SAFETY FACTOR ASSESSMENT PERIODIC 5-YEAR REVIEW

CFR 257.73e

West Bottom Ash Pond

Rockport Plant
Rockport, Indiana

October 2021

Prepared for: Indiana Michigan Power Company

Prepared by: American Electric Power Service Corporation

1 Riverside Plaza

Columbus, OH 43215

AEP Unique Document ID: GERS-21-044

SAFETY FACTOR ASSESSMENT
PERIODIC 5-YEAR REVIEW
CFR 257.73(e)
ROCKPORT PLANT
WEST BOTTOM ASH POND

PREPARED BY Dan Murphy DATE 9/29/2021
Dan Murphy, P.E.

REVIEWED BY M Aj L DATE 9/29/2021
Mohammad Ajlouni, Ph. D, P.E.

APPROVED BY Gary F. Zych DATE 9/30/2021
Gary F. Zych, P.E.
Section Manager – AEP Geotechnical Engineering

Gary F. Zych
GARY F. ZYCH
REGISTERED
No.
11500709
STATE OF
INDIANA
PROFESSIONAL ENGINEER
9/30/2021

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

Table of CONTENTS

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 Rockport plant is located near the City of Rockport, Spencer County, Indiana. It is owned by Indiana Michigan Power Co. (I&M), a unit of American Electric Power. The facility operates two surface impoundments for storing CCR within the Bottom Ash Complex. The bottom ash ponds and wastewater ponds were designed in tandem; one bottom ash pond and one wastewater pond are in service at any given time.

There are six main ponds within the bottom ash pond complex as listed below.

List of Main Ponds within the Bottom Ash Complex

- West Bottom Ash Pond
- East Bottom Ash Pond
- West Waste Water Pond
- East Waste Water Pond
- Reclaim Pond
- Clear Water Pond

The West Bottom Ash Pond is impounded by dikes along the western, southern and eastern edges of the pond and incised on the northern edge of the pound.

The east to west trending splitter dike separates the West Bottom Ash Pond from the West Wastewater Pond. The east-to-west trending splitter dike is approximately 650 feet long and has a maximum design height of 21.5 feet. The top of the dike is at elevation 399. The design height is measured from the crest of the dike to the floor of the West Waste Water Pond. The dike is constructed out of compacted soil. Both interior and exterior slopes are designed to be 2 Horizontal to 1 Vertical. Native soil is estimated around elevation 390, based on original design drawings.

The north-to-south trending splitter dike separates the West Bottom Ash Pond from the East Bottom Ash Pond. This splitter dike is approximately 2,000 feet long and has a maximum design height of 22 feet. The top of the dike is at elevation 399. The design height is measured from the crest of the dike to the floor of the East Bottom Ash Pond. The dike is constructed out of compacted cohesive soil. Both interior and exterior slopes are designed to be 2 Horizontal to 1 Vertical. Native soil is estimated around elevation 390, based on original design drawings. Full assessment for this splitter dike is contained in the Safety Factor Assesment for the East Bottom Ash Pond.

The western dike is approximately 2,000 feet long and has a maximum design height of 10 feet. The top of the dike is at elevation 399. The design height is measured from the crest of the dike to the exterior toe. The interior slopes are designed to be 2 Horizontal to 1 Vertical. The exterior slopes of the western dike are currently about 5 Horizontal to 1 Vertical. The dike is constructed out of compacted cohesive soil. Native soil is estimated around elevation 390, based on original design drawings.

3.0 SAFETY FACTOR ASSESSMENT 275.73(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.

During this review, additional analysis was performed on the east-to-west splitter dike separating the West Bottom Ash Pond from the West Wastewater Pond. Refer to Attachment B. Load cases analyzed were chosen where the hydrostatic forces across the splitting dikes were maximized and represent critical loading scenarios. Phreatic surfaces were assumed to be simple straight line through the dike cross section. The results summarized in Table 1 indicate that the calculated factors of safety meet or exceed the minimum values defined in Section 275.73(e).

Table 1- Safety Factor Assessment Summary for east to west splitter dike

Description	Calculated Safety Factor	Required Safety Factor	Comment
WWWP Normal- WBAP Drained	1.74	1.50	
WWWP Flood Stage- WBAP Drained	1.74	1.40	
WWWP Normal- WBAP Drained- Seismic	1.28	1.0	Horizontal Seismic Coefficient = 0.145
WBAP Rapid Drawdown (Duncan, Wright and Wong, 1990)	1.56	*	*= Required Factor of Safety not specified in 40 CFR 257.73 (d) (1) (vii).

The assumptions, material properties and operating pools defined in the initial assessment for the western dike were reviewed. Refer to Attachment A. 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 summarized in Table 2 indicate that the calculated factors of safety meet or exceed the minimum values defined in Section 275.73(e).

ATTACHMENT A- Safety Factor Assessment for the western dike

Geotechnical Engineering Report

AEP Rockport Bottom Ash Complex
Professional Engineering Certification
Rockport, Indiana

December 21, 2015

Terracon Project No. N4155126

Prepared for:

American Electric Power
Columbus, Ohio

Prepared by:

Terracon Consultants, Inc.
Columbus, Ohio

TABLE OF CONTENTS

GEOTECHNICAL ENGINEERING REPORT
AEP ROCKPORT BOTTOM ASH COMPLEX
PROFESSIONAL ENGINEERING CERTIFICATION
ROCKPORT, INDIANA
Terracon Project No. N4155126
December 21, 2015

1.0 INTRODUCTION

This report provides the results of our field and laboratory testing programs, and presents our conclusions and slope stability analysis results to satisfy the criteria set forth by the most recently mandated USEPA rule 40 CFR Part 257, Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities (CCR rules) for the AEP Rockport Bottom Ash Complex in Rockport, Indiana. The subsurface conditions were explored by two (2) borings sampled to depths of about 30 to 44 feet below the existing ground surface. Additionally, a groundwater observation well was installed within the embankment to a depth of about 15 feet, located approximately 10 feet south of Boring B-2.

2.0 PROJECT INFORMATION

In AEP's Stability Assessment of Bottom Ash Pond, West Dike report dated June 21, 2010, AEP conducted geotechnical engineering analyses of the Rockport impoundment and determined the minimum upstream and downstream dike factors of safety against slope failure considering both existing and earthquake loading conditions. As part of the current project, Terracon was requested to perform the following tasks in order to certify that the existing impoundment meets the minimum requirement of the recently mandated USEPA CCR rules:

- Perform Site Visit
- Review Previous Slope Stability Analysis
- Perform Hydrologic and Hydraulic Analysis
- Establish Piezometer Action Values

The results of these tasks are summarized in the following sections. Please note that the results of the hydrologic and hydraulic analysis are being submitted in a separate report.

3.0 SITE VISIT

On July 14, 2015 the undersigned representatives of Terracon met with AEP personnel and performed a site reconnaissance of the Rockport Plant Bottom Ash Pond Complex. The only above-grade embankment is along the west side of the West Bottom Ash Pond and West Wastewater Pond. The remaining ponds were constructed by excavating below original grade. Based on conversations with AEP, we understand that no significant modifications have been made to the geometry of the existing impoundment perimeter embankment slopes since the time of AEP's 2010 slope stability analyses. However, based on site observations and information in provided topographic information, the exterior slopes appeared to be flatter than the 2.5H:1V presented in the original design drawings and used in the 2010 analyses. The embankment also appeared to be lower in height than the 13 feet used in the 2010 analyses. Previous modifications to the perimeter embankment of the existing complex are understood to have occurred in 1984. These previous modifications included regrading and redressing of the slopes. Pertinent photographs from the July 14, 2015 site reconnaissance have been included in the Appendix of this report in Appendix E.

4.0 REVIEW OF PREVIOUS SLOPE STABILITY ANALYSES

Terracon has completed a review of the slope stability analyses performed by AEP in 2010. During the previous analyses, an idealized cross-section consisting of a 13-foot high embankment with 2.5H:1V exterior and 2H:1V interior slopes based on the original construction drawings. The profile was determined based on borings performed in 1977 as part of the original investigation for the Rockport Power Plant. As no strength testing was performed during this investigation, the parameters used in the model were assumed typical values for the material encountered.

Considering the AEP 2010 analyses and the limited subsurface exploration, Terracon performed two additional borings at the site (one along the crest and one at the toe of the embankment) to verify the soil conditions and conduct strength testing on the embankment and foundation soils. Additionally, a groundwater monitoring well was installed within the embankment to evaluate the presence of groundwater within the embankment, and updated topographic information provided by AEP was used to develop a cross-section for analysis.

5.0 SUBSURFACE CONDITIONS

5.1 Site Geology

The site of Rockport Bottom Ash Complex is within the flood plain of the Ohio River and the Boonville Hills physiographic province of the Southern Hills and Lowlands physiographic region.

According to the USDA Soil Survey of Spencer County, Indiana (September 2015), the predominant soil in the vicinity of the site is the Ginat silt loam (Gn). The Weinbach silt loam (WcA), Sciotoville silt loam (ScA and ScB2), and Wheeling loam (WhB2) are also present near the facility, but to a lesser extent. A majority of the soils in the vicinity of the site have been altered or removed during site development and are classified as Udorthents (Uaa) or Mine Dumps (Du).

The Ginat consists of poorly-drained silt loam and silty clay loam. The Weinbach consists of somewhat poorly drained silt loam and silty clay loam. The Sciotoville and Wheeling consist of moderately well-drained to well-drained silt loam, clay loam, and loam.

The Bottom Ash Complex is located on the western bank of the Ohio River and is underlain by Quaternary age alluvium consisting of Wisconsinan age undifferentiated outwash. Geotechnical borings performed at the site during the original subsurface investigation indicate clay generally ranging from less than 5 to about 15 feet in thickness, but may extend up to about 30 feet and contain layers or lenses of fine sand. The clay layer was underlain by fine to coarse sand deposits. Historical boring information is presented in Appendix A.

Bedrock consists of the Raccoon Creek Group Formation of Pennsylvanian age and is comprised of predominantly shale and sandstone with thin beds of limestone, clay, and coal. The Raccoon Creek Group is underlain by rocks ranging in age from Middle Devonian to Late Mississippian and is located at about elevation 280 to 300 feet.

Structurally, the area is located within the Illinois Basin, near the eastern border of the Wabash Valley Seismic Zone, which generally consists of vertically-oriented faults buried under layers of sediment.

5.2 Site Characterization

Subsurface conditions were explored by two (2) borings. The approximate locations of the borings are presented on Exhibit A-3 in Appendix A. Logs of the borings are also included in Appendix A. Note that stratification boundaries on the boring logs represent the approximate locations of changes in soil types; in situ, the transition between materials may be gradual. In addition to the borings, one groundwater observation well was installed within the embankment in an offset hole. Well completion details are also presented in Appendix A.

Borings 361, 364, and 367 provided by AEP for the initial design of the power plant were included in this study. The locations and logs of these previous borings are presented in Appendix A.

Laboratory tests were conducted for soil classification and strength measurements. The laboratory testing methods are described in Appendix B. The laboratory test results are presented on the boring logs in Appendix A and laboratory data sheets in Appendix B.

5.3 Typical Profile

Two borings were drilled at the location of the selected critical cross-section, which represented the tallest embankment section. Boring B-1 was performed at the outboard toe of the embankment. Boring B-2 was performed at the crest of the embankment section. At the time the soil borings were performed, the East Bottom Ash Pond was receiving an inflow of Bottom Ash from the plant. The West Bottom Ash Pond did not contain standing water.

Boring B-2 encountered approximately 12 feet of embankment fill consisting of lean clay with varying amounts of sand, and sandy silt, to about elevation 389.5. Beneath the embankment fill, and within Boring B-1, a layer of stiff fat and lean clay was encountered to elevations of approximately 372 to 376 feet. Below the clay, the soils contained a 1 to 2 foot thick transitional layer of loose clayey sand and sandy silt deposits, grading to deposits of loose to medium dense poorly graded sand and silty sand containing varying amounts of gravel to the termination depths of the borings.

5.4 Water Level Observations

The borings were observed while drilling for the presence and level of groundwater. Groundwater was encountered within the sand deposits at depths of approximately 17.5 feet in Boring B-1, and at 25.1 feet in Boring B-2, which correspond to elevations of about 372.2 and 372.3 feet, respectively. At the time the borings were performed, the West Bottom Ash Pond was not in service, and was not filled with standing water.

A groundwater monitoring well was installed in an offset hole within the embankment approximately 10 feet south of Boring B-2 to a depth of about 15 feet below the ground surface. At the time of installation, no water was encountered within the well. The West Bottom Ash Pond was returned to service the week of September 6, 2015. A water reading within the well, obtained on October 13, 2015, indicated water at a depth of 3.36 feet below the top of the well cover, corresponding to a water elevation of about 394.2 feet. This elevation approximately matches the minimum normal operating elevation of the West Bottom Ash Pond. The West Bottom Ash Pond contained standing water at the time of this water reading.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff, ash pond levels, river levels, and other factors not evident at the time the borings were performed. In addition, perched or trapped water can develop over low permeability soils. Therefore, groundwater levels at other times in the life of the ponds may be higher or lower than the levels indicated on the boring logs.

5.5 Laboratory Testing Summary

A summary of the laboratory tests results are included in the following tables. The testing program and test results are presented in Appendix B. Abbreviations used in the tables are as follows:

- USCS = United Soil Classification System
- LL = Liquid Limit
- PI = Plasticity Index
- UU = Unconsolidated Undrained Triaxial Test
- CU = Consolidated Undrained Triaxial Test
- φ = Soil Internal Angle of Friction
- C = Soil Cohesion
- Effective = Effective Stress Parameters
- Total = Total Stress Parameters

The test results are presented for embankment fill and native soils samples collected during the field exploration.

Embankment Fill

Boring	Sample Depth (ft)	USCS Type	LL (%)	PI (%)	UU C (tsf)	CU Effective		CU Total	
						φ (deg)	C (tsf)	φ (deg)	C (tsf)
B-2	0-2	CL	28	13	--	--	--	--	--
B-2	4-6	ML	19	3	--	29.1	0.12	19.4	0.22

Native Soils

Boring	Sample Depth (ft)	USCS Type	LL (%)	PI (%)	UU C (tsf)	CU Effective		CU Total	
						φ (deg)	C (tsf)	φ (deg)	C (tsf)
B-1	2-4	CH	69	43	--	--	--	--	--
B-1	8-10	CL	42	20	--	34.4	0.05	22.0	0.11
B-1	14-16	CL	28	10	1.26	--	--	--	--
B-2	10-12	CL	30	9	3.85	--	--	--	--
B-2	16-18	CL	35	20	--	--	--	--	--

6.0 GEOTECHNICAL ANALYSES

6.1 Slope Stability

To evaluate the stability existing embankment slope, slope stability analyses were performed on the selected “critical” cross-section of the western dike. The critical section was selected based on the tallest embankment height. During the planning of the geotechnical exploration, the critical section was considered to be about 2/3 of the way south along the West Bottom Ash Pond embankment, where the borings were drilled; however, considering the provided topographic mapping, the final cross-section used in analyses is about 3/4 of the way south along the embankment to represent the tallest dike section. The location of this cross-section is shown on Exhibit A-3.

Previous documents for the Rockport Bottom Ash Complex indicate approximately 2H:1V inboard and 2.5H:1V outboard slopes. However, based on our site visits and provided topographic information, the outboard slopes generally range from about 5H:1V to 6H:1V. The existing ground surface was developed from topographic survey mapping provided by AEP, which was performed by Henderson Aerial Surveys, Inc. dated November 10, 2007. The geometry of the inboard slopes and bottoms of the pond were estimated using the 1977 design drawings.

Strength parameters were developed based on the results of the field and laboratory testing. Soil profiles were developed based on subsurface conditions interpreted from the borings. The soil parameters used for the slope stability analyses are summarized in the following table and included on their respective slope stability summary exhibits in Appendix D.

Material	Unit Weight (pcf)	Effective Strength Parameters	
		φ (deg)	C (psf)
Embankment Fill	130	29	50
Stiff Clay	123	34	50
Loose Sand	115	30	0
Medium Dense Sand	123	33	0

The following general cases were analyzed:

- Long Term, Steady-State at Maximum Storage Pool Elevation 396 feet – This case represents the expected maximum normal operating elevation.

- Long Term, Steady-State at Maximum Surcharge Pool Elevation 398 feet – This case represents a long-term condition when the pond is completely filled to top of dike and represents an extreme case.

- Seismic – For this case, seismic loading was applied to the “Long Term, Steady-State at Maximum Storage Pool Elevation 396 feet” case and performed using a horizontal seismic coefficient of 0.22, based on the 2008 Peak Ground Acceleration with 2% Probability of Exceedance in 50 Years.

The stability analyses were performed using the computer program Slope/W 2012 (Version 8.0.10) developed by Geo-Slope International, Ltd. Spencer’s Method was used in the program to perform 2-Dimensional limit equilibrium slope stability analyses with a deterministic approach. Water levels within the embankment were estimated based on piezometric information from the borings during drilling, and from well readings after the borings were performed.

The analyzed factors of safety (FoS) for each case, as well as the minimum FoS values as outlined in the mostly recently mandated USEPA CCR rules, are presented in the following table. Detailed graphical summaries showing the cross-section and critical trial failure surfaces are presented in Appendix D. It should be noted that a minimum failure depth of 5.0 feet was specified to eliminate reporting of local, surficial failure surfaces.

Summary of Stability Analysis Results – Section A-A'

Slope Stability Case	Minimum Factor of Safety from Slope Stability Analysis		Required Minimum Factor of Safety	Exhibits [1]
	Exterior	Interior		
Long Term, Maximum Surcharge Pool Loading	4.2	2.1	1.4	D-1, D-2
Long-Term, Maximum Storage Pool Loading	4.3	1.9	1.5	D-3, D-4
Long-Term with Seismic Loading	1.6	1.0	1.0	D-5, D-6

1. *Refers to exhibit designation of slope stability output included in Appendix D of this submittal.*

In addition, the CCR rules require that for dikes constructed of soils with a susceptibility to liquefaction, the calculated factor of safety against liquefaction must equal or exceed a value of 1.20. The west dike is constructed predominantly of lean clay containing varying amounts of sand and is not considered to be susceptible to liquefaction.

Based on the analyses performed to date, it is the conclusion of Terracon that the subject impoundment satisfies all of the minimum slope stability factor of safety values required by the CCR rules.

7.0 HYDROLOGIC AND HYDRAULIC ANALYSIS

As stated previously, the required hydrologic and hydraulic analysis for the Rockport Plant Bottom Ash Pond Complex is being submitted in a separate report.

8.0 GENERAL COMMENTS

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

9.0 P.E. CERTIFICATION

Based on the site reconnaissance visit, review of previous analyses, field and laboratory testing, and the slope stability analysis performed by Terracon personnel, I hereby certify that the factors of safety for slope stability for the Rockport Plant Bottom Ash Pond Complex meet or exceed the minimum required factors of safety, in accordance with requirements of Section 257.73 of the USEPA CCR Rules.

Baba Yahaya

BABA M. YAHAYA
REGISTERED
PE11500100
STATE OF
INDIANA
PROFESSIONAL ENGINEER

12-21-15

Baba M. Yahaya, P.E.
Certifying Engineer
PE11500100

APPENDIX A
FIELD EXPLORATION

Field Exploration Description

The subsurface exploration consisted of drilling and sampling two (2) borings at the site to depths of about 35 to 44 feet below existing grades. The boring locations were staked in the field by Terracon personnel using existing site features as references. Elevations of the ground surface at each boring location were provided by Chamness Land Surveying. Ground surface elevations indicated on the logs are rounded to the nearest 0.1 foot. Latitude and longitude information was determined from Google Earth based on location information provided by Chamness Land Surveying. The locations and elevations of the borings and test pits should be considered accurate only to the degree implied by the means and methods used to define them. The approximate boring locations are indicated on the attached Boring Location Plan.

The borings were drilled with a track-mounted rotary drill rig using continuous flight hollow-stem augers to advance the boreholes. Samples of the soil encountered in the borings were obtained using the split barrel sampling procedures or Shelby tube (push-tube) samplers.

An observation well was installed in an offset hole within the embankment. The screened interval for the well was determined in the field based on the subsurface conditions encountered in Boring B-2. A well completion record for this well has been included in this appendix.

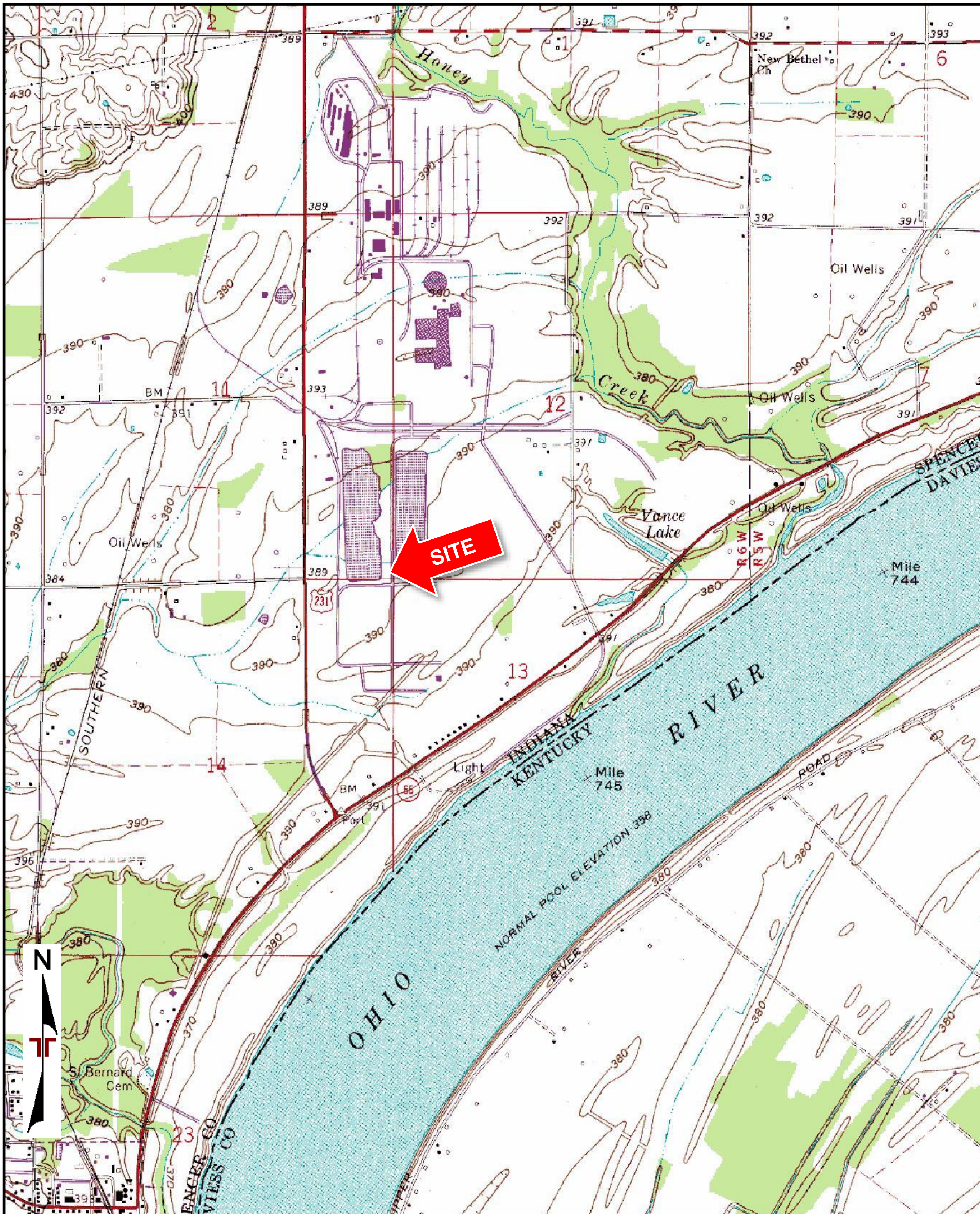
In the split-barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler the last 12 inches of the typical total 18-inch penetration by means of a 140-pound auto-hammer with a free fall of 30 inches, is the standard penetration resistance value (SPT-N). This value is used to estimate the in-situ relative density of cohesionless soils and consistency of cohesive soils.

An automatic SPT hammer was used to advance the split-barrel sampler in the borings performed on this site. A significantly greater efficiency is achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. This higher efficiency has an appreciable effect on the SPT-N value. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

In the push-tube sampling procedure, a thin-walled tube is hydraulically pushed into the soil.

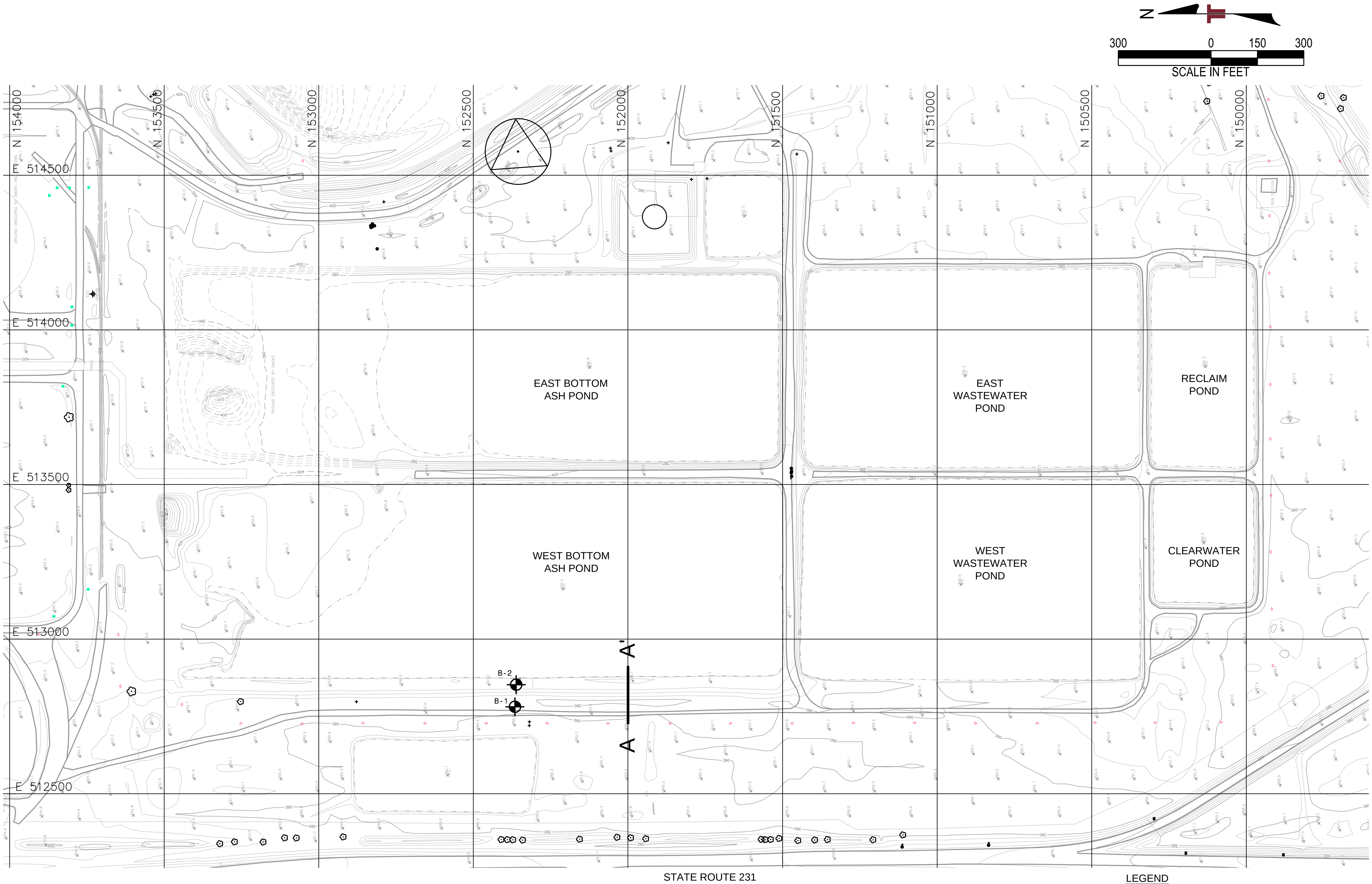
The samples were tagged for identification, sealed to reduce moisture loss, and taken to our laboratory for further examination, testing, and classification. Information provided on the boring logs attached to this report includes soil descriptions, consistency evaluations, boring depths, sampling intervals, and any groundwater conditions. The borings were backfilled with cement/bentonite grout prior to the drill crew leaving the site.

A field log of each boring/test pit was prepared by a Terracon engineer. These logs included visual classifications of the materials encountered during drilling, as well as the engineer’s interpretation of the subsurface conditions between samples. Final boring logs included with this report represent the engineer's interpretation of the field logs and include modifications based on laboratory observation and tests of the samples.



TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY
QUADRANGLES INCLUDE: ROCKPORT, IN (1/1/1982).

Project Manager: MSF	Project No. N4155126	Terracon	SITE LOCATION MAP	Exhibit
Drawn by: AKB	Scale: 1:24,000	800 Morrison Rd.	AEP Rockport Bottom Ash PE Certification	A-2
Checked by: KME	File Name: N4155126	Columbus, OH 43230	US Highway 231	
Approved by: KME	Date: Dec. 2015		Rockport, IN	



LEGEND

B-1 SOIL BORING

NOTE

THE AERIAL TOPOGRAPHY WAS OBTAINED FROM HENDERSON AERIAL SURVEYS INC., DATED 11/10/2007.

EXHIBIT A-3

DESIGNED BY:	BMY
DRAWN BY:	DAB
APPVD. BY:	MSF
SCALE:	1"=300'
DATE:	10/15/15
JOB NO.	N4155126
ACAD NO.	PSET2
SHEET NO.:	1 OF 1

SITE PLAN

ROCKPORT PLANT

AMERICAN ELECTRIC POWER

ROCKPORT PLANT BOTTOM ASH POND COMPLEX

ROCKPORT IN

Terracon
Consulting Engineers and Scientists
800 MORRISON ROAD COLUMBUS, OHIO 43230
PH. (614) 863-3113 FAX. (614) 863-0475

REV.	DATE	BY	DESCRIPTION

BORING LOG NO. B-1

PROJECT: Rockport Plant Impoundment Certification

**CLIENT: American Electric Power
Columbus, Ohio**

SITE:
Rockport, Indiana

LOCATION See Exhibit A-3

Latitude: 37.918487° Longitude: -87.039045°

Surface Elev.: 389.7 (Ft.)

DEPTH	Material Description	ELEVATION (Ft.)
0.3	**TOPSOIL (3")**	389.5
6.0	**SANDY FAT CLAY (CH)**, trace gravel, brown, stiff	383.5
17.5	**LEAN CLAY (CL)**, trace sand, gray and brown, stiff	372
18.5	**SANDY SILT (ML)**, brown, loose	371
23.0	**POORLY GRADED SAND (SP)**, brown, loose	366.5
	POORLY GRADED SAND (SP), trace gravel, brown, medium dense	

DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	ATTERBERG LIMITS LL-PL-PI
0–2	X	14	5-3-4-4 N=7	3.0 (HP)	
2–4	X	12	5-4-4-5 N=8	1.0 (HP)	69-26-43
4–6	■	18			
6–8	X	24	2-3-4-5 N=7	2.0 (HP)	
8–10	■	24			42-22-20
10–12	X	24	2-3-5-6 N=8	1.25 (HP)	
12–14	X	24	2-4-5-6 N=9	2.0 (HP)	
14–16	■	24			28-18-10
16–18	X	24	2-3-3-3 N=6	1.25 (HP)	
18–20	X	18	2-4-4-4 N=8		
23–25	X	24	3-7-8-9 N=15		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25" Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement/bentonite grout upon completion.

See Exhibit A-1 for description of field procedures

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water encountered at 17.5 feet while sampling*

Terracon
800 Morrison Road
Columbus, Ohio

Boring Started: 9/3/2015	Boring Completed: 9/4/2015
Drill Rig: Track	Driller: Davis
Project No.: N4155126	Exhibit: A-4

BORING LOG NO. B-1

PROJECT: Rockport Plant Impoundment Certification

CLIENT: American Electric Power Columbus, Ohio

SITE: Rockport, Indiana

LOCATION See Exhibit A-3

Latitude: 37.918487° Longitude: -87.039045°

Surface Elev.: 389.7 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	ATTERBERG LIMITS LL-PL-PI
	POORLY GRADED SAND (SP), trace gravel, brown, medium dense *(continued)*								
			30		X	24	4-5-5-5 N=10		
	33.0	356.5							
	POORLY GRADED SAND (SP), trace gravel, brown, medium dense				X	24	4-6-7-7 N=13		
	35.0	354.5	35						
	Boring Terminated at 35 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25" Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement/bentonite grout upon completion.

See Exhibit A-1 for description of field procedures

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Water encountered at 17.5 feet while sampling

Terracon
800 Morrison Road
Columbus, Ohio

Boring Started: 9/3/2015	Boring Completed: 9/4/2015
Drill Rig: Track	Driller: Davis
Project No.: N4155126	Exhibit: A-4

BORING LOG NO. B-2

PROJECT: Rockport Plant Impoundment Certification

CLIENT: American Electric Power Columbus, Ohio

SITE: Rockport, Indiana

LOCATION See Exhibit A-3

Latitude: 37.918457° Longitude: -87.038804°

Surface Elev.: 397.4 (Ft.)

DEPTH	Material Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	ATTERBERG LIMITS LL-PL-PI
0.1	**TOPSOIL (1")**	397.3							
	FILL - LEAN CLAY (CL), trace sand, brown					19	6-10-14-16 N=24		28-15-13
4.0		393.5				4	15-12-10-10 N=22		
	FILL - SANDY SILT (ML), brown		5			24			19-16-3
6.0		391.5							
	FILL - SANDY LEAN CLAY (CL), trace gravel, gray and brown 5" poorly graded sand seam from 6-6.4'					23	2-3-5-6 N=8		
8.0		389.5							
	LEAN CLAY (CL), trace sand, gray, very stiff					24	3-7-10-17 N=17	3.25 (HP)	
			10			24			30-21-9
12.0		385.5							
	LEAN CLAY (CL), brown, stiff					24	3-4-6-8 N=10	1.5 (HP)	
14.0		383.5							
	SANDY LEAN CLAY (CL), trace gravel, gray and orange, stiff		15			24	3-5-7-9 N=12	1.75 (HP)	
						17	6-10-12-14 N=22	2.75 (HP)	35-15-20
						24			
20.8		376.5	20						
	CLAYEY SAND (SC), brown, loose					24	3-4-4-5 N=8		
22.7		374.5							
	POORLY GRADED SAND WITH SILT (SP-SM), trace gravel, brown, loose					23	3-3-4-5 N=7		
			25			21	2-3-4-4		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25" Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement/bentonite grout upon completion.

See Exhibit A-1 for description of field procedures

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

A monitoring well was installed in an offset hole approximately 10 feet south of the boring.

WATER LEVEL OBSERVATIONS

Water encountered at 25.1 feet while sampling

Terracon
800 Morrison Road
Columbus, Ohio

Boring Started: 9/4/2015	Boring Completed: 9/4/2015
Drill Rig: Track	Driller: Davis
Project No.: N4155126	Exhibit: A-5

BORING LOG NO. B-2

PROJECT: Rockport Plant Impoundment Certification

CLIENT: American Electric Power Columbus, Ohio

SITE: Rockport, Indiana

LOCATION See Exhibit A-3

Latitude: 37.918457° Longitude: -87.038804°

Surface Elev.: 397.4 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	ATTERBERG LIMITS LL-PL-PI
25.5		372		▽		21	N=7		
	POORLY GRADED SAND WITH SILT (SP-SM), trace gravel, brown, loose to medium dense					24	6-6-5-4 N=11		
						18	2-2-5-3 N=7		
			30			24	2-3-4-4 N=7		
32.5	**SILTY SAND (SM)**, brown, loose	365				19	1-2-2-2 N=4		
34.0	3" clay seam at 33.7'	363.5							
	SILTY SAND (SM), trace gravel, brown, loose		35			8	2-3-3-4 N=6		
						17	2-2-2-4 N=4		
38.0	**POORLY GRADED SAND (SP)**, trace gravel, brown, loose to medium dense	359.5				1	3-4-5-5 N=9		
			40			9	3-5-6-5 N=11		
42.0	**POORLY GRADED SAND (SP)**, trace gravel, brown, medium dense	355.5				6	4-6-9-12 N=15		
44.0		353.5							
	Boring Terminated at 44 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25" Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement/bentonite grout upon completion.

See Exhibit A-1 for description of field procedures

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

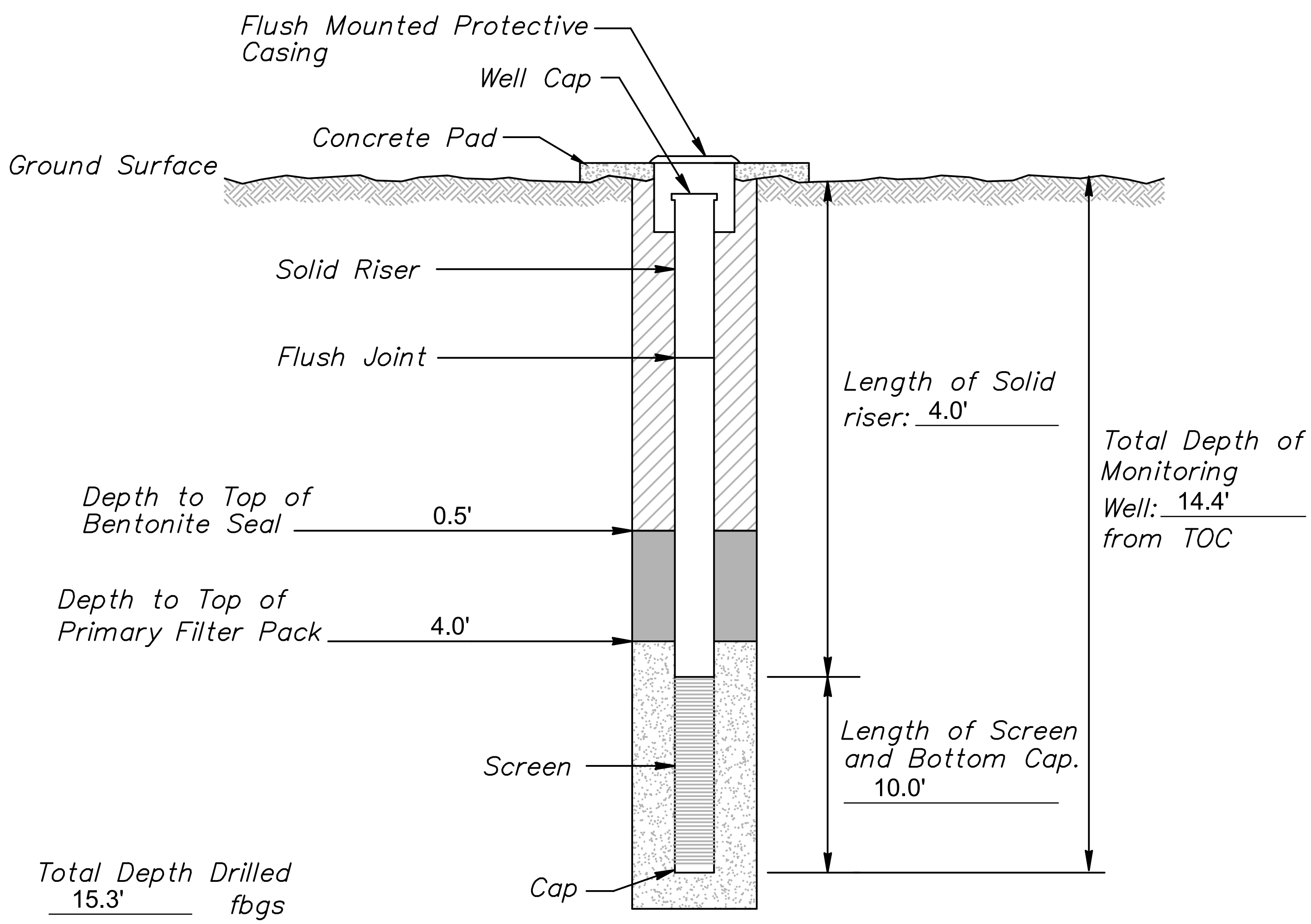
▽ *Water encountered at 25.1 feet while sampling*

Terracon
800 Morrison Road
Columbus, Ohio

Boring Started: 9/4/2015	Boring Completed: 9/4/2015
Drill Rig: Track	Driller: Davis
Project No.: N4155126	Exhibit: A-5

MONITORING WELL INSTALLATION RECORD

Job Name ROCKPORT BOTTOM ASH PE CERTIFICATION Well Number B-2A
Job Number N4155126 Installation Date 9-4-15 Location 37.918422°N, 87.038781°W
Datum Elevation 397.56 Surface Elevation 397.56
Datum for Water Level Measurement TOP OF METAL WELL COVER
Screen Diameter & Material 1" PVC SCHEDULE 40 Slot Size 0.010"
Riser Diameter & Material 1" PVC SCHEDULE 40 Borehole Diameter 6 5/8" O.D.
Granular Backfill Material GLOBAL #5 SAND Terracon Representative ALMA BARATTA
Drilling Method 3 1/4" HSA Drilling Contractor TERRACON



(Not to Scale)

Portland/Bentonite Grout

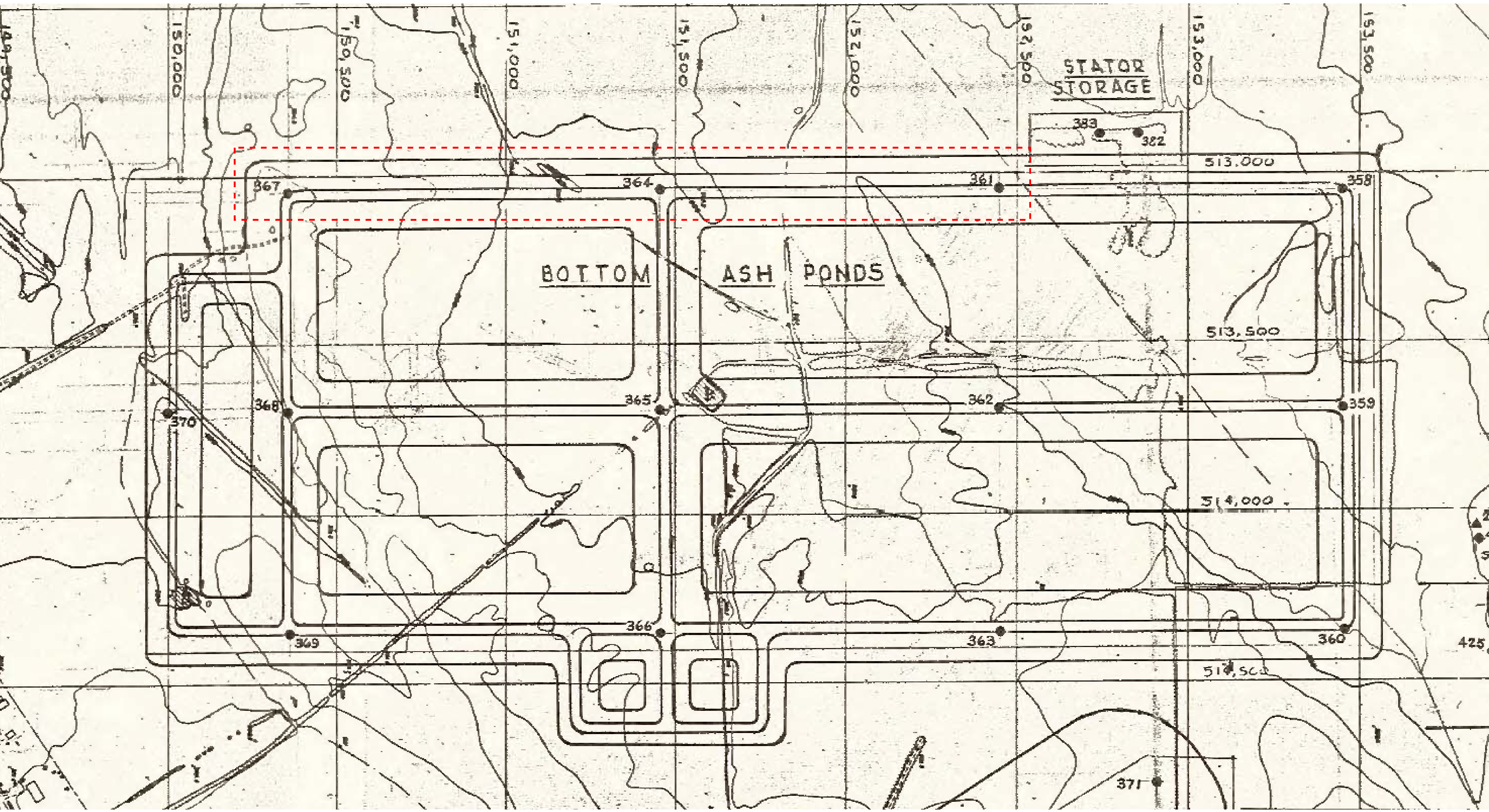
Bentonite Pellet Plug

Granular Backfill

NOTE: LOCATION/ELEVATION DATA FROM CHAMNESS LAND SURVEYING ON 9/29/2015

Terracon
Consulting Engineers and Scientists
800 MORRISON ROAD COLUMBUS, OHIO 43230
PH. (614) 863-3113 FAX. (614) 863-0475

MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: N4155126
WELL NUMBER: B-2A
DRAWING NUMBER: form-mw-b-2a CHECKED BY: KME



Extent of borings included for slope stability analyses

NOTE: This figure is from historical planning documents, and the points shown do not necessarily represent current conditions.

Exhibit A-7

PROJECT: Rockport Site PROJECT NO W6-1482 BORING: BH-361

DATE: 3/17/77 DRILLER: G. Powers CREW: J. Hardman/J. Selbe SURFACE ELEV.

DEPTH FROM	DEPTH TO	SOIL STRATA — SOIL DESCRIPTION AND REMARKS	TIME	TYPE	NO.	DEPTH FROM	DEPTH TO	FIRST 6"	2ND 6"	3RD 6"	REC
		Topsoil									
	1.0										
1.0		Very stiff brown and gray silty clay		SS	1	5.0	6.5	5	8	11	10
		Very stiff brown and gray silty clay		SS	2	10.0	11.5	8	13	14	9
	13.0										
13.0		Firm brown silty fine sand		SS	3	15.0	16.5	5	5	6	8
	19.0										
19.0		Very loose brown silty fine sand		SS	4	20.0	21.5	1	2	2	1[illegible]
		Very loose brown silty fine sand		SS	5	25.0	26.5	1	2	2	16
	30.0										
30.0		Very dense dark brown silty fine sand		SS	6	30.0	31.5	66	43	30	16
	34.0										
34.0		Firm brown medium to coarse silty sand		SS	7	35.0	36.5	9	10	13	8
	41.0										
41.0		Firm brown silty fine sand		SS	8	40.0	41.5	9	11	13	16
	44.0										
44.0		Firm brown medium and coarse sand		SS	9	45.0	46.5	8	11	19	16
	48.0										
48.0	51.5	Dense grayish brown silty fine to medium sand		SS	10	50.0	51.5	21	21	24	14
		Boring Terminated @ 51.5 3/17/77									

METHOD OF DRILLING (Check One)

a. AUGER ~~XXXX~~ Rod SIZE A

b. WASH XX WATER MUD XX

BORING SIZE BIT USED 2-7/8" Side Discharge

CASING: SIZE N/W LENGTH 5.0

UNDISTURBED SAMPLES: NO. SIZE

ROCK SAMPLES: NO.

WATER LOSSES % DEPTH

SPECIAL TESTS (Hrs & Explain)

WEATHER Overcast 45 degrees

NON-DRILLING TIME (Hrs.)

BORING LAYOUT MOVING

HAULING WATER STANDBY

WATER LEVEL: @ DATE TIME

@ DATE TIME

CAVE-IN DEPTH: @ DATE TIME

REMARKS: (All remarks should be explained on the back of white copy) THIS IS A DRILLER'S LOG AND THE CLASSIFICATIONS HAVE NOT BEEN REVIEWED BY AN ENGINEER

Exhibit A-7

AW ENGINEERING TESTING COMPANY

TEST BORING FIELD RECORD

ROJECT: Rockport Site PROJECT NO. W6-1482 BORING: BH=364

DATE: 3/15/77 DRILLER: G. Powers CREW: J. Hardman/J. Selbe SURFACE ELEV. 389.5

DEPTH FROM	DEPTH TO	SOIL STRATA SOIL DESCRIPTION AND REMARKS	TIME	TYPE	NO.	DEPTH FROM	DEPTH TO	FIRST 6"	2ND 6"	3RD 6"	REC.
0		Topsoil									
	1.4										
1.4		Stiff brown and gray silty clay traces fine sand		SS	1	5.0	6.5	4	6	7	16
	13.0	Stiff brown and gray silty clay traces fine sand		SS	2	10.0	11.5	3	4	6	12
13.0		Loose brown silty fine sand		SS	3	15.0	16.5	3	4	3	17
	24.0	Loose brown silty fine sand		SS	4	20.0	21.5	3	3	3	8
24.0		Firm brown fine to medium sand		SS	5	25.0	26.5	6	8	8	7
	34.5	Firm brown fine to medium sand		SS	6	30.0	31.5	6	8	9	8
34.5		Firm brown medium to coarse sand		SS	7	35.0	36.5	5	8	10	8
	43.0	Firm brown medium to coarse sand		SS	8	40.0	41.5	5	6	8	7
43.0	47.0	Loose brown medium to coarse sand & gravel		SS	9	45.0	46.5	4	3	3	8
47.0	51.5	Firm brown medium to coarse sand traces gravel		SS	10	50.0	51.5	8	9	13	8
		Boring Terminated @ 51.5 3/15/77									

METHOD OF DRILLING (Check One)

a. AUGER XXXXX Rod SIZE A

b. WASH XX WATER MUD XX

B NG SIZE BIT USED 2-7/8" Side Discharge

CASING: SIZE NW LENGTH 5'

UNDISTURBED SAMPLES: NO. SIZE

BAG SAMPLES: NO

WATER LOSSES, @ DEPTH

SPECIAL TESTS (Hrs & Explain)

WEATHER 70 degrees clear

NON-DRILLING TIME (Hrs)

BORING LAYOUT MOVING

HAULING WATER STANDBY

WATER LEVEL: @ DATE TIME

@ DATE TIME

CAVE-IN DEPTH: @ DATE TIME

REMARKS (All remarks should be explained on the back of white copy) THIS IS A DRILLER'S LOG THE CLASSIFICATION ...

Exhibit A-7

AEPRPP000212

PROJECT: Rockport Site PROJECT NO. W6-1482 BORING: Bh-367

DATE: 3/16/77 DRILLER: G. Powers CREW: J. Hardman/J. Selbe SURFACE ELEV.

DEPTH FROM	DEPTH TO	SOIL STRATA SOIL DESCRIPTION AND REMARKS	TIME	TYPE	NO.	DEPTH FROM	DEPTH TO	FIRST 6"	2ND 6"	3RD 6"	REC
0		Topsoil									
	1.2										
1.2		Firm brown silty fine sand traces clay		SS	1	5.0	6.5	3	4	7	14
	8.0										
8.0		Loose brown silty fine sand		SS	2	10.0	11.5	3	3	5	12
		Loose brown silty fine sand		SS	3	15.0	16.5	3	3	4	10
		Loose brown silty fine sand		SS	4	20.0	21.5	3	5	5	8
	23.0										
23.0		Firm brown silty fine to medium sand		SS	5	25.0	26.5	7	10	14	7
		Firm brown silty fine to medium sand		SS	6	30.0	31.5	7	8	9	6
		Firm brown silty fine to medium sand		SS	7	35.0	36.5	5	7	10	6
		Firm brown silty fine to medium sand		SS	8	40.0	41.5	8	11	14	6
	44.0										
44.0		Firm brown silty medium to coarse sand		SS	9	45.0	46.5	10	15	13	8
	51.5	Firm brown silty medium to coarse sand		SS	10	50.0	51.5	7	12	11	10
		Boring Terminated @ 51.5									

ETHOD OF DRILLING (Check One)

a. ~~AUGER~~ XXXX Rod SIZE A

b. WASH XX WATER MUD XX

ORING SIZE BIT USED 2-7/8" Side Discharge

ASING: SIZE NW LENGTH 5.0'

INDISTURBED SAMPLES: NO. SIZE

AG SAMPLES: NO.

ATER LOSSES % DEPTH

ECIAL TESTS (Hrs & Explain)

WEATHER Clear 60 degrees

NON-DRILLING TIME (Hrs.)

BORING LAYOUT MOVING

HAULING WATER STANDBY

WATER LEVEL: @ DATE TIME

@ DATE TIME

CAVE-IN DEPTH: @ DATE TIME

REMARKS: (All remarks should be explained on the back of white copy) THIS IS A DRILLER'S LOG AND THE CLASSIFICATIONS HAVE NOT BEEN REVIEWED BY AN ENGINEER

Exhibit A-7

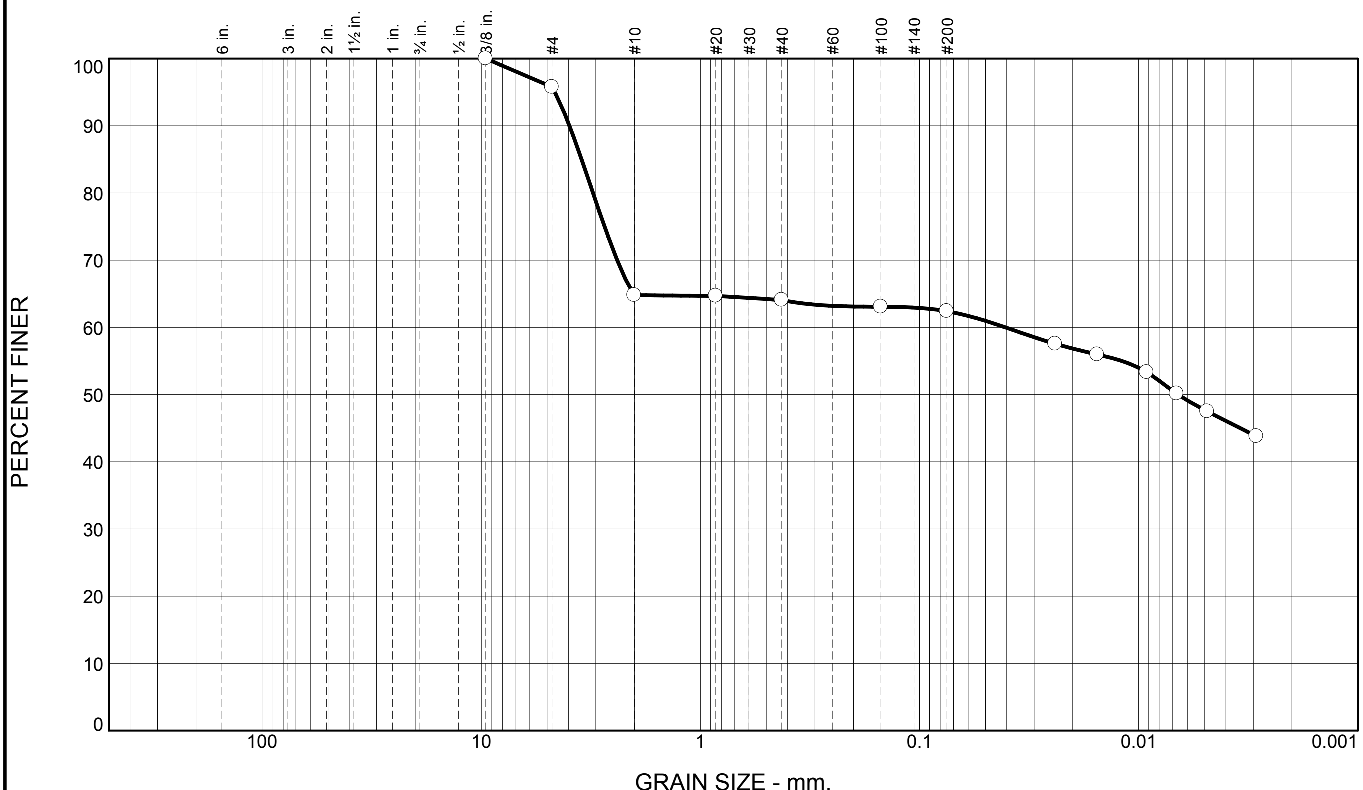
AEPRPP000215

APPENDIX B
LABORATORY TESTING

Laboratory Testing

As a part of the laboratory testing program, the soil samples were classified in the field based on visual observation, and texture. The soil descriptions presented on the boring logs for native soils are in accordance with our enclosed General Notes and Unified Soil Classification System (USCS). A brief description of the Unified System is included in this report. Classification was predominantly by visual manual procedures. Moisture content, Atterberg Limits, grain size distribution, unconsolidated undrained triaxial, and consolidated undrained triaxial with pore-water pressure measurements, were performed on selected samples. Testing followed ASTM procedures. The results of this laboratory testing are presented on the boring logs and laboratory data sheets are included in Appendix B.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.2	31.0	0.7	1.7	14.7	47.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8	100.0		
#4	95.8		
#10	64.8		
#20	64.7		
#40	64.1		
#100	63.1		
#200	62.4		
0.0240 mm.	57.5		
0.0155 mm.	56.0		
0.0092 mm.	53.3		
0.0067 mm.	50.1		
0.0049 mm.	47.5		
0.0029 mm.	43.8		

* (no specification provided)

Soil Description

Brown SANDY FAT CLAY, trace gravel

Atterberg Limits

PL= 26 LL= 69 PI= 43

Coefficients

D_{90}= 3.9559 D_{85}= 3.4817 D_{60}= 0.0406
D_{50}= 0.0066 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(25)

Remarks

F.M.=1.79

Source of Sample: B-1 **Depth:** 2.0'-4.0'
Sample Number: S-2

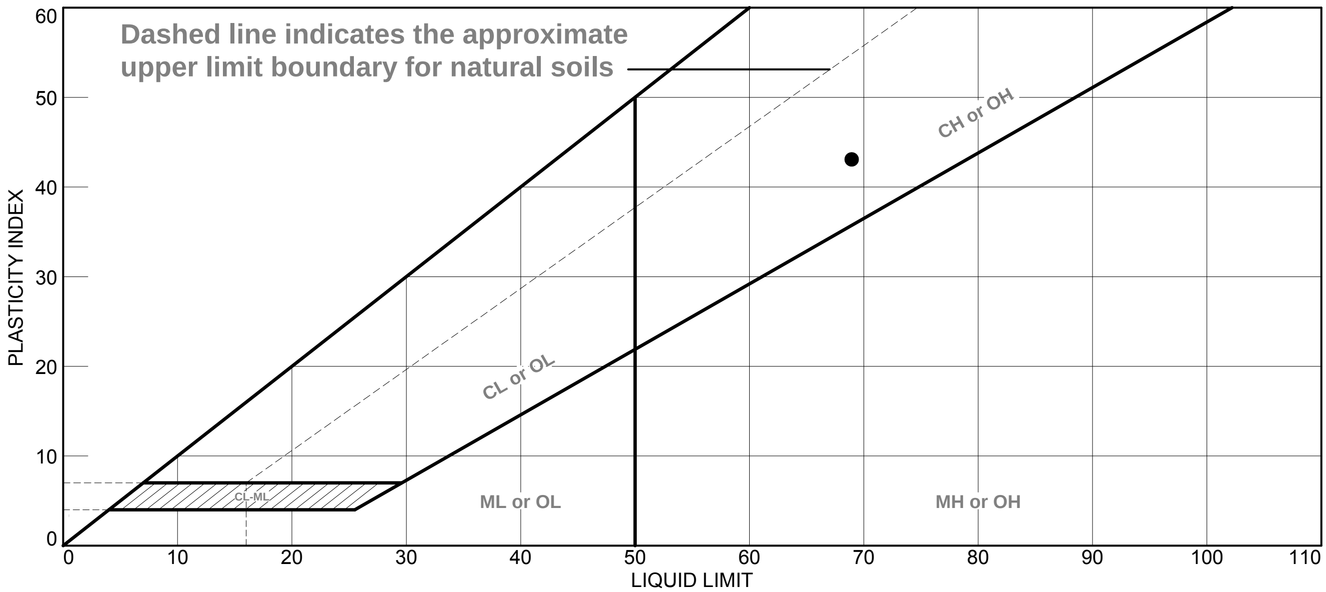
Date: 9-21-15

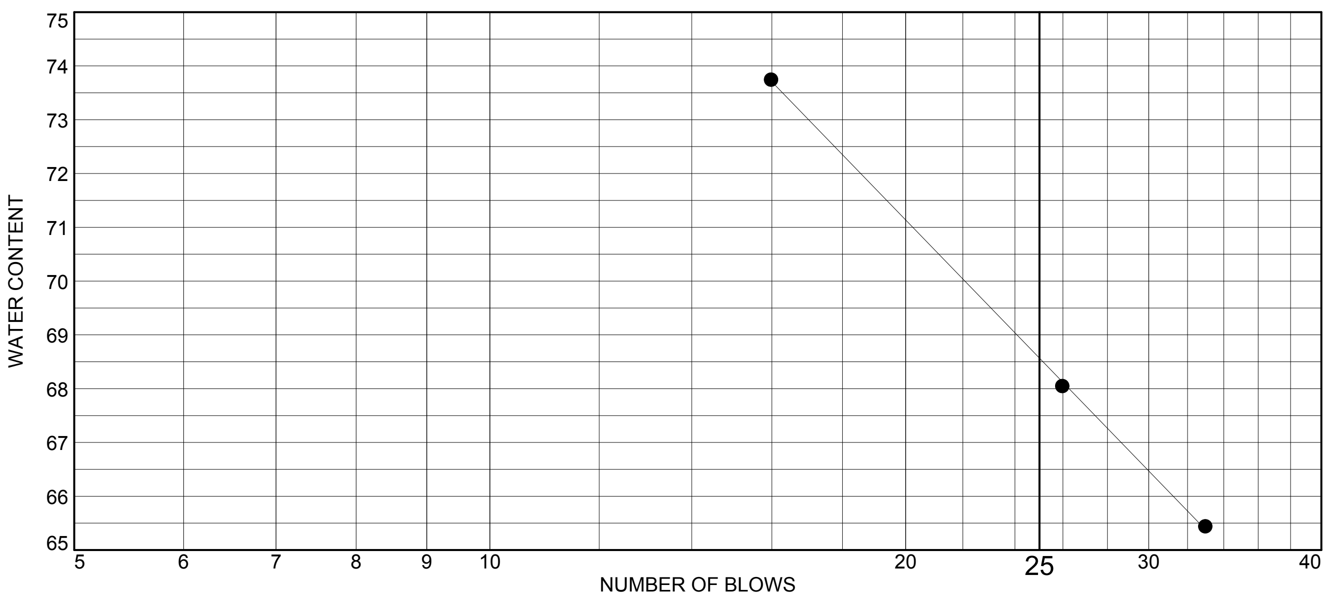
TERRACON
CONSULTANTS, INC.
Columbus, Ohio

Client: American Electric Power
Project: Rockport Plant Impoundment Certification
Project No: N4155126 **Exhibit** B-2

Tested By: DS **Checked By:** AM

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown SANDY FAT CLAY, trace gravel	69	26	43	64.1	62.4	CH

Project No. N4155126 **Client:** American Electric Power

Project: Rockport Plant Impoundment Certification

Source of Sample: B-1 **Depth:** 2.0'-4.0'
Sample Number: S-2

Remarks:
●Date: 9-21-15

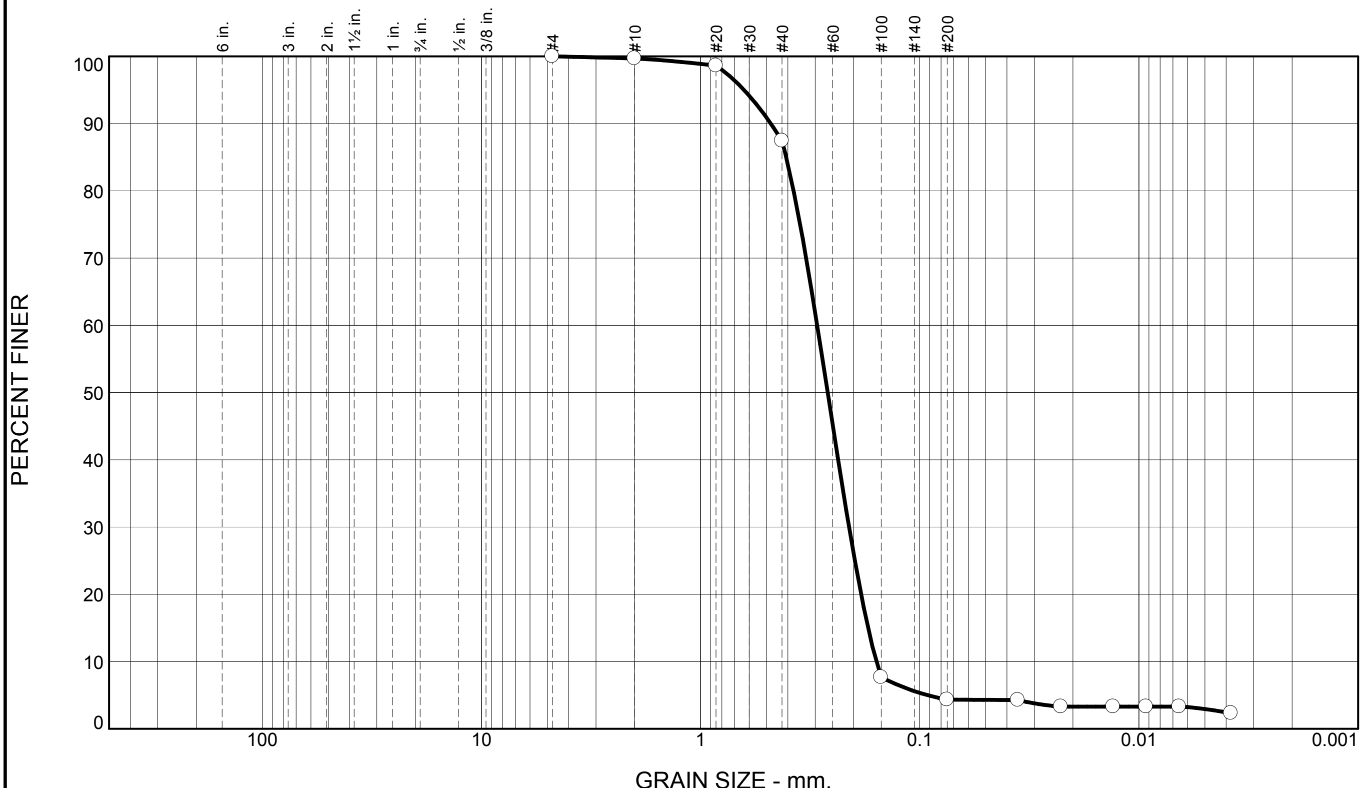
TERRACON CONSULTANTS, INC.

Columbus, Ohio

Exhibit B-3

Tested By: DS **Checked By:** AM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	12.3	83.1	1.4	2.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#20	98.6		
#40	87.4		
#100	7.7		
#200	4.3		
0.0357 mm.	4.3		
0.0227 mm.	3.3		
0.0131 mm.	3.3		
0.0093 mm.	3.3		
0.0066 mm.	3.3		
0.0038 mm.	2.3		

* (no specification provided)

Soil Description

Brown poorly graded SAND

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.4785 D_{85}= 0.4068 D_{60}= 0.2938
D_{50}= 0.2631 D_{30}= 0.2102 D_{15}= 0.1721
D_{10}= 0.1577 C_u= 1.86 C_c= 0.95

Classification

USCS= SP AASHTO= A-3

Remarks

F.M.=1.37

Source of Sample: B-1 **Depth:** 18.0'-20.0'
Sample Number: S-7

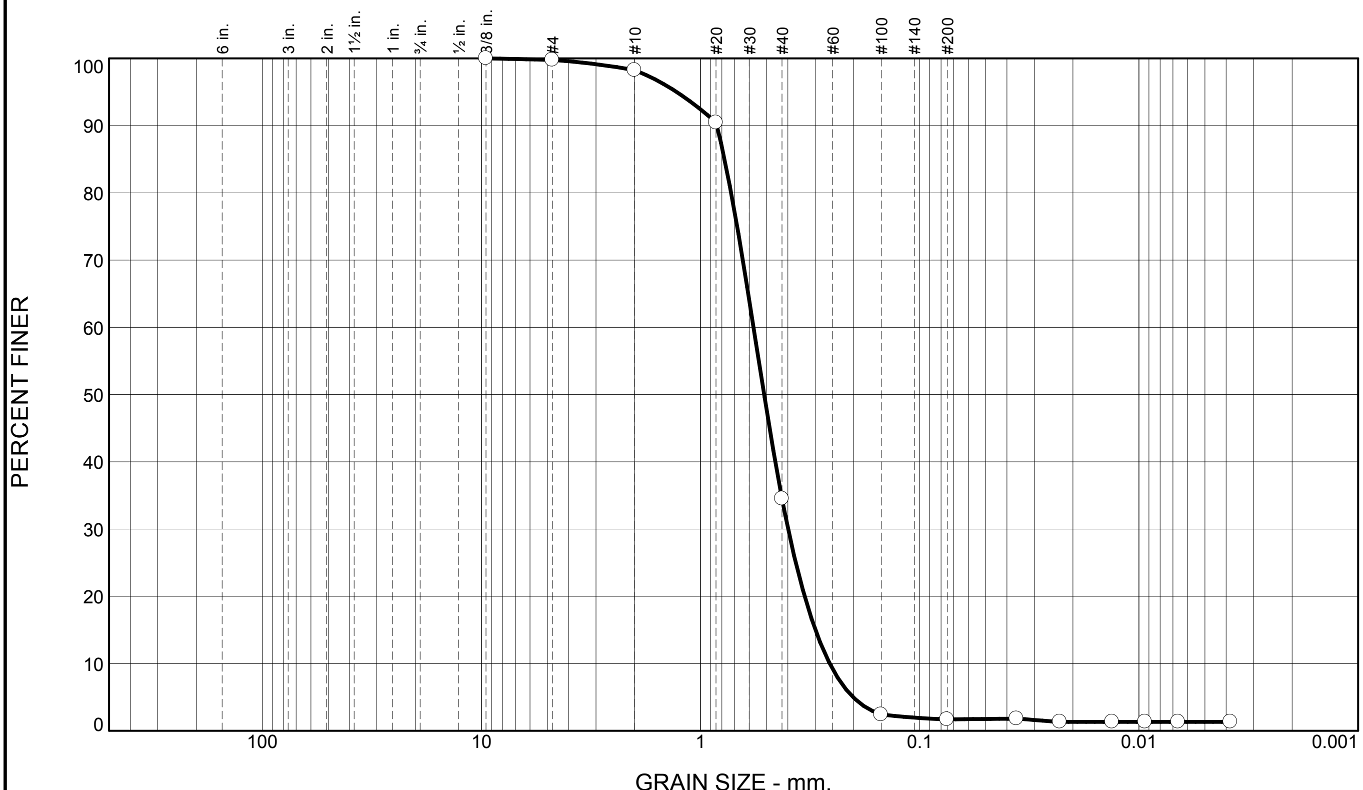
Date: 9-21-15

TERRACON
CONSULTANTS, INC.
Columbus, Ohio

Client: American Electric Power
Project: Rockport Plant Impoundment Certification
Project No: N4155126 **Exhibit** B-4

Tested By: DS **Checked By:** AM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	1.6	63.7	32.8	0.4	1.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8	100.0		
#4	99.8		
#10	98.2		
#20	90.4		
#40	34.5		
#100	2.4		
#200	1.7		
0.0362 mm.	1.8		
0.0229 mm.	1.3		
0.0132 mm.	1.3		
0.0094 mm.	1.3		
0.0066 mm.	1.3		
0.0038 mm.	1.3		

* (no specification provided)

Soil Description

Brown poorly graded SAND, trace gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.8432 D_{85}= 0.7776 D_{60}= 0.5735
D_{50}= 0.5129 D_{30}= 0.3986 D_{15}= 0.2992
D_{10}= 0.2576 C_u= 2.23 C_c= 1.08

Classification

USCS= SP AASHTO= A-1-b

Remarks

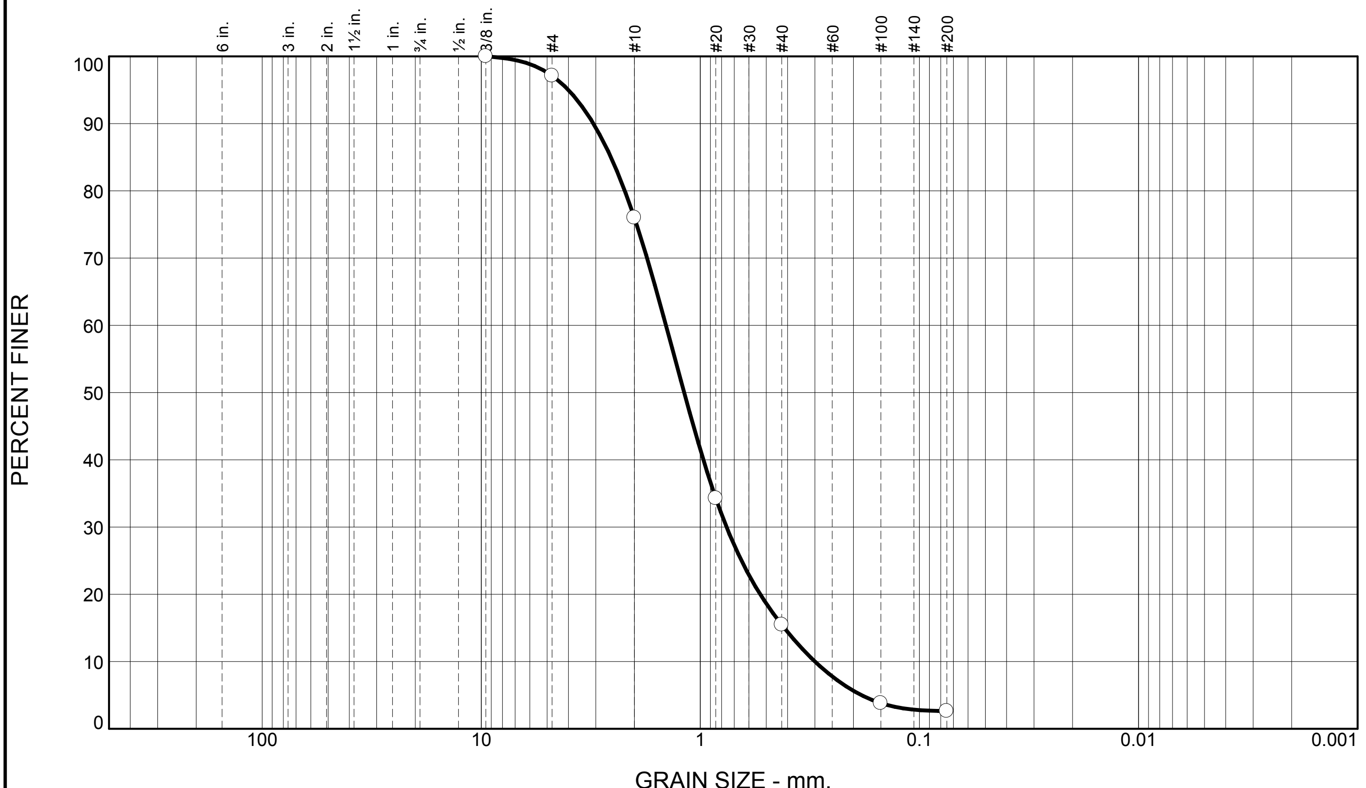
F.M.=2.26

Source of Sample: B-1 **Depth:** 28.0'-30.0'
Sample Number: S-9 **Date:** 9-21-15

TERRACON CONSULTANTS, INC. Columbus, Ohio	**Client:** American Electric Power **Project:** Rockport Plant Impoundment Certification **Project No:** N4155126 **Exhibit** B-5

Tested By: DS **Checked By:** AM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.9	21.1	60.5	12.9	2.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8	100.0		
#4	97.1		
#10	76.0		
#20	34.3		
#40	15.5		
#100	3.8		
#200	2.6		

* (no specification provided)

Soil Description

Brown poorly graded SAND, trace gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 3.0772 D_{85}= 2.5603 D_{60}= 1.4351
D_{50}= 1.1849 D_{30}= 0.7595 D_{15}= 0.4140
D_{10}= 0.2999 C_u= 4.79 C_c= 1.34

Classification

USCS= SP AASHTO= A-1-b

Remarks

F.M.=3.34

Source of Sample: B-1 **Depth:** 33.0'-35.0'
Sample Number: S-10

Date: 9-21-15

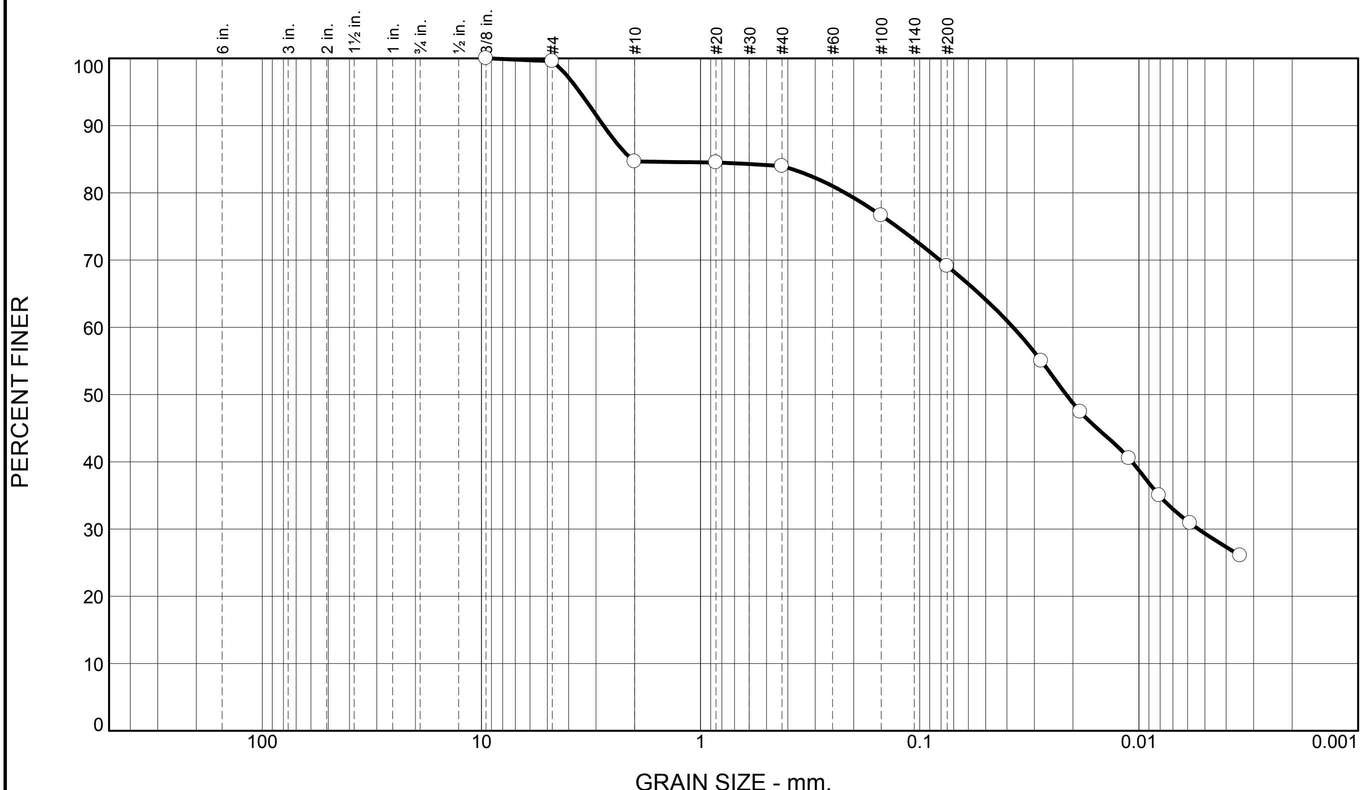
TERRACON
CONSULTANTS, INC.
Columbus, Ohio

Client: American Electric Power
Project: Rockport Plant Impoundment Certification

Project No: N4155126 **Exhibit** B-6

Tested By: DS **Checked By:** AM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.4	14.9	0.7	14.9	39.8	29.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8	100.0		
#4	99.6		
#10	84.7		
#20	84.5		
#40	84.0		
#100	76.6		
#200	69.1		
0.0279 mm.	55.0		
0.0185 mm.	47.4		
0.0111 mm.	40.5		
0.0081 mm.	35.0		
0.0058 mm.	30.9		
0.0034 mm.	26.1		

* (no specification provided)

Soil Description

FILL: Brown sandy lean clay, trace gravel

Atterberg Limits

PL= 15 LL= 28 PI= 13

Coefficients

D_{90}= 2.7745 D_{85}= 2.0607 D_{60}= 0.0375
D_{50}= 0.0215 D_{30}= 0.0054 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(6)

Remarks

F.M.=0.86

Source of Sample: B-2 **Depth:** 0.0'-2.0'
Sample Number: S-1

Date: 9-21-15

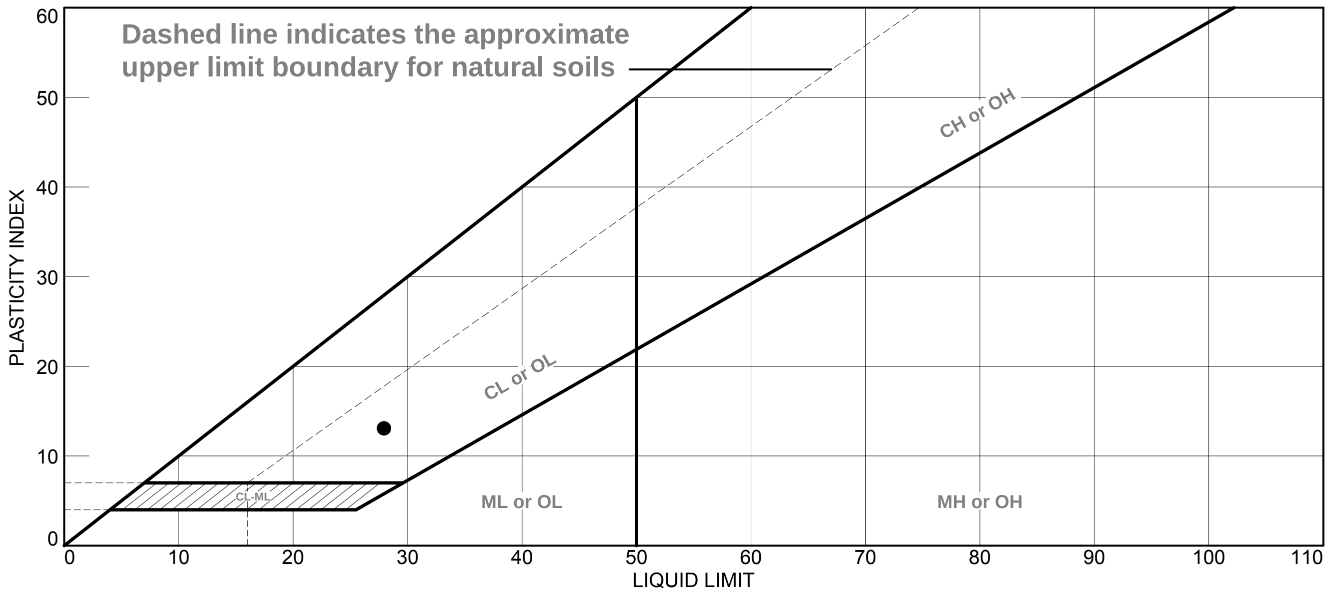
TERRACON
CONSULTANTS, INC.
Columbus, Ohio

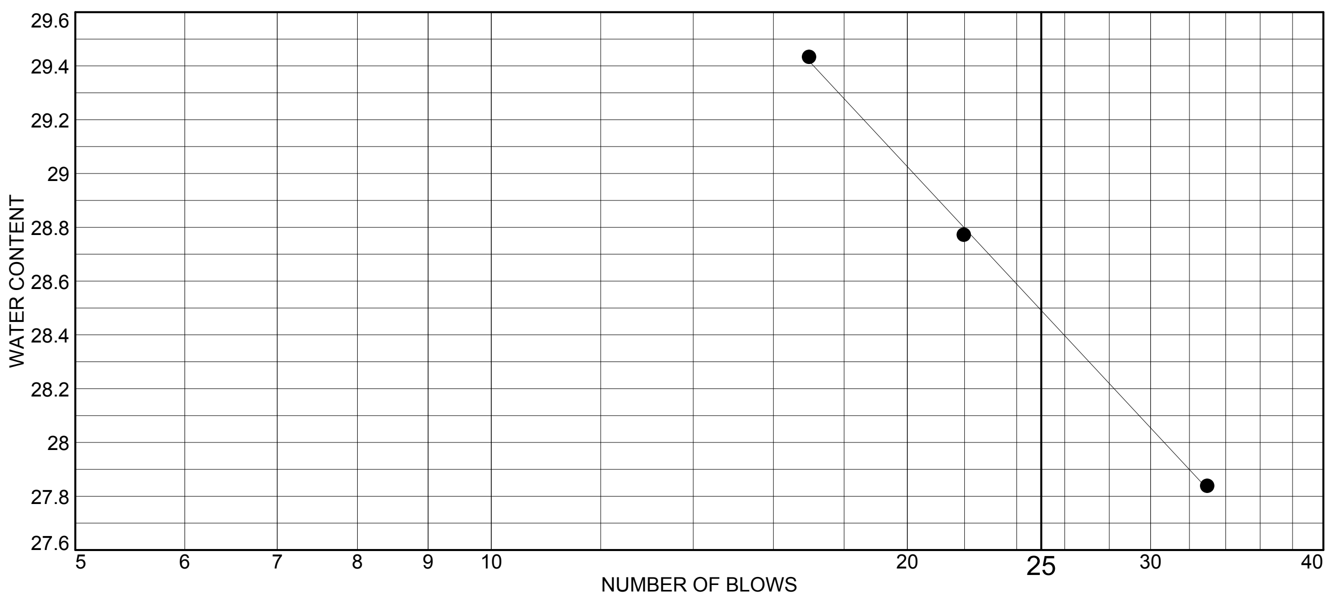
Client: American Electric Power
Project: Rockport Plant Impoundment Certification

Project No: N4155126 **Exhibit** B-7

Tested By: DS **Checked By:** AM

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	FILL: Brown sandy lean clay, trace gravel	28	15	13	84.0	69.1	CL

Project No. N4155126 **Client:** American Electric Power

Project: Rockport Plant Impoundment Certification

Source of Sample: B-2 **Depth:** 0.0'-2.0'
Sample Number: S-1

Remarks:
●Date: 9-21-15

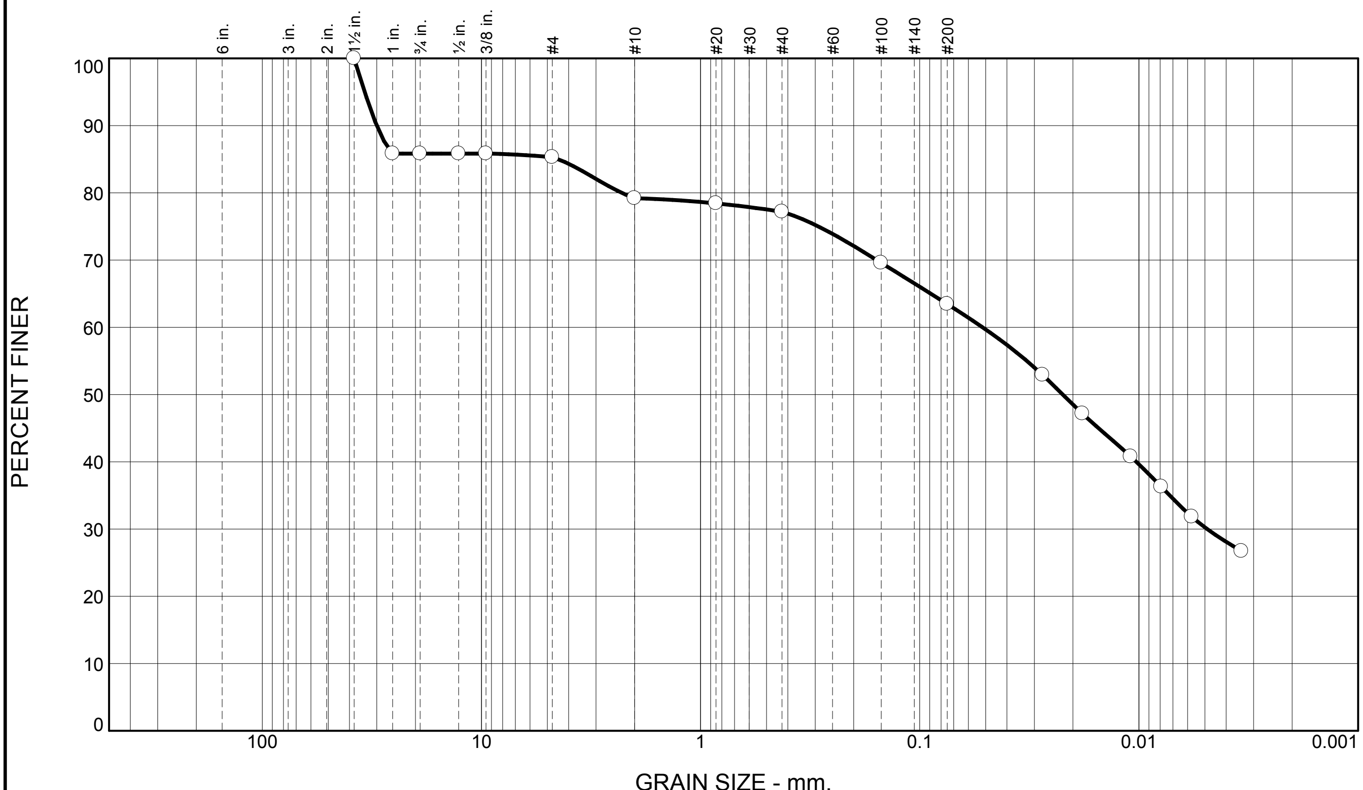
TERRACON CONSULTANTS, INC.

Columbus, Ohio

Exhibit B-8

Tested By: DS **Checked By:** AM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	14.2	0.5	6.1	2.0	13.7	33.3	30.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1.0	85.8		
3/4	85.8		
1/2	85.8		
3/8	85.8		
#4	85.3		
#10	79.2		
#20	78.4		
#40	77.2		
#100	69.6		
#200	63.5		
0.0275 mm.	52.9		
0.0181 mm.	47.2		
0.0109 mm.	40.8		
0.0079 mm.	36.3		
0.0057 mm.	31.8		
0.0034 mm.	26.7		

* (no specification provided)

Soil Description

Gray and orange SANDY LEAN CLAY, trace gravel

Atterberg Limits

PL= 15 LL= 35 PI= 20

Coefficients

D_{90}= 30.0206 D_{85}= 4.4748 D_{60}= 0.0517
D_{50}= 0.0223 D_{30}= 0.0049 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(10)

Remarks

F.M.=1.61

Source of Sample: B-2 **Depth:** 16.0'-18.0'
Sample Number: S-7

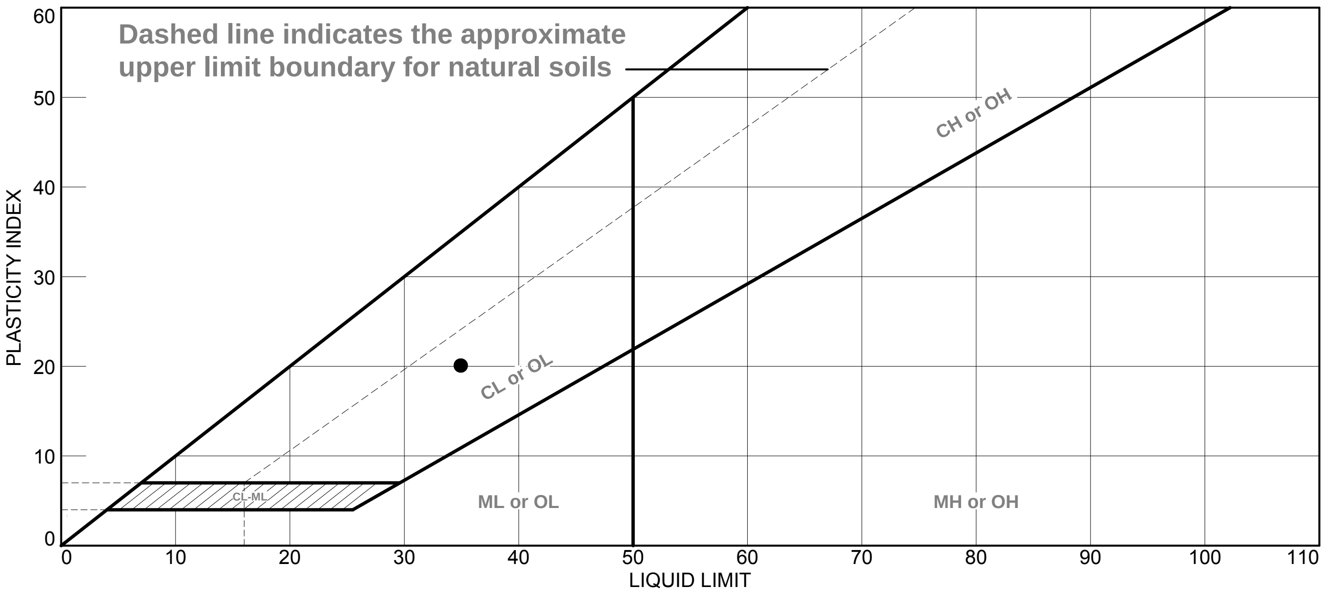
Date: 9-21-15

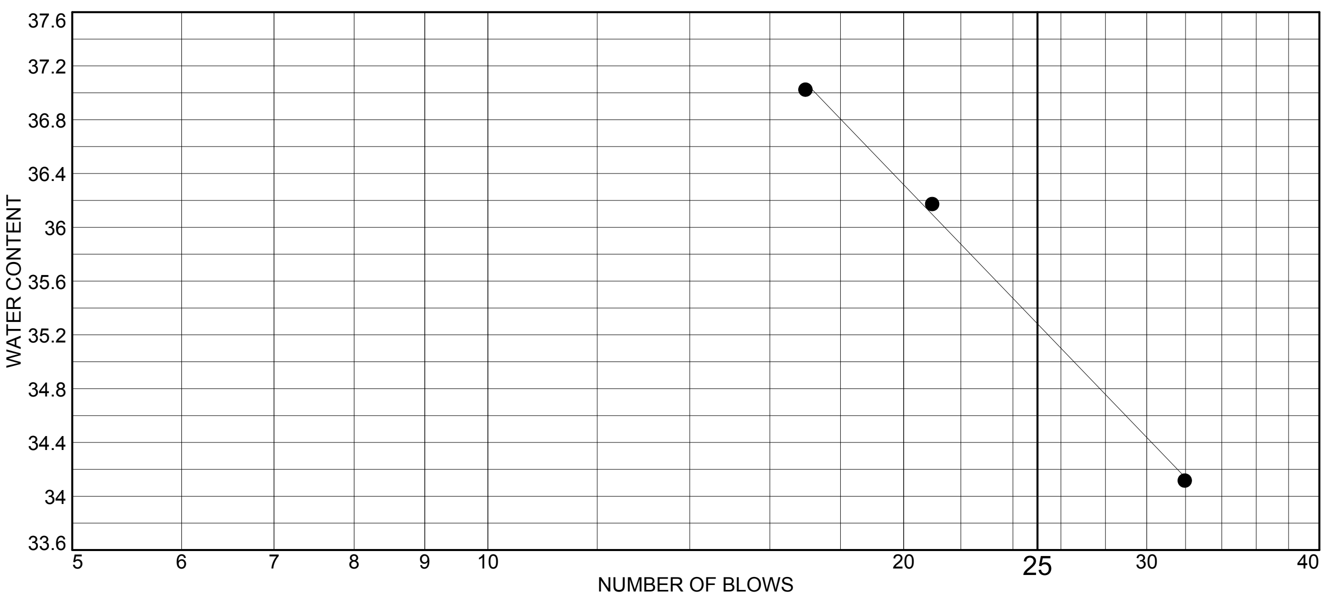
TERRACON
CONSULTANTS, INC.
Columbus, Ohio

Client: American Electric Power
Project: Rockport Plant Impoundment Certification
Project No: N4155126 **Exhibit** B-9

Tested By: DS **Checked By:** AM

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray and orange SANDY LEAN CLAY, trace gravel	35	15	20	77.2	63.5	CL

Project No. N4155126 **Client:** American Electric Power

Project: Rockport Plant Impoundment Certification

Source of Sample: B-2 **Depth:** 16.0'-18.0'
Sample Number: S-7

Remarks:
●Date: 9-21-15

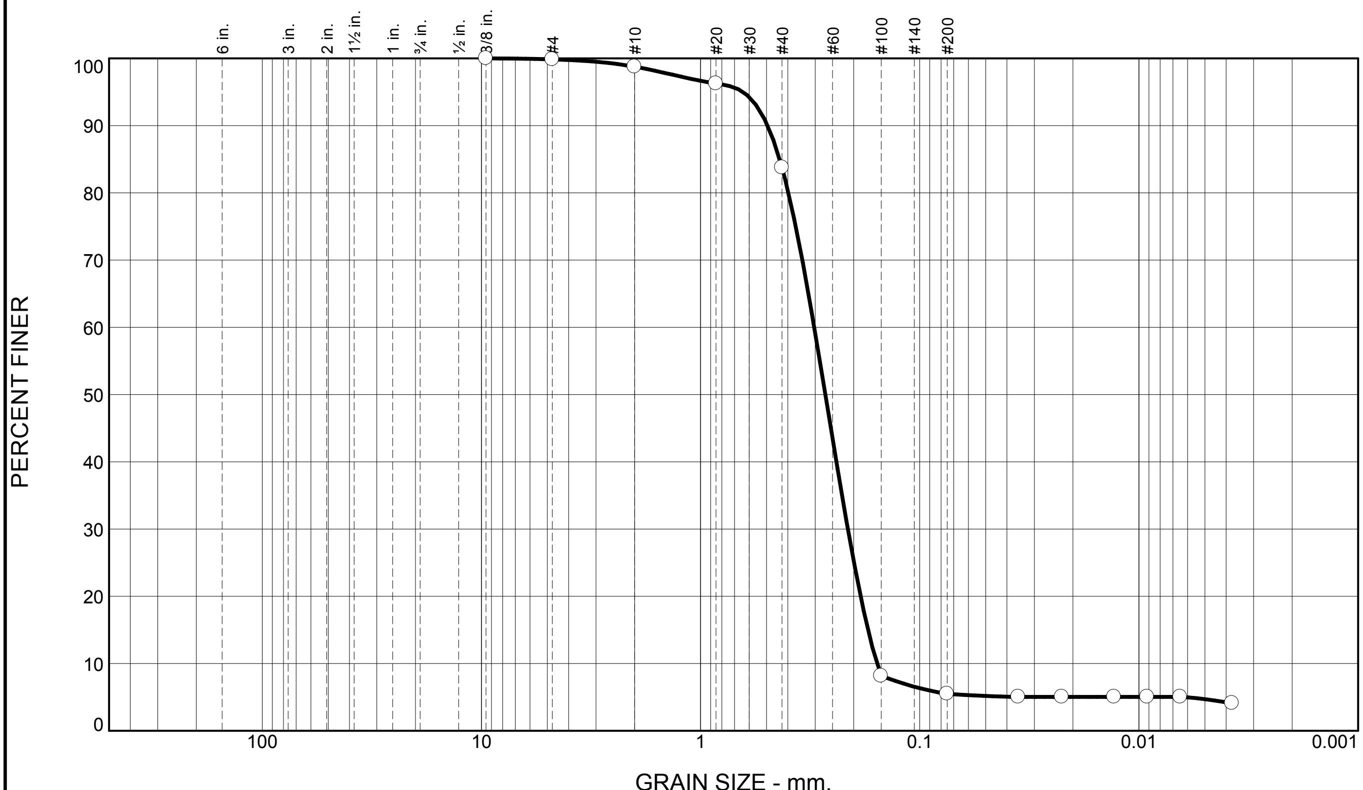
TERRACON CONSULTANTS, INC.

Columbus, Ohio

Exhibit B-10

Tested By: DS **Checked By:** AM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	1.0	15.0	78.3	0.8	4.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8	100.0		
#4	99.8		
#10	98.8		
#20	96.2		
#40	83.8		
#100	8.2		
#200	5.5		
0.0355 mm.	5.0		
0.0224 mm.	5.0		
0.0130 mm.	5.0		
0.0092 mm.	5.0		
0.0065 mm.	5.0		
0.0038 mm.	4.1		

* (no specification provided)

Soil Description

Brown poorly graded SAND with silt, trace gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.4948 D_{85}= 0.4358 D_{60}= 0.3031
D_{50}= 0.2696 D_{30}= 0.2128 D_{15}= 0.1722
D_{10}= 0.1566 C_u= 1.94 C_c= 0.95

Classification

USCS= SP-SM AASHTO= A-3

Remarks

F.M.=1.42

Source of Sample: B-2 **Depth:** 22.0'-24.0'
Sample Number: S-9

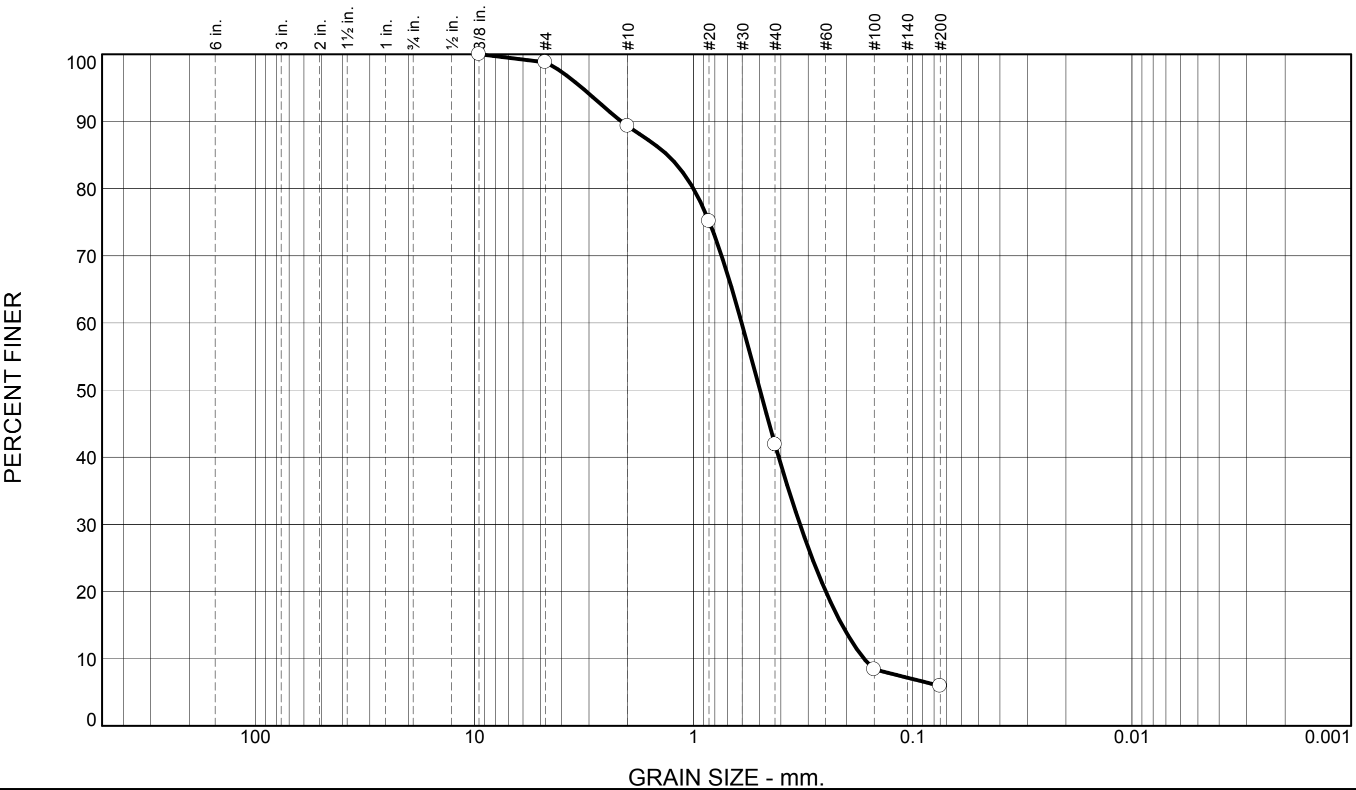
Date: 9-21-15

TERRACON
CONSULTANTS, INC.
Columbus, Ohio

Client: American Electric Power
Project: Rockport Plant Impoundment Certification
Project No: N4155126 **Exhibit** B-11

Tested By: DS **Checked By:** AM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.2	9.5	47.4	36.0	5.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8	100.0		
#4	98.8		
#10	89.3		
#20	75.1		
#40	41.9		
#100	8.4		
#200	5.9		

* (no specification provided)

Soil Description

Brown poorly graded SAND with silt, trace gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 2.1334 D_{85}= 1.3167 D_{60}= 0.6037
D_{50}= 0.4980 D_{30}= 0.3271 D_{15}= 0.2100
D_{10}= 0.1667 C_u= 3.62 C_c= 1.06

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

F.M.=2.32

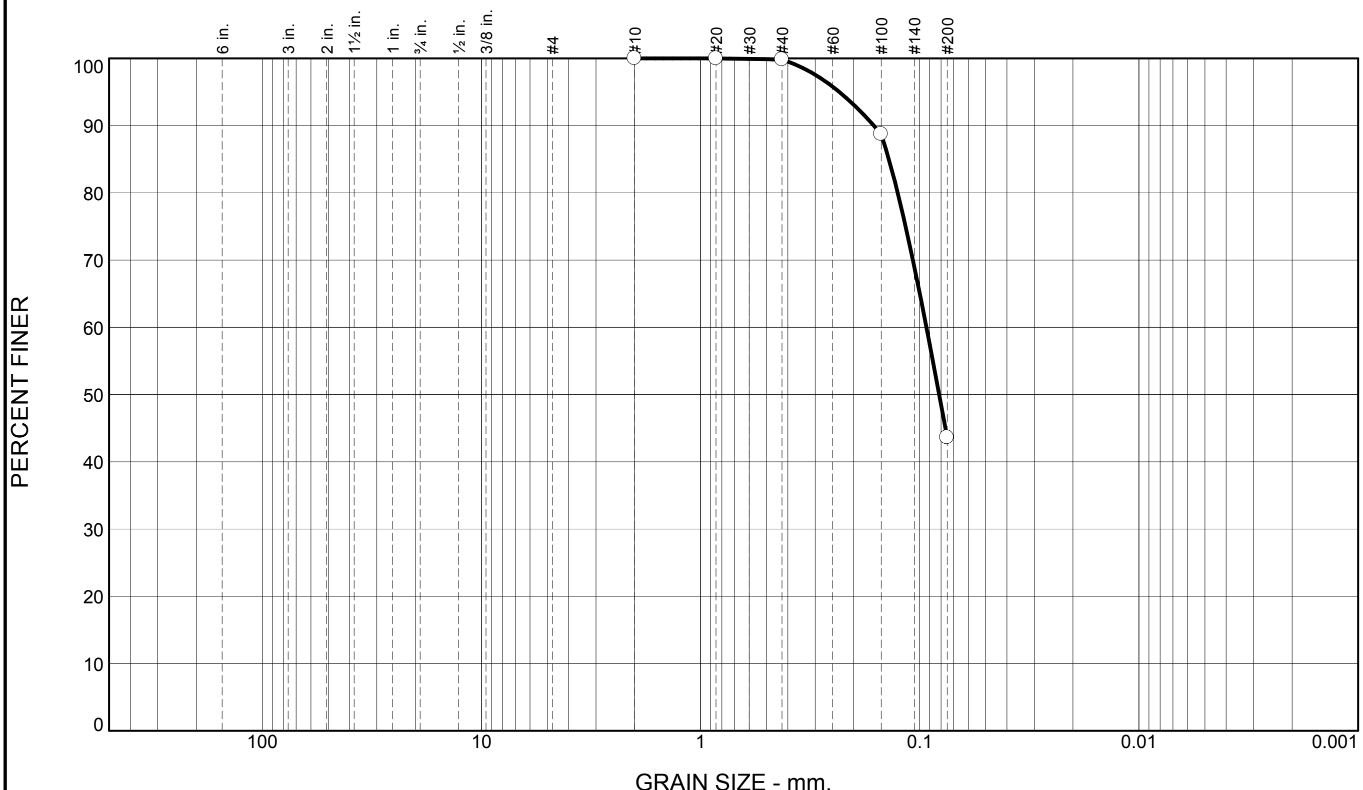
Source of Sample: B-2 **Depth:** 28.0'-30.0'
Sample Number: S-12 **Date:** 9-21-15

TERRACON
CONSULTANTS, INC.
Columbus, Ohio

Client: American Electric Power
Project: Rockport Plant Impoundment Certification
Project No: N4155126 **Exhibit** B-12

Tested By: DS **Checked By:** AM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	56.2	43.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	99.8		
#100	88.7		
#200	43.6		

* (no specification provided)

Soil Description

Brown SILTY SAND

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.1621 D_{85}= 0.1384 D_{60}= 0.0932
D_{50}= 0.0815 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

F.M.=0.14

Source of Sample: B-2 **Depth:** 32.0'-33.7'
Sample Number: S-14A

Date: 9-21-15

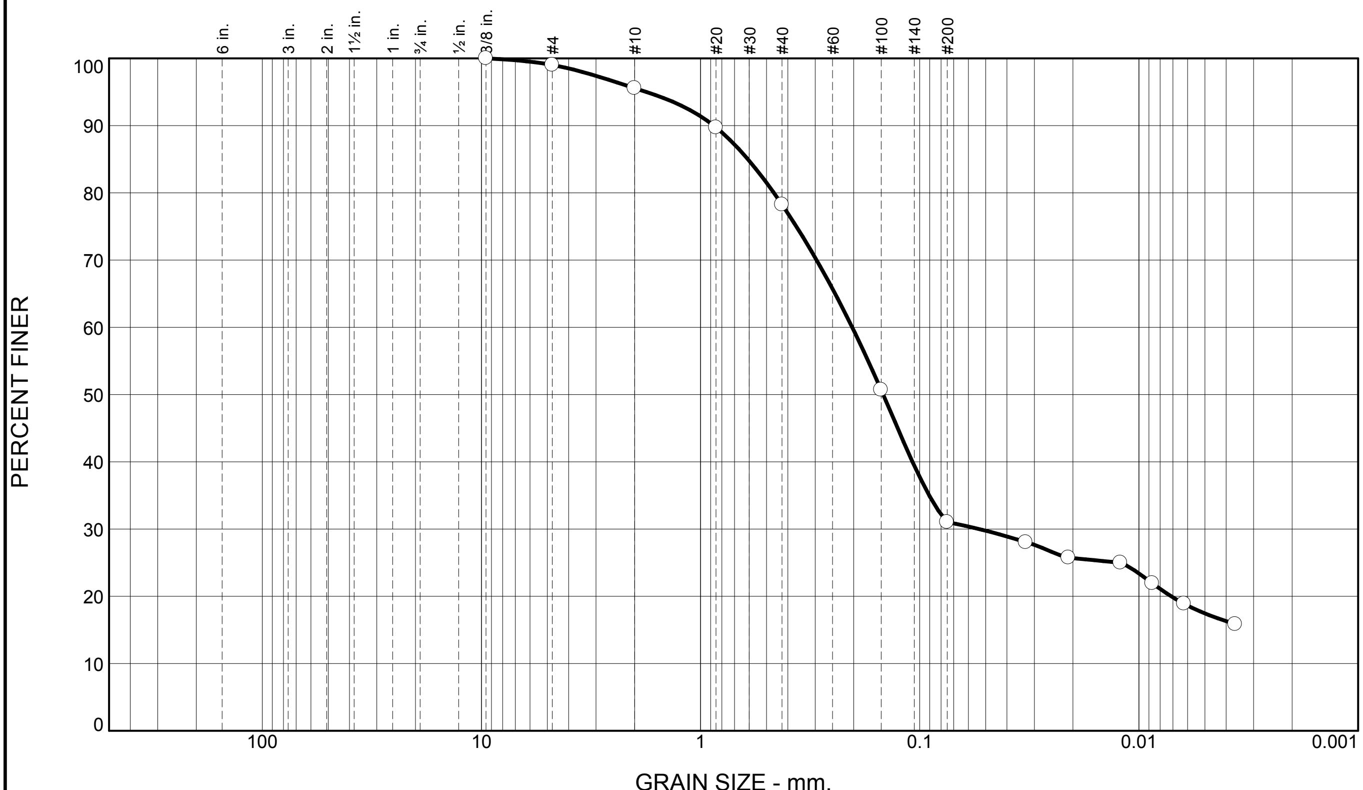
TERRACON
CONSULTANTS, INC.
Columbus, Ohio

Client: American Electric Power
Project: Rockport Plant Impoundment Certification

Project No: N4155126 **Exhibit** B-13

Tested By: DS **Checked By:** AM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.0	3.4	17.4	47.2	13.5	17.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8	100.0		
#4	99.0		
#10	95.6		
#20	89.7		
#40	78.2		
#100	50.7		
#200	31.0		
0.0328 mm.	28.0		
0.0210 mm.	25.7		
0.0121 mm.	25.0		
0.0087 mm.	21.9		
0.0062 mm.	18.9		
0.0036 mm.	15.8		

* (no specification provided)

Soil Description

Brown SILTY SAND, trace gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.8715 D_{85}= 0.6088 D_{60}= 0.2033
D_{50}= 0.1468 D_{30}= 0.0537 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

F.M.=1.06

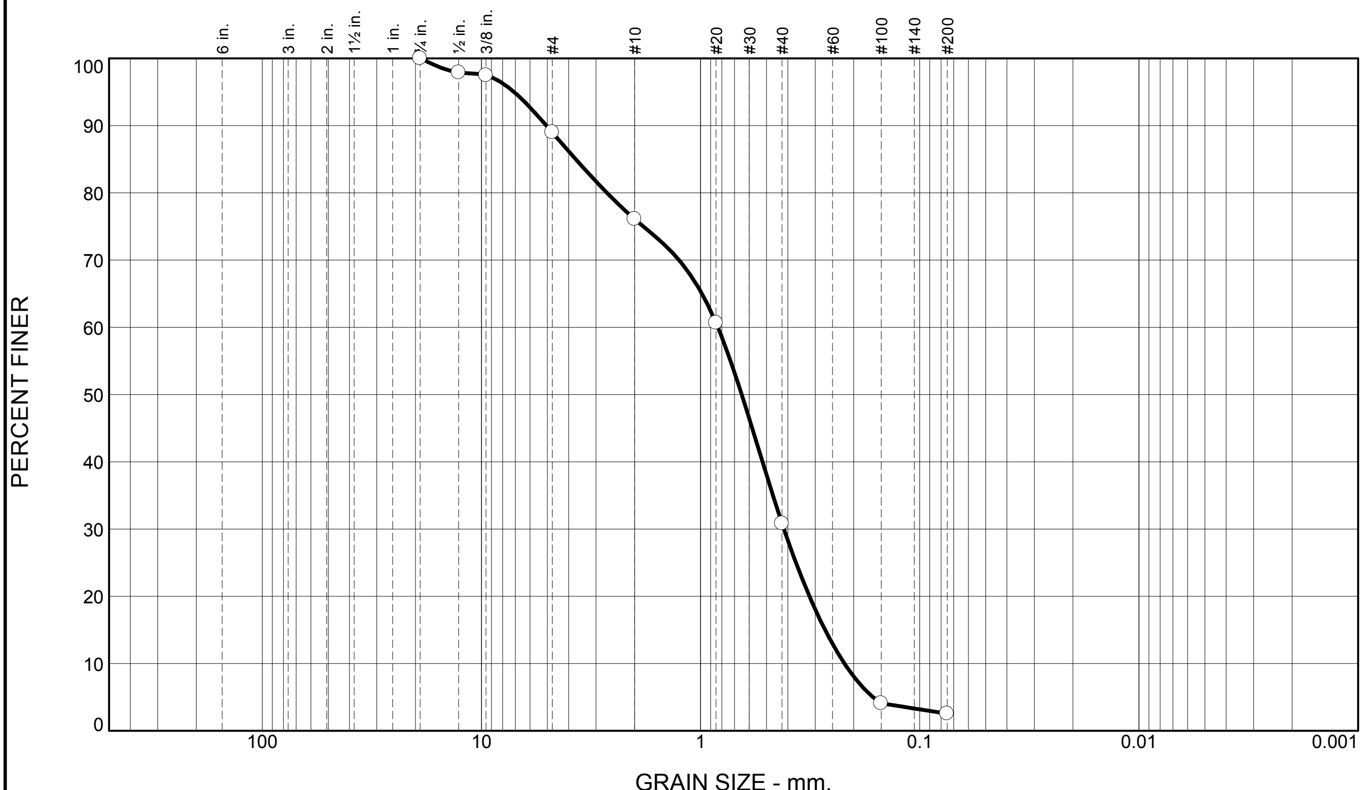
Source of Sample: B-2 **Depth:** 34.0'-36.0'
Sample Number: S-15 **Date:** 9-21-15

TERRACON
CONSULTANTS, INC.
Columbus, Ohio

Client: American Electric Power
Project: Rockport Plant Impoundment Certification
Project No: N4155126 **Exhibit** B-14

Tested By: DS **Checked By:** AM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	11.0	12.9	45.3	28.3	2.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	97.9		
3/8	97.5		
#4	89.0		
#10	76.1		
#20	60.7		
#40	30.8		
#100	4.1		
#200	2.5		

* (no specification provided)

Soil Description

Brown poorly graded SAND, trace gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 5.0561 D_{85}= 3.7126 D_{60}= 0.8336
D_{50}= 0.6494 D_{30}= 0.4167 D_{15}= 0.2704
D_{10}= 0.2206 C_u= 3.78 C_c= 0.94

Classification

USCS= SP AASHTO= A-1-b

Remarks

F.M.=2.98

Source of Sample: B-2 **Depth:** 42.0'-44.0'
Sample Number: S-19

Date: 9-21-15

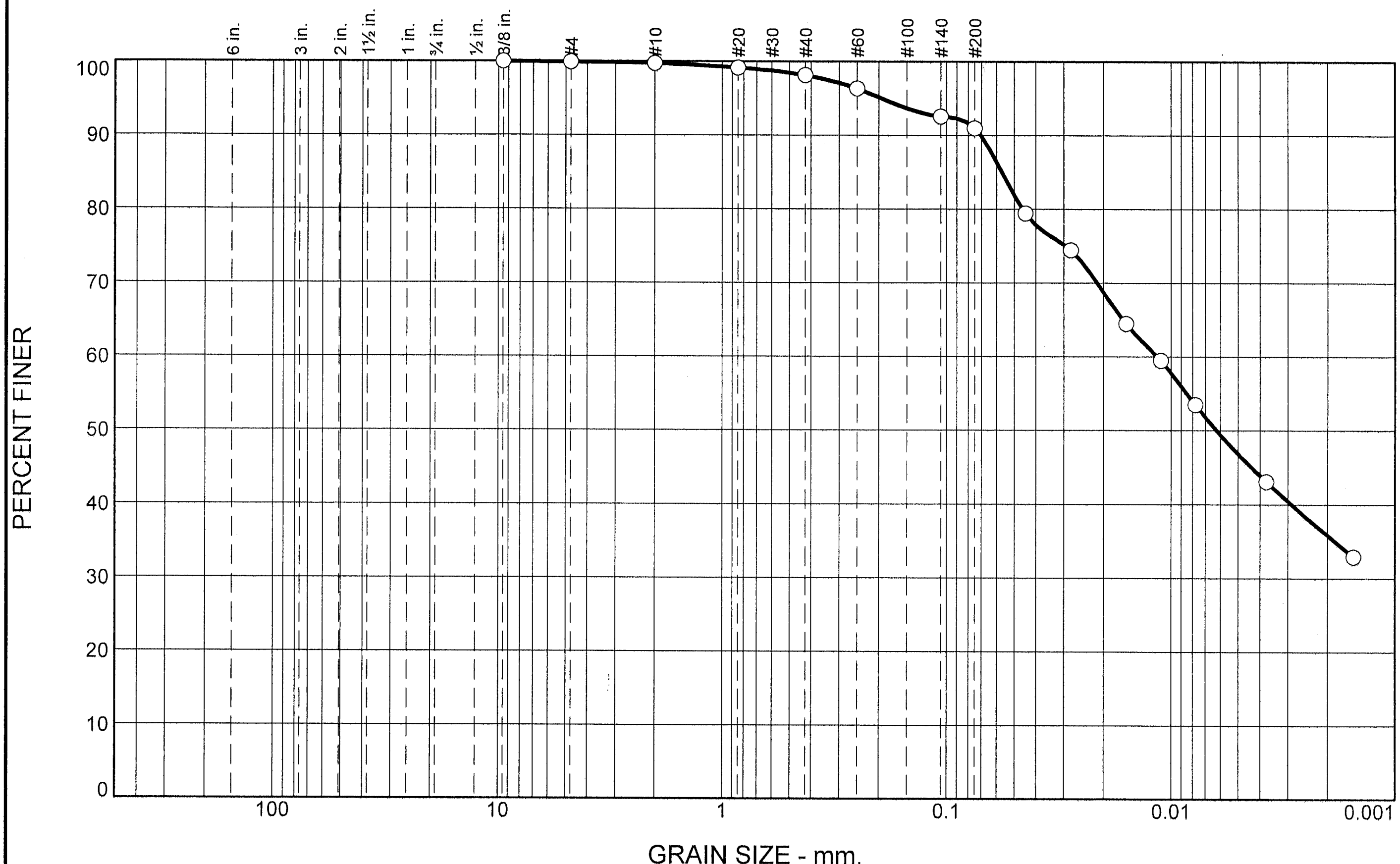
TERRACON
CONSULTANTS, INC.
Columbus, Ohio

Client: American Electric Power
Project: Rockport Plant Impoundment Certification

Project No: N4155126 **Exhibit** B-15

Tested By: DS **Checked By:** AM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.2	1.5	7.2	55.1	35.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.9		
#10	99.7		
#20	99.2		
#40	98.2		
#60	96.4		
#140	92.6		
#200	91.0		

* (no specification provided)

Material Description

BROWN GRAY LEAN CLAY

Atterberg Limits

PL= 22 LL= 42 PI= 20

Coefficients

D_{90}= 0.0705 D_{85}= 0.0568 D_{60}= 0.0115
D_{50}= 0.0062 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(19)

Remarks

Source of Sample: B-1 **Depth:** 8-10'
Sample Number: ST-2

Date: 9-28-15

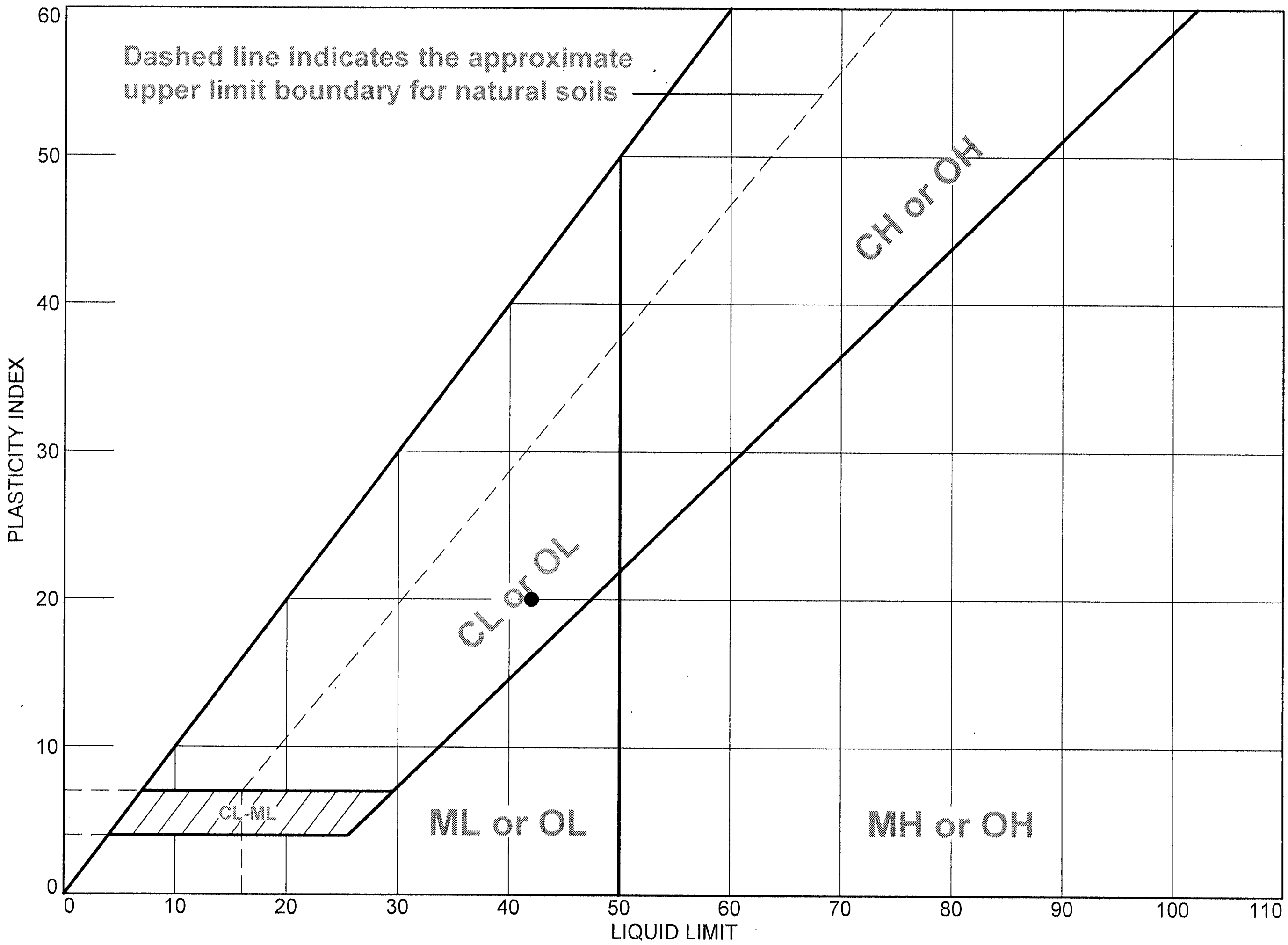
Terracon, Inc.

Cincinnati, Ohio

Client: AEP
Project: ROCKPORT PLANT IMPROVEMENT CERTIFICATION
Project No: N4155126 **Exhibit** 7353

Tested By: DR **Checked By:** GS

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN GRAY LEAN CLAY	42	22	20	98.2	91.0	CL

Project No. N4155126 **Client:** AEP

Project: ROCKPORT PLANT IMPROVEMENT CERTIFICATION

● **Source of Sample:** B-1 **Depth:** 8-10' **Sample Number:** ST-2

Remarks:

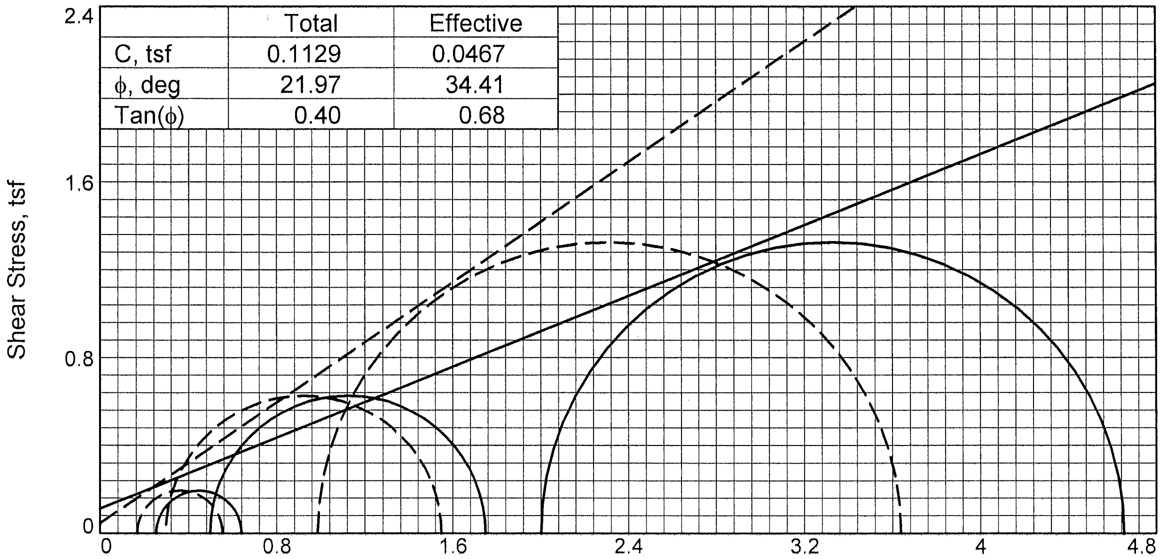
Terracon, Inc.

Cincinnati, Ohio

Exhibit 7353

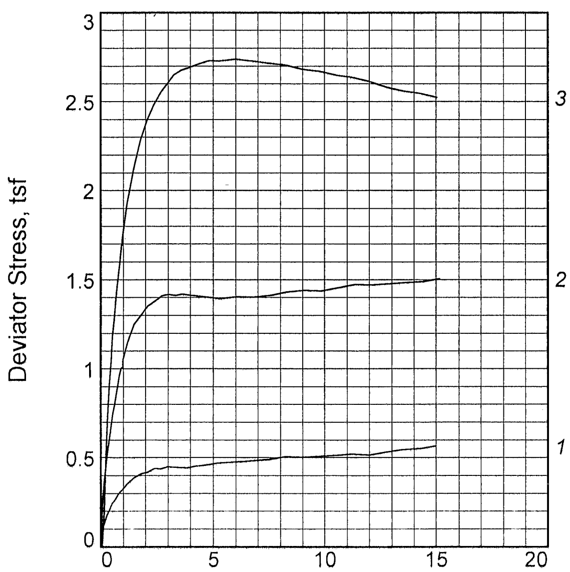
Tested By: MD **Checked By:** GS

Exhibit B-17



	Total	Effective
C, tsf	0.1129	0.0467
ϕ, deg	21.97	34.41
Tan(ϕ)	0.40	0.68

Total Normal Stress, tsf ———
Effective Normal Stress, tsf — — —



Sample No.		1	2	3
Initial	Water Content, %	25.2	28.6	27.0
	Dry Density, pcf	99.0	94.6	97.1
	Saturation, %	96.6	98.7	98.9
	Void Ratio	0.7033	0.7825	0.7364
	Diameter, in.	2.867	2.885	2.862
	Height, in.	5.748	5.717	5.757
At Test	Water Content, %	25.2	27.8	24.9
	Dry Density, pcf	100.4	96.3	100.7
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6794	0.7499	0.6736
	Diameter, in.	2.854	2.867	2.827
	Height, in.	5.721	5.682	5.687
Strain rate, in./min.		0.000	0.000	0.000
Back Pressure, tsf		3.600	3.600	3.600
Cell Pressure, tsf		3.852	4.097	5.602
Fail. Stress, tsf		0.388	1.252	2.652
Total Pore Pr., tsf		3.686	3.802	4.615
Ult. Stress, tsf				
Total Pore Pr., tsf				
$\bar{\sigma}_1$ Failure, tsf		0.554	1.547	3.638
$\bar{\sigma}_3$ Failure, tsf		0.166	0.295	0.986

Type of Test:
CU with Pore Pressures
Sample Type: ST
Description: BROWN GRAY LEAN CLAY

LL= 42 **PL=** 22 **PI=** 20
Assumed Specific Gravity= 2.70
Remarks:

Exhibit 7353

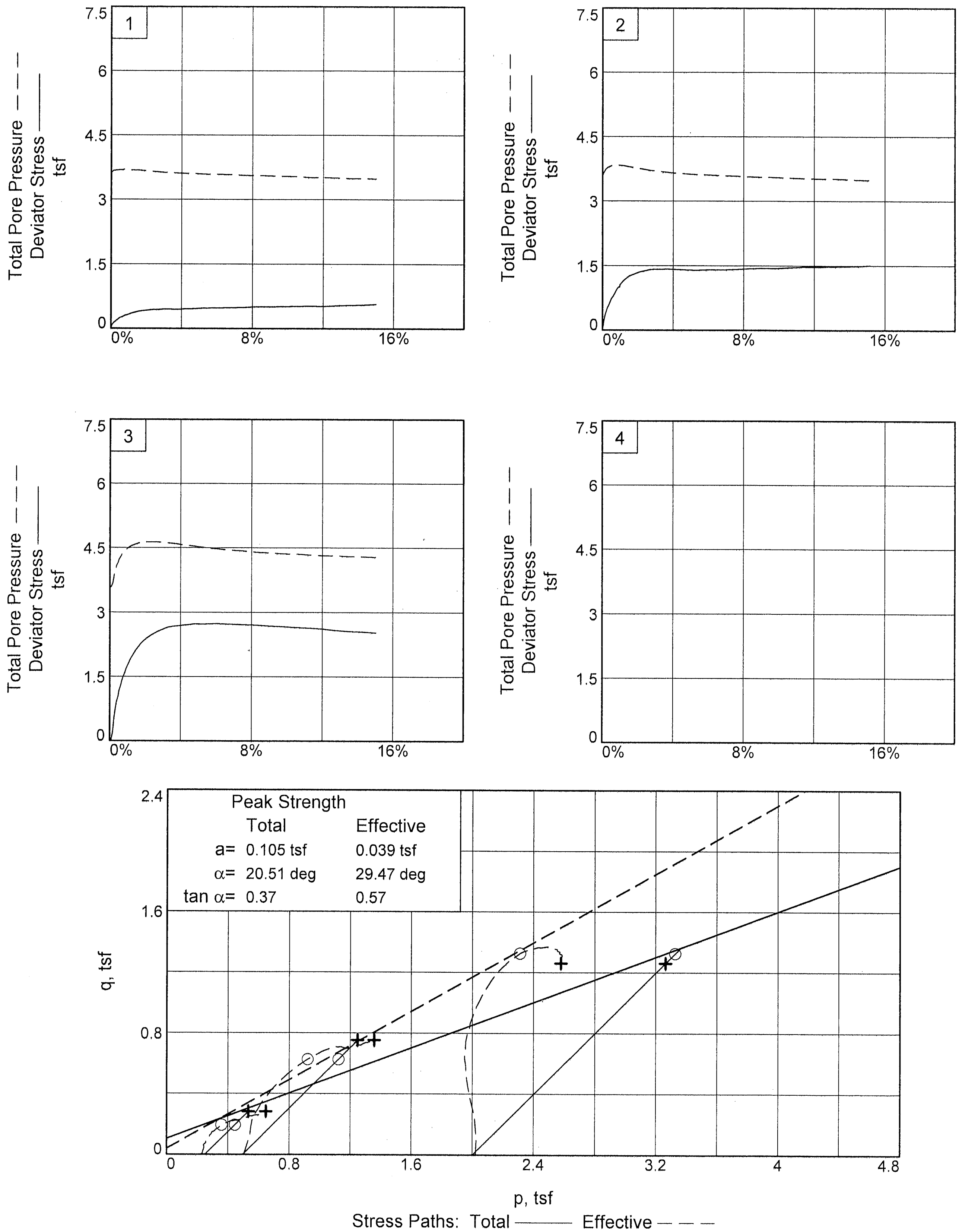
Client: AEP

Project: ROCKPORT PLANT IMPROVEMENT CERTIFICATION

Source of Sample: B-1 **Depth:** 8-10'
Sample Number: ST-2
Proj. No.: N4155126 **Date Sampled:** 9-28-15

TRIAXIAL SHEAR TEST REPORT
Terracon, Inc.
Cincinnati, Ohio

Tested By: FCE **Checked By:** GS



Client: AEP

Project: ROCKPORT PLANT IMPROVEMENT CERTIFICATION

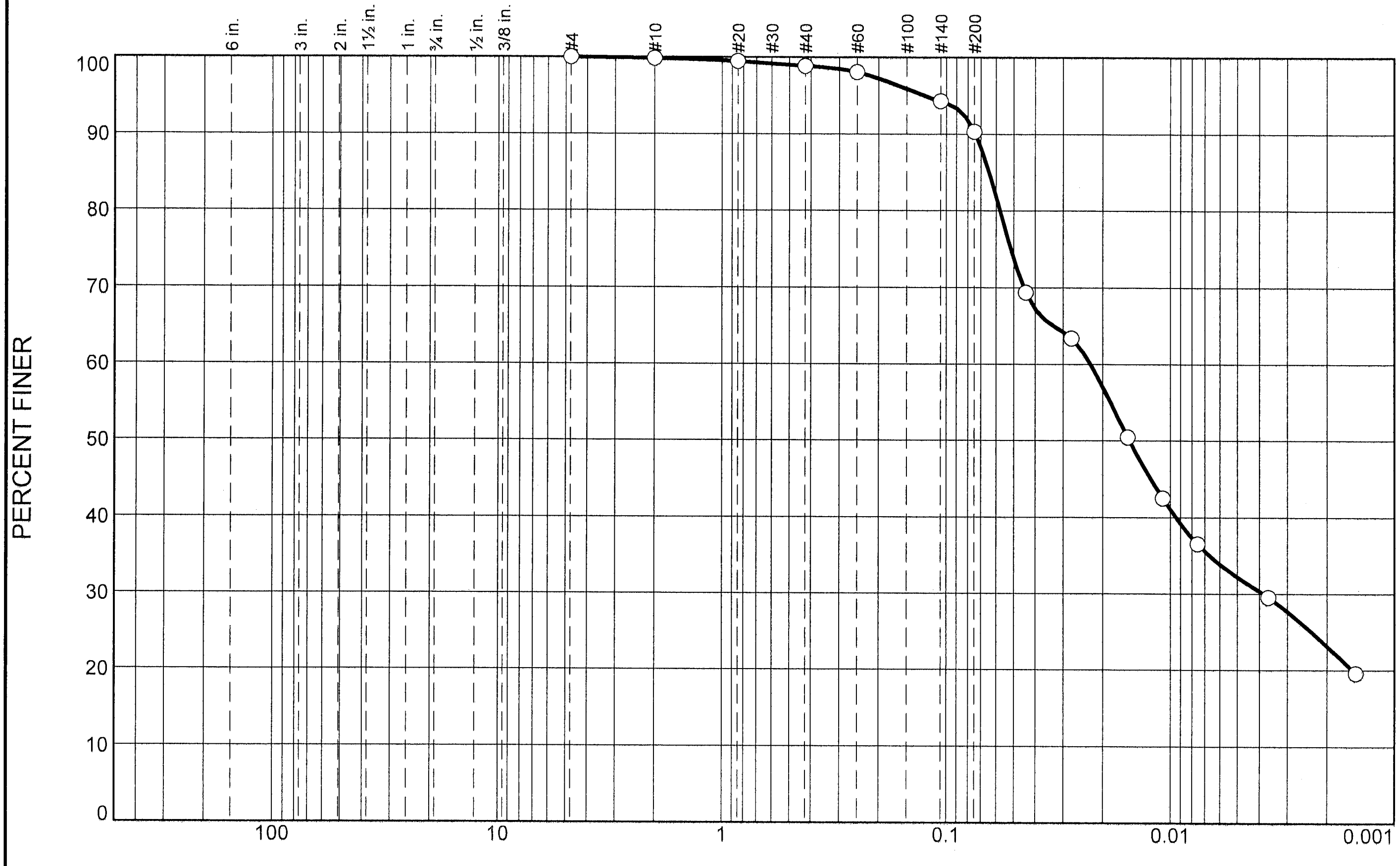
Source of Sample: B-1 **Depth:** 8-10' **Sample Number:** ST-2

Project No.: N4155126 **Exhibit** ________

Terracon, Inc.

Tested By: FCE **Checked By:** GS

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	9.7	58.1	32.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.5		
#40	98.9		
#60	98.1		
#140	94.3		
#200	90.3		

* (no specification provided)

Material Description

BROWN GRAY LEAN CLAY

Atterberg Limits

PL= 18 LL= 28 PI= 10

Coefficients

D_{90}= 0.0742 D_{85}= 0.0645 D_{60}= 0.0227
D_{50}= 0.0152 D_{30}= 0.0038 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-4(8)

Remarks

Source of Sample: B-1 **Depth:** 14-16'
Sample Number: ST-3

Date: 10-05-15

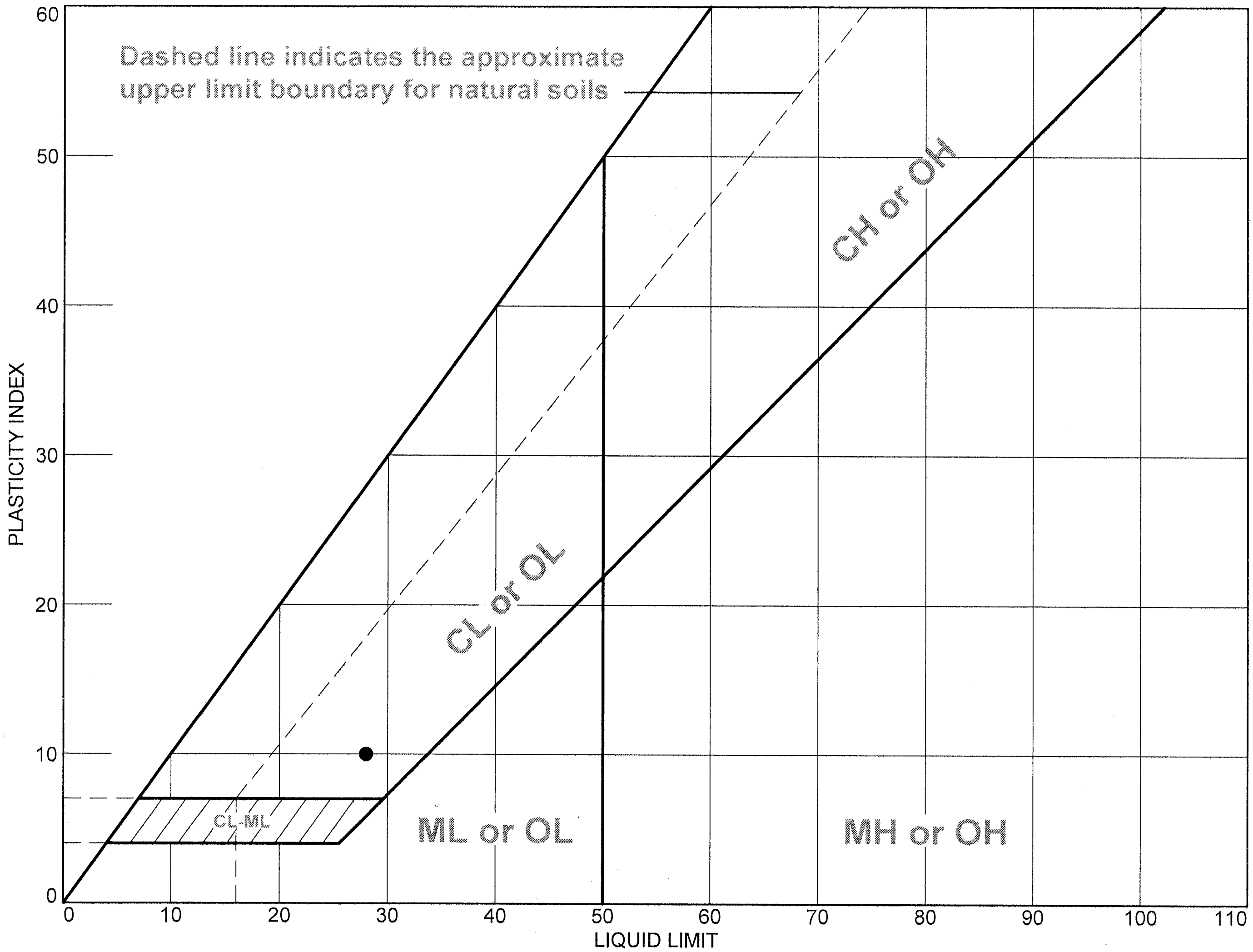
Terracon, Inc.
Cincinnati, Ohio

Client: AEP
Project: ROCKPORT PLANT IMPROVEMENT CERTIFICATION
Project No: N4155126 **Exhibit**

Tested By: JB **Checked By:** GS

Exhibit B-20

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN GRAY LEAN CLAY	28	18	10	98.9	90.3	CL

Project No. N4155126 **Client:** AEP

Project: ROCKPORT PLANT IMPROVEMENT CERTIFICATION

● **Source of Sample:** B-1 **Depth:** 14-16' **Sample Number:** ST-3

Remarks:

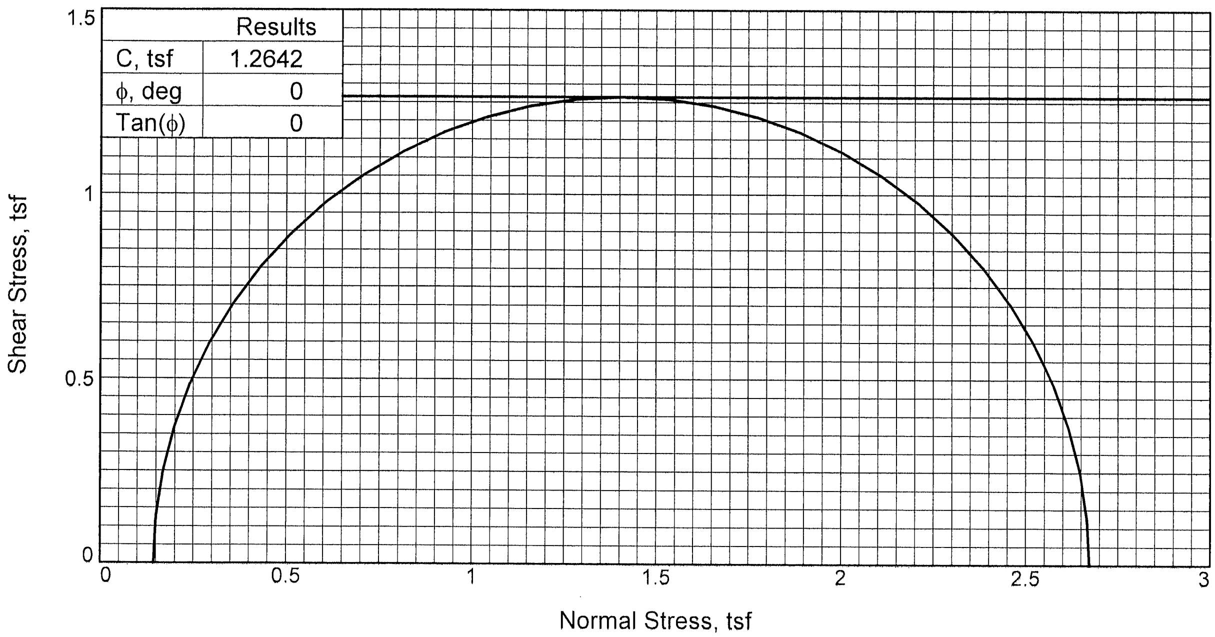
● MC - 22.5%

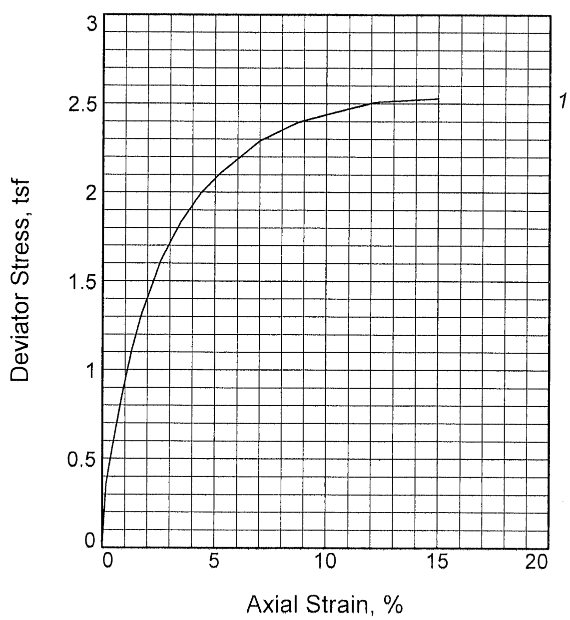
Terracon, Inc.

Cincinnati, Ohio

Exhibit

Exhibit B-21





Sample No.		1
Initial	Water Content, %	22.5
	Dry Density, pcf	104.7
	Saturation, %	99.5
	Void Ratio	0.6095
	Diameter, in.	2.860
	Height, in.	5.734
At Test	Water Content, %	22.9
	Dry Density, pcf	104.7
	Saturation, %	101.4
	Void Ratio	0.6095
	Diameter, in.	2.860
	Height, in.	5.734
Strain rate, in./min.		0.057
Back Pressure, tsf		0.000
Cell Pressure, tsf		0.144
Fail. Stress, tsf		2.528
Ult. Stress, tsf		
σ_1 Failure, tsf		2.672
σ_3 Failure, tsf		0.144

Type of Test:
Unconsolidated Undrained

Sample Type: ST

Description: BROWN GRAY LEAN CLAY

LL= 28 **PL=** 18 **PI=** 10

Assumed Specific Gravity= 2.70

Remarks:

Exhibit 7354

Client: AEP

Project: ROCKPORT PLANT IMPROVEMENT CERTIFICATION

Source of Sample: B-1 **Depth:** 14-16'

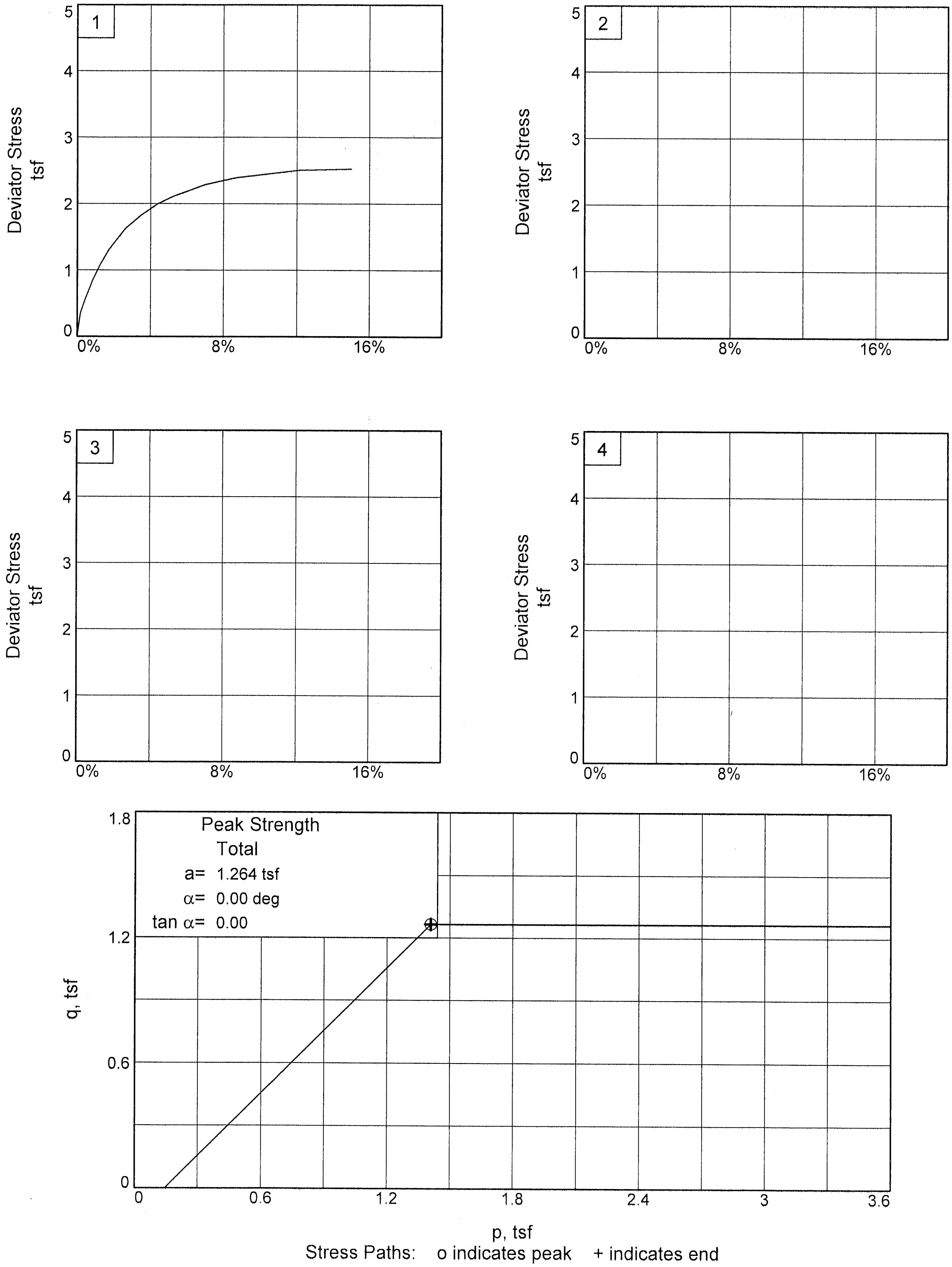
Sample Number: ST-3

Proj. No.: N4155126 **Date Sampled:** 10-05-15

TRIAXIAL SHEAR TEST REPORT

Terracon, Inc.
Cincinnati, Ohio

Tested By: FCE **Checked By:** GS



Client: AEP

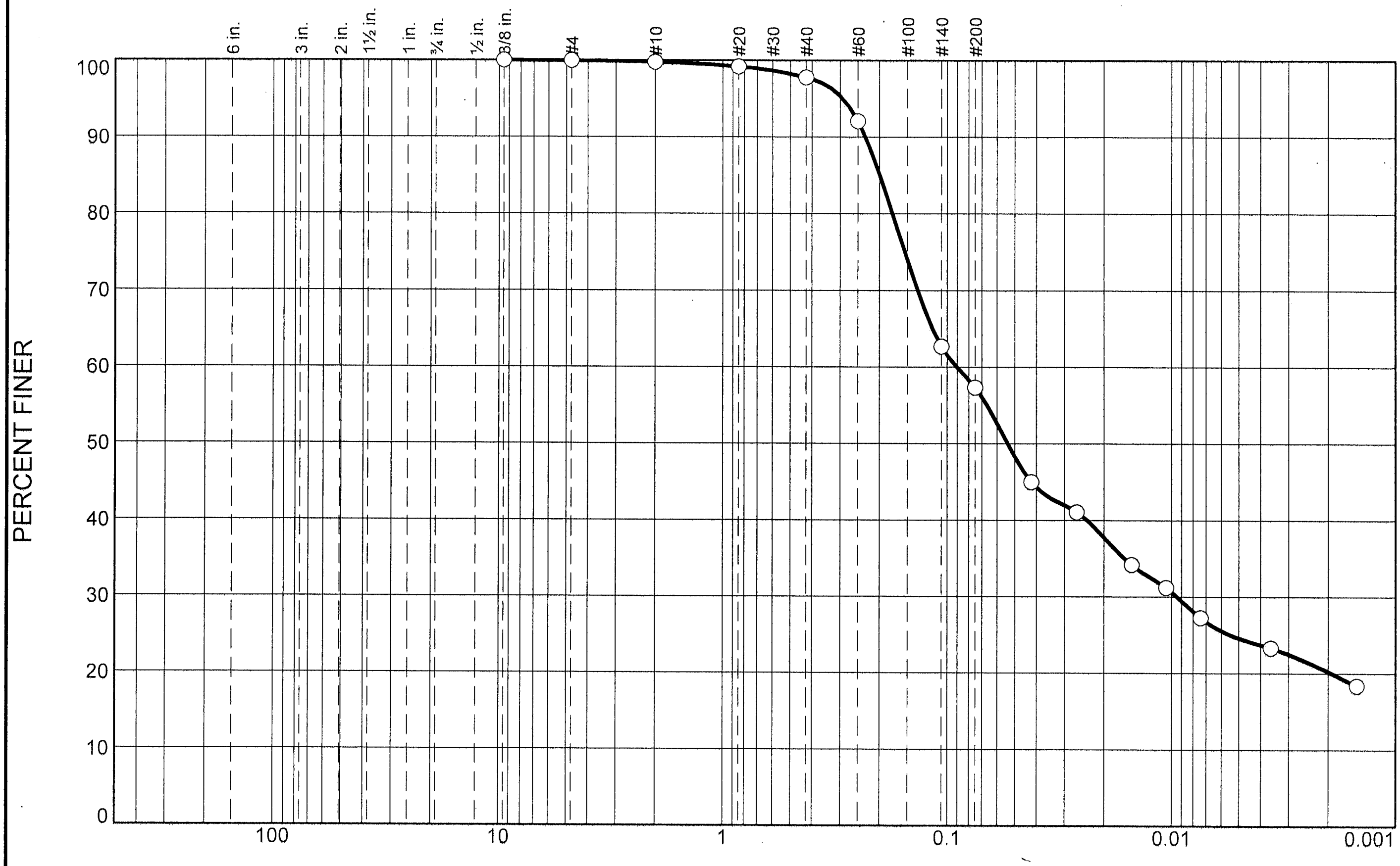
Project: ROCKPORT PLANT IMPROVEMENT CERTIFICATION

Source of Sample: B-1 **Depth:** 14-16' **Sample Number:** ST-3

Project No.: N4155126 **Exhibit** ________ **Terracon, Inc.**

Tested By: FCE **Checked By:** GS

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	42.7	32.7	24.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	100.0		
#10	99.8		
#20	99.2		
#40	97.8		
#60	92.1		
#140	62.7		
#200	57.3		

* (no specification provided)

Material Description

BROWN SANDY SILT

Atterberg Limits

PL= 16 LL= 19 PI= 3

Coefficients

D_{90}= 0.2316 D_{85}= 0.1995 D_{60}= 0.0905
D_{50}= 0.0538 D_{30}= 0.0094 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

Source of Sample: B-2 **Depth:** 4-6'
Sample Number: ST-1

Date: 10-5-15

Terracon, Inc.

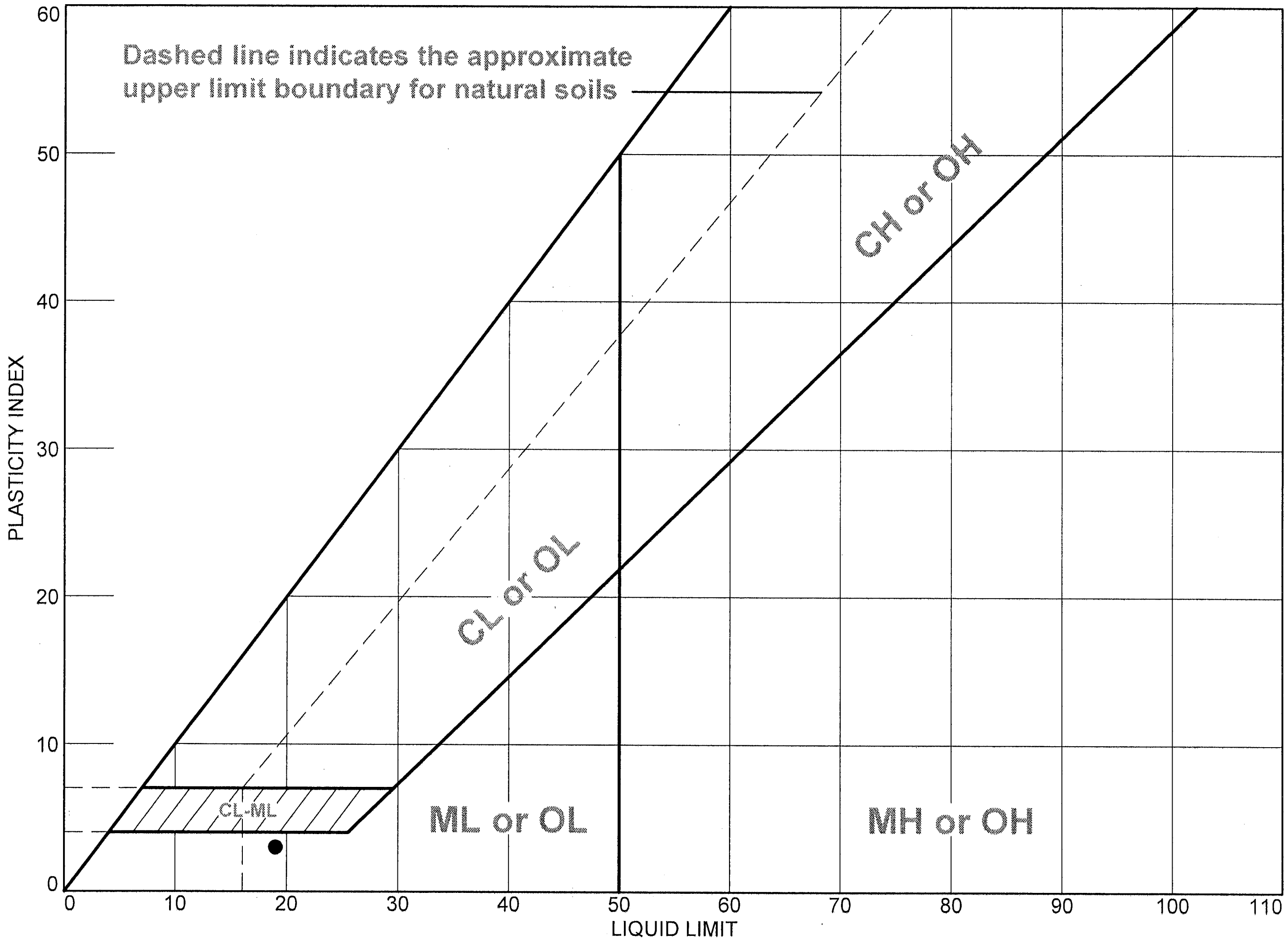
Cincinnati, Ohio

Client: AEP
Project: ROCKPORT PLANT IMPROVEMENT CERTIFICATION
Project No: N4155126 **Exhibit**

Tested By: JB **Checked By:** GS

Exhibit B-24

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN SANDY SILT	19	16	3	97.8	57.3	ML

Project No. N4155126 **Client:** AEP

Project: ROCKPORT PLANT IMPROVEMENT CERTIFICATION

● **Source of Sample:** B-2 **Depth:** 4-6' **Sample Number:** ST-1

Remarks:

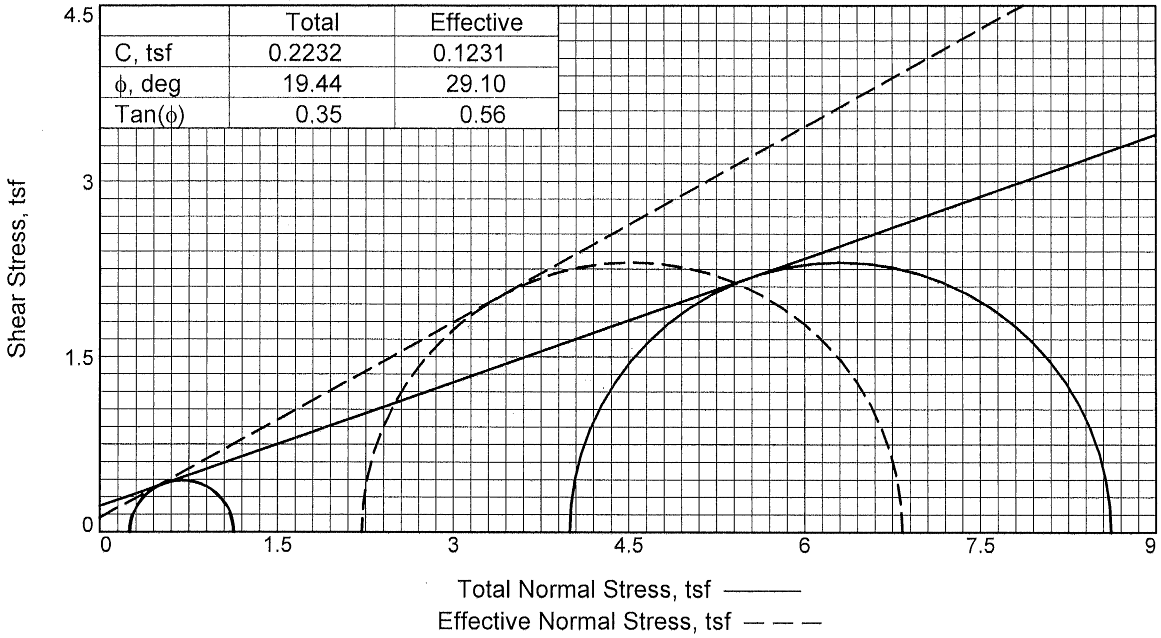
Terracon, Inc.

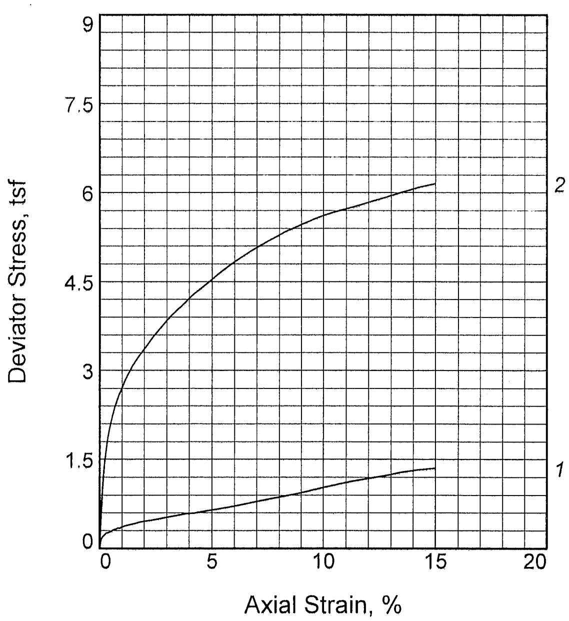
Cincinnati, Ohio

Exhibit

Tested By: VD **Checked By:** GS

	Total	Effective
C, tsf	0.2232	0.1231
φ, deg	19.44	29.10
Tan(φ)	0.35	0.56





	Sample No.	1	2
Initial	Water Content, %	15.6	17.3
	Dry Density, pcf	110.4	114.3
	Saturation, %	80.0	98.5
	Void Ratio	0.5262	0.4741
	Diameter, in.	2.853	2.844
	Height, in.	5.704	5.702
At Test	Water Content, %	18.1	15.8
	Dry Density, pcf	113.2	118.0
	Saturation, %	100.0	100.0
	Void Ratio	0.4887	0.4279
	Diameter, in.	2.829	2.814
	Height, in.	5.657	5.642
	Strain rate, in./min.	0.001	0.001
	Back Pressure, tsf	3.600	3.600
	Cell Pressure, tsf	3.852	7.596
	Fail. Stress, tsf	0.883	4.618
	Total Pore Pr., tsf	3.607	5.378
	Ult. Stress, tsf		
	Total Pore Pr., tsf		
	$\bar{\sigma}_1$ Failure, tsf	1.127	6.836
	$\bar{\sigma}_3$ Failure, tsf	0.245	2.218

Type of Test:
CU with Pore Pressures

Sample Type: ST

Description: BROWN SANDY SILT

LL= 19 **PL=** 16 **PI=** 3

Assumed Specific Gravity= 2.70

Remarks:

Exhibit 7355

Client: AEP

Project: ROCKPORT PLANT IMPROVEMENT CERTIFICATION

Source of Sample: B-2 **Depth:** 4-6'

Sample Number: ST-1

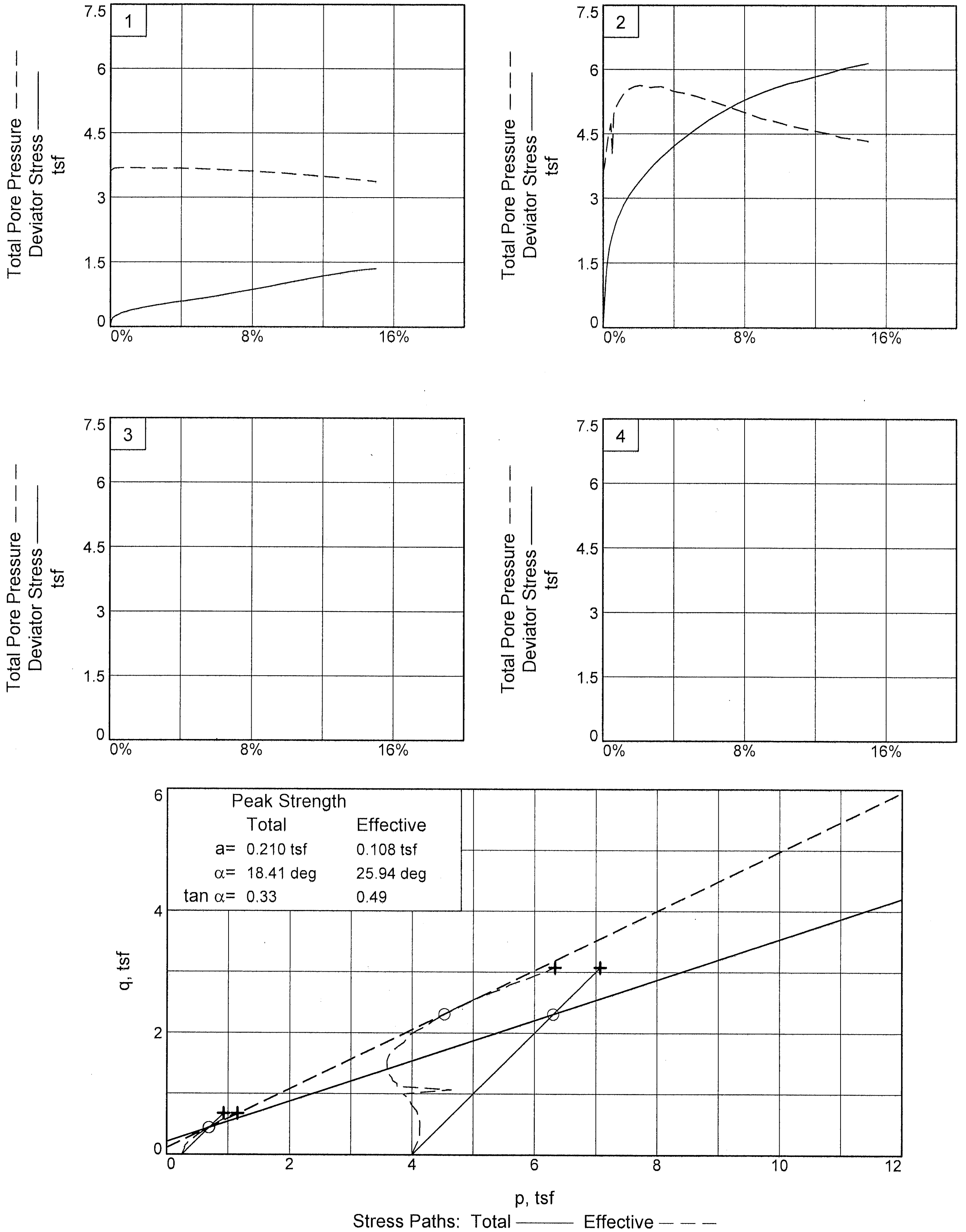
Proj. No.: N4155126 **Date Sampled:** 10-5-15

TRIAXIAL SHEAR TEST REPORT

Terracon, Inc.

Cincinnati, Ohio

Tested By: FCE **Checked By:** GS



Client: AEP

Project: ROCKPORT PLANT IMPROVEMENT CERTIFICATION

Source of Sample: B-2 **Depth:** 4-6' **Sample Number:** ST-1

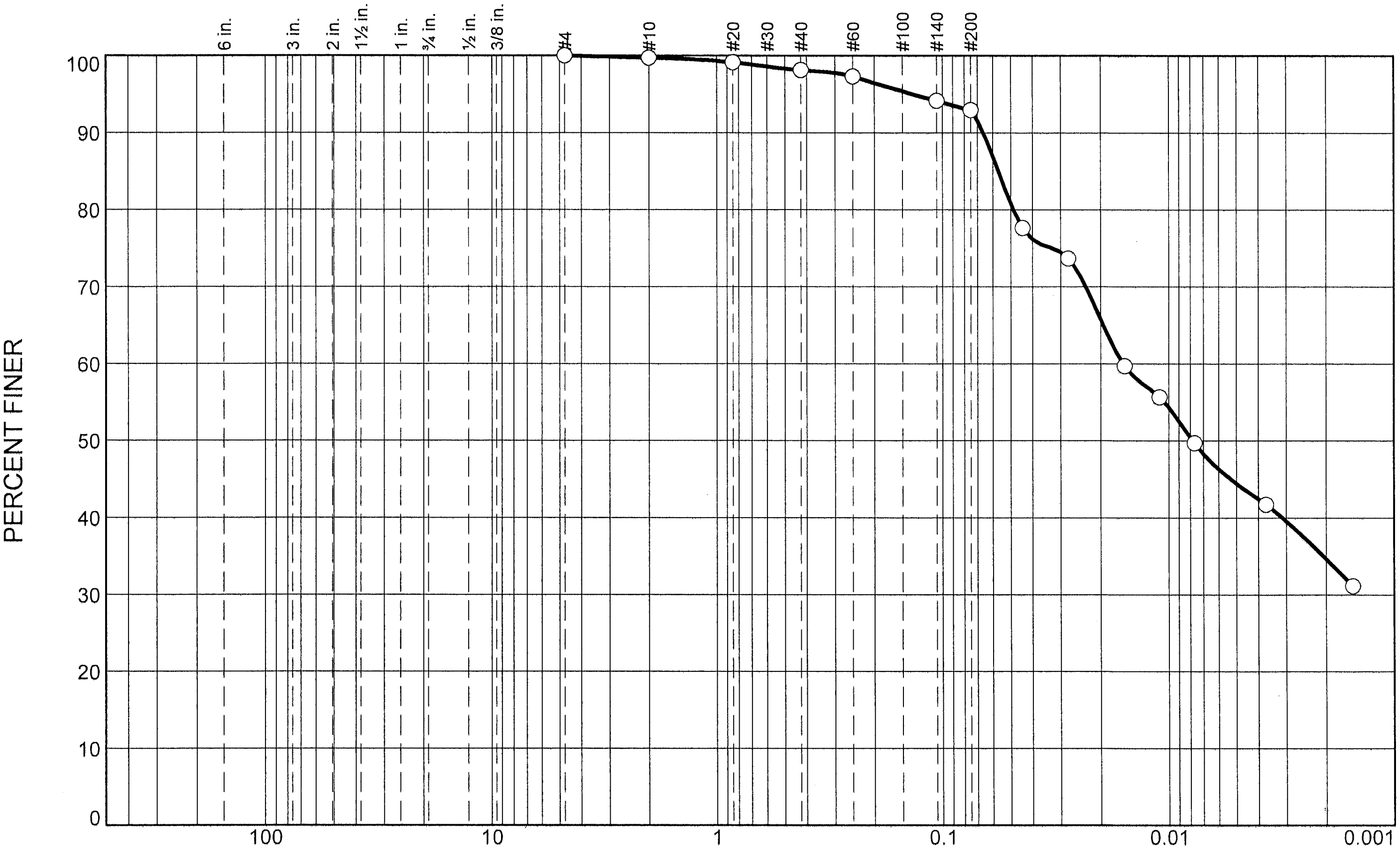
Project No.: N4155126 **Exhibit** ________

Terracon, Inc.

Tested By: FCE **Checked By:** GS

Exhibit B-27

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	7.0	48.5	44.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#20	99.1		
#40	98.1		
#60	97.3		
#140	94.2		
#200	93.0		

* (no specification provided)

Material Description

GRAY LEAN CLAY

Atterberg Limits

PL= 21 LL= 30 PI= 9

Coefficients

D_{90}= 0.0662 D_{85}= 0.0568 D_{60}= 0.0159
D_{50}= 0.0078 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-4(8)

Remarks

Source of Sample: B-2 **Depth:** 10-12'
Sample Number: ST-2

Date: 10-13-15

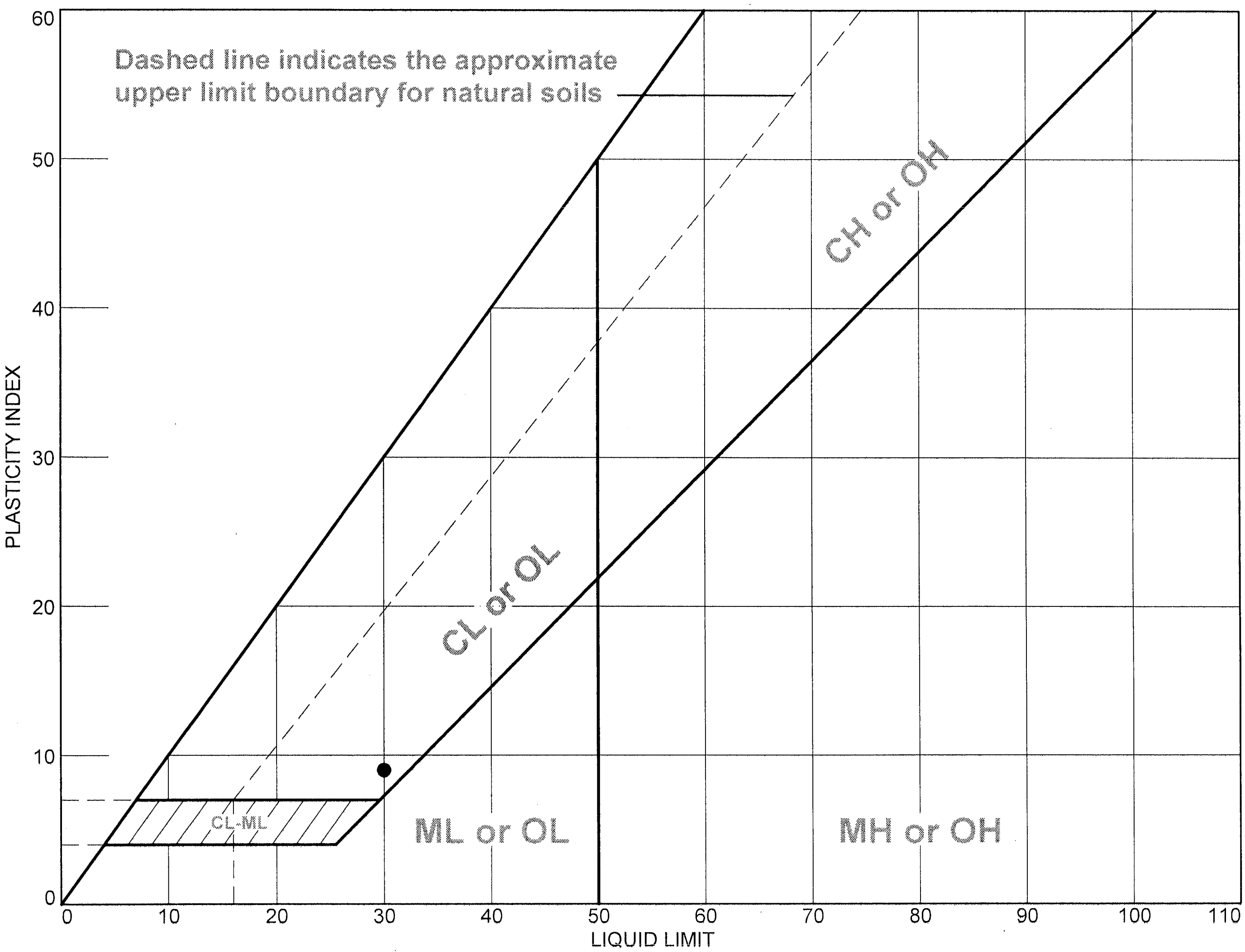
Terracon, Inc.

Cincinnati, Ohio

Client: AEP
Project: ROCKPORT PLANT IMPROVEMENT CERTIFICATION
Project No: N4155126 **Exhibit**

Tested By: DR **Checked By:** GS

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY LEAN CLAY	30	21	9	98.1	93.0	CL

Project No. N4155126 **Client:** AEP

Project: ROCKPORT PLANT IMPROVEMENT CERTIFICATION

● **Source of Sample:** B-2 **Depth:** 10-12' **Sample Number:** ST-2

Remarks:

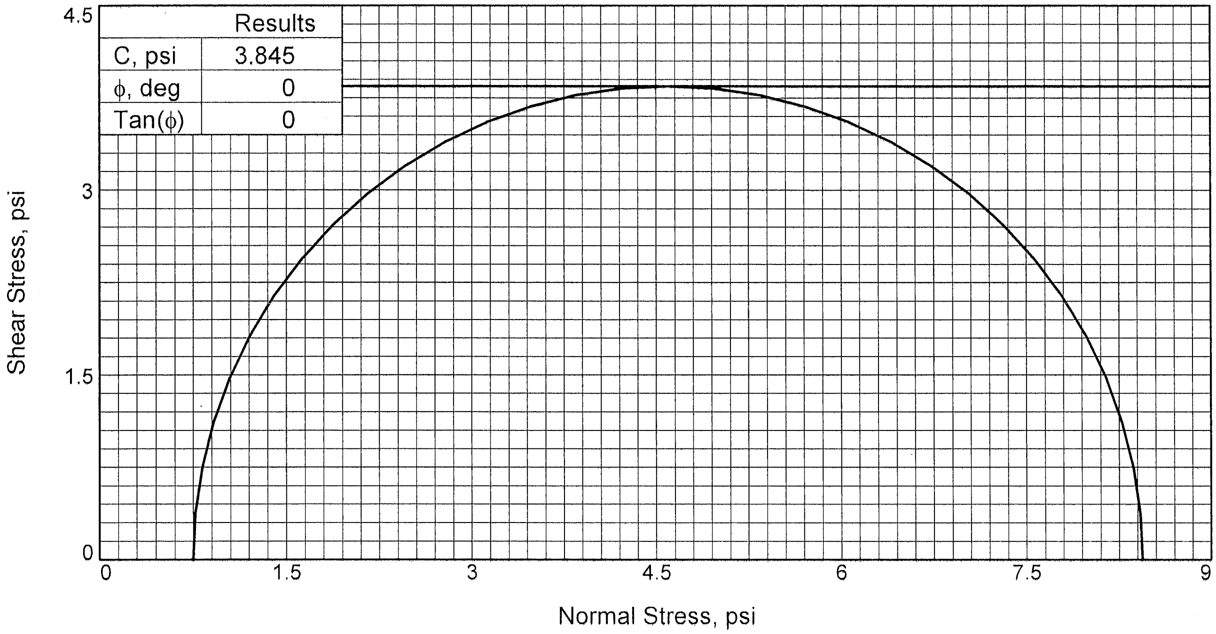
● Initial MC - 27.2%

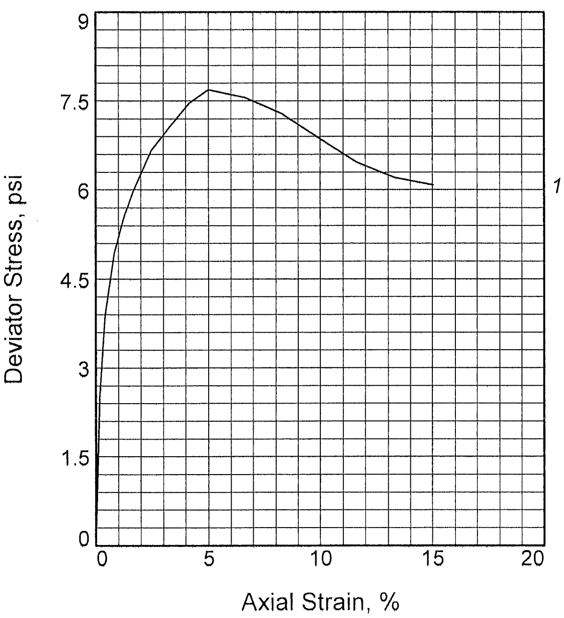
Terracon, Inc.

Cincinnati, Ohio

Exhibit

Exhibit B-29





Sample No.		1
Initial	Water Content, %	27.2
	Dry Density, pcf	94.9
	Saturation, %	94.7
	Void Ratio	0.7768
	Diameter, in.	2.860
	Height, in.	6.020
At Test	Water Content, %	27.2
	Dry Density, pcf	94.9
	Saturation, %	94.7
	Void Ratio	0.7768
	Diameter, in.	2.860
	Height, in.	6.020
Strain rate, in./min.		0.060
Back Pressure, psi		0.000
Cell Pressure, psi		0.750
Fail. Stress, psi		7.691
Ult. Stress, psi		
σ_1 Failure, psi		8.441
σ_3 Failure, psi		0.750

Type of Test:
Unconsolidated Undrained

Sample Type: ST

Description: GRAY LEAN CLAY

LL= 30 **PL=** 21 **PI=** 9

Assumed Specific Gravity= 2.70

Remarks:

Exhibit 7356

Client: AEP

Project: ROCKPORT PLANT IMPROVEMENT CERTIFICATION

Source of Sample: B-2 **Depth:** 10-12'

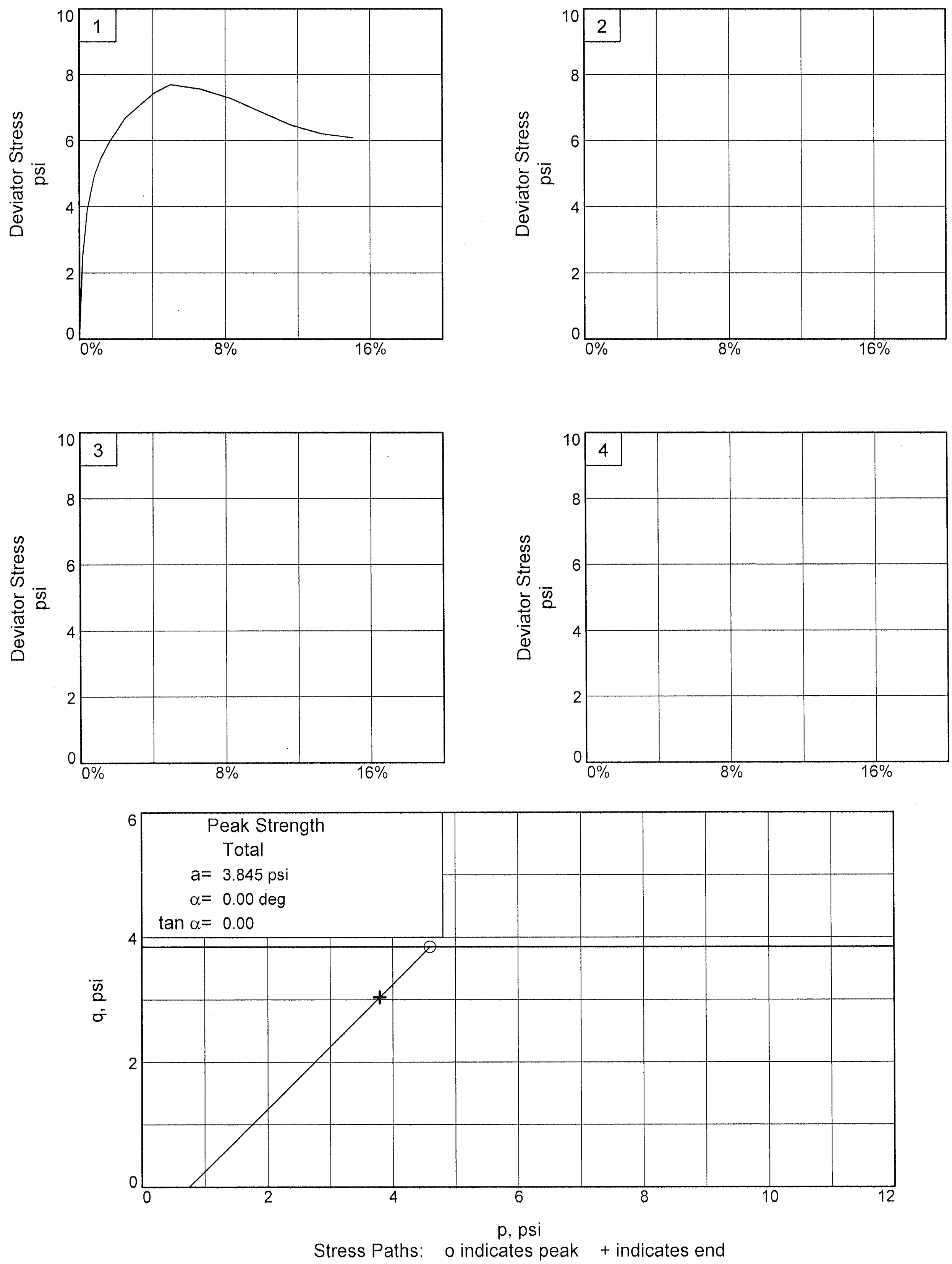
Sample Number: ST-2

Proj. No.: N4155126 **Date Sampled:** 10-13-15

TRIAXIAL SHEAR TEST REPORT

Terracon, Inc.
Cincinnati, Ohio

Tested By: FCE **Checked By:** GS



Client: AEP
Project: ROCKPORT PLANT IMPROVEMENT CERTIFICATION
Source of Sample: B-2 **Depth:** 10-12' **Sample Number:** ST-2
Project No.: N4155126 **Exhibit** ________ **Terracon, Inc.**

Tested By: FCE **Checked By:** GS

APPENDIX C
SUPPORTING DOCUMENTS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING

Auger	Split Spoon
Shelby Tube	Macro Core
Ring Sampler	Rock Core
Grab Sample	No Recovery

WATER LEVEL

- Water Initially Encountered
- Water Level After a Specified Period of Time
- Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	Hand Penetrometer
(T)	Torvane
(b/f)	Standard Penetration Test (blows per foot)
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, tsf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	0 - 6	Very Soft	less than 0.25	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	0.25 to 0.50	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	0.50 to 1.00	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	1.00 to 2.00	8 - 15	10 - 18
Very Dense	> 50	$\geq$ 99	Very Stiff	2.00 to 4.00	15 - 30	19 - 42
			Hard	> 4.00	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

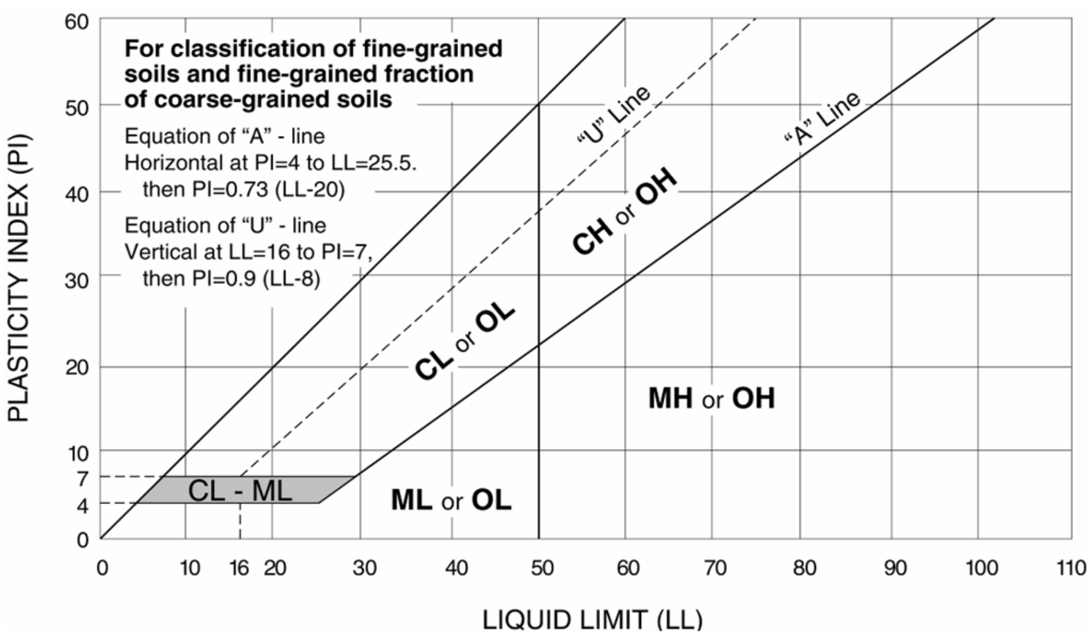
UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu ≥ 4 and 1 ≤ Cc ≤ 3 [E]		GW	Well-graded gravel [F]
			Cu < 4 and/or 1 > Cc > 3 [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu ≥ 6 and 1 ≤ Cc ≤ 3 [E]		SW	Well-graded sand [I]
			Cu < 6 and/or 1 > Cc > 3 [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10} \qquad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

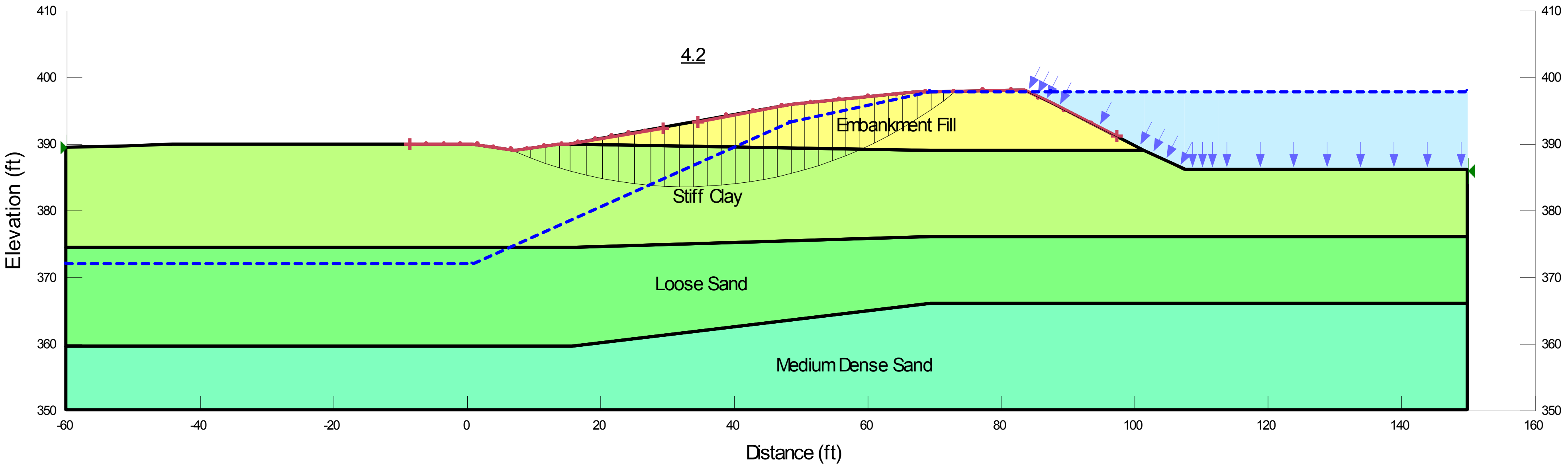
[F] If soil contains ≥ 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] PI ≥ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.



Terracon

APPENDIX D
SLOPE STABILITY ANALYSES

MAXIMUM SURCHARGE POOL WATER LEVEL: EXTERIOR



Name: Embankment Fill Unit Weight: 130 pcf Cohesion': 50 psf Phi': 29 ° Piezometric Line: 1
Name: Stiff Clay Unit Weight: 123 pcf Cohesion': 50 psf Phi': 34 ° Piezometric Line: 1
Name: Loose Sand Unit Weight: 115 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: Medium Dense Sand Unit Weight: 123 pcf Cohesion': 0 psf Phi': 33 ° Piezometric Line: 1

Method: Spencer

Project Manager:	KME	Project No.	N4155126
Drawn by:	AKB	Scale:	N.T.S.
Checked by:	KME	File Name:	N4155126SS
Approved by:	KME	Date:	Dec 2015

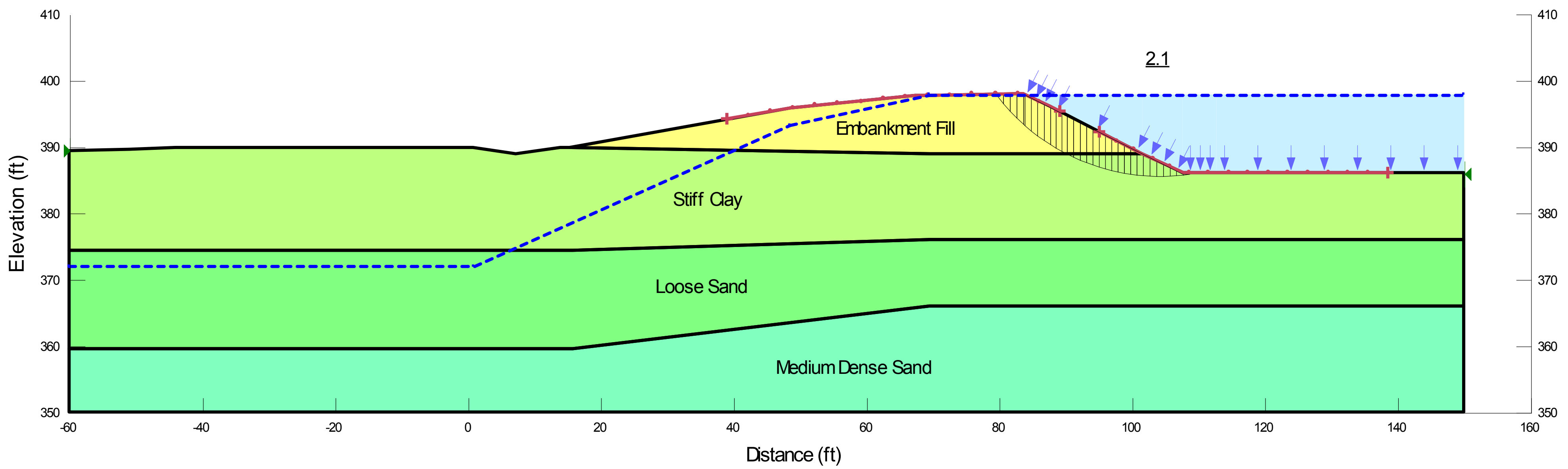
Terracon
Consulting Engineers & Scientists
800 Morrison Road Columbus, Ohio 43230
PH. (614) 863-3113 FAX. (614) 863-0475

SLOPE/W MODEL SECTION A-A'

AMERICAN ELECTRIC POWER
AEP ROCKPORT BOTTOM ASH COMPLEX PE CERTIFICATION
ROCKPORT, INDIANA

Exhibit
D-1

MAXIMUM SURCHARGE POOL WATER LEVEL: INTERIOR



Name: Embankment Fill Unit Weight: 130 pcf Cohesion': 50 psf Phi': 29 ° Piezometric Line: 1
Name: Stiff Clay Unit Weight: 123 pcf Cohesion': 50 psf Phi': 34 ° Piezometric Line: 1
Name: Loose Sand Unit Weight: 115 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: Medium Dense Sand Unit Weight: 123 pcf Cohesion': 0 psf Phi': 33 ° Piezometric Line: 1

Method: Spencer

Project Manager:	KME
Drawn by:	AKB
Checked by:	KME
Approved by:	KME
Project No.	N4155126
Scale:	N.T.S.
File Name:	N4155126SS
Date:	Dec 2015

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800 Morrison Road Columbus, Ohio 43230
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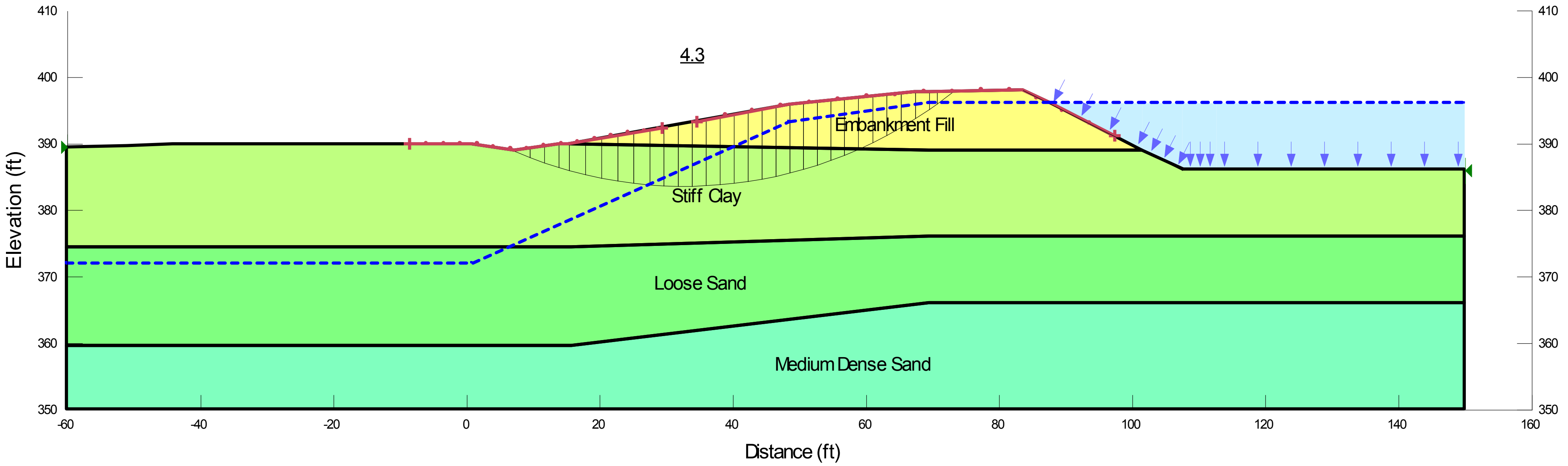
SLOPE/W MODEL SECTION A-A'

AMERICAN ELECTRIC POWER
AEP ROCKPORT BOTTOM ASH COMPLEX PE CERTIFICATION
ROCKPORT, INDIANA

Exhibit
D-2

MAXIMUM STORAGE POOL WATER LEVEL: EXTERIOR



Name: Embankment Fill Unit Weight: 130 pcf Cohesion': 50 psf Phi': 29 ° Piezometric Line: 1
Name: Stiff Clay Unit Weight: 123 pcf Cohesion': 50 psf Phi': 34 ° Piezometric Line: 1
Name: Loose Sand Unit Weight: 115 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: Medium Dense Sand Unit Weight: 123 pcf Cohesion': 0 psf Phi': 33 ° Piezometric Line: 1

Method: Spencer

Project Manager: KME	Project No. N4155126
Drawn by: AKB	Scale: N.T.S.
Checked by: KME	File Name: N4155126SS
Approved by: KME	Date: Dec 2015

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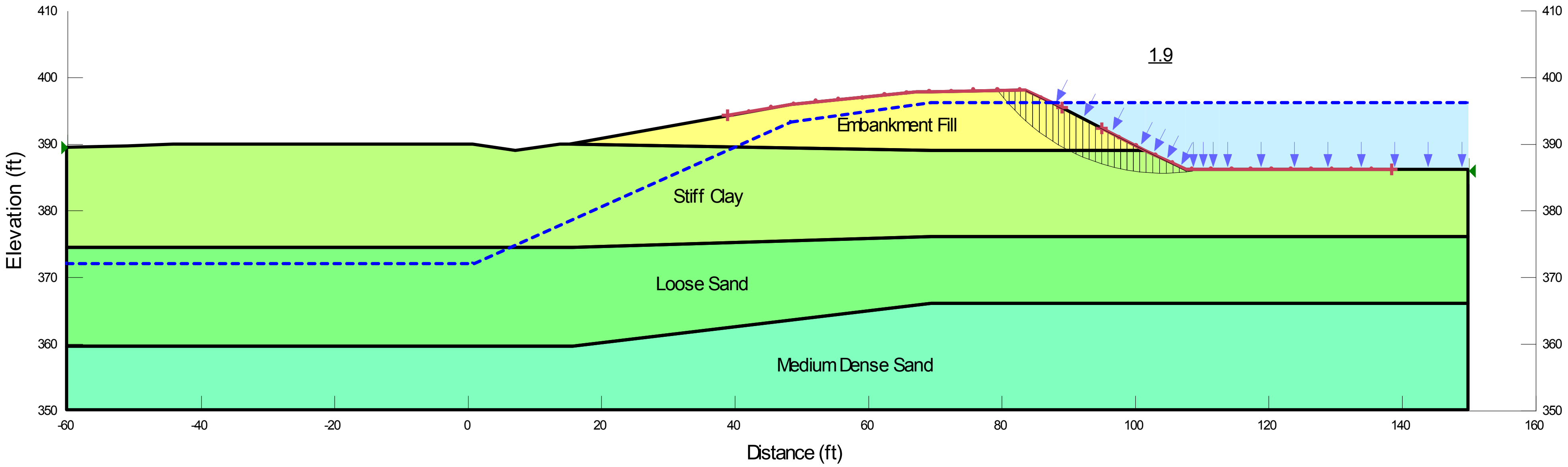
SLOPE/W MODEL SECTION A-A'
AMERICAN ELECTRIC POWER
AEP ROCKPORT BOTTOM ASH COMPLEX PE CERTIFICATION
ROCKPORT, INDIANA

Exhibit
D-3

MAXIMUM STORAGE POOL WATER LEVEL: INTERIOR



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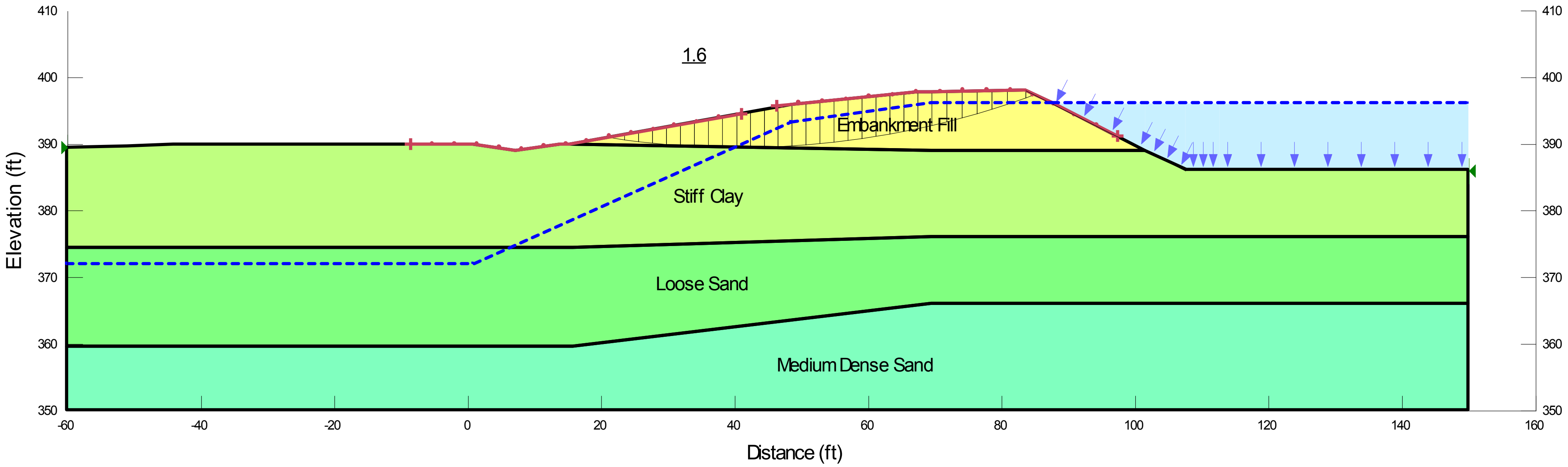
Name: Stiff Clay Unit Weight: 123 pcf Cohesion': 50 psf Phi': 34 ° Piezometric Line: 1
Name: Loose Sand Unit Weight: 115 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: Medium Dense Sand Unit Weight: 123 pcf Cohesion': 0 psf Phi': 33 ° Piezometric Line: 1

Method: Spencer

Project Manager: KME	Project No. N4155126	Terracon Consulting Engineers & Scientists	SLOPE/W MODEL SECTION A-A’
Drawn by: AKB	Scale: N.T.S.	800 Morrison Road, Columbus, Ohio 43230	AMERICAN ELECTRIC POWER AEP ROCKPORT BOTTOM ASH COMPLEX PE CERTIFICATION ROCKPORT, INDIANA
Checked by: KME	File Name: N4155126SS	PH. (614) 863-3113 FAX. (614) 863-0475	Exhibit
Approved by: KME	Date: Dec 2015		D-4

MAXIMUM STORAGE POOL WATER LEVEL (SEISMIC): EXTERIOR



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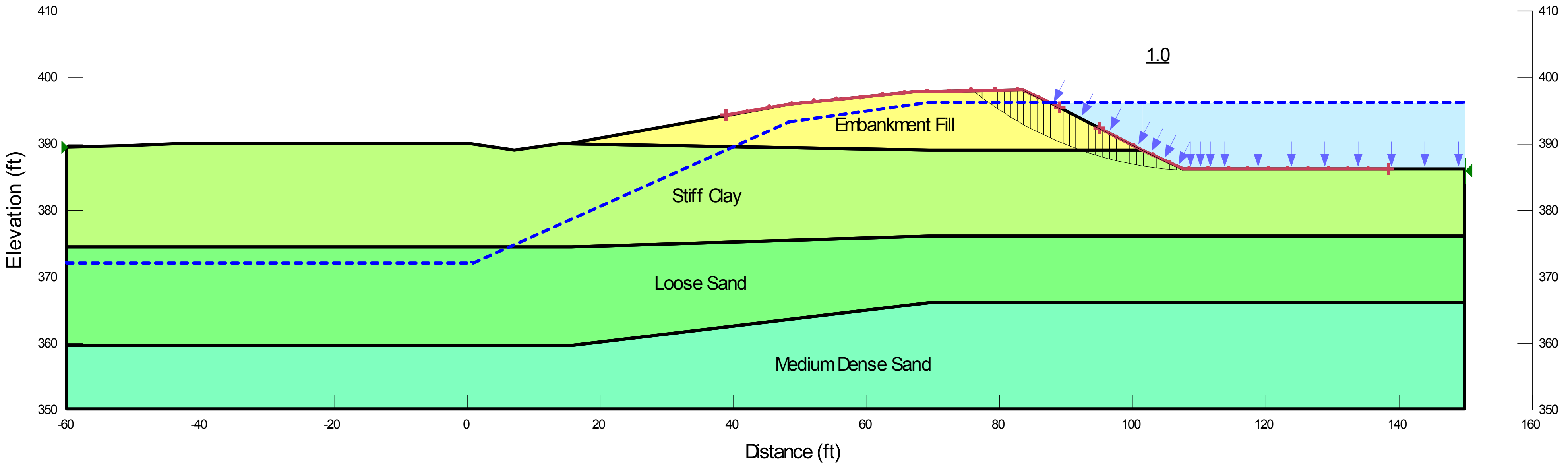
Name: Stiff Clay   Unit Weight: 123 pcf   Cohesion': 50 psf   Phi': 34 °   Piezometric Line: 1
Name: Loose Sand   Unit Weight: 115 pcf   Cohesion': 0 psf   Phi': 30 °   Piezometric Line: 1
Name: Medium Dense Sand   Unit Weight: 123 pcf   Cohesion': 0 psf   Phi': 33 °   Piezometric Line: 1

Method: Spencer

Project Manager: KME	Project No. N4155126	Terracon Consulting Engineers & Scientists	SLOPE/W MODEL SECTION A-A'	Exhibit
Drawn by: AKB	Scale: N.T.S.	800 Morrison Road Columbus, Ohio 43230	AMERICAN ELECTRIC POWER	D-5
Checked by: KME	File Name: N4155126SS	PH. (614) 863-3113 FAX. (614) 863-0475	AEP ROCKPORT BOTTOM ASH COMPLEX PE CERTIFICATION	
Approved by: KME	Date: Dec 2015		ROCKPORT, INDIANA	

MAXIMUM STORAGE POOL WATER LEVEL (SEISMIC): INTERIOR



Name: Embankment Fill   Unit Weight: 130 pcf   Cohesion': 50 psf   Phi': 29 °   Piezometric Line: 1
Name: Stiff Clay   Unit Weight: 123 pcf   Cohesion': 50 psf   Phi': 34 °   Piezometric Line: 1
Name: Loose Sand   Unit Weight: 115 pcf   Cohesion': 0 psf   Phi': 30 °   Piezometric Line: 1
Name: Medium Dense Sand   Unit Weight: 123 pcf   Cohesion': 0 psf   Phi': 33 °   Piezometric Line: 1

Method: Spencer

Project Manager: KME	Project No. N4155126	Terracon Consulting Engineers & Scientists	SLOPE/W MODEL SECTION A-A’
Drawn by: AKB	Scale: N.T.S.	800 Morrison Road, Columbus, Ohio 43230	AMERICAN ELECTRIC POWER
Checked by: KME	File Name: N4155126SS	PH. (614) 863-3113 FAX. (614) 863-0475	AEP ROCKPORT BOTTOM ASH COMPLEX PE CERTIFICATION
Approved by: KME	Date: Dec 2015		ROCKPORT, INDIANA

Exhibit D-6

APPENDIX E
PHOTO LOG

Photo 1: West Bottom Ash Pond, west dike: exterior slope (facing north).

Photo 2: West Bottom Ash Pond, west dike: exterior slope (facing south).

Photo 3: West Bottom Ash Pond, west dike: ponded water at exterior toe.

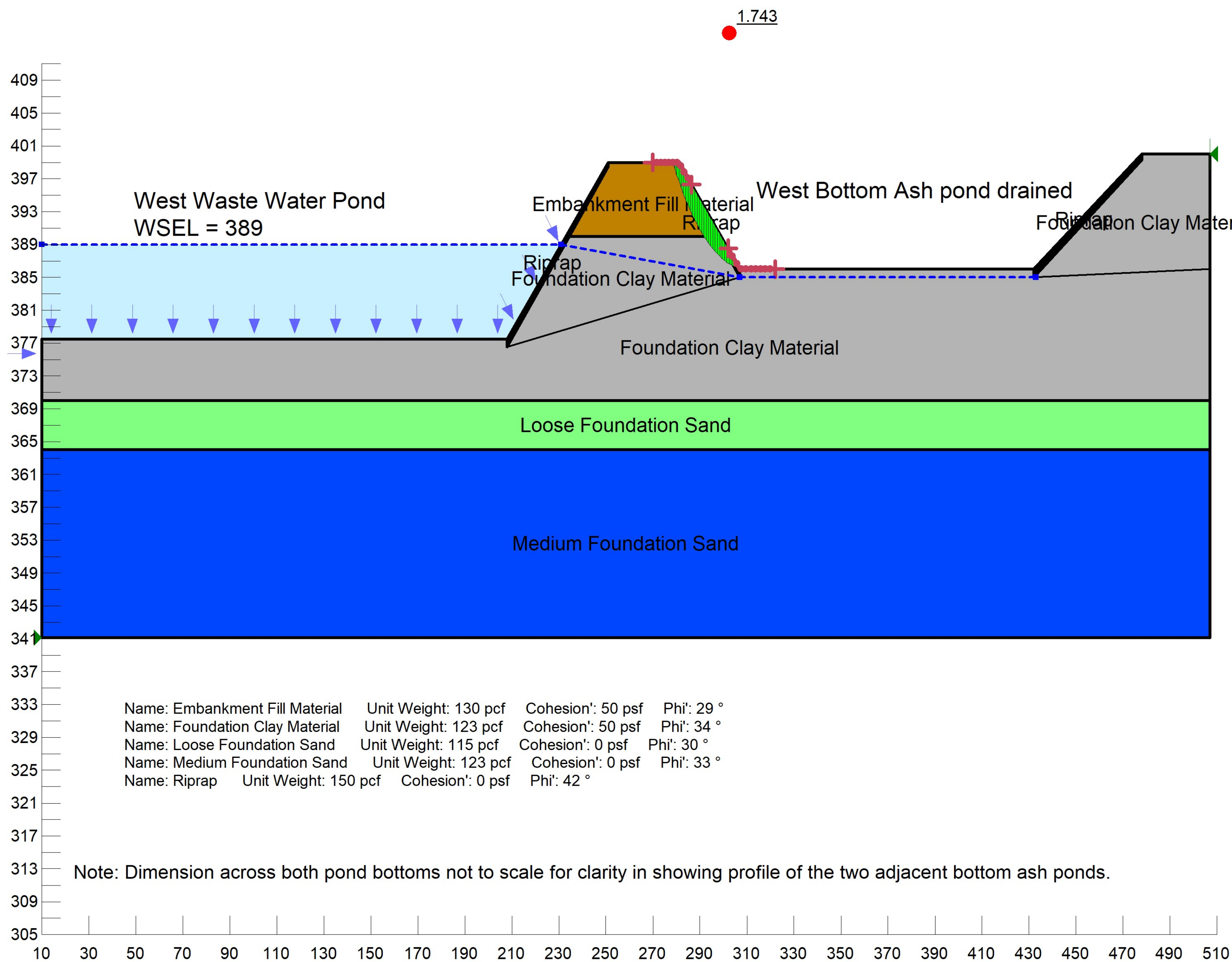
Photo 4: West Bottom Ash Pond, west dike: crest and interior slope (facing south).

Photo 5: West Bottom Ash Pond, west dike: crest and interior slope (facing north).

Photo 6: West Bottom Ash Pond, west dike: bottom ash pond interior.

Photo 7: West Bottom Ash Pond, west dike: bottom ash pond interior.

ATTACHMENT B- Safety Factor Assessment for the east to west splitter dike



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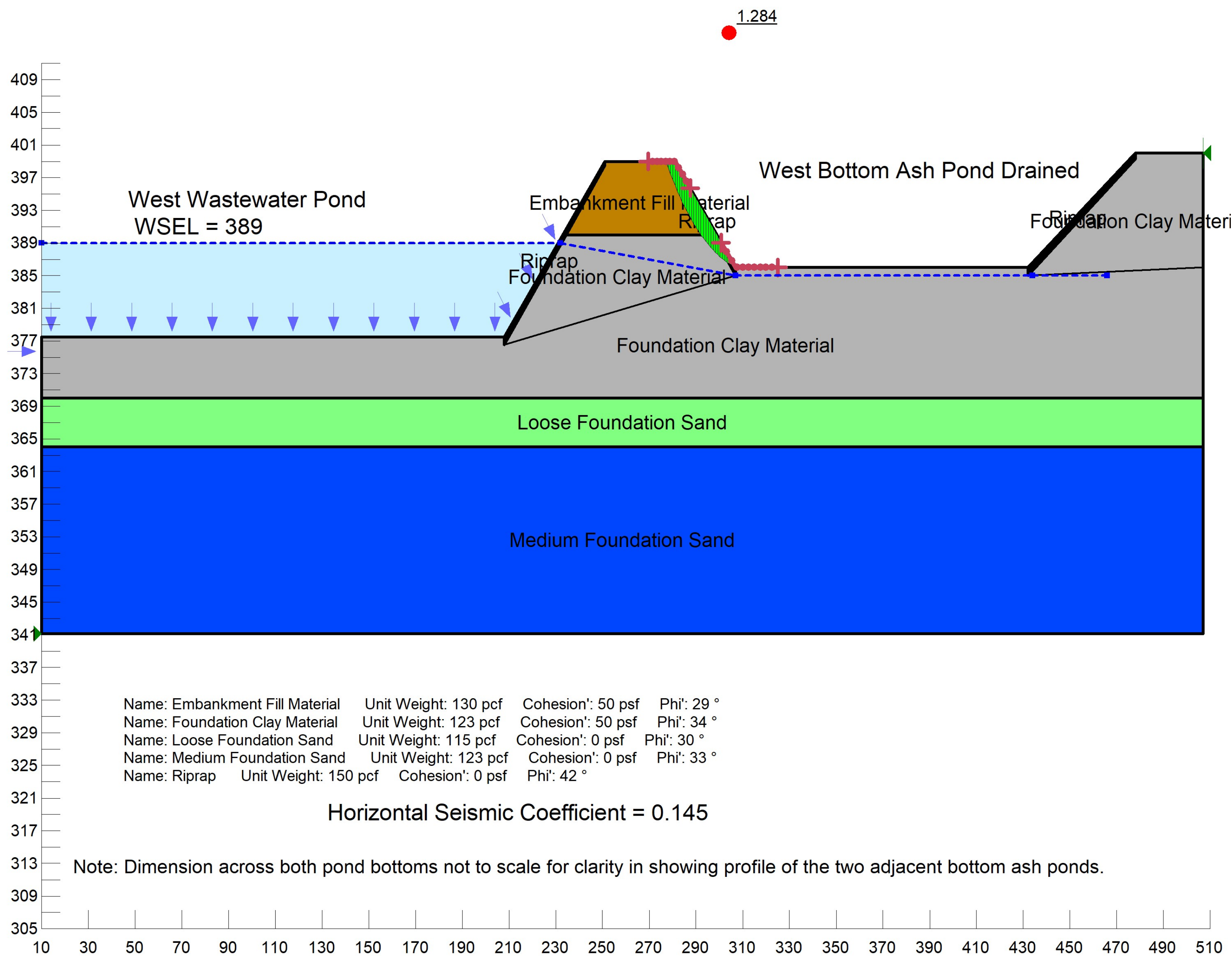
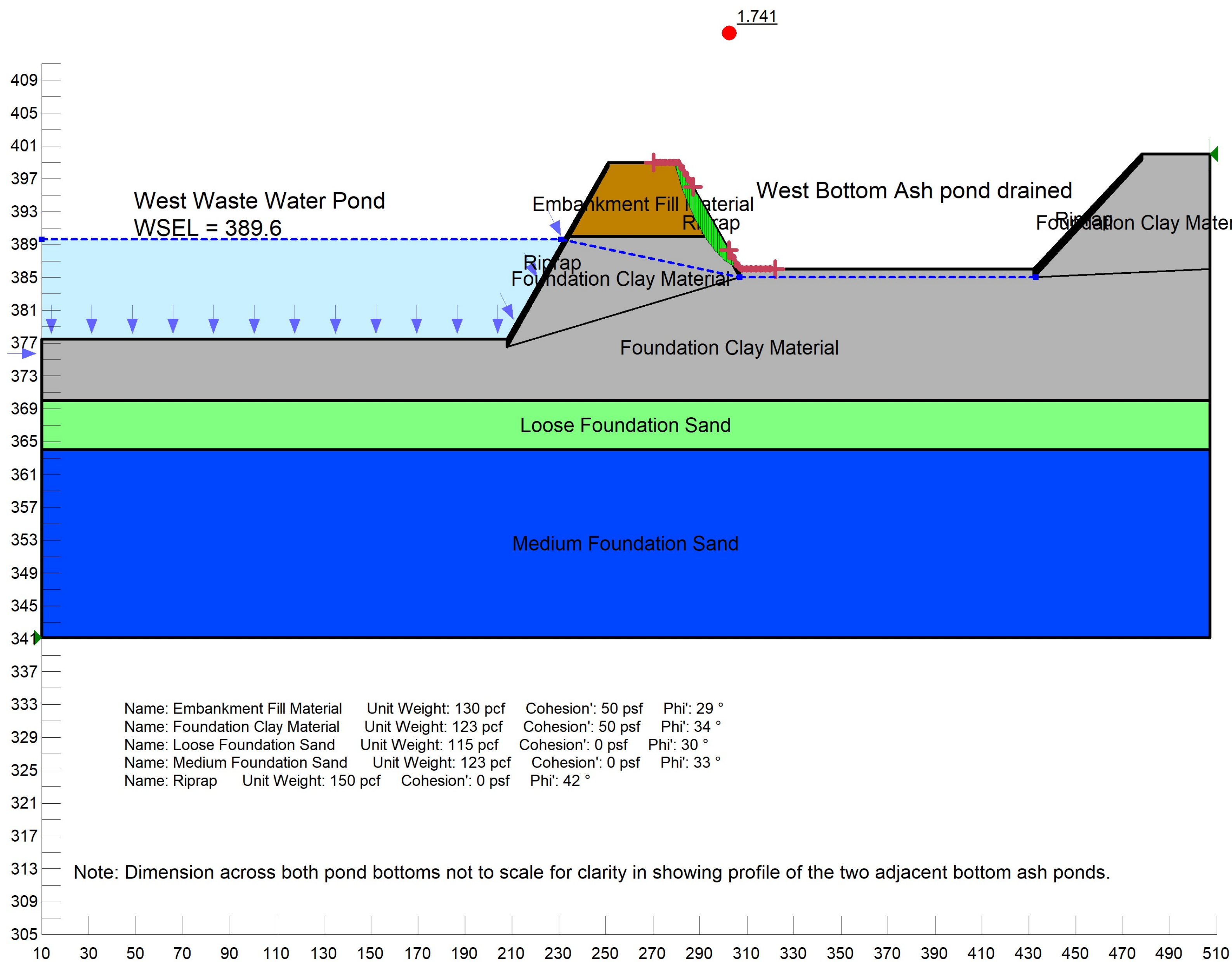
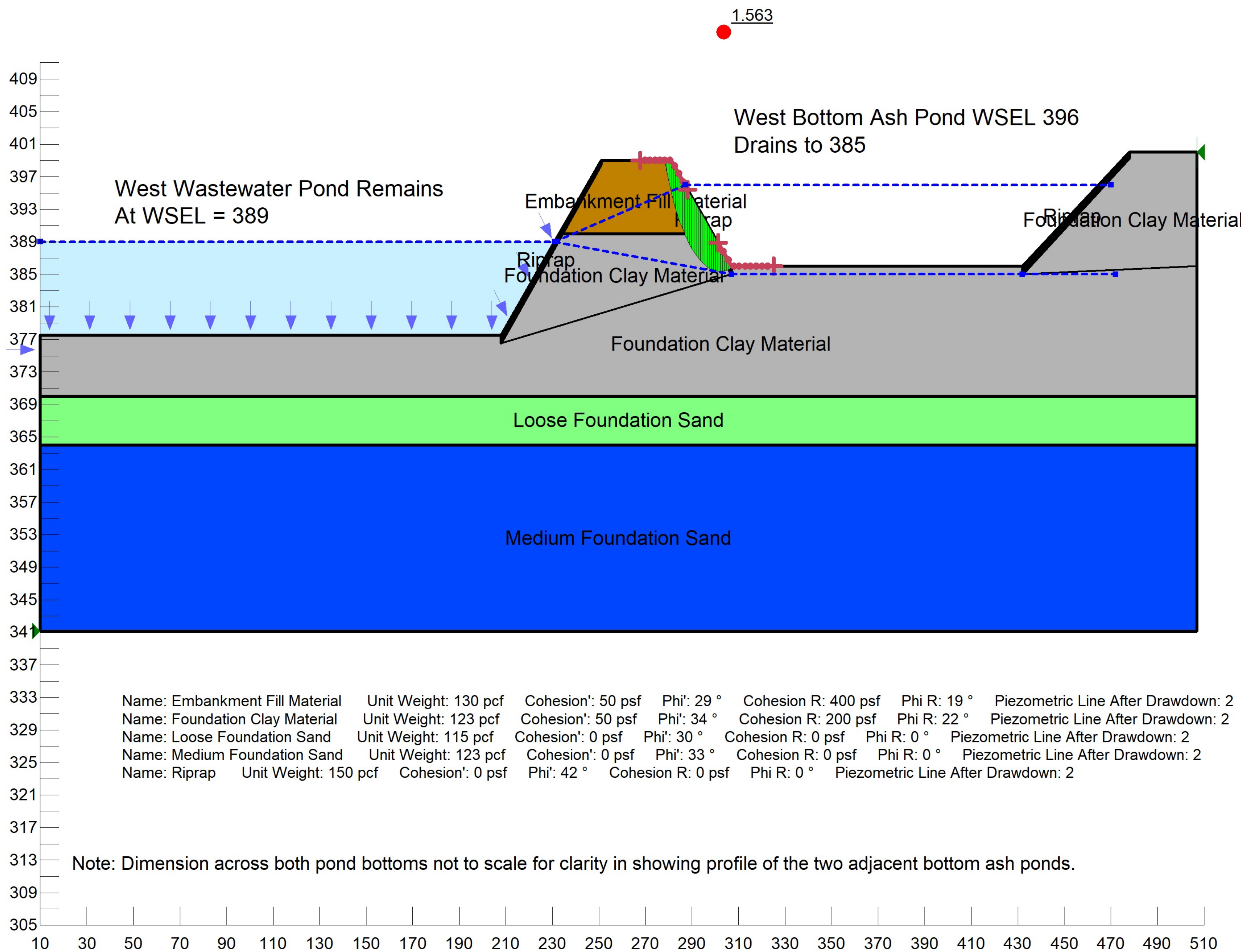
Name: Foundation Clay Material Unit Weight: 123 pcf Cohesion': 50 psf Phi': 34 °
Name: Loose Foundation Sand Unit Weight: 115 pcf Cohesion': 0 psf Phi': 30 °
Name: Medium Foundation Sand Unit Weight: 123 pcf Cohesion': 0 psf Phi': 33 °
Name: Riprap Unit Weight: 150 pcf Cohesion': 0 psf Phi': 42 °

Note: Dimension across both pond bottoms not to scale for clarity in showing profile of the two adjacent bottom ash ponds.


1.284
West Wastewater Pond
WSEL = 389
West Bottom Ash Pond Drained
Embankment Fill Material
Riprap
Foundation Clay Material
Loose Foundation Sand
Medium Foundation Sand
Name: Embankment Fill Material Unit Weight: 130 pcf Cohesion': 50 psf Phi': 29 °
Name: Foundation Clay Material Unit Weight: 123 pcf Cohesion': 50 psf Phi': 34 °
Name: Loose Foundation Sand Unit Weight: 115 pcf Cohesion': 0 psf Phi': 30 °
Name: Medium Foundation Sand Unit Weight: 123 pcf Cohesion': 0 psf Phi': 33 °
Name: Riprap Unit Weight: 150 pcf Cohesion': 0 psf Phi': 42 °
Horizontal Seismic Coefficient = 0.145
Note: Dimension across both pond bottoms not to scale for clarity in showing profile of the two adjacent bottom ash ponds.



1.741
West Waste Water Pond
WSEL = 389.6
Embankment Fill Material
Riprap
Foundation Clay Material
West Bottom Ash pond drained
Foundation Clay Material
Loose Foundation Sand
Medium Foundation Sand
Name: Embankment Fill Material Unit Weight: 130 pcf Cohesion': 50 psf Phi': 29 °
Name: Foundation Clay Material Unit Weight: 123 pcf Cohesion': 50 psf Phi': 34 °
Name: Loose Foundation Sand Unit Weight: 115 pcf Cohesion': 0 psf Phi': 30 °
Name: Medium Foundation Sand Unit Weight: 123 pcf Cohesion': 0 psf Phi': 33 °
Name: Riprap Unit Weight: 150 pcf Cohesion': 0 psf Phi': 42 °
Note: Dimension across both pond bottoms not to scale for clarity in showing profile of the two adjacent bottom ash ponds.



Note: Dimension across both pond bottoms not to scale for clarity in showing profile of the two adjacent bottom ash ponds.