Closure Completion Notification for Closure by Removal

January 15, 2025
Closure Completion Notification
Mitchell Plant
Bottom Ash Pond

On December 24, 2024, the Mitchell Plant Bottom Ash Pond was transitioned to closure status in accordance with 40 CFR 257.102. This notice of completion of closure is being placed in the operating record in accordance with 40 CFR 257.102(h).

Effective with the Closure Completion Notification, the former ash storage site is no longer a CCR unit. The following operating record documents are no longer required going forward:

- Hazard Potential Classification
- Emergency Action Plan (EAP)
- Face to Face Meeting Documentation for EAP
- History of Construction and Revisions for Surface Impoundments
- Structural Stability Assessments
- Safety Factor Assessments
- Fugitive Dust Plan
- Inflow Design Flood System Control Plan

CLOSURE CERTIFICATION BY QUALIFIED PROFESSIONAL ENGINEER

I certify that the AEP Mitchell Bottom Ash Pond has been closed in accordance with the most recent written closure plan specified by 40 CFR 257.102(b) and the requirements of 40 CFR 257.102.

David Anthony Miller
Printed Name of Licensed Professional Engineer


Signature

22663	West Virginia	01.15.2025
License Number	Licensing State	Date

March 8, 2023
Document Number: APO087.0003

VERDANTAS CERTIFICATION

Based on the construction observations performed by Verdantas representatives, I hereby certify that the Bottom Ash Pond West Basin at the Mitchell Plant in Moundsville, West Virginia, as shown on the record drawing located in Appendix C, has achieved removal of all CCR material and soil with constituent concentrations above relevant background standards (i.e., closed by removal) in substantial compliance with the Construction Quality Assurance (CQA) Plan for Pond Closure and Repurposing, the Construction Drawings for the CCR/ELG closure by removal project, Bottom Ash Pond Closure and Repurposing Contract as provided by Worley (December 3, 2021) and as per 40 CFR 257.102, and as clarified herein. The groundwater monitoring and compliance aspect of CCR Unit closure by removal criteria, as found at 40 CFR 257.102(c), will be certified under a separate report. The Contractor (R.B. Jergens) obtained the survey data used to develop the record drawing. R.B. Jergens verified that the elevations met the closure requirements, and Verdantas also reviewed the survey data.

Chris Goddard
Quality Assurance Officer/CQA Manager

Allen J. Smith Jr., PE
Certifying Engineer
WV PE# 020463

ALLEN J. SMITH, JR.
REGISTERED
20463
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

3/9/2023

April 4, 2024
Document Number: APO087.0006

VERDANTAS CERTIFICATION

Based on the construction observations with associated photographic records, testing performed by Verdantas representatives in the field and documented in this report, I hereby certify to the best of my knowledge and to the extent of available information that the East Wastewater Pond at the Mitchell Plant in Moundsville, West Virginia, as shown on the record drawing located in Appendix B, has achieved removal of all CCR material and one foot (minimum) of underlying native soil in substantial compliance with the Construction Quality Assurance (CQA) Plan for Pond Closure and Repurposing, the Construction Drawings for the CCR/ELG Project, the Bottom Ash Pond Closure and Repurposing Contract as provided by Worley (December 3, 2021), per 40 CFR 257.102 and as clarified herein. The groundwater monitoring and compliance aspect of CCR Unit closure by removal criteria, as found at 40 CFR 257.102(c), will be certified under a separate report. This certification is strictly limited to CQA observations and associated field testing and does not include an engineering analysis of previously approved and permitted engineering designs or subsequent approved design/field changes. The Contractor (R.B. Jergens) obtained the survey data used to develop the attached record drawing. R.B. Jergens verified that the elevations met the construction requirements, and Verdantas also reviewed the survey data.

Chris Goddard
Quality Assurance Officer/CQA Manager

Allen J. Smith Jr., PE
Certifying Engineer
WV PE# 020463

ALLEN J. SMITH JR.
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20463
STATE OF
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4/4/2024

SAFETY FACTOR ASSESSMENT
PERIODIC 5-YEAR REVIEW

CFR 257.73e

Bottom Ash Pond Complex

Mitchell Power Plant
Marshall County, West Virginia

October, 2021

Prepared for: Wheeling Power Company & Kentucky Power Company

Prepared by: American Electric Power Service Corporation

1 Riverside Plaza

Columbus, OH 43215

GERS-21-045

Safety Factor Assessment Periodic 5-Year Review

CFR 257.73(e)

Mitchell Power Plant

Bottom Ash Pond Complex

PREPARED BY	Mohammad A. Ajlouni, Ph.D.,P.E.	DATE	9/28/2021
REVIEWED BY	Dan Murphy, P. E.	DATE	9/30/2021
APPROVED BY	Gary F. Zych, P.E. Manager – AEP Geotechnical Engineering	DATE	10/1/2021

Gary F. Zych

GARY F. ZYCH
REGISTERED
21201
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

10/1/2021

I certify to the best of my knowledge, information, and belief that the information contained in this safety factor assessment meets the requirements of 40 CFR § 257.73(e)

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1.0 OBJECTIVE

This report was prepared by AEP- Geotechnical Engineering Services (GES) section to fulfill requirements of CFR 257.73(e) for the safety factor assessment of CCR surface impoundments.
This is the first periodic 5-year review of the safety factor assessment.

2.0 DESCRIPTION OF THE CCR UNIT

The Mitchell Bottom Ash Pond Complex is located at the Mitchell Power Plant in Marshall County, West Virginia. The impoundment was constructed in 1977 and is comprised of a Bottom Ash Pond and a Clear Water Pond. The purpose of the pond is for the disposal of Bottom Ash produced at the Mitchell Power Plant.

The complex is surrounded by the Mitchell Power Plant on its north side, West Virginia State Route 2 on its east side, the adjacent wallboard facility and ancillary structures on its south side, and the metal cleaning tank, railroad tracks, and the Ohio River on its west side. The Bottom Ash Pond Complex is approximately 17 acres in size and consists of two impounding facilities, the Bottom Ash Pond which is approximately 10 acres, and the Clear Water Pond which is approximately 7 acres. The Bottom Ash Pond comprises the north portion of the complex and the Clear Water Pond comprises the southern portion. The Mitchell Bottom Ash Pond Complex is regulated by the West Virginia Division of Water and Waste Management (WVDWWM) as a Hazard Class “2” Structure.

3.0 SAFETY FACTOR ASSESSMENT 257.73(e)

The periodic 5-year review was conducted to evaluate if any physical changes have been made to the earthen dam and/or operating changes that could impact the loading on the structure. The assumptions, material properties and operating pools defined in the initial assessment were reviewed. The review concluded that there have been no changes that would impact the stability analyses that were previously conducted. Therefore, the previous report and analyses are still applicable to the current conditions of the facility. The results indicate that the calculated factors of safety meet or exceed the minimum values defined in Section 257.73(e).

ATTACHMENT A

Safety Factor Assessment of Mitchell Power Plant Bottom Ash Pond Complex

CCR RULES ASSESSMENT AND CERTIFICATION
MITCHELL PLANT BOTTOM ASH COMPLEX
KENTUCKY POWER COMPANY
AEP SERVICE CORPORATION

PREPARED BY:

GEO/ENVIRONMENTAL ASSOCIATES, INC.

A SCHNABEL ENGINEERING COMPANY

KNOXVILLE, TENNESSEE

PROJECT NUMBER 15055013.00

DECEMBER 22, 2015

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CCR RULES ASSESSMENT AND CERTIFICATION
MITCHELL POWER PLANT BOTTOM ASH COMPLEX
KENTUCKY POWER COMPANY
MARSHALL COUNTY, WEST VIRGINIA
DECEMBER 22, 2015

INTRODUCTION

Geo/Environmental Associates, Inc. (GA) has performed a site inspection, conducted an engineering assessment, and prepared a certification statement for the Mitchell Power Plant Bottom Ash Complex. These services were performed to meet specific requirements set forth in the Environmental Protection Agency's CCR Rules.(1) Provided in this report is a discussion of GA's findings and a certification statement pertaining to the facility. Field and laboratory data, engineering analyses, and a drawing are included in the appendices.

SITE DESCRIPTION

General

The Mitchell Bottom Ash Complex is equally owned by American Electric Power Generation Resources, Inc. and Kentucky Power Company (KPC) and it is operated by KPC to provide disposal capacity for bottom ash generated at the Mitchell Power Plant. AEPSC, based in Columbus, Ohio, provides engineering support for the Bottom Ash Complex. The Mitchell Bottom Ash Complex is located near Cresap in Marshall County, West Virginia at approximately latitude 39° 49' 30" and longitude 80° 48' 56".

The complex is surrounded by: (1) the Mitchell Power Plant on its north side, (2) West Virginia State Route 2 on its east side, (3) the adjacent wallboard facility and ancillary structures on its south side, and (4) the metal cleaning tank, railroad tracks, and the Ohio River on its west side. As shown on drawing sheet 1 in Appendix IV, the Mitchell Bottom Ash Complex consists of two impounding facilities: (1) the Bottom Ash Pond and (2) the Clear Water Pond. The Bottom Ash Pond comprises the north portion of the complex and the Clear Water Pond comprises the southern portion. The Mitchell Bottom Ash Complex is regulated by the West Virginia Division of Water and Waste Management (WVDWWM) as a Hazard Class "2" structure.

The Bottom Ash Pond is separated into ponding areas in its western and northeastern portions. In general, bottom ash is sluiced into the northeastern portion of the pond; where after, the sluice water is routed through an interior splitter dike to the western portion of the pond. Flow through the western portion of the pond is routed around three interior flow diversion dikes. The southeastern portion of the Bottom Ash Pond is above the normal operating pool (pond) level

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(1) Environmental Protection Agency, 40 CFR Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal combustion Residuals from Electric Utilities; Final Rule," April 17, 2015

and is used as an excavation and loadout area for bottom ash. The Bottom Ash Pond was constructed partially as an incised pond and partially using raised dike construction. Specifically, the pool level on the east side of the pond is generally below the bottom elevation of the east dike (i.e., it is incised). The inside slopes of the Bottom Ash Pond are lined with a composite soil and PVC liner. The southern dike separates the Bottom Ash Pond and Clear Water Pond.

Overflow from the western portion of the Bottom Ash Pond is conveyed to the Clear Water Pond via a concrete overflow shaft and a 30-inch diameter reinforced concrete pipe to a 30-inch diameter perforated distribution pipe in the Clear Water Pond. The Clear Water Pond was constructed using both incised pond and diked pond construction methods. In general, the pool levels along the southern and eastern sides of the Clear Water Pond are primarily incised. Similar to the Bottom Ash Pond, the inside slopes of the Clear Water Pond are lined with a composite soil and PVC liner. Overflow from the Clear Water Pond is conveyed through an overflow tower into a 36-inch diameter reinforced concrete pipe through the embankment and then a series of 36-inch diameter corrugated metal pipes which discharge into a riprap-lined channel leading to the Ohio River.

Approximate Existing Conditions

A summary of the approximate existing conditions for the Mitchell Bottom Ash Complex is provided in List 1. A site plan view of the facility is included in Appendix IV.

LIST 1
SUMMARY OF APPROXIMATE EXISTING CONDITIONS FOR MITCHELL BOTTOM ASH COMPLEX

Bottom Ash Pond Crest Elevation .... 690 feet, NAVD
Bottom Ash Pond Normal Operating Pool Level .... 681 feet, NAVD
Bottom Ash Pond Design Storm Level (1) .... 682.98 feet, NAVD
Bottom Ash Pond Bottom Level .... 660 feet, NAVD
Clear Water Pond Crest Elevation .... 675 feet, NAVD
Clear Water Pond Normal Operating Pool Level .... 664 feet, NAVD
Clear Water Pond Design Storm Level (2) .... 665.62 feet, NAVD
Clear Water Pond Bottom Level .... 645 feet, NAVD

Notes:

(1) The Bottom Ash Pond maximum design storm level is based on a normal operating pool elevation of 681 feet, NAVD and a pool increase of 1.98 feet during the 1/2 PMP 6-hour storm event.
(2) The Clear Water Pond maximum design storm level is based on a normal operating pool elevation of 664 feet, NAVD and a pool increase of 1.62 feet during the 1/2 PMP 6-hour storm event.

SITE INSPECTION

At the request of AEPSC, GA personnel performed a site inspection of the Bottom Ash Complex to observe and document the prevalent site conditions. Specifically, Seth W. Frank, P.E. (GA) performed a site inspection of the Bottom Ash Complex on July 14, 2015. It is GA's opinion that the Bottom Ash Complex is in good condition. Moreover, GA believes that the conditions observed, during the July 14, 2015, site inspection, are representative of the conditions modeled in the assessments and analyses provided in this report.

FIELD, LABORATORY, AND INSTRUMENTATION DATA

For reference, pertinent field and laboratory data for the Bottom Ash Complex is provided in Appendix I. The field and laboratory data were gathered during a subsurface investigation coordinated by GA in 2009. The field data includes detailed borehole logs and results of in-situ testing (i.e., standard penetration testing). Laboratory data provided in Appendix I includes: (1) grain size distributions, (2) Atterberg limits test results, (3) unconfined compressive strength test results, and (4) triaxial compressive strength test results.

AEP monitors four standpipe piezometers, at the Bottom Ash Complex facility, monthly. Results of instrumentation monitoring are collected and summarized in annual inspection reports.

Locations of the site boreholes/piezometers are shown on the Site Plan View drawing in Appendix IV.

HYDRAULICS AND HYDROLOGY

Flood routing analyses were developed for the existing conditions at the Bottom Ash Complex using the *HEC-1* computer program, developed by the U.S. Army Corps of Engineers. Flood routing parameters and the *HEC-1* output are provided in Appendix II. In accordance with the 40 CFR Parts 257 and 261 (CCR Rules), the flood routing analyses were performed using the 1/2 PMP 6-hour storm event. A summary of the flood routing results is provided in Table 1.

TABLE 1
SUMMARY OF FLOOD ROUTING ANALYSES
FOR EXISTING CONDITIONS

Pond	Crest Elevation (ft, NAVD)	Design Storm	Principal Spillway/Overflow Structure Invert Elevation/Pool at Start of storm (ft, NAVD)	Peak Inflow (cfs)	Peak Outflow (cfs)	Peak Stage (ft, NAVD)	Minimum Freeboard (ft)
Bottom Ash	690'	1/2 PMP6-hour	681'	111.08	23.83	683.51	6.49
Clearwater	675'	1/2 PMP6-hour	664'	71.44	44.76	666.50	8.50

As shown in Table 1, the as-built Bottom Ash Pond and Clearwater Pond are capable of storing/routing the 1/2 PMP 6-hour storm event, while providing at least 3 feet of freeboard for the minimum embankment crest elevations of 690 feet, NAVD and 675 feet, NAVD respectively. Note that the storm routing analyses assume a constant, peak inflow of 7.5 million gallons per day from plant processes, in addition to the storm runoff.

SLOPE STABILITY ANALYSES

General

The computer program *SLOPE/W*, developed by GEO-SLOPE International, Ltd., was used to perform slope stability analyses on two critical embankment profiles for the as-built Bottom Ash Complex. Specifically, the Morgenstern-Price limit equilibrium method was applied in the slope stability analyses. The slope stability analyses were conducted for the as-built Bottom Ash Complex Profiles SP1-SP1 and SP2-SP2. Locations of the critical profiles are shown on the drawing in Appendix IV. Section SP1-SP1 was chosen as a critical section because of its height and potential to directly release material during a failure. Section SP2-SP2 was selected as a critical section because it is the highest embankment (measured from the crest to the downstream toe) and impounds water against both the upstream face and the downstream toe. A failure at Section SP2-SP2 would likely be contained in the Clear Water Pond, but would likely release sediment/ash through the Clear Water Pond spillway causing environmental damage and potentially clogging the spillway. Slope stability loading conditions and factor of safety requirements are outlined in the CCR Rules. Where applicable, those requirements were modeled for the critical embankment profiles. A description of the slope stability analyses/assessments follows.

Static Factor of Safety Under Long Term, Maximum Storage Pool Loading Conditions

The long term, maximum storage pool loading condition was modeled in the downstream direction for the critical embankment profiles. Specifically, the Bottom Ash Pond normal operating pool elevation of 681 feet, NAVD and the Clearwater Pond normal operating pool elevation of 664 feet, NAVD were modeled in the slope stability analyses. The phreatic levels within the profiles were conservatively assumed to extend linearly from the pool on the upstream side to the toe or pool on the downstream side. Historical piezometer levels indicate phreatic levels considerably lower than those modeled.

Static Factor of Safety Under Maximum Surcharge Pool Loading Conditions

The maximum surcharge pool loading condition was modeled in the downstream direction for the critical embankment profiles. Specifically, the 1/2 PMP 6-hour design storm peak stage for the Bottom Ash Pond and the Clearwater Pond of 682.98 feet, NAVD and 665.62 feet, NAVD respectively, were modeled in the impoundments for the slope stability analyses. For the maximum surcharge pool loading condition a minimum factor of safety equal to 1.2 is required. The phreatic levels within the profiles were conservatively assumed to extend linearly from the pool on the upstream side to the toe or pool on the downstream side. Historical piezometer levels indicate phreatic levels considerably lower than those modeled. It should be noted that the existing principal spillway and overflow structures are capable of routing the excess storage in a short period of time. Therefore, it is unlikely that an elevated steady-state phreatic level will fully develop through the embankment during the maximum surcharge pool loading conditions.

Seismic Factor of Safety

The seismic loading condition was modeled in the upstream and downstream direction for the critical embankment profiles. The Bottom Ash Pond normal operating pool elevation of 681 feet, NAVD and the Clearwater Pond normal operating pool elevation of 664 feet, NAVD were modeled in the seismic slope stability analysis. Based on the *2008 Interactive Deaggregations* website provided online through the USGS Geologic Hazards Science Center, the Bottom Ash Complex facility has a peak ground acceleration of 0.046g for a seismic loading event with a mean return time of 2,475 years. Conservatively assuming soft soil ground conditions above rock, translates to a peak horizontal ground surface acceleration of approximately 0.*12* g. Using a commonly applied factor of 0.5 times the peak horizontal acceleration yields the conservative horizontal seismic coefficient of 0.06 that was applied in the slope stability analyses. As described in the previous sections, the phreatic levels within the profiles were conservatively assumed to extend linearly from the pool on the upstream side to the toe or pool on the downstream side of the embankment.

Liquefaction Assessment

The CCR Rules state that "Liquefaction analysis is only necessary in instances where CCR surface impoundments show, through representative soil sampling, construction documentation, or anecdotal evidence from personnel with knowledge of the CCR unit's construction, that soils of the embankment are susceptible to liquefaction." Based on the results of the 2009 subsurface investigation, the embankment consists primarily of dense to very dense silty, clayey sands. However, the original ground (foundation) materials consist primarily of loose to medium dense, silty sands (i.e., corrected SPT blow count – N – values ranging from 2.3 to 43.6, with median values for each boring ranging from 5.2 to 18.1). See the boring logs and summary of corrected SPT blow counts located in Appendix I. Strength loss in sands during an earthquake is generally considered unlikely when blow counts are greater than 15[(2)]. Although the majority of blow counts occurred at lower depths of natural materials tested, for our liquefaction analyses, we conservatively assume uniform material parameters throughout the natural ground interval.

The *QUAKE/W* computer program developed by GEO-SLOPE International, Ltd., was used to perform dynamic finite element stress analyses for the two critical sections, SP1-SP1 and SP2-SP2. The dynamic analysis consisted of the following three steps/analyses: (1) an initial static analysis that determines the initial stress conditions, (2) a dynamic analysis using a scaled

(2) Engineering and Design Manual – Coal Refuse Disposal Facilities, 2nd Ed., Mine Safety and Health Administration (based on data from Seed and Harder, 1990; Castro, 1995; Wride et. al. , 1999)

earthquake record that determines potentially liquefiable zones, and (3) a Newmark Deformation analysis that determines the critical failure surface and corresponding factor of safety. The dynamic conditions were modeled using earthquake time-acceleration data for an earthquake centered in the Giles County, Virginia, area. Time-acceleration data for the Giles County earthquake was provided in *Research Report KTC-96-4 Source Zones, Recurrence Rates, and Time Histories for Earthquakes Affecting Kentucky*. The earthquake was scaled to the earthquake ground acceleration value of 0.05g, based on the *2008 Interactive Deaggregations* value described in the previous section. The phreatic levels used in the initial static analyses are conservatively applied using approximately the maximum phreatic level recorded since piezometers were installed in 2009.

End of Construction Analyses

The CCR Rules require that "End-of-Construction loading condition must be calculated for new CCR surface impoundments to ensure that the CCR surface impoundment can withstand a "first filling" of the embankment, during which time the embankment first becomes saturated and is subject to phreatic flow through the cross-section." First filling of the Bottom Ash Complex occurred in the mid to late 1970s and the embankments have developed a "measureable" steady-state phreatic surface through the critical profiles. Therefore, an End-of-Construction analysis is not necessary for the Bottom Ash Complex embankments.

Assumptions and Parameters

GA selected the strength parameters that were applied in the slope stability analyses using site specific field and laboratory data. Strength parameters are based on field and laboratory data gathered during a subsurface investigation coordinated by GA in 2009. For reference, the laboratory testing data is provided in Appendix I. A summary of material strength parameters is provided in Table 2.

TABLE 2
SUMMARY OF STRENGTH PARAMETERS USED IN SLOPE STABILITY ANALYSES

Material	Moist Unit Weight (pcf)	Saturated Unit Weight (pcf)	Effective Strength Parameters	
			Cohesion, c' (psf)	Friction Angle, φ' (degrees)
Soil Dike	124	134	300	29
Original Soil	120	130	0	34
Cohesive Liner	121	131	900	0

Material parameters used in the finite element liquefaction assessment are provided in Table 3. Parameters were based on site specific data and from accepted reference materials in relation to the site specific soils/conditions.

TABLE 3
SUMMARY OF MATERIAL PARAMETERS USED IN LIQUEFACTION ANALYSES

	Soil Dike (Clayey, Silty, Sand)	Original Ground (Silty Sand)	Cohesive Liner (Clay)
Damping Ratio Function(1)	Seed – Idriss	Seed – Idriss	Clay – Sun
Small Strain Shear Modulus G_{max} (psf)	121,540	166,540	QUAKE/W Function
Source(2)	GA – Triaxial Estimate	GA – Triaxial Estimate	QUAKE/W
Poisson's Ratio	0.28	0.28	0.3
Source(3)	Bowles	Bowles	Bowles
Cyclic Number Function(4)	QUAKE/W	QUAKE/W	None

Notes: (1) Damping Ratios from:
- Seed – Idriss (SHAKE91 User's Manual)
- Clay – Sun, et.al.

(2) G_{max} values estimated from results of triaxial tests performed by GA and built-in QUAKE/W function based on work by Hardin, Drnevich, Mayne, and Rix.

(3) Poisson's Ratio based on typical values described in Foundation Analysis and Design, 4th Ed., Joseph E. Bowles, P.E., S.E.

(4) Cyclic Number Function is a QUAKE/W built-in function based on work by Seed and Lee.

Summary of Results

A summary of the slope stability analysis results are provided in Table 4. *SLOPE/W* and *QUAKE/W* results showing the modeled profiles, loading conditions, areas of potential liquefaction, and critical failure surfaces are provided in Appendix III.

TABLE 4 SUMMARY OF SLOPE STABILITY ANALYSES RESULTS						
	Slope Stability Safety Factors					
Profile	Downstream Static Long-Term Maximum Storage Pool	Downstream Static Maximum Surcharge Pool	Downstream Seismic	Upstream Seismic	Downstream Liquefaction Assessment	Upstream Liquefaction Assessment
SP1-SP1	2.09	2.04	1.80	2.08	2.02	1.20
SP2-SP2	1.87	1.87	1.53	2.01	1.21	1.24

As shown in the slope stability analysis results in Table 4, and the *SLOPE/W* and *QUAKE/W* computer output in Appendix III, the factors of safety meet the requirements specified in the CCR Rules. Although the liquefaction assessment shows areas that are potentially liquefiable (see elements shaded in yellow in the *QUAKE/W* results in Appendix III), we feel that the assessment is very conservative based on parameter selection. A summary of the phreatic levels modeled in the stability analyses is provided in Table 5.

TABLE 5 SUMMARY OF PHREATIC LEVELS USED IN STABILITY ANALYSES				
	Piezometric Surface Elevation at Piezometer Location (Feet, NAVD)			
Profile	**Downstream Static Long-Term Maximum Storage Pool**	**Downstream Static Maximum Surcharge Pool**	**Seismic**	**Liquefaction Assessment**
SP1-SP1	675	677	675	669 (2) (maximum measured)
SP2-SP2	675	676.5	675	669 (2) (maximum measured)
	690 (1) (FS = 1.35)			
	682 (1) (FS = 1.5)			

(1) For reference, we included hypothetical elevated phreatic levels for Section SP2 (the more critical section for Static Stability). Specifically, we assumed the embankment was fully saturated to the crest (690 feet, NAVD) and to elevation 682 feet, NAVD, corresponding to a Factor of Safety (FS) of 1.5.

(2) 669 feet, NAVD is approximately the maximum measured piezometer level for Sections SP1 and SP2, since piezometers were installed in March of 2009.

CERTIFICATION STATEMENT

Based on the site inspections, review of construction monitoring and periodic inspection data, the results of the field and laboratory testing of the materials used in the embankment construction, and our review of the as-built embankment geometry; it is our opinion that the embankments within the Bottom Ash Complex have slope stability factors of safety that meet or exceed the requirements in the CCR Rules. Furthermore, based on our review of the as-built embankment geometries, current operating pool levels, and the existing spillway and overflow system; we believe that the facility is capable of storing/routing the runoff from the 1/2 PMP 6-hour storm event.

Accordingly, I hereby certify that the Bottom Ash Complex is generally maintained in good condition and the facility generally meets the stability requirements in the CCR Rules. It should be clearly noted that this certification is not a legal guarantee. This certification is merely a statement by a registered professional engineer that, to the best of his knowledge, the facility was generally constructed according to the approved plan and that it meets the applicable stability requirements set forth in the CCR Rules. No warranties, expressed or implied, are provided. If you have any questions regarding the information provided, please contact me at 865-584-0344.

[signature] 12-22-2015

Seth W. Frank, P.E.
West Virginia R.P.E. No. 20574

Date

SETH W. FRANK
REGISTERED
20574
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

Appendix I

Field and Laboratory Data

Geo/Environmental Associates, Inc.

Boring No. B-1

Page 1 Of 2

PROJECT: AEP Mitchell BAP

PROJECT NO: 09-379

Start Date: 3-4-09

Finish Date: 3-4-09

Logged By: Seth Frank

Location: N 485362.82 E 1599372.71NAD83

Ground Elevation: 692.42' NAVD88

Drilling Contractor: Horn and Associates

Driller: Tom Leininger

Helper: Jared and Bradley

Drill Type: Dietrick D50

Notes:

Thickness of Soil:

Depth Drilled In Rock:

Total Depth of Boring: 51.0'

DEPTH (FEET) FROM	TO	SAMPLE NOS., & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
2.0	3.5	S-1 / 1.2'	SAND, brown w/green & yellow, gravel, dense, damp	15-22-19
4.5	6.0	S-2 / 1.3'	SAND, brown w/grey & yellow, gravel, very dense, damp	17-32-24
7.0	8.5	S-3 / 1.3'	SAND, clayey, silty , brown, gravel, medium dense, moist	10-11-15
9.5	9.9	ST-1 / 0.4'	SAND, clayey, silty, brown, gravel, moist	
12.0	13.5	S-4 / 1.4'	0-0.2': SAND, brown, gravel; 0.2-0.6': SAND, black (possible bottom of preexisting fill); 0.6-1.0': SAND, grey/white; 1.0-1.4': SAND- silty, brown, dense, damp	10-20-19
14.5	16.0	S-5 / 1.2'	SILT, sandy, clayey, gravel, medium dense to very stiff (qu>5tsf), damp	8-12-13
17.0	18.5	S-6 / 1.5'	SAND, brown, gravel, medium dense, damp	9-9-10
19.5	20.5	S-7 / 1.1'	SAND, gravely, brown, medium dense, damp	6-7-5
22.0	23.5	S-8 / 1.3'	SAND, brown, gravel, medium dense, damp	5-5-6

Geo/Environmental Associates, Inc.

Project Name/ Job Number: 09-379

Boring Log No.: B-1

DEPTH (FEET)		SAMPLE NO., SAMPLE INTERVAL & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
FROM	TO			
24.5	26.0	S-9 / 1.3’	SAND, brown, river rock, medium dense, wet	4-5-6
30.0	31.5	S-10 / 1.2’	GRAVEL, sandy, brown, very loose, wet	1-2-1
35.0	36.5	S-11 / 1.3’	SAND, silty, brown, gravel, loose, wet	3-4-3
39.5	42.0	ST-2 / 2.3’	SAND, gravely, brown, wet	
44.5	46.0	S-12 / 1.2’	SAND, gravely, brown, loose, wet	4-4-4
49.5	51.0	S-13 / 1.2’	SAND, brown, mottled black, medium dense, wet	5-5-5
			TRANSITION FROM DIKE TO ORIGINAL AT APPROXIMATELY 10.0’-12.0’	

Geo/Environmental Associates, Inc.

PROJECT: AEP Mitchell BAP	PROJECT NO: 09-379
Start Date: 3-4-09	Drilling Contractor: Horn and Associates
Finish Date: 3-5-09	Driller: Tom Leininger
Logged By: Seth Frank	Helper: Jared and Bradley
Location: N 485698.27 E 1598947.58 NAD83	Drill Type: Dietrick D50
Ground Elevation: 690.72' NAVD88	
Notes: Set piezometer to tip depth of 31.0'	Thickness of Soil:
Well dry at 31' on 3-5-09.	Depth Drilled In Rock:
Piezometer Elevation: 690.59' NAVD88	Total Depth of Boring: 51.0'
Casing Elevation: 691.78' NAVD88	

DEPTH (FEET) FROM	DEPTH (FEET) TO	SAMPLE NOS., & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
2.0	3.5	S-1 / 1.3'	SAND, brown, gravel, medium dense, moist	6-6-6
4.5	6.0	S-2 / 1.4'	SAND, brown, gravel, medium dense, moist	5-8-9
7.0	8.5	S-3 / 1.4'	SAND, silty, brown, gravel, very dense, damp	15-22-32
9.5	11.0	S-4 / 1.4'	SAND, silty, brown, gravel, very dense, moist	15-26-31
12.0	13.5	S-5 / 1.2'	SAND, clayey, silty, brown, gravel, medium dense, damp-moist	12-15-15
14.5	14.7	ST-1 / 0.2'	SAND, clayey, silty, brown, gravel, moist	
17.0	18.5	S-6 / 1.3'	CLAY, sandy, silty, brown mottled black, gravel, medium dense – very stiff (qu = 2.5tsf), moist	6-5-10
19.5	19.5	S-7 / 0.0'		NO RECOVERY
22.0	23.5	S-8 / 1.0'	SAND, brown, gravel, medium dense, damp (estimated original ground)	4-5-6
24.5	26.0	2-9 / 1.1'	SAND, brown, gravel, loose, damp – distinct 0.2' black, sandy layer at top of sample	4-5-4
29.0	30.5	S-10 / 1.2'	SAND, brown, clean, loose, damp	1-4-3
34.5	36.5	ST-2 / 1.7'	SAND, brown, light brown, damp	

Geo/Environmental Associates, Inc.

Project Name/ Job Number: 09-379

Boring/Well Log No.: B-2

DEPTH (FEET)		SAMPLE NO., SAMPLE INTERVAL & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
FROM	TO			
44.5	46.0	S-12 / 1.4'	SAND, brown, clean, loose, damp	3-3-4
49.5	51.0	S-13 / 1.5'	SAND, brown, clean, loose, moist – transition at 0.7' to clay, sandy, brown, firm (qu=1.0tsf), wet	3-2-2

TRANSITION FROM DIKE TO ORIGINAL AT APPROXIMATELY 24.5
SET PIPE AT 31.0'

51.0	to	35.0	SAND CUTTINGS
35.0	to	32.0	BENTONITE
32.0	to	31.0	SAND
31.0	to	20.8	SCREEN
20.8	to	0.3	RISER
32.0	to	14.5	SAND
19.5	to	16.5	BENTONITE
16.5	to	3.0	GROUT
3.0	to	0.0	CONCRETE WITH MAN HOLE

W/L DRY @ 50.0'

Geo/Environmental Associates, Inc.

Boring No. B-3

PROJECT: AEP Mitchell BAP

PROJECT NO: 09-379

Start Date: 3-3-09

Finish Date: 3-5-09

Logged By: Seth Frank

Location: N 485238.72 E1598811.08 NAD83

Ground Elevation: 691.80' NAVD88

Drilling Contractor: Horn and Associates

Driller: Tom Leininger

Helper: Jared and Bradley

Drill Type: Dietrick D50

Notes: Set piezometer to tip depth of 31.0'

W/L at 23.3' below top of pipe on 3-5-09

Casing Elevation: 691.85' NAVD88

Piezometer Elevation: 691.54' NAVD88

Thickness of Soil:

Depth Drilled In Rock:

Total Depth of Boring: 51.0'

DEPTH (FEET)		SAMPLE NOS., & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
FROM	TO			
2.0	3.5	S-1 / 1.2'	SAND, brown, gravel, very dense, damp	12-27-39
4.5	6.0	S-2 / 1.3'	SAND, brown, gravel, very dense, damp	14-29-30
7.0	8.5	S-3 / 1.4'	SAND, brown, gravel, dense, moist	18-23-26
9.5	9.9	ST-1 / 0.4'	SAND, brown, gravel, moist	
12.0	13.5	S-4 / 1.0'	SAND, dark brown, gravel, very dense, moist	17-29-38
14.5	16.0	S-5 / 1.1'	SAND, brown mottled grey, gravel, dense, moist	8-14-23
17.0	18.5	S-6 / 1.5'	SAND , clayey, silty, brown mottled black and grey, gravel, medium dense, moist	9-9-10
19.5	21.0	S-7 / 1.4'	SAND - gravely , brown mottled grey, medium dense, damp-moist	21-21-23
22.0	23.5	S-8 / 1.4'	SAND, brown & black, gravel, dense, moist	15-21-20
24.5	26.0	S-9 / 1.3'	SAND brown mottled black, very dense, wet	15-24-23
27.0	28.5	S-10 / 1.3'	SAND, brown, gravel, dense, very wet	8-13-23

Geo/Environmental Associates, Inc.

Project Name/ Job Number: 09-379

Boring/Well Log No.: B-3

DEPTH (FEET)		SAMPLE NO., SAMPLE INTERVAL & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
FROM	TO			
29.5	31.0	S-11 / 1.1'	SAND, silty, clayey, brown, medium dense - very stiff (qu = 3.25tsf), moist	12-15-35
32.0	33.5	S-12 / 0.2'	SAND, silty, clayey, brown, very dense, wet **split spoon blocked by rock*	19-29-29
34.5	35.5	ST-2 / 1.0'	CLAY, silty, sandy, brown, gravel, wet	
39.5	41.0	S-13 / 1.1'	SAND, brown, gravel, medium dense, wet	4-6-7
45.0	46.5	S-14 / 1.2'	SAND, brown, gravel, medium dense, wet	3-4-7
49.5	51.0	S-15 / 1.0'	SAND, brown, medium dense, wet	3-6-8

TRANSITION FROM DIKE TO ORIGINAL AT
APPROXIMATELY 29.5 - 30'
SET PIPE AT 31'

51.0	to	35.0	SAND CUTTINGS
35.0	to	32.0	BENTONITE
32.0	to	31.0	SAND
31.0	to	20.8	SCREEN
20.8	to	0.2	RISER
32.0	to	19.5	SAND
19.5	to	16.5	BENTONITE
16.5	to	3.0	GROUT
3.0	to	0.0	CONCRETE WITH MAN HOLE

Geo/Environmental Associates, Inc.

Boring No. B-4

PROJECT: AEP Mitchell BAP

PROJECT NO: 09-379

Start Date: 3-2-09

Finish Date: 3-3-09

Logged By: Seth Frank & Robby Reynolds

Location: N 484958.8 E 1599000.96 NAD83

Ground Elevation: 692.17' NAVD88

Drilling Contractor: Horn and Associates

Driller: Tom Leininger

Helper: Jared and Bradley

Drill Type: Dietrick D50

Notes: Set piezometer to tip depth of 30.0'

W/L at 24.6' below top of pipe on 3/5/09

Piezometer Elevation: 691.91' NAVD88

Casing Elevation: 692.20' NAVD88

Thickness of Soil:

Depth Drilled In Rock:

Total Depth of Boring: 51.0'

DEPTH (FEET)		SAMPLE NOS., & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
FROM	TO			
2.0	3.5	S-1	SAND, brown, gravel, very dense, damp	25-41-26
4.5	6.0	S-2	SAND, brown, gravel, dense, damp	12-17-23
7.0	8.5	S-3	SAND, brown, gravel, very dense, damp	19-28-30
9.5	10.0	ST-1 / 0.5'	SAND, clayey, silty, brown, gravel, damp	
12.0	13.5	S-4	SAND, silty, black / brown, gravel, dense, damp	12-17-23
14.5	16.0	S-5	SAND, black / brown, gravel, dense, damp	12-20-21
17.0	18.5	S-6	SAND, clayey, silty, brown / black, gravel, dense, damp	11-12-19
19.5	21.0	S-7	SAND, gravely , brown mottled grey, medium dense, damp-moist	8-13-13
22.0	23.5	S-8	SAND, silty, clayey, dark brown / black, dense, moist	8-13-20
24.5	26.0	S-9	SAND, gravely, brown, medium dense, moist - wet	19-17-13
27.0	28.5	S-10	SAND, brown, gravel, dense, very wet	17-24-20

Geo/Environmental Associates, Inc.

Project Name/ Job Number: 09-379

Boring/Well Log No.: B-4

DEPTH (FEET)		SAMPLE NO., SAMPLE INTERVAL & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
FROM	TO			
29.5	31.0	S-11	SAND, silty, clayey, black / dark brown, organic matter, medium dense, moist (qu = 3.25tsf)	8-11-14
34.5	36.5	ST-2 / 1.7'	SAND, brown, wet	
39.5	41.0	S-12	SAND, brown, loose, wet	2-3-4
45.0	46.5	S-13	SAND, brown, medium, wet	3-4-6
49.5	51.0	S-14	SAND, brown, medium, wet	3-6-7

TRANSITION FROM DIKE TO ORIGINAL AT APPROXIMATELY 24.5'
SET PIPE AT 30.0'

51.0	to	34.0	SAND CUTTINGS
34.0	to	31.0	BENTONITE
31.0	to	30.0	SAND
30.0	to	19.8	SCREEN
19.8	to	0.2	RISER
31.0	to	18.0	SAND
18.0	to	15.0	BENTONITE
15.0	to	3.0	GROUT
3.0	to	0.0	CONCRETE WITH MAN HOLE

Geo/Environmental Associates, Inc.

PROJECT: AEP Mitchell BAP	PROJECT NO: 09-379
Start Date: 3-2-09	Drilling Contractor: Horn and Associates
Finish Date: 3-3-09	Driller: Tom Leininger
Logged By: Seth Frank & Robby Reynolds	Helper: Jared and Bradley
Location: N 484664.32 E 1598966.05 NAD83	Drill Type: Dietrick D50
Ground Elevation: 674.82' NAVD88	
Notes: Set piezometer to tip depth of 17.0'	Thickness of Soil:
Well dry at 17.0' on 3-5-09	Depth Drilled In Rock:
Piezometer Elevation: 674.43' NAVD88	Total Depth of Boring: 36.0'
Casing Elevation: 674.86' NAVD88	

DEPTH (FEET)		SAMPLE NOS., & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
FROM	TO			
2.0	3.5	S-1	SAND, silty, brown, slightly gravely, medium, dense, damp	7-10-9
4.5	6.0	S-2	SAND, silty, grey to brown, slightly gravely medium dense, damp	3-5-7
7.0	8.5	S-3	SAND, silty, brown, slightly gravely, loose, damp	4-4-3
9.5	11.0	S-4	SAND, silty, brown, dark brown, gravel, loose damp	1-2-2
12.0	13.5	S-5	Transition: SAND, black, slightly gravely, damp To SAND clayey silty, dark brown, gravel, dense, damp	12-26-3
14.5	16.0	S-6	SAND, clayey, silty, brown, river rock, dense, damp	12-15-22
17.0	18.5	S-7	SILT, clayey, brown, very stiff, damp (qu=5tsf)	7-12-13
19.5	20.5	ST-1 / 0.8'	SAND, clayey, silty, brown, gravel, damp	
24.5	26.0	S-8	SAND, clayey, silty, dark brown, gravel, loose, damp	3-4-5

Geo/Environmental Associates, Inc.

Project Name/ Job Number: 09-379

Boring/Well Log No.: B-5

DEPTH (FEET)		SAMPLE NO., SAMPLE INTERVAL & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
FROM	TO			
29.5	31.0	S-9	SAND, dark brown, gravel, medium dense, damp	4-5-7
34.5	36.0	S-10	SAND, gravely, light brown, medium dense, damp	6-9-9

TRANSITION FROM DIKE TO ORIGINAL AT APPROXIMATELY 12.0'
SET PIPE AT 17.0'

36.0	to	21.0	SAND CUTTINGS
21.0	to	18.0	BENTONITE
18.0	to	17.0	SAND
17.0	to	7.0	SCREEN
7.0	to	0.6	RISER
18.0	to	5.0	SAND
5.0	to	2.5	BENTONITE
2.5	to	0.0	CONCRETE WITH MAN HOLE

W/L DRY @ 36.0'

Geo/Environmental Associates, Inc.

Job: Mitchell Plant Bottom Ash Complex
Title: SPT Correction
Performed By: BTK
G.A. Job Number: 15055013
Date: October 29, 2015

Unit Weights: Overburden= 124 pcf

Boring	Sample No	Depth	Uncorrected N	Depth to Water (ft)	Thickness of Moist Soil (ft)	Thickness of Sat Soil (ft)	Effective Stress (psf)	N Correction	Corrected N	
B-1 (Embankment)	1	3.5	41	25	3.5	0.0	434	1.70	50+	
B-1 (Embankment)	2	6	56	25	6.0	0.0	744	1.68	50+	
B-1 (Embankment)	3	8.5	26	25	8.5	0.0	1,054	1.41	36.6	
									Median=	50+
B-1 (Natural Soil))	4	13.5	39	25	13.5	0.0	1,674	1.12	43.6	
B-1 (Natural Soil))	5	16	25	25	16.0	0.0	1,984	1.03	25.7	
B-1 (Natural Soil))	6	18.5	19	25	18.5	0.0	2,294	0.95	18.1	
B-1 (Natural Soil))	7	20.5	12	25	20.5	0.0	2,542	0.91	10.9	
B-1 (Natural Soil))	8	23.5	11	25	23.5	0.0	2,914	0.85	9.3	
B-1 (Natural Soil))	9	26	11	25	25.0	1.0	3,162	0.81	8.9	
B-1 (Natural Soil))	10	31.5	3	25	25.0	6.5	3,500	0.77	2.3	
B-1 (Natural Soil))	11	36.5	7	25	25.0	11.5	3,808	0.74	5.2	
B-1 (Natural Soil))	12	46	8	25	25.0	21.0	4,394	0.69	5.5	
B-1 (Natural Soil))	13	51	10	25	25.0	26.0	4,702	0.67	6.7	
									Median=	9.1
B-2 (Embankment)	1	3.5	12	50	3.5	0.0	434	1.70	20.4	
B-2 (Embankment)	2	6	17	50	6.0	0.0	744	1.68	28.5	
B-2 (Embankment)	3	8.5	54	50	8.5	0.0	1,054	1.41	50+	
B-2 (Embankment)	4	11	57	50	11.0	0.0	1,364	1.24	50+	
B-2 (Embankment)	5	13.5	30	50	13.5	0.0	1,674	1.12	33.5	
B-2 (Embankment)	6	18.5	15	50	18.5	0.0	2,294	0.95	14.3	
									Median=	31.0
B-2 (Natural Soil)	8	23.5	11	50	23.5	0.0	2,914	0.85	9.3	
B-2 (Natural Soil)	9	26	9	50	26.0	0.0	3,224	0.81	7.2	
B-2 (Natural Soil)	10	30.5	7	50	30.5	0.0	3,782	0.74	5.2	
B-2 (Natural Soil)	12	46	7	50	46.0	0.0	5,704	0.61	4.2	
B-2 (Natural Soil)	13	51	4	50	50.0	1.0	6,262	0.58	2.3	
									Median=	5.2
B-3 (Embankment)	1	3.5	66	25	3.5	0.0	434	1.70	50+	
B-3 (Embankment)	2	6	59	25	6.0	0.0	744	1.68	50+	
B-3 (Embankment)	3	8.5	49	25	8.5	0.0	1,054	1.41	50+	
B-3 (Embankment)	4	13.5	67	25	13.5	0.0	1,674	1.12	50+	
B-3 (Embankment)	5	16	37	25	16.0	0.0	1,984	1.03	38.0	
B-3 (Embankment)	6	18.5	19	25	18.5	0.0	2,294	0.95	18.1	
B-3 (Embankment)	7	21	44	25	21.0	0.0	2,604	0.90	39.4	
B-3 (Embankment)	8	23.5	41	25	23.5	0.0	2,914	0.85	34.7	
B-3 (Embankment)	9	26	47	25	25.0	1.0	3,162	0.81	38.2	
B-3 (Embankment)	10	28.5	36	25	25.0	3.5	3,316	0.79	28.6	
B-3 (Embankment)	11	31	50	25	25.0	6.0	3,470	0.78	38.8	
B-3 (Embankment)	12	33.5	58	25	25.0	8.5	3,624	0.76	44.0	
									Median=	39.1
B-3 (Natural Soil)	13	41	13	25	25.0	16.0	4,086	0.72	9.3	
B-3 (Natural Soil)	14	46.5	11	25	25.0	21.5	4,424	0.69	7.6	
B-3 (Natural Soil)	15	51	14	25	25.0	26.0	4,702	0.67	9.3	
									Median=	9.3
B-4 (Embankment)	1	3.5	67	25	3.5	0.0	434	1.70	50+	
B-4 (Embankment)	2	6	40	25	6.0	0.0	744	1.68	50+	
B-4 (Embankment)	3	8.5	58	25	8.5	0.0	1,054	1.41	50+	
B-4 (Embankment)	4	13.5	40	25	13.5	0.0	1,674	1.12	44.7	
B-4 (Embankment)	5	16	41	25	16.0	0.0	1,984	1.03	42.1	
B-4 (Embankment)	6	18.5	31	25	18.5	0.0	2,294	0.95	29.6	
B-4 (Embankment)	7	21	26	25	21.0	0.0	2,604	0.90	23.3	
B-4 (Embankment)	8	23.5	33	25	23.5	0.0	2,914	0.85	27.9	
B-4 (Embankment)	9	26	30	25	25.0	1.0	3,162	0.81	24.4	
									Median=	42.1
B-4 (Natural Soil)	10	28.5	44	25	25.0	3.5	3,316	0.79	34.9	
B-4 (Natural Soil)	11	31	25	25	25.0	6.0	3,470	0.78	19.4	
B-4 (Natural Soil)	12	41	7	25	25.0	16.0	4,086	0.72	5.0	
B-4 (Natural Soil)	13	46.5	10	25	25.0	21.5	4,424	0.69	6.9	
B-4 (Natural Soil)	14	51	13	25	25.0	26.0	4,702	0.67	8.7	
									Median=	8.7
B-5 (Embankment)	1	3.5	19	50	3.5	0.0	434	1.70	32.3	
B-5 (Embankment)	2	6	12	50	6.0	0.0	744	1.68	20.1	
B-5 (Embankment)	3	8.5	7	50	8.5	0.0	1,054	1.41	9.9	
B-5 (Embankment)	4	11	4	50	11.0	0.0	1,364	1.24	5.0	
									Median=	15.0
B-5 (Natural Soil)	5	13.5	29	50	13.5	0.0	1,674	1.12	32.4	
B-5 (Natural Soil)	6	16	37	50	16.0	0.0	1,984	1.03	38.0	
B-5 (Natural Soil)	7	18.5	25	50	18.5	0.0	2,294	0.95	23.9	
B-5 (Natural Soil)	8	26	9	50	26.0	0.0	3,224	0.81	7.2	
B-5 (Natural Soil)	9	31	12	50	31.0	0.0	3,844	0.74	8.8	
B-5 (Natural Soil)	10	36	18	50	36.0	0.0	4,464	0.68	12.3	
									Median=	18.1

SUMMARY OF LABORATORY TEST RESULTS

Project: Mitchell Bottom Ash Pond

Project Number: 09-379

Date: March 18, 2009

Boring	Sample No.	Sample Type*	Depth (ft)	Natural Moisture	Dry Density	Specific Gravity	ATTERBERG LIMITS Liquid Limit	Plasticity Index	USCS	Other Test	Soil Description
B-1	S-3	SS	7.0-8.5	11.0	--	2.68	19	7	SC-SM	S	Sand, clayey, silty, brown, black, gray w/rock
B-1	S-11	SS	35.0-36.5	15.2	--	2.74	12	np	SW-SM	S	Sand, silty, black w/rock
B-2	S-5	SS	12.0-13.5	5.7	--	2.67	15	5	SP-SC	S	Sand, clayey, silty, brown, dark brown w/rock
B-2	S-10	SS	29.0-30.5	5.4	--	2.71	--	np	SP-SM	S	Sand, brown
B-2	ST-2	ST	34.5-36.5	8.7	105.5	2.70	--	np	SM	K,S,T	Sand, brown, light brown (Sand Foundation)
B-3	S-6	SS	17.0-18.5	9.2	--	2.71	17	5	SC-SM	S	Sand, clayey, silty, dark brown, brown w/rock
B-3	S-11	SS	29.5-31.0	13.0	--	2.65	17	5	SC-SM	S	Sand, clayey, silty, black, brown, w/rock &
B-3	ST-2	ST	34.5-35.5	18.5	112.1	2.62	26	9	CL	K,S,U	Clay, silty, sandy, brown w/rock
B-4	S-4	SS	12.0-13.5	7.9	--	2.69	--	np	SM	S	Sand, silty, brown, dark brown w/rock
B-4	S-12	SS	39.5-41.0	5.2	--	2.71	--	np	SP	S	Sand, brown
B-1,B-3,B-4	ST-1	ST	9.5-10.0	9.3	114.5	2.68	16	4	SC-SM	K,S,T	Sand, clayey, silty, brown w/rock
B-5	S-3	SS	7.0-8.5	7.9	--	2.70	12	np	SM	S	Sand, silty, dark brown w/rock
B-5	S-8	SS	24.5-26.0	7.8	--	2.66	16	4	SP-SC	S	Sand, clayey, silty, brown w/rock
na	B	B	na	3.6	--	2.26	--	np	SP	S	Bottom Ash

*ST-SHELBY TUBE SAMPLE, SS-SPLIT SPOON SAMPLE, B-BAG SAMPLE, J-JAR SAMPLE

**TEST RESULTS REPORTED ON OTHER SHEETS:

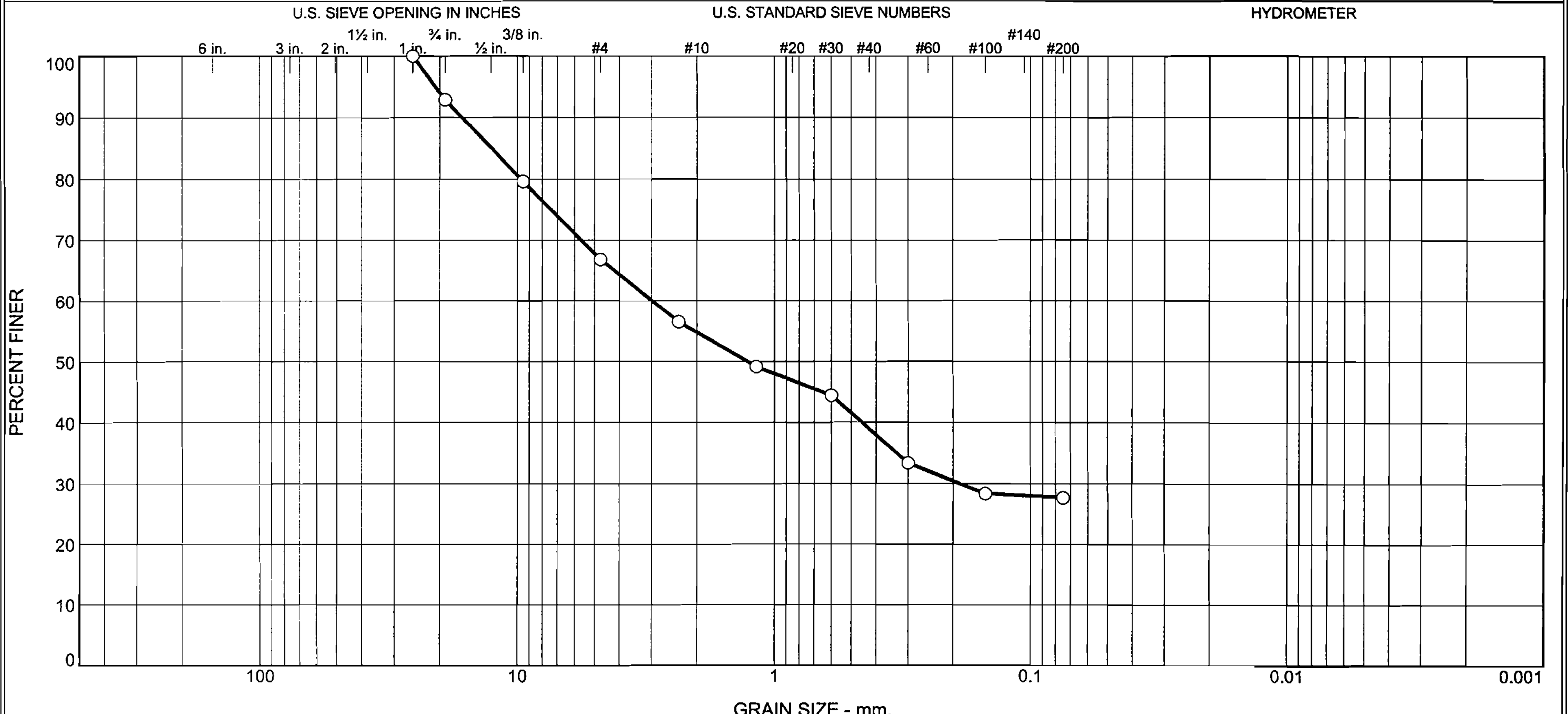
T-TRIAXIAL
S-SIEVE OR GRAIN SIZE ANALYSIS
U-UNCONFINED COMPRESSION

P-PROCTOR TEST
K-PERMEABILITY
C-CONSOLIDATION

Geo/Environmental Associates

DATA CHECKED BY ___________

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	7.2	26.0	12.1	15.8	11.3	27.6	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-1 S-3	7.0'-8.5'		SC-SM	Sand, clayey, silty, brown, black, gray w/rock	11.0	19	12

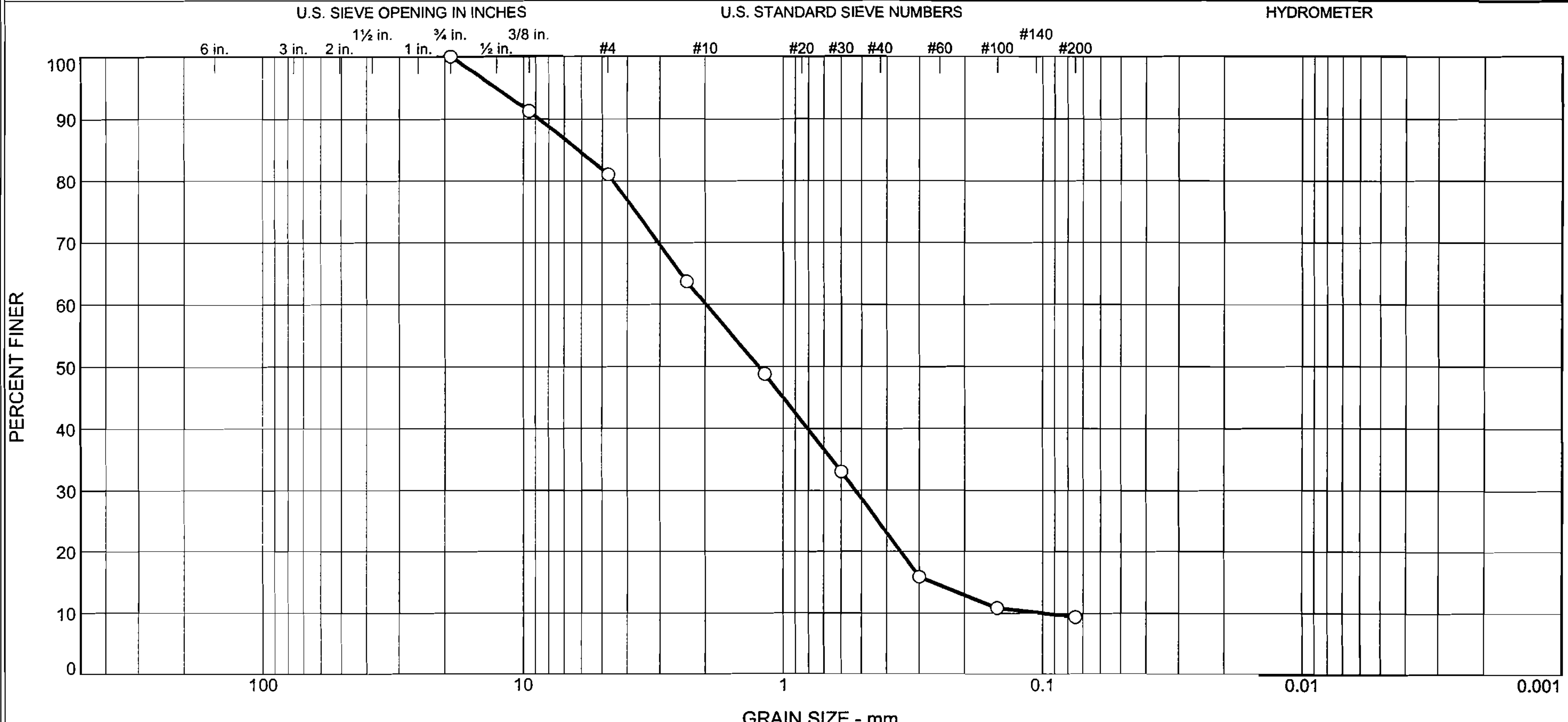
Client American Electric Power

Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc.
Knoxville, Tennessee

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	19.0	20.9	35.6	15.1	9.4	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-1 S-11	35.0'-36.5'		SW-SM	Sand, silty, black w/rock	15.2	12	np

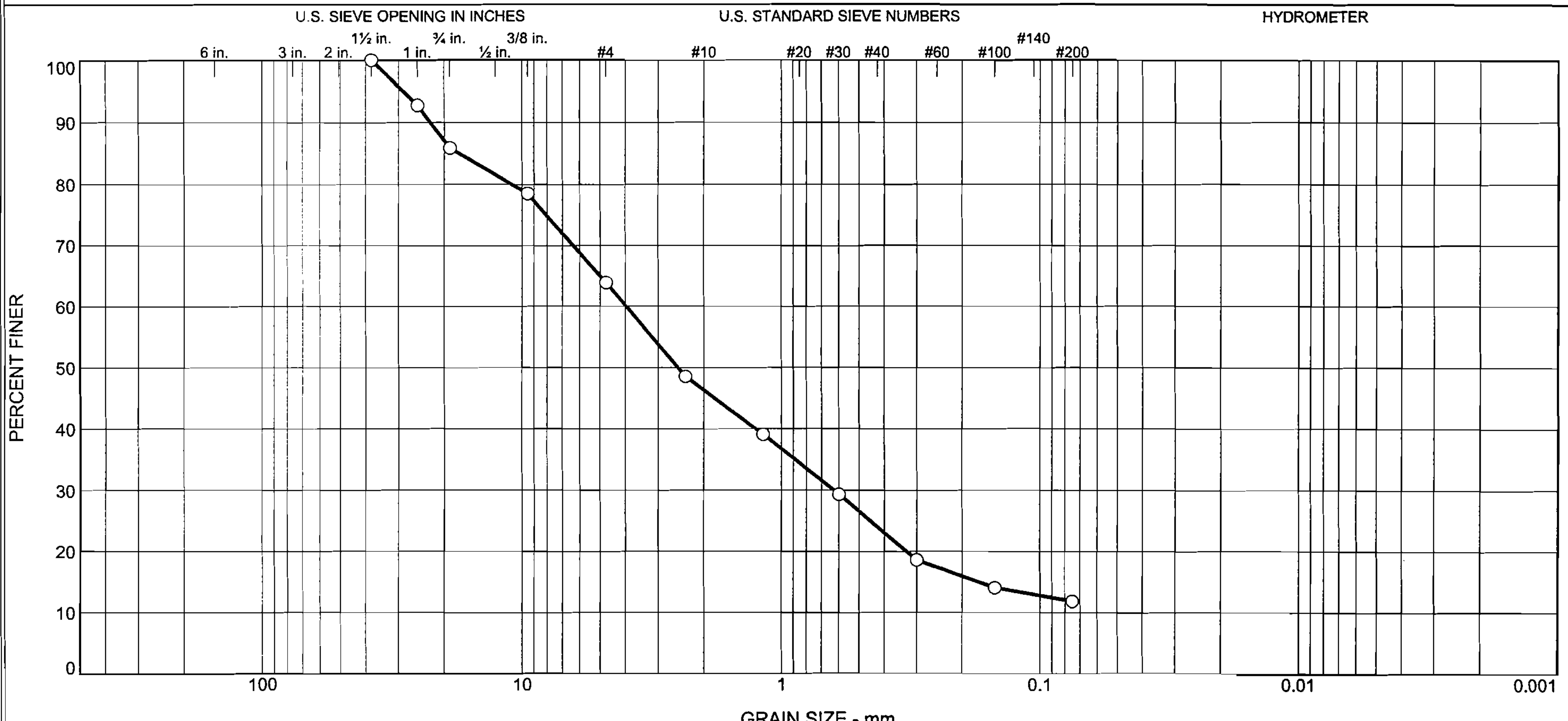
Client American Electric Power

Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc.
Knoxville, Tennessee

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	14.2	21.9	17.7	22.2	12.2	11.8	

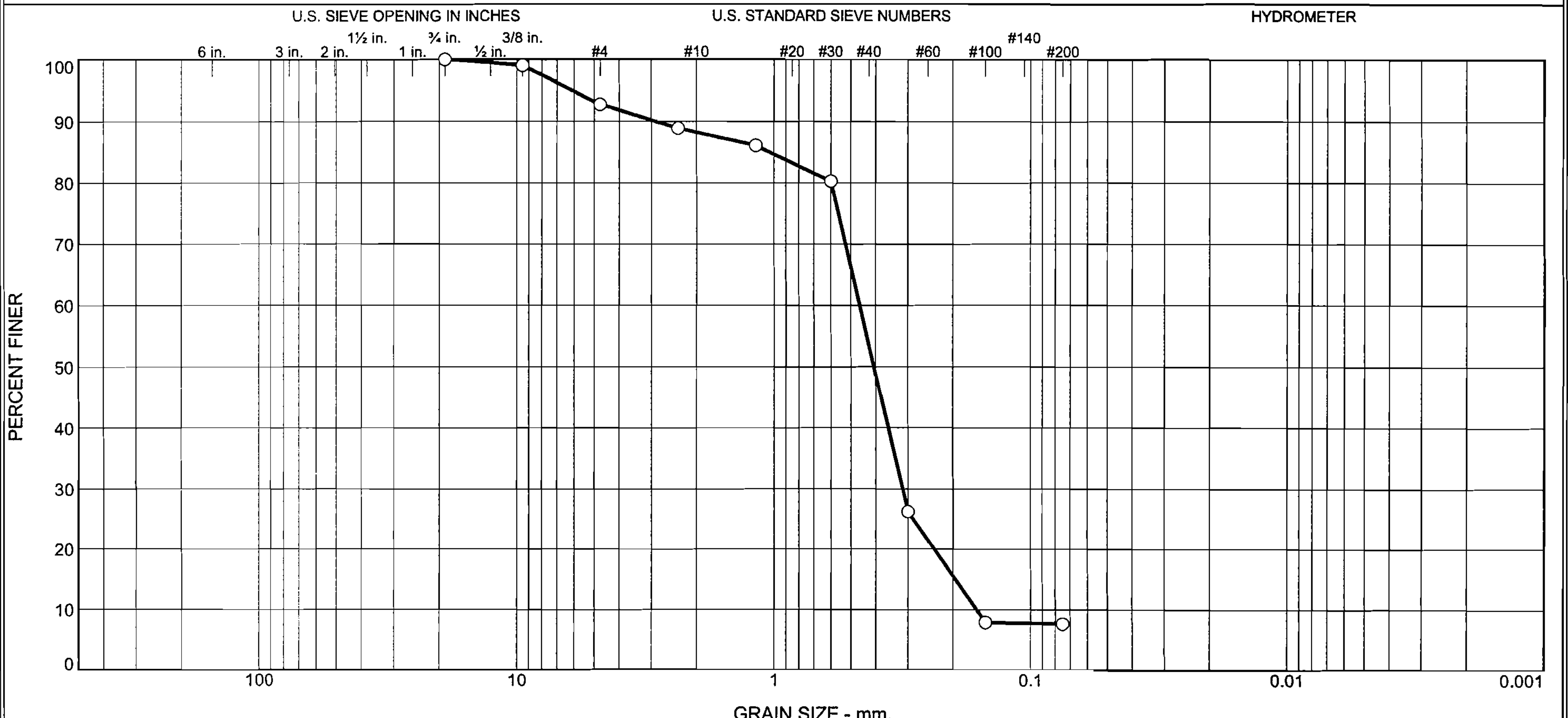
	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-2 S-5	12.0'-13.5'		SP-SC	Sand, clayey, silty, brown, dark brown w/rock	5.7	15	10

Client American Electric Power
Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc.
Knoxville, Tennessee

Particle Size Distribution Report



	% +3"	% Gravel Coarse	% Gravel Fine	% Sand Coarse	% Sand Medium	% Sand Fine	% Fines Silt	% Fines Clay
○	0.0	0.0	7.3	4.5	34.9	45.7	7.6	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-2 S-10	29.0'-30.5'		SP-SM	Sand, brown	5.4	nv	np

Client American Electric Power

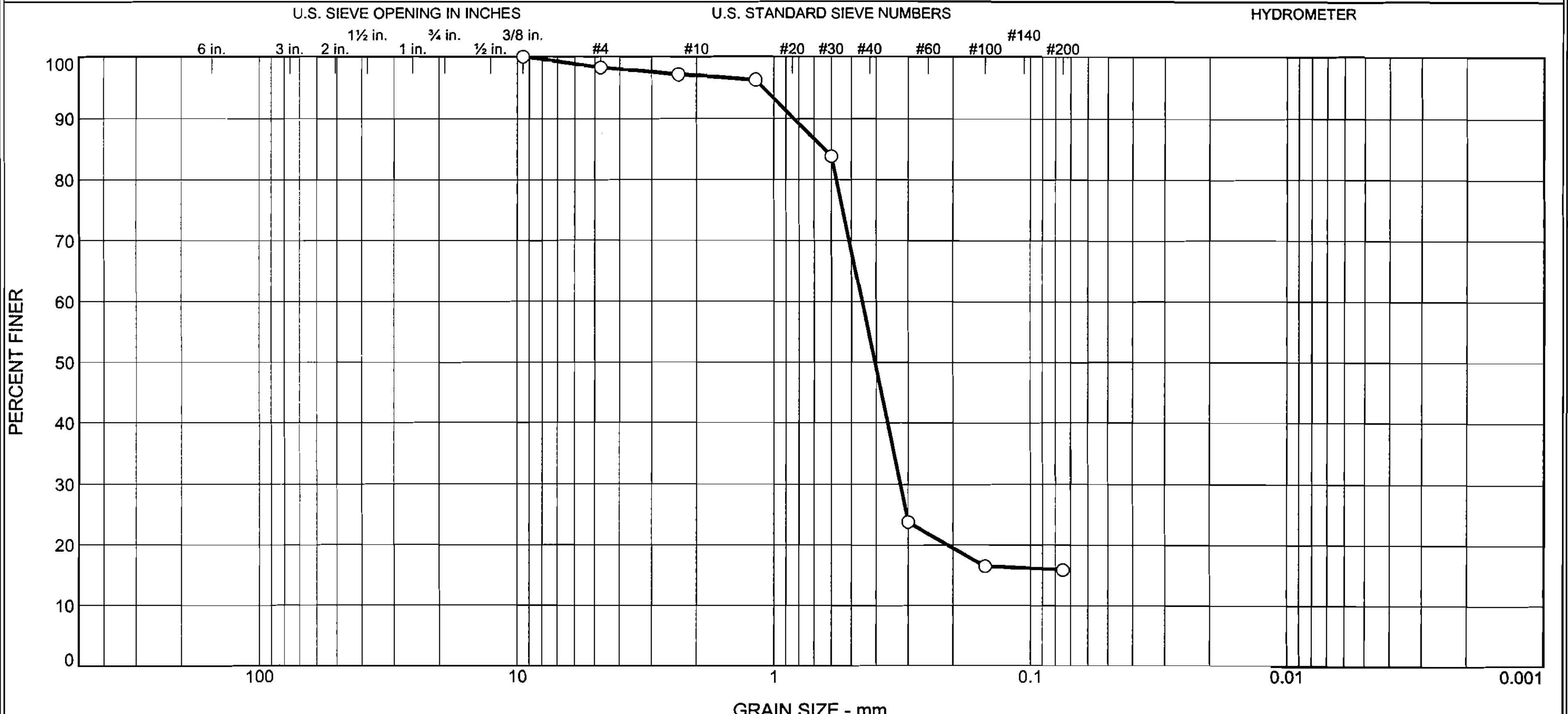
Project Mitchell Bottom Ash Pond

Project No. 09-379

Figure

Geo/Environmental Associates, Inc.
Knoxville, Tennessee

Particle Size Distribution Report



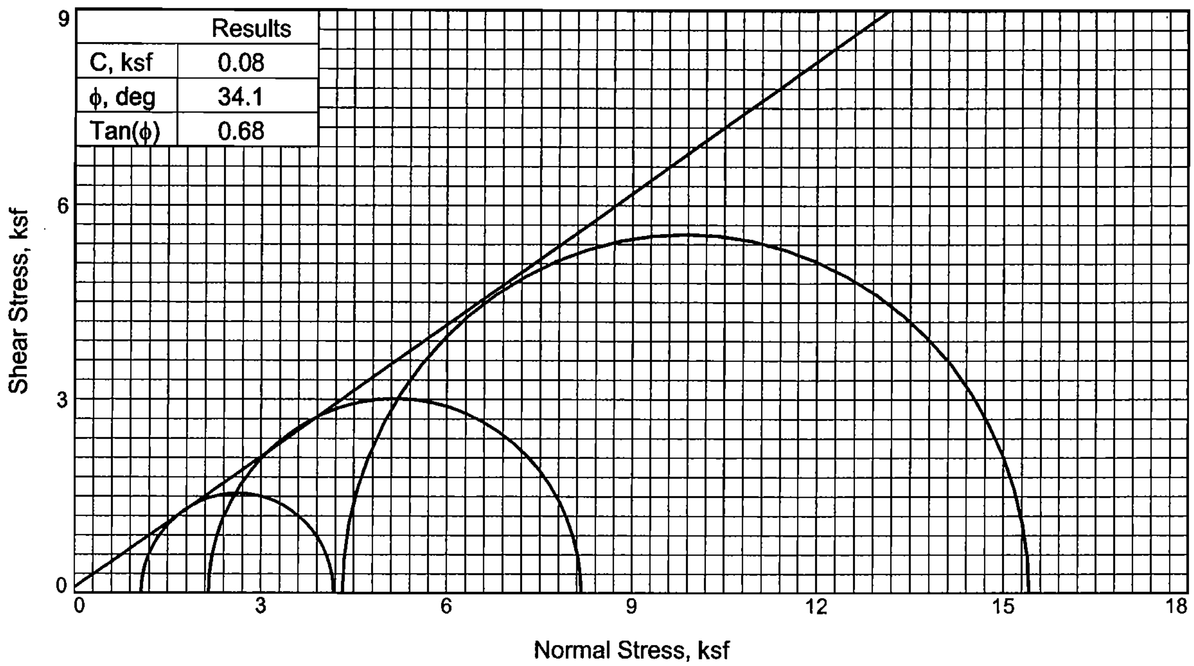
	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.8	1.3	43.0	38.0	15.9	

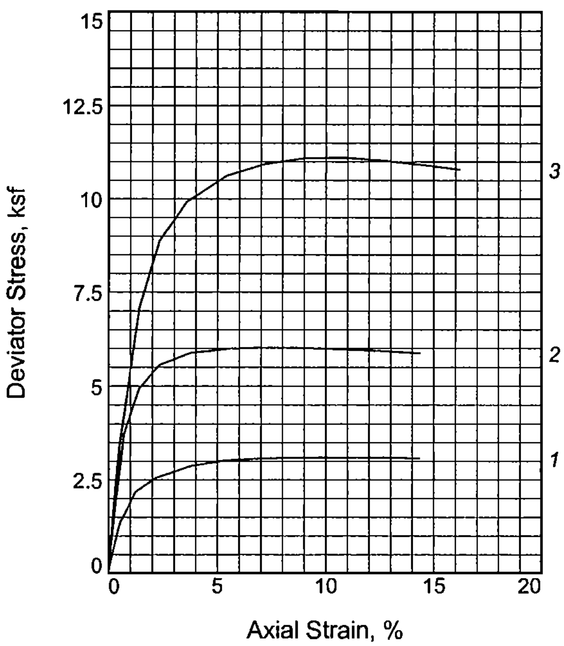
	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-2 ST-2	34.5'-36.5'		SM	Sand, brown, light brown	8.7	nv	np

Client American Electric Power
Project Mitchell Bottom Ash Pond
Project No. 09-379 Figure

Geo/Environmental Associates, Inc.
Knoxville, Tennessee

○ Sand Foundation Material





Sample No.		1	2	3
Initial	Water Content, %	8.6	9.0	8.7
	Dry Density, pcf	105.3	105.8	105.5
	Saturation, %	38.7	40.9	39.3
	Void Ratio	0.6009	0.5926	0.5976
	Diameter, in.	2.80	2.80	2.80
	Height, in.	5.60	5.60	5.60
At Test	Water Content, %	21.6	21.0	20.8
	Dry Density, pcf	106.4	107.6	107.9
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.5838	0.5670	0.5618
	Diameter, in.	2.79	2.78	2.78
	Height, in.	5.58	5.57	5.56
Strain rate, in./min.		0.00	0.00	0.00
Back Pressure, psi		0.00	0.00	0.00
Cell Pressure, psi		7.50	15.00	30.00
Fail. Stress, ksf		3.1	6.0	11.1
Ult. Stress, ksf				
σ_1 Failure, ksf		4.2	8.2	15.4
σ_3 Failure, ksf		1.1	2.2	4.3

Type of Test:
Consolidated Drained

Sample Type: Shelby Tube

Description: Sand, brown, light brown

LL= nv **PI=** np

Specific Gravity= 2.70

Remarks:

Figure 1

Client: American Electric Power

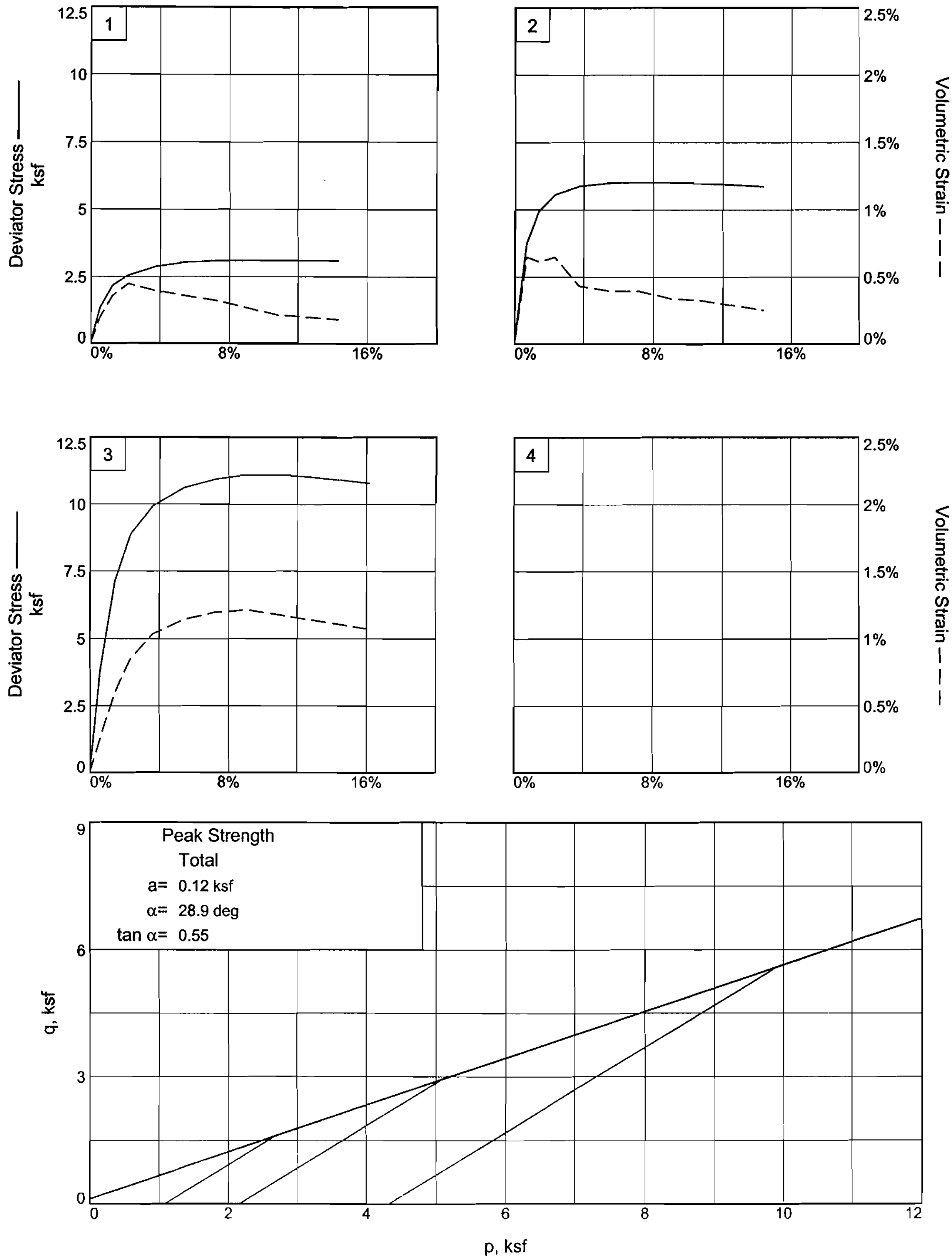
Project: Mitchell Bottom Ash Pond

Sample Number: B-2 ST-2 **Depth:** 34.5'-36.5'

Proj. No.: 09-379 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

Geo/Environmental Associates, Inc.



Client: American Electric Power
Project: Mitchell Bottom Ash Pond
Depth: 34.5'-36.5' **Sample Number:** B-2 ST-2
Project No.: 09-379 **Figure** 2

Geo/Environmental Associates, Inc.

CONSTANT HEAD PERMEABILITY TESTING
ASTM D5084-90/SW846 Method 9100 Section 2.8

PROJECT NAME	: Mitchell Bottom Ash Pond	**PROJECT NUMBER**	: 09-379
CLIENT	: American Electric Power	**DATE**	: March 13, 2009

SAMPLE LOCATION AND CONDITIONS

Sample Id. : B-2 ST-2 **Depth of Tested Sample** : 34.5'-35.5'

Specimen : 7.5 psi Triaxial Specimen **Remolded** : Yes

Sample Description : Sand, brown, light brown (Sand Foundation)

INITIAL SPECIMEN PROPERTIES

Length (in.):	5.6	**Volume (ft^3):**	0.0200	**Wet Density (PCF):**	114.3
Diameter (in.):	2.8	**Weight (lbs):**	2.28	**Dry Density (PCF):**	105.3
Area (ft^2):	0.0428	**Moisture (%):**	8.6		

Chamber Pressure (psi):	5	**Change in Pore Pressure (psi):**	2.0
Influent Pressure (psi):	3	**Change in Chamber Pressure (psi):**	2.0
Back Pressure (psi):	0	**"B" Factor:**	1.0

PERMEABILITY CALCULATIONS

k = Hydraulic Conductivity, (cm/sec)

L = Length of Sample, along path of flow, (cm)

Q = Quantity of flow, taken as the average of inflow and outflow, (cm^3)

A = Cross-sectional area of specimen, (cm^2)

t = Interval of time, over which the flow Q occurs, (sec)

h = Difference in hydraulic head across specimen, (cm)

$$k = \frac{QL}{Ath} = \text{cm/sec}$$

$$k = \frac{(700.0)(14.22)}{(39.73)(893)(211.01)}$$

$$= \frac{9{,}954.00}{7{,}486{,}400.58}$$

$$= 1.33 \times 10^{-3} \text{ cm/sec}$$

CONSTANT HEAD PERMEABILITY TESTING
ASTM D5084-90/SW846 Method 9100 Section 2.8

PROJECT NAME : Mitchell Bottom Ash Pond　　**PROJECT NUMBER** : 09-379

CLIENT : American Electric Power　　**DATE** : March 13, 2009

SAMPLE LOCATION AND CONDITIONS

Sample Id. : B-2 ST-2　　**Depth of Tested Sample** : 34.5'-35.5'

Specimen : 15 psi Triaxial Specimen　　**Remolded** : Yes

Sample Description : Sand, brown, light brown (Sand Foundation)

INITIAL SPECIMEN PROPERTIES

Length (in.): 5.6　**Volume (ft^3):** 0.0200　**Wet Density (PCF):** 115.3

Diameter (in.): 2.8　**Weight (lbs):** 2.30　**Dry Density (PCF):** 105.8

Area (ft^2): 0.0428　**Moisture (%):** 9.0

Chamber Pressure (psi): 8　　**Change in Pore Pressure (psi):** 2.0

Influent Pressure (psi): 6　　**Change in Chamber Pressure (psi):** 2.0

Back Pressure (psi): 3　　**"B" Factor:** 1.0

PERMEABILITY CALCULATIONS

k = Hydraulic Conductivity, (cm/sec)

L = Length of Sample, along path of flow, (cm)

Q = Quantity of flow, taken as the average of inflow and outflow, (cm^3)

A = Cross-sectional area of specimen, (cm^2)

t = Interval of time, over which the flow Q occurs, (sec)

h = Difference in hydraulic head across specimen, (cm)

$$k = \frac{QL}{Ath} = \text{cm/sec}$$

$$k = \frac{(700.0)(14.22)}{(39.73)(942)(211.01)}$$

$$= \frac{9{,}954.00}{7{,}897{,}188.52}$$

$$= 1.26 \times 10^{-3} \text{ cm/sec}$$

CONSTANT HEAD PERMEABILITY TESTING
ASTM D5084-90/SW846 Method 9100 Section 2.8

PROJECT NAME : Mitchell Bottom Ash Pond

PROJECT NUMBER : 09-379

CLIENT : American Electric Power

DATE : March 13, 2009

SAMPLE LOCATION AND CONDITIONS

Sample Id. : B-2 ST-2

Depth of Tested Sample : 34.5'-35.5'

Specimen : 30 psi Triaxial Specimen

Remolded : Yes

Sample Description : Sand, brown, light brown (Sand Foundation)

INITIAL SPECIMEN PROPERTIES

Length (in.): 5.6 **Volume (ft^3):** 0.0200 **Wet Density (PCF):** 114.7

Diameter (in.): 2.8 **Weight (lbs):** 2.29 **Dry Density (PCF):** 105.5

Area (ft^2): 0.0428 **Moisture (%):** 8.7

Chamber Pressure (psi): 10

Influent Pressure (psi): 8

Back Pressure (psi): 5

Change in Pore Pressure (psi): 5.0

Change in Chamber Pressure (psi): 5.0

"B" Factor: 1.0

PERMEABILITY CALCULATIONS

k = Hydraulic Conductivity, (cm/sec)

L = Length of Sample, along path of flow, (cm)

Q = Quantity of flow, taken as the average of inflow and outflow, (cm^3)

A = Cross-sectional area of specimen, (cm^2)

t = Interval of time, over which the flow Q occurs, (sec)

h = Difference in hydraulic head across specimen, (cm)

$$k = \frac{QL}{Ath} = \text{cm/sec}$$

$$k = \frac{(700.0)(14.22)}{(39.73)(735)(211.01)}$$

$$= \frac{9{,}954.00}{6{,}161{,}819.07}$$

$$= 1.62 \times 10^{-3} \text{ cm/sec}$$

Particle Size Distribution Report

	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	22.8	19.1	22.6	13.3	22.2	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-3 S-6	17.0'-18.5'		SC-SM	Sand, clayey, silty, dark brown, brown w/rock	9.2	17	12

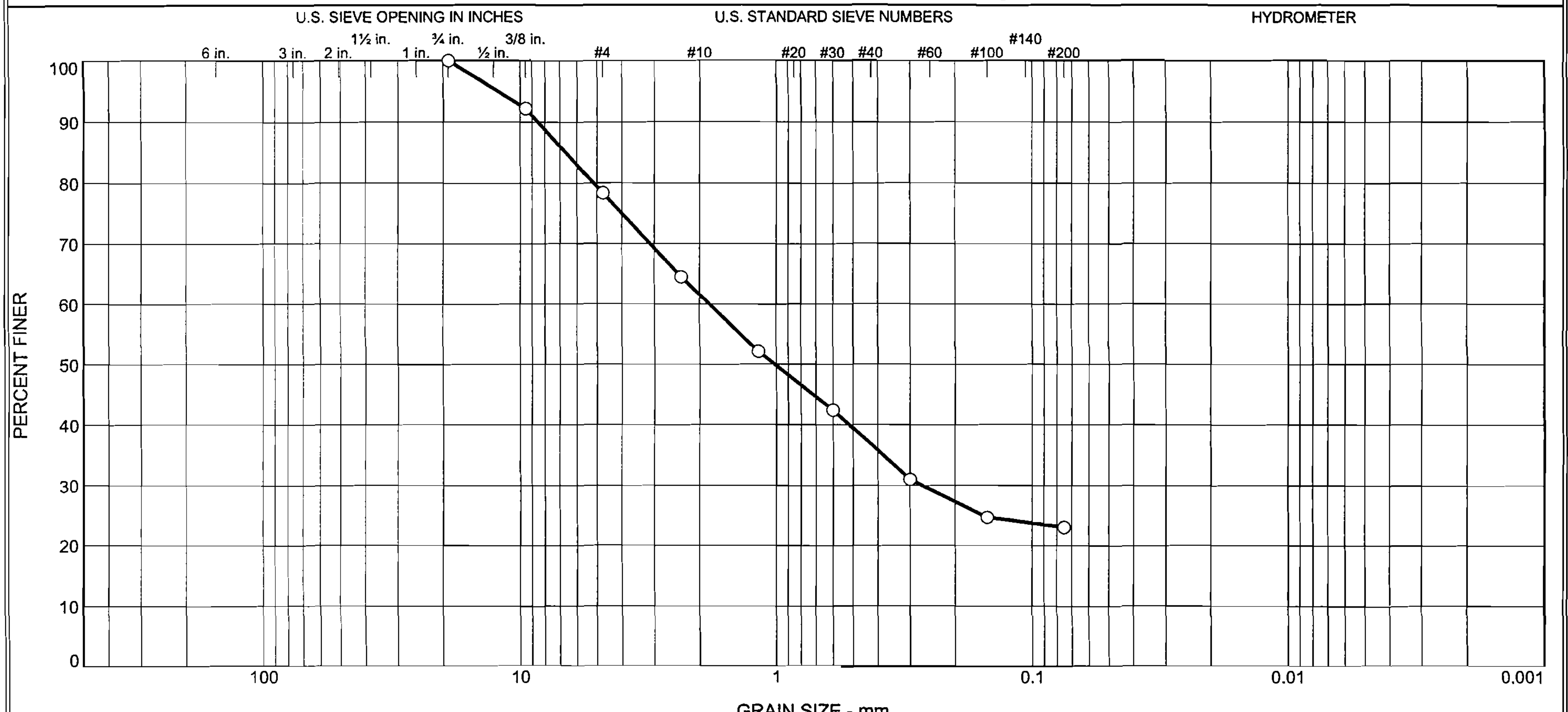
Client American Electric Power

Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc. Knoxville, Tennessee

Particle Size Distribution Report

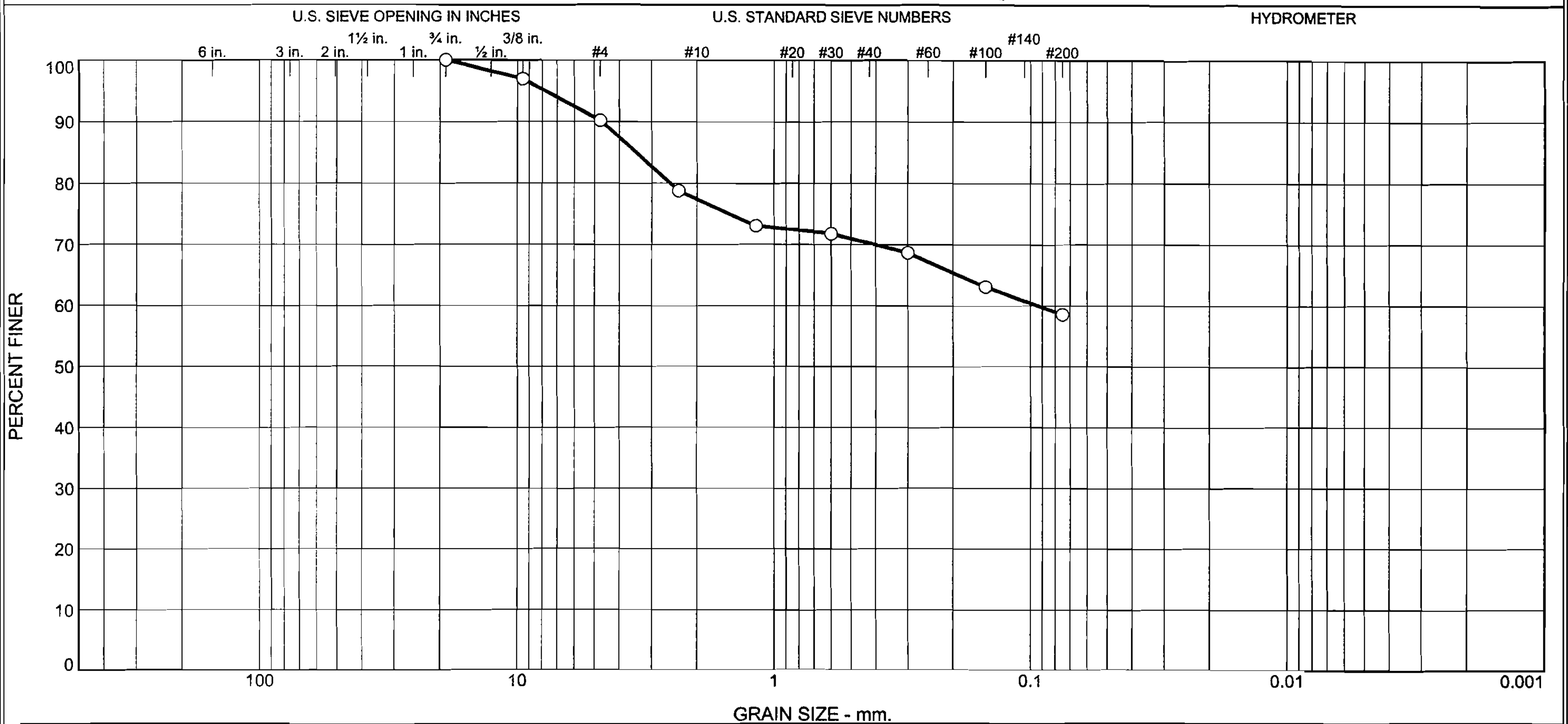


	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	21.7	16.8	24.8	13.7	23.0	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-3 S-11	29.5'-31.0'		SC-SM	Sand, clayey, silty, black, brown w/rock & cinders	13.0	17	12

Client American Electric Power	**Geo/Environmental Associates, Inc. Knoxville, Tennessee**
Project Mitchell Bottom Ash Pond	
Project No. 09-379	Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	9.8	12.8	7.2	11.7	58.5	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-3 ST-2	34.5'-35.5'		CL	Clay, silty, sandy, brown w/rock	18.5	26	17

Client American Electric Power

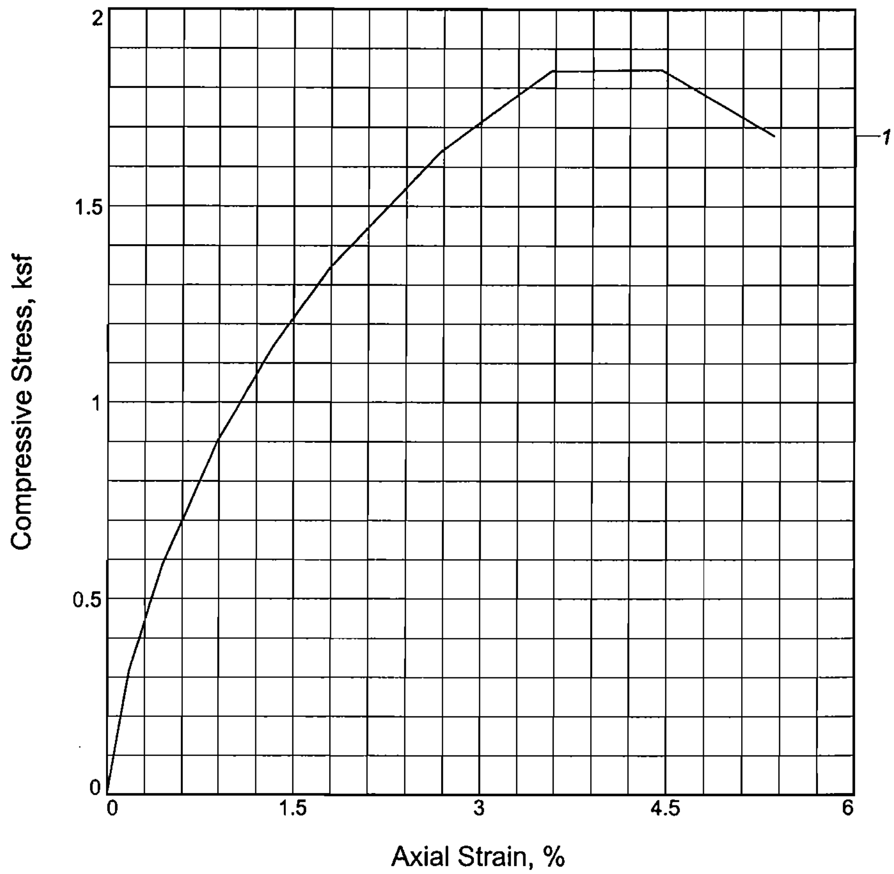
Project Mitchell Bottom Ash Pond

Project No. 09-379

Figure

Geo/Environmental Associates, Inc.
Knoxville, Tennessee

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, ksf	1.85			
Undrained shear strength, ksf	0.92			
Failure strain, %	4.5			
Strain rate, in./min.	0.01			
Water content, %	12.6			
Wet density, pcf	131.2			
Dry density, pcf	116.5			
Saturation, %	82.0			
Void ratio	0.4041			
Specimen diameter, in.	2.84			
Specimen height, in.	5.61			
Height/diameter ratio	1.98			

Description: Clay, silty, sandy, brown w/rock

LL = 26	**PL =** 17	**PI =** 9	**GS=** 2.62	**Type:** Shelby Tube

Project No.: 09-379
Date Sampled:
Remarks:

Figure _______

Client: American Electric Power

Project: Mitchell Bottom Ash Pond

Sample Number: B-3 ST-2 **Depth:** 34.5'-35.5'

UNCONFINED COMPRESSION TEST

Geo/Environmental Associates, Inc.

CONSTANT HEAD PERMEABILITY TESTING
ASTM D5084-90/SW846 Method 9100 Section 2.8

PROJECT NAME : Mitchell Bottom Ash Pond

PROJECT NUMBER : 09-379

CLIENT : American Electric Power

DATE : March 13, 2009

SAMPLE LOCATION AND CONDITIONS

Sample Id. : B-3 ST-2

Depth of Tested Sample : 34.5'-35.5'

Date Tested : 03/10/09

Remolded : no

Sample Description : Clay, silty, sandy, brown w/rock

INITIAL SPECIMEN PROPERTIES

Length (in.): 4.25 **Volume (ft^3):** 0.0159 **Wet Density (PCF):** 132.8

Diameter (in.): 2.87 **Weight (lbs):** 2.11 **Dry Density (PCF):** 112.1

Area (ft^2): 0.0449 **Moisture (%):** 18.5

Chamber Pressure (psi): 20

Influent Pressure (psi): 18

Back Pressure (psi): 15

Change in Pore Pressure (psi): 5.0

Change in Chamber Pressure (psi): 5.0

"B" Factor: 1.0

PERMEABILITY CALCULATIONS

k = Hydraulic Conductivity, (cm/sec)

L = Length of Sample, along path of flow, (cm)

Q = Quantity of flow, taken as the average of inflow and outflow, (cm^3)

A = Cross-sectional area of specimen, (cm^2)

t = Interval of time, over which the flow Q occurs, (sec)

h = Difference in hydraulic head across specimen, (cm)

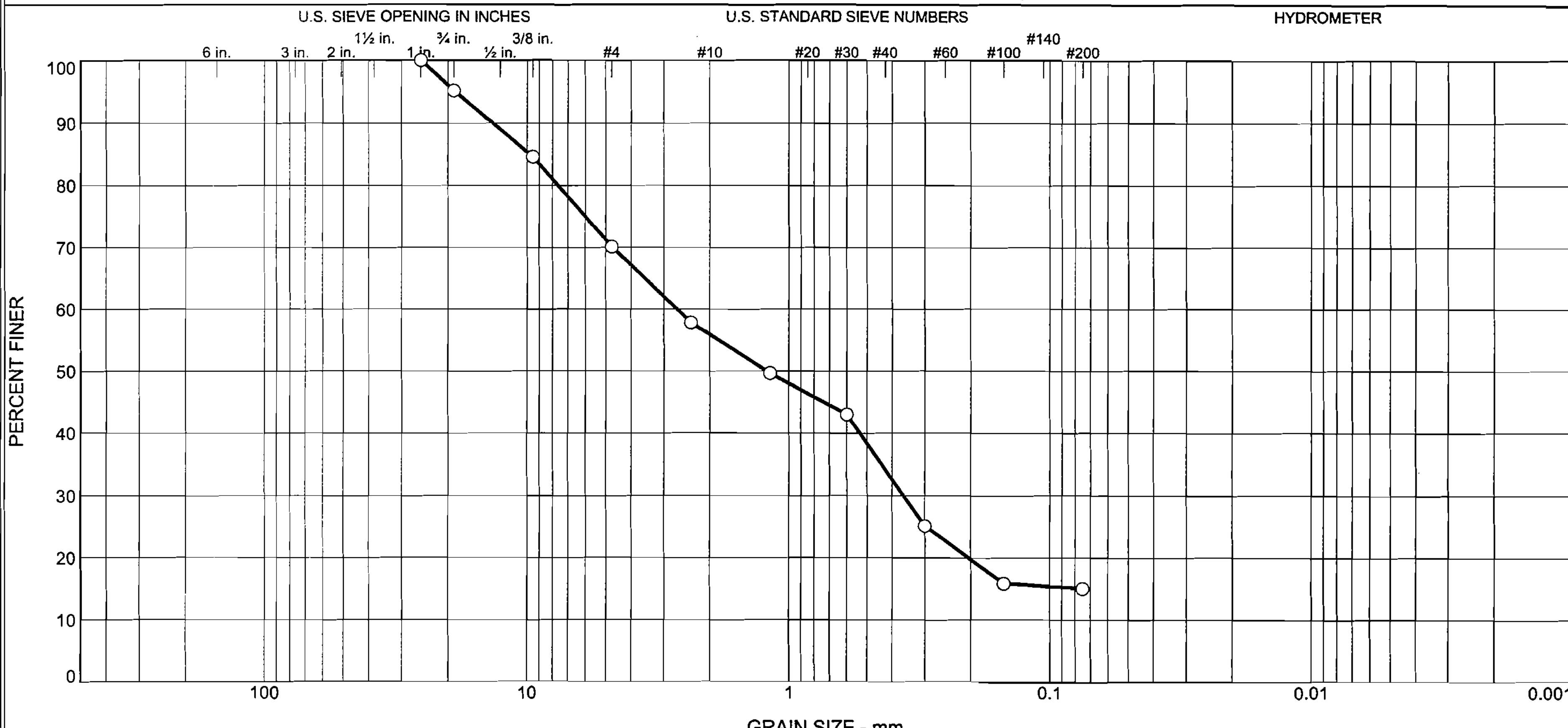
$$k = \frac{QL}{Ath} = \text{cm/sec}$$

$$k = \frac{(15.2)(10.80)}{(41.74)(155{,}400)(211.01)}$$

$$= \frac{164.16}{1{,}368{,}694{,}419.96}$$

$$= 1.20 \times 10^{-7} \text{ cm/sec}$$

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	4.8	25.1	14.2	21.8	19.1	15.0	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-4 S-4	12.0'-13.5'		SM	Sand, silty, brown, dark brown w/rock	7.9	nv	np

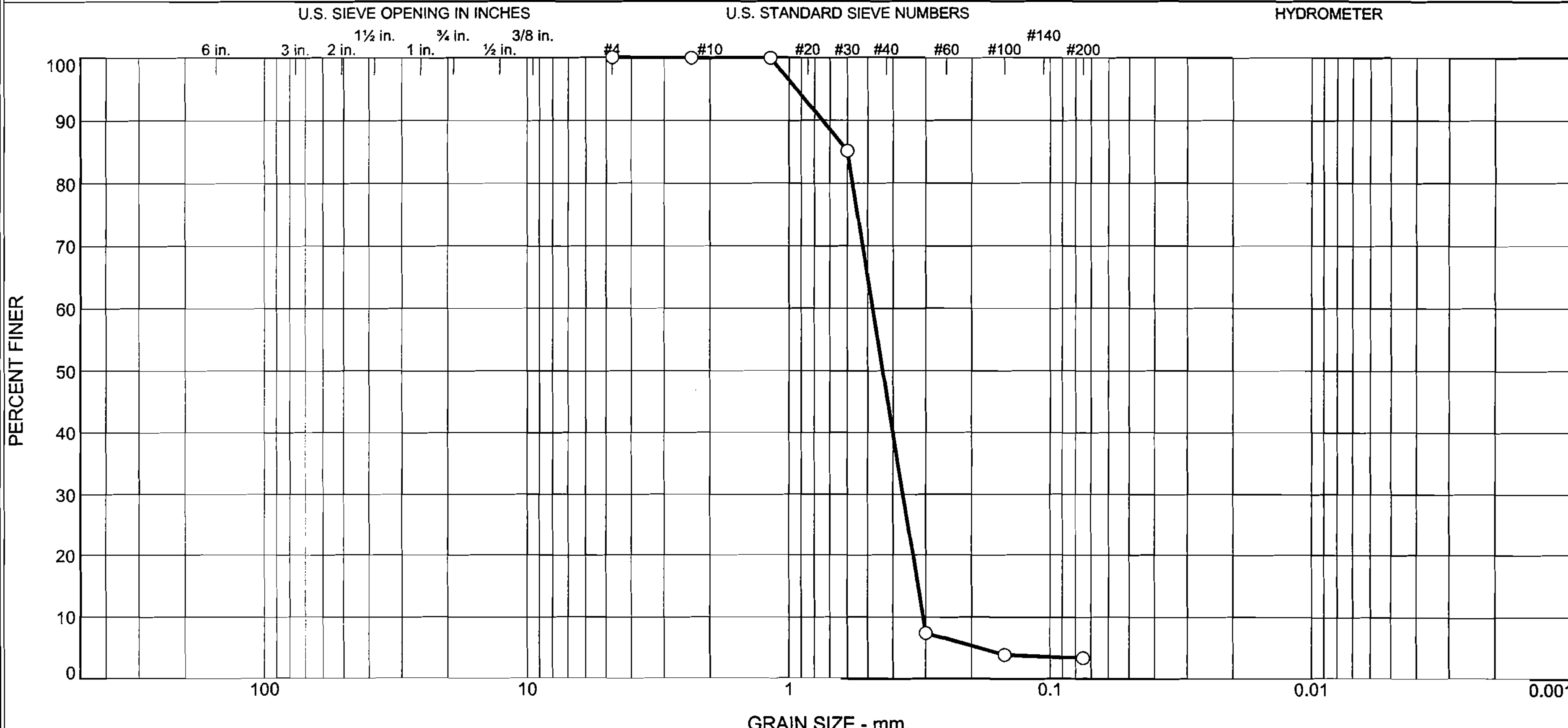
Client American Electric Power

Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc.
Knoxville, Tennessee

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.1	53.4	43.2	3.3	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-4 S-12	39.5'-41.0'		SP	Sand, brown	5.2	nv	np

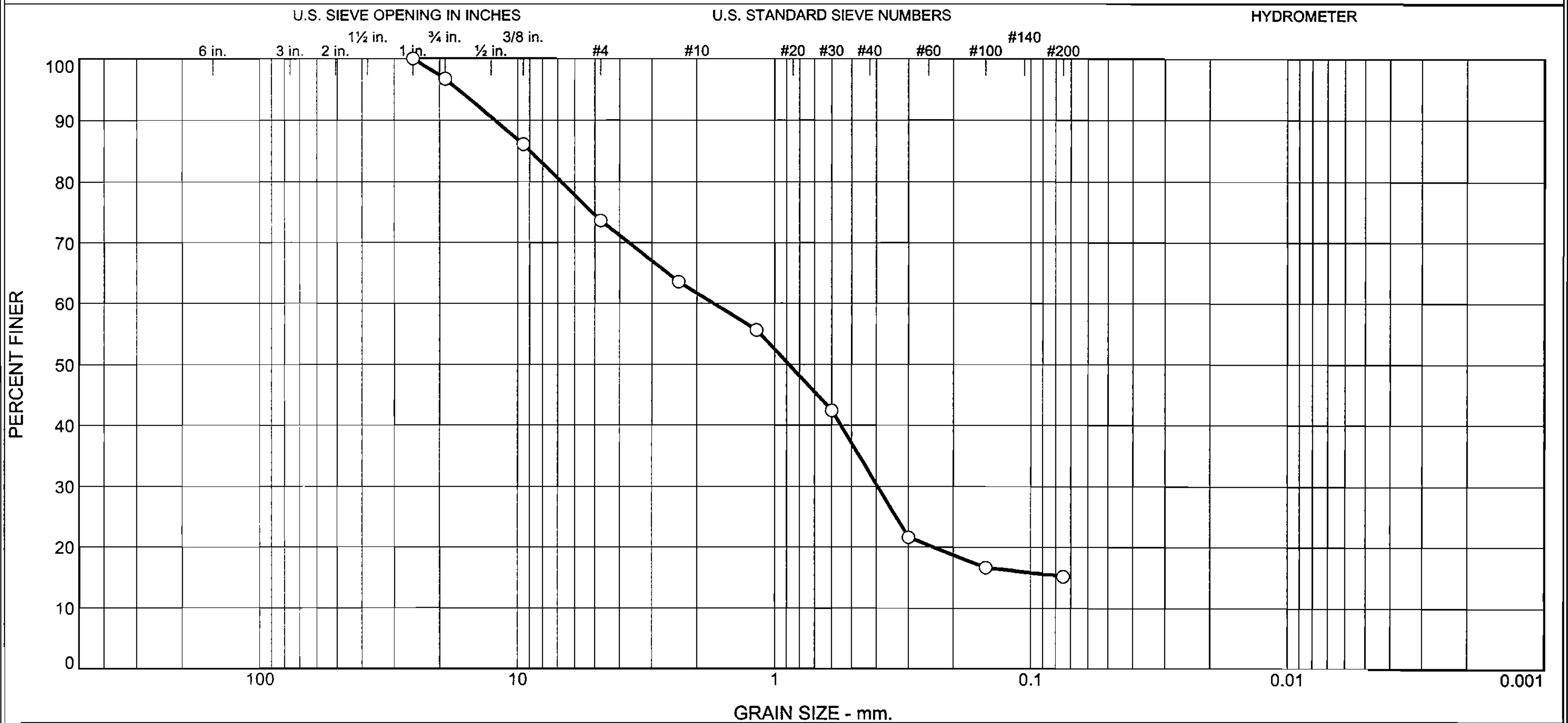
Client American Electric Power

Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc. Knoxville, Tennessee

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	3.3	23.1	12.0	29.5	16.9	15.2	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-1,B-3,B-4	9.5'-10.0'		SC-SM	Sand, clayey, silty, brown w/rock	9.3	16	12
		ST-1							

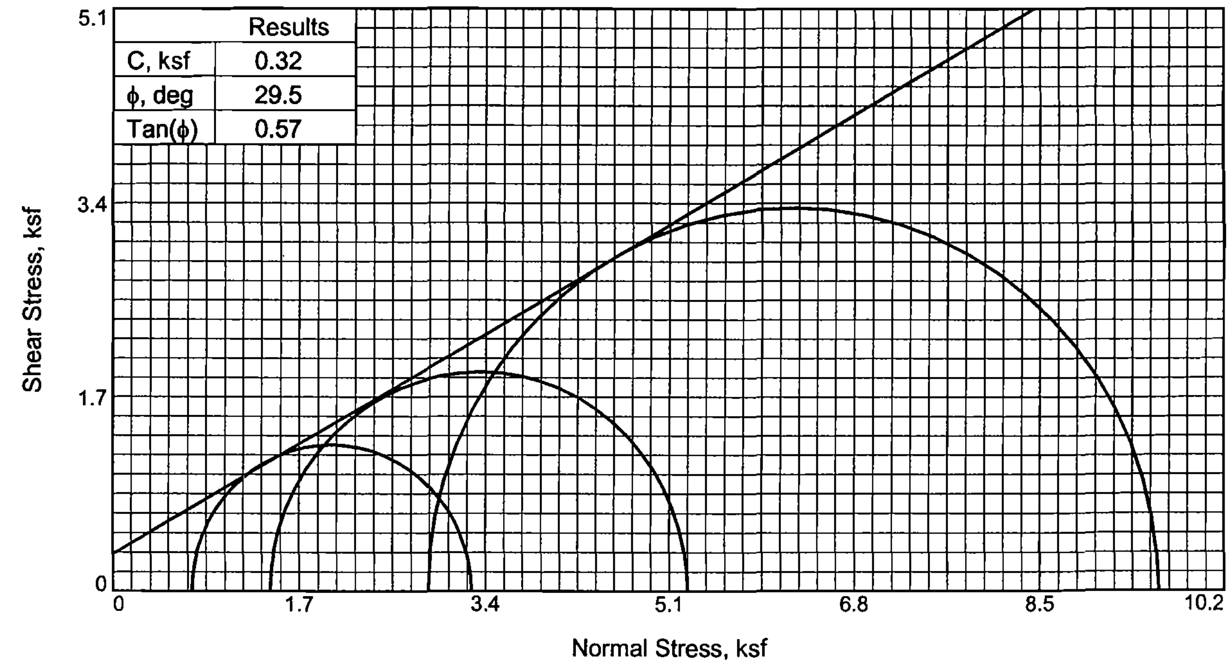
Client American Electric Power

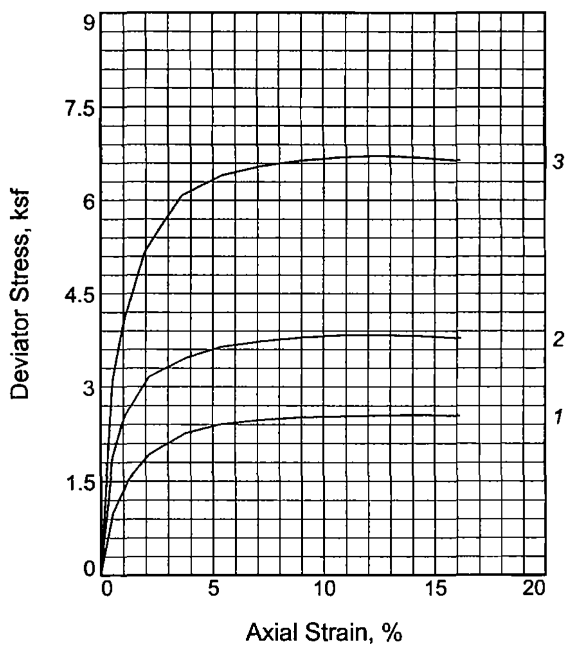
Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc. Knoxville, Tennessee

○ Sand Dike Material





Sample No.		1	2	3
Initial	Water Content, %	9.2	9.3	9.3
	Dry Density, pcf	114.3	114.5	113.2
	Saturation, %	53.1	53.8	52.0
	Void Ratio	0.4632	0.4617	0.4774
	Diameter, in.	2.80	2.80	2.80
	Height, in.	5.60	5.60	5.60
At Test	Water Content, %	16.8	16.2	16.9
	Dry Density, pcf	115.5	116.6	115.1
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4491	0.4344	0.4538
	Diameter, in.	2.79	2.78	2.78
	Height, in.	5.58	5.56	5.57
Strain rate, in./min.		0.00	0.00	0.00
Back Pressure, psi		0.00	0.00	0.00
Cell Pressure, psi		5.00	10.00	20.00
Fail. Stress, ksf		2.55	3.83	6.72
Ult. Stress, ksf				
σ_1 Failure, ksf		3.27	5.27	9.60
σ_3 Failure, ksf		0.72	1.44	2.88

Type of Test:
Consolidated Drained

Sample Type: Shelby Tubes

Description: Sand, clayey, silty, brown w/rock

LL= 16 **PL=** 12 **PI=** 4

Specific Gravity= 2.68

Remarks: Remolded specimens from B-1 ST-1, B-3 ST-1 & B-4 ST-1

Figure 1

Client: American Electric Power

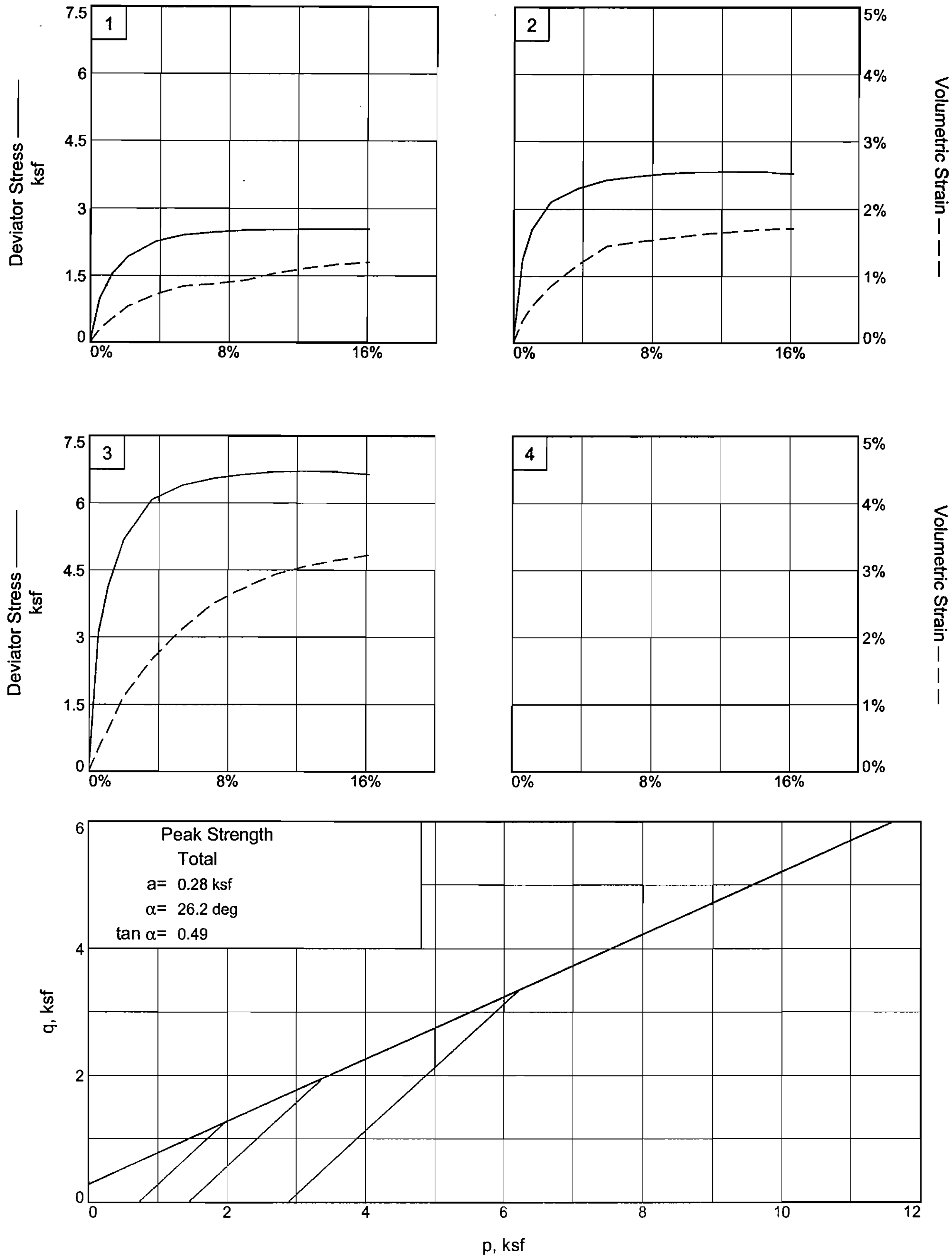
Project: Mitchell Bottom Ash Pond

Sample Number: B-1,B-3,B-4 ST-1 **Depth:** 9.5'-10.0'

Proj. No.: 09-379 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

Geo/Environmental Associates, Inc.



Client: American Electric Power
Project: Mitchell Bottom Ash Pond
Depth: 9.5'-10.0' **Sample Number:** B-1,B-3,B-4 ST-1
Project No.: 09-379

Figure 2

Geo/Environmental Associates, Inc.

CONSTANT HEAD PERMEABILITY TESTING
ASTM D5084-90/SW846 Method 9100 Section 2.8

PROJECT NAME : Mitchell Bottom Ash Pond

PROJECT NUMBER : 09-379

CLIENT : American Electric Power

DATE : March 16, 2009

SAMPLE LOCATION AND CONDITIONS

Sample Id. : B-1, B-3 & B-4; ST-1

Depth of Tested Sample : 9.5'-10.0'

Specimen : 5 psi Triaxial Specimen

Remolded : Yes

Sample Description : Sand, clayey, silty, brown w/rock (Sand Dike)

INITIAL SPECIMEN PROPERTIES

Length (in.): 5.6 **Volume (ft^3):** 0.0200 **Wet Density (PCF):** 124.8

Diameter (in.): 2.8 **Weight (lbs):** 2.49 **Dry Density (PCF):** 114.3

Area (ft^2): 0.0428 **Moisture (%):** 9.2

Chamber Pressure (psi): 5

Influent Pressure (psi): 3

Back Pressure (psi): 0

Change in Pore Pressure (psi): 2.0

Change in Chamber Pressure (psi): 2.0

"B" Factor: 1.0

PERMEABILITY CALCULATIONS

k = Hydraulic Conductivity, (cm/sec)

L = Length of Sample, along path of flow, (cm)

Q = Quantity of flow, taken as the average of inflow and outflow, (cm^3)

A = Cross-sectional area of specimen, (cm^2)

t = Interval of time, over which the flow Q occurs, (sec)

h = Difference in hydraulic head across specimen, (cm)

$$k = \frac{QL}{Ath} = \text{cm/sec}$$

$$k = \frac{(700.0)(14.22)}{(39.73)(2352)(211.01)}$$

$$= \frac{9{,}954.00}{19{,}717{,}821.01}$$

$$= 5.05 \times 10^{-4} \text{ cm/sec}$$

CONSTANT HEAD PERMEABILITY TESTING
ASTM D5084-90/SW846 Method 9100 Section 2.8

PROJECT NAME : Mitchell Bottom Ash Pond **PROJECT NUMBER** : 09-379

CLIENT : American Electric Power **DATE** : March 16, 2009

SAMPLE LOCATION AND CONDITIONS

Sample Id. : B-1, B-3 & B-4; ST-1 **Depth of Tested Sample** : 9.5'-10.0'

Specimen : 10 psi Triaxial Specimen **Remolded** : Yes

Sample Description : Sand, clayey, silty, brown w/rock (Sand Dike)

INITIAL SPECIMEN PROPERTIES

Length (in.): 5.6 **Volume (ft^3):** 0.0200 **Wet Density (PCF):** 125.1

Diameter (in.): 2.8 **Weight (lbs):** 2.50 **Dry Density (PCF):** 114.5

Area (ft^2): 0.0428 **Moisture (%):** 9.3

Chamber Pressure (psi): 7 **Change in Pore Pressure (psi):** 2.0

Influent Pressure (psi): 5 **Change in Chamber Pressure (psi):** 2.0

Back Pressure (psi): 2 **"B" Factor:** 1.0

PERMEABILITY CALCULATIONS

k = Hydraulic Conductivity, (cm/sec)

L = Length of Sample, along path of flow, (cm)

Q = Quantity of flow, taken as the average of inflow and outflow, (cm^3)

A = Cross-sectional area of specimen, (cm^2)

t = Interval of time, over which the flow Q occurs, (sec)

h = Difference in hydraulic head across specimen, (cm)

$$k = \frac{QL}{Ath} = \text{cm/sec}$$

$$k = \frac{(700.0)(14.22)}{(39.73)(2662)(211.01)}$$

$$= \frac{9{,}954.00}{22{,}316{,}683.47}$$

$$= 4.46 \times 10^{-4} \text{ cm/sec}$$

CONSTANT HEAD PERMEABILITY TESTING
ASTM D5084-90/SW846 Method 9100 Section 2.8

PROJECT NAME : Mitchell Bottom Ash Pond

PROJECT NUMBER : 09-379

CLIENT : American Electric Power

DATE : March 16, 2009

SAMPLE LOCATION AND CONDITIONS

Sample Id. : B-1, B-3 & B-4; ST-1

Depth of Tested Sample : 9.5'-10.0'

Specimen : 20 psi Triaxial Specimen

Remolded : Yes

Sample Description : Sand, clayey, silty, brown w/rock (Sand Dike)

INITIAL SPECIMEN PROPERTIES

Length (in.): 5.6 **Volume (ft^3):** 0.0200 **Wet Density (PCF):** 123.7

Diameter (in.): 2.8 **Weight (lbs):** 2.47 **Dry Density (PCF):** 113.2

Area (ft^2): 0.0428 **Moisture (%):** 9.3

Chamber Pressure (psi): 10

Influent Pressure (psi): 8

Back Pressure (psi): 5

Change in Pore Pressure (psi): 2.0

Change in Chamber Pressure (psi): 2.0

"B" Factor: 1.0

PERMEABILITY CALCULATIONS

k = Hydraulic Conductivity, (cm/sec)

L = Length of Sample, along path of flow, (cm)

Q = Quantity of flow, taken as the average of inflow and outflow, (cm^3)

A = Cross-sectional area of specimen, (cm^2)

t = Interval of time, over which the flow Q occurs, (sec)

h = Difference in hydraulic head across specimen, (cm)

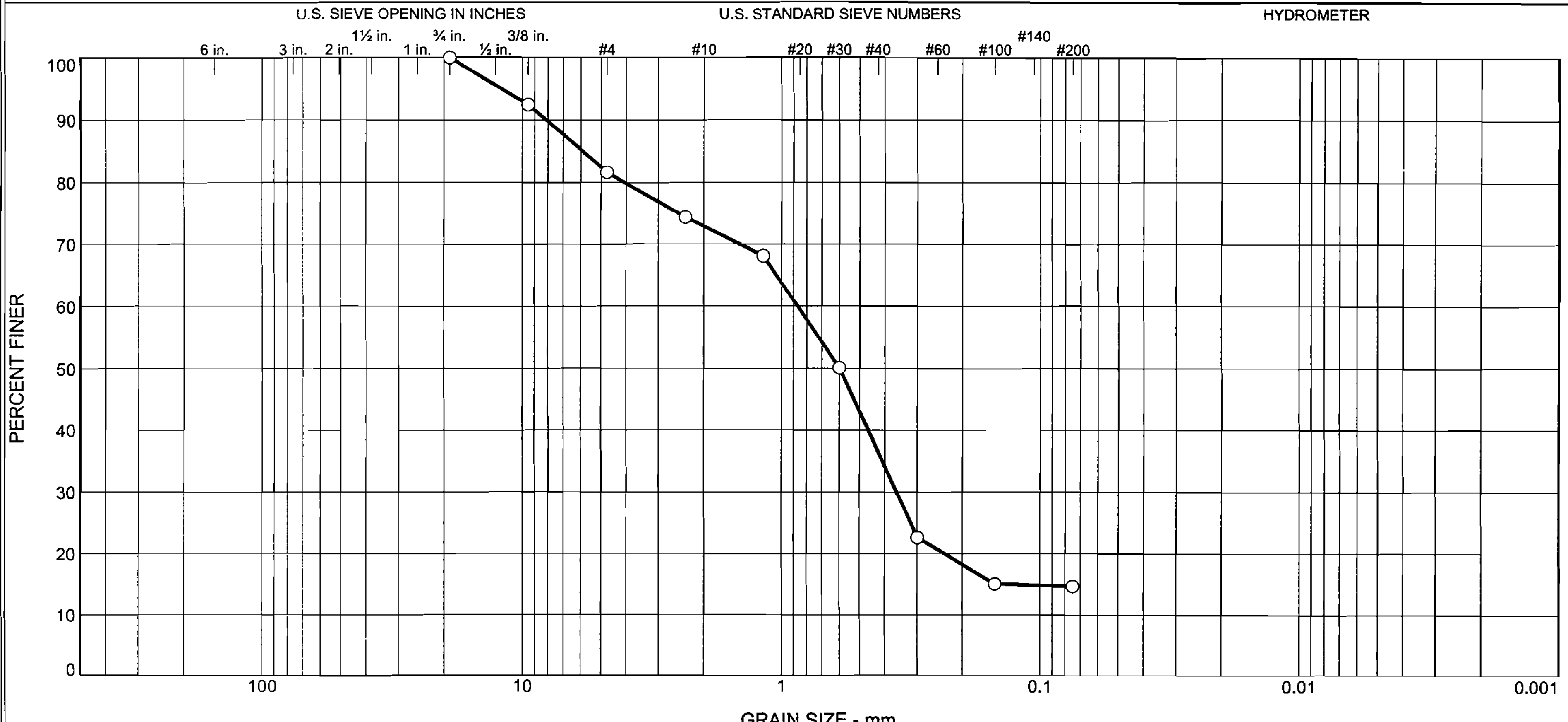
$$k = \frac{QL}{Ath} = \text{cm/sec}$$

$$k = \frac{(700.0)(14.22)}{(39.73)(1424)(211.01)}$$

$$= \frac{9{,}954.00}{11{,}938{,}000.48}$$

$$= 8.34 \times 10^{-4} \text{ cm/sec}$$

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	18.4	8.8	36.4	21.8	14.6	

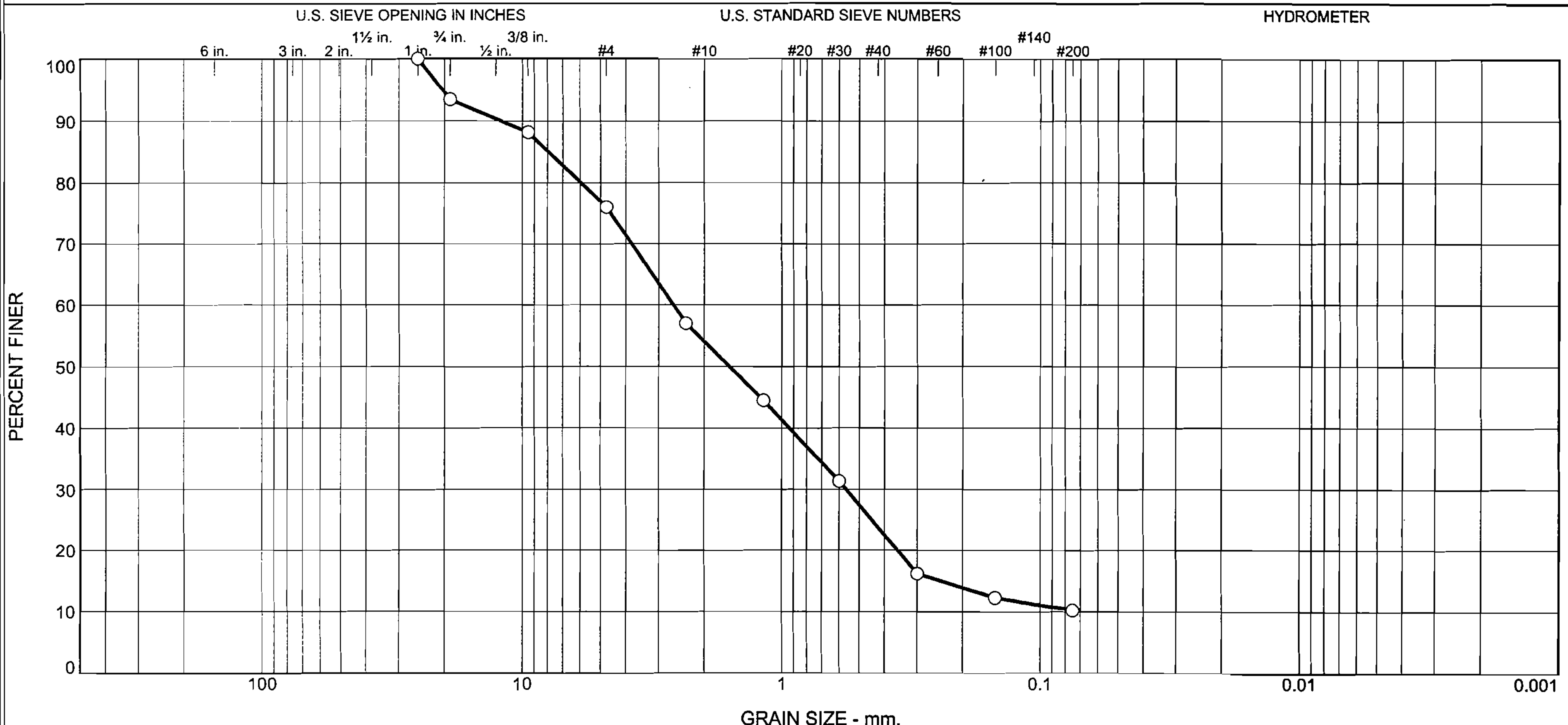
	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-5 S-3	7.0'-8.5'		SM	Sand, silty, dark brown w/rock	7.9	12	np

Client American Electric Power
Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc.
Knoxville, Tennessee

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	6.6	17.4	22.0	30.2	13.6	10.2	

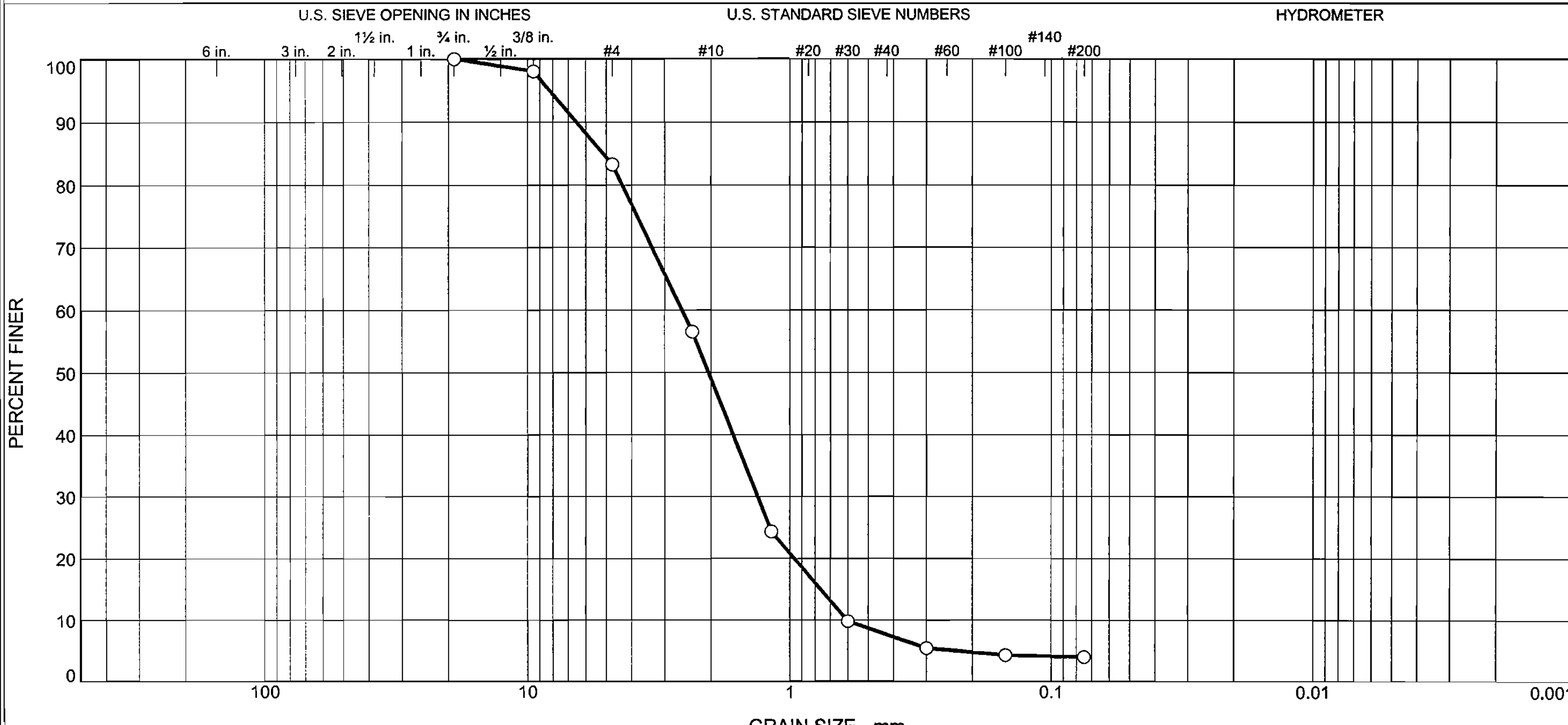
	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-5 S-8	24.5'-26.0'		SP-SC	Sand, clayey, silty, brown w/rock	7.9	16	12

Client American Electric Power
Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc.
Knoxville, Tennessee

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	16.8	34.4	41.2	3.6	4.0	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		Bucket			SP	Bottom Ash	3.6	nv	np

Client American Electric Power
Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc. Knoxville, Tennessee

Appendix II

Hydraulics and Hydrology

Bottom Ash Pond

SUMMARY OF INFLOW HYDROGRAPH AND FLOOD ROUTING THROUGH MITCHELL BOTTOM ASH POND FOR ½ 6-HOUR PMP STORM EVENT

Starting Pool Elevation	=	681 ft, NAVD
Pipe Spillway Invert Elevation	=	681 ft, NAVD
Crest Elevation	=	690 ft, NAVD
Peak Inflow	=	111.08 cfs
Peak Outflow	=	23.83 cfs
Peak Storage	=	10.75 ac-ft
Maximum Impoundment Level During Storm	=	683.51 ft, NAVD
Minimum Freeboard During Storm	=	6.49 ft

```
1***************************************                                                               **************************************
 *                                      *                                                               *                                    *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                               *   U.S. ARMY CORPS OF ENGINEERS     *
 *            SEPTEMBER 1990            *                                                               *   HYDROLOGIC ENGINEERING CENTER    *
 *             VERSION 4.0              *                                                               *         609 SECOND STREET          *
 *                                      *                                                               *      DAVIS, CALIFORNIA 95616       *
 *  RUN DATE  12/21/2015  TIME  10:40:34 *                                                              *          (916) 756-1104            *
 *                                      *                                                               *                                    *
 ***************************************                                                               **************************************



                                                     X     X  XXXXXXX   XXXXX           X
                                                     X     X  X        X     X         XX
                                                     X     X  X        X                X
                                                     XXXXXXX  XXXX     X        XXXXX   X
                                                     X     X  X        X                X
                                                     X     X  X        X     X          X
                                                     X     X  XXXXXXX   XXXXX          XXX




            THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

            THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
            THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
            NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
            DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
            KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM
```

```
        LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 *** FREE ***
           1          ID  ****************************************************************************
           2          ID  *      Mitchell Bottom Ash Pond       File: MBAP.inp                        *
           3          ID  *      GA Project No. 15055007.00                                           *
           4          ID  *      Storm Storage for 1/2 6-Hour PMP                                     *
           5          ID  *      Crest Elevation = 690'                                               *
           6          ID  ****************************************************************************
           7          ID  *      Analyses by: Geo/Environmental Associates, Inc.                      *
           8          ID  *                   Knoxville, TN                                           *
           9          ID  *                   Seth W. Frank P.E.                                      *
          10          ID  *                   August 2014                                             *
          11          ID  ****************************************************************************
          12          IT       5       0       0     300
          13          IO       1
          14          JR  PRECIP     0.5
          15          VS   BASIN    BASE      IN     IMP     IMP     IMP
          16          VV    2.11    2.11    2.11    2.11    6.11    7.11
          17          IN      15

          18          KK   BASIN
          19          KM   COMPUTE INFLOW HYDROGRAPH FOR MITCHELL BOTTOM ASH POND USING SCS METHOD
          20          PB       0
          21          PI   0.258   0.347   0.420   0.478   0.520   0.546   0.624   0.804   0.790   0.939
          22          PI   2.264   4.483   4.834   3.277   1.215   0.797   0.831   0.735   0.553   0.535
          23          PI   0.501   0.451   0.386   0.305
          24          BA   0.016
          25          LU       0    0.05    44.8
          26          UD     0.0

          27          KK    BASE
          28          KM   BASE FLOW
          29          IN     360
          30          QI    11.6    11.6    11.6

          31          KK      IN
          32          KM   COMBINE BASIN INFLOW AND BASEFLOW
          33          KO       1
          34          HC       2

          35          KK     IMP
          36          KM   ROUTE COMPUTED HYDROGRAPH AND BASE FLOW THROUGH CLEAR WATER POND
          37          RS       1    ELEV     681
          38          SA    4.03    4.18    4.45    4.72    6.27    7.81    8.03    8.26    8.48    8.71
          39          SQ       0    6.90   17.82   29.62   40.80   50.31   57.32   61.12   61.12   61.12
          40          SE     681     682     683     684     685     686     687     688     689     690
          41          ZZ
```

```
1***************************************                                                ***************************************
 *                                     *                                                *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                               *   U.S. ARMY CORPS OF ENGINEERS      *
 *           SEPTEMBER 1990            *                                                *   HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.0              *                                                *        609 SECOND STREET            *
 *                                     *                                                *     DAVIS, CALIFORNIA 95616         *
 *  RUN DATE  12/21/2015  TIME  10:40:34 *                                              *          (916) 756-1104             *
 *                                     *                                                *                                     *
***************************************                                                 ***************************************


                    *************************************************************************
                    *      Mitchell Bottom Ash Pond       File: MBAP.inp                    *
                    *      GA Project No. 15055007.00                                       *
                    *      Storm Storage for 1/2 6-Hour PMP                                 *
                    *      Crest Elevation = 690'                                           *
                    *************************************************************************
                    *      Analyses by: Geo/Environmental Associates, Inc.                  *
                    *                   Knoxville, TN                                       *
                    *                   Seth W. Frank P.E.                                  *
                    *                   August 2014                                         *
                    *************************************************************************

  13 IO         OUTPUT CONTROL VARIABLES
                      IPRNT          1  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT         HYDROGRAPH TIME DATA
                       NMIN          5  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME       0000  STARTING TIME
                         NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      2    0  ENDING DATE
                     NDTIME       0055  ENDING TIME
                     ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE   24.92 HOURS

        ENGLISH UNITS
             DRAINAGE AREA          SQUARE MILES
             PRECIPITATION DEPTH    INCHES
             LENGTH, ELEVATION      FEET
             FLOW                   CUBIC FEET PER SECOND
             STORAGE VOLUME         ACRE-FEET
             SURFACE AREA           ACRES
             TEMPERATURE            DEGREES FAHRENHEIT

               USER-DEFINED OUTPUT SPECIFICATIONS

       TABLE 1
    VS       STATION     BASIN      BASE        IN       IMP       IMP       IMP
    VV VARIABLE CODE      2.11      2.11      2.11      2.11      6.11      7.11       .00       .00       .00       .00

    JP          MULTI-PLAN OPTION
                      NPLAN          1  NUMBER OF PLANS

    JR          MULTI-RATIO OPTION
                    RATIOS OF PRECIPITATION
                     .50


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
  18 KK   *    BASIN   *
          *            *
          **************
                          COMPUTE INFLOW HYDROGRAPH FOR MITCHELL BOTTOM ASH POND USING SCS METHOD

  17 IN         TIME DATA FOR INPUT TIME SERIES
                      JXMIN         15  TIME INTERVAL IN MINUTES
                     JXDATE      1    0  STARTING DATE
                     JXTIME          0  STARTING TIME
```

```
             SUBBASIN RUNOFF DATA

  24 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .02  SUBBASIN AREA

                 PRECIPITATION DATA

  20 PB                STORM       26.89  BASIN TOTAL PRECIPITATION

  21 PI            INCREMENTAL PRECIPITATION PATTERN
                       .09       .09       .09       .12       .12       .12       .14       .14       .14       .16
                       .16       .16       .17       .17       .17       .18       .18       .18       .21       .21
                       .21       .27       .27       .27       .26       .26       .26       .31       .31       .31
                       .75       .75       .75      1.49      1.49      1.49      1.61      1.61      1.61      1.09
                      1.09      1.09       .41       .40       .41       .27       .27       .27       .28       .28
                       .28       .25       .24       .25       .18       .18       .18       .18       .18       .18
                       .17       .17       .17       .15       .15       .15       .13       .13       .13       .10
                       .10       .10

  25 LU          UNIFORM LOSS RATE
                       STRTL         .00  INITIAL LOSS
                       CNSTL         .05  UNIFORM LOSS RATE
                       RTIMP       44.80  PERCENT IMPERVIOUS AREA

  26 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .00  LAG

                                                                        ***


  PEAK FLOW     TIME                               MAXIMUM AVERAGE FLOW
                                          6-HR       24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                             (CFS)
+       24.     4.58                       21.         15.         14.          14.
                          (INCHES)      6.212      17.047      17.093       17.093
                           (AC-FT)        11.         29.         29.          29.

 PEAK STORAGE   TIME                             MAXIMUM AVERAGE STORAGE
                                          6-HR       24-HR       72-HR     24.92-HR
+  (AC-FT)      (HR)
        11.     4.58                       10.          7.          7.           7.

  PEAK STAGE    TIME                               MAXIMUM AVERAGE STAGE
                                          6-HR       24-HR       72-HR     24.92-HR
+   (FEET)      (HR)
     683.51     4.58                    683.30      682.70      682.64       682.64

                              CUMULATIVE AREA =     .03 SQ MI
```

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .50
HYDROGRAPH AT					
+	BASIN	.02	1	FLOW	99.
				TIME	3.25
HYDROGRAPH AT					
+	BASE	.02	1	FLOW	12.
				TIME	.08
2 COMBINED AT					
+	IN	.03	1	FLOW	111.
				TIME	3.25
ROUTED TO					
+	IMP	.03	1	FLOW	24.
				TIME	4.58
			** PEAK STAGES IN FEET **		
			1	STAGE	683.51
				TIME	4.58

1TABLE 1	STATION		BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
	PLAN		1	1	1	1	1	1
	RATIO		.50	.50	.50	.50	.50	.50
PER	DAY MON	HRMN						
1	1	0000	.00	11.60	11.60	.00	.00	681.00
2	1	0005	3.75	11.60	15.35	.16	.09	681.02
3	1	0010	4.80	11.60	16.40	.34	.20	681.05
4	1	0015	5.00	11.60	16.60	.52	.31	681.08
5	1	0020	6.41	11.60	18.01	.72	.43	681.10
6	1	0025	6.79	11.60	18.39	.92	.55	681.13
7	1	0030	6.87	11.60	18.47	1.12	.67	681.16
8	1	0035	8.00	11.60	19.60	1.32	.79	681.19
9	1	0040	8.31	11.60	19.91	1.54	.91	681.22
10	1	0045	8.38	11.60	19.98	1.75	1.04	681.25
11	1	0050	9.28	11.60	20.88	1.96	1.17	681.28
12	1	0055	9.53	11.60	21.13	2.18	1.30	681.32
13	1	0100	9.58	11.60	21.18	2.40	1.43	681.35
14	1	0105	10.23	11.60	21.83	2.62	1.56	681.38
15	1	0110	10.41	11.60	22.01	2.84	1.69	681.41
16	1	0115	10.45	11.60	22.05	3.06	1.82	681.44
17	1	0120	10.85	11.60	22.45	3.28	1.95	681.48
18	1	0125	10.96	11.60	22.56	3.51	2.09	681.51
19	1	0130	10.99	11.60	22.59	3.73	2.22	681.54
20	1	0135	12.19	11.60	23.79	3.95	2.35	681.57
21	1	0140	12.52	11.60	24.12	4.18	2.49	681.61
22	1	0145	12.59	11.60	24.19	4.41	2.62	681.64
23	1	0150	15.36	11.60	26.96	4.65	2.77	681.67
24	1	0155	16.14	11.60	27.74	4.91	2.92	681.71
25	1	0200	16.29	11.60	27.89	5.18	3.08	681.75
26	1	0205	16.10	11.60	27.70	5.44	3.24	681.79
27	1	0210	16.04	11.60	27.64	5.69	3.39	681.83
28	1	0215	16.03	11.60	27.63	5.95	3.54	681.86
29	1	0220	18.32	11.60	29.92	6.21	3.69	681.90
30	1	0225	18.96	11.60	30.56	6.49	3.86	681.94
31	1	0230	19.08	11.60	30.68	6.76	4.02	681.98
32	1	0235	39.43	11.60	51.03	7.28	4.26	682.04
33	1	0240	45.13	11.60	56.73	8.09	4.57	682.11
34	1	0245	46.24	11.60	57.84	8.94	4.91	682.19
35	1	0250	80.51	11.60	92.11	10.08	5.36	682.29
36	1	0255	90.04	11.60	101.64	11.58	5.95	682.43
37	1	0300	91.92	11.60	103.52	13.15	6.58	682.57
38	1	0305	97.68	11.60	109.28	14.77	7.21	682.72
39	1	0310	99.18	11.60	110.78	16.41	7.86	682.87
40	1	0315	99.48	11.60	111.08	18.05	8.51	683.02
41	1	0320	75.65	11.60	87.25	19.47	9.06	683.14
42	1	0325	68.96	11.60	80.56	20.61	9.50	683.24
43	1	0330	67.65	11.60	79.25	21.65	9.91	683.32
44	1	0335	35.75	11.60	47.35	22.38	10.19	683.39
45	1	0340	26.89	11.60	38.49	22.74	10.33	683.42
46	1	0345	25.15	11.60	36.75	23.00	10.43	683.44
47	1	0350	18.39	11.60	29.99	23.18	10.50	683.45
48	1	0355	16.60	11.60	28.20	23.29	10.54	683.46
49	1	0400	16.24	11.60	27.84	23.37	10.58	683.47
50	1	0405	16.70	11.60	28.30	23.45	10.61	683.48

1TABLE 1 (CONT.)	STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE	
	PLAN	1	1	1	1	1	1	
	RATIO	.50	.50	.50	.50	.50	.50	
PER DAY MON	HRMN							
51 1	0410	16.84	11.60	28.44	23.54	10.64	683.48	
52 1	0415	16.87	11.60	28.47	23.63	10.68	683.49	
53 1	0420	15.40	11.60	27.00	23.70	10.70	683.50	
54 1	0425	14.99	11.60	26.59	23.75	10.72	683.50	
55 1	0430	14.91	11.60	26.51	23.80	10.74	683.51	
56 1	0435	12.10	11.60	23.70	23.83	**10.75**	**683.51**	**Maximum impoundment stage/storage**
57 1	0440	11.32	11.60	22.92	23.82	10.75	683.51	
58 1	0445	11.17	11.60	22.77	23.80	10.74	683.51	
59 1	0450	10.86	11.60	22.46	23.78	10.73	683.51	
60 1	0455	10.78	11.60	22.38	23.75	10.72	683.50	
61 1	0500	10.77	11.60	22.37	23.73	10.72	683.50	
62 1	0505	10.24	11.60	21.84	23.70	10.70	683.50	
63 1	0510	10.10	11.60	21.70	23.67	10.69	683.50	
64 1	0515	10.07	11.60	21.67	23.63	10.68	683.49	
65 1	0520	9.29	11.60	20.89	23.59	10.66	683.49	
66 1	0525	9.08	11.60	20.68	23.54	10.64	683.48	
67 1	0530	9.04	11.60	20.64	23.49	10.62	683.48	
68 1	0535	8.03	11.60	19.63	23.43	10.60	683.48	
69 1	0540	7.75	11.60	19.35	23.36	10.57	683.47	
70 1	0545	7.70	11.60	19.30	23.29	10.55	683.46	
71 1	0550	6.44	11.60	18.04	23.21	10.51	683.46	
72 1	0555	6.10	11.60	17.70	23.12	10.48	683.45	
73 1	0600	6.03	11.60	17.63	23.02	10.44	683.44	
74 1	0605	1.55	11.60	13.15	22.89	10.39	683.43	
75 1	0610	.29	11.60	11.89	22.71	10.32	683.41	
76 1	0615	.05	11.60	11.65	22.51	10.24	683.40	
77 1	0620	.00	11.60	11.60	22.32	10.17	683.38	
78 1	0625	.00	11.60	11.60	22.13	10.09	683.37	
79 1	0630	.00	11.60	11.60	21.95	10.02	683.35	
80 1	0635	.00	11.60	11.60	21.77	9.95	683.33	
81 1	0640	.00	11.60	11.60	21.59	9.88	683.32	
82 1	0645	.00	11.60	11.60	21.41	9.81	683.30	
83 1	0650	.00	11.60	11.60	21.24	9.75	683.29	
84 1	0655	.00	11.60	11.60	21.07	9.68	683.28	
85 1	0700	.00	11.60	11.60	20.90	9.62	683.26	
86 1	0705	.00	11.60	11.60	20.74	9.55	683.25	
87 1	0710	.00	11.60	11.60	20.58	9.49	683.23	
88 1	0715	.00	11.60	11.60	20.42	9.43	683.22	
89 1	0720	.00	11.60	11.60	20.27	9.37	683.21	
90 1	0725	.00	11.60	11.60	20.11	9.31	683.19	
91 1	0730	.00	11.60	11.60	19.97	9.25	683.18	
92 1	0735	.00	11.60	11.60	19.82	9.20	683.17	
93 1	0740	.00	11.60	11.60	19.67	9.14	683.16	
94 1	0745	.00	11.60	11.60	19.53	9.08	683.15	
95 1	0750	.00	11.60	11.60	19.39	9.03	683.13	
96 1	0755	.00	11.60	11.60	19.26	8.98	683.12	
97 1	0800	.00	11.60	11.60	19.12	8.92	683.11	
98 1	0805	.00	11.60	11.60	18.99	8.87	683.10	
99 1	0810	.00	11.60	11.60	18.86	8.82	683.09	
100 1	0815	.00	11.60	11.60	18.73	8.77	683.08	

1TABLE 1 (CONT.)			STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
			PLAN	1	1	1	1	1	1
			RATIO	.50	.50	.50	.50	.50	.50
PER	DAY	MON	HRMN						
101	1		0820	.00	11.60	11.60	18.61	8.72	683.07
102	1		0825	.00	11.60	11.60	18.48	8.68	683.06
103	1		0830	.00	11.60	11.60	18.36	8.63	683.05
104	1		0835	.00	11.60	11.60	18.24	8.58	683.04
105	1		0840	.00	11.60	11.60	18.13	8.54	683.03
106	1		0845	.00	11.60	11.60	18.01	8.49	683.02
107	1		0850	.00	11.60	11.60	17.90	8.45	683.01
108	1		0855	.00	11.60	11.60	17.79	8.41	683.00
109	1		0900	.00	11.60	11.60	17.68	8.36	682.99
110	1		0905	.00	11.60	11.60	17.58	8.32	682.98
111	1		0910	.00	11.60	11.60	17.47	8.28	682.97
112	1		0915	.00	11.60	11.60	17.37	8.24	682.96
113	1		0920	.00	11.60	11.60	17.27	8.20	682.95
114	1		0925	.00	11.60	11.60	17.17	8.16	682.94
115	1		0930	.00	11.60	11.60	17.08	8.13	682.93
116	1		0935	.00	11.60	11.60	16.98	8.09	682.92
117	1		0940	.00	11.60	11.60	16.89	8.05	682.91
118	1		0945	.00	11.60	11.60	16.80	8.02	682.91
119	1		0950	.00	11.60	11.60	16.71	7.98	682.90
120	1		0955	.00	11.60	11.60	16.62	7.95	682.89
121	1		1000	.00	11.60	11.60	16.53	7.91	682.88
122	1		1005	.00	11.60	11.60	16.45	7.88	682.87
123	1		1010	.00	11.60	11.60	16.37	7.84	682.87
124	1		1015	.00	11.60	11.60	16.28	7.81	682.86
125	1		1020	.00	11.60	11.60	16.20	7.78	682.85
126	1		1025	.00	11.60	11.60	16.12	7.75	682.84
127	1		1030	.00	11.60	11.60	16.04	7.72	682.84
128	1		1035	.00	11.60	11.60	15.97	7.69	682.83
129	1		1040	.00	11.60	11.60	15.89	7.66	682.82
130	1		1045	.00	11.60	11.60	15.82	7.63	682.82
131	1		1050	.00	11.60	11.60	15.74	7.60	682.81
132	1		1055	.00	11.60	11.60	15.67	7.57	682.80
133	1		1100	.00	11.60	11.60	15.60	7.54	682.80
134	1		1105	.00	11.60	11.60	15.53	7.52	682.79
135	1		1110	.00	11.60	11.60	15.47	7.49	682.78
136	1		1115	.00	11.60	11.60	15.40	7.46	682.78
137	1		1120	.00	11.60	11.60	15.33	7.44	682.77
138	1		1125	.00	11.60	11.60	15.27	7.41	682.77
139	1		1130	.00	11.60	11.60	15.21	7.39	682.76
140	1		1135	.00	11.60	11.60	15.14	7.36	682.75
141	1		1140	.00	11.60	11.60	15.08	7.34	682.75
142	1		1145	.00	11.60	11.60	15.02	7.31	682.74
143	1		1150	.00	11.60	11.60	14.96	7.29	682.74
144	1		1155	.00	11.60	11.60	14.90	7.27	682.73
145	1		1200	.00	11.60	11.60	14.85	7.24	682.73
146	1		1205	.00	11.60	11.60	14.79	7.22	682.72
147	1		1210	.00	11.60	11.60	14.74	7.20	682.72
148	1		1215	.00	11.60	11.60	14.68	7.18	682.71
149	1		1220	.00	11.60	11.60	14.63	7.16	682.71
150	1		1225	.00	11.60	11.60	14.58	7.14	682.70

1TABLE 1 (CONT.)			STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
			PLAN	1	1	1	1	1	1
			RATIO	.50	.50	.50	.50	.50	.50
PER	DAY	MON	HRMN						
151	1		1230	.00	11.60	11.60	14.52	7.12	682.70
152	1		1235	.00	11.60	11.60	14.47	7.10	682.69
153	1		1240	.00	11.60	11.60	14.42	7.08	682.69
154	1		1245	.00	11.60	11.60	14.38	7.06	682.68
155	1		1250	.00	11.60	11.60	14.33	7.04	682.68
156	1		1255	.00	11.60	11.60	14.28	7.02	682.68
157	1		1300	.00	11.60	11.60	14.23	7.00	682.67
158	1		1305	.00	11.60	11.60	14.19	6.98	682.67
159	1		1310	.00	11.60	11.60	14.14	6.97	682.66
160	1		1315	.00	11.60	11.60	14.10	6.95	682.66
161	1		1320	.00	11.60	11.60	14.06	6.93	682.66
162	1		1325	.00	11.60	11.60	14.01	6.92	682.65
163	1		1330	.00	11.60	11.60	13.97	6.90	682.65
164	1		1335	.00	11.60	11.60	13.93	6.88	682.64
165	1		1340	.00	11.60	11.60	13.89	6.87	682.64
166	1		1345	.00	11.60	11.60	13.85	6.85	682.64
167	1		1350	.00	11.60	11.60	13.81	6.84	682.63
168	1		1355	.00	11.60	11.60	13.77	6.82	682.63
169	1		1400	.00	11.60	11.60	13.74	6.81	682.63
170	1		1405	.00	11.60	11.60	13.70	6.79	682.62
171	1		1410	.00	11.60	11.60	13.66	6.78	682.62
172	1		1415	.00	11.60	11.60	13.63	6.76	682.62
173	1		1420	.00	11.60	11.60	13.59	6.75	682.61
174	1		1425	.00	11.60	11.60	13.56	6.74	682.61
175	1		1430	.00	11.60	11.60	13.52	6.72	682.61
176	1		1435	.00	11.60	11.60	13.49	6.71	682.60
177	1		1440	.00	11.60	11.60	13.46	6.70	682.60
178	1		1445	.00	11.60	11.60	13.43	6.68	682.60
179	1		1450	.00	11.60	11.60	13.40	6.67	682.59
180	1		1455	.00	11.60	11.60	13.36	6.66	682.59
181	1		1500	.00	11.60	11.60	13.33	6.65	682.59
182	1		1505	.00	11.60	11.60	13.30	6.63	682.59
183	1		1510	.00	11.60	11.60	13.27	6.62	682.58
184	1		1515	.00	11.60	11.60	13.25	6.61	682.58
185	1		1520	.00	11.60	11.60	13.22	6.60	682.58
186	1		1525	.00	11.60	11.60	13.19	6.59	682.58
187	1		1530	.00	11.60	11.60	13.16	6.58	682.57
188	1		1535	.00	11.60	11.60	13.13	6.57	682.57
189	1		1540	.00	11.60	11.60	13.11	6.56	682.57
190	1		1545	.00	11.60	11.60	13.08	6.55	682.57
191	1		1550	.00	11.60	11.60	13.06	6.54	682.56
192	1		1555	.00	11.60	11.60	13.03	6.53	682.56
193	1		1600	.00	11.60	11.60	13.01	6.52	682.56
194	1		1605	.00	11.60	11.60	12.98	6.51	682.56
195	1		1610	.00	11.60	11.60	12.96	6.50	682.55
196	1		1615	.00	11.60	11.60	12.93	6.49	682.55
197	1		1620	.00	11.60	11.60	12.91	6.48	682.55
198	1		1625	.00	11.60	11.60	12.89	6.47	682.55
199	1		1630	.00	11.60	11.60	12.87	6.46	682.55
200	1		1635	.00	11.60	11.60	12.84	6.45	682.54

1TABLE 1 (CONT.)		STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
		PLAN	1	1	1	1	1	1
		RATIO	.50	.50	.50	.50	.50	.50
PER	DAY MON	HRMN						
201	1	1640	.00	11.60	11.60	12.82	6.44	682.54
202	1	1645	.00	11.60	11.60	12.80	6.44	682.54
203	1	1650	.00	11.60	11.60	12.78	6.43	682.54
204	1	1655	.00	11.60	11.60	12.76	6.42	682.54
205	1	1700	.00	11.60	11.60	12.74	6.41	682.53
206	1	1705	.00	11.60	11.60	12.72	6.40	682.53
207	1	1710	.00	11.60	11.60	12.70	6.40	682.53
208	1	1715	.00	11.60	11.60	12.68	6.39	682.53
209	1	1720	.00	11.60	11.60	12.66	6.38	682.53
210	1	1725	.00	11.60	11.60	12.65	6.37	682.53
211	1	1730	.00	11.60	11.60	12.63	6.37	682.52
212	1	1735	.00	11.60	11.60	12.61	6.36	682.52
213	1	1740	.00	11.60	11.60	12.59	6.35	682.52
214	1	1745	.00	11.60	11.60	12.58	6.35	682.52
215	1	1750	.00	11.60	11.60	12.56	6.34	682.52
216	1	1755	.00	11.60	11.60	12.54	6.33	682.52
217	1	1800	.00	11.60	11.60	12.53	6.33	682.52
218	1	1805	.00	11.60	11.60	12.51	6.32	682.51
219	1	1810	.00	11.60	11.60	12.49	6.31	682.51
220	1	1815	.00	11.60	11.60	12.48	6.31	682.51
221	1	1820	.00	11.60	11.60	12.46	6.30	682.51
222	1	1825	.00	11.60	11.60	12.45	6.30	682.51
223	1	1830	.00	11.60	11.60	12.43	6.29	682.51
224	1	1835	.00	11.60	11.60	12.42	6.29	682.51
225	1	1840	.00	11.60	11.60	12.41	6.28	682.50
226	1	1845	.00	11.60	11.60	12.39	6.27	682.50
227	1	1850	.00	11.60	11.60	12.38	6.27	682.50
228	1	1855	.00	11.60	11.60	12.36	6.26	682.50
229	1	1900	.00	11.60	11.60	12.35	6.26	682.50
230	1	1905	.00	11.60	11.60	12.34	6.25	682.50
231	1	1910	.00	11.60	11.60	12.33	6.25	682.50
232	1	1915	.00	11.60	11.60	12.31	6.24	682.50
233	1	1920	.00	11.60	11.60	12.30	6.24	682.49
234	1	1925	.00	11.60	11.60	12.29	6.23	682.49
235	1	1930	.00	11.60	11.60	12.28	6.23	682.49
236	1	1935	.00	11.60	11.60	12.26	6.22	682.49
237	1	1940	.00	11.60	11.60	12.25	6.22	682.49
238	1	1945	.00	11.60	11.60	12.24	6.22	682.49
239	1	1950	.00	11.60	11.60	12.23	6.21	682.49
240	1	1955	.00	11.60	11.60	12.22	6.21	682.49
241	1	2000	.00	11.60	11.60	12.21	6.20	682.49
242	1	2005	.00	11.60	11.60	12.20	6.20	682.49
243	1	2010	.00	11.60	11.60	12.19	6.19	682.48
244	1	2015	.00	11.60	11.60	12.18	6.19	682.48
245	1	2020	.00	11.60	11.60	12.17	6.19	682.48
246	1	2025	.00	11.60	11.60	12.16	6.18	682.48
247	1	2030	.00	11.60	11.60	12.15	6.18	682.48
248	1	2035	.00	11.60	11.60	12.14	6.17	682.48
249	1	2040	.00	11.60	11.60	12.13	6.17	682.48
250	1	2045	.00	11.60	11.60	12.12	6.17	682.48

1TABLE 1 (CONT.)	STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
	PLAN	1	1	1	1	1	1
	RATIO	.50	.50	.50	.50	.50	.50
PER DAY MON	HRMN						
251 1	2050	.00	11.60	11.60	12.11	6.16	682.48
252 1	2055	.00	11.60	11.60	12.10	6.16	682.48
253 1	2100	.00	11.60	11.60	12.09	6.16	682.48
254 1	2105	.00	11.60	11.60	12.09	6.15	682.47
255 1	2110	.00	11.60	11.60	12.08	6.15	682.47
256 1	2115	.00	11.60	11.60	12.07	6.15	682.47
257 1	2120	.00	11.60	11.60	12.06	6.14	682.47
258 1	2125	.00	11.60	11.60	12.05	6.14	682.47
259 1	2130	.00	11.60	11.60	12.05	6.14	682.47
260 1	2135	.00	11.60	11.60	12.04	6.13	682.47
261 1	2140	.00	11.60	11.60	12.03	6.13	682.47
262 1	2145	.00	11.60	11.60	12.02	6.13	682.47
263 1	2150	.00	11.60	11.60	12.02	6.13	682.47
264 1	2155	.00	11.60	11.60	12.01	6.12	682.47
265 1	2200	.00	11.60	11.60	12.00	6.12	682.47
266 1	2205	.00	11.60	11.60	11.99	6.12	682.47
267 1	2210	.00	11.60	11.60	11.99	6.11	682.47
268 1	2215	.00	11.60	11.60	11.98	6.11	682.47
269 1	2220	.00	11.60	11.60	11.97	6.11	682.46
270 1	2225	.00	11.60	11.60	11.97	6.11	682.46
271 1	2230	.00	11.60	11.60	11.96	6.10	682.46
272 1	2235	.00	11.60	11.60	11.95	6.10	682.46
273 1	2240	.00	11.60	11.60	11.95	6.10	682.46
274 1	2245	.00	11.60	11.60	11.94	6.10	682.46
275 1	2250	.00	11.60	11.60	11.94	6.09	682.46
276 1	2255	.00	11.60	11.60	11.93	6.09	682.46
277 1	2300	.00	11.60	11.60	11.93	6.09	682.46
278 1	2305	.00	11.60	11.60	11.92	6.09	682.46
279 1	2310	.00	11.60	11.60	11.91	6.09	682.46
280 1	2315	.00	11.60	11.60	11.91	6.08	682.46
281 1	2320	.00	11.60	11.60	11.90	6.08	682.46
282 1	2325	.00	11.60	11.60	11.90	6.08	682.46
283 1	2330	.00	11.60	11.60	11.89	6.08	682.46
284 1	2335	.00	11.60	11.60	11.89	6.08	682.46
285 1	2340	.00	11.60	11.60	11.88	6.07	682.46
286 1	2345	.00	11.60	11.60	11.88	6.07	682.46
287 1	2350	.00	11.60	11.60	11.87	6.07	682.46
288 1	2355	.00	11.60	11.60	11.87	6.07	682.46
289 2	0000	.00	11.60	11.60	11.86	6.07	682.45
290 2	0005	.00	11.60	11.60	11.86	6.06	682.45
291 2	0010	.00	11.60	11.60	11.85	6.06	682.45
292 2	0015	.00	11.60	11.60	11.85	6.06	682.45
293 2	0020	.00	11.60	11.60	11.85	6.06	682.45
294 2	0025	.00	11.60	11.60	11.84	6.06	682.45
295 2	0030	.00	11.60	11.60	11.84	6.06	682.45
296 2	0035	.00	11.60	11.60	11.83	6.05	682.45
297 2	0040	.00	11.60	11.60	11.83	6.05	682.45
298 2	0045	.00	11.60	11.60	11.83	6.05	682.45
299 2	0050	.00	11.60	11.60	11.82	6.05	682.45
300 2	0055	.00	11.60	11.60	11.82	6.05	682.45
	MAX	99.48	11.60	111.08	23.83	10.75	683.51
	MIN	.00	11.60	11.60	.00	.00	681.00
	AVE	5.49	11.60	17.09	14.14	6.88	682.64

*** NORMAL END OF HEC-1 ***

Clear Water Pond

SUMMARY OF INFLOW HYDROGRAPH AND FLOOD ROUTING THROUGH MITCHELL CLEAR WATER POND FOR ½ 6-HOUR PMP STORM EVENT

Starting Pool Elevation	=	664 ft, NAVD
Pipe Spillway Invert Elevation	=	664 ft, NAVD
Crest Elevation	=	675 ft, NAVD
Peak Inflow	=	71.44 cfs
Peak Outflow	=	44.76 cfs
Peak Storage	=	5.65 ac-ft
Maximum Impoundment Level During Storm	=	666.50 ft, NAVD
Minimum Freeboard During Storm	=	8.50 ft

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1***************************************                                                ***************************************
 *                                     *                                                *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                              *    U.S. ARMY CORPS OF ENGINEERS     *
 *           SEPTEMBER 1990            *                                                *    HYDROLOGIC ENGINEERING CENTER    *
 *            VERSION 4.0              *                                                *         609 SECOND STREET           *
 *                                     *                                                *      DAVIS, CALIFORNIA 95616        *
 *  RUN DATE  12/21/2015  TIME  11:05:16 *                                              *          (916) 756-1104             *
 *                                     *                                                *                                     *
 ***************************************                                                ***************************************


                              X     X  XXXXXXX   XXXXX           X
                              X     X  X        X     X         XX
                              X     X  X        X                X
                              XXXXXXX  XXXX     X        XXXXX   X
                              X     X  X        X                X
                              X     X  X        X     X          X
                              X     X  XXXXXXX   XXXXX          XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

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          LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 *** FREE ***
             1           ID  ****************************************************************************
             2           ID  *      Mitchell Clear Water Pond       File: MCWP.inp                      *
             3           ID  *      GA Project No. 01-269BA                                             *
             4           ID  *      Storm Routing for 1/2 6-Hour PMP                                    *
             5           ID  *      Crest Elevation = 675'                                              *
             6           ID  ****************************************************************************
             7           ID  *      Analyses by: Geo/Environmental Associates, Inc.                     *
             8           ID  *                   Knoxville, TN                                          *
             9           ID  *                   Seth W. Frank P.E.                                     *
            10           ID  *                   August 2014                                            *
            11           ID  ****************************************************************************
            12           IT      15       0       0     300
            13           IO       1
            14           JR  PRECIP     0.5
            15           VS   BASIN    BASE      IN     IMP     IMP     IMP
            16           VV    2.11    2.11    2.11    2.11    6.11    7.11
            17           IN      15

            18           KK   BASIN
            19           KM   COMPUTE INFLOW HYDROGRAPH FOR MITCHELL CLEAR WATER POND USING SCS METHOD
            20           PB       0
            21           PI   0.258   0.347   0.420   0.478   0.520   0.546   0.624   0.804   0.790   0.939
            22           PI   2.264   4.483   4.834   3.277   1.215   0.797   0.831   0.735   0.553   0.535
            23           PI   0.501   0.451   0.386   0.305
            24           BA   0.008
            25           LU       0    0.05    45.5
            26           UD     0.0

            27           KK    BASE
            28           KM   BASE FLOW
            29           IN     360
            30           QI   23.83   23.83   23.83

            31           KK      IN
            32           KM   COMBINE BASIN INFLOW AND BASEFLOW
            33           KO       1
            34           HC       2

            35           KK     IMP
            36           KM   ROUTE COMPUTED HYDROGRAPH AND BASE FLOW THROUGH CLEAR WATER POND
            37           RS       1    ELEV     664
            38           SA    2.18    2.24    2.30    2.38    2.45    2.56    2.67    2.79    2.91    3.03
            39           SA    3.15    3.30
            40           SQ       0   12.15   32.67    56.9   68.98   71.79   74.50   77.12   79.65   82.10
            41           SQ   84.48   86.79
            42           SE     664     665     666     667     668     669     670     671     672     673
            43           SE     674     675
            44           ZZ
```

```
1*****************************************                                                                        ***************************************
 *                                       *                                                                        *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                                        *   U.S. ARMY CORPS OF ENGINEERS      *
 *           SEPTEMBER 1990              *                                                                        *   HYDROLOGIC ENGINEERING CENTER     *
 *             VERSION 4.0               *                                                                        *        609 SECOND STREET            *
 *                                       *                                                                        *     DAVIS, CALIFORNIA 95616         *
 *  RUN DATE  12/21/2015  TIME  11:05:16 *                                                                        *          (916) 756-1104             *
 *                                       *                                                                        *                                     *
 *****************************************                                                                        ***************************************



                          ****************************************************************************
                          *      Mitchell Clear Water Pond       File: MCWP.inp                      *
                          *      GA Project No. 01-269BA                                             *
                          *      Storm Routing for 1/2 6-Hour PMP                                    *
                          *      Crest Elevation = 675'                                              *
                          ****************************************************************************
                          *      Analyses by: Geo/Environmental Associates, Inc.                     *
                          *                   Knoxville, TN                                          *
                          *                   Seth W. Frank P.E.                                     *
                          *                   August 2014                                            *
                          ****************************************************************************

  13 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          1  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN         15  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1   0  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      4   0  ENDING DATE
                      NDTIME       0245  ENDING TIME
                      ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL     .25 HOURS
                       TOTAL TIME BASE   74.75 HOURS

         ENGLISH UNITS
              DRAINAGE AREA         SQUARE MILES
              PRECIPITATION DEPTH   INCHES
              LENGTH, ELEVATION     FEET
              FLOW                  CUBIC FEET PER SECOND
              STORAGE VOLUME        ACRE-FEET
              SURFACE AREA          ACRES
              TEMPERATURE           DEGREES FAHRENHEIT

                USER-DEFINED OUTPUT SPECIFICATIONS

          TABLE 1
     VS       STATION     BASIN      BASE        IN       IMP       IMP       IMP
     VV VARIABLE CODE      2.11      2.11      2.11      2.11      6.11      7.11       .00       .00       .00       .00

     JP          MULTI-PLAN OPTION
                       NPLAN          1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    .50


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  18 KK     *    BASIN   *
            *            *
            **************
                           COMPUTE INFLOW HYDROGRAPH FOR MITCHELL CLEAR WATER POND USING SCS METHOD

  17 IN          TIME DATA FOR INPUT TIME SERIES
                       JXMIN         15  TIME INTERVAL IN MINUTES
                      JXDATE      1   0  STARTING DATE
                      JXTIME          0  STARTING TIME
```

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              SUBBASIN RUNOFF DATA

   24 BA        SUBBASIN CHARACTERISTICS
                      TAREA        .01  SUBBASIN AREA

                PRECIPITATION DATA

   20 PB              STORM      26.89  BASIN TOTAL PRECIPITATION

   21 PI          INCREMENTAL PRECIPITATION PATTERN
                      .26       .35       .42       .48       .52       .55       .62       .80       .79       .94
                     2.26      4.48      4.83      3.28      1.22       .80       .83       .74       .55       .53
                      .50       .45       .39       .31

   25 LU        UNIFORM LOSS RATE
                      STRTL        .00  INITIAL LOSS
                      CNSTL        .05  UNIFORM LOSS RATE
                      RTIMP      45.50  PERCENT IMPERVIOUS AREA

   26 UD        SCS DIMENSIONLESS UNITGRAPH
                       TLAG        .00  LAG

                                                                      ***

 W
  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     74.75-HR
+   (CFS)       (HR)
                             (CFS)
+      45.      3.75                  33.         26.         25.          24.
                          (INCHES)   19.054      60.757     171.538      175.055
                           (AC-FT)      16.         52.        146.         149.

 PEAK STORAGE   TIME                       MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     74.75-HR
+  (AC-FT)      (HR)
        6.      3.75                   4.          4.          4.           4.

  PEAK STAGE    TIME                        MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     74.75-HR
+   (FEET)      (HR)
    666.50      3.75                665.99      665.68      665.60       665.58

                             CUMULATIVE AREA =     .02 SQ MI
```

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1

               PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                                 FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                                TIME TO PEAK IN HOURS


                                                           RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN           RATIO 1
                                                       .50

 HYDROGRAPH AT
+                 BASIN       .01     1   FLOW          48.
                                          TIME        3.25

 HYDROGRAPH AT
+                  BASE       .01     1   FLOW          24.
                                          TIME         .25

  2 COMBINED AT
+                    IN       .02     1   FLOW          71.
                                          TIME        3.25

 ROUTED TO
+                   IMP       .02     1   FLOW          45.
                                          TIME        3.75

                                     ** PEAK STAGES IN FEET **
                                      1   STAGE      666.50
                                          TIME        3.75
```

1TABLE 1	STATION		BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE	
	PLAN		1	1	1	1	1	1	
	RATIO		.50	.50	.50	.50	.50	.50	
PER	DAY MON	HRMN							
1	1	0000	.00	23.83	23.83	.00	.00	664.00	
2	1	0015	1.87	23.83	25.70	2.66	.48	664.22	
3	1	0030	3.08	23.83	26.91	5.20	.95	664.43	
4	1	0045	3.94	23.83	27.77	7.58	1.38	664.62	
5	1	0100	4.60	23.83	28.43	9.79	1.78	664.81	
6	1	0115	5.08	23.83	28.91	11.82	2.15	664.97	
7	1	0130	5.40	23.83	29.23	14.57	2.48	665.12	
8	1	0145	6.08	23.83	29.91	17.13	2.76	665.24	
9	1	0200	7.64	23.83	31.47	19.45	3.02	665.36	
10	1	0215	7.96	23.83	31.79	21.53	3.25	665.46	
11	1	0230	9.15	23.83	32.98	23.38	3.45	665.55	
12	1	0245	19.64	23.83	43.47	25.92	3.73	665.67	
13	1	0300	39.57	23.83	63.40	30.62	4.25	665.90	
14	1	0315	47.61	23.83	71.44	37.46	4.94	666.20	
15	1	0330	37.46	23.83	61.29	43.05	5.48	666.43	
16	1	0345	18.64	23.83	42.47	44.76	**5.65**	**666.50**	**Maximum impoundment stage/storage**
17	1	0400	10.37	23.83	34.20	43.51	5.53	666.45	
18	1	0415	8.74	23.83	32.57	41.56	5.34	666.37	
19	1	0430	7.72	23.83	31.55	39.72	5.16	666.29	
20	1	0445	6.10	23.83	29.93	37.99	4.99	666.22	
21	1	0500	5.53	23.83	29.36	36.37	4.84	666.15	
22	1	0515	5.15	23.83	28.98	34.98	4.70	666.10	
23	1	0530	4.67	23.83	28.50	33.77	4.59	666.05	
24	1	0545	4.05	23.83	27.88	32.69	4.48	666.00	
25	1	0600	3.26	23.83	27.09	31.80	4.38	665.96	
26	1	0615	.82	23.83	24.65	30.79	4.27	665.91	
27	1	0630	.15	23.83	23.98	29.68	4.15	665.85	
28	1	0645	.02	23.83	23.85	28.70	4.04	665.81	
29	1	0700	.00	23.83	23.83	27.87	3.95	665.77	
30	1	0715	.00	23.83	23.83	27.18	3.87	665.73	
31	1	0730	.00	23.83	23.83	26.61	3.81	665.70	
32	1	0745	.00	23.83	23.83	26.13	3.76	665.68	
33	1	0800	.00	23.83	23.83	25.74	3.71	665.66	
34	1	0815	.00	23.83	23.83	25.41	3.68	665.65	
35	1	0830	.00	23.83	23.83	25.14	3.65	665.63	
36	1	0845	.00	23.83	23.83	24.92	3.62	665.62	
37	1	0900	.00	23.83	23.83	24.73	3.60	665.61	
38	1	0915	.00	23.83	23.83	24.58	3.58	665.61	
39	1	0930	.00	23.83	23.83	24.45	3.57	665.60	
40	1	0945	.00	23.83	23.83	24.34	3.56	665.59	
41	1	1000	.00	23.83	23.83	24.26	3.55	665.59	
42	1	1015	.00	23.83	23.83	24.18	3.54	665.59	
43	1	1030	.00	23.83	23.83	24.12	3.53	665.58	
44	1	1045	.00	23.83	23.83	24.07	3.53	665.58	
45	1	1100	.00	23.83	23.83	24.03	3.52	665.58	
46	1	1115	.00	23.83	23.83	24.00	3.52	665.58	
47	1	1130	.00	23.83	23.83	23.97	3.52	665.58	
48	1	1145	.00	23.83	23.83	23.94	3.51	665.57	
49	1	1200	.00	23.83	23.83	23.93	3.51	665.57	
50	1	1215	.00	23.83	23.83	23.91	3.51	665.57	

1TABLE 1 (CONT.)			STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
			PLAN	1	1	1	1	1	1
			RATIO	.50	.50	.50	.50	.50	.50
PER	DAY	MON	HRMN						
51	1		1230	.00	23.83	23.83	23.90	3.51	665.57
52	1		1245	.00	23.83	23.83	23.88	3.51	665.57
53	1		1300	.00	23.83	23.83	23.88	3.51	665.57
54	1		1315	.00	23.83	23.83	23.87	3.51	665.57
55	1		1330	.00	23.83	23.83	23.86	3.51	665.57
56	1		1345	.00	23.83	23.83	23.86	3.50	665.57
57	1		1400	.00	23.83	23.83	23.85	3.50	665.57
58	1		1415	.00	23.83	23.83	23.85	3.50	665.57
59	1		1430	.00	23.83	23.83	23.84	3.50	665.57
60	1		1445	.00	23.83	23.83	23.84	3.50	665.57
61	1		1500	.00	23.83	23.83	23.84	3.50	665.57
62	1		1515	.00	23.83	23.83	23.84	3.50	665.57
63	1		1530	.00	23.83	23.83	23.84	3.50	665.57
64	1		1545	.00	23.83	23.83	23.84	3.50	665.57
65	1		1600	.00	23.83	23.83	23.83	3.50	665.57
66	1		1615	.00	23.83	23.83	23.83	3.50	665.57
67	1		1630	.00	23.83	23.83	23.83	3.50	665.57
68	1		1645	.00	23.83	23.83	23.83	3.50	665.57
69	1		1700	.00	23.83	23.83	23.83	3.50	665.57
70	1		1715	.00	23.83	23.83	23.83	3.50	665.57
71	1		1730	.00	23.83	23.83	23.83	3.50	665.57
72	1		1745	.00	23.83	23.83	23.83	3.50	665.57
73	1		1800	.00	23.83	23.83	23.83	3.50	665.57
74	1		1815	.00	23.83	23.83	23.83	3.50	665.57
75	1		1830	.00	23.83	23.83	23.83	3.50	665.57
76	1		1845	.00	23.83	23.83	23.83	3.50	665.57
77	1		1900	.00	23.83	23.83	23.83	3.50	665.57
78	1		1915	.00	23.83	23.83	23.83	3.50	665.57
79	1		1930	.00	23.83	23.83	23.83	3.50	665.57
80	1		1945	.00	23.83	23.83	23.83	3.50	665.57
81	1		2000	.00	23.83	23.83	23.83	3.50	665.57
82	1		2015	.00	23.83	23.83	23.83	3.50	665.57
83	1		2030	.00	23.83	23.83	23.83	3.50	665.57
84	1		2045	.00	23.83	23.83	23.83	3.50	665.57
85	1		2100	.00	23.83	23.83	23.83	3.50	665.57
86	1		2115	.00	23.83	23.83	23.83	3.50	665.57
87	1		2130	.00	23.83	23.83	23.83	3.50	665.57
88	1		2145	.00	23.83	23.83	23.83	3.50	665.57
89	1		2200	.00	23.83	23.83	23.83	3.50	665.57
90	1		2215	.00	23.83	23.83	23.83	3.50	665.57
91	1		2230	.00	23.83	23.83	23.83	3.50	665.57
92	1		2245	.00	23.83	23.83	23.83	3.50	665.57
93	1		2300	.00	23.83	23.83	23.83	3.50	665.57
94	1		2315	.00	23.83	23.83	23.83	3.50	665.57
95	1		2330	.00	23.83	23.83	23.83	3.50	665.57
96	1		2345	.00	23.83	23.83	23.83	3.50	665.57
97	2		0000	.00	23.83	23.83	23.83	3.50	665.57
98	2		0015	.00	23.83	23.83	23.83	3.50	665.57
99	2		0030	.00	23.83	23.83	23.83	3.50	665.57
100	2		0045	.00	23.83	23.83	23.83	3.50	665.57

1TABLE 1 (CONT.)	STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
	PLAN	1	1	1	1	1	1
	RATIO	.50	.50	.50	.50	.50	.50
PER DAY MON	HRMN						
101 2	0100	.00	23.83	23.83	23.83	3.50	665.57
102 2	0115	.00	23.83	23.83	23.83	3.50	665.57
103 2	0130	.00	23.83	23.83	23.83	3.50	665.57
104 2	0145	.00	23.83	23.83	23.83	3.50	665.57
105 2	0200	.00	23.83	23.83	23.83	3.50	665.57
106 2	0215	.00	23.83	23.83	23.83	3.50	665.57
107 2	0230	.00	23.83	23.83	23.83	3.50	665.57
108 2	0245	.00	23.83	23.83	23.83	3.50	665.57
109 2	0300	.00	23.83	23.83	23.83	3.50	665.57
110 2	0315	.00	23.83	23.83	23.83	3.50	665.57
111 2	0330	.00	23.83	23.83	23.83	3.50	665.57
112 2	0345	.00	23.83	23.83	23.83	3.50	665.57
113 2	0400	.00	23.83	23.83	23.83	3.50	665.57
114 2	0415	.00	23.83	23.83	23.83	3.50	665.57
115 2	0430	.00	23.83	23.83	23.83	3.50	665.57
116 2	0445	.00	23.83	23.83	23.83	3.50	665.57
117 2	0500	.00	23.83	23.83	23.83	3.50	665.57
118 2	0515	.00	23.83	23.83	23.83	3.50	665.57
119 2	0530	.00	23.83	23.83	23.83	3.50	665.57
120 2	0545	.00	23.83	23.83	23.83	3.50	665.57
121 2	0600	.00	23.83	23.83	23.83	3.50	665.57
122 2	0615	.00	23.83	23.83	23.83	3.50	665.57
123 2	0630	.00	23.83	23.83	23.83	3.50	665.57
124 2	0645	.00	23.83	23.83	23.83	3.50	665.57
125 2	0700	.00	23.83	23.83	23.83	3.50	665.57
126 2	0715	.00	23.83	23.83	23.83	3.50	665.57
127 2	0730	.00	23.83	23.83	23.83	3.50	665.57
128 2	0745	.00	23.83	23.83	23.83	3.50	665.57
129 2	0800	.00	23.83	23.83	23.83	3.50	665.57
130 2	0815	.00	23.83	23.83	23.83	3.50	665.57
131 2	0830	.00	23.83	23.83	23.83	3.50	665.57
132 2	0845	.00	23.83	23.83	23.83	3.50	665.57
133 2	0900	.00	23.83	23.83	23.83	3.50	665.57
134 2	0915	.00	23.83	23.83	23.83	3.50	665.57
135 2	0930	.00	23.83	23.83	23.83	3.50	665.57
136 2	0945	.00	23.83	23.83	23.83	3.50	665.57
137 2	1000	.00	23.83	23.83	23.83	3.50	665.57
138 2	1015	.00	23.83	23.83	23.83	3.50	665.57
139 2	1030	.00	23.83	23.83	23.83	3.50	665.57
140 2	1045	.00	23.83	23.83	23.83	3.50	665.57
141 2	1100	.00	23.83	23.83	23.83	3.50	665.57
142 2	1115	.00	23.83	23.83	23.83	3.50	665.57
143 2	1130	.00	23.83	23.83	23.83	3.50	665.57
144 2	1145	.00	23.83	23.83	23.83	3.50	665.57
145 2	1200	.00	23.83	23.83	23.83	3.50	665.57
146 2	1215	.00	23.83	23.83	23.83	3.50	665.57
147 2	1230	.00	23.83	23.83	23.83	3.50	665.57
148 2	1245	.00	23.83	23.83	23.83	3.50	665.57
149 2	1300	.00	23.83	23.83	23.83	3.50	665.57
150 2	1315	.00	23.83	23.83	23.83	3.50	665.57

1TABLE 1 (CONT.)	STATION			BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
	PLAN			1	1	1	1	1	1
	RATIO			.50	.50	.50	.50	.50	.50
PER	DAY	MON	HRMN						
151	2		1330	.00	23.83	23.83	23.83	3.50	665.57
152	2		1345	.00	23.83	23.83	23.83	3.50	665.57
153	2		1400	.00	23.83	23.83	23.83	3.50	665.57
154	2		1415	.00	23.83	23.83	23.83	3.50	665.57
155	2		1430	.00	23.83	23.83	23.83	3.50	665.57
156	2		1445	.00	23.83	23.83	23.83	3.50	665.57
157	2		1500	.00	23.83	23.83	23.83	3.50	665.57
158	2		1515	.00	23.83	23.83	23.83	3.50	665.57
159	2		1530	.00	23.83	23.83	23.83	3.50	665.57
160	2		1545	.00	23.83	23.83	23.83	3.50	665.57
161	2		1600	.00	23.83	23.83	23.83	3.50	665.57
162	2		1615	.00	23.83	23.83	23.83	3.50	665.57
163	2		1630	.00	23.83	23.83	23.83	3.50	665.57
164	2		1645	.00	23.83	23.83	23.83	3.50	665.57
165	2		1700	.00	23.83	23.83	23.83	3.50	665.57
166	2		1715	.00	23.83	23.83	23.83	3.50	665.57
167	2		1730	.00	23.83	23.83	23.83	3.50	665.57
168	2		1745	.00	23.83	23.83	23.83	3.50	665.57
169	2		1800	.00	23.83	23.83	23.83	3.50	665.57
170	2		1815	.00	23.83	23.83	23.83	3.50	665.57
171	2		1830	.00	23.83	23.83	23.83	3.50	665.57
172	2		1845	.00	23.83	23.83	23.83	3.50	665.57
173	2		1900	.00	23.83	23.83	23.83	3.50	665.57
174	2		1915	.00	23.83	23.83	23.83	3.50	665.57
175	2		1930	.00	23.83	23.83	23.83	3.50	665.57
176	2		1945	.00	23.83	23.83	23.83	3.50	665.57
177	2		2000	.00	23.83	23.83	23.83	3.50	665.57
178	2		2015	.00	23.83	23.83	23.83	3.50	665.57
179	2		2030	.00	23.83	23.83	23.83	3.50	665.57
180	2		2045	.00	23.83	23.83	23.83	3.50	665.57
181	2		2100	.00	23.83	23.83	23.83	3.50	665.57
182	2		2115	.00	23.83	23.83	23.83	3.50	665.57
183	2		2130	.00	23.83	23.83	23.83	3.50	665.57
184	2		2145	.00	23.83	23.83	23.83	3.50	665.57
185	2		2200	.00	23.83	23.83	23.83	3.50	665.57
186	2		2215	.00	23.83	23.83	23.83	3.50	665.57
187	2		2230	.00	23.83	23.83	23.83	3.50	665.57
188	2		2245	.00	23.83	23.83	23.83	3.50	665.57
189	2		2300	.00	23.83	23.83	23.83	3.50	665.57
190	2		2315	.00	23.83	23.83	23.83	3.50	665.57
191	2		2330	.00	23.83	23.83	23.83	3.50	665.57
192	2		2345	.00	23.83	23.83	23.83	3.50	665.57
193	3		0000	.00	23.83	23.83	23.83	3.50	665.57
194	3		0015	.00	23.83	23.83	23.83	3.50	665.57
195	3		0030	.00	23.83	23.83	23.83	3.50	665.57
196	3		0045	.00	23.83	23.83	23.83	3.50	665.57
197	3		0100	.00	23.83	23.83	23.83	3.50	665.57
198	3		0115	.00	23.83	23.83	23.83	3.50	665.57
199	3		0130	.00	23.83	23.83	23.83	3.50	665.57
200	3		0145	.00	23.83	23.83	23.83	3.50	665.57

1TABLE 1 (CONT.)	STATION		BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
	PLAN		1	1	1	1	1	1
	RATIO		.50	.50	.50	.50	.50	.50
PER	DAY MON	HRMN						
201	3	0200	.00	23.83	23.83	23.83	3.50	665.57
202	3	0215	.00	23.83	23.83	23.83	3.50	665.57
203	3	0230	.00	23.83	23.83	23.83	3.50	665.57
204	3	0245	.00	23.83	23.83	23.83	3.50	665.57
205	3	0300	.00	23.83	23.83	23.83	3.50	665.57
206	3	0315	.00	23.83	23.83	23.83	3.50	665.57
207	3	0330	.00	23.83	23.83	23.83	3.50	665.57
208	3	0345	.00	23.83	23.83	23.83	3.50	665.57
209	3	0400	.00	23.83	23.83	23.83	3.50	665.57
210	3	0415	.00	23.83	23.83	23.83	3.50	665.57
211	3	0430	.00	23.83	23.83	23.83	3.50	665.57
212	3	0445	.00	23.83	23.83	23.83	3.50	665.57
213	3	0500	.00	23.83	23.83	23.83	3.50	665.57
214	3	0515	.00	23.83	23.83	23.83	3.50	665.57
215	3	0530	.00	23.83	23.83	23.83	3.50	665.57
216	3	0545	.00	23.83	23.83	23.83	3.50	665.57
217	3	0600	.00	23.83	23.83	23.83	3.50	665.57
218	3	0615	.00	23.83	23.83	23.83	3.50	665.57
219	3	0630	.00	23.83	23.83	23.83	3.50	665.57
220	3	0645	.00	23.83	23.83	23.83	3.50	665.57
221	3	0700	.00	23.83	23.83	23.83	3.50	665.57
222	3	0715	.00	23.83	23.83	23.83	3.50	665.57
223	3	0730	.00	23.83	23.83	23.83	3.50	665.57
224	3	0745	.00	23.83	23.83	23.83	3.50	665.57
225	3	0800	.00	23.83	23.83	23.83	3.50	665.57
226	3	0815	.00	23.83	23.83	23.83	3.50	665.57
227	3	0830	.00	23.83	23.83	23.83	3.50	665.57
228	3	0845	.00	23.83	23.83	23.83	3.50	665.57
229	3	0900	.00	23.83	23.83	23.83	3.50	665.57
230	3	0915	.00	23.83	23.83	23.83	3.50	665.57
231	3	0930	.00	23.83	23.83	23.83	3.50	665.57
232	3	0945	.00	23.83	23.83	23.83	3.50	665.57
233	3	1000	.00	23.83	23.83	23.83	3.50	665.57
234	3	1015	.00	23.83	23.83	23.83	3.50	665.57
235	3	1030	.00	23.83	23.83	23.83	3.50	665.57
236	3	1045	.00	23.83	23.83	23.83	3.50	665.57
237	3	1100	.00	23.83	23.83	23.83	3.50	665.57
238	3	1115	.00	23.83	23.83	23.83	3.50	665.57
239	3	1130	.00	23.83	23.83	23.83	3.50	665.57
240	3	1145	.00	23.83	23.83	23.83	3.50	665.57
241	3	1200	.00	23.83	23.83	23.83	3.50	665.57
242	3	1215	.00	23.83	23.83	23.83	3.50	665.57
243	3	1230	.00	23.83	23.83	23.83	3.50	665.57
244	3	1245	.00	23.83	23.83	23.83	3.50	665.57
245	3	1300	.00	23.83	23.83	23.83	3.50	665.57
246	3	1315	.00	23.83	23.83	23.83	3.50	665.57
247	3	1330	.00	23.83	23.83	23.83	3.50	665.57
248	3	1345	.00	23.83	23.83	23.83	3.50	665.57
249	3	1400	.00	23.83	23.83	23.83	3.50	665.57
250	3	1415	.00	23.83	23.83	23.83	3.50	665.57

1TABLE 1 (CONT.)	STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
	PLAN	1	1	1	1	1	1
	RATIO	.50	.50	.50	.50	.50	.50
PER DAY MON	HRMN						
251 3	1430	.00	23.83	23.83	23.83	3.50	665.57
252 3	1445	.00	23.83	23.83	23.83	3.50	665.57
253 3	1500	.00	23.83	23.83	23.83	3.50	665.57
254 3	1515	.00	23.83	23.83	23.83	3.50	665.57
255 3	1530	.00	23.83	23.83	23.83	3.50	665.57
256 3	1545	.00	23.83	23.83	23.83	3.50	665.57
257 3	1600	.00	23.83	23.83	23.83	3.50	665.57
258 3	1615	.00	23.83	23.83	23.83	3.50	665.57
259 3	1630	.00	23.83	23.83	23.83	3.50	665.57
260 3	1645	.00	23.83	23.83	23.83	3.50	665.57
261 3	1700	.00	23.83	23.83	23.83	3.50	665.57
262 3	1715	.00	23.83	23.83	23.83	3.50	665.57
263 3	1730	.00	23.83	23.83	23.83	3.50	665.57
264 3	1745	.00	23.83	23.83	23.83	3.50	665.57
265 3	1800	.00	23.83	23.83	23.83	3.50	665.57
266 3	1815	.00	23.83	23.83	23.83	3.50	665.57
267 3	1830	.00	23.83	23.83	23.83	3.50	665.57
268 3	1845	.00	23.83	23.83	23.83	3.50	665.57
269 3	1900	.00	23.83	23.83	23.83	3.50	665.57
270 3	1915	.00	23.83	23.83	23.83	3.50	665.57
271 3	1930	.00	23.83	23.83	23.83	3.50	665.57
272 3	1945	.00	23.83	23.83	23.83	3.50	665.57
273 3	2000	.00	23.83	23.83	23.83	3.50	665.57
274 3	2015	.00	23.83	23.83	23.83	3.50	665.57
275 3	2030	.00	23.83	23.83	23.83	3.50	665.57
276 3	2045	.00	23.83	23.83	23.83	3.50	665.57
277 3	2100	.00	23.83	23.83	23.83	3.50	665.57
278 3	2115	.00	23.83	23.83	23.83	3.50	665.57
279 3	2130	.00	23.83	23.83	23.83	3.50	665.57
280 3	2145	.00	23.83	23.83	23.83	3.50	665.57
281 3	2200	.00	23.83	23.83	23.83	3.50	665.57
282 3	2215	.00	23.83	23.83	23.83	3.50	665.57
283 3	2230	.00	23.83	23.83	23.83	3.50	665.57
284 3	2245	.00	23.83	23.83	23.83	3.50	665.57
285 3	2300	.00	23.83	23.83	23.83	3.50	665.57
286 3	2315	.00	23.83	23.83	23.83	3.50	665.57
287 3	2330	.00	23.83	23.83	23.83	3.50	665.57
288 3	2345	.00	23.83	23.83	23.83	3.50	665.57
289 4	0000	.00	23.83	23.83	23.83	3.50	665.57
290 4	0015	.00	23.83	23.83	23.83	3.50	665.57
291 4	0030	.00	23.83	23.83	23.83	3.50	665.57
292 4	0045	.00	23.83	23.83	23.83	3.50	665.57
293 4	0100	.00	23.83	23.83	23.83	3.50	665.57
294 4	0115	.00	23.83	23.83	23.83	3.50	665.57
295 4	0130	.00	23.83	23.83	23.83	3.50	665.57
296 4	0145	.00	23.83	23.83	23.83	3.50	665.57
297 4	0200	.00	23.83	23.83	23.83	3.50	665.57
298 4	0215	.00	23.83	23.83	23.83	3.50	665.57
299 4	0230	.00	23.83	23.83	23.83	3.50	665.57
300 4	0245	.00	23.83	23.83	23.83	3.50	665.57
	MAX	47.61	23.83	71.44	44.76	5.65	666.50
	MIN	.00	23.83	23.83	.00	.00	664.00
	AVE	.91	23.83	24.74	24.14	3.52	665.58

*** NORMAL END OF HEC-1 ***

Appendix III

Stability Analyses

Summary of Material Parameters Used in Slope Stability and Liquefaction Analyses

Material Strength Parameters

Material	Moist Unit Weight (pcf)	Saturated Unit Weight (pcf)	Effective Strength Parameters	
			Cohesion, c' (psf)	Friction Angle, φ' (degrees)
Soil Dike	124	134	300	29
Original Soil	120	130	0	34
Cohesive Liner	121	131	900	0

Material Parameters Used in Liquefaction Assessment

	Soil Dike (Clayey, Silty, Sand)	Original Ground (Silty Sand)	Cohesive Liner (Clay)
Damping Ratio Function(1)	Seed – Idriss	Seed – Idriss	Clay – Sun
Small Strain Shear Modulus G_{max} (psf)	121,540	166,540	QUAKE/W Function
Source(2)	GA – Triaxial Estimate	GA – Triaxial Estimate	QUAKE/W
Poisson's Ratio	0.28	0.28	0.3
Source(3)	Bowles	Bowles	Bowles
Cyclic Number Function(4)	QUAKE/W	QUAKE/W	None

Notes: (1) Damping Ratios from:
- Seed – Idriss (SHAKE91 User's Manual)
- Clay – Sun, et.al.

(2) G_{max} values estimated from results of triaxial tests performed by GA and built-in QUAKE/W function based on work by Hardin, Drnevich, Mayne, and Rix.

(3) Poisson's Ratio based on typical values described in Foundation Analysis and Design, 4th Ed., Joseph E. Bowles, P.E., S.E.

(4) Cyclic Number Function is a QUAKE/W built-in function based on work by Seed and Lee.

Summary of Stability Analysis Results

Stability Analysis Results

Profile	Downstream Static Long-Term Maximum Storage Pool	Downstream Static Maximum Surcharge Pool	Downstream Seismic	Upstream Seismic	Downstream Liquefaction Assessment	Upstream Liquefaction Assessment
SP1-SP1	2.09	2.05	1.80	2.08	2.02	1.20
SP2-SP2	1.87	1.86	1.53	2.01	1.21	1.24

Summary of Piezometric Levels Used

Profile	Piezometric Surface Elevation at Piezometer Location (Feet, NAVD)			
	Downstream Static Long-Term Maximum Storage Pool	Downstream Static Maximum Surcharge Pool	Seismic	Liquefaction Assessment
SP1-SP1	675	677	675	669 [2] (maximum measured)
SP2-SP2 [1]	675	676.5	675	669 [2] (maximum measured)
	690 (FS = 1.35)			
	682 (FS = 1.5)			

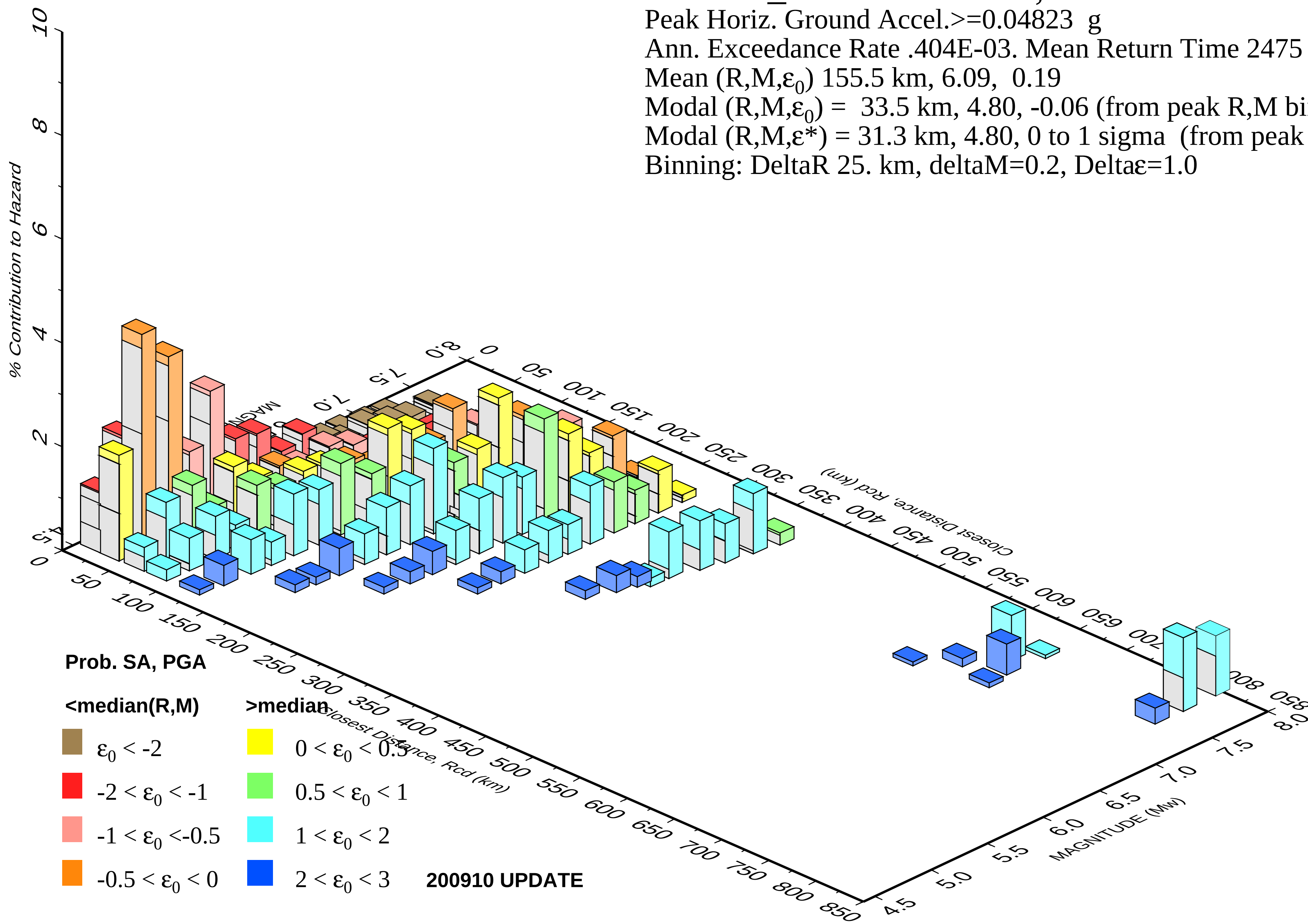
(1) For reference, given that section SP2 is the critical section for static stability, we included hypothetical elevated phreatic levels at the crest (690 feet NAVD) and corresponding to a Factor of Safety (FS) of 1.5.

(2) 669 is approximately the maximum measured piezometer level for Sections SP1 and SP2, since piezometers were installed in March of 2009.

PSH Deaggregation on NEHRP BC rock

Mitchell_Plant 80.486° W, 39.493 N.

Peak Horiz. Ground Accel.>=0.04823 g
Ann. Exceedance Rate .404E-03. Mean Return Time 2475 years
Mean (R,M,ε_0) 155.5 km, 6.09, 0.19
Modal (R,M,ε_0) = 33.5 km, 4.80, -0.06 (from peak R,M bin)
Modal (R,M,ε^*) = 31.3 km, 4.80, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR 25. km, deltaM=0.2, Deltaε=1.0



GMT 2015 Oct 28 14:45:31 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on rock with average vs= 760. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted

Geo/Environmental Associates, Inc.

Job Name: MITCHELL PLANT - CCR RULES A & C

Job Number: 15055013.00

Title: HORIZONTAL SEISMIC COEFFICIENT DETERMINATION FOR CONNER RUN DAM

Computed by: RWC Checked by: ________

Date: 11/6/15 Sheet: 1 Of: 2

GIVEN: - FIGURE 20.4 FROM "GEOTECHNICAL ENGINEERING - PRINCIPLES AND PRACTICES," (CODUTO, 1999)

- PEAK HORIZONTAL GROUND ACCELERATION = 0.04609 (ROCK) FOR ANNUAL EXCEEDANCE RATE = 0.401E-3; MEAN RETURN TIME = 2,475 YRS FROM "PSH DEAGGREGATION ON NEHRP BC ROCK - CONNER RUN DAM 80.805°W, 39.825N," USGS INTERACTIVE DEAGGREGATION WEBSITE.

REQ'D: DETERMINE HORIZONTAL SEISMIC COEFFICIENT FOR CONNER RUN DAM.

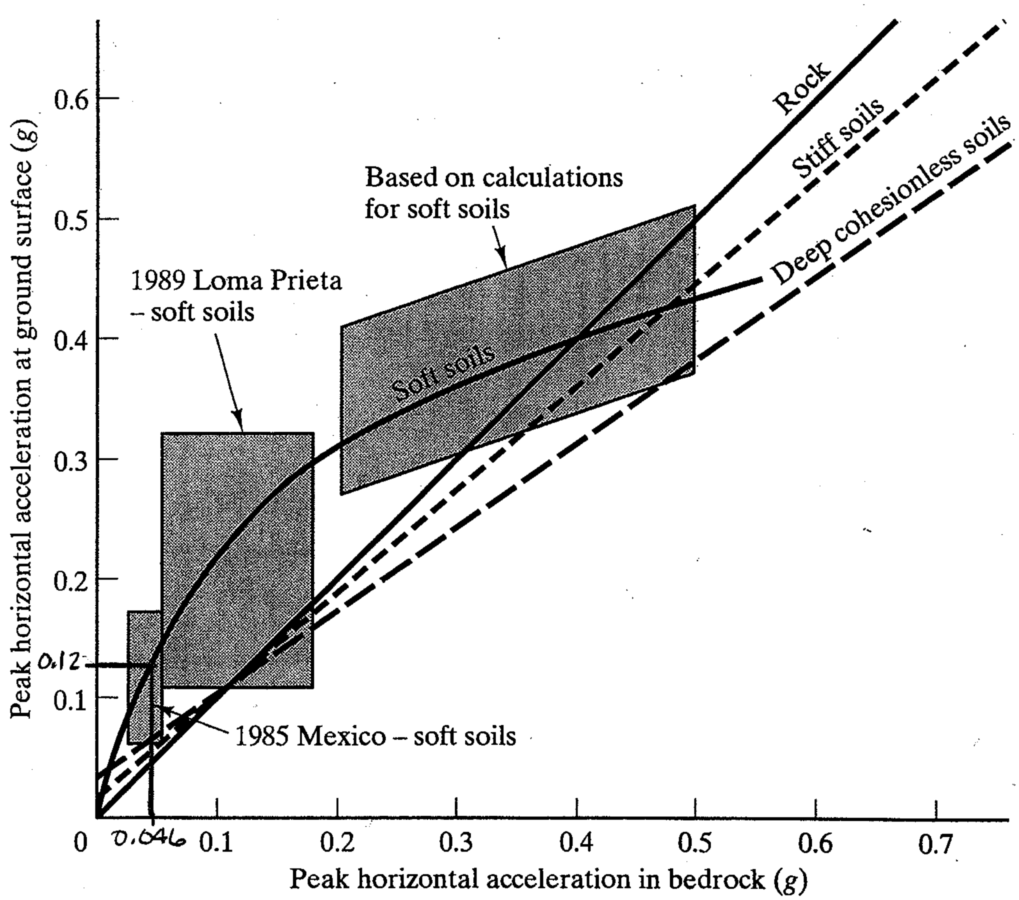


Figure 20.4 Approximate adjustment to convert peak rock acceleration to peak acceleration at the ground surface. The shaded boxes indicate observed relationships for soft soil sites during the 1989 Loma Prieta and 1985 Mexico earthquakes, along with a predicted relationship (Seed, et al., 1976, and Idriss, 1990).

GA
Geo/Environmental Associates, Inc.

Job Name: MITCHELL PLANT - CCR RULES A&C

Job Number: 15055013.00

Title: HORIZONTAL SEISMIC COEFFICIENT DETERMINATION FOR CONNER RUN DAM

Computed by: RWC Checked by:

Date: 11/6/15 Sheet: 2 Of: 2

SOLUTION: - USING FIGURE 20.4 AND DEAGGREGATION CHART, DETERMINE PEAK ACCELERATION AT GROUND SURFACE CONSERVATIVELY ASSUMING SOFT SOILS ARE PRESENT.

→ PEAK HORIZONTAL ACCELERATION AT GROUND SURFACE = 0.12g (FOR SOFT SOILS)

- USING A COMMONLY APPLIED FACTOR OF 0.5 * PGA:

HORIZONTAL SEISMIC COEFFICIENT = (0.5)(1.2) = 0.06g

Job Name: CCR Rules - Bottom Ash Ponds

Job Number: 15055013

Title: Estimation of Shear Modulus G'

Computed by: SWF Checked by:

Date: 10-30-15 Sheet: 1 Of: 1

- From triaxial test results estimate shear modulus for
  1) clayey/silty sand embankment soil and
  2) silty sand foundation soil

1) clayey/silty sand embankment soil

* - shear modulus G' = ratio of shear stress to shear strain

$$G' = \frac{E_s}{2(1+\nu)}$$ where E = stress - strain Modulus and ν = Poison's Ratio

See estimation of E from triaxial testing of B-1, B-3, + B-4 Shelby tube samples (remolded).

E = 316 ksf = 316000 psf

ν (from Bowles*) = 0.3

$$G' = \frac{316000}{2(1+0.3)} = 121540 \text{ psf}$$

2) silty sand foundation soil

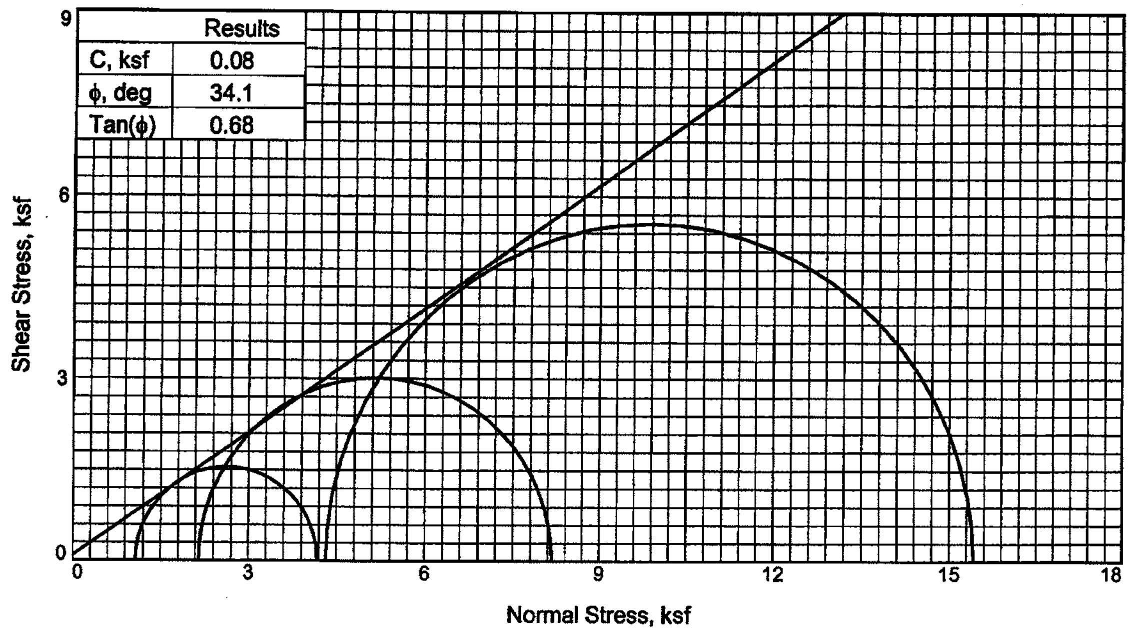
See estimation of E from triaxial testing of B-2, ST-2 shelby tube sample.

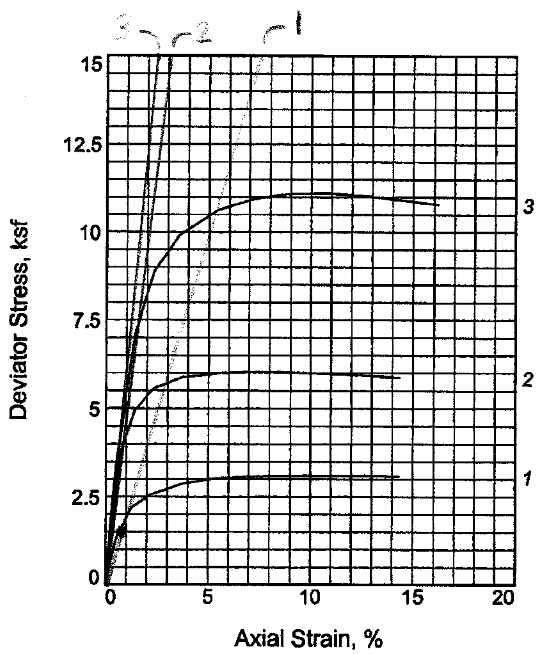
E = 433 ksf = 433000 psf

ν (from Bowles*) = 0.3

$$G' = \frac{433000}{2(1+0.3)} = 166540 \text{ psf}$$

* Foundation Analysis and Design, 4th Edition, Joseph E. Bowles, P.E., S.E.





Modulus E (ksf) 200 500 600 Avg. 433

Sample No.		1	2	3
Initial	Water Content, %	8.6	9.0	8.7
	Dry Density, pcf	105.3	105.8	105.5
	Saturation, %	38.7	40.9	39.3
	Void Ratio	0.6009	0.5926	0.5976
	Diameter, in.	2.80	2.80	2.80
	Height, in.	5.60	5.60	5.60
At Test	Water Content, %	21.6	21.0	20.8
	Dry Density, pcf	106.4	107.6	107.9
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.5838	0.5670	0.5618
	Diameter, in.	2.79	2.78	2.78
	Height, in.	5.58	5.57	5.56
Strain rate, in./min.		0.00	0.00	0.00
Back Pressure, psi		0.00	0.00	0.00
Cell Pressure, psi		7.50	15.00	30.00
Fail. Stress, ksf		3.1	6.0	11.1
Ult. Stress, ksf				
σ_1 Failure, ksf		4.2	8.2	15.4
σ_3 Failure, ksf		1.1	2.2	4.3

Type of Test:
Consolidated Drained

Sample Type: Shelby Tube

Description: Sand, brown, light brown

LL= nv **PI=** np

Specific Gravity= 2.70

Remarks:

Client: American Electric Power

Project: Mitchell Bottom Ash Pond

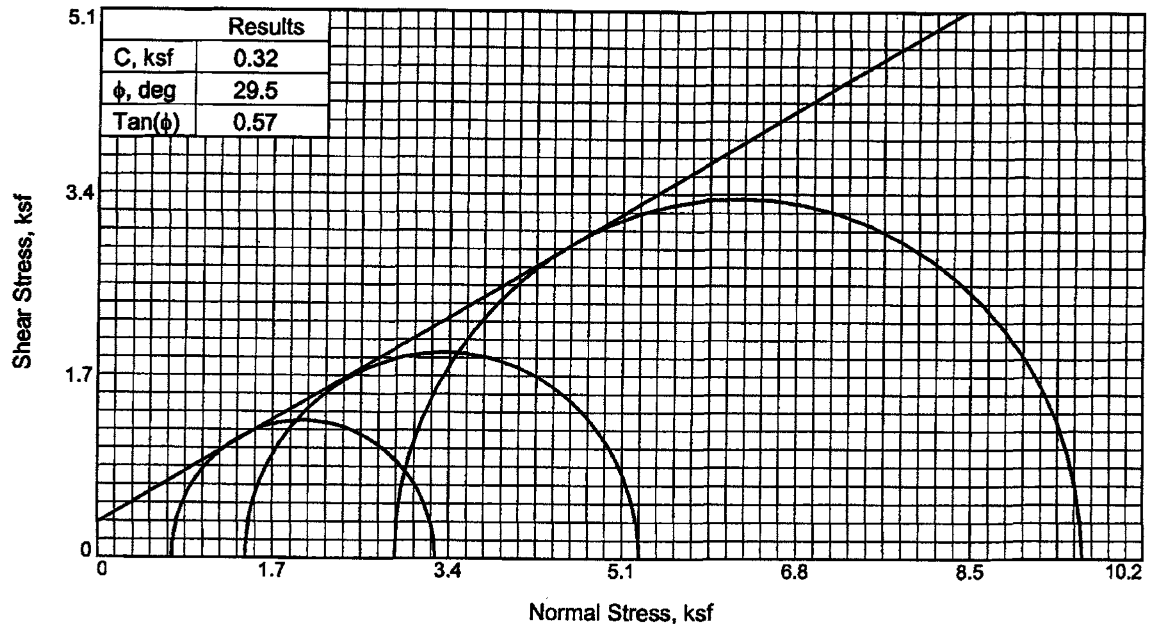
Sample Number: B-2 ST-2 **Depth:** 34.5'-36.5'

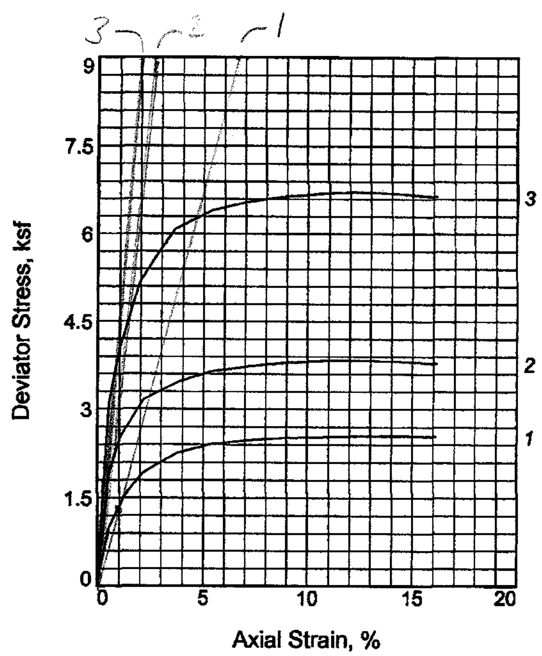
Proj. No.: 09-379 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

Geo/Environmental Associates, Inc.

Figure 1





Modulus E (ksf) 138 360 450

No. 316

		Sample No.	1	2	3
Initial		Water Content, %	9.2	9.3	9.3
		Dry Density, pcf	114.3	114.5	113.2
		Saturation, %	53.1	53.8	52.0
		Void Ratio	0.4632	0.4617	0.4774
		Diameter, in.	2.80	2.80	2.80
		Height, in.	5.60	5.60	5.60
At Test		Water Content, %	16.8	16.2	16.9
		Dry Density, pcf	115.5	116.6	115.1
		Saturation, %	100.0	100.0	100.0
		Void Ratio	0.4491	0.4344	0.4538
		Diameter, in.	2.79	2.78	2.78
		Height, in.	5.58	5.56	5.57
Strain rate, in./min.			0.00	0.00	0.00
Back Pressure, psi			0.00	0.00	0.00
Cell Pressure, psi			5.00	10.00	20.00
Fail. Stress, ksf			2.55	3.83	6.72
Ult. Stress, ksf					
σ_1 Failure, ksf			3.27	5.27	9.60
σ_3 Failure, ksf			0.72	1.44	2.88

Type of Test:
Consolidated Drained

Sample Type: Shelby Tubes

Description: Sand, clayey, silty, brown w/rock

LL= 16 **PL=** 12 **PI=** 4

Specific Gravity= 2.68

Remarks: Remolded specimens from B-1 ST-1, B-3 ST-1 & B-4 ST-1

Figure 1

Client: American Electric Power

Project: Mitchell Bottom Ash Pond

Sample Number: B-1,B-3,B-4 ST-1 **Depth:** 9.5'-10.0'

Proj. No.: 09-379 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

Geo/Environmental Associates, Inc.

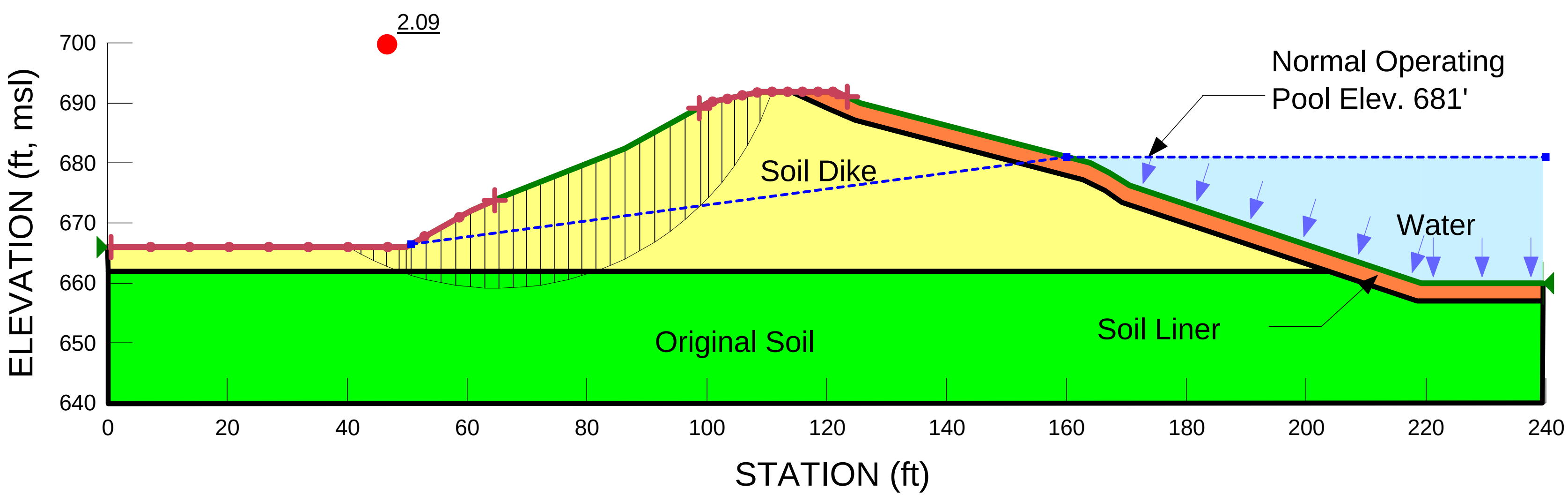
Section SP1 Stability Analyses

Title: Mitchell Bottom Ash Pond
Comments: Profile SP1-SP1 Downstream Static Stability Analysis
Maximum Longterm Pool
Name: MBAP_SP1_DS Stability Max Longterm Pool.gsz
Date: 11/4/2015
Method: Morgenstern-Price

Name: Original
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 34 °
Constant Unit Wt. Above Water Table: 120 pcf

Name: Soil Dike
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion': 300 psf
Phi': 29 °
Constant Unit Wt. Above Water Table: 124 pcf

Name: Liner
Model: Mohr-Coulomb
Unit Weight: 131 pcf
Cohesion': 900 psf
Phi': 0 °
Constant Unit Wt. Above Water Table: 121 pcf

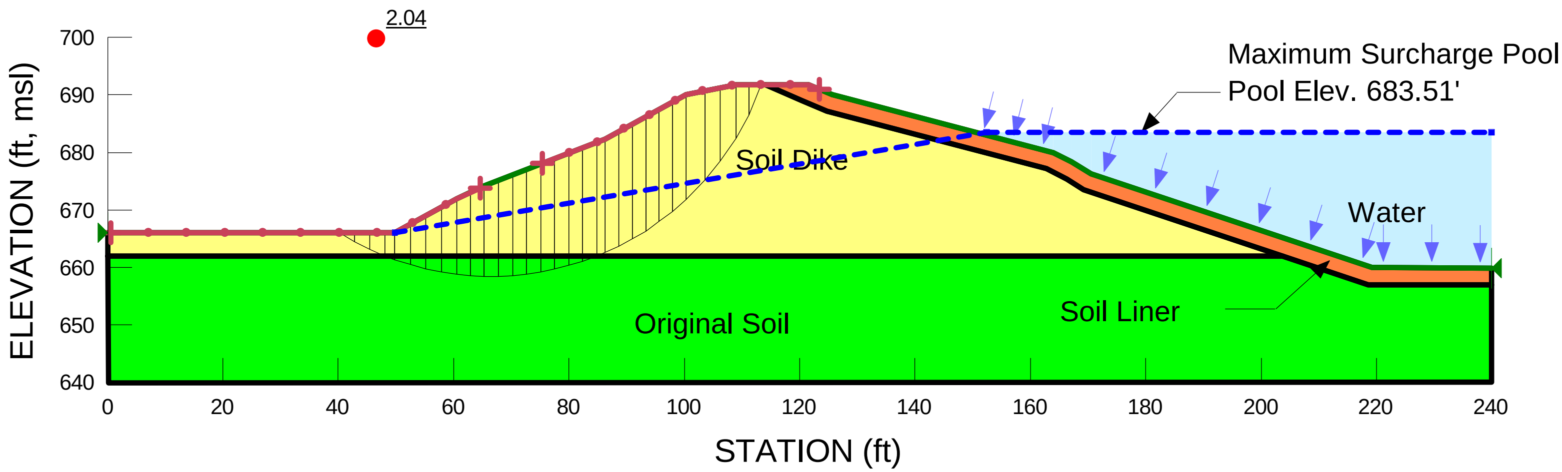


Title: Mitchell Bottom Ash Pond
Comments: Profile SP1-SP1 Downstream Static Stability Analysis
Maximum Surcharge Pool
Name: MBAP_SP1_DS Static Stability Max Surcharge Pool.gsz
Date: 12/21/2015
Method: Morgenstern-Price

Name: Original
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 34 °
Constant Unit Wt. Above Water Table: 120 pcf

Name: Soil Dike
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion': 300 psf
Phi': 29 °
Constant Unit Wt. Above Water Table: 124 pcf

Name: Liner
Model: Mohr-Coulomb
Unit Weight: 131 pcf
Cohesion': 900 psf
Phi': 0 °
Constant Unit Wt. Above Water Table: 121 pcf

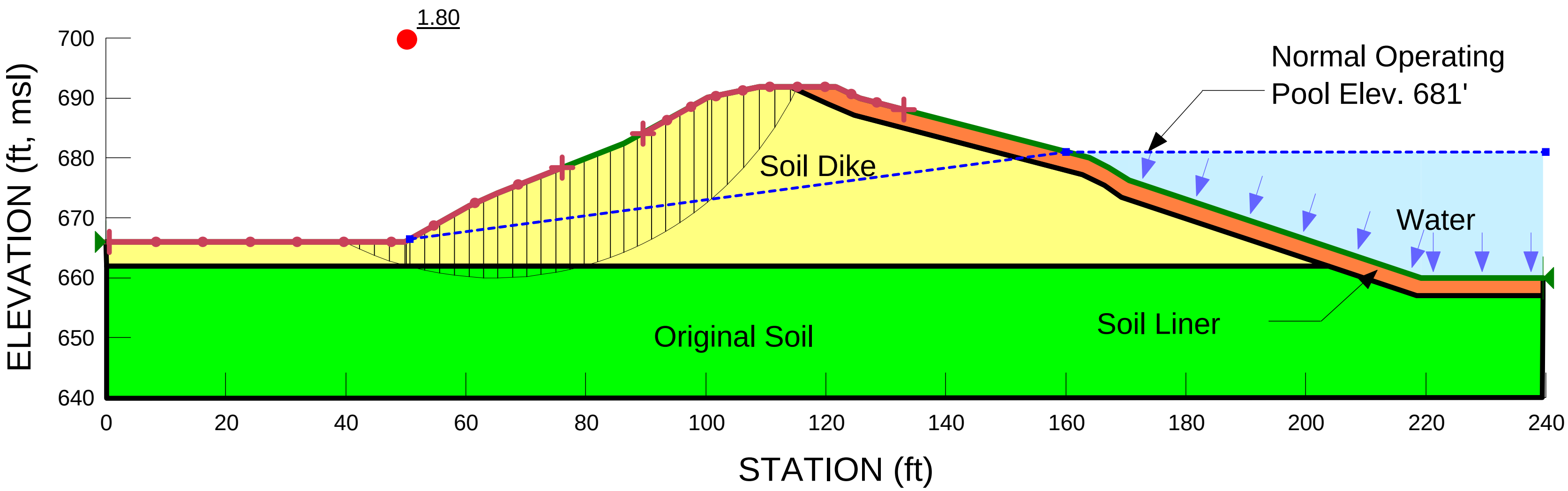


Title: Mitchell Bottom Ash Pond
Comments: Profile SP1-SP1 Downstream Pseudo-Static Stability Analysis
Maximum Longterm Pool
Name: MBAP_SP1_DS Pseudo-Static Stability Max Long-term Pool.gsz
Date: 11/6/2015
Method: Morgenstern-Price
Horz Seismic Coef.: 0.06

Name: Original
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 34 °
Constant Unit Wt. Above Water Table: 120 pcf

Name: Soil Dike
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion': 300 psf
Phi': 29 °
Constant Unit Wt. Above Water Table: 124 pcf

Name: Liner
Model: Mohr-Coulomb
Unit Weight: 131 pcf
Cohesion': 900 psf
Phi': 0 °
Constant Unit Wt. Above Water Table: 121 pcf

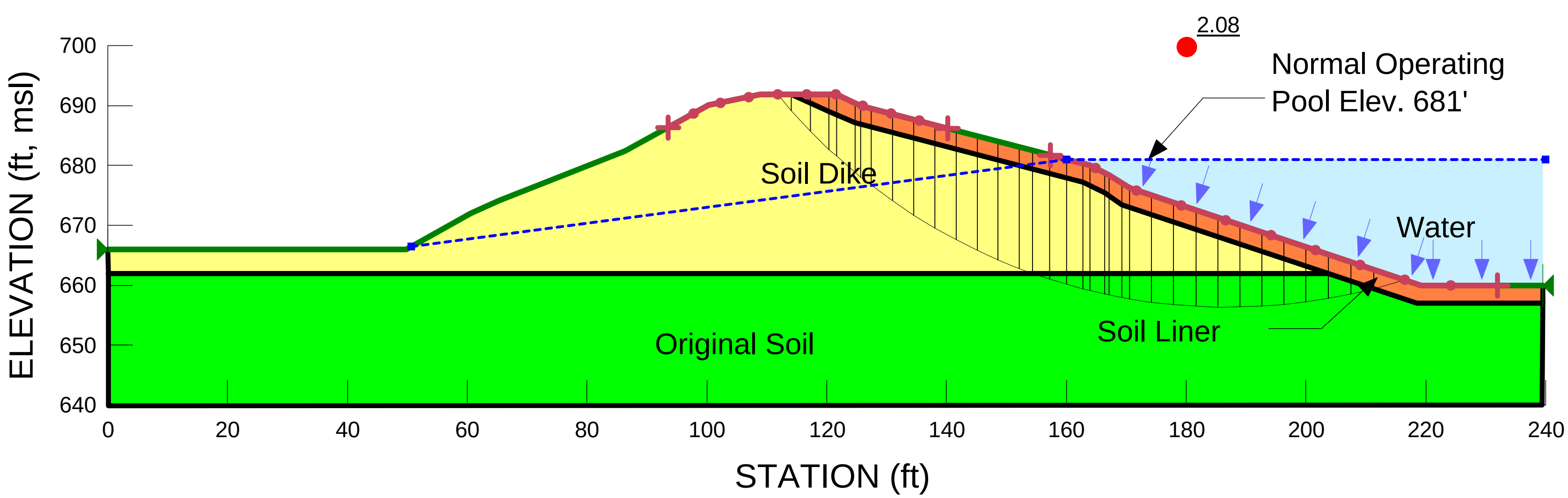


Title: Mitchell Bottom Ash Pond
Comments: Profile SP1-SP1 Upstream Pseudo-Static Stability Analysis
Maximum Longterm Pool
Name: MBAP_SP1_US Pseudo-Static Stability Max Long-term Pool.gsz
Date: 11/6/2015
Method: Morgenstern-Price
Horz Seismic Coef.: 0.06

Name: Original
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 34 °
Constant Unit Wt. Above Water Table: 120 pcf

Name: Soil Dike
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion': 300 psf
Phi': 29 °
Constant Unit Wt. Above Water Table: 124 pcf

Name: Liner
Model: Mohr-Coulomb
Unit Weight: 131 pcf
Cohesion': 900 psf
Phi': 0 °
Constant Unit Wt. Above Water Table: 121 pcf

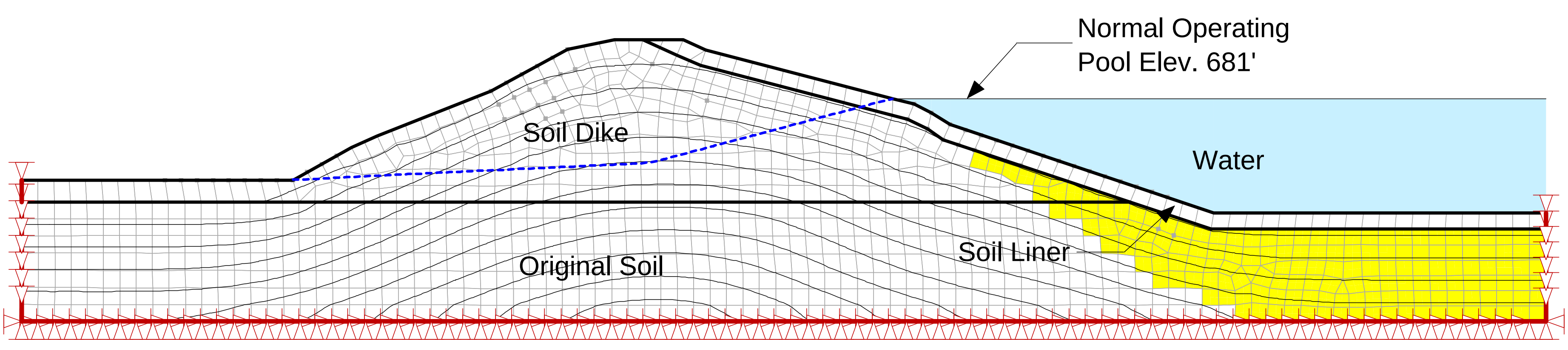


Title: Mitchell Bottom Ash Pond
Comments: Profile SP1-SP1 Upstream Liquefaction Analyis
Name: MBAP_SP1_US Liquefaction.gsz
Date: 11/9/2015
Method: Equivalent Linear Dynamic

Name: Soil Dike
Model: Equivalent Linear
Unit Weight: 124 pcf
Poisson's Ratio: 0.28
Dynamic G-Reduction Function: Seed-Idriss (sands)
Pore Water Pressure Function: Built-in Function
K-Alpha Function: Built-in Function (dense sand)
K-Sigma Function: Built-in Function (sand)
Cyclic Function: Built-in Function (dense sand)
Dynamic Damping Ratio Function: Seed-Idriss
G Modulus: 121540 psf

Name: Original
Model: Equivalent Linear
Unit Weight: 120 pcf
Poisson's Ratio: 0.28
Dynamic G-Reduction Function: Seed-Idriss (sands)
Pore Water Pressure Function: Built-in Function
K-Alpha Function: Built-in Function (med dense sand)
K-Sigma Function: Built-in Function (sand)
Cyclic Function: Built-in Function (med dense sand)
Dynamic Damping Ratio Function: Seed-Idriss
G Modulus: 166540 psf

Name: Liner
Model: Equivalent Linear
Unit Weight: 121 pcf
Poisson's Ratio: 0.3
Dynamic G-Reduction Function: Built-in Function
Pore Water Pressure Function: Built-in Function
Dynamic Damping Ratio Function: Clay-Sun, et. al.
GMax Function: Gmax Function 1

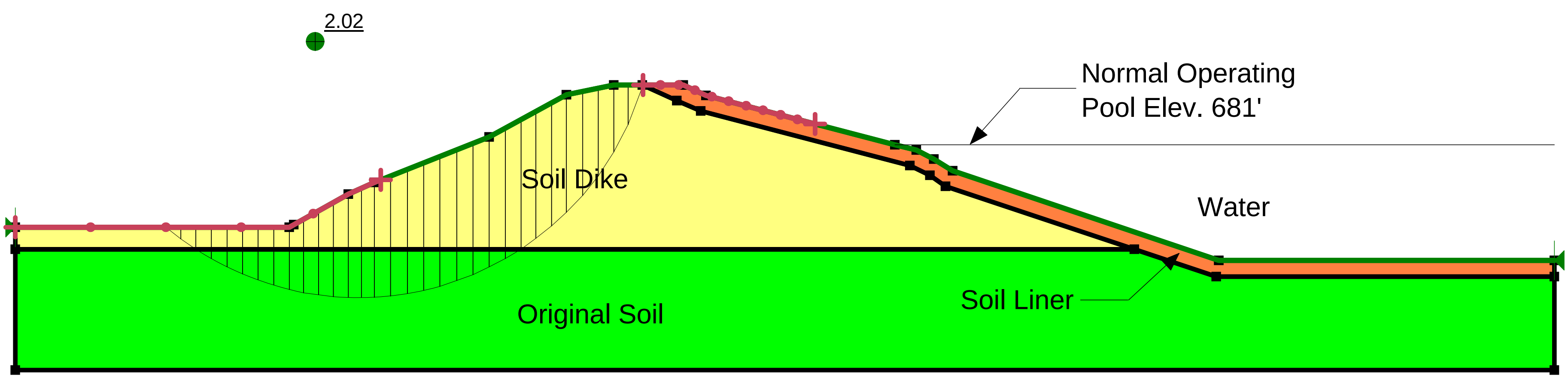


Title: Mitchell Bottom Ash Pond
Comments: Profile SP1-SP1 Downstream Liquefaction Analyis
Name: MBAP_SP1_DS Liquefaction.gsz
Date: 11/9/2015
Method: QUAKE/W Newmark Deformation

Name: Soil Dike
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Unit Wt. Above Water Table: 124 pcf
Cohesion: 300 psf
Phi: 29 °

Name: Original
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Unit Wt. Above Water Table: 120 pcf
Cohesion: 0 psf
Phi: 34 °

Name: Liner
Model: Mohr-Coulomb
Unit Weight: 131 pcf
Unit Wt. Above Water Table: 121 pcf
Cohesion: 900 psf
Phi: 0 °

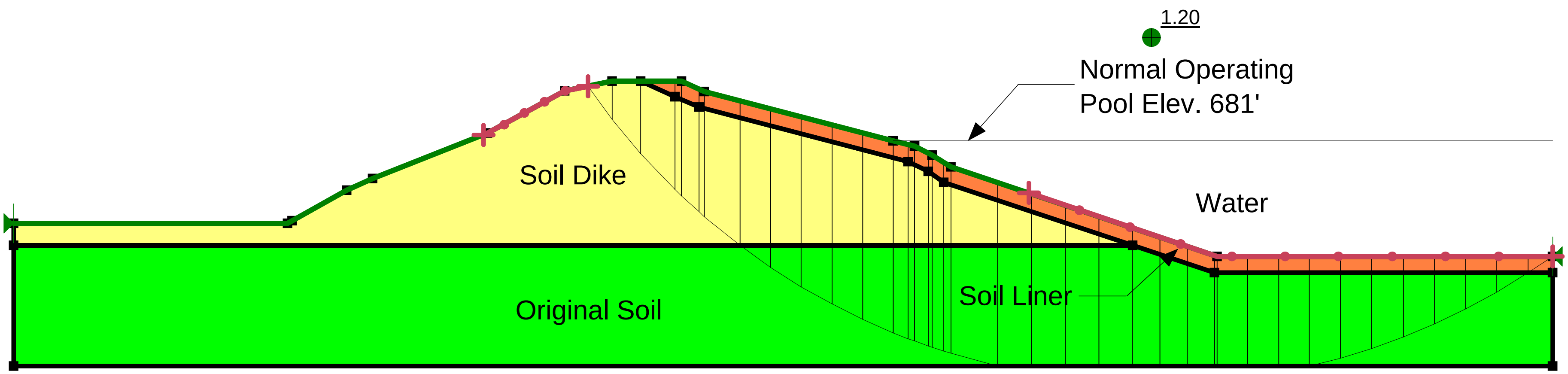


Title: Mitchell Bottom Ash Pond
Comments: Profile SP1-SP1 Upstream Liquefaction Analyis
Name: MBAP_SP1_US Liquefaction.gsz
Date: 11/9/2015
Method: QUAKE/W Newmark Deformation

Name: Soil Dike
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Unit Wt. Above Water Table: 124 pcf
Cohesion: 300 psf
Phi: 29 °

Name: Original
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Unit Wt. Above Water Table: 120 pcf
Cohesion: 0 psf
Phi: 34 °

Name: Liner
Model: Mohr-Coulomb
Unit Weight: 131 pcf
Unit Wt. Above Water Table: 121 pcf
Cohesion: 900 psf
Phi: 0 °



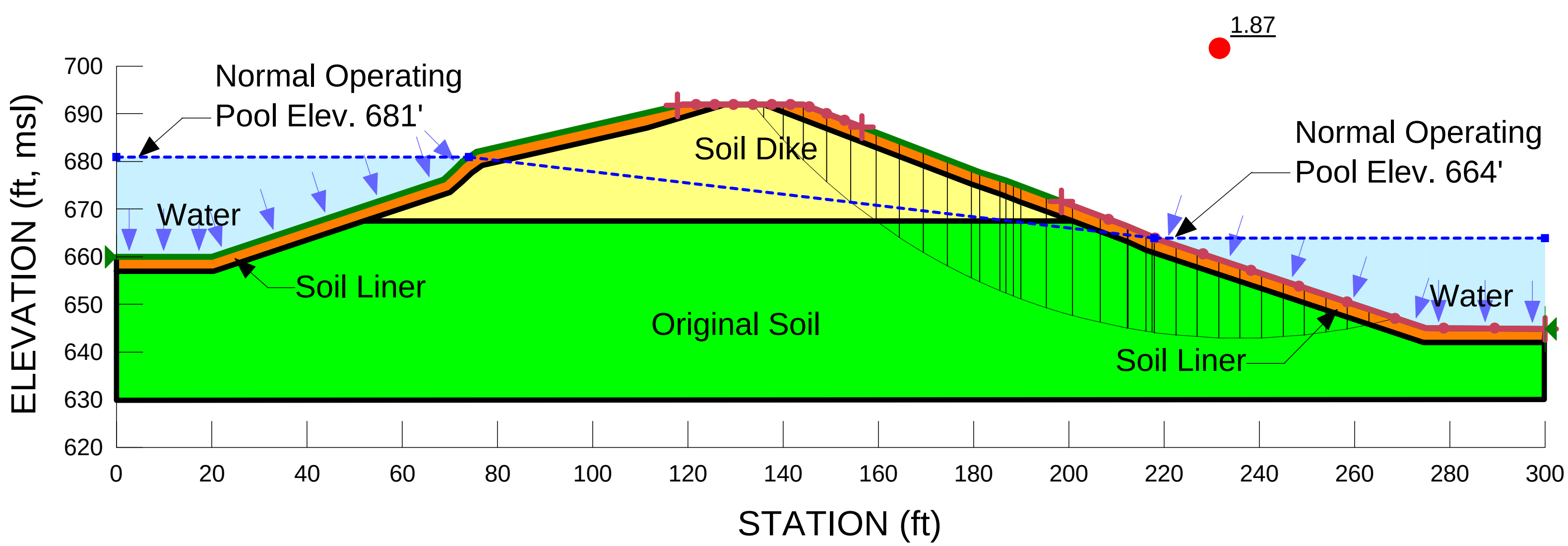
Section SP2 Stability Analyses

Title: Mitchell Bottom Ash Pond
Comments: Profile SP2-SP2 Downstream Static Stability Analysis
Name: MBAP_SP2_DS Stability Max Long-term Pool.gsz
Date: 11/4/2015
Method: Morgenstern-Price

Name: Original
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 34 °
Constant Unit Wt. Above Water Table: 120 pcf

Name: Liner
Model: Mohr-Coulomb
Unit Weight: 131 pcf
Cohesion': 900 psf
Phi': 0 °
Constant Unit Wt. Above Water Table: 121 pcf

Name: Soil Dike
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion': 300 psf
Phi': 29 °
Constant Unit Wt. Above Water Table: 124 pcf

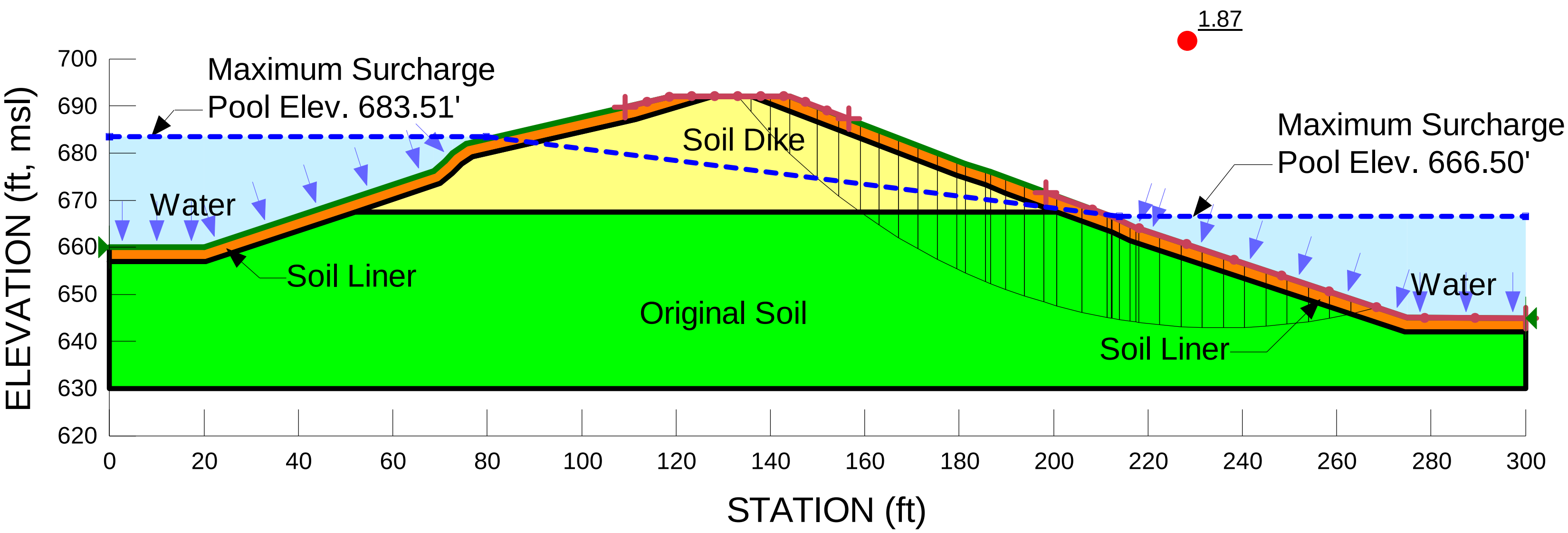


Title: Mitchell Bottom Ash Pond
Comments: Profile SP2-SP2 Downstream Static Stability Analysis
Maximum Surcharge Pool
Name: MBAP_SP2_DS Static Stability Max Surcharge Pool.gsz
Date: 12/21/2015
Method: Morgenstern-Price

Name: Original
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 34 °
Constant Unit Wt. Above Water Table: 120 pcf

Name: Liner
Model: Mohr-Coulomb
Unit Weight: 131 pcf
Cohesion': 900 psf
Phi': 0 °
Constant Unit Wt. Above Water Table: 121 pcf

Name: Soil Dike
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion': 300 psf
Phi': 29 °
Constant Unit Wt. Above Water Table: 124 pcf

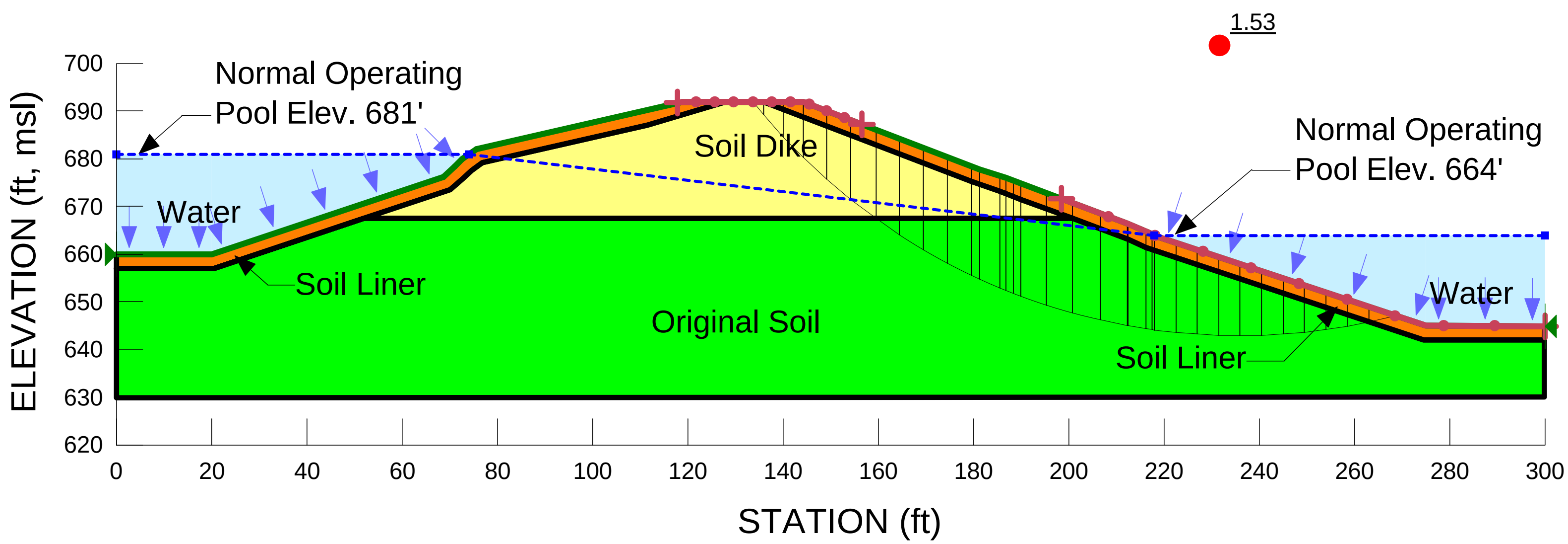


Title: Mitchell Bottom Ash Pond
Comments: Profile SP2-SP2 Downstream Pseudo-Static Stability Analysis
Name: MBAP_SP2_DS Pseudo-Static Stability Max Long-term Pool.gsz
Date: 11/6/2015
Method: Morgenstern-Price
Horz Seismic Coef.: 0.06

Name: Original
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 34 °
Constant Unit Wt. Above Water Table: 120 pcf

Name: Liner
Model: Mohr-Coulomb
Unit Weight: 131 pcf
Cohesion': 900 psf
Phi': 0 °
Constant Unit Wt. Above Water Table: 121 pcf

Name: Soil Dike
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion': 300 psf
Phi': 29 °
Constant Unit Wt. Above Water Table: 124 pcf

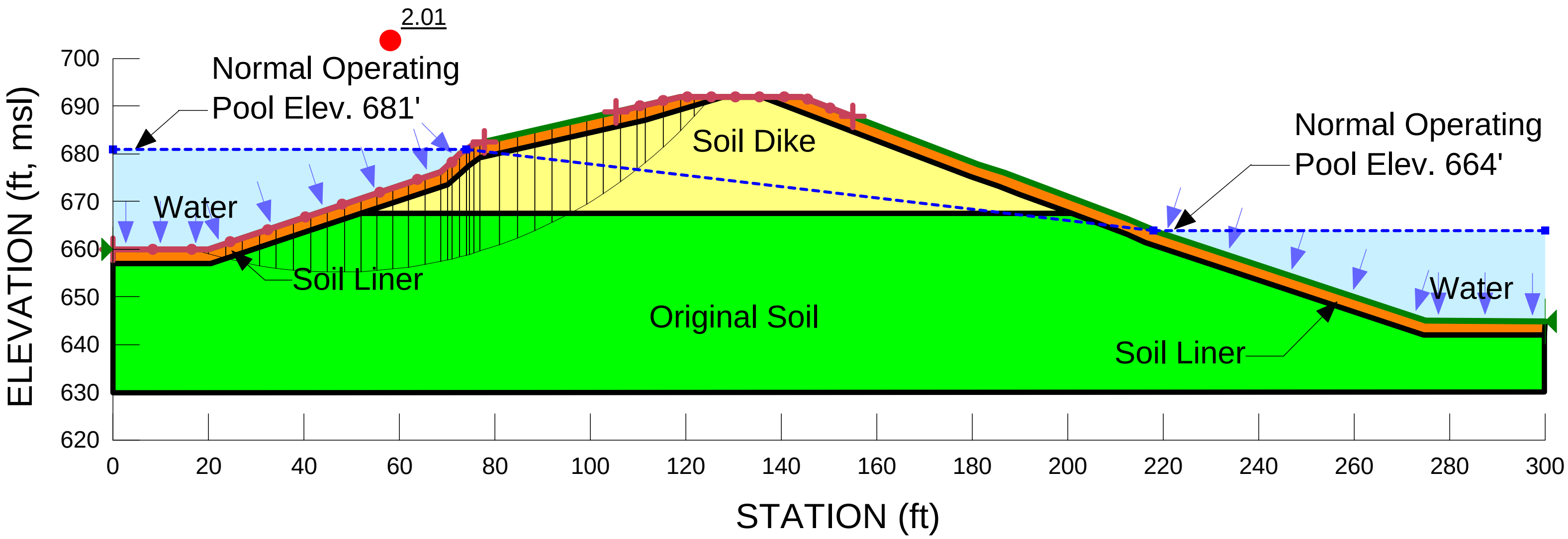


Title: Mitchell Bottom Ash Pond
Comments: Profile SP2-SP2 Upstream Pseudo-Static Stability Analysis
Name: MBAP_SP2_US Pseudo-Static Stability Max Long-term Pool.gsz
Date: 11/6/2015
Method: Morgenstern-Price
Horz Seismic Coef.: 0.06

Name: Original
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 34 °
Constant Unit Wt. Above Water Table: 120 pcf

Name: Liner
Model: Mohr-Coulomb
Unit Weight: 131 pcf
Cohesion': 900 psf
Phi': 0 °
Constant Unit Wt. Above Water Table: 121 pcf

Name: Soil Dike
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion': 300 psf
Phi': 29 °
Constant Unit Wt. Above Water Table: 124 pcf

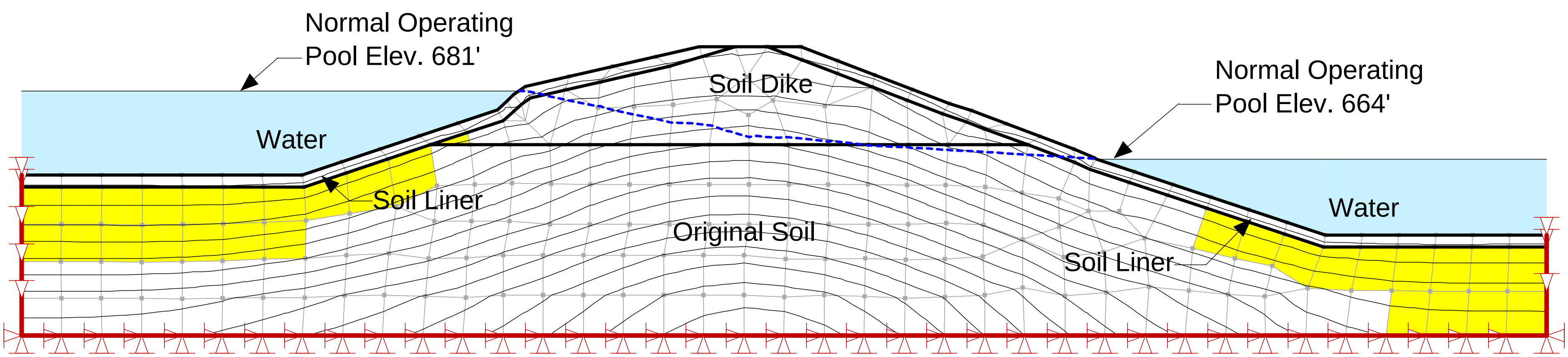


Title: Mitchell Bottom Ash Pond
Comments: Profile SP2-SP2 Downstream Liquefaction Analysis
Name: MBAP_SP2_DS Liquefaction.gsz
Date: 11/9/2015
Method: Equivalent Linear Dynamic

Name: Soil Dike
Model: Equivalent Linear
Unit Weight: 134 pcf
Poisson's Ratio: 0.28
Dynamic G-Reduction Function: Seed-Idriss (sands)
Pore Water Pressure Function: Built-in Function
K-Alpha Function: Built-in Funciton (dense sand)
K-Sigma Function: Built-in Function (sand)
Cyclic Function: Built-in Function (dense sand)
Dynamic Damping Ratio Function: Seed-Idriss
G Modulus: 121540 psf

Name: Original
Model: Equivalent Linear
Unit Weight: 120 pcf
Poisson's Ratio: 0.28
Dynamic G-Reduction Function: Seed-Idriss (sands)
Pore Water Pressure Function: Built-in Function
K-Alpha Function: Built-in Function (med dense sand)
K-Sigma Function: Built-in Function (sand)
Cyclic Function: Built-in Function (med dense sand)
Dynamic Damping Ratio Function: Seed-Idriss
G Modulus: 166540 psf

Name: Liner
Model: Equivalent Linear
Unit Weight: 121 pcf
Poisson's Ratio: 0.3
Dynamic G-Reduction Function: Built-in Function
Pore Water Pressure Function: Built-in Function
Dynamic Damping Ratio Function: Clay-Sun, et. al.
GMax Function: Gmax Function 1

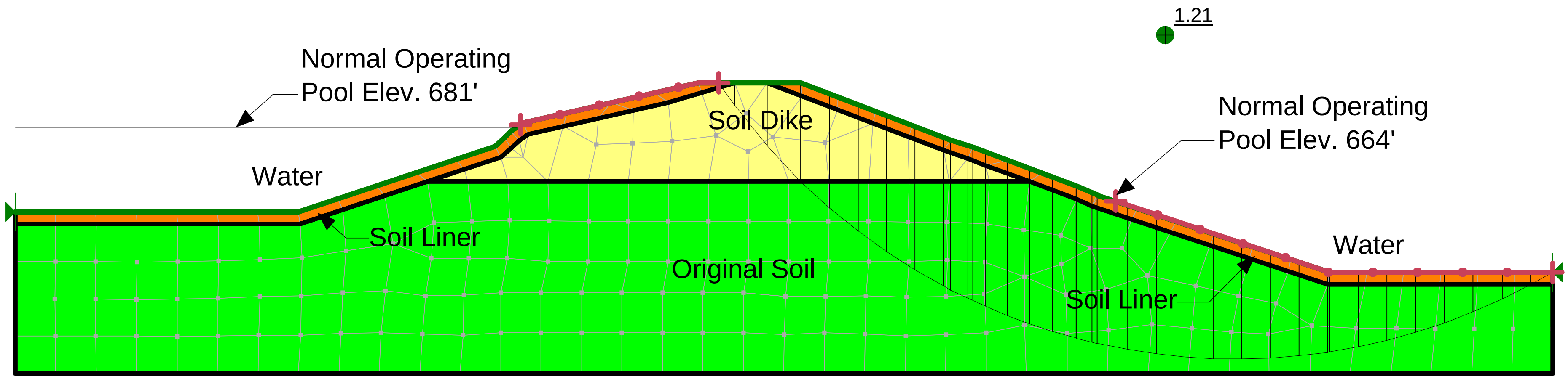


Title: Mitchell Bottom Ash Pond
Comments: Profile SP2-SP2 Downstream Liquefaction Analysis
Name: MBAP_SP2_DS Liquefaction.gsz
Date: 11/9/2015
Method: QUAKE/W Newmark Deformation

Name: Soil Dike
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Unit Wt. Above Water Table: 124 pcf
Cohesion: 300 psf
Phi: 29 °

Name: Original
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Unit Wt. Above Water Table: 120 pcf
Cohesion: 0 psf
Phi: 34 °

Name: Liner
Model: Mohr-Coulomb
Unit Weight: 131 pcf
Unit Wt. Above Water Table: 121 pcf
Cohesion: 900 psf
Phi: 0 °

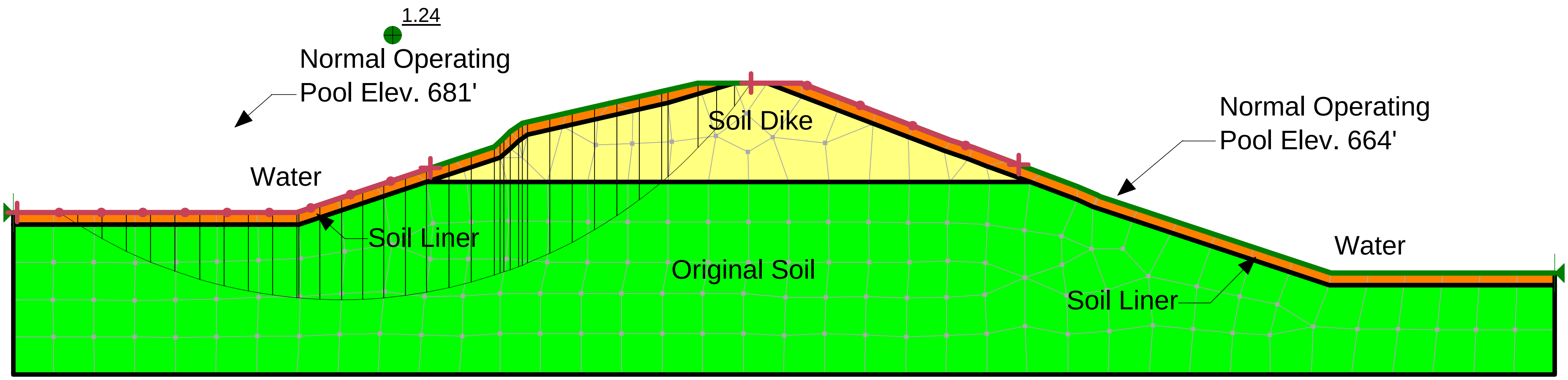


Title: Mitchell Bottom Ash Pond
Comments: Profile SP2-SP2 Downstream Liquefaction Analysis
Name: MBAP_SP2_US Liquefaction.gsz
Date: 11/6/2015
Method: QUAKE/W Newmark Deformation

Name: Soil Dike
Model: Mohr-Coulomb
Unit Weight: 134
Unit Wt. Above Water Table: 124
Cohesion: 300
Phi: 29
Phi-B: 0

Name: Original
Model: Mohr-Coulomb
Unit Weight: 130
Unit Wt. Above Water Table: 120
Cohesion: 0
Phi: 34
Phi-B: 0

Name: Liner
Model: Mohr-Coulomb
Unit Weight: 131
Unit Wt. Above Water Table: 121
Cohesion: 900
Phi: 0
Phi-B: 0



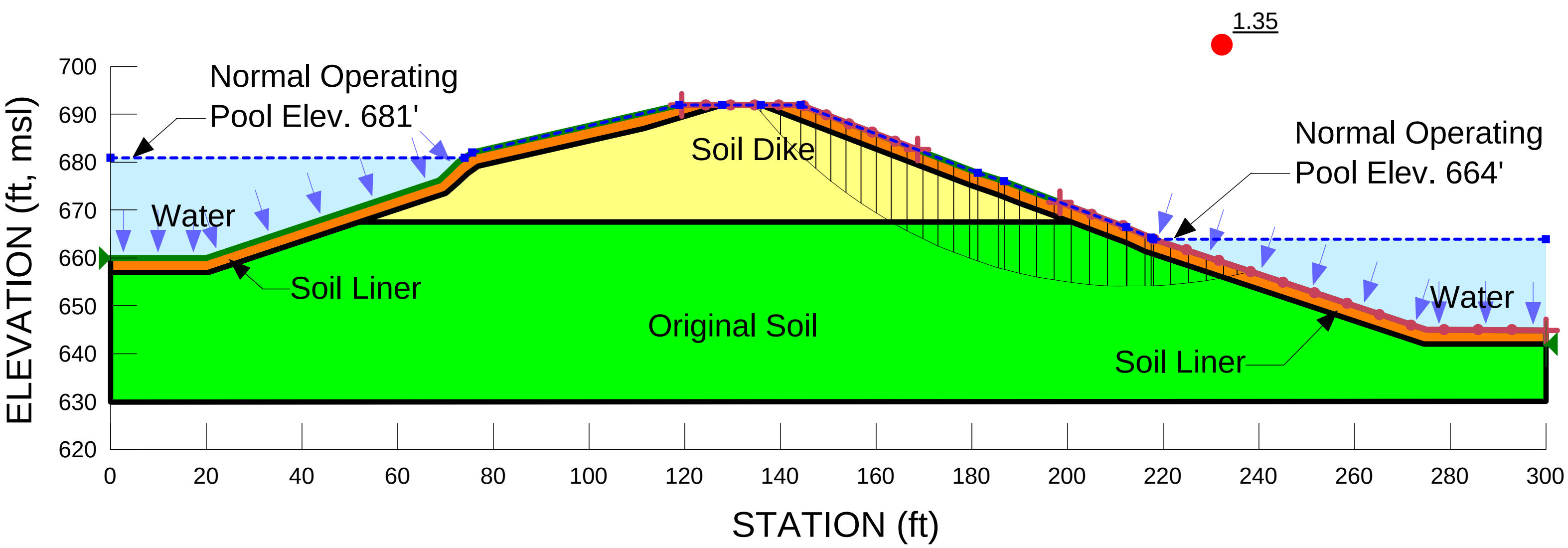
Section SP2 Stability Analyses with Elevated Phreatic Levels

Title: Mitchell Bottom Ash Pond
Comments: Profile SP2-SP2 Downstream Static Stability Analysis - Minimum FS
Name: MBAP_SP2_DS Stability Max Long-term Pool_Critical Piezometer.gsz
Date: 11/11/2015
Method: Morgenstern-Price

Name: Original
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 34 °
Constant Unit Wt. Above Water Table: 120 pcf

Name: Liner
Model: Mohr-Coulomb
Unit Weight: 131 pcf
Cohesion': 900 psf
Phi': 0 °
Constant Unit Wt. Above Water Table: 121 pcf

Name: Soil Dike
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion': 300 psf
Phi': 29 °
Constant Unit Wt. Above Water Table: 124 pcf

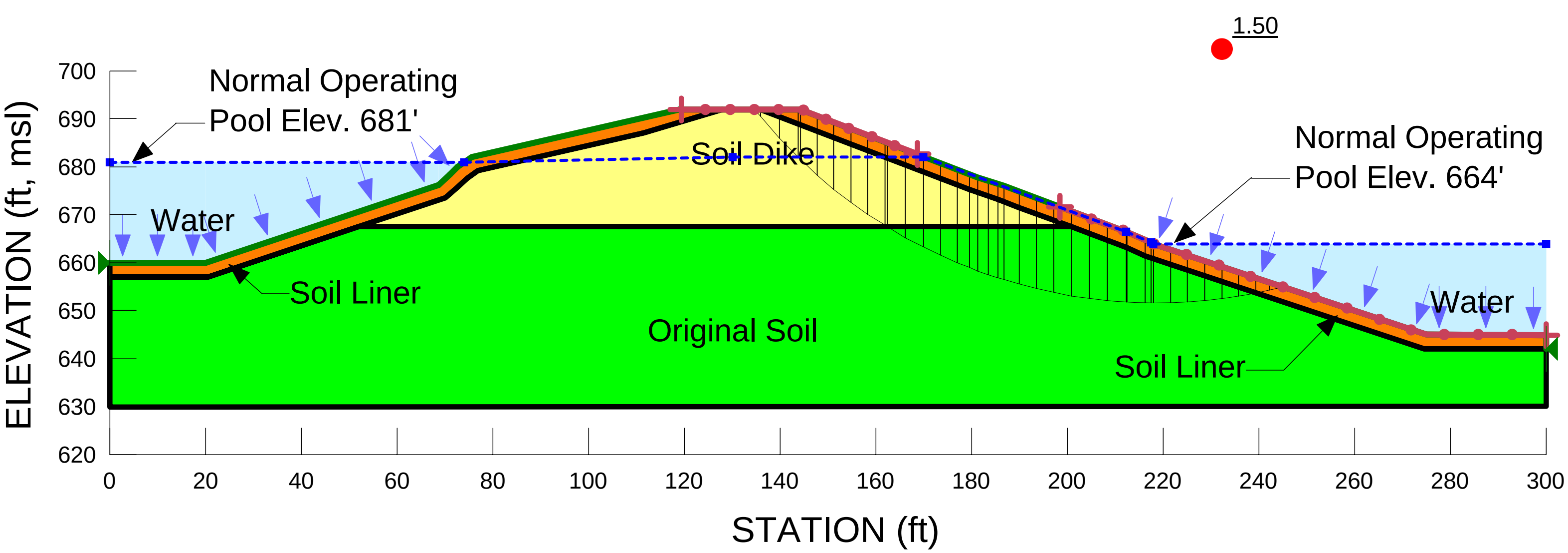


Title: Mitchell Bottom Ash Pond
Comments: Profile SP2-SP2 Downstream Static Stability Analysis - FS=1.5
Name: MBAP_SP2_DS Stability Max Long-term Pool_Critical Piezometer_1.5.gsz
Date: 11/11/2015
Method: Morgenstern-Price

Name: Original
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 34 °
Constant Unit Wt. Above Water Table: 120 pcf

Name: Liner
Model: Mohr-Coulomb
Unit Weight: 131 pcf
Cohesion': 900 psf
Phi': 0 °
Constant Unit Wt. Above Water Table: 121 pcf

Name: Soil Dike
Model: Mohr-Coulomb
Unit Weight: 134 pcf
Cohesion': 300 psf
Phi': 29 °
Constant Unit Wt. Above Water Table: 124 pcf



Appendix IV

Drawing

NOTES

1. PLAN ADAPTED FROM DRAWINGS PROVIDED BY AEPSC, DATED 11-10-10.

LEGEND

SP1 — SP1 (0+00)	SECTION LIMITS
B-1	SAMPLED BOREHOLE LOCATION
B-2	SAMPLED BOREHOLE LOCATION WITH PIEZOMETER

THESE DRAWINGS ARE PART OF A SET OF DESIGN DOCUMENTS WHICH ALSO CONTAINS A WRITTEN TEXT. THAT TEXT EXPLAINS SOME OF THE DETAILS SHOWN HEREIN AND THEREFORE THESE DRAWINGS SHOULD ONLY BE USED IN CONJUNCTION WITH THE TEXT.

DATE	REVISIONS	BY

SITE PLAN VIEW
CCR RULES ASSESSMENT

MITCHELL PLANT
BOTTOM ASH COMPLEX
MARSHALL COUNTY, WEST VIRGINIA

SCALE: AS SHOWN	DR RAR	CHK RWC	REV SWF

PREPARED FOR:

AEP SERVICE CORPORATION

PREPARED BY:

Geo/Environmental Associates, Inc.
3502 OVERLOOK CIRCLE • KNOXVILLE, TENNESSEE 37909 • (865) 584-0344

PROJ: 15055013.00	DATE: 12-22-15	SHEET 1 OF 1