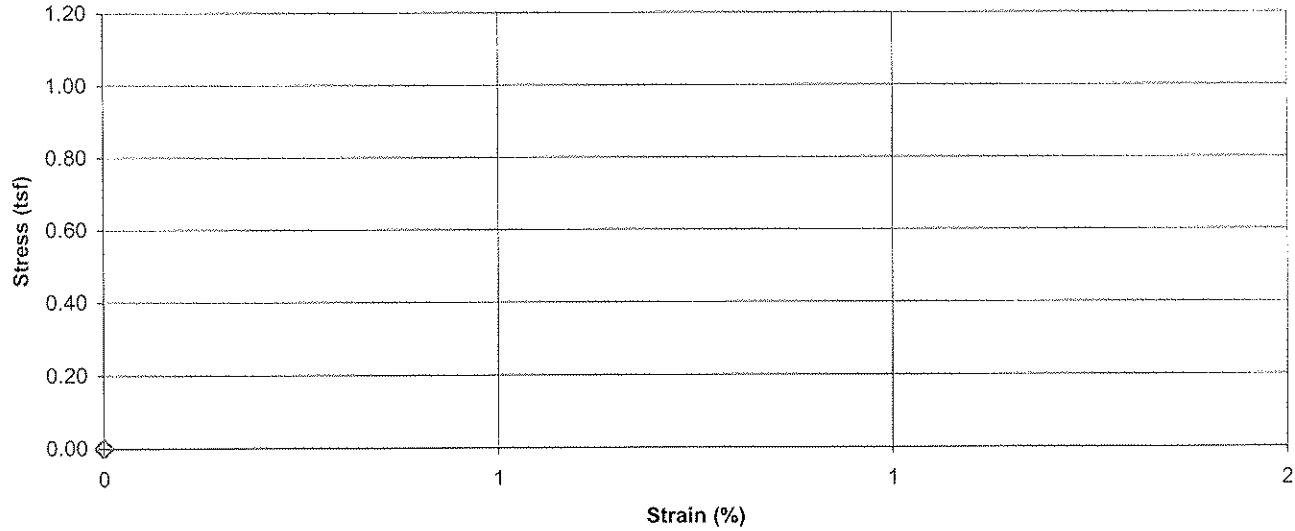
Initial Wet Density (pcf)	102.7
Initial Dry Density (pcf)	91.8
Initial Moisture Content (%)	12.0
At Test Moisture Content (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.120
Average Diameter (in)	2.869
Height to Diameter Ratio	2.1

Initial MC Taken Before Test, From Trimmings

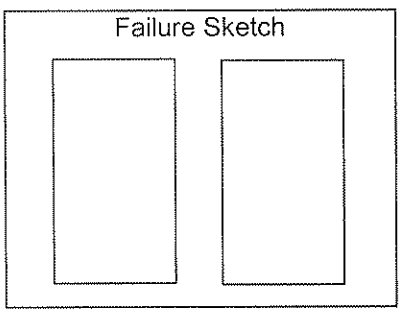
At Test MC Taken N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A

Torvane Reading (kg/cm^2) N/A

Comments Dried at 40° C.

Weight of cylinder and material - 1841.23g.

Average height of cylinder - 7.2325"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

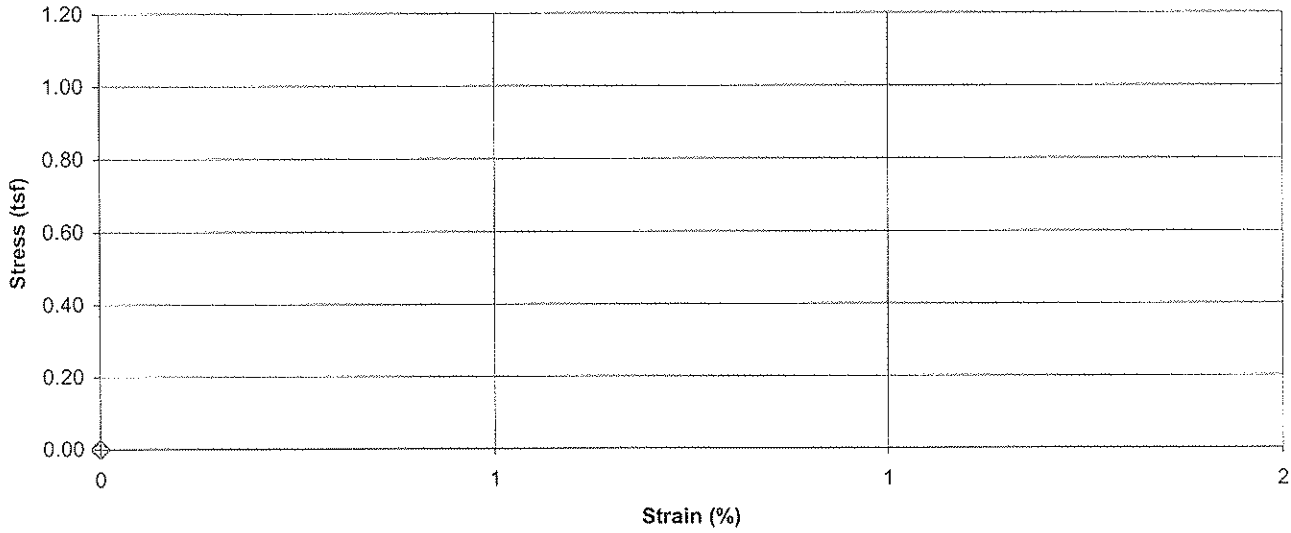
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 9.5'-11.5' | Lab ID: 569A
Visual Description: Silt (ML), gray to light gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 9.7' - 10.2'

Specimen Type: Undisturbed

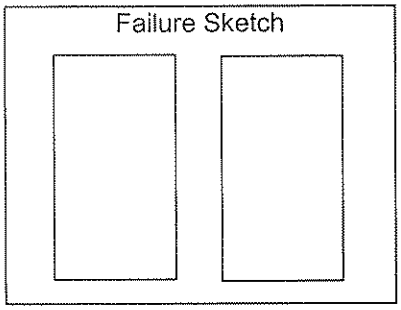
LL	N/A		
PL	N/A	Date Extruded	03/03/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	111.5		
Initial Dry Density (pcf)	93.2		
Initial Moisture Content (%)	19.7	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.099	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.854	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.
Weight of cylinder and material - 1748.28g.
Average height of cylinder - 6.5600"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

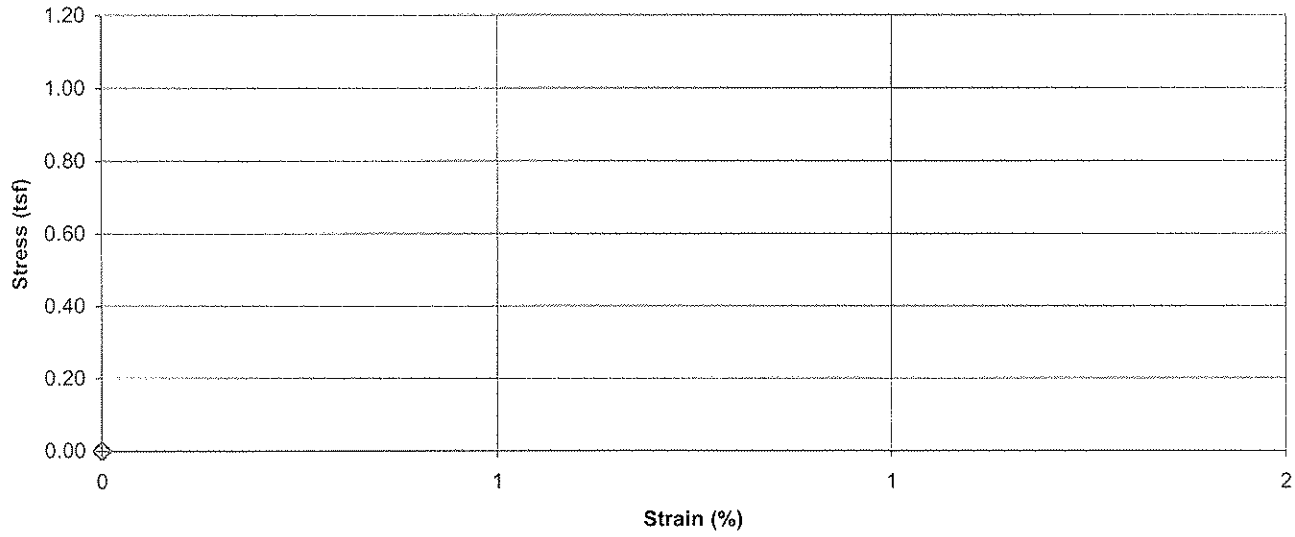
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 9.5'-11.5' | Lab ID: 569B
Visual Description: Silt (ML), gray to light gray, moist, soft,fyl ash with pockets of gypsum
Recovered: 0.6'
Test Interval: 10.3' - 10.8'

Specimen Type: Undisturbed

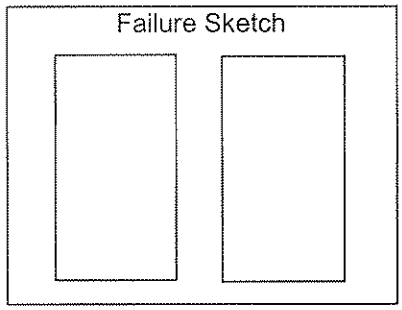
LL	N/A		
PL	N/A	Date Extruded	03/03/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	111.9		
Initial Dry Density (pcf)	90.4		
Initial Moisture Content (%)	23.8	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.157	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.854	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.2	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.
Weight of cylinder and material - 1887.84 g.
Average height of cylinder - 7.0680"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

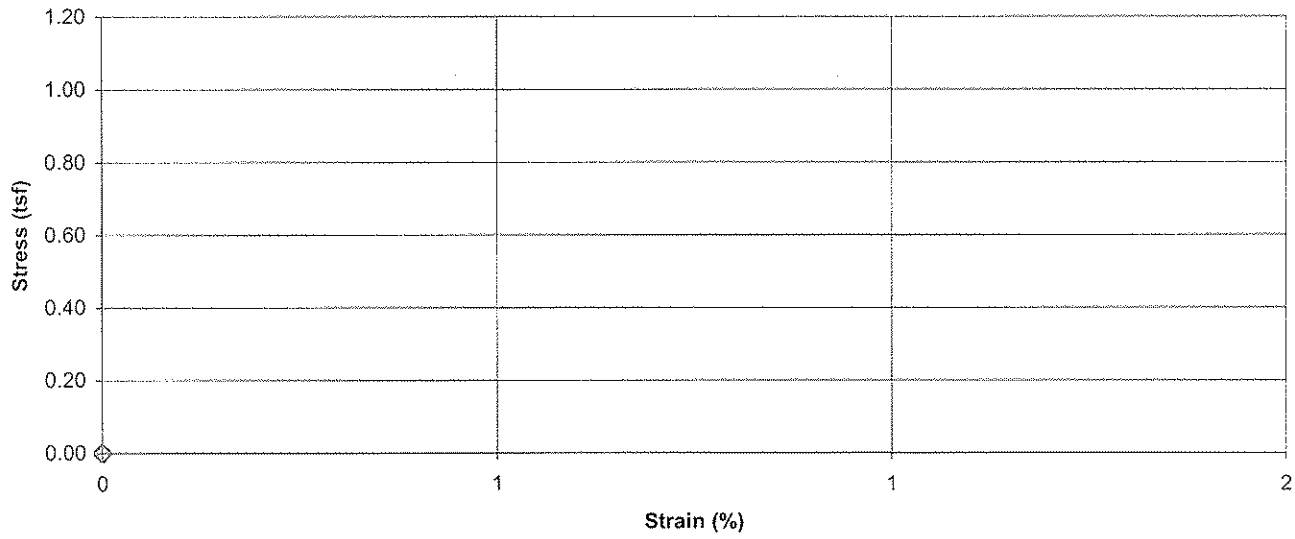
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 9.5'-11.5' | Lab ID: 569C
Visual Description: Silt (ML), gray to dark gray, moist, soft, fly ash with pockets of gypsum
Recovered: 0.6'
Test Interval: 11.0' - 11.5'

Specimen Type: Undisturbed

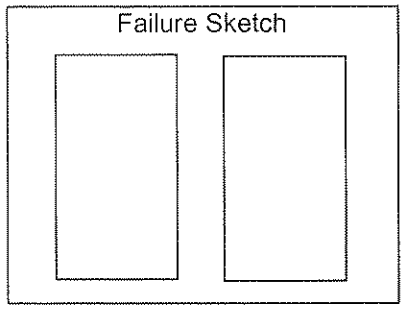
LL	N/A		
PL	N/A	Date Extruded	03/03/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	113.5		
Initial Dry Density (pcf)	91.2		
Initial Moisture Content (%)	24.4	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.112	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.880	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.
Weight of cylinder and material - 1916.35 g.
Average height of cylinder - 7.0685"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

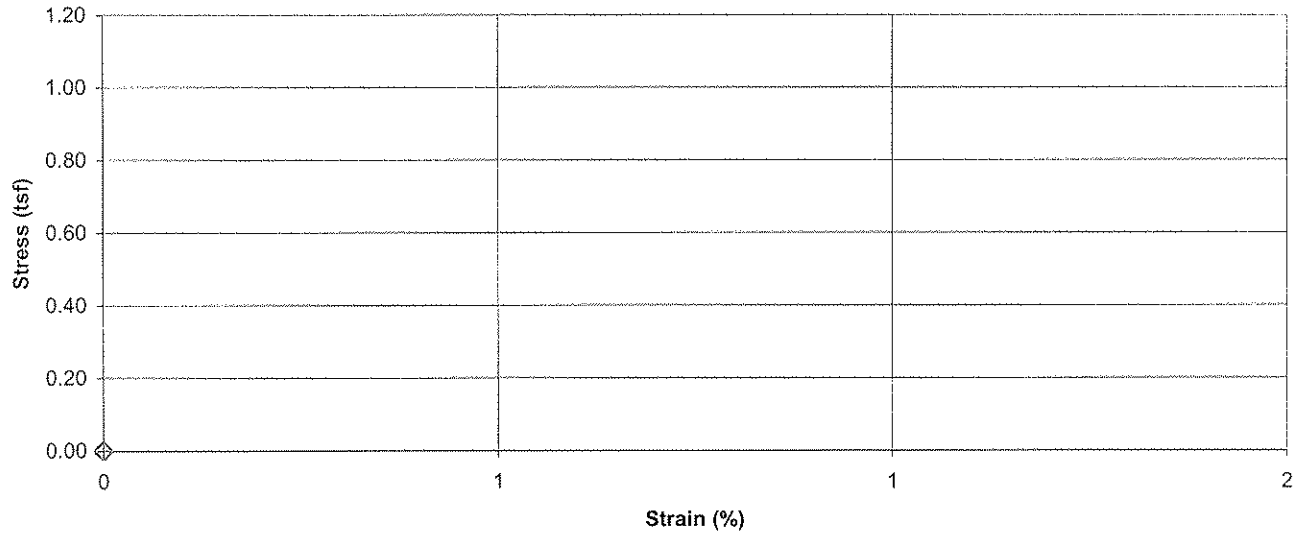
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 14.5'-16.5' | Lab ID: 570A
Visual Description: Silt (ML), gray to dark gray, moist, soft,fly ash with pockets of gypsum and coal
Recovered: 0.6'
Test Interval: 14.5' - 15.0'

Specimen Type: Undisturbed

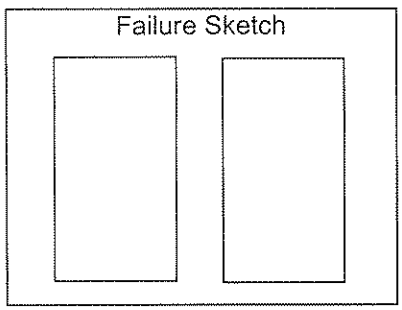
LL	N/A		
PL	N/A	Date Extruded	03/03/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	112.2		
Initial Dry Density (pcf)	93.5		
Initial Moisture Content (%)	19.9	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.104	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.808	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.2	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.
Weight of cylinder and material - 1843.87 g.
Average height of cylinder - 7.1535"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118

Source: B-8A, 14.5'-16.5' | Lab ID: 570B

Visual Description: Silt (ML), gray to dark gray, moist, firm,fly ash with pockets of gypsum

Recovered: 0.6'

Test Interval: 15.1' - 15.6'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/03/2009

Date Tested: N/A

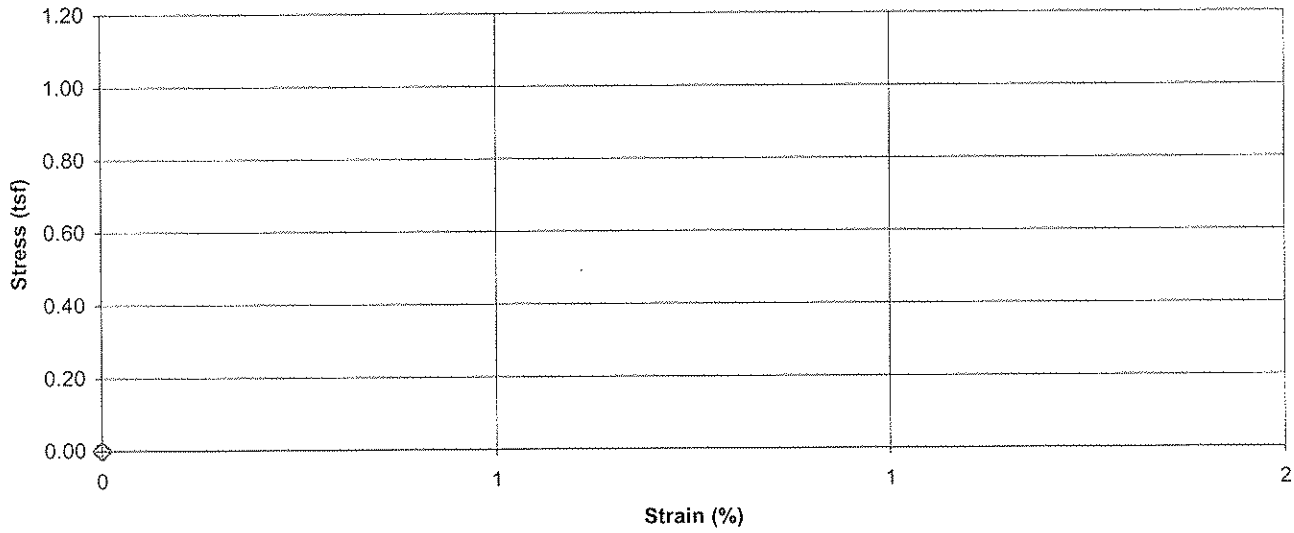
Initial Wet Density (pcf)	116.5
Initial Dry Density (pcf)	95.9
Initial Moisture Content (%)	21.5
At Test Moisture Content (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.066
Average Diameter (in)	2.829
Height to Diameter Ratio	2.1

Initial MC Taken: Before Test, From Trimmings

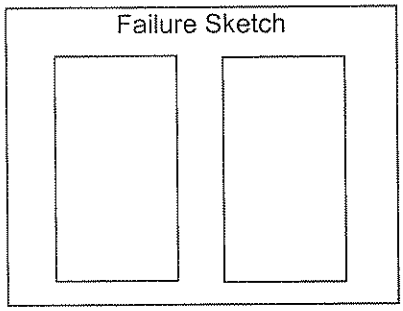
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A

Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.

Weight of cylinder and material - 1920.22 g.

Average height of cut cylinder - 7.1680"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

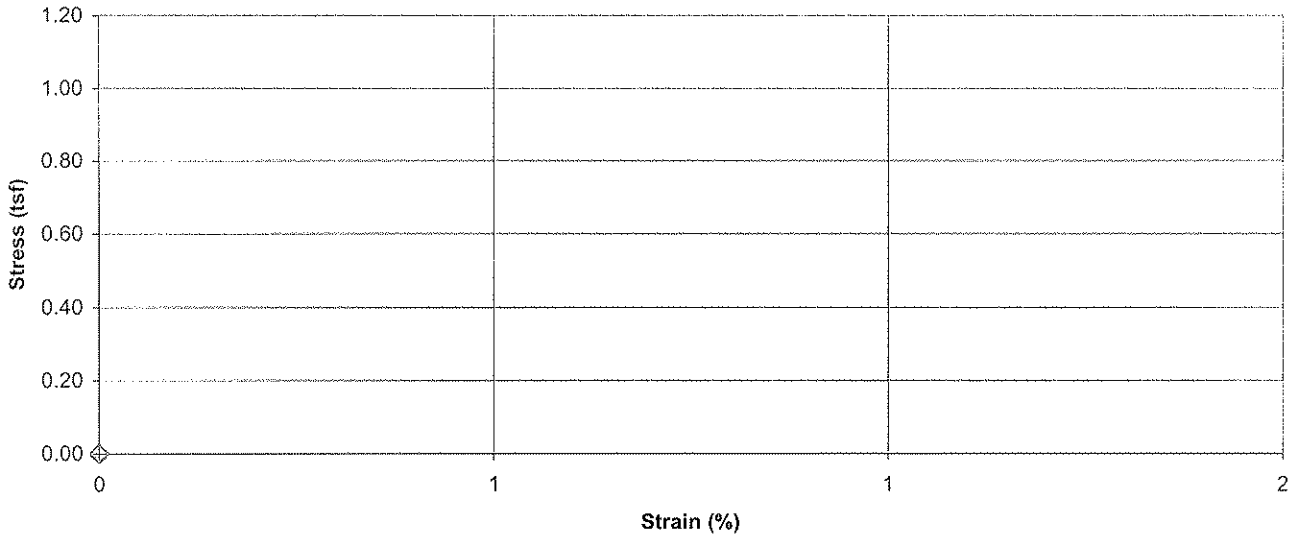
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 19.5'-21.5' | Lab ID: 571A
Visual Description: Silt (ML), gray, moist, soft, fly ash, rock throughout sample
Recovered: 0.5'
Test Interval: 19.5' - 20.0'

Specimen Type: Undisturbed

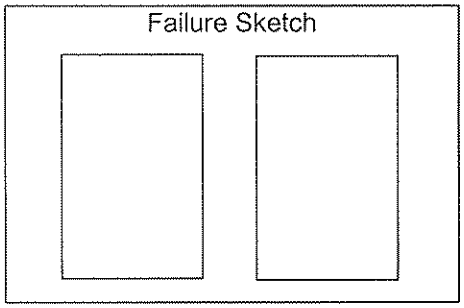
LL	N/A		
PL	N/A	Date Extruded	03/04/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	115.0		
Initial Dry Density (pcf)	97.5		
Initial Moisture Content, 40°C (%)	18.0	Initial MC Taken	Before Test, From Trimmings
Initial Moisture Content, 200°C (%)	29.2		
At Test Moisture Content, 40°C (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.453	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.859	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	1.9	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dru unit weight determined using 40° C mc
Weight of cylinder and material 1529.60 g.
Average height of cut cylinder 5.839"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 19.5'-21.5' | Lab ID: 571B
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 20.0' - 20.5'

Specimen Type: Undisturbed

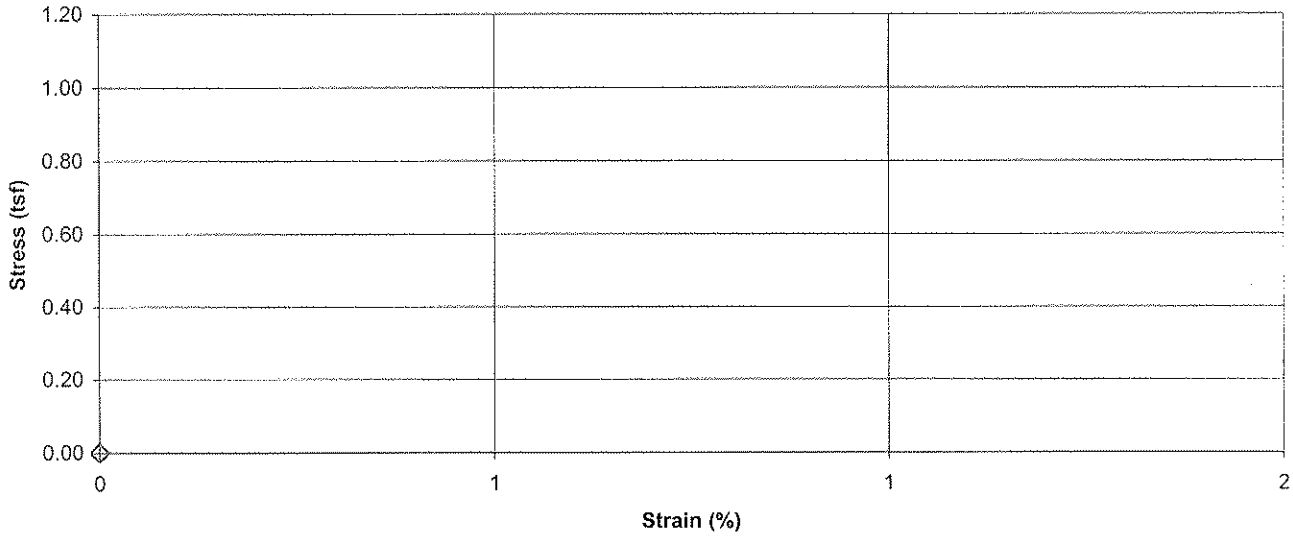
LL	N/A
PL	N/A
PI	N/A
Date Extruded	03/03/2009
Date Tested	N/A

Initial Wet Density (pcf)	115.2
Initial Dry Density (pcf)	95.3
Initial Moisture Content, 40°C (%)	20.9
Initial Moisture Content, 200°C (%)	36.8
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.987
Average Diameter (in)	2.845
Height to Diameter Ratio	2.1

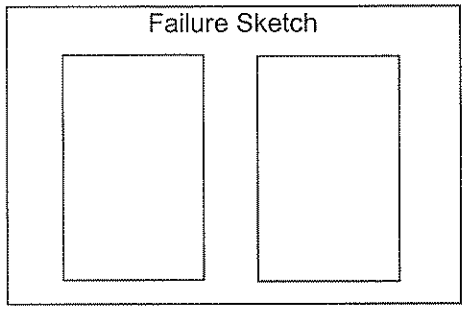
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined by 40° C mc
Weightof cylinder and material 1842.67
Average height of cut cylinder 6.976"

Reviewed By:

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2
Project Number: 171468118
Source: B-8A, 19.5'-21.5'
Lab ID: 571C
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 20.7' - 21.2'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/04/2009
Date Tested: N/A

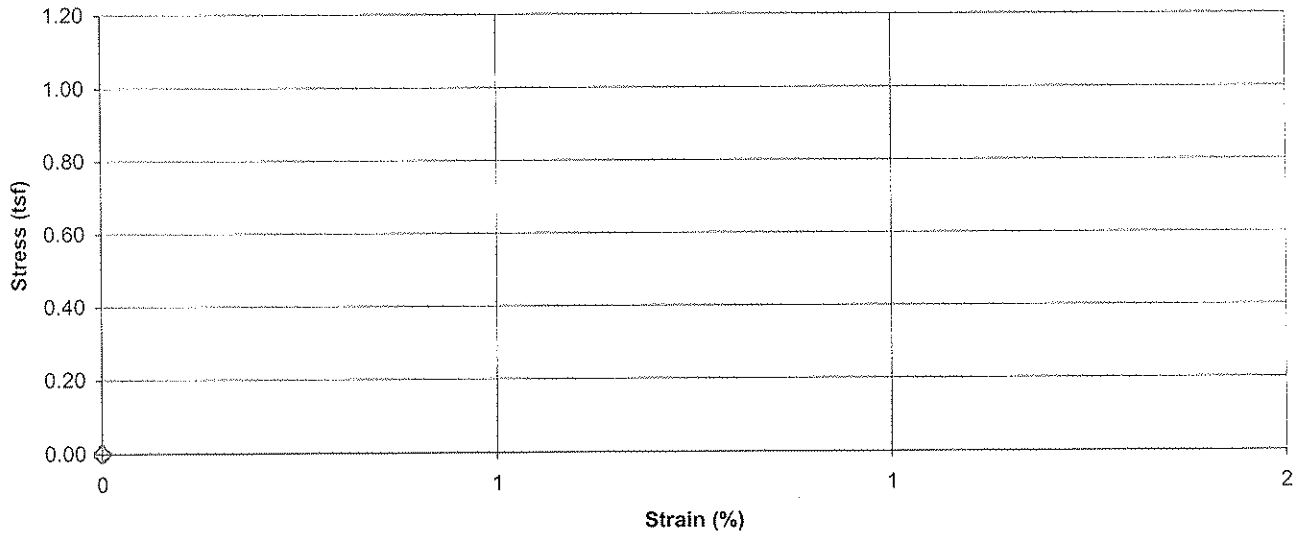
Initial Wet Density (pcf)	115.1
Initial Dry Density (pcf)	93.6
Initial Moisture Content, 40°C (%)	23.0
Initial Moisture Content, 200°C (%)	36.8
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.050
Average Diameter (in)	2.862
Height to Diameter Ratio	2.1

Initial MC Taken: Before Test, From Trimmings

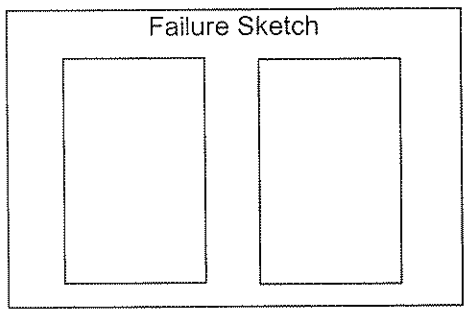
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1844.87 g.
Average height of cut cylinder 6.889"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 24.5'-26.5' | Lab ID: 572A
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 24.8' - 25.3'

Specimen Type: Undisturbed

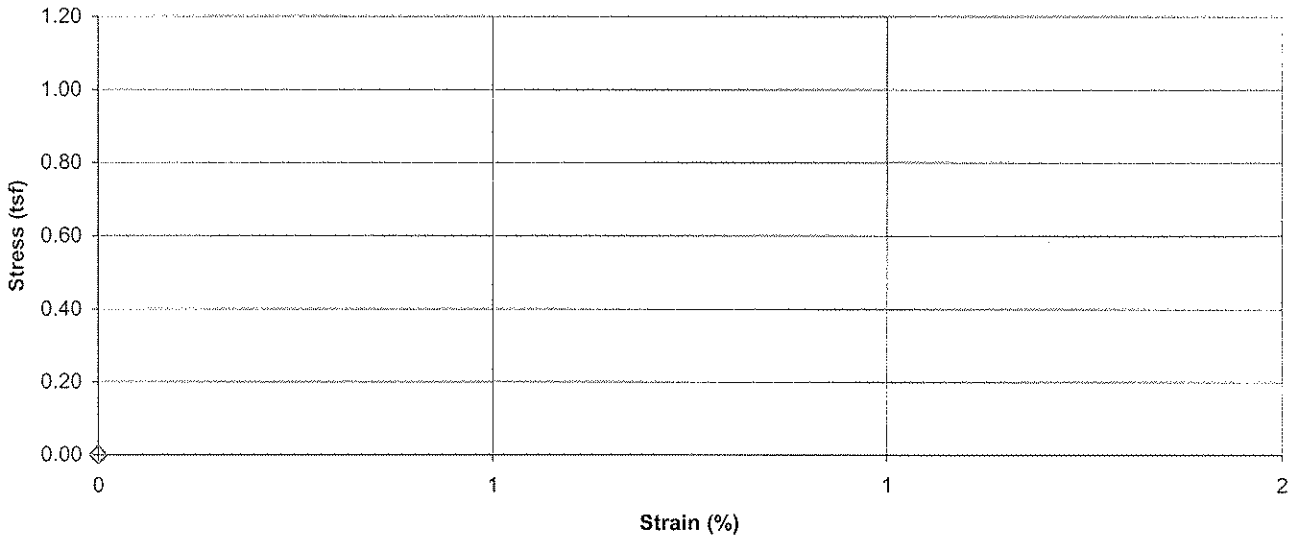
LL	N/A
PL	N/A
PI	N/A
Date Extruded	03/04/2009
Date Tested	N/A

Initial Wet Density (pcf)	118.4
Initial Dry Density (pcf)	98.4
Initial Moisture Content, 40°C (%)	20.3
Initial Moisture Content, 200°C (%)	32.8
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.069
Average Diameter (in)	2.883
Height to Diameter Ratio	2.1

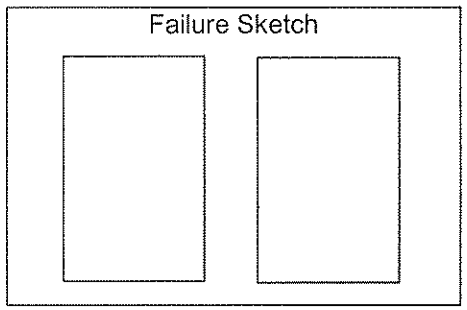
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weigh determined using 40° C mc
Weight of cylinder and material 1929.0 g
Average height of cut cylinder 7.182"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 24.5'-26.5' | Lab ID: 572B
Visual Description: Silt (ML), dark gray, moist, soft, pockets of coal, fly ash
Recovered: 0.6'
Test Interval: 25.4' - 25.9'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/04/2009
Date Tested: N/A

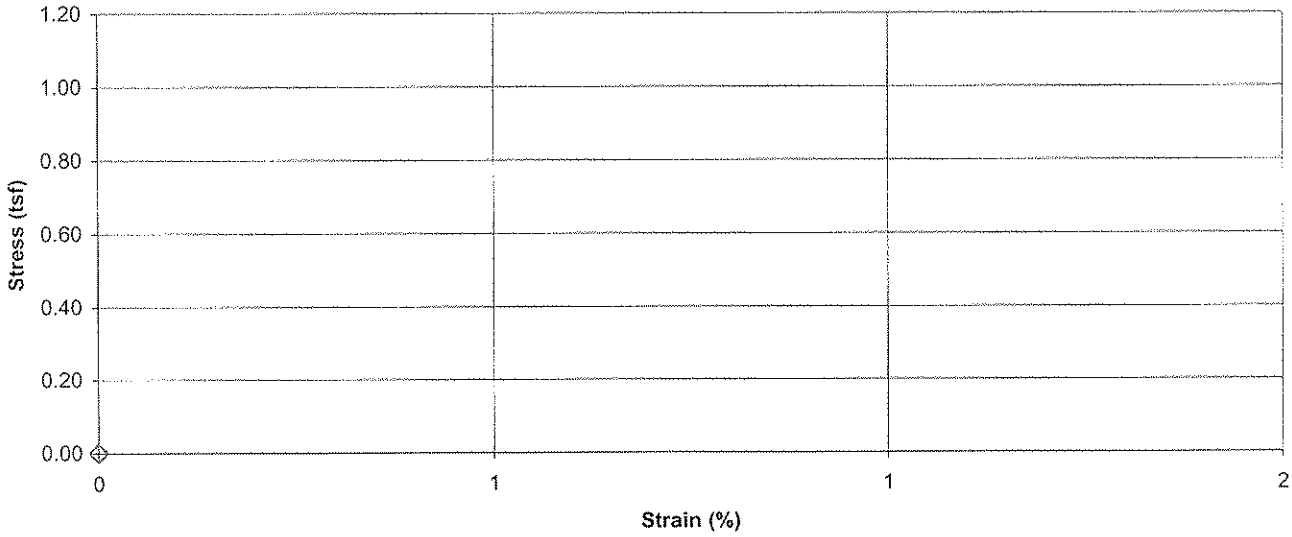
Initial Wet Density (pcf)	114.5
Initial Dry Density (pcf)	94.7
Initial Moisture Content, 40°C (%)	20.8
Initial Moisture Content, 200°C (%)	45.7
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.842
Average Diameter (in)	3.039
Height to Diameter Ratio	1.9

Initial MC Taken: Before Test, From Trimmings

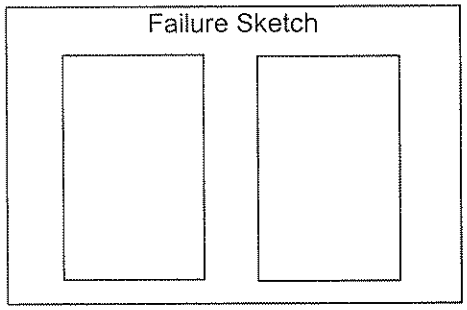
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Unit weight determined using 40° C mc
Weight of cylinder and material 1914.81 g.
Average height of cut cylinder 7.208"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 24.5'-26.5' | Lab ID: 572C
Visual Description: Silt (ML), gray to dark gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 26.0' - 26.5'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

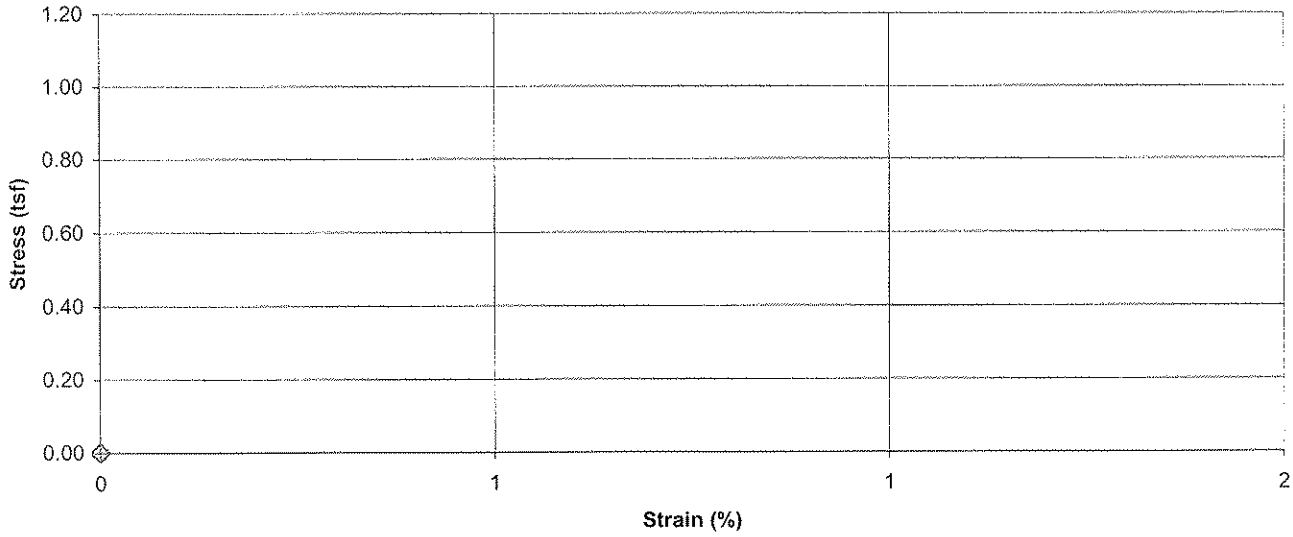
Date Extruded: 03/04/2009
Date Tested: N/A

Initial Wet Density (pcf)	113.7
Initial Dry Density (pcf)	90.9
Initial Moisture Content, 40°C (%)	25.1
Initial Moisture Content, 200°C (%)	51.5
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.095
Average Diameter (in)	2.867
Height to Diameter Ratio	2.1

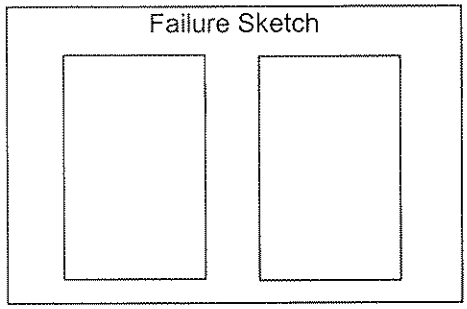
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1858.5 g
Average height of cut cylinder 6.952"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: Tva Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 29.5'-31.5' | Lab ID: 573A
Visual Description: Silt (ML), dark gray, moist soft, fly ash
Recovered: 0.6'
Test Interval: 29.8' - 30.3'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

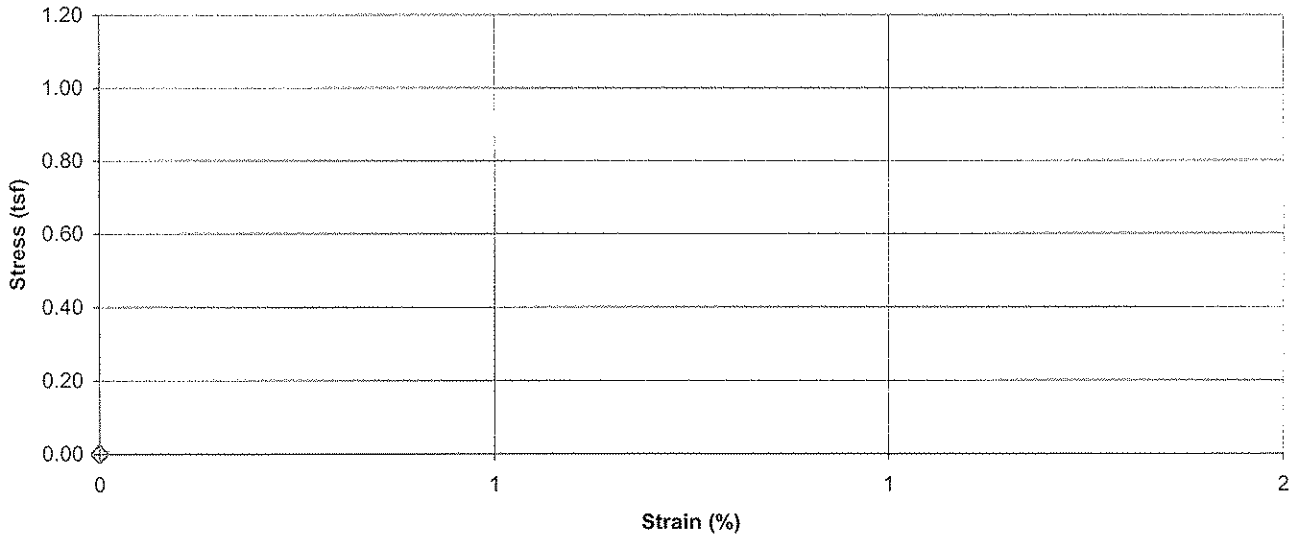
Date Extruded: 03/04/2009
Date Tested: N/A

Initial Wet Density (pcf)	114.6
Initial Dry Density (pcf)	95.2
Initial Moisture Content, 40°C (%)	20.4
Initial Moisture Content, 200°C (%)	43.4
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.669
Average Diameter (in)	2.922
Height to Diameter Ratio	1.9

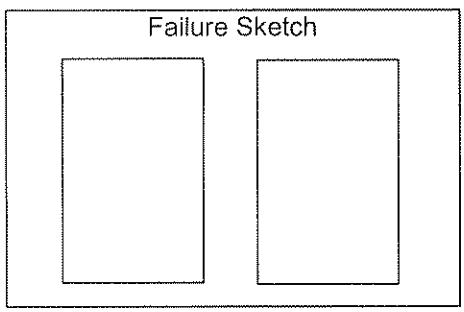
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1743.18 g
Average height of cut cylinder 7.017"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 29.5'-31.5' | Lab ID: 573B
Visual Description: Silt (ML), dark gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 30.4' - 30.9'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/04/2009
Date Tested: N/A

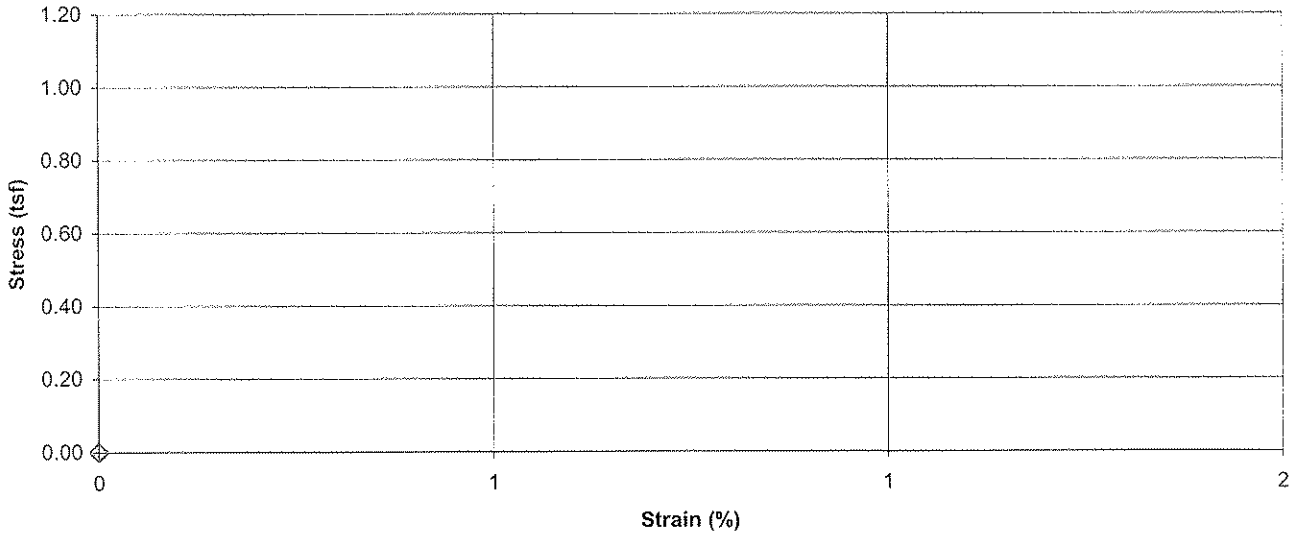
Initial Wet Density (pcf)	119.0
Initial Dry Density (pcf)	98.7
Initial Moisture Content, 40°C (%)	20.5
Initial Moisture Content, 200°C (%)	31.9
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.966
Average Diameter (in)	2.875
Height to Diameter Ratio	2.1

Initial MC Taken: Before Test, From Trimmings

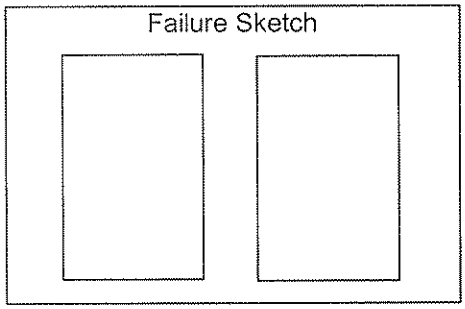
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weigh determined using 40° C mc
Weight of cylinder and material 1860.95 g
Average height of cut cylinder 7.115"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 29.5'-31.5' | Lab ID: 573C
Visual Description: Silt (ML), gray to dark gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 31.0' - 31.5'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/04/2009
Date Tested: N/A

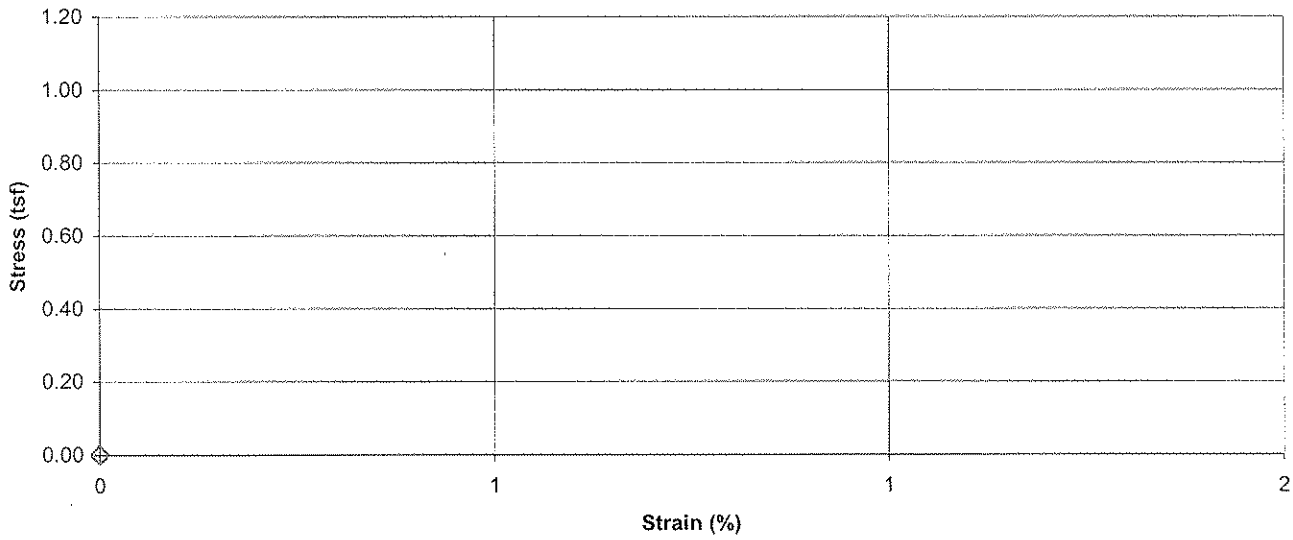
Initial Wet Density (pcf)	120.5
Initial Dry Density (pcf)	100.4
Initial Moisture Content, 40°C (%)	20.0
Initial Moisture Content, 200°C (%)	28.3
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.189
Average Diameter (in)	2.853
Height to Diameter Ratio	2.2

Initial MC Taken: Before Test, From Trimmings

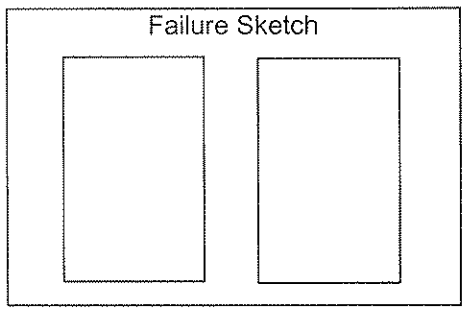
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1984.18 g
Average height of cut cylinder 7.0973"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 34.5'-36.5' | Lab ID: 574A
Visual Description: Silt (ML), dark gray, moist, soft, fly ash
Recovered: 0.5'
Test Interval: 34.5' - 35.0'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/04/2009
Date Tested: N/A

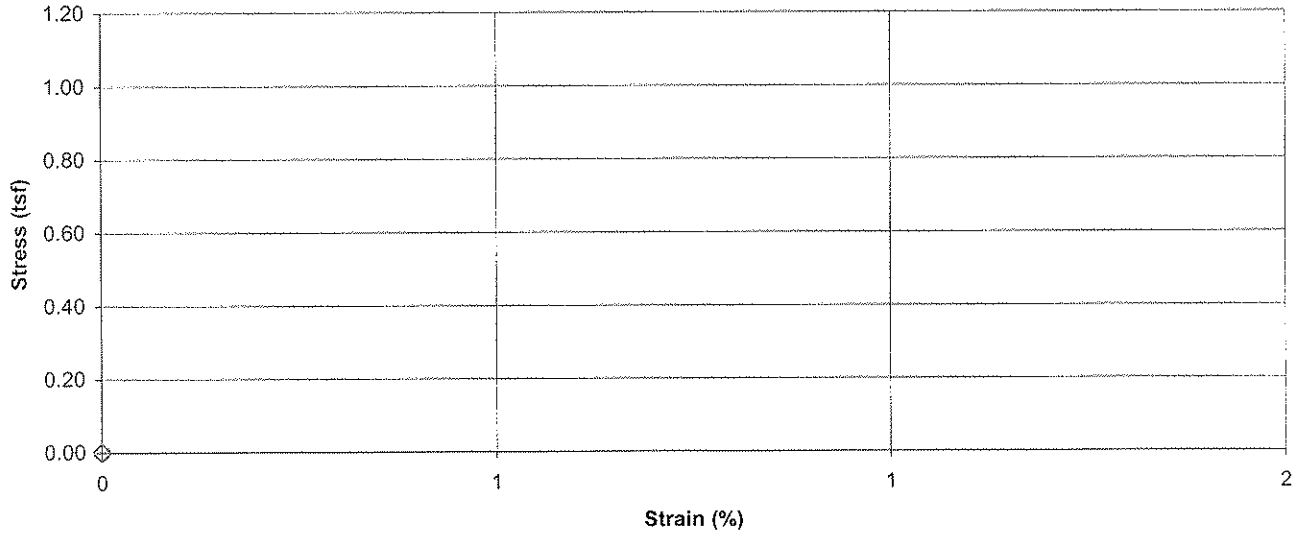
Initial Wet Density (pcf)	118.5
Initial Dry Density (pcf)	97.0
Initial Moisture Content, 40°C (%)	22.2
Initial Moisture Content, 200°C (%)	45.7
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.455
Average Diameter (in)	2.888
Height to Diameter Ratio	1.9

Initial MC Taken: Before Test, From Trimmings

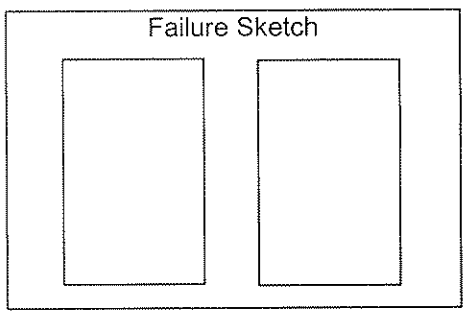
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1576.19 g.
Average height of cut cylinder 6.053"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 34.5'-36.5' | Lab ID: 574B
Visual Description: Silt (ML), dark gray, moist, soft, fly ash
Recovered: 0.5'
Test Interval: 35.0' - 35.5'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/04/2009
Date Tested: N/A

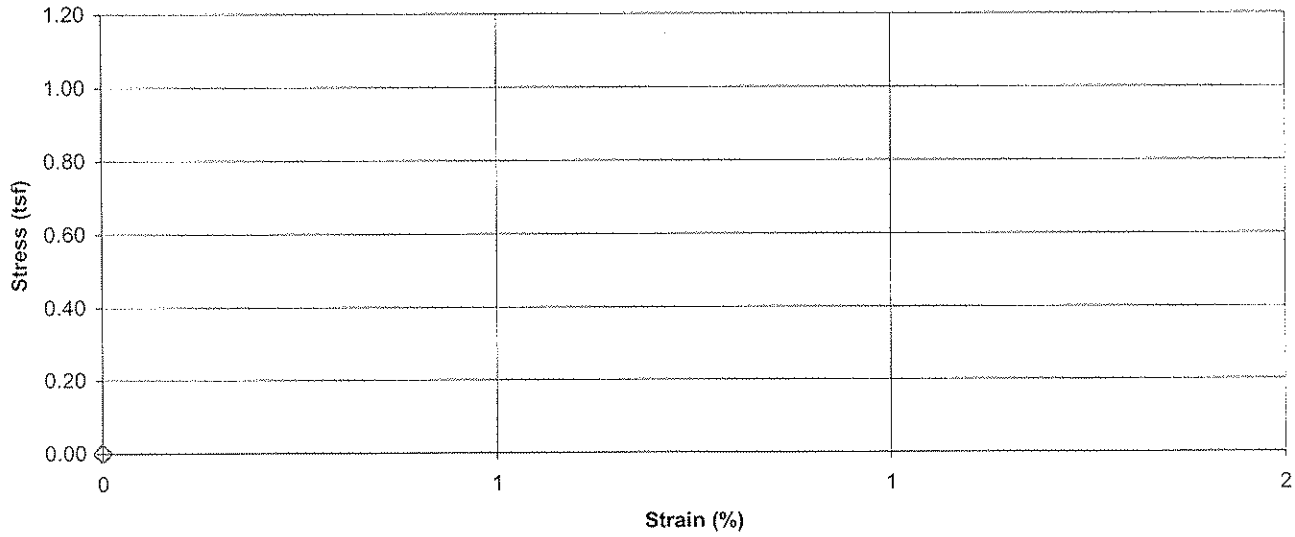
Initial Wet Density (pcf)	121.2
Initial Dry Density (pcf)	101.9
Initial Moisture Content, 40°C (%)	19.0
Initial Moisture Content, 200°C (%)	40.6
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.507
Average Diameter (in)	2.860
Height to Diameter Ratio	1.9

Initial MC Taken: Before Test, From Trimmings

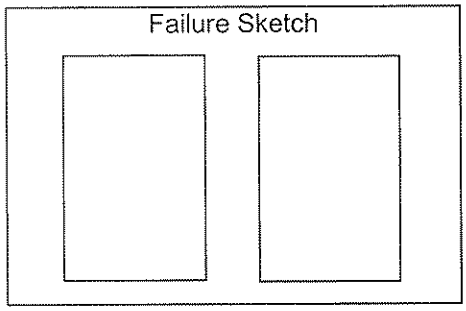
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1633.37 g
Average height of cut cylinder 5.935"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facililties Assessment - PAF Phase 2
Project Number: 171468118
Source: B-8A, 39.5'-41.5'
Lab ID: 575A
Visual Description: Silt (ML), dark gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 39.8' - 40.3'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/05/2009
Date Tested: N/A

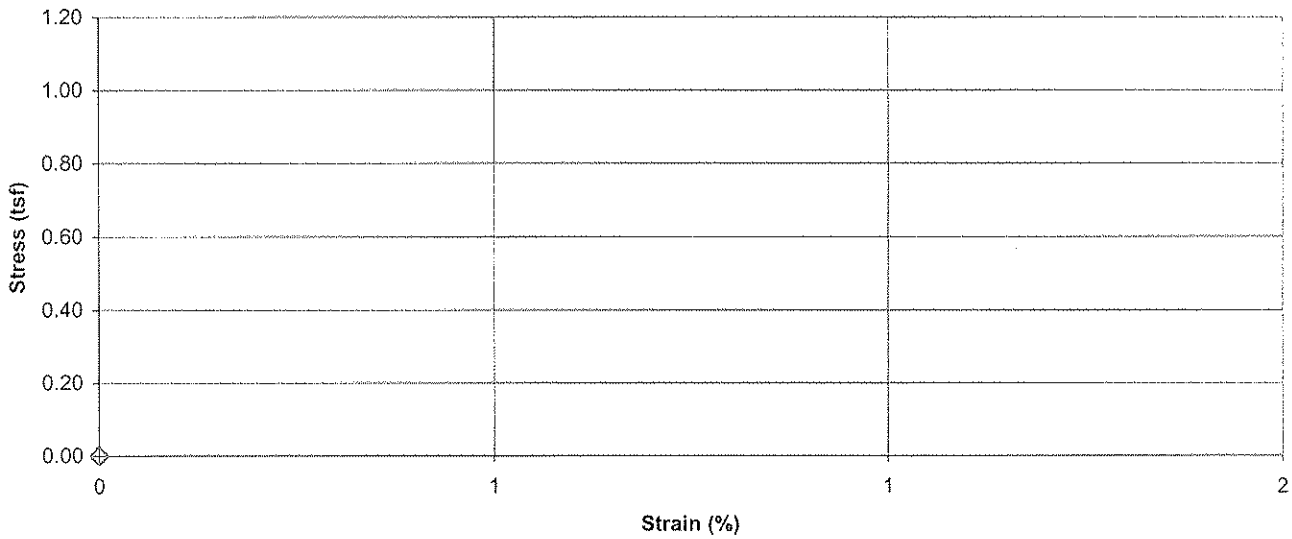
Initial Wet Density (pcf)	121.3
Initial Dry Density (pcf)	101.5
Initial Moisture Content, 40°C (%)	19.6
Initial Moisture Content, 200°C (%)	35.2
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.836
Average Diameter (in)	2.957
Height to Diameter Ratio	2.0

Initial MC Taken: Before Test, From Trimmings

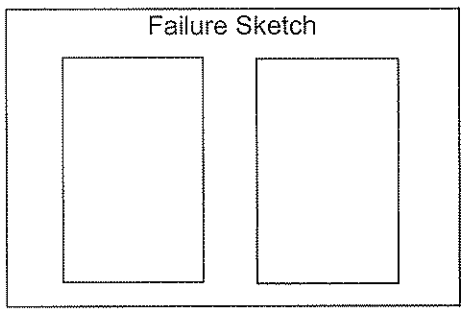
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1852.83 g
Average height of cut cylinder 7.178"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: Tva Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 39.5'-41.5' | Lab ID: 575B
Visual Description: Silt (ML), light gray to dark gray, moist, firm, fly ash
Recovered: 0.6'
Test Interval: 40.3' - 40.8'

Specimen Type: Undisturbed

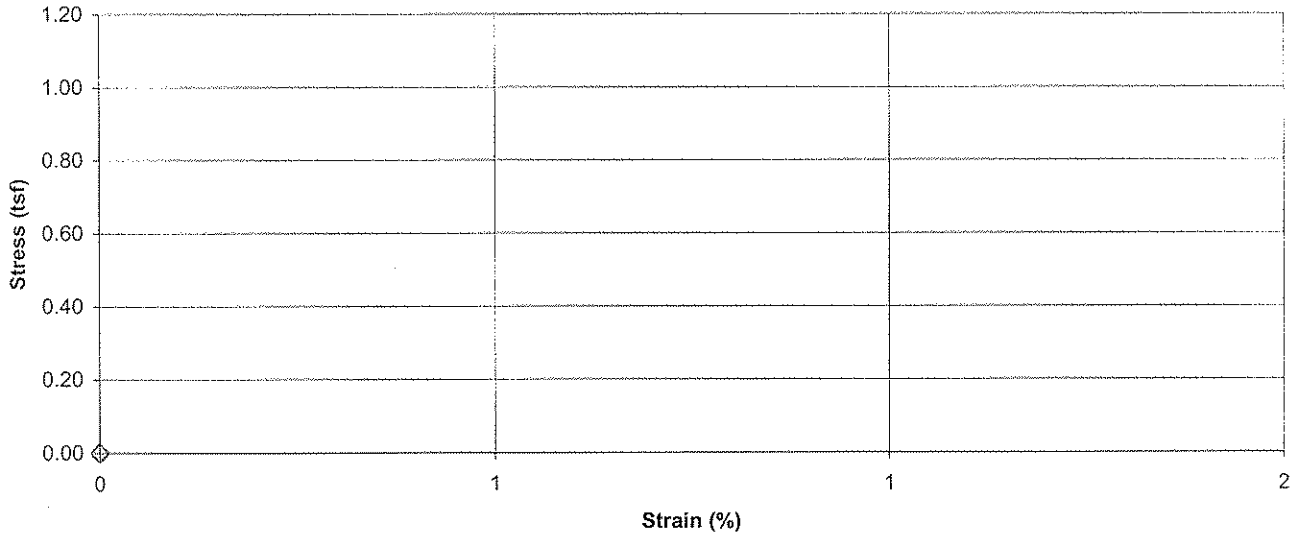
LL	N/A		
PL	N/A	Date Extruded	03/05/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	120.0
Initial Dry Density (pcf)	100.5
Initial Moisture Content, 40°C (%)	19.4
Initial Moisture Content, 200°C (%)	39.2
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.050
Average Diameter (in)	2.855
Height to Diameter Ratio	2.1

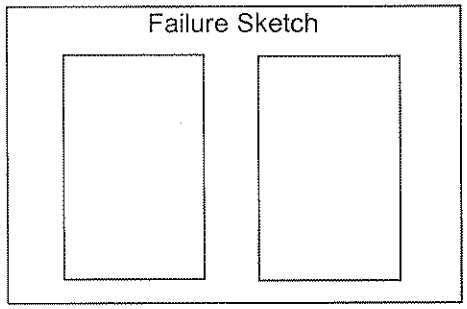
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1960.86g
Average height of cut cylinder 7.1675"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

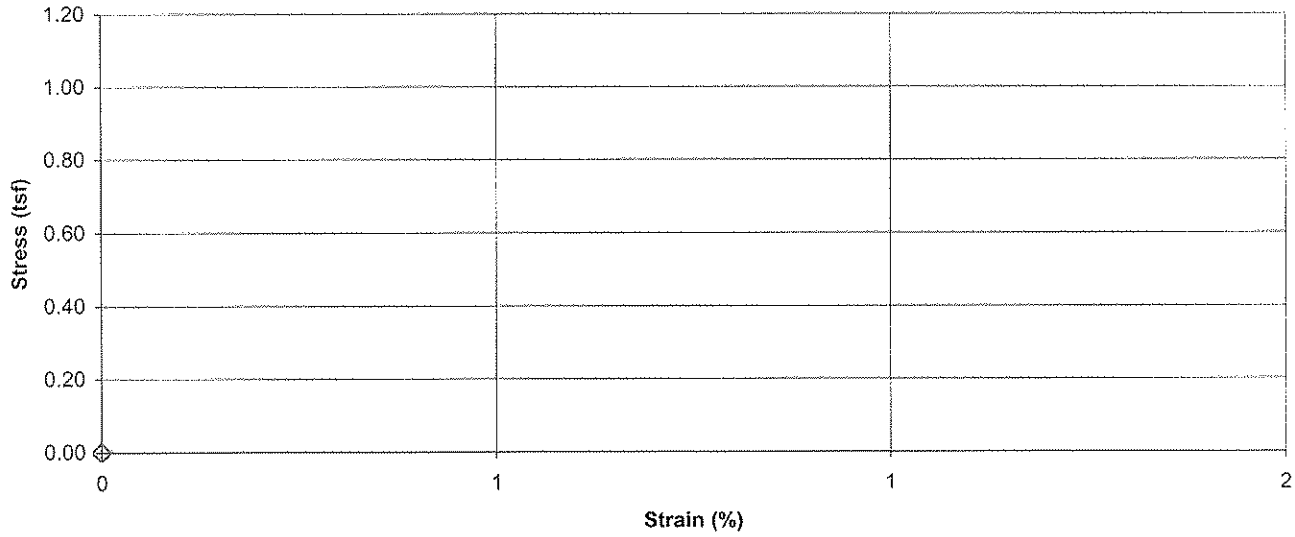
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 39.5'-41.5' | Lab ID: 575C
Visual Description: Silt (ML), gray to dark gray, moist, firm, fly ash with pockets of gypsum
Recovered: 0.6'
Test Interval: 40.9' - 41.4'

Specimen Type: Undisturbed

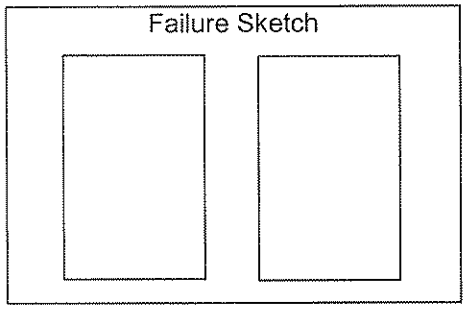
LL	N/A		
PL	N/A	Date Extruded	03/03/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	116.3		
Initial Dry Density (pcf)	98.1		
Initial Moisture Content, 40°C (%)	18.5	Initial MC Taken	Before Test, From Trimmings
Initial Moisture Content, 200°C (%)	40.6		
At Test Moisture Content, 40°C (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.019	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.873	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1950.03 g
Average height of cut cylinder 7.1795"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 44.5'-46.5' | Lab ID: 576A
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 44.8' - 45.3'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

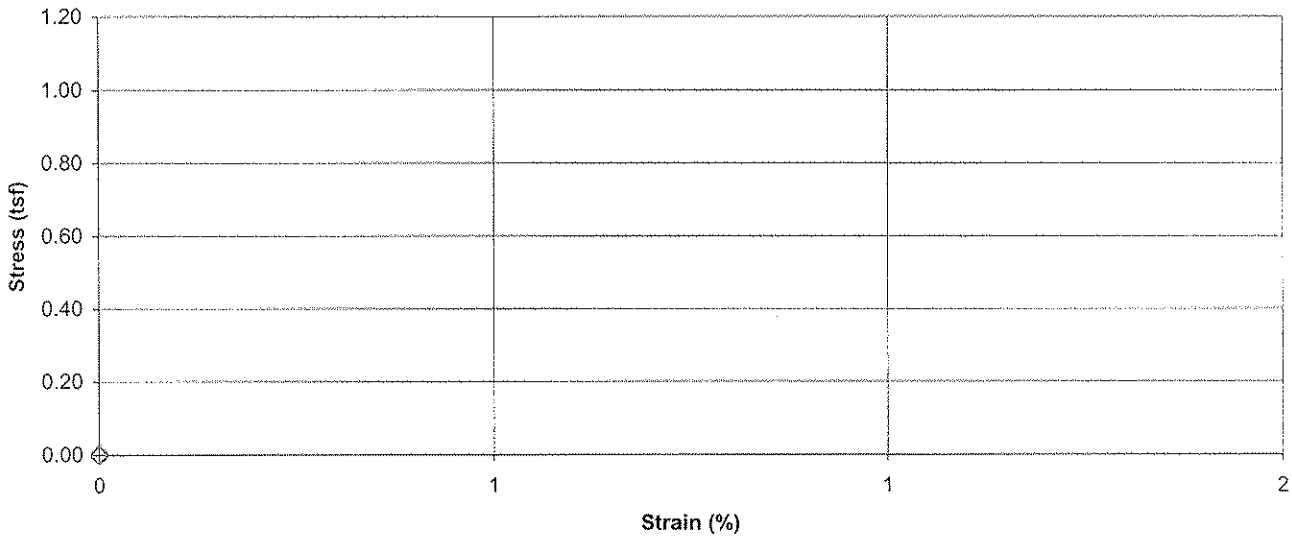
Date Extruded: 03/05/2009
Date Tested: N/A

Initial Wet Density (pcf)	118.1
Initial Dry Density (pcf)	97.6
Initial Moisture Content, 40°C (%)	21.0
Initial Moisture Content, 200°C (%)	42.3
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.063
Average Diameter (in)	2.928
Height to Diameter Ratio	2.1

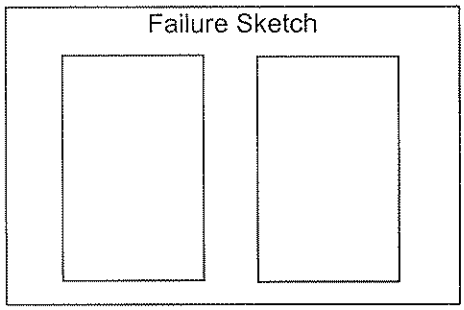
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1910.18
Average height of cut cylinder 7.206"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

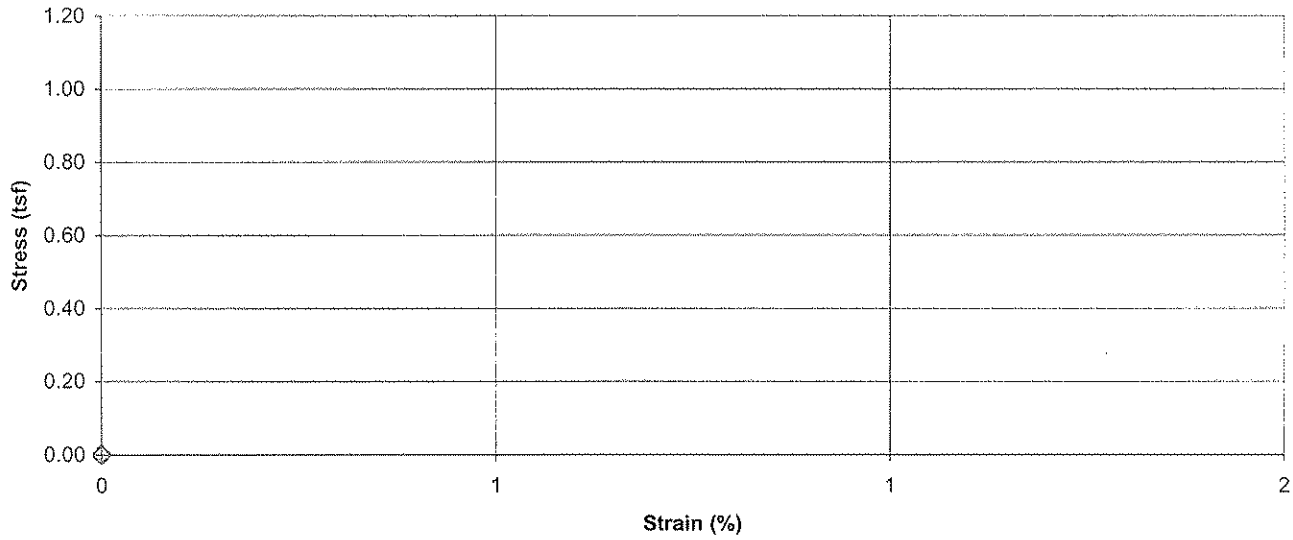
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 44.5'-46.5' | Lab ID: 576B
Visual Description: Silt (ML), gray to dark gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 45.4' - 45.9'

Specimen Type: Undisturbed

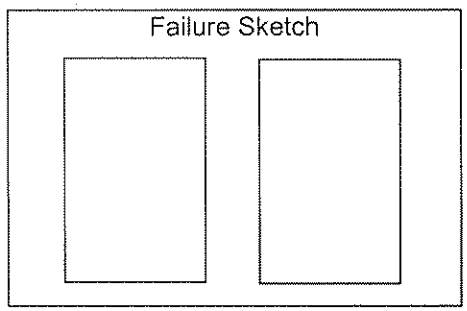
LL	N/A		
PL	N/A	Date Extruded	03/05/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	118.1		
Initial Dry Density (pcf)	97.8		
Initial Moisture Content, 40°C (%)	20.8	Initial MC Taken	Before Test, From Trimmings
Initial Moisture Content, 200°C (%)	42.4		
At Test Moisture Content, 40°C (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.803	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.927	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.0	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1945.80 g
Average height of cut cylinder 7.188"

Reviewed By:

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2
Project Number: 171468118
Source: B-8A, 44.5'-46.5'
Lab ID: 576C
Visual Description: Silt (ML), light gray to dark gray, moist, firm, fly ash
Recovered: 0.6'
Test Interval: 45.9' - 46.4'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

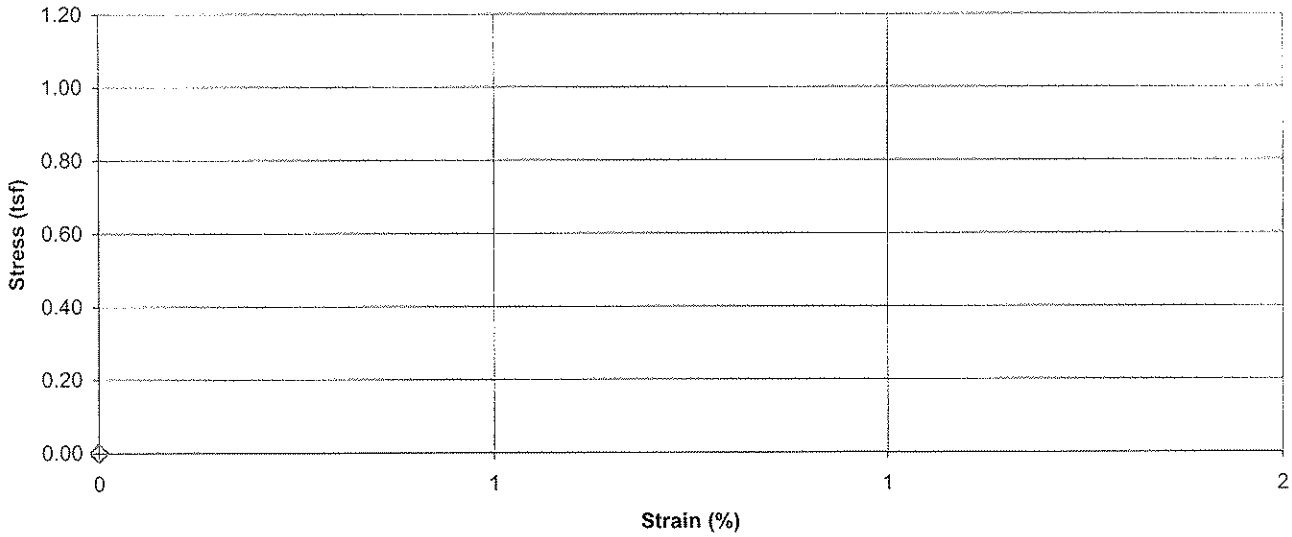
Date Extruded: 03/05/2009
Date Tested: N/A

Initial Wet Density (pcf)	114.8
Initial Dry Density (pcf)	98.0
Initial Moisture Content, 40°C (%)	17.1
Initial Moisture Content, 200°C (%)	38.4
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.078
Average Diameter (in)	2.848
Height to Diameter Ratio	2.1

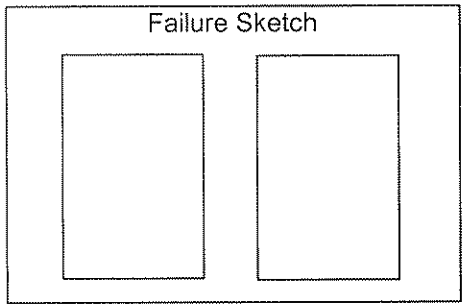
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1906.54 g
Average height of cut cylinder 7.047"

Reviewed By:

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 49.5'-51.5' | Lab ID: 577A
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.5'
Test Interval: 49.5' - 50.0'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

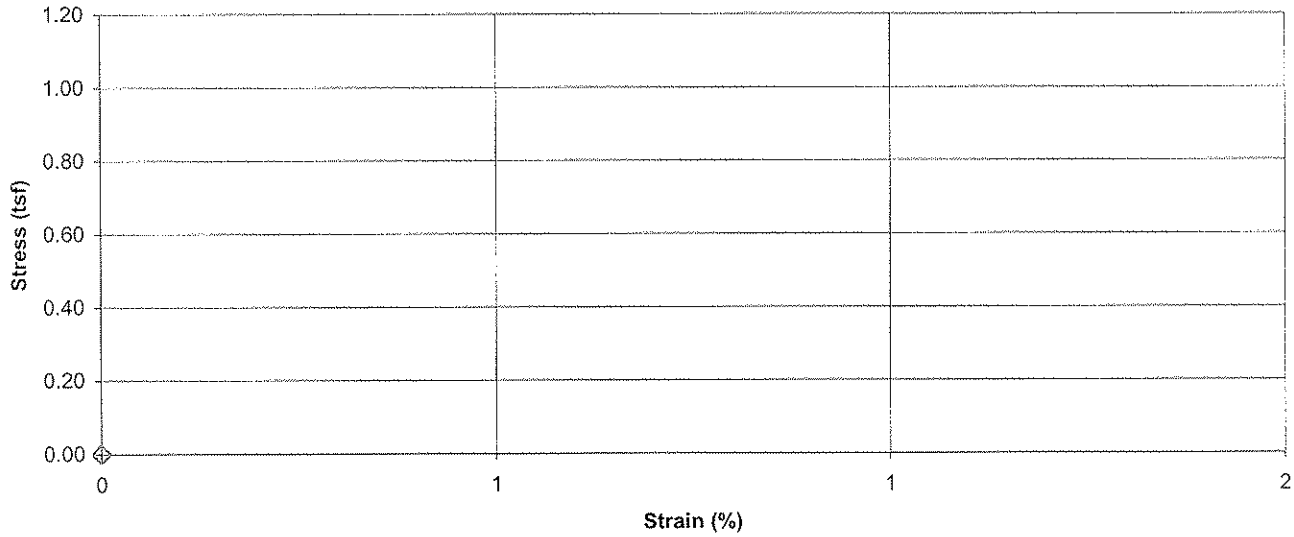
Date Extruded: 03/04/2009
Date Tested: N/A

Initial Wet Density (pcf)	113.3
Initial Dry Density (pcf)	92.4
Initial Moisture Content, 40°C (%)	22.6
Initial Moisture Content, 200°C (%)	47.5
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	4.454
Average Diameter (in)	3.024
Height to Diameter Ratio	1.5

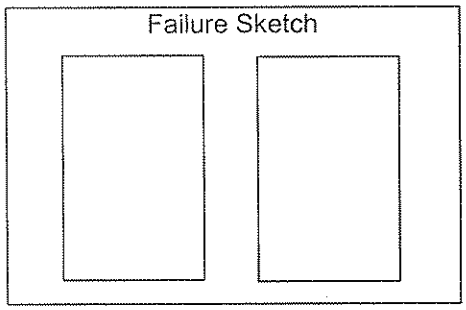
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1523.41 g
Average height of cut cylinder 6.772"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 49.5'-51.5' | Lab ID: 577B
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 50.1' - 50.6'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/04/2009
Date Tested: N/A

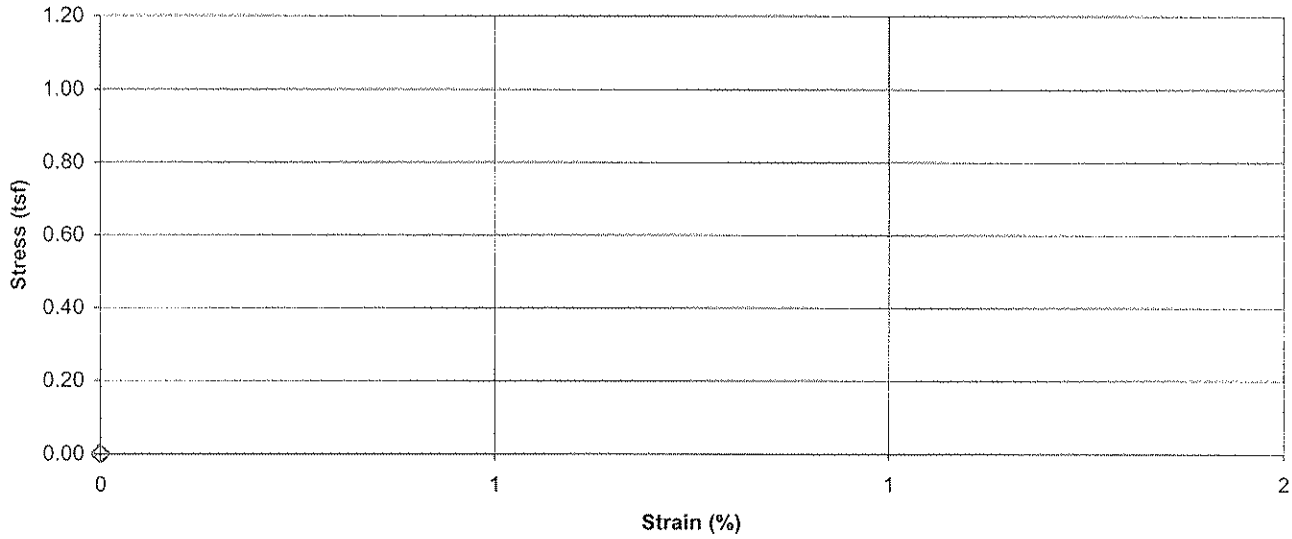
Initial Wet Density (pcf)	114.1
Initial Dry Density (pcf)	94.2
Initial Moisture Content, 40°C (%)	21.0
Initial Moisture Content, 200°C (%)	45.2
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.125
Average Diameter (in)	3.076
Height to Diameter Ratio	1.7

Initial MC Taken: Before Test, From Trimmings

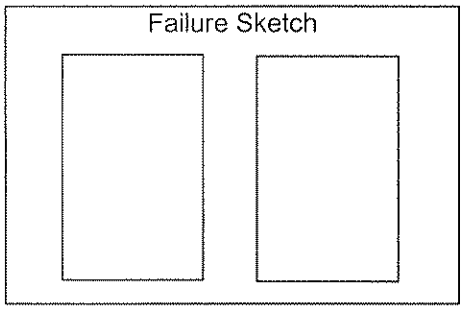
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1735.85 g
Average height of cut cylinder 7.137"

Reviewed By:

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 49.5'-51.5' | Lab ID: 577C
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 50.7' - 51.2'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

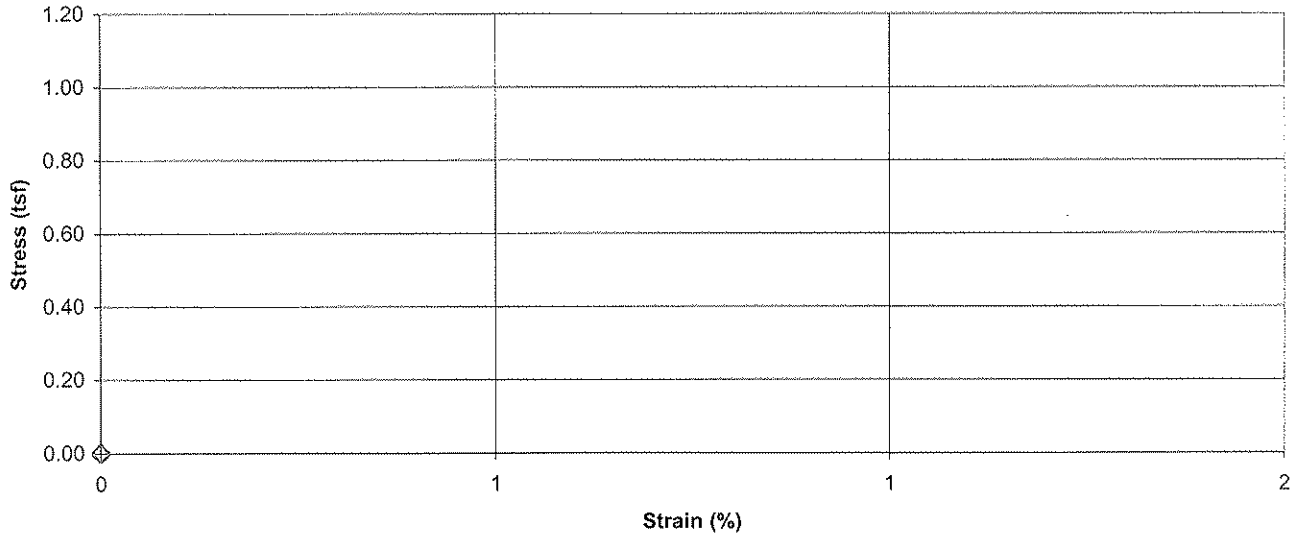
Date Extruded: 03/04/2009
Date Tested: N/A

Initial Wet Density (pcf)	119.7
Initial Dry Density (pcf)	101.0
Initial Moisture Content, 40°C (%)	18.6
Initial Moisture Content, 200°C (%)	41.9
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.985
Average Diameter (in)	2.917
Height to Diameter Ratio	2.1

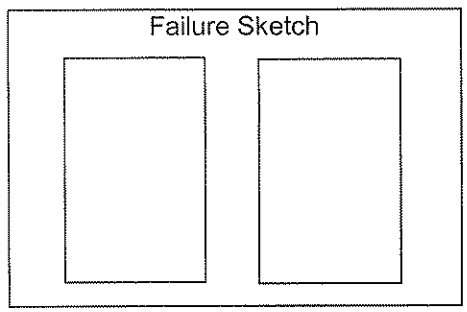
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1965.31 g
Average height of cut cylinder 7.164"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 54.5'-56.5' | Lab ID: 578A
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 54.8' - 55.3'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/04/2009
Date Tested: N/A

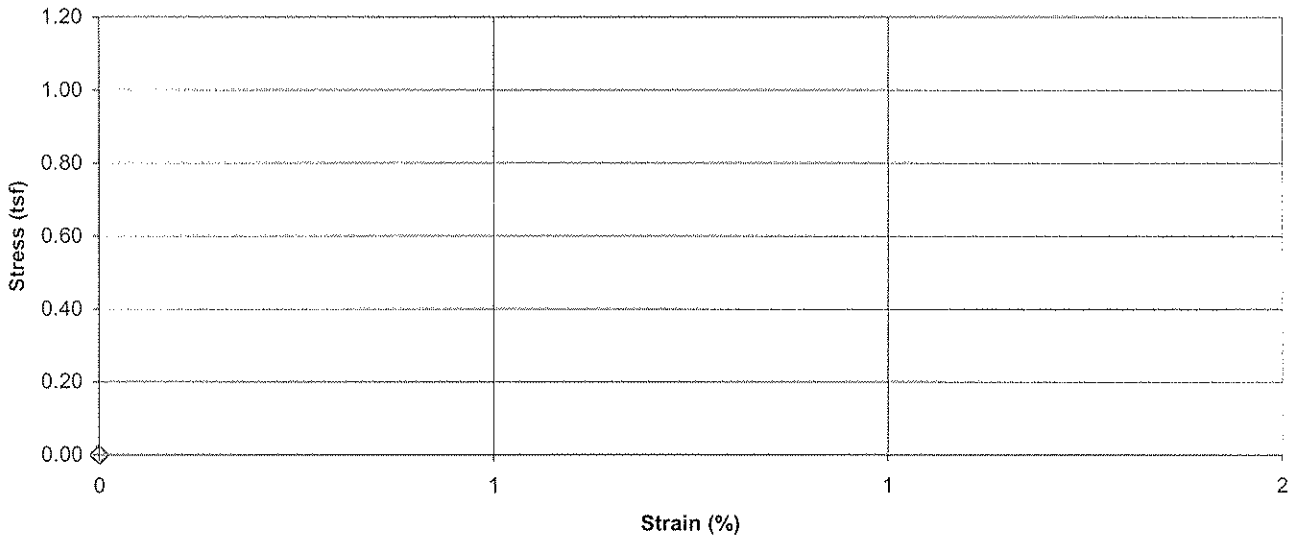
Initial Wet Density (pcf)	112.4
Initial Dry Density (pcf)	92.4
Initial Moisture Content, 40°C (%)	21.6
Initial Moisture Content, 200°C (%)	49.0
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.814
Average Diameter (in)	2.914
Height to Diameter Ratio	2.0

Initial MC Taken: Before Test, From Trimmings

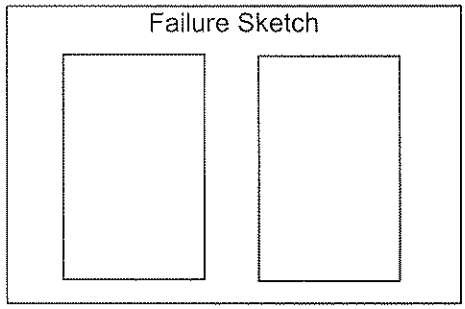
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined by 40° C
Weight of cylinder and material 1912.83 g
Average height of cut cylinder 7.815"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

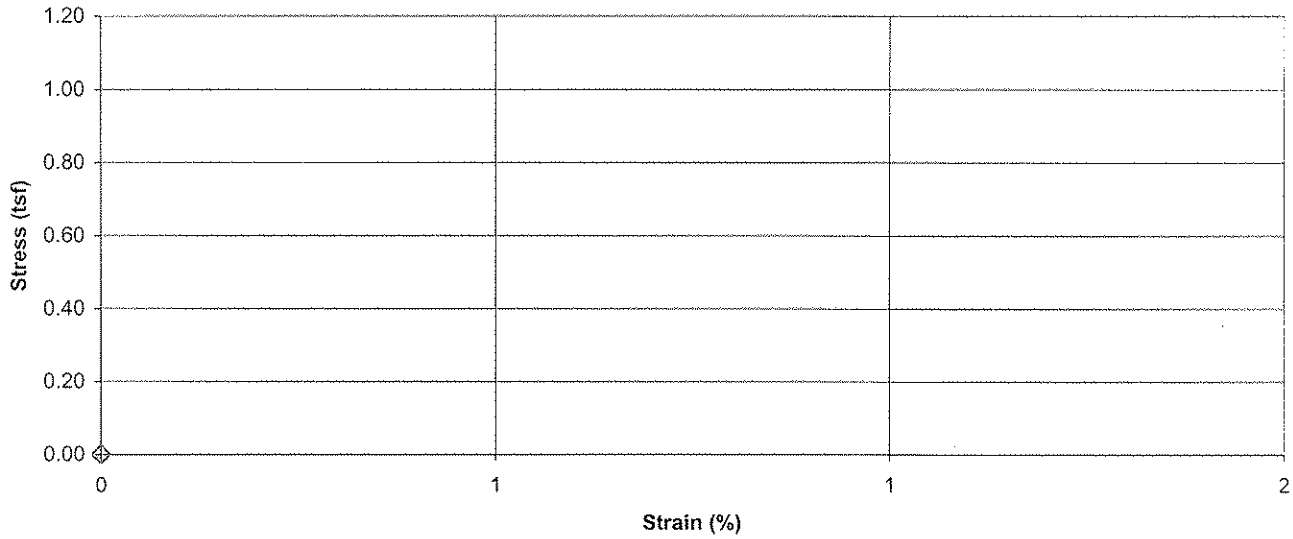
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 54.5'-56.5' | Lab ID: 578B
Visual Description: Silt (ML), light gray to dark gray, moist, firm, gypsum with pockets of fly ash
Recovered: 0.6'
Test Interval: 55.3' - 55.8'

Specimen Type: Undisturbed

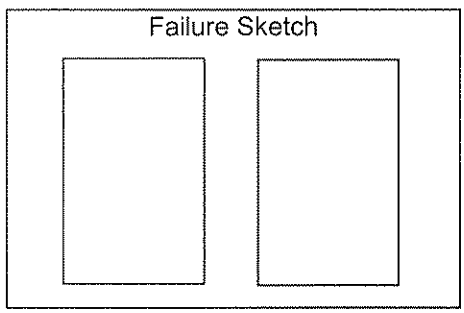
LL	N/A		
PL	N/A	Date Extruded	03/03/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	113.4		
Initial Dry Density (pcf)	91.2		
Initial Moisture Content, 40°C (%)	24.4	Initial MC Taken	Before Test, From Trimmings
Initial Moisture Content, 200°C (%)	52.7		
At Test Moisture Content, 40°C (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.060	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.888	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1887.03 g
Average height of cut cylinder 7.0823"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

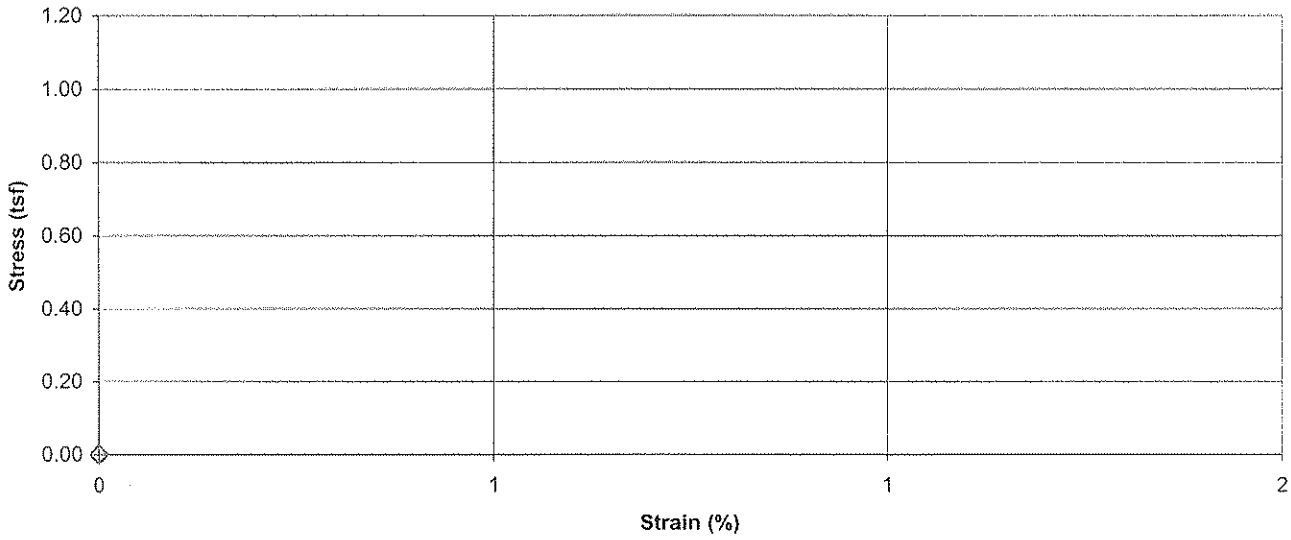
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 59.5'-61.5' | Lab ID: 579A
Visual Description: Silt (ML), dark gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 59.8' - 60.3'

Specimen Type: Undisturbed

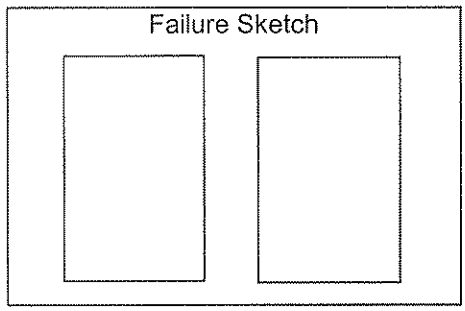
LL	N/A		
PL	N/A	Date Extruded	03/04/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	113.9		
Initial Dry Density (pcf)	83.2		
Initial Moisture Content, 40°C (%)	37.0	Initial MC Taken	Before Test, From Trimmings
Initial Moisture Content, 200°C (%)	59.1		
At Test Moisture Content, 40°C (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.849	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	3.001	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	1.9	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1894.81 g
Average height of cut cylinder 7.22"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-8A, 59.5'-61.5' | Lab ID: 579B
Visual Description: Silt (ML), gray to dark gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 60.3' - 60.8'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/03/2009
Date Tested: N/A

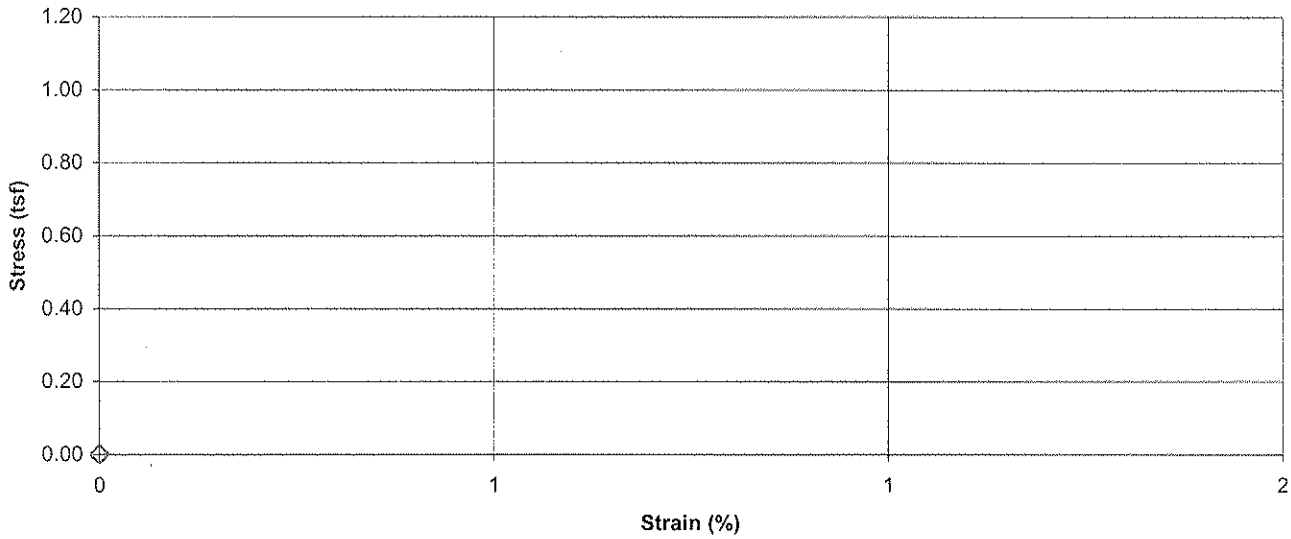
Initial Wet Density (pcf)	118.3
Initial Dry Density (pcf)	103.4
Initial Moisture Content, 40°C (%)	14.4
Initial Moisture Content, 200°C (%)	26.7
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.017
Average Diameter (in)	2.859
Height to Diameter Ratio	2.1

Initial MC Taken: Before Test, From Trimmings

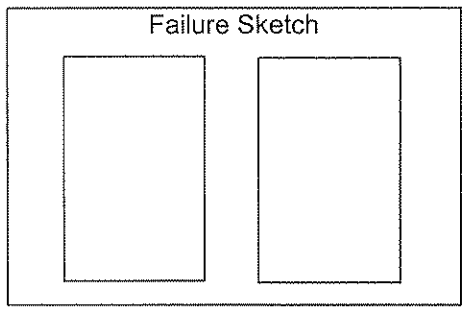
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 2050.61 g
Average height of cut cylinder 7.2855"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-9A, 5.0'-7.0' | Lab ID: 580A
Visual Description: Silt (ML), gray, moist, soft, fly ash with rocks throughout
Recovered: 0.4'
Test Interval: 5.0' - 5.4'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

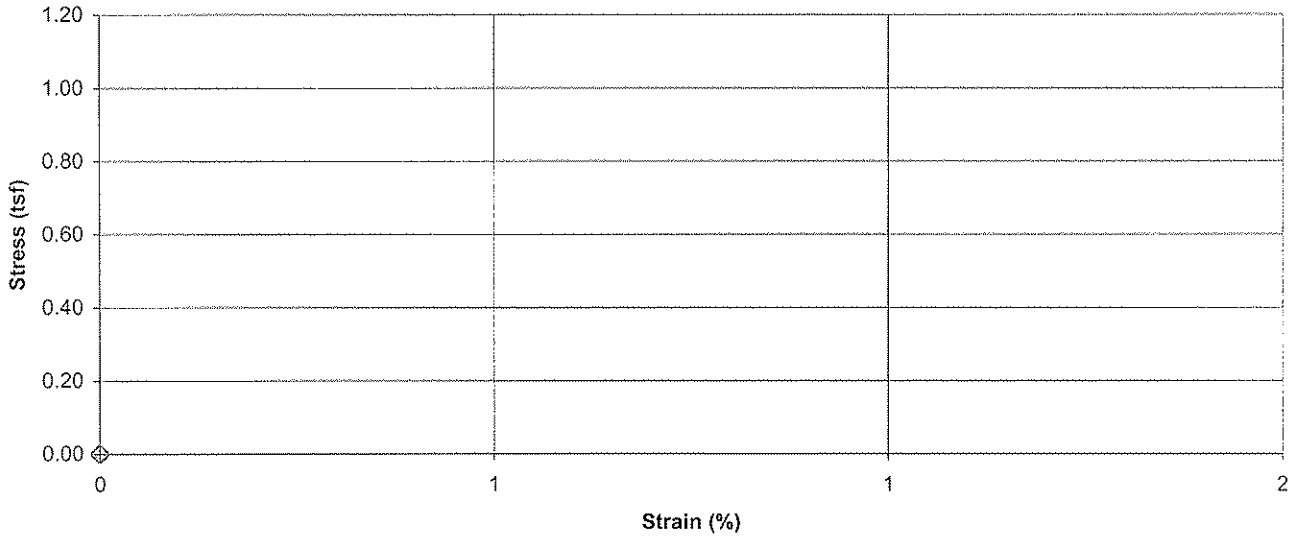
Date Extruded: 03/03/2009
Date Tested: N/A

Initial Wet Density (pcf)	126.5
Initial Dry Density (pcf)	100.2
Initial Moisture Content, 40°C (%)	26.2
Initial Moisture Content, 200°C (%)	20.6
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	4.266
Average Diameter (in)	2.843
Height to Diameter Ratio	1.5

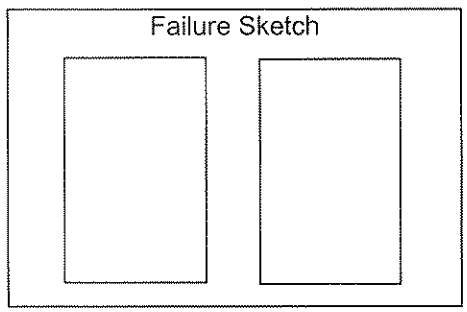
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1273.68 g
Average height of cut cylinder 4.4253"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-9A, 40.0'-42.0' | Lab ID: 587
Visual Description: Silt (ML), gray brown, moist, soft, gypsum

Recovered: 0.5'
Test Interval: 40.0' - 40.5'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/19/2009
Date Tested: N/A

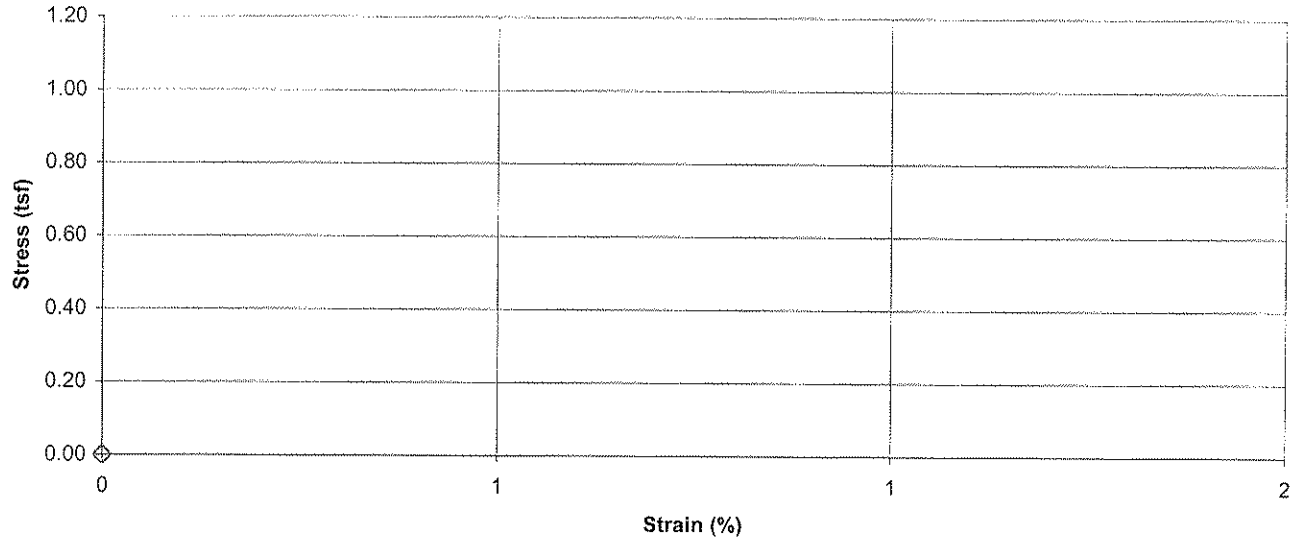
Initial Wet Density (pcf)	114.3
Initial Dry Density (pcf)	96.2
Initial Moisture Content, 40°C (%)	18.8
Initial Moisture Content, 200°C (%)	45.9
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.943
Average Diameter (in)	2.864
Height to Diameter Ratio	2.1

Initial MC Taken: Before Test, From Trimmings

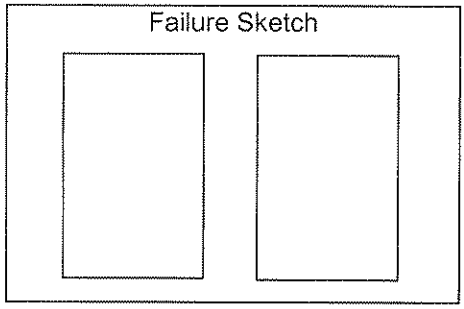
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry Unit weight determined using 40° C mc
Weight of cylinder and material 1654.12 g
Average height of cut cylinder 6.160"

Reviewed By: [signature]

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 4.5'-6.5' | Lab ID: 631A
Visual Description: Sandy Lean Clay (CL), gray brown to gray, moist, soft, pockets of coal and gypsum
Recovered: 0.6'
Test Interval: 4.8' - 5.3'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/10/2009
Date Tested: N/A

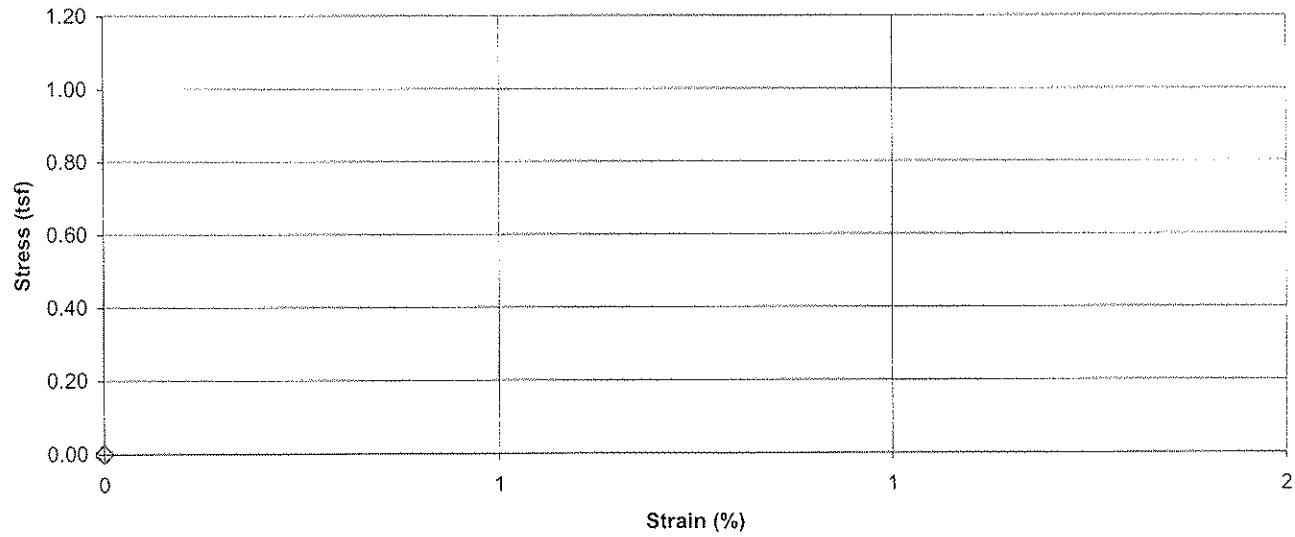
Initial Wet Density (pcf)	107.7
Initial Dry Density (pcf)	93.6
Initial Moisture Content, 40°C (%)	15.1
Initial Moisture Content, 200°C (%)	25.6
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.987
Average Diameter (in)	2.898
Height to Diameter Ratio	2.1

Initial MC Taken: Before Test, From Trimmings

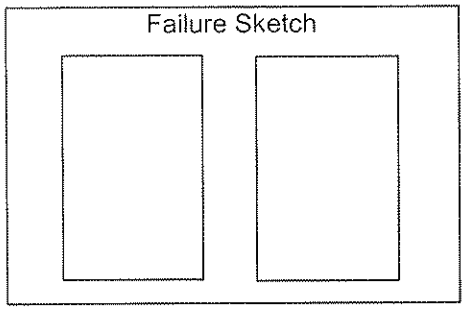
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1846.31 g
Average height of cut cylinder 7.272"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 4.5'-6.5' | Lab ID: 631B
Visual Description: Silt (ML), gray to dark gray, moist, very soft, gypsum with pockets of fly ash
Recovered: 0.6'
Test Interval: 5.3' - 5.8'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

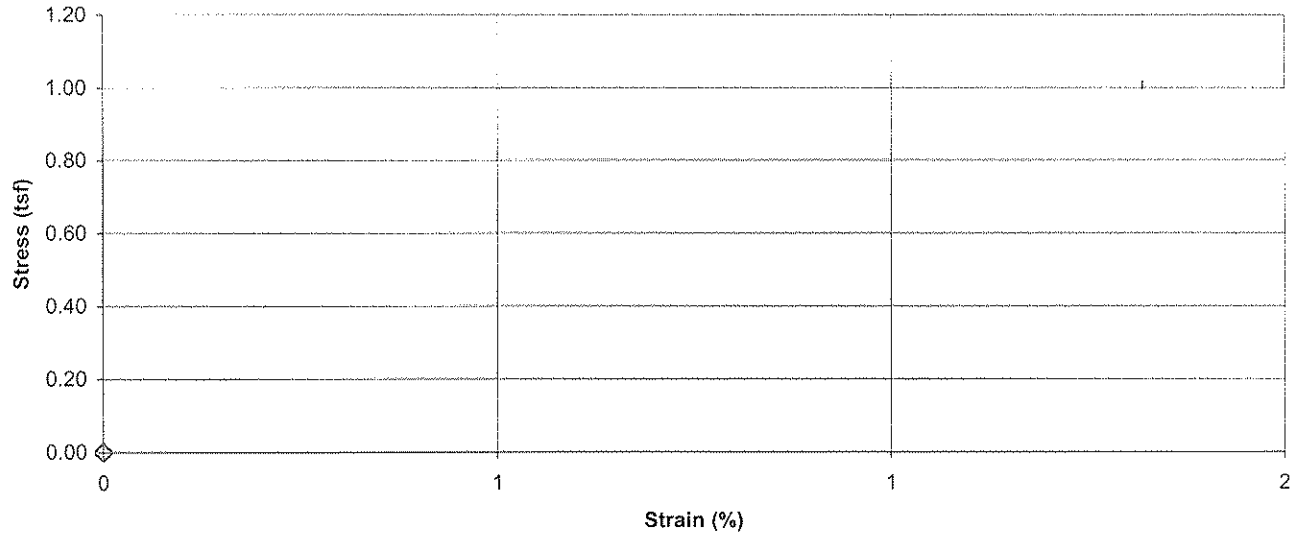
Date Extruded: 03/09/2009
Date Tested: N/A

Initial Wet Density (pcf)	96.0
Initial Dry Density (pcf)	87.4
Initial Moisture Content, 40°C (%)	9.8
Initial Moisture Content, 200°C (%)	29.1
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.155
Average Diameter (in)	2.862
Height to Diameter Ratio	2.2

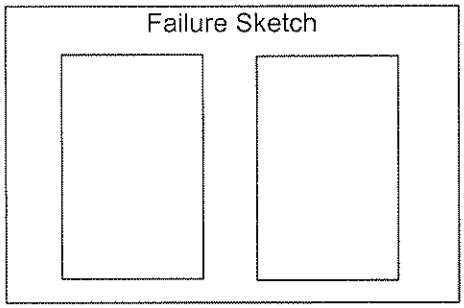
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and sample 1688.22 g
Average height of cut cylinder 7.1150"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 4.5'-6.5' | Lab ID: 631C
Visual Description: Silt (ML), gray to dark gray, moist, very soft, gypsum with pockets of fly ash
Recovered: 0.6'
Test Interval: 5.9' - 6.5'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/10/2009
Date Tested: N/A

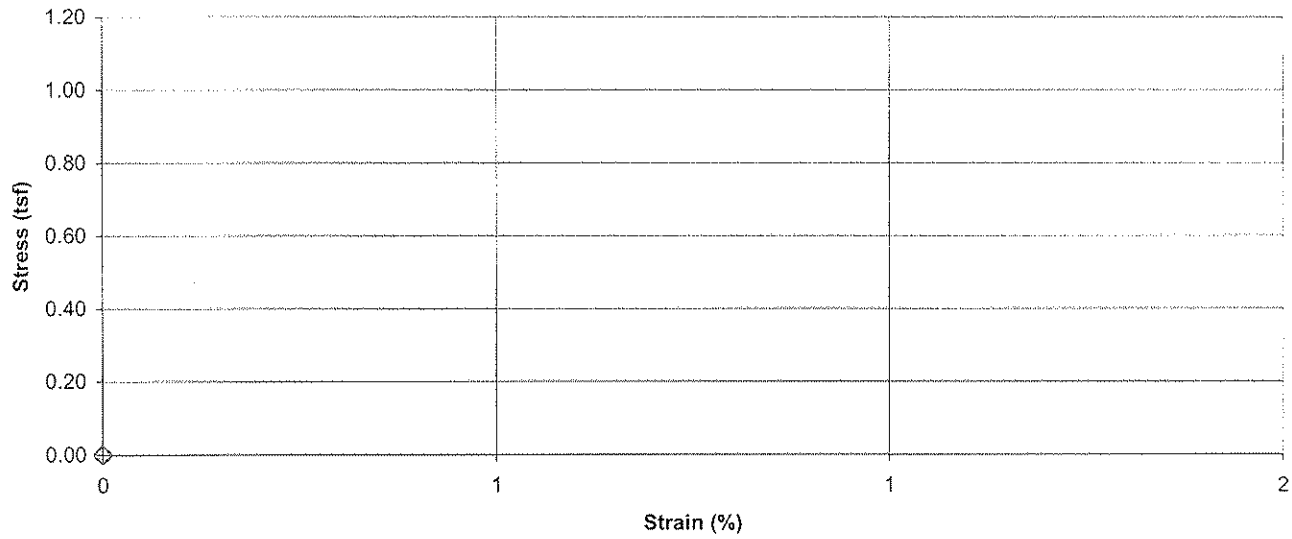
Initial Wet Density (pcf)	
Initial Dry Density (pcf)	N/A
Initial Moisture Content, 40°C (%)	12.8
Initial Moisture Content, 200°C (%)	34.5
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	N/A
Average Diameter (in)	N/A
Height to Diameter Ratio	N/A

Initial MC Taken: Before Test, From Center of Specimen

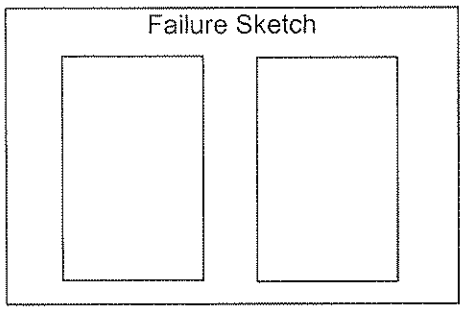
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Saved in a bag
Weight of cylinder and material 1781.13 g
Average height of cut cylinder 7.2355"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 9.5'-11.5' | Lab ID: 632A
Visual Description: Silt (ML), gray, moist, very soft, gypsum
Recovered: 0.6'
Test Interval: 9.7' - 10.3'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

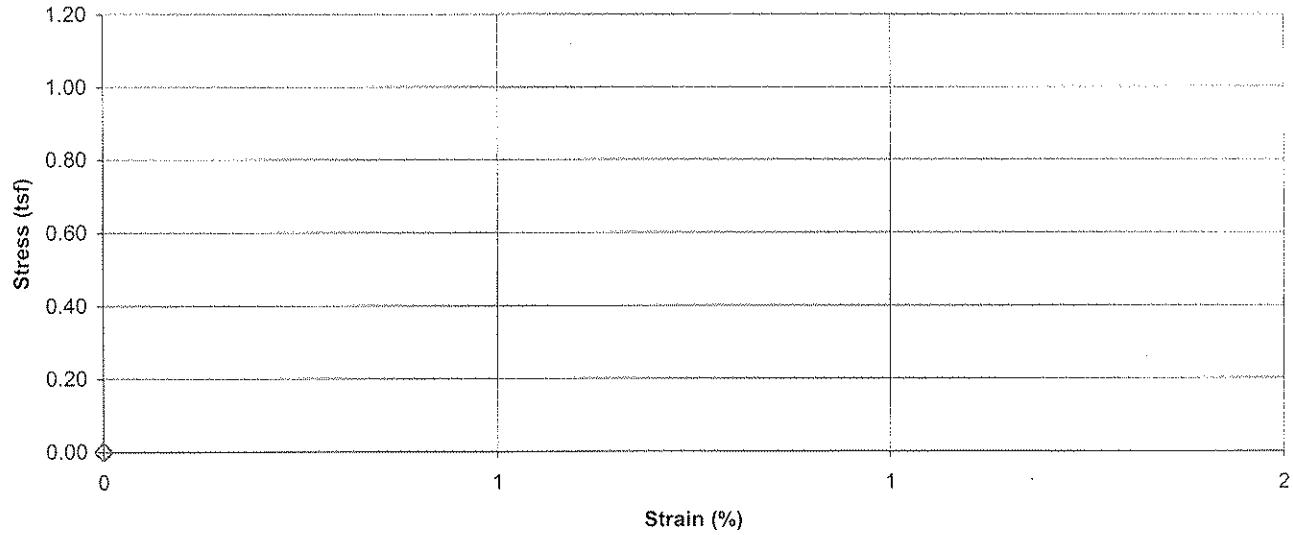
Date Extruded: 03/09/2009
Date Tested: N/A

Initial Wet Density (pcf)	
Initial Dry Density (pcf)	N/A
Initial Moisture Content, 40°C (%)	10.8
Initial Moisture Content, 200°C (%)	30.1
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	N/A
Average Diameter (in)	N/A
Height to Diameter Ratio	N/A

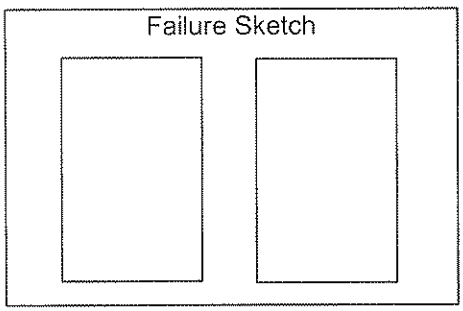
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
Weight of cylinder and material 1670.51 g
Average height of cut cylinder 7.1220"
Test interval saved in a bag

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

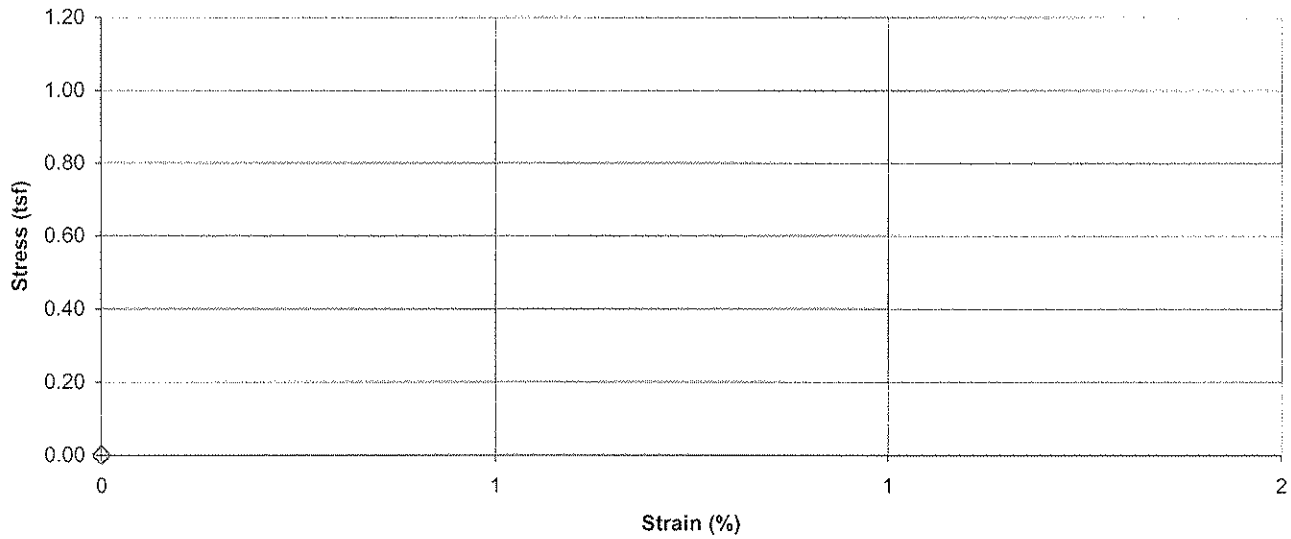
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 9.5'-11.5' | Lab ID: 632B
Visual Description: Silt (ML), gray, moist, very soft, gypsum with pockets of fly ash
Recovered: 0.6'
Test Interval: 10.3' - 10.8'

Specimen Type: Undisturbed

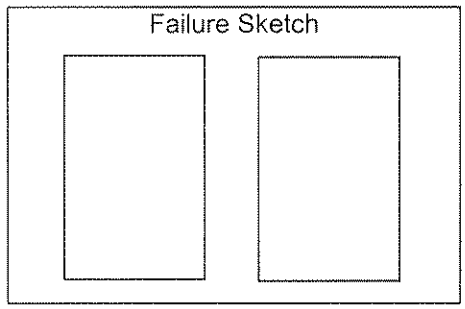
LL	N/A		
PL	N/A	Date Extruded	03/10/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	94.9		
Initial Dry Density (pcf)	85.1		
Initial Moisture Content, 40°C (%)	11.5	Initial MC Taken	Before Test, From Trimmings
Initial Moisture Content, 200°C (%)	33.0		
At Test Moisture Content, 40°C (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.062	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.881	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1699.02 g
Average height of cut cylinder 7.1585"
Sample fell apart after measuring
Saved in bag

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 9.5'-11.5' | Lab ID: 632C
Visual Description: Silt (ML), light gray, moist, very soft, gypsum with pockets of fly ash
Recovered: 0.6'
Test Interval: 11.0' - 11.5'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

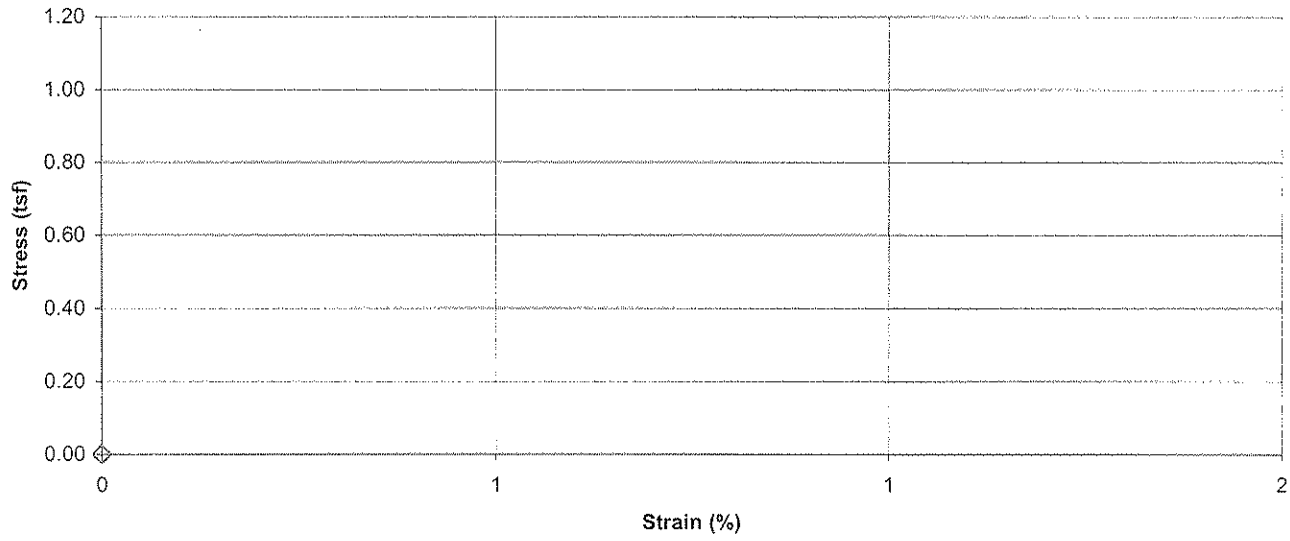
Date Extruded: 03/09/2009
Date Tested: N/A

Initial Wet Density (pcf)	95.9
Initial Dry Density (pcf)	85.6
Initial Moisture Content, 40°C (%)	12.0
Initial Moisture Content, 200°C (%)	34.3
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.137
Average Diameter (in)	2.861
Height to Diameter Ratio	2.1

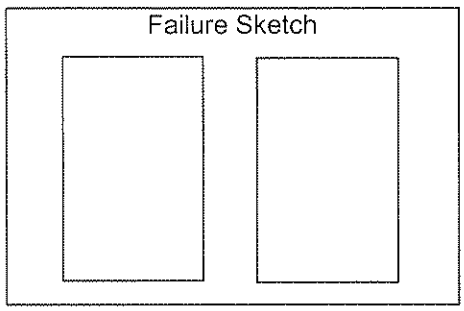
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1720.79 g
Average height of cut cylinder 7.1215"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 14.5'-16.5' | Lab ID: 633A
Visual Description: Silt (ML), gray to dark gray, moist, soft, fly ash with pockets of gypsum
Recovered: 0.6'
Test Interval: 15.7' - 16.2'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/09/2009
Date Tested: N/A

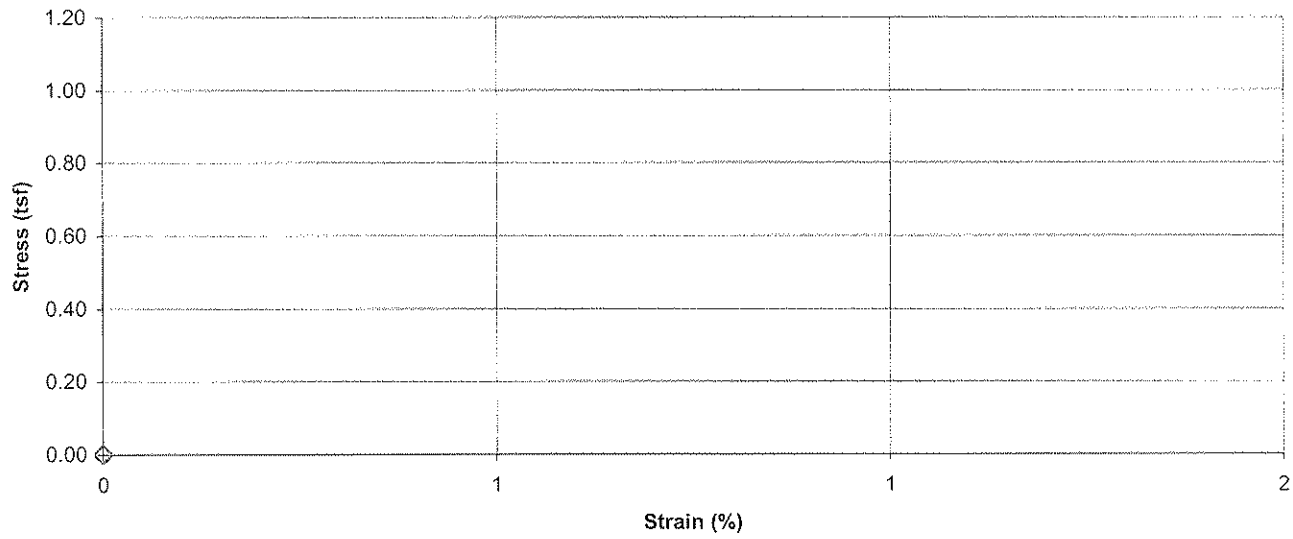
Initial Wet Density (pcf)	101.1
Initial Dry Density (pcf)	85.5
Initial Moisture Content, 40°C (%)	18.3
Initial Moisture Content, 200°C (%)	38.4
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.134
Average Diameter (in)	2.873
Height to Diameter Ratio	2.1

Initial MC Taken: Before Test, From Trimmings

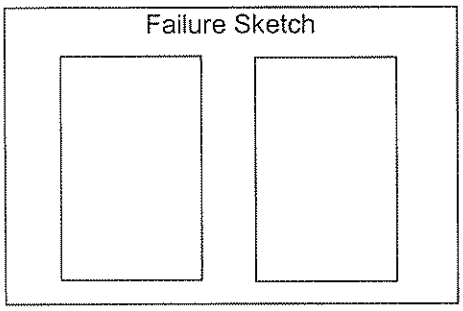
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1645.09 g
Average height of cut cylinder 7.0365"

Reviewed By: _____

Stantec

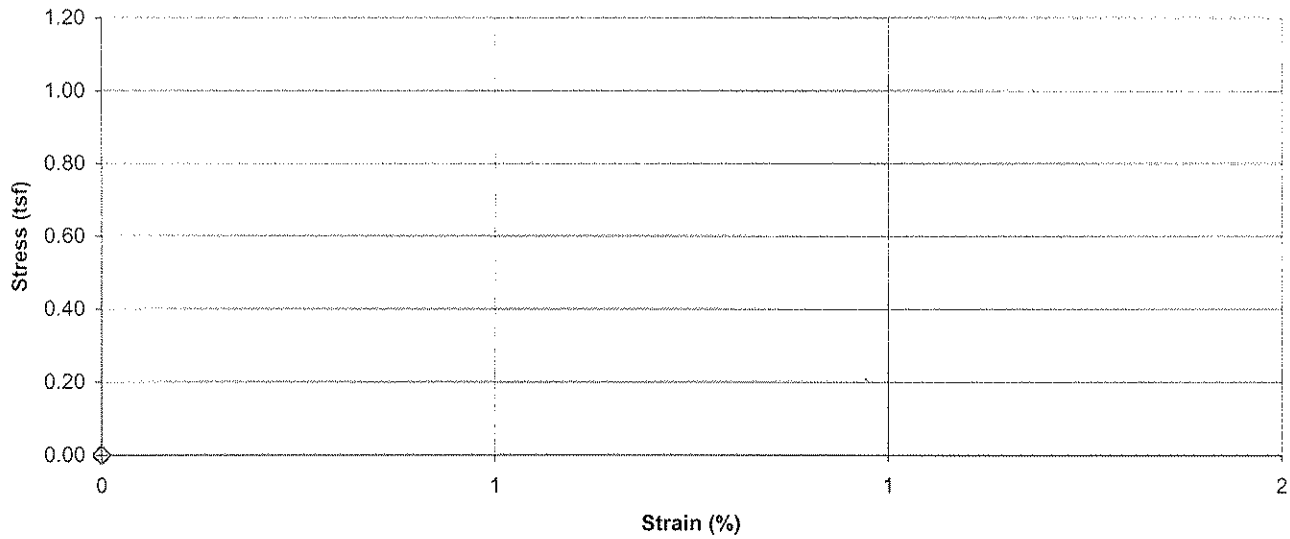
Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Source	B-10A, 14.5'-16.5'	Lab ID	633B
Visual Description	Silt (ML), gray, moist, soft, fly ash with pockets of coal		
		Recovered	0.6'
		Test Interval	15.3' - 15.7'
Specimen Type:	Undisturbed	LL	N/A
		PL	N/A
		PI	N/A
		Date Extruded	03/10/2009
		Date Tested	N/A

Initial Wet Density (pcf)	102.7		
Initial Dry Density (pcf)	82.0		
Initial Moisture Content, 40°C (%)	25.3	Initial MC Taken	Before Test, From Trimmings
Initial Moisture Content, 200°C (%)	49.5		
At Test Moisture Content, 40°C (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	4.983	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.854	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	1.7	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch

Pocket Penetrometer Reading (tsf) N/A

Torvane Reading (kg/cm^2) N/A

Comments Dry unit weight determined using 40° C mc

Weight of cylinder and material 1788.39 g

Average height of cut cylinder 7.175"

Reviewed By _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 19.5'-21.5' | Lab ID: 634A
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 19.7' - 20.2'

Specimen Type: Undisturbed

LL: N/A
PL: N/A
PI: N/A

Date Extruded: 03/10/2009
Date Tested: N/A

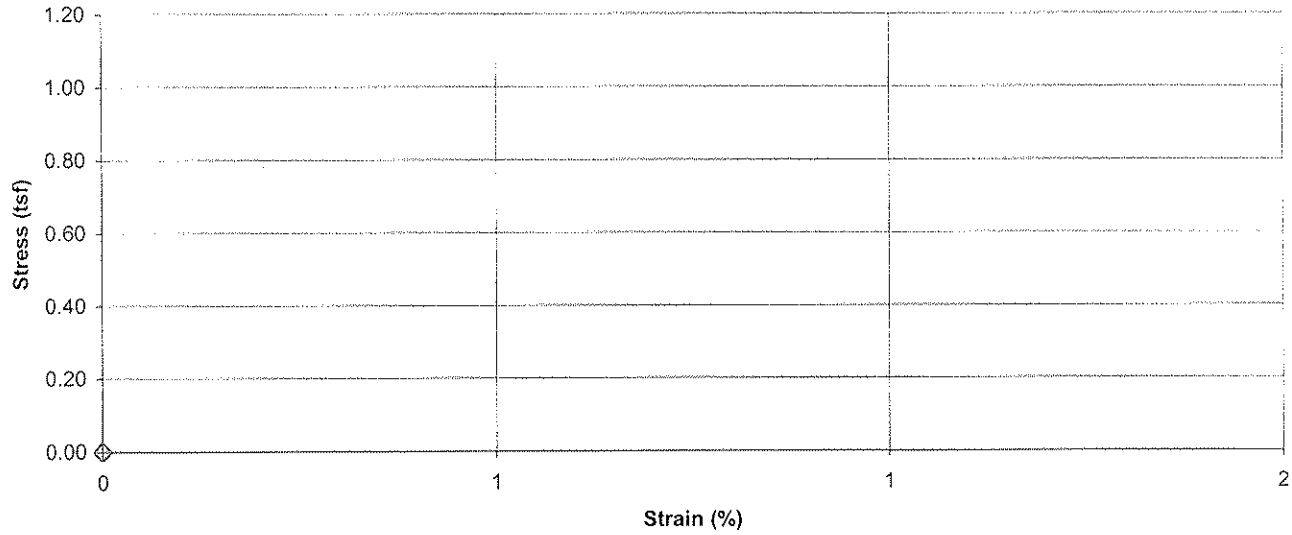
Initial Wet Density (pcf)	100.2
Initial Dry Density (pcf)	84.1
Initial Moisture Content, 40°C (%)	19.1
Initial Moisture Content, 200°C (%)	31.0
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.821
Average Diameter (in)	2.825
Height to Diameter Ratio	2.1

Initial MC Taken: Before Test, From Trimmings

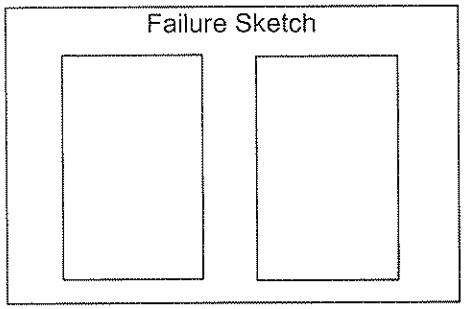
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 19.5'-21.5' | Lab ID: 634B
Visual Description: Silt (ML), gray to dark gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 20.3' - 20.8'

Specimen Type: Undisturbed

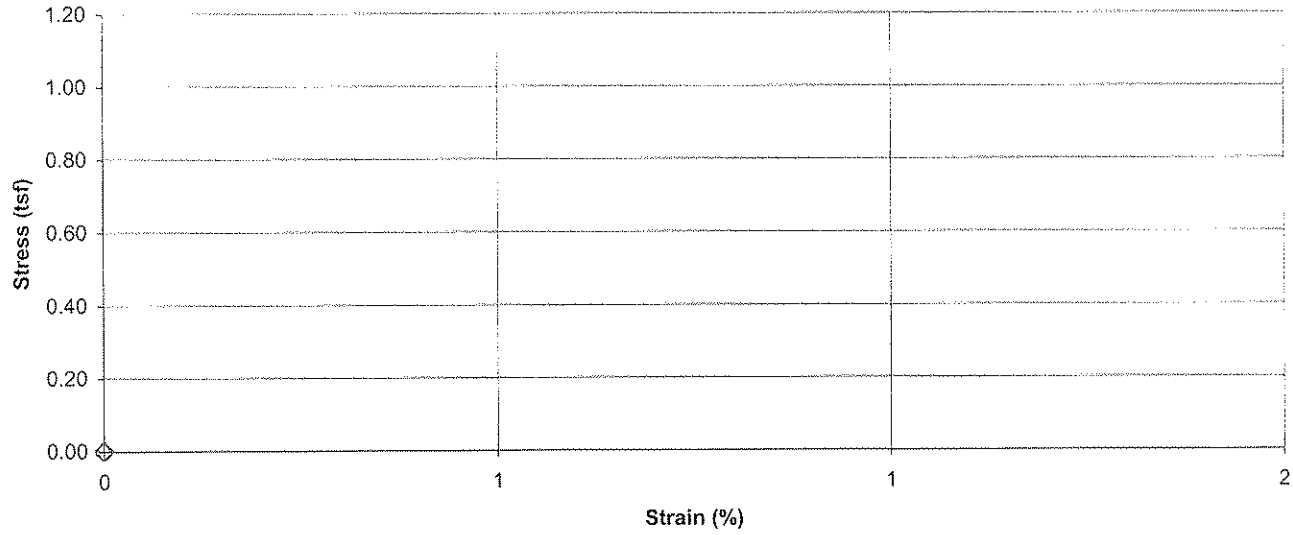
LL	N/A		
PL	N/A	Date Extruded	03/10/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	107.0
Initial Dry Density (pcf)	86.1
Initial Moisture Content, 40°C (%)	24.3
Initial Moisture Content, 200°C (%)	47.0
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.007
Average Diameter (in)	2.874
Height to Diameter Ratio	2.1

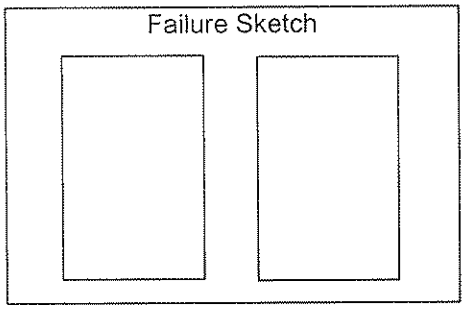
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1832.25 g
Average height of cut cylinder 7.096"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

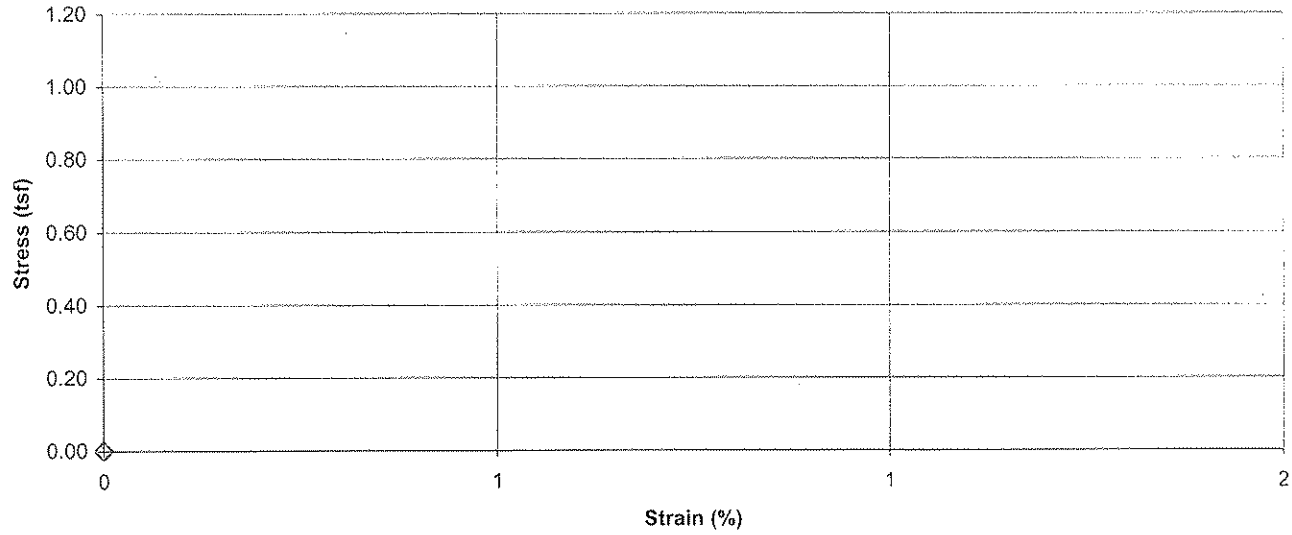
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 19.5'-21.5' | Lab ID: 634C
Visual Description: Silt (ML), gray to dark gray, moist, soft, fly ash with pockets of gypsum
Recovered: 0.6'
Test Interval: 20.8' - 21.3'

Specimen Type: Undisturbed

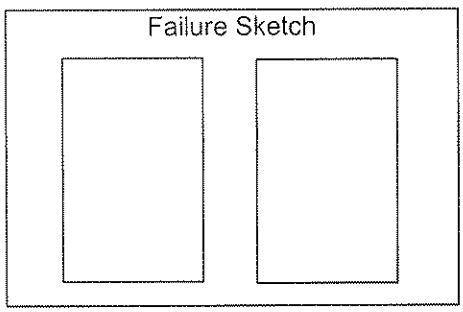
LL	N/A		
PL	N/A	Date Extruded	03/09/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	107.7		
Initial Dry Density (pcf)	87.3		
Initial Moisture Content, 40°C (%)	23.4	Initial MC Taken	Before Test, From Trimmings
Initial Moisture Content, 200°C (%)	47.6		
At Test Moisture Content, 40°C (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.165	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.871	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1909.44 g
Average height of cut cylinder 7.2140"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 24.5'-26.5' | Lab ID: 635A
Visual Description: Silt (ML), gray, moist, soft, flyash with pockets of gypsum
Recovered: 0.6'
Test Interval: 24.5' - 25.0'

Specimen Type: Undisturbed

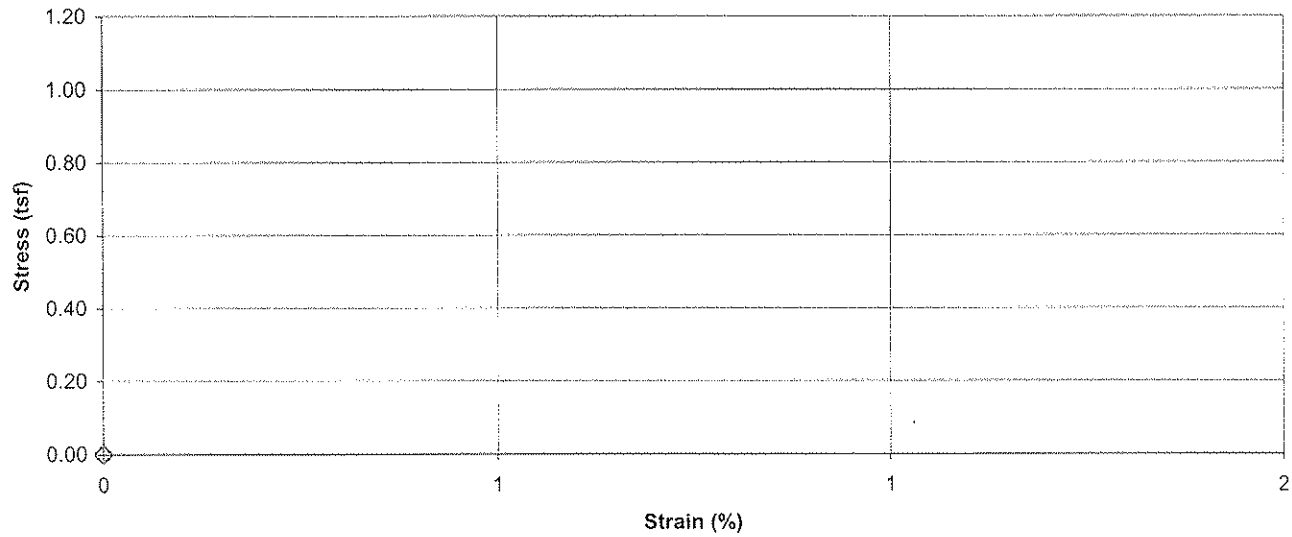
LL	N/A		
PL	N/A	Date Extruded	03/10/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	113.4
Initial Dry Density (pcf)	93.0
Initial Moisture Content, 40°C (%)	21.9
Initial Moisture Content, 200°C (%)	44.2
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.617
Average Diameter (in)	2.862
Height to Diameter Ratio	2.0

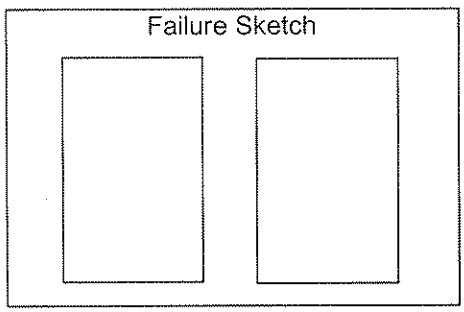
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1519.78 g
Average height of cut cylinder 5.884"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 24.5'-26.5' | Lab ID: 635B
Visual Description: Silt (ML), gray, wet, very soft, gypsum with pockets of fly ash
Recovered: 0.6'
Test Interval: 25.0' - 25.5'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

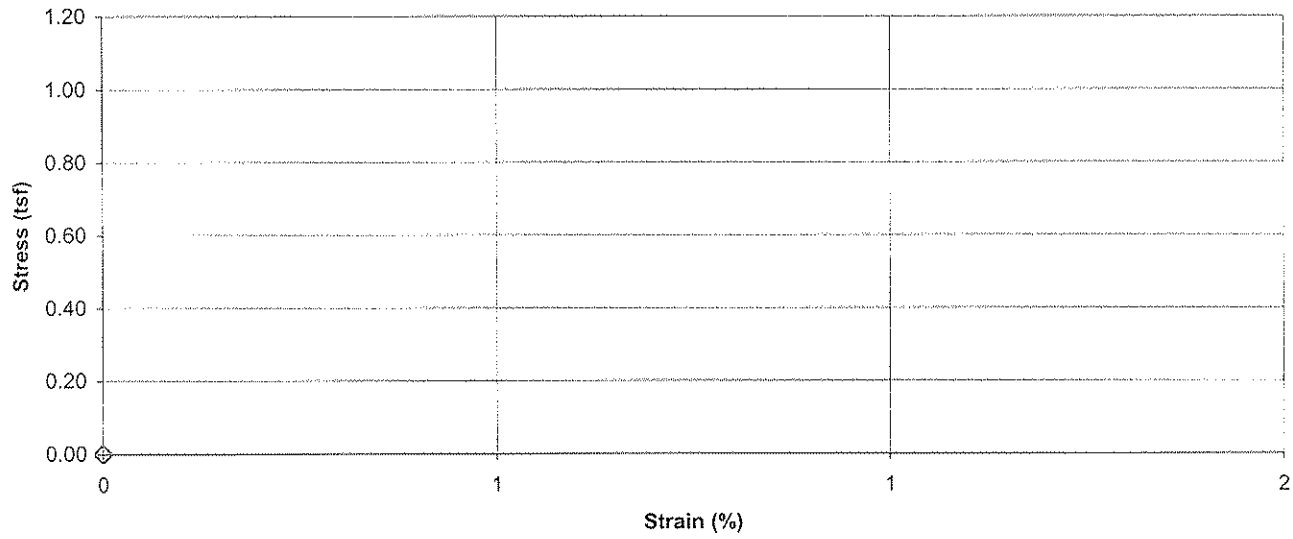
Date Extruded: 03/09/2009
Date Tested: N/A

Initial Wet Density (pcf)	113.1
Initial Dry Density (pcf)	91.4
Initial Moisture Content, 40°C (%)	23.7
Initial Moisture Content, 200°C (%)	52.7
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.016
Average Diameter (in)	2.879
Height to Diameter Ratio	2.1

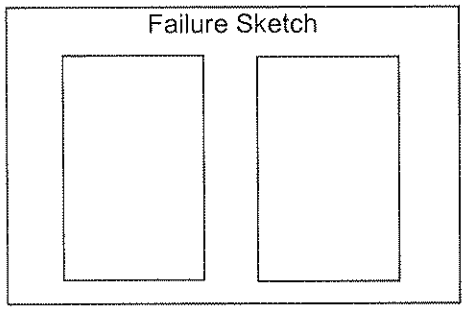
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined by 40° C mc
Weight of cylinder and material 1849.24 g
Average height of cut cylinder 7.1645"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 29.5'-31.5' | Lab ID: 636A
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.5'
Test Interval: 29.5' - 30.0'

Specimen Type: Undisturbed

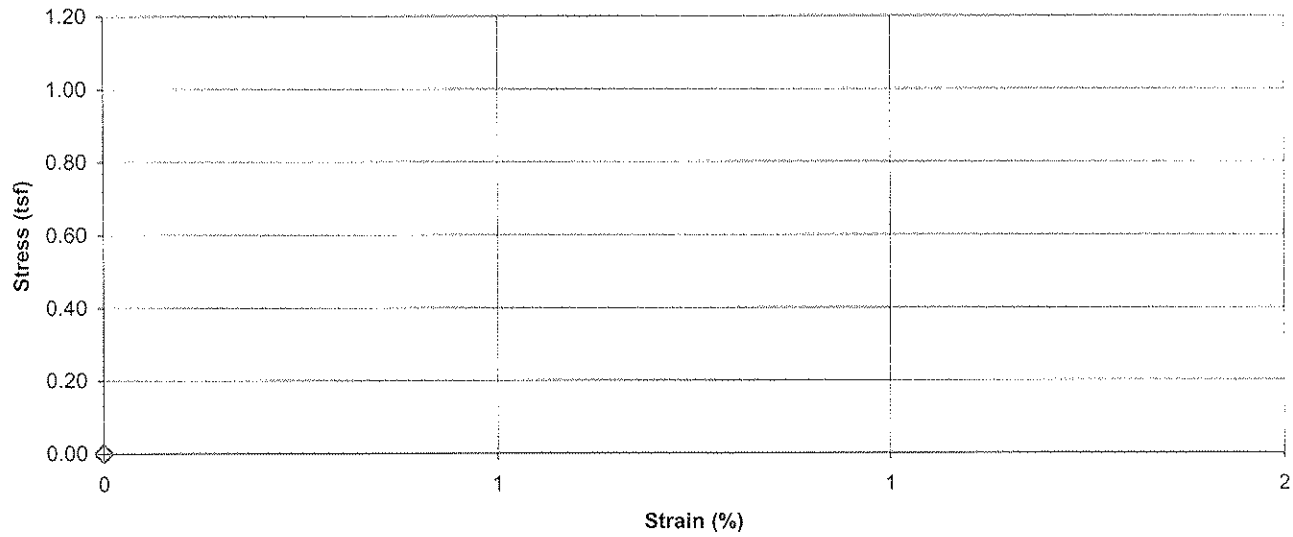
LL	N/A		
PL	N/A	Date Extruded	03/10/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	115.6
Initial Dry Density (pcf)	96.2
Initial Moisture Content, 40°C (%)	20.2
Initial Moisture Content, 200°C (%)	45.1
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.399
Average Diameter (in)	2.890
Height to Diameter Ratio	1.9

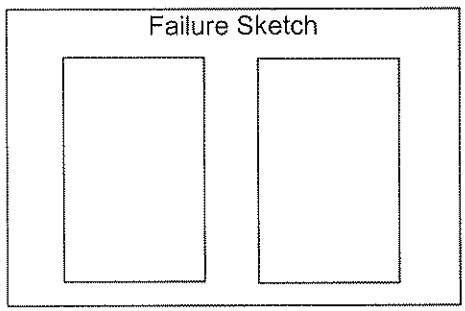
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1535.75 g
Average height of cut cylinder 5.823"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 29.5'-31.5' | Lab ID: 636B
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 30.1' - 30.6'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/10/2009
Date Tested: N/A

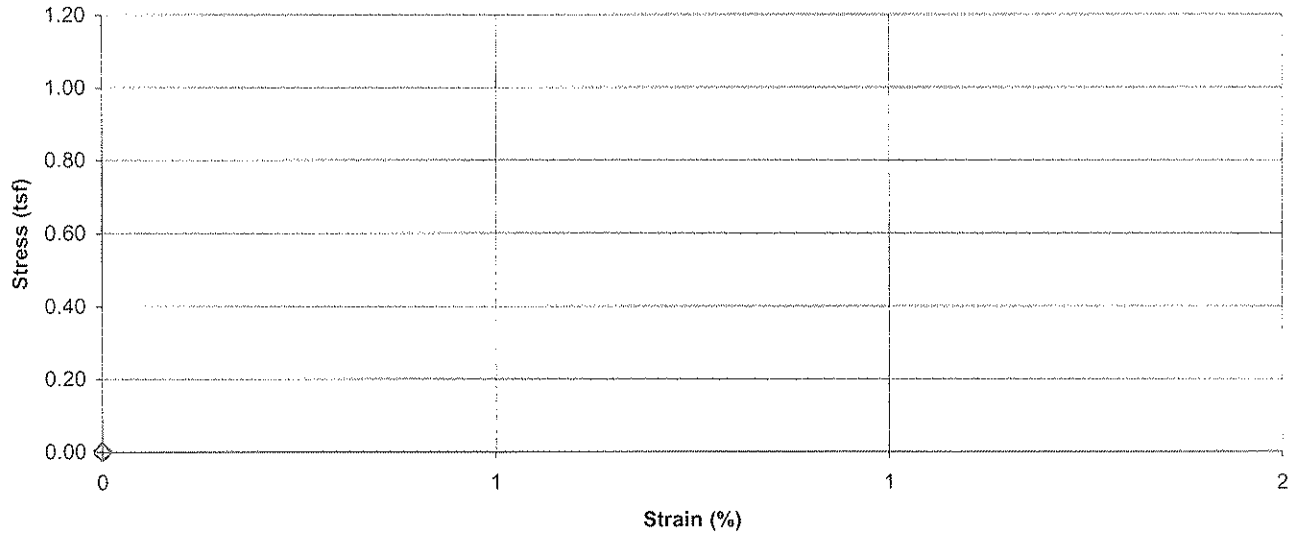
Initial Wet Density (pcf)	118.1
Initial Dry Density (pcf)	97.5
Initial Moisture Content, 40°C (%)	21.1
Initial Moisture Content, 200°C (%)	45.2
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.040
Average Diameter (in)	2.892
Height to Diameter Ratio	2.1

Initial MC Taken: Before Test, From Trimmings

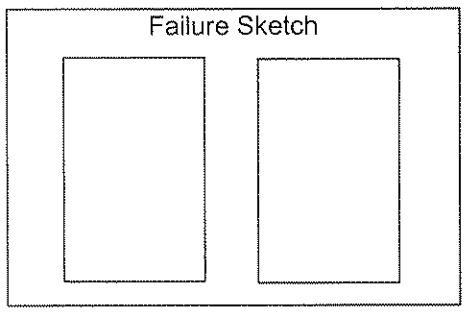
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1961.41 g
Average height of cut cylinder 7.247"

Reviewed By:

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 29.5'-31.5' | Lab ID: 636C
Visual Description: Silt (ML), gray to dark gray, moist, firm, gypsum
Recovered: 0.6'
Test Interval: 30.6' - 31.1'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/10/2009
Date Tested: N/A

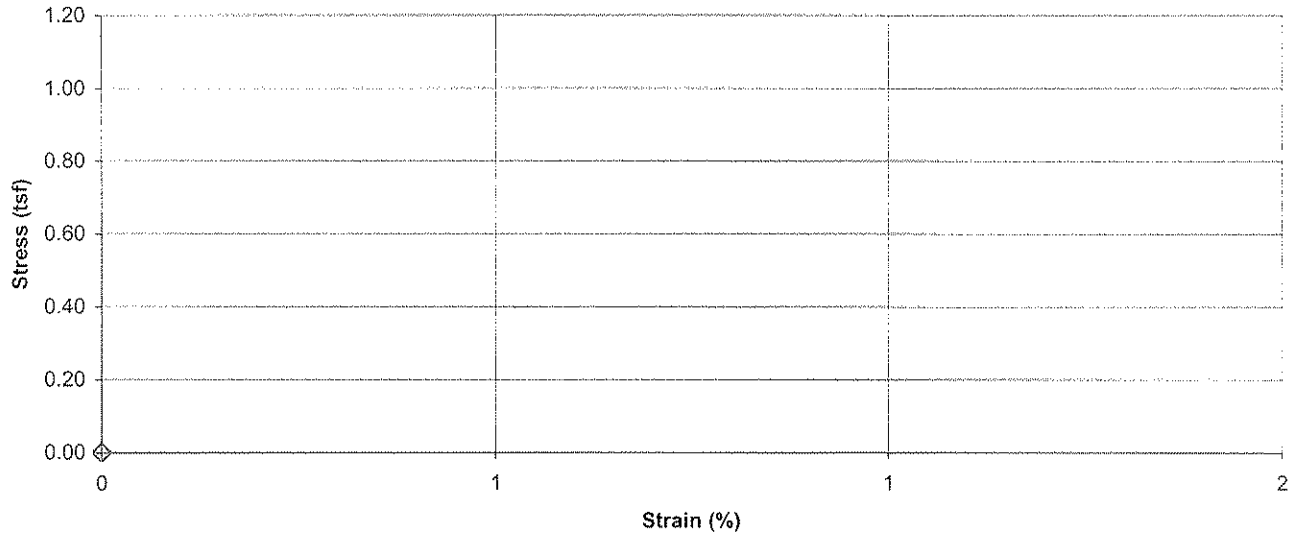
Initial Wet Density (pcf)	115.7
Initial Dry Density (pcf)	93.5
Initial Moisture Content, 40°C (%)	23.7
Initial Moisture Content, 200°C (%)	49.2
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.064
Average Diameter (in)	2.883
Height to Diameter Ratio	2.1

Initial MC Taken: Before Test, From Trimmings

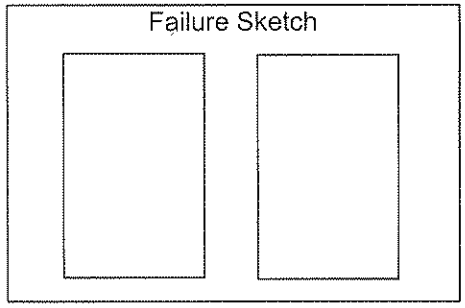
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1928.81 g
Average height of cut cylinder 7.1735"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 34.5'-36.5' | Lab ID: 637A
Visual Description: Silt (ML), dark gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 34.8' - 35.3'

Specimen Type: Undisturbed

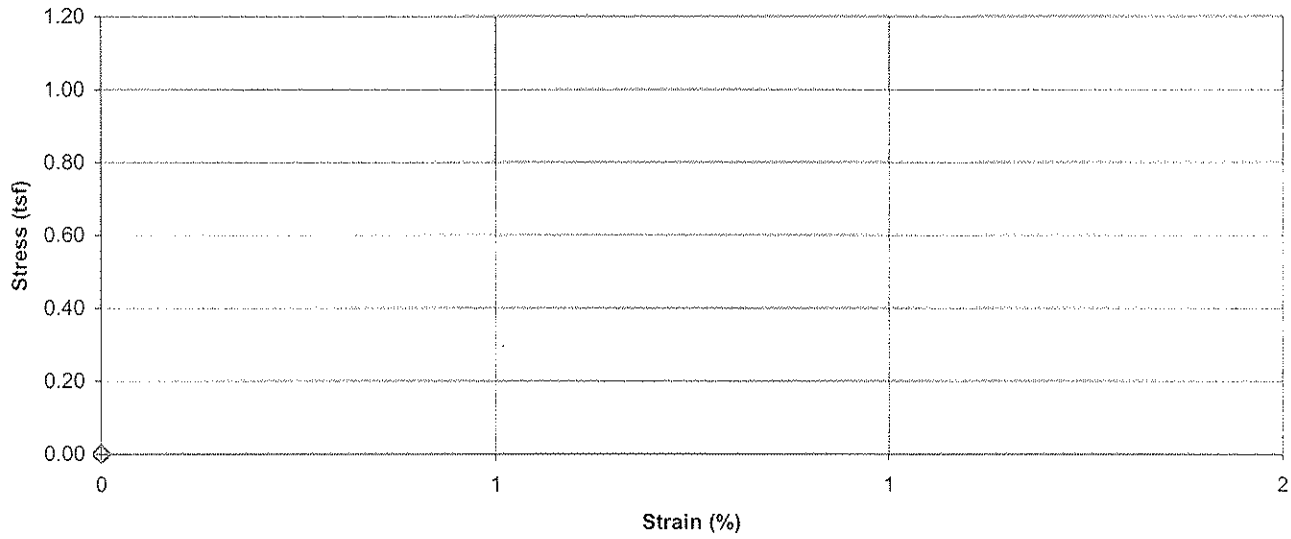
LL	N/A
PL	N/A
PI	N/A
Date Extruded	03/10/2009
Date Tested	N/A
Initial Wet Density (pcf)	116.0
Initial Dry Density (pcf)	94.4
Initial Moisture Content, 40°C (%)	22.8
Initial Moisture Content, 200°C (%)	47.1
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.421
Average Diameter (in)	3.142
Height to Diameter Ratio	1.7

Initial MC Taken: Before Test, From Trimmings

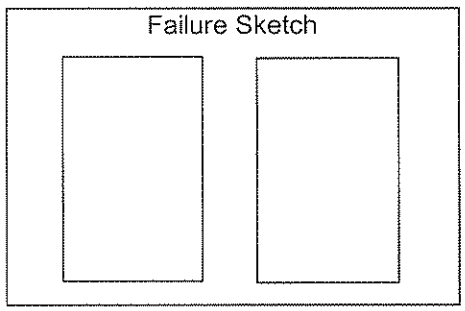
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1938.16 g
Average height of cut cylinder 7.217"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

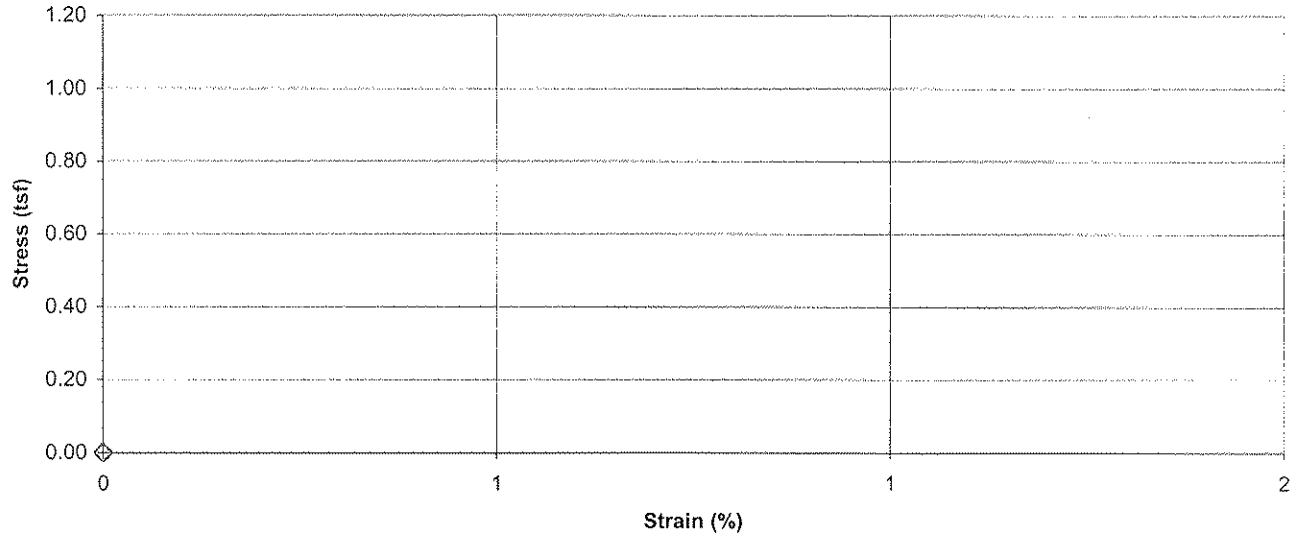
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 34.5'-36.5' | Lab ID: 637B
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 35.4' - 35.9'
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 03/10/2009
Date Tested: N/A

Initial Wet Density (pcf)	114.9
Initial Dry Density (pcf)	96.1
Initial Moisture Content, 40°C (%)	19.6
Initial Moisture Content, 200°C (%)	45.1
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.001
Average Diameter (in)	2.851
Height to Diameter Ratio	2.1

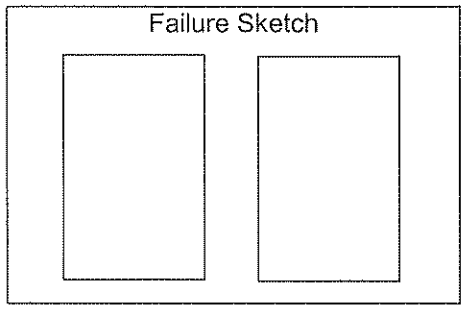
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1943.42 g
Average height of cut cylinder 7.218"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 39.5'-41.5' | Lab ID: 638A
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 39.8' - 40.3'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/10/2009
Date Tested: N/A

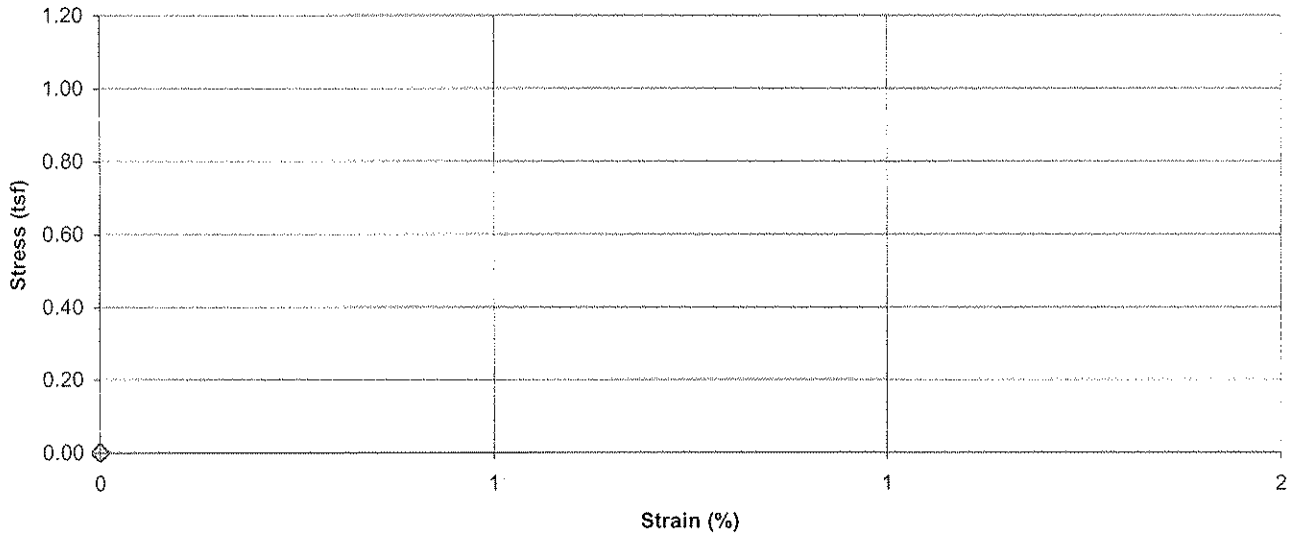
Initial Wet Density (pcf)	118.6
Initial Dry Density (pcf)	99.5
Initial Moisture Content, 40°C (%)	19.2
Initial Moisture Content, 200°C (%)	42.6
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.845
Average Diameter (in)	2.892
Height to Diameter Ratio	2.0

Initial MC Taken: Before Test, From Trimmings

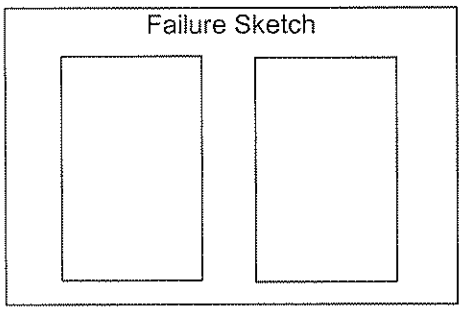
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1952.23 g
Average height of cut cylinder 7.165"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 39.5'-41.5' | Lab ID: 638B
Visual Description: Silt (ML), gray to dark gray, moist, soft, gypsum with pockets of fly ash
Recovered: 0.6'
Test Interval: 40.3' - 40.8'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A
Date Extruded	03/10/2009
Date Tested	N/A

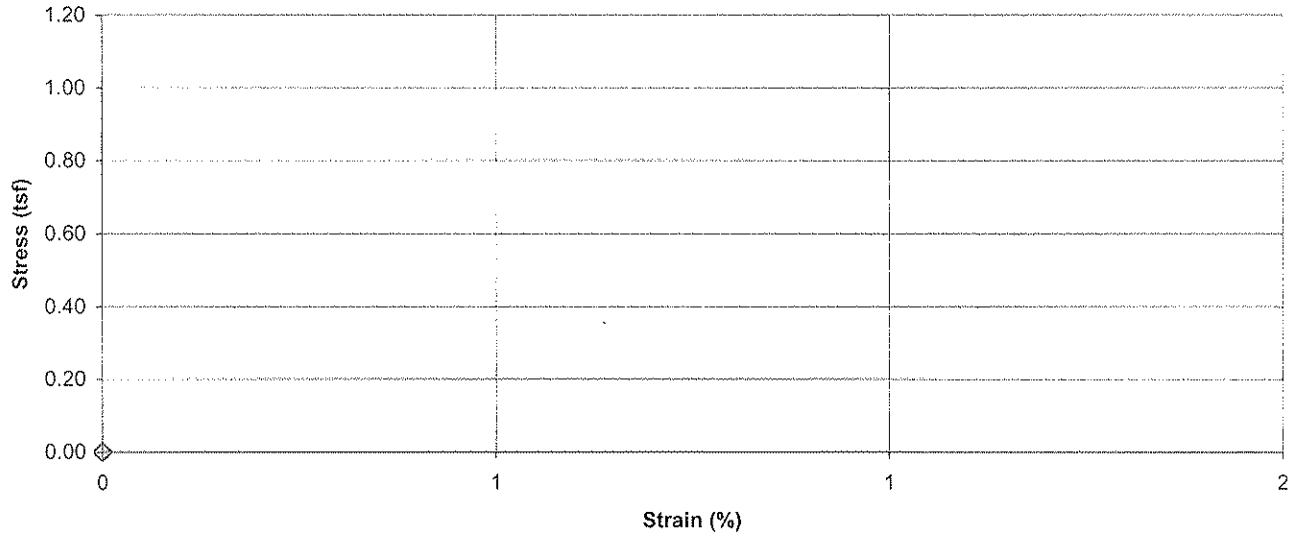
Initial Wet Density (pcf)	116.4
Initial Dry Density (pcf)	95.9
Initial Moisture Content, 40°C (%)	21.4
Initial Moisture Content, 200°C (%)	49.5
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.073
Average Diameter (in)	2.881
Height to Diameter Ratio	2.1

Initial MC Taken: Before Test, From Trimmings

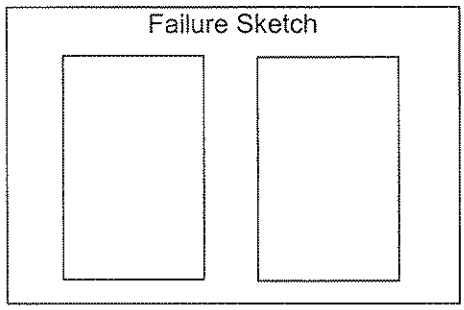
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1919.00 g
Average height of cut cylinder 7.146"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 44.5'-46.5' | Lab ID: 639B
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 45.4' - 45.9'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/10/2009
Date Tested: N/A

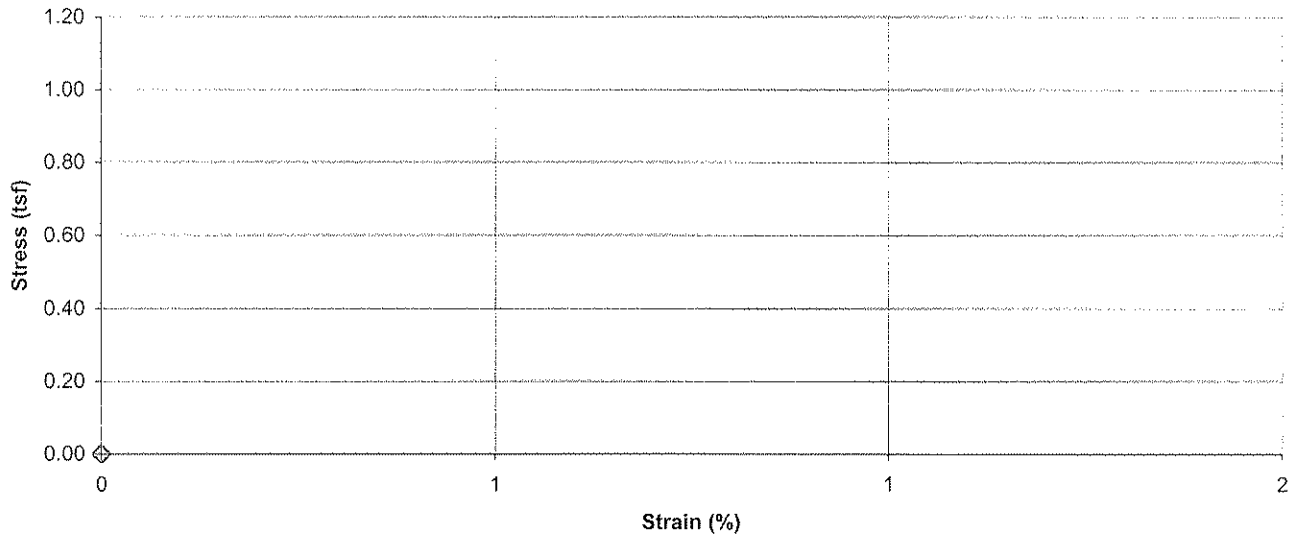
Initial Wet Density (pcf)	115.1
Initial Dry Density (pcf)	97.7
Initial Moisture Content, 40°C (%)	17.8
Initial Moisture Content, 200°C (%)	38.8
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.463
Average Diameter (in)	3.059
Height to Diameter Ratio	1.8

Initial MC Taken: Before Test, From Trimmings

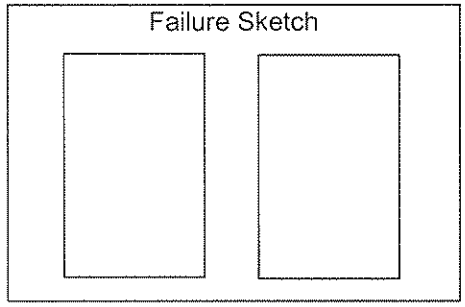
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1868.76 g
Average height of cut cylinder 7.199"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 44.5'-46.5' | Lab ID: 639A
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 44.8' - 45.3'

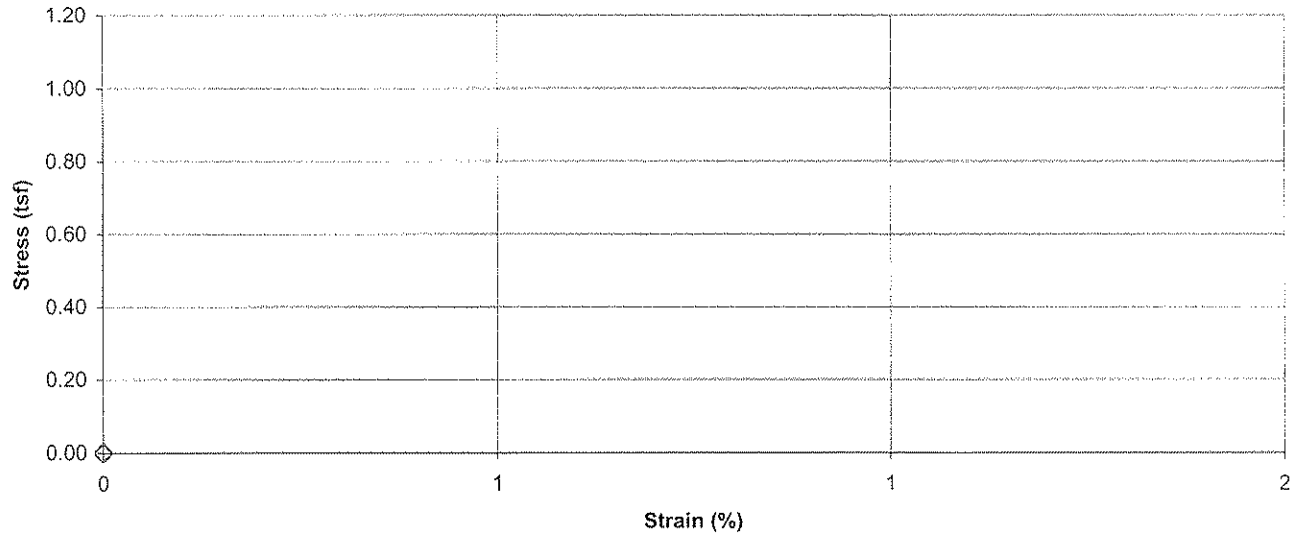
Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A
Date Extruded	03/10/2009
Date Tested	N/A
Initial Wet Density (pcf)	
Initial Dry Density (pcf)	N/A
Initial Moisture Content, 40°C (%)	19.1
Initial Moisture Content, 200°C (%)	39.7
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	N/A
Average Diameter (in)	N/A
Height to Diameter Ratio	N/A

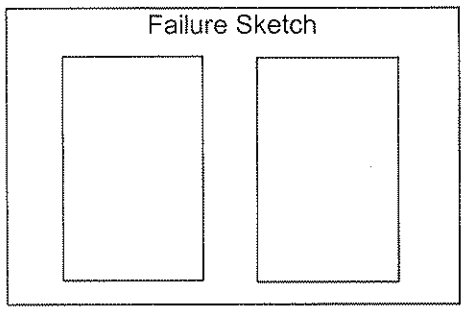
Initial MC Taken: Before Test, From Center of Specimen
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: **Saved in bag**
Weight of cylinder and material 1920.54 g
Average height of cut cylinder 7.221"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-10A, 44.5'-46.5' | Lab ID: 639C
Visual Description: Silt (ML), gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 46.0' - 46.5'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/10/2009
Date Tested: N/A

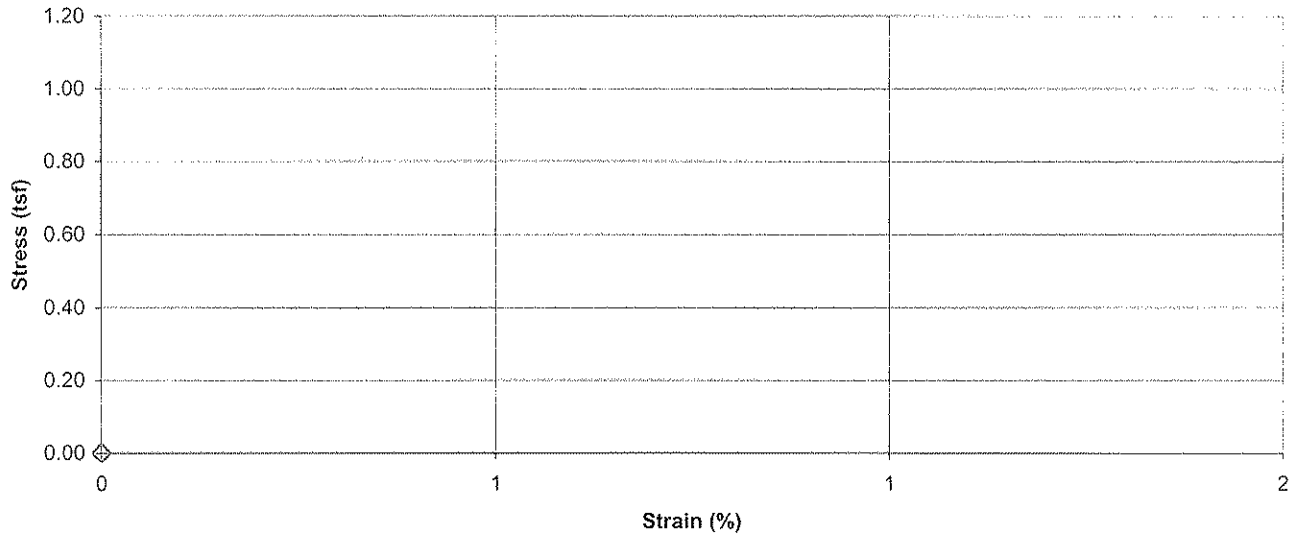
Initial Wet Density (pcf)	116.7
Initial Dry Density (pcf)	99.3
Initial Moisture Content, 40°C (%)	17.5
Initial Moisture Content, 200°C (%)	39.1
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.076
Average Diameter (in)	2.878
Height to Diameter Ratio	2.1

Initial MC Taken: Before Test, From Trimmings

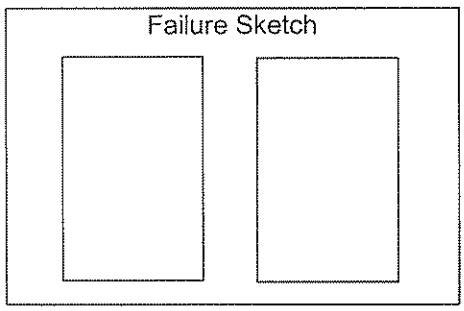
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1955.27 g
Average height of cut cylinder 7.1397"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

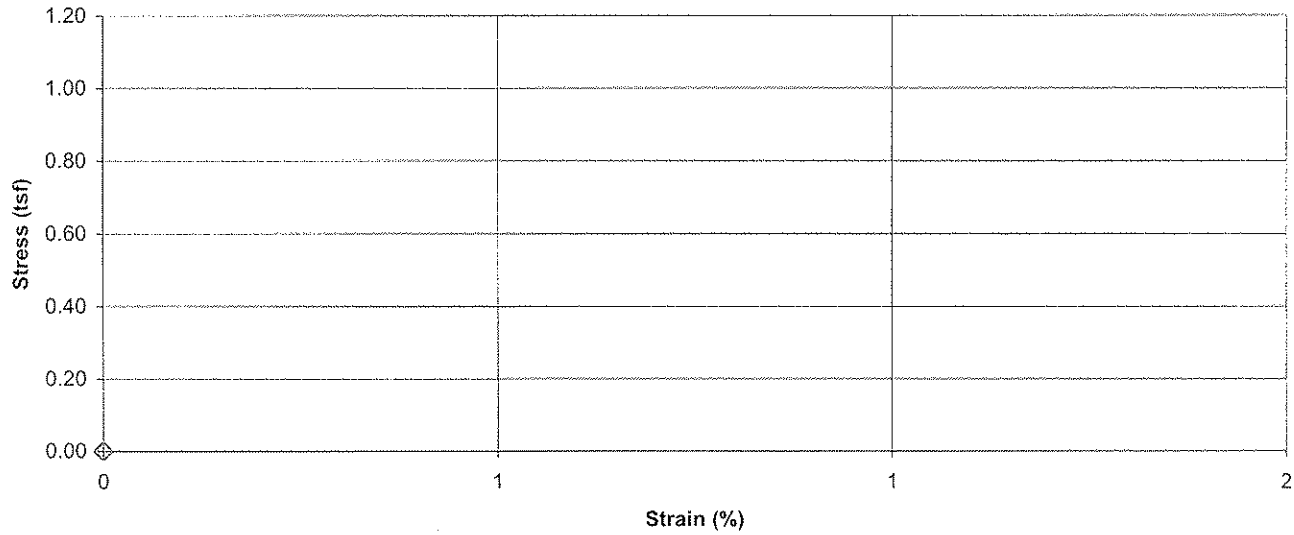
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-11, 5.0'-7.0' | Lab ID: 351A
Visual Description: Silt (ML), (gypsum), gray, moist, firm
Recovered: 1.3'
Test Interval: 5.2' - 5.5'

Specimen Type: Undisturbed

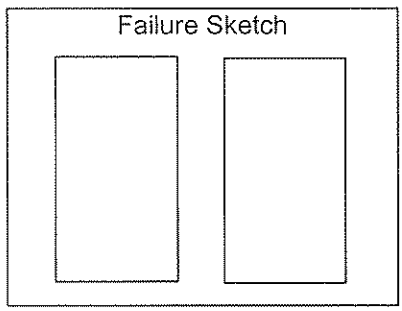
LL	N/A		
PL	N/A	Date Extruded	02/25/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	101.8		
Initial Dry Density (pcf)	88.1		
Initial Moisture Content (%)	15.6	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	3.523	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.856	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	1.2	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C
5.5' - 5.8' saved in a bag

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-11, 5.0'-7.0' | Lab ID: 351B
Visual Description: Silt (ML), (gypsum), gray, moist, soft
Recovered: 1.3'
Test Interval: 5.8' - 6.3'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

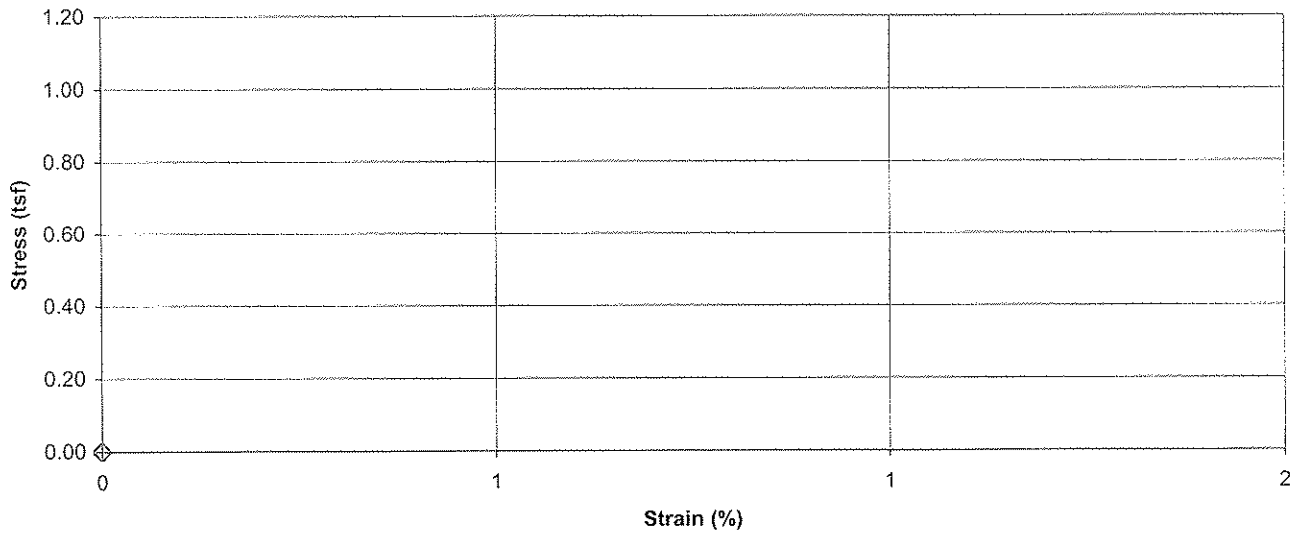
Date Extruded: 02/25/2009
Date Tested: N/A

Initial Wet Density (pcf)	100.6
Initial Dry Density (pcf)	82.3
Initial Moisture Content (%)	22.2
At Test Moisture Content (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.177
Average Diameter (in)	2.865
Height to Diameter Ratio	2.2

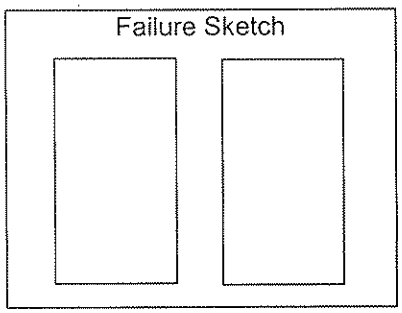
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C
Weight of cylinder and sample - 1767.11 g
Average height of cylinder - 7.1055"

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

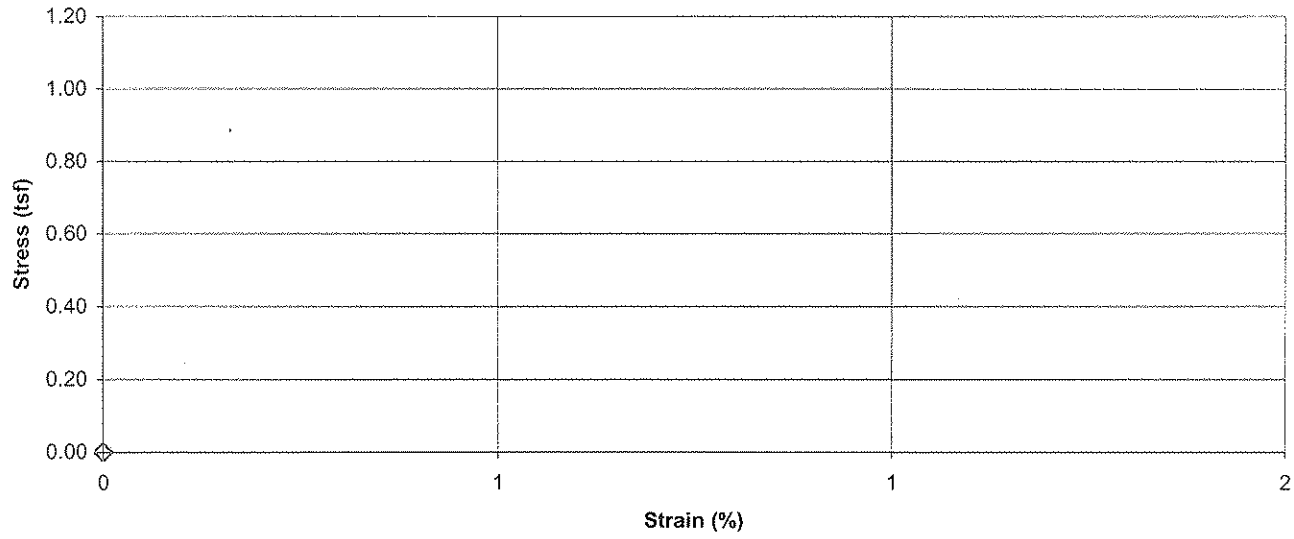
Project Name TVA Facilities Assessment - PAF Phase 2 | Project Number 171468118
Source B-11, 5.0'-7.0' | Lab ID 351C
Visual Description Silt (ML), (fly ash), gray, moist, soft
Recovered 0.6'
Test Interval 6.5' - 7.0'

Specimen Type: Undisturbed

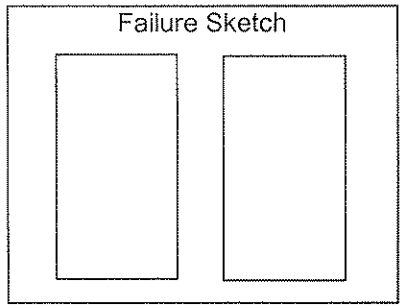
LL	N/A		
PL	N/A	Date Extruded	02/26/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	121.3		
Initial Dry Density (pcf)	98.6		
Initial Moisture Content (%)	23.0	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	Before Test, From Trimmings
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.300	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.736	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	1.9	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A
Torvane Reading (kg/cm^2) N/A

Comments Dried at 40° C.
Weight of cylinder and material 1856.50 g.
Average height of cut cylinder 7.2253"

Reviewed By KLG

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

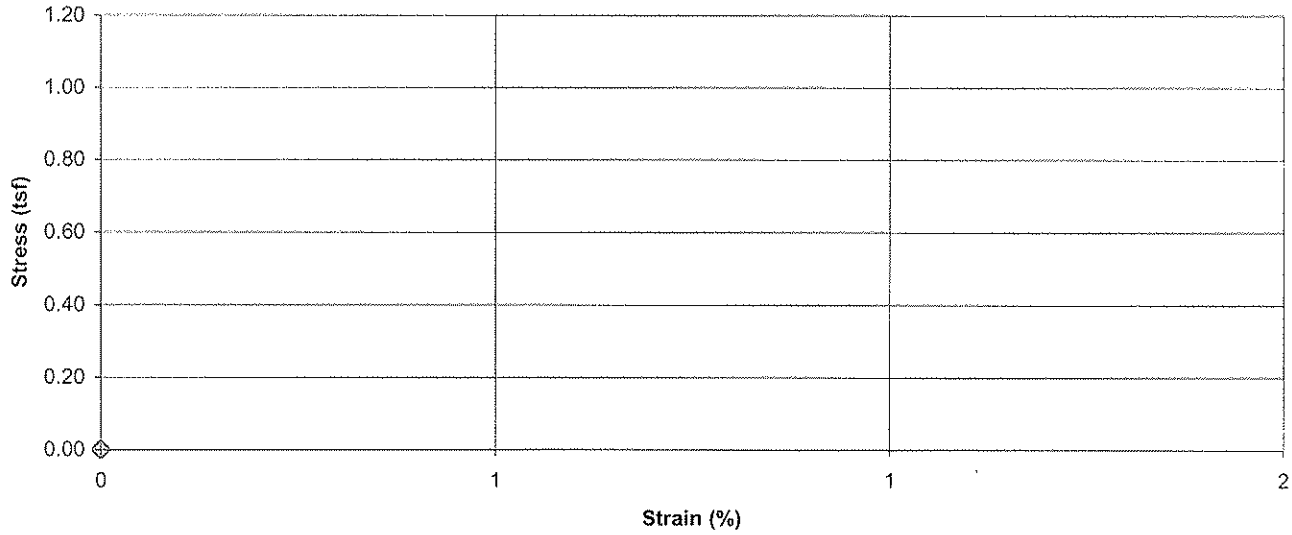
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-11, 10.0'-12.0' | Lab ID: 352A
Visual Description: Silt (ML), (fly ash), gray to dark gray, moist, soft
Recovered: 0.6'
Test Interval: 10.3' - 10.8'

Specimen Type: Undisturbed

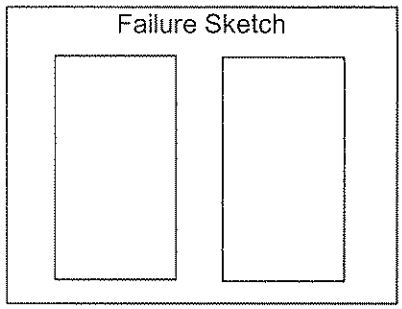
LL	N/A		
PL	N/A	Date Extruded	02/26/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	108.7		
Initial Dry Density (pcf)	86.9		
Initial Moisture Content (%)	25.1	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	Before Test, From Trimmings
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.347	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	3.074	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	1.7	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.
Weight of cylinder and material - 1868.98 g.
Average height of cut cylinder - 7.1595"

Reviewed By: KDG

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

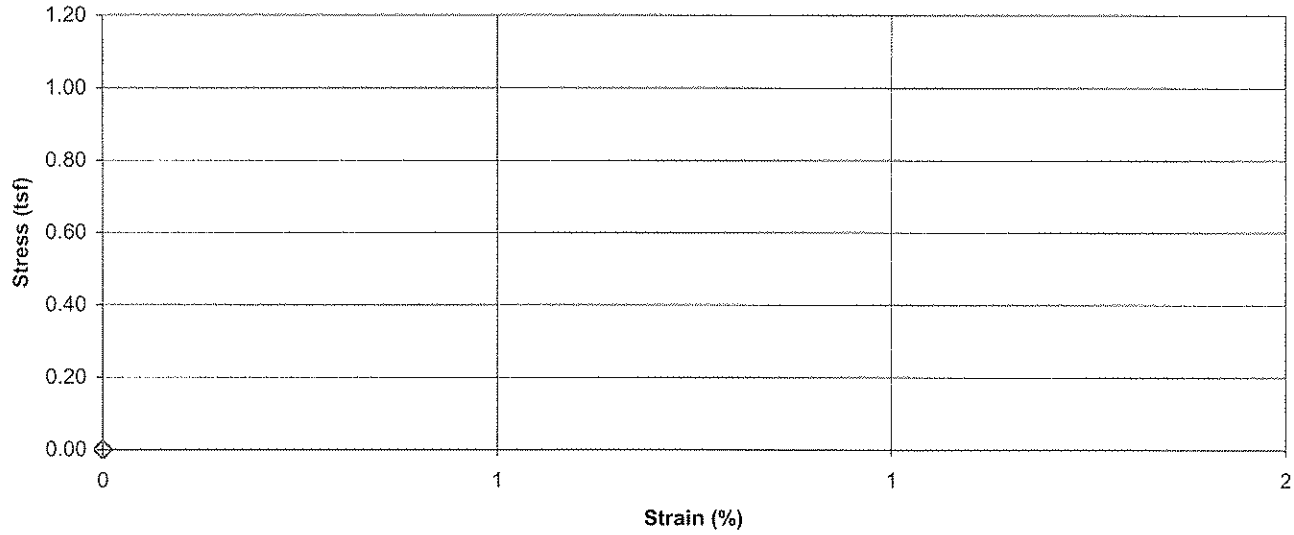
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-11, 10.0'-12.0' | Lab ID: 352B
Visual Description: Silt (ML), (fly ash), gray to dark gray, moist, soft
Recovered: 0.6'
Test Interval: 10.9' - 11.4'

Specimen Type: Undisturbed

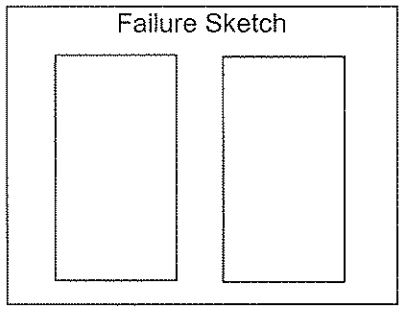
LL	N/A		
PL	N/A	Date Extruded	02/26/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	114.2		
Initial Dry Density (pcf)	92.1		
Initial Moisture Content (%)	24.0	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	Before Test, From Trimmings
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.054	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.866	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.
Weight of cylinder and material - 1942.27 g.
Average height of cut cylinder - 7.1705"

Reviewed By: KDG

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-11, 10.0'-12.0' | Lab ID: 352C
Visual Description: Silt (ML), (fly ash), gray to dark gray, moist, soft

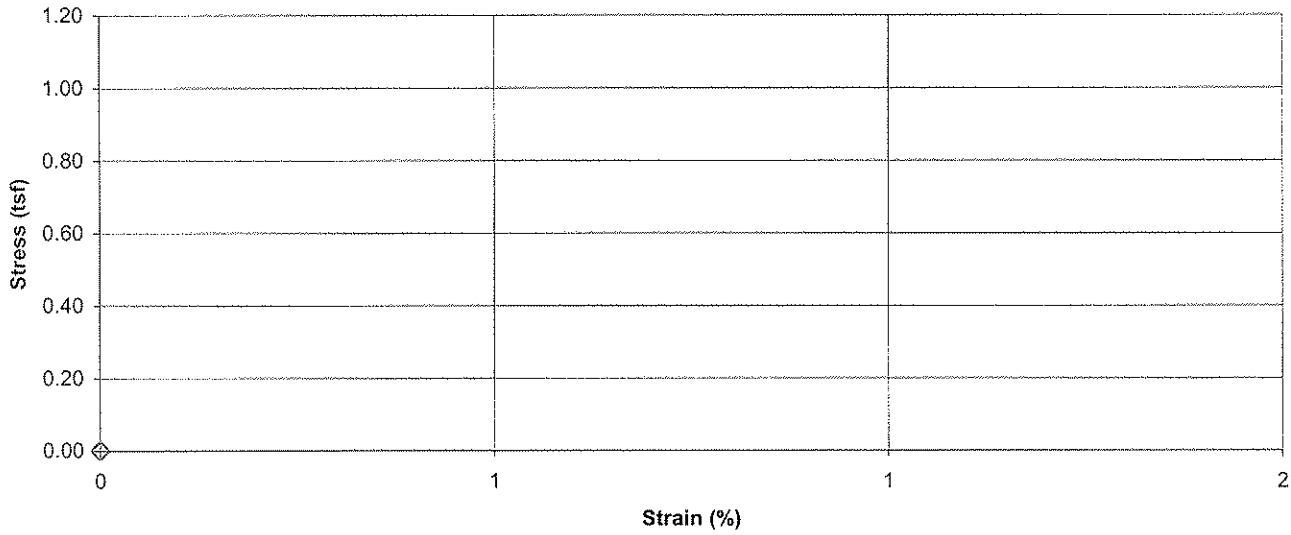
Recovered: 0.6'
Test Interval: 11.5' - 12.0'

Specimen Type: Undisturbed

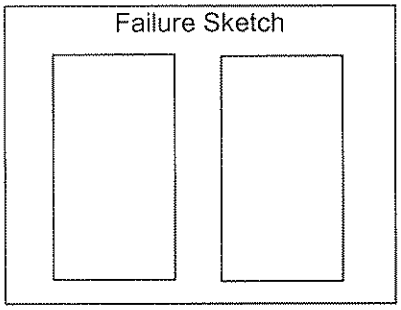
LL	N/A		
PL	N/A	Date Extruded	02/26/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	112.3		
Initial Dry Density (pcf)	90.9		
Initial Moisture Content (%)	23.6	Initial MC Taken	Before Test, From Trimmings
At Test Moisture Content (%)	N/A	At Test MC Taken	Before Test, From Trimmings
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.018	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.861	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dried at 40° C.
Weight of cylinder and material - 1887.56 g.
Average height of cut cylinder - 7.233"

Reviewed By: TLK

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-13A, 5.0'-7.0' | Lab ID: 641A
Visual Description: Silt (ML), gray to dark gray, moist, firm, gypsum with layers of fly ash
Recovered: 0.6'
Test Interval: 5.2' - 5.7'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 03/10/2009
Date Tested: N/A

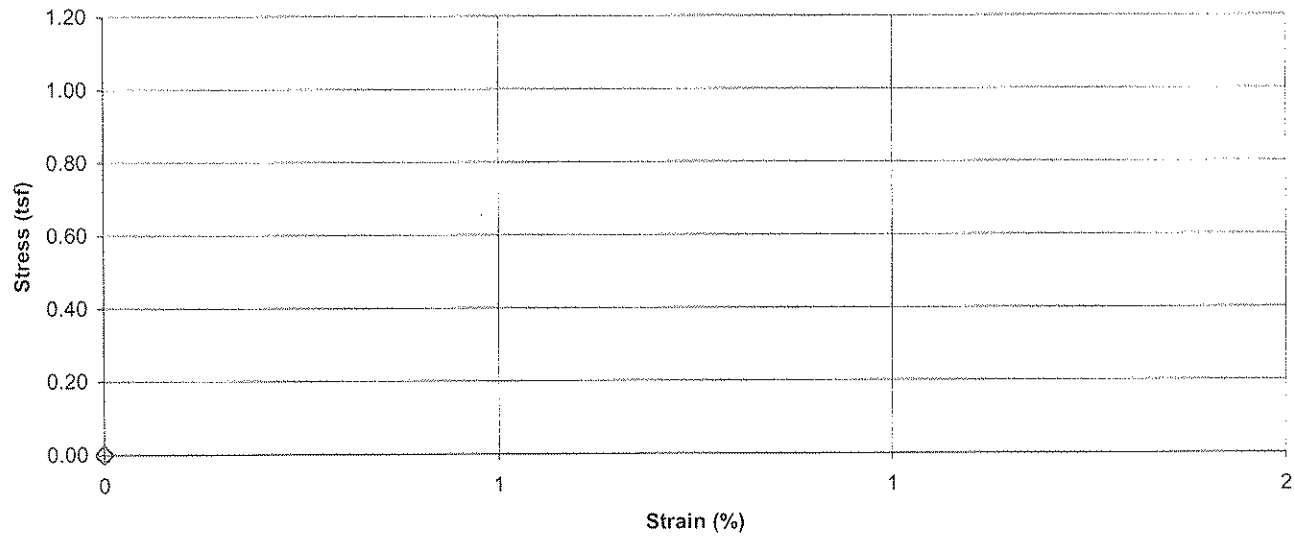
Initial Wet Density (pcf)	102.5
Initial Dry Density (pcf)	89.3
Initial Moisture Content, 40°C (%)	14.8
Initial Moisture Content, 200°C (%)	32.3
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.666
Average Diameter (in)	2.861
Height to Diameter Ratio	2.0

Initial MC Taken: Before Test, From Trimmings

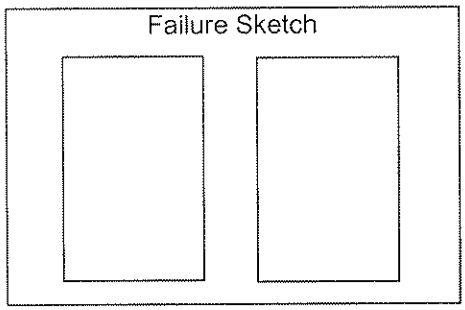
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1757.7 g
Average height of cut cylinder 7.152"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-13A, 5.0'-7.0' | Lab ID: 641B
Visual Description: Silt (ML), light gray, moist, soft, gypsum
Recovered: 0.6'
Test Interval: 5.8' - 6.4'

Specimen Type: Undisturbed

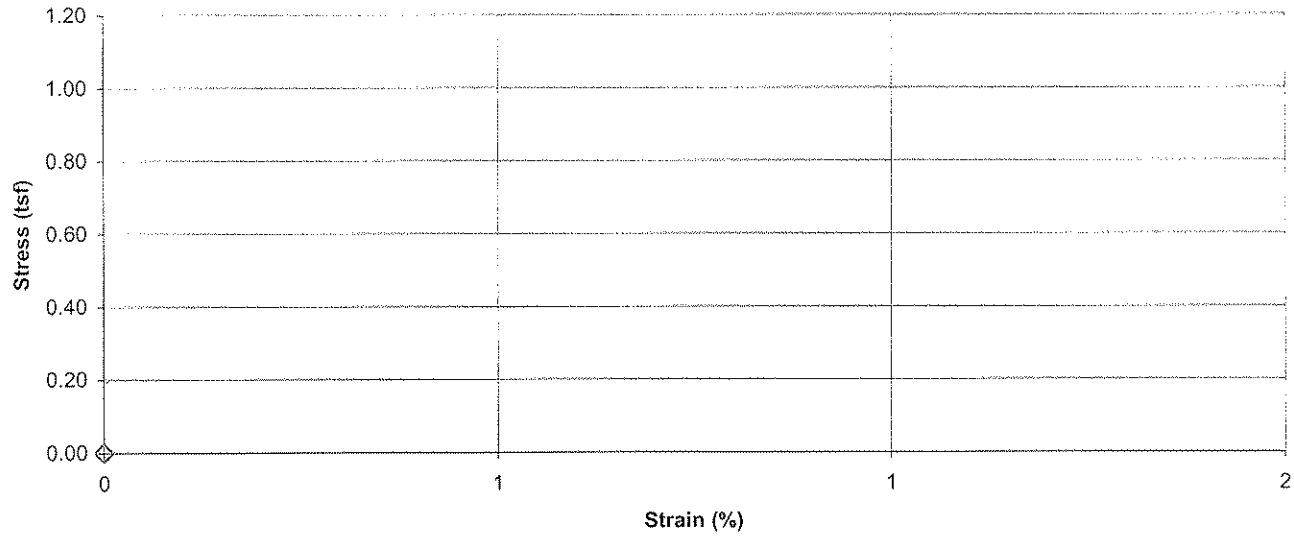
LL	N/A
PL	N/A
PI	N/A
Date Extruded	03/10/2009
Date Tested	N/A

Initial Wet Density (pcf)	
Initial Dry Density (pcf)	N/A
Initial Moisture Content, 40°C (%)	20.2
Initial Moisture Content, 200°C (%)	43.5
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	N/A
Average Diameter (in)	N/A
Height to Diameter Ratio	N/A

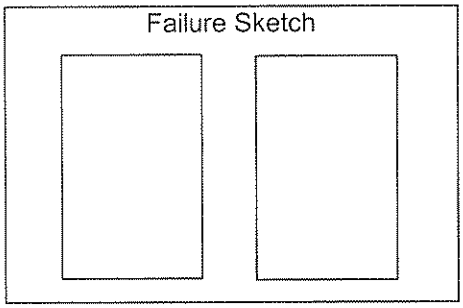
Initial MC Taken: Before Test, From Center of Specimen
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Saved in a bag
Weight of cylinder and material 1724.35 g
Average height of cut cylinder 7.158"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-13A, 5.0'-7.0' | Lab ID: 641C
Visual Description: Silt (ML), gray, moist, very soft, gypsum

Recovered: 0.6'
Test Interval: 6.4' - 7.0'

Specimen Type: Undisturbed

LL: N/A
PL: N/A
PI: N/A

Date Extruded: 03/10/2009
Date Tested: N/A

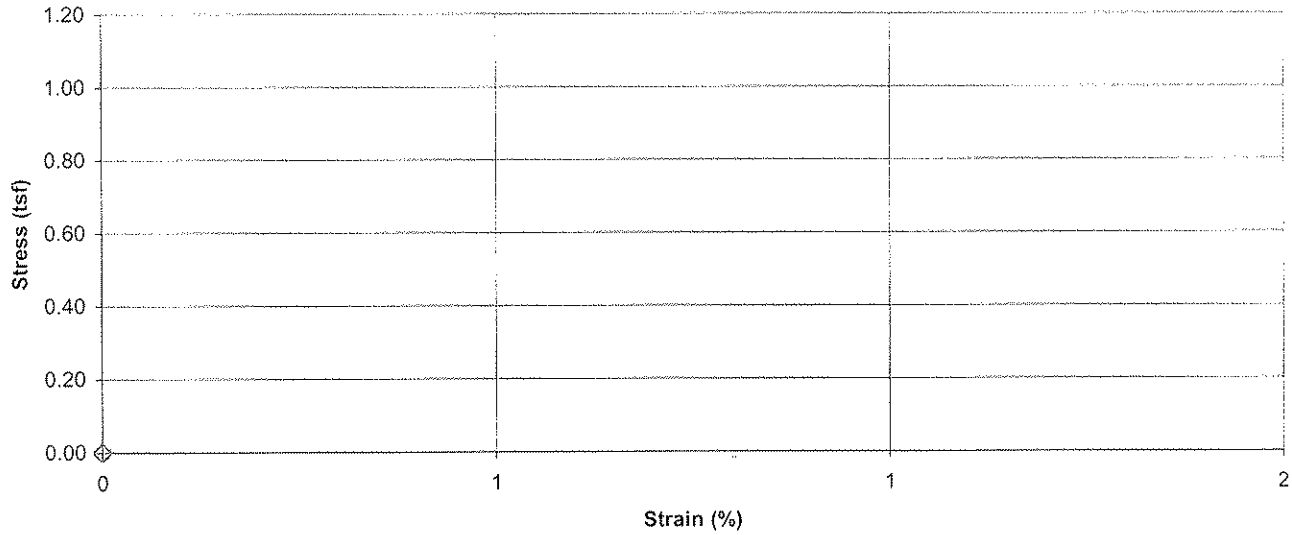
Initial Wet Density (pcf)	
Initial Dry Density (pcf)	N/A
Initial Moisture Content, 40°C (%)	17.7
Initial Moisture Content, 200°C (%)	31.2
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	N/A
Average Diameter (in)	N/A
Height to Diameter Ratio	N/A

Initial MC Taken: Before Test, From Center of Specimen

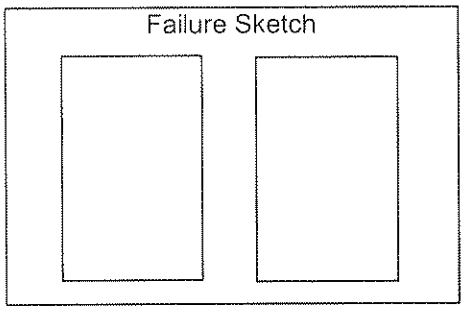
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: **Saved in bag**
Weight of cylinder and material 1651.2 g
Average height of cut cylinder 7.1645"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

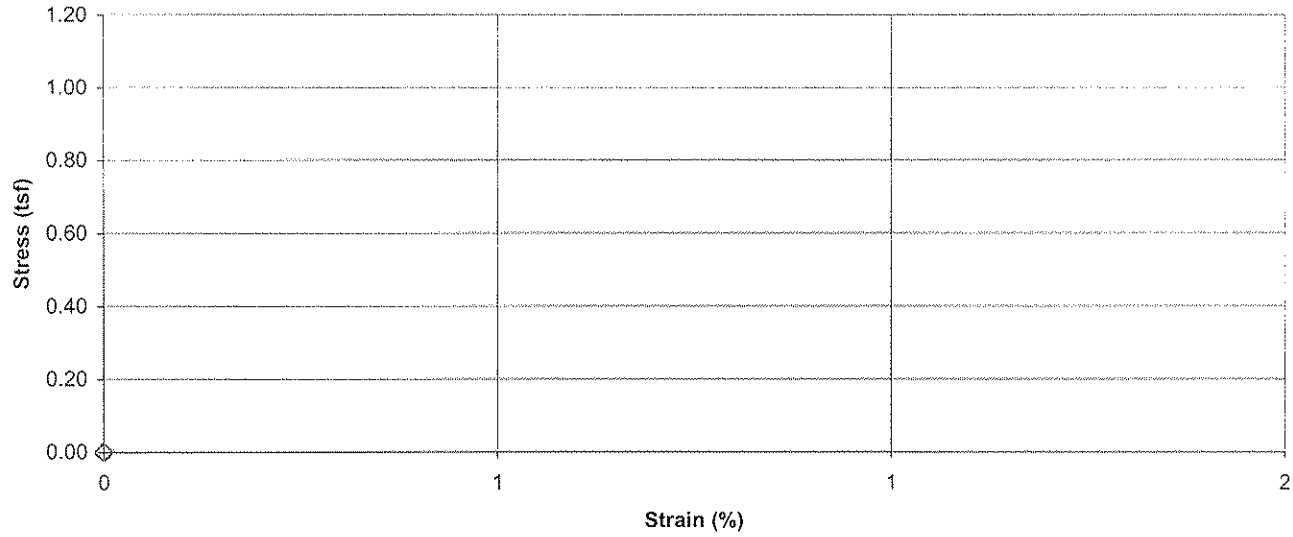
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-13A, 10.0'-12.0' | Lab ID: 642A
Visual Description: Silt (ML), light gray, moist, very soft, gypsum with pockets of fly ash
Recovered: 0.6'
Test Interval: 10.3' - 10.8'

Specimen Type: Undisturbed

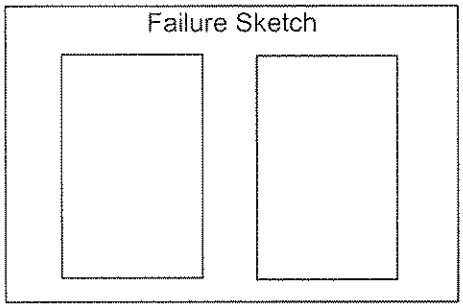
LL	N/A		
PL	N/A	Date Extruded	03/09/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	116.1		
Initial Dry Density (pcf)	95.2		
Initial Moisture Content, 40°C (%)	22.0	Initial MC Taken	Before Test, From Trimmings
Initial Moisture Content, 200°C (%)	42.7		
At Test Moisture Content, 40°C (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.042	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.872	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1901.10 g
Average height of cut cylinder 7.2870"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-13A, 10.0'-12.0' | Lab ID: 642B
Visual Description: Silt (ML), gray to dark gray, moist, firm, fly ash with pockets of gypsum
Recovered: 0.6'
Test Interval: 11.0' - 11.5'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

Date Extruded: 06/10/2009
Date Tested: N/A

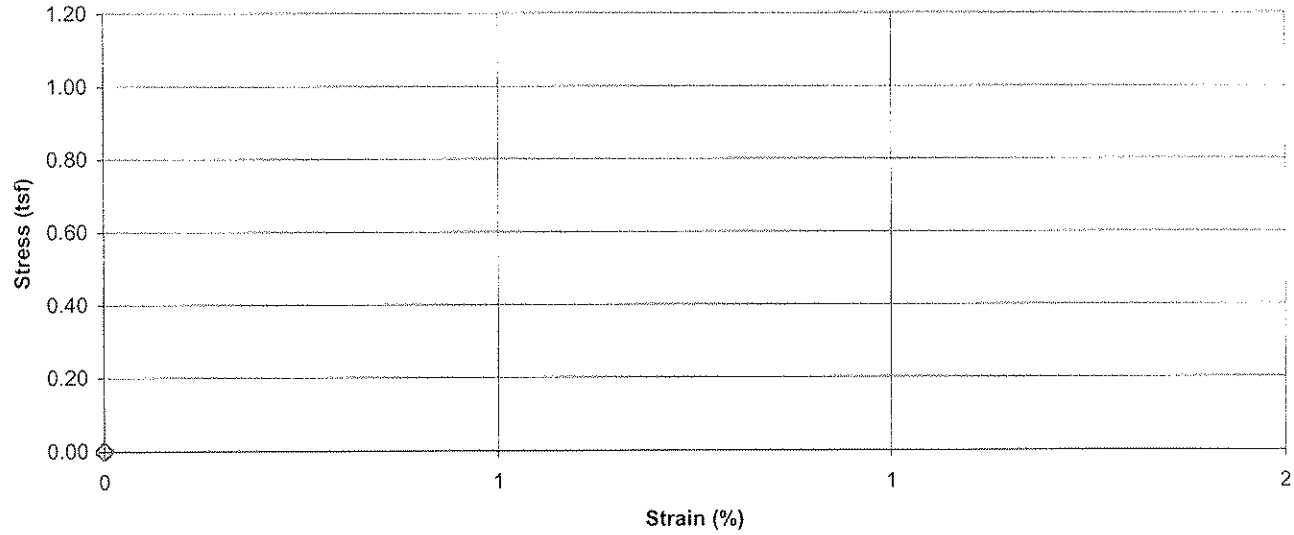
Initial Wet Density (pcf)	116.3
Initial Dry Density (pcf)	92.7
Initial Moisture Content, 40°C (%)	25.4
Initial Moisture Content, 200°C (%)	48.8
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.125
Average Diameter (in)	2.873
Height to Diameter Ratio	2.1

Initial MC Taken: Before Test, From Trimmings

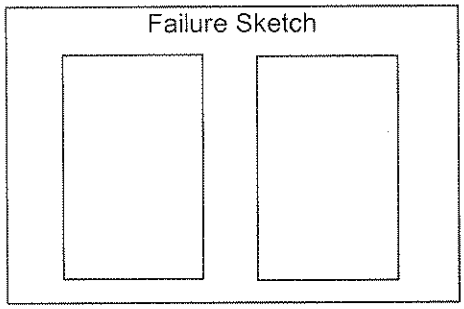
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A
Comments: Dry unit weight determined using 40° C mc

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-13A, 15.0'-17.0' | Lab ID: 643A
Visual Description: Silt (ML), dark gray, moist, soft, fly ash
Recovered: 0.6'
Test Interval: 15.3' - 15.8'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

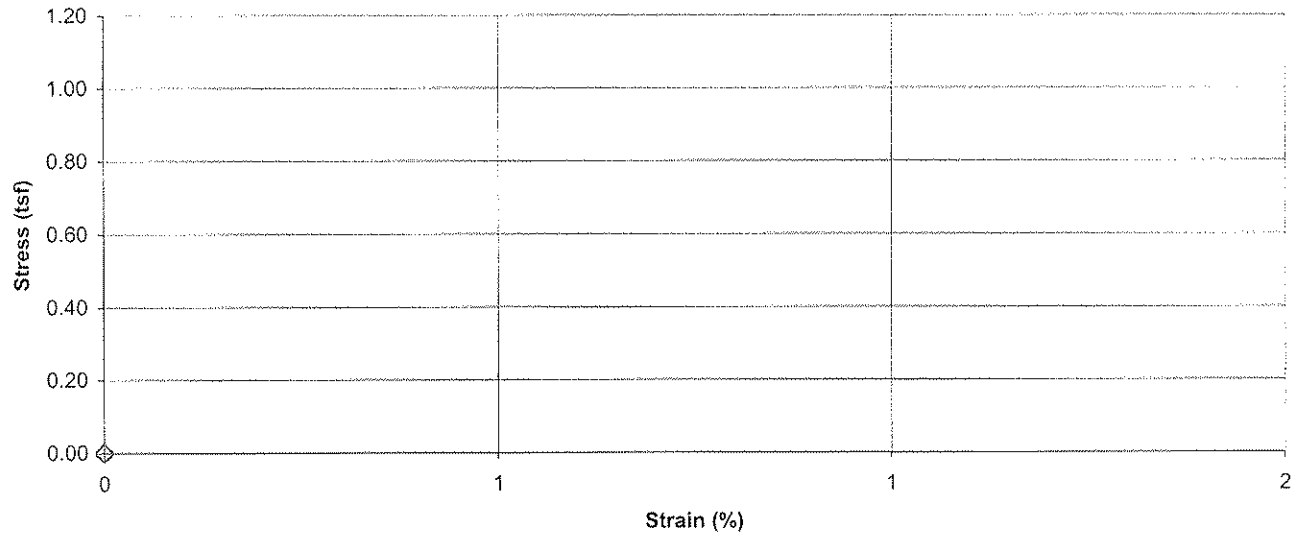
Date Extruded: 03/10/2009
Date Tested: N/A

Initial Wet Density (pcf)	116.1
Initial Dry Density (pcf)	96.3
Initial Moisture Content, 40°C (%)	20.6
Initial Moisture Content, 200°C (%)	41.1
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.168
Average Diameter (in)	2.950
Height to Diameter Ratio	2.1

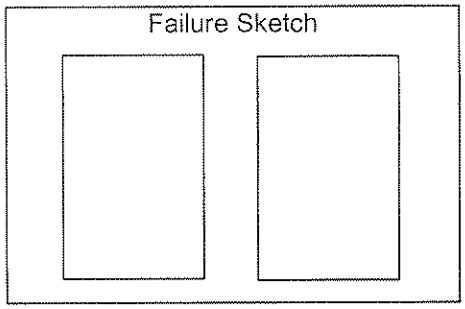
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1931.93 g
Average height of cut cylinder 7.221"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

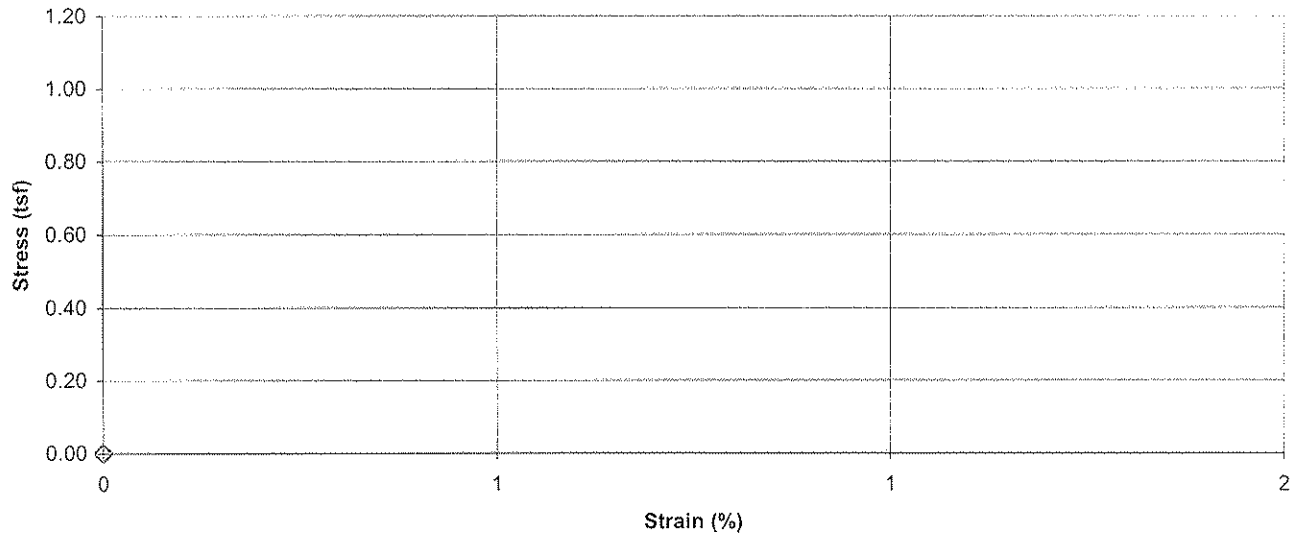
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-13A, 15.0'-17.0' | Lab ID: 643B
Visual Description: Silt (ML), gray, moist, soft, gypsum
Recovered: 0.6'
Test Interval: 15.8' - 16.3'
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 03/10/2009
Date Tested: N/A

Initial Wet Density (pcf)	113.6
Initial Dry Density (pcf)	91.9
Initial Moisture Content, 40°C (%)	23.5
Initial Moisture Content, 200°C (%)	46.5
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.084
Average Diameter (in)	2.868
Height to Diameter Ratio	2.1

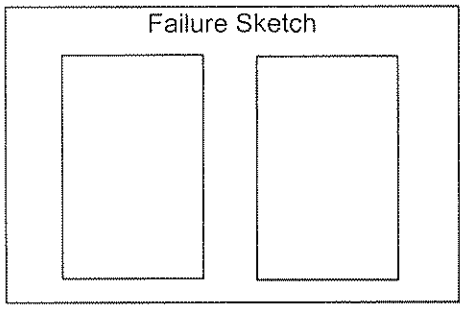
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1938.16 g
Average height of cut cylinder 7.215"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

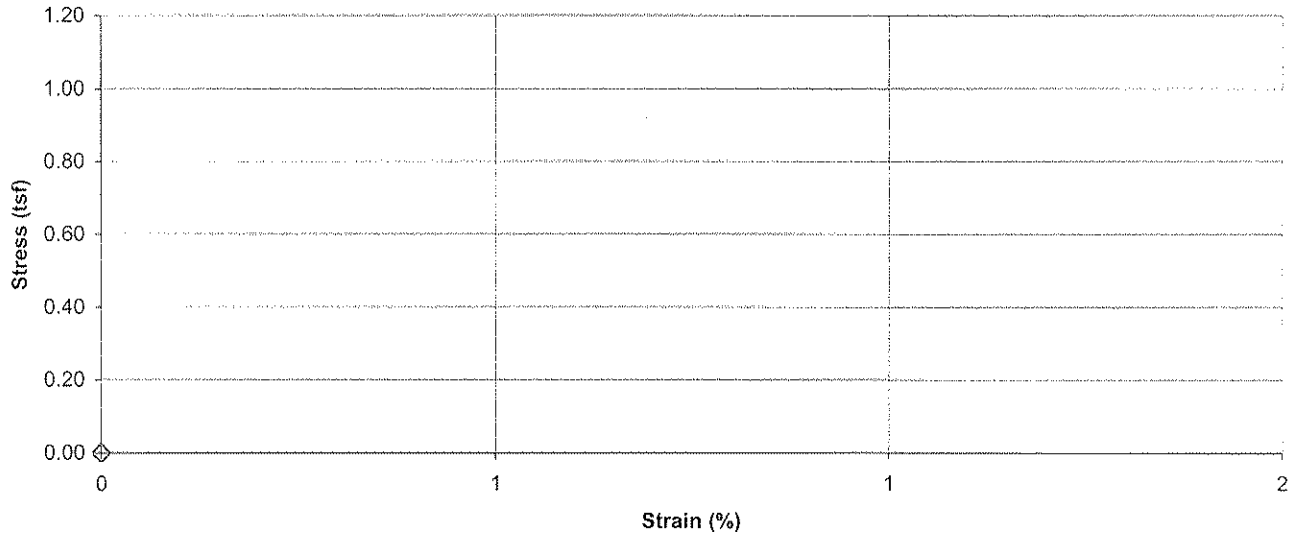
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-13A, 15.0'-17.0' | Lab ID: 643C
Visual Description: Silt (ML), gray to dark gray, moist, firm, fly ash with pockets of gypsum
Recovered: 0.6'
Test Interval: 16.5' - 17.0'

Specimen Type: Undisturbed

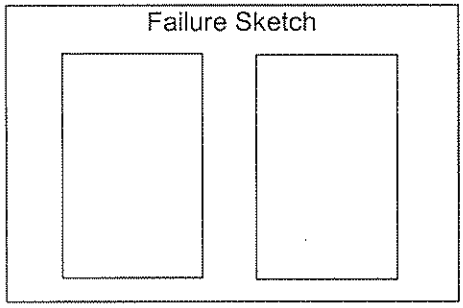
LL	N/A		
PL	N/A	Date Extruded	03/10/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	113.2		
Initial Dry Density (pcf)	90.8		
Initial Moisture Content, 40°C (%)	24.7	Initial MC Taken	Before Test, From Trimmings
Initial Moisture Content, 200°C (%)	48.7		
At Test Moisture Content, 40°C (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.086	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.879	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1914.06 g
Average height of cut cylinder 7.1415"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

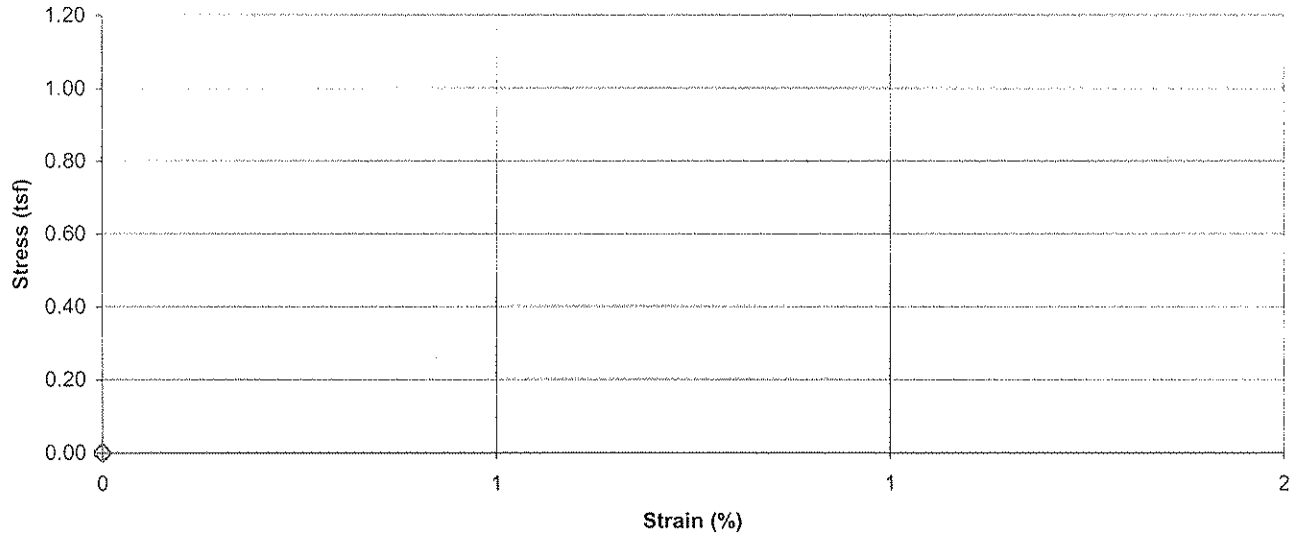
Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-13A, 23.0'-25.0' | Lab ID: 645A
Visual Description: Silt (ML), dark gray, moist, soft, fly ash
Recovered: 0.5'
Test Interval: 23.0' - 23.5'

Specimen Type: Undisturbed

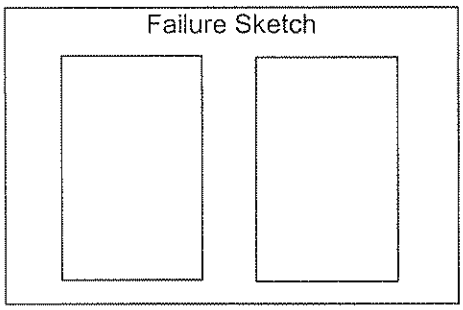
LL	N/A		
PL	N/A	Date Extruded	03/10/2009
PI	N/A	Date Tested	N/A

Initial Wet Density (pcf)	143.3		
Initial Dry Density (pcf)	116.8		
Initial Moisture Content, 40°C (%)	22.7	Initial MC Taken	Before Test, From Trimmings
Initial Moisture Content, 200°C (%)	39.9		
At Test Moisture Content, 40°C (%)	N/A	At Test MC Taken	N/A
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	4.786	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.881	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	1.7	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1692.53 g
Average height of cut cylinder 6.284"

Reviewed By: _____

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project Number: 171468118
Source: B-13A, 23.0'-25.0' | Lab ID: 645B
Visual Description: Lean Clay with Sand (CL), gray brown, moist, firm
Recovered: 0.6'
Test Interval: 23.5' - 24.0'

Specimen Type: Undisturbed

LL	N/A
PL	N/A
PI	N/A

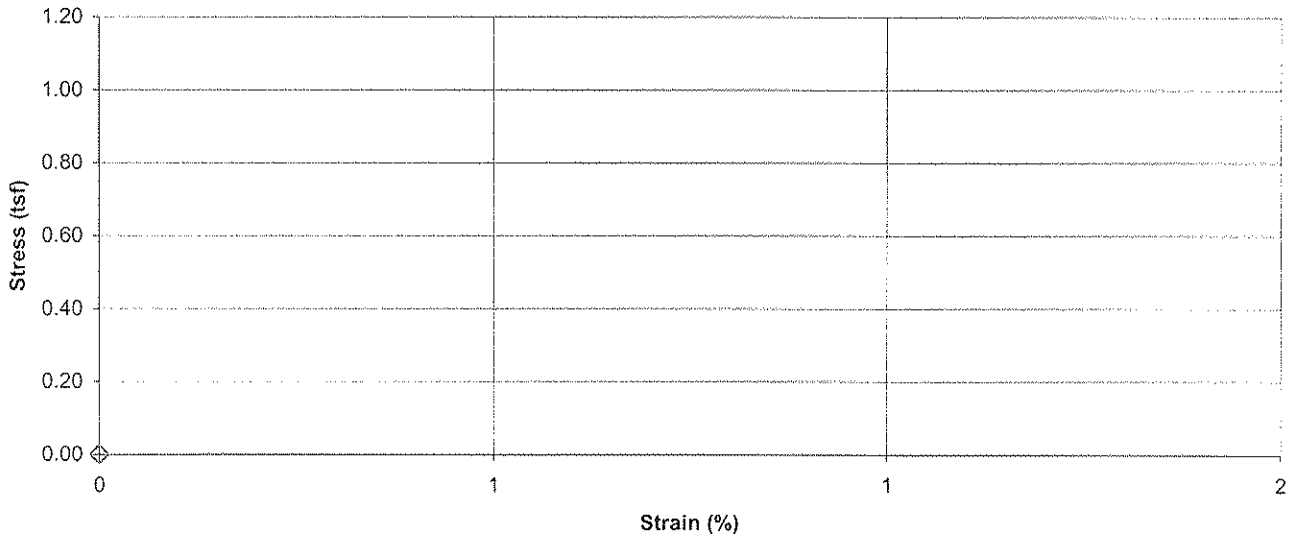
Date Extruded: 03/10/2009
Date Tested: N/A

Initial Wet Density (pcf)	131.3
Initial Dry Density (pcf)	110.5
Initial Moisture Content, 40°C (%)	18.9
Initial Moisture Content, 200°C (%)	24.8
At Test Moisture Content, 40°C (%)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.376
Average Diameter (in)	2.899
Height to Diameter Ratio	1.9

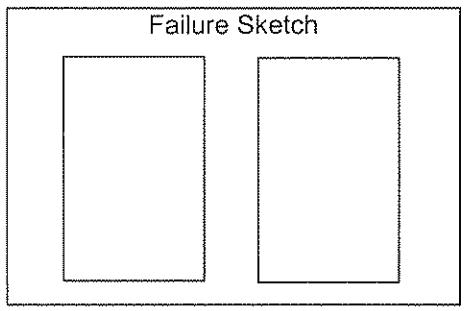
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

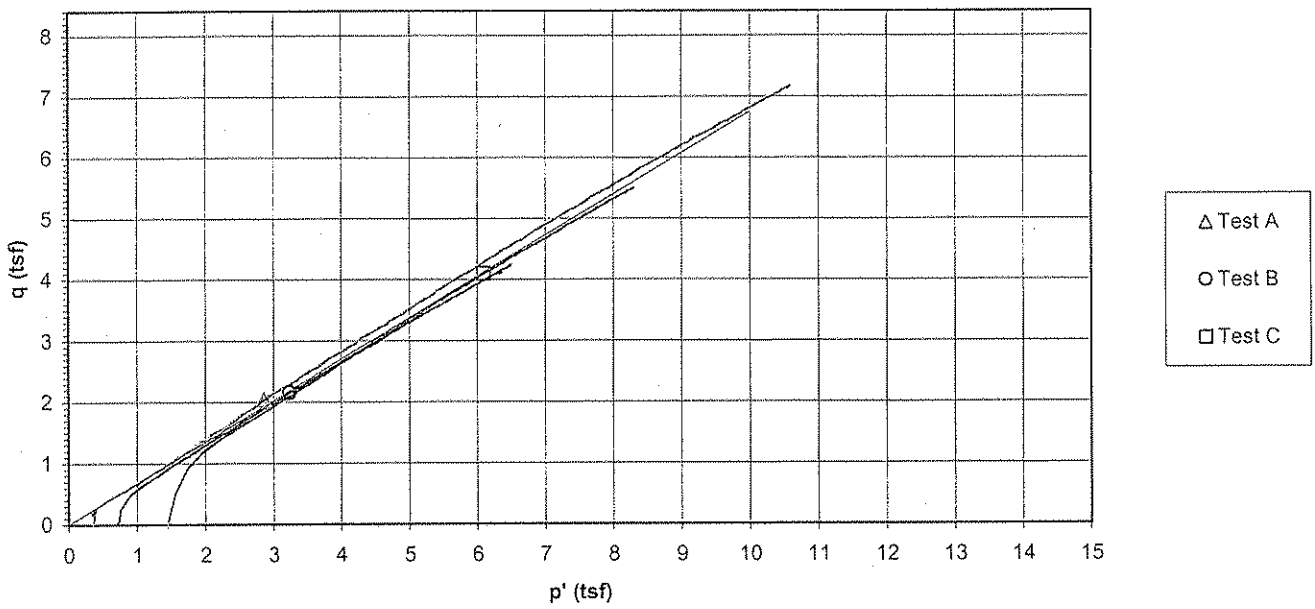
Comments: Dry unit weight determined using 40° C mc
Weight of cylinder and material 1949.32 g
Average height of cut cylinder 6.475"

Reviewed By: _____

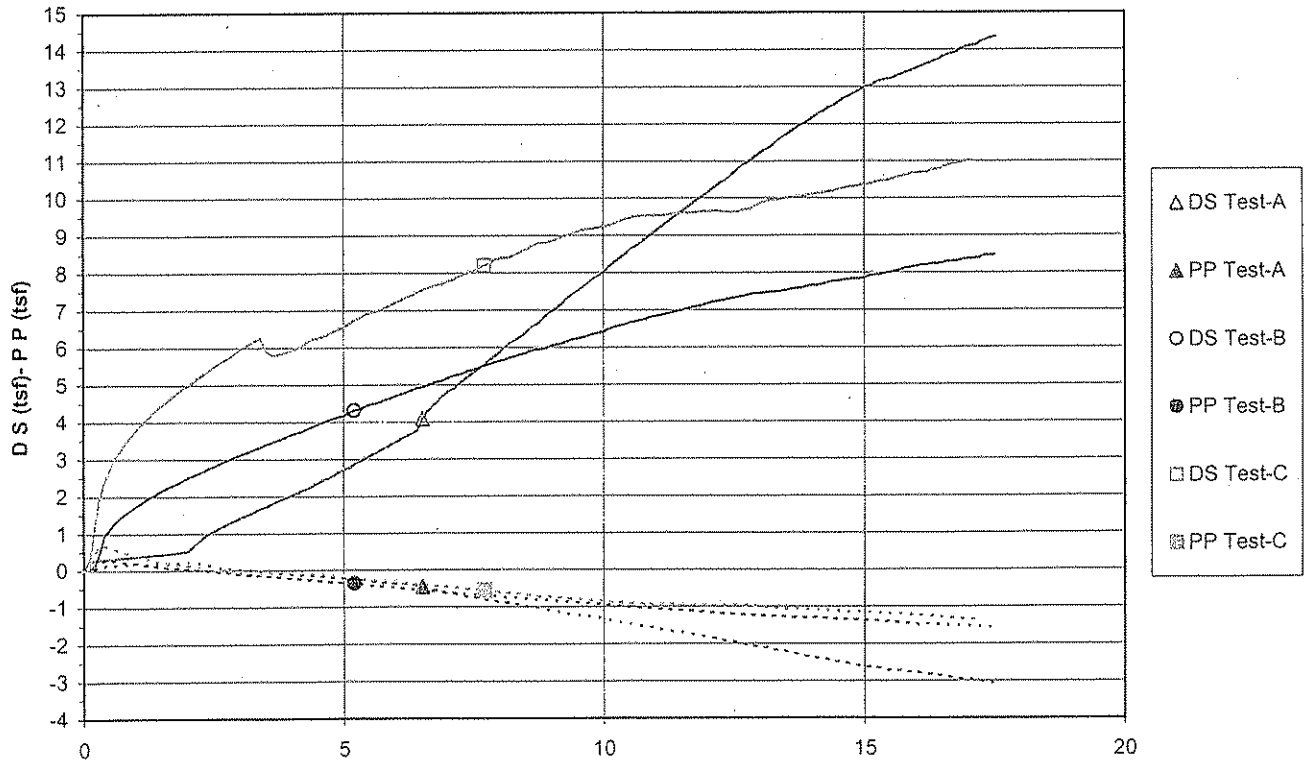
Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Project	TVA Facililities Assessment - PAF Phase 2	Project No.	171468118
Sample ID	B-1, 9.7' - 10.2', 10.4' - 10.9', 11.0' - 11.5'	Test Number	346
Failure Criterion:	Maximum Effective Principal Stress Ratio	ϕ' = 42.6 deg.	c' = 0.00 tsf

p' vs. q Plot



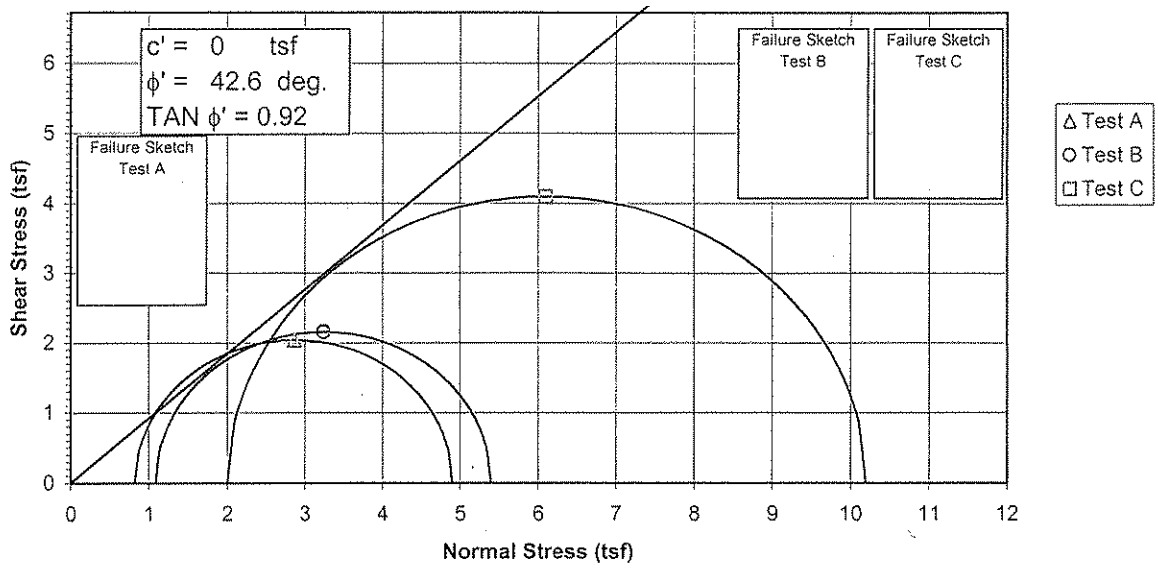
Deviator Stress and Induced Pore Pressure vs. Axial Strain



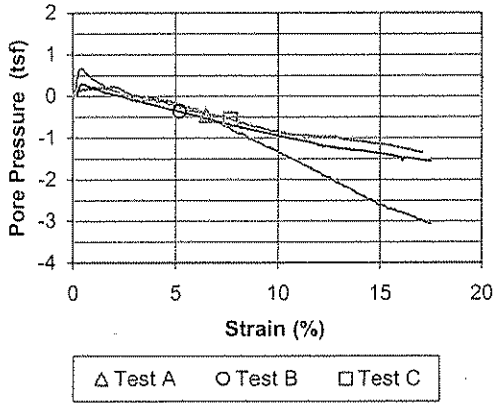
EM 1110-2-1906
Appendix X
30 Nov. 70

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	24.0	25.7	25.7
	Dry Density PCF	γ_{d_o}	90.1	89.4	91.3
	Saturation %	S_o	82.0	86.3	90.5
	Void Ratio	e_o	0.733	0.745	0.709
After Shear	Water content %	W_f	22.7	24.6	23.2
	Dry Density PCF	γ_{d_f}	99.5	96.6	98.8
	Saturation %	S_f	100.0	100.0	100.0
	Void Ratio	e_f	0.568	0.616	0.579
	Final Back Pressure TSF	u_c	6.12	5.76	5.04
Minor Principal Stress TSF @ failure		$\sigma_3'f$	0.83	1.09	2.01
Maximum Deviator Stress (tsf) @ failure		$(\sigma_1'-\sigma_3')_{max}$	4.08	4.31	8.20
Time to (σ1'-σ3')max min.		t_f	418.3	357.4	471.4
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	2.865
Initial Height, in.		H_o	6.138	6.104	6.085

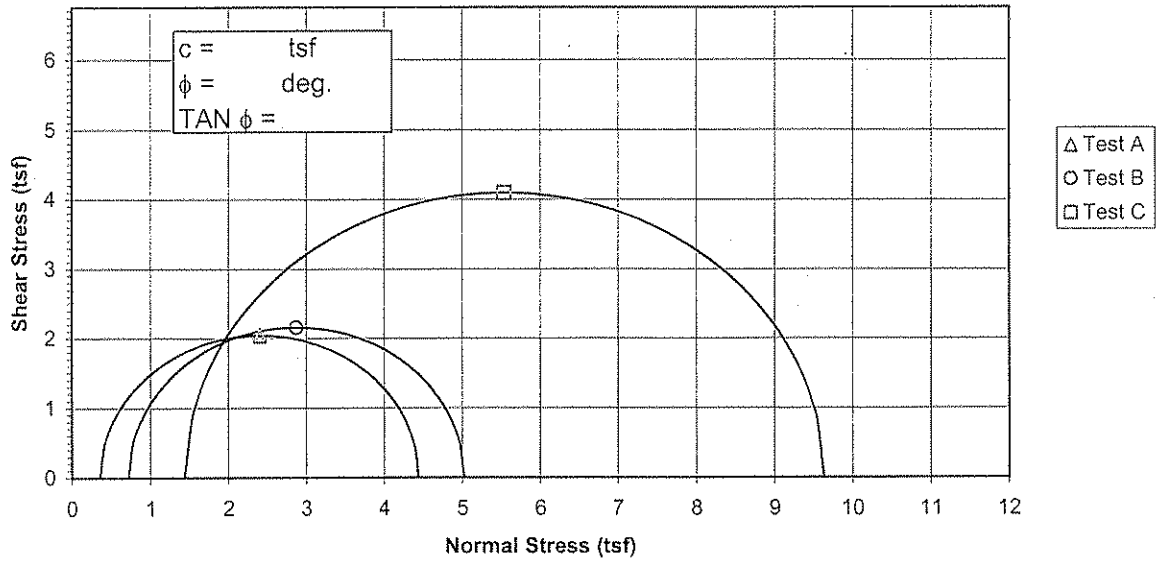
Controlled - Strain Test							
Description of Specimens	Silt (ML), gray to dark gray, moist, soft						
LL	NP	PL	NP	PI	NP	Gs	2.5
Remarks:							

Type of Specimen	Undisturbed		Type of test R
Project	TVA Facililities Assessment - PAF Phase 2		
Boring No.	B-1	Sample No.	346
Depth Elev.	9.5' - 11.5'		
Laboratory	Stantec	Date	3-16-09
TRIAXIAL COMPRESSION TEST REPORT			

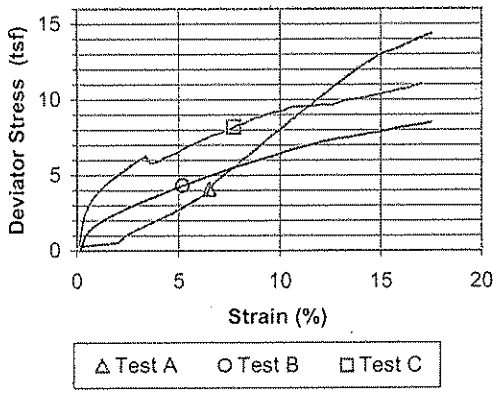
EM 1110-2-1906
Appendix X
30 Nov. 70

Failure Criterion: Maximum Effective Principal Stress Ratio

Total Strength Envelope



Deviator Stress vs. Strain



Specimen No.			A	B	C
Initial Data	Water content %	W_o	24.0	25.7	25.7
	Dry Density PCF	γ_{d_o}	90.1	89.4	91.3
	Saturation %	S_o	82.0	86.3	90.5
	Void Ratio	e_o	0.733	0.745	0.709
After Shear	Water content %	W_f	22.7	24.6	23.2
	Dry Density PCF	γ_{d_f}	99.5	96.6	98.8
	Saturation %	S_f	100.0	100.0	100.0
	Void Ratio	e_f	0.568	0.616	0.579
	Final Back Pressure TSF	u_c	6.12	5.76	5.04
Minor Principal Stress TSF		σ_3	0.36	0.72	1.44
Maximum Deviator Stress (tsf) @ failure		$(\sigma_1-\sigma_3)_{max}$	4.08	4.31	8.20
Time to $(\sigma_1-\sigma_3)_{Max.}$ min.		t_f	418.3	357.4	471.4
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	2.865
Initial Height, in.		H_o	6.138	6.104	6.085

Controlled - Strain Test					
Description of Specimens	Silt (ML), gray to dark gray, moist, soft				
		Type of Specimen	Undisturbed	Type of test	$\bar{R}$
LL NP	PL NP	PI NP	Gs 2.5	Project	TVA Facililities Assessment - PAF Phase 2
Remarks:					
		Boring No.	B-1	Sample No.	346
		Depth Elev.	9.5' - 11.5'		
		Laboratory	Stantec	Date	3-16-09
		TRIAXIAL COMPRESSION TEST REPORT			

Consolidated Undrained Triaxial Test

ASTM D4767-04

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Sample Identification	B-1, 9.7' - 10.2'	Test Number	CU-346A
Visual Description	Silt (ML), gray to dark gray, moist, soft	Prepared By	KDG
Undisturbed	Source B-1, 9.5' - 11.5'	Date	3-4-2009

Specific Gravity 2.50 Assumed | Liquid Limit NP | Plastic Limit NP | Plasticity Index NP

Initial Specimen Data

Specimen Diameter (in.)		Specimen Height (in.)		Volumes (in^3)		Specimen	
Top	2.866	1	6.144	Sample	39.2767 (V_o)	Wet Weight (g)	1149.90
Middle	2.845	2	6.127	Solids	22.6285 (VS_o)	Dry Weight (g)	927.09
Bottom	2.852	3	6.139	Water	13.5958 (Vw_o)	Wet Unit Weight (pcf)	111.5
Avg.	2.8543 (D_o)	4	6.144	Voids	16.6482 (Vv_o)	Dry Unit Weight (pcf)	89.9
Area (in^2)	6.3988 (A_o)	Avg. (H_o)	6.1381	Degree of Saturation (%)	81.7 (S_o)		
Moisture Content (%)	24.0	Final Trimmings		Void Ratio	0.736		

Saturation

Set Up & Saturated: Wet xx Dry ____ | Set up By KDG

Back Pressure Saturated to: 85 (psi) | Final Pore Pressure Parameter B 0.97 | Date 3-4-09

Panel Board Number A

Height Readings (in.)		Back Pressure Burette		Chamber Burette			
Initial	0.2424	Initial	15.88 (in.)	Initial	8.89 (in.)	Specimen Height (in.)	6.1305 (H_s)
Final	0.25	Final	10.65 (in.)	Final	3.07 (in.)	Area (in^2) Method A	6.3829 (A_s)
Change	-0.0076 (ΔH_o)	Change	-5.23 (in.)	Change	-5.82 (in.)	Specimen Volume (in^3)	39.13 (Vs)

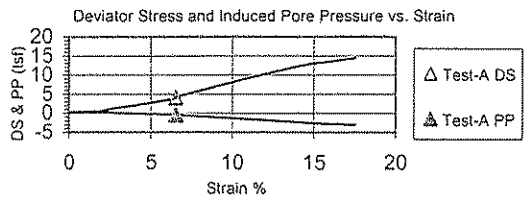
Consolidation

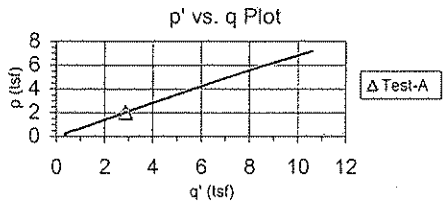
Height Readings (in.)		Back Pressure Burette Readings		Chamber Burette Readings		Pressures (psi)	
Initial	0.25	Initial	0.95 (in.)	Initial	17.69 (in.)	Chamber	90
Final	0.2922	Final	5.49 (in.)	Final	12.37 (in.)	Back	85
Change	-0.0422 (ΔH_c)	Change	-4.54 (in.)	Change	-5.32 (in.)	Lateral	5 (σ_3)
Height (in.)	6.0883 (H_c)			Volume (in^3)	35.4877 (V_c)		
Area (in^3) Method B	5.8288 (A_c)			Volume - Water (in^3)	12.8592 (VWc)	t_{50} (min.)	150
Diameter (in.)	2.7242 (D_c)			Water Content (%)	22.7		
Dry Density (pcf)	99.5			Degree of Saturation (%)	100.0 (S_c)	Void Ratio	0.568

After Test

Final Measurements		Final Moisture Content		Stresses (membrane corrected) at Failure (psi)	
Maximum Diameter	3.39 (in.)	Wet Weight (g)	1137.83	Corrected Deviator	4.08 σ_d (tsf)
Wet weight (g)	1137.83 (WWf)	Dry Weight (g)	927.09	Major Principal	4.90 $\sigma_1'_f$ (tsf)
Corrected Diameter	3.342 (in.)	Tare Weight (g)	0.00	Minor Principal	0.83 $\sigma_3'_f$ (tsf)
				Rate of Strain (% / min.)	0.018
Youngs Modulus for Membrane (psi)	200			Axial Strain at Failure (%)	6.51
Membrane Thickness (in.)	0.024			Failure Criterion:	Maximum Effective Principal Stress Ratio

Failure Sketch





Comments:

Consolidated Undrained Triaxial Test

ASTM D4767-04

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Sample Identification	B-1, 10.4' - 10.9'	Test Number	CU-346B
Visual Description	Silt (ML), gray to dark gray, moist, soft	Prepared By	KDG
Undisturbed	Source B-1, 9.5' - 11.5'	Date	3-4-2009

Specific Gravity 2.50 Assumed | Liquid Limit NP | Plastic Limit NP | Plasticity Index NP

Initial Specimen Data

Specimen Diameter (in.)		Specimen Height (in.)		Volumes (in3)		Specimen	
Top	2.883	1	6.100	Sample	39.7523 (V_o)	Wet Weight (g)	1174.64
Middle	2.886	2	6.106	Solids	22.8020 (VS_o)	Dry Weight (g)	934.20
Bottom	2.870	3	6.110	Water	14.6715 (Vw_o)	Wet Unit Weight (pcf)	112.6
Avg.	2.8797 (D_o)	4	6.100	Voids	16.9503 (Vv_o)	Dry Unit Weight (pcf)	89.5
Area (in^2)	6.5129 (A_o)	Avg. (H_o)	6.1036	Degree of Saturation (%)	86.6 (S_o)		
Moisture Content (%)	25.7	Final Trimmings		Void Ratio	0.743		

Saturation

Set Up & Saturated: Wet xx Dry ____ | Set up By KDG

Back Pressure Saturated to: 80 (psi) | Final Pore Pressure Parameter B 0.98 | Date 3-4-09

Panel Board Number B

Height Readings (in.)		Back Pressure Burette		Chamber Burette			
Initial	0.2465	Initial	16.21 (in.)	Initial	10.97 (in.)	Specimen Height (in.)	6.1000 (H_s)
Final	0.2501	Final	13.33 (in.)	Final	0.83 (in.)	Area (in^2) Method A	6.5052 (A_s)
Change	-0.0036 (ΔH_o)	Change	-2.88 (in.)	Change	-10.14 (in.)	Specimen Volume (in^3)	39.68 (V_s)

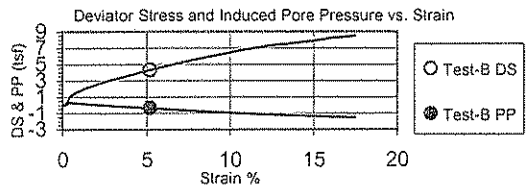
Consolidation

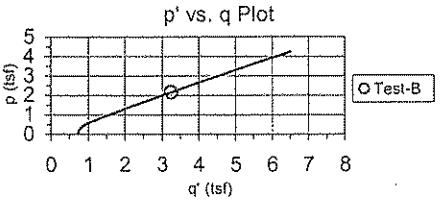
Height Readings (in.)		Back Pressure Burette Readings		Chamber Burette Readings		Pressures (psi)	
Initial	0.2501	Initial	1.45 (in.)	Initial	17.64 (in.)	Chamber	90
Final	0.2817	Final	3.94 (in.)	Final	12.86 (in.)	Back	80
Change	-0.0316 (ΔH_c)	Change	-2.49 (in.)	Change	-4.78 (in.)	Lateral	10 (σ_3)
Height (in.)	6.0684 (H_c)			Volume (in^3)	36.8468 (V_c)		
Area (in^3) Method B	6.0719 (A_c)			Volume - Water (in^3)	14.0448 (VWc)	D_{50} (min.)	28
Diameter (in.)	2.7805 (D_c)			Water Content (%)	24.6		
Dry Density (pcf)	96.6			Degree of Saturation (%)	100.0 (S_c)	Void Ratio	0.616

After Test

Final Measurements		Final Moisture Content		Stresses (membrane corrected) at Failure (psi)	
Maximum Diameter	3.329 (in.)	Wet Weight (g)	1164.37	Corrected Deviator	4.31 σ_d (tsf)
Wet weight (g)	1164.37 (WWf)	Dry Weight (g)	934.20	Major Principal	5.40 $\sigma_1'_f$ (tsf)
Corrected Diameter	3.305 (in.)	Tare Weight (g)	0.00	Minor Principal	1.09 $\sigma_3'_f$ (tsf)
				Rate of Strain (% / min.)	0.014
Youngs Modulus for Membrane (psi)	200			Axial Strain at Failure (%)	5.20
Membrane Thickness (in.)	0.012			Failure Criterion:	Maximum Effective Principal Stress Ratio

Failure Sketch





Comments:

Consolidated Undrained Triaxial Test

ASTM D4767-04

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Sample Identification	B-1, 11.0' - 11.5'	Test Number	CU-346C
Visual Description	Silt (ML), gray to dark gray, moist, soft	Prepared By	KDG
Undisturbed	Source B-1, 9.5' - 11.5'	Date	3-4-2009

Specific Gravity 2.50 Assumed | Liquid Limit NP | Plastic Limit NP | Plasticity Index NP

Initial Specimen Data

Specimen Diameter (in.)		Specimen Height (in.)		Volumes (in^3)		Specimen	
Top	2.868	1	6.085	Sample	39.2616 (V_o)	Wet Weight (g)	1181.61
Middle	2.860	2	6.076	Solids	22.9492 (VS_o)	Dry Weight (g)	940.23
Bottom	2.871	3	6.092	Water	14.7288 (Vw_o)	Wet Unit Weight (pcf)	114.6
Avg.	2.8663 (D_o)	4	6.085	Voids	16.3124 (Vv_o)	Dry Unit Weight (pcf)	91.2
Area (in^2)	6.4527 (A_o)	Avg. (H_o)	6.0845	Degree of Saturation (%)	90.3 (S_o)		
Moisture Content (%)	25.7	Final Trimmings		Void Ratio	0.711		

Saturation

Set Up & Saturated: Wet xx Dry

Back Pressure Saturated to: 70 (psi) | Final Pore Pressure Parameter B 0.97 | Set up By KDG | Date 3-4-07 | Panel Board Number E

Height Readings (in.)		Back Pressure Burette		Chamber Burette			
Initial	0.242	Initial	15.97 (in.)	Initial	11.26 (in.)	Specimen Height (in.)	6.0792 (H_s)
Final	0.2473	Final	13.62 (in.)	Final	8.56 (in.)	Area (in^2) Method A	6.4415 (A_s)
Change	-0.0053 (ΔH_o)	Change	-2.35 (in.)	Change	-2.70 (in.)	Specimen Volume (in^3)	39.16 (V_s)

Consolidation

Height Readings (in.)		Back Pressure Burette Readings		Chamber Burette Readings		Pressures (psi)	
Initial	0.2473	Initial	1.35 (in.)	Initial	17.36 (in.)	Chamber	90
Final	0.3262	Final	9.86 (in.)	Final	8.06 (in.)	Back	70
Change	-0.0789 (ΔH_c)	Change	-8.51 (in.)	Change	-9.30 (in.)	Lateral	20 (σ_3)
Height (in.)	6.0003 (H_c)			Volume (in^3)	36.2477 (V_c)		
Area (in^3) Method B	6.0410 (A_c)			Volume - Water (in^3)	13.2984 (VWc)	D_{50} (min.)	160
Diameter (in.)	2.7734 (D_c)			Water Content (%)	23.2		
Dry Density (pcf)	98.8			Degree of Saturation (%)	100.0 (S_c)	Void Ratio	0.579

After Test

Final Measurements		Final Moisture Content	
Maximum Diameter	3.29 (in.)	Wet Weight (g)	1158.17
Wet weight (g)	1158.17 (WWf)	Dry Weight (g)	940.23
Corrected Diameter	3.266 (in.)	Tare Weight (g)	0.00

Stresses (membrane corrected) at Failure (psi)

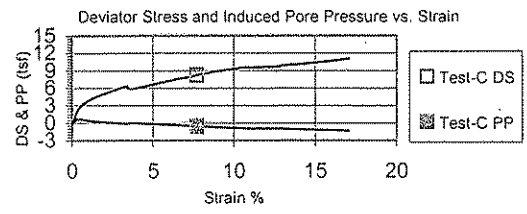
Corrected Deviator	8.20 σ_d (tsf)
Major Principal	10.19 $\sigma_1'_f$ (tsf)
Minor Principal	2.01 $\sigma_3'_f$ (tsf)
Rate of Strain (% / min.)	0.013
Axial Strain at Failure (%)	7.70

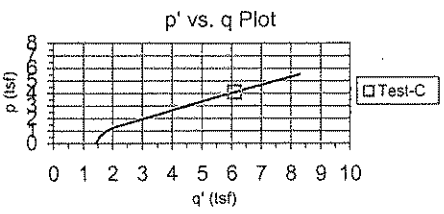
Youngs Modulus for Membrane (psi) 200

Membrane Thickness (in.) 0.012

Failure Criterion: Maximum Effective Principal Stress Ratio

Failure Sketch



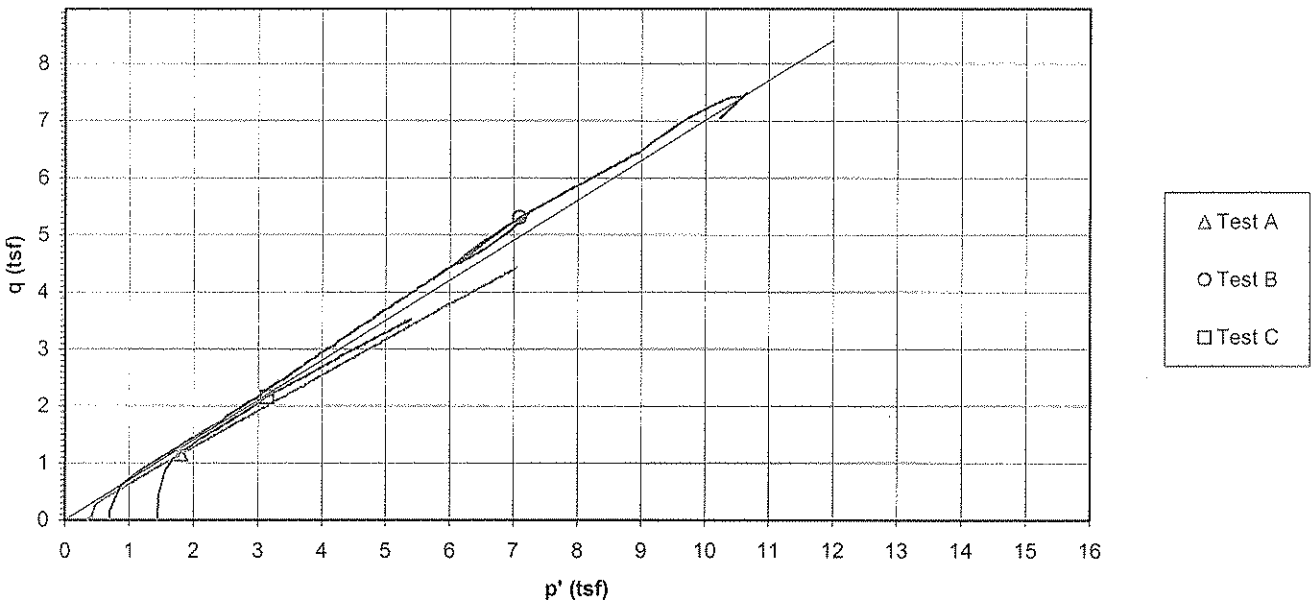


Comments:

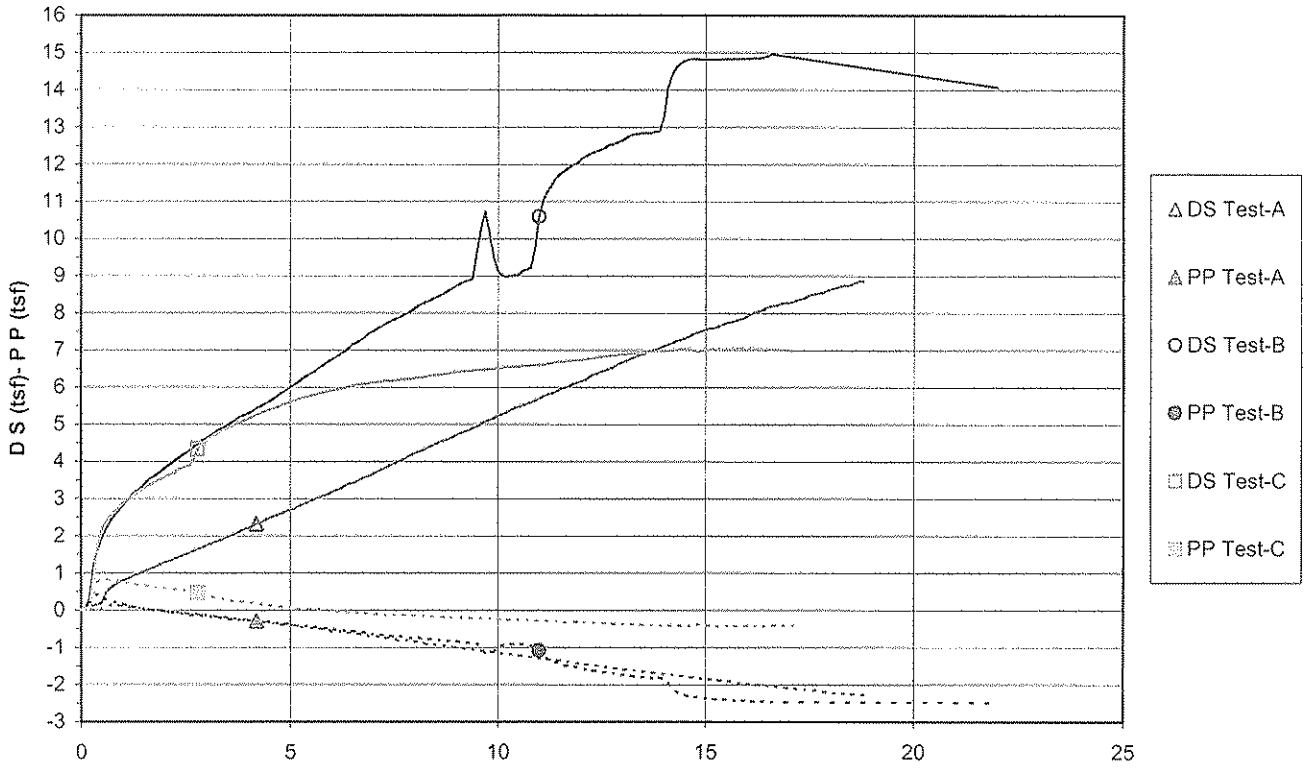
Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Project	TVA Facilities Assessment - PAF Phase 2	Project No.	171468118
Sample ID	B-1, 14.7'-15.2' & B-1, 15.3'-15.8' & B-1, 16.0'-16.5'	Test Number	347
Failure Criterion:	Maximum Effective Principal Stress Ratio	ϕ' = 44.5 deg.	c' = 0.00 tsf

p' vs. q Plot



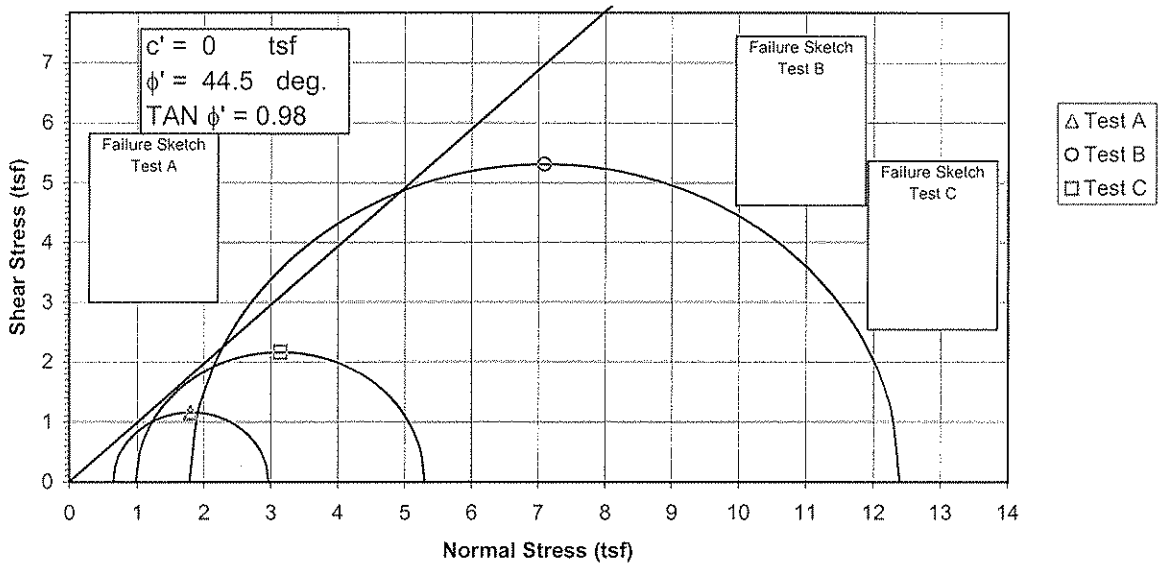
Deviator Stress and Induced Pore Pressure vs. Axial Strain



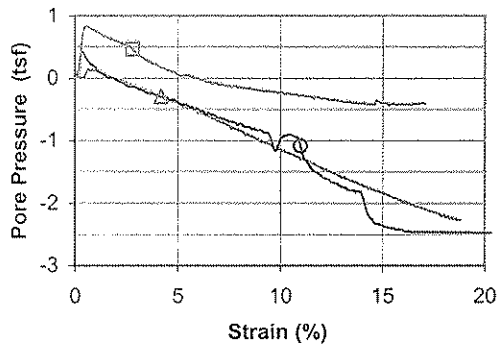
EM 1110-2-1906
Appendix X
30 Nov. 70

Failure Criterion: Maximum Effective Principal Stress Ratio

Effective Strength Envelope



Induced Pore Pressure vs. Strain



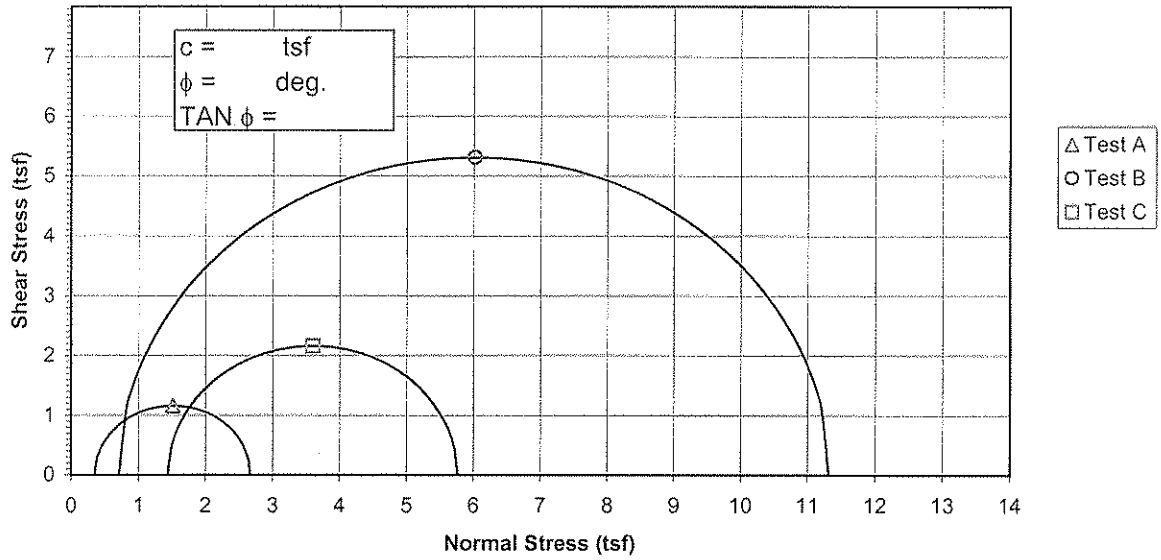
Specimen No.			A	B	C	
Initial Data	Water content %	W_o	20.7	29.2	29.9	
	Dry Density PCF	γ_{d_o}	98.2	85.7	84.7	
	Saturation %	S_o	85.6	87.3	87.2	
	Void Ratio	e_o	0.615	0.851	0.872	
After Shear	Water content %	W_f	20.2	25.3	26.7	
	Dry Density PCF	γ_{d_f}	104.8	96.6	94.5	
	Saturation %	S_f	100.0	100.0	100.0	
	Void Ratio	e_f	0.513	0.642	0.677	
	Final Back Pressure TSF	u_c	6.12	5.76	5.04	
Minor Principal Stress TSF @ failure		σ_3'f	0.65	1.79	0.99	
Maximum Deviator Stress (tsf) @ failure		$(\sigma_1'-\sigma_3')_{max}$	2.31	10.60	4.33	
Time to (σ1'-σ3')max min.		t_f	147.4	1210.8	315.3	
Ultimate Deviator Stress, t/sq ft		$(\sigma 1'-\sigma 3')_{ult}$	n/a	n/a	n/a	
Initial Diameter, in.		D_o	2.833	2.855	2.835	
Initial Height, in.		H_o	5.897	5.988	6.030	

Controlled - Strain Test					
Description of Specimens	Silt (ML), (fly ash), gray to dark gray, moist, soft				
			Type of Specimen	Undisturbed	Type of test $\bar{R}$
LL	PL	PI	Gs 2.54	Project	TVA Facilities Assessment - PAF Phase 2
Remarks:	Tested with gypsum saturated water.				
			Boring No.	B-1	Sample No. 347
			Depth Elev.	14.7'-15.2', 15.3'-15.8', 16.0'-16.5'	
			Laboratory	Stantec	Date 5-22-09
			TRIAXIAL COMPRESSION TEST REPORT		

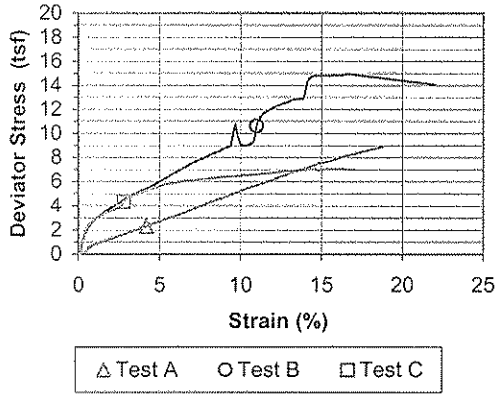
EM 1110-2-1906
Appendix X
30 Nov. 70

Failure Criterion: Maximum Effective Principal Stress Ratio

Total Strength Envelope



Deviator Stress vs. Strain



Specimen No.			A	B	C	
Initial Data	Water content %	W_o	20.7	29.2	29.9	
	Dry Density PCF	γ_{d_o}	98.2	85.7	84.7	
	Saturation %	S_o	85.6	87.3	87.2	
	Void Ratio	e_o	0.615	0.851	0.872	
After Shear	Water content %	W_f	20.2	25.3	26.7	
	Dry Density PCF	γ_{d_f}	104.8	96.6	94.5	
	Saturation %	S_f	100.0	100.0	100.0	
	Void Ratio	e_f	0.513	0.642	0.677	
	Final Back Pressure TSF	u_c	6.12	5.76	5.04	
Minor Principal Stress TSF		σ_3	0.36	0.72	1.44	
Maximum Deviator Stress (tsf) @ failure		$(\sigma_1-\sigma_3)_{max}$	2.31	10.60	4.33	
Time to $(\sigma_1-\sigma_3)_{Max.}$ min.		t_f	147.4	1210.8	315.3	
Ultimate Deviator Stress, t/sq ft		$(\sigma_1-\sigma_3)_{ult}$	n/a	n/a	n/a	
Initial Diameter, in.		D_o	2.833	2.855	2.835	
Initial Height, in.		H_o	5.897	5.988	6.030	

Controlled - Strain Test					
Description of Specimens	Silt (ML), (fly ash), gray to dark gray, moist, soft				
			Type of Specimen	Undisturbed	Type of test R
LL	PL	PI	Gs 2.54	Project	TVA Facilities Assessment - PAF Phase 2
Remarks:	Tested with gypsum saturated water.				
			Boring No.	B-1	Sample No. 347
			Depth Elev.	14.7'-15.2', 15.3'-15.8', 16.0'-16.5'	
			Laboratory	Stantec	Date 5-22-09
			TRIAXIAL COMPRESSION TEST REPORT		

Consolidated Undrained Triaxial Test

ASTM D4767-04

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Sample Identification	B-1, 14.7'-15.2'	Test Number	CU-347A
Visual Description	Silt (ML), (fly ash), gray to dark gray, moist, soft	Prepared By	KDG
Undisturbed	Source B-1, 14.5' - 16.5'	Date	4-30-2009

Specific Gravity 2.54 ASTM D854 Method A Liquid Limit N/A Plastic Limit N/A Plasticity Index N/A

Initial Specimen Data

Specimen Diameter (in.)		Specimen Height (in.)		Volumes (in^3)		Specimen	
Top	2.824	1	5.919	Sample	36.9622 (V_o)	Wet Weight (g)	1156.15
Middle	2.855	2	5.895	Solids	23.0080 (VS_o)	Dry Weight (g)	957.72
Bottom	2.796	3	5.953	Water	12.1080 (Vw_o)	Wet Unit Weight (pcf)	119.2
Avg.	2.8250 (D_o)	4	5.821	Voids	13.9542 (Vv_o)	Dry Unit Weight (pcf)	98.7
Area (in^2)	6.2680 (A_o)	Avg. (H_o)	5.8970	Degree of Saturation (%)	86.8 (S_o)		
Moisture Content (%)	20.7	Final Trimmings		Void Ratio	0.606		

Saturation

Set Up & Saturated: Wet xx Dry ____ with gypsum saturated water Set up By KDG

Back Pressure Saturated to: 85 (psi) Final Pore Pressure Parameter B 0.98 Date 4-30-09

Panel Board Number B

Height Readings (in.)		Back Pressure Burette		Chamber Burette			
Initial	0.2466	Initial	16.46 (in.)	Initial	10.51 (in.)	Specimen Height (in.)	5.9055 (H_s)
Final	0.2381	Final	13.11 (in.)	Final	7.34 (in.)	Area (in^2) Method A	6.2860 (A_s)
Change	0.0085 (ΔH_o)	Change	-3.35 (in.)	Change	-3.17 (in.)	Specimen Volume (in^3)	37.12 (Vs)

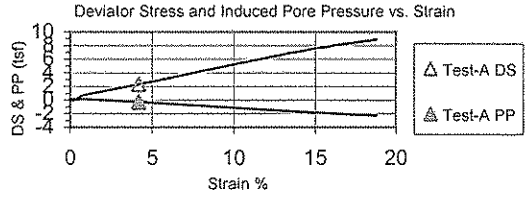
Consolidation

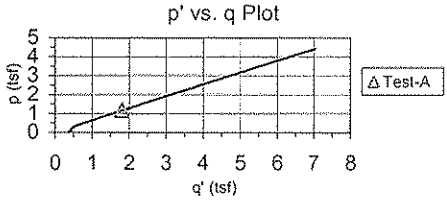
Height Readings (in.)		Back Pressure Burette Readings		Chamber Burette Readings		Pressures (psi)	
Initial	0.2381	Initial	1.09 (in.)	Initial	17.55 (in.)	Chamber	90
Final	0.2448	Final	4.98 (in.)	Final	9.89 (in.)	Back	85
Change	-0.0067 (ΔH_c)	Change	-3.89 (in.)	Change	-7.66 (in.)	Lateral	5 (σ_3)
Height (in.)	5.8988 (H_c)			Volume (in^3)	34.8017 (V_c)		
Area (in^3) Method B	5.8998 (A_c)			Volume - Water (in^3)	11.7937 (VWc)	t_{50} (min.)	1600
Diameter (in.)	2.7408 (D_c)			Water Content (%)	20.2		
Dry Density (pcf)	104.8			Degree of Saturation (%)	100.0 (S_c)	Void Ratio	0.513

After Test

Final Measurements			Final Moisture Content		Stresses (membrane corrected) at Failure (psi)	
Maximum Diameter	3.282 (in.)		Wet Weight (g)	1151.00	Corrected Deviator	2.31 σ_d (tsf)
Wet weight (g)	1151 (WWf)		Dry Weight (g)	957.72	Major Principal	2.97 $\sigma_1'_f$ (tsf)
Corrected Diameter	3.258 (in.)		Tare Weight (g)	0.00	Minor Principal	0.65 $\sigma_3'_f$ (tsf)
					Rate of Strain (% / min.)	0.026
Youngs Modulus for Membrane (psi)	200				Axial Strain at Failure (%)	4.20
Membrane Thickness (in.)	0.012				Failure Criterion:	Maximum Effective Principal Stress Ratio

Failure Sketch





Comments:

Consolidated Undrained Triaxial Test

ASTM D4767-04

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Sample Identification	B-1, 15.3'-15.8'	Test Number	CU-367B
Visual Description	Silt (ML), (fly ash), gray to dark gray, moist, soft	Prepared By	KDG
Undisturbed	Source B-1, 14.5'-16.5'	Date	4-30-2009

Specific Gravity 2.54 ASTM D854 Method A Liquid Limit N/A Plastic Limit N/A Plasticity Index N/A

Initial Specimen Data

Specimen Diameter (in.)		Specimen Height (in.)		Volumes (in3)		Specimen	
Top	2.778	1	6.001	Sample	38.0229 (V_o)	Wet Weight (g)	1114.27
Middle	2.891	2	5.967	Solids	20.7120 (VS_o)	Dry Weight (g)	862.15
Bottom	2.861	3	6.001	Water	15.3843 (Vw_o)	Wet Unit Weight (pcf)	111.6
Avg.	2.8433 (D_o)	4	5.984	Voids	17.3109 (Vv_o)	Dry Unit Weight (pcf)	86.4
Area (in^2)	6.3496 (A_o)	Avg. (H_o)	5.9883	Degree of Saturation (%)	88.9 (S_o)		
Moisture Content (%)	29.2	Final Trimmings		Void Ratio	0.836		

Saturation

Set Up & Saturated: Wet xx Dry ____ with gypsum saturated water Set up By KDG

Back Pressure Saturated to: 80 (psi) Final Pore Pressure Parameter B 0.98 Date 4-30-09

Panel Board Number E

Height Readings (in.)		Back Pressure Burette		Chamber Burette			
Initial	0.2386	Initial	15.76 (in.)	Initial	9.86 (in.)	Specimen Height (in.)	5.9756 (H_s)
Final	0.2513	Final	14.85 (in.)	Final	6.16 (in.)	Area (in^2) Method A	6.3226 (A_s)
Change	-0.0127 (ΔH_o)	Change	-0.91 (in.)	Change	-3.70 (in.)	Specimen Volume (in^3)	37.78 (V_s)

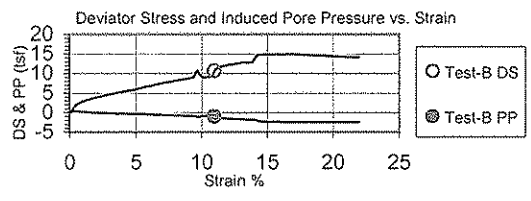
Consolidation

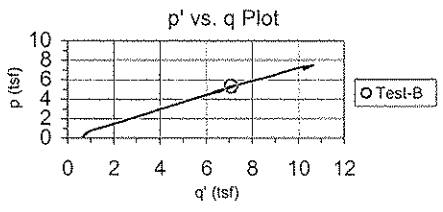
Height Readings (in.)		Back Pressure Burette Readings		Chamber Burette Readings		Pressures (psi)	
Initial	0.2513	Initial	1.21 (in.)	Initial	16.92 (in.)	Chamber	90
Final	0.2543	Final	8.54 (in.)	Final	7.59 (in.)	Back	80
Change	-0.0030 (ΔH_c)	Change	-7.33 (in.)	Change	-9.33 (in.)	Lateral	10 (σ_3)
Height (in.)	5.9726 (H_c)			Volume (in^3)	34.0149 (V_c)		
Area (in^3) Method B	5.6952 (A_c)			Volume - Water (in^3)	13.3029 (VWc)	D_{50} (min.)	960
Diameter (in.)	2.6928 (D_c)			Water Content (%)	25.3		
Dry Density (pcf)	96.6			Degree of Saturation (%)	100.0 (S_c)	Void Ratio	0.642

After Test

Final Measurements			Final Moisture Content		Stresses (membrane corrected) at Failure (psi)	
Maximum Diameter	3.404 (in.)		Wet Weight (g)	1080.16	Corrected Deviator	10.60 σ_d (tsf)
Wet weight (g)	1080.16 (WWf)		Dry Weight (g)	862.15	Major Principal	12.41 $\sigma_1'_f$ (tsf)
Corrected Diameter	3.380 (in.)		Tare Weight (g)	0.00	Minor Principal	1.79 $\sigma_3'_f$ (tsf)
					Rate of Strain (% / min.)	0.015
Youngs Modulus for Membrane (psi)	200				Axial Strain at Failure (%)	11.00
Membrane Thickness (in.)	0.012				Failure Criterion:	Maximum Effective Principal Stress Ratio

Failure Sketch





Comments:

Consolidated Undrained Triaxial Test

ASTM D4767-04

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Sample Identification	B-1, 16.0'-16.5'	Test Number	CU-347C
Visual Description	Silt (ML), (fly ash), gray to dark gray, moist, soft	Prepared By	KDG
Undisturbed	Source B-1, 14.5' - 16.5'	Date	4-30-2009

Specific Gravity 2.54 ASTM D854 Method A Liquid Limit N/A Plastic Limit N/A Plasticity Index N/A

Initial Specimen Data

Specimen Diameter (in.)		Specimen Height (in.)		Volumes (in^3)		Specimen	
Top	2.827	1	6.050	Sample	38.1071 (V_o)	Wet Weight (g)	1099.03
Middle	2.828	2	6.015	Solids	20.3187 (VS_o)	Dry Weight (g)	845.78
Bottom	2.855	3	6.037	Water	15.4534 (Vw_o)	Wet Unit Weight (pcf)	109.9
Avg.	2.8367 (D_o)	4	6.018	Voids	17.7884 (Vv_o)	Dry Unit Weight (pcf)	84.6
Area (in^2)	6.3198 (A_o)	Avg. (H_o)	6.0298	Degree of Saturation (%)	86.9 (S_o)		
Moisture Content (%)	29.9	Final Trimmings		Void Ratio	0.875		

Saturation

Set Up & Saturated: Wet xx Dry ____ with gypsum saturated water Set up By KDG

Back Pressure Saturated to: 70 (psi) Final Pore Pressure Parameter B 0.98 Date 4-30-09

Panel Board Number F

Height Readings (in.)		Back Pressure Burette			Chamber Burette				
Initial	0.25	Initial	14.73	(in.)	Initial	10.88	(in.)	Specimen Height (in.)	6.0266 (H_s)
Final	0.2532	Final	13.33	(in.)	Final	8.38	(in.)	Area (in^2) Method A	6.3131 (A_s)
Change	-0.0032 (ΔH_o)	Change	-1.40	(in.)	Change	-2.50	(in.)	Specimen Volume (in^3)	38.05 (V_s)

Consolidation

Height Readings (in.)		Back Pressure Burette Readings			Chamber Burette Readings			Pressures (psi)	
Initial	0.2532	Initial	1.07	(in.)	Initial	17.56	(in.)	Chamber	90
Final	0.3333	Final	8.38	(in.)	Final	8.23	(in.)	Back	70
Change	-0.0801 (ΔH_c)	Change	-7.31	(in.)	Change	-9.33	(in.)	Lateral	20 (σ_3)
Height (in.)	5.9465 (H_c)				Volume (in^3)	34.0800 (V_c)			
Area (in^3) Method B	5.7311 (A_c)				Volume - Water (in^3)	13.7613 (VWc)		D_{50} (min.)	410
Diameter (in.)	2.7013 (D_c)				Water Content (%)	26.7			
Dry Density (pcf)	94.5				Degree of Saturation (%)	100.0 (S_c)		Void Ratio	0.677

After Test

Final Measurements			Final Moisture Content	
Maximum Diameter	3.314	(in.)	Wet Weight (g)	1071.30
Wet weight (g)	1071.3	(WWf)	Dry Weight (g)	845.78
Corrected Diameter	3.290	(in.)	Tare Weight (g)	0.00

Stresses (membrane corrected) at Failure (psi)

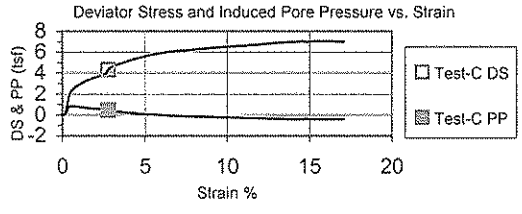
Corrected Deviator	4.33	σ_d (tsf)
Major Principal	5.31	$\sigma_1'_f$ (tsf)
Minor Principal	0.99	$\sigma_3'_f$ (tsf)
Rate of Strain (% / min.)	0.014	
Axial Strain at Failure (%)	2.80	

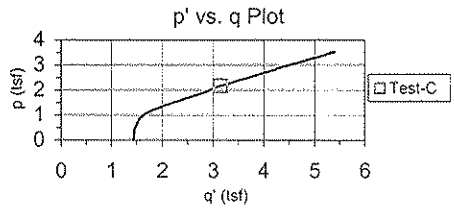
Youngs Modulus for Membrane (psi) 200

Membrane Thickness (in.) 0.012

Failure Criterion: Maximum Effective Principal Stress Ratio

Failure Sketch



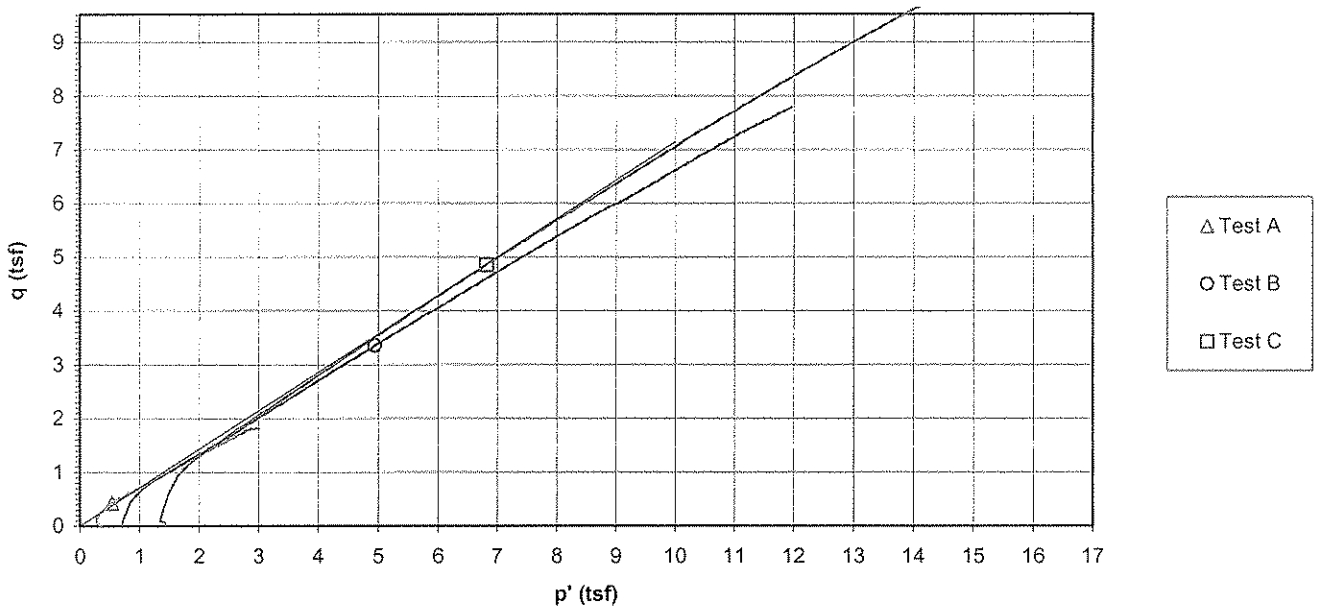


Comments:

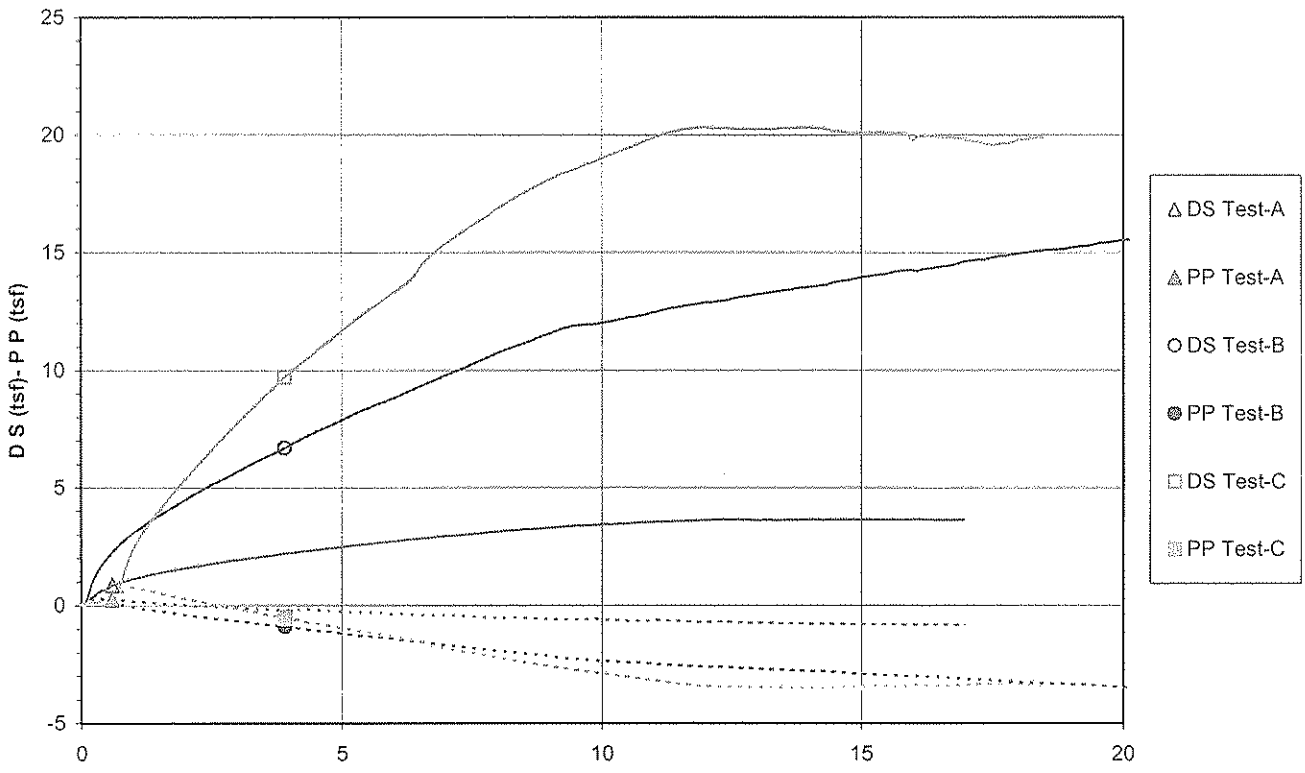
Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Project	TVA Facilities Assessment - PAF Phase 2	Project No.	171468118
Sample ID	B-6A, 9.8'-11.3', 10.4'-10.9', 11.0'-11.5'	Test Number	770
Failure Criterion:	Maximum Effective Principal Stress Ratio	ϕ' = 35.6 deg.	c' = 0.00 tsf

p' vs. q Plot



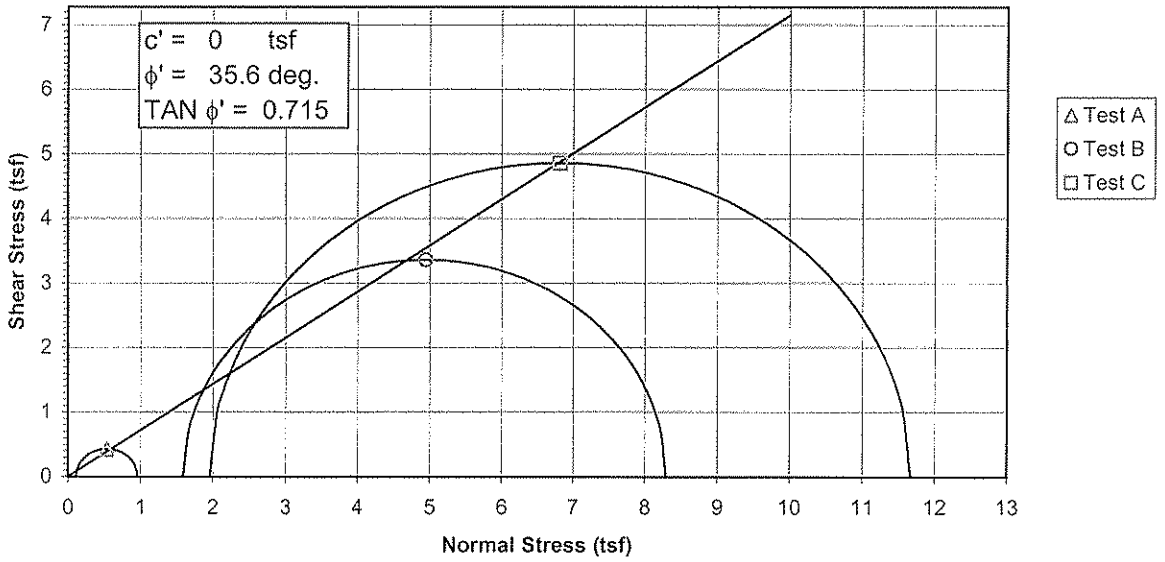
Deviator Stress and Induced Pore Pressure vs. Axial Strain



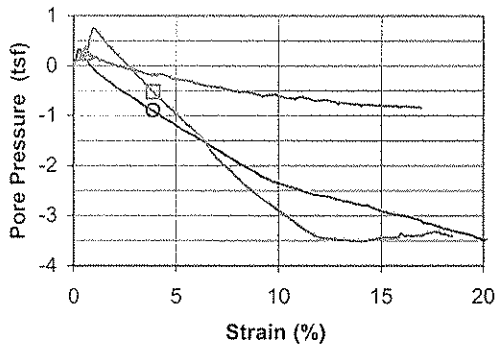
EM 1110-2-1906
Appendix X
30 Nov. 70

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	16.2	22.8	26.4	
	Dry Density PCF	γ_{d_o}	86.9	89.7	86.9	
	Saturation %	S_o	51.0	77.0	82.8	
	Void Ratio	e_o	0.796	0.741	0.796	
After Shear	Water content %	W_f	24.6	24.2	26.0	
	Dry Density PCF	γ_{d_f}	96.6	97.2	94.6	
	Saturation %	S_f	100.0	100.0	100.0	
	Void Ratio	e_f	0.615	0.605	0.650	
	Final Back Pressure TSF	u_c	6.12	5.76	5.04	
Minor Principal Stress TSF @ failure		σ_3'f	0.11	1.59	1.96	
Maximum Deviator Stress (tsf) @ failure		$(\sigma_1'-\sigma_3')_{max}$	0.85	6.69	9.71	
Time to (σ1'-σ3')max min.		t_f	59.7	210.2	151.2	
Ultimate Deviator Stress, t/sq ft		$(\sigma 1'-\sigma 3')_{ult}$	n/a	n/a	n/a	
Initial Diameter, in.		D_o	2.862	2.875	2.850	
Initial Height, in.		H_o	6.101	6.044	5.979	

Controlled - Strain Test

Description of Specimens: Silt (ML), gray, moist, soft, fly ash

LL	NP	PL	NP	PI	NP	Gs	2.5

Remarks:

Type of Specimen: Undisturbed — Type of test: $\bar{R}$

Project: TVA Facilities Assessment - PAF Phase 2

Boring No.: B-6A — Sample No.: 562

Depth Elev.: 9.5' - 11.5'

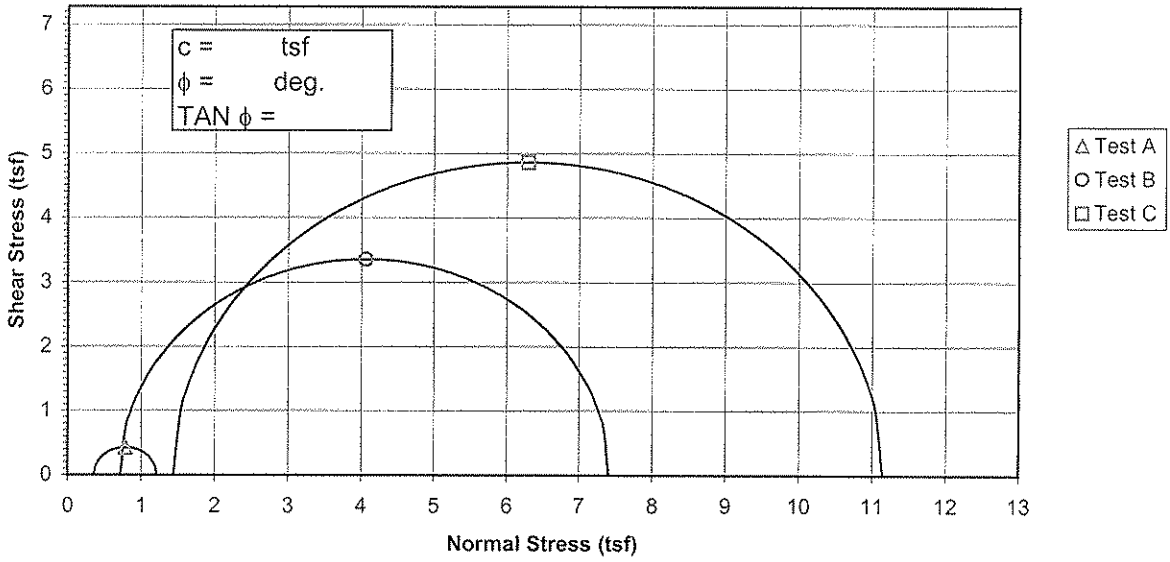
Laboratory: Stantec — Date: 3-30-09

TRIAXIAL COMPRESSION TEST REPORT

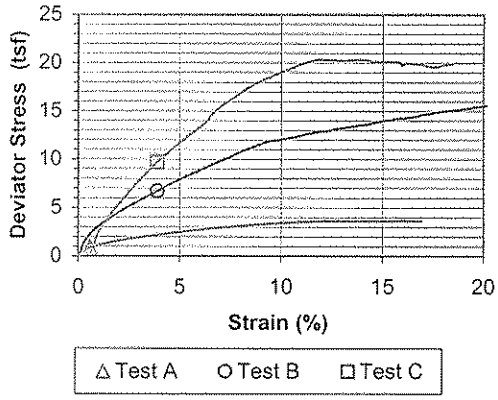
EM 1110-2-1906
Appendix X
30 Nov. 70

Failure Criterion: Maximum Effective Principal Stress Ratio

Total Strength Envelope



Deviator Stress vs. Strain



Specimen No.			A	B	C	
Initial Data	Water content %	W_o	16.2	22.8	26.4	
	Dry Density PCF	γ_{d_o}	86.9	89.7	86.9	
	Saturation %	S_o	51.0	77.0	82.8	
	Void Ratio	e_o	0.796	0.741	0.796	
After Shear	Water content %	W_f	24.6	24.2	26.0	
	Dry Density PCF	γ_{d_f}	96.6	97.2	94.6	
	Saturation %	S_f	100.0	100.0	100.0	
	Void Ratio	e_f	0.615	0.605	0.650	
	Final Back Pressure TSF	u_c	6.12	5.76	5.04	
Minor Principal Stress TSF		σ_3	0.36	0.72	1.44	
Maximum Deviator Stress (tsf) @ failure		$(\sigma_1-\sigma_3)_{max}$	0.85	6.69	9.71	
Time to $(\sigma_1-\sigma_3)_{Max.}$ min.		t_f	59.7	210.2	151.2	
Ultimate Deviator Stress, t/sq ft		$(\sigma_1-\sigma_3)_{ult}$	n/a	n/a	n/a	
Initial Diameter, in.		D_o	2.862	2.875	2.850	
Initial Height, in.		H_o	6.101	6.044	5.979	

Controlled - Strain Test

Description of Specimens Silt (ML), gray, moist, soft, fly ash

LL NP	PL NP	PI NP	Gs 2.5	Type of Specimen Undisturbed	Type of test $\bar{R}$
Remarks:				Project TVA Facilities Assessment - PAF Phase 2	
				Boring No. B-6A	Sample No. 562
				Depth Elev. 9.5' - 11.5'	
				Laboratory Stantec	Date 3-30-09
				TRIAXIAL COMPRESSION TEST REPORT	

Consolidated Undrained Triaxial Test

ASTM D4767-04

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Sample Identification	B-6A, 9.8' - 10.3'	Test Number	CU-562A
Visual Description	Silt (ML), gray, moist, soft, fly ash	Prepared By	KDG
Undisturbed	Source B-6A, 9.5' - 11.5'	Date	3-17-2009

Specific Gravity 2.50 Assumed | Liquid Limit NP | Plastic Limit NP | Plasticity Index NP

Initial Specimen Data

Specimen Diameter (in.)		Specimen Height (in.)		Volumes (in^3)		Specimen	
Top	2.870	1	6.065	Sample	39.3282 (V_o)	Wet Weight (g)	1040.66
Middle	2.853	2	6.136	Solids	21.8562 (VS_o)	Dry Weight (g)	895.45
Bottom	2.872	3	6.137	Water	8.8605 (Vw_o)	Wet Unit Weight (pcf)	100.8
Avg.	2.8650 (D_o)	4	6.065	Voids	17.4720 (Vv_o)	Dry Unit Weight (pcf)	86.7
Area (in^2)	6.4467 (A_o)	Avg. (H_o)	6.1005	Degree of Saturation (%)	50.7 (S_o)		
Moisture Content (%)	16.2	Final Trimmings		Void Ratio	0.799		

Saturation

Set Up & Saturated: Wet xx Dry

Back Pressure Saturated to: 85 (psi) Final Pore Pressure Parameter B 0.98

Set up By KDG

Date 3-17-09

Panel Board Number D

Height Readings (in.)		Back Pressure Burette		Chamber Burette			
Initial	0.2719	Initial	23.67 (in.)	Initial	13.57 (in.)	Specimen Height (in.)	6.1045 (H_s)
Final	0.2679	Final	0 (in.)	Final	6.17 (in.)	Area (in^2) Method A	6.4552 (A_s)
Change	0.0040 (ΔH_o)	Change	-23.67 (in.)	Change	-7.40 (in.)	Specimen Volume (in^3)	39.41 (Vs)

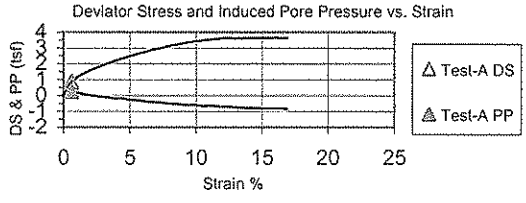
Consolidation

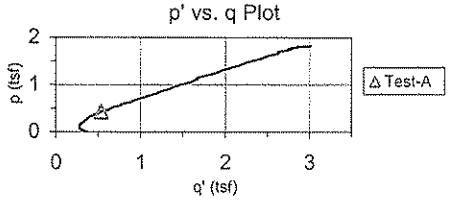
Height Readings (in.)		Back Pressure Burette Readings		Chamber Burette Readings		Pressures (psi)	
Initial	0.2679	Initial	0.95 (in.)	Initial	17.43 (in.)	Chamber	90
Final	0.3248	Final	3.29 (in.)	Final	13.26 (in.)	Back	85
Change	-0.0569 (ΔH_c)	Change	-2.34 (in.)	Change	-4.17 (in.)	Lateral	5 (σ_3)
Height (in.)	6.0476 (H_c)			Volume (in^3)	35.3042 (V_c)		
Area (in^3) Method B	5.8377 (A_c)			Volume - Water (in^3)	13.4480 (VWc)	t_{50} (min.)	320
Diameter (in.)	2.7263 (D_c)			Water Content (%)	24.6		
Dry Density (pcf)	96.6			Degree of Saturation (%)	100.0 (S_c)	Void Ratio	0.615

After Test

Final Measurements			Final Moisture Content		Stresses (membrane corrected) at Failure (psi)	
Maximum Diameter	3.287 (in.)		Wet Weight (g)	1115.84	Corrected Deviator	0.85 σ_d (tsf)
Wet weight (g)	1115.84 (WWf)		Dry Weight (g)	895.45	Major Principal	0.96 $\sigma_1'_f$ (tsf)
Corrected Diameter	3.263 (in.)		Tare Weight (g)	0.00	Minor Principal	0.11 $\sigma_3'_f$ (tsf)
					Rate of Strain (% / min.)	0.021
Youngs Modulus for Membrane (psi)	200				Axial Strain at Failure (%)	0.60
Membrane Thickness (in.)	0.012				Failure Criterion:	Maximum Effective Principal Stress Ratio

Failure Sketch





Comments:

Consolidated Undrained Triaxial Test

ASTM D4767-04

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Sample Identification	B-6A, 10.4' - 10.9'	Test Number	CU-562B
Visual Description	Silt (ML), gray, moist, soft, fly ash	Prepared By	KDG
Undisturbed	Source B-6A, 9.5' - 11.5'	Date	3-17-2009

Specific Gravity 2.50 Assumed | Liquid Limit NP | Plastic Limit NP | Plasticity Index NP

Initial Specimen Data

Specimen Diameter (in.)		Specimen Height (in.)		Volumes (in3)		Specimen	
Top	2.873	1	6.051	Sample	39.2108 (V_o)	Wet Weight (g)	1133.90
Middle	2.877	2	6.049	Solids	22.5379 (VS_o)	Dry Weight (g)	923.38
Bottom	2.872	3	6.027	Water	12.8459 (Vw_o)	Wet Unit Weight (pcf)	110.2
Avg.	2.8740 (D_o)	4	6.051	Voids	16.6729 (Vv_o)	Dry Unit Weight (pcf)	89.7
Area (in^2)	6.4873 (A_o)	Avg. (H_o)	6.0443	Degree of Saturation (%)	77.0 (S_o)		
Moisture Content (%)	22.8 Final Trimmings			Void Ratio	0.740		

Saturation

Set Up & Saturated: Wet xx Dry

Back Pressure Saturated to: 80 (psi) | Final Pore Pressure Parameter B 0.97 | Set up By KDG | Date 3-17-09 | Panel Board Number E

Height Readings (in.)		Back Pressure Burette		Chamber Burette			
Initial	0.247	Initial	15.56 (in.)	Initial	12.33 (in.)	Specimen Height (in.)	5.8371 (H_s)
Final	0.4542	Final	7.39 (in.)	Final	7.67 (in.)	Area (in^2) Method A	6.0267 (A_s)
Change	-0.2072 (ΔH_o)	Change	-8.17 (in.)	Change	-4.66 (in.)	Specimen Volume (in^3)	35.18 (V_s)

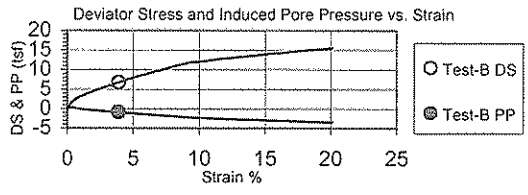
Consolidation

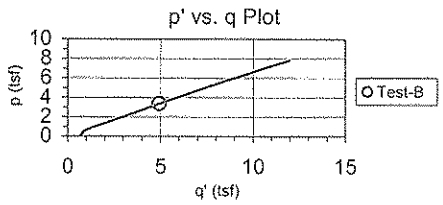
Height Readings (in.)		Back Pressure Burette Readings		Chamber Burette Readings		Pressures (psi)	
Initial	0.4542	Initial	0.85 (in.)	Initial	17.23 (in.)	Chamber	90
Final	0.6095	Final	4.73 (in.)	Final	12.15 (in.)	Back	80
Change	-0.1553 (ΔH_c)	Change	-3.88 (in.)	Change	-5.08 (in.)	Lateral	10 (σ_3)
Height (in.)	5.6818 (H_c)			Volume (in^3)	36.1752 (V_c)		
Area (in^3) Method B	6.3669 (A_c)			Volume - Water (in^3)	13.6373 (VWc)	D_{50} (min.)	450
Diameter (in.)	2.8472 (D_c)			Water Content (%)	24.2		
Dry Density (pcf)	97.2			Degree of Saturation (%)	100.0 (S_c)	Void Ratio	0.605

After Test

Final Measurements			Final Moisture Content		Stresses (membrane corrected) at Failure (psi)	
Maximum Diameter	3.378 (in.)	Wet Weight (g)	1146.87		Corrected Deviator	6.69 σ_d (tsf)
Wet weight (g)	1146.87 (WWf)	Dry Weight (g)	923.38		Major Principal	8.30 $\sigma_1'_f$ (tsf)
Corrected Diameter	3.354 (in.)	Tare Weight (g)	0.00		Minor Principal	1.59 $\sigma_3'_f$ (tsf)
					Rate of Strain (% / min.)	0.017
Youngs Modulus for Membrane (psi)	200				Axial Strain at Failure (%)	3.91
Membrane Thickness (in.)	0.012				Failure Criterion:	Maximum Effective Principal Stress Ratio

Failure Sketch





Comments:

Consolidated Undrained Triaxial Test

ASTM D4767-04

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Sample Identification	B-6A, 11.0' - 11.5'	Test Number	CU-562C
Visual Description	Silt (ML), gray, moist, soft, fly ash	Prepared By	KDG
Undisturbed	Source B-6A, 9.5' - 11.5'	Date	3-17-2009

Specific Gravity 2.50 Assumed | Liquid Limit NP | Plastic Limit NP | Plasticity Index NP

Initial Specimen Data

Specimen Diameter (in.)		Specimen Height (in.)		Volumes (in^3)		Specimen	
Top	2.850	1	5.992	Sample	38.1424 (V_o)	Wet Weight (g)	1099.26
Middle	2.848	2	5.955	Solids	21.2324 (VS_o)	Dry Weight (g)	869.90
Bottom	2.852	3	5.978	Water	13.9958 (Vw_o)	Wet Unit Weight (pcf)	109.8
Avg.	2.8500 (D_o)	4	5.992	Voids	16.9100 (Vv_o)	Dry Unit Weight (pcf)	86.9
Area (in^2)	6.3794 (A_o)	Avg. (H_o)	5.9790	Degree of Saturation (%)	82.8 (S_o)		
Moisture Content (%)	26.4	Final Trimmings		Void Ratio	0.796		

Saturation

Set Up & Saturated: Wet xx Dry

Back Pressure Saturated to: 70 (psi) Final Pore Pressure Parameter B 0.97

Set up By KDG | Date 3-17-09 | Panel Board Number F

Height Readings (in.)		Back Pressure Burette		Chamber Burette			
Initial	0.2533	Initial	14.73 (in.)	Initial	12.03 (in.)	Specimen Height (in.)	5.9745 (H_s)
Final	0.2578	Final	4.34 (in.)	Final	9.85 (in.)	Area (in^2) Method A	6.3698 (A_s)
Change	-0.0045 (ΔH_o)	Change	-10.39 (in.)	Change	-2.18 (in.)	Specimen Volume (in^3)	38.06 (V_s)

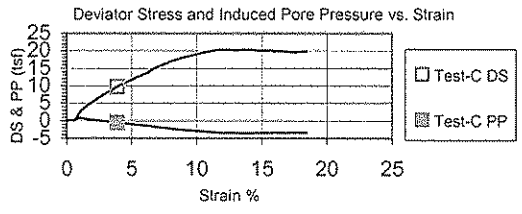
Consolidation

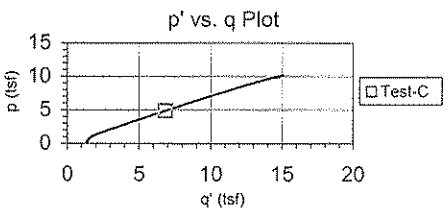
Height Readings (in.)		Back Pressure Burette Readings		Chamber Burette Readings		Pressures (psi)	
Initial	0.2578	Initial	1.01 (in.)	Initial	17.74 (in.)	Chamber	90
Final	0.257	Final	6.41 (in.)	Final	11.23 (in.)	Back	70
Change	0.0008 (ΔH_c)	Change	-5.40 (in.)	Change	-6.51 (in.)	Lateral	20 (σ_3)
Height (in.)	5.9753 (H_c)			Volume (in^3)	35.0287 (V_c)		
Area (in^3) Method B	5.8623 (A_c)			Volume - Water (in^3)	13.7963 (VWc)	D_{50} (min.)	130
Diameter (in.)	2.7320 (D_c)			Water Content (%)	26.0		
Dry Density (pcf)	94.6			Degree of Saturation (%)	100.0 (S_c)	Void Ratio	0.650

After Test

Final Measurements		Final Moisture Content		Stresses (membrane corrected) at Failure (psi)	
Maximum Diameter	3.307 (in.)	Wet Weight (g)	1095.99	Corrected Deviator	9.71 σ_d (tsf)
Wet weight (g)	1095.99 (WWf)	Dry Weight (g)	869.90	Major Principal	11.67 $\sigma_1'_f$ (tsf)
Corrected Diameter	3.283 (in.)	Tare Weight (g)	0.00	Minor Principal	1.96 $\sigma_3'_f$ (tsf)
				Rate of Strain (% / min.)	0.024
Youngs Modulus for Membrane (psi)	200			Axial Strain at Failure (%)	3.92
Membrane Thickness (in.)	0.012			Failure Criterion:	Maximum Effective Principal Stress Ratio

Failure Sketch



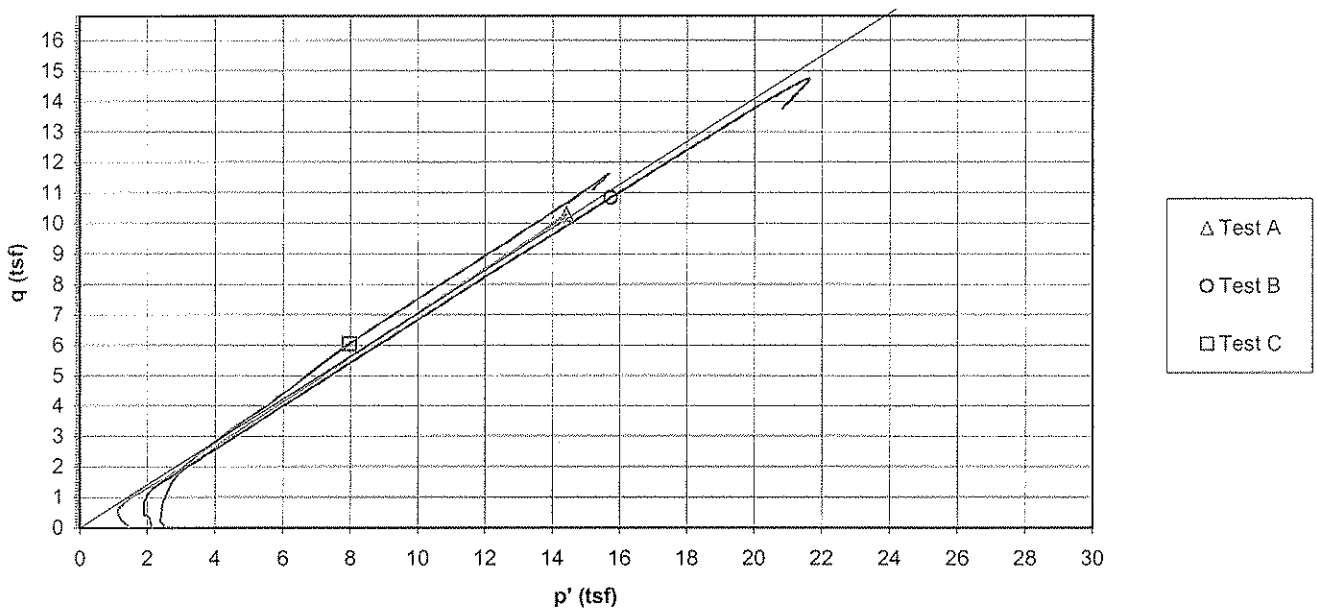


Comments:

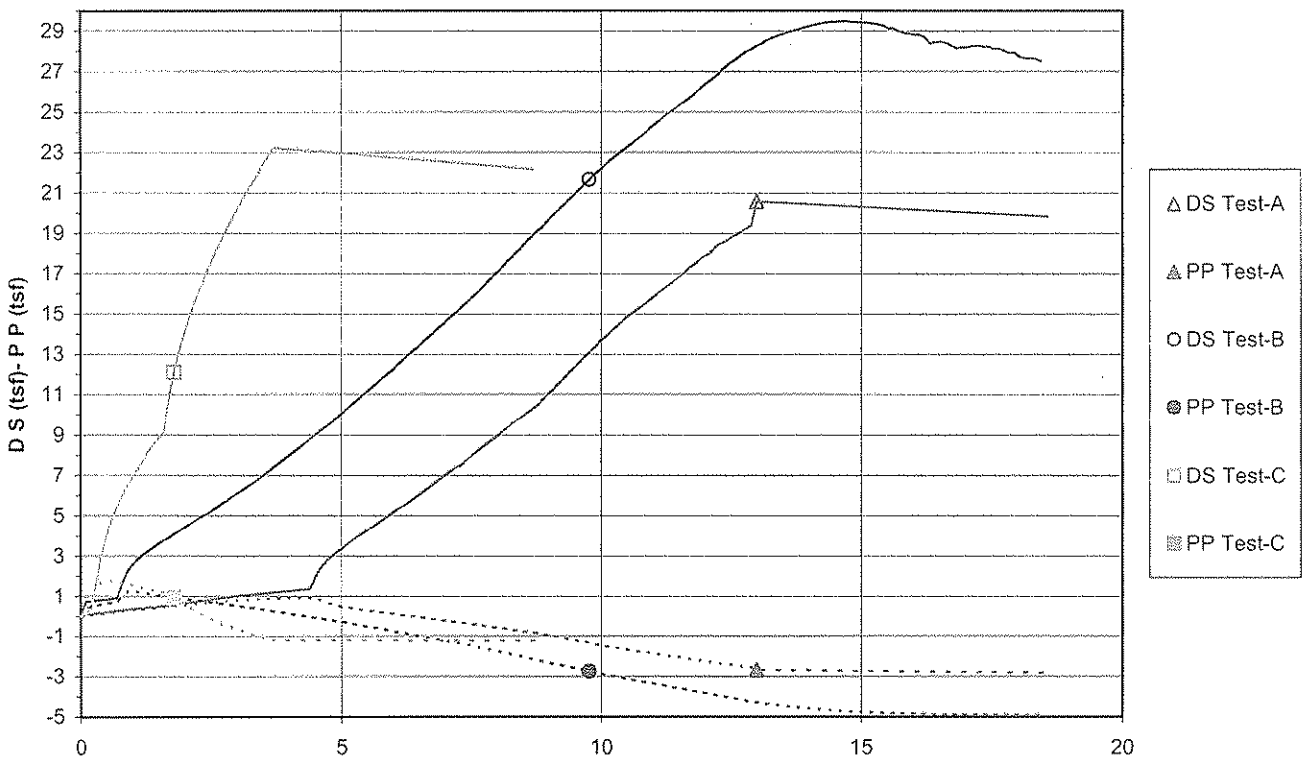
Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Project	TVA Facilities Assessment - PAF Phase 2	Project No.	171468118
Sample ID	B-6A, 29.7' - 30.2' & B-6A, 30.3' - 30.8' & B-6A, 30.9' - 31.4'	Test Number	566
Failure Criterion:	Maximum Effective Principal Stress Ratio	ϕ' = 35.1 deg.	c' = 0.00 tsf

p' vs. q Plot



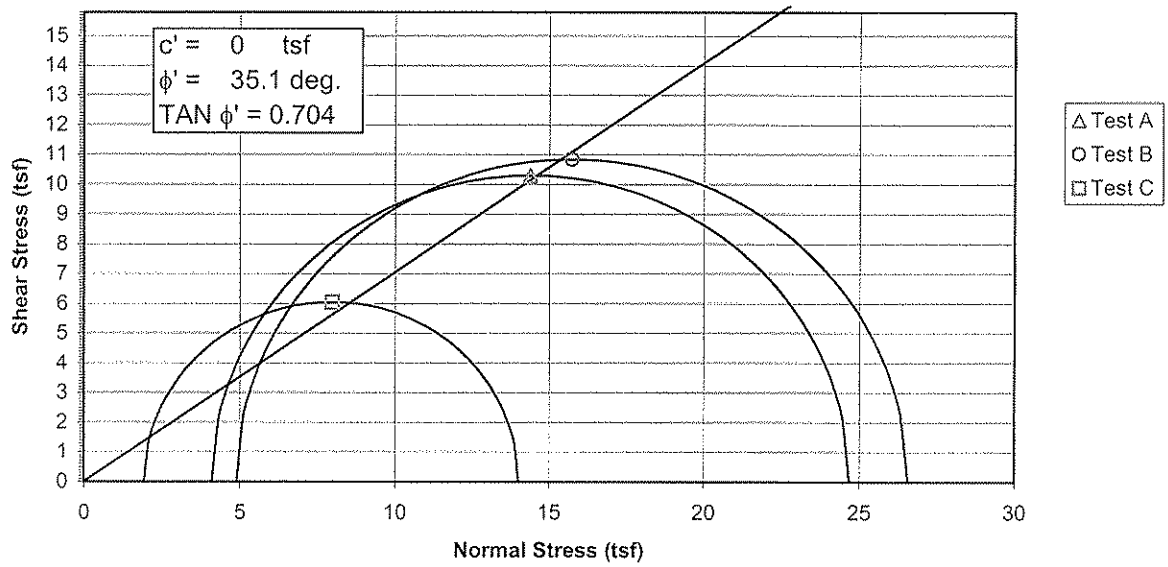
Deviator Stress and Induced Pore Pressure vs. Axial Strain



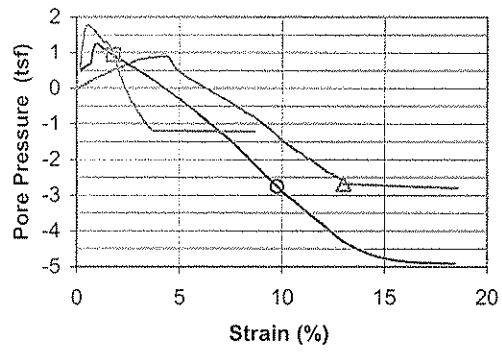
EM 1110-2-1906
Appendix X
30 Nov. 70

Failure Criterion: Maximum Effective Principal Stress Ratio

Effective Strength Envelope



Induced Pore Pressure vs. Strain



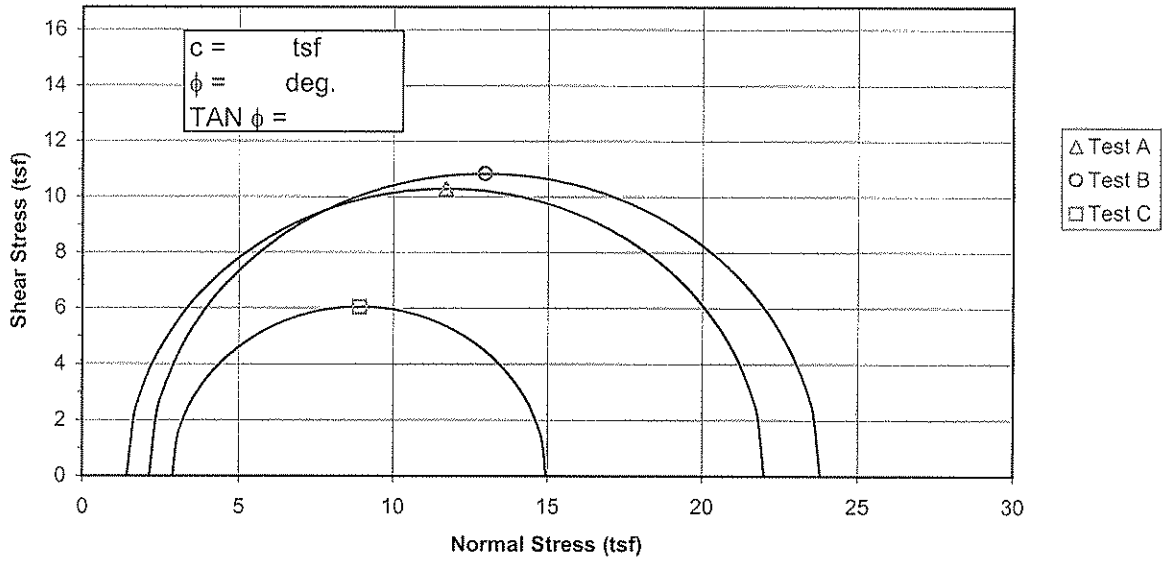
Specimen No.			A	B	C
Initial Data	Water content %	W_o	20.8	22.2	22.3
	Dry Density PCF	γ_{d_o}	103.3	98.8	94.8
	Saturation %	S_o	102.0	95.8	86.3
	Void Ratio	e_o	0.510	0.580	0.647
After Shear	Water content %	W_f	16.3	17.1	20.9
	Dry Density PCF	γ_{d_f}	110.8	109.3	102.5
	Saturation %	S_f	100.0	100.0	100.0
	Void Ratio	e_f	0.408	0.427	0.522
	Final Back Pressure TSF	u_c	5.04	4.32	3.60
Minor Principal Stress TSF @ failure		σ_3'f	4.11	4.91	1.94
Maximum Deviator Stress (tsf) @ failure		$(\sigma_1'-\sigma_3')_{max}$	20.57	21.65	12.09
Time to (σ1'-σ3')max min.		t_f	1331.9	354.6	256.4
Ultimate Deviator Stress, t/sq ft		$(\sigma 1'-\sigma 3')_{ult}$	19.84	n/a	n/a
Initial Diameter, in.		D_o	2.850	2.934	2.880
Initial Height, in.		H_o	5.996	5.862	6.039

Controlled - Strain Test							
Description of Specimens	Silt (ML), gray to dark gray, moist, soft, fly ash						
					Type of Specimen	Undisturbed	Type of test R
LL	NP	PL	NP	PI	NP	Gs	2.5
Remarks:							
					Boring No.	B-6A	Sample No. 566
					Depth Elev.	29.5' - 31.5'	
					Laboratory	Stantec	Date 4-6-09
					TRIAXIAL COMPRESSION TEST REPORT		

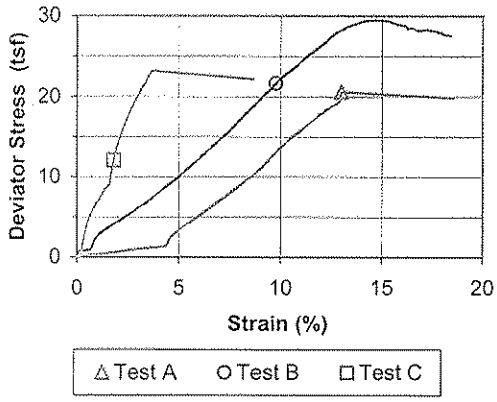
EM 1110-2-1906
Appendix X
30 Nov. 70

Failure Criterion: Maximum Effective Principal Stress Ratio

Total Strength Envelope



Deviator Stress vs. Strain



Specimen No.			A	B	C	
Initial Data	Water content %	W_o	20.8	22.2	22.3	
	Dry Density PCF	γ_{d_o}	103.3	98.8	94.8	
	Saturation %	S_o	102.0	95.8	86.3	
	Void Ratio	e_o	0.510	0.580	0.647	
After Shear	Water content %	W_f	16.3	17.1	20.9	
	Dry Density PCF	γ_{d_f}	110.8	109.3	102.5	
	Saturation %	S_f	100.0	100.0	100.0	
	Void Ratio	e_f	0.408	0.427	0.522	
	Final Back Pressure TSF	u_c	5.04	4.32	3.60	
Minor Principal Stress TSF		σ_3	1.44	2.16	2.88	
Maximum Deviator Stress (tsf) @ failure		$(\sigma_1-\sigma_3)_{max}$	20.57	21.65	12.09	
Time to $(\sigma_1-\sigma_3)_{Max.}$ min.		t_f	1331.9	354.6	256.4	
Ultimate Deviator Stress, t/sq ft		$(\sigma_1-\sigma_3)_{ult}$	19.84	n/a	n/a	
Initial Diameter, in.		D_o	2.850	2.934	2.880	
Initial Height, in.		H_o	5.996	5.862	6.039	

Controlled - Strain Test					
Description of Specimens	Silt (ML), gray to dark gray, moist, soft, fly ash				
		Type of Specimen	Undisturbed	Type of test	$\bar{R}$
LL NP	PL NP	PI NP	Gs 2.5	Project	TVA Facilities Assessment - PAF Phase 2
Remarks:					
		Boring No.	B-6A	Sample No.	566
		Depth Elev.	29.5' - 31.5'		
		Laboratory	Stantec	Date	4-6-09
		TRIAXIAL COMPRESSION TEST REPORT			

Consolidated Undrained Triaxial Test

ASTM D4767-04

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Sample Identification	B-6A, 29.7' - 30.2'	Test Number	CU-566A
Visual Description	Silt (ML), gray to dark gray, moist, soft, fly ash	Prepared By	KDG
Undisturbed	Source B-6A, 29.5' - 31.5'	Date	3-24-2009

Specific Gravity	2.50	Assumed	Liquid Limit	NP	Plastic Limit	NP	Plasticity Index	NP

Initial Specimen Data

Specimen Diameter (in.)		Specimen Height (in.)		Volumes (in^3)		Specimen	
Top	2.874	1	6.013	Sample	38.2793 (V_o)	Wet Weight (g)	1253.90
Middle	2.848	2	6.002	Solids	25.3338 (VS_o)	Dry Weight (g)	1037.93
Bottom	2.831	3	5.957	Water	13.1784 (Vw_o)	Wet Unit Weight (pcf)	124.8
Avg.	2.8510 (D_o)	4	6.013	Voids	12.9455 (Vv_o)	Dry Unit Weight (pcf)	103.3
Area (in^2)	6.3839 (A_o)	Avg. (H_o)	5.9963	Degree of Saturation (%)	101.8 (S_o)		
Moisture Content (%)	20.8	Final Trimmings		Void Ratio	0.511		

Saturation

Set Up & Saturated: Wet xx Dry

Back Pressure Saturated to: 70 (psi) Final Pore Pressure Parameter B 0.98

Set up By KDG

Date 3-24-09

Panel Board Number E

Height Readings (in.)		Back Pressure Burette			Chamber Burette				
Initial	0.3065	Initial	16.08	(in.)	Initial	11.94	(in.)	Specimen Height (in.)	5.9961 (H_s)
Final	0.3067	Final	14.95	(in.)	Final	7.74	(in.)	Area (in^2) Method A	6.3834 (A_s)
Change	-0.0002 (ΔH_o)	Change	-1.13	(in.)	Change	-4.20	(in.)	Specimen Volume (in^3)	38.28 (Vs)

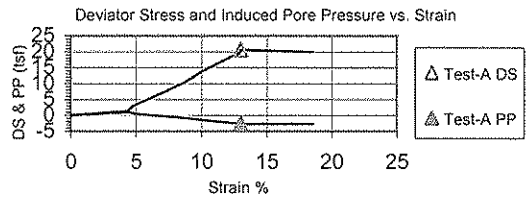
Consolidation

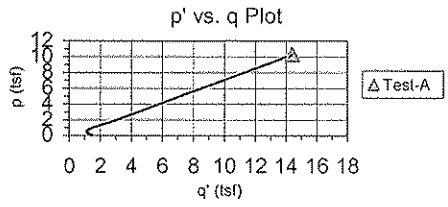
Height Readings (in.)			Back Pressure Burette Readings			Chamber Burette Readings			Pressures (psi)	
Initial	0.3067		Initial	1.26	(in.)	Initial	17.75	(in.)	Chamber	90
Final	0.306		Final	7.54	(in.)	Final	11.14	(in.)	Back	70
Change	0.0007	(ΔH_c)	Change	-6.28	(in.)	Change	-6.61	(in.)	Lateral	20 (σ_3)
Height (in.)	5.9968	(H_c)				Volume (in^3)	35.6699	(V_c)		
Area (in^3) Method B	5.9482	(A_c)				Volume - Water (in^3)	10.3361	(VWc)	t_{50} (min.)	220
Diameter (in.)	2.7520	(D_c)				Water Content (%)	16.3			
Dry Density (pcf)	110.8					Degree of Saturation (%)	100.0	(S_c)	Void Ratio	0.408

After Test

Final Measurements			Final Moisture Content		Stresses (membrane corrected) at Failure (psi)	
Maximum Diameter	3.051	(in.)	Wet Weight (g)	1207.32	Corrected Deviator	20.57 σ_d (tsf)
Wet weight (g)	1207.32	(WWf)	Dry Weight (g)	1037.93	Major Principal	24.70 $\sigma_1'_f$ (tsf)
Corrected Diameter	3.027	(in.)	Tare Weight (g)	0.00	Minor Principal	4.11 $\sigma_3'_f$ (tsf)
					Rate of Strain (% / min.)	0.014
Youngs Modulus for Membrane (psi)	200				Axial Strain at Failure (%)	13.01
Membrane Thickness (in.)	0.012				Failure Criterion:	Maximum Effective Principal Stress Ratio

Failure Sketch





Comments: Test stopped due to load cell maximum reached.

Consolidated Undrained Triaxial Test

ASTM D4767-04

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Sample Identification	B-6A, 30.3' - 30.8'	Test Number	CU-566B
Visual Description	Silt (ML), dark gray, moist, soft, fly ash	Prepared By	KDG
Undisturbed	Source B-6A, 29.5' - 31.5'	Date	3-25-2009

Specific Gravity 2.50 Assumed | Liquid Limit NP | Plastic Limit NP | Plasticity Index NP

Initial Specimen Data

Specimen Diameter (in.)		Specimen Height (in.)		Volumes (in3)		Specimen	
Top	2.864	1	5.894	Sample	39.3901 (V_o)	Wet Weight (g)	1256.45
Middle	2.962	2	5.857	Solids	25.0940 (VS_o)	Dry Weight (g)	1028.10
Bottom	2.949	3	5.803	Water	13.9337 (Vw_o)	Wet Unit Weight (pcf)	121.5
Avg.	2.9250 (D_o)	4	5.894	Voids	14.2962 (Vv_o)	Dry Unit Weight (pcf)	99.4
Area (in^2)	6.7196 (A_o)	Avg. (H_o)	5.8620	Degree of Saturation (%)	97.5 (S_o)		
Moisture Content (%)	22.2	Final Trimmings		Void Ratio	0.570		

Saturation

Set Up & Saturated: Wet xx Dry ____ | Set up By KDG

Back Pressure Saturated to: 60 (psi) | Final Pore Pressure Parameter B 0.97 | Date 3-25-09

Panel Board Number C

Height Readings (in.)		Back Pressure Burette		Chamber Burette			
Initial	0.2455	Initial	16.71 (in.)	Initial	13.21 (in.)	Specimen Height (in.)	5.8585 (H_s)
Final	0.249	Final	15.59 (in.)	Final	9.52 (in.)	Area (in^2) Method A	6.7115 (A_s)
Change	-0.0035 (ΔH_o)	Change	-1.12 (in.)	Change	-3.69 (in.)	Specimen Volume (in^3)	39.32 (V_s)

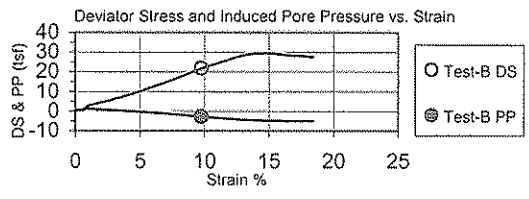
Consolidation

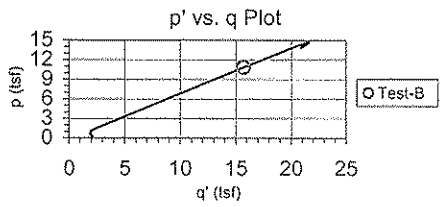
Height Readings (in.)		Back Pressure Burette Readings		Chamber Burette Readings		Pressures (psi)	
Initial	0.249	Initial	1.22 (in.)	Initial	17.58 (in.)	Chamber	90
Final	0.2502	Final	7.71 (in.)	Final	10.76 (in.)	Back	60
Change	-0.0012 (ΔH_c)	Change	-6.49 (in.)	Change	-6.82 (in.)	Lateral	30 (σ_3)
Height (in.)	5.8573 (H_c)			Volume (in^3)	35.8211 (V_c)		
Area (in^3) Method B	6.1156 (A_c)			Volume - Water (in^3)	10.7271 (VWc)	D_{50} (min.)	65
Diameter (in.)	2.7905 (D_c)			Water Content (%)	17.1		
Dry Density (pcf)	109.3			Degree of Saturation (%)	100.0 (S_c)	Void Ratio	0.427

After Test

Final Measurements			Final Moisture Content		Stresses (membrane corrected) at Failure (psi)	
Maximum Diameter	3.261 (in.)	Wet Weight (g)	1203.90		Corrected Deviator	21.65 σ_d (tsf)
Wet weight (g)	1203.9 (WWf)	Dry Weight (g)	1028.10		Major Principal	26.57 $\sigma_1'_f$ (tsf)
Corrected Diameter	3.237 (in.)	Tare Weight (g)	0.00		Minor Principal	4.91 $\sigma_3'_f$ (tsf)
					Rate of Strain (% / min.)	0.022
Youngs Modulus for Membrane (psi)	200				Axial Strain at Failure (%)	9.77
Membrane Thickness (in.)	0.012				Failure Criterion:	Maximum Effective Principal Stress Ratio

Failure Sketch





Comments: Test stopped due to load cell maximum reached.

Consolidated Undrained Triaxial Test

ASTM D4767-04

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Sample Identification	B-6A, 30.9' - 31.4'	Test Number	CU-566C
Visual Description	Silt (ML), gray to dark gray, moist, soft, fly ash	Prepared By	KDG
Undisturbed	Source B-6A, 29.5' - 31.5'	Date	3-25-2009

Specific Gravity 2.50 Assumed | Liquid Limit NP | Plastic Limit NP | Plasticity Index NP

Initial Specimen Data

Specimen Diameter (in.)		Specimen Height (in.)		Volumes (in^3)		Specimen	
Top	2.871	1	6.042	Sample	39.3753 (V_o)	Wet Weight (g)	1197.03
Middle	2.876	2	6.036	Solids	23.8859 (VS_o)	Dry Weight (g)	978.61
Bottom	2.897	3	6.035	Water	13.3279 (Vw_o)	Wet Unit Weight (pcf)	115.8
Avg.	2.8813 (D_o)	4	6.042	Voids	15.4894 (Vv_o)	Dry Unit Weight (pcf)	94.7
Area (in^2)	6.5204 (A_o)	Avg. (H_o)	6.0388	Degree of Saturation (%)	86.0 (S_o)		
Moisture Content (%)	22.3	Final Trimmings		Void Ratio	0.648		

Saturation

Set Up & Saturated: Wet xx Dry ____ | Set up By KDG

Back Pressure Saturated to: 50 (psi) | Final Pore Pressure Parameter B 0.97 | Date 3-25-09

Panel Board Number D

Height Readings (in.)		Back Pressure Burette		Chamber Burette			
Initial	0.2722	Initial	15.62 (in.)	Initial	12.28 (in.)	Specimen Height (in.)	6.0461 (H_s)
Final	0.2649	Final	13.93 (in.)	Final	9.03 (in.)	Area (in^2) Method A	6.5362 (A_s)
Change	0.0073 (ΔH_o)	Change	-1.69 (in.)	Change	-3.25 (in.)	Specimen Volume (in^3)	39.52 (V_s)

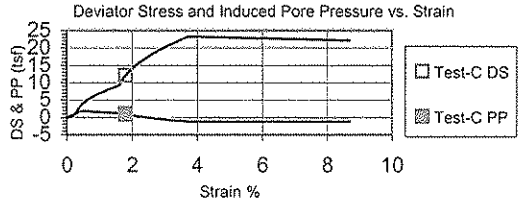
Consolidation

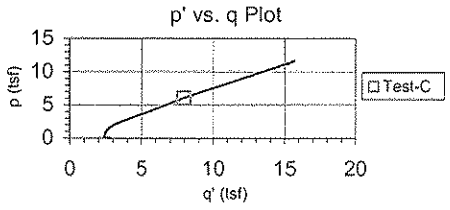
Height Readings (in.)		Back Pressure Burette Readings		Chamber Burette Readings		Pressures (psi)	
Initial	0.2649	Initial	1.15 (in.)	Initial	17.24 (in.)	Chamber	90
Final	0.3275	Final	6.20 (in.)	Final	12.54 (in.)	Back	50
Change	-0.0626 (ΔH_c)	Change	-5.05 (in.)	Change	-4.70 (in.)	Lateral	40 (σ_3)
Height (in.)	5.9835 (H_c)			Volume (in^3)	36.3523 (V_c)		
Area (in^3) Method B	6.0755 (A_c)			Volume - Water (in^3)	12.4663 (VWc)	D_{50} (min.)	26
Diameter (in.)	2.7813 (D_c)			Water Content (%)	20.9		
Dry Density (pcf)	102.6			Degree of Saturation (%)	100.0 (S_c)	Void Ratio	0.522

After Test

Final Measurements			Final Moisture Content		Stresses (membrane corrected) at Failure (psi)	
Maximum Diameter	2.935 (in.)	Wet Weight (g)	1182.91		Corrected Deviator	12.09 σ_d (tsf)
Wet weight (g)	1182.91 (WWf)	Dry Weight (g)	978.61		Major Principal	14.02 $\sigma_1'_f$ (tsf)
Corrected Diameter	2.911 (in.)	Tare Weight (g)	0.00		Minor Principal	1.94 $\sigma_3'_f$ (tsf)
					Rate of Strain (% / min.)	0.026
Youngs Modulus for Membrane (psi)	200				Axial Strain at Failure (%)	1.81
Membrane Thickness (in.)	0.012				Failure Criterion:	Maximum Effective Principal Stress Ratio

Failure Sketch





Comments: Test stopped due to load cell maximum reached.

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter ASTM D 5084-03

Project Name TVA Facilities Assessment - PAF Phase 2 | Project No. 171468118
Source B-1, 4.5'-5.0' | Test ID 345A
Visual Classification Lean Clay (CL), gray, moist, firm | Prepared By BWT
Undisturbed XX | Specific Gravity 2.62 ASTM D854-A | Date 3-30-09
Maximum Dry Density (pcf) | Percent of Maximum
Permeant: Gypsum saturated water
Selection and Preparation Comments:

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

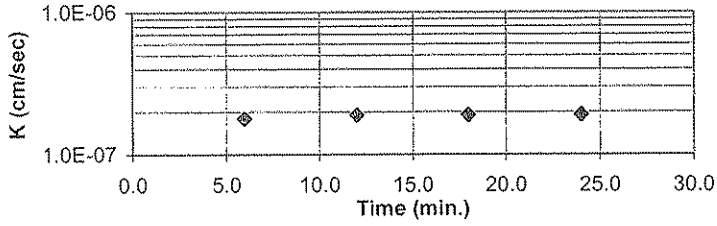
	Initial Specimen Data	After Consolidation Data	After Test Data
Height (in.)	2.4578	2.4331	2.4332
Diameter (in.)	2.8047		2.8003
Moisture Content (%)	22.4		23.1
Dry Unit Weight (pcf)	102.2		103.6
Void Ratio	0.600		0.579
Degree of Saturation (%)	98.0		104.5
Trimmings MC (%)	16.5		

Final Pressures (psi): Chamber 75; Influent 70; Effluent 65

Applied Head Difference (psi) 5
Back Pressure Saturated to (psi) 65
Maximum Effective Consolidation Stress (psi) 10
Minimum Effective Consolidation Stress (psi) 5

Date	Clock (24H:M)	Temp. °F	Bottom Head	Top Head	Test Time (sec)	Hydraulic Conductivity k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
4-1-09	14:19	72.0	22.20	3.01	0	---	---	---	---
4-1-09	14:25	72.0	22.02	3.21	3.60E+02	1.9E-09	1.9E-07	1.8E-09	1.8E-07
4-1-09	14:31	72.0	21.82	3.41	3.60E+02	2.0E-09	2.0E-07	1.9E-09	1.9E-07
4-1-09	14:37	72.0	21.62	3.61	3.60E+02	2.0E-09	2.0E-07	1.9E-09	1.9E-07
4-1-09	14:43	72.0	21.42	3.81	3.60E+02	2.0E-09	2.0E-07	1.9E-09	1.9E-07

Corrected Permeability vs. Time



A gradient of approximately 56.1 was used for this test. This gradient exceeds ASTM guidelines for maximum gradient, but was used to achieve the requestors desired test duration. Examination of the sample shows no signs of material loss or clogging that may affect test results.

Average Hydraulic Conductivity @ 20° C (last 4 determinations) m/s 1.86E-09 cm/s 1.86E-07
Average Hydraulic Conductivity @ 20° C (last run) m/s 1.86E-09 cm/s 1.86E-07

Reviewed by:

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
ASTM D 5084-03

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project No.: 171468118
Source: B-1, 34.7'-35.2' | Test ID: 350A
Visual Classification: Silt (ML), dark gray, wet, soft | Prepared By: KDG
Undisturbed: XX | Specific Gravity: 2.45 ASTM D854-A | Date: 3-31-09
Maximum Dry Density (pcf): | Percent of Maximum:
Permeant: Gypsum saturated water
Selection and Preparation Comments:

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 25 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

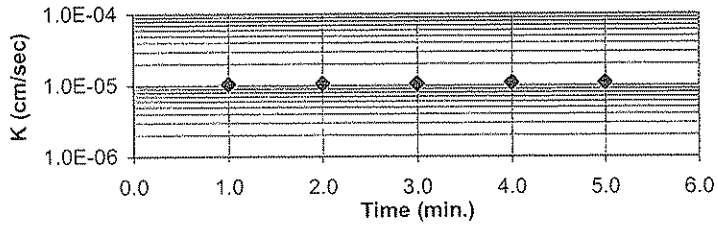
	Initial Specimen Data	After Consolidation Data	After Test Data
Height (in.)	2.4030	2.3241	2.3244
Diameter (in.)	2.8260		2.8275
Moisture Content (%)	39.1		35.8
Dry Unit Weight (pcf)	88.5		91.4
Void Ratio	0.727		0.673
Degree of Saturation (%)	131.7		130.2
Trimmings MC (%)	22.6		

Final Pressures (psi)	
Chamber	75
Influent	70
Effluent	65

Applied Head Difference (psi): 5
Back Pressure Saturated to (psi): 65
Maximum Effective Consolidation Stress (psi): 10
Minimum Effective Consolidation Stress (psi): 5

Date	Clock (24H:M)	Temp. °F	Bottom Head	Top Head	Test Time (sec)	Hydraulic Conductivity k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
4-2-09	11:44	70.0	21.54	3.26	0	---	---	---	---
4-2-09	11:45	70.0	21.06	3.74	6.00E+01	1.1E-07	1.1E-05	1.0E-07	1.0E-05
4-2-09	11:46	70.0	20.58	4.23	6.00E+01	1.1E-07	1.1E-05	1.1E-07	1.1E-05
4-2-09	11:47	70.0	20.10	4.71	6.00E+01	1.1E-07	1.1E-05	1.1E-07	1.1E-05
4-2-09	11:48	70.0	19.61	5.20	6.00E+01	1.1E-07	1.1E-05	1.1E-07	1.1E-05
4-2-09	11:49	70.0	19.12	5.69	6.00E+01	1.1E-07	1.1E-05	1.1E-07	1.1E-05

Corrected Permeability vs. Time



A gradient of approximately 57.4 was used for this test. This gradient exceeds ASTM guidelines for maximum gradient, but was used to achieve the requestors desired test duration. Examination of the sample shows no signs of material loss or clogging that may affect test results.

Average Hydraulic Conductivity @ 20° C (last 4 determinations) m/s 1.07E-07 cm/s 1.07E-05
Average Hydraulic Conductivity @ 20° C (last run) m/s 1.06E-07 cm/s 1.06E-05

Reviewed by:

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter ASTM D 5084-03

Project Name TVA Facilities Assessment - PAF Phase 2 | Project No. 171468118
Source B-6A, 4.7'-5.2' | Test ID 561A
Visual Classification Lean Clay (CL), gray brown, moist, firm | Prepared By JAM
Undisturbed XX | Specific Gravity 2.71 ASTM D854-A | Date 3-31-09
Maximum Dry Density (pcf) | Percent of Maximum
Permeant: Gypsum saturated water
Selection and Preparation Comments:

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

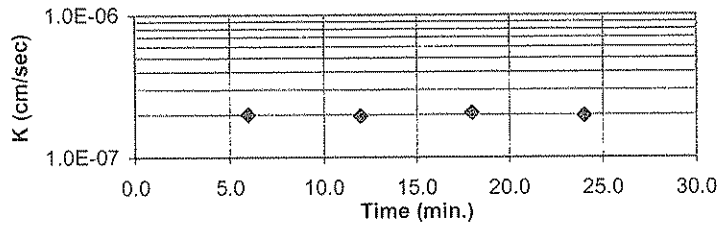
	Initial Specimen Data	After Consolidation Data	After Test Data
Height (in.)	2.4550	2.4384	2.4410
Diameter (in.)	2.8097		2.7943
Moisture Content (%)	15.8		17.8
Dry Unit Weight (pcf)	112.8		114.7
Void Ratio	0.500		0.475
Degree of Saturation (%)	85.4		101.7
Trimmings MC (%)	14.6		

Final Pressures (psi): Chamber 75; Influent 70; Effluent 65

Applied Head Difference (psi) 5
Back Pressure Saturated to (psi) 65
Maximum Effective Consolidation Stress (psi) 10
Minimum Effective Consolidation Stress (psi) 5

Date	Clock (24H:M)	Temp. °F	Bottom Head	Top Head	Test Time (sec)	Hydraulic Conductivity k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
4-3-09	9:20	70.0	21.10	2.06	0	---	---	---	---
4-3-09	9:26	70.0	20.90	2.27	3.60E+02	2.0E-09	2.0E-07	2.0E-09	2.0E-07
4-3-09	9:32	70.0	20.70	2.47	3.60E+02	2.0E-09	2.0E-07	1.9E-09	1.9E-07
4-3-09	9:38	70.0	20.49	2.68	3.60E+02	2.1E-09	2.1E-07	2.1E-09	2.1E-07
4-3-09	9:44	70.0	20.29	2.88	3.60E+02	2.0E-09	2.0E-07	2.0E-09	2.0E-07

Corrected Permeability vs. Time



A gradient of approximately 56.2 was used for this test. This gradient exceeds ASTM guidelines for maximum gradient, but was used to achieve the requestors desired test duration. Examination of the sample shows no signs of material loss or clogging that may affect test results.

Average Hydraulic Conductivity @ 20° C (last 4 determinations) m/s 1.99E-09 cm/s 1.99E-07
Average Hydraulic Conductivity @ 20° C (last run) m/s 1.99E-09 cm/s 1.99E-07

Reviewed by:

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
ASTM D 5084-03

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project No.: 171468118
Source: B-6A, 25.1'-25.6' | Test ID: 565B
Visual Classification: Silt (ML), dark gray, moist, firm | Prepared By: JAM
Undisturbed: XX | Specific Gravity: 2.45 | Date: 3-31-09
Maximum Dry Density (pcf): | Percent of Maximum:
Permeant: Gypsum satured water
Selection and Preparation Comments:

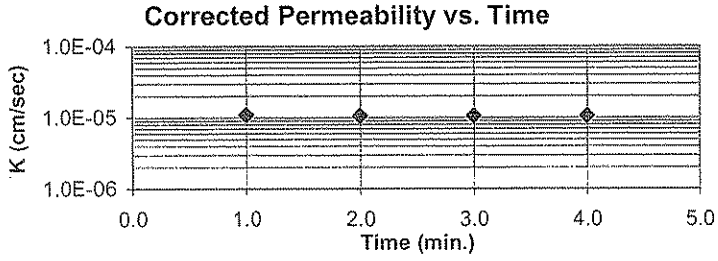
Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data
Height (in.)	2.4566	2.4345	2.4356
Diameter (in.)	2.8010		2.7938
Moisture Content (%)	35.2		34.9
Dry Unit Weight (pcf)	89.8		91.0
Void Ratio	0.704		0.681
Degree of Saturation (%)	122.4		125.6
Trimmings MC (%)	22.9		

Final Pressures (psi)	
Chamber	75
Influent	70
Effluent	65

Applied Head Difference (psi)	5
Back Pressure Saturated to (psi)	65
Maximum Effective Consolidation Stress (psi)	10
Minimum Effective Consolidation Stress (psi)	5

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. °F	Bottom Head	Top Head	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
4-2-09	11:15	70.0	20.62	3.82	0	---	---	---	---
4-2-09	11:16	70.0	20.14	4.28	6.00E+01	1.1E-07	1.1E-05	1.1E-07	1.1E-05
4-2-09	11:17	70.0	19.69	4.73	6.00E+01	1.1E-07	1.1E-05	1.1E-07	1.1E-05
4-2-09	11:18	70.0	19.23	5.17	6.00E+01	1.1E-07	1.1E-05	1.1E-07	1.1E-05
4-2-09	11:19	70.0	18.80	5.63	6.00E+01	1.1E-07	1.1E-05	1.1E-07	1.1E-05



A gradient of approximately 56.2 was used for this test. This gradient exceeds ASTM guidelines for maximum gradient, but was used to achieve the requestors desired test duration. Examination of the sample shows no signs of material loss or clogging that may affect test results.

Average Hydraulic Conductivity @ 20° C (last 4 determinations) m/s 1.06E-07 cm/s 1.06E-05
Average Hydraulic Conductivity @ 20° C (last run) m/s 1.06E-07 cm/s 1.06E-05

Reviewed by:

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter ASTM D 5084-03

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project No.: 171468118
Source: B-8A, 5.3'-5.8' | Test ID: 568B
Visual Classification: Silt (ML), gray, moist, firm | Prepared By: JAM
Undisturbed: XX | Specific Gravity: 2.45 ASTM D854-A | Date: 3-31-09
Maximum Dry Density (pcf): | Percent of Maximum:
Permeant: Gypsum saturated water
Selection and Preparation Comments:

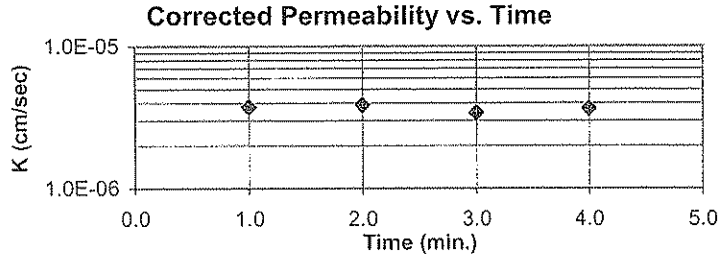
Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data
Height (in.)	2.4321	2.4239	2.4266
Diameter (in.)	2.7777		2.7802
Moisture Content (%)	26.5		32.5
Dry Unit Weight (pcf)	88.5		88.6
Void Ratio	0.728		0.727
Degree of Saturation (%)	89.2		109.4
Trimmings MC (%)	10.5		

Final Pressures (psi)	
Chamber	75
Influent	70
Effluent	65

Applied Head Difference (psi)	5
Back Pressure Saturated to (psi)	65
Maximum Effective Consolidation Stress (psi)	10
Minimum Effective Consolidation Stress (psi)	5

Date	Clock (24H:M)	Temp. °F	Bottom Head	Top Head	Test Time (sec)	Hydraulic Conductivity k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
4-2-09	11:28	70.0	21.97	3.04	0	---	---	---	---
4-2-09	11:29	70.0	21.83	3.22	6.00E+01	3.8E-08	3.8E-06	3.7E-08	3.7E-06
4-2-09	11:30	70.0	21.67	3.39	6.00E+01	4.0E-08	4.0E-06	3.9E-08	3.9E-06
4-2-09	11:31	70.0	21.53	3.54	6.00E+01	3.5E-08	3.5E-06	3.4E-08	3.4E-06
4-2-09	11:32	70.0	21.38	3.70	6.00E+01	3.7E-08	3.7E-06	3.6E-08	3.6E-06



A gradient of approximately 56.7 was used for this test. This gradient exceeds ASTM guidelines for maximum gradient, but was used to achieve the requestors desired test duration. Examination of the sample shows no signs of material loss or clogging that may affect test results.

Average Hydraulic Conductivity @ 20° C (last 4 determinations) m/s 3.65E-08 cm/s 3.65E-06
Average Hydraulic Conductivity @ 20° C (last run) m/s 3.65E-08 cm/s 3.65E-06

Reviewed by:

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter ASTM D 5084-03

Project Name	TVA Facilities Assessment - PAF Phase 2	Project No.	171468118
Source	B-9A, 40.0'-40.5'	Test ID	587
Visual Classification	Silt (ML), gray, moist, firm	Prepared By	BT
Undisturbed	XX	Specific Gravity 2.38 ASTM D854-A	Date 3-30-09
		Maximum Dry Density (pcf)	Percent of Maximum

Permeant: Gypsum saturated water

Selection and Preparation Comments:

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 25 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

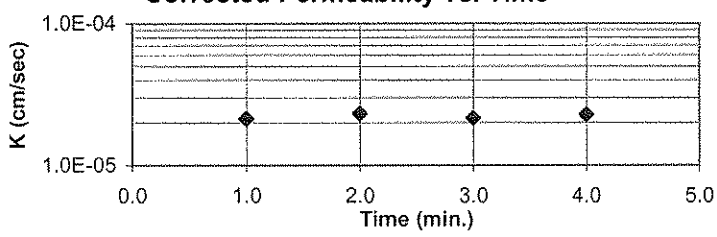
	Initial Specimen Data	After Consolidation Data	After Test Data
Height (in.)	2.4586	2.4199	2.4207
Diameter (in.)	2.8053		2.7871
Moisture Content (%)	48.2		47.5
Dry Unit Weight (pcf)	79.1		81.4
Void Ratio	0.878		0.825
Degree of Saturation (%)	130.8		136.9
Trimmings MC (%)	45.9		

Final Pressures (psi)	
Chamber	75
Influent	70
Effluent	65

Applied Head Difference (psi)	5
Back Pressure Saturated to (psi)	65
Maximum Effective Consolidation Stress (psi)	10
Minimum Effective Consolidation Stress (psi)	5

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. °F	Bottom Head	Top Head	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
4-1-09	10:49	73.0	19.84	4.84	0	---	---	---	---
4-1-09	10:50	73.0	18.86	5.76	6.00E+01	2.3E-07	2.3E-05	2.1E-07	2.1E-05
4-1-09	10:51	73.0	17.85	6.79	6.00E+01	2.5E-07	2.5E-05	2.3E-07	2.3E-05
4-1-09	10:52	73.0	16.92	7.73	6.00E+01	2.3E-07	2.3E-05	2.2E-07	2.2E-05
4-1-09	10:53	73.0	15.96	8.72	6.00E+01	2.4E-07	2.4E-05	2.3E-07	2.3E-05

Corrected Permeability vs. Time



A gradient of approximately 56.1 was used for this test. This gradient exceeds ASTM guidelines for maximum gradient, but was used to achieve the requestors desired test duration. Examination of the sample shows no signs of material loss or clogging that may affect test results.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	2.22E-07	cm/s	2.22E-05
Average Hydraulic Conductivity @ 20° C (last run)	m/s	2.22E-07	cm/s	2.22E-05

Reviewed by:

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
ASTM D 5084-03

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project No.: 171468118
Source: B-10A, 4.5' - 6.5', TI 4.8' - 5.3' | Test ID: 631A
Visual Classification: Lean Clay with Gravel (CL), gray brown, moist, firm | Prepared By: BT
Undisturbed: XX | Specific Gravity: 2.71 | Date: 3-30-09
Maximum Dry Density (pcf): | Percent of Maximum:
Permeant: Gypsum saturated water
Selection and Preparation Comments:

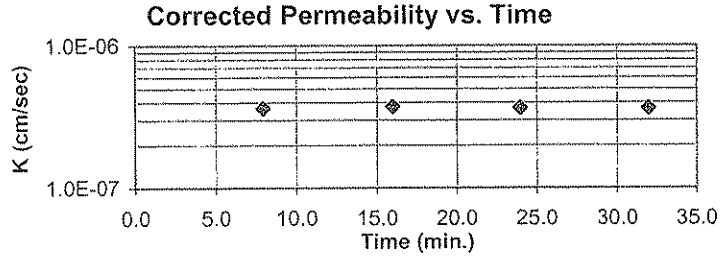
Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data
Height (in.)	2.4691	2.4071	2.4076
Diameter (in.)	2.7667		2.7802
Moisture Content (%)	20.7		23.0
Dry Unit Weight (pcf)	102.6		104.2
Void Ratio	0.649		0.624
Degree of Saturation (%)	86.5		100.0
Trimmings MC (%)	22.2		

Final Pressures (psi)	
Chamber	75
Influent	70
Effluent	65

Applied Head Difference (psi)	5
Back Pressure Saturated to (psi)	65
Maximum Effective Consolidation Stress (psi)	10
Minimum Effective Consolidation Stress (psi)	5

Date	Clock (24H:M)	Temp. °F	Bottom Head	Top Head	Test Time (sec)	Hydraulic Conductivity k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
4-1-09	14:18	72.0	22.36	3.23	0	---	---	---	---
4-1-09	14:26	72.0	21.84	3.73	4.80E+02	3.8E-09	3.8E-07	3.6E-09	3.6E-07
4-1-09	14:34	72.0	21.34	4.27	4.80E+02	3.9E-09	3.9E-07	3.7E-09	3.7E-07
4-1-09	14:42	72.0	20.84	4.78	4.80E+02	3.8E-09	3.8E-07	3.6E-09	3.6E-07
4-1-09	14:50	72.0	20.34	5.28	4.80E+02	3.8E-09	3.8E-07	3.6E-09	3.6E-07



A gradient of approximately 55.9 was used for this test. This gradient exceeds ASTM guidelines for maximum gradient, but was used to achieve the requestors desired test duration. Examination of the sample shows no signs of material loss or clogging that may affect test results.

Average Hydraulic Conductivity @ 20° C (last 4 determinations) m/s 3.65E-09 cm/s 3.65E-07
Average Hydraulic Conductivity @ 20° C (last run) m/s 3.65E-09 cm/s 3.65E-07

Reviewed by:

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
ASTM D 5084-03

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project No.: 171468118
Source: B-10A, 39.5' - 41.5', TI 39.7' - 40.2' | Test ID: 638A
Visual Classification: Silt (ML), gray, moist, firm | Prepared By: BT
Undisturbed: XX | Specific Gravity: 2.45 ASTM D854-A | Date: 3-30-09
Maximum Dry Density (pcf): | Percent of Maximum:

Permeant: Gypsum saturated water
Selection and Preparation Comments:

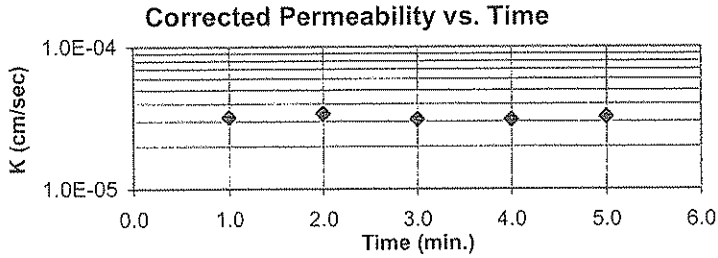
Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data
Height (in.)	2.4670	2.4201	2.4214
Diameter (in.)	2.7930		2.7775
Moisture Content (%)	42.7		40.8
Dry Unit Weight (pcf)	84.8		87.4
Void Ratio	0.804		0.751
Degree of Saturation (%)	130.0		133.0
Trimmings MC (%)	42.1		

Final Pressures (psi)	
Chamber	75
Influent	70
Effluent	65

Applied Head Difference (psi)	5
Back Pressure Saturated to (psi)	65
Maximum Effective Consolidation Stress (psi)	10
Minimum Effective Consolidation Stress (psi)	5

Date	Clock (24H:M)	Temp. °F	Bottom Head	Top Head	Test Time (sec)	Hydraulic Conductivity k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
4-1-09	10:17	73.0	19.45	5.04	0	---	---	---	---
4-1-09	10:18	73.0	18.04	6.45	6.00E+01	3.4E-07	3.4E-05	3.2E-07	3.2E-05
4-1-09	10:19	73.0	16.56	7.91	6.00E+01	3.6E-07	3.6E-05	3.4E-07	3.4E-05
4-1-09	10:20	73.0	15.26	9.24	6.00E+01	3.3E-07	3.3E-05	3.1E-07	3.1E-05
4-1-09	10:21	73.0	13.97	10.51	6.00E+01	3.3E-07	3.3E-05	3.1E-07	3.1E-05
4-1-09	10:22	73.0	12.66	11.83	6.00E+01	3.4E-07	3.4E-05	3.2E-07	3.2E-05



A gradient of approximately 55.9 was used for this test. This gradient exceeds ASTM guidelines for maximum gradient, but was used to achieve the requestors desired test duration. Examination of the sample shows no signs of material loss or clogging that may affect test results.

Average Hydraulic Conductivity @ 20° C (last 4 determinations) m/s 3.20E-07 cm/s 3.20E-05
Average Hydraulic Conductivity @ 20° C (last run) m/s 3.20E-07 cm/s 3.20E-05

Reviewed by:

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter ASTM D 5084-03

Stantec

Project Name	TVA Facilities Assessment - PAF Phase 2	Project No.	171468118
Source	B-13A, 5.0' - 7.0', TI 5.2' - 5.7'	Test ID	641A
Visual Classification	Silt (ML), gray, moist, firm	Prepared By	BWT
Undisturbed	XX	Specific Gravity	2.45 ASTM D854-A
		Date	3-30-09
		Maximum Dry Density (pcf)	
		Percent of Maximum	

Permeant: Gypsum saturated water

Selection and Preparation Comments:

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

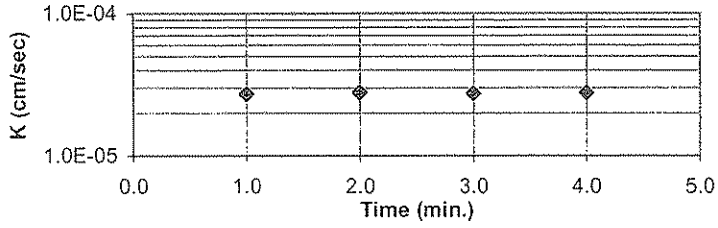
	Initial Specimen Data	After Consolidation Data	After Test Data
Height (in.)	2.4578	2.4252	2.4265
Diameter (in.)	2.7990		2.7674
Moisture Content (%)	34.9		45.1
Dry Unit Weight (pcf)	78.0		80.9
Void Ratio	0.960		0.891
Degree of Saturation (%)	89.2		124.1
Trimmings MC (%)	14.1		

Final Pressures (psi)	
Chamber	75
Influent	70
Effluent	65

Applied Head Difference (psi)	5
Back Pressure Saturated to (psi)	65
Maximum Effective Consolidation Stress (psi)	10
Minimum Effective Consolidation Stress (psi)	5

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. °F	Bottom Head	Top Head	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
4-1-09	11:49	73.0	19.03	5.73	0	---	---	---	---
4-1-09	11:50	73.0	17.85	6.93	6.00E+01	2.9E-07	2.9E-05	2.7E-07	2.7E-05
4-1-09	11:51	73.0	16.64	8.11	6.00E+01	3.0E-07	3.0E-05	2.8E-07	2.8E-05
4-1-09	11:52	73.0	15.47	9.26	6.00E+01	2.9E-07	2.9E-05	2.7E-07	2.7E-05
4-1-09	11:53	73.0	14.33	10.42	6.00E+01	3.0E-07	3.0E-05	2.8E-07	2.8E-05

Corrected Permeability vs. Time



A gradient of approximately 56.1 was used for this test. This gradient exceeds ASTM guidelines for maximum gradient, but was used to achieve the requestors desired test duration. Examination of the sample shows no signs of material loss or clogging that may affect test results.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	2.75E-07	cm/s	2.75E-05
Average Hydraulic Conductivity @ 20° C (last run)	m/s	2.75E-07	cm/s	2.75E-05

Reviewed by:

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
ASTM D 5084-03

Project Name: TVA Facilities Assessment - PAF Phase 2 | Project No.: 171468118
Source: B-13A, 15.0' - 17.0', TI 15.2' - 15.7' | Test ID: 643A
Visual Classification: Silt (ML), gray, moist, firm | Prepared By: BT
Undisturbed: XX | Specific Gravity: 2.45 ASTM D854-A | Date: 3-30-09
Maximum Dry Density (pcf): | Percent of Maximum:
Permeant: Gypsum saturated water
Selection and Preparation Comments:

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

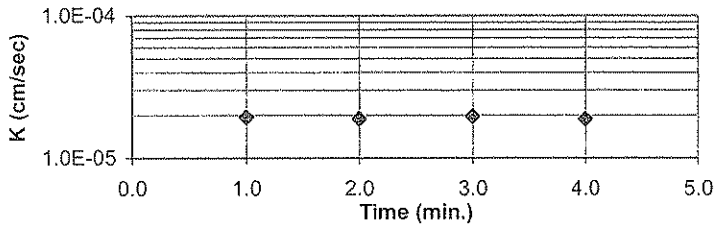
	Initial Specimen Data	After Consolidation Data	After Test Data
Height (in.)	2.4661	2.3218	2.3231
Diameter (in.)	2.7953		2.8033
Moisture Content (%)	36.7		34.0
Dry Unit Weight (pcf)	89.4		94.3
Void Ratio	0.711		0.621
Degree of Saturation (%)	126.5		133.9
Trimmings MC (%)	21.3		

Final Pressures (psi): Chamber 75; Influent 70; Effluent 65

Applied Head Difference (psi): 5
Back Pressure Saturated to (psi): 65
Maximum Effective Consolidation Stress (psi): 10
Minimum Effective Consolidation Stress (psi): 5

Date	Clock (24H:M)	Temp. °F	Bottom Head	Top Head	Test Time (sec)	Hydraulic Conductivity k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
4-1-09	11:03	73.0	19.72	5.30	0	---	---	---	---
4-1-09	11:04	73.0	18.82	6.22	6.00E+01	2.1E-07	2.1E-05	1.9E-07	1.9E-05
4-1-09	11:05	73.0	17.93	7.08	6.00E+01	2.0E-07	2.0E-05	1.9E-07	1.9E-05
4-1-09	11:06	73.0	17.03	7.98	6.00E+01	2.1E-07	2.1E-05	2.0E-07	2.0E-05
4-1-09	11:07	73.0	16.18	8.82	6.00E+01	2.0E-07	2.0E-05	1.9E-07	1.9E-05

Corrected Permeability vs. Time



A gradient of approximately 56 was used for this test. This gradient exceeds ASTM guidelines for maximum gradient, but was used to achieve the requestors desired test duration. Examination of the sample shows no signs of material loss or clogging that may affect test results.

Average Hydraulic Conductivity @ 20° C (last 4 determinations) m/s 1.91E-07 cm/s 1.91E-05
Average Hydraulic Conductivity @ 20° C (last run) m/s 1.91E-07 cm/s 1.91E-05

Reviewed by:

Stantec

Summary of Soil Tests

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Source	B-3, 1.5'-7.5'	Lab ID	828
County	Muhlenberg	Date Received	3-27-09
Sample Type	SPT Comp	Date Reported	4-9-09

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	91.0
No. 4	4.75	85.6
No. 10	2	69.7
No. 40	0.425	63.6
No. 200	0.075	56.5
	0.02	48.4
	0.005	32.9
	0.002	21.5
estimated	0.001	14.0

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

	ASTM	AASHTO
Range	(%)	(%)
Gravel	14.4	30.3
Coarse Sand	15.9	6.1
Medium Sand	6.1	---
Fine Sand	7.1	7.1
Silt	23.6	35.0
Clay	32.9	21.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	37
Plastic Limit:	19
Plasticity Index:	18
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:	2.69

Classification

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

Comments:

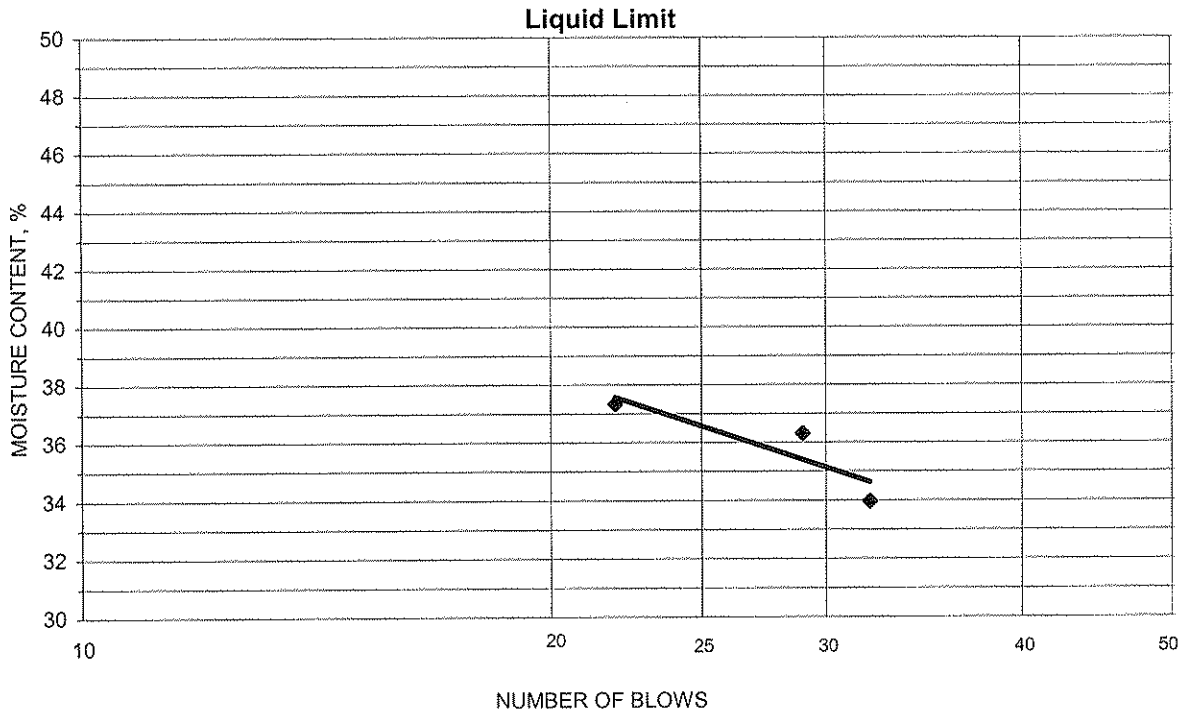
Reviewed by:

Stantec

ATTERBERG LIMITS

Project	TVA Facilities Assessment - PAF Phase 2	Project No.	171468118
Source	B-3, 1.5'-7.5'	Lab ID	828
		% + No. 40	36
Tested By	RC	Test Method	ASTM D 4318 Method A
Test Date	04-03-2009	Prepared	Dry
		Date Received	02-20-2009

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
22.21	19.48	11.44	32	34.0	
22.20	19.34	11.46	29	36.3	
24.18	20.75	11.56	22	37.3	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
20.61	19.22	11.74	18.6	19	18
19.37	18.14	11.49	18.5		

Remarks: _____

Reviewed By _____

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: TVA Facilities Assessment - PAF Phase 2
Project Number: 171468118
Source: B-3, 1.5'-7.5'
Lab ID: 828

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: Soft

Tested By: DG
Test Date: 03-30-2009
Date Received: 02-20-2009

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	100.0
3/8"	91.0
No. 4	85.6
No. 10	69.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

Specific Gravity: 2.69

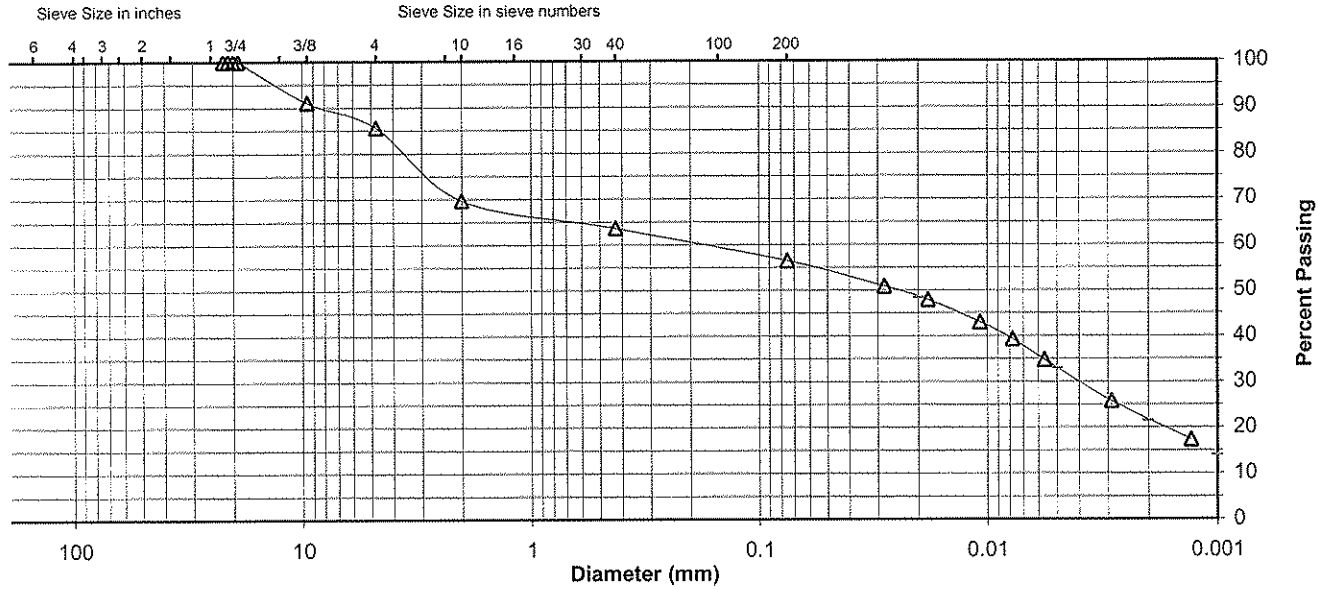
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	63.6
No. 200	56.5
0.02 mm	48.4
0.005 mm	32.9
0.002 mm	21.5
0.001 mm	14.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	14.4	15.9	6.1	7.1	23.6	32.9

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	30.3	6.1	7.1	35.0	21.5



Comments

Reviewed By

Stantec

Summary of Soil Tests

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Source	B-4, 9.0'-15.0'	Lab ID	829
County	Muhlenberg	Date Received	3-27-09
Sample Type	SPT Comp	Date Reported	4-9-09

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	94.5
No. 4	4.75	82.6
No. 10	2	65.8
No. 40	0.425	58.4
No. 200	0.075	51.3
	0.02	40.3
	0.005	26.3
	0.002	16.9
estimated	0.001	11.0

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

	ASTM	AASHTO
Range	(%)	(%)
Gravel	17.4	34.2
Coarse Sand	16.8	7.4
Medium Sand	7.4	---
Fine Sand	7.1	7.1
Silt	25.0	34.4
Clay	26.3	16.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	33
Plastic Limit:	18
Plasticity Index:	15
Activity Index:	0.88

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:	2.68

Classification

Unified Group Symbol: CL

Group Name: Sandy lean clay with gravel

AASHTO Classification: A-6 (4)

Comments:

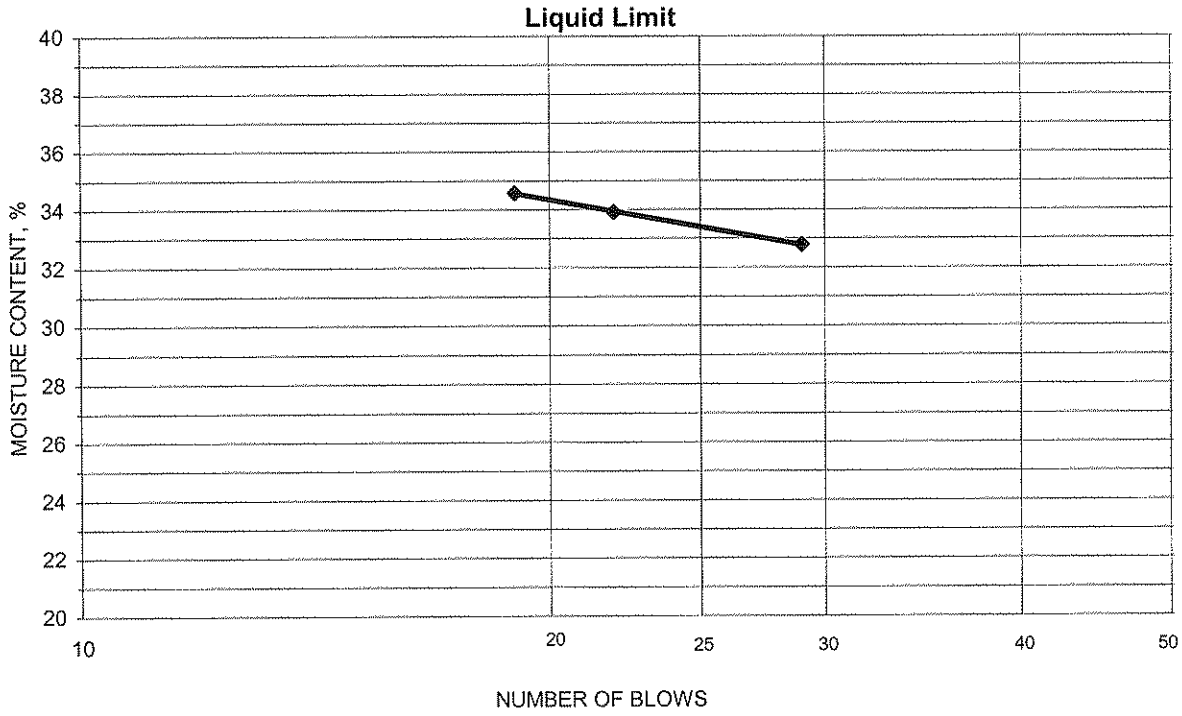
Reviewed by:

Stantec

ATTERBERG LIMITS

Project	TVA Facilities Assessment - PAF Phase 2	Project No.	171468118
Source	B-4, 9.0'-15.0'	Lab ID	829
		% + No. 40	42
Tested By	RC	Test Method	ASTM D 4318 Method A
Test Date	04-03-2009	Prepared	Dry
		Date Received	03-27-2009

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
23.54	20.63	11.75	29	32.8	
22.66	19.70	10.97	22	33.9	
22.82	19.84	11.22	19	34.6	33



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
20.69	19.25	11.24	18.0	18	15
20.94	19.46	11.04	17.6		

Remarks: _____

Reviewed By _____

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: TVA Facilities Assessment - PAF Phase 2
Project Number: 171468118
Source: B-4, 9.0'-15.0'
Lab ID: 829

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: DG
Test Date: 03-30-2009
Date Received: 03-27-2009

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	100.0
3/8"	94.5
No. 4	82.6
No. 10	65.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

Specific Gravity: 2.68

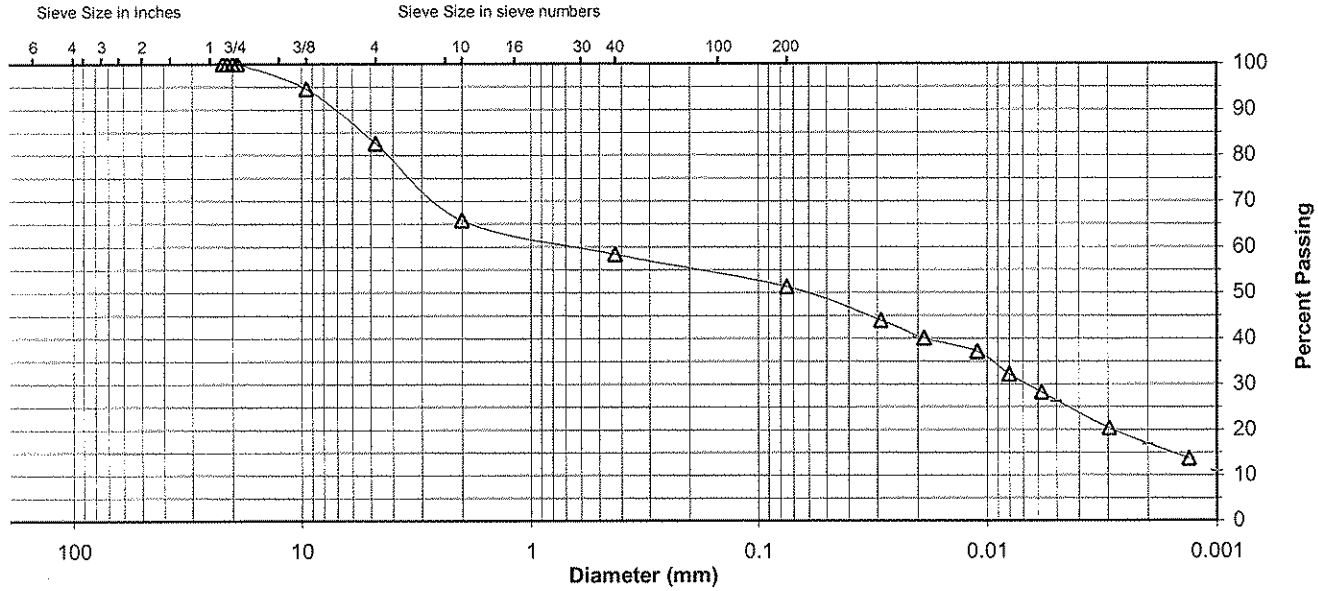
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	58.4
No. 200	51.3
0.02 mm	40.3
0.005 mm	26.3
0.002 mm	16.9
0.001 mm	11.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	17.4	16.8	7.4	7.1	25.0	26.3

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	34.2	7.4	7.1	34.4	16.9



Comments

Reviewed By

Stantec

Summary of Soil Tests

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Source	Sample 1, Bag 1 of 2	Lab ID	830
County	Muhlenberg	Date Received	4-2-09
Sample Type	Bag	Date Reported	4-15-09

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	99.5
No. 40	0.425	95.1
No. 200	0.075	88.4
	0.02	78.4
	0.005	60.8
	0.002	40.9
estimated	0.001	30.0

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

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.1	0.5
Coarse Sand	0.4	4.4
Medium Sand	4.4	---
Fine Sand	6.7	6.7
Silt	27.6	47.5
Clay	60.8	40.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	51
Plastic Limit:	24
Plasticity Index:	27
Activity Index:	0.66

Moisture-Density Relationship

Test Method: ASTM D 1557 Method B

Maximum Dry Density (lb/ft^3):	115.9
Maximum Dry Density (kg/m^3):	1857
Optimum Moisture Content (%):	14.1
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:	2.77

Classification

Unified Group Symbol: CH/CL

Group Name: Fat clay

AASHTO Classification: A-7-6 (26)

Comments:

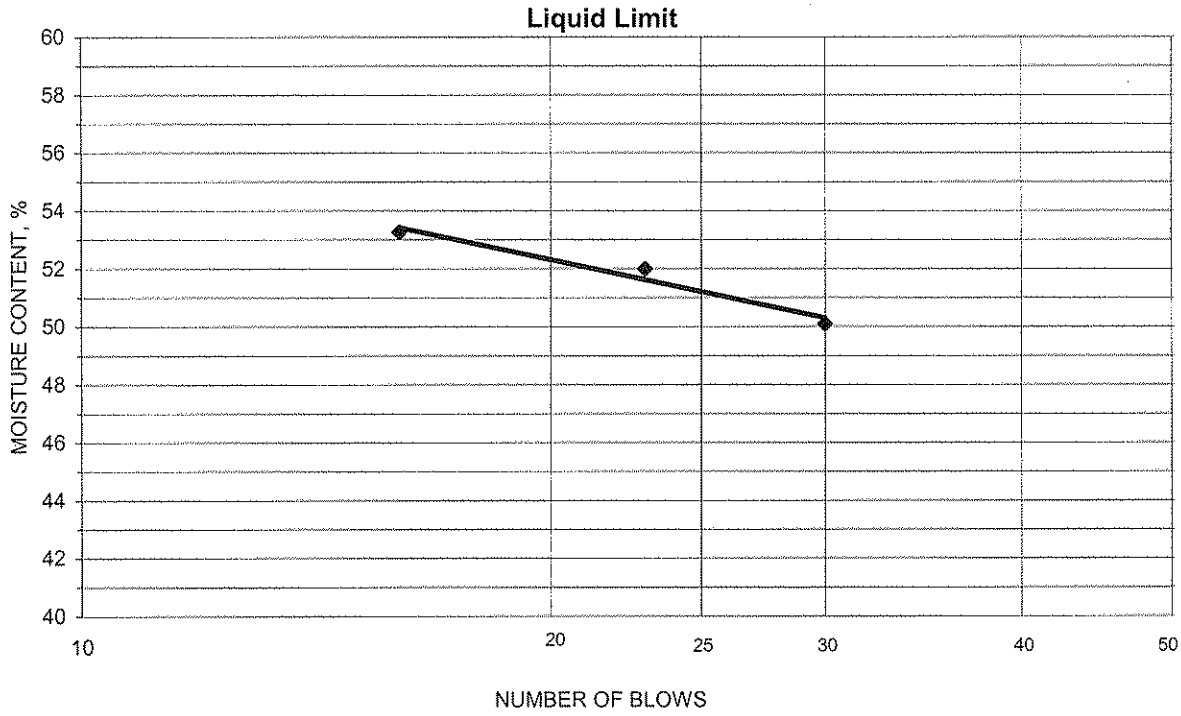
Reviewed by:

Stantec

ATTERBERG LIMITS

Project	TVA Facilities Assessment - PAF Phase 2			Project No.	171468118
Source	Sample 1, Bag 1 of 2			Lab ID	830
				% + No. 40	5
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	04-02-2009
Test Date	04-13-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.61	16.80	11.19	30	50.1	
19.48	16.60	11.06	23	52.0	
19.58	16.80	11.58	16	53.3	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
17.62	16.31	10.71	23.4	24	27
18.51	17.21	11.79	24.0		

Remarks: _____

Reviewed By _____

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: TVA Facilities Assessment - PAF Phase 2
Project Number: 171468118
Source: Sample 1, Bag 1 of 2
Lab ID: 830

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: Weathered and Friable

Tested By: BWT
Test Date: 04-08-2009
Date Received: 04-02-2009

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	99.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

Specific Gravity: 2.77

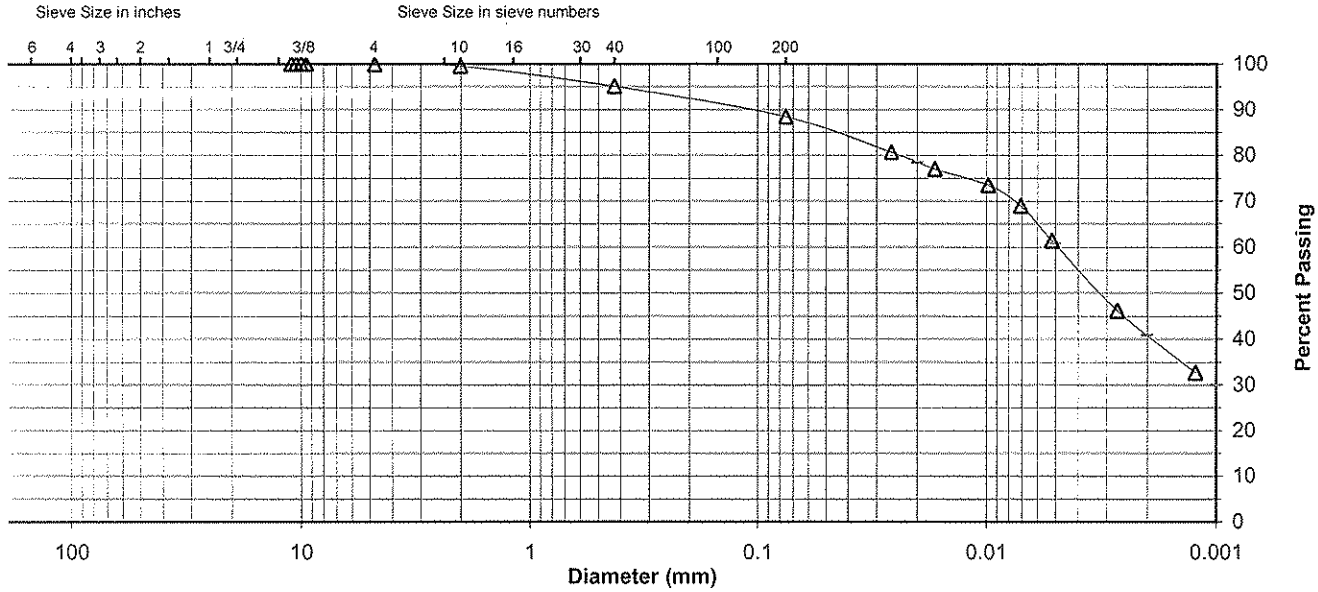
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	95.1
No. 200	88.4
0.02 mm	78.4
0.005 mm	60.8
0.002 mm	40.9
0.001 mm	30.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.1	0.4	4.4	6.7	27.6	60.8

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.5	4.4	6.7	47.5	40.9



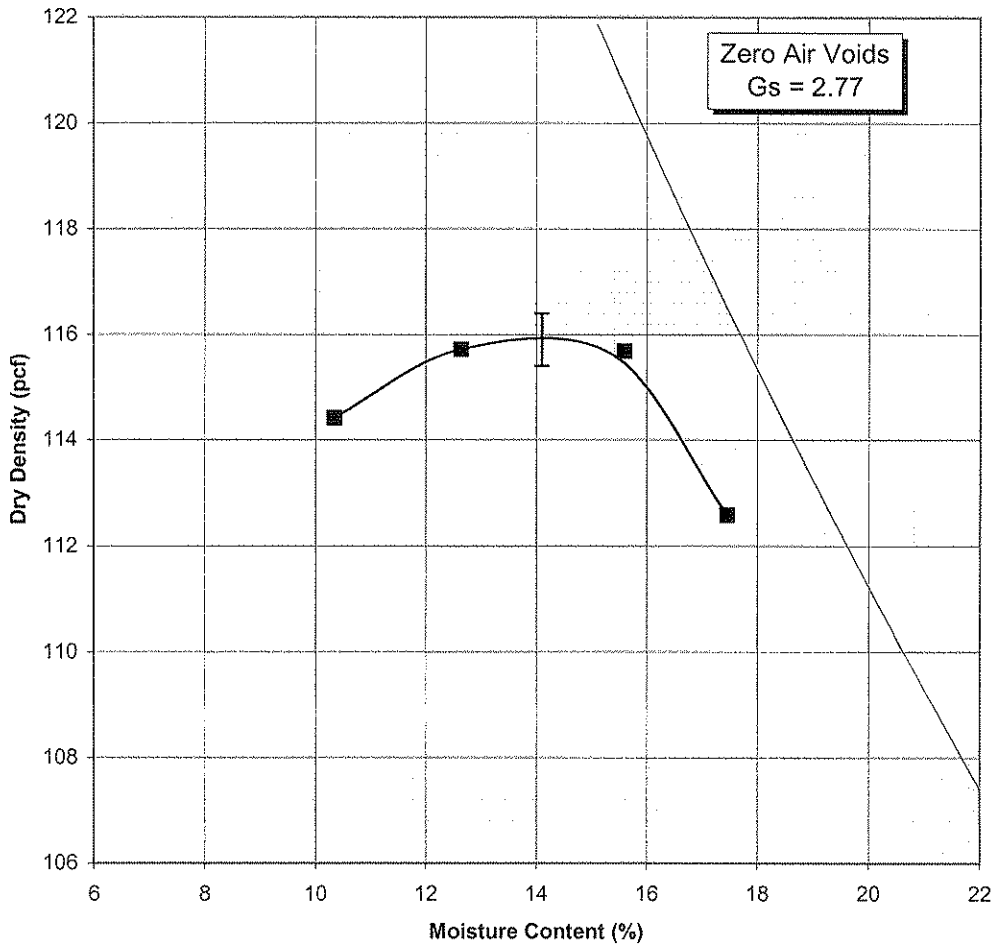
Comments

Reviewed By

Moisture-Density Data Sheet

Project: TVA Facilities Assessment - PAF Phase 2
Project No.: 171468118
Source: Sample 1, Bag 1 of 2
Sample No.: 830
Sample Description: Fat Clay (CH/CL), light brown gray
Visual Notes:
Test Method: ASTM D 1557 - Method B
Prepared: Moist
Oversized Fraction: 0 %
Rammer: Mechanical
Gs - Fines: ASTM D 854

Mold Weight 4215 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)
6184	1969	655.83	590.44	72.97	12.6	115.7
6235	2020	664.50	585.31	77.65	15.6	115.7
6212	1997	644.91	559.81	72.50	17.5	112.6
6122	1907	634.42	581.73	72.32	10.3	114.4



Maximum Dry Density 115.9 PCF
Optimum Moisture Content 14.1 %

Stantec

Summary of Soil Tests

Project Name	TVA Facilities Assessment - PAF Phase 2	Project Number	171468118
Source	Sample 1, Bag 2 of 2	Lab ID	831
County	Muhlenberg	Date Received	4-2-09
Sample Type	Bag	Date Reported	4-15-09

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	97.3
No. 10	2	94.4
No. 40	0.425	90.2
No. 200	0.075	83.9
	0.02	77.3
	0.005	61.5
	0.002	41.8
estimated	0.001	31.0

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

	ASTM	AASHTO
Range	(%)	(%)
Gravel	2.7	5.6
Coarse Sand	2.9	4.2
Medium Sand	4.2	---
Fine Sand	6.3	6.3
Silt	22.4	42.1
Clay	61.5	41.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	52
Plastic Limit:	25
Plasticity Index:	27
Activity Index:	0.64

Moisture-Density Relationship

Test Method: ASTM D 1557 Method B

Maximum Dry Density (lb/ft^3):	108.9
Maximum Dry Density (kg/m^3):	1745
Optimum Moisture Content (%):	16.7
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:	CH
Group Name:	Fat clay with sand
AASHTO Classification:	A-7-6 (24)

Comments:

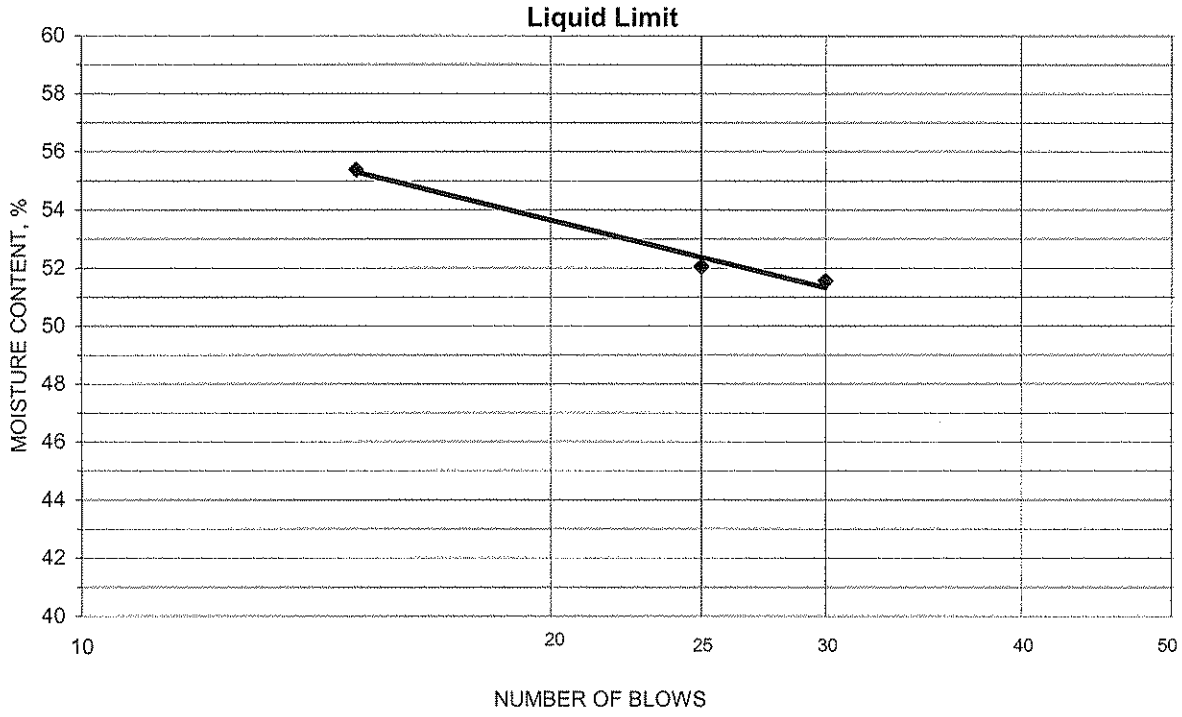
Reviewed by:

Stantec

ATTERBERG LIMITS

Project	TVA Facilities Assessment - PAF Phase 2			Project No.	171468118
Source	Sample 1, Bag 2 of 2			Lab ID	831
				% + No. 40	10
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	04-02-2009
Test Date	04-13-2009	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.98	17.16	11.69	30	51.6	
17.94	15.65	11.25	25	52.0	
18.95	16.22	11.29	15	55.4	52



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
17.33	16.05	10.95	25.1	25	27
18.77	17.37	11.77	25.0		

Remarks: _____

Reviewed By _____

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: TVA Facilities Assessment - PAF Phase 2
Project Number: 171468118
Source: Sample 1, Bag 2 of 2
Lab ID: 831

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: Soft

Tested By: BWT
Test Date: 04-09-2009
Date Received: 04-02-2009

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	97.3
No. 10	94.4

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

Specific Gravity: 2.71

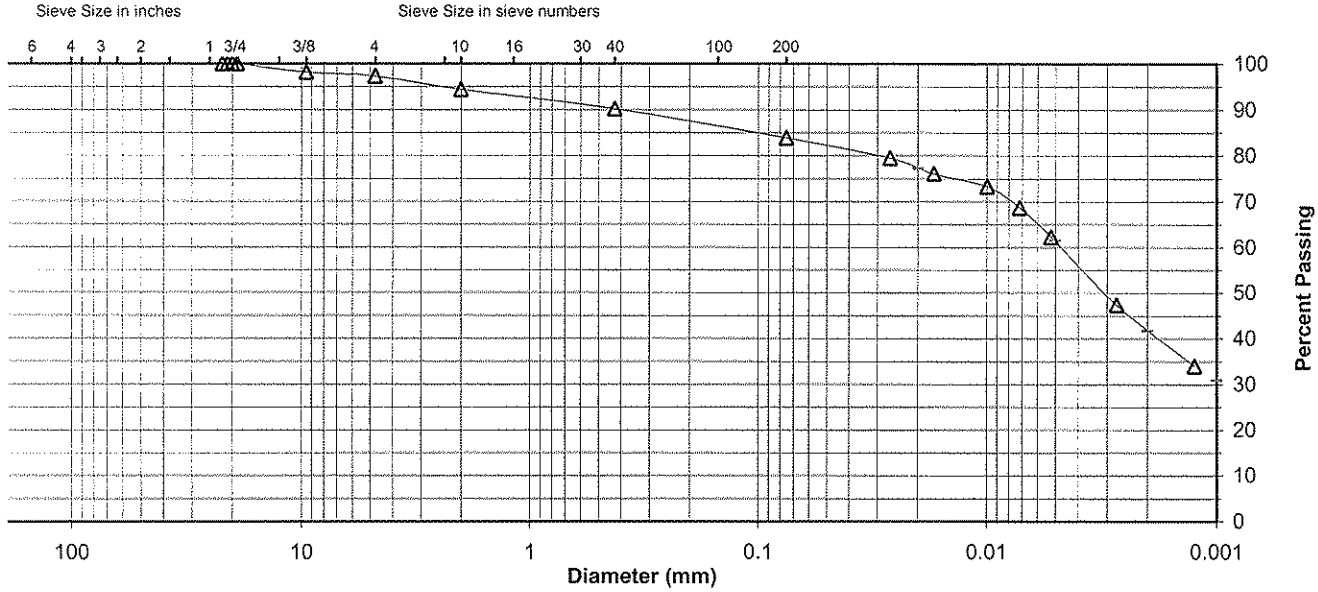
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	90.2
No. 200	83.9
0.02 mm	77.3
0.005 mm	61.5
0.002 mm	41.8
0.001 mm	31.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	2.7	2.9	4.2	6.3	22.4	61.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	5.6	4.2	6.3	42.1	41.8



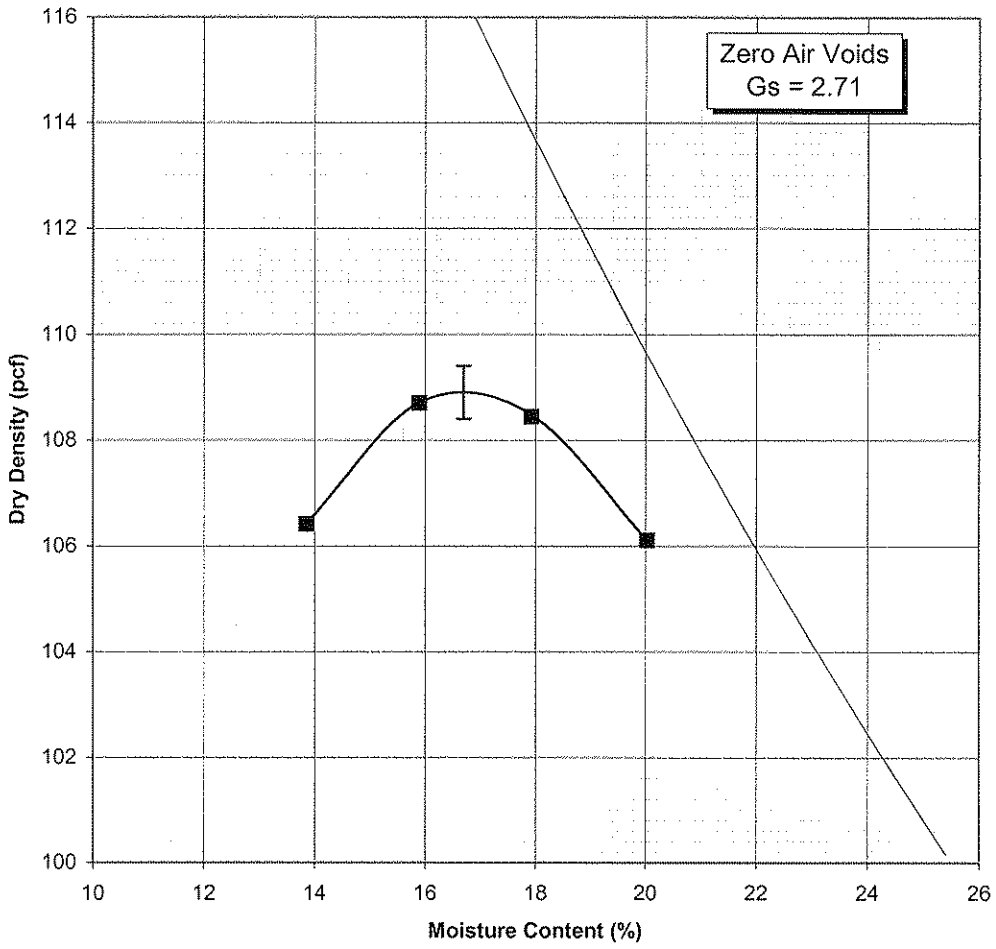
Comments

Reviewed By

Moisture-Density Data Sheet

Project: TVA Facilities Assessment - PAF Phase 2 — Project No.: 171468118
Source: Sample 1, Bag 2 of 2 — Sample No.: 831
Sample Description: Fat Clay with Sand (CH), light brown gray
Visual Notes: — Test Method: ASTM D 1557 - Method B
Prepared: Moist — Oversized Fraction: 2 % — Rammer: Mechanical — Gs - Fines: ASTM D 854

Mold Weight 4215 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)
6118	1903	570.56	502.29	72.97	15.9	108.7
6147	1932	627.33	542.92	72.04	17.9	108.4
6139	1924	567.76	484.67	70.01	20.0	106.1
6045	1830	614.10	548.14	72.04	13.9	106.4

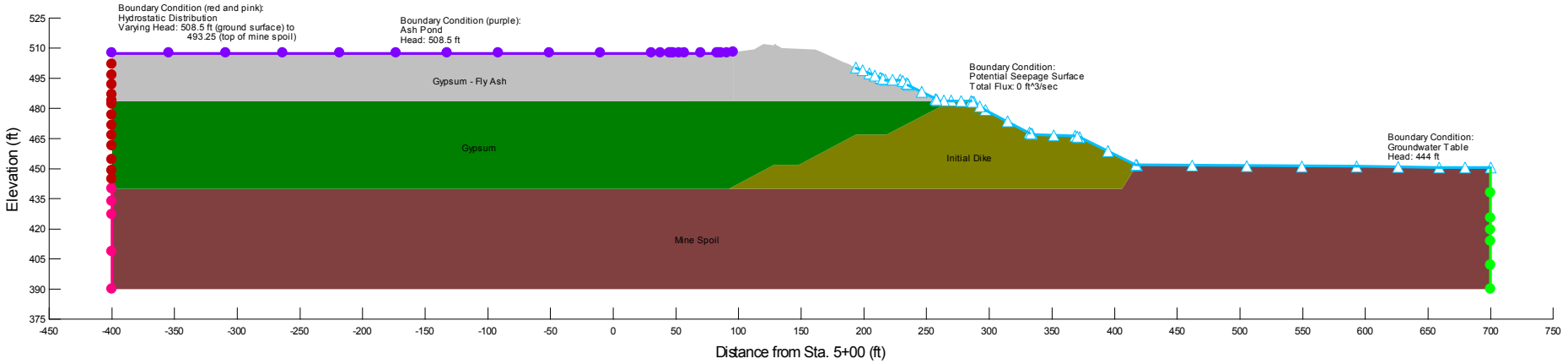


Maximum Dry Density 108.9 PCF
Optimum Moisture Content 16.7 %

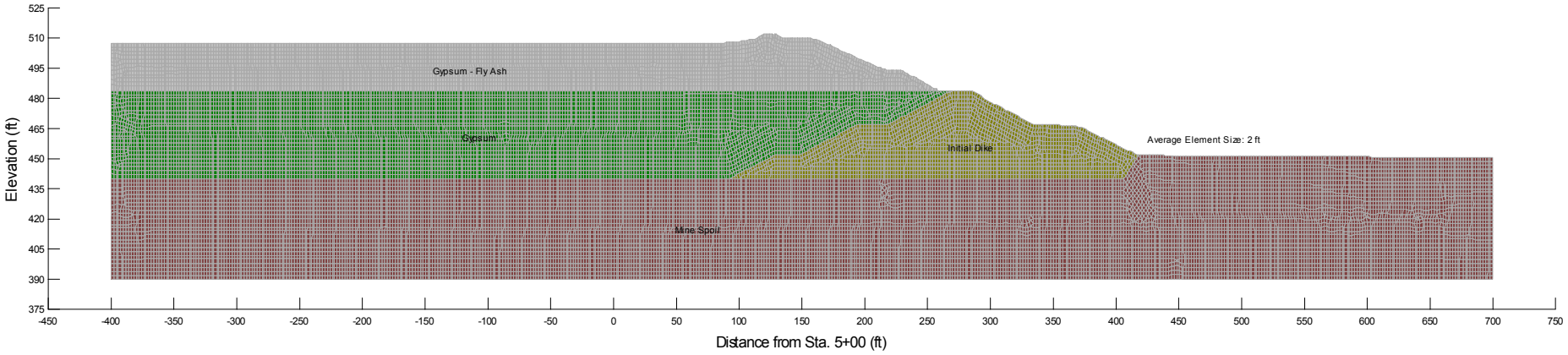
Appendix G

Results of Engineering Analysis

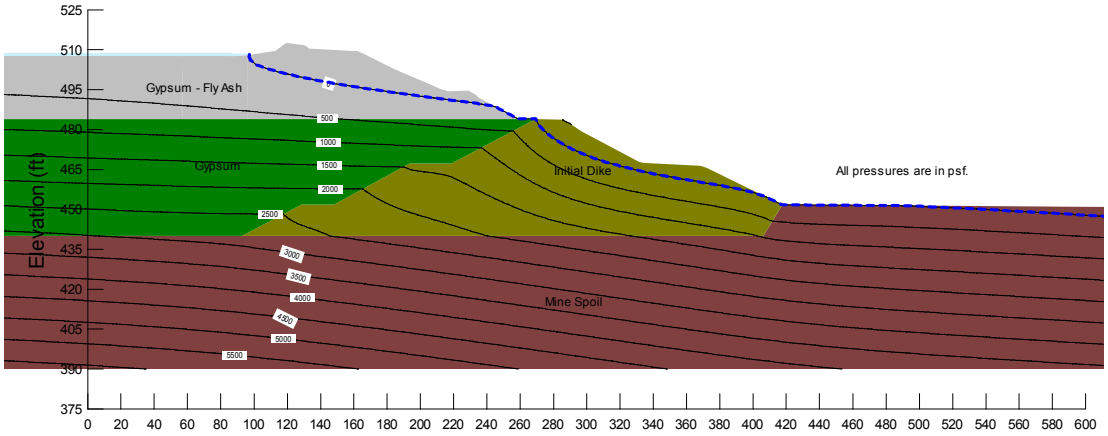
Paradise Fossil Plant
Scrubber Sludge Complex - Case 1X
Subsurface Profile and Boundary Conditions



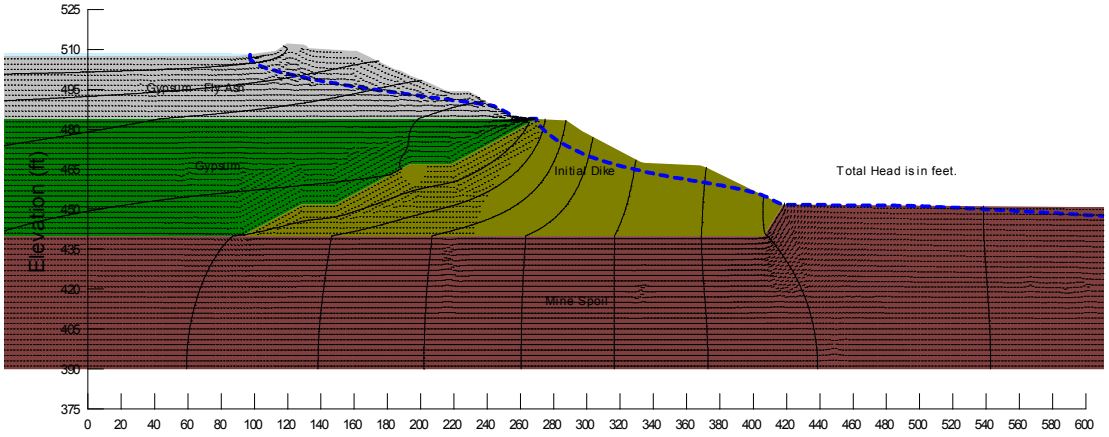
Paradise Fossil Plant
Scrubber Sludge Complex - Case 1X
Subsurface Profile and Boundary Conditions



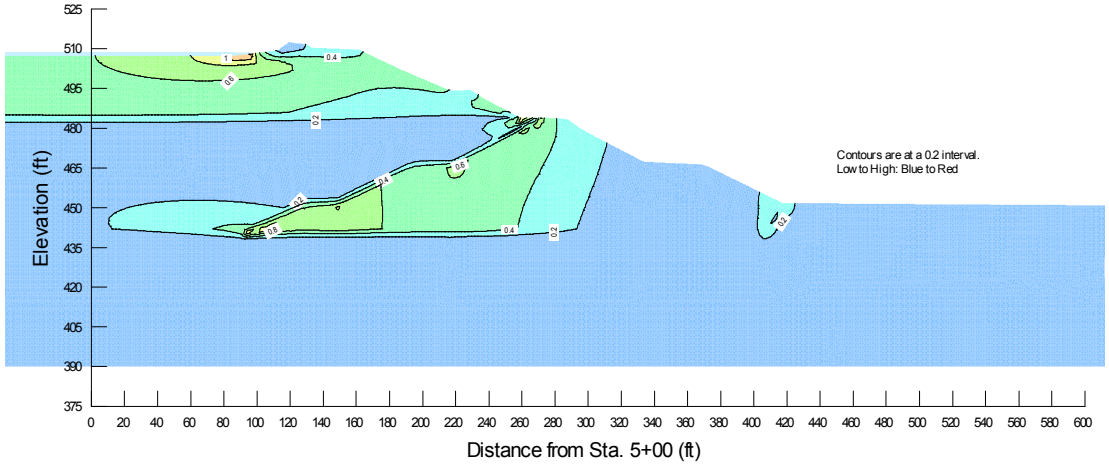
Paradise Fossil Plant
Scrubber Sludge Complex - Case 1X
Pore Water Pressure Contours



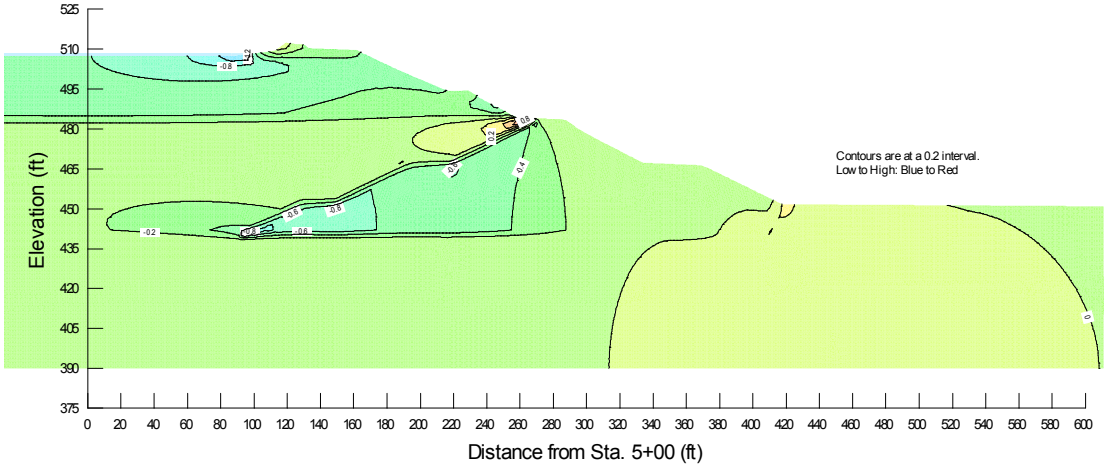
Paradise Fossil Plant
Scrubber Sludge Complex - Case 1X
Total Head Contours and Flow Vectors



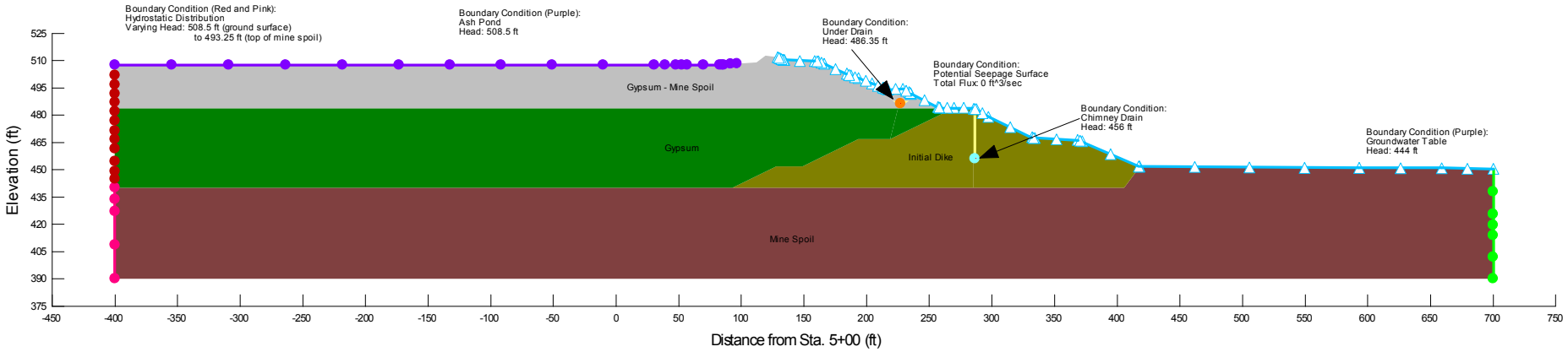
Paradise Fossil Plant
Scrubber Sludge Complex - Case 1X
Gradient Contours



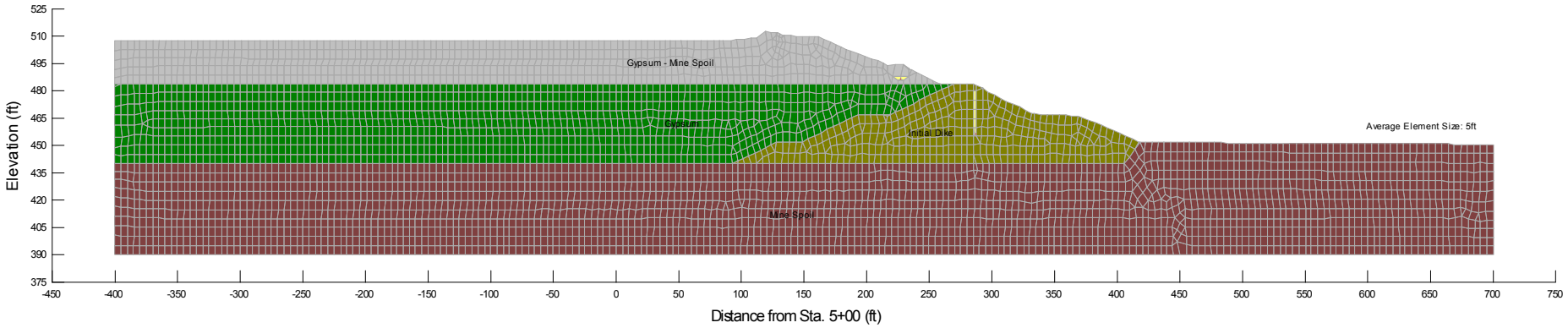
Paradise Fossil Plant
Scrubber Sludge Complex - Case 1X
Vertical Gradient Contours



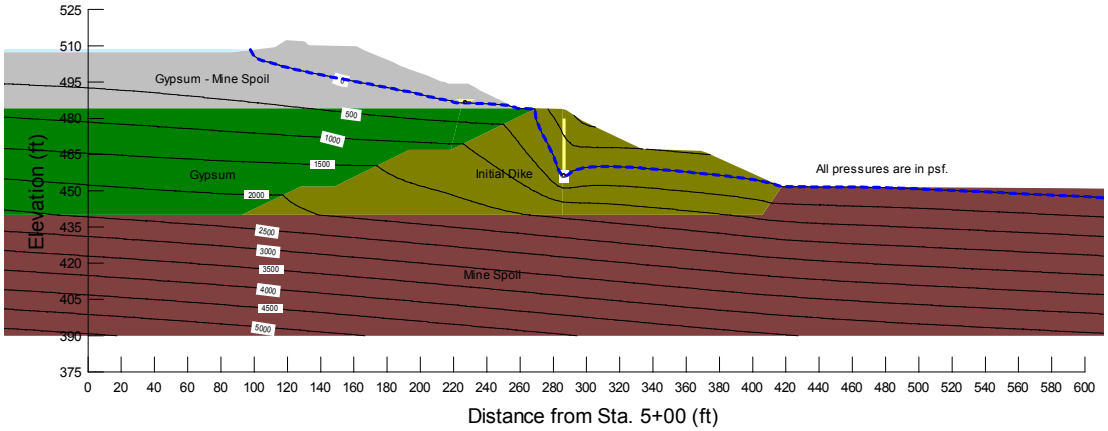
Paradise Fossil Plant
Scrubber Sludge Complex - Case 1Y
Subsurface Profile and Boundary Conditions



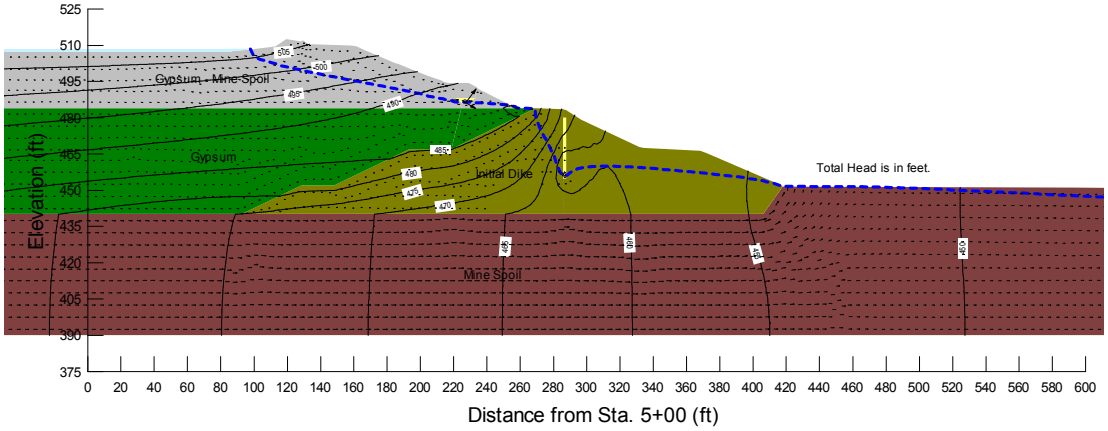
Paradise Fossil Plant
Scrubber Sludge Complex - Case 1Y
Finite Element Mesh



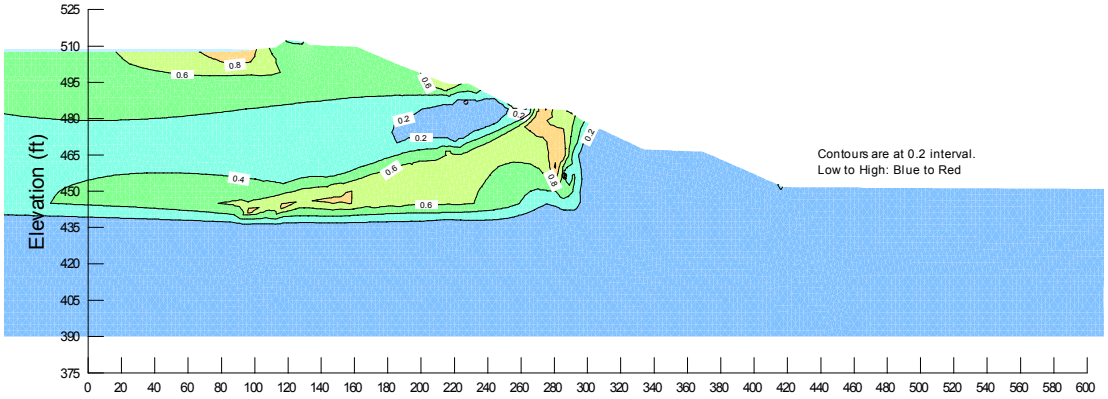
Paradise Fossil Plant
Scrubber Sludge Complex - Case 1Y
Pore Water Pressure Contours



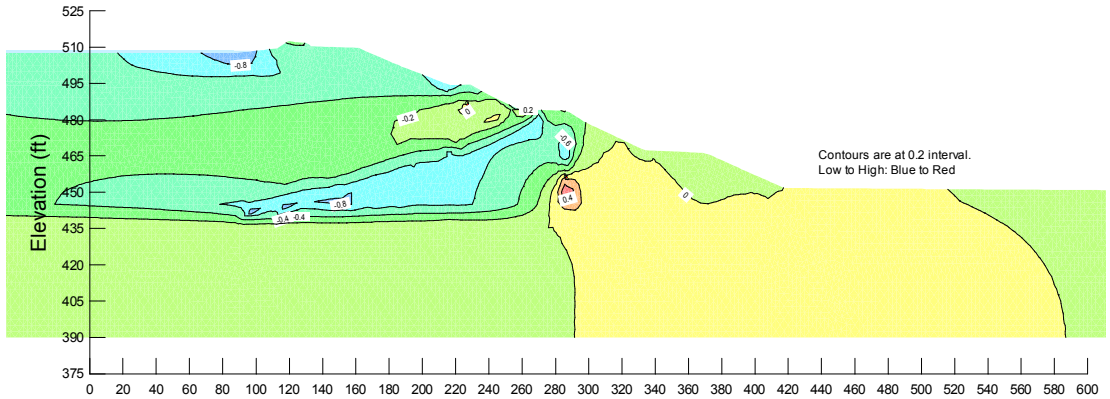
Paradise Fossil Plant
Scrubber Sludge Complex - Case 1Y
Total Head Contours and Flow Vectors



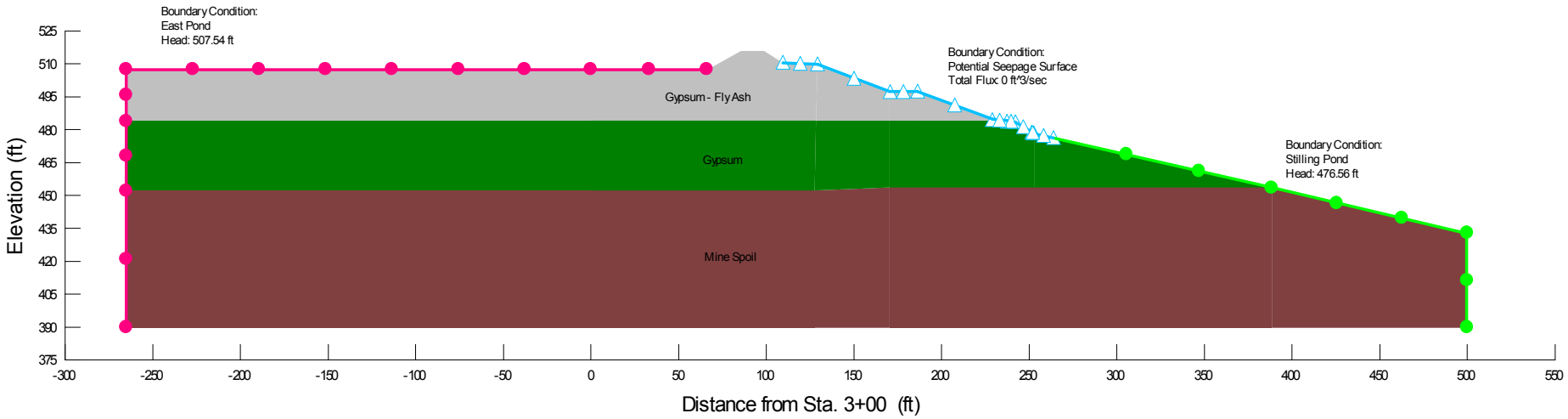
Paradise Fossil Plant
Scrubber Sludge Complex - Case 1Y
Gradient Contours



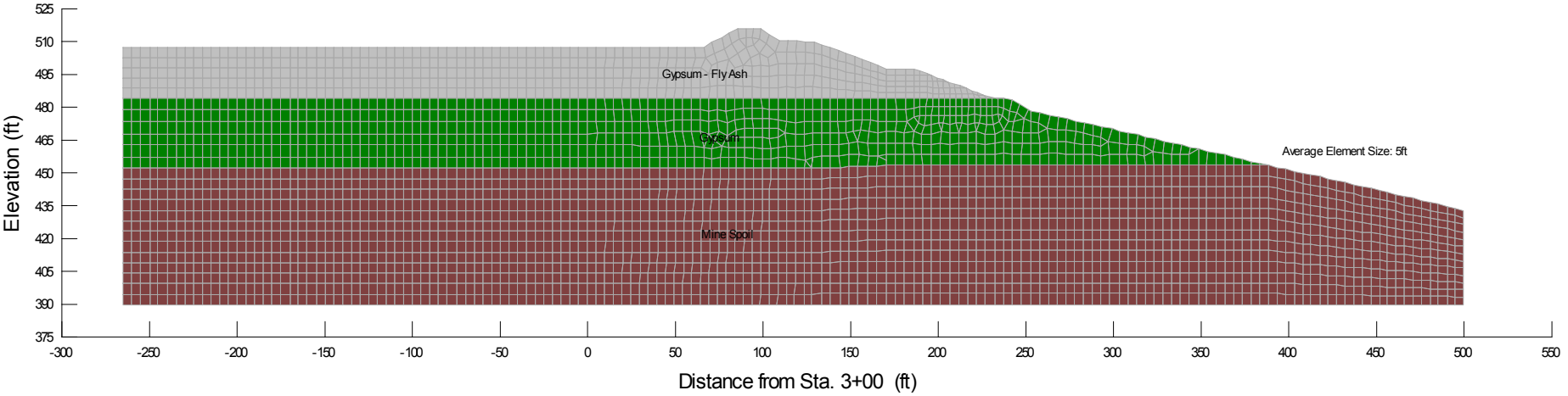
Paradise Fossil Plant
Scrubber Sludge Complex - Case 1Y
Vertical Gradient Contours



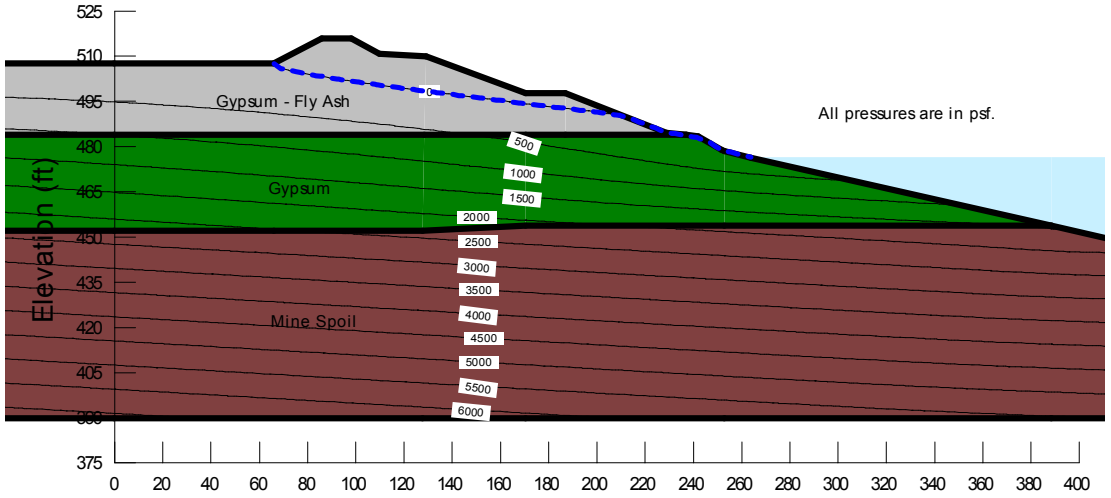
Paradise Fossil Plant
Scrubber Sludge Complex - Case 2X
Subsurface Profile and Boundary Conditions



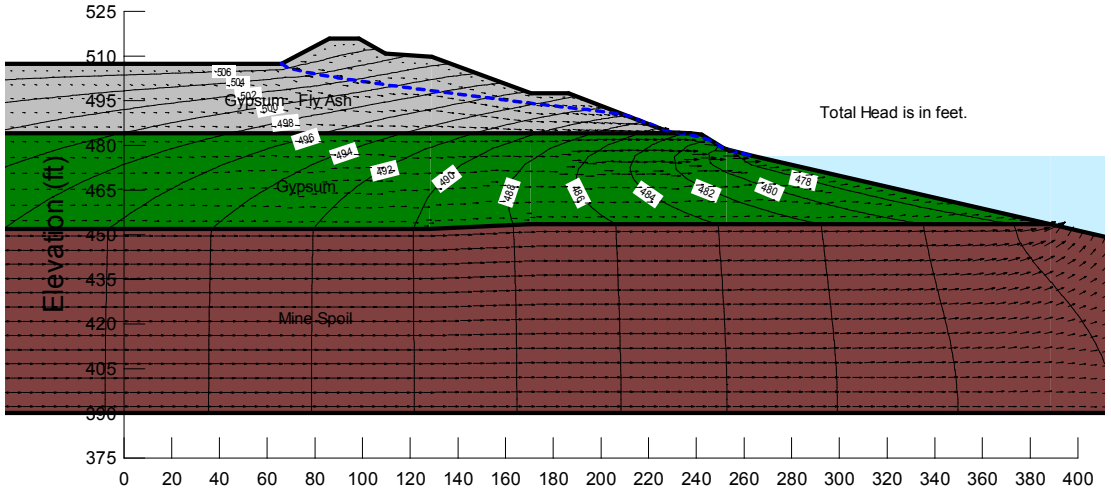
Paradise Fossil Plant
Scrubber Sludge Complex - Case 2X
Finite Element Mesh



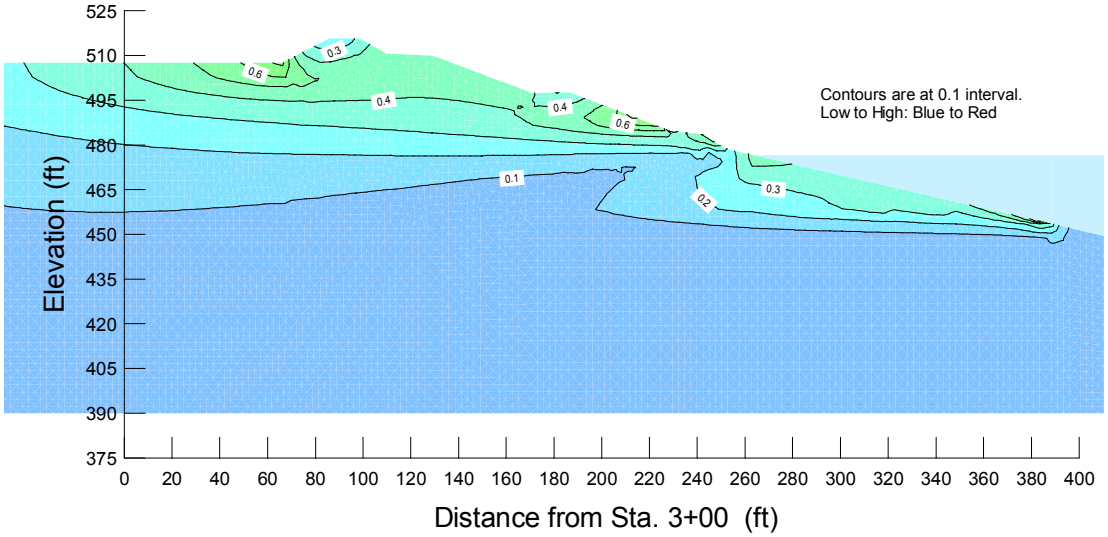
Paradise Fossil Plant
Scrubber Sludge Complex - Case 2X
Pore Water Pressure Contours



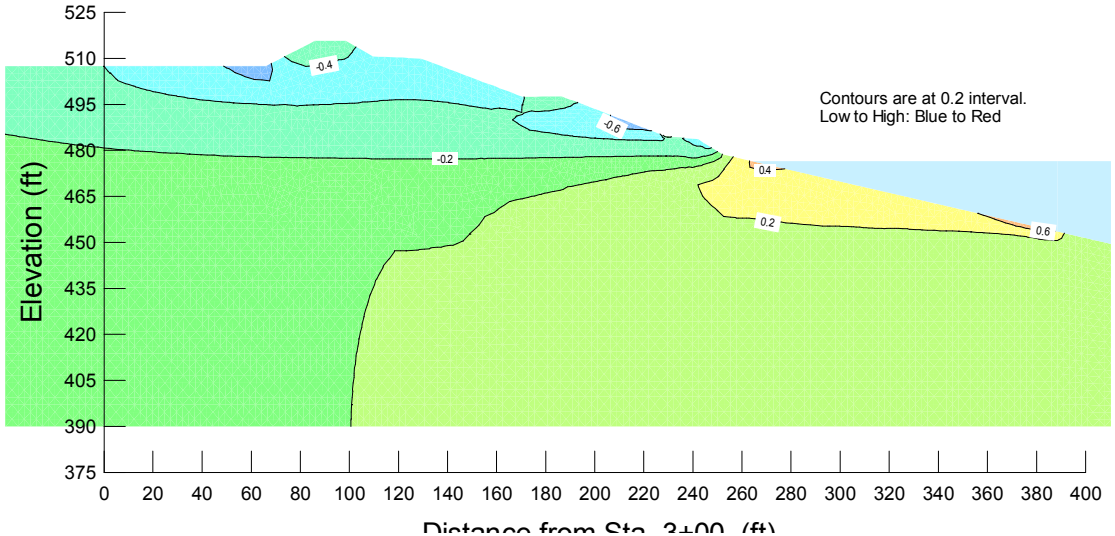
Paradise Fossil Plant
Scrubber Sludge Complex - Case 2X
Total Head Contours and Flow Vectors



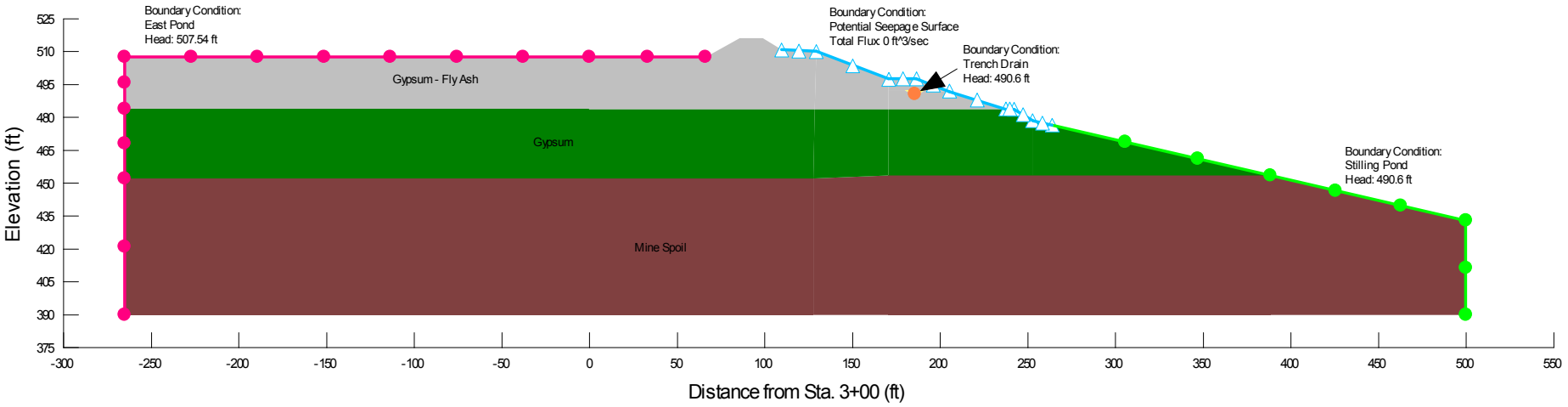
Paradise Fossil Plant
Scrubber Sludge Complex - Case 2X
Gradient Contours



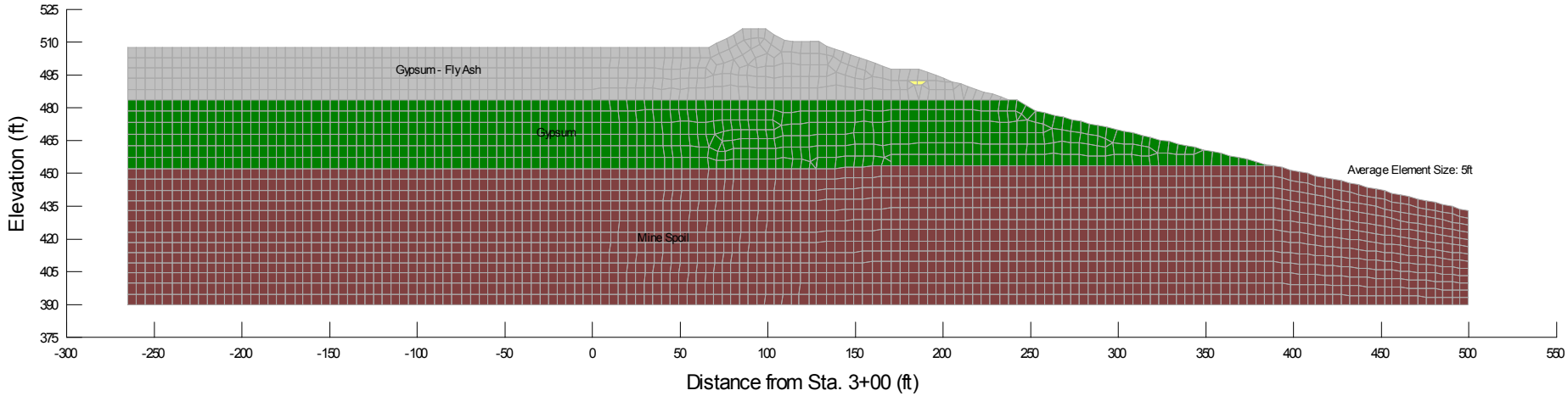
Paradise Fossil Plant
Scrubber Sludge Complex - Case 2X
Vertical Gradient Contours



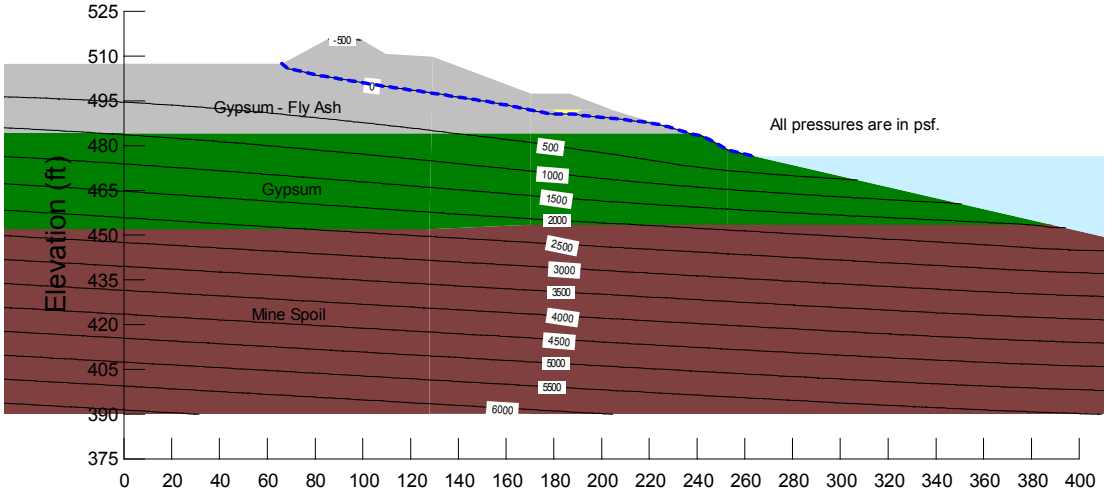
Paradise Fossil Plant
Scrubber Sludge Complex - Case 2Y
Subsurface Profile and Boundary Conditions



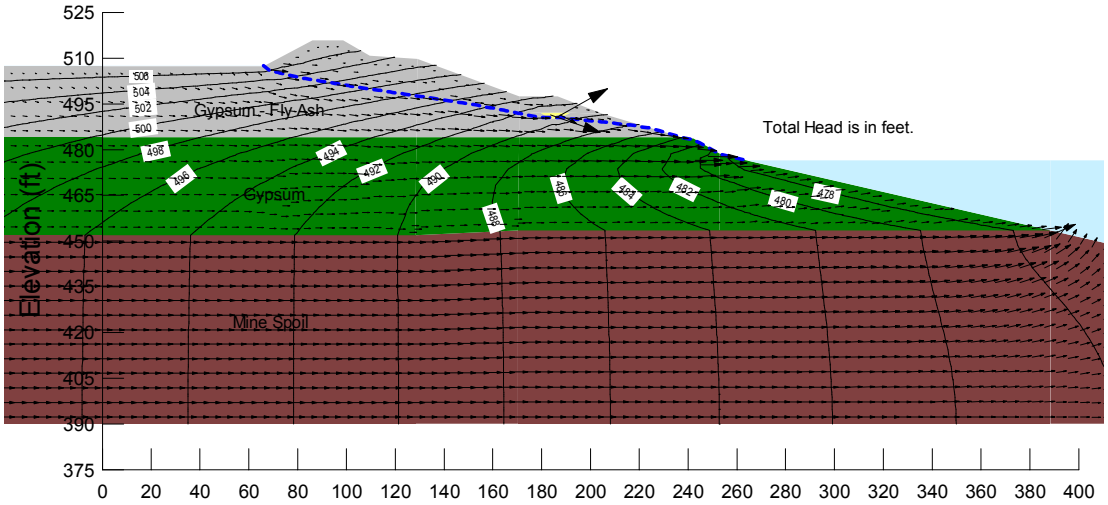
Paradise Fossil Plant
Scrubber Sludge Complex - Case 2Y
Finite Element Mesh



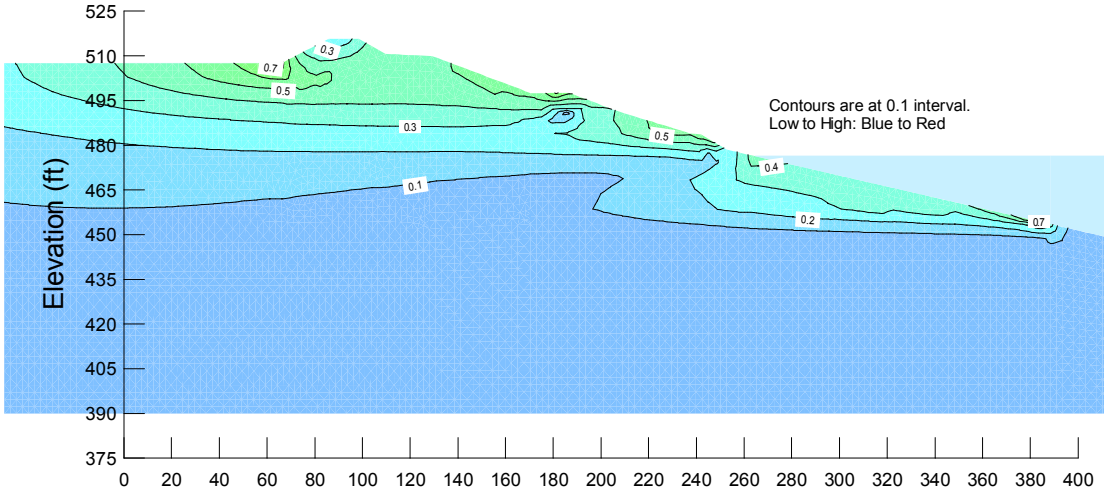
Paradise Fossil Plant
Scrubber Sludge Complex - Case 2Y
Pore Water Pressure Contours



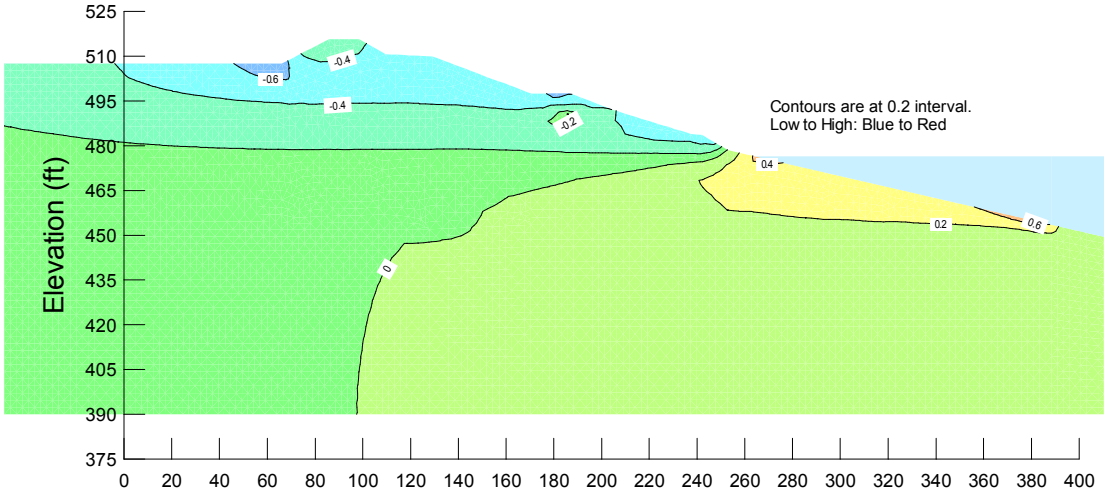
Paradise Fossil Plant
Scrubber Sludge Complex - Case 2Y
Total Head Contours and Flow Vectors



Paradise Fossil Plant
Scrubber Sludge Complex - Case 2Y
Gradient Contours



Paradise Fossil Plant
Scrubber Sludge Complex - Case 2Y
Vertical Gradient Contours

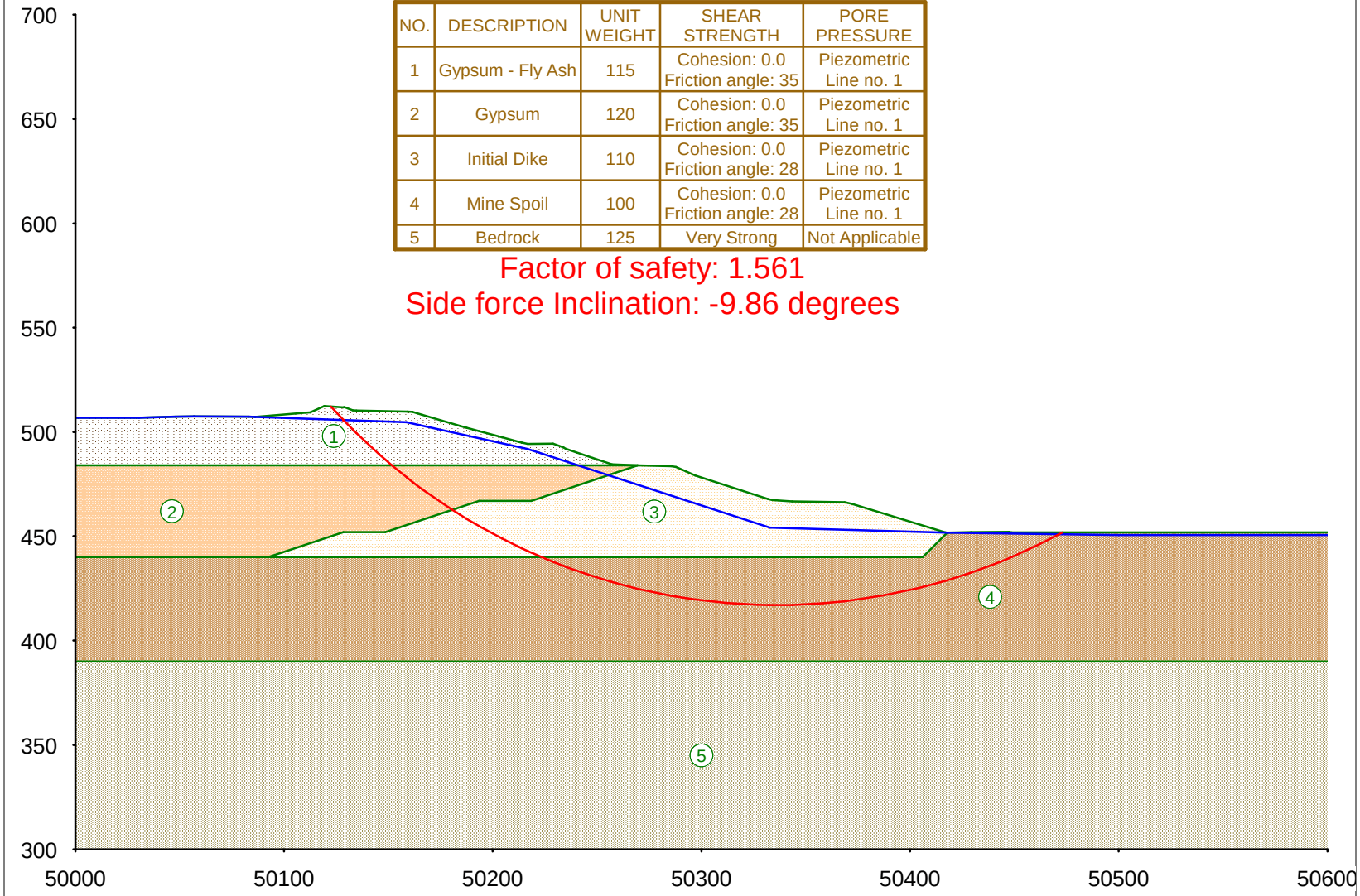


Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Initial Dike	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
5	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.561

Side force Inclination: -9.86 degrees



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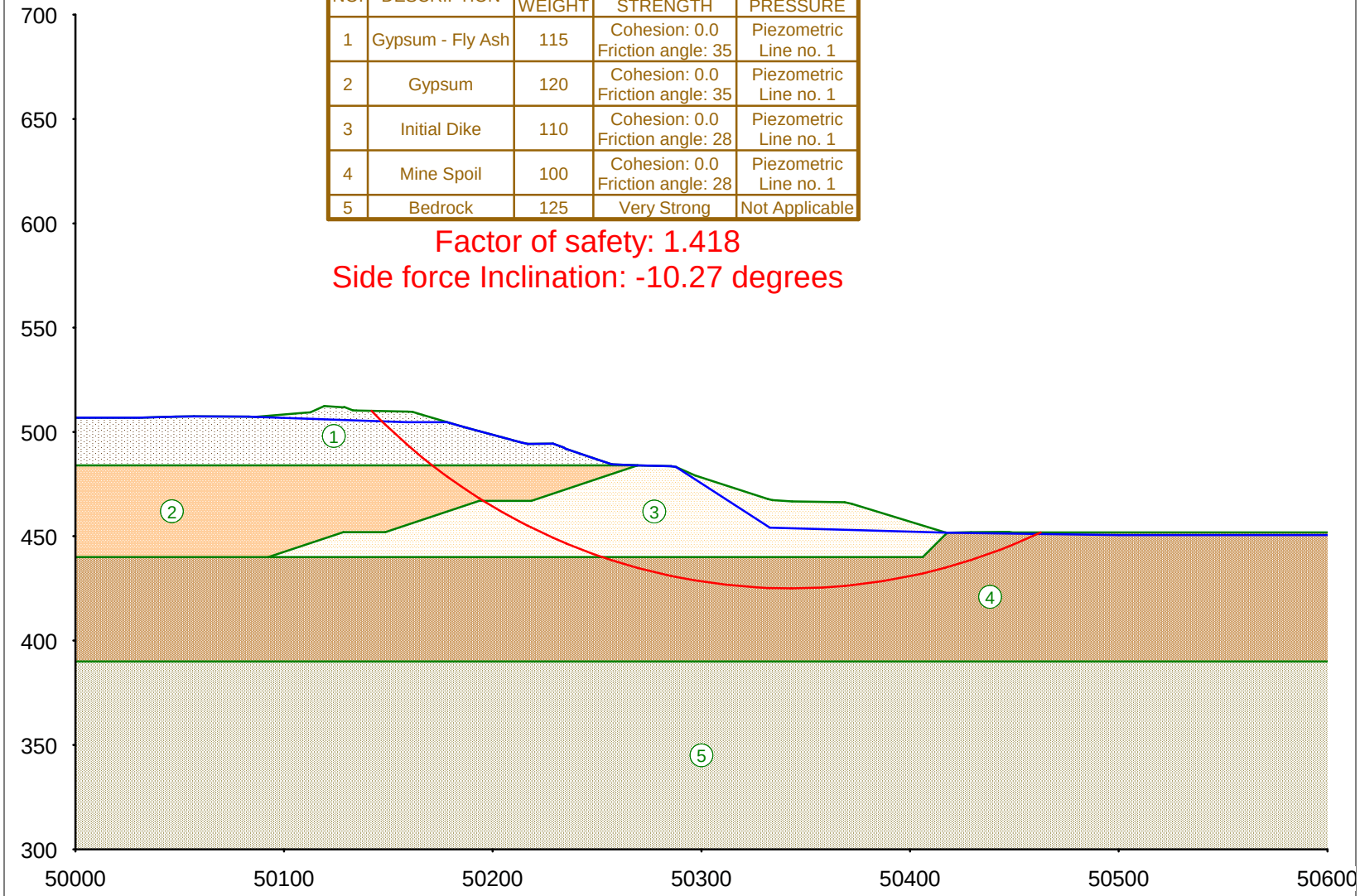
Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Initial Dike	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
5	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.418

Side force Inclination: -10.27 degrees



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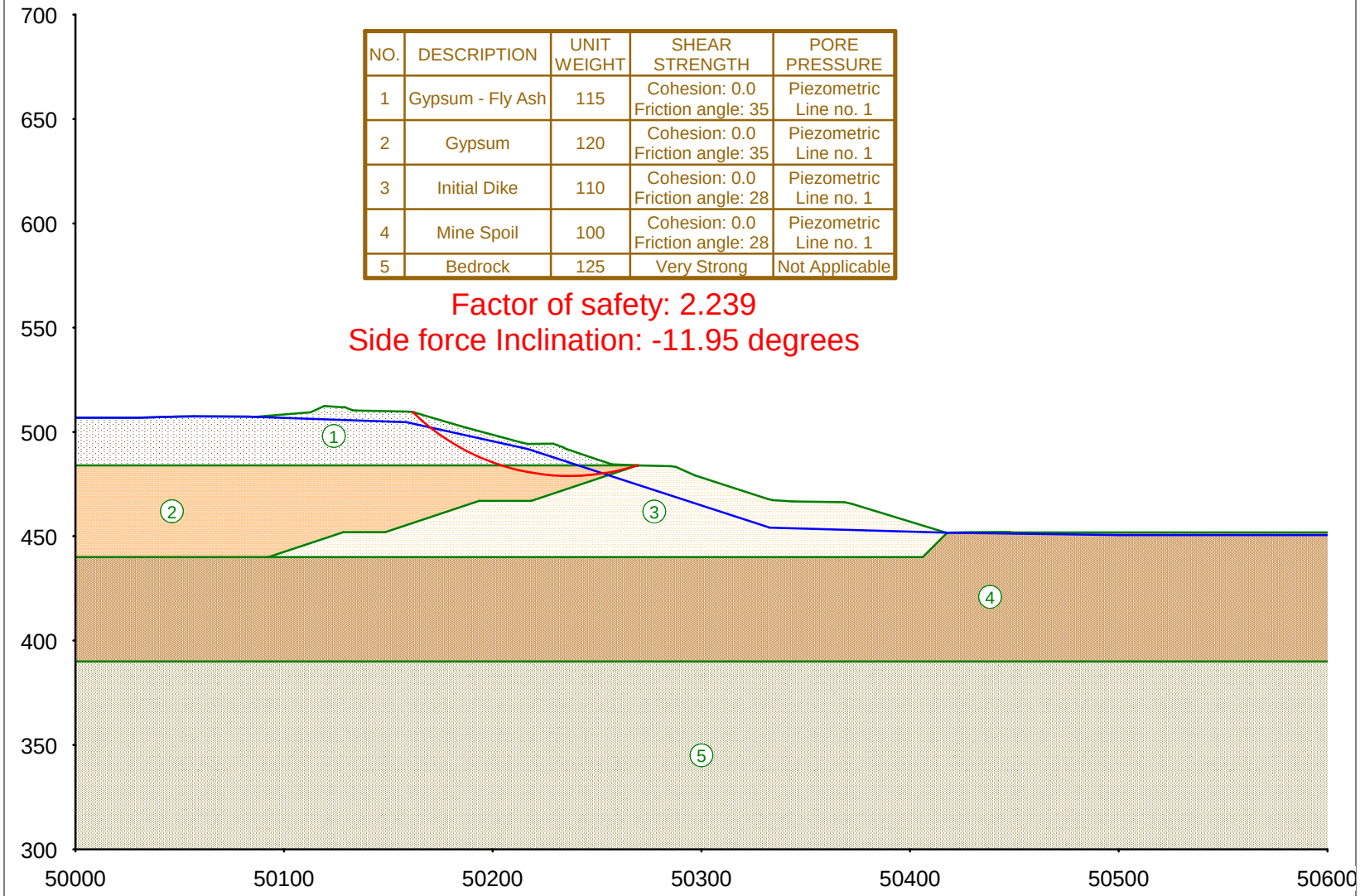
Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Initial Dike	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
5	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 2.239

Side force Inclination: -11.95 degrees



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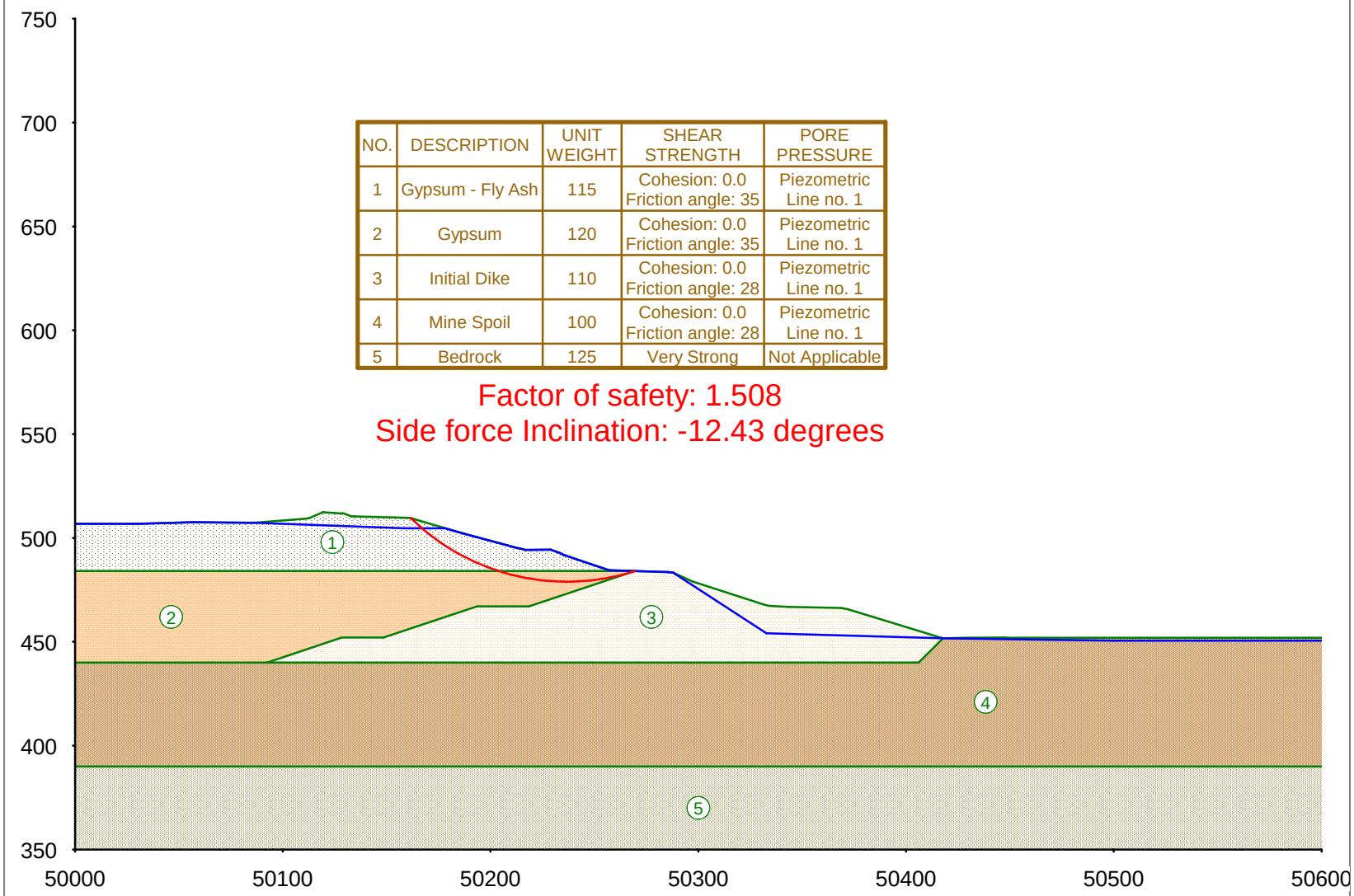
Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Initial Dike	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
5	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.508

Side force Inclination: -12.43 degrees



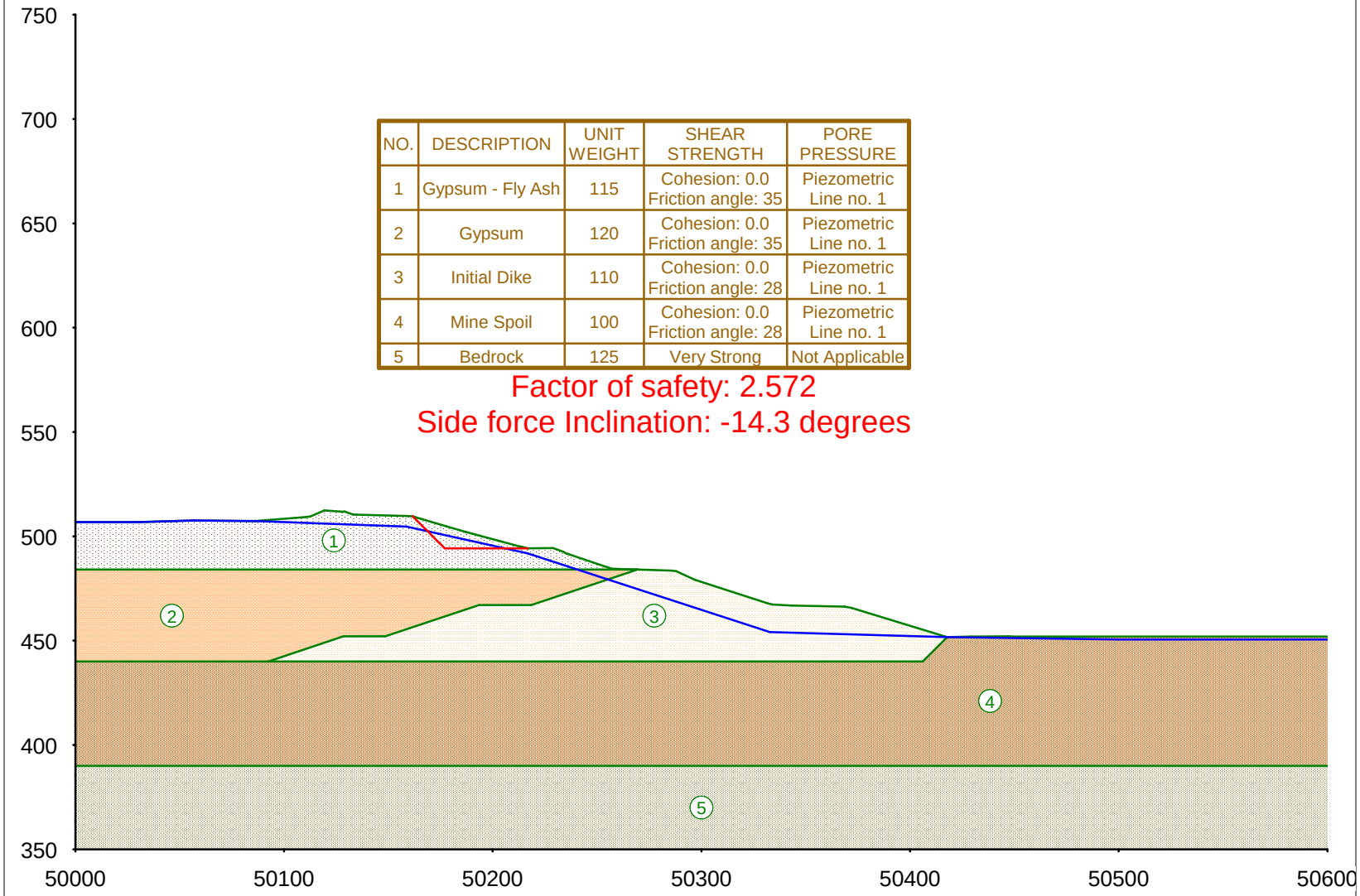
Date: Wed Jul 22 2009 Filename: 1YB.UT4 Time: 16:00:09

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Initial Dike	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
5	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 2.572

Side force Inclination: -14.3 degrees



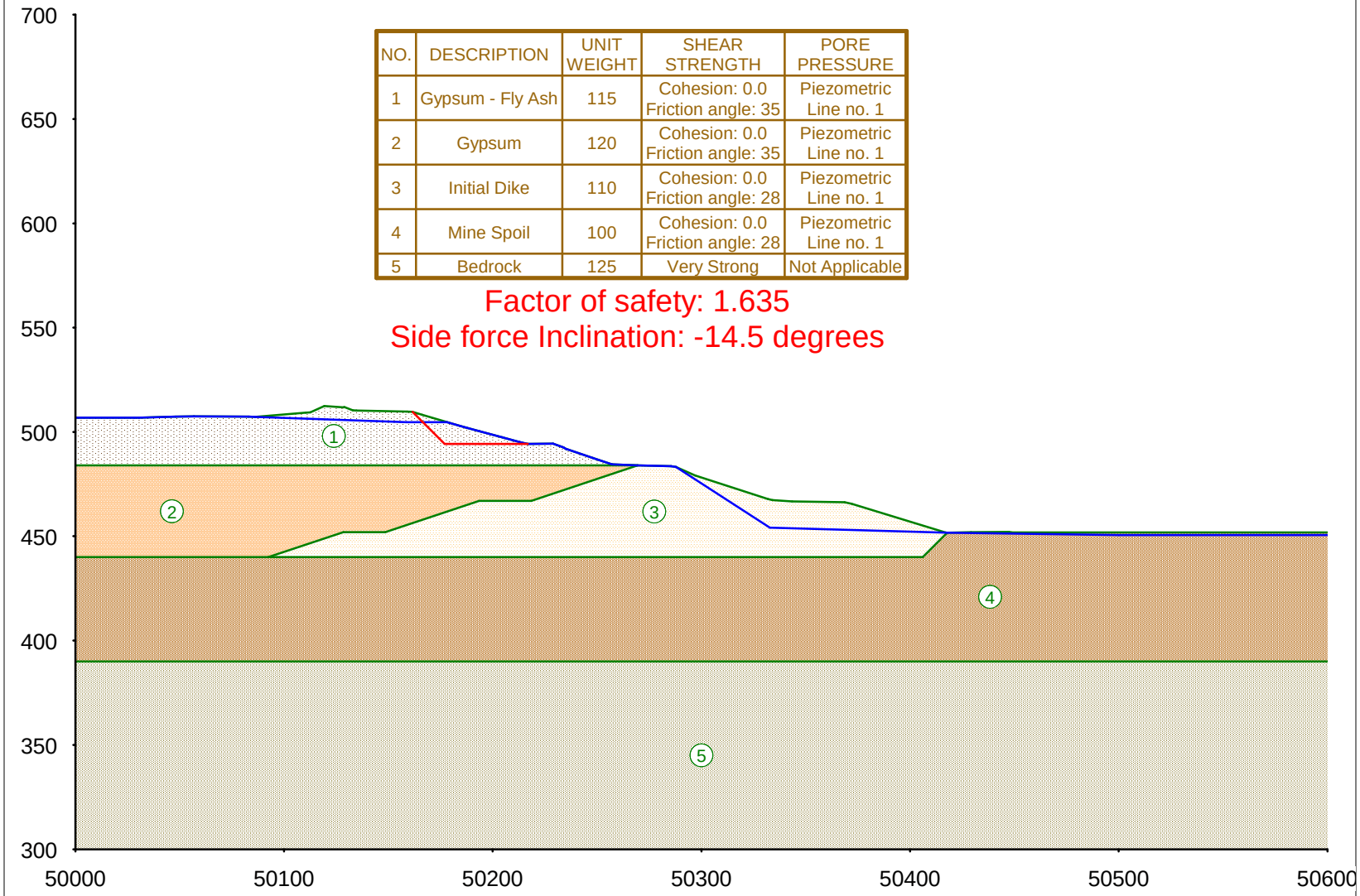
Date: Wed Jul 22 2009 Filename: 1ZA.UT4 Time: 16:00:43

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Initial Dike	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
5	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.635

Side force Inclination: -14.5 degrees



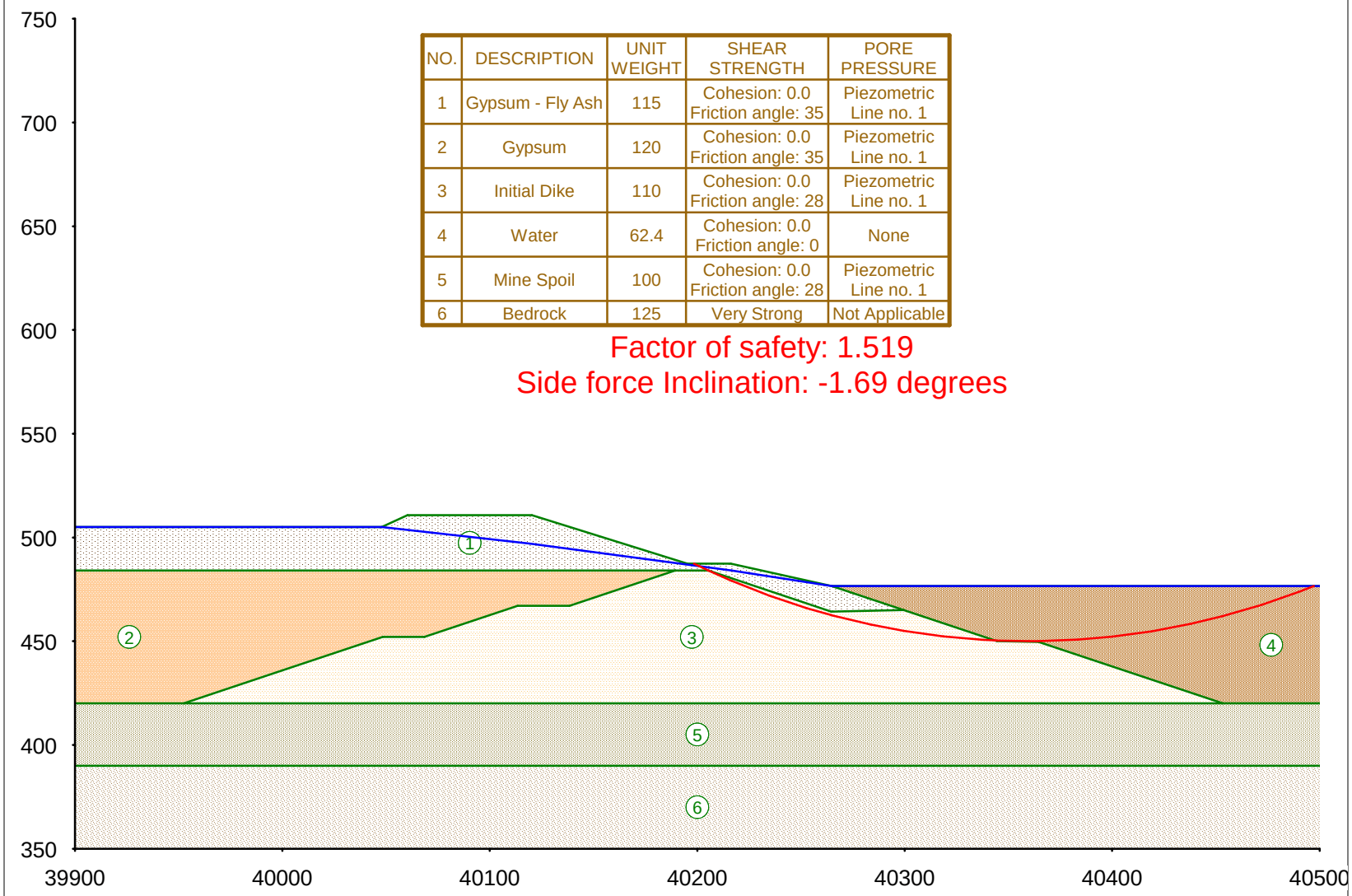
Date: Wed Jul 22 2009 Filename: 1ZB.UT4 Time: 16:01:21

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Initial Dike	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Water	62.4	Cohesion: 0.0 Friction angle: 0	None
5	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
6	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.519

Side force Inclination: -1.69 degrees



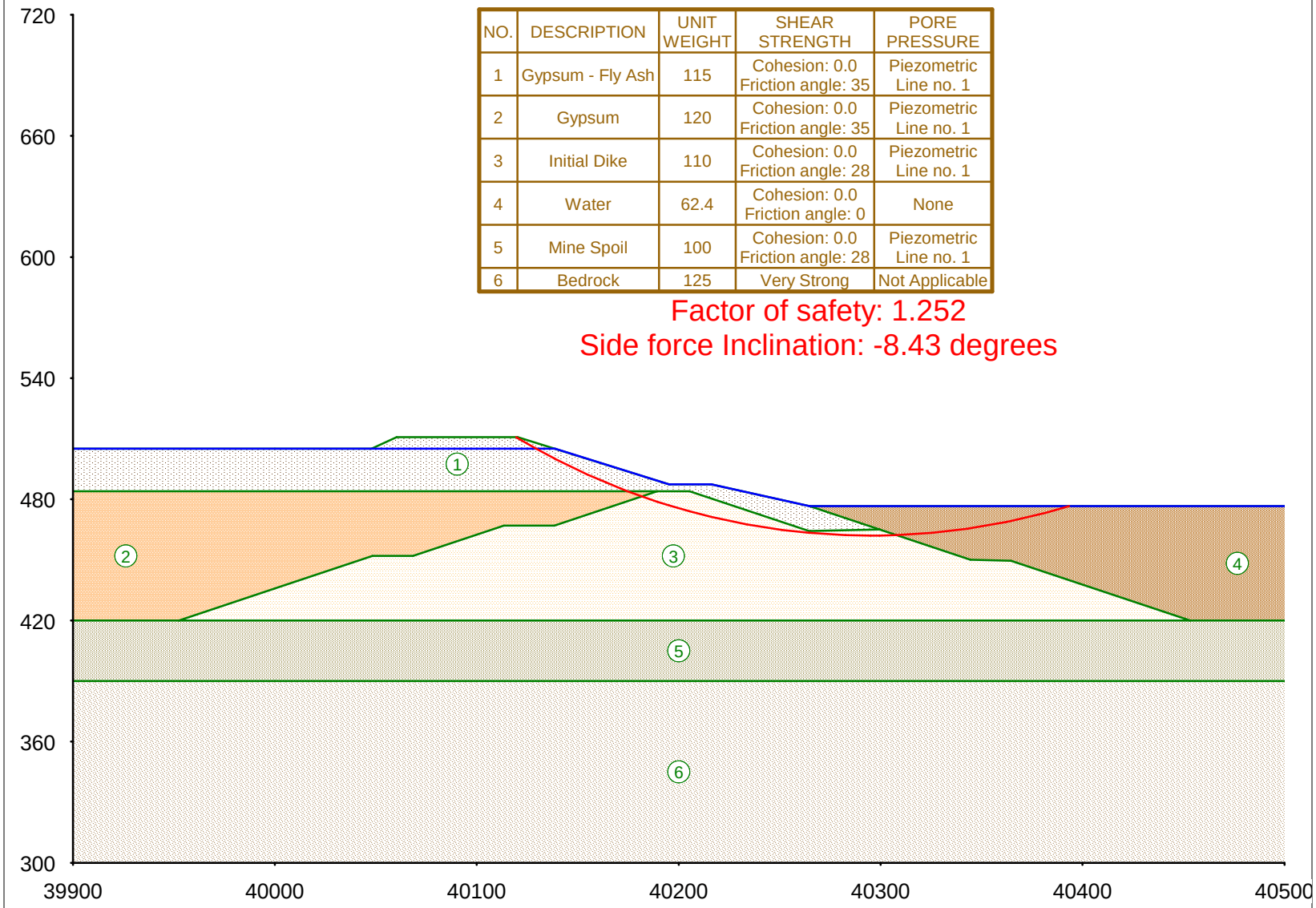
Date: Wed Jul 22 2009 Filename: 2XA.UT4 Time: 15:06:29

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Initial Dike	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Water	62.4	Cohesion: 0.0 Friction angle: 0	None
5	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
6	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.252

Side force Inclination: -8.43 degrees



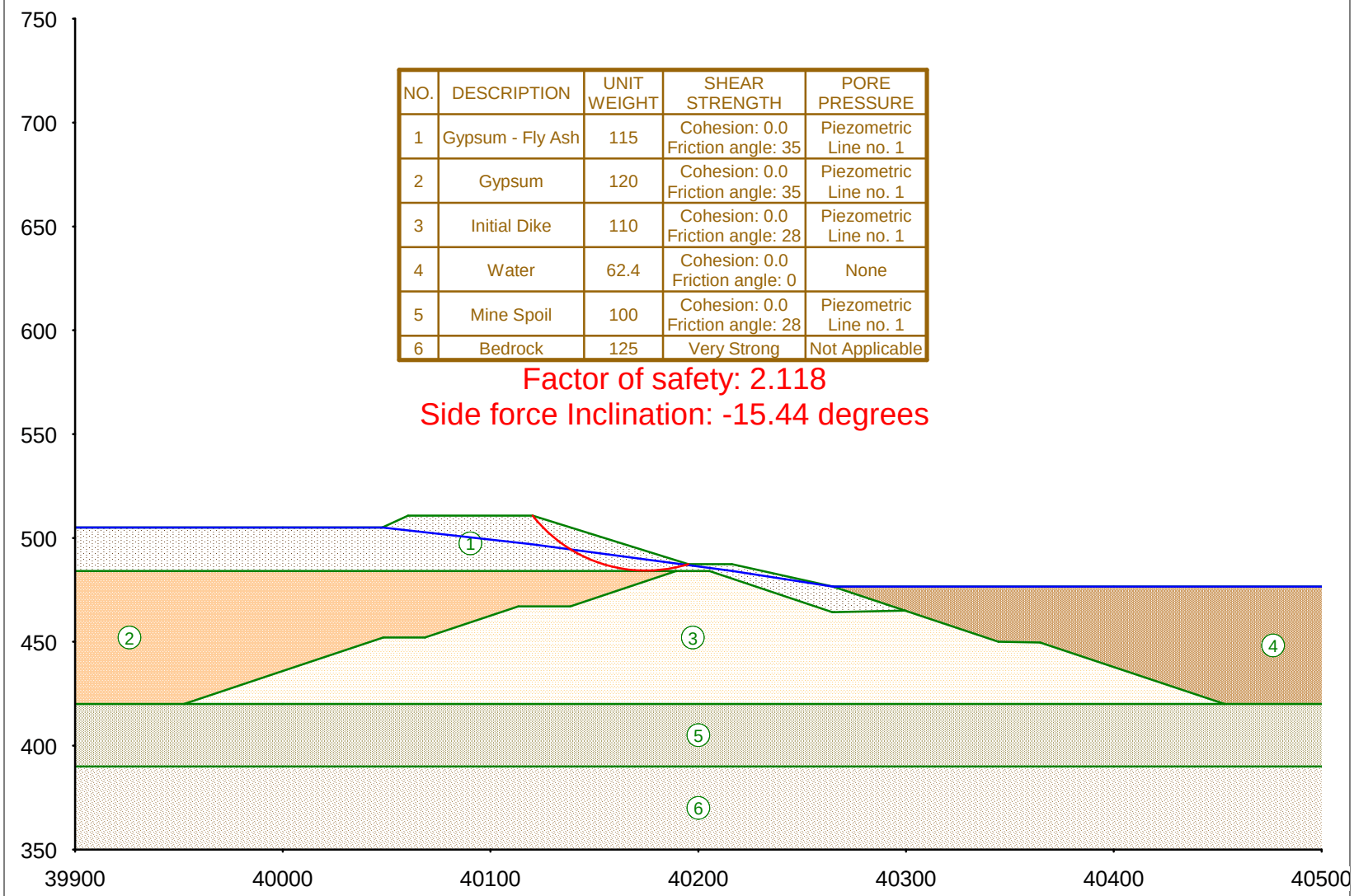
Date: Wed Jul 22 2009 Filename: 2XB.UT4 Time: 15:11:44

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Initial Dike	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Water	62.4	Cohesion: 0.0 Friction angle: 0	None
5	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
6	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 2.118

Side force Inclination: -15.44 degrees



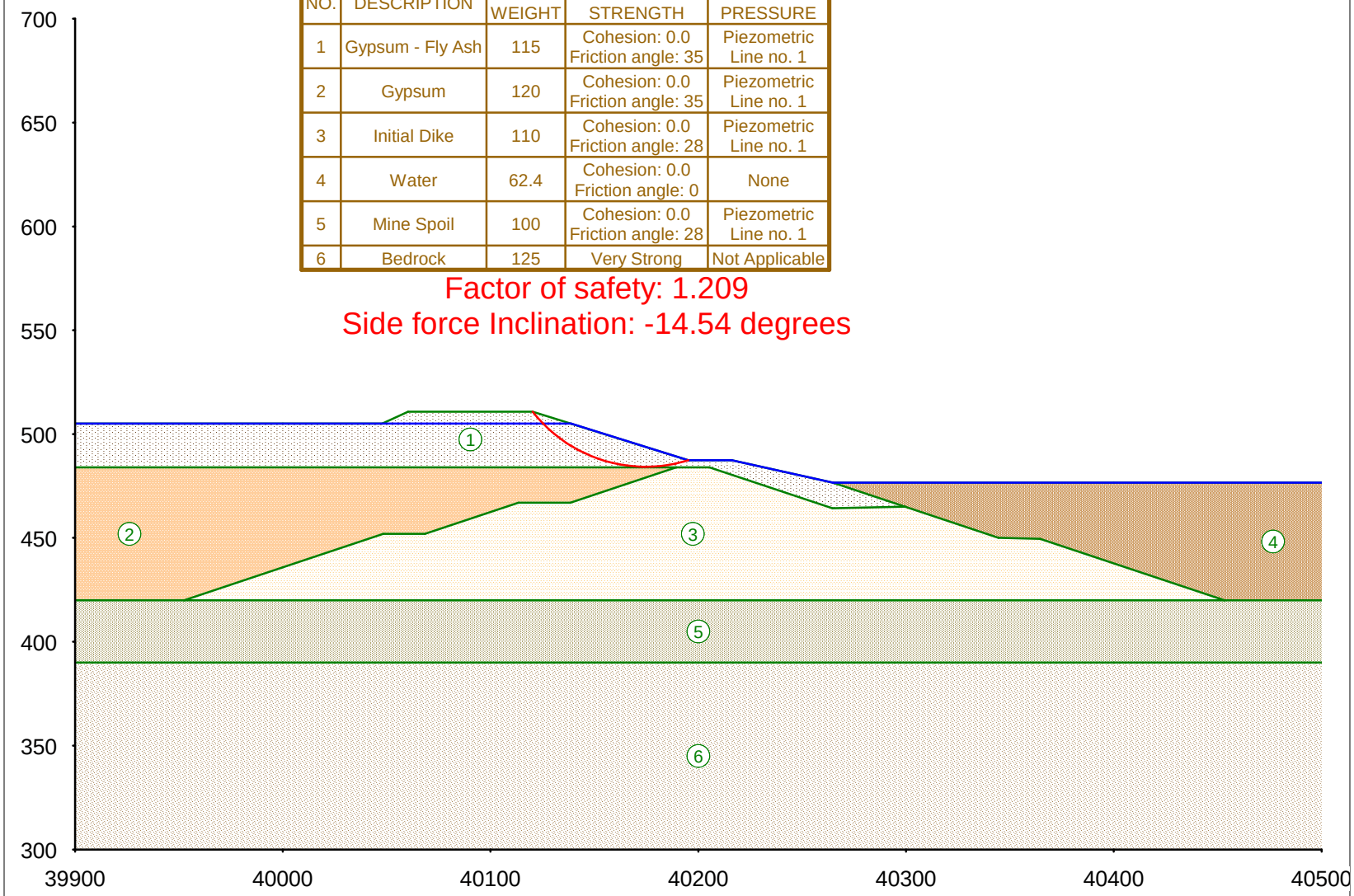
Date: Wed Jul 22 2009 Filename: 2YA.UT4 Time: 15:12:22

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Initial Dike	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Water	62.4	Cohesion: 0.0 Friction angle: 0	None
5	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
6	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.209

Side force Inclination: -14.54 degrees



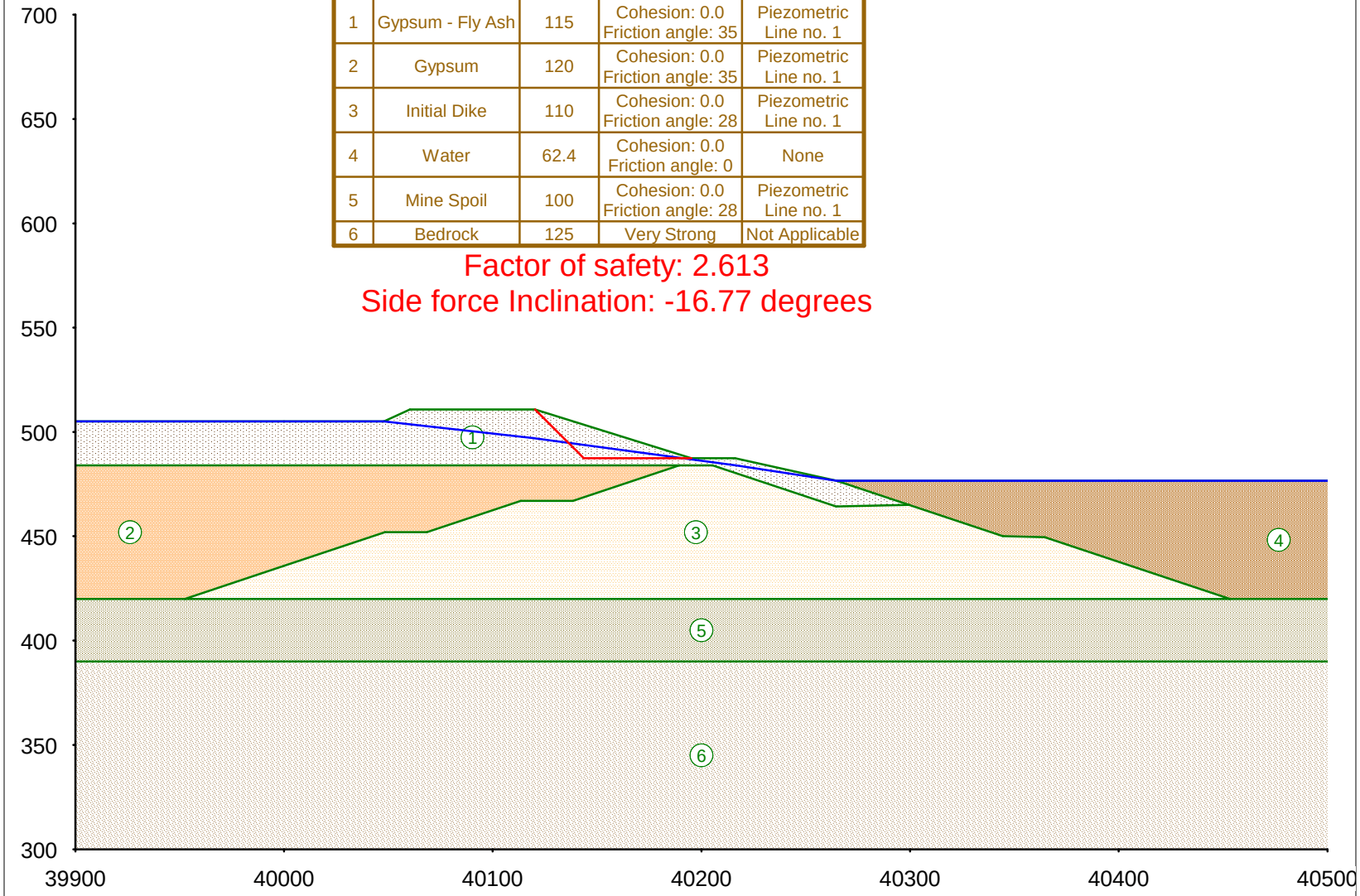
Date: Wed Jul 22 2009 Filename: 2YB.UT4 Time: 15:13:00

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Initial Dike	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Water	62.4	Cohesion: 0.0 Friction angle: 0	None
5	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
6	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 2.613

Side force Inclination: -16.77 degrees



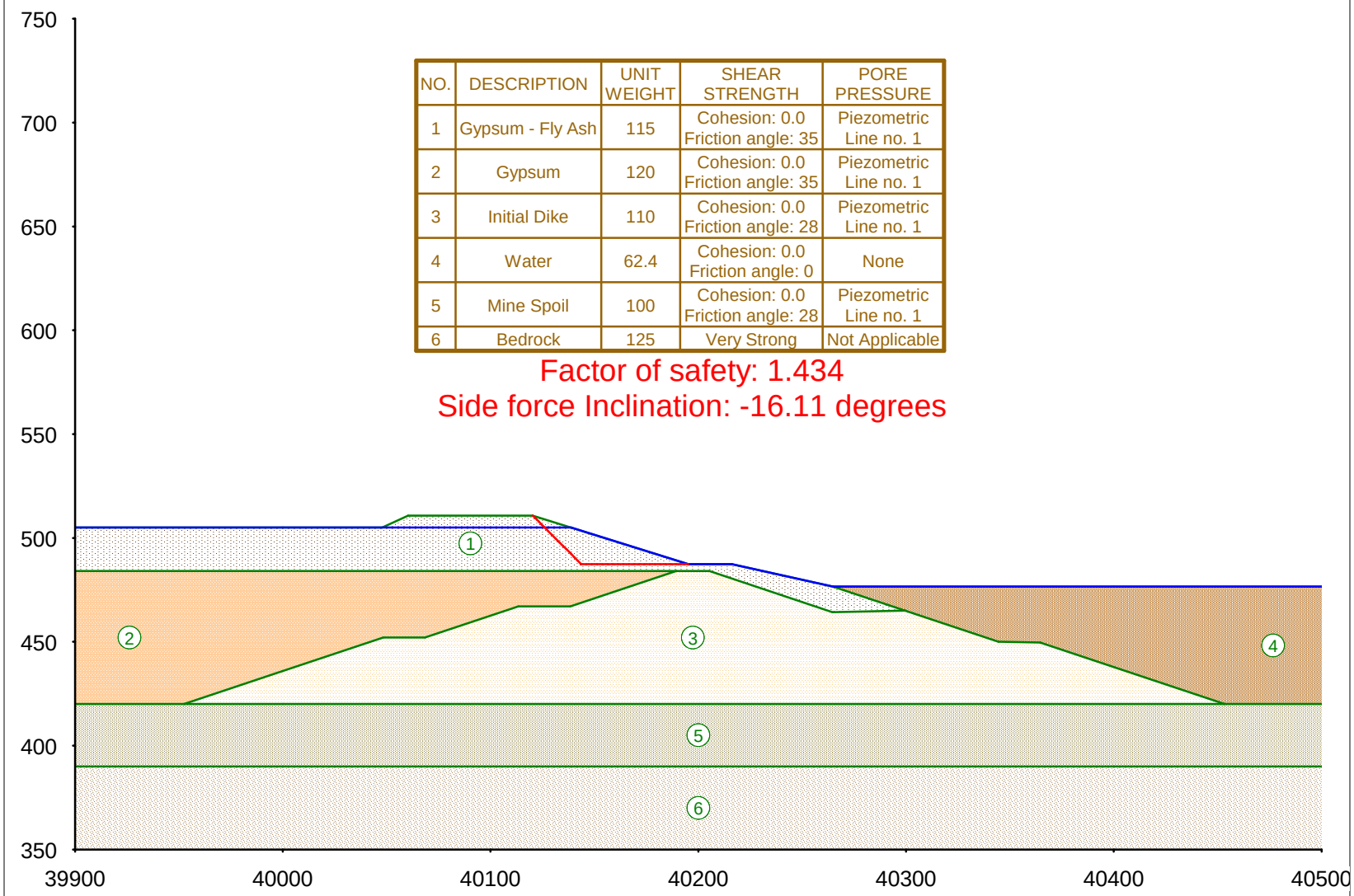
Date: Wed Jul 22 2009 Filename: 2ZA.UT4 Time: 15:13:33

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Initial Dike	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Water	62.4	Cohesion: 0.0 Friction angle: 0	None
5	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
6	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.434

Side force Inclination: -16.11 degrees



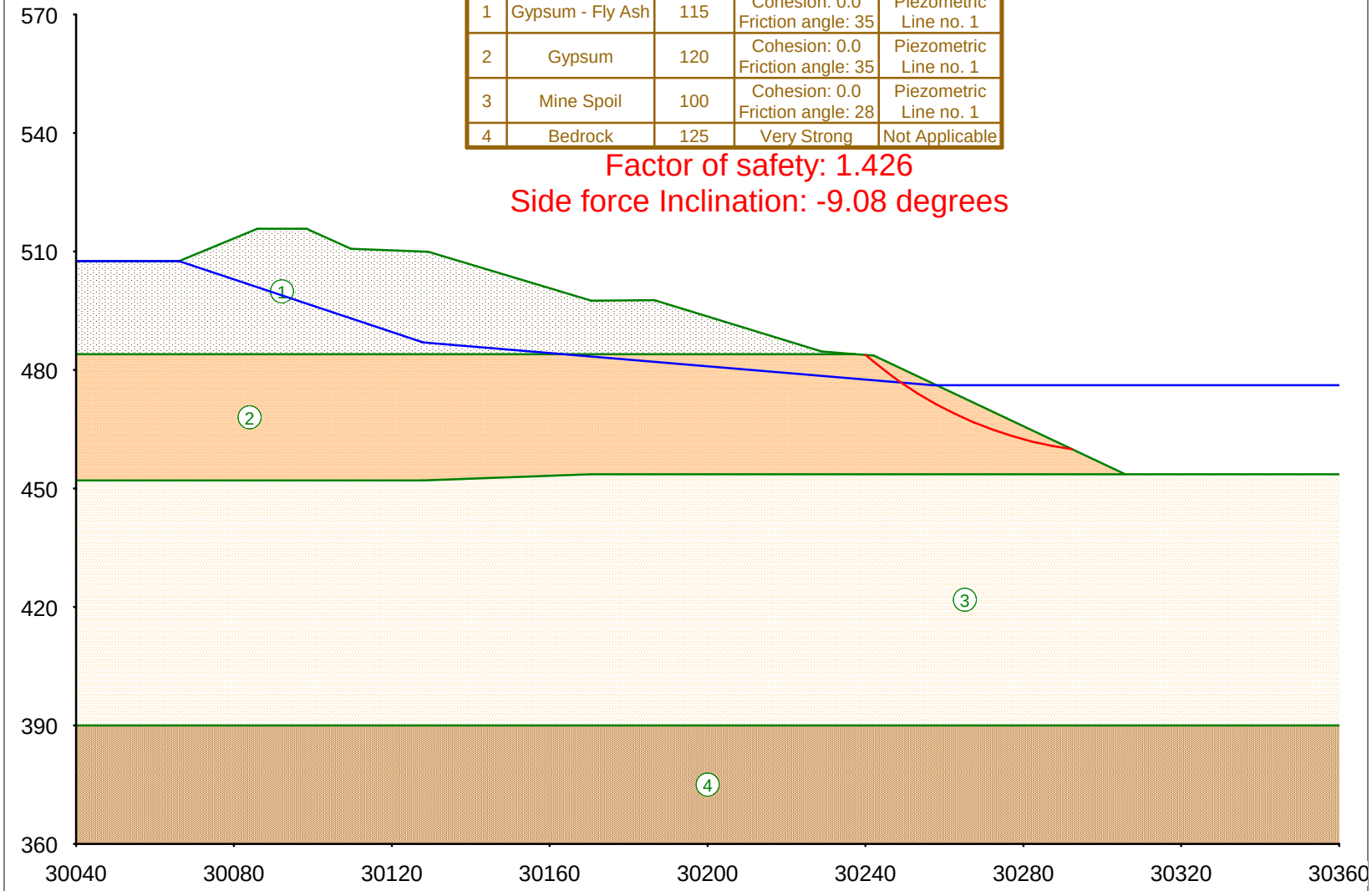
Date: Wed Jul 22 2009 Filename: 2ZB.UT4 Time: 15:14:16

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.426

Side force Inclination: -9.08 degrees



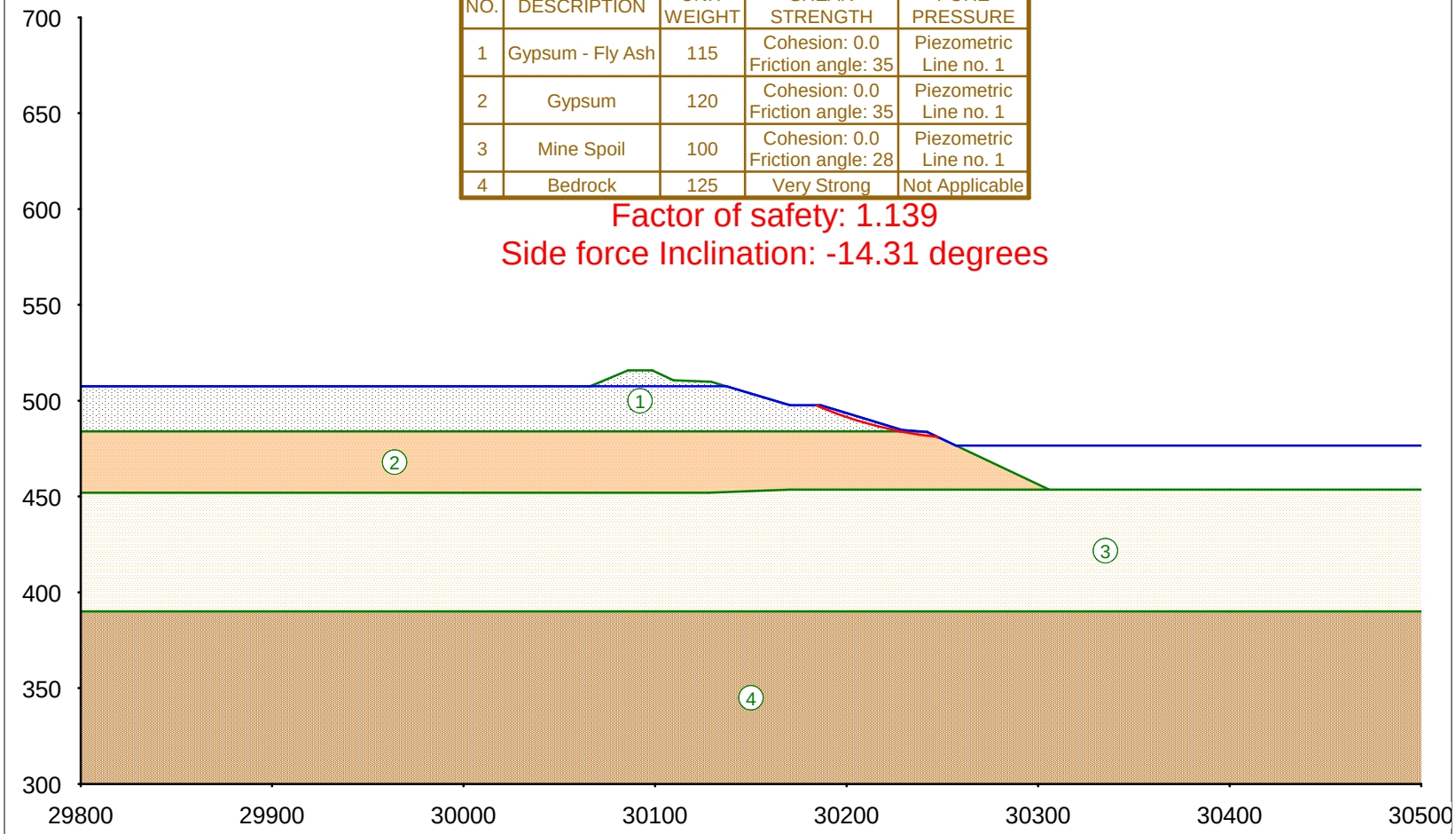
Date: Mon Jul 27 2009 Filename: 3XA.UT4 Time: 11:52:56

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.139

Side force Inclination: -14.31 degrees



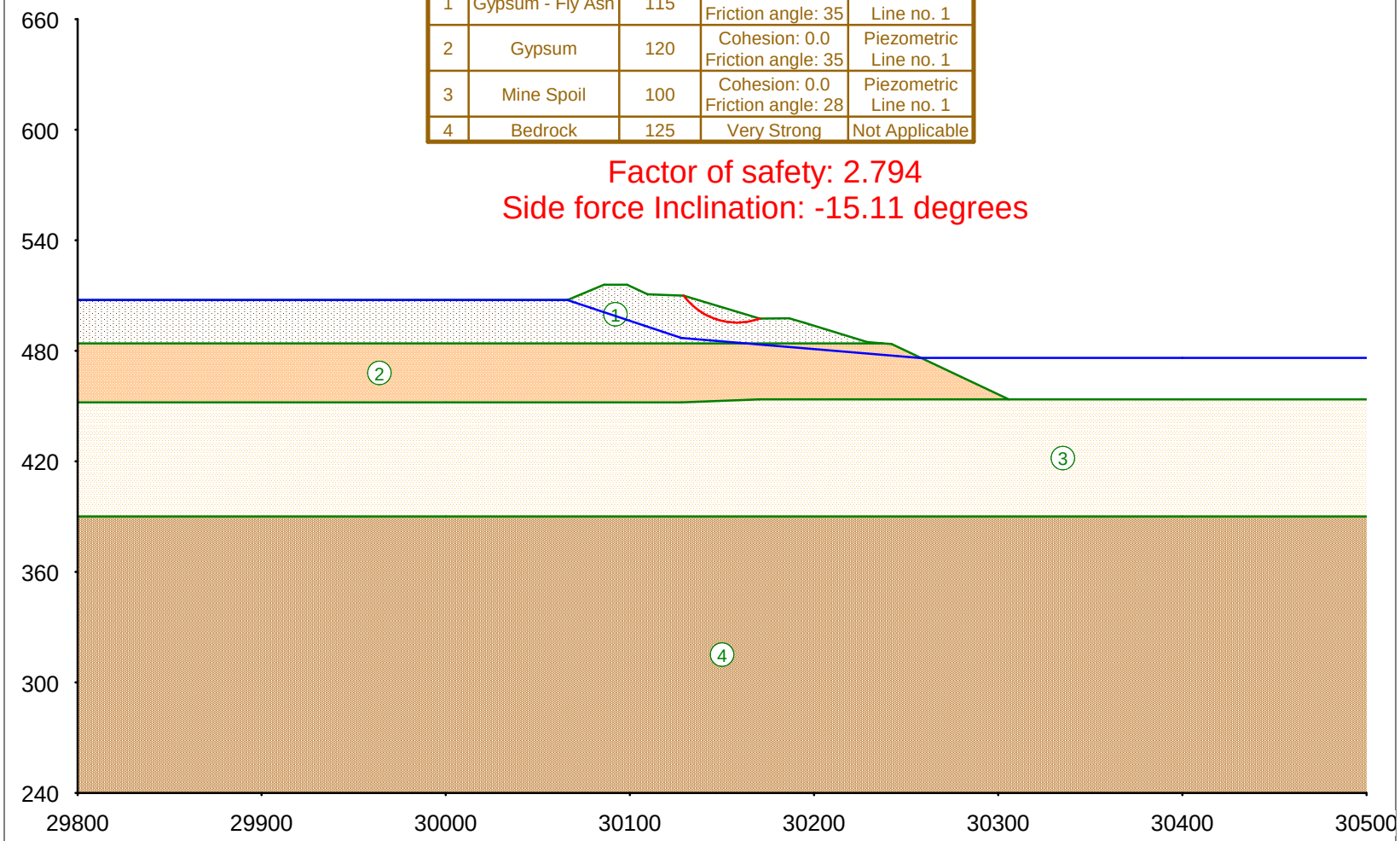
Date: Wed Jul 22 2009 Filename: 3XB.UT4 Time: 16:13:52

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 2.794

Side force Inclination: -15.11 degrees



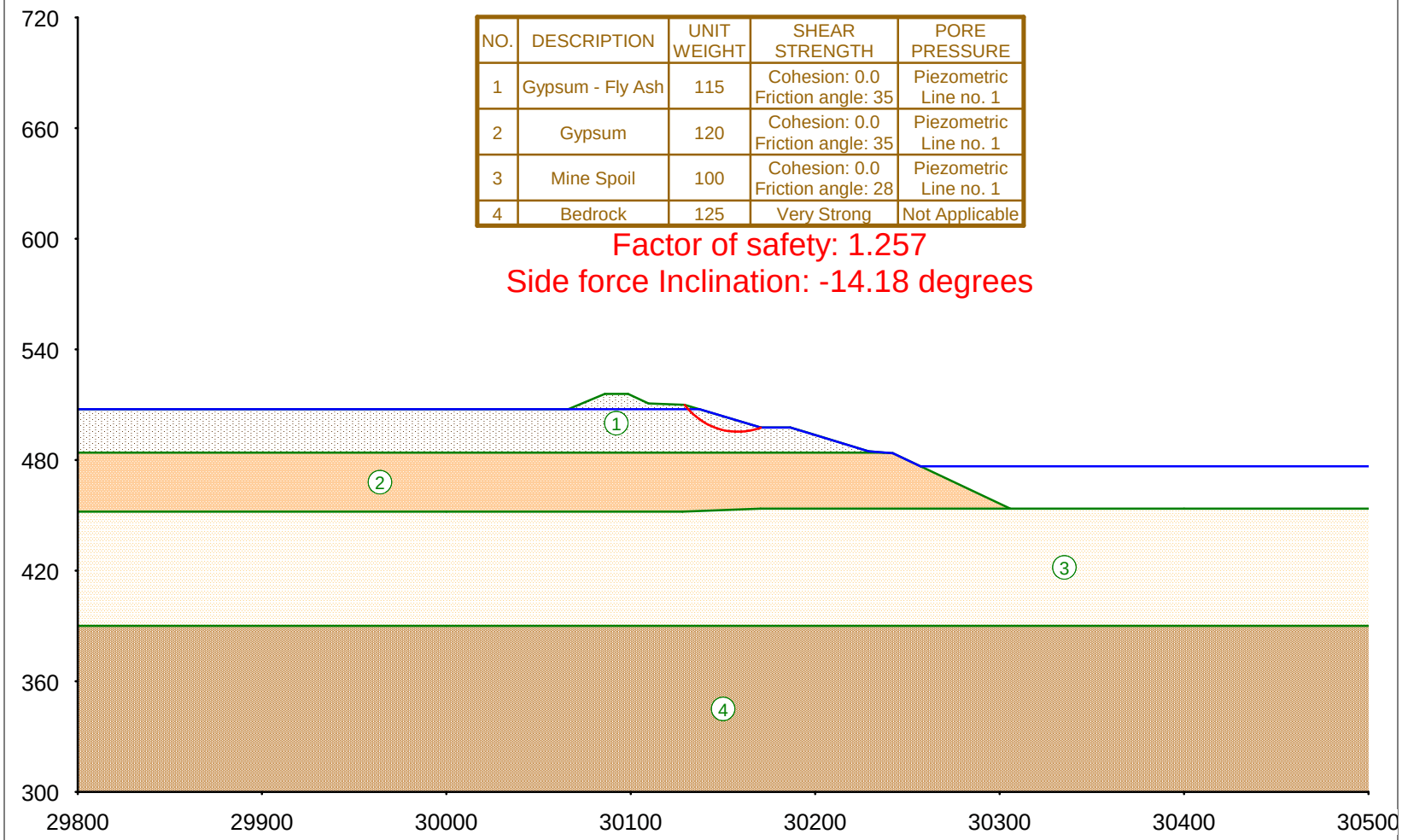
Date: Mon Jul 27 2009 Filename: 3YA.UT4 Time: 11:54:58

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.257

Side force Inclination: -14.18 degrees



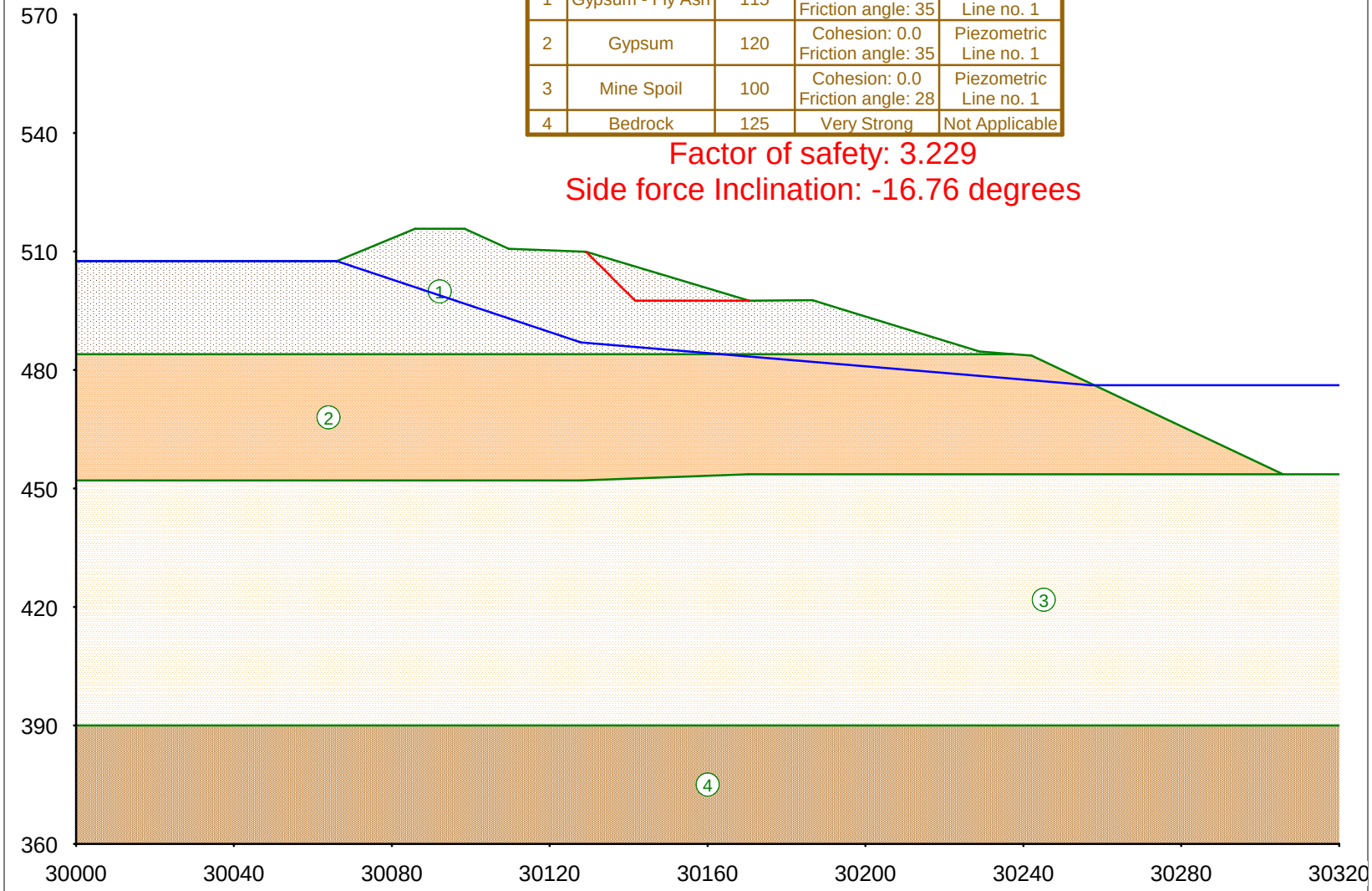
Date: Wed Jul 22 2009 Filename: 3YB.UT4 Time: 16:18:39

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 3.229

Side force Inclination: -16.76 degrees



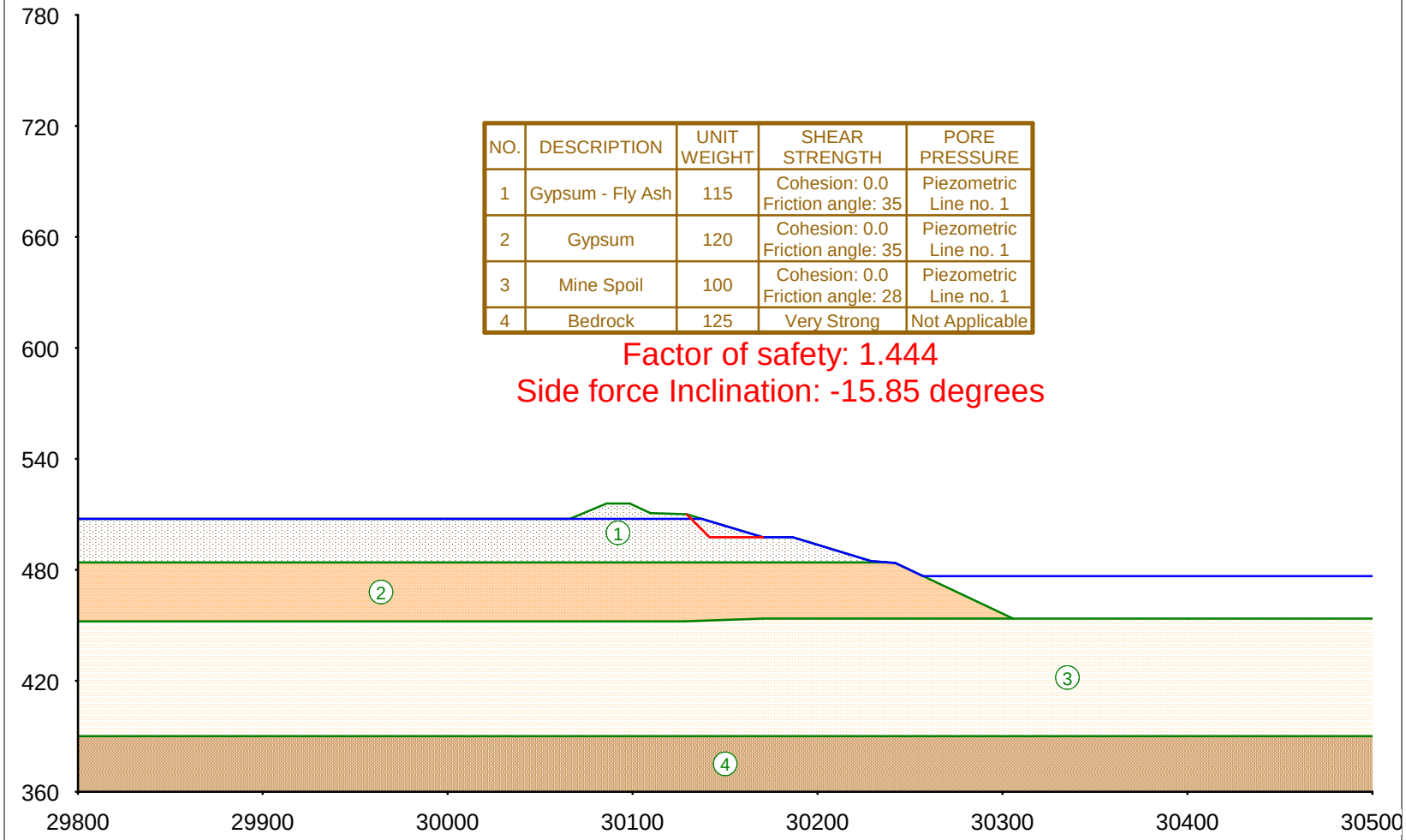
Date: Mon Jul 27 2009 Filename: 3ZA.UT4 Time: 11:56:03

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.444

Side force Inclination: -15.85 degrees



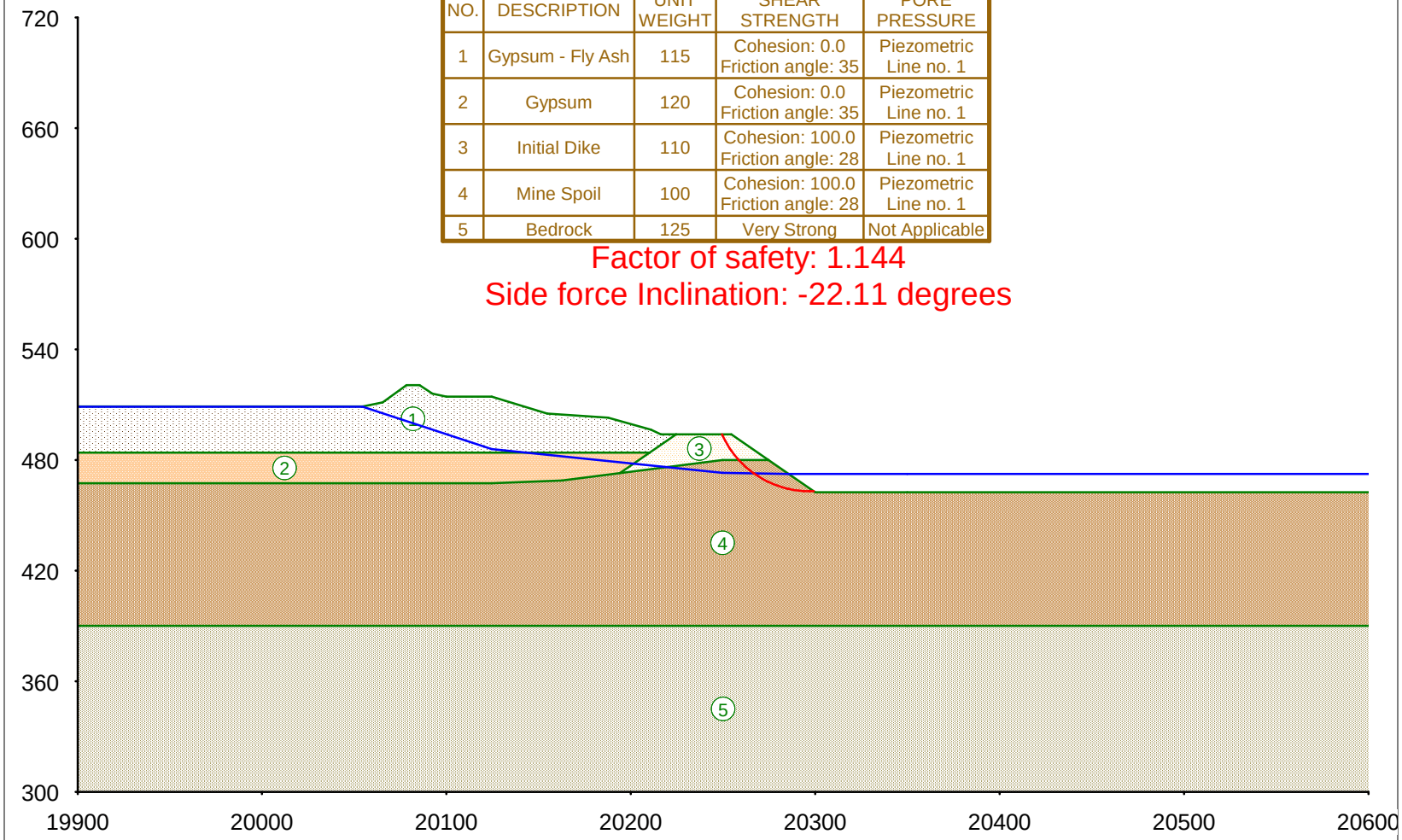
Date: Wed Jul 22 2009 Filename: 3ZB.UT4 Time: 16:19:50

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Initial Dike	110	Cohesion: 100.0 Friction angle: 28	Piezometric Line no. 1
4	Mine Spoil	100	Cohesion: 100.0 Friction angle: 28	Piezometric Line no. 1
5	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.144

Side force Inclination: -22.11 degrees



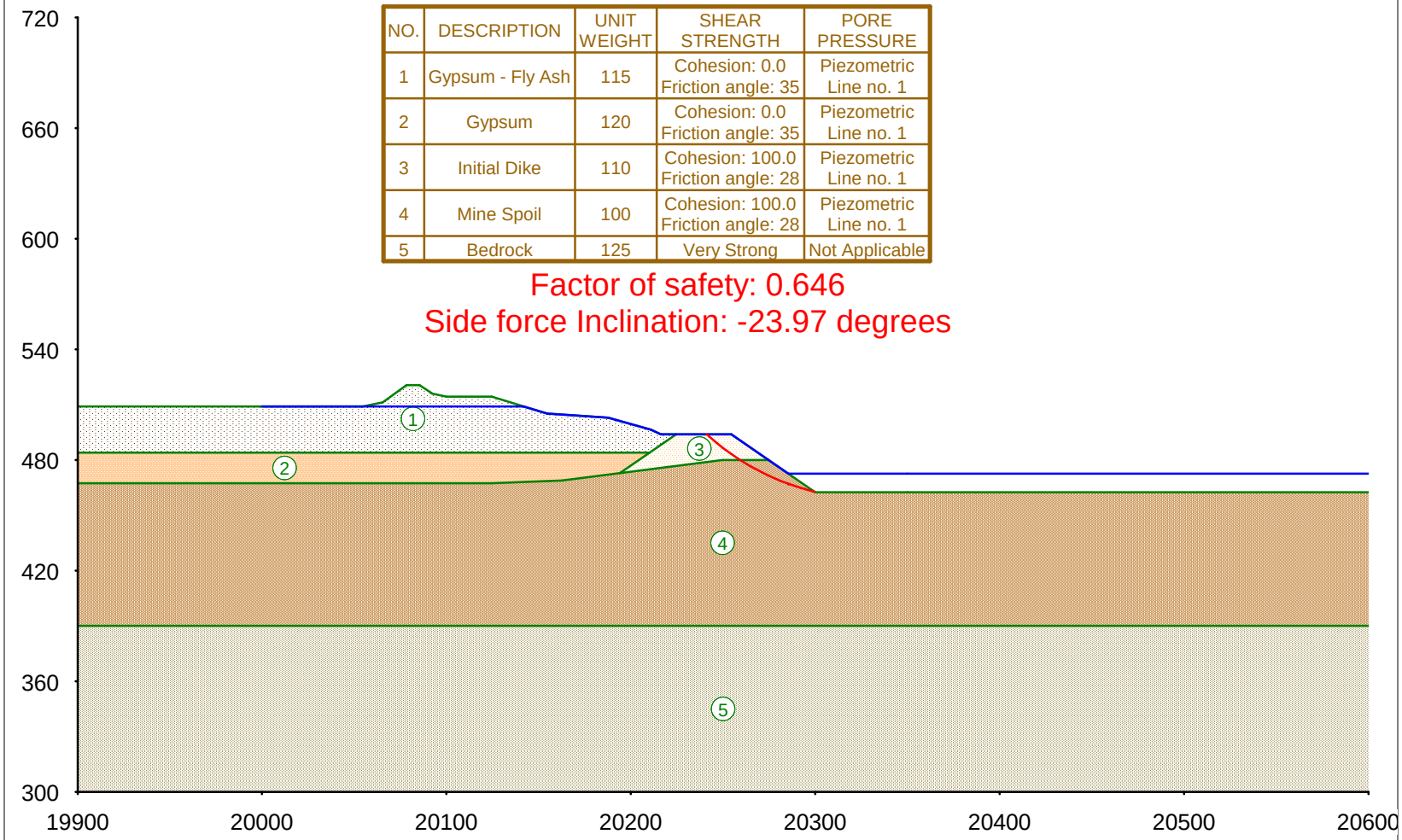
Date: Wed Jul 22 2009 Filename: 4XA.UT4 Time: 16:26:34

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Initial Dike	110	Cohesion: 100.0 Friction angle: 28	Piezometric Line no. 1
4	Mine Spoil	100	Cohesion: 100.0 Friction angle: 28	Piezometric Line no. 1
5	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 0.646

Side force Inclination: -23.97 degrees



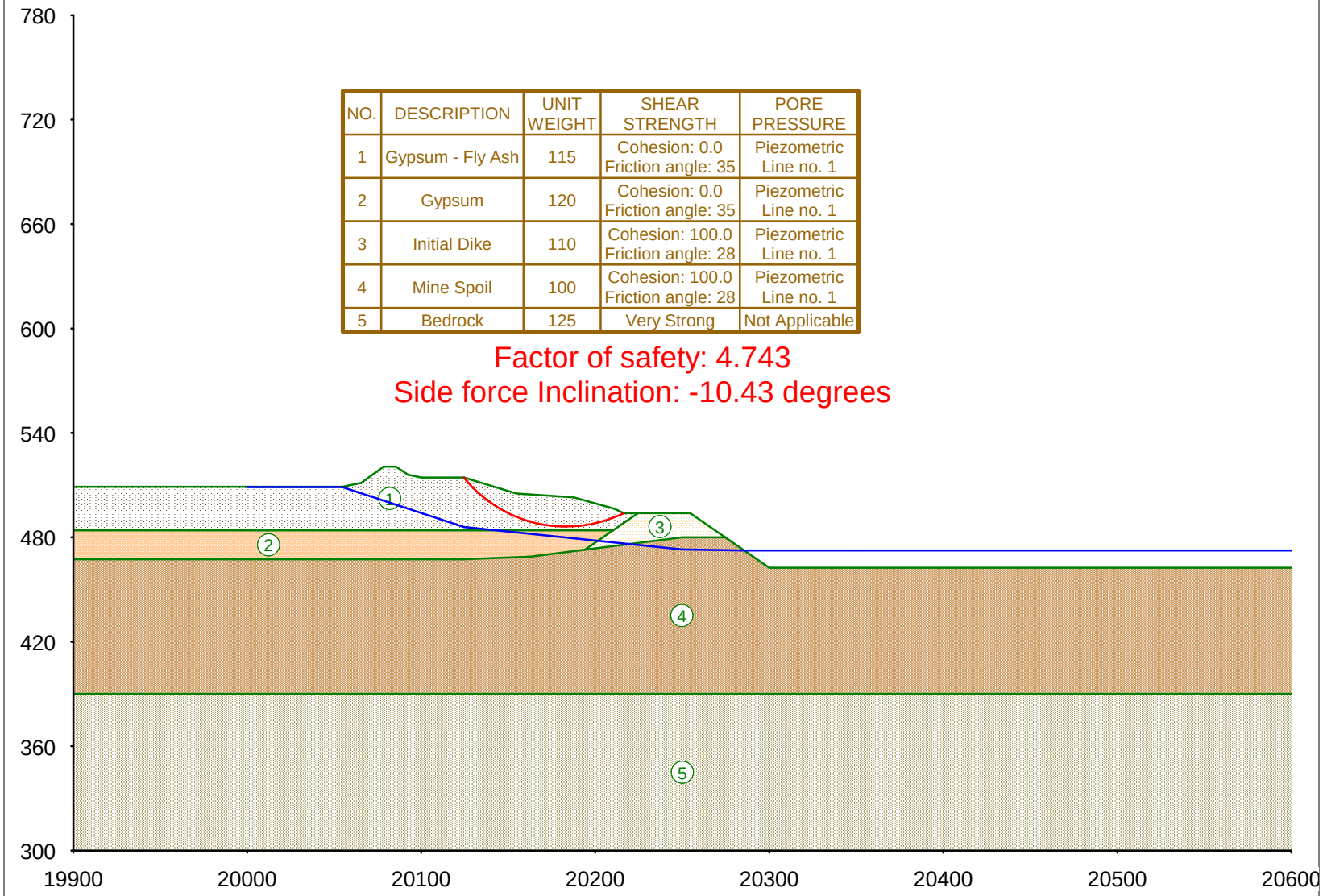
Date: Wed Jul 22 2009 Filename: 4XB.UT4 Time: 16:32:00

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Initial Dike	110	Cohesion: 100.0 Friction angle: 28	Piezometric Line no. 1
4	Mine Spoil	100	Cohesion: 100.0 Friction angle: 28	Piezometric Line no. 1
5	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 4.743

Side force Inclination: -10.43 degrees



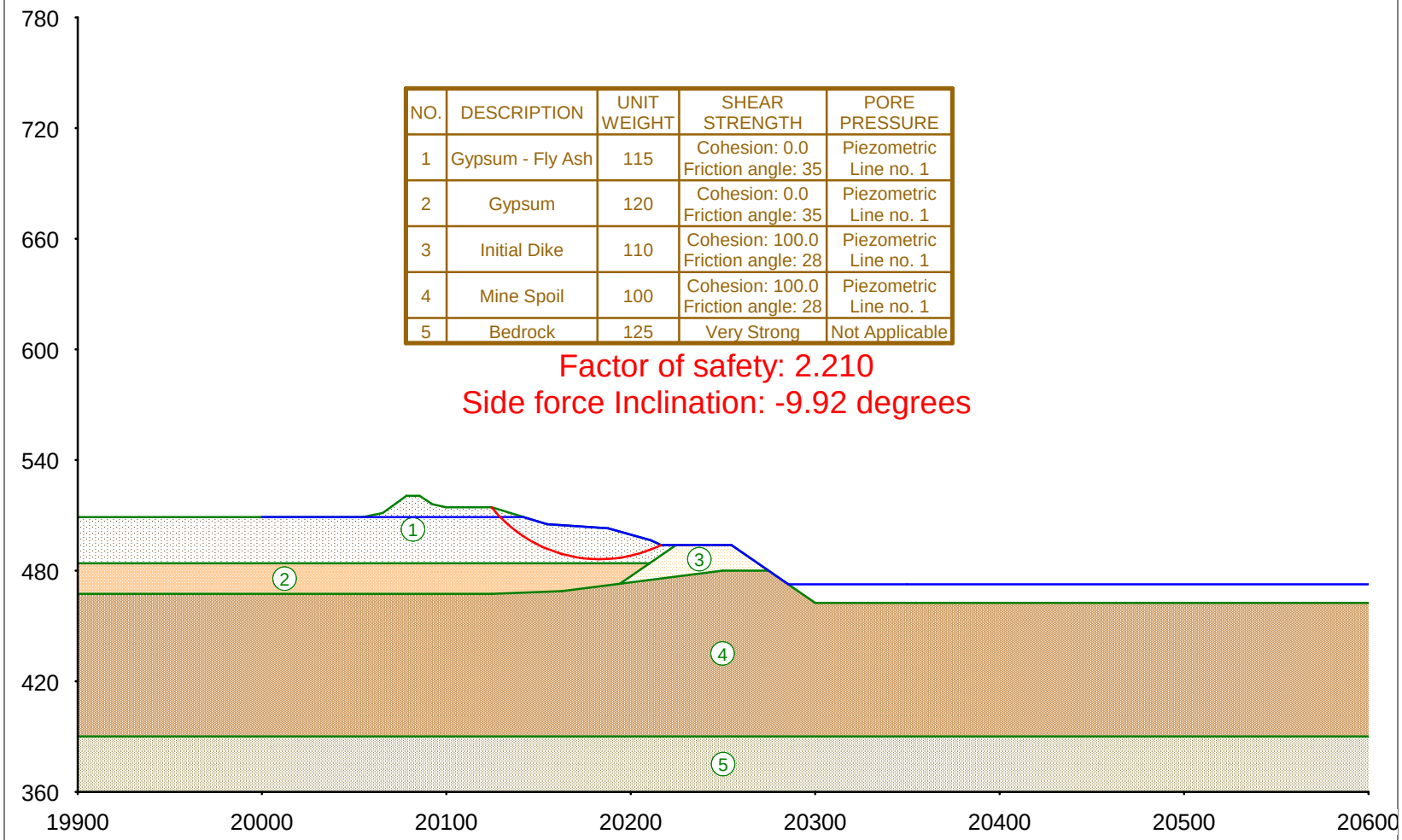
Date: Wed Jul 22 2009 Filename: 4YA.UT4 Time: 16:32:54

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Initial Dike	110	Cohesion: 100.0 Friction angle: 28	Piezometric Line no. 1
4	Mine Spoil	100	Cohesion: 100.0 Friction angle: 28	Piezometric Line no. 1
5	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 2.210

Side force Inclination: -9.92 degrees



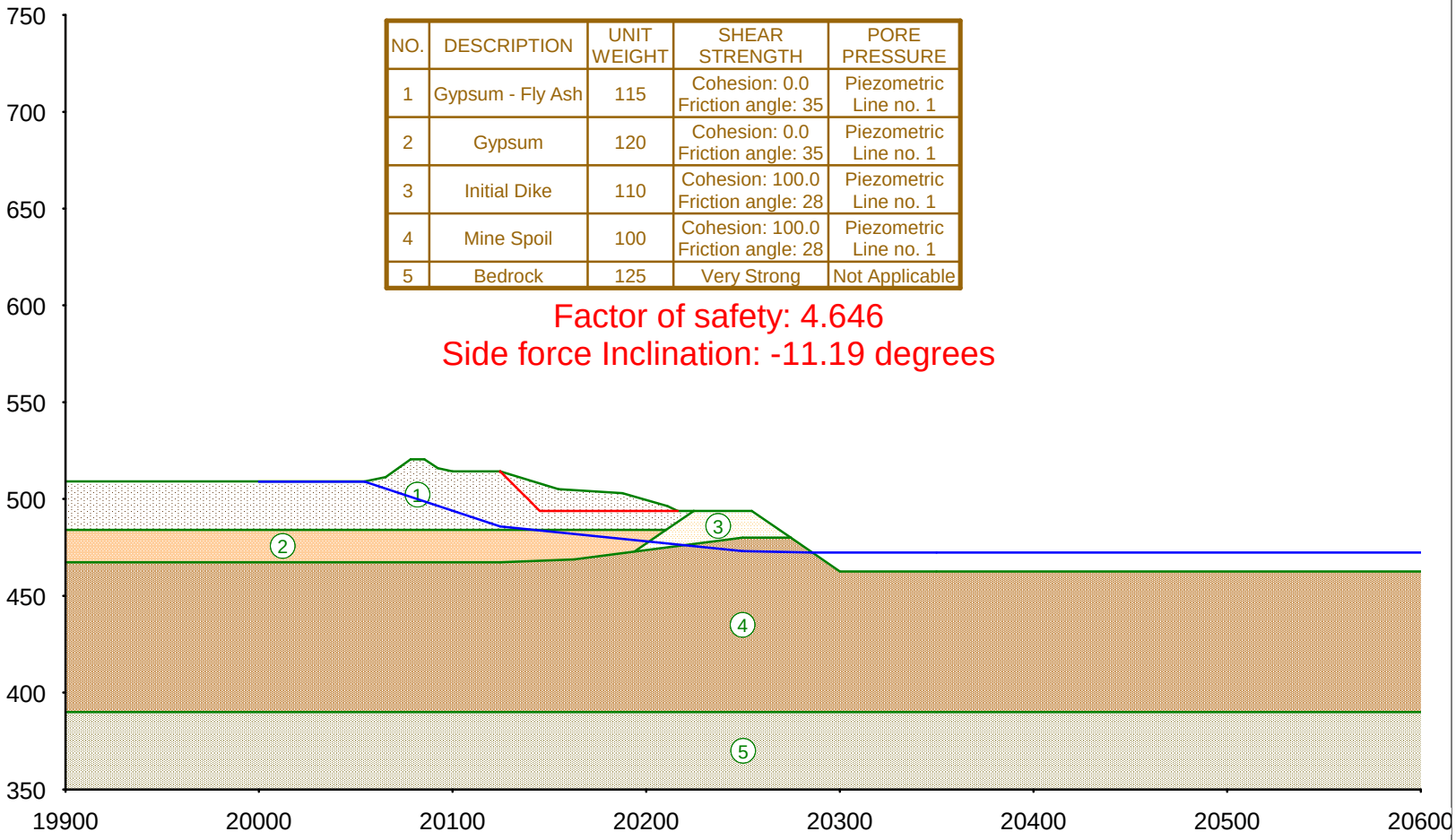
Date: Wed Jul 22 2009 Filename: 4YB.UT4 Time: 16:33:29

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Initial Dike	110	Cohesion: 100.0 Friction angle: 28	Piezometric Line no. 1
4	Mine Spoil	100	Cohesion: 100.0 Friction angle: 28	Piezometric Line no. 1
5	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 4.646

Side force Inclination: -11.19 degrees



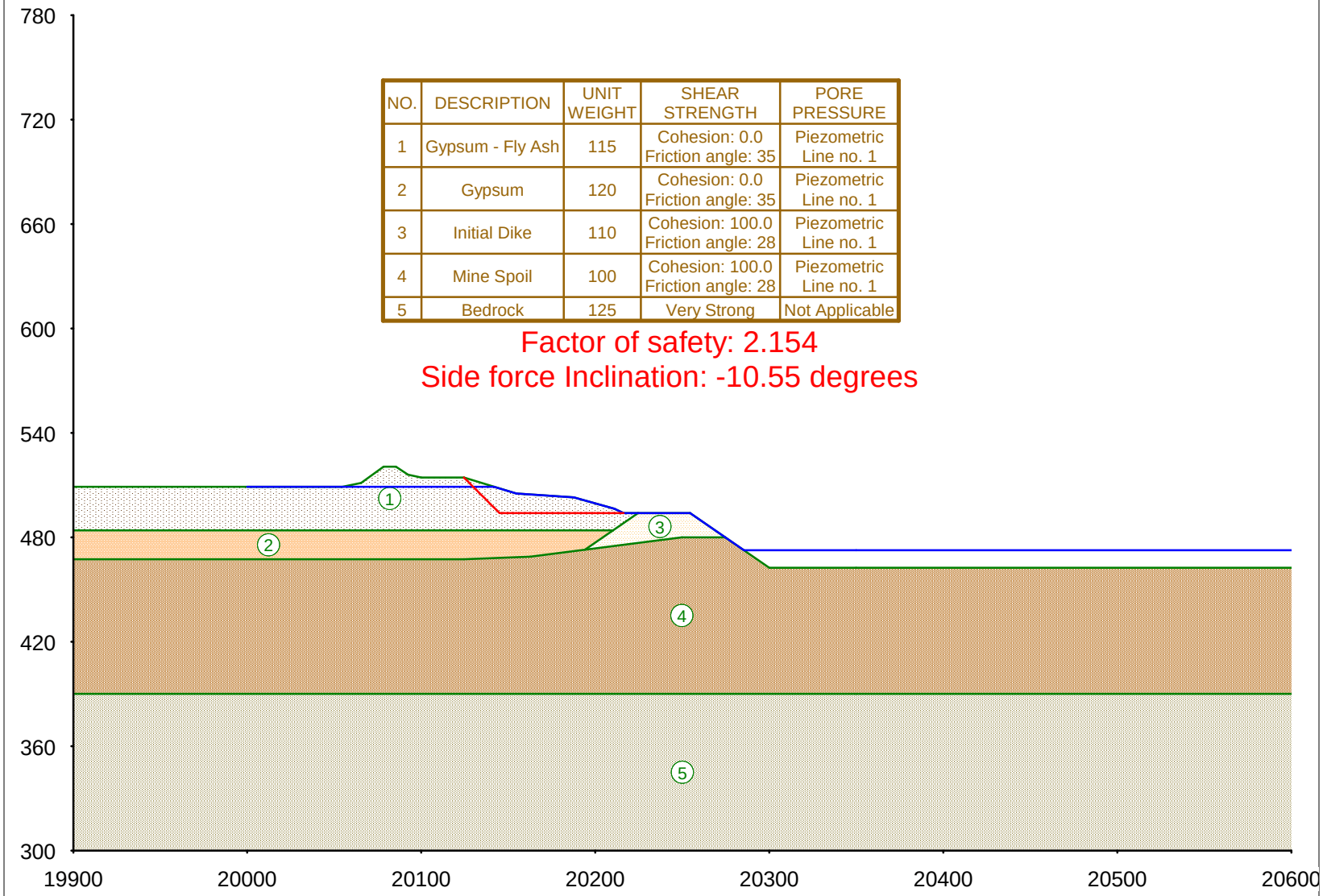
Date: Wed Jul 22 2009 Filename: 4ZA.UT4 Time: 16:34:05

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Initial Dike	110	Cohesion: 100.0 Friction angle: 28	Piezometric Line no. 1
4	Mine Spoil	100	Cohesion: 100.0 Friction angle: 28	Piezometric Line no. 1
5	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 2.154

Side force Inclination: -10.55 degrees



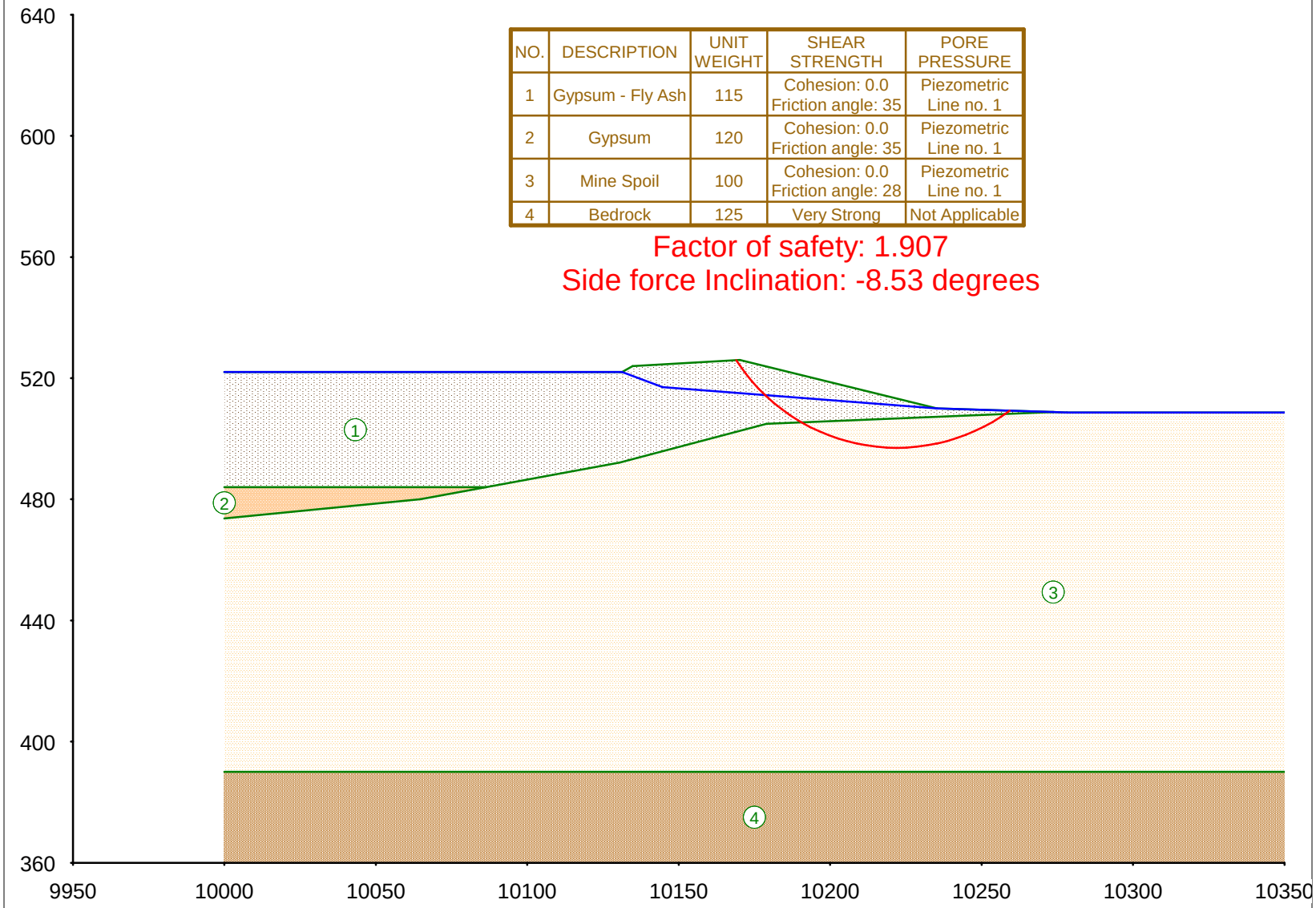
Date: Wed Jul 22 2009 Filename: 4ZB.UT4 Time: 16:34:38

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.907

Side force Inclination: -8.53 degrees



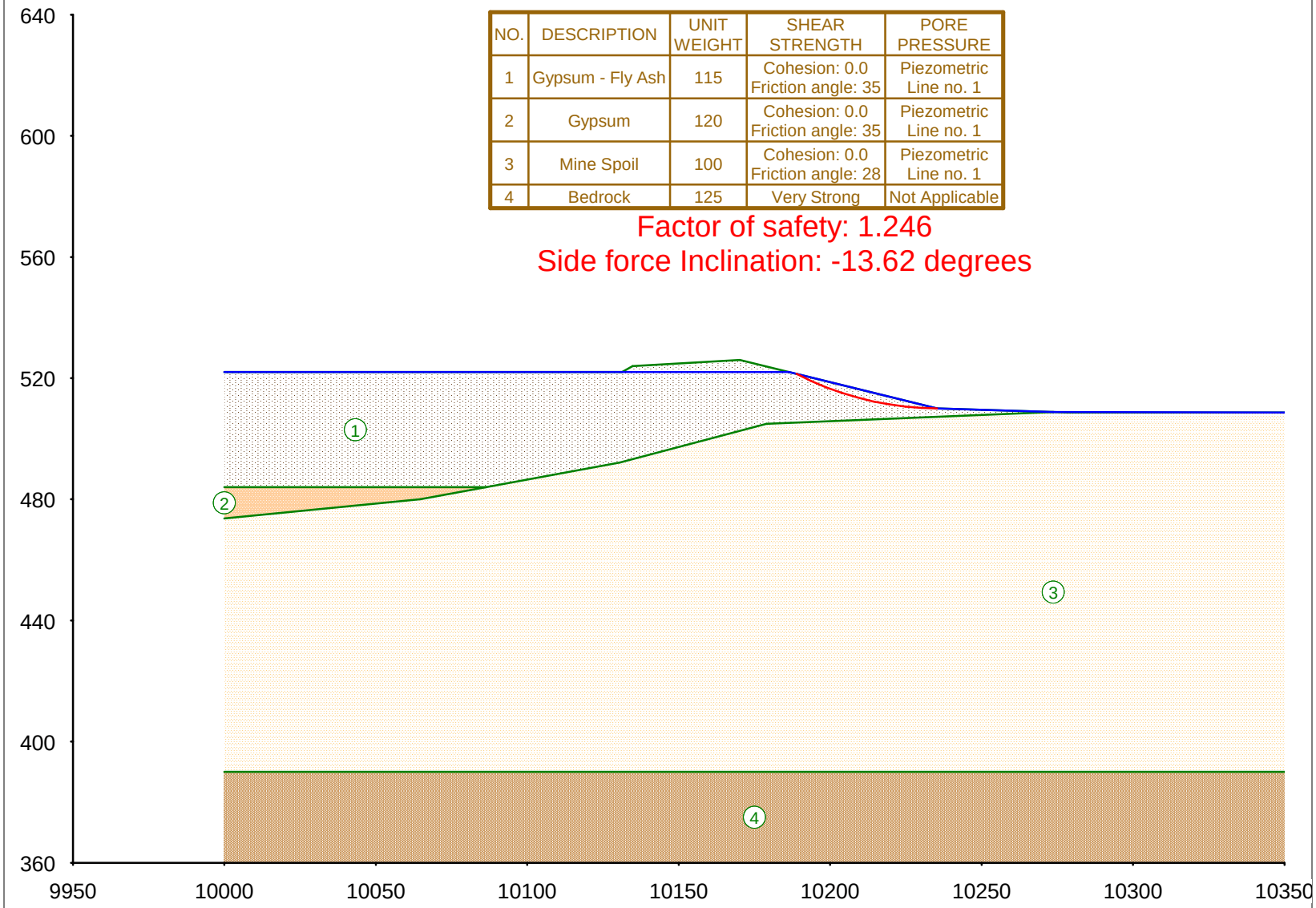
Date: Wed Jul 22 2009 Filename: 5XA.UT4 Time: 16:41:11

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.246

Side force Inclination: -13.62 degrees



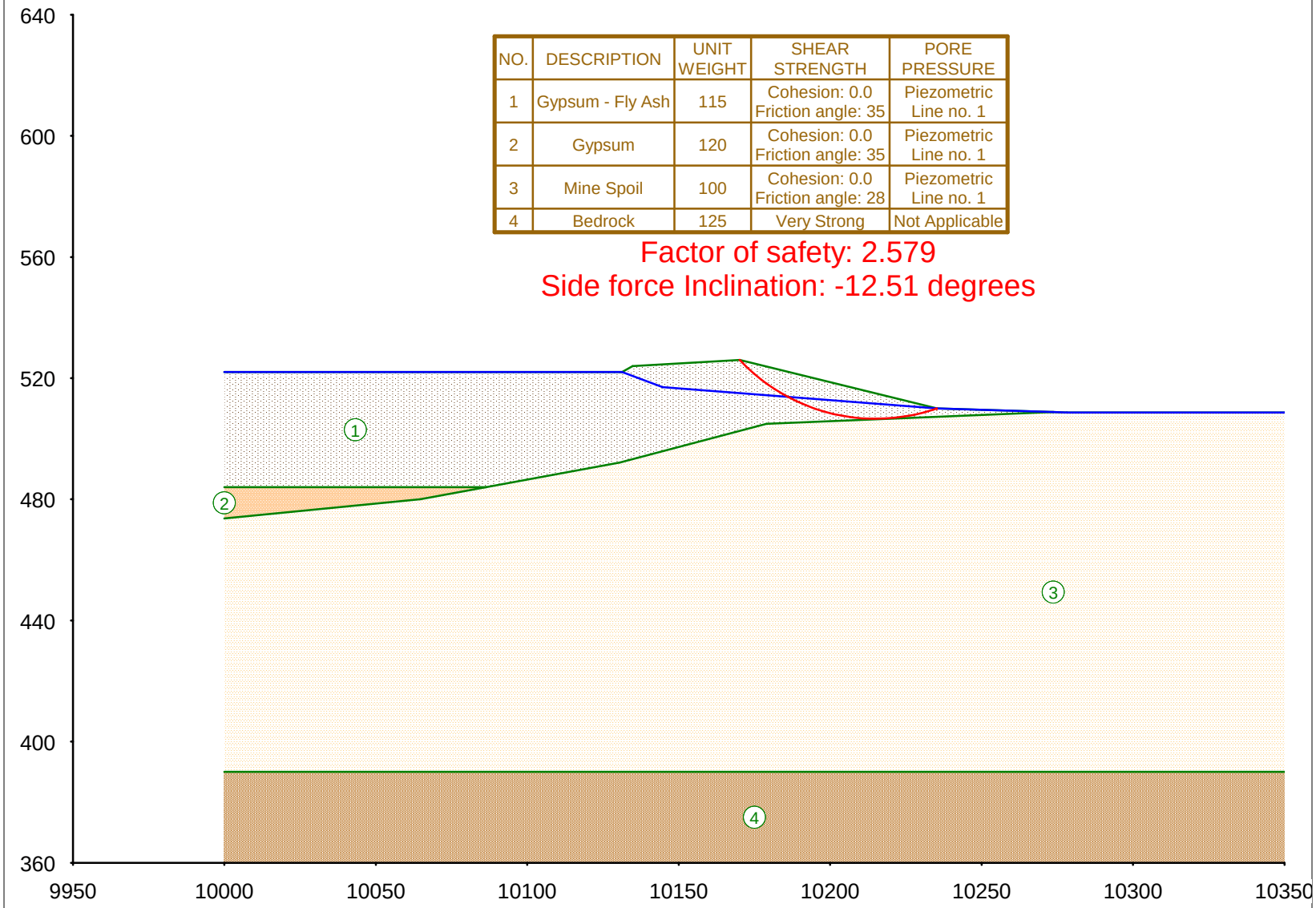
Date: Wed Jul 22 2009 Filename: 5XB.UT4 Time: 16:42:03

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 2.579

Side force Inclination: -12.51 degrees



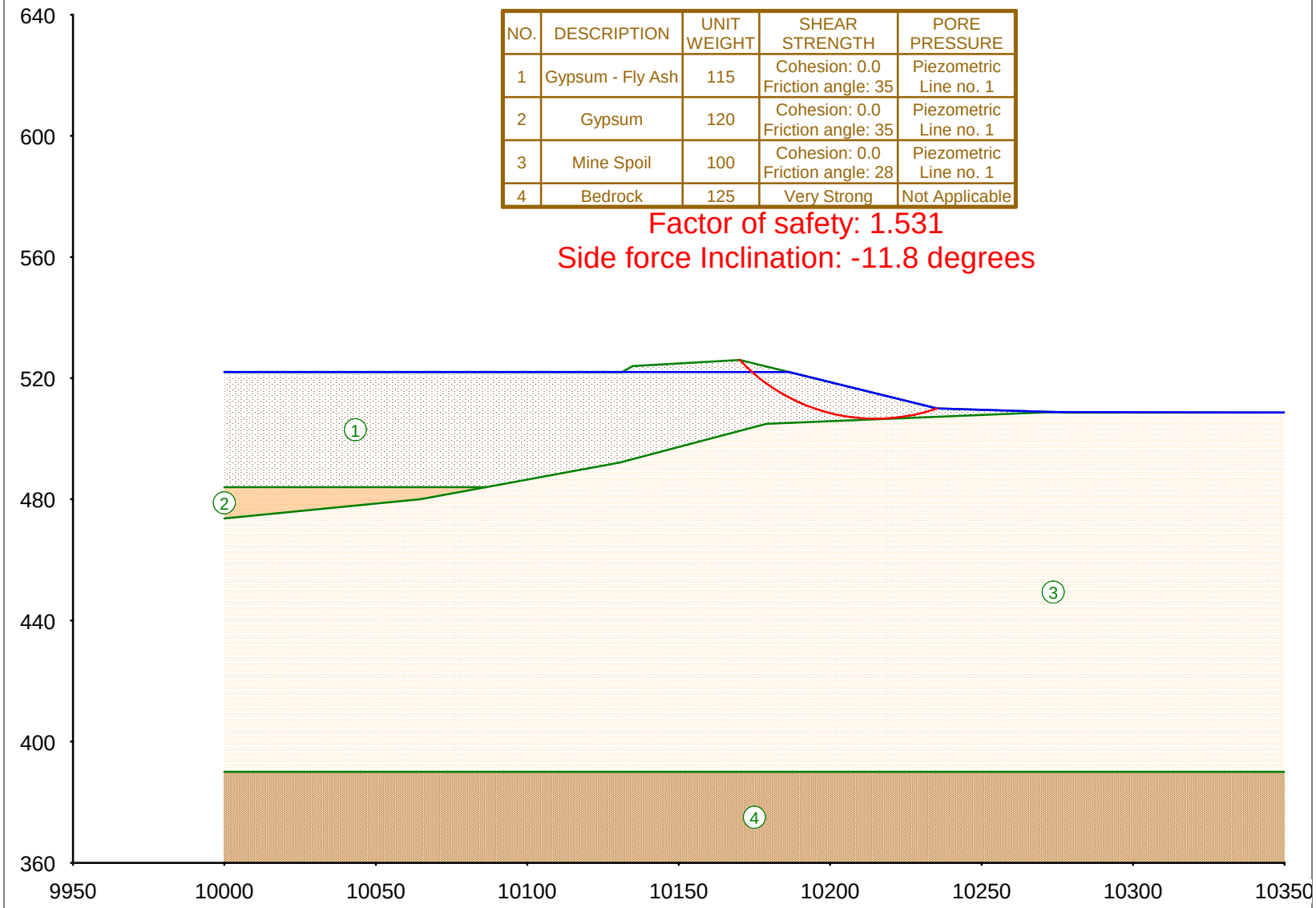
Date: Wed Jul 22 2009 Filename: 5YA.UT4 Time: 16:42:49

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.531

Side force Inclination: -11.8 degrees



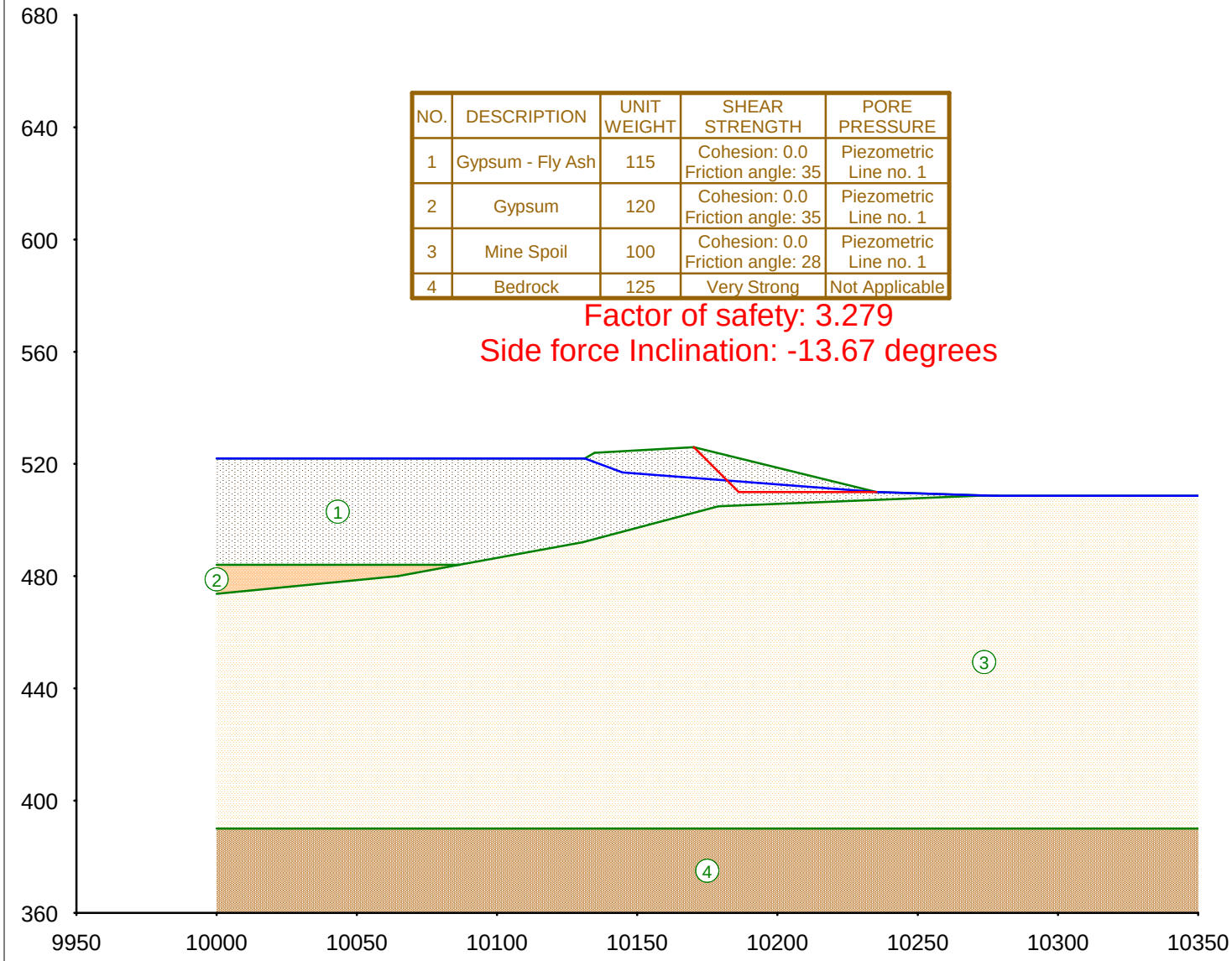
Date: Wed Jul 22 2009 Filename: 5YB.UT4 Time: 16:43:37

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 3.279

Side force Inclination: -13.67 degrees



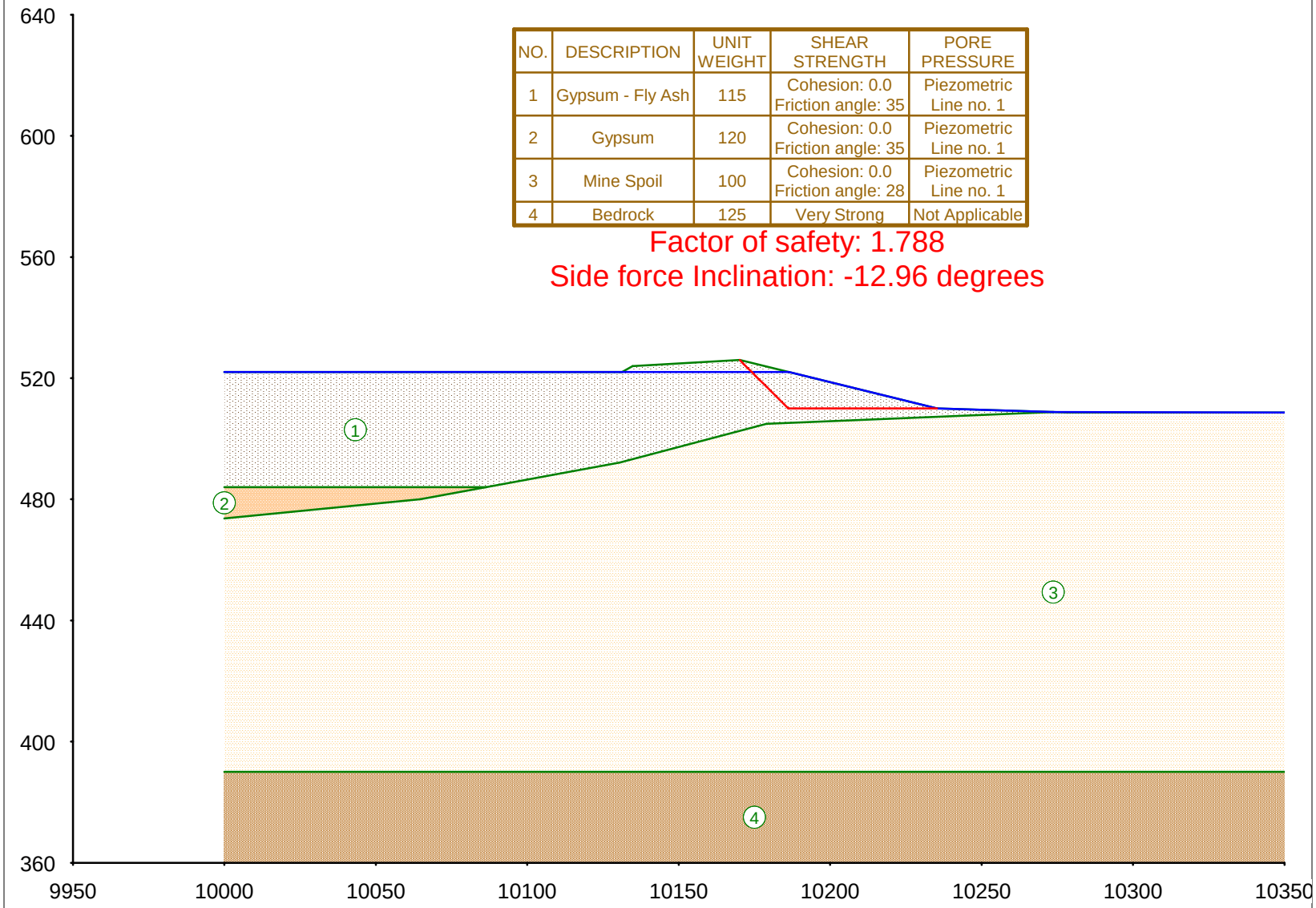
Date: Wed Jul 22 2009 Filename: 5ZA.UT4 Time: 16:44:28

Phase 2 Assessment - Scrubber Sludge Complex

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum - Fly Ash	115	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
2	Gypsum	120	Cohesion: 0.0 Friction angle: 35	Piezometric Line no. 1
3	Mine Spoil	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.788

Side force Inclination: -12.96 degrees



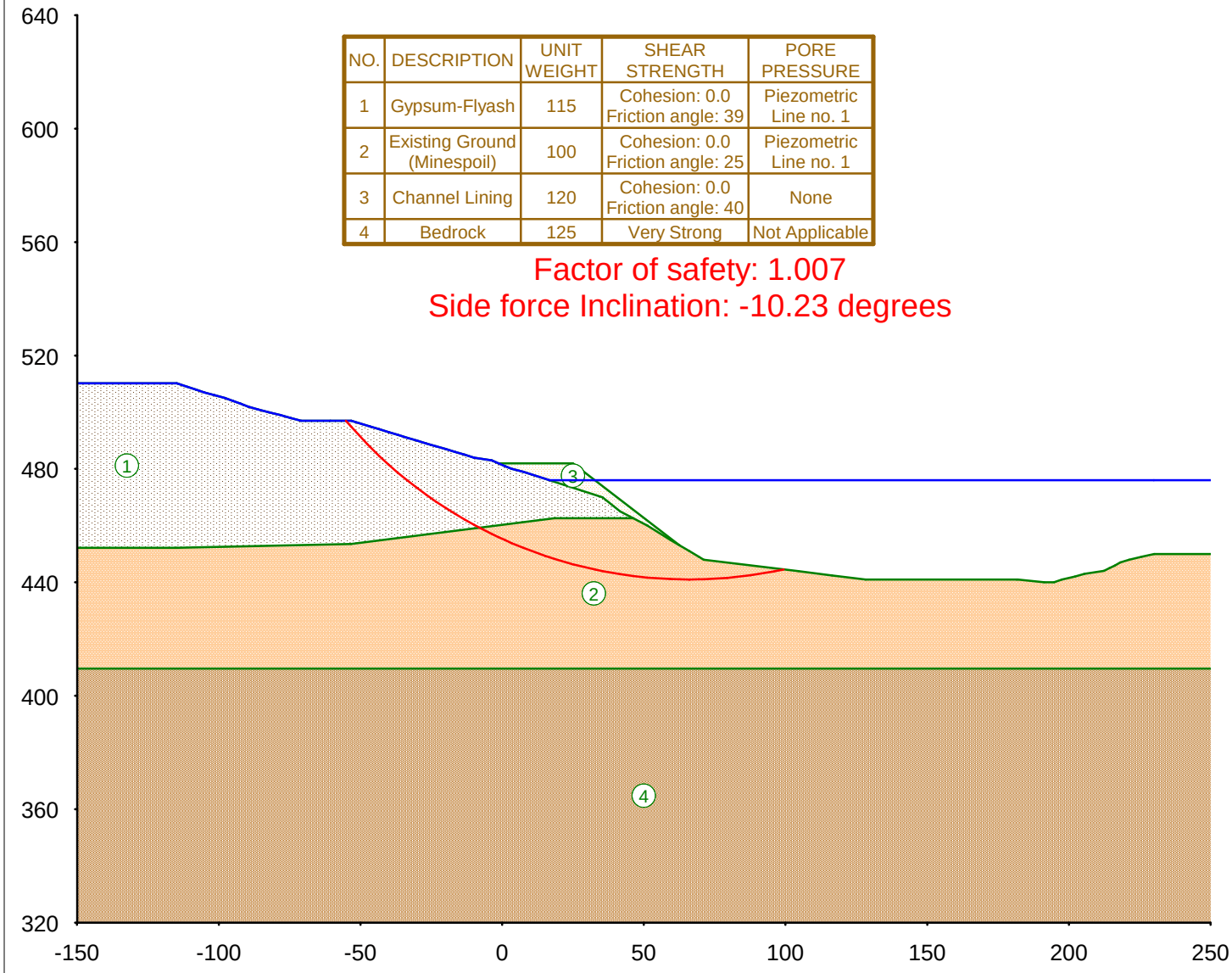
Date: Wed Jul 22 2009 Filename: 5ZB.UT4 Time: 16:45:04

PAF Gypsum Stack South Slope of East Pond

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum-Flyash	115	Cohesion: 0.0 Friction angle: 39	Piezometric Line no. 1
2	Existing Ground (Minespoil)	100	Cohesion: 0.0 Friction angle: 25	Piezometric Line no. 1
3	Channel Lining	120	Cohesion: 0.0 Friction angle: 40	None
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.007

Side force Inclination: -10.23 degrees



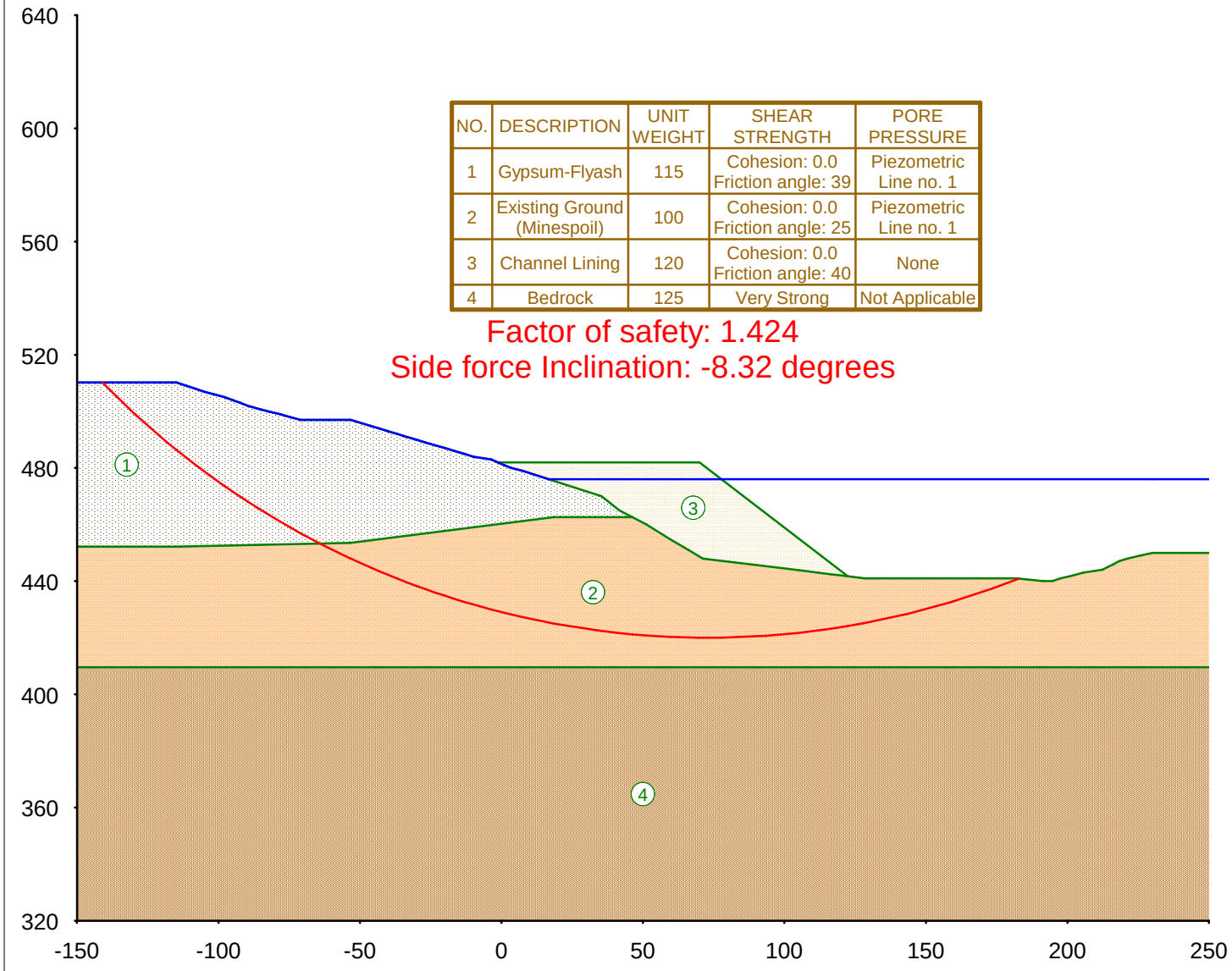
Date: Tue Jun 30 2009 Filename: 1A.UT4 Time: 09:02:43

PAF Gypsum Stack South Slope of East Pond

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum-Flyash	115	Cohesion: 0.0 Friction angle: 39	Piezometric Line no. 1
2	Existing Ground (Minespoil)	100	Cohesion: 0.0 Friction angle: 25	Piezometric Line no. 1
3	Channel Lining	120	Cohesion: 0.0 Friction angle: 40	None
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.424

Side force Inclination: -8.32 degrees



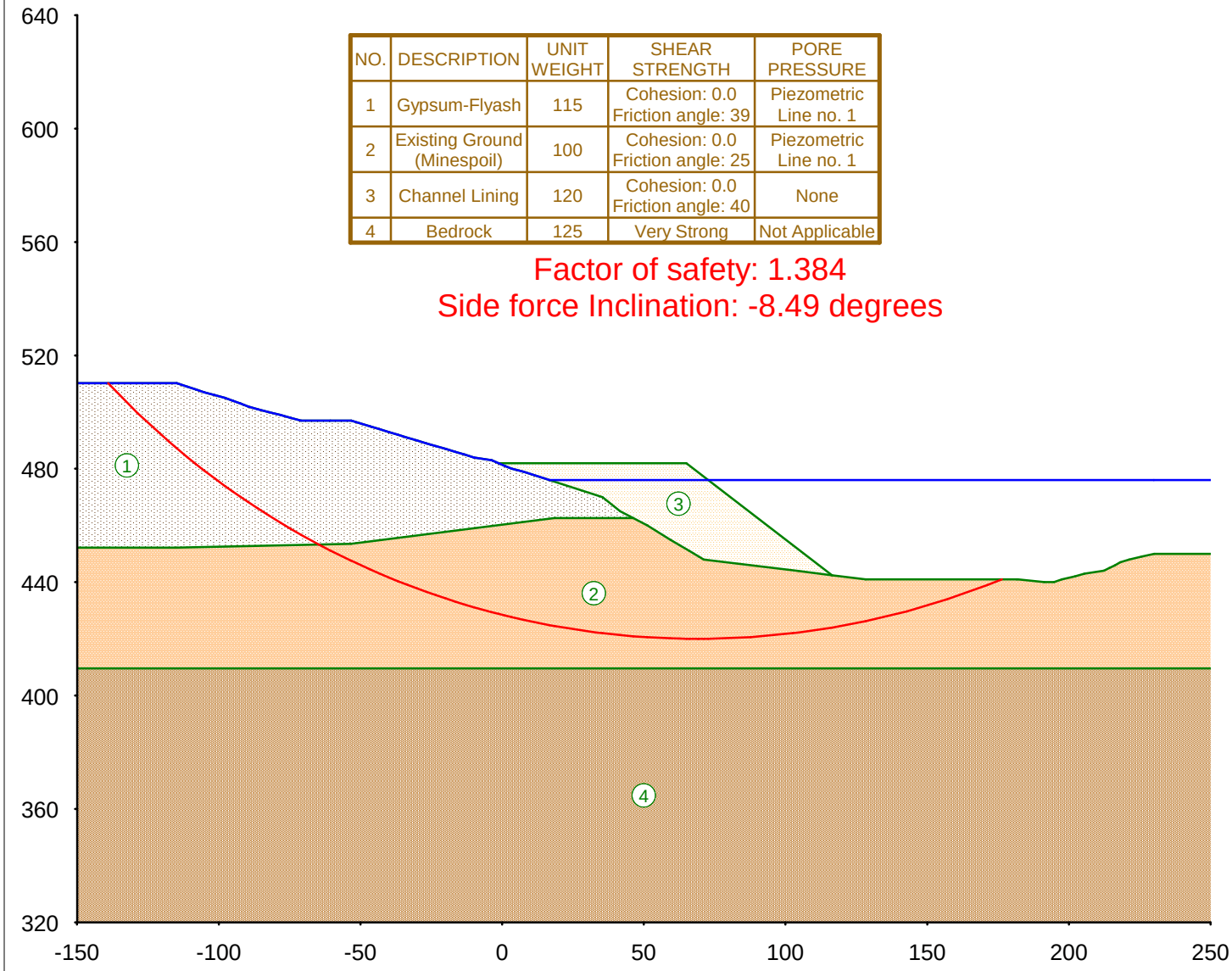
Date: Tue Jun 30 2009 Filename: 1C.UT4 Time: 09:05:01

PAF Gypsum Stack South Slope of East Pond

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum-Flyash	115	Cohesion: 0.0 Friction angle: 39	Piezometric Line no. 1
2	Existing Ground (Minespoil)	100	Cohesion: 0.0 Friction angle: 25	Piezometric Line no. 1
3	Channel Lining	120	Cohesion: 0.0 Friction angle: 40	None
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.384

Side force Inclination: -8.49 degrees



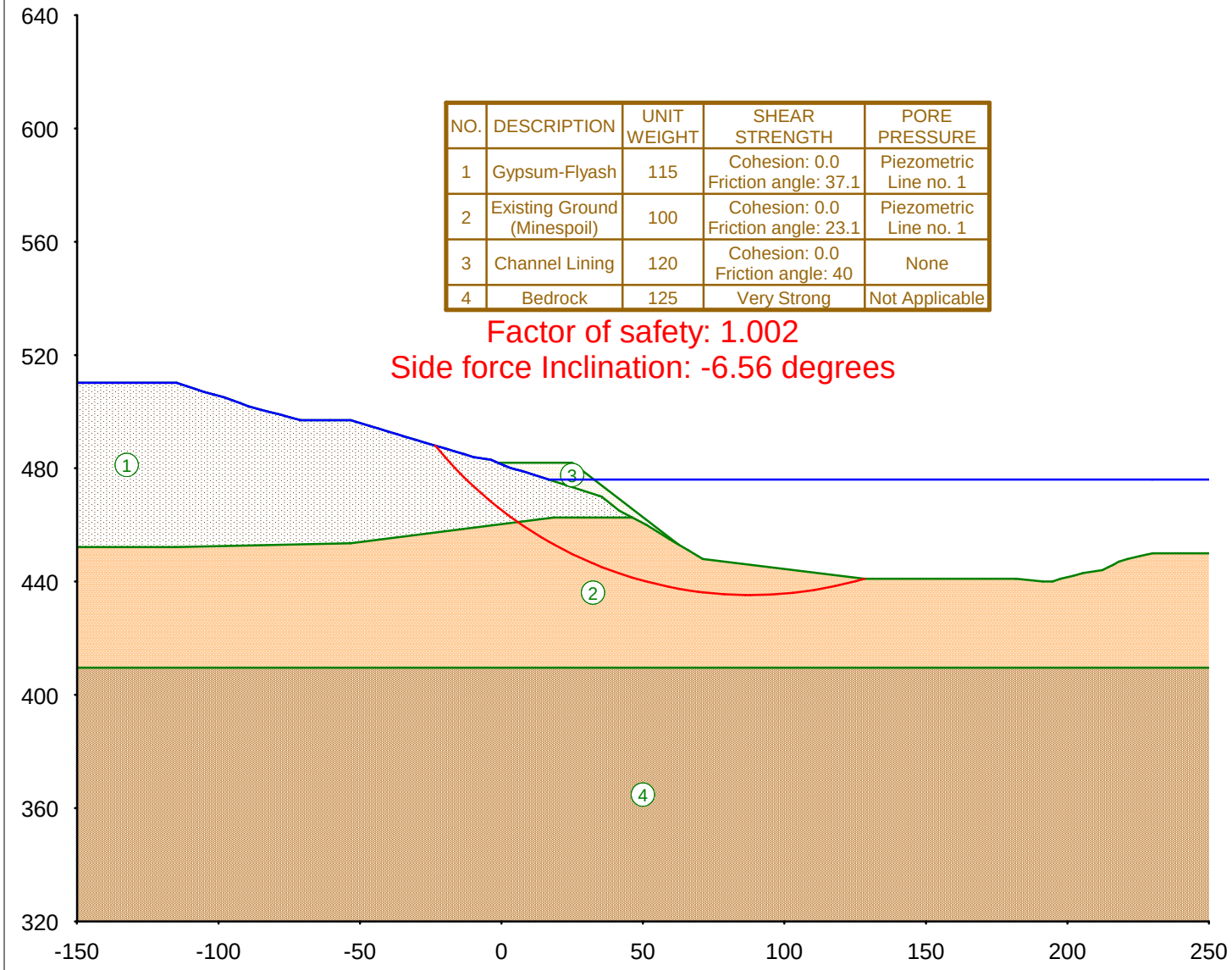
Date: Tue Jun 30 2009 Filename: 1B.UT4 Time: 09:03:59

PAF Gypsum Stack South Slope of East Pond

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum-Flyash	115	Cohesion: 0.0 Friction angle: 37.1	Piezometric Line no. 1
2	Existing Ground (Minespoil)	100	Cohesion: 0.0 Friction angle: 23.1	Piezometric Line no. 1
3	Channel Lining	120	Cohesion: 0.0 Friction angle: 40	None
4	Bedrock	125	Very Strong	Not Applicable

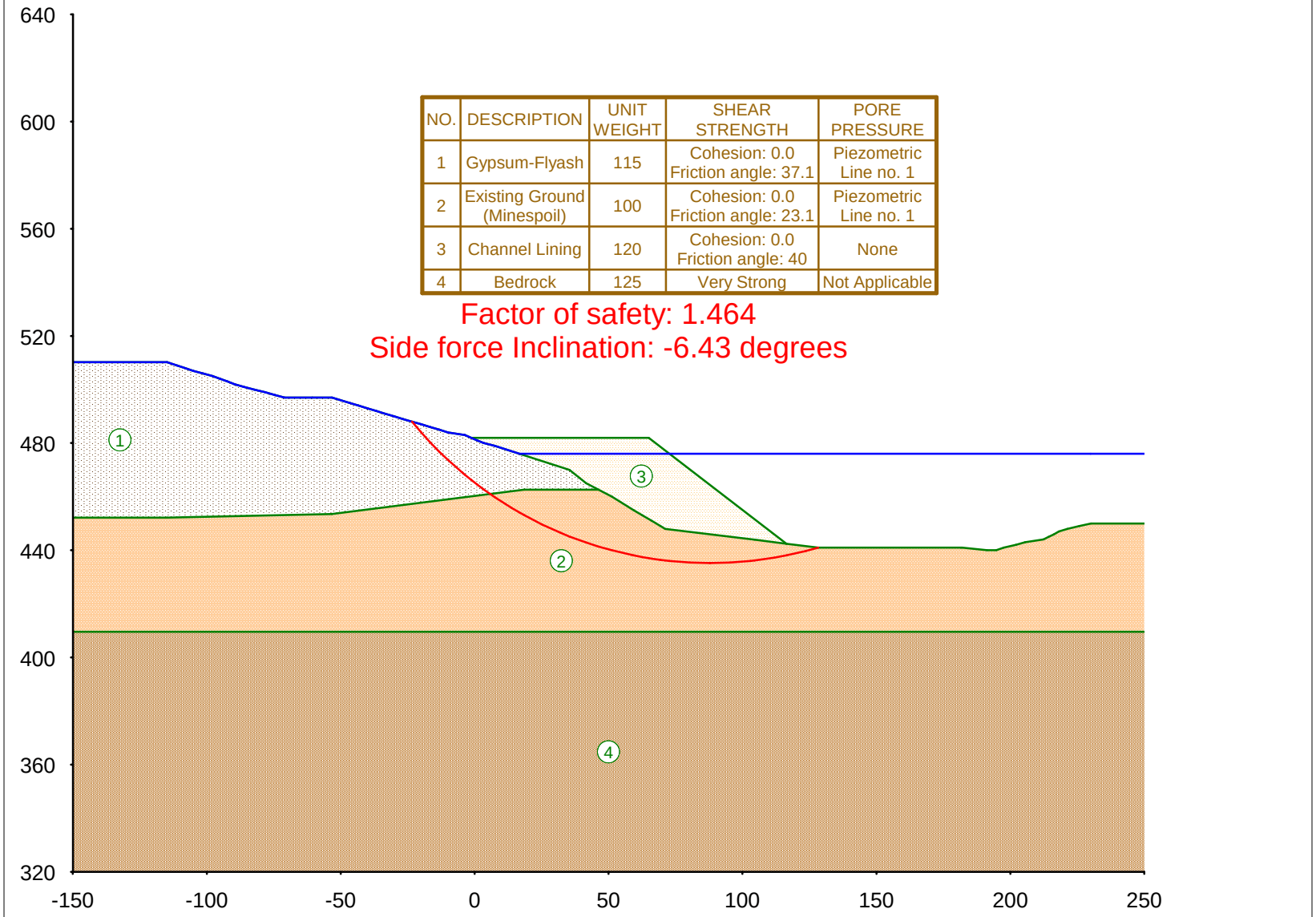
Factor of safety: 1.002

Side force Inclination: -6.56 degrees



Date: Tue Jun 30 2009 Filename: 2A.UT4 Time: 09:07:17

PAF Gypsum Stack South Slope of East Pond



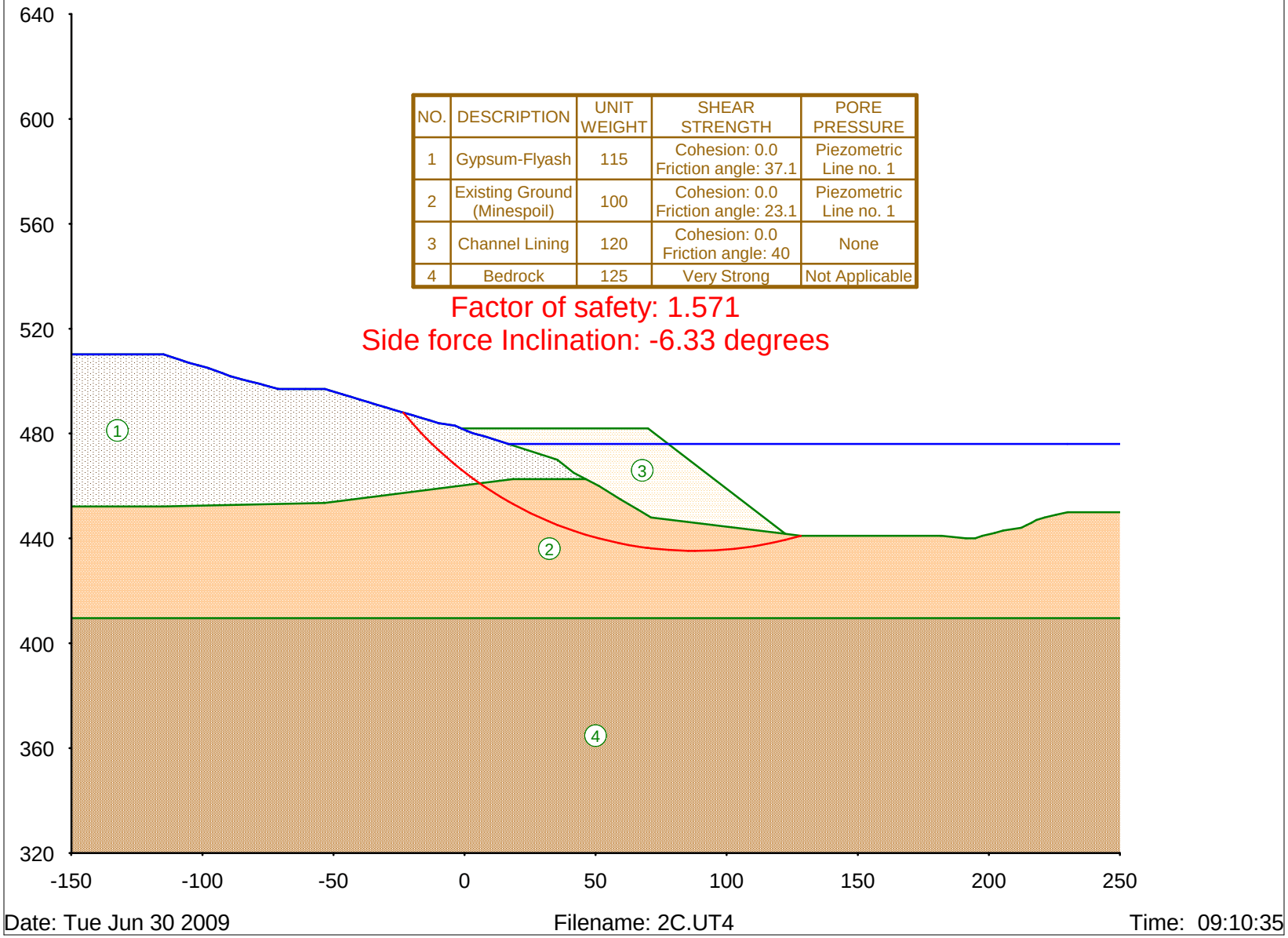
NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum-Flyash	115	Cohesion: 0.0 Friction angle: 37.1	Piezometric Line no. 1
2	Existing Ground (Minespoil)	100	Cohesion: 0.0 Friction angle: 23.1	Piezometric Line no. 1
3	Channel Lining	120	Cohesion: 0.0 Friction angle: 40	None
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.464

Side force Inclination: -6.43 degrees

Date: Tue Jun 30 2009 Filename: 2B.UT4 Time: 09:08:08

PAF Gypsum Stack South Slope of East Pond



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum-Flyash	115	Cohesion: 0.0 Friction angle: 37.1	Piezometric Line no. 1
2	Existing Ground (Minespoil)	100	Cohesion: 0.0 Friction angle: 23.1	Piezometric Line no. 1
3	Channel Lining	120	Cohesion: 0.0 Friction angle: 40	None
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.571

Side force Inclination: -6.33 degrees

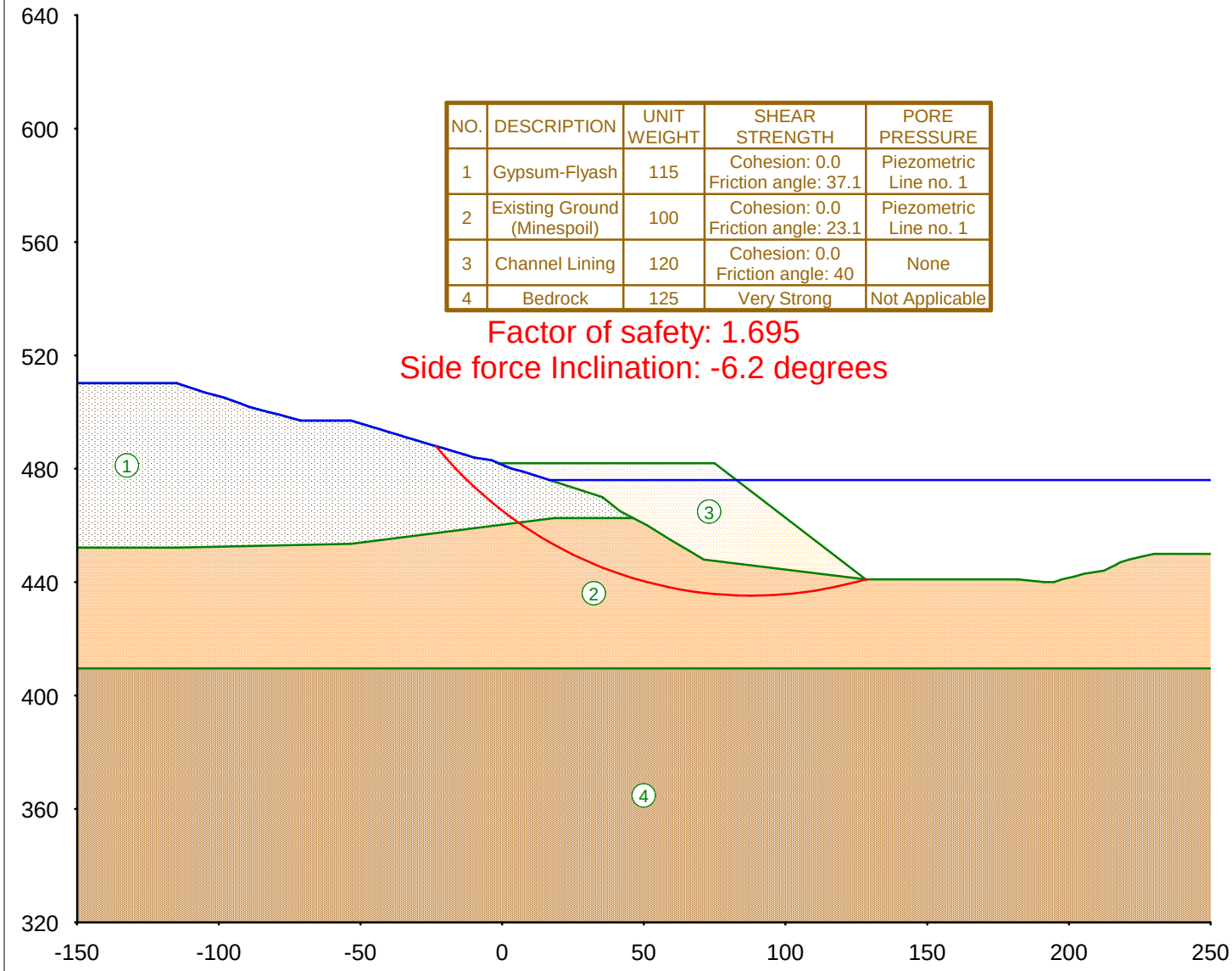
Date: Tue Jun 30 2009 Filename: 2C.UT4 Time: 09:10:35

PAF Gypsum Stack South Slope of East Pond

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum-Flyash	115	Cohesion: 0.0 Friction angle: 37.1	Piezometric Line no. 1
2	Existing Ground (Minespoil)	100	Cohesion: 0.0 Friction angle: 23.1	Piezometric Line no. 1
3	Channel Lining	120	Cohesion: 0.0 Friction angle: 40	None
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.695

Side force Inclination: -6.2 degrees



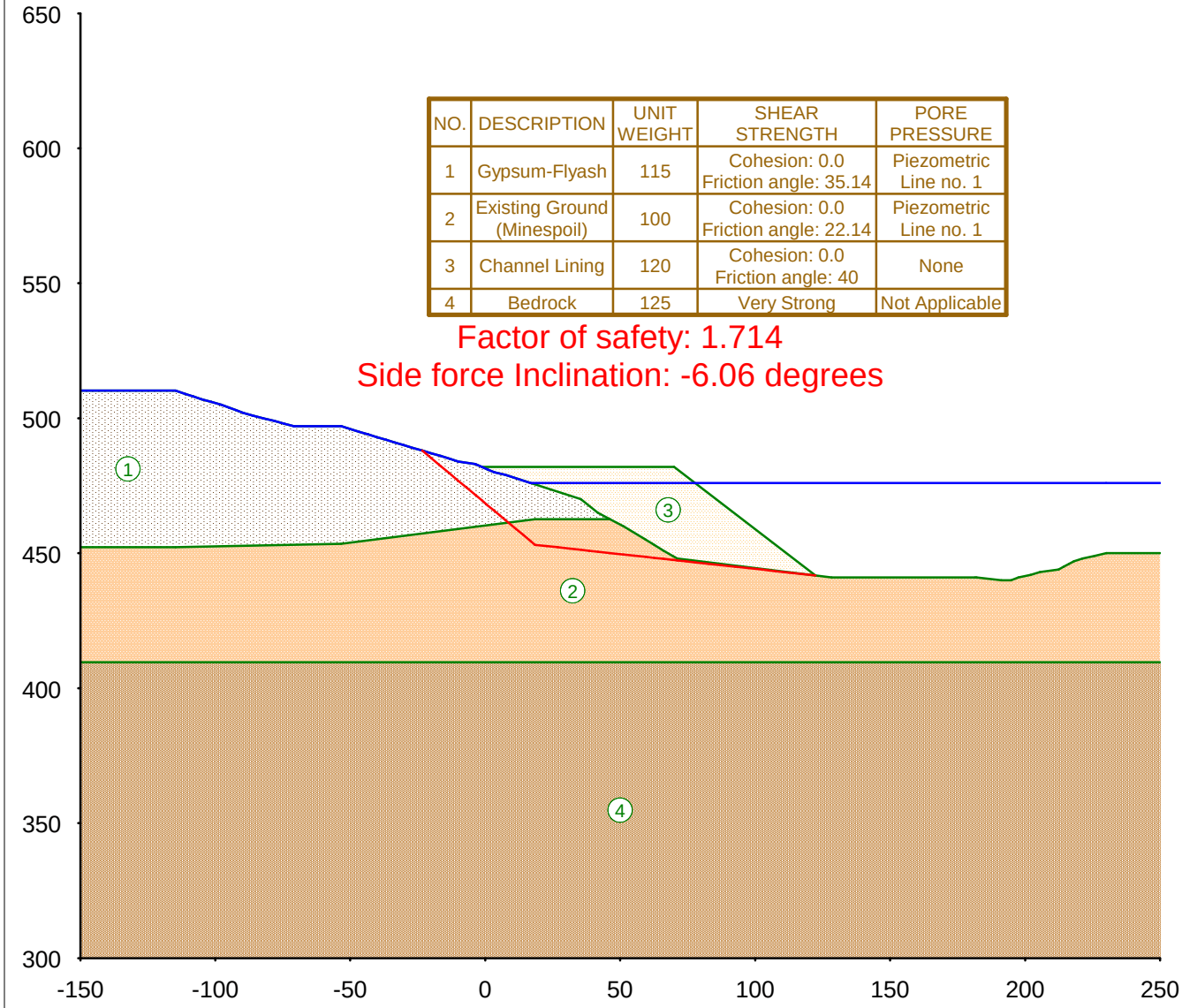
Date: Tue Jun 30 2009 Filename: 2D.UT4 Time: 09:20:28

PAF Gypsum Stack South Slope of East Pond

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum-Flyash	115	Cohesion: 0.0 Friction angle: 35.14	Piezometric Line no. 1
2	Existing Ground (Minespoil)	100	Cohesion: 0.0 Friction angle: 22.14	Piezometric Line no. 1
3	Channel Lining	120	Cohesion: 0.0 Friction angle: 40	None
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.714

Side force Inclination: -6.06 degrees



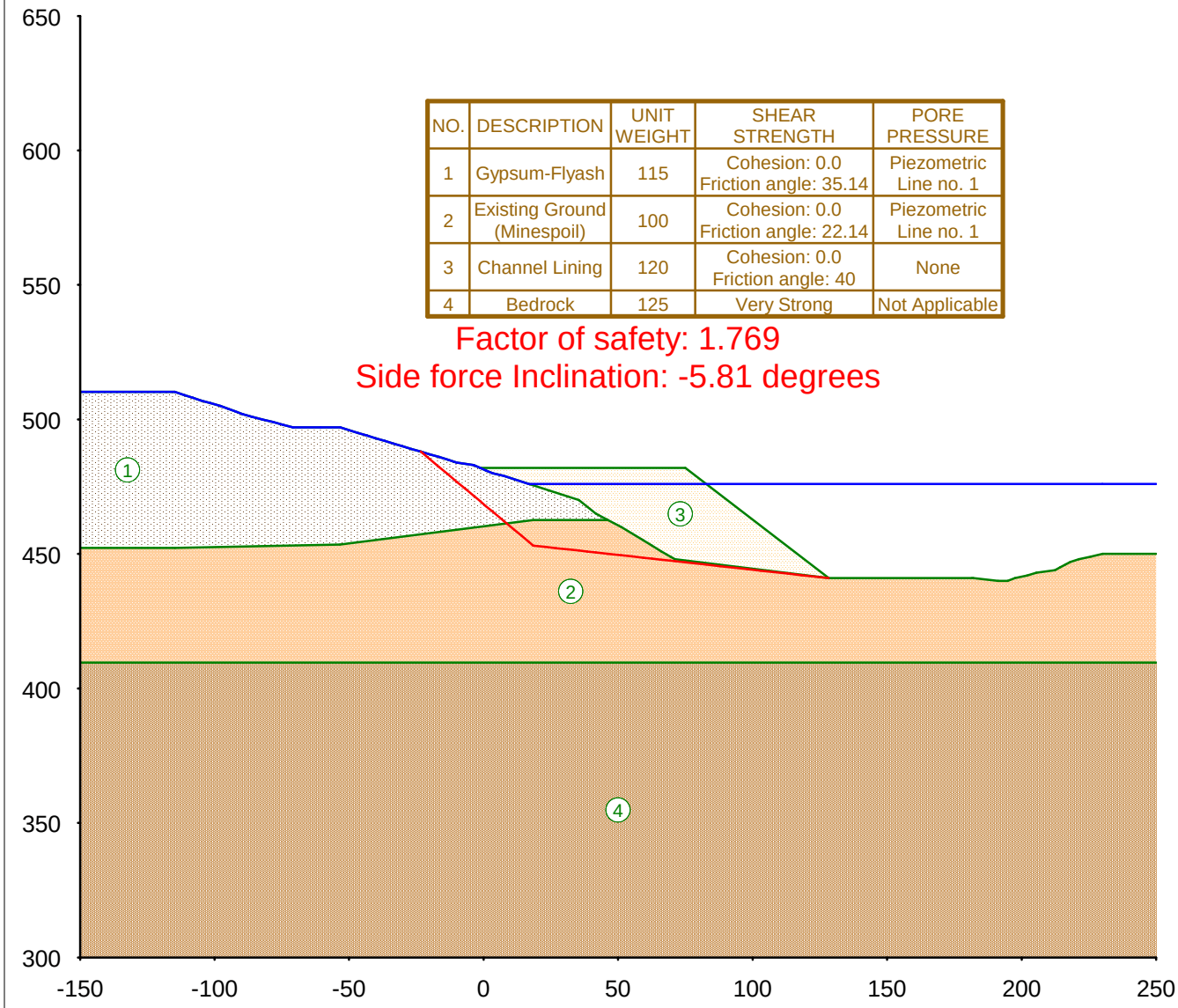
Date: Tue Jun 30 2009 Filename: 3C.UT4 Time: 09:23:54

PAF Gypsum Stack South Slope of East Pond

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum-Flyash	115	Cohesion: 0.0 Friction angle: 35.14	Piezometric Line no. 1
2	Existing Ground (Minespoil)	100	Cohesion: 0.0 Friction angle: 22.14	Piezometric Line no. 1
3	Channel Lining	120	Cohesion: 0.0 Friction angle: 40	None
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.769

Side force Inclination: -5.81 degrees



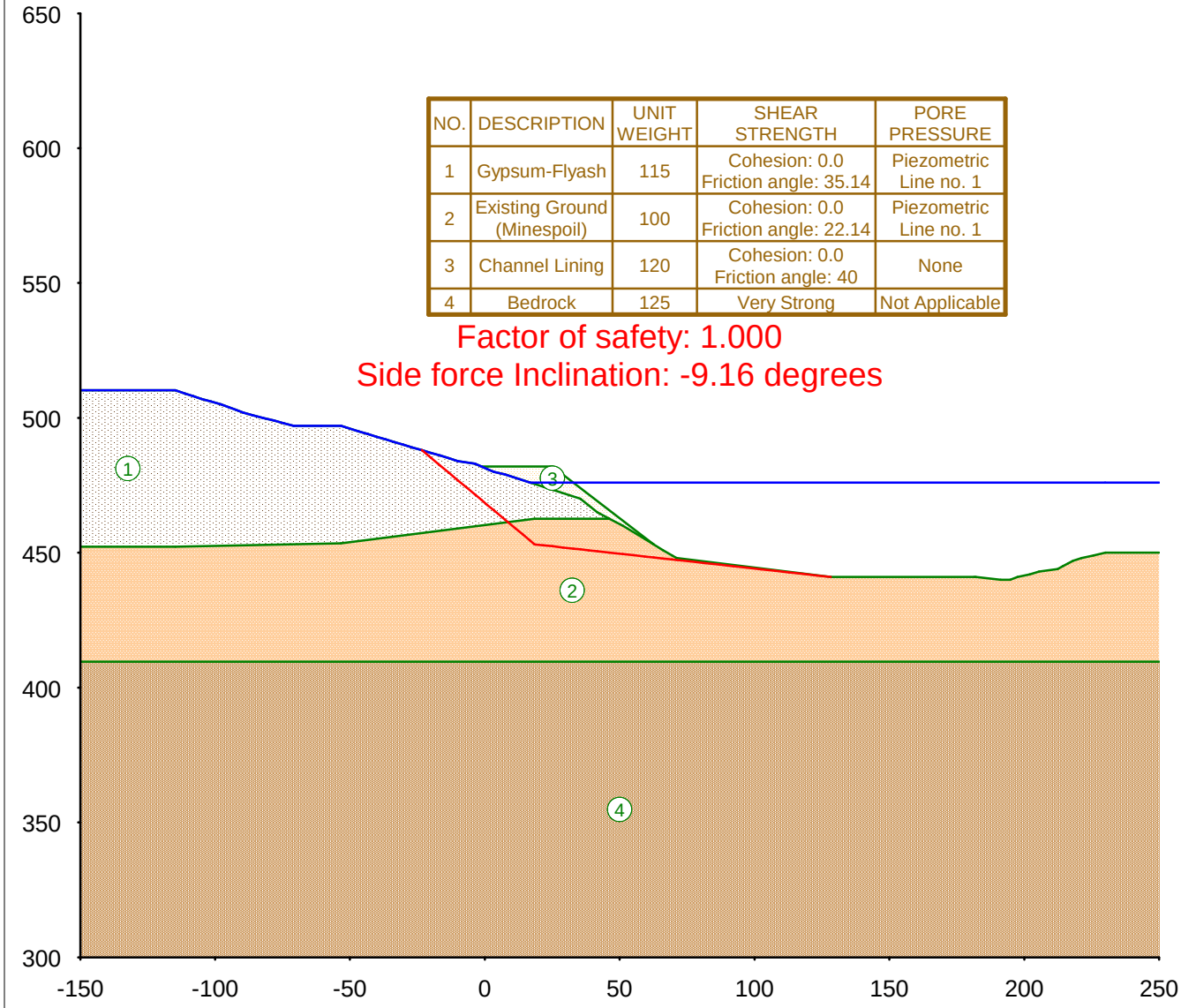
Date: Tue Jun 30 2009 Filename: 3D.UT4 Time: 09:24:43

PAF Gypsum Stack South Slope of East Pond

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum-Flyash	115	Cohesion: 0.0 Friction angle: 35.14	Piezometric Line no. 1
2	Existing Ground (Minespoil)	100	Cohesion: 0.0 Friction angle: 22.14	Piezometric Line no. 1
3	Channel Lining	120	Cohesion: 0.0 Friction angle: 40	None
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.000

Side force Inclination: -9.16 degrees



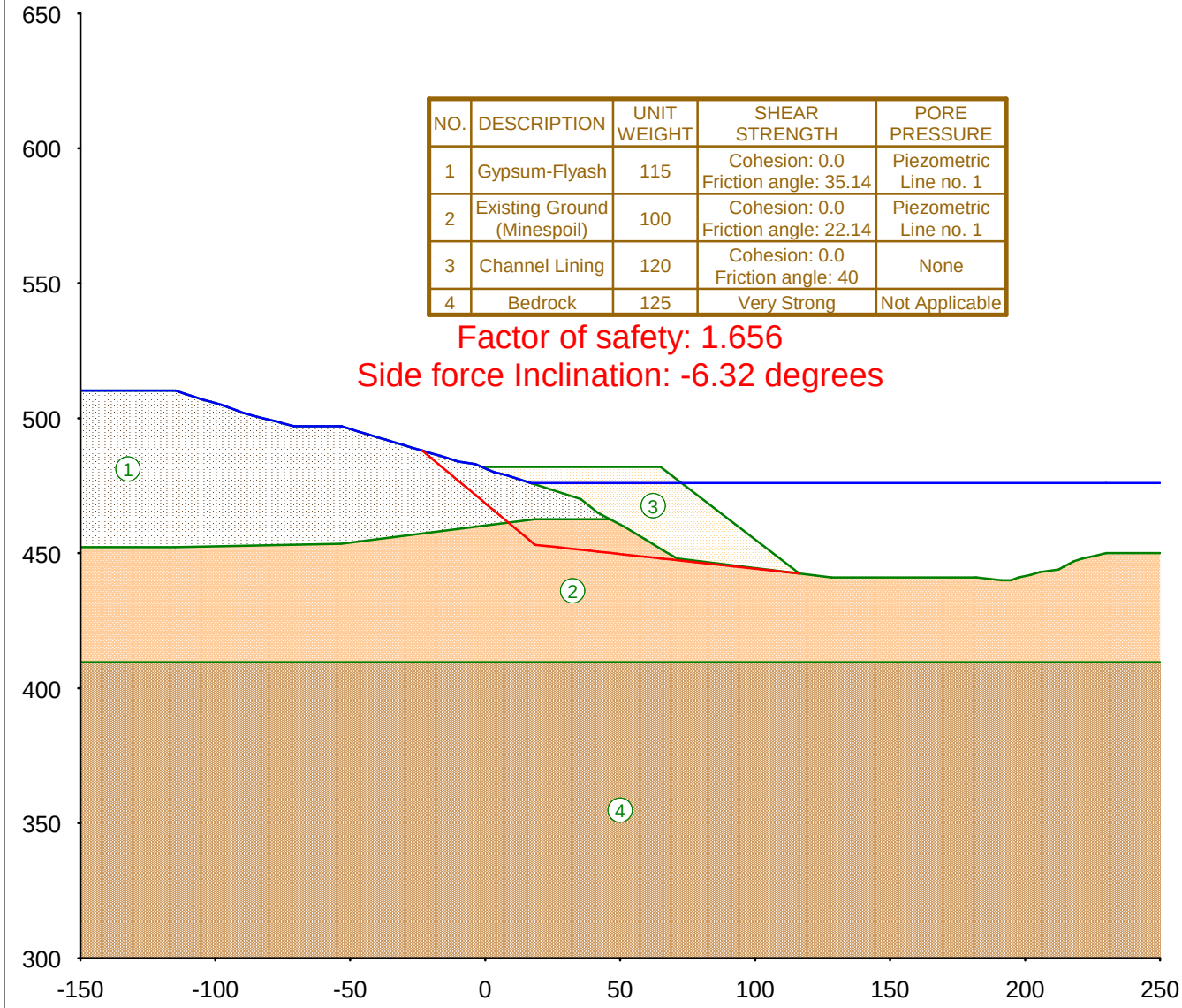
Date: Tue Jun 30 2009 Filename: 3A.UT4 Time: 09:22:04

PAF Gypsum Stack South Slope of East Pond

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Gypsum-Flyash	115	Cohesion: 0.0 Friction angle: 35.14	Piezometric Line no. 1
2	Existing Ground (Minespoil)	100	Cohesion: 0.0 Friction angle: 22.14	Piezometric Line no. 1
3	Channel Lining	120	Cohesion: 0.0 Friction angle: 40	None
4	Bedrock	125	Very Strong	Not Applicable

Factor of safety: 1.656

Side force Inclination: -6.32 degrees



Date: Tue Jun 30 2009 Filename: 3B.UT4 Time: 09:23:07

Appendix H

Mine Maps

STANTEC CONSULTING SERVICES INC.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000

Stantec

Topographic Map

Phase 2 Assessment
Scrubber Sludge Complex
Paradise Fossil Plant
Muhlenberg County, Kentucky

PROJECT NO.	175569040
DATE	JUNE 2009
DRAWN BY	AMG
CHECKED BY	SV
CHECKED BY	
SCALE	1" = 500'
REVISED	
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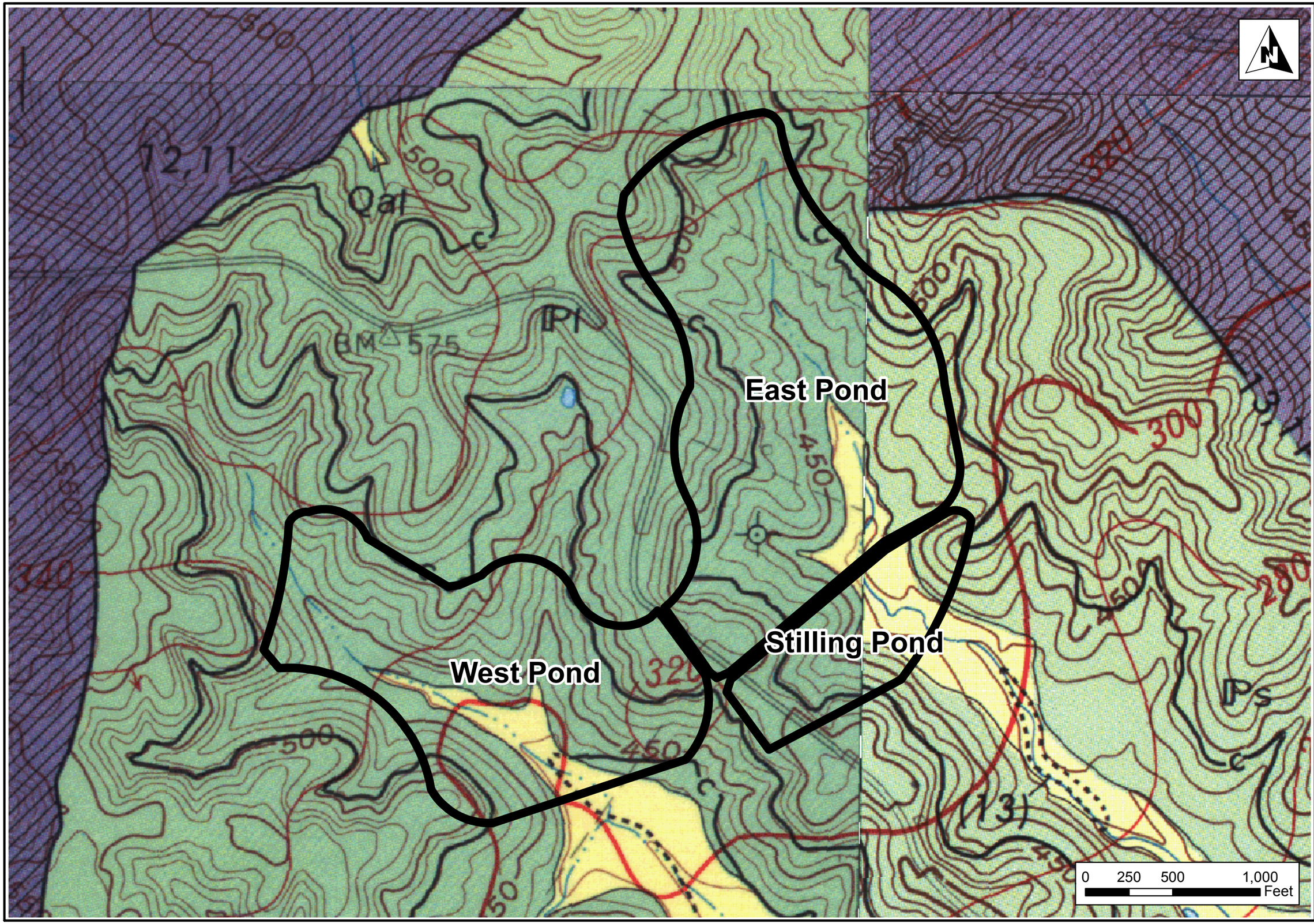
SHEET

1 OF 1



STANTEC CONSULTING SERVICES INC.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000

Stantec

Geologic Map

Phase 2 Assessment
Scrubber Sludge Complex
Paradise Fossil Plant
Muhlenberg County, Kentucky

PROJECT NO.	175569040
DATE	JUNE 2009
DRAWN BY	AMG
CHECKED BY	SV
CHECKED BY	
SCALE	1" = 500'
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1 OF 1

SFN	SEAM	TYPE	STATUS	SOURCEID	ID
92789	600	Unknown	Abandoned	600-03532	1333
06620-4	600	URC	Abandoned	600-03533	1334
05877-15	600	UTC	Abandoned	600-50504	1670

Note: The mining map presented here is based on the information obtained from Kentucky Mine Mapping Information System's website. The information is believed to be approximate and no warranties can be made regarding its accuracy. The map presented here does not constitute all coal mining voids nor does it show naturally occurring voids or other unknown underground mining voids. Any determination made from this data should be confirmed or denied by examining the archive maps at the Kentucky Office of Mine Safety and Licensing and/or by doing local geotechnical investigations.

STANTEC CONSULTING SERVICES INC.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000

Stantec

Mine Map

Phase 2 Assessment
Scrubber Sludge Complex
Paradise Fossil Plant
Muhlenberg County, Kentucky

PROJECT NO.	175569040
DATE	JUNE 2009
DRAWN BY	AMG
CHECKED BY	SV
CHECKED BY	
SCALE	1" = 500'
REVISED	
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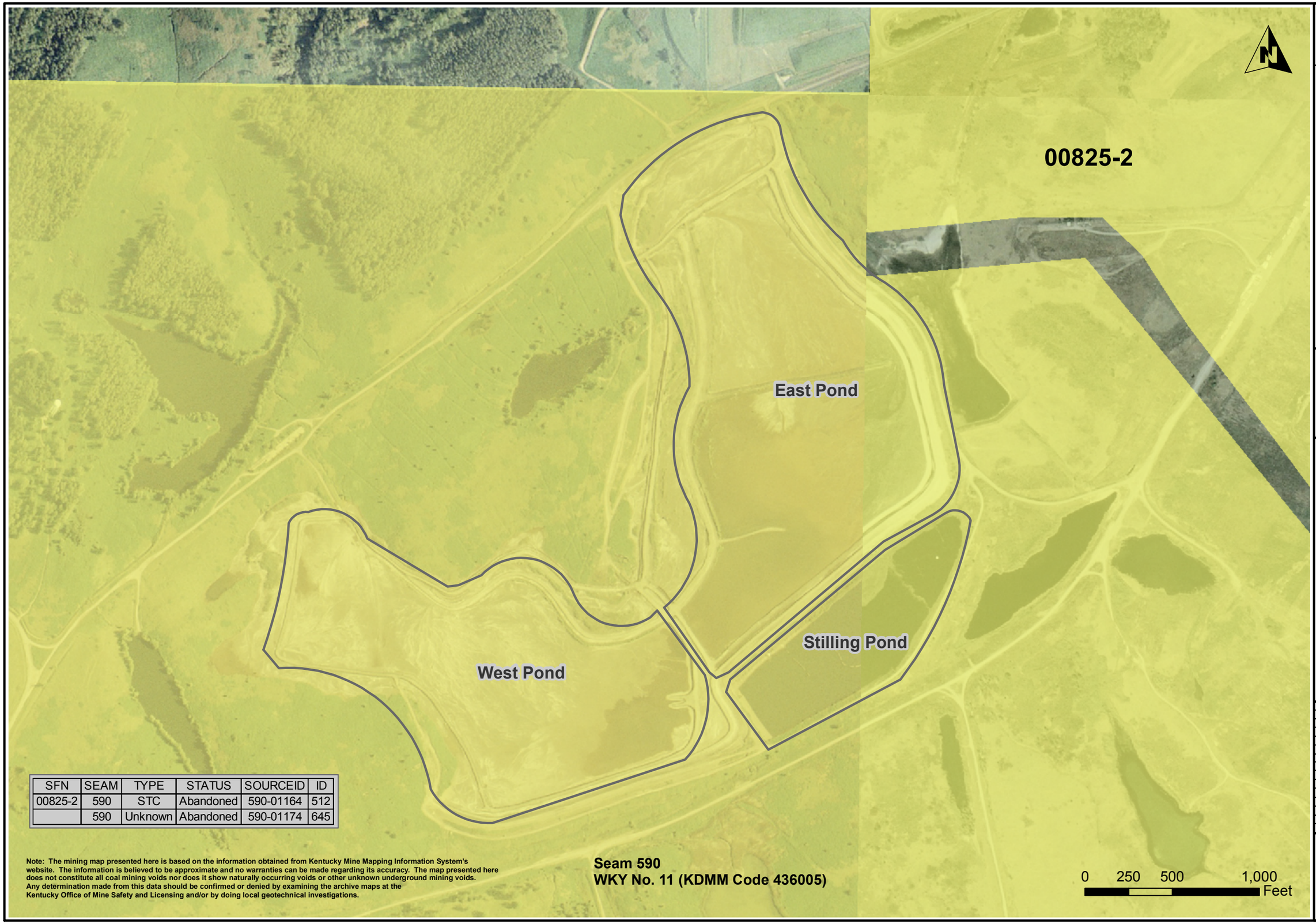
1 OF 4



SFN	SEAM	TYPE	STATUS	SOURCEID	ID
00825-2	590	STC	Abandoned	590-01164	512
	590	Unknown	Abandoned	590-01174	645

Note: The mining map presented here is based on the information obtained from Kentucky Mine Mapping Information System's website. The information is believed to be approximate and no warranties can be made regarding its accuracy. The map presented here does not constitute all coal mining voids nor does it show naturally occurring voids or other unknown underground mining voids. Any determination made from this data should be confirmed or denied by examining the archive maps at the Kentucky Office of Mine Safety and Licensing and/or by doing local geotechnical investigations.

Seam 590
WKY No. 11 (KDMM Code 436005)

0 250 500 1,000 Feet

STANTEC CONSULTING SERVICES INC.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000

Stantec

Mine Map

Phase 2 Assessment
Scrubber Sludge Complex
Paradise Fossil Plant
Muhlenberg County, Kentucky

PROJECT NO.	175569040
DATE	JUNE 2009
DRAWN BY	AMG
CHECKED BY	SV
CHECKED BY	
SCALE	1" = 500'
REVISED	
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SFN	SEAM	TYPE	STATUS	SOURCEID
2106	585	SRC	Abandoned	585-00325
00825-2	585	STC	Abandoned	585-00725
	585	Unknown	Abandoned	585-00734

Note: The mining map presented here is based on the information obtained from Kentucky Mine Mapping Information System's website. The information is believed to be approximate and no warranties can be made regarding its accuracy. The map presented here does not constitute all coal mining voids nor does it show naturally occurring voids or other unknown underground mining voids. Any determination made from this data should be confirmed or denied by examining the archive maps at the Kentucky Office of Mine Safety and Licensing and/or by doing local geotechnical investigations.

Seam 585
WKY No. 12 (KDMM Code 441015)

STANTEC CONSULTING SERVICES INC.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000

Stantec

Mine Map

Phase 2 Assessment
Scrubber Sludge Complex
Paradise Fossil Plant
Muhlenberg County, Kentucky

PROJECT NO.	175569040
DATE	JUNE 2009
DRAWN BY	AMG
CHECKED BY	SV
CHECKED BY	
SCALE	1" = 500'
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SHEET

02106

East Pond

West Pond

Stilling Pond

SFN	SEAM	TYPE	STATUS	SOURCEID
2106	580	SRC	Abandoned	580-00663

Note: The mining map presented here is based on the information obtained from Kentucky Mine Mapping Information System's website. The information is believed to be approximate and no warranties can be made regarding its accuracy. The map presented here does not constitute all coal mining voids nor does it show naturally occurring voids or other unknown underground mining voids. Any determination made from this data should be confirmed or denied by examining the archive maps at the Kentucky Office of Mine Safety and Licensing and/or by doing local geotechnical investigations.

Seam 580
WKY No. 13 (KDMM Code 442005)

0 250 500 1,000 Feet

STANTEC CONSULTING SERVICES INC.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000

Stantec

Mine Map

Phase 2 Assessment
Scrubber Sludge Complex
Paradise Fossil Plant
Muhlenberg County, Kentucky

PROJECT NO.	175569040
DATE	JUNE 2009
DRAWN BY	AMG
CHECKED BY	SV
CHECKED BY	
SCALE	1" = 500'
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SHEET

4 OF 4

Appendix I

Work Plans

Memo

Stantec

To:	Bill Hickman and Alan Casaday TVA Paradise Fossil Plant Gypsum Stack	From:	Hugo Aparicio
File:	171468118	Date:	February 11, 2009

Reference: Apparent Abandoned Decant Spillway Pipes

TVA design drawing 10W4280-13, a copy of which is shown on a separate document, shows the location of two decant spillway pipes, one associated with the West Pond and another associated with the East Pond of the PAF gypsum stack. The drawings show the pipe outlets to be located near the northwest corner of the Gypsum Stack stilling basin (also labeled on the drawings as 'Clarification Pond'). A note referred to on the TVA drawings states that the decant spillways would not be used if the decant water could be discharged "over/through the rim dike down the scrubber sludge stack slope to the perimeter ditch where it will be returned to the clarification pond". At this time it is assumed these decant spillway pipes were installed and have been abandoned.

Field observations made during the Phase 1b assessment of the stack near the general area of the pipe outlets shown on the drawings revealed the following:

East Pond Abandoned Spillway Pipe Outlet

The presumed spillway outlet consists of a 36" CM pipe partly damaged and partially covered with pieces of concrete and boulders. Water flowing out of the pipe at the approximate rate of 10 gpm was noted during the field observations. Photographs included on a separate attachment show the conditions described above.

West Pond Abandoned Spillway Pipe Outlet

The presumed spillway outlet appears to have been plugged with a 3'x3' concrete/asphalt patch as shown on photographs included in a separate attachment. The patch exhibits some cracking and its bottom left corner (looking upstream) has broken off.

Reference: Apparent Abandoned Decant Spillway Pipes

Assuming the features described above are indeed associated with abandoned decant spillway pipes and assuming the pipes have not been abandoned properly, the immediate concern before proceeding with new abandonment measures (such as grouting), is the fact these pipes may be under hydraulic pressure equivalent to the difference between pool and outlet invert elevations. The head pressure could be in excess of 35 feet. Because of the potential pool water and gypsum slurry contained in both ponds may leak through these abandoned spillways, it is recommended that the following actions be implemented:

1. Survey the location of both features, including ground information of nearby stilling basin areas (bottom of pond), and determine East and West Pond pool elevations. This work is scheduled to be completed February 13 by a Stantec crew.

2. Interview plant personnel to obtain any information relative to the construction, operation and abandonment of the decant spillways. The interviews are scheduled to be completed February 12, 2009 provided plant personnel are available.

3. Drill two geotechnical borings near this area of the dike as proposed on a work plan submitted earlier. Subsurface information obtained from these borings will be useful in planning some of the work discussed below. The drilling of these boring will be completed February 13, 2009.

4. Construct a cofferdam around the East Pond Abandoned Spillway Outlet, for possible TV camera work and bulk heading of pipe outlet. This work can start immediately provided TVA personnel and equipment is available. Stantec will provide pool depth information near the pipe outlet. Cofferdam construction should take one day to complete once equipment and materials are available on site. Stantec will provide a sketch showing the recommended cofferdam construction.

The selection of the next step would need to be evaluated further to allow TVA to consider the potential risks associated with these actions.

5A. One option would be to attempt locating the horizontal section of the pipes by drilling target holes from the top of the dikes. Once the pipes are located, abandonment grouting can be accomplished through holes drilled into the pipes. This method was actually considered during the grouting of the WCF Gypsum Pond 2b abandoned pipe. Because the drilling would occur from the top of the dike, which is higher than the pool elevation, loss of pool water and

gypsum slurry through the pipe should not occur. This work must be preceded by constructing a bulkhead to seal the downstream end of the East Pond pipe. Constructing the bulkhead will require clearing the debris off the pipe outlet area and cutting off the damaged section of the pipe. Grouting both pipes using this approach could take four to five days once equipment is on site and the target drilling is successful and completed in the first two days. Based on the available information, this would be the preferred course of action.

5B. Another approach would consist of finding and exposing the inlet of the abandoned spillways. Although there may be more than one way to provide access toward presumed inlet locations, the concern is that these actions may actually trigger the leakage of water and gypsum slurry through the spillway pipes (a more detailed explanation relative to this potential sequence of events can be provided based on observations made at Widows Creek after January 9, 2009, when water and gypsum slurry from Pond 2b leaked through an abandoned spillway pipe). This could especially be the case with the East Pond spillway, which currently has the highest pool elevation and there is no surface evidence that it has been properly abandoned. Loss through the West Pond spillway may not occur automatically if the presumed outlet plug (bulkhead) is sufficiently robust. A successful exposure of the pipe inlets would then be followed by conventional grouting of the spillways. This work would require special equipment (capable of operating on soft ground conditions) and could be completed in two days once equipment and materials are available on site. Subsequent conventional grouting of the pipes would take another two days.

6. Although obtaining additional information relative to the conditions of the East Pond pipe outlet area by using a TV camera (as performed at WCF) would be useful in planning and executing the grouting, there is an element of risk associated with the insertion of the TV camera. It is conceivable this pipe is not properly abandoned since water is currently flowing out of the pipe. Therefore, any insertion action may cause unexpected release of pool water and gypsum slurry. Inspecting the pipe by inserting a TV camera from the outlet is not recommended at this time.

6. Should TVA elect to proceed with action 5A as described above, it is recommended the work be performed as outlined by Hayward Baker (HB) in their proposal to grout abandoned pipes at WCF believed to be buried and with precise locations unknown.

The following sequence of actions to implement the measures recommended under paragraph 5A is adapted from HB's narrative provided to TVA for additional grouting work at WCF.

Grout Mix

The grout mix is a ready mix product that is a bentonite, sand, cement, and fly ash mixture. The mix proportions consists of approximately 600 lbs of cement, 600 lbs of fly ash, 2300 lbs of natural sand, and high range water reducer admixture. The design slump is 8 to 10 inches. When the mix arrives onsite, we add pre-wetted bentonite to the mix at a ratio of approximately 1.5% by weight of water; or, about 50 lbs bentonite per 8 CY load.

Grouting Abandoned Spillway Pipes

Since neither pipe locations are completely known, HB will be required to target drill to intercept the pipe in order to grout it. The proposed method for grouting this pipe is as follows:

- *The assumed approximate centerline of the pipes will be staked by TVA or Stantec surveyors. The depth and length of the pipes is unknown. HB will set some drill points on top of the dikes by string lining between the stakes. Using a rotary hydraulic drill, HB will attempt to drill along the center line of the pipes in an attempt to intercept the pipes.*
- *HB will drill by water flushing 4-inch temporary casing to depth using internal rotary flush drilling methods. By using an internal flushing system, HB will minimize the hole size and disturbance to the embankment. The internal system will also allow HB to control the water usage, which is generally required when drilling dam embankments.*
- *Once the pipes are intercepted, HB will seat the casing in the pipe wall and then drill through the top of the pipe using an internal drill string and roller bit.*
- *Once HB drills through the pipes, HB will probe the pipes to see if its backfilled or empty.*
- *HB will attempt to intercept the pipes in at least 2 locations to determine the slope and direction of the pipes.*
- *Once the casing is seated into the top of the pipes, we will withdraw the inner drill string and then proceed to grout the pipes.*
- *HB will grout the pipes by pumping the grout mix through the casing and allowing it to flow as far as possible in the pipes.*
- *HB will pump as much volume as possible; however, since the length of the pipes is unknown the actual volume of grout is also unknown.*
- *Once the grouting is finished, HB will extract the casing filling the drill with grout as the casing is pulled.*

Reference: Apparent Abandoned Decant Spillway Pipes

A more detailed discussion of the actions described above can be provided upon request. Some of these actions may need to be revised as additional information relative to the abandoned spillways and subsurface conditions is obtained.

STANTEC CONSULTING SERVICES INC.

Hugo Aparicio, PE
Principal
Hugo.Aparicio@stantec.com

East Pond Potentially Abandoned Spillway

Picture showing potentially abandoned spillway, 36” CMP with some observed flow ~10 gpm, partially closed due to concrete slabs being placed on and around pipe

East Pond Potentially Abandoned Spillway

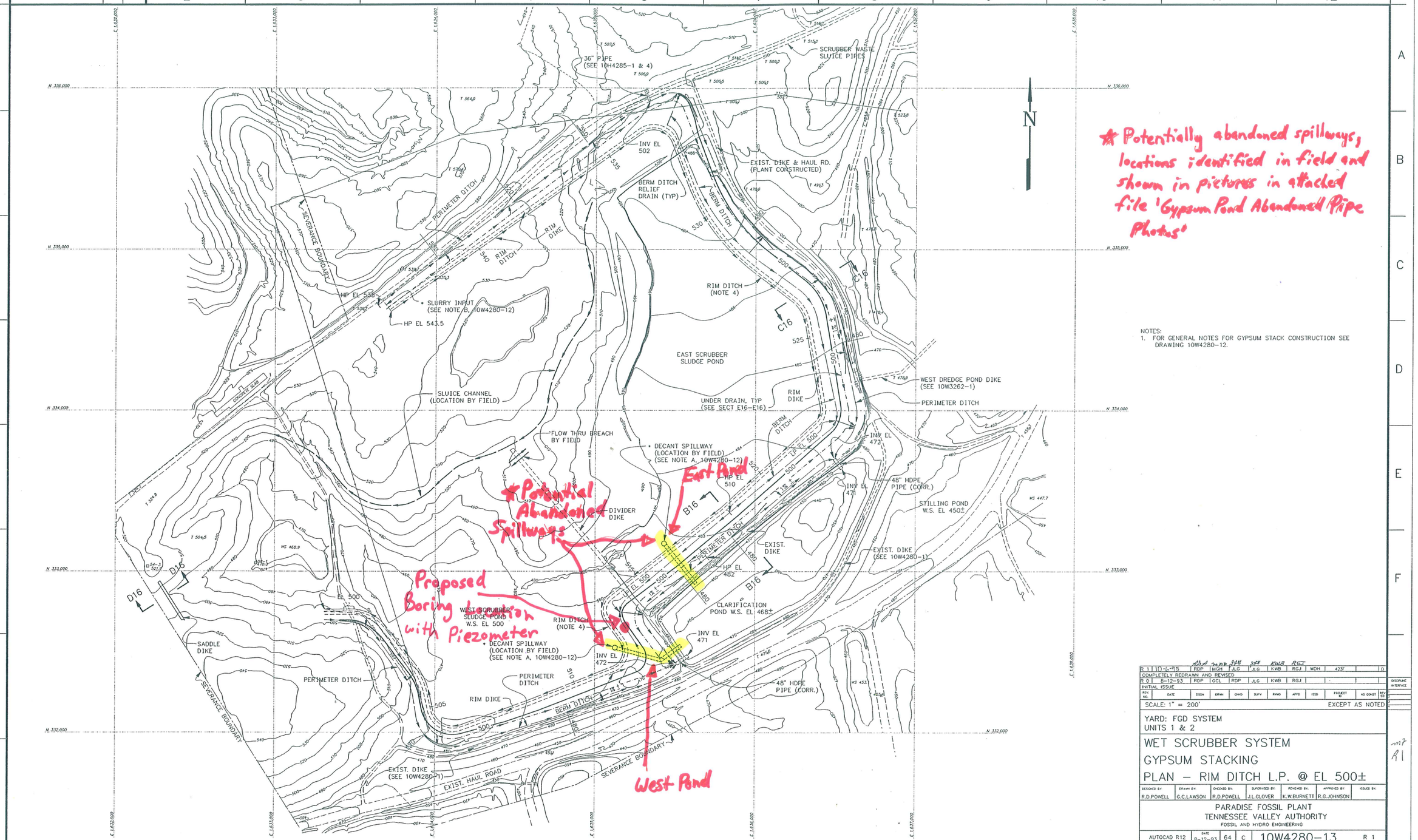
Picture showing flow coming out of pipe

East Pond Potentially Abandoned Spillway — Picture directly above pipe looking down at stilling pond, showing close proximity to stilling pond pool level

East Pond Potentially Abandoned Spillway — Picture showing pipe deformation and some undermining around left side of pipe, slope has failed in area and some seepage flow coming out of undermining channel

West Pond Potentially Abandoned Spillway — Picture showing patch of potentially abandoned spillway, patch is concrete/asphalt in nature, approximately 3'x3', with some cracking and bottom left corner broken off, located on slope directly above stilling pond pool level

West Pond Potentially Abandoned Spillway — Picture looking at patch on slope, approximately 3' above pool level of stilling pond



* Potentially abandoned spillways, locations identified in field and shown in pictures in attached file 'Gypsum Pond Abandoned Pipe Photos'

NOTES:
1. FOR GENERAL NOTES FOR GYPSUM STACK CONSTRUCTION SEE DRAWING 10W4280-12.

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	REVWD	APPD	ISSD	PROJECT ENGR	AS CONST	REV. NO.
R 1	10-6-95	RDP	MGH	J.L.G	J.L.G	K.W.B	R.G.J	W.D.H	423F		D
COMPLETELY REDRAWN AND REVISED											
R 0	8-12-93	RDP	GCL	RDP	J.L.G	K.W.B	R.G.J	-			DISCIPLINE INTERFACE
INITIAL ISSUE											

SCALE: 1" = 200' EXCEPT AS NOTED

YARD: FGD SYSTEM
UNITS 1 & 2

WET SCRUBBER SYSTEM
GYPSUM STACKING
PLAN – RIM DITCH L.P. @ EL 500±

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
R.D.POWELL	G.C.LAWSON	R.D.POWELL	J.L.GLOVER	K.W.BURNETT	R.G.JOHNSON	

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R12	DATE 8-12-93	64	C	10W4280-13	R 1

PLOT FACTOR: 2400
W-SIZE
FILENAME: PF428013.DWG

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TASK COMPLETED BY: | REV NO.

Sat Sep 30 16:03:43 1995 c:\towns\wtf\fftf05opt Mike Hranek D:\wf05\PARADISE\OPTSHA\PF428013.PRF

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

February 11, 2010 let_016_paf_175569040

Mr. Chris Buttram, PE
Tennessee Valley Authority
Fossil Power Group
1101 Market Street, MS LP 2E-C
Chattanooga, Tennessee 37402

Re: Construction Work Plan Closure
Work Plan No. PAF-LT-090224
Scrubber Sludge Complex
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Buttram:

Stantec Consulting Services Inc. (Stantec) would like to issue this letter requesting closure of the above mentioned work plan. Pertinent details of the work plan are presented in Table 1.

Table 1: Work Plan Details

Work Plan Issue Date	Subject	Reference No.	Status (P=Planning, W=In Progress, C=Complete)	Const. Start Date	Const. Complete Date
02/24/09	Gypsum Stack-Repair Exterior Slope Above Decant Spillway Pipe Outlets	PAF-LT-090224 (mem_005_paf_171468118)	C	02/24/09	03/04/09

Based on the observations made in the field during construction, a review of daily field reports, photos and available information, it is our opinion that the temporary buttress was constructed to match reasonably well with the recommendations in our work plan. Pertinent attachments for documentation are included along with this letter. These include original work plan issued by Stantec on February 24, 2009 and selected photos from the field. The

record drawing for TVA's business support library will be submitted electronically. Daily field reports for the project have already been submitted to TVA.

We appreciate this opportunity and look forward to continue working with you on this project. If you have any questions or required additional information, please contact us.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Sharath C. Vemuri, PE
Senior Project Engineer

/rws

Attachment 1

Memo

Stantec

To:	Alan Casaday	From:	Hugo Aparicio
File:	171468118_mem_005	Date:	February 24, 2009

Reference: PAF Gypsum Stack
Exterior Slope Area above Decant Spillway Pipe Outlets

Stantec engineers visited the referenced site February 20, 2009 to further review existing conditions. The Gypsum Stack exterior slope area immediately south of the interior divider dike between the West Pond and East Pond includes an extremely wet and soft curved bench area (elevation ~ 485). There are two active and two abandoned decant pipes and five abandoned sluice line pipes that cross under this bench area. Furthermore, boiling areas can be observed on the surface of the bench, including the one depicted below, where seepage water mixed with gypsum fines emerges at the ground surface.

Reference: **PAF Gypsum Stack**
Exterior Slope Area above Decant Spillway Pipe Outlets

It is probable the numerous pipe penetrations and apparent lack of seepage control through the dike walls are the cause of significant unstable conditions observed in this area. In a previous memorandum, Stantec recommended measures (grouting) to address the closure of the abandoned decant pipe outlets to prevent potential loss of pool through presumed improperly abandoned pipes. However, closures of the abandoned decant pipes may require prolonged efforts currently under TVA's consideration, and removal of the numerous pipe penetrations and attempting to control seepage through the dike may not be practical with the current pool elevation (~ 510).

Although the dike slope above the bench appears stable, it is supported by wet and soft bench and slope areas which could fail without significant warning if corrective actions are not implemented. Because of its location, failure in this area can result in a breach of both the West and East Pond dikes. Therefore, it is strongly recommended the following measures be implemented **immediately**.

- Construct a toe buttress below the curved area of the unstable bench. The buttress should consist of a berm constructed using Channel III Lining (as per KYDOT Standard Specifications for Road and Bridge Construction, current edition). A plan view and typical cross-section of the berm are attached to this memo.
- Construction of the berm should start by placing Channel III Lining material on the slope immediately north of the abandoned sluice lines. This material can then be pushed toward the edge of the Stilling Basin using a bulldozer. The purpose of this initial action should be to construct the base of the berm along the edge of the pond. Once the bottom lift is established, the existing slope above the Channel Lining should be lined with Type IV geotextile fabric (as per KYDOT Standard Specifications for Road and Bridge Construction, current edition). Channel Lining placement should then resume using a 1:1 slope up to approximate elevation 485.
- Light or heavy construction equipment **should not** travel or operate from the intermediate bench area above the proposed berm until the recommended buttressing is fully completed. All operations should be conducted with extreme caution making sure decant pipe outlets (active or abandoned) are properly protected.
- Once the recommended measures described herein are completed, further measures to stabilize the bench surface and adjacent upslope will be formulated.
- It is recommended that construction measures be monitored by Stantec personnel. Field dimension adjustments will be necessary as the fieldwork progresses and should be agreed on between TVA construction personnel and Stantec representatives.

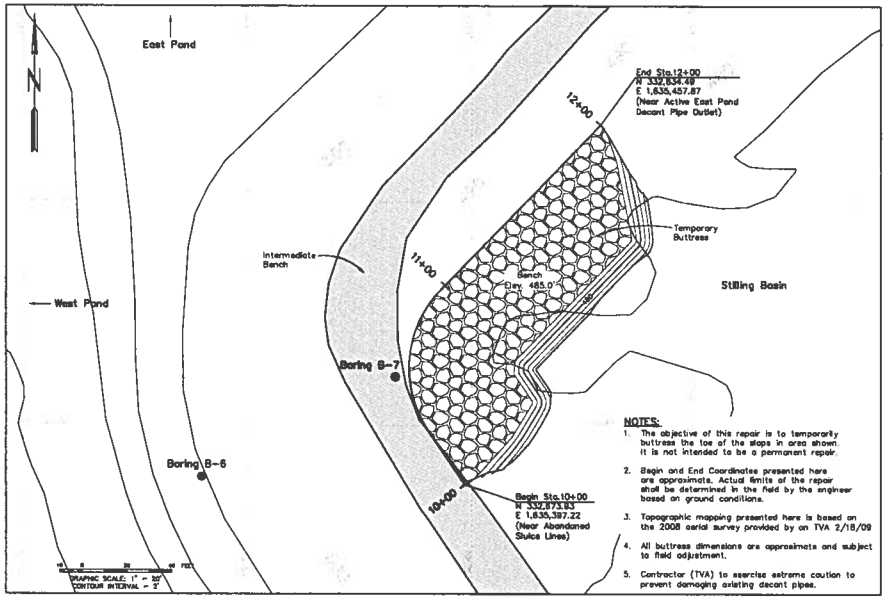
The recommended work described in this memorandum was discussed in the field on February 20, 2009 with plant (William Perry) and office (Alan Casaday) TVA personnel. Other ongoing construction work related to surface drainage conditions along the south

Reference: **PAF Gypsum Stack**
Exterior Slope Area above Decant Spillway Pipe Outlets

side of the West Pond dike were also discussed with William Perry. Sketches of the immediate work to follow these surface drainage measures were provided to William Perry. Once current and complete topographic information of the gypsum stack is provided by TVA, Stantec will provide formal work plans, which will also address surface drainage conditions and temporary treatment of wet sloped areas around the entire gypsum stack structure.

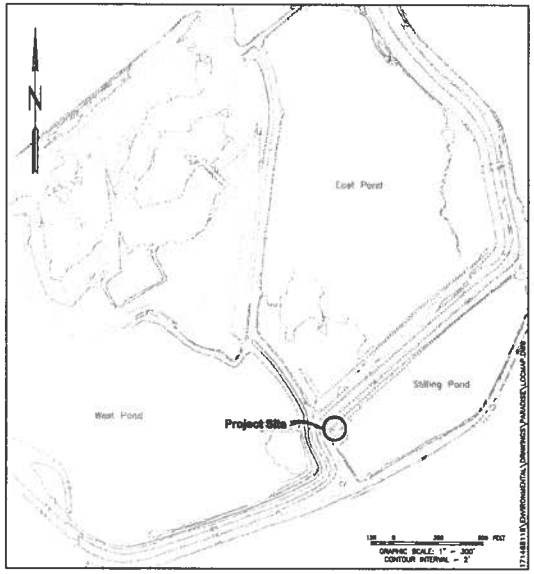
STANTEC CONSULTING SERVICES INC.

Hugo Aparicio, PE
Principal
Hugo.Aparicio@stantec.com

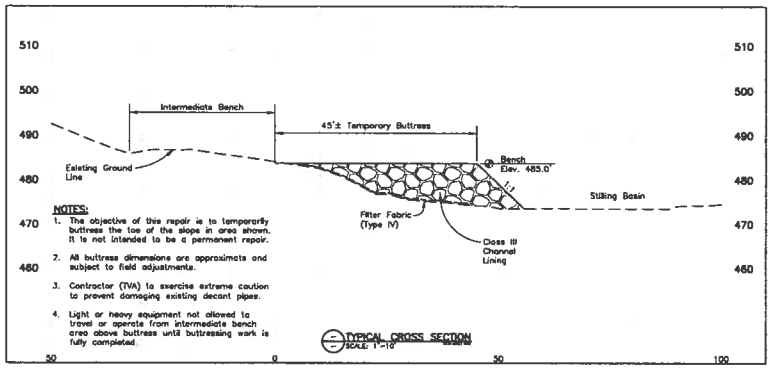


NOTES:
1. The objective of this repair is to temporarily buttress the toe of the slope in area shown. It is not intended to be a permanent repair.
2. Begin and End Coordinates presented here are approximate. Actual limits of the repair shall be determined in the field by the engineer based on ground conditions.
3. Topographic mapping presented here is based on the 2008 aerial survey provided by on TVA 2/18/09
4. All buttress dimensions are approximate and subject to field adjustment.
5. Contractor (TVA) to exercise extreme caution to prevent damaging existing decant pipes.

PLAN - TEMPORARY BUTTRESS
SCALE: 1"=20'



LOCATION MAP



NOTES:
1. The objective of this repair is to temporarily buttress the toe of the slope in area shown. It is not intended to be a permanent repair.
2. All buttress dimensions are approximate and subject to field adjustments.
3. Contractor (TVA) to exercise extreme caution to prevent damaging existing decant pipes.
4. Light or heavy equipment not allowed to travel or operate from intermediate bench area above buttress until buttressing work is fully completed.

TYPICAL CROSS SECTION
SCALE: 1"=10'

ISSUED FOR REVIEW
NOT FOR CONSTRUCTION

Stantec

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000
www.stantec.com

REV	DATE	BY	CHK	APP
0	07-23-09	SCV	PJR	WRM
INITIAL ISSUE				

SCALE: AS SHOWN EXCEPT AS NOTED

YARD
PAF GYPSUM STACK

SLOPE ABOVE DECANT PIPE OUTLETS RECOMMENDED TEMPORARY BUTTRESS OF INTERMEDIATE BENCH

PARADISE CREEK FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 09-23-09 | 34 | C | XXWXXX | R 0

PLOT FACTOR=XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TASK COMPLETED BY | PLP NO.

Attachment 2

Rock Buttress during construction

Rock Buttress during construction

Rock Buttress during construction

Rock Buttress during construction

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

February 11, 2010 let_017_paf_175569040

Mr. Chris Buttram, PE
Tennessee Valley Authority
Fossil Power Group
1101 Market Street, MS LP 2E-C
Chattanooga, Tennessee 37402

Re: Construction Work Plan Closure
Work Plan No. PAF-LT-090303
Scrubber Sludge Complex
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Buttram:

Stantec Consulting Services Inc. (Stantec) would like to issue this letter requesting closure of the above mentioned work plan. Pertinent details of the work plan are presented in Table 1.

Table 1: Work Plan Details

Work Plan Issue Date	Subject	Reference No.	Status (P=Planning, W=In Progress, C=Complete)	Const. Start Date	Const. Complete Date
03/03/09	Gypsum Stack West Pond- East Slope Temp. Slope and Ditch Repairs	PAF-WP-090303 (let_005_paf_171 468118)	C	03/04/09	04/15/09

Based on the observations made in the field during construction, a review of daily field reports, photos and available information, it is our opinion that the ditch repairs were performed to match reasonably well with the recommendations in our work plan. Pertinent attachments for documentation are included along with this letter. These include original work plan issued by Stantec on March 3, 2009 and selected photos from the field. The

record drawing for TVA's business support library will be submitted electronically. Daily field reports for the project have already been submitted to TVA.

We appreciate this opportunity and look forward to continue working with you on this project. If you have any questions or required additional information, please contact us.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Sharath C. Vemuri, PE
Senior Project Engineer

/rws

Attachment 1

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

March 3, 2009 let_005_paf_171468118

Mr. Alan Casaday
Tennessee Valley Authority
1101 Market Street
LP 5E-C
Chattanooga, Tennessee 37402

Re: Temporary Slope and Ditch Repairs
East Slope of Gypsum Stack West Pond
TVA Facilities Assessment Project
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Casaday:

Stantec engineers visited the referenced site on February 20, 2009 to further review existing conditions as part of facilities assessment project. This letter superceedes let_003_paf_171468118 submitted on February 26, 2009 and summarizes the results of our field visit along with recommendations relative to temporary construction of repair measures on the east slope of the West Pond.

Introduction

The Gypsum Stack West Pond exterior slope adjacent to an existing 48" HDPE drainage pipe includes an extremely wet and soft toe and bench area. Currently, there is no defined or protected drainage channel in the area routing seepage and runoff water into the existing drainage pipe subsequently into the stilling pond. Furthermore, the lack of grading to promote positive drainage is causing saturated conditions and heavy phragmites growth around the drainage pipe. The pictures on the following page illustrate the conditions described here.

Although the dike slope above this area appears to be stable at this time, the lack of positive drainage is leading to wet and soft bench conditions and sloped areas here could become unstable if corrective actions are not implemented. Therefore, it is recommended the following temporary repair measures be implemented.

Recommendations

i. Construct a drainage channel at the toe of the upper exterior slope extending from the toe adjacent to the five abandoned sluice lines to the limits of the existing rip-rap protection on the south slope of the West Pond. The ditch should consist of undercutting the existing cover soil a maximum of 1', placing Type IV geotextile fabric to line the ditch (as per KYDOT Standard

Specifications for Road and Bridge Construction, current edition), and using a minimum of 2' of Class II Channel Lining (Rip-Rap) (as per KYDOT Standard Specifications for Road and Bridge Construction, current edition) to bring the ditch to grade. The ditch shall be graded towards the existing drainage pipe from both sides at a minimum of 0.5%. A plan view and typical cross-section of the ditch are attached to this memo.

ii. Construction of the rip-rap ditch should extend approximately 1/3 up the height of the slope, to stabilize the saturated conditions described above.

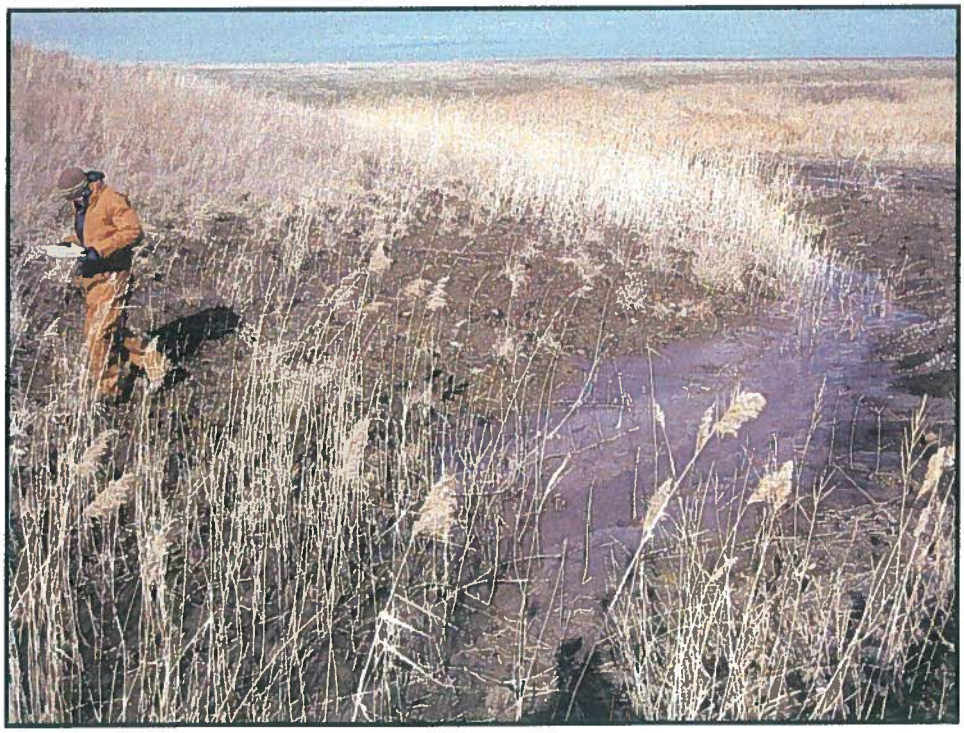
iii. The existing 24" Cast Iron drainage pipe which runs underneath the intermediate bench of the south slope of the West Pond should be replaced with a new 24" PVC pipe. The pipe should be backfilled in accordance with all applicable TVA specifications.

iv. The area near the 48" HDPE pipe inlet as shown on the attached plan view should receive rip-rap and cement-grout protection. After the filter fabric and rip-rap has been properly placed in the designated area, cement grout should be prepared and applied according to the following

specifications: Cement grout should consist of a mixture of two parts mortar sand to one part cement and approximately five gallons of water per sack of cement. The water may be adjusted to provide a grout consistency suitable for the conditions encountered at the time of application. The grout is to be applied uniformly to the Class II Channel Lining in an effort to fully penetrate and fill the voids within the rock. Pumping of the grout is encouraged as a means to inject the grout under pressure into the voids. The grout surface shall be broomed to provide a uniform, textured surface. Photos showing previous examples of this type of grouting are attached to this memo.

v. Light or heavy construction equipment **should not** travel or operate from the intermediate bench area north of the abandoned sluice lines until the previously recommended buttressing in the area is fully completed. Once the recommended measures described herein are completed, further measures to stabilize the bench surface and adjacent upslope will be formulated.

vi. It is recommended that construction measures be monitored by Stantec personnel. Field dimension adjustments will be necessary as the fieldwork progresses and should be agreed on between TVA construction personnel and Stantec representatives



Standing water near the toe of the slope

Closure

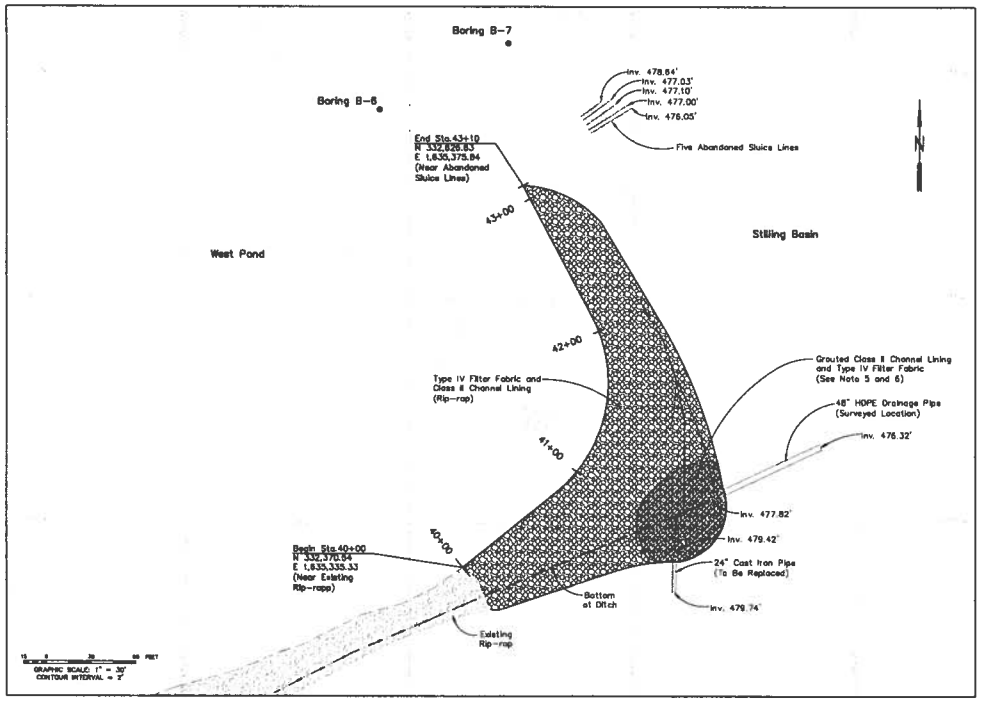
The objective of the repairs described here is to temporarily stabilize the area indicated and are not intended to be permanent repairs. Contractor should verify the construction plan accompanying this letter for further information.

Sincerely,

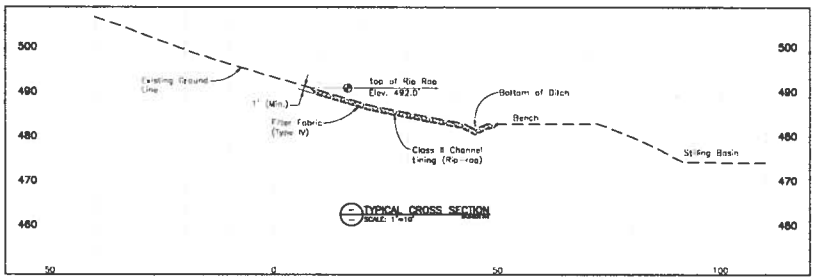
STANTEC CONSULTING SERVICES INC.

Hugo R. Aparicio, PE
Principal

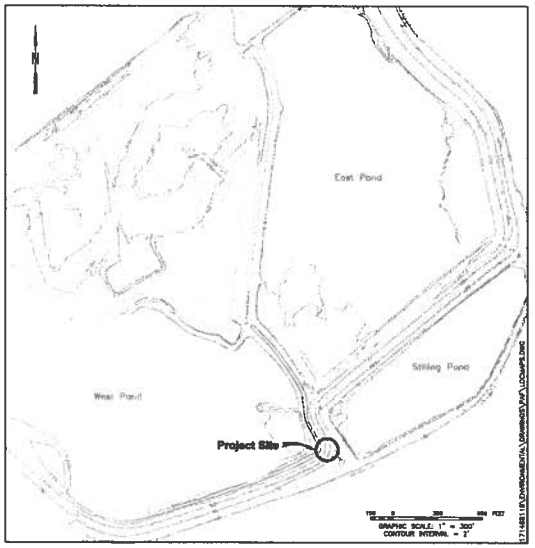
/rws



PLAN – DRAINAGE DITCH
SCALE: 1"=30'



TYPICAL CROSS SECTION
SCALE: 1"=10'



LOCATION MAP

NOTES:

1. The objective of this repair is to facilitate drainage from the slope and intermediate bench in the area shown and direct runoff into the existing 48" HDPE pipe. These repairs are intended to be temporary measures and not permanent repairs.
2. No light or heavy equipment shall be allowed to operate or travel on the intermediate bench area near the active decant spillway pipes until buttressing (not part of this drawings) work on the slope is fully completed.
3. The Contractor shall cut into the slope a minimum of 1 foot. Type IV filter fabric shall be placed and a minimum of 1 foot of rip-rap shall be placed. The existing 24" cast iron pipe shall be replaced with a new 24" PVC pipe. The pipe shall be backfilled in accordance with applicable TVA Standards.
4. Topographic mapping presented here is based on the 2008 aerial survey provided by TVA on 2/18/09.
5. Cement grout shall consist of a mixture of two parts mortar sand to one part cement and approximately five gallons of water per sack of cement. The water may be adjusted to provide a grout consistency suitable for the conditions encountered at the time of application.
6. The grout is to be uniformly applied to the Class II Channel Lining in an effort to fully penetrate and fill the voids within the rock. Grouting shall be confined to the area indicated on the drawing. Pumping of the grout is encouraged as a means to inject the grout under pressure into the voids. The grout surface shall be broomed to provide a uniform textured surface.
7. Contractor shall also refer to the letter of recommendations prepared by Stantec for this work.
8. The dimensions and limits of repairs shown on this drawing are subject to field adjustments by Stantec's on-site representative.

ISSUED FOR CONSTRUCTION

REV.	DATE	DESCRIPTION	BY
R 1	03/09	ISSUED FOR CONSTRUCTION	SCV
R 0	02/09		SCV

SCALE: AS SHOWN EXCEPT AS NOTED

FACILITIES ASSESSMENT
PAF GYPSUM STACK PHASE 2

EAST SLOPE OF WEST POND
TEMPORARY SLOPE AND
DITCH REPAIRS

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	ASSISTED BY	APPROVED BY
S. WEAVER	S. PUMPH	S. WEAVER	K. APPERSON	-	

PARADISE CREEK FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | 34 | C | XXWXXX | R 0

PLOT FACTOR: XX
© TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

Stantec

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000
www.stantec.com

TASK COMPLETED BY: – REV NO. –

XXWXXX | C | 34

Attachment 2

During construction

During construction

During construction

After construction

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

February 11, 2010 let_018_paf_175569040

Mr. Chris Buttram, PE
Tennessee Valley Authority
Fossil Power Group
1101 Market Street, MS LP 2E-C
Chattanooga, Tennessee 37402

Re: Construction Work Plan Closure
Work Plan No. PAF-LT-090311
Scrubber Sludge Complex
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Buttram:

Stantec Consulting Services Inc. (Stantec) would like to issue this letter requesting closure of the above mentioned work plan. Pertinent details of the work plan are presented in Table 1.

Table 1: Work Plan Details

Work Plan Issue Date	Subject	Reference No.	Status (P=Planning, W=In Progress, C=Complete)	Const. Start Date	Const. Complete Date
03/11/09	Gypsum Stack-Exterior Slope Repair Near Decant Spillway Pipe Outlets	PAF-WP-090311 (let_006_paf_171468118)	C	03/18/09	03/25/09

Based on the observations made in the field during construction, a review of daily field reports, photos and available information, it is our opinion that the temporary repair measures were implemented to match reasonably well with the recommendations in our work plan. Pertinent attachments for documentation are included along with this letter. These include original work plan issued by Stantec on March 11, 2009 and selected photos

from the field. The record drawing for TVA's business support library will be submitted electronically. Daily field reports for the project have already been submitted to TVA.

We appreciate this opportunity and look forward to continue working with you on this project. If you have any questions or required additional information, please contact us.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Sharath C. Vemuri, PE
Senior Project Engineer

/rws

Attachment 1

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

March 11, 2009

let_006_paf_171468118

Mr. Alan Casaday
Tennessee Valley Authority
1101 Market Street
LP 5E-C
Chattanooga, Tennessee 37402

Re: Temporary Slope and Ditch Repairs and Toe Buttressing
Exterior Slope of Gypsum Stack Near Active Decant Spillway Pipe Outlets
TVA Facilities Assessment Project
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Casaday:

Stantec engineers visited the referenced site on March 5, 2009 to further review the on-going construction repairs including the toe buttress near the decant spillway pipe outlets and the drainage ditch and slope repairs on the east exterior embankment of the West Pond. This letter summarizes the status of the on-going repair measures in the referenced area along with recommendations for additional repair measures.

On-Going Work

The temporary toe buttress has been constructed by HED personnel to elevation 485 feet as recommended by Stantec in the memo dated February 24, 2009 (file no. mem_005_paf_171468118). The toe buttress was constructed using Class III Channel lining underlain by Type IV Filter Fabric. HED personnel are also beginning to construct the drainage ditch and slope repairs on the southeastern corner slope area of the West Pond as recommended by Stantec in the letter dated March 3, 2009 (file no. let_005_paf_171468118). The temporary drainage ditch and slope repairs are being constructed using Type IV Filter Fabric and Class II Channel Lining. The drainage ditch and slope repairs are planned to extend from existing Class II Lining on the south embankment of the West Pond to the five abandoned sluice lines near the decant spillway pipe outlets. Similarly, the limits of the toe buttress are planned to extend from the abandoned sluice lines to the East Pond active spillway outlet. Previous recommendations by Stantec stated that no heavy construction equipment should travel on the intermediate bench above the temporary toe buttress and no slope work in the area should be undertaken due to saturated slope conditions. Stantec recommended that once the temporary toe buttress construction was satisfactorily completed to temporarily stabilize the area, further recommendations for the slope would be provided.

Recommended Additional Work

During the March 5 site visit, Stantec engineers observed the wet areas previously identified along the exterior slope and intermediate bench adjacent to the toe buttress and discussed potential repair measures with William Perry of TVA. Therefore, it is recommended that these additional areas be added to the on-going repair measures in the area. Recommendations relative to these repairs are presented below along with a plan view and cross section drawing attached to this letter. Although the temporary toe buttress was constructed to stabilize the intermediate bench and slope in this area, unless proper drainage measures are implemented the slope and bench areas will continue to be saturated and cause stability concerns.

Recommendations

i. Construct a drainage channel at the toe of the upper exterior slope extending from the toe adjacent to the eastern edge of the toe buttress and connecting to the limits of the previously recommended channel adjacent to the five abandoned sluice pipes. The ditch should consist of undercutting the existing cover soil a minimum of 1', placing Type IV geotextile fabric to line the ditch (as per KYDOT Standard Specifications for Road and Bridge Construction, current edition), and using a minimum of 2' of Class II Channel Lining (Rip-Rap) (as per KYDOT Standard Specifications for Road and Bridge Construction, current edition) to bring the ditch to original grade or slightly above. The ditch shall be tied into the previously constructed ditch at the toe adjacent to the abandoned sluice lines and there should be no gap in Filter Fabric lining. The ditch shall be graded towards the existing 48" drainage pipe at a minimum of 0.5%. A plan view and typical cross-section of the ditch are attached to this letter.

ii. Construction of the rip-rap protection should extend approximately 1/3rd up the height of the slope, to stabilize the wet areas described above.

iii. The toe buttress shall be extended to the elevation of the intermediate bench across its entire length. The buttress extension should consist of a berm constructed using Channel III Lining (as per KYDOT Standard Specifications for Road and Bridge Construction, current edition) placed on top of the existing buttress. The exterior slope of the buttress extension should be constructed using a 1:1 slope and tying into the existing buttress exterior slope.

iv. The intermediate bench above the limits of the toe buttress and extending south adjacent to the 48" drainage pipe should be lined with Class II Channel Lining and choked with No. 4 Stone to stabilize the bench and provide a smooth drivable surface for construction equipment and to facilitate inspections of the area. A plan view and typical cross-section are attached to this letter.

v. A minimum of 1' of cover soil should remain in the on the slope or in the ditch before the filter fabric is placed. If undercutting reveals gypsum, then cover soil needs to be

placed to achieve this minimum. The existing access road on the intermediate bench to the east of the ditch will have to be raised and graded as needed for rip-rap placement in the ditch not to exceed the road elevation. The bench should be raised using soil from the slope excavation or from other borrow areas on site, and should be raised accordingly to provide better drainage channel runoff for the completed ditch.

vi. It is recommended that construction measures be monitored by Stantec personnel. Field adjustments to the repairs will be necessary as the construction progresses and should be agreed on between TVA construction personnel and Stantec's on-site engineering technician.

South Slope of West Pond

Stantec engineers also discussed with William Perry potential repairs to other drainage ditches along the East and West Pond. It was decided that the updated 2009 topographic mapping would be needed in order to complete the drainage design for the majority of the Gypsum Pond. However, the drainage ditch between the upper and middle benches on the eastern side of the south slope of the West Pond was one area identified for immediate repair measures. A 24" Cast Iron drainage pipe at the eastern edge of the referenced drainage ditch was recently replaced per Stantec recommendations by a new 24" PVC pipe. In order to facilitate positive drainage from the ditch and slopes into the new pipe, the following measures are recommended at this time.

Recommendations

i. Clean out the drainage channel between the upper and middle benches on the eastern side of the south slope of the West Pond. Begin at the inlet of the new 24" PVC pipe and extend west approximately 400'. Cut into the existing ditch material a maximum of 1' in order to achieve a minimum grade of 0.5% towards the PVC pipe. The repairs should be terminated at the point where the minimum grade can no longer be achieved with the existing ditch configuration and elevation. Construct a V-shaped channel and place Type IV geotextile fabric to line the ditch (as per KYDOT Standard Specifications for Road and Bridge Construction, current edition), and using a minimum of 2' of Class II Channel Lining (Rip-Rap) (as per KYDOT Standard Specifications for Road and Bridge Construction, current edition) to bring the ditch to original grade or slightly above.

ii. Field adjustments to the repairs will be necessary as the construction progresses and should be agreed on between TVA construction personnel and Stantec's on-site engineering technician.

South Slope of East Pond

Stantec engineers also observed the south exterior slopes of the East Pond during the site visit. These slopes have recently been mowed by HED to facilitate inspections, but some dense phragmite growth remains near the toe of the slope close to the pool level of the Stilling Pond. As discussed in the field with William Perry, the clearing has exposed a failure along the toe of the East Pond south slope, which is also the bank of the stilling basin. In order to allow Stantec engineers to fully observe the conditions on this slope, it is recommended that all phragmites growth on the south slope of the East Pond be removed and any other vegetation be mowed. Once this area is cleared of vegetation, the toe of the slope needs to be monitored closely to make sure any failures don't expand in any direction. After a more thorough inspection of the East Pond south slope is possible, recommendations to stabilize any failure areas will be formulated.

Closure

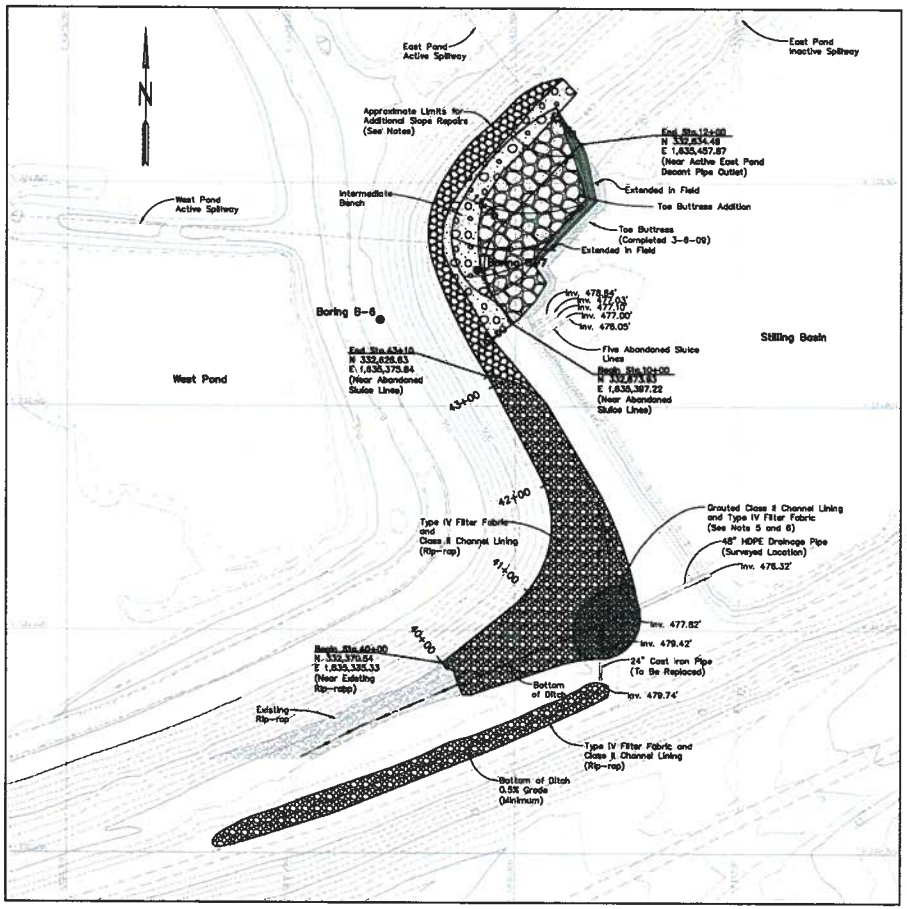
The objective of the repairs described here is to temporarily stabilize the area indicated and are not intended to be permanent repairs. Contractor should verify the construction plan accompanying this letter for further information.

Sincerely,

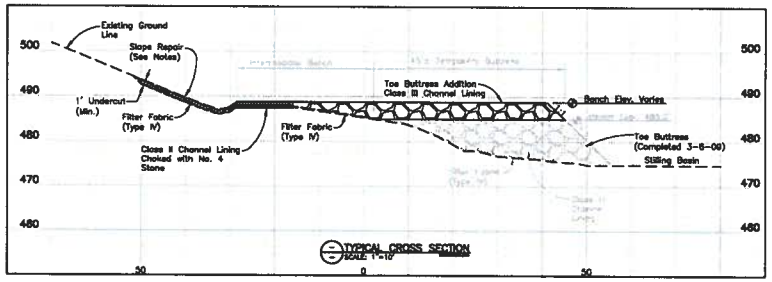
STANTEC CONSULTING SERVICES INC.

Hugo R. Aparicio, PE
Principal

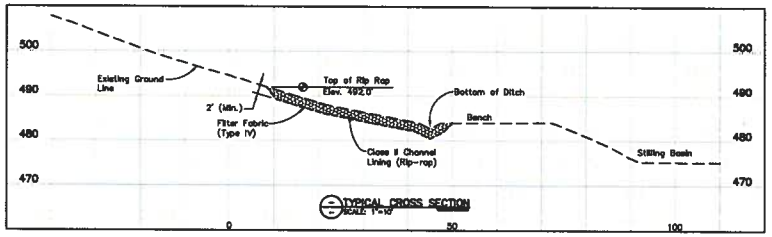
/rws



PLAN - DRAINAGE REPAIRS
SCALE: 1"=40'



TYPICAL CROSS SECTION
SCALE: 1"=10'



TYPICAL CROSS SECTION
SCALE: 1"=10'

DRAINAGE DITCH NOTES:

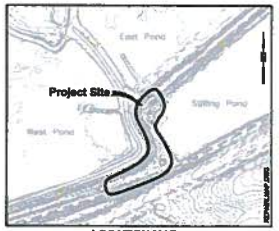
1. The objective of this repair is to facilitate drainage from the slope and intermediate bench in the area shown and direct runoff into the existing 24" HDPE pipe. These repairs are intended to be temporary measures and not permanent repairs.
2. The Contractor shall cut into the embankment a maximum of 1 foot to achieve a minimum grade of the drainage of 0.5%. Type IV filter fabric shall be placed and a minimum of 2 feet of rip-rap shall be placed.
3. Topographic mapping presented here is based on the 2008 aerial survey provided by TVA on 2/18/09.
4. Contractor shall also refer to the letter of recommendations prepared by Stantec for this work.
5. The dimensions and limits of repairs shown on this drawing are subject to field adjustments by Stantec's on-site representative.

TEMPORARY BUTTRESS NOTES:

1. The objective of this repair is to temporarily buttress the toe of the slope in area shown. It is not intended to be a permanent repair.
2. Begin and End Coordinates presented here are approximate. Actual limits of the repair shall be determined in the field by the engineer based on ground conditions.
3. Topographic mapping presented here is based on the 2008 aerial survey provided by on TVA 2/18/09.
4. All buttress dimensions are approximate and subject to field adjustment.
5. Contractor (TVA) to exercise extreme caution to prevent damaging existing decant pipes.
6. The limits of slope repair shall be determined in the field by Stantec's on-site Engineering Technician.

TEMPORARY SLOPE NOTES:

1. The objective of this repair is to facilitate drainage from the slope and intermediate bench in the area shown and direct runoff into the existing 48" HDPE pipe. These repairs are intended to be temporary measures and not permanent repairs.
2. No light or heavy equipment shall be allowed to operate or travel on the intermediate bench area near the active decant spillway pipes until buttressing (not part of this drawings) work on the slope is fully completed.
3. The Contractor shall cut into the slope a minimum of 2 feet. Type IV filter fabric shall be placed and a minimum of 2 foot of rip-rap shall be placed. The existing 24" cast iron pipe shall be replaced with a new 24" PVC pipe. The pipe shall be backfilled in accordance with applicable TVA Standards.
4. Topographic mapping presented here is based on the 2008 aerial survey provided by TVA on 2/18/09.
5. Cement grout shall consist of a mixture of two parts mortar sand to one part cement and approximately five gallons of water per sack of cement. The water may be adjusted to provide a grout consistency suitable for the conditions encountered at the time of application.
6. The grout is to be uniformly applied to the Class II Channel Lining in an effort to fully penetrate and fill the voids within the rock. Grouting shall be confined to the area indicated on the drawing. Pumping of the grout is encouraged as a means to inject the grout under pressure into the voids. The grout surface shall be broomed to provide a uniform textured surface.
7. Contractor shall also refer to the letter of recommendations prepared by Stantec for this work.
8. The dimensions and limits of repairs shown on this drawing are subject to field adjustments by Stantec's on-site representative.



LOCATION MAP
SCALE: 1"=300'

ISSUED FOR REVIEW
NOT FOR CONSTRUCTION

Stantec

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000
www.stantec.com

R 0	03/09	BDV	JBF	MRM	HRA	-	-
INITIAL ISSUE							
NO.	REVISION	BY	APP'D	REVISION	BY	APP'D	DATE

SCALE: AS SHOWN — EXCEPT AS NOTED

PAF GYPSUM STACK

TEMPORARY REPAIR MEASURES

DESIGNED BY	DRAWN BY	CHECKED BY	QUALITY CHECK BY	REVIEWED BY	APPROVED BY	RELEASED BY
K. VEALE	K. FLYNN	B. MATHENEY	H. SPARKMAN	-	-	-

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2008	DWG no./file	34	C	XXWXXX	R 0

PLOT FACTOR: XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TASK COMPLETED BY: -
REV NO. -

XXXMXX | C | 34

Attachment 2

Slope during construction

Buttress during construction

Slope after construction

Buttress after construction

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

February 11, 2010 let_019_paf_175569040

Mr. Chris Buttram, PE
Tennessee Valley Authority
Fossil Power Group
1101 Market Street, MS LP 2E-C
Chattanooga, Tennessee 37402

Re: Construction Work Plan Closure
Work Plan No. PAF-LT-090320
Scrubber Sludge Complex
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Buttram:

Stantec Consulting Services Inc. (Stantec) would like to issue this letter requesting closure of the above mentioned work plan. Pertinent details of the work plan are presented in Table 1.

Table 1: Work Plan Details

Work Plan Issue Date	Subject	Reference No.	Status (P=Planning, W=In Progress, C=Complete)	Const. Start Date	Const. Complete Date
03/20/09	East Pond-Access Road Repair	PAF-LT-090320 (let_007_paf_171468118)	C	03/18/09	04/15/09

Based on the observations made in the field during construction, a review of daily field reports, photos and available information, it is our opinion that the ditch repair measures were implemented to match reasonably well with the recommendations in our work plan. Pertinent attachments for documentation are included along with this letter. These include original work plan issued by Stantec on March 20, 2009 and selected photos from the field. The record drawing for TVA's business support library will be submitted electronically. Daily field reports for the project have already been submitted to TVA.

We appreciate this opportunity and look forward to continue working with you on this project. If you have any questions or required additional information, please contact us.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Sharath C. Vemuri, PE
Senior Project Engineer

/rws

Attachment 1

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

March 20, 2009 let_007_paf_171468118

Mr. Alan Casaday
Tennessee Valley Authority
1101 Market Street
LP 5E-C
Chattanooga, Tennessee 37402

Re: Ditch Repairs
East Pond Access Road Ditch
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Casaday:

Repairs are required for approximately 1,830 linear feet of ditch along the East Access Road to improve surface storm drainage as shown on the attached Drainage Ditch Improvement Plan. The existing 12-inch diameter pipe should be removed and replaced with a 24-inch diameter pipe. The existing roadside ditch should be initially cleaned of excess vegetation and muck/silt deposits, excavated approximately one foot in depth, regraded to provide positive drainage, and backfilled with Class II Channel Lining underlain with filter fabric. The following steps shall be used for the ditch repairs:

- Remove any excess vegetation within the drainage ditch starting at the invert of the existing 12 inch diameter pipe crossing the access road and ending approximately 700 feet south of the active sluice lines.
- Remove the existing 12-inch diameter HDPE pipe near the stilling pond, and install 46 linear feet of new 24-inch diameter HDPE (DR26) Driscoplex pipe as shown on the attached drawing.
- Install Class II channel lining erosion protection at each end of the new 24-inch HDPE pipe.
- Survey existing ditch grades placing grade stakes for the ditch flowline at maximum 100 feet intervals using a plan slope of approximately 0.85 percent to 1.0 percent.
- Clean ditch by excavating and disposing of areas of silt, sediment, and muck with a small excavator using care not to over excavate the ditch.
- Regrade existing ditch sides and flowline with a small dozer to match grade and plan cross section template.
- Dispose of excavated material.
- Place filter fabric and Class II Channel Lining erosion protection.
- Re-survey regraded ditch flowline and perform final grading with small excavation equipment and hand tools as needed.

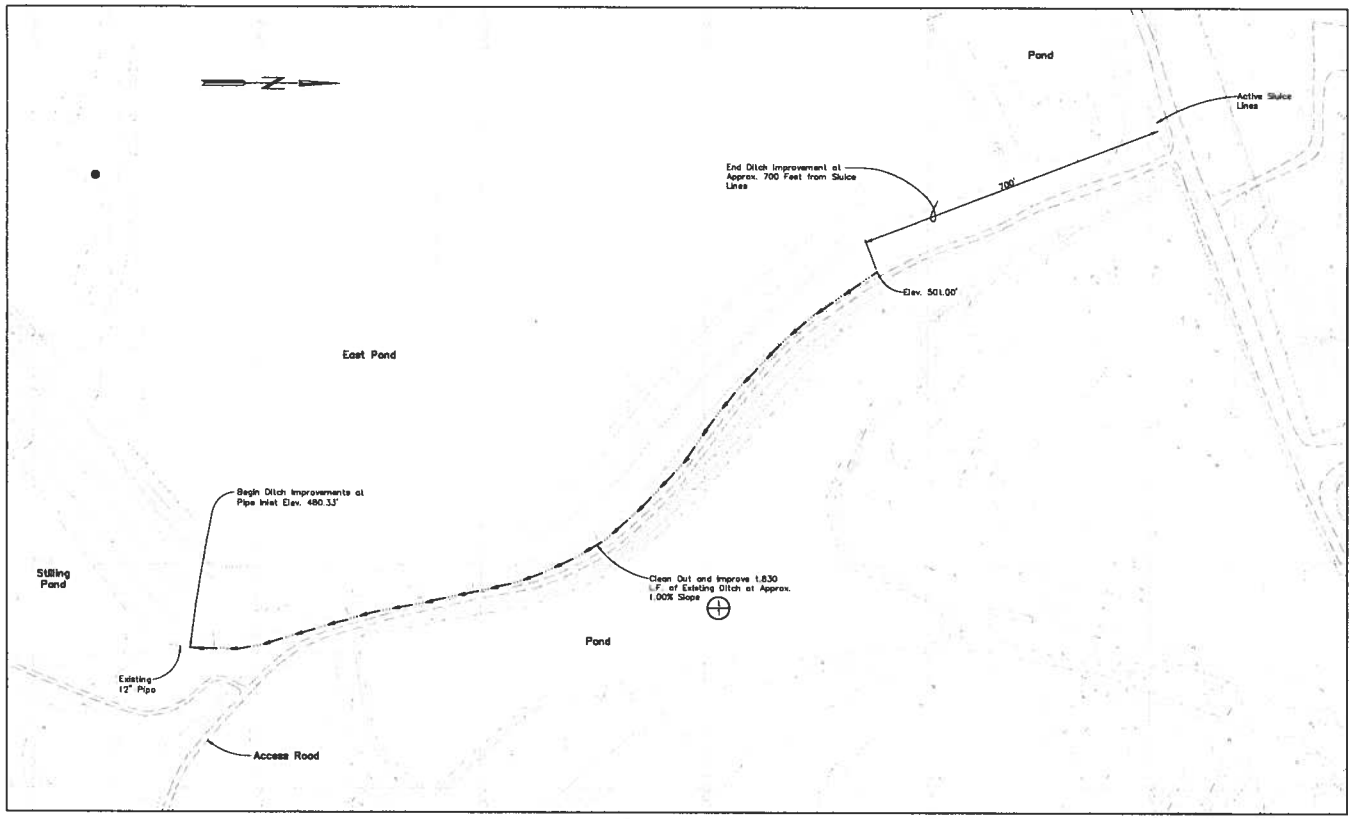
Please call if you have any questions or need additional information.

Sincerely,

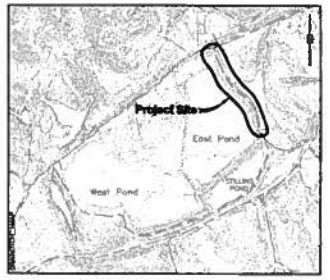
STANTEC CONSULTING SERVICES INC.

Hugo R. Aparicio, PE
Principal

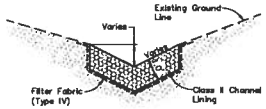
/rdr



PLAN – DRAINAGE DITCH IMPROVEMENTS
SCALE: 1"=100'



LOCATION MAP
SCALE: 1"=1000'



DETAIL – V-DITCH
SCALE: 1"=2'

ISSUED FOR CONSTRUCTION

NOTES:

1. Topographic mapping was obtained from an aerial survey performed by Tuck Mapping Solutions, Inc. on February 22, 2009. Coordinate system is based on Kentucky State Plane, South Zone.
2. The purpose of this repair is to improve drainage within the existing ditch along the east access road. Refer to the letter of recommendations prepared by Stantec for this work.

Section or Detail No.
Sheet Where Shown
REFERENCE KEY

Stantec

Stantec Consulting Services Inc.
1408 N. Forbes Rd.
Lexington, Kentucky
40511-2030
859-422-3000
www.stantec.com

REV	DATE	DRAWN	DESIGN	CHECKED	APPROVED	DESCRIPTION
0	03/09	VJS	JMF	VJS	HRA	INITIAL ISSUE

SCALE: AS SHOWN EXCEPT AS NOTED

PAF GYPSUM STACK

DRAINAGE DITCH IMPROVEMENT

PARADISE CREEK FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2008	SHEET 34	C	XXWXXX-01	R 0

PLOT FACTOR: XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TASK COMPLETED BY: REV NO

XXWXXX | C | 34

Attachment 2

Ditch during repairs

Ditch during repairs

Ditch during repairs

Ditch after repairs

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

February 26, 2010 let_024_paf_175569040

Mr. Chris Buttram, PE
Tennessee Valley Authority
Fossil Power Group
1101 Market Street, MS LP 2G-C
Chattanooga, Tennessee 37402

Re: Construction Work Plans Closure
Work Plan Nos. PAF-LT-090331 and PAF-LT-090402
Scrubber Sludge Complex
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Buttram:

Stantec Consulting Services Inc. (Stantec) would like to issue this letter requesting closure of the above mentioned work plans. Pertinent details of the workplans are presented in Table 1.

Table1: Work Plan Details

Workplan Issue Date	Subject	Reference No.	Status (P=Planning, W=In Progress, C=Complete)	Const. Start Date	Const. Complete Date
03/31/09	Gypsum Stack-Slope and Ditch Repairs South Side of West Pond	PAF-LT-090331 (let_009_paf_171468118)	C	04/16/09	11/19/09
04/02/09	Gypsum Stack-Slope and Ditch Repairs South Side of West Pond (revision)	PAF-LT-090402 (let_010_paf_171468118)	C	04/16/09	11/19/09

Based on the observations made in the field during construction, a review of daily field reports, photos and available information, it is our opinion that the slope and ditch repairs were performed to match reasonably well with the recommendations in our work plan. Pertinent attachments for documentation are included along with this letter. These include

original work plans issued by Stantec and selected photos from the field. The record drawing for TVA's business support library will be submitted electronically. Daily field reports for the project have already been submitted to TVA.

We appreciate this opportunity and look forward to continue working with you on this project. If you have any questions or required additional information, please contact us.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Sharath C. Vemuri, PE
Senior Project Engineer

/rdr

Attachment 1A

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

March 31, 2009 ltr_009_paf_171468118

Mr. Alan Casaday
Tennessee Valley Authority
1101 Market Street, LP 5E-C
Chattanooga, Tennessee 37402

Re: Slope and Ditch Repairs
Exterior Slope of Gypsum Stack Near South Side of West Pond
TVA Facilities Assessment Project
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Casaday:

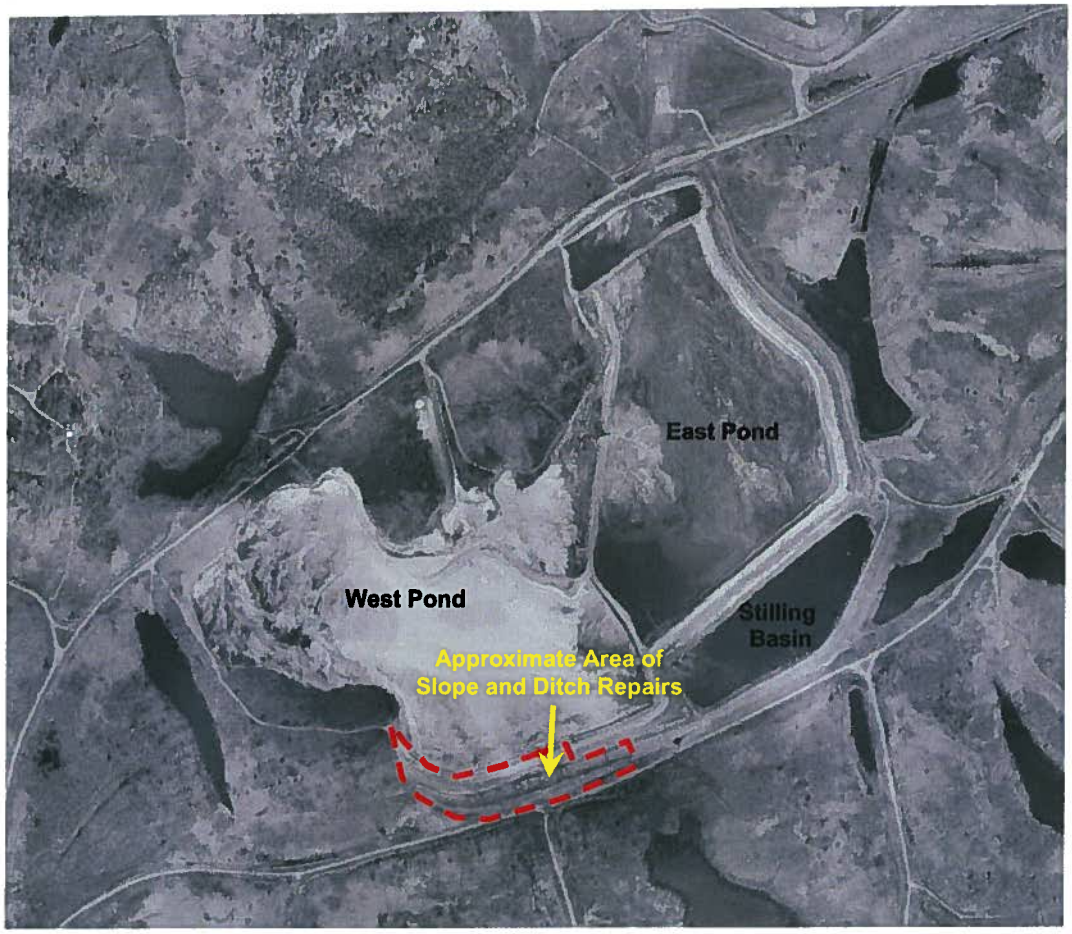
Stantec Consulting Engineers Inc. (Stantec) has been assisting TVA with repairs associated with slope stability, drainage, and maintenance issues for the above referenced facility. The south slope of the west pond has recognized drainage issues and per our March 11, 2009 summary this letter includes recommendations for those repair measures. The goal of these repairs is to bring the facility closer to compliance with the permit/design drawings and promote positive drainage and stormwater runoff along the intermediate benches.

Recommendations

At present the intermediate benches in this area are relatively flat and do not drain well. The benches have been constructed with little or no slope and re-grading is needed to restore the slopes to the desired configuration. Because of the relatively shallow cover soil material currently on the benches and the need to avoid exposing underlying by-product material, additional soil fill will be required to revise the grades. A material specification and special construction instructions for the soil fill are included below. Vegetative growth along the benches exacerbate drainage issues and pose a challenge to ongoing maintenance activities. Due to the relatively flat slope of the benches and the maintenance issues associated with this vegetation, inset ditches lined with Class II channel lining underlain by Type IV filter fabric are recommended.

The original plan for the facility was to drain the first (lowest) bench toward a series of connector channels that carried the water off the slope to a ditch at the toe of the fill. The toe ditch has already been repaired and lined with Class II Channel Lining to restore drainage. The efforts herein will include constructing approximately 1400 linear feet of ditch at the back of the first bench to collect runoff and drain it positively toward the collector channels.

For the second (middle) and third (upper) benches the original plan called for them to convey water along their length toward the east where they would empty into the stilling basin. A ditch slope 0.5-percent is the minimum recommended for maintaining this drainage. In order to achieve that slope, soil fill was required for approximately 1500 feet of the second bench and approximately 1000 feet of the third bench.



General Requirements and Specifications

1. The bench and ditch construction described herein should consist of placing fill according to the specification and instructions below and/or: undercutting the existing cover soil a minimum of 1'; placing Type IV geotextile fabric to line the ditch (as per KYDOT Standard Specifications for Road and Bridge Construction, current edition); and using a minimum of 2' of Class II Channel Lining (Rip-Rap) (as per KYDOT Standard Specifications for Road and Bridge Construction, current edition) to bring the ditch to the specified grade. Where indicated the ditches shall be tied into the previously constructed ditches and repaired areas. At interface areas, there should be no gap in Filter Fabric lining. A plan view with typical cross-sections and location coordinates for each of the benches is attached to this letter.

2. A minimum of 1' of cover soil should remain in the on the slope or in the ditches before the filter fabric is placed. If undercutting reveals gypsum, then additional cover soil needs to be placed to achieve this minimum. The existing access road on the second (middle) bench will have to be raised and graded as needed for rip-rap placement in the ditch not to exceed the road elevation. The bench should be raised using soil from the slope excavation or from other borrow areas on site, and should be raised accordingly to provide better drainage channel runoff for the completed ditch.

3. Where intermediate benches will serve as access roadways per the instruction of TVA, upon achieving the final grade configuration, the bench shall be stabilized with No. 4 Stone as necessary to provide a smooth drivable surface for construction equipment and to facilitate inspections of the area. Otherwise, the bench surfaces shall be vegetated according to TVA standards.

4. It is recommended that construction measures be monitored by Stantec personnel. Field adjustments to the repairs will be necessary as the construction progresses and should be agreed on between TVA construction personnel and Stantec's on-site engineering technician.

Soil Fill Requirements and Specifications

1. **Specifications:** Given below are the specifications for using mine spoils (available on site) as bench regrading material. It is to be noted that the mine spoils encountered at the project site are heterogeneous in composition. The specifications presented below may need to be adjusted or modified in the field by the Engineer or Engineer's representative based on ground conditions observed.

2. **Mine Spoils:** It is recommended that the mine spoils consist of plastic clays, free of vegetation, topsoil, organics, wet soil, construction debris or industrial by-product. The borrow material shall classify as CH, or CL according to the Unified Soil Classification System. The material shall contain no stones whose largest dimension exceeds three inches. The compaction requirements for mine spoils are presented in the following sections.

3. **Fill Placement:** Contractor shall place fill (mine spoils) to lines and grades shown on the attached drawings. Certain exceptions will be made in areas where field adjustments are to be made during construction. These changes shall be approved by the Engineer or Engineer's Representative before being implemented.

4. **Preparing Ground Surface:** The intermediate benches along south dike consist of several soft areas with standing water. It is recommended that the soft areas be stabilized prior to placing any new fill. This will include undercutting soft soils and proof rolling the surface. If the undercutting needed is more than 18 inches, Contractor shall use class II channel lining (choked with no. 57 stone) to stabilize the ground surface prior to fill placement. Final surface shall be approved by the Engineer or Engineer's Representative prior to fill placement.

5. **Material Spreading:** The distribution and gradation of mine spoils throughout fill areas shall be free from lenses, pockets, streaks or layers of material differing substantially in texture or gradation from the surrounding material. The placing operations shall be performed such that the material being compacted will be blended sufficiently to secure the best practicable degree of compaction and stability.

6. **Layer Thickness:** The thickness of the layers before compaction shall not be more than eight (8) inches. No material shall be placed in the fill by dumping in piles or windrow incorporated in a layer in that position. Instead, the material shall be moved and spread by blading or similar approved methods. Material coming from an offsite location in the form of large lumps or masses shall be pulverized by disking, harrowing, or by the use of mechanical pulverizers prior to compacting. All lumps or masses, whose largest dimension exceeds six (6) inches, shall be broken down prior to compacting. When the top surface of a layer becomes too dry or too smooth to permit suitable bond with the subsequent layer, the Contractor shall loosen the material by scarifying or disking.

7. **Moisture Control:** During compaction operations, the material being placed shall be maintained within minus two percent (-2%) of optimum moisture content to plus four percent (+4%) of optimum moisture content as determined by ASTM D 698. The moisture content shall be controlled in the following manner:

   7.1. Water may be added to the fill materials at the source or after the material has been brought onto the dike, whichever is the more practical. When material deposited on the dike is too dry, the Contractor shall be required to sprinkle each layer and obtain uniform moisture distribution in the layer by disking, blading or other approved methods. The amount of water applied shall be accurately controlled so that free water will not appear on the surface during or after compaction operations.

   7.2. Material deposited on the fill that is too wet shall be removed or spread and permitted to dry, assisted by disking or blading, if necessary, until the moisture content is reduced to the specified limits.

   7.3. When the top surface of a layer becomes too dry or too smooth to permit suitable bond with the subsequent layer, the Contractor shall loosen the material by scarifying or disking. The Contractor shall moisten the loosened material to

acceptable moisture content and re-compact the material to the specified density. Traversing the fill surface with tamping foot compactor or track equipment may not achieve adequate scarification.

7.4. Adjustments of moisture content will be made on the basis of determination of moisture by field tests as construction progresses.

8. **Compaction Equipment:** Compaction equipment shall conform to the following requirements and shall be used as prescribed in subsequent paragraphs.

8.1. Self-Propelled Tamping Rollers: The use of self-propelled non-vibratory tamping rollers conforming to the following specifications will be permitted. Their design and operation shall be subject to the approval of the Engineer, who shall have the right, at any time during execution of the Work, to direct such modifications of the tamping feet or variations in roller drum weight as may be found necessary to secure specified compaction of the dike materials. If the use of self-propelled tamping rollers causes shearing of the fill, laminations in the fill, or results in inadequate compaction, the Engineer may direct such rollers be removed from the fill and appropriate tamping rollers used. The self-propelled unit shall consist of two rear and two front independent tamping rollers that can oscillate so as to maintain positive contact with the material being compacted. The unit shall have a minimum operating weight of 70,000 pounds equally distributed to each drum. The minimum drum width shall be 3.5 feet. The unit shall also be equipped with a hydraulic front blade for the purpose of spreading earth and rock material. Four-drum equipment separated by cab and differential shall be arranged in tandem with the drums positioned such that the prints of the tamping feet are staggered. The surface on which the tamping feet are mounted shall have a minimum outside diameter of four feet and at least one tamping foot for each 100 square inches of drum surface. The distance between the centers of any two adjacent tamping feet shall be not less than nine inches. The length of each tamping foot from the outside mounting surface of the drum shall be not more than 11 inches and shall be maintained at not less than nine inches. The bearing surface of each tamping foot shall have a chevron tip design and surface area of not less than seven square inches or more than 14 square inches. Cupped recesses within the bearing surface of each tamping foot will be permitted but shall not exceed 0.5 inch in depth. During rolling operations, the spaces between the tamping feet shall be maintained clear of materials that may impair the effectiveness of the tamping roller. The weight of all roller drums during the compaction of fill materials shall be uniformly maintained such that the weight per foot of drum length is not less than 4,300 pounds. Self-propelled rollers shall be operated at speeds of no more than 5.0 miles per hour.

8.2. Smooth Drum Vibratory Rollers: Smooth drum vibratory rollers shall be equipped with a smooth steel compaction drum and shall be operated at a frequency of vibration during compaction operations between 1,400 and 1,800 vibrations per minute (vpm). Vibratory rollers must be self-propelled and shall have an unsprung drum weight that is a minimum of 60 percent of the rollers' static weight. Rollers shall

have a minimum static weight of 30,000 pounds, a minimum dynamic force of 70,000 pounds when operating at 1,400 vpm, and an applied force not less than 10,000 pounds per foot of compaction drum length. The total applied force shall be the sum of the centrifugal force and the drum module weight. The level of amplitude and vibration frequency during compaction shall be maintained uniformly throughout the embankment zone within which it is operating. Rollers shall be operated at speeds which will result in a minimum of 10 impacts per foot of roller travel. The equipment manufacturer shall provide sufficient data, drawings, and computations to verify that the proposed equipment meets the above specifications. The character and efficiency of this equipment shall be subject to the approval of the Engineer.

8.3. Tamping Foot Vibratory Rollers: Tamping foot vibratory rollers shall have the same requirements as mentioned above except that the drum shall be equipped with tamping feet. The character and efficiency of this equipment shall be subject to approval of the Engineer.

8.4. Manual Tampers: In areas where it is impracticable to use a self propelled roller, compaction of material shall be performed by the use of approved manual tampers. To the extent practical, "walk-behind" manual tamping foot rollers shall be used. Manual tamping foot rollers shall be designed with a minimum operating weight of 2,750 pounds, shall exert a minimum centrifugal force of 8,000 pounds, and shall have a means of self-cleaning the tamping feet. Where not accessible to other equipment, manually operated rammers may be used only if approved by the Engineer. Manually operated rammers shall have a minimum operating weight of 135 pounds and shall exert at least 3,000 pounds per blow.

8.5. Discs: Discs shall have at least two gangs hooked in tandem and shall be sized to penetrate the fill lift thickness, when compacted, of at least eight inches. The width of cut shall be less than 12 feet. Disc blades shall be notched, spaced a minimum of 16 inches, and have a minimum diameter of 36 inches. Wear-down shall not exceed 10 percent of the new disc diameter, at which time disc blades will be removed and replaced with new blades. The disc shall be equipped with self-cleaning scrapers to prevent the accumulation of soil and debris between the disc blades while operated at speeds to ensure mixing and blending of materials. The angle of cut shall be adjustable while the tool is in operation.

9. Compaction Requirements: Compaction shall conform to the following requirements.

9.1. After each layer of material has been placed, spread, and contains the required moisture, it shall be compacted by passing the self propelled tamping roller, over the entire surface of the layer a sufficient number of times to obtain the specified density. Adjustments in compactive effort shall be made on the basis of field density determinations made as construction progresses or visual observations by the Engineer or Engineer's representative.

9.2. Material shall be compacted to 95 percent of its maximum dry density as determined by ASTM D 698. In-place moisture shall be within minus two percent (-2%) of optimum moisture content to plus four percent (+4%) of optimum moisture as determined by ASTM D 698. In-place material not meeting these specifications shall be reworked until satisfactory results are obtained. The compacted surface shall be approved by the Engineer or Engineer's representative before placing next layer on top.

9.3. Field compaction tests, utilizing the nuclear method outlined in ASTM D 2922 or other approved methods, will be made as the construction proceeds. The tests will be performed by the Engineer or Engineer's representative.

9.4. The final surface of the bench in all areas shall be smooth and free of rocks, stones or any protruding objects.

Closure

The objective of the repairs described here is to restore the benches to promote positive drainage and reduce maintenance issues. The Contractor is advised to review the enclosed plans carefully and contact TVA and Stantec immediately if any discrepancies are noted.

Sincerely,

STANTEC CONSULTING SERVICES INC.

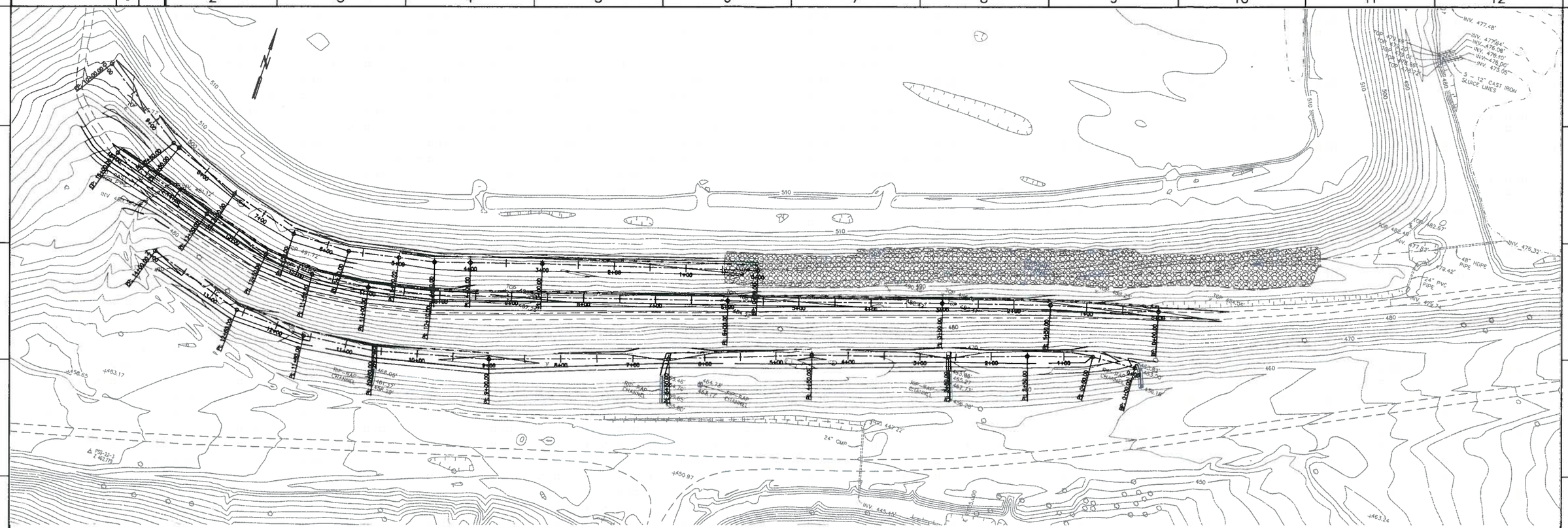
Sharath Vemuri

Sharath C. Vemuri, PE
Senior Project Engineer

Sharath Vemuri for

Hugo R. Aparicio, PE
Principal

/cmw



Section or Detail No.

Sheet Where Shown

REFERENCE KEY

ISSUED FOR CONSTRUCTION

NOTES:

1. Topographic mapping was obtained from an aerial survey performed by Tuck Mapping Solutions, Inc. on February 22, 2009 and conventional survey performed by Stantec on February 12, 2009.
2. Horizontal coordinates are based on the Kentucky State Plane South NAD27 coordinate system with units of feet. The vertical datum referenced is NGVD 29.
3. Contractor shall also refer to the letter of recommendations prepared by Stantec for this work.
4. The dimensions and limits of repairs shown on this drawing are subject to field adjustment by Stantec's on-site representative.
5. The objective of this work is to regrade the intermediate benches and construct drainage ditches to facilitate positive drainage and eliminate ponded areas. The minimum ditch slope used shall be 0.5%.
6. If waste material is encountered during the course of construction, Contractor shall undercut the area a minimum of 12" below proposed grade and backfill with soil material. The goal is to maintain 12" minimum soil cover over waste material in all locations. Waste material shall be handled per instruction of TVA authorities.

REV NO.	DATE	DESIGN	DRAWN	CHKD	SUPV	PMDD	APPD	ISSD	PROJECT ID	AS CONST	DISCIPLINE INTERFACE
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	03/09	ELC	JRF	ELC	HRA	–	–	–	–	–	–
INITIAL ISSUE											

SCALE: AS SHOWN EXCEPT AS NOTED

FACILITIES ASSESSMENT
PAF GYPSUM STACK PHASE 2

SOUTH SLOPE OF WEST POND SLOPE AND DITCH REPAIRS

—

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
E. CAUDILL	R. FLYNN	E. CAUDILL	H. APARICIO	–		

PARADISE CREEK FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2008	DATE 03/09	34	C	XXWXXX-01	R 0

PLOT FACTOR:XX
W_TVA

C.A.O. DRAWING
DO NOT ALTER MANUALLY

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000
www.stantec.com

–	–
TASK COMPLETED BY:	REV NO.

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XXWXXX | C | 34

Attachment 1B

Stantec

April 2, 2009 ltr_010_paf_171468118

Mr. Alan Casaday
Tennessee Valley Authority
1101 Market Street, LP 5E-C
Chattanooga, Tennessee 37402

Re: Slope and Ditch Repairs
Exterior Slope of Gypsum Stack Near South Side of West Pond
TVA Facilities Assessment Project
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Casaday:

On March 31, 2009 Stantec issued a work plan and specifications for the repairs described above. Absent from those plans were instructions for dealing with the outlet of subgrade drains along the outslope benches of the gypsum stack. A typo was also discovered for one of the coordinates of the bench alignments. These issues have been corrected on the attached work plan. The requirements and specifications in our March 31, 2009 letter apply as originally stated.

Please feel free to contact us if you have any questions or comments, or if any other discrepancies are noted.

Sincerely,

STANTEC CONSULTING SERVICES INC.

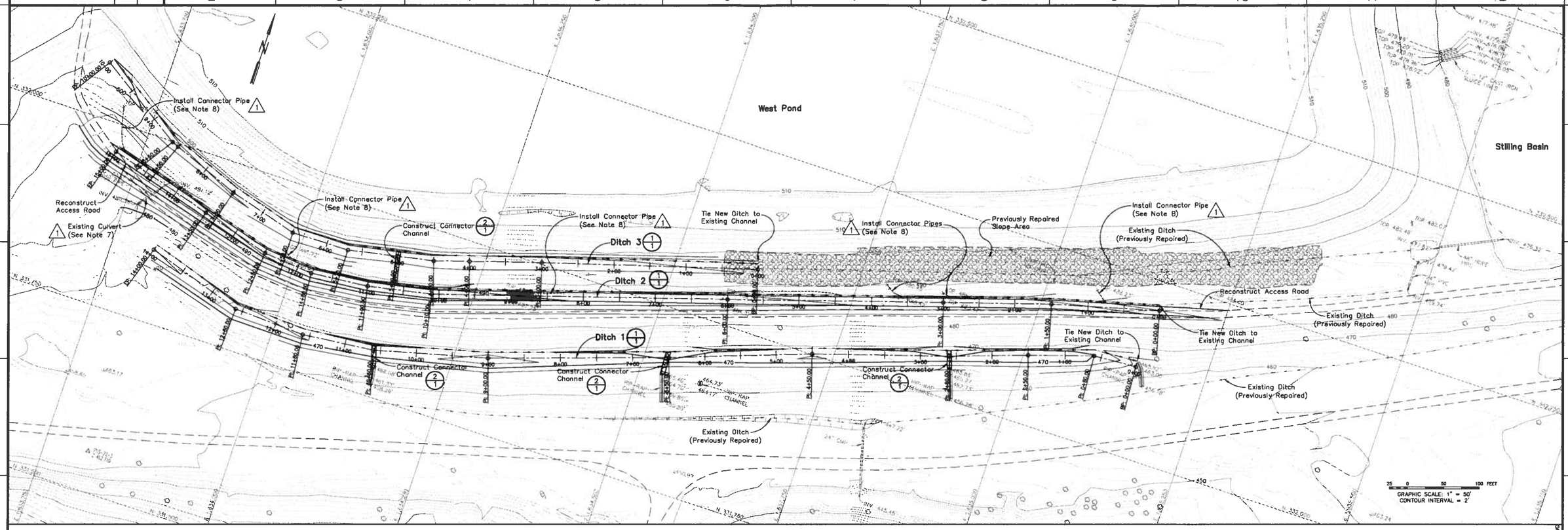
Erman Caudill

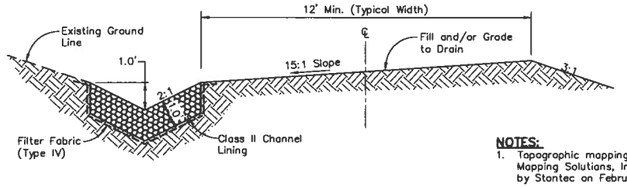
Erman Caudill, PE, CFM
Associate, Sr. Project Engineer

/cmw

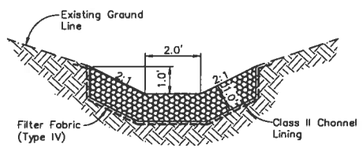
Enclosures: 1 Work Plan, Revision #1

cc: Mr. William Perry (TVA)





1/1 DETAIL – TYPICAL BENCH AND DITCH
SCALE: 1"=2'



2/1 DETAIL – TYPICAL CONNECTOR DITCH
SCALE: 1"=2'

NOTES:

1. Topographic mapping was obtained from an aerial survey performed by Tuck Mapping Solutions, Inc. on February 22, 2009 and conventional survey performed by Stantec on February 12, 2009.
2. Horizontal coordinates are based on the Kentucky State Plane South NAD27 coordinate system with units of feet. The vertical datum referenced is NGVD 29.
3. Contractor shall also refer to the letter of recommendations prepared by Stantec for this work.
4. The dimensions and limits of repairs shown on this drawing are subject to field adjustment by Stantec's on-site representative.
5. The objective of this work is to regrade the intermediate benches and construct drainage ditches to facilitate positive drainage and eliminate ponded areas. The minimum ditch slope used shall be 0.5%.
6. If waste material is encountered during the course of construction, Contractor shall undercut the area a minimum of 12" below proposed grade and backfill with soil material. The goal is to maintain 12" minimum soil cover over waste material in all locations. Waste material shall be handled per instruction of TVA authorities.
1 7. Remove existing culvert and backfill with compacted soil as illustrated. All drainage from Bench 2 and Bench 3 shall be conveyed to the east and discharge to the Stilling Basin.
1 8. Existing subdrain pipes shall be extended down gradient to drain positively to the drainage ditch along Bench 2. In no case shall subdrains be terminated below Bench 2 or outlet onto the slopes. Subdrains shall be outletted to day light and shall not be terminated below the finish grade. An extension of HDPE corrugated drain pipe or other pipe of consistent material and dimension shall be used. Pipe fittings or other means recommended by the pipe manufacturer shall be used to connect pipes and form a water tight seal. If existing conditions prevent this connection, field adjustment may be required as instructed by Stantec's on-site representative.

PLAN – WEST POND SOUTH DRAINAGE DITCH
SCALE: 1"=50'

DITCH 1 COORDINATE TABLE

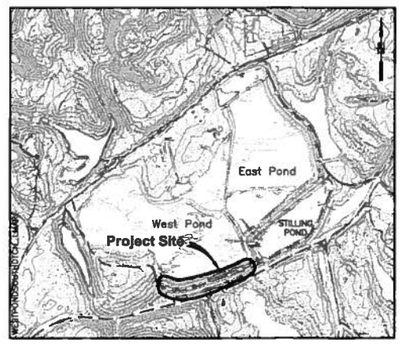
Station	Easting	Northing	Bench Centerline Existing Elevation	Bench Centerline Proposed Elevation	Ditch C.L. Proposed Elevation	Description
0 + 00	1,635,151.9	332,125.5	464.44	469.50	468.10	Start
0 + 80	1,635,092.0	332,121.5	466.72	470.10	468.70	PI
1 + 50	1,635,009.4	332,093.9	467.26	471.00	469.60	PI, PVI
2 + 60	1,634,902.4	332,058.0	466.18	469.90	468.50	PI, PVI, Connector
4 + 50	1,634,721.2	332,000.8	467.18	471.80	470.40	PI, PVI
6 + 50	1,634,533.0	331,933.1	466.52	469.80	468.40	PI, PVI, Connector
9 + 00	1,634,298.1	331,853.4	466.88	472.30	470.90	PI, PVI
10 + 80	1,634,141.1	331,813.5	467.73	470.70	469.30	PI, PVI, Connector
11 + 80	1,634,041.7	331,803.1	468.00	471.70	470.30	PI
12 + 80	1,633,941.8	331,807.5	469.50	472.70	471.30	PI
14 + 00	1,633,808.1	331,849.2	473.56	474.10	472.70	End

DITCH 2 COORDINATE TABLE

Station	Easting	Northing	Bench Centerline Existing Elevation	Bench Centerline Proposed Elevation	Ditch C.L. Proposed Elevation	Description
0 + 00	1,635,158.6	332,210.0	482.87	485.50	484.10	Start
1 + 50	1,635,013.9	332,171.0	483.21	486.25	484.85	PI
3 + 00	1,634,870.8	332,126.0	482.89	487.00	485.60	PI
6 + 00	1,634,584.9	332,035.3	484.12	488.50	487.10	PI
10 + 10	1,634,193.3	331,913.0	485.66	490.53	489.15	PI
11 + 00	1,634,105.3	331,895.2	485.41	491.00	489.60	PI
11 + 80	1,634,025.6	331,887.8	486.65	491.40	490.00	PI
12 + 50	1,633,955.9	331,894.0	487.02	491.75	490.35	PI
13 + 50	1,633,859.8	331,920.7	488.19	492.25	490.85	PI
15 + 00	1,633,715.4	331,962.3	485.47	493.00	491.60	End

DITCH 3 COORDINATE TABLE

Station	Easting	Northing	Bench Centerline Existing Elevation	Bench Centerline Proposed Elevation	Ditch C.L. Proposed Elevation	Description
0 + 00	1,634,611.9	332,068.4	493.72	495.50	494.10	Start
3 + 00	1,634,324.4	332,002.7	495.12	497.00	495.60	PI
4 + 00	1,634,229.0	331,972.8	496.78	497.50	496.10	PVI
4 + 50	1,634,181.4	331,957.6	495.73	497.00	495.60	PI
5 + 00	1,634,132.3	331,947.8	495.84	496.50	495.10	PVI, Connector
5 + 70	1,634,063.7	331,934.1	495.07	496.85	495.45	PI
8 + 50	1,633,983.7	331,933.0	495.91	497.25	495.85	PI
7 + 50	1,633,887.3	331,959.8	496.15	497.75	496.35	PI
8 + 50	1,633,794.0	331,995.8	497.48	498.25	496.85	PVI
8 + 80	1,633,764.8	331,899.1	497.32	498.45	497.05	PI
10 + 00	1,633,667.9	332,078.4	501.84	501.25	499.65	End



LOCATION MAP
SCALE: 1"=1000'

LEGEND

1 Denotes Revision

Section or Detail No.

Sheet Where Shown

REFERENCE KEY

ISSUED FOR CONSTRUCTION

REV NO.	DATE	DESIGN	DRAWN	CHKED	SUPV	APPD	ISSUED	PROJECT MGR	AS CONST
R 1	04/09	ELC	ACC	ELC	HRA	–	–	–	–
REVISED TO ADDRESS SLOPE DRAIN OUTLET PIPES									
R 0	03/09	ELC	JRF	ELC	HRA	–	–	–	–
INITIAL ISSUE									

SCALE: AS SHOWN EXCEPT AS NOTED

FACILITIES ASSESSMENT
PAF GYPSUM STACK PHASE 2

SOUTH SLOPE OF WEST POND SLOPE AND DITCH REPAIRS

–

Stantec

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000
www.stantec.com

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
E. CAUDILL	R. FLYNN	E. CAUDILL	H. APARICIO	–		

PARADISE CREEK FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2008	DATE 03/09	34	C	XXWXXX–01	R 0

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TASK COMPLETED BY: – REV NO. –

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XXWXXX C 34

Attachment 2

During Construction

During Construction

During Construction

During Construction

After Construction

After Construction

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

February 11, 2010 let_020_paf_175569040

Mr. Chris Buttram, PE
Tennessee Valley Authority
Fossil Power Group
1101 Market Street, MS LP 2E-C
Chattanooga, Tennessee 37402

Re: Construction Work Plan Closure
Work Plan No. PAF-LT-090417
Scrubber Sludge Complex
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Buttram:

Stantec Consulting Services Inc. (Stantec) would like to issue this letter requesting closure of the above mentioned work plan. Pertinent details of the work plan are presented in Table 1.

Table 1: Work Plan Details

Work Plan Issue Date	Subject	Reference No.	Status (P=Planning, W=In Progress, C=Complete)	Const. Start Date	Const. Complete Date
04/17/09	Gypsum Stack-East Pond Slope Toe Buttress	PAF-LT-090417 (let_012_paf_171468118)	C	05/12/09	06/08/09

Based on the observations made in the field during construction, a review of daily field reports, photos and available information, it is our opinion that the buttress was constructed to match reasonably well with the recommendations in our work plan. Pertinent attachments for documentation are included along with this letter. These include original work plan issued by Stantec on April 17, 2009 and selected photos from the field. The record drawing for

TVA's business support library will be submitted electronically. Daily field reports for the project have already been submitted to TVA.

We appreciate this opportunity and look forward to continue working with you on this project. If you have any questions or required additional information, please contact us.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Sharath C. Vemuri, PE
Senior Project Engineer

/rws

Attachment 1

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

April 17, 2009 let_012_paf_171468118

Mr. Alan Casaday
Tennessee Valley Authority
1101 Market Street, LP 5E-C
Chattanooga, Tennessee 37402

Re: East Pond Slope Toe Buttress near
North East Corner of Stilling Pond
TVA Facilities Assessment Project
Scrubber Sludge Complex (Gypsum Stack)
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Casaday:

Stantec Consulting Services Inc. (Stantec) has been assisting TVA with repairs associated with slope stability, drainage, and maintenance issues for the above referenced facility. The current work plan has been prepared by Stantec to address the slumps observed at the toe of the east pond slope near the north east corner of the stilling pond. This work plan includes a brief description of the project site and provides recommendations for buttressing slumped area of the slope.

Description

An area of the east pond south slope approximately 90 feet wide near the north east corner of the stilling pond (See Figure 1) has slumped toward the pond. As requested by Stantec, a survey was conducted by TVA to delineate this area. In addition, TVA also performed a hydrographic survey to map the bottom of the stilling pond. Survey information obtained from TVA was used in designing the repairs presented in this work plan.

Toe Buttress

Based on the visual observations made by Stantec and the survey information provided by TVA, Stantec recommends that a toe buttress using class III channel lining be constructed to improve the stability of the area in question. The toe buttress proposed would be similar to the one recently constructed by HED near the south east corner of the west pond. In order to assist HED with the layout and construction of the toe buttress, Stantec has prepared a

drawing with relevant survey information and construction details. HED shall refer to this drawing as needed during the construction. Recommendations for the repair work are presented in the following paragraphs.

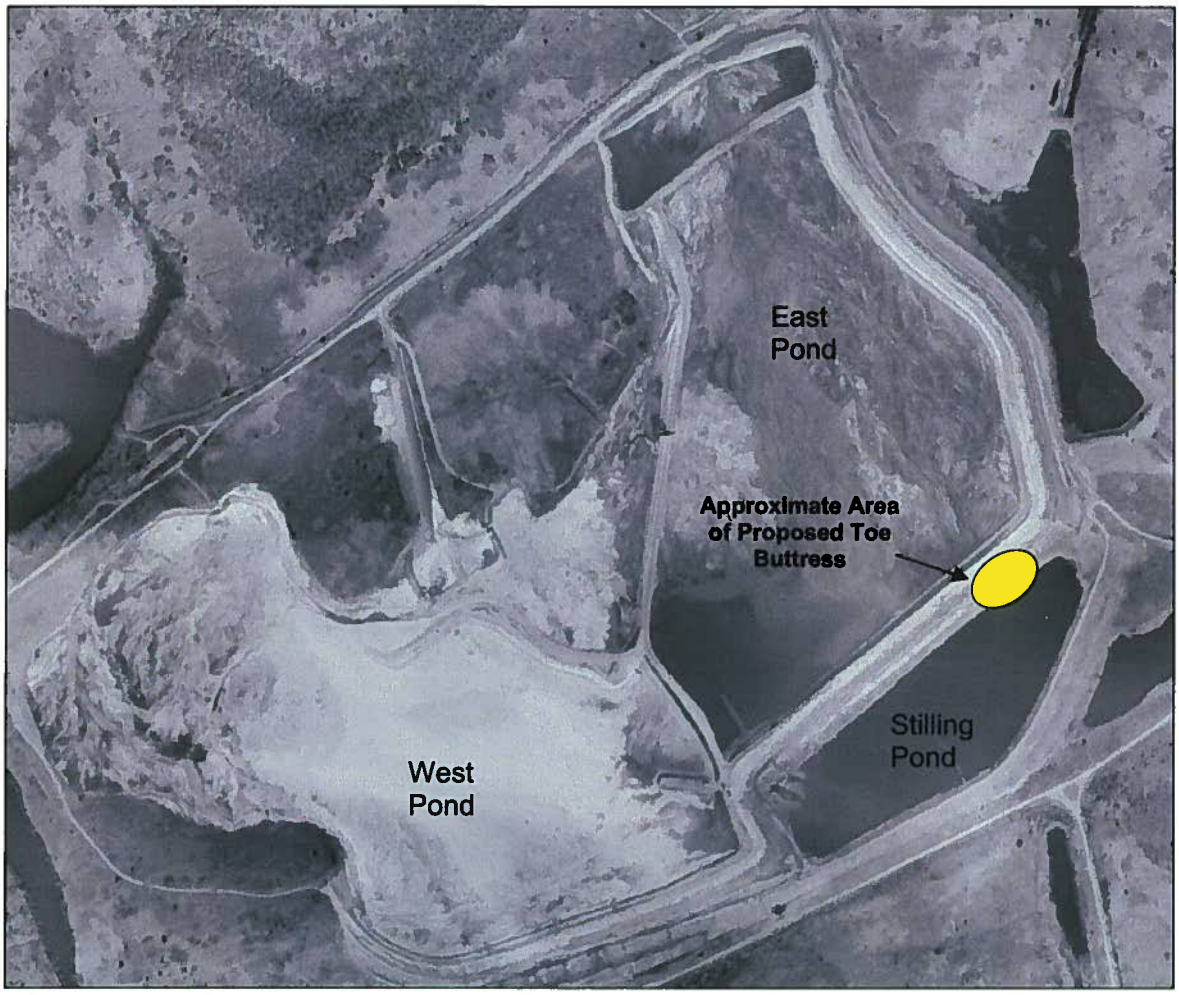


Figure 1. Project Site Location

Repair Construction Recommendations

- Contractor shall make an attempt to remove all vegetation from the area to be stabilized.
- As with the construction of the previous buttress, it is recommended that an excavator be used to probe the bottom of the pond (foundation area or buttress subgrade) and attempt to flatten this area by removing some of the sediment.
- Place 24-inch thick layer of class III channel lining (as per KYDOT Standard Specifications for Road and Bridge Construction, current edition) to stabilize the subgrade.
- Place an additional layer of crushed stone and determine (by visual observation) whether these initial layers remain stable.
- Continue placing crushed stone up to near the normal pool elevation.
- Place filter fabric (Type I) on the slope area above the water and continue building the buttress as shown on the attached drawing. Recommended filter fabric is US270NW by US Fabrics inc.
- The class III channel lining should be placed in 24-inch thick layers and compacted with heavy dozer passes.
- It is recommended that construction measures be monitored by Stantec personnel. Field dimension adjustments will be necessary as the fieldwork progresses and should be agreed on between TVA construction personnel and Stantec representatives.

Closure

The recommended work described in this work plan has been discussed in the field with William Perry (HED). The objective of this repair is to buttress the toe of the slope in the area. The Contractor is advised to review the enclosed drawing carefully and contact Stantec for any clarifications, if needed.

Sincerely,

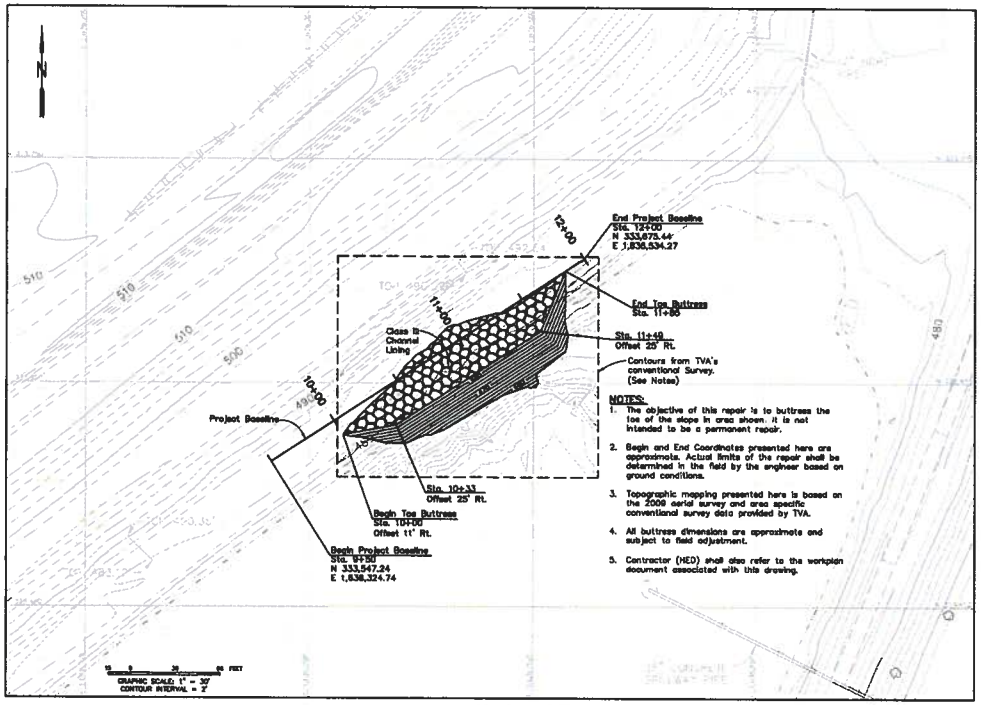
STANTEC CONSULTING SERVICES INC.

Sharath C. Vemuri, PE
Senior Project Engineer

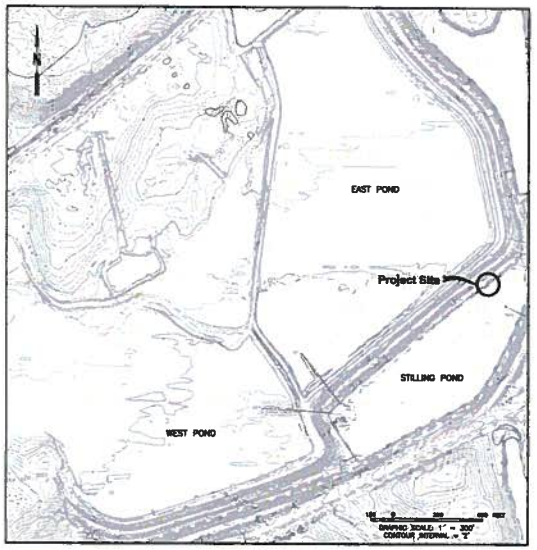
Sharath Vemuri, for

Hugo R. Aparicio, PE
Principal

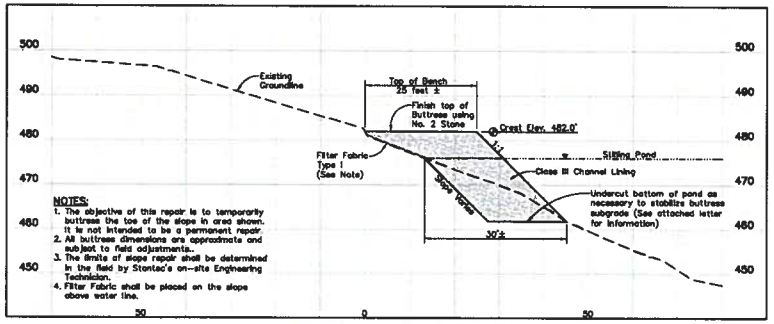
/cmw



PLAN – TEMPORARY BUTTRESS
SCALE: 1"=30'



LOCATION MAP
SCALE: 1"=300'



TYPICAL CROSS SECTION – TEMPORARY BUTTRESS
SCALE: 1"=10'

ISSUED FOR CONSTRUCTION

Stantec

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2029
859-422-3000
www.stantec.com

REV	DATE	DRAWN	DESIGN	CHECKED	APPROVED
R 0	04/09	SCV	DMD	SCV	MRA

INITIAL ISSUE

SCALE: AS SHOWN
EXCEPT AS NOTED

YARD
PAF GYPSUM STACK

EAST POND SLOPE TOE BUTTRESS
NEAR NORTHEAST CORNER OF
STILLING POND

DESIGNED BY	DRAWN BY	CHECKED BY	QUALITY CONTROL BY	SUPERVISED BY	APPROVED BY
S. VISAGE	A. DRAKE	S. VISAGE	R. JOHNSON		

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2008	DATE 04/09	64	C	XXWXXX-01	R 0

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TASK COMPLETED BY: –
REV NO. –

64 C XXWXXX-01

Attachment 2

Rock Buttress during construction

Rock Buttress during construction

Rock Buttress after construction

Rock Buttress after construction

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington, KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

February 19, 2010 let_021_paf_ 175569040

Mr. Chris Buttram, PE
Tennessee Valley Authority
Fossil Power Group
1101 Market Street, MS LP-2G-C
Chattanooga, Tennessee 37402

Re: Construction Work Plan Closure
Work Plan No. PAF-LT-090420
Scrubber Sludge Complex
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Buttram:

Stantec Consulting Services Inc. (Stantec) would like to issue this letter requesting closure of the above mentioned work plan. Pertinent details of the workplan are presented in Table 1.

Table 1. Work Plan Details

Workplan Issue Date	Subject	Reference No.	Status (P=Planning, W=In Progress, C=Complete)	Const. Start Date	Const. Complete Date
04/20/09	Gypsum Stack East Pond Exterior Slope and Ditch Repairs	PAF-LT-090420 (let_013_paf_171468118)	C	06/01/09	11/19/09

Based on the observations made in the field during construction, a review of daily field reports, photos and available information, it is our opinion that the slope and ditch repairs were performed to match reasonably well with the recommendations in our work plan. Pertinent attachments for documentation are included along with this letter. These include original work plan issued by Stantec on April 20, 2009 and selected photos from the field. The record drawing for TVA's business support library will be submitted electronically. Daily field reports for the project have already been submitted to TVA.

We appreciate this opportunity and look forward to continue working with you on this project. If you have any questions or required additional information, please contact us.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Sharath C. Vemuri, PE
Senior Project Engineer

/rdr

Attachment 1

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

April 20, 2009

ltr_013_paf_171468118

Mr. Alan Casaday
Tennessee Valley Authority
1101 Market Street, LP 5E-C
Chattanooga, Tennessee 37402

Re: Slope and Ditch Repairs
Exterior slope of Scrubber Sludge Facility near South and East Sides of East Pond
TVA Facilities Assessment Project
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Casaday:

Stantec Consulting Engineers Inc. (Stantec) has been assisting TVA with repairs associated with slope stability, drainage, and maintenance issues for the above referenced facility. The south and east slopes of the east pond has recognized drainage issues and this letter includes recommendations for those repair measures. The goal of these repairs is to bring the facility closer to compliance with the permit/design drawings and promote positive drainage and stormwater runoff along the intermediate benches.

Recommendations

At present the intermediate benches in this area are relatively flat and do not drain well. The benches have been constructed with little or no slope and re-grading is needed to restore the slopes to the desired configuration. Because of the relatively shallow cover soil material currently on the benches and the need to avoid exposing underlying by-product material, additional soil fill will be required to revise the grades. A material specification and special construction instructions for the soil fill are included below. Vegetative growth along the benches exacerbate drainage issues and pose a challenge to ongoing maintenance activities. Due to the relatively flat slope of the benches and the maintenance issues associated with this vegetation, inset ditches lined with Class II channel lining underlain by Type I filter fabric are recommended.

The overall plan for the East pond is to drain the outslope benches toward the Stilling Pond through a series of ditches and connector channels that carry the water off the slope to a ditch at the toe of the fill. The toe ditch has already been repaired and lined with Class II Channel Lining to restore drainage. The efforts herein will include constructing approximately 3,800 linear feet of ditch at the back of the first bench to collect runoff and

drain it positively toward the collector channels and stilling pond. Because of the shallow soil cover and length of the bench, soil fill will be required to establish positive grade for the ditch.

General Requirements and Specifications

1. The bench and ditch construction described herein should consist of placing fill according to the specification and instructions below and/or: undercutting the existing cover soil a minimum of 1'; placing Type I geotextile fabric to line the ditch (as per KYDOT Standard Specifications for Road and Bridge Construction, current edition) recommended filter fabric is US270NW by US Fabrics Inc. or equivalent with approval by TVA; and using a minimum of 2' of Class II Channel Lining (Rip-Rap) (as per KYDOT Standard Specifications for Road and Bridge Construction, current edition) to bring the ditch to the specified grade. Where indicated the ditches shall be tied into the previously constructed

ditches and repaired areas. At interface areas, there should be no gap in Filter Fabric lining. A plan view with typical cross-sections and location coordinates for each of the benches is attached to this letter.

2. A minimum of 1' of cover soil should remain in the on the slope or in the ditches before the filter fabric is placed. If undercutting reveals gypsum, then additional cover soil needs to be placed to achieve this minimum. The existing access road on the second (middle) bench will have to be raised and graded as needed for rip-rap placement in the ditch not to exceed the road elevation. The bench should be raised using soil from the slope excavation or from other borrow areas on site, and should be raised accordingly to provide better drainage channel runoff for the completed ditch.

3. Where intermediate benches will serve as access roadways per the instruction of TVA, upon achieving the final grade configuration, the bench shall be stabilized with No. 4 Stone as necessary to provide a smooth drivable surface for construction equipment and to facilitate inspections of the area. Otherwise, the bench surfaces shall be vegetated according to TVA standards.

4. It is recommended that construction measures be monitored by Stantec personnel. Field adjustments to the repairs will be necessary as the construction progresses and should be agreed on between TVA construction personnel and Stantec's on-site engineering technician.

Soil Fill Requirements and Specifications

1. **Specifications:** Given below are the specifications for using mine spoils (available on site) as bench regrading material. It is to be noted that the mine spoils encountered at the project site are heterogeneous in composition. The specifications presented below may need to be adjusted or modified in the field by the Engineer or Engineer's representative based on ground conditions observed.

2. **Mine Spoils:** It is recommended that the mine spoils consist of plastic clays, free of vegetation, topsoil, organics, wet soil, construction debris or industrial by-product. The borrow material shall classify as CH, or CL according to the Unified Soil Classification System. The material shall contain no stones whose largest dimension exceeds three inches. The compaction requirements for mine spoils are presented in the following sections.

3. **Fill Placement:** Contractor shall place fill (mine spoils) to lines and grades shown on the attached drawings. Certain exceptions will be made in areas where field adjustments are to be made during construction. These changes shall be approved by the Engineer or Engineer's Representative before being implemented.

4. **Preparing Ground Surface:** The intermediate benches along south dike consist of several soft areas with standing water. It is recommended that the soft areas be stabilized prior to placing any new fill. This will include undercutting soft soils and proof rolling the surface. If the undercutting needed is more than 18 inches, Contractor shall use class II

channel lining (choked with no. 57 stone) to stabilize the ground surface prior to fill placement. Final surface shall be approved by the Engineer or Engineer's Representative prior to fill placement.

5. **Material Spreading:** The distribution and gradation of mine spoils throughout fill areas shall be free from lenses, pockets, streaks or layers of material differing substantially in texture or gradation from the surrounding material. The placing operations shall be performed such that the material being compacted will be blended sufficiently to secure the best practicable degree of compaction and stability.

6. **Layer Thickness:** The thickness of the layers before compaction shall not be more than eight (8) inches. No material shall be placed in the fill by dumping in piles or windrow incorporated in a layer in that position. Instead, the material shall be moved and spread by blading or similar approved methods. Material coming from an offsite location in the form of large lumps or masses shall be pulverized by disking, harrowing, or by the use of mechanical pulverizers prior to compacting. All lumps or masses, whose largest dimension exceeds six (6) inches, shall be broken down prior to compacting. When the top surface of a layer becomes too dry or too smooth to permit suitable bond with the subsequent layer, the Contractor shall loosen the material by scarifying or disking.

7. **Moisture Control:** During compaction operations, the material being placed shall be maintained within minus two percent (-2%) of optimum moisture content to plus four percent (+4%) of optimum moisture content as determined by ASTM D 698. The moisture content shall be controlled in the following manner:

7.1. Water may be added to the fill materials at the source or after the material has been brought onto the dike, whichever is the more practical. When material deposited on the dike is too dry, the Contractor shall be required to sprinkle each layer and obtain uniform moisture distribution in the layer by disking, blading or other approved methods. The amount of water applied shall be accurately controlled so that free water will not appear on the surface during or after compaction operations.

7.2. Material deposited on the fill that is too wet shall be removed or spread and permitted to dry, assisted by disking or blading, if necessary, until the moisture content is reduced to the specified limits.

7.3. When the top surface of a layer becomes too dry or too smooth to permit suitable bond with the subsequent layer, the Contractor shall loosen the material by scarifying or disking. The Contractor shall moisten the loosened material to acceptable moisture content and re-compact the material to the specified density. Traversing the fill surface with tamping foot compactor or track equipment may not achieve adequate scarification.

7.4. Adjustments of moisture content will be made on the basis of determination of moisture by field tests as construction progresses.

8. **Compaction Equipment:** Compaction equipment shall conform to the following requirements and shall be used as prescribed in subsequent paragraphs.

8.1. Self-Propelled Tamping Rollers: The use of self-propelled non-vibratory tamping rollers conforming to the following specifications will be permitted. Their design and operation shall be subject to the approval of the Engineer, who shall have the right, at any time during execution of the Work, to direct such modifications of the tamping feet or variations in roller drum weight as may be found necessary to secure specified compaction of the dike materials. If the use of self-propelled tamping rollers causes shearing of the fill, laminations in the fill, or results in inadequate compaction, the Engineer may direct such rollers be removed from the fill and appropriate tamping rollers used. The self-propelled unit shall consist of two rear and two front independent tamping rollers that can oscillate so as to maintain positive contact with the material being compacted. The unit shall have a minimum operating weight of 70,000 pounds equally distributed to each drum. The minimum drum width shall be 3.5 feet. The unit shall also be equipped with a hydraulic front blade for the purpose of spreading earth and rock material. Four-drum equipment separated by cab and differential shall be arranged in tandem with the drums positioned such that the prints of the tamping feet are staggered. The surface on which the tamping feet are mounted shall have a minimum outside diameter of four feet and at least one tamping foot for each 100 square inches of drum surface. The distance between the centers of any two adjacent tamping feet shall be not less than nine inches. The length of each tamping foot from the outside mounting surface of the drum shall be not more than 11 inches and shall be maintained at not less than nine inches. The bearing surface of each tamping foot shall have a chevron tip design and surface area of not less than seven square inches or more than 14 square inches. Cupped recesses within the bearing surface of each tamping foot will be permitted but shall not exceed 0.5 inch in depth. During rolling operations, the spaces between the tamping feet shall be maintained clear of materials that may impair the effectiveness of the tamping roller. The weight of all roller drums during the compaction of fill materials shall be uniformly maintained such that the weight per foot of drum length is not less than 4,300 pounds. Self-propelled rollers shall be operated at speeds of no more than 5.0 miles per hour.

8.2. Smooth Drum Vibratory Rollers: Smooth drum vibratory rollers shall be equipped with a smooth steel compaction drum and shall be operated at a frequency of vibration during compaction operations between 1,400 and 1,800 vibrations per minute (vpm). Vibratory rollers must be self-propelled and shall have an unsprung drum weight that is a minimum of 60 percent of the rollers' static weight. Rollers shall have a minimum static weight of 30,000 pounds, a minimum dynamic force of 70,000 pounds when operating at 1,400 vpm, and an applied force not less than 10,000 pounds per foot of compaction drum length. The total applied force shall be the sum of the centrifugal force and the drum module weight. The level of amplitude and vibration frequency during compaction shall be maintained uniformly throughout the embankment zone within which it is operating. Rollers shall be operated at speeds which will result in a minimum of 10 impacts per foot of roller travel. The equipment

manufacturer shall provide sufficient data, drawings, and computations to verify that the proposed equipment meets the above specifications. The character and efficiency of this equipment shall be subject to the approval of the Engineer.

8.3. Tamping Foot Vibratory Rollers: Tamping foot vibratory rollers shall have the same requirements as mentioned above except that the drum shall be equipped with tamping feet. The character and efficiency of this equipment shall be subject to approval of the Engineer.

8.4. Manual Tampers: In areas where it is impracticable to use a self propelled roller, compaction of material shall be performed by the use of approved manual tampers. To the extent practical, "walk-behind" manual tamping foot rollers shall be used. Manual tamping foot rollers shall be designed with a minimum operating weight of 2,750 pounds, shall exert a minimum centrifugal force of 8,000 pounds, and shall have a means of self-cleaning the tamping feet. Where not accessible to other equipment, manually operated rammers may be used only if approved by the Engineer. Manually operated rammers shall have a minimum operating weight of 135 pounds and shall exert at least 3,000 pounds per blow.

8.5. Discs: Discs shall have at least two gangs hooked in tandem and shall be sized to penetrate the fill lift thickness, when compacted, of at least eight inches. The width of cut shall be less than 12 feet. Disc blades shall be notched, spaced a minimum of 16 inches, and have a minimum diameter of 36 inches. Wear-down shall not exceed 10 percent of the new disc diameter, at which time disc blades will be removed and replaced with new blades. The disc shall be equipped with self-cleaning scrapers to prevent the accumulation of soil and debris between the disc blades while operated at speeds to ensure mixing and blending of materials. The angle of cut shall be adjustable while the tool is in operation.

9. Compaction Requirements: Compaction shall conform to the following requirements.

9.1. After each layer of material has been placed, spread, and contains the required moisture, it shall be compacted by passing the self propelled tamping roller, over the entire surface of the layer a sufficient number of times to obtain the specified density. Adjustments in compactive effort shall be made on the basis of field density determinations made as construction progresses or visual observations by the Engineer or Engineer's representative.

9.2. Material shall be compacted to 95 percent of its maximum dry density as determined by ASTM D 698. In-place moisture shall be within minus two percent (-2%) of optimum moisture content to plus four percent (+4%) of optimum moisture as determined by ASTM D 698. In-place material not meeting these specifications shall be reworked until satisfactory results are obtained. The compacted surface shall be approved by the Engineer or Engineer's representative before placing next layer on top.

9.3. Field compaction tests, utilizing the nuclear method outlined in ASTM D 2922 or other approved methods, will be made as the construction proceeds. The tests will be performed by the Engineer or Engineer's representative.

9.4. The final surface of the bench in all areas shall be smooth and free of rocks, stones or any protruding objects.

Closure

The objective of the repairs described here is to restore the benches to promote positive drainage and reduce maintenance issues. The Contractor is advised to review the enclosed plans carefully and contact TVA and Stantec immediately if any discrepancies are noted.

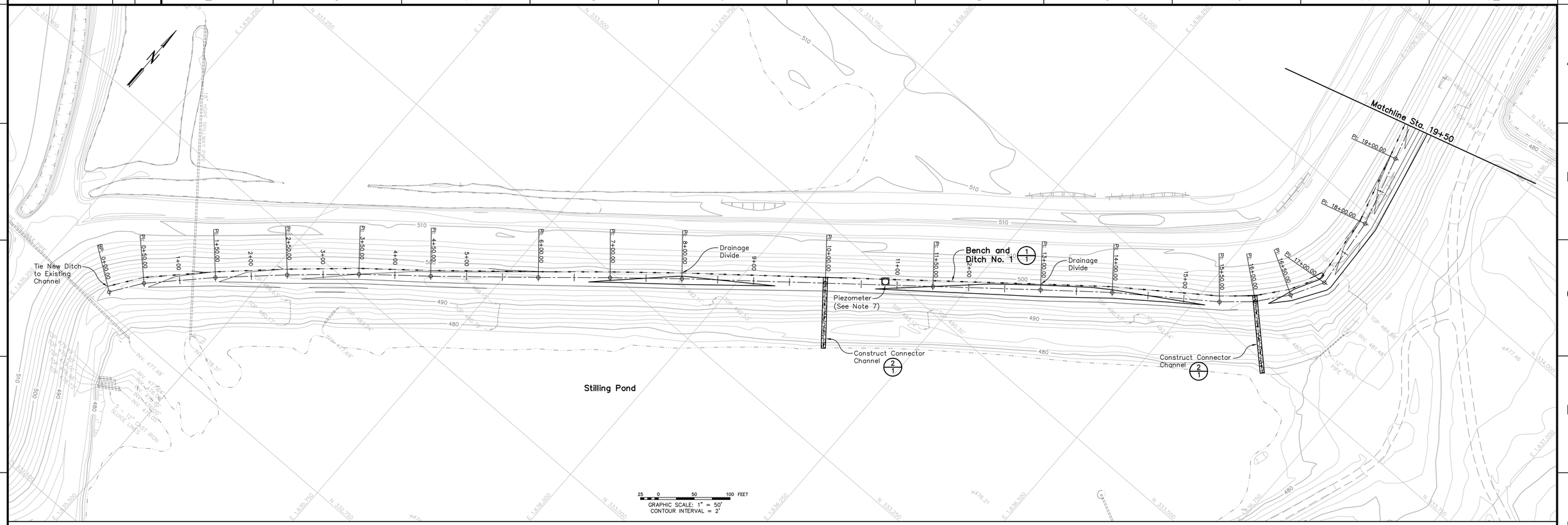
Sincerely,

STANTEC CONSULTING SERVICES INC.

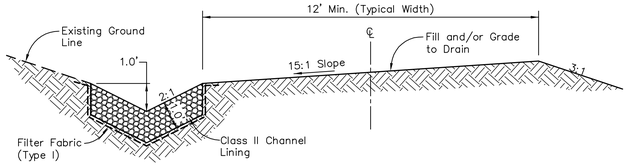
Erman Caudill, PE
Senior Project Engineer

Hugo R. Aparicio, PE
Principal

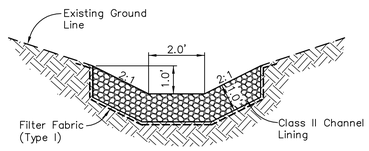
/cmw



PLAN – EAST POND DRAINAGE DITCH
SCALE: 1"=50'



1/1 DETAIL – TYPICAL BENCH AND DITCH
SCALE: 1"=2'



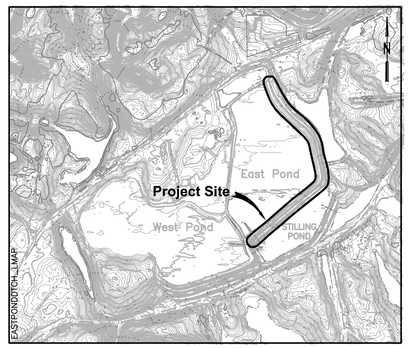
2/1 DETAIL – TYPICAL CONNECTOR DITCH
SCALE: 1"=2'

NOTES:

1. Topographic mapping was obtained from an aerial survey performed by Tuck Mapping Solutions, Inc. on February 22, 2009 and conventional survey performed by Stantec on February 12, 2009.
2. Horizontal coordinates are based on the Kentucky State Plane South NAD27 coordinate system with units of feet. The vertical datum referenced is NGVD 29.
3. Contractor shall also refer to the letter of recommendations prepared by Stantec for this work.
4. The dimensions and limits of repairs shown on this drawing are subject to field adjustment by Stantec's on–site representative.
5. The objective of this work is to regrade the intermediate benches and construct drainage ditches to facilitate positive drainage and eliminate ponded areas. The minimum ditch slope used shall be 0.5%.
6. If waste material is encountered during the course of construction, Contractor shall undercut the area a minimum of 12" below proposed grade and backfill with soil material. The goal is to maintain 12" minimum soil cover over waste material in all locations. Waste material shall be handled per instruction of TVA authorities.
7. Contractor shall use caution to not disturb piezometer housing. Soil fill shall be placed around the metal casing as directed by Stantec's on–site representative.

BENCH / DITCH 1 COORDINATE TABLE

			Bench Centerline		Ditch C.L.	
Station	Easting	Northing	Existing Elevation	Proposed Elevation	Proposed Elevation	Description
0+00.00'	1,635,347.3	332,771.9	490.40	492.50	491.10	Start
0+50.00'	1,635,376.1	332,812.8	492.15	493.50	492.10	PI
1+50.00'	1,635,446.3	332,884.0	494.28	495.50	494.10	PI
2+50.00'	1,635,519.5	332,952.2	495.98	497.50	496.10	PI, PVI
3+50.00'	1,635,594.5	333,018.3	495.70	498.00	496.60	PI
4+50.00'	1,635,672.0	333,081.6	495.96	498.50	497.10	PI
6+00.00'	1,635,786.6	333,178.3	496.07	499.25	497.85	PI
7+00.00'	1,635,862.4	333,243.5	496.33	499.75	498.35	PI
8+00.00'	1,635,939.1	333,307.7	497.05	500.25	498.85	PI, PVI
10+00.00'	1,636,094.3	333,433.8	497.09	499.25	497.85	PI, PVI, Connector
11+50.00'	1,636,210.8	333,528.4	497.77	500.00	498.60	PI
13+00.00'	1,636,327.3	333,622.9	496.79	500.75	499.35	PI, PVI
14+00.00'	1,636,405.3	333,685.4	496.88	500.25	498.85	PI
15+50.00'	1,636,526.9	333,773.3	497.66	499.50	498.10	PI
16+00.00'	1,636,564.4	333,806.3	498.02	499.25	497.85	PI, PVI, Connector
16+50.00'	1,636,595.6	333,845.3	498.61	500.25	498.85	PI
17+00.00'	1,636,619.9	333,889.0	499.76	501.25	499.85	PI
18+00.00'	1,636,609.1	333,988.5	500.48	503.25	501.85	PI
19+00.00'	1,636,581.8	334,084.6	502.31	505.25	503.85	PI
20+00.00'	1,636,554.0	334,180.7	503.83	507.25	505.85	PI, PVI
21+50.00'	1,636,521.6	334,327.2	504.10	506.50	505.10	PI
23+00.00'	1,636,497.8	334,475.3	503.01	505.75	504.35	PI
24+00.00'	1,636,481.0	334,573.8	501.76	505.25	503.85	PI, PVI, Connector
24+50.00'	1,636,462.3	334,620.2	503.34	505.50	504.10	PI
25+00.00'	1,636,443.5	334,666.5	503.21	505.75	504.35	PI
26+00.00'	1,636,392.3	334,752.5	502.34	506.25	504.85	PI
27+00.00'	1,636,329.7	334,830.4	502.26	506.75	505.35	PI
29+00.00'	1,636,175.5	334,957.8	504.03	507.75	506.35	PI
30+50.00'	1,636,059.0	335,052.3	505.06	508.50	507.10	PI
32+00.00'	1,635,955.7	335,161.1	505.20	509.25	507.85	PI, PVI
33+00.00'	1,635,896.4	335,241.6	505.00	508.75	507.35	PI
34+50.00'	1,635,813.7	335,366.8	505.72	508.00	506.60	PI, PVI, Connector
36+00.00'	1,635,731.8	335,492.4	507.48	509.50	508.10	PI
38+00.00'	1,635,656.4	335,677.7	509.18	511.50	510.10	End



LOCATION MAP
SCALE: 1"=1000'

Section or Detail No.
Sheet Where Shown
REFERENCE KEY

ISSUED FOR CONSTRUCTION

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INITIAL ISSUE											

DISCIPLINE INTERFACE

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV. CD
											1
											2
											3
											4

SCALE: AS SHOWN EXCEPT AS NOTED

FACILITIES ASSESSMENT
PAF SCRUBBER SLUDGE FACILITY

SOUTH AND EAST SLOPE OF EAST POND SLOPE AND DITCH REPAIRS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
E. CAUDILL	P. BOND	E. CAUDILL	H. APARICIO	J. MONTGOMERY		

PARADISE CREEK FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2008 | DATE 04/09 | 64 | C | XXWXXX–01 | R 0

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511–2050
859–422–3000
www.stantec.com

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

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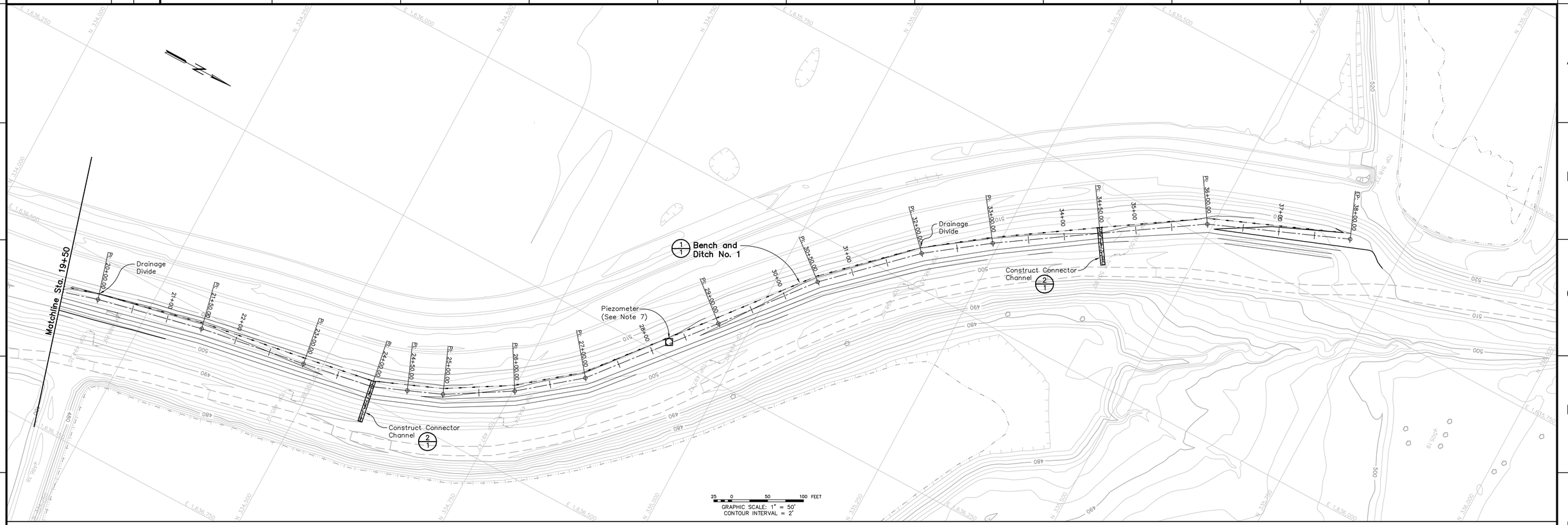
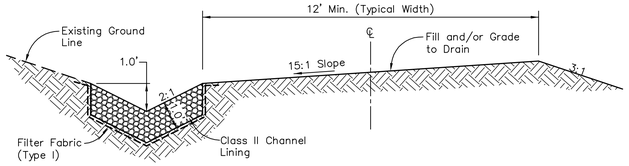
TASK COMPLETED BY: | REV NO.



PLAN – EAST POND DRAINAGE DITCH

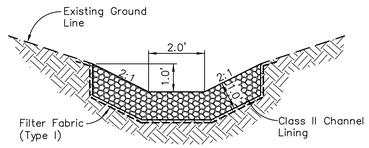
SCALE: 1"=50'

EASTPONDDITCH_PLAN



1/1 DETAIL – TYPICAL BENCH AND DITCH

SCALE: 1"=2'



2/1 DETAIL – TYPICAL CONNECTOR DITCH

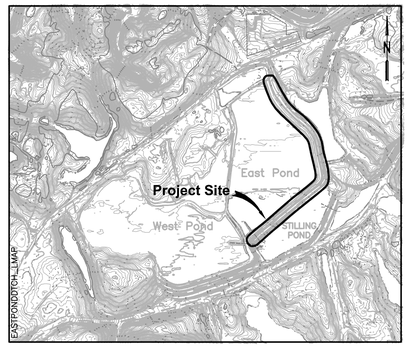
SCALE: 1"=2'

BENCH / DITCH 1 COORDINATE TABLE

			Bench Centerline		Ditch C.L.	
			Existing	Proposed	Proposed	
Station	Easting	Northing	Elevation	Elevation	Elevation	Description
0+00.00'	1,635,347.3	332,771.9	490.40	492.50	491.10	Start
0+50.00'	1,635,376.1	332,812.8	492.15	493.50	492.10	PI
1+50.00'	1,635,446.3	332,884.0	494.28	495.50	494.10	PI
2+50.00'	1,635,519.5	332,952.2	495.98	497.50	496.10	PI, PVI
3+50.00'	1,635,594.5	333,018.3	495.70	498.00	496.60	PI
4+50.00'	1,635,672.0	333,081.6	495.96	498.50	497.10	PI
6+00.00'	1,635,786.6	333,178.3	496.07	499.25	497.85	PI
7+00.00'	1,635,862.4	333,243.5	496.33	499.75	498.35	PI
8+00.00'	1,635,939.1	333,307.7	497.05	500.25	498.85	PI, PVI
10+00.00'	1,636,094.3	333,433.8	497.09	499.25	497.85	PI, PVI, Connector
11+50.00'	1,636,210.8	333,528.4	497.77	500.00	498.60	PI
13+00.00'	1,636,327.3	333,622.9	496.79	500.75	499.35	PI, PVI
14+00.00'	1,636,405.3	333,685.4	496.88	500.25	498.85	PI
15+50.00'	1,636,526.9	333,773.3	497.66	499.50	498.10	PI
16+00.00'	1,636,564.4	333,806.3	498.02	499.25	497.85	PI, PVI, Connector
16+50.00'	1,636,595.6	333,845.3	498.61	500.25	498.85	PI
17+00.00'	1,636,619.9	333,889.0	499.76	501.25	499.85	PI
18+00.00'	1,636,609.1	333,988.5	500.48	503.25	501.85	PI
19+00.00'	1,636,581.8	334,084.6	502.31	505.25	503.85	PI
20+00.00'	1,636,554.0	334,180.7	503.83	507.25	505.85	PI, PVI
21+50.00'	1,636,521.6	334,327.2	504.10	506.50	505.10	PI
23+00.00'	1,636,497.8	334,475.3	503.01	505.75	504.35	PI
24+00.00'	1,636,481.0	334,573.6	501.76	505.25	503.85	PI, PVI, Connector
24+50.00'	1,636,462.3	334,620.2	503.34	505.50	504.10	PI
25+00.00'	1,636,443.5	334,666.5	503.21	505.75	504.35	PI
26+00.00'	1,636,392.3	334,752.5	502.34	506.25	504.85	PI
27+00.00'	1,636,329.7	334,830.4	502.26	506.75	505.35	PI
29+00.00'	1,636,175.5	334,957.8	504.03	507.75	506.35	PI
30+50.00'	1,636,059.0	335,052.3	505.06	508.50	507.10	PI
32+00.00'	1,635,955.7	335,161.1	505.20	509.25	507.85	PI, PVI
33+00.00'	1,635,896.4	335,241.6	505.00	508.75	507.35	PI
34+50.00'	1,635,813.7	335,366.8	505.72	508.00	506.60	PI, PVI, Connector
36+00.00'	1,635,731.8	335,492.4	507.48	509.50	508.10	PI
38+00.00'	1,635,656.4	335,677.7	509.18	511.50	510.10	End

NOTES:

1. Topographic mapping was obtained from an aerial survey performed by Tuck Mapping Solutions, Inc. on February 22, 2009 and conventional survey performed by Stantec on February 12, 2009.
2. Horizontal coordinates are based on the Kentucky State Plane South NAD27 coordinate system with units of feet. The vertical datum referenced is NGVD 29.
3. Contractor shall also refer to the letter of recommendations prepared by Stantec for this work.
4. The dimensions and limits of repairs shown on this drawing are subject to field adjustment by Stantec's on–site representative.
5. The objective of this work is to regrade the intermediate benches and construct drainage ditches to facilitate positive drainage and eliminate ponded areas. The minimum ditch slope used shall be 0.5%.
6. If waste material is encountered during the course of construction, Contractor shall undercut the area a minimum of 12" below proposed grade and backfill with soil material. The goal is to maintain 12" minimum soil cover over waste material in all locations. Waste material shall be handled per instruction of TVA authorities.
7. Contractor shall use caution to not disturb piezometer housing. Soil fill shall be placed around the metal casing as directed by Stantec's on–site representative.



EASTPONDDITCH_LMAP

LOCATION MAP

SCALE: 1"=1000'

Section or Detail No.

Sheet Where Shown

REFERENCE KEY

ISSUED FOR CONSTRUCTION

SaveDate: 2009/04/20 4:21 PM Login: Johnson, Tracy
K:\TVA\active\VTN46818\environmental\planning\port\065186-port-104-ph5.dwg

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	DISCIPLINE INTERFACE
–	–	–	–	–	–	–	–	–	–	–	–
R 0	04/09	ELC	PJB	ELC	HRA	JSM	–	–	–	–	–
INITIAL ISSUE											

SCALE: AS SHOWN EXCEPT AS NOTED

FACILITIES ASSESSMENT
PAF SCRUBBER SLUDGE FACILITY

SOUTH AND EAST SLOPE OF EAST POND SLOPE AND DITCH REPAIRS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
E. CAUDILL	P. BOND	E. CAUDILL	H. APARICIO	J. MONTGOMERY		

PARADISE CREEK FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511–2050
859–422–3000
www.stantec.com

AUTOCAD R 2008	DATE 04/09	64	C	XXWXXX–02	R 0

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY

–	–
TASK COMPLETED BY:	REV NO.

Attachment 2

During Construction

During Construction

After Construction

After Construction

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington, KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

February 19, 2010 let_022_paf_175569040

Mr. Chris Buttram, PE
Tennessee Valley Authority
Fossil Power Group
1101 Market Street, MS LP 2G-C
Chattanooga, Tennessee 37402

Re: Construction Work Plan Closure
Work Plan No. PAF-LT-090605
Scrubber Sludge Complex
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Buttram:

Stantec Consulting Services Inc. (Stantec) would like to issue this letter requesting closure of the above mentioned work plan. Pertinent details of the workplan are presented in Table 1.

Table 1. Work Plan Details

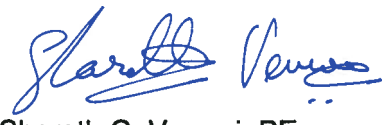
Workplan Issue Date	Subject	Reference No.	Status (P=Planning, W=In Progress, C=Complete)	Const. Start Date	Const. Complete Date
06/05/09	Gypsum Stack East Pond Soil Piping Repairs	PAF-LT-090605 (let_001_paf_175569040)	C	06/10/09	06/10/09

Based on the observations made in the field during construction, a review of daily field reports, photos and available information, it is our opinion that the repairs were performed to match reasonably well with the recommendations in our work plan. Pertinent attachments for documentation are included along with this letter. These include original work plan issued by Stantec on June 5, 2009 and selected photos from the field. The record drawing for TVA's business support library will be submitted electronically. Daily field reports for the project have already been submitted to TVA.

We appreciate this opportunity and look forward to continue working with you on this project. If you have any questions or required additional information, please contact us.

Sincerely,

STANTEC CONSULTING SERVICES INC.



Sharath C. Vemuri, PE
Senior Project Engineer

/rdr

Attachment 1

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

June 5, 2009 let_001_paf_175569040

Mr. Alan Casaday
Tennessee Valley Authority
1101 Market Street, LP 5E-C
Chattanooga, Tennessee 37402

Re: Exploration and Treatment of Presumed Piping Channels
East Pond Rim Ditch
TVA Facilities Assessment Project
Scrubber Sludge Complex (Gypsum Stack)
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Casaday:

Stantec Consulting Services Inc. (Stantec) has been assisting TVA with repairs associated with slope stability, drainage, and maintenance issues for the above referenced facility. The current work plan has been prepared by Stantec to address the depressions with presumed piping channels observed at three locations in the rim ditch of the eastern portion of the east pond. This work plan includes a brief description of the project site and provides recommendations for exploration and treatment of the noted depressions.

Description

On March 26, 2009 after a rainy event, TVA personnel noted three depressions (See Figure 1) had formed in the rim ditch on the eastern side of the Gypsum Stack East Pond. The three areas were presumed to be piping channels and causing a loss of water flowing through the rim ditch creating a localized depression. On May 28, 2009 Stantec personnel directed TVA to dig an exploratory pit at each presumed piping area. Pits were performed at Depressions 1 and 2, but due to poor weather conditions Depression 3 has not been explored at this time. Upon the completion of the excavation of the pit at Depression 1, water was poured into the pit to determine if piping channels were present. The only unusual observation noted was the development of several small black spots, which were presumed to be small piping channels at the bottom of the excavated pit. The water that was poured into the pit did drop in elevation (although not all the water drained out) with some air bubbles

surfacing, signifying the water filling the presumed piping channels. Upon the completion of excavation of the pit at Depression 2, the gypsum in the bottom of the pit was noted to be saturated and extremely wet. It was determined that no water needed to be poured into the pit because the gypsum was already saturated and no voids or channels were observed.

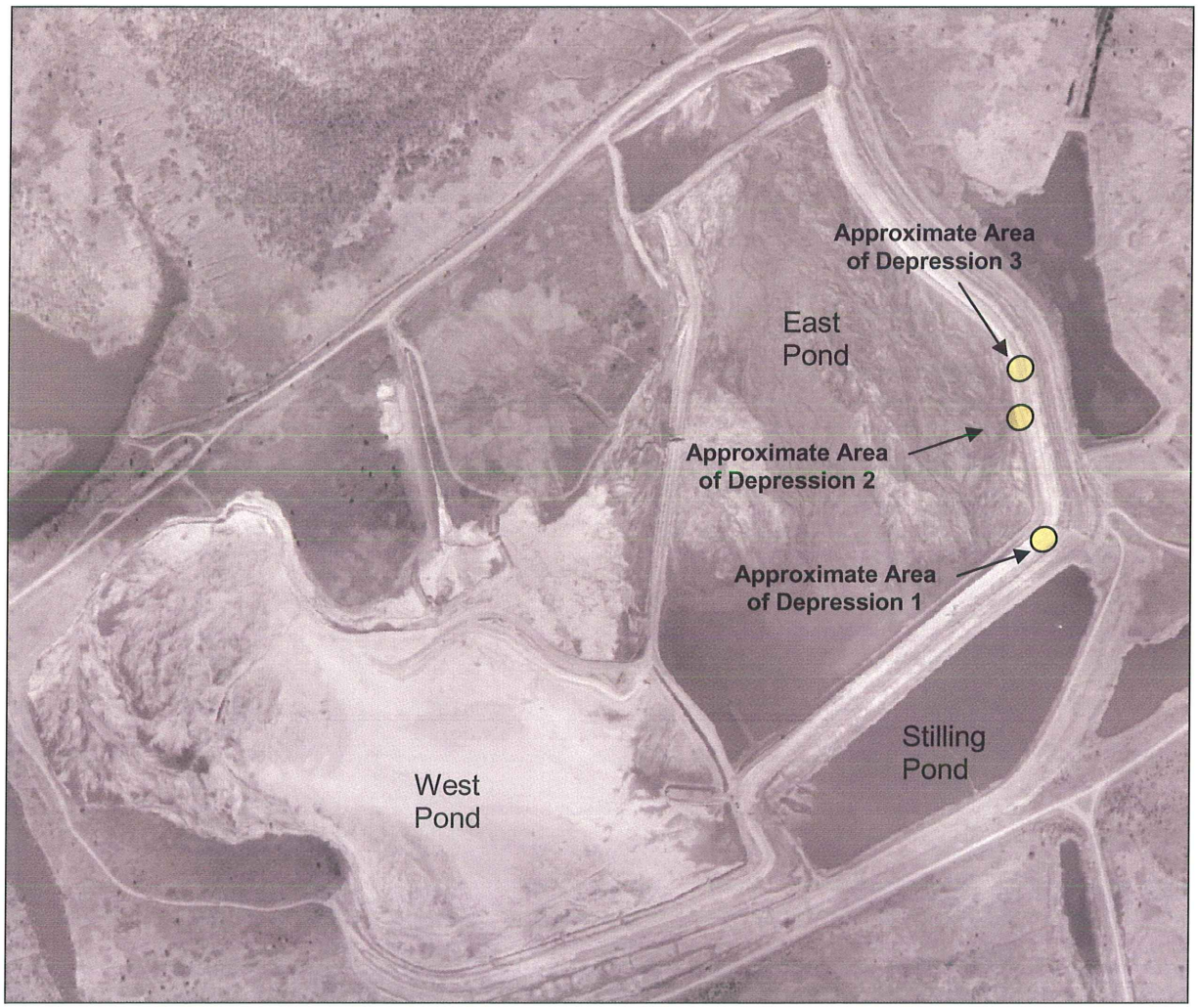


Figure 1. Project Site Location

Exploratory Pit Exploration

As noted above, the exploration has already been completed for Depressions 1 and 2. Based on the observations from the first 2 pits, Stantec recommends that an exploratory pit be excavated at the location of Depression 3. The exploratory pit proposed would be similar to the ones excavated at Depressions 1 and 2. An excavator of sufficient size should be used to remove gypsum from the rim ditch covering the entire area of the visible depression. A Stantec representative will be on-site to observe the excavation and direct the field work. The Stantec representative will also look for piping channels in the pit as the excavation progresses. Upon the completion of the pit excavation, it will be determined if water should be poured into the pit to monitor for the development or observation of piping channels. Stantec has prepared a drawing with relevant construction details and backfilling treatment recommendations. Recommendations for the exploratory pit backfilling treatment are presented in the following paragraph.

Exploratory Pit Treatment Construction Recommendations

- Upon completion of the 3 exploratory pits the following recommendations should be used to backfill the pits to obtain normal rim ditch operation.
- Line the bottom and all sides of the pit with filter fabric (Type I) as shown on the attached drawing. If the pit is too wide to use one roll, then a minimum 18" overlap should be used between sheets. Cut the filter fabric to a sufficient length that it can be overlapped on the top of the pit after placement of dry gypsum (as shown on the drawing.) Recommended filter fabric is US270NW by US Fabrics Inc.
- Place and compact dry gypsum in the pit on the filter fabric, continue placement until the gypsum is 6" from the top of the pit (the elevation of the rim ditch.) Placement should occur in small lifts that are uniform in height across the entire pit, after the placement of each lift, compaction should be achieved by tamping with the excavator bucket so as not to disturb the gypsum outside of the pit but to achieve adequate density. Stantec's on-site representative will take a density reading of the gypsum in the rim ditch near each pit location using a nuclear density gauge. After each lift is placed and compacted, a dry density reading will be taken in the compacted layer. It is recommended that compaction in the pit achieves a minimum of 95% dry density of the surrounding rim ditch dry density. Upon compaction of each lift the subsequent lifts should be placed and compacted using the same technique until the pit is filled approximately 6" from the top.

- Fold the filter fabric back over the dry gypsum from both sides. There should be a minimum 18" overlap between the sheets.
- Place an additional 6" layer of dry gypsum on top of the folded fabric and compact as stated above. The top of the backfilled pit should be level with the remainder of the rim ditch in the vicinity of the pit. If an additional layer of dry gypsum is needed to achieve this, then place and compact as stated above.
- It is recommended that construction measures be monitored by Stantec personnel. Field dimension adjustments will be necessary as the fieldwork progresses and should be agreed on between TVA construction personnel and Stantec representatives.

Closure

The recommended work described in this work plan has been discussed in the field with William Perry (HED). The objective of this repair is to explore and treat the presumed piping channels at the observed depressions in the rim ditch of the East Pond of the Gypsum Stack. The Contractor is advised to review the enclosed drawing carefully and contact Stantec for any clarifications, if needed.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Will Mattingly, EIT
Project Engineer

Hugo R. Aparicio, PE
Principal

/cmw

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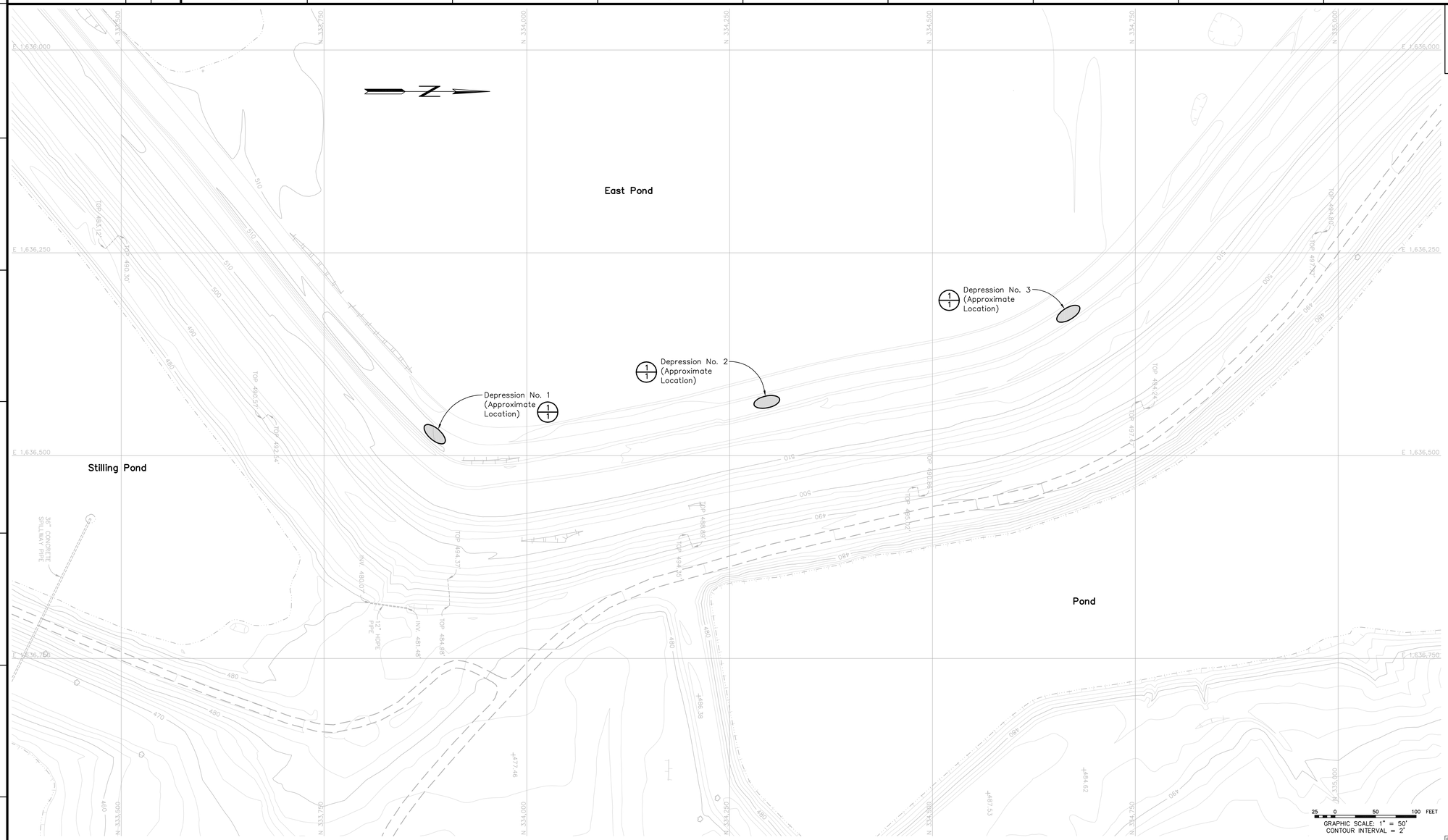
The Contractor shall verify and be responsible for all dimensions. DO NOT scale the drawing – any errors or omissions shall be reported to Stantec without delay.
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other than that authorized by Stantec is forbidden.

NOTES

1. Topographic mapping was obtained from an aerial survey performed by Tuck Mapping Solutions, Inc. on February 22, 2009. Coordinate system is based on Kentucky State Plane, South Zone.
2. Depression locations were taken from field observations made by TVA and Stantec personnel on March 26, 2009. Locations should be considered approximate.
3. Contractor shall also refer to the letter of recommendations prepared by Stantec for this work.
4. The dimensions and limits of repairs shown on this drawing are subject to field adjustment by Stantec's on-site representative.
5. The objective of this work is to explore the depressions for presumed piping channel and properly backfill the excavated exploratory pits.
6. Treatment pits have been excavated at the locations of Depressions 1 and 2 on May 28, 2009.
7. Instructions for placement and compaction of dry gypsum should be inferred from the letter of recommendations prepared by Stantec for this work and coordinated with Stantec's on-site representative.

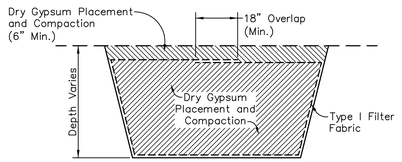


PLAN
SCALE: 1"=50'

LOCATION MAP
SCALE: 1"=1000'

ISSUED FOR REVIEW
NOT FOR CONSTRUCTION

1/1 TYPICAL CROSS SECTION
SCALE: 1"=10'



2/1 DETAIL – TREATMENT PIT
SCALE: 1/2"=1'-0"

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ED	AS CONST	REV'S
R 0	06/09	WRM	TJ	RDF	HRA	JSM	–	–	–	–	–
INITIAL ISSUE											

DISCIPLINE INTERFACE
1 –
2
3
4

SCALE: AS SHOWN EXCEPT AS NOTED

YARD
–

GYPSUM STACK EXPLORATION AND TREATMENT OF PRESUMED PIPING CHANNELS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
W. MATTINGLY	T. JOHNSON	R. FULLER	H. APARICIO	J. MONTGOMERY		

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
Tel. 859.422.3000
Fax. 859.422.3100
www.stantec.com

AUTOCAD R 2008	DATE 06/09	64	C	XXWXXX–01	R 0

PLOT FACTOR: XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

–	–
TASK COMPLETED BY:	REV NO.

PLOT DATE: 06/05/2009 USER: JOHNSON, TRACY
X:\TVS\VA\TVA\VA\TVA\VA\TVA

Attachment 2

Existing Conditions

Existing Conditions

During Construction

During Construction

During Construction

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington, KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

February 19, 2010 let_023_paf_175569040

Mr. Chris Buttram, PE
Tennessee Valley Authority
Fossil Power Group
1101 Market Street, MS LP-2G-C
Chattanooga, Tennessee 37402

Re: Construction Work Plan Closure
Work Plan No. PAF-LT-090608
Scrubber Sludge Complex
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Buttram:

Stantec Consulting Services Inc. (Stantec) would like to issue this letter requesting closure of the above mentioned work plan. Pertinent details of the workplan are presented in Table 1.

Table 1. Work Plan Details

Workplan Issue Date	Subject	Reference No.	Status (P=Planning, W=In Progress, C=Complete)	Const. Start Date	Const. Complete Date
06/08/09	Gypsum Stack East Pond Slope Toe Buttress near NE Corner of Stilling Pond	PAF-LT-090608 (let_002_paf_175569040)	C	06/15/09	07/07/09

Based on the observations made in the field during construction, a review of daily field reports, photos and available information, it is our opinion that the buttress construction was performed to match reasonably well with the recommendations in our work plan. Pertinent attachments for documentation are included along with this letter. These include original

work plan issued by Stantec on June 8, 2009 and selected photos from the field. The record drawing for TVA's business support library will be submitted electronically. Daily field reports for the project have already been submitted to TVA.

We appreciate this opportunity and look forward to continue working with you on this project. If you have any questions or required additional information, please contact us.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Sharath C. Vemuri, PE
Senior Project Engineer

/rdr

Attachment 1

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

June 8, 2009 let_002_175569040

Mr. Alan Casaday
Tennessee Valley Authority
1101 Market Street, LP 5E-C
Chattanooga, Tennessee 37402

Re: East Pond Slope Toe Buttress near
North East Corner of Stilling Pond
TVA Facilities Assessment Project
Scrubber Sludge Complex (Gypsum Stack)
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Casaday:

Stantec Consulting Services Inc. (Stantec) has been assisting TVA with repairs associated with slope stability, drainage, and maintenance issues for the above referenced facility. The current work plan has been prepared by Stantec to address the slump observed along the east pond slope near the north east corner of the stilling pond. This work plan includes a brief description of the project site and provides recommendations for buttressing slumped area of the slope.

1. Introduction

An area of the east pond south slope approximately 90 feet wide near the north east corner of the stilling pond (See Figure 1) has slumped toward the pond. Previously, a work plan was issued by Stantec (dated April 17, 2009) to repair this area. Following the construction of the toe buttress, additional movement of the slope occurred resulting in visible cracks along the slope. Subsequently, Stantec performed a geotechnical exploration of the site and prepared the recommendations presented in this letter.

2. Subsurface Exploration

Stantec's scope of work consisted of geotechnical exploration and design of repair measures. The fieldwork for the geotechnical exploration was performed during the week of May 25th, 2009. The fieldwork consisted of advancing two (2) borings at the project site, designated herein as STN-15 and STN-16. The boring locations were staked in the field by Stantec and surveyed by CRLLC. The locations of the borings are given on the attached drawing.

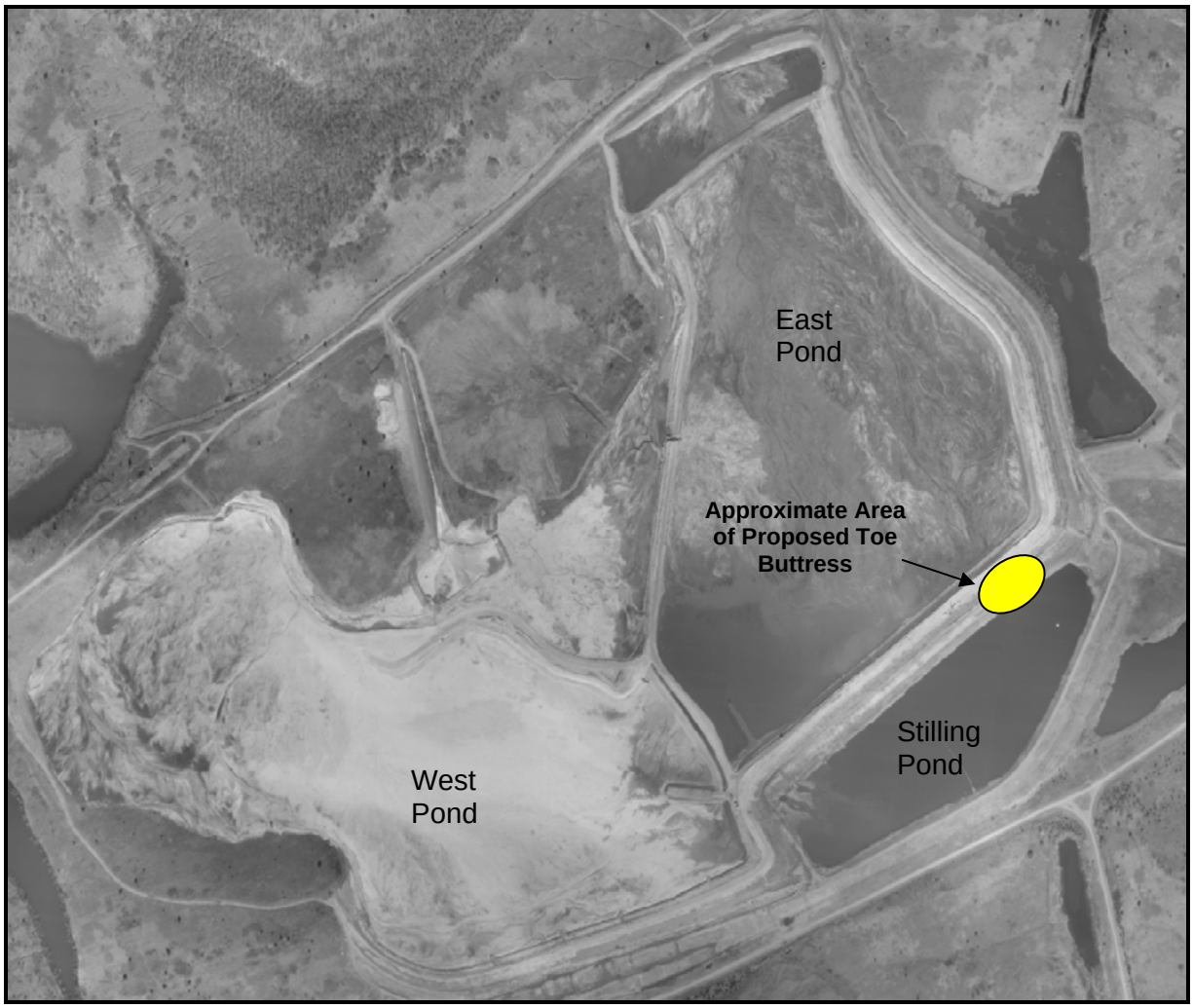


Figure 1. Project Site Location

The subsurface exploration was performed using a track-mounted drill rig equipped with 4¼-inch (ID) hollow stem augers. Standard Penetration Testing (SPT) was performed in the borings at selected depth intervals and samples were obtained. A standard penetration test consists of dropping a 140-pound hammer to drive a split-barrel sampler 18 inches. The consistency or relative density of the soil material 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. Upon completion of the drilling and sampling procedures, slope inclinometer casing was installed in the borehole and the annulus was grouted with cement-bentonite mix.

A geotechnical engineer was present on-site throughout the drilling and sampling operations. The engineer directed the drill crew, logged the subsurface materials encountered during the exploration and collected soil samples. Particular attention was given to the soil's color, texture, moisture content and consistency or relative density. The recovered soil samples were transported to Stantec's laboratory.

Upon installation of slope inclinometers, Stantec continued monitoring the slopes by taking readings using an inclinometer probe. The first survey establishes the initial profile of the casing. This is followed by subsequent surveys which reveal changes in the profile of the casing if movement has occurred. At the time of this writing, the following readings were taken.

Boring No.	First Reading	Second Reading	Third Reading	Fourth Reading
STN-15	May 28, 2009	May 29, 2009	June 1, 2009	June 2, 2009
STN-16	May 29, 2009	June 1, 2009	June 2, 2009	

Stantec scope of work included performing a slope stability analysis using the survey information, inclinometer data and assumed shear strength parameters. Based on the results of slope stability analysis, Stantec recommends that a toe buttress using class III channel lining be constructed to improve the stability of the area. The toe buttress proposed would be similar to the one recently constructed by TVA in the same area. In order to assist TVA with the layout and construction of the toe buttress, Stantec has prepared a drawing with relevant survey information and construction details. TVA shall refer to this drawing as needed during the construction. Recommendations for the repair work are presented in the following paragraphs.

Repair Construction Recommendations

- TVA shall remove all vegetation from the area to be stabilized.
- Buttress side shall be accessed from the northeast corner of the pond using an existing bench. The surface of the access road shall be stabilized with crushed stone as needed to allow construction equipment to enter the site.
- TVA shall first construct a portion of the buttress as shown on the drawing. This portion will serve as access to construct the remaining portion of the buttress. Under no circumstances shall the Contractor allow equipment or other construction related traffic on top of the existing toe buttress which is marginally stable at this point.
- Place crushed stone in layers and determine (by visual observation) whether these initial layers remain stable. Rock placement shall be continuously monitored for movement.

- Continue placing crushed stone up to near the normal pool elevation.
- Once above pool elevation, place class III channel lining in 24-inch thick layers and compact with heavy dozer passes.
- It is recommended that construction measures be monitored by Stantec personnel. Field dimension adjustments will be necessary as the fieldwork progresses and should be agreed on between TVA construction personnel and Stantec representatives.
- Contractor shall follow all applicable safety regulations including those of TVA, OSHA, Local, State and Federal requirements.

Closure

The recommended work described in this work plan has been discussed in the field with William Perry (TVA) on June 3, 2009 during a site visit by Stantec personnel. The objective of this repair is to buttress the toe of the slope in the area. The Contractor is advised to review the enclosed drawing carefully and contact Stantec for any clarifications, if needed.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Sharath C. Vemuri, PE
Senior Project Engineer

Hugo R. Aparicio, PE
Principal

Attachments: Boring Logs (Four Pages), Plans for Construction (Two Sheets), Slope Inclinometer Readings (Two Pages)

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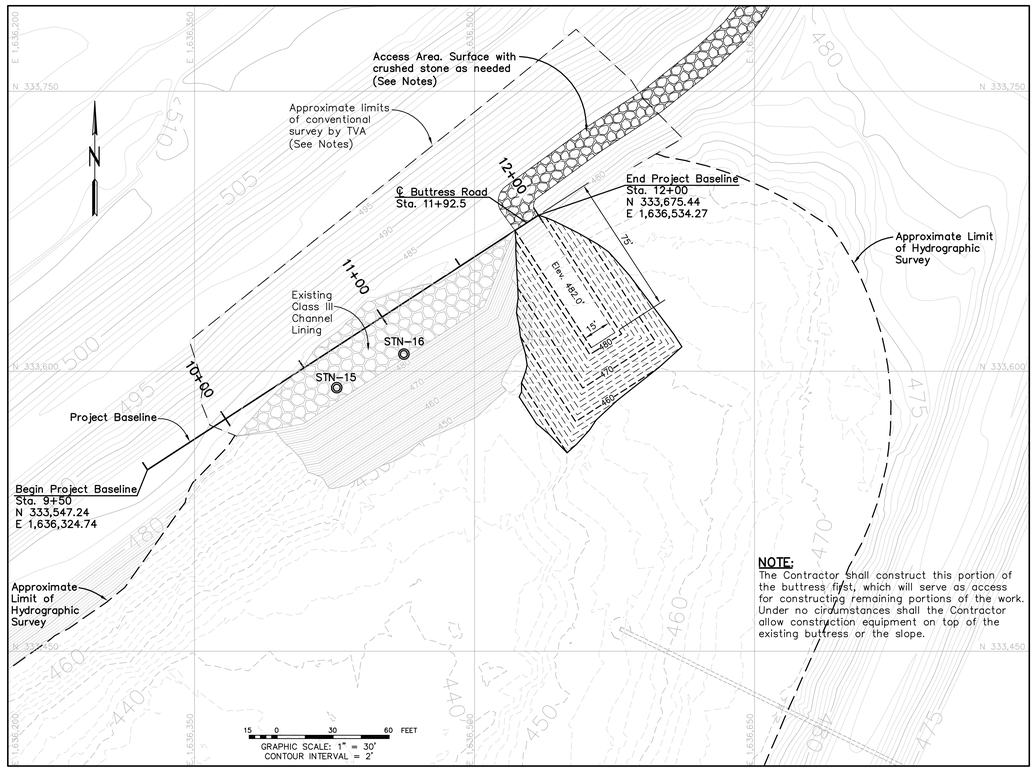
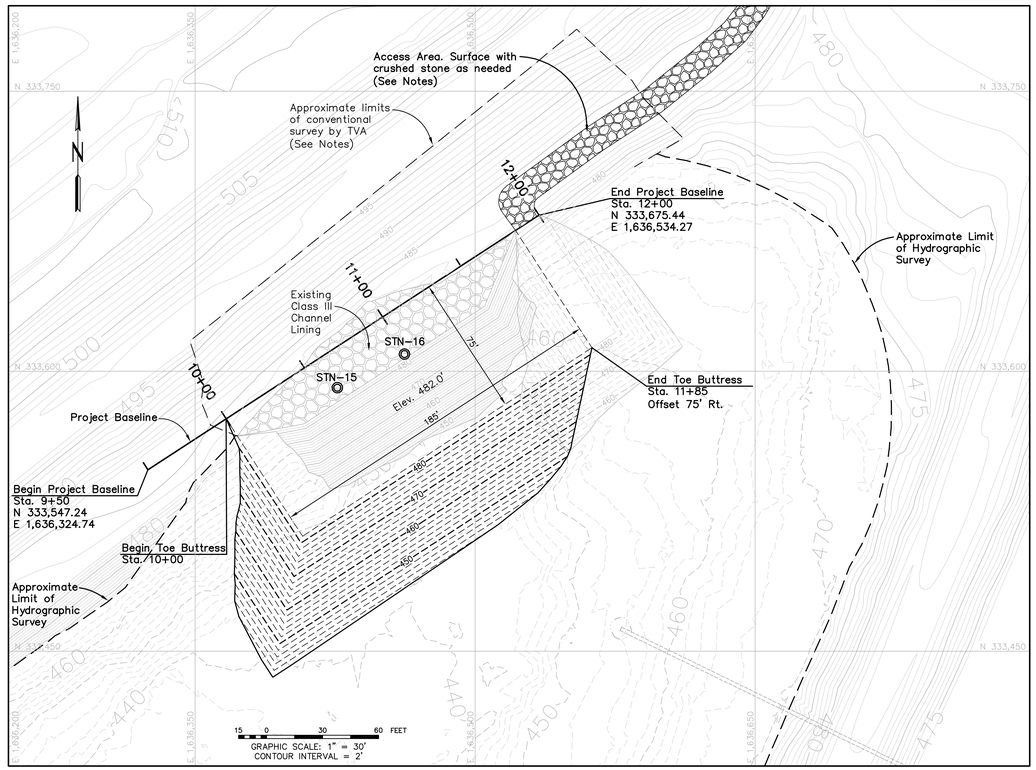
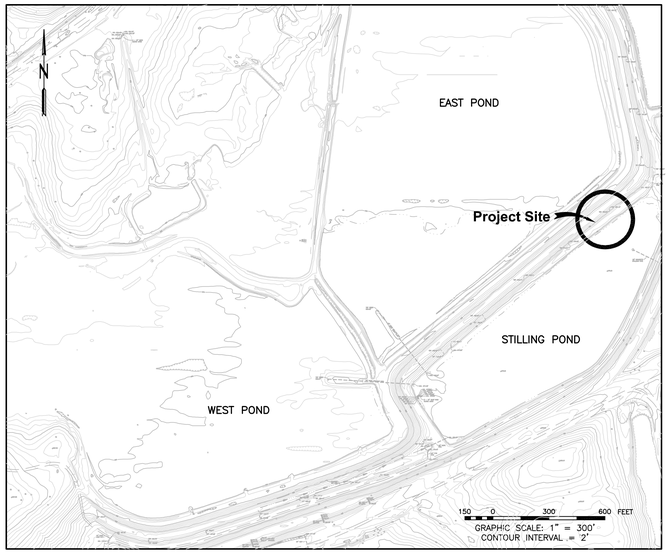


NOTE:
The Contractor shall construct this portion of the buttress first, which will serve as access for constructing remaining portions of the work. Under no circumstances shall the Contractor allow construction equipment on top of the existing buttress or the slope.

PLAN – BUTTRESS ACCESS ROAD
SCALE: 1"=30'



PLAN – BUTTRESS
SCALE: 1"=30'



LOCATION MAP
SCALE: 1"=300'

NOTES:
1. The objective of this repair is to buttress the toe of the slope in area shown.
2. Begin and End Coordinates presented here are approximate. Actual limits of the repair shall be determined in the field by the engineer's representative based on ground conditions.
3. Topographic mapping presented here is based on the 2009 aerial survey and area specific conventional survey data and hydrographic survey data provided by TVA.
4. All buttress dimensions are approximate and subject to field adjustment.
5. TVA shall also refer to the workplan document associated with this drawing.
6. Contractor shall adhere to all applicable safety regulations including but not limited to OSHA, Federal, State, Local and TVA.
7. Place 24 inch pipe in the existing ditch line and backfill with crushed limestone. Surface the bench area (approximately 300 feet long) with Class III channel lining 3 feet (thick) by 15 feet (wide). Choke the top surface with No. 4 Stone. No access shall be provided from the top of the existing buttress.

ISSUED FOR CONSTRUCTION

PLOT DATE: 06/08/2009 USER: SAMS, BRIAN
N:\TFS\ACTIVE\175569840\GEOTECHNICAL\DRAWING\GYPSUM_STACK\[PDNG_BUTTRESS]99400-PAF-104-004.DWG

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R –	–	–	–	–	–	–	–	–	–	–
R 0	06/09	SCV	BFS	SCV	DAB	HRA	–	–	–	–
INITIAL ISSUE										

DISCIPLINE INTERFACE
1 —
2 —
3 —
4 —

SCALE: NONE EXCEPT AS NOTED

YARD
PAF GYPSUM STACK

EAST POND SLOPE TOE BUTTRESS NEAR NORTHEAST CORNER OF STILLING POND

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
Tel. 859.422.3000
Fax 859.422.3100
www.stantec.com

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	B. SAMS	S. VEMURI	D. BACK	H. APARICIO		

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2008	DATE 06/09	64	C	XXWXXX–01	R 0

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

–	–
TASK COMPLETED BY:	REV NO.

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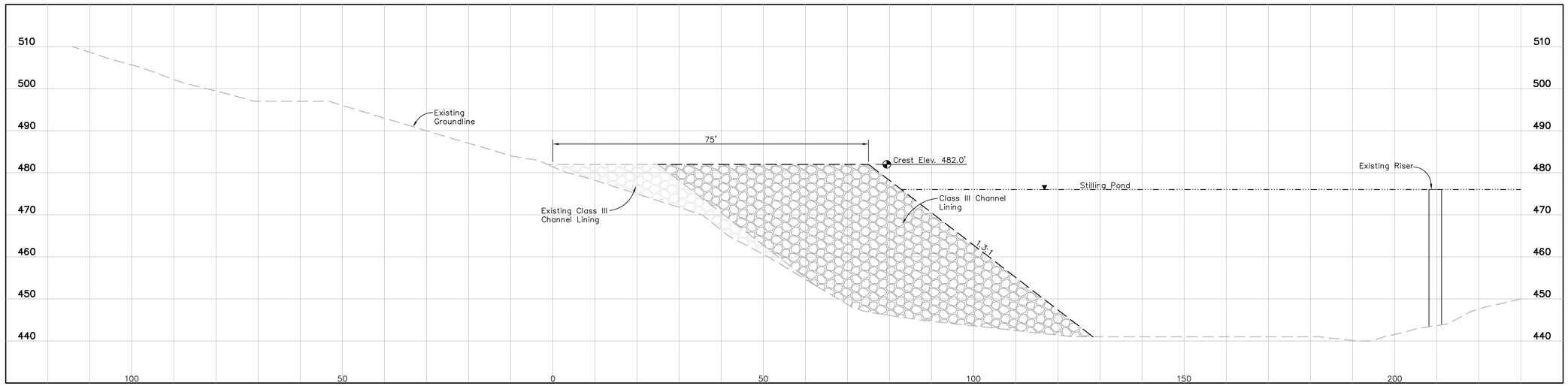

TYPICAL CROSS SECTION
SCALE: 1"=10'

ISSUED FOR CONSTRUCTION

PLOT DATE: 06/08/2009 USER: SAMS, BRIAN
V:\1795\ACTIVE\172569140\GEOTECHNICAL\DRAWING\GYPSUM_STACK\EPOND_BUTTRESS\69405-THF-104-X01.DWG

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT TO	AS CONST	REV NO.
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	06/09	SCV	BFS	SCV	DAB	HRA	–	–	–	–	–
INITIAL ISSUE											

DISCIPLINE INTERFACE
1
2
3
4

SCALE: NONE EXCEPT AS NOTED

YARD
PAF GYPSUM STACK

EAST POND SLOPE TOE BUTTRESS NEAR NORTHEAST CORNER OF STILLING POND

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	B. SAMS	S. VEMURI	D. BACK	H. APARICIO		

Stantec Consulting Services Inc.
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PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2008	DATE 06/09	64	C	XXWXXX–01	R 0

TASK COMPLETED BY:	REV NO.
–	–

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-15** Total Depth 71.5 ft
County	Muhlenberg, KY	Surface Elevation	480.9 ft
Project Type	Geotechnical Exploration	Date Started	5/28/09 Completed 5/28/09
Supervisor	Z. Massey Driller K. Clements	Depth to Water	4.9 ft Date/Time 5/28/09
Logged By	Z. Massey	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
480.9	0.0	Top of Hole							
		Class III Channel Lining							Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
472.9	8.0								Installed 72.0 feet of slope inclinometer casing with steel cover set in concrete pad.
		Gypsum-Fly Ash: Light gray to dark gray, moist to wet and very loose to loose.		SPT-1	9.0 - 10.5	0.3	WOH-1-1	--	
				SPT-2	10.5 - 12.0	0.7	WOH-1-2	--	Boring grouted with cement-bentonite mixture from 0 to 70.0 feet.
				SPT-3	12.0 - 13.5	0.7	1-2-2	--	
				SPT-4	13.5 - 15.0	0.8	1-1-1	--	
				SPT-5	15.0 - 16.5	0.5	1-2-2	--	Boring location at sta 10+59 feet, offset 18.5 feet right.
				SPT-6	16.5 - 18.0	1.0	1-2-3	--	
				SPT-7	18.0 - 19.5	0.9	1-2-3	--	
				SPT-8	19.5 - 21.0	1.4	2-2-3	--	Sampling performed with an automatic hammer
459.9	21.0								
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, very soft to very stiff and with heterogeneous mixture of coal, shale, sandstone and siltstone fragments.		SPT-9	21.0 - 22.5	0.6	2-4-3	--	
				SPT-10	22.5 - 24.0	1.5	2-3-4	--	
				SPT-11	24.0 - 25.5	1.5	4-3-3	--	
				SPT-12	25.5 - 27.0	0.1	1-1-3	--	
				SPT-13	27.0 - 28.5	1.5	5-13-4	--	
				SPT-14	28.5 - 30.0	1.5	5-6-5	--	
				SPT-15	30.0 - 31.5	0.8	3-4-3	--	
				SPT-16	31.5 - 33.0	1.2	4-3-4	--	
				SPT-17	33.0 - 34.5	1.5	6-5-5	--	
				SPT-18	34.5 - 36.0	0.9	WOR-WOR-2	--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 6/8/09

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, Ky

Project Name PAF: Phase 2 | Boring No. **STN-15** | Total Depth 71.5 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-19	36.0 - 37.5	1.4	5-6-4	--	
				SPT-20	37.5 - 39.0	1.5	6-8-8	--	
440.9	40.0			SPT-21	39.0 - 40.5	1.2	1-3-4	--	
		Mine Spoil: Lean to fat clay with intermediate sand lenses, dark gray to black, moist to wet, medium stiff to very stiff, with heterogeneous mixture of coal, shale, sandstone and siltstone fragments and organics.		SPT-22	40.5 - 42.0	1.0	5-6-8	--	
				SPT-23	42.0 - 43.5	1.5	9-8-8	--	
				SPT-24	43.5 - 45.0	1.5	11-9-14	--	
				SPT-25	45.0 - 46.5	1.5	4-4-6	--	
				SPT-26	46.5 - 48.0	1.4	7-12-21	--	
				SPT-27	48.0 - 49.5	1.5	5-7-14	--	
				SPT-28	55.0 - 56.5	1.5	3-4-7	--	
				SPT-29	60.0 - 61.5	0.8	65-21-14	--	
				SPT-30	65.0 - 66.5	1.0	6-6-10	--	
409.4	71.5			SPT-31	70.0 - 71.5	0.9	3-7-14	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 6/8/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-16** Total Depth 71.5 ft
County	Muhlenberg, KY	Surface Elevation	481.1 ft
Project Type	Geotechnical Exploration	Date Started	5/28/09 Completed 5/29/09
Supervisor	Z. Massey Driller K. Clements	Depth to Water	5.1 ft Date/Time 5/28/09
Logged By	Z. Massey	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
481.1	0.0	Top of Hole							
		Class III Channel Lining							Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
472.1	9.0								Installed 72.0 feet of slope inclinometer casing with steel cover set in concrete pad.
		Gypsum-Fly Ash: Light gray to dark gray, moist to wet and very loose to loose.		SPT-1	10.0 - 11.5	1.0	WOR-1-2	--	Boring grouted with cement-bentonite mixture from 0 to 70.0 feet.
				SPT-2	11.5 - 13.0	0.7	1-1-1	--	
				SPT-3	13.0 - 14.5	1.1	WOH-1-2	--	
				SPT-4	14.5 - 16.0	1.0	WOH-2-3	--	
				SPT-5	16.0 - 17.5	1.1	4-3-3	--	Boring location at sta 10+99 feet, offset 23.0 feet right.
462.6	18.5			SPT-6	17.5 - 19.0	1.5	5-4-5	--	
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone and siltstone fragments.		SPT-7	19.0 - 20.5	0.7	3-1-2	--	Sampling performed with an automatic hammer
				SPT-8	20.5 - 22.0	1.2	4-4-5	--	
				SPT-9	22.0 - 23.5	1.5	2-3-5	--	
				SPT-10	23.5 - 25.0	0.4	WOH-1-2	--	
				SPT-11	25.0 - 26.5	0.7	2-3-8	--	
				SPT-12	26.5 - 28.0	0.8	5-3-7	--	
				SPT-13	28.0 - 29.5	1.0	2-3-4	--	
				SPT-14	29.5 - 31.0	0.2	13-5-6	--	
				SPT-15	31.0 - 32.5	0.3	3-5-5	--	
				SPT-16	32.5 - 34.0	1.2	3-5-7	--	
				SPT-17	34.0 - 35.5	0.2	14-12-7	--	
				SPT-18	35.5 - 37.0	0.8	10-9-11	--	

STANTEC/FMSM_LEGACY_PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 6/8/09

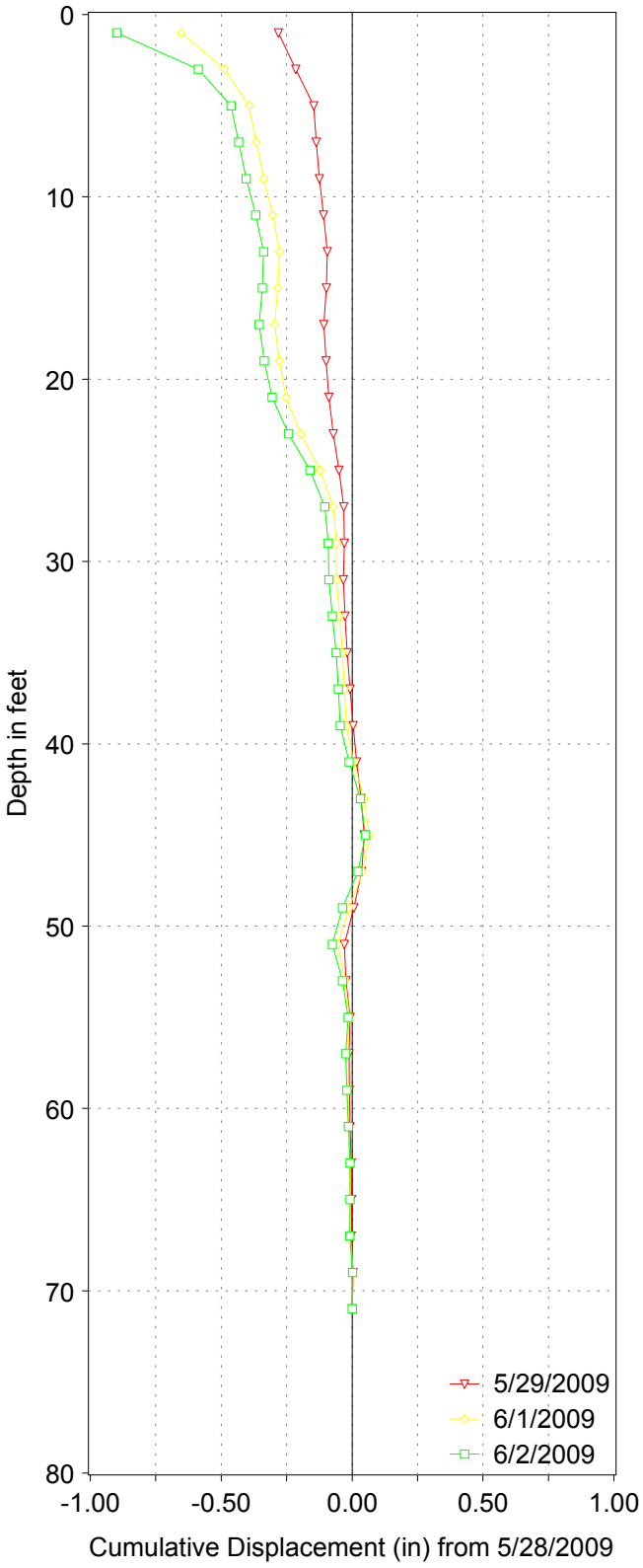
SUBSURFACE LOG

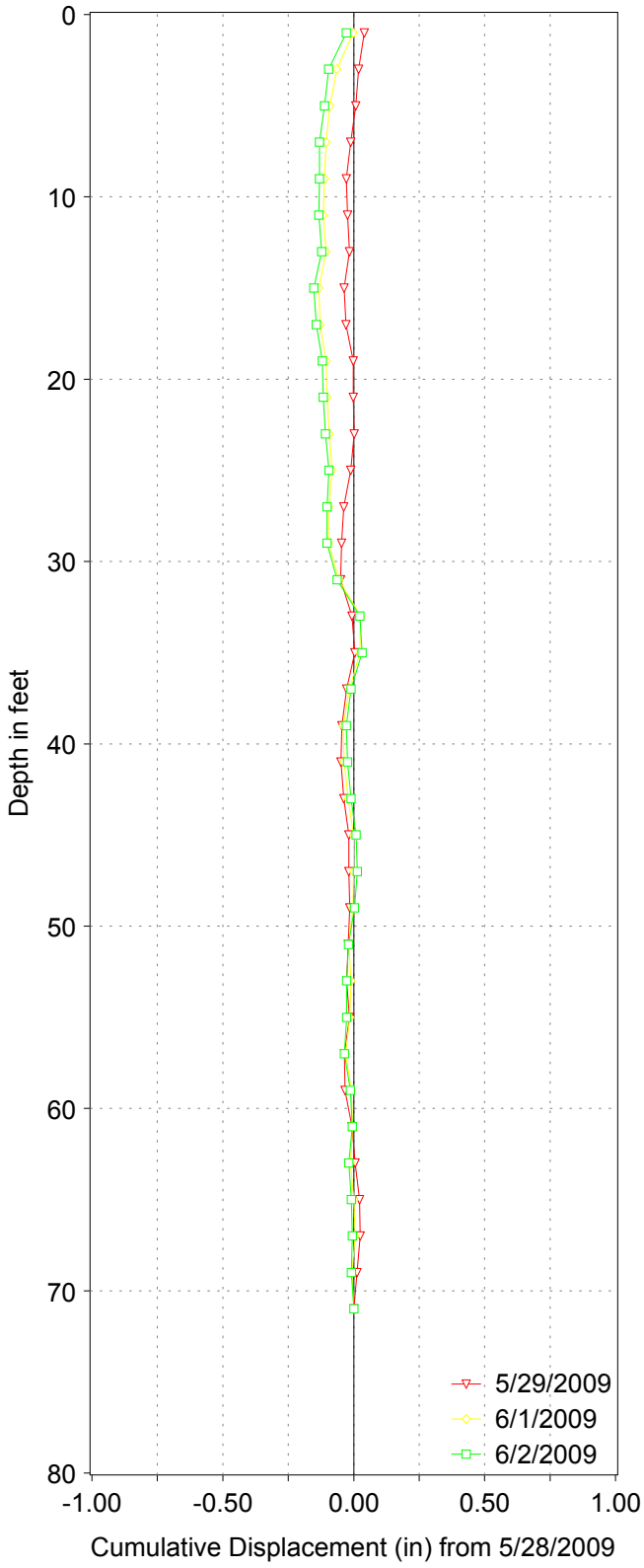
Project Number 175569040 | Location Drakesboro, Ky

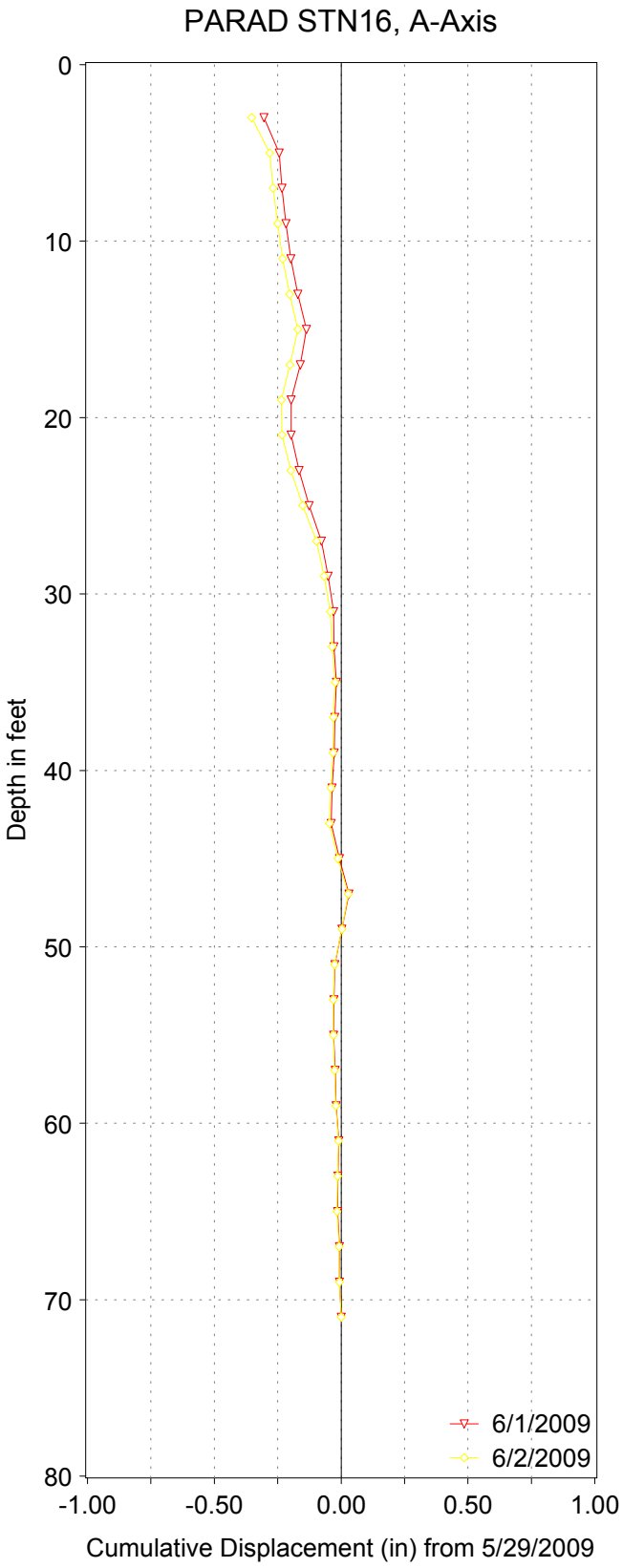
Project Name PAF: Phase 2 | Boring No. **STN-16** | Total Depth 71.5 ft

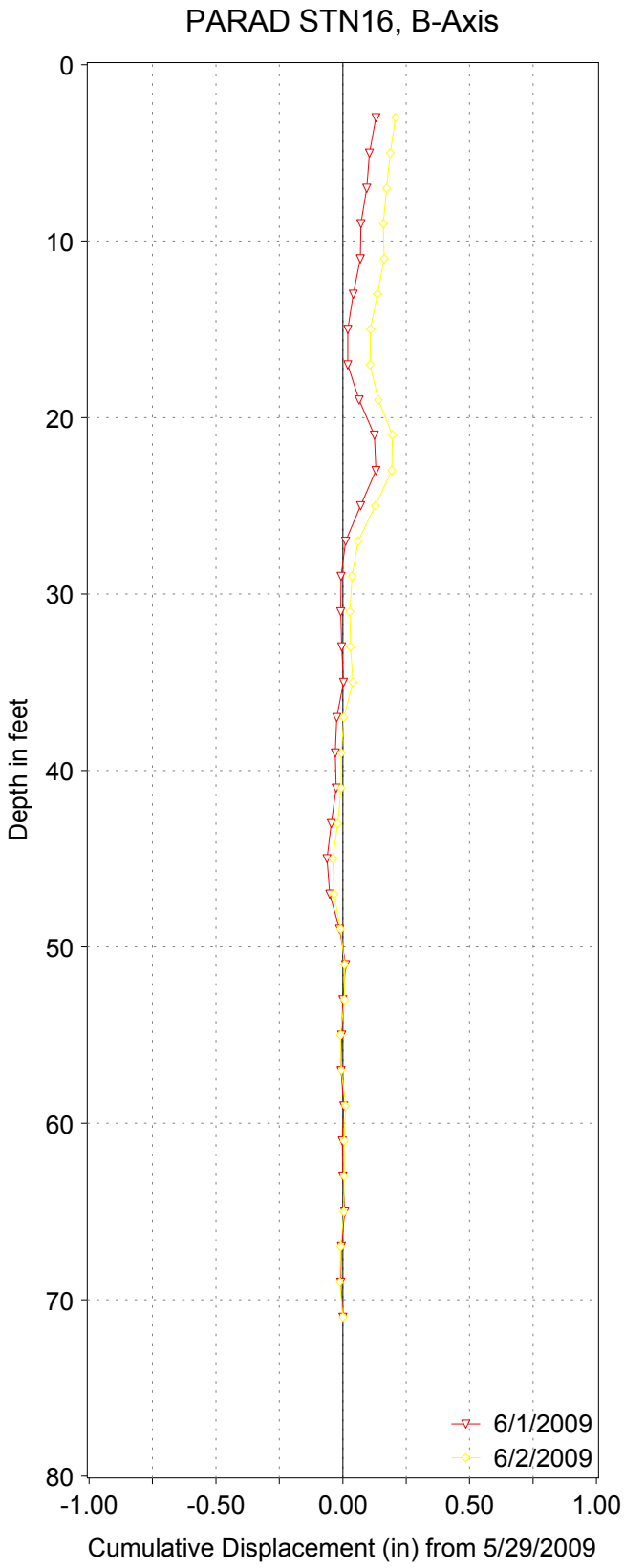
Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
				SPT-19	37.0 - 38.5	0.9	11-11-12	--	
442.1	39.0								
		Mine Spoil: Lean to fat clay with intermediate sand lenses, dark gray to black, moist to wet, medium stiff to very stiff, with heterogeneous mixture of coal, shale, sandstone and siltstone fragments and organics.		SPT-20	38.5 - 40.0	1.2	4-5-7	--	
				SPT-21	40.0 - 41.5	1.5	3-4-6	--	
				SPT-22	41.5 - 43.0	1.5	5-5-6	--	
				SPT-23	43.0 - 44.5	1.5	3-6-10	--	
				SPT-24	44.5 - 46.0	1.3	5-7-7	--	
				SPT-25	46.0 - 47.5	1.5	3-5-9	--	
				SPT-26	47.5 - 49.0	1.5	4-4-7	--	
				SPT-27	49.0 - 50.5	1.5	3-4-5	--	
				SPT-28	55.0 - 56.5	1.5	3-2-6	--	
				SPT-29	60.0 - 61.5	1.0	4-4-7	--	
				SPT-30	65.0 - 66.5	1.5	5-9-15	--	
				SPT-31	70.0 - 71.5	1.0	5-5-8	--	
409.6	71.5								
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 6/8/09


PARAD STN15, A-Axis
Depth in feet
0
10
20
30
40
50
60
70
80
-1.00
-0.50
0.00
0.50
1.00
Cumulative Displacement (in) from 5/28/2009
5/29/2009
6/1/2009
6/2/2009


PARAD STN15, B-Axis
Depth in feet
0
10
20
30
40
50
60
70
80
-1.00
-0.50
0.00
0.50
1.00
Cumulative Displacement (in) from 5/28/2009
5/29/2009
6/1/2009
6/2/2009


PARAD STN16, A-Axis
0
10
20
30
40
50
60
70
80
Depth in feet
-1.00
-0.50
0.00
0.50
1.00
Cumulative Displacement (in) from 5/29/2009
6/1/2009
6/2/2009


PARAD STN16, B-Axis
0
10
20
30
40
50
60
70
80
Depth in feet
-1.00
-0.50
0.00
0.50
1.00
Cumulative Displacement (in) from 5/29/2009
6/1/2009
6/2/2009

Attachment 2

During Construction

During Construction

During Construction

After Construction

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

February 26, 2010

let_025_paf_175569040

Mr. Chris Buttram, PE
Tennessee Valley Authority
Fossil Power Group
1101 Market Street,MS LP 2G-C
Chattanooga, Tennessee 37402

Re: Construction Work Plan Closure
Work Plan No. PAF-LT-091013
Scrubber Sludge Complex
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Buttram:

Stantec Consulting Services Inc. (Stantec) would like to issue this letter requesting closure of the above mentioned work plans. Pertinent details of the workplans are presented in Table 1.

Table1: Work Plan Details

Workplan Issue Date	Subject	Reference No.	Status (P=Planning, W=In Progress, C=Complete)	Const. Start Date	Const. Complete Date
10/13/09	Gypsum Stack-West Pond South Slope Armoring	PAF-WP-091013 (let_006_paf_175569040)	C	11/16/09	12/28/09

Based on the observations made in the field during construction, a review of daily field reports, photos and available information, it is our opinion that the repairs were performed to match reasonably well with the recommendations in our work plan. Pertinent attachments for documentation are included along with this letter. These include original work plan issued by Stantec and selected photos from the field. The record drawing for TVA's business support library will be submitted electronically. Daily field reports for the project have already been submitted to TVA.

We appreciate this opportunity and look forward to continue working with you on this project. If you have any questions or required additional information, please contact us.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Sharath C. Vemuri, PE
Senior Project Engineer

/rdr

Attachment 1

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

October 13, 2009 let_006_175569040

Mr. Barry Snider, PE
Tennessee Valley Authority
1101 Market Street, LP 5E-C
Chattanooga, Tennessee 37402

Re: Issued for Construction
West Pond South Slope Armoring
Scrubber Sludge Complex
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Snider:

Stantec Consulting Services Inc. (Stantec) has completed the design of slope armoring at south slope of West Pond and would like to issue the following work plan for construction. This document incorporates the comments received from TVA and AECOM following a review of our October 2, 2009 work plan (let_005_175569040).

In this work plan, we have changed the slope armoring detail to reflect the latest decision taken by TVA (with assistance from Stantec and AECOM) to go with sand instead of filter fabric for slope armoring. Accordingly, on the attached construction drawing we have altered the detail to show six-inch layers of sand and No. 57 crushed limestone in place of Type I filter fabric. We have also replaced Class II channel lining with Class III channel lining. The subsequent paragraphs of this work plan provide a brief background of the project followed by construction recommendations.

1. Background

TVA is currently completing repair work at the south slope of West Pond. This repair work includes several drainage ditches and bench modifications based on the work plan issued by Stantec on March 31, 2009 (ltr_009_paf_171468118). Stantec personnel visited the site on September 23, 2009 to assess the current conditions. In addition, as-built survey information was also obtained along the south slope of the West Pond.

2. Recommendation

Based on the conditions noted in the field and the results of as-built survey, it is recommended that an area along the south slope of West Pond (approximately 1,000 feet long near the west end) be armored using sand, No. 57 Stone and Class III Channel Lining. The proposed slope armoring shall tie into the existing slope armoring already installed by TVA recently (See Figure 1).

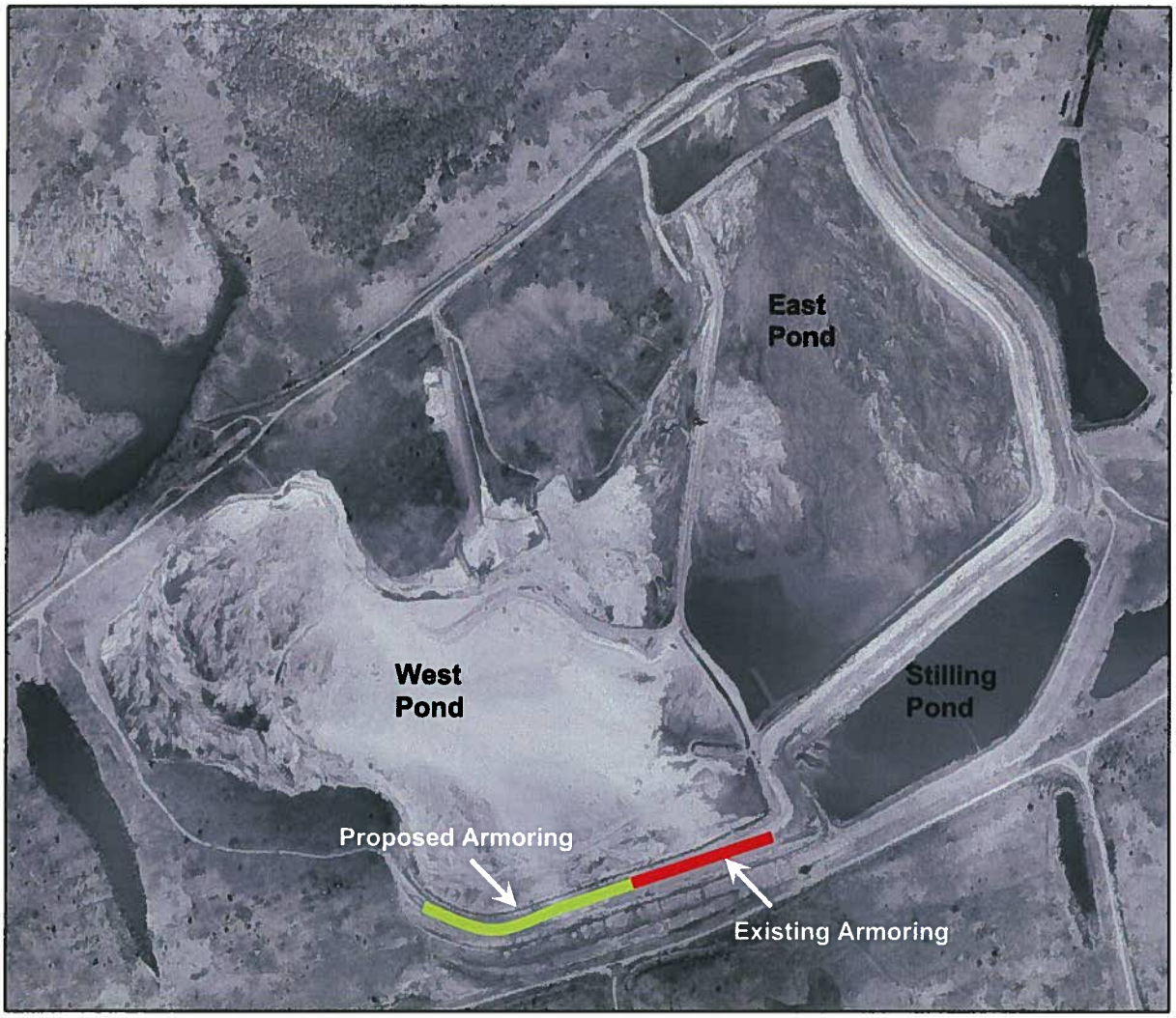


Figure 1: Approximate Area of Repair Work

3. Construction Recommendations

- **Safety:** Contractor shall be responsible for the health and safety of its personnel and shall meet all applicable local, state, and federal safety regulations; including but not limited to OSHA standards and TVA safety requirements.
- **Measurements:** Contractor shall base all measurements, both vertical and horizontal, from established benchmarks and monuments. A project baseline is presented on the attached drawing for assisting the Contractor with staking of approximate work limits.
- **Erosion and Sediment Control:** Silt fences shall be installed as directed by TVA. Installation, inspection and maintenance of silt fences shall follow the Best Management Practice (BMP) provisions given in Kentucky Erosion Prevention and Sediment Control Field Guide. A free copy of this guide can be obtained from Kentucky Division of Water.
- **Undercutting:** Contractor shall undercut the slope no more than 2-feet. Undercutting shall smoothly transition into original ground on all sides.
- **Materials:** Construction materials shall meet the requirements presented in KTC's Standard Specifications for Road and Bridge Construction Manual, current edition.
- **Stone Placement:** It is recommended that an excavator be used to place the materials in layers (starting from the bottom). Upon placing the minimum required layers of sand and No. 57 stone, channel lining shall be used to raise the undercut slope to original grade (or as needed to create a stable slope). Materials shall smoothly transition into original ground on all sides leaving a stable slope.
- **Begin Armoring:** Contractor shall begin armoring of the slope near the edge of the newly constructed ditch. The armoring shall smoothly transition to the ditch.
- **Field Adjustments:** It is recommended that construction measures be monitored by Stantec personnel. Adjustments will be necessary as the fieldwork progresses and should be agreed upon between TVA and Stantec prior to implementation.
- **Material Disposal:** Material removed shall be disposed off properly at the direction of TVA.

4. Construction Plan

Stantec prepared a construction plan drawing to assist TVA personnel with the construction of the repairs discussed above. The construction drawing shows the lateral and vertical extents of the repair limits and a typical cross-section of the repairs.

5. Quantities

It is estimated that a total of approximately 650 cubic yards of Class III channel lining would be required for constructing the slope armoring. This equals to approximately 950 tons of channel lining. Approximate quantity estimate of materials is presented in the table below.

Table 1. Quantity Estimate

Material	Quantity
Sand	600 tons
No. 57 Stone	500 tons
Class III Channel Lining	950 tons

6. Construction Cost Opinion

It is our understanding that TVA will be procuring materials from local vendors and constructing the slope armoring using in house resources. Based on this assumption only material cost opinion is presented below.

Table 2. Material Cost Opinion

	Quantity (Tons)	Unit Price* ($)	Cost ($)
Sand	600	19.43	11,658
No. 57 Stone	500	11.73	5,865
Class III Channel Lining	950	12.43	11,809
		Estimated Material Cost	29,332
		Contingency (15%)	4,400
		Total Estimated Material Cost	**$33,732**

*- Unit prices are based on conversations with William Perry and include delivery to the site

7. Closure

The analysis and conclusions presented here are based on information gathered from the borings, several assumptions and calculations performed 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 beyond

borings. The objective of this repair is to armor the exterior slope in the area discussed above. The Contractor is advised to review this work plan and contact Stantec for any clarifications, if needed.

Sincerely,

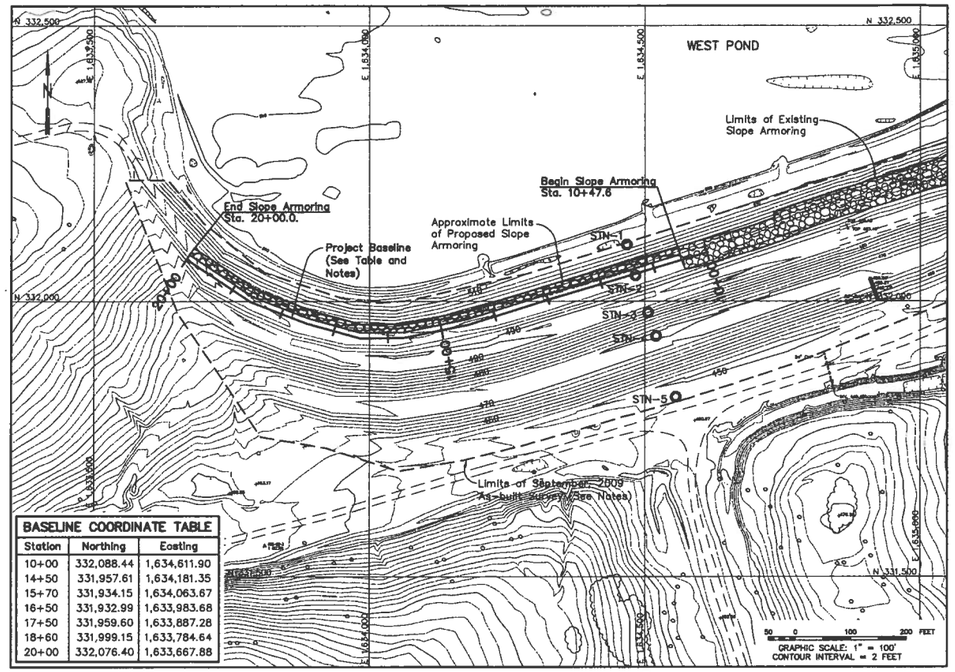
STANTEC CONSULTING SERVICES INC.

Sharath C. Vemuri, PE
Geotechnical Engineer

Hugo R. Aparicio, PE
Principal

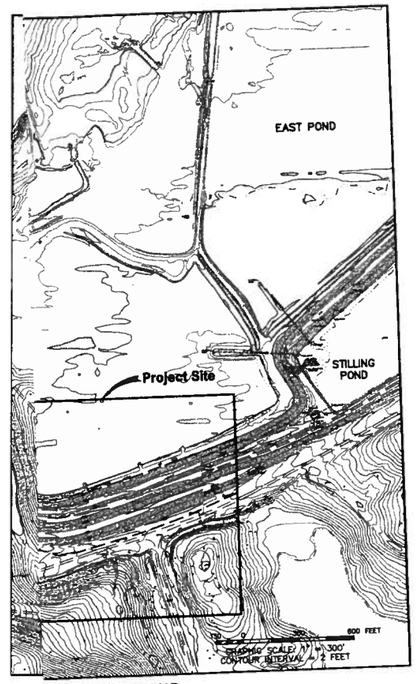
/sv/rws

Enclosures: 1 Construction Work Plan

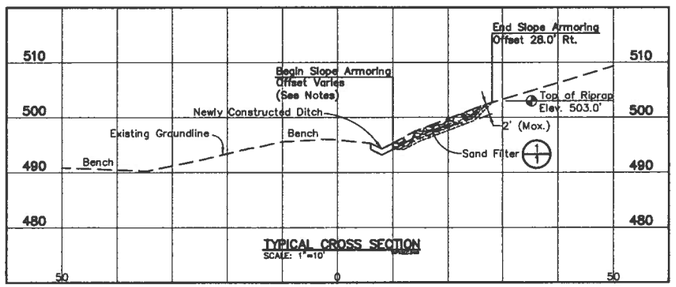


BASELINE COORDINATE TABLE		
Station	Northing	Easting
10+00	332,088.44	1,634,611.90
14+50	331,957.61	1,634,181.35
15+70	331,934.15	1,634,063.67
16+50	331,932.99	1,633,983.68
17+50	331,959.60	1,633,887.28
18+60	331,999.15	1,633,784.64
20+00	332,076.40	1,633,667.88

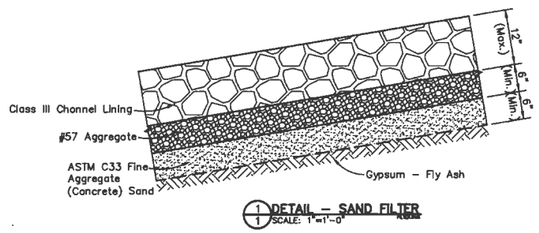
PLAN – SLOPE ARMORING
SCALE: 1"=100'



PROJECT LOCATION MAP
SCALE: 1"=300'



TYPICAL CROSS SECTION
SCALE: 1"=10'



1 DETAIL – SAND FILTER
1 SCALE: 1"=1'-0"

NOTES:

1. Objective: The objective of this repair is to armor the south slope of West Pond in the area indicated.
2. Measurements: Contractor shall base all measurements, both vertical and horizontal from established benchmarks and monuments. A project baseline is presented on the drawing to assist contractor with staking of approximate work limits.
3. Erosion and Sediment Control: Silt fences shall be installed as directed by TVA. Installation, inspection and maintenance of silt fences shall follow the Best Management Practice (BMP) provisions given in Kentucky Erosion Prevention and Sediment Control Field Guide. A free copy of this guide can be obtained from Kentucky Division of Water.
4. Undercutting: Contractor shall undercut the slope no more than 2–feet. Undercutting shall smoothly transition into original ground on all sides.
5. Materials: Materials used shall meet the requirements presented in KTC's Standard Specifications for Road and Bridge Construction Manual, current edition.
6. Stone Placement: It is recommended that an excavator be used to place the stone in layers (starting from the bottom). Channel lining shall be used to raise the undercut slope to original grade (or as needed to create a stable slope). Channel lining shall smoothly transition into original ground on all sides leaving a stable slope.
7. Begin Armoring: Contractor shall begin armoring of the slope near the edge of the newly constructed ditch. The armoring shall smoothly transition to the ditch.
8. Field Adjustments: It is recommended that construction measures be monitored by Stantec personnel. Adjustments will be necessary as the fieldwork progresses and should be agreed upon between TVA and Stantec prior to implementation.
9. Mapping: The topographic mapping within the repair limits is based on the as–built survey conducted by Stantec in September, 2009. Outside these limits, the topographic mapping is based on February, 2009 aerial survey by TVA.
10. Letter: Contractor shall refer to the attached letter of recommendations prepared by Stantec for this work.
11. Material Disposal: Material removed shall be disposed off at the direction of TVA.

ISSUED FOR CONSTRUCTION

REV NO.	DATE	DSGN	DRTN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ENGR	AS CONST
R –	–	–	–	–	–	–	–	–	–	–
R 0	10/13/09	SCV	DMG	SCV	HRA	HRA	HRA	TJ	–	–
ISSUED FOR CONSTRUCTION										

EXCEPT AS NOTED

SCALE: AS SHOWN

YARD

–

SCRUBBER SLUDGE COMPLEX
WEST POND
SOUTH SLOPE ARMORING

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
S. VEMURI	D. GRAHAM	S. VEMURI	H. APARICIO	H. APARICIO	H. APARICIO	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 10/13/09 | 64 | C | 10W701–01 | R 0

PLOT FACTOR: XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2060
Tel. 859.422.3000
Fax 859.422.3100
www.stantec.com

REFERENCE

REV NO. 0

PLOT DATE: 10/1/2009 USER: JOHNSON, TRACY
V:\TVA\ACTIVE\TVA5889\DOT\DOT\DRAWINGS\10W701-01-SLOPE ARMOR.DWG

Attachment 2

During Construction

During Construction

During Construction

After Construction

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

February 26, 2010 let_026_paf_175569040

Mr. Chris Buttram, PE
Tennessee Valley Authority
Fossil Power Group
1101 Market Street, MS LP 2G-C
Chattanooga, Tennessee 37402

Re: Construction Work Plan Closure
Work Plan No. PAF-LT-091027
Scrubber Sludge Complex
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Buttram:

Stantec Consulting Services Inc. (Stantec) would like to issue this letter requesting closure of the above mentioned work plans. Pertinent details of the workplans are presented in Table 1.

Table1: Work Plan Details

Workplan Issue Date	Subject	Reference No.	Status (P=Planning, W=In Progress, C=Complete)	Const. Start Date	Const. Complete Date
10/27/09	Gypsum Stack-East Pond South Slope Buttress	PAF-WP-091027-001 (let_009_paf_175569040)	C	11/27/09	1/12/10

Based on the observations made in the field during construction, a review of daily field reports, photos and available information, it is our opinion that the toe buttress was constructed to match reasonably well with the recommendations in our work plan. Pertinent attachments for documentation are included along with this letter. These include original work plan issued by Stantec and selected photos from the field. The record drawing for TVA's business support library will be submitted electronically. Daily field reports for the project have already been submitted to TVA.

We appreciate this opportunity and look forward to continue working with you on this project. If you have any questions or required additional information, please contact us.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Sharath C. Vemuri, PE
Senior Project Engineer

/rdr

Attachment 1

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

October 27, 2009 let_009_175569040

Mr. Barry Snider, PE
Tennessee Valley Authority
1101 Market Street, LP 5E-C
Chattanooga, Tennessee 37402

Re: Issued for Construction
Rock Buttress
South Slope of East Pond
Scrubber Sludge Complex
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Snider:

Stantec Consulting Services Inc. (Stantec) has completed the design of rock buttress at south slope of East Pond and would like to issue the following work plan for construction. This document incorporates the comments received from TVA and AECOM following a review of our October 19, 2009 work plan (let_007_175569040).

In this work plan, we have changed the buttress detail to reflect the latest decision taken by TVA (with assistance from Stantec and AECOM) to use filter fabric as a layer of separation between the buttress and existing slope. Accordingly, on the attached construction drawing we have altered the detail to show filter fabric. This letter presents a brief description of the project, alternate solutions considered for stabilizing the dike, results of engineering analysis and construction recommendations.

1. Background

During the 2009 Phase 1 geotechnical evaluation of the Scrubber Sludge Complex, Stantec personnel observed numerous wet and soft conditions throughout the lower two-thirds of the East Pond stacking slopes caused due to uncontrolled seepage through the dike. In addition, numerous intermediate bench areas with standing water were also noted promoting dense Phragmites growth along the benches.

Since April, 2009, TVA has performed several repairs along the south slope of the East Pond to address the soft and wet areas. These included (i) regrading the upper intermediate bench to promote positive drainage (work plan no. let_013_paf_171468118), (ii) installing a ditch to collect and direct the uncontrolled seepage to the Stilling Pond (work plan no.

let_013_paf_171468118) and (iii) constructing a rock buttress near the east end of the slope (work plan nos. let_012_paf_171468118 and let_002_paf_175569040). The current work plan has been prepared by Stantec to address the stabilization of the entire south slope using a similar rock buttress.

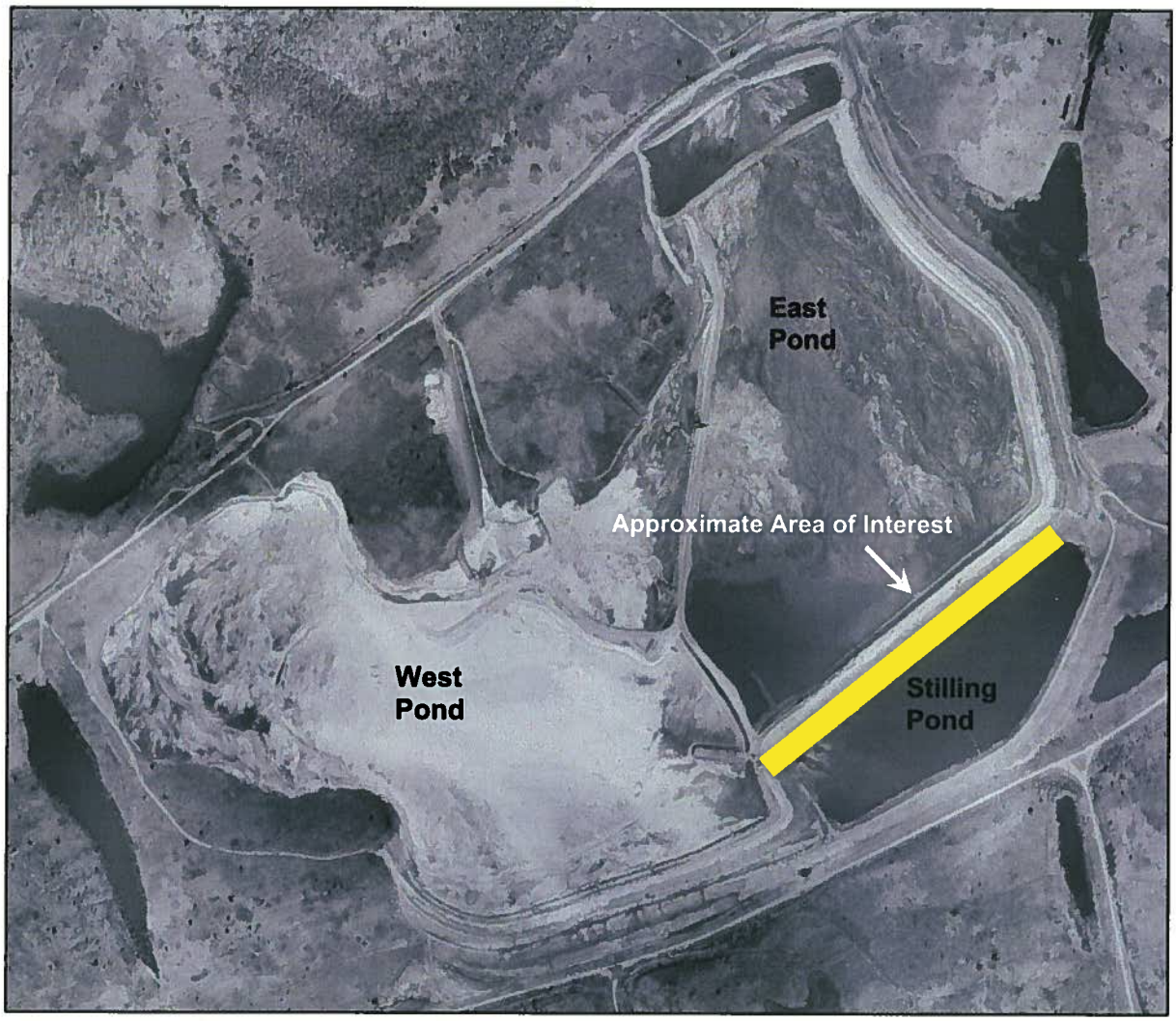


Figure 1: Approximate Area of Interest

2. Conceptual Alternatives Considered

2.1. General

As part of the design process, Stantec considered several alternatives for stabilizing the slope. These alternatives are listed in Table 1 and briefly described in subsequent paragraphs.

Table 1. Repair Alternatives Considered

Option No.	Repair Alternative
1	Flattening of slope
2	Toe buttressing using gypsum-fly ash or mine spoil
3	Toe buttressing using channel lining

2.2. Flattening of Slopes

Stantec considered the option of flattening the slope in order to increase its stability. While this option is commonly used for repairing the slopes, it could not be considered as a feasible solution for the current project, partly due to the geometrical constraints involved. For example, flattening the slope would require the existing slope geometry to be altered significantly (undercutting upper portion of the slope). To facilitate flatter slope, the dike crest would have to be moved towards the center of the east pond which is currently being used for gypsum-fly ash disposal. Therefore, due to the relatively intrusive nature of this alternative and the operational challenges involved, Stantec did not consider this option beyond the conceptual phase.

2.3. Toe Buttressing Using Gypsum-Fly ash or Mine spoil

Stantec considered the option of buttressing the toe of the slide using gypsum-fly ash material or mine spoil available in the area. This option was not considered to be practical because the gypsum-fly ash or the mine spoil would have to be placed below water and compacted under water (Stilling Pond). This would be extremely difficult and may lead to several constructability issues. Therefore, Stantec did not explore this option beyond the conceptual phase.

2.4. Toe Buttressing Using Channel Lining

A slightly varied version of the previous option would be to buttress the slope using Class III channel lining. This option does not require the use of a specialty contractor and TVA has been able to procure channel lining reasonably quickly for previously completed work. Due to the viability surrounding this option and TVA's experience at Paradise with this type of repair, Stantec considered this option to be more practical (of the alternatives discussed here). Hence Stantec moved forward to the next phase which was engineering analysis and

design. The results of engineering analysis and design associated with this option are discussed in the subsequent paragraphs.

3. Engineering Analysis

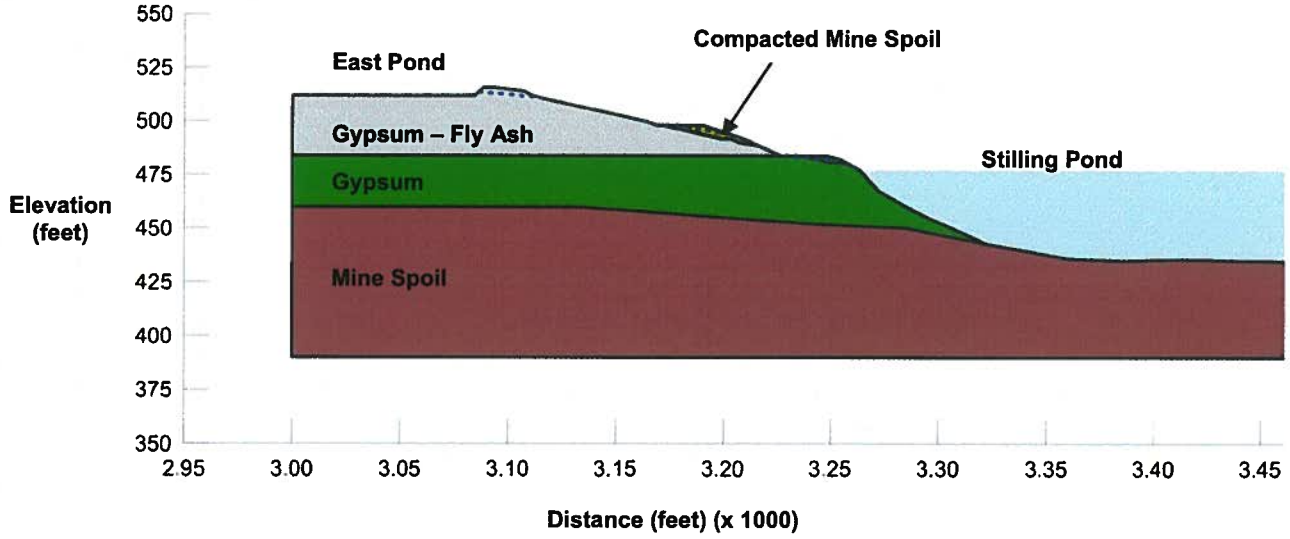
3.1. General

Stantec's scope of work included performing seepage analysis and slope stability analysis for existing conditions and proposed conditions. Analysis was performed for one (1) cross section through the dike. The analysis procedure and the results of the analysis are presented in the following paragraphs. Outputs from the engineering analysis are presented as attachment to this letter and electronic version of Geo-Studio files are provided on the attached CD.

3.2 Cross Section

Analysis (seepage and slope stability) was performed for the following existing ground cross section.

1) C-C' (cross section through borings STN-8 to STN-9)



3.3 Seepage Analysis

3.3.1 Background

The objective of seepage analysis was to understand the total head (and pore water pressure) distribution within a given cross section of the dike. Seepage analysis was performed using SEEP/W, a numerical software tool developed by Geo-Slope International

Inc. SEEP/W is a finite element software product for analyzing groundwater seepage and pore-water pressure distribution problems within porous materials such as soil and rock.

The first step in the seepage analysis was to develop a cross section of the dike. Stantec utilized boring logs, historic drawings and survey information to estimate the dimensions of the cross section. SEEP/W uses the concept of regions and points to define the geometry of a problem and to facilitate discretization (or meshing) of the problem. Upon defining the geometry of the model, material properties were assigned for the *Saturated/Unsaturated Model* offered in SEEP/W. The next step in the process was to define boundary conditions. All boundary conditions were applied to region points and region lines. Upon defining the boundary conditions, the model was analyzed using *Steady State* seepage analysis option available in SEEP/W based on the assumption that the boundary conditions are constant over time. Specific details regarding the analysis procedure are presented in the following sections.

3.3.2 Material Properties

The material properties used for seepage analysis are presented in Table 2. Material properties are consistent with those used in Phase 2 report (dated August 24, 2009). In this section, the term 'laboratory test results' refers to those presented in Appendix F of the Phase 2 report.

Table 2. Material Properties used for Seepage Analysis

Material	Kv (cm/sec)	Kv/Kh	Kh/Kv	e	w-sat (%)	w-res (%)
Gypsum – Fly Ash	2E-5	0.02	50	0.65	41	3
Gypsum	2E-5	0.02	50	0.70	39	3
Compacted Mine Spoil	5E-5	0.33	3	0.60	37	2
Class III Channel Lining	1E-2	1.00	1	0.66	40	0
Mine Spoil	5E-5	0.33	3	0.60	37	2

Where,

- k_v is the vertical hydraulic conductivity
- k_h is the horizontal hydraulic conductivity
- e is the void ratio
- w_{sat} is the saturated volumetric water content, and
- w_{res} is the residual water content

Vertical Hydraulic Conductivity (Kv): The *Kv* values gypsum-fly ash and gypsum were estimated based on the laboratory test results (ASTM D5084). The *Kv* value for mine spoil was assumed.

Horizontal Hydraulic Conductivity (Kh): The *Kh* values of all materials were assumed. The ratio of Kv to Kh was estimated based on placement of the material. The closer the material was to behaving in an isotropic manner the higher the value of the ratio. Gypsum and gypsum-fly ash layers were assumed to be relatively anisotropic due to the fact that they were hydraulically placed. The mine spoil was assumed to be anisotropic due to the varying particles (soil and rock) that comprise mine spoil.

Void Ratio (e): The *e* values of two materials (gypsum-fly ash and gypsum) were estimated based on the laboratory test results (ASTM D5084). The *e* value for mine spoil was assumed.

Saturated Volumetric Water Content (w-sat): The *w-sat* values of all materials (gypsum-fly ash and gypsum) were calculated using the following relationship:

$$w_{sat} = \frac{e}{1+e}$$

Residual Water Content (w-res): The *w-res* values of all materials were assumed using the reference Rawls et al.'s "Estimation of Soil Water Properties".

3.3.3 Under-drains

Seepage analysis was performed assuming no under-drains to be present. This is based on results of Phase 1 and 2 geotechnical evaluation which indicated that existing under-drains were not functioning properly and were unable to control the seepage through the dike. However, even if the under-drain was included in the seepage analysis, the results of seepage analysis (from Phase 2 evaluation) indicate that the under-drain does not effect the location of the phreatic surface. Therefore, for the current analysis, seepage analysis was performed assuming 'no under-drain' condition. Excerpt from Table 19 of the Phase 2 report, is presented below for comparison purposes.

Table 3. Total Head Measurements*

Cross-Section	Piezometer	Tip Elevation (feet)	SEEP/W No Under-Drains	SEEP/W With Under-Drains	Average Field Measurement
C-C'	PZ-8A	452	490	490	487
	PZ-9	455	488	488	496

*-Taken from Table 19, Report of Geotechnical Exploration, dated August 25, 2009 by Stantec

3.3.4 Results

Detailed results of seepage analysis are presented in Attachment 1. SEEP/W electronic files (.gsz files) are provided on the attached CD.

3.4 Slope Stability Analysis

3.4.1 Background

The stability of the existing dike slope was evaluated using the two-dimensional limit equilibrium method of analysis. Factors of safety against failure were calculated using Spencer's method.

3.4.2 Material Properties

The shear strength parameters for all materials were calculated using the limit equilibrium methodology (back analysis). Under this method, different shear strength parameters (friction angles) are input into the program until the existing slope (assumed to be marginally stable) achieves a factor of safety of 1.0. The strength parameters obtained using this method are presented in Table 4. Please note that the cohesion values for all cases were assumed to be zero, which is typically recommended when analyzing drained strength parameters long-term stability.

Table 4. Material Properties for SLOPE/W Analysis

Material	Cohesion (c')	Friction Angle (Φ')
Gypsum – Fly Ash	0	36°
Gypsum	0	36°
Compacted Mine Spoil	0	28°
Class III Channel Lining	0	40°
Mine Spoil	0	28°

Where,

- *c'* is the cohesion
- *Φ'* is the friction angle

3.4.3 Cases

Two cases were analyzed and these included

A) Existing Condition (no rock buttress)
B) Proposed Condition (with rock buttress)

3.4.4. Failure Modes

The following failure modes were analyzed.

X) Auto Search (searches for critical failure circle using grid and radius method)
Y) Forced Circle (Failure circle for a given center and radius)

3.4.5 Buttress Width (BW)

The following buttress widths (BW) were analyzed

1) 0 feet (existing condition)
2) 35 feet (proposed condition)
3) 45 feet (proposed condition)
4) 55 feet (proposed condition)
5) 65 feet (proposed condition)
6) 75 feet (proposed condition)

3.4.6 Minimum Depth (MD)

Slope/W defines 'minimum slip surface depth' as the minimum thickness of a valid slip surface. Analysis was performed for the following minimum slip surface depths (MD) when using 'Auto Search' failure mode.

I. 16 feet (existing condition)
II. 30 feet (proposed condition)
III. 40 feet (proposed condition)
IV. 50 feet (proposed condition)
V. 60 feet (proposed condition)

3.4.7 Case IDs

A total of twenty six (26) cases of slope stability were analyzed of which one (1) was existing condition and twenty five (25) were for proposed conditions. The case identifications (IDs) given to each case are presented in Table 5.

Table 5. Case IDs[1]

Failure Mode	Buttress Width (ft)	Minimum Slip Surface Depth (ft)				
		16	30	40	50	60
1. Auto Search	0	1_BW0_MD16				
	35		1_BW35_MD30	1_BW35_MD40	1_BW35_MD50	1_BW35_MD60
	45		1_BW45_MD30	1_BW45_MD40	1_BW45_MD50	1_BW45_MD60
	55		1_BW55_MD30	1_BW55_MD40	1_BW55_MD50	1_BW55_MD60
	65		1_BW65_MD30	1_BW65_MD40	1_BW65_MD50	1_BW65_MD60
	75		1_BW75_MD30	1_BW75_MD40	1_BW75_MD50	1_BW75_MD60
2. Forced Circle	35	2_BW35_MD16				
	45	2_BW45_MD16				
	55	2_BW55_MD16				
	65	2_BW65_MD16				
	75	2_BW75_MD16				

[1] File naming convention on attached CD matches Case IDs. BW refers to Buttress Width; MD refers to Minimum Depth of the Slip Surface

3.4.8 Results

The factor of safety computed for each case is presented in Table 6.

Table 6. Case IDs

Failure Mode	Buttress Width (ft)	Minimum Slip Surface Depth (ft)				
		16	30	40	50	60
1. Auto Search	0	1.00[1]				
	35		1.30	1.36	1.50	1.60
	45		1.38	1.41	1.57	1.69
	55		1.46	1.50	1.63	1.79
	65		1.53	1.58	1.67	1.86
	75		1.59	1.65	1.71	1.91
2. Forced Circle	35	1.73				
	45	2.09				
	55	2.54				
	65	3.14				
	75	3.97				

[1]-Existing condition analysis for obtaining shear strength parameters (existing slope assumed to be marginally stable) (see section 3.4.2)

4. Buttress

4.1. Recommended Buttress Options

Based on the information discussed here and the results of engineering analysis it is recommended that the south slope of East Pond be stabilized using a rock buttress constructed from Class III channel lining. TVA has requested that Stantec provide two options for the rock buttress based on the factor of safety of 1.3 and 1.5. The recommended buttress options are presented in Table 7.

Table 7. Recommended Buttress Options

Parameter	Option A	Option B
Factor of Safety	1.3	1.5
Top Width	35 feet	55 feet
Top Elevation	482 feet	482 feet
Slope	1.5H:1V	1.5H:1V

As recommended by AECOM, Stantec analyzed the slope stability of Option A and B using filter fabric. Stantec analyzed this case by altering the friction angle of Class III channel lining to match the suggested interface friction angle between non-woven geotextile fabric and granular soil (*GRI Report 30)*. Specifically, the friction angle was changed from 40 degrees to 30 degrees while keeping the unit weight as-is. The results of this analysis (presented in Attachment 1) indicate that the factors of safety presented in Table 7 are achievable at the buttress widths recommended.

4.2. Construction Plans

Following the completion of engineering analysis, Stantec's performed a computer-aided-design and drafting of the buttress. Design was performed using Civil 3D 2009 and drafting was completed in AutoCAD 2008. The objective of the design and drafting was to develop construction plans to assist TVA and to estimate the material quantities. The results of Stantec's design are presented on the two construction plan drawings (plan view and cross section) attached to this letter. TVA shall refer to these plans for additional information regarding the recommended buttress options.

4.3. Material Quantities

The quantity estimates for the two options (A and B) are presented in Table 8.

Table 8. Material Quantities

Option	Top Width (feet)	Material	Volume (Cubic Yards)	Weight (Tons)	Weight (Tons)[1]
A	35	Class III Channel Lining	40,500	59,049	59,000
B	55	Class III Channel Lining	69,000	100,602	100,600
A or B	---	Filter Fabric	18,000 sy	---	---

(1) Rounded

4.4. Material Cost Opinion

It is our understanding that TVA will be procuring class III channel lining from local quarry and constructing the buttress using in house resources. Based on this assumption, only material cost opinion is presented in Table 9.

Table 9. Material Cost Opinion

Option	Top Width (feet)	Material	Weight (Tons)	Unit Price (per ton)	Cost[1]
A	35	Class III Channel Lining	59,000	$12.43	$ 733,000
B	55	Class III Channel Lining	100,600	$12.43	$ 1,250,000
A or B	---	Filter Fabric	18,000 sy	$0.75	$ 13,500
				Approximate Material Cost Difference	$ 517,000

(1) Rounded to the nearest thousand

4.5. Construction Sequence

Contractor is made aware that slope armoring work (a separate work plan) will have to be coordinated with the current work (buttressing). Contractor shall refer to drawing no. 10W702-03 and associated work plan for additional information. Suggested sequence of construction is presented on drawing no. 10W702-02.

4.6. Recommendations for Buttress Construction

- **Safety:** TVA (Contractor) shall be responsible for the health and safety of its personnel and shall meet all applicable local, state, and federal safety regulations; including but not limited to OSHA standards and TVA safety requirements
- **Purpose:** The objective of this repair is to stabilize the south slope of the East Pond in area indicated using a Class III channel lining (crushed stone) buttress
- **Measurements:** Contractor shall base all measurements, both vertical and horizontal, from established benchmarks and monuments. A project baseline is presented on the attached drawing for assisting the Contractor with staking of approximate work limits

- **Erosion and Sediment Control:** Silt fences shall be installed as directed by TVA. Installation, inspection and maintenance of silt fences shall follow the Best Management Practice (BMP) provisions given in Kentucky Erosion Prevention and Sediment Control Field Guide. A free copy of this guide can be obtained from Kentucky Division of Water
- **Vegetation:** All vegetation within area to be stabilized and above water shall be removed prior to placement of crushed stone
- **Materials:** Construction materials shall meet the requirements presented in KTC (Kentucky Transportation Cabinet) Standard Specifications for Road and Bridge Construction Manual, current edition
- **Filter Fabric:** The geotextile (filter fabric) shall have a minimum weight of 12oz per square yard and satisfy (or exceed) Type I criteria of Kentucky Transportation Cabinet's Standard Specifications for Road and Bridge Construction (current edition). Examples include GSE NW12 manufactured by GSE Lining Technology Inc. or US 300NW manufactured by US Fabrics Inc.
- **Fabric Length:** Filter fabric shall be cut into 80 feet (length) pieces and used along the slope. Depending on the depth of the pond, the filter fabric may or may not extend down to the toe of the slope (below water). As long as the Contractor is using the entire roll width and 80 feet long pieces it would be acceptable.
- **Fabric Placement:** Contractor shall use extreme care while installing the filter fabric, especially under water. Filter fabric shall not be ruptured during the placement of Class III channel lining.
- **Overlapping:** Contractor shall overlap the filter fabric (width direction) a minimum of 2 feet.
- **Stone Placement:** It is recommended that an excavator be used to place the crushed stone in layers (starting from the bottom). During the placement, determine (by visual observation) whether these initial layers remain stable. Crushed stone placement shall be continuously monitored for movement and smoothly transition into original ground on all sides leaving a stable slope
- **Surfacing Stone:** No.2 stone shall be used to choke the top of Class III channel lining as needed in the field.
- **Existing Slope:** The existing slope is assumed to be marginally stable. Until the buttress is constructed, Contactor shall under no circumstances allow heavy equipment or other construction related traffic on top of the existing slope
- **Access:** It is suggested that the Contractor access the area from the east end and/or west end and not from the top of the slope. However, the final determination regarding proper access to the construction area shall be made by the Contractor based on field conditions and safety considerations

- **Compaction:** Place crushed stone up to near the normal pool elevation. Once above pool elevation, place crushed stone in 24-inch thick layers and compact with heavy dozer passes
- **Field Adjustments:** It is recommended that construction measures be monitored by Stantec personnel. Adjustments will be necessary as the fieldwork progresses and should be agreed upon between TVA and Stantec prior to implementation
- **Material Disposal:** Construction generated waste shall be disposed properly at the direction of TVA.
- **Work Plan:** Contractor shall refer to the construction work plan associated with this drawing for additional information and general recommendations.

5. Closure

The analysis and conclusions presented here are based on information gathered from the borings, several assumptions and theoretical calculations performed 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. The recommended work described here has been discussed in the field with TVA personnel on October 5, 2009 during a site visit by Stantec personnel. The objective of this repair is to buttress the toe of the slope in the area. The Contractor is advised to review attached construction plans and contact Stantec for any clarifications, if needed.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Sharath C. Vemuri, PE
Geotechnical Engineer

Hugo R. Aparicio, PE
Principal

/sv/rws

Enclosures: 1 Attachment 1 (Calculations)
2 Attachment 2 (Construction Plans)
3 CD (Engineering Analysis)

Attachment 1

Engineering Analysis

TVA Calculation Package

Title PAF- Scrubber Sludge Complex south slope of East Pond Buttress

Location Description: *(Optional)* PAF-Scrubber Sludge Complex	**Total Pages:** *(including appendices & attachments)* 37

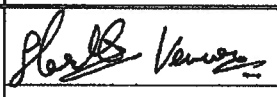
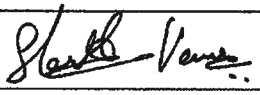
Calculation ID *(All parts required to form a unique ID)*:

Org Code	Location/ Plant Code	Branch Code	**Alphanumeric Part** = Discipline Code (1) + Type Code (1) + "X" + Unit Field (3) + Sys Code (3) + Year (4) + Sequence No. (4)
FPG	PAF	FES	C-D-X-000--000-2009-0002

NOTE: When referencing the calculation ID, include all parts without spaces or dashes between them.

Unit(s), Spill gate(s), or Voltages (PSO):	**Key Nouns (For CTS/CCRIS):**
000	CTS

Applicable Design Document(s):	**Rev**	**RIMS/EDMS Accession Number** *(Optional)*
Drawing 10W702-01	R0	
Drawing 10W702-02	R	
UNID System(s):	R	
	R	

	R0	R	R	R
DCN, PCN, NA				
Prepared: Sign→				
Print Name	Sharath Vemuri			
Checked: Sign→				
Print Name	Sharath Vemuri			
	These calculations contain unverified assumption(s) that must be verified later? ☐ Yes ☒ No These calculations contain special requirements and/or limiting conditions? ☒ Yes ☐ No			
Approved: Sign→				
Print Name	Sharath Vemuri			
Approval Date	10/27/09			
	These calculations contain a design output attachment? ☒ Yes ☐ No			
Revision Applicability	☐ Entire calc	☐ Entire calc ☐ Selected pgs	☐ Entire calc ☐ Selected pgs	☐ Entire calc ☐ Selected pgs
	Computer output Microfiche generated? ☐ Yes ☒ No Number: _____			

Purpose of the Calculation: Stability runs used to size slope buttress for the south slope of East Pond at Scrubber Sludge Complex

Abstract:

☒ Electronically file and return calculation to Calculation Library.
☐ Electronically file and return calculation _____ Address: _____

TVA Calculation Coversheet
CTS Input Form

Preparer	Preparer Login ID	Date
Checker	Checker Login ID	Date

Update Code: ☐ Add ☐ Change ☐ Delete ☐ Rename ☐ Supersede ☐ Duplicate ☐ Verify

The following section applies if a calculation is being renamed, superseded, or has a duplicate.

	Org Code	Plant	Branch	Number	Cur Rev	New Rev
Current Calc ID:						

The following section applies to all calculations.

Calc ID:	FPG	PAF	FES	C-D-X-000--000-2009-0002	0	0

Firm: *(TVA or Contractor)* Contractor-Stantec

Cross-References

A/C/D	Xref Code	Type	Org Code	Plant	Branch	Number	Rev

TVA Calculation Record of Revision

Calculation Identifier: FPG-PAF-FES-C-D-X-000--000-2009-0002

Title PAF- Scrubber Sludge Complex south slope of East Pond Buttress

Revision No.	Description of Revision
0	Design of Slope Buttress for Scrubber Sludge Complex south slope of East Pond

TVA Computer File Storage Information Sheet

Calculation Identifier: FPG-PAF-FES-C-D-X-000--000-2009-0002 **Rev.** 0 **Plant:** PAF

Subject: Slope buttressing for the south slope of the East Pond of the PAF Scrubber Sludge Complex

Software Name: SLOPE/W **Revision Level:**

Vendor Name: Geo-Slope

Address: 1400, 633 - 6th Avenue S.W.
Calgary, Alberta
T2P 2Y5, Canada

Executable Files

☒ No TVA developed **executable files** were used in this calculation.
Comments:

☐ TVA developed **executable files** used in this calculation have been stored electronically and sufficient identifying information is provided below for each executable file. *(Any retrieved file requires re-verification of its contents before use.)*

Input Files

☒ Electronic storage of the **input files** for this calculation is not required.
Comments:

☐ **Input files** for this calculation have been stored electronically and sufficient identifying information is provided below for each input file. *(Any retrieved file requires re-verification of its contents before use.)*

TVA Calculation Table of Contents

Calculation Identifier: FPG-PAF-FES-C-D-X-000--000-2009-0002 **Revision:** 0

Table of Contents

Section	Title	Page
1	Seepage and Slope Stability Analysis Runs	6

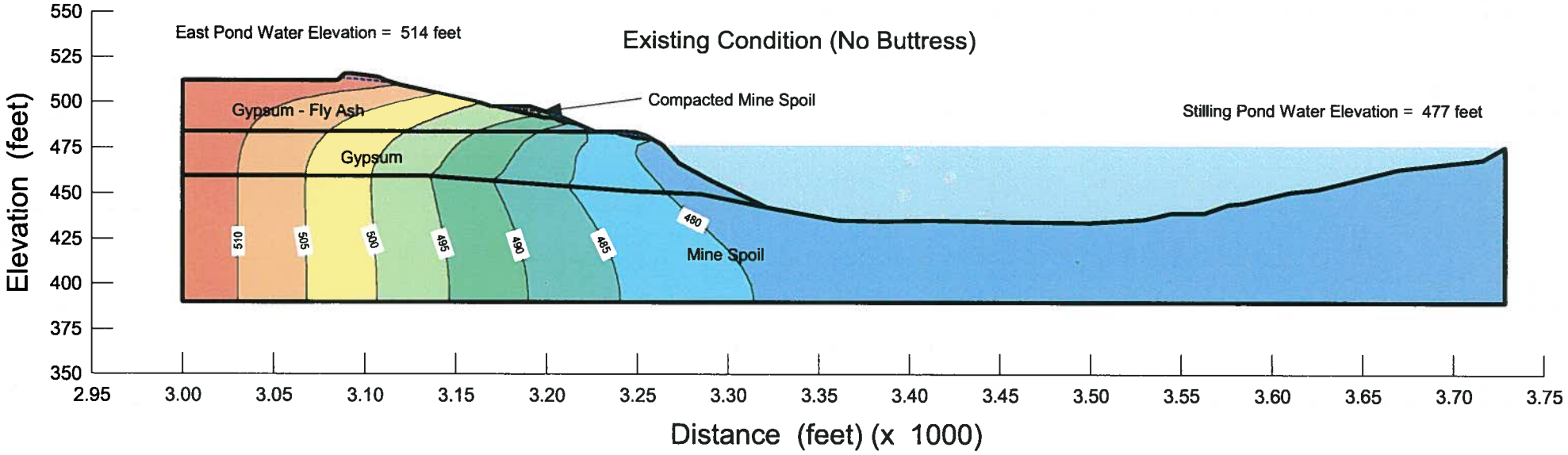
SEEP/W Analysis
South Slope of East Pond
Scrubber Sludge Complex

Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Steady-State Seepage
File Name: 1_BW0_MD16.gsz

Material Type	Ksat	Kratio	Wsat
Gypsum - Fly Ash	3.28e-005	0.02	0.41
Mine Spoil	4.92e-006	0.333	0.37
Gypsum	3.28e-005	0.02	0.39
Class III Channel Lining	0.01	1	0.4
Compacted Mine Spoil	4.92e-006	0.333	0.37

Note:
The results of 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
South Slope of East Pond
Scrubber Sludge Complex

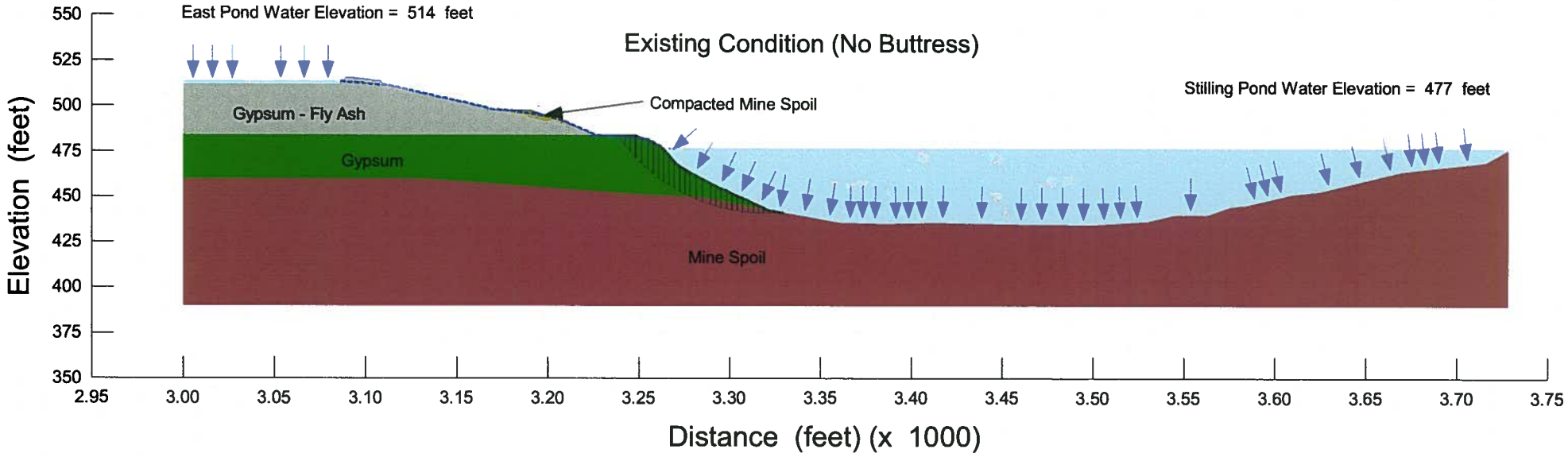
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW0_MD16.gsz

Factor of Safety: 1.0
Center: (3320, 540) ft
Radius: 99 ft
Minimum Slip Surface Depth: 16 ft

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28

Note:
The results of 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.



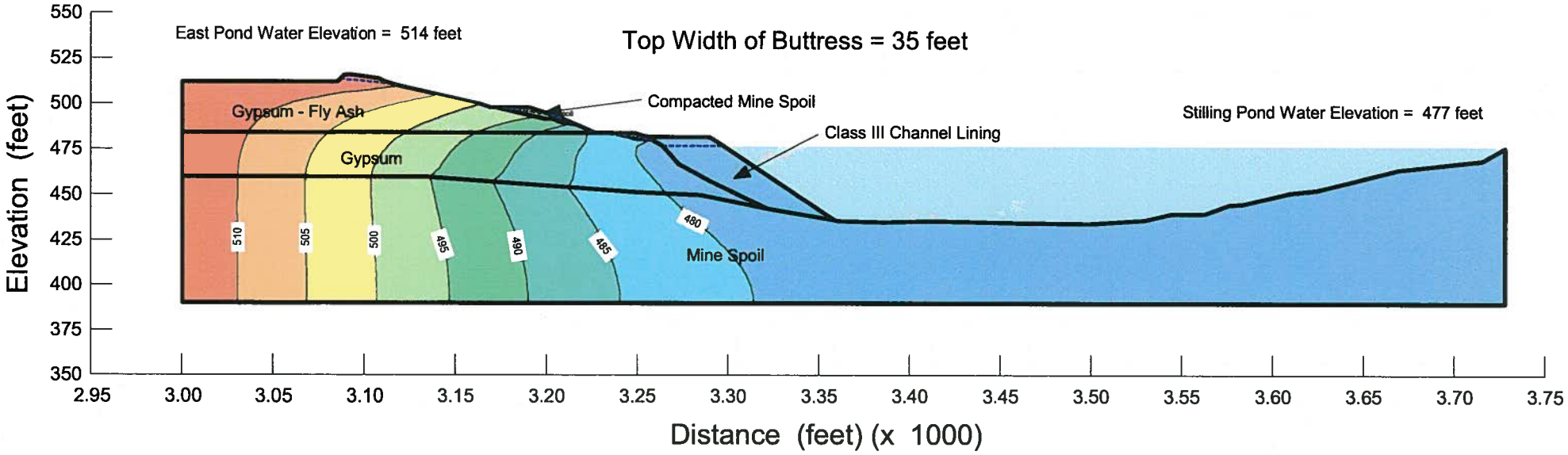
SEEP/W Analysis
South Slope of East Pond
Scrubber Sludge Complex

Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Steady-State Seepage
File Name: 1_BW35_MD30.gsz

Note:
The results of 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.

Material Type	Ksat	Kratio	Wsat
Gypsum - Fly Ash	3.28e-005	0.02	0.41
Mine Spoil	4.92e-006	0.333	0.37
Gypsum	3.28e-005	0.02	0.39
Class III Channel Lining	0.01	1	0.4
Compacted Mine Spoil	4.92e-006	0.333	0.37



Slope Stability
South Slope of East Pond
Scrubber Sludge Complex

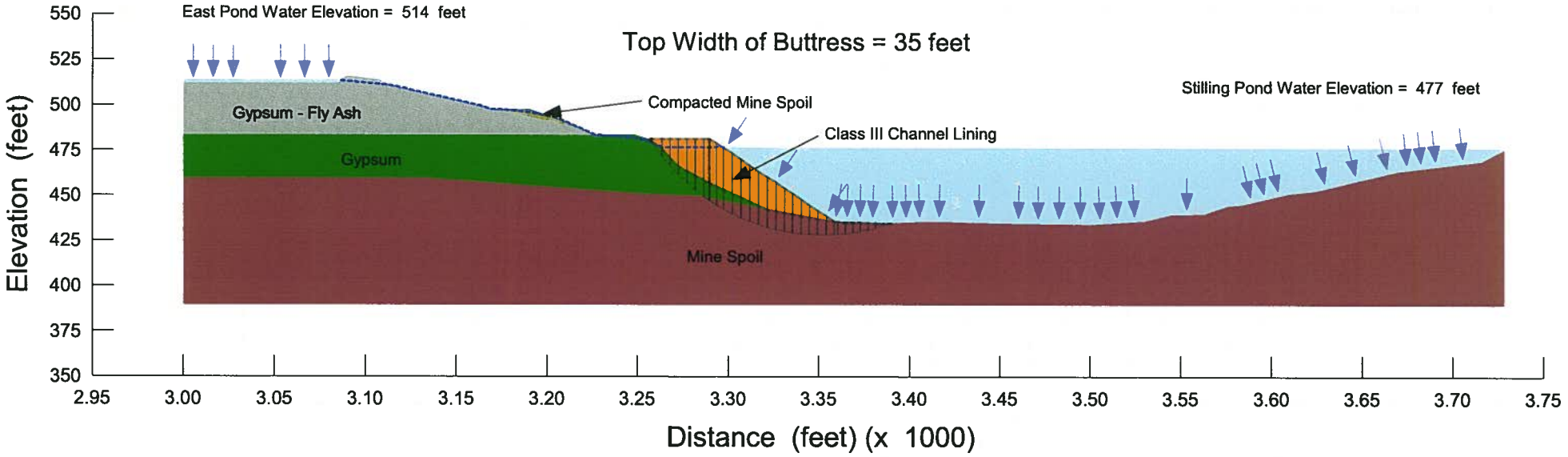
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW35_MD30.gsz

Factor of Safety: 1.30
Center: (3352, 540) ft
Radius: 111.5 ft
Minimum Slip Surface Depth: 30 ft

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28

Note:
The results of 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
South Slope of East Pond
Scrubber Sludge Complex

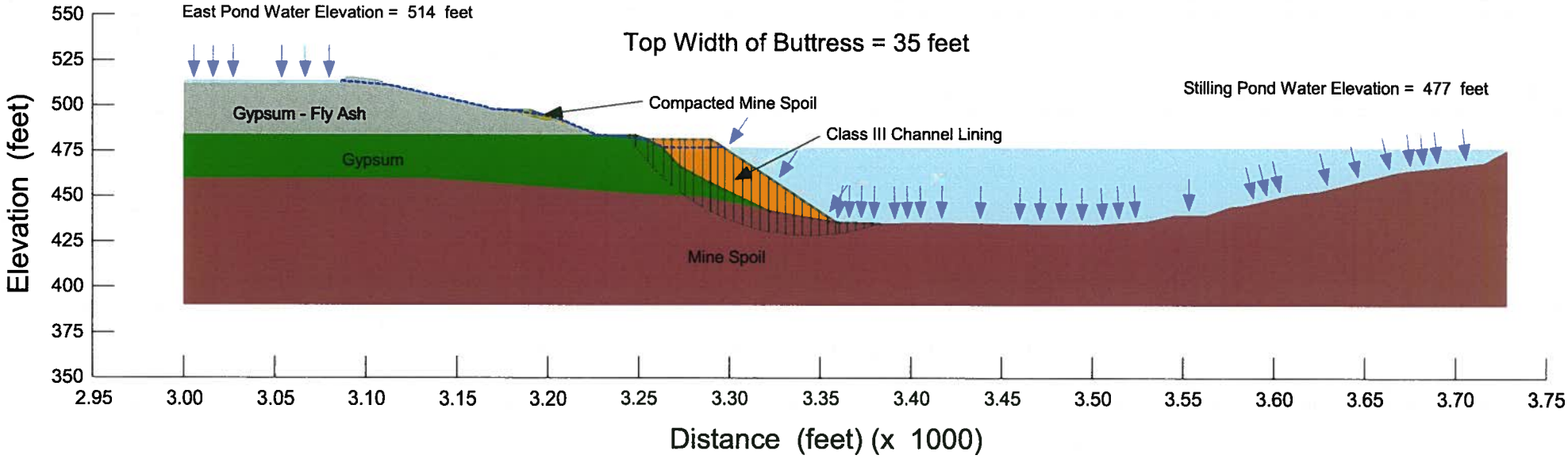
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW35_MD40.gsz

Factor of Safety: 1.36
Center: (3344, 546.75) ft
Radius: 118.25 ft
Minimum Slip Surface Depth: 40 ft

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28

Note:
The results of 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
South Slope of East Pond
Scrubber Sludge Complex

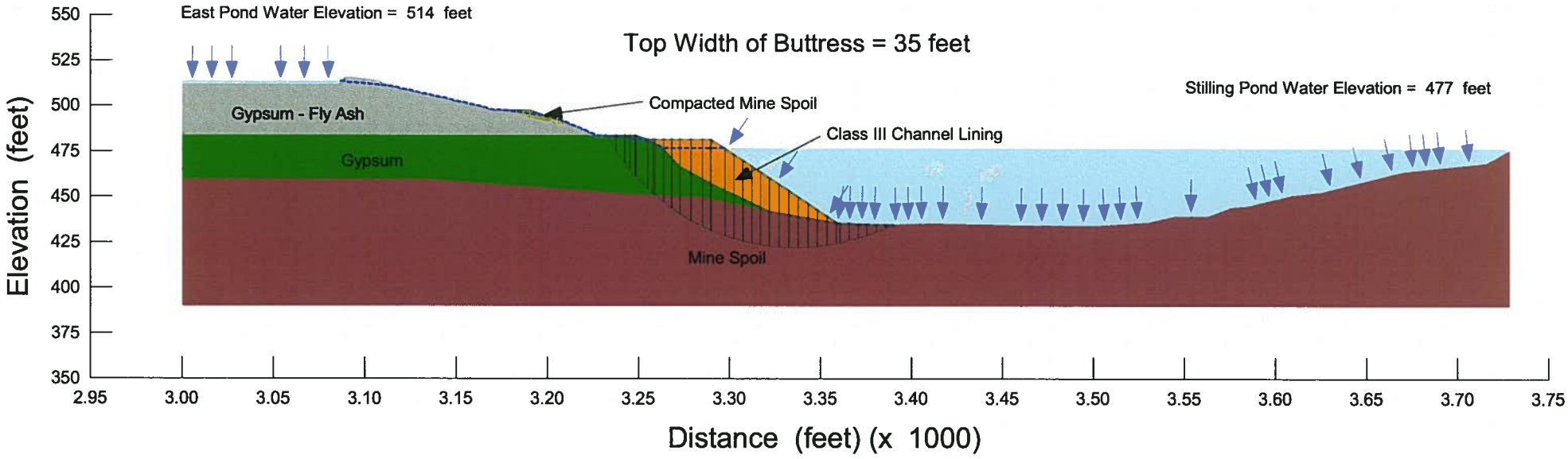
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW35_MD50.gsz

Factor of Safety: 1.50
Center: (3336, 540) ft
Radius: 117.75 ft
Minimum Slip Surface Depth: 50 ft

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28

Note:
The results of 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
South Slope of East Pond
Scrubber Sludge Complex

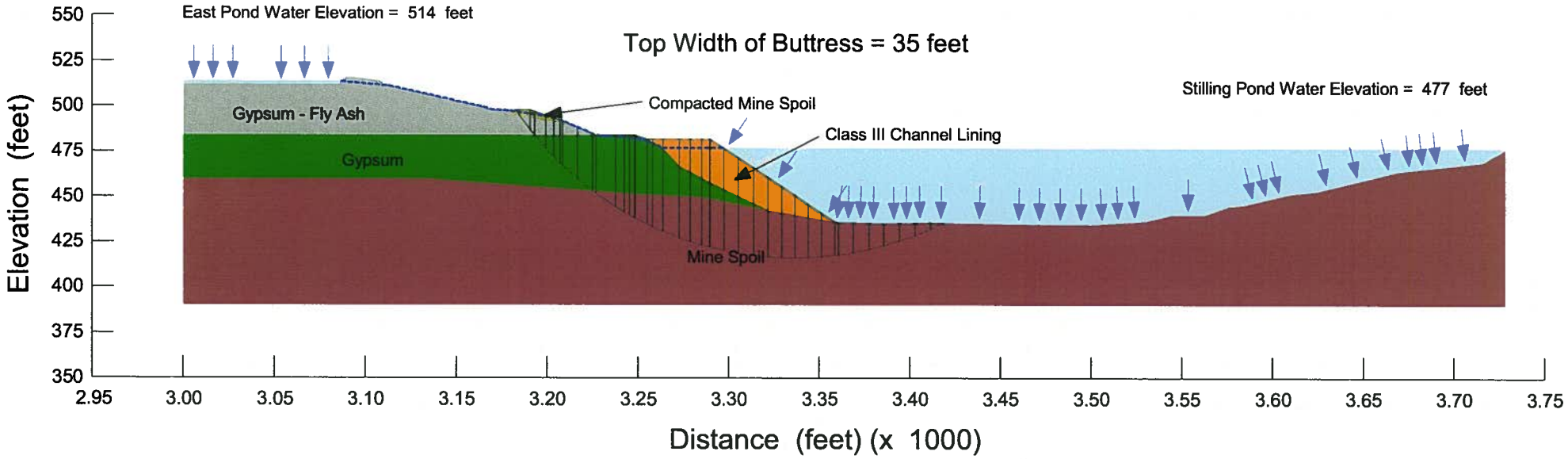
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW35_MD60.gsz

Factor of Safety: 1.60
Center: (3336, 600.75) ft
Radius: 184.75 ft
Minimum Slip Surface Depth: 60 ft

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28

Note:
The results of 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.



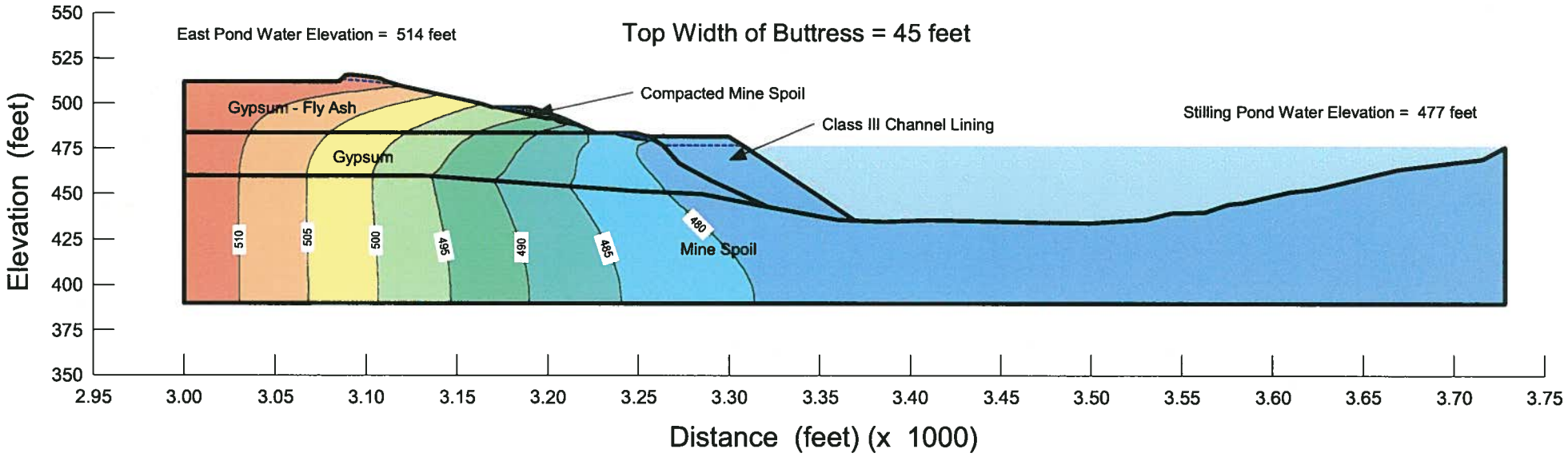
SEEP/W Analysis
South Slope of East Pond
Scrubber Sludge Complex

Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Steady-State Seepage
File Name: 1_BW45_MD30.gsz

Note:
The results of 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.

Material Type	Ksat	Kratio	Wsat
Gypsum - Fly Ash	3.28e-005	0.02	0.41
Mine Spoil	4.92e-006	0.333	0.37
Gypsum	3.28e-005	0.02	0.39
Class III Channel Lining	0.01	1	0.4
Compacted Mine Spoil	4.92e-006	0.333	0.37



Slope Stability
South Slope of East Pond
Scrubber Sludge Complex

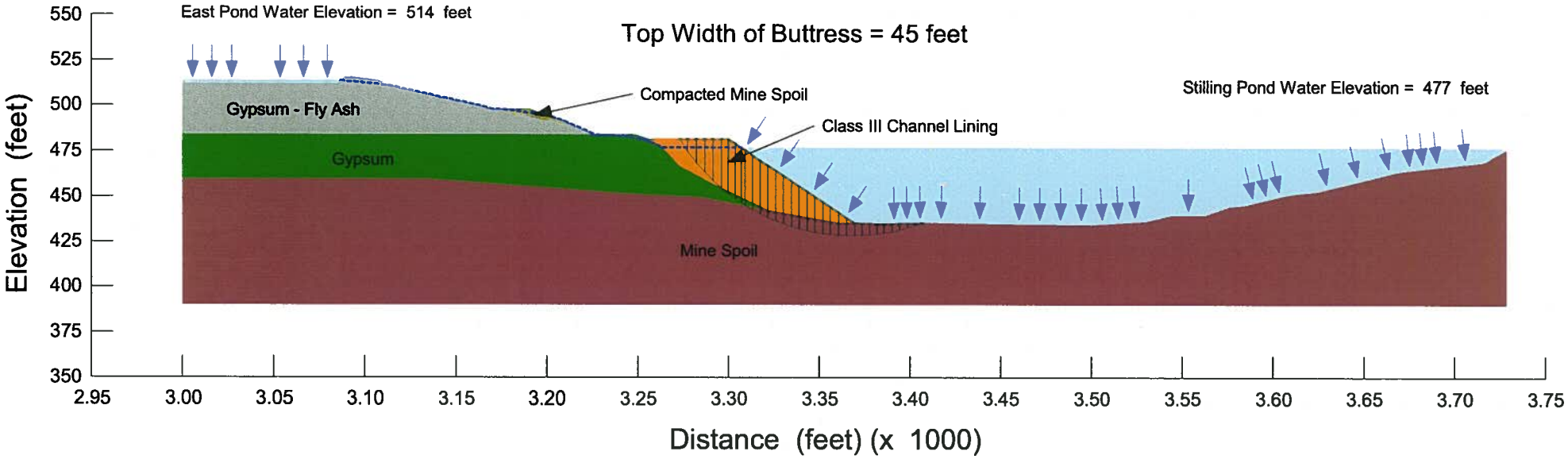
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW45_MD30.gsz

Factor of Safety: 1.38
Center: (3368, 540) ft
Radius: 111.5 ft
Minimum Slip Surface Depth: 30 ft

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28

Note:
The results of 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
South Slope of East Pond
Scrubber Sludge Complex

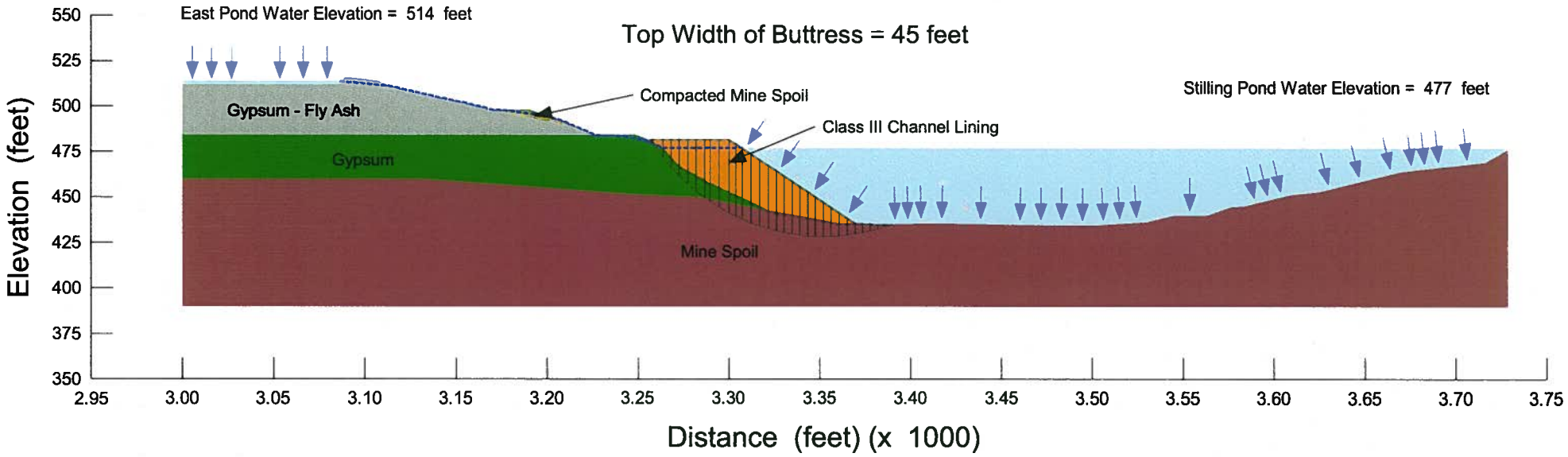
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW45_MD40.gsz

Factor of Safety: 1.41
Center: (3352, 540) ft
Radius: 111.5 ft
Minimum Slip Surface Depth: 40 ft

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28

Note:
The results of 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
South Slope of East Pond
Scrubber Sludge Complex

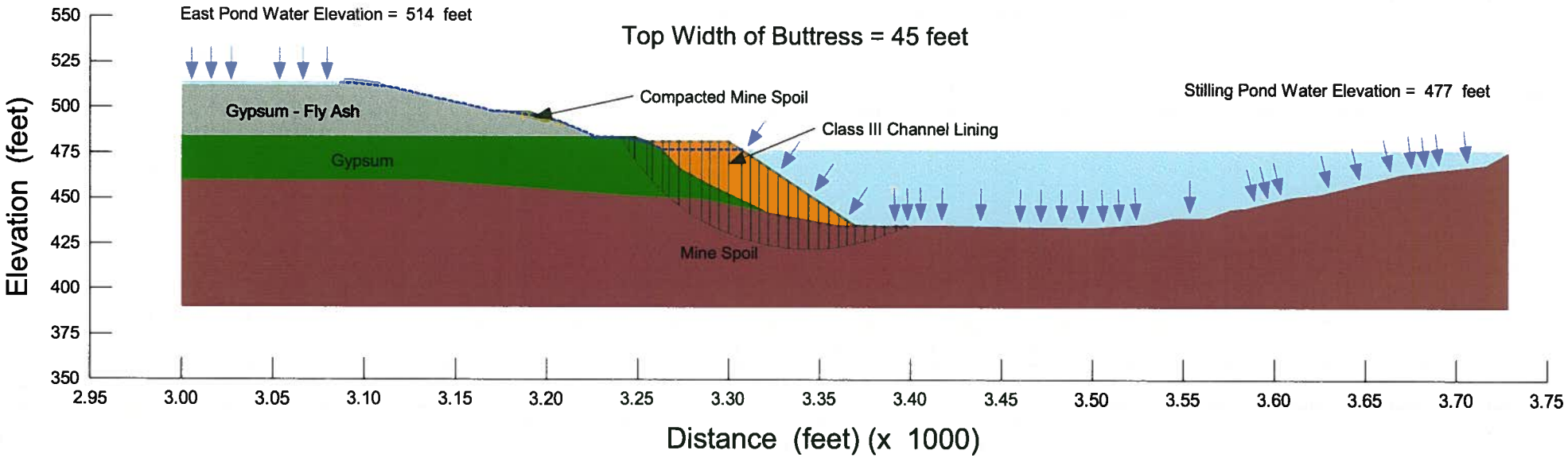
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW45_MD50.gsz

Factor of Safety: 1.57
Center: (3344, 540) ft
Radius: 117.75 ft
Minimum Slip Surface Depth: 50 ft

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28

Note:
The results of 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
South Slope of East Pond
Scrubber Sludge Complex

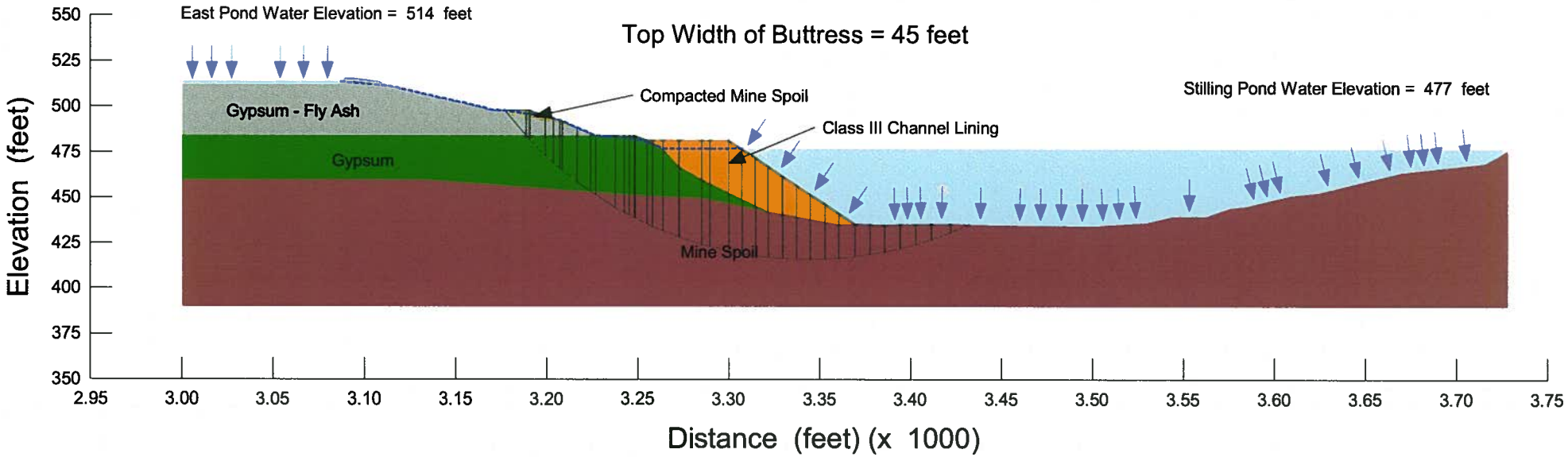
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW45_MD60.gsz

Factor of Safety: 1.69
Center: (3344, 627.75) ft
Radius: 211.75 ft
Minimum Slip Surface Depth: 60 ft

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28

Note:
The results of 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.



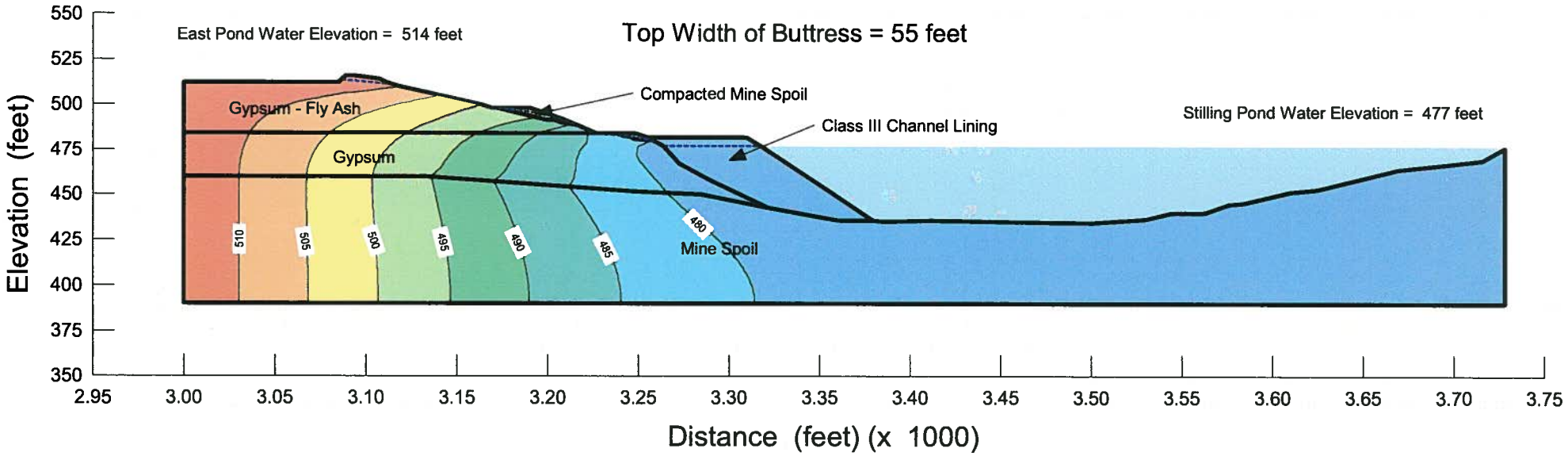
SEEP/W Analysis
South Slope of East Pond
Scrubber Sludge Complex

Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Steady-State Seepage
File Name: 1_BW55_MD30.gsz

Note:
The results of 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.

Material Type	Ksat	Kratio	Wsat
Gypsum - Fly Ash	3.28e-005	0.02	0.41
Mine Spoil	4.92e-006	0.333	0.37
Gypsum	3.28e-005	0.02	0.39
Class III Channel Lining	0.01	1	0.4
Compacted Mine Spoil	4.92e-006	0.333	0.37



Slope Stability
South Slope of East Pond
Scrubber Sludge Complex

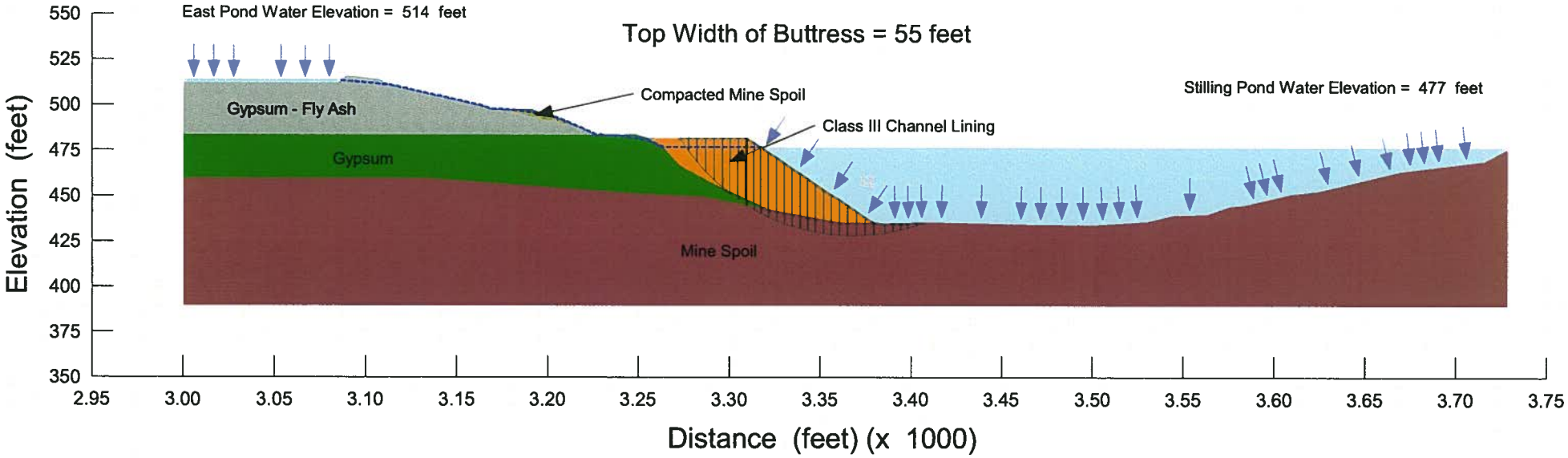
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW55_MD30.gsz

Factor of Safety: 1.46
Center: (3368, 540) ft
Radius: 111.5 ft
Minimum Slip Surface Depth: 30 ft

Note:
The results of 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.

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28



Slope Stability
South Slope of East Pond
Scrubber Sludge Complex

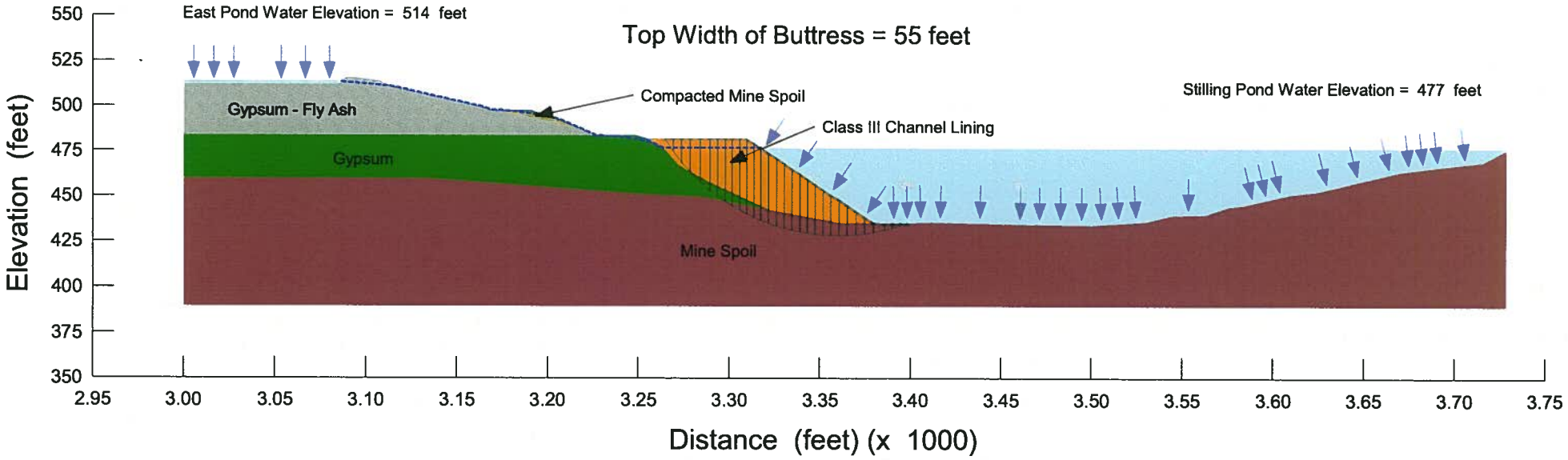
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW55_MD40.gsz

Factor of Safety: 1.50
Center: (3360, 540) ft
Radius: 111.5 ft
Minimum Slip Surface Depth: 40 ft

Note:
The results of 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.

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28



Slope Stability
South Slope of East Pond
Scrubber Sludge Complex

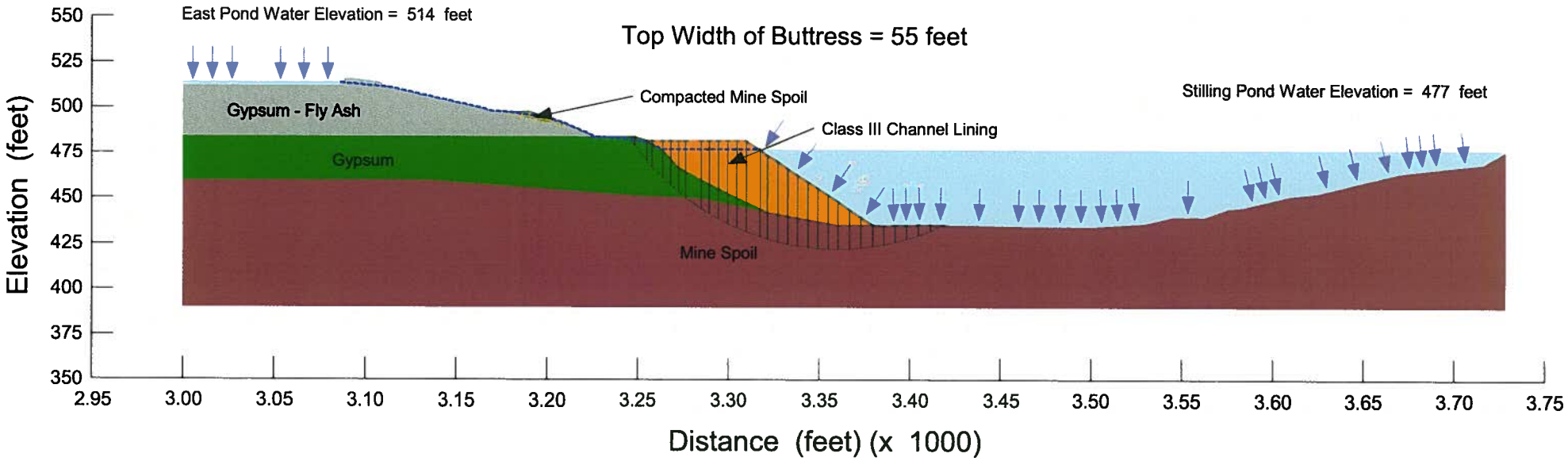
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW55_MD50.gsz

Factor of Safety: 1.63
Center: (3360, 560.25) ft
Radius: 138 ft
Minimum Slip Surface Depth: 50 ft

Note:
The results of 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.

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28



Slope Stability
South Slope of East Pond
Scrubber Sludge Complex

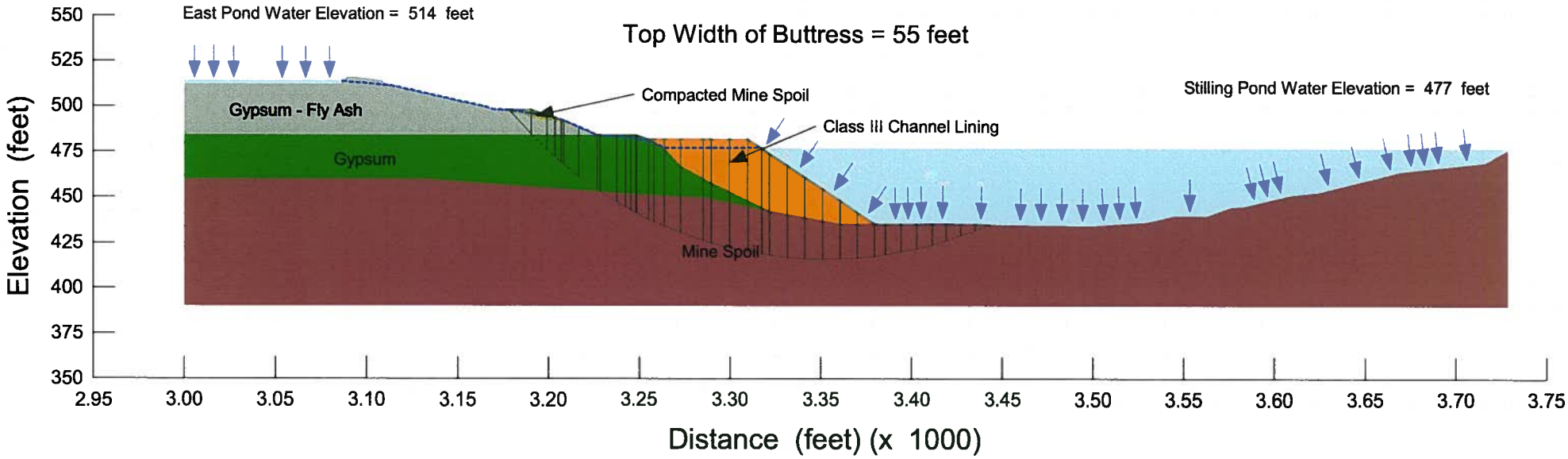
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW55_MD60.gsz

Factor of Safety: 1.79
Center: (3352, 641.25) ft
Radius: 225.25 ft
Minimum Slip Surface Depth: 60 ft

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28

Note:
The results of 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.



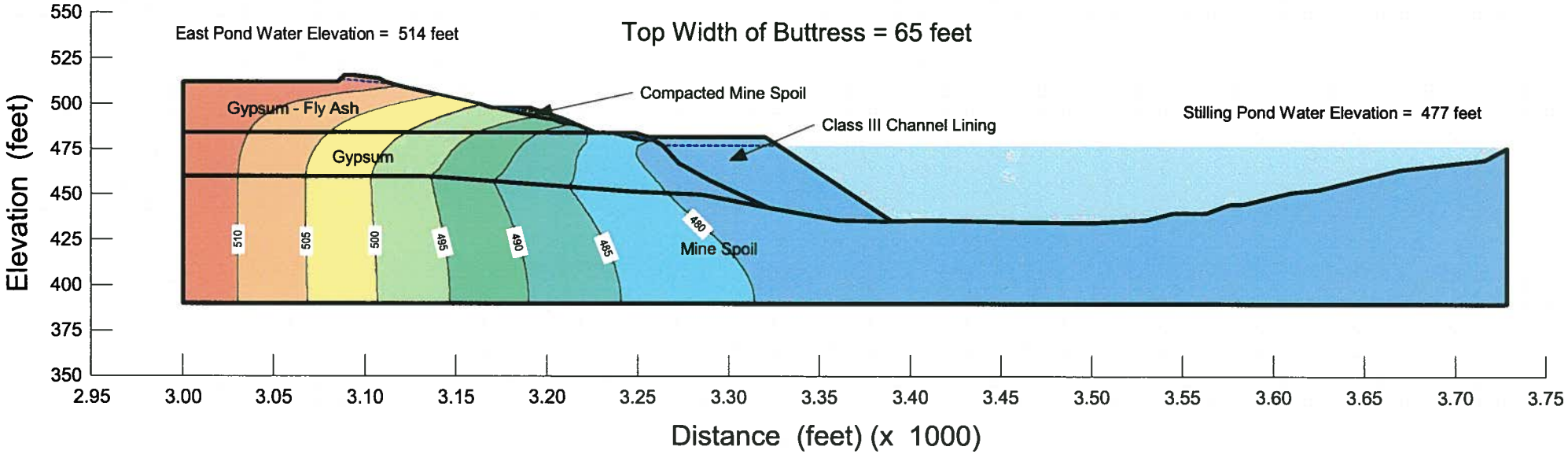
SEEP/W Analysis
South Slope of East Pond
Scrubber Sludge Complex

Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Steady-State Seepage
File Name: 1_BW65_MD30.gsz

Note:
The results of 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.

Material Type	Ksat	Kratio	Wsat
Gypsum - Fly Ash	3.28e-005	0.02	0.41
Mine Spoil	4.92e-006	0.333	0.37
Gypsum	3.28e-005	0.02	0.39
Class III Channel Lining	0.01	1	0.4
Compacted Mine Spoil	4.92e-006	0.333	0.37



Slope Stability
South Slope of East Pond
Scrubber Sludge Complex

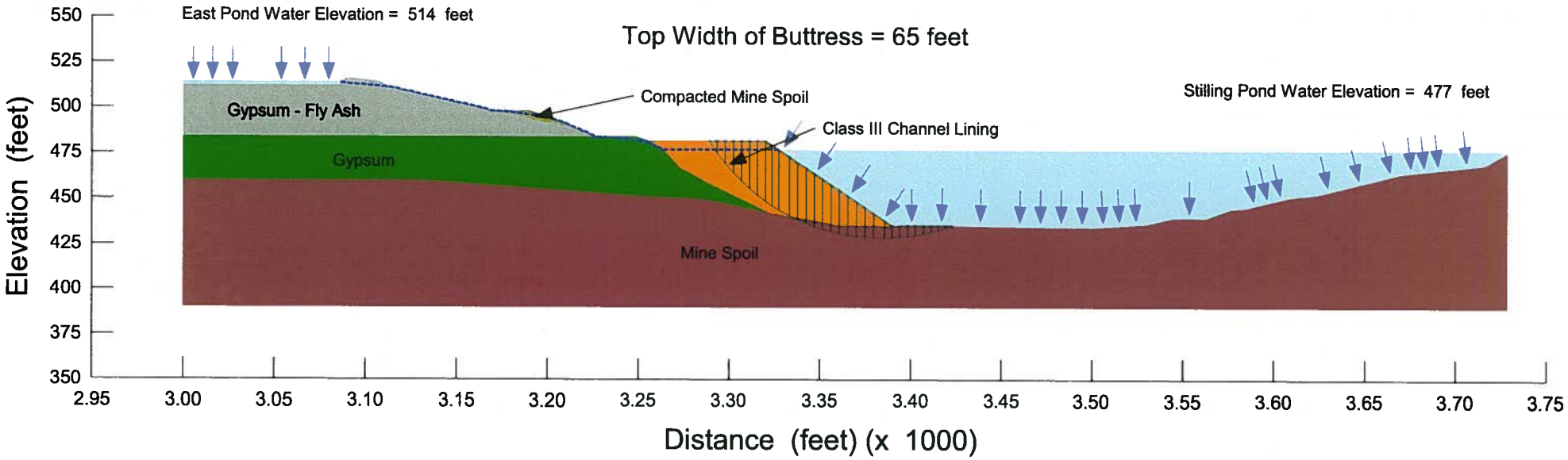
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW65_MD30.gsz

Factor of Safety: 1.53
Center: (3384, 540) ft
Radius: 111.5 ft
Minimum Slip Surface Depth: 30 ft

Note:
The results of 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.

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28



Slope Stability
South Slope of East Pond
Scrubber Sludge Complex

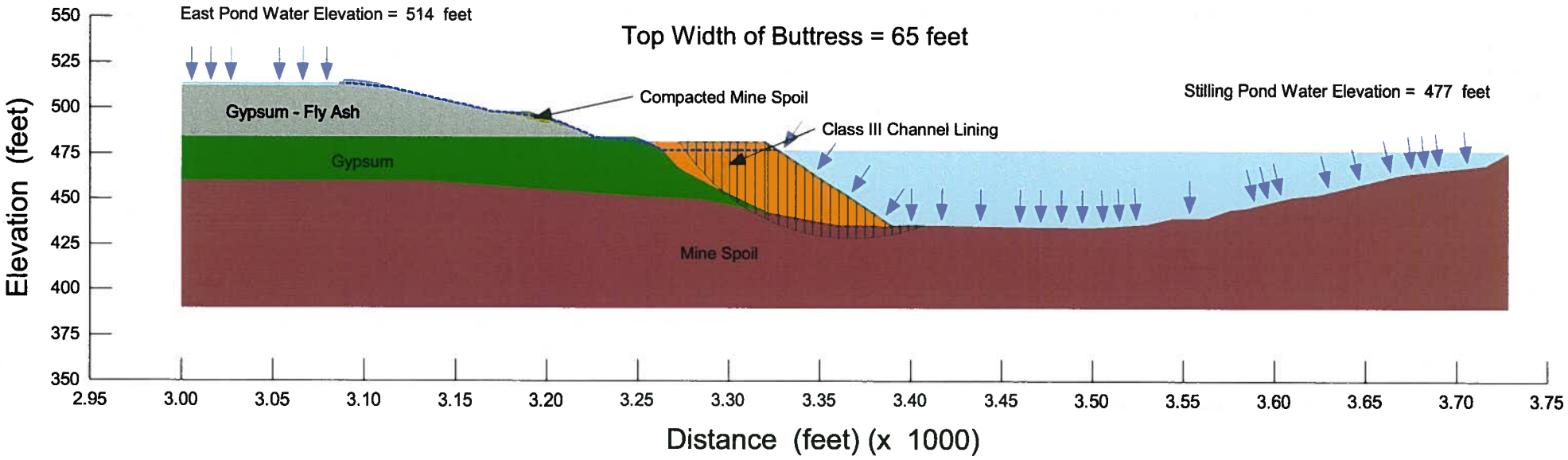
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW65_MD40.gsz

Factor of Safety: 1.58
Center: (3368, 540) ft
Radius: 111.5 ft
Minimum Slip Surface Depth: 40 ft

Note:
The results of 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.

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28



Slope Stability
South Slope of East Pond
Scrubber Sludge Complex

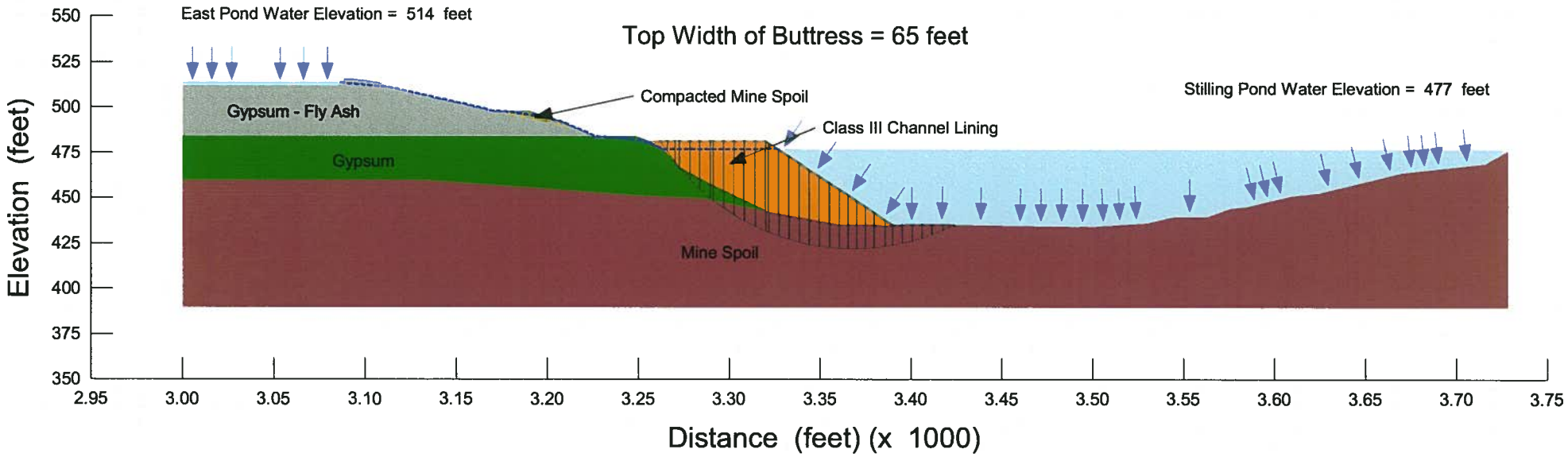
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW65_MD50.gsz

Factor of Safety: 1.67
Center: (3368, 546.75) ft
Radius: 124.5 ft
Minimum Slip Surface Depth: 50 ft

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28

Note:
The results of 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
South Slope of East Pond
Scrubber Sludge Complex

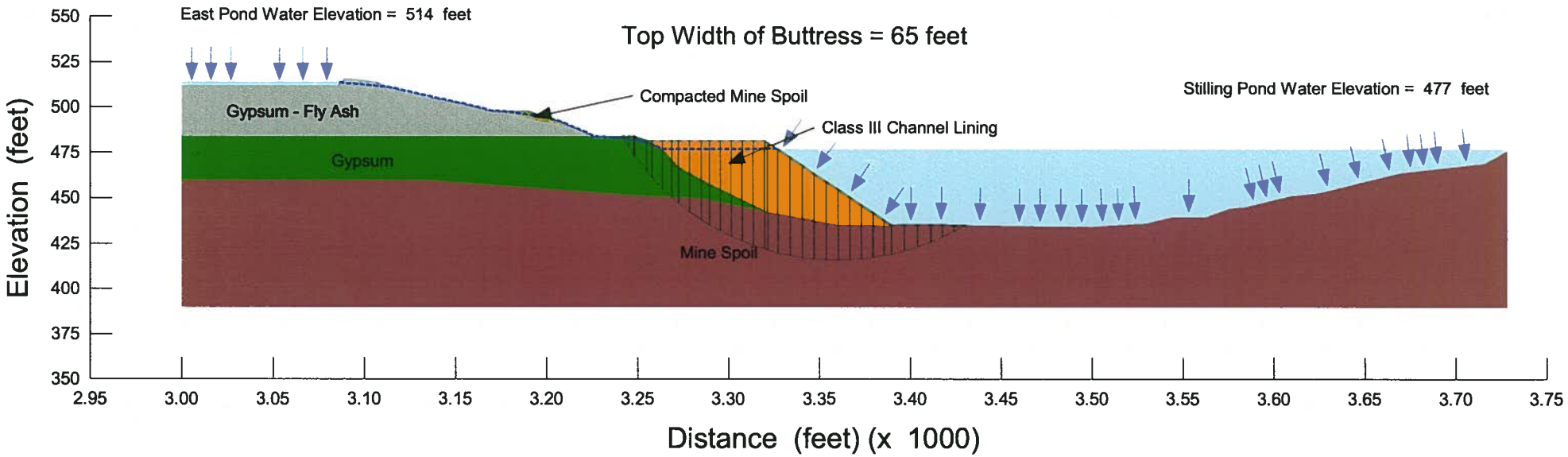
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW65_MD60.gsz

Factor of Safety: 1.86
Center: (3360, 553.5) ft
Radius: 137.5 ft
Minimum Slip Surface Depth: 60 ft

Note:
The results of 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.

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28



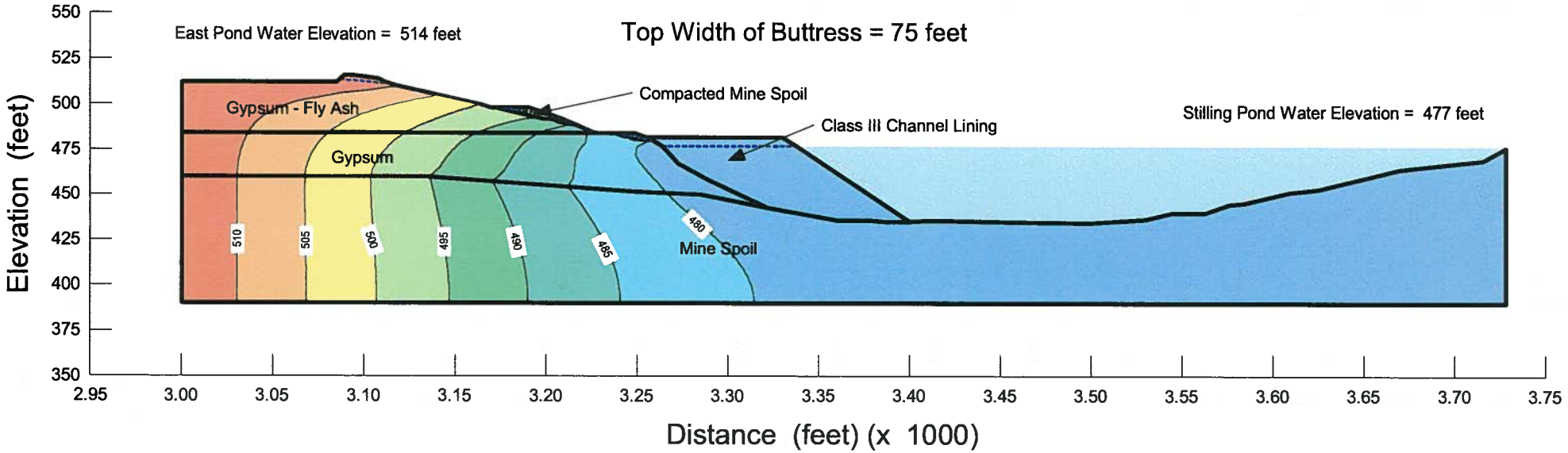
SEEP/W Analysis
South Slope of East Pond
Scrubber Sludge Complex

Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Steady-State Seepage
File Name: 1_BW75_MD30.gsz

Note:
The results of 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.

Material Type	Ksat	Kratio	Wsat
Gypsum - Fly Ash	3.28e-005	0.02	0.41
Mine Spoil	4.92e-006	0.333	0.37
Gypsum	3.28e-005	0.02	0.39
Class III Channel Lining	0.01	1	0.4
Compacted Mine Spoil	4.92e-006	0.333	0.37



Slope Stability
South Slope of East Pond
Scrubber Sludge Complex

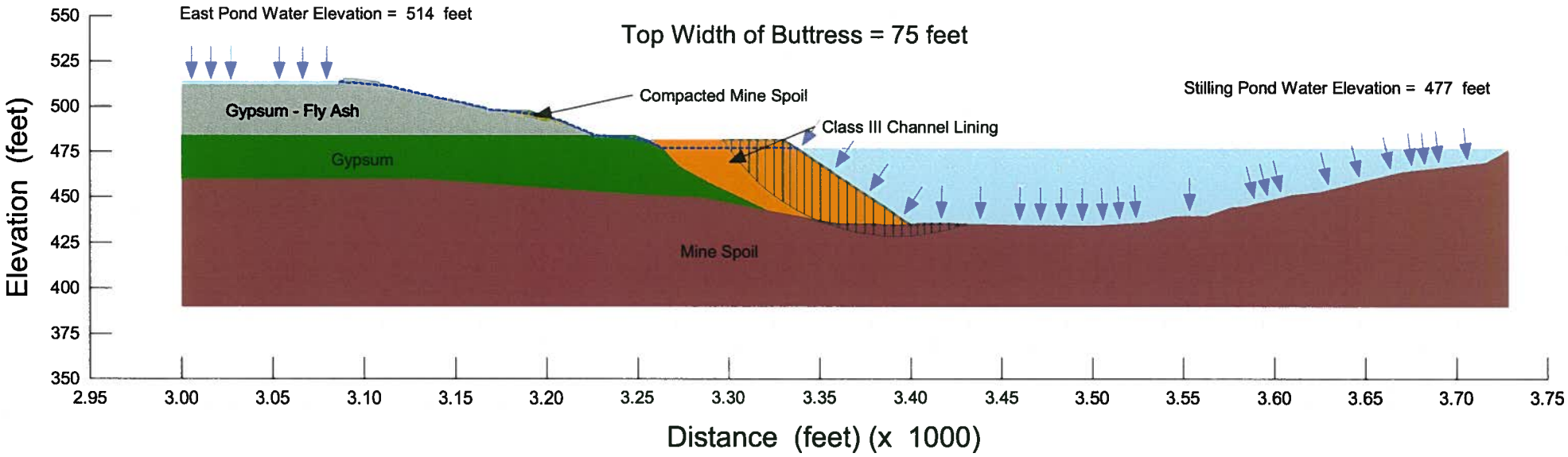
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW75_MD30.gsz

Factor of Safety: 1.59
Center: (3392, 540) ft
Radius: 111.5 ft
Minimum Slip Surface Depth: 30 ft

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28

Note:
The results of 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
South Slope of East Pond
Scrubber Sludge Complex

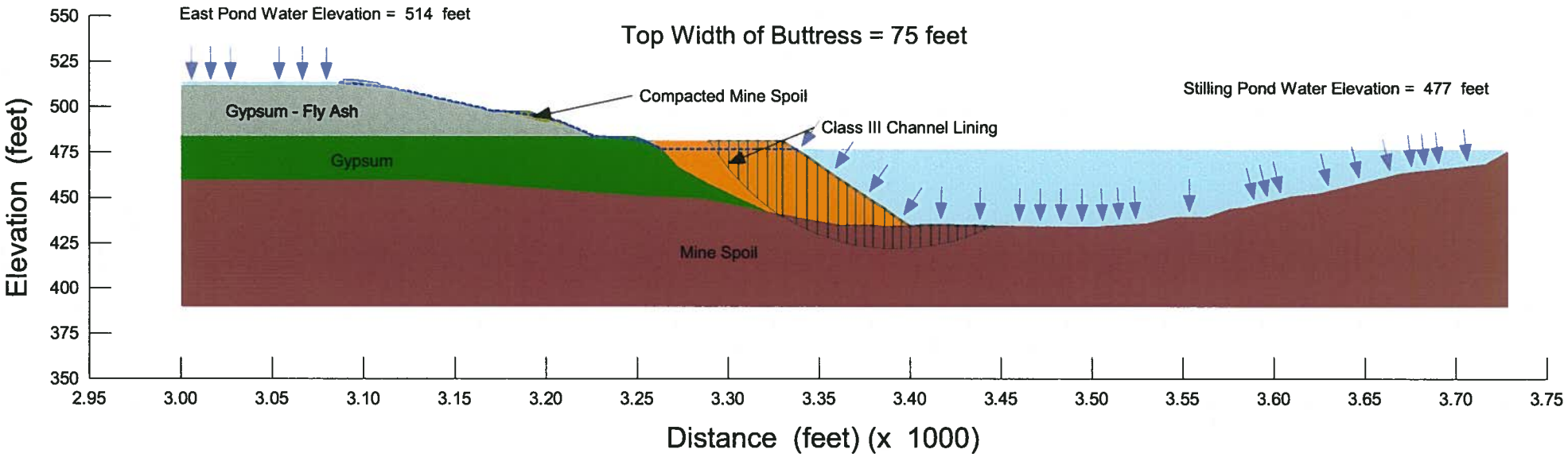
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW75_MD40.gsz

Factor of Safety: 1.65
Center: (3392, 540) ft
Radius: 117.75 ft
Minimum Slip Surface Depth: 40 ft

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28

Note:
The results of 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
South Slope of East Pond
Scrubber Sludge Complex

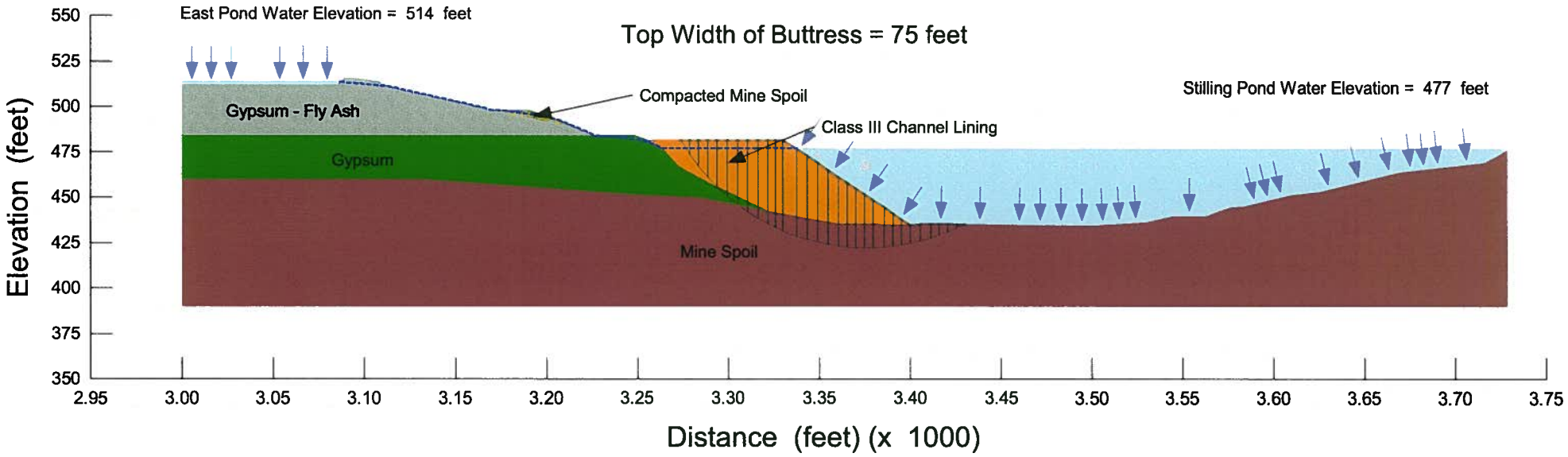
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW75_MD50.gsz

Factor of Safety: 1.71
Center: (3376, 540) ft
Radius: 117.75 ft
Minimum Slip Surface Depth: 50 ft

Note:
The results of 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.

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28



Slope Stability
South Slope of East Pond
Scrubber Sludge Complex

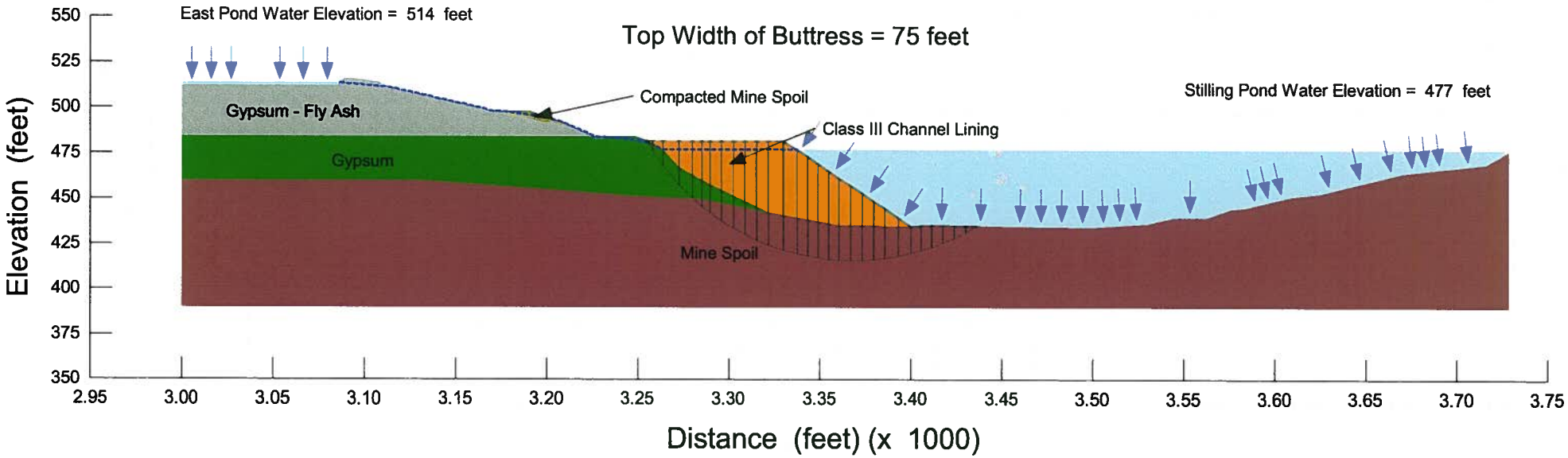
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW75_MD60.gsz

Factor of Safety: 1.91
Center: (3368, 546.75) ft
Radius: 130.75 ft
Minimum Slip Surface Depth: 60 ft

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28

Note:
The results of 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
South Slope of East Pond
Scrubber Sludge Complex

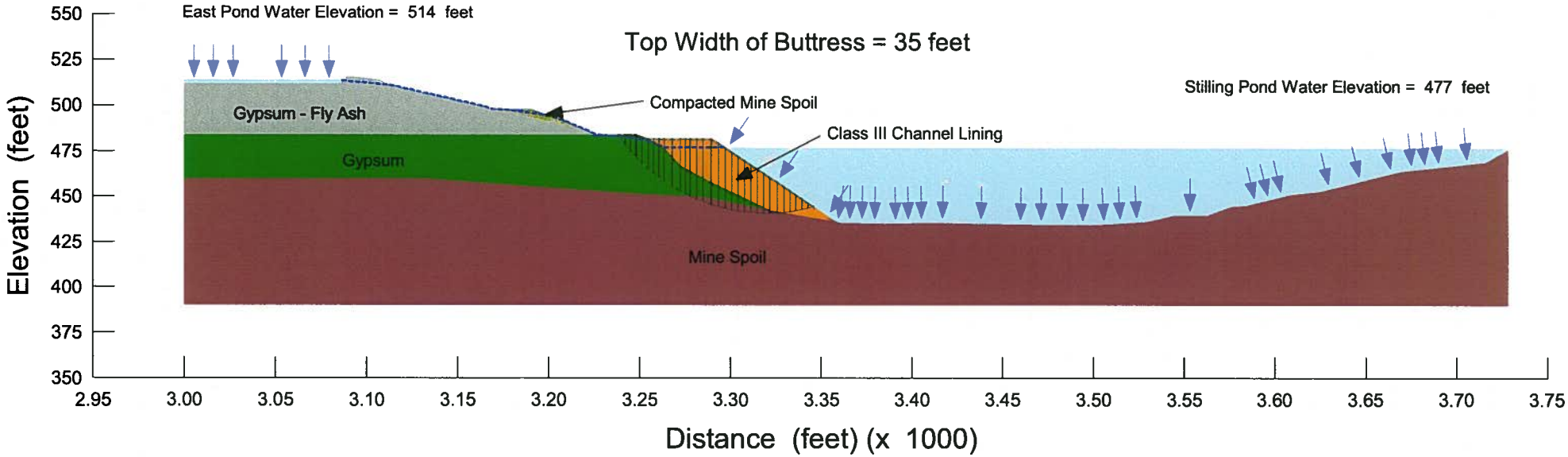
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 2_BW35_MD16.gsz

Factor of Safety: 1.73
Center: (3320, 540) ft
Radius: 99 ft
Minimum Slip Surface Depth: 16 ft

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28

Note:
The results of 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
South Slope of East Pond
Scrubber Sludge Complex

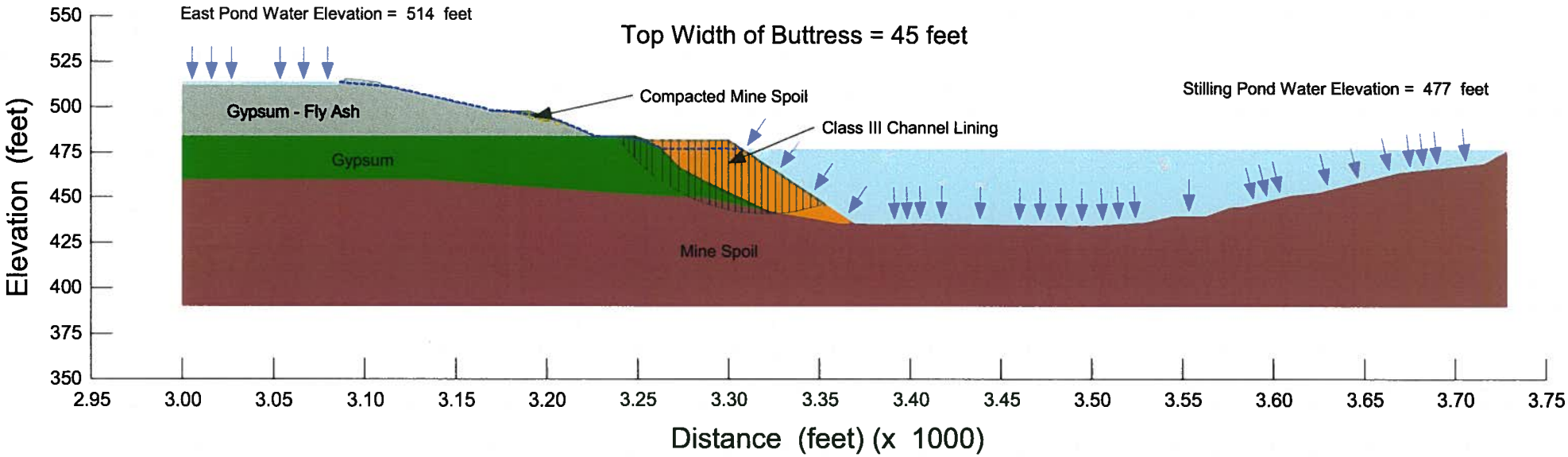
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 2_BW45_MD16.gsz

Factor of Safety: 2.09
Center: (3320, 540) ft
Radius: 99 ft
Minimum Slip Surface Depth: 16 ft

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28

Note:
The results of 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
South Slope of East Pond
Scrubber Sludge Complex

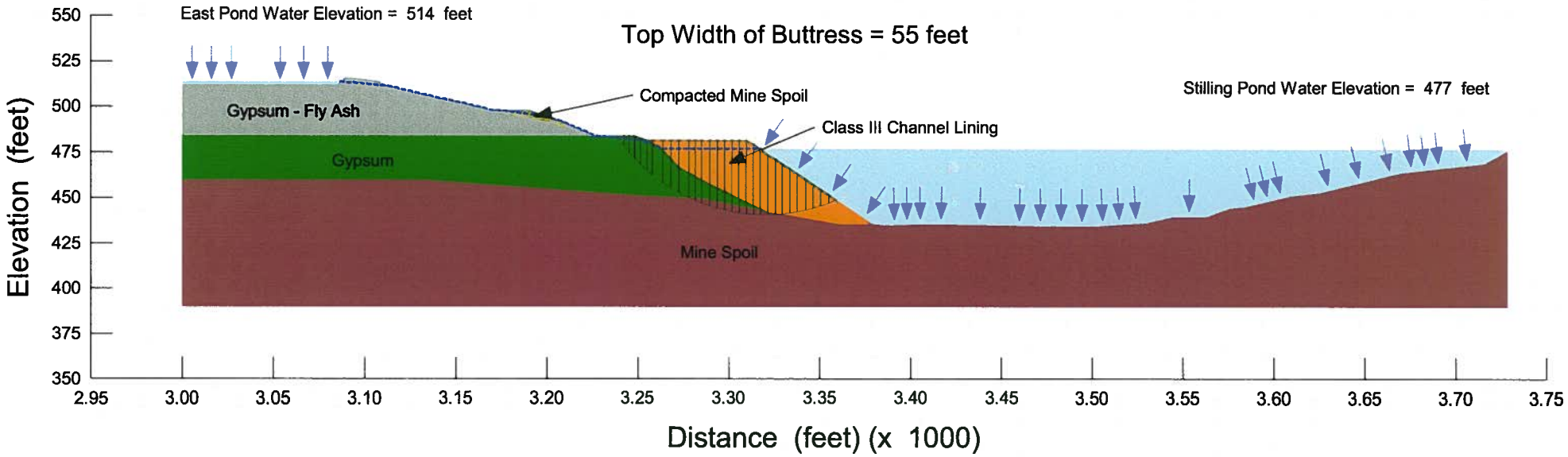
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 2_BW55_MD16.gsz

Factor of Safety: 2.54
Center: (3320, 540) ft
Radius: 99 ft
Minimum Slip Surface Depth: 16 ft

Note:
The results of 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.

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28



Slope Stability
South Slope of East Pond
Scrubber Sludge Complex

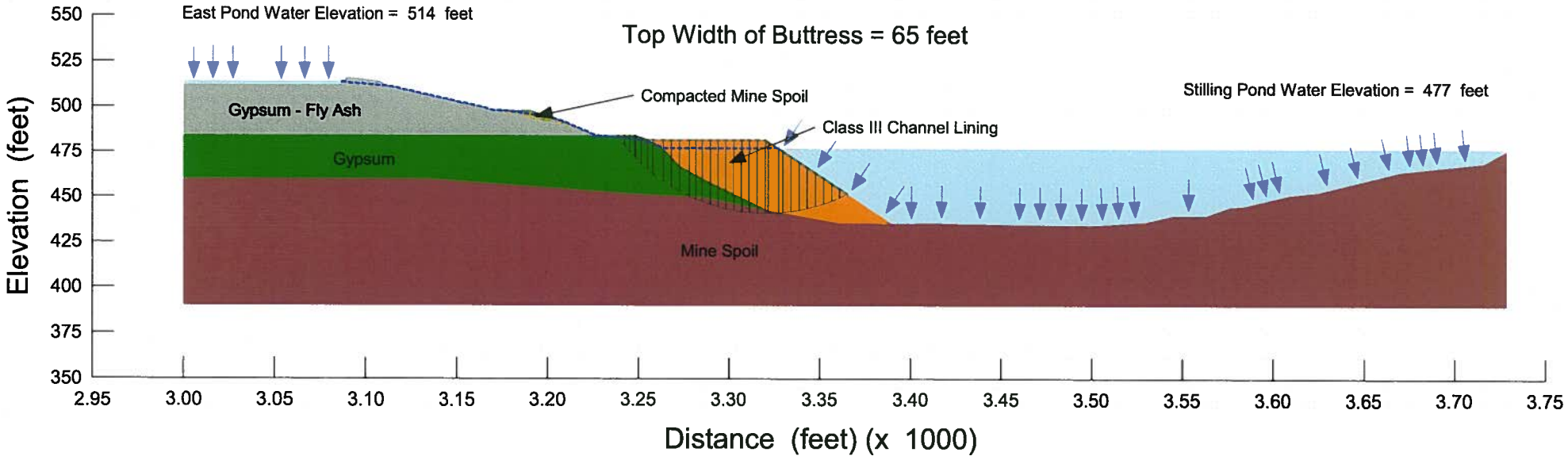
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 2_BW65_MD16.gsz

Factor of Safety: 3.14
Center: (3320, 540) ft
Radius: 99 ft
Minimum Slip Surface Depth: 16 ft

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28

Note:
The results of 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
South Slope of East Pond
Scrubber Sludge Complex

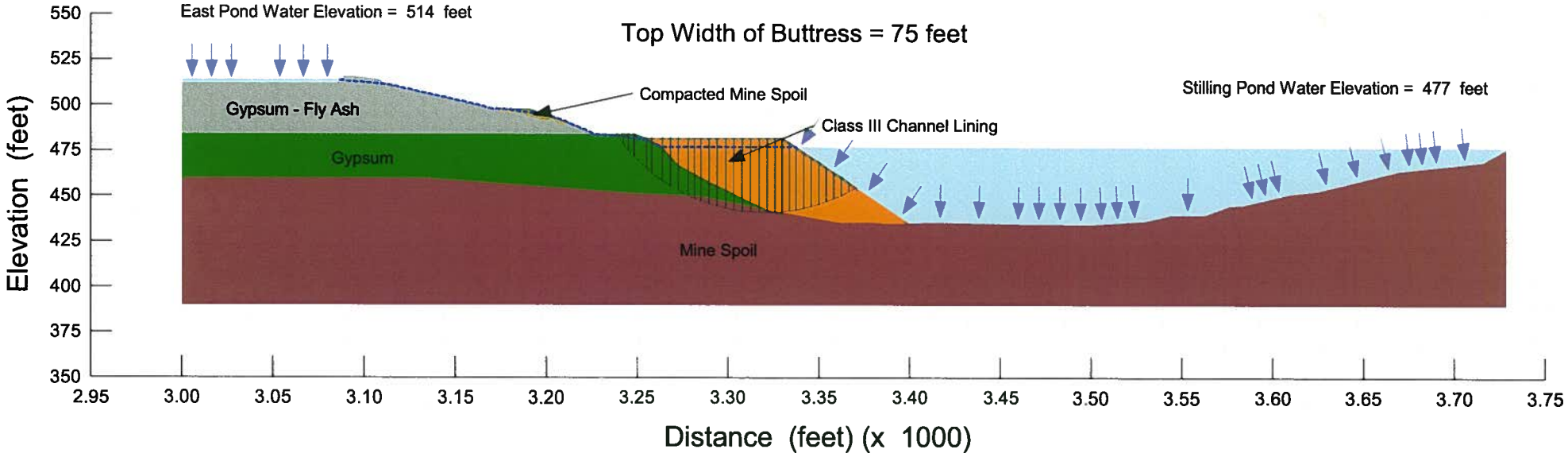
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 2_BW75_MD16.gsz

Factor of Safety: 3.97
Center: (3320, 540) ft
Radius: 99 ft
Minimum Slip Surface Depth: 16 ft

Note:
The results of 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.

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	40
Compacted Mine Spoil	115	0	28



Slope Stability
South Slope of East Pond
Scrubber Sludge Complex

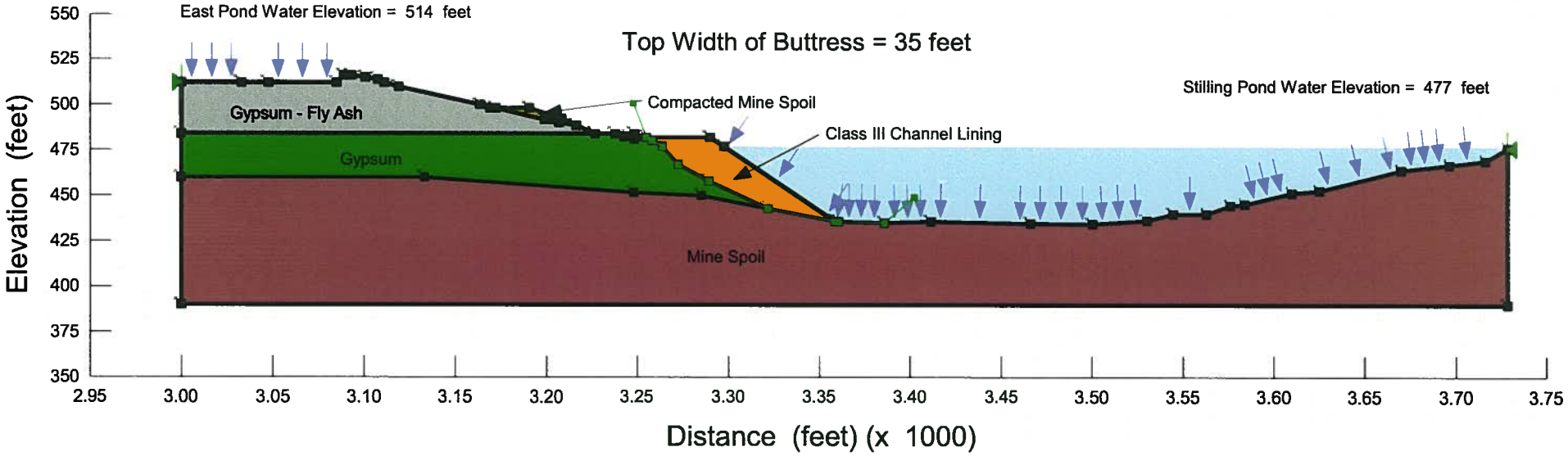
Factor of Safety: 1.30

Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW35_MD1_Fabric Layer.gsz

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	30
Compacted Mine Spoil	115	0	28

Note:
The results of 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
South Slope of East Pond
Scrubber Sludge Complex

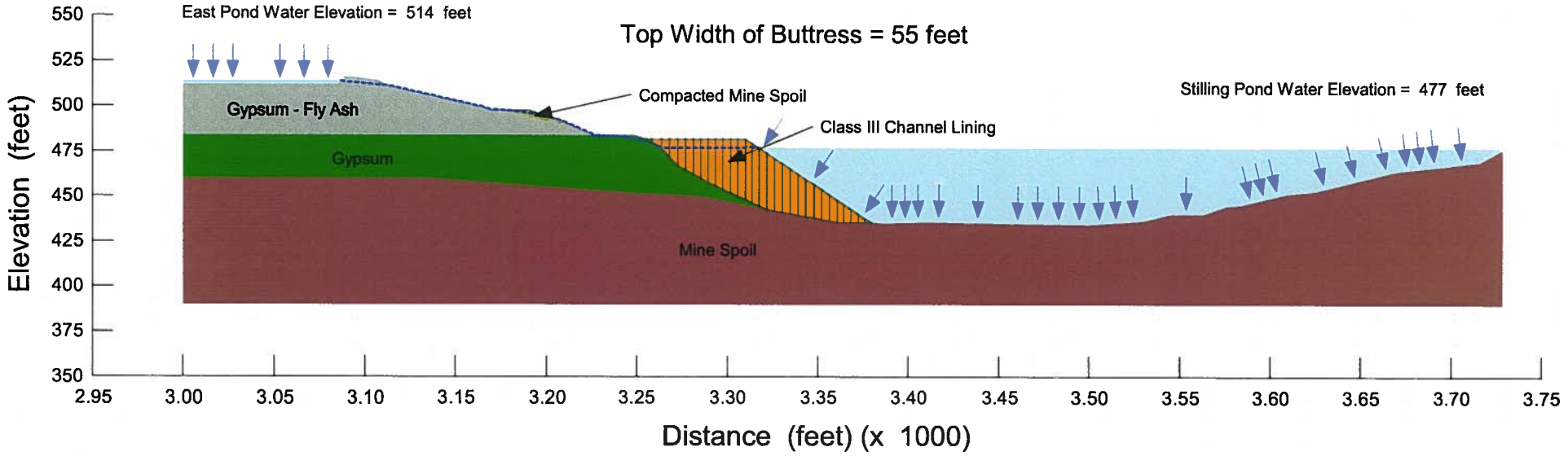
Factor of Safety: 1.55

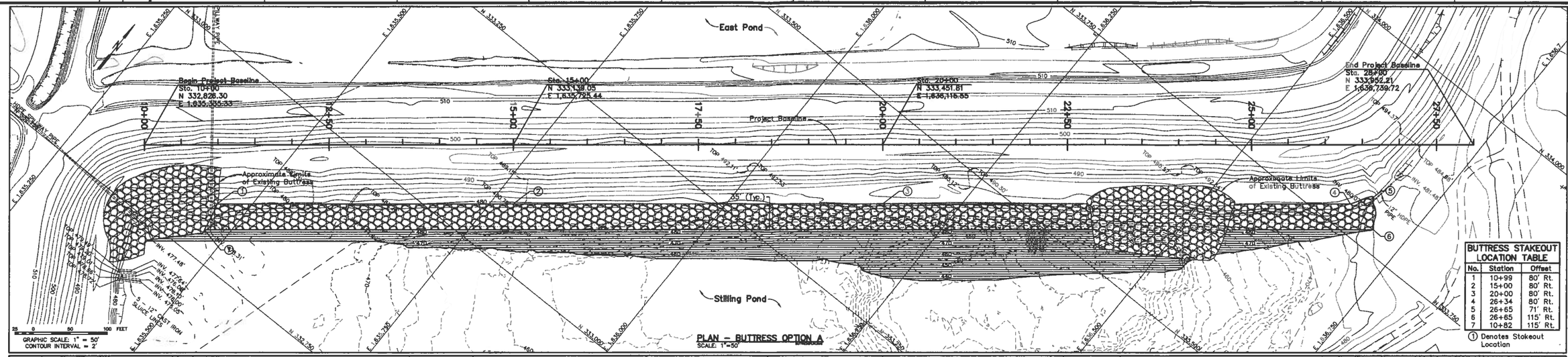
Paradise Fossil Plant
Tennessee Valley Authority

October 2009
Method: Modified Spencer
File Name: 1_BW55_MD1_fabric.gsz

Note:
The results of 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.

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum - Fly Ash	115	0	36
Mine Spoil	115	0	28
Gypsum	120	0	36
Class III Channel Lining	120	0	30
Compacted Mine Spoil	115	0	28





BUTTRESS STAKEOUT LOCATION TABLE

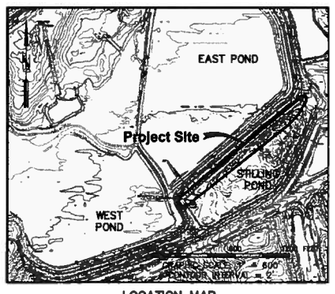
No.	Station	Offset
1	10+99	80' Rt.
2	15+00	80' Rt.
3	20+00	80' Rt.
4	26+34	80' Rt.
5	26+65	71' Rt.
6	26+65	115' Rt.
7	10+82	115' Rt.

① Denotes Stakeout Location

BUTTRESS STAKEOUT LOCATION TABLE

No.	Station	Offset
1	10+99	80' Rt.
2	15+00	80' Rt.
3	20+00	80' Rt.
4	26+34	80' Rt.
5	26+65	71' Rt.
6	26+65	135' Rt.
7	10+01	135' Rt.
8	10+80	119' Rt.

① Denotes Stakeout Location



LOCATION MAP
SCALE: 1"=600'

NOTES:

1. Safety: TVA (Contractor) shall be responsible for the health and safety of its personnel and shall meet all applicable local, state, and federal safety regulations; including but not limited to OSHA standards and TVA safety requirements
2. Purpose: The objective of this repair is to stabilize the south slope of the East Pond in area indicated using a Class III channel lining (crushed stone) buttress. Two options (A and B) are shown here as requested by TVA (Fossil Group). Contractor shall consult with TVA (Fossil Group) prior to ordering materials for construction.
3. Measurements: Contractor shall base all measurements, both vertical and horizontal, from established benchmarks and monuments. A project baseline is presented on this drawing for assisting the Contractor with staking of approximate work limits
4. Erosion and Sediment Control: Silt fences shall be installed as directed by TVA. Installation, inspection and maintenance of silt fences shall follow the Best Management Practice (BMP) provisions given in Kentucky Erosion Prevention and Sediment Control Field Guide. A free copy of this guide can be obtained from Kentucky Division of Water
5. Vegetation: All vegetation from within area to be stabilized (above water) shall be removed prior to placement of crushed stone
6. Materials: Construction materials shall meet the requirements presented in KTC (Kentucky Transportation Cabinet) Standard Specifications for Road and Bridge Construction Manual, current edition
7. Stone Placement: It is recommended that an excavator be used to place the crushed stone in layers (starting from the bottom). During the placement, determine (by visual observation) whether these initial layers remain stable. Crushed stone placement shall be continuously monitored for movement and smoothly transition into original ground on all sides leaving a stable slope
8. Existing Slope: The existing slope is assumed to be marginally stable. Until the buttress is constructed, Contactor shall under no circumstances allow heavy equipment or other construction related traffic on top of the existing slope
9. Access: It is suggested that the Contractor access the area from the east end and/or west end and not from the top of the slope. However, the final determination regarding proper access to the construction area shall be made by the Contractor based on field conditions and safety considerations
10. Compaction: Place crushed stone up to near the normal pool elevation. Once above pool elevation, place crushed stone in 24-inch thick layers and compact with heavy dozer passes
11. Field Adjustments: It is recommended that construction measures be monitored by Stantec personnel. Adjustments will be necessary as the fieldwork progresses and should be agreed upon between TVA and Stantec prior to implementation
12. Material Disposal: Construction generated waste shall be disposed properly at the direction of TVA.
13. Work Plan: Contractor shall refer to the construction work plan associated with this drawing for additional information and general recommendations.

ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPGPAFFESCDX000000020090002

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ENG	AS CONST
R 0	10/27/09	SV	PJB	SV	SV	SV	HRA	TJ	–	–

ISSUED FOR CONSTRUCTION

SCALE: AS SHOWN EXCEPT AS NOTED

YARD

–

SCRUBBER SLUDGE COMPLEX
SOUTH SLOPE OF EAST POND
BUTTRESS PLAN – OPTION A AND B

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	P. BOND	S. VEMURI	S. VEMURI	S. VEMURI	H. APARICIO	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2060
Tel. 859.422.3000
Fax 859.422.3100
www.stantec.com

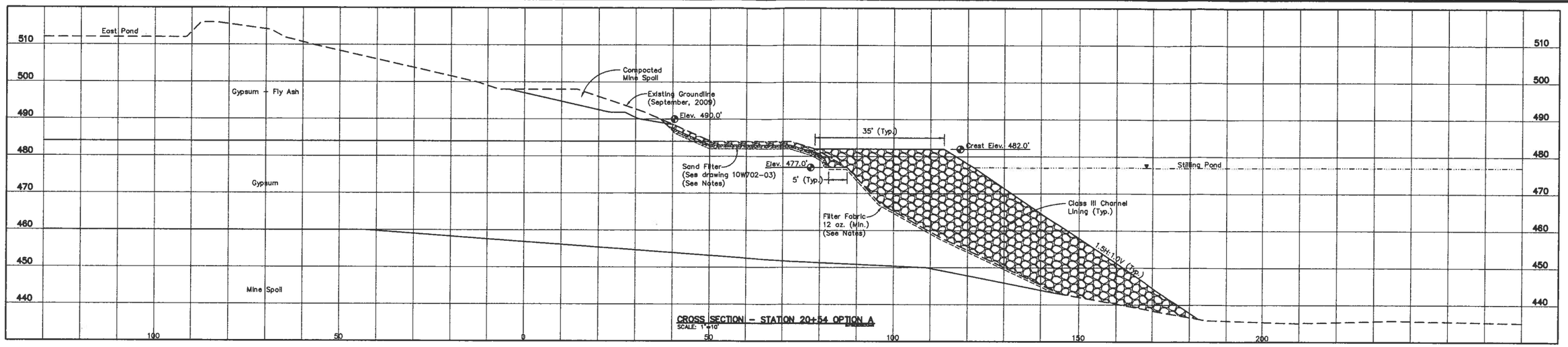
AUTOCAD R 2000	DATE 10/27/09	64	C	10W702-01	R 0

PLOT FACTOR:XX
W_TVA

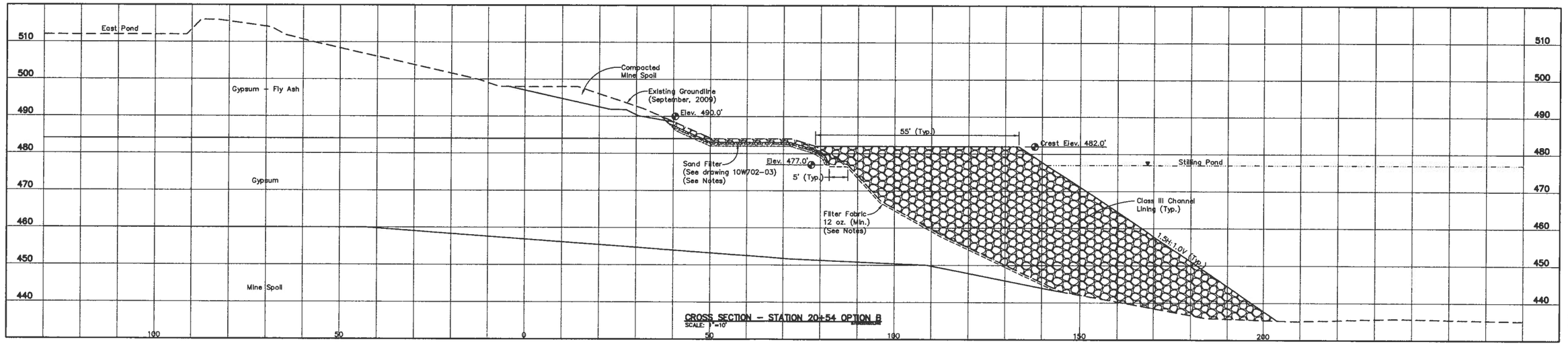
C.A.O. DRAWING
DO NOT ALTER MANUALLY

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT DATE: 10/27/2009 USER: JOHNSON, TALLY
N:\10W\10W702\DRAWINGS\FOSSIL\SHEETS\BUTTRESS_OPTIONS\10W702_BUTTRESS_OPTIONS_AB.DWG



CROSS SECTION – STATION 20+54 OPTION A
SCALE: 1"=10'



CROSS SECTION – STATION 20+54 OPTION B
SCALE: 1"=10'

NOTES:

1. Filter Fabric: The geotextile (filter fabric) shall have a minimum weight of 12oz per square yard and satisfy (or exceed) Type I criteria of Kentucky Transportation Cabinet's Standard Specifications for Road and Bridge Construction (current edition). Examples include GSE NW12 manufactured by GSE Lining Technology Inc. or US 300NW manufactured by US Fabrics Inc.
2. Length: Filter fabric shall be cut into 80 feet (length) pieces and used along the slope. Depending on the depth of the pond, the filter fabric may or may not extend down to the toe of the slope (below water). As long as the Contractor is using the entire roll width and 80 feet long pieces it would be acceptable.
3. Overlapping: Contractor shall overlap the filter fabric (width direction) a minimum of 2 feet.
4. Placement: Contractor shall use extreme care while installing the filter fabric, especially under water. Filter fabric shall not be ruptured during the placement of Class III channel lining.
5. Sand Filter: The sand filter detail shown here is part of another work plan. Contractor shall refer to drawing no. 10W702-03 and the work plan associated with that drawing for additional information.
6. Surfacing Stone: No.2 stone shall be used to choke the top of Class III channel lining as needed in the field.
7. Construction Sequence: The suggested construction sequence is presented in the steps below. However, the final determination of construction sequence will have to be made by the Contractor based on (but not limited to) safety, field conditions, constructability and access restrictions.

   I Excavate: Excavate 5 feet wide bench at Elevation 477 feet.

   II Fabric: Install filter fabric along the bench from Elevation 477 feet and below.

   III Partial Buttress: Construct rock buttress from east end and west end up to elevation 477 feet.

   iv Partial Armor: Use rock buttress as access to construct slope armoring from elevation 477 feet and above (as permitted by the reach of the equipment).

   v Complete Buttress: Complete rock buttress from elevation 477 feet to 482 feet.

   vi Surfacing: Choke Class III channel lining surface with No.2 stone as needed to goin access to remaining area (up the slope) for armoring.

   vii Complete Armor: Complete slope armoring up to elevation 490 feet.

For Supporting Design Calculations see FPGPAFFESCDX00000020090002

STATE OF KENTUCKY SHAUN CHANDRA VEMURI 28120 LICENSED PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
Tel. 859.422.3000
Fax 859.422.3100
www.stantec.com

R:	–	–	–	–	–	–	–	–	–	–	–
R 0	10/27/09	SV	PJB	SV	SV	SV	HRA	TJ	–	–	–
ISSUED FOR CONSTRUCTION											
REV. NO.	DATE	DESN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV

SCALE: AS SHOWN EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
SOUTH SLOPE OF EAST POND
CROSS SECTIONS – OPTION A AND B

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
S. VEMURI	P. BOND	S. VEMURI	S. VEMURI	S. VEMURI	H. APARICIO	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 10/27/09	64	C	10W702-02	R 0

STANTEC 0
TASK COMPLETED BY: REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

DISCIPLINE INTERFACE

Attachment 2

During Construction

During Construction

During Construction

During Construction

During Construction

During Construction

Stantec Consulting Services Inc
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

October 27, 2009 let_010_175569040

Mr. Barry Snider, PE
Tennessee Valley Authority
1101 Market Street, LP 5E-C
Chattanooga, Tennessee 37402

Re: Issued for Construction
Slope Armoring
South Slope of East Pond
Scrubber Sludge Complex
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Snider:

Stantec Consulting Services Inc. (Stantec) has completed the design of armoring for south slope of East Pond and would like to issue the following work plan for construction. This document incorporates the comments received from TVA and AECOM following a review of our October 19, 2009 work plan (let_008_175569040).

In this work plan, we have changed the buttress detail to reflect the latest decision taken by TVA (with assistance from Stantec and AECOM) to extend the sand filter detail further down the slope. Accordingly, on the attached construction drawing we have altered the detail to show sand filter down to Elevation 477 feet. We have also updated the material quantities and cost estimate. This work plan consists of a brief background of the project, recommended armoring detail and related construction recommendations.

1. Background

During the 2009 Phase 1 geotechnical evaluation of the Scrubber Sludge Complex, Stantec personnel observed numerous wet and soft conditions throughout the lower two-thirds of the East Pond stacking slopes caused due to uncontrolled seepage through the dike. In addition, numerous intermediate bench areas with standing water were also noted promoting dense Phragmites growth along the benches.

Since April, 2009, TVA has performed several repairs along the south slope of the East Pond to address the soft and wet areas. These included (i) regrading the upper intermediate bench to promote positive drainage (work plan no. let_013_paf_171468118), (ii) installing a ditch to collect and direct the uncontrolled seepage to the Stilling Pond (work plan no. let_013_paf_171468118) and (iii) constructing a rock buttress near the east end of the slope (work plan nos. let_012_paf_171468118 and let_002_paf_175569040). The current work

plan has been prepared by Stantec address the armoring of the entire south slope using a combination of sand, No.57 (or No.8) stone and Class III channel lining.

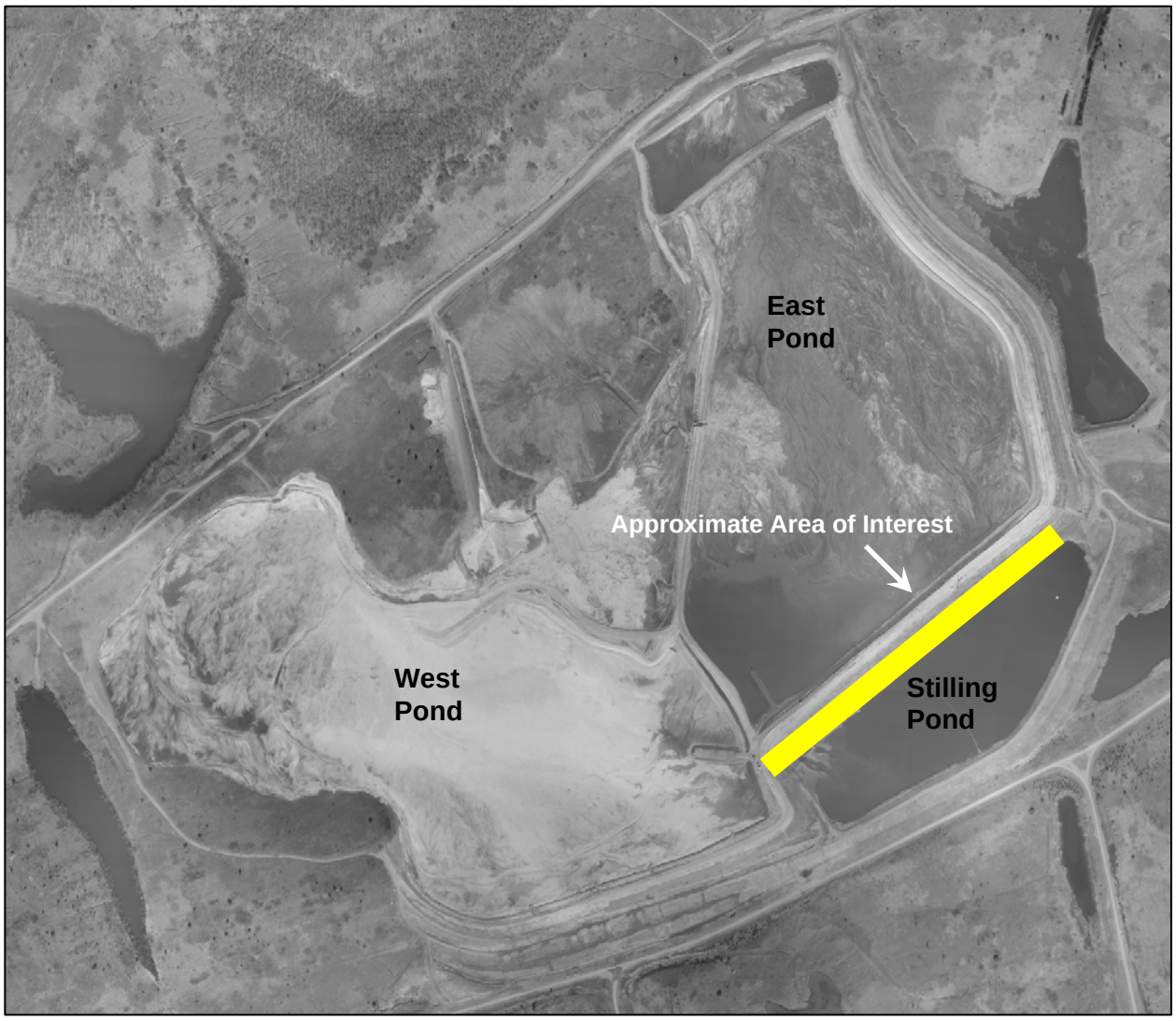


Figure 1: Approximate Area of Interest

2. Slope Armoring

2.1 Recommended Slope Armoring

Based on the conditions noted in the field and the results of as-built survey, it is recommended that the south slope of East Pond be armored in areas indicated using sand, No. 57 (or No.8) Stone and Class III Channel Lining. The recommended armoring option is presented in Table 1.

Table 1. Recommended Armoring Option

Parameter	Value
Top Elevation of Rip-Rap	490 feet
Bottom Elevation of Rip-Rap	477 feet
Total Thickness	2 feet
Sand Layer Thickness	6 inches
No.57 (or No.8) Layer Thickness	6 inches
Class III Layer Thickness	12 inches

At the time of this writing, TVA and Stantec have not made a decision regarding using No.57 stone or No.8 stone. The decision will be made prior to construction based on site specific filter calculations which are pending at this point. Preliminary calculations indicate that the filter design (with No.57 stone) shown on the attached drawing (10W702-03) satisfies the permeability criteria presented in Appendix B of EM 1110-2-2300. Contractor shall consult with TVA (fossil group) prior to ordering materials for construction.

The results of slope stability analysis performed by Stantec indicate that the proposed armoring will improve the factor of safety against shallow (infinite slope) failures between elevations 477 feet and 490 feet.

2.2 Construction Plans

Stantec's performed a computer-aided-design and drafting of the armoring using AutoCAD 2008. The objective of the design and drafting was to develop construction plans to assist TVA and to estimate the material quantities. The results of Stantec's design and drafting are presented on the construction plan drawing attached to this letter and summarized in subsequent paragraphs.

2.3. Material Quantities

The material quantity estimate for armoring is presented in Table 2.

Table 2. Material Quantities

Material	Volume (cubic yds)	Weight (tons)	Weight (tons)[(1)]
Sand	1,423	2,594	**2,600**
No.57 (or No.8)	1,423	2,114	**2,100**
Class III	2,847	4,151	**4,200**

[(1)] Rounded

2.4. Material Cost Opinion

It is our understanding that TVA will be procuring the materials from local vendors and constructing the armoring using in house resources. Based on this assumption, only material cost opinion is presented in Table 3.

Table 3. Material Cost Opinion

Material	Weight (Tons)	Unit Price (per ton)	Cost[(1)]
Sand	2,600	20.50	$53,300
No. 57 (or No.8) Stone	2,100	11.73	$24,633
Class III Channel Lining	4,200	12.43	$52,206
Total Estimated Material Cost			**$ 130,000[(1)]**

[(1)] Rounded to the nearest thousand

2.5. Construction Sequence

Contractor is made aware that rock buttressing work (a separate work plan) will have to be coordinated with the current work (armoring). Contractor shall refer to drawing nos. 10W702-01 and 02 and associated work plan for additional information. Suggested sequence of construction is presented on drawing no. 10W702-02.

2.6. Construction Recommendations

- **Safety:** Contractor shall be responsible for the health and safety of its personnel and shall meet all applicable local, state, and federal safety regulations; including but not limited to OSHA standards and TVA safety requirements.
- **Measurements:** Contractor shall base all measurements, both vertical and horizontal, from established benchmarks and monuments. A project baseline is presented on the attached drawing for assisting the Contractor with staking of approximate work limits.
- **Erosion and Sediment Control:** Silt fences shall be installed as directed by TVA. Installation, inspection and maintenance of silt fences shall follow the Best Management Practice (BMP) provisions given in Kentucky Erosion Prevention and Sediment Control Field Guide. A free copy of this guide can be obtained from Kentucky Division of Water.
- **Undercutting:** Contractor shall undercut the slope no more than 2-feet. Undercutting shall smoothly transition into original ground on all sides.
- **Materials:** Construction materials shall meet the requirements presented in KTC's Standard Specifications for Road and Bridge Construction Manual, current edition. Sand shall conform to ASTM C33.

- **Stone Placement:** It is recommended that an excavator be used to place the materials in layers (starting from the bottom). Upon placing the minimum required layers of sand and No. 57 (or No. 8) stone, channel lining shall be used to raise the undercut slope to original grade (or as needed to create a stable slope). Materials shall smoothly transition into original ground on all sides leaving a stable slope.
- **Begin Armoring:** Contractor shall begin armoring at elevation 477 feet.
- **Field Adjustments:** It is recommended that construction measures be monitored by Stantec personnel. Adjustments will be necessary as the fieldwork progresses and should be agreed upon between TVA and Stantec prior to implementation.
- **Material Disposal:** Material removed shall be disposed off properly at the direction of TVA.

3. Closure

The analysis and conclusions presented here are based on information gathered from the borings, several assumptions and theoretical calculations performed 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. The recommended work described here has been discussed in the field with TVA personnel on October 5, 2009 during a site visit by Stantec personnel. The objective of this repair is to armor the slope in the area indicated. Contractor is advised to review attached construction plans and contact Stantec for any clarifications, if needed.

Sincerely,

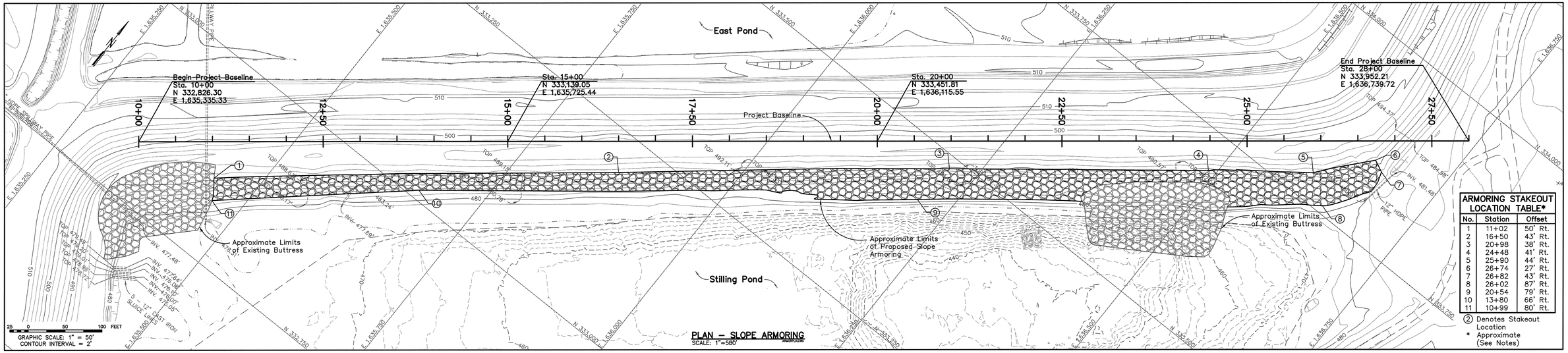
STANTEC CONSULTING SERVICES INC.

Sharath C. Vemuri, PE
Geotechnical Engineer

Hugo R. Aparicio, PE
Principal

/sv/rws

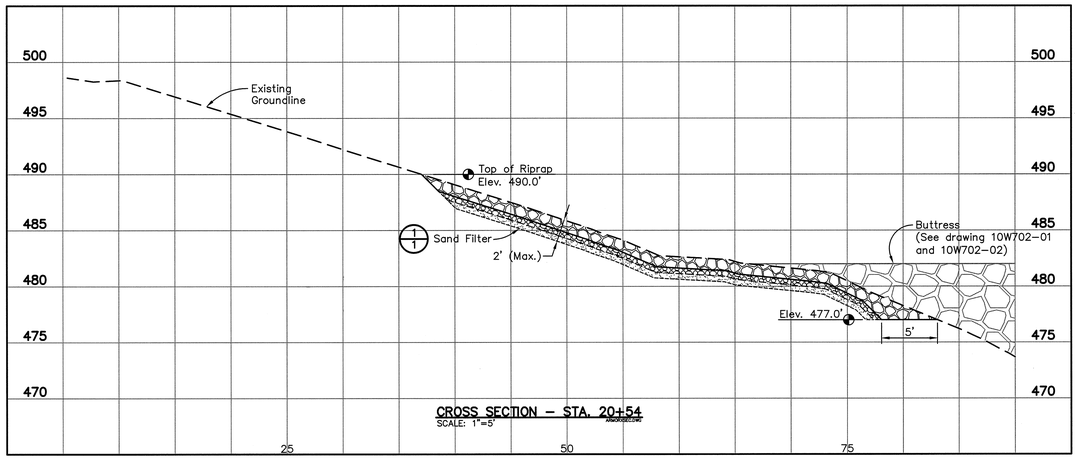
Enclosures: 1 Construction Work Plan



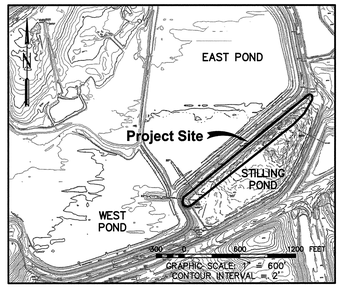
PLAN – SLOPE ARMORING
SCALE: 1"=50'

ARMORING STAKEOUT LOCATION TABLE*		
No.	Station	Offset
1	11+02	50' Rt.
2	16+50	43' Rt.
3	20+98	38' Rt.
4	24+48	41' Rt.
5	25+90	44' Rt.
6	26+74	27' Rt.
7	26+82	43' Rt.
8	26+02	87' Rt.
9	20+54	79' Rt.
10	13+80	66' Rt.
11	10+99	80' Rt.

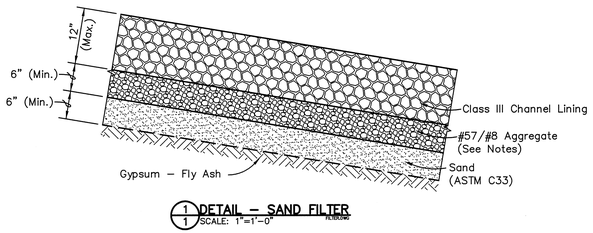
(2) Denotes Stakeout Location
* Approximate (See Notes)



CROSS SECTION – STA. 20+54
SCALE: 1"=5'



LOCATION MAP
SCALE: 1"=600'



DETAIL – SAND FILTER
SCALE: 1"=1'-0"

Section or Detail No.
Sheet Where Shown
REFERENCE KEY

NOTES:

1. Objective: The objective of this repair is to armor the south slope of East Pond in the area indicated.
2. Measurements: TVA (Contractor) shall base all measurements, both vertical and horizontal from established benchmarks and monuments. A project baseline is presented on the drawing to assist contractor with staking of approximate work limits.
3. Erosion and Sediment Control: Silt fences shall be installed as directed by TVA. Installation, inspection and maintenance of silt fences shall follow the Best Management Practice (BMP) provisions given in Kentucky Erosion Prevention and Sediment Control Field Guide. A free copy of this guide can be obtained from Kentucky Division of Water.
4. Undercutting: Contractor shall undercut the slope no more than 2–feet. Undercutting shall smoothly transition into original ground on all sides.
5. Materials: Materials used shall meet the requirements presented in KTC's Standard Specifications for Road and Bridge Construction Manual, current edition. Sand shall conform to ASTM C33 Specifications. At the time of this writing, a decision regarding the use of No. 57 or No. 8 stone has not been made. Contractor shall consult with TVA (Fossil Group) and Stantec prior to ordering materials for construction.
6. Stone Placement: It is recommended that an excavator be used to place the stone in layers (starting from the bottom). Channel lining shall be used to raise the undercut slope to original grade (or as needed to create a stable slope). Channel lining shall smoothly transition into original ground on all sides leaving a stable slope.
7. Begin Armoring: Contractor shall begin armoring at the toe of the slope where intermediate bench is present (east half of the project area). The remaining project area (west half) where no intermediate bench is present, Contractor shall begin armoring at elevation 482 feet.
8. Field Adjustments: It is recommended that construction measures be monitored by Stantec personnel. Adjustments will be necessary as the fieldwork progresses and should be agreed upon between TVA and Stantec prior to implementation.
9. Mapping: The topographic mapping used for design purposes was based on the as–built survey conducted by Stantec in September, 2009. The topographic mapping shown here is based on February, 2009 aerial survey by TVA.
10. Letter: Contractor shall refer to the attached letter of recommendations prepared by Stantec for this work.
11. Material Disposal: Material removed shall be disposed at the direction of TVA.
12. Buttress: The buttress detail shown here is part of another work plan. Contractor shall refer to drawing numbers 10W702–01 and 10W702–02 (and associated work plan) for additional information.

ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPGPAFFESCDX00000020090003

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV. ID
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	10/27/09	SV	PJB	SV	SV	SV	HRA	TJ	–	–	–

ISSUED FOR CONSTRUCTION

DISCIPLINE INTERFACE

SCALE: AS SHOWN EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
SOUTH SLOPE OF EAST POND
ARMORING PLAN AND CROSS SECTION

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	P. BOND	S. VEMURI	S. VEMURI	S. VEMURI	H. APARICIO	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
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Fax 859.422.3100
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AUTOCAD R 2000 | DATE 10/27/09 | 64 | C | 10W702–03 | R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 10/27/2009 USER: JOHNSON, TRACY
K:\TVS\KVIET\TVS056940\GEOTECHNICAL\DRAWING\SCRUBBER_SLUDGE_COMPLEX\EAST_POND\VEMURI\VE10_PLT000400-TVS-101-001.DWG

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

December 16, 2009 let_004_175569055

Mr. Chris Buttram, PE
Tennessee Valley Authority
1101 Market Street
MS LP 2G-C
Chattanooga, Tennessee 37402

Re: Issued for Construction
Work Plan for
Scrubber Sludge Storage Facility Operations Modifications
Paradise Fossil Plant
Muhlenberg County, Kentucky

Dear Mr. Buttram:

Stantec Consulting Services Inc. (Stantec) has completed the design of the proposed Scrubber Sludge Storage Facility operations modifications at the Paradise Fossil Plant based on the IFR review meeting at the Paradise Plant on November 9, 2009. This work plan includes a brief description of the revised cell configurations, dike and cutoff trench construction, riser structures, and decant piping design components presented in the attached construction drawings.

Purpose of Project

The purpose of the gypsum stack operation modifications is to relocate the gypsum sluicing operations away from the south and east outslopes that have exhibited signs of seepage and potential slope instability. The temporary cell configurations will be used for approximately three to five years until the existing facility can replaced and closed. The preliminary design modifications were developed after Stantec met onsite with TVA personnel on September 23, 2009 to discuss feasible cell configurations and stacking operations.

Description of Operations Modification

The proposed operations modifications consist of two new 17 acre cells constructed near the upper end of the existing west cell footprint of the gypsum stack. The new configuration will consists of two new cells with a center divider dike, two new riser/decant structures, a 4,000 linear foot HDPE decant pipe and a new sluice ditch alignment. Descriptions of the major design items are detailed in the following paragraphs.

Gypsum Dike and Cutoff Trench Construction

The design includes the construction of approximately 5,300 linear feet of new soil dikes and a 1,800 foot long gypsum divider dike. Each dike will be constructed to elevation 520 and will be 20 feet wide with 3H:1V side slopes. A saddle dam will be required along the western hillside to reinforce the proposed dike to elevation 520.0, and the northeast portion of each cell will be excavated into the existing hillside. The bottom of Cell No. 1 will be excavated to elevation 504 and Cell No. 2 will be excavated to elevation 501. A cutoff trench is proposed below the eastern dike alignment to intercept seepage currently flowing horizontally through the sedimented gypsum towards the existing southern embankment slope. The cutoff trench will extend beneath the gypsum to the underlying mine spoil material. Pumping operations and excavation benching will be required to excavate and backfill the cutoff trench as shown on the enclosed drawings.

Selected soil/mine spoil materials excavated from the hillside excavation will be used to construct a 1,000 feet long, 25 foot wide cutoff below the proposed east dike alignment extending vertically from the top of the dike, through the gypsum, to the underlying mine spoil material.

Riser/Decant Structures

A new riser structure will be constructed near the southeast edge of each cell. The riser structures will consist of a half section of 48-inch diameter corrugated metal pipe fabricated with steel channels, bulkheads and base plates similar to the existing riser structures at the facility. Treated timber stop logs will be inserted at half-foot intervals to control decant flows to a maximum elevation of 514.0'. The base of each riser structure will be constructed upon a reinforced concrete slab foundation. Each riser structure location will be excavated to the underlying mine spoil material. A layer of crushed stone will be placed on the mine spoil material prior to constructing the reinforced concrete base.

Decant Discharge Piping

A new, 4,000 foot long, 18-inch diameter, solid wall, HDPE decant pipe is proposed from the west edge of the new cells to the existing stilling pond. The pipe alignment will extend approximately 2,000 feet exposed along the existing bench of the regraded west pond south slope from the existing stilling pond at a grade of 0.50 percent. The remaining 2,000 feet of pipe will be placing within a deeply excavated trench extending up the hillside to the proposed riser locations. The pipe installation will require a maximum excavation depth of approximately 25 feet at one point. Two deep precast manhole structures are proposed along the decant piping near the two new riser locations.

Sluice Ditch Alignment

The design includes a new 1,800 linear foot long sluice ditch alignment from the outlet of the sluice line discharge pond to the new cells. The sluice ditch design consists of a ten foot wide flat bottom with a 0.20 percent flow slope and 2H:1V side slopes. The estimated sluice ditch outlet elevation at the distribution cell is elevation 514.8 feet.

Cell and Riser Operation

The proposed operation will initially consist of sluicing gypsum to one cell until the fines collect to an elevation of approximately 512'. Once the first cell is filled, the gypsum sluicing operations will be switched to the second cell while sedimented gypsum from the first cell is excavated, hauled, and placed dry onto the eastern and southern portions of the existing gypsum stack. It is estimated that each cell may provide up to two months of gypsum storage. Therefore, a full cell must be excavated at least every two months to provide continuous sluicing operations.

Existing Cell Modifications

After the new cells become operational, the existing east and west ponds will be regraded to drain storm flows to the existing risers. As the existing ponds dewater, the surface grades will be adjusted lower and lower at the riser locations until direct surface flow to the outlet pipes can be achieved. The dry gypsum stacking will be configured to support positive drainage of storm flows and to eliminate ponded water from the original ponds. Regrading plans will be evaluated in closure.

Material Quantities

The estimated material quantities required for the project are summarized in Table 1.

Table 1. Material Quantities

Material	Quantity
¾" Steel Blockoff Plates (4'x4') (2 Plates)	980 lb
36" Dia., ½ -inch Wall Steel Pipes	135 lf.
18" Dia, IPS SDR 17 HPDE Pipe	4,000 lf.
18" Dia. IPS SDR 17 HPDE Pipe Flanges	2 ea.
22.75" Bolt Circle, Ductile Iron Backup Rings	2 ea.
18" Dia. Carbon Steel Pipe	7 lf.
18" Dia. Carbon Steel Pipe Flanges	2 ea.
KYTC Precast 4' Dia. Manhole Base	2 ea.
KYTC Precast 4' Dia. Manhole Riser Barrels	6 ea.
KYTC Precast 4' Dia. Manhole Conical Riser	2 ea.
Cast Iron Manhole Frame and Cover	2 ea.
10 Ga., 48-inch Dia. CMP	18 lf.
Reinforced Concrete Riser Foundations	5.5 cy.
No. 2 Grade 4"x8"x4'-3 1/4" Timber Stoplogs	46 ea
Miscellaneous Steel Angles and Channels	2,250 lb
½" Steel Base Plate (3'-6" x 5'-9')	825 lb
3/8" Steel Bulkhead Plate (3'-0" x 4'-0")	370 lb
¾" Dia. x 12" Steel Anchor Bolts	14 ea.
No. 57 Crushed Stone	32 tons

Table 1. Material Quantities

Material	Quantity
6" x ½ inch Dia. Expansion Anchors	8 ea
1" x ¼ inch Steel Pipe Straps	4 ea
No. 610 Crushed Stone Road Surfacing	2,850 tons

The estimated excavation quantities required for the project are summarized in Table 2.

Table 2. Estimated Earthwork Quantities

Excavation Volumes (Cubic Yards)			
Item	**Mine Spoil**	**Gypsum**	**Total**
Sluice Ditch	73,000	0	73,000
Cutoff Trench	5,000	89,000	94,000
Cells/Perimeter Berms	250,000	457,000	707,000
Total Excavation Volumes	**328,000**	**546,000**	**874,000**

Volume Correction (Cubic Yards)			
Item	**Mine Spoil**	**Gypsum**	**Total**
Waste for saturated/oversized (Assumed 30 Percent)	98,400	0	98,400
Correction for Shrinkage (Assumed 5 Percent)	11,480	27,300	38,780
Useable Material Volumes	218,120	518,700	736,820

Fill Volumes (Cubic Yards)			
Item	**Mine Spoil**	**Gypsum**	**Total**
Sluice Ditch	0	0	0
Cutoff Trench (Up to 512')	44,000	50,000	94,000
Saddle Dam/Perimeter Dikes	20,000	0	20,000
Gypsum Berms	0	29,000	29,000
Divider Dike	0	75,000	75,000
Total Fill Volumes	**64,000**	**154,000**	**218,000**

Surplus Volumes (Cubic Yards)			
Item	**Mine Spoil**	**Gypsum**	**Total**
Surplus	**154,120**	**364,700**	**518,820**

Please contact our office if you have any questions.

We appreciate this opportunity to work with you on this project.

Sincerely,

STANTEC CONSULTING SERVICES INC.

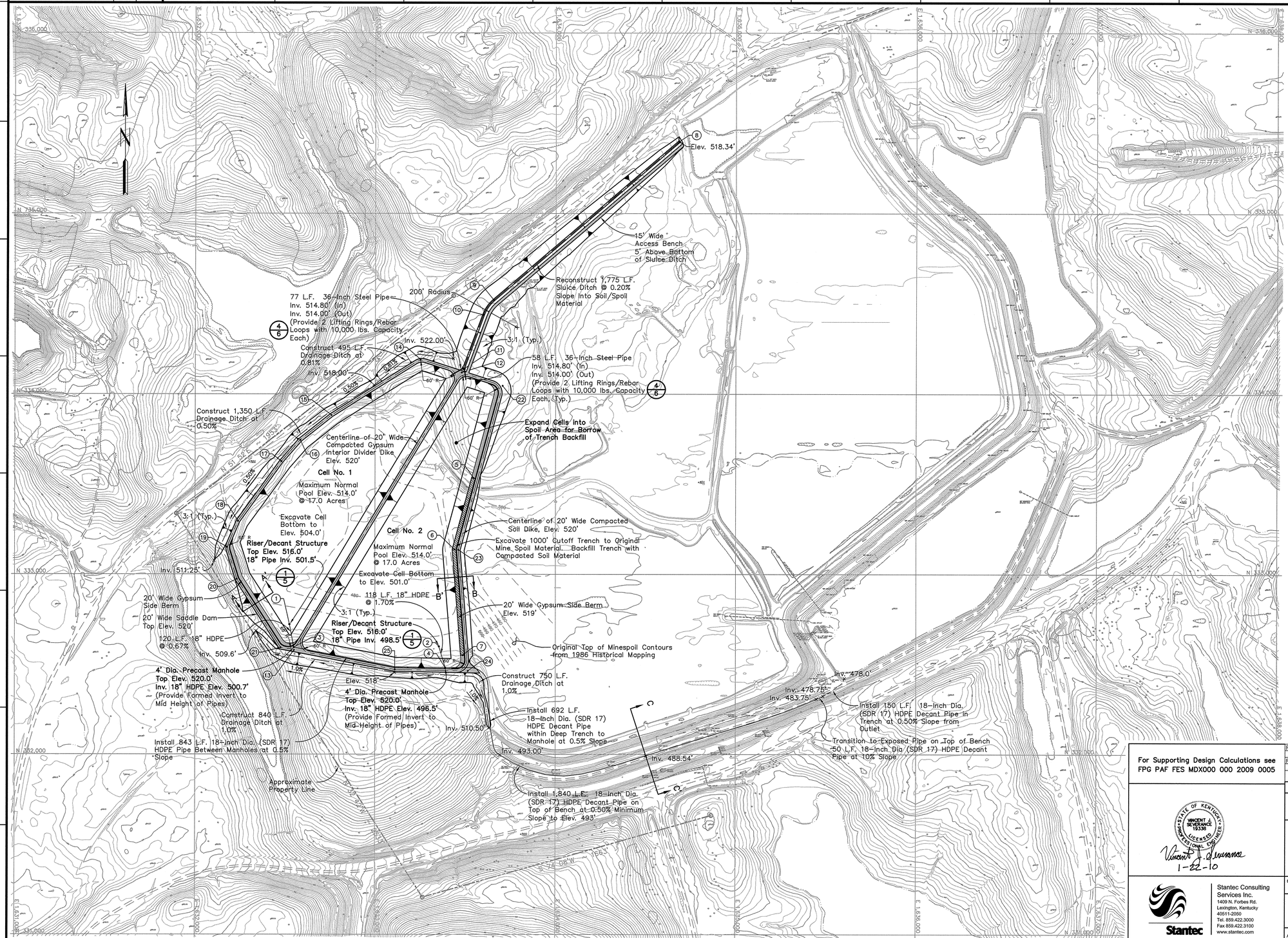
Vincent J. Severance, PE
Senior Project Engineer

Dan A. Back, PE, PLS, SE
Project Manager

/vjs/rws

Enclosures: 6 IFC Drawings, Engineering Calculations

cc: Jeff Ward
Barry Snider



SITE COORDINATE TABLE			
No.	Northing	Easting	Description
1	332,721.79	1,632,525.20	Riser Structure
2	332,598.87	1,633,354.62	Riser Structure
3	332,594.19	1,632,549.54	4' Dia. Manhole
4	332,481.38	1,633,389.34	4' Dia. Manhole
5	333,533.86	1,633,546.91	CL Cutoff Trench
6	333,137.80	1,633,439.98	CL Cutoff Trench
7	332,549.87	1,633,486.38	CL Cutoff Trench
8	335,397.83	1,634,683.78	CL Begin Sluice Ditch
9	334,520.51	1,633,657.67	CL Ditch Begin Radius
10	334,438.27	1,633,600.21	CL Ditch End Radius
11	334,137.52	1,633,488.24	CL End Sluice Ditch
12	334,118.95	1,633,479.30	CL Dike
13	332,578.73	1,632,550.47	CL Dike
14	334,192.36	1,633,251.07	CL Dike Cell 1
15	333,882.79	1,632,756.18	CL Dike Cell 1
16	333,745.78	1,632,583.82	CL Dike Cell 1
17	333,626.64	1,632,479.45	CL Dike Cell 1
18	333,294.92	1,632,239.31	CL Dike Cell 1
19	333,151.00	1,632,177.67	CL Dike Cell 1
20	332,973.57	1,632,232.68	CL Dike Cell 1
21	332,593.05	1,632,476.20	CL Dike Cell 1
22	334,045.59	1,633,707.36	CL Dike Cell 2
23	333,135.78	1,633,461.70	CL Dike Cell 2
24	332,462.52	1,633,514.85	CL Dike Cell 2
25	332,470.77	1,633,110.89	CL Dike Cell 2

(1) Denotes Coordinate Location

NOTES:

1. The footprint of the saddle dam and all new dikes shall be excavated to original mine spoil material prior to placement and compaction of new soil embankment material.
2. Compacted soil zone material shall consist of plastic clay soil free of organic material obtained from nearby mine spoil borrow areas. The borrow material shall contain no stones whose largest dimension exceeds six (6) inches. The thickness of layers before compaction shall not exceed eight (8) inches.
3. The decant piping shall consist of 18-inch diameter, solid wall, IPS SDR 17, high density polyethylene (HDPE) pipe with a material classification of PE 3608 meeting ASTM D 3350. Solid wall HDPE pipes shall be joined with heat fusing equipment in accordance with the manufacturer.
4. Trench excavations for the HDPE decant piping shall be backfilled with excavated materials. The backfill shall contain no stones whose largest dimension exceeds two inches.
5. All manhole structures shall consist of precast KYTC Type B, 4-foot diameter barrels, risers, and eccentric conical sections meeting the requirements of ASTM C 478 with casted-in-place A-Loc premium #580 compression gaskets.
6. Topographic mapping obtained from an aerial survey performed by Tuck Mapping Solutions, Inc. for TVA on February 22, 2009. Coordinate system based on Kentucky State Plane, South Zone, NAD27. Vertical datum NGVD29.

Section or Detail No.

Sheet Where Shown

REFERENCE KEY

ISSUED FOR CONSTRUCTION

PLOT DATE: 01/21/2010 USER: ELLISON, DOC
V:\TVA\VA\THEY\739999005\GEOTECH\CAL\DRAWING\VIEW_PF\10W704-01-R1.DWG

For Supporting Design Calculations see FPG PAF FES MDX000 000 2009 0005

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 1	01/22/10	VJS	DMG	VJS	DAB	DAB	DAB	TJ	–	–
ISSUED FOR CONSTRUCTION										
R 0	12/16/09	VJS	DMG	VJS	DAB	DAB	DAB	TJ	–	–
ISSUED FOR CONSTRUCTION										

DISCIPLINE INTERFACE
REV 01
1
2
3
4

SCALE: 1"=200' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX OPERATIONS MODIFICATION PLAN VIEW

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
V. SEVERANCE	D. GRAHAM	V. SEVERANCE	D. BACK	D. BACK	D. BACK	T. JOHNSON

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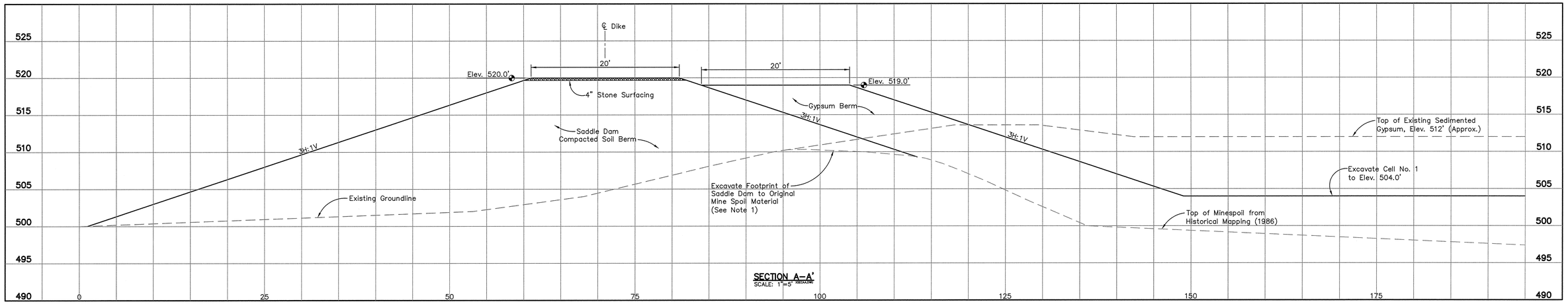
PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 12/16/09	64	C	10W704-01	R 1

STANTEC	1
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY



SECTION A–A'
SCALE: 1"=5' HORIZONTAL

NOTES:

1. The footprint of the saddle dam and perimeter dikes shall be excavated to original mine spoil material and proof rolled with heavy construction equipment in the presence of a Geotechnical Engineer. Any soft of yielding zones shall be stabilized as required by the Geotechnical Engineer prior to placement and compaction of new soil embankment material.
2. Compacted soil zone material shall consist of plastic clay soil free of organic material obtained from nearby mine spoil borrow areas. The borrow material shall contain no stones whose largest dimension exceeds six (6) inches. The thickness of layers before compaction shall not exceed eight (8) inches.
3. Clay soil embankment materials shall be compacted to 95 percent of standard Proctor maximum dry density, and in–place moisture shall be within (–2%) to (+4%) of optimum moisture content as determined by ASTM D698.
4. Stone surfacing shall be placed on the crest of all dikes to create all–weather access roads around each cell. Stone surfacing shall consist of a minimum four (4) inch thick layer of No. 610 crushed stone.
5. Excavated side slopes and sheeting and bracing as required to safely support the sides of excavations shall comply with OSHA requirements.
6. Temporary pumping equipment and sumps may be required to dewater and maintain the excavations free of standing water.

ISSUED FOR CONSTRUCTION

PLOT DATE: 01/21/2010 USER: ELLISON, DOC
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For Supporting Design Calculations see FPG PAF FES MDX000 000 2009 0005

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 1	01/22/10 ISSUED FOR CONSTRUCTION	VJS	DMG	VJS	DAB	DAB	DAB	TJ	–	–
R 0	12/16/09 ISSUED FOR CONSTRUCTION	VJS	DMG	VJS	DAB	DAB	DAB	TJ	–	–

DISCIPLINE INTERFACE: 1 2 3 4

SCALE: 1"=5' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX OPERATIONS MODIFICATIONS SADDLE DAM CROSS SECTION

STATE OF KENTUCKY · VINCENT J. SEVERANCE 19338 · LICENSED PROFESSIONAL ENGINEER
Vincent J. Severance
1-22-10

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
V. SEVERANCE	R. ELLISON	V. SEVERANCE	D. BACK	D. BACK	D. BACK	T. JOHNSON

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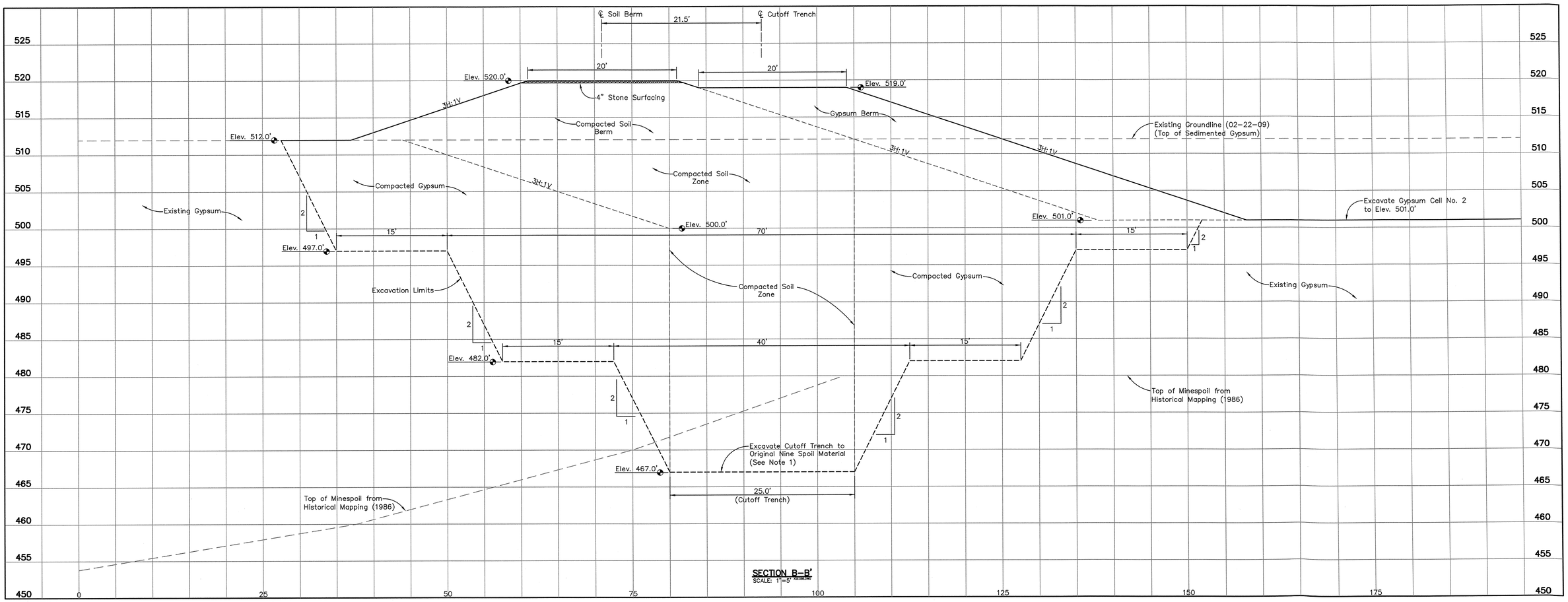
PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 12/16/09	64	C	10W704–02	R 1

STANTEC	1
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY



SECTION B–B'
SCALE: 1"=5'

NOTES:

1. The footprint of the cutoff trench shall be excavated to original mine spoil material and proof rolled with heavy construction equipment in the presence of a Geotechnical Engineer. Any soft of yielding zones shall be stabilized as required by the Geotechnical Engineer prior to placement and compaction of new soil embankment material.
2. Compacted soil zone material shall consist of plastic clay soil free of organic material obtained from nearby mine spoil borrow areas. The borrow material shall contain no stones whose largest dimension exceeds six (6) inches. The thickness of layers before compaction shall not exceed eight (8) inches.
3. Clay soil and gypsum embankment materials shall be compacted to 95 percent of standard Proctor maximum dry density, and in–place moisture shall be within (–2%) to (+4%) of optimum moisture content as determined by ASTM D698.
4. Stone surfacing shall be placed on the crest of all dikes to create all–weather access roads around each cell. Stone surfacing shall consist of a minimum four (4) inch thick layer of No. 610 crushed stone.
5. Excavated side slopes and sheeting and bracing as required to safely support the sides of excavations shall comply with OSHA requirements.
6. Temporary pumping equipment and sumps may be required to dewater and maintain the excavations free of standing water.

ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPG PAF FES MDX000 000 2009 0005

STATE OF KENTUCKY · VINCENT A. SEVERANCE 19338 · LICENSED PROFESSIONAL ENGINEER
1-22-10

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REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV
R 1	01/22/10	VJS	DMG	VJS	DAB	DAB	DAB	TJ	–	–	–
	ISSUED FOR CONSTRUCTION										
R 0	12/16/09	VJS	DMG	VJS	DAB	DAB	DAB	TJ	–	–	–
	ISSUED FOR CONSTRUCTION										

DISCIPLINE INTERFACE
1
2
3
4

SCALE: 1"=5' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX OPERATIONS MODIFICATIONS CUTOFF TRENCH CROSS SECTION

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
V. SEVERANCE	R. ELLISON	V. SEVERANCE	D. BACK	D. BACK	D. BACK	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 12/16/09	64	C	10W704–03	R 1

STANTEC	1
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
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PLOT DATE: 01/21/2010 USER: ELLISON, DOC
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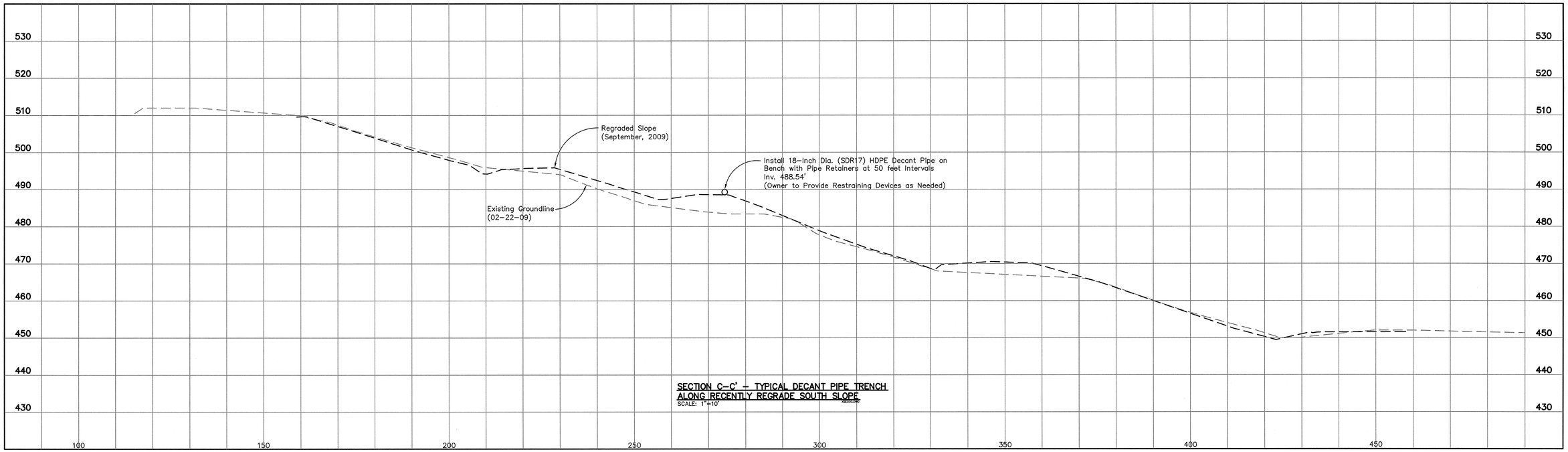

SECTION C-C' - TYPICAL DECANT PIPE TRENCH ALONG RECENTLY REGRADE SOUTH SLOPE
SCALE: 1"=10'

NOTES:

1. Excavated side slopes and sheeting and bracing as required to safely support the sides of excavations shall comply with OSHA requirements.
2. Temporary pumping equipment and sumps may be required to dewater and maintain the excavations free of standing water.

ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPG PAF FES MDX000 000 2009 0005

STATE OF KENTUCKY · VINCENT J. SEVERANCE · 19330 · LICENSED PROFESSIONAL ENGINEER
Vincent J. Severance
1-22-10

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 1	01/22/10	VJS	DMG	VJS	DAB	DAB	DAB	TJ	–	–
	ISSUED FOR CONSTRUCTION									
R 0	12/16/09	VJS	DMG	VJS	DAB	DAB	DAB	TJ	–	–
	ISSUED FOR CONSTRUCTION									

DISCIPLINE INTERFACE

SCALE: 1"=5' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX OPERATIONS MODIFICATIONS REGRADED SLOPE CROSS SECTION

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
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AUTOCAD R 2000	DATE 12/16/09	64	C	10W704-04	R 1

STANTEC	1
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 01/21/2010 USER: ELLISON, DOC
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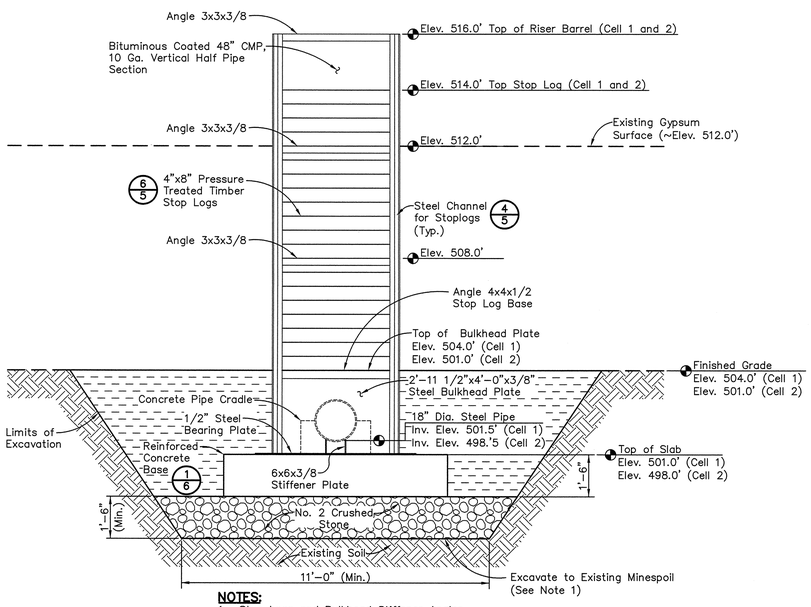
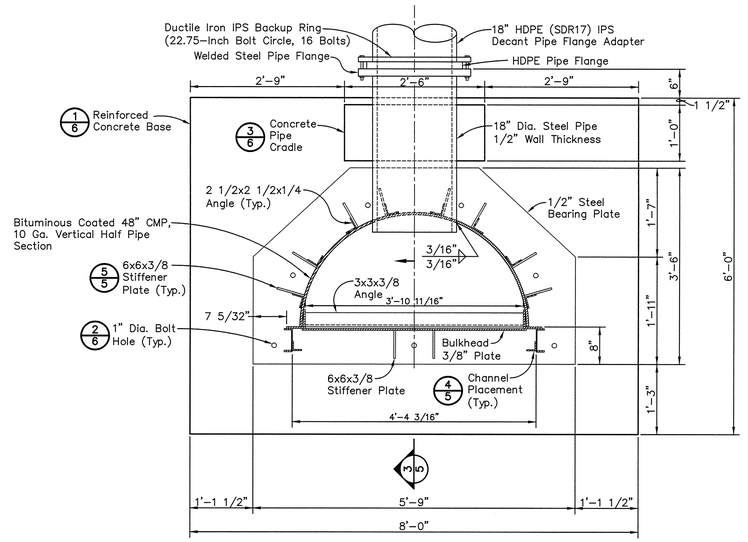


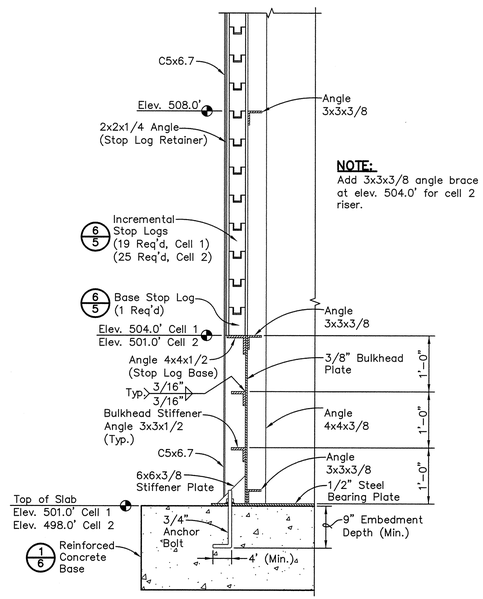
NOTES:
1. Stop Logs and Bulkhead Stiffener Angles not shown for clarity. See Riser Section Detail.
2. Add 3x3x3/8 Angle Brace at Elev. 504.0' for Cell 2 Riser.

1/5 **ELEVATION – 48" CMP RISER** SCALE: 1/2"=1'-0"



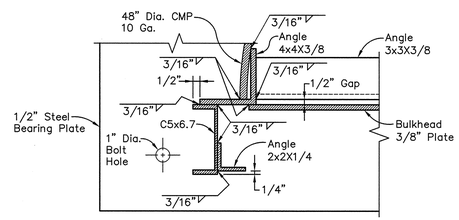
NOTE:
Stop Logs and Bulkhead Stiffener Angles not shown for clarity. See Riser Section Detail.

2/5 **DETAIL – RISER PLAN** SCALE: 1"=1'-0"

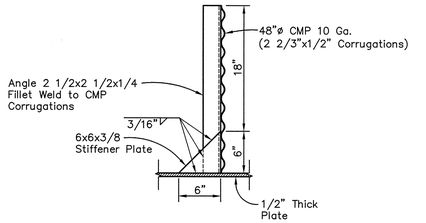


NOTE:
Hidden lines not shown for clarity.

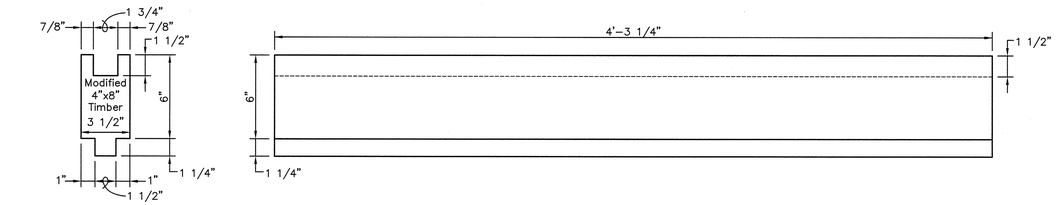
3/5 **DETAIL – RISER SECTION** SCALE: 1"=1'-0"



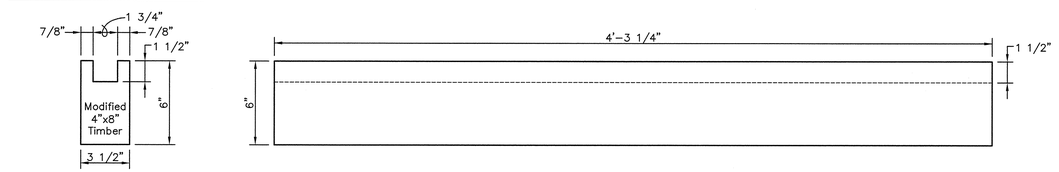
4/5 **DETAIL – CHANNEL PLACEMENT** SCALE: 3"=1'-0"



5/5 **DETAIL – STIFFENER PLATE** SCALE: 1 1/2"=1'-0"



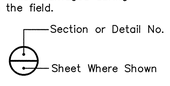
INCREMENTAL STOP LOG (23 REQ'D)



BASE STOP LOG (1 REQ'D)

6/5 **DETAIL – STOP LOG** SCALE: 3"=1'-0"

NOTES:
1. Sedimented gypsum shall be excavated down to the underlying mine spoil materials at each new riser location and proof rolled with heavy construction equipment in the presence of a Geotechnical Engineer. Any soft or yielding zones shall be stabilized as required by the Geotechnical Engineer. A minimum 18-inch thick layer of No. 2 stone shall be placed in base of the excavation prior to constructing a reinforced concrete riser foundation.
2. Excavated side slopes and sheeting and bracing as required to safely support the sides of excavations shall comply with OSHA requirements.
3. All cast-in-place concrete shall have a minimum compressive strength at twenty-eight (28) days of 4,500 psi.
4. Wooden stop logs shall consist of pressure treated Grade No. 2 or better southern pine lumber.
5. A hole shall be carefully cut in the 48-inch CMP to accept the 18-inch diameter steel pipe within a close tolerance to allow a continuous 3/16-inch seal weld to be performed on both sides of the pipe connection.
6. All steel elements shall be hot-dipped galvanized or coated with a zinc rich primer and a coal-tar epoxy top coat. Any areas of finish damaged during assembly/construction shall be primed and painted in the field.



REFERENCE KEY

ISSUED FOR CONSTRUCTION

PLOT DATE: 01/21/2010 USER: ELLISON, DOC
V:\1795\ACTIVE\TVS56955\GEOTECHNICAL\DRAWING\WDFT_JF\10W704-05-R1.DWG

For Supporting Design Calculations see FPG PAF FES MDX000 000 2009 0005

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ENG	AS CONST	REV NO
R 1	01/22/10	VJS	DMG	VJS	DAB	DAB	DAB	TJ	–	–	–
	ISSUED FOR CONSTRUCTION										
R 0	12/16/09	VJS	DMG	VJS	DAB	DAB	DAB	TJ	–	–	–
	ISSUED FOR CONSTRUCTION										

DISCIPLINE INTERFACE

SCALE: AS SHOWN EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX OPERATIONS MODIFICATIONS DETAILS – RISER STRUCTURES

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
V. SEVERANCE	D. GRAHAM	V. SEVERANCE	D. BACK	D. BACK	D. BACK	T. JOHNSON

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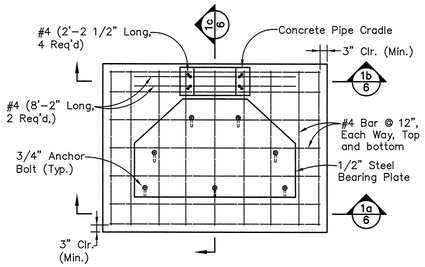
PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 12/16/09	64	C	10W704-05	R 1

STANTEC	1
TASK COMPLETED BY:	REV NO.

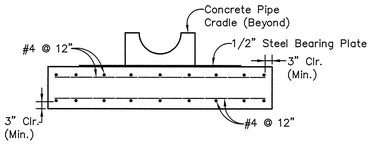
PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY



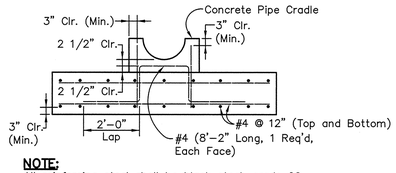
NOTES:
1. Concrete Pipe Cradle to be formed and poured after Riser installation.
2. All reinforcing steel shall be black steel, grade 60.

1 / 6 **PLAN – REINFORCED CONCRETE BASE STEEL PLACEMENT**
SCALE: 1/2"=1'-0"



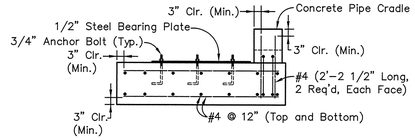
NOTE:
All reinforcing steel shall be black steel, grade 60.

1a / 6 **SECTION – REINFORCED CONCRETE BASE STEEL PLACEMENT**
SCALE: 1/2"=1'-0"



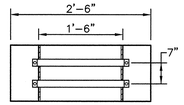
NOTE:
All reinforcing steel shall be black steel, grade 60.

1b / 6 **SECTION – REINFORCED CONCRETE BASE CONCRETE CRADLE STEEL PLACEMENT**
SCALE: 1/2"=1'-0"



NOTE:
All reinforcing steel shall be black steel, grade 60.

1c / 6 **SECTION – REINFORCED CONCRETE BASE STEEL PLACEMENT**
SCALE: 1/2"=1'-0"



PLAN

ESTIMATED MATERIAL QUANTITIES

ITEM DESCRIPTION	UNITS	QUANTITY
3/4" Steel Blockoff Plates (4'-0"x4'-0") (2 plates)	980	Pounds
36" Dia. 1/2" Wall Steel Pipes	135	Linear Foot
18" Dia. IPS SDR 17 HDPE Pipe	4,000	Linear Foot
18" Dia. IPS SDR 17 HDPE Pipe Flanges	2	Each
22.75" Dia. Bolt Circle, Ductile Iron IPS Backup Rings	2	Each
18" Dia. Carbon Steel Pipe (1/2 inch wall)	6	Linear Foot
18" Dia. Carbon Steel Pipe Flanges	2	Each
KYTC Precast 4 Feet Dia. Manhole Bases	2	Each
KYTC Precast 4 Feet Dia. Riser Barrels	6	Each
KYTC Precast 4 Feet Dia. Conical Risers	2	Each
Cast Iron Manhole Frame and Cover	2	Each
10 Ga., 48-inch Dia. CMP	18	Linear Foot
Reinforced Concrete Riser Foundations	5.5	Cubic Yard
No. 2 Grade, 4" x 8" x 4'– 3 1/4" Treated Timber Stoplogs	46	Each
Miscellaneous Steel Angles and Channels	2,250	Pounds
1/2" Steel Base Plate (3'–6" x 5'–9")	825	Pounds
3/8" Steel Bulkhead Plate (3'–0" x 4'–0")	370	Pounds
3/4" Dia. x 12" Steel Anchor Bolts	14	Each
No. 57 Crushed Stone	32	Ton
6" x 1/2" Dia. Expansion Anchors	8	Each
1" x 1/4" Steel Pipe Straps	4	Each
No. 610 Crushed Stone Surfacing	2,850	Ton

ESTIMATED EARTHWORK QUANTITIES

EXCAVATION VOLUME (CUBIC YARDS)

ITEM	MINE SPOIL	GYPSUM	TOTAL
Sluice Ditch	73,000	0	73,000
Cutoff Trench	5,000	89,000	94,000
Cells/Perimeter Berms	250,000	457,000	707,000
Total Excavation Volumes	328,000	546,000	874,000

VOLUME CORRECTION (CUBIC YARDS)

ITEM	MINE SPOIL	GYPSUM	TOTAL
Waste for saturated/oversized (Assumed 30 Percent)	98,400	0	98,400
Correction for Shrinkage (Assumed 5 Percent)	11,480	27,300	38,780
Useable Material Volumes	218,120	518,700	736,820

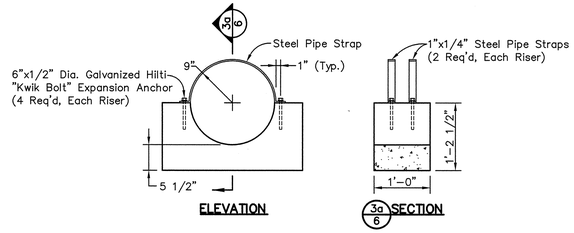
FILL VOLUMES (CUBIC YARDS)

ITEM	MINE SPOIL	GYPSUM	TOTAL
Sluice Ditch	0	0	0
Cutoff Trench (Up to 512')	44,000	50,000	94,000
Saddle Dam/Perimeter Dikes	20,000	0	20,000
Gypsum Berms	0	29,000	29,000
Divider Dike	0	75,000	75,000
Total Fill Volumes	64,000	154,000	218,000

SURPLUS VOLUMES (CUBIC YARDS)

ITEM	MINE SPOIL	GYPSUM	TOTAL
Surplus	154,120	364,700	518,820

2 / 6 **PLAN – REINFORCED CONCRETE BASE ANCHOR BOLT PLACEMENT**
SCALE: 1/2"=1'-0"



ELEVATION

3a / 6 **SECTION**

3 / 6 **DETAIL – PIPE CRADLE**
SCALE: 1"=1'-0"

NOTE:
Lifting Rings or Rebar Loops shall be placed along Pipe at 1/3 and 2/3 of pipe length.

4 / 6 **DETAIL – LIFTING RING – REBAR LOOP**
SCALE: 3"=1'-0"

Section or Detail No.
Sheet Where Shown
REFERENCE KEY

ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPG PAF FES MDX000 000 2009 0005

STATE OF KENTUCKY · VINCENT J. SEVERANCE · 19338 · LICENSED PROFESSIONAL ENGINEER
Vincent J. Severance 1-22-10

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1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
Tel. 859.422.3000
Fax 859.422.3100
www.stantec.com

REV	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 1	01/22/10	VJS	DMG	VJS	DAB	DAB	DAB	TJ	–	–
	ISSUED FOR CONSTRUCTION									
R 0	12/16/09	VJS	DMG	VJS	DAB	DAB	DAB	TJ	–	–
	ISSUED FOR CONSTRUCTION									

SCALE: AS SHOWN — EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX OPERATIONS MODIFICATIONS DETAILS – RISER STRUCTURES

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
V. SEVERANCE	D. GRAHAM	V. SEVERANCE	D. BACK	D. BACK	D. BACK	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 12/16/09 | 64 | C | 10W704–06 | R 1

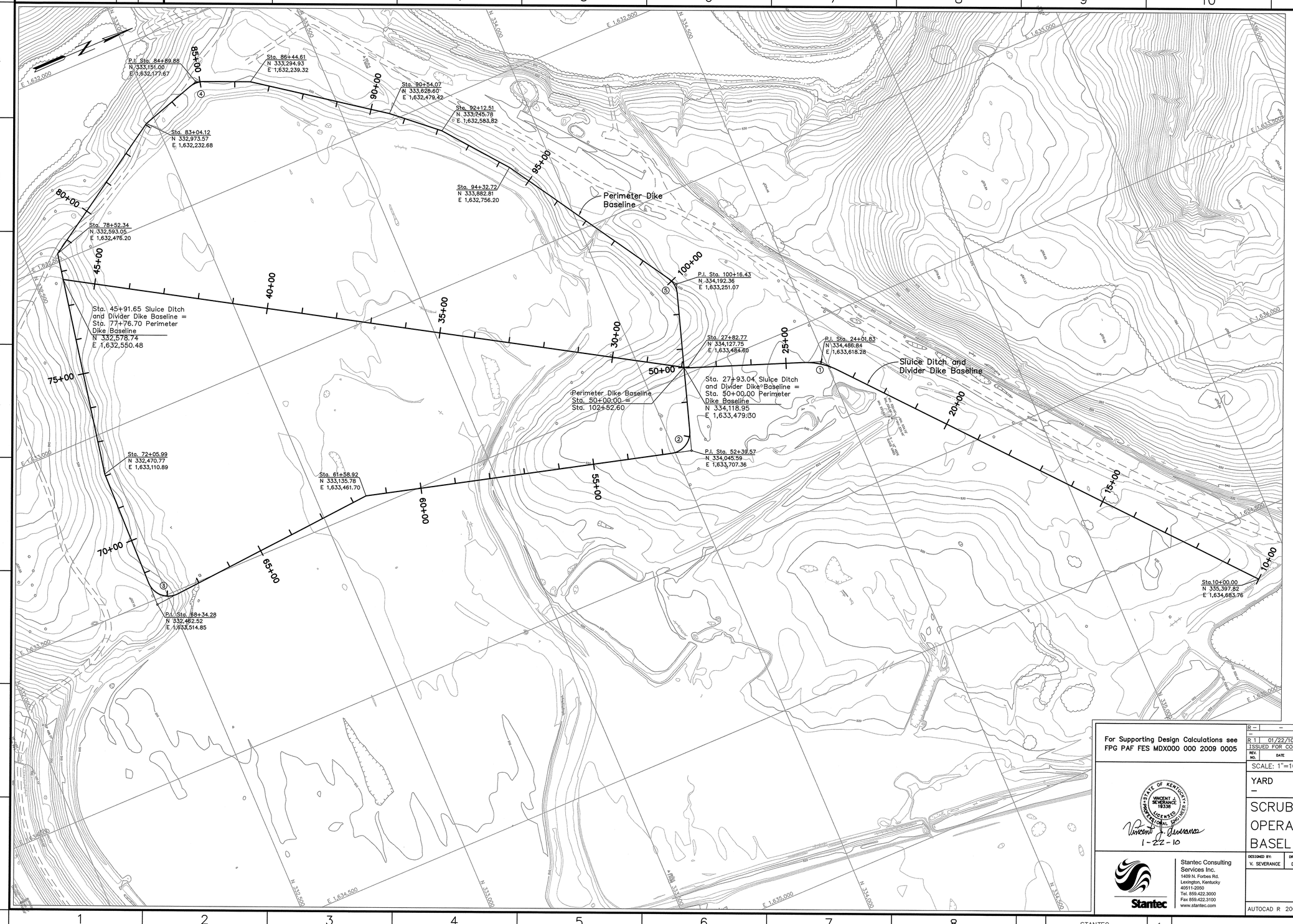
DISCIPLINE INTERFACE

PLOT DATE: 01/21/2010 USER: ELLISON, DOC
R:\STANTEC\PROJECTS\MDX000\000\2009\0005\CAD\MISC\VERT_JF\10W704-06-R1.DWG

STANTEC | 1
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY



NOTES:

1. Topographic mapping obtained from an aerial survey performed by Tuck Mapping Solutions, Inc. for TVA on February 22, 2009. Coordinate system based on Kentucky State Plane, South Zone, NAD27. Vertical datum NGVD29.
2. These drawings are to be used in conjunction with the Operations Modification – Issued for Construction Drawing Set dated December 16, 2009. (Drawing No. 10W704-01 through 10W704-06)

SLUICE DITCH BASELINE CURVE DATA

①

P.I. Sta.= 24+01.83
Northing = 334,486.84
Easting = 1,633,618.28
Δ = 29°03'00" Left
D = 28°38'52"
R = 200.00'
T = 51.82'
L = 101.40'
E = 6.60'
P.C. Sta.= 23+50.02
P.T. Sta.= 24+51.42

PERIMETER DIKE BASELINE CURVE DATA

②

P.I. Sta.= 52+39.57
Northing = 334,045.59
Easting = 1,633,707.36
Δ = 87°23'13" Right
D = 95°29'35"
R = 60.00'
T = 57.32'
L = 91.51'
E = 22.98'
P.C. Sta.= 51+82.35
P.T. Sta.= 52+73.75

③

P.I. Sta.= 68+34.28
Northing = 332,462.52
Easting = 1,633,514.85
Δ = 95°49'56" Right
D = 95°29'35"
R = 60.00'
T = 66.44'
L = 100.36'
E = 29.52'
P.C. Sta.= 67+68.01
P.T. Sta.= 68+68.21

④

P.I. Sta.= 84+89.88
Northing = 333,151.00
Easting = 1,632,177.67
Δ = 40°24'31" Right
D = 95°29'35"
R = 60.00'
T = 22.08'
L = 42.32'
E = 3.93'
P.C. Sta.= 84+67.80
P.T. Sta.= 85+10.11

⑤

P.I. Sta.= 100+16.43
Northing = 334,192.36
Easting = 1,633,251.07
Δ = 49°51'31" Right
D = 95°29'35"
R = 60.00
T = 27.89'
L = 52.21'
E = 6.16'
P.C. Sta.= 99+88.54
P.T. Sta.= 100+40.75

ISSUED FOR CONSTRUCTION

50 0 100 200 FEET
GRAPHIC SCALE: 1" = 100'
CONTOUR INTERVAL = 1 FOOT

PLOT DATE: 01/21/2010 USER: ELLISON, DOC
V:\TVA\ACAD\PROJ\DRAWINGS\STRUCTURAL\DRAWINGS\SH_LAY\10W704-03-R1.DWG

For Supporting Design Calculations see FPG PAF FES MDX000 000 2009 0005

STATE OF KENTUCKY · VINCENT J. SEVERANCE · 19338 · LICENSED PROFESSIONAL ENGINEER
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1-22-10

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REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV NO.
R –	–	–	–	–	–	–	–	–	–	–	–
R 1	01/22/10	VJS	DMG	VJS	DAB	DAB	DAB	TJ	–	–	–

ISSUED FOR CONSTRUCTION

DISCIPLINE INTERFACE

SCALE: 1"=100' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX OPERATIONS MODIFICATION BASELINE LAYOUT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
V. SEVERANCE	D. GRAHAM	V. SEVERANCE	D. BACK	D. BACK	D. BACK	T. JOHNSON

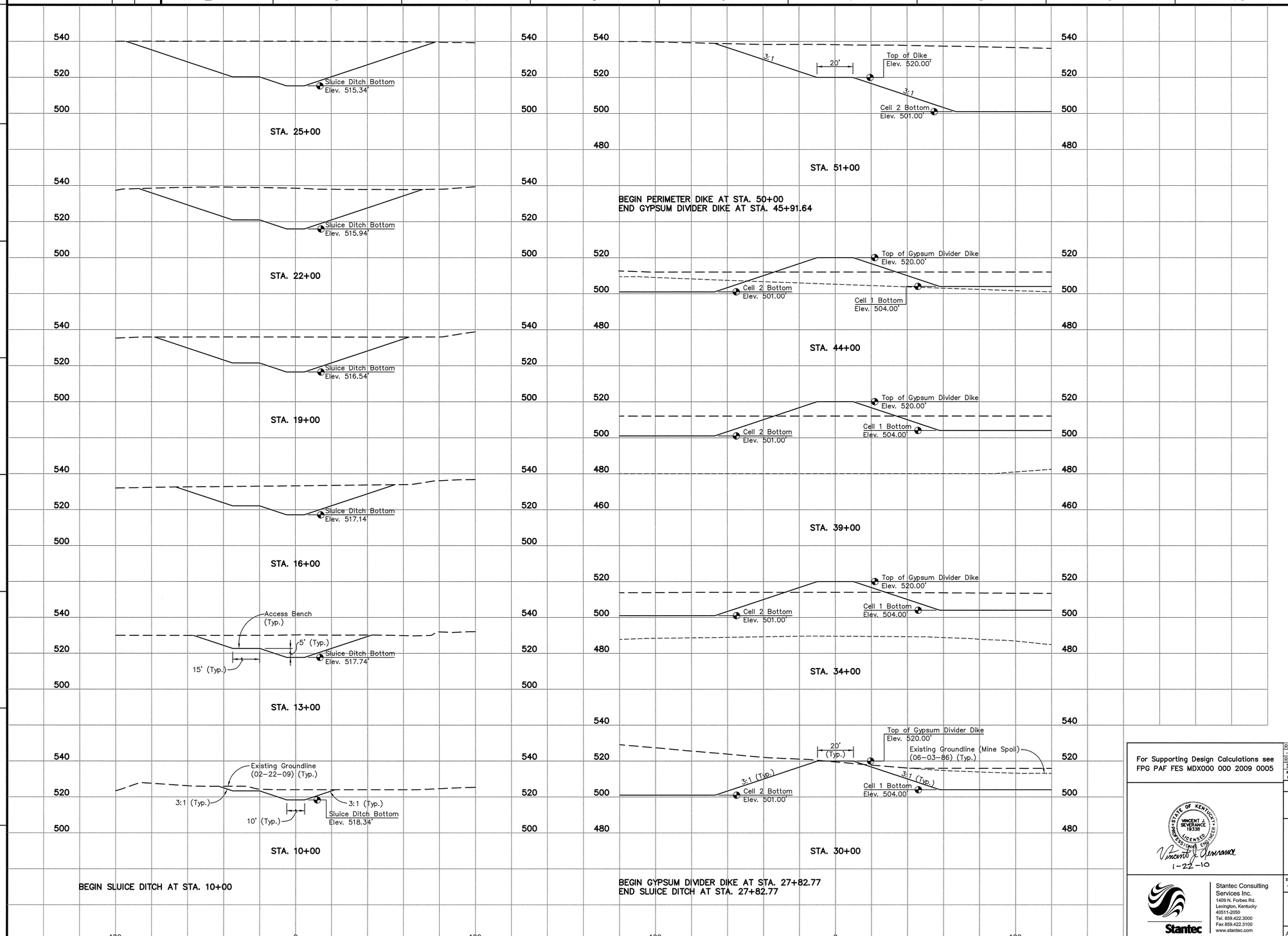
PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 01/22/10	64	C	10W704-07	R 1

STANTEC	1
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY



NOTES:

1. The bottom of Cutoff Trench shall be excavated a minimum of two feet below the lowest point of Mine Spoil encountered within the section.
2. The maximum Cutoff Trench excavation depth shown on the sections shall not be exceeded without consulting the Geotechnical Engineer.
3. These drawings are to be used in conjunction with the Operations Modification – Issued for Construction Drawing Set dated December 16, 2009. (Drawing No. 10W704-01 through 10W704-06)

ISSUED FOR CONSTRUCTION

PLOT DATE: 01/21/2010 USER: ELLISON, DOC
K:\TVA\VATVA\TV59569\DS\TECHNICAL\DRAWING\VIEW_LAY\10W704-08-R1.DWG

For Supporting Design Calculations see FPG PAF FES MDX000 000 2009 0005

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ??	AS CONST
R –	–	–	–	–	–	–	–	–	–	–
R 1	01/22/10	VJS	ACC	VJS	VJS	DAB	DAB	TJ	–	–

ISSUED FOR CONSTRUCTION

DISCIPLINE INTERFACE

SCALE: 1"=20' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX OPERATIONS MODIFICATIONS CROSS SECTIONS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
V. SEVERANCE	A. CLINKENBEARD	V. SEVERANCE	V. SEVERANCE	D. BACK	D. BACK	T. JOHNSON

COMMONWEALTH OF KENTUCKY
VINCENT J. SEVERANCE
19350
LICENSED PROFESSIONAL ENGINEER
Vincent J. Severance
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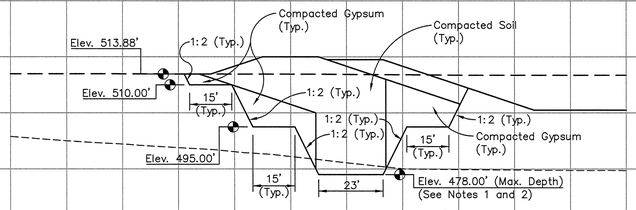
PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 01/22/10	64	C	10W704-08	R 1

STANTEC | 1
TASK COMPLETED BY: | REV NO.

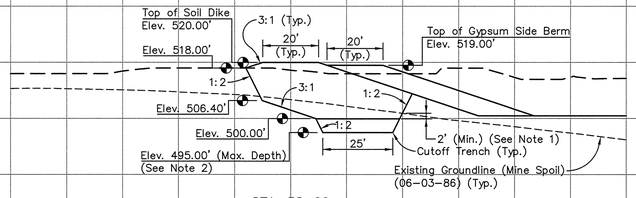
PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY



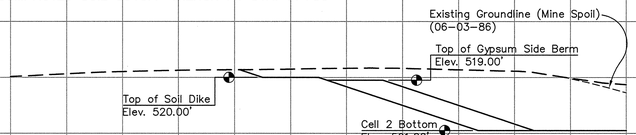
STA. 59+00

PROVIDE UNIFORM BENCH TRANSITIONS BETWEEN STA. 58+00 AND STA. 59+00

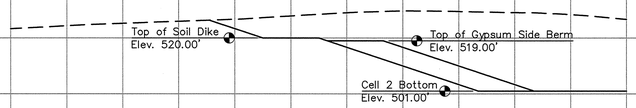


STA. 58+00

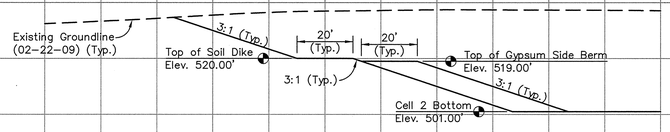
BEGIN COMPACTED SOIL CUTOFF TRENCH AT STA. 57+50



STA. 57+00

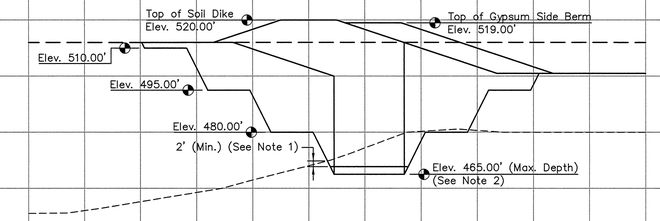


STA. 56+00

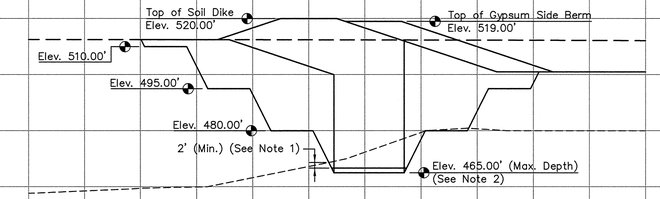


STA. 53+00

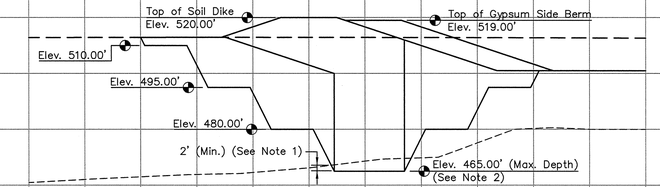
BEGIN GYPSUM SIDE BERM AT STA. 51+59



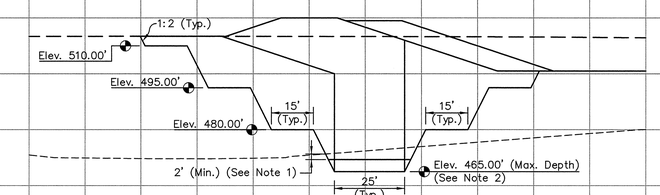
STA. 63+00



STA. 62+00



STA. 61+00



STA. 60+00

PROVIDE UNIFORM BENCH TRANSITIONS BETWEEN STA. 59+00 AND STA. 60+00

NOTES:

1. The bottom of Cutoff Trench shall be excavated a minimum of two feet below the lowest point of Mine Spoil encountered within the section.
2. The maximum Cutoff Trench excavation depth shown on the sections shall not be exceeded without consulting the Geotechnical Engineer.
3. These drawings are to be used in conjunction with the Operations Modification – Issued for Construction Drawing Set dated December 16, 2009. (Drawing No. 10W704-01 through 10W704-06)

ISSUED FOR CONSTRUCTION

PLOT DATE: 01/21/2010 USER: ELLISON, DOC
V:\7704\ACTIVE\72599695\GEOTECHNICAL\DRAWING\VIEW_EPC\10W704-09-R1.DWG

For Supporting Design Calculations see FPG PAF FES MDX000 000 2009 0005

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Vincent J. Severance
1-22-10

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Fax 859.422.3100
www.stantec.com

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT MGR	AS CONST	DISCIPLINE INTERFACE
R –	–	–	–	–	–	–	–	–	–	–	–
R 1	01/22/10	VJS	ACC	VJS	VJS	DAB	DAB	TJ	–	–	–

ISSUED FOR CONSTRUCTION

SCALE: 1"=20' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX OPERATIONS MODIFICATIONS CROSS SECTIONS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
V. SEVERANCE	A. CLINKENBEARD	V. SEVERANCE	V. SEVERANCE	D. BACK	D. BACK	T. JOHNSON

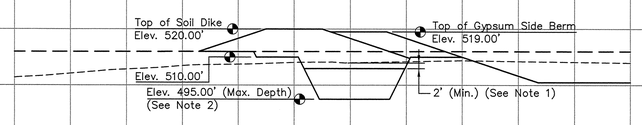
PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 01/22/10	64	C	10W704-09	R 1

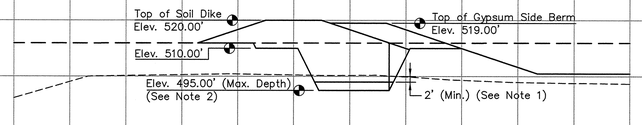
STANTEC	1
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

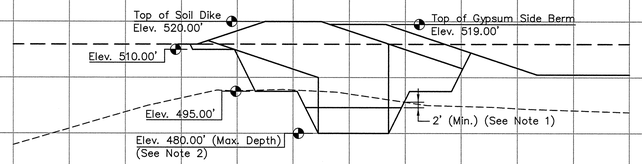


STA. 67+00

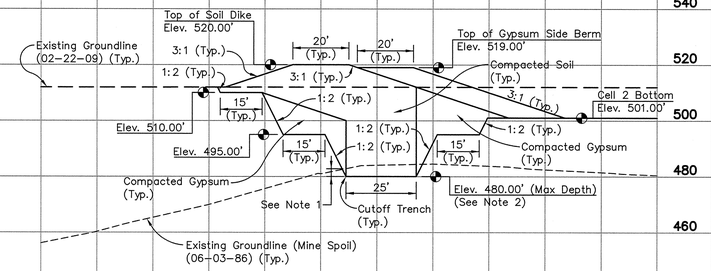


STA. 66+00

PROVIDE UNIFORM BENCH TRANSITIONS BETWEEN STA. 65+00 AND STA. 66+00



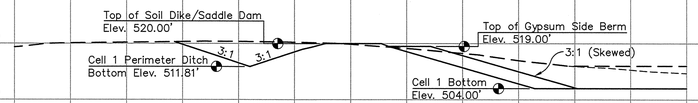
STA. 65+00



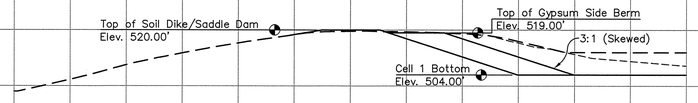
STA. 64+00

PROVIDE UNIFORM BENCH TRANSITIONS BETWEEN STA. 63+00 AND STA. 64+00

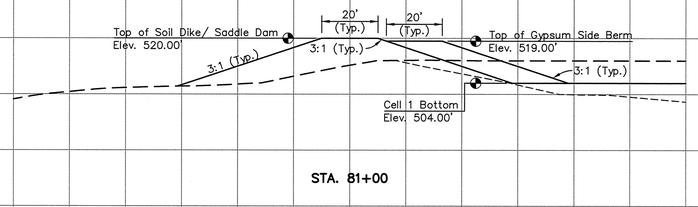
END GYPSUM SIDE BERM AT STA. 85+42



STA. 85+00



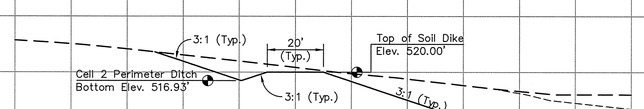
STA. 83+00



STA. 81+00

BEGIN GYPSUM SIDE BERM AT STA. 77+67

STA. 76+00



STA. 71+00

END GYPSUM SIDE BERM AT STA. 68+91
END COMPACTED SOIL CUTOFF TRENCH AT STA. 68+25

NOTES:

1. The bottom of Cutoff Trench shall be excavated a minimum of two feet below the lowest point of Mine Spoil encountered within the section.
2. The maximum Cutoff Trench excavation depth shown on the sections shall not be exceeded without consulting the Geotechnical Engineer.
3. These drawings are to be used in conjunction with the Operations Modification – Issued for Construction Drawing Set dated December 16, 2009. (Drawing No. 10W704-01 through 10W704-06)

ISSUED FOR CONSTRUCTION

PLOT DATE: 01/21/2010 USER: ELLISON, DOC
N:\TVA\Active\TVA9999\WORK\GEOTECHNICAL\DRAWINGS\REVIT_FILES\10W704-15-R1.DWG

For Supporting Design Calculations see FPG PAF FES MDX000 000 2009 0005

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 1	01/22/10	VJS	ACC	VJS	VJS	DAB	DAB	TJ	–	–
ISSUED FOR CONSTRUCTION										

DISCIPLINE INTERFACE

SCALE: 1"=20' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX OPERATIONS MODIFICATIONS CROSS SECTIONS

STATE OF KENTUCKY · VINCENT J. SEVERANCE · 19338 · LICENSED PROFESSIONAL ENGINEER
Vincent J. Severance 1-22-10

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www.stantec.com

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
V. SEVERANCE	A. CLINKENBEARD	V. SEVERANCE	V. SEVERANCE	D. BACK	D. BACK	T. JOHNSON

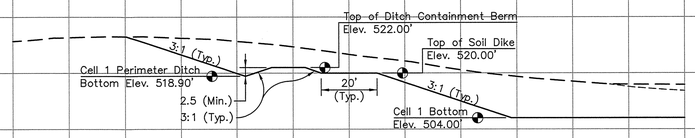
PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 01/22/10	64	C	10W704-10	R 1

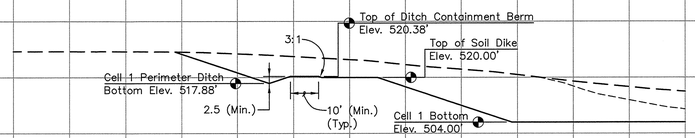
STANTEC	1
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

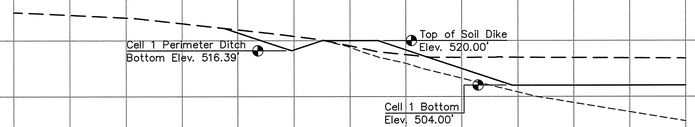


STA. 99+00

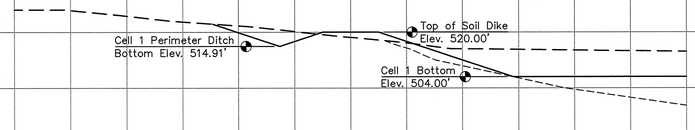


STA. 97+00

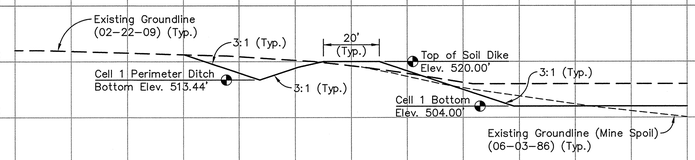
BEGIN DITCH CONTAINMENT BERM TRANSITION FROM STA. 95+50 TO STA. 96+25



STA. 94+00

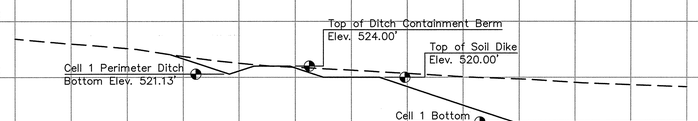


STA. 91+00



STA. 88+00

END PERIMETER DIKE AT STA. 102+52.60



STA. 101+00

NOTES:

1. The bottom of Cutoff Trench shall be excavated a minimum of two feet below the lowest point of Mine Spoil encountered within the section.
2. The maximum Cutoff Trench excavation depth shown on the sections shall not be exceeded without consulting the Geotechnical Engineer.
3. These drawings are to be used in conjunction with the Operations Modification – Issued for Construction Drawing Set dated December 16, 2009. (Drawing No. 10W704-01 through 10W704-06)

ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPG PAF FES MDX000 000 2009 0005

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R –	–	–	–	–	–	–	–	–	–	–
R 1	01/22/10	VJS	ACC	VJS	VJS	DAB	DAB	TJ	–	–

ISSUED FOR CONSTRUCTION

DISCIPLINE INTERFACE

SCALE: 1"=20' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
OPERATIONS MODIFICATIONS
CROSS SECTIONS

VINCENT J. SEVERANCE 19339 LICENSED PROFESSIONAL ENGINEER STATE OF KENTUCKY
1-22-10

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
Tel. 859.422.3000
Fax 859.422.3100
www.stantec.com

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
V. SEVERANCE	A. CLINKENBEARD	V. SEVERANCE	V. SEVERANCE	D. BACK	D. BACK	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 01/22/10 | 64 | C | 10W704-11 | R 1

STANTEC | 1
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 01/21/2010 USER: ELLISRAL DGN: N:\TVSS\ACAD\ECS\PDS\SHEET\DSGN\SHEET\DRAWING\R01A_2PCL\10W704-11-R1.DWG

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

December 15, 2009 let_014_paf_175569040

Mr. Barry Snider, PE
Tennessee Valley Authority
1101 Market Street, LP 5E-C
Chattanooga, Tennessee 37402

Re: Issued for Construction
Slope Armoring
East Slope of East Pond
Scrubber Sludge Complex
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Snider:

Stantec Consulting Services Inc. (Stantec) has completed the design of armoring for east slope of East Pond and would like to issue the following work plan for review. This work plan presents a brief background of the project, recommended armoring detail and related construction recommendations.

1. Background

During the 2009 Phase 1 geotechnical evaluation of the Scrubber Sludge Complex, Stantec personnel observed numerous wet and soft conditions throughout the lower two-thirds of the East Pond stacking slopes caused due to uncontrolled seepage through the dike. In addition, numerous intermediate bench areas with standing water were also noted promoting dense Phragmites growth along the benches.

Since April, 2009, TVA has performed several repairs along the south slope of the East Pond to address the soft and wet areas. These included (i) regrading the upper intermediate bench to promote positive drainage (work plan no. let_013_paf_171468118), (ii) installing a ditch to collect and direct the uncontrolled seepage to the Stilling Pond (work plan no. let_013_paf_171468118) and (iii) constructing a rock buttress near the east end of the slope (work plan nos. let_012_paf_171468118 and let_002_paf_175569040). The current work plan has been prepared by Stantec address the armoring of the east slope using a combination of sand, No.57 (or No.8) stone and Class III channel lining.

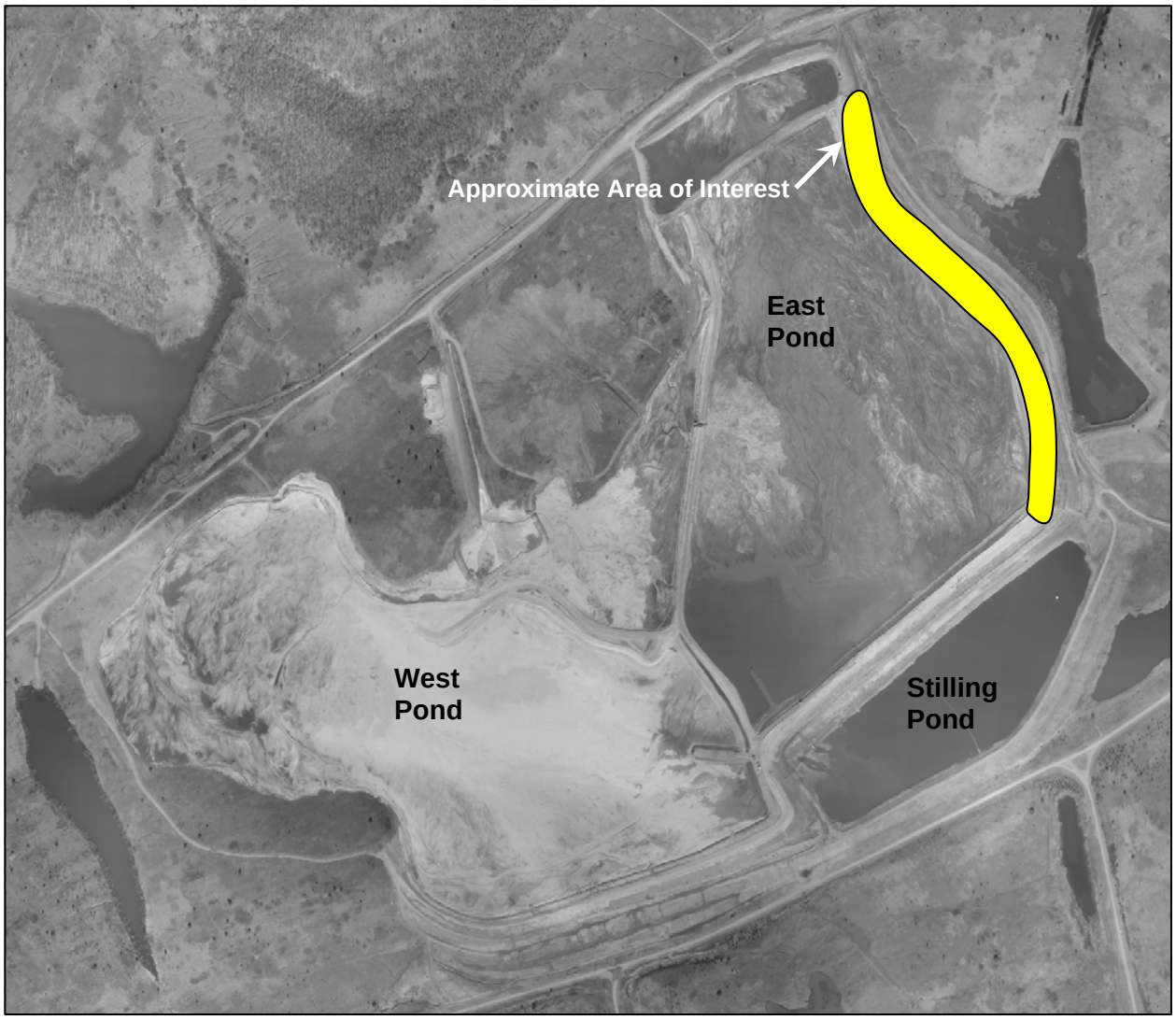


Figure 1: Approximate Area of Interest

2. Slope Armoring

2.1 Recommended Slope Armoring

Based on the conditions noted in the field and the results of as-built survey, it is recommended that the east slope of East Pond be armored in areas indicated using sand, No. 57 Stone and Class III Channel Lining. The recommended armoring option is presented in Table 1.

Table 1. Recommended Armoring Option

Parameter	Value
Top Elevation of Rip-Rap	Varies(1)
Bottom Elevation of Rip-Rap	Varies(1)
Total Thickness	2 feet
Sand Layer Thickness	6 inches
No.57 Layer Thickness	6 inches
Class III Layer Thickness	12 inches

(1) Armoring shall begin at the toe of slope and go 18 feet (linear distance) up the slope or to the top of the slope, which ever occurs first. See attached drawing for armoring stakeout table and additional details.

2.2 Construction Plans

Stantec's performed a computer-aided-design and drafting of the armoring using AutoCAD 2008. The objective of the design and drafting was to develop construction plans to assist TVA and to estimate the material quantities. The results of Stantec's design and drafting are presented on the construction plan drawing attached to this letter and summarized in subsequent paragraphs.

2.3. Material Quantities

The material quantity estimate for armoring is presented in Table 2.

Table 2. Material Quantities

Material	Volume (cubic yds)	Weight (tons)	Weight (tons)(1)
Sand	725	1,322	**1,300**
No.57	725	1,077	**1,100**
Class III	1,450	2,115	**2,100**

(1) Rounded

2.4. Material Cost Opinion

It is our understanding that TVA will be procuring the materials from local vendors and constructing the armoring using in house resources. Based on this assumption, only material cost opinion is presented in Table 3.

Table 3. Material Cost Opinion

Material	Weight (Tons)	Unit Price (per ton)	Cost[(1)]
Sand	1,300	$20.50	$27,000
No. 57 Stone	1,100	$11.73	$13,000
Class III Channel Lining	2,100	$12.43	$26,000
Total Estimated Material Cost			**$ 66,000**

(1) Rounded to the nearest thousand

2.5. Construction Sequence

Contractor is made aware that other construction work (dewatering of dredge cell, slope repairs etc.) will also be underway depending on the construction schedule. A separate work plan is currently being prepared by Stantec for this work. Contractor shall refer to this work plan for additional information and coordinate construction accordingly.

2.6. Construction Recommendations

- **Safety:** Contractor shall be responsible for the health and safety of its personnel and shall meet all applicable local, state, and federal safety regulations; including but not limited to OSHA standards and TVA safety requirements.
- **Measurements:** Contractor shall base all measurements, both vertical and horizontal, from established benchmarks and monuments. A project baseline is presented on the attached drawing for assisting the Contractor with staking of approximate work limits.
- **Erosion and Sediment Control:** Silt fences shall be installed as directed by TVA. Installation, inspection and maintenance of silt fences shall follow the Best Management Practice (BMP) provisions given in Kentucky Erosion Prevention and Sediment Control Field Guide. A free copy of this guide can be obtained from Kentucky Division of Water.
- **Undercutting:** Contractor shall undercut the slope no more than 2-feet. Undercutting shall smoothly transition into original ground on all sides.
- **Materials:** Construction materials shall meet the requirements presented in KTC's Standard Specifications for Road and Bridge Construction Manual, current edition. Sand shall conform to ASTM C33.
- **Stone Placement:** It is recommended that an excavator be used to place the materials in layers (starting from the bottom). Upon placing the minimum required layers of sand and No. 57 stone, channel lining shall be used to raise the undercut slope to original grade (or as needed to create a stable slope). Materials shall smoothly transition into original ground on all sides leaving a stable slope.

- **Begin Armoring:** Contractor shall begin armoring at the toe of the slope and go 18 feet (linear distance) up the slope or to the top of the slope, which ever occurs first. Armoring stakeout table is presented on the attached drawing.
- **Field Adjustments:** It is recommended that construction measures be monitored by Stantec personnel. Adjustments will be necessary as the fieldwork progresses and should be agreed upon between TVA and Stantec prior to implementation.
- **Material Disposal:** Material removed shall be disposed off properly at the direction of TVA.

3. Closure

The analysis and conclusions presented here are based on information gathered from the borings, several assumptions and theoretical calculations performed 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. The recommended work described here has been discussed in the field with TVA personnel on October 5, 2009 during a site visit by Stantec personnel. The objective of this repair is to armor the slope in the area indicated. Contractor is advised to review attached construction plan and contact Stantec for any clarifications, if needed.

Sincerely,

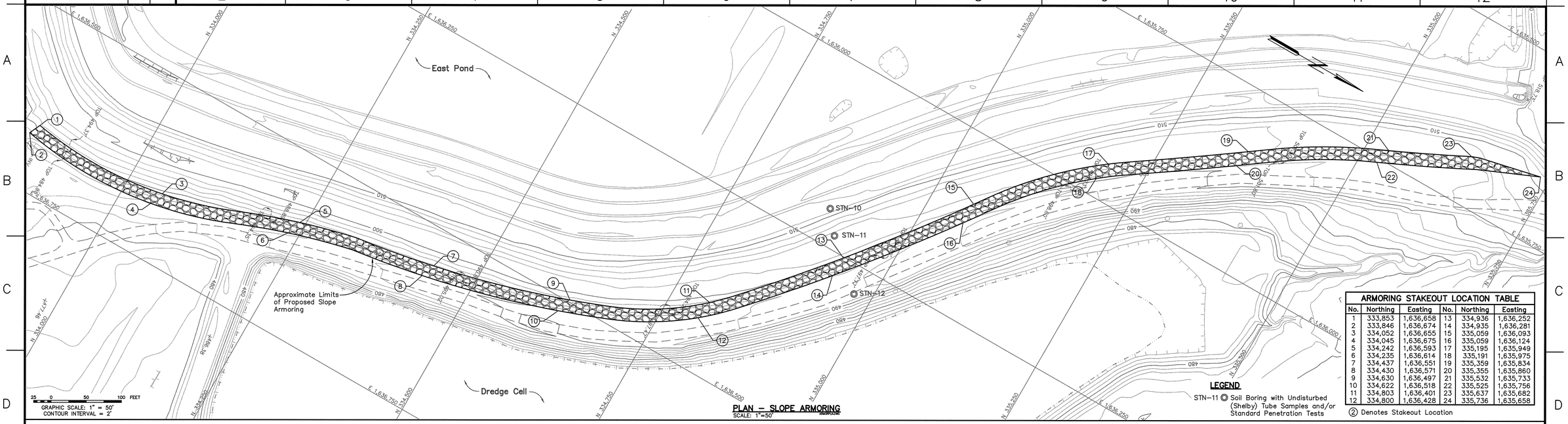
STANTEC CONSULTING SERVICES INC.

Sharath C. Vemuri, PE
Geotechnical Engineer

Hugo R. Aparicio, PE
Principal

/sv/rws

Enclosures: 2 Construction Work Plan (10W703-01-R0)
Calculations Package (FPGPAFFESCDX00000020090006)



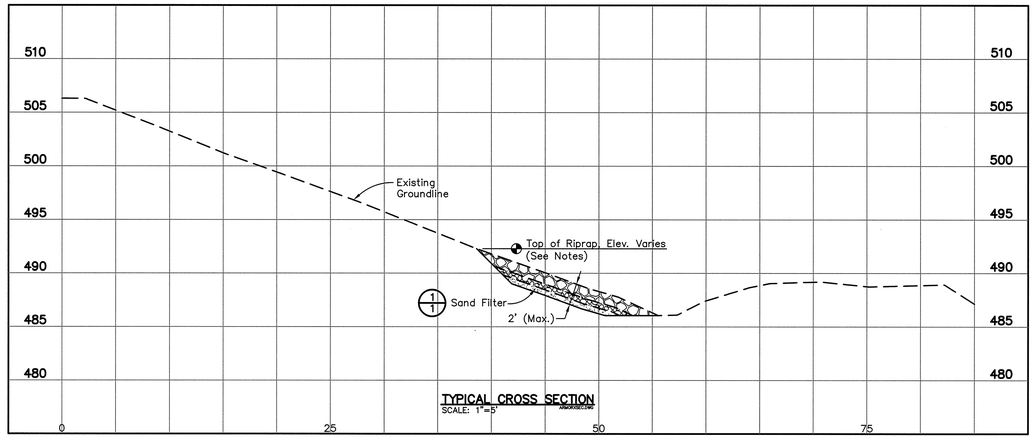
PLAN – SLOPE ARMORING
SCALE: 1"=50'

ARMORING STAKEOUT LOCATION TABLE					
No.	Northing	Easting	No.	Northing	Easting
1	333,853	1,636,658	13	334,936	1,636,252
2	333,846	1,636,674	14	334,935	1,636,281
3	334,052	1,636,655	15	335,059	1,636,093
4	334,045	1,636,675	16	335,059	1,636,124
5	334,242	1,636,593	17	335,195	1,635,949
6	334,235	1,636,614	18	335,191	1,635,975
7	334,437	1,636,551	19	335,359	1,635,834
8	334,430	1,636,571	20	335,355	1,635,860
9	334,630	1,636,497	21	335,532	1,635,733
10	334,622	1,636,518	22	335,525	1,635,756
11	334,803	1,636,401	23	335,637	1,635,682
12	334,800	1,636,428	24	335,736	1,635,658

LEGEND

STN–11 ◎ Soil Boring with Undisturbed (Shelby) Tube Samples and/or Standard Penetration Tests

② Denotes Stakeout Location



TYPICAL CROSS SECTION
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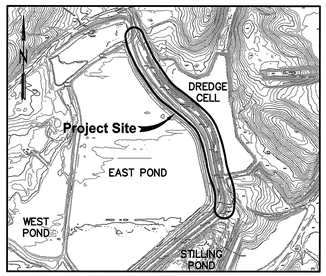
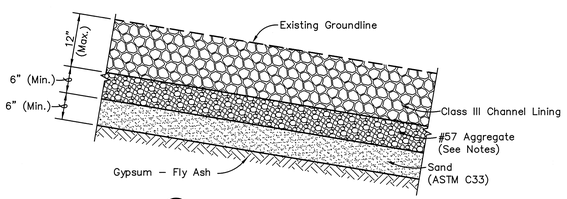


LOCATION MAP
SCALE: 1"=600'



1/1 DETAIL – SAND FILTER
SCALE: 1"=1'-0"

Section or Detail No.

Sheet Where Shown

REFERENCE KEY

ISSUED FOR CONSTRUCTION

NOTES:

1. Objective: The objective of this repair is to armor the south slope of East Pond in the area indicated.
2. Measurements: Contractor shall base all measurements, both vertical and horizontal from established benchmarks and monuments. A project baseline is presented on the drawing to assist contractor with staking of approximate work limits.
3. Erosion and Sediment Control: Silt fences shall be installed as directed by TVA. Installation, inspection and maintenance of silt fences shall follow the Best Management Practice (BMP) provisions given in Kentucky Erosion Prevention and Sediment Control Field Guide. A free copy of this guide can be obtained from Kentucky Division of Water.
4. Undercutting: Contractor shall undercut the slope no more than 2–feet. Undercutting shall smoothly transition into original ground on all sides.
5. Materials: Materials used shall meet the requirements presented in KYTC's Standard Specifications for Road and Bridge Construction Manual, current edition. Sand shall conform to ASTM C33 Specifications.
6. Stone Placement: It is recommended that an excavator be used to place the stone in layers (starting from the bottom). Channel lining shall be used to raise the undercut slope to original grade (or as needed to create a stable slope). Channel lining shall smoothly transition into original ground on all sides leaving a stable slope.
7. Begin Armoring: Contractor shall begin armoring at the toe of the slope and go 18 feet (linear distance) up the slope or to the top of the slope, which ever occurs first. Armoring stakeout table is presented for assisting Contractor.
8. Field Adjustments: It is recommended that construction measures be monitored by Stantec personnel. Adjustments will be necessary as the fieldwork progresses and should be agreed upon between TVA and Stantec prior to implementation.
9. Mapping: The topographic mapping used for design purposes was based on the as–built survey conducted by Stantec in September, 2009. The topographic mapping shown here is based on February, 2009 aerial survey by TVA.
10. Letter: Contractor shall refer to the attached letter of recommendations prepared by Stantec for this work.
11. Material Disposal: Material removed shall be disposed at the direction of TVA.

PLOT DATE: 12/09/2009 USER: JOHNSON, TRACY
N:\TVA\DESIGN\PROJECTS\PARADISE\SCRUBBER_SLUDGE_COMPLEX\EAST_POND\LEAST_SLOPE\ARMORING\DGN\SCRUBBER_SLUDGE_COMPLEX_EAST_POND_ARMORING_PLAN_AND_CROSS_SECTION-01.DWG

For Supporting Design Calculations see FPGPAFFESCDX00000020090006

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV ID
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	12/09/09	CP	TJ	SV	SV	SV	HRA	TJ	–	–	–
ISSUED FOR CONSTRUCTION											DISCIPLINE INTERFACE

SCALE: AS SHOWN EXCEPT AS NOTED

YARD

–

SCRUBBER SLUDGE COMPLEX
EAST SLOPE OF EAST POND
ARMORING PLAN AND CROSS SECTION

STATE OF KENTUCKY SHARATH CHANDRA VEMURI 28100 LICENSED PROFESSIONAL ENGINEER

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DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
C. PRADO	T. JOHNSON	S. VEMURI	S. VEMURI	S. VEMURI	H. APARICIO	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

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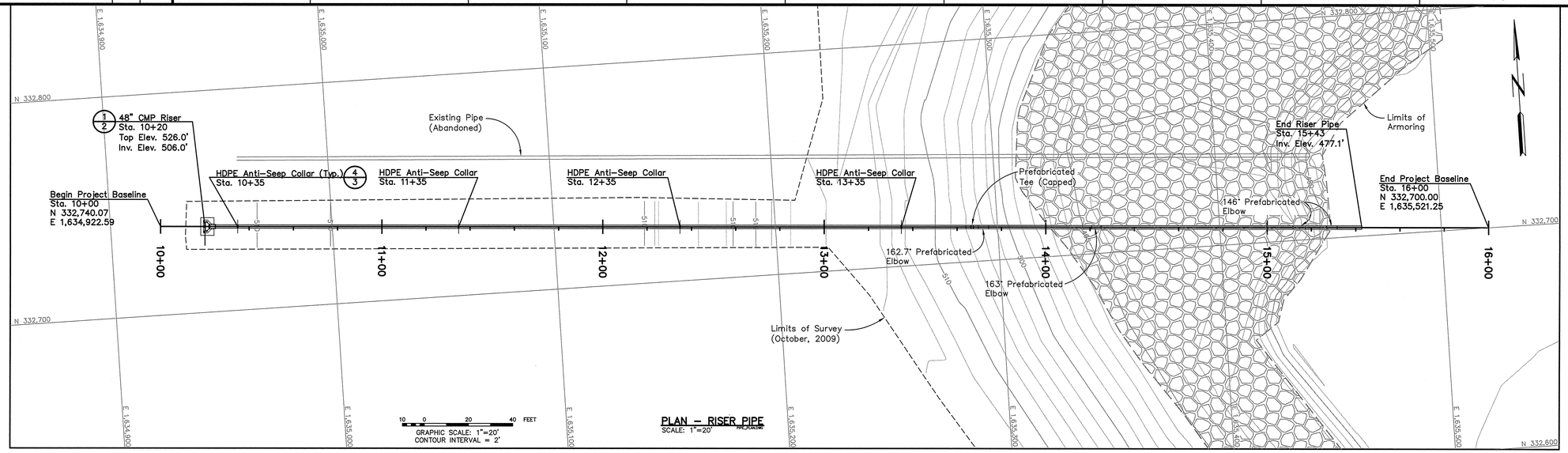
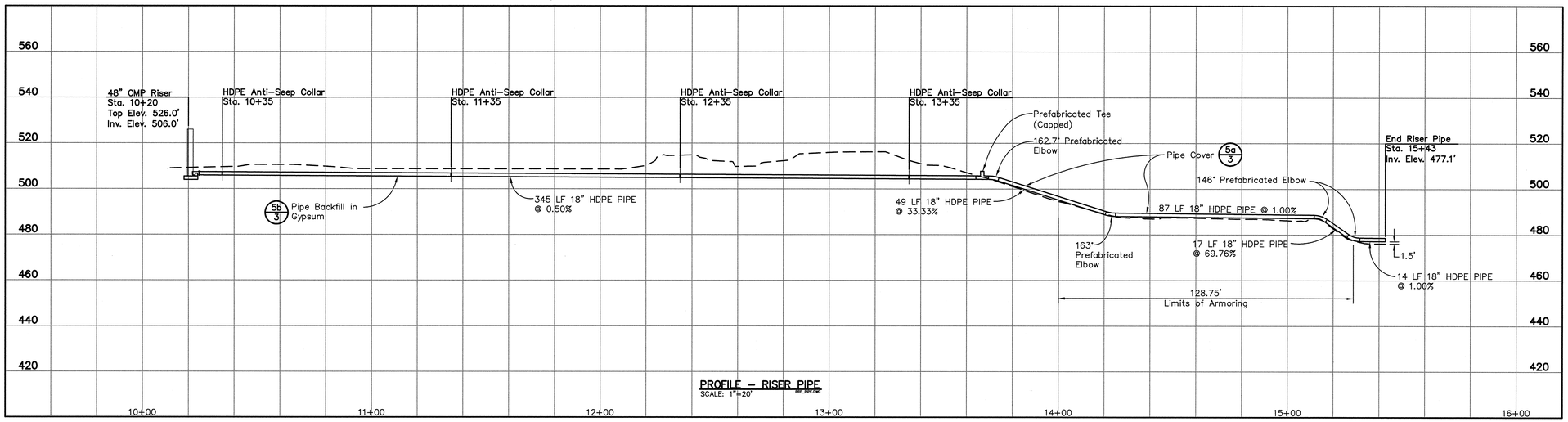
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY



PLAN – RISER PIPE
SCALE: 1"=20'



PROFILE – RISER PIPE
SCALE: 1"=20'

NOTES:

1. The decant piping shall consist of 18-inch diameter, solid, wall, SDR 17, high density polyethylene (HDPE) pipe with a material classification of PE 3608 meeting ASTM D 3350. Solid wall HDPE pipes shall be joined with heat fusing equipment in accordance with the manufacturer.
2. Trench excavations of the HDPE decant piping shall be backfilled with excavated materials. The backfill shall contain no stones whose largest dimension exceeds two inches.
3. Prefabricated elbows to be installed per pipe Manufacturer's specifications.

ISSUED FOR CONSTRUCTION

Section or Detail No.
Sheet Where Shown
REFERENCE KEY

For Supporting Design Calculations see
FPG PAF FES MDX000 000 2009 0005

STATE OF KENTUCKY
ERNEST E LAUGHLIN
13295
REGISTERED ENGINEER

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R –	–	–	–	–	–	–	–	–	–	–
R 0	01/26/10	EEL	PJB	EEL	EEL	EEL	EEL	TJ	–	–
ISSUED FOR CONSTRUCTION										

DISCIPLINE INTERFACE
REV 01 2 3 4 5

SCALE: 1"=20' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
WEST POND RISER MODIFICATIONS
PLAN AND PROFILE

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
E. LAUGHLIN	P. BOND	E. LAUGHLIN	E. LAUGHLIN	E. LAUGHLIN	E. LAUGHLIN	T. JOHNSON

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PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 01/26/10	64	C	10W705-01	R 0

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

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DO NOT ALTER MANUALLY

PLOT DATE: 02/03/2010 USER: JOHNSON, TRACY
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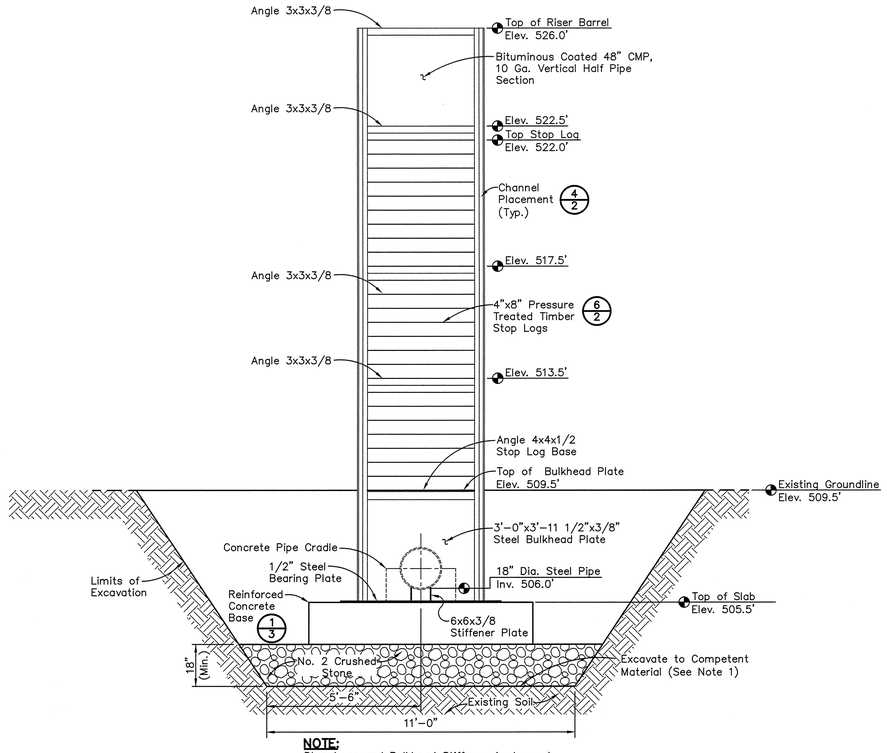
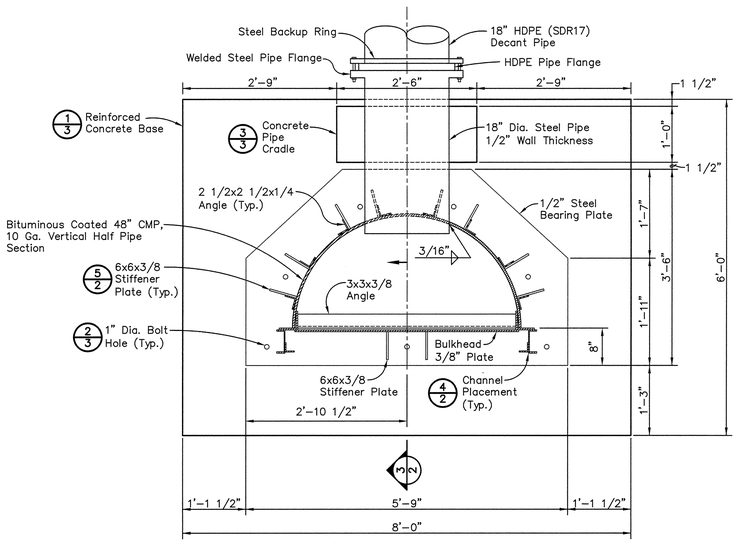


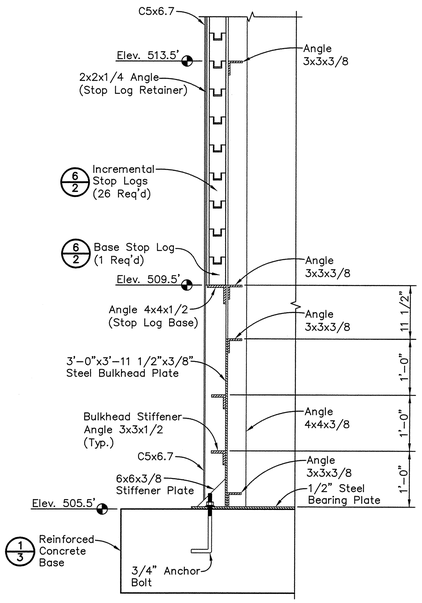
NOTE:
Stop Logs and Bulkhead Stiffener Angles not shown for clarity. See Riser Section Detail.

1/2 **ELEVATION – 48" CMP RISER**
SCALE: 1/2"=1'-0"



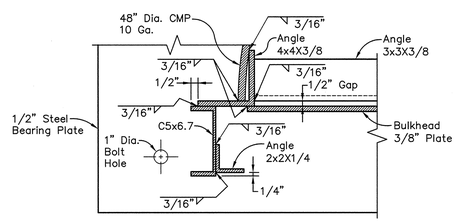
NOTE:
Stop Logs and Bulkhead Stiffener Angles not shown for clarity. See Riser Section Detail.

2/2 **DETAIL – RISER PLAN**
SCALE: 1"=1'-0"



NOTE:
Hidden lines not shown for clarity.

3/2 **DETAIL – RISER SECTION**
SCALE: 1"=1'-0"



4/2 **DETAIL – CHANNEL PLACEMENT**
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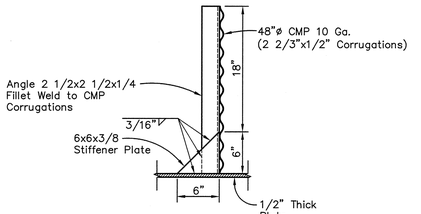
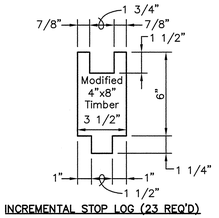
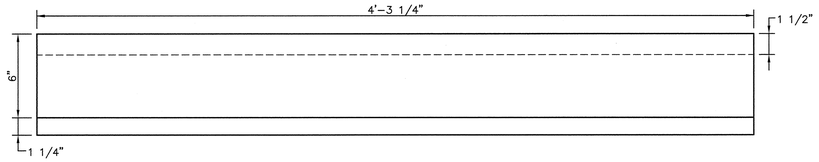
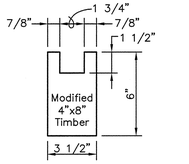


5/2 **DETAIL – STIFFENER PLATE**
SCALE: 1 1/2"=1'-0"

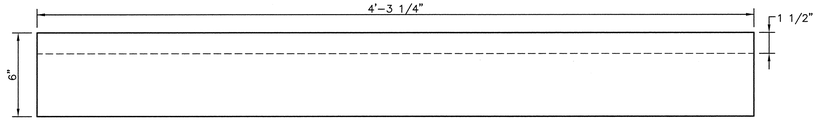


INCREMENTAL STOP LOG (23 REQ'D)





BASE STOP LOG (1 REQ'D)



6/2 **DETAIL – STOP LOG**
SCALE: 3"=1'-0"

NOTES:

1. Sedimented gypsum shall be excavated down to a minimum of 18 inches below the elevation of the bottom of the proposed reinforced concrete riser foundation at the riser location and proof rolled with heavy construction equipment in the presence of a Geotechnical Engineer. Separation fabric and a minimum 18–inch thick layer of No. 2 stone shall be placed in base of the excavation prior to constructing the reinforced concrete riser foundation. The separation fabric is intended to minimize migration of the gypsum material up into the No. 2 stone layer.
2. If the Engineer determines that the foundation materials may not be suitable after taking the measures specified in Note 1, the reinforced concrete riser foundation may be increased in size as specified by the Engineer.
3. Settlement of underlying materials over time may cause settleing and/or unstability of the riser. Periodic monitoring of the reinforced concrete base corners is recommended.
4. Excavated side slopes and sheeting and bracing as required to safely support the sides of excavations shall comply with OSHA requirements.
5. All cast–in–place concrete shall have a minimum compressive strength at twenty–eight (28) days of 4,500 psi.
6. Wooden stop logs shall consist of pressure treated Grade No. 2 or better southern pine lumber.
7. A hole shall be carefully cut in the 48–inch CMP to accept the 18–inch diameter steel pipe within a close tolerance to allow a continuous 3/16–inch seal weld to be performed on both sides of the pipe connection.

Section or Detail No.
Sheet Where Shown
REFERENCE KEY

ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPG PAF FES MDX000 000 2009 0005

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT EP	AS CONST	DISCIPLINE INTERFACE
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	01/26/10	EEL	PJB	EEL	EEL	EEL	EEL	TJ	–	–	–
ISSUED FOR CONSTRUCTION											

SCALE: AS SHOWN EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
WEST POND RISER MODIFICATIONS
DETAILS – RISER STRUCTURES

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
E. LAUGHLIN	P. BOND	E. LAUGHLIN	E. LAUGHLIN	E. LAUGHLIN	E. LAUGHLIN	T. JOHNSON

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Fax 859.422.3100
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PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

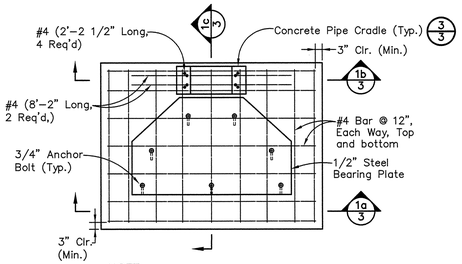
AUTOCAD R 2000 | DATE 01/26/10 | 64 | C | 10W705–02 | R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

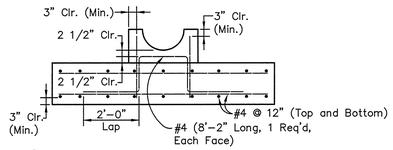
C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 02/03/2010 USER: JOHNSON, TRACY
K:\TVA\ACTIVE\TV70566\WD\GEOTECHNICAL\DRAWING\SCRUBBER_SLUDGE_COMPLEX\WEST_POND\RISER\RISER_PLAN\10W705-02-R0.DWG

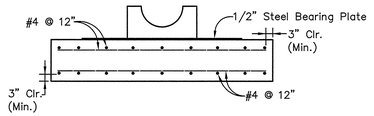


NOTE:
Concrete Pipe Cradle to be formed and poured after Riser installation.

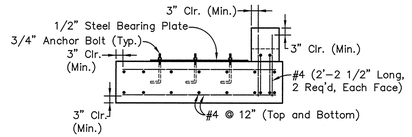
1/3 PLAN – REINFORCED CONCRETE BASE STEEL PLACEMENT
SCALE: 1/2"=1'-0"



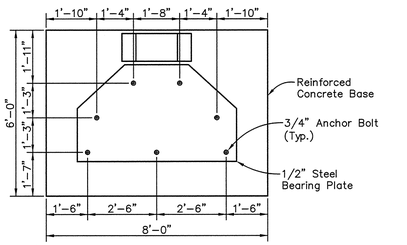
1a/3 SECTION – REINFORCED CONCRETE BASE CONCRETE CRADLE STEEL PLACEMENT
SCALE: 1/2"=1'-0"



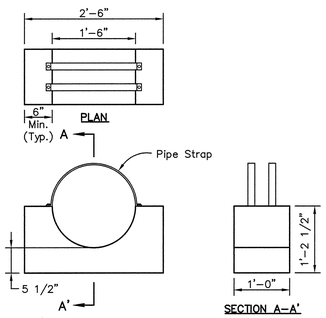
1b/3 SECTION – REINFORCED CONCRETE BASE STEEL PLACEMENT
SCALE: 1/2"=1'-0"



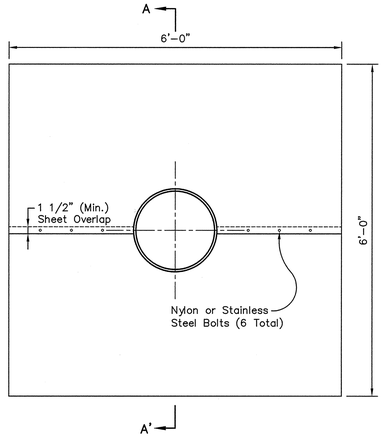
1c/3 SECTION – REINFORCED CONCRETE BASE STEEL PLACEMENT
SCALE: 1/2"=1'-0"

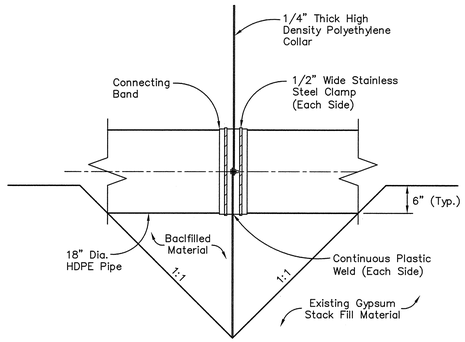


2/3 PLAN – REINFORCED CONCRETE BASE ANCHOR BOLT PLACEMENT
SCALE: 1/2"=1'-0"



3/3 DETAIL – CONCRETE PIPE CRADLE
SCALE: 1"=1'-0"

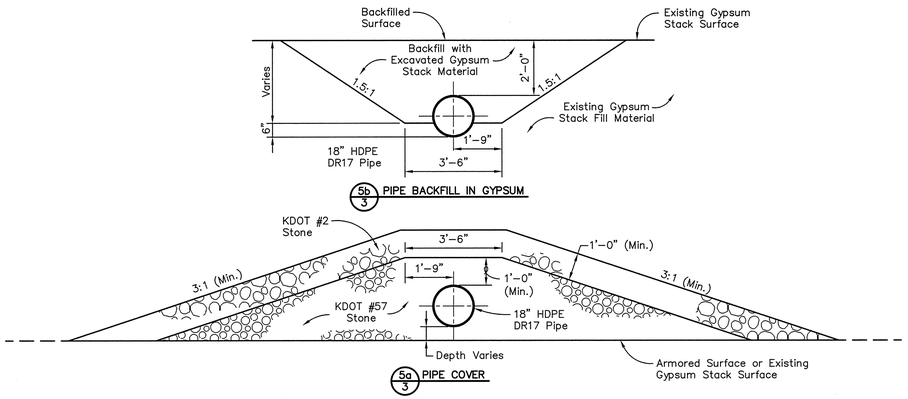




SECTION A-A'

4/3 DETAIL – HDPE ANTI-SEEP COLLAR
SCALE: 1"=1'-0"

NOTES:
1. The pipe, connection band, and seam coating can be either silicon caulking (recommended), tar or mastic.
2. Apply silicon caulk, tar, or mastic to the connecting band and set it in place, lining up the bolt holes.
3. Install the Stainless Steel Clamps on the split halves of the connecting bands and tighten the bolts and clamps.
4. Apply silicon caulk, tar, or mastic on the seams as needed to insure a good seal so that the completed installation is watertight.
5. Backfilled material shall be hand-tamped on both sides of the HDPE collar to form a seal.



5b/3 PIPE BACKFILL IN GYPSUM

5a/3 PIPE COVER

5/3 DETAIL – PIPE TREATMENT
SCALE: 1/2"=1'-0"

NOTES:
1. The CONTRACTOR shall construct and maintain all necessary channels, flumes and/or other temporary diversion and protective works; shall furnish all materials required therefore; and shall furnish, install, maintain, and operate all pumping and other equipment for dewatering and maintaining the Work free from water as required. After having served their purpose, temporary protective works shall be removed, or leveled, to give a sightly appearance and so as not to interfere in any way with the operation, usefulness or stability of the permanent structures.
2. Prior to the placement of the pipe, the subgrade surface shall be compacted by passing a smooth drum vibratory roller over the entire surface of the layer a sufficient number times to obtain the specified density. Adjustments in compactive effort shall be made on the basis of field density determinations made as construction progresses.
3. The bottom of the compacted pipe trench shall be excavated by hand to conform with the bottom six (6) inches of the pipe so that the pipe fits smoothly and firmly in the trench.
4. After each layer of gypsum material has been placed, spread and contains the required moisture, it shall be compacted by passing a smooth drum vibratory roller in accordance with the following:
5. Gypsum embankment shall be compacted to 95 percent of its maximum dry density as determined by ASTM D 698. In-place moisture shall be within minus two percent (-2%) to plus four percent (+4%) of optimum moisture as determined by ASTM D 698. In-place material not meeting these specifications shall be reworked until satisfactory results are obtained. Field compaction tests, utilizing the nuclear method outlined in ASTM D 2922 or other methods, will be made as the construction proceeds. The tests will be performed by the OWNER'S REPRESENTATIVE. Backfill material shall be compacted by hand tamper under the haunches of the pipe.

Section or Detail No.
Sheet Where Shown
REFERENCE KEY

ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPG PAF FES MDX000 000 2009 0005

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV 00
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	01/26/10	EEL	PJB	EEL	EEL	EEL	EEL	TJ	–	–	–
ISSUED FOR CONSTRUCTION											DISCIPLINE INTERFACE

SCALE: AS SHOWN EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
WEST POND RISER MODIFICATIONS
DETAILS – RISER STRUCTURES

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
E. LAUGHLIN	P. BOND	E. LAUGHLIN	E. LAUGHLIN	E. LAUGHLIN	E. LAUGHLIN	T. JOHNSON

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PADUCAH FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 01/26/10 | 64 | C | 10W705-03 | R 0

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 01/27/2010 - 10:08:31 (JOSEPH_JOHNSON_TENN)
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Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington, KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

March 4, 2010 let_028_175569040

Mr. Barry Snider, PE
Tennessee Valley Authority
1101 Market Street, LP 5E-C
Chattanooga, Tennessee 37402

Re: Issued for Construction
Toe Buttress
East Slope of East Pond
Scrubber Sludge Complex
Paradise Fossil Plant
Paradise, Muhlenberg County, Kentucky

Dear Mr. Snider:

Stantec Consulting Services Inc. (Stantec) has completed the design of rock buttress at east slope of East Pond and would like to issue the following work plan for construction. This document incorporates the comments received from TVA and AECOM following a review of our February 1, 2009 work plan (file no.: let_015_175569040).

In this work plan, we have updated the buttress detail to include a graded filter (as recommended by AECOM). This letter presents a brief description of the project, results of engineering analysis and construction recommendations.

1. Background

During the 2009 Phase 1 geotechnical evaluation of the Scrubber Sludge Complex, Stantec personnel observed steep slopes along the lower half of the East pond east slope adjacent to West Dredge Cell. In some areas the slopes were steeper than 1H:1V.

Since 2009, TVA has performed several repairs along the east slope of the East Pond to address the soft and wet areas. These included (i) repairing a perimeter ditch along the east slope access road, (ii) regrading the upper intermediate bench to promote positive drainage (work plan no. let_013_paf_171468118), (iii) and armoring the east slope of the East Pond (work plan no. let_014_paf_175569040) with a graded filter (on-going). The current work plan has been prepared by Stantec to address the stabilization of the steep areas along the entire east slope adjacent to West Dredge Cell using a buttress.

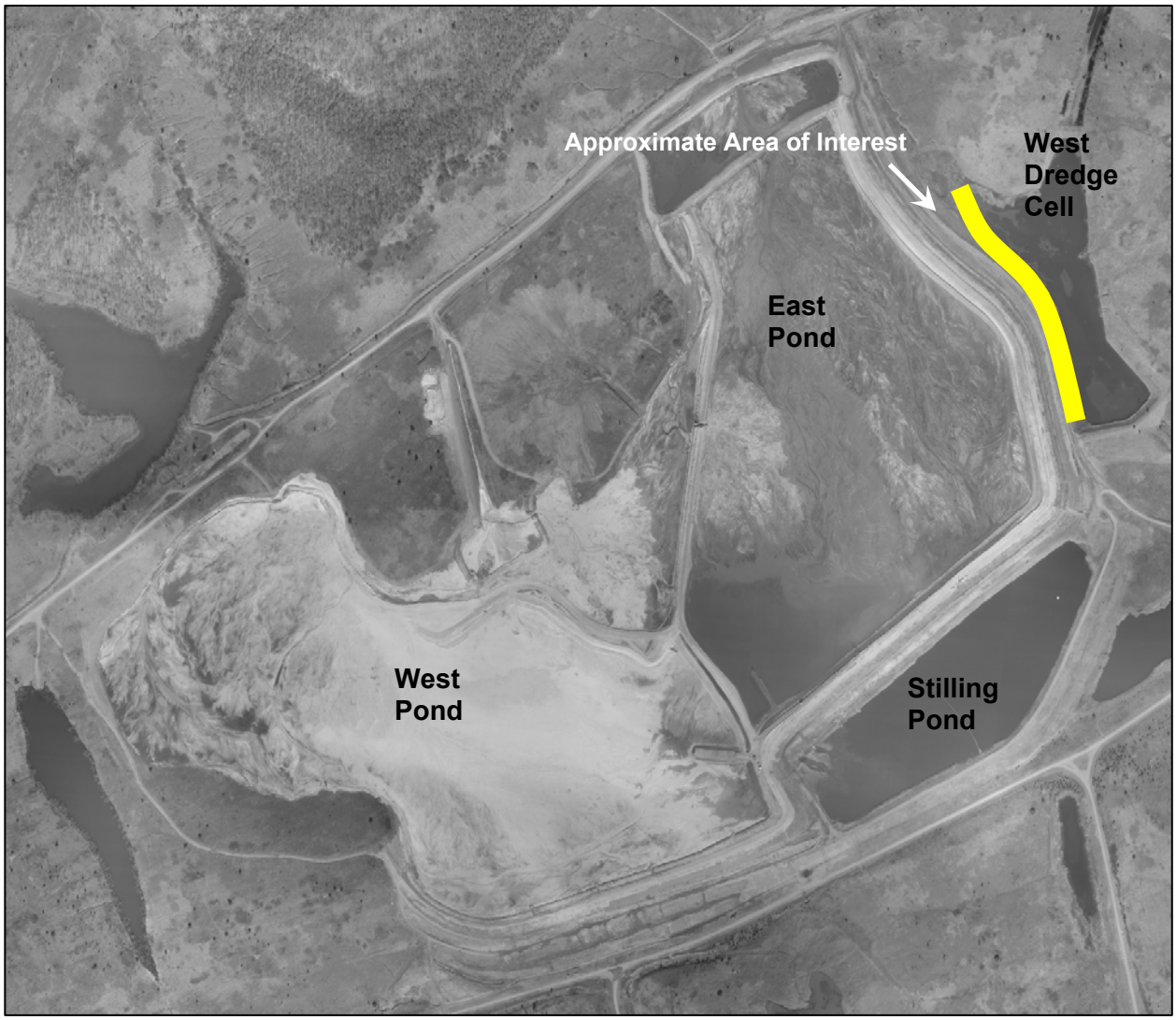


Figure 1: Approximate Area of Interest

2. Subsurface Exploration

2.1. General

Stantec's scope of work consisted of a subsurface exploration. Fieldwork for the geotechnical exploration was performed by Stantec during the months of November and December, 2009. The field work consisted of advancing a total of twelve (12) borings at the project site. Boring locations were chosen, staked and surveyed by Stantec. The locations

of the borings and their corresponding elevations are given on the boring layout drawing presented in Attachment A. The subsurface exploration was performed using 4¼ inch (ID) hollow stem augers following a carbide tipped tooth bit.

Standard Penetration Testing (SPT) was performed in selected borings at continuous depth intervals within the gypsum-fly ash material and at selected depth intervals within the underlying mine spoil. A standard penetration test consists of dropping a 140-pound hammer to drive a split-barrel sampler 18 inches. The consistency or relative density of the soil material is estimated by the number of blows it takes to drive the split spoon sampler 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. The results of SPT testing are presented on the boring logs included in Attachment B.

Undisturbed Shelby tube samples of gypsum-fly ash and gypsum deposits were obtained from various borings at selected depth intervals. All Shelby tube samples were sealed with caps in the field and transported to Stantec's laboratory for testing. A list of recovered samples, including sample depths and percent recovery is presented on the boring logs in Attachment B.

Upon completion of the drilling and sampling procedures, the boreholes were either backfilled with auger cuttings or well backfill materials (cement, sand and/or bentonite) if piezometer was installed in the borehole. A geologist was present on-site throughout the drilling and sampling operations. The geologist directed the drill crew, logged the subsurface materials encountered during the exploration and collected soil samples. Particular attention was given to the material's color, texture, moisture content and consistency or relative density. Following the field exploration, the SPT samples and Shelby tubes were transported to our laboratory for subsequent testing. The samples will be available for review up to thirty (30) days following the submittal of this letter, at which time the samples will be discarded unless prior arrangements for storage have been made.

2.2. Summary of Borings

Layout of borings is presented on a drawing included in Attachment A. Typed boring logs are presented in Attachment B. Summary of boring information is presented in Table 1, where all measurements are expressed in feet.

Table 1. Summary of Borings

Boring No.	Top of Hole (Elevation)	Bottom of Hole (Elevation)	Bottom of Hole (Feet)
STN-17	483.5	440.5	43.0
STN-18	501.5	440.0	61.5
STN-19	519.7	441.2	78.5
STN-20	489.7	438.2	51.5

Table 1. Summary of Borings

Boring No.	Top of Hole (Elevation)	Bottom of Hole (Elevation)	Bottom of Hole (Feet)
STN-20A	489.7	462.7	27.0
STN-21	506.5	439.5	67.0
STN-21A	506.5	479.5	27.0
STN-22	519.4	439.9	79.5
STN-22A	519.4	487.4	32.0
STN-23	501.8	438.8	63.0
STN-23A	501.8	466.8	35.0
STN-24	508.7	439.2	69.5
STN-24A	508.7	486.7	22.0
STN-25	523.3	440.3	83.0
STN-25A	523.3	487.3	36.0

2.3. Instrumentation

Stantec's scope of work for geotechnical exploration also included installing piezometers in selected borings. Standpipe piezometers, installed in a borehole, consisted of a filter tip joined to a 1-inch diameter riser pipe. The filter tip was placed in a sand pack and a bentonite seal was placed above the sand to isolate the target pore water pressure reading area. The annular space between the riser pipe and the borehole was backfilled to the surface with bentonite grout to prevent vertical migration of water. The riser pipe was terminated slightly above ground level and protected with a lockable metal cover. Instrumentation schematics and water level readings of piezometers are presented in Attachment C. A summary of instrumentation is presented in Table 2.

Table 2. Summary of Instrumentation

Boring No.	Instrument	Instrument ID
STN-20A	PZ	PZ-20A
STN-22A	PZ	PZ-22A
STN-23A	PZ	PZ-23A
STN-25A	PZ	PZ-25A

2.4. Subsurface Soil Conditions

The subsurface conditions encountered in different borings consisted of co-mingled gypsum and fly ash, gypsum, mine spoil or a combination thereof. Co-mingled gypsum-fly ash material encountered in different borings can be described as moist to wet, light gray to dark gray, mottled, and very loose to very dense. Gypsum material encountered in different borings can be described as light gray to gray, moist to wet and medium dense to dense.

Mine spoils encountered in different borings can be visually described as lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone and siltstone fragments.

2.5. Laboratory Testing

Stantec performed laboratory testing of gypsum-fly ash, gypsum and mine spoil samples to estimate their engineering properties. The laboratory tests were performed in general accordance with ASTM standard testing procedures. Detailed results of laboratory testing are presented in Attachment D.

3. Engineering Analysis

3.1. General

Stantec's scope of work included performing seepage analysis and slope stability analysis for existing conditions and proposed conditions. Analysis was performed for two (2) cross sections through the dike. The analysis procedure and the results of the analysis are presented in the following paragraphs. Outputs from the engineering analysis are presented as attachment to this letter.

3.2 Cross Section

Analysis (seepage and slope stability) was performed for the following existing ground cross section.

1) DD' (cross section through borings STN-10, STN-11 and STN-12)
2) GG' (cross section through borings STN-20, STN-21 and STN-22)

3.3 Seepage Analysis

3.3.1 Background

The objective of seepage analysis was to understand the total head (and pore water pressure) distribution within a given cross section of the dike. Seepage analysis was performed using SEEP/W, a numerical software tool developed by Geo-Slope International Inc. SEEP/W is a finite element software product for analyzing groundwater seepage and pore-water pressure distribution problems within porous materials such as soil and rock.

The first step in the seepage analysis was to develop a cross section of the dike. Stantec utilized boring logs, historic drawings and survey information to estimate the dimensions of the cross section. SEEP/W uses the concept of regions and points to define the geometry of a problem and to facilitate discretization (or meshing) of the problem. Upon defining the geometry of the model, material properties were assigned for the *Saturated/Unsaturated Model* offered in SEEP/W. The next step in the process was to define boundary conditions.

All boundary conditions were applied to region points and region lines. Upon defining the boundary conditions, the model was analyzed using *Steady State* seepage analysis option available in SEEP/W based on the assumption that the boundary conditions are constant over time. Specific details regarding the analysis procedure are presented in the following sections.

3.3.2 Material Properties

The material properties used for seepage analysis are presented in Table 3. Material properties are consistent with those used in Phase 2 report (dated August 24, 2009). In this section, the term 'laboratory test results' refers to those presented in Attachment F of the Phase 2 report.

Table 3. Material Properties used for Seepage Analysis

Material	Kv (cm/sec)	Kv/Kh	Kh/Kv	e	w-sat (%)	w-res (%)
Gypsum – Fly Ash	2E-5	0.02	50	0.65	41	3
Gypsum	2E-5	0.02	50	0.70	39	3
Compacted Mine Spoil	5E-5	0.33	3	0.60	37	2
Mine Spoil	5E-5	0.33	3	0.60	37	2

Where,

- k_v is the vertical hydraulic conductivity
- k_h is the horizontal hydraulic conductivity
- e is the void ratio
- w_{sat} is the saturated volumetric water content, and
- w_{res} is the residual water content

3.3.3 Under-drains

Seepage analysis was performed assuming no under-drains to be present. This is based on results of Phase 1 and 2 geotechnical evaluation which indicated that existing under-drains were not functioning properly and were unable to control the seepage through the dike. However, even if the under-drain was included in the seepage analysis, the results of seepage analysis (from Phase 2 evaluation) indicate that the under-drain does not effect the location of the phreatic surface. Therefore, the current seepage analysis was performed assuming 'no under-drain' condition. Excerpt from "Table 19" of the Phase 2 report, is presented as Table 4 below.

Table 4. Total Head Measurements*

Cross-Section	Piezometer	Tip Elevation (feet)	SEEP/W No Under-Drains	SEEP/W With Under-Drains	Average Field Measurement
C-C'	PZ-8A	452	490	490	487
	PZ-9	455	488	488	496

*-Taken from Table 19, Report of Geotechnical Exploration, dated August 25, 2009 by Stantec

3.3.4 Results

Detailed results of seepage analysis are presented in Attachment E.

3.4 Slope Stability Analysis

3.4.1 Background

The stability of the existing dike slope was evaluated using the two-dimensional limit equilibrium method of analysis. Factors of safety against failure were calculated using Spencer's method.

3.4.2 Material Properties

The shear strength parameters for all materials were calculated using the limit equilibrium methodology (back analysis). Under this method, different shear strength parameters (friction angles) are input into the program until the existing slope (assumed to be marginally stable) achieves a factor of safety of 1.0. The strength parameters obtained using this method are presented in Table 5. Please note that the cohesion values for all cases were assumed to be zero, which is typically recommended when analyzing drained strength parameters long-term stability.

Table 5. Shear Strength Properties for SLOPE/W Analysis

Material	Cohesion (c')	Friction Angle (Φ')
Gypsum – Fly Ash	0	35º
Gypsum	0	35º
Mine Spoil	0	30º
Compacted Mine Spoil	0	33º

Where,

- *c'* is the cohesion
- *Φ*' is the friction angle

3.4.3 Cases

Two cases were analyzed and these included

A) Existing Condition (no buttress)
B) Proposed Condition (with buttress)

3.4.4. Failure Modes

The following failure modes were analyzed.

X) Auto Search (searches for critical failure circle using grid and radius method)

3.4.5 Results

Results of slope stability analysis are presented in Attachment E.

4. Buttress

4.1. Recommended Buttress

Based on the information discussed here and the results of engineering analysis it is recommended that the east slope of East Pond be stabilized using a clay fill (mine spoil) buttress.

4.2. Construction Plans

Following the completion of engineering analysis, Stantec's performed a computer-aided-design and drafting of the buttress. Design was performed using Civil 3D 2009 and drafting was completed in AutoCAD 2008. The objective of the design and drafting was to develop construction plans to assist TVA and to estimate the material quantities. The results of Stantec's design are presented on the construction plans attached to this letter (Attachment A). TVA shall refer to these plans for additional information regarding the recommended buttress option.

4.3. Material Quantities

Material quantities needed for sub grade preparation, buttress construction and ditch construction are presented on attached plans. Quantities presented shall be considered approximate and are subject to change based on field conditions.

4.4. Construction Recommendations and General Notes

For recommendations relative to the construction of the buttress and pertinent general notes, Contractor shall refer to the "General Notes" sheet presented in Attachment A.

5. Closure

The analysis and conclusions presented here are based on information gathered from the borings, several assumptions and theoretical calculations performed 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. The objective of this repair is to buttress the toe of the east slope of East Pond. The Contractor is advised to review attached construction plans and contact Stantec for any clarifications, if needed.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Sharath C. Vemuri, PE
Senior Project Engineer

Hugo R. Aparicio, PE
Principal

/rdr

Enclosures:
1 Attachment A (Plans for Construction)
2 Attachment B (Typed Logs)
3 Attachment C (Instrumentation Schematics)
4 Attachment D (Results of Laboratory Testing)
5 Attachment E (Results of Engineering Analysis)

Attachment A

Plans for Construction

PLANS FOR CONSTRUCTION

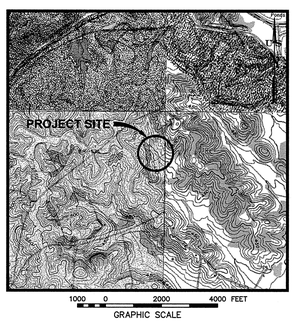
EAST POND EAST SLOPE BUTTRESS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT

MUHLENBERG COUNTY, KENTUCKY

PREPARED FOR

TENNESSEE VALLEY AUTHORITY

PREPARED BY



VICINITY MAP

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INDEX OF SHEETS

1	COVER SHEET
2	GENERAL NOTES
3	EXISTING CONDITIONS
4	SUBGRADE PREPARATION PLAN
5	GRADING PLAN - BUTTRESS
6	TYPICAL SECTION
7	BORING LAYOUT
8	INSTRUMENTATION PLAN
9-11	LOGS OF BORINGS
12	CROSS SECTION D-D'
13-14	CROSS SECTION F-F'
15	CROSS SECTION G-G'
16	CROSS SECTION H-H'

PLOT DATE: 03/05/2010 USER: ELLISON, DOC
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ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPGPAFFESCDX00000020100007

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
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ISSUED FOR CONSTRUCTION										

DISCIPLINE INTERFACE: REV. 03

SCALE: AS SHOWN EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
EAST POND EAST SLOPE BUTTRESS
COVER SHEET

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	T. JOHNSON	S. VEMURI	H. APARICIO	S. VEMURI	H. APARICIO	T. JOHNSON

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PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
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AUTOCAD R 2000	DATE 03/04/10	64	C	10W711-01	R 0

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

GENERAL NOTES

1. SUMMARY OF WORK

1.1. Purpose: The purpose of this work is to construct a buttress along the toe of the East Pond east slope. Specifically, the buttress will be constructed using compacted fill material (mine spoils) meeting the criteria presented here in.

1.2. Plans: The attached plans were prepared by Stantec Consulting Services Inc. (Stantec).
For the construction aspects shown herein Tennessee Valley Authority (TVA) is the Owner and the Contractor. Stantec is the Engineer.

2. SITE CONDITIONS

2.1. Mapping: Topographic mapping for the site was developed through a combination of aerial survey (performed by TVA in February, 2009), site specific survey (performed by Stantec in September, 2009) and hydrographic survey (performed by Stantec in December, 2009). The project baselines, coordinates and elevations are referenced to Kentucky State Plane Coordinate System (NAD 27).

2.2. Access: Vehicular access to the site shall be determined by TVA. No construction activities shall be performed that causes an interference with through traffic during construction. Contractor shall provide approved signage, barriers and traffic safety personnel responsible for directing construction and plant traffic at all points of ingress and egress.

2.3. Utilities: Utilities shown on the attached plans shall be considered approximate and do not cover all existing utilities in the area. Contractor shall exercise extreme caution during excavation. Should piping or other utilities that are not shown on the drawings be encountered, Contractor shall notify the Engineer immediately. Where applicable, the Contractor shall provide necessary measures to protect utilities from damage due to Contractor's work.

2.4. Excavation: It shall be distinctly understood that any reference to rock, soil, or any other material in the attached specification and on these drawings whether in numbers, words, letters or lines, is solely for TVA's information and is not to be taken as an indication of classified excavation or the quantity of any of the various materials involved. Irrespective of the materials encountered, all excavation shall be considered unclassified.

3. CONTRACTOR ACTIVITIES

3.1. Safety: Contractor shall be responsible for the health and safety of its personnel and shall meet all applicable local, state, and federal safety regulations; including but not limited to OSHA standards and TVA safety requirements. Where applicable for trench excavation and construction, the Contractor shall provide sheeting and bracing as necessary to ensure a stable trench excavation. Trenching procedures shall meet all applicable safety regulations including those mentioned above.

3.2. Quantities: Contractor shall employ a competent surveyor licensed in the Commonwealth of Kentucky to establish or confirm all lines, elevations, reference marks, etc. needed by the Contractor or Engineer during construction. The quantities of materials presented here shall be considered approximate and are subject to change based on field conditions.

3.3. Measurements: Contractor shall base all measurements, both vertical and horizontal, from established benchmarks and monuments. Existing grades as well as dimensions and conditions at the site after construction shall be verified by performing an as-built survey.

3.4. Construction Limits: Contractor shall confine his equipment, storage, and operations to only areas designated for those uses. Where temporary entry is required, the Contractor shall enter those areas only for the duration of time required to complete the work. The Owner will have other contractors performing work within these defined project construction limits and at nearby areas during the time of this work. The Contractor shall coordinate with other contractors in the execution of the work and shall accommodate access route revisions, minor delays, and share work areas and other coordination efforts without additional cost to the Owner.

3.5. Blasting: Blasting is prohibited for this project.

3.6. Erosion and Sediment Control: Silt fences and other erosion and sediment control measures shall be installed at locations as directed by the Owner or Engineer. Installation, inspection, and maintenance of silt fences and other erosion and sediment control measures shall follow the Best Management Practice (BMP) provisions given in Kentucky Erosion Prevention and Sediment Control Field Guide. A free copy of this guide can be obtained from Kentucky Division of Water.

3.7. Fugitive Dust Control: Contractor is responsible for fugitive dust control to prevent the generation of airborne dust during all site operations.

3.8. Materials Storage: Delivered materials for incorporation into the work shall be temporarily stored in areas designated for such use by the Owner.

3.9. As-Built Drawings: Contractor shall maintain at the site a complete set of project plans as issued with the construction documents. Project plans shall be updated by the Contractor to show any and all deviations made during construction. These plans shall be labeled AS-BUILT and submitted to the Engineer at the completion of the project or within seven (7) days of the project completion. All such revisions shall be marked upon execution and at a minimum every week to keep the drawings set current during the construction process and prior to any item becoming inaccessible for an 'AS-BUILT' drawing to be performed.

3.10. Debris Disposal: All excess construction spoils and debris shall be dewatered and disposed offsite in areas approved by the Owner.

3.11. Site Reclamation: Upon completion of the project, the Contractor shall remove all personnel and equipment from the site, including any temporary items installed by the Contractor during the course of their work. The site shall be left in a sightly condition with all trash and rubbish removed. Any parking and staging areas prepared by the Contractor shall be removed and restored to their original condition, or better.

3.12. Field Adjustments: It is recommended that construction measures be monitored by Stantec personnel. Adjustments will be necessary as the fieldwork progresses and should be agreed upon between TVA and Stantec prior to implementation.

4. MATERIALS

4.1. Compacted Fill: The compacted fill used for buttress construction and flattening of interior slopes shall consist of mine spoil material available at Paradise Facility. The fill material shall consist of plastic clays, free of vegetation, topsoil, organics, wet soil, construction debris or industrial waste. The borrow material shall classify as CH, or CL according to the Unified Soil Classification System. The material shall contain no stones whose largest dimension exceeds three inches. The source of the clay fill has not been identified at the time of this writing and will be determined by TVA at a later date prior to construction. The project specific compaction requirements for clay fill and general earthwork recommendations are presented in the following sections.

4.2. Class II Channel Lining: The rip-rap (Class II Channel Lining) shall be used for subgrade stabilization as described in Section 5. The rip-rap shall conform to Kentucky Transportation Cabinet's "Standard Specification for Road and Bridge Construction", current edition. The Contractor shall provide certifications to the Engineer prior to delivery of any rock.

4.3. Quantities: It is estimated that approximately 31,000 cubic yards of fill and 6,500 cubic yards of cut will be required to regrade the pond bottom as shown on Subgrade Preparation Plan. Approximately 27,000 cubic yards of fill will be needed to construct the buttress. 6,000 cubic yards will be generated from the ditch construction.

5. CONSTRUCTION ACTIVITIES

5.1. Construction Sequence: Suggested construction sequence for this project is presented below. However, the final determination of the sequence shall be made by the Contractor.

i. Controlled Dewatering of West Dredge Cell Pond
ii. Stabilize Soft Areas within the Pond Bottom
iii. Interior Slopes Vegetation Removal
iv. Existing Spillway and Riser Structure Removal
v. Existing Dike Cut at the South End
vi. Subgrade Preparation
vii. Interior Slopes Regrading
viii. Buttress Construction
ix. Ditch Construction

5.2. Dewatering of West Dredge Cell Pond: It is recommended that the West Dredge Cell pond be dewatered in controlled fashion so as to not blow out or damage the existing weir located further downstream. Contractor shall also ensure that the downstream channel capacity is not exceeded during dewatering. Dewatering of the pond is the sole responsibility of the Contractor and all appropriate safety precautions shall be observed.

5.3. Stabilizing Pond Bottom: Upon dewatering the pond, Contractor shall visually observe the pond bottom for any soft areas and stabilize these areas to create a working surface. Stabilizing may involve proof rolling and/or using rip-rap (Class II channel lining) to create a working area.

5.4. Clearing and Grubbing: Upon dewatering the pond and creating a working surface, all interior slopes of the West Dredge Cell pond shall be cleared, grubbed, and stripped of all vegetation to a minimum depth of six inches prior to placement of fill material. The approximate limits of clearing and grubbing are shown on the attached plans. However, the final depth and extents shall be determined during construction based on field conditions and must be agreed upon between the Contractor and the Engineer. All tree and vegetation removal activities shall follow the standard guidelines issued by Stantec to TVA. A copy of these guidelines can be provided upon request.

5.5. Existing Spillway and Riser: Contractor shall safely remove the existing riser and spillway at the south end of the pond after the pond is dewatered.

5.6. Existing Dike Cut at South End: Upon removing the existing riser and spillway at the south end, Contractor shall breach the existing dike in the area in accordance with the attached plans. The side slopes shall be 3H:1V or flatter as needed to create a stable cut.

5.7. Subgrade Preparation: Contractor shall regrade the pond bottom as part of subgrade preparation for the proposed buttress and ditch. A grading stakeout table along with coordinates and proposed elevations is presented on the attached plans for assisting Contractor with subgrade preparation. However, based on the amount of soft sediment observed in the pond bottom and the amount of undercutting and/or proof rolling needed to create a workable area, the final subgrade surface contours presented on attached plans may need to be altered. The overall objective of subgrade preparation is to promote positive drainage toward the proposed ditch. All subgrade areas that will receive the buttress shall be properly proof-rolled in accordance with subsequent sections of the general notes. The final subgrade surface receiving the buttress shall be inspected and approved by the engineer or engineer's representative.

5.8. Interior Slopes Regrading: Contractor shall flatten the interior slopes of the pond along the east side as shown on the attached plans. Specifically, contractor shall flatten the interior slopes to 3H:1V (or flatter) starting at elevation 482 feet. The limits of regrading shown on the attached plans are approximate and subject to change based on field conditions. The actual extents shall be determined during construction by the Contractor and agreed upon by TVA and Stantec's on-site representative.

5.9. Buttress Construction: Contractor shall construct the buttress using approved fill material (mine spoil) and using side slope of 4H:1V. Criteria for approved fill material and its placement are presented in subsequent sections.

5.10. Ditch Construction: Upon completion of the buttress construction, Contractor shall construct a ditch to convey storm water from north end of the site to the south end. Details for ditch construction are provided in the attached plans.

5.11. Erosion and Sediment Control: Silt fences shall be in place prior to site disturbance, and maintained throughout the duration of construction. Contractor shall inspect silt fences after every 0.5-inch rainfall and at least daily during prolonged rainfall events. Contractor shall be responsible for replacing items that start to become ineffective. Sediment deposits shall be removed as directed by the Engineer and at a minimum of when deposits reach one-half the available control height or when heavy runoff or high water is expected. When removing sediment, care shall be taken not to damage the silt fences.

5.12. Storm Water Management: Contractor shall have a temporary storm water management plan for construction phase of the project such that water does not accumulate within the construction areas. This plan should include temporarily providing a ditch for water to exit the site without excessive erosion.

5.13. Excavation: Contractor shall excavate to the lines and grades shown on the construction drawings. Certain exceptions will be made in areas where field adjustements are to be made during construction. Contractor shall maintain stable excavation slopes at all times. This may require utilizing flatter slopes than those indicated on the plans if dictated by the field conditions. These changes shall be approved by the Engineer before being implemented. Material obtained from excavation operations shall be properly disposed off in areas designated for such use by TVA. Excavation shall smoothly transition into original slopes on all sides.

5.14. Seeps and Sloughs: Contractor shall notify the Engineer if water seeps and/or sloughs are observed during excavation. This may require additional treatment as directed by the Engineer.

5.15. Subgrade Preparation: It is the Contractor's responsibility to regrade the site in a manner to promote adequate compaction, bonding and positive drainage. This will require using fill material (mine spoils) to raise the subgrade and proof-rolling.

5.16. Layer Thickness for Subgrade: Fill material for subgrade preparation shall be placed in layers. The thickness of the layers before proof-rolling shall not be more than twelve (12) inches. No material shall be placed in the fill by dumping in piles or windrow incorporated in a layer in that position. Instead, the material shall be moved and spread by blading or similar approved methods. Material in the form of large lumps or masses shall be pulverized by disking, harrowing, or by the use of mechanical pulverizers prior to compacting. All lumps or masses, whose largest dimension exceeds six (6) inches, shall be broken down prior to compacting.

5.17. Proof-Rolling of Subgrade: Proof-rolling shall be performed using the equipment conforming to Section 6 of the general notes. A minimum of three (3) passes shall be made. However, additional passes may be needed based on the field conditions. Placing operations shall be such that the material being proof-rolled blends sufficiently to secure the best practicable degree of compaction and stability. Excessive wet material shall be allowed to dry prior to proof-rolling. The proof rolled surface shall be approved by the Engineer's representative.

6. BUTTRESS CONSTRUCTION

6.1. Buttress Construction: It is the Contractor's responsibility to perform buttress construction in a manner to promote adequate compaction and bonding. If the Contractor's operations affect the buttress quality, corrections shall be made by the Contractor by undercutting the soft buttress material and then re-compacting as directed by the Engineer. For buttress quality degradation beyond the control of the Contractor, those areas shall be remediated as directed by the Engineer.

6.2. Compaction Equipment: Compaction equipment shall conform to the following requirements and shall be used as prescribed in subsequent paragraphs.

6.2.1. Self-Propelled Tamping Rollers: The use of self-propelled non-vibratory tamping rollers conforming to the following specifications will be permitted. Their design and operation shall be subject to the approval of the Engineer, who shall have the right, at any time during execution of the Work, to direct such modifications of the tamping feet or variations in roller drum weight as may be found necessary to secure specified compaction of the dike materials. If the use of self-propelled tamping rollers causes shearing of the fill, laminations in the fill, or results in inadequate compaction, the Engineer may direct such rollers be removed from the fill and appropriate tamping rollers used. The self-propelled unit shall consist of two rear and two front independent tamping rollers that can oscillate so as to maintain positive contact with the material being compacted. The unit shall have a minimum operating weight of 70,000 pounds equally distributed to each drum. The minimum drum width shall be 3.5 feet. The unit shall also be equipped with a hydraulic front blade for the purpose of spreading earth and rock material. Four-drum equipment separated by cab and differential shall be arranged in tandem with the drums positioned such that the prints of the tamping feet are staggered. The surface on which the tamping feet are mounted shall have a minimum outside diameter of four feet and at least one tamping foot for each 100 square inches of drum surface. The distance between the centers of any two adjacent tamping feet shall be not less than nine inches. The length of each tamping foot from the outside mounting surface of the drum shall be not more than 11 inches and shall be maintained at not less than nine inches. The bearing surface of each tamping foot shall have a chevron tip design and surface area of not less than seven square inches nor more than 14 square inches. Cupped recesses within the bearing surface of each tamping foot will be permitted but shall not exceed 0.5 inch in depth. During rolling operations, the spaces between the tamping feet shall be maintained clear of materials that may impair the effectiveness of the tamping roller. The weight of all roller drums during the compaction of fill materials shall be uniformly maintained such that the weight per foot of drum length is not less than 4,300 pounds. Self-propelled rollers shall be operated at speeds of no more than 5.0 miles per hour.

6.2.2. Smooth Drum Vibratory Rollers: Smooth drum vibratory rollers shall be equipped with a smooth steel compaction drum and shall be operated at a frequency of vibration during compaction operations between 1,400 and 1,800 vibrations per minute (vpm). Vibratory rollers must be self-propelled and shall have an unsprung drum weight that is a minimum of 60 percent of the rollers' static weight. Rollers shall have a minimum static weight of 30,000 pounds, a minimum dynamic force of 70,000 pounds when operating at 1,400 vpm, and an applied force not less than 10,000 pounds per foot of compaction drum length. The total applied force shall be the sum of the centrifugal force and the drum module weight. The level of amplitude and vibration frequency during compaction shall be maintained uniformly throughout the buttress zone within which it is operating. Rollers shall be operated at speeds which will result in a minimum of 10 impacts per foot of roller travel. The equipment manufacturer shall provide sufficient data, drawings, and computations to verify that the proposed equipment meets the above specifications. The character and efficiency of this equipment shall be subject to the approval of the Engineer.

6.2.3. Tamping Foot Vibratory Rollers: Tamping foot vibratory rollers shall have the same requirements as Paragraph 5.11.2 except that the drum shall be equipped with tamping feet. The equipment manufacturer shall provide sufficient data, drawings, and computations to verify the proposed equipment meets the specifications. The character and efficiency of this equipment shall be subject to approval of the Engineer.

6.2.4. Manual Tampers: In areas where it is impracticable to use a self propelled roller, compaction of material shall be performed by the use of approved manual tampers. To the extent practical, "walk-behind" manual tamping foot rollers shall be used. Manual tamping foot rollers shall be designed with a minimum operating weight of 2,750 pounds, shall exert a minimum centrifugal force of 8,000 pounds, and shall have a means of self-cleaning the tamping feet. Where not accessible to other equipment, manually operated rammers may be used only if approved by the Engineer. Manually operated rammers shall have a minimum operating weight of 135 pounds and shall exert at least 3,000 pounds per blow.

6.2.5. Discs: Discs shall have at least two gangs hooked in tandem and shall be sized to penetrate the fill lift thickness, when compacted, of at least eight inches. The width of cut shall be less than 12 feet. Disc blades shall be notched, spaced a minimum of 16 inches, and have a minimum diameter of 36 inches. Wear-down shall not exceed 10 percent of the new disc diameter, at which time disc blades will be removed and replaced with new blades. The disc shall be equipped with self-cleaning scrapers to prevent the accumulation of soil and debris between the disc blades while operated at speeds to ensure mixing and blending of materials. The angle of cut shall be adjustable while the tool is in operation.

6.3. Buttress Material Spreading: The distribution and gradation of clay fill shall be free from lenses, pockets, streaks or layers of material differing substantially in texture or gradation from the surrounding material. The placing operations shall be performed such that the material being compacted blends sufficiently to secure the best practicable degree of compaction and stability.

6.4. Layer Thickness: Fill material for buttress construction shall be placed in layers. The thickness of the layers before compaction shall not be more than six (6) inches. No material shall be placed in the fill by dumping in piles or windrow incorporated in a layer in that position. Instead, the material shall be moved and spread by blading or similar approved methods. Buttress material in the form of large lumps or masses shall be pulverized by disking, harrowing, or by the use of mechanical pulverizers prior to compacting. All lumps or masses, whose largest dimension exceeds four (4) inches, shall be broken down prior to compacting.

6.5. Moisture Control: During compaction operations, the fill material being placed shall be maintained within minus two percent (-2%) of optimum moisture content to plus four percent (+4%) of optimum moisture content as determined by ASTM D 698. The moisture content shall be controlled in the following manner:

6.5.1. Water may be added to the fill materials at the source or after the material has been brought onto the buttress, whichever is the most practical. When material deposited on the buttress is too dry, the Contractor shall be required to sprinkle each layer and obtain uniform moisture distribution in the layer by disking, blading or other approved methods. The amount of water applied shall be accurately controlled so that free water will not appear on the surface during or after compaction operations.

6.5.2. Material deposited on the fill that is too wet shall be removed or spread and permitted to dry, assisted by disking or blading, if necessary, until the moisture content is reduced to the specified limits.

6.5.3. When the top surface of a layer becomes too dry or too smooth to permit suitable bond with the subsequent layer, the Contractor shall loosen the material by scarifying or disking. The Contractor shall moisten the loosened material to acceptable moisture content and re-compact the material to the specified density. Traversing the fill surface with tamping foot compactor or track equipment may not achieve adequate scarification.

6.5.4. Adjustments of moisture content will be made on the basis of determination of moisture by field tests as construction progresses

6.6. Compaction Requirements: Compaction requirements for buttress are prescribed in subsequent paragraphs.

6.6.1. After each layer of fill material has been placed, spread, and contains the required moisture, it shall be compacted by passing the self propelled tamping roller, over the entire surface of the layer a sufficient number of times to obtain the specified density. Adjustments in compactive effort shall be made on the basis of field density determinations made as construction progresses. Vibratory rollers shall not be used to compact clay buttress material. Smaller compactors will be required where thin sections of clay buttress slopes are required to be placed in horizontal lifts.

6.6.2. Buttress shall be compacted to 95 percent of its maximum dry density as determined by ASTM D 698. In-place moisture shall be within minus two percent (-2%) of optimum moisture content to plus four percent (+4%) of optimum moisture as determined by ASTM D 698. In-place material not meeting these specifications shall be reworked until satisfactory results are obtained.

6.6.3. Field compaction tests, utilizing the nuclear method outlined in ASTM D 2922 or other approved methods, will be made as the construction proceeds. The number of field density tests shall be 9 tests per acre per lift. The footprint of the proposed buttress is approximately 3 acres. As a minimum, one test shall be performed every day the material is placed. The engineering technician may perform additional tests at his/her discretion if deemed necessary.

6.6.4. The final surface of the buttress in all areas shall be smooth and free of rocks, stones or any protruding objects.

6.7. Re-vegetation: All interior slopes (including the completed buttress) and exposed subgrade shall be re-vegetated in accordance with TVA guidelines upon completion of all construction items.

6.8 Contractor shall refer to the construction quality control plan attached to this work plan for compliance with the QA/QC procedures.

ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPGPAFFESCDX00000020100007

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	03/04/10	SV	TJ	SV	HRA	SV	HRA	TJ	–	–	–

ISSUED FOR CONSTRUCTION

DISCIPLINE INTERFACE

SCALE: NONE EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
EAST POND EAST SLOPE BUTTRESS
GENERAL NOTES

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	T. JOHNSON	S. VEMURI	H. APARICIO	S. VEMURI	H. APARICIO	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 03/04/10 | 64 | C | 10W711-02 | R 0

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
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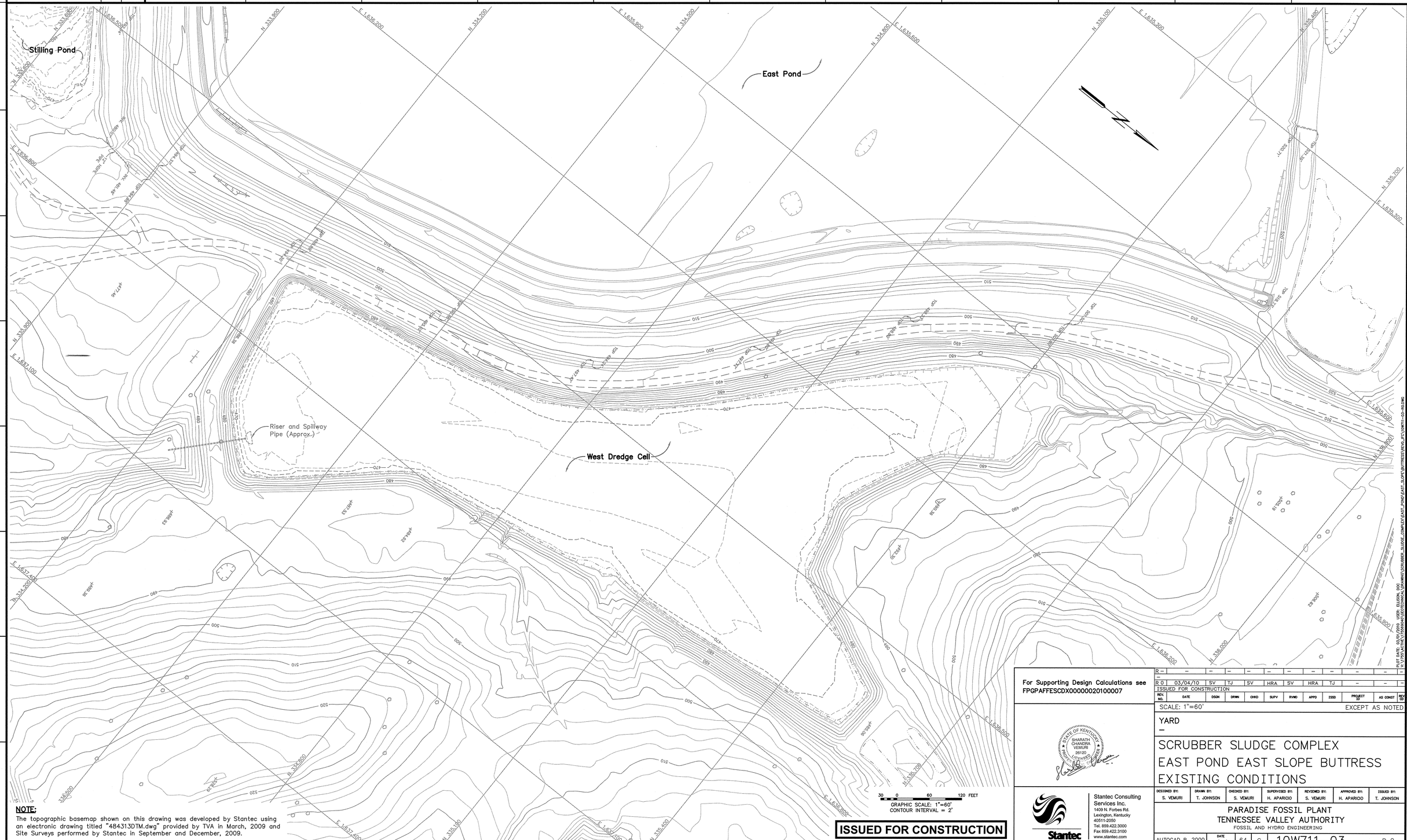
Fax 859.422.3100
www.stantec.com

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 03/04/2010 USER: ELLISOL DGN: C:\TVA\10W711\DRAWINGS\DESIGN\CAD\MICROSTATION\SCRUBBER_SLUDGE_COMPLEX\EAST_POND\EAST_SLOPE\BUTTRESS\REVID_EC\10W711-02-R0.DWG



NOTE:
The topographic basemap shown on this drawing was developed by Stantec using an electronic drawing titled "484313DTM.dwg" provided by TVA in March, 2009 and Site Surveys performed by Stantec in September and December, 2009.

ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPGPAFFESCDX00000020100007

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R –	–	–	–	–	–	–	–	–	–	–
R 0	03/04/10	SV	TJ	SV	HRA	SV	HRA	TJ	–	–

ISSUED FOR CONSTRUCTION

DISCIPLINE INTERFACE
REV NO.
1
2
3
4

SCALE: 1"=60' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
EAST POND EAST SLOPE BUTTRESS
EXISTING CONDITIONS

STATE OF KENTUCKY
SHARATH CHANDRA VEMURI
26120
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DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	T. JOHNSON	S. VEMURI	H. APARICIO	S. VEMURI	H. APARICIO	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 03/04/10	64	C	10W711-03	R 0

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 04/01/2010 USER: ELLISON, ERIC
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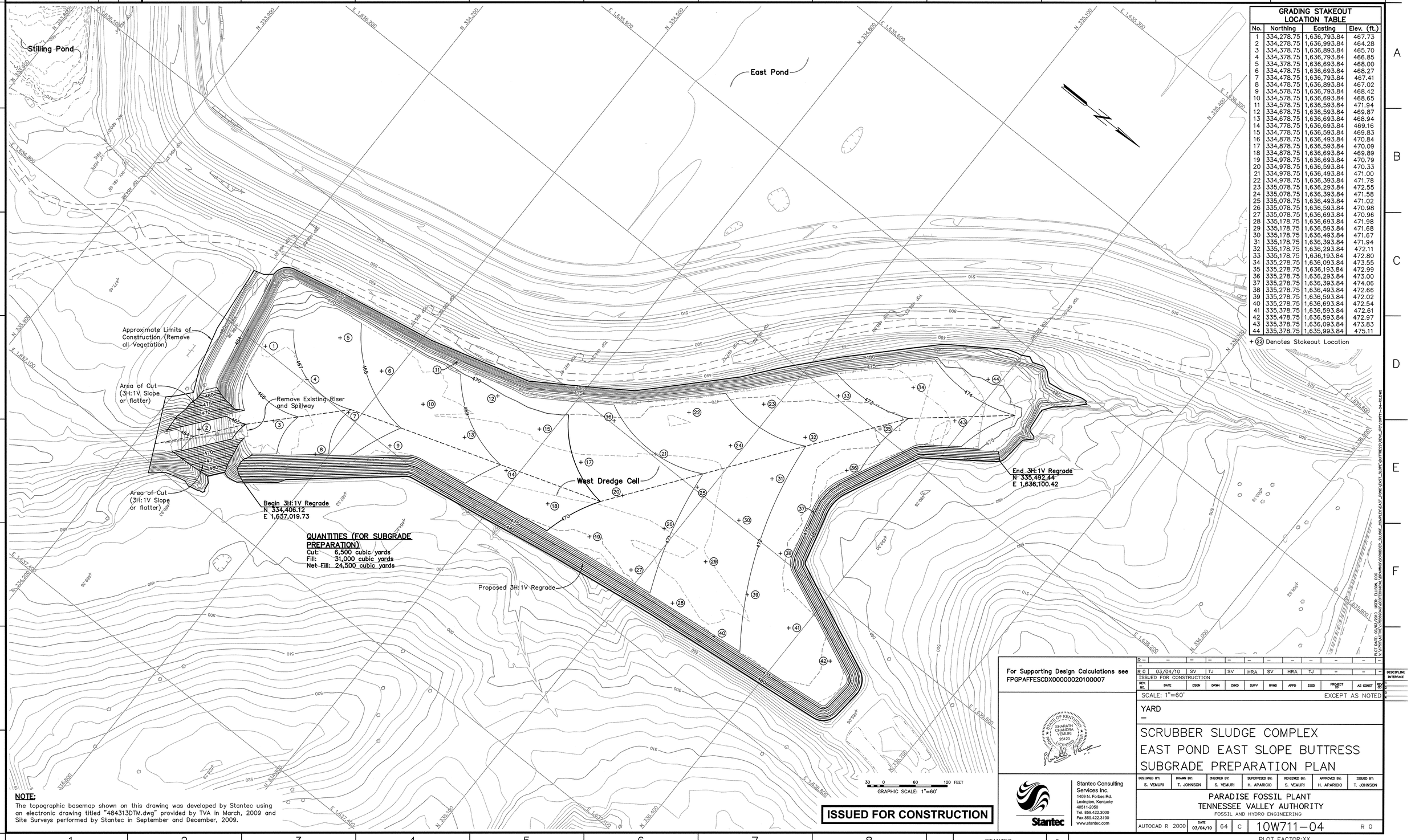

GRADING STAKEOUT LOCATION TABLE

No.	Northing	Easting	Elev. (ft.)
1	334,278.75	1,636,793.84	467.73
2	334,278.75	1,636,993.84	464.28
3	334,378.75	1,636,893.84	465.70
4	334,378.75	1,636,793.84	466.85
5	334,378.75	1,636,693.84	468.00
6	334,478.75	1,636,693.84	468.27
7	334,478.75	1,636,793.84	467.41
8	334,478.75	1,636,893.84	467.02
9	334,578.75	1,636,793.84	468.42
10	334,578.75	1,636,693.84	468.65
11	334,578.75	1,636,593.84	471.94
12	334,678.75	1,636,593.84	469.87
13	334,678.75	1,636,693.84	468.94
14	334,778.75	1,636,693.84	469.16
15	334,778.75	1,636,593.84	469.83
16	334,878.75	1,636,493.84	470.84
17	334,878.75	1,636,593.84	470.09
18	334,878.75	1,636,693.84	469.89
19	334,978.75	1,636,693.84	470.79
20	334,978.75	1,636,593.84	470.33
21	334,978.75	1,636,493.84	471.00
22	334,978.75	1,636,393.84	471.78
23	335,078.75	1,636,293.84	472.55
24	335,078.75	1,636,393.84	471.58
25	335,078.75	1,636,493.84	471.02
26	335,078.75	1,636,593.84	470.98
27	335,078.75	1,636,693.84	470.96
28	335,178.75	1,636,693.84	471.98
29	335,178.75	1,636,593.84	471.68
30	335,178.75	1,636,493.84	471.67
31	335,178.75	1,636,393.84	471.94
32	335,178.75	1,636,293.84	472.11
33	335,178.75	1,636,193.84	472.80
34	335,278.75	1,636,093.84	473.55
35	335,278.75	1,636,193.84	472.99
36	335,278.75	1,636,293.84	473.00
37	335,278.75	1,636,393.84	474.06
38	335,278.75	1,636,493.84	472.66
39	335,278.75	1,636,593.84	472.02
40	335,278.75	1,636,693.84	472.54
41	335,378.75	1,636,593.84	472.61
42	335,478.75	1,636,593.84	472.97
43	335,378.75	1,636,093.84	473.83
44	335,378.75	1,635,993.84	475.11

+ (22) Denotes Stakeout Location

NOTE:
The topographic basemap shown on this drawing was developed by Stantec using an electronic drawing titled "484313DTM.dwg" provided by TVA in March, 2009 and Site Surveys performed by Stantec in September and December, 2009.

ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPGPAFFESCDX00000020100007

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ER	AS CONST	REV ID
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	03/04/10	SV	TJ	SV	HRA	SV	HRA	TJ	–	–	–
ISSUED FOR CONSTRUCTION											

DISCIPLINE INTERFACE

SCALE: 1"=60' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
EAST POND EAST SLOPE BUTTRESS
SUBGRADE PREPARATION PLAN

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	T. JOHNSON	S. VEMURI	H. APARICIO	S. VEMURI	H. APARICIO	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 03/04/10 | 64 | C | 10W711-04 | R 0

Stantec Consulting Services Inc.
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40511-2050
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STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 03/04/2010 USER: ELJORDAN
N:\CAD\PROJECTS\2009\484313\CAD\DRAWINGS\SCRUBBER_SLUDGE_COMPLEX\EAST_POND\EAST_SLOPE\BUTTRESS\W7XX_R0.DWG

DITCH STAKEOUT LOCATION TABLE			
No.	Northing	Easting	Elev. (ft.)
A	334,232.11	1,637,069.91	461.6
B	334,341.47	1,636,931.44	462.5
C	334,479.07	1,636,786.30	463.5
D	334,763.77	1,636,691.72	465.0
E	334,953.57	1,636,628.66	466.0
F	335,189.97	1,636,305.99	468.0
G	335,308.17	1,636,144.65	469.0
H	335,373.10	1,636,068.60	470.0
I	335,461.32	1,635,973.12	472.6
J	335,531.55	1,635,919.80	482.0
K	335,153.55	1,636,631.50	467.0
L	335,353.53	1,636,634.35	468.0
M	335,525.16	1,636,636.79	468.9
N	335,558.01	1,636,637.25	482.0

+ (A) Denotes Stakeout Location

BUTTRESS STAKEOUT LOCATION TABLE		
No.	Northing	Easting
1	334,216.82	1,636,650.35
2	334,514.02	1,636,578.39
3	334,702.89	1,636,524.61
4	334,864.37	1,636,413.54
5	334,996.11	1,636,267.91
6	335,112.45	1,636,110.23
7	335,250.78	1,635,972.61
8	335,409.38	1,635,859.71
9	335,524.50	1,635,828.30
10	335,451.02	1,635,955.52
11	335,308.64	1,636,054.40
12	335,179.54	1,636,181.27
13	335,069.73	1,636,316.66
14	334,915.52	1,636,484.29
15	334,750.39	1,636,593.73
16	334,533.37	1,636,664.44
17	334,277.73	1,636,705.90
18	334,253.81	1,636,747.54

+ (10) Denotes Stakeout Location

Stilling Pond

East Pond

West Dredge Cell

Class II Channel Lining, 10' Width (Min.)

Class II Channel Lining, 20' Width (Min.)

Approximate Grading Limits

Transition smoothly into existing ditch

(1/6) Type I Ditch (Typ.)

APPROXIMATE QUANTITIES (FOR BUTTRESS AND DITCH CONSTRUCTION)

Cut: 7,300 cubic yards (Ditch)
Fill: 28,000 cubic yards (Buttress)
Net Fill: 20,700 cubic yards

NOTE:
The topographic basemap shown on this drawing was developed by Stantec using an electronic drawing titled "484313DTM.dwg" provided by TVA in March, 2009 and Site Surveys performed by Stantec in September and December, 2009.

Section or Detail No.
Sheet Where Shown
REFERENCE KEY

GRAPHIC SCALE: 1"=60'

ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPGPAFFESCDX00000020100007

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV ID
R 0	03/04/10	SV	TJ	SV	HRA	SV	HRA	TJ	–	–	–
ISSUED FOR CONSTRUCTION											

DISCIPLINE INTERFACE: 1 – 2 – 3 – 4 – 5

SCALE: 1"=60' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
EAST POND EAST SLOPE BUTTRESS
GRADING PLAN – BUTTRESS

STATE OF KENTUCKY · SHARATH CHANDRA VEMURI · 26120 · LICENSED PROFESSIONAL ENGINEER

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S. VEMURI	T. JOHNSON	S. VEMURI	H. APARICIO	S. VEMURI	H. APARICIO	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

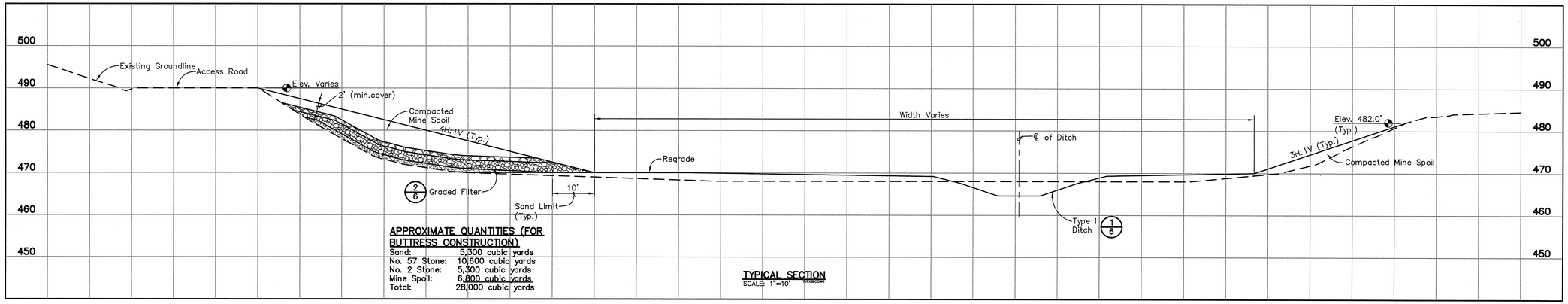
AUTOCAD R 2000 | DATE: 03/04/10 | 64 | C | 10W711-05 | R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

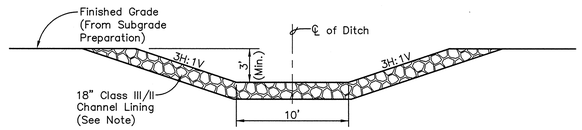
PLOT DATE: 03/04/2010 USER: ELLISRA, LDO
K:\OT\KNX\PROJECTS\484313\CAD\DRWG\SCRUBBER_SLUDGE_COMPLEX\EAST_POND\EAST_SLOPE\BUTTRESS\PAD_BUTTRESS.DWG



APPROXIMATE QUANTITIES (FOR BUTTRESS CONSTRUCTION)

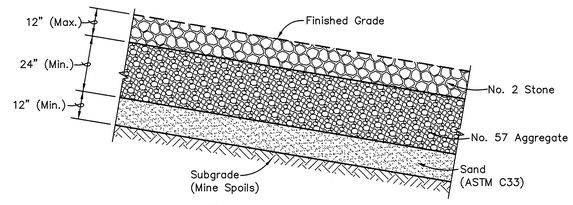
Sand:	5,300 cubic yards
No. 57 Stone:	10,600 cubic yards
No. 2 Stone:	5,300 cubic yards
Mine Spoil:	6,800 cubic yards
Total:	28,000 cubic yards

TYPICAL SECTION
SCALE: 1"=10'



NOTE:
Use Class III Channel Lining between ditch coordinates G and J. Everywhere else use Class II Channel Lining. See Sheet 05 for ditch coordinates table.

1/6 **DETAIL – TYPE I DITCH**
SCALE: 1"=5'



2/6 **DETAIL – GRADED FILTER**
SCALE: 1"=1'-0"

Section or Detail No.
Sheet Where Shown
REFERENCE KEY

ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPGPAFFESCDX00000020100007

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REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT 10	AS CONST
R –	–	–	–	–	–	–	–	–	–	–
R 0	03/04/10	SV	TJ	SV	HRA	SV	HRA	TJ	–	–
ISSUED FOR CONSTRUCTION										

SCALE: AS SHOWN EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
EAST POND EAST SLOPE BUTTRESS
TYPICAL SECTION

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	T. JOHNSON	S. VEMURI	H. APARICIO	S. VEMURI	H. APARICIO	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 03/04/10 | 64 | C | 10W711-06 | R 0

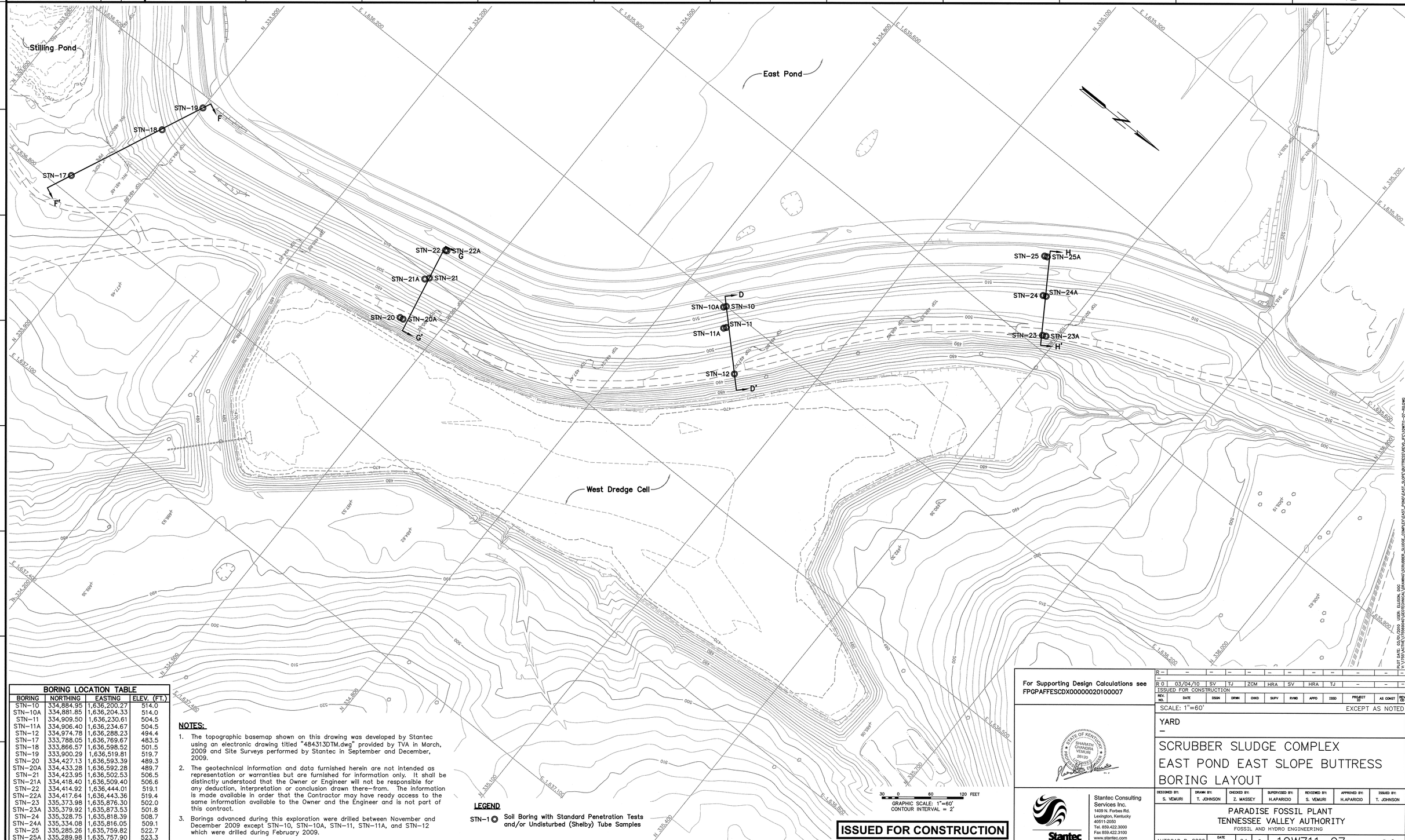
DISCIPLINE INTERFACE

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

R:\07_DATE\ 03\04\2010 USER\ ELISSON_DOC
D:\DOCUMENTS AND SETTINGS\ELISSON_DOC\MIS\GRUBBER_SLUDGE_COMPLEX\EAST_POND\EAST_SLOPE\BUTTRESS\SHEUD_JEF.DWG



BORING LOCATION TABLE			
BORING	NORTHING	EASTING	ELEV. (FT.)
STN-10	334,884.95	1,636,200.27	514.0
STN-10A	334,881.85	1,636,204.33	514.0
STN-11	334,909.50	1,636,230.61	504.5
STN-11A	334,906.40	1,636,234.67	504.5
STN-12	334,974.78	1,636,288.23	494.4
STN-17	333,788.05	1,636,769.67	483.5
STN-18	333,866.57	1,636,598.52	501.5
STN-19	333,900.29	1,636,519.81	519.7
STN-20	334,427.13	1,636,593.39	489.3
STN-20A	334,433.28	1,636,592.28	489.7
STN-21	334,423.95	1,636,502.53	506.5
STN-21A	334,418.40	1,636,509.40	506.6
STN-22	334,414.92	1,636,444.01	519.1
STN-22A	334,417.64	1,636,443.36	519.4
STN-23	335,373.98	1,635,876.30	502.0
STN-23A	335,379.92	1,635,873.53	501.8
STN-24	335,328.75	1,635,818.39	508.7
STN-24A	335,334.08	1,635,816.05	509.1
STN-25	335,285.26	1,635,759.82	522.7
STN-25A	335,289.98	1,635,757.90	523.3

NOTES:

1. The topographic basemap shown on this drawing was developed by Stantec using an electronic drawing titled "484313DTM.dwg" provided by TVA in March, 2009 and Site Surveys performed by Stantec in September and December, 2009.
2. 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 there-from. 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.
3. Borings advanced during this exploration were drilled between November and December 2009 except STN-10, STN-10A, STN-11, STN-11A, and STN-12 which were drilled during February 2009.

LEGEND

STN-1 ◎ Soil Boring with Standard Penetration Tests and/or Undisturbed (Shelby) Tube Samples

ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPGPAFFESCDX00000020100007

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV. NO.
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	03/04/10	SV	TJ	ZCM	HRA	SV	HRA	TJ	–	–	–

ISSUED FOR CONSTRUCTION

DISCIPLINE INTERFACE

SCALE: 1"=60' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
EAST POND EAST SLOPE BUTTRESS
BORING LAYOUT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	T. JOHNSON	Z. MASSEY	H.APARICIO	S. VEMURI	H.APARICIO	T. JOHNSON

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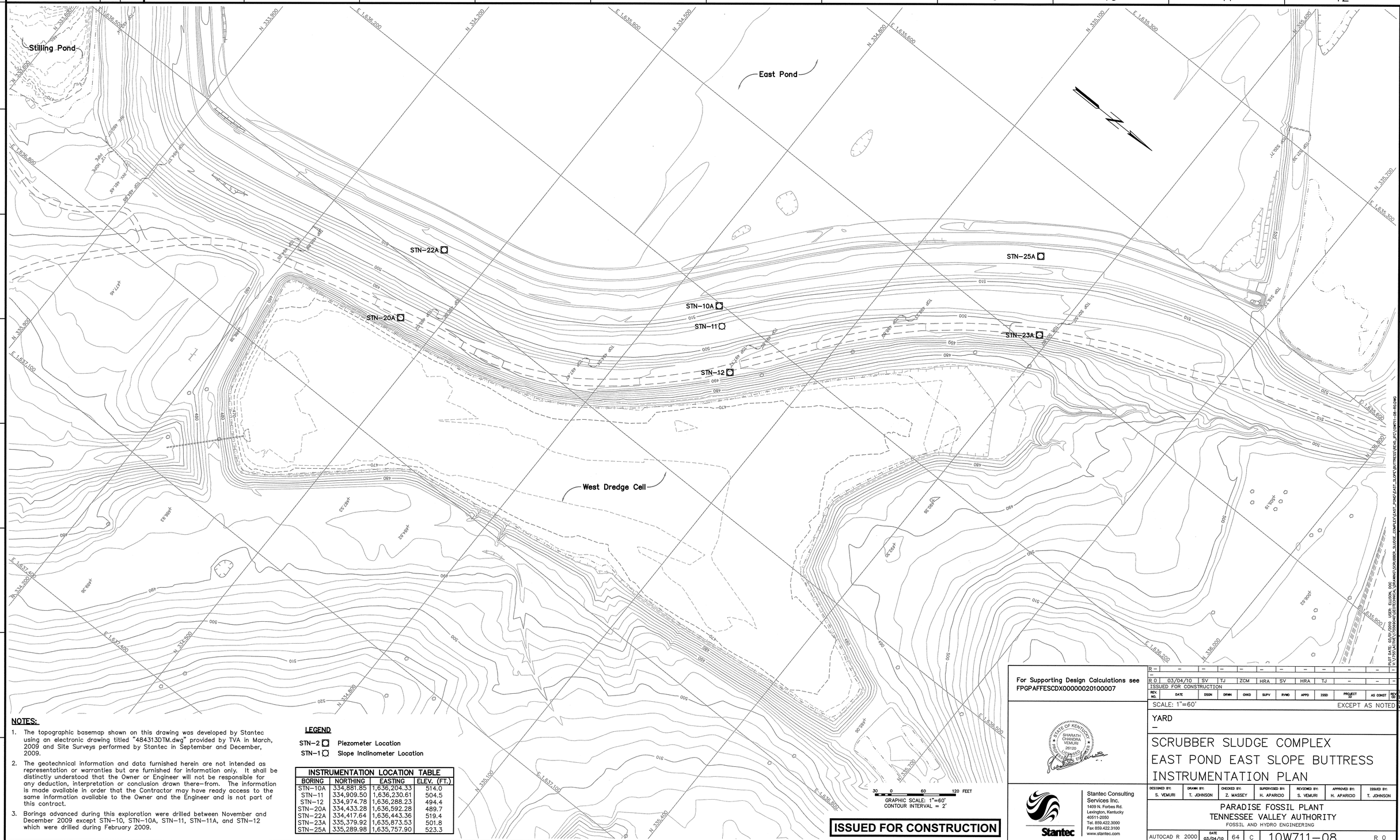
AUTOCAD R 2000 | DATE: 03/04/10 | 64 | C | 10W711-07 | R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 03/30/2010 - USER: ELLISON, DOC
N:\TVA\PARADISE\GEOTECH\CAD\SCRUBBER_SLUDGE_COMPLEX\EAST_POND\EAST_SLOPE\BUTTRESS\BH10_R1.DWG



NOTES:

1. The topographic basemap shown on this drawing was developed by Stantec using an electronic drawing titled "484313DTM.dwg" provided by TVA in March, 2009 and Site Surveys performed by Stantec in September and December, 2009.
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3. Borings advanced during this exploration were drilled between November and December 2009 except STN-10, STN-10A, STN-11, STN-11A, and STN-12 which were drilled during February 2009.

LEGEND

STN-2 ○ Piezometer Location
STN-1 ○ Slope Inclinometer Location

INSTRUMENTATION LOCATION TABLE			
BORING	NORTHING	EASTING	ELEV. (FT.)
STN-10A	334,881.85	1,636,204.33	514.0
STN-11	334,909.50	1,636,230.61	504.5
STN-12	334,974.78	1,636,288.23	494.4
STN-20A	334,433.28	1,636,592.28	489.7
STN-22A	334,417.64	1,636,443.36	519.4
STN-23A	335,379.92	1,635,873.53	501.8
STN-25A	335,289.98	1,635,757.90	523.3

ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPGPAFFESCDX00000020100007

R	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV BY
–	–	–	–	–	–	–	–	–	–	–	–
R 0	03/04/10	SV	TJ	ZCM	HRA	SV	HRA	TJ	–	–	–
ISSUED FOR CONSTRUCTION											

DISCIPLINE INTERFACE

SCALE: 1"=60' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
EAST POND EAST SLOPE BUTTRESS
INSTRUMENTATION PLAN

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
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PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
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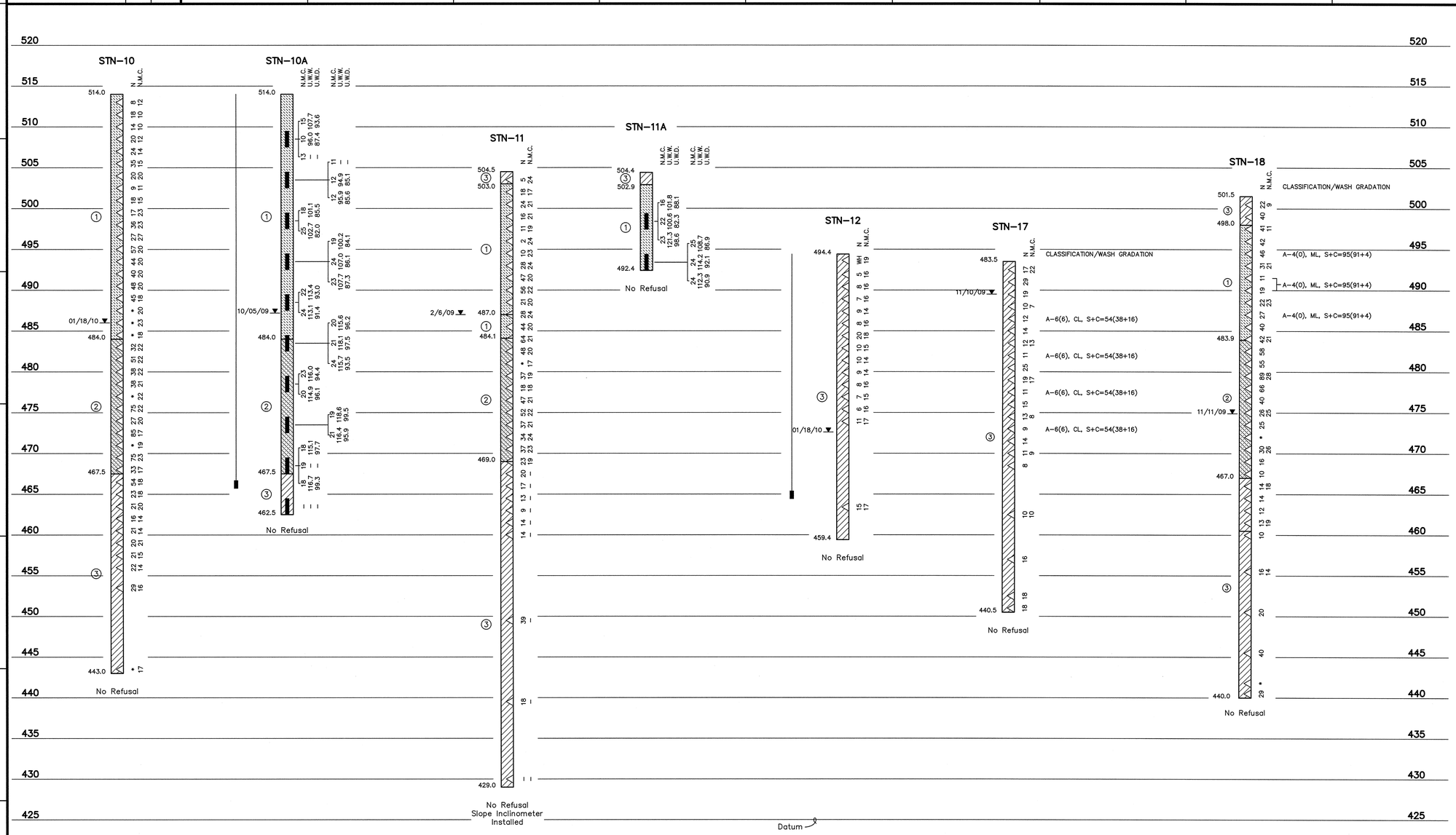
AUTOCAD R 2000	DATE 03/04/10	64	C	10W711-08	R 0

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 03/05/2010 USER: ELDRON, DOC
N:\TVDOC\ACAD\CONSTRUCTION\DRAWING\SUBMIT\BUTTRESS\INSTR_SLUDGE_COMPLEX\EAST_POND\EAST_SLOPE\BUTTRESS INSTR_POND EAST_SLOPE.DWG



LEGEND

① Gypsum – Fly Ash: Dark gray to gray, moist to wet and very loose to very dense

② Gypsum: Dark gray to gray, moist to wet and very loose to very dense

③ Mine Spoil: Lean to sandy lean clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone and siltstone fragments

Denotes location of Piezometer Tip

WH Weight of Hammer

Standard Penetration Test Interval

Undisturbed Thin-Walled (Shelby) Tube Sample

N Standard Penetration Test Blow Count (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. Unconfined Compressive Strength

2/12/09 ▼ Water Level and Date Recorded

No Refusal No Refusal Encountered

* Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

NOTES:

1. Natural Moisture Content testing of samples containing gypsum flyash material were conducted at 40°C and 200°C. For clarity only the 40°C have been reported on the drawings. The results from 200°C tests can be found in the geotechnical report. Natural Moisture Content testing of samples containing residual clay material were conducted at 110°C, only.

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.

ISSUED FOR CONSTRUCTION

LOGS OF BORINGS
SCALE: 1"=5' (VERTICAL ONLY)

For Supporting Design Calculations see FPGPAFFESCDX00000020100007

STATE OF KENTUCKY · SHARATH CHANDRA VEMURI · 26120 · LICENSED PROFESSIONAL ENGINEER

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R –	–	–	–	–	–	–	–	–	–	–
R 0	03/04/10	SV	RWE	ZCM	HRA	SV	HRA	TJ	–	–

ISSUED FOR CONSTRUCTION

DISCIPLINE INTERFACE: 1 2 3 4

SCALE: 1"=5' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
EAST POND EAST SLOPE BUTTRESS
LOGS OF BORINGS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	R. ELLISON	Z. MASSEY	H. APARICIO	S. VEMURI	H. APARICIO	T. JOHNSON

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PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 03/04/10 | 64 | C | 10W711-09 | R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 03/02/2010 USER: ELLISON, DOC
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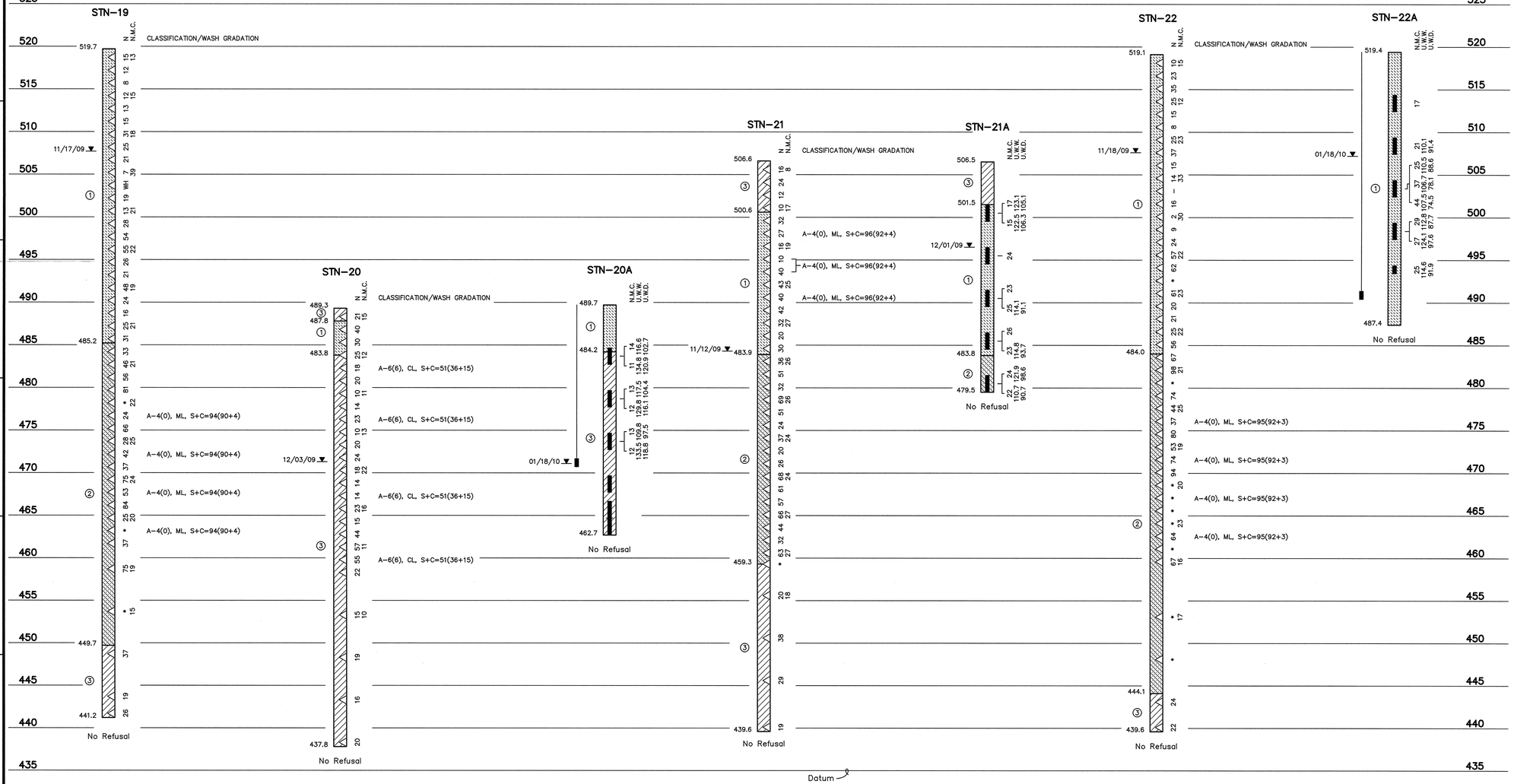

LEGEND

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- ② Gypsum: Dark gray to gray, moist to wet and very loose to very dense
- ③ Mine Spoil: Lean to sandy lean clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone and siltstone fragments
- Denotes location of Piezometer Tip
- WH Weight of Hammer
- Standard Penetration Test Interval
- Undisturbed Thin-Walled (Shelby) Tube Sample
- N Standard Penetration Test Blow Count (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. Unconfined Compressive Strength
- 2/12/09 Water Level and Date Recorded
- No Refusal No Refusal Encountered
- * Standard Penetration Test (SPT) terminated per ASTM D 1586-99.
- Refer to typed boring log.

NOTES:

1. Natural Moisture Content testing of samples containing gypsum flyash material were conducted at 40°C and 200°C. For clarity only the 40°C have been reported on the drawings. The results from 200°C tests can be found in the geotechnical report. Natural Moisture Content testing of samples containing residual clay material were conducted at 110°C, only.
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LOGS OF BORINGS
SCALE: 1"=5' (VERTICAL ONLY)

ISSUED FOR CONSTRUCTION

PLOT DATE: 03/31/2010 USER: ELLISON, DOC
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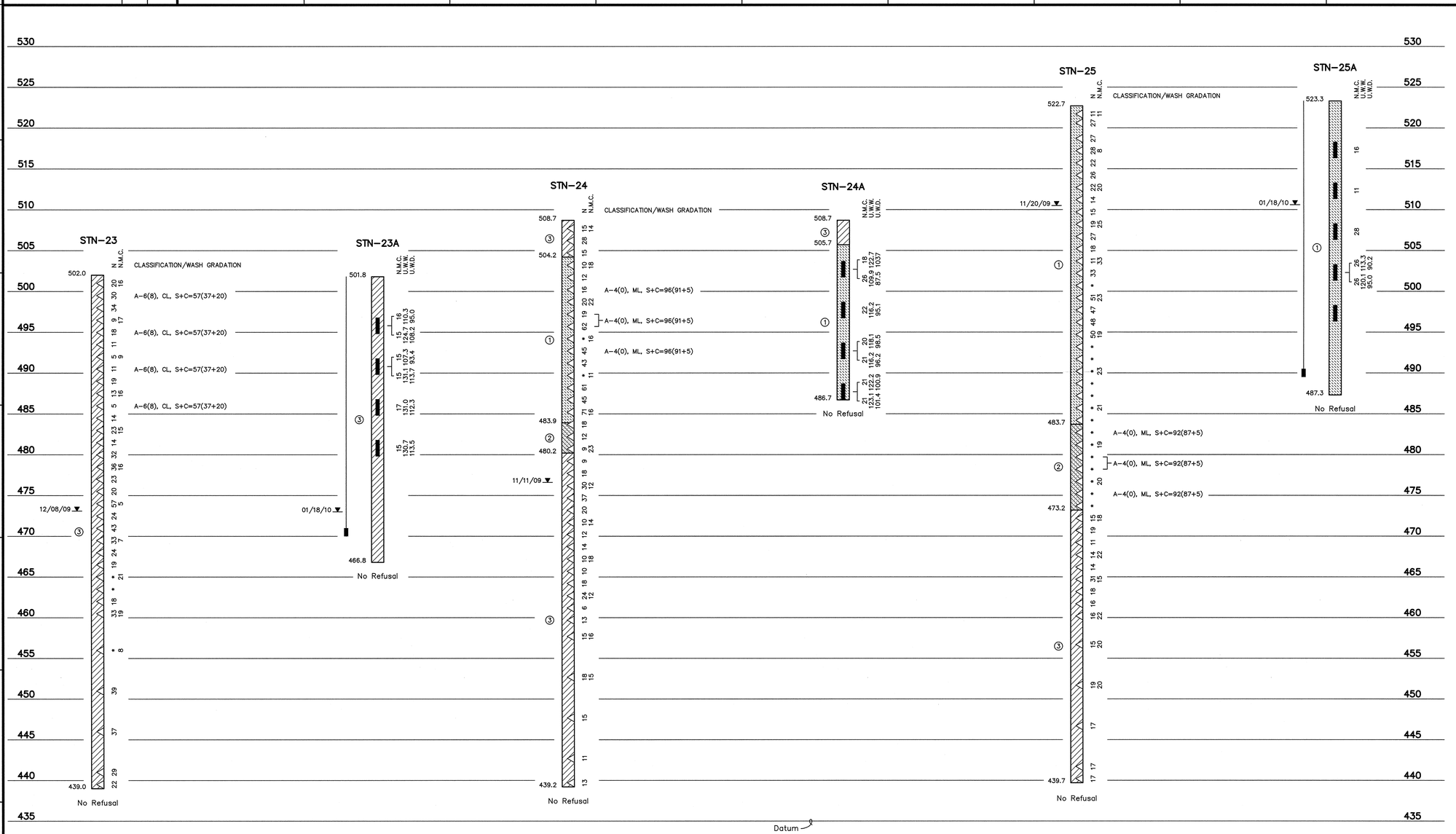

LEGEND

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- ② Gypsum: Dark gray to gray, moist to wet and very loose to very dense
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- Denotes location of Piezometer Tip
- WH Weight of Hammer
- Standard Penetration Test Interval
- Undisturbed Thin-Walled (Shelby) Tube Sample
- N Standard Penetration Test Blow Count (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. Unconfined Compressive Strength
- 2/12/09 Water Level and Date Recorded
- No Refusal No Refusal Encountered
- * Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

NOTES:

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LOGS OF BORINGS
SCALE: 1"=5' (VERTICAL ONLY)

ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPGPAFFESCDX00000020100007

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 0	03/04/10	SV	RWE	ZCM	HRA	SV	HRA	TJ	–	–

ISSUED FOR CONSTRUCTION

DISCIPLINE INTERFACE

SCALE: 1"=5' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
EAST POND EAST SLOPE BUTTRESS
LOGS OF BORINGS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	R. ELLISON	Z. MASSEY	H. APARICIO	S. VEMURI	H. APARICIO	T. JOHNSON

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Lexington, Kentucky
40511-2050
Tel. 859.422.3000
Fax 859.422.3100
www.stantec.com

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

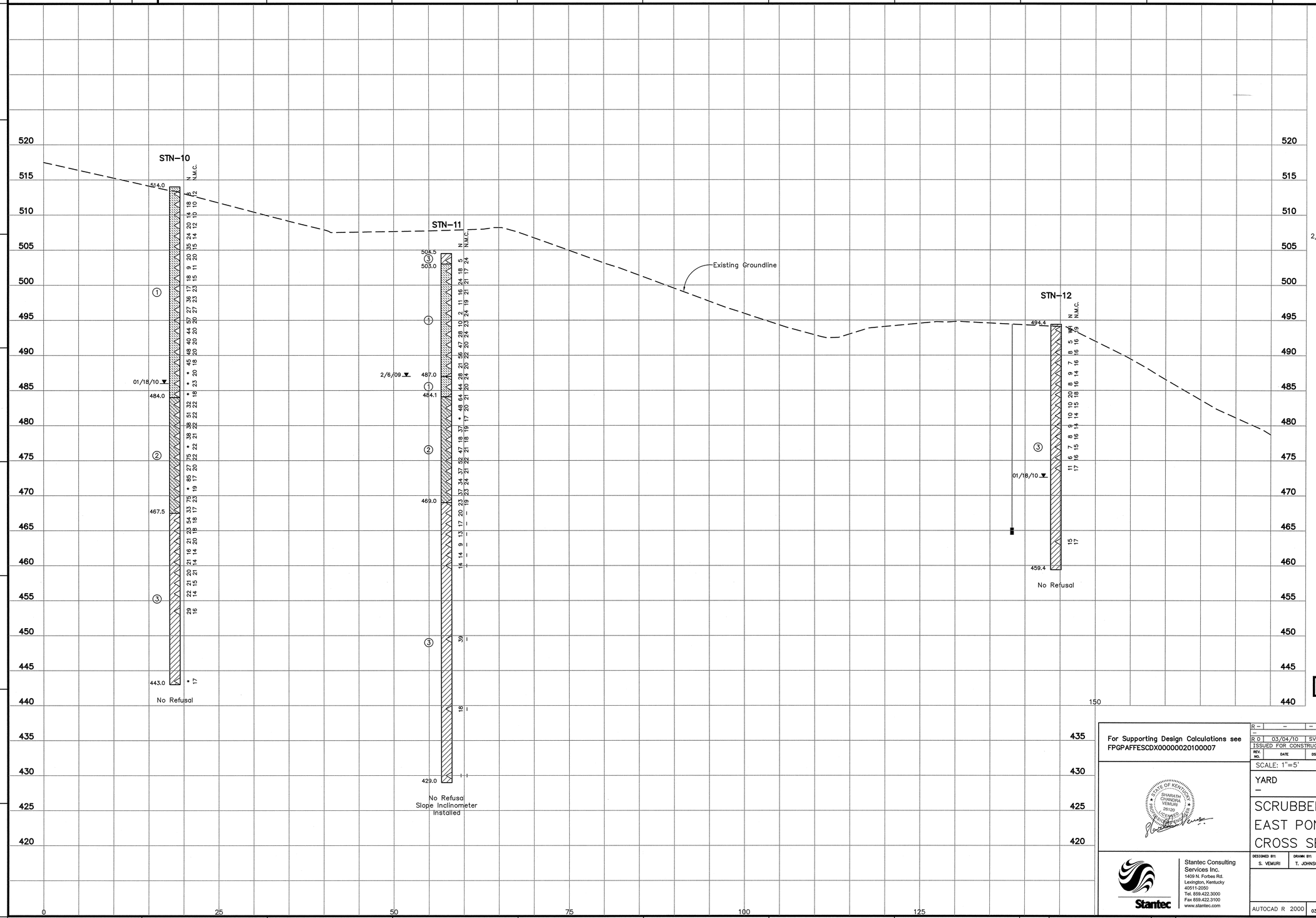
AUTOCAD R 2000 | DATE: 03/04/10 | 64 | C | 10W711-11 | R 0

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 03/05/2010 USER: ELLISON, DOC
N:\DOCUMENTS\DRAWINGS\SCRUBBER_SLUDGE_COMPLEX\EAST_POND\EAST_SLOPE\BUTTRESS\REVG_JF\10W711-11-REVG.DWG



LEGEND

- ① Gypsum – Fly Ash: Dark gray to gray, moist to wet and very loose to very dense
- ② Gypsum: Dark gray to gray, moist to wet and very loose to very dense
- ③ Mine Spoil: Lean to sandy lean clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogeneous mixture of coal, shale, sandstone and siltstone fragments
- Denotes location of Piezometer Tip
- WH Weight of Hammer
- Standard Penetration Test Interval
- Undisturbed Thin-Walled (Shelby) Tube Sample
- N Standard Penetration Test Blow Count (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. Unconfined Compressive Strength
- 2/12/09 Water Level and Date Recorded
- No Refusal No Refusal Encountered
- * Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

NOTES:

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ISSUED FOR CONSTRUCTION

PLOT DATE: 03/29/2010 USER: EUSON, ERIC
L:\1705\ACTIVE\172540440\GEOTECHNICAL\DRAWING\SCRUBBER_SLUDGE_COMPLEX\EAST_POND\EAST_SLOPE\BUTTRESS\REVD_FCV\10W711-12-R0.DWG

For Supporting Design Calculations see FPGPAFFESCDX00000020100007

STATE OF KENTUCKY · SHARATH CHANDRA VEMURI · 28120 · LICENSED PROFESSIONAL ENGINEER

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R –	–	–	–	–	–	–	–	–	–	–
R 0	03/04/10	SV	TJ	SV	HRA	SV	HRA	TJ	–	–
ISSUED FOR CONSTRUCTION										

DISCIPLINE INTERFACE

SCALE: 1"=5' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
EAST POND EAST SLOPE BUTTRESS
CROSS SECTION D-D'

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVISED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	T. JOHNSON	S. VEMURI	H. APARICIO	S. VEMURI	H. APARICIO	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 03/04/10 | 64 | C | 10W711-12 | R 0

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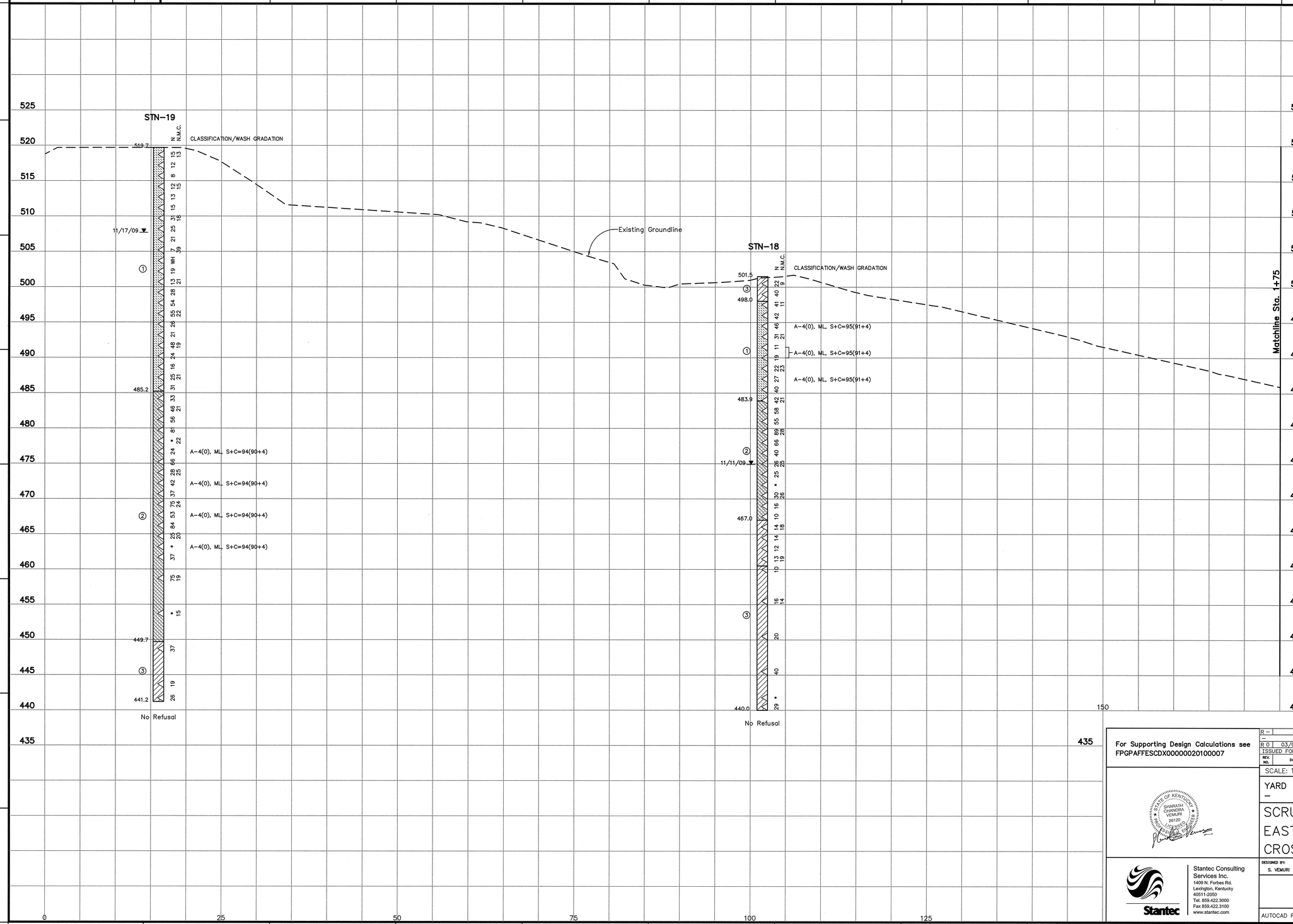
STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR: XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY



LEGEND

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- ② Gypsum: Dark gray to gray, moist to wet and very loose to very dense
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- Denotes location of Piezometer Tip
- WH Weight of Hammer
- Standard Penetration Test Interval
- Undisturbed Thin-Walled (Shelby) Tube Sample
- N Standard Penetration Test Blow Count (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. Unconfined Compressive Strength
- 2/12/09 Water Level and Date Recorded
- No Refusal No Refusal Encountered
- * Standard Penetration Test (SPT) terminated per ASTM D 1586-99. Refer to typed boring log.

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ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPGPAFFESCDX00000020100007

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV NO.
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	03/04/10	SV	TJ	SV	HRA	SV	HRA	TJ	–	–	–
ISSUED FOR CONSTRUCTION											

DISCIPLINE INTERFACE: 1 1 1 1

SCALE: 1"=5' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
EAST POND EAST SLOPE BUTTRESS
CROSS SECTION F-F'

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	T. JOHNSON	S. VEMURI	H. APARICIO	S. VEMURI	H. APARICIO	T. JOHNSON

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE: 03/04/10 | 64 | C | 10W711-13 | R 0

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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: 02/22/2010 USER: ELLISON, DOC
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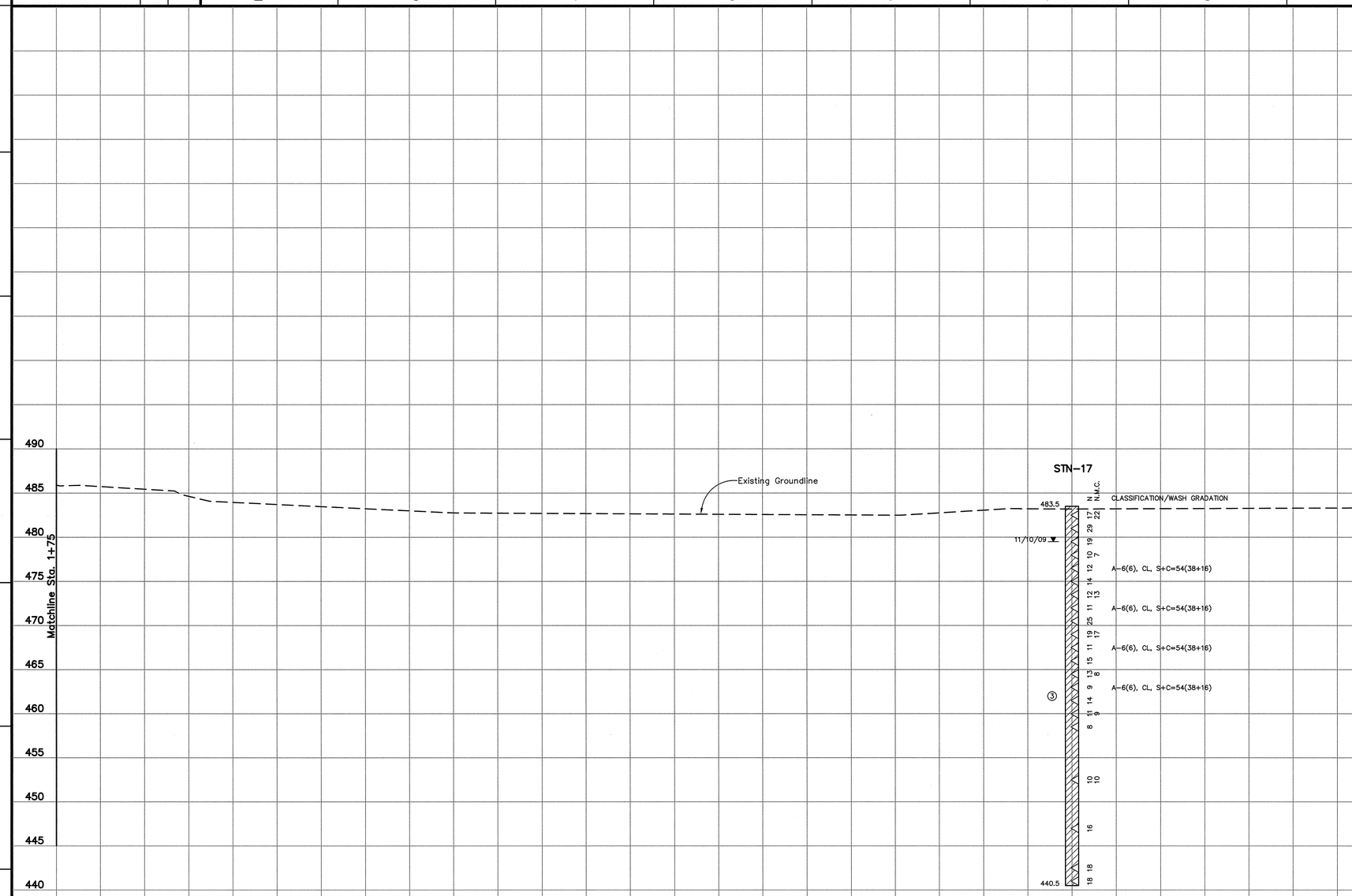

LEGEND

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	Denotes location of Piezometer Tip
WH	Weight of Hammer
◁	Standard Penetration Test Interval
■	Undisturbed Thin-Walled (Shelby) Tube Sample
N	Standard Penetration Test Blow Count (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.	Unconfined Compressive Strength
2/12/09 ▼	Water Level and Date Recorded
No Refusal	No Refusal Encountered
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ISSUED FOR CONSTRUCTION

PLOT DATE: 03/01/2010 USER: ELLISON, JON
N:\SOUTH\PROJECTS\PARADISE\CAD\DRAWINGS\SCRUBBER_SLUDGE_COMPLEX\EAST_POND\EAST_SLOPE\BUTTRESS\VER06_EFG\10W711-14-R0.DWG

For Supporting Design Calculations see FPGPAFFESCDX00000020100007

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R –	–	–	–	–	–	–	–	–	–	–
R 0	03/04/10	SV	TJ	SV	HRA	SV	HRA	TJ	–	–

ISSUED FOR CONSTRUCTION

DISCIPLINE INTERFACE

SCALE: 1"=5' EXCEPT AS NOTED

YARD

–

SCRUBBER SLUDGE COMPLEX
EAST POND EAST SLOPE BUTTRESS
CROSS SECTION F–F'

STATE OF KENTUCKY · SHARATH CHANDRA VEMURI · 26120 · LICENSED PROFESSIONAL ENGINEER

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DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	T. JOHNSON	S. VEMURI	H. APARICIO	S. VEMURI	H. APARICIO	T. JOHNSON

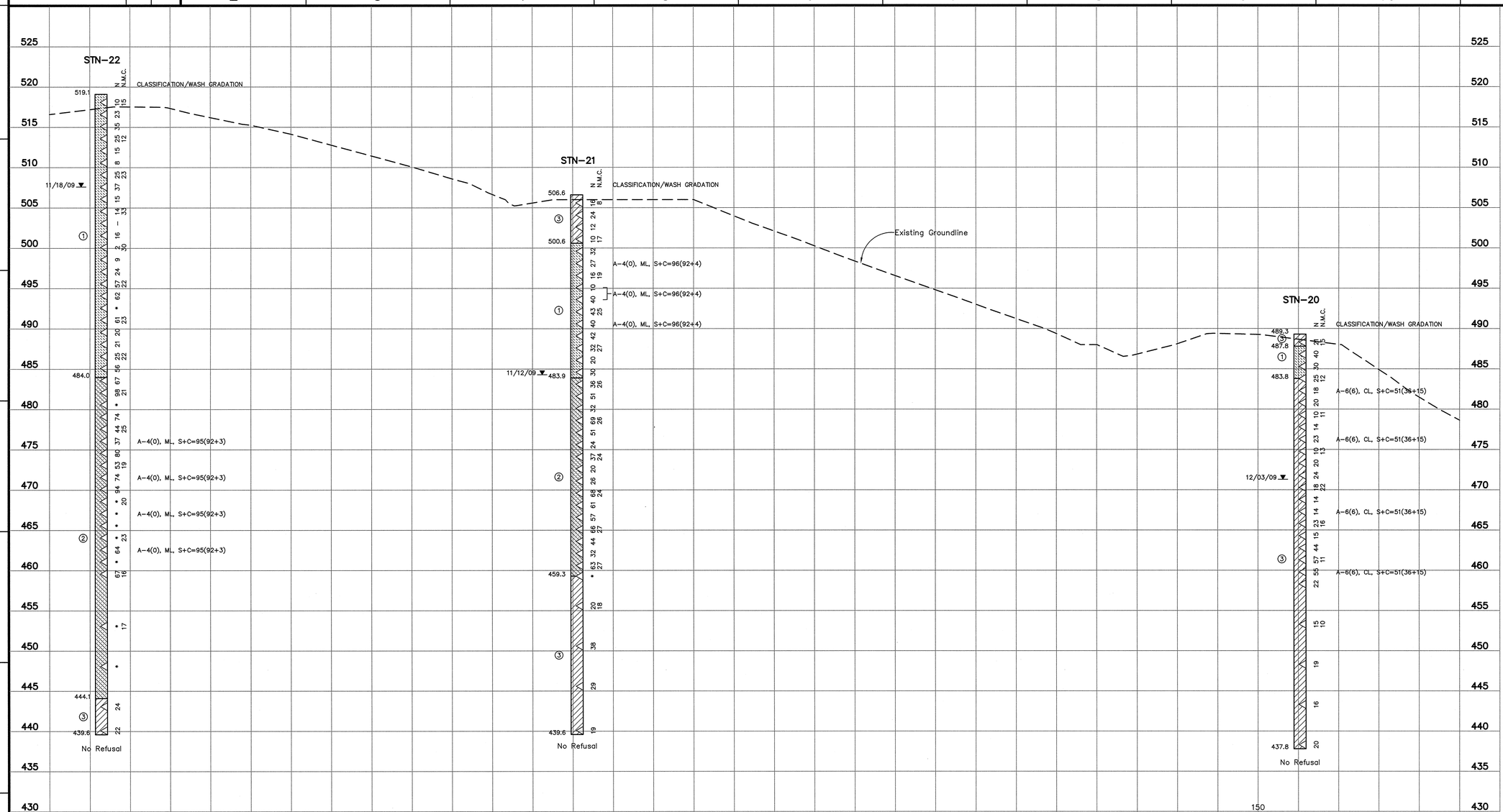
PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 03/04/10	64	C	10W711-14	R 0

STANTEC 0
TASK COMPLETED BY: REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY



LEGEND

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U.W.W.	Unit Weight Wet (lbs./cu.ft.)
U.W.D.	Unit Weight Dry (lbs./cu.ft.)
U.C.	Unconfined Compressive Strength
2/12/09 ▼	Water Level and Date Recorded
No Refusal	No Refusal Encountered
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ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPGPAFFESCDX00000020100007

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT 10	AS CONST	REV. CD
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	03/04/10	SV	TJ	SV	HRA	SV	HRA	TJ	–	–	–

ISSUED FOR CONSTRUCTION

DISCIPLINE INTERFACE

SCALE: 1"=5' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
EAST POND EAST SLOPE BUTTRESS
CROSS SECTION G-G'

STATE OF KENTUCKY · SHARATH CHANDRA VEMURI · 26120 · LICENSED PROFESSIONAL ENGINEER

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DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	T. JOHNSON	S. VEMURI	H. APARICIO	S. VEMURI	H. APARICIO	T. JOHNSON

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TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

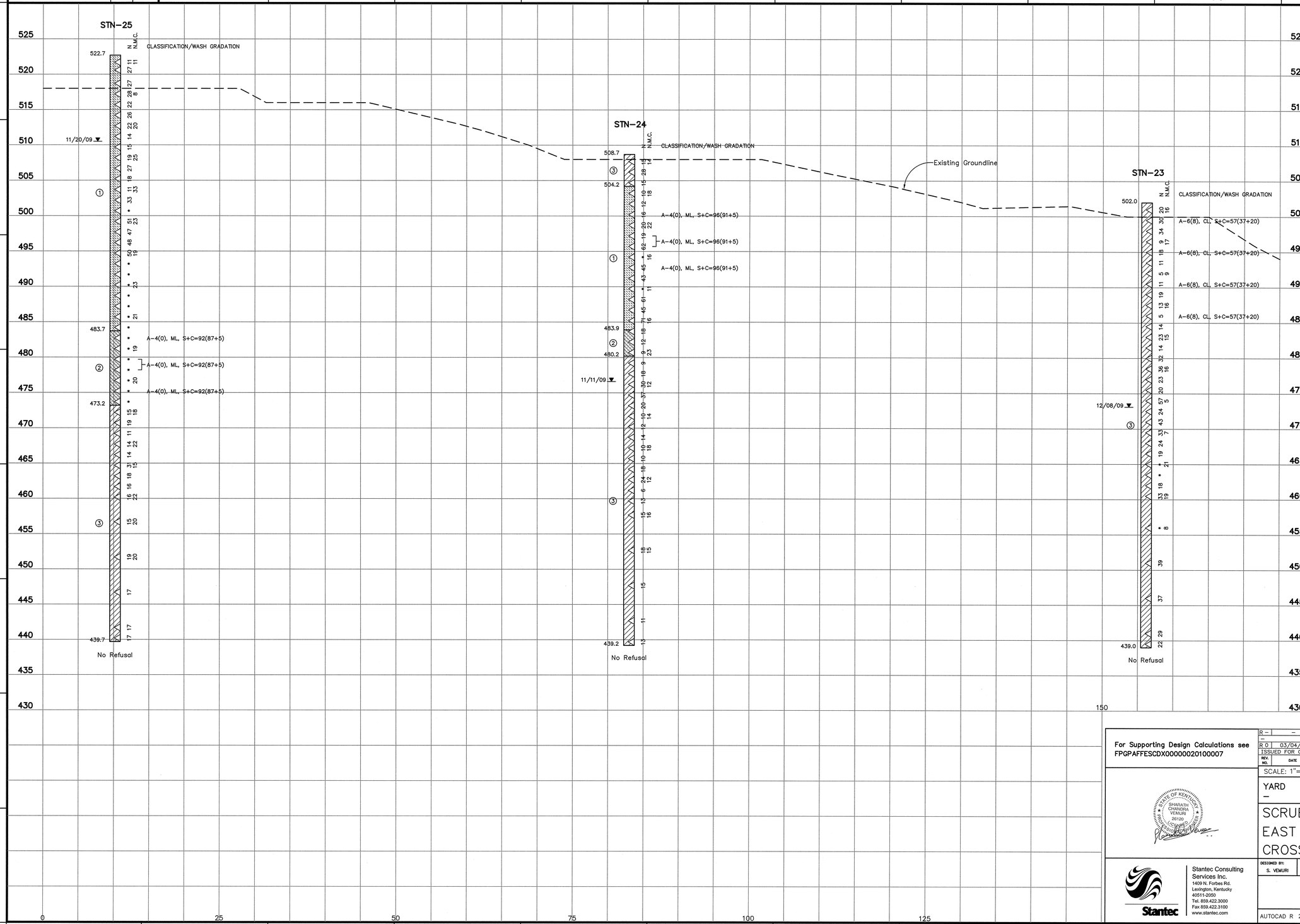
AUTOCAD R 2000	DATE 03/04/10	64	C	10W711-15	R 0

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 03/05/2010 USER: ELLISON, DOC
K:\T29S\ACTIVE\755204AA\GEOTECHNICAL\DRAWING\SCRUBBER_SLUDGE_COMPLEX\EAST_POND\EAST_SLOPE\BUTTRESS\VIEWS_JPG\10W711-15-R0.DWG



LEGEND

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- U.W.W. Unit Weight Wet (lbs./cu.ft.)
- U.W.D. Unit Weight Dry (lbs./cu.ft.)
- U.C. Unconfined Compressive Strength
- 2/12/09 Water Level and Date Recorded
- No Refusal No Refusal Encountered
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ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPGPAFFESCDX00000020100007

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT 10	AS CONST
R –	–	–	–	–	–	–	–	–	–	–
R 0	03/04/10	SV	TJ	SV	HRA	SV	HRA	TJ	–	–
ISSUED FOR CONSTRUCTION										

015C2PLINE INTERFACE

SCALE: 1"=5' EXCEPT AS NOTED

YARD
–

SCRUBBER SLUDGE COMPLEX
EAST POND EAST SLOPE BUTTRESS
CROSS SECTION H-H'

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
S. VEMURI	T. JOHNSON	S. VEMURI	H. APARICIO	S. VEMURI	H. APARICIO	T. JOHNSON

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FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 03/04/10	64	C	10W711-16	R 0

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 03/01/2010 USER: ELLISON, ROC
V:\1795\ACTIVE\179599AA\GEOTECH\CAD\DRAWING\SCRUBBER_SLUDGE_COMPLEX\EAST_POND\EAST_SLOPE\BUTTRESS\VEMURI_SCRUBBER_SLUDGE_COMPLEX_EAST_POND_EAST_SLOPE_BUTTRESS_CROSS_SECTION_H-H'.DWG

Attachment B

Logs of Borings

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-10** Total Depth 71.0 ft
County	Muhlenberg, KY	Surface Elevation	514.0 ft
Project Type	Geotechnical Exploration	Date Started	2/23/09 Completed 2/23/09
Supervisor	R. Riker Driller K. Clements	Depth to Water	15.0 ft Date/Time 2/23/09
Logged By	R. Riker	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
514.0	0.0	Top of Hole							
		Gypsum-Fly Ash: Dark gray to gray, moist to wet and medium loose to very dense		SPT-1	0.0 - 1.5	1.2	2-3-5	--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
				SPT-2	1.5 - 3.0	1.2	7-10-8	--	
				SPT-3	3.0 - 4.5	1.2	6-6-8	--	
				SPT-4	4.5 - 6.0	1.5	5-6-14	--	Boring grouted from 0 to 71.0 feet.
				SPT-5	6.0 - 7.5	1.3	11-11-13	--	
				SPT-6	7.5 - 9.0	1.2	14-19-16	--	
				SPT-7	9.0 - 10.5	0.9	8-9-11	--	
				SPT-8	10.5 - 12.0	1.2	12-5-4	--	
				SPT-9	12.0 - 13.5	0.9	8-9-9	--	
				SPT-10	13.5 - 15.0	1.5	11-12-5	--	
				SPT-11	15.0 - 16.5	1.5	14-19-17	--	
				SPT-12	16.5 - 18.0	1.2	12-12-15	--	
				SPT-13	18.0 - 19.5	1.5	23-30-27	--	
				SPT-14	19.5 - 21.0	1.5	12-21-23	--	
				SPT-15	21.0 - 22.5	1.5	15-20-20	--	
				SPT-16	22.5 - 24.0	1.5	15-25-23	--	
				SPT-17	24.0 - 25.5	1.5	9-20-25	--	
				SPT-18	25.5 - 27.0	1.5	50+	--	
				SPT-19	27.0 - 28.5	1.0	30-50+	--	
484.0	30.0			SPT-20	28.5 - 30.0	1.5	34-50+	--	
		Gypsum: Dark gray to gray, moist to wet and medium loose to very dense		SPT-21	30.0 - 31.5	1.3	12-15-17	--	
				SPT-22	31.5 - 33.0	1.4	17-30-21	--	
				SPT-23	33.0 - 34.5	1.3	17-17-21	--	
				SPT-24	34.5 - 36.0	1.5	10-18-20	--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, Ky

Project Name PAF: Phase 2 | Boring No. **STN-10** | Total Depth 71.0 ft

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
		Gypsum: Dark gray to gray, moist to wet and medium loose to very dense *(Continued)*		SPT-25	36.0 - 37.5	1.5	12-36-50+	--	
				SPT-26	37.5 - 39.0	1.5	17-36-39	--	
				SPT-27	39.0 - 40.5	1.5	10-14-13	--	
				SPT-28	40.5 - 42.0	1.5	34-35-50	--	
				SPT-29	42.0 - 43.5	1.5	30-50+	--	
				SPT-30	43.5 - 45.0	1.3	12-30-45	--	
467.5	46.5			SPT-31	45.0 - 46.5	1.4	6-7-26	--	
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.		SPT-32	46.5 - 48.0	1.0	20-25-29	--	
				SPT-33	48.0 - 49.5	0.6	10-12-11	--	
				SPT-34	49.5 - 51.0	0.5	8-8-13	--	
				SPT-35	51.0 - 52.5	0.5	6-6-10	--	
				SPT-36	52.5 - 54.0	0.8	6-10-11	--	
				SPT-37	54.0 - 55.5	0.9	7-8-12	--	
				SPT-38	55.5 - 57.0	0.8	6-9-12	--	
				SPT-39	57.0 - 58.5	1.0	8-10-12	--	
				SPT-40	59.5 - 61.0	0.7	4-19-10	--	
443.0	71.0			SPT-41	69.5 - 71.0	0.9	50+	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT~GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-10A** Total Depth 51.5 ft
County	Muhlenberg, KY	Surface Elevation	514.0 ft
Project Type	Geotechnical Exploration	Date Started	2/23/09 Completed 2/24/09
Supervisor	R. Riker Driller K. Clements	Depth to Water	26.8 ft Date/Time 2/24/09
Logged By	R. Riker	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
514.0	0.0	Top of Hole							
		Gypsum-Fly Ash: Dark gray to gray, moist to wet and medium loose to very dense							Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
				ST-1	4.5 - 6.5	2.0		--	Piezometer Installed. See Figure in Appendix D.
				ST-2	9.5 - 11.5	2.0		--	
				ST-3	14.5 - 16.5	1.7		--	
				ST-4	19.5 - 21.5	2.0		--	
				ST-5	24.5 - 26.5	2.0		--	
484.0	30.0								
		Gypsum: Dark gray to gray, moist to wet and medium loose to very dense		ST-6	29.5 - 31.5	1.8		--	
				ST-7	34.5 - 36.5	1.5		--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, Ky

Project Name PAF: Phase 2 | Boring No. **STN-10A** | Total Depth 51.5 ft

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
Elevation	Depth								
		Gypsum: Dark gray to gray, moist to wet and medium loose to very dense *(Continued)*		ST-8	39.5 - 41.5	1.3		--	
				ST-9	44.5 - 46.5	2.0		--	
467.5	46.5								
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.		ST-10	49.5 - 51.5	0.0		--	
462.5	51.5	No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT~GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-11** Total Depth 75.5 ft
County	Muhlenberg, KY	Surface Elevation	504.5 ft
Project Type	Geotechnical Exploration	Date Started	2/3/09 Completed 2/6/09
Supervisor	B. Evans Driller K. Clements	Depth to Water	25.1 ft Date/Time 2/4/09
Logged By	B. Evans	Depth to Water	17.5 ft Date/Time 2/6/09

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
504.5	0.0	Top of Hole							
503.0	1.5	Mine Spoil: Clay, brownish gray, damp and soft.		SPT-1	0.0 - 1.5	1.0	2-2-3	--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
		Gypsum-Fly Ash: Gray to brown, moist to saturated and very loose to dense.		SPT-2	1.5 - 3.0	0.2	7-8-10	--	
				SPT-3	3.0 - 4.5	1.2	9-12-12	--	
				SPT-4	4.5 - 6.0	1.5	6-7-9	--	
				SPT-5	6.0 - 7.5	1.5	5-5-6	--	Slope Inclinometer Installed. See Figure in Appendix D
				SPT-6	7.5 - 9.0	1.0	2-1-1	--	
				SPT-7	9.0 - 10.5	1.5	3-6-4	--	
				SPT-8	10.5 - 12.0	1.5	9-14-14	--	
				SPT-9	12.0 - 13.5	1.5	22-22-25	--	
				SPT-10	13.5 - 15.0	1.5	28-26-30	--	
				SPT-11	15.0 - 16.5	1.5	3-9-12	--	
487.0	17.5			SPT-12	16.5 - 18.0	1.5	12-14-14	--	
		Gypsum-Fly Ash: Dark brown to dark gray, wet and dense to very dense.		SPT-13	18.0 - 19.5	1.5	17-20-24	--	
484.1	20.4			SPT-14	19.5 - 21.0	1.5	5-34-30	--	
		Gypsum: Dark brown to dark gray, wet and dense to very dense.		SPT-15	21.0 - 22.5	1.5	5-23-25	--	
				SPT-16	22.5 - 24.0	1.5	50+	--	
				SPT-17	24.0 - 25.5	1.5	8-16-21	--	
				SPT-18	25.5 - 27.0	1.5	3-6-12	--	
				SPT-19	27.0 - 28.5	1.5	16-20-27	--	
				SPT-20	28.5 - 30.0	0.8	18-20-32	--	
				SPT-21	30.0 - 31.5	1.5	9-21-16	--	
				SPT-22	31.5 - 33.0	1.5	16-20-14	--	
				SPT-23	33.0 - 34.5	0.5	17-17-20	--	
469.0	35.5			SPT-24	34.5 - 36.0	1.5	9-13-10	--	

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT~GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, Ky

Project Name PAF: Phase 2 | Boring No. **STN-11** | Total Depth 75.5 ft

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
Elevation	Depth								
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments. *(Continued)*		SPT-25	36.0 - 37.5	0.5	10-11-9	--	
				SPT-26	37.5 - 39.0	0.8	8-8-9	--	
				SPT-27	39.0 - 40.5	0.5	7-6-7	--	
				SPT-28	40.5 - 42.0	0.8	3-4-5	--	
				SPT-29	42.0 - 43.5	1.0	5-6-8	--	
				SPT-30	43.5 - 45.0	1.0	7-7-7	--	
				SPT-31	54.0 - 55.5	1.0	15-22-17	--	
				SPT-32	64.0 - 65.5	1.5	10-10-8	--	
				SPT-33	74.0 - 75.0	1.5	-----	--	
429.0	75.5	No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT-GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky		
Project Name	PAF: Phase 2	Boring No.	**STN-11A**	Total Depth	12.0 ft
County	Muhlenberg, KY	Surface Elevation	504.4 ft		
Project Type	Geotechnical Exploration	Date Started	2/6/09	Completed	2/6/09
Supervisor	B. Evans Driller K. Clements	Depth to Water	Dry	Date/Time	2/6/09
Logged By	B. Evans	Depth to Water	--	Date/Time	--

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
504.4	0.0	Top of Hole							
502.9	1.5	Mine Spoil: Clay, brownish gray, damp and soft.							Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
		Gypsum-Fly Ash: Gray to brown, moist to saturated and very loose to dense.		ST-1	5.0 - 7.0	2.0		--	Boring grouted from 0 to12.0 feet.
492.4	12.0			ST-2	10.0 - 12.0	2.0		--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT~GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, Ky
Project Name	PAF: Phase 2	Boring No.	**STN-12** Total Depth 35.0 ft
County	Muhlenberg, KY	Surface Elevation	494.4 ft
Project Type	Geotechnical Exploration	Date Started	2/26/09 Completed 2/26/09
Supervisor	R. Riker Driller K. Clements	Depth to Water	20.8 ft Date/Time 2/27/09
Logged By	R. Riker	Depth to Water	-- Date/Time --

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
494.4	0.0	Top of Hole							
		Mine Spoil: Lean to fat clay with intermediate sand lenses, gray to dark gray, moist to wet, soft to very stiff and with heterogenous mixture of coal, shale, sandstone and siltstone fragments.		SPT-1	0.0 - 1.5	0.6	WOH-WOH-2	--	Boring advanced with 4-1/4 I.D. Hollow Stem Augers.
				SPT-2	1.5 - 3.0	0.8	2-2-3	--	
				SPT-3	3.0 - 4.5	0.9	2-4-4	--	Piezometer Installed. See Figure in Appendix D.
				SPT-4	4.5 - 6.0	0.9	2-3-4	--	
				SPT-5	6.0 - 7.5	0.6	3-4-5	--	
				SPT-6	7.5 - 9.0	1.1	2-5-3	--	
				SPT-7	9.0 - 10.5	1.5	4-9-11	--	
				SPT-8	10.5 - 12.0	1.3	5-5-5	--	
				SPT-9	12.0 - 13.5	1.0	5-5-5	--	
				SPT-10	13.5 - 15.0	0.7	5-5-4	--	
				SPT-11	15.0 - 16.5	1.2	3-4-4	--	
				SPT-12	16.5 - 18.0	0.6	6-4-3	--	
				SPT-13	18.0 - 19.5	1.2	4-3-3	--	
				SPT-14	19.5 - 21.0	1.4	3-4-7	--	
				SPT-15	30.0 - 31.5	1.3	6-7-8	--	
459.4	35.0								
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY PARADISE FOSSIL PLANT~GYPSUM STACK.GPJ FMSM-GRAPHIC LOG.GDT 8/5/09

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY		
Project Name	Scrubber Sludge Complex	Boring No.	**STN-17**	Total Depth	43.0 ft
County	Muhlenberg	Surface Elevation	483.0 ft		
Project Type	Geotechnical Exploration	Date Started	11/10/09	Completed	11/10/09
Supervisor	AKS Driller Mark Martin	Depth to Water	4.0 ft	Date/Time	11/10/09
Logged By	AKS	Depth to Water	N/A	Date/Time	N/A

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
483.0'	0.0'	Top of Hole							
		Mine Spoil: Lean to Fat Clay with intermediate sand lenses, gray to dark gray, moist to west, soft to very stiff and with heterogenous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-1	0.0' - 1.5'	0.7'	4-9-8	--	
				SPT-2	1.5' - 3.0'	1.0'	6-13-16	--	
				SPT-3	3.0' - 4.5'	0.4'	9-13-6	--	
				SPT-4	4.5' - 6.0'	0.3'	6-6-4	--	
				SPT-5	6.0' - 7.5'	1.2'	9-6-6	--	
				SPT-6	7.5' - 9.0'	1.2'	10-8-6	--	
				SPT-7	9.0' - 10.5'	0.7'	3-6-6	--	
				SPT-8	10.5' - 12.0'	0.6'	6-6-5	--	
				SPT-9	12.0' - 13.5'	0.5'	17-16-9	--	
				SPT-10	13.5' - 15.0'	0.2'	7-9-10	--	
				SPT-11	15.0' - 16.5'	1.2'	5-6-5	--	
				SPT-12	16.5' - 18.0'	0.5'	6-8-7	--	
				SPT-13	18.0' - 19.5'	0.7'	6-6-7	--	
				SPT-14	19.5' - 21.0'	0.7'	4-4-5	--	
				SPT-15	21.0' - 22.5'	1.3'	9-8-6	--	
				SPT-16	22.5' - 24.0'	1.2'	3-4-7	--	
				SPT-17	24.0' - 25.5'	0.3'	9-3-5	--	
				SPT-18	30.0' - 31.5'	1.5'	5-5-5	--	
				SPT-19	35.5' - 37.0'	1.0'	11-6-10	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number 175569040 Location Drakesboro, KY

Project Name Scrubber Sludge Complex Boring No. **STN-17** Total Depth 43.0 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
				SPT-20	40.0' - 41.5'	0.6'	9-9-9	--	Backfilled from 43.0 to 0.0 Bentonite grout
440.0'	43.0'			SPT-21	41.5' - 43.0'	0.2'	9-10-8	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN-18** Total Depth 61.5 ft
County	Muhlenberg	Surface Elevation	501.6 ft
Project Type	Geotechnical Exploration	Date Started	11/10/09 Completed 11/11/09
Supervisor	AKS Driller Mark Martin	Depth to Water	26.6 ft Date/Time 11/11/09
Logged By	AKS	Depth to Water	N/A Date/Time N/A

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
501.6'	0.0'	Top of Hole							
		Mine Spoil: Lean to Fat Clay with intermediate sand lenses, gray to dark gray, moist to west, soft to very stiff and with heterogenous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-1	0.0' - 1.5'	'	9-9-13	--	
				SPT-2	1.5' - 3.0'	'	16-20-20	--	
498.1'	3.5'			SPT-3	3.0' - 3.5'	'	5-16-25	--	
				SPT-3A	3.5' - 4.5'	'	5-16-25	--	
				SPT-4	4.5' - 6.0'	'	5-17-25	--	
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense		SPT-5	6.0' - 7.5'	'	17-21-25	--	
				SPT-6	7.5' - 9.0'	'	11-15-16	--	
				SPT-7	9.0' - 10.5'	'	7-6-5	--	
				SPT-8	10.5' - 12.0'	'	5-9-10	--	
				SPT-9	12.0' - 13.5'	'	5-11-11	--	
				SPT-10	13.5' - 15.0'	'	5-17-10	--	
				SPT-11	15.0' - 16.5'	'	10-20-20	--	
				SPT-12	16.5' - 18.0'	'	15-16-26	--	
				SPT-13	18.0' - 19.5'	'	11-34-24	--	
				SPT-14	19.5' - 21.0'	'	8-19-36	--	
				SPT-15	21.0' - 22.5'	'	26-40-49	--	
				SPT-16	22.5' - 24.0'	'	11-30-36	--	
				SPT-17	24.0' - 25.5'	'	20-20-20	--	
				SPT-18	25.5' - 27.0'	'	11-9-17	--	
				SPT-19	27.0' - 28.5'	'	7-10-15	--	
				SPT-20	28.5' - 30.0'	'	25-27-50+	--	
				SPT-21	30.0' - 31.5'	'	20-10-20	--	
				SPT-22	31.5' - 33.0'	'	5-7-9	--	
467.1'	34.5'			SPT-23	33.0' - 34.5'	'	3-4-6	--	
				SPT-24	34.5' - 36.0'	'	3-6-8	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, KY

Project Name Scrubber Sludge Complex | Boring No. **STN-18** | Total Depth 61.5 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		Mine Spoil: Lean to Fat Clay with intermediate sand lenses, gray to dark gray, moist to west, soft to very stiff and with heterogenous mixture of coal, shale, sandstone, and siltstone fragments. *(Continued)*		SPT-25	36.0' - 37.5'	'	6-6-8	--	
				SPT-26	37.5' - 39.0'	'	3-5-7	--	
				SPT-27	39.0' - 40.5'	'	3-6-7	--	
				SPT-28	40.5' - 42.0'	'	2-3-7	--	
				SPT-29	45.0' - 46.5'	'	16-9-7	--	
				SPT-30	50.0' - 51.5'	'	10-9-11	--	
				SPT-31	55.0' - 56.5'	'	25-22-18	--	
				SPT-32	59.5' - 59.7'	'	50+	--	Backfilled with Bentonite Grout 61.5-0.0
440.1'	61.5'			SPT-33	60.0' - 61.5'	'	17-16-13	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY		
Project Name	Scrubber Sludge Complex	Boring No.	**STN-19**	Total Depth	78.5 ft
County	Muhlenberg	Surface Elevation	518.5 ft		
Project Type	Geotechnical Exploration	Date Started	11/12/09	Completed	11/17/09
Supervisor	AKS	Driller	Steve Bradford	Depth to Water	12.0 ft	Date/Time	11/17/09
Logged By	AKS			Depth to Water	N/A	Date/Time	N/A

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
518.5'	0.0'	Top of Hole							
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense		SPT-1	0.0' - 1.5'	1.3'	5-7-8	--	
				SPT-2	1.5' - 3.0'	1.4'	3-5-7	--	
				SPT-3	3.0' - 4.5'	1.3'	3-2-6	--	
				SPT-4	4.5' - 6.0'	1.4'	2-4-8	--	
				SPT-5	6.0' - 7.5'	1.5'	5-6-7	--	
				SPT-6	7.5' - 9.0'	0.9'	6-7-8	--	
				SPT-7	9.0' - 10.5'	1.4'	7-14-17	--	
				SPT-8	10.5' - 12.0'	1.3'	11-12-13	--	
				SPT-9	12.0' - 13.5'	1.4'	10-9-12	--	
				SPT-10	13.5' - 15.0'	1.5'	4-3-4	--	
				SPT-11	15.0' - 16.5'	1.4'	1-WH-WH	--	
				SPT-12	16.5' - 18.0'	1.0'	WH-8-11	--	
				SPT-13	18.0' - 19.5'	1.3'	8-7-6	--	
				SPT-14	19.5' - 21.0'	1.0'	WH-11-17	--	
				SPT-15	21.0' - 22.5'	1.5'	12-28-26	--	
				SPT-16	22.5' - 24.0'	1.4'	22-25-30	--	
				SPT-17	24.0' - 25.5'	1.4'	4-9-17	--	
				SPT-18	25.5' - 27.0'	1.3'	4-10-11	--	
				SPT-19	27.0' - 28.5'	1.2'	6-26-22	--	
				SPT-20	28.5' - 30.0'	1.5'	6-11-13	--	
				SPT-21	30.0' - 31.5'	1.3'	4-7-9	--	
				SPT-22	31.5' - 33.0'	1.4'	9-12-13	--	
				SPT-23	33.0' - 34.5'	1.2'	9-10-21	--	
				SPT-24	34.5' - 36.0'	1.0'	9-14-19	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, KY

Project Name Scrubber Sludge Complex | Boring No. **STN-19** | Total Depth 78.5 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-25	36.0' - 37.5'	1.1'	14-18-28	--	
479.5'	39.0'			SPT-26	37.5' - 39.0'	1.0'	17-20-36	--	
		Gypsum: dark gray to gray, moist to wet, loose to very dense		SPT-27	39.0' - 40.5'	1.0'	6-45-36	--	
				SPT-28	40.5' - 42.0'	0.8'	59-100+	--	
				SPT-29	42.0' - 43.5'	1.2'	7-14-10	--	
				SPT-30	43.5' - 45.0'	1.0'	8-28-38	--	
				SPT-31	45.0' - 46.5'	1.2'	4-16-12	--	
				SPT-32	46.5' - 48.0'	1.3'	14-22-20	--	
				SPT-33	48.0' - 49.5'	1.0'	9-15-22	--	
				SPT-34	49.5' - 51.0'	1.1'	9-32-43	--	
				SPT-35	51.0' - 52.5'	1.4'	30-18-35	--	
				SPT-36	52.5' - 54.0'	1.5'	16-22-62	--	
				SPT-37	54.0' - 55.5'	'	6-7-18	--	
				SPT-38	55.5' - 57.0'	'		--	
				SPT-39	57.0' - 58.5'	'		--	
				SPT-40	60.0' - 61.5'	'		--	
				SPT-41	65.0' - 66.5'	'		--	
448.5'	70.0'								
		Mine Spoil: Lean to Fat Clay with intermediate sand lenses, gray to dark gray, moist to west, soft to very stiff and with heterogenous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-42	70.0' - 71.5'	'		--	
				SPT-43	75.0' - 76.5'	'		--	Backfilled with Bentonite grout 78.5-0.0

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN-19** Total Depth 78.5 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
440.0'	78.5'			SPT-44	77.0' - 78.5'	'		--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY		
Project Name	Scrubber Sludge Complex	Boring No.	**STN -20**	Total Depth	51.5 ft
County	Muhlenberg	Surface Elevation	489.2 ft		
Project Type	Geotechnical Exploration	Date Started	12/3/09	Completed	12/3/09
Supervisor	R. Riker	Driller	Steve Bradford	Depth to Water	18.0 ft	Date/Time	12/3/09
Logged By	R. Riker	Depth to Water	N/A	Date/Time	N/A

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
489.2'	0.0'	Top of Hole							
487.7'	1.5'	Mine Spoil: Lean Clay, brown, wet, very stiff, heterogenous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-1	0.0' - 1.5'	0.8'	10-11-10	--	
				SPT-2	1.5' - 3.0'	0.9'	9-18-22	--	
484.7'	4.5'			SPT-3	3.0' - 4.5'	0.8'	10-12-18	--	
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, dense		SPT-4	4.5' - 6.0'	0.5'	8-17-8	--	Top cover by Minespoil and DGA road way
				SPT-5	6.0' - 7.5'	1.0'	8-10-8	--	
		Mine Spoil: Lean Clay, brown to dark gray, moist to west, stiff to hard, heterogenous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-6	7.5' - 9.0'	0.6'	10-10-10	--	
				SPT-7	9.0' - 10.5'	0.9'	5-4-6	--	
				SPT-8	10.5' - 12.0'	0.5'	11-6-8	--	
				SPT-9	12.0' - 13.5'	1.0'	4-5-18	--	
				SPT-10	13.5' - 15.0'	1.1'	8-4-6	--	
				SPT-11	15.0' - 16.5'	1.0'	6-8-12	--	
				SPT-12	16.5' - 18.0'	0.1'	4-12-12	--	
				SPT-13	18.0' - 19.5'	0.6'	8-10-8	--	Wet From 18.0 to 21.0
				SPT-14	19.5' - 21.0'	0.4'	3-7-7	--	
				SPT-15	21.0' - 22.5'	1.1'	3-6-8	--	
				SPT-16	22.5' - 24.0'	1.4'	10-12-11	--	
				SPT-17	24.0' - 25.5'	1.1'	5-7-8	--	
				SPT-18	25.5' - 27.0'	1.3'	8-18-26	--	
				SPT-19	27.0' - 28.5'	1.2'	17-21-36	--	
				SPT-20	28.5' - 30.0'	1.0'	21-28-27	--	
				SPT-21	30.0' - 31.5'	0.7'	11-12-10	--	
				SPT-22	35.0' - 36.5'	1.0'	7-8-7	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN -20** Total Depth 51.5 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		Mine Spoil: Lean Clay, brown to dark gray, moist to west, stiff to hard, heterogenous mixture of coal, shale, sandstone, and siltstone fragments. *(Continued)*		SPT-23	40.0' - 41.5'	1.5'	7-9-10	--	
				SPT-24	45.0' - 46.5'	1.4'	6-6-10	--	Backfilled with 2 bags quikgrout and 1 bag portland cement
437.7'	51.5'			SPT-25	50.0' - 51.5'	0.9'	8-12-8	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY		
Project Name	Scrubber Sludge Complex	Boring No.	**STN-20A**	Total Depth	27.0 ft
County	Muhlenberg	Surface Elevation	489.2 ft		
Project Type	Geotechnical Exploration	Date Started	12/3/09	Completed	12/3/09
Supervisor	R. Riker	Driller	Steve Bradford	Depth to Water	Dry	Date/Time	12/3/09
Logged By	R. Riker	Depth to Water	N/A	Date/Time	N/A

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
489.2'	0.0'	Top of Hole							
		Mine Spoil: Lean Clay, brown to dark gray, moist to west, stiff to hard (Est.) heterogenous mixture of coal, shale, sandstone, and siltstone fragments.			5.0' - 7.0'	1.4'		--	Top cover Mine spoil
					10.0' - 12.0'	1.4'		--	
					15.0' - 17.0'	1.2'		--	
									Boulder zone from 18.0 to 27.0(BOH)
					20.0' - 22.0'	0.0'		--	
					23.0' - 25.0'	0.0'		--	
									PZ Installed
462.2'	27.0'				25.0' - 27.0'	0.0'		--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN-21** Total Depth 67.0 ft
County	Muhlenberg	Surface Elevation	506.7 ft
Project Type	Geotechnical Exploration	Date Started	11/11/09 Completed 11/12/09
Supervisor	AKS Driller Mark Martin	Depth to Water	22.3 ft Date/Time 11/12/09
Logged By	BT	Depth to Water	N/A Date/Time N/A

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
506.7'	0.0'	Top of Hole							
		Mine Spoil: Lean to Fat Clay with intermediate sand lenses, gray to dark gray, moist to west, soft to very stiff and with heterogenous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-1	0.0' - 1.5'	0.6'	5-7-9	--	
				SPT-2	1.5' - 3.0'	1.1'	9-12-12	--	
				SPT-3	3.0' - 4.5'	1.1'	10-5-7	--	
500.7'	6.0'			SPT-4	4.5' - 6.0'	0.9'	5-5-5	--	
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense		SPT-5	6.0' - 7.5'	1.0'	7-17-15	--	
				SPT-6	7.5' - 9.0'	0.8'	5-12-15	--	
				SPT-7	9.0' - 10.5'	1.3'	6-8-8	--	
				SPT-8	10.5' - 12.0'	1.5'	4-4-6	--	
				SPT-9	12.0' - 13.5'	1.5'	9-20-20	--	
				SPT-10	13.5' - 15.0'	1.5'	7-17-26	--	
				SPT-11	15.0' - 16.5'	1.5'	6-16-24	--	
				SPT-12	16.5' - 18.0'	1.4'	7-21-21	--	
				SPT-13	18.0' - 19.5'	1.5'	8-12-20	--	
				SPT-14	19.5' - 21.0'	1.5'	5-7-13	--	
				SPT-15	21.0' - 22.5'	1.4'	8-13-17	--	
				SPT-16	22.5' - 24.0'	1.5'	9-16-20	--	
				SPT-17	24.0' - 25.5'	1.5'	12-21-30	--	
				SPT-18	25.5' - 27.0'	1.4'	5-13-19	--	
				SPT-19	27.0' - 28.5'	1.5'	5-19-50	--	
				SPT-20	28.5' - 30.0'	1.5'	5-19-32	--	
				SPT-21	30.0' - 31.5'	1.5'	10-12-12	--	
				SPT-22	31.5' - 33.0'	1.5'	10-12-25	--	
				SPT-23	33.0' - 34.5'	1.5'	3-7-13	--	
				SPT-24	34.5' - 36.0'	1.5'	6-10-16	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, KY

Project Name Scrubber Sludge Complex | Boring No. **STN-21** | Total Depth 67.0 ft

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense *(Continued)*		SPT-25	36.0' - 37.5'	1.3'	21-34-34	--	
				SPT-26	37.5' - 39.0'	1.5'	11-21-40	--	
				SPT-27	39.0' - 40.5'	1.5'	5-17-40	--	
				SPT-28	40.5' - 42.0'	1.5'	19-31-35	--	
				SPT-29	42.0' - 43.5'	1.5'	5-19-25	--	
				SPT-30	43.5' - 45.0'	1.4'	18-19-13	--	
				SPT-31	45.0' - 46.5'	1.4'	8-18-45	--	
459.4'	47.3'			SPT-32	46.5' - 47.3'	0.6'	30-50+	--	
		Mine Spoil: Lean to Fat Clay with intermediate sand lenses, gray to dark gray, moist to west, soft to very stiff and with heterogenous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-33	50.0' - 51.5'	1.3'	7-10-10	--	
				SPT-34	55.0' - 56.5'	1.4'	20-17-21	--	
				SPT-35	60.0' - 61.5'	1.5'	11-14-15	--	
439.7'	67.0'			SPT-36	65.5' - 67.0'	1.5'	7-9-10	--	Backfilled with Bentonite Grout 67.0-0.0
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number	175569040		Location	Drakesboro, KY	
Project Name	Scrubber Sludge Complex		Boring No.	**STN-21A** Total Depth	27.0 ft
County	Muhlenberg		Surface Elevation	506.7 ft	
Project Type	Geotechnical Exploration		Date Started	12/1/09 Completed	12/1/09
Supervisor	R. Riker	Driller Steve Bradford	Depth to Water	10.0 ft Date/Time	12/1/09
Logged By	R. Riker		Depth to Water	N/A Date/Time	N/A

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
506.7'	0.0'	Top of Hole							
501.7'	5.0'	Mine Spoil: Lean Clay, brown to dark gray, moist to west, stiff to hard (Est.) heterogenous mixture of coal, shale, sandstone, and siltstone fragments.							
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense(Est.)			5.0' - 7.0'	1.7'		--	Top Cover by minespoil roadway
					10.0' - 12.0'	1.1'		--	
					15.0' - 17.0'	1.6'		--	
					20.0' - 22.0'	1.0'		--	Backfilled by 2 bags Quikgrout, and 1 bag Portland Cement
479.7'	27.0'				25.0' - 27.0'	1.5'		--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY		
Project Name	Scrubber Sludge Complex	Boring No.	**STN-22**	Total Depth	79.5 ft
County	Muhlenberg	Surface Elevation	519.1 ft		
Project Type	Geotechnical Exploration	Date Started	11/17/09	Completed	11/18/09
Supervisor	AKS	Driller	Steve Bradford	Depth to Water	11.5 ft	Date/Time	11/18/09
Logged By	AKS	Depth to Water	N/A	Date/Time	N/A

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
519.1'	0.0'	Top of Hole							
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense		SPT-1	0.0' - 1.5'	1.4'	3-5-5	--	
				SPT-2	1.5' - 3.0'	0.9'	9-12-11	--	
				SPT-3	3.0' - 4.5'	1.1'	12-17-18	--	
				SPT-4	4.5' - 6.0'	0.8'	5-12-13	--	
				SPT-5	6.0' - 7.5'	0.9'	10-8-7	--	
				SPT-6	7.5' - 9.0'	1.1'	4-4-4	--	
				SPT-7	9.0' - 10.5'	1.5'	7-12-13	--	
				SPT-8	10.5' - 12.0'	1.0'	14-16-21	--	
				SPT-9	12.0' - 13.5'	0.9'	12-7-8	--	
				SPT-10	13.5' - 15.0'	1.2'	7-8-6	--	
				SPT-11	15.0' - 16.5'	1.5'	1-WH-1	--	
				SPT-12	16.5' - 18.0'	1.3'	5-9-7	--	
				SPT-13	18.0' - 19.5'	1.4'	WH-1-1	--	
				SPT-14	19.5' - 21.0'	1.3'	6-4-5	--	
				SPT-15	21.0' - 22.5'	1.2'	8-12-12	--	
				SPT-16	22.5' - 24.0'	1.4'	16-25-32	--	
				SPT-17	24.0' - 25.5'	1.1'	8-23-39	--	
				SPT-18	25.5' - 27.0'	0.8'	56-100+	--	
				SPT-19	27.0' - 28.5'	1.5'	43-26-35	--	
				SPT-20	28.5' - 30.0'	1.3'	8-10-10	--	
				SPT-21	30.0' - 31.5'	0.9'	4-8-13	--	
				SPT-22	31.5' - 33.0'	1.2'	10-12-13	--	
				SPT-23	33.0' - 34.5'	1.0'	13-25-31	--	
				SPT-24	34.5' - 36.0'	1.1'	15-29-38	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, KY

Project Name Scrubber Sludge Complex | Boring No. **STN-22** | Total Depth 79.5 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-25	36.0' - 37.5'	1.3'	28-41-57	--	
480.1'	39.0'			SPT-26	37.5' - 39.0'	1.2'	51-90-100+	--	
		Gypsum: dark gray to gray, moist to wet, loose to very dense		SPT-27	39.0' - 40.5'	1.5'	27-31-43	--	
				SPT-28	40.5' - 42.0'	1.2'	20-14-30	--	
				SPT-29	42.0' - 43.5'	0.9'	21-13-24	--	
				SPT-30	43.5' - 45.0'	0.8'	26-31-49	--	
				SPT-31	45.0' - 46.5'	1.5'	19-19-34	--	
				SPT-32	46.5' - 48.0'	1.4'	28-32-42	--	
				SPT-33	48.0' - 49.5'	1.3'	39-44-50	--	
				SPT-34	49.5' - 51.0'	1.3'	30-42-50+	--	
				SPT-35	51.0' - 52.5'	1.2'	39-48-50+	--	
				SPT-36	52.5' - 54.0'	1.2'	28-48-50+	--	
				SPT-37	54.0' - 55.5'	0.8'	49-50+	--	
				SPT-38	55.5' - 57.0'	1.1'	48-37-27	--	
				SPT-39	57.0' - 58.5'	0.9'	35-50+	--	
				SPT-40	58.5' - 60.0'	0.7'	9-18-49	--	
				SPT-41	65.0' - 66.5'	0.9'	25-50+	--	
				SPT-42	70.0' - 71.5'	0.6'	31-50+	--	
444.1'	75.0'								
				SPT-43	75.0' - 76.5'	1.1'	10-11-13	--	Backfilled with Bentonite Grout from 79.5-0.0

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN-22** Total Depth 79.5 ft

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
439.6'	79.5'	Mine Spoil: Lean to Fat Clay with intermediate sand lenses, gray to dark gray, moist to west, soft to very stiff and with heterogenous mixture of coal, shale, sandstone, and siltstone fragments. *(Continued)*		SPT-44	78.0' - 79.5'	1.0'	16-11-11	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number	175569040		Location	Drakesboro, KY	
Project Name	Scrubber Sludge Complex		Boring No.	**STN-22A**	Total Depth 32.0 ft
County	Muhlenberg		Surface Elevation	519.1 ft	
Project Type	Geotechnical Exploration		Date Started	11/18/09	Completed 11/19/09
Supervisor	AKS	Driller Steve Bradford	Depth to Water	12.7 ft	Date/Time 11/19/09
Logged By	AKS		Depth to Water	N/A	Date/Time N/A

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
519.1'	0.0'	Top of Hole							
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense							
					5.0' - 7.0'	1.8'		--	
					10.0' - 12.0'	1.7'		--	
					15.0' - 17.0'	2.0'		--	
					20.0' - 22.0'	2.0'		--	
					25.0' - 26.0'	1.0'		--	
487.1'	32.0'								
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY		
Project Name	Scrubber Sludge Complex	Boring No.	**STN-23**	Total Depth	63.0 ft
County	Muhlenberg	Surface Elevation	501.8 ft		
Project Type	Geotechnical Exploration	Date Started	12/7/09	Completed	12/8/09
Supervisor	B. Taylor	Driller	Steve Bradford	Depth to Water	28.9 ft	Date/Time	12/8/09
Logged By	B. Taylor	Depth to Water	N/A	Date/Time	N/A

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
501.8'	0.0'	Top of Hole							
		Mine spoil: Lean to fat clay with mixture of coal, shale, sandstone and siltstone fragments and lenses of gypsum/fly ash, brown to dark brown, gray to dark gray, moist to wet, soft to very stiff		SPT-1	0.0' - 1.5'	1.1'	3-8-12	--	
				SPT-2	1.5' - 3.0'	1.2'	10-16-14	--	
				SPT-3	3.0' - 4.5'	1.0'	14-19-15	--	
				SPT-4	4.5' - 6.0'	0.7'	3-4-5	--	Cobble Block
				SPT-5	6.0' - 7.5'	0.6'	5-10-8	--	
				SPT-6	7.5' - 9.0'	0.9'	4-4-7	--	
				SPT-7	9.0' - 10.5'	0.9'	2-2-3	--	
				SPT-8	10.5' - 12.0'	1.2'	2-4-7	--	
				SPT-9	12.0' - 13.5'	1.3'	7-10-9	--	
				SPT-10	13.5' - 15.0'	0.7'	8-7-6	--	
				SPT-11	15.0' - 16.5'	0.2'	2-2-3	--	
				SPT-12	16.5' - 18.0'	0.7'	6-6-8	--	
				SPT-13	18.0' - 19.5'	1.5'	9-10-13	--	
				SPT-14	19.5' - 21.0'	1.5'	5-5-9	--	
				SPT-15	21.0' - 22.5'	1.0'	12-14-18	--	
				SPT-16	22.5' - 24.0'	1.4'	15-15-21	--	
				SPT-17	24.0' - 25.5'	0.7'	9-15-8	--	
				SPT-18	25.5' - 27.0'	1.1'	15-11-9	--	
				SPT-19	27.0' - 28.5'	0.8'	9-11-46	--	Cobbles
				SPT-20	28.5' - 30.0'	1.4'	33-14-10	--	
				SPT-21	30.0' - 31.5'	1.3'	10-10-33	--	
				SPT-22	31.5' - 33.0'	1.0'	24-15-19	--	
				SPT-23	33.0' - 34.5'	0.6'	15-13-11	--	
				SPT-24	34.5' - 36.0'	1.5'	7-11-8	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, KY

Project Name Scrubber Sludge Complex | Boring No. **STN-23** | Total Depth 63.0 ft

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
Elevation	Depth								
		Mine spoil: Lean to fat clay with mixture of coal, shale, sandstone and siltstone fragments and lenses of gypsum/fly ash, brown to dark brown, gray to dark gray, moist to wet, soft to very stiff *(Continued)*		SPT-25	36.0' - 37.5'	0.5'	50+	--	
				SPT-26	37.5' - 39.0'	0.3'	50+	--	
				SPT-27	39.0' - 40.5'	1.3'	5-10-8	--	
				SPT-28	40.5' - 42.0'	1.0'	5-18-15	--	
				SPT-29	45.0' - 46.5'	0.4'	50+	--	
				SPT-30	50.0' - 51.5'	1.5'	14-16-23	--	
				SPT-31	55.0' - 56.5'	1.2'	12-15-22	--	
				SPT-32	60.0' - 61.5'	1.2'	15-17-12	--	
438.8'	63.0'			SPT-33	61.5' - 63.0'	0.6'	14-12-10	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY		
Project Name	Scrubber Sludge Complex	Boring No.	**STN-23A**	Total Depth	35.0 ft
County	Muhlenberg	Surface Elevation	501.8 ft		
Project Type	Geotechnical Exploration	Date Started	12/9/09	Completed	12/9/09
Supervisor	B. Taylor	Driller	Steve Bradford	Depth to Water	Dry	Date/Time	12/9/09
Logged By	B. Taylor	Depth to Water	N/A	Date/Time	N/A

Lithology Elevation	Lithology Depth	Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
501.8'	0.0'	Top of Hole							
		Mine spoil: Lean to fat clay with mixture of coal, shale, sandstone and siltstone fragments and lenses of gypsum/fly ash, brown to dark brown, gray to dark gray, moist to wet, soft to very stiff		ST-1	5.0' - 7.0'	1.7'		--	
				ST-2	10.0' - 12.0'	1.7'		--	
				ST-3	15.0' - 17.0'	1.2'		--	
				ST-4	20.0' - 22.0'	1.4'		--	
466.8'	35.0'	No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY		
Project Name	Scrubber Sludge Complex	Boring No.	**STN-24**	Total Depth	69.5 ft
County	Muhlenberg	Surface Elevation	508.8 ft		
Project Type	Geotechnical Exploration	Date Started	11/11/09	Completed	11/11/09
Supervisor	AKS	Driller	Steve Bradford	Depth to Water	32.1 ft	Date/Time	11/11/09
Logged By	AKS			Depth to Water	N/A	Date/Time	N/A

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
508.8'	0.0'	Top of Hole							
		Mine Spoil: Lean to Fat Clay with intermediate sand lenses, gray to dark gray, moist to west, soft to very stiff and with heterogenous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-1	0.0' - 1.5'	0.9'	5-5-10	--	
				SPT-2	1.5' - 3.0'	1.1'	10-12-16	--	
504.3'	4.5'			SPT-3	3.0' - 4.5'	1.0'	10-9-6	--	
				SPT-4	4.5' - 6.0'	0.4'	7-4-6	--	
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense		SPT-5	6.0' - 7.5'	1.2'	9-6-6	--	
				SPT-6	7.5' - 9.0'	1.1'	9-9-7	--	
				SPT-7	9.0' - 10.5'	0.6'	6-8-12	--	
				SPT-8	10.5' - 12.0'	1.5'	5-7-12	--	
				SPT-9	12.0' - 13.5'	1.2'	12-26-36	--	
				SPT-10	13.5' - 15.0'	1.3'	28-55-59	--	
				SPT-11	15.0' - 16.5'	1.4'	6-21-24	--	
				SPT-12	16.5' - 18.0'	1.5'	6-19-24	--	
				SPT-13	18.0' - 19.5'	1.5'	47-73-84	--	
				SPT-14	19.5' - 21.0'	1.3'	4-19-42	--	
				SPT-15	21.0' - 22.5'	1.4'	23-12-33	--	
				SPT-16	22.5' - 24.0'	1.5'	47-37-34	--	
				SPT-17	24.0' - 25.5'	1.0'	4-7-11	--	
				SPT-18	25.5' - 27.0'	1.5'	4-5-7	--	
480.3'	28.5'			SPT-19	27.0' - 28.5'	1.2'	3-3-6	--	
		Mine Spoil: Lean to Fat Clay with intermediate sand lenses, gray to dark gray, moist to west, soft to very stiff and with heterogenous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-20	28.5' - 30.0'	1.1'	3-3-6	--	
				SPT-21	30.0' - 31.5'	1.4'	6-9-9	--	
				SPT-22	31.5' - 33.0'	1.1'	10-18-12	--	
				SPT-23	33.0' - 34.5'	0.8'	9-15-22	--	
				SPT-24	34.5' - 36.0'	1.2'	7-10-10	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number 175569040 | Location Drakesboro, KY

Project Name Scrubber Sludge Complex | Boring No. **STN-24** | Total Depth 69.5 ft

Lithology		Description	Overburden / Rock Core	Sample # / RQD	Depth / Run	Rec. Ft. / Rec. Ft.	Blows / Rec. %	Mois.Cont. % / Run Depth	Remarks
Elevation	Depth								
		Mine Spoil: Lean to Fat Clay with intermediate sand lenses, gray to dark gray, moist to west, soft to very stiff and with heterogenous mixture of coal, shale, sandstone, and siltstone fragments. *(Continued)*		SPT-25	36.0' - 37.5'	1.4'	3-4-6	--	
				SPT-26	37.5' - 39.0'	1.3'	3-5-7	--	
				SPT-27	39.0' - 40.5'	1.2'	5-6-8	--	
				SPT-28	40.5' - 42.0'	1.2'	3-3-7	--	
				SPT-29	42.0' - 43.5'	1.0'	4-6-4	--	
				SPT-30	43.5' - 45.0'	1.1'	12-12-6	--	
				SPT-31	45.0' - 46.5'	1.2'	14-12-12	--	
				SPT-32	46.5' - 48.0'	0.7'	3-3-3	--	
				SPT-33	48.0' - 49.5'	0.4'	7-8-5	--	
				SPT-34	50.0' - 51.5'	1.5'	7-9-6	--	
				SPT-35	55.0' - 56.5'	1.4'	6-7-11	--	
				SPT-36	60.0' - 61.5'	1.1'	5-7-8	--	
				SPT-37	65.0' - 66.5'	1.4'	7-6-5	--	
439.3'	69.5'	No Refusal / Bottom of Hole		SPT-38	68.0' - 69.5'	1.3'	6-7-6	--	Backfilled with Bentonite Grout 69.5-0.0

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY		
Project Name	Scrubber Sludge Complex	Boring No.	**STN-24A**	Total Depth	22.0 ft
County	Muhlenberg	Surface Elevation	508.8 ft		
Project Type	Geotechnical Exploration	Date Started	11/12/09	Completed	11/12/09
Supervisor	AKS	Driller	Steve Bradford	Depth to Water	Dry	Date/Time	11/12/09
Logged By	AKS	Depth to Water	N/A	Date/Time	N/A

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
508.8'	0.0'	Top of Hole							
504.3'	4.5'	Mine Spoil: Lean to Fat Clay with intermediate sand lenses, gray to dark gray, moist to west, soft to very stiff and with heterogenous mixture of coal, shale, sandstone, and siltstone fragments.			5.0' - 7.0'	2.0'		--	
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense			10.0' - 12.0'	1.8'		--	
					15.0' - 17.0'	1.1'		--	
486.8'	22.0'				20.0' - 22.0'	1.7'		--	Backfilled with Bentonite Grout 22.0-0.0
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY		
Project Name	Scrubber Sludge Complex	Boring No.	**STN-25**	Total Depth	83.0 ft
County	Muhlenberg	Surface Elevation	523.0 ft		
Project Type	Geotechnical Exploration	Date Started	11/19/09	Completed	11/20/09
Supervisor	AKS	Driller	Steve Bradford	Depth to Water	12.2 ft	Date/Time	11/20/09
Logged By	AKS	Depth to Water	N/A	Date/Time	N/A

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
523.0'	0.0'	Top of Hole							
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense		SPT-1	0.0' - 1.5'	'	3-5-6	--	
				SPT-2	1.5' - 3.0'	'	9-13-14	--	
				SPT-3	3.0' - 4.5'	'	8-12-15	--	
				SPT-4	4.5' - 6.0'	'	9-13-15	--	
				SPT-5	6.0' - 7.5'	'	16-11-11	--	
				SPT-6	7.5' - 9.0'	'	10-11-15	--	
				SPT-7	9.0' - 10.5'	'	14-11-11	--	
				SPT-8	10.5' - 12.0'	'	6-7-7	--	
				SPT-9	12.0' - 13.5'	'	6-7-8	--	
				SPT-10	13.5' - 15.0'	'	6-7-12	--	
				SPT-11	15.0' - 16.5'	'	8-15-12	--	
				SPT-12	16.5' - 18.0'	'	12-12-6	--	
				SPT-13	18.0' - 19.5'	'	8-5-6	--	
				SPT-14	19.5' - 21.0'	'	7-10-23	--	
				SPT-15	21.0' - 22.5'	'	26-50+	--	
				SPT-16	22.5' - 24.0'	'	20-25-26	--	
				SPT-17	24.0' - 25.5'	'	14-19-28	--	
				SPT-18	25.5' - 27.0'	'	27-26-22	--	
				SPT-19	27.0' - 28.5'	'	32-23-27	--	
493.0'	30.0'			SPT-20	28.5' - 30.0'	'	28-32-50+	--	
		Gypsum: dark gray to gray, moist to wet, loose to very dense		SPT-21	30.0' - 31.5'	'	26-50+	--	
				SPT-22	31.5' - 33.0'	'	49-50+	--	
				SPT-23	33.0' - 34.5'	'	50+	--	
				SPT-24	34.5' - 36.0'	'	30-50+	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

Project Number 175569040 Location Drakesboro, KY

Project Name Scrubber Sludge Complex Boring No. **STN-25** Total Depth 83.0 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		Gypsum: dark gray to gray, moist to wet, loose to very dense *(Continued)*		SPT-25	36.0' - 37.5'	'	50+	--	
				SPT-26	37.5' - 39.0'	'	50+	--	
				SPT-27	39.0' - 40.5'	'	31-40-50+	--	
				SPT-28	40.5' - 42.0'	'	50+	--	
				SPT-29	42.0' - 43.5'	'	50+	--	
				SPT-30	43.5' - 45.0'	'	28-50+	--	
				SPT-31	45.0' - 46.5'	'	36-49-50+	--	
				SPT-32	46.5' - 48.0'	'	50+	--	
473.5'	49.5'			SPT-33	48.0' - 49.5'	'	29-50+	--	
		Mine Spoil: Lean to Fat Clay with intermediate sand lenses, gray to dark gray, moist to west, soft to very stiff and with heterogenous mixture of coal, shale, sandstone, and siltstone fragments.		SPT-34	49.5' - 51.0'	'	5-6-9	--	
				SPT-35	51.0' - 52.5'	'	7-10-9	--	
				SPT-36	52.5' - 54.0'	'	4-4-7	--	
				SPT-37	54.0' - 55.5'	'	5-7-7	--	
				SPT-38	55.5' - 57.0'	'	7-7-7	--	
				SPT-39	57.0' - 58.5'	'	4-9-22	--	
				SPT-40	58.5' - 60.0'	'	8-8-10	--	
				SPT-41	60.0' - 61.5'	'	3-11	--	
				SPT-42	61.5' - 63.0'	'	3-5-11	--	
				SPT-43	65.0' - 66.5'	'	5-7-8	--	
				SPT-44	70.0' - 71.5'	'	7-10-9	--	
				SPT-45	75.0' - 76.5'	'	10-8-9	--	

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN-25** Total Depth 83.0 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
				SPT-46	80.0' - 81.5'	'	2-7-10	--	Backfilled with Bentonite Grout 83.0-0.0
440.0'	83.0'			SPT-47	81.5' - 83.0'	'	5-8-9	--	
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

Project Number	175569040	Location	Drakesboro, KY		
Project Name	Scrubber Sludge Complex	Boring No.	**STN-25A**	Total Depth	36.0 ft
County	Muhlenberg	Surface Elevation	523.1 ft		
Project Type	Geotechnical Exploration	Date Started	12/1/09	Completed	12/1/09
Supervisor	R. Riker	Driller	Steve Bradford	Depth to Water	20.0 ft	Date/Time	12/1/09
Logged By	R. Riker	Depth to Water	N/A	Date/Time	N/A

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
523.1'	0.0'	Top of Hole							
		Gypsum-Fly Ash: Dark gray to gray, moist to wet, medium loose to dense(Est.)							
					5.0' - 7.0'	2.0'		--	Top cover Gypsum ash. CME 85 Truck used W/ 4 1/4 HSA and 2.5' shelby tube
					10.0' - 12.0'	1.9'		--	
					15.0' - 17.0'	2.0'		--	
					20.0' - 22.0'	2.0'		--	Tube refused and was crushed, no recovery
					25.0' - 27.0'	0.0'		--	PZ installed
487.1'	36.0'								

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

SUBSURFACE LOG

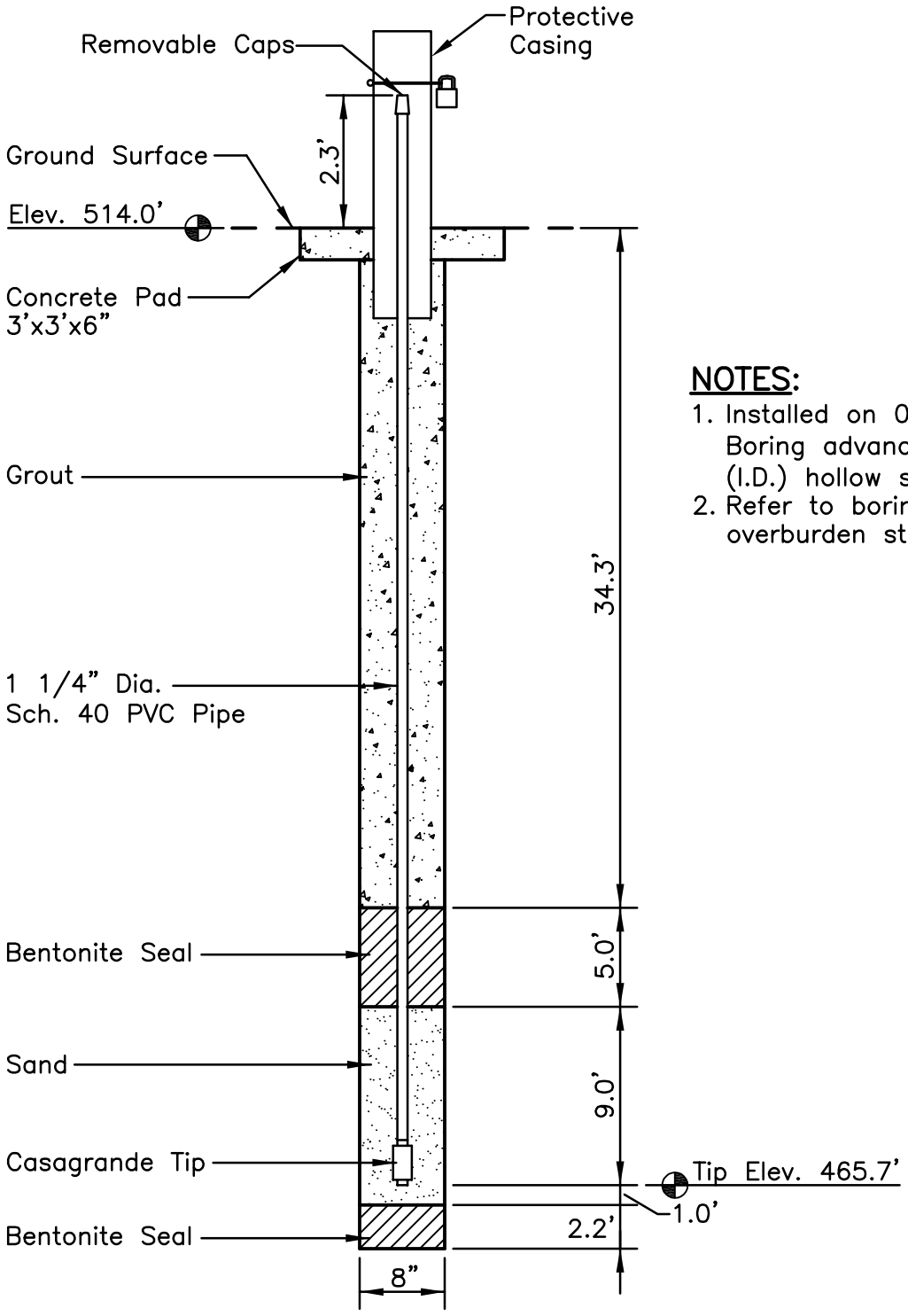
Project Number	175569040	Location	Drakesboro, KY
Project Name	Scrubber Sludge Complex	Boring No.	**STN-25A** Total Depth 36.0 ft

Lithology			Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	
Elevation	Depth	Description	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	Remarks
		No Refusal / Bottom of Hole							

STANTEC/FMSM_LEGACY 171467156.GPJ FMSM-GRAPHIC LOG.GDT 1/6/10

Attachment C

Instrumentation Data



NOTES:

1. Installed on 02/24/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 333,881.85*
Easting: 1,634,204.33*
Ground Elevation: 514.0 feet*

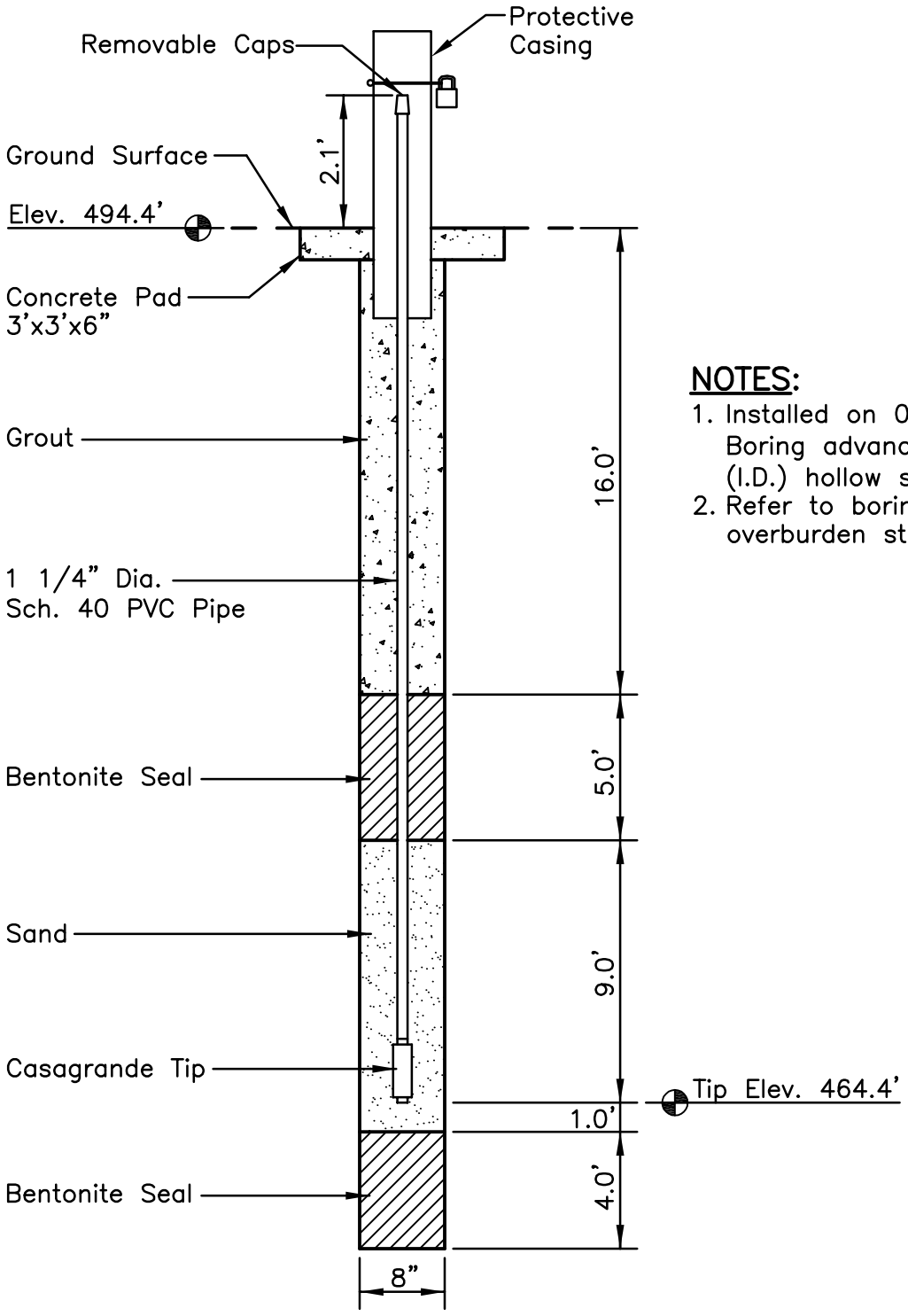
*Approximate. Locations provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

PIEZOMETER STN-10A
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000
www.stantec.com

DRAWN BY	BFS	DATE	AUG., 2009	REVISED	SHEET
CHECKED BY	SV	PROJ. NO.	175569040	1. 3.	1 OF 1
CHECKED BY	SV	SCALE	NTS	2. 4.	

PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
V:\1755\ACTIVE\175569040\GEOTECHNICAL\DRAWING\SCRUBBER\69040C-PAF-101-PZ10A.DWG



NOTES:

1. Installed on 02/27/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 334,974.78
Easting: 1,636,288.23
Ground Elevation: 494.4 feet

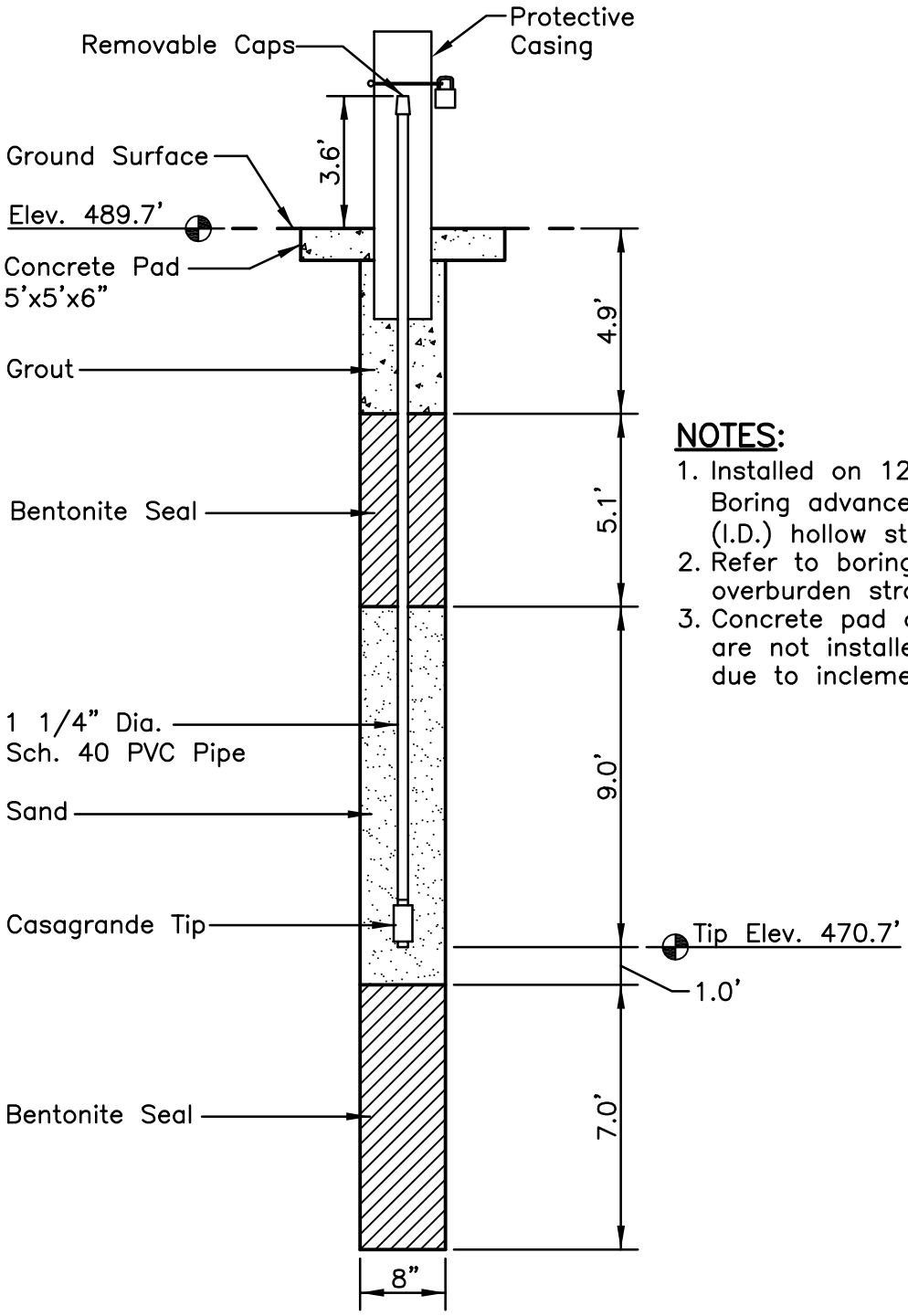
Locations provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

PIEZOMETER STN-12
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000
www.stantec.com

DRAWN BY	BFS	DATE	AUG., 2009	REVISED	SHEET
CHECKED BY	SV	PROJ. NO.	175569040	1. 3.	1 OF 1
CHECKED BY	SV	SCALE	NTS	2. 4.	

PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
V:\1755\ACTIVE\175569040\GEOTECHNICAL\DRAWING\SCRUBBER\69040C-PAF-101-PZ12.DWG



NOTES:

1. Installed on 12/03/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.
3. Concrete pad and well cover are not installed at this time due to inclement weather.

LOCATION:
Northing: 334,433.28
Easting: 1,636,592.28
Ground Elevation: 489.7 feet

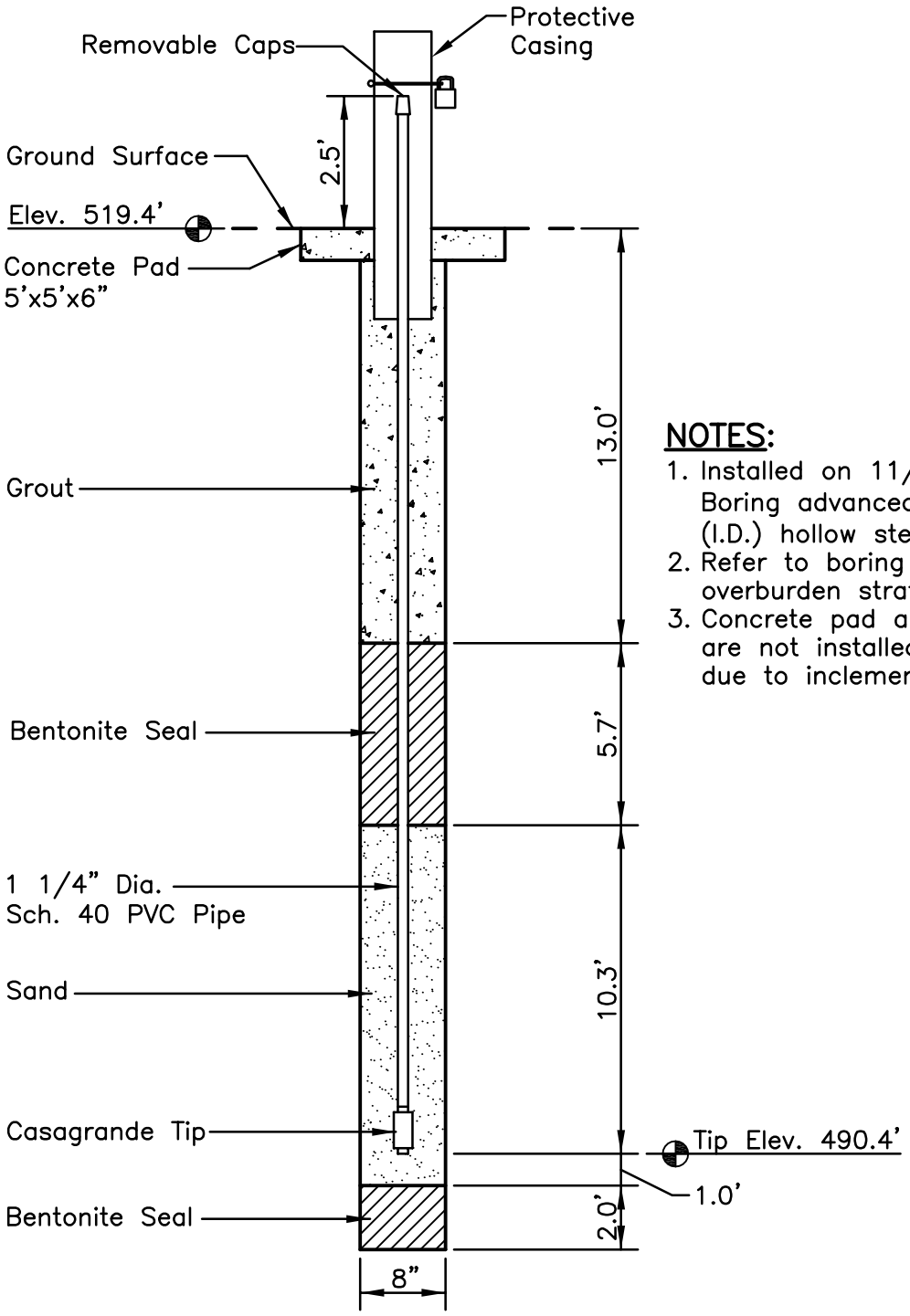
Locations provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

PIEZOMETER STN-20A
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000
www.stantec.com

DRAWN BY	ACC	DATE	JAN., 2010	REVISED	SHEET
CHECKED BY	ZM	PROJ. NO.	175569040	1. 3.	1 OF 1
CHECKED BY	SV	SCALE	NTS	2. 4.	

PLOT DATE: 01/19/2010 USER: VEMURI, SHARATH
V:\1755\ACTIVE\175569040\GEOTECHNICAL\DRAWING\SCRUBBER_SLUDGE_COMPLEX\INSTRUMENTATION\69040C-PAF-101-PZ20A.DWG



NOTES:

1. Installed on 11/18/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.
3. Concrete pad and well cover are not installed at this time due to inclement weather.

LOCATION:

Northing: 334,417.64
Easting: 1,636,443.36
Ground Elevation: 519.4 feet

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

PIEZOMETER STN-22A
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000
www.stantec.com

DRAWN BY	ACC	DATE	JAN., 2010	REVISED	SHEET
CHECKED BY	ZM	PROJ. NO.	175569040	1. 3.	1 OF 1
CHECKED BY	SV	SCALE	NTS	2. 4.	

PLOT DATE: 01/19/2010 USER: VEMURI, SHARATH
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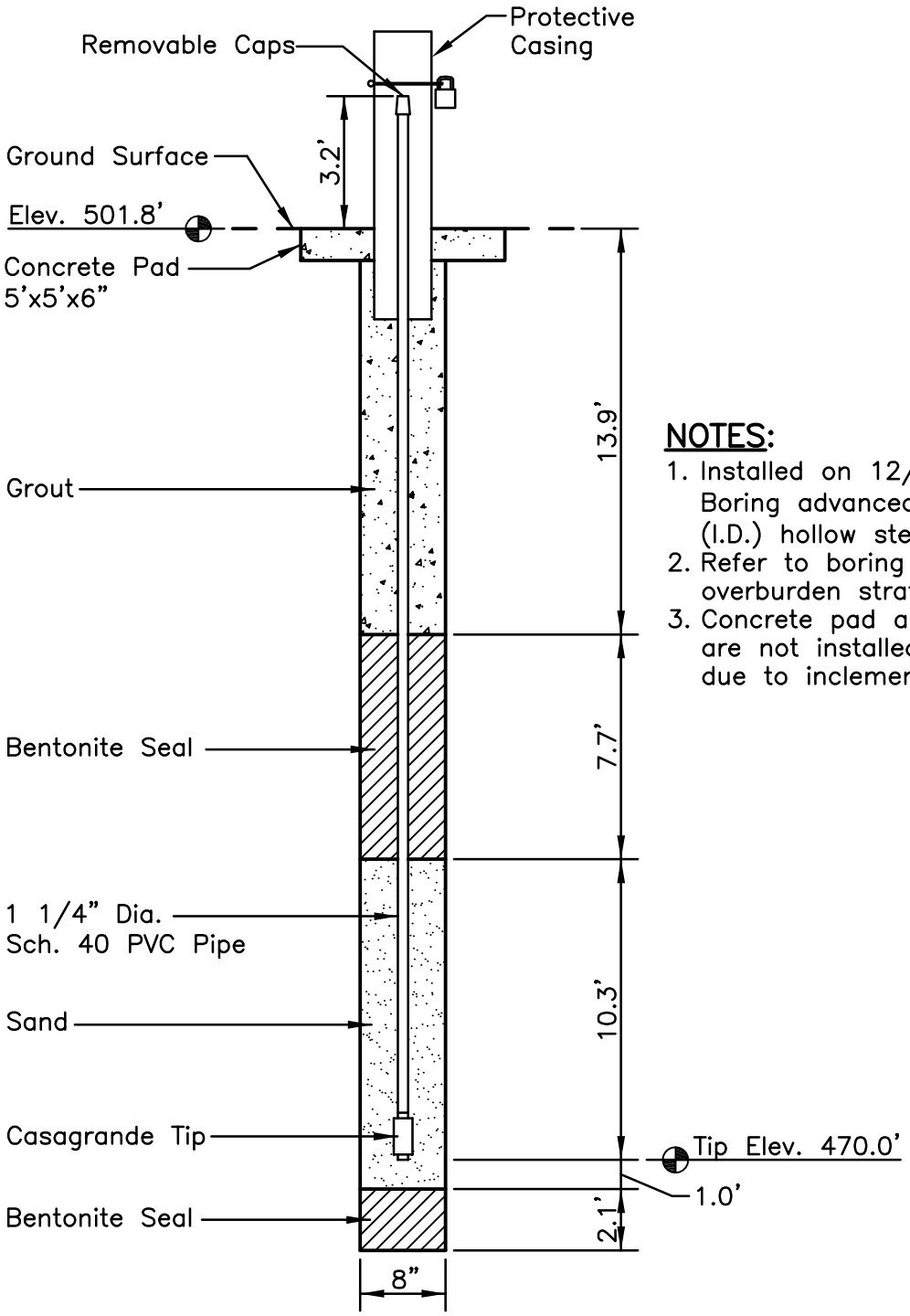


NOTES:

1. Installed on 12/09/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.
3. Concrete pad and well cover are not installed at this time due to inclement weather.

LOCATION:

Northing: 335,379.92
Easting: 1,635,873.53
Ground Elevation: 501.8 feet

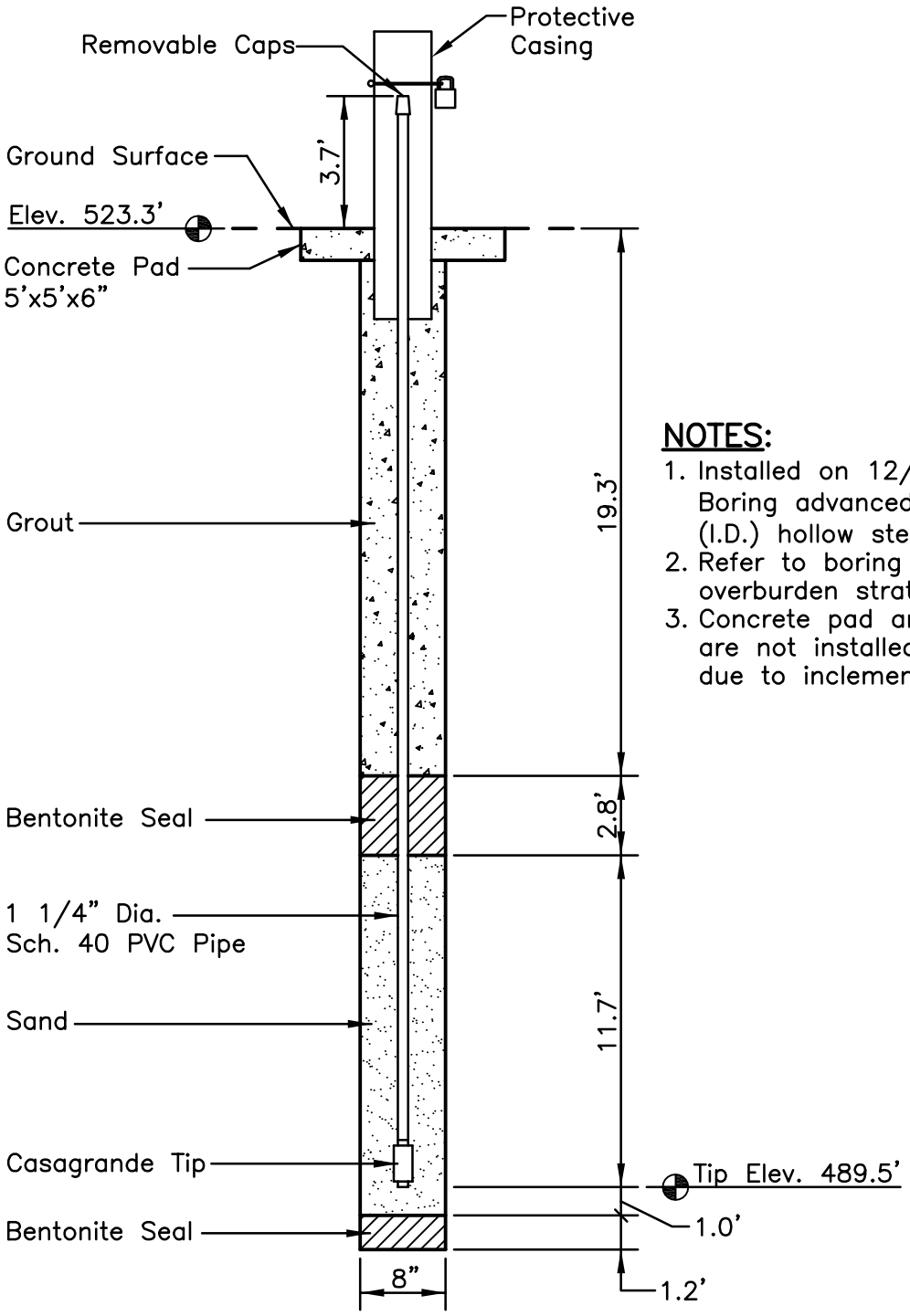
Locations provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

PIEZOMETER STN-23A
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000
www.stantec.com

DRAWN BY	ACC	DATE	JAN., 2010	REVISED	SHEET
CHECKED BY	ZM	PROJ. NO.	175569040	1. 3.	1 OF 1
CHECKED BY	SV	SCALE	NTS	2. 4.	

PLOT DATE: 01/19/2010 USER: VEMURI, SHARATH
V:\1755\ACTIVE\175569040\GEOTECHNICAL\DRAWING\SCRUBBER_SLUDGE_COMPLEX\INSTRUMENTATION\69040C-PAF-101-PZ23A.DWG



NOTES:

1. Installed on 12/01/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.
3. Concrete pad and well cover are not installed at this time due to inclement weather.

LOCATION:

Northing: 335,289.98
Easting: 1,635,757.90
Ground Elevation: 523.3 feet

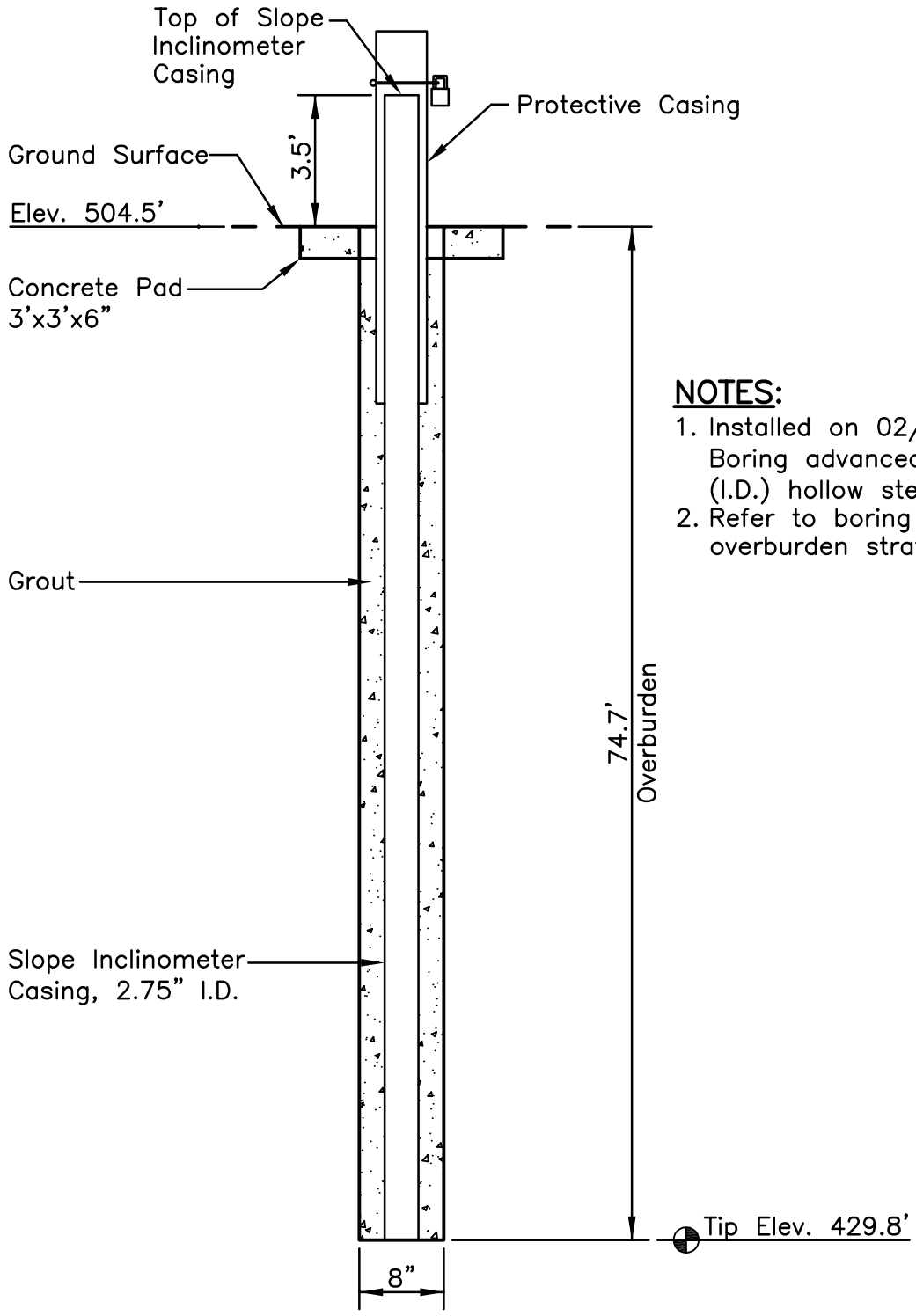
Locations provided by TVA, Power Systems Operations, Surveying and Project Services.
Horizontal Datum: NAD 27
Vertical Datum: NGVD29

PIEZOMETER STN-25A
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000
www.stantec.com

DRAWN BY	ACC	DATE	JAN., 2010	REVISED	SHEET
CHECKED BY	ZM	PROJ. NO.	175569040	1. 3.	1 OF 1
CHECKED BY	SV	SCALE	NTS	2. 4.	

PLOT DATE: 01/19/2010 USER: VEMURI, SHARATH
V:\1755\ACTIVE\175569040\GEOTECHNICAL\DRAWING\SCRUBBER_SLUDGE_COMPLEX\INSTRUMENTATION\69040C-PAF-101-PZ25A.DWG



NOTES:

1. Installed on 02/04/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 334,909.50
Easting: 1,636,230.61
Ground Elevation: 504.5 feet

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

SLOPE INCLINOMETER STN-11
GEOTECHNICAL EXPLORATION
SCRUBBER SLUDGE COMPLEX

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky
40511-2050
859-422-3000
www.stantec.com

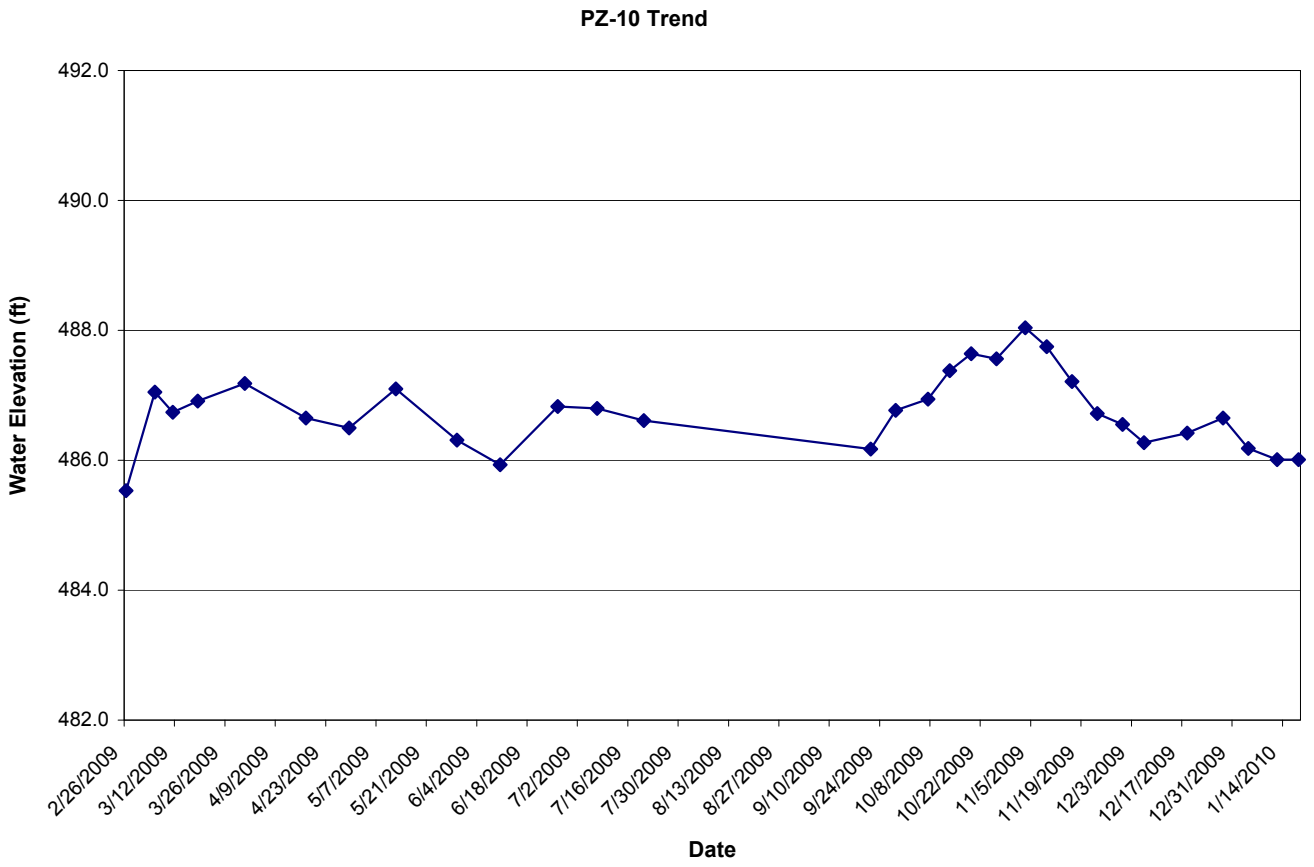
DRAWN BY	BFS	DATE	AUG., 2009	REVISED	SHEET
CHECKED BY	SV	PROJ. NO.	175569040	1. 3.	1 OF 1
CHECKED BY	SV	SCALE	NTS	2. 4.	

PLOT DATE: 08/05/2009 USER: SAMS, BRIAN
V:\1755\ACTIVE\175569040\GEOTECHNICAL\DRAWING\SCRUBBER\690400-PAF-101-SI11.DWG

PIEZOMETER READINGS- JANUARY 2010
EAST POND EAST SLOPE BUTTRESS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No.	PZ-10	Project No.	175569040
Piezometer Installation Date	2/24/2009	Tip Elevation (ft)	465.7
Surface Elevation (ft)	514	Location	East Pond East Slope

Date	Water Elevation (ft)
2/26/2009	485.5
3/6/2009	487.1
3/11/2009	486.7
3/18/2009	486.9
3/31/2009	487.2
4/17/2009	486.7
4/29/2009	486.5
5/12/2009	487.1
5/29/2009	486.3
6/10/2009	485.9
6/26/2009	486.8
7/7/2009	486.8
7/20/2009	486.6
9/21/2009	486.2
9/28/2009	486.8
10/7/2009	486.9
10/13/2009	487.4
10/19/2009	487.6
10/26/2009	487.6
11/3/2009	488.0
11/9/2009	487.8
11/16/2009	487.2
11/23/2009	486.7
11/30/2009	486.6
12/6/2009	486.3
12/18/2009	486.4
12/28/2009	486.7
1/4/2010	486.2
1/12/2010	486.0
1/18/2010	486.0

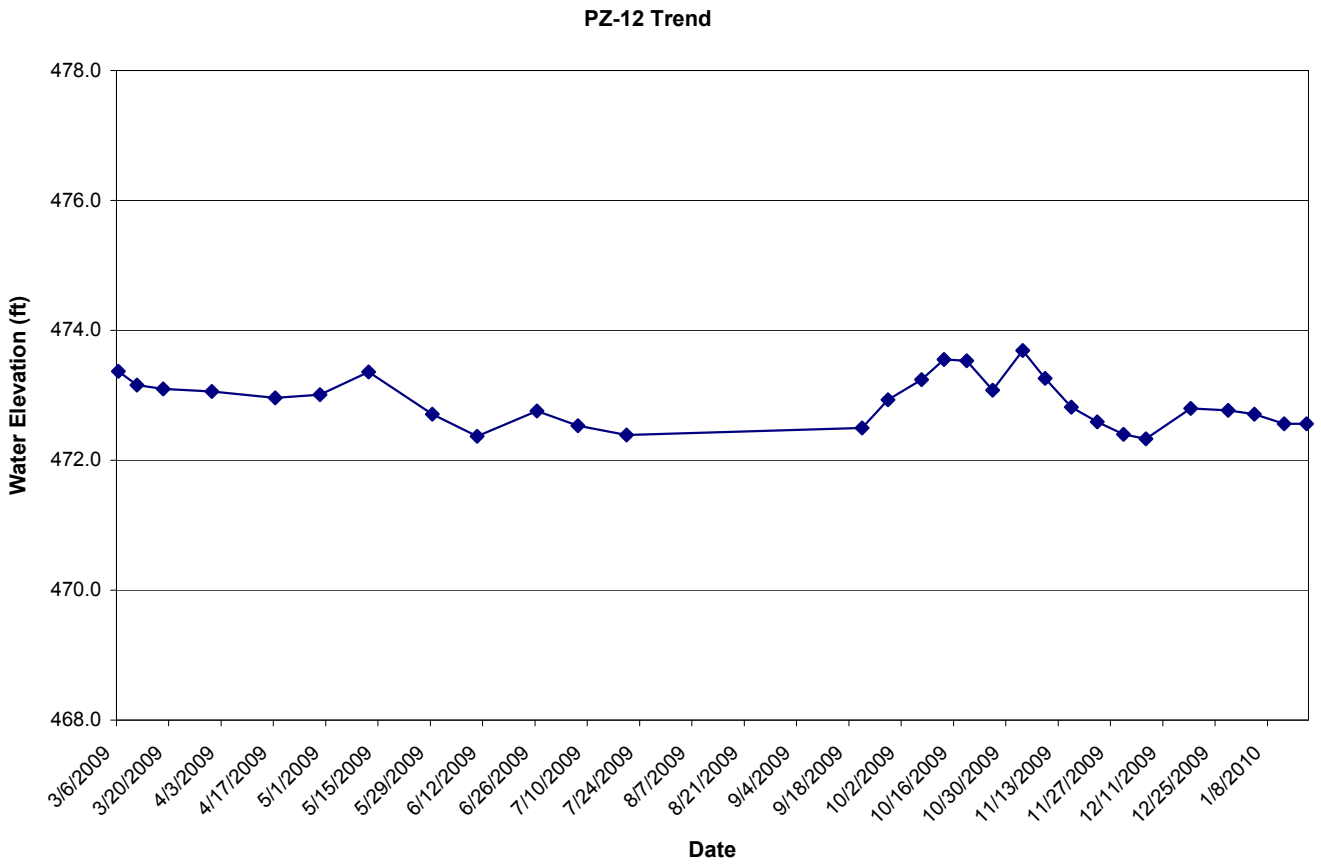


Notes: See attached instrumentation schematics for tip elevation and other pertinent data

PIEZOMETER READINGS- JANUARY 2010
EAST POND EAST SLOPE BUTTRESS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No.	PZ-12	Project No.	175569040
Piezometer Installation Date	2/27/2009	Tip Elevation (ft)	464.4
Surface Elevation (ft)	494.4	Location	East Pond East Slope

Date	Water Elevation (ft)
2/26/2009	494.4
3/6/2009	473.4
3/11/2009	473.2
3/18/2009	473.1
3/31/2009	473.1
4/17/2009	473.0
4/29/2009	473.0
5/12/2009	473.4
5/29/2009	472.7
6/10/2009	472.4
6/26/2009	472.8
7/7/2009	472.5
7/20/2009	472.4
9/21/2009	472.5
9/28/2009	472.9
10/7/2009	473.2
10/13/2009	473.6
10/19/2009	473.5
10/26/2009	473.1
11/3/2009	473.7
11/9/2009	473.3
11/16/2009	472.8
11/23/2009	472.6
11/30/2009	472.4
12/6/2009	472.3
12/18/2009	472.8
12/28/2009	472.8
1/4/2010	472.7
1/12/2010	472.6
1/18/2010	472.6

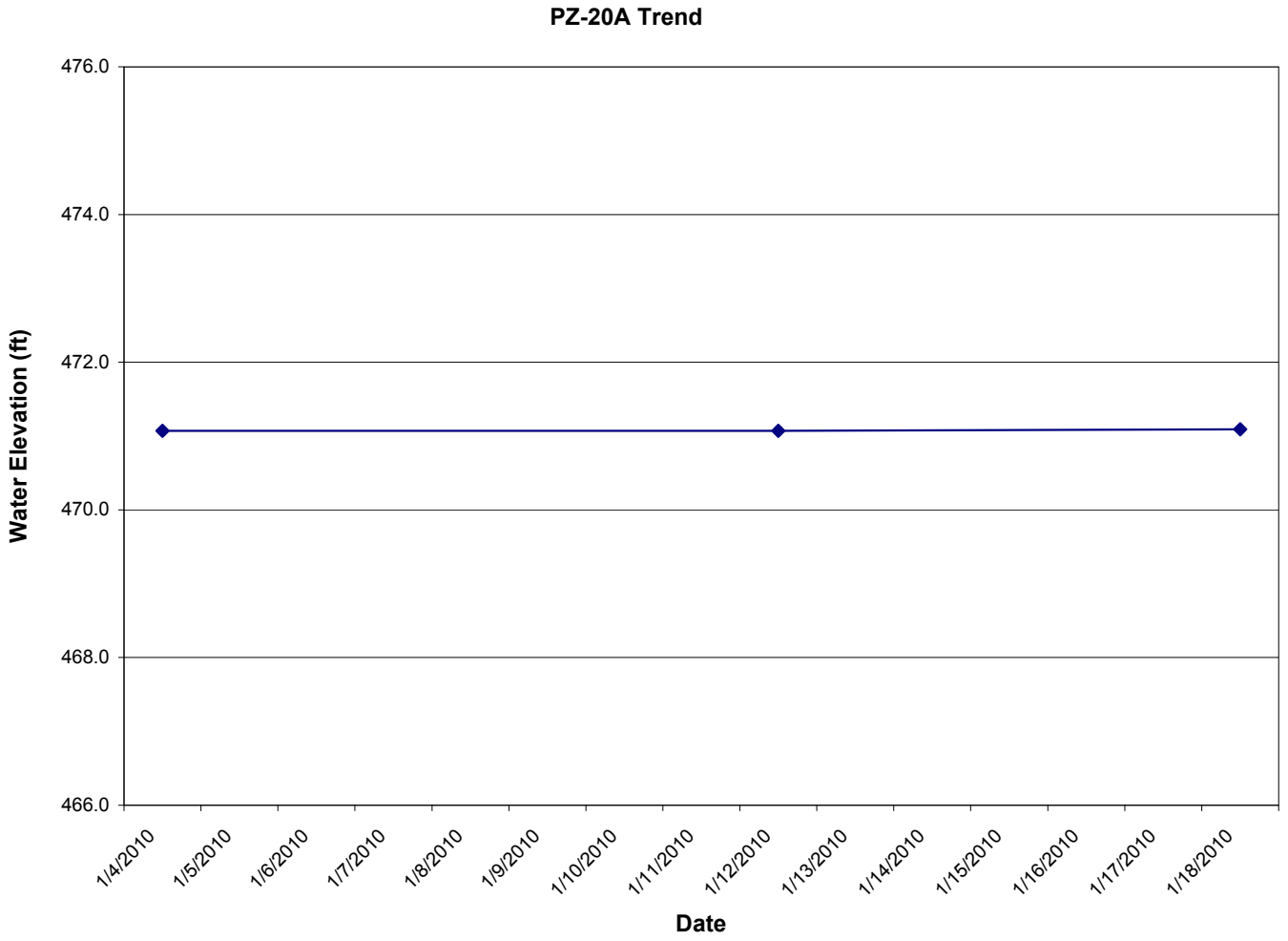


Notes: See attached instrumentation schematics for tip elevation and other pertinent data

PIEZOMETER READINGS- JANUARY 2010
EAST POND EAST SLOPE BUTTRESS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No.	PZ-20A	Project No.	175569040
Piezometer Installation Date	12/3/2009	Tip Elevation (ft)	470.7
Surface Elevation (ft)	489.7	Location	East Pond East Slope

Date	Water Elevation (ft)
1/4/2010	471.1
1/12/2010	471.1
1/18/2010	471.1

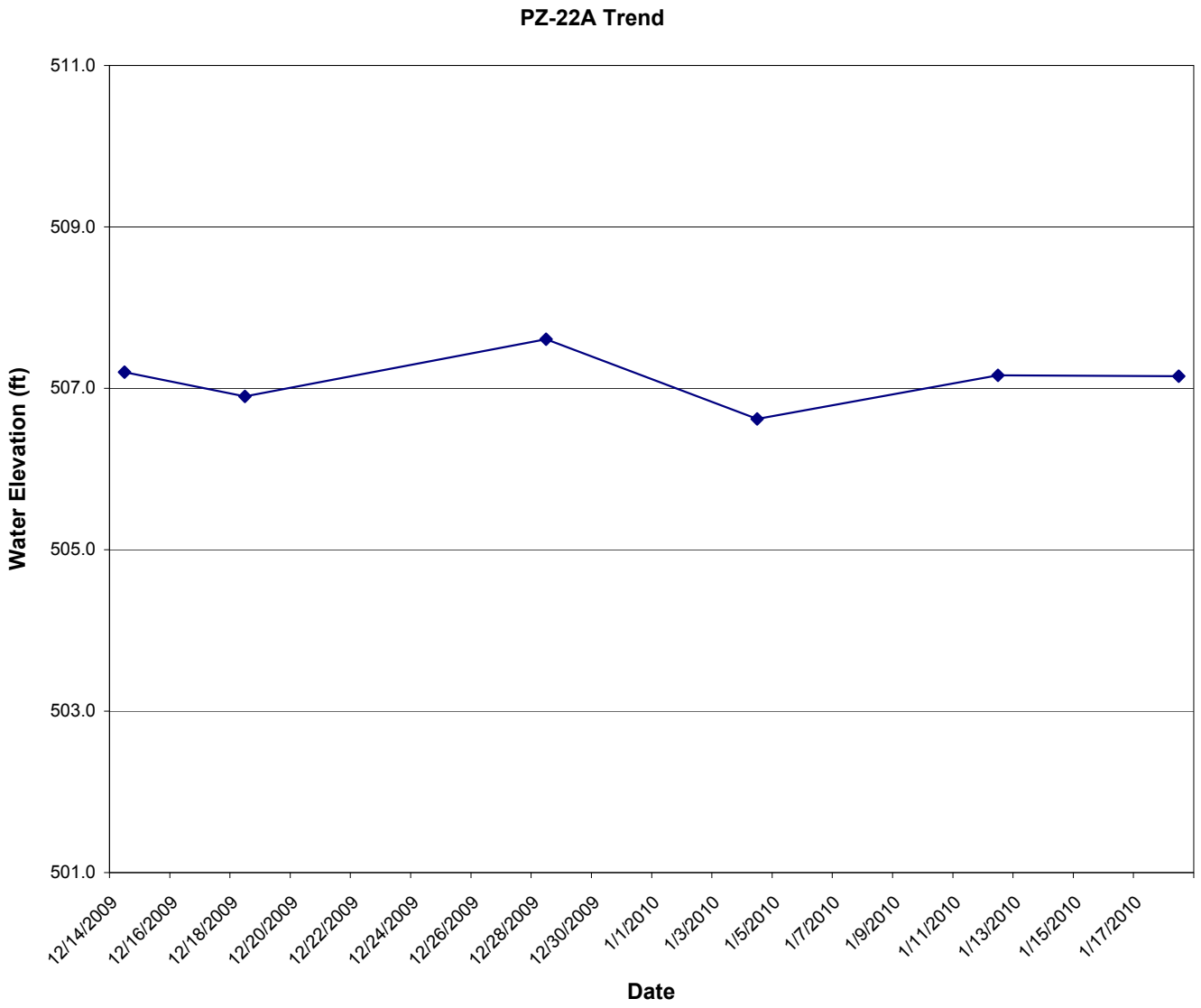


Notes: See attached instrumentation schematics for tip elevation and other pertinent data

PIEZOMETER READINGS- JANUARY 2010
EAST POND EAST SLOPE BUTTRESS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No.	PZ-22A	Project No.	175569040
Piezometer Installation Date	11/18/2009	Tip Elevation (ft)	490.4
Surface Elevation (ft)	519.4	Location	East Pond East Slope

Date	Water Elevation (ft)
12/14/2009	507.2
12/18/2009	506.9
12/28/2009	507.6
1/4/2010	506.6
1/12/2010	507.2
1/18/2010	507.2

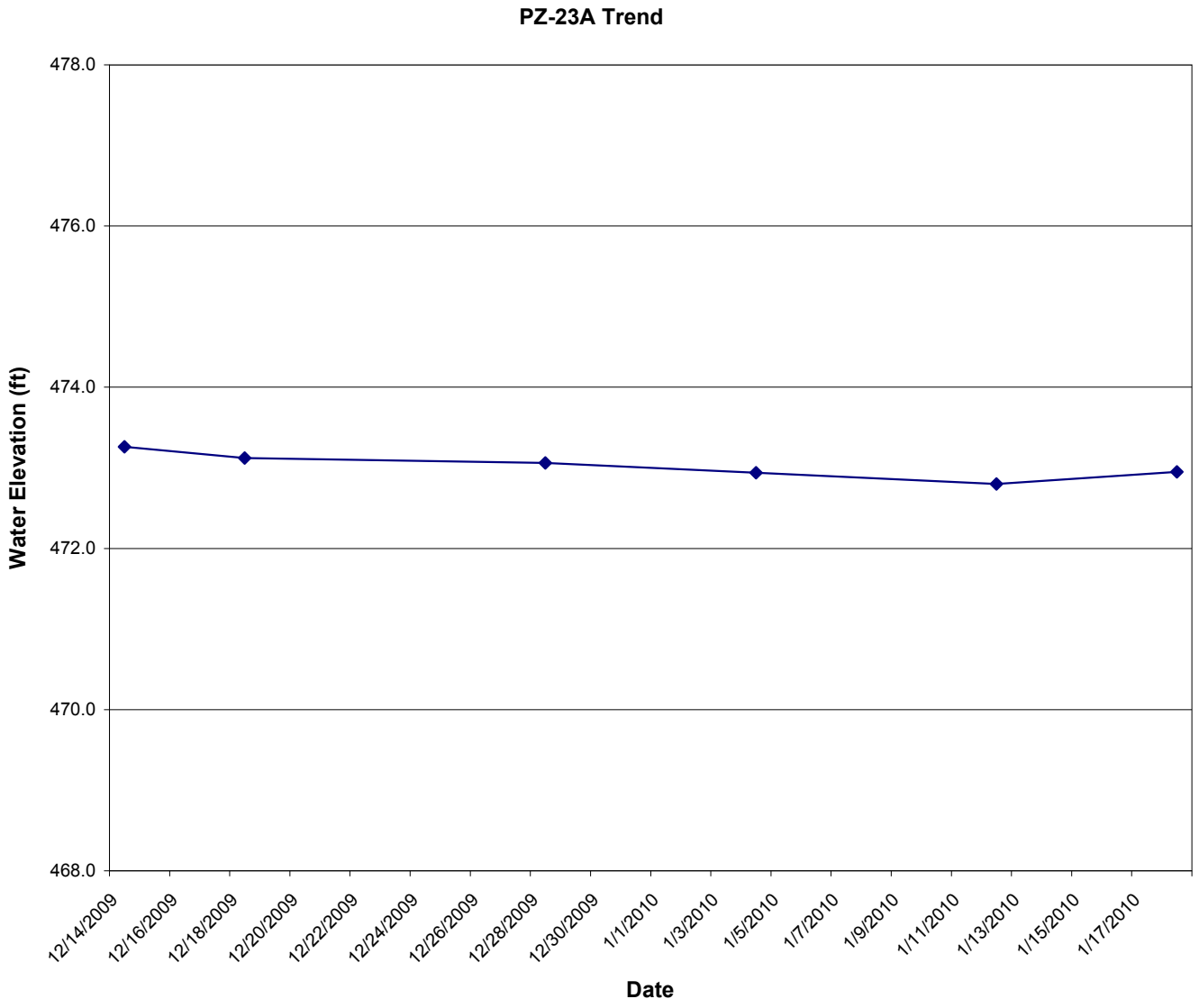


Notes: See attached instrumentation schematics for tip elevation and other pertinent data

PIEZOMETER READINGS- JANUARY 2010
EAST POND EAST SLOPE BUTTRESS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No.	PZ-23A	Project No.	175569040
Piezometer Installation Date	12/9/2009	Tip Elevation (ft)	470
Surface Elevation (ft)	501.8	Location	East Pond East Slope

Date	Water Elevation (ft)
12/14/2009	473.3
12/18/2009	473.1
12/28/2009	473.1
1/4/2010	472.9
1/12/2010	472.8
1/18/2010	473.0

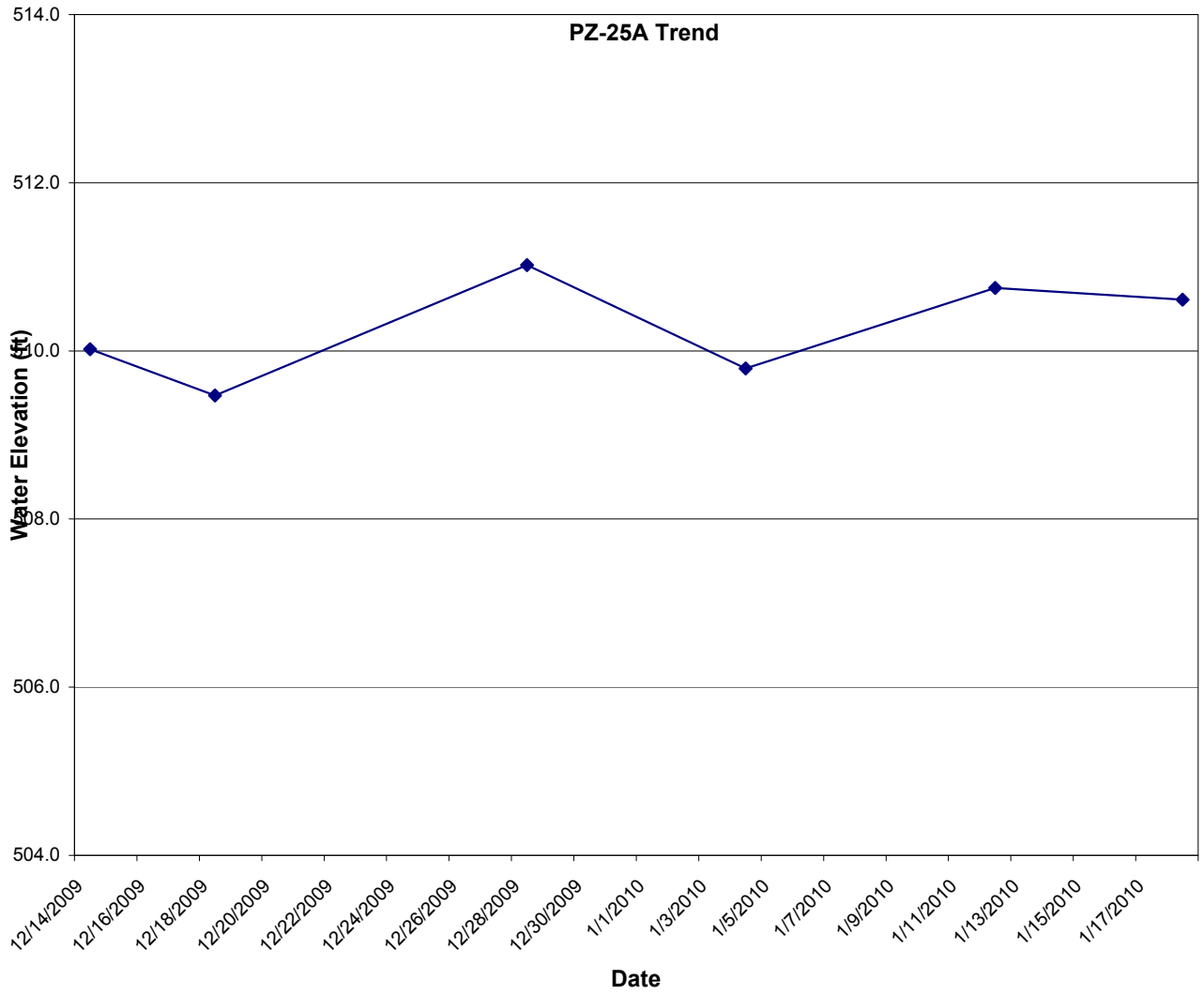


Notes: See attached instrumentation schematics for tip elevation and other pertinent data

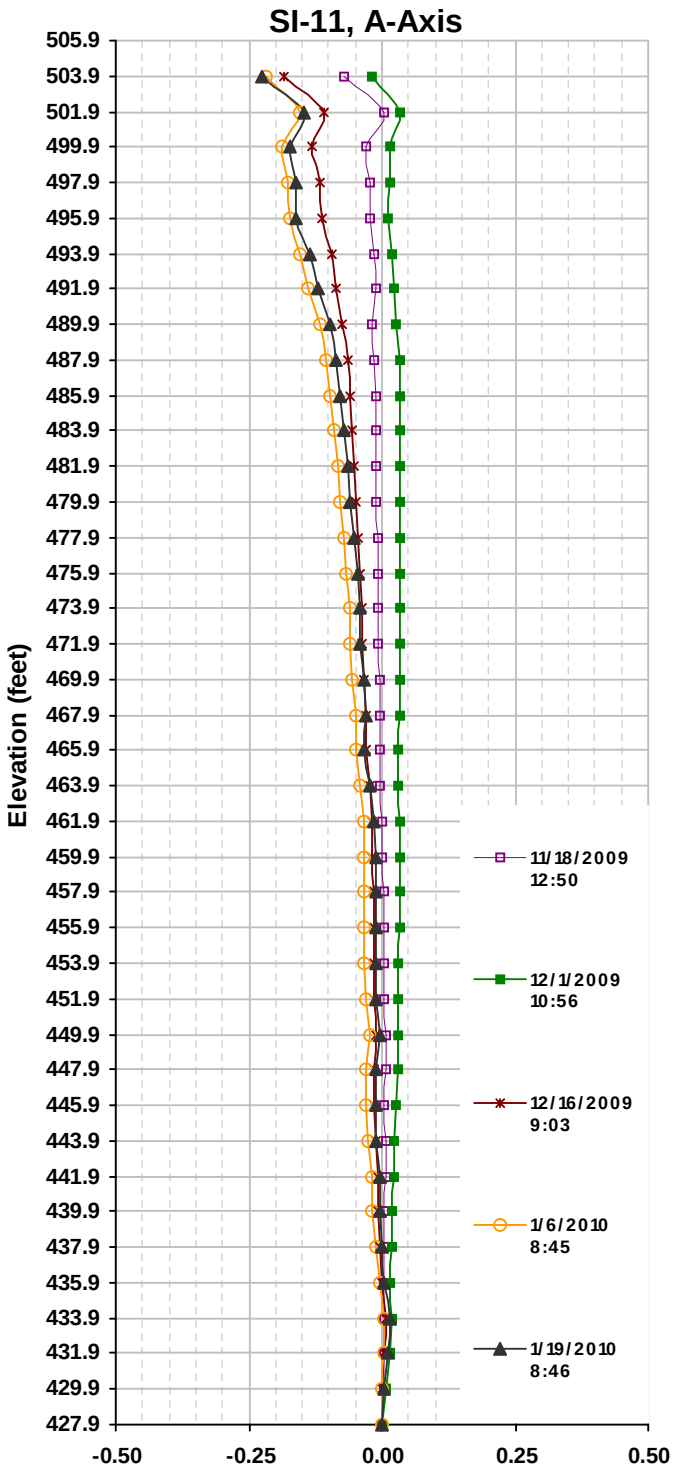
PIEZOMETER READINGS- JANUARY 2010
EAST POND EAST SLOPE BUTTRESS
SCRUBBER SLUDGE COMPLEX
PARADISE FOSSIL PLANT
MUHLENBERG COUNTY, KENTUCKY
TENNESSEE VALLEY AUTHORITY

Piezometer No.	PZ-25A	Project No.	175569040
Piezometer Installation Date	12/1/2009	Tip Elevation (ft)	489.3
Surface Elevation (ft)	523.28	Location	East Pond East Slope

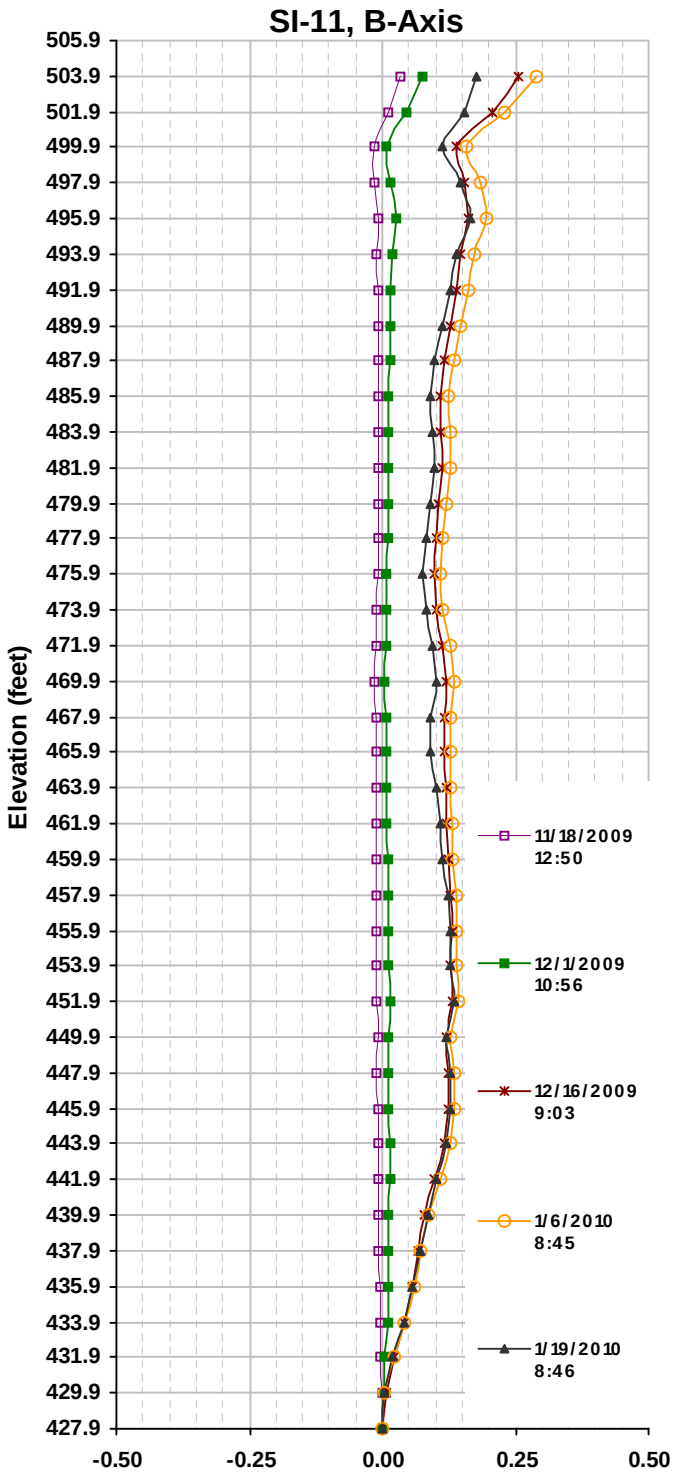
Date	Water Elevation (ft)
12/14/2009	510.0
12/18/2009	509.5
12/28/2009	511.0
1/4/2010	509.8
1/12/2010	510.8
1/18/2010	510.6



Notes: See attached instrumentation schematics for tip elevation and other pertinent data

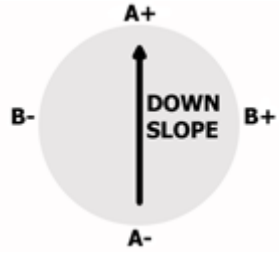


Cumulative Displacement (in) from 11/4/2009



Cumulative Displacement (in) from 11/4/2009

Stantec



Paradise Fossil Plant

Drakesboro, KY

175569040

1/26/2010

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

CURRENT SURVEY 11/18/2009 12:50:23 PM

INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 1/26/2010 3:18:55 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-2554	2551	-3.0630	-2603	2628	-3.1386	-0.0756	-0.0726
6	-1717	1723	-2.0640	-1683	1703	-2.0316	0.0324	0.0030
8	-221	225	-0.2676	-224	231	-0.2730	-0.0054	-0.0294
10	107	-97	0.1224	109	-91	0.1200	-0.0024	-0.0240
12	468	-458	0.5556	463	-449	0.5472	-0.0084	-0.0216
14	646	-636	0.7692	648	-631	0.7674	-0.0018	-0.0132
16	298	-292	0.3540	310	-291	0.3606	0.0066	-0.0114
18	99	-88	0.1122	99	-81	0.1080	-0.0042	-0.0180
20	110	-100	0.1260	112	-94	0.1236	-0.0024	-0.0138
22	86	-76	0.0972	90	-72	0.0972	0.0000	-0.0114
24	69	-62	0.0786	71	-57	0.0768	-0.0018	-0.0114
26	63	-52	0.0690	67	-48	0.0690	0.0000	-0.0096
28	-10	20	-0.0180	-7	24	-0.0186	-0.0006	-0.0096
30	-39	49	-0.0528	-37	54	-0.0546	-0.0018	-0.0090
32	-19	31	-0.0300	-17	34	-0.0306	-0.0006	-0.0072
34	-25	33	-0.0348	-21	37	-0.0348	0.0000	-0.0066
36	9	2	0.0042	9	7	0.0012	-0.0030	-0.0066
38	28	-17	0.0270	31	-13	0.0264	-0.0006	-0.0036
40	-29	39	-0.0408	-25	42	-0.0402	0.0006	-0.0030
42	-115	127	-0.1452	-112	130	-0.1452	0.0000	-0.0036
44	-91	98	-0.1134	-89	104	-0.1158	-0.0024	-0.0036
46	-31	42	-0.0438	-30	48	-0.0468	-0.0030	-0.0012
48	3	7	-0.0024	5	11	-0.0036	-0.0012	0.0018
50	15	-4	0.0114	17	0	0.0102	-0.0012	0.0030
52	47	-37	0.0504	50	-33	0.0498	-0.0006	0.0042
54	45	-34	0.0474	47	-31	0.0468	-0.0006	0.0048
56	-2	12	-0.0084	1	16	-0.0090	-0.0006	0.0054
58	36	-26	0.0372	39	-23	0.0372	0.0000	0.0060
60	28	-17	0.0270	33	-15	0.0288	0.0018	0.0060
62	-35	46	-0.0486	-34	50	-0.0504	-0.0018	0.0042
64	-86	92	-0.1068	-82	96	-0.1068	0.0000	0.0060
66	-146	157	-0.1818	-141	160	-0.1806	0.0012	0.0060
68	-234	244	-0.2868	-230	248	-0.2868	0.0000	0.0048
70	-362	374	-0.4416	-357	377	-0.4404	0.0012	0.0048
72	-524	534	-0.6348	-520	538	-0.6348	0.0000	0.0036
74	-585	598	-0.7098	-583	602	-0.7110	-0.0012	0.0036
76	-578	594	-0.7032	-575	596	-0.7026	0.0006	0.0048
78	-611	622	-0.7398	-606	620	-0.7356	0.0042	0.0042
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

CURRENT SURVEY 12/1/2009 10:56:05 AM

INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 1/26/2010 3:18:55 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-2554	2551	-3.0630	-2607	2587	-3.1164	-0.0534	-0.0186
6	-1717	1723	-2.0640	-1694	1713	-2.0442	0.0198	0.0348
8	-221	225	-0.2676	-222	222	-0.2664	0.0012	0.0150
10	107	-97	0.1224	110	-97	0.1242	0.0018	0.0138
12	468	-458	0.5556	462	-451	0.5478	-0.0078	0.0120
14	646	-636	0.7692	643	-633	0.7656	-0.0036	0.0198
16	298	-292	0.3540	298	-285	0.3498	-0.0042	0.0234
18	99	-88	0.1122	95	-84	0.1074	-0.0048	0.0276
20	110	-100	0.1260	110	-98	0.1248	-0.0012	0.0324
22	86	-76	0.0972	87	-76	0.0978	0.0006	0.0336
24	69	-62	0.0786	69	-60	0.0774	-0.0012	0.0330
26	63	-52	0.0690	64	-51	0.0690	0.0000	0.0342
28	-10	20	-0.0180	-9	21	-0.0180	0.0000	0.0342
30	-39	49	-0.0528	-39	50	-0.0534	-0.0006	0.0342
32	-19	31	-0.0300	-19	30	-0.0294	0.0006	0.0348
34	-25	33	-0.0348	-23	33	-0.0336	0.0012	0.0342
36	9	2	0.0042	8	3	0.0030	-0.0012	0.0330
38	28	-17	0.0270	29	-17	0.0276	0.0006	0.0342
40	-29	39	-0.0408	-27	38	-0.0390	0.0018	0.0336
42	-115	127	-0.1452	-115	126	-0.1446	0.0006	0.0318
44	-91	98	-0.1134	-91	101	-0.1152	-0.0018	0.0312
46	-31	42	-0.0438	-32	43	-0.0450	-0.0012	0.0330
48	3	7	-0.0024	4	6	-0.0012	0.0012	0.0342
50	15	-4	0.0114	15	-5	0.0120	0.0006	0.0330
52	47	-37	0.0504	49	-37	0.0516	0.0012	0.0324
54	45	-34	0.0474	45	-35	0.0480	0.0006	0.0312
56	-2	12	-0.0084	-2	13	-0.0090	-0.0006	0.0306
58	36	-26	0.0372	38	-29	0.0402	0.0030	0.0312
60	28	-17	0.0270	31	-20	0.0306	0.0036	0.0282
62	-35	46	-0.0486	-34	45	-0.0474	0.0012	0.0246
64	-86	92	-0.1068	-83	93	-0.1056	0.0012	0.0234
66	-146	157	-0.1818	-143	154	-0.1782	0.0036	0.0222
68	-234	244	-0.2868	-233	243	-0.2856	0.0012	0.0186
70	-362	374	-0.4416	-361	374	-0.4410	0.0006	0.0174
72	-524	534	-0.6348	-525	535	-0.6360	-0.0012	0.0168
74	-585	598	-0.7098	-584	595	-0.7074	0.0024	0.0180
76	-578	594	-0.7032	-575	585	-0.6960	0.0072	0.0156
78	-611	622	-0.7398	-606	613	-0.7314	0.0084	0.0084
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

CURRENT SURVEY 12/16/2009 9:03:57 AM

INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 1/26/2010 3:18:55 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-2554	2551	-3.0630	-2622	2609	-3.1386	-0.0756	-0.1854
6	-1717	1723	-2.0640	-1700	1704	-2.0424	0.0216	-0.1098
8	-221	225	-0.2676	-241	228	-0.2814	-0.0138	-0.1314
10	107	-97	0.1224	100	-97	0.1182	-0.0042	-0.1176
12	468	-458	0.5556	448	-448	0.5376	-0.0180	-0.1134
14	646	-636	0.7692	634	-632	0.7596	-0.0096	-0.0954
16	298	-292	0.3540	286	-285	0.3426	-0.0114	-0.0858
18	99	-88	0.1122	87	-85	0.1032	-0.0090	-0.0744
20	110	-100	0.1260	102	-100	0.1212	-0.0048	-0.0654
22	86	-76	0.0972	79	-77	0.0936	-0.0036	-0.0606
24	69	-62	0.0786	62	-61	0.0738	-0.0048	-0.0570
26	63	-52	0.0690	56	-53	0.0654	-0.0036	-0.0522
28	-10	20	-0.0180	-17	20	-0.0222	-0.0042	-0.0486
30	-39	49	-0.0528	-46	47	-0.0558	-0.0030	-0.0444
32	-19	31	-0.0300	-26	28	-0.0324	-0.0024	-0.0414
34	-25	33	-0.0348	-29	33	-0.0372	-0.0024	-0.0390
36	9	2	0.0042	2	0	0.0012	-0.0030	-0.0366
38	28	-17	0.0270	21	-18	0.0234	-0.0036	-0.0336
40	-29	39	-0.0408	-34	36	-0.0420	-0.0012	-0.0300
42	-115	127	-0.1452	-124	127	-0.1506	-0.0054	-0.0288
44	-91	98	-0.1134	-97	99	-0.1176	-0.0042	-0.0234
46	-31	42	-0.0438	-36	39	-0.0450	-0.0012	-0.0192
48	3	7	-0.0024	-2	4	-0.0036	-0.0012	-0.0180
50	15	-4	0.0114	10	-9	0.0114	0.0000	-0.0168
52	47	-37	0.0504	43	-41	0.0504	0.0000	-0.0168
54	45	-34	0.0474	39	-36	0.0450	-0.0024	-0.0168
56	-2	12	-0.0084	-10	11	-0.0126	-0.0042	-0.0144
58	36	-26	0.0372	35	-34	0.0414	0.0042	-0.0102
60	28	-17	0.0270	23	-21	0.0264	-0.0006	-0.0144
62	-35	46	-0.0486	-41	43	-0.0504	-0.0018	-0.0138
64	-86	92	-0.1068	-93	95	-0.1128	-0.0060	-0.0120
66	-146	157	-0.1818	-150	153	-0.1818	0.0000	-0.0060
68	-234	244	-0.2868	-240	243	-0.2898	-0.0030	-0.0060
70	-362	374	-0.4416	-371	372	-0.4458	-0.0042	-0.0030
72	-524	534	-0.6348	-535	533	-0.6408	-0.0060	0.0012
74	-585	598	-0.7098	-589	591	-0.7080	0.0018	0.0072
76	-578	594	-0.7032	-582	582	-0.6984	0.0048	0.0054
78	-611	622	-0.7398	-616	616	-0.7392	0.0006	0.0006
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

CURRENT SURVEY 1/6/2010 8:45:23 AM

INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 1/26/2010 3:18:55 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-2554	2551	-3.0630	-2611	2598	-3.1254	-0.0624	-0.2178
6	-1717	1723	-2.0640	-1688	1697	-2.0310	0.0330	-0.1554
8	-221	225	-0.2676	-237	227	-0.2784	-0.0108	-0.1884
10	107	-97	0.1224	102	-97	0.1194	-0.0030	-0.1776
12	468	-458	0.5556	445	-444	0.5334	-0.0222	-0.1746
14	646	-636	0.7692	631	-627	0.7548	-0.0144	-0.1524
16	298	-292	0.3540	278	-277	0.3330	-0.0210	-0.1380
18	99	-88	0.1122	84	-82	0.0996	-0.0126	-0.1170
20	110	-100	0.1260	100	-97	0.1182	-0.0078	-0.1044
22	86	-76	0.0972	77	-74	0.0906	-0.0066	-0.0966
24	69	-62	0.0786	60	-58	0.0708	-0.0078	-0.0900
26	63	-52	0.0690	55	-52	0.0642	-0.0048	-0.0822
28	-10	20	-0.0180	-19	22	-0.0246	-0.0066	-0.0774
30	-39	49	-0.0528	-47	49	-0.0576	-0.0048	-0.0708
32	-19	31	-0.0300	-27	30	-0.0342	-0.0042	-0.0660
34	-25	33	-0.0348	-30	33	-0.0378	-0.0030	-0.0618
36	9	2	0.0042	1	1	0.0000	-0.0042	-0.0588
38	28	-17	0.0270	20	-17	0.0222	-0.0048	-0.0546
40	-29	39	-0.0408	-34	35	-0.0414	-0.0006	-0.0498
42	-115	127	-0.1452	-126	130	-0.1536	-0.0084	-0.0492
44	-91	98	-0.1134	-99	100	-0.1194	-0.0060	-0.0408
46	-31	42	-0.0438	-36	39	-0.0450	-0.0012	-0.0348
48	3	7	-0.0024	-2	4	-0.0036	-0.0012	-0.0336
50	15	-4	0.0114	11	-9	0.0120	0.0006	-0.0324
52	47	-37	0.0504	43	-41	0.0504	0.0000	-0.0330
54	45	-34	0.0474	37	-35	0.0432	-0.0042	-0.0330
56	-2	12	-0.0084	-11	12	-0.0138	-0.0054	-0.0288
58	36	-26	0.0372	37	-35	0.0432	0.0060	-0.0234
60	28	-17	0.0270	23	-22	0.0270	0.0000	-0.0294
62	-35	46	-0.0486	-42	43	-0.0510	-0.0024	-0.0294
64	-86	92	-0.1068	-96	97	-0.1158	-0.0090	-0.0270
66	-146	157	-0.1818	-151	153	-0.1824	-0.0006	-0.0180
68	-234	244	-0.2868	-243	244	-0.2922	-0.0054	-0.0174
70	-362	374	-0.4416	-374	373	-0.4482	-0.0066	-0.0120
72	-524	534	-0.6348	-540	535	-0.6450	-0.0102	-0.0054
74	-585	598	-0.7098	-591	592	-0.7098	0.0000	0.0048
76	-578	594	-0.7032	-582	582	-0.6984	0.0048	0.0048
78	-611	622	-0.7398	-618	615	-0.7398	0.0000	0.0000
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

CURRENT SURVEY 1/19/2010 8:46:19 AM

INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 1/26/2010 3:18:55 PM

Data Reduction for A Axis:

	Initial			Current				
Depth (ft)	A0	A180	Incr. Dev (in)	A0	A180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-2554	2551	-3.0630	-2609	2624	-3.1398	-0.0768	-0.2250
6	-1717	1723	-2.0640	-1698	1700	-2.0388	0.0252	-0.1482
8	-221	225	-0.2676	-238	227	-0.2790	-0.0114	-0.1734
10	107	-97	0.1224	105	-99	0.1224	0.0000	-0.1620
12	468	-458	0.5556	441	-440	0.5286	-0.0270	-0.1620
14	646	-636	0.7692	631	-625	0.7536	-0.0156	-0.1350
16	298	-292	0.3540	279	-278	0.3342	-0.0198	-0.1194
18	99	-88	0.1122	83	-81	0.0984	-0.0138	-0.0996
20	110	-100	0.1260	99	-97	0.1176	-0.0084	-0.0858
22	86	-76	0.0972	77	-74	0.0906	-0.0066	-0.0774
24	69	-62	0.0786	60	-58	0.0708	-0.0078	-0.0708
26	63	-52	0.0690	56	-53	0.0654	-0.0036	-0.0630
28	-10	20	-0.0180	-19	22	-0.0246	-0.0066	-0.0594
30	-39	49	-0.0528	-48	50	-0.0588	-0.0060	-0.0528
32	-19	31	-0.0300	-27	29	-0.0336	-0.0036	-0.0468
34	-25	33	-0.0348	-30	33	-0.0378	-0.0030	-0.0432
36	9	2	0.0042	1	2	-0.0006	-0.0048	-0.0402
38	28	-17	0.0270	21	-18	0.0234	-0.0036	-0.0354
40	-29	39	-0.0408	-33	34	-0.0402	0.0006	-0.0318
42	-115	127	-0.1452	-126	130	-0.1536	-0.0084	-0.0324
44	-91	98	-0.1134	-103	101	-0.1224	-0.0090	-0.0240
46	-31	42	-0.0438	-37	40	-0.0462	-0.0024	-0.0150
48	3	7	-0.0024	-2	4	-0.0036	-0.0012	-0.0126
50	15	-4	0.0114	11	-9	0.0120	0.0006	-0.0114
52	47	-37	0.0504	44	-41	0.0510	0.0006	-0.0120
54	45	-34	0.0474	39	-36	0.0450	-0.0024	-0.0126
56	-2	12	-0.0084	-11	13	-0.0144	-0.0060	-0.0102
58	36	-26	0.0372	38	-36	0.0444	0.0072	-0.0042
60	28	-17	0.0270	24	-22	0.0276	0.0006	-0.0114
62	-35	46	-0.0486	-41	43	-0.0504	-0.0018	-0.0120
64	-86	92	-0.1068	-94	97	-0.1146	-0.0078	-0.0102
66	-146	157	-0.1818	-149	153	-0.1812	0.0006	-0.0024
68	-234	244	-0.2868	-241	244	-0.2910	-0.0042	-0.0030
70	-362	374	-0.4416	-370	372	-0.4452	-0.0036	0.0012
72	-524	534	-0.6348	-537	535	-0.6432	-0.0084	0.0048
74	-585	598	-0.7098	-589	592	-0.7086	0.0012	0.0132
76	-578	594	-0.7032	-580	581	-0.6966	0.0066	0.0120
78	-611	622	-0.7398	-613	611	-0.7344	0.0054	0.0054
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

CURRENT SURVEY 11/18/2009 12:50:23 PM

INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 1/26/2010 3:19:06 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-529	595	-0.6744	-510	575	-0.6510	0.0234	0.0354
6	-416	451	-0.5202	-390	435	-0.4950	0.0252	0.0120
8	-138	173	-0.1866	-134	176	-0.1860	0.0006	-0.0132
10	-219	270	-0.2934	-224	275	-0.2994	-0.0060	-0.0138
12	-264	315	-0.3474	-260	315	-0.3450	0.0024	-0.0078
14	-210	262	-0.2832	-209	265	-0.2844	-0.0012	-0.0102
16	-108	155	-0.1578	-109	155	-0.1584	-0.0006	-0.0090
18	3	59	-0.0336	6	61	-0.0330	0.0006	-0.0084
20	39	22	0.0102	42	26	0.0096	-0.0006	-0.0090
22	68	-21	0.0534	69	-18	0.0522	-0.0012	-0.0084
24	69	-4	0.0438	73	-3	0.0456	0.0018	-0.0072
26	51	15	0.0216	52	17	0.0210	-0.0006	-0.0090
28	83	-16	0.0594	83	-14	0.0582	-0.0012	-0.0084
30	97	-31	0.0768	101	-30	0.0786	0.0018	-0.0072
32	95	-49	0.0864	99	-46	0.0870	0.0006	-0.0090
34	108	-45	0.0918	111	-42	0.0918	0.0000	-0.0096
36	38	23	0.0090	42	21	0.0126	0.0036	-0.0096
38	-27	95	-0.0732	-26	97	-0.0738	-0.0006	-0.0132
40	0	63	0.0000	1	67	-0.0396	0.0000	-0.0126
42	1	47	-0.0276	3	51	-0.0288	-0.0012	-0.0126
44	-27	90	-0.0702	-25	93	-0.0708	-0.0006	-0.0114
46	-36	101	-0.0822	-35	103	-0.0828	-0.0006	-0.0108
48	-38	103	-0.0846	-36	106	-0.0852	-0.0006	-0.0102
50	-63	126	-0.1134	-58	129	-0.1122	0.0012	-0.0096
52	-94	142	-0.1416	-92	143	-0.1410	0.0006	-0.0108
54	-91	154	-0.1470	-90	156	-0.1476	-0.0006	-0.0114
56	-47	90	-0.0822	-46	94	-0.0840	-0.0018	-0.0108
58	31	33	-0.0012	34	33	0.0006	0.0018	-0.0090
60	-2	49	-0.0306	-3	51	-0.0324	-0.0018	-0.0108
62	91	-51	0.0852	91	-50	0.0846	-0.0006	-0.0090
64	176	-119	0.1770	175	-119	0.1764	-0.0006	-0.0084
66	306	-247	0.3318	306	-245	0.3306	-0.0012	-0.0078
68	411	-355	0.4596	411	-355	0.4596	0.0000	-0.0066
70	530	-493	0.6138	528	-491	0.6114	-0.0024	-0.0066
72	724	-687	0.8466	721	-687	0.8448	-0.0018	-0.0042
74	905	-857	1.0572	904	-859	1.0578	0.0006	-0.0024
76	1076	-1020	1.2576	1071	-1019	1.2540	-0.0036	-0.0030
78	1201	-1143	1.4064	1202	-1143	1.4070	0.0006	0.0006
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

CURRENT SURVEY 12/1/2009 10:56:05 AM

INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 1/26/2010 3:19:06 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-529	595	-0.6744	-498	575	-0.6438	0.0306	0.0750
6	-416	451	-0.5202	-377	429	-0.4836	0.0366	0.0444
8	-138	173	-0.1866	-141	185	-0.1956	-0.0090	0.0078
10	-219	270	-0.2934	-225	280	-0.3030	-0.0096	0.0168
12	-264	315	-0.3474	-255	311	-0.3396	0.0078	0.0264
14	-210	262	-0.2832	-206	262	-0.2808	0.0024	0.0186
16	-108	155	-0.1578	-105	157	-0.1572	0.0006	0.0162
18	3	59	-0.0336	8	61	-0.0318	0.0018	0.0156
20	39	22	0.0102	44	25	0.0114	0.0012	0.0138
22	68	-21	0.0534	71	-18	0.0534	0.0000	0.0126
24	69	-4	0.0438	73	-4	0.0462	0.0024	0.0126
26	51	15	0.0216	53	18	0.0210	-0.0006	0.0102
28	83	-16	0.0594	84	-14	0.0588	-0.0006	0.0108
30	97	-31	0.0768	102	-31	0.0798	0.0030	0.0114
32	95	-49	0.0864	99	-46	0.0870	0.0006	0.0084
34	108	-45	0.0918	111	-43	0.0924	0.0006	0.0078
36	38	23	0.0090	41	23	0.0108	0.0018	0.0072
38	-27	95	-0.0732	-26	98	-0.0744	-0.0012	0.0054
40	0	63	0.0000	2	67	-0.0390	0.0000	0.0066
42	1	47	-0.0276	3	51	-0.0288	-0.0012	0.0066
44	-27	90	-0.0702	-25	93	-0.0708	-0.0006	0.0078
46	-36	101	-0.0822	-34	105	-0.0834	-0.0012	0.0084
48	-38	103	-0.0846	-39	107	-0.0876	-0.0030	0.0096
50	-63	126	-0.1134	-58	129	-0.1122	0.0012	0.0126
52	-94	142	-0.1416	-93	145	-0.1428	-0.0012	0.0114
54	-91	154	-0.1470	-91	156	-0.1482	-0.0012	0.0126
56	-47	90	-0.0822	-42	93	-0.0810	0.0012	0.0138
58	31	33	-0.0012	35	33	0.0012	0.0024	0.0126
60	-2	49	-0.0306	-1	54	-0.0330	-0.0024	0.0102
62	91	-51	0.0852	91	-50	0.0846	-0.0006	0.0126
64	176	-119	0.1770	176	-119	0.1770	0.0000	0.0132
66	306	-247	0.3318	309	-245	0.3324	0.0006	0.0132
68	411	-355	0.4596	413	-358	0.4626	0.0030	0.0126
70	530	-493	0.6138	529	-490	0.6114	-0.0024	0.0096
72	724	-687	0.8466	726	-685	0.8466	0.0000	0.0120
74	905	-857	1.0572	908	-870	1.0668	0.0096	0.0120
76	1076	-1020	1.2576	1069	-1025	1.2564	-0.0012	0.0024
78	1201	-1143	1.4064	1205	-1145	1.4100	0.0036	0.0036
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

CURRENT SURVEY 12/16/2009 9:03:57 AM

INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 1/26/2010 3:19:06 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-529	595	-0.6744	-516	524	-0.6240	0.0504	0.2556
6	-416	451	-0.5202	-382	376	-0.4548	0.0654	0.2052
8	-138	173	-0.1866	-176	159	-0.2010	-0.0144	0.1398
10	-219	270	-0.2934	-265	239	-0.3024	-0.0090	0.1542
12	-264	315	-0.3474	-291	262	-0.3318	0.0156	0.1632
14	-210	262	-0.2832	-243	215	-0.2748	0.0084	0.1476
16	-108	155	-0.1578	-127	118	-0.1470	0.0108	0.1392
18	3	59	-0.0336	-35	1	-0.0216	0.0120	0.1284
20	39	22	0.0102	-1	-31	0.0180	0.0078	0.1164
22	68	-21	0.0534	27	-59	0.0516	-0.0018	0.1086
24	69	-4	0.0438	17	-54	0.0426	-0.0012	0.1104
26	51	15	0.0216	4	-40	0.0264	0.0048	0.1116
28	83	-16	0.0594	31	-74	0.0630	0.0036	0.1068
30	97	-31	0.0768	50	-86	0.0816	0.0048	0.1032
32	95	-49	0.0864	53	-86	0.0834	-0.0030	0.0984
34	108	-45	0.0918	53	-78	0.0786	-0.0132	0.1014
36	38	23	0.0090	-10	-14	0.0024	-0.0066	0.1146
38	-27	95	-0.0732	-73	39	-0.0672	0.0060	0.1212
40	0	63	0.0000	-48	11	-0.0354	0.0000	0.1152
42	1	47	-0.0276	-40	12	-0.0312	-0.0036	0.1152
44	-27	90	-0.0702	-81	38	-0.0714	-0.0012	0.1188
46	-36	101	-0.0822	-92	49	-0.0846	-0.0024	0.1200
48	-38	103	-0.0846	-97	56	-0.0918	-0.0072	0.1224
50	-63	126	-0.1134	-113	77	-0.1140	-0.0006	0.1296
52	-94	142	-0.1416	-132	99	-0.1386	0.0030	0.1302
54	-91	154	-0.1470	-141	110	-0.1506	-0.0036	0.1272
56	-47	90	-0.0822	-65	52	-0.0702	0.0120	0.1308
58	31	33	-0.0012	-20	-8	-0.0072	-0.0060	0.1188
60	-2	49	-0.0306	-39	10	-0.0294	0.0012	0.1248
62	91	-51	0.0852	67	-86	0.0918	0.0066	0.1236
64	176	-119	0.1770	154	-170	0.1944	0.0174	0.1170
66	306	-247	0.3318	283	-302	0.3510	0.0192	0.0996
68	411	-355	0.4596	385	-405	0.4740	0.0144	0.0804
70	530	-493	0.6138	519	-523	0.6252	0.0114	0.0660
72	724	-687	0.8466	715	-718	0.8598	0.0132	0.0546
74	905	-857	1.0572	893	-902	1.0770	0.0198	0.0414
76	1076	-1020	1.2576	1052	-1070	1.2732	0.0156	0.0216
78	1201	-1143	1.4064	1158	-1196	1.4124	0.0060	0.0060
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

CURRENT SURVEY 1/6/2010 8:45:23 AM

INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 1/26/2010 3:19:06 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-529	595	-0.6744	-501	519	-0.6120	0.0624	0.2910
6	-416	451	-0.5202	-374	374	-0.4488	0.0714	0.2286
8	-138	173	-0.1866	-185	168	-0.2118	-0.0252	0.1572
10	-219	270	-0.2934	-267	243	-0.3060	-0.0126	0.1824
12	-264	315	-0.3474	-285	256	-0.3246	0.0228	0.1950
14	-210	262	-0.2832	-239	214	-0.2718	0.0114	0.1722
16	-108	155	-0.1578	-124	118	-0.1452	0.0126	0.1608
18	3	59	-0.0336	-30	2	-0.0192	0.0144	0.1482
20	39	22	0.0102	2	-30	0.0192	0.0090	0.1338
22	68	-21	0.0534	27	-58	0.0510	-0.0024	0.1248
24	69	-4	0.0438	17	-53	0.0420	-0.0018	0.1272
26	51	15	0.0216	10	-40	0.0300	0.0084	0.1290
28	83	-16	0.0594	36	-73	0.0654	0.0060	0.1206
30	97	-31	0.0768	52	-85	0.0822	0.0054	0.1146
32	95	-49	0.0864	52	-87	0.0834	-0.0030	0.1092
34	108	-45	0.0918	53	-77	0.0780	-0.0138	0.1122
36	38	23	0.0090	-11	-11	0.0000	-0.0090	0.1260
38	-27	95	-0.0732	-67	40	-0.0642	0.0090	0.1350
40	0	63	0.0000	-45	13	-0.0348	0.0000	0.1260
42	1	47	-0.0276	-42	9	-0.0306	-0.0030	0.1260
44	-27	90	-0.0702	-81	39	-0.0720	-0.0018	0.1290
46	-36	101	-0.0822	-92	48	-0.0840	-0.0018	0.1308
48	-38	103	-0.0846	-97	54	-0.0906	-0.0060	0.1326
50	-63	126	-0.1134	-112	77	-0.1134	0.0000	0.1386
52	-94	142	-0.1416	-134	101	-0.1410	0.0006	0.1386
54	-91	154	-0.1470	-141	112	-0.1518	-0.0048	0.1380
56	-47	90	-0.0822	-60	50	-0.0660	0.0162	0.1428
58	31	33	-0.0012	-21	-5	-0.0096	-0.0084	0.1266
60	-2	49	-0.0306	-40	12	-0.0312	-0.0006	0.1350
62	91	-51	0.0852	69	-85	0.0924	0.0072	0.1356
64	176	-119	0.1770	159	-169	0.1968	0.0198	0.1284
66	306	-247	0.3318	284	-303	0.3522	0.0204	0.1086
68	411	-355	0.4596	388	-406	0.4764	0.0168	0.0882
70	530	-493	0.6138	520	-524	0.6264	0.0126	0.0714
72	724	-687	0.8466	718	-719	0.8622	0.0156	0.0588
74	905	-857	1.0572	896	-900	1.0776	0.0204	0.0432
76	1076	-1020	1.2576	1055	-1072	1.2762	0.0186	0.0228
78	1201	-1143	1.4064	1160	-1191	1.4106	0.0042	0.0042
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000

SITE PAFTVA

INSTALLATION SI-11

DESCRIPTION From DataMate

CURRENT SURVEY 1/19/2010 8:46:19 AM

INITIAL SURVEY 11/4/2009 10:45:30 AM

DATE PRINTED 1/26/2010 3:19:06 PM

Data Reduction for B Axis:

	Initial			Current				
Depth (ft)	B0	B180	Incr. Dev (in)	B0	B180	Incr. Dev (in)	Incr. Disp. (in)	Cum. Disp. (in)
4	-529	595	-0.6744	-542	547	-0.6534	0.0210	0.1770
6	-416	451	-0.5202	-398	394	-0.4752	0.0450	0.1560
8	-138	173	-0.1866	-194	177	-0.2226	-0.0360	0.1110
10	-219	270	-0.2934	-267	250	-0.3102	-0.0168	0.1470
12	-264	315	-0.3474	-283	255	-0.3228	0.0246	0.1638
14	-210	262	-0.2832	-236	214	-0.2700	0.0132	0.1392
16	-108	155	-0.1578	-124	118	-0.1452	0.0126	0.1260
18	3	59	-0.0336	-28	2	-0.0180	0.0156	0.1134
20	39	22	0.0102	3	-29	0.0192	0.0090	0.0978
22	68	-21	0.0534	28	-53	0.0486	-0.0048	0.0888
24	69	-4	0.0438	19	-47	0.0396	-0.0042	0.0936
26	51	15	0.0216	12	-39	0.0306	0.0090	0.0978
28	83	-16	0.0594	39	-69	0.0648	0.0054	0.0888
30	97	-31	0.0768	55	-84	0.0834	0.0066	0.0834
32	95	-49	0.0864	55	-82	0.0822	-0.0042	0.0768
34	108	-45	0.0918	54	-77	0.0786	-0.0132	0.0810
36	38	23	0.0090	-8	-9	0.0006	-0.0084	0.0942
38	-27	95	-0.0732	-65	39	-0.0624	0.0108	0.1026
40	0	63	0.0000	-44	16	-0.0360	0.0000	0.0918
42	1	47	-0.0276	-41	20	-0.0366	-0.0090	0.0918
44	-27	90	-0.0702	-80	49	-0.0774	-0.0072	0.1008
46	-36	101	-0.0822	-88	59	-0.0882	-0.0060	0.1080
48	-38	103	-0.0846	-93	65	-0.0948	-0.0102	0.1140
50	-63	126	-0.1134	-110	84	-0.1164	-0.0030	0.1242
52	-94	142	-0.1416	-132	107	-0.1434	-0.0018	0.1272
54	-91	154	-0.1470	-139	115	-0.1524	-0.0054	0.1290
56	-47	90	-0.0822	-59	52	-0.0666	0.0156	0.1344
58	31	33	-0.0012	-18	-3	-0.0090	-0.0078	0.1188
60	-2	49	-0.0306	-40	14	-0.0324	-0.0018	0.1266
62	91	-51	0.0852	69	-85	0.0924	0.0072	0.1284
64	176	-119	0.1770	158	-167	0.1950	0.0180	0.1212
66	306	-247	0.3318	283	-301	0.3504	0.0186	0.1032
68	411	-355	0.4596	385	-405	0.4740	0.0144	0.0846
70	530	-493	0.6138	521	-523	0.6264	0.0126	0.0702
72	724	-687	0.8466	718	-718	0.8616	0.0150	0.0576
74	905	-857	1.0572	896	-903	1.0794	0.0222	0.0426
76	1076	-1020	1.2576	1050	-1071	1.2726	0.0150	0.0204
78	1201	-1143	1.4064	1161	-1192	1.4118	0.0054	0.0054
80	0	0	0.0000	0	0	0.0000	0.0000	0.0000

Attachment D

Laboratory Testing

Natural Moisture Content Testing

Stantec

Moisture Content of Soil

ASTM D 2216

Project Name PAF-Scrubber Sludge Complex

Project Number 175569040

Tested By JF/RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source		Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
STN - 17 / SPT - 1, 0.0'-1.5'		7	1/7/10	Hom	3/8"			No	21.75	99.04	85.36	21.5
STN - 17 / SPT - 4, 4.5'-6.0'		8	1/7/10		3/8"			No	21.74	86.19	82.17	6.7
STN - 17 / SPT - 7, 9.0'-10.5'		11	1/7/10	Hom	No. 4			No	22.62	97.11	88.28	13.4
STN - 17 / SPT - 10, 13.5'-15.0'		13	1/7/10		3/8"			No	23.69	59.30	54.19	16.8
STN - 17 / SPT - 13, 18.0'-19.5'		15	1/7/10	Hom	3/4"			No	22.28	97.70	92.30	7.7
STN - 17 / SPT - 16, 22.5'-24.0'	40° C	17	1/7/10	Hom	3/4"			No	22.66	99.57	93.47	8.6
STN - 17 / SPT - 18, 30.0'-31.5'	40° C	18	1/7/10	Hom	3/4"			No	22.27	99.20	92.09	10.2
STN - 18 / SPT - 1, 0.0'-1.5'		19	1/7/10	Hom	No. 4			No	22.25	112.20	104.62	9.2
STN - 18 / SPT - 3A, 3.5'-4.5'	40° C	20	1/7/10		No. 10			Yes	23.30	81.71	76.08	10.7
STN - 18 / SPT - 6, 7.5'-9.0'	40° C	23	1/7/10		No. 10			Yes	21.58	90.36	78.32	21.2
STN - 18 / SPT - 9, 12.0'-13.5'	40° C	26	1/7/10		No. 10			Yes	22.26	104.83	89.30	23.2
STN - 18 / SPT - 12, 16.5'-18.0'	40° C	28	1/7/10		No. 10			Yes	21.73	105.63	91.34	20.5
STN - 18 / SPT - 15, 21.0'-22.5'	40° C	29	1/7/10		No. 10			Yes	21.42	120.60	98.97	27.9
STN - 18 / SPT - 18, 25.5'-27.0'	40° C	30	1/7/10		No. 10			Yes	21.63	113.65	95.32	24.9
STN - 18 / SPT - 21, 30.0'-31.5'	40° C	31	1/7/10		No. 10			Yes	22.07	107.86	89.93	26.4
STN - 18 / SPT - 24, 34.5'-36.0'		32	1/7/10	Hom	3/4"			No	21.47	96.45	84.79	18.4
STN - 18 / SPT - 27, 39.0'-40.5'		33	1/7/10	Hom	3/4"			No	21.37	112.92	98.17	19.2
STN - 18 / SPT - 29, 45.0'-46.5'		34	1/7/10	Hom	3/8"			No	22.29	99.63	90.21	13.9
STN - 19 / SPT - 1, 0.0'-1.5'	40° C	35	1/7/10	Hom	No. 10			Yes	21.99	104.09	94.40	13.4
STN - 19 / SPT - 4, 4.5'-6.0'	40° C	36	1/7/10		No. 10			Yes	22.11	107.96	96.74	15.0
STN - 19 / SPT - 7, 9.0'-10.5'	40° C	37	1/7/10		No. 10			Yes	21.39	94.87	83.58	18.2
STN - 19 / SPT - 10, 13.5'-15.0'	40° C	38	1/7/10		No. 10			Yes	21.78	108.37	84.24	38.6
STN - 19 / SPT - 13, 18.0'-19.5'	40° C	39	1/7/10		No. 10			Yes	21.75	101.66	87.71	21.1
STN - 19 / SPT - 16, 22.5'-24.0'	40° C	40	1/7/10		No. 10			Yes	21.77	104.57	89.79	21.7
STN - 19 / SPT - 19, 27.0'-28.5'	40° C	41	1/7/10		No. 10			Yes	21.84	102.77	89.79	19.1
STN - 19 / SPT - 22, 31.5'-33.0'	40° C	42	1/7/10		No. 10			Yes	22.14	109.23	94.31	20.7
STN - 19 / SPT - 25, 36.0'-37.5'	40° C	43	1/7/10		No. 10			Yes	22.29	112.78	96.81	21.4
STN - 19 / SPT - 28, 40.5'-42.0'	40° C	44	1/7/10	Hom	No. 10			Yes	19.26	85.62	73.53	22.3

Stantec

Moisture Content of Soil

ASTM D 2216

Project Name PAF-Scrubber Sludge Complex

Project Number 175569040

Tested By JF/RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source		Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
STN - 19 / SPT - 31, 45.0'-46.5'	40° C	47	1/7/10	Hom	No. 10			Yes	22.11	110.88	93.17	24.9
STN - 19 / SPT - 34, 49.5'-51.0'	40° C	49	1/7/10	Hom	No. 10			Yes	22.90	101.92	86.84	23.6
STN - 19 / SPT - 37, 54.0'-55.5'	40° C	51	1/7/10		No. 10			Yes	22.33	91.24	79.79	19.9
STN - 19 / SPT - 40, 60.0'-61.5'	40° C	53	1/7/10	Hom	No. 10			Yes	21.46	99.97	87.59	18.7
STN - 19 / SPT - 41, 65.0'-66.5'	40° C	54	1/7/10	Lam	No. 10			Yes	21.85	105.39	94.32	15.3
STN - 20 / SPT - 1, 0.0'-1.5'		55	1/7/10	Hom	3/8"			No	22.46	90.17	81.16	15.3
STN - 20 / SPT - 4, 4.5'-6.0'		56	1/7/10	Hom	3/8"			No	22.16	97.86	89.53	12.4
STN - 20 / SPT - 7, 9.0'-10.5'		59	1/7/10	Hom	3/4"			No	22.82	100.05	92.34	11.1
STN - 20 / SPT - 10, 13.5'-15.0'		61	1/7/10	Hom	3/4"			No	20.75	90.80	82.69	13.1
STN - 20 / SPT - 13, 18.0'-19.5'		62	1/7/10		3/8"			No	21.54	105.70	90.30	22.4
STN - 20 / SPT - 16, 22.5'-24.0'		64	1/7/10	Hom	3/8"			No	21.95	98.42	87.91	15.9
STN - 20 / SPT - 19, 27.0'-28.5'		65	1/7/10	Hom	3/4"			No	21.64	87.63	81.23	10.7
STN - 20 / SPT - 22, 35.0'-36.5'	40° C	67	1/7/10	Hom	3/8"			No	18.93	80.61	75.02	10.0
STN - 21 / SPT - 1, 0.0'-1.5'		71	1/7/10	Hom	3/8"			No	19.47	89.14	83.74	8.4
STN - 21 / SPT - 4, 4.5'-6.0'		72	1/7/10	Hom	3/8"			No	20.30	88.82	78.90	16.9
STN - 21 / SPT - 7, 9.0'-10.5'	40° C	75	1/7/10		No. 10			Yes	21.50	95.17	83.22	19.4
STN - 21 / SPT - 10, 13.5'-15.0'	40° C	78	1/7/10		No. 10			Yes	21.35	101.34	85.49	24.7
STN - 21 / SPT - 13, 18.0'-19.5'	40° C	80	1/7/10		No. 10			Yes	22.57	124.49	102.95	26.8
STN - 21 / SPT - 16, 22.5'-24.0'	40° C	81	1/7/10		No. 10			Yes	19.66	107.13	89.13	25.9
STN - 21 / SPT - 19, 27.0'-28.5'	40° C	82	1/7/10		No. 10			Yes	23.04	120.66	100.57	25.9
STN - 21 / SPT - 22, 31.5'-33.0'	40° C	83	1/7/10		No. 10			Yes	23.56	121.94	102.83	24.1
STN - 21 / SPT - 25, 36.0'-37.5'	40° C	84	1/7/10		No. 10			Yes	21.91	106.84	90.23	24.3
STN - 21 / SPT - 28, 40.5'-42.0'	40° C	85	1/7/10		No. 10			Yes	20.95	100.17	83.11	27.4
STN - 21 / SPT - 31, 45.0'-46.5'	40° C	86	1/7/10		No. 10			Yes	18.81	98.30	81.41	27.0
STN - 21 / SPT - 33, 50.0'-51.5'		87	1/7/10	Hom	3/4"			No	21.41	114.45	100.48	17.7
STN - 22 / SPT - 1, 0.0'-1.5'	40° C	93	1/7/10		No. 10			Yes	21.47	97.87	88.10	14.7
STN - 22 / SPT - 4, 4.5'-6.0'	40° C	94	1/7/10		No. 10			Yes	21.63	82.44	76.16	11.5
STN - 22 / SPT - 7, 9.0'-10.5'	40° C	95	1/7/10		No. 10			Yes	22.71	106.49	90.69	23.2
STN - 22 / SPT - 10, 13.5'-15.0'	40° C	96	1/7/10		No. 10			Yes	21.36	93.68	75.92	32.6
STN - 22 / SPT - 13, 18.0'-19.5'	40° C	97	1/7/10		No. 10			Yes	21.98	117.26	95.35	29.9
STN - 22 / SPT - 16, 22.5'-24.0'	40° C	98	1/7/10		No. 10			Yes	21.89	122.13	104.10	21.9

Stantec

Moisture Content of Soil

ASTM D 2216

Project Name PAF-Scrubber Sludge Complex

Project Number 175569040

Tested By JF/RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source		Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
STN - 22 / SPT - 19, 27.0'-28.5'	40° C	99	1/7/10		No. 10			Yes	22.35	100.15	85.69	22.8
STN - 22 / SPT - 22, 31.5'-33.0'	40° C	100	1/7/10		No. 10			Yes	20.05	84.98	73.14	22.3
STN - 22 / SPT - 25, 36.0'-37.5'	40° C	101	1/7/10		No. 10			Yes	22.38	113.87	97.94	21.1
STN - 22 / SPT - 28, 40.5'-42.0'	40° C	102	1/7/10		No. 10			Yes	19.13	106.13	89.01	24.5
STN - 22 / SPT - 31, 45.0'-46.5'	40° C	105	1/7/10		No. 10			Yes	20.87	87.34	76.73	19.0
STN - 22 / SPT - 34, 49.5'-51.0'	40° C	107	1/7/10		No. 10			Yes	21.55	88.20	77.16	19.9
STN - 22 / SPT - 37, 54.0'-55.5'	40° C	109	1/7/10		No. 10			Yes	21.67	103.86	88.40	23.2
STN - 22 / SPT - 40, 58.5'-60.0'	40° C	111	1/7/10		No. 10			Yes	21.69	90.90	81.55	15.6
STN - 22 / SPT - 41, 65.0'-66.5'	40° C	112	1/7/10		No. 10			Yes	22.25	89.14	79.48	16.9
STN - 23 / SPT - 1, 0.0'-1.5'		118	1/7/10	Hom	3/4"			No	22.21	101.90	90.94	15.9
STN - 23 / SPT - 4, 4.5'-6.0'		121	1/7/10	Hom	3/4"			No	21.67	89.88	80.07	16.8
STN - 23 / SPT - 7, 9.0'-10.5'		123	1/7/10	Hom	3/4"			No	21.74	108.79	101.51	9.1
STN - 23 / SPT - 10, 13.5'-15.0'		125	1/7/10	Hom	3/4"			No	21.88	102.39	91.61	15.5
STN - 23 / SPT - 13, 18.0'-19.5'		127	1/19/10	Hom	1 1/2"			No	21.52	108.55	97.24	14.9
STN - 23 / SPT - 16, 22.5'-24.0'		128	1/19/10	Hom	3/4"			No	21.60	108.04	96.00	16.2
STN - 23 / SPT - 19, 27.0'-28.5'	40° C	129	1/8/10	Hom	3/4"			No	21.16	85.75	82.61	5.1
STN - 23 / SPT - 22, 31.5'-33.0'	40° C	130	1/8/10		3/4"			No	19.56	90.00	85.45	6.9
STN - 23 / SPT - 25, 36.0'-37.5'	40° C	131	1/8/10		3/4"			No	19.62	89.24	77.01	21.3
STN - 23 / SPT - 28, 40.5'-42.0'	40° C	132	1/8/10		3/4"			No	21.53	111.02	97.01	18.6
STN - 23 / SPT - 29, 45.0'-46.5'	40° C	133	1/8/10		3/4"			No	22.03	104.96	98.72	8.1
STN - 24 / SPT - 1, 0.0'-1.5'		138	1/8/10	Hom	3/4"			No	21.89	93.10	84.49	13.8
STN - 24 / SPT - 4, 4.5'-6.0'	40° C	139	1/8/10	Hom	No. 10			Yes	19.72	71.98	63.85	18.4
STN - 24 / SPT - 7, 9.0'-10.5'	40° C	142	1/8/10	Hom	No. 10			Yes	22.94	88.54	76.62	22.2
STN - 24 / SPT - 10, 13.5'-15.0'	40° C	145	1/8/10	Hom	No. 10			Yes	21.69	92.09	82.18	16.4
STN - 24 / SPT - 13, 18.0'-19.5'	40° C	147	1/8/10	Hom	No. 10			Yes	22.17	109.25	100.58	11.1
STN - 24 / SPT - 16, 22.5'-24.0'	40° C	148	1/8/10	Hom	No. 10			Yes	22.99	107.53	95.69	16.3
STN - 24 / SPT - 19, 27.0'-28.5'	40° C	149	1/8/10		No. 10			Yes	22.01	108.64	92.44	23.0
STN - 24 / SPT - 22, 31.5'-33.0'	40° C	150	1/8/10	Hom	3/8"			No	22.97	93.65	86.04	12.1
STN - 24 / SPT - 25, 36.0'-37.5'	40° C	151	1/8/10		3/4"			No	23.35	123.24	110.74	14.3
STN - 24 / SPT - 28, 40.5'-42.0'	40° C	152	1/8/10		3/4"			No	21.95	94.47	83.60	17.6
STN - 24 / SPT - 31, 45.0'-46.5'		153	1/8/10		3/4"			No	27.03	101.96	94.00	11.9

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Moisture Content of Soil

ASTM D 2216

Project Name PAF-Scrubber Sludge Complex

Project Number 175569040

Tested By JF/RJ

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous

Source		Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
STN - 24 / SPT - 34, 50.0'-51.5'	40° C	154	1/8/10		3/4"			No	29.09	121.38	108.40	16.4
STN - 24 / SPT - 35, 55.0'-56.5'	40° C	155	1/8/10		3/4"			No	26.26	145.74	130.32	14.8
STN - 25 / SPT - 1, 0.0'-1.5'	40° C	160	1/8/10		No. 10			Yes	29.46	120.34	111.11	11.3
STN - 25 / SPT - 4, 4.5'-6.0'	40° C	161	1/8/10		No. 10			Yes	21.44	97.15	91.65	7.8
STN - 25 / SPT - 7, 9.0'-10.5'	40° C	162	1/8/10		No. 10			Yes	21.09	98.75	85.77	20.1
STN - 25 / SPT - 10, 13.5'-15.0'	40° C	163	1/8/10		No. 10			Yes	22.52	105.17	88.55	25.2
STN - 25 / SPT - 13, 18.0'-19.5'	40° C	164	1/8/10		No. 10			Yes	21.58	123.98	98.35	33.4
STN - 25 / SPT - 16, 22.5'-24.0'	40° C	165	1/8/10		No. 10			Yes	21.50	103.18	87.79	23.2
STN - 25 / SPT - 19, 27.0'-28.5'	40° C	166	1/8/10		No. 10			Yes	21.82	103.67	90.72	18.8
STN - 25 / SPT - 22, 31.5'-33.0'	40° C	167	1/8/10		No. 10			Yes	21.46	96.35	82.49	22.7
STN - 25 / SPT - 25, 36.0'-37.5'	40° C	168	1/8/10	Hom	No. 10			Yes	21.37	97.39	84.10	21.2
STN - 25 / SPT - 28, 40.5'-42.0'	40° C	171	1/8/10	Hom	No. 10			Yes	21.23	110.78	96.38	19.2
STN - 25 / SPT - 31, 45.0'-46.5'	40° C	174	1/8/10		No. 10			Yes	21.49	96.46	84.25	19.5
STN - 25 / SPT - 34, 49.5'-51.0'		176	1/8/10	Hom	3/8"			No	21.59	107.62	94.63	17.8
STN - 25 / SPT - 37, 54.0'-55.5'		177	1/8/10	Hom	3/4"			No	22.80	123.96	105.56	22.2
STN - 25 / SPT - 40, 58.5'-60.0'		178	1/8/10	Hom	3/8"			No	21.44	107.97	96.83	14.8
STN - 25 / SPT - 42, 61.5'-63.0'		179	1/8/10		3/4"			No	21.50	109.23	93.27	22.2
STN - 25 / SPT - 43, 65.0'-66.5'		180	1/8/10		3/4"			No	21.91	130.59	112.31	20.2
STN - 25 / SPT - 44, 70.0'-71.5'		181	1/8/10		3/4"			No	21.61	127.17	109.57	20.0

Permeability Testing

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter ASTM D 5084-03

Project Name: PAF- Scrubber Sludge Complex | Project No.: 175569040
Source: STN-20A/ST-2, 10.0'-12.0', TI 10.0'-10.5' | Test ID: 69A
Visual Classification: Gravelly Silt (ML), gray, moist, firm, mine spoil | Prepared By: BWT
Undisturbed: XX | Specific Gravity: 2.7 ASTM D854-A | Date: 11-15-10
Maximum Dry Density (pcf): | Percent of Maximum:
Permeant: De-aired tap water
Selection and Preparation Comments:

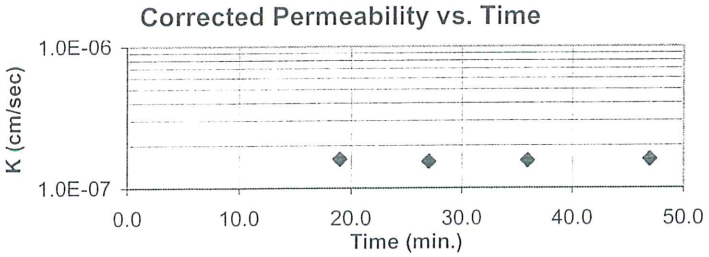
Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 25 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data
Height (in.)	2.4530	2.3732	2.3746
Diameter (in.)	2.7990		2.7627
Moisture Content (%)	14.3		19.9
Dry Unit Weight (pcf)	101.8		108.0
Void Ratio	0.656		0.561
Degree of Saturation (%)	59.0		95.6
Trimmings MC (%)	14.3		

Final Pressures (psi): Chamber 75; Influent 70; Effluent 65

Applied Head Difference (psi): 5
Back Pressure Saturated to (psi): 65
Maximum Effective Consolidation Stress (psi): 10
Minimum Effective Consolidation Stress (psi): 5

Date	Clock (24H:M)	Temp. °F	Bottom Head	Top Head	Test Time (sec)	Hydraulic Conductivity k (m/s)	Hydraulic Conductivity k (cm/s)	Hydraulic Conductivity k @ 20° C (m/s)	Hydraulic Conductivity k @ 20° C (cm/s)
1-25-10	12:36	72.0	21.88	4.54	0	---	---	---	---
1-25-10	12:55	72.0	21.35	5.08	1.14E+03	1.7E-09	1.7E-07	1.6E-09	1.6E-07
1-25-10	13:03	72.0	21.15	5.31	4.80E+02	1.6E-09	1.6E-07	1.5E-09	1.5E-07
1-25-10	13:12	72.0	20.89	5.54	5.40E+02	1.6E-09	1.6E-07	1.6E-09	1.6E-07
1-25-10	13:23	72.0	20.59	5.85	6.60E+02	1.7E-09	1.7E-07	1.6E-09	1.6E-07



A gradient of approximately 56.3 was used for this test. This gradient exceeds ASTM guidelines for maximum gradient, but was used to achieve the requestors desired test duration. Examination of the sample shows no signs of material loss or clogging that may affect test results.

Average Hydraulic Conductivity @ 20° C (last 4 determinations) m/s 1.57E-09 cm/s 1.57E-07
Average Hydraulic Conductivity @ 20° C (last run) m/s 1.57E-09 cm/s 1.57E-07

Reviewed by: KDG

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter ASTM D 5084-03

Project Name: PAF- Scrubber Sludge Complex
Project No.: 175569040
Source: STN-21A/ST-1, 5.0'-7.0', TI 5.0'-5.5'
Test ID: 88A
Visual Classification: Gravelly Lean Clay (CL), gray brown, moist, firm
Prepared By: BWT
Undisturbed: XX
Specific Gravity: 2.73 ASTM D854-A
Date: 1-15-10
Maximum Dry Density (pcf):
Percent of Maximum:
Permeant: De-aired tap water
Selection and Preparation Comments:

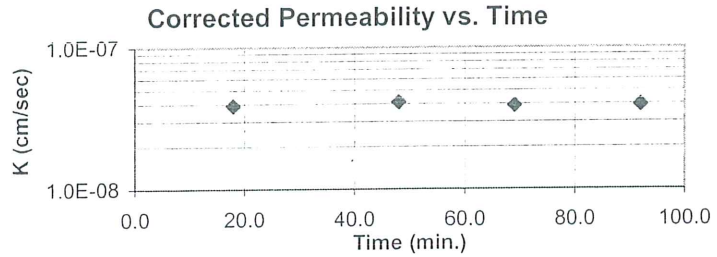
Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 25 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data
Height (in.)	2.4545	2.4505	2.4494
Diameter (in.)	2.8067		2.8199
Moisture Content (%)	17.3		20.8
Dry Unit Weight (pcf)	108.6		107.8
Void Ratio	0.569		0.581
Degree of Saturation (%)	83.1		97.7
Trimmings MC (%)	16.8		

Final Pressures (psi)	
Chamber	75
Influent	70
Effluent	65

Applied Head Difference (psi)	5
Back Pressure Saturated to (psi)	65
Maximum Effective Consolidation Stress (psi)	10
Minimum Effective Consolidation Stress (psi)	5

Date	Clock (24H:M)	Temp. °F	Bottom Head	Top Head	Test Time (sec)	Hydraulic Conductivity k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
1-25-10	14:05	72.0	22.28	3.08	0	---	---	---	---
1-25-10	14:23	72.0	22.16	3.21	1.08E+03	4.1E-10	4.1E-08	3.9E-10	3.9E-08
1-25-10	14:53	72.0	21.94	3.43	1.80E+03	4.3E-10	4.3E-08	4.1E-10	4.1E-08
1-25-10	15:14	72.0	21.80	3.58	1.26E+03	4.1E-10	4.1E-08	3.9E-10	3.9E-08
1-25-10	15:37	72.0	21.64	3.74	1.38E+03	4.1E-10	4.1E-08	3.9E-10	3.9E-08



A gradient of approximately 56.2 was used for this test. This gradient exceeds ASTM guidelines for maximum gradient, but was used to achieve the requestors desired test duration. Examination of the sample shows no signs of material loss or clogging that may affect test results.

Average Hydraulic Conductivity @ 20° C (last 4 determinations) m/s 3.95E-10 cm/s 3.95E-08
Average Hydraulic Conductivity @ 20° C (last run) m/s 3.95E-10 cm/s 3.95E-08

Reviewed by:

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
ASTM D 5084-03

Project Name: PAF- Scrubber Sludge Complex | Project No.: 175569040
Source: STN-23A/ST-1, 5.0'-7.0', TI - 5.0'-5.5' | Test ID: 134A
Visual Classification: Lean Clay with Gravel (CL), brown, moist, firm, coal | Prepared By: KDG
Undisturbed: XX | Specific Gravity: 2.62 ASTM D854-A | Date: 1-20-10
Maximum Dry Density (pcf): | Percent of Maximum:
Permeant: De-aired tap water
Selection and Preparation Comments:

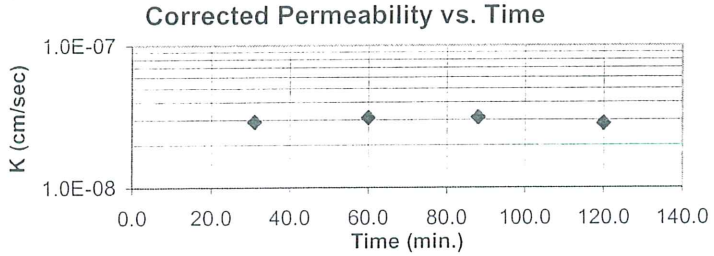
Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 25 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data
Height (in.)	2.4765	2.4192	2.4160
Diameter (in.)	2.7733		2.7541
Moisture Content (%)	15.9		22.2
Dry Unit Weight (pcf)	99.6		103.6
Void Ratio	0.642		0.579
Degree of Saturation (%)	65.1		100.5
Trimmings MC (%)	15.1		

Final Pressures (psi)	
Chamber	75
Influent	70
Effluent	65

Applied Head Difference (psi)	5
Back Pressure Saturated to (psi)	65
Maximum Effective Consolidation Stress (psi)	10
Minimum Effective Consolidation Stress (psi)	5

Date	Clock (24H:M)	Temp. °F	Bottom Head	Top Head	Test Time (sec)	Hydraulic Conductivity k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
1-26-10	8:01	72.0	21.90	4.07	0	---	---	---	---
1-26-10	8:32	72.0	21.75	4.23	1.86E+03	3.1E-10	3.1E-08	2.9E-10	2.9E-08
1-26-10	9:01	72.0	21.60	4.39	1.74E+03	3.3E-10	3.3E-08	3.1E-10	3.1E-08
1-26-10	9:29	72.0	21.45	4.54	1.68E+03	3.3E-10	3.3E-08	3.1E-10	3.1E-08
1-26-10	10:01	72.0	21.30	4.70	1.92E+03	3.0E-10	3.0E-08	2.8E-10	2.8E-08



A gradient of approximately 55.7 was used for this test. This gradient exceeds ASTM guidelines for maximum gradient, but was used to achieve the requestors desired test duration. Examination of the sample shows no signs of material loss or clogging that may affect test results.

Average Hydraulic Conductivity @ 20° C (last 4 determinations) m/s 2.98E-10 cm/s 2.98E-08
Average Hydraulic Conductivity @ 20° C (last run) m/s 2.98E-10 cm/s 2.98E-08

Reviewed by:

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter ASTM D 5084-03

Project Name: PAF- Scrubber Sludge Complex | Project No.: 175569040
Source: STN-23A/ST-1, 5.0'-7.0', TI 5.8'-6.3' | Test ID: 134B
Visual Classification: Gravelly Lean Clay (CL), brown, moist, firm, mine spoil | Prepared By: BWT
Undisturbed: XX | Specific Gravity: 2.71 ASTM D854-A | Date: 1-19-10
Maximum Dry Density (pcf): | Percent of Maximum:
Permeant: De-aired tap water
Selection and Preparation Comments:

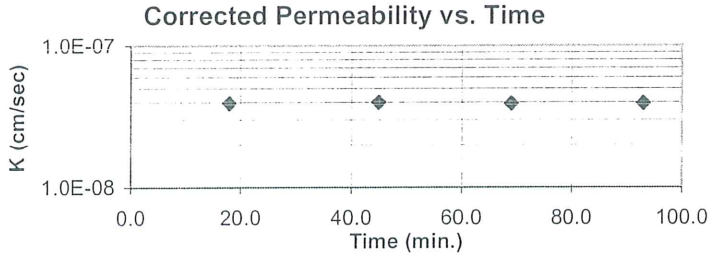
Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 25 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data
Height (in.)	2.4598	2.4491	2.4484
Diameter (in.)	2.7910		2.8061
Moisture Content (%)	14.9		17.3
Dry Unit Weight (pcf)	111.6		110.9
Void Ratio	0.516		0.526
Degree of Saturation (%)	77.9		89.0
Trimmings MC (%)	14.0		

Final Pressures (psi)	
Chamber	75
Influent	70
Effluent	65

Applied Head Difference (psi)	5
Back Pressure Saturated to (psi)	65
Maximum Effective Consolidation Stress (psi)	10
Minimum Effective Consolidation Stress (psi)	5

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. °F	Bottom Head	Top Head	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
1-25-10	14:03	72.0	22.15	3.41	0	---	---	---	---
1-25-10	14:21	72.0	22.02	3.53	1.08E+03	4.1E-10	4.1E-08	3.9E-10	3.9E-08
1-25-10	14:48	72.0	21.84	3.73	1.62E+03	4.2E-10	4.2E-08	4.0E-10	4.0E-08
1-25-10	15:12	72.0	21.69	3.91	1.44E+03	4.1E-10	4.1E-08	3.9E-10	3.9E-08
1-25-10	15:36	72.0	21.54	4.09	1.44E+03	4.1E-10	4.1E-08	3.9E-10	3.9E-08



A gradient of approximately 56.1 was used for this test. This gradient exceeds ASTM guidelines for maximum gradient, but was used to achieve the requestors desired test duration. Examination of the sample shows no signs of material loss or clogging that may affect test results.

Average Hydraulic Conductivity @ 20° C (last 4 determinations) m/s 3.93E-10 cm/s 3.93E-08
Average Hydraulic Conductivity @ 20° C (last run) m/s 3.93E-10 cm/s 3.93E-08

Reviewed by:

Soil Classification Testing

Stantec

Summary of Soil Tests

Project Name	PAF- Scrubber Sludge Complex	Project Number	175569040
Source	STN - 17 / SPT - 5, 6.0'-7.5' & STN - 17 / SPT - 8, 10.5'-12.0' & STN - 17 / SPT - 11, 15.0'-16.5' & STN - 17 / SPT - 14, 19.5'-21.0'	Lab ID	9
County	Muhlenberg	Date Received	1-5-10
Sample Type	SPT Comp	Date Reported	1-20-10

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	95.8
3/8"	9.5	90.0
No. 4	4.75	81.4
No. 10	2	70.2
No. 40	0.425	59.3
No. 200	0.075	53.1
	0.02	40.8
	0.005	25.5
	0.002	15.6
estimated	0.001	10.0

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

	ASTM	AASHTO
Range	(%)	(%)
Gravel	18.6	29.8
Coarse Sand	11.2	10.9
Medium Sand	10.9	---
Fine Sand	6.2	6.2
Silt	27.6	37.5
Clay	25.5	15.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 37
Plastic Limit: 19
Plasticity Index: 18
Activity Index: 1.13

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 with gravel

AASHTO Classification: A-6 (6)

Comments: mc determined using 40° C oven

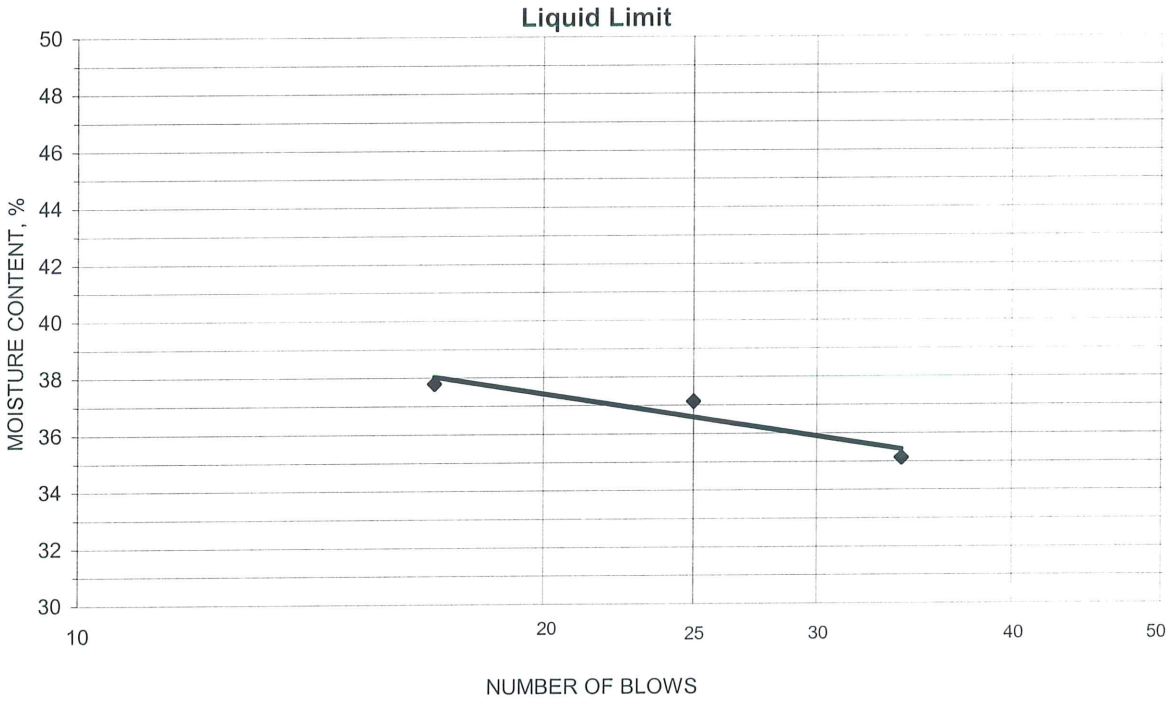
Reviewed by:

Stantec

ATTERBERG LIMITS

Project	PAF- Scrubber Sludge Complex	Project No.	175569040
Source	STN - 17 / SPT - 5, 6.0'-7.5' & STN - 17 / SPT - 8, 10.5'-12.0' & STN - 17 / SPT - 11, 15.0'-16.5' & STN - 17 / SPT - 14, 19.5'-21.0'	Lab ID	9
		% + No. 40	41
Tested By	KWS	Date Received	01-05-2010
Test Method	ASTM D 4318 Method A		
Test Date	01-12-2010		
Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.92	17.62	11.07	34	35.1	37
19.41	17.16	11.10	25	37.1	
19.73	17.35	11.05	17	37.8	



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
18.25	17.14	11.18	18.6	19	18
18.38	17.18	10.92	19.2		

Remarks: _____

Reviewed By _____

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 17 / SPT - 5, 6.0'-7.5' & STN - 17 / SPT - 8, 10.5'-12.0' & STN - 17 / SPT - 11, 15.0'-16.5' & STN - 17 / SPT - 14, 19.5'-21.0'
Lab ID: 9

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: JF
Test Date: 01-08-2010
Date Received: 01-05-2010

Maximum Particle size: 1" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	100.0
3/4"	95.8
3/8"	90.0
No. 4	81.4
No. 10	70.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

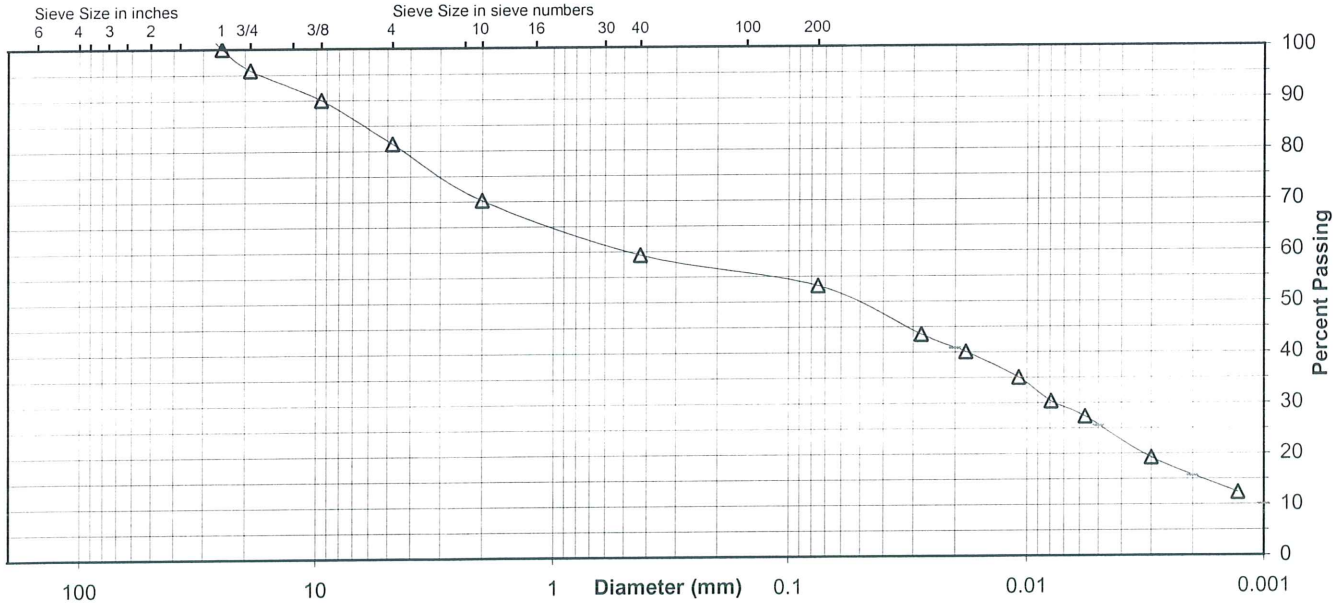
Specific Gravity: 2.71

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	59.3
No. 200	53.1
0.02 mm	40.8
0.005 mm	25.5
0.002 mm	15.6
0.001 mm	10.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	4.2	14.4	11.2	10.9	6.2	27.6	25.5
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	29.8			10.9	6.2	37.5	15.6



Comments

Reviewed By

Stantec

Summary of Soil Tests

Project Name	PAF- Scrubber Sludge Complex	Project Number	175569040
Source	STN - 18 / SPT - 5, 6.0'-7.5' & STN - 18 / SPT - 7, 9.0'-10.5' & STN - 18 / SPT - 8, 10.5'-12.0' & STN - 18 / SPT - 10, 13.5'-15.0'	Lab ID	21
County	Muhlenberg	Date Received	1-5-10
Sample Type	SPT Comp	Date Reported	1-20-10

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	99.8
No. 10	2	99.7
No. 40	0.425	96.5
No. 200	0.075	95.5
	0.02	22.2
	0.005	5.6
	0.002	4.1
estimated	0.001	3.0

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

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.2	0.3
Coarse Sand	0.1	3.2
Medium Sand	3.2	---
Fine Sand	1.0	1.0
Silt	89.9	91.4
Clay	5.6	4.1

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: 2.41

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments: mc determined using 40° C oven

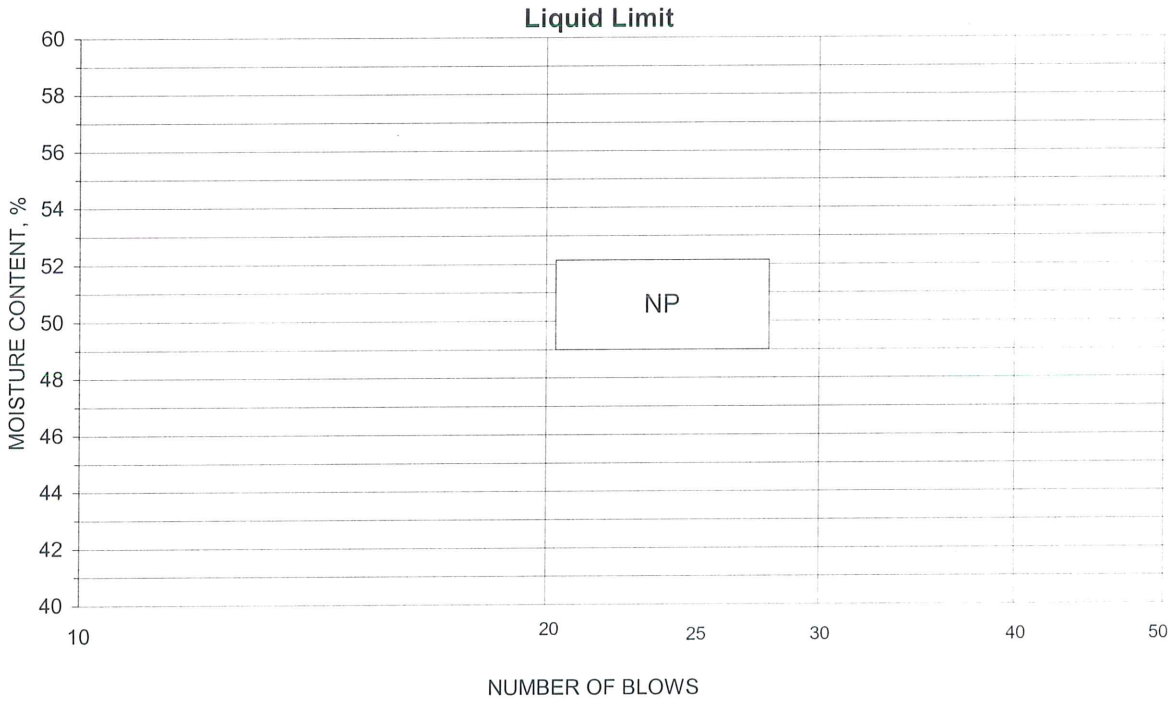
Reviewed by:

Stantec

ATTERBERG LIMITS

Project	PAF- Scrubber Sludge Complex	Project No.	175569040
Source	STN - 18 / SPT - 5, 6.0'-7.5' & STN - 18 / SPT - 7, 9.0'-10.5' & STN - 18 / SPT - 8, 10.5'-12.0' & STN - 18 / SPT - 10, 13.5'-15.0'	Lab ID	21
		% + No. 40	3
Tested By	KWS	Test Method	ASTM D 4318 Method A
Test Date	01-12-2010	Prepared	Dry
		Date Received	01-05-2010

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 _____

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 18 / SPT - 5, 6.0'-7.5' & STN - 18 / SPT - 7, 9.0'-10.5' & STN - 18 / SPT - 8, 10.5'-12.0' & STN - 18 / SPT - 10, 13.5'-15.0'
Lab ID: 21

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: JF
Test Date: 01-08-2010
Date Received: 01-05-2010

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	
3/8"	100.0
No. 4	99.8
No. 10	99.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

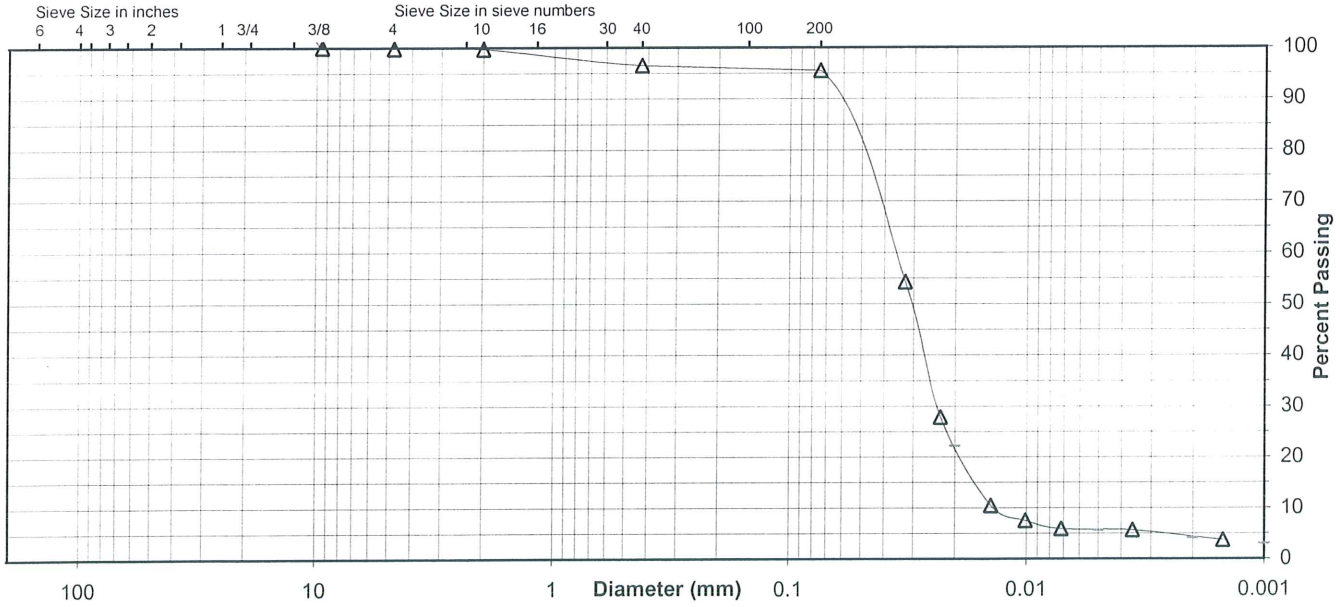
Specific Gravity: 2.41

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	96.5
No. 200	95.5
0.02 mm	22.2
0.005 mm	5.6
0.002 mm	4.1
0.001 mm	3.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.2	0.1	3.2	1.0	89.9	5.6
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.3			3.2	1.0	91.4	4.1



Comments

Reviewed By

Stantec

Summary of Soil Tests

Project Name	PAF- Scrubber Sludge Complex	Project Number	175569040
Source	STN - 19 / SPT - 29, 42.0'-43.5' & STN - 19 / SPT - 32, 46.5'-48.0' & STN - 19 / SPT - 35, 51.0'-52.5' & STN - 19 / SPT - 38, 55.5'-57.0'	Lab ID	45
County	Muhlenberg	Date Received	1-5-10
Sample Type	SPT Comp	Date Reported	1-20-10

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	96.0
No. 200	0.075	94.0
	0.02	24.2
	0.005	5.4
	0.002	3.8
estimated	0.001	2.0

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

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	4.0
Medium Sand	4.0	---
Fine Sand	2.0	2.0
Silt	88.6	90.2
Clay	5.4	3.8

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: 2.42

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments: mc determined using 40° C oven

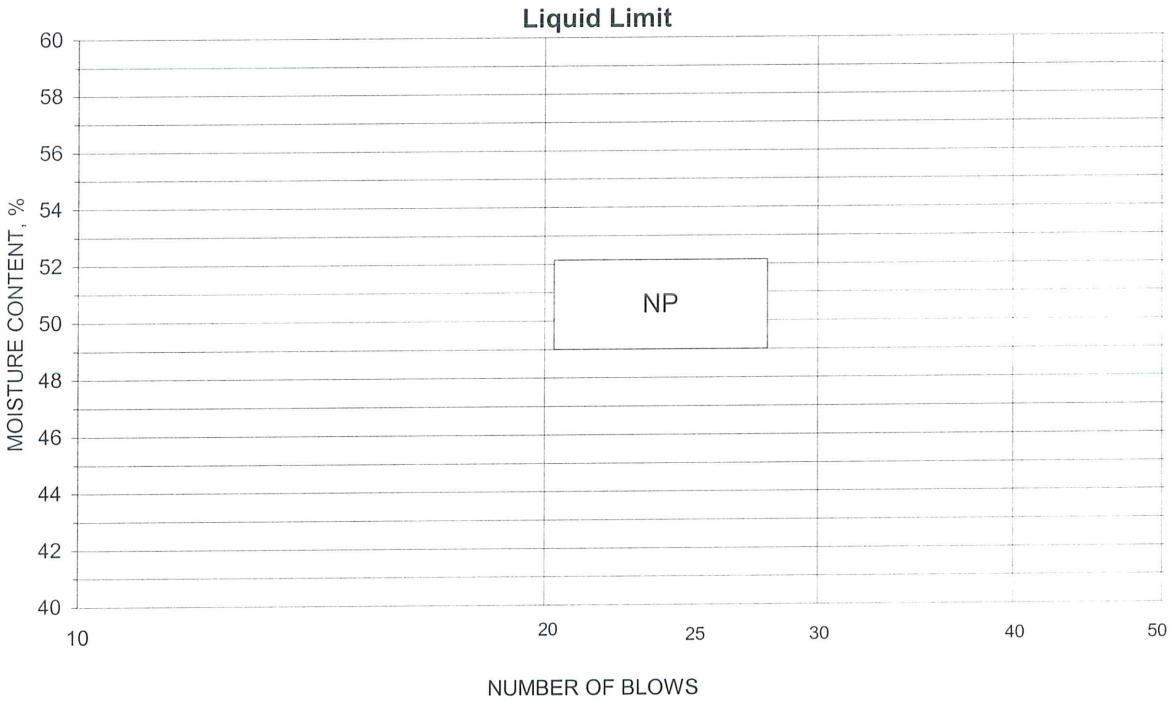
Reviewed by:

Stantec

ATTERBERG LIMITS

Project	PAF- Scrubber Sludge Complex	Project No.	175569040
Source	STN - 19 / SPT - 29, 42.0'-43.5' & STN - 19 / SPT - 32, 46.5'-48.0' & STN - 19 / SPT - 35, 51.0'-52.5' & STN - 19 / SPT - 38, 55.5'-57.0'	Lab ID	45
		% + No. 40	4
Tested By	KWS	Test Method	ASTM D 4318 Method A
Test Date	01-12-2010	Prepared	Dry
		Date Received	01-05-2010

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 _____

Particle-Size Analysis of Soils
ASTM D 422

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 19 / SPT - 29, 42.0'-43.5' & STN - 19 / SPT - 32, 46.5'-48.0' & STN - 19 / SPT - 35, 51.0'-52.5' & STN - 19 / SPT - 38, 55.5'-57.0'
Lab ID: 45

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: JF
Test Date: 01-08-2010
Date Received 01-05-2010

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 2.42

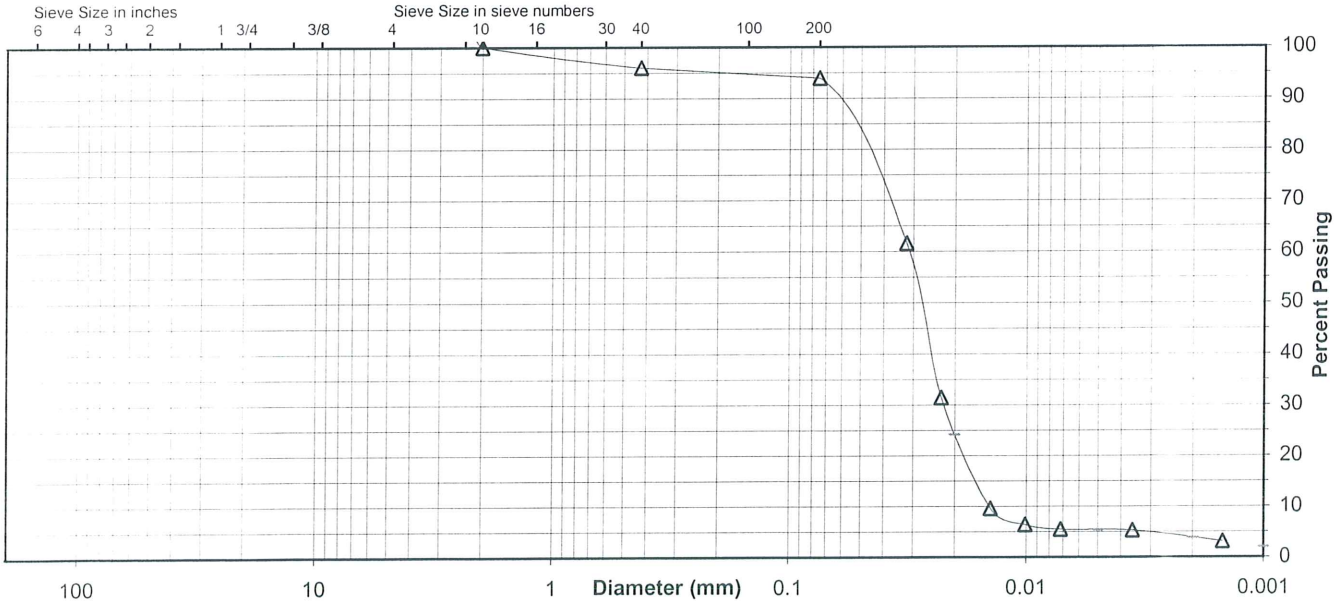
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	96.0
No. 200	94.0
0.02 mm	24.2
0.005 mm	5.4
0.002 mm	3.8
0.001 mm	2.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	4.0	2.0	88.6	5.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	4.0	2.0	90.2	3.8



Comments

Reviewed By

Stantec

Summary of Soil Tests

Project Name	PAF- Scrubber Sludge Complex	Project Number	175569040
Source	STN - 20 / SPT - 5, 6.0'-7.5' & STN - 20 / SPT - 9, 12.0'-13.5' & SPT - 15, 21.0'-22.5' & STN - 20 / SPT - 20, 28.5'-30.0'	Lab ID	57
County	Muhlenberg	Date Received	1-5-10
Sample Type	SPT Comp	Date Reported	1-20-10

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	100.0
1"	25	96.2
3/4"	19	94.9
3/8"	9.5	87.7
No. 4	4.75	84.5
No. 10	2	73.3
No. 40	0.425	59.6
No. 200	0.075	51.1
	0.02	38.8
	0.005	25.8
	0.002	15.3
estimated	0.001	7.0

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

	ASTM	AASHTO
Range	(%)	(%)
Gravel	15.5	26.7
Coarse Sand	11.2	13.7
Medium Sand	13.7	---
Fine Sand	8.5	8.5
Silt	25.3	35.8
Clay	25.8	15.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	35
Plastic Limit:	17
Plasticity Index:	18
Activity Index:	1.20

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 with gravel

AASHTO Classification: A-6 (6)

Comments: mc determined using 40° C oven

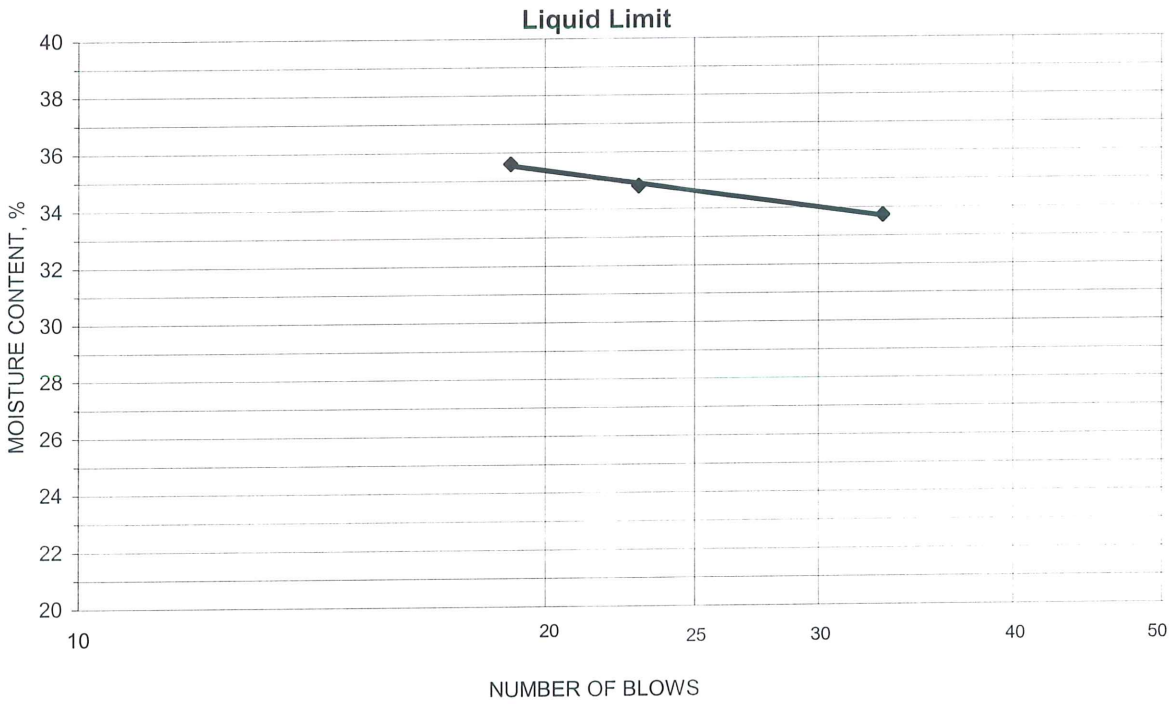
Reviewed by:

Stantec

ATTERBERG LIMITS

Project	PAF- Scrubber Sludge Complex	Project No.	175569040
Source	STN - 20 / SPT - 5, 6.0'-7.5' & STN - 20 / SPT - 9, 12.0'-13.5' & STN - 20 / SPT - 15, 21.0'-22.5' & STN - 20 / SPT - 20, 28.5'-30.0'	Lab ID	57
		% + No. 40	40
Tested By	CSM	Test Method	ASTM D 4318 Method A
Test Date	01-13-2010	Prepared	Dry
		Date Received	01-05-2010

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
22.61	19.69	11.03	33	33.7	35
23.11	19.90	10.88	19	35.6	
23.07	20.00	11.18	23	34.8	



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
18.95	17.82	11.25	17.2	17	18
18.72	17.59	10.94	17.0		

Remarks: _____

Reviewed By _____

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: PAF- Scrubber Sludge Complex
Source: STN - 20 / SPT - 5, 6.0'-7.5' & STN - 20 / SPT - 9, 12.0'-13.5' & STN - 20 / SPT - 15, 21.0'-22.5' & STN - 20 / SPT - 20, 28.5'-30.0'

Project Number: 175569040
Lab ID: 57

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: JF
Test Date: 01-12-2010
Date Received: 01-05-2010

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	100.0
1"	96.2
3/4"	94.9
3/8"	87.7
No. 4	84.5
No. 10	73.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

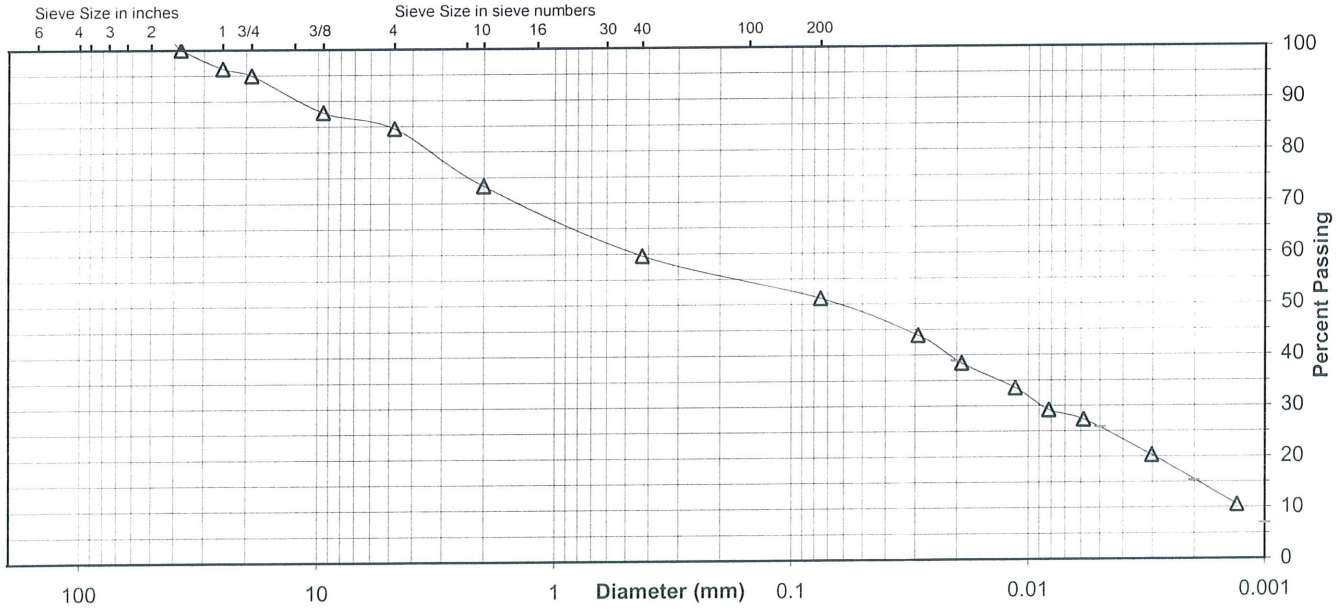
Specific Gravity: 2.71

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	59.6
No. 200	51.1
0.02 mm	38.8
0.005 mm	25.8
0.002 mm	15.3
0.001 mm	7.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	5.1	10.4	11.2	13.7	8.5	25.3	25.8
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	26.7			13.7	8.5	35.8	15.3



Comments

Reviewed By

Stantec

Summary of Soil Tests

Project Name	PAF- Scrubber Sludge Complex	Project Number	175569040
Source	STN - 21 / SPT - 6, 7.5'-9.0' & STN - 21 / SPT - 8, 10.5'-12.0' & STN - 21 / SPT - 9, 12.0'-13.5' & STN - 21 / SPT - 11, 15.0'-16.5'	Lab ID	73
County	Muhlenberg	Date Received	1-5-10
Sample Type	SPT Comp	Date Reported	1-20-10

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	99.4
No. 10	2	99.0
No. 40	0.425	96.9
No. 200	0.075	95.6
	0.02	22.1
	0.005	5.4
	0.002	3.8
estimated	0.001	3.0

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

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.6	1.0
Coarse Sand	0.4	2.1
Medium Sand	2.1	---
Fine Sand	1.3	1.3
Silt	90.2	91.8
Clay	5.4	3.8

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: 2.40

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

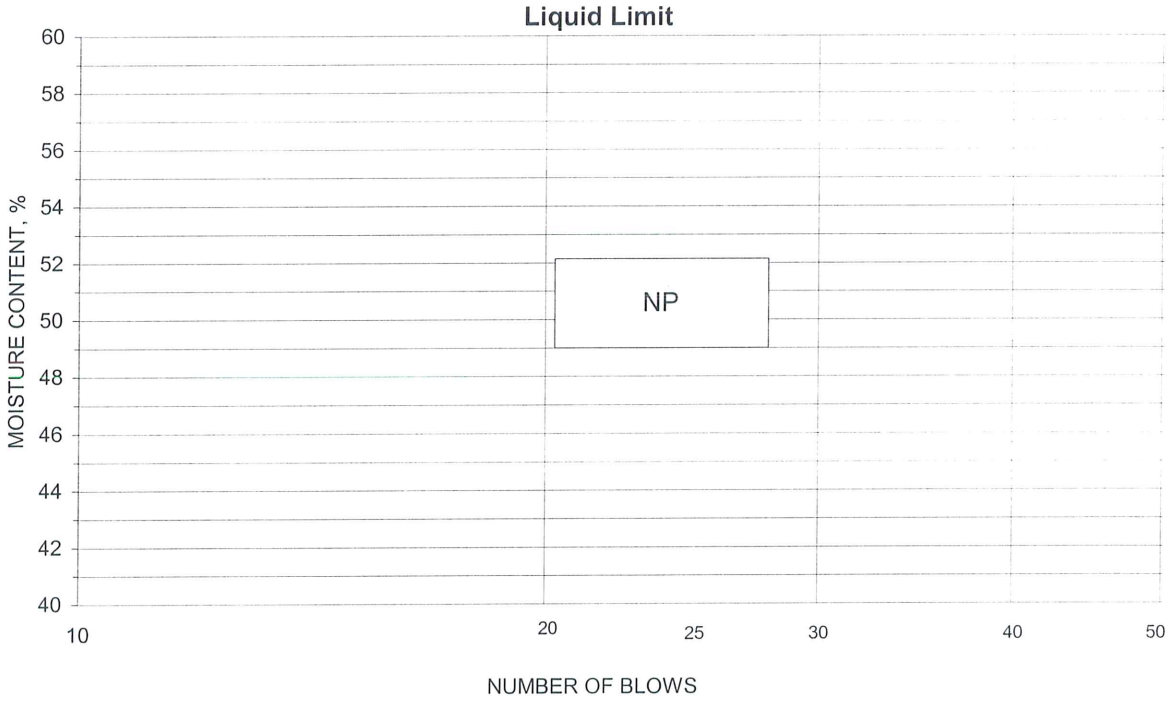
Reviewed by:

Stantec

ATTERBERG LIMITS

Project	PAF- Scrubber Sludge Complex	Project No.	175569040
Source	STN - 21 / SPT - 6, 7.5'-9.0' & STN - 21 / SPT - 8, 10.5'-12.0' & STN - 21 / SPT - 9, 12.0'-13.5' & STN - 21 / SPT - 11, 15.0'-16.5'	Lab ID	73
		% + No. 40	3
Tested By	KWS	Test Method	ASTM D 4318 Method A
Test Date	01-12-2010	Prepared	Dry
		Date Received	01-05-2010

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 _____

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: PAF- Scrubber Sludge Complex
Source: STN - 21 / SPT - 6, 7.5'-9.0' & STN - 21 / SPT - 8, 10.5'-12.0' & STN - 21 / SPT - 9, 12.0'-13.5' & STN - 21 / SPT - 11, 15.0'-16.5'

Project Number: 175569040
Lab ID: 73

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: JF
Test Date: 01-12-2010
Date Received: 01-05-2010

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	
3/8"	100.0
No. 4	99.4
No. 10	99.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

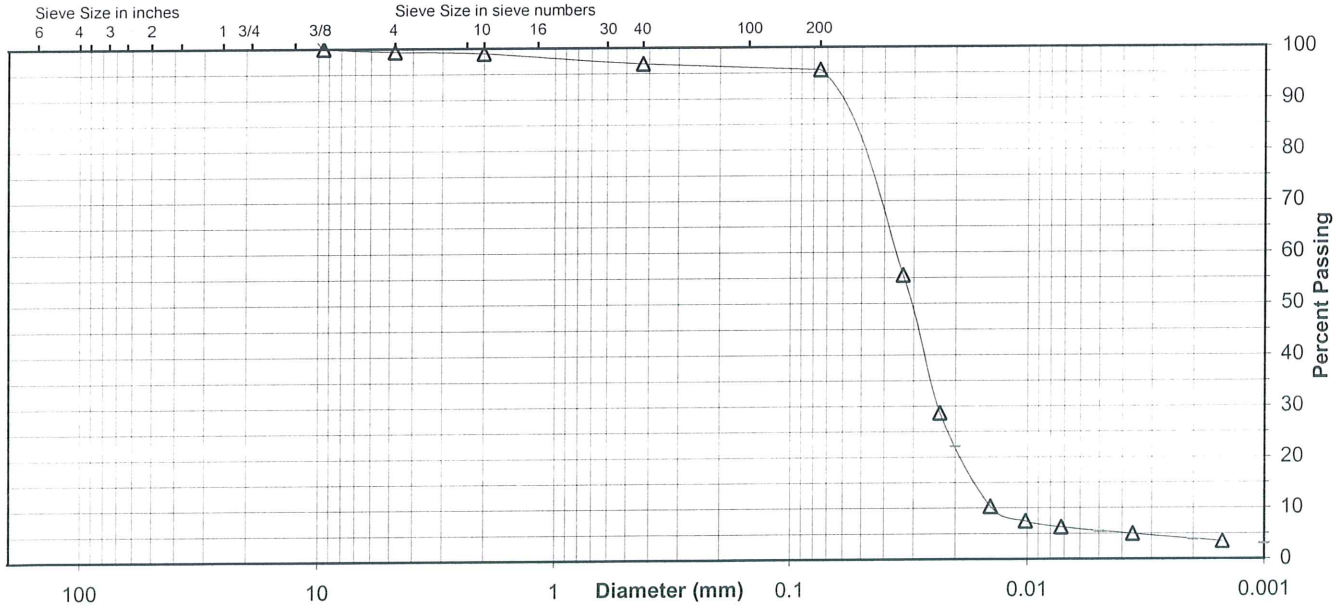
Specific Gravity: 2.4

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	96.9
No. 200	95.6
0.02 mm	22.1
0.005 mm	5.4
0.002 mm	3.8
0.001 mm	3.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.6	0.4	2.1	1.3	90.2	5.4
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	1.0			2.1	1.3	91.8	3.8



Comments

Reviewed By

Stantec

Summary of Soil Tests

Project Name	PAF- Scrubber Sludge Complex	Project Number	175569040
Source	STN - 22 / SPT - 29, 42.0'-43.5' & STN - 22 / SPT - 32, 46.5'-48.0' & STN - 22 / SPT - 35, 51.0'-52.5' & STN - 22 / SPT - 38, 55.5'-57.0'	Lab ID	103
County	Muhlenberg	Date Received	1-5-10
Sample Type	SPT Comp	Date Reported	1-20-10

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	97.3
No. 200	0.075	95.7
	0.02	20.6
	0.005	5.2
	0.002	3.4
estimated	0.001	2.0

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

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	2.7
Medium Sand	2.7	---
Fine Sand	1.6	1.6
Silt	90.5	92.3
Clay	5.2	3.4

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: 2.43

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments: mc determined using 40° C oven

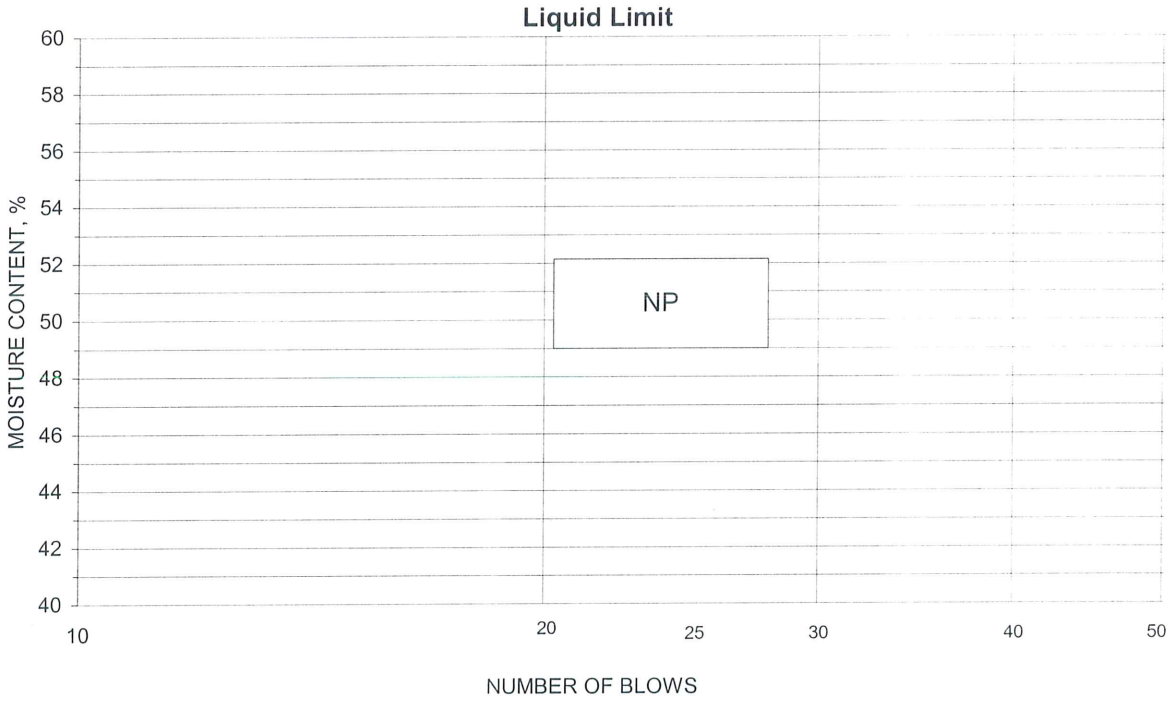
Reviewed by:

Stantec

ATTERBERG LIMITS

Project	PAF- Scrubber Sludge Complex	Project No.	175569040
Source	STN - 22 / SPT - 29, 42.0'-43.5' & STN - 22 / SPT - 32, 46.5'-48.0' & STN - 22 / SPT - 35, 51.0'-52.5' & STN - 22 / SPT - 38, 55.5'-57.0'	Lab ID	103
		% + No. 40	3
Tested By	KWS	Test Method	ASTM D 4318 Method A
Test Date	01-12-2010	Prepared	Dry
		Date Received	01-05-2010

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 _____

Particle-Size Analysis of Soils
ASTM D 422

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 22 / SPT - 29, 42.0'-43.5' & STN - 22 / SPT - 32, 46.5'-48.0' & STN - 22 / SPT - 35, 51.0'-52.5' & STN - 22 / SPT - 38, 55.5'-57.0'
Lab ID: 103

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: JF
Test Date: 01-12-2009
Date Received: 01-05-2010

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: 2.43

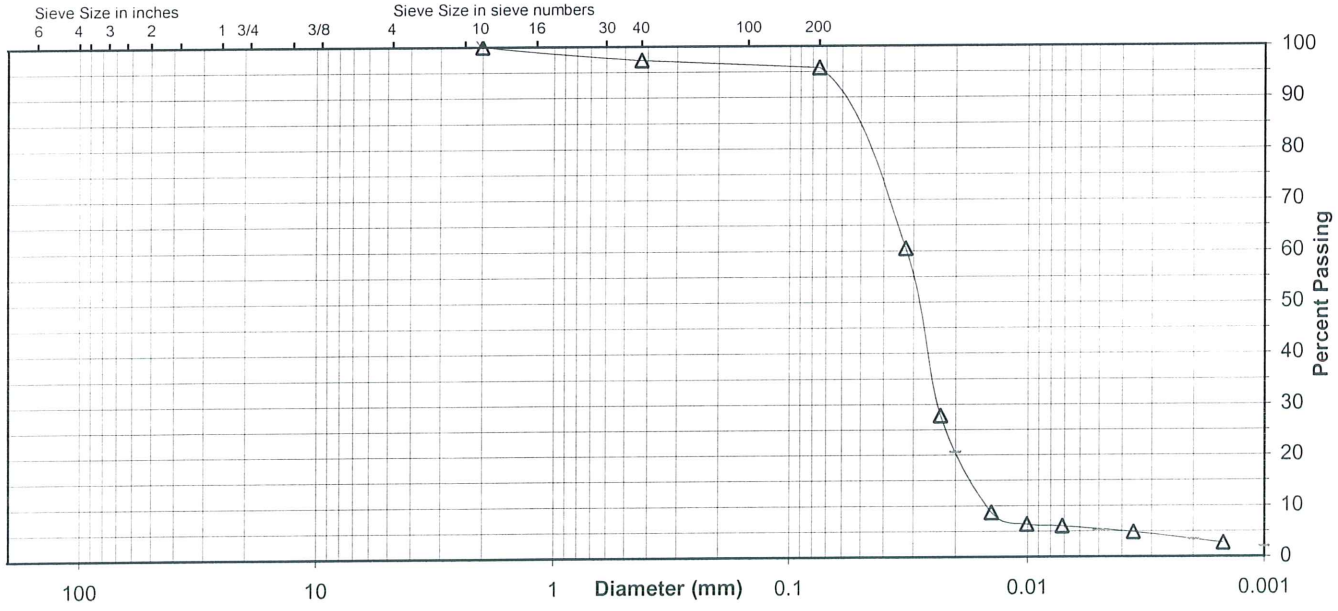
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	97.3
No. 200	95.7
0.02 mm	20.6
0.005 mm	5.2
0.002 mm	3.4
0.001 mm	2.0

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	2.7	1.6	90.5	5.2

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	2.7	1.6	92.3	3.4



Comments

Reviewed By

Stantec

Summary of Soil Tests

Project Name	PAF- Scrubber Sludge Complex	Project Number	175569040
Source	STN - 23 / SPT - 2, 1.5'-3.0' & STN - 23 / SPT - 5, 6.0'-7.5' & STN - 23 / SPT - 8, 10.5'-12.0' & STN - 23 / SPT - 11, 15.0'-16.5'	Lab ID	119
County	Muhlenberg	Date Received	1-5-10
Sample Type	SPT Comp	Date Reported	1-20-10

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	94.1
No. 4	4.75	86.7
No. 10	2	77.9
No. 40	0.425	65.5
No. 200	0.075	57.4
	0.02	47.3
	0.005	33.0
	0.002	20.1
estimated	0.001	13.0

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

	ASTM	AASHTO
Range	(%)	(%)
Gravel	13.3	22.1
Coarse Sand	8.8	12.4
Medium Sand	12.4	---
Fine Sand	8.1	8.1
Silt	24.4	37.3
Clay	33.0	20.1

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	37
Plastic Limit:	18
Plasticity Index:	19
Activity Index:	0.95

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:	2.62

Classification

Unified Group Symbol: CL

Group Name: Sandy lean clay

AASHTO Classification: A-6 (8)

Comments: MC determined using 40°C oven

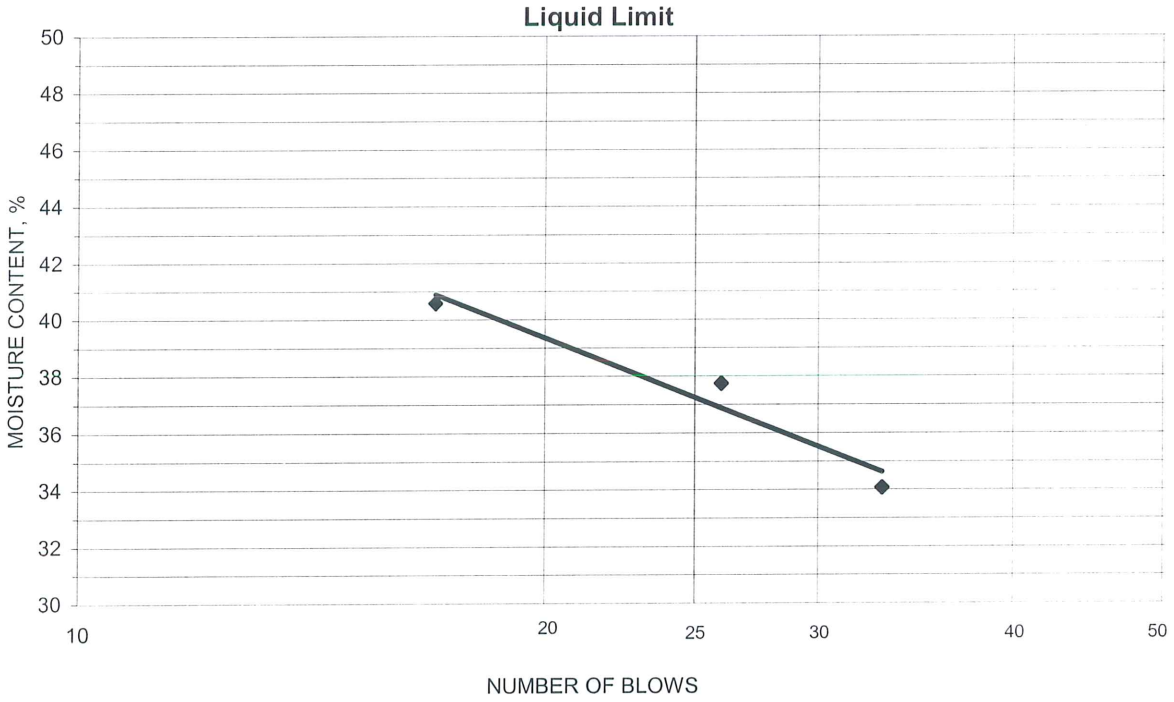
Reviewed by:

Stantec

ATTERBERG LIMITS

Project	PAF- Scrubber Sludge Complex	Project No.	175569040
Source	STN - 23 / SPT - 2, 1.5'-3.0' & STN - 23 / SPT - 5, 6.0'-7.5' & STN - 23 / SPT - 8, 10.5'-12.0' & STN - 23 / SPT - 11, 15.0'-16.5'	Lab ID	119
		% + No. 40	35
Tested By	CSM	Test Method	ASTM D 4318 Method A
Test Date	01-13-2010	Prepared	Dry
		Date Received	01-05-2010

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
23.88	20.60	10.97	33	34.1	
21.64	18.75	11.09	26	37.7	
21.49	18.50	11.13	17	40.6	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
18.74	17.56	11.01	18.0	18	19
18.96	17.76	10.93	17.6		

Remarks: _____

Reviewed By _____

Particle-Size Analysis of Soils
ASTM D 422

Project Name: PAF- Scrubber Sludge Complex
Source: STN - 23 / SPT - 2, 1.5'-3.0' & STN - 23 / SPT - 5, 6.0'-7.5' & STN - 23 / SPT - 8, 10.5'-12.0' & STN - 23 / SPT - 11, 15.0'-16.5'

Project Number: 175569040
Lab ID: 119

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: JF
Test Date: 01-12-2010
Date Received 01-05-2010

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	100.0
3/8"	94.1
No. 4	86.7
No. 10	77.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

Specific Gravity 2.62

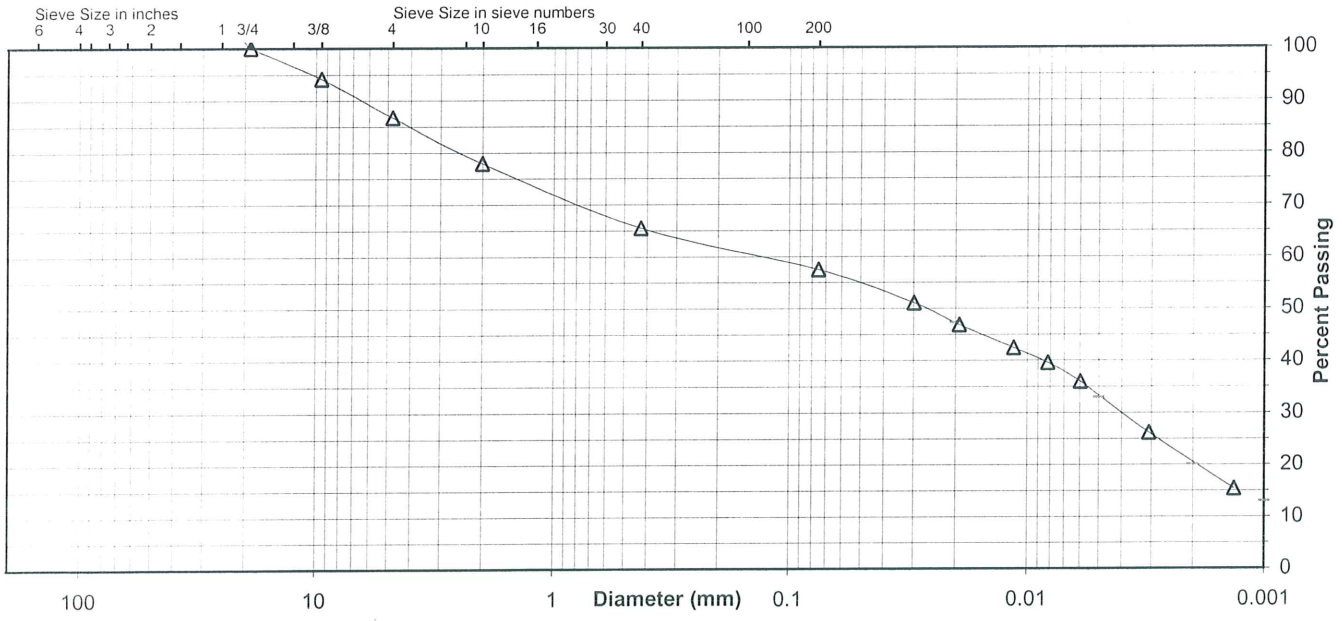
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	65.5
No. 200	57.4
0.02 mm	47.3
0.005 mm	33.0
0.002 mm	20.1
0.001 mm	13.0

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	13.3	8.8	12.4	8.1	24.4	33.0

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	22.1	12.4	8.1	37.3	20.1



Comments

Reviewed By

Stantec

Summary of Soil Tests

Project Name	PAF- Scrubber Sludge Complex	Project Number	175569040
Source	STN - 24 / SPT - 6, 7.5'-9.0' & STN - 24 / SPT - 8, 10.5'-12.0' & STN - 24 / SPT - 9, 12.0'-13.5' & STN - 24 / SPT - 11, 15.0'-16.5'	Lab ID	140
County	Muhlenberg	Date Received	1-5-10
Sample Type	SPT Comp	Date Reported	1-20-10

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	100.0
No. 40	0.425	98.0
No. 200	0.075	96.1
	0.02	14.2
	0.005	6.4
	0.002	4.7
estimated	0.001	3.0

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

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	2.0
Medium Sand	2.0	---
Fine Sand	1.9	1.9
Silt	89.7	91.4
Clay	6.4	4.7

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: 2.44

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments: MC determined using 40°C oven

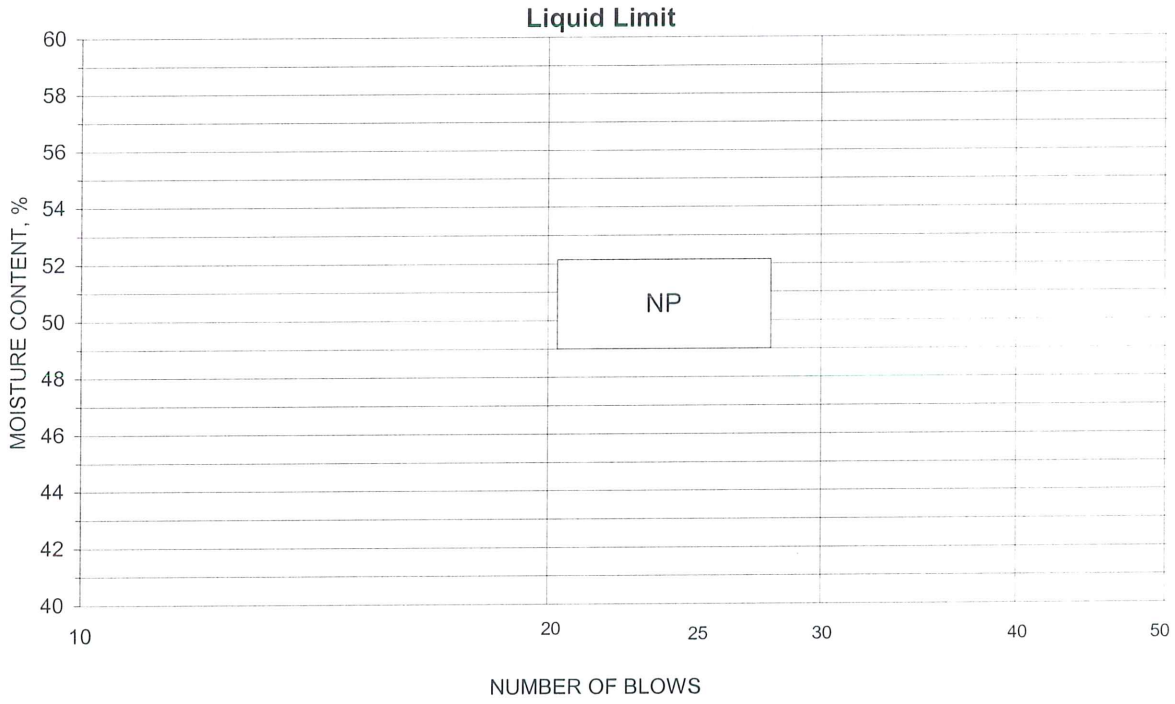
Reviewed by:

Stantec

ATTERBERG LIMITS

Project	PAF- Scrubber Sludge Complex	Project No.	175569040
Source	STN - 24 / SPT - 6, 7.5'-9.0' & STN - 24 / SPT - 8, 10.5'-12.0' & STN - 24 / SPT - 9, 12.0'-13.5' & STN - 24 / SPT - 11, 15.0'-16.5'	Lab ID	140
		% + No. 40	2
Tested By	KWS	Test Method	ASTM D 4318 Method A
Test Date	01-12-2010	Prepared	Dry
		Date Received	01-05-2010

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 _____

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: PAF- Scrubber Sludge Complex
Source: STN - 24 / SPT - 6, 7.5'-9.0' & STN - 24 / SPT - 8, 10.5'-12.0' & STN - 24 / SPT - 9, 12.0'-13.5' & STN - 24 / SPT - 11, 15.0'-16.5'

Project Number: 175569040
Lab ID: 140

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: JF
Test Date: 01-12-2010
Date Received: 01-05-2010

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	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

Specific Gravity: 2.44

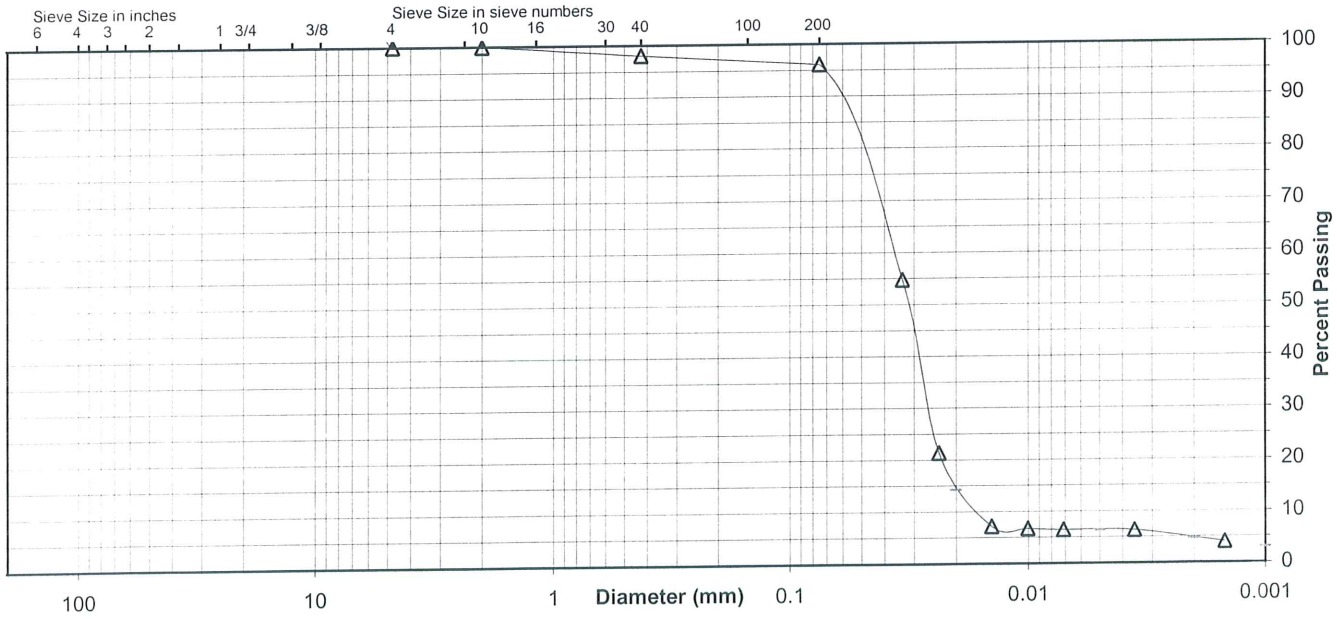
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	98.0
No. 200	96.1
0.02 mm	14.2
0.005 mm	6.4
0.002 mm	4.7
0.001 mm	3.0

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	2.0	1.9	89.7	6.4

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	2.0	1.9	91.4	4.7



Comments

Reviewed By

Stantec

Summary of Soil Tests

Project Name	PAF- Scrubber Sludge Complex	Project Number	175569040
Source	STN - 25 / SPT - 27, 39.0'-40.5' & STN - 25 / SPT - 29, 42.0'-43.5' & STN - 25 / SPT - 30, 43.5'-45.0' & STN - 25 / SPT - 32, 46.5'-48.0'	Lab ID	169
County	Muhlenberg	Date Received	1-5-10
Sample Type	SPT Comp	Date Reported	1-20-10

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	95.2
No. 200	0.075	92.3
	0.02	8.5
	0.005	6.3
	0.002	5.0
estimated	0.001	4.0

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

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	4.8
Medium Sand	4.8	---
Fine Sand	2.9	2.9
Silt	86.0	87.3
Clay	6.3	5.0

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: 2.36

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments: MC determined using 40°C oven

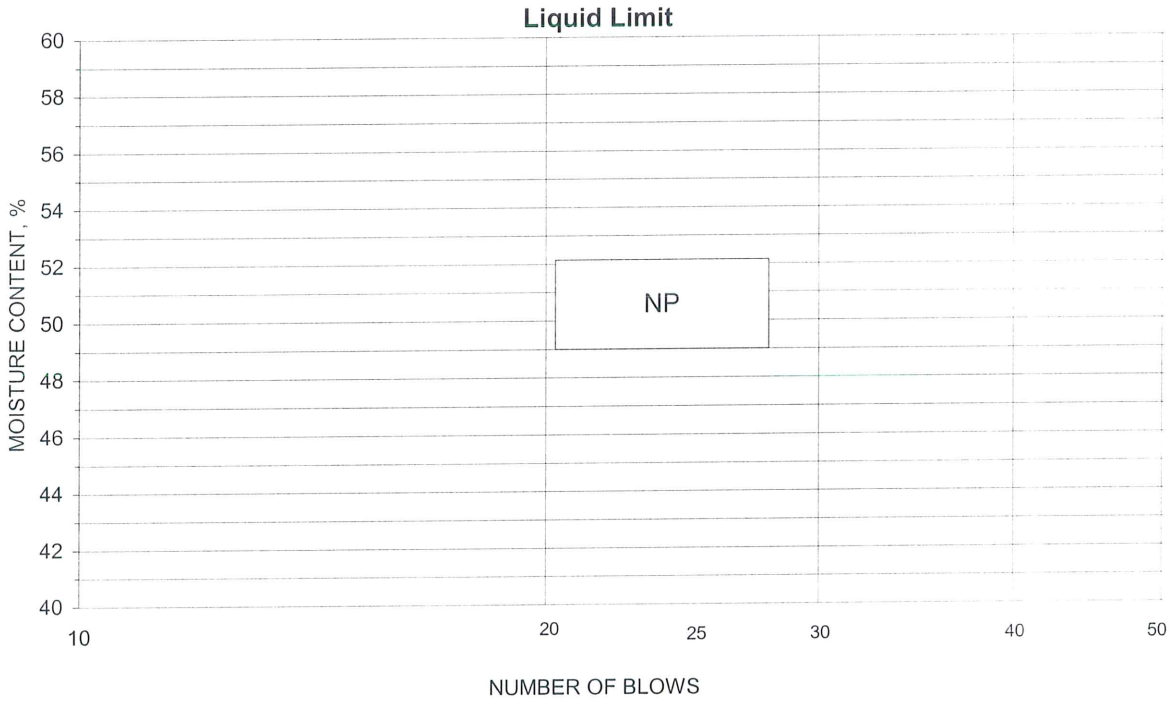
Reviewed by:

Stantec

ATTERBERG LIMITS

Project	PAF- Scrubber Sludge Complex	Project No.	175569040
Source	STN - 25 / SPT - 27, 39.0'-40.5' & STN - 25 / SPT - 29, 42.0'-43.5' & STN - 25 / SPT - 30, 43.5'-45.0' & STN - 25 / SPT - 32, 46.5'-48.0'	Lab ID	169
		% + No. 40	5
Tested By	KWS	Test Method	ASTM D 4318 Method A
Test Date	01-12-2010	Prepared	Dry
		Date Received	01-05-2010

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 _____

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: PAF- Scrubber Sludge Complex
Source: STN - 25 / SPT - 27, 39.0'-40.5' & STN - 25 / SPT - 29, 42.0'-43.5' & STN - 25 / SPT - 30, 43.5'-45.0' & STN - 25 / SPT - 32, 46.5'-48.0'

Project Number: 175569040
Lab ID: 169

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: JF
Test Date: 01-12-2010
Date Received: 01-05-2010

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

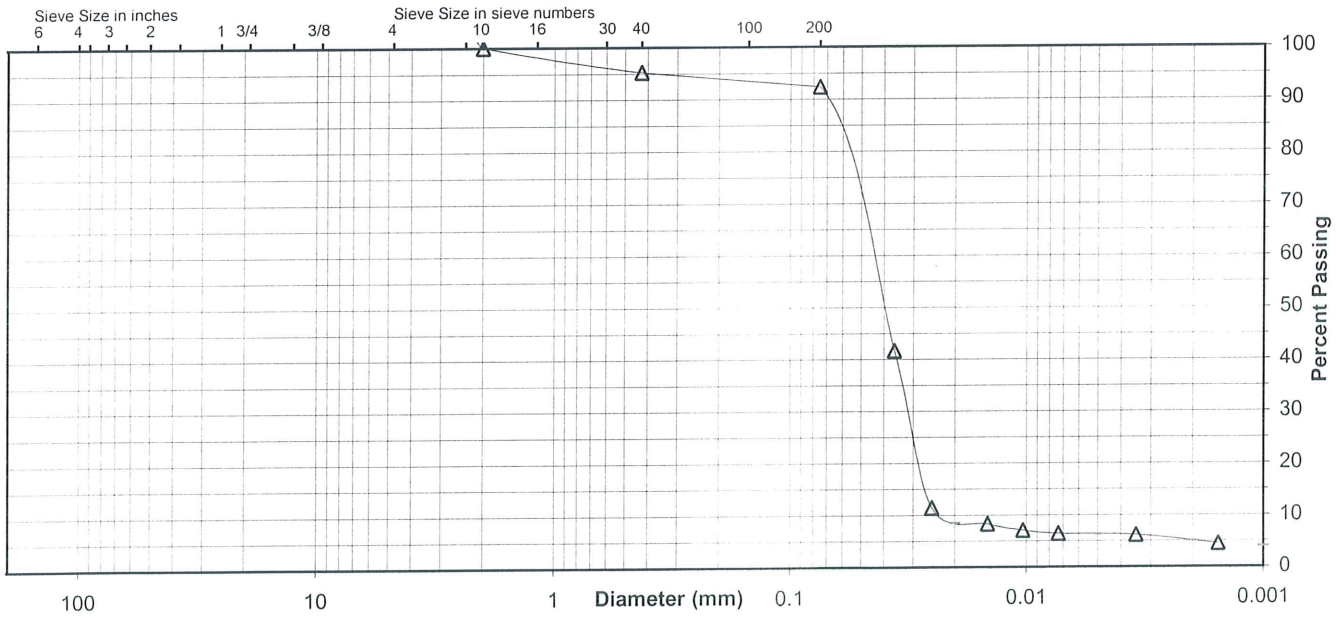
Specific Gravity: 2.36

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	95.2
No. 200	92.3
0.02 mm	8.5
0.005 mm	6.3
0.002 mm	5.0
0.001 mm	4.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	4.8	2.9	86.0	6.3
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			4.8	2.9	87.3	5.0



Comments

Reviewed By

Shelby Tube Samples

Unit Weight Testing

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 20A / ST -1, 5.0'-7.0'
Lab ID: 68A
Visual Description: Gravelly Silt (ML), gray, moist, firm, mine spoil
Recovered: 1.1'
Test Interval: 5.0' - 5.5'

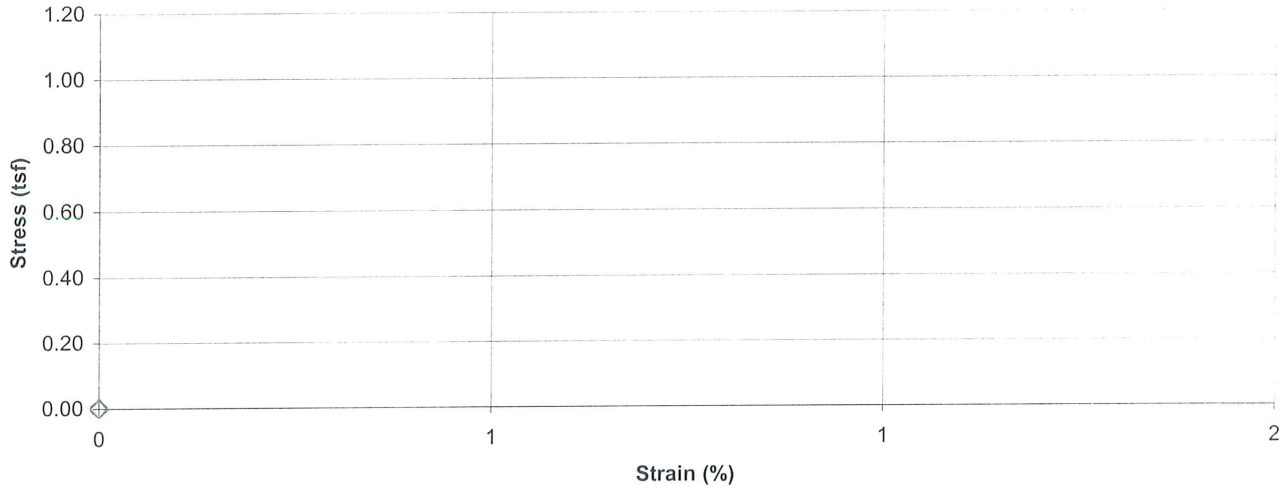
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/07/2010
Date Tested: N/A

Initial Wet Density (pcf)	116.6
Initial Moisture Content (%)	13.5
Initial Dry Density (pcf)	102.7
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.012
Average Diameter (in)	2.892
Height to Diameter Ratio	2.1

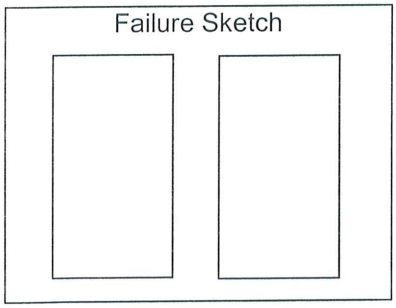
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

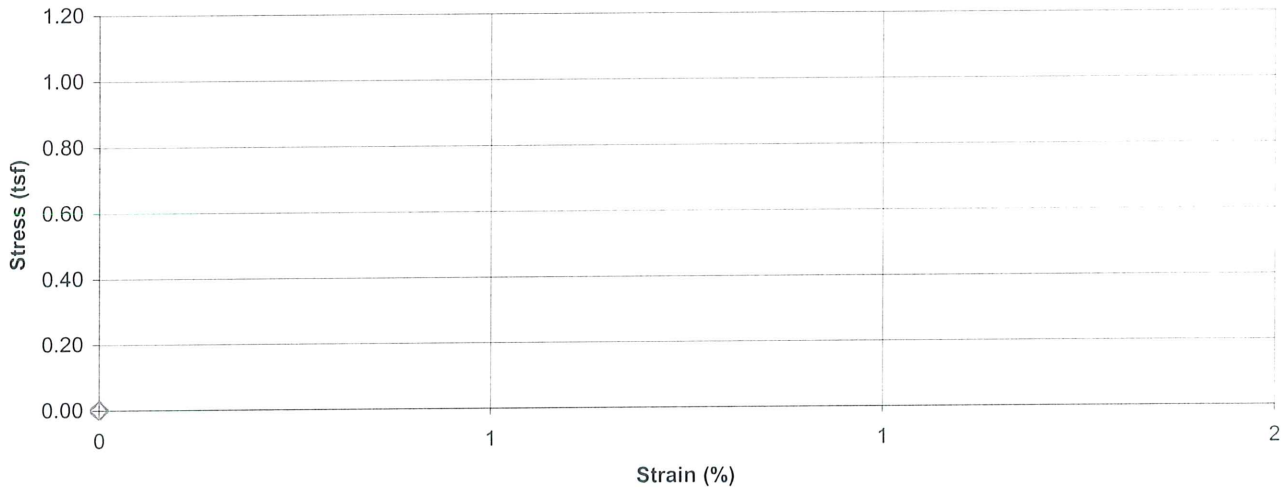
ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 20A / ST -1, 5.0'-7.0'
Lab ID: 68B
Visual Description: Gravelly Silt (ML), gray, moist, firm, mine spoil
Recovered: 1.1'
Test Interval: 5.5' - 6.0'

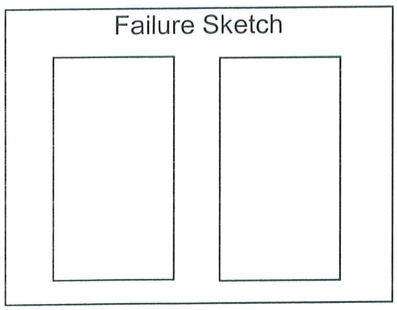
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/07/2010
Date Tested: N/A

Initial Wet Density (pcf)	134.8	Initial MC Taken	Before Test, From Trimmings
Initial Moisture Content (%)	11.4		
Initial Dry Density (pcf)	120.9		
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
At Test Dry Density (pcf)	N/A		
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.078	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.890	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 20A / ST -2, 10.0'-12.0'
Lab ID: 69A
Visual Description: Gravelly Silt (ML), gray, moist, firm, mine spoil

Recovered: 1.1'
Test Interval: 10.0' - 10.5'

Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A

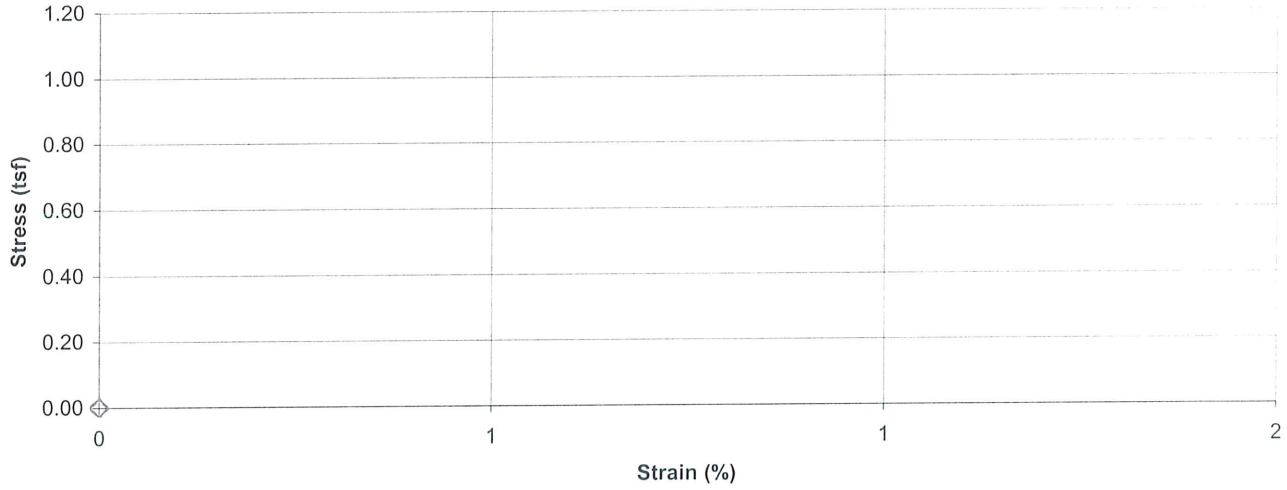
Date Extruded: 01/07/2010
Date Tested: N/A

Initial Wet Density (pcf)	117.5
Initial Moisture Content (%)	12.5
Initial Dry Density (pcf)	104.4
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.893
Average Diameter (in)	2.879
Height to Diameter Ratio	2.0

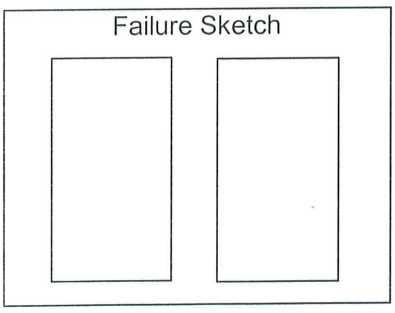
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 20A / ST -2, 10.0'-12.0'
Lab ID: 69B
Visual Description: Gravelly Silt (ML), gray, moist, firm, mine spoil

Recovered: 1.1'
Test Interval: 10.5' - 11'

Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A

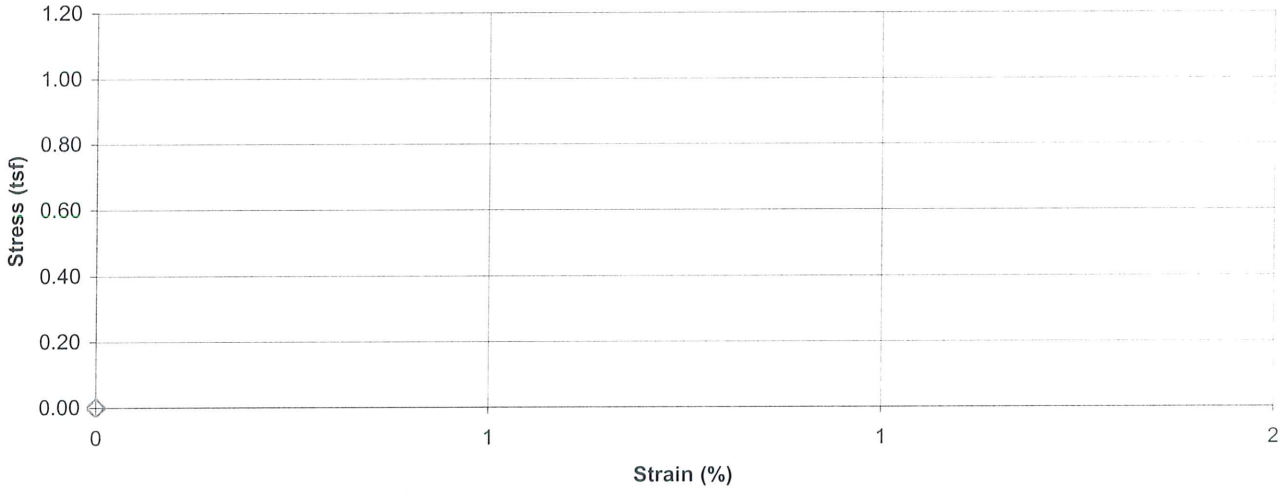
Date Extruded: 01/07/2010
Date Tested: N/A

Initial Wet Density (pcf)	129.8
Initial Moisture Content (%)	11.8
Initial Dry Density (pcf)	116.1
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.923
Average Diameter (in)	2.888
Height to Diameter Ratio	2.1

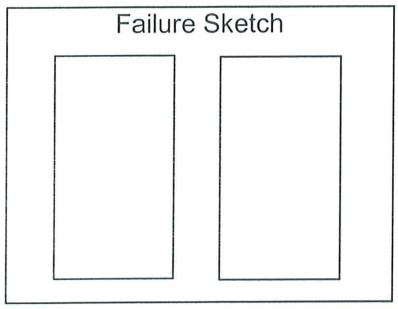
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 20A / ST -3, 15.0'-17.0'
Lab ID: 70A
Visual Description: Gravelly Silt (ML), gray, moist, firm, mine spoil

Recovered: 1'
Test Interval: 15.0' - 15.5'

Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A

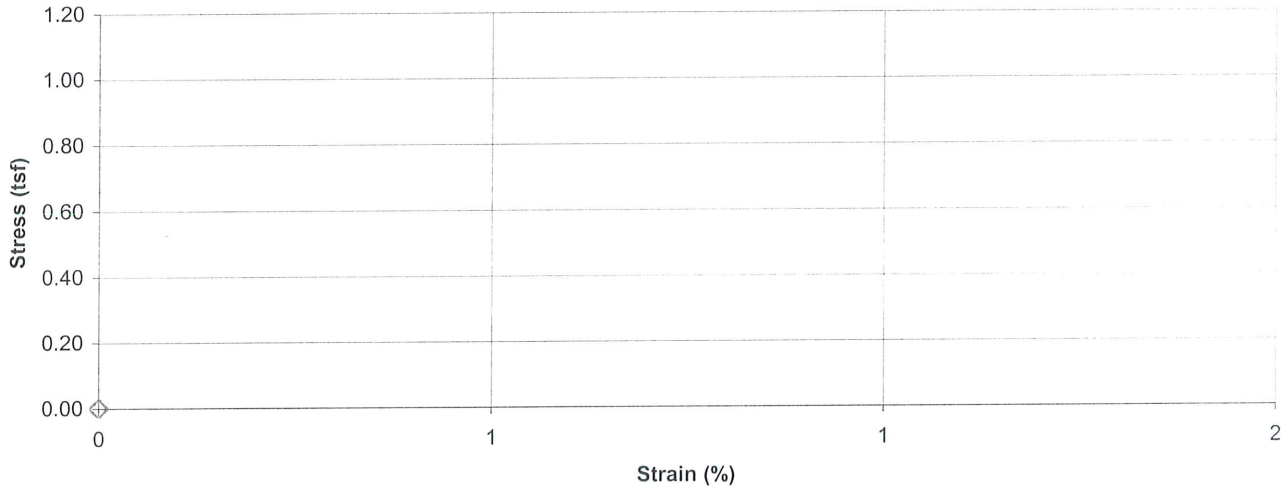
Date Extruded: 01/08/2010
Date Tested: N/A

Initial Wet Density (pcf)	109.8
Initial Moisture Content (%)	12.6
Initial Dry Density (pcf)	97.5
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.915
Average Diameter (in)	2.877
Height to Diameter Ratio	2.1

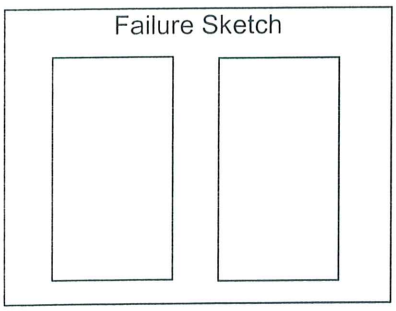
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 20A / ST -3, 15.0'-17.0'
Lab ID: 70B
Visual Description: Gravelly Silt (ML), gray, moist, firm, mine spoil
Recovered: 1'
Test Interval: 15.5' - 16.0'

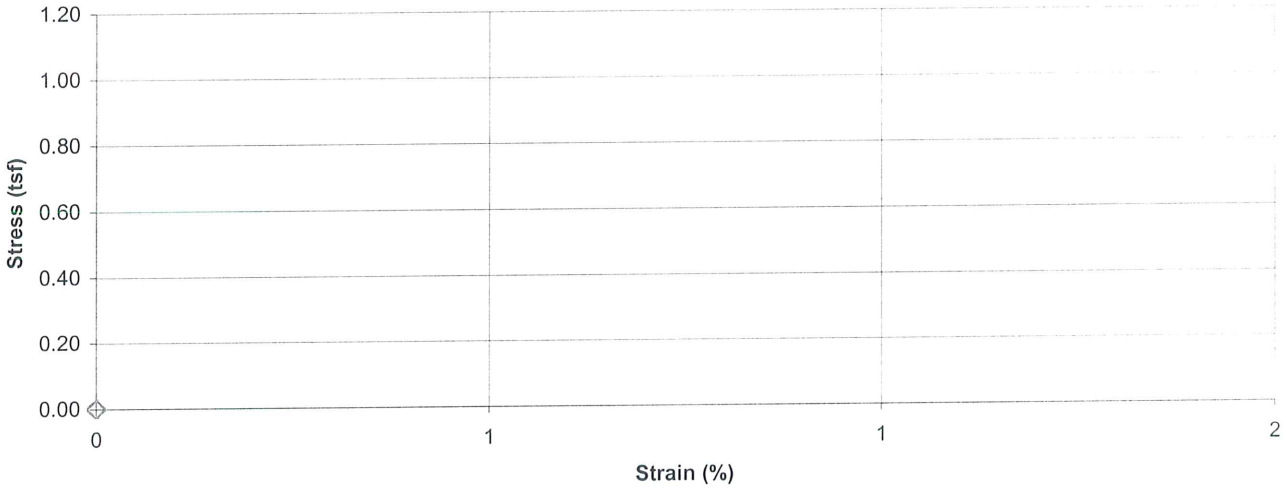
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/08/2010
Date Tested: N/A

Initial Wet Density (pcf)	133.5
Initial Moisture Content (%)	12.3
Initial Dry Density (pcf)	118.8
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.258
Average Diameter (in)	2.882
Height to Diameter Ratio	2.2

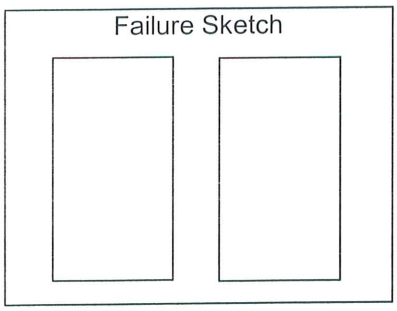
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 21A / ST - 1, 5.0'-7.0'
Lab ID: 88A
Visual Description: Gravelly Lean Clay (CL), gray brown, moist, firm

Recovered: 1.2'
Test Interval: 5.0' - 5.5'

Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A

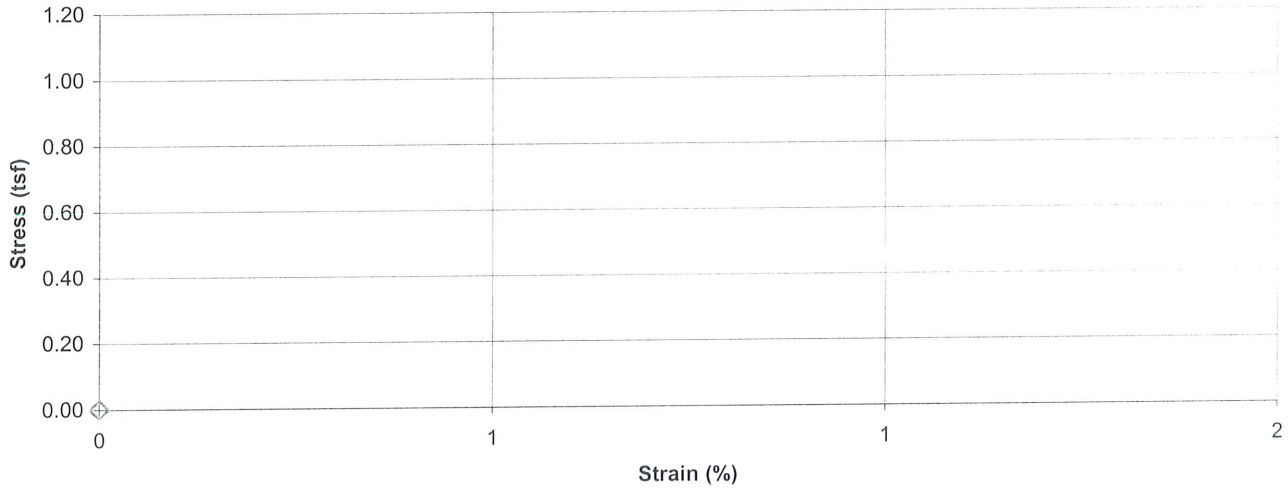
Date Extruded: 01/08/2010
Date Tested: N/A

Initial Wet Density (pcf)	123.1
Initial Moisture Content (%)	17.1
Initial Dry Density (pcf)	105.1
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.145
Average Diameter (in)	2.865
Height to Diameter Ratio	2.1

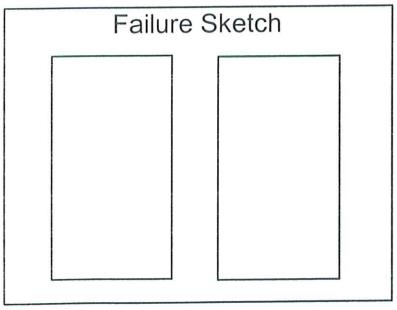
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 21A / ST - 1, 5.0'-7.0'
Lab ID: 88B
Visual Description: 5.5'-5.8' Gravelly Lean Clay (CL), gray brown, moist, firm
5.8'-6.0' Silt (ML), gray brown, moist, firm
Recovered: 1.2'
Test Interval: 5.5' - 6.0'

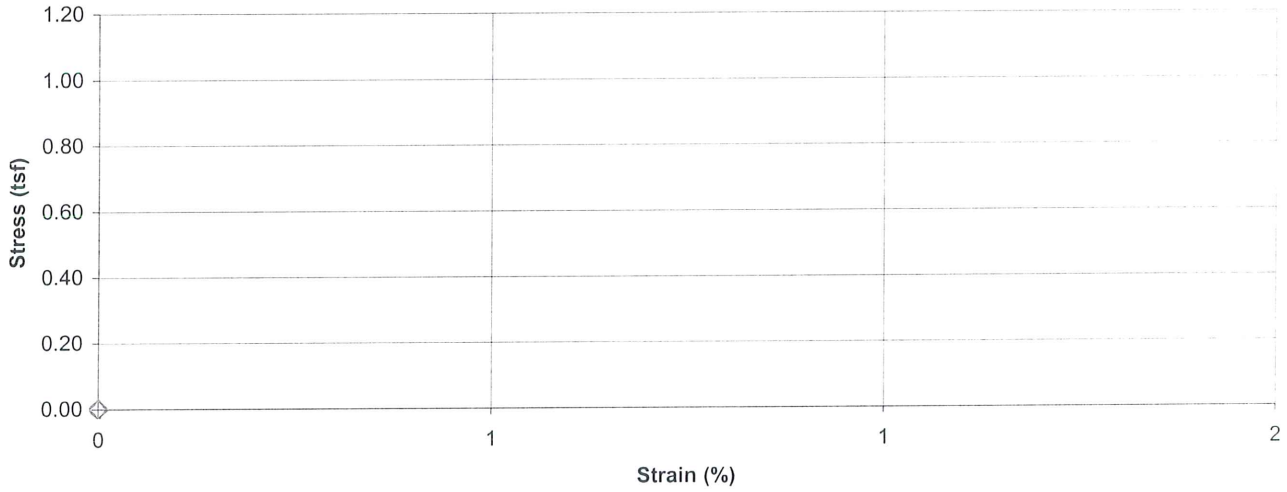
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/08/2010
Date Tested: N/A

Initial Wet Density (pcf)	122.5
Initial Moisture Content (%)	15.3
Initial Dry Density (pcf)	106.3
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.201
Average Diameter (in)	2.874
Height to Diameter Ratio	2.2

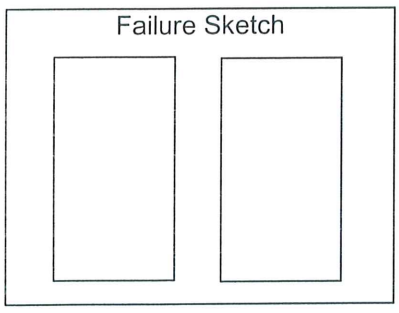
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 21A / ST - 2, 10.0'-12.0'
Lab ID: 89
Visual Description: Gravelly Lean Clay (CL), brown, moist, firm
Recovered: 0.4'
Test Interval: 10.0' - 10.4'

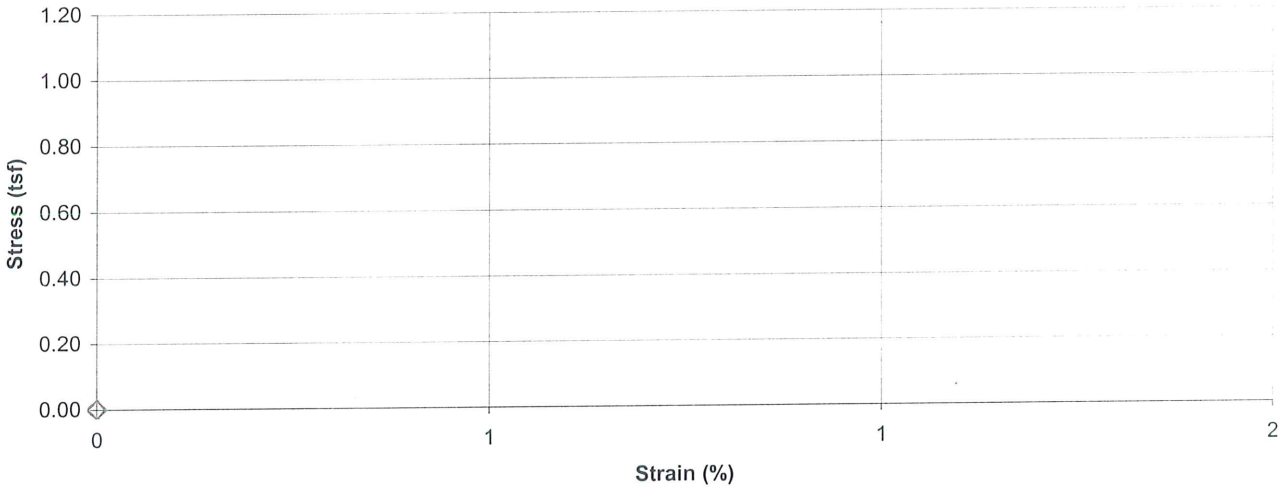
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/08/2010
Date Tested: N/A

Initial Wet Density (pcf)	N/A
Initial Moisture Content (%)	23.6
Initial Dry Density (pcf)	N/A
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	N/A
Average Diameter (in)	N/A
Height to Diameter Ratio	N/A

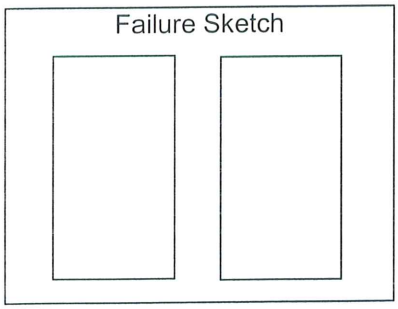
Initial MC Taken: Before Test, From Center of Specimen
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
No test specimen obtained due to low recovery.
10.0'-10.3' large sandstone rock in sample. Saved in a bag.

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 21A / ST - 3, 15.0'-17.0'
Lab ID: 90A
Visual Description: Silt (ML), gray brown, wet, soft, fly ash and gypsum

Recovered: 1.4'
Test Interval: 15.2' - 15.6'

Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A

Date Extruded: 01/08/2010
Date Tested: N/A

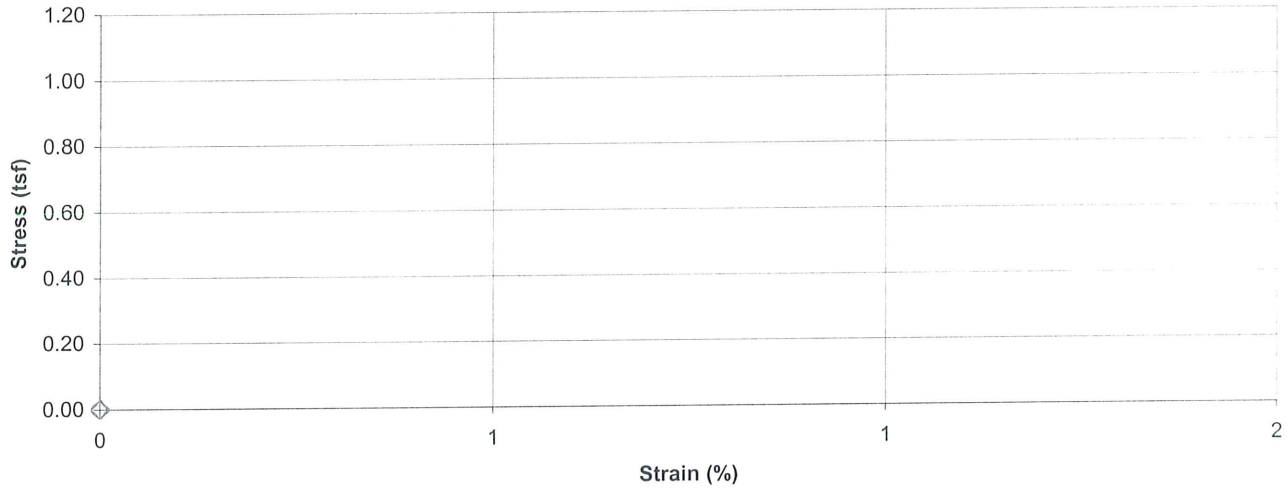
Initial Wet Density (pcf)	N/A
Initial Moisture Content (%)	23.2
Initial Dry Density (pcf)	N/A
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	N/A
Average Diameter (in)	N/A
Height to Diameter Ratio	N/A

Initial MC Taken: Before Test, From Center of Specimen

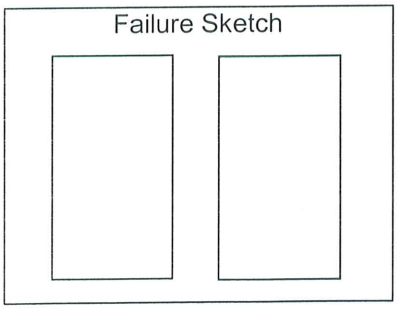
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven
Unable to obtain a test specimen due to insufficient recovery.
Saved in a bag.

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 21A / ST - 3, 15.0'-17.0'
Lab ID: 90B
Visual Description: Silt (ML), gray brown, moist, firm, fly ash and gypsum
Recovered: 1.4'
Test Interval: 15.6' - 16.1'

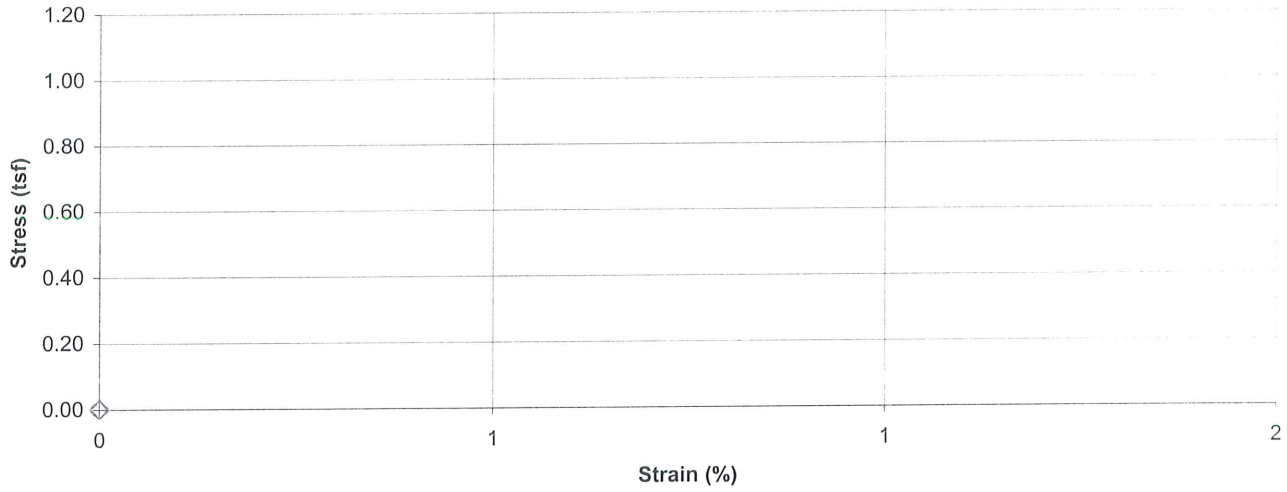
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/08/2010
Date Tested: N/A

Initial Wet Density (pcf)	114.1
Initial Moisture Content (%)	25.2
Initial Dry Density (pcf)	91.1
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.889
Average Diameter (in)	2.896
Height to Diameter Ratio	2.0

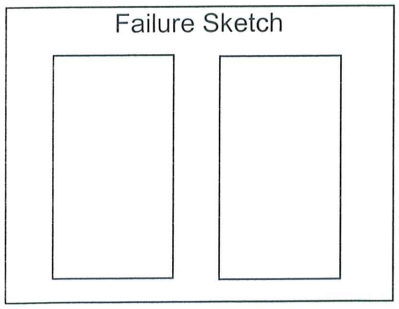
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 21A / ST - 4, 20.0'-22.0'
Lab ID: 91A
Visual Description: Silt (ML), gray brown, wet, soft, fly ash and gypsum
Recovered: 1.1'
Test Interval: 20.0' - 20.5'

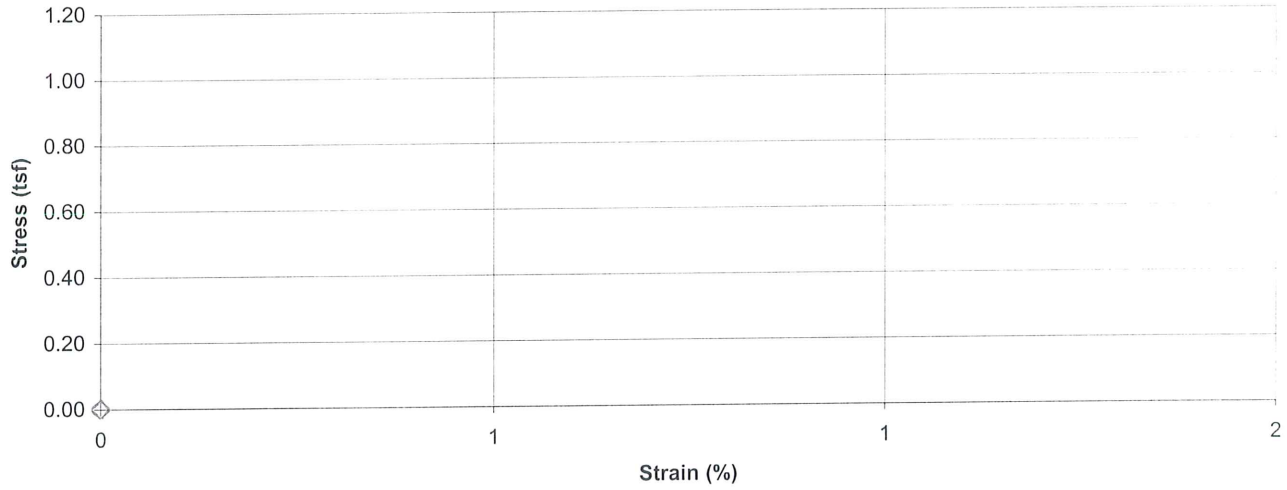
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/08/2010
Date Tested: N/A

Initial Wet Density (pcf)	N/A
Initial Moisture Content (%)	25.7
Initial Dry Density (pcf)	N/A
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	N/A
Average Diameter (in)	N/A
Height to Diameter Ratio	N/A

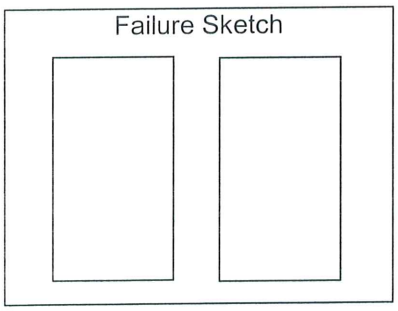
Initial MC Taken: Before Test, From Center of Specimen
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven
No test specimen obtained

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 21A / ST - 4, 20.0'-22.0'
Lab ID: 91B
Visual Description: Silt (ML), gray brown, moist, soft, fly ash and gypsum
Recovered: 1.1'
Test Interval: 20.5' - 21.0'

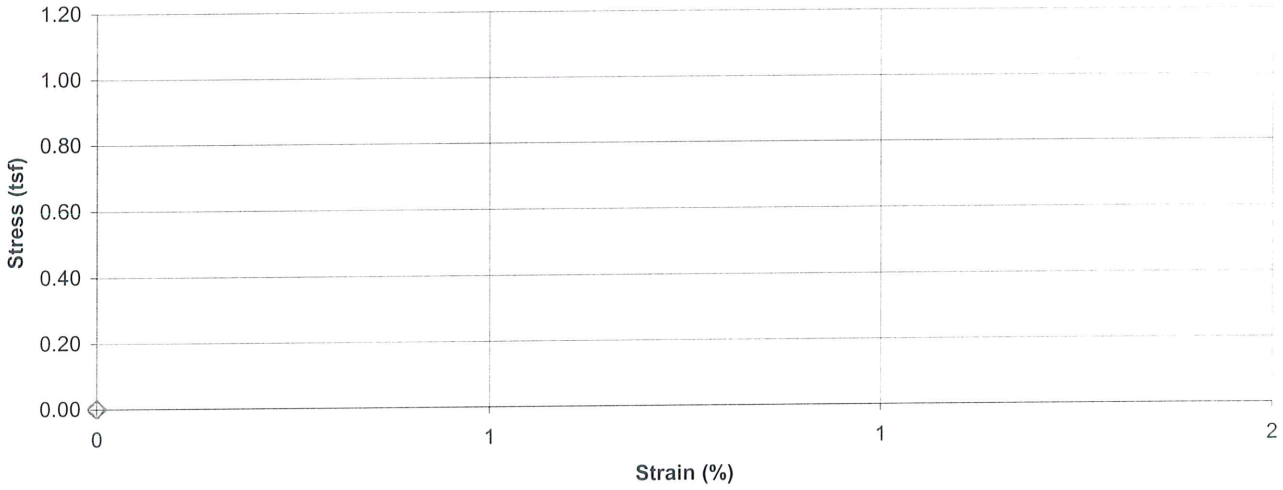
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/08/2010
Date Tested: N/A

Initial Wet Density (pcf)	114.8
Initial Moisture Content (%)	22.5
Initial Dry Density (pcf)	93.7
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.026
Average Diameter (in)	2.852
Height to Diameter Ratio	2.1

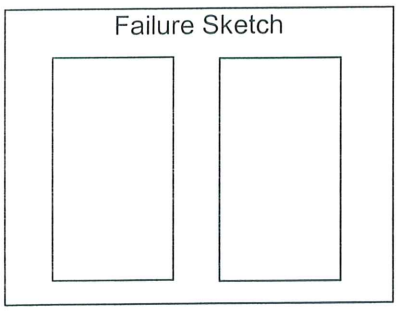
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 21A / ST - 5, 25.0'-27.0'
Lab ID: 92A
Visual Description: Silt (ML), gray brown, moist, soft, fly ash and gypsum
Recovered: 1.4'
Test Interval: 25.4' - 25.9'

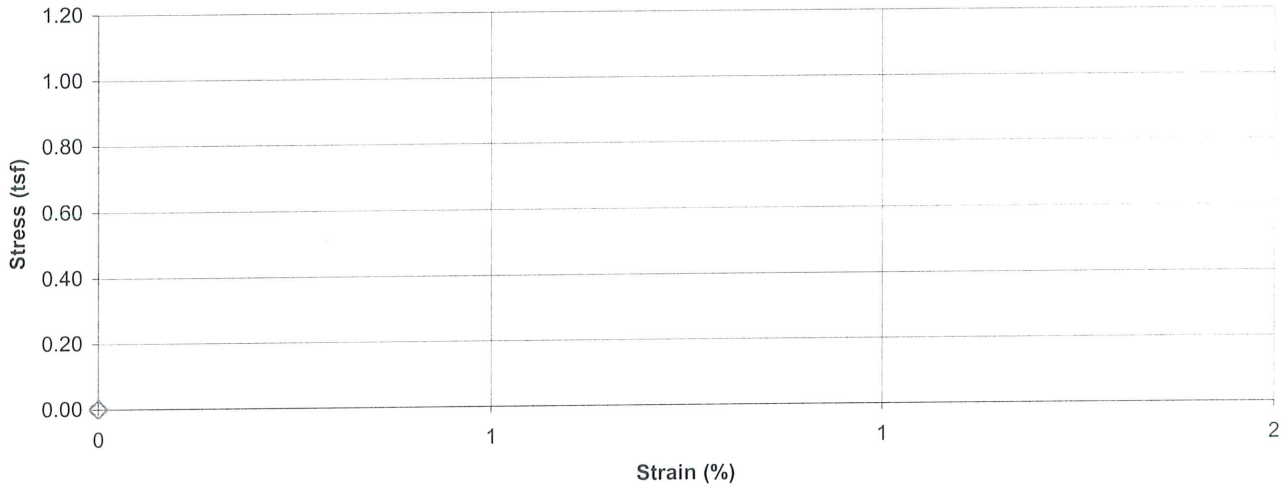
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/08/2010
Date Tested: N/A

Initial Wet Density (pcf)	121.9
Initial Moisture Content (%)	23.6
Initial Dry Density (pcf)	98.6
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.004
Average Diameter (in)	2.857
Height to Diameter Ratio	2.1

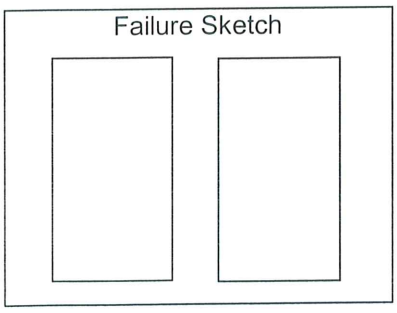
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 21A / ST - 5, 25.0'-27.0'
Lab ID: 92B
Visual Description: Silt (ML), gray brown, moist, soft, fly ash and gypsum

Recovered: 1.4'
Test Interval: 25.9' - 26.4'

Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A

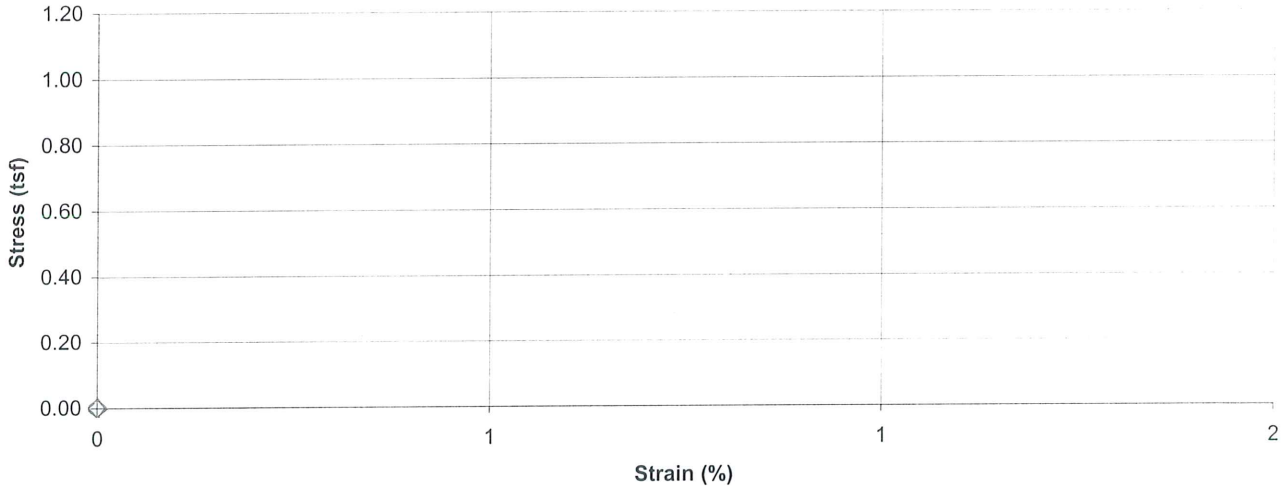
Date Extruded: 01/08/2010
Date Tested: N/A

Initial Wet Density (pcf)	110.7
Initial Moisture Content (%)	22.1
Initial Dry Density (pcf)	90.7
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.978
Average Diameter (in)	2.848
Height to Diameter Ratio	2.1

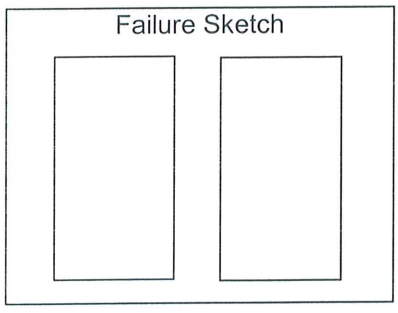
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 22A / ST - 1, 5.0'-7.0'
Lab ID: 113
Visual Description: Silt (ML), gray, moist, soft, fly ash and gypsum
Recovered: 1.7'
Test Interval: 5.0' - 6.7'

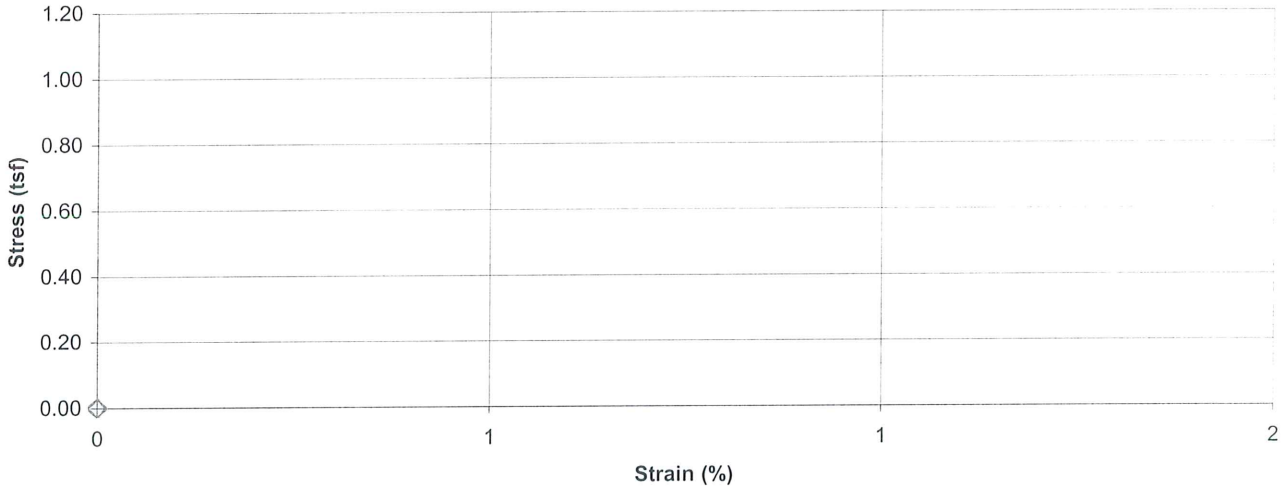
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/08/2010
Date Tested: N/A

Initial Wet Density (pcf)	N/A
Initial Moisture Content (%)	16.9
Initial Dry Density (pcf)	N/A
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	N/A
Average Diameter (in)	N/A
Height to Diameter Ratio	N/A

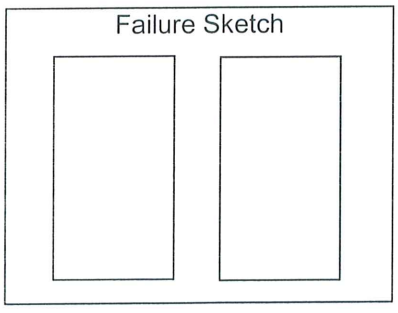
Initial MC Taken: Before Test, From Center of Specimen
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven
No test specimen obtained due to fragile sample
Saved in a bag

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 22A / ST - 2, 10.0'-12.0'
Lab ID: 114
Visual Description: Silt (ML), gray, moist, soft, fly ash and gypsum
Recovered: 1.8'
Test Interval: 10.7' - 11.2'

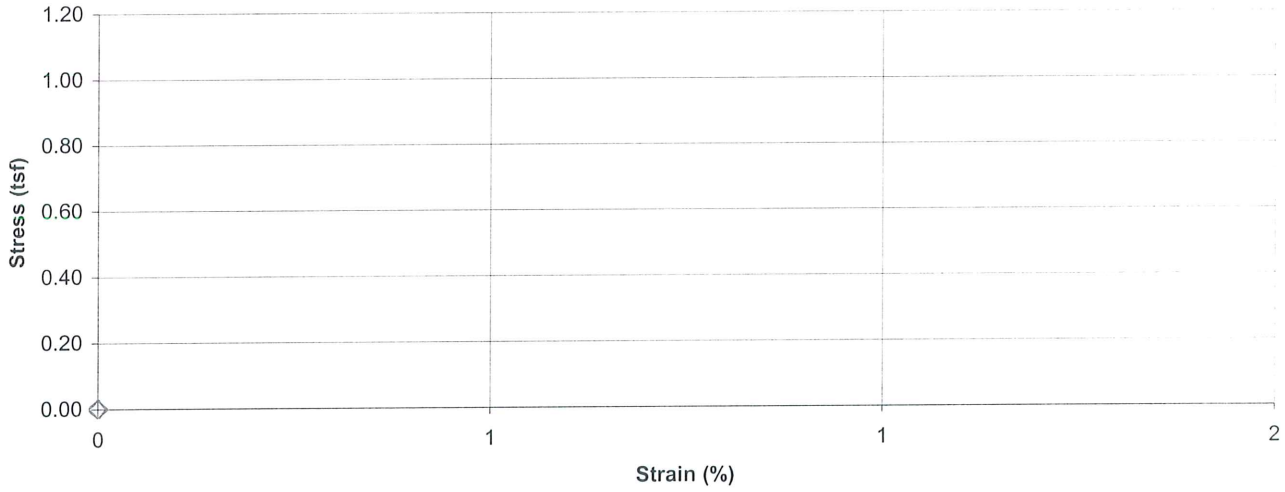
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/08/2010
Date Tested: N/A

Initial Wet Density (pcf)	110.1
Initial Moisture Content (%)	20.5
Initial Dry Density (pcf)	91.4
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.410
Average Diameter (in)	2.823
Height to Diameter Ratio	2.3

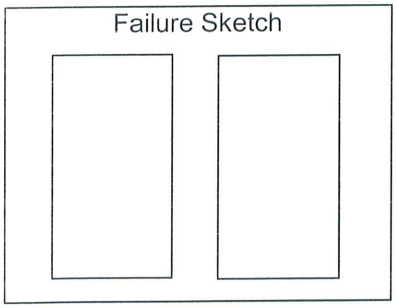
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven
Only one test specimen obtained due to fragile sample

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

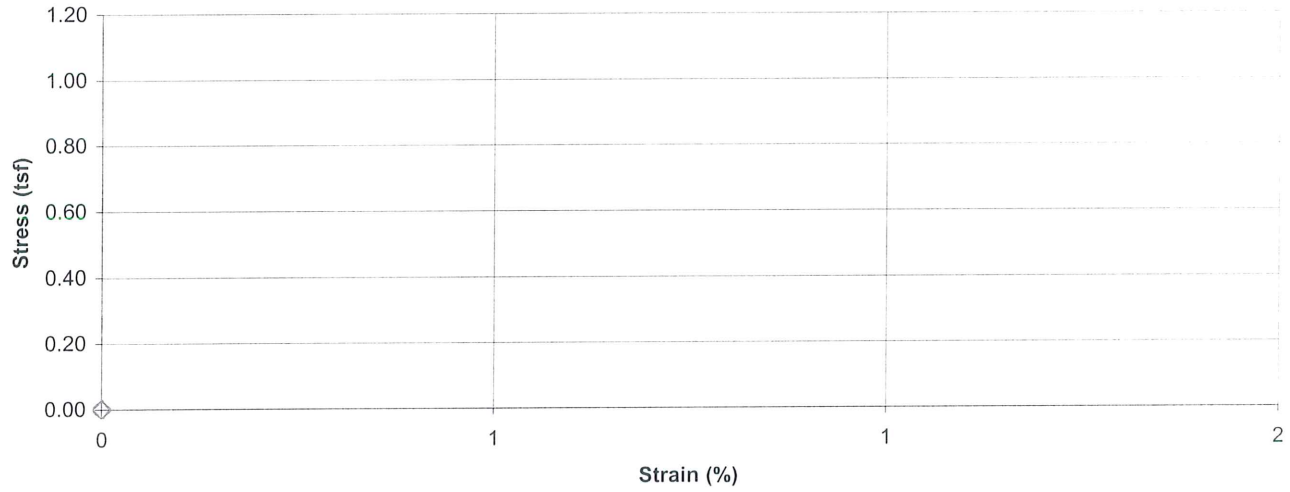
ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 22A / ST - 3, 15.0'-17.0'
Lab ID: 115A
Visual Description: Silt (ML), gray brown, moist, soft to firm, fly ash and gypsum
Recovered: 1.9'
Test Interval: 15.0' - 15.5'

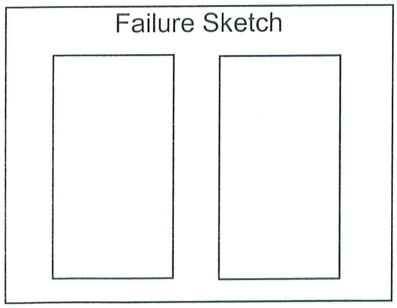
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	110.5		
Initial Moisture Content (%)	24.7	Initial MC Taken	Before Test, From Trimmings
Initial Dry Density (pcf)	88.6		
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
At Test Dry Density (pcf)	N/A		
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.936	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.877	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 22A / ST - 3, 15.0'-17.0'
Lab ID: 115B
Visual Description: Silt (ML), gray brown, moist to wet, soft to firm, fly ash and gypsum
Recovered: 1.9'
Test Interval: 15.5' - 16.0'

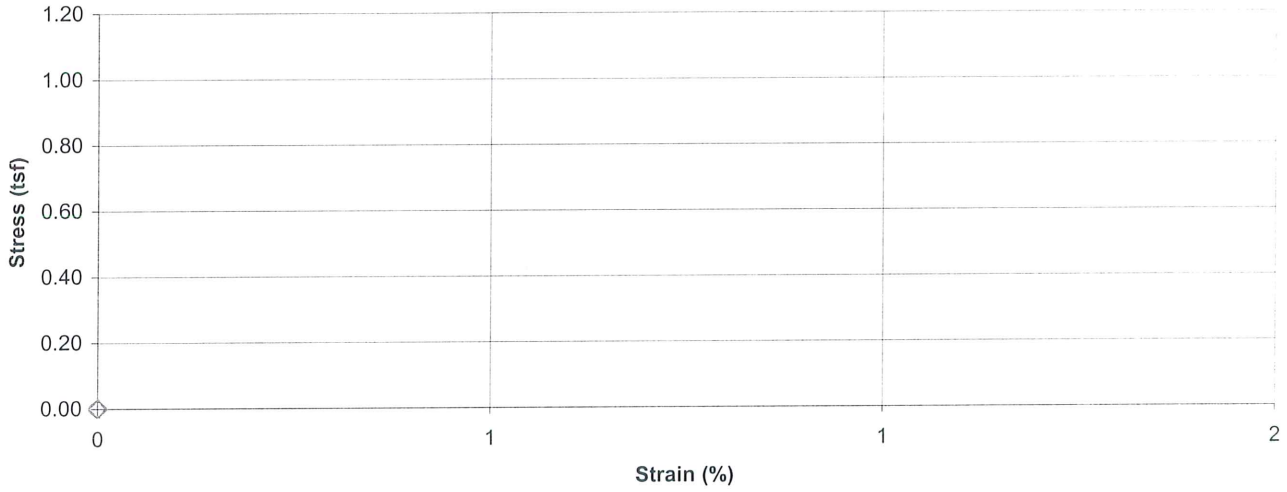
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	106.7
Initial Moisture Content (%)	36.7
Initial Dry Density (pcf)	78.1
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.071
Average Diameter (in)	2.823
Height to Diameter Ratio	2.2

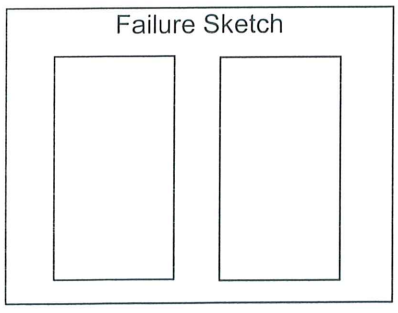
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

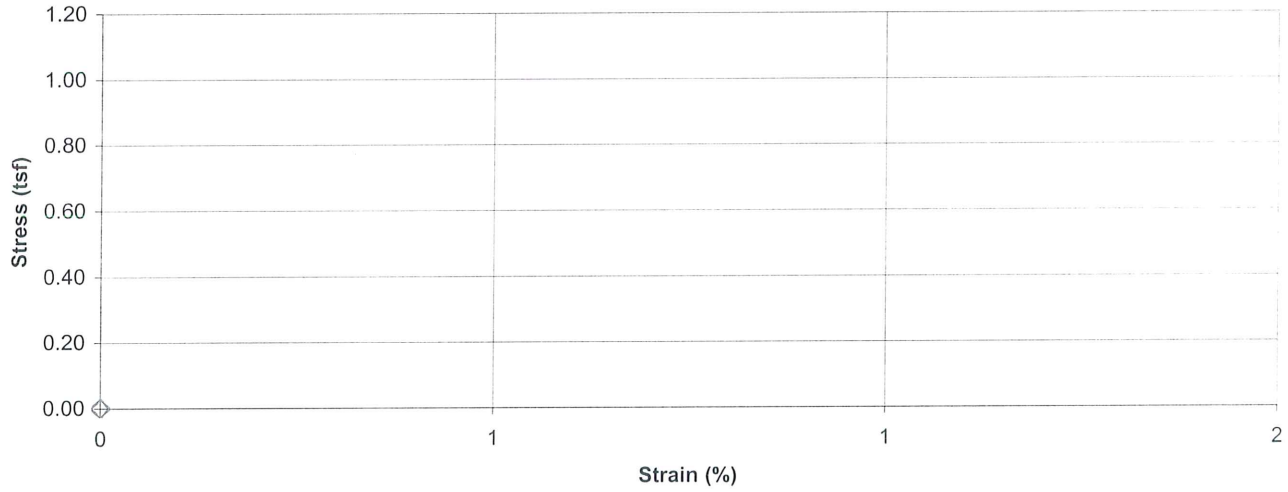
ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 22A / ST - 3, 15.0'-17.0'
Lab ID: 115C
Visual Description: Silt (ML), gray brown, moist to wet, soft to firm, fly ash and gypsum
Recovered: 1.9'
Test Interval: 16.0' - 16.5'

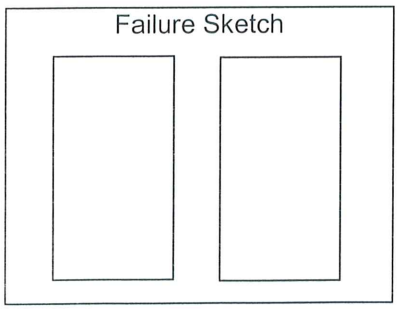
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	107.5		
Initial Moisture Content (%)	44.3	Initial MC Taken	Before Test, From Trimmings
Initial Dry Density (pcf)	74.5		
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
At Test Dry Density (pcf)	N/A		
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.030	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.832	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

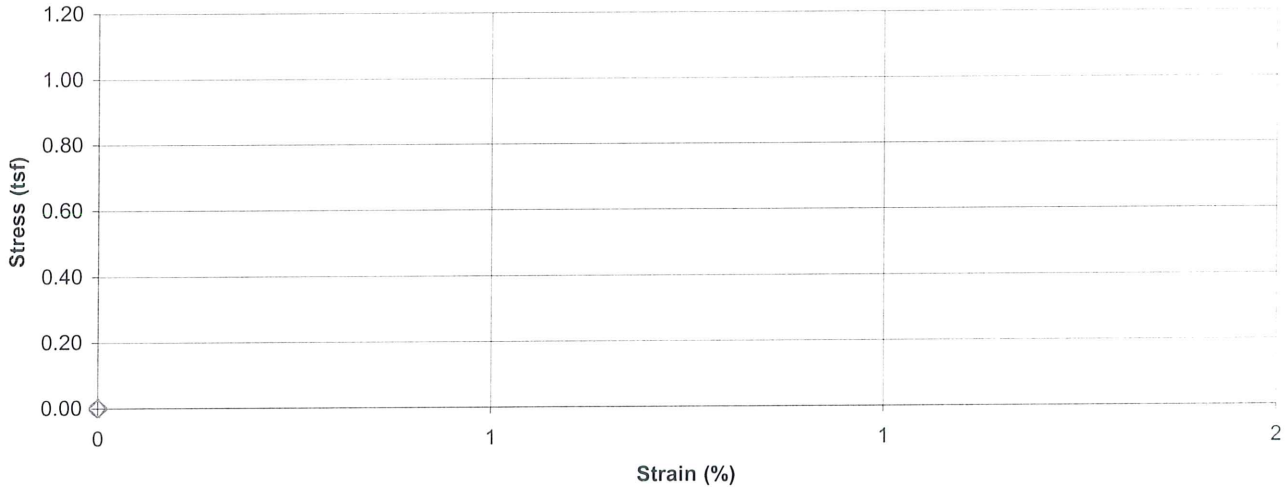
ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 22A / ST - 4, 20.0'-22.0'
Lab ID: 116A
Visual Description: Silt (ML), gray brown, moist to wet, soft to firm, fly ash and gypsum
Recovered: 1.7'
Test Interval: 20.0' - 20.5'

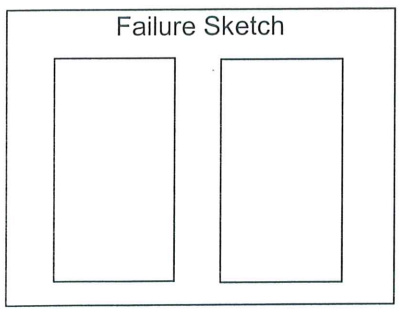
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	112.8		
Initial Moisture Content (%)	28.6	Initial MC Taken	Before Test, From Trimmings
Initial Dry Density (pcf)	87.7		
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
At Test Dry Density (pcf)	N/A		
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.925	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.868	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 22A / ST - 4, 20.0'-22.0'
Lab ID: 116B
Visual Description: Silt (ML), gray brown, moist to wet, soft to firm, fly ash and gypsum
Recovered: 1.7'
Test Interval: 20.9' - 21.4'

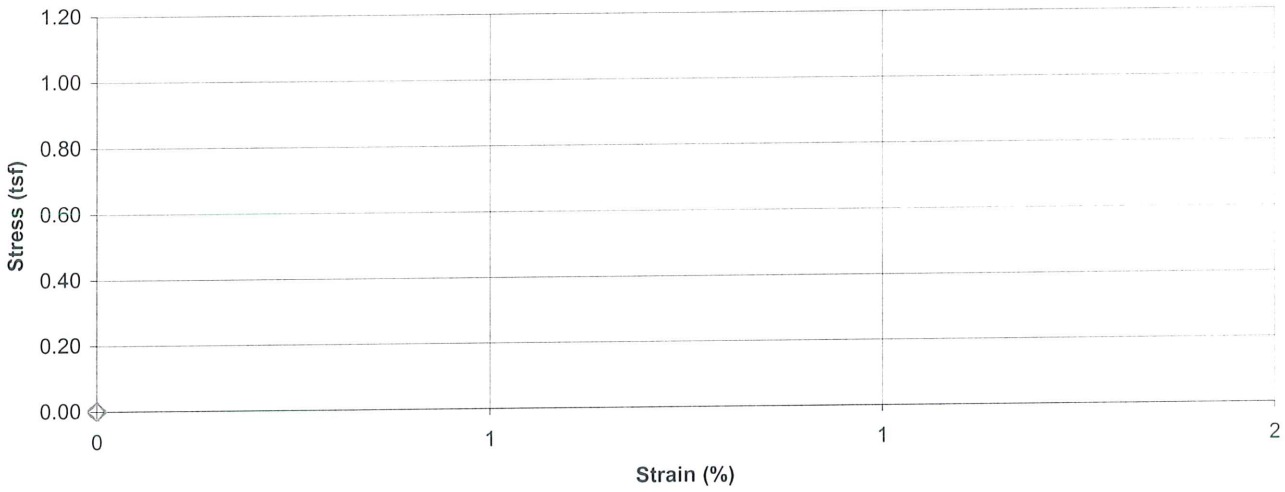
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	124.1
Initial Moisture Content (%)	27.2
Initial Dry Density (pcf)	97.6
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.695
Average Diameter (in)	2.809
Height to Diameter Ratio	2.0

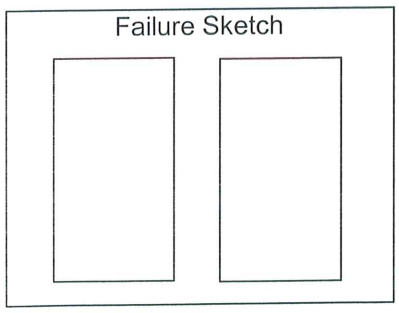
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By: [signature]

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 22A / ST - 5, 25.0'-26.0'
Lab ID: 117
Visual Description: Silt (ML), gray brown, moist, firm, fly ash and gypsum

Recovered: 0.9'
Test Interval: 25.0' - 25.5'

Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A

Date Extruded: 01/11/2010
Date Tested: N/A

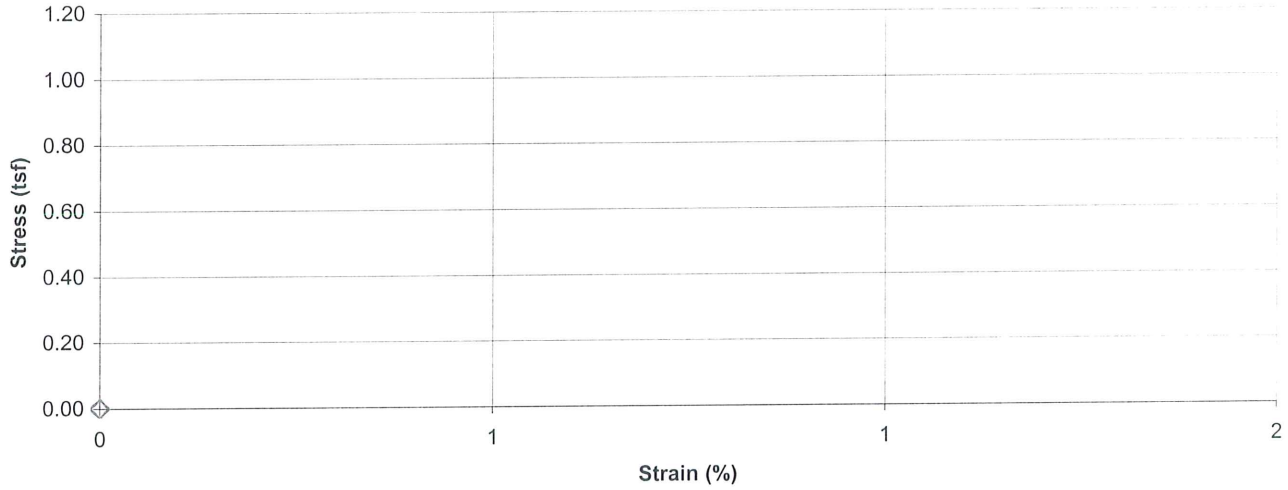
Initial Wet Density (pcf)	114.6
Initial Moisture Content (%)	24.6
Initial Dry Density (pcf)	91.9
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.770
Average Diameter (in)	2.881
Height to Diameter Ratio	2.0

Initial MC Taken: Before Test, From Trimmings

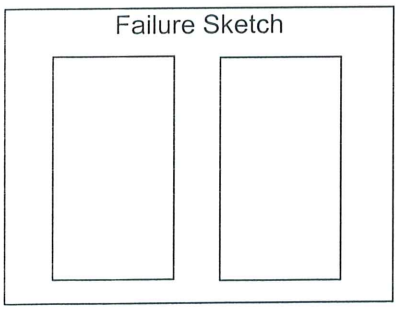
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By: \

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 23A / ST - 1, 5.0'-7.0'
Lab ID: 134A
Visual Description: Lean Clay with Gravel (CL), brown, moist, firm, coal
Recovered: 1.3'
Test Interval: 5.0' - 5.5'

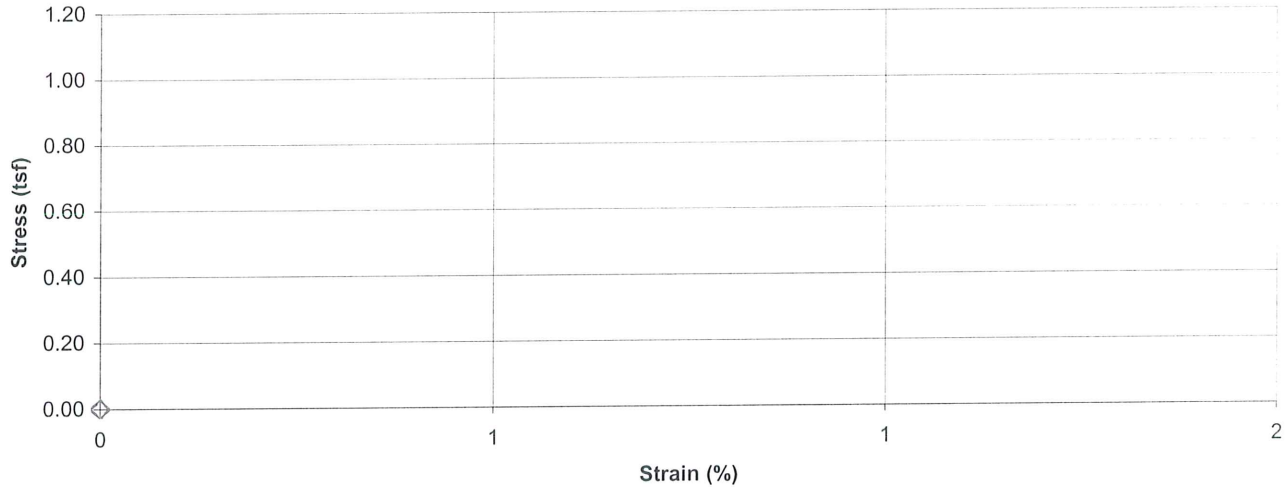
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	110.3
Initial Moisture Content (%)	16.0
Initial Dry Density (pcf)	95.0
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.112
Average Diameter (in)	2.862
Height to Diameter Ratio	2.1

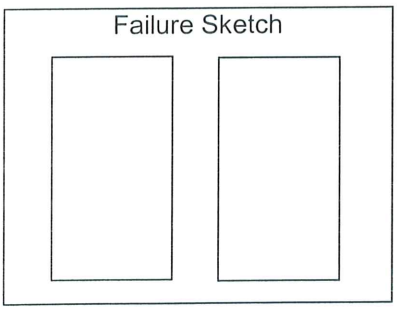
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
Rock Gouge 5.5' - 5.8'

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

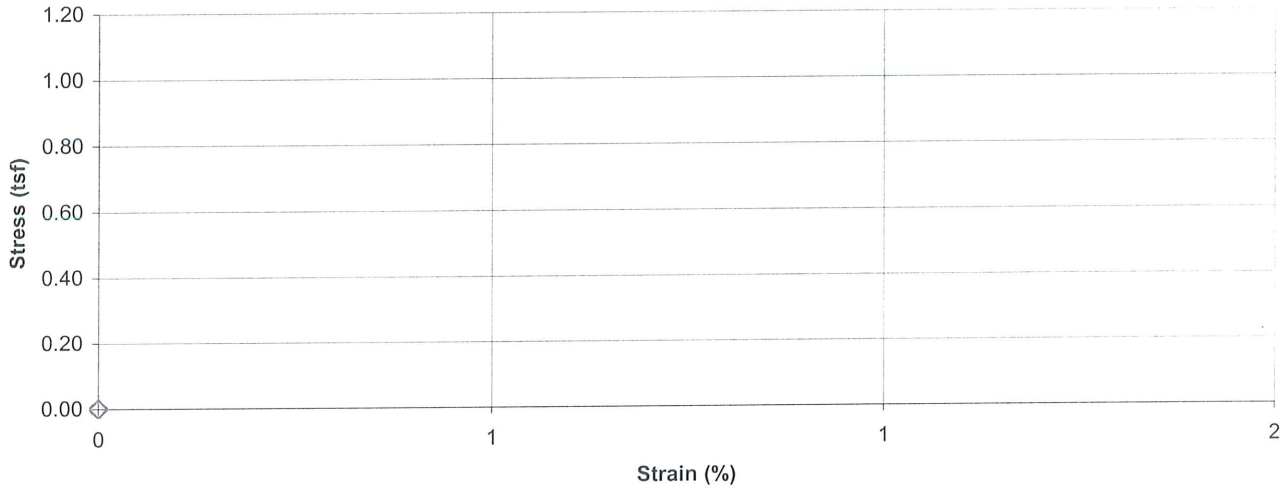
ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 23A / ST - 1, 5.0'-7.0'
Lab ID: 134B
Visual Description: Gravelly Lean Clay (CL), brown, moist, firm, coal
Recovered: 1.3'
Test Interval: 5.8' - 6.3'

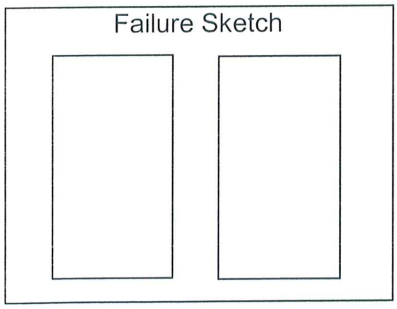
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2009
Date Tested: N/A

Initial Wet Density (pcf)	124.7		
Initial Moisture Content (%)	15.3	Initial MC Taken	Before Test, From Trimmings
Initial Dry Density (pcf)	108.2		
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
At Test Dry Density (pcf)	N/A		
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.937	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.888	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments

Reviewed By: \

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 23A / ST - 2, 10.0'-12.0'
Lab ID: 135A
Visual Description: Lean Clay with Gravel (CL), gray brown, moist, firm, coal
Recovered: 1.4'
Test Interval: 10.0' - 10.5'

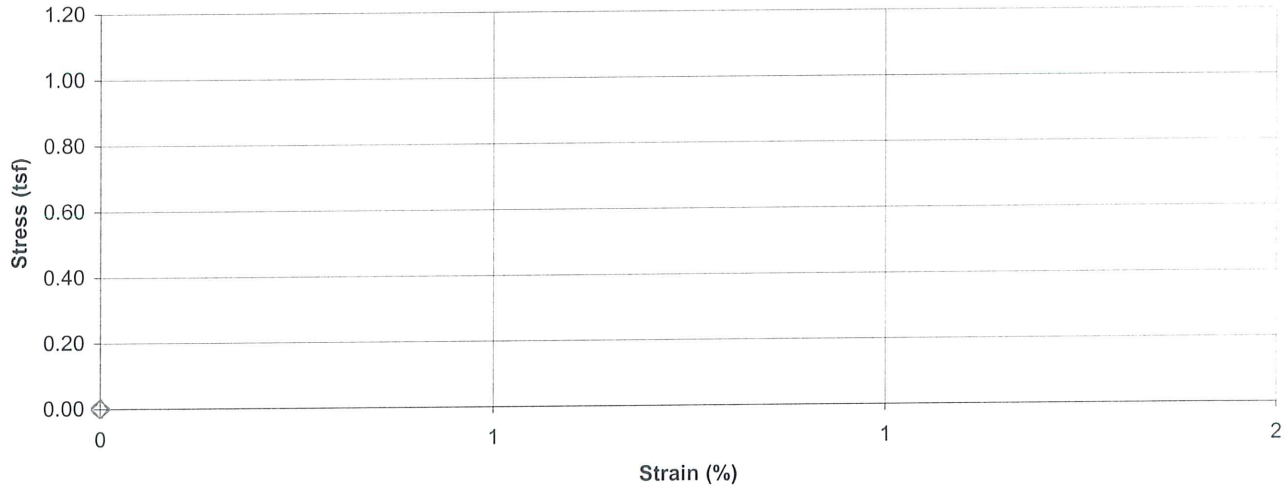
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	107.3
Initial Moisture Content (%)	14.9
Initial Dry Density (pcf)	93.4
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.959
Average Diameter (in)	2.875
Height to Diameter Ratio	2.1

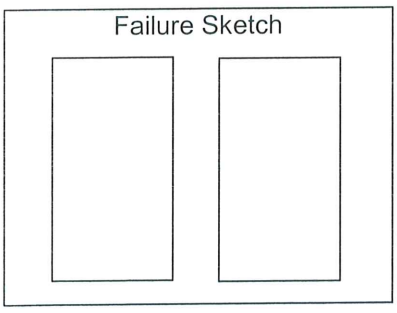
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

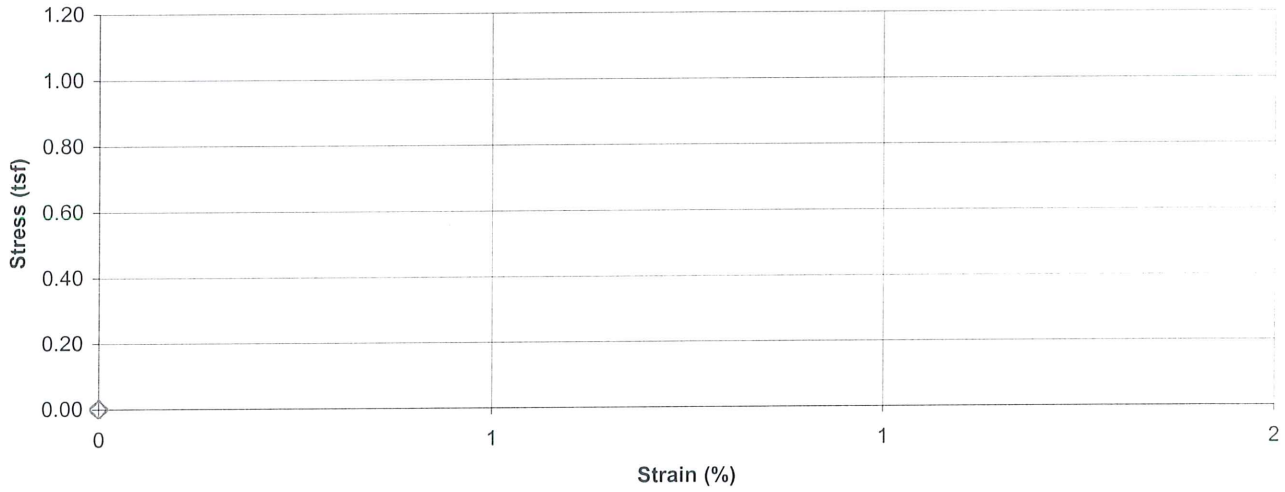
ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 23A / ST - 2, 10.0'-12.0'
Lab ID: 135B
Visual Description: Lean Clay with Gravel (CL), gray brown, moist, firm, coal
Recovered: 1.4'
Test Interval: 10.8' - 11.3'

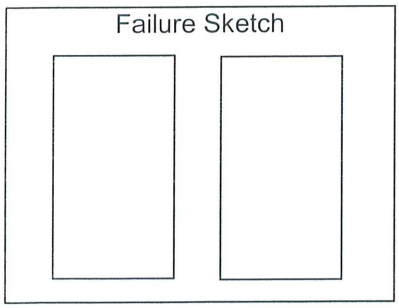
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	131.1		
Initial Moisture Content (%)	15.3	Initial MC Taken	Before Test, From Trimmings
Initial Dry Density (pcf)	113.7		
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
At Test Dry Density (pcf)	N/A		
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.875	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.896	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.0	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

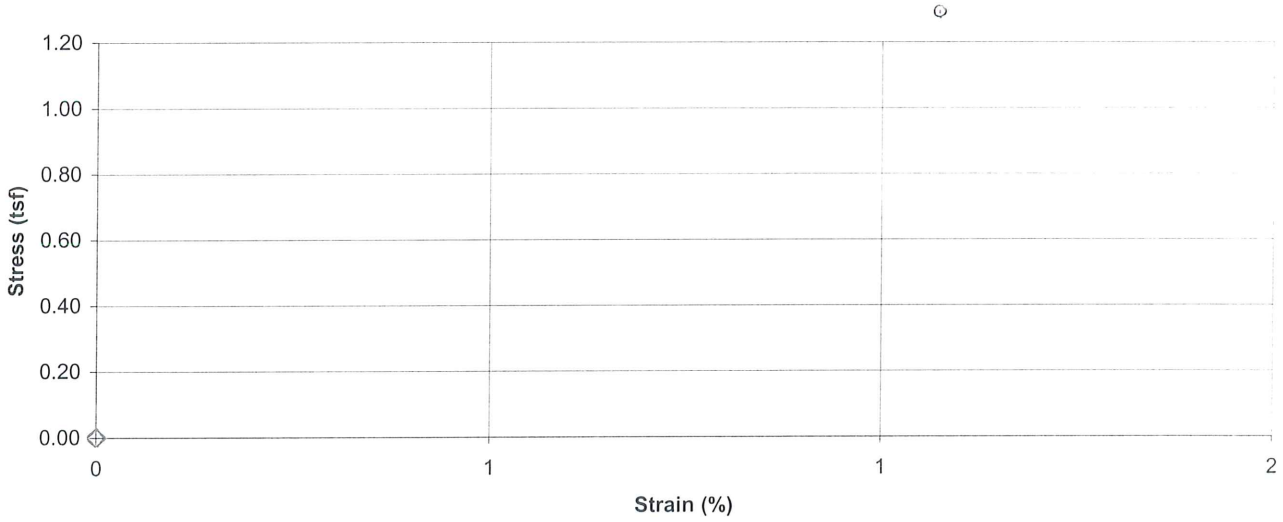
ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 23A / ST - 3, 15.0'-17.0'
Lab ID: 136
Visual Description: Lean Clay with Gravel (CL), gray brown, moist, firm, mine spoil
Recovered: 0.9'
Test Interval: 15.4' - 15.9'

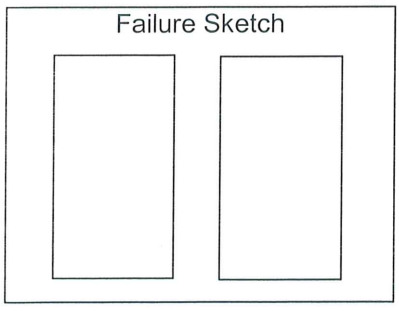
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	131.0	Initial MC Taken	Before Test, From Trimmings
Initial Moisture Content (%)	16.7		
Initial Dry Density (pcf)	112.3		
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
At Test Dry Density (pcf)	N/A		
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.907	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.882	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.0	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 23A / ST - 4, 20.0'-22.0'
Lab ID: 137
Visual Description: Gravelly Lean Clay (CL), gray brown, moist, firm, mine spoil
Recovered: 0.8'
Test Interval: 20.2' - 20.7'

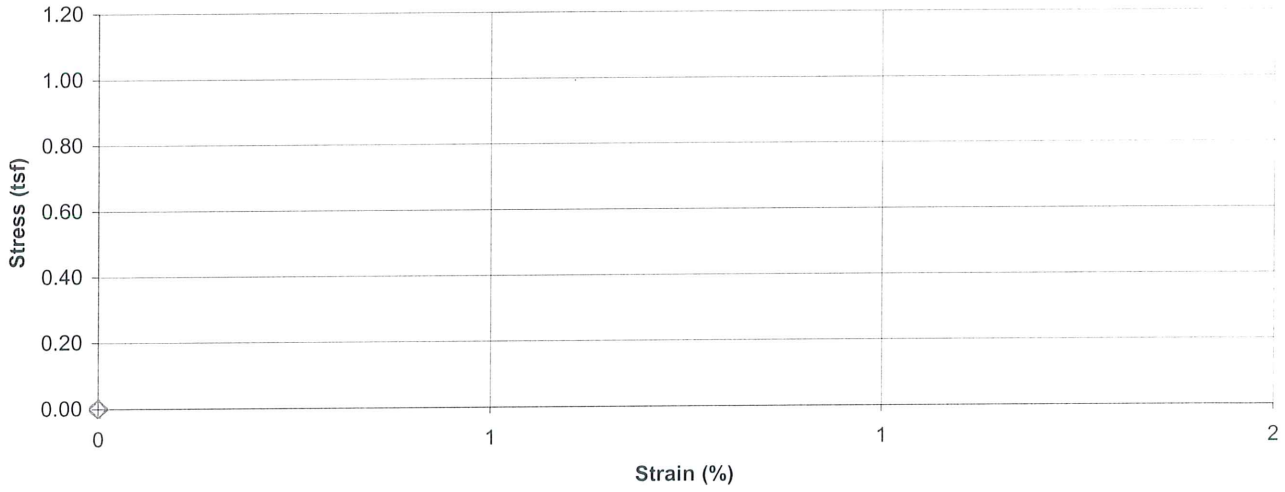
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	130.7
Initial Moisture Content (%)	15.2
Initial Dry Density (pcf)	113.5
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.970
Average Diameter (in)	2.885
Height to Diameter Ratio	2.1

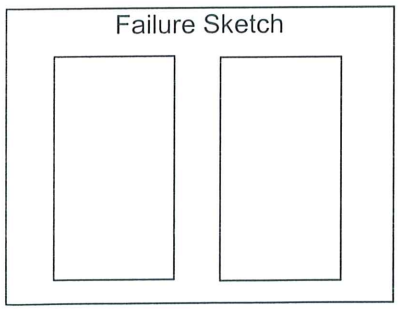
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
Large shale and limestone aggregate at 20.7'.

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 24A / ST - 1, 5.0'-7.0'
Lab ID: 156A
Visual Description: Silt (ML), gray brown, moist, firm, mine spoil

Recovered: 1.4'
Test Interval: 5.0' - 5.5'

Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A

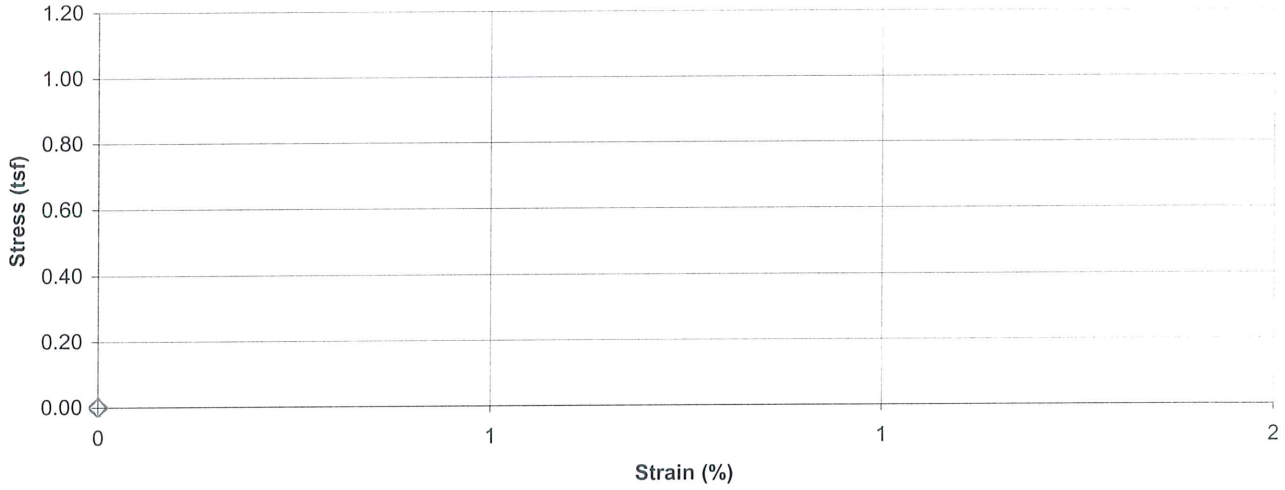
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	122.7
Initial Moisture Content (%)	18.4
Initial Dry Density (pcf)	103.7
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	6.138
Average Diameter (in)	2.892
Height to Diameter Ratio	2.1

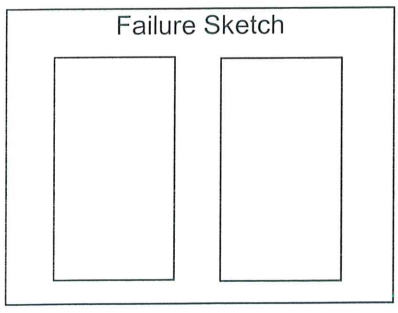
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

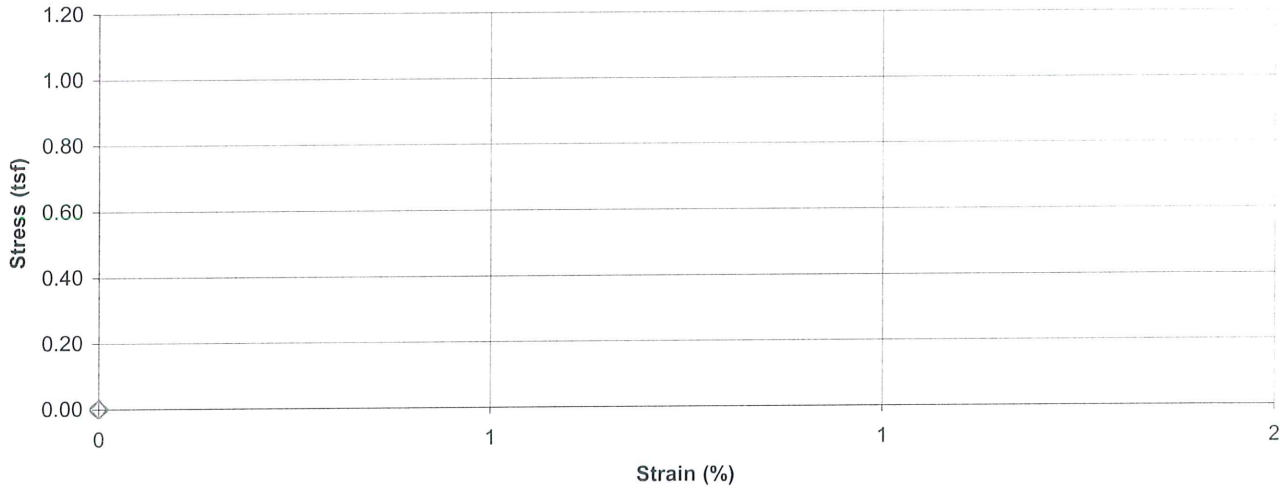
ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 24A / ST - 1, 5.0'-7.0'
Lab ID: 156B
Visual Description: Silt (ML), gray brown, moist, firm, fly ash and gypsum
Recovered: 1.4'
Test Interval: 5.7' - 6.2'

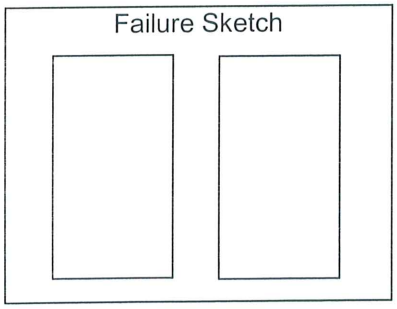
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	109.9		
Initial Moisture Content (%)	25.6	Initial MC Taken	Before Test, From Trimmings
Initial Dry Density (pcf)	87.5		
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
At Test Dry Density (pcf)	N/A		
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.897	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.867	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

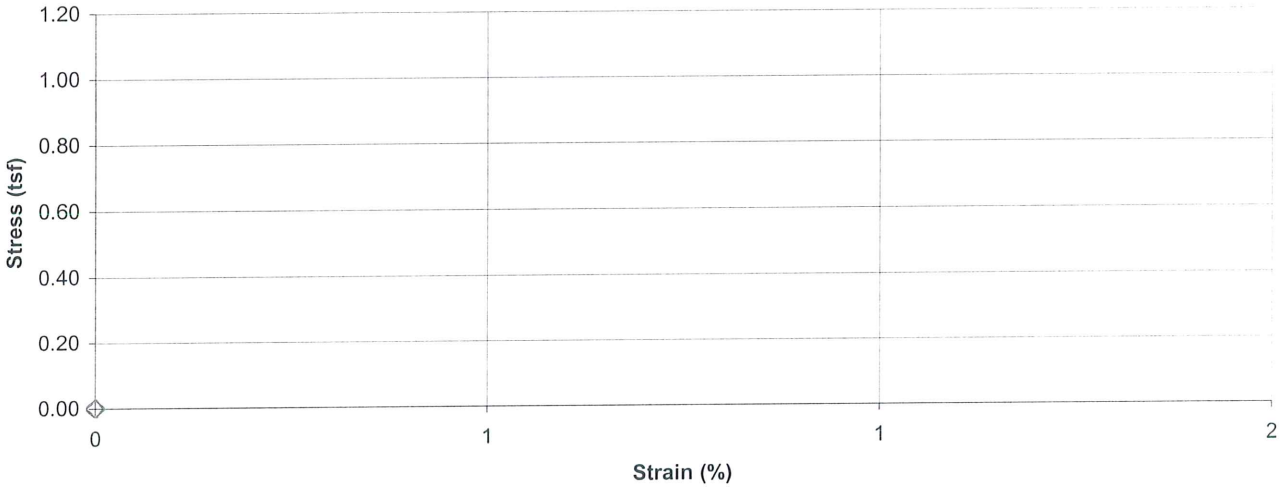
ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 24A / ST - 2, 10.0'-12.0'
Lab ID: 157
Visual Description: Silt (ML), gray, moist, firm to soft, fly ash and gypsum
Recovered: 1.4'
Test Interval: 10.4' - 10.9'

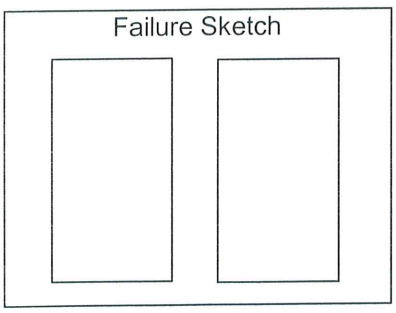
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	116.2	Initial MC Taken	Before Test, From Trimmings
Initial Moisture Content (%)	22.3		
Initial Dry Density (pcf)	95.1		
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
At Test Dry Density (pcf)	N/A		
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.976	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.859	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven
Unable to obtain more test specimens due to fragile sample.
Saved in a bag

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 24A / ST - 3, 15.0'-17.0'
Lab ID: 158A
Visual Description: Silt (ML), gray brown, moist, firm, fly ash and gypsum
Recovered: 1'
Test Interval: 15.0' - 15.5'

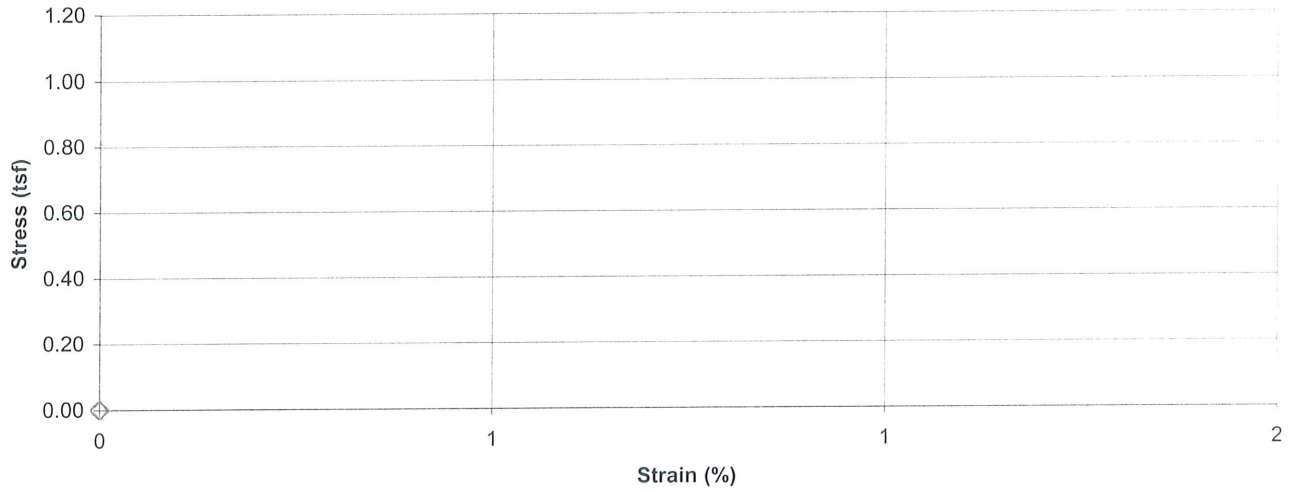
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	118.1
Initial Moisture Content (%)	19.8
Initial Dry Density (pcf)	98.5
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.846
Average Diameter (in)	2.870
Height to Diameter Ratio	2.0

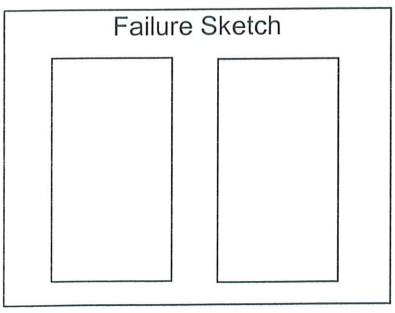
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

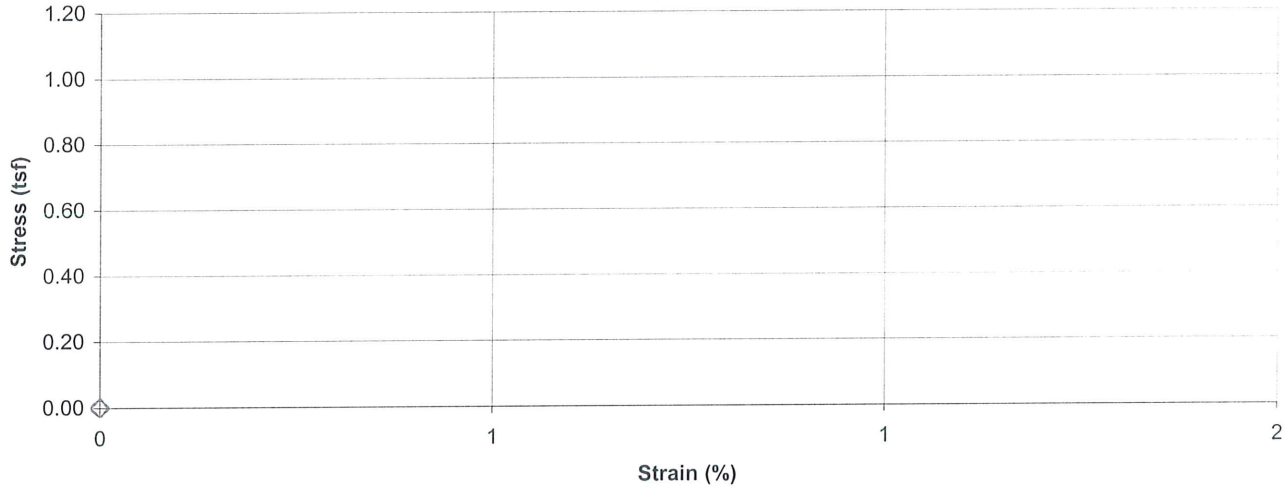
ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 24A / ST - 3, 15.0'-17.0'
Lab ID: 158B
Visual Description: Silt (ML), gray brown, moist, firm, fly ash and gypsum
Recovered: 1'
Test Interval: 15.5' - 16.0'

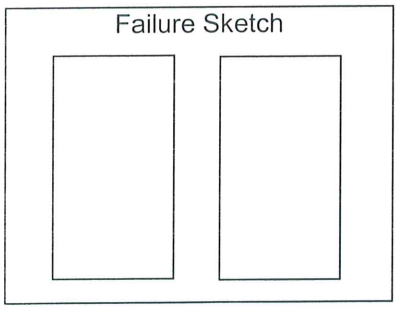
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	116.2	Initial MC Taken	Before Test, From Trimmings
Initial Moisture Content (%)	20.8		
Initial Dry Density (pcf)	96.2		
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
At Test Dry Density (pcf)	N/A		
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	5.897	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.874	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By: JW

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 24A / ST - 4, 20.0'-22.0'
Lab ID: 159A
Visual Description: Silt (ML), gray brown, wet, soft, fly ash and gypsum
Recovered: 1.4'
Test Interval: 20.0' - 20.5'

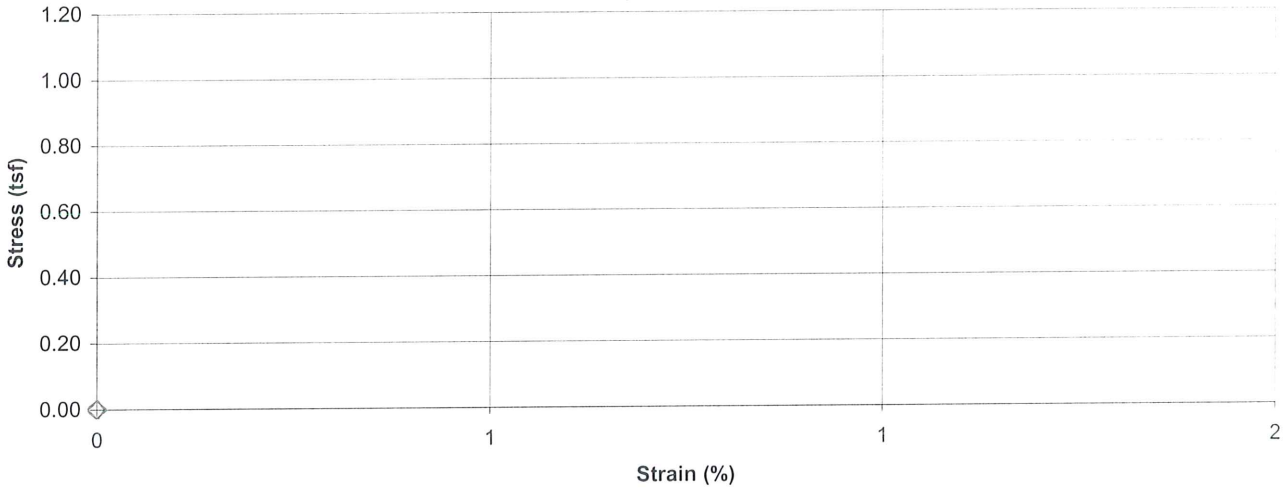
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	122.2
Initial Moisture Content (%)	21.0
Initial Dry Density (pcf)	100.9
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.940
Average Diameter (in)	2.849
Height to Diameter Ratio	2.1

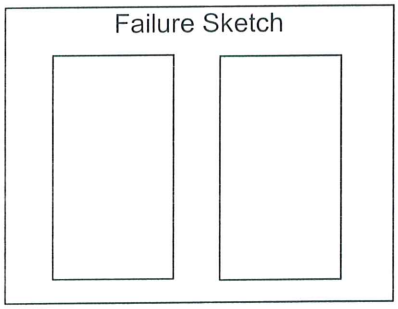
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 24A / ST - 4, 20.0'-22.0'
Lab ID: 159B
Visual Description: Silt (ML), gray brown, moist to wet, soft to firm, fly ash and gypsum
Recovered: 1.4'
Test Interval: 20.5' - 21.0'

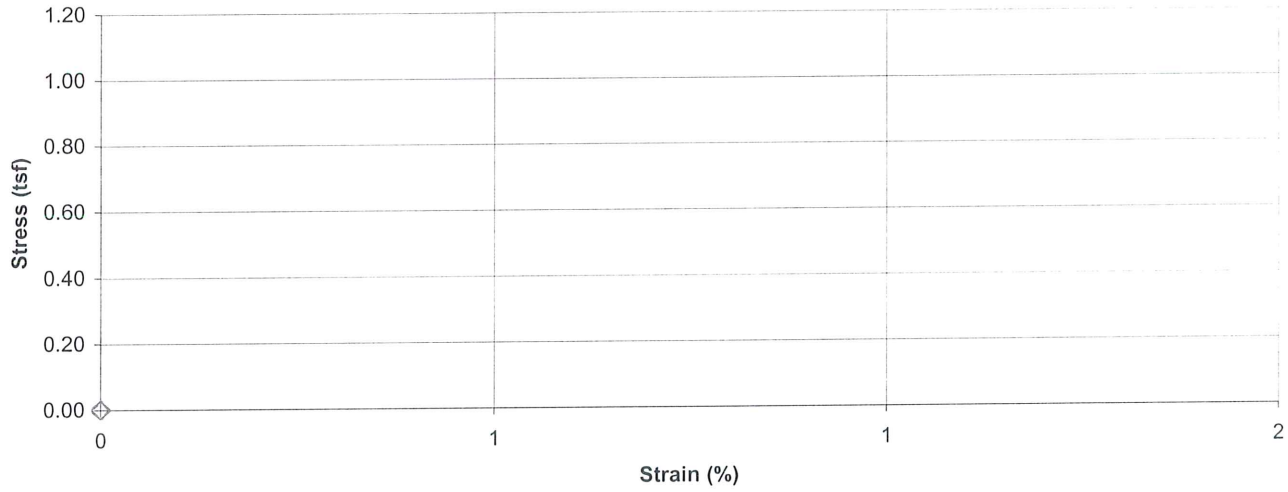
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	123.1
Initial Moisture Content (%)	21.4
Initial Dry Density (pcf)	101.4
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.859
Average Diameter (in)	2.854
Height to Diameter Ratio	2.1

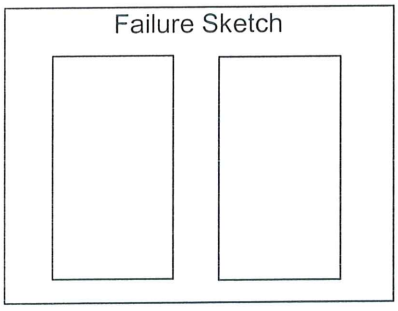
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 25A / ST - 1, 5.0'-7.0'
Lab ID: 182
Visual Description: Silt (ML), gray, moist, soft, fly ash and gypsum

Recovered: 1.8'
Test Interval: 5.0' - 6.8'

Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A

Date Extruded: 01/11/2010
Date Tested: N/A

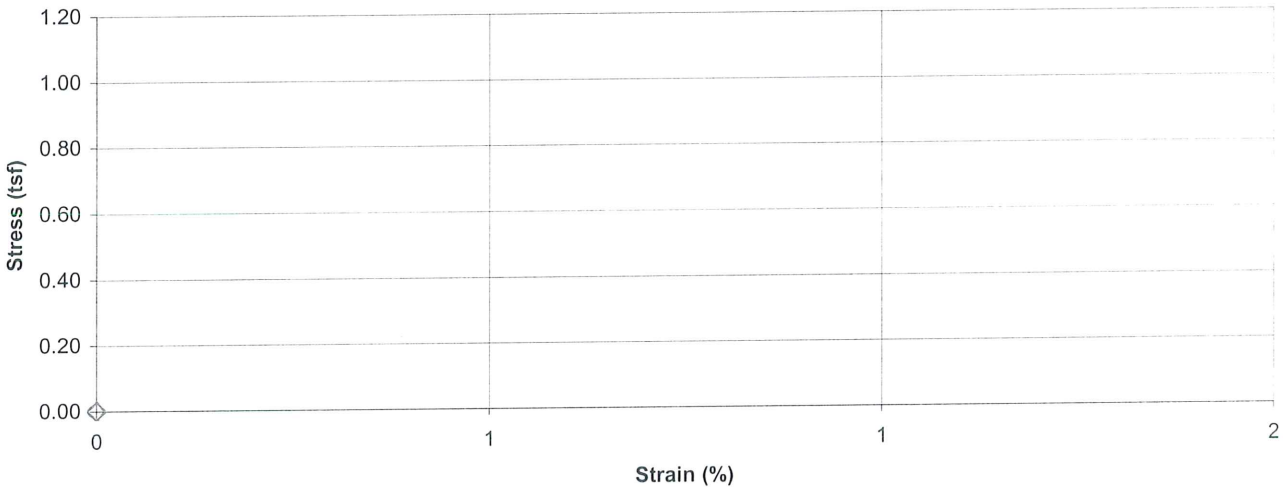
Initial Wet Density (pcf)	N/A
Initial Moisture Content (%)	16.4
Initial Dry Density (pcf)	N/A
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	N/A
Average Diameter (in)	N/A
Height to Diameter Ratio	N/A

Initial MC Taken: Before Test, From Center of Specimen

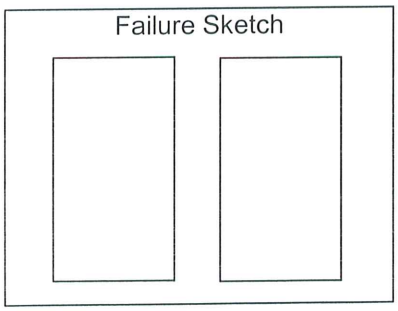
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven
Unable to obtain a test specimen due to fragile sample
Saved in a bag

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 25A / ST - 2, 10.0'-12.0'
Lab ID: 183
Visual Description: Silt (ML), gray, moist, soft, gypsum and fly ash

Recovered: 1.8'
Test Interval: 10.0' - 11.8'

Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A

Date Extruded: 01/11/2010
Date Tested: N/A

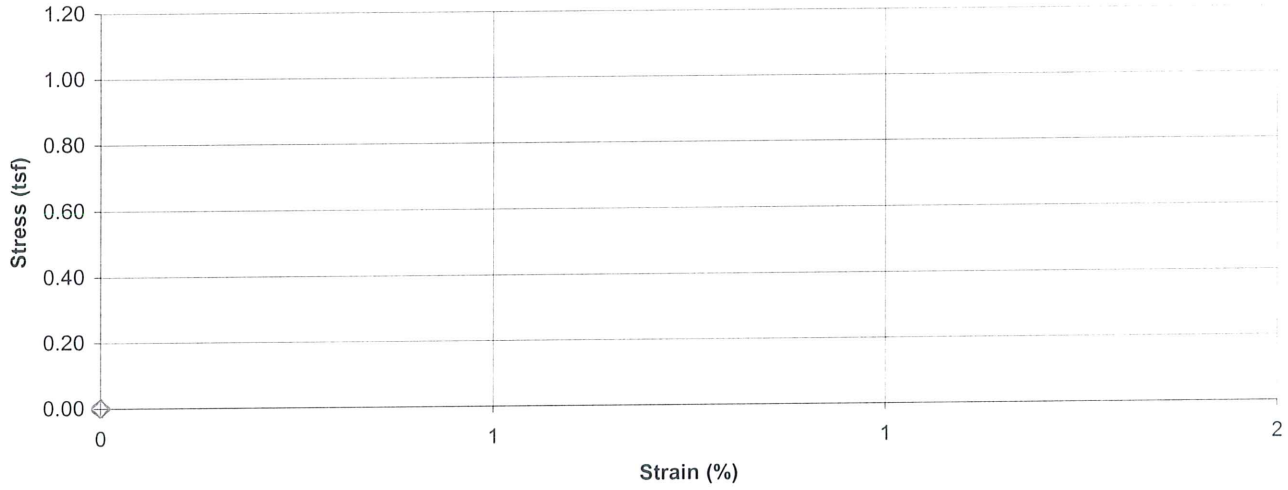
Initial Wet Density (pcf)	N/A
Initial Moisture Content (%)	10.8
Initial Dry Density (pcf)	N/A
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	N/A
Average Diameter (in)	N/A
Height to Diameter Ratio	N/A

Initial MC Taken: Before Test, From Center of Specimen

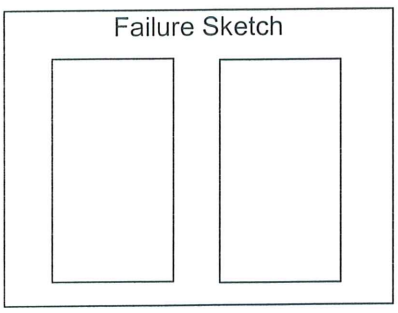
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven
Unable to obtain a test specimen due to softness and fractures
Saved in a bag

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 25A / ST - 3, 15.0'-17.0'
Lab ID: 184
Visual Description: Silt (ML), gray, moist, soft, fly ash and gypsum
Recovered: 1.9'
Test Interval: 15.0' - 16.9'

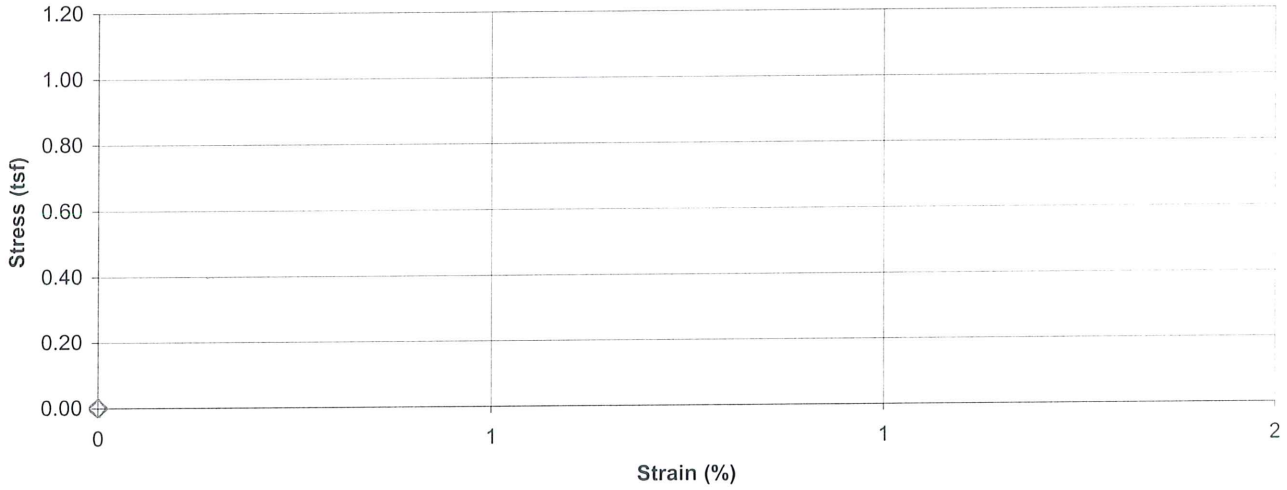
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	N/A
Initial Moisture Content (%)	27.8
Initial Dry Density (pcf)	N/A
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	N/A
Average Diameter (in)	N/A
Height to Diameter Ratio	N/A

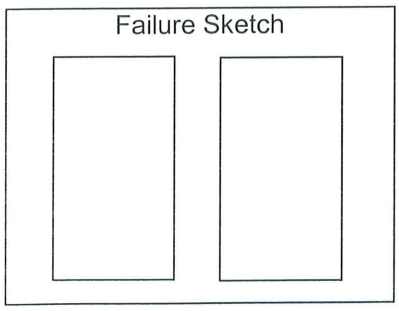
Initial MC Taken: Before Test, From Center of Specimen
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven
Unable to obtain a test specimen due to fragile sample
Saved in a bag

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 25A / ST - 4, 20.0'-22.0'
Lab ID: 185A
Visual Description: Silt (ML), brown and gray, wet, soft, fly ash and gypsum
Recovered: 1.6'
Test Interval: 20.0' - 20.5'

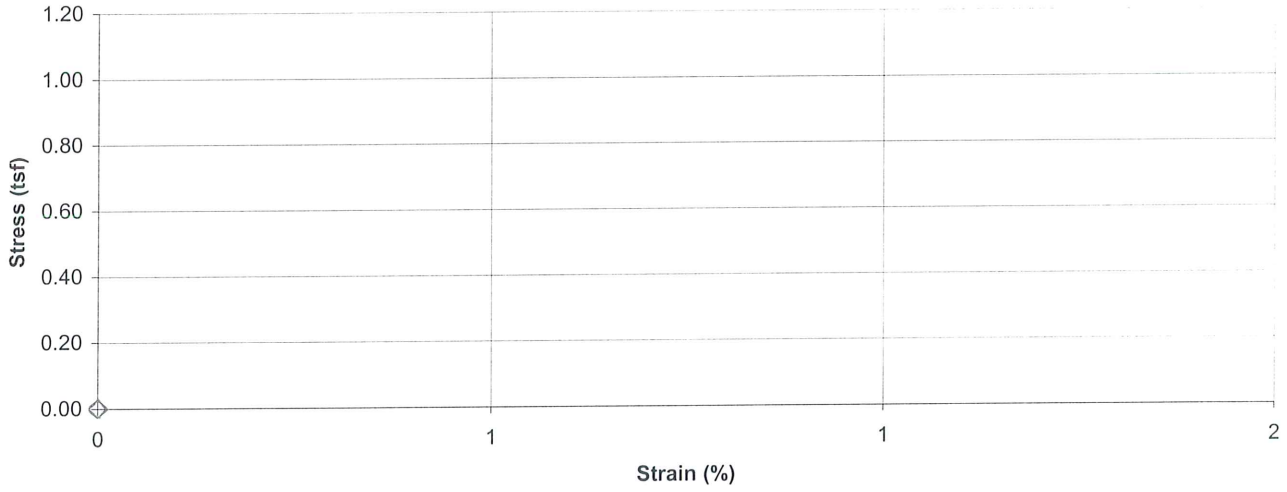
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	113.3
Initial Moisture Content (%)	25.7
Initial Dry Density (pcf)	90.2
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.879
Average Diameter (in)	2.902
Height to Diameter Ratio	2.0

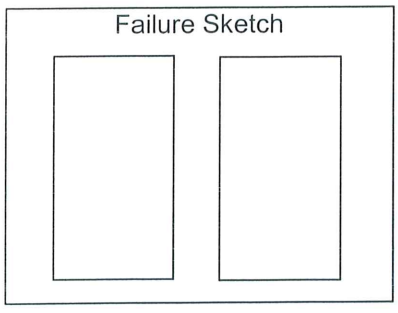
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

Comments
MC determined using 40° C oven
20.5'-21.0' no test specimen obtained due to moisture content

Reviewed By

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name: PAF- Scrubber Sludge Complex
Project Number: 175569040
Source: STN - 25A / ST - 4, 20.0'-22.0'
Lab ID: 185B
Visual Description: Silt (ML), brown and gray, wet, soft
Recovered: 1.6'
Test Interval: 21.0' - 21.5'

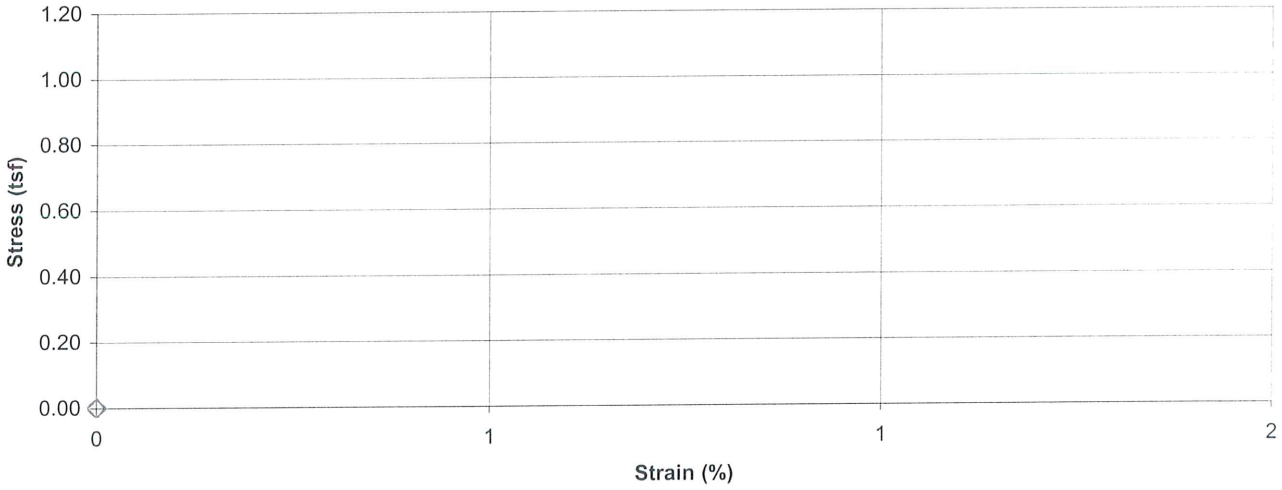
Specimen Type: Undisturbed
LL: N/A
PL: N/A
PI: N/A
Date Extruded: 01/11/2010
Date Tested: N/A

Initial Wet Density (pcf)	120.1
Initial Moisture Content (%)	26.4
Initial Dry Density (pcf)	95.0
At Test Moisture Content (%)	N/A
At Test Dry Density (pcf)	N/A
Specific Gravity	N/A
Degree of Saturation (%)	N/A
Average Height (in)	5.938
Average Diameter (in)	2.816
Height to Diameter Ratio	2.1

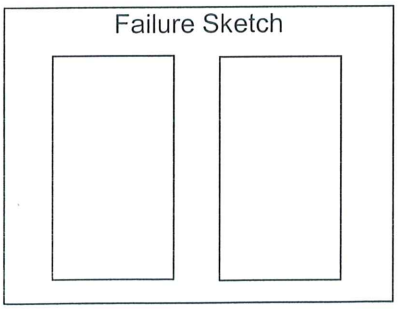
Initial MC Taken: Before Test, From Trimmings
At Test MC Taken: N/A

Unconfined Compressive Strength (tsf)	N/A
Undrained Shear Strength (tsf)	N/A
Strain at Maximum Stress (%)	N/A
Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf): N/A
Torvane Reading (kg/cm^2): N/A

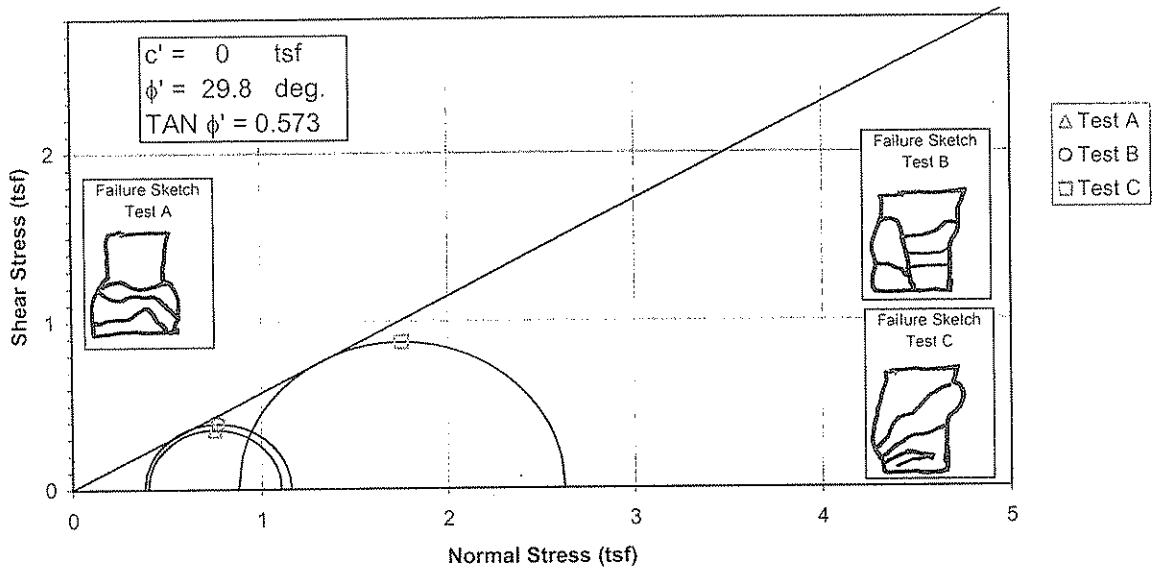
Comments
MC determined using 40° C oven

Reviewed By

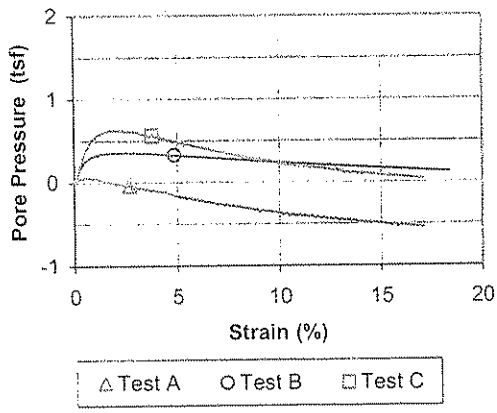
CU Triaxial Testing

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	14.4	13.6	11.8	
	Dry Density PCF	γ_{d_o}	117.7	114.2	119.5	
	Saturation %	S_o	87.1	74.8	74.8	
	Void Ratio	e_o	0.454	0.498	0.431	
After Shear	Water content %	W_f	17.2	17.3	14.1	
	Dry Density PCF	γ_{d_f}	116.4	116.0	123.5	
	Saturation %	S_f	100.0	100.0	100.0	
	Void Ratio	e_f	0.470	0.475	0.385	
	Final Back Pressure TSF	u_c	6.12	5.76	5.04	
Minor Principal Stress TSF @ failure		$\sigma_3'f$	0.40	0.38	0.88	
Maximum Deviator Stress (tsf) @ failure		$(\sigma_1'-\sigma_3')_{max}$	0.71	0.77	1.75	
Time to $(\sigma 1'-\sigma 3')$max min.		t_f	157.9	291.8	244.4	
Ultimate Deviator Stress, t/sq ft		$(\sigma 1'-\sigma 3')_{ult}$	n/a	n/a	n/a	
Initial Diameter, in.		D_o	2.890	2.889	2.881	
Initial Height, in.		H_o	6.086	5.923	6.255	

Controlled - Strain Test

Description of Specimens Gravelly Silt (ML), gray, moist, firm, mine spoil

LL	PL	PI	Gs 2.74

Remarks:

Type of Specimen Undisturbed | Type of test R

Project PAF- Scrubber Sludge Complex

Boring No. STN-20A | Sample No. 1

Depth Elev. 5.5'-6.0', 10.5'-11.0', 15.5'-16.0'

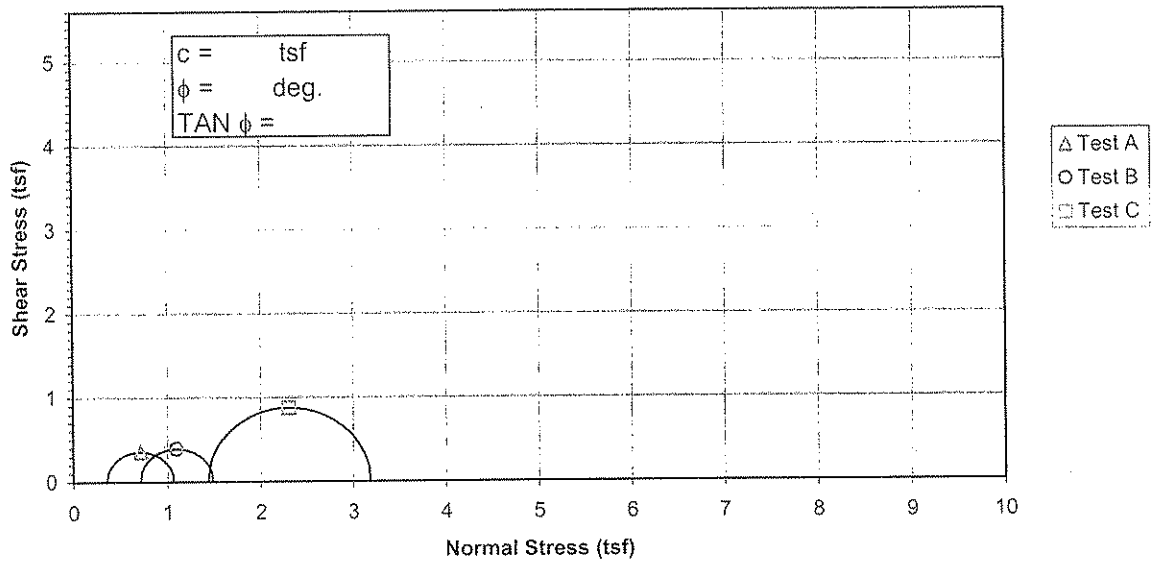
Laboratory Stantec | Date 1-28-10

TRIAXIAL COMPRESSION TEST REPORT

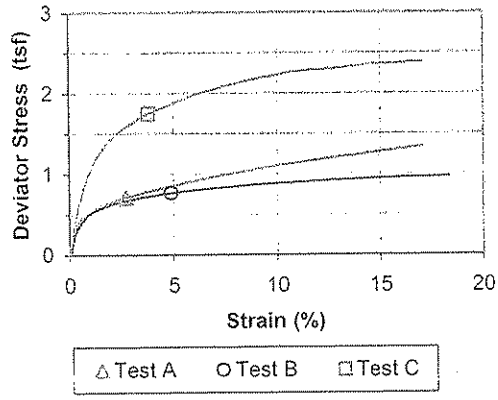
EM 1110-2-1906
Appendix X
30 Nov. 70

Failure Criterion: Maximum Effective Principal Stress Ratio

Total Strength Envelope



Deviator Stress vs. Strain



Specimen No.			A	B	C	
Initial Data	Water content %	W_o	14.4	13.6	11.8	
	Dry Density PCF	γ_{d_o}	117.7	114.2	119.5	
	Saturation %	S_o	87.1	74.8	74.8	
	Void Ratio	e_o	0.454	0.498	0.431	
After Shear	Water content %	W_f	17.2	17.3	14.1	
	Dry Density PCF	γ_{d_f}	116.4	116.0	123.5	
	Saturation %	S_f	100.0	100.0	100.0	
	Void Ratio	e_f	0.470	0.475	0.385	
	Final Back Pressure TSF	u_c	6.12	5.76	5.04	
Minor Principal Stress TSF		σ_3	0.36	0.72	1.44	
Maximum Deviator Stress (tsf) @ failure		$(\sigma_1-\sigma_3)_{max}$	0.71	0.77	1.75	
Time to $(\sigma_1-\sigma_3)_{Max.}$ min.		t_f	157.9	291.8	244.4	
Ultimate Deviator Stress, t/sq ft		$(\sigma_1-\sigma_3)_{ult}$	n/a	n/a	n/a	
Initial Diameter, in.		D_o	2.890	2.889	2.881	
Initial Height, in.		H_o	6.086	5.923	6.255	

Controlled - Strain Test

Description of Specimens: Gravelly Silt (ML), gray, moist, firm, mine spoil

LL	PL	PI	Gs 2.74

Remarks:

Type of Specimen: Undisturbed — Type of test: R

Project: PAF- Scrubber Sludge Complex

Boring No.: STN-20A — Sample No.: 1

Depth Elev.: 5.5'-6.0', 10.5'-11.0', 15.5'-16.0'

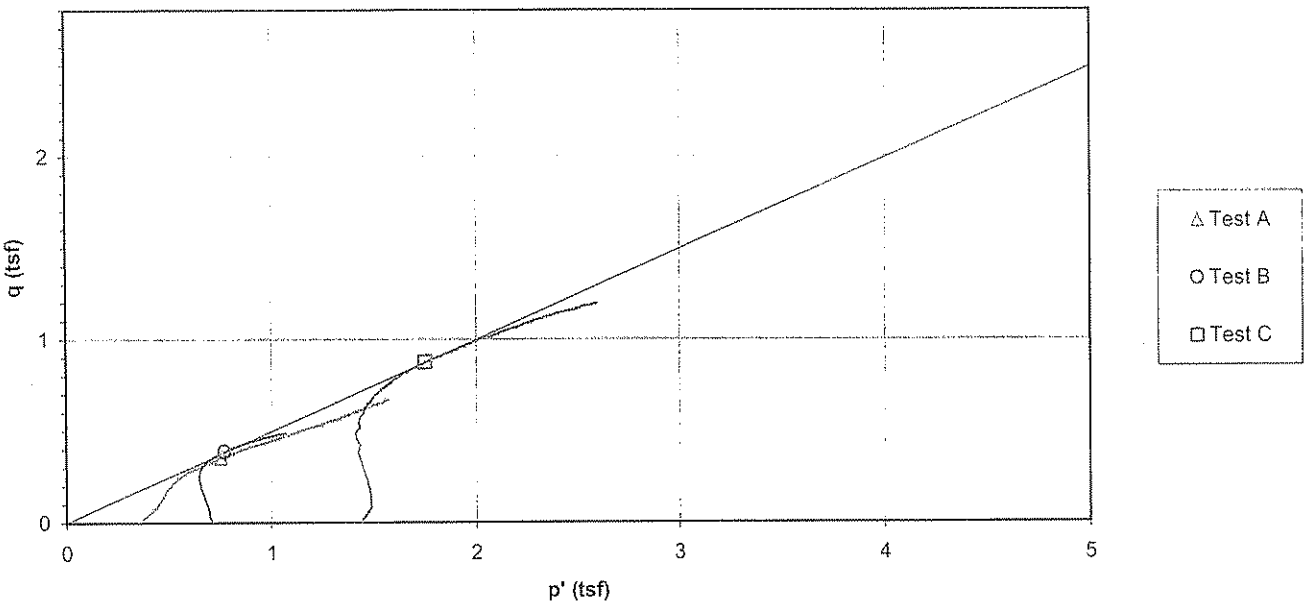
Laboratory: Stantec — Date: 1-28-10

TRIAXIAL COMPRESSION TEST REPORT

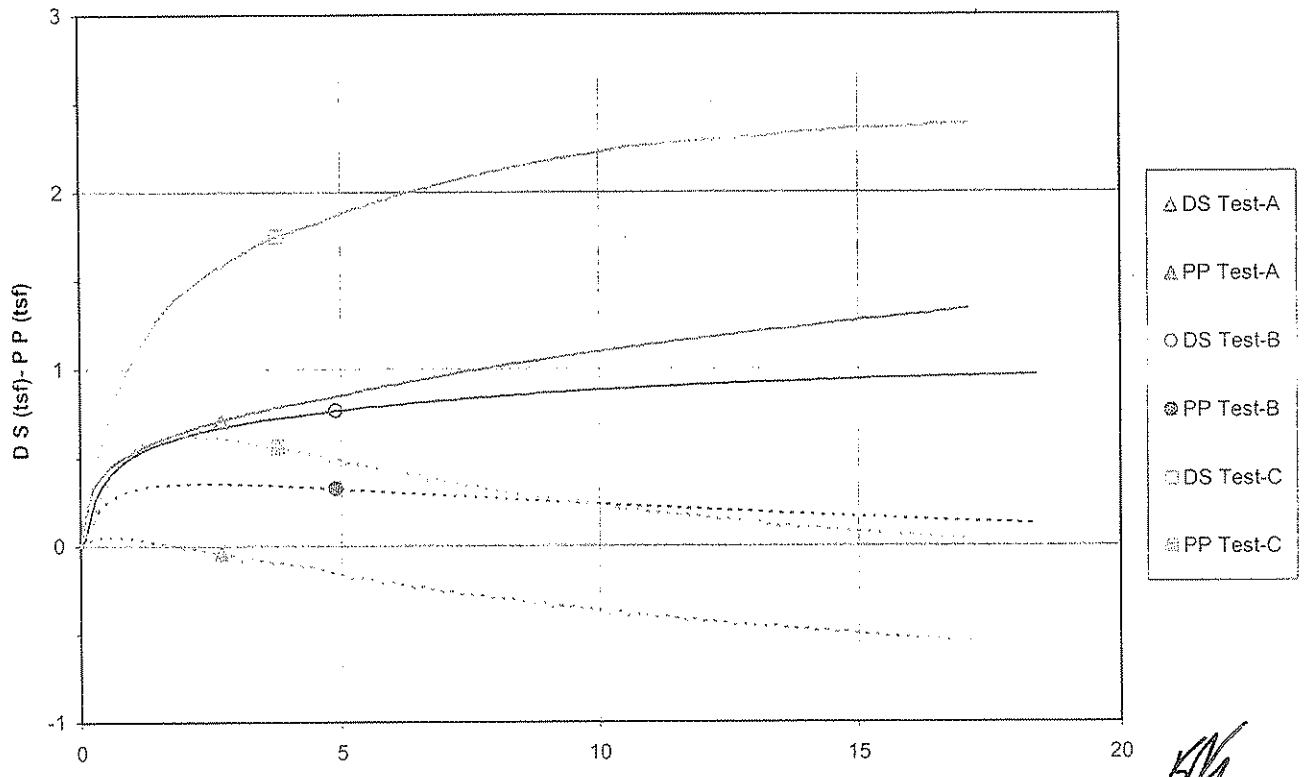
Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Project	PAF- Scrubber Sludge Complex	Project No.	175569040
Sample ID	STN-20A/ST-1, 5.5'-6.0' & STN-20A/ST-2, 10.5'-11.0' & STN-20A/ST-3, 15.5'-16.0'	Test Number	1
Failure Criterion:	Maximum Effective Principal Stress Ratio	ϕ' = 29.8 deg.	c' = 0.00 tsf

p' vs. q Plot



Deviator Stress and Induced Pore Pressure vs. Axial Strain



Consolidated Undrained Triaxial Test

ASTM D4767-04

Project Name	PAF- Scrubber Sludge Complex	Project Number	175569040
Sample Identification	STN-20A/ST-1, 5.5'-6.0'	Test Number	CU-1A
Visual Description	Gravelly Silt (ML), gray, moist, firm, mine spoil	Prepared By	RJ
Undisturbed	Source STN-20A/ST-1, 5.0'-7.0'	Date	1-7-2010

Specific Gravity 2.74 ASTM D854 Method A Liquid Limit N/A Plastic Limit N/A Plasticity Index N/A

Initial Specimen Data

Specimen Diameter (in.)		Specimen Height (in.)		Volumes (in^3)		Specimen	
Top	2.892	1	6.111	Sample	39.9317 (V_o)	Wet Weight (g)	1410.85
Middle	2.888	2	6.063	Solids	27.4594 (VS_o)	Dry Weight (g)	1233.02
Bottom	2.891	3	6.059	Water	10.8513 (Vw_o)	Wet Unit Weight (pcf)	134.6
Avg.	2.8903 (D_o)	4	6.111	Voids	12.4723 (Vv_o)	Dry Unit Weight (pcf)	117.6
Area (in^2)	6.5612 (A_o)	Avg. (H_o)	6.0860	Degree of Saturation (%)	87.0 (S_o)		
Moisture Content (%)	14.4 Final Trimmings			Void Ratio	0.454		

Saturation

Set Up & Saturated: Wet xx Dry ____ Set up By KDG

Back Pressure Saturated to: 85 (psi) Final Pore Pressure Parameter B 0.96 Date 1-18-10

Panel Board Number B

Height Readings (in.)		Back Pressure Burette		Chamber Burette			
Initial	0.1392	Initial	16.99 (in.)	Initial	13.08 (in.)	Specimen Height (in.)	6.0907 (H_s)
Final	0.1345	Final	4.86 (in.)	Final	15.51 (in.)	Area (in^2) Method A	6.5714 (A_s)
Change	0.0047 (ΔH_o)	Change	-12.13 (in.)	Change	2.43 (in.)	Specimen Volume (in^3)	40.02 (Vs)

Consolidation

Height Readings (in.)		Back Pressure Burette Readings		Chamber Burette Readings		Pressures (psi)	
Initial	0.1345	Initial	1.41 (in.)	Initial	17.58 (in.)	Chamber	90
Final	0.1352	Final	3.69 (in.)	Final	14.64 (in.)	Back	85
Change	-0.0007 (ΔH_c)	Change	-2.28 (in.)	Change	-2.94 (in.)	Lateral	5 (σ_3)
Height (in.)	6.0900 (H_c)			Volume (in^3)	40.3640 (V_c)		
Area (in^3) Method B	6.6279 (A_c)			Volume - Water (in^3)	12.9046 (VWc)	t_{50} (min.)	17
Diameter (in.)	2.9050 (D_c)			Water Content (%)	17.2		
Dry Density (pcf)	116.4			Degree of Saturation (%)	100.0 (S_c)	Void Ratio	0.470

After Test

Final Measurements		Final Moisture Content	
Maximum Diameter	3.642 (in.)	Wet Weight (g)	1444.50
Wet weight (g)	1444.5 (WWf)	Dry Weight (g)	1233.02
Corrected Diameter	3.618 (in.)	Tare Weight (g)	0.00

Stresses (membrane corrected) at Failure (psi)

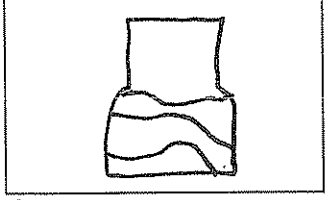
Corrected Deviator	0.71 σ_d (tsf)
Major Principal	1.11 $\sigma_1'_f$ (tsf)
Minor Principal	0.40 $\sigma_3'_f$ (tsf)
Rate of Strain (% / min.)	0.016
Axial Strain at Failure (%)	2.71

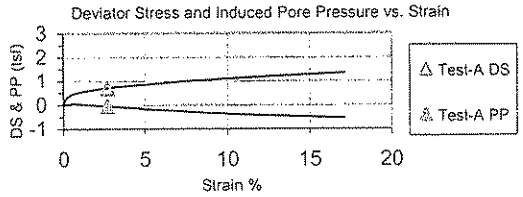
Youngs Modulus for Membrane (psi) 200

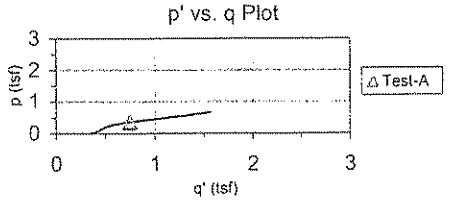
Membrane Thickness (in.) 0.012

Failure Criterion: Maximum Effective Principal Stress Ratio

Failure Sketch







Comments: ____

Consolidated Undrained Triaxial Test

ASTM D4767-04

Project Name	PAF- Scrubber Sludge Complex	Project Number	175569040
Sample Identification	STN-20A/ST-2, 10.5'-11.0'	Test Number	CU-1B
Visual Description	Gravelly Silt (ML), gray, moist, firm, mine spoil	Prepared By	RJ
Undisturbed	Source STN-20A/ST-2, 10.0'-12.0'	Date	1-7-2010

Specific Gravity 2.74 ASTM D854 Method A Liquid Limit N/A Plastic Limit N/A Plasticity Index N/A

Initial Specimen Data

Specimen Diameter (in.)		Specimen Height (in.)		Volumes (in3)		Specimen	
Top	2.890	1	5.922	Sample	38.7881 (V_o)	Wet Weight (g)	1321.21
Middle	2.891	2	5.939	Solids	25.9015 (VS_o)	Dry Weight (g)	1163.06
Bottom	2.882	3	5.909	Water	9.6502 (Vw_o)	Wet Unit Weight (pcf)	129.8
Avg.	2.8877 (D_o)	4	5.922	Voids	12.8866 (Vv_o)	Dry Unit Weight (pcf)	114.2
Area (in^2)	6.5491 (A_o)	Avg. (H_o)	5.9226	Degree of Saturation (%)	74.9 (S_o)		
Moisture Content (%)	13.6 Final Trimmings			Void Ratio	0.498		

Saturation

Set Up & Saturated: Wet xx Dry Set up By KDG

Back Pressure Saturated to: 80 (psi) Final Pore Pressure Parameter B 0.95 Date 1-18-10

Panel Board Number C

Height Readings (in.)		Back Pressure Burette		Chamber Burette			
Initial	0.1632	Initial	16.84 (in.)	Initial	11.94 (in.)	Specimen Height (in.)	5.9230 (H_s)
Final	0.1628	Final	0 (in.)	Final	16.21 (in.)	Area (in^2) Method A	6.5500 (A_s)
Change	0.0004 (ΔH_o)	Change	-16.84 (in.)	Change	4.27 (in.)	Specimen Volume (in^3)	38.80 (V_s)

Consolidation

Height Readings (in.)		Back Pressure Burette Readings		Chamber Burette Readings		Pressures (psi)	
Initial	0.1628	Initial	1.87 (in.)	Initial	17.69 (in.)	Chamber	90
Final	0.1876	Final	8.83 (in.)	Final	9.81 (in.)	Back	80
Change	-0.0248 (ΔH_c)	Change	-6.96 (in.)	Change	-7.88 (in.)	Lateral	10 (σ_3)
Height (in.)	5.8982 (H_c)			Volume (in^3)	38.1993 (V_c)		
Area (in^3) Method B	6.4764 (A_c)			Volume - Water (in^3)	12.2978 (VWc)	D_{50} (min.)	33
Diameter (in.)	2.8716 (D_c)			Water Content (%)	17.3		
Dry Density (pcf)	116.0			Degree of Saturation (%)	100.0 (S_c)	Void Ratio	0.475

After Test

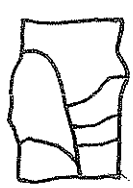
Final Measurements		Final Moisture Content		Stresses (membrane corrected) at Failure (psi)	
Maximum Diameter	3.39 (in.)	Wet Weight (g)	1364.60	Corrected Deviator	0.77 σ_d (tsf)
Wet weight (g)	1364.6 (WWf)	Dry Weight (g)	1163.06	Major Principal	1.16 $\sigma_1'_f$ (tsf)
Corrected Diameter	3.366 (in.)	Tare Weight (g)	0.00	Minor Principal	0.38 $\sigma_3'_f$ (tsf)
				Rate of Strain (% / min.)	0.017
				Axial Strain at Failure (%)	4.90

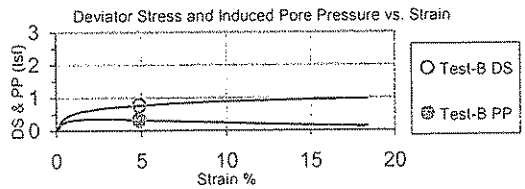
Youngs Modulus for Membrane (psi) 200

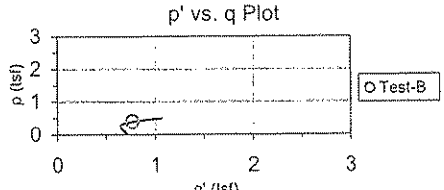
Membrane Thickness (in.) 0.012

Failure Criterion: Maximum Effective Principal Stress Ratio

Failure Sketch







Comments:

Consolidated Undrained Triaxial Test

ASTM D4767-04

Project Name	PAF- Scrubber Sludge Complex	Project Number	175569040
Sample Identification	STN-20A/ST-3, 15.5'-16.0'	Test Number	CU-1C
Visual Description	Gravelly Silt (ML), gray, moist, firm, mine spoil	Prepared By	RJ
Undisturbed	Source STN-20A/ST-3, 15.0'-17.0'	Date	1-8-2010

Specific Gravity 2.74 ASTM D854 Method A Liquid Limit N/A Plastic Limit N/A Plasticity Index N/A

Initial Specimen Data

Specimen Diameter (in.)		Specimen Height (in.)		Volumes (in^3)		Specimen	
Top	2.880	1	6.245	Sample	40.7948 (V_o)	Wet Weight (g)	1429.92
Middle	2.880	2	6.276	Solids	28.4881 (VS_o)	Dry Weight (g)	1279.21
Bottom	2.885	3	6.255	Water	9.1962 (Vw_o)	Wet Unit Weight (pcf)	133.5
Avg.	2.8817 (D_o)	4	6.245	Voids	12.3067 (Vv_o)	Dry Unit Weight (pcf)	119.5
Area (in^2)	6.5219 (A_o)	Avg. (H_o)	6.2550	Degree of Saturation (%)	74.7 (S_o)		
Moisture Content (%)	11.8 Final Trimmings			Void Ratio	0.432		

Saturation

Set Up & Saturated: Wet xx Dry

Back Pressure Saturated to: 70 (psi) Final Pore Pressure Parameter B 0.96

Set up By KDG

Date 1-18-10

Panel Board Number D

Height Readings (in.)		Back Pressure Burette		Chamber Burette			
Initial	0.1159	Initial	17.74 (in.)	Initial	11.74 (in.)	Specimen Height (in.)	6.1734 (H_s)
Final	0.1975	Final	0 (in.)	Final	16.51 (in.)	Area (in^2) Method A	6.3495 (A_s)
Change	-0.0816 (ΔH_o)	Change	-17.74 (in.)	Change	4.77 (in.)	Specimen Volume (in^3)	39.20 (V_s)

Consolidation

Height Readings (in.)		Back Pressure Burette Readings		Chamber Burette Readings		Pressures (psi)	
Initial	0.1975	Initial	1.49 (in.)	Initial	17.65 (in.)	Chamber	90
Final	0.1326	Final	11.68 (in.)	Final	6.83 (in.)	Back	70
Change	0.0649 (ΔH_c)	Change	-10.19 (in.)	Change	-10.82 (in.)	Lateral	20 (σ_3)
Height (in.)	6.2383 (H_c)			Volume (in^3)	39.4588 (V_c)		
Area (in^3) Method B	6.3253 (A_c)			Volume - Water (in^3)	10.9707 (VWc)	D_{50} (min.)	21
Diameter (in.)	2.8379 (D_c)			Water Content (%)	14.1		
Dry Density (pcf)	123.5			Degree of Saturation (%)	100.0 (S_c)	Void Ratio	0.385

After Test

Final Measurements		Final Moisture Content	
Maximum Diameter	3.222 (in.)	Wet Weight (g)	1459.00
Wet weight (g)	1459 (WWf)	Dry Weight (g)	1279.21
Corrected Diameter	3.198 (in.)	Tare Weight (g)	0.00

Stresses (membrane corrected) at Failure (psi)

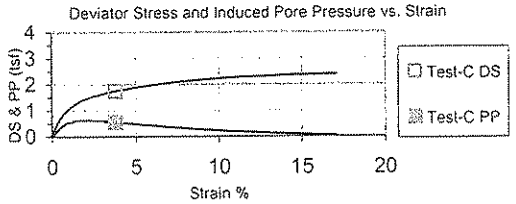
Corrected Deviator	1.75 σ_d (tsf)
Major Principal	2.63 $\sigma_1'_f$ (tsf)
Minor Principal	0.88 $\sigma_3'_f$ (tsf)
Rate of Strain (% / min.)	0.015
Axial Strain at Failure (%)	3.80

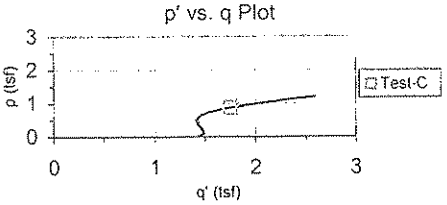
Youngs Modulus for Membrane (psi) 200

Membrane Thickness (in.) 0.012

Failure Criterion: Maximum Effective Principal Stress Ratio

Failure Sketch





Comments:

Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Consolidation Values			Final Values		Tested By	KDG	Project Number	175569040
Height	6.090 (in.)	15.469 (cm)	Height	5.047 (in.)	Date	1-21-10	Test Number	CU-1A
Diameter	2.905 (in)	7.379 (cm)	Dia. avg.	3.249 (in)	Press No	2	Data File ID	1A
Area	6.628 (in^2)	42.763 (cm^2)	Area avg.	8.291 (in^2)	Panel No.	D	Lateral Pressure (psi)	5.0
							Chamber Pressure - σ_3 (psi)	90

Clock Time (min.)	Load (lbf)	Deflection Dial Reading (in.)	Pore Pressure Reading (psi)	Corrected Hieght (in.)	Strain (%)	Corrected Area (cm^2)	Corrected Load (lbf)	Deviator Stress (tsf)	Corrected Deviator Stress* (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p' $(\sigma_1'+\sigma_3')/2$ (tsf)	q $(\sigma_1-\sigma_3')/2$ (tsf)	Effective Principal Stress Ratio σ_1'/σ_3'
0:00:00	12.1	-0.003	85.0	6.090	0.00	42.7633	0.0	0.000	0.000	0.360	0.360	0.358	0.359	0.001	1.005
0:05:32	26.2	0.003	85.0	6.084	0.10	42.8064	14.1	0.153	0.153	0.513	0.516	0.362	0.439	0.077	1.427
0:11:01	38.9	0.010	85.4	6.078	0.20	42.8500	26.8	0.291	0.291	0.651	0.624	0.332	0.478	0.146	1.881
0:16:33	44.1	0.016	85.6	6.072	0.30	42.8925	32.0	0.347	0.346	0.706	0.661	0.313	0.487	0.174	2.111
0:21:59	48.0	0.022	85.7	6.066	0.40	42.9358	35.9	0.388	0.387	0.747	0.702	0.313	0.508	0.195	2.243
0:27:36	50.9	0.028	85.8	6.059	0.50	42.9791	38.8	0.420	0.419	0.779	0.725	0.305	0.515	0.210	2.381
0:33:17	54.1	0.034	85.7	6.053	0.60	43.0219	42.0	0.454	0.452	0.812	0.762	0.308	0.535	0.227	2.472
0:38:58	56.2	0.040	85.8	6.047	0.71	43.0670	44.1	0.476	0.475	0.835	0.779	0.303	0.541	0.238	2.572
0:44:39	58.1	0.046	85.7	6.041	0.80	43.1096	46.0	0.496	0.495	0.855	0.808	0.311	0.559	0.248	2.594
0:50:30	59.6	0.052	85.7	6.035	0.90	43.1526	47.4	0.511	0.509	0.869	0.819	0.308	0.563	0.255	2.661
0:56:04	60.8	0.058	85.6	6.029	1.00	43.1961	48.7	0.524	0.522	0.882	0.841	0.318	0.580	0.262	2.648
1:01:57	62.3	0.064	85.6	6.023	1.10	43.2403	50.2	0.540	0.538	0.898	0.854	0.315	0.584	0.270	2.713
1:07:55	64.2	0.070	85.5	6.017	1.20	43.2836	52.1	0.560	0.557	0.917	0.885	0.326	0.606	0.279	2.711
1:13:58	65.8	0.077	85.5	6.011	1.30	43.3286	53.7	0.577	0.573	0.933	0.901	0.326	0.613	0.288	2.766
1:19:35	66.8	0.083	85.3	6.005	1.40	43.3719	54.7	0.587	0.583	0.943	0.925	0.340	0.633	0.293	2.720
1:25:50	68.2	0.089	85.2	5.998	1.50	43.4159	56.1	0.600	0.597	0.957	0.947	0.349	0.648	0.299	2.717
1:31:53	69.3	0.095	85.2	5.992	1.60	43.4600	57.2	0.612	0.608	0.968	0.956	0.346	0.651	0.305	2.760
1:37:56	70.5	0.101	85.0	5.986	1.70	43.5046	58.3	0.624	0.620	0.980	0.980	0.359	0.670	0.311	2.730
1:43:44	71.5	0.107	85.0	5.980	1.80	43.5491	59.4	0.635	0.630	0.990	0.991	0.359	0.675	0.316	2.760
1:49:55	72.4	0.113	85.0	5.974	1.91	43.5941	60.3	0.643	0.638	0.998	1.002	0.362	0.682	0.320	2.769
1:55:45	73.6	0.119	84.7	5.968	2.00	43.6377	61.5	0.655	0.650	1.010	1.035	0.383	0.709	0.326	2.702
2:01:49	74.4	0.125	84.8	5.962	2.10	43.6826	62.3	0.663	0.658	1.018	1.034	0.374	0.704	0.330	2.765
2:07:54	75.5	0.132	84.8	5.956	2.21	43.7278	63.4	0.674	0.669	1.029	1.048	0.377	0.713	0.335	2.778
2:14:00	76.8	0.138	84.6	5.950	2.30	43.7722	64.7	0.687	0.681	1.041	1.073	0.390	0.732	0.342	2.751
2:19:53	77.2	0.144	84.6	5.943	2.41	43.8175	65.1	0.691	0.685	1.045	1.073	0.387	0.730	0.343	2.777
2:25:52	78.1	0.150	84.5	5.937	2.51	43.8626	66.0	0.700	0.694	1.054	1.091	0.395	0.743	0.348	2.763
2:31:50	79.2	0.156	84.5	5.931	2.61	43.9072	67.1	0.711	0.704	1.064	1.105	0.399	0.752	0.353	2.772
2:37:51	79.7	0.162	84.5	5.925	2.71	43.9523	67.6	0.715	0.709	1.069	1.110	0.399	0.754	0.355	2.780
2:43:59	80.7	0.168	84.1	5.919	2.81	43.9976	68.6	0.725	0.718	1.078	1.145	0.425	0.785	0.360	2.694
2:50:00	81.5	0.174	84.3	5.913	2.90	44.0427	69.4	0.733	0.726	1.086	1.139	0.411	0.775	0.364	2.769
2:56:10	82.2	0.180	84.3	5.907	3.00	44.0882	70.1	0.740	0.733	1.093	1.147	0.413	0.780	0.367	2.780
3:02:18	83.1	0.186	83.8	5.901	3.11	44.1349	71.0	0.748	0.740	1.100	1.187	0.445	0.816	0.371	2.669
3:08:24	84.1	0.192	84.1	5.895	3.21	44.1795	72.0	0.758	0.750	1.110	1.177	0.425	0.801	0.376	2.769
3:14:35	84.8	0.199	84.1	5.889	3.31	44.2260	72.7	0.764	0.757	1.117	1.185	0.427	0.806	0.379	2.776
3:20:50	85.1	0.205	83.7	5.883	3.41	44.2716	73.0	0.767	0.759	1.119	1.213	0.452	0.833	0.380	2.681
3:27:06	85.8	0.211	83.9	5.876	3.51	44.3170	73.7	0.773	0.765	1.125	1.206	0.440	0.823	0.383	2.745
3:33:24	86.6	0.217	83.8	5.870	3.61	44.3635	74.5	0.781	0.773	1.133	1.217	0.443	0.830	0.387	2.748
3:39:35	87.6	0.223	83.6	5.864	3.71	44.4098	75.5	0.790	0.781	1.141	1.245	0.462	0.853	0.392	2.695
3:45:50	88.1	0.229	83.7	5.858	3.81	44.4562	76.0	0.795	0.786	1.146	1.241	0.453	0.847	0.394	2.736
3:52:05	88.8	0.235	83.7	5.852	3.91	44.5019	76.7	0.801	0.792	1.152	1.249	0.456	0.853	0.397	2.741
3:58:21	89.5	0.241	83.5	5.846	4.01	44.5486	77.3	0.807	0.798	1.158	1.270	0.471	0.871	0.400	2.698
4:04:39	89.9	0.247	83.6	5.840	4.11	44.5951	77.8	0.811	0.801	1.161	1.267	0.464	0.866	0.401	2.730
4:10:57	90.5	0.254	83.5	5.834	4.21	44.6421	78.4	0.816	0.806	1.166	1.276	0.468	0.872	0.404	2.726
4:17:12	91.2	0.260	83.3	5.828	4.31	44.6883	79.1	0.823	0.812	1.172	1.296	0.482	0.889	0.407	2.690
4:23:25	92.1	0.266	83.4	5.822	4.41	44.7350	80.0	0.832	0.821	1.181	1.299	0.477	0.888	0.411	2.726
4:29:41	92.7	0.272	83.3	5.815	4.51	44.7820	80.6	0.837	0.826	1.186	1.311	0.483	0.897	0.414	2.713
4:35:58	93.1	0.278	83.1	5.809	4.61	44.8290	81.0	0.840	0.829	1.189	1.324	0.494	0.909	0.415	2.683
4:42:21	93.7	0.284	83.1	5.803	4.71	44.8763	81.6	0.846	0.835	1.195	1.335	0.499	0.917	0.418	2.677
4:48:37	94.4	0.290	83.0	5.797	4.81	44.9234	82.2	0.851	0.840	1.200	1.348	0.507	0.927	0.421	2.662
4:54:59	95.2	0.296	82.7	5.791	4.91	44.9706	83.1	0.859	0.847	1.207	1.372	0.523	0.947	0.425	2.625
5:01:22	95.6	0.302	82.8	5.785	5.01	45.0182	83.5	0.862	0.850	1.210	1.372	0.520	0.946	0.426	2.638
5:07:50	96.3	0.308	82.7	5.779	5.11	45.0656	84.2	0.869	0.857	1.217	1.384	0.525	0.954	0.429	2.635
5:14:12	96.9	0.314	82.4	5.773	5.21	45.1132	84.8	0.874	0.862	1.222	1.411	0.547	0.979	0.432	2.579
5:20:35	97.9	0.321	82.5	5.767	5.31	45.1613	85.7	0.883	0.870	1.230	1.408	0.537	0.972	0.436	2.625
5:26:45	98.5	0.327	82.5	5.761	5.41	45.2086	86.4	0.889	0.876	1.236	1.418	0.540	0.979	0.439	2.625
5:33:06	99.6	0.333	82.2	5.754	5.51	45.2566	87.5	0.899	0.886	1.246	1.446	0.558	1.002	0.444	2.590
5:39:26	100.1	0.339	82.4	5.748	5.61	45.3048	88.0	0.903	0.890	1.250	1.442	0.550	0.996	0.446	2.621
5:45:54	100.5	0.345	82.3	5.742	5.71	45.3529	88.4	0.906	0.893	1.253	1.448	0.553	1.001	0.447	2.616
5:52:19	101.4	0.351	82.0	5.736	5.81	45.4011	89.3	0.915	0.901	1.261	1.476	0.573	1.024	0.451	2.576
5:58:37	102.1	0.357	82.2	5.730	5.91	45.4494	90.0	0.921	0.907	1.267	1.471	0.563	1.017	0.454	2.614

Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Consolidation Values			Final Values		Tested By	KDG	Project Number	175569040
Height	6.090 (in.)	15.469 (cm)	Height	5.047 (in.)	Date	1-21-10	Test Number	CU-1A
Diameter	2.905 (in)	7.379 (cm)	Dia. avg.	3.249 (in)	Press No.	2	Data File ID	1A
Area	6.628 (in^2)	42.763 (cm^2)	Area avg.	8.291 (in^2)	Panel No.	D	Lateral Pressure (psi)	5.0
							Chamber Pressure - σ_3 (psi)	90

Clock Time (min.)	Load (lbf)	Deflection Dial Reading (in.)	Pore Pressure Reading (psi)	Corrected Hieght (in.)	Strain (%)	Corrected Area (cm^2)	Corrected Load (lbf)	Deviator Stress (tsf)	Corrected Deviator Stress* (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p' $(\sigma_1'+\sigma_3')/2$ (tsf)	q $(\sigma_1-\sigma_3)/2$ (tsf)	Effective Principal Stress Ratio σ_1'/σ_3'
6:04:57	102.6	0.363	82.2	5.724	6.01	45.4979	90.5	0.925	0.911	1.271	1.477	0.565	1.021	0.456	2.615
6:11:20	102.9	0.369	81.9	5.718	6.11	45.5465	90.8	0.927	0.913	1.273	1.501	0.587	1.044	0.457	2.559
6:17:38	103.8	0.375	82.0	5.712	6.21	45.5949	91.7	0.936	0.921	1.281	1.499	0.577	1.038	0.461	2.600
6:23:58	104.6	0.382	81.9	5.706	6.31	45.6437	92.5	0.942	0.927	1.287	1.509	0.580	1.044	0.464	2.603
6:30:20	105.2	0.388	81.7	5.700	6.41	45.6925	93.1	0.947	0.932	1.292	1.535	0.601	1.068	0.467	2.554
6:36:33	105.5	0.394	81.8	5.693	6.51	45.7415	93.4	0.950	0.934	1.294	1.527	0.591	1.059	0.468	2.583
6:42:54	106.7	0.400	81.7	5.687	6.61	45.7908	94.6	0.960	0.945	1.305	1.541	0.595	1.068	0.473	2.592
6:49:09	106.8	0.406	81.5	5.681	6.71	45.8399	94.7	0.961	0.945	1.305	1.558	0.611	1.085	0.473	2.548
6:55:22	107.7	0.412	81.6	5.675	6.81	45.8891	95.6	0.969	0.953	1.313	1.560	0.605	1.083	0.477	2.577
7:01:42	108.2	0.418	81.5	5.669	6.91	45.9385	96.1	0.973	0.957	1.317	1.569	0.610	1.090	0.479	2.570
7:08:00	108.9	0.424	81.2	5.663	7.01	45.9880	96.8	0.979	0.962	1.322	1.594	0.630	1.112	0.482	2.529
7:14:18	109.5	0.430	81.4	5.657	7.11	46.0375	97.4	0.984	0.967	1.327	1.586	0.617	1.102	0.484	2.569
7:20:34	110.2	0.436	81.4	5.651	7.21	46.0871	98.1	0.990	0.972	1.332	1.595	0.621	1.108	0.487	2.569
7:26:49	111.1	0.443	81.1	5.645	7.31	46.1372	99.0	0.998	0.980	1.340	1.620	0.638	1.129	0.491	2.540
7:32:57	111.7	0.449	81.2	5.639	7.41	46.1868	99.6	1.002	0.985	1.345	1.617	0.631	1.124	0.493	2.564
7:39:13	112.5	0.455	81.2	5.632	7.51	46.2372	100.4	1.009	0.991	1.351	1.627	0.633	1.130	0.497	2.568
7:45:30	112.8	0.461	81.0	5.626	7.61	46.2872	100.7	1.012	0.993	1.353	1.644	0.649	1.146	0.498	2.535
7:51:36	113.3	0.467	81.1	5.620	7.71	46.3375	101.2	1.015	0.997	1.357	1.640	0.642	1.141	0.499	2.556
7:57:49	114.0	0.473	81.0	5.614	7.81	46.3877	101.8	1.021	1.002	1.362	1.650	0.646	1.148	0.502	2.555
8:04:00	114.7	0.479	80.9	5.608	7.91	46.4380	102.6	1.028	1.009	1.369	1.668	0.657	1.163	0.505	2.538
8:10:17	115.5	0.485	80.9	5.602	8.01	46.4888	103.4	1.034	1.015	1.375	1.670	0.653	1.162	0.508	2.557
8:16:26	115.8	0.491	80.9	5.596	8.11	46.5394	103.7	1.036	1.017	1.377	1.676	0.657	1.166	0.509	2.551
8:22:36	116.7	0.497	80.8	5.590	8.21	46.5903	104.5	1.043	1.024	1.384	1.691	0.665	1.178	0.513	2.542
8:28:42	117.1	0.504	80.8	5.584	8.31	46.6410	105.0	1.047	1.027	1.387	1.692	0.663	1.178	0.514	2.552
8:34:52	117.6	0.510	80.7	5.578	8.41	46.6919	105.5	1.050	1.030	1.390	1.704	0.672	1.188	0.516	2.536
8:41:13	118.0	0.516	80.6	5.571	8.52	46.7436	105.9	1.053	1.033	1.393	1.711	0.677	1.194	0.517	2.529
8:47:21	118.6	0.522	80.6	5.565	8.61	46.7944	106.5	1.058	1.038	1.398	1.714	0.675	1.195	0.520	2.540
8:53:36	119.3	0.528	80.5	5.559	8.71	46.8457	107.2	1.064	1.043	1.403	1.731	0.686	1.209	0.522	2.522
8:59:51	119.7	0.534	80.5	5.553	8.82	46.8975	107.6	1.067	1.046	1.406	1.735	0.687	1.211	0.524	2.525
9:05:57	120.5	0.540	80.5	5.547	8.91	46.9486	108.4	1.074	1.052	1.412	1.740	0.686	1.213	0.527	2.536
9:12:08	121.0	0.546	80.0	5.541	9.02	47.0008	108.9	1.078	1.056	1.416	1.782	0.723	1.252	0.529	2.463
9:18:28	121.5	0.552	80.3	5.535	9.12	47.0523	109.4	1.081	1.059	1.419	1.759	0.698	1.228	0.531	2.521
9:24:48	122.3	0.558	80.3	5.529	9.22	47.1043	110.1	1.087	1.065	1.425	1.764	0.697	1.230	0.534	2.532
9:31:06	122.6	0.565	80.2	5.523	9.32	47.1560	110.5	1.089	1.067	1.427	1.778	0.709	1.243	0.534	2.508
9:37:24	123.6	0.571	80.2	5.517	9.42	47.2082	111.5	1.098	1.076	1.436	1.784	0.707	1.246	0.539	2.524
9:43:42	123.9	0.577	80.2	5.510	9.52	47.2607	111.8	1.100	1.077	1.437	1.785	0.706	1.246	0.539	2.528
9:50:00	124.5	0.583	80.1	5.504	9.62	47.3132	112.4	1.105	1.082	1.442	1.797	0.714	1.256	0.542	2.517
9:56:10	124.8	0.589	80.0	5.498	9.72	47.3655	112.7	1.106	1.083	1.443	1.801	0.716	1.259	0.542	2.514
10:02:18	125.9	0.595	80.1	5.492	9.82	47.4180	113.8	1.116	1.092	1.452	1.808	0.714	1.261	0.547	2.532
10:08:32	126.1	0.601	79.9	5.486	9.92	47.4709	114.0	1.116	1.093	1.453	1.824	0.730	1.277	0.547	2.500
10:14:37	126.6	0.607	79.9	5.480	10.02	47.5235	114.5	1.121	1.097	1.457	1.823	0.725	1.274	0.549	2.516
10:20:40	127.2	0.613	79.9	5.474	10.12	47.5765	115.1	1.125	1.101	1.461	1.828	0.725	1.277	0.551	2.520
10:27:01	127.7	0.619	79.5	5.468	10.22	47.6299	115.6	1.128	1.104	1.464	1.863	0.757	1.310	0.553	2.460
10:33:19	128.3	0.626	79.6	5.462	10.32	47.6829	116.2	1.133	1.109	1.469	1.845	0.734	1.289	0.555	2.512
10:39:39	128.6	0.632	79.8	5.456	10.42	47.7363	116.5	1.135	1.110	1.470	1.848	0.736	1.292	0.556	2.512
10:45:57	129.3	0.638	79.4	5.449	10.52	47.7896	117.2	1.140	1.115	1.475	1.883	0.766	1.325	0.558	2.458
10:52:12	130.1	0.644	79.6	5.443	10.62	47.8430	118.0	1.147	1.122	1.482	1.869	0.745	1.307	0.562	2.508
10:58:40	130.7	0.650	79.7	5.437	10.72	47.8971	118.5	1.151	1.125	1.485	1.872	0.745	1.309	0.564	2.513
11:05:05	130.8	0.656	79.2	5.431	10.82	47.9512	118.7	1.151	1.125	1.485	1.904	0.777	1.341	0.563	2.450
11:11:27	131.8	0.662	79.5	5.425	10.92	48.0055	119.6	1.159	1.133	1.493	1.888	0.753	1.321	0.567	2.506
11:17:38	132.3	0.668	79.6	5.419	11.02	48.0588	120.2	1.163	1.137	1.497	1.891	0.752	1.321	0.569	2.514
11:23:56	132.6	0.674	79.3	5.413	11.12	48.1127	120.5	1.164	1.138	1.498	1.912	0.772	1.342	0.570	2.476
11:30:09	133.2	0.680	79.4	5.407	11.22	48.1670	121.1	1.169	1.143	1.503	1.906	0.762	1.334	0.572	2.502
11:36:25	133.7	0.687	79.4	5.401	11.32	48.2214	121.6	1.173	1.146	1.506	1.908	0.761	1.334	0.574	2.509
11:42:35	134.4	0.693	79.2	5.395	11.42	48.2759	122.3	1.178	1.151	1.511	1.929	0.776	1.353	0.576	2.484
11:48:43	134.9	0.699	79.3	5.388	11.52	48.3307	122.8	1.181	1.154	1.514	1.925	0.769	1.347	0.578	2.502
11:54:46	135.2	0.705	79.3	5.382	11.62	48.3852	123.1	1.183	1.155	1.515	1.926	0.768	1.347	0.579	2.506
12:00:52	136.2	0.711	79.0	5.376	11.72	48.4404	124.1	1.191	1.163	1.523	1.960	0.795	1.378	0.582	2.464
12:06:56	136.1	0.717	79.2	5.370	11.82	48.4953	124.0	1.189	1.161	1.521	1.940	0.777	1.359	0.581	2.496
12:13:01	136.9	0.723	79.2	5.364	11.92	48.5505	124.8	1.195	1.167	1.527	1.947	0.779	1.363	0.584	2.500

Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Consolidation Values			Final Values		Tested By	KDG	Project Number	175569040
Height	6.090 (in.)	15.469 (cm)	Height	5.047 (in.)	Date	1-21-10	Test Number	CU-1A
Diameter	2.905 (in)	7.379 (cm)	Dia. avg.	3.249 (in)	Press No.	2	Data File ID	1A
Area	6.628 (in^2)	42.763 (cm^2)	Area avg.	8.291 (in^2)	Panel No.	D	Lateral Pressure (psi)	5.0
							Chamber Pressure - σ_3 (psi)	90

Clock Time (min.)	Load (lbf)	Deflection Dial Reading (in.)	Pore Pressure Reading (psi)	Corrected Hieght (in.)	Strain (%)	Corrected Area (cm^2)	Corrected Load (lbf)	Deviator Stress (tsf)	Corrected Deviator Stress* (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p' $(\sigma_1'+\sigma_3')/2$ (tsf)	q $(\sigma_1-\sigma_3)/2$ (tsf)	Effective Principal Stress Ratio σ_1'/σ_3'
12:19:09	137.6	0.729	79.0	5.358	12.02	48.6058	125.5	1.200	1.172	1.532	1.967	0.794	1.380	0.587	2.479
12:25:17	137.9	0.735	79.1	5.352	12.12	48.6611	125.8	1.202	1.173	1.533	1.960	0.785	1.372	0.587	2.497
12:31:33	138.4	0.741	79.0	5.346	12.22	48.7167	126.3	1.205	1.176	1.536	1.967	0.789	1.378	0.589	2.494
12:37:58	139.1	0.748	78.9	5.340	12.32	48.7732	127.0	1.211	1.181	1.541	1.984	0.801	1.392	0.592	2.478
12:44:21	139.6	0.754	79.0	5.334	12.42	48.8281	127.5	1.214	1.185	1.545	1.980	0.794	1.387	0.593	2.495
12:50:43	140.2	0.760	79.0	5.327	12.52	48.8840	128.1	1.218	1.188	1.548	1.986	0.795	1.390	0.595	2.496
12:57:09	140.7	0.766	78.7	5.321	12.62	48.9399	128.6	1.222	1.192	1.552	2.006	0.813	1.409	0.597	2.468
13:03:29	141.4	0.772	78.9	5.315	12.72	48.9961	129.3	1.227	1.197	1.557	2.001	0.802	1.401	0.599	2.494
13:09:54	141.9	0.778	78.9	5.309	12.82	49.0526	129.8	1.231	1.200	1.560	2.002	0.800	1.401	0.601	2.502
13:16:19	142.4	0.784	78.6	5.303	12.92	49.1091	130.3	1.234	1.203	1.563	2.028	0.824	1.426	0.602	2.462
13:22:42	143.0	0.790	78.8	5.297	13.02	49.1655	130.9	1.238	1.207	1.567	2.017	0.808	1.412	0.605	2.497
13:29:00	143.6	0.796	78.8	5.291	13.12	49.2220	131.5	1.242	1.211	1.571	2.021	0.808	1.415	0.606	2.501
13:35:25	144.0	0.802	78.6	5.285	13.22	49.2789	131.9	1.244	1.213	1.573	2.037	0.822	1.429	0.607	2.477
13:41:40	144.9	0.809	78.7	5.279	13.32	49.3363	132.8	1.252	1.220	1.580	2.037	0.815	1.426	0.611	2.499
13:47:51	144.9	0.815	78.7	5.273	13.42	49.3929	132.8	1.250	1.218	1.578	2.033	0.813	1.423	0.610	2.500
13:54:06	145.5	0.821	78.4	5.266	13.52	49.4503	133.4	1.254	1.222	1.582	2.056	0.832	1.444	0.612	2.470
14:00:31	145.7	0.827	78.6	5.260	13.62	49.5076	133.6	1.255	1.223	1.583	2.048	0.823	1.436	0.612	2.487
14:06:54	146.3	0.833	78.6	5.254	13.72	49.5652	134.2	1.259	1.226	1.586	2.051	0.823	1.437	0.614	2.493
14:13:22	146.5	0.839	78.4	5.248	13.82	49.6226	134.4	1.259	1.226	1.586	2.062	0.834	1.448	0.614	2.472
14:19:47	147.5	0.845	78.4	5.242	13.92	49.6804	135.4	1.267	1.234	1.594	2.069	0.833	1.451	0.618	2.483
14:26:17	147.9	0.851	78.4	5.236	14.02	49.7382	135.8	1.270	1.236	1.596	2.070	0.832	1.451	0.619	2.487
14:33:04	148.2	0.857	78.4	5.230	14.12	49.7962	136.1	1.271	1.238	1.598	2.077	0.838	1.458	0.620	2.479
14:39:53	149.1	0.863	78.2	5.224	14.22	49.8547	137.0	1.278	1.244	1.604	2.093	0.847	1.470	0.623	2.471
14:46:40	149.8	0.870	78.3	5.218	14.32	49.9132	137.7	1.283	1.249	1.609	2.093	0.842	1.467	0.625	2.486
14:53:18	150.5	0.876	78.3	5.212	14.42	49.9712	138.4	1.288	1.253	1.613	2.096	0.841	1.469	0.628	2.492
14:59:55	150.9	0.882	78.2	5.205	14.52	50.0295	138.8	1.290	1.255	1.615	2.110	0.853	1.481	0.629	2.474
15:06:27	151.8	0.888	78.2	5.199	14.62	50.0882	139.7	1.297	1.262	1.622	2.116	0.852	1.484	0.632	2.484
15:12:55	151.9	0.894	78.2	5.193	14.72	50.1474	139.8	1.296	1.261	1.621	2.112	0.848	1.480	0.632	2.489
15:19:35	152.7	0.900	78.2	5.187	14.83	50.2067	140.5	1.302	1.266	1.626	2.120	0.852	1.486	0.634	2.488
15:26:05	152.8	0.906	78.0	5.181	14.93	50.2657	140.7	1.302	1.266	1.626	2.129	0.860	1.495	0.634	2.474
15:32:35	153.8	0.912	78.1	5.175	15.03	50.3247	141.7	1.309	1.273	1.633	2.130	0.855	1.492	0.638	2.492
15:39:02	154.7	0.918	78.1	5.169	15.13	50.3839	142.6	1.316	1.280	1.640	2.139	0.857	1.498	0.641	2.496
15:45:23	154.5	0.924	77.9	5.163	15.22	50.4433	142.4	1.313	1.277	1.637	2.148	0.870	1.509	0.639	2.470
15:51:45	155.3	0.931	78.0	5.157	15.33	50.5032	143.2	1.318	1.282	1.642	2.147	0.863	1.505	0.642	2.488
15:58:05	155.7	0.937	78.0	5.151	15.43	50.5633	143.6	1.321	1.284	1.644	2.150	0.864	1.507	0.643	2.488
16:04:35	155.9	0.943	77.8	5.144	15.53	50.6230	143.8	1.321	1.284	1.644	2.164	0.878	1.521	0.643	2.464
16:11:01	156.7	0.949	77.9	5.138	15.63	50.6828	144.6	1.326	1.289	1.649	2.160	0.869	1.515	0.645	2.485
16:17:26	157.4	0.955	77.9	5.132	15.73	50.7431	145.3	1.332	1.294	1.654	2.165	0.869	1.517	0.648	2.490
16:23:58	157.9	0.961	77.6	5.126	15.83	50.8036	145.7	1.334	1.296	1.656	2.192	0.894	1.543	0.649	2.452
16:30:26	158.3	0.967	77.8	5.120	15.93	50.8643	146.2	1.337	1.299	1.659	2.179	0.878	1.529	0.650	2.481
16:36:39	159.0	0.973	77.8	5.114	16.03	50.9247	146.9	1.341	1.303	1.663	2.181	0.876	1.529	0.652	2.489
16:43:04	159.3	0.979	77.7	5.108	16.13	50.9860	147.1	1.342	1.304	1.664	2.191	0.886	1.538	0.653	2.474
16:49:19	159.9	0.985	77.7	5.102	16.23	51.0465	147.8	1.347	1.308	1.668	2.194	0.884	1.539	0.655	2.482
16:55:42	159.8	0.992	77.7	5.096	16.33	51.1078	147.7	1.344	1.305	1.665	2.189	0.883	1.536	0.653	2.480
17:01:57	160.9	0.998	77.6	5.090	16.43	51.1690	148.8	1.352	1.313	1.673	2.207	0.892	1.550	0.658	2.474
17:08:15	161.6	1.004	77.6	5.083	16.53	51.2306	149.5	1.357	1.318	1.678	2.211	0.892	1.552	0.660	2.479
17:14:38	162.5	1.010	77.6	5.077	16.63	51.2921	150.4	1.364	1.324	1.684	2.215	0.889	1.552	0.663	2.491
17:20:58	162.2	1.016	77.5	5.071	16.73	51.3538	150.1	1.359	1.320	1.680	2.218	0.897	1.557	0.661	2.474
17:27:14	163.2	1.022	77.5	5.065	16.83	51.4153	151.1	1.367	1.327	1.687	2.227	0.898	1.562	0.664	2.479
17:33:36	164.1	1.028	77.6	5.059	16.93	51.4778	152.0	1.373	1.332	1.692	2.228	0.894	1.561	0.667	2.492
17:39:54	164.5	1.034	77.5	5.053	17.03	51.5401	152.4	1.375	1.335	1.695	2.239	0.903	1.571	0.668	2.481
17:46:02	165.3	1.040	77.5	5.047	17.13	51.6017	153.2	1.380	1.340	1.700	2.243	0.902	1.573	0.671	2.487

Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Consolidation Values			Final Values		Tested By	KDG	Project Number	175569040
Height	5.898 (in.)	14.981 (cm)	Height	4.813 (in.)	Date	1-20-10	Test Number	CU-1B
Diameter	2.872 (in)	7.294 (cm)	Dia. avg.	3.306 (in)	Press No.	1	Data File ID	1B
Area	6.477 (in^2)	41.786 (cm^2)	Area avg.	8.583 (in^2)	Panel No.	C	Lateral Pressure (psi)	10.0
							Chamber Pressure - σ_3 (psi)	90

Clock Time (min.)	Load (lbf)	Deflection Dial Reading (in.)	Pore Pressure Reading (psi)	Corrected Hieght (in.)	Strain (%)	Corrected Area (cm^2)	Corrected Load (lbf)	Deviator Stress (tsf)	Corrected Deviator Stress* (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p' $(\sigma_1'+\sigma_3')/2$ (tsf)	q $(\sigma_1-\sigma_3)/2$ (tsf)	Effective Principal Stress Ratio σ_1'/σ_3'
0:00:00	13.8	-0.022	80.2	5.898	0.00	41.7858	0.0	0.000	0.000	0.720	0.720	0.706	0.713	0.007	1.019
0:05:36	17.1	-0.016	80.6	5.892	0.10	41.8285	3.3	0.036	0.036	0.756	0.725	0.675	0.700	0.025	1.074
0:11:49	28.1	-0.010	81.6	5.886	0.20	41.8704	14.3	0.159	0.158	0.878	0.776	0.604	0.690	0.086	1.284
0:17:54	37.8	-0.004	82.6	5.880	0.30	41.9118	24.0	0.266	0.265	0.985	0.814	0.535	0.674	0.140	1.522
0:23:49	43.2	0.002	83.1	5.875	0.40	41.9544	29.4	0.326	0.325	1.045	0.833	0.495	0.664	0.169	1.683
0:29:56	47.0	0.008	83.5	5.869	0.50	41.9967	33.2	0.368	0.367	1.087	0.847	0.466	0.656	0.190	1.817
0:35:37	50.3	0.014	83.8	5.863	0.60	42.0388	36.5	0.404	0.403	1.123	0.862	0.445	0.653	0.208	1.935
0:41:19	53.1	0.020	84.1	5.857	0.70	42.0805	39.3	0.434	0.433	1.153	0.873	0.427	0.650	0.223	2.045
0:47:40	55.6	0.025	84.3	5.851	0.80	42.1230	41.8	0.462	0.460	1.180	0.884	0.410	0.647	0.237	2.154
0:53:36	57.9	0.031	84.5	5.845	0.90	42.1654	44.1	0.486	0.484	1.204	0.896	0.399	0.648	0.249	2.247
0:59:55	59.7	0.037	84.6	5.839	1.00	42.2081	45.9	0.506	0.503	1.223	0.906	0.389	0.647	0.258	2.329
1:05:44	61.3	0.043	84.7	5.833	1.10	42.2507	47.5	0.523	0.521	1.241	0.916	0.382	0.649	0.267	2.399
1:11:49	62.9	0.049	84.8	5.827	1.20	42.2938	49.1	0.540	0.537	1.257	0.926	0.375	0.651	0.275	2.467
1:17:49	64.3	0.055	84.9	5.821	1.30	42.3368	50.5	0.555	0.552	1.272	0.934	0.369	0.652	0.283	2.531
1:23:33	65.5	0.061	84.9	5.816	1.40	42.3793	51.7	0.567	0.564	1.284	0.944	0.366	0.655	0.289	2.576
1:29:27	66.6	0.067	85.0	5.810	1.50	42.4224	52.8	0.579	0.575	1.295	0.951	0.362	0.657	0.294	2.626
1:35:22	67.6	0.073	85.0	5.804	1.60	42.4661	53.8	0.589	0.585	1.305	0.960	0.361	0.661	0.300	2.658
1:41:17	68.5	0.079	85.0	5.798	1.70	42.5087	54.7	0.598	0.594	1.314	0.965	0.358	0.662	0.304	2.698
1:47:18	69.3	0.085	85.0	5.792	1.80	42.5522	55.5	0.607	0.603	1.323	0.973	0.357	0.665	0.308	2.728
1:53:21	70.5	0.090	85.1	5.786	1.90	42.5959	56.7	0.618	0.614	1.334	0.982	0.355	0.668	0.314	2.770
1:59:21	71.3	0.096	85.1	5.780	2.00	42.6390	57.5	0.627	0.622	1.342	0.988	0.353	0.670	0.318	2.803
2:05:17	72.0	0.102	85.1	5.774	2.10	42.6828	58.2	0.634	0.629	1.349	0.995	0.353	0.674	0.321	2.819
2:11:01	73.0	0.108	85.1	5.768	2.20	42.7266	59.2	0.645	0.639	1.359	1.004	0.351	0.678	0.327	2.860
2:17:01	73.8	0.114	85.1	5.762	2.30	42.7701	60.0	0.652	0.647	1.367	1.013	0.353	0.683	0.330	2.871
2:22:45	74.4	0.120	85.1	5.757	2.40	42.8142	60.6	0.658	0.652	1.372	1.017	0.352	0.685	0.333	2.892
2:28:32	75.2	0.126	85.1	5.751	2.50	42.8577	61.4	0.666	0.660	1.380	1.024	0.351	0.687	0.337	2.921
2:34:29	75.8	0.132	85.1	5.745	2.60	42.9016	62.0	0.672	0.666	1.386	1.031	0.352	0.691	0.340	2.933
2:40:11	76.2	0.138	85.1	5.739	2.70	42.9457	62.4	0.676	0.669	1.389	1.035	0.352	0.693	0.342	2.942
2:46:08	76.9	0.143	85.1	5.733	2.80	42.9900	63.1	0.682	0.676	1.396	1.043	0.353	0.698	0.345	2.952
2:52:04	77.5	0.149	85.1	5.727	2.90	43.0343	63.7	0.688	0.682	1.402	1.049	0.354	0.701	0.348	2.965
2:58:07	78.0	0.155	85.1	5.721	3.00	43.0792	64.2	0.693	0.686	1.406	1.055	0.356	0.706	0.350	2.966
3:03:59	78.6	0.161	85.1	5.715	3.10	43.1233	64.8	0.699	0.692	1.412	1.061	0.356	0.708	0.353	2.984
3:09:48	79.3	0.167	85.1	5.709	3.20	43.1679	65.5	0.705	0.698	1.418	1.067	0.355	0.711	0.356	3.001
3:15:50	79.7	0.173	85.0	5.704	3.30	43.2122	65.9	0.710	0.702	1.422	1.073	0.358	0.715	0.358	2.999
3:21:49	80.2	0.179	85.0	5.698	3.40	43.2572	66.4	0.713	0.705	1.425	1.077	0.358	0.718	0.359	3.006
3:27:44	80.9	0.185	85.0	5.692	3.50	43.3018	67.1	0.721	0.712	1.432	1.087	0.361	0.724	0.363	3.014
3:33:42	81.2	0.191	85.0	5.686	3.60	43.3468	67.4	0.724	0.715	1.435	1.090	0.361	0.725	0.364	3.018
3:39:54	81.8	0.197	85.0	5.680	3.70	43.3919	68.0	0.729	0.720	1.440	1.095	0.362	0.728	0.367	3.028
3:45:51	82.2	0.202	84.9	5.674	3.80	43.4371	68.4	0.732	0.723	1.443	1.101	0.364	0.733	0.368	3.023
3:51:50	82.7	0.208	84.9	5.668	3.90	43.4823	68.9	0.737	0.728	1.448	1.107	0.366	0.736	0.371	3.028
3:57:48	83.1	0.214	84.9	5.662	4.00	43.5276	69.3	0.741	0.731	1.451	1.112	0.368	0.740	0.372	3.025
4:03:43	83.5	0.220	84.9	5.656	4.10	43.5729	69.7	0.744	0.734	1.454	1.116	0.369	0.742	0.374	3.028
4:09:39	84.0	0.226	84.8	5.650	4.20	43.6186	70.2	0.749	0.739	1.459	1.124	0.371	0.748	0.376	3.025
4:15:47	84.5	0.232	84.8	5.644	4.30	43.6642	70.7	0.753	0.742	1.462	1.129	0.372	0.750	0.378	3.030
4:21:47	84.9	0.238	84.8	5.639	4.40	43.7099	71.1	0.757	0.746	1.466	1.133	0.374	0.754	0.380	3.032
4:27:43	85.3	0.244	84.8	5.633	4.50	43.7556	71.5	0.760	0.749	1.469	1.139	0.376	0.758	0.381	3.027
4:33:50	85.8	0.250	84.8	5.627	4.60	43.8014	72.0	0.764	0.753	1.473	1.144	0.377	0.760	0.383	3.034
4:39:45	86.2	0.256	84.7	5.621	4.70	43.8472	72.4	0.768	0.757	1.477	1.152	0.382	0.767	0.385	3.018
4:45:49	86.6	0.262	84.7	5.615	4.80	43.8936	72.8	0.771	0.760	1.480	1.154	0.380	0.767	0.387	3.033
4:51:45	87.4	0.267	84.7	5.609	4.90	43.9394	73.6	0.778	0.767	1.487	1.161	0.381	0.771	0.390	3.049
4:57:44	87.5	0.273	84.7	5.603	5.00	43.9858	73.7	0.779	0.767	1.487	1.165	0.384	0.775	0.390	3.029
5:03:44	87.8	0.279	84.6	5.597	5.10	44.0324	74.0	0.782	0.769	1.489	1.169	0.386	0.777	0.391	3.028
5:09:45	88.5	0.285	84.6	5.591	5.20	44.0787	74.7	0.788	0.775	1.495	1.178	0.390	0.784	0.394	3.024
5:15:42	88.9	0.291	84.6	5.586	5.30	44.1251	75.1	0.791	0.779	1.499	1.182	0.389	0.786	0.396	3.035
5:21:48	89.3	0.297	84.6	5.580	5.40	44.1718	75.5	0.795	0.782	1.502	1.186	0.391	0.788	0.398	3.035
5:27:50	89.7	0.303	84.5	5.574	5.50	44.2187	75.9	0.798	0.785	1.505	1.193	0.394	0.793	0.399	3.026
5:33:48	90.1	0.309	84.5	5.568	5.60	44.2654	76.3	0.802	0.789	1.509	1.197	0.394	0.795	0.401	3.034
5:39:52	90.2	0.315	84.5	5.562	5.70	44.3126	76.4	0.802	0.788	1.508	1.200	0.399	0.800	0.401	3.009
5:45:51	90.5	0.320	84.5	5.556	5.80	44.3595	76.7	0.804	0.790	1.510	1.203	0.399	0.801	0.402	3.014
5:51:57	90.9	0.326	84.4	5.550	5.90	44.4066	77.1	0.808	0.794	1.514	1.207	0.400	0.803	0.404	3.019

Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Consolidation Values			Final Values				
Height	5.898 (in.)	14.981 (cm)	Height	4.813 (in.)	Tested By	KDG	Project Number 175569040
Diameter	2.872 (in)	7.294 (cm)	Dia. avg.	3.306 (in)	Date	1-20-10	Test Number CU-1B
Area	6.477 (in^2)	41.786 (cm^2)	Area avg.	8.583 (in^2)	Press No.	1	Data File ID 1B
					Panel No.	C	Lateral Pressure (psi) 10.0
							Chamber Pressure - σ_3 (psi) 90

Clock Time (min.)	Load (lbf)	Deflection Dial Reading (in.)	Pore Pressure Reading (psi)	Corrected Hieght (in.)	Strain (%)	Corrected Area (cm^2)	Corrected Load (lbf)	Deviator Stress (tsf)	Corrected Deviator Stress* (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p' $(\sigma_1'+\sigma_3')/2$ (tsf)	q $(\sigma_1-\sigma_3)/2$ (tsf)	Effective Principal Stress Ratio σ_1'/σ_3'
5:57:52	91.3	0.332	84.4	5.544	6.00	44.4538	77.5	0.811	0.796	1.516	1.211	0.401	0.806	0.405	3.018
6:03:57	91.9	0.338	84.4	5.538	6.10	44.5015	78.1	0.816	0.801	1.521	1.217	0.403	0.810	0.407	3.023
6:09:59	91.9	0.344	84.3	5.532	6.20	44.5486	78.1	0.815	0.800	1.520	1.222	0.408	0.815	0.407	2.995
6:16:01	92.5	0.350	84.3	5.526	6.30	44.5964	78.7	0.821	0.806	1.526	1.226	0.407	0.817	0.410	3.012
6:21:58	92.8	0.356	84.3	5.521	6.40	44.6441	79.0	0.823	0.808	1.528	1.229	0.408	0.819	0.411	3.013
6:27:58	93.2	0.362	84.3	5.515	6.50	44.6916	79.4	0.826	0.810	1.530	1.236	0.412	0.824	0.412	3.001
6:33:50	93.5	0.368	84.3	5.509	6.60	44.7396	79.7	0.828	0.812	1.532	1.238	0.412	0.825	0.413	3.004
6:39:37	93.9	0.374	84.2	5.503	6.70	44.7876	80.1	0.831	0.815	1.535	1.245	0.416	0.830	0.414	2.992
6:45:35	94.3	0.380	84.2	5.497	6.80	44.8361	80.5	0.835	0.819	1.539	1.248	0.416	0.832	0.416	3.004
6:51:27	94.5	0.385	84.2	5.491	6.90	44.8841	80.7	0.836	0.820	1.540	1.251	0.418	0.834	0.417	2.995
6:57:21	94.9	0.391	84.2	5.485	7.00	44.9320	81.1	0.839	0.823	1.543	1.256	0.420	0.838	0.418	2.992
7:03:16	95.3	0.397	84.2	5.479	7.10	44.9804	81.5	0.842	0.825	1.545	1.259	0.420	0.839	0.419	2.998
7:09:28	95.4	0.403	84.1	5.473	7.20	45.0291	81.6	0.843	0.825	1.545	1.261	0.423	0.842	0.419	2.985
7:15:33	95.8	0.409	84.1	5.468	7.30	45.0776	82.0	0.846	0.828	1.548	1.267	0.424	0.845	0.421	2.984
7:21:35	96.4	0.415	84.1	5.462	7.40	45.1262	82.6	0.851	0.834	1.554	1.272	0.425	0.848	0.424	2.996
7:27:40	96.6	0.421	84.0	5.456	7.50	45.1753	82.8	0.852	0.834	1.554	1.278	0.430	0.854	0.424	2.971
7:33:29	96.9	0.427	84.0	5.450	7.60	45.2239	83.1	0.854	0.836	1.556	1.279	0.430	0.855	0.425	2.976
7:39:24	97.3	0.433	84.0	5.444	7.70	45.2729	83.5	0.858	0.839	1.559	1.283	0.430	0.856	0.427	2.986
7:45:29	97.5	0.439	84.0	5.438	7.80	45.3226	83.7	0.859	0.840	1.560	1.287	0.433	0.860	0.427	2.972
7:51:24	97.8	0.444	84.0	5.432	7.90	45.3714	84.0	0.861	0.842	1.562	1.290	0.434	0.862	0.428	2.969
7:57:21	98.2	0.450	83.9	5.426	8.00	45.4205	84.4	0.864	0.845	1.565	1.294	0.436	0.865	0.429	2.969
8:03:22	98.6	0.456	83.9	5.420	8.10	45.4703	84.8	0.867	0.848	1.568	1.300	0.439	0.869	0.431	2.963
8:09:17	98.9	0.462	83.9	5.414	8.20	45.5195	85.1	0.869	0.849	1.569	1.302	0.440	0.871	0.431	2.963
8:15:18	99.0	0.468	83.8	5.409	8.30	45.5691	85.2	0.870	0.850	1.570	1.308	0.444	0.876	0.432	2.945
8:21:18	99.6	0.474	83.8	5.403	8.40	45.6190	85.8	0.874	0.854	1.574	1.311	0.443	0.877	0.434	2.957
8:27:16	99.8	0.480	83.8	5.397	8.50	45.6696	86.0	0.875	0.855	1.575	1.313	0.445	0.879	0.434	2.953
8:33:17	99.9	0.486	83.8	5.391	8.60	45.7189	86.1	0.876	0.855	1.575	1.317	0.448	0.882	0.435	2.941
8:39:09	100.4	0.492	83.8	5.385	8.70	45.7690	86.6	0.880	0.859	1.579	1.321	0.448	0.884	0.436	2.946
8:45:01	100.8	0.497	83.7	5.379	8.80	45.8192	87.0	0.883	0.862	1.582	1.328	0.453	0.890	0.438	2.933
8:50:56	101.1	0.503	83.7	5.373	8.90	45.8695	87.3	0.885	0.864	1.584	1.329	0.451	0.890	0.439	2.944
8:56:46	101.4	0.509	83.7	5.367	9.00	45.9201	87.6	0.887	0.866	1.586	1.332	0.453	0.893	0.440	2.941
9:02:41	101.7	0.515	83.7	5.361	9.10	45.9705	87.9	0.889	0.867	1.587	1.336	0.456	0.896	0.440	2.932
9:08:42	102.0	0.521	83.7	5.355	9.20	46.0211	88.2	0.891	0.869	1.589	1.339	0.456	0.897	0.441	2.937
9:14:34	102.1	0.527	83.6	5.349	9.30	46.0721	88.3	0.892	0.869	1.589	1.341	0.458	0.900	0.441	2.927
9:20:36	102.7	0.533	83.6	5.344	9.40	46.1226	88.9	0.896	0.873	1.593	1.347	0.460	0.903	0.443	2.928
9:26:43	102.8	0.539	83.6	5.338	9.50	46.1739	89.0	0.897	0.874	1.594	1.348	0.461	0.904	0.444	2.927
9:32:49	103.1	0.545	83.5	5.332	9.60	46.2255	89.3	0.898	0.875	1.595	1.354	0.465	0.910	0.444	2.910
9:38:48	103.6	0.551	83.5	5.326	9.70	46.2760	89.8	0.902	0.879	1.599	1.358	0.465	0.912	0.446	2.918
9:44:52	103.6	0.557	83.5	5.320	9.80	46.3275	89.8	0.902	0.878	1.598	1.357	0.465	0.911	0.446	2.916
9:51:00	104.0	0.562	83.5	5.314	9.90	46.3787	90.2	0.904	0.881	1.601	1.363	0.469	0.916	0.447	2.906
9:57:01	104.4	0.568	83.5	5.308	10.00	46.4302	90.6	0.908	0.884	1.604	1.366	0.469	0.918	0.449	2.912
10:03:02	104.5	0.574	83.4	5.302	10.10	46.4820	90.7	0.907	0.883	1.603	1.368	0.472	0.920	0.448	2.900
10:09:09	104.8	0.580	83.4	5.296	10.20	46.5338	91.0	0.909	0.884	1.604	1.371	0.473	0.922	0.449	2.900
10:15:10	105.0	0.586	83.4	5.291	10.30	46.5857	91.2	0.911	0.886	1.606	1.374	0.474	0.924	0.450	2.896
10:21:08	105.3	0.592	83.4	5.285	10.40	46.6379	91.5	0.912	0.887	1.607	1.379	0.479	0.929	0.450	2.881
10:27:09	105.6	0.598	83.4	5.279	10.50	46.6899	91.8	0.914	0.889	1.609	1.381	0.478	0.929	0.451	2.889
10:33:11	105.8	0.604	83.4	5.273	10.60	46.7422	92.0	0.915	0.890	1.610	1.382	0.479	0.931	0.452	2.887
10:39:13	106.0	0.610	83.3	5.267	10.70	46.7949	92.2	0.916	0.890	1.610	1.387	0.483	0.935	0.452	2.874
10:45:17	106.4	0.616	83.3	5.261	10.80	46.8470	92.6	0.919	0.893	1.613	1.389	0.482	0.936	0.453	2.879
10:51:16	106.7	0.621	83.3	5.255	10.90	46.8999	92.9	0.921	0.895	1.615	1.393	0.484	0.938	0.454	2.875
10:57:05	107.0	0.627	83.3	5.249	11.00	46.9524	93.2	0.923	0.896	1.616	1.395	0.485	0.940	0.455	2.876
11:02:50	107.3	0.633	83.3	5.243	11.10	47.0051	93.5	0.924	0.898	1.618	1.397	0.486	0.941	0.456	2.877
11:08:44	107.4	0.639	83.2	5.237	11.20	47.0578	93.6	0.925	0.898	1.618	1.400	0.488	0.944	0.456	2.867
11:14:36	107.8	0.645	83.2	5.231	11.30	47.1115	94.0	0.927	0.900	1.620	1.403	0.489	0.946	0.457	2.868
11:20:25	108.0	0.651	83.2	5.226	11.40	47.1644	94.2	0.929	0.901	1.621	1.406	0.491	0.949	0.458	2.863
11:26:24	108.3	0.657	83.2	5.220	11.50	47.2174	94.5	0.930	0.903	1.623	1.409	0.492	0.950	0.458	2.861
11:32:32	108.5	0.663	83.2	5.214	11.60	47.2708	94.7	0.932	0.904	1.624	1.410	0.492	0.951	0.459	2.864
11:38:28	108.9	0.669	83.1	5.208	11.70	47.3248	95.1	0.934	0.906	1.626	1.418	0.498	0.958	0.460	2.845
11:44:19	109.2	0.675	83.1	5.202	11.80	47.3784	95.4	0.937	0.908	1.628	1.418	0.496	0.957	0.461	2.858
11:50:09	109.6	0.680	83.1	5.196	11.90	47.4318	95.8	0.940	0.911	1.631	1.422	0.497	0.959	0.462	2.860

Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Consolidation Values		
Height	5.898 (in.)	14.981 (cm)
Diameter	2.872 (in)	7.294 (cm)
Area	6.477 (in^2)	41.786 (cm^2)

Final Values	
Height	4.813 (in.)
Dia. avg.	3.306 (in)
Area avg.	8.583 (in^2)

Tested By	KDG
Date	1-20-10
Press No.	1
Panel No.	C

Project Number	175569040
Test Number	CU-1B
Data File ID	1B
Lateral Pressure (psi)	10.0
Chamber Pressure - σ_3 (psi)	90

Clock Time (min.)	Load (lbf)	Deflection Dial Reading (in.)	Pore Pressure Reading (psi)	Corrected Hieght (in.)	Strain (%)	Corrected Area (cm^2)	Corrected Load (lbf)	Deviator Stress (tsf)	Corrected Deviator Stress* (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p' $(\sigma_1'+\sigma_3')/2$ (tsf)	q $(\sigma_1-\sigma_3)/2$ (tsf)	Effective Principal Stress Ratio σ_1'/σ_3'
11:56:05	109.8	0.686	83.1	5.190	12.00	47.4858	96.0	0.940	0.911	1.631	1.424	0.500	0.962	0.462	2.848
12:02:06	109.9	0.692	83.0	5.184	12.10	47.5398	96.1	0.940	0.910	1.630	1.425	0.501	0.963	0.462	2.845
12:08:14	110.3	0.698	83.0	5.178	12.20	47.5943	96.5	0.943	0.913	1.633	1.432	0.505	0.969	0.463	2.835
12:14:15	110.5	0.704	83.0	5.173	12.30	47.6484	96.7	0.944	0.914	1.634	1.432	0.504	0.968	0.464	2.843
12:20:16	110.7	0.710	83.0	5.167	12.40	47.7030	96.9	0.944	0.914	1.634	1.433	0.505	0.969	0.464	2.838
12:26:15	110.9	0.716	83.0	5.161	12.50	47.7578	97.1	0.945	0.915	1.635	1.436	0.507	0.972	0.464	2.831
12:32:12	111.4	0.722	83.0	5.155	12.60	47.8119	97.6	0.949	0.919	1.639	1.440	0.507	0.973	0.466	2.837
12:38:00	111.6	0.728	82.9	5.149	12.70	47.8667	97.8	0.950	0.920	1.640	1.443	0.509	0.976	0.467	2.834
12:43:57	111.6	0.734	82.9	5.143	12.80	47.9220	97.8	0.949	0.918	1.638	1.444	0.512	0.978	0.466	2.821
12:50:07	112.0	0.739	82.9	5.137	12.90	47.9767	98.2	0.952	0.921	1.641	1.446	0.511	0.978	0.467	2.828
12:56:08	112.4	0.745	82.9	5.131	13.01	48.0325	98.6	0.954	0.923	1.643	1.451	0.514	0.983	0.468	2.822
13:01:54	112.4	0.751	82.8	5.125	13.10	48.0873	98.6	0.953	0.922	1.642	1.450	0.515	0.983	0.468	2.816
13:07:51	112.8	0.757	82.8	5.119	13.21	48.1431	99.0	0.957	0.925	1.645	1.454	0.516	0.985	0.469	2.820
13:13:45	113.0	0.763	82.8	5.113	13.30	48.1983	99.2	0.957	0.925	1.645	1.457	0.518	0.987	0.470	2.813
13:19:40	113.2	0.769	82.8	5.108	13.40	48.2537	99.4	0.958	0.925	1.645	1.459	0.520	0.989	0.470	2.807
13:25:45	113.4	0.775	82.7	5.102	13.50	48.3100	99.6	0.958	0.926	1.646	1.463	0.524	0.993	0.470	2.794
13:31:54	113.5	0.781	82.7	5.096	13.60	48.3656	99.7	0.959	0.926	1.646	1.462	0.522	0.992	0.470	2.800
13:38:10	113.9	0.787	82.7	5.090	13.71	48.4227	100.1	0.961	0.928	1.648	1.466	0.524	0.995	0.471	2.797
13:44:11	114.0	0.793	82.7	5.084	13.81	48.4782	100.2	0.961	0.928	1.648	1.468	0.526	0.997	0.471	2.790
13:50:18	114.5	0.798	82.7	5.078	13.90	48.5343	100.7	0.965	0.932	1.652	1.471	0.525	0.998	0.473	2.799
13:56:27	114.6	0.804	82.7	5.072	14.01	48.5913	100.8	0.965	0.931	1.651	1.472	0.527	1.000	0.472	2.792
14:02:32	114.7	0.810	82.6	5.066	14.11	48.6477	100.9	0.965	0.931	1.651	1.475	0.531	1.003	0.472	2.778
14:08:41	115.2	0.816	82.6	5.060	14.20	48.7039	101.4	0.968	0.934	1.654	1.478	0.530	1.004	0.474	2.789
14:14:56	115.6	0.822	82.6	5.054	14.30	48.7609	101.8	0.970	0.936	1.656	1.485	0.535	1.010	0.475	2.774
14:20:55	115.6	0.828	82.6	5.049	14.40	48.8177	101.8	0.970	0.935	1.655	1.482	0.534	1.008	0.474	2.778
14:26:58	115.7	0.834	82.6	5.043	14.51	48.8752	101.9	0.969	0.935	1.655	1.483	0.535	1.009	0.474	2.772
14:33:07	116.3	0.840	82.5	5.037	14.61	48.9324	102.5	0.974	0.939	1.659	1.489	0.537	1.013	0.476	2.775
14:39:12	116.6	0.846	82.5	5.031	14.70	48.9894	102.8	0.975	0.940	1.660	1.491	0.537	1.014	0.477	2.774
14:45:06	116.6	0.852	82.5	5.025	14.81	49.0472	102.8	0.974	0.939	1.659	1.490	0.538	1.014	0.476	2.770
14:51:24	116.9	0.857	82.5	5.019	14.90	49.1046	103.1	0.976	0.940	1.660	1.494	0.540	1.017	0.477	2.767
14:57:31	117.2	0.863	82.5	5.013	15.00	49.1625	103.4	0.978	0.942	1.662	1.496	0.541	1.018	0.478	2.768
15:03:38	117.2	0.869	82.4	5.007	15.10	49.2204	103.4	0.977	0.940	1.660	1.501	0.546	1.023	0.477	2.746
15:09:53	117.6	0.875	82.4	5.001	15.20	49.2784	103.8	0.980	0.943	1.663	1.501	0.544	1.023	0.478	2.758
15:15:50	118.2	0.881	82.5	4.996	15.31	49.3368	104.4	0.984	0.947	1.667	1.504	0.544	1.024	0.480	2.767
15:21:57	118.3	0.887	82.4	4.990	15.41	49.3953	104.5	0.984	0.947	1.667	1.506	0.546	1.026	0.480	2.758
15:28:05	118.4	0.893	82.4	4.984	15.51	49.4541	104.6	0.984	0.946	1.666	1.507	0.547	1.027	0.480	2.755
15:33:59	118.7	0.899	82.4	4.978	15.61	49.5128	104.9	0.985	0.947	1.667	1.509	0.548	1.029	0.481	2.753
15:40:02	119.1	0.905	82.4	4.972	15.71	49.5710	105.3	0.987	0.950	1.670	1.513	0.550	1.032	0.482	2.751
15:45:59	119.0	0.910	82.3	4.966	15.80	49.6296	105.2	0.986	0.948	1.668	1.513	0.552	1.033	0.481	2.743
15:51:59	119.3	0.916	82.3	4.960	15.91	49.6893	105.5	0.988	0.949	1.669	1.518	0.555	1.036	0.482	2.736
15:58:07	119.6	0.922	82.3	4.954	16.00	49.7479	105.8	0.989	0.951	1.671	1.518	0.554	1.036	0.482	2.741
16:04:07	119.9	0.928	82.3	4.948	16.11	49.8072	106.1	0.990	0.952	1.672	1.520	0.554	1.037	0.483	2.741
16:10:04	120.0	0.934	82.3	4.942	16.21	49.8672	106.2	0.991	0.952	1.672	1.522	0.557	1.039	0.483	2.734
16:16:06	120.3	0.940	82.2	4.936	16.31	49.9268	106.5	0.992	0.953	1.673	1.525	0.558	1.042	0.483	2.731
16:22:21	120.6	0.946	82.2	4.931	16.41	49.9869	106.8	0.993	0.954	1.674	1.527	0.560	1.043	0.484	2.728
16:28:23	120.7	0.952	82.2	4.925	16.51	50.0460	106.9	0.993	0.953	1.673	1.529	0.562	1.045	0.483	2.720
16:34:20	121.0	0.958	82.2	4.919	16.61	50.1059	107.2	0.994	0.954	1.674	1.531	0.563	1.047	0.484	2.720
16:40:24	121.3	0.964	82.1	4.913	16.71	50.1664	107.5	0.996	0.956	1.676	1.535	0.566	1.050	0.485	2.714
16:46:21	121.4	0.969	82.2	4.907	16.81	50.2264	107.6	0.996	0.955	1.675	1.534	0.565	1.049	0.484	2.715
16:52:20	121.7	0.975	82.1	4.901	16.91	50.2871	107.9	0.998	0.957	1.677	1.537	0.566	1.051	0.485	2.715
16:58:22	122.0	0.981	82.1	4.895	17.01	50.3475	108.2	0.999	0.958	1.678	1.540	0.568	1.054	0.486	2.711
17:04:30	121.9	0.987	82.1	4.889	17.11	50.4091	108.1	0.997	0.956	1.676	1.539	0.569	1.054	0.485	2.705
17:10:32	122.1	0.993	82.0	4.883	17.21	50.4691	108.3	0.998	0.957	1.677	1.544	0.574	1.059	0.485	2.691
17:16:21	122.5	0.999	82.0	4.878	17.31	50.5302	108.7	1.000	0.959	1.679	1.545	0.573	1.059	0.486	2.698
17:22:18	122.7	1.005	82.0	4.872	17.41	50.5915	108.9	1.001	0.959	1.679	1.545	0.573	1.059	0.486	2.699
17:28:20	122.8	1.011	82.0	4.866	17.51	50.6528	109.0	1.001	0.958	1.678	1.546	0.574	1.060	0.486	2.695
17:34:13	123.0	1.017	82.0	4.860	17.61	50.7142	109.2	1.002	0.959	1.679	1.547	0.574	1.060	0.486	2.695
17:40:12	123.3	1.023	82.0	4.854	17.71	50.7765	109.5	1.002	0.960	1.680	1.552	0.579	1.066	0.487	2.681
17:46:16	123.5	1.029	82.0	4.848	17.81	50.8383	109.7	1.003	0.960	1.680	1.551	0.577	1.064	0.487	2.687
17:52:23	123.6	1.034	82.0	4.842	17.91	50.9003	109.8	1.003	0.960	1.680	1.552	0.578	1.065	0.487	2.684

Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Consolidation Values			Final Values		
Height	5.898 (in.)	14.981 (cm)	Height	4.813 (in.)	
Diameter	2.872 (in)	7.294 (cm)	Dia. avg.	3.306 (in)	
Area	6.477 (in^2)	41.786 (cm^2)	Area avg.	8.583 (in^2)	

Tested By	KDG
Date	1-20-10
Press No.	1
Panel No.	C

Project Number	175569040
Test Number	CU-1B
Data File ID	1B
Lateral Pressure (psi)	10.0
Chamber Pressure - σ_3 (psi)	90

Clock Time (min.)	Load (lbf)	Deflection Dial Reading (in.)	Pore Pressure Reading (psi)	Corrected Hieght (in.)	Strain (%)	Corrected Area (cm^2)	Corrected Load (lbf)	Deviator Stress (tsf)	Corrected Deviator Stress* (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p' $(\sigma_1'+\sigma_3')/2$ (tsf)	q $(\sigma_1-\sigma_3)/2$ (tsf)	Effective Principal Stress Ratio σ_1' / σ_3'
17:58:22	124.0	1.040	81.9	4.836	18.01	50.9616	110.2	1.006	0.962	1.682	1.556	0.580	1.068	0.488	2.683
18:04:31	124.4	1.046	82.0	4.830	18.11	51.0244	110.6	1.008	0.964	1.684	1.557	0.579	1.068	0.489	2.688
18:10:27	124.4	1.052	81.9	4.824	18.21	51.0870	110.6	1.007	0.963	1.683	1.558	0.581	1.069	0.488	2.681
18:16:11	124.6	1.058	81.9	4.819	18.31	51.1489	110.8	1.008	0.964	1.684	1.561	0.583	1.072	0.489	2.675
18:22:24	125.0	1.064	81.9	4.813	18.41	51.2116	111.2	1.009	0.965	1.685	1.562	0.583	1.073	0.489	2.678

Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Consolidation Values			Final Values		
Height	6.238 (in.)	15.845 (cm)	Height	5.171 (in.)	
Diameter	2.838 (in)	7.208 (cm)	Dia. avg.	3.105 (in)	
Area	6.326 (in^2)	40.811 (cm^2)	Area avg.	7.572 (in^2)	

Tested By	KDG
Date	1-20-10
Press No.	2
Panel No.	D

Project Number	175569040
Test Number	CU-1C
Data File ID	1C
Lateral Pressure (psi)	20.0
Chamber Pressure - σ_3 (psi)	90

Clock Time (min.)	Load (lbf)	Deflection Dial Reading (in.)	Pore Pressure Reading (psi)	Corrected Hieght (in.)	Strain (%)	Corrected Area (cm^2)	Corrected Load (lbf)	Deviator Stress (tsf)	Corrected Deviator Stress* (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p' $(\sigma_1'+\sigma_3')/2$ (tsf)	q $(\sigma_1-\sigma_3)/2$ (tsf)	Effective Principal Stress Ratio σ_1'/σ_3'
0:00:00	9.5	-0.001	70.0	6.238	0.00	40.8105	0.0	0.000	0.000	1.440	1.440	1.438	1.439	0.001	1.001
0:03:54	23.9	0.005	70.5	6.232	0.10	40.8516	14.4	0.164	0.164	1.604	1.572	1.407	1.489	0.083	1.118
0:08:10	36.6	0.011	71.5	6.226	0.20	40.8926	27.1	0.309	0.308	1.748	1.639	1.330	1.485	0.155	1.233
0:13:12	49.8	0.018	72.8	6.220	0.30	40.9337	40.3	0.458	0.457	1.897	1.700	1.241	1.471	0.229	1.370
0:19:08	60.1	0.024	73.8	6.213	0.40	40.9753	50.6	0.574	0.573	2.013	1.739	1.163	1.451	0.288	1.494
0:25:04	68.4	0.030	74.6	6.207	0.50	41.0163	58.9	0.668	0.667	2.107	1.774	1.105	1.439	0.334	1.605
0:31:20	76.5	0.036	75.5	6.201	0.60	41.0578	67.0	0.759	0.757	2.197	1.803	1.045	1.424	0.379	1.726
0:37:57	84.0	0.043	75.9	6.195	0.70	41.0988	74.5	0.843	0.842	2.282	1.857	1.013	1.435	0.422	1.832
0:44:27	90.6	0.049	76.7	6.188	0.80	41.1400	81.1	0.917	0.915	2.355	1.874	0.957	1.416	0.458	1.958
0:51:07	96.1	0.055	77.2	6.182	0.90	41.1813	86.6	0.978	0.976	2.416	1.900	0.922	1.411	0.489	2.060
0:57:25	101.8	0.061	77.3	6.176	1.00	41.2229	92.3	1.042	1.039	2.479	1.955	0.914	1.435	0.520	2.138
1:03:55	107.0	0.068	77.8	6.170	1.10	41.2652	97.5	1.099	1.096	2.536	1.975	0.877	1.426	0.549	2.252
1:10:15	111.5	0.074	78.0	6.163	1.20	41.3064	102.0	1.149	1.146	2.586	2.010	0.862	1.436	0.574	2.331
1:16:40	115.7	0.080	78.1	6.157	1.30	41.3486	106.2	1.194	1.191	2.631	2.049	0.856	1.452	0.596	2.393
1:23:10	119.4	0.086	78.3	6.151	1.40	41.3901	109.9	1.235	1.232	2.672	2.072	0.839	1.456	0.617	2.470
1:29:52	124.0	0.092	78.5	6.145	1.50	41.4322	114.5	1.286	1.282	2.722	2.111	0.827	1.469	0.642	2.551
1:36:49	127.0	0.099	78.5	6.138	1.60	41.4747	117.5	1.318	1.314	2.754	2.143	0.828	1.485	0.658	2.589
1:43:33	130.9	0.105	78.6	6.132	1.70	41.5170	121.4	1.360	1.356	2.796	2.175	0.817	1.496	0.679	2.661
1:50:13	133.8	0.111	78.7	6.126	1.80	41.5592	124.3	1.391	1.386	2.826	2.200	0.812	1.506	0.694	2.709
1:56:48	136.0	0.117	78.6	6.120	1.90	41.6012	126.5	1.414	1.409	2.849	2.229	0.818	1.523	0.705	2.725
2:03:39	138.2	0.124	78.7	6.113	2.00	41.6440	128.8	1.438	1.433	2.873	2.248	0.814	1.531	0.717	2.762
2:10:12	140.6	0.130	78.7	6.107	2.10	41.6865	131.1	1.463	1.458	2.898	2.271	0.812	1.541	0.730	2.797
2:16:51	142.5	0.136	78.6	6.101	2.20	41.7291	133.0	1.482	1.477	2.917	2.298	0.819	1.559	0.739	2.805
2:23:19	144.6	0.142	78.6	6.095	2.30	41.7721	135.1	1.504	1.498	2.938	2.318	0.818	1.568	0.750	2.834
2:30:01	146.9	0.149	78.6	6.088	2.40	41.8150	137.4	1.528	1.522	2.962	2.346	0.822	1.584	0.762	2.853
2:36:45	149.3	0.155	78.6	6.082	2.50	41.8577	139.8	1.553	1.547	2.987	2.371	0.822	1.597	0.774	2.884
2:43:23	151.0	0.161	78.6	6.076	2.60	41.9007	141.5	1.570	1.564	3.004	2.388	0.822	1.605	0.783	2.904
2:50:10	152.1	0.168	78.4	6.070	2.70	41.9451	142.6	1.581	1.574	3.014	2.410	0.834	1.622	0.788	2.889
2:56:54	153.7	0.174	78.4	6.064	2.80	41.9869	144.2	1.597	1.591	3.031	2.424	0.832	1.628	0.796	2.913
3:03:34	155.7	0.180	78.5	6.057	2.90	42.0298	146.2	1.618	1.611	3.051	2.444	0.832	1.638	0.806	2.939
3:10:35	157.4	0.186	78.3	6.051	3.00	42.0732	147.9	1.634	1.627	3.067	2.471	0.843	1.657	0.814	2.932
3:17:10	158.7	0.192	78.2	6.045	3.10	42.1165	149.2	1.647	1.640	3.080	2.489	0.848	1.668	0.821	2.937
3:24:02	160.7	0.199	78.2	6.039	3.20	42.1601	151.2	1.667	1.659	3.099	2.511	0.850	1.681	0.831	2.954
3:30:46	162.9	0.205	78.0	6.032	3.30	42.2038	153.4	1.690	1.682	3.122	2.547	0.863	1.705	0.842	2.950
3:37:29	164.3	0.211	78.0	6.026	3.40	42.2474	154.9	1.704	1.696	3.136	2.562	0.864	1.713	0.849	2.964
3:44:06	165.6	0.217	78.0	6.020	3.50	42.2913	156.1	1.716	1.708	3.148	2.574	0.865	1.719	0.855	2.976
3:50:56	167.1	0.224	77.7	6.014	3.60	42.3351	157.6	1.731	1.723	3.163	2.607	0.883	1.745	0.862	2.953
3:57:38	168.4	0.230	77.8	6.007	3.70	42.3790	158.9	1.744	1.735	3.175	2.616	0.879	1.748	0.868	2.975
4:04:25	169.8	0.236	77.8	6.001	3.80	42.4231	160.3	1.758	1.748	3.188	2.628	0.879	1.754	0.875	2.992
4:11:20	170.9	0.242	77.6	5.995	3.90	42.4673	161.4	1.767	1.758	3.198	2.651	0.891	1.771	0.880	2.974
4:18:04	172.0	0.249	77.6	5.989	4.00	42.5115	162.5	1.778	1.768	3.208	2.662	0.892	1.777	0.885	2.983
4:24:59	172.8	0.255	77.6	5.982	4.10	42.5563	163.3	1.785	1.775	3.215	2.671	0.895	1.783	0.888	2.984
4:31:44	174.4	0.261	77.4	5.976	4.20	42.6002	164.9	1.800	1.790	3.230	2.697	0.906	1.802	0.896	2.976
4:38:36	175.4	0.267	77.4	5.970	4.30	42.6452	165.9	1.809	1.798	3.238	2.711	0.911	1.811	0.900	2.976
4:45:18	176.5	0.273	77.3	5.964	4.40	42.6895	167.0	1.819	1.808	3.248	2.725	0.916	1.821	0.905	2.975
4:51:53	177.2	0.280	77.1	5.957	4.50	42.7341	167.7	1.825	1.814	3.254	2.747	0.931	1.839	0.908	2.950
4:58:32	178.6	0.286	77.1	5.951	4.60	42.7796	169.1	1.838	1.827	3.267	2.760	0.931	1.846	0.914	2.963
5:05:05	180.0	0.292	77.0	5.945	4.70	42.8241	170.5	1.851	1.840	3.280	2.774	0.933	1.854	0.921	2.973
5:11:42	181.1	0.298	76.6	5.939	4.80	42.8691	171.6	1.861	1.850	3.290	2.814	0.962	1.888	0.926	2.923
5:18:17	182.8	0.305	76.8	5.932	4.90	42.9143	173.3	1.878	1.866	3.306	2.815	0.948	1.882	0.934	2.970
5:24:52	183.5	0.311	76.8	5.926	5.00	42.9591	174.0	1.883	1.871	3.311	2.823	0.950	1.886	0.936	2.972
5:31:32	184.8	0.317	76.5	5.920	5.10	43.0045	175.3	1.895	1.883	3.323	2.858	0.973	1.916	0.942	2.936
5:38:09	186.4	0.323	76.6	5.914	5.20	43.0500	176.9	1.911	1.898	3.338	2.864	0.964	1.914	0.950	2.970
5:44:49	187.6	0.330	76.6	5.908	5.30	43.0952	178.1	1.921	1.909	3.349	2.876	0.966	1.921	0.955	2.977
5:51:31	188.1	0.336	76.1	5.901	5.40	43.1409	178.6	1.925	1.912	3.352	2.911	0.998	1.955	0.957	2.917
5:58:11	189.2	0.342	76.3	5.895	5.50	43.1868	179.7	1.935	1.922	3.362	2.907	0.983	1.945	0.962	2.956
6:04:44	190.4	0.348	76.3	5.889	5.60	43.2323	180.9	1.945	1.932	3.372	2.919	0.986	1.952	0.967	2.961
6:11:23	191.6	0.355	76.1	5.883	5.70	43.2782	182.1	1.957	1.943	3.383	2.945	1.000	1.972	0.972	2.945
6:18:03	192.7	0.361	76.1	5.876	5.80	43.3241	183.2	1.966	1.952	3.392	2.956	1.002	1.979	0.977	2.950
6:24:40	193.4	0.367	76.0	5.870	5.90	43.3703	183.9	1.972	1.958	3.398	2.966	1.007	1.986	0.980	2.947

Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Consolidation Values			Final Values		Tested By	KDG	Project Number	175569040
Height	6.238 (in.)	15.845 (cm)	Height	5.171 (in.)	Date	1-20-10	Test Number	CU-1C
Diameter	2.838 (in)	7.208 (cm)	Dia. avg.	3.105 (in)	Press No.	2	Data File ID	1C
Area	6.326 (in^2)	40.811 (cm^2)	Area avg.	7.572 (in^2)	Panel No.	D	Lateral Pressure (psi)	20.0
							Chamber Pressure - σ_3 (psi)	90

Clock Time (min.)	Load (lbf)	Deflection Dial Reading (in.)	Pore Pressure Reading (psi)	Corrected Hieght (in.)	Strain (%)	Corrected Area (cm^2)	Corrected Load (lbf)	Deviator Stress (tsf)	Corrected Deviator Stress* (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p' $(\sigma_1'+\sigma_3')/2$ (tsf)	q $(\sigma_1-\sigma_3)/2$ (tsf)	Effective Principal Stress Ratio σ_1'/σ_3'
6:31:23	194.7	0.373	75.9	5.864	6.00	43.4162	185.2	1.983	1.969	3.409	2.984	1.014	1.999	0.985	2.944
6:38:02	195.6	0.380	75.8	5.858	6.10	43.4625	186.2	1.992	1.977	3.417	3.000	1.022	2.011	0.989	2.936
6:44:45	197.0	0.386	75.8	5.851	6.20	43.5091	187.5	2.004	1.989	3.429	3.013	1.022	2.018	0.995	2.948
6:51:29	197.7	0.392	75.7	5.845	6.30	43.5554	188.2	2.009	1.994	3.434	3.022	1.027	2.024	0.998	2.943
6:58:12	198.6	0.398	75.6	5.839	6.40	43.6018	189.1	2.017	2.001	3.441	3.043	1.040	2.042	1.001	2.925
7:04:56	199.8	0.405	75.6	5.833	6.50	43.6486	190.3	2.027	2.011	3.451	3.053	1.040	2.047	1.006	2.935
7:11:49	200.7	0.411	75.5	5.826	6.60	43.6954	191.2	2.034	2.018	3.458	3.064	1.044	2.054	1.010	2.935
7:18:40	201.4	0.417	75.1	5.820	6.70	43.7422	191.9	2.040	2.024	3.464	3.098	1.073	2.085	1.013	2.888
7:25:40	202.4	0.423	75.2	5.814	6.80	43.7890	192.9	2.048	2.032	3.472	3.096	1.062	2.079	1.017	2.914
7:32:39	203.5	0.429	75.2	5.808	6.90	43.8361	194.0	2.058	2.041	3.481	3.107	1.065	2.086	1.021	2.919
7:39:35	204.4	0.436	75.1	5.801	7.00	43.8834	194.9	2.065	2.048	3.488	3.120	1.071	2.095	1.025	2.914
7:46:32	205.3	0.442	74.9	5.795	7.10	43.9306	195.8	2.072	2.055	3.495	3.142	1.086	2.114	1.028	2.894
7:53:33	206.4	0.448	74.9	5.789	7.20	43.9782	196.9	2.082	2.065	3.505	3.150	1.084	2.117	1.033	2.907
8:00:32	207.4	0.454	74.9	5.783	7.30	44.0257	197.9	2.090	2.072	3.512	3.159	1.085	2.122	1.037	2.911
8:07:24	208.3	0.461	74.8	5.777	7.40	44.0730	198.8	2.097	2.079	3.519	3.179	1.098	2.138	1.040	2.896
8:14:16	209.2	0.467	74.7	5.770	7.50	44.1204	199.7	2.105	2.086	3.526	3.187	1.099	2.143	1.044	2.900
8:21:08	210.2	0.473	74.7	5.764	7.60	44.1685	200.7	2.113	2.095	3.535	3.196	1.099	2.148	1.048	2.907
8:28:02	210.6	0.479	74.6	5.758	7.70	44.2162	201.1	2.115	2.096	3.536	3.203	1.106	2.154	1.049	2.897
8:34:44	211.8	0.486	74.4	5.752	7.80	44.2640	202.4	2.126	2.107	3.547	3.228	1.120	2.174	1.054	2.882
8:41:31	212.9	0.492	74.5	5.745	7.90	44.3122	203.4	2.134	2.115	3.555	3.234	1.117	2.176	1.058	2.894
8:48:18	213.2	0.498	74.4	5.739	8.00	44.3604	203.7	2.136	2.116	3.556	3.238	1.121	2.180	1.059	2.890
8:55:05	213.9	0.504	74.0	5.733	8.10	44.4087	204.4	2.140	2.120	3.560	3.271	1.149	2.210	1.061	2.847
9:01:42	215.2	0.511	74.2	5.727	8.20	44.4574	205.7	2.152	2.132	3.572	3.271	1.137	2.204	1.067	2.876
9:08:26	215.6	0.517	74.2	5.720	8.30	44.5055	206.1	2.153	2.133	3.573	3.274	1.139	2.207	1.067	2.874
9:15:23	216.5	0.523	74.1	5.714	8.40	44.5546	207.0	2.161	2.140	3.580	3.289	1.147	2.218	1.071	2.868
9:22:10	217.6	0.529	74.0	5.708	8.50	44.6031	208.1	2.169	2.148	3.588	3.303	1.153	2.228	1.075	2.865
9:28:50	218.1	0.536	74.0	5.702	8.60	44.6516	208.6	2.173	2.152	3.592	3.307	1.154	2.231	1.077	2.866
9:35:44	219.0	0.542	74.0	5.695	8.70	44.7008	209.5	2.179	2.158	3.598	3.314	1.154	2.234	1.080	2.871
9:42:26	219.8	0.548	73.8	5.689	8.80	44.7499	210.3	2.186	2.164	3.604	3.334	1.168	2.251	1.083	2.855
9:49:06	220.7	0.554	73.8	5.683	8.90	44.7989	211.2	2.192	2.171	3.611	3.337	1.165	2.251	1.086	2.865
9:55:49	221.4	0.561	73.8	5.677	9.00	44.8482	211.9	2.197	2.175	3.615	3.343	1.166	2.254	1.088	2.867
10:02:21	221.9	0.567	73.5	5.670	9.10	44.8974	212.4	2.200	2.178	3.618	3.364	1.185	2.275	1.090	2.839
10:08:53	223.5	0.573	73.7	5.664	9.20	44.9472	214.0	2.214	2.192	3.632	3.370	1.177	2.273	1.097	2.864
10:15:23	223.3	0.579	73.6	5.658	9.30	44.9966	213.8	2.210	2.187	3.627	3.366	1.177	2.271	1.094	2.859
10:21:44	224.5	0.585	73.4	5.652	9.40	45.0460	215.0	2.220	2.197	3.637	3.391	1.193	2.292	1.099	2.842
10:28:04	225.2	0.592	73.6	5.645	9.50	45.0961	215.7	2.224	2.201	3.641	3.387	1.184	2.285	1.101	2.860
10:34:19	225.7	0.598	73.5	5.639	9.60	45.1460	216.2	2.227	2.204	3.644	3.392	1.187	2.289	1.103	2.858
10:40:40	226.4	0.604	73.3	5.633	9.70	45.1957	216.9	2.232	2.208	3.648	3.410	1.200	2.305	1.105	2.841
10:47:05	226.7	0.610	73.4	5.627	9.80	45.2458	217.2	2.233	2.209	3.649	3.408	1.197	2.303	1.105	2.846
10:53:28	227.6	0.617	73.3	5.621	9.90	45.2962	218.1	2.239	2.214	3.654	3.418	1.202	2.310	1.108	2.843
10:59:58	228.6	0.623	73.1	5.614	10.00	45.3464	219.1	2.246	2.222	3.662	3.438	1.214	2.326	1.112	2.831
11:06:20	229.2	0.629	73.1	5.608	10.10	45.3969	219.7	2.250	2.226	3.666	3.443	1.215	2.329	1.114	2.833
11:12:53	230.3	0.635	73.1	5.602	10.20	45.4478	220.8	2.259	2.235	3.675	3.453	1.217	2.335	1.118	2.838
11:19:20	231.1	0.642	72.9	5.596	10.30	45.4986	221.6	2.265	2.240	3.680	3.471	1.230	2.351	1.121	2.822
11:25:50	231.9	0.648	72.9	5.589	10.40	45.5489	222.4	2.271	2.246	3.686	3.477	1.230	2.353	1.124	2.828
11:32:18	232.6	0.654	72.9	5.583	10.50	45.6003	223.1	2.275	2.249	3.689	3.482	1.231	2.357	1.125	2.828
11:38:43	233.4	0.660	72.8	5.577	10.60	45.6511	223.9	2.281	2.255	3.695	3.498	1.242	2.370	1.128	2.817
11:45:06	233.9	0.667	72.8	5.571	10.70	45.7023	224.4	2.283	2.257	3.697	3.496	1.238	2.367	1.129	2.824
11:51:29	234.4	0.673	72.8	5.564	10.80	45.7533	224.9	2.286	2.260	3.700	3.500	1.239	2.370	1.131	2.825
11:57:49	234.8	0.679	72.6	5.558	10.90	45.8046	225.3	2.288	2.261	3.701	3.513	1.250	2.381	1.131	2.810
12:04:14	235.1	0.685	72.7	5.552	11.00	45.8561	225.6	2.288	2.261	3.701	3.512	1.249	2.380	1.131	2.812
12:10:39	236.0	0.692	72.7	5.546	11.10	45.9077	226.5	2.294	2.267	3.707	3.517	1.248	2.383	1.134	2.817
12:17:07	236.6	0.698	72.5	5.539	11.20	45.9594	227.1	2.298	2.270	3.710	3.530	1.258	2.394	1.136	2.806
12:23:37	237.1	0.704	72.6	5.533	11.30	46.0113	227.6	2.300	2.273	3.713	3.530	1.255	2.393	1.137	2.812
12:30:02	237.7	0.710	72.6	5.527	11.40	46.0634	228.2	2.304	2.276	3.716	3.533	1.255	2.394	1.139	2.814
12:36:18	238.1	0.717	72.4	5.521	11.50	46.1154	228.7	2.306	2.278	3.718	3.545	1.266	2.405	1.140	2.801
12:42:40	238.8	0.723	72.4	5.514	11.60	46.1676	229.3	2.309	2.281	3.721	3.547	1.264	2.406	1.141	2.805
12:49:03	239.4	0.729	72.4	5.508	11.70	46.2199	229.9	2.313	2.284	3.724	3.550	1.265	2.408	1.143	2.807
12:55:28	239.5	0.735	72.3	5.502	11.80	46.2723	230.0	2.311	2.282	3.722	3.557	1.273	2.415	1.142	2.794
13:01:51	240.2	0.741	72.4	5.496	11.90	46.3247	230.7	2.316	2.287	3.727	3.559	1.271	2.415	1.144	2.801

Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Consolidation Values			Final Values		
Height	6.238 (in.)	15.845 (cm)	Height	5.171 (in.)	
Diameter	2.838 (in)	7.208 (cm)	Dia. avg.	3.105 (in)	
Area	6.326 (in^2)	40.811 (cm^2)	Area avg.	7.572 (in^2)	

Tested By	KDG
Date	1-20-10
Press No.	2
Panel No.	D

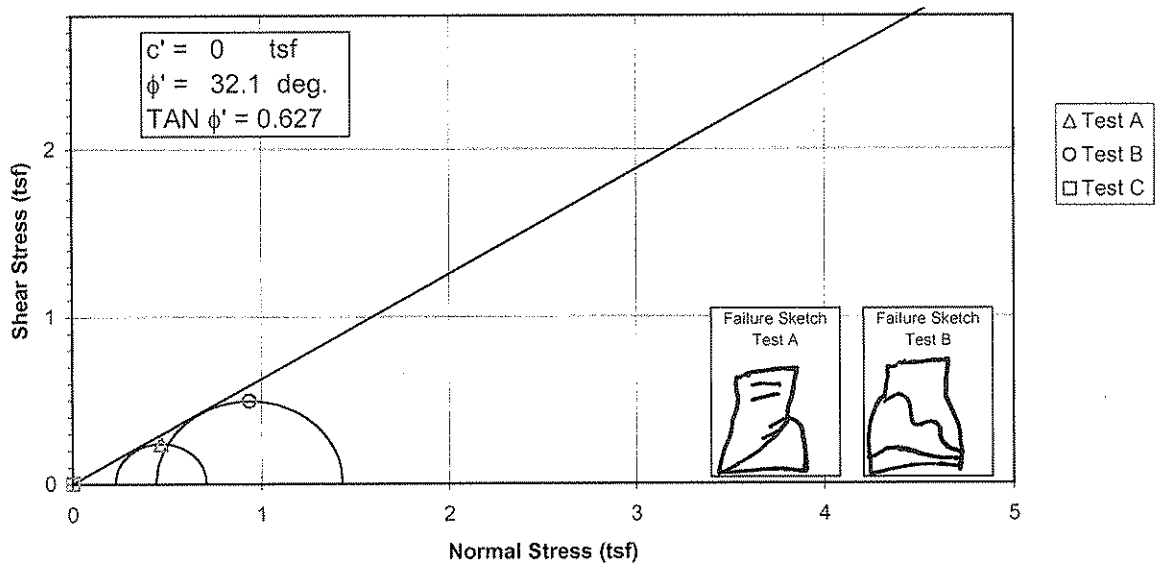
Project Number	175569040
Test Number	CU-1C
Data File ID	1C
Lateral Pressure (psi)	20.0
Chamber Pressure - σ_3 (psi)	90

Clock Time (min.)	Load (lbf)	Deflection Dial Reading (in.)	Pore Pressure Reading (psi)	Corrected Hieght (in.)	Strain (%)	Corrected Area (cm^2)	Corrected Load (lbf)	Deviator Stress (tsf)	Corrected Deviator Stress* (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p' $(\sigma_1'+\sigma_3')/2$ (tsf)	q $(\sigma_1-\sigma_3)/2$ (tsf)	Effective Principal Stress Ratio σ_1'/σ_3'
13:08:16	241.0	0.748	72.3	5.489	12.00	46.3777	231.5	2.321	2.292	3.732	3.570	1.276	2.423	1.147	2.797
13:14:36	241.2	0.754	72.2	5.483	12.10	46.4301	231.7	2.320	2.291	3.731	3.574	1.281	2.427	1.146	2.789
13:20:57	241.1	0.760	72.3	5.477	12.20	46.4831	231.6	2.317	2.288	3.728	3.567	1.278	2.423	1.145	2.791
13:27:24	242.2	0.766	72.1	5.471	12.30	46.5364	232.7	2.326	2.296	3.736	3.586	1.289	2.437	1.149	2.783
13:33:47	242.5	0.773	72.1	5.465	12.40	46.5893	233.0	2.325	2.295	3.735	3.585	1.289	2.437	1.148	2.782
13:40:10	243.3	0.779	72.2	5.458	12.50	46.6427	233.8	2.331	2.301	3.741	3.587	1.285	2.436	1.151	2.792
13:46:37	243.3	0.785	71.9	5.452	12.60	46.6962	233.8	2.329	2.298	3.738	3.605	1.306	2.455	1.150	2.761
13:53:07	243.8	0.791	72.0	5.446	12.70	46.7493	234.3	2.330	2.299	3.739	3.596	1.295	2.446	1.150	2.777
13:59:49	244.5	0.798	72.1	5.440	12.80	46.8031	235.0	2.335	2.304	3.744	3.596	1.291	2.443	1.153	2.786
14:06:15	245.0	0.804	71.8	5.433	12.90	46.8569	235.5	2.337	2.306	3.746	3.619	1.311	2.465	1.154	2.760
14:12:37	245.3	0.810	71.9	5.427	13.00	46.9105	235.8	2.337	2.306	3.746	3.611	1.304	2.458	1.154	2.769
14:19:00	245.6	0.816	71.9	5.421	13.10	46.9647	236.1	2.337	2.305	3.745	3.611	1.304	2.458	1.154	2.769
14:25:30	246.2	0.823	71.5	5.415	13.20	47.0189	236.7	2.341	2.309	3.749	3.645	1.334	2.490	1.155	2.732
14:31:50	247.1	0.829	71.7	5.408	13.30	47.0730	237.6	2.347	2.314	3.754	3.632	1.316	2.474	1.158	2.759
14:38:13	247.7	0.835	71.7	5.402	13.40	47.1275	238.2	2.351	2.318	3.758	3.638	1.318	2.478	1.160	2.760
14:44:43	248.7	0.841	71.4	5.396	13.50	47.1821	239.2	2.358	2.325	3.765	3.666	1.339	2.503	1.163	2.737
14:51:11	249.4	0.848	71.6	5.390	13.60	47.2367	239.9	2.362	2.329	3.769	3.657	1.327	2.492	1.165	2.757
14:57:36	249.8	0.854	71.6	5.383	13.70	47.2914	240.4	2.363	2.330	3.770	3.657	1.325	2.491	1.166	2.759
15:04:01	250.5	0.860	71.3	5.377	13.80	47.3461	241.0	2.367	2.333	3.773	3.680	1.346	2.513	1.167	2.735
15:10:29	251.2	0.866	71.5	5.371	13.90	47.4014	241.7	2.371	2.337	3.777	3.671	1.333	2.502	1.169	2.755
15:16:49	251.4	0.873	71.5	5.365	14.00	47.4564	241.9	2.370	2.336	3.776	3.670	1.332	2.501	1.169	2.755
15:23:09	252.1	0.879	71.3	5.358	14.10	47.5115	242.6	2.374	2.340	3.780	3.690	1.348	2.519	1.171	2.737
15:29:29	252.2	0.885	71.4	5.352	14.20	47.5669	242.7	2.373	2.338	3.778	3.681	1.341	2.511	1.170	2.745
15:36:03	252.8	0.891	71.4	5.346	14.30	47.6228	243.3	2.375	2.341	3.781	3.683	1.341	2.512	1.171	2.747
15:42:28	253.7	0.898	71.2	5.340	14.40	47.6785	244.2	2.382	2.347	3.787	3.701	1.353	2.527	1.174	2.736
15:48:48	254.4	0.904	71.3	5.333	14.51	47.7344	244.9	2.385	2.350	3.790	3.698	1.346	2.522	1.176	2.747
15:55:06	254.7	0.910	71.3	5.327	14.60	47.7898	245.3	2.386	2.351	3.791	3.700	1.347	2.523	1.176	2.746
16:01:24	255.6	0.916	71.1	5.321	14.70	47.8461	246.1	2.392	2.356	3.796	3.716	1.358	2.537	1.179	2.736
16:07:42	256.0	0.922	71.2	5.315	14.80	47.9022	246.5	2.393	2.357	3.797	3.714	1.355	2.534	1.179	2.740
16:14:04	256.5	0.929	71.2	5.309	14.90	47.9585	247.0	2.395	2.359	3.799	3.715	1.354	2.534	1.180	2.743
16:20:32	256.6	0.935	71.0	5.302	15.00	48.0147	247.1	2.393	2.356	3.796	3.723	1.365	2.544	1.179	2.728
16:26:57	257.4	0.941	71.1	5.296	15.10	48.0713	247.9	2.398	2.362	3.802	3.724	1.361	2.543	1.182	2.736
16:33:26	257.3	0.947	71.1	5.290	15.20	48.1283	247.8	2.394	2.357	3.797	3.721	1.362	2.541	1.179	2.732
16:39:59	257.7	0.954	71.0	5.284	15.30	48.1848	248.2	2.395	2.358	3.798	3.729	1.370	2.550	1.180	2.722
16:46:31	258.3	0.960	71.0	5.277	15.41	48.2424	248.8	2.398	2.361	3.801	3.731	1.368	2.549	1.181	2.727
16:53:06	258.9	0.966	71.0	5.271	15.51	48.2995	249.4	2.401	2.363	3.803	3.733	1.368	2.550	1.182	2.729
16:59:38	259.2	0.972	70.9	5.265	15.60	48.3563	249.7	2.401	2.363	3.803	3.741	1.376	2.559	1.182	2.718
17:06:08	259.3	0.979	70.9	5.259	15.70	48.4136	249.8	2.399	2.361	3.801	3.735	1.373	2.554	1.181	2.721
17:12:47	259.7	0.985	70.9	5.252	15.80	48.4713	250.2	2.400	2.362	3.802	3.736	1.373	2.555	1.182	2.722
17:19:22	260.4	0.991	70.8	5.246	15.90	48.5288	250.9	2.404	2.366	3.806	3.750	1.382	2.566	1.184	2.713
17:26:02	261.1	0.997	70.8	5.240	16.00	48.5868	251.6	2.408	2.369	3.809	3.751	1.380	2.565	1.185	2.718
17:32:42	261.1	1.004	70.8	5.234	16.10	48.6444	251.6	2.405	2.366	3.806	3.747	1.380	2.564	1.184	2.715
17:39:19	261.8	1.010	70.7	5.227	16.21	48.7029	252.3	2.409	2.369	3.809	3.762	1.391	2.576	1.185	2.705
17:45:54	262.7	1.016	70.7	5.221	16.30	48.7607	253.2	2.415	2.375	3.815	3.763	1.387	2.575	1.188	2.714
17:52:31	263.3	1.022	70.7	5.215	16.40	48.8192	253.8	2.418	2.378	3.818	3.766	1.387	2.577	1.190	2.716
17:59:01	263.9	1.029	70.6	5.209	16.51	48.8778	254.4	2.420	2.380	3.820	3.777	1.396	2.587	1.191	2.706
18:05:26	263.9	1.035	70.7	5.202	16.60	48.9364	254.5	2.418	2.377	3.817	3.772	1.393	2.582	1.190	2.708
18:11:59	264.6	1.041	70.6	5.196	16.70	48.9950	255.1	2.421	2.380	3.820	3.775	1.393	2.584	1.191	2.709
18:18:22	265.1	1.047	70.5	5.190	16.80	49.0539	255.6	2.423	2.382	3.822	3.784	1.401	2.593	1.192	2.701
18:24:44	265.2	1.053	70.6	5.184	16.91	49.1132	255.8	2.421	2.380	3.820	3.782	1.400	2.591	1.191	2.701
18:31:02	265.9	1.060	70.5	5.177	17.01	49.1726	256.4	2.425	2.384	3.824	3.788	1.402	2.595	1.193	2.701
18:37:20	266.1	1.066	70.4	5.171	17.11	49.2316	256.6	2.424	2.382	3.822	3.792	1.408	2.600	1.192	2.693

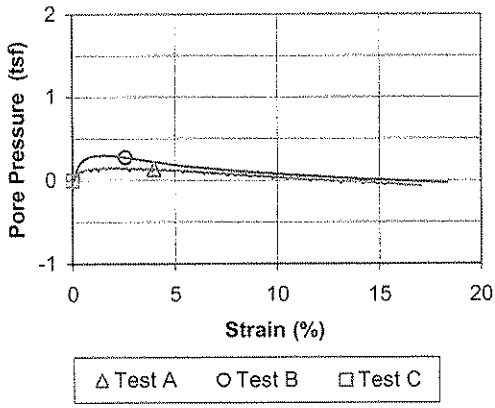
EM 1110-2-1906
Appendix X
30 Nov. 70

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	22.6	22.8		
	Dry Density PCF	γ_{d_o}	100.1	99.6		
	Saturation %	S_o	83.9	83.8		
	Void Ratio	e_o	0.759	0.768		
After Shear	Water content %	W_f	23.8	24.2		
	Dry Density PCF	γ_{d_f}	105.4	104.6		
	Saturation %	S_f	100.0	100.0		
	Void Ratio	e_f	0.670	0.683		
	Final Back Pressure TSF	u_c	6.12	5.76	0.00	
Minor Principal Stress TSF @ failure		σ_3'f	0.23	0.44	0.00	
Maximum Deviator Stress (tsf) @ failure		$(\sigma_1'-\sigma_3')_{max}$	0.48	0.99	0.00	
Time to $(\sigma 1'-\sigma 3')$max min.		t_f	101.6	96.1	0.0	
Ultimate Deviator Stress, t/sq ft		$(\sigma 1'-\sigma 3')_{ult}$	n/a	n/a	0.00	
Initial Diameter, in.		D_o	2.892	2.873		
Initial Height, in.		H_o	6.141	6.192		

Controlled - Strain Test

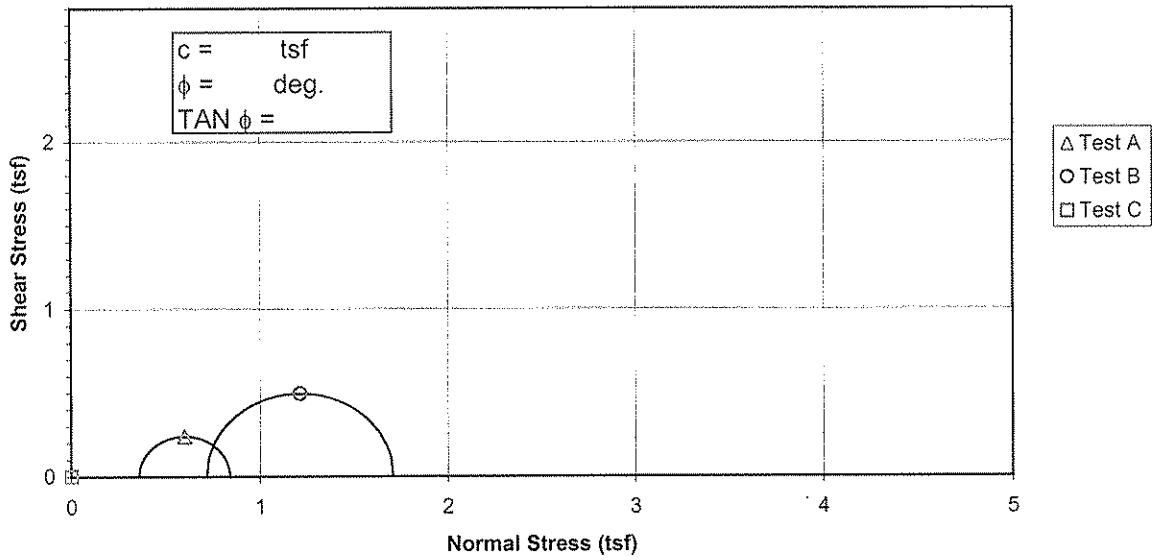
Description of Specimens: Silt (ML), gray brown, moist, firm, mine spoil

				Type of Specimen: Undisturbed	Type of test: R
LL	PL	PI	Gs 2.82	Project: PAF- Scrubber Sludge Complex	
Remarks:				Boring No. STN-24A/ST-1, STN-21A/ST-1	
					Sample No. 4
				Depth Elev. 5.0'-5.5', 5.5'-6.0'	
				Laboratory Stantec	Date 1-29-10
				TRIAXIAL COMPRESSION TEST REPORT	

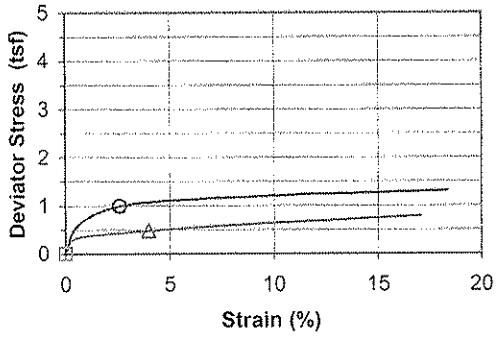
EM 1110-2-1906
Appendix X
30 Nov. 70

Failure Criterion: Maximum Effective Principal Stress Ratio

Total Strength Envelope



Deviator Stress vs. Strain



Specimen No.			A	B	C	
Initial Data	Water content %	W_o	22.6	22.8		
	Dry Density PCF	γ_{d_o}	100.1	99.6		
	Saturation %	S_o	83.9	83.8		
	Void Ratio	e_o	0.759	0.768		
After Shear	Water content %	W_f	23.8	24.2		
	Dry Density PCF	γ_{d_f}	105.4	104.6		
	Saturation %	S_f	100.0	100.0		
	Void Ratio	e_f	0.670	0.683		
	Final Back Pressure TSF	u_c	6.12	5.76	0.00	
Minor Principal Stress TSF		σ_3	0.36	0.72	0.00	
Maximum Deviator Stress (tsf) @ failure		$(\sigma_1-\sigma_3)_{max}$	0.48	0.99	0.00	
Time to $(\sigma_1-\sigma_3)_{Max.}$ min.		t_f	101.6	96.1	0.0	
Ultimate Deviator Stress, t/sq ft		$(\sigma_1-\sigma_3)_{ult}$	n/a	n/a	0.00	
Initial Diameter, in.		D_o	2.892	2.873		
Initial Height, in.		H_o	6.141	6.192		

Controlled - Strain Test

Description of Specimens: Silt (ML), gray brown, moist, firm, mine spoil

LL	PL	PI	Gs 2.82

Remarks:

Type of Specimen: Undisturbed — Type of test: R

Project: PAF- Scrubber Sludge Complex

Boring No. STN-24A/ST-1, STN-21A/ST-1

Sample No. 4

Depth Elev. 5.0'-5.5', 5.5'-6.0'

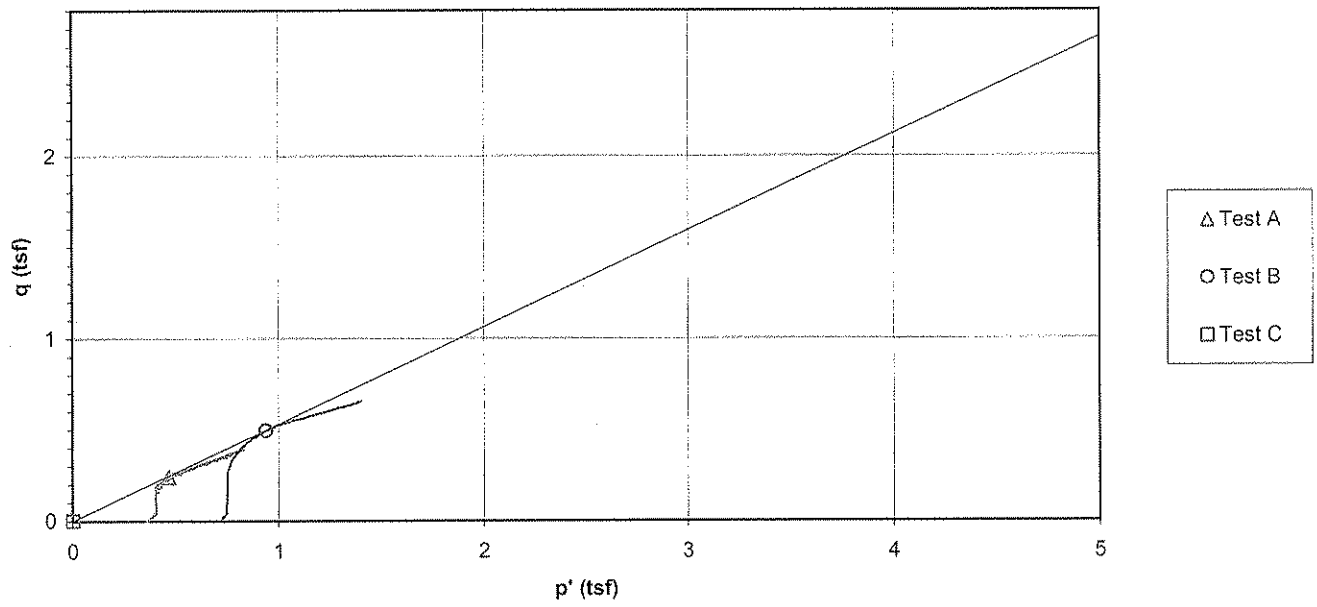
Laboratory: Stantec — Date: 1-29-10

TRIAXIAL COMPRESSION TEST REPORT

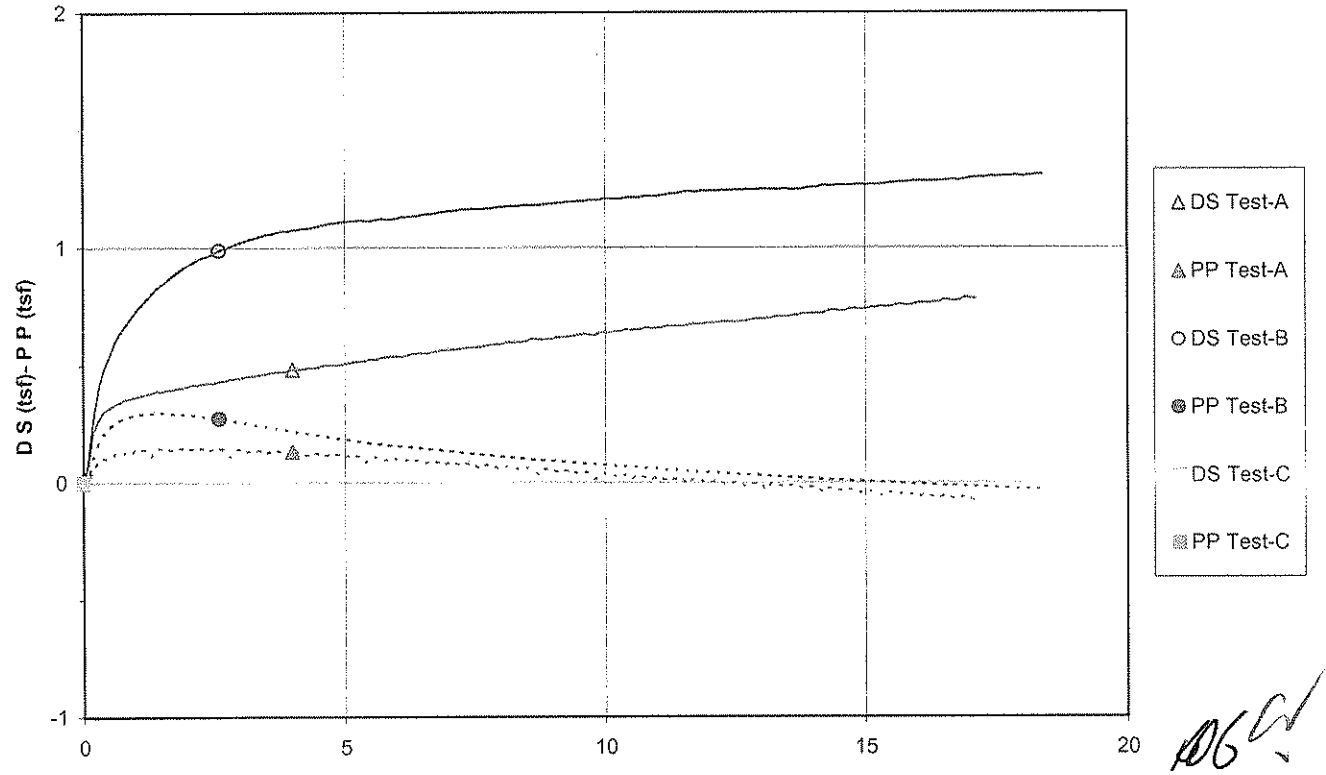
Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Project	PAF- Scrubber Sludge Complex	Project No.	175569040
Sample ID	STN-24A/ST-1, 5.0'-5.5' & STN-21A/ST-1, 5.0'-5.5'	Test Number	4
Failure Criterion:	Maximum Effective Principal Stress Ratio	ϕ' = 32.1 deg.	c' = 0.00 tsf

p' vs. q Plot



Deviator Stress and Induced Pore Pressure vs. Axial Strain



Consolidated Undrained Triaxial Test

ASTM D4767-04

Project Name	PAF- Scrubber Sludge Complex	Project Number	175569040
Sample Identification	STN-24A/ST-1, 5.0'-5.5'	Test Number	CU-4A
Visual Description	Silt (ML), gray brown, moist, firm, mine spoil	Prepared By	RJ/RM
	STN-24A/ST-1, 5.0'-7.0'	Date	1-11-2010

Specific Gravity 2.82 ASTM D854 Method A Liquid Limit N/A Plastic Limit N/A Plasticity Index N/A

Initial Specimen Data

Specimen Diameter (in.)		Specimen Height (in.)		Volumes (in^3)		Specimen	
Top	2.891	1	6.150	Sample	40.3459 (V_o)	Wet Weight (g)	1298.99
Middle	2.891	2	6.118	Solids	22.9298 (VS_o)	Dry Weight (g)	1059.68
Bottom	2.895	3	6.145	Water	14.6024 (Vw_o)	Wet Unit Weight (pcf)	122.7
Avg.	2.8923 (D_o)	4	6.150	Voids	17.4161 (Vv_o)	Dry Unit Weight (pcf)	100.1
Area (in^2)	6.5703 (A_o)	Avg. (H_o)	6.1406	Degree of Saturation (%)	83.8 (S_o)		
Moisture Content (%)	22.6	Final Trimmings		Void Ratio	0.760		

Saturation

Set Up & Saturated: Wet xx Dry

Back Pressure Saturated to: 85 (psi) Final Pore Pressure Parameter B 0.96

Set up By KDG

Date 1-22-10

Panel Board Number D

Height Readings (in.)		Back Pressure Burette		Chamber Burette			
Initial	0.1329	Initial	15.73 (in.)	Initial	10.81 (in.)	Specimen Height (in.)	6.1390 (H_s)
Final	0.1345	Final	2.75 (in.)	Final	8.82 (in.)	Area (in^2) Method A	6.5669 (A_s)
Change	-0.0016 (ΔH_o)	Change	-12.98 (in.)	Change	-1.99 (in.)	Specimen Volume (in^3)	40.31 (Vs)

Consolidation

Height Readings (in.)		Back Pressure Burette Readings		Chamber Burette Readings		Pressures (psi)	
Initial	0.1345	Initial	1.22 (in.)	Initial	17.76 (in.)	Chamber	90
Final	0.1443	Final	3.28 (in.)	Final	15.58 (in.)	Back	85
Change	-0.0098 (ΔH_c)	Change	-2.06 (in.)	Change	-2.18 (in.)	Lateral	5 (σ_3)
Height (in.)	6.1292 (H_c)			Volume (in^3)	38.2876 (V_c)		
Area (in^3) Method B	6.2467 (A_c)			Volume - Water (in^3)	15.3579 (VWc)	t_{50} (min.)	2.7
Diameter (in.)	2.8202 (D_c)			Water Content (%)	23.8		
Dry Density (pcf)	105.4			Degree of Saturation (%)	100.0 (S_c)	Void Ratio	0.670

After Test

Final Measurements		Final Moisture Content	
Maximum Diameter	3.453 (in.)	Wet Weight (g)	1311.37
Wet weight (g)	1311.37 (WWf)	Dry Weight (g)	1059.68
Corrected Diameter	3.429 (in.)	Tare Weight (g)	0.00

Stresses (membrane corrected) at Failure (psi)

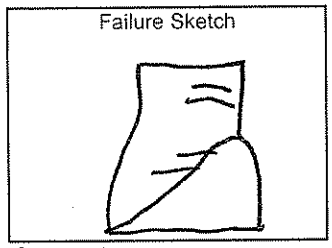
Corrected Deviator	0.48 σ_d (tsf)
Major Principal	0.71 $\sigma_1'_f$ (tsf)
Minor Principal	0.23 $\sigma_3'_f$ (tsf)
Rate of Strain (% / min.)	0.039
Axial Strain at Failure (%)	4.00

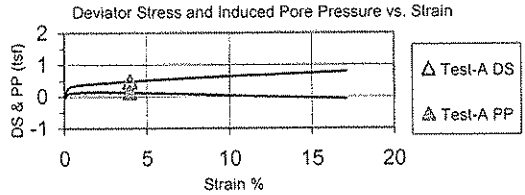
Youngs Modulus for Membrane (psi) 200

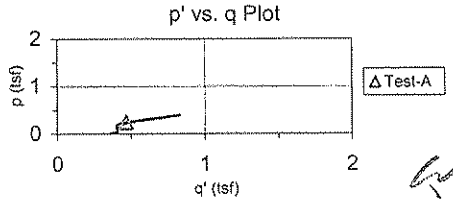
Membrane Thickness (in.) 0.012

Failure Criterion: Maximum Effective Principal Stress Ratio

Failure Sketch







Comments:

Consolidated Undrained Triaxial Test

ASTM D4767-04

Project Name	PAF- Scrubber Sludge Complex	Project Number	175569040
Sample Identification	STN-21A/ST-1, 5.0'-5.5'	Test Number	CU-4B
Visual Description	Gravelly Lean Clay (CL), gray brown, moist, firm 5.8'-6.0' Silt (ML), gray brown, moist, firm	Prepared By	RJ
	STN-21A/ST-1, 5.0'-7.0'	Date	1-8-2010

Specific Gravity 2.82 ASTM D854 Method A Liquid Limit N/A Plastic Limit N/A Plasticity Index N/A

Initial Specimen Data

Specimen Diameter (in.)		Specimen Height (in.)		Volumes (in3)		Specimen	
Top	2.875	1	6.163	Sample	40.1567 (V_o)	Wet Weight (g)	1288.32
Middle	2.870	2	6.242	Solids	22.6970 (VS_o)	Dry Weight (g)	1048.93
Bottom	2.876	3	6.200	Water	14.6077 (Vw_o)	Wet Unit Weight (pcf)	122.2
Avg.	2.8737 (D_o)	4	6.163	Voids	17.4597 (Vv_o)	Dry Unit Weight (pcf)	99.5
Area (in^2)	6.4858 (A_o)	Avg. (H_o)	6.1915	Degree of Saturation (%)	83.7 (S_o)		
Moisture Content (%)	22.8	Final Trimmings		Void Ratio	0.769		

Saturation

Set Up & Saturated: Wet xx Dry

Back Pressure Saturated to: 80 (psi) Final Pore Pressure Parameter B 0.96 Set up By KDG Date 1-26-10 Panel Board Number C

Height Readings (in.)		Back Pressure Burette		Chamber Burette			
Initial	0.1243	Initial	15.91 (in.)	Initial	11.82 (in.)	Specimen Height (in.)	6.1895 (H_s)
Final	0.1263	Final	8.7 (in.)	Final	8.93 (in.)	Area (in^2) Method A	6.4816 (A_s)
Change	-0.0020 (ΔH_o)	Change	-7.21 (in.)	Change	-2.89 (in.)	Specimen Volume (in^3)	40.12 (V_s)

Consolidation

Height Readings (in.)		Back Pressure Burette Readings		Chamber Burette Readings		Pressures (psi)	
Initial	0.1263	Initial	1.81 (in.)	Initial	17.65 (in.)	Chamber	90
Final	0.1699	Final	5.56 (in.)	Final	12.91 (in.)	Back	80
Change	-0.0436 (ΔH_c)	Change	-3.75 (in.)	Change	-4.74 (in.)	Lateral	10 (σ_3)
Height (in.)	6.1459 (H_c)			Volume (in^3)	38.2011 (V_c)		
Area (in^3) Method B	6.2157 (A_c)			Volume - Water (in^3)	15.5041 (VWc)	D_{50} (min.)	16
Diameter (in.)	2.8132 (D_c)			Water Content (%)	24.2		
Dry Density (pcf)	104.6			Degree of Saturation (%)	100.0 (S_c)	Void Ratio	0.683

After Test

Final Measurements		Final Moisture Content	
Maximum Diameter	3.526 (in.)	Wet Weight (g)	1303.01
Wet weight (g)	1303.01 (WWf)	Dry Weight (g)	1048.93
Corrected Diameter	3.502 (in.)	Tare Weight (g)	0.00

Stresses (membrane corrected) at Failure (psi)

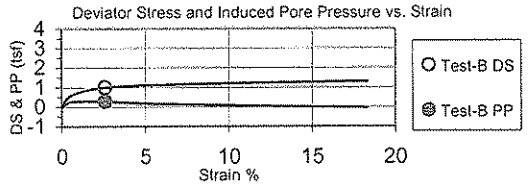
Corrected Deviator	0.99 σ_d (tsf)
Major Principal	1.43 $\sigma_1'_f$ (tsf)
Minor Principal	0.44 $\sigma_3'_f$ (tsf)
Rate of Strain (% / min.)	0.027
Axial Strain at Failure (%)	2.60

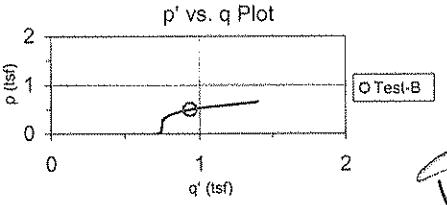
Youngs Modulus for Membrane (psi) 200

Membrane Thickness (in.) 0.012

Failure Criterion: Maximum Effective Principal Stress Ratio

Failure Sketch





Comments:

Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Consolidation Values			Final Values		Tested By	KDG	Project Number	175569040
Height	6.129 (in.)	15.568 (cm)	Height	5.081 (in.)	Date	1-25-10	Test Number	CU-4A
Diameter	2.820 (in)	7.164 (cm)	Dia. avg.	3.237 (in)	Press No.	2	Data File ID	4A
Area	6.247 (in^2)	40.304 (cm^2)	Area avg.	8.227 (in^2)	Panel No.	D	Lateral Pressure (psi)	5.0
							Chamber Pressure - σ_3 (psi)	90

Clock Time (min.)	Load (lbf)	Deflection Dial Reading (in.)	Pore Pressure Reading (psi)	Corrected Hieght (in.)	Strain (%)	Corrected Area (cm^2)	Corrected Load (lbf)	Deviator Stress (tsf)	Corrected Deviator Stress* (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p' $(\sigma_1'+\sigma_3')/2$ (tsf)	q $(\sigma_1-\sigma_3)/2$ (tsf)	Effective Principal Stress Ratio σ_1'/σ_3'
0:00:00	12.6	-0.003	85.0	6.129	0.00	40.3039	0.0	0.000	0.000	0.360	0.360	0.363	0.362	-0.002	0.991
0:02:53	19.9	0.003	84.9	6.123	0.10	40.3444	7.3	0.084	0.084	0.444	0.450	0.370	0.410	0.040	1.218
0:05:22	31.9	0.010	85.9	6.117	0.20	40.3858	19.4	0.223	0.222	0.582	0.515	0.296	0.406	0.110	1.740
0:07:55	36.4	0.016	86.3	6.111	0.30	40.4267	23.9	0.275	0.274	0.634	0.539	0.269	0.404	0.135	2.007
0:10:24	39.1	0.022	86.4	6.105	0.40	40.4663	26.6	0.305	0.304	0.664	0.559	0.258	0.408	0.151	2.169
0:12:50	40.5	0.028	86.4	6.098	0.50	40.5070	27.9	0.320	0.319	0.679	0.577	0.261	0.419	0.158	2.210
0:15:21	41.7	0.034	86.7	6.092	0.60	40.5480	29.1	0.334	0.332	0.692	0.570	0.241	0.406	0.165	2.365
0:17:52	42.7	0.040	86.8	6.086	0.70	40.5898	30.2	0.346	0.344	0.704	0.574	0.233	0.403	0.170	2.461
0:20:20	43.9	0.046	86.8	6.080	0.80	40.6292	31.3	0.358	0.356	0.716	0.586	0.233	0.409	0.176	2.517
0:22:49	44.1	0.053	86.5	6.074	0.90	40.6702	31.6	0.361	0.359	0.719	0.604	0.249	0.426	0.178	2.429
0:25:15	44.8	0.059	86.9	6.068	1.00	40.7117	32.2	0.368	0.365	0.725	0.586	0.224	0.405	0.181	2.618
0:27:46	45.4	0.065	86.9	6.062	1.10	40.7523	32.8	0.374	0.371	0.731	0.589	0.220	0.405	0.184	2.670
0:30:17	45.9	0.071	86.9	6.055	1.20	40.7954	33.4	0.380	0.377	0.737	0.598	0.223	0.410	0.187	2.676
0:32:40	46.4	0.077	86.6	6.050	1.30	40.8349	33.8	0.385	0.382	0.742	0.626	0.248	0.437	0.189	2.529
0:35:21	47.2	0.083	87.0	6.043	1.40	40.8774	34.7	0.394	0.391	0.751	0.605	0.217	0.411	0.194	2.785
0:37:54	47.1	0.089	87.0	6.037	1.50	40.9188	34.5	0.392	0.388	0.748	0.600	0.215	0.407	0.192	2.793
0:40:25	47.7	0.095	86.9	6.031	1.60	40.9593	35.1	0.398	0.395	0.755	0.612	0.221	0.416	0.196	2.772
0:43:01	47.9	0.102	86.9	6.025	1.70	41.0012	35.4	0.401	0.397	0.757	0.618	0.225	0.421	0.197	2.753
0:45:34	48.5	0.108	87.0	6.019	1.80	41.0432	35.9	0.407	0.402	0.762	0.614	0.215	0.414	0.199	2.856
0:48:08	48.7	0.114	87.0	6.013	1.90	41.0851	36.2	0.409	0.405	0.765	0.616	0.215	0.416	0.201	2.867
0:50:36	49.4	0.120	86.9	6.007	2.00	41.1271	36.8	0.416	0.412	0.772	0.630	0.222	0.426	0.204	2.842
0:53:07	50.1	0.126	87.0	6.000	2.10	41.1690	37.5	0.424	0.418	0.778	0.632	0.217	0.425	0.208	2.914
0:55:43	50.1	0.132	87.0	5.994	2.20	41.2115	37.6	0.424	0.419	0.779	0.629	0.214	0.421	0.208	2.943
0:58:12	50.6	0.138	87.0	5.988	2.30	41.2529	38.0	0.429	0.423	0.783	0.636	0.217	0.426	0.210	2.938
1:00:43	50.9	0.144	86.8	5.982	2.40	41.2953	38.3	0.431	0.425	0.785	0.649	0.227	0.438	0.211	2.858
1:03:13	50.8	0.151	87.0	5.976	2.50	41.3377	38.2	0.430	0.424	0.784	0.637	0.217	0.427	0.210	2.935
1:05:47	51.5	0.157	87.0	5.970	2.60	41.3810	39.0	0.438	0.431	0.791	0.646	0.218	0.432	0.214	2.965
1:08:20	51.8	0.163	86.9	5.963	2.70	41.4240	39.3	0.441	0.434	0.794	0.652	0.222	0.437	0.215	2.944
1:10:51	52.5	0.169	86.5	5.957	2.80	41.4658	40.0	0.448	0.441	0.801	0.687	0.249	0.468	0.219	2.762
1:13:22	52.9	0.175	86.9	5.951	2.90	41.5086	40.3	0.451	0.444	0.804	0.661	0.220	0.441	0.221	3.004
1:15:55	53.0	0.181	86.9	5.945	3.00	41.5508	40.5	0.453	0.446	0.806	0.662	0.220	0.441	0.221	3.010
1:18:26	53.7	0.187	86.8	5.939	3.10	41.5937	41.1	0.460	0.452	0.812	0.677	0.228	0.452	0.225	2.973
1:21:00	53.9	0.194	86.8	5.933	3.20	41.6367	41.4	0.462	0.454	0.814	0.680	0.229	0.455	0.225	2.966
1:23:38	54.2	0.200	86.9	5.927	3.30	41.6801	41.6	0.465	0.457	0.817	0.677	0.224	0.450	0.227	3.026
1:26:09	54.7	0.206	86.8	5.921	3.40	41.7226	42.1	0.470	0.461	0.821	0.685	0.227	0.456	0.229	3.016
1:28:44	55.1	0.212	86.7	5.915	3.50	41.7659	42.5	0.473	0.465	0.825	0.701	0.239	0.470	0.231	2.927
1:31:23	55.5	0.218	86.9	5.908	3.60	41.8105	42.9	0.477	0.468	0.828	0.690	0.225	0.458	0.232	3.064
1:33:54	56.0	0.224	86.9	5.902	3.70	41.8531	43.4	0.482	0.473	0.833	0.695	0.225	0.460	0.235	3.087
1:36:25	55.9	0.230	86.8	5.896	3.80	41.8962	43.4	0.481	0.472	0.832	0.700	0.231	0.466	0.234	3.026
1:38:58	56.5	0.237	86.4	5.890	3.90	41.9406	43.9	0.487	0.477	0.837	0.730	0.256	0.493	0.237	2.852
1:41:34	57.1	0.243	86.8	5.884	4.00	41.9836	44.5	0.493	0.483	0.843	0.709	0.229	0.469	0.240	3.092
1:44:05	57.2	0.249	86.8	5.878	4.10	42.0278	44.6	0.493	0.483	0.843	0.711	0.231	0.471	0.240	3.082
1:46:36	57.4	0.255	86.7	5.872	4.20	42.0716	44.8	0.495	0.485	0.845	0.720	0.238	0.479	0.241	3.023
1:49:05	57.8	0.261	86.6	5.866	4.30	42.1151	45.2	0.499	0.489	0.849	0.732	0.247	0.490	0.243	2.964
1:51:40	58.0	0.267	86.7	5.859	4.40	42.1596	45.4	0.501	0.490	0.850	0.723	0.236	0.479	0.244	3.068
1:54:09	58.4	0.273	86.7	5.853	4.50	42.2033	45.8	0.505	0.494	0.854	0.729	0.239	0.484	0.245	3.055
1:56:40	59.2	0.279	86.6	5.847	4.60	42.2478	46.6	0.513	0.502	0.862	0.745	0.247	0.496	0.249	3.018
1:59:13	59.3	0.285	86.6	5.841	4.70	42.2922	46.7	0.513	0.502	0.862	0.743	0.244	0.493	0.249	3.043
2:01:47	59.4	0.292	86.6	5.835	4.80	42.3372	46.8	0.514	0.503	0.863	0.741	0.241	0.491	0.250	3.070
2:04:15	59.4	0.298	86.6	5.829	4.90	42.3809	46.8	0.514	0.502	0.862	0.743	0.245	0.494	0.249	3.037
2:06:46	59.9	0.304	86.4	5.823	5.00	42.4259	47.3	0.518	0.506	0.866	0.759	0.256	0.507	0.251	2.965
2:09:17	60.3	0.310	86.6	5.817	5.10	42.4703	47.8	0.523	0.510	0.870	0.754	0.246	0.500	0.254	3.057
2:11:51	61.0	0.316	86.6	5.810	5.20	42.5153	48.5	0.530	0.517	0.877	0.762	0.248	0.505	0.257	3.077
2:14:24	61.2	0.322	86.5	5.804	5.30	42.5610	48.6	0.531	0.518	0.878	0.766	0.252	0.509	0.257	3.046
2:16:55	61.3	0.328	86.2	5.798	5.40	42.6049	48.8	0.532	0.519	0.879	0.789	0.273	0.531	0.258	2.888
2:19:26	62.1	0.334	86.5	5.792	5.50	42.6500	49.6	0.540	0.527	0.887	0.775	0.251	0.513	0.262	3.083
2:21:59	61.9	0.341	86.5	5.786	5.60	42.6954	49.4	0.538	0.524	0.884	0.773	0.252	0.513	0.260	3.064
2:24:32	62.8	0.347	86.4	5.780	5.70	42.7414	50.2	0.546	0.532	0.892	0.789	0.260	0.525	0.265	3.033
2:27:06	63.1	0.353	86.3	5.774	5.80	42.7863	50.5	0.549	0.535	0.895	0.797	0.266	0.532	0.266	2.997
2:29:37	63.4	0.359	86.4	5.768	5.90	42.8314	50.9	0.552	0.538	0.898	0.793	0.258	0.526	0.267	3.070

Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Consolidation Values			Final Values			Tested By	KDG	Project Number	175569040
Height	6.129 (in.)	15.568 (cm)	Height	5.081 (in.)		Date	1-25-10	Test Number	CU-4A
Diameter	2.820 (in)	7.164 (cm)	Dia. avg.	3.237 (in)		Press No.	2	Data File ID	4A
Area	6.247 (in^2)	40.304 (cm^2)	Area avg.	8.227 (in^2)		Panel No.	D	Lateral Pressure (psi)	5.0
								Chamber Pressure - σ_3 (psi)	90

Clock Time (min.)	Load (lbf)	Deflection Dial Reading (in.)	Pore Pressure Reading (psi)	Corrected Hieght (in.)	Strain (%)	Corrected Area (cm^2)	Corrected Load (lbf)	Deviator Stress (tsf)	Corrected Deviator Stress* (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p' $(\sigma_1'+\sigma_3')/2$ (tsf)	q $(\sigma_1-\sigma_3')/2$ (tsf)	Effective Principal Stress Ratio σ_1' / σ_3'
2:32:10	63.5	0.365	86.4	5.761	6.00	42.8772	51.0	0.553	0.538	0.898	0.796	0.261	0.528	0.267	3.050
2:34:44	63.6	0.371	86.3	5.755	6.10	42.9232	51.1	0.553	0.538	0.898	0.804	0.268	0.536	0.268	2.993
2:37:17	64.1	0.377	86.3	5.749	6.20	42.9685	51.5	0.557	0.542	0.902	0.805	0.266	0.536	0.269	3.026
2:39:53	65.0	0.384	86.3	5.743	6.30	43.0145	52.4	0.567	0.551	0.911	0.812	0.264	0.538	0.274	3.073
2:42:26	65.0	0.390	86.3	5.737	6.40	43.0603	52.5	0.567	0.551	0.911	0.817	0.269	0.543	0.274	3.033
2:45:00	65.2	0.396	86.1	5.731	6.50	43.1063	52.7	0.568	0.552	0.912	0.832	0.283	0.558	0.274	2.938
2:47:35	65.2	0.402	86.2	5.725	6.60	43.1528	52.6	0.567	0.551	0.911	0.822	0.274	0.548	0.274	2.997
2:50:09	65.9	0.408	86.2	5.718	6.70	43.1987	53.3	0.574	0.558	0.918	0.825	0.270	0.548	0.277	3.051
2:52:42	66.4	0.414	86.1	5.712	6.80	43.2455	53.8	0.579	0.562	0.922	0.836	0.278	0.557	0.279	3.011
2:55:13	66.7	0.420	86.0	5.706	6.90	43.2922	54.1	0.581	0.564	0.924	0.848	0.287	0.568	0.280	2.952
2:57:46	66.9	0.426	86.2	5.700	7.00	43.3383	54.3	0.583	0.566	0.926	0.838	0.276	0.557	0.281	3.041
3:00:17	67.0	0.433	86.1	5.694	7.10	43.3846	54.5	0.584	0.566	0.926	0.841	0.278	0.560	0.281	3.022
3:02:51	67.5	0.439	86.0	5.688	7.20	43.4314	54.9	0.588	0.570	0.930	0.853	0.286	0.570	0.283	2.980
3:05:24	67.9	0.445	86.1	5.682	7.30	43.4791	55.3	0.592	0.574	0.934	0.853	0.282	0.568	0.285	3.021
3:07:57	68.2	0.451	86.1	5.676	7.40	43.5256	55.7	0.595	0.577	0.937	0.854	0.280	0.567	0.287	3.045
3:10:31	68.3	0.457	86.0	5.669	7.50	43.5723	55.7	0.595	0.576	0.936	0.860	0.286	0.573	0.287	3.001
3:13:07	68.5	0.463	85.8	5.663	7.60	43.6201	55.9	0.596	0.577	0.937	0.879	0.305	0.592	0.287	2.884
3:15:40	69.1	0.469	86.0	5.657	7.70	43.6669	56.5	0.602	0.583	0.943	0.867	0.287	0.577	0.290	3.019
3:18:16	69.6	0.475	86.0	5.651	7.80	43.7142	57.0	0.606	0.587	0.947	0.872	0.288	0.580	0.292	3.029
3:20:52	69.8	0.482	85.9	5.645	7.90	43.7620	57.2	0.608	0.589	0.949	0.882	0.296	0.589	0.293	2.978
3:23:25	70.0	0.488	85.7	5.639	8.00	43.8095	57.4	0.610	0.590	0.950	0.893	0.306	0.599	0.293	2.917
3:25:59	70.8	0.494	85.9	5.633	8.10	43.8568	58.2	0.617	0.597	0.957	0.888	0.294	0.591	0.297	3.018
3:28:37	70.9	0.500	85.9	5.627	8.20	43.9046	58.3	0.618	0.598	0.958	0.892	0.297	0.595	0.297	3.000
3:31:13	71.0	0.506	85.7	5.620	8.30	43.9526	58.4	0.618	0.597	0.957	0.900	0.306	0.603	0.297	2.942
3:33:48	71.3	0.512	85.8	5.614	8.40	44.0011	58.7	0.620	0.600	0.960	0.897	0.301	0.599	0.298	2.985
3:36:24	71.8	0.518	85.8	5.608	8.50	44.0492	59.2	0.625	0.604	0.964	0.900	0.300	0.600	0.300	3.005
3:39:00	72.8	0.525	85.8	5.602	8.60	44.0971	60.2	0.635	0.614	0.974	0.916	0.305	0.610	0.305	3.004
3:41:38	72.6	0.531	85.5	5.596	8.70	44.1460	60.0	0.632	0.611	0.971	0.934	0.327	0.631	0.304	2.859
3:44:09	72.6	0.537	85.8	5.590	8.80	44.1935	60.0	0.632	0.610	0.970	0.912	0.305	0.608	0.303	2.989
3:46:47	72.9	0.543	85.8	5.584	8.90	44.2425	60.3	0.634	0.612	0.972	0.915	0.306	0.610	0.305	2.992
3:49:18	73.1	0.549	85.6	5.578	9.00	44.2905	60.5	0.635	0.613	0.973	0.923	0.313	0.618	0.305	2.946
3:51:54	73.8	0.555	85.6	5.571	9.10	44.3398	61.3	0.643	0.620	0.980	0.936	0.318	0.626	0.309	2.942
3:54:30	73.9	0.561	85.7	5.565	9.20	44.3887	61.4	0.643	0.620	0.980	0.927	0.310	0.619	0.309	2.989
3:57:06	74.2	0.567	85.6	5.559	9.30	44.4371	61.6	0.645	0.622	0.982	0.933	0.315	0.624	0.309	2.967
3:59:42	74.6	0.574	85.5	5.553	9.40	44.4864	62.1	0.649	0.626	0.986	0.946	0.324	0.635	0.311	2.922
4:02:20	75.0	0.580	85.6	5.547	9.50	44.5358	62.5	0.652	0.629	0.989	0.944	0.318	0.631	0.313	2.965
4:04:56	75.4	0.586	85.6	5.541	9.60	44.5854	62.9	0.656	0.632	0.992	0.946	0.317	0.632	0.314	2.982
4:07:31	75.2	0.592	85.5	5.535	9.70	44.6343	62.7	0.653	0.629	0.989	0.950	0.324	0.637	0.313	2.933
4:10:10	75.1	0.598	85.2	5.528	9.80	44.6838	62.6	0.651	0.627	0.987	0.970	0.346	0.658	0.312	2.801
4:12:48	76.5	0.604	85.5	5.522	9.90	44.7334	63.9	0.665	0.640	1.000	0.961	0.324	0.642	0.318	2.968
4:15:24	76.4	0.610	85.5	5.516	10.00	44.7831	63.9	0.663	0.638	0.998	0.961	0.326	0.643	0.318	2.951
4:17:59	76.6	0.616	85.4	5.510	10.10	44.8326	64.0	0.664	0.639	0.999	0.969	0.333	0.651	0.318	2.911
4:20:35	77.1	0.623	85.4	5.504	10.20	44.8830	64.5	0.669	0.644	1.004	0.975	0.334	0.654	0.320	2.916
4:23:11	77.2	0.629	85.4	5.498	10.30	44.9330	64.6	0.669	0.644	1.004	0.970	0.330	0.650	0.320	2.944
4:25:47	78.0	0.635	85.4	5.492	10.40	44.9834	65.4	0.676	0.651	1.011	0.981	0.334	0.657	0.324	2.940
4:28:23	77.9	0.641	85.1	5.485	10.50	45.0337	65.3	0.674	0.649	1.009	0.998	0.352	0.675	0.323	2.831
4:30:56	78.3	0.647	85.3	5.479	10.60	45.0833	65.8	0.678	0.652	1.012	0.984	0.335	0.659	0.324	2.938
4:33:32	78.5	0.653	85.3	5.473	10.70	45.1339	65.9	0.679	0.653	1.013	0.986	0.336	0.661	0.325	2.934
4:36:08	79.2	0.659	85.2	5.467	10.80	45.1844	66.6	0.686	0.659	1.019	0.999	0.343	0.671	0.328	2.913
4:38:41	79.1	0.666	85.1	5.461	10.90	45.2352	66.5	0.684	0.657	1.017	1.003	0.350	0.676	0.327	2.870
4:41:17	79.3	0.672	85.3	5.455	11.00	45.2860	66.7	0.685	0.658	1.018	0.996	0.341	0.669	0.328	2.921
4:43:50	79.5	0.678	85.2	5.449	11.10	45.3369	66.9	0.686	0.659	1.019	1.001	0.345	0.673	0.328	2.900
4:46:28	80.4	0.684	85.1	5.443	11.20	45.3884	67.8	0.695	0.667	1.027	1.019	0.355	0.687	0.332	2.870
4:49:04	80.3	0.690	85.2	5.436	11.30	45.4401	67.7	0.693	0.666	1.026	1.011	0.348	0.679	0.331	2.902
4:51:38	80.7	0.696	85.2	5.430	11.40	45.4909	68.1	0.696	0.668	1.028	1.013	0.348	0.680	0.332	2.912
4:54:13	80.6	0.702	85.1	5.424	11.50	45.5430	68.0	0.695	0.666	1.026	1.016	0.353	0.685	0.332	2.876
4:56:47	81.1	0.708	84.8	5.418	11.60	45.5938	68.6	0.699	0.671	1.031	1.044	0.376	0.710	0.334	2.776
4:59:20	81.6	0.715	85.1	5.412	11.70	45.6454	69.1	0.704	0.675	1.035	1.024	0.353	0.688	0.336	2.905
5:01:54	81.8	0.721	85.1	5.406	11.80	45.6973	69.2	0.704	0.676	1.036	1.025	0.353	0.689	0.336	2.905
5:04:24	81.9	0.727	85.0	5.400	11.90	45.7491	69.3	0.704	0.675	1.035	1.033	0.361	0.697	0.336	2.860

Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

	Consolidation Values		Final Values		Tested By	KDG	Project Number	175569040
Height	6.129 (in.)	15.568 (cm)	Height	5.081 (in.)	Date	1-25-10	Test Number	CU-4A
Diameter	2.820 (in)	7.164 (cm)	Dia. avg.	3.237 (in)	Press No.	2	Data File ID	4A
Area	6.247 (in^2)	40.304 (cm^2)	Area avg.	8.227 (in^2)	Panel No.	D	Lateral Pressure (psi)	5.0
							Chamber Pressure - σ_3 (psi)	90

Clock Time (min.)	Load (lbf)	Deflection Dial Reading (in.)	Pore Pressure Reading (psi)	Corrected Hieght (in.)	Strain (%)	Corrected Area (cm^2)	Corrected Load (lbf)	Deviator Stress (tsf)	Corrected Deviator Stress* (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p' $(\sigma_1'+\sigma_3')/2$ (tsf)	q $(\sigma_1-\sigma_3)/2$ (tsf)	Effective Principal Stress Ratio σ_1'/σ_3'
5:06:55	82.4	0.733	84.9	5.394	12.00	45.8011	69.8	0.709	0.679	1.039	1.040	0.364	0.702	0.338	2.857
5:09:29	82.6	0.739	85.0	5.387	12.10	45.8534	70.0	0.710	0.681	1.041	1.035	0.358	0.697	0.339	2.892
5:12:00	82.8	0.745	85.0	5.381	12.20	45.9055	70.3	0.712	0.682	1.042	1.040	0.361	0.700	0.339	2.879
5:14:31	83.3	0.751	84.9	5.375	12.30	45.9576	70.8	0.716	0.686	1.046	1.052	0.369	0.710	0.341	2.850
5:17:04	83.4	0.758	84.9	5.369	12.40	46.0106	70.8	0.716	0.685	1.045	1.049	0.367	0.708	0.341	2.857
5:19:33	83.5	0.764	85.0	5.363	12.50	46.0627	70.9	0.716	0.685	1.045	1.045	0.363	0.704	0.341	2.877
5:22:04	83.6	0.770	84.9	5.357	12.60	46.1158	71.1	0.717	0.686	1.046	1.051	0.369	0.710	0.341	2.852
5:24:30	83.8	0.776	84.7	5.351	12.70	46.1681	71.2	0.717	0.686	1.046	1.064	0.381	0.722	0.341	2.794
5:27:03	84.4	0.782	84.9	5.344	12.80	46.2217	71.8	0.723	0.691	1.051	1.057	0.369	0.713	0.344	2.865
5:29:31	85.1	0.788	84.9	5.338	12.90	46.2740	72.5	0.729	0.697	1.057	1.063	0.369	0.716	0.347	2.881
5:32:02	85.3	0.794	84.8	5.332	13.00	46.3273	72.7	0.730	0.698	1.058	1.069	0.374	0.722	0.347	2.855
5:34:36	85.3	0.800	84.4	5.326	13.10	46.3811	72.7	0.729	0.697	1.057	1.095	0.401	0.748	0.347	2.729
5:37:09	85.6	0.807	84.8	5.320	13.20	46.4350	73.0	0.731	0.699	1.059	1.068	0.373	0.721	0.348	2.866
5:39:38	86.5	0.813	84.8	5.314	13.30	46.4875	74.0	0.740	0.707	1.067	1.078	0.374	0.726	0.352	2.882
5:42:09	86.6	0.819	84.7	5.308	13.40	46.5412	74.0	0.740	0.707	1.067	1.084	0.380	0.732	0.352	2.852
5:44:42	86.6	0.825	84.7	5.302	13.50	46.5959	74.1	0.739	0.706	1.066	1.083	0.380	0.732	0.351	2.847
5:47:13	87.1	0.831	84.8	5.296	13.60	46.6492	74.6	0.743	0.710	1.070	1.082	0.376	0.729	0.353	2.880
5:49:44	87.5	0.837	84.7	5.289	13.70	46.7033	74.9	0.746	0.712	1.072	1.088	0.379	0.734	0.354	2.868
5:52:15	88.1	0.843	84.6	5.283	13.80	46.7576	75.6	0.751	0.718	1.078	1.104	0.390	0.747	0.357	2.831
5:54:48	88.5	0.849	84.7	5.277	13.90	46.8118	75.9	0.754	0.720	1.080	1.099	0.382	0.740	0.358	2.877
5:57:19	88.7	0.856	84.7	5.271	14.00	46.8663	76.2	0.756	0.721	1.081	1.100	0.382	0.741	0.359	2.880
5:59:53	88.6	0.862	84.6	5.265	14.10	46.9211	76.1	0.754	0.719	1.079	1.105	0.389	0.747	0.358	2.841
6:02:26	89.0	0.868	84.3	5.259	14.20	46.9759	76.5	0.757	0.722	1.082	1.129	0.410	0.770	0.359	2.752
6:05:02	90.1	0.874	84.6	5.253	14.30	47.0307	77.6	0.767	0.732	1.092	1.116	0.387	0.752	0.364	2.881
6:07:38	90.5	0.880	84.6	5.246	14.40	47.0858	77.9	0.769	0.734	1.094	1.120	0.389	0.755	0.365	2.878
6:10:11	90.4	0.886	84.5	5.240	14.50	47.1408	77.8	0.767	0.732	1.092	1.126	0.397	0.762	0.364	2.833
6:12:44	90.4	0.892	84.5	5.234	14.60	47.1954	77.8	0.767	0.731	1.091	1.123	0.396	0.760	0.364	2.837
6:15:20	91.4	0.898	84.5	5.228	14.70	47.2506	78.8	0.776	0.740	1.100	1.129	0.393	0.761	0.368	2.874
6:17:54	91.6	0.905	84.5	5.222	14.80	47.3061	79.1	0.777	0.741	1.101	1.135	0.397	0.766	0.369	2.858
6:20:29	91.5	0.911	84.3	5.216	14.90	47.3621	78.9	0.775	0.738	1.098	1.144	0.409	0.777	0.368	2.796
6:23:03	91.8	0.917	84.5	5.210	15.00	47.4176	79.2	0.777	0.740	1.100	1.135	0.399	0.767	0.368	2.848
6:25:41	92.5	0.923	84.4	5.204	15.10	47.4739	79.9	0.783	0.746	1.106	1.142	0.400	0.771	0.371	2.855
6:28:14	92.8	0.929	84.4	5.197	15.20	47.5298	80.2	0.784	0.747	1.107	1.150	0.406	0.778	0.372	2.833
6:30:48	93.2	0.935	84.1	5.191	15.30	47.5855	80.6	0.788	0.750	1.110	1.168	0.421	0.795	0.373	2.773
6:33:24	93.1	0.941	84.4	5.185	15.40	47.6418	80.6	0.786	0.748	1.108	1.150	0.405	0.777	0.373	2.842
6:36:02	93.5	0.948	84.4	5.179	15.50	47.6989	80.9	0.789	0.751	1.111	1.154	0.407	0.780	0.374	2.838
6:38:35	94.3	0.954	84.2	5.173	15.60	47.7549	81.8	0.796	0.758	1.118	1.169	0.414	0.792	0.377	2.821
6:41:09	94.6	0.960	84.3	5.167	15.70	47.8115	82.0	0.797	0.759	1.119	1.167	0.411	0.789	0.378	2.839
6:43:42	94.2	0.966	84.3	5.161	15.80	47.8682	81.7	0.793	0.755	1.115	1.161	0.410	0.786	0.376	2.833
6:46:18	94.6	0.972	84.2	5.155	15.90	47.9251	82.0	0.796	0.757	1.117	1.169	0.415	0.792	0.377	2.817
6:48:51	95.5	0.978	84.1	5.148	16.00	47.9820	82.9	0.803	0.764	1.124	1.189	0.428	0.808	0.380	2.777
6:51:24	95.8	0.984	84.2	5.142	16.10	48.0394	83.2	0.805	0.766	1.126	1.178	0.415	0.797	0.381	2.837
6:54:00	95.8	0.990	84.2	5.136	16.20	48.0972	83.2	0.805	0.765	1.125	1.178	0.416	0.797	0.381	2.829
6:56:34	96.3	0.997	84.1	5.130	16.30	48.1545	83.7	0.809	0.769	1.129	1.189	0.424	0.807	0.383	2.805
6:59:07	96.2	1.003	84.0	5.124	16.40	48.2118	83.6	0.807	0.766	1.126	1.192	0.429	0.811	0.382	2.778
7:01:45	97.6	1.009	84.2	5.118	16.50	48.2698	85.0	0.819	0.779	1.139	1.197	0.421	0.809	0.388	2.842
7:04:21	97.5	1.015	84.1	5.112	16.60	48.3275	84.9	0.817	0.777	1.137	1.199	0.426	0.812	0.387	2.817
7:06:54	97.3	1.021	84.0	5.105	16.70	48.3854	84.7	0.814	0.773	1.133	1.205	0.435	0.820	0.385	2.769
7:09:33	97.9	1.027	84.1	5.099	16.80	48.4439	85.4	0.819	0.778	1.138	1.201	0.427	0.814	0.387	2.816
7:12:11	99.0	1.033	84.1	5.093	16.90	48.5023	86.4	0.829	0.787	1.147	1.211	0.427	0.819	0.392	2.838
7:14:47	98.8	1.039	84.0	5.087	17.00	48.5604	86.3	0.826	0.784	1.144	1.214	0.433	0.823	0.391	2.804
7:17:25	98.7	1.046	83.8	5.081	17.10	48.6198	86.1	0.823	0.782	1.142	1.222	0.444	0.833	0.389	2.755

Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Consolidation Values			Final Values		
Height	6.146 (in.)	15.611 (cm)	Height	5.016 (in.)	
Diameter	2.813 (in)	7.146 (cm)	Dia. avg.	3.260 (in)	
Area	6.216 (in^2)	40.104 (cm^2)	Area avg.	8.348 (in^2)	

Tested By	KDG
Date	1-27-10
Press No.	1
Panel No.	C

Project Number	175569040
Test Number	CU-4B
Data File ID	4B
Lateral Pressure (psi)	10.0
Chamber Pressure - σ_3 (psi)	90

Clock Time (min.)	Load (lbf)	Deflection Dial Reading (in.)	Pore Pressure Reading (psi)	Corrected Hieght (in.)	Strain (%)	Corrected Area (cm^2)	Corrected Load (lbf)	Deviator Stress (tsf)	Corrected Deviator Stress* (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p' $(\sigma_1'+\sigma_3')/2$ (tsf)	q $(\sigma_1-\sigma_3)/2$ (tsf)	Effective Principal Stress Ratio σ_1'/σ_3'
0:00:00	12.4	-0.022	80.0	6.146	0.00	40.1037	0.0	0.000	0.000	0.720	0.720	0.718	0.719	0.001	1.003
0:04:50	19.2	-0.016	80.2	6.140	0.10	40.1439	6.8	0.079	0.078	0.798	0.787	0.707	0.747	0.040	1.113
0:08:43	37.0	-0.010	81.6	6.134	0.20	40.1841	24.5	0.284	0.283	1.003	0.893	0.608	0.751	0.142	1.468
0:12:41	47.8	-0.004	82.4	6.127	0.30	40.2255	35.3	0.408	0.407	1.127	0.955	0.545	0.750	0.205	1.750
0:16:26	54.5	0.002	82.9	6.121	0.40	40.2650	42.0	0.485	0.484	1.204	0.996	0.509	0.752	0.243	1.954
0:20:10	59.0	0.008	83.3	6.115	0.50	40.3052	46.6	0.537	0.536	1.256	1.022	0.484	0.753	0.269	2.112
0:24:01	64.1	0.015	83.5	6.109	0.60	40.3464	51.6	0.595	0.593	1.313	1.060	0.465	0.763	0.298	2.279
0:27:36	67.6	0.021	83.7	6.103	0.70	40.3862	55.1	0.635	0.633	1.353	1.087	0.451	0.769	0.318	2.407
0:31:20	70.5	0.027	83.9	6.097	0.80	40.4275	58.1	0.668	0.666	1.386	1.109	0.441	0.775	0.334	2.513
0:34:51	73.2	0.033	84.0	6.091	0.90	40.4681	60.7	0.698	0.695	1.415	1.132	0.435	0.784	0.349	2.602
0:38:29	75.8	0.039	84.0	6.084	1.00	40.5092	63.3	0.727	0.725	1.445	1.156	0.430	0.793	0.363	2.691
0:42:17	78.4	0.045	84.1	6.078	1.10	40.5497	66.0	0.757	0.754	1.474	1.181	0.425	0.803	0.378	2.778
0:45:52	80.5	0.051	84.1	6.072	1.20	40.5914	68.1	0.780	0.777	1.497	1.201	0.422	0.812	0.390	2.844
0:49:35	82.6	0.058	84.2	6.066	1.30	40.6323	70.1	0.802	0.799	1.519	1.222	0.421	0.822	0.401	2.902
0:53:05	84.8	0.064	84.2	6.060	1.40	40.6732	72.4	0.828	0.824	1.544	1.247	0.421	0.834	0.413	2.962
0:56:43	86.5	0.070	84.2	6.054	1.50	40.7154	74.0	0.846	0.842	1.562	1.263	0.419	0.841	0.422	3.014
1:00:24	87.9	0.076	84.2	6.048	1.60	40.7556	75.5	0.861	0.857	1.577	1.280	0.420	0.850	0.430	3.043
1:03:58	90.0	0.082	84.1	6.041	1.70	40.7969	77.5	0.883	0.879	1.599	1.304	0.423	0.863	0.441	3.085
1:07:27	91.4	0.088	84.1	6.035	1.80	40.8389	78.9	0.899	0.894	1.614	1.318	0.422	0.870	0.448	3.121
1:10:57	92.9	0.094	84.1	6.029	1.90	40.8797	80.5	0.915	0.911	1.631	1.336	0.424	0.880	0.456	3.152
1:14:24	94.1	0.101	84.1	6.023	2.00	40.9222	81.7	0.928	0.923	1.643	1.352	0.427	0.890	0.462	3.166
1:17:57	95.3	0.107	84.0	6.017	2.10	40.9634	82.9	0.941	0.935	1.655	1.366	0.429	0.898	0.469	3.184
1:21:30	96.6	0.113	84.0	6.011	2.20	41.0056	84.2	0.954	0.949	1.669	1.383	0.432	0.908	0.475	3.199
1:25:09	97.6	0.119	84.0	6.005	2.30	41.0472	85.1	0.965	0.959	1.679	1.395	0.434	0.915	0.480	3.212
1:28:52	98.3	0.125	83.9	5.998	2.40	41.0895	85.8	0.971	0.965	1.685	1.405	0.438	0.922	0.483	3.206
1:32:31	99.3	0.131	83.9	5.992	2.50	41.1312	86.9	0.982	0.976	1.696	1.419	0.441	0.930	0.489	3.218
1:36:07	100.5	0.137	83.8	5.986	2.60	41.1735	88.1	0.995	0.988	1.708	1.435	0.444	0.939	0.495	3.228
1:39:49	101.4	0.143	83.8	5.980	2.70	41.2158	88.9	1.003	0.996	1.716	1.447	0.448	0.947	0.499	3.227
1:43:31	102.1	0.150	83.7	5.974	2.80	41.2581	89.6	1.010	1.003	1.723	1.457	0.452	0.955	0.502	3.223
1:47:08	103.1	0.156	83.7	5.968	2.90	41.3004	90.6	1.020	1.013	1.733	1.471	0.456	0.963	0.507	3.226
1:50:50	103.9	0.162	83.6	5.962	3.00	41.3432	91.4	1.028	1.021	1.741	1.484	0.461	0.973	0.511	3.218
1:54:31	104.6	0.168	83.6	5.956	3.10	41.3855	92.1	1.035	1.028	1.748	1.492	0.463	0.977	0.515	3.225
1:58:10	105.4	0.174	83.5	5.949	3.20	41.4282	92.9	1.043	1.035	1.755	1.504	0.467	0.985	0.518	3.221
2:01:54	106.0	0.180	83.4	5.943	3.30	41.4711	93.6	1.049	1.041	1.761	1.515	0.472	0.994	0.521	3.209
2:05:30	106.9	0.186	83.4	5.937	3.40	41.5140	94.4	1.058	1.049	1.769	1.524	0.473	0.999	0.526	3.221
2:09:04	107.4	0.193	83.4	5.931	3.50	41.5568	95.0	1.063	1.054	1.774	1.534	0.478	1.006	0.528	3.208
2:12:46	107.8	0.199	83.3	5.925	3.60	41.6003	95.4	1.066	1.057	1.777	1.543	0.484	1.013	0.530	3.189
2:16:19	108.6	0.205	83.3	5.919	3.70	41.6432	96.1	1.073	1.064	1.784	1.551	0.485	1.018	0.533	3.199
2:19:59	109.3	0.211	83.2	5.913	3.80	41.6863	96.8	1.080	1.071	1.791	1.562	0.490	1.026	0.536	3.189
2:23:38	109.3	0.217	83.1	5.906	3.90	41.7304	96.9	1.080	1.070	1.790	1.566	0.494	1.030	0.536	3.170
2:27:17	109.8	0.223	83.1	5.900	4.00	41.7733	97.3	1.084	1.074	1.794	1.573	0.497	1.035	0.538	3.164
2:30:56	110.1	0.229	83.0	5.894	4.10	41.8167	97.7	1.086	1.076	1.796	1.579	0.501	1.040	0.539	3.151
2:34:38	110.7	0.236	83.0	5.888	4.20	41.8602	98.3	1.092	1.081	1.801	1.588	0.505	1.046	0.542	3.146
2:38:22	110.9	0.242	83.0	5.882	4.30	41.9039	98.5	1.093	1.082	1.802	1.591	0.507	1.049	0.542	3.136
2:42:02	111.4	0.248	82.9	5.876	4.40	41.9478	98.9	1.097	1.086	1.806	1.599	0.512	1.056	0.544	3.125
2:45:33	112.0	0.254	82.8	5.870	4.50	41.9920	99.5	1.102	1.091	1.811	1.608	0.515	1.062	0.547	3.122
2:49:09	112.6	0.260	82.8	5.863	4.60	42.0355	100.2	1.108	1.097	1.817	1.617	0.518	1.067	0.549	3.122
2:52:45	113.1	0.266	82.8	5.857	4.70	42.0797	100.6	1.112	1.101	1.821	1.624	0.522	1.073	0.551	3.113
2:56:16	113.4	0.272	82.7	5.851	4.80	42.1237	101.0	1.115	1.103	1.823	1.631	0.527	1.079	0.552	3.098
2:59:47	114.0	0.279	82.6	5.845	4.90	42.1683	101.5	1.119	1.107	1.827	1.640	0.530	1.085	0.555	3.092
3:03:22	114.2	0.285	82.6	5.839	5.00	42.2128	101.8	1.121	1.109	1.829	1.642	0.532	1.087	0.555	3.090
3:06:59	114.6	0.291	82.6	5.833	5.10	42.2568	102.1	1.124	1.112	1.832	1.649	0.536	1.093	0.557	3.077
3:10:32	114.8	0.297	82.5	5.827	5.20	42.3013	102.4	1.125	1.113	1.833	1.656	0.541	1.099	0.557	3.059
3:14:09	115.2	0.303	82.5	5.820	5.30	42.3463	102.7	1.128	1.115	1.835	1.659	0.542	1.101	0.558	3.060
3:17:46	115.1	0.309	82.4	5.814	5.40	42.3908	102.7	1.127	1.113	1.833	1.661	0.546	1.103	0.558	3.044
3:21:24	115.3	0.315	82.4	5.808	5.50	42.4359	102.8	1.127	1.113	1.833	1.665	0.550	1.108	0.558	3.028
3:25:02	115.7	0.321	82.3	5.802	5.59	42.4804	103.3	1.130	1.117	1.837	1.670	0.551	1.111	0.559	3.029
3:28:42	116.4	0.328	82.3	5.796	5.69	42.5254	104.0	1.137	1.123	1.843	1.678	0.553	1.115	0.562	3.034
3:32:22	116.3	0.334	82.3	5.790	5.79	42.5705	103.8	1.134	1.120	1.840	1.678	0.556	1.117	0.561	3.016
3:35:56	116.5	0.340	82.2	5.784	5.90	42.6160	104.0	1.135	1.120	1.840	1.681	0.558	1.120	0.561	3.010

Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Consolidation Values			Final Values					
Height	6.146 (in.)	15.611 (cm)	Height	5.016 (in.)	Tested By	KDG	Project Number	175569040
Diameter	2.813 (in)	7.146 (cm)	Dia. avg.	3.260 (in)	Date	1-27-10	Test Number	CU-4B
Area	6.216 (in^2)	40.104 (cm^2)	Area avg.	8.348 (in^2)	Press No.	1	Data File ID	4B
					Panel No.	C	Lateral Pressure (psi)	10.0
							Chamber Pressure - σ_3 (psi)	90

Clock Time (min.)	Load (lbf)	Deflection Dial Reading (in.)	Pore Pressure Reading (psi)	Corrected Hieght (in.)	Strain (%)	Corrected Area (cm^2)	Corrected Load (lbf)	Deviator Stress (tsf)	Corrected Deviator Stress* (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p' $(\sigma_1'+\sigma_3')/2$ (tsf)	q $(\sigma_1-\sigma_3')/2$ (tsf)	Effective Principal Stress Ratio σ_1' / σ_3'
3:39:26	116.8	0.346	82.2	5.777	5.99	42.6610	104.4	1.138	1.123	1.843	1.686	0.561	1.124	0.563	3.005
3:43:02	117.7	0.352	82.2	5.771	6.09	42.7063	105.2	1.146	1.131	1.851	1.696	0.563	1.129	0.566	3.011
3:46:39	117.8	0.358	82.2	5.765	6.19	42.7518	105.3	1.146	1.130	1.850	1.696	0.564	1.130	0.566	3.007
3:50:18	118.0	0.364	82.1	5.759	6.29	42.7974	105.6	1.147	1.131	1.851	1.701	0.568	1.134	0.567	2.997
3:53:54	118.3	0.371	82.1	5.753	6.39	42.8432	105.9	1.149	1.133	1.853	1.705	0.570	1.137	0.568	2.993
3:57:39	119.0	0.377	82.1	5.747	6.49	42.8888	106.6	1.155	1.139	1.859	1.712	0.571	1.142	0.571	2.997
4:01:17	119.4	0.383	82.0	5.741	6.59	42.9349	106.9	1.158	1.142	1.862	1.718	0.574	1.146	0.572	2.993
4:04:57	119.6	0.389	82.0	5.734	6.70	42.9813	107.2	1.159	1.143	1.863	1.721	0.576	1.149	0.572	2.986
4:08:40	120.1	0.395	82.0	5.728	6.79	43.0270	107.7	1.164	1.147	1.867	1.727	0.578	1.153	0.574	2.987
4:12:12	120.6	0.401	81.9	5.722	6.89	43.0729	108.2	1.168	1.151	1.871	1.733	0.580	1.157	0.576	2.987
4:15:52	121.0	0.407	81.9	5.716	6.99	43.1194	108.6	1.171	1.154	1.874	1.738	0.583	1.161	0.578	2.982
4:19:33	121.3	0.414	81.9	5.710	7.09	43.1658	108.9	1.173	1.155	1.875	1.743	0.586	1.165	0.579	2.974
4:23:07	121.8	0.420	81.8	5.704	7.19	43.2121	109.4	1.177	1.160	1.880	1.749	0.587	1.168	0.581	2.977
4:26:46	122.2	0.426	81.8	5.698	7.29	43.2589	109.7	1.180	1.162	1.882	1.753	0.590	1.171	0.582	2.973
4:30:28	122.4	0.432	81.7	5.691	7.39	43.3059	110.0	1.181	1.163	1.883	1.759	0.595	1.177	0.582	2.959
4:34:04	122.6	0.438	81.8	5.685	7.49	43.3522	110.2	1.182	1.163	1.883	1.759	0.594	1.176	0.583	2.962
4:37:37	122.7	0.444	81.7	5.679	7.59	43.3991	110.2	1.181	1.162	1.882	1.761	0.597	1.179	0.582	2.951
4:41:16	123.1	0.450	81.7	5.673	7.69	43.4458	110.6	1.184	1.165	1.885	1.767	0.600	1.183	0.584	2.946
4:44:58	123.4	0.457	81.7	5.667	7.79	43.4935	110.9	1.186	1.167	1.887	1.769	0.601	1.185	0.584	2.946
4:48:36	123.7	0.463	81.6	5.661	7.89	43.5403	111.3	1.189	1.169	1.889	1.775	0.604	1.189	0.585	2.939
4:52:15	124.2	0.469	81.6	5.655	7.99	43.5876	111.8	1.192	1.173	1.893	1.781	0.606	1.194	0.587	2.937
4:56:05	124.4	0.475	81.6	5.649	8.09	43.6351	111.9	1.193	1.173	1.893	1.781	0.606	1.194	0.587	2.937
4:59:49	124.8	0.481	81.5	5.642	8.19	43.6829	112.3	1.196	1.176	1.896	1.787	0.610	1.198	0.589	2.931
5:03:33	124.7	0.487	81.5	5.636	8.29	43.7304	112.3	1.194	1.174	1.894	1.789	0.613	1.201	0.588	2.917
5:07:18	125.3	0.493	81.5	5.630	8.39	43.7778	112.8	1.198	1.178	1.898	1.793	0.613	1.203	0.590	2.923
5:10:53	125.6	0.500	81.5	5.624	8.49	43.8257	113.1	1.200	1.179	1.899	1.797	0.616	1.206	0.590	2.919
5:14:31	125.7	0.506	81.4	5.618	8.59	43.8732	113.3	1.201	1.180	1.900	1.800	0.619	1.209	0.591	2.910
5:18:11	125.8	0.512	81.4	5.612	8.69	43.9215	113.4	1.200	1.179	1.899	1.799	0.619	1.209	0.590	2.908
5:21:43	126.2	0.518	81.4	5.606	8.79	43.9695	113.8	1.203	1.182	1.902	1.804	0.621	1.213	0.592	2.905
5:25:18	126.6	0.524	81.3	5.599	8.89	44.0177	114.1	1.206	1.184	1.904	1.809	0.623	1.216	0.593	2.903
5:28:56	126.8	0.530	81.3	5.593	8.99	44.0660	114.4	1.207	1.185	1.905	1.811	0.624	1.218	0.593	2.901
5:32:34	127.3	0.536	81.3	5.587	9.09	44.1147	114.9	1.211	1.188	1.908	1.816	0.626	1.221	0.595	2.901
5:36:07	127.6	0.543	81.3	5.581	9.19	44.1631	115.2	1.212	1.190	1.910	1.820	0.629	1.225	0.596	2.895
5:39:42	128.1	0.549	81.3	5.575	9.29	44.2114	115.7	1.217	1.194	1.914	1.826	0.630	1.228	0.598	2.899
5:43:21	128.3	0.555	81.2	5.569	9.39	44.2605	115.8	1.217	1.194	1.914	1.828	0.632	1.230	0.598	2.891
5:46:54	128.6	0.561	81.2	5.563	9.49	44.3094	116.2	1.219	1.196	1.916	1.832	0.634	1.233	0.599	2.889
5:50:31	128.8	0.567	81.2	5.556	9.59	44.3582	116.4	1.220	1.196	1.916	1.835	0.637	1.236	0.599	2.880
5:54:16	129.3	0.573	81.2	5.550	9.69	44.4071	116.9	1.224	1.200	1.920	1.838	0.636	1.237	0.601	2.889
5:57:47	129.6	0.579	81.1	5.544	9.79	44.4564	117.2	1.226	1.202	1.922	1.842	0.639	1.240	0.602	2.884
6:01:22	129.8	0.586	81.1	5.538	9.89	44.5057	117.4	1.227	1.202	1.922	1.847	0.643	1.245	0.602	2.873
6:04:54	130.4	0.592	81.1	5.532	9.99	44.5552	118.0	1.231	1.207	1.927	1.850	0.641	1.246	0.604	2.884
6:08:30	130.5	0.598	81.1	5.526	10.09	44.6047	118.0	1.230	1.206	1.926	1.850	0.643	1.247	0.604	2.878
6:12:06	130.5	0.604	81.0	5.520	10.19	44.6542	118.1	1.230	1.204	1.924	1.853	0.646	1.249	0.603	2.867
6:15:42	130.8	0.610	81.0	5.513	10.29	44.7040	118.3	1.231	1.205	1.925	1.854	0.646	1.250	0.604	2.867
6:19:19	131.4	0.616	81.0	5.507	10.39	44.7543	118.9	1.235	1.210	1.930	1.860	0.649	1.254	0.606	2.868
6:23:00	131.7	0.622	81.0	5.501	10.49	44.8037	119.3	1.238	1.212	1.932	1.865	0.651	1.258	0.607	2.865
6:26:45	131.7	0.628	81.0	5.495	10.59	44.8538	119.3	1.237	1.211	1.931	1.864	0.652	1.258	0.606	2.861
6:30:22	132.1	0.635	80.9	5.489	10.69	44.9041	119.7	1.239	1.213	1.933	1.869	0.654	1.261	0.608	2.859
6:33:58	132.8	0.641	80.9	5.483	10.79	44.9542	120.4	1.245	1.218	1.938	1.876	0.655	1.266	0.610	2.862
6:37:48	132.9	0.647	80.9	5.477	10.89	45.0049	120.5	1.245	1.218	1.938	1.877	0.657	1.267	0.610	2.858
6:41:26	132.9	0.653	80.9	5.470	10.99	45.0556	120.5	1.244	1.217	1.937	1.877	0.658	1.268	0.609	2.851
6:45:00	133.5	0.659	80.8	5.464	11.09	45.1057	121.1	1.248	1.221	1.941	1.882	0.660	1.271	0.611	2.853
6:48:42	133.9	0.665	80.8	5.458	11.19	45.1568	121.5	1.251	1.224	1.944	1.890	0.664	1.277	0.613	2.845
6:52:20	134.6	0.671	80.8	5.452	11.29	45.2076	122.1	1.256	1.229	1.949	1.893	0.663	1.278	0.615	2.856
6:55:55	134.7	0.678	80.8	5.446	11.39	45.2582	122.3	1.256	1.228	1.948	1.895	0.665	1.280	0.615	2.850
6:59:28	135.3	0.684	80.7	5.440	11.49	45.3094	122.8	1.261	1.232	1.952	1.902	0.668	1.285	0.617	2.849
7:03:10	136.0	0.690	80.7	5.434	11.59	45.3605	123.5	1.266	1.238	1.958	1.907	0.667	1.287	0.620	2.858
7:06:45	135.9	0.696	80.7	5.428	11.69	45.4118	123.4	1.264	1.235	1.955	1.907	0.670	1.288	0.619	2.847
7:10:20	136.1	0.702	80.7	5.421	11.79	45.4632	123.7	1.265	1.236	1.956	1.910	0.672	1.291	0.619	2.842
7:13:54	136.7	0.708	80.7	5.415	11.89	45.5151	124.3	1.270	1.240	1.960	1.913	0.671	1.292	0.621	2.851

Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Consolidation Values			Final Values			Tested By	KDG	Project Number	175569040
Height	6.146 (in.)	15.611 (cm)	Height	5.016 (in.)		Date	1-27-10	Test Number	CU-4B
Diameter	2.813 (in)	7.146 (cm)	Dia. avg.	3.260 (in)		Press No.	1	Data File ID	4B
Area	6.216 (in^2)	40.104 (cm^2)	Area avg.	8.348 (in^2)		Panel No.	C	Lateral Pressure (psi)	10.0
								Chamber Pressure - σ_3 (psi)	90

Clock Time (min.)	Load (lbf)	Deflection Dial Reading (in.)	Pore Pressure Reading (psi)	Corrected Hieght (in.)	Strain (%)	Corrected Area (cm^2)	Corrected Load (lbf)	Deviator Stress (tsf)	Corrected Deviator Stress* (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p' $(\sigma_1'+\sigma_3')/2$ (tsf)	q $(\sigma_1-\sigma_3)/2$ (tsf)	Effective Principal Stress Ratio σ_1'/σ_3'
7:17:35	136.8	0.714	80.6	5.409	11.99	45.5665	124.3	1.269	1.239	1.959	1.915	0.674	1.295	0.621	2.842
7:21:15	136.8	0.721	80.6	5.403	12.09	45.6186	124.4	1.268	1.238	1.958	1.916	0.676	1.296	0.620	2.834
7:24:59	137.1	0.727	80.6	5.397	12.19	45.6706	124.7	1.269	1.239	1.959	1.917	0.676	1.297	0.621	2.836
7:28:35	137.6	0.733	80.6	5.391	12.29	45.7223	125.1	1.273	1.243	1.963	1.922	0.677	1.300	0.622	2.837
7:32:22	137.8	0.739	80.6	5.385	12.39	45.7744	125.3	1.273	1.243	1.963	1.924	0.680	1.302	0.622	2.832
7:36:04	137.9	0.745	80.6	5.378	12.49	45.8267	125.4	1.273	1.242	1.962	1.924	0.680	1.302	0.622	2.829
7:39:39	138.2	0.751	80.5	5.372	12.59	45.8791	125.8	1.275	1.244	1.964	1.928	0.683	1.306	0.623	2.824
7:43:10	138.4	0.757	80.5	5.366	12.69	45.9315	125.9	1.275	1.244	1.964	1.930	0.684	1.307	0.623	2.821
7:46:53	138.7	0.764	80.5	5.360	12.79	45.9845	126.2	1.276	1.245	1.965	1.934	0.687	1.311	0.623	2.815
7:50:29	138.8	0.770	80.5	5.354	12.89	46.0368	126.4	1.276	1.245	1.965	1.933	0.687	1.310	0.623	2.815
7:54:02	139.1	0.776	80.4	5.348	12.99	46.0897	126.7	1.278	1.246	1.966	1.936	0.688	1.312	0.624	2.814
7:57:38	139.4	0.782	80.4	5.342	13.09	46.1428	127.0	1.280	1.248	1.968	1.940	0.690	1.315	0.625	2.810
8:01:19	139.4	0.788	80.4	5.335	13.19	46.1960	127.0	1.278	1.246	1.966	1.938	0.690	1.314	0.624	2.809
8:04:54	139.7	0.794	80.4	5.329	13.29	46.2490	127.3	1.280	1.247	1.967	1.940	0.691	1.315	0.624	2.807
8:08:33	139.8	0.800	80.4	5.323	13.39	46.3024	127.4	1.279	1.246	1.966	1.942	0.694	1.318	0.624	2.798
8:12:12	140.1	0.807	80.4	5.317	13.49	46.3558	127.7	1.281	1.248	1.968	1.943	0.693	1.318	0.625	2.802
8:15:48	139.9	0.813	80.3	5.311	13.59	46.4096	127.5	1.277	1.244	1.964	1.942	0.696	1.319	0.623	2.789
8:19:22	140.3	0.819	80.3	5.305	13.69	46.4633	127.9	1.280	1.246	1.966	1.944	0.697	1.321	0.624	2.791
8:23:03	140.4	0.825	80.3	5.299	13.79	46.5172	128.0	1.280	1.246	1.966	1.945	0.698	1.322	0.624	2.788
8:26:35	141.2	0.831	80.3	5.292	13.89	46.5712	128.8	1.286	1.251	1.971	1.953	0.700	1.326	0.627	2.792
8:30:09	141.7	0.837	80.3	5.286	13.99	46.6251	129.3	1.289	1.255	1.975	1.957	0.701	1.329	0.628	2.794
8:33:47	141.9	0.843	80.2	5.280	14.09	46.6794	129.5	1.290	1.255	1.975	1.960	0.703	1.331	0.628	2.787
8:37:19	142.9	0.850	80.2	5.274	14.19	46.7339	130.5	1.298	1.263	1.983	1.968	0.703	1.336	0.633	2.800
8:40:54	142.9	0.856	80.2	5.268	14.29	46.7882	130.5	1.297	1.262	1.982	1.967	0.704	1.335	0.632	2.795
8:44:33	143.1	0.862	80.2	5.262	14.39	46.8428	130.6	1.297	1.262	1.982	1.970	0.707	1.339	0.632	2.787
8:48:07	143.6	0.868	80.2	5.256	14.49	46.8975	131.1	1.300	1.264	1.984	1.973	0.706	1.340	0.633	2.792
8:51:40	143.7	0.874	80.2	5.249	14.59	46.9522	131.2	1.300	1.264	1.984	1.973	0.707	1.340	0.633	2.790
8:55:25	143.8	0.880	80.1	5.243	14.69	47.0072	131.4	1.300	1.264	1.984	1.976	0.711	1.344	0.633	2.780
8:59:09	144.1	0.886	80.1	5.237	14.79	47.0624	131.7	1.301	1.265	1.985	1.976	0.710	1.343	0.633	2.784
9:02:44	144.5	0.893	80.1	5.231	14.89	47.1177	132.0	1.303	1.266	1.986	1.979	0.711	1.345	0.634	2.784
9:06:18	144.6	0.899	80.1	5.225	14.99	47.1729	132.2	1.303	1.266	1.986	1.981	0.714	1.348	0.634	2.777
9:10:01	144.7	0.905	80.1	5.219	15.09	47.2288	132.3	1.302	1.265	1.985	1.980	0.713	1.347	0.633	2.776
9:13:42	145.1	0.911	80.1	5.213	15.19	47.2840	132.6	1.304	1.267	1.987	1.984	0.715	1.350	0.634	2.774
9:17:16	145.3	0.917	80.0	5.206	15.29	47.3398	132.9	1.305	1.268	1.988	1.987	0.717	1.352	0.635	2.770
9:20:53	145.7	0.923	80.0	5.200	15.39	47.3960	133.2	1.307	1.269	1.989	1.988	0.717	1.353	0.636	2.773
9:24:30	146.2	0.929	80.0	5.194	15.49	47.4518	133.8	1.311	1.273	1.993	1.993	0.718	1.356	0.637	2.774
9:28:15	146.5	0.935	80.0	5.188	15.59	47.5080	134.0	1.312	1.273	1.993	1.995	0.720	1.358	0.638	2.771
9:31:48	147.0	0.942	80.0	5.182	15.69	47.5645	134.6	1.316	1.277	1.997	2.000	0.721	1.361	0.639	2.773
9:35:22	147.2	0.948	80.0	5.176	15.78	47.6205	134.7	1.315	1.277	1.997	2.000	0.722	1.361	0.639	2.771
9:39:07	147.8	0.954	80.0	5.170	15.88	47.6772	135.3	1.320	1.281	2.001	2.006	0.724	1.365	0.641	2.773
9:42:42	148.1	0.960	79.9	5.163	15.98	47.7339	135.7	1.322	1.282	2.002	2.011	0.726	1.368	0.642	2.768
9:46:21	148.3	0.966	79.9	5.157	16.09	47.7917	135.8	1.322	1.282	2.002	2.009	0.726	1.367	0.642	2.770
9:50:03	148.5	0.972	79.9	5.151	16.18	47.8476	136.0	1.322	1.282	2.002	2.010	0.727	1.368	0.642	2.767
9:53:43	148.7	0.979	79.9	5.145	16.29	47.9052	136.2	1.322	1.282	2.002	2.012	0.728	1.370	0.642	2.763
9:57:30	148.9	0.985	79.9	5.139	16.38	47.9622	136.4	1.323	1.282	2.002	2.013	0.729	1.371	0.642	2.762
10:01:13	149.2	0.991	79.9	5.133	16.48	48.0195	136.7	1.324	1.283	2.003	2.015	0.730	1.372	0.643	2.761
10:04:57	149.5	0.997	79.8	5.127	16.58	48.0770	137.1	1.326	1.285	2.005	2.018	0.731	1.374	0.643	2.760
10:08:41	149.9	1.003	79.9	5.120	16.68	48.1348	137.5	1.328	1.287	2.007	2.020	0.731	1.375	0.644	2.764
10:12:24	149.9	1.009	79.8	5.114	16.78	48.1925	137.4	1.326	1.285	2.005	2.019	0.733	1.376	0.643	2.756
10:15:59	150.5	1.015	79.8	5.108	16.89	48.2510	138.1	1.330	1.289	2.009	2.025	0.734	1.380	0.645	2.758
10:19:38	151.1	1.022	79.8	5.102	16.99	48.3090	138.7	1.335	1.293	2.013	2.028	0.733	1.381	0.647	2.765
10:23:20	151.7	1.028	79.8	5.096	17.08	48.3665	139.2	1.338	1.297	2.017	2.033	0.735	1.384	0.649	2.767
10:26:54	151.8	1.034	79.8	5.090	17.18	48.4248	139.3	1.338	1.296	2.016	2.035	0.737	1.386	0.649	2.760
10:30:30	152.2	1.040	79.8	5.084	17.28	48.4835	139.7	1.340	1.298	2.018	2.037	0.738	1.388	0.650	2.761
10:34:14	152.6	1.046	79.7	5.077	17.38	48.5425	140.1	1.342	1.300	2.020	2.041	0.739	1.390	0.651	2.761
10:38:01	153.0	1.052	79.7	5.071	17.48	48.6013	140.5	1.345	1.302	2.022	2.044	0.740	1.392	0.652	2.761
10:41:38	153.1	1.058	79.7	5.065	17.58	48.6603	140.7	1.344	1.301	2.021	2.046	0.744	1.395	0.651	2.752
10:45:15	153.5	1.064	79.7	5.059	17.68	48.7188	141.1	1.346	1.303	2.023	2.046	0.742	1.394	0.652	2.759
10:48:49	153.6	1.071	79.7	5.053	17.78	48.7785	141.2	1.346	1.302	2.022	2.047	0.744	1.395	0.652	2.753
10:52:24	154.2	1.077	79.7	5.047	17.88	48.8372	141.7	1.349	1.305	2.025	2.052	0.745	1.399	0.654	2.754

Consolidated Undrained Triaxial Test
EM 1110-2-1906 Appendix X

Consolidation Values			Final Values					
Height	6.146 (in.)	15.611 (cm)	Height	5.016 (in.)	Tested By	KDG	Project Number	175569040
Diameter	2.813 (in)	7.146 (cm)	Dia. avg.	3.260 (in)	Date	1-27-10	Test Number	CU-4B
Area	6.216 (in^2)	40.104 (cm^2)	Area avg.	8.348 (in^2)	Press No.	1	Data File ID	4B
					Panel No.	C	Lateral Pressure (psi)	10.0
							Chamber Pressure - σ_3 (psi)	90

Clock Time (min.)	Load (lbf)	Deflection Dial Reading (in.)	Pore Pressure Reading (psi)	Corrected Hieght (in.)	Strain (%)	Corrected Area (cm^2)	Corrected Load (lbf)	Deviator Stress (tsf)	Corrected Deviator Stress* (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p' $(\sigma_1'+\sigma_3')/2$ (tsf)	q $(\sigma_1-\sigma_3)/2$ (tsf)	Effective Principal Stress Ratio σ_1' / σ_3'
10:56:09	153.7	1.083	79.7	5.041	17.98	48.8968	141.3	1.344	1.300	2.020	2.046	0.745	1.396	0.651	2.747
10:59:41	154.4	1.089	79.6	5.035	18.08	48.9565	142.0	1.349	1.304	2.024	2.053	0.746	1.400	0.653	2.750
11:03:24	154.7	1.095	79.6	5.028	18.18	49.0164	142.3	1.349	1.305	2.025	2.055	0.748	1.401	0.653	2.747
11:06:58	155.4	1.101	79.6	5.022	18.28	49.0770	143.0	1.355	1.310	2.030	2.059	0.747	1.403	0.656	2.755
11:10:28	155.5	1.107	79.6	5.016	18.38	49.1362	143.0	1.354	1.308	2.028	2.060	0.750	1.405	0.655	2.747

Attachment E

Results of Engineering Analysis

TVA Calculation Package

Title PAF- Scrubber Sludge Complex east slope of East Pond Buttressing

Location Description: *(Optional)* PAF-Scrubber Sludge Complex	**Total Pages:** *(including appendices & attachments)*

Calculation ID *(All parts required to form a unique ID)*:

Org Code	Location/ Plant Code	Branch Code	**Alphanumeric Part** = Discipline Code (1) + Type Code (1) + "X" + Unit Field (3) + Sys Code (3) + Year (4) + Sequence No. (4)
FPG	PAF	FES	CDX00000020100007

NOTE: When referencing the calculation ID, include all parts without spaces or dashes between them.

Unit(s), Spill gate(s), or Voltages (PSO):	**Key Nouns (For CTS/CCRIS):**
000	CTS

Applicable Design Document(s):	**Rev**	**RIMS/EDMS Accession Number** *(Optional)*
	R0	
	R	
UNID System(s):	R	
	R	

	R0	R	R	R
DCN, PCN, NA	NA-WP			
Prepared: Sign➔	Anita Amla, Erman Caudill			
Print Name	Anita Amla, Erman Caudill			
Checked: Sign➔	Sharath Vemuri			
Print Name	Sharath Vemuri			
	These calculations contain unverified assumption(s) that must be verified later? ☐ Yes ☒ No These calculations contain special requirements and/or limiting conditions? ☐ Yes ☒ No			
Approved: Sign➔	Sharath Vemuri			
Print Name	Sharath Vemuri			
Approval Date	03-04-10			
	These calculations contain a design output attachment? ☐ Yes ☒ No			
Revision Applicability	☐ Entire calc	☐ Entire calc ☐ Selected pgs	☐ Entire calc ☐ Selected pgs	☐ Entire calc ☐ Selected pgs
	Computer output Microfiche generated? ☐ Yes ☒ No Number: _____			

Purpose of the Calculation: Stability Analysis and Ditch Capacity/Lining Design for East Pond East Slope Buttressing

Abstract:

☒ Electronically file and return calculation to Calculation Library.
☐ Electronically file and return calculation _____ Address: _____

TVA Calculation Coversheet
CTS Input Form

Preparer	Preparer Login ID	Date
Checker	Checker Login ID	Date

Update Code: ☐ Add ☐ Change ☐ Delete ☐ Rename ☐ Supersede ☐ Duplicate ☐ Verify

The following section applies if a calculation is being renamed, superseded, or has a duplicate.

	Org Code	Plant	Branch	Number	Cur Rev	New Rev
Current Calc ID:						

The following section applies to all calculations.

Calc ID:	FPG	PAF	FES	CDX00000020100007	0	0

Firm: *(TVA or Contractor)* _____

Cross-References

A/C/D	Xref Code	Type	Org Code	Plant	Branch	Number	Rev

TVA Calculation Record of Revision

Calculation Identifier: FPGPAFFESCDX00000020100007

Title PAF- Scrubber Sludge Complex east slope of East Pond Buttressing

Revision No.	Description of Revision

TVA Computer File Storage Information Sheet

Calculation Identifier: FPGPAFFESCDX0000002010007 **Rev.** 0 **Plant:** PAF

Subject: Buttressing for the east slope of the East Pond of the PAF Scrubber Sludge Complex

Software Name: _____ **Revision Level:** _____

Vendor Name: _____

Address: _____

Executable Files

☒ No TVA developed **executable files** were used in this calculation.

Comments:

☐ TVA developed **executable files** used in this calculation have been stored electronically and sufficient identifying information is provided below for each executable file. *(Any retrieved file requires re-verification of its contents before use.)*

Input Files

☐ Electronic storage of the **input files** for this calculation is not required.

Comments:

☐ **Input files** for this calculation have been stored electronically and sufficient identifying information is provided below for each input file. *(Any retrieved file requires re-verification of its contents before use.)*

TVA Calculation Table of Contents

Calculation Identifier: FPGPAFFESCDX00000020100007 **Revision:** 0

Table of Contents

Section	Title	Page
1	Slope Stability Analysis Runs and Ditch Capacity/Lining Calculations	6

SEEP/W Analysis
East Slope of East Pond
Scrubber Sludge Complex

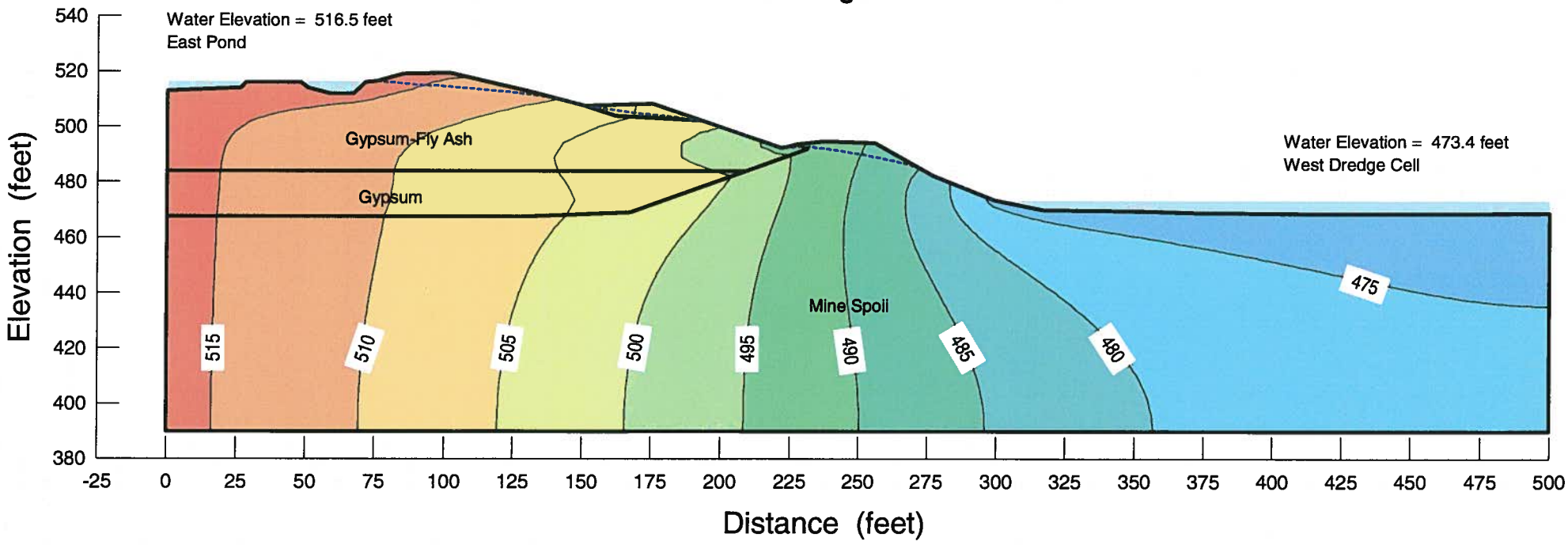
Paradise Fossil Plant
Tennessee Valley Authority

January 2010
Method: Steady-State Seepage
File Name: D-D' Existing.gsz

Note:
The results of 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.

Material Type	Ksat	Kratio	Wsat
Gypsum	3.28e-005	0.02	0.39
Gypsum-Fly Ash	3.28e-005	0.02	0.41
Mine Spoil	4.92e-006	0.33	0.37

Existing Condition



Slope Stability
East Slope of East Pond
Scrubber Sludge Complex

Paradise Fossil Plant
Tennessee Valley Authority

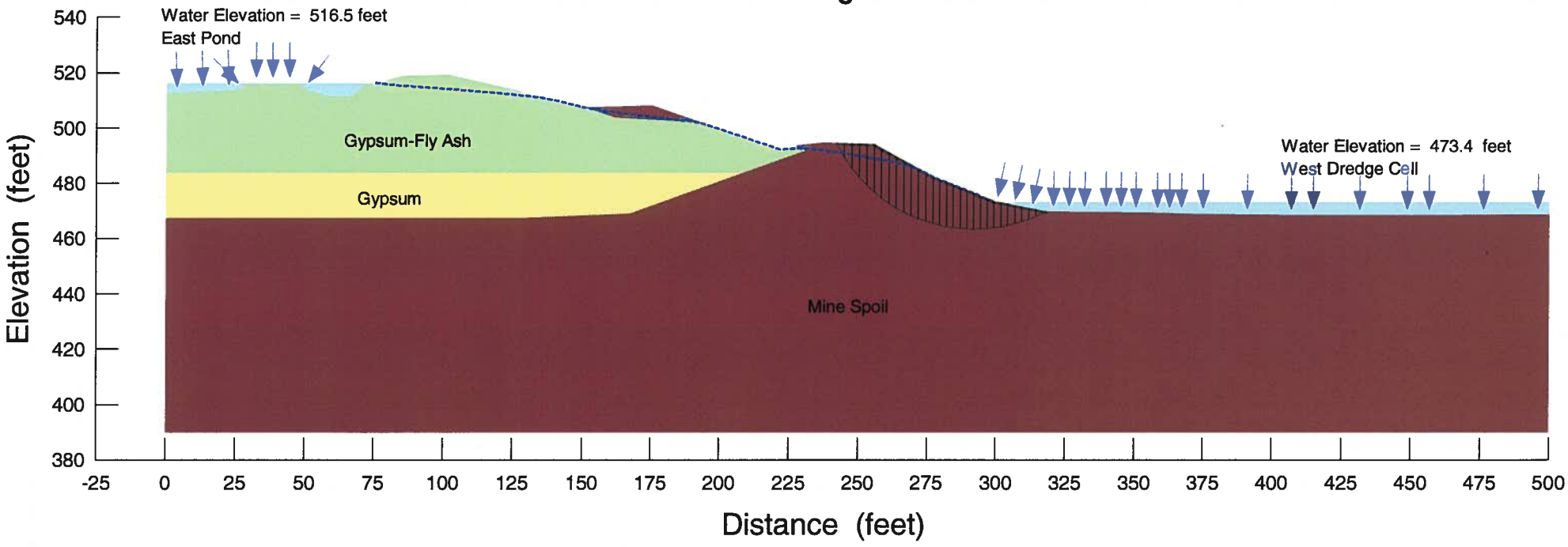
January 2010
Method: Modified Spencer
File Name: D-D' Existing.gsz

Factor of Safety: 1.0
Center: (292.2, 519) ft
Radius: 55.5 ft
Minimum Slip Surface Depth: 18 ft

Note:
The results of 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.

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum	120	0	35
Gypsum-Fly Ash	115	0	35
Mine Spoil	135	0	30

Existing Condition



SEEP/W Analysis
East Slope of East Pond
Scrubber Sludge Complex

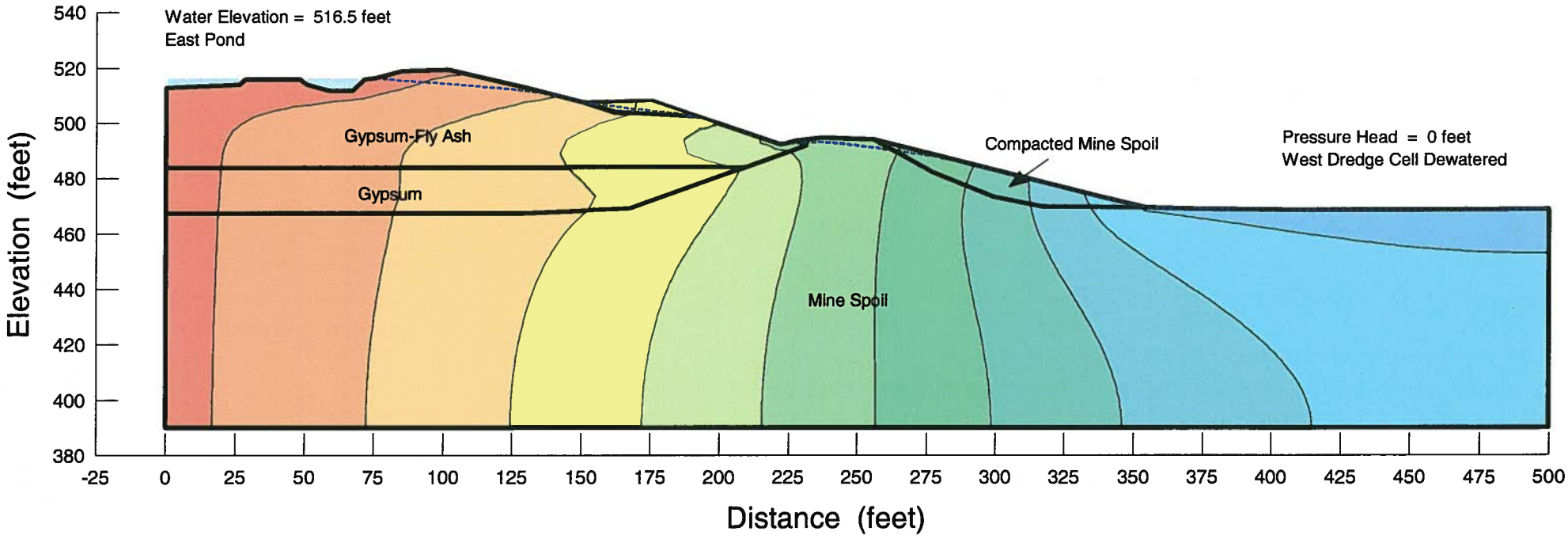
Paradise Fossil Plant
Tennessee Valley Authority

January 2010
Method: Steady-State Seepage
File Name: D-D' Proposed.gsz

Note:
The results of 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.

Material Type	Ksat	Kratio	Wsat
Gypsum	3.28e-005	0.02	0.39
Gypsum-Fly Ash	3.28e-005	0.02	0.41
Mine Spoil	4.92e-006	0.33	0.37
Compacted Mine Spoil	4.92e-006	0.33	0.37

Proposed Condition



Slope Stability
East Slope of East Pond
Scrubber Sludge Complex

Paradise Fossil Plant
Tennessee Valley Authority

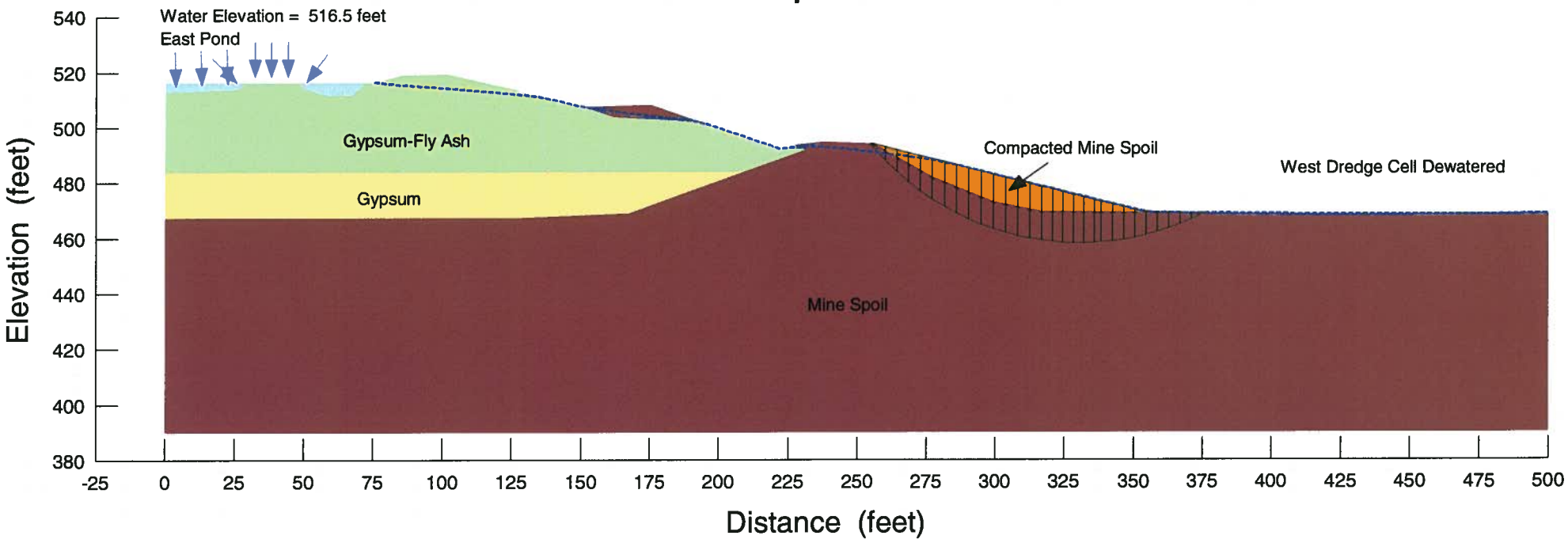
January 2010
Method: Modified Spencer
File Name: D-D' Proposed.gsz

Factor of Safety: 1.5
Center: (330.84, 557) ft
Radius: 98.75 ft
Minimum Slip Surface Depth: 18 ft

Note:
The results of 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.

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum	120	0	35
Gypsum-Fly Ash	115	0	35
Mine Spoil	135	0	30
Compacted Mine Spoil	135	0	33

Proposed Condition



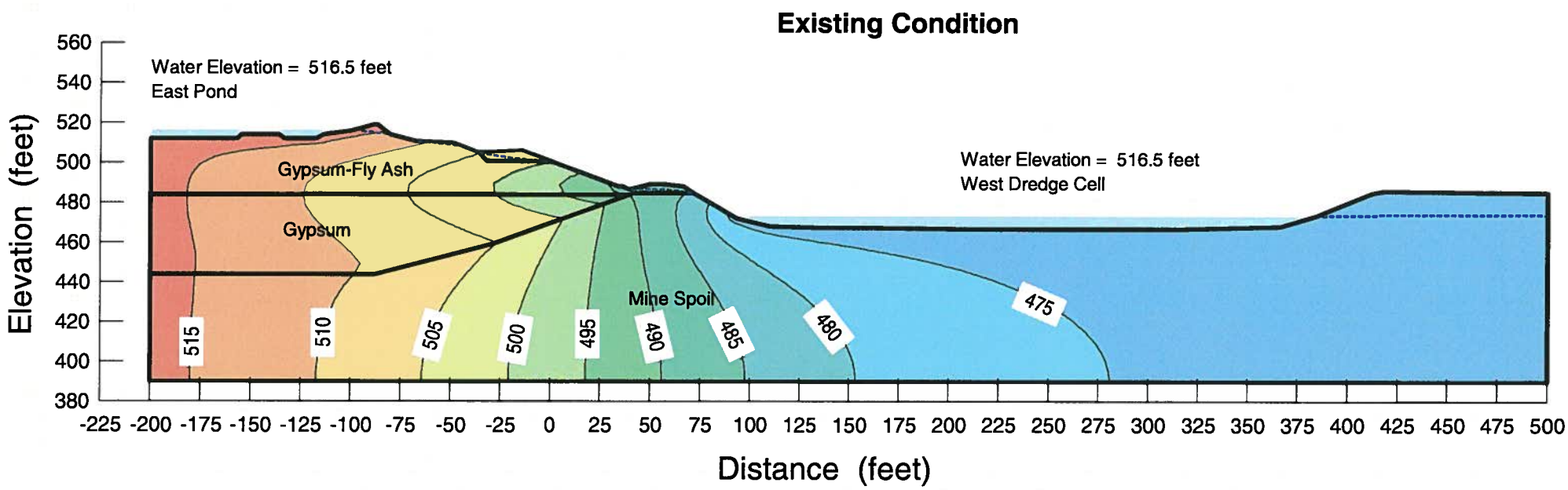
SEEP/W Analysis
East Slope of East Pond
Scrubber Sludge Complex

Paradise Fossil Plant
Tennessee Valley Authority

January 2010
Method: Steady-State Seepage
File Name: G-G' Existing.gsz

Note:
The results of 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.

Material Type	Ksat	Kratio	Wsat
Gypsum	3.28e-005	0.02	0.39
Gypsum-Fly Ash	3.28e-005	0.02	0.41
Mine Spoil	4.92e-006	0.33	0.37



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Slope Stability
East Slope of East Pond
Scrubber Sludge Complex

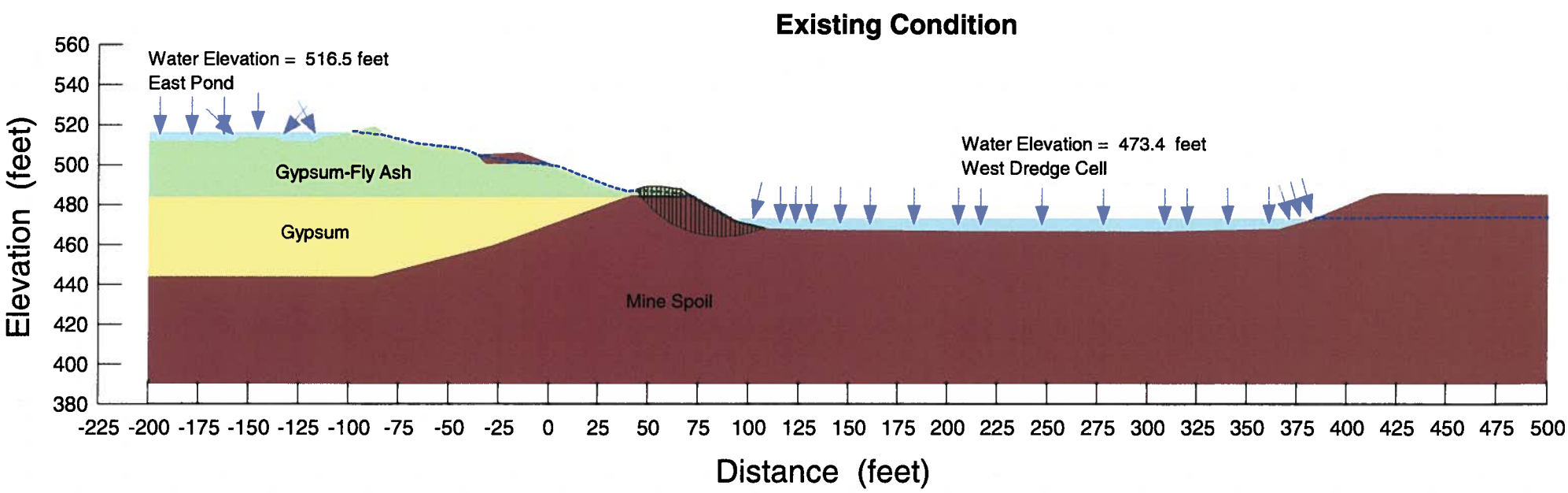
Paradise Fossil Plant
Tennessee Valley Authority

January 2010
Method: Modified Spencer
File Name: G-G' Existing.gsz

Factor of Safety: 1.0
Center: (86.8, 515) ft
Radius: 50.75 ft
Minimum Slip Surface Depth: 19 ft

Note:
The results of 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.

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum	120	0	35
Gypsum-Fly Ash	115	0	35
Mine Spoil	135	0	30



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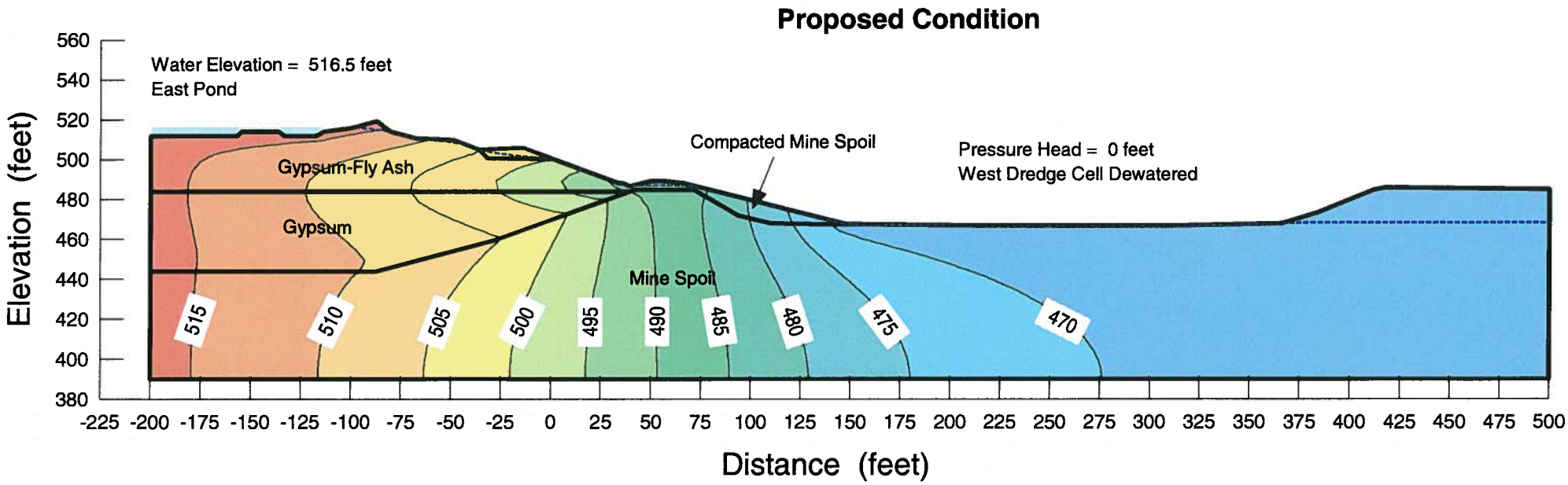
SEEP/W Analysis
East Slope of East Pond
Scrubber Sludge Complex

Paradise Fossil Plant
Tennessee Valley Authority

January 2010
Method: Steady-State Seepage
File Name: G-G' Proposed.gsz

Note:
The results of 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.

Material Type	Ksat	Kratio	Wsat
Gypsum	3.28e-005	0.02	0.39
Gypsum-Fly Ash	3.28e-005	0.02	0.41
Mine Spoil	4.92e-006	0.33	0.37
Compacted Mine Spoil	4.92e-006	0.33	0.37



Slope Stability
East Slope of East Pond
Scrubber Sludge Complex

Paradise Fossil Plant
Tennessee Valley Authority

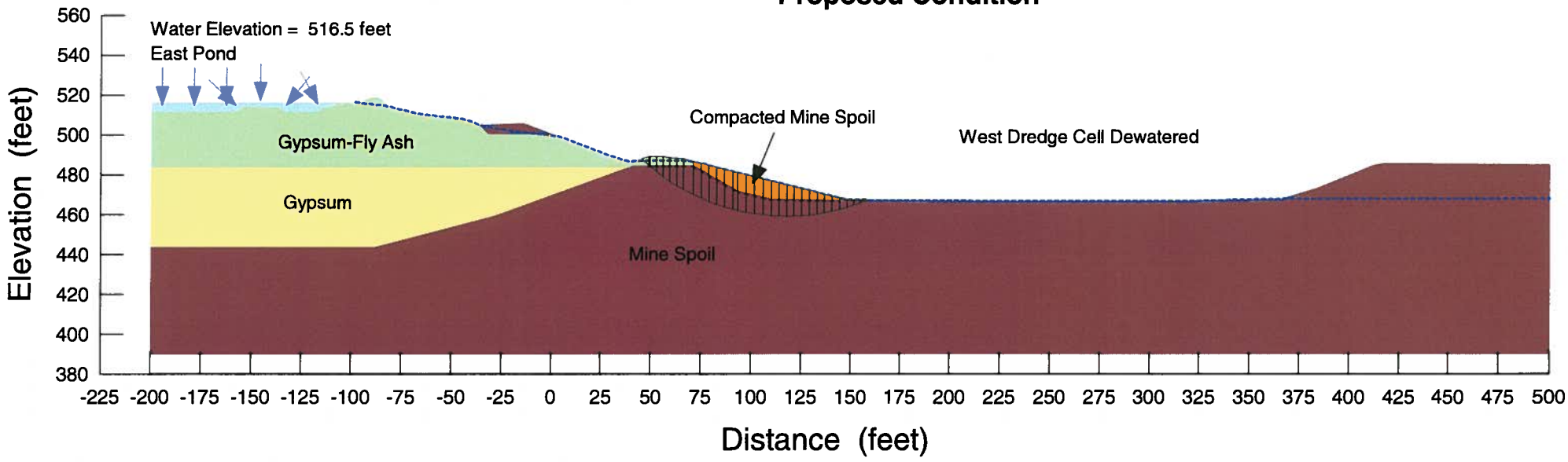
January 2010
Method: Modified Spencer
File Name: G-G' Proposed.gsz

Factor of Safety: 1.5
Center: (118, 565) ft
Radius: 105.7 ft
Minimum Slip Surface Depth: 19 ft

Note:
The results of 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.

Material Type	Unit Weight	Cohesion	Friction Angle
Gypsum	120	0	35
Gypsum-Fly Ash	115	0	35
Mine Spoil	135	0	30
Compacted Mine Spoil	135	0	33

Proposed Condition

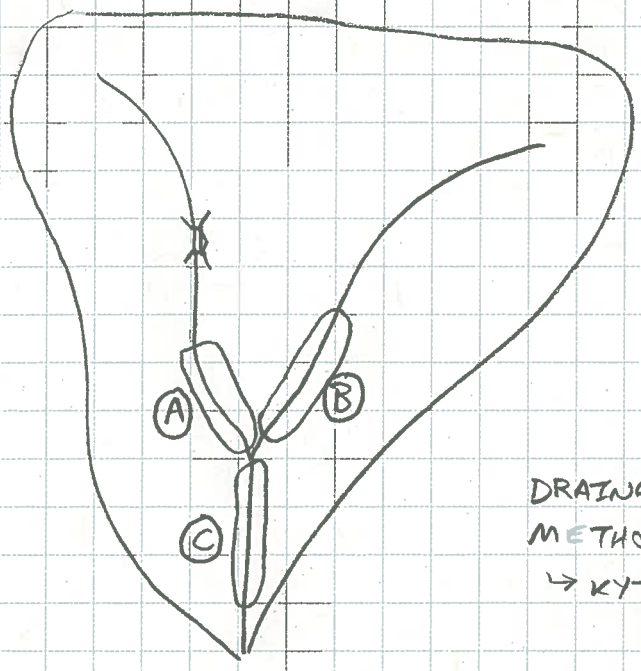


Stantec

TUA PARADISE – WEST DREDGE CELL REPLACEMENT
DITCH CAPACITY & LINING REQUIREMENTS
175569040

1/3

WATERSHED IS APPROXIMATELY 145 ACRES AT THE DOWNSTREAM POINT WHERE THE WEST DREDGE CELL EMBANKMENT IS. THE WATERSHED IS CHARACTERIZED AS BRUSH & GRASS COVER WITH THE PREDOMINANT SOIL BEING MINE SPOIL. ASSUMED TO BE HYDROLOGIC SOIL GROUP D.



DITCH SEGMENT	DRAINAGE AREA (ACRES)	APPROX. SLOPE (%)
A	65	8
B	45	2
C	145	0.5

DRAINAGE AREAS ARE SMALL SO RATIONAL METHOD SHOULD SUFFICE
↳ KYTC ACCEPTS IT UP TO 200 ACRES

$$Q = C\,I\,A$$

C-FACTOR: BRUSH&GRASS USE PASTURE, ROLLING, CLAY = 0.55
↳ REF. C.T. HAAN DESIGN HYDROLOGY FOR SMALL CATCHMENTS 1994 Pg 85

INTENSITY: DESIGN CHANNEL FOR 10YR, ASSUME $T_c \sim 1$ HR
$I_{10} = 2.1"$ → REF. KY MEMO #2

DESIGN DISCHARGES

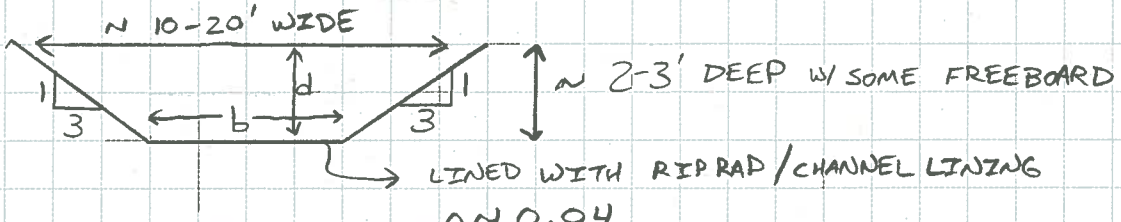
A $Q = CIA = (0.55)(2.1)(65) = 75$ CFS
B $= (0.55)(2.1)(45) = 52$ CFS
C $= (0.55)(2.1)(145) = 168$ CFS

Designed by: ERMAN CANDILL Checked by:

Stantec

2/3

TRAPEZOIDAL CHANNEL



USE MANNING'S EQ.

$Q = \frac{1.49}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$ $\quad R = \frac{A}{W_p}$

SEGMENT C
LOOKING FOR Q = 170 CFS
AT A MIN. SLOPE OF 0.5% = 0.005 FT/FT

IF b = 10' d = 3' A = 57 W_p = 29' R = 1.97' Q = 235 CFS (OK)
b = 5' d = 3' A = 42 W_p = 24' R = 1.75' Q = 160 CFS (NO GOOD)

↳ USE A CHANNEL ~ 10' WIDE AT BASE AND ~ 3' DEEP FOR SEGMENT C

VELOCITY = $\frac{Q}{A}$ WHEN FULL $V = \frac{Q}{A} = \frac{235}{57} = 4.1 \frac{FT}{S}$

↳ RIPRAP IS MORE THAN ENOUGH FOR THIS VELOCITY

FOR SEGMENTS A & B LOOKING FOR Q ~ 75 CFS AT S_o ~ 2%
IF b = 5' d = 2' A = 22 W_p = 17.65' R = 1.25 Q = 135 CFS (OK)
↳ THIS IS A PRACTICAL SIZE, GO WITH IT
AT SLOPE OF 8% & Q = 75 CFS WHAT IS VELOCITY?
↳ USING SOLVER d = 0.95'
↳ A = 7.46 V = 10.1 FT/S (PRETTY HIGH)

CSU PROCEDURE SEE HAAN ABOVE Pg 129

$\tau = \gamma d S = 62.4 (0.95)(0.08) = 4.74 \ lb/FT^2$

$n_B = \frac{2 I \tau}{\gamma (SG-1) D_{50}} = \frac{2 I (4.74)}{62.4 (2.65-1)} \frac{1}{D_{50}} = \frac{0.97}{D_{50}}$

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3/3

SAFETY FACTOR $SF = \frac{\cos\theta \tan\phi}{\sin\theta + n_b \tan\phi}$

θ = ANGLE OF CHANNEL BOTTOM | $S_o = 0.08 \rightarrow \theta = 4.57°$

ϕ = ANGLE OF REPOSE OF STONE = 42°

$SF \geq 1$ = STABLE CHANNEL

$$SF = \frac{\cos(4.57)\tan(42)}{\sin(4.57) + \frac{0.97}{D_{50}}(\tan(42))} = 1$$

$$0.898 = 0.08 + \frac{0.874}{D_{50}} \qquad D_{50} = 1.07' \sim 13''$$

↳ NEED CLASS III CHANNEL LINING FOR STEEP SECTION

CHECK FOR THE 2% SLOPE

$Q = 75$ CFS $\quad S_o = 2\% \rightarrow d = 1.33' \rightarrow A = 12 \quad V = 6.25$ FT/S

$\tau = \gamma d S = 62.4(1.33)(0.02) = 1.65$ lb/FT^2

$$n_b = \frac{21\tau}{\gamma(SG-1)D_{50}} = \frac{21(1.65)}{62.4(2.65-1)}\frac{1}{D_{50}} = \frac{0.337}{D_{50}}$$

$\theta = 1.14°$

$$SF = \frac{\cos(1.14)\tan(42)}{\sin(1.14) + \frac{0.337}{D_{50}}\tan(42)} = 1$$

$$0.90 = 0.02 + \frac{0.303}{D_{50}} \qquad D_{50} = 0.34' \sim 4''$$

↳ CLASS IA WORKS, CLASS II IS FINE

RECOMMENDATION:

- SEGMENTS A&B USE TRAPEZOID 2' DEEP 5' WIDE CLASS III LINING FOR STEEPER SEGMENT CLASS II FOR OTHER
- SEGMENT C USE TRAPEZOID 3' DEEP 10' WIDE CLASS II LINING IS OK

Designed by: Checked by: