Factor of Safety Assessment
South Recycle Pond

Entergy -
White Bluff Steam Electric Station
White Bluff, Arkansas

November 19, 2020

ERM Project Number: 0558908

The business of sustainability

QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION

I hereby certify, as a Professional Engineer in the State of Arkansas, that the information in this document was assembled under my direct supervisory control. This report is not intended or represented to be suitable for reuse by Entergy Arkansas, LLC, White Bluff Steam Electric Station or others without specific verification or adaptation by the Engineer.

This assessment has been prepared for the exclusive use of Entergy Arkansas, LLC, in accordance with the general engineering standards at the time the services were performed. This work has been performed for the sole purpose of assisting Entergy in evaluating the White Bluff South Recycle Pond consistent with the FOS assessment provisions of 40 CFR 257.73(e).

The findings of the assessment, as represented within this report, must be viewed in recognition of certain limiting conditions. The scope of work commissioned for this project represents a reasonable engineering analysis, consistent with good commercial practice and subject to all of the limitations; both stated and unstated in the report as well as identified assumptions. In the course of this assessment, ERM has relied on information provided by Entergy, such as design drawings, regulatory correspondence, site inspection of the facility, interviews, and the project team's experience. ERM has made no independent investigation as to the validity, completeness, or accuracy of such information provided. For the purposes of this assessment, such information is assumed accurate unless contradictory evidence is noted, and ERM does not express or imply any warranty regarding information provided to us.

The findings and conclusions presented herein should reflect conditions as identified during ERM's site visit.

Wayne T. Sicora P.E., Arkansas

Seals

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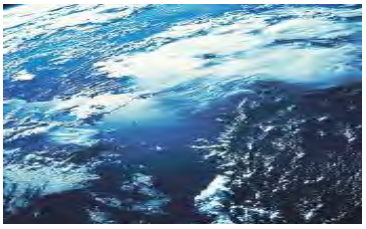


List of Appendices

1.0 PURPOSE AND SCOPE

The South Recycle Pond was used primarily, but not exclusively, for recycling bottom ash sluice water at the White Bluff Steam Electric Station. The South Recycle Pond ceased all waste receipt in October 2018. This sluice water may have contained filtrate deposits of bottom ash, which also present finer-grained particles intermixed with the bottom ash. Altogether, the finer-grained particles intermixed with bottom ash is identified as "infill" herein, and plainly as "ash" throughout Appendix G. For purposes of this assessment, ERM has assumed that the recycle pond is a coal combustion residuals (CCR) surface impoundment as defined by the *Hazardous and Solid Waste Management System, Disposal of Coal Combustion Residuals from Electric Utilities* (the "CCR Rule") in 40 CFR 257.2.

Entergy requested that ERM perform a Factor of Safety (FOS) Assessment for the South Recycle Pond at the White Bluff Steam Electric Station consistent with the FOS requirements described in 40 CFR 257.73(e) (i through iv), which are part of the broader provisions of the 40 CFR 257.73, *Structural Integrity Criteria for existing CCR surface impoundments.*

ERM has conducted these FOS assessments utilizing existing site-specific data, literature research values and information, and field inspection of the South Recycle Pond containment berms to assess compliance. The berms assessed include the Southern Berm, and the inner berm shared between the South Recycle Pond and the separate North Recycle Pond. The results of the stability analyses are summarized in Table 1, below, with a comparison to the regulatory requirements and minimum standards specified under the CCR Rule:

Table 1. Factor of Safety Summary

40 CFR 257.73 (e) - Structural Integrity Criteria for Existing CCR Surface Impoundments	Minimum FOS Requirement	South Pond Critical Structures	Minimum Calculated Factor of Safety
i) The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.	1.50	North-South Ponds Shared Inner Berm	2.34
		Southern Berm	2.42
ii) The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.	1.40	North-South Ponds Shared Inner Berm	2.24
		Southern Berm	2.49
iii) The calculated seismic factor of safety must equal or exceed 1.00.	1.00	North-South Ponds Shared Inner Berm	1.24
		Southern Berm	1.41
iv) For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20	1.20	N/A	1.49

2.0 Slope Stability Analyses

2.1 General

The stability of berms containing the South Recycle Pond were assessed under both static and seismic conditions consistent with the CCR Rule. The analyses of the South Recycle Pond were conducted on the inner berm shared by the North and South Recycle Ponds and the southern perimeter berm (separating the South Recycle Pond from the lower lake). Although the shared inner berm is currently an interior structure for which a breach failure would be within the confines of the two-pond footprint and would not result in a release, the analyses assume a primary failure of the southern perimeter berm and a secondary failure of the shared North-South Ponds inner berm. The sections modeled herein incorporated elevation and grade information provided through two surveys and a design profile: a Topographic Survey (Appendix A) and Profile (Appendix B) produced by B&F Engineering, Inc. (B&F Engineering), dated July 5 and 6, 2018 were the principal source, verified with a marine geophysical survey (Appendix C) that mapped pond floor elevation, prepared by GeoView, Inc. (Geoview) of St. Petersburg, FL, dated June 14 and 15, 2018. The slope stability software program GEO 5 Slope Stability (Fine Ltd, version 19) was used to model all critical sections along these berms.

The B&F Engineering topography of the recycle ponds, the design configuration, and the surface of the surveyed infill surface currently in the ponds (Appendices A and B) were initially used to define the geometry for completing the stability analyses. The profile indicates, however, only a section at one location through the center of the ponds, from north to south, and not variable configurations as may be suggested by the topography. This variation was determined from the Geoview geophysical survey (Appendix C) which depicts the elevations of the interpreted surface of the pond floors (Geoview Figures 1 and 2). Furthermore, the geophysical survey depicted areas of the pond floors at elevations lower than the profile; these were used in developing a critical section that maximized the depth of the pond floor and infill relative to the floor (i.e., the western portion of the South Recycle Pond as depicted in Figure 1). Despite these differences, the data sources available were not inconsistent and were used collectively to derive the typical, critical section geometry of the ponds.

The steepest and longest exposed slopes identified were used to create the critical sections for analytical purposes. Elevations of the top of berm, top of infill, and pond floor at those sections were defined for both berms. In developing the critical sections it was observed that the slopes indicated in both surveys were at least as steep as the design grades presented on the profile drawing (Appendix B), and thus, the design profile effectively represented the critical section. Ultimately, two composite sections, utilizing the critical North Recycle Pond and South Recycle Pond berm geometry along the north-south alignment were analyzed for stability.

For each critical section, various stages of pond operations were modeled according to the potential water surface elevations within the North and South Recycle Ponds and the lower lake, including: 1.) the water surface elevation at long-term, maximum storage elevation (i.e., maximum operating pool) defined as elevation +278 feet above mean sea level (msl) for the North and South Recycle Pond and elevation +276 feet msl for the lower lake; 2.) the water surface at the maximum surcharge elevation (i.e., assuming zero freeboard and pending overtopping) in the North and South Ponds; and, 3.) the water surface in the ponds or lake as “empty”, defined as the top of infill elevation at elevation +267 feet above msl in the South Recycle Pond or at the lower lake floor elevation at +269 feet above msl. For purposes of these analyses, the lowest elevation of the floor and greatest infill thickness (relative to the lowest floor elevation) in each pond was set as uniform for the corresponding ponds. Likewise, the topographic survey data as presented on the B&F Engineering drawing, designated *Recycle Ponds Profiles* (Appendix B) represents the top of berm elevations for the North and South Recycle Ponds, and represents the water surface elevation in the lower lake, or +276 feet msl. The lower lake floor elevation is assumed to be at elevation of +269 feet msl, derived from this profile.

2.2 Site Data

The critical slopes were analyzed for stability under both static and seismic conditions using a combination of site subsurface lithological and laboratory data as well as literature values correlated to the known conditions at the site, as discussed below. Limited field data on the various soil layers beneath the ponds was, however, available to definitively provide input parameters. The available data consisted of soil borings surrounding the recycle ponds as presented in Appendix D, which is entitled *Site Map, Entergy White Bluff Recycle Ponds.* The locations of the borings along the interior and southern berms of the recycle ponds were used to develop a typical vertical profile that is representative of the subsurface lithology at the critical sections. The variability in the boring logs (see Appendix E) is noted and therefore multiple locations were used to assign a most-representative section for the analyses.

In general, three types of soils and infill material, as defined by the Unified Soil Classification System (USCS), were described, specifically including CL/CH, SC, and SM classified soil materials, and the bottom ash deposits. While the thicknesses of the soil units varied, it is projected that they generally consisted of fine-grained (CL, CH and SC) cohesive soils exhibiting a high clay content, with intermediate lenses, pockets and/or thin layers of cohesionless SM material. The uppermost layer consists of silty clays of low to high plasticity, is variable in thickness and composition, and is reported to be fill materials obtained from a neighboring on-site borrow source during construction of the ponds. The SM materials were generally present in thin lenses and pockets throughout the subsurface beneath the surficial cohesive fill soils but were only observed in one layer that uniformly underlies the site at a depth of approximately 20 feet. This layer ranged from less than 1 foot to about 7 feet in thickness. Beneath this SM layer was CL/CH materials similar to those above. For purposes of the analyses, the geometry was configured with an upper clayey soil layer underlain by a uniform SM layer of the maximum thickness observed, and thereafter underlain by clayey soils to the maximum depth of the borings. The bottom ash deposits were sluice-water placed and sorted, and consist basically of coarse granular materials derived from the combustion process. Bottom ash is typically angular and exhibits high interlocking potential between particles. The deposits were configured from the surveys previously referenced. This geometry was used throughout the analyses.

The soils were sampled in six locations at which undisturbed samples were obtained to conduct triaxial, consolidated-undrained shear strength tests with pore pressure measurements (tx/cu/pp tests) in a geotechnical laboratory in addition to classification and correlation tests. This data is summarized in Table 2, and as may be observed, the results of the strength testing indicates very similar results for the CL/CH and SC materials, with some variance for the SM materials. These data were used in the analyses as representative of the soil materials anticipated at the critical sections, and were utilized in the models utilizing the average of the data results. The average data were used given the relatively uniform test data results obtained and their presence within an expected range of industry standards that correlate with that type of soil. The complete laboratory data utilized is presented in Appendix F.

Table 2. Shear Strength Test Results Summary

Location	Depth (ft)	USCS	Effective Stress			Total Stress			Density (pcf)
			Angle of Friction (°)	Cohesion (psi)	Cohesion (psf)	Angle of Friction (°)	Cohesion (psi)	Cohesion (psf)	
B-1	8 to 10	CL	21.6	1.5	216.0	12.3	2.6	374.4	100.0
B-3	10 to 12	SC	32.5	0.0	0.0	23.6	0.0	0.0	100.0
B-3	20 to 22	SM	22.1	3.0	432.0	22.4	4.2	604.8	100.0
B-5	3 to 5	CL	29.6	2.5	360.0	26.1	1.5	216.0	95.4

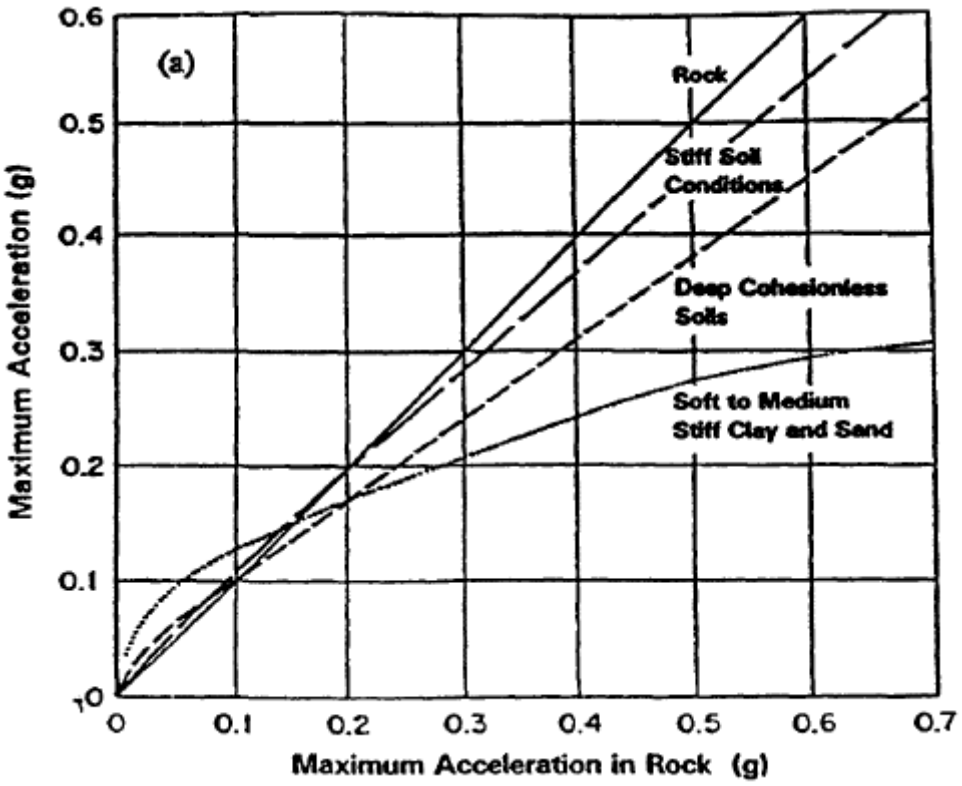
Location	Depth (ft)	USCS	Effective Stress			Total Stress			Density (pcf)
			Angle of Friction (°)	Cohesion (psi)	Cohesion (psf)	Angle of Friction (°)	Cohesion (psi)	Cohesion (psf)	
B-7	5 to 7	SM	42.5	11.2	1612.8	31.7	12.2	1756.8	90.4
B-7	15 to 17	SC	25.4	0.9	129.6	16.9	0.0	0.0	100.0
RP-4	20 to 22	CL	24.3	0.9	129.6	12.5	2.2	316.8	93.0
		Average CL	25.2		235.2	17.0		302.4	96.1
		Average SC	29.0		64.8	20.3		0.0	100
		Average SM	32.3		1022.4	27.1		1180.8	95.2
		Bottom Ash[1]	38		0	38		0	100

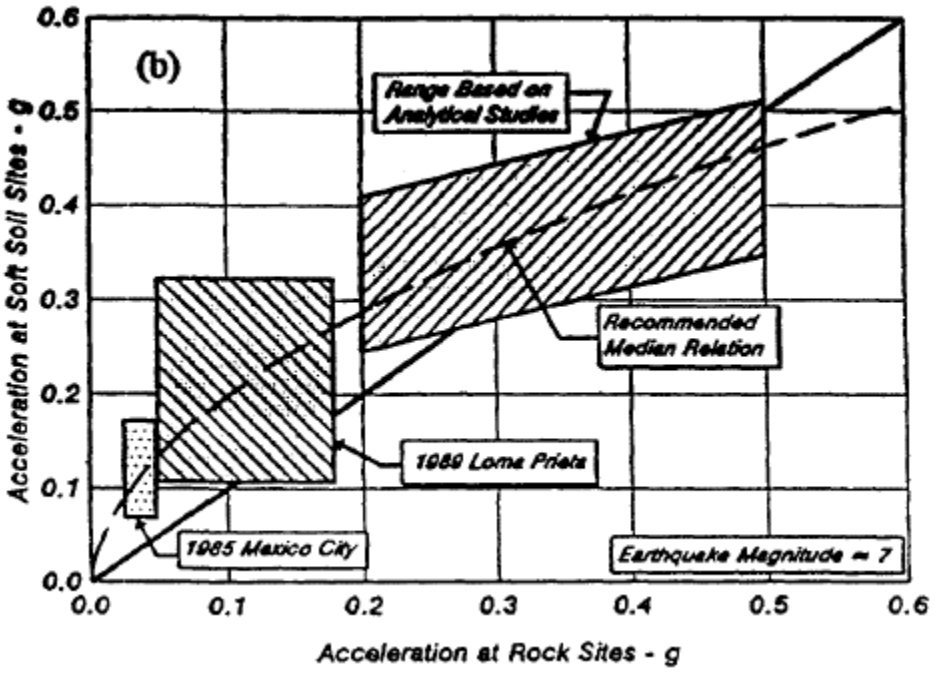
Notes:

1. The infill material, or the finer-grained particles intermixed with bottom ash in the South Pond was not specifically sampled and analyzed. The strength parameters are derived from the typical range of industry-accepted direct shear test values surveyed by the Federal Highway Administration (FHWA) Research and Technology Program (FHWA-RD-97-148) entitled, User Guidelines for Waste and Byproduct Materials in Pavement Construction, 2008). The range of angle of internal friction from this source is 38 to 42 degrees; a conservative assignment of 38 degrees was applied to accommodate the potential for finer-grained particles being entrained in the bottom ash. Though ash can exhibit some apparent cohesion, none was applied as a conservative value.

It is noted, however, that the site data available was of a general nature and not necessarily representative of that at the specific critical sections, or comprehensive for the specific purposes of this analysis. Therefore, the data was supplemented with literature values and data correlations with known parameters that may be indirect measures of the required parameters. The values selected were also deemed by ERM as representative of known site conditions from inspections of the site by qualified individuals. The sensitivity of the critical sections to variations in the soil parameters was evaluated for comparative purposes, but nevertheless, the results may vary if more specific soil data were available.

The peak ground acceleration (PGA) for the bedrock beneath the site was derived from analyses conducted by FTN Environmental. The PGA was determined to be 0.16 g (a percentage factor times the acceleration of gravity) in that document. The seismic coefficient adopted was an amplification of the PGA in the bedrock to reflect conditions at the ground surface. The amplification factor varies by the slope severity; “moderate” slopes were assumed which can be represented by a factor of 25% increase, and yielded a ground surface acceleration at the surface of the slope of 0.20g. In the GEO 5 software program, the PGA of 0.2g is modeled as an additional horizontal force acting at the center of gravity of a respective block with magnitude Kh*Wi, where Wi is the block overall weight including the material component of the slope surcharge. As supporting information, the RCRA Subtitle D (40 CFR 258) figures below indicate the amplified acceleration to be approximately 0.165-0.17g for a PGA of 0.16g. The use of 0.2g as horizontal acceleration is therefore deemed to be conservative.





The results of the static and seismic stability analyses are summarized below. The slope stability model outputs are presented in Appendix G.

Table 3. Slope Stability Analysis

Location	Stage (Arbitrary ID)	Scenario	Critical Slope	Static Response[1]				Seismic Response (K_h = 1.25*PGA = 0.2)			
				Peak		Residual		Peak		Residual	
				Rotational	Polygonal	Rotational	Polygonal	Rotational	Polygonal	Rotational	Polygonal
North-South Inner Berm (Composite Section)	1	South Pond Water Elev. 267' (top of infill) North Pond Max Storage Water Elev. 278'	Inner Berm - Southern Slope	2.34	2.39	2.46	2.6	1.27	1.34	1.4	1.55
	2	South Pond Water Elev. 267' (top of infill) North Pond Max Surcharge Water Elev. 281'		2.24	2.44	2.32	2.45	1.24	1.42	1.3	1.43
South Pond Composite Section	3	Lower Pond Water Elev. 276' South Pond Max Storage Water Elev. 278'	South Pond	3.92*	2.42	3.89*	2.75	1.54*	1.69	1.55*	1.59*
	4	Lower Pond Water Elev. 276' South Pond Max Surcharge Water Elev. 281'		3.94	3.72	3.96	2.87	1.46	1.56	1.49	1.50
	5	Lower Pond Water Elev.269' (lake floor) South Pond Max Storage Water Elev. 278'		2.86	2.58	2.95	2.56	1.45	1.52	1.53	1.64
	6	Lower Pond Water Elev.269' (lake floor) South Pond Max Surcharge Water Elev. 281'		2.76	2.54	2.83	2.49	1.36	1.43	1.48	1.49

Notes:

1. The FOS in the Static Response condition relates to the requirements set by the two separate categories in the 40 CFR 257.73(e): maximum storage pool loading conditions (I,) and maximum surcharge pool loading (ii) conditions.
2. An * indicates the factor of safety for the south berm critical slope as the interior of the south berm, whereas an FOS without an asterisk identifies the exterior slope of the south berm as the critical slope. Only the lowest FOS is provided.

3.0 LIQUEFACTION ASSESSMENT

3.1 Procedures

Two methods were used to evaluate the susceptibility of site soils to liquefaction:

1. Bray and Sancio Method for Fine-Grained Soils: Low to medium plasticity clays are characteristic of the site, as evident in the boring logs and laboratory results for particle-size distribution and the Atterberg limits (see Appendix E). Although not considered susceptible to liquefaction, these materials may be susceptible to strength loss as a result of a design seismic event. A method proposed by Bray and Sancio (2006) uses the results of laboratory investigations on silts and clays to define a range of soil index parameters for which a silt or clay may be susceptible to strength loss.

2. SPT-based Method: No measured SPT N-values are available; however, literature values were used to correlate N-values (blow counts) to the soil types encountered, and along with the laboratory data, N-values were extrapolated.

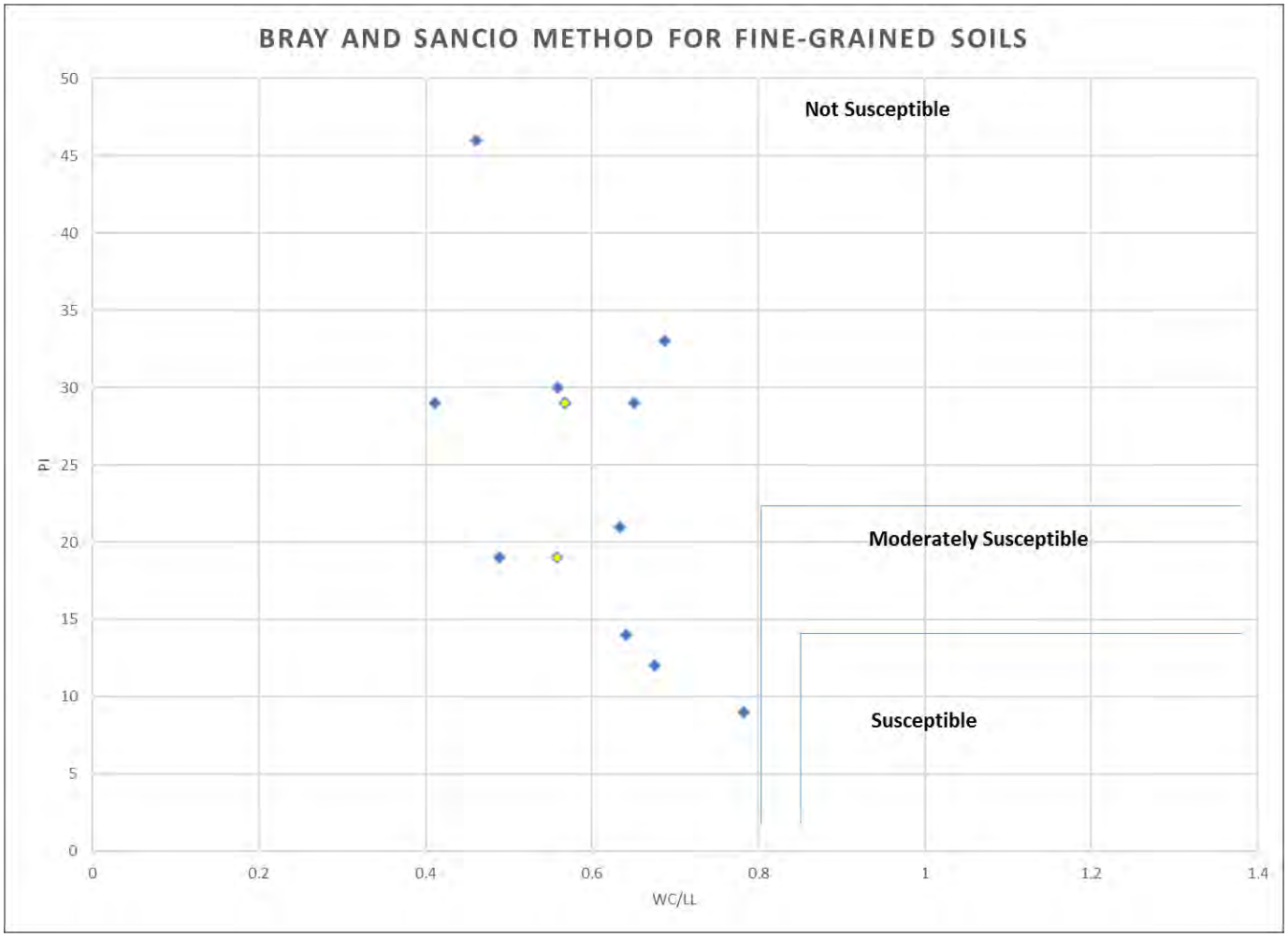
3.2 Bray and Sancio Method

Based on Bray and Sancio, a soil deposit is considered to be susceptible to liquefaction or cyclic mobility if the ratio of the water content to liquid limit is equal to or greater than 0.85 (wc /LL = 0.85), and the soil plasticity index is equal to or less than twelve (PI =< 12). Soils with plasticity index greater than twelve and less than or equal to twenty (12 < PI =< 20) and water content to liquid limit ratio greater to or equal than 0.8 (wc /LL = 0.8) may be moderately susceptible to liquefaction or cyclic mobility, and should be tested in the laboratory to assess the strain potential and liquefaction susceptibility under the loading conditions existing in the field. Soils with PI > 20 are considered too plastic with clays to liquefy.

The results provided in the table below indicate that the clayey soils tested plot outside the window for materials susceptible to liquefaction, according to Bray and Sancio. Based on this evaluation, it may be concluded that all site clayey soils are of sufficiently high plasticity and low moisture content that liquefaction is not a concern. It is noted that Borings B-3 and B-4 represent the locations of critical sections, as highlighted on the table and plot.

Table 4. Soil Data Summary Table Jun-18 – White Bluff Recycle Ponds

Sample ID	Sample Depth	Classification	LL	W_c	W_c/LL	PI	Susceptible?
B-1	3-5'	CH	63	29	0.460317	46	NOT
B-1	8-10'	CL	44	25	0.568182	29	NOT
B-3	5-7'	CL	37	24.1	0.651351	29	NOT
B-3	10-12'	SC	32	21.6	0.675	12	NOT
B-3	15-17'	SC	34	19	0.558824	19	NOT
B-4	8-10'	CH	59	33.5	0.567797	29	NOT
B-5	3-5'	CL	42	26.6	0.633333	21	NOT
B-5	10-12'	CL	35	17.1	0.488571	19	NOT
B-7	7-9'	CL	34	21.8	0.641176	14	NOT
B-7	15-17'	SC	28	21.9	0.782143	9	NOT
RP-4	20-22'	CL	54	22.2	0.411111	29	NOT
RP-4	30-32'	CH	54	37.1	0.687037	33	NOT
RP-9	30-32'	CH	54	30.2	0.559259	30	NOT



3.3 SPT-Based Method

Using the soil boring descriptions, existing soil type correlations and the laboratory shear strength data available, predictions of the range of N-values at the site were developed for the SM materials. (It is noted that the infill material as the contained waste materials, was not assessed as to liquefaction since it will be contained by the pond walls.) N-values were compared to typical ranges for similar materials. The intent was to apply the SPT Method of determining liquefaction potential to this layer of soil. The assumptions and methodology applied are presented below for this analysis:

Initial Data Limitation:
No Standard Penetration Test Results or Cone Penetration Test Results available:
Initial Assumption:

(Terzaghi, 1968) Table 45.1 Relative Density of Sands according to Results of SPT

No. of Blows	Relative Density
0- 4	Very Loose
4- 10	Loose
10- 30	Medium
30- 50	Dense
Over 50	Very Dense

1. According to (Terzaghi, 1968) Table 17.1 Relative Density of Sands according to Results of SPT Silty Sand has a range "phi" of 27-33 degrees (loose) and 30-34 degrees (dense)
2. The average SM materials exhibit an average effcetive "phi" of 32.3 degrees (see Table 2); therefore, assume an average N- value given the comparion of the actual laboratory data to the typical range, which indicates a high, loose to medium relative density for which an N-value of 20 may be representative.
3. A back-calculation of the minimum "phi" that assures a factor of safety above the requirement was perfomed to verify the selection of N-Value. The minimum N-value to meet the requirement was determined to be 17, which is well-within the typical range.

Factor of Safety Against Liquefaction Triggering (FSL) was calculated using the procedure presented in Youd et al. (2001):

$$FS_L = \frac{CRR_{7.5} \cdot MSF}{CSR} \cdot K_\sigma$$

FS= 1.49

CSR is the Cyclic Stress Ratio as defined by the equa (given) PGA = 0.2
(assumed) Total vertical stress: ranges 2300-2500 psf
(assumed) Effective vertical stress: ranges 1300 - 1700 psf
(assumed) rd = ranges from 0.8 - 1.0
Assumed effective vertical stress is 1/2 of total stress, based on stress values in the ASTM D4767 compression test report. This is not a verified correlation.

$$CSR = \frac{\tau_{av}}{\sigma'_{v0}} = \frac{0.65 \cdot PGA \cdot \sigma_{v0} \cdot r_d}{\sigma'_{v0}}$$

CSR = 0.208

MSF is the magnitude scaling factor, where Mw is moment magnitude (assumed):

$$MSF = \frac{10^{2.24}}{M_w^{2.56}}$$

History of magnitude ranges from 2.0-3.5 on average
maximum magnitude reach 5.0 within last 30 years

(used magnitude of 6.5)

MSF= 1.441922

K_σ is the overburden correction factor to convert $CRR_{7.5}$ to the confining stress of interest. The equation for K_σ is provided below, where P_a is 1 atm (in consistent and f is a function of site conditions (relative density, stress history, aging etc.). In our

1 atm = 2116 psf

Assumed as 1, because low relative density, little stress history other than weight of berm

$$K_\sigma = \left(\frac{\sigma'_{v0}}{p_a}\right)^{(f-1)} \quad (4\text{-}4)$$

K_σ=	f
1	1
1.157369	0.7
1.27581	0.5
1.406373	0.3
1.550298	0.1

$CRR_{7.5}$ is the cyclic resistance ratio of the soil normalized to a magnitude 7.5 earthquake and confining stress of 1 atm and is calculated as:

$$CRR_{7.5} = \frac{1}{34-(N_1)_{60cs}} + \frac{(N_1)_{60cs}}{135} + \frac{50}{\left[10\cdot(N_1)_{60cs}+45\right]^2} - \frac{1}{200} \quad (4\text{-}5)$$

where

- $(N_1)_{60cs}$ is the clean sand normalized standard penetration test blow count, such that $(N_1)_{60cs} = \alpha + \beta \cdot (N_1)_{60}$ where α and β are a function of the Fines Content (FC) as defined in the table below:

CRR= 0.21541

$(N_1)_{60CS}$ = % fines within 5-35%
alpha 3.233549
beta 1.066368
$(N_1)_{60CS}$ = 20 <-- minmium blow count correlating to the characteristic soil
0.11136
$(N_1)_{60CS}$ = 9.8

Fine content for boring -3 at 20-22 feet below grade is 18%

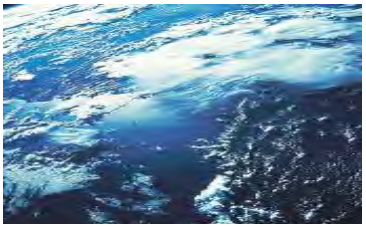
FC	*α*	*β*
≤ 5 %	0	1
5 – 35 %	exp[1.76 - (190/FC^2)]	[0.99 + (FC$^{1.5}$/1000)]
≥ 35 %	5	1.2

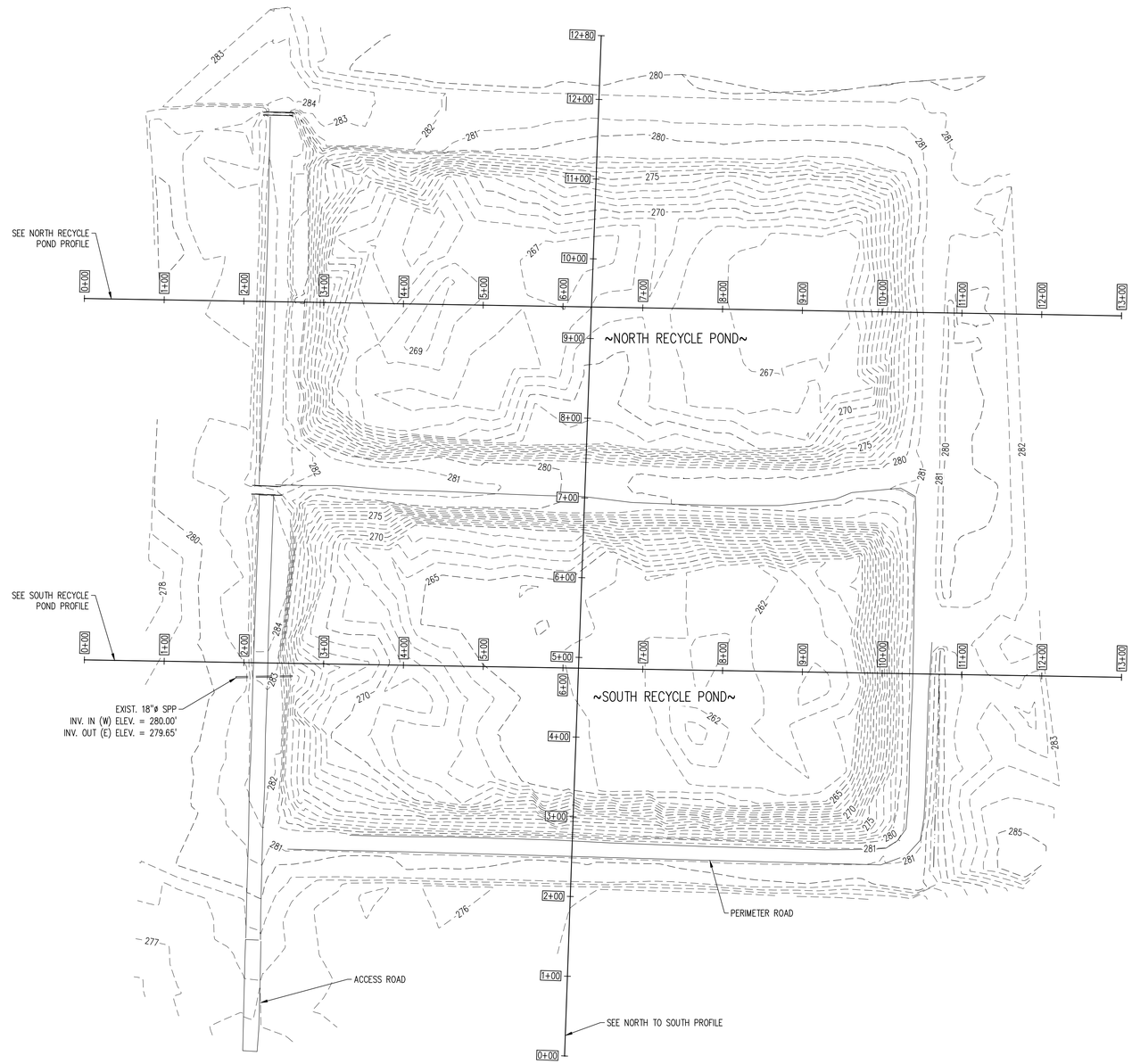
- $(N_1)_{60}$ is the normalized standard penetration resistance given as $(N_1)_{60} = N_m C_N C_E C_B C_R C_S$, where N_m is the measured SPT blow count and C_N, C_E, C_B, C_R, and C_S are defined in Table 4-3.

If the fines content (FC) was measured in the laboratory, that fines content was used for the spreadsheet analysis. Alternatively, FC was estimated based on field classification information on the boring logs according to:

Descriptor	*FC*
ML, CL, CH	35
SM, SC, SC/SM, SM/SC	12
SP/SM, SP/SC, SW/SM, SW/SC	8
SP, SW	0

Appendix A
Topographic Survey





NOTE: TOPOGRAPHIC MAP BASED ON SURVEY BY B&F ENGINEERING ON JULY 5TH & 6TH, 2018 AND ELECTRONIC CAD FILE BY HARMON SURVEYING, INC. DATED 6/28/18.

LEGEND

235 — MAJOR CONTOUR INDEX

236 — MINOR CONTOUR

PRELIMINARY
FOR REFERENCE ONLY

80 80 60 20 0 40 80 160
SCALE: 1" = 80'

REV. #	REV. DATE	BY	REVISIONS
A	8/6/18	DBW	ISSUED FOR REVIEW

B&F ENGINEERING, INC.
928 AIRPORT ROAD
HOT SPRINGS, AR 71913
(PH) 501-767-2366
(FAX) 501-767-6859
(EMAIL) info@bnfeng.com

PRELIMINARY

WHITE BLUFF RECYCLE PONDS

ENTERGY ARKANSAS
1100 WHITE BLUFF RD
REDFIELD, AR

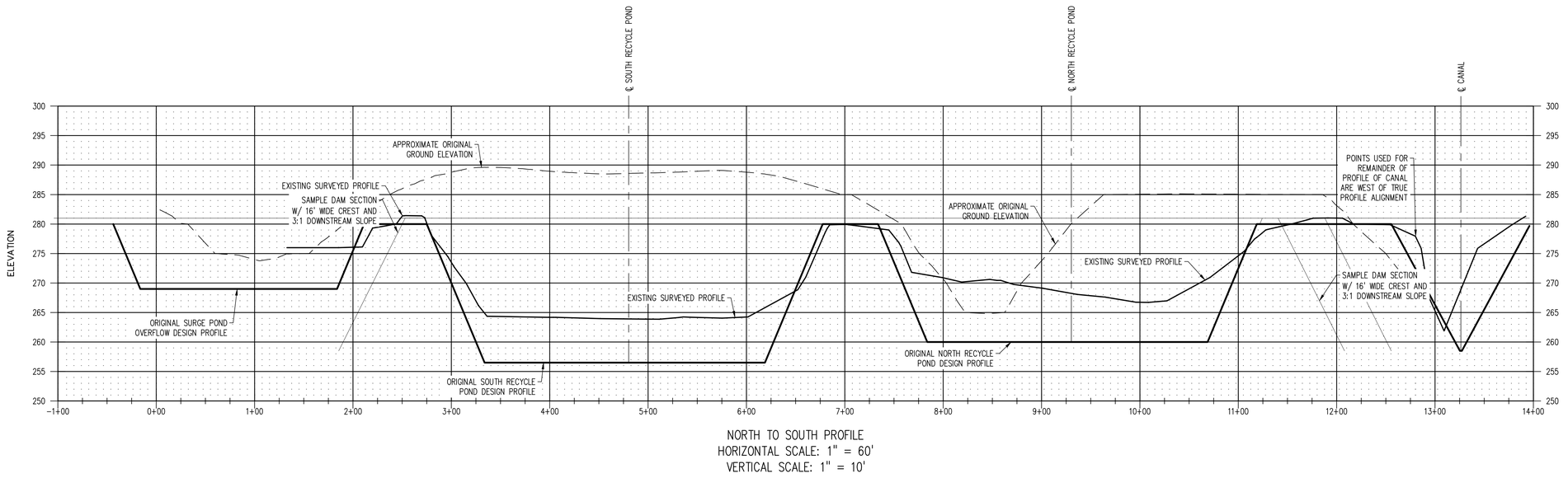
	BY	DATE
Design	DMM	7/18
Drawn	DMM	7/18
Checked		
Survey	TAW	07/18
Fld.Bk. #	2177	
Rev. #		

B&F PROJ. 7-4183-0201
FILE NAME: 002
ISSUE DATE: 8/6/18

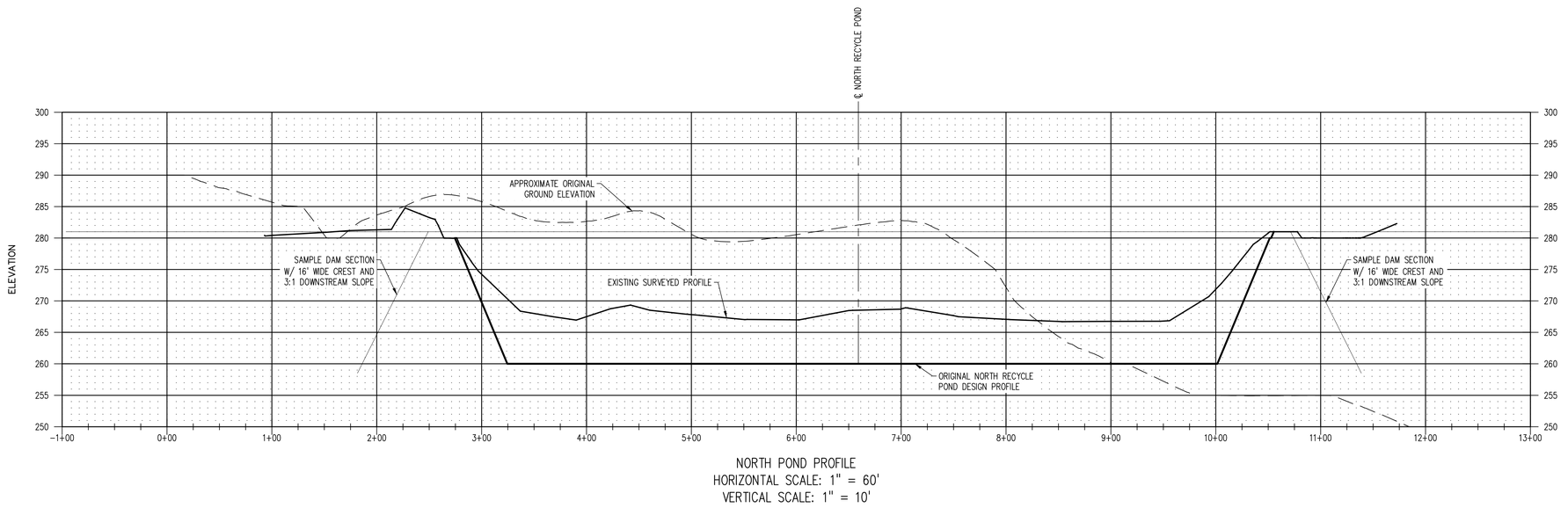
RECYCLE PONDS PLAN VIEW

EX 1

Appendix B
Recycle Ponds Profiles



NORTH TO SOUTH PROFILE
HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 1" = 10'



NORTH POND PROFILE
HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 1" = 10'

PRELIMINARY
FOR REFERENCE ONLY

10 8 6 4 2 0 5 10 20
SCALE: 1" = 10'

60 50 40 30 20 10 0 30 60 100
SCALE: 1" = 60'

REV. #	REV. DATE	BY	REVISIONS
A	8/6/18	DBW	ISSUED FOR REVIEW

B&F ENGINEERING, INC.
928 AIRPORT ROAD
HOT SPRINGS, AR 71913
(PH) 501-767-2366
(FAX) 501-767-6859
(EMAIL) info@bnfeng.com

PRELIMINARY

WHITE BLUFF RECYCLE PONDS

ENTERGY ARKANSAS
1100 WHITE BLUFF RD
REDFIELD, AR

	BY	DATE
Design	DMM	7/18
Drawn	DMM	7/18
Checked		
Survey	TAW	07/18
Fld.Bk. #	2177	
Rev. #		

B&F PROJ. 7-4183-0201
FILE NAME: 002
ISSUE DATE: 8/6/18

RECYCLE PONDS PROFILES

EX 2

Appendix C
Final Report for Geophysical Survey

FINAL REPORT
ASH POND SURVEY
WHITE BLUFF POWER PLANT
JEFFERSON COUNTY, ARKANSAS

Prepared for FTN Associates, Ltd.
Little Rock, Arkansas

Prepared by GeoView, Inc.
St. Petersburg, Florida

September 24, 2018

Ms. Dana Derrington, PE, PG
FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

Subject: Transmittal of Final Report for Geophysical Survey
White Bluff Steam Electric Station – Recycle Pond Survey
Jefferson County, Arkansas
GeoView Project Number 26897 Rev 2

Dear Ms. Derrington,

GeoView, Inc. (GeoView) is pleased to submit the final report which summarizes and presents the results of the geophysical survey conducted at the above referenced site. Sub-bottom profiling was used to map the bottom of the recycle ponds. GeoView appreciates the opportunity to have assisted you on this project. If you have any questions or comments about the report, please contact us.

Sincerely,
GEOVIEW, INC.

Chris Taylor, P.G.
Vice President
Florida Professional Geologist
Number 2256

Merritt McLean
Geophysicist

1.0 Introduction

A marine geophysical survey was conducted on two recycle ponds located at the White Bluff Steam Electric Station in Jefferson County, Arkansas. The purpose of the study was to map the bottom elevation of the recycle ponds. Each recycle pond was approximately 750 by 390 feet in size. The survey was conducted on June 14 and 15, 2018. The locations of the geophysical survey area are provided on Figures 1 and 2.

2.0 Description of Geophysical Investigation

The geophysical survey was conducted using a sub-bottom profiling towfish. The sub-bottom data was collected using an Edgetech 3100 system with a 216 towfish. The Edgetech system is a full Spectrum CHIRP imaging system. A frequency range of 2-16 kHz was used. During the survey, the towfish was situated 1.0 feet below the surface of the water. The high-power, low-frequency system was chosen to map the pond bottoms. The equipment was mounted to an unmanned, portable pontoon boat. The boat was pulled using ropes along each transect line. Photographs showing the equipment configuration are provided in Appendix 2.

Within each pond, data was collected on north/south oriented transects spaced approximately 50 feet apart. The positions of the geophysical transect lines were recorded using a differential Trimble Geo6000 Global Positioning System (GPS). Real time differential corrections were applied to the GPS positions.

The data was processed using Edgetech Discover software. The two way travel time distances to the pond bottom were digitized and depths/elevations were calculated using a velocity of 4,921 feet per second.

The digitized elevations were exported into an Excel spreadsheet and converted for use in Surfer. The coordinates were converted to Arkansas South State Plane, NAD2011 (US Survey feet) using Trimble Pathfinder and the elevations were converted to State Plane NAVD88 using a topographic site survey provided by FTN.

3.0 Survey Results

Results of the survey were able to provide accurate sub-bottom information for the elevation of the bottom of the recycle ponds. Contour maps showing the elevations of the bottom of the ponds are shown on Figure 1.

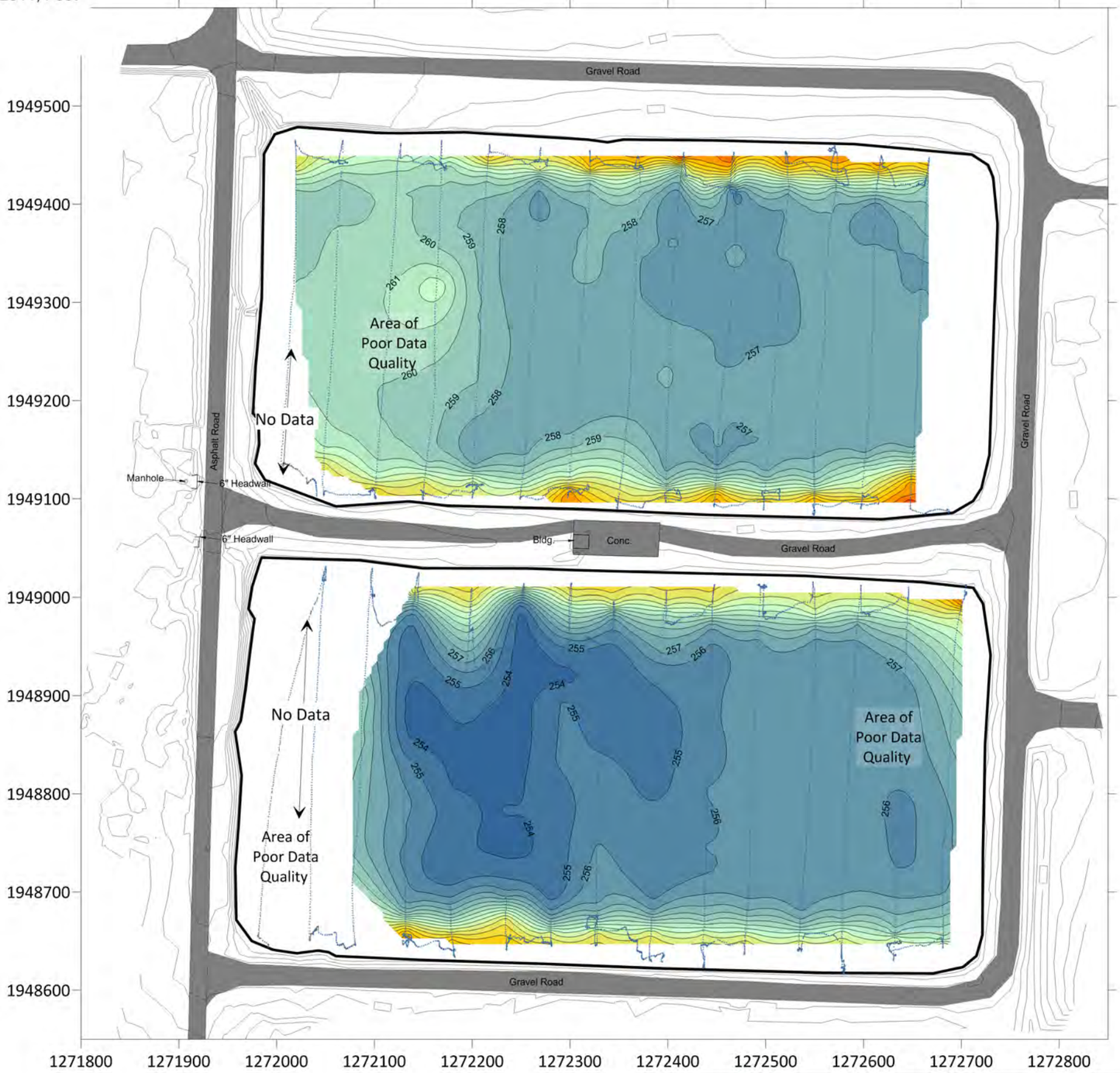
In general, the bottom elevation of the pond in the north pond ranged from approximately 256 to 260 feet. The bottom elevation of the pond in the south pond ranged from approximately 253.5 to 256 feet.

The data quality within the western portion of the north pond and the eastern and far western portions of the south pond was lower than in other portions of survey areas. In these areas, a shallower, intermediate reflector was present that partially obscured the bottom of the pond. In portions of the southern pond, the bottom of the pond was completely obscured and no valid data was able to be derived. These areas of poor quality are shown on the figure.

A discussion of the limitations of the geophysical methods used in this investigation is provided in Appendix 3.

APPENDIX 1
FIGURES

1. Coordinates: US State Plane, Arkansas South, NAD 2011, Feet
2. Vertical Datum: NAVD88, Feet
3. Elevation of Water at Time of Survey:
   277.75 Feet (North Pond)
   278.1 Feet (South Pond)
4. Towfish Located 1 foot Below Water Surface



275
274
273
272
271
270
269
268
267
266
265
264
263
262
261
260
259
258
257
256
255
254
253

Elevation of Pond Bottom
(NAVD 88, Feet)

NORTH

0 60 120

SCALE: 1"= 120'

EXPLANATION

ELEVATION CONTOUR OF POND BOTTOM (FEET)

SUB-BOTTOM TRANECT LINES

GeoView A geophysical services company

FIGURE 1

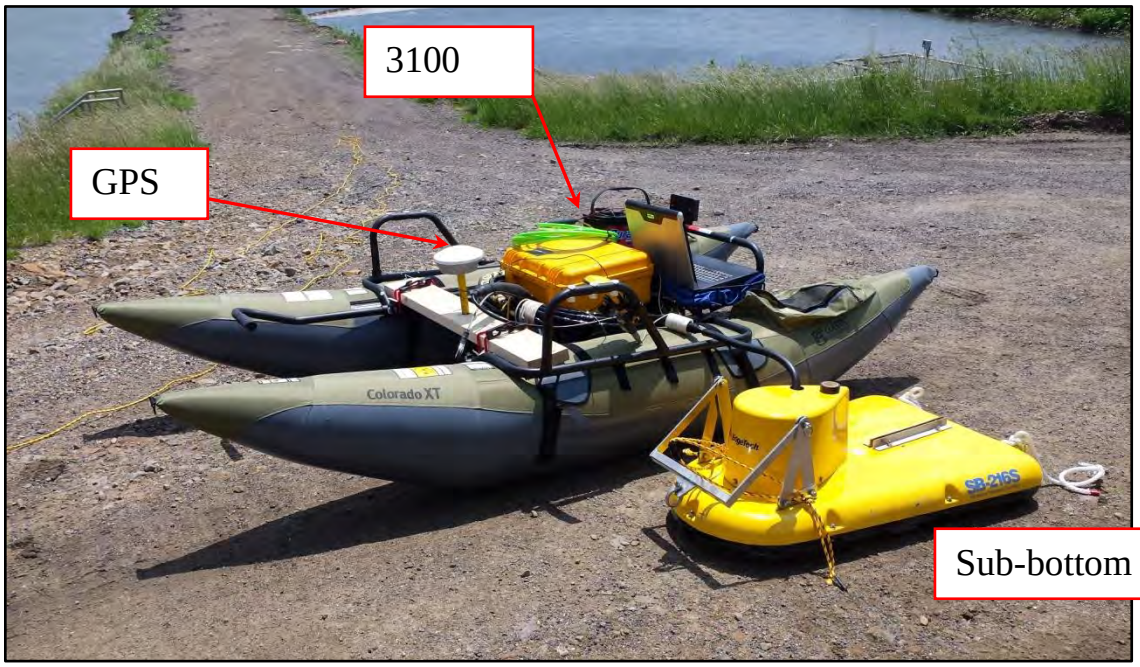
ELEVATION OF POND BOTTOM

WHITE BLUFF STEAM ELECTRIC STATION
JEFFERSON COUNTY, ARKANSAS

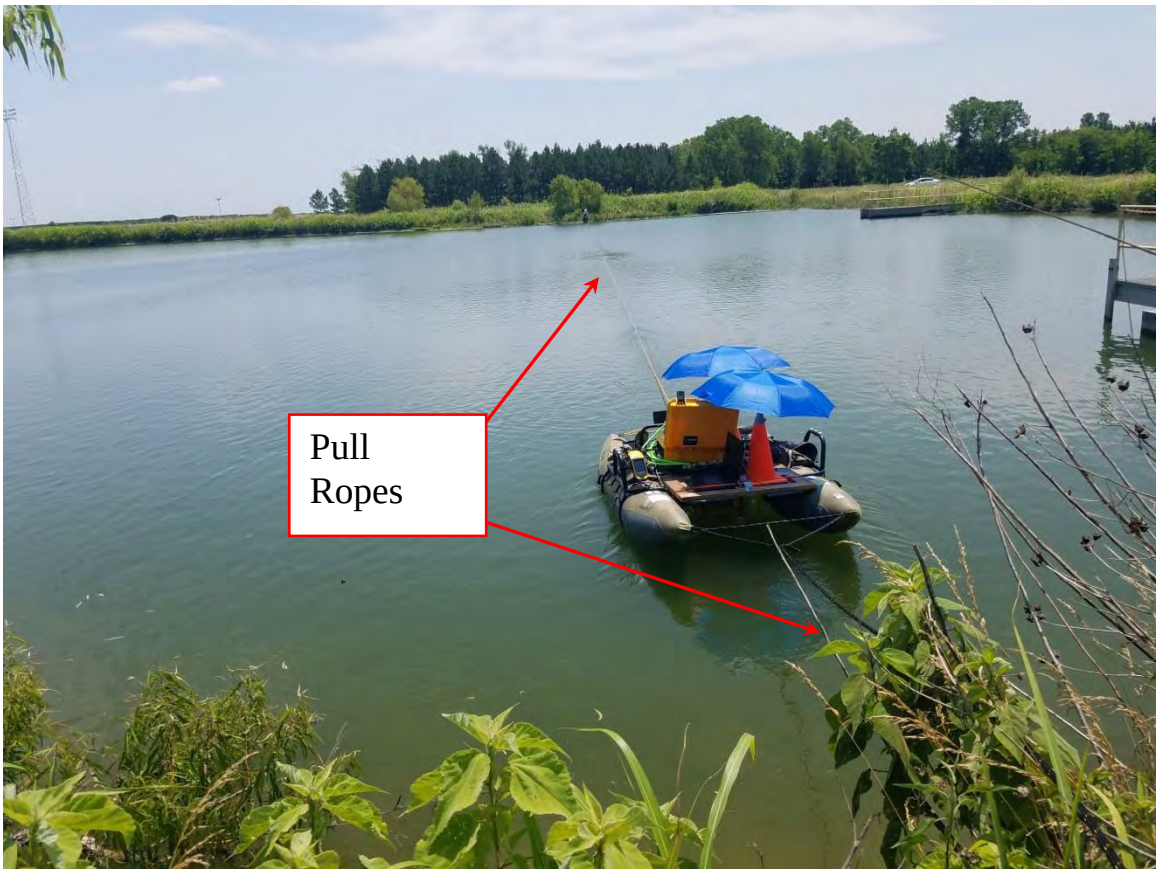
FTN ASSOCIATES, LTD
LITTLE ROCK, ARKANSAS

PROJECT: 26897
DATE: 09/24/18

APPENDIX 2
PHOTOGRAPHS



Picture Showing the GPS, 3100 Topside Unit and 216 Sub-bottom Unit (towfish)



Data Collection

APPENDIX 3
LIMITATIONS

Edgetech 3100 XS system

The 3100- Sub-bottom Profiling System is a Full Spectrum CHIRP imaging system. It was used with a SB-216S towfish. The 3100- system uses specially designed transmitters with low Q wideband characteristics best suited for CHIRP transmissions. Two hydrophones are installed in the tow vehicle to reduce acoustic scattering from the sides. This results in a narrower across track beam pattern, enabling the 3100 to have both high resolution and ample depth of penetration. For this survey, GeoView mounted the fish directly under the center of the tow raft. A GPS antenna was mounted directly over the transducer.

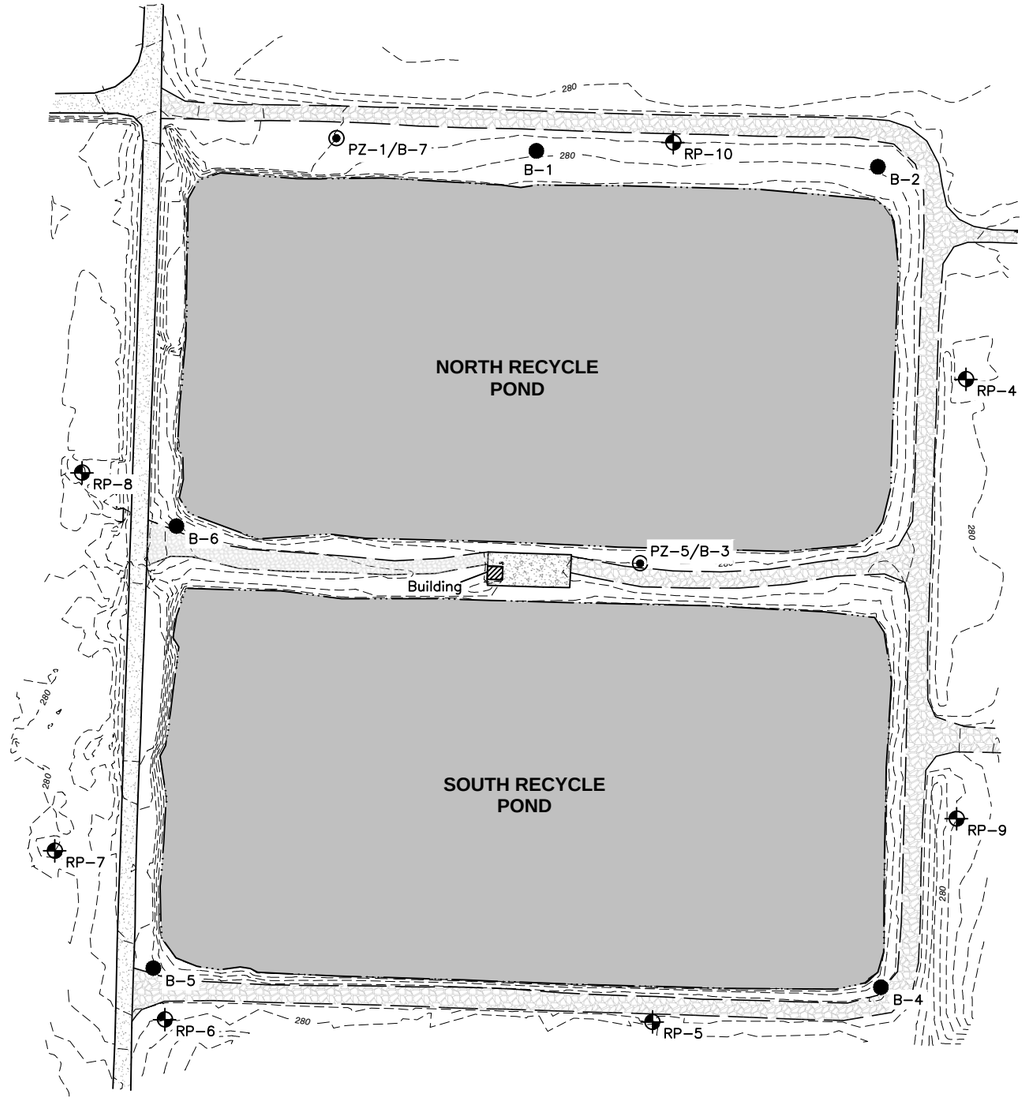
Limitations of geophysical data

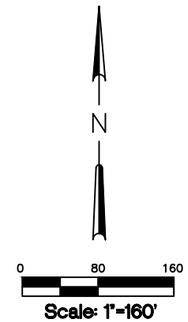
The marine environment, together with its boundaries, forms a remarkably complex medium for the propagation of sound. Both signal loss and interference result from interactions with boundaries and components within the water column, causing the source to be delayed, distorted and weakened. The main components affecting sound propagation are spreading loss and attenuation loss.

The ability of geophysical to collect interpretable information at a project site is limited by the attenuation (absorption) of the geophysical signal by underlying earth materials. Once the geophysical signal has been attenuated at a particular depth, information regarding deeper geological conditions will not be obtained. Geophysical data can only resolve subsurface features that have a sufficient density contrast between the feature in question and surrounding earth materials. If an insufficient contrast is present, the subsurface feature will not be identified.

GeoView can make no warranties or representations of geological conditions that may be present beyond the depth of investigation or resolving capability of the geophysical equipment or in areas that were not accessible to the geophysical investigation.

Appendix D
Geotechnical Boring Locations





LEGEND

- 280 — 5-FT INDEX CONTOUR
- 1-FT INTERMEDIATE CONTOUR
- PAVED ROAD
- GRAVEL ROAD
- CONCRETE PAD
- B-1 SOIL BORING
- PZ-1 PIEZOMETER
- RP-6 MONITORING WELL
- EXTENT OF WATER, JUNE 2018
- EDGE OF WATER, JUNE 2018

NOTES:

1. TOPOGRAPHIC INFORMATION IS FROM SURVEY PERFORMED BY HARMON SURVEYING, INC., JUNE 2018.
2. DRAWING IS BASED ON ARKANSAS STATE PLANE SYSTEM, NAD83, U.S. FEET.

R:\projects\07920-1845-001\cad\dwg\257-61 Wetlands\07920-1862-001-FG01.DWG

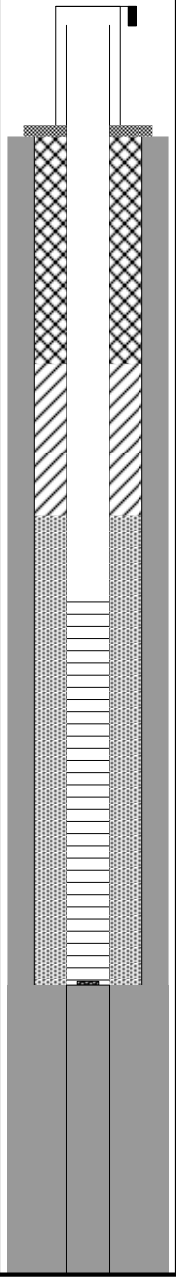
Figure 1. Site Map, Entergy White Bluff Recycle Ponds.

Appendix E
Geotechnical Boring Logs

FTN Associates Ltd. water resources / environmental consultants	PROJECT: **Monitoring Well Installations**	BORING ID: **RP-1**	
	LOCATION: **Entergy White Bluff Plant**	WELL ID: **RP-1**	
	DRILLING CONTRACTOR: **Walker-Hill Environmental, Inc.**	NORTHING: **1949807.4**	EASTING: **1273086.5**
	DRILLING EQUIPMENT: **Geoprobe 8150LS**	GROUND ELEVATION: **282.8 ft**	TOC ELEVATION: **285.72 ft**
FTN Project # R07920-1845-001	DRILLING METHOD: **Sonic with 4x6 core and case**	TOTAL WELL DEPTH: **25.3 ft below TOC**	DEPTH TO WATER: (7/17/2018) **8.97 ft below TOC**
LOGGED BY: **DLD**	SAMPLING METHOD: **Continuous with 10 ft 4 in diameter core barrel**	DATE STARTED: **6/13/2018**	DATE COMPLETED: **6/15/2018**

Depth (feet)	USCS	Description	% REC
-4			
0	CL	TOP SOIL	
		LEAN CLAY, light gray with reddish brown and orange mottles, stiff, moist.	
4			30
	CL		
8		@ 10 ft, SANDY LEAN CLAY, pinkish tan with dark pinkish tan clay lenses and orange and bright yellow mottling. Stiff, moist.	
12			
	SC	CLAYEY SAND, tan with orange and bright yellow mottles, dense, moist.	100
16	CL	SANDY LEAN CLAY, pinkish tan with dark pinkish tan clay lenses and orange and bright yellow mottling, stiff, moist.	
	SC	CLAYEY SAND, tan with orange and bright yellow mottles, dense, moist.	
20			
		FAT CLAY, dark pinkish tan, laminated with light gray silt, stiff, moist.	
24			100
	CH	@ 26 ft, color changes to olive gray.	
28			

Well Construction

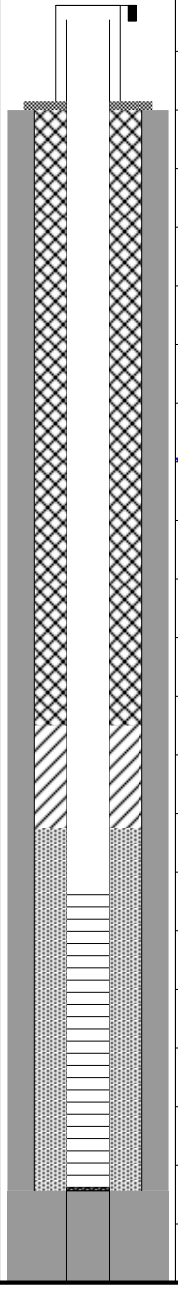


- Above ground completion includes 3x3 ft concrete pad, four pipe bollards, and locking outer aluminum casing.
- 15.2 ft of 4 in Sch. 40 PVC including 2.9 ft of stickup (vented below cap)
- Cement/bentonite grout from 0 to 6 ft bgs
- Bentonite seal from 6.0 to 10.0 ft. bgs
- Silica size 20/40 filter pack from 10.0 to 22.0 ft bgs
- 10 ft of 4 in dia. 0.010 in slot, Sch 40 PVC well screen
- 0.1 ft 4 in dia. Sch 40 PVC end cap
- Slough from 22.0 ft to 30.0 ft in 4 in dia., borehole.
- Drilling terminated at 30 ft bgs

NOTES: Horizontal and vertical data are based on the Harmon Surveying report dated July 13, 2018 (AR State Plane NAD83 South and NAVD88).

PROJECT: **Monitoring Well Installations**		BORING ID: **RP-2**	
LOCATION: **Entergy White Bluff Plant**		WELL ID: **RP-2**	
DRILLING CONTRACTOR: **Walker-Hill Environmental, Inc.**		NORTHING: **1950042**	EASTING: **1274004**
DRILLING EQUIPMENT: **Geoprobe 8150LS**		GROUND ELEVATION: **288.9 ft**	TOC ELEVATION: **291.92 ft**
FTN Project # R07920-1845-001	DRILLING METHOD: **Sonic with 4x6 core and case**	TOTAL WELL DEPTH: **39.9 ft below TOC**	DEPTH TO WATER: (7/17/2018) **15.14 ft below TOC**
LOGGED BY: **DLD**	SAMPLING METHOD: **Continuous with 10 ft 4 in diameter core barrel**	DATE STARTED: **6/13/2018**	DATE COMPLETED: **6/15/2018**

Depth (feet)	USCS	Description	% REC
0	CL	TOP SOIL	
		LEAN CLAY, light gray with orange mottles and light gray silt lenses, stiff, dry.	
4			30
8	CL		
12		@ 14 ft, color changes to greenish gray with orange mottles.	
16		FAT CLAY, pinkish tan with orange and some bright yellow mottles, blocky, very stiff, moist.	100
20	CH	@ 20 ft, color to reddish light brown with few mottles.	
24		@ 22.3 ft, FAT SANDY CLAY, silty, olive gray, fine-grained, increasing sand content with depth, very stiff.	100
28		CLAYEY SAND, fine-grained, olive gray, dense, moist.	
32	SC		
36			100
		FAT SANDY CLAY, olive gray, very stiff, moist.	
40	CH		



Well Construction

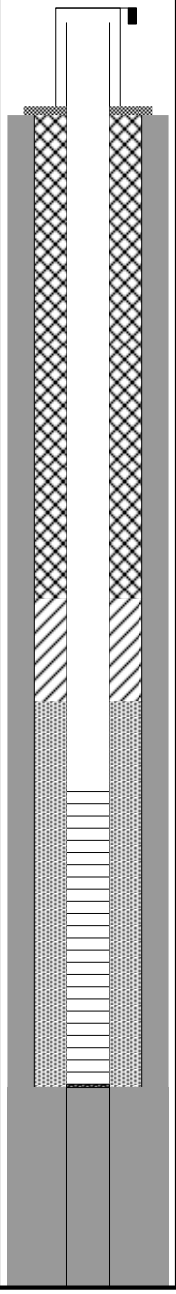
- Above ground completion includes 3x3 ft concrete pad, four pipe bollards, and locking outer aluminum casing.
- 29.8 ft of 4 in Sch. 40 PVC including 3.0 ft of stickup (vented below cap)
- Cement/bentonite grout from 0 to 21 ft bgs
- Bentonite seal from 21.0 to 24.5 ft bgs
- Silica size 20/40 filter pack from 24.5 to 37.0 ft bgs
- 10 ft of 4 in dia. 0.010 in slot, Sch 40 PVC well screen
- 0.1 ft 4 in dia. Sch 40 PVC end cap
- Slough from 37.0 ft to 40.0 ft in 4 in dia., borehole.
- Drilling terminated at 40 ft bgs

NOTES: Horizontal and vertical data are based on the Harmon Surveying report dated July 13, 2018 (AR State Plane NAD83 South and NAVD88).

FTN Associates Ltd. water resources / environmental consultants	PROJECT: **Monitoring Well Installations**	BORING ID: **RP-3**	
	LOCATION: **Entergy White Bluff Plant**	WELL ID: **RP-3**	
	DRILLING CONTRACTOR: **Walker-Hill Environmental, Inc.**	NORTHING: **1949489.5**	EASTING: **1273729.9**
	DRILLING EQUIPMENT: **Geoprobe 8150LS**	GROUND ELEVATION: **281.0 ft**	TOC ELEVATION: **284.15 ft**
FTN Project # R07920-1845-001	DRILLING METHOD: **Sonic with 4x6 core and case**	TOTAL WELL DEPTH: **36.3 ft below TOC**	DEPTH TO WATER: (7/17/2018) **8.6 ft below TOC**
LOGGED BY: **DLD**	SAMPLING METHOD: **Continuous with 10 ft 4 in diameter core barrel**	DATE STARTED: **6/12/2018**	DATE COMPLETED: **6/15/2018**

Depth (feet)	USCS	Graphic Log	Description	% REC
-4				
0			FAT CLAY, tan with yellowish orange mottles and some fine-grained sand, stiff, moist.	
4				30
8	CH			
12				
16				100
20			CLAYEY SAND, olive gray, stiff, moist.	
24	SC			100
28			POORLY GRADED SAND, fine-grained, clayey , olive gray, soft, moist.	
32	SP		LEAN CLAY, olive gray, laminated with light gray silt and very fine-grained sand, stiff, moist	
36	CL			
40				

Well Construction



- Above ground completion includes 3x3 ft concrete pad, four pipe bollards, and locking outer aluminum casing.
- 26.2 ft of 4 in Sch. 40 PVC including 3.2 ft of stickup (vented below cap)
- Cement/bentonite grout from 0 to 16.5 ft bgs
- Bentonite seal from 16.5 to 20.0 ft bgs
- Silica size 20/40 filter pack from 20.0 to 33.0 ft bgs
- 10 ft of 4 in dia. 0.010 in slot, Sch 40 PVC well screen
- 0.1 ft 4 in dia. Sch 40 PVC end cap
- Slough from 33.0 ft to 40.0 ft in 4 in dia., borehole.
- Drilling terminated at 40 ft bgs

NOTES: Horizontal and vertical data are based on the Harmon Surveying report dated July 13, 2018 (AR State Plane NAD83 South and NAVD88).

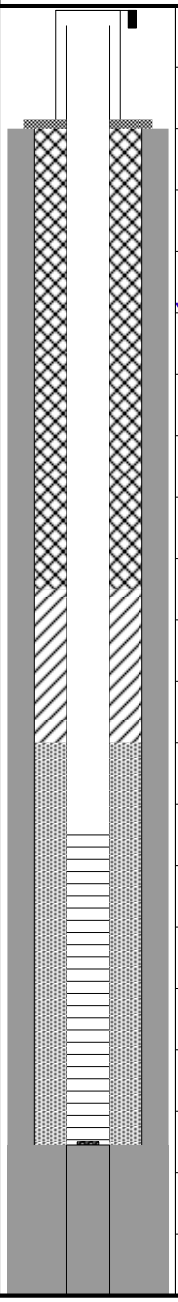
PROJECT: **Monitoring Well Installations**		BORING ID: **RP-4**	
LOCATION: **Entergy White Bluff Plant**		WELL ID: **RP-4**	
DRILLING CONTRACTOR: **Walker-Hill Environmental, Inc.**		NORTHING: **1949249.3**	EASTING: **1272808.4**
DRILLING EQUIPMENT: **Geoprobe 8150LS**		GROUND ELEVATION: **280.8 ft**	TOC ELEVATION: **284.17 ft**
DRILLING METHOD: **Sonic with 4x6 core and case**		TOTAL WELL DEPTH: **36.5 ft below TOC**	DEPTH TO WATER: (7/17/2018) **9.34 ft below TOC**
LOGGED BY: **AJP**	SAMPLING METHOD: **Continuous with 10 ft 4 in diameter core barrel**	DATE STARTED: **6/6/2018**	DATE COMPLETED: **6/15/2018**

ftn Associates Ltd.
water resources / environmental consultants

FTN Project # R07920-1845-001

Depth (feet)	USCS	Description
-4		
0	CL	TOP SOIL FAT CLAY, yellowish orange with some fine-grained sand and small gravel, stiff, moist to dry.
4	CH	@ 4-5.5 ft, FAT SANDY CLAY with some well-rounded gravel (< 2 inch) dia, tan, stiff, moist @ 6-6.3 ft, with clayey sand, red, medium to coarse grained sand, stiff.
8	CL	SILTY to SANDY CLAY, light gray to tan with some orange and red staining, fine-grained sand, stiff, moist.
	CH	FAT CLAY, yellowish orange with some fine-grained sand and small gravel, stiff, moist to dry.
12	ML	SILT, gray with black organic matter, sulfur smell.
	CL/ML	LEAN CLAY to SILT with sand, gray, increasing sand content with depth, medium stiff, moist.
16	CH	FAT CLAY, yellowish orange, with orange mottles.
	SC	CLAYEY SAND, fine-grained, red and light gray, medium stiff, moist.
20	SM	SILTY SAND, red to bright red, stiff.
	CH	FAT CLAY, light gray with some red mottles, soft to medium stiff, moist.
24	ML/CL	CLAYEY SILT to LEAN CLAY, gray, sulfur smell.
	CH	FAT SANDY CLAY, yellowish orange to olive green with some orange and red mottles. @ 26.2 - 26.5 ft, with silt laminations.
28	ML	SILT, light gray with lenses of olive gray clay, soft, moist. @ 27.2 - 27.3 ft, layer of organic matter.
32	CH	FAT CLAY, laminated with lenses of white silt to fine-grained sand, stiff, moist.
36		@ 38 ft, decreasing silt and sand content with depth.

% REC
100
50
60
100



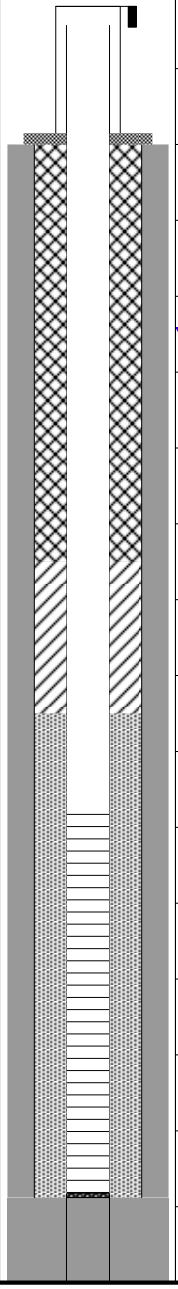
Well Construction
Above ground completion includes 3x3 ft concrete pad, four pipe bollards, and locking outer aluminum casing.
26.4 ft of 4 in Sch. 40 PVC including 3.4 ft of stickup (vented below cap)
Cement/benontite grout from 0 to 15.0 ft bgs
Bentonite seal from 15.0 to 20.0 ft bgs
Silica size 20/40 filter pack from 20.0 to 33.0 ft bgs
10 ft of 4 in dia. 0.010 in. slot, Sch 40 PVC well screen
0.1 ft 4 in dia. Sch 40 PVC end cap
Slough from 33.0 ft to 38.0 ft in 4 in dia., borehole.
Drilling terminated at 38 ft bgs

NOTES: Horizontal and vertical data are based on the Harmon Surveying report dated July 13, 2018 (AR State Plane NAD83 South and NAVD88).

PROJECT: **Monitoring Well Installations**		BORING ID: **RP-5**	
LOCATION: **Entergy White Bluff Plant**		WELL ID: **RP-5**	
DRILLING CONTRACTOR: **Walker-Hill Environmental, Inc.**		NORTHING: **1948586.2**	EASTING: **1272475.8**
DRILLING EQUIPMENT: **Geoprobe 8150LS**		GROUND ELEVATION: **281.4 ft**	TOC ELEVATION: **284.57 ft**
FTN Project # R07920-1845-001	DRILLING METHOD: **Sonic with 4x6 core and case**	TOTAL WELL DEPTH: **30.9 ft below TOC**	DEPTH TO WATER: (7/17/2018) **8.23 ft below TOC**
LOGGED BY: **AJP**	SAMPLING METHOD: **Continuous with 10 ft 4 in diameter core barrel**	DATE STARTED: **6/5/2018**	DATE COMPLETED: **6/15/2018**

Depth (feet)	USCS	Description	% REC
-4			
0	FILL	FILL, consisting of nepheline syenite gravel.	
4		FAT CLAY, yellowish orange to tan with oxidized orange silt and sand lenses, medium stiff to stiff, moist.	20
8	CH		
12		@ 12 ft, FAT SANDY CLAY, increasing sand content with depth, yellow and orange silt and fine-grained sand lenses.	
	SC	CLAYEY SAND, yellow and orange silt lenses, decreasing clay content with depth, medium stiff, moist.	100
16	SC/SM	CLAYEY SAND to SILTY SAND, tan with orange oxidized staining that decreases with depth, increasing clay content with depth, soft to medium stiff to soft, wet.	
	CH	FAT SANDY CLAY, orange and yellow staining along silt and sand lenses.	
20	SC	CLAYEY SAND, fine-grained, olive gray, decreasing clay content with depth, loose to medium dense.	
24	SM	SILTY SAND, fine-grained, olive gray, medium dense, wet.	100
28	CH	FAT SANDY CLAY, olive gray, stiff, moist. @ 27.5 ft, FAT CLAY, laminated lenses of white silt to fine-grained sand with some greenish gray to green clay layers.	

Well Construction



-4 Above ground completion includes 3x3 ft concrete pad, four pipe bollards, and locking outer aluminum casing.

0

4 20.8 ft of 4 in Sch 40 PVC including 3.2 ft of stickup (vented below cap)

8 Cement/benonite grout from 0 to 11 ft bgs

12 Bentonite seal from 11.0 to 15.0 ft bgs

16 Silica size 20/40 filter pack from 15.0 to 28.0 ft bgs

20

10 ft of 4 in dia. 0.010 in slot, Sch 40 PVC well screen

24

0.1 ft 4 in dia. Sch 40 PVC end cap

28 Slough from 28.0 ft to 30.0 ft in 4 in dia., borehole.

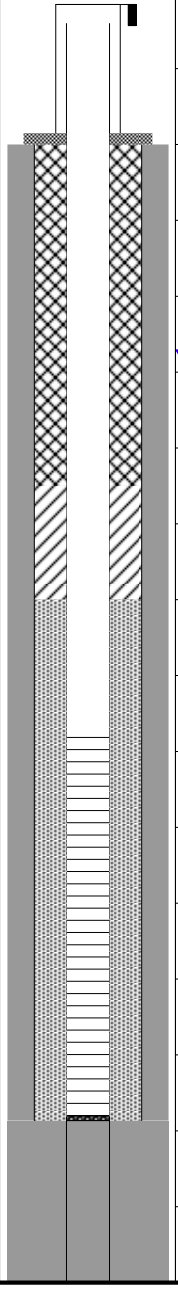
Drilling terminated at 30 ft bgs

NOTES: Horizontal and vertical data are based on the Harmon Surveying report dated July 13, 2018 (AR State Plane NAD83 South and NAVD88).

PROJECT: **Monitoring Well Installations**		BORING ID: **RP-6**	
LOCATION: **Entergy White Bluff Plant**		WELL ID: **RP-6**	
DRILLING CONTRACTOR: **Walker-Hill Environmental, Inc.**		NORTHING: **1948590.9**	EASTING: **1271958.9**
DRILLING EQUIPMENT: **Geoprobe 8150LS**		GROUND ELEVATION: **280.6 ft**	TOC ELEVATION: **283.81 ft**
FTN Project # R07920-1845-001	DRILLING METHOD: **Sonic with 4x6 core and case**	TOTAL WELL DEPTH: **28.9 ft below TOC**	DEPTH TO WATER: (7/17/2018) **8.82 ft below TOC**
LOGGED BY: **AJP**	SAMPLING METHOD: **Continuous with 10 ft 4 in diameter core barrel**	DATE STARTED: **6/5/2018**	DATE COMPLETED: **6/15/2018**

Depth (feet)	USCS	Description	% REC
-4			
0	CH	FAT CLAY, yellowish orange with some rootlets in upper 3 inches, medium stiff to stiff, moist.	
	ML	SILT, with layers of fine-grained sand, yellowish orange with oxidation along silt layers, dry to moist with moisture increasing with depth.	
4	CL	LEAN CLAY, yellowish orange, silt content decreases with depth, stiff, moist.	60
	CH	FAT CLAY, yellowish brown with yellow and orange silt lenses that decrease in frequency with depth, moist. @ 9.7 ft, color changes to olive gray. @ 10 ft, increasing fine-grained sand content with depth.	
8			
12	SC	CLAYEY SAND, fine-grained, olive gray, medium dense, moist.	
	CH	FAT SANDY CLAY, olive gray with lenses of fine-grained sand, stiff.	
	SC	CLAYEY SAND, fine-grained, olive gray, medium dense, moist.	8
16	CH	FAT SANDY CLAY, olive gray with lenses of fine-grained sand, stiff.	
20	SC	CLAYEY SAND, fine-grained, olive gray, decreasing sand content with depth, medium dense, moist.	
	SM	SILTY SAND, olive gray, medium dense. @ 23.8 ft, layer of organic matter.	100
24	SC	CLAYEY SAND, fine-grained, olive gray, increasing clay and lenses of white silt to fine-grained sand with depth, medium dense, moist.	
	CH	FAT CLAY, with laminated lenses of white silt to fine-grained sand, stiff, moist to dry. @ 25 ft, with greenish gray clay layers.	100
28			

Well Construction



- Above ground completion includes 3x3 ft concrete pad, four pipe bollards, and locking outer aluminum casing.
- 18.8 ft of 4 in Sch 40 PVC including 3.2 ft of stickup (vented below cap)
- Cement/bentonite grout from 0 to 9.0 ft bgs
- Bentonite seal from 9.0 to 12.0 ft bgs
- Silica size 20/40 filter pack from 12.0 to 26.0 ft bgs
- 10 ft of 4 in dia. 0.010 in. slot, Sch 40 PVC well screen
- 0.1 ft 4 in dia. Sch 40 PVC end cap
- Slough from 26.0 ft to 30.0 ft in 4 in dia., borehole.
- Drilling terminated at 30 ft bgs

NOTES: Horizontal and vertical data are based on the Harmon Surveying report dated July 13, 2018 (AR State Plane NAD83 South and NAVD88).

PROJECT: **Monitoring Well Installations**		BORING ID: **RP-7**	
LOCATION: **Entergy White Bluff Plant**		WELL ID: **RP-7**	
DRILLING CONTRACTOR: **Walker-Hill Environmental, Inc.**		NORTHING: **1948766.8**	EASTING: **1271839.4**
DRILLING EQUIPMENT: **Geoprobe 8150LS**		GROUND ELEVATION: **281.3 ft**	TOC ELEVATION: **284.46 ft**
DRILLING METHOD: **Sonic with 4x6 core and case**		TOTAL WELL DEPTH: **27.5 ft below TOC**	DEPTH TO WATER: (7/17/2018) **9.98 ft below TOC**
SAMPLING METHOD: **Continuous with 10 ft 4 in diameter core barrel**		DATE STARTED: **6/5/2018**	DATE COMPLETED: **6/15/2018**

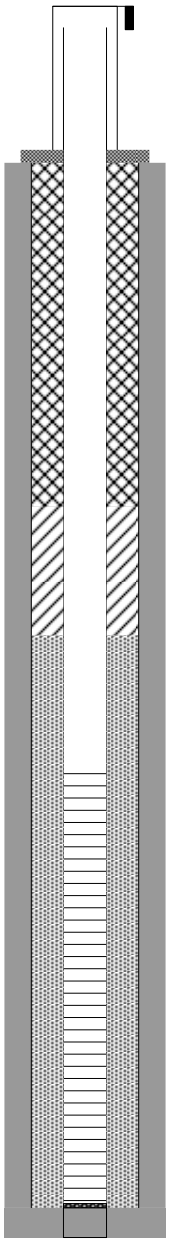
ftn Associates Ltd.
water resources / environmental consultants

FTN Project # R07920-1845-001

LOGGED BY: **AJP**

Depth (feet)	USCS	Description	% REC
-4			
0	CL / CH	TOP SOIL and GRAVEL FAT SANDY CLAY, yellowish orange, rootlets, medium stiff, moist.	
	ML	SILT, with clayey fine-grained sand, yellowish orange, increasing clay content with depth, moist to dry.	
4	CL	LEAN CLAY, yellowish orange with lenses of oxidized silt to fine-grained sand, stiff, moist.	80
8	CH	FAT CLAY, olive gray with lenses of white silt to fine-grained sand, stiff, moist.	
12			
16	SC	CLAYEY SAND, fine-grained, medium dense, moist.	80
	CH	FAT SANDY CLAY, olive gray, medium stiff, moist.	
20	SC	CLAYEY SAND, fine-grained, medium dense, moist.	
	SM	SILTY SAND, fine-grained, olive gray, wet.	
	SC	CLAYEY SAND, fine-grained, medium dense, moist.	100
24	CH	FAT CLAY, with laminated lenses of white silt to fine-grained sand, very stiff, moisture decreases with depth.	

Well Construction

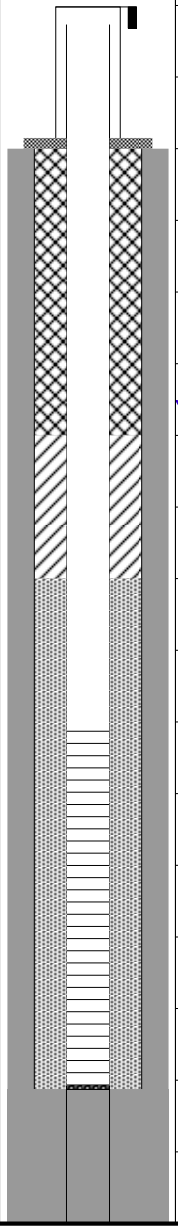


- Above ground completion includes 3x3 ft concrete pad, four pipe bollards, and locking outer aluminum casing.
- 17.4 ft of 4 in Sch 40 PVC including 3.2 ft stickup (vented below cap)
- Cement/bentonite grout from 0 to 8.0 ft bgs
- Bentonite seal from 8.0 to 11.0 ft bgs
- Silica size 20/40 filter pack from 11.0 to 24.0 ft bgs
- 10 ft of 4 in dia. 0.010 in slot, Sch 40 PVC well screen
- 0.1 ft 4 in dia. Sch 40 PVC end cap
- Slough from 24.0 ft to 25.0 ft in 4 in dia., borehole.
- Drilling terminated at 25 ft bgs

NOTES: Horizontal and vertical data are based on the Harmon Surveying report dated July 13, 2018 (AR State Plane NAD83 South and NAVD88).

PROJECT: **Monitoring Well Installations**		BORING ID: **RP-8**	
LOCATION: **Entergy White Bluff Plant**		WELL ID: **RP-8**	
DRILLING CONTRACTOR: **Walker-Hill Environmental, Inc.**		NORTHING: **1949162.5**	EASTING: **1271875.3**
DRILLING EQUIPMENT: **Geoprobe 8150LS**		GROUND ELEVATION: **282.1 ft**	TOC ELEVATION: **285.60 ft**
FTN Project # R07920-1845-001	DRILLING METHOD: **Sonic with 4x6 core and case**	TOTAL WELL DEPTH: **29.7 ft below TOC**	DEPTH TO WATER: (7/17/2018) **10.75 ft below TOC**
LOGGED BY: **AJP**	SAMPLING METHOD: **Continuous with 10 ft 4 in diameter core barrel**	DATE STARTED: **6/4/2018**	DATE COMPLETED: **6/15/2018**

Depth (feet)	USCS	Description	% REC
-6			
-2	CH	FAT SANDY CLAY, yellowish orange, increasing sand and silt content with depth, medium stiff, moist.	
2	ML	SILT, with clayey fine-grained sand, tan to yellowish orange with lenses of clay, moist to dry.	
6	CH/CL	FAT SANDY CLAY to LEAN CLAY, orange oxidized lenses of silt within fat sandy clay, sand content increasing with depth, stiff.	80
10		@ 10 ft, medium stiff, increasing moisture with depth.	
14	SC	CLAYEY SAND, yellowish brown, loose to medium dense. @ 13.8 ft, color changes to olive gray.	80
18	CH	FAT SANDY CLAY, olive gray, medium stiff to stiff, moist.	
	SC	CLAYEY SAND, yellowish brown, loose to medium dense. @ 20 ft, decreasing clay content with depth.	
22	SM	SILTY SAND, fine-grained, olive gray, loose, moist.	
26	CH	FAT CLAY, with laminated lenses of white silt to fine-grained sand.	100
30			



Well Construction

- Above ground completion includes 3x3 ft concrete pad, four pipe bollards, and locking outer aluminum casing.
- 19.6 ft of 4 in Sch 40 PVC including 3.5 ft stickup (vented below cap)
- Cement/bentonite grout from 0 to 8.0 ft bgs
- Bentonite seal from 8.0 to 12.0 ft bgs
- Silica size 20/40 filter pack from 12.0 to 26.3 ft bgs
- 10 ft of 4 in dia. 0.010 in slot, Sch 40 PVC well screen
- 0.1 ft 4 in dia. Sch 40 PVC end cap
- Slough from 26.3 ft to 30.0 ft in 4 in dia., borehole.
- Drilling terminated at 30 ft bgs

NOTES: Horizontal and vertical data are based on the Harmon Surveying report dated July 13, 2018 (AR State Plane NAD83 South and NAVD88).

PROJECT: **Monitoring Well Installations**		BORING ID: **RP-9**	
LOCATION: **Entergy White Bluff Plant**		WELL ID: **RP-9**	
DRILLING CONTRACTOR: **Walker-Hill Environmental, Inc.**		NORTHING: **1948797.6**	EASTING: **1272803.3**
DRILLING EQUIPMENT: **Geoprobe 8150LS**		GROUND ELEVATION: **281.4 ft**	TOC ELEVATION: **284.68 ft**
FTN Project # R07920-1845-001	DRILLING METHOD: **Sonic with 4x6 core and case**	TOTAL WELL DEPTH: **29.8 ft below TOC**	DEPTH TO WATER: (7/17/2018) **8.35 ft below TOC**
LOGGED BY: **AJP**	SAMPLING METHOD: **Continuous with 10 ft 4 in diameter core barrel**	DATE STARTED: **6/6/2018**	DATE COMPLETED: **6/15/2018**

Depth (feet)	USCS	Description	% REC
-4			
0	CL	TOP SOIL	
	CH	FAT CLAY, yellowish orange to tan, rootlets in upper 1 ft, increasing silt with depth, hard, dry.	
4	ML	SILT, with fine-grained sand that increases with depth, tan, soft to medium stiff, moist.	
	SM	SILTY SAND, fine-grained, tan with orange oxide staining, medium stiff to stiff, moisture increases with depth.	100
	GC	CLAYEY GRAVEL with sand, well graded angular to subrounded sand with subrouneded to rounded gravel (<1 in), dry to moist.	
	SM	SILTY SAND, fine-grained, tan with orange oxide staining, medium stiff to stiff, moisture increases with depth.	
8	GM/SW	WELL GRADED SAND and GRAVEL, very fine-grained to coarse-grained, angular to subrounded sand and subangular to subrounded gravel (<2 in), dry to moist.	
	GW	WELL GRADED GRAVEL, angular to subrounded (<2 in).	
12	CH	FAT SANDY CLAY, tan with oxidized lenses of silt and fine-grained sand, sand content increases with depth, soft to medium stiff,	
	SC	CLAYEY SAND, light gray, soft, wet.	
	SM	SILTY SAND, light gray with some orange oxide staining, loose, wet.	100
16			
	CL/CH	LEAN SANDY CLAY to FAT SANDY CLAY, lenses of silt and sand, heavily oxidized, decreasing clay content with depth, soft, wet.	
	SM	SILTY SAND, fine-grained, tan to yellow, loose, wet.	
20			
24			
	CH	FAT CLAY, tan, stiff, moist.	100
		@ 25 ft, color changes to olive gray.	
28			

Well Construction

-4

Above ground completion includes 3x3 ft concrete pad, four pipe bollards, and locking outer aluminum casing.

0

19.7 ft of 4 in Sch 40 PVC including 3.3 ft stickup (vented below cap)

4

Cement/bentonite grout from 0 to 9.0 ft bgs

8

Bentonite seal from 9.0 to 14.0 ft bgs

12

16

Silica size 20/40 filter pack from 14.0 to 26.5 ft bgs

20

10 ft of 4 in dia. 0.010 in slot, Sch 40 PVC well screen

24

0.1 ft 4 in dia. Sch 40 PVC end cap

Slough from 26.5 ft to 30.0 ft in 4 in dia., borehole.

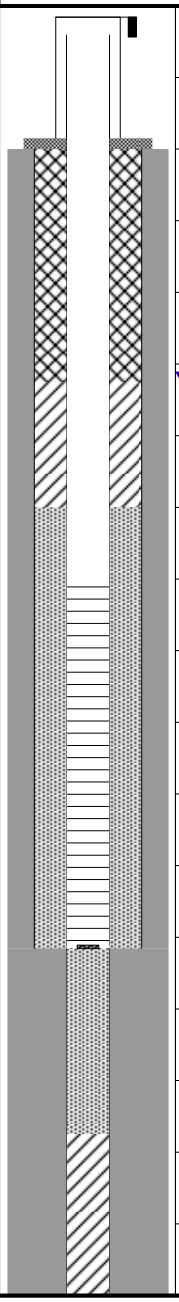
28

Drilling terminated at 30 ft bgs

NOTES: Horizontal and vertical data are based on the Harmon Surveying report dated July 13, 2018 (AR State Plane NAD83 South and NAVD88).

FTN Associates Ltd. water resources / environmental consultants	PROJECT: **Monitoring Well Installations**	BORING ID: **RP-10**	
	LOCATION: **Entergy White Bluff Plant**	WELL ID: **RP-10**	
	DRILLING CONTRACTOR: **Walker-Hill Environmental, Inc.**	NORTHING: **1949510.5**	EASTING: **1272499**
	DRILLING EQUIPMENT: **Geoprobe 8150LS**	GROUND ELEVATION: **280.5 ft**	TOC ELEVATION: **283.66 ft**
FTN Project # R07920-1845-001	DRILLING METHOD: **Sonic with 4x6 core and case**	TOTAL WELL DEPTH: **25.5 ft below TOC**	DEPTH TO WATER: (7/17/2018) **9.6 ft below TOC**
LOGGED BY: **DLD**	SAMPLING METHOD: **Continuous with 10 ft 4 in diameter core barrel**	DATE STARTED: **6/12/2018**	DATE COMPLETED: **6/15/2018**

Depth (feet)	USCS	Description	% REC
-4			
0	FILL	FILL, consisting of nepheline syenite gravel.	
4		FAT CLAY, tan with yellowish orange mottles, some fine-grained sand, stiff, moist.	40
8	CH		
12		@ 12 ft, SANDY FAT CLAY.	
	SC	CLAYEY SAND, fine-grained, gray with orange mottles, dense, moist.	
16	SP	POORLY GRADED SAND, fine-grained, silty, gray with orange mottles, wet.	100
20			
	CL	SILT and FAT CLAY, brownish tan clay with light gray silt, medium stiff, moist.	
24		FAT CLAY, dark gray with light gray laminated silt lenses, stiff, moist.	100
28	CH		
32			



Well Construction

- Above ground completion includes 3x3 ft concrete pad, four pipe bollards, and locking outer aluminum casing.
- 15.4 ft of 4 in Sch 40 PVC including 3.2 ft stickup (vented below cap)
- Cement/bentonite grout from 0 to 6.5 ft bgs
- Bentonite seal from 6.5 to 10.0 ft bgs
- Silica size 20/40 filter pack from 10.0 to 22.3 ft bgs
- 10 ft of 4 in dia. 0.010 in slot, Sch 40 PVC well screen
- 0.1 ft 4 in dia. Sch 40 PVC end cap
- Silica size 20/40 filter pack from 22.3 to 27.5 ft bgs in a 4 in dia. borehole
- Bentonite seal from 27.5 to 32.0 ft bgs in a 4 in dia. borehole
- Drilling terminated at 32 ft bgs

NOTES: Horizontal and vertical data are based on the Harmon Surveying report dated July 13, 2018 (AR State Plane NAD83 South and NAVD88).

PROJECT: **Monitoring Well Installations**		BORING ID: **B-1**	
LOCATION: **Entergy White Bluff Plant**		WELL ID: **N/A**	
DRILLING CONTRACTOR: **Walker-Hill Environmental, Inc.**		NORTHING: **1949501.9**	EASTING: **1272354.9**
DRILLING EQUIPMENT: **Geoprobe 8150LS**		GROUND SURFACE ELEV.: **280.3 ft NAVD88**	
FTN Project # R07920-1845-001	DRILLING METHOD: **Sonic with 4 in diameter core**	TOTAL DEPTH: **10 ft bgs**	DEPTH TO WATER: **N/A**
LOGGED BY: **AJP**	SAMPLING METHOD: **Continuous with 10 ft 4 in diameter core barrel**	DATE STARTED: **5/16/2018**	DATE COMPLETED: **5/16/2018**

Depth (feet)	% REC	USCS	Graphic Log	Description
0		FILL		FILL
1	77	GW		WELL GRADED GRAVEL with sand, medium to coarse sand, fine to coarse-grained angular to round gravel, medium dense to loose, dry.
3	66	CH		FAT SANDY CLAY, tan with orange oxide staining, lenses of fine sand, stiff, moist.
8		CL		LEAN CLAY with fine-grained sand, silty yellowish brown and gray, moist.
10				Boring terminated at 10 ft bgs.

NOTES: Northings and eastings recorded using a Garmin eTrex30 and converted to AR State Plane NAD83 South
Borehole backfilled with bentonite to ground surface.

PROJECT: **Monitoring Well Installations**		BORING ID: **B-2**	
LOCATION: **Entergy White Bluff Plant**		WELL ID: **N/A**	
DRILLING CONTRACTOR: **Walker-Hill Environmental, Inc.**		NORTHING: **1949485.1**	EASTING: **1272715.5**
DRILLING EQUIPMENT: **Geoprobe 8150LS**		GROUND SURFACE ELEV.: **280.2 ft NAVD88**	
FTN Project # R07920-1845-001	DRILLING METHOD: **Sonic with 4 in diameter core**	TOTAL DEPTH: **10 ft bgs**	DEPTH TO WATER: **N/A**
LOGGED BY: **AJP**	SAMPLING METHOD: **Continuous with 10 ft 4 in diameter core barrel**	DATE STARTED: **5/16/2018**	DATE COMPLETED: **5/16/2018**

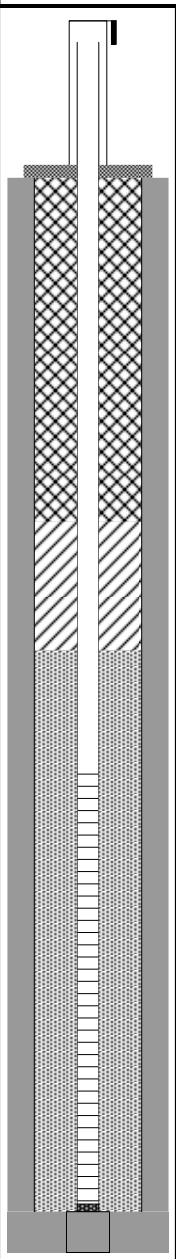
Depth (feet)	% REC	USCS	Graphic Log	Description
0				FAT SANDY CLAY, light gray with orange and red oxide staining, fine grained sand, rootlets, very stiff, dry to moist.
1				
2				
	100			
3				
4				
5		CH		@ 4.6 ft FAT CLAY with sand and some rounded gravels, soft, moist. @ 5 ft FAT SANDY CLAY, light gray with orange and red oxide staining, fine grained sand, very stiff, dry to moist.
6				
7				
	50			
8				
9				
10				

NOTES: Northings and eastings recorded using a Garmin eTrex30 and converted to AR State Plane NAD83 South
Borehole backfilled with bentonite to ground surface.

FTN Associates Ltd. water resources / environmental consultants	PROJECT: **Monitoring Well Installations**	BORING ID: **B-3**	
	LOCATION: **Entergy White Bluff Plant**	WELL ID: **PZ-5**	
	DRILLING CONTRACTOR: **Walker-Hill Environmental, Inc.**	NORTHING: **1949067.5**	EASTING: **1272460.6**
	DRILLING EQUIPMENT: **Geoprobe 8150LS**	GROUND ELEVATION: **279.9 ft**	TOC ELEVATION: **283.01 ft**
FTN Project # R07920-1845-001	DRILLING METHOD: **Sonic with 4x6 core and case**	TOTAL WELL DEPTH: **27.2 ft below TOC**	DEPTH TO WATER: (7/17/2018) **8.72 ft below TOC**
LOGGED BY: **AJP**	SAMPLING METHOD: **Continuous with 10 ft 4 in diameter core barrel**	DATE STARTED: **5/15/2018**	DATE COMPLETED: **6/15/2018**

Depth (feet)	USCS	Graphic Log	Description	% REC
-4				
0	CH		FAT CLAY, light brown, stiff, moist.	50
			@ 4.8 ft, with rounded gravel.	
4			SANDY CLAY, light gray to tan with some iron stained lenses, soft, moist.	33
8	CL			
	SC		CLAYEY SAND, tan, soft, moist to wet.	
12	CL		LEAN SANDY CLAY, light gray to tan with some iron stained lenses, soft, moist to wet.	80
	CH		FAT SANDY CLAY, tan with lenses of fine-grained sand, stiff, moist.	
16	SC		CLAYEY SAND,fine-grained, tan with orange oxide staining, clay content decreasing with depth, loose, wet.	100
20	SM		SILTY SAND, tan with some oxide staining, loose, wet.	100
			@ 20.8 - 21 ft layer of fat clay.	
			@ 22.9 - 23 ft, lenses of olive gray clay.	
24	CH		FAT CLAY, olive gray, laminated with white silt to fine-grained sand, stiff, dry.	

Well Construction



- -4: Above ground completion includes 2x2 ft concrete pad, four pipe bollards, and locking outer aluminum casing.
- 0: 17.0 ft of 2 in Sch 40 PVC including 3.1 ft stickup (vented below cap)
- 4: Cement/bentonite grout from 0 to 8.0 ft bgs
- 8: Bentonite seal from 8.0 to 11.0 ft bgs
- 12: Silica size 20/40 filter pack from 11.0 to 24.0 ft bgs
- 16
- 20: 10 ft of 2 in dia. 0.010 in slot, Sch 40 PVC well screen
- 24: 0.18 ft 2 in dia. Sch 40 PVC end cap
  Slough from 24 ft bgs to 25 ft bgs
  Drilling terminated at 25 ft bgs

NOTES: Horizontal and vertical data are based on the Harmon Surveying report dated July 13, 2018 (AR State Plane NAD83 South and NAVD88).

PROJECT: **Monitoring Well Installations**		BORING ID: **B-4**	
LOCATION: **Entergy White Bluff Plant**		WELL ID: **N/A**	
DRILLING CONTRACTOR: **Walker-Hill Environmental, Inc.**		NORTHING: **1948619**	EASTING: **1272718.6**
DRILLING EQUIPMENT: **Geoprobe 8150LS**		GROUND SURFACE ELEV.: **280.8 ft NAVD88**	
FTN Project # R07920-1845-001	DRILLING METHOD: **Sonic with 4 in diameter core**	TOTAL DEPTH: **10 ft bgs**	DEPTH TO WATER: **N/A**
LOGGED BY: **AJP**	SAMPLING METHOD: **Continuous with 10 ft 4 in diameter core barrel**	DATE STARTED: **5/17/2018**	DATE COMPLETED: **5/17/2018**

Depth (feet)	% REC	USCS	Graphic Log	Description
0		FILL		FILL
				FAT CLAY with sand, yellowish orange with orange to red oxide staining, sand content increasing with depth, stiff, moist.
1				@1.6-1.7 ft layer of white silt.
2				
3				
4	88			@ 4 ft FAT SANDY CLAY, light gray to olive gray, fine grained, sand content increases with depth, stiff, moist.
5		CH		@ 5-5.3 ft small gravel.
6				
7				
8				
9				
10				Boring terminated at 10 ft bgs.

NOTES: Northings and eastings recorded using a Garmin eTrex30 and converted to AR State Plane NAD83 South
Borehole backfilled with bentonite to ground surface.

PROJECT: **Monitoring Well Installations**		BORING ID: **B-5**	
LOCATION: **Entergy White Bluff Plant**		WELL ID: **N/A**	
DRILLING CONTRACTOR: **Walker-Hill Environmental, Inc.**		NORTHING: **1948639.2**	EASTING: **1271950.5**
DRILLING EQUIPMENT: **Geoprobe 8150LS**		GROUND SURFACE ELEV.: **281.0 ft NAVD88**	
FTN Project # R07920-1845-001	DRILLING METHOD: **Sonic with 4 in diameter core**	TOTAL DEPTH: **12 ft bgs**	DEPTH TO WATER: **N/A**
LOGGED BY: **AJP**	SAMPLING METHOD: **Continuous with 10 ft 4 in diameter core barrel**	DATE STARTED: **5/17/2018**	DATE COMPLETED: **5/17/2018**

Depth (feet)	% REC	USCS	Graphic Log	Description
0				FILL
1				
2	66	FILL		
3				LEAN CLAY with sand, yellowish orange with yellow and orange staining, stiff, dry.
4				
5				
6		CL		
7	100			
8				
9				FAT CLAY with sand, stiff, moist.
10		CH		
11				LEAN CLAY, light brown, silty, some fine-grained sand, trace fine-grained gravel, moist.
12		CL		Boring terminated at 12 ft bgs.

NOTES: Northings and eastings recorded using a Garmin eTrex30 and converted to AR State Plane NAD83 South
Borehole backfilled with bentonite to ground surface.

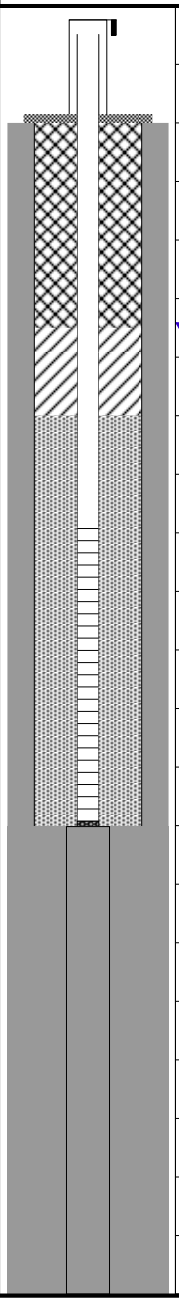
PROJECT: **Monitoring Well Installations**		BORING ID: **B-6**	
LOCATION: **Entergy White Bluff Plant**		WELL ID: **N/A**	
DRILLING CONTRACTOR: **Walker-Hill Environmental, Inc.**		NORTHING: **1949105.8**	EASTING: **1271974.9**
DRILLING EQUIPMENT: **Geoprobe 8150LS**		GROUND SURFACE ELEV.: **281.9 ft NAVD88**	
FTN Project # R07920-1845-001	DRILLING METHOD: **Sonic with 4 in diameter core**	TOTAL DEPTH: **30 ft bgs**	DEPTH TO WATER: **N/A**
LOGGED BY: **AJP**	SAMPLING METHOD: **Continuous with 10 ft 4 in diameter core barrel**	DATE STARTED: **6/14/2018**	DATE COMPLETED: **6/14/2018**

Depth (feet)	% REC	USCS	Graphic Log	Description
0–2		FILL		FILL
2–10	25	CL		LEAN CLAY with sand, tan with lenses of sand and greenish gray silt, soft, wet.
10–16	100	SM		SILTY SAND, tan with lenses of orange to yellow oxidized sand. @ 15 ft color changes to tan and greenish gray, increasing clay content with depth.
16–18		CH		FAT SANDY CLAY, brown to tan with orange oxidation along sandy lenses, fine-grained sand, medium stiff, moist. @ 18 ft color changes to olive gray.
18–20		SC		CLAYEY SAND, olive gray, decreasing clay with depth, medium stiff, moist to wet.
20–26	100	SM		SILTY SAND, fine-grain, olive gray, medium stiff, saturated. @ 24-25 ft then lenses of dark gray clay.
26–30		CH		FAT CLAY with sand, olive gray to greenish gray clay with laminated lenses of white silt to fine-grained sand, stiff. Borehole terminated at 30 ft bgs.

NOTES: Northings and eastings recorded using a Garmin eTrex30 and converted to AR State Plane NAD83 South
Borehole backfilled with bentonite to ground surface.

PROJECT: **Monitoring Well Installations**		BORING ID: **B-7**	
LOCATION: **Entergy White Bluff Plant**		WELL ID: **PZ-1**	
DRILLING CONTRACTOR: **Walker-Hill Environmental, Inc.**		NORTHING: **1949513.9**	EASTING: **1272146.8**
DRILLING EQUIPMENT: **Geoprobe 8150LS**		GROUND ELEVATION: **281.9 ft**	TOC ELEVATION: **284.94 ft**
FTN Project # R07920-1845-001	DRILLING METHOD: **Sonic with 4x6 core and case**	TOTAL WELL DEPTH: **27.1 ft below TOC**	DEPTH TO WATER: (7/17/2018) **10.09 ft below TOC**
LOGGED BY: **AJP**	SAMPLING METHOD: **Continuous with 10 ft 4 in diameter core barrel**	DATE STARTED: **5/16/2018**	DATE COMPLETED: **6/15/2018**

Depth (feet)	USCS	Description	% REC
-4			
0	FILL	FILL	46
4		FAT SANDY CLAY, tan with orang staining, decreasing clay content with depth, medium stiff, moist.	
8	CH		
12	SC	CLAYEY SAND, tan with oxide staining, loose, moist to wet.	100
	CH	FAT SANDY CLAY, tan with oxide staining along sandy lenses, stiff, moist.	
	SC	SANDY CLAY, oxide stained, decreasing sand content with depth, medium stiff, moist.	
16		SILTY SAND, fine-grain, tan with oxide staining in upper 1 ft, very loose, wet.	
20	SM		100
	SC	CLAYEY SAND, tan to orange with lenses of light gray to olive gray clay, moisture increases with depth. @ 23.2 fine-grained olive gray sand, loose, wet.	100
24		FAT CLAY, with lenses of silt to very fine-grained sand, blocky, stiff to very stiff, moist. @ 25 ft laminations of white silt to fine-grained sand, blocky, stiff to hard, somewhat moist to dry.	
28			100
		@ 30 ft, silt and sand laminations decrease with depth.	
32	CH		
36			100
		@ 38 ft, with lenses of fine to medium-grained olive gray to greenish gray sand.	
40			



Well Construction

- -4: Above ground completion includes 2x2 ft concrete pad, four pipe bollards, and locking outer aluminum casing.
- 0: 16.9 ft of 2 in Sch 40 PVC including 3.0 ft stickup (vented below cap)
- 4: Cement/bentonite grout from 0 to 7 ft bgs
- 8: Bentonite seal from 7.0 to 10.0 ft bgs
- 12: Silica size 20/40 filter pack from 10.0 to 24.0 ft bgs
- 16: 10 ft of 2 in dia. 0.010 in slot, Sch 40 PVC well screen
- 20: 0.18 ft 2 in dia. Sch 40 PVC end cap
- 24: Slough from 24.0 ft to 40.0 ft in 4 in dia., borehole.
- 32
- 36
- 40: Drilling terminated at 40 ft bgs

NOTES: Horizontal and vertical data are based on the Harmon Surveying report dated July 13, 2018 (AR State Plane NAD83 South and NAVD88).

Appendix F
Geotechnical Laboratory Data

FTN/ENTERGY WHITE BLUFF/AR
SUMMARY OF SOIL DATA

Sample Identification	Sample Type	Sample Depth	Soil Classification	Natural Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		Gs	Unit Weight		Permeability (cm/sec)	Additional Tests Conducted (See Notes)
					L.L.	P.L.	P.I.	L.I.	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %		Moisture %	Dry (lb/cuft)		
B-1	UD	3.0-5.0'	CH	29.0	63	17	46	0.27	100.0	88.9	59.5	-	-	-	29.0	92.8	1.6E-08	-
B-1	UD	8.0-10.0'	CL	25.0	44	15	29	0.35	100.0	53.8	40.4	-	-	2.57	25.0	93.9	-	T-CU w/pp
B-3	UD	5.0-7.0'	CL	24.1	37	17	20	0.37	100.0	73.3	47.7	-	-	-	24.1	98.7	2.2E-08	-
B-3	UD	10.0-12.0'	SC	21.6	32	20	12	0.18	100.0	41.9	31.0	-	-	2.58	21.6	100.9	-	T-CU w/pp
B-3	UD	15.0-17.0'	SC	19.0	34	15	19	0.23	100.0	28.2	22.0	-	-	-	19.0	110.5	6.3E-06	-
B-3	UD	20.0-22.0'	SM	31.5	NP	NP	NP	NP	100.0	18.1	9.5	-	-	-	31.5	79.2	-	DS
B-4	UD	8.0-10.0'	CH	33.5	59	30	29	0.13	100.0	94.7	51.5	-	-	-	33.5	86.1	4.6E-08	-
B-5	UD	3.0-5.0'	CL	26.6	42	21	21	0.28	95.4	73.1	28.0	-	-	2.69	26.6	91.7	-	T-CU w/pp
B-5	UD	10.0-12.0'	CL	17.1	35	16	19	0.07	97.6	90.3	46.0	-	-	-	17.1	113.8	1.5E-08	-
B-7	UD	5.0-7.0'	SM	20.5	34	26	8	-0.73	90.4	40.0	21.1			2.66	20.5	104.7	-	T-CU w/pp
B-7	UD	7.0-9.0'	CL	21.8	34	20	14	0.13	100.0	52.7	34.5	-	-	-	21.8	98.1	6.7E-07	-
B-7	UD	15.0-17.0'	SC	21.9	28	19	9	0.36	100.0	36.5	24.0	-	-	2.62	21.9	102.2	-	T-CU w/pp
RP-4	UD	20.0-22.0'	CL	22.2	44	15	29	0.24	93.0	66.9	39.5	-	-	2.67	22.2	101.8	-	T-CU w/pp
RP-4	UD	30.0-32.0'	CH	37.1	54	21	33	0.47	100.0	96.3	57.4			-	37.1	80.2	3.5E-07	-
RP-9	UD	30.0-32.0'	CH	30.2	54	24	30	0.19	100.0	98.8	44.0	-	-	2.67	30.2	88.9	-	C

ABBREVIATIONS: LIQUID LIMIT (LL)
PLASTIC LIMIT (PL)
PLASTICITY INDEX (PI)
LIQUIDITY INDEX (LI)
SPECIFIC GRAVITY (Gs)
MOISTURE (Mc)

NOTES: T = TRIAXIAL TEST
U = UNCONFINED COMPRESSION TEST
C = CONSOLIDATION TEST
DS = DIRECT SHEAR TEST
O = ORGANIC CONTENT
P = pH

FTN/ENTERGY WHITE BLUFF/AR
SUMMARY OF SOIL DATA

Sample Identification	Sample Type	Sample Depth	Soil Classification	Natural Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		Gs	Unit Weight		Permeability (cm/sec)	Additional Tests Conducted (See Notes)
					L.L.	P.L.	P.I.	L.I.	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %		Moisture %	Dry (lb/cuft)		
B-2	Bag	5.0-7.5'	CH	24.7	52	21	31	0.13	100.0	86.0	55.0	-	-	-	-	-	-	-
B-3 (P2-5)	Bag	13.0-14.0'	CL	23.3	40	19	21	0.18	100.0	54.1	41.0	-	-	-	-	-	-	-
B-3 (P2-5)	Bag	23.0-24.0'	SM	30.0	NP	NP	NP	NP	100.0	28.1	16.5	-	-	-	-	-	-	-
B-5	Bag	4.0-6.0'	ML	27.4	46	30	16	-0.17	100.0	70.7	33.0	-	-	-	-	-	-	-
B-5	Bag	9.0-10.0'	ML	26.3	49	31	18	-0.27	100.0	89.1	45.0	-	-	-	-	-	-	-
B-6	Bag	11.0-12.0'	SM	12.4	NP	NP	NP	NP	100.0	27.6	20.0	-	-	-	-	-	-	-
B-6	Bag	16.0-17.0'	CL	21.3	36	23	13	-0.11	100.0	54.2	38.0	-	-	-	-	-	-	-
B-6	Bag	22.0-24.0'	SM	10.9	NP	NP	NP	NP	100.0	28.6	18.9	-	-	-	-	-	-	-
B-7	Bag	18.0-20.0'	SM	22.8	NP	NP	NP	NP	100.0	21.4	15.0	-	-	-	-	-	-	-
RP-3	Bag	18.0-20.0'	CH	27.1	56	27	29	0.02	100.0	95.6	44.0	-	-	-	-	-	-	-
RP-3	Bag	29.0-30.0'	SM	22.4	NP	NP	NP	NP	100.0	26.3	20.0	-	-	-	-	-	-	-
RP-4	Bag	8.0-9.0'	CL	13.4	30	16	14	-0.17	100.0	50.8	29.0	-	-	-	-	-	-	-
RP-4	Bag	25.0-26.0'	ML	37.7	48	30	18	0.40	100.0	98.7	43.0	-	-	-	-	-	-	-
RP-5	Bag	15.0-18.0'	SC-SM	24.4	28	22	6	0.51	100.0	34.0	25.9	-	-	-	-	-	-	-
RP-7	Bag	16.6-17.4'	SC	22.3	36	19	17	0.20	100.0	46.7	34.0	-	-	-	-	-	-	-

ABBREVIATIONS:
LIQUID LIMIT (LL)
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FTN/ENTERGY WHITE BLUFF/AR
SUMMARY OF SOIL DATA

Sample Identification	Sample Type	Sample Depth	Soil Classi-fication	Natural Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		Gs	Unit Weight		Permeability (cm/sec)	Additional Tests Conducted (See Notes)
					L.L.	P.L.	P.I.	L.I.	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %		Moisture %	Dry (lb/cuft)		
RP-9	Bag	9.0-10.0'	SC-SM	4.2	20	15	5	-2.35	67.7	16.4	9.5	-	-	-	-	-	-	-
RP-9	Bag	26.0-27.0'	CH	31.3	50	20	30	0.36	100.0	98.1	54.0	-	-	-	-	-	-	-

ABBREVIATIONS: LIQUID LIMIT (LL)
PLASTIC LIMIT (PL)
PLASTICITY INDEX (PI)
LIQUIDITY INDEX (LI)
SPECIFIC GRAVITY (Gs)
MOISTURE (Mc)

NOTES: T = TRIAXIAL TEST
U = UNCONFINED COMPRESSION TEST
C = CONSOLIDATION TEST
DS = DIRECT SHEAR TEST
O = ORGANIC CONTENT
P = pH

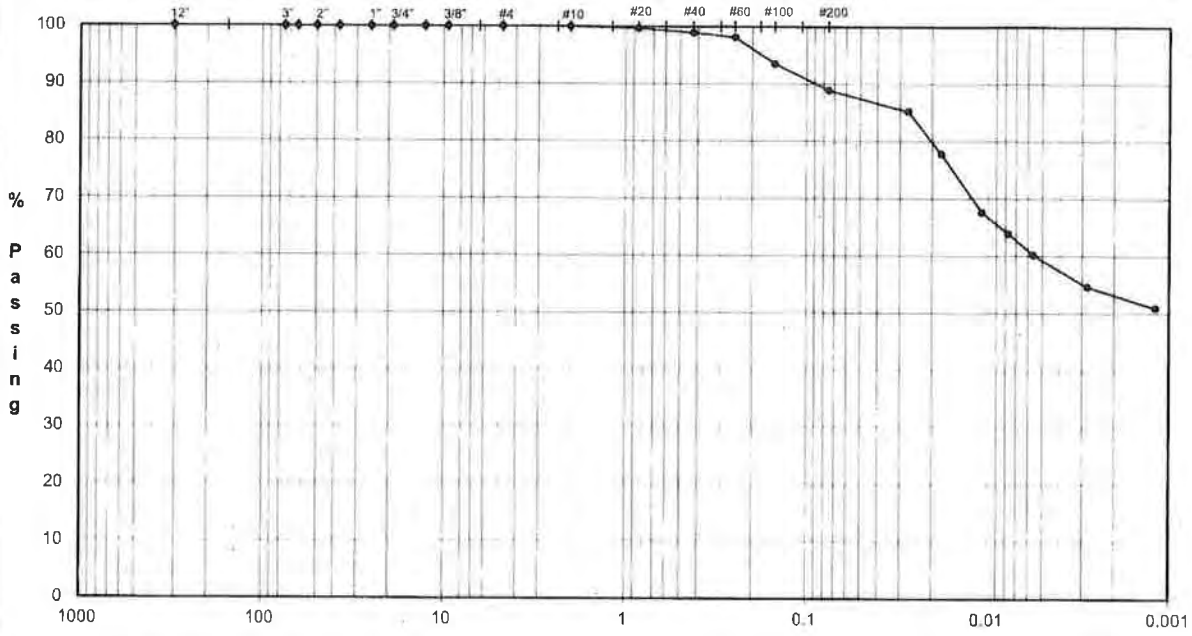
JUNE 2018

18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **B-1** Depth: **3.0-5.0'**
TYPE: **UD**



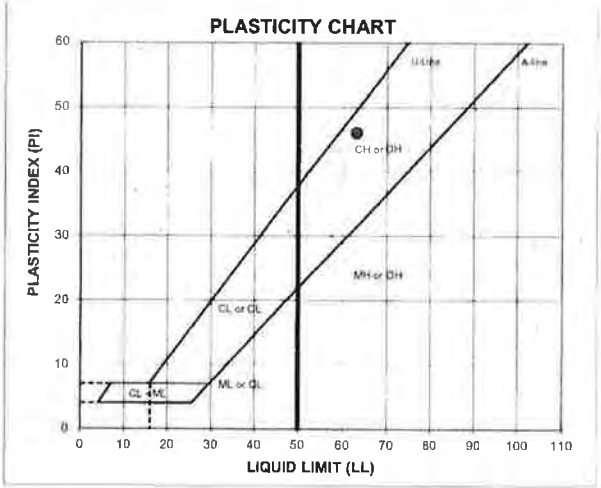
COBBLES	Coarse GRAVEL	Fine GRAVEL	Coarse SAND	Medium SAND	Fine SAND	Silt or Clay FINES

U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	100.0		
3.0"	75.0	100.0	Cobbles	0.0
2.5"	63.5	100.0		
2.0"	50.0	100.0		
1.5"	37.5	100.0		
1.0"	25.0	100.0		
0.75"	19.0	100.0	Coarse Gravel	0.0
0.50"	12.7	100.0		
0.375"	9.5	100.0		
#4	4.8	100.0	Fine Gravel	0.0
#10	2.00	100.0	Coarse Sand	0.0
#20	0.85	99.6		
#40	0.43	98.9	Medium Sand	1.1
#60	0.25	98.1		
#100	0.15	93.5		
#200	0.075	88.9	Fine Sand	10.0

Hydrometer Analysis

(mm)	%Finer		
0.027	85.2		
0.018	77.8		
0.011	67.6	Fines	
0.0078	63.9	Silt or Clay	88.9
0.0056	60.2		
0.0028	54.6		
0.0012	50.9		



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
29.0	63	17	46	0.27

LL (oven-dried) / 0.75 ORGANIC (OL-OH)

DESCRIPTION: CLAY, some fine to medium sand; yellowish brown.

USCS: CH

TECH	TB
DATE	7/23/18
CHECK	
REVIEW	
APPROVE	

Golder Associates Inc.

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

PROJECT TITLE	FTN/ENTERGY WHITE BLUFF/AR		Board #	12	COMMENTS
PROJECT NUMBER	18103173		Flow Pump	2	
SAMPLE ID	B-1	3.0-5.0'	Flow Pump Speed	11	
SAMPLE TYPE	UD		Technician	FT	

Sample Data, Initial				Sample Data, Final	
Height, inches	3.114	B-Value, f	0.97	Height, inches	3.142
Diameter, inches	2.836	Cell Pres.	88.0	Diameter, inches	2.858
Area, cm^2	40.75	Bot. Pres.	80.0	Area, cm^2	41.39
Volume, cm^3	322.35	Top Pres.	80.0	Volume, cm^3	330.31
Mass, g	618.40	Tot. B.P.	80.0	Mass, g	632.58
Moisture Content, %	29.04	Head, max.	137.16	Moisture Content, %	31.99
Dry Density, pcf	92.77	Head, min.	137.16	Dry Density, pcf	90.54
Spec. Gravity (assumed)	2.720	Max. Grad.	17.19	Volume Solids, cm^3	176.19
Volume Solids, cm^3	176.19	Min. Grad.	17.19	Volume Voids, cm^3	154.12
Volume Voids, cm^3	146.15			Void Ratio	0.87
Void Ratio	0.83			Saturation, %	99.5%
Saturation, %	95.2%				

WATER CONTENTS		Sample Initial	Sample Final
Wt Soil & Tare, i	g	618.40	715.61
Wt Soil & Tare, f	g	479.25	562.37
Wt Tare	g	0.00	83.41
Wt Moisture Lost	g	139.15	153.24
Wt Dry Soil	g	479.25	478.96
Water Content	%	29.04%	31.99%

DESCRIPTION: CLAY, some fine to medium sand; yellowish brown.

Flow Pump Rate: 1.18E-05 cm^3/sec

USCS: CH

TIME FUNCTIONS, SECONDS								dP				
DATE	DAY	HOUR	MIN	TEMP (°C)	dt (min)	dt,acc (min)	dt (sec)	dt,acc (sec)	Reading (psi)	Head (cm)	Gradient	Permeability (cm/sec)
07/23/18	43304	9	0	20.5	0	0	0	0	1.95	137.16	17.19	1.6E-08
07/23/18	43304	9	5	20.5	5	5	300	300	1.95	137.16	17.19	1.6E-08
07/23/18	43304	9	10	20.5	5	10	300	600	1.95	137.16	17.19	1.6E-08
07/23/18	43304	9	15	20.5	5	15	300	900	1.95	137.16	17.19	1.6E-08 *
07/23/18	43304	9	20	20.5	5	20	300	1200	1.95	137.16	17.19	1.6E-08 *
07/23/18	43304	9	25	20.5	5	25	300	1500	1.95	137.16	17.19	1.6E-08 *
07/23/18	43304	9	30	20.5	5	30	300	1800	1.95	137.16	17.19	1.6E-08 *

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.6E-08 cm/sec **

DATE	7/23/18
CHECK	
REVIEW	
APPROVE	

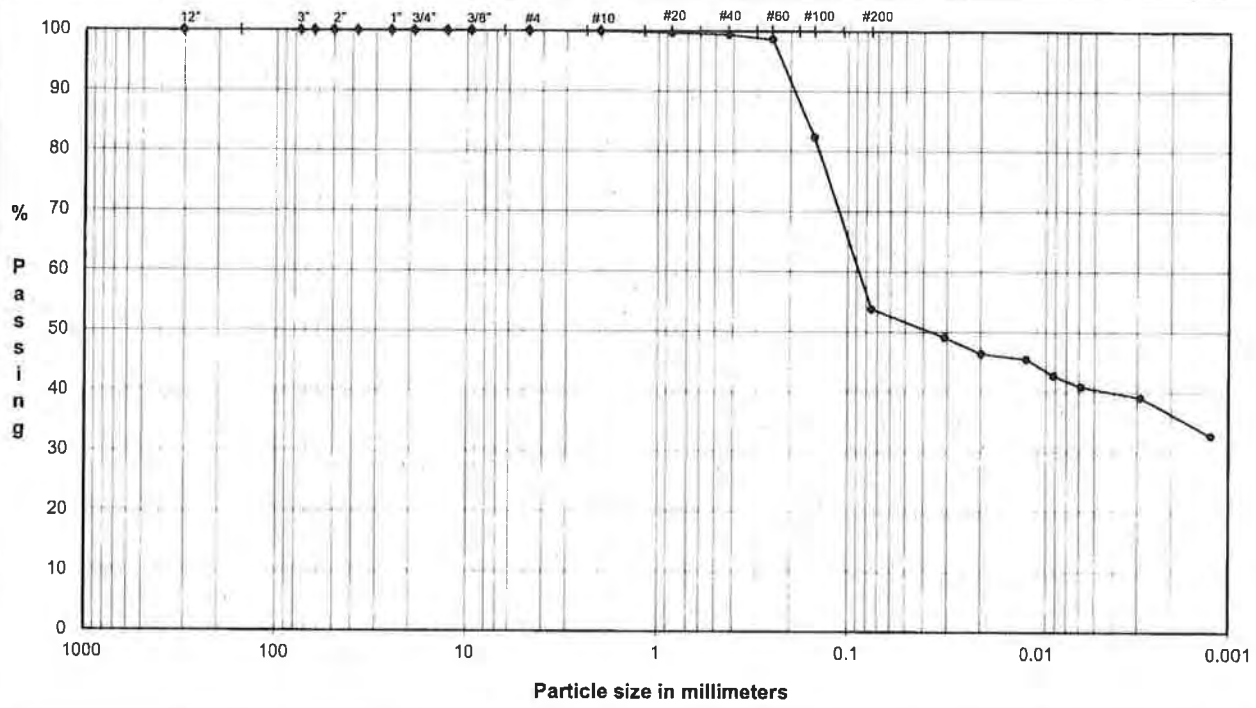
JULY 2018

18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **B-1** Depth: **8.0-10.0'**
TYPE: **UD**



COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

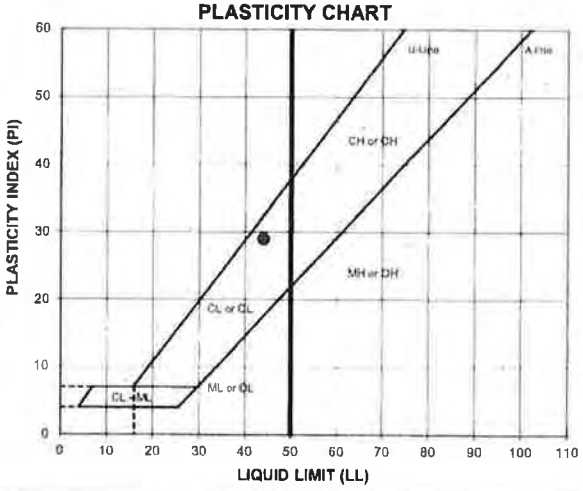
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	100.0		
3.0"	75.0	100.0	Cobbles	0.0
2.5"	63.5	100.0		
2.0"	50.0	100.0		
1.5"	37.5	100.0		
1.0"	25.0	100.0		
0.75"	19.0	100.0	Coarse Gravel	0.0
0.50"	12.7	100.0		
0.375"	9.5	100.0		
#4	4.8	100.0	Fine Gravel	0.0
#10	2.00	99.9	Coarse Sand	0.1
#20	0.85	99.7		
#40	0.43	99.4	Medium Sand	0.5
#60	0.25	98.6		
#100	0.15	82.3		
#200	0.075	53.8	Fine Sand	45.6

Hydrometer Analysis

(mm)	%Finer		
0.031	49.1		
0.020	46.4		
0.011	45.5	Fines	
0.0082	42.8	Silt or Clay	53.8
0.0059	40.9		
0.0029	39.1		
0.0012	32.8		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
25.0	44	15	29	0.35

LL (oven-dried) / 0.75 ORGANK (OL/OH)

DESCRIPTION: SILTY CLAY and SAND, fine to coarse; yellowish brown and gray.

USCS: CL

TECH	TB/HH/BA
DATE	7/20/18
CHECK	
REVIEW	
APPROVE	

SPECIFIC GRAVITY OF SOILS
ASTM D-854
PYCNOMETER METHOD

PROJECT TITLE	**FTN/ENTERGY WHITE BLUFF/AR**		
PROJECT NUMBER	**18103173**	**SAMPLE ID**	**B-1**
		SAMPLE TYPE	**UD**
TESTED FOR	**Gs**	**SAMPLE DEPTH**	**8.0-10.0'**

MOISTURE CONTENT OF MATERIAL PASSING THE #4 SIEVE

Weight Soil and Tare, Initial (gm)	**203.53**
Weight Soil and Tare, Final (gm)	**203.11**
Weight Of Tare (gm)	**51.24**
Weight Of Moisture (gm)	**0.42**
Weight Of Dry Soil (gm)	**151.87**
Hygroscopic Moisture In (%)	**0.3%**

Test Method		**Method - B**
Pycnometer Number		**24**
Weight Pycnometer Empty (gm)		181.79
Volume of Pycnometer (gm)		499.61
Weight Pycnometer and Water (gm)		680.37
Mass of Pycnometer and Water at the test Temperture	(A)	679.99
Observed Temperature (Tb), for (Mb) In Degrees C		24.50
Weight of Soil, Water & Pycnometer (gm)	(B)	**710.61**
Temperature, C		**24.5**
Density of water @ tested temperature (g/ml)		1.00
Tare Number		-
Weight of Dry Soil Slurry plus Tare		**50.04**
Weight of Tare		**0.00**
Weight of Dry Soil (gm)	(C)	50.04
Temperature Coefficient		0.9990

SPECIFIC GRAVITY (G) **2.575**

$G @ 20^0 C = [C/(A-(B - C))]*(K)$

METHOD - A WET METHOD
METHOD - B OVEN-DRIED METHOD

METHOD OF AIR REMOVAL: VACUUM

Recommended Mass for Test Specimen

Soil Type	Specimen Dry Mass when using 500 ml Pycnometer
SP, SP-SM	100
SP-SC, SM , SC	75
SILT OR CLAY	50

TECH	TJ
DATE	7/20/18
CHECK	
REVIEW	
APPROVE	

Boring or Test Pit:	B-1		Boring or Test Pit:	B-1		Boring or Test Pit:	B-1	
Sample:	UD		Sample:	UD		Sample:	UD	
Depth:	8.0-10.0'	ft	Depth:	8.0-10.0'	ft	Depth:	8.0-10.0'	ft
Point No.:	1		Point No.:	2		Point No.:	3	
	Initial			**Initial**			**Initial**	
Length =	6.234	in	Length =	6.070	in	Length =	6.034	in
Diameter =	2.856	in	Diameter =	2.869	in	Diameter =	2.870	in
Wet Mass =	2.835	lb	Wet Mass =	2.565	lb	Wet Mass =	2.631	lb
Area =	6.406	in^2	Area =	6.465	in^2	Area =	6.469	in^2
Volume =	39.937	in^3	Volume =	39.241	in^3	Volume =	39.035	in^3
Specific Gravity =	2.57	(ASTM D854)	Specific Gravity =	2.57	(ASTM D854)	Specific Gravity =	2.57	(ASTM D854)
Dry Mass of Solids =	2.291	lb	Dry Mass of Solids =	2.079	lb	Dry Mass of Solids =	2.060	lb
Moisture Content =	23.8%		Moisture Content =	23.4%		Moisture Content =	27.7%	
Wet Unit Weight =	122.7	pcf	Wet Unit Weight =	112.9	pcf	Wet Unit Weight =	116.5	pcf
Dry Unit Weight =	99.1	pcf	Dry Unit Weight =	91.5	pcf	Dry Unit Weight =	91.2	pcf
Void Ratio =	0.62		Void Ratio =	0.75		Void Ratio =	0.76	
Percent Saturation =	99%		Percent Saturation =	80%		Percent Saturation =	94%	
	After Consolidation			**After Consolidation**			**After Consolidation**	
Length =	6.173	in	Length =	5.950	in	Length =	5.890	in
Diameter =	2.917	in	Diameter =	2.847	in	Diameter =	2.858	in
Area =	6.682	in^2 (Method B)	Area =	6.365	in^2 (Method B)	Area =	6.415	in^2 (Method B)
Volume =	41.249	in^3	Volume =	37.868	in^3	Volume =	37.784	in^3
Moisture Content =	26.1%		Moisture Content =	26.9%		Moisture Content =	27.3%	
Wet Unit Weight =	121.0	pcf	Wet Unit Weight =	120.3	pcf	Wet Unit Weight =	119.9	pcf
Dry Unit Weight =	96.0	pcf	Dry Unit Weight =	94.8	pcf	Dry Unit Weight =	94.2	pcf
Void Ratio =	0.67		Void Ratio =	0.69		Void Ratio =	0.70	
Percent Saturation =	100%		Percent Saturation =	100%		Percent Saturation =	100%	
B Parameter =	0.99		B Parameter =	1.00		B Parameter =	0.97	
Shear Rate =	0.012%	/min	Shear Rate =	0.012%	/min.	Shear Rate =	0.012%	/min.
t_{50} =	5.84	min.	t_{50} =	14.95	min.	t_{50} =	9.87	min.
Strain at Failure =	3.2%		Strain at Failure =	3.3%		Strain at Failure =	2.3%	
Cell Pressure =	89.0	psi	Cell Pressure =	98.0	psi	Cell Pressure =	107.0	psi
Back Pressure =	80.0	psi	Back Pressure =	80.0	psi	Back Pressure =	80.0	psi
Confining Pressure =	9.0	psi	Confining Pressure =	18.0	psi	Confining Pressure =	27.0	psi

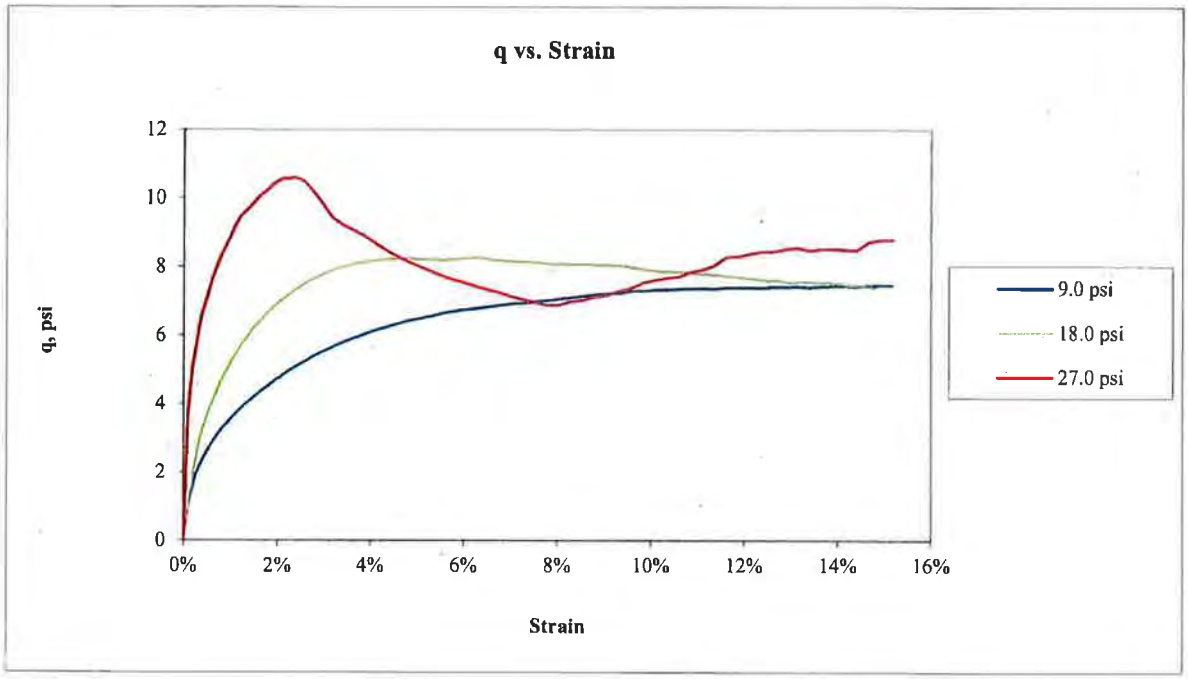
Notes: Sample description: (CL) SILTY CLAY and SAND, fine to coarse; yellowish brown and gray

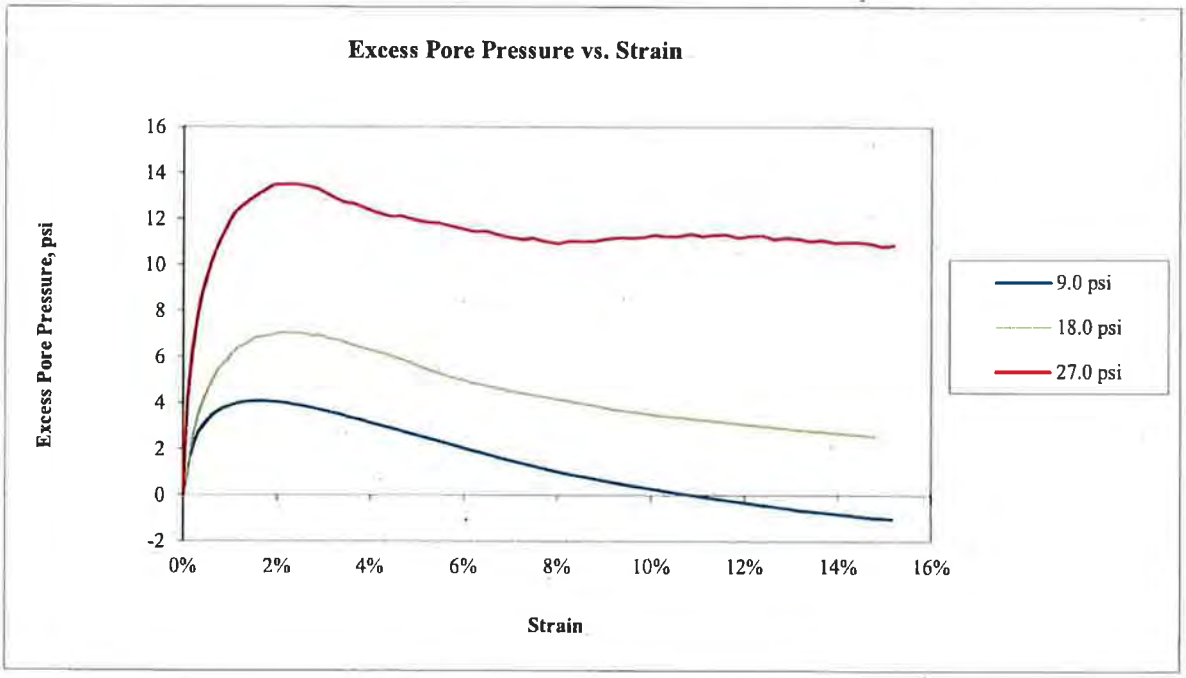
Atterberg limits: LL = 44 PL = 15 PI = 29 (ASTM D4318)

Percent finer: 3/4 in. = 100% No. 4 = 100% No. 200 = 54% (ASTM D422, refer to separate report for gradation curve)

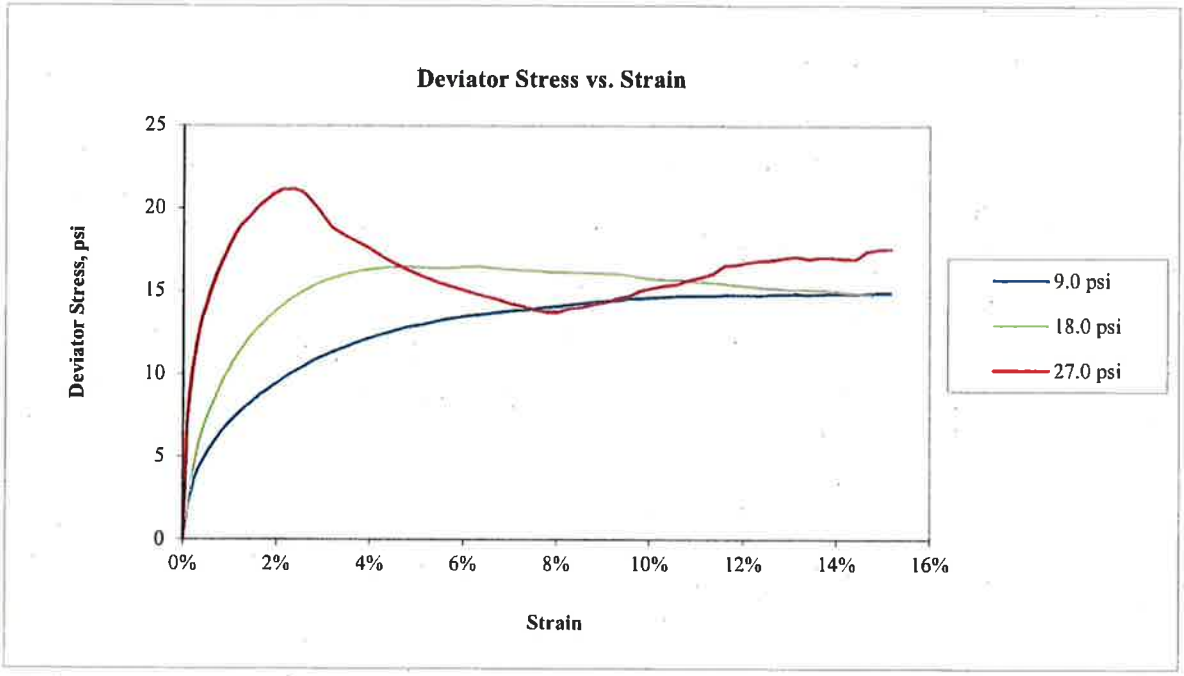
Specimen type:	X	Intact		Reconstituted
Moisture from:		Cuttings	X	Entire specimen
Saturation method:	X	Wet		Dry
Failure criterion:	X	$(\sigma'_1/\sigma'_3)_{max}$		$(\sigma'_1-\sigma'_3)_{max}$ ____ % strain
Membrane effect:	X	Corrected		Not Corrected

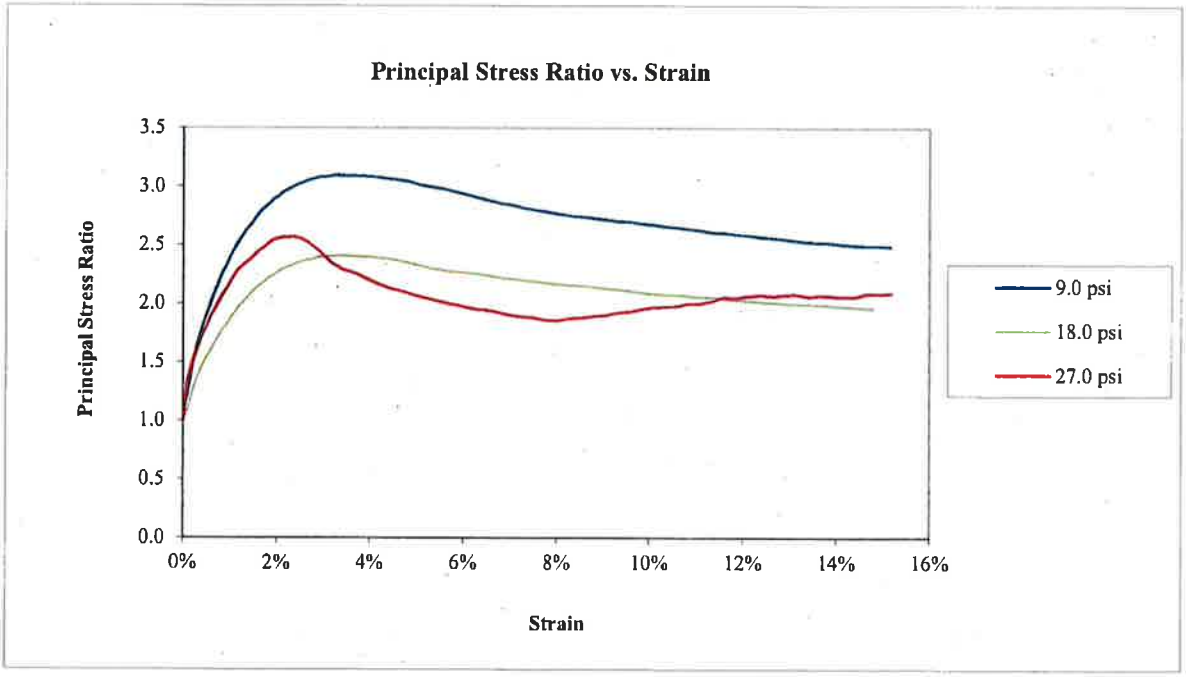
Golder Associates Inc. **Atlanta, Georgia**	**Title:** **ASTM D4767** **CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT** **SAMPLE AND TEST DATA**			
Job Short Title: **FTN/ENTERGY WHITE BLUFF/AR**				
Sample: **B-1 UD 8.0-10.0'**	**Technician:** **PWM/FT** **Checked:**	**Reviewed:** **Approved:**	**Start Date:** **7/17/2018**	**Job Number:** **18103173**	**Figure:** **1**





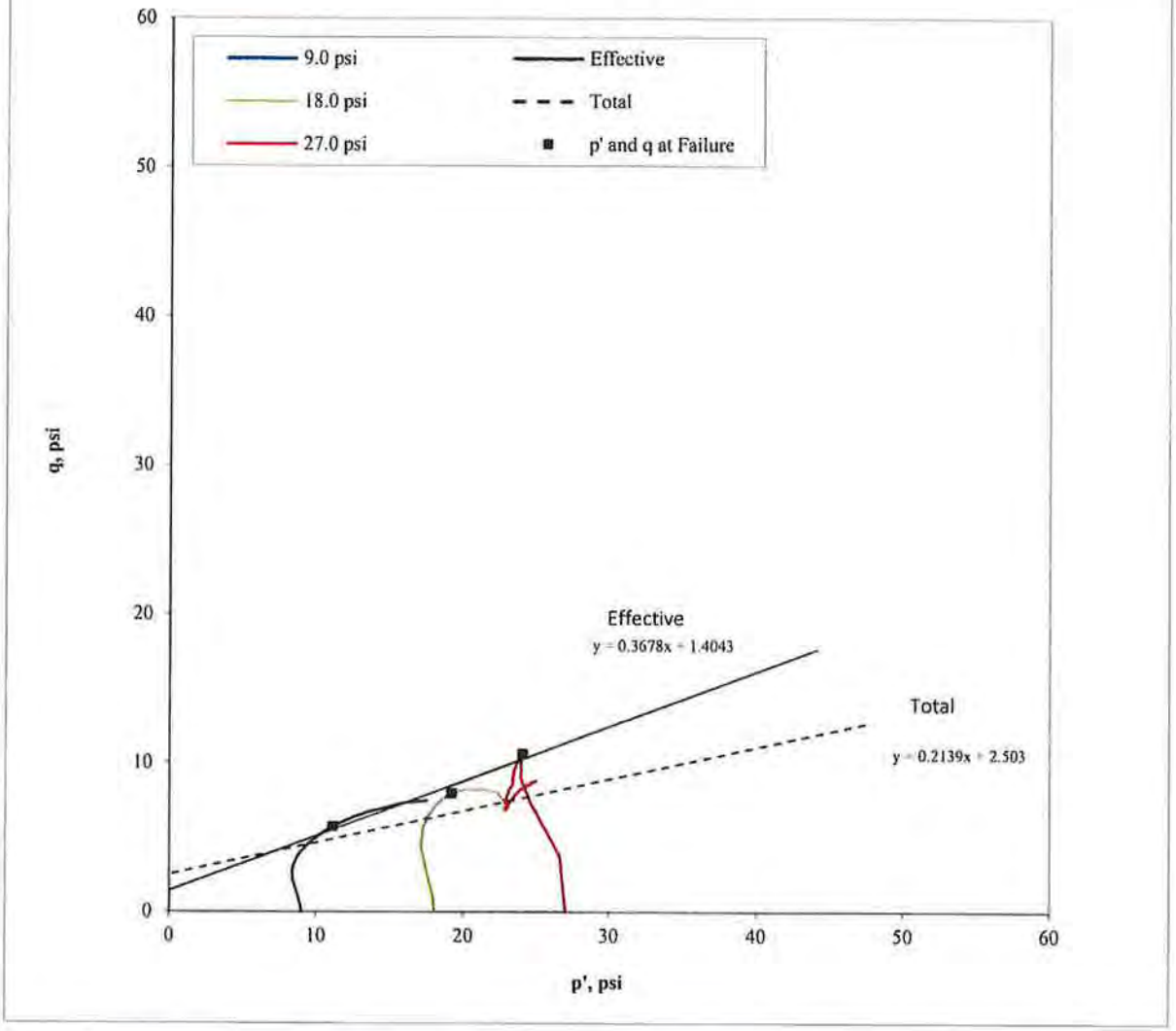
Golder Associates Inc. Atlanta, Georgia	Title: ASTM D4767 CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT q AND EXCESS PORE PRESSURE PLOTS				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: B-1 UD 8.0-10.0'	Technician: PWM/FT Check:	Reviewed: Approved:	Start Date: 7/17/2018	Job Number: 18103173	Figure: 2





Golder Associates Inc. Atlanta, Georgia	Title: ASTM D4767 CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT DEVIATOR STRESS AND PRINCIPAL STRESS RATIO PLOT				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: B-1 UD 8.0-10.0'	Technician: PWM/FT Check:	Reviewed: Approved:	Start Date: 7/17/2018	Job Number: 18103173	Figure: 3

Stress Path (p'-q) Plot



Confining Pressure (psi)	p at failure (psi)	p' at failure (psi)	q at failure (psi)
9.0	14.7	11.1	5.7
18.0	26.0	19.2	8.0
27.0	37.6	24.1	10.6

Effective

α ' =	20.2	degree
a' =	1.4	psi

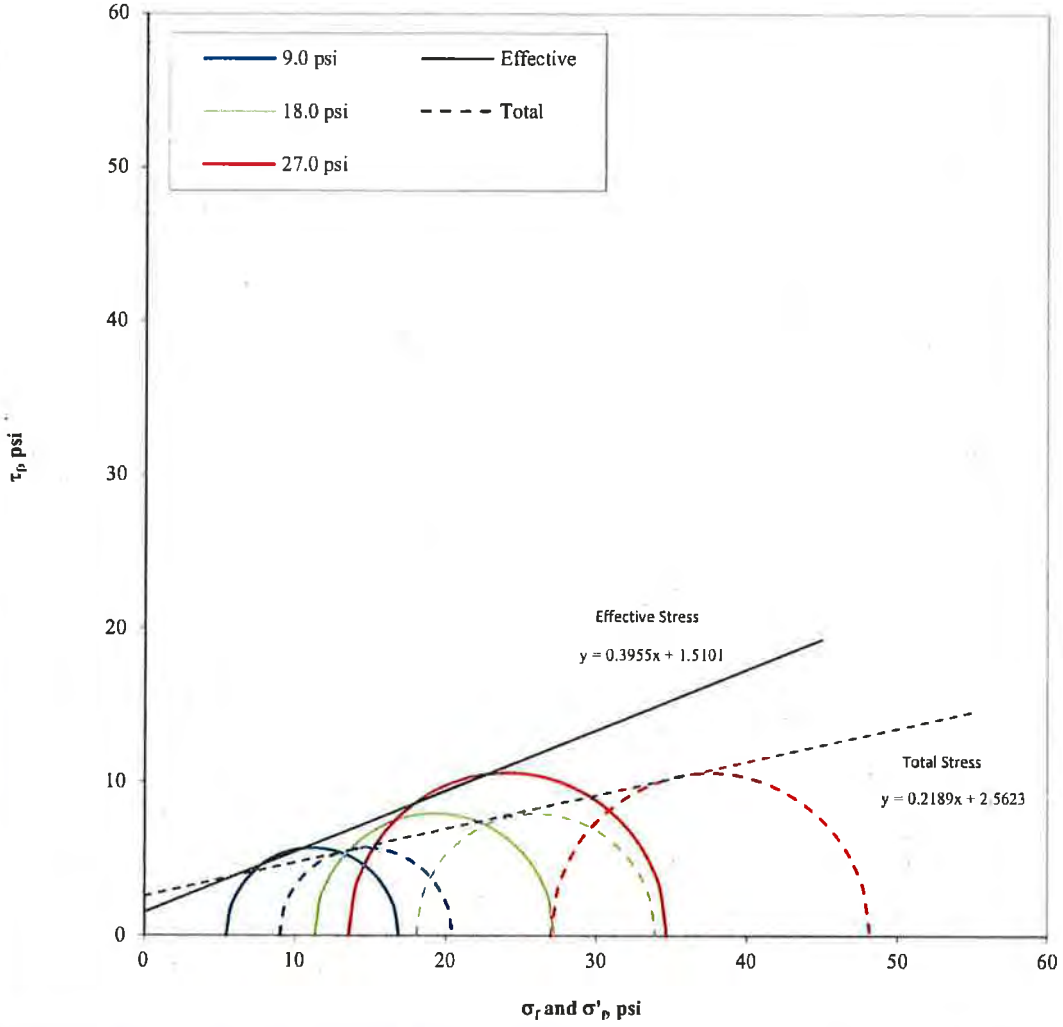
Total

α =	12.1	degree
a =	2.5	psi

Note: The laboratory testing relates only to the sample tested. GAI neither accepts responsibility for nor makes claims to the final use and purpose of the material.

Golder Associates Inc. Atlanta, Georgia	**Title:** ASTM D4767 CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT STRESS PATH PLOT				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: B-1 UD 8.0-10.0'	**Technician:** PWM/FT **Check:**	**Reviewed:** **Approved:**	**Start Date:** 7/17/2018	**Job Number:** 18103173	**Figure:** 4

Mohr's Circle Diagram



Confining Pressure (psi)	σ'_1 at failure (psi)	σ'_3 at failure (psi)	σ_1 at failure (psi)	σ_3 at failure (psi)
9.0	16.8	5.4	20.4	9.0
18.0	27.2	11.3	33.9	18.0
27.0	34.7	13.5	48.2	27.0

Effective

ϕ' =	21.6	degree
c' =	1.5	psi

Total

ϕ =	12.3	degree
c =	2.6	psi

Note: The laboratory testing relates only to the sample tested. GAI neither accepts responsibility for nor makes claims to the final use and purpose of the material.

Golder Associates Inc.
Atlanta, Georgia

Title:
ASTM D4767
CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT
MOHR'S CIRCLE DIAGRAM

Job Short Title: FTN/ENTERGY WHITE BLUFF/AR

Sample:	Technician:	Reviewed:	Start Date:	Job Number:	Figure:
B-1 UD 8.0-10.0'	PWM/FT Check:	Approved:	7/17/2018	18103173	5

9.0 psi

18.0 psi

27.0 psi

NOTE: Pore pressure built up before shearing, adjusted results to initial backpressure.

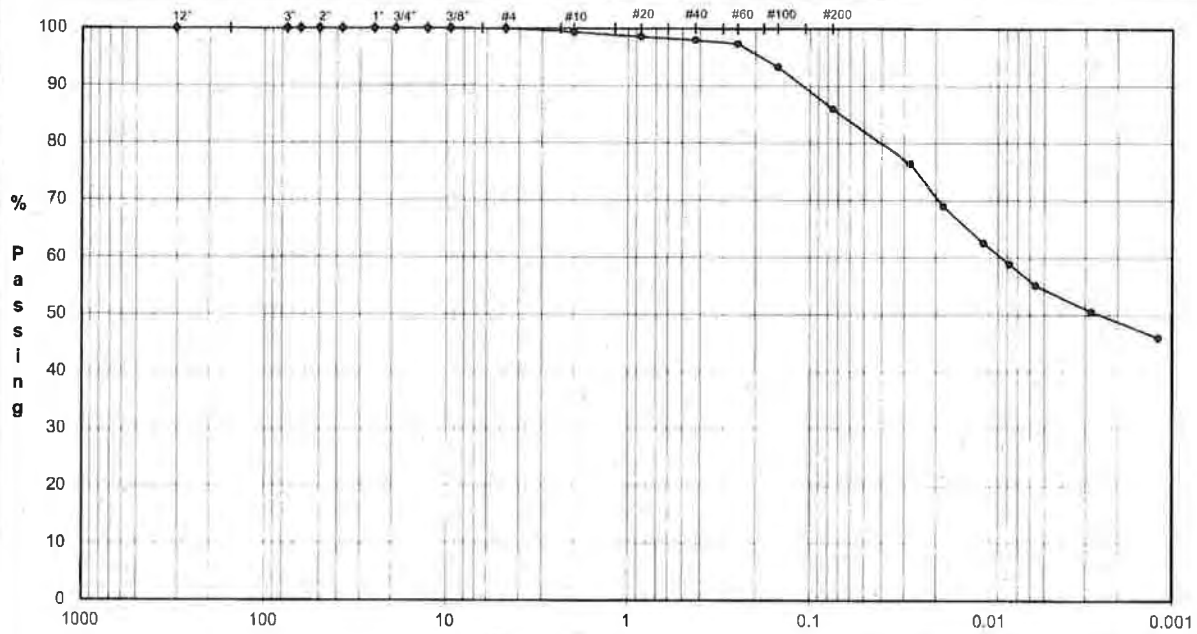
Golder Associates Inc. **Atlanta, Georgia**	**Title:** **ASTM D4767** **CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT** **SPECIMENS PHOTOGRAPH - 9.0 / 18.0 / 27.0 psi**				
Job Short Title: **FTN/ENTERGY WHITE BLUFF/AR**					
Sample: **B-1 UD 8.0-10.0'**	**Technician:** **PWM/FT** **Check:**	**Reviewed:** **Approved:**	**Start Date:** **7/17/2018**	**Job Number:** **18103173**	**Figure:** **6**

AUGUST 2018 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **B-2** Depth: **5.0-7.5'**
TYPE: **Bag**



COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

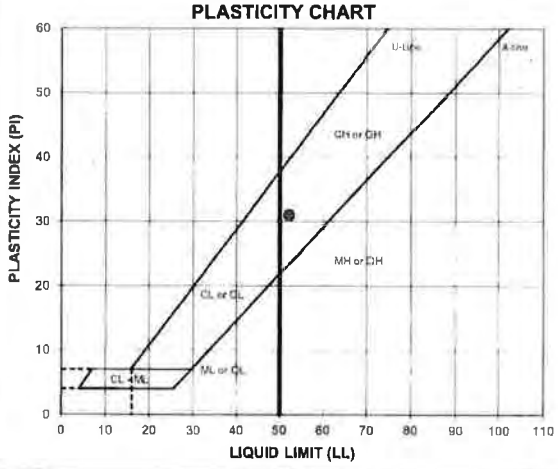
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**99.3**	Coarse Sand	**0.7**
#20	0.85	**98.5**		
#40	0.43	**97.9**	Medium Sand	**1.4**
#60	0.25	**97.4**		
#100	0.15	**93.2**		
#200	0.075	**86.0**	Fine Sand	**11.9**

Hydrometer Analysis

(mm)	%Finer		
0.028	**76.4**		
0.018	**69.0**		
0.011	**62.6**	Fines	
0.0078	**58.9**	Silt or Clay	**86.0**
0.0056	**55.2**		
0.0028	**50.6**		
0.0012	**46.0**		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

M.	LL	PL	PI	LI
24.7	52	21	31	0.13

LL (oven-dried) / 0.75 ORGANIC (OL/OH)

DESCRIPTION: sandy CLAY, fine to coarse; yellowish brown

USCS: CH

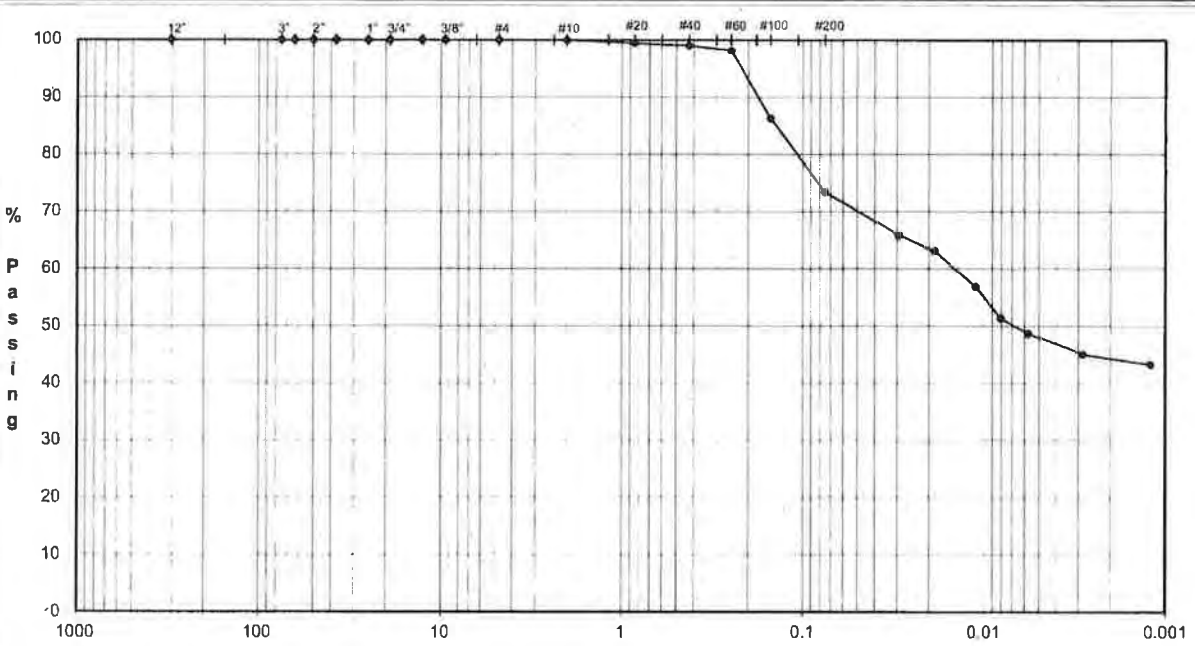
TECH	HH/BA/TB
DATE	8/1/18
CHECK	
REVIEW	
APPROVE	

JUNE 2018 | 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **B-3** Depth: **5.0-7.0'**
TYPE: **UD**



COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

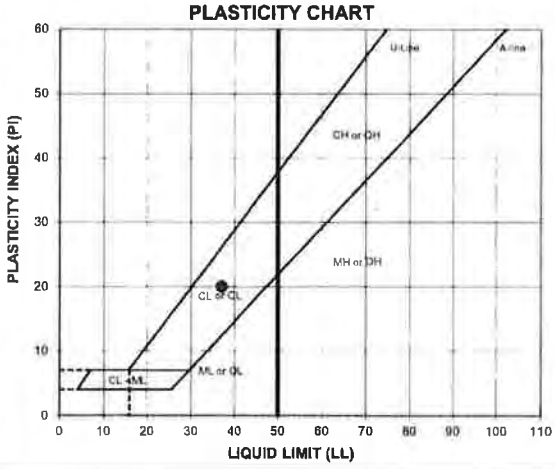
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	100.0		
3.0"	75.0	100.0	Cobbles	0.0
2.5"	63.5	100.0		
2.0"	50.0	100.0		
1.5"	37.5	100.0		
1.0"	25.0	100.0		
0.75"	19.0	100.0	Coarse Gravel	0.0
0.50"	12.7	100.0		
0.375"	9.5	100.0		
#4	4.8	100.0	Fine Gravel	0.0
#10	2.00	100.0	Coarse Sand	0.0
#20	0.85	99.4		
#40	0.43	99.0	Medium Sand	1.0
#60	0.25	98.1		
#100	0.15	86.3		
#200	0.075	73.3	Fine Sand	25.6

Hydrometer Analysis

(mm)	%Finer		
0.029	65.8		
0.019	63.1		
0.011	56.8	Fines Silt or Clay	73.3
0.0081	51.4		
0.0057	48.7		
0.0029	45.1		
0.0012	43.3		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
24.1	37	17	20	0.37

LL (oven-dried) / 0.75 ORGANIC (OL/OH)

DESCRIPTION: sandy SILTY CLAY, fine to medium; yellowish brown, gray, and brown.

USCS: CL

TECH	BA/HH
DATE	7/26/18
CHECK	
REVIEW	
APPROVE	

Golder Associates Inc.

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

PROJECT TITLE	FTN/ENTERGY WHITE BLUFF/AR		Board #	9	COMMENTS
PROJECT NUMBER	18103173		Flow Pump	2	
SAMPLE ID	B-3	5.0-7.0'	Flow Pump Speed	10	
SAMPLE TYPE	UD		Technician	FT	

Sample Data, Initial				Sample Data, Final	
Height, inches	3.147	B-Value, f	1.00	Height, inches	3.139
Diameter, inches	2.854	Cell Pres.	88.0	Diameter, inches	2.837
Area, cm²	41.27	Bot. Pres.	80.0	Area, cm²	40.78
Volume, cm³	329.91	Top Pres.	80.0	Volume, cm³	325.16
Mass, g	647.92	Tot. B.P.	80.0	Mass, g	656.52
Moisture Content, %	24.12	Head, max.	187.10	Moisture Content, %	25.76
Dry Density, pcf	98.74	Head, min.	187.10	Dry Density, pcf	100.18
Spec. Gravity (assumed)	2.750	Max. Grad.	23.47	Volume Solids, cm³	189.83
Volume Solids, cm³	189.83	Min. Grad.	23.47	Volume Voids, cm³	135.33
Volume Voids, cm³	140.08			Void Ratio	0.71
Void Ratio	0.74			Saturation, %	99.4%
Saturation, %	89.9%				

WATER CONTENTS		Sample Initial	Sample Final
Wt Soil & Tare, i	g	647.92	736.33
Wt Soil & Tare, f	g	522.03	601.84
Wt Tare	g	0.00	79.81
Wt Moisture Lost	g	125.89	134.49
Wt Dry Soil	g	522.03	522.03
Water Content	%	24.12%	25.76%

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: CL

DESCRIPTION: sandy SILTY CLAY, fine to medium; yellowish brown, gray, and brown.

TIME FUNCTIONS, SECONDS								dP				
DATE	DAY	HOUR	MIN	TEMP (°C)	dt (min)	dt,acc (min)	dt (sec)	dt,acc (sec)	Reading (psi)	Head (cm)	Gradient	Permeability (cm/sec)
07/26/18	43307	13	0	22.3	0	0	0	0	2.66	187.10	23.47	2.2E-08
07/26/18	43307	13	5	22.3	5	5	300	300	2.66	187.10	23.47	2.2E-08
07/26/18	43307	13	10	22.3	5	10	300	600	2.66	187.10	23.47	2.2E-08
07/26/18	43307	13	15	22.3	5	15	300	900	2.66	187.10	23.47	2.2E-08 *
07/26/18	43307	13	20	22.3	5	20	300	1200	2.66	187.10	23.47	2.2E-08 *
07/26/18	43307	13	25	22.3	5	25	300	1500	2.66	187.10	23.47	2.2E-08 *
07/26/18	43307	13	30	22.3	5	30	300	1800	2.66	187.10	23.47	2.2E-08 *

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.2E-08 cm/sec **

DATE	7/26/18
CHECK	
REVIEW	
APPROVE	

Boring or Test Pit:	B-3		Boring or Test Pit:	B-3		Boring or Test Pit:	B-3	
Sample:	UD		Sample:	UD		Sample:	UD	
Depth:	10.0-12.0 ft		Depth:	10.0-12.0 ft		Depth:	10.0-12.0 ft	
Point No.:	1		Point No.:	2		Point No.:	3	
Initial			**Initial**			**Initial**		
Length =	6.001	in	Length =	5.995	in	Length =	5.996	in
Diameter =	2.829	in	Diameter =	2.871	in	Diameter =	2.858	in
Wet Mass =	2.610	lb	Wet Mass =	2.758	lb	Wet Mass =	2.793	lb
Area =	6.286	in^2	Area =	6.474	in^2	Area =	6.415	in^2
Volume =	37.721	in^3	Volume =	38.810	in^3	Volume =	38.466	in^3
Specific Gravity =	2.58	(ASTM D854)	Specific Gravity =	2.58	(ASTM D854)	Specific Gravity =	2.58	(ASTM D854)
Dry Mass of Solids =	2.117	lb	Dry Mass of Solids =	2.316	lb	Dry Mass of Solids =	2.285	lb
Moisture Content =	23.3%		Moisture Content =	19.1%		Moisture Content =	22.2%	
Wet Unit Weight =	119.6	pcf	Wet Unit Weight =	122.8	pcf	Wet Unit Weight =	125.5	pcf
Dry Unit Weight =	97.0	pcf	Dry Unit Weight =	103.1	pcf	Dry Unit Weight =	102.7	pcf
Void Ratio =	0.65		Void Ratio =	0.56		Void Ratio =	0.56	
Percent Saturation =	92%		Percent Saturation =	88%		Percent Saturation =	102%	
After Consolidation			**After Consolidation**			**After Consolidation**		
Length =	5.941	in	Length =	5.957	in	Length =	5.930	in
Diameter =	2.844	in	Diameter =	2.884	in	Diameter =	2.879	in
Area =	6.353	in^2 (Method B)	Area =	6.533	in^2 (Method B)	Area =	6.508	in^2 (Method B)
Volume =	37.747	in^3	Volume =	38.920	in^3	Volume =	38.593	in^3
Moisture Content =	25.5%		Moisture Content =	21.8%		Moisture Content =	22.1%	
Wet Unit Weight =	121.6	pcf	Wet Unit Weight =	125.2	pcf	Wet Unit Weight =	124.9	pcf
Dry Unit Weight =	96.9	pcf	Dry Unit Weight =	102.8	pcf	Dry Unit Weight =	102.3	pcf
Void Ratio =	0.66		Void Ratio =	0.56		Void Ratio =	0.57	
Percent Saturation =	100%		Percent Saturation =	100%		Percent Saturation =	100%	
B Parameter =	0.97		B Parameter =	0.97		B Parameter =	0.99	
Shear Rate =	0.012%	/min.	Shear Rate =	0.090%	/min.	Shear Rate =	0.090%	/min.
t_{50} =	28.79	min.	t_{50} =	2.39	min.	t_{50} =	1.03	min.
Strain at Failure =	2.3%		Strain at Failure =	4.3%		Strain at Failure =	4.7%	
Cell Pressure =	90.0	psi	Cell Pressure =	100.0	psi	Cell Pressure =	110.0	psi
Back Pressure =	80.0	psi	Back Pressure =	80.0	psi	Back Pressure =	80.0	psi
Confining Pressure =	10.0	psi	Confining Pressure =	20.0	psi	Confining Pressure =	30.0	psi

Notes: Sample description: (SC) SAND and SILTY CLAY, fine to coarse; light gray and yellow.

Atterberg limits: LL = 32 PL = 20 PI = 12 (ASTM D4318)

Percent finer: 3/4 in. = 100% No. 4 = 100% No. 200 = 42% (ASTM D422, refer to separate report for gradation curve)

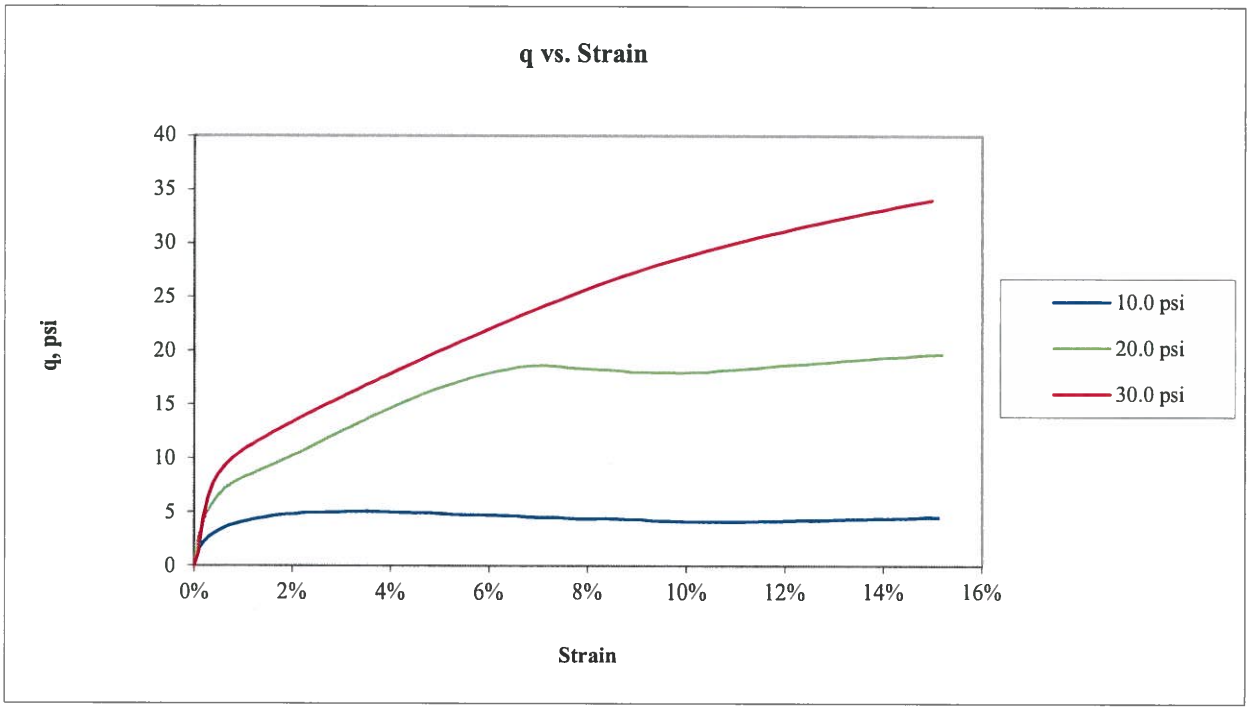
Specimen type:	X	Intact		Reconstituted
Moisture from:		Cuttings	X	Entire specimen
Saturation method:	X	Wet		Dry
Failure criterion:	X	$(\sigma'_1/\sigma'_3)_{max}$		$(\sigma'_1-\sigma'_3)_{max}$ ____ % strain
Membrane effect:	X	Corrected		Not Corrected

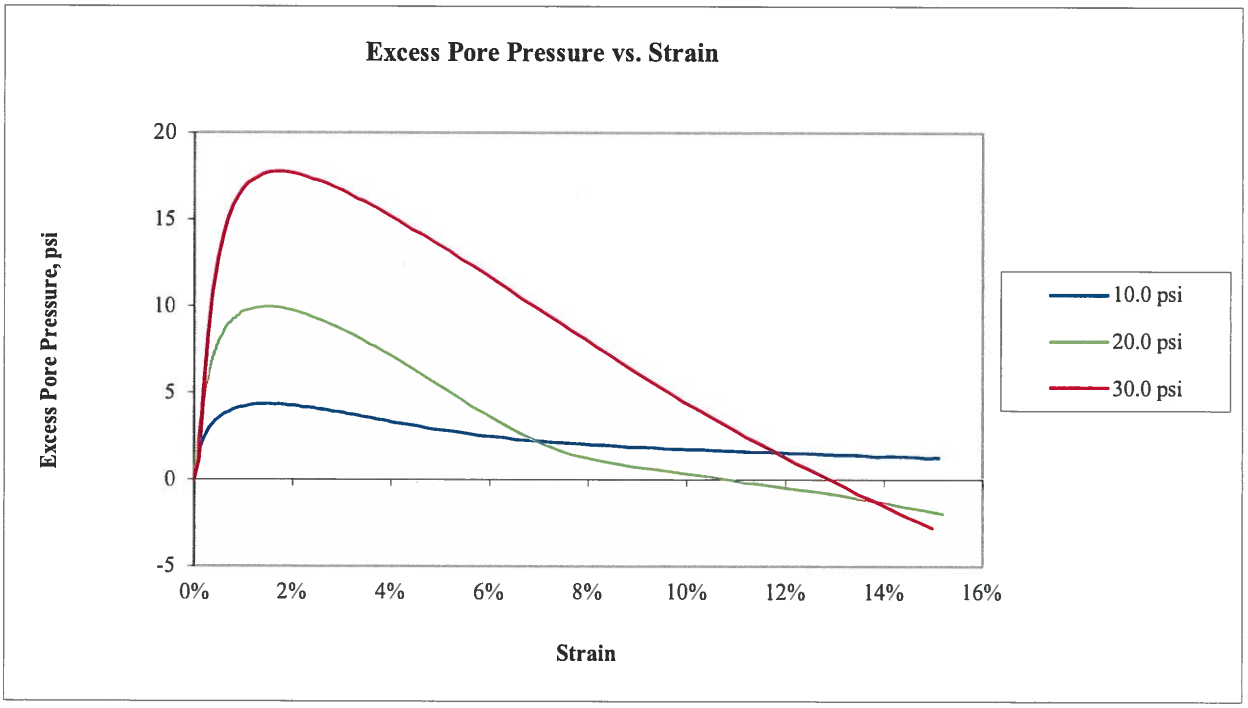
Golder Associates Inc.
Atlanta, Georgia

Title:
ASTM D4767
CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT
SAMPLE AND TEST DATA

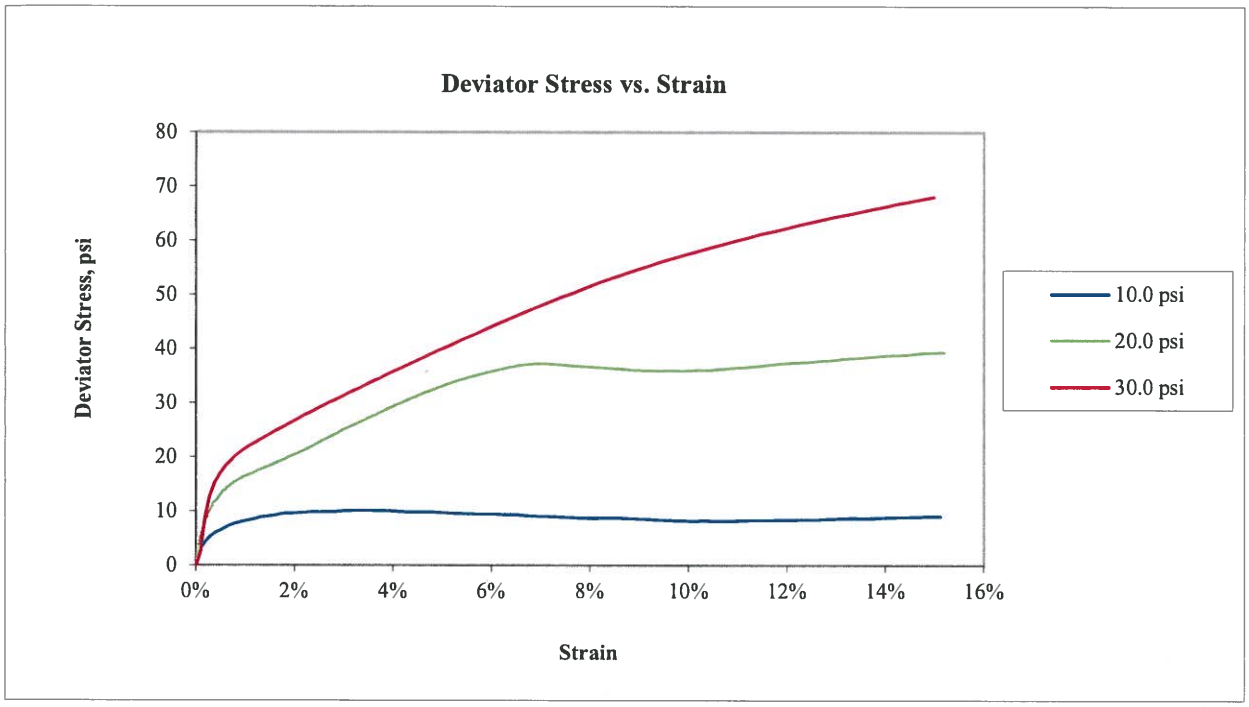
Job Short Title:
FTN/ENTERGY WHITE BLUFF/AR

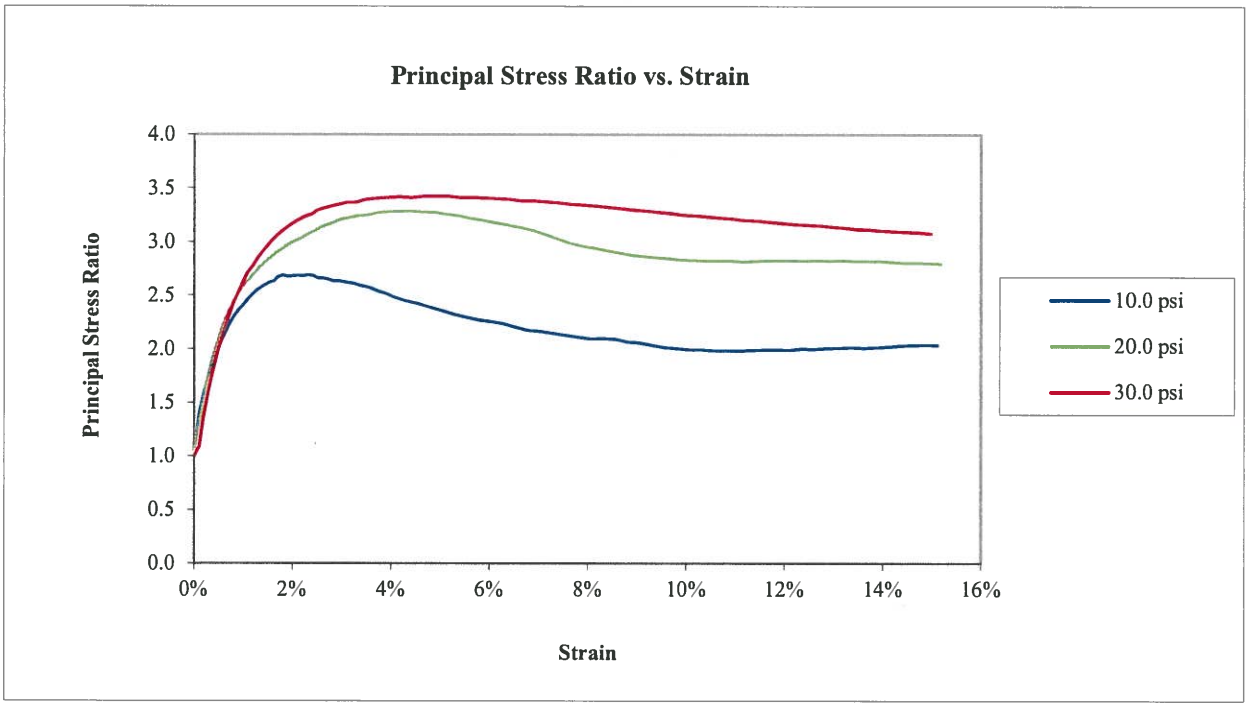
Sample:	Technician:	Reviewed:	Start Date:	Job Number:	Figure:
B-3 UD 10.0-12.0'	PWM/FT Check: PWM	Approved:	8/24/2018	18103173	1





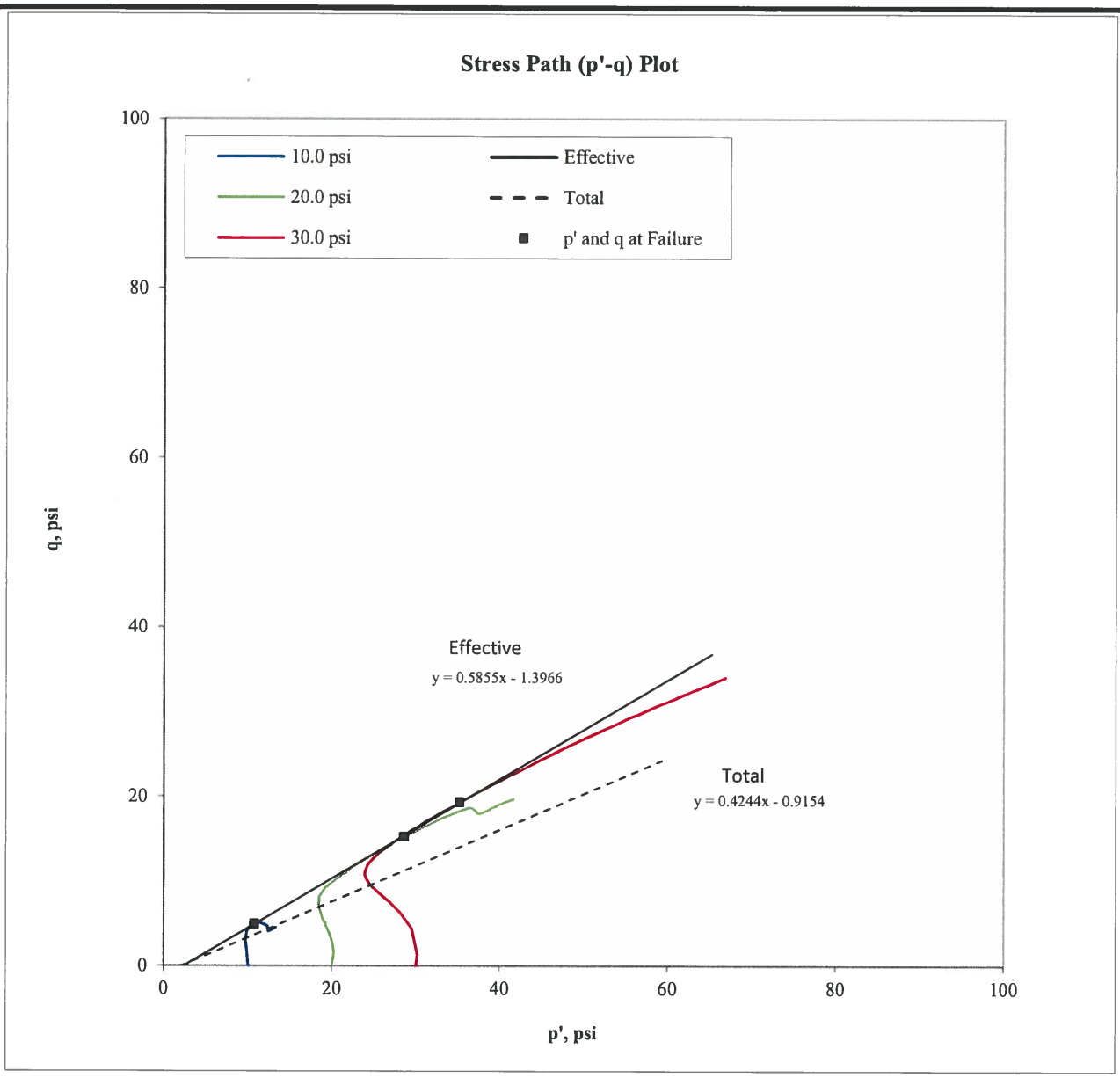
Golder Associates Inc. **Atlanta, Georgia**	**Title:** **ASTM D4767** **CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT** **q AND EXCESS PORE PRESSURE PLOTS**				
Job Short Title: **FTN/ENTERGY WHITE BLUFF/AR**					
Sample: **B-3 UD 10.0-12.0'**	**Technician:** **PWM/FT** **Check:**	**Reviewed:** **Approved:**	**Start Date:** **8/24/2018**	**Job Number:** **18103173**	**Figure:** **2**





Golder Associates Inc. **Atlanta, Georgia**	**Title:** **ASTM D4767** **CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT** **DEVIATOR STRESS AND PRINCIPAL STRESS RATIO PLOT**				
Job Short Title: **FTN/ENTERGY WHITE BLUFF/AR**					
Sample: **B-3 UD 10.0-12.0'**	**Technician:** **PWM/FT** **Check:**	**Reviewed:** **Approved:**	**Start Date:** **8/24/2018**	**Job Number:** **18103173**	**Figure:** **3**

Stress Path (p'-q) Plot



Confining Pressure (psi)	p at failure (psi)	p' at failure (psi)	q at failure (psi)
10.0	14.9	10.8	4.9
20.0	35.2	28.6	15.2
30.0	49.3	35.2	19.3

Effective

α ' =	28.3	degree
a' =	0.0	psi

Total

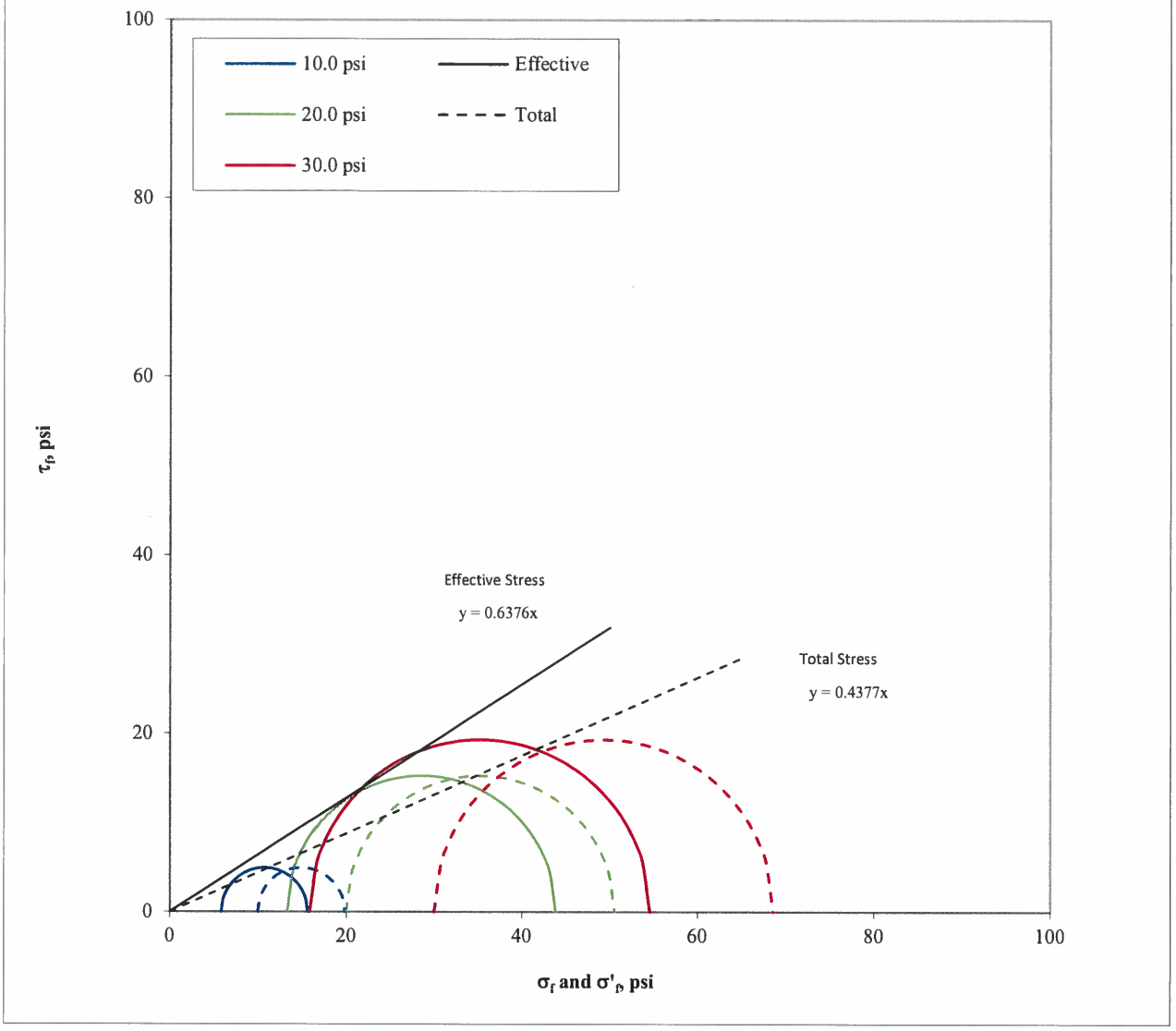
α =	21.9	degree
a =	0.0	psi

Note: The laboratory testing relates only to the sample tested. GAI neither accepts responsibility for nor makes claims to the final use and purpose of the material.

Golder Associates Inc. **Atlanta, Georgia**	**Title:** **ASTM D4767** **CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT** **STRESS PATH PLOT**
Job Short Title: **FTN/ENTERGY WHITE BLUFF/AR**	

Sample:	Technician:	Reviewed:	Start Date:	Job Number:	Figure:
B-3 UD 10.0-12.0'	PWM/FT Check:	Approved:	8/24/2018	18103173	4

Mohr's Circle Diagram



Confining Pressure (psi)	σ'_1 at failure (psi)	σ'_3 at failure (psi)	σ_1 at failure (psi)	σ_3 at failure (psi)
10.0	15.7	5.8	19.9	10.0
20.0	43.8	13.3	50.5	20.0
30.0	54.5	15.9	68.6	30.0

Effective

ϕ' =	32.5	degree
c' =	0.0	psi

Total

ϕ =	23.6	degree
c =	0.0	psi

Note: The laboratory testing relates only to the sample tested. GAI neither accepts responsibility for nor makes claims to the final use and purpose of the material.

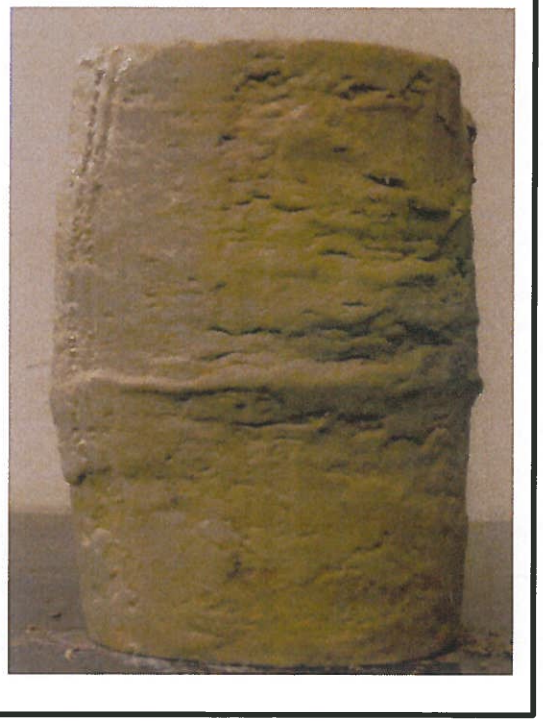
Golder Associates Inc. **Atlanta, Georgia**	**Title:** **ASTM D4767** **CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT** **MOHR'S CIRCLE DIAGRAM**
Job Short Title: **FTN/ENTERGY WHITE BLUFF/AR**	

Sample:	Technician:	Reviewed:	Start Date:	Job Number:	Figure:
B-3 UD 10.0-12.0'	PWM/FT Check: PWM	Approved:	8/24/2018	18103173	5

10.0 psi

20.0 psi

30.0 psi



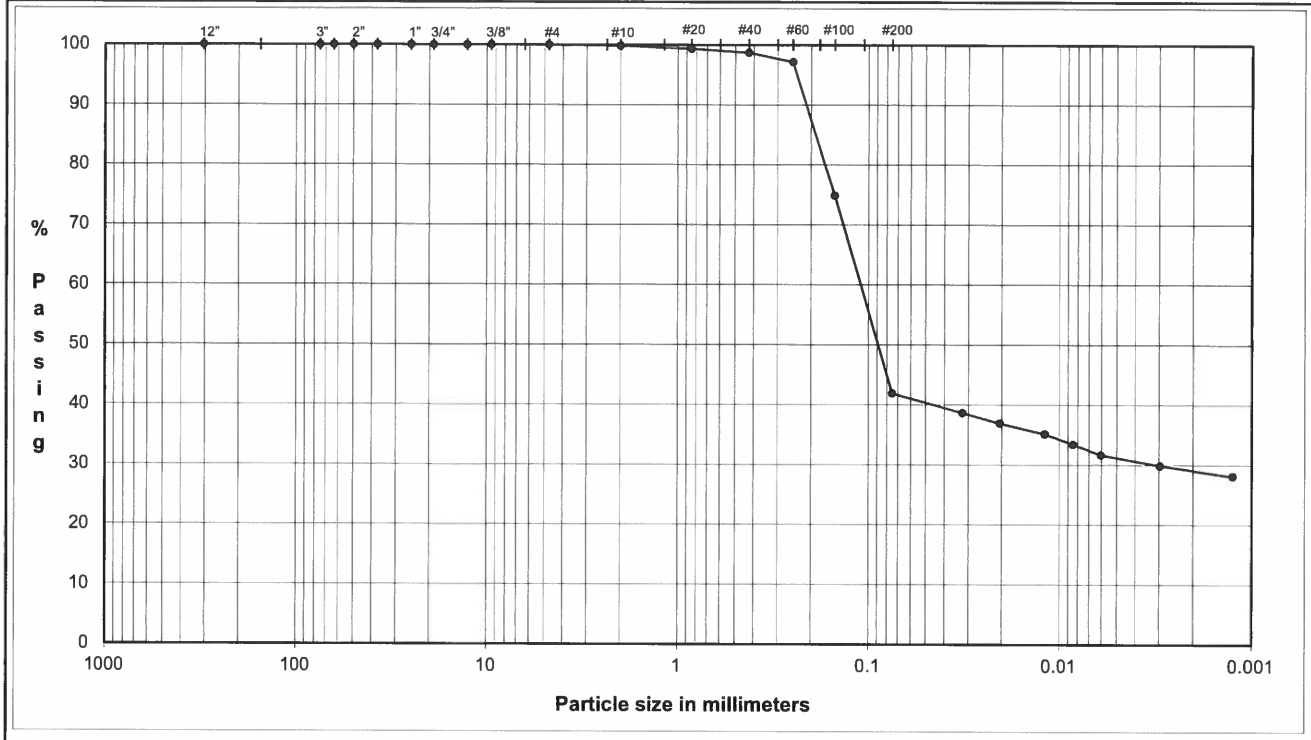
Golder Associates Inc. **Atlanta, Georgia**	**Title:** ASTM D4767 CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT SPECIMENS PHOTOGRAPH - 10.0 / 20.0 / 30.0 psi				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: B-3 UD 10.0-12.0'	**Technician:** PWM/FT **Check:**	**Reviewed:** **Approved:**	**Start Date:** 8/24/2018	**Job Number:** 18103173	**Figure:** 6

AUGUST 2018 | 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **B-3** Depth: **10.0-12.0'**
TYPE: **UD**



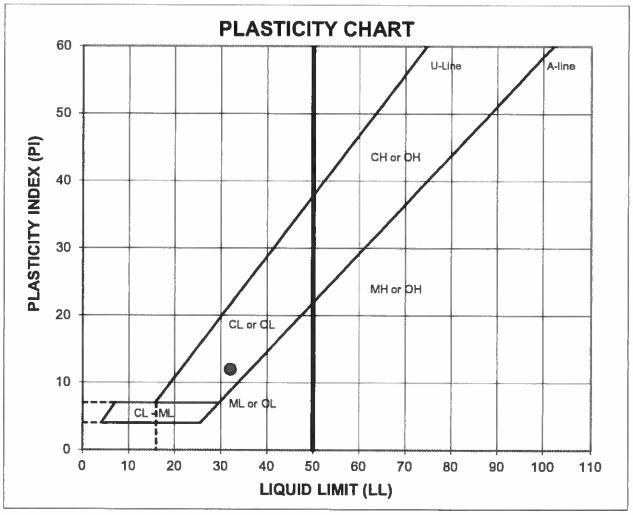
COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay

U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**99.8**	Coarse Sand	**0.2**
#20	0.85	**99.3**		
#40	0.43	**98.7**	Medium Sand	**1.1**
#60	0.25	**97.1**		
#100	0.15	**74.9**		
#200	0.075	**41.9**	Fine Sand	**56.8**

Hydrometer Analysis

(mm)	%Finer		
0.032	**38.7**		
0.020	**36.9**		
0.012	**35.1**	Fines	
0.0085	**33.4**	Silt or Clay	**41.9**
0.0060	**31.6**		
0.0030	**29.9**		
0.0012	**28.1**		



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
21.6	**32**	**20**	**12**	**0.18**

LL (oven-dried) / < 0.75 = ORGANIC (OL/OH)

DESCRIPTION: SAND and SILTY CLAY, fine to coarse; light gray and yellow.

USCS: SC

TECH	TJ/BA/HH
DATE	8/23/18
CHECK	
REVIEW	
APPROVE	

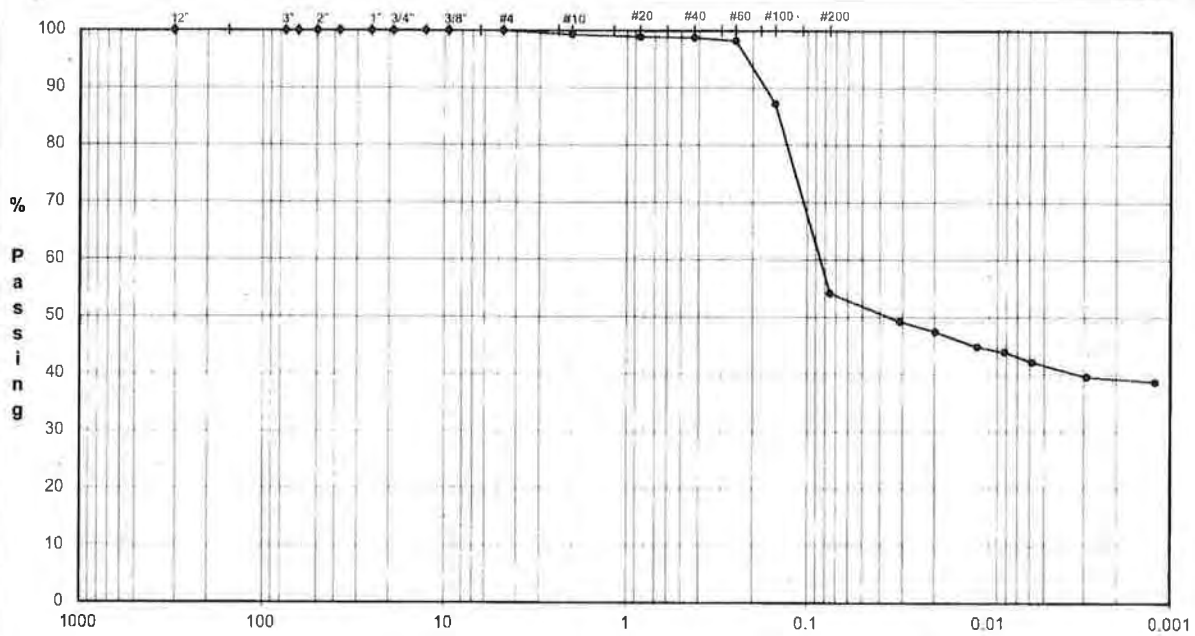
Golder Associates Inc.

AUGUST 2018 | 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **B-3 (P2-5)** Depth: **13.0-14.0'**
TYPE: **Bag**



COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

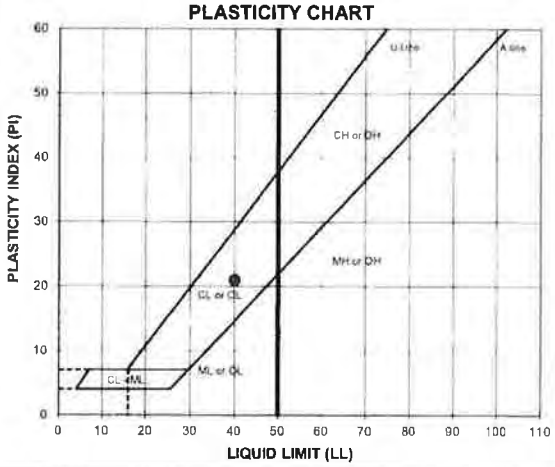
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**99.3**	Coarse Sand	**0.7**
#20	0.85	**98.9**		
#40	0.43	**98.8**	Medium Sand	**0.5**
#60	0.25	**98.2**		
#100	0.15	**87.2**		
#200	0.075	**54.1**	Fine Sand	**44.7**

Hydrometer Analysis

(mm)	%Finer		
0.031	**49.2**		
0.020	**47.4**		
0.012	**44.8**	Fines	
0.0082	**43.9**	Silt or Clay	**54.1**
0.0058	**42.2**		
0.0029	**39.5**		
0.0012	**38.7**		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
23.3	**40**	**19**	**21**	**0.18**

LL (oven-dried) / 0.75 ORGANIC (OL/OH)

DESCRIPTION: SILTY CLAY and SAND, fine to coarse; light gray.

USCS: CL

TECH	HH/BA/TJ
DATE	8/1/18
CHECK	
REVIEW	
APPROVE	

JUNE 2018

18103173

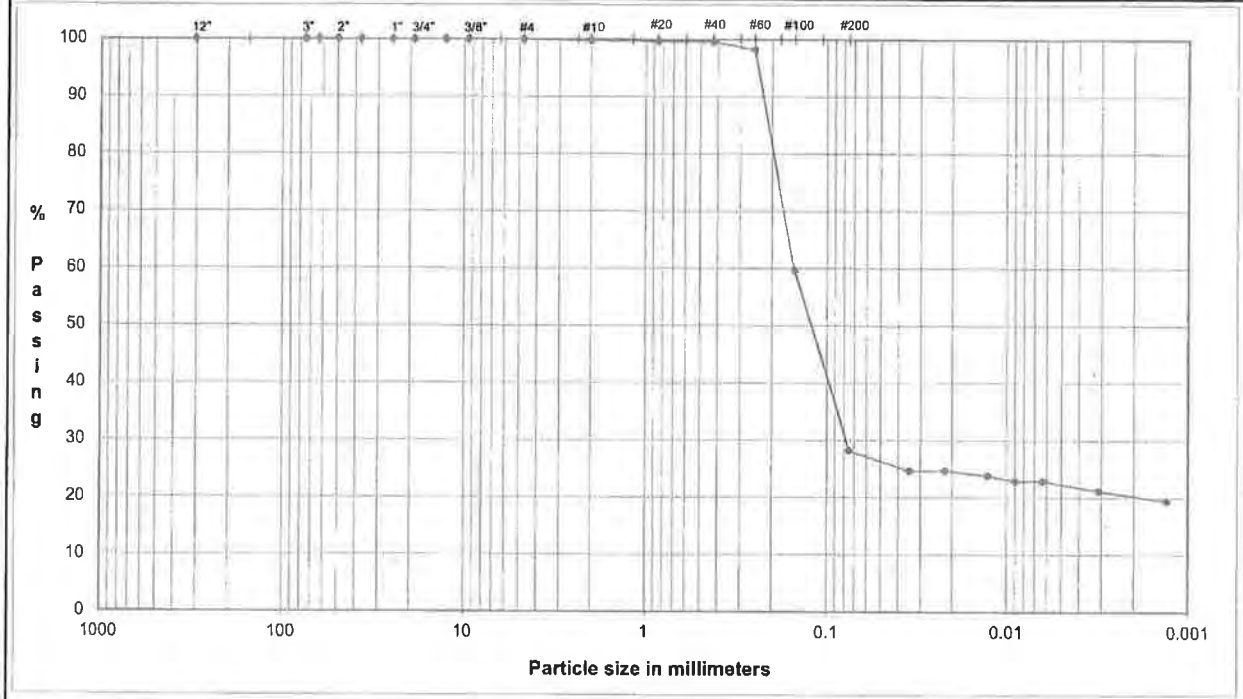
PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**

SAMPLE ID: **B-3** Depth: **15.0-17.0'**

TYPE: **UD**



	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
COBBLES	GRAVEL		SAND			FINES

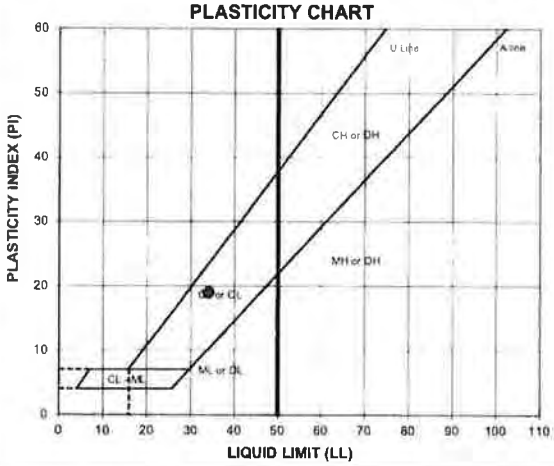
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	100.0		
3.0"	75.0	100.0	Cobbles	0.0
2.5"	63.5	100.0		
2.0"	50.0	100.0		
1.5"	37.5	100.0		
1.0"	25.0	100.0		
0.75"	19.0	100.0	Coarse Gravel	0.0
0.50"	12.7	100.0		
0.375"	9.5	100.0		
#4	4.8	100.0	Fine Gravel	0.0
#10	2.00	99.8	Coarse Sand	0.2
#20	0.85	99.6		
#40	0.43	99.6	Medium Sand	0.2
#60	0.25	98.1		
#100	0.15	59.6		
#200	0.075	28.2	Fine Sand	71.4

Hydrometer Analysis

(mm)	%Finer		
0.035	24.7		
0.022	24.7		
0.013	23.8	Fines	
0.0090	22.9	Silt or Clay	28.2
0.0063	22.9		
0.0031	21.1		
0.0013	19.4		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
19.0	34	15	19	0.23

LL (oven-dried) / 0.75 ORGANIC (OLOH)

DESCRIPTION: CLAYEY SAND, fine to coarse; light brown.

USCS: SC

TECH	TB/BA
DATE	6/19/18
CHECK	
REVIEW	
APPROVE	

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

PROJECT TITLE	FTN/ENTERGY WHITE BLUFF/AR		Board #	5	COMMENTS
PROJECT NUMBER	18103173		Flow Pump	2	
SAMPLE ID	B-3	15.0-17.0'	Flow Pump Speed	5	
SAMPLE TYPE	UD		Technician	FT	

Sample Data, Initial				Sample Data, Final	
Height, inches	3.008	B-Value, f	0.99	Height, inches	3.009
Diameter, inches	2.839	Cell Pres.	88.0	Diameter, inches	2.848
Area, cm^2	40.84	Bot. Pres.	80.0	Area, cm^2	41.10
Volume, cm^3	312.03	Top Pres.	80.0	Volume, cm^3	314.12
Mass, g	657.54	Tot. B.P.	80.0	Mass, g	660.77
Moisture Content, %	19.00	Head, max.	33.76	Moisture Content, %	19.59
Dry Density, pcf	110.50	Head, min.	33.76	Dry Density, pcf	109.76
Spec. Gravity (assumed)	2.700	Max. Grad.	4.42	Volume Solids, cm^3	204.64
Volume Solids, cm^3	204.64	Min. Grad.	4.42	Volume Voids, cm^3	109.47
Volume Voids, cm^3	107.39			Void Ratio	0.53
Void Ratio	0.52			Saturation, %	98.9%
Saturation, %	97.8%				

WATER CONTENTS		Sample Initial	Sample Final
Wt Soil & Tare, i	g	657.54	742.00
Wt Soil & Tare, f	g	552.54	634.47
Wt Tare	g	0.00	85.52
Wt Moisture Lost	g	105.00	107.53
Wt Dry Soil	g	552.54	548.95
Water Content	%	19.00%	19.59%

DESCRIPTION: CLAYEY SAND, fine to coarse; light brown.

Flow Pump Rate: 1.17E-03 cm^3/sec USCS: SC

TIME FUNCTIONS, SECONDS								dP				
DATE	DAY	HOUR	MIN	TEMP (°C)	dt (min)	dt,acc (min)	dt (sec)	dt,acc (sec)	Reading (psi)	Head (cm)	Gradient	Permeability (cm/sec)
06/19/18	43270	10	0	20.9	0	0	0	0	0.48	33.76	4.42	6.3E-06
06/19/18	43270	10	5	20.9	5	5	300	300	0.48	33.76	4.42	6.3E-06
06/19/18	43270	10	10	20.9	5	10	300	600	0.48	33.76	4.42	6.3E-06
06/19/18	43270	10	15	20.9	5	15	300	900	0.48	33.76	4.42	6.3E-06 *
06/19/18	43270	10	20	20.9	5	20	300	1200	0.48	33.76	4.42	6.3E-06 *
06/19/18	43270	10	25	20.9	5	25	300	1500	0.48	33.76	4.42	6.3E-06 *
06/19/18	43270	10	30	20.9	5	30	300	1800	0.48	33.76	4.42	6.3E-06 *

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 6.3E-06 cm/sec **

DATE	6/19/18
CHECK	
REVIEW	
APPROVE	

JULY 2018

18103173

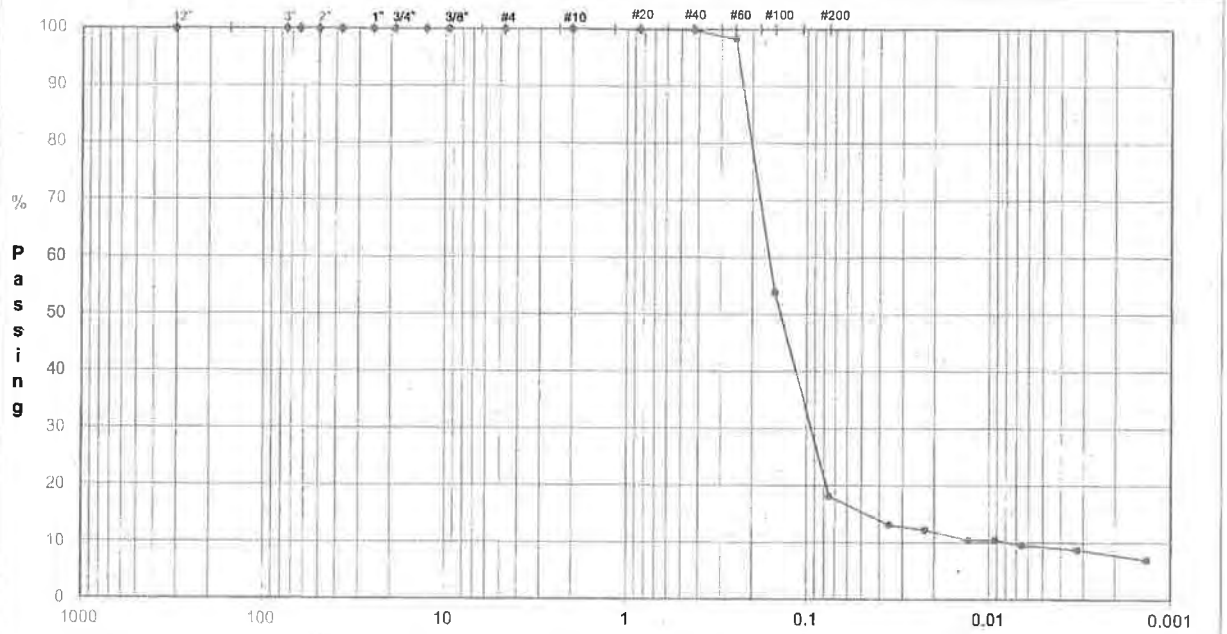
PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**

SAMPLE ID: **B-3** - Depth: **20.0-22.0'**

TYPE: **UD**



COBBLES	Coarse GRAVEL	Fine GRAVEL	Coarse SAND	Medium SAND	Fine SAND	Silt or Clay FINES

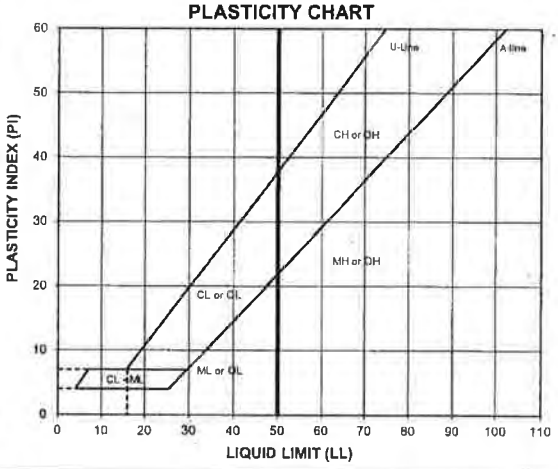
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	100.0		
3.0"	75.0	100.0	Cobbles	0.0
2.5"	63.5	100.0		
2.0"	50.0	100.0		
1.5"	37.5	100.0		
1.0"	25.0	100.0		
0.75"	19.0	100.0	Coarse Gravel	0.0
0.50"	12.7	100.0		
0.375"	9.5	100.0		
#4	4.8	100.0	Fine Gravel	0.0
#10	2.00	100.0	Coarse Sand	0.0
#20	0.85	99.9		
#40	0.43	99.8	Medium Sand	0.2
#60	0.25	98.3		
#100	0.15	53.8		
#200	0.075	18.1	Fine Sand	81.7

Hydrometer Analysis

(mm)	%Finer		
0.036	13.1		
0.022	12.2		
0.013	10.5	Fines	
0.0092	10.5	Silt or Clay	18.1
0.0066	9.6		
0.0032	8.7		
0.0013	7.0		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

M_r	LL	PL	PI	LI
31.5	NP	NP	NP	NP

LL (oven-dried) / 0.75 ORGANIC (OL-OH)

DESCRIPTION: SILTY SAND, fine to medium; light yellowish brown.

USCS: SM

TECH	TB
DATE	7/13/18
CHECK	
REVIEW	
APPROVE	

Golder Associates Inc.

Boring or Test Pit: B-3	Boring or Test Pit: B-3	Boring or Test Pit: B-3
Sample: UD	Sample: UD	Sample: UD
Depth: 20.0-22.0'	Depth: 20.0-22.0'	Depth: 20.0-22.0'
Point No.: 1	Point No.: 2	Point No.: 3

Initial			Initial			Initial		
Thickness =	0.750	in	Thickness =	0.750	in	Thickness =	0.750	in
Diameter =	2.500	in	Diameter =	2.500	in	Diameter =	2.500	in
Wet Mass =	0.220	lb	Wet Mass =	0.211	lb	Wet Mass =	0.235	lb
Area =	4.909	in^2	Area =	4.909	in^2	Area =	4.909	in^2
Volume =	3.682	in^3	Volume =	3.682	in^3	Volume =	3.682	in^3
Specific Gravity =	2.67	(Assumed)	Specific Gravity =	2.67	(Assumed)	Specific Gravity =	2.67	(Assumed)
Dry Mass of Solids =	0.167	lb	Dry Mass of Solids =	0.160	lb	Dry Mass of Solids =	0.179	lb
Moisture Content =	31.5%		Moisture Content =	31.5%		Moisture Content =	31.5%	
Wet Unit Weight =	103.1	pcf	Wet Unit Weight =	99.0	pcf	Wet Unit Weight =	110.4	pcf
Dry Unit Weight =	78.4	pcf	Dry Unit Weight =	75.3	pcf	Dry Unit Weight =	83.9	pcf
Void Ratio =	1.12		Void Ratio =	1.21		Void Ratio =	0.98	
Percent Saturation =	75%		Percent Saturation =	70%		Percent Saturation =	86%	

Pre-Shear			Pre-Shear			Pre-Shear		
Thickness =	0.739	in	Thickness =	0.663	in	Thickness =	0.641	in
Diameter =	2.500	in	Diameter =	2.500	in	Diameter =	2.500	in
Area =	4.909	in^2	Area =	4.909	in^2	Area =	4.909	in^2
Volume =	3.628	in^3	Volume =	3.254	in^3	Volume =	3.147	in^3
Moisture Content =	35.1%		Moisture Content =	42.1%		Moisture Content =	28.2%	
Wet Unit Weight =	107.4	pcf	Wet Unit Weight =	121.0	pcf	Wet Unit Weight =	125.9	pcf
Dry Unit Weight =	79.5	pcf	Dry Unit Weight =	85.2	pcf	Dry Unit Weight =	98.2	pcf
Void Ratio =	1.09		Void Ratio =	0.95		Void Ratio =	0.70	
Percent Saturation =	100%		Percent Saturation =	100%		Percent Saturation =	100%	

Shear Rate =	0.001	in/min	Shear Rate =	0.001	in/min	Shear Rate =	0.001	in/min
Normal Stress =	18	psi	Normal Stress =	36	psi	Normal Stress =	54	psi

Notes:

Sample description: (SM) SILTY SAND, fine to medium; light yellowish brown.

Atterberg limit: LL = NP PL = NP PI = NP (ASTM D4318)

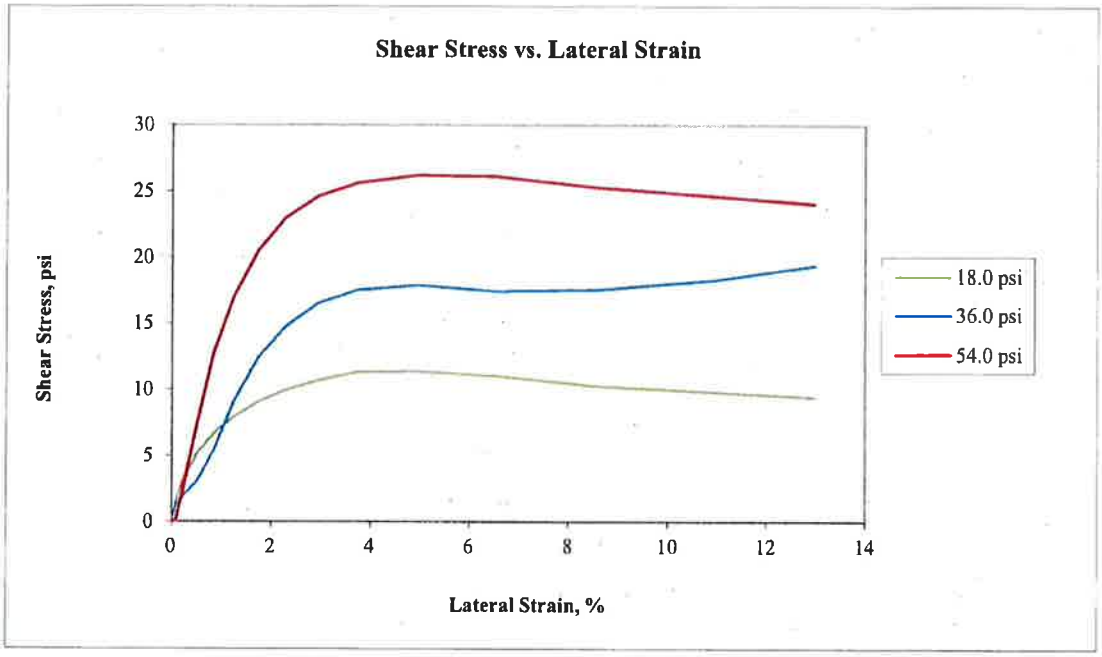
Percent finer: 3/4 in. = 100% No. 4 = 100% No. 200 = 18% (ASTM D422, refer to separate report)

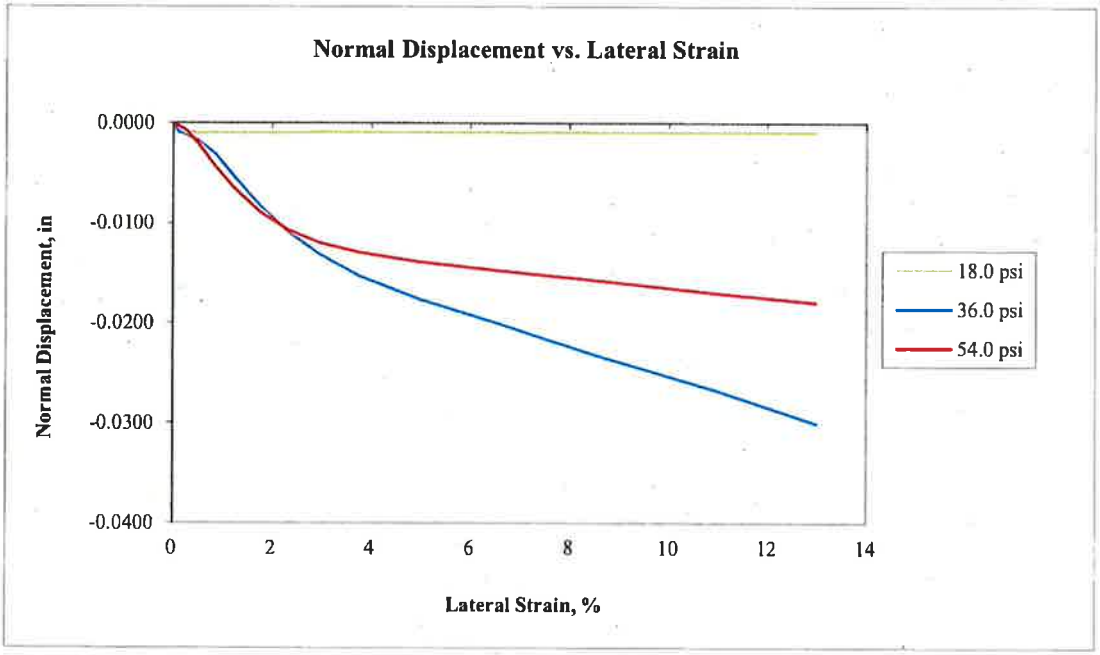
Specimen type: [X] Intact [ ] Reconstituted

Inundation: At seating load of approximately 100 psf

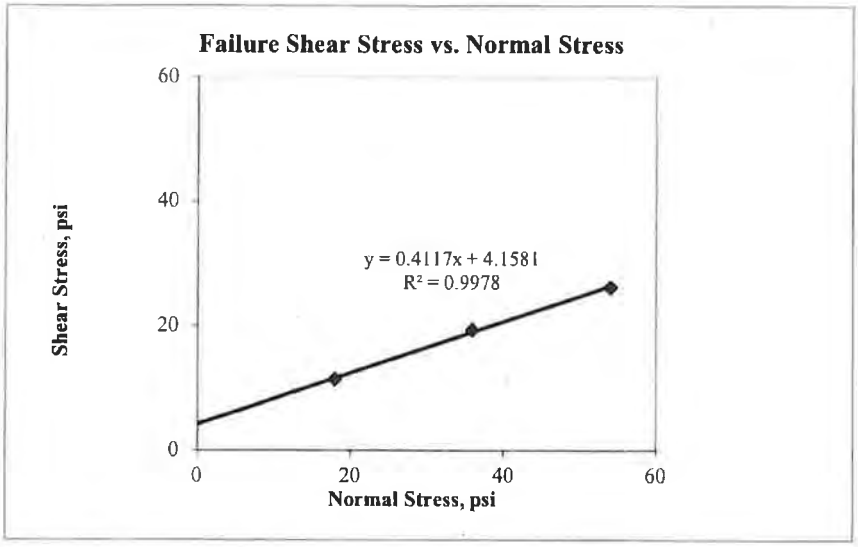
Apparatus: 2.5 -inch nominal diameter box, Humboldt Material Testing Software and Equipment.

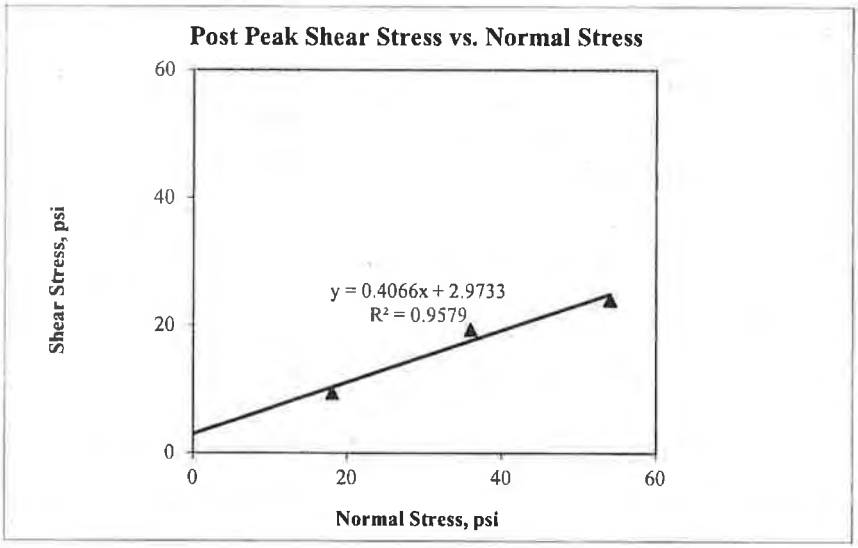
Golder Associates Inc. Atlanta, Georgia	**Title:** ASTM D3080 CONSOLIDATED DRAINED DIRECT SHEAR TEST REPORT SAMPLE AND TEST DATA			
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR				
Sample: B-3 UD 20.0-22.0'	**Technician:** FT	**Checked:** / **Reviewed:**	**Date:** 7/16/2018	**Job Number:** 18103173	**Figure:** 1





Golder Associates Inc. **Atlanta, Georgia**	**Title:** **ASTM D3080** **CONSOLIDATED DRAINED DIRECT SHEAR TEST REPORT** **SHEAR STRESS AND NORMAL DISPLACEMENT PLOTS**				
Job Short Title: **FTN/ENTERGY WHITE BLUFF/AR**					
Sample: **B-3 UD 20.0-22.0'**	**Technician:** **FT**	**Checked:** **Reviewed:**	**Date:** **7/16/2018**	**Job Number:** **18103173**	**Figure:** **2**





Normal Stress psi	Peak Shear Stress psi
18.0	11.4
36.0	19.4
54.0	26.2

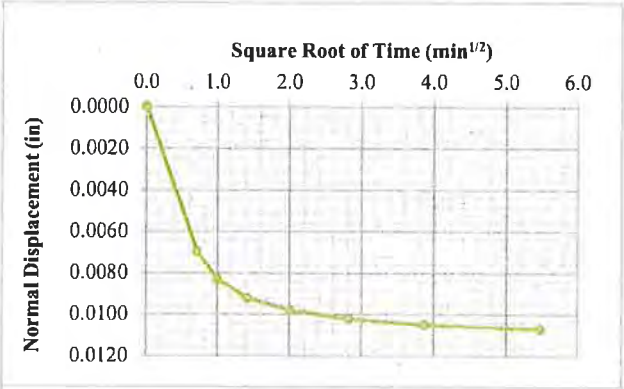
Normal Stress psi	Post Peak Shear Stress psi
18.0	9.4
36.0	19.4
54.0	24.0

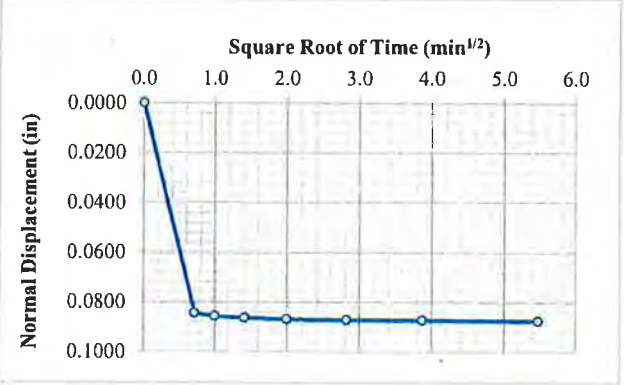
Failure	Post Peak
ϕ = 22.4 °	ϕ = 22.1 °
c = 4.2 psi	c = 3.0 psi

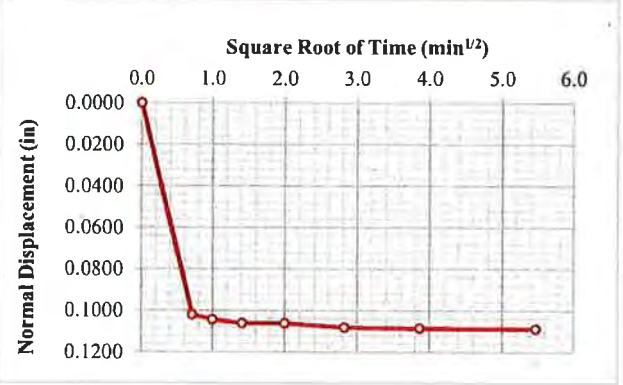
Golder Associates Inc. Atlanta, Georgia	**Title:** ASTM D3080 CONSOLIDATED DRAINED DIRECT SHEAR TEST REPORT FAILURE ENVELOPES				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: B-3 UD 20.0-22.0'	**Technician:** FT	**Checked/Reviewed:**	**Date:** 7/16/2018	**Job Number:** 18103173	**Figure:** 3

Golder Associates Inc. **Atlanta, Georgia**	**Title:** **ASTM D3080** **CONSOLIDATED DRAINED DIRECT SHEAR TEST REPORT** **SPECIMEN PHOTOGRAPH - 18 psi**				
Job Short Title: **FTN/ENTERGY WHITE BLUFF/AR**					
Sample: **B-3 UD 20.0-22.0'**	**Technician:** **FT**	**Reviewed:**	**Date:** **7/16/2018**	**Job Number:** **18103173**	**Figure:** **4**

Consolidation Data Used to Determine Shear Rate







TIME, MIN	SQUARE ROOT OF TIME	DIAL READING
Point No. 1		
0.000	0.00	0.0000
0.50	0.71	0.0070
1.0	1.00	0.0083
2.0	1.41	0.0092
4.0	2.00	0.0098
8.0	2.83	0.0102
15.0	3.87	0.0105
30.0	5.48	0.0107
Point No. 2		
0.000	0.00	0.0000
0.50	0.71	0.0846
1.0	1.00	0.0858
2.0	1.41	0.0865
4.0	2.00	0.0870
8.0	2.83	0.0873
15.0	3.87	0.0874
30.0	5.48	0.0877
Point No. 3		
0.000	0.00	0.0000
0.50	0.71	0.1021
1.0	1.00	0.1044
2.0	1.41	0.1062
4.0	2.00	0.1062
8.0	2.83	0.1082
15.0	3.87	0.1086
30.0	5.48	0.1090

Golder Associates Inc. **Atlanta, Georgia**	Title: **ASTM D3080** **CONSOLIDATED DRAINED DIRECT SHEAR TEST REPORT** **CONSOLIDATION DATA**				
Job Short Title: **FTN/ENTERGY WHITE BLUFF/AR**					
Sample: **B-3 UD 20.0-22.0'**	**Technician:** **FT**	**Reviewed:**	**Date:** **7/16/2018**	**Job Number:** **18103173**	**Figure:** **5**

AUGUST 2018

18103173

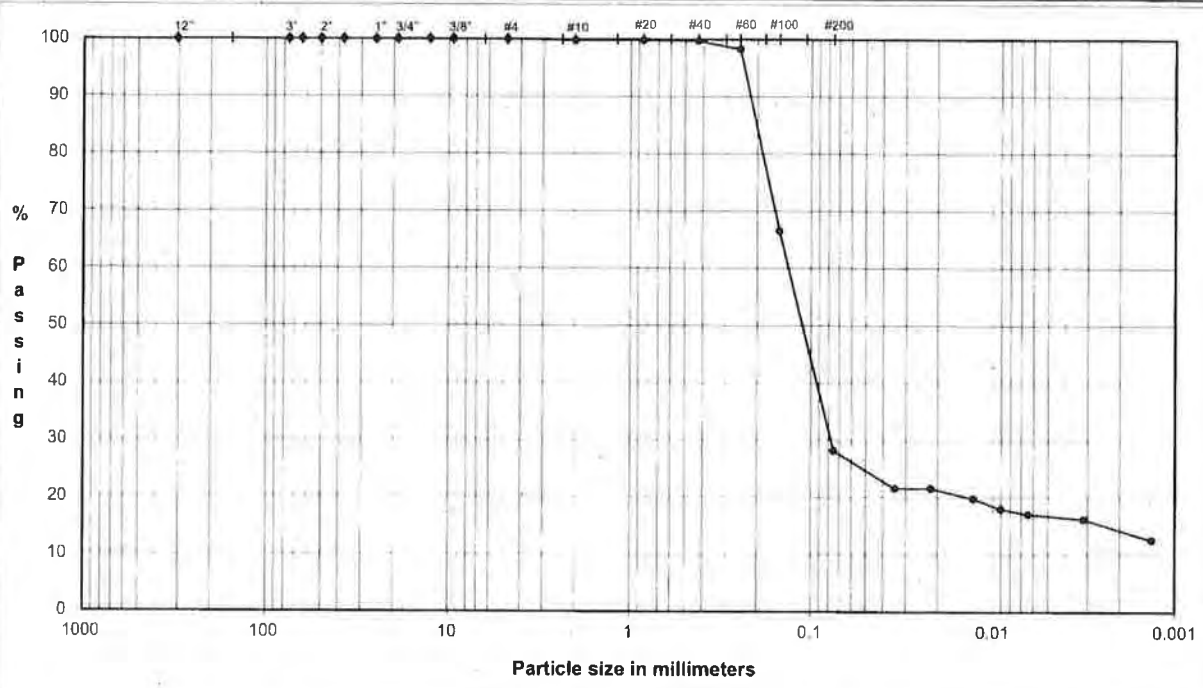
PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**

SAMPLE ID: **B-3 (P2-5)** Depth: **23.0-24.0'**

TYPE: **Bag**



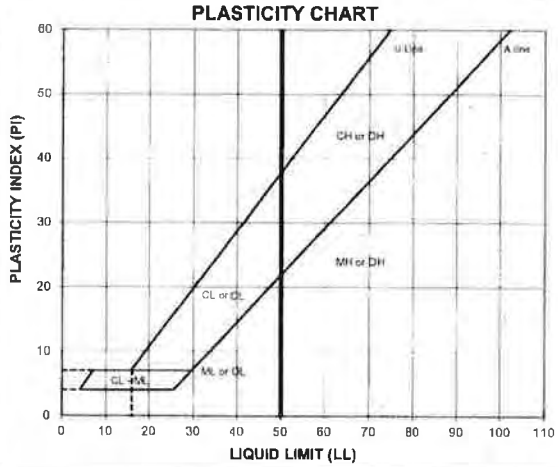
COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**99.8**	Coarse Sand	**0.2**
#20	0.85	**99.8**		
#40	0.43	**99.7**	Medium Sand	**0.1**
#60	0.25	**98.3**		
#100	0.15	**66.5**		
#200	0.075	**28.1**	Fine Sand	**71.6**

Hydrometer Analysis

(mm)	%Finer		
0.035	**21.6**		
0.022	**21.6**		
0.013	**19.8**	Fines	
0.0090	**18.0**	Silt or Clay	**28.1**
0.0064	**17.1**		
0.0032	**16.2**		
0.0013	**12.6**		



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
30.0	**NP**	**NP**	**NP**	**NP**

LL (oven-dried) / 0.75 ORGANIC (OL/OH)

DESCRIPTION: SILTY SAND, fine to coarse; brownish gray

USCS: SM

TECH	HH/BA
DATE	8/2/18
CHECK	
REVIEW	
APPROVE	

Golder Associates Inc.

JUNE 2018

18103173

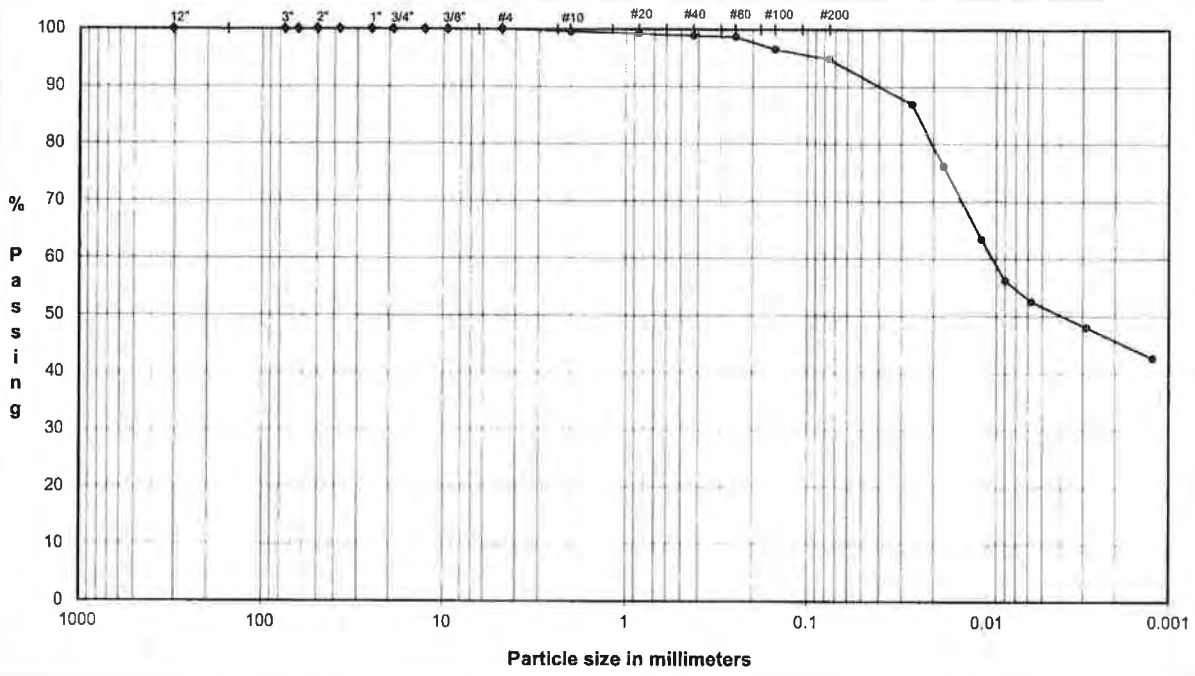
PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**

SAMPLE ID: **B-4** Depth: **8.0-10.0'**

TYPE: **UD**



COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

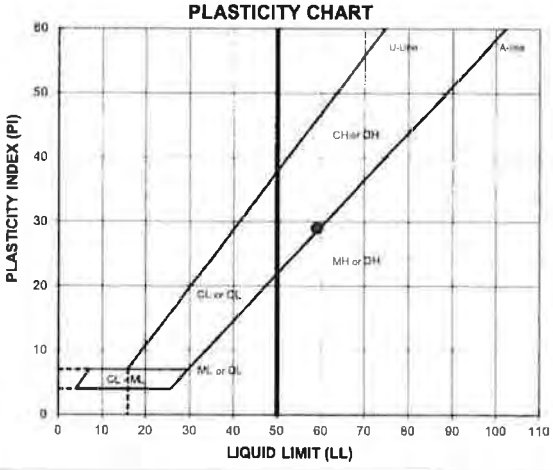
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**99.6**	Coarse Sand	**0.4**
#20	0.85	**99.2**		
#40	0.43	**98.9**	Medium Sand	**0.7**
#60	0.25	**98.7**		
#100	0.15	**96.5**		
#200	0.075	**94.7**	Fine Sand	**4.2**

Hydrometer Analysis

(mm)	%Finer		
0.026	**87.0**		
0.018	**76.1**		
0.011	**63.4**	Fines	
0.0080	**56.2**	Silt or Clay	**94.7**
0.0058	**52.6**		
0.0029	**48.0**		
0.0012	**42.6**		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
33.5	**59**	**30**	**29**	**0.13**

LL (oven-dried) / 0.75 ORGANIC (OL/OH)

DESCRIPTION: CLAY, some fine to coarse sand; yellowish brown.

USCS: CH

TECH	TJ/BA/TB
DATE	6/8/18
CHECK	
REVIEW	
APPROVE	

Golder Associates Inc.

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

PROJECT TITLE	FTN/ENTERGY WHITE BLUFF/AR		Board #	2	COMMENTS
PROJECT NUMBER	18103173		Flow Pump	2	
SAMPLE ID	B-4	8.0-10.0'	Flow Pump Speed	9	
SAMPLE TYPE	UD		Technician	FT	

Sample Data, Initial				Sample Data, Final	
Height, inches	2.999	B-Value, f	0.99	Height, inches	3.002
Diameter, inches	2.869	Cell Pres.	88.0	Diameter, inches	2.899
Area, cm²	41.71	Bot. Pres.	80.0	Area, cm²	42.58
Volume, cm³	317.71	Top Pres.	80.0	Volume, cm³	324.71
Mass, g	585.31	Tot. B.P.	80.0	Mass, g	596.72
Moisture Content, %	33.46	Head, max.	162.49	Moisture Content, %	36.07
Dry Density, pcf	86.13	Head, min.	162.49	Dry Density, pcf	84.28
Spec. Gravity (assumed)	2.700	Max. Grad.	21.31	Volume Solids, cm³	162.43
Volume Solids, cm³	162.43	Min. Grad.	21.31	Volume Voids, cm³	162.29
Volume Voids, cm³	155.28			Void Ratio	1.00
Void Ratio	0.96			Saturation, %	97.5%
Saturation, %	94.5%				

WATER CONTENTS		Sample Initial	Sample Final
Wt Soil & Tare, i	g	585.31	686.79
Wt Soil & Tare, f	g	438.55	528.69
Wt Tare	g	0.00	90.33
Wt Moisture Lost	g	146.76	158.10
Wt Dry Soil	g	438.55	438.36
Water Content	%	33.46%	36.07%

Flow Pump Rate: 4.26E-05 cm³/sec

USCS: CH

DESCRIPTION: CLAY, some fine to coarse sand; yellowish brown.

TIME FUNCTIONS, SECONDS								dP				
DATE	DAY	HOUR	MIN	TEMP (°C)	dt (min)	dt,acc (min)	dt (sec)	dt,acc (sec)	Reading (psi)	Head (cm)	Gradient	Permeability (cm/sec)
06/08/18	43259	13	0	20.9	0	0	0	0	2.31	162.49	21.31	4.6E-08
06/08/18	43259	13	5	20.9	5	5	300	300	2.31	162.49	21.31	4.6E-08
06/08/18	43259	13	10	20.9	5	10	300	600	2.31	162.49	21.31	4.6E-08
06/08/18	43259	13	15	20.9	5	15	300	900	2.31	162.49	21.31	4.6E-08 *
06/08/18	43259	13	20	20.9	5	20	300	1200	2.31	162.49	21.31	4.6E-08 *
06/08/18	43259	13	25	20.9	5	25	300	1500	2.31	162.49	21.31	4.6E-08 *
06/08/18	43259	13	30	20.9	5	30	300	1800	2.31	162.49	21.31	4.6E-08 *

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 4.6E-08 cm/sec **

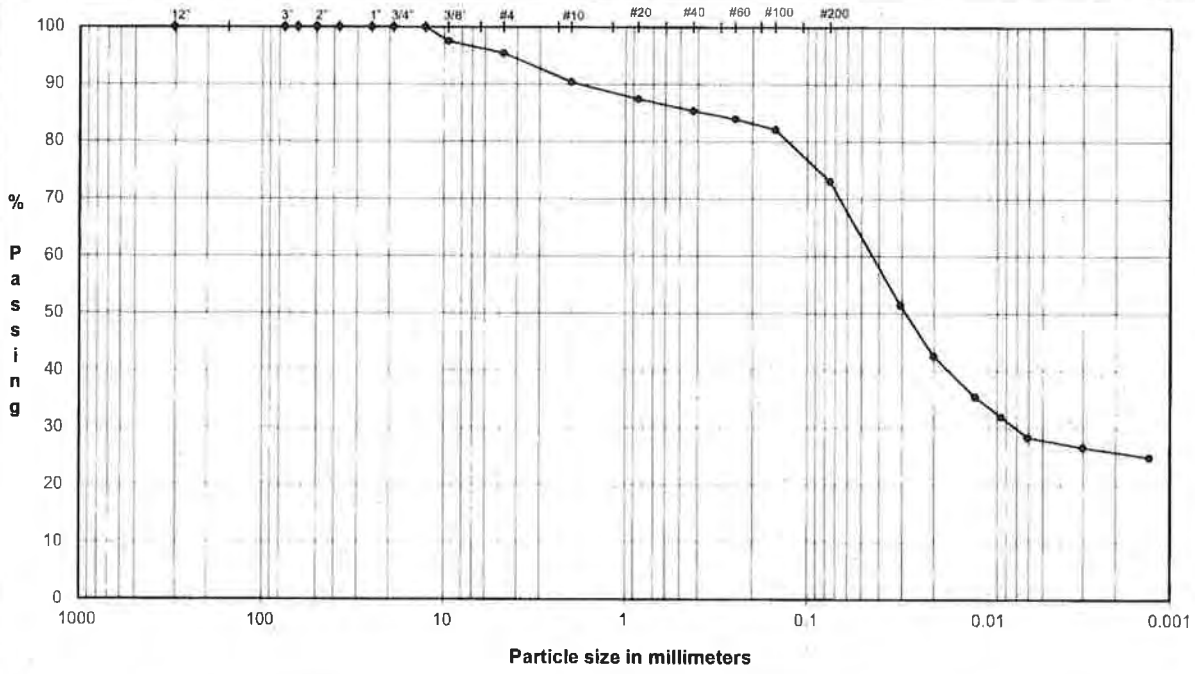
DATE	6/8/18
CHECK	
REVIEW	
APPROVE	

JUNE 2018 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **B-5** Depth: **3.0-5.0'**
TYPE: **UD**



COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

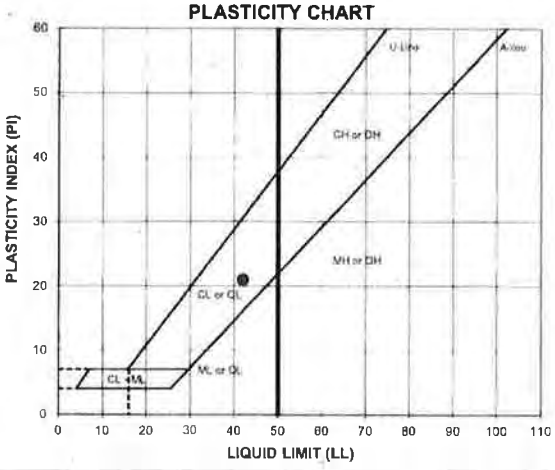
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**97.5**		
#4	4.8	**95.4**	Fine Gravel	**4.6**
#10	2.00	**90.4**	Coarse Sand	**5.0**
#20	0.85	**87.4**		
#40	0.43	**85.4**	Medium Sand	**5.0**
#60	0.25	**84.0**		
#100	0.15	**82.1**		
#200	0.075	**73.1**	Fine Sand	**12.3**

Hydrometer Analysis

(mm)	%Finer		
0.031	**51.4**		
0.020	**42.6**		
0.012	**35.5**	Fines	
0.0085	**31.9**	Silt or Clay	**73.1**
0.0061	**28.4**		
0.0030	**26.6**		
0.0013	**24.8**		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

ML	LL	PL	PI	LI
26.6	**42**	**21**	**21**	**0.28**

LL (oven-dried) / 0.75 ORGANIC (OL OH)

DESCRIPTION: SAND and SILTY CLAY, fine to medium; dark brown.

USCS: CL

TECH	TB/HH/TJ
DATE	6/25/18
CHECK	
REVIEW	
APPROVE	

Golder Associates Inc.

Boring or Test Pit:	B-5		Boring or Test Pit:			Boring or Test Pit:		
Sample:	1		Sample:			Sample:		
Depth:	3.0-5.0	ft	Depth:			Depth:		
Point No.:	1		Point No.:			Point No.:		
Initial								
Length =	6.012	in	Length =	6.009		Length =	5.925	
Diameter =	2.877	in	Diameter =	2.842		Diameter =	2.863	
Wet Mass =	2.625	lb	Wet Mass =			Wet Mass =		
Area =	6.501	in^2	Area =			Area =		
Volume =	39.083	in^3	Volume =			Volume =		
Specific Gravity =	2.69	(ASTM D854)	Specific Gravity =			Specific Gravity =		
Dry Mass of Solids =	2.073	lb	Dry Mass of Solids =			Dry Mass of Solids =		
Moisture Content =	26.6%		Moisture Content =			Moisture Content =		
Wet Unit Weight =	116.1	pcf	Wet Unit Weight =			Wet Unit Weight =		
Dry Unit Weight =	91.7	pcf	Dry Unit Weight =			Dry Unit Weight =		
Void Ratio =	0.83		Void Ratio =			Void Ratio =		
Percent Saturation =	86%		Percent Saturation =			Percent Saturation =		
After Consolidation			**After Consolidation**			**After Consolidation**		
Length =	6.009	in	Length =	5.925	in	Length =	5.849	in
Diameter =	2.842	in	Diameter =	2.863	in	Diameter =	2.881	in
Area =	6.345		Area =	6.436		Area =	6.519	in^2 (Method B)
Volume =	38.129		Volume =	38.129		Volume =	38.129	in^3
Moisture Content =			Moisture Content =			Moisture Content =	29.2%	
Wet Unit Weight =			Wet Unit Weight =			Wet Unit Weight =	121.4	pcf
Dry Unit Weight =			Dry Unit Weight =			Dry Unit Weight =	94.0	pcf
Void Ratio =			Void Ratio =			Void Ratio =	0.78	
Percent Saturation =			Percent Saturation =			Percent Saturation =	100%	
B Parameter =	0.99		B Parameter =	--		B Parameter =	--	
Shear Rate =	0.089%	/min.	Shear Rate =	0.099%	/min	Shear Rate =	0.092%	/min.
t_{50} =	0.3	min.	t_{50} =	0.6	min.	t_{50} =	0.1	min
Strain at Failure =	1.3%		Strain at Failure =	2.7%		Strain at Failure =	4.3%	
Cell Pressure =	74.0	psi	Cell Pressure =	80.0	psi	Cell Pressure =	85.0	psi
Back Pressure =	70.0	psi	Back Pressure =	70.0	psi	Back Pressure =	70.0	psi
Confining Pressure =	4.0	psi	Confining Pressure =	10.0	psi	Confining Pressure =	15.0	psi

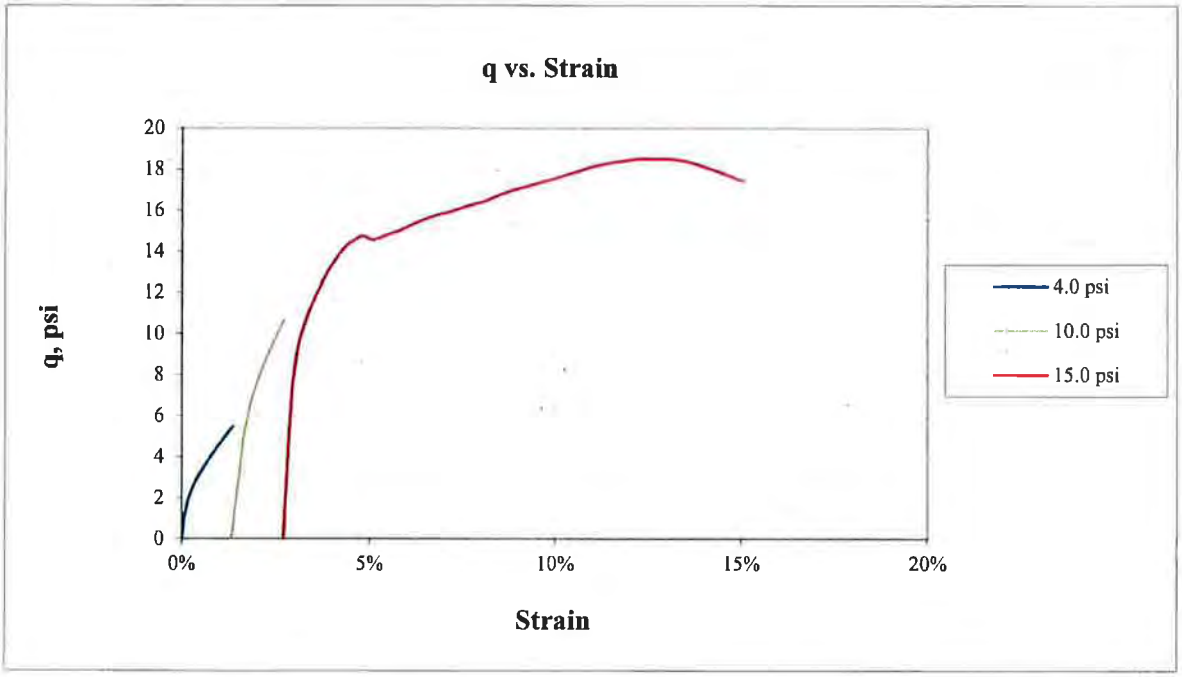
Notes: Sample description: (CL) SAND and SILTY CLAY, fine to medium; dark brown.

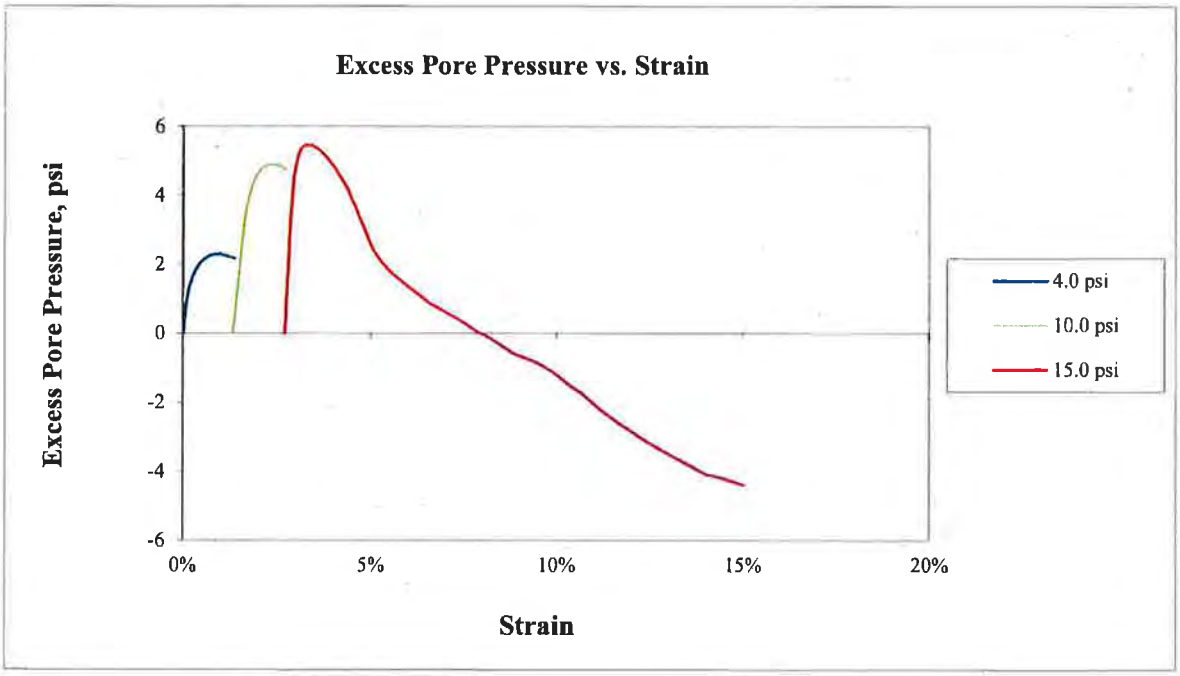
Atterberg limits: LL = 42 PL = 21 PI = 21 (ASTM D4318)

Percent finer: 3/4 in. = 100.0% No. 4 = 95.4% No. 200 = 73.1% (ASTM D422, refer to separate report for gradation curve)

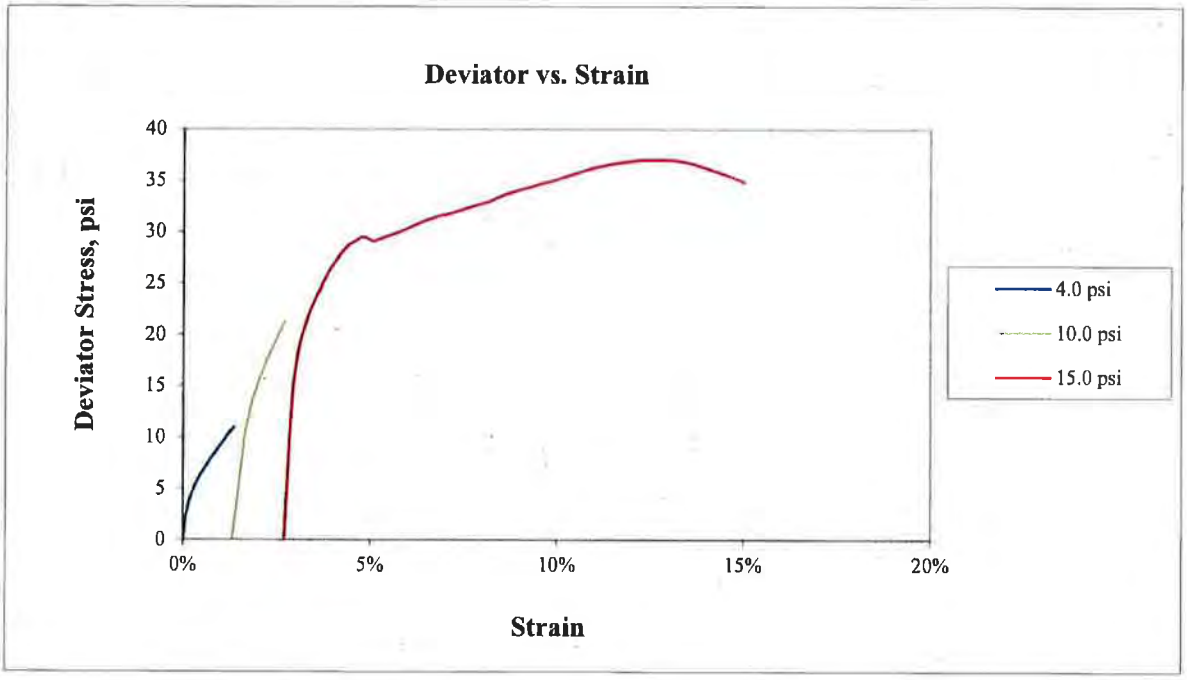
Specimen type:	X	Intact		Reconstituted
Moisture from:		Cuttings	X	Entire specimen
Saturation method:	X	Wet		Dry
Failure criterion:	X	$(\sigma'_1/\sigma'_3)_{max}$		$(\sigma'_1-\sigma'_3)_{max}$ ____ % strain
Membrane effect:	X	Corrected		Not Corrected

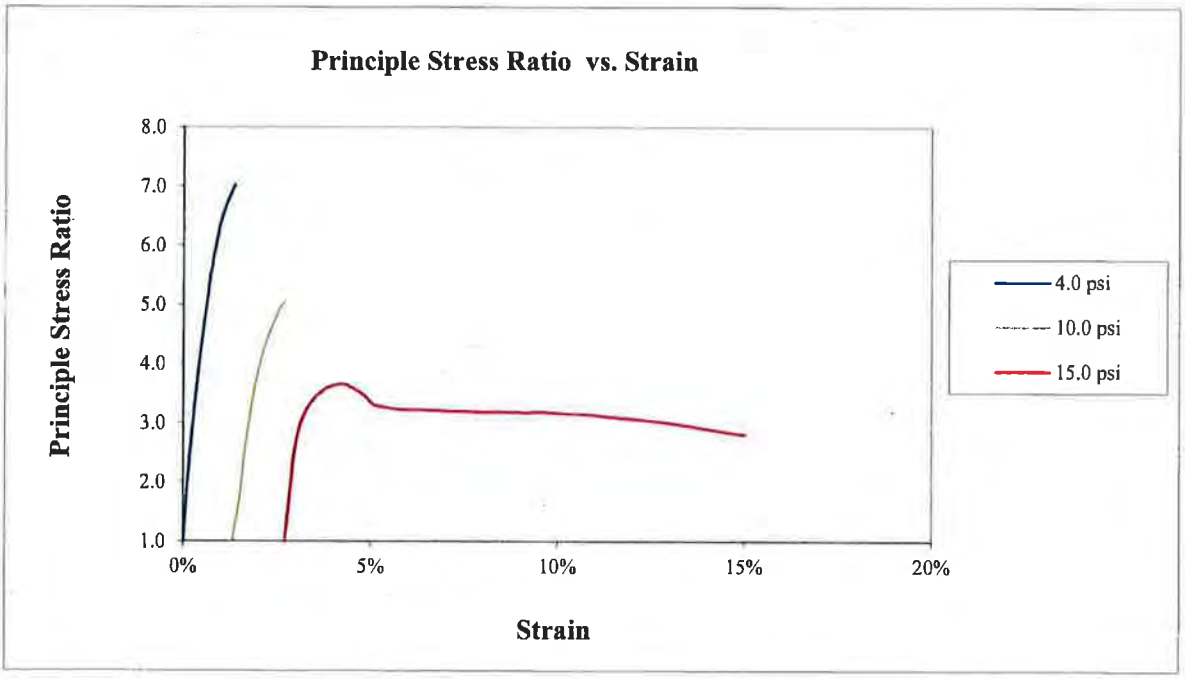
Golder Associates Inc. **Atlanta, Georgia**	**Title:** **MODIFIED (Multi-Stage) - ASTM D4767** **CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT** **SAMPLE AND TEST DATA**				
Job Short Title: **FTN/ENTERGY WHITE BLUFF/AR**					
Sample: **B-5 UD 3.0-5.0'**	**Technician:** **FT/PWM** **Checked:**	**Reviewed:** **Approved:**	**Start Date:** **7/10/2018**	**Job Number:** **18103173**	**Figure:** **1**





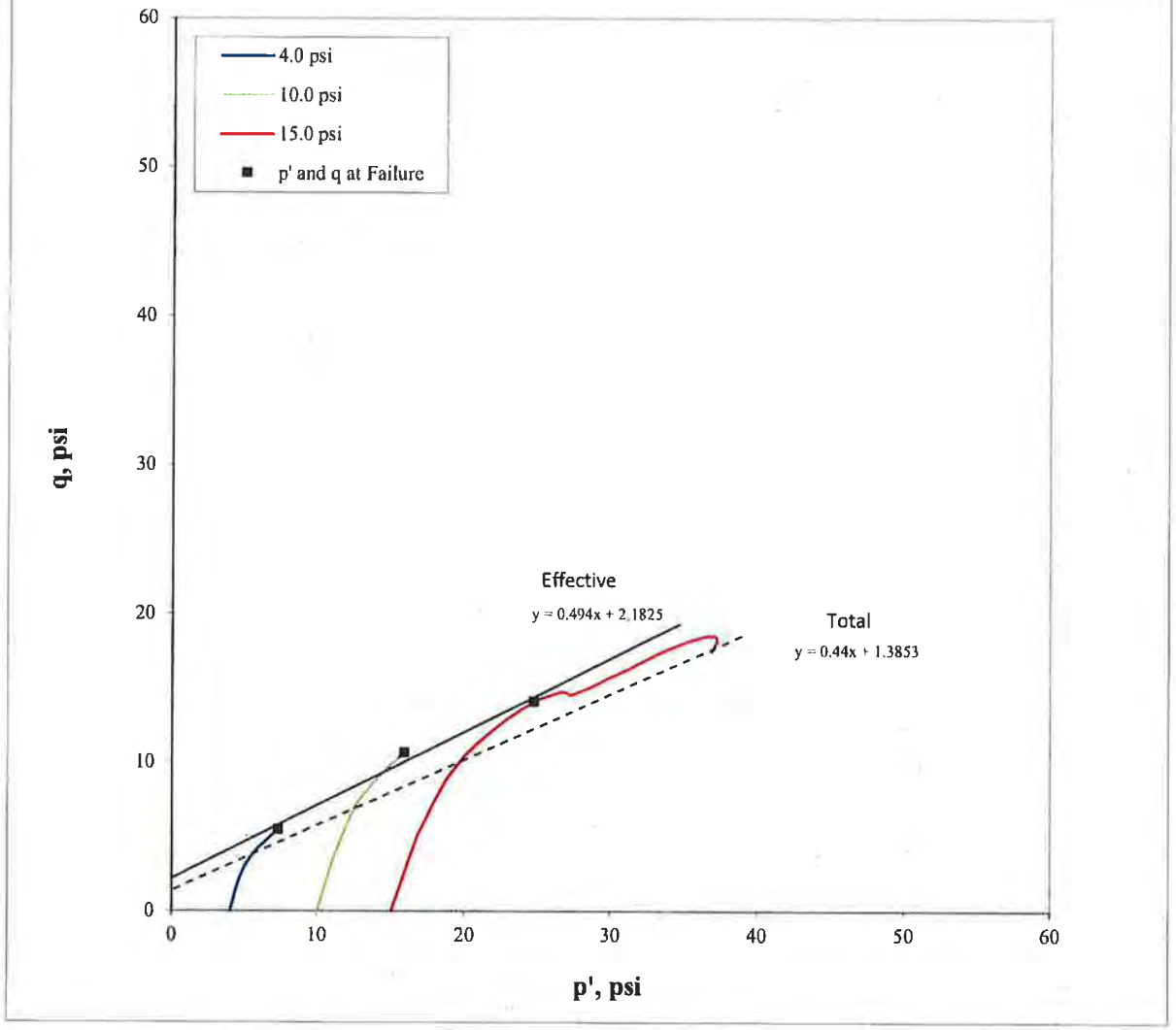
Golder Associates Inc. Atlanta, Georgia	Title: MODIFIED (Multi-Stage) - ASTM D4767 CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT q AND EXCESS PORE PRESSURE PLOTS				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: B-5 UD 3.0-5.0'	Technician: FT/PWM Check: TWM	Reviewed: SL Approved:	Start Date: 7/10/2018	Job Number: 18103173	Figure: 2





Golder Associates Inc. Atlanta, Georgia	Title: MODIFIED (Multi-Stage) - ASTM D4767 CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT q AND EXCESS PORE PRESSURE PLOTS				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: B-5 UD 3.0-5.0'	Technician: FT/PWM Check:	Reviewed: Approved:	Start Date: 7/10/2018	Job Number: 18103173	Figure: 3

Stress Path (p'-q) Plot



Confining Pressure (psi)	p at failure (psi)	p' at failure (psi)	q at failure (psi)
4.0	9.5	7.3	5.5
10.0	20.6	15.9	10.6
15.0	29.1	24.7	14.1

Effective

α ' =	26.3	degree
a' =	2.2	psi

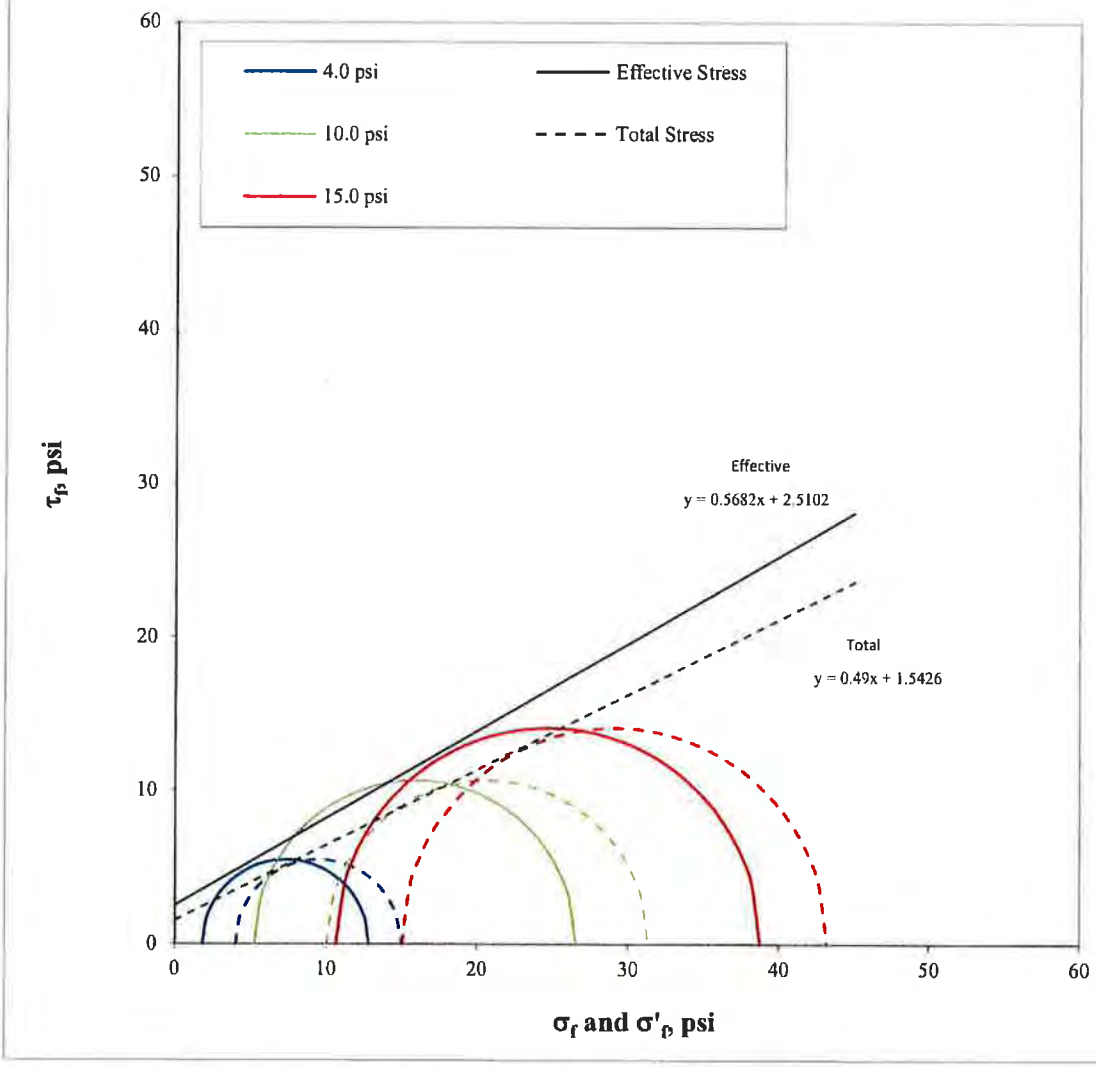
Total

α =	23.7	degree
a =	1.4	psi

Note: The laboratory testing relates only to the sample tested. GAI neither accepts responsibility for nor makes claims to the final use and purpose of the material.

Golder Associates Inc. Atlanta, Georgia	**Title:** MODIFIED (Multi-Stage) - ASTM D4767 CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT STRESS PATH PLOT				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: B-5 UD 3.0-5.0'	**Technician:** FT/PWM **Check:**	**Reviewed:** **Approved:**	**Start Date:** 7/10/2018	**Job Number:** 18103173	**Figure:** 4

Mohr's Circle Diagram



Confining Pressure (psi)	σ'_1 at failure (psi)	σ'_3 at failure (psi)	σ_1 at failure (psi)	σ_3 at failure (psi)
4.0	12.8	1.8	15.0	4.0
10.0	26.5	5.2	31.3	10.0
15.0	38.8	10.6	43.2	15.0

Effective

ϕ' = 29.6 degree

c' = 2.5 psi

Total

ϕ = 26.1 degree

c = 1.5 psi

Note: The laboratory testing relates only to the sample tested. GAI neither accepts responsibility for nor makes claims to the final use and purpose of the material.

Golder Associates Inc. Atlanta, Georgia	**Title:** MODIFIED (Multi-Stage) - ASTM D4767 CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT MOHR'S CIRCLE DIAGRAM				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: B-5 UD 3.0-5.0'	**Technician:** FT/PWM **Check:** TWM	**Reviewed:** **Approved:**	**Start Date:** 7/10/2018	**Job Number:** 18103173	**Figure:** 5

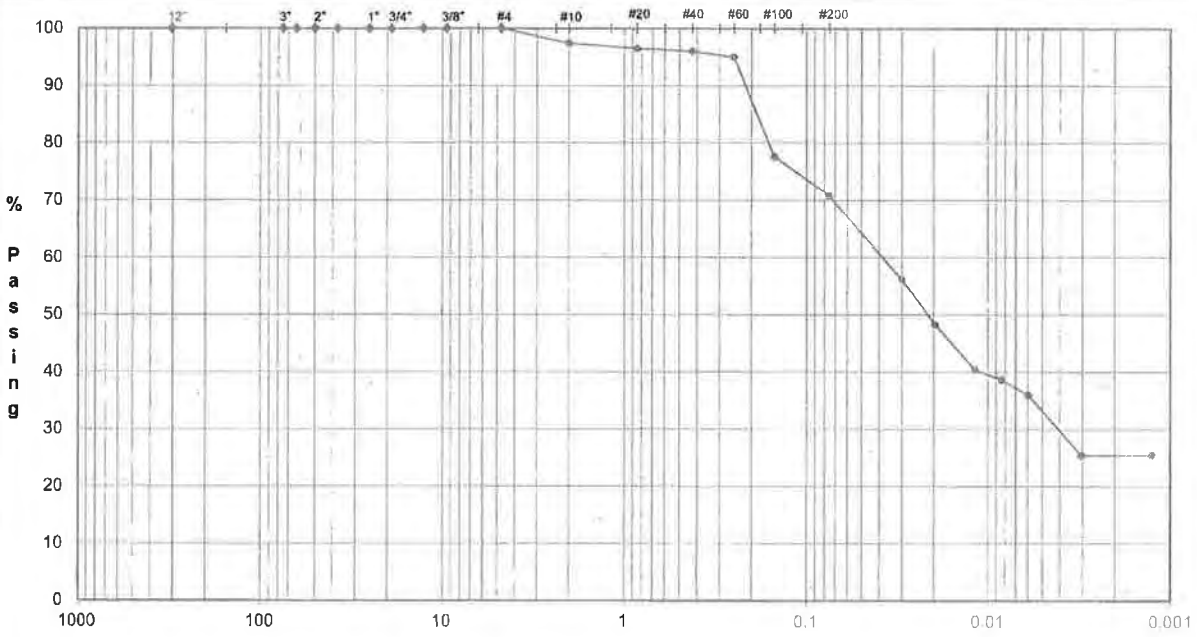
Golder Associates Inc. **Atlanta, Georgia**	**Title:** MODIFIED (Multi-Stage) - ASTM D4767 CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT SPECIMEN PHOTOGRAPH - Single Specimen				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: B-5 UD 3.0-5.0'	**Technician:** FT/PWM **Check:**	**Reviewed:** **Approved:**	**Start Date:** 7/10/2018	**Job Number:** 18103173	**Figure:** 6

AUGUST 2018 | 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **B-5** Depth: 4.0-6.0'
TYPE: **Bag**



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay

U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**97.4**	Coarse Sand	**2.6**
#20	0.85	**96.5**		
#40	0.43	**96.0**	Medium Sand	**1.4**
#60	0.25	**95.0**		
#100	0.15	**77.6**		
#200	0.075	**70.7**	Fine Sand	**25.3**

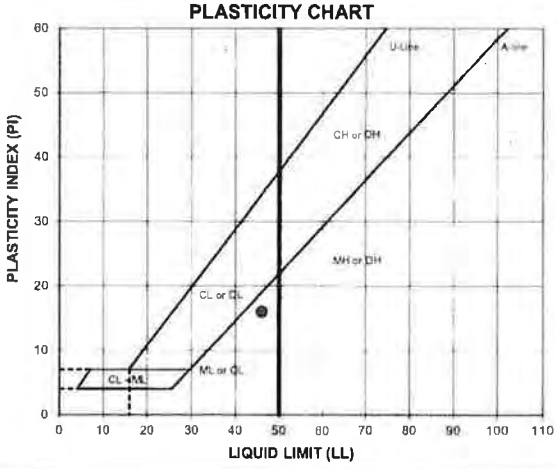
Hydrometer Analysis

(mm)	%Finer		
0.030	**56.1**		
0.020	**48.2**		
0.012	**40.3**	Fines	
0.0084	**38.6**	Silt or Clay	**70.7**
0.0060	**36.0**		
0.0030	**25.4**		
0.0013	**25.4**		

DESCRIPTION: sandy CLAYEY SILT, fine to coarse; yellowish brown.

USCS: ML

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
27.4	**46**	**30**	**16**	**-0.17**

LL (oven-dried) / 0.75 | ORGANIC (OL/OH)

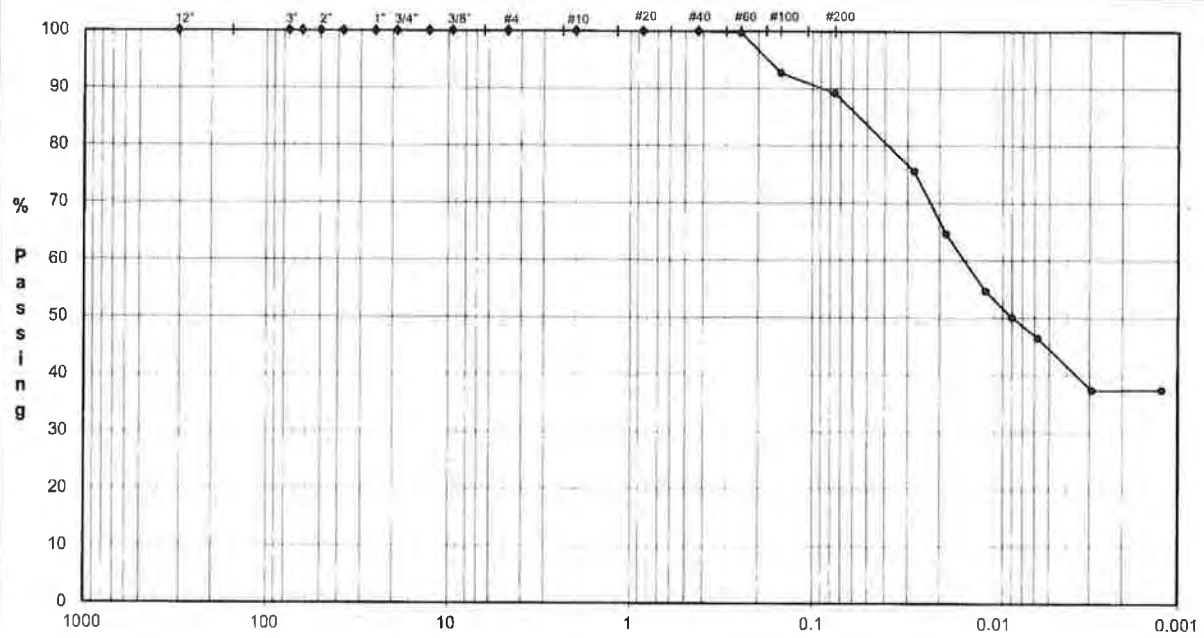
TECH	HH/BA/TJ
DATE	8/1/18
CHECK	
REVIEW	
APPROVE	

AUGUST 2018 | 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **B-5** Depth: **9.0-10.0'**
TYPE: **Bag**



COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

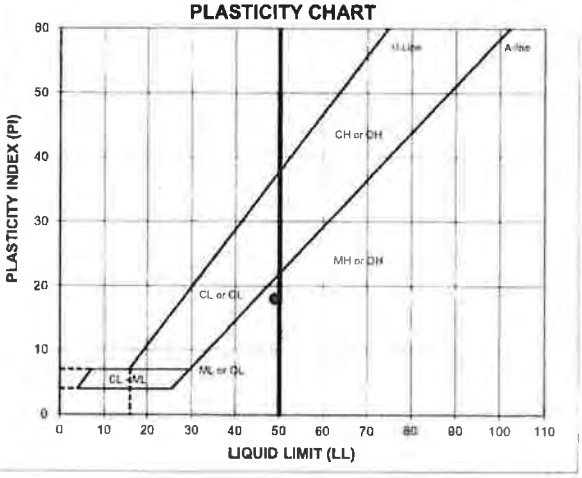
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	100.0		
3.0"	75.0	100.0	Cobbles	0.0
2.5"	63.5	100.0		
2.0"	50.0	100.0		
1.5"	37.5	100.0		
1.0"	25.0	100.0		
0.75"	19.0	100.0	Coarse Gravel	0.0
0.50"	12.7	100.0		
0.375"	9.5	100.0		
#4	4.8	100.0	Fine Gravel	0.0
#10	2.00	100.0	Coarse Sand	0.0
#20	0.85	100.0		
#40	0.43	100.0	Medium Sand	0.0
#60	0.25	99.7		
#100	0.15	92.7		
#200	0.075	89.1	Fine Sand	10.9

Hydrometer Analysis

(mm)	%Finer		
0.028	75.6		
0.018	64.6		
0.011	54.6	Fines	
0.0080	50.1	Silt or Clay	89.1
0.0058	46.4		
0.0029	37.3		
0.0012	37.3		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
26.3	49	31	18	-0.27

LL (oven-dried) / 0.75 ORG \NK (OL/OH)

DESCRIPTION: CLAYEY SILT, some fine sand; dark gray.

USCS: ML

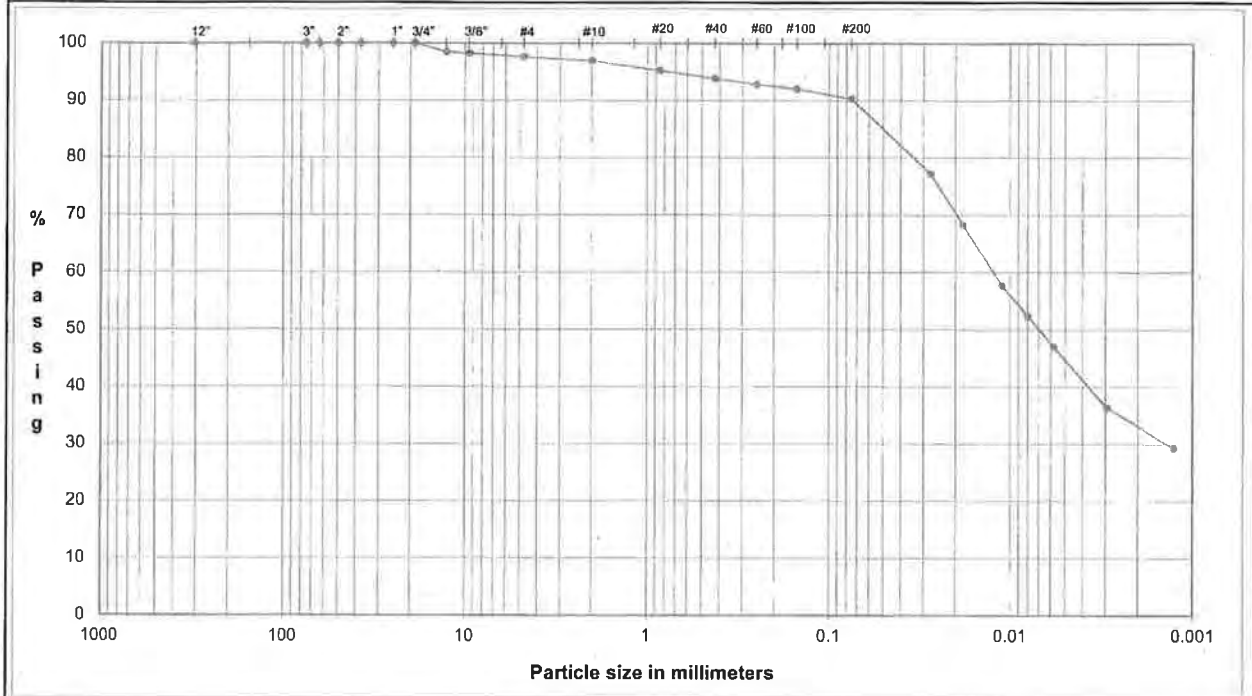
TECH	HH/BA/TJ
DATE	8/1/18
CHECK	
REVIEW	
APPROVE	

JUNE 2018 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **B-5** Depth: **10.0-12.0'**
TYPE: **UD**



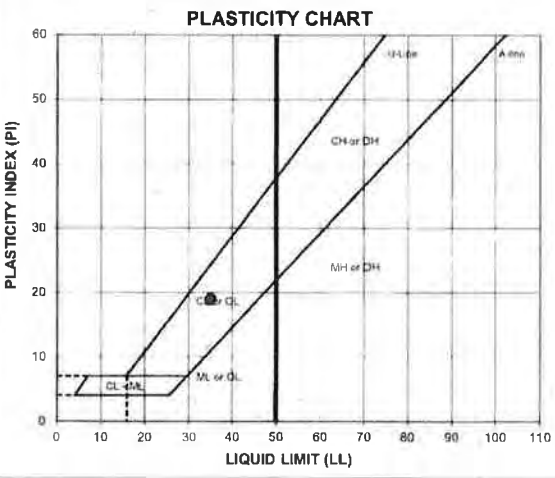
COBBLES	Coarse GRAVEL	Fine GRAVEL	Coarse SAND	Medium SAND	Fine SAND	Silt or Clay FINES

U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**98.4**		
0.375"	9.5	**98.2**		
#4	4.8	**97.6**	Fine Gravel	**2.4**
#10	2.00	**96.9**	Coarse Sand	**0.7**
#20	0.85	**95.2**		
#40	0.43	**93.8**	Medium Sand	**3.1**
#60	0.25	**92.8**		
#100	0.15	**92.0**		
#200	0.075	**90.3**	Fine Sand	**3.5**

Hydrometer Analysis

(mm)	%Finer		
0.027	**77.2**		
0.018	**68.3**		
0.011	**57.7**	Fines	
0.0080	**52.3**	Silt or Clay	**90.3**
0.0058	**47.0**		
0.0030	**36.4**		
0.0013	**29.3**		



ATTERBERG LIMITS
Method -B (Dry preparation)

M_c	LL	PL	PI	LI
17.1	**35**	**16**	**19**	**0.07**

LL (oven-dried) / 0.75 ORGANIC (OL/OH)

DESCRIPTION: SILTY CLAY, some fine to coarse sand, trace fine gravel; light brown.

USCS: CL

TECH	HH/TB
DATE	6/20/18
CHECK	
REVIEW	
APPROVE	

Golder Associates Inc.

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

PROJECT TITLE	FTN/ENTERGY WHITE BLUFF/AR		Board #	8	COMMENTS
PROJECT NUMBER	18103173		Flow Pump	2	
SAMPLE ID	B-5	10.0-12.0'	Flow Pump Speed	11	
SAMPLE TYPE	UD		Technician	FT	

Sample Data, Initial				Sample Data, Final	
Height, inches	3.000	B-Value, f	1.00	Height, inches	3.004
Diameter, inches	2.836	Cell Pres.	88.0	Diameter, inches	2.898
Area, cm²	40.75	Bot. Pres.	80.0	Area, cm²	42.56
Volume, cm³	310.55	Top Pres.	80.0	Volume, cm³	324.70
Mass, g	663.16	Tot. B.P.	80.0	Mass, g	674.45
Moisture Content, %	17.07	Head, max.	135.05	Moisture Content, %	19.06
Dry Density, pcf	113.82	Head, min.	135.05	Dry Density, pcf	108.86
Spec. Gravity (assumed)	2.700	Max. Grad.	17.70	Volume Solids, cm³	209.80
Volume Solids, cm³	209.80	Min. Grad.	17.70	Volume Voids, cm³	114.90
Volume Voids, cm³	100.75			Void Ratio	0.55
Void Ratio	0.48			Saturation, %	94.0%
Saturation, %	96.0%				

WATER CONTENTS		Sample Initial	Sample Final
Wt Soil & Tare, i	g	663.16	756.65
Wt Soil & Tare, f	g	566.46	648.69
Wt Tare	g	0.00	82.40
Wt Moisture Lost	g	96.70	107.96
Wt Dry Soil	g	566.46	566.29
Water Content	%	17.07%	19.06%

Flow Pump Rate: 1.18E-05 cm³/sec

USCS: CL

DESCRIPTION: SILTY CLAY, some fine to coarse sand, trace fine gravel; light brown.

TIME FUNCTIONS, SECONDS								dP				
DATE	DAY	HOUR	MIN	TEMP (°C)	dt (min)	dt,acc (min)	dt (sec)	dt,acc (sec)	Reading (psi)	Head (cm)	Gradient	Permeability (cm/sec)
06/25/18	43276	12	0	21.7	0	0	0	0	1.92	135.05	17.70	1.5E-08
06/25/18	43276	12	5	21.7	5	5	300	300	1.92	135.05	17.70	1.5E-08
06/25/18	43276	12	10	21.7	5	10	300	600	1.92	135.05	17.70	1.5E-08
06/25/18	43276	12	15	21.7	5	15	300	900	1.92	135.05	17.70	1.5E-08 *
06/25/18	43276	12	20	21.7	5	20	300	1200	1.92	135.05	17.70	1.5E-08 *
06/25/18	43276	12	25	21.7	5	25	300	1500	1.92	135.05	17.70	1.5E-08 *
06/25/18	43276	12	30	21.7	5	30	300	1800	1.92	135.05	17.70	1.5E-08 *

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.5E-08 cm/sec **

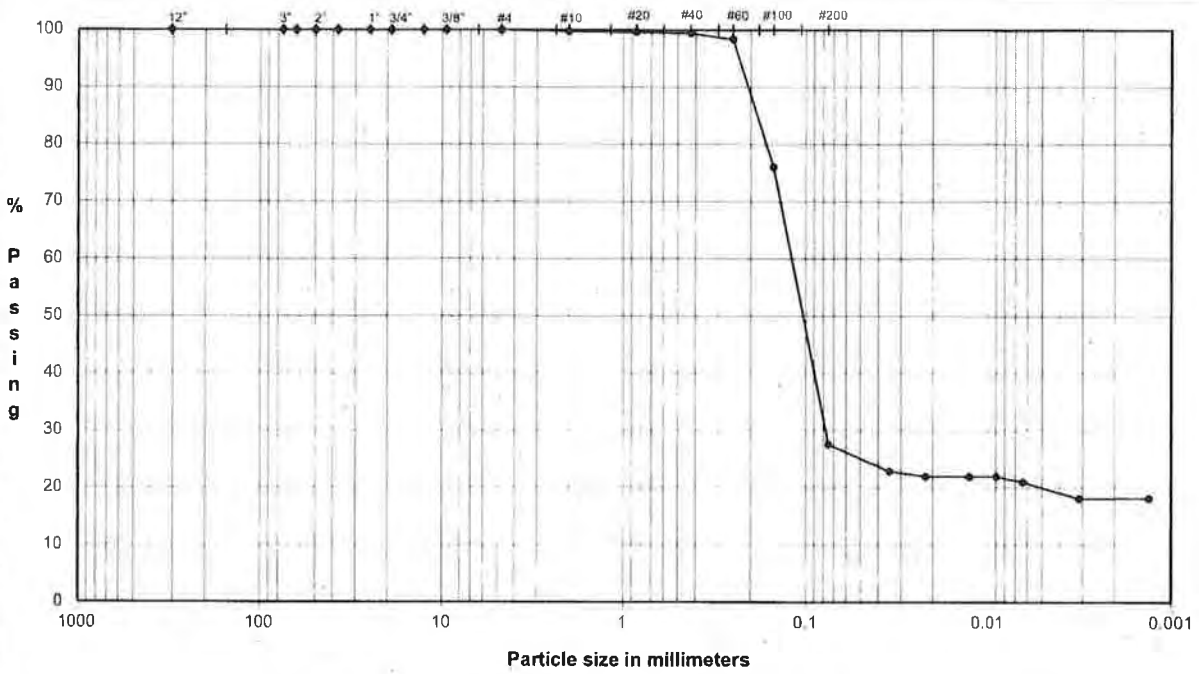
DATE	6/25/18
CHECK	
REVIEW	
APPROVE	

AUGUST 2018 | 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **B-6** Depth: **11.0-12.0'**
TYPE: **Bag**



COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

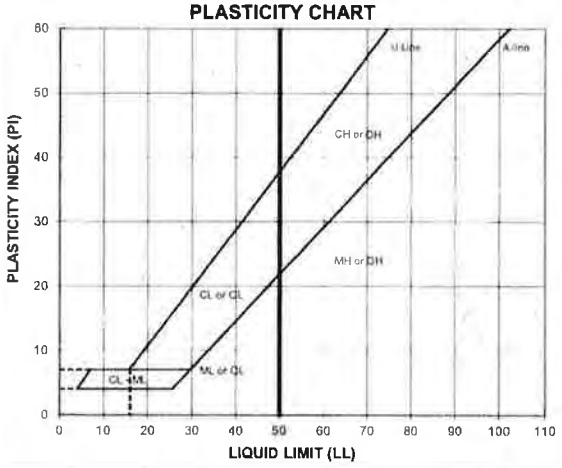
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**99.8**	Coarse Sand	**0.2**
#20	0.85	**99.6**		
#40	0.43	**99.4**	Medium Sand	**0.4**
#60	0.25	**98.3**		
#100	0.15	**76.0**		
#200	0.075	**27.6**	Fine Sand	**71.8**

Hydrometer Analysis

(mm)	%Finer		
0.035	**22.9**		
0.022	**21.9**		
0.013	**21.9**	Fines	
0.0089	**21.9**	Silt or Clay	**27.6**
0.0064	**21.0**		
0.0031	**18.1**		
0.0013	**18.1**		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
12.4	**NP**	**NP**	**NP**	**NP**

LL (oven-dried) / 0.75 ORGANIC (OL OH)

DESCRIPTION: SILTY SAND, fine to coarse; yellowish brown.

USCS: SM

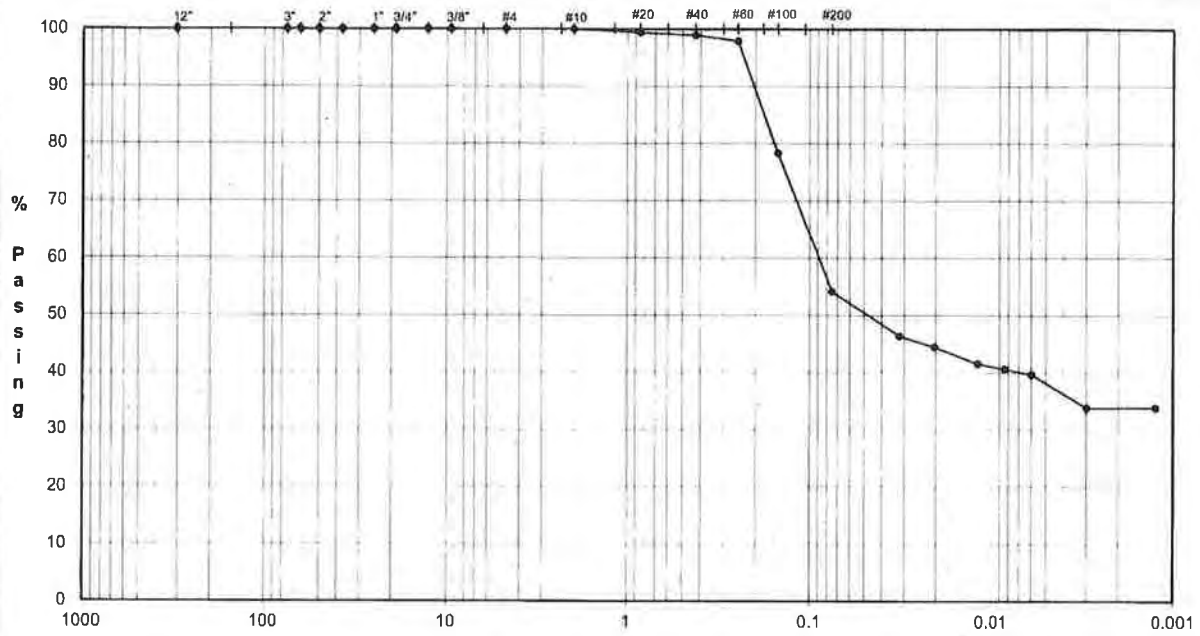
TECH	TJ/BA/HH
DATE	8/2/18
CHECK	
REVIEW	
APPROVE	

AUGUST 2018 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **B-6** Depth: **16.0-17.0'**
TYPE: **Bag**



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay

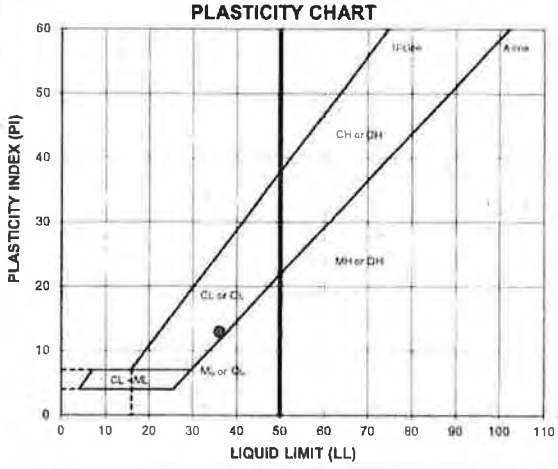
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**99.9**	Coarse Sand	**0.1**
#20	0.85	**99.4**		
#40	0.43	**98.9**	Medium Sand	**1.0**
#60	0.25	**97.9**		
#100	0.15	**78.3**		
#200	0.075	**54.2**	Fine Sand	**44.8**

Hydrometer Analysis

(mm)	%Finer		
0.032	**46.4**		
0.020	**44.5**		
0.012	**41.6**	Fines	
0.0084	**40.6**	Silt or Clay	**54.2**
0.0060	**39.6**		
0.0030	**33.8**		
0.0012	**33.8**		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
21.3	**36**	**23**	**13**	**-0.11**

LL (oven-dried) / 0.75 ORGANIC (OL/OH)

DESCRIPTION: SILTY CLAY and SAND, fine to coarse; dark yellowish brown

USCS: CL

TECH	TJ/BA/HH
DATE	8/2/18
CHECK	
REVIEW	
APPROVE	

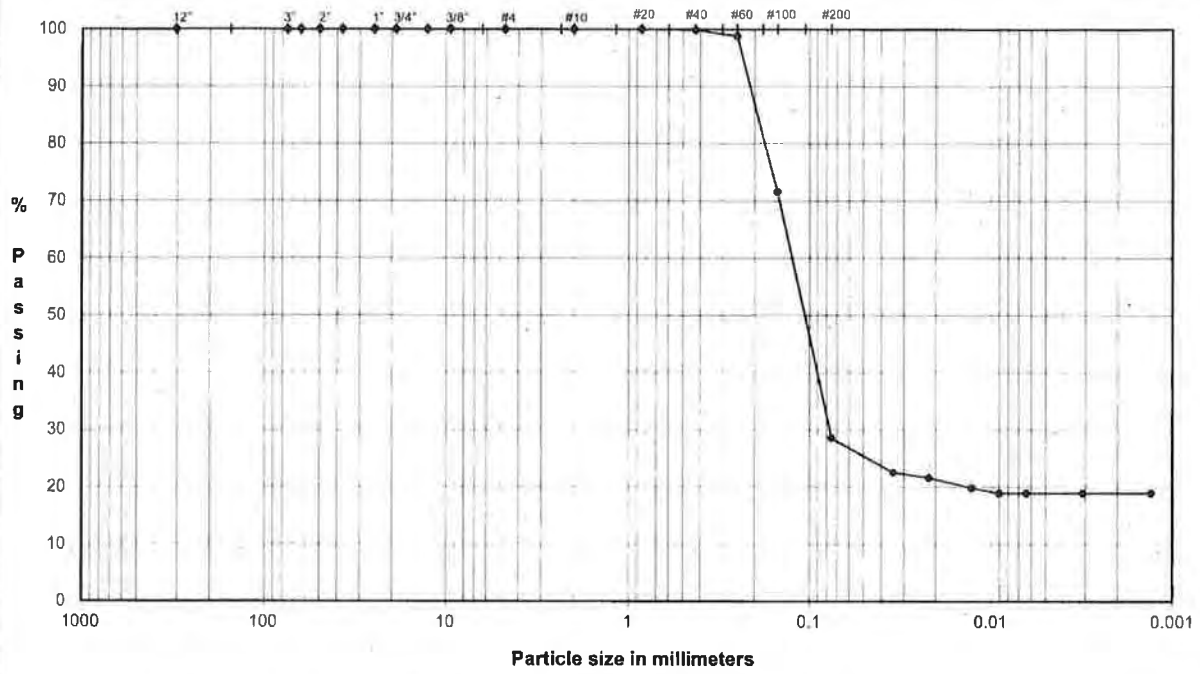
Golder Associates Inc.

AUGUST 2018 | 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **B-6** Depth: **22.0-24.0'**
TYPE: **Bag**



COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

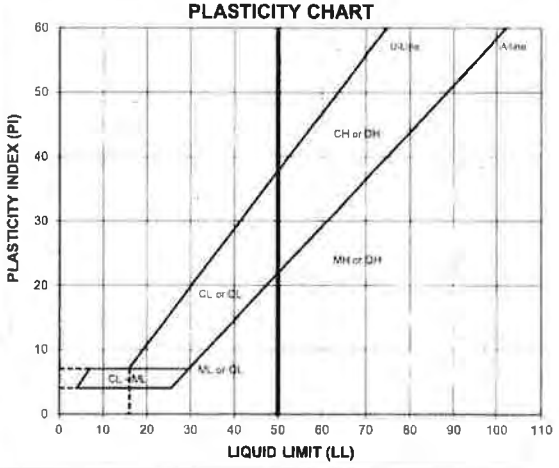
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**100.0**	Coarse Sand	**0.0**
#20	0.85	**100.0**		
#40	0.43	**99.9**	Medium Sand	**0.1**
#60	0.25	**98.8**		
#100	0.15	**71.5**		
#200	0.075	**28.6**	Fine Sand	**71.3**

Hydrometer Analysis

(mm)	%Finer		
0.034	**22.5**		
0.022	**21.6**		
0.013	**19.8**	Fines	
0.0090	**18.9**	Silt or Clay	**28.6**
0.0064	**18.9**		
0.0031	**18.9**		
0.0013	**18.9**		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
10.9	**NP**	**NP**	**NP**	**NP**

LL (oven-dried) / 0.75 ORGANIC (OL/OH)

DESCRIPTION: SILTY SAND, fine to medium; dark gray.

USCS: SM

TECH	TJ/BA/HH
DATE	8/2/18
CHECK	
REVIEW	
APPROVE	

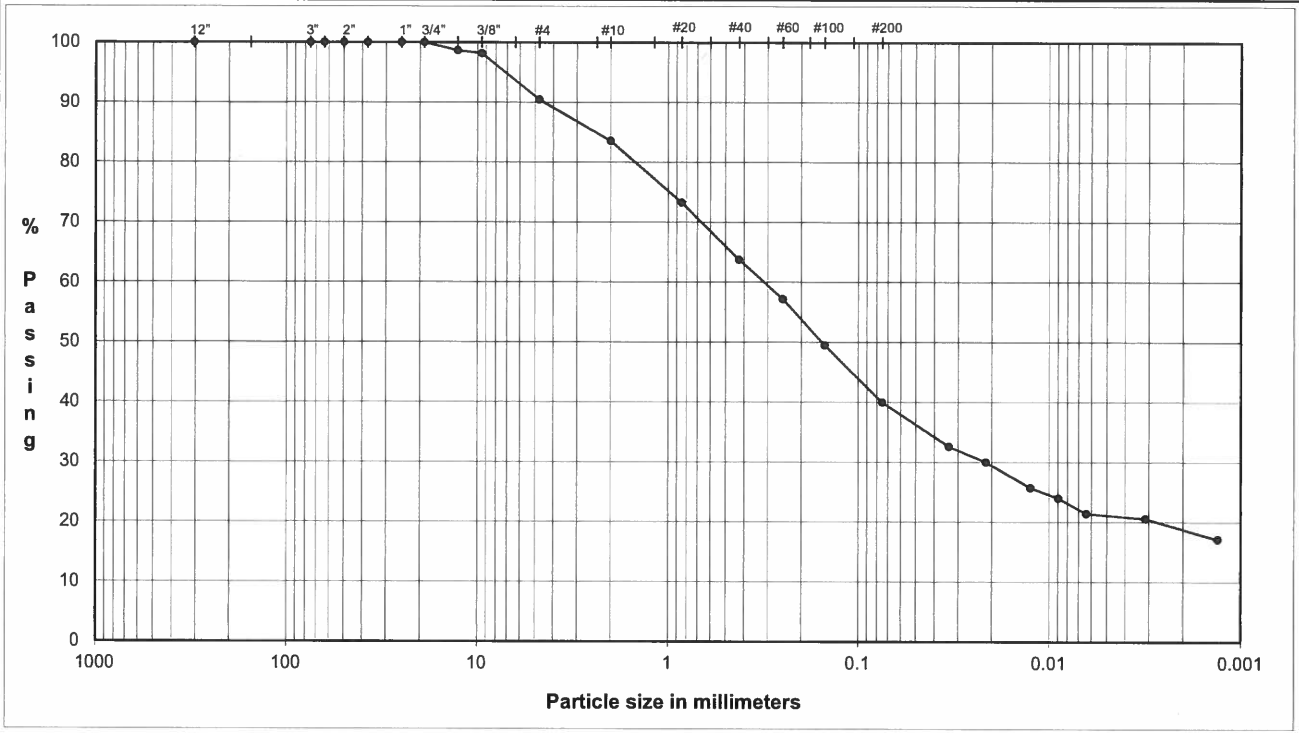
Golder Associates Inc.

AUGUST 2018 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **B-7** Depth: **5.0-7.0'**
TYPE: **UD**



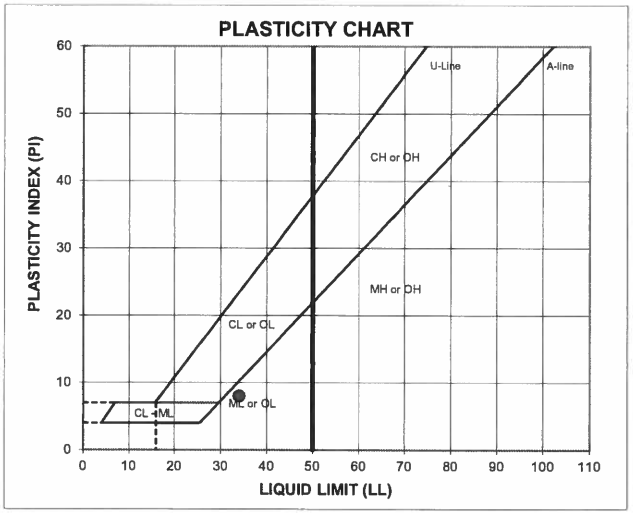
COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**98.6**		
0.375"	9.5	**98.1**		
#4	4.8	**90.4**	Fine Gravel	**9.6**
#10	2.00	**83.6**	Coarse Sand	**6.9**
#20	0.85	**73.2**		
#40	0.43	**63.8**	Medium Sand	**19.8**
#60	0.25	**57.2**		
#100	0.15	**49.5**		
#200	0.075	**40.0**	Fine Sand	**23.8**

Hydrometer Analysis

(mm)	%Finer		
0.034	**32.6**		
0.021	**30.0**		
0.013	**25.7**	Fines	
0.0089	**24.0**	Silt or Clay	**40.0**
0.0064	**21.4**		
0.0031	**20.6**		
0.0013	**17.1**		



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
20.5	**34**	**26**	**8**	**-0.73**

LL (oven-dried) / 0.75 = ORGANIC (OL/OH)

DESCRIPTION: SILTY SAND, fine to coarse, some fine gravel; gray.

USCS: SM

TECH	TJ/HH/BA
DATE	8/14/18
CHECK	
REVIEW	
APPROVE	

Boring or Test Pit:	B-7		Boring or Test Pit:			Boring or Test Pit:		
Sample:	1		Sample:			Sample:		
Depth:	5.0-7.0	ft	Depth:			Depth:		
Point No.:	1		Point No.:			Point No.:		
	Initial							
Length =	6.041	in	Length =	6.023		Length =	5.966	
Diameter =	2.848	in	Diameter =	2.883		Diameter =	2.897	
Wet Mass =	2.811	lb	Wet Mass =			Wet Mass =		
Area =	6.370	in^2	Area =			Area =		
Volume =	38.484	in^3	Volume =			Volume =		
Specific Gravity =	2.66	(ASTM D854)	Specific Gravity =			Specific Gravity =		
Dry Mass of Solids =	2.332	lb	Dry Mass of Solids =			Dry Mass of Solids =		
Moisture Content =	20.5%		Moisture Content =			Moisture Content =		
Wet Unit Weight =	126.2	pcf	Wet Unit Weight =			Wet Unit Weight =		
Dry Unit Weight =	104.7	pcf	Dry Unit Weight =			Dry Unit Weight =		
Void Ratio =	0.58		Void Ratio =			Void Ratio =		
Percent Saturation =	94%		Percent Saturation =			Percent Saturation =		
	After Consolidation			**After Consolidation**			**After Consolidation**	
Length =	6.023	in	Length =	5.966	in	Length =	5.920	in
Diameter =	2.883	in	Diameter =	2.897	in	Diameter =	2.908	in
Area =	6.529		Area =	6.592		Area =	6.643	in^2 (Method B)
Volume =	39.326		Volume =	39.326		Volume =	39.326	in^3
Moisture Content =			Moisture Content =			Moisture Content =	23.2%	
Wet Unit Weight =			Wet Unit Weight =			Wet Unit Weight =	126.3	pcf
Dry Unit Weight =			Dry Unit Weight =			Dry Unit Weight =	102.5	pcf
Void Ratio =			Void Ratio =			Void Ratio =	0.62	
Percent Saturation =			Percent Saturation =			Percent Saturation =	100%	
B Parameter =	0.96		B Parameter =	--		B Parameter =	--	
Shear Rate =	0.088%	/min.	Shear Rate =	0.087%	/min.	Shear Rate =	0.090%	/min.
t_{50} =	1.2	min.	t_{50} =	0.9	min.	t_{50} =	0.8	min.
Strain at Failure =	0.5%		Strain at Failure =	1.9%		Strain at Failure =	2.8%	
Cell Pressure =	66.0	psi	Cell Pressure =	72.0	psi	Cell Pressure =	78.0	psi
Back Pressure =	60.0	psi	Back Pressure =	60.0	psi	Back Pressure =	60.0	psi
Confining Pressure =	6.0	psi	Confining Pressure =	12.0	psi	Confining Pressure =	18.0	psi

Notes: Sample description: (SM) SILTY SAND, fine to coarse, some fine gravel; gray.

Atterberg limits: LL = 34 PL = 26 PI = 8 (ASTM D4318)

Percent finer: 3/4 in. = 100.0% No. 4 = 90.4% No. 200 = 40.0% (ASTM D422, refer to separate report for gradation curve)

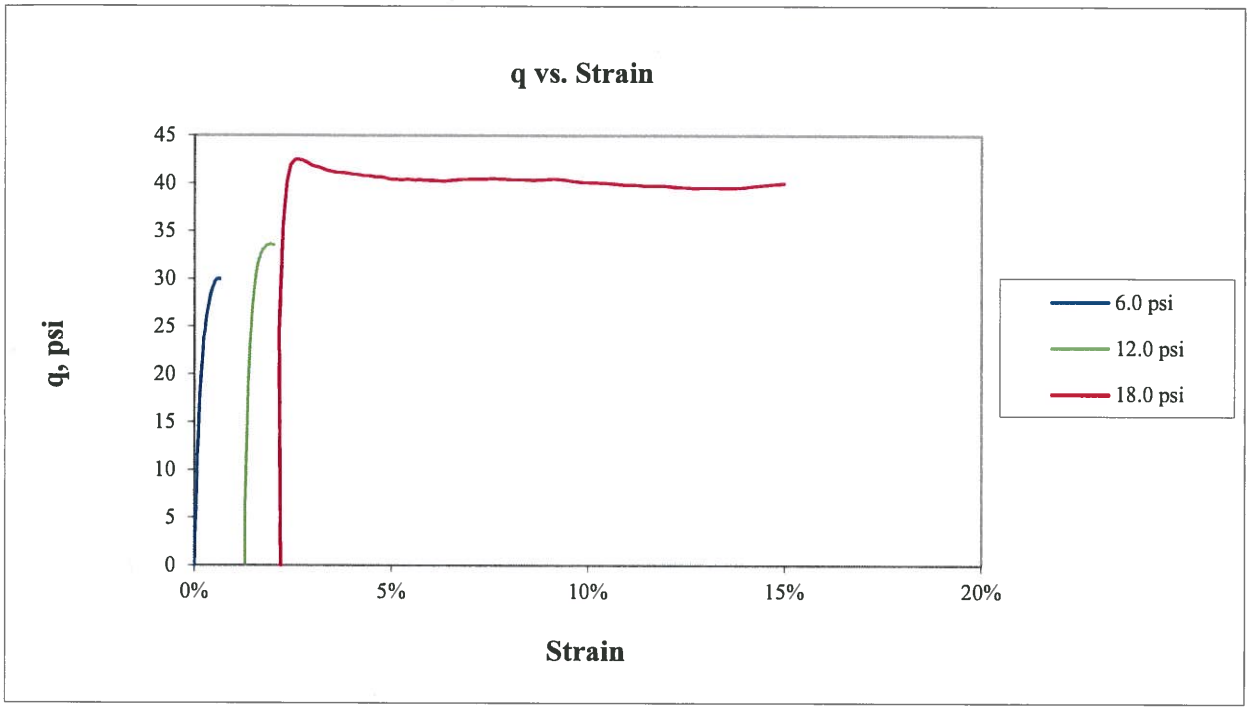
Specimen type:	X	Intact		Reconstituted
Moisture from:		Cuttings	X	Entire specimen
Saturation method:	X	Wet		Dry
Failure criterion:	X	$(\sigma'_1/\sigma'_3)_{max}$		$(\sigma'_1-\sigma'_3)_{max}$ % strain
Membrane effect:	X	Corrected		Not Corrected

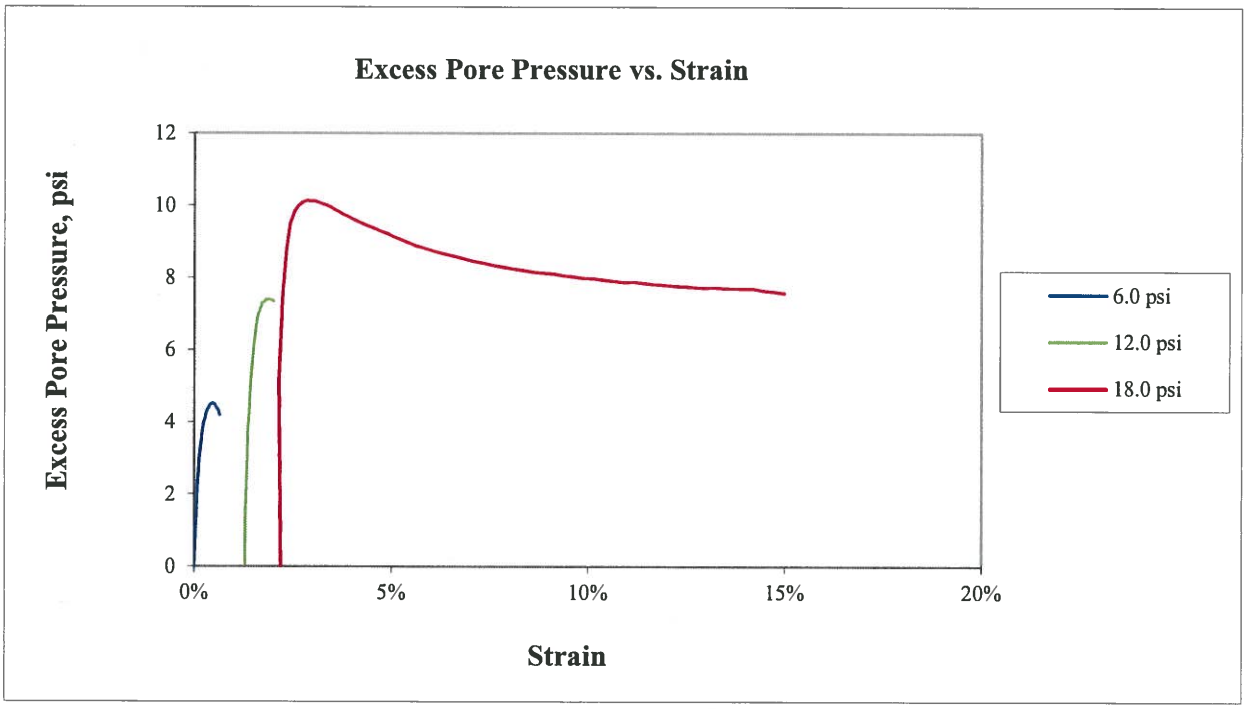
Golder Associates Inc.
Atlanta, Georgia

Title:
MODIFIED (Multi-Stage) - ASTM D4767
CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT
SAMPLE AND TEST DATA

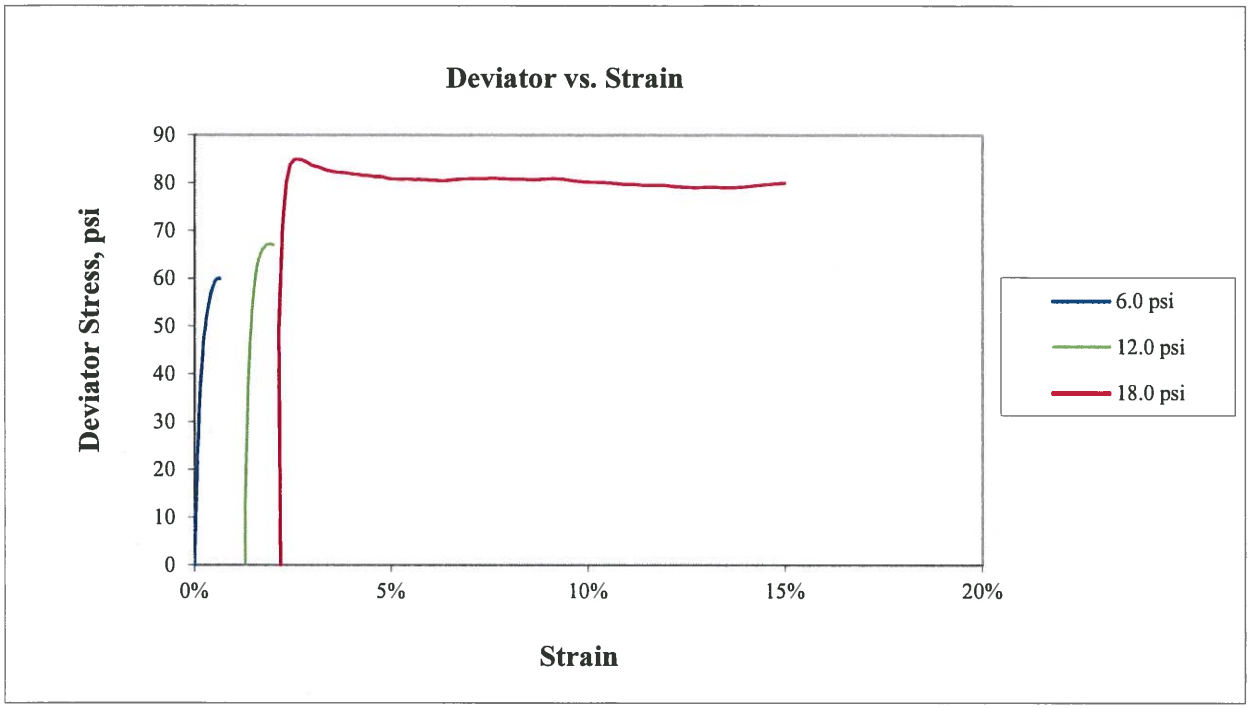
Job Short Title:
FTN/ENTERGY WHITE BLUFF/AR

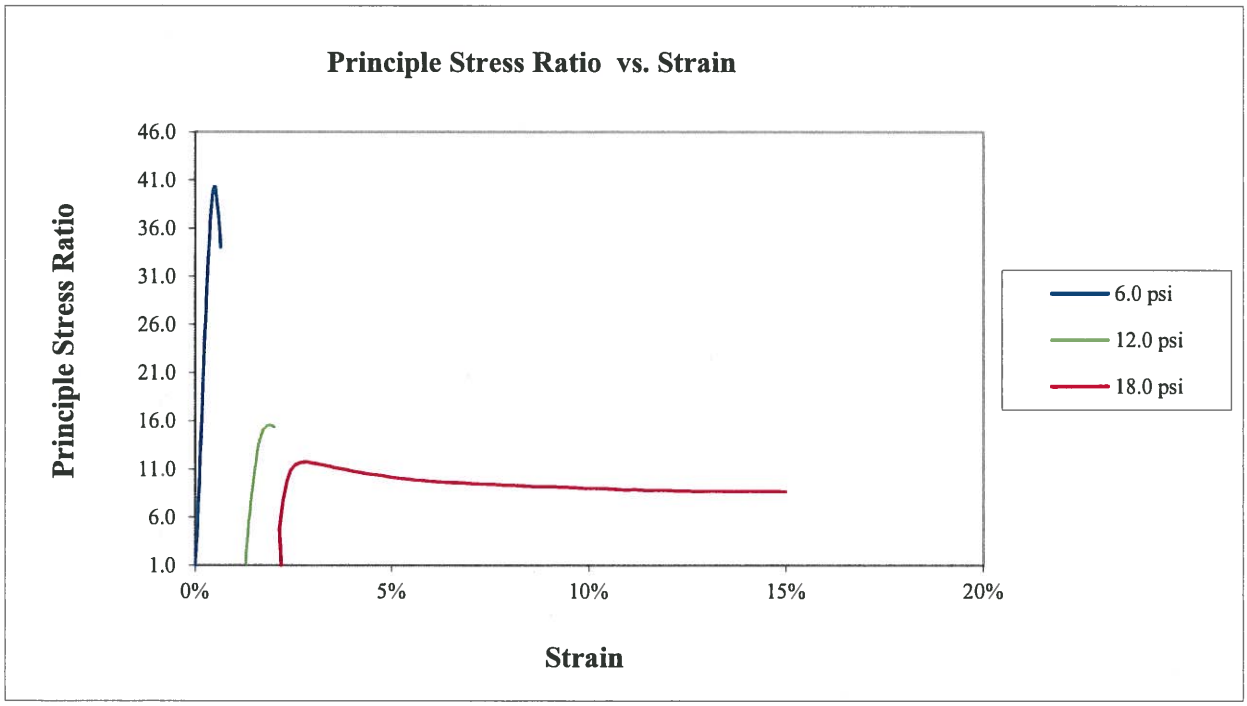
Sample:	Technician:	Reviewed:	Start Date:	Job Number:	Figure:
B-7 UD 5.0-7.0'	FT/PWM		8/29/2018	18103173	1
	Check: PWM	Approved:			





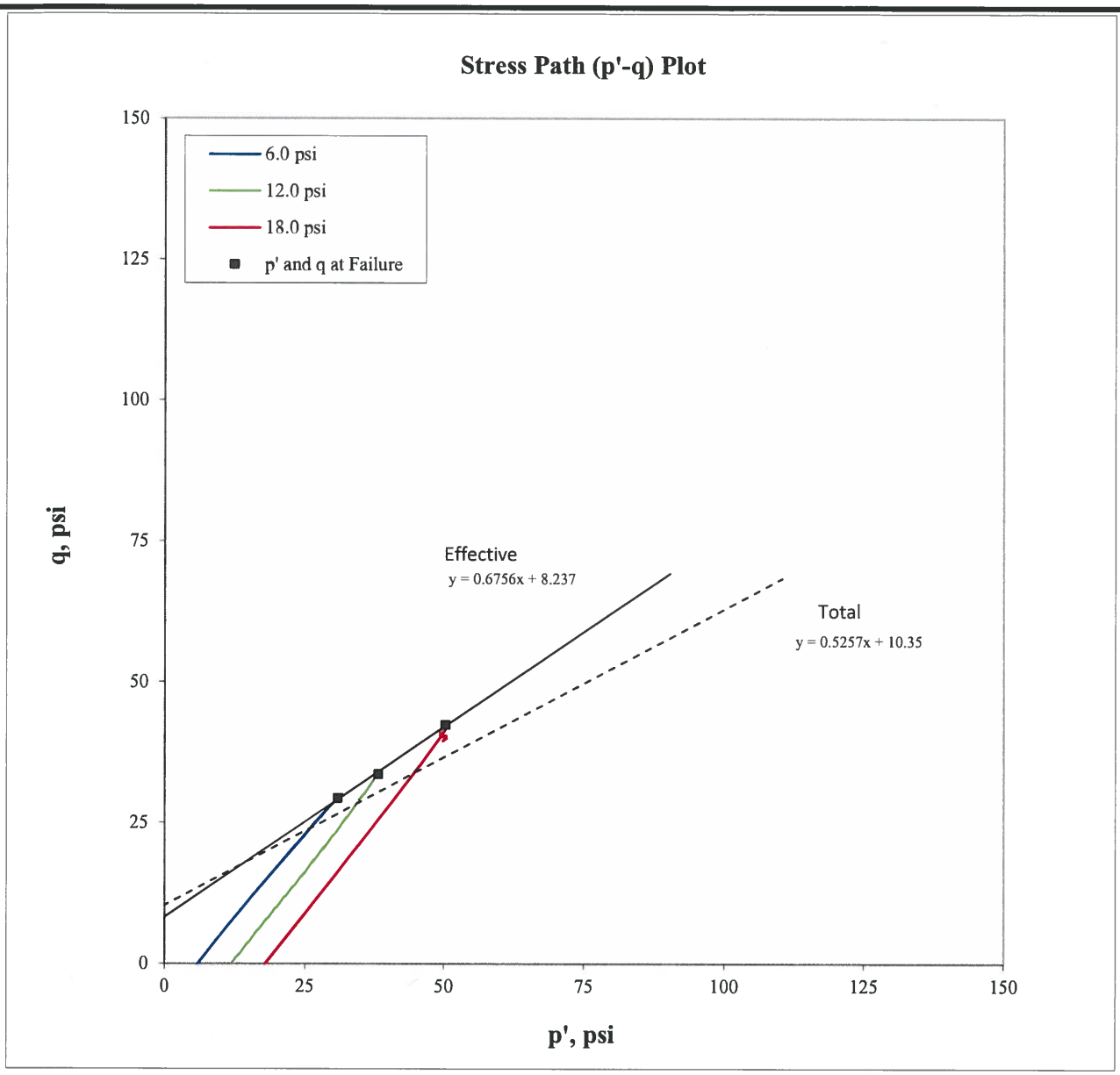
Golder Associates Inc. Atlanta, Georgia	Title: MODIFIED (Multi-Stage) - ASTM D4767 CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT q AND EXCESS PORE PRESSURE PLOTS				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: B-7 UD 5.0-7.0'	Technician: FT/PWM Check:	Reviewed: Approved:	Start Date: 8/29/2018	Job Number: 18103173	Figure: 2





Golder Associates Inc. **Atlanta, Georgia**	**Title:** **MODIFIED (Multi-Stage) - ASTM D4767** **CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT** **q AND EXCESS PORE PRESSURE PLOTS**				
Job Short Title: **FTN/ENTERGY WHITE BLUFF/AR**					
Sample: **B-7 UD 5.0-7.0'**	**Technician:** **FT/PWM** **Check:**	**Reviewed:** **Approved:**	**Start Date:** **8/29/2018**	**Job Number:** **18103173**	**Figure:** **3**

Stress Path (p'-q) Plot



Confining Pressure (psi)	p at failure (psi)	p' at failure (psi)	q at failure (psi)
6.0	35.4	30.9	29.4
12.0	45.6	38.2	33.6
18.0	60.4	50.3	42.4

Effective

α ' =	34.0	degree
a' =	8.2	psi

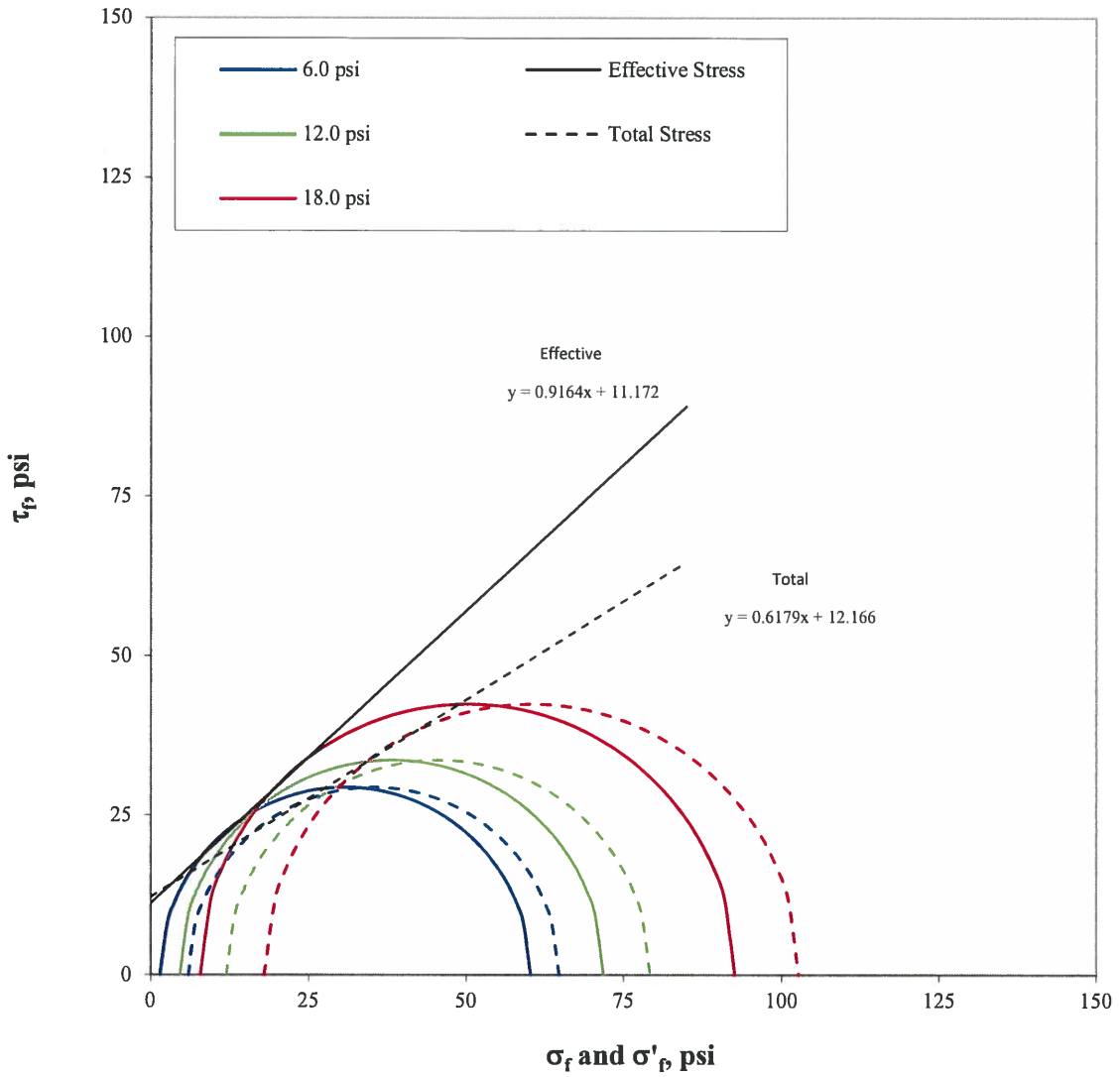
Total

α =	27.7	degree
a =	10.3	psi

Note: The laboratory testing relates only to the sample tested. GAI neither accepts responsibility for nor makes claims to the final use and purpose of the material.

Golder Associates Inc. Atlanta, Georgia	**Title:** MODIFIED (Multi-Stage) - ASTM D4767 CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT STRESS PATH PLOT				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: B-7 UD 5.0-7.0'	**Technician:** FT/PWM **Check:**	**Reviewed:** **Approved:**	**Start Date:** 8/29/2018	**Job Number:** 18103173	**Figure:** 4

Mohr's Circle Diagram



Confining Pressure (psi)	σ'_1 at failure (psi)	σ'_3 at failure (psi)	σ_1 at failure (psi)	σ_3 at failure (psi)
6.0	60.2	1.5	64.7	6.0
12.0	71.8	4.6	79.2	12.0
18.0	92.7	7.9	102.8	18.0

Effective

ϕ' =	42.5	degree
c' =	11.2	psi

Total

ϕ =	31.7	degree
c =	12.2	psi

Note: The laboratory testing relates only to the sample tested. GAI neither accepts responsibility for nor makes claims to the final use and purpose of the material.

Golder Associates Inc. Atlanta, Georgia	**Title:** MODIFIED (Multi-Stage) - ASTM D4767 CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT MOHR'S CIRCLE DIAGRAM				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: B-7 UD 5.0-7.0'	**Technician:** FT/PWM **Check:** MWH	**Reviewed:** **Approved:**	**Start Date:** 8/29/2018	**Job Number:** 18103173	**Figure:** 5

Golder Associates Inc. **Atlanta, Georgia**	**Title:** MODIFIED (Multi-Stage) - ASTM D4767 CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT SPECIMEN PHOTOGRAPH - Single Specimen				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample:	**Technician:** FT/PWM	**Reviewed:**	**Start Date:**	**Job Number:**	**Figure:**
B-7 UD 5.0-7.0'	**Check:**	**Approved:**	8/29/2018	18103173	6

JUNE 2018

18103173

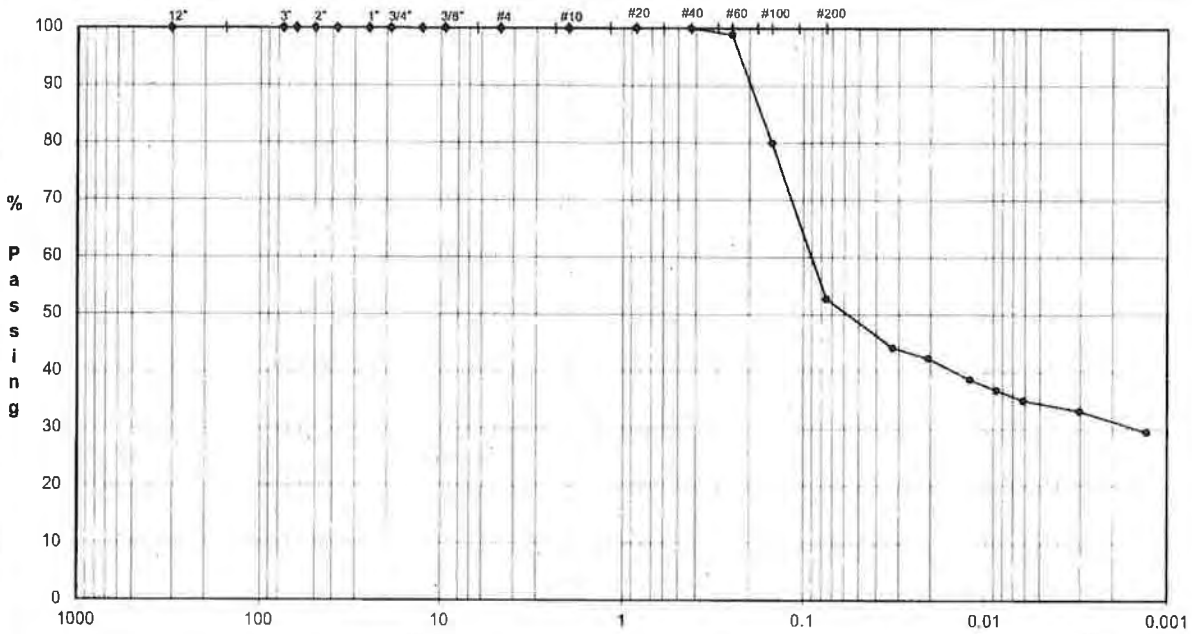
PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**

SAMPLE ID: **B-7** Depth: **7.0-9.0'**

TYPE: **UD**



COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

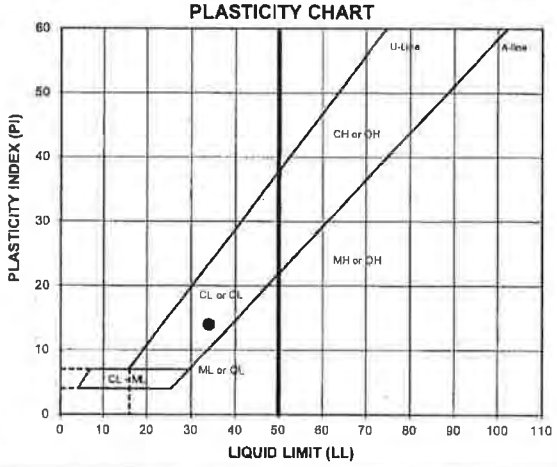
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**100.0**	Coarse Sand	**0.0**
#20	0.85	**100.0**		
#40	0.43	**100.0**	Medium Sand	**0.0**
#60	0.25	**98.9**		
#100	0.15	**79.9**		
#200	0.075	**52.7**	Fine Sand	**47.3**

Hydrometer Analysis

(mm)	%Finer		
0.033	**44.2**		
0.021	**42.4**		
0.012	**38.7**	Fines	
0.0086	**36.8**	Silt or Clay	**52.7**
0.0062	**35.0**		
0.0030	**33.2**		
0.0013	**29.5**		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
21.8	**34**	**20**	**14**	**0.13**

LL (oven-dried) / 0.75 ORGANIC (OLOII)

DESCRIPTION: SILTY CLAY and SAND, fine to medium; yellowish brown.

USCS: CL

TECH	TJ
DATE	6/7/18
CHECK	
REVIEW	
APPROVE	

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

PROJECT TITLE	FTN/ENTERGY WHITE BLUFF/AR		Board #	15	COMMENTS
PROJECT NUMBER	18103173		Flow Pump	2	
SAMPLE ID	B-7	7.0-9.0'	Flow Pump Speed	7	
SAMPLE TYPE	UD		Technician	FT	

Sample Data, Initial				Sample Data, Final	
Height, inches	3.000	B-Value, f	0.98	Height, inches	3.001
Diameter, inches	2.883	Cell Pres.	88.0	Diameter, inches	2.874
Area, cm²	42.12	Bot. Pres.	80.0	Area, cm²	41.85
Volume, cm³	320.92	Top Pres.	80.0	Volume, cm³	319.03
Mass, g	614.74	Tot. B.P.	80.0	Mass, g	632.69
Moisture Content, %	21.80	Head, max.	61.90	Moisture Content, %	25.36
Dry Density, pcf	98.14	Head, min.	61.90	Dry Density, pcf	98.72
Spec. Gravity (assumed)	2.700	Max. Grad.	8.12	Volume Solids, cm³	186.93
Volume Solids, cm³	186.93	Min. Grad.	8.12	Volume Voids, cm³	132.10
Volume Voids, cm³	133.99			Void Ratio	0.71
Void Ratio	0.72			Saturation, %	96.9%
Saturation, %	82.1%				

WATER CONTENTS		Sample Initial	Sample Final
Wt Soil & Tare, i	g	614.74	714.76
Wt Soil & Tare, f	g	504.72	586.83
Wt Tare	g	0.00	82.29
Wt Moisture Lost	g	110.02	127.93
Wt Dry Soil	g	504.72	504.54
Water Content	%	21.80%	25.36%

DESCRIPTION: SILTY CLAY and SAND, fine to medium; yellowish brown.

Flow Pump Rate: 2.38E-04 cm³/sec USCS: CL

TIME FUNCTIONS, SECONDS								dP				
DATE	DAY	HOUR	MIN	TEMP (°C)	dt (min)	dt,acc (min)	dt (sec)	dt,acc (sec)	Reading (psi)	Head (cm)	Gradient	Permeability (cm/sec)
06/08/18	43259	14	30	21.8	0	0	0	0	0.88	61.90	8.12	6.7E-07
06/08/18	43259	14	35	21.8	5	5	300	300	0.88	61.90	8.12	6.7E-07
06/08/18	43259	14	40	21.8	5	10	300	600	0.88	61.90	8.12	6.7E-07
06/08/18	43259	14	45	21.8	5	15	300	900	0.88	61.90	8.12	6.7E-07 *
06/08/18	43259	14	50	21.8	5	20	300	1200	0.88	61.90	8.12	6.7E-07 *
06/08/18	43259	14	55	21.8	5	25	300	1500	0.88	61.90	8.12	6.7E-07 *
06/08/18	43259	15	0	21.8	5	30	300	1800	0.88	61.90	8.12	6.7E-07 *

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 6.7E-07 cm/sec **

DATE	6/8/18
CHECK	
REVIEW	
APPROVE	

JULY 2018

18103173

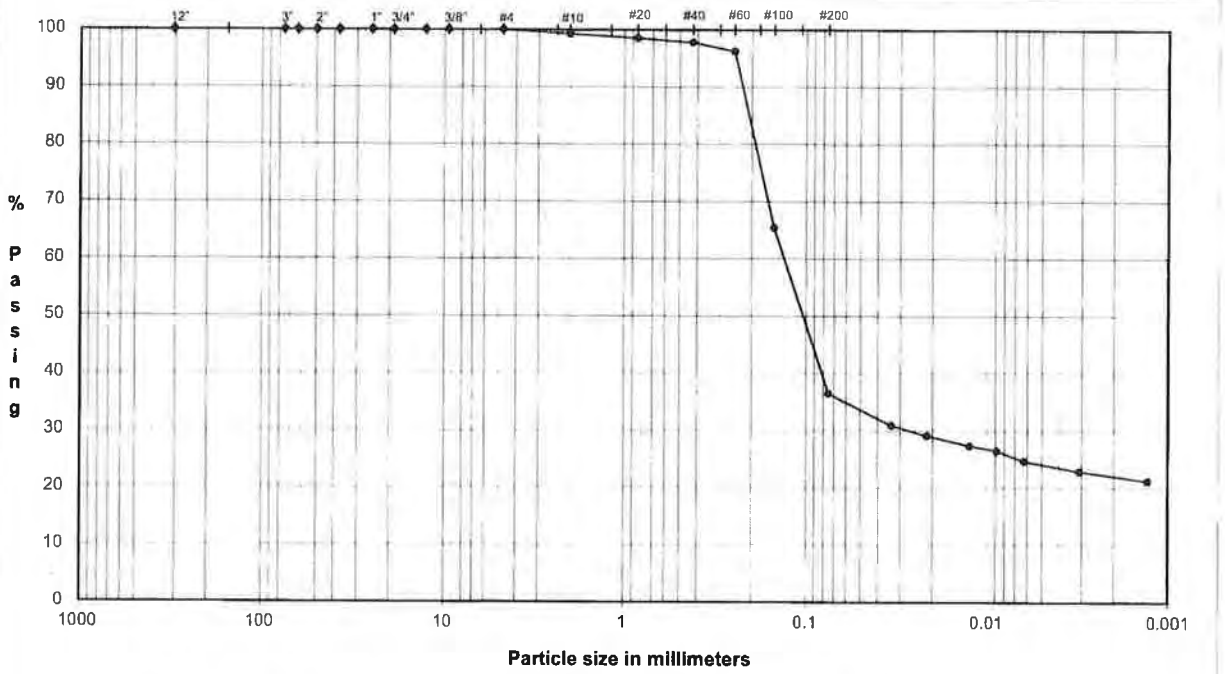
PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**

SAMPLE ID: **B-7** Depth: **15.0-17.0'**

TYPE: **UD**



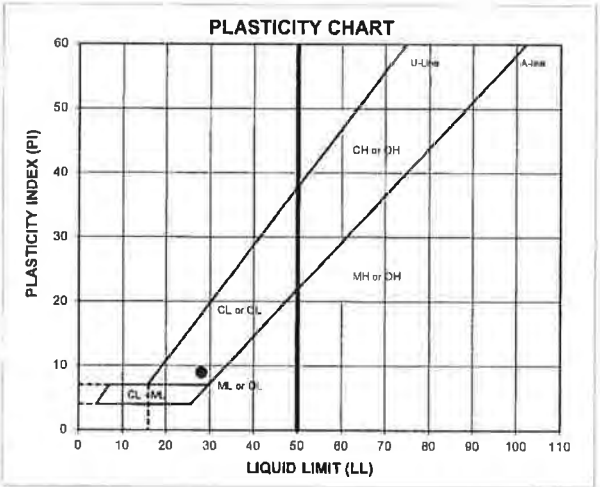
COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**99.3**	Coarse Sand	**0.7**
#20	0.85	**98.5**		
#40	0.43	**97.8**	Medium Sand	**1.5**
#60	0.25	**96.2**		
#100	0.15	**65.4**		
#200	0.075	**36.5**	Fine Sand	**61.3**

Hydrometer Analysis

(mm)	%Finer		
0.034	**30.9**		
0.021	**29.1**		
0.013	**27.4**	Fines	
0.0088	**26.5**	Silt or Clay	**36.5**
0.0063	**24.7**		
0.0031	**22.9**		
0.0013	**21.2**		



ATTERBERG LIMITS

Method -B (Dry preparation)

ML	LL	PL	PI	LI
21.9	28	19	9	0.36

LL (oven-dried) / 0.75 ORGANIC (OL/OH)

DESCRIPTION: SAND and SILTY CLAY, fine to coarse; grayish brown and yellow.

USCS: SC

TECH	HH/BA/TJ
DATE	7/27/18
CHECK	
REVIEW	
APPROVE	

Golder Associates Inc.

SPECIFIC GRAVITY OF SOILS
ASTM D-854
PYCNOMETER METHOD

PROJECT TITLE	FTN/ENTERGY WHITE BLUFF/AR		
PROJECT NUMBER	18103173	**SAMPLE ID**	B-7
		SAMPLE TYPE	UD
TESTED FOR	Gs	**SAMPLE DEPTH**	15.0-17.0'

MOISTURE CONTENT OF MATERIAL PASSING THE #4 SIEVE

Weight Soil and Tare, Initial (gm)	166.24
Weight Soil and Tare, Final (gm)	165.14
Weight Of Tare (gm)	42.93
Weight Of Moisture (gm)	1.10
Weight Of Dry Soil (gm)	122.21
Hygroscopic Moisture In (%)	0.9%

Test Method		Method - B
Pycnometer Number		11
Weight Pycnometer Empty (gm)		159.54
Volume of Pycnometer (gm)		499.57
Weight Pycnometer and Water (gm)		658.13
Mass of Pycnometer and Water at the test Temperture	(A)	657.81
Observed Temperature (Tb), for (Mb) In Degrees C		23.50
Weight of Soil, Water & Pycnometer (gm)	(B)	688.66
Temperature, C		23.5
Density of water @ tested temperature (g/ml)		1.00
Tare Number		-
Weight of Dry Soil Slurry plus Tare		49.87
Weight of Tare		0.00
Weight of Dry Soil (gm)	(C)	49.87
Temperature Coefficient		0.9992

SPECIFIC GRAVITY (G) 2.620

$G @ 20^0 C = [C/(A-(B - C))]*(K)$

METHOD - A WET METHOD
METHOD - B OVEN-DRIED METHOD

METHOD OF AIR REMOVAL: VACUUM

Recommended Mass for Test Specimen

Soil Type	Specimen Dry Mass when using 500 ml Pycnometer
SP, SP-SM	100
SP-SC, SM , SC	75
SILT OR CLAY	50

TECH	FT
DATE	7/31/18
CHECK	
REVIEW	
APPROVE	

Boring or Test Pit:	B-7		Boring or Test Pit:			Boring or Test Pit:		
Sample:	1		Sample:			Sample:		
Depth:	15.0-17.0	ft	Depth:			Depth:		
Point No.:	1		Point No.:			Point No.:		
	Initial							
Length =	6.012	in	Length =	5.936		Length =	5.798	
Diameter =	2.877	in	Diameter =	2.889		Diameter =	2.923	
Wet Mass =	2.817	lb	Wet Mass =			Wet Mass =		
Area =	6.501	in^2	Area =			Area =		
Volume =	39.083	in^3	Volume =			Volume =		
Specific Gravity =	2.62	(ASTM D854)	Specific Gravity =			Specific Gravity =		
Dry Mass of Solids =	2.311	lb	Dry Mass of Solids =			Dry Mass of Solids =		
Moisture Content =	21.9%		Moisture Content =			Moisture Content =		
Wet Unit Weight =	124.5	pcf	Wet Unit Weight =			Wet Unit Weight =		
Dry Unit Weight =	102.2	pcf	Dry Unit Weight =			Dry Unit Weight =		
Void Ratio =	0.60		Void Ratio =			Void Ratio =		
Percent Saturation =	96%		Percent Saturation =			Percent Saturation =		
	After Consolidation			**After Consolidation**			**After Consolidation**	
Length =	5.936	in	Length =	5.798	in	Length =	5.704	in
Diameter =	2.889	in	Diameter =	2.923	in	Diameter =	2.947	in
Area =	6.556		Area =	6.712		Area =	6.822	in^2 (Method B)
Volume =	38.914		Volume =	38.914		Volume =	38.914	in^3
Moisture Content =			Moisture Content =			Moisture Content =	22.5%	
Wet Unit Weight =			Wet Unit Weight =			Wet Unit Weight =	125.8	pcf
Dry Unit Weight =			Dry Unit Weight =			Dry Unit Weight =	102.6	pcf
Void Ratio =			Void Ratio =			Void Ratio =	0.59	
Percent Saturation =			Percent Saturation =			Percent Saturation =	100%	
B Parameter =	1.00		B Parameter =	--		B Parameter =	--	
Shear Rate =	0.094%	/min.	Shear Rate =	0.100%	/min.	Shear Rate =	0.099%	/min.
t_{50} =	1.0	min.	t_{50} =	0.7	min.	t_{50} =	0.8	min.
Strain at Failure =	1.0%		Strain at Failure =	2.7%		Strain at Failure =	4.7%	
Cell Pressure =	64.0	psi	Cell Pressure =	78.0	psi	Cell Pressure =	92.0	psi
Back Pressure =	50.0	psi	Back Pressure =	50.0	psi	Back Pressure =	50.0	psi
Confining Pressure =	14.0	psi	Confining Pressure =	28.0	psi	Confining Pressure =	42.0	psi

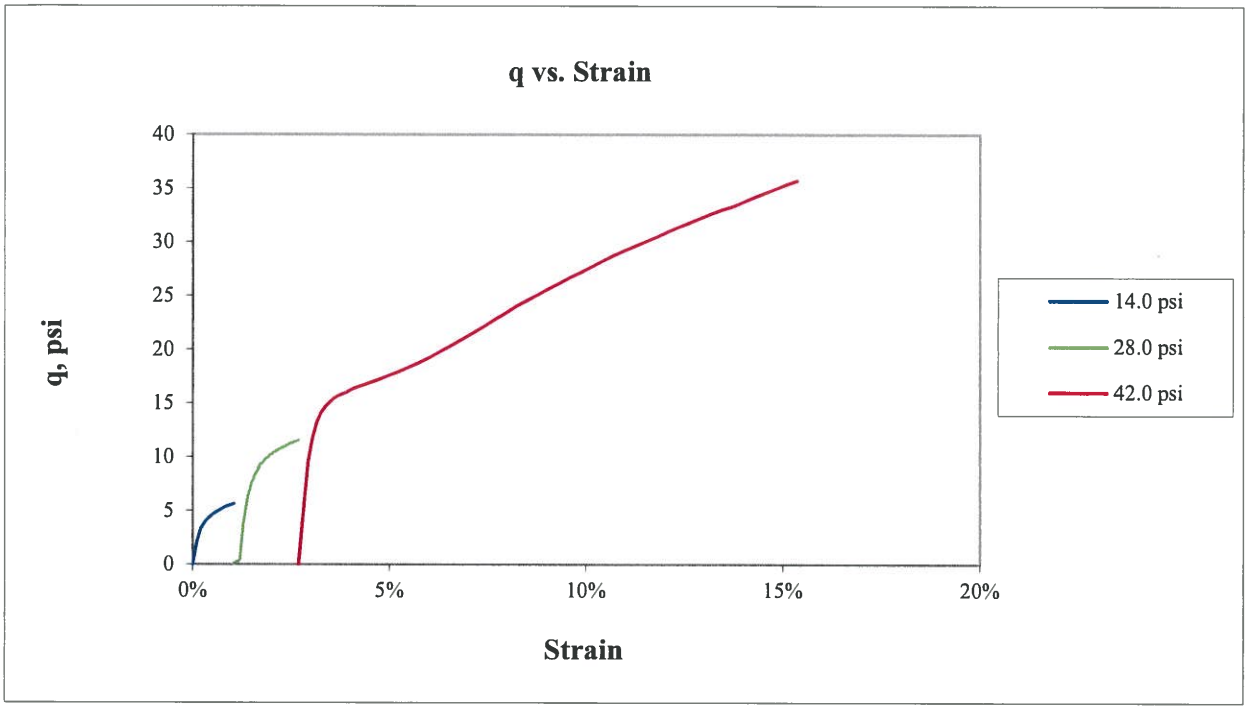
Notes: Sample description: (SC) SAND and SILTY CLAY, fine to coarse; grayish brown and yellow.

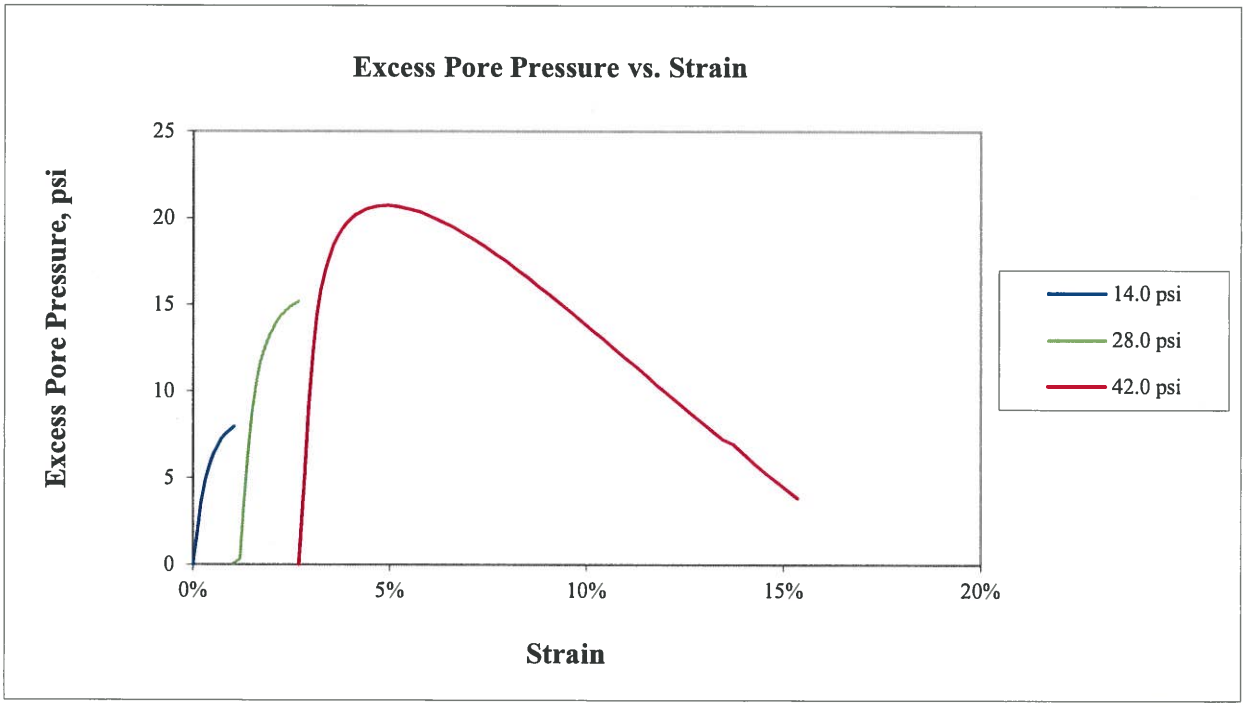
Atterberg limits: LL = 28 PL = 19 PI = 9 (ASTM D4318)

Percent finer: 3/4 in. = 100.0% No. 4 = 100.0% No. 200 = 36.5% (ASTM D422, refer to separate report for gradation curve)

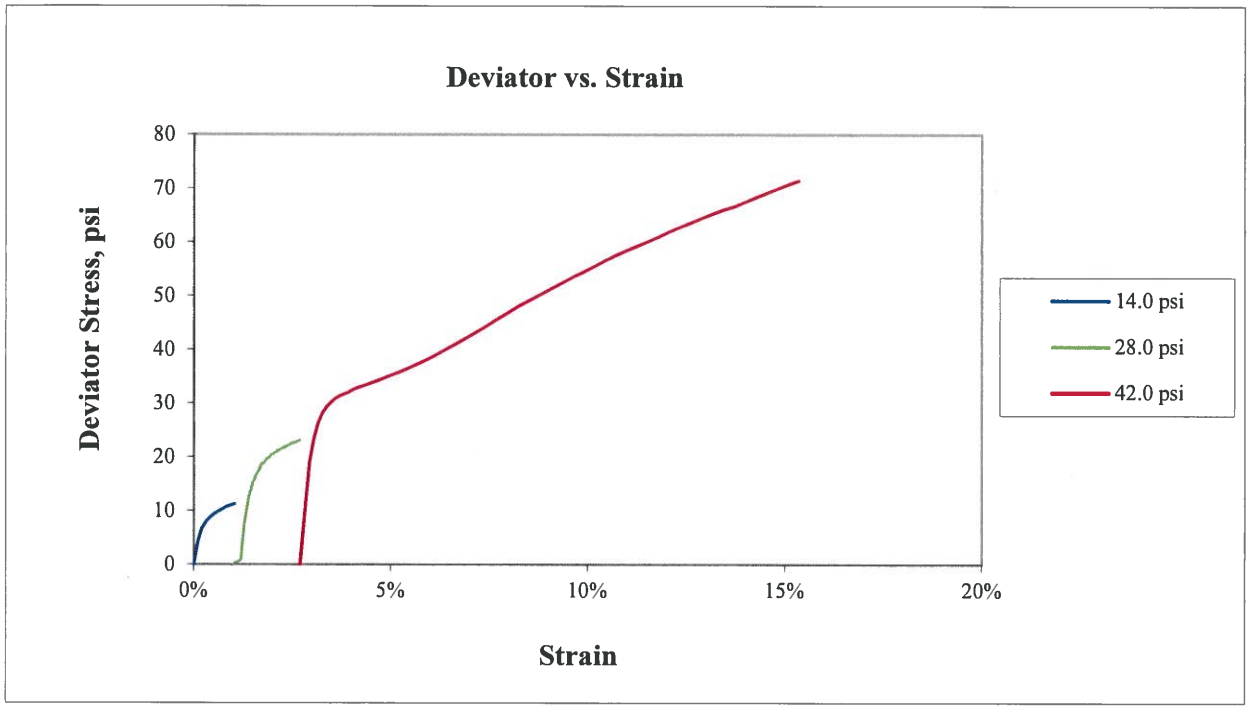
Specimen type:	X	Intact		Reconstituted
Moisture from:		Cuttings	X	Entire specimen
Saturation method:	X	Wet		Dry
Failure criterion:	X	$(\sigma'_1/\sigma'_3)_{max}$		$(\sigma'_1-\sigma'_3)_{max}$ ____ % strain
Membrane effect:	X	Corrected		Not Corrected

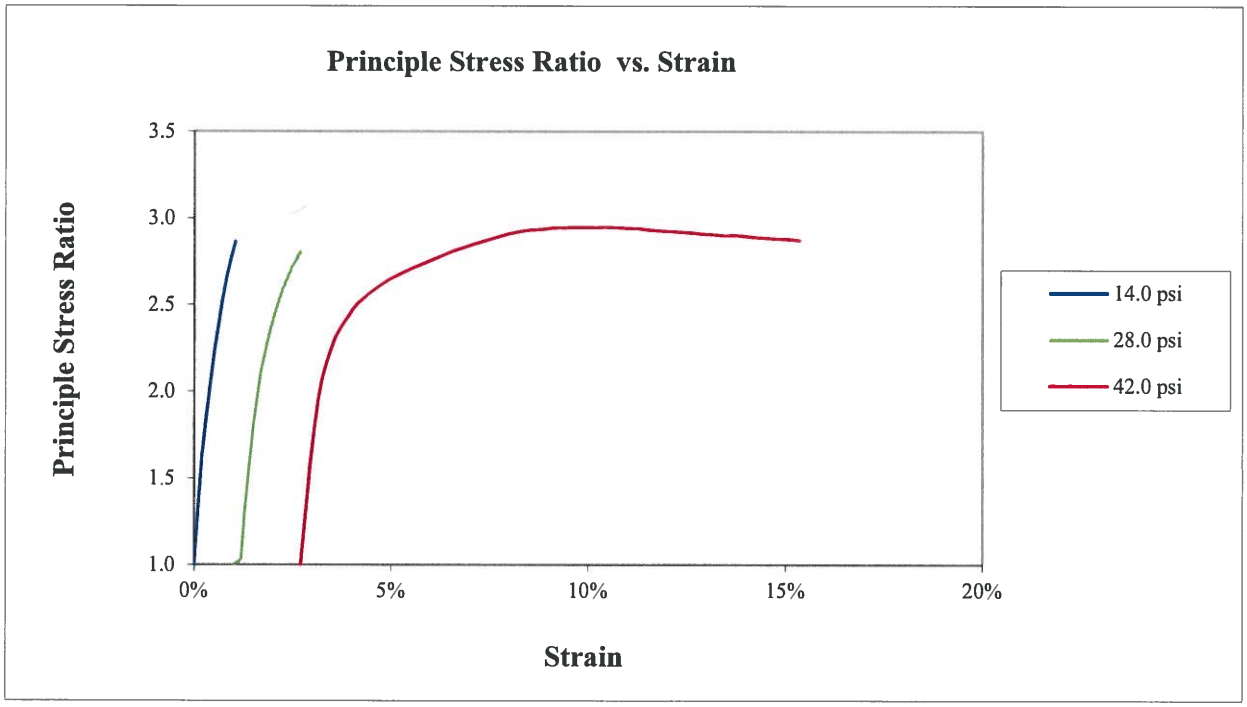
Golder Associates Inc. **Atlanta, Georgia**	**Title:** **MODIFIED (Multi-Stage) - ASTM D4767** **CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT** **SAMPLE AND TEST DATA**				
Job Short Title: **FTN/ENTERGY WHITE BLUFF/AR**					
Sample: **B-7 UD 15.0-17.0'**	**Technician:** **FT/PWM** **Check:** JWL	**Reviewed:** **Approved:**	**Start Date:** **7/10/2018**	**Job Number:** **18103173**	**Figure:** **1**





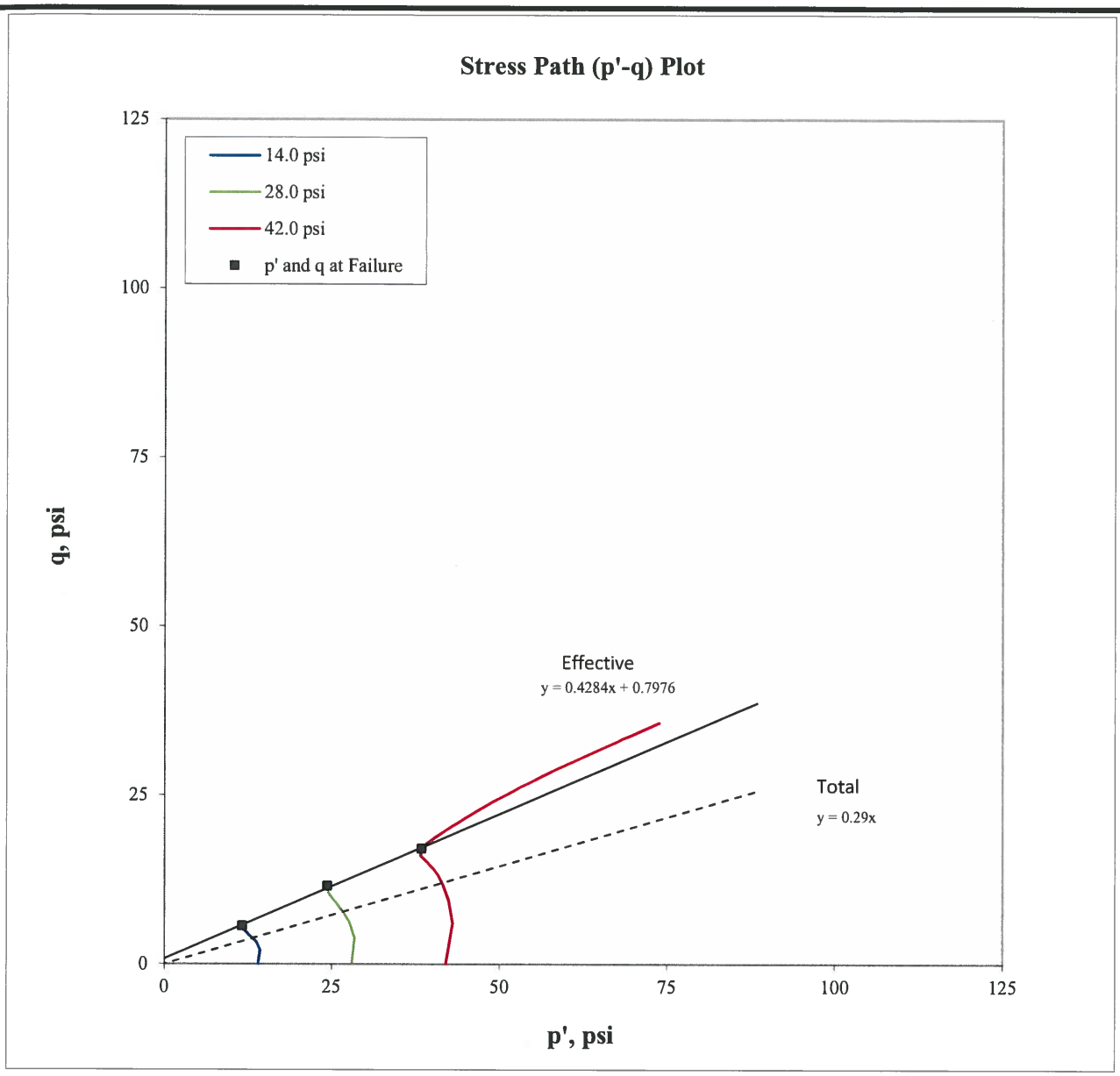
Golder Associates Inc. **Atlanta, Georgia**	**Title:** **MODIFIED (Multi-Stage) - ASTM D4767** **CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT** **q AND EXCESS PORE PRESSURE PLOTS**				
Job Short Title: **FTN/ENTERGY WHITE BLUFF/AR**					
Sample: **B-7 UD 15.0-17.0'**	**Technician:** **FT/PWM** **Check:** IWN	**Reviewed:** **Approved:**	**Start Date:** **7/10/2018**	**Job Number:** **18103173**	**Figure:** **2**





Golder Associates Inc. Atlanta, Georgia	Title: MODIFIED (Multi-Stage) - ASTM D4767 CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT q AND EXCESS PORE PRESSURE PLOTS				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: B-7 UD 15.0-17.0'	Technician: FT/PWM Check:	Reviewed: Approved:	Start Date: 7/10/2018	Job Number: 18103173	Figure: 3

Stress Path (p'-q) Plot



Confining Pressure (psi)	p at failure (psi)	p' at failure (psi)	q at failure (psi)
14.0	19.6	11.7	5.6
28.0	39.6	24.4	11.6
42.0	59.1	38.4	17.1

Effective

α ' =	23.2	degree
a' =	0.8	psi

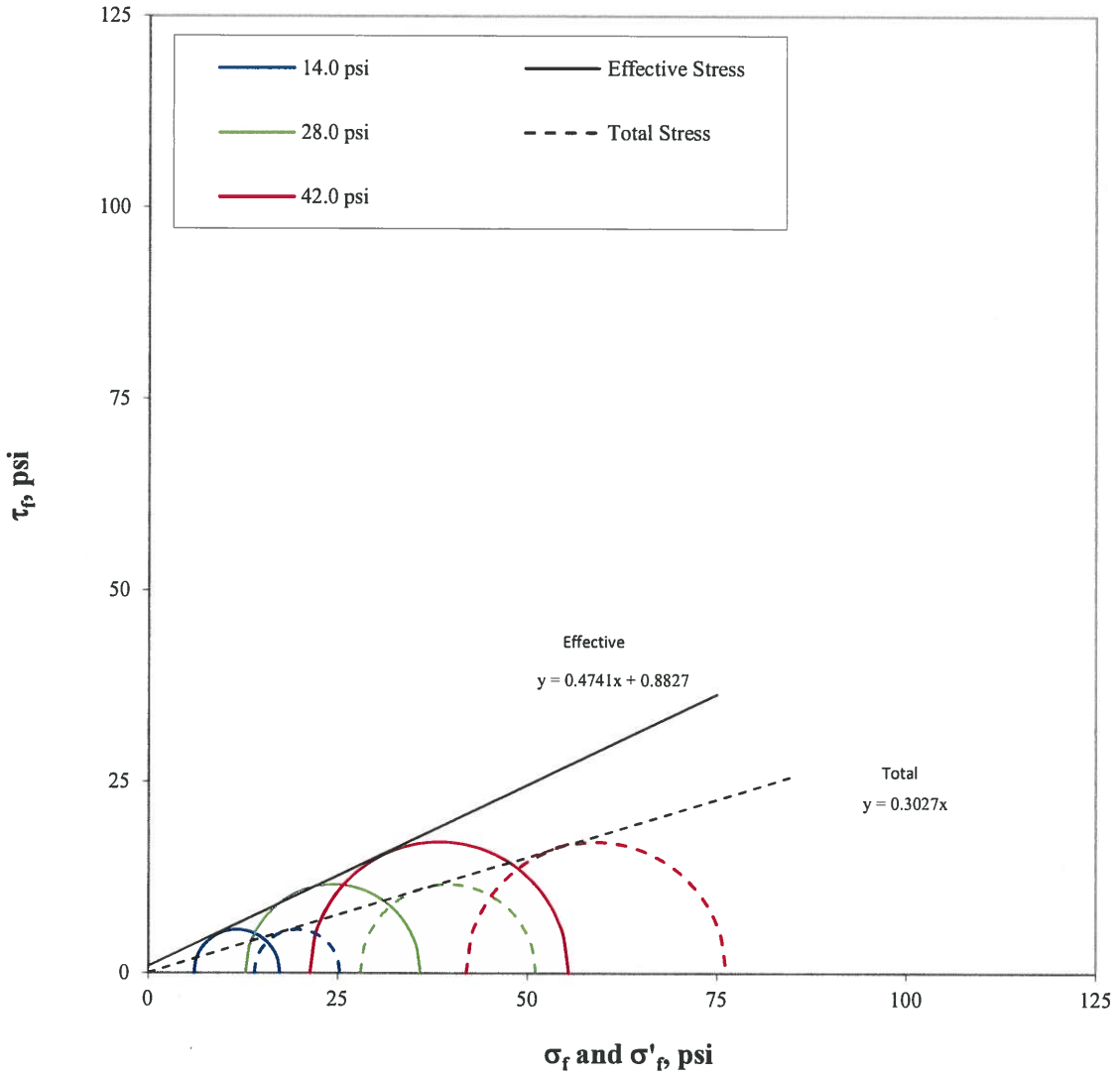
Total

α =	16.2	degree
a =	0.0	psi

Note: The laboratory testing relates only to the sample tested. GAI neither accepts responsibility for nor makes claims to the final use and purpose of the material.

Golder Associates Inc. Atlanta, Georgia	**Title:** MODIFIED (Multi-Stage) - ASTM D4767 CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT STRESS PATH PLOT				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: B-7 UD 15.0-17.0'	**Technician:** FT/PWM **Check:**	**Reviewed:** **Approved:**	**Start Date:** 7/10/2018	**Job Number:** 18103173	**Figure:** 4

Mohr's Circle Diagram



Confining Pressure (psi)	σ'_1 at failure (psi)	σ'_3 at failure (psi)	σ_1 at failure (psi)	σ_3 at failure (psi)
14.0	17.3	6.0	25.3	14.0
28.0	35.9	12.8	51.1	28.0
42.0	55.5	21.3	76.2	42.0

Effective

ϕ' =	25.4	degree
c' =	0.9	psi

Total

ϕ =	16.9	degree
c =	0.0	psi

Note: The laboratory testing relates only to the sample tested. GAI neither accepts responsibility for nor makes claims to the final use and purpose of the material.

Golder Associates Inc. Atlanta, Georgia	**Title:** MODIFIED (Multi-Stage) - ASTM D4767 CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT MOHR'S CIRCLE DIAGRAM				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: B-7 UD 15.0-17.0'	**Technician:** FT/PWM **Check:** MW	**Reviewed:** **Approved:**	**Start Date:** 7/10/2018	**Job Number:** 18103173	**Figure:** 5

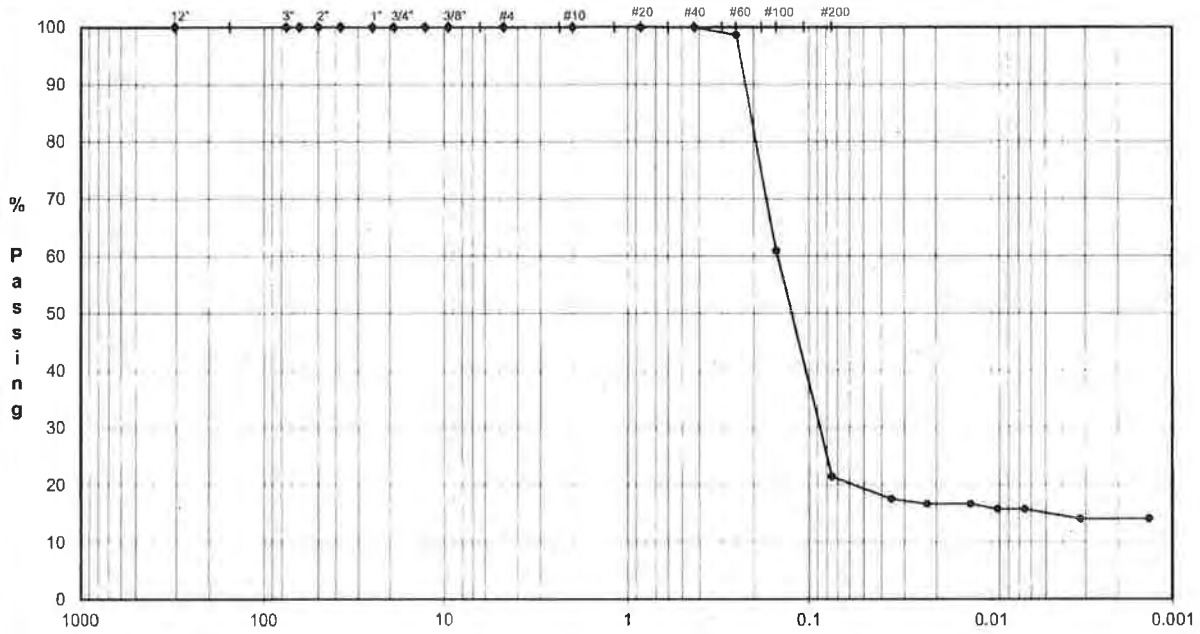
Golder Associates Inc. **Atlanta, Georgia**	**Title:** **MODIFIED (Multi-Stage) - ASTM D4767** **CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT** **SPECIMEN PHOTOGRAPH - Single Specimen**				
Job Short Title: **FTN/ENTERGY WHITE BLUFF/AR**					
Sample: **B-7 UD 15.0-17.0'**	**Technician:** **FT/PWM** **Check:**	**Reviewed:** **Approved:**	**Start Date:** **7/10/2018**	**Job Number:** **18103173**	**Figure:** **6**

AUGUST 2018 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **B-7** Depth: **18.0-20.0'**
TYPE: **Bag**



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay

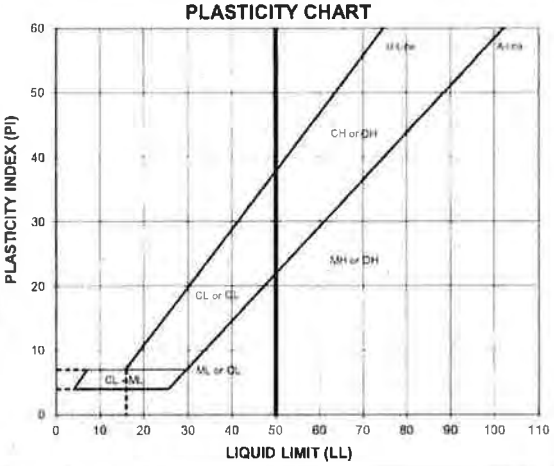
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**100.0**	Coarse Sand	**0.0**
#20	0.85	**100.0**		
#40	0.43	**100.0**	Medium Sand	**0.0**
#60	0.25	**98.5**		
#100	0.15	**60.9**		
#200	0.075	**21.4**	Fine Sand	**78.5**

Hydrometer Analysis

(mm)	%Finer		
0.035	**17.5**		
0.023	**16.6**		
0.013	**16.6**	Fines	
0.0092	**15.8**	Silt or Clay	**21.4**
0.0065	**15.8**		
0.0032	**14.0**		
0.0013	**14.0**		

PLASTICITY CHART



ATTERBERG LIMITS
Method -B (Dry preparation)

M_c	LL	PL	PI	LI
22.8	**NP**	**NP**	**NP**	**NP**

LL (oven-dried) / 0.75 ORGANIC (OL OH)

DESCRIPTION: SILTY SAND, fine; light gray

USCS: SM

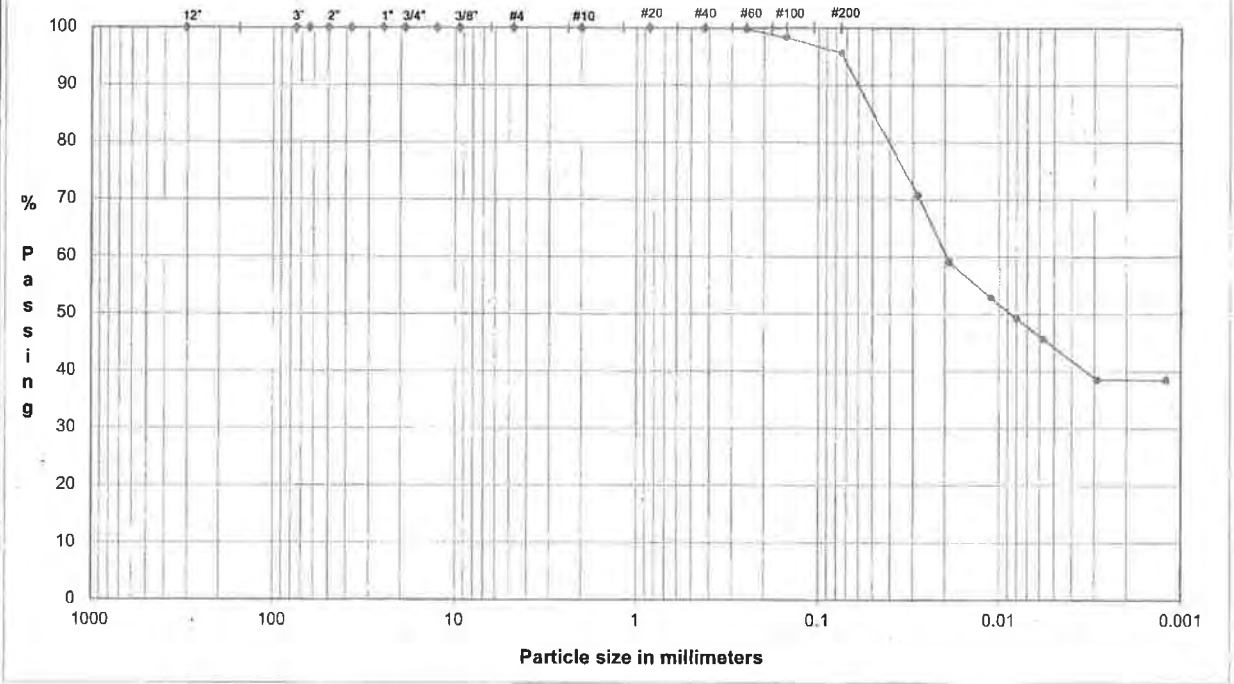
TECH	TJ/BA/HH
DATE	8/2/18
CHECK	
REVIEW	
APPROVE	

AUGUST 2018 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **RP-3** Depth: **18.0-20.0'**
TYPE: **Bag**



COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

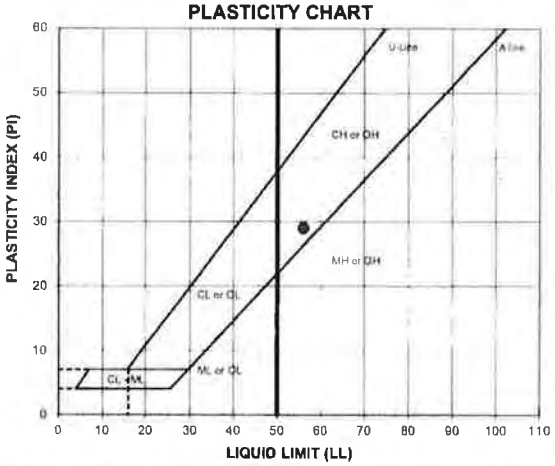
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**100.0**	Coarse Sand	**0.0**
#20	0.85	**100.0**		
#40	0.43	**99.9**	Medium Sand	**0.1**
#60	0.25	**99.8**		
#100	0.15	**98.2**		
#200	0.075	**95.6**	Fine Sand	**4.3**

Hydrometer Analysis

(mm)	%Finer		
0.028	**70.8**		
0.019	**59.1**		
0.011	**52.8**	Fines	
0.0080	**49.3**	Silt or Clay	**95.6**
0.0058	**45.7**		
0.0029	**38.5**		
0.0012	**38.5**		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
27.1	**56**	**27**	**29**	**0.02**

LL (oven-dried) / 0.75 ORGANIC (OL/OH)

DESCRIPTION: CLAY, trace fine to medium sand; dark gray.

USCS: CH

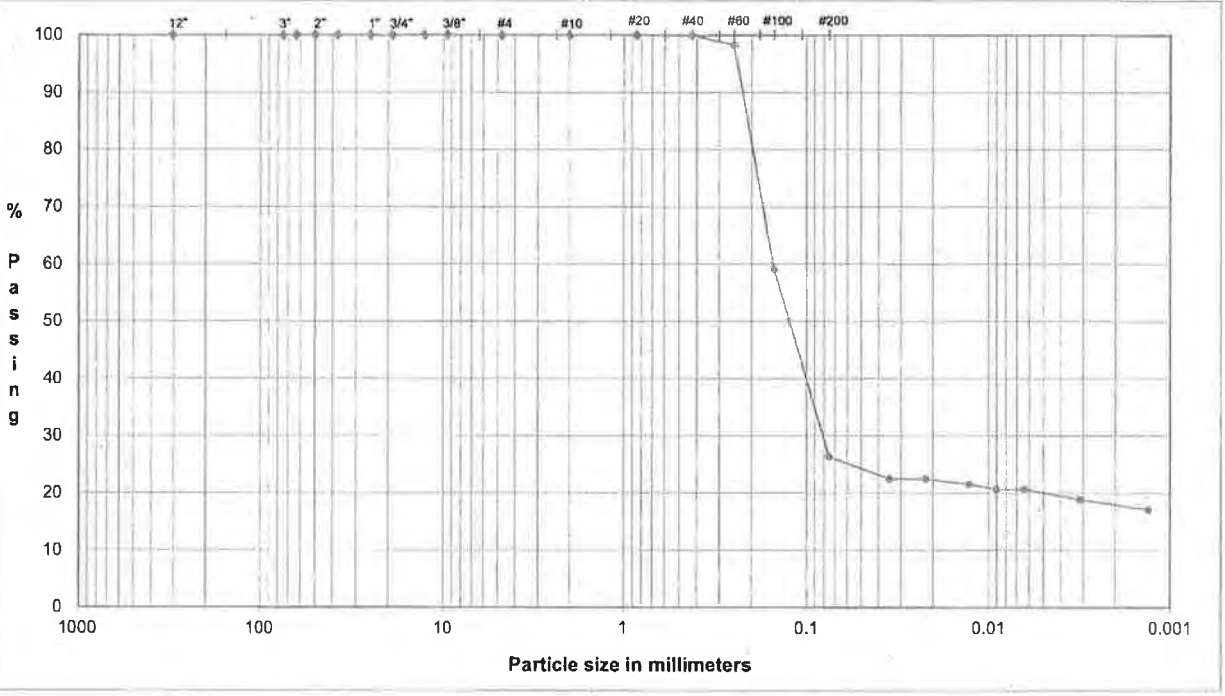
TECH	HH/BA/TJ
DATE	8/1/18
CHECK	
REVIEW	
APPROVE	

AUGUST 2018 | 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **RP-3** Depth: **29.0-30.0'**
TYPE: **UD**



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay

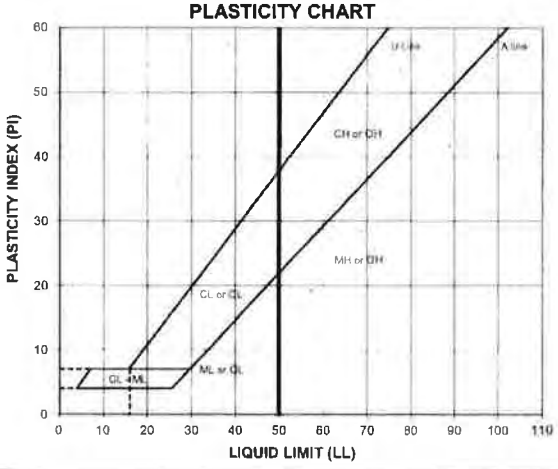
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**100.0**	Coarse Sand	**0.0**
#20	0.85	**100.0**		
#40	0.43	**100.0**	Medium Sand	**0.0**
#60	0.25	**98.2**		
#100	0.15	**58.9**		
#200	0.075	**26.3**	Fine Sand	**73.7**

Hydrometer Analysis

(mm)	%Finer		
0.035	**22.4**		
0.022	**22.4**		
0.013	**21.5**	Fines	
0.0090	**20.6**	Silt or Clay	**26.3**
0.0064	**20.6**		
0.0032	**18.8**		
0.0013	**17.1**		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

M,	LL	PL	PI	LI
22.4	NP	NP	NP	NP

LL (oven-dried) / 0.75 OROANIC (OL/OH)

DESCRIPTION: SILTY SAND, fine; dark gray.

USCS: SM

TECH	HH/TJ
DATE	8/2/18
CHECK	
REVIEW	
APPROVE	

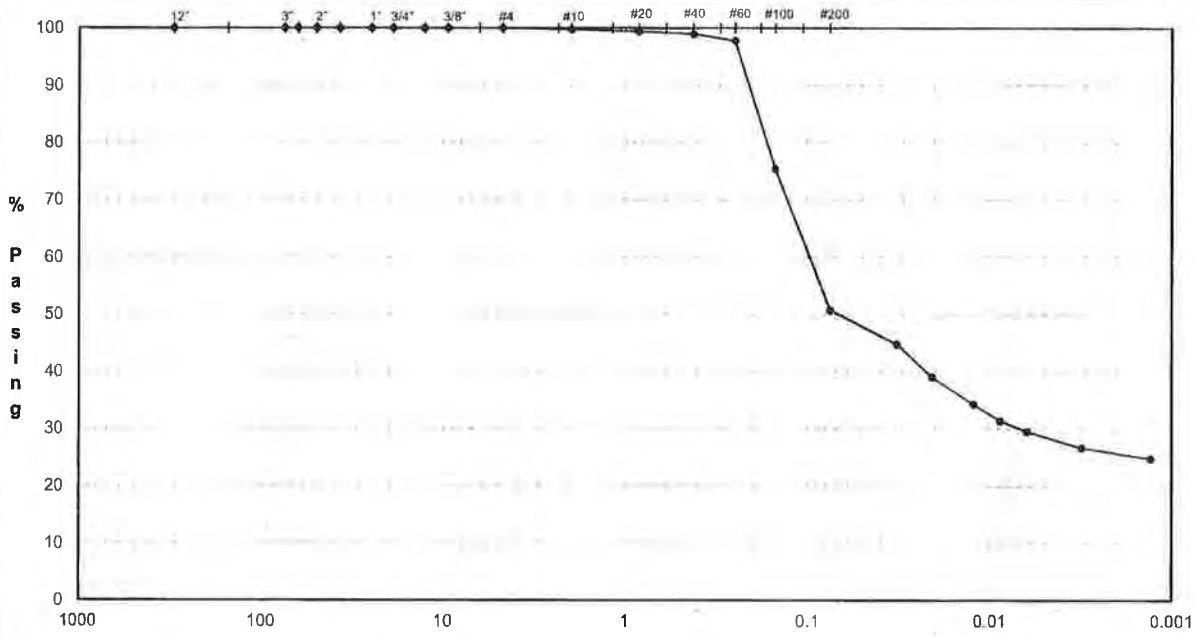
Golder Associates Inc.

AUGUST 2018 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **RP-4** Depth: **8.0-9.0'**
TYPE: **Bag**



COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

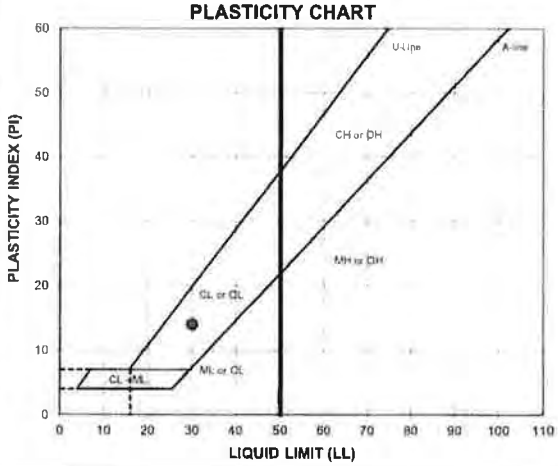
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**99.8**	Coarse Sand	**0.2**
#20	0.85	**99.4**		
#40	0.43	**99.0**	Medium Sand	**0.8**
#60	0.25	**97.8**		
#100	0.15	**75.4**		
#200	0.075	**50.8**	Fine Sand	**48.2**

Hydrometer Analysis

(mm)	%Finer		
0.032	**44.7**		
0.021	**39.0**		
0.012	**34.3**	Fines	
0.0088	**31.4**	Silt or Clay	**50.8**
0.0063	**29.5**		
0.0031	**26.7**		
0.0013	**24.8**		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

M	LL	PL	PI	LI
13.4	30	16	14	-0.17

LL (oven-dried) / 0.75 ORGANIC (OL,OH)

DESCRIPTION: SILTY CLAY and SAND, fine to coarse; brown

USCS: CL

TECH	TJ/HH/HEH
DATE	8/2/18
CHECK	
REVIEW	
APPROVE	

Golder Associates Inc.

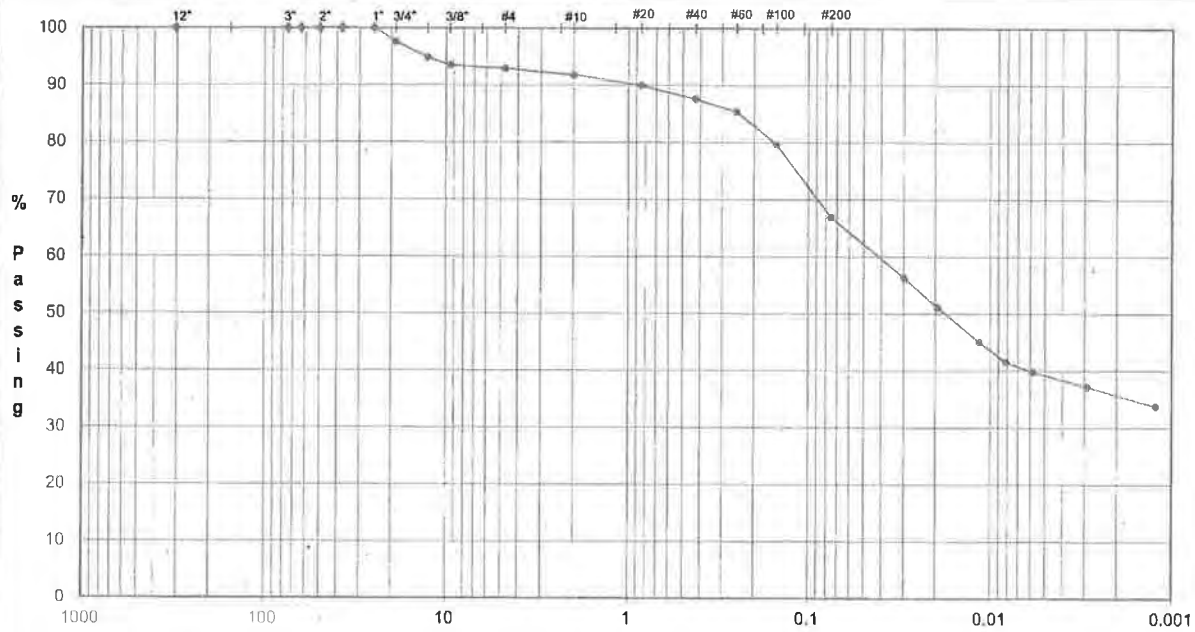
JULY 2018

18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **RP-4** - Depth: **20.0-22.0'**
TYPE: **UD**



COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

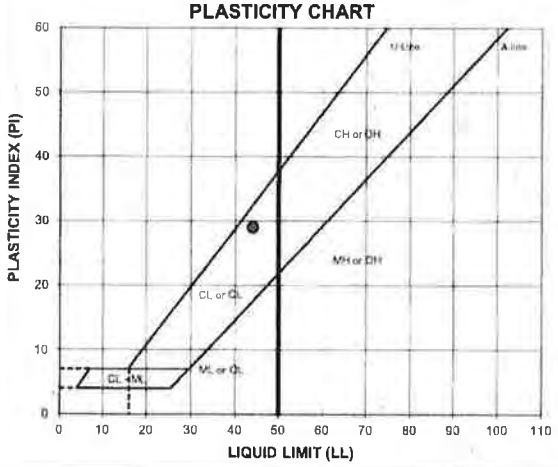
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**97.6**	Coarse Gravel	**2.4**
0.50"	12.7	**94.9**		
0.375"	9.5	**93.5**		
#4	4.8	**93.0**	Fine Gravel	**4.7**
#10	2.00	**91.8**	Coarse Sand	**1.2**
#20	0.85	**90.0**		
#40	0.43	**87.6**	Medium Sand	**4.2**
#60	0.25	**85.4**		
#100	0.15	**79.6**		
#200	0.075	**66.9**	Fine Sand	**20.7**

Hydrometer Analysis

(mm)	%Finer		
0.030	**56.3**		
0.019	**51.1**		
0.011	**45.0**	Fines	
0.0082	**41.6**	Silt or Clay	**66.9**
0.0058	**39.8**		
0.0029	**37.2**		
0.0012	**33.8**		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
22.2	44	15	29	0.24

LL (oven-dried) / 0.75 ORGANIC (OL/OH)

DESCRIPTION: sandy SILTY CLAY, fine to coarse, some fine to coarse gravel; yellowish brown.

USCS: CL

TECH	TB/HH/BA
DATE	7/17/18
CHECK	
REVIEW	
APPROVE	

Golder Associates Inc.

SPECIFIC GRAVITY OF SOILS
ASTM D-854
PYCNOMETER METHOD

PROJECT TITLE	**FTN/ENTERGY WHITE BLUFF/AR**		
PROJECT NUMBER	**18103173**	**SAMPLE ID**	**RP-4**
		SAMPLE TYPE	**UD**
TESTED FOR	**Gs**	**SAMPLE DEPTH**	**20.0-22.0'**

MOISTURE CONTENT OF MATERIAL PASSING THE #4 SIEVE

Weight Soil and Tare, Initial (gm)	**196.37**
Weight Soil and Tare, Final (gm)	**192.05**
Weight Of Tare (gm)	**51.66**
Weight Of Moisture (gm)	**4.32**
Weight Of Dry Soil (gm)	**140.39**
Hygroscopic Moisture In (%)	**3.1%**

Test Method		**Method - B**
Pycnometer Number		**14**
Weight Pycnometer Empty (gm)		185.81
Volume of Pycnometer (gm)		499.41
Weight Pycnometer and Water (gm)		684.20
Mass of Pycnometer and Water at the test Temperture	(A)	683.75
Observed Temperature (Tb), for (Mb) In Degrees C		25.00
Weight of Soil, Water & Pycnometer (gm)	(B)	**714.40**
Temperature, C		**25.0**
Density of water @ tested temperature (g/ml)		1.00
Tare Number		-
Weight of Dry Soil Slurry plus Tare		**48.92**
Weight of Tare		**0.00**
Weight of Dry Soil (gm)	(C)	48.92
Temperature Coefficient		0.9988

SPECIFIC GRAVITY (G) **2.674**

G @ 20^0 C = [C/(A-(B - C))]*(K)

METHOD - A WET METHOD

METHOD - B OVEN-DRIED METHOD

METHOD OF AIR REMOVAL: VACUUM

Recommended Mass for Test Specimen

Soil Type	Specimen Dry Mass when using 500 ml Pycnometer
SP, SP-SM	100
SP-SC, SM , SC	75
SILT OR CLAY	50

TECH	BA
DATE	7/18/18
CHECK	
REVIEW	
APPROVE	

Boring or Test Pit:	RP-4		Boring or Test Pit:	RP-4		Boring or Test Pit:	RP-4	
Sample:	UD		Sample:	UD		Sample:	UD	
Depth:	20.0-22.0 ft		Depth:	20.0-22.0 ft		Depth:	20.0-22.0 ft	
Point No.:	1		Point No.:	2		Point No.:	3	
Initial			**Initial**			**Initial**		
Length =	5.901	in	Length =	6.114	in	Length =	6.178	in
Diameter =	2.881	in	Diameter =	2.863	in	Diameter =	2.819	in
Wet Mass =	2.777	lb	Wet Mass =	2.837	lb	Wet Mass =	2.765	lb
Area =	6.519	in^2	Area =	6.438	in^2	Area =	6.241	in^2
Volume =	38.468	in^3	Volume =	39.360	in^3	Volume =	38.559	in^3
Specific Gravity =	2.67	(ASTM D854)	Specific Gravity =	2.67	(ASTM D854)	Specific Gravity =	2.67	(ASTM D854)
Dry Mass of Solids =	2.261	lb	Dry Mass of Solids =	2.346	lb	Dry Mass of Solids =	2.253	lb
Moisture Content =	22.9%		Moisture Content =	20.9%		Moisture Content =	22.7%	
Wet Unit Weight =	124.8	pcf	Wet Unit Weight =	124.5	pcf	Wet Unit Weight =	123.9	pcf
Dry Unit Weight =	101.5	pcf	Dry Unit Weight =	103.0	pcf	Dry Unit Weight =	100.9	pcf
Void Ratio =	0.64		Void Ratio =	0.62		Void Ratio =	0.65	
Percent Saturation =	95%		Percent Saturation =	91%		Percent Saturation =	93%	
After Consolidation			**After Consolidation**			**After Consolidation**		
Length =	5.819	in	Length =	6.040	in	Length =	6.119	in
Diameter =	2.862	in	Diameter =	2.841	in	Diameter =	2.814	in
Area =	6.431	in^2 (Method B)	Area =	6.341	in^2 (Method B)	Area =	6.219	in^2 (Method B)
Volume =	37.424	in^3	Volume =	38.298	in^3	Volume =	38.050	in^3
Moisture Content =	22.3%		Moisture Content =	21.5%		Moisture Content =	23.5%	
Wet Unit Weight =	127.7	pcf	Wet Unit Weight =	128.6	pcf	Wet Unit Weight =	126.4	pcf
Dry Unit Weight =	104.4	pcf	Dry Unit Weight =	105.8	pcf	Dry Unit Weight =	102.3	pcf
Void Ratio =	0.60		Void Ratio =	0.57		Void Ratio =	0.63	
Percent Saturation =	100%		Percent Saturation =	100%		Percent Saturation =	100%	
B Parameter =	0.96		B Parameter =	0.98		B Parameter =	0.98	
Shear Rate =	0.009%	/min.	Shear Rate =	0.009%	/min.	Shear Rate =	0.008%	/min.
t_{50} =	6.94	min.	t_{50} =	37.68	min.	t_{50} =	30.90	min.
Strain at Failure =	4.9%		Strain at Failure =	3.5%		Strain at Failure =	10.5%	
Cell Pressure =	68.0	psi	Cell Pressure =	86.0	psi	Cell Pressure =	104.0	psi
Back Pressure =	50.0	psi	Back Pressure =	50.0	psi	Back Pressure =	50.0	psi
Confining Pressure =	18.0	psi	Confining Pressure =	36.0	psi	Confining Pressure =	54.0	psi

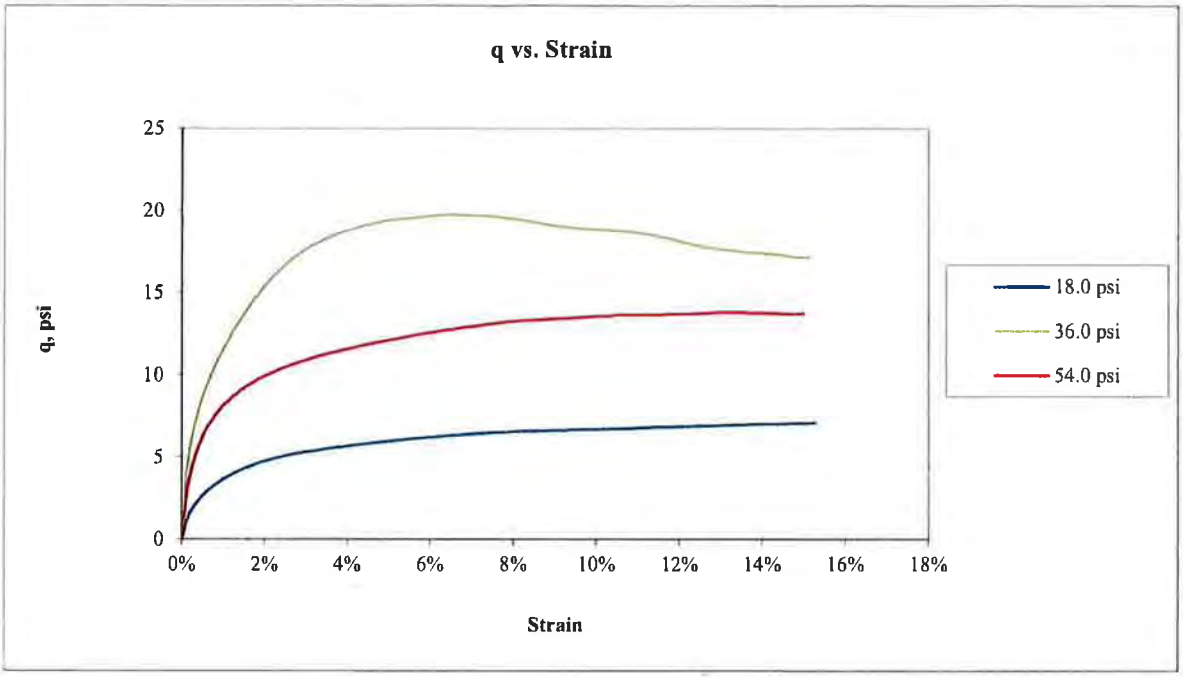
Notes: Sample description: (CL) sandy SILTY CLAY, fine to coarse, some fine to coarse gravel; yellowish brown.

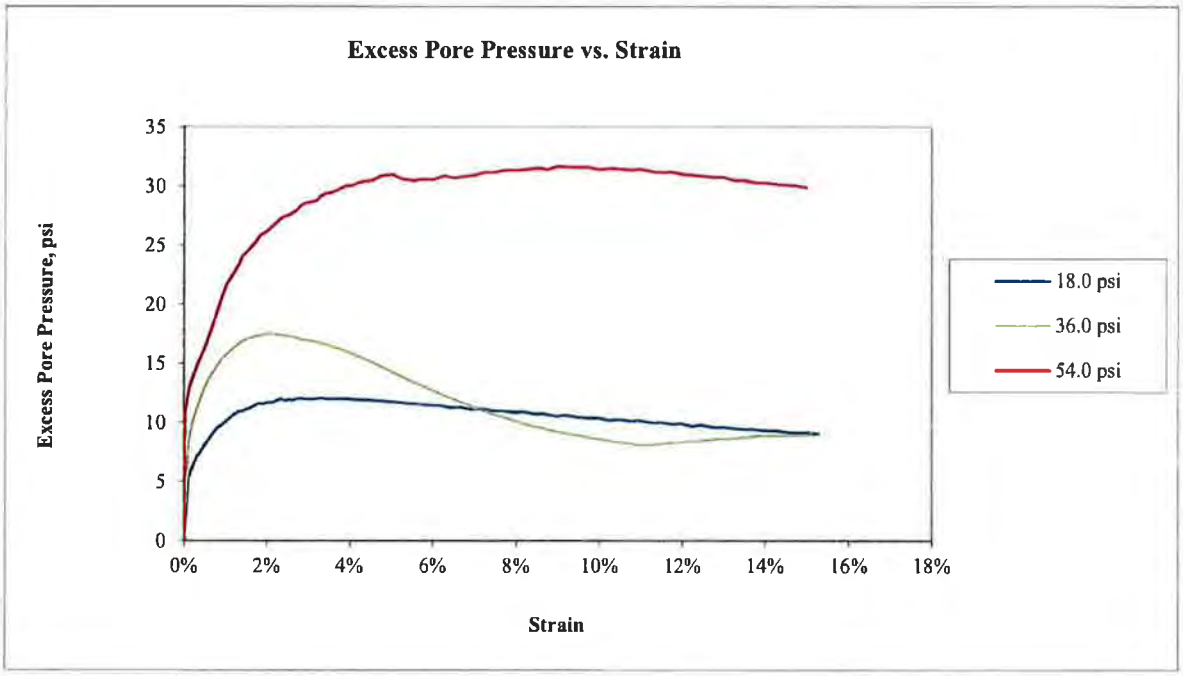
Atterberg limits: LL = 44 PL = 15 PI = 29 (ASTM D4318)

Percent finer: 3/4 in. = 100% No. 4 = 93% No. 200 = 67% (ASTM D422, refer to separate report for gradation curve)

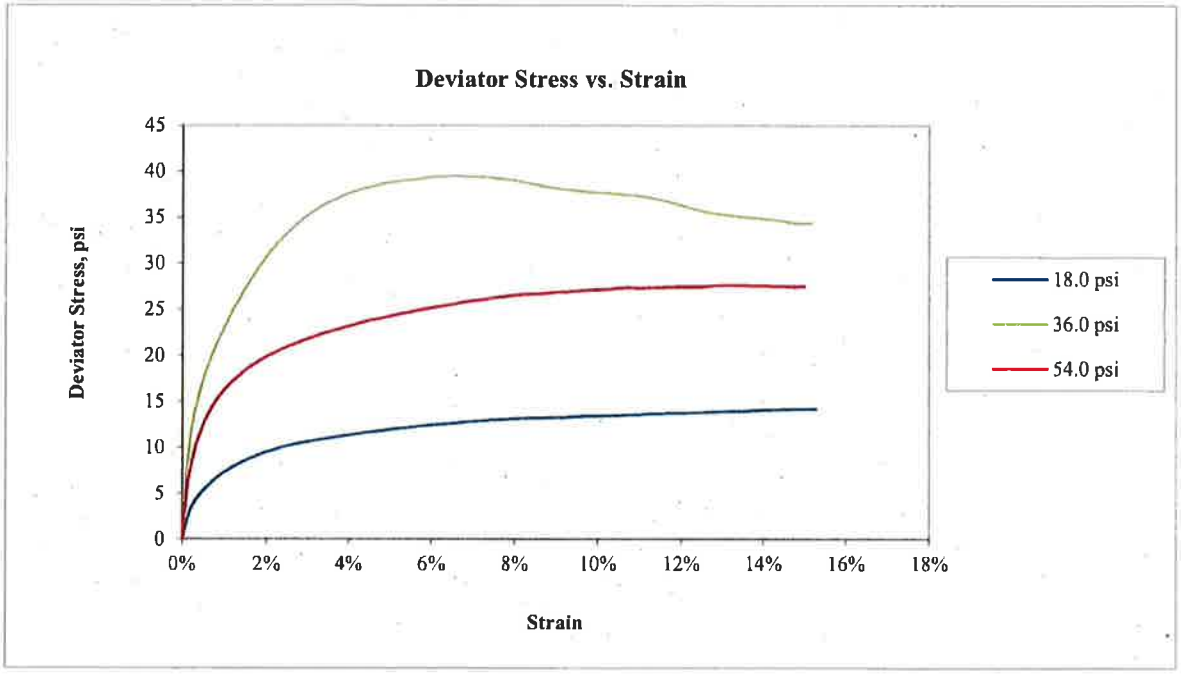
Specimen type:	X	Intact		Reconstituted
Moisture from:		Cuttings	X	Entire specimen
Saturation method:	X	Wet		Dry
Failure criterion:	X	$(\sigma'_1/\sigma'_3)_{max}$		$(\sigma'_1-\sigma'_3)_{max}$ ____ % strain
Membrane effect:	X	Corrected		Not Corrected

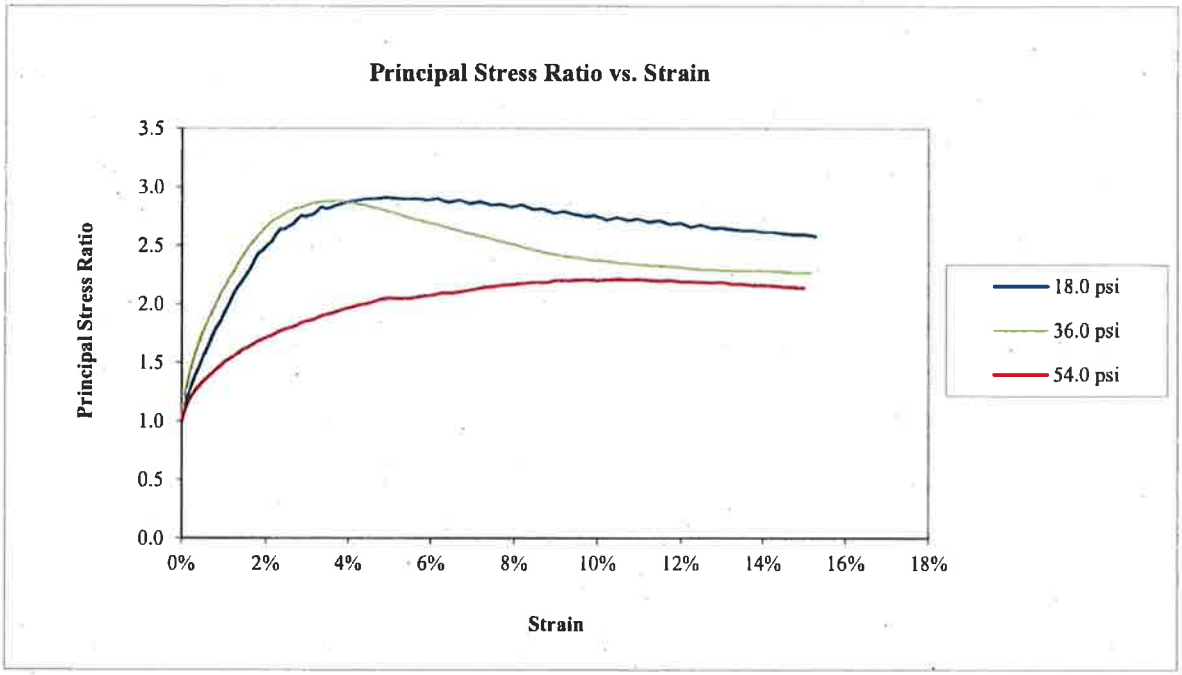
Golder Associates Inc. **Atlanta, Georgia**	**Title:** **ASTM D4767** **CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT** **SAMPLE AND TEST DATA**				
Job Short Title: **FTN/ENTERGY WHITE BLUFF/AR**					
Sample: **RP-4 UD 20.0-22.0'**	**Technician:** **PWM/FT** **Check:**	**Reviewed:** **Approved:**	**Start Date:** **7/17/2018**	**Job Number:** **18103173**	**Figure:** **1**





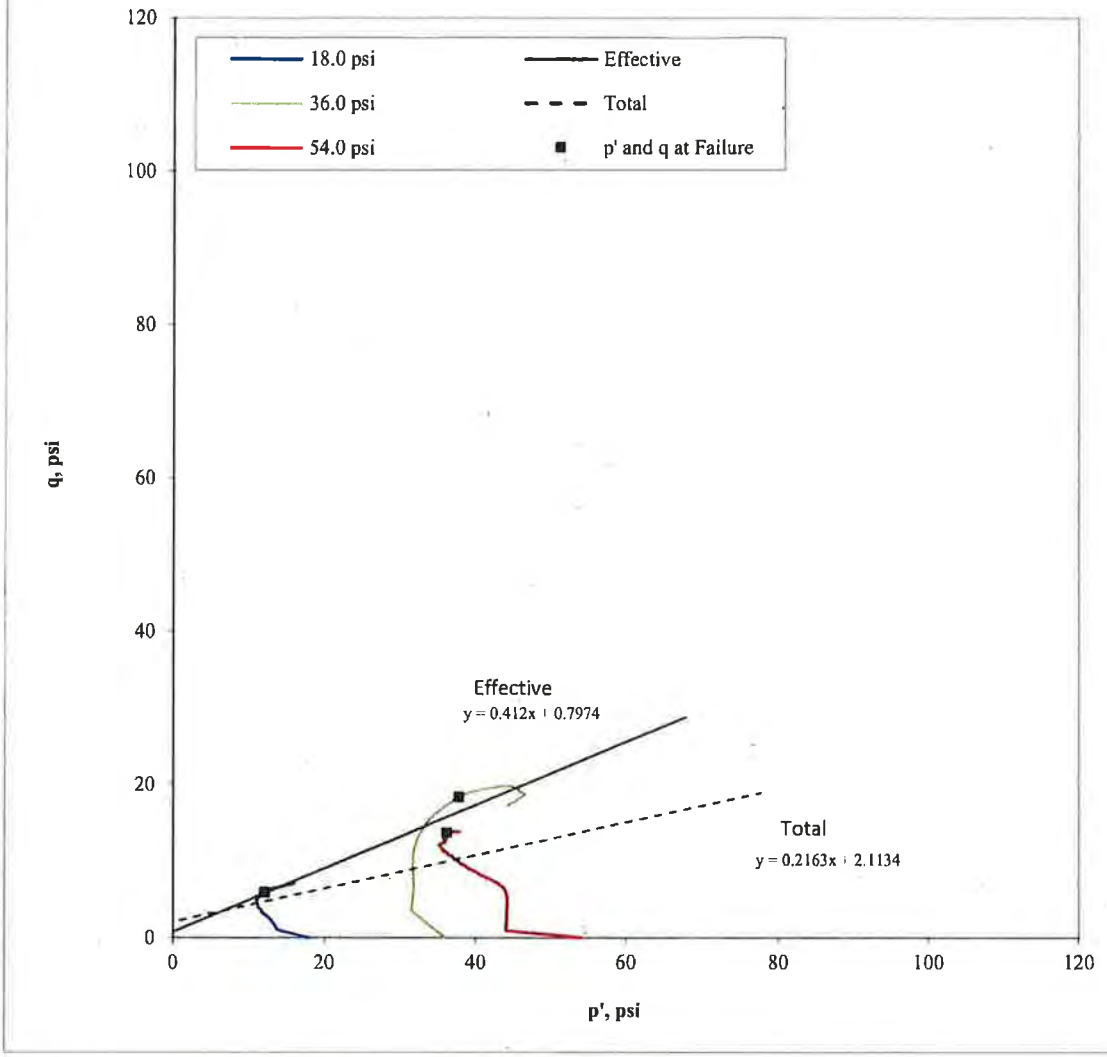
Golder Associates Inc. Atlanta, Georgia	Title: ASTM D4767 CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT q AND EXCESS PORE PRESSURE PLOTS				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample:	Technician: PWM/FT	Reviewed: SP	Start Date:	Job Number:	Figure:
RP-4 UD 20.0-22.0'	Check: MWM	Approved:	7/17/2018	18103173	2





Golder Associates Inc. Atlanta, Georgia	Title: ASTM D4767 CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT DEVIATOR STRESS AND PRINCIPAL STRESS RATIO PLOT				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: RP-4 UD 20.0-22.0'	Technician: PWM/FT Check:	Reviewed: Approved:	Start Date: 7/17/2018	Job Number: 18103173	Figure: 3

Stress Path (p'-q) Plot



Confining Pressure (psi)	p at failure (psi)	p' at failure (psi)	q at failure (psi)
18.0	23.9	12.2	5.9
36.0	54.3	37.8	18.3
54.0	67.7	36.2	13.7

Effective

α ' =	22.4	degree
a' =	0.8	psi

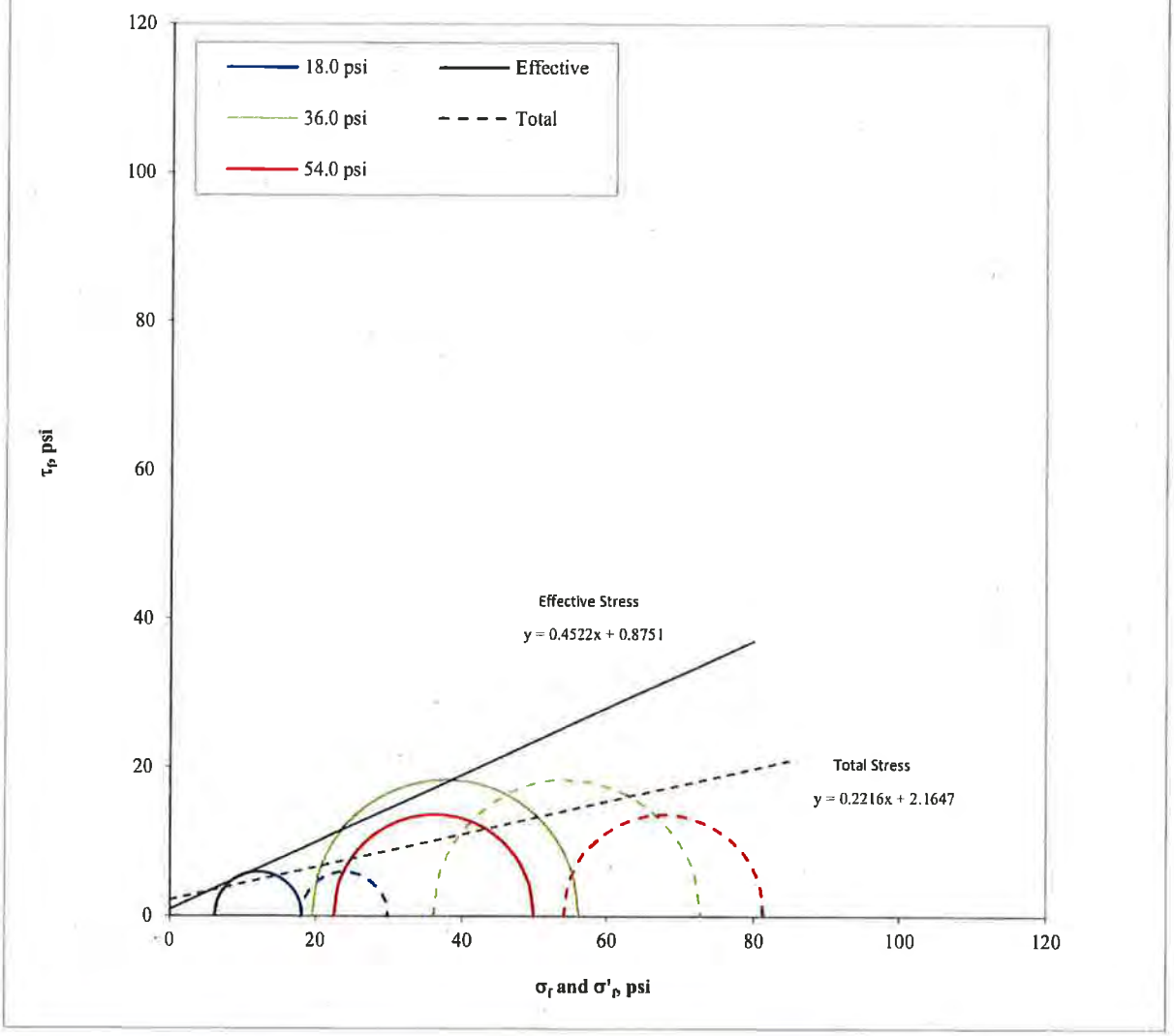
Total

α =	12.2	degree
a =	2.1	psi

Note: The laboratory testing relates only to the sample tested. GAI neither accepts responsibility for nor makes claims to the final use and purpose of the material.

Golder Associates Inc. Atlanta, Georgia	**Title:** ASTM D4767 CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT STRESS PATH PLOT				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: RP-4 UD 20.0-22.0'	**Technician:** PWM/FT **Check:** JWM	**Reviewed:** **Approved:**	**Start Date:** 7/17/2018	**Job Number:** 18103173	**Figure:** 4

Mohr's Circle Diagram



Confining Pressure (psi)	σ'_1 at failure (psi)	σ'_3 at failure (psi)	σ_1 at failure (psi)	σ_3 at failure (psi)
18.0	18.1	6.2	29.9	18.0
36.0	56.1	19.5	72.6	36.0
54.0	49.9	22.6	81.3	54.0

Effective

ϕ' =	24.3	degree
c' =	0.9	psi

Total

ϕ =	12.5	degree
c =	2.2	psi

Note: The laboratory testing relates only to the sample tested. GAI neither accepts responsibility for nor makes claims to the final use and purpose of the material.

Golder Associates Inc.
Atlanta, Georgia

Title:
ASTM D4767
CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT
MOHR'S CIRCLE DIAGRAM

Job Short Title: FTN/ENTERGY WHITE BLUFF/AR

Sample:	Technician:	Reviewed:	Start Date:	Job Number:	Figure:
RP-4 UD 20.0-22.0'	PWM/FT Check:	Approved:	7/17/2018	18103173	5

18.0 psi

36.0 psi

54.0 psi

NOTE: Pore pressure built up before shearing, adjusted results to initial backpressure.

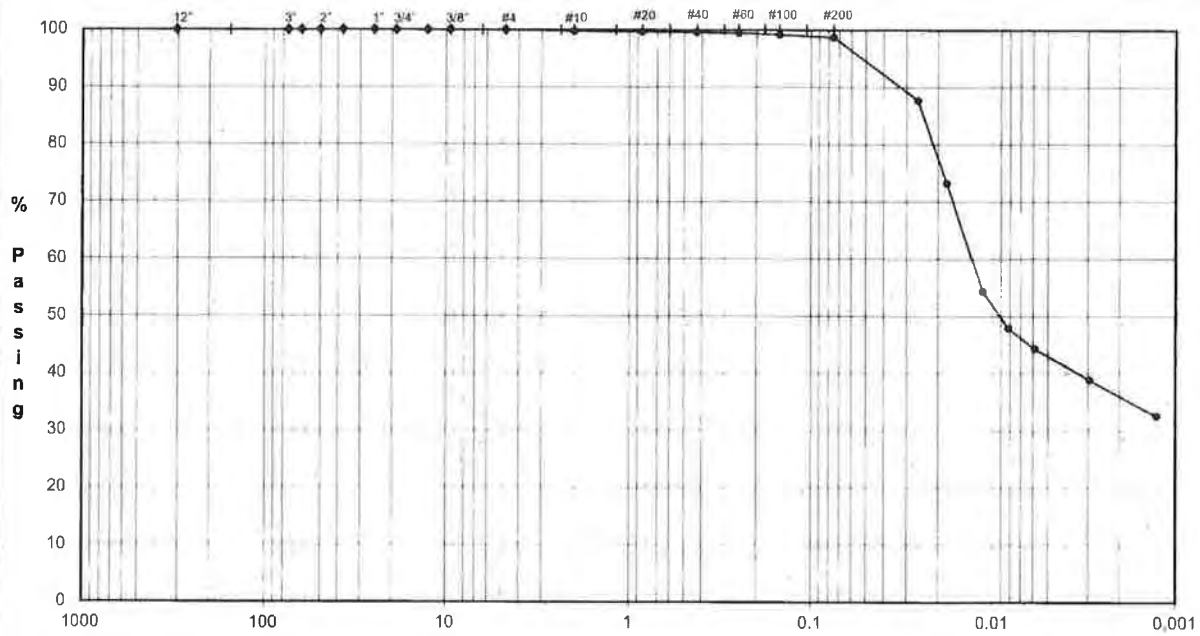
Golder Associates Inc. **Atlanta, Georgia**	**Title:** **ASTM D4767** **CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST REPORT** **SPECIMENS PHOTOGRAPH - 18.0 / 36.0 / 54.0 psi**				
Job Short Title: **FTN/ENTERGY WHITE BLUFF/AR**					
Sample: **RP-4 UD 20.0-22.0'**	**Technician:** **PWM/FT** **Check:** PWM	**Reviewed:** SK **Approved:**	**Start Date:** **7/17/2018**	**Job Number:** **18103173**	**Figure:** **6**

AUGUST 2018 | 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **RP-4** Depth: **25.0-26.0'**
TYPE: **Bag**



COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

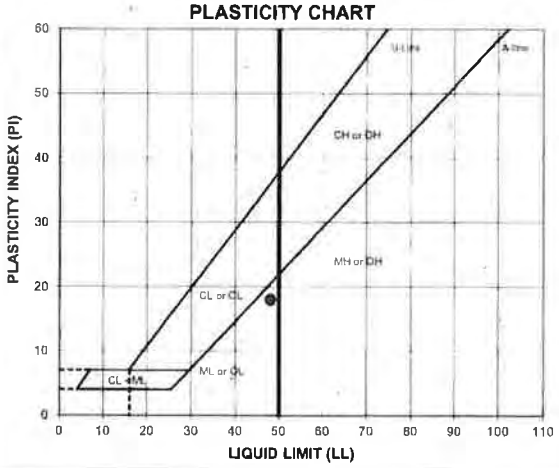
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**99.8**	Coarse Sand	**0.2**
#20	0.85	**99.7**		
#40	0.43	**99.6**	Medium Sand	**0.2**
#60	0.25	**99.5**		
#100	0.15	**99.2**		
#200	0.075	**98.7**	Fine Sand	**0.9**

Hydrometer Analysis

(mm)	%Finer		
0.026	**87.7**		
0.018	**73.2**		
0.011	**54.2**	Fines	
0.0082	**47.9**	Silt or Clay	**98.7**
0.0059	**44.3**		
0.0029	**38.9**		
0.0013	**32.5**		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

NL	LL	PL	PI	LI
37.7	**48**	**30**	**18**	**0.40**

LL (oven-dried) / 0.75 ORGANIC (OL OH)

DESCRIPTION: CLAYEY SILT, trace fine to coarse sand; dark yellowish brown.

USCS: ML

TECH	HH/HEH/TJ
DATE	8/1/18
CHECK	
REVIEW	
APPROVE	

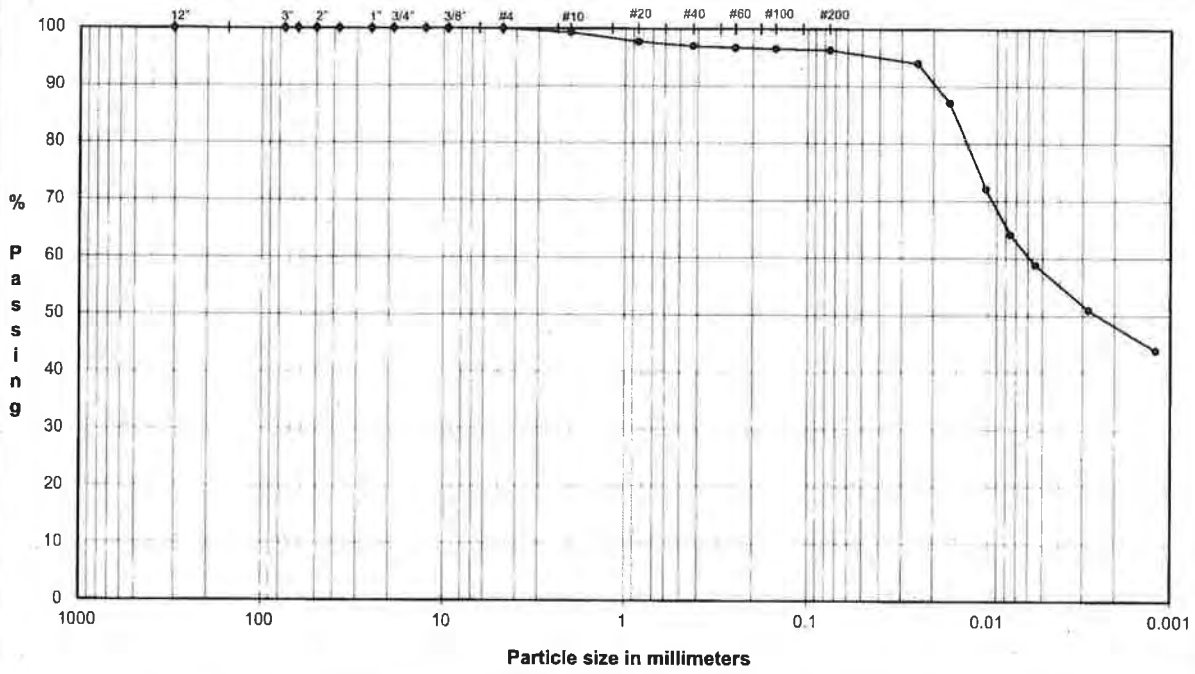
AUGUST 2018

18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **RP-4** Depth: **30.0-32.0'**
TYPE: **UD**



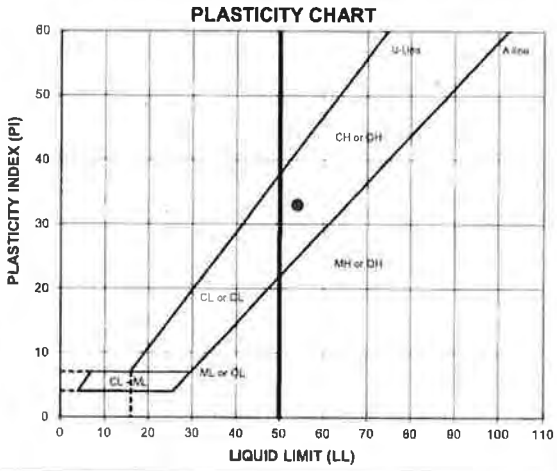
COBBLES	Coarse GRAVEL	Fine GRAVEL	Coarse SAND	Medium SAND	Fine SAND	Silt or Clay FINES

U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**99.3**	Coarse Sand	**0.7**
#20	0.85	**97.8**		
#40	0.43	**97.0**	Medium Sand	**2.3**
#60	0.25	**96.7**		
#100	0.15	**96.5**		
#200	0.075	**96.3**	Fine Sand	**0.7**

Hydrometer Analysis

(mm)	%Finer		
0.024	**94.0**		
0.016	**87.0**		
0.010	**72.1**	Fines	
0.0075	**64.2**	Silt or Clay	**96.3**
0.0055	**58.9**		
0.0028	**51.0**		
0.0012	**43.9**		



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
37.1	**54**	**21**	**33**	**0.47**

LL (oven-dried) / 0.75 = ORGANIC (OL OH)

DESCRIPTION: CLAY, trace fine to coarse sand; brown, yellow, and gray.

USCS: CH

TECH	TB/HH/HEH
DATE	8/1/18
CHECK	
REVIEW	
APPROVE	

Golder Associates Inc.

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

PROJECT TITLE	FTN/ENTERGY WHITE BLUFF/AR		Board #	7	COMMENTS
PROJECT NUMBER	18103173		Flow Pump	2	
SAMPLE ID	RP-4	30.0-32.0'	Flow Pump Speed	7	
SAMPLE TYPE	UD		Technician	FT	

Sample Data, Initial				Sample Data, Final	
Height, inches	3.137	B-Value, f	1.00	Height, inches	3.135
Diameter, inches	2.879	Cell Pres.	90.0	Diameter, inches	2.878
Area, cm²	42.00	Bot. Pres.	80.0	Area, cm²	41.97
Volume, cm³	334.65	Top Pres.	80.0	Volume, cm³	334.20
Mass, g	589.95	Tot. B.P.	80.0	Mass, g	596.75
Moisture Content, %	37.08	Head, max.	123.80	Moisture Content, %	38.66
Dry Density, pcf	80.25	Head, min.	123.80	Dry Density, pcf	80.36
Spec. Gravity (assumed)	2.700	Max. Grad.	15.55	Volume Solids, cm³	159.40
Volume Solids, cm³	159.40	Min. Grad.	15.55	Volume Voids, cm³	174.81
Volume Voids, cm³	175.25			Void Ratio	1.10
Void Ratio	1.10			Saturation, %	95.2%
Saturation, %	91.1%				

WATER CONTENTS		Sample Initial	Sample Final
Wt Soil & Tare, i	g	589.95	711.15
Wt Soil & Tare, f	g	430.37	544.79
Wt Tare	g	0.00	114.47
Wt Moisture Lost	g	159.58	166.36
Wt Dry Soil	g	430.37	430.32
Water Content	%	37.08%	38.66%

Flow Pump Rate: 2.38E-04 cm³/sec

USCS: CH

DESCRIPTION: CLAY, trace fine to coarse sand; brown, yellow, and gray.

TIME FUNCTIONS, SECONDS								dP				
DATE	DAY	HOUR	MIN	TEMP (°C)	dt (min)	dt,acc (min)	dt (sec)	dt,acc (sec)	Reading (psi)	Head (cm)	Gradient	Permeability (cm/sec)
08/02/18	43314	10	0	21.4	0	0	0	0	1.76	123.80	15.55	3.5E-07
08/02/18	43314	10	5	21.4	5	5	300	300	1.76	123.80	15.55	3.5E-07
08/02/18	43314	10	10	21.4	5	10	300	600	1.76	123.80	15.55	3.5E-07
08/02/18	43314	10	15	21.4	5	15	300	900	1.76	123.80	15.55	3.5E-07 *
08/02/18	43314	10	20	21.4	5	20	300	1200	1.76	123.80	15.55	3.5E-07 *
08/02/18	43314	10	25	21.4	5	25	300	1500	1.76	123.80	15.55	3.5E-07 *
08/02/18	43314	10	30	21.4	5	30	300	1800	1.76	123.80	15.55	3.5E-07 *

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.5E-07 cm/sec **

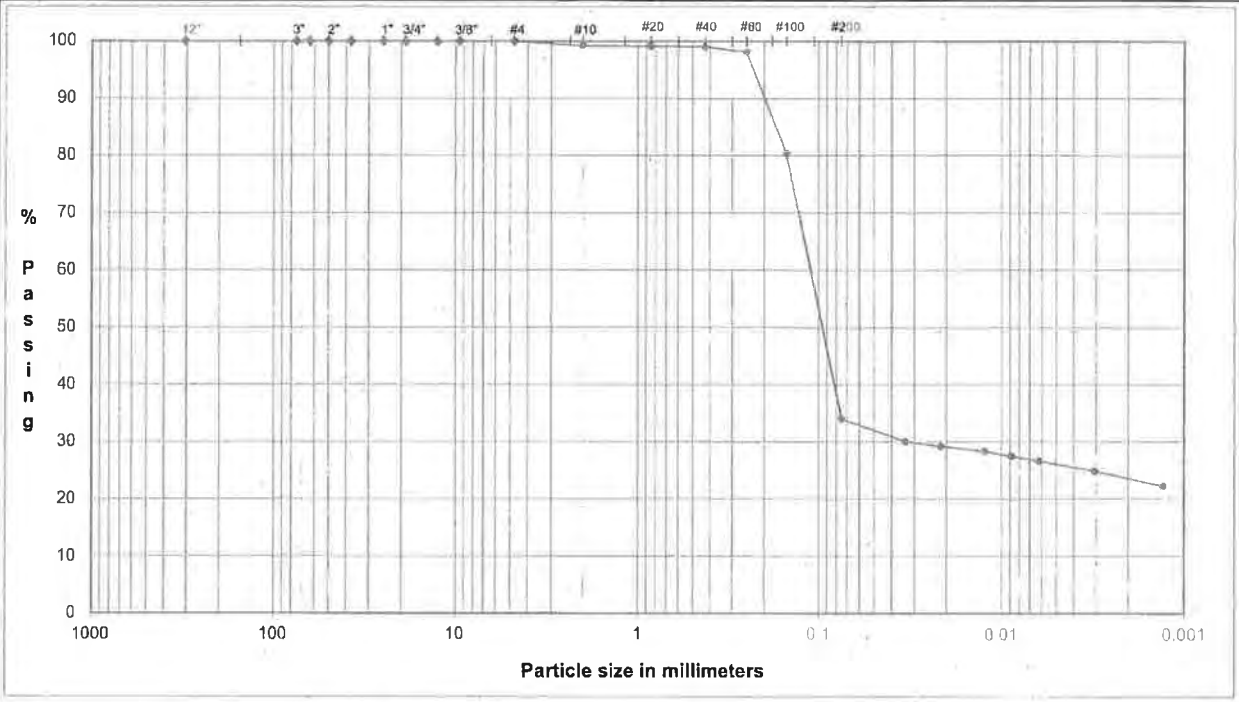
DATE	8/2/18
CHECK	
REVIEW	
APPROVE	

AUGUST 2018 | 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **RP-5** Depth: **15.0-18.0'**
TYPE: **Bag**



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay

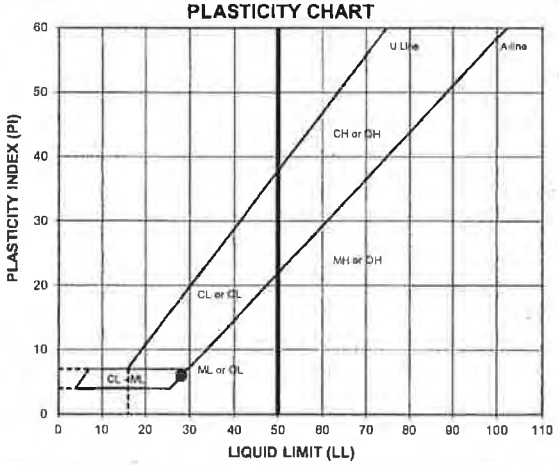
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**99.2**	Coarse Sand	**0.8**
#20	0.85	**99.1**		
#40	0.43	**99.0**	Medium Sand	**0.2**
#60	0.25	**98.0**		
#100	0.15	**80.3**		
#200	0.075	**34.0**	Fine Sand	**65.0**

Hydrometer Analysis

(mm)	%Finer		
0.034	**30.0**		
0.021	**29.2**		
0.012	**28.3**	Fines	
0.0088	**27.5**	Silt or Clay	**34.0**
0.0063	**26.6**		
0.0031	**24.9**		
0.0013	**22.3**		

PLASTICITY CHART



ATTERBERG LIMITS
Method -B (Dry preparation)

M_c	LL	PL	PI	LI
24.4	**28**	**22**	**6**	**0.51**

LL (oven-dried) / 0.75 · ORGANIC (OL/OH)

DESCRIPTION: CLAYEY SAND to SILTY SAND, fine to coarse; yellowish brown.

USCS: SC-SM

TECH	HH/HEH/TJ
DATE	8/1/18
CHECK	
REVIEW	
APPROVE	

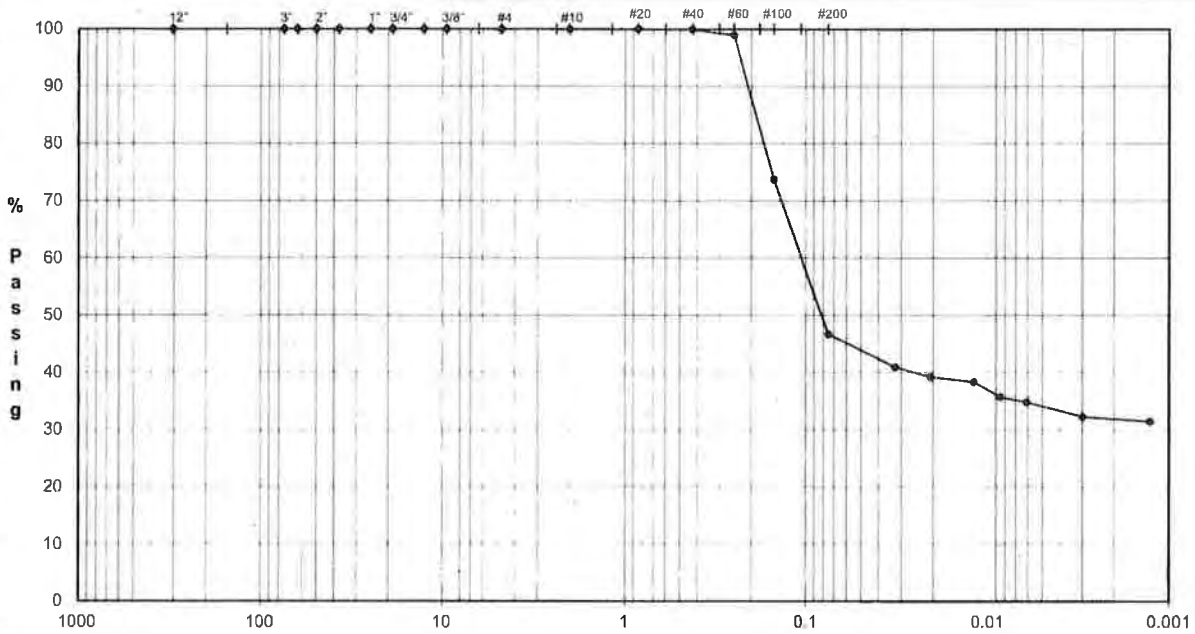
Golder Associates Inc.

AUGUST 2018 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **RP-7** Depth: **16.6-17.4'**
TYPE: **Bag**



COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

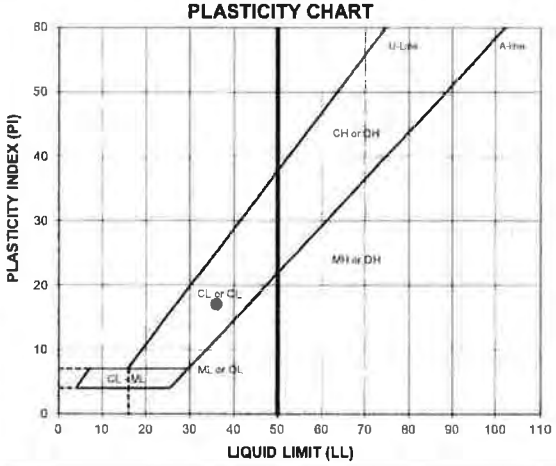
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**100.0**	Coarse Sand	**0.0**
#20	0.85	**100.0**		
#40	0.43	**99.9**	Medium Sand	**0.1**
#60	0.25	**98.9**		
#100	0.15	**73.6**		
#200	0.075	**46.7**	Fine Sand	**53.3**

Hydrometer Analysis

(mm)	%Finer		
0.032	**40.9**		
0.021	**39.2**		
0.012	**38.3**	Fines	
0.0085	**35.7**	Silt or Clay	**46.7**
0.0061	**34.8**		
0.0030	**32.2**		
0.0013	**31.4**		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
22.3	**36**	**19**	**17**	**0.20**

LL (oven-dried) / 0.75 ORGANIC (OL OH)

DESCRIPTION: SAND and SILTY CLAY, fine to medium; dark gray.

USCS: SC

TECH	HH/HEH/TJ
DATE	8/2/18
CHECK	
REVIEW	
APPROVE	

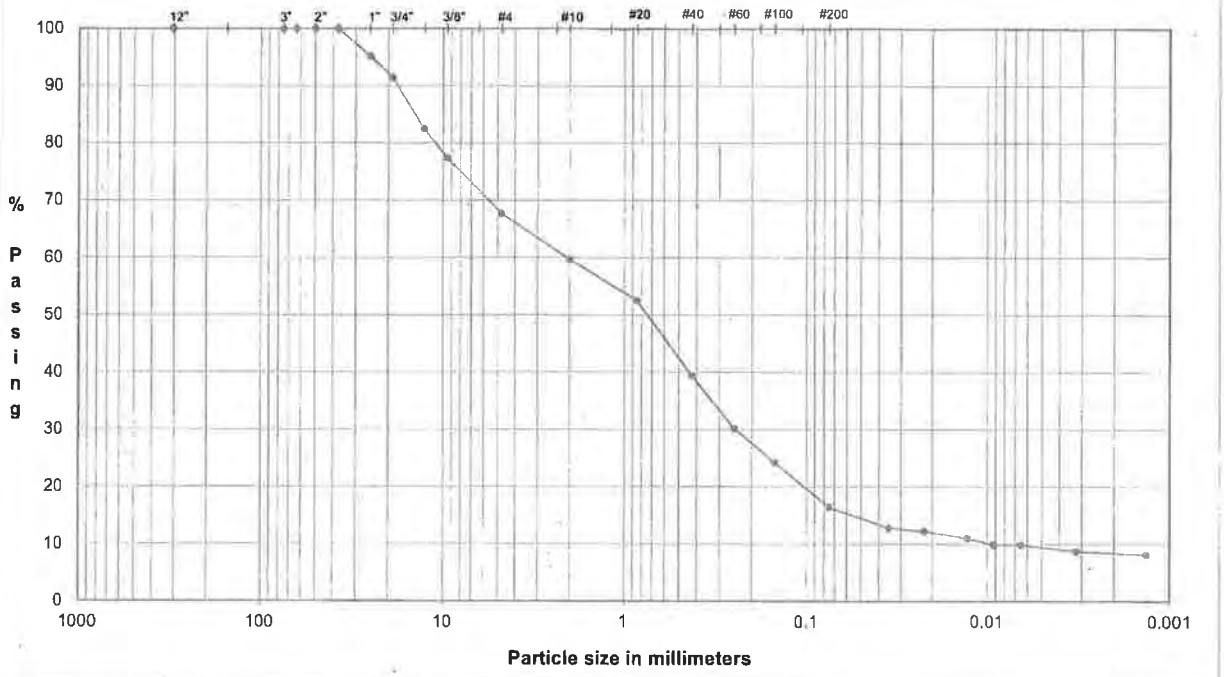
Golder Associates Inc.

AUGUST 2018 | 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **RP-9** Depth: **9.0-10.0'**
TYPE: **Bag**



COBBLES	Coarse GRAVEL	Fine GRAVEL	Coarse SAND	Medium SAND	Fine SAND	Silt or Clay FINES

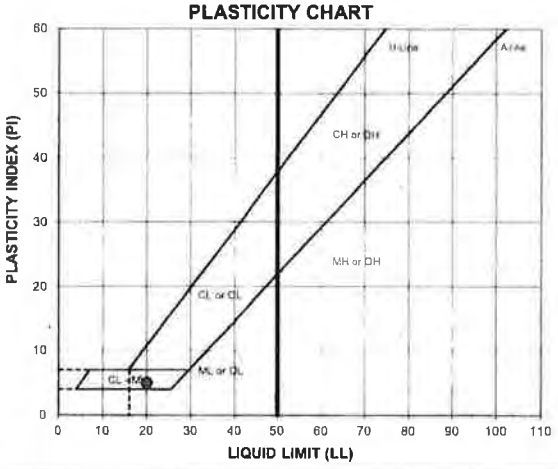
U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**95.1**		
0.75"	19.0	**91.4**	Coarse Gravel	**8.6**
0.50"	12.7	**82.4**		
0.375"	9.5	**77.3**		
#4	4.8	**67.7**	Fine Gravel	**23.7**
#10	2.00	**59.7**	Coarse Sand	**8.0**
#20	0.85	**52.5**		
#40	0.43	**39.4**	Medium Sand	**20.3**
#60	0.25	**30.2**		
#100	0.15	**24.2**		
#200	0.075	**16.4**	Fine Sand	**23.0**

Hydrometer Analysis

(mm)	%Finer		
0.035	**12.8**		
0.022	**12.2**		
0.013	**11.0**	Fines Silt or Clay	**16.4**
0.0092	**9.9**		
0.0065	**9.9**		
0.0032	**8.7**		
0.0013	**8.1**		

PLASTICITY CHART



ATTERBERG LIMITS

Method -B (Dry preparation)

M,	LL	PL	PI	LI
4.2	**20**	**15**	**5**	**-2.35**

LL (oven-dried) / 0.75 ORGANIC (OL/OH)

DESCRIPTION: gravelly CLAYEY SAND to SILTY SAND, fine to coarse, fine to coarse gravel; reddish brown.

USCS: SC-SM

TECH	HH/HEH/TJ
DATE	8/1/18
CHECK	
REVIEW	
APPROVE	

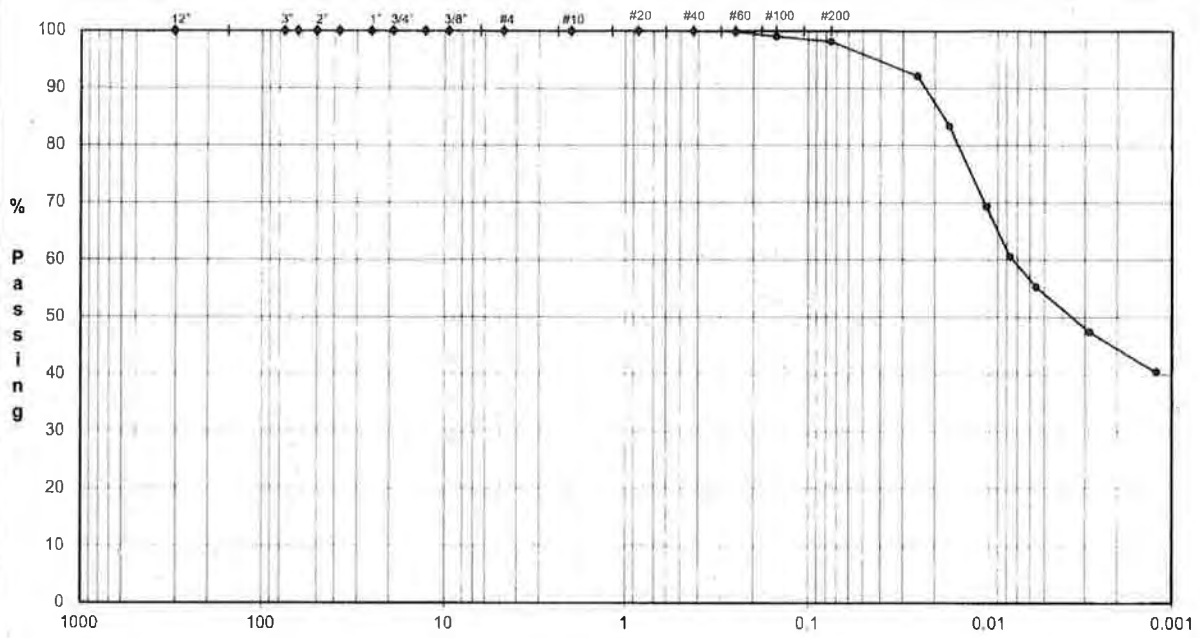
NOTE: Insufficient sample received to perform in accordance with ASTM Standards

AUGUST 2018 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **RP-9** Depth: **26.0-27.0'**
TYPE: **Bag**



COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

U.S. Standard Sieves Sizes and Numbers

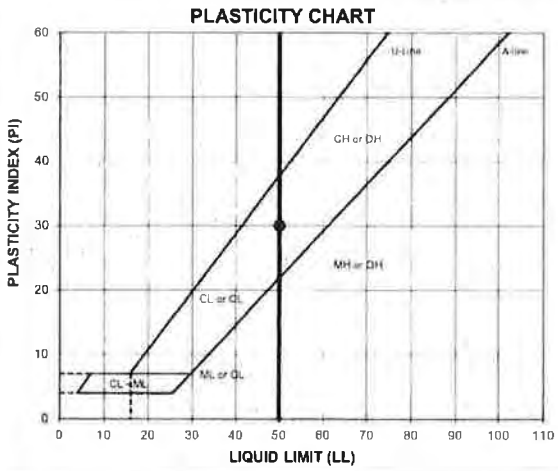
	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**100.0**	Coarse Sand	**0.0**
#20	0.85	**100.0**		
#40	0.43	**100.0**	Medium Sand	**0.0**
#60	0.25	**99.9**		
#100	0.15	**99.0**		
#200	0.075	**98.1**	Fine Sand	**1.8**

Hydrometer Analysis

(mm)	%Finer		
0.025	**92.1**		
0.017	**83.4**		
0.010	**69.3**	Fines	
0.0077	**60.6**	Silt or Clay	**98.1**
0.0056	**55.3**		
0.0028	**47.4**		
0.0012	**40.4**		

DESCRIPTION: CLAY, trace fine sand; gray.

USCS: CH



ATTERBERG LIMITS

Method -B (Dry preparation)

M,	LL	PL	PI	LI
31.3	**50**	**20**	**30**	**0.36**

LL (oven-dried) / 0.75 ORGANIC / 0.OL OH

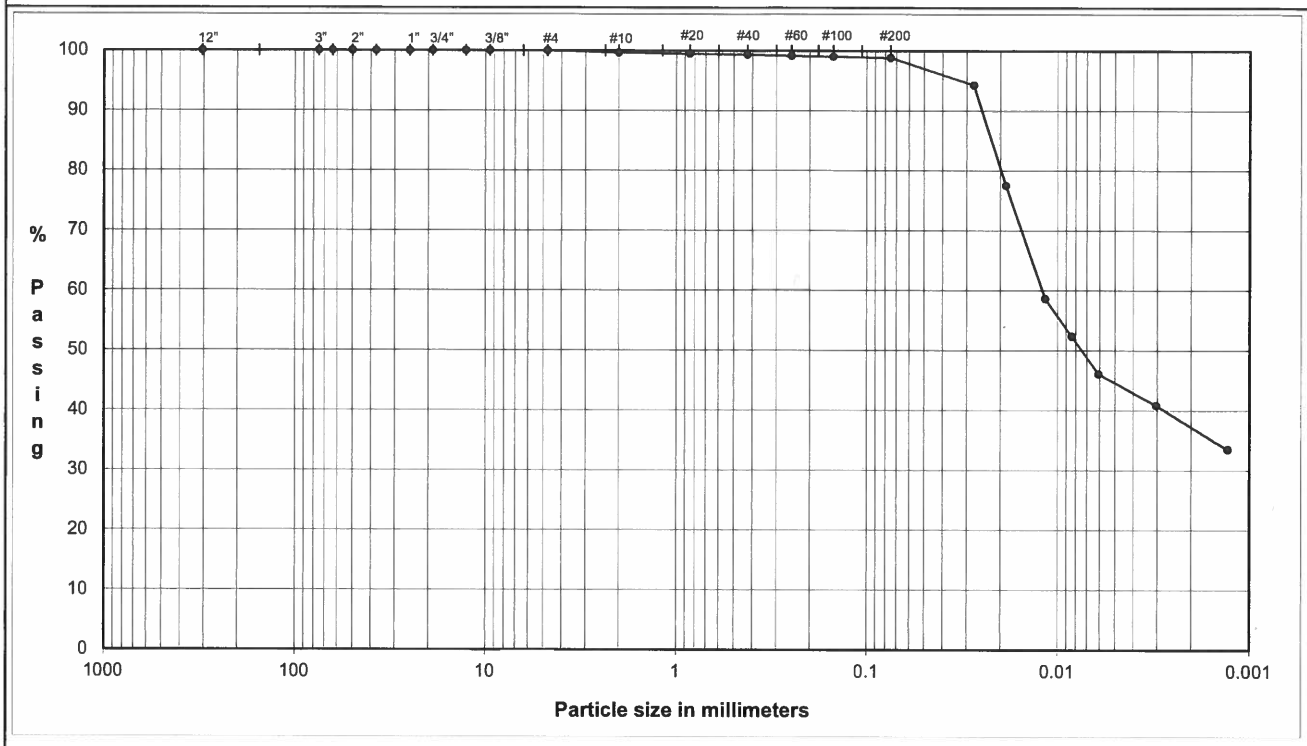
TECH	HH/HEH/TB
DATE	8/1/18
CHECK	
REVIEW	
APPROVE	

AUGUST 2018 18103173

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: **FTN/ENTERGY WHITE BLUFF/AR**
SAMPLE ID: **RP-9** Depth: **30.0-32.0'**
TYPE: **UD**



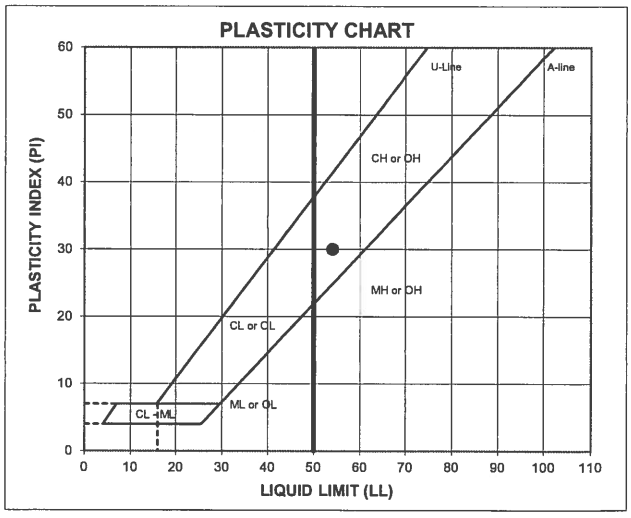
COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
	GRAVEL		SAND			FINES

U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	100.0		
3.0"	75.0	100.0	Cobbles	0.0
2.5"	63.5	100.0		
2.0"	50.0	100.0		
1.5"	37.5	100.0		
1.0"	25.0	100.0		
0.75"	19.0	100.0	Coarse Gravel	0.0
0.50"	12.7	100.0		
0.375"	9.5	100.0		
#4	4.8	100.0	Fine Gravel	0.0
#10	2.00	99.6	Coarse Sand	0.4
#20	0.85	99.5		
#40	0.43	99.3	Medium Sand	0.3
#60	0.25	99.2		
#100	0.15	99.0		
#200	0.075	98.8	Fine Sand	0.5

Hydrometer Analysis

(mm)	%Finer		
0.027	94.3		
0.019	77.5		
0.012	58.7	Fines	
0.0084	52.4	Silt or Clay	98.8
0.0061	46.1		
0.0030	40.9		
0.0013	33.5		



ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
30.2	54	24	30	0.19

LL (oven-dried) / 0.75 = ORGANIC (OL/OH)

DESCRIPTION: CLAY, trace fine to coarse sand; olive gray.

USCS: CH

TECH	HEH/HH/HB/TJ
DATE	8/27/18
CHECK	
REVIEW	
APPROVE	

	Initial		Final		Notes
Height =	1.000	in	0.988	in	Visual description (Golder procedure): (CH) CLAY, trace fine to coarse sand; olive gray.
Diameter =	2.500	in	2.500	in	Atterberg Limits (ASTM D4318): LL = 54 PL = 24 PI = 30
Area =	4.909	in^2	4.909	in^2	Percent Finer (ASTM D422): 3/4 in. = 100% No. 4 = 100% No. 200 = 99%
Volume =	4.909	in^3	4.848	in^3	Specimen Type: [X] Intact [ ] Reconstituted
Water Content =	30.2%		34.0%		Remold Targets:
Specific Gravity =	2.67	(ASTM D854)	2.67	(ASTM D854)	Water Content of Trimmings (ASTM D2216): -
Height of Solids =	0.5345	in	0.5345	in	Trimming Procedure: Trimming ring
Void Ratio =	0.871		0.848		Inundation: [ ] Not inundated [X] Inundated at 1.70 ksf
Degree of Saturation =	92.5%		100.0%		Test Method: [ ] A [X] B
Wet Mass =	0.329	lb	0.338	lb	Apparatus: GeoTac automated consolidometer
Dry Mass =	0.253	lb	0.253	lb	Final Water Content Specimen: [X] Entire [ ] Partial
Wet Unit Weight =	115.7	pcf	120.6	pcf	Final Differential Height: 0.0000 in
Dry Unit Weight =	88.9	pcf	90.0	pcf	Estimated Preconsolidation Stress: ksf

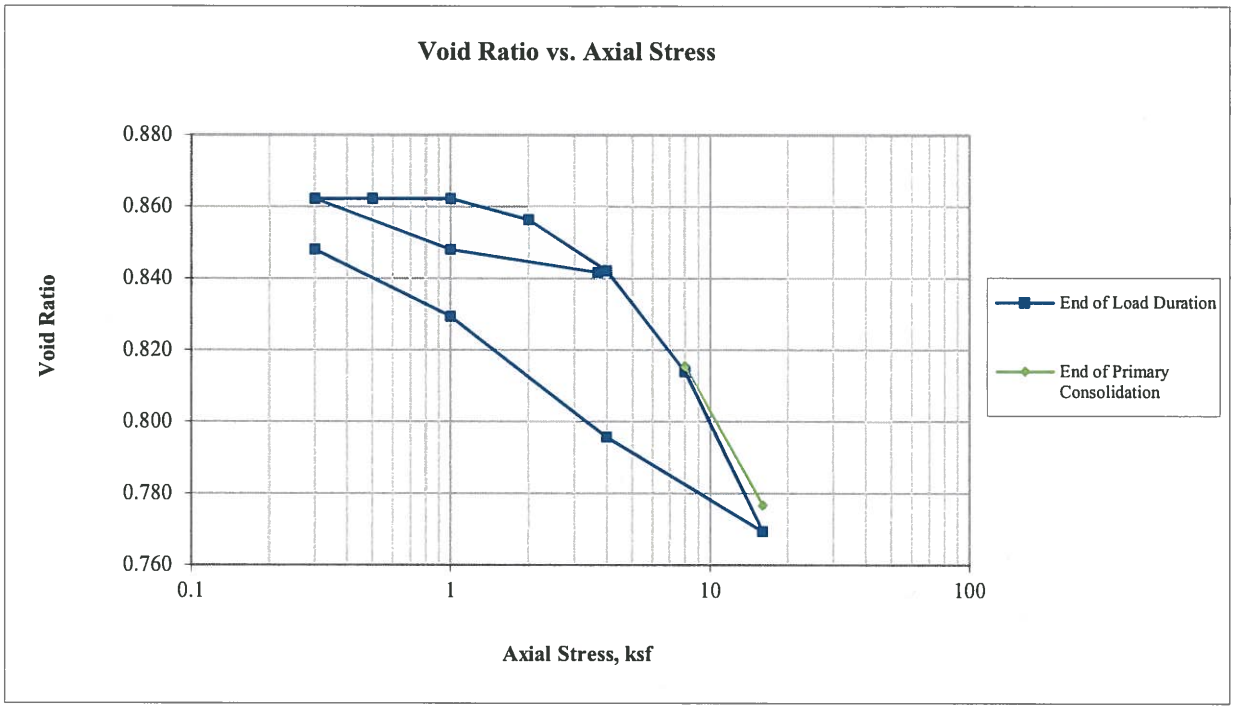
			At End of Primary Consolidation				At End of Load Duration							
	Axial Stress (ksf)	Load Duration (min)	Deformation (in)	Specimen Height (in)	Axial Strain (%)	Void Ratio	Deformation (in)	Specimen Height (in)	Axial Strain (%)	Void Ratio	Time Deformation Method	Average Void Ratio	Coefficient of Consolidation (ft^2/day)	Time to 50% Consolidation (min)
Seating*	1.70	60					0.0000	0.9925	0.00	0.857				
1	3.7	60					0.0082	0.9843	0.82	0.842				
2	1.0	60					0.0047	0.9877	0.47	0.848				
3	0.3	17					-0.0028	0.9953	-0.28	0.862				
4	0.5	60					-0.0029	0.9953	-0.29	0.862				
5	1.0	60					-0.0028	0.9953	-0.28	0.862				
6	2.0	60					0.0003	0.9922	0.03	0.856				
7	4.0	60					0.0080	0.9845	0.80	0.842				
8	8.0	240	0.0221	0.9704	2.21	0.816	0.0230	0.9695	2.30	0.814	2 (Root time)	0.822	0.322	1.3
9	16.0	240	0.0429	0.9496	4.29	0.777	0.0468	0.9457	4.68	0.769	2 (Root time)	0.790	0.247	1.8
10	4.0	240					0.0327	0.9597	3.27	0.796				
11	1.0	120					0.0147	0.9777	1.47	0.829				
12	0.3	27					0.0048	0.9877	0.48	0.848				

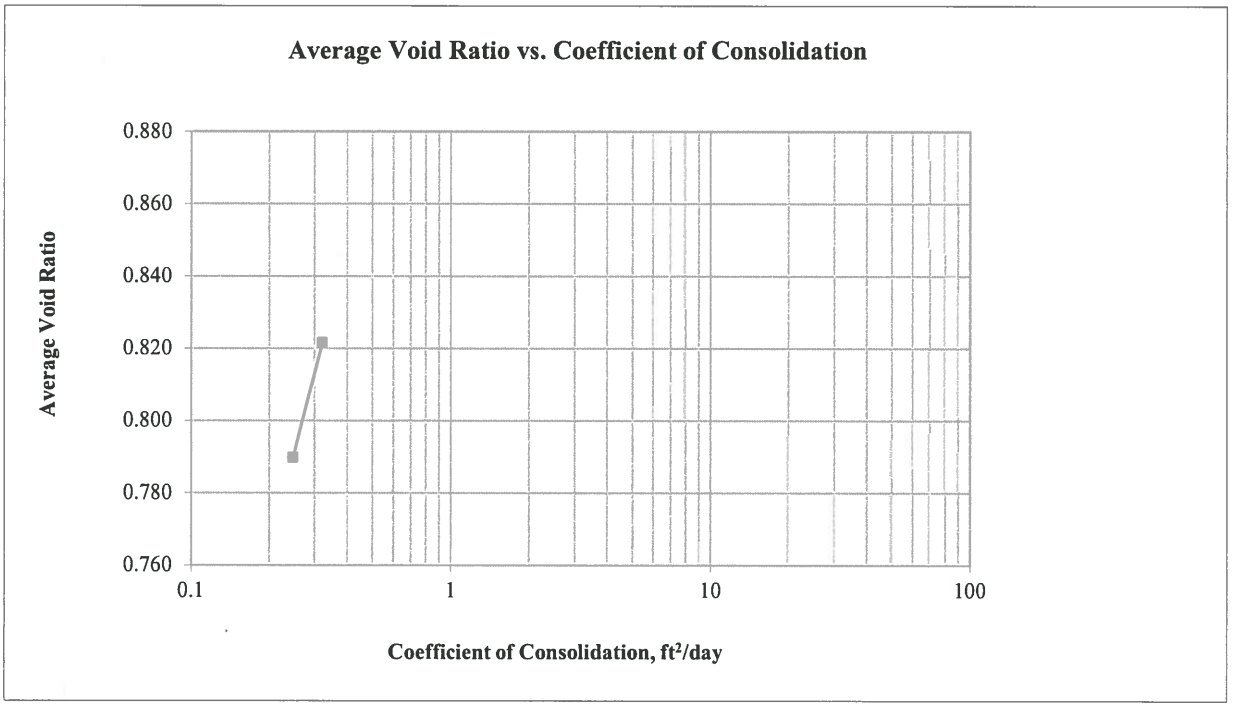
Golder Associates Inc.
Atlanta, Georgia

Title:
ASTM D2435
ONE-DIMENSIONAL CONSOLIDATION TEST REPORT
SPECIMEN AND SUMMARY DATA

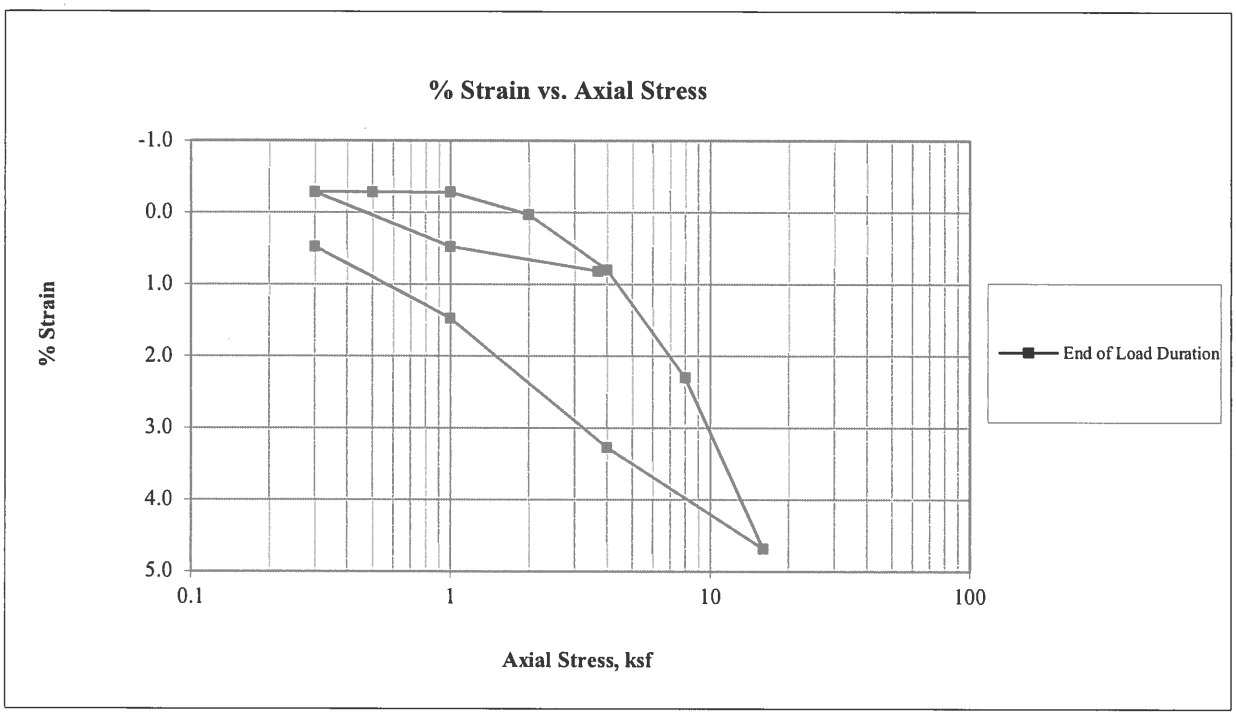
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR

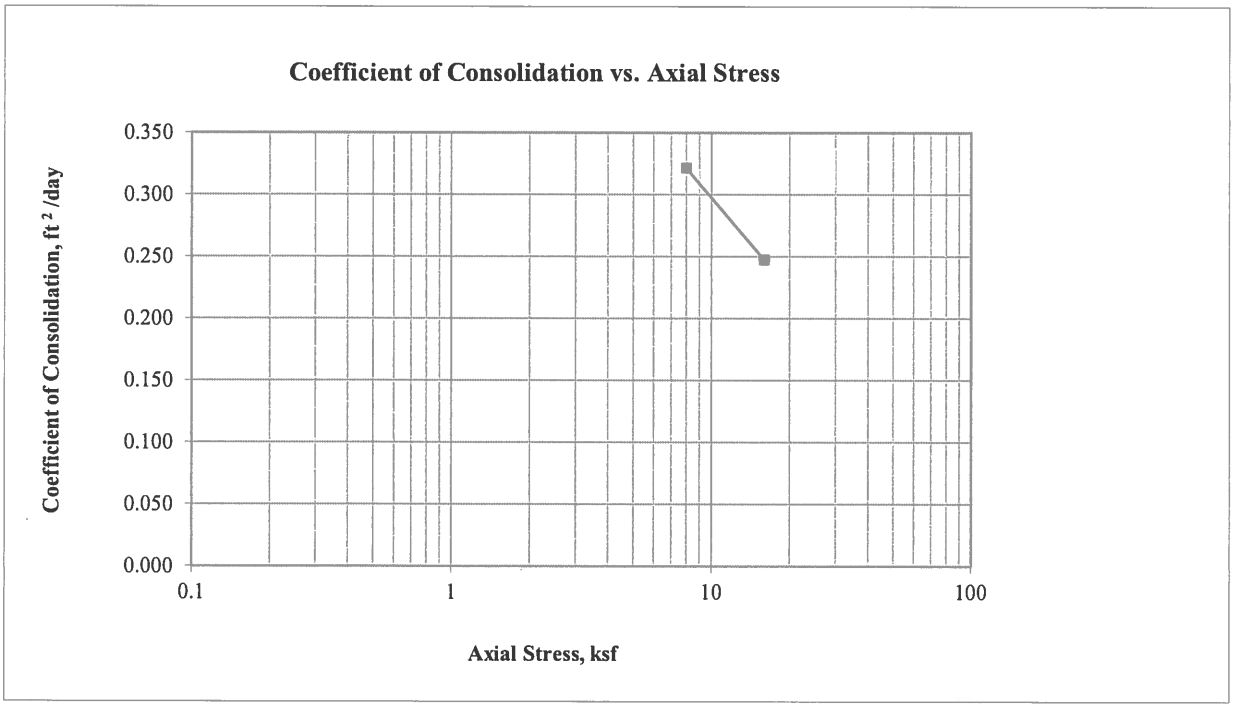
Sample:	Technician:	Checked:	Reviewed:	Approved:	Start Date:	Job Number:	Figure:
RP-9 UD 30.0-32.0'	PWM/FT	PWM			8/28/2018	18103173	1





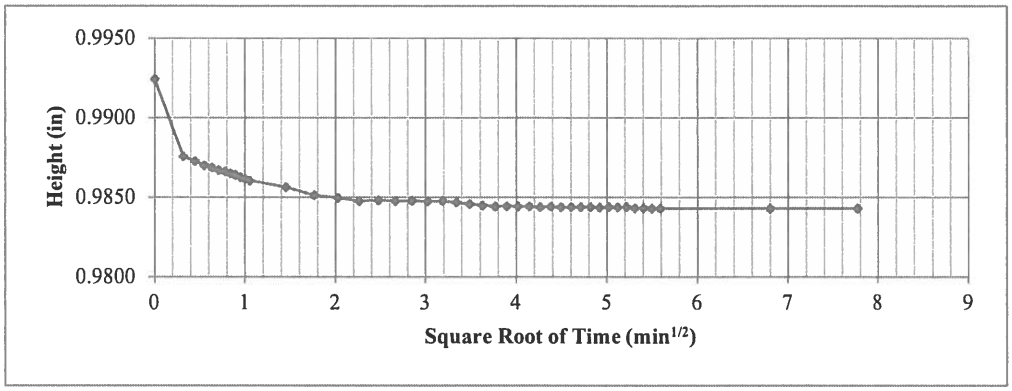
Golder Associates Inc. **Atlanta, Georgia**	**Title:** **ASTM D2435** **ONE-DIMENSIONAL CONSOLIDATION TEST REPORT** **CONSOLIDATION PLOTS**				
Job Short Title: **FTN/ENTERGY WHITE BLUFF/AR**					
Sample: **RP-9 UD 30.0-32.0'**	**Technician:** **PWM/FT**	**Reviewed:**	**Start Date:** **8/28/2018**	**Job Number:** **18103173**	**Figure:** **2**



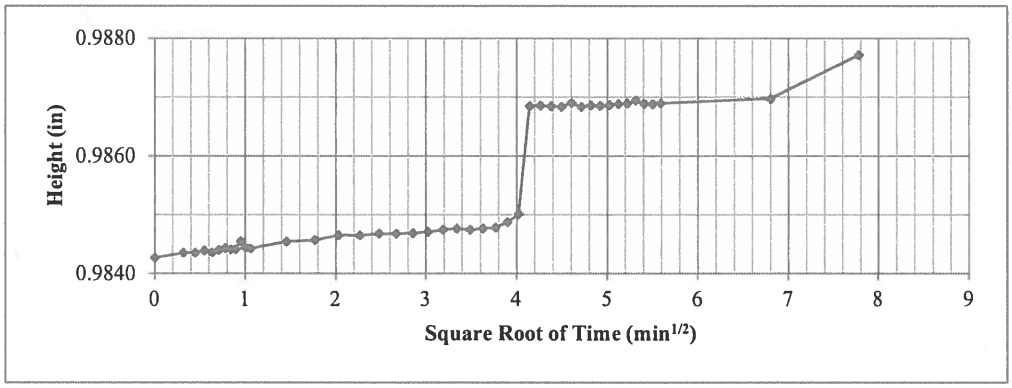


Golder Associates Inc. Atlanta, Georgia	Title: ASTM D2435 ONE-DIMENSIONAL CONSOLIDATION TEST REPORT CONSOLIDATION PLOTS				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: RP-9 UD 30.0-32.0'	Technician: PWM/FT	Reviewed:	Start Date: 8/28/2018	Job Number: 18103173	Figure: 2A

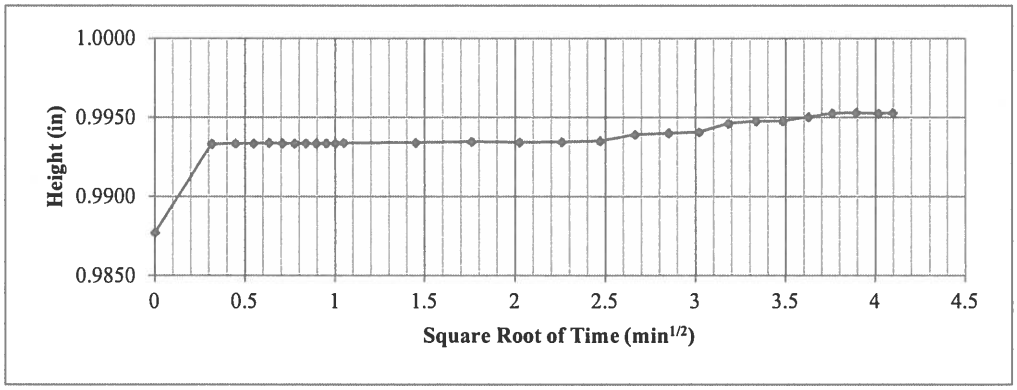
3.7 ksf



1.0 ksf

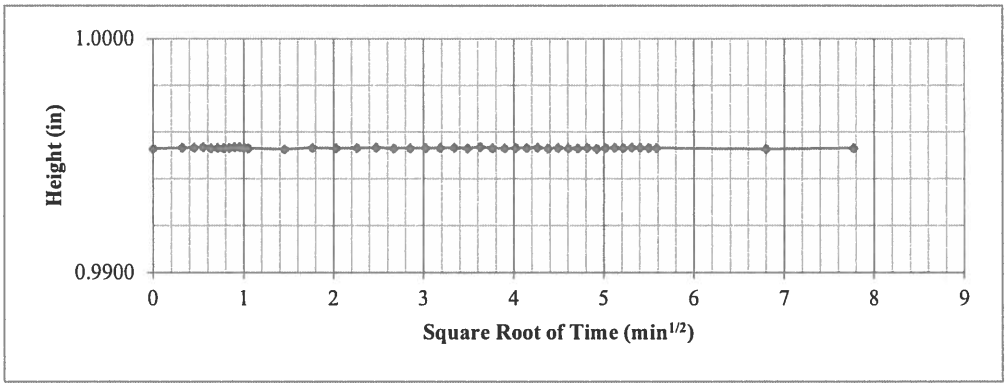


0.3 ksf

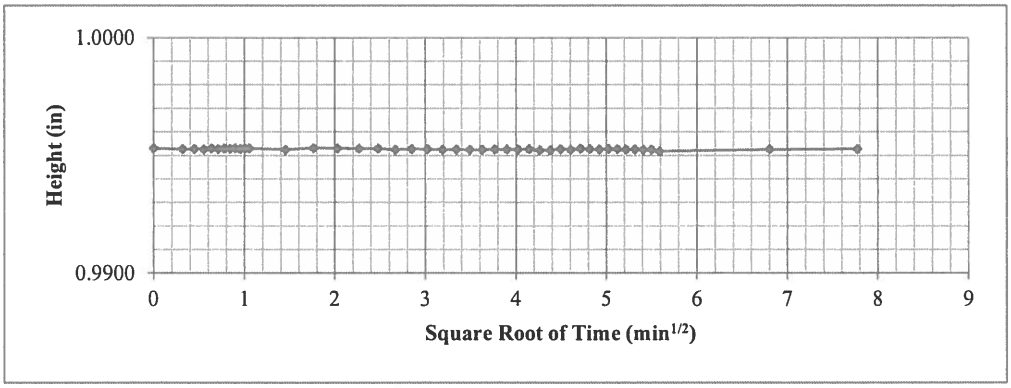


Golder Associates Inc. Atlanta, Georgia	Title: ASTM D2435 ONE-DIMENSIONAL CONSOLIDATION TEST REPORT TIME-DEFORMATION PLOTS (1)				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: RP-9 UD 30.0-32.0'	Technician: PWM/FT	Reviewed:	Start Date: 8/28/2018	Job Number: 18103173	Figure: 3

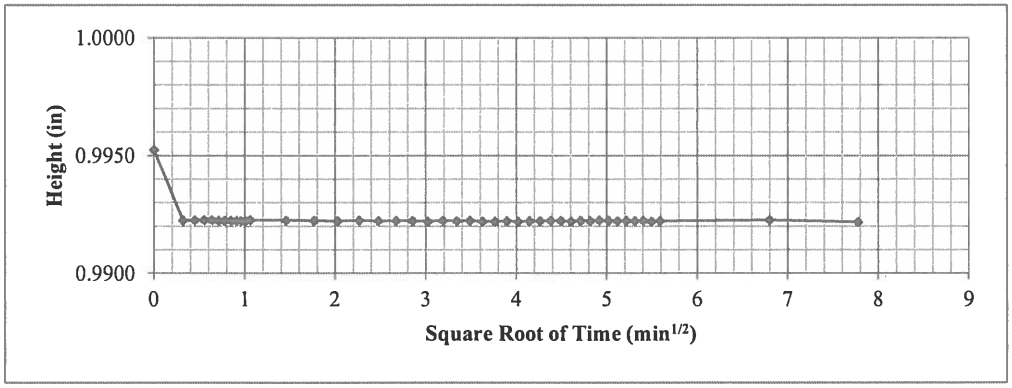
0.5 ksf



1.0 ksf

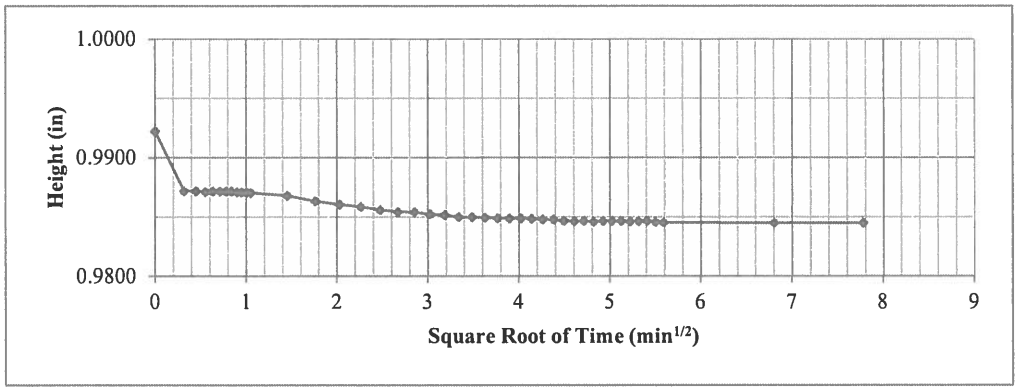


2.0 ksf

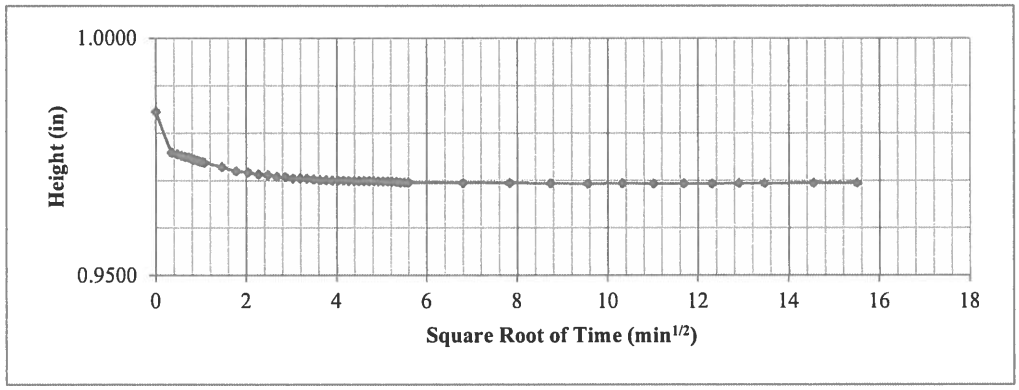


Golder Associates Inc. Atlanta, Georgia	Title: ASTM D2435 ONE-DIMENSIONAL CONSOLIDATION TEST REPORT TIME-DEFORMATION PLOTS (2)				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: RP-9 UD 30.0-32.0'	Technician: PWM/FT	Reviewed:	Start Date: 8/28/2018	Job Number: 18103173	Figure: 4

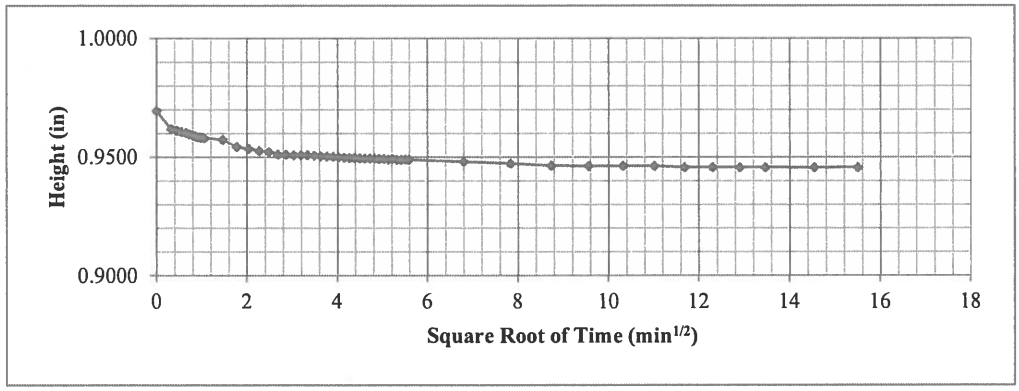
4.0 ksf



8.0 ksf

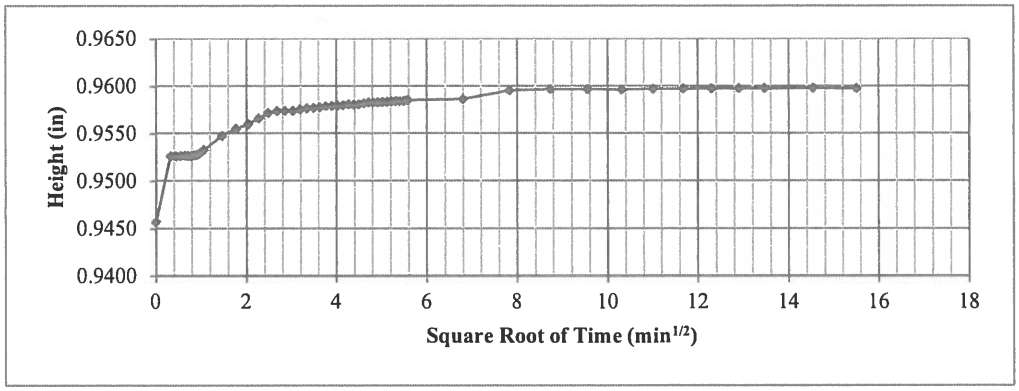


16.0 ksf

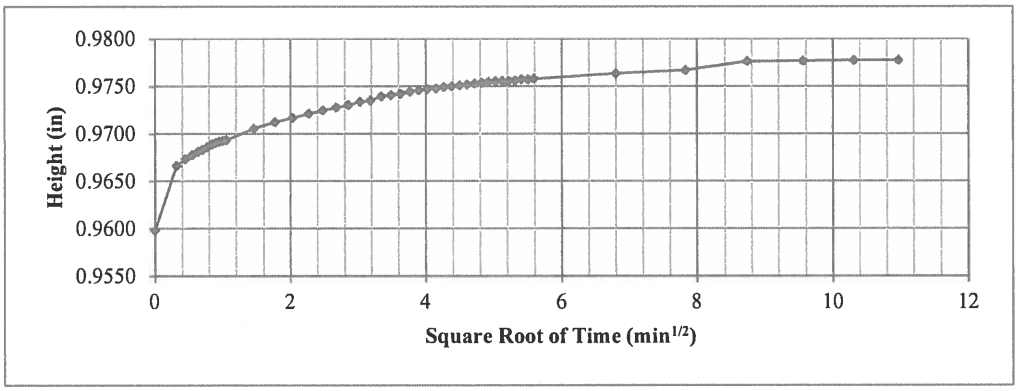


Golder Associates Inc. **Atlanta, Georgia**	**Title:** **ASTM D2435** **ONE-DIMENSIONAL CONSOLIDATION TEST REPORT** **TIME-DEFORMATION PLOTS (3)**				
Job Short Title: **FTN/ENTERGY WHITE BLUFF/AR**					
Sample: **RP-9 UD 30.0-32.0'**	**Technician:** **PWM/FT**	**Reviewed:**	**Start Date:** **8/28/2018**	**Job Number:** **18103173**	**Figure:** **5**

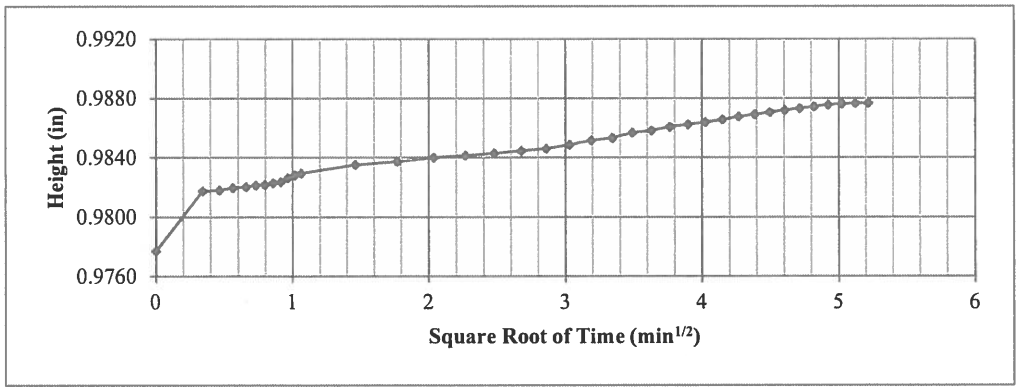
4.0 ksf



1.0 ksf



0.3 ksf



Golder Associates Inc. Atlanta, Georgia	Title: ASTM D2435 ONE-DIMENSIONAL CONSOLIDATION TEST REPORT TIME-DEFORMATION PLOTS (4)				
Job Short Title: FTN/ENTERGY WHITE BLUFF/AR					
Sample: RP-9 UD 30.0-32.0'	Technician: PWM/FT	Reviewed:	Start Date: 8/28/2018	Job Number: 18103173	Figure: 6

Appendix G
Static and Seismic Slope Stability Model Outputs

Slope stability analysis

Input data

Project

Task : Slope Stability Analysis
Description : Composite Slope Encompassing the Worst-Case Geometry
Author : ERM - Annapolis
Date : 12/10/2018

Settings

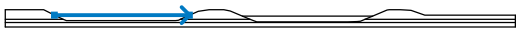
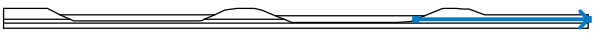
Standard - safety factors

Stability analysis

Earthquake analysis : Standard
Verification methodology : Safety factors (ASD)

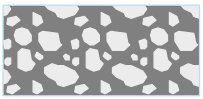
Safety factors			
Seismic design situation			
Safety factor :	SF_s =	1.00	[–]

Interface

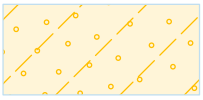
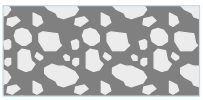
No.	Interface location	Coordinates of interface points [ft]					
		x	z	x	z	x	z
1		-480.00	281.00	-396.00	281.00	-372.12	269.00
		-352.68	260.06	-346.00	257.00	-106.00	257.00
		-100.00	258.00	-95.63	259.96	-75.60	268.96
		-56.00	277.75	-32.48	281.00	0.00	281.00
		14.18	278.00	40.68	267.00	40.70	266.99
		57.43	260.06	72.00	254.00	272.00	254.00
		292.00	255.00	300.00	256.00	309.46	259.91
		326.60	267.00	358.00	280.00	363.00	281.00
		387.00	281.00	400.00	280.00	411.00	279.50
		441.00	269.00	640.00	269.00		
2		-372.12	269.00	-75.60	268.96		
3		40.68	267.00	40.70	267.00	326.60	267.00
4		-480.00	260.00	-352.68	260.06		
5		-95.63	259.96	57.43	260.06		
6		309.46	259.91	640.00	259.88		
7		-480.00	253.00	640.00	253.00		

Soil parameters - effective stress state

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [psf]	γ [pcf]
1	Clay with high or very high plasticity (CH, CV, CE), soft consistency		17.00	302.4	96.1
2	Silty sand (SM)		27.10	1180.0	95.2

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [psf]	γ [pcf]
3	Ash		38.00	0.0	100.0

Soil parameters - uplift

No.	Name	Pattern	γ_{sat} [pcf]	γ_s [pcf]	n [–]
1	Clay with high or very high plasticity (CH, CV, CE), soft consistency		96.1		
2	Silty sand (SM)		95.2		
3	Ash		100.0		

Soil parameters

Clay with high or very high plasticity (CH, CV, CE), soft consistency

Unit weight : γ = 96.1 pcf
Stress-state : effective
Angle of internal friction : φ_{ef} = 17.00 °
Cohesion of soil : c_{ef} = 302.4 psf
Saturated unit weight : γ_{sat} = 96.1 pcf

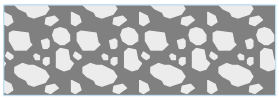
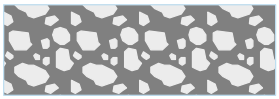
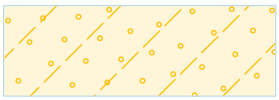
Silty sand (SM)

Unit weight : γ = 95.2 pcf
Stress-state : effective
Angle of internal friction : φ_{ef} = 27.10 °
Cohesion of soil : c_{ef} = 1180.0 psf
Saturated unit weight : γ_{sat} = 95.2 pcf

Ash

Unit weight : γ = 100.0 pcf
Stress-state : effective
Angle of internal friction : φ_{ef} = 38.00 °
Cohesion of soil : c_{ef} = 0.0 psf
Saturated unit weight : γ_{sat} = 100.0 pcf

Assigning and surfaces

No.	Surface position	Coordinates of surface points [ft]				Assigned soil
		x	z	x	z	
1		-352.68	260.06	-372.12	269.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		-396.00	281.00	-480.00	281.00	
		-480.00	260.00			
2		57.43	260.06	40.70	266.99	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		40.68	267.00	14.18	278.00	
		0.00	281.00	-32.48	281.00	
		-56.00	277.75	-75.60	268.96	
		-95.63	259.96			
3		640.00	259.88	640.00	269.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		441.00	269.00	411.00	279.50	
		400.00	280.00	387.00	281.00	
		363.00	281.00	358.00	280.00	
		326.60	267.00	309.46	259.91	
4		-372.12	269.00	-352.68	260.06	Ash
		-346.00	257.00	-106.00	257.00	
		-100.00	258.00	-95.63	259.96	
		-75.60	268.96			
5		40.70	267.00	40.68	267.00	Ash
		40.70	266.99	57.43	260.06	
		72.00	254.00	272.00	254.00	
		292.00	255.00	300.00	256.00	
		309.46	259.91	326.60	267.00	
6		640.00	253.00	640.00	259.88	Silty sand (SM)
		309.46	259.91	300.00	256.00	
		292.00	255.00	272.00	254.00	
		72.00	254.00	57.43	260.06	
		-95.63	259.96	-100.00	258.00	
		-106.00	257.00	-346.00	257.00	
		-352.68	260.06	-480.00	260.00	
		-480.00	253.00			
7		-480.00	253.00	-480.00	243.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		640.00	243.00	640.00	253.00	
						

Water

Water type : No water

Tensile crack

Tensile crack not input.

Earthquake

Horizontal seismic coefficient : K_h = 0.20
Vertical seismic coefficient : K_v = 0.00

Settings of the stage of construction

Design situation : seismic

Results (Stage of construction 1)

Analysis 1 (stage 1)

Circular slip surface

Slip surface parameters							
Center :	x =	26.92	[ft]	Angles :	α_1 =	-49.42	[°]
	z =	320.00	[ft]		α_2 =	27.86	[°]
Radius :	R =	59.95	[ft]				
The slip surface after optimization.							

Segments restricting slip surface

No.	First point		Second point	
	x [ft]	z [ft]	x [ft]	z [ft]
1	-479.92	243.25	640.00	243.01

The restrictions of points of circular slip surface

Slope stability verification (Bishop)

Sum of active forces : F_a = 26644.3 lbf/ft
Sum of passive forces : F_p = 44149.8 lbf/ft

Sliding moment : M_a = 1597323.5 lbfft/ft
Resisting moment : M_p = 2646779.2 lbfft/ft

Factor of safety = 1.66 > 1.00

Slope stability ACCEPTABLE

Optimization of circular slip surface (Bishop)

No.	Center		Radius	FS	Verification
	x [ft]	z [ft]	R [ft]		
1	-118.69	518.21	261.94	554.35	ACCEPTABLE
2	-118.69	518.21	261.94	554.35	ACCEPTABLE
3	-118.69	518.21	261.94	554.35	ACCEPTABLE
4	-130.16	549.06	294.82	4.05	ACCEPTABLE
5	62.16	694.36	441.24	6.14	ACCEPTABLE
6	-130.16	549.06	294.82	4.05	ACCEPTABLE
7	-105.52	1237.11	990.73	2.77	ACCEPTABLE
8	43.59	1236.66	990.28	2.81	ACCEPTABLE
9	-245.34	1236.30	989.92	3.54	ACCEPTABLE
10	-100.89	334.27	87.88	3.97	ACCEPTABLE
11	-204.74	896.06	629.16	3.91	ACCEPTABLE
12	-55.58	896.06	629.16	2.47	ACCEPTABLE
13	175.29	1032.22	763.89	3.91	ACCEPTABLE
14	125.63	536.52	268.22	3.91	ACCEPTABLE
15	-204.74	896.06	629.16	3.91	ACCEPTABLE
16	-55.58	896.06	629.16	2.47	ACCEPTABLE
17	-55.58	896.06	629.16	2.47	ACCEPTABLE
18	125.73	595.54	328.04	3.92	ACCEPTABLE
19	-55.58	896.06	629.16	2.47	ACCEPTABLE

No.	Center		Radius	FS	Verification
	x [ft]	z [ft]	R [ft]		
20	-117.13	745.93	479.20	176.36	ACCEPTABLE
21	-55.58	896.06	629.16	2.47	ACCEPTABLE
22	-92.29	658.89	392.34	3.99	ACCEPTABLE
23	-59.73	370.10	115.14	3.53	ACCEPTABLE
24	-7.32	292.18	23.36	2.89	ACCEPTABLE
25	-55.58	896.06	629.16	2.47	ACCEPTABLE
26	-77.56	658.89	392.34	2.82	ACCEPTABLE
27	-6.42	283.60	34.45	3.92	ACCEPTABLE
28	-54.47	454.08	191.69	2.14	ACCEPTABLE
29	-63.81	807.89	544.42	2.36	ACCEPTABLE
30	-54.36	637.09	376.90	2.19	ACCEPTABLE
31	-22.77	493.49	230.73	1.99	ACCEPTABLE
32	-14.27	1160.83	897.59	2.55	ACCEPTABLE
33	-13.02	1044.11	781.55	2.51	ACCEPTABLE
34	23.06	636.31	372.84	2.97	ACCEPTABLE
35	-6.63	284.66	34.75	3.88	ACCEPTABLE
36	-54.47	454.09	191.70	2.14	ACCEPTABLE
37	-46.07	379.58	123.26	3.19	ACCEPTABLE
38	-13.13	318.27	55.44	1.91	ACCEPTABLE
39	-24.08	509.46	246.19	2.02	ACCEPTABLE
40	-15.61	405.66	147.80	3.19	ACCEPTABLE
41	-44.32	322.26	59.65	2.16	ACCEPTABLE
42	-22.78	493.55	230.78	1.99	ACCEPTABLE
43	-13.13	318.27	55.44	1.91	ACCEPTABLE
44	-22.73	431.07	167.60	1.91	ACCEPTABLE
45	-15.85	370.67	111.53	2.65	ACCEPTABLE
46	13.83	307.97	44.51	3.53	ACCEPTABLE
47	-8.46	305.89	62.18	2.48	ACCEPTABLE
48	-34.57	321.61	59.03	1.75	ACCEPTABLE
49	-43.72	418.60	155.13	1.97	ACCEPTABLE
50	-35.98	360.79	102.22	2.85	ACCEPTABLE
51	-13.14	318.28	55.45	1.91	ACCEPTABLE
52	-28.51	305.00	61.31	2.29	ACCEPTABLE
53	-53.63	327.00	64.26	3.22	ACCEPTABLE
54	-48.33	297.19	41.38	4.71	ACCEPTABLE
55	-41.34	400.79	138.37	1.90	ACCEPTABLE
56	-12.42	314.59	52.49	1.91	ACCEPTABLE
57	-34.57	321.61	59.03	1.75	ACCEPTABLE
58	-18.18	306.25	46.92	2.51	ACCEPTABLE
59	-41.03	382.92	119.51	1.90	ACCEPTABLE
60	-13.24	283.22	34.68	3.34	ACCEPTABLE
61	-35.70	348.08	88.07	1.91	ACCEPTABLE
62	-21.48	321.61	59.03	1.73	ACCEPTABLE
63	-0.29	290.30	36.04	5.22	ACCEPTABLE
64	-27.81	384.10	120.68	1.81	ACCEPTABLE
65	1.01	281.50	33.46	4.93	ACCEPTABLE
66	-22.55	349.04	88.97	1.70	ACCEPTABLE
67	-7.78	346.69	87.49	2.74	ACCEPTABLE
68	-45.78	434.85	167.87	2.26	ACCEPTABLE

No.	Center		Radius	FS	Verification
	x [ft]	z [ft]	R [ft]		
69	-26.09	419.33	158.55	1.82	ACCEPTABLE
70	-1.81	300.88	54.02	2.93	ACCEPTABLE
71	-23.18	390.55	132.15	2.90	ACCEPTABLE
72	-8.76	354.19	93.99	1.87	ACCEPTABLE
73	-16.99	329.47	81.98	2.38	ACCEPTABLE
74	-19.17	310.87	50.35	1.73	ACCEPTABLE
75	-95.36	737.65	471.33	3.44	ACCEPTABLE
76	-35.74	348.34	88.29	1.74	ACCEPTABLE
77	-20.57	289.43	42.76	2.70	ACCEPTABLE
78	-12.98	282.00	34.35	3.36	ACCEPTABLE
79	-30.04	311.11	59.57	2.78	ACCEPTABLE
80	-16.40	297.94	41.38	3.35	ACCEPTABLE
81	-27.81	296.52	51.55	2.45	ACCEPTABLE
82	-33.38	332.91	75.43	3.02	ACCEPTABLE
83	-18.88	309.52	49.32	1.74	ACCEPTABLE
84	-25.19	410.42	150.27	1.80	ACCEPTABLE
85	-9.42	359.24	98.47	1.87	ACCEPTABLE
86	-22.55	349.04	88.97	1.70	ACCEPTABLE
87	-13.87	356.02	95.43	1.79	ACCEPTABLE
88	-31.64	381.64	115.84	1.94	ACCEPTABLE
89	-57.20	672.69	405.78	2.40	ACCEPTABLE
90	-41.24	555.86	288.94	2.25	ACCEPTABLE
91	-25.16	394.10	133.41	1.77	ACCEPTABLE
92	-8.02	313.33	61.35	3.09	ACCEPTABLE
93	-23.09	376.09	117.12	2.69	ACCEPTABLE
94	-13.37	352.37	92.22	1.78	ACCEPTABLE
95	-18.19	333.49	81.72	2.81	ACCEPTABLE
96	-20.81	324.44	63.65	1.70	ACCEPTABLE
97	-11.48	324.11	63.17	1.86	ACCEPTABLE
98	-26.00	335.88	69.71	1.90	ACCEPTABLE
99	-55.25	566.72	299.72	2.41	ACCEPTABLE
100	-34.83	454.51	187.08	2.20	ACCEPTABLE
101	-24.23	360.21	98.79	1.73	ACCEPTABLE
102	-6.51	296.36	43.84	3.75	ACCEPTABLE
103	-21.74	343.64	84.34	2.46	ACCEPTABLE
104	-11.43	323.80	62.92	1.86	ACCEPTABLE
105	-17.28	313.97	61.49	3.04	ACCEPTABLE
106	-18.06	302.65	41.19	1.82	ACCEPTABLE
107	-43.17	396.46	130.19	2.13	ACCEPTABLE
108	-35.97	377.54	110.11	2.14	ACCEPTABLE
109	-29.54	324.44	63.65	1.67	ACCEPTABLE
110	-21.11	326.00	64.94	1.70	ACCEPTABLE
111	-35.81	337.84	71.92	1.96	ACCEPTABLE
112	-63.25	556.41	289.42	2.61	ACCEPTABLE
113	-46.56	460.43	193.44	2.27	ACCEPTABLE
114	-33.07	359.43	98.01	1.75	ACCEPTABLE
115	-15.56	296.73	44.17	3.34	ACCEPTABLE
116	-30.54	342.91	83.65	2.48	ACCEPTABLE
117	-20.81	324.44	63.65	1.70	ACCEPTABLE

No.	Center		Radius	FS	Verification
	x [ft]	z [ft]	R [ft]		
118	-26.08	313.76	61.28	3.03	ACCEPTABLE
119	-27.36	303.75	42.26	1.69	ACCEPTABLE
120	-51.90	396.46	130.19	2.49	ACCEPTABLE
121	-47.43	384.71	117.72	2.44	ACCEPTABLE
122	-38.27	324.44	63.65	1.79	ACCEPTABLE
123	-27.47	288.51	36.50	3.26	ACCEPTABLE
124	-22.30	283.34	30.65	3.83	ACCEPTABLE
125	-34.44	304.23	48.61	3.43	ACCEPTABLE
126	-25.19	294.97	36.24	2.76	ACCEPTABLE
127	-32.40	293.44	42.52	2.98	ACCEPTABLE
128	-36.64	315.85	56.83	2.71	ACCEPTABLE
129	-26.84	301.65	40.72	1.69	ACCEPTABLE
130	-32.14	353.33	92.62	1.72	ACCEPTABLE
131	-21.60	328.62	67.13	1.71	ACCEPTABLE
132	-29.54	324.44	63.65	1.67	ACCEPTABLE
133	-24.52	328.66	67.16	1.69	ACCEPTABLE
134	-33.24	332.99	68.37	1.81	ACCEPTABLE
135	-42.50	411.62	146.03	2.05	ACCEPTABLE
136	-33.64	376.81	111.20	1.92	ACCEPTABLE
137	-31.97	347.25	85.96	1.72	ACCEPTABLE
138	-19.93	304.42	48.73	3.31	ACCEPTABLE
139	-30.28	336.88	77.07	2.11	ACCEPTABLE
140	-23.72	324.44	63.65	1.68	ACCEPTABLE
141	-26.89	316.19	60.89	3.26	ACCEPTABLE
142	-28.33	311.10	49.65	1.67	ACCEPTABLE
143	-42.10	360.06	95.33	1.99	ACCEPTABLE
144	-36.41	347.09	81.43	1.93	ACCEPTABLE
145	-35.36	324.44	63.65	1.73	ACCEPTABLE
146	-27.60	296.89	41.90	3.44	ACCEPTABLE
147	-24.19	292.68	37.23	3.48	ACCEPTABLE
148	-33.05	312.26	54.15	2.91	ACCEPTABLE
149	-26.75	304.06	44.37	2.21	ACCEPTABLE
150	-30.92	300.96	46.57	3.51	ACCEPTABLE
151	-34.35	319.10	59.36	2.24	ACCEPTABLE
152	-27.76	308.57	47.69	1.67	ACCEPTABLE
153	-31.28	343.02	82.29	1.70	ACCEPTABLE
154	-24.36	327.83	66.47	1.68	ACCEPTABLE
155	-29.54	324.44	63.65	1.67	ACCEPTABLE
156	-26.42	328.43	66.97	1.68	ACCEPTABLE
157	-31.82	329.93	66.43	1.74	ACCEPTABLE
158	-36.35	369.46	105.35	1.85	ACCEPTABLE
159	-30.86	351.93	87.78	1.79	ACCEPTABLE
160	-31.20	339.41	78.24	1.70	ACCEPTABLE
161	-22.97	310.23	52.68	2.95	ACCEPTABLE
162	-30.06	332.80	72.64	1.68	ACCEPTABLE
163	-25.66	324.44	63.65	1.67	ACCEPTABLE
164	-22.54	328.43	66.97	1.70	ACCEPTABLE
165	-27.94	329.93	66.43	1.73	ACCEPTABLE
166	-32.47	369.46	105.35	1.82	ACCEPTABLE

No.	Center		Radius	FS	Verification
	x [ft]	z [ft]	R [ft]		
167	-26.98	351.93	87.78	1.79	ACCEPTABLE
168	-27.32	339.41	78.24	1.69	ACCEPTABLE
169	-19.09	310.23	52.68	3.00	ACCEPTABLE
170	-26.18	332.80	72.64	1.67	ACCEPTABLE
171	-21.78	324.44	63.65	1.69	ACCEPTABLE
172	-23.70	318.29	61.13	2.99	ACCEPTABLE
173	-24.93	315.69	54.41	1.67	ACCEPTABLE
174	-33.43	344.99	81.47	1.77	ACCEPTABLE
175	-29.25	336.14	71.96	1.76	ACCEPTABLE
176	-29.54	324.44	63.65	1.67	ACCEPTABLE
177	-24.04	303.97	47.02	3.09	ACCEPTABLE
178	-21.77	300.76	43.50	3.08	ACCEPTABLE
179	-28.13	316.97	57.70	2.44	ACCEPTABLE
180	-23.84	310.55	50.40	1.67	ACCEPTABLE
181	-26.26	307.12	50.52	3.12	ACCEPTABLE
182	-28.90	321.07	60.92	1.66	ACCEPTABLE
183	-25.65	324.40	63.62	1.67	ACCEPTABLE
184	-30.87	325.43	62.51	1.72	ACCEPTABLE
185	-34.99	361.57	98.04	1.81	ACCEPTABLE
186	-29.62	345.36	81.80	1.75	ACCEPTABLE
187	-30.44	335.02	74.50	1.68	ACCEPTABLE
188	-22.54	307.95	51.09	3.08	ACCEPTABLE
189	-29.44	329.16	69.65	2.32	ACCEPTABLE
190	-25.02	321.07	60.92	1.66	ACCEPTABLE
191	-27.15	315.78	59.29	3.11	ACCEPTABLE
192	-28.15	312.60	51.97	1.66	ACCEPTABLE
193	-36.25	339.40	76.46	1.79	ACCEPTABLE
194	-32.00	330.77	67.17	1.75	ACCEPTABLE
195	-32.78	321.07	60.92	1.69	ACCEPTABLE
196	-27.54	302.10	45.80	3.22	ACCEPTABLE
197	-25.27	298.97	42.38	3.19	ACCEPTABLE
198	-31.50	314.30	55.67	2.71	ACCEPTABLE
199	-27.20	308.08	48.56	2.32	ACCEPTABLE
200	-29.77	305.15	49.21	3.27	ACCEPTABLE
201	-32.21	318.05	58.53	2.35	ACCEPTABLE
202	-27.77	310.77	50.56	1.66	ACCEPTABLE
203	-30.01	332.51	72.41	1.68	ACCEPTABLE
204	-25.43	323.24	62.67	1.66	ACCEPTABLE
205	-28.90	321.07	60.92	1.66	ACCEPTABLE
206	-26.82	323.75	63.09	1.67	ACCEPTABLE
207	-30.16	323.95	61.89	1.69	ACCEPTABLE
208	-32.51	344.78	82.35	1.74	ACCEPTABLE
209	-29.04	335.45	72.99	1.71	ACCEPTABLE
210	-29.95	330.27	69.85	1.67	ACCEPTABLE
211	-24.59	311.95	53.92	2.85	ACCEPTABLE
212	-29.28	326.50	66.76	2.16	ACCEPTABLE
213	-26.31	321.07	60.92	1.66	ACCEPTABLE
214	-24.23	323.75	63.09	1.67	ACCEPTABLE
215	-27.57	323.95	61.89	1.68	ACCEPTABLE

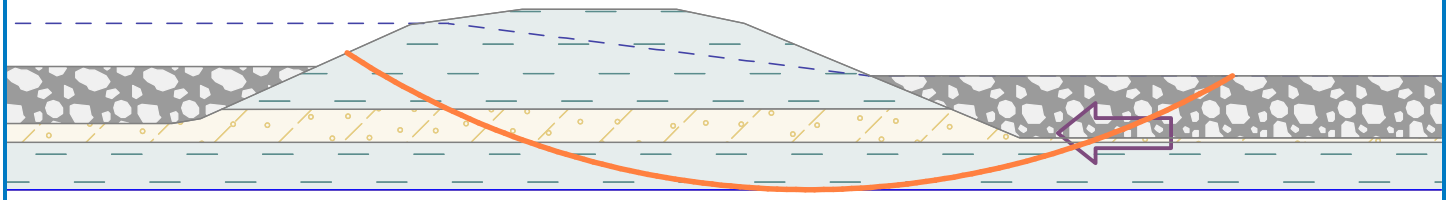
No.	Center		Radius	FS	Verification
	x [ft]	z [ft]	R [ft]		
216	-29.92	344.78	82.35	1.72	ACCEPTABLE
217	-26.45	335.45	72.99	1.71	ACCEPTABLE
218	-27.36	330.27	69.85	1.67	ACCEPTABLE
219	-22.00	311.95	53.92	2.86	ACCEPTABLE
220	-26.69	326.50	66.76	2.16	ACCEPTABLE
221	-23.72	321.07	60.92	1.67	ACCEPTABLE
222	-25.05	317.25	59.53	2.90	ACCEPTABLE
223	-25.84	315.48	54.98	1.66	ACCEPTABLE
224	-31.05	332.44	70.38	1.70	ACCEPTABLE
225	-28.14	326.75	64.26	1.70	ACCEPTABLE
226	-28.90	321.07	60.92	1.66	ACCEPTABLE
227	-25.25	307.41	49.82	2.93	ACCEPTABLE
228	-23.74	305.13	47.34	2.92	ACCEPTABLE
229	-28.10	316.87	57.62	2.44	ACCEPTABLE
230	-25.19	312.29	52.52	2.12	ACCEPTABLE
231	-26.74	309.66	52.28	2.99	ACCEPTABLE
232	-28.53	319.14	59.39	2.15	ACCEPTABLE
233	-25.56	314.07	53.89	1.66	ACCEPTABLE
234	-27.05	328.57	68.45	1.66	ACCEPTABLE
235	-24.02	322.62	62.17	1.67	ACCEPTABLE
236	-26.31	321.07	60.92	1.66	ACCEPTABLE
237	-24.96	323.05	62.51	1.67	ACCEPTABLE
238	-27.13	322.98	61.52	1.67	ACCEPTABLE
239	-28.56	335.69	74.01	1.69	ACCEPTABLE
240	-26.28	330.00	68.30	1.69	ACCEPTABLE
241	-27.01	327.16	66.82	1.66	ACCEPTABLE
242	-23.40	314.80	56.04	2.64	ACCEPTABLE
243	-26.57	324.70	64.82	2.00	ACCEPTABLE
244	-24.59	321.07	60.92	1.66	ACCEPTABLE
245	-25.43	318.38	59.84	2.69	ACCEPTABLE
246	-26.01	317.36	56.98	1.66	ACCEPTABLE
247	-29.41	328.32	66.88	1.68	ACCEPTABLE
248	-27.44	324.57	62.85	1.68	ACCEPTABLE
249	-28.03	321.07	60.92	1.66	ACCEPTABLE
250	-25.52	311.45	52.99	2.72	ACCEPTABLE
251	-24.51	309.83	51.25	2.70	ACCEPTABLE
252	-27.53	318.42	58.82	2.25	ACCEPTABLE
253	-25.57	315.17	55.26	1.95	ACCEPTABLE
254	-26.52	313.05	54.73	2.77	ACCEPTABLE
255	-27.80	319.82	59.93	1.99	ACCEPTABLE
256	-25.81	316.35	56.18	1.66	ACCEPTABLE
257	-24.45	318.19	57.64	1.67	ACCEPTABLE
258	-26.56	317.89	56.43	1.67	ACCEPTABLE
259	-28.00	330.00	68.30	1.68	ACCEPTABLE
260	-25.72	324.57	62.85	1.68	ACCEPTABLE
261	-26.52	322.15	61.79	1.66	ACCEPTABLE
262	-22.94	310.57	51.79	2.64	ACCEPTABLE
263	-26.08	319.82	59.93	1.99	ACCEPTABLE
264	-24.09	316.35	56.18	1.67	ACCEPTABLE

No.	Center		Radius	FS	Verification
	x [ft]	z [ft]	R [ft]		
265	-24.97	314.01	55.45	2.70	ACCEPTABLE
266	-25.50	312.80	52.39	1.66	ACCEPTABLE
267	-28.85	322.98	61.53	1.68	ACCEPTABLE
268	-26.88	319.40	57.66	1.68	ACCEPTABLE
269	-27.53	316.35	56.18	1.66	ACCEPTABLE
270	-25.06	307.40	48.93	2.73	ACCEPTABLE
271	-24.05	305.86	47.25	2.70	ACCEPTABLE
272	-27.03	313.83	54.23	2.26	ACCEPTABLE
273	-25.07	310.74	50.81	1.93	ACCEPTABLE
274	-26.06	308.93	50.60	2.77	ACCEPTABLE
275	-27.30	315.17	55.26	1.96	ACCEPTABLE
276	-25.30	311.86	51.66	1.66	ACCEPTABLE
277	-26.31	321.07	60.92	1.66	ACCEPTABLE
278	-24.29	317.36	56.98	1.67	ACCEPTABLE
279	-25.81	316.35	56.18	1.66	ACCEPTABLE
280	-24.92	317.66	57.21	1.66	ACCEPTABLE
281	-26.31	317.38	56.33	1.67	ACCEPTABLE
282	-27.21	325.01	63.82	1.67	ACCEPTABLE
283	-25.70	321.60	60.39	1.67	ACCEPTABLE
284	-26.28	320.19	59.89	1.66	ACCEPTABLE
285	-23.88	312.42	53.16	2.44	ACCEPTABLE
286	-25.99	318.67	58.68	1.83	ACCEPTABLE
287	-24.66	316.35	56.18	1.66	ACCEPTABLE
288	-25.23	314.72	55.62	2.50	ACCEPTABLE
289	-25.61	313.99	53.66	1.66	ACCEPTABLE
290	-27.81	320.66	59.62	1.67	ACCEPTABLE
291	-26.49	318.29	57.06	1.67	ACCEPTABLE
292	-26.96	316.35	56.18	1.66	ACCEPTABLE
293	-25.27	310.15	51.10	2.54	ACCEPTABLE
294	-24.60	309.07	49.94	2.51	ACCEPTABLE
295	-26.64	314.74	54.93	2.08	ACCEPTABLE
296	-25.32	312.59	52.57	1.68	ACCEPTABLE
297	-25.94	311.21	52.26	2.58	ACCEPTABLE
298	-26.81	315.58	55.58	1.77	ACCEPTABLE
299	-25.47	313.33	53.14	1.66	ACCEPTABLE
300	-26.14	319.47	59.32	1.66	ACCEPTABLE
301	-24.80	317.04	56.73	1.67	ACCEPTABLE
302	-25.81	316.35	56.18	1.66	ACCEPTABLE
303	-25.22	317.26	56.89	1.66	ACCEPTABLE
304	-26.14	317.04	56.28	1.66	ACCEPTABLE
305	-26.72	321.95	61.09	1.67	ACCEPTABLE
306	-25.72	319.75	58.89	1.67	ACCEPTABLE
307	-26.13	318.90	58.64	1.66	ACCEPTABLE
308	-24.52	313.69	54.12	2.27	ACCEPTABLE
309	-25.93	317.90	57.85	1.66	ACCEPTABLE
310	-25.34	318.81	58.57	1.66	ACCEPTABLE
311	-26.26	318.63	57.99	1.66	ACCEPTABLE
312	-26.84	323.59	62.86	1.67	ACCEPTABLE
313	-25.84	321.37	60.62	1.67	ACCEPTABLE

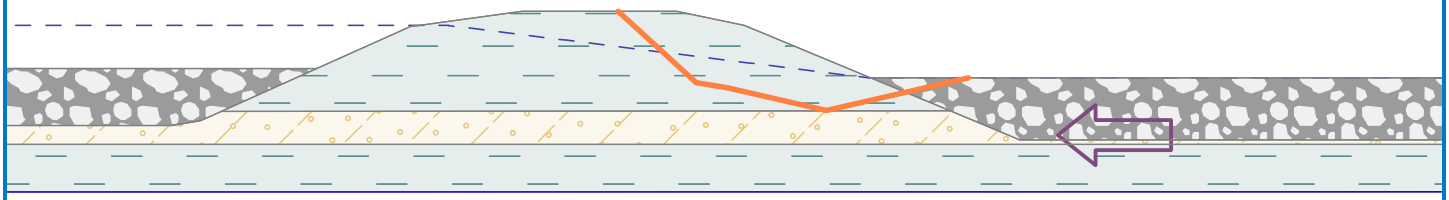
No.	Center		Radius	FS	Verification
	x [ft]	z [ft]	R [ft]		
314	-26.24	320.48	60.34	1.66	ACCEPTABLE
315	-24.64	315.18	55.74	2.34	ACCEPTABLE
316	-26.05	319.48	59.54	1.91	ACCEPTABLE
317	-25.16	317.90	57.85	1.66	ACCEPTABLE
318	-25.53	316.75	57.41	2.40	ACCEPTABLE
319	-25.80	316.31	56.15	1.66	ACCEPTABLE
320	-27.26	320.79	60.16	1.66	ACCEPTABLE
321	-26.37	319.19	58.44	1.66	ACCEPTABLE
322	-26.70	317.90	57.85	1.66	ACCEPTABLE
323	-26.11	318.81	58.57	1.66	ACCEPTABLE
324	-27.03	318.63	57.99	1.66	ACCEPTABLE
325	-27.61	323.59	62.86	1.66	ACCEPTABLE
326	-26.61	321.37	60.62	1.66	ACCEPTABLE
327	-27.01	320.48	60.34	1.66	ACCEPTABLE
328	-25.41	315.18	55.74	2.34	ACCEPTABLE
329	-26.82	319.48	59.54	1.91	ACCEPTABLE
330	-25.93	317.90	57.85	1.66	ACCEPTABLE
331	-26.30	316.75	57.41	2.40	ACCEPTABLE
332	-26.57	316.31	56.15	1.66	ACCEPTABLE
333	-28.03	320.79	60.16	1.66	ACCEPTABLE
334	-27.14	319.19	58.44	1.66	ACCEPTABLE
335	-27.47	317.90	57.85	1.66	ACCEPTABLE
336	-26.33	313.57	54.27	2.42	ACCEPTABLE
337	-25.88	312.83	53.47	2.39	ACCEPTABLE
338	-27.26	316.85	57.03	2.07	ACCEPTABLE
339	-26.38	315.35	55.40	1.89	ACCEPTABLE
340	-26.77	314.32	55.08	2.45	ACCEPTABLE
341	-27.37	317.39	57.45	1.91	ACCEPTABLE
342	-26.48	315.85	55.79	1.66	ACCEPTABLE
343	-26.92	320.00	59.95	1.66	ACCEPTABLE
344	-26.33	320.94	60.70	1.66	ACCEPTABLE
345	-27.26	320.80	60.15	1.66	ACCEPTABLE
346	-27.84	325.87	65.13	1.67	ACCEPTABLE
347	-26.84	323.60	62.85	1.67	ACCEPTABLE
348	-27.23	322.64	62.50	1.66	ACCEPTABLE
349	-25.62	317.18	57.73	2.35	ACCEPTABLE
350	-27.04	321.61	61.67	1.91	ACCEPTABLE
351	-26.15	320.00	59.95	1.66	ACCEPTABLE
352	-26.51	318.77	59.44	2.40	ACCEPTABLE
353	-26.79	318.38	58.22	1.66	ACCEPTABLE
354	-28.26	323.01	62.37	1.66	ACCEPTABLE
355	-27.37	321.38	60.62	1.67	ACCEPTABLE
356	-27.69	320.00	59.95	1.66	ACCEPTABLE
357	-26.54	315.53	56.23	2.41	ACCEPTABLE
358	-26.09	314.77	55.41	2.40	ACCEPTABLE
359	-27.48	318.93	59.10	2.06	ACCEPTABLE
360	-26.60	317.40	57.45	1.89	ACCEPTABLE
361	-26.98	316.29	57.05	2.43	ACCEPTABLE
362	-27.59	319.48	59.54	1.91	ACCEPTABLE

ERM - Annapolis

Name : Stage 1	Stage - analysis : 2 - 1
Description : Seismic Peak Rotational	



Name : Stage 1	Stage - analysis : 2 - 2
Description : Polygonal	



No.	Center x [ft]	Center z [ft]	Radius R [ft]	FS	Verification
363	-26.70	317.90	57.84	1.66	ACCEPTABLE
364	-27.14	322.14	62.10	1.66	ACCEPTABLE
365	-26.25	320.49	60.34	1.66	ACCEPTABLE
366	-26.92	320.00	59.95	1.66	ACCEPTABLE

Analysis 2 (stage 1)

Polygonal slip surface

Coordinates of slip surface points [ft]									
x	z	x	z	x	z	x	z	x	z
-25.20	281.00	-22.39	279.22	19.46	247.80	97.67	252.65	99.69	253.86
123.28	267.00								
The slip surface after optimization.									

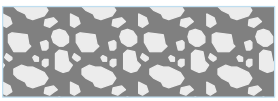
Segments restricting slip surface

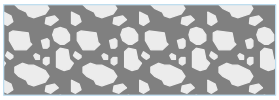
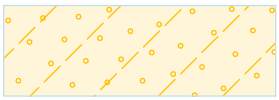
No.	First point x [ft]	First point z [ft]	Second point x [ft]	Second point z [ft]
1	639.99	243.01	-480.00	243.02

Slope stability verification (Janbu)
Factor of safety = 2.22 > 1.00
Slope stability ACCEPTABLE

Input data (Stage of construction 2)

Assigning and surfaces

No.	Surface position	Coordinates of surface points [ft] x	z	x	z	Assigned soil
1		-352.68	260.06	-372.12	269.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		-396.00	281.00	-480.00	281.00	
		-480.00	260.00			
2		57.43	260.06	40.70	266.99	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		40.68	267.00	14.18	278.00	
		0.00	281.00	-32.48	281.00	
		-56.00	277.75	-75.60	268.96	
		-95.63	259.96			
3		640.00	259.88	640.00	269.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		441.00	269.00	411.00	279.50	
		400.00	280.00	387.00	281.00	
		363.00	281.00	358.00	280.00	
		326.60	267.00	309.46	259.91	
4		-372.12	269.00	-352.68	260.06	Ash
		-346.00	257.00	-106.00	257.00	
		-100.00	258.00	-95.63	259.96	
		-75.60	268.96			

No.	Surface position	Coordinates of surface points [ft]				Assigned soil
		x	z	x	z	
5		40.70	267.00	40.68	267.00	Ash
		40.70	266.99	57.43	260.06	
		72.00	254.00	272.00	254.00	
		292.00	255.00	300.00	256.00	
		309.46	259.91	326.60	267.00	
6		640.00	253.00	640.00	259.88	Silty sand (SM)
		309.46	259.91	300.00	256.00	
		292.00	255.00	272.00	254.00	
		72.00	254.00	57.43	260.06	
		-95.63	259.96	-100.00	258.00	
		-106.00	257.00	-346.00	257.00	
		-352.68	260.06	-480.00	260.00	
		-480.00	253.00			
7		-480.00	253.00	-480.00	243.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		640.00	243.00	640.00	253.00	
						

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [ft]					
		x	z	x	z	x	z
1		-480.00	278.00	-160.00	278.00	-48.02	278.00
		40.26	267.00	327.32	267.00	420.32	276.00
		640.00	276.00				

Tensile crack

Tensile crack not input.

Earthquake

Horizontal seismic coefficient : K_h = 0.20
Vertical seismic coefficient : K_v = 0.00

Settings of the stage of construction

Design situation : seismic

Results (Stage of construction 2)

Analysis 1 (stage 2)

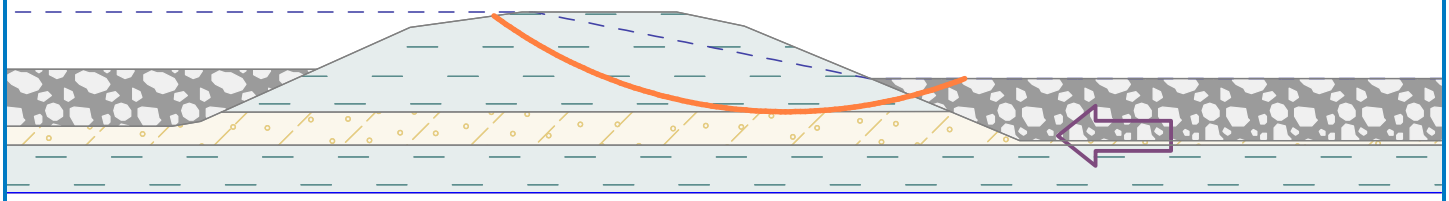
Circular slip surface

Slip surface parameters							
Center :	x =	27.67	[ft]	Angles :	α_1 =	-33.02	[°]
	z =	420.89	[ft]		α_2 =	30.05	[°]
Radius :	R =	177.78	[ft]				
The slip surface after optimization.							

Segments restricting slip surface

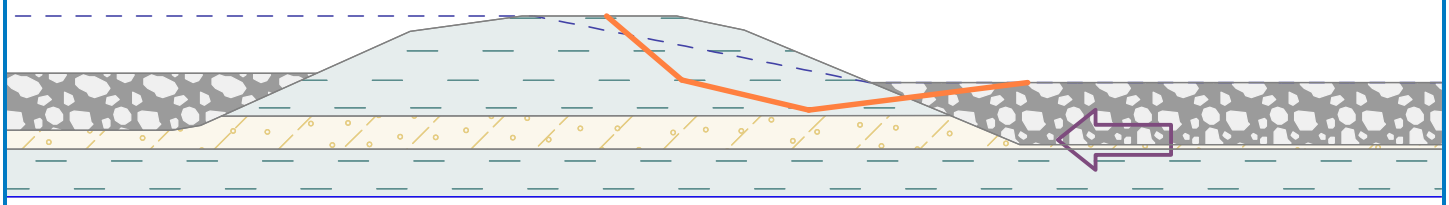
ERM - Annapolis

Name : Stage 2 rotational	Stage - analysis : 3 - 1



ERM - Annapolis

Name : Stage 2 poly	Stage - analysis : 3 - 2



No.	First point		Second point	
	x [ft]	z [ft]	x [ft]	z [ft]
1	639.92	243.08	-479.98	243.10

The restrictions of points of circular slip surface

Slope stability verification (Bishop)

Sum of active forces : F_a = 99390.5 lbf/ft
Sum of passive forces : F_p = 126362.9 lbf/ft

Sliding moment : M_a = 17669643.0 lbfft/ft
Resisting moment : M_p = 22464794.9 lbfft/ft
Factor of safety = 1.27 > 1.00
Slope stability ACCEPTABLE

Analysis 2 (stage 2)

Polygonal slip surface

Coordinates of slip surface points [ft]									
x	z	x	z	x	z	x	z	x	z
-12.35	281.00	4.05	265.99	10.62	264.92	31.40	260.13	61.25	267.00
The slip surface after optimization.									

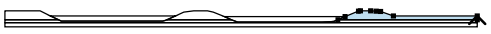
Segments restricting slip surface

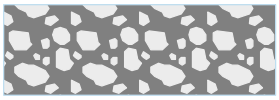
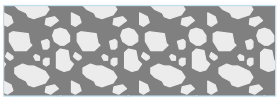
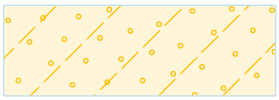
No.	First point		Second point	
	x [ft]	z [ft]	x [ft]	z [ft]
1	-480.00	243.03	639.88	243.15

Slope stability verification (Janbu)
Factor of safety = 1.34 > 1.00
Slope stability ACCEPTABLE

Input data (Stage of construction 3)

Assigning and surfaces

No.	Surface position	Coordinates of surface points [ft]				Assigned soil
		x	z	x	z	
1		-352.68	260.06	-372.12	269.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		-396.00	281.00	-480.00	281.00	
		-480.00	260.00			
2		57.43	260.06	40.70	266.99	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		40.68	267.00	14.18	278.00	
		0.00	281.00	-32.48	281.00	
		-56.00	277.75	-75.60	268.96	
		-95.63	259.96			
3		640.00	259.88	640.00	269.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		441.00	269.00	411.00	279.50	
		400.00	280.00	387.00	281.00	
		363.00	281.00	358.00	280.00	
		326.60	267.00	309.46	259.91	

No.	Surface position	Coordinates of surface points [ft]				Assigned soil
		x	z	x	z	
4		-372.12	269.00	-352.68	260.06	Ash
		-346.00	257.00	-106.00	257.00	
		-100.00	258.00	-95.63	259.96	
		-75.60	268.96			
5		40.70	267.00	40.68	267.00	Ash
		40.70	266.99	57.43	260.06	
		72.00	254.00	272.00	254.00	
		292.00	255.00	300.00	256.00	
		309.46	259.91	326.60	267.00	
6		640.00	253.00	640.00	259.88	Silty sand (SM)
		309.46	259.91	300.00	256.00	
		292.00	255.00	272.00	254.00	
		72.00	254.00	57.43	260.06	
		-95.63	259.96	-100.00	258.00	
		-106.00	257.00	-346.00	257.00	
		-352.68	260.06	-480.00	260.00	
		-480.00	253.00			
7		-480.00	253.00	-480.00	243.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		640.00	243.00	640.00	253.00	
						

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [ft]					
		x	z	x	z	x	z
1		-480.00	280.00	-397.22	281.00	-30.17	281.00
		40.38	267.00	329.40	267.00	416.23	276.00
		453.08	276.00	640.00	276.00		

Tensile crack

Tensile crack not input.

Earthquake

Horizontal seismic coefficient : K_h = 0.20
Vertical seismic coefficient : K_v = 0.00

Settings of the stage of construction

Design situation : seismic

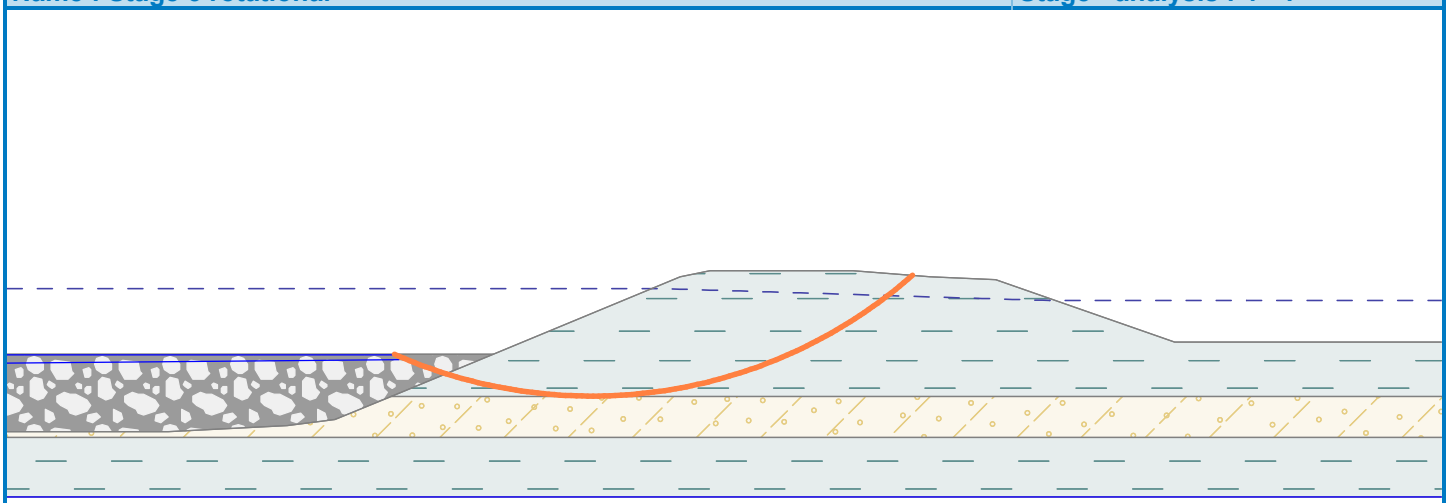
Results (Stage of construction 3)

Analysis 1 (stage 3)

Circular slip surface

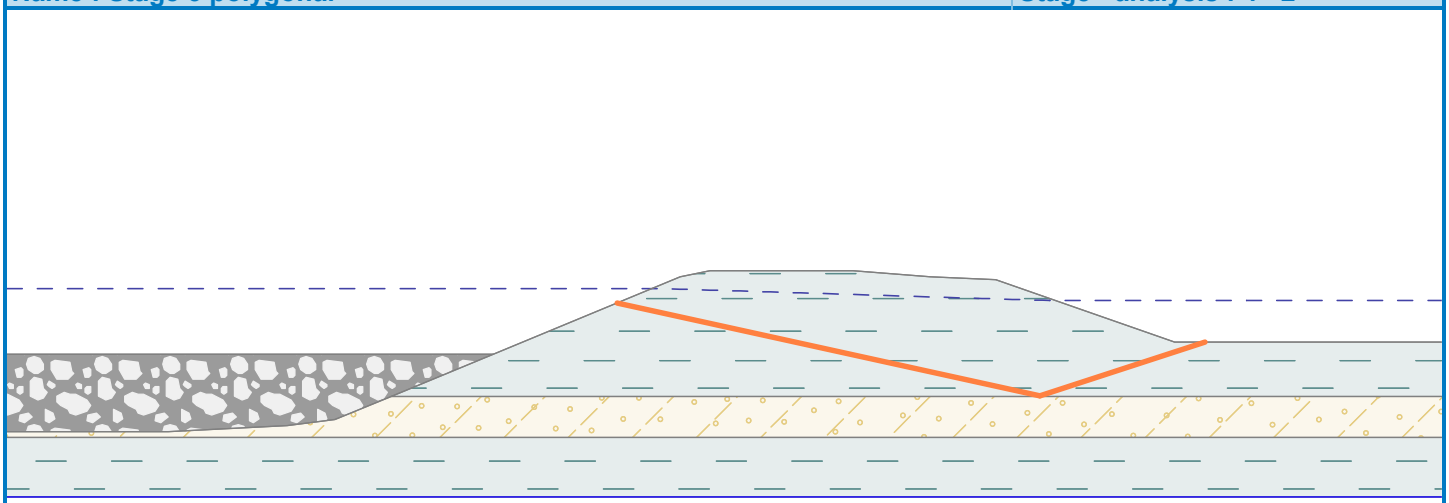
ERM - Annapolis

Name : Stage 3 rotational	Stage - analysis : 4 - 1



ERM - Annapolis

Name : Stage 3 polygonal	Stage - analysis : 4 - 2



Slip surface parameters							
Center :	x =	23.09	[ft]	Angles :	α_1 =	-36.31	[°]
	z =	363.82	[ft]		α_2 =	21.10	[°]
Radius :	R =	103.78	[ft]				
The slip surface after optimization.							

Segments restricting slip surface

No.	First point		Second point	
	x [ft]	z [ft]	x [ft]	z [ft]
1	639.89	243.09	-479.99	243.04

The restrictions of points of circular slip surface

Slope stability verification (Bishop)

Sum of active forces : F_a = 34886.5 lbf/ft
Sum of passive forces : F_p = 43321.0 lbf/ft

Sliding moment : M_a = 3620519.1 lbfft/ft
Resisting moment : M_p = 4495852.8 lbfft/ft

Factor of safety = 1.24 > 1.00
Slope stability ACCEPTABLE

Analysis 2 (stage 3)

Polygonal slip surface

Coordinates of slip surface points [ft]									
x	z	x	z	x	z	x	z	x	z
-14.76	281.00	1.05	267.56	27.70	261.24	73.69	267.00		
The slip surface after optimization.									

Segments restricting slip surface

No.	First point		Second point	
	x [ft]	z [ft]	x [ft]	z [ft]
1	-479.99	243.02	640.00	243.00

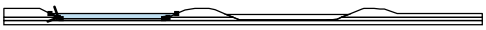
Slope stability verification (Janbu)

Factor of safety = 1.42 > 1.00
Slope stability ACCEPTABLE

Input data (Stage of construction 4)

Assigning and surfaces

No.	Surface position	Coordinates of surface points [ft]				Assigned soil
		x	z	x	z	
1		-352.68	260.06	-372.12	269.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		-396.00	281.00	-480.00	281.00	
		-480.00	260.00			

No.	Surface position	Coordinates of surface points [ft]				Assigned soil
		x	z	x	z	
2		57.43	260.06	40.70	266.99	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		40.68	267.00	14.18	278.00	
		0.00	281.00	-32.48	281.00	
		-56.00	277.75	-75.60	268.96	
		-95.63	259.96			
3		640.00	259.88	640.00	269.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		441.00	269.00	411.00	279.50	
		400.00	280.00	387.00	281.00	
		363.00	281.00	358.00	280.00	
		326.60	267.00	309.46	259.91	
4		-372.12	269.00	-352.68	260.06	Ash
		-346.00	257.00	-106.00	257.00	
		-100.00	258.00	-95.63	259.96	
		-75.60	268.96			
5		40.70	267.00	40.68	267.00	Ash
		40.70	266.99	57.43	260.06	
		72.00	254.00	272.00	254.00	
		292.00	255.00	300.00	256.00	
		309.46	259.91	326.60	267.00	
6		640.00	253.00	640.00	259.88	Silty sand (SM)
		309.46	259.91	300.00	256.00	
		292.00	255.00	272.00	254.00	
		72.00	254.00	57.43	260.06	
		-95.63	259.96	-100.00	258.00	
		-106.00	257.00	-346.00	257.00	
		-352.68	260.06	-480.00	260.00	
		-480.00	253.00			
7		-480.00	253.00	-480.00	243.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		640.00	243.00	640.00	253.00	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [ft]					
		x	z	x	z	x	z
1		-480.00	278.00	-397.22	278.00	354.92	278.00
		420.00	276.00	453.08	276.00	640.00	276.00

Tensile crack

Tensile crack not input.

Earthquake

Horizontal seismic coefficient : K_h = 0.20

Vertical seismic coefficient : K_v = 0.00

Settings of the stage of construction

Design situation : seismic

Results (Stage of construction 4)

Analysis 1 (stage 4)

Circular slip surface

Slip surface parameters							
Center :	x =	343.14	[ft]	Angles :	α_1 =	-23.99	[°]
	z =	341.54	[ft]		α_2 =	41.29	[°]
Radius :	R =	81.59	[ft]				
The slip surface after optimization.							

Segments restricting slip surface

No.	First point		Second point	
	x [ft]	z [ft]	x [ft]	z [ft]
1	640.00	243.00	-479.99	243.01
2	203.77	266.86	309.93	266.86
3	65.71	263.92	310.73	266.04

The restrictions of points of circular slip surface

Slope stability verification (Bishop)

Sum of active forces : F_a = 24067.4 lbf/ft
Sum of passive forces : F_p = 37012.9 lbf/ft

Sliding moment : M_a = 1963662.4 lbfft/ft
Resisting moment : M_p = 3019881.4 lbfft/ft
Factor of safety = 1.54 > 1.00
Slope stability ACCEPTABLE

Analysis 2 (stage 4)

Polygonal slip surface

Coordinates of slip surface points [ft]									
x	z	x	z	x	z	x	z	x	z
347.38	275.60	418.37	259.97	446.12	269.00				
The slip surface after optimization.									

Segments restricting slip surface

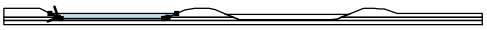
No.	First point		Second point	
	x [ft]	z [ft]	x [ft]	z [ft]
1	-159.78	250.98	109.70	250.98
2	-480.00	243.01	640.00	243.00
3	-162.89	268.92	-87.44	269.14
4	59.32	266.96	146.07	266.96

Slope stability verification (Janbu)

Factor of safety = 1.69 > 1.00
Slope stability ACCEPTABLE

Input data (Stage of construction 5)

Assigning and surfaces

No.	Surface position	Coordinates of surface points [ft]				Assigned soil
		x	z	x	z	
1		-352.68	260.06	-372.12	269.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		-396.00	281.00	-480.00	281.00	
		-480.00	260.00			
2		57.43	260.06	40.70	266.99	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		40.68	267.00	14.18	278.00	
		0.00	281.00	-32.48	281.00	
		-56.00	277.75	-75.60	268.96	
		-95.63	259.96			
3		640.00	259.88	640.00	269.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		441.00	269.00	411.00	279.50	
		400.00	280.00	387.00	281.00	
		363.00	281.00	358.00	280.00	
		326.60	267.00	309.46	259.91	
4		-372.12	269.00	-352.68	260.06	Ash
		-346.00	257.00	-106.00	257.00	
		-100.00	258.00	-95.63	259.96	
		-75.60	268.96			
5		40.70	267.00	40.68	267.00	Ash
		40.70	266.99	57.43	260.06	
		72.00	254.00	272.00	254.00	
		292.00	255.00	300.00	256.00	
		309.46	259.91	326.60	267.00	
6		640.00	253.00	640.00	259.88	Silty sand (SM)
		309.46	259.91	300.00	256.00	
		292.00	255.00	272.00	254.00	
		72.00	254.00	57.43	260.06	
		-95.63	259.96	-100.00	258.00	
		-106.00	257.00	-346.00	257.00	
		-352.68	260.06	-480.00	260.00	
		-480.00	253.00			
7		-480.00	253.00	-480.00	243.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		640.00	243.00	640.00	253.00	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [ft]					
		x	z	x	z	x	z
1		-480.00	281.00	-397.22	281.00	363.96	281.00
		418.69	276.00	640.00	276.00		

Tensile crack

Tensile crack not input.

Earthquake

Horizontal seismic coefficient : K_h = 0.20
Vertical seismic coefficient : K_v = 0.00

Settings of the stage of construction

Design situation : seismic

Results (Stage of construction 5)

Analysis 1 (stage 5)

Circular slip surface

Slip surface parameters							
Center :	x =	406.56	[ft]	Angles :	α_1 =	-33.65	[°]
	z =	361.21	[ft]		α_2 =	24.48	[°]
Radius :	R =	101.32	[ft]				
The slip surface after optimization.							

Segments restricting slip surface

No.	First point		Second point	
	x [ft]	z [ft]	x [ft]	z [ft]
1	-159.58	250.78	109.90	251.38
2	106.95	266.86	290.40	267.28
3	639.76	244.48	58.61	245.20
4	294.71	264.84	101.63	263.47

The restrictions of points of circular slip surface

Slope stability verification (Bishop)

Sum of active forces : F_a = 31599.2 lbf/ft
Sum of passive forces : F_p = 46107.7 lbf/ft

Sliding moment : M_a = 3201627.9 lbfft/ft
Resisting moment : M_p = 4671634.7 lbfft/ft

Factor of safety = 1.46 > 1.00

Slope stability ACCEPTABLE

Optimization of circular slip surface (Bishop)

No.	Center		Radius	FS	Verification
	x [ft]	z [ft]	R [ft]		
1	-406.56	361.21	101.32	1.46	ACCEPTABLE
2	-406.56	361.21	101.32	1.46	ACCEPTABLE
3	-406.56	361.21	101.32	1.46	ACCEPTABLE
4	-366.93	4391.41	4131.40	5.32	ACCEPTABLE
5	-406.56	361.21	101.32	1.46	ACCEPTABLE
6	-548.64	400.37	140.23	3.38	ACCEPTABLE
7	-406.56	361.21	101.32	1.46	ACCEPTABLE
8	-498.92	400.37	140.23	3.38	ACCEPTABLE
9	-201.44	641.35	393.76	1.73	ACCEPTABLE

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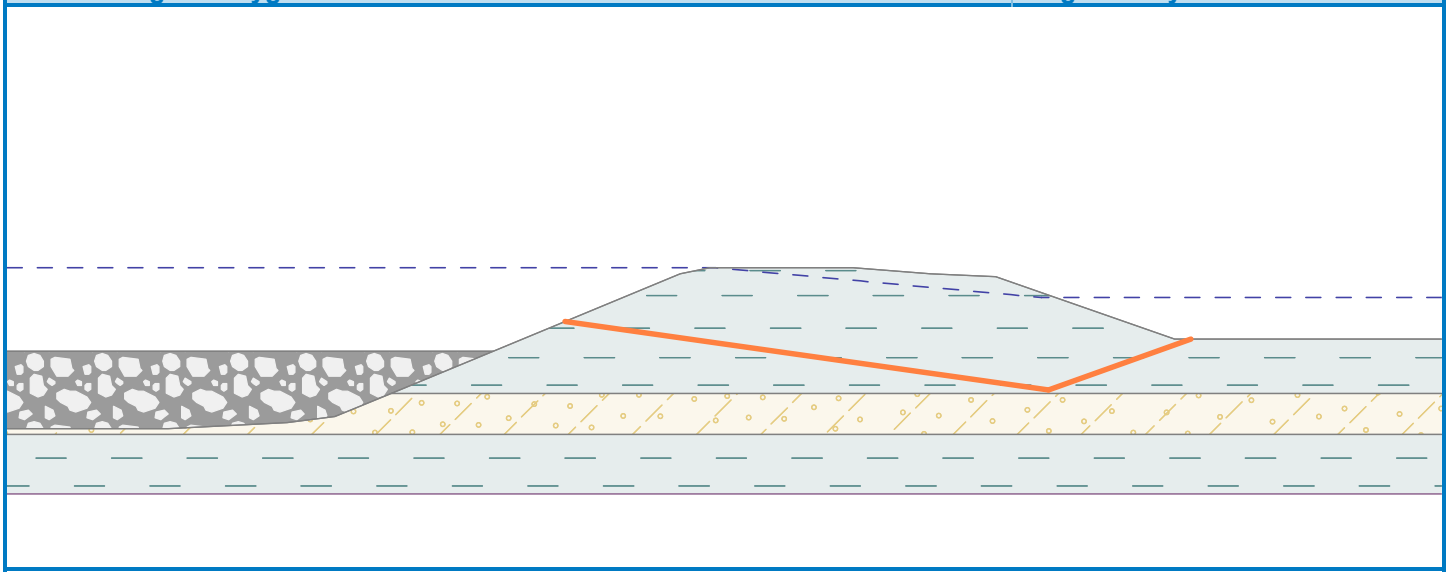
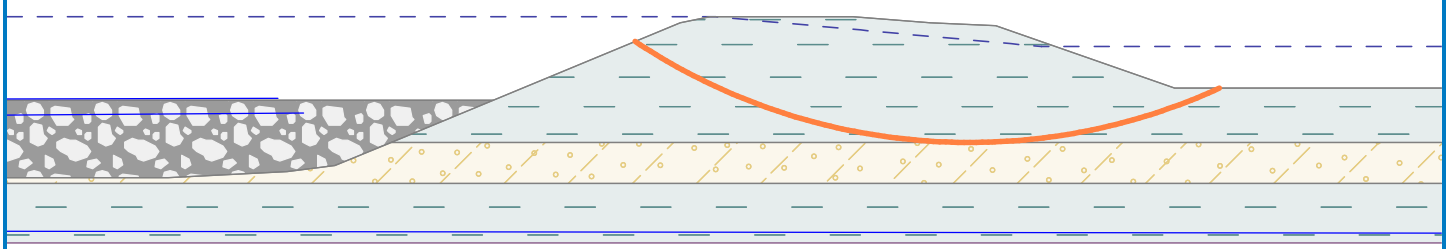
Name : Stage 4 Polygonal	Stage - analysis : 5 - 2



ERM - Annapolis

Name : stage 4 rotational	Stage - analysis : 5 - 1



No.	Center		Radius	FS	Verification
	x [ft]	z [ft]	R [ft]		
10	-406.56	361.21	101.32	1.46	ACCEPTABLE
11	-473.22	359.17	99.31	3.61	ACCEPTABLE
12	-764.59	1616.84	1384.40	13.39	ACCEPTABLE
13	-406.56	361.21	101.32	1.46	ACCEPTABLE
14	-452.57	351.15	91.44	2.75	ACCEPTABLE
15	-962.92	3985.79	3752.22	4.22	ACCEPTABLE
16	-406.56	361.21	101.32	1.46	ACCEPTABLE
17	-438.09	349.76	90.09	2.22	ACCEPTABLE
18	-433.43	311.67	61.71	2.40	ACCEPTABLE
19	-406.56	361.21	101.32	1.46	ACCEPTABLE
20	-400.43	284.29	30.55	4.84	ACCEPTABLE
21	-428.27	349.76	90.09	2.03	ACCEPTABLE
22	-400.18	282.39	30.15	4.43	ACCEPTABLE
23	-425.63	328.18	72.90	3.07	ACCEPTABLE
24	-401.79	294.56	34.50	2.00	ACCEPTABLE
25	-406.56	361.21	101.32	1.46	ACCEPTABLE
26	-386.76	344.41	88.14	3.19	ACCEPTABLE
27	-416.93	400.71	131.09	2.24	ACCEPTABLE
28	-403.08	452.99	193.09	1.51	ACCEPTABLE
29	-386.57	305.50	59.87	2.34	ACCEPTABLE
30	-402.90	443.90	184.50	2.23	ACCEPTABLE
31	-386.92	374.55	114.41	1.61	ACCEPTABLE
32	-400.90	342.01	94.98	1.90	ACCEPTABLE
33	-403.96	307.99	48.63	2.32	ACCEPTABLE
34	-453.75	611.65	342.74	2.74	ACCEPTABLE
35	-432.97	515.43	244.50	2.80	ACCEPTABLE
36	-421.72	349.76	90.09	1.95	ACCEPTABLE
37	-408.52	292.64	46.49	2.28	ACCEPTABLE
38	-400.65	284.30	37.28	3.00	ACCEPTABLE
39	-417.78	317.52	65.41	2.59	ACCEPTABLE
40	-403.04	301.36	44.45	3.14	ACCEPTABLE
41	-420.20	337.28	79.87	2.72	ACCEPTABLE
42	-404.20	309.71	49.79	1.65	ACCEPTABLE
43	-403.15	456.83	196.73	1.52	ACCEPTABLE
44	-386.88	367.37	107.97	2.31	ACCEPTABLE
45	-406.56	361.21	101.32	1.46	ACCEPTABLE
46	-394.44	365.55	106.31	2.25	ACCEPTABLE
47	-414.02	383.19	116.66	1.80	ACCEPTABLE
48	-426.68	1010.83	742.46	2.25	ACCEPTABLE
49	-409.83	759.32	490.82	2.00	ACCEPTABLE
50	-404.91	418.67	158.57	1.49	ACCEPTABLE
51	-392.69	320.81	69.73	2.51	ACCEPTABLE
52	-404.60	410.30	150.80	2.09	ACCEPTABLE
53	-394.75	373.42	113.35	1.51	ACCEPTABLE
54	-402.24	346.08	94.71	2.33	ACCEPTABLE
55	-406.25	325.29	65.19	1.52	ACCEPTABLE
56	-427.97	447.24	180.63	2.08	ACCEPTABLE
57	-417.73	410.89	143.19	1.94	ACCEPTABLE
58	-417.03	351.60	91.88	1.87	ACCEPTABLE

No.	Center		Radius	FS	Verification
	x [ft]	z [ft]	R [ft]		
59	-407.74	305.59	54.81	2.43	ACCEPTABLE
60	-402.66	298.48	47.18	2.71	ACCEPTABLE
61	-414.90	333.01	76.77	2.84	ACCEPTABLE
62	-405.25	317.84	59.50	2.58	ACCEPTABLE
63	-412.53	312.29	62.26	2.23	ACCEPTABLE
64	-416.18	344.16	85.67	2.45	ACCEPTABLE
65	-406.06	323.86	64.07	1.77	ACCEPTABLE
66	-404.88	417.83	157.79	1.49	ACCEPTABLE
67	-394.73	373.12	113.08	1.51	ACCEPTABLE
68	-406.56	361.21	101.32	1.46	ACCEPTABLE
69	-399.11	369.73	109.77	1.47	ACCEPTABLE
70	-411.51	375.35	110.84	1.64	ACCEPTABLE
71	-412.34	530.52	264.87	1.82	ACCEPTABLE
72	-405.14	478.09	212.45	1.72	ACCEPTABLE
73	-405.75	397.89	137.75	1.48	ACCEPTABLE
74	-397.05	332.53	78.25	3.11	ACCEPTABLE
75	-405.45	391.75	132.14	1.96	ACCEPTABLE
76	-399.13	370.10	110.10	1.47	ACCEPTABLE
77	-403.36	349.74	95.50	3.02	ACCEPTABLE
78	-406.92	336.75	76.63	1.48	ACCEPTABLE
79	-419.20	406.85	142.27	1.75	ACCEPTABLE
80	-412.77	385.97	120.75	1.69	ACCEPTABLE
81	-413.67	354.05	94.29	1.78	ACCEPTABLE
82	-407.24	317.71	63.86	3.09	ACCEPTABLE
83	-403.99	312.07	57.93	3.16	ACCEPTABLE
84	-412.54	343.20	85.18	2.56	ACCEPTABLE
85	-406.22	330.86	71.83	2.28	ACCEPTABLE
86	-410.45	323.26	69.81	3.06	ACCEPTABLE
87	-413.20	349.56	90.47	2.26	ACCEPTABLE
88	-406.70	334.87	75.08	1.74	ACCEPTABLE
89	-405.67	396.20	136.21	1.48	ACCEPTABLE
90	-399.21	371.42	111.29	1.48	ACCEPTABLE
91	-406.56	361.21	101.32	1.46	ACCEPTABLE
92	-401.74	368.37	108.25	1.47	ACCEPTABLE
93	-409.60	370.26	107.16	1.57	ACCEPTABLE
94	-409.49	441.46	177.72	1.64	ACCEPTABLE
95	-404.85	417.06	153.32	1.61	ACCEPTABLE
96	-406.15	384.95	124.84	1.47	ACCEPTABLE
97	-399.99	340.93	84.68	2.89	ACCEPTABLE
98	-405.90	380.71	121.01	1.88	ACCEPTABLE
99	-401.65	366.91	106.95	1.47	ACCEPTABLE
100	-404.25	352.80	96.66	2.85	ACCEPTABLE
101	-406.89	344.39	84.32	1.47	ACCEPTABLE
102	-414.46	388.68	125.56	1.61	ACCEPTABLE
103	-410.11	375.07	111.56	1.59	ACCEPTABLE
104	-411.33	356.28	96.47	1.69	ACCEPTABLE
105	-406.92	328.45	72.57	2.89	ACCEPTABLE
106	-404.76	324.04	67.99	2.91	ACCEPTABLE
107	-410.71	349.87	90.99	2.32	ACCEPTABLE

No.	Center		Radius	FS	Verification
	x [ft]	z [ft]	R [ft]		
108	-406.46	340.29	80.88	2.07	ACCEPTABLE
109	-409.07	332.81	77.15	2.89	ACCEPTABLE
110	-411.07	353.52	94.10	2.06	ACCEPTABLE
111	-406.73	342.83	83.01	1.69	ACCEPTABLE
112	-406.06	383.42	123.45	1.47	ACCEPTABLE
113	-401.74	368.27	108.16	1.47	ACCEPTABLE
114	-406.56	361.21	101.32	1.46	ACCEPTABLE
115	-403.42	366.58	106.45	1.47	ACCEPTABLE
116	-408.48	367.08	104.99	1.53	ACCEPTABLE
117	-408.27	406.06	143.61	1.56	ACCEPTABLE
118	-405.22	392.59	130.14	1.55	ACCEPTABLE
119	-406.35	376.72	116.66	1.47	ACCEPTABLE
120	-402.07	347.11	89.60	2.67	ACCEPTABLE
121	-406.16	373.86	114.10	1.79	ACCEPTABLE
122	-403.30	364.92	104.98	1.46	ACCEPTABLE
123	-404.93	355.21	97.81	2.69	ACCEPTABLE
124	-406.82	349.75	89.73	1.47	ACCEPTABLE
125	-411.63	378.44	116.36	1.55	ACCEPTABLE
126	-408.72	369.56	107.23	1.54	ACCEPTABLE
127	-409.75	357.84	98.01	1.68	ACCEPTABLE
128	-406.75	337.28	80.06	2.70	ACCEPTABLE
129	-405.30	333.99	76.66	2.70	ACCEPTABLE
130	-409.40	353.99	94.69	2.13	ACCEPTABLE
131	-406.55	346.95	87.35	1.96	ACCEPTABLE
132	-408.18	340.55	83.46	2.71	ACCEPTABLE
133	-409.60	356.13	96.53	1.96	ACCEPTABLE
134	-406.70	348.57	88.73	1.67	ACCEPTABLE
135	-406.27	375.54	115.60	1.46	ACCEPTABLE
136	-403.38	366.01	105.95	1.47	ACCEPTABLE
137	-406.56	361.21	101.32	1.46	ACCEPTABLE
138	-404.50	365.03	104.95	1.46	ACCEPTABLE
139	-407.80	365.05	103.68	1.50	ACCEPTABLE
140	-407.62	388.20	126.60	1.52	ACCEPTABLE
141	-405.60	380.16	118.56	1.51	ACCEPTABLE
142	-406.44	371.41	111.39	1.46	ACCEPTABLE
143	-403.51	351.53	93.20	2.50	ACCEPTABLE
144	-406.31	369.50	109.69	1.70	ACCEPTABLE
145	-404.40	363.64	103.72	1.46	ACCEPTABLE
146	-405.43	357.01	98.78	2.52	ACCEPTABLE
147	-406.75	353.45	93.48	1.46	ACCEPTABLE
148	-409.86	372.27	110.90	1.51	ACCEPTABLE
149	-407.92	366.44	104.91	1.51	ACCEPTABLE
150	-408.70	358.93	99.08	1.66	ACCEPTABLE
151	-406.65	344.17	86.06	2.53	ACCEPTABLE
152	-405.69	341.79	83.61	2.52	ACCEPTABLE
153	-408.49	356.57	97.03	1.99	ACCEPTABLE
154	-406.58	351.57	91.85	1.82	ACCEPTABLE
155	-407.61	346.54	88.50	2.56	ACCEPTABLE
156	-408.60	357.85	98.14	1.82	ACCEPTABLE

No.	Center		Radius	FS	Verification
	x [ft]	z [ft]	R [ft]		
157	-406.67	352.61	92.75	1.62	ACCEPTABLE
158	-406.38	370.56	110.64	1.46	ACCEPTABLE
159	-404.46	364.45	104.43	1.46	ACCEPTABLE
160	-406.56	361.21	101.32	1.46	ACCEPTABLE
161	-405.20	363.86	103.82	1.46	ACCEPTABLE
162	-407.37	363.74	102.85	1.49	ACCEPTABLE
163	-407.24	378.11	117.08	1.50	ACCEPTABLE
164	-405.90	373.10	112.07	1.49	ACCEPTABLE
165	-406.49	367.95	107.97	1.46	ACCEPTABLE
166	-404.50	354.62	95.77	2.33	ACCEPTABLE
167	-406.40	366.67	106.84	1.68	ACCEPTABLE
168	-405.12	362.81	102.90	1.46	ACCEPTABLE
169	-405.78	358.32	99.53	2.35	ACCEPTABLE
170	-406.69	355.98	96.04	1.46	ACCEPTABLE
171	-408.73	368.41	107.52	1.49	ACCEPTABLE
172	-407.44	364.56	103.58	1.49	ACCEPTABLE
173	-407.99	359.67	99.81	1.63	ACCEPTABLE
174	-406.61	349.30	90.60	2.37	ACCEPTABLE
175	-405.97	347.63	88.88	2.36	ACCEPTABLE
176	-407.86	358.20	98.52	1.87	ACCEPTABLE
177	-406.58	354.72	94.94	1.73	ACCEPTABLE
178	-407.25	350.98	92.32	2.39	ACCEPTABLE
179	-407.93	358.98	99.20	1.74	ACCEPTABLE
180	-406.64	355.40	95.53	1.46	ACCEPTABLE
181	-406.45	367.36	107.45	1.46	ACCEPTABLE
182	-405.16	363.39	103.40	1.46	ACCEPTABLE
183	-406.56	361.21	101.32	1.46	ACCEPTABLE
184	-405.66	363.02	103.02	1.46	ACCEPTABLE
185	-407.09	362.88	102.32	1.48	ACCEPTABLE
186	-407.00	372.03	111.38	1.48	ACCEPTABLE
187	-406.11	368.84	108.19	1.48	ACCEPTABLE
188	-406.52	365.67	105.72	1.46	ACCEPTABLE
189	-405.18	356.76	97.55	2.18	ACCEPTABLE
190	-406.46	364.82	104.97	1.64	ACCEPTABLE
191	-405.60	362.27	102.37	1.46	ACCEPTABLE
192	-406.03	359.24	100.08	2.21	ACCEPTABLE
193	-406.65	357.70	97.77	1.46	ACCEPTABLE
194	-407.99	365.94	105.38	1.48	ACCEPTABLE
195	-407.13	363.38	102.77	1.48	ACCEPTABLE
196	-407.51	360.18	100.30	1.46	ACCEPTABLE
197	-406.58	353.01	93.91	2.22	ACCEPTABLE
198	-406.16	351.85	92.72	2.22	ACCEPTABLE
199	-407.43	359.24	99.48	1.75	ACCEPTABLE
200	-406.58	356.86	97.04	1.69	ACCEPTABLE
201	-407.01	354.17	95.10	2.25	ACCEPTABLE
202	-407.48	359.73	99.91	1.69	ACCEPTABLE
203	-406.62	357.30	97.42	1.46	ACCEPTABLE
204	-406.49	365.27	105.37	1.46	ACCEPTABLE
205	-405.63	362.67	102.71	1.46	ACCEPTABLE

No.	Center x [ft]	Center z [ft]	Radius R [ft]	FS	Verification
206	-406.56	361.21	101.32	1.46	ACCEPTABLE

Analysis 2 (stage 5)

Polygonal slip surface

Coordinates of slip surface points [ft]									
x	z	x	z	x	z	x	z	x	z
338.62	271.97	419.87	260.50	443.76	269.00				
The slip surface after optimization.									

Segments restricting slip surface

No.	First point x [ft]	First point z [ft]	Second point x [ft]	Second point z [ft]
1	-159.78	250.98	109.70	250.98

Slope stability verification (Janbu)
Factor of safety = 1.56 > 1.00
Slope stability ACCEPTABLE

Input data (Stage of construction 6)

Assigning and surfaces

No.	Surface position	Coordinates of surface points [ft] x	z	x	z	Assigned soil
1		-352.68	260.06	-372.12	269.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		-396.00	281.00	-480.00	281.00	
		-480.00	260.00			
2		57.43	260.06	40.70	266.99	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		40.68	267.00	14.18	278.00	
		0.00	281.00	-32.48	281.00	
		-56.00	277.75	-75.60	268.96	
		-95.63	259.96			
3		640.00	259.88	640.00	269.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		441.00	269.00	411.00	279.50	
		400.00	280.00	387.00	281.00	
		363.00	281.00	358.00	280.00	
		326.60	267.00	309.46	259.91	
4		-372.12	269.00	-352.68	260.06	Ash
		-346.00	257.00	-106.00	257.00	
		-100.00	258.00	-95.63	259.96	
		-75.60	268.96			
5		40.70	267.00	40.68	267.00	Ash
		40.70	266.99	57.43	260.06	
		72.00	254.00	272.00	254.00	
		292.00	255.00	300.00	256.00	
		309.46	259.91	326.60	267.00	

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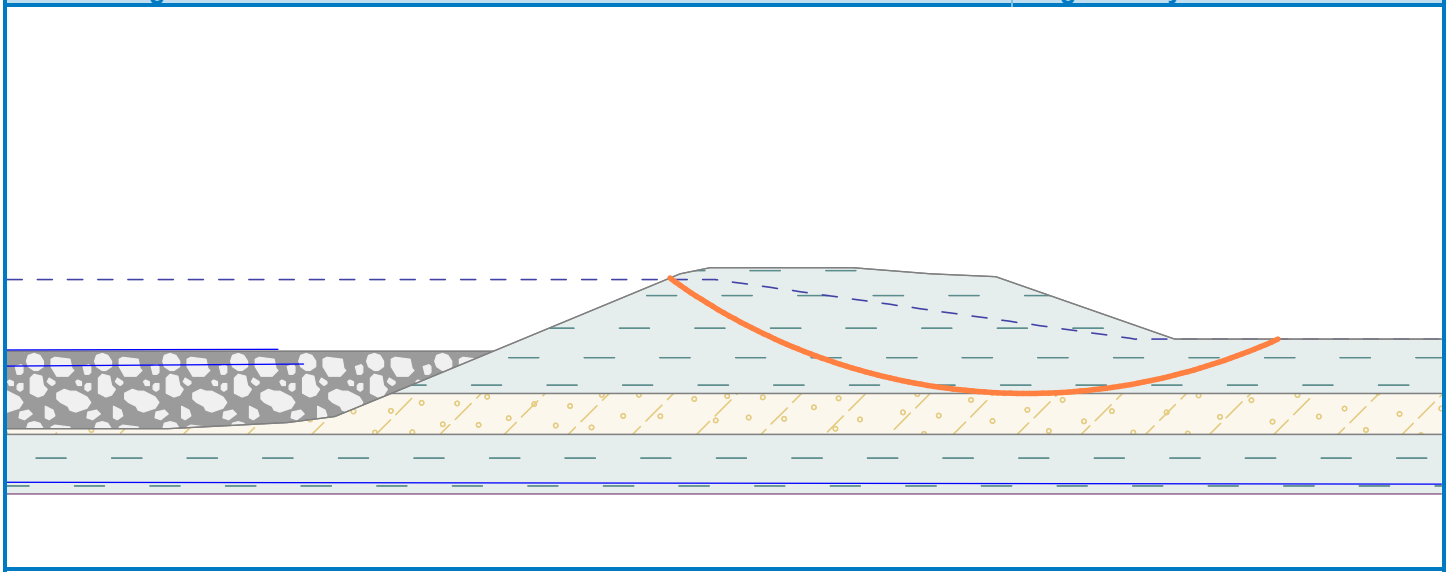
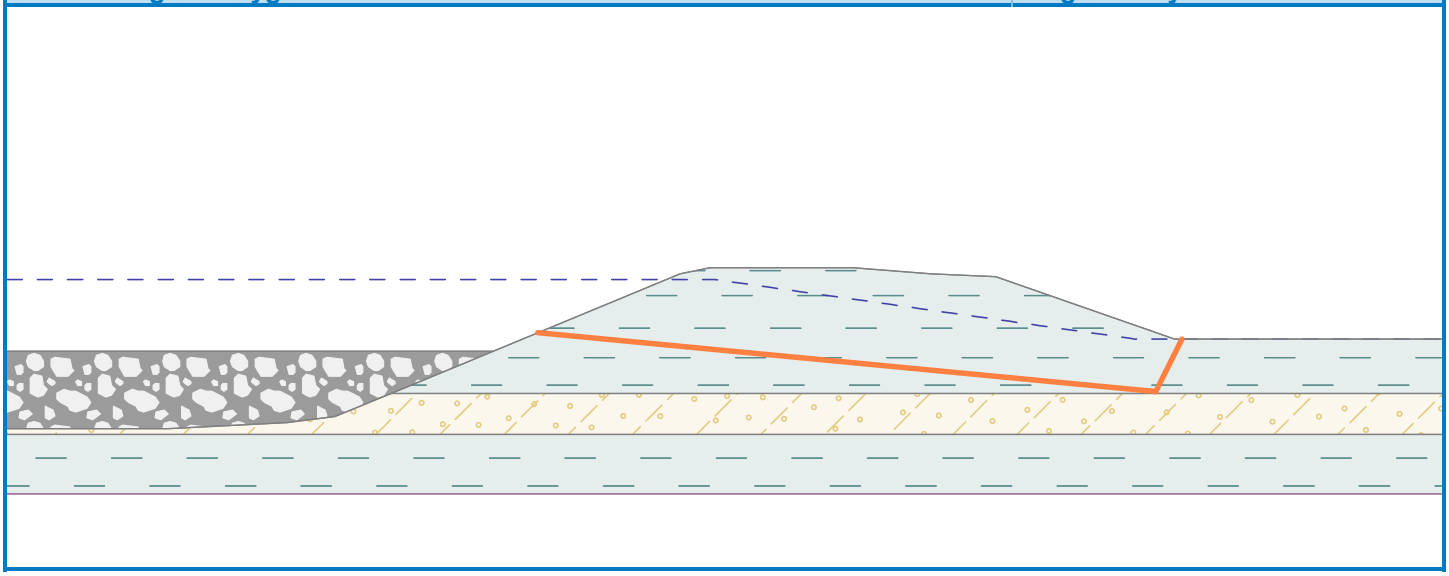
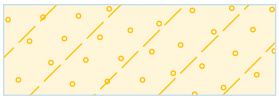
Name : Stage 5 Rotational	Stage - analysis : 7 - 1



ERM - Annapolis

Name : Stage 5 Polygonal	Stage - analysis : 7 - 2



No.	Surface position	Coordinates of surface points [ft]				Assigned soil
		x	z	x	z	
6		640.00	253.00	640.00	259.88	Silty sand (SM)
		309.46	259.91	300.00	256.00	
		292.00	255.00	272.00	254.00	
		72.00	254.00	57.43	260.06	
		-95.63	259.96	-100.00	258.00	
		-106.00	257.00	-346.00	257.00	
		-352.68	260.06	-480.00	260.00	
		-480.00	253.00			
7		-480.00	253.00	-480.00	243.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		640.00	243.00	640.00	253.00	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [ft]					
		x	z	x	z	x	z
1		-480.00	281.00	-397.22	281.00	378.66	281.00
		434.84	269.00	640.00	269.00		

Tensile crack

Tensile crack not input.

Earthquake

Horizontal seismic coefficient : K_h = 0.20
Vertical seismic coefficient : K_v = 0.00

Settings of the stage of construction

Design situation : seismic

Results (Stage of construction 6)

Analysis 1 (stage 6)

Circular slip surface

Slip surface parameters							
Center :	x =	409.29	[ft]	Angles :	α_1 =	-32.63	[°]
	z =	368.42	[ft]		α_2 =	23.67	[°]
Radius :	R =	108.55	[ft]				
The slip surface after optimization.							

Segments restricting slip surface

No.	First point		Second point	
	x [ft]	z [ft]	x [ft]	z [ft]
1	-159.58	250.78	109.90	251.38
2	639.76	244.48	58.61	245.20
3	51.50	266.59	282.50	266.86

The restrictions of points of circular slip surface

Slope stability verification (Bishop)

Sum of active forces : F_a = 36547.7 lbf/ft
Sum of passive forces : F_p = 49673.0 lbf/ft

Sliding moment : M_a = 3967252.5 lbfft/ft
Resisting moment : M_p = 5392007.3 lbfft/ft
Factor of safety = 1.36 > 1.00
Slope stability ACCEPTABLE
Optimization of circular slip surface (Bishop)

No.	Center		Radius	FS	Verification
	x [ft]	z [ft]	R [ft]		
1	-409.29	368.42	108.55	1.36	ACCEPTABLE
2	-409.29	368.42	108.55	1.36	ACCEPTABLE
3	-409.29	368.42	108.55	1.36	ACCEPTABLE
4	-606.92	304.25	47.90	6.91	ACCEPTABLE
5	-367.16	4371.96	4111.98	5.40	ACCEPTABLE
6	-409.29	368.42	108.55	1.36	ACCEPTABLE
7	-550.97	411.45	151.32	3.36	ACCEPTABLE
8	-409.29	368.42	108.55	1.36	ACCEPTABLE
9	-501.25	411.45	151.32	3.36	ACCEPTABLE
10	-409.29	368.42	108.55	1.36	ACCEPTABLE
11	-475.81	367.09	107.24	3.64	ACCEPTABLE
12	-409.29	368.42	108.55	1.36	ACCEPTABLE
13	-455.30	357.99	98.30	2.45	ACCEPTABLE
14	-409.29	368.42	108.55	1.36	ACCEPTABLE
15	-440.84	356.40	96.75	2.00	ACCEPTABLE
16	-436.25	317.35	66.79	2.13	ACCEPTABLE
17	-402.39	282.32	22.20	3.15	ACCEPTABLE
18	-409.29	368.42	108.55	1.36	ACCEPTABLE
19	-403.80	289.82	34.54	3.79	ACCEPTABLE
20	-431.02	356.40	96.75	1.85	ACCEPTABLE
21	-403.20	285.74	33.14	3.86	ACCEPTABLE
22	-428.42	334.24	78.74	2.66	ACCEPTABLE
23	-405.20	299.30	39.31	1.78	ACCEPTABLE
24	-409.29	368.42	108.55	1.36	ACCEPTABLE
25	-390.66	362.81	105.50	2.77	ACCEPTABLE
26	-426.63	438.05	169.13	2.13	ACCEPTABLE
27	-405.72	464.34	204.42	1.41	ACCEPTABLE
28	-389.57	311.14	65.26	2.12	ACCEPTABLE
29	-405.52	454.54	195.13	2.05	ACCEPTABLE
30	-391.25	390.95	130.85	1.49	ACCEPTABLE
31	-403.36	347.16	100.14	1.69	ACCEPTABLE
32	-408.07	316.28	56.57	1.83	ACCEPTABLE
33	-458.63	647.07	378.14	2.73	ACCEPTABLE
34	-458.04	644.17	375.19	2.73	ACCEPTABLE
35	-424.47	356.40	96.75	1.80	ACCEPTABLE
36	-411.14	295.65	49.51	1.95	ACCEPTABLE
37	-403.65	287.28	40.29	2.48	ACCEPTABLE
38	-420.59	323.34	70.79	2.39	ACCEPTABLE
39	-406.61	306.68	49.88	2.81	ACCEPTABLE
40	-422.96	343.54	86.06	2.44	ACCEPTABLE
41	-408.11	316.53	56.75	1.73	ACCEPTABLE
42	-405.78	467.75	207.66	1.42	ACCEPTABLE

No.	Center		Radius	FS	Verification
	x [ft]	z [ft]	R [ft]		
43	-391.14	385.75	126.07	1.93	ACCEPTABLE
44	-409.29	368.42	108.55	1.36	ACCEPTABLE
45	-397.63	377.05	117.63	2.03	ACCEPTABLE
46	-418.25	397.80	131.38	1.74	ACCEPTABLE
47	-429.88	1035.99	767.64	2.21	ACCEPTABLE
48	-417.05	828.90	560.55	1.97	ACCEPTABLE
49	-407.58	428.47	168.37	1.39	ACCEPTABLE
50	-395.45	326.37	75.24	2.28	ACCEPTABLE
51	-407.26	419.62	160.12	1.94	ACCEPTABLE
52	-397.91	383.64	123.61	1.42	ACCEPTABLE
53	-404.77	351.69	100.33	2.10	ACCEPTABLE
54	-409.49	332.15	72.03	1.41	ACCEPTABLE
55	-431.24	461.75	195.13	2.00	ACCEPTABLE
56	-422.44	429.16	161.63	1.89	ACCEPTABLE
57	-419.79	358.23	98.54	1.72	ACCEPTABLE
58	-410.38	309.39	58.62	2.13	ACCEPTABLE
59	-405.49	302.23	50.96	2.38	ACCEPTABLE
60	-417.68	339.15	82.77	2.55	ACCEPTABLE
61	-408.35	323.61	65.29	2.35	ACCEPTABLE
62	-415.16	316.39	66.34	1.94	ACCEPTABLE
63	-418.94	350.56	92.04	2.23	ACCEPTABLE
64	-409.22	330.16	70.43	1.71	ACCEPTABLE
65	-407.54	427.36	167.33	1.39	ACCEPTABLE
66	-397.93	384.03	123.96	1.42	ACCEPTABLE
67	-409.29	368.42	108.55	1.36	ACCEPTABLE
68	-401.81	377.98	118.00	1.39	ACCEPTABLE
69	-414.52	384.59	120.08	1.58	ACCEPTABLE
70	-415.30	546.07	280.44	1.74	ACCEPTABLE
71	-408.07	492.37	226.74	1.67	ACCEPTABLE
72	-408.45	406.76	146.63	1.38	ACCEPTABLE
73	-399.62	338.03	83.75	2.85	ACCEPTABLE
74	-408.13	400.30	140.69	1.82	ACCEPTABLE
75	-401.81	377.98	118.00	1.39	ACCEPTABLE
76	-405.94	355.75	101.53	2.74	ACCEPTABLE
77	-409.71	342.86	82.76	1.38	ACCEPTABLE
78	-422.21	417.20	152.62	1.65	ACCEPTABLE
79	-415.78	395.60	130.40	1.63	ACCEPTABLE
80	-416.45	360.70	100.96	1.67	ACCEPTABLE
81	-409.91	322.21	68.38	2.76	ACCEPTABLE
82	-406.66	316.35	62.23	2.84	ACCEPTABLE
83	-415.31	349.54	91.47	2.33	ACCEPTABLE
84	-409.00	336.62	77.59	2.11	ACCEPTABLE
85	-413.11	327.98	74.53	2.72	ACCEPTABLE
86	-415.98	356.05	96.96	2.07	ACCEPTABLE
87	-409.48	340.80	81.03	1.64	ACCEPTABLE
88	-408.36	404.90	144.92	1.38	ACCEPTABLE
89	-401.89	379.47	119.35	1.40	ACCEPTABLE
90	-409.29	368.42	108.55	1.36	ACCEPTABLE
91	-404.45	376.25	116.13	1.38	ACCEPTABLE

No.	Center		Radius	FS	Verification
	x [ft]	z [ft]	R [ft]		
92	-412.49	378.66	115.58	1.49	ACCEPTABLE
93	-412.33	452.95	189.24	1.56	ACCEPTABLE
94	-407.68	427.85	164.13	1.54	ACCEPTABLE
95	-408.86	393.23	133.14	1.37	ACCEPTABLE
96	-402.61	346.92	90.67	2.66	ACCEPTABLE
97	-408.60	388.79	129.10	1.76	ACCEPTABLE
98	-404.34	374.56	114.61	1.38	ACCEPTABLE
99	-406.87	359.14	103.02	2.61	ACCEPTABLE
100	-409.66	350.84	90.80	1.37	ACCEPTABLE
101	-417.35	397.73	134.62	1.51	ACCEPTABLE
102	-413.00	383.66	120.17	1.51	ACCEPTABLE
103	-414.09	363.10	103.31	1.60	ACCEPTABLE
104	-409.60	333.63	77.77	2.61	ACCEPTABLE
105	-407.44	329.06	73.03	2.63	ACCEPTABLE
106	-413.47	356.48	97.60	2.13	ACCEPTABLE
107	-409.22	346.51	87.12	1.93	ACCEPTABLE
108	-411.75	338.15	82.50	2.60	ACCEPTABLE
109	-413.83	360.24	100.83	1.91	ACCEPTABLE
110	-409.49	349.17	89.37	1.60	ACCEPTABLE
111	-408.76	391.59	131.65	1.37	ACCEPTABLE
112	-404.44	376.02	115.93	1.38	ACCEPTABLE
113	-409.29	368.42	108.55	1.36	ACCEPTABLE
114	-406.13	374.22	114.11	1.38	ACCEPTABLE
115	-411.31	375.02	112.96	1.44	ACCEPTABLE
116	-411.07	415.74	153.30	1.47	ACCEPTABLE
117	-408.01	401.85	139.41	1.47	ACCEPTABLE
118	-409.06	384.63	124.59	1.37	ACCEPTABLE
119	-404.72	353.45	95.96	2.47	ACCEPTABLE
120	-408.87	381.64	121.89	1.66	ACCEPTABLE
121	-406.01	372.41	112.49	1.37	ACCEPTABLE
122	-407.58	361.80	104.42	2.47	ACCEPTABLE
123	-409.57	356.44	96.45	1.37	ACCEPTABLE
124	-414.46	386.78	124.71	1.45	ACCEPTABLE
125	-411.55	377.60	115.30	1.45	ACCEPTABLE
126	-412.51	364.79	104.98	1.58	ACCEPTABLE
127	-409.44	343.02	85.81	2.47	ACCEPTABLE
128	-408.00	339.61	82.30	2.46	ACCEPTABLE
129	-412.15	360.80	101.50	1.97	ACCEPTABLE
130	-409.30	353.50	93.91	1.82	ACCEPTABLE
131	-410.87	346.40	89.32	2.48	ACCEPTABLE
132	-412.35	363.01	103.42	1.82	ACCEPTABLE
133	-409.45	355.19	95.37	1.56	ACCEPTABLE
134	-408.98	383.39	123.47	1.36	ACCEPTABLE
135	-406.09	373.58	113.53	1.37	ACCEPTABLE
136	-409.29	368.42	108.55	1.36	ACCEPTABLE
137	-407.22	372.53	112.46	1.37	ACCEPTABLE
138	-410.59	372.73	111.37	1.41	ACCEPTABLE
139	-410.39	396.92	135.34	1.43	ACCEPTABLE
140	-408.37	388.62	127.04	1.42	ACCEPTABLE

No.	Center		Radius	FS	Verification
	x [ft]	z [ft]	R [ft]		
141	-409.16	379.08	119.09	1.36	ACCEPTABLE
142	-406.19	358.14	99.83	2.32	ACCEPTABLE
143	-409.02	377.08	117.29	1.61	ACCEPTABLE
144	-407.11	371.04	111.13	1.37	ACCEPTABLE
145	-408.11	363.79	105.57	2.31	ACCEPTABLE
146	-409.49	360.31	100.36	1.36	ACCEPTABLE
147	-412.66	380.20	118.84	1.41	ACCEPTABLE
148	-410.72	374.17	112.67	1.42	ACCEPTABLE
149	-411.44	365.96	106.13	1.55	ACCEPTABLE
150	-409.36	350.33	92.24	2.33	ACCEPTABLE
151	-408.40	347.87	89.71	2.33	ACCEPTABLE
152	-411.23	363.51	103.98	1.85	ACCEPTABLE
153	-409.32	358.33	98.64	1.72	ACCEPTABLE
154	-410.32	352.78	94.76	2.34	ACCEPTABLE
155	-411.34	364.83	105.14	1.71	ACCEPTABLE
156	-409.42	359.42	99.58	1.54	ACCEPTABLE
157	-409.10	378.19	118.29	1.36	ACCEPTABLE
158	-407.17	371.89	111.90	1.37	ACCEPTABLE
159	-409.29	368.42	108.55	1.36	ACCEPTABLE
160	-407.92	371.26	111.24	1.37	ACCEPTABLE
161	-410.14	371.25	110.38	1.39	ACCEPTABLE
162	-409.99	386.27	125.26	1.40	ACCEPTABLE
163	-408.65	381.10	120.09	1.40	ACCEPTABLE
164	-409.22	375.46	115.51	1.36	ACCEPTABLE
165	-407.20	361.42	102.58	2.16	ACCEPTABLE
166	-409.12	374.13	114.31	1.57	ACCEPTABLE
167	-407.84	370.15	110.25	1.36	ACCEPTABLE
168	-408.48	365.23	106.46	2.17	ACCEPTABLE
169	-409.43	362.96	103.03	1.36	ACCEPTABLE
170	-411.50	376.08	115.21	1.39	ACCEPTABLE
171	-410.21	372.11	111.15	1.40	ACCEPTABLE
172	-410.73	366.77	106.92	1.54	ACCEPTABLE
173	-409.32	355.79	97.10	2.19	ACCEPTABLE
174	-408.68	354.05	95.32	2.18	ACCEPTABLE
175	-410.60	365.22	105.56	1.74	ACCEPTABLE
176	-409.32	361.63	101.87	1.64	ACCEPTABLE
177	-409.96	357.51	98.87	2.19	ACCEPTABLE
178	-410.67	366.04	106.28	1.64	ACCEPTABLE
179	-409.38	362.34	102.49	1.54	ACCEPTABLE
180	-409.17	374.84	114.95	1.36	ACCEPTABLE
181	-407.88	370.75	110.79	1.37	ACCEPTABLE
182	-409.29	368.42	108.55	1.36	ACCEPTABLE
183	-408.38	370.36	110.38	1.36	ACCEPTABLE
184	-409.85	370.29	109.75	1.38	ACCEPTABLE
185	-409.75	379.86	119.23	1.39	ACCEPTABLE
186	-408.85	376.56	115.93	1.39	ACCEPTABLE
187	-409.25	373.09	113.16	1.36	ACCEPTABLE
188	-407.88	363.69	104.50	2.04	ACCEPTABLE
189	-409.18	372.20	112.36	1.56	ACCEPTABLE

No.	Center x [ft]	Center z [ft]	Radius R [ft]	FS	Verification
190	-408.33	369.56	109.68	1.36	ACCEPTABLE
191	-408.74	366.24	107.11	2.05	ACCEPTABLE
192	-409.39	364.75	104.85	1.36	ACCEPTABLE
193	-410.75	373.45	112.91	1.38	ACCEPTABLE
194	-409.89	370.82	110.22	1.38	ACCEPTABLE
195	-410.25	367.31	107.46	1.54	ACCEPTABLE
196	-409.30	359.72	100.64	2.07	ACCEPTABLE
197	-408.87	358.52	99.41	2.06	ACCEPTABLE
198	-410.17	366.33	106.59	1.66	ACCEPTABLE
199	-409.32	363.87	104.07	1.60	ACCEPTABLE
200	-409.73	360.92	101.86	2.07	ACCEPTABLE
201	-410.21	366.84	107.04	1.60	ACCEPTABLE
202	-409.35	364.33	104.47	1.51	ACCEPTABLE
203	-409.21	372.66	112.78	1.36	ACCEPTABLE
204	-408.36	369.98	110.05	1.36	ACCEPTABLE
205	-409.29	368.42	108.55	1.36	ACCEPTABLE

Analysis 2 (stage 6)

Polygonal slip surface

Coordinates of slip surface points [ft]									
x	z	x	z	x	z	x	z	x	z
349.62	276.53	437.49	259.66	441.55	269.00				
The slip surface after optimization.									

Segments restricting slip surface

No.	First point x [ft]	First point z [ft]	Second point x [ft]	Second point z [ft]
1	-159.78	250.98	109.70	250.98

Slope stability verification (Janbu)
Factor of safety = 1.43 > 1.00
Slope stability ACCEPTABLE

Input data (Stage of construction 7)

Assigning and surfaces

No.	Surface position	Coordinates of surface points [ft] x	z	x	z	Assigned soil
1		-352.68	260.06	-372.12	269.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		-396.00	281.00	-480.00	281.00	
		-480.00	260.00			
2		57.43	260.06	40.70	266.99	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		40.68	267.00	14.18	278.00	
		0.00	281.00	-32.48	281.00	
		-56.00	277.75	-75.60	268.96	
		-95.63	259.96			

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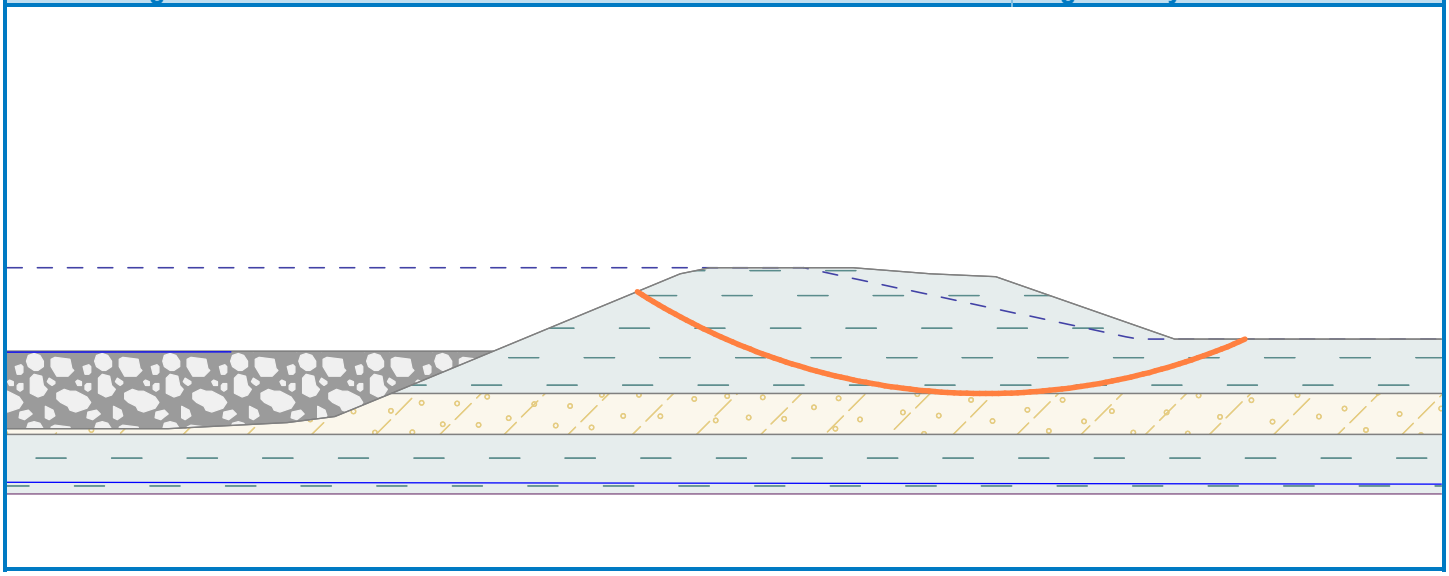
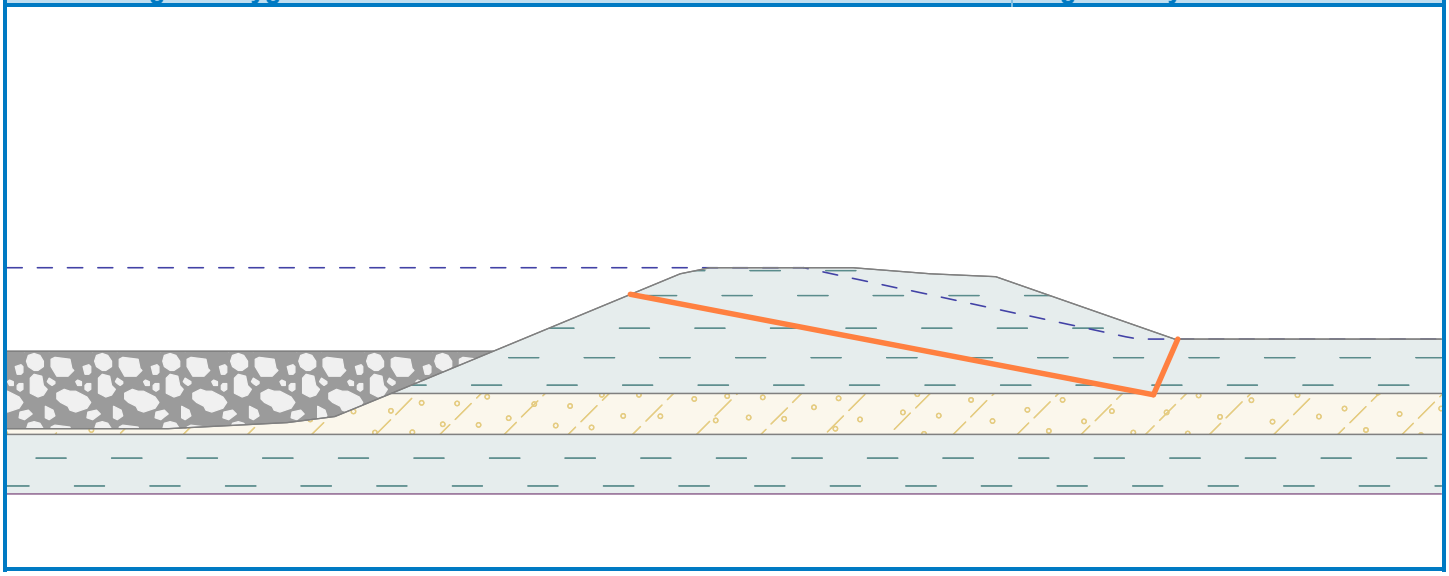
Name : Stage 6 Rotational	Stage - analysis : 6 - 1



ERM - Annapolis

Name : Stage 6 Polygonal	Stage - analysis : 6 - 2



No.	Surface position	Coordinates of surface points [ft]				Assigned soil
		x	z	x	z	
3		640.00	259.88	640.00	269.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		441.00	269.00	411.00	279.50	
		400.00	280.00	387.00	281.00	
		363.00	281.00	358.00	280.00	
		326.60	267.00	309.46	259.91	
4		-372.12	269.00	-352.68	260.06	Ash
		-346.00	257.00	-106.00	257.00	
		-100.00	258.00	-95.63	259.96	
		-75.60	268.96			
5		40.70	267.00	40.68	267.00	Ash
		40.70	266.99	57.43	260.06	
		72.00	254.00	272.00	254.00	
		292.00	255.00	300.00	256.00	
		309.46	259.91	326.60	267.00	
6		640.00	253.00	640.00	259.88	Silty sand (SM)
		309.46	259.91	300.00	256.00	
		292.00	255.00	272.00	254.00	
		72.00	254.00	57.43	260.06	
		-95.63	259.96	-100.00	258.00	
		-106.00	257.00	-346.00	257.00	
		-352.68	260.06	-480.00	260.00	
		-480.00	253.00			
7		-480.00	253.00	-480.00	243.00	Clay with high or very high plasticity (CH, CV, CE), soft consistency
		640.00	243.00	640.00	253.00	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [ft]					
		x	z	x	z	x	z
1		-480.00	279.00	-397.22	279.00	363.96	279.00
		434.56	269.00	640.00	269.00		

Tensile crack

Tensile crack not input.

Earthquake

Horizontal seismic coefficient : K_h = 0.20
Vertical seismic coefficient : K_v = 0.00

Settings of the stage of construction

Design situation : seismic

Results (Stage of construction 7)

Analysis 1 (stage 7)

Circular slip surface

Slip surface parameters							
Center :	x =	416.16	[ft]	Angles :	α_1 =	-35.85	[°]
	z =	362.20	[ft]		α_2 =	24.36	[°]
Radius :	R =	102.31	[ft]				
The slip surface after optimization.							

Segments restricting slip surface

No.	First point		Second point	
	x [ft]	z [ft]	x [ft]	z [ft]
1	-159.58	250.78	109.90	251.38
2	106.95	266.86	290.40	267.28
3	639.76	244.48	58.61	245.20
4	294.71	264.84	101.63	263.47

The restrictions of points of circular slip surface

Slope stability verification (Bishop)

Sum of active forces : F_a = 35519.0 lbf/ft
Sum of passive forces : F_p = 51670.4 lbf/ft

Sliding moment : M_a = 3633946.7 lbfft/ft
Resisting moment : M_p = 5286395.6 lbfft/ft
Factor of safety = 1.45 > 1.00
Slope stability ACCEPTABLE

Analysis 2 (stage 7)

Polygonal slip surface

Coordinates of slip surface points [ft]									
x	z	x	z	x	z	x	z	x	z
334.08	270.10	437.83	260.22	442.28	269.00				
The slip surface after optimization.									

Segments restricting slip surface

No.	First point		Second point	
	x [ft]	z [ft]	x [ft]	z [ft]
1	-159.78	250.98	109.70	250.98

Slope stability verification (Janbu)

Factor of safety = 1.52 > 1.00
Slope stability ACCEPTABLE

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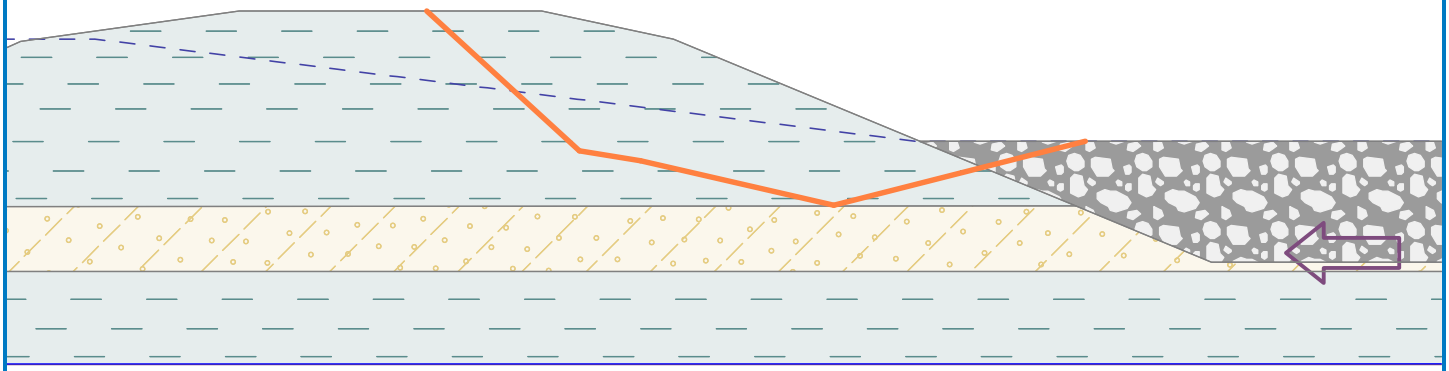
Name : 1 seismic peak poly. 1.34	Stage - analysis : 2 - 2



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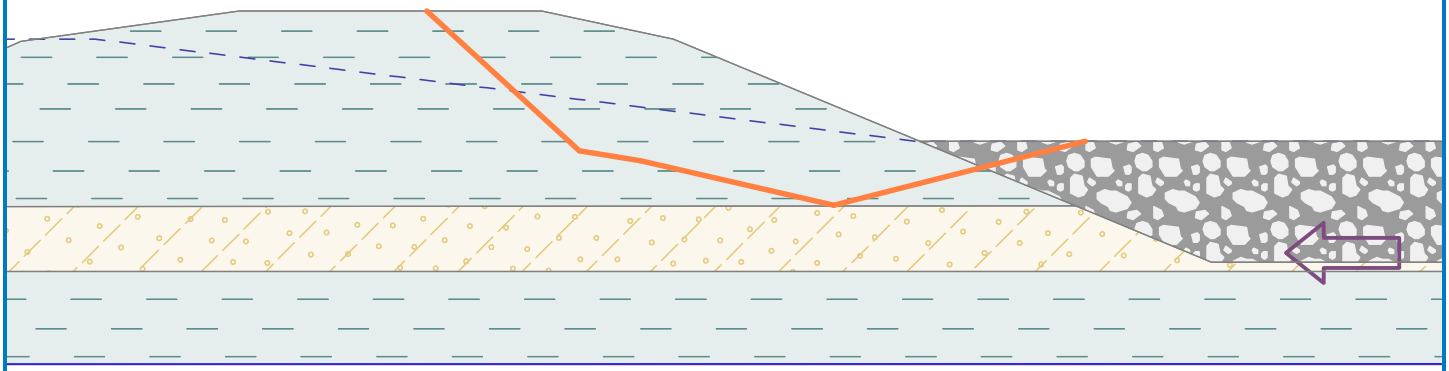
Name : 1 seismic peak poly. 1.36	Stage - analysis : 2 - 2



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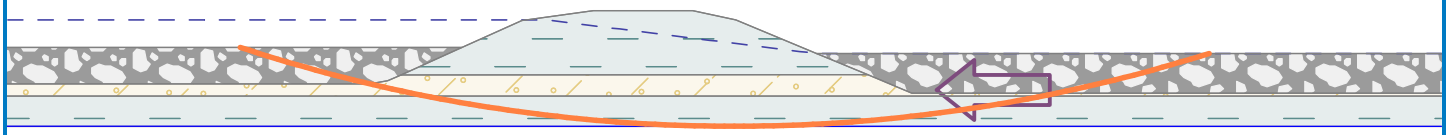
Name : 1 seismic peak rot. 1.26	Stage - analysis : 2 - 1



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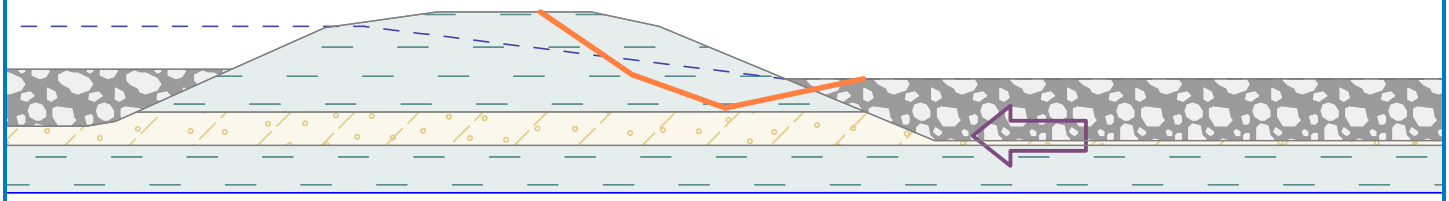
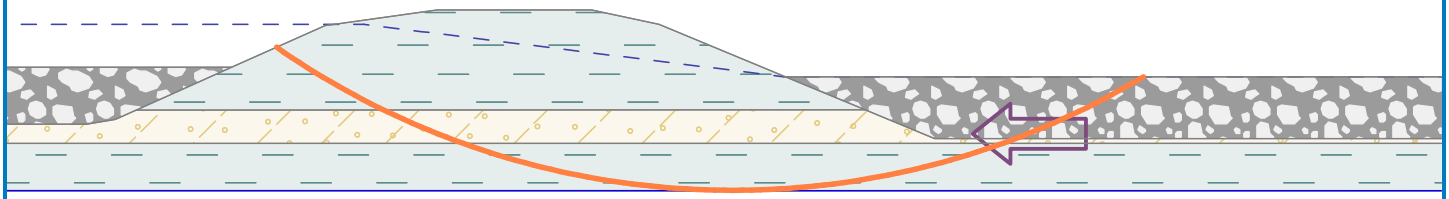
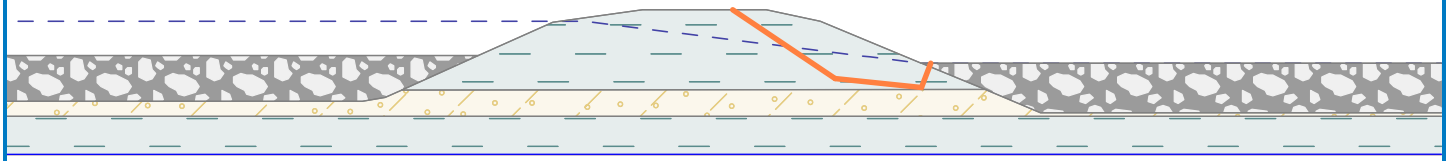
Name : 1 Seismic resi. poly. 1.55	Stage - analysis : 2 - 2



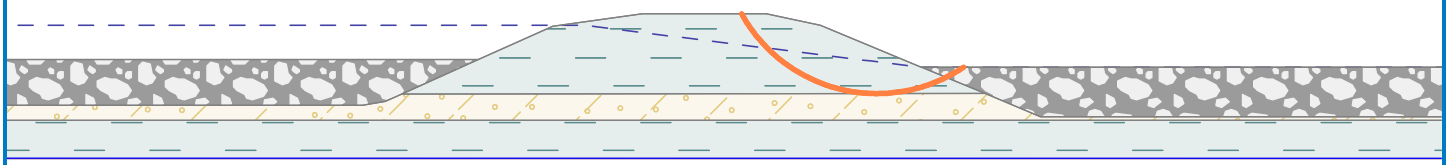
Name : 1 Seismic resi. rota. 1.4	Stage - analysis : 2 - 1



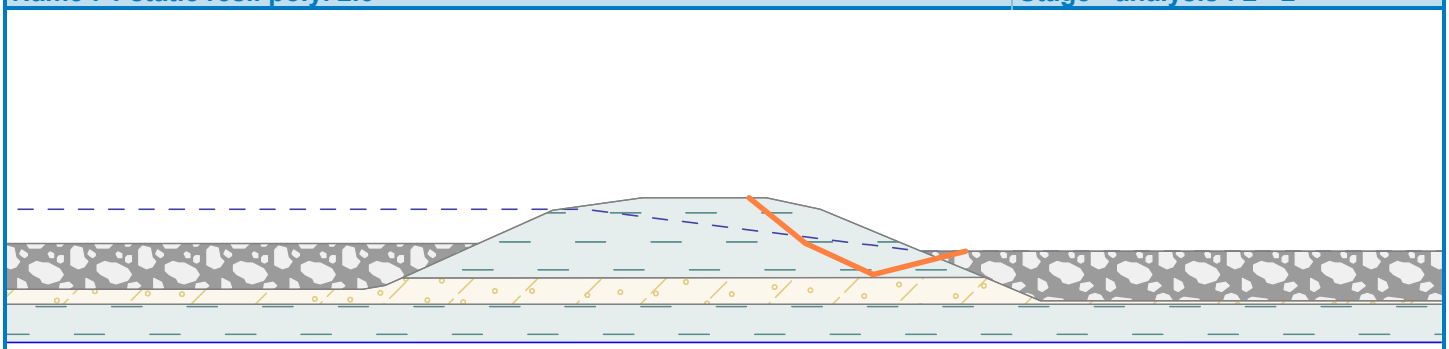
Name : 1 static peakpolygonal 2.39	Stage - analysis : 2 - 2



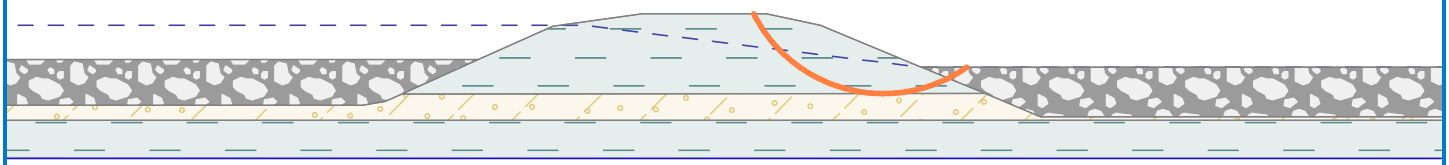
Name : 1 static peak rotation 2.34	Stage - analysis : 2 - 1



Name : 1 static resi. poly. 2.6	Stage - analysis : 2 - 2



Name : 1 static resi. rota. 2.46	Stage - analysis : 2 - 1



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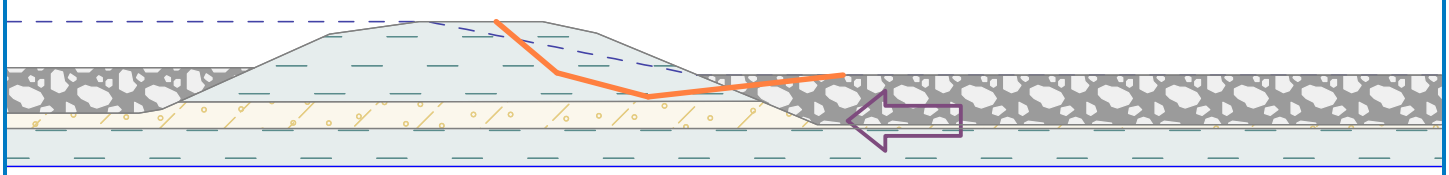
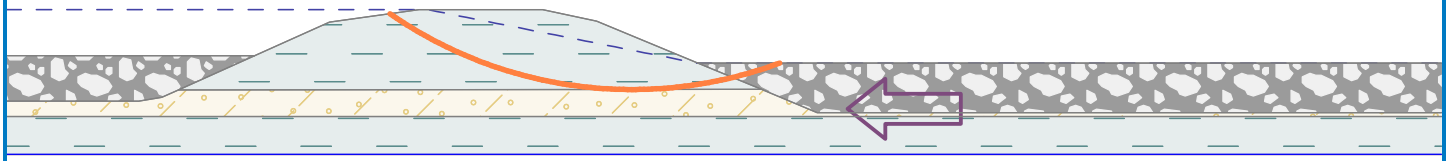
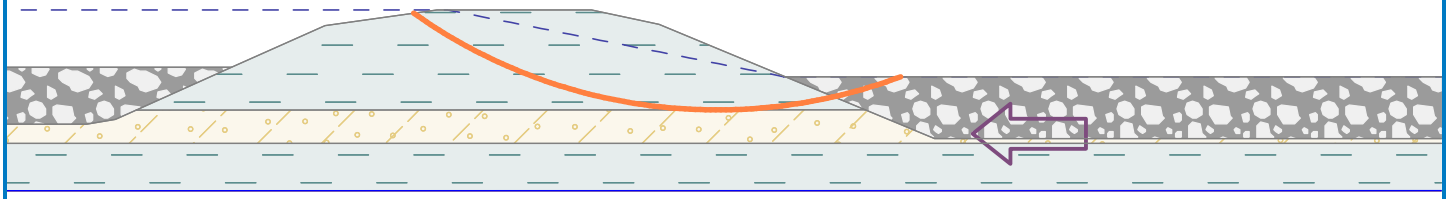
Name : 2 seismic peak poly. 1.43	Stage - analysis : 3 - 2



Name : 2 seismic peak rota. 1.24	Stage - analysis : 3 - 1



Name : 2 Seismic resi. rota. 1.3	Stage - analysis : 3 - 1



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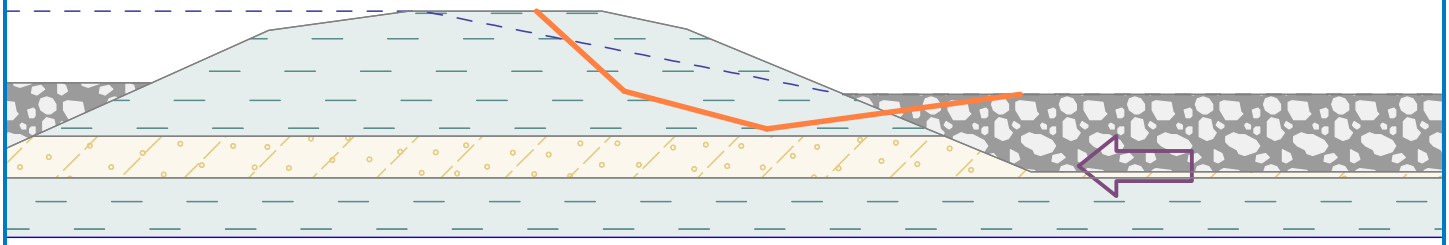
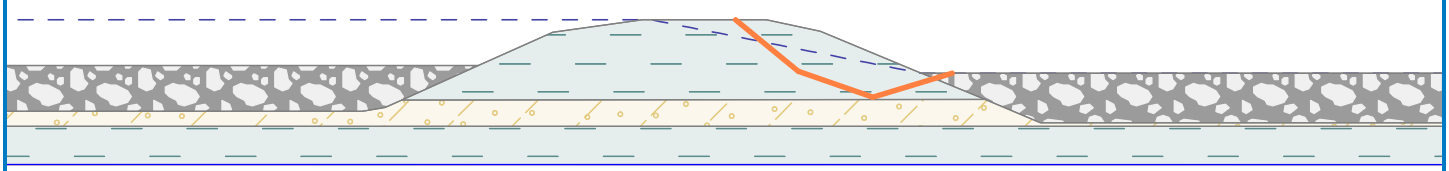
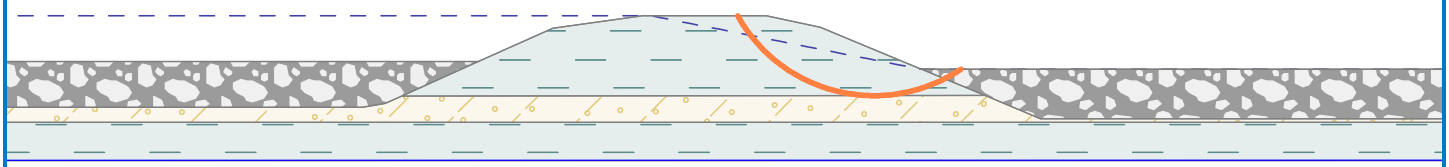
Name : 2 Seismic resi.poly. 1.43	Stage - analysis : 3 - 2



Name : 2 static peak poly. 2.44	Stage - analysis : 3 - 2



Name : 2 static peak rot. 2.24	Stage - analysis : 3 - 1



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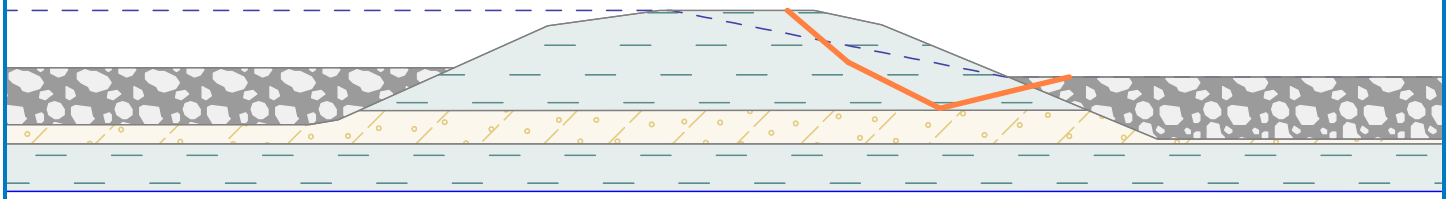
Name : 2 static resi. poly. 2.45	Stage - analysis : 3 - 2



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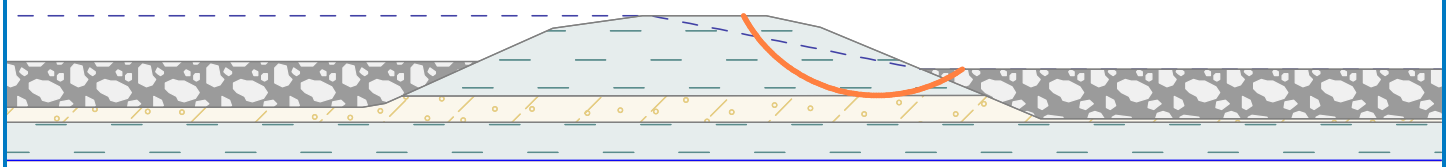
Name : 2 static resi. rota. 2.32	Stage - analysis : 3 - 1



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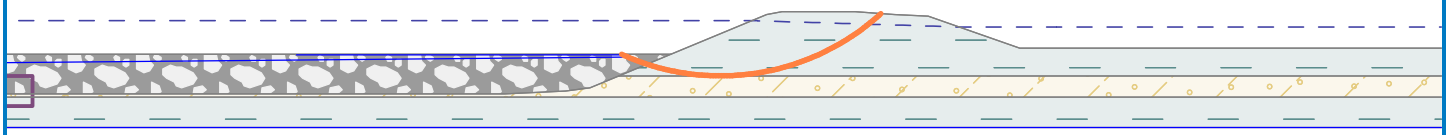
Name : 3 seismic peak rotational 1.53	Stage - analysis : 4 - 1



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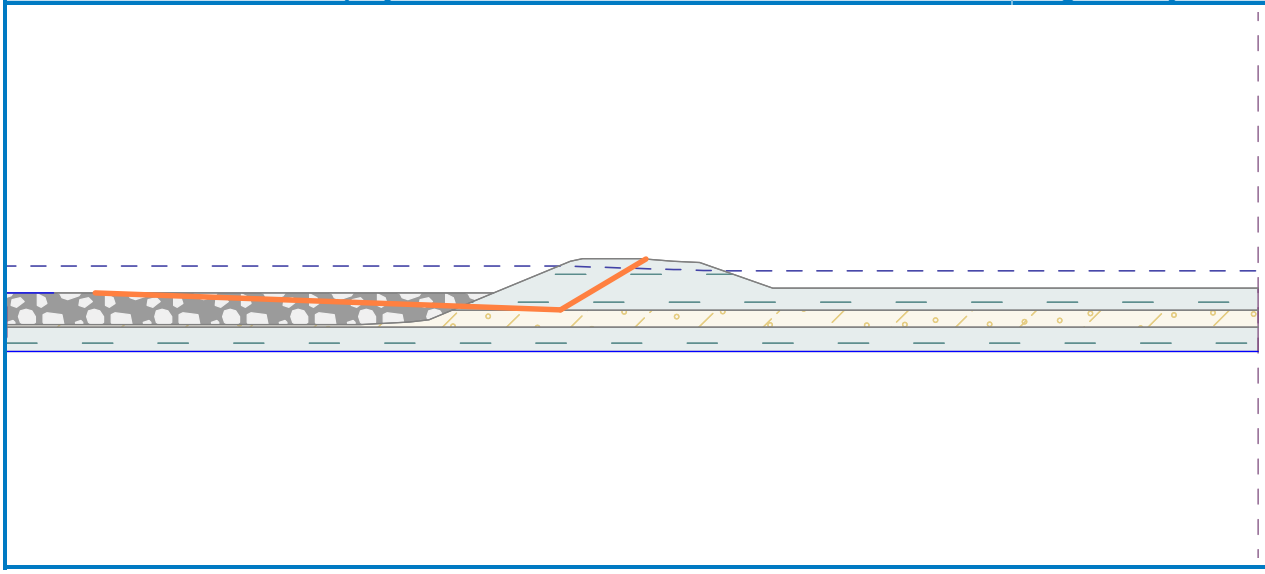
Name : 3 seismic residual poly 1.59	Stage - analysis : 4 - 2



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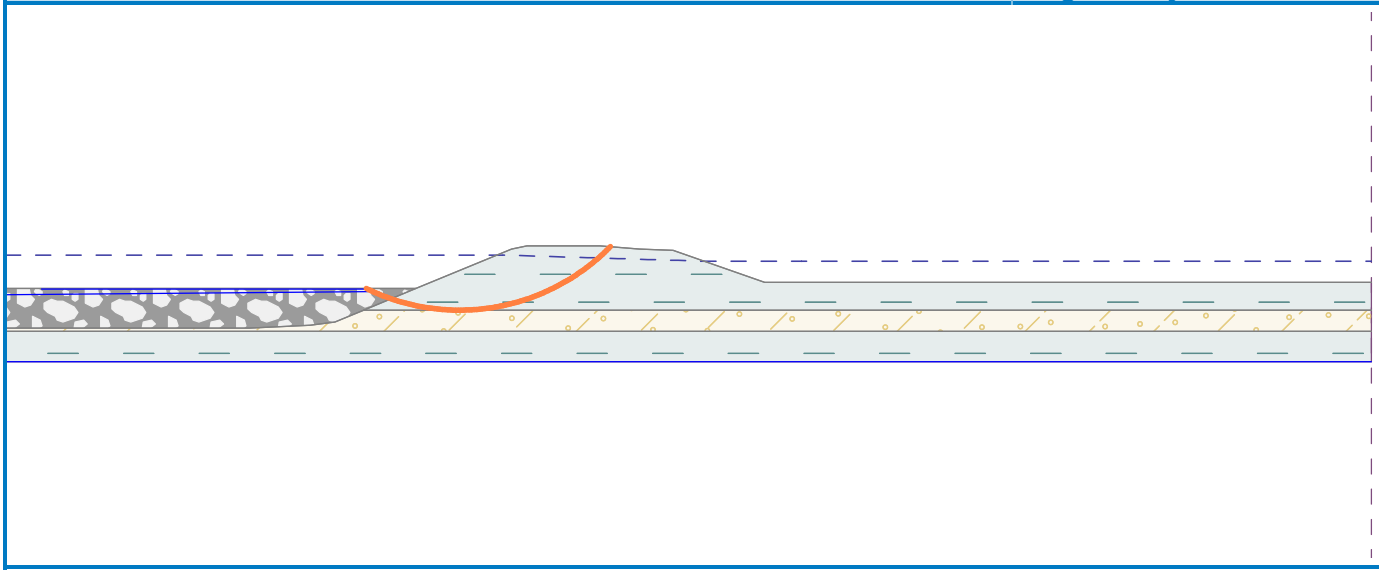
Name : 3 seismic residual rotational 1.55	Stage - analysis : 4 - 1



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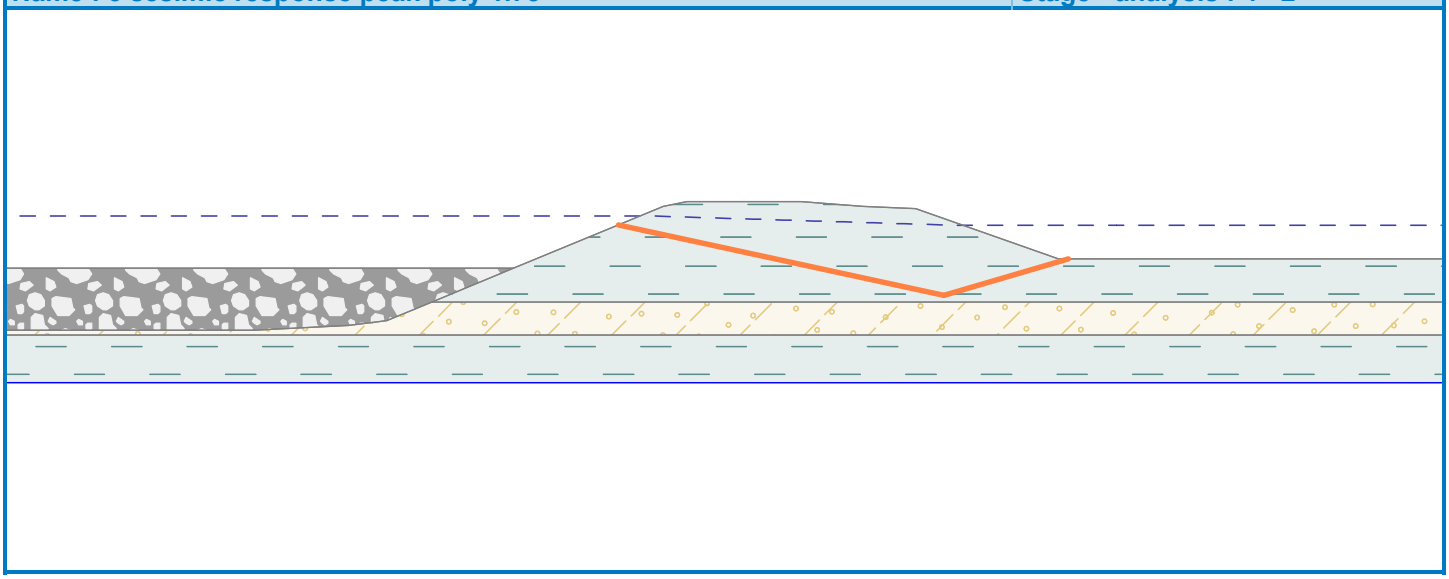
Name : 3 sesimic response peak poly 1.75	Stage - analysis : 4 - 2



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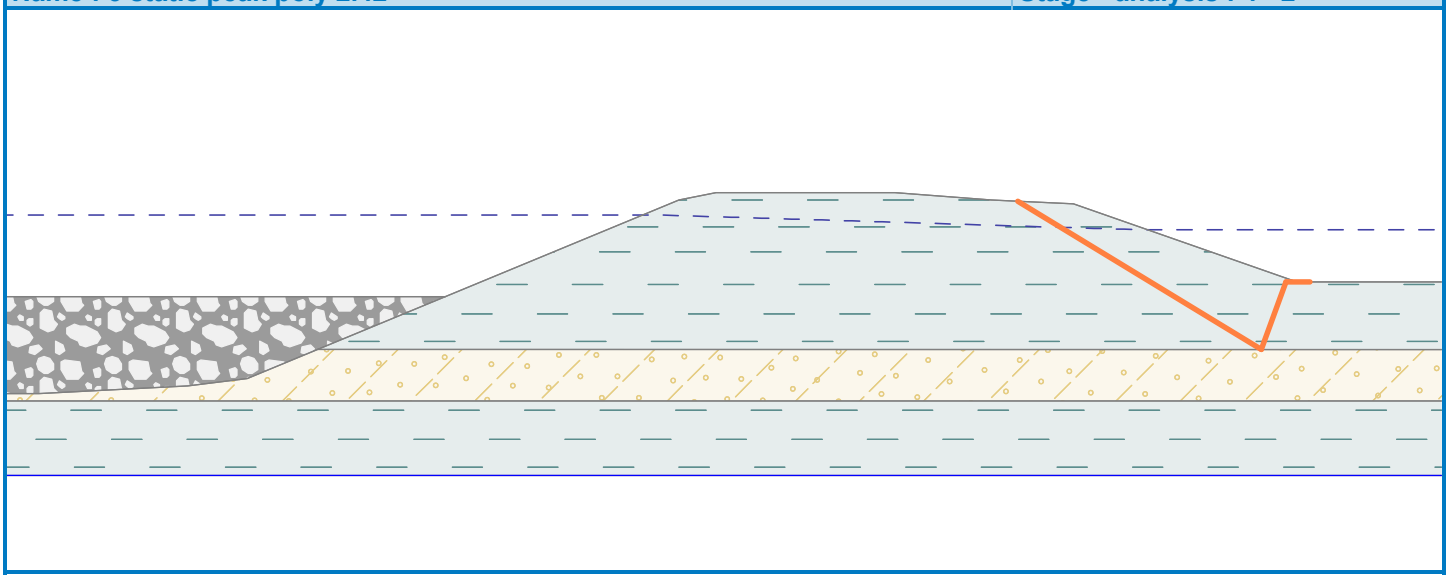
Name : 3 static peak poly 2.42	Stage - analysis : 4 - 2



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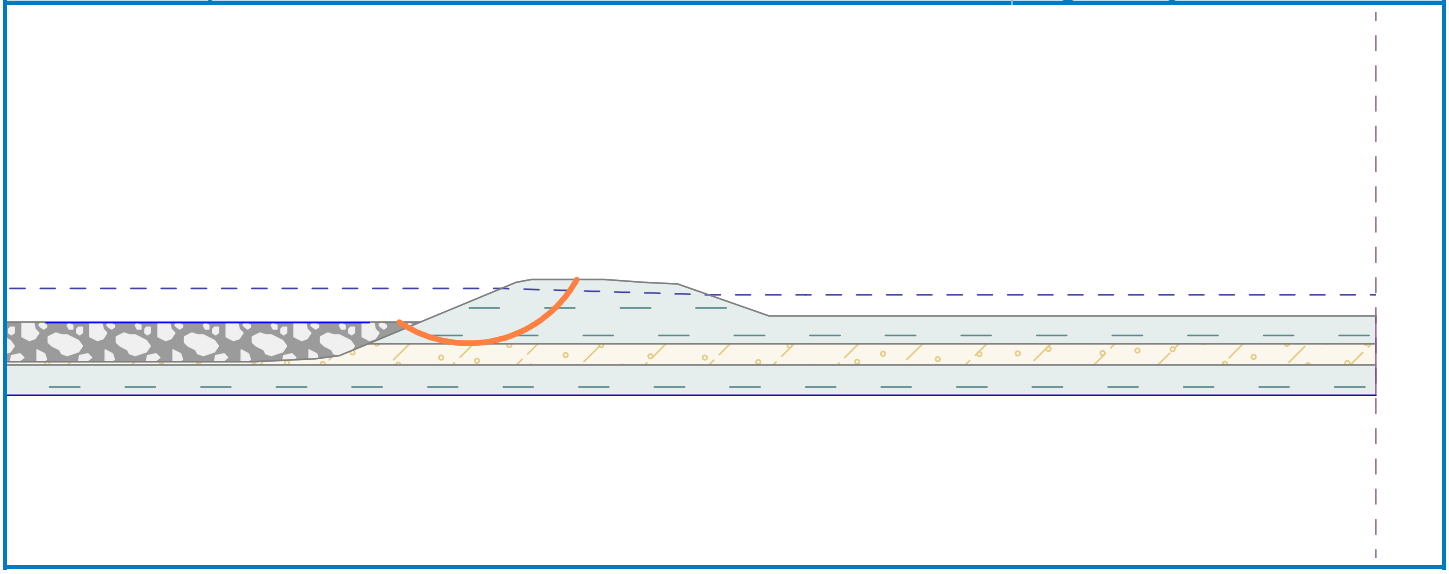
Name : 3 static peak rotational 3.92	Stage - analysis : 4 - 1



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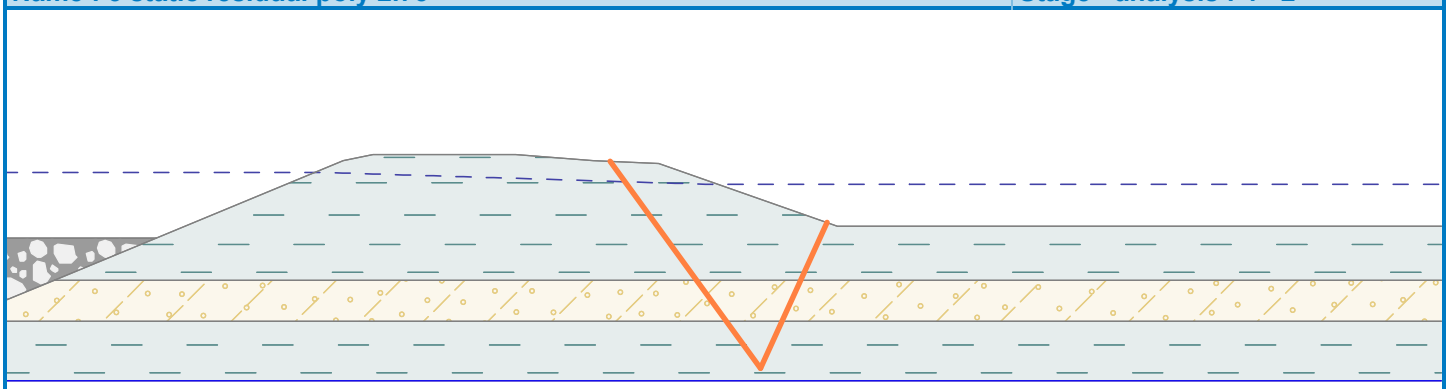
Name : 3 static residual poly 2.75	Stage - analysis : 4 - 2



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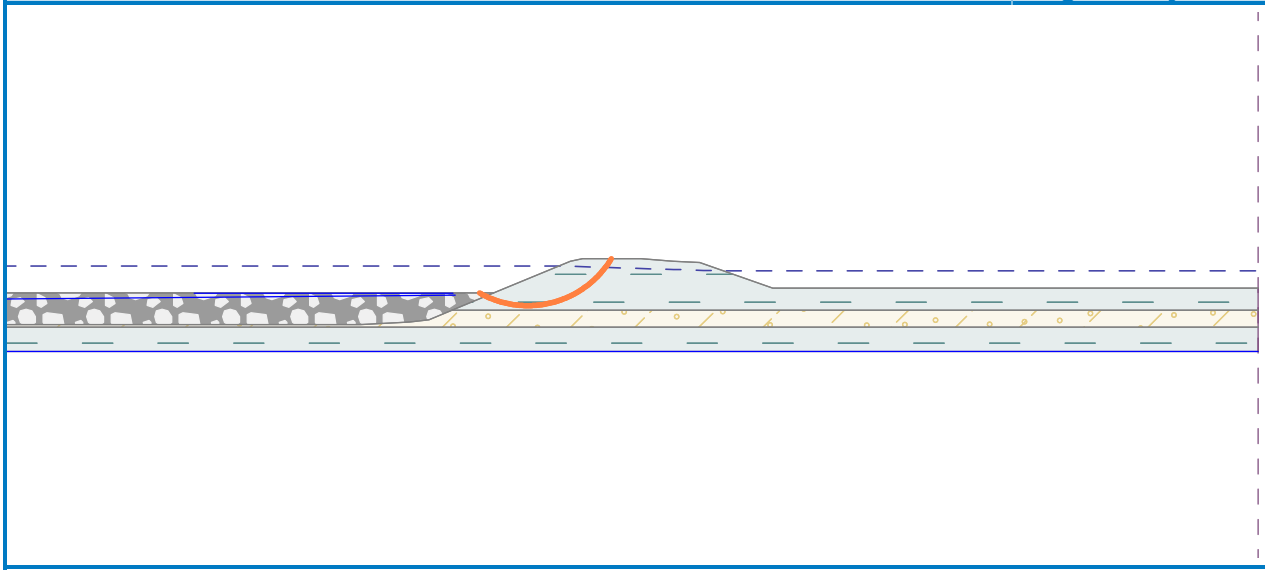
Name : 3 static residual rotat 3.89	Stage - analysis : 4 - 1



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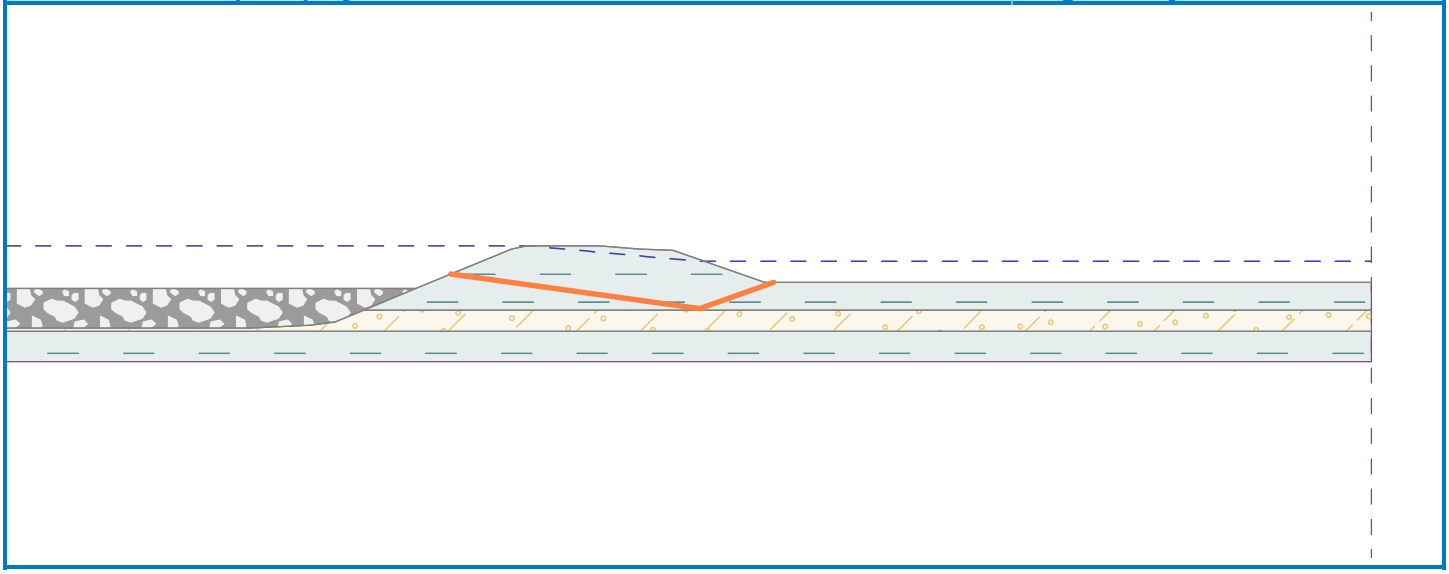
Name : 4 seismic peak poly 1.55	Stage - analysis : 5 - 2



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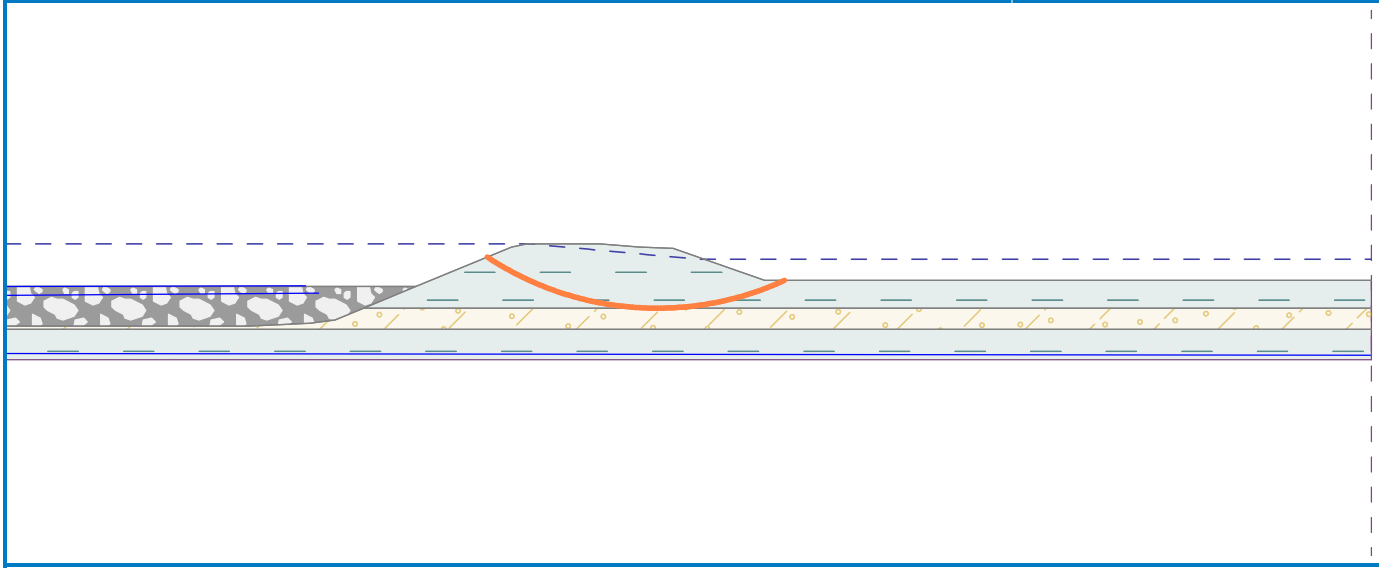
Name : 4 seismic peak rotational 1.46	Stage - analysis : 5 - 1



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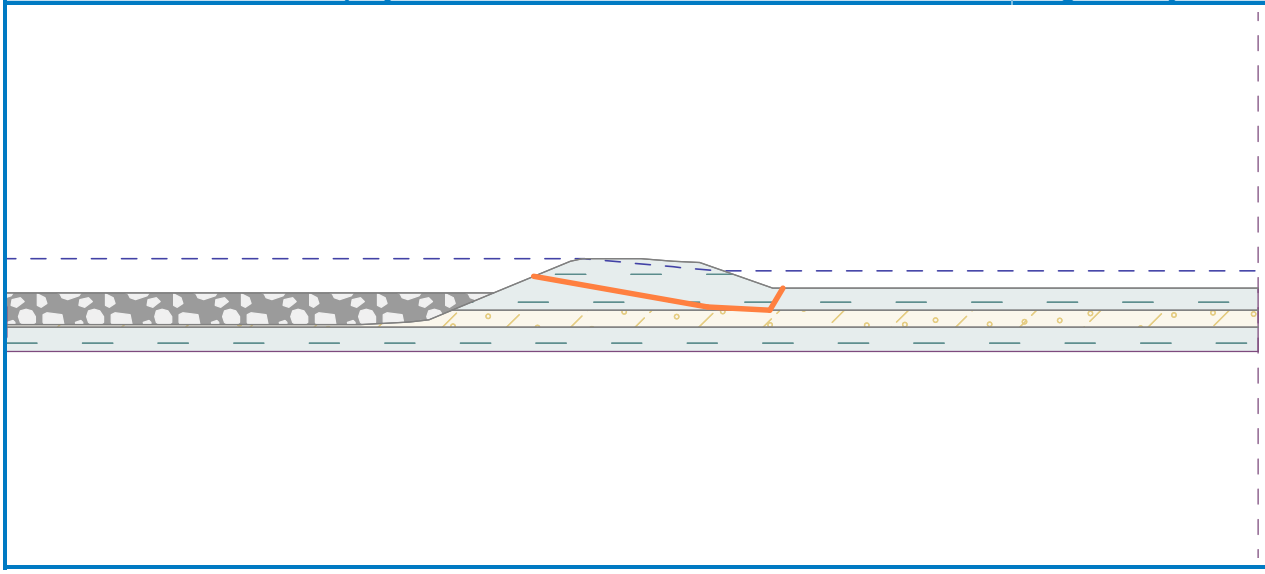
Name : 4 seismic residual poly 1.5	Stage - analysis : 5 - 2



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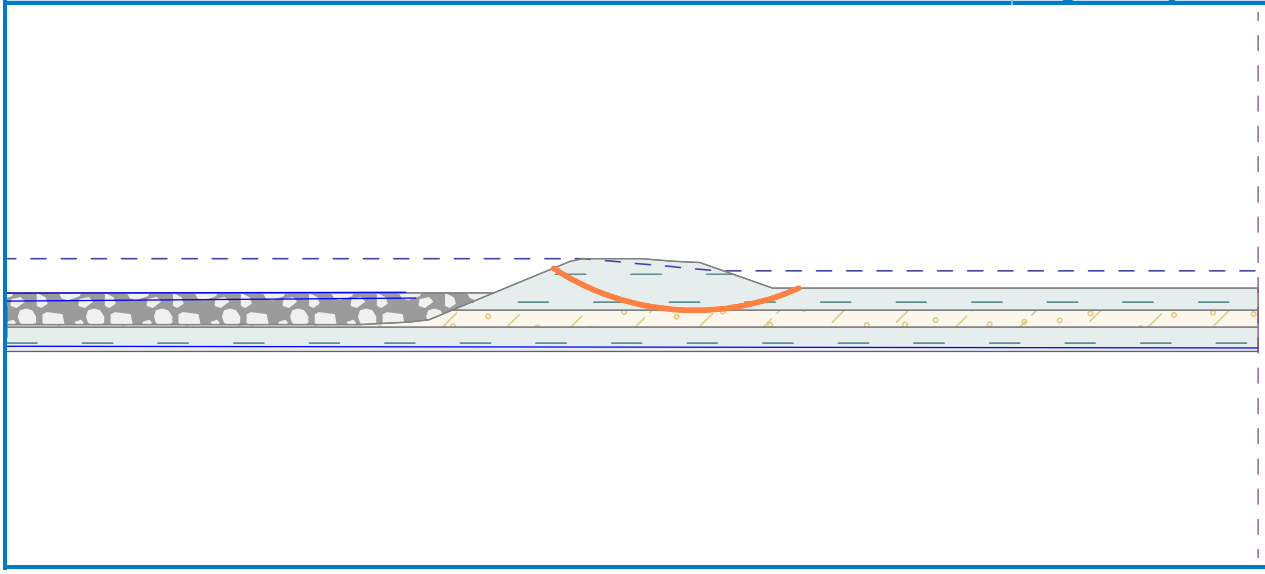
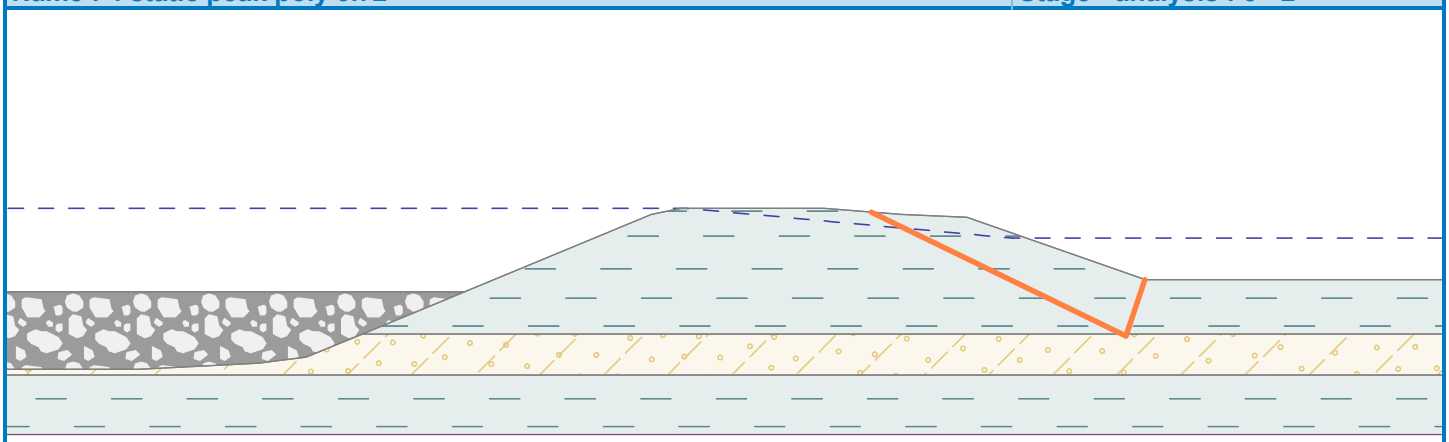
Name : 4 seismic residual rotat 1.49	Stage - analysis : 5 - 1



ERM - Annapolis

Name : 4 static peak poly 3.72	Stage - analysis : 5 - 2



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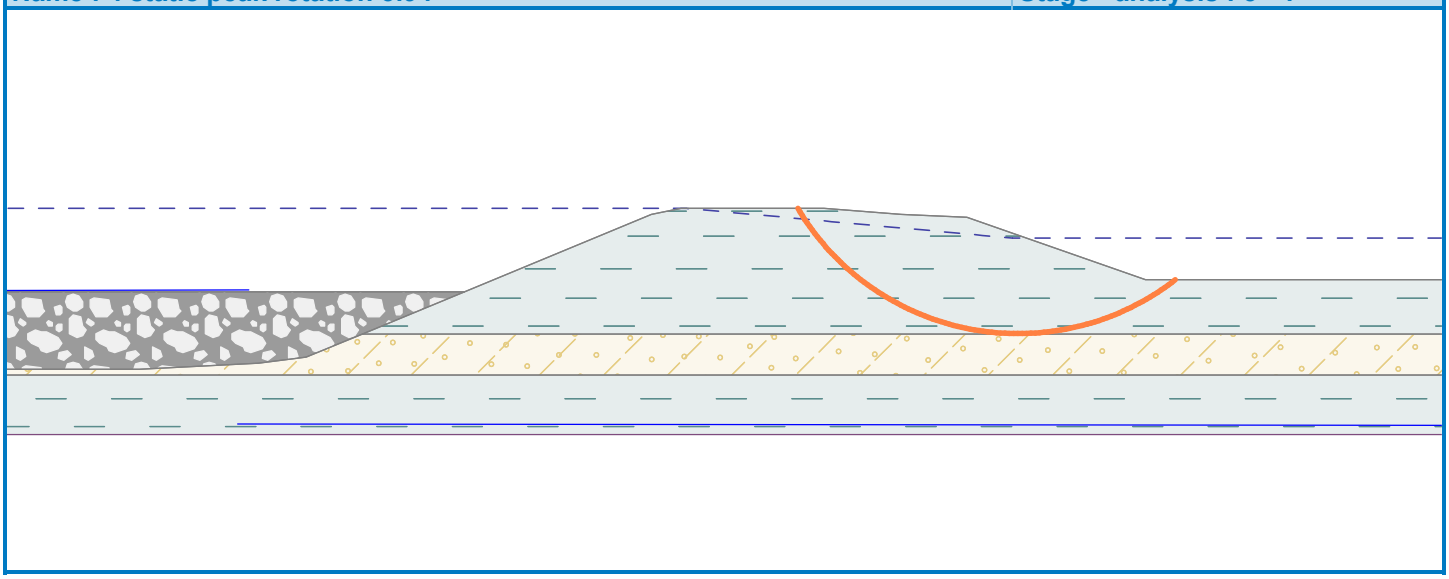
Name : 4 static peak rotation 3.94	Stage - analysis : 5 - 1



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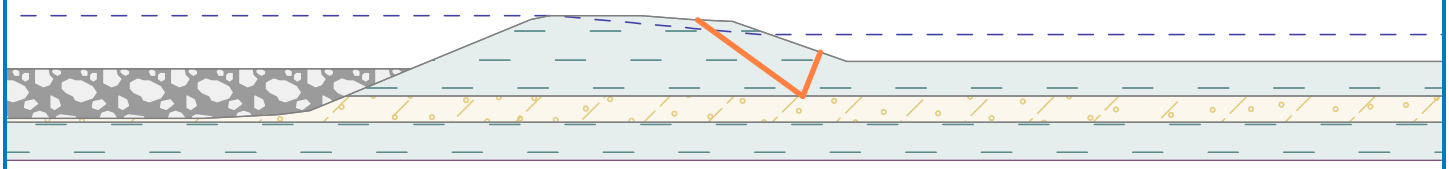
Name : 4 static residual poly 2.87	Stage - analysis : 5 - 2



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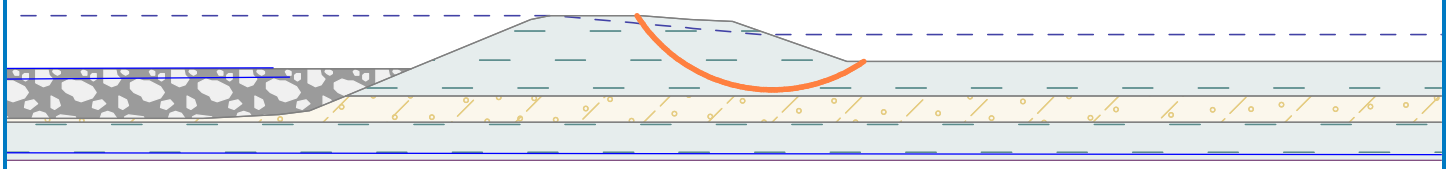
Name : 4 static residual rotational 3.96	Stage - analysis : 5 - 1



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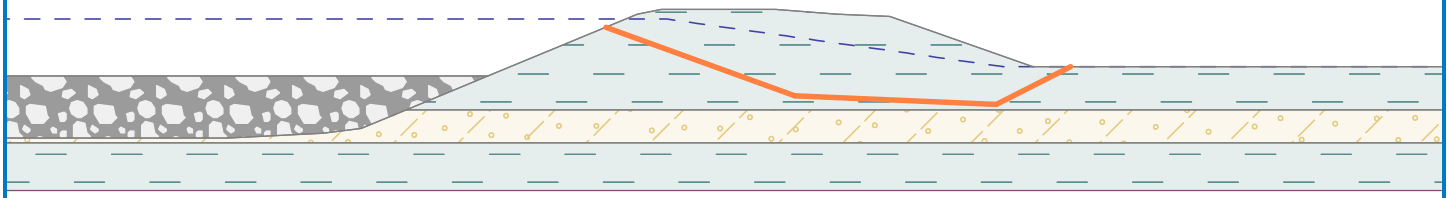
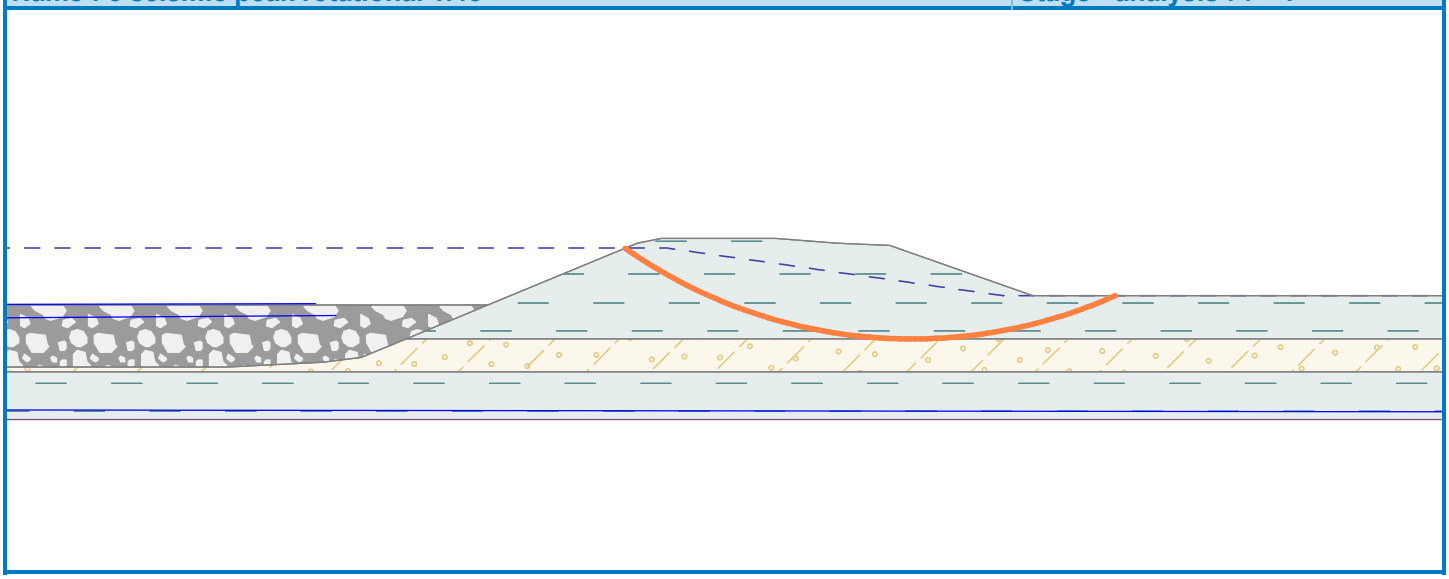
Name : 5 seismic peak poly 1.51	Stage - analysis : 7 - 2



ERM - Annapolis

Name : 5 seismic peak rotational 1.45	Stage - analysis : 7 - 1



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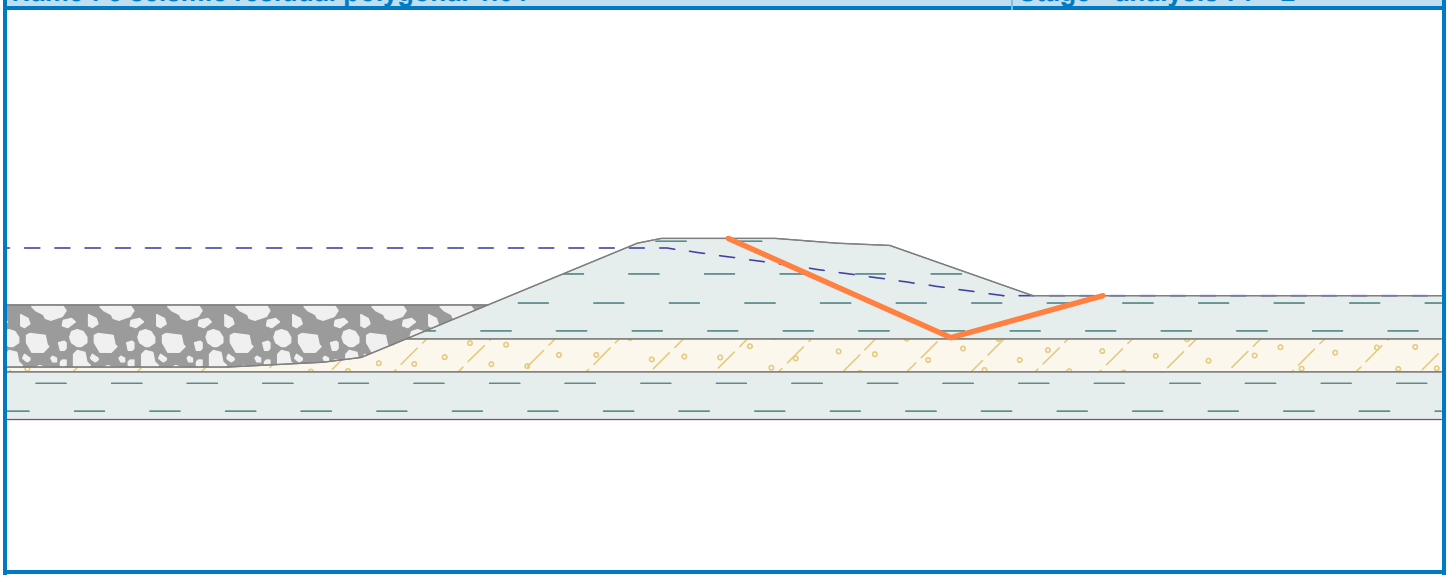
Name : 5 seismic residual polygonal 1.64	Stage - analysis : 7 - 2



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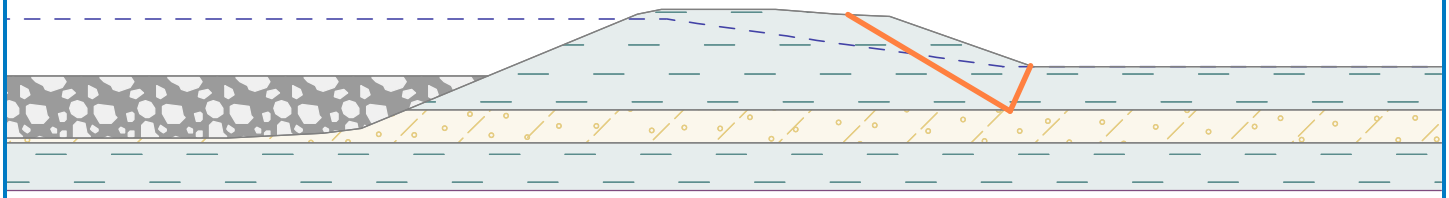
Name : 5 static peak poly 2.58	Stage - analysis : 7 - 2



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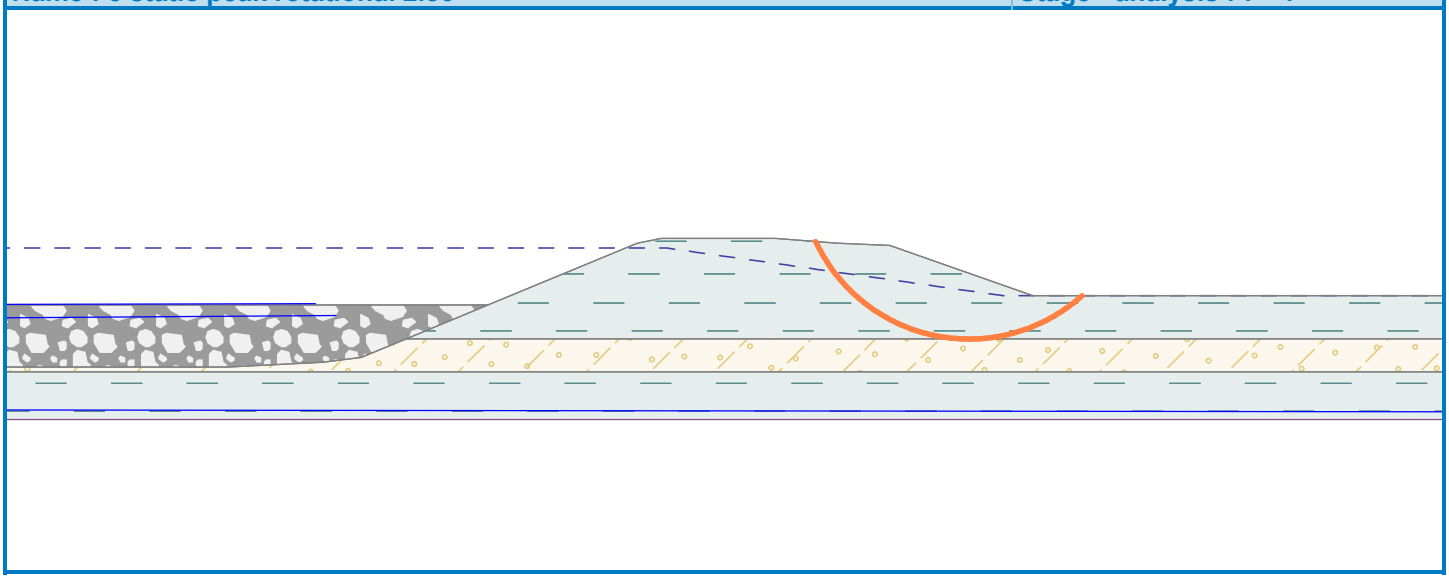
Name : 5 static peak rotational 2.86	Stage - analysis : 7 - 1



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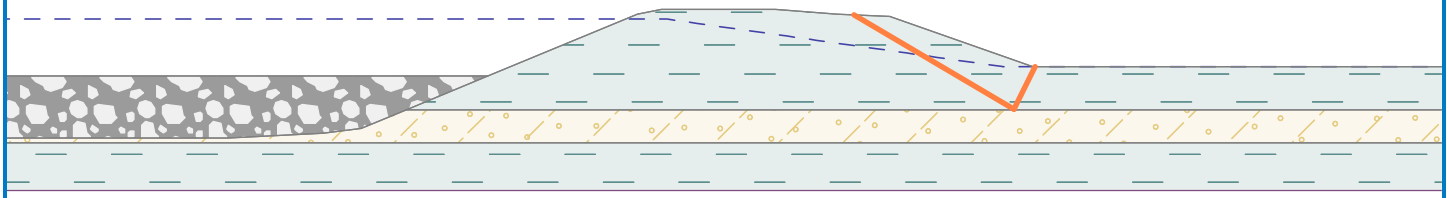
Name : 5 static residual poly 2.56	Stage - analysis : 7 - 2



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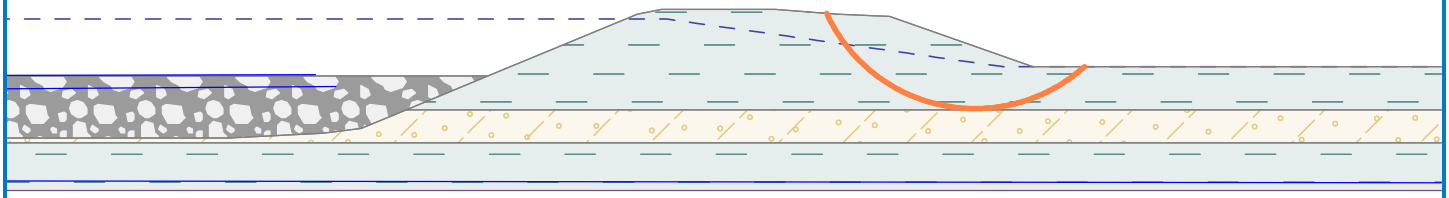
Name : 5 static residual rotational 2.95	Stage - analysis : 7 - 1



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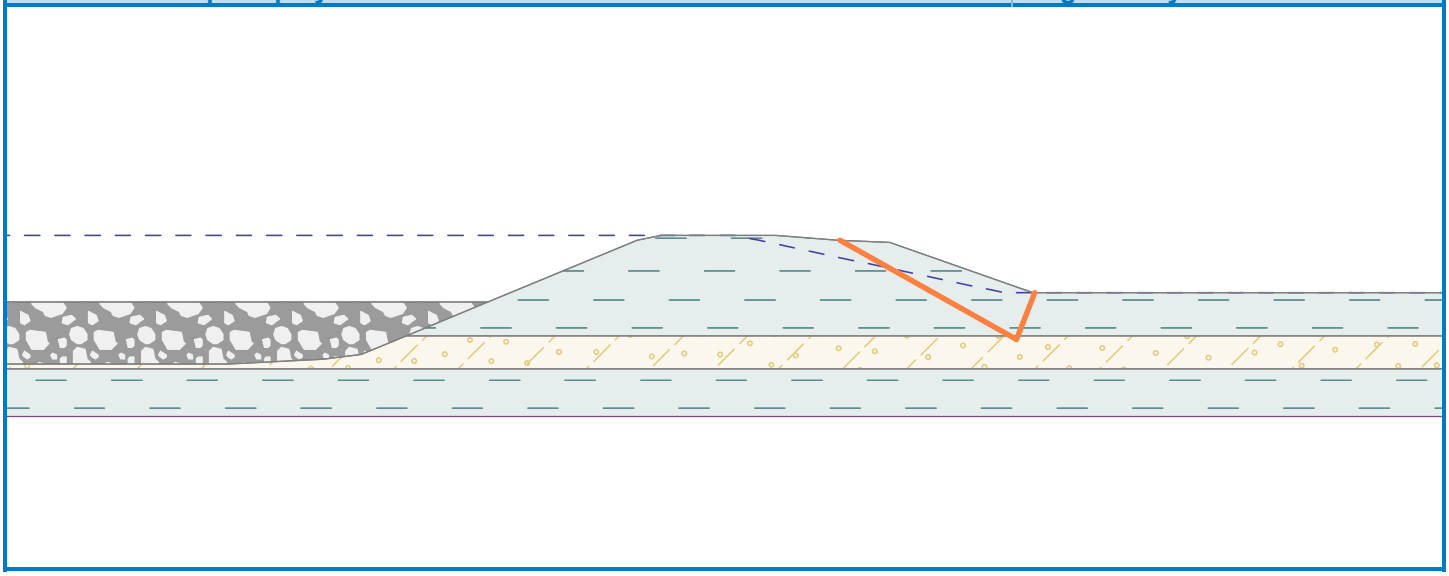
Name : 6 static peak poly 2.54	Stage - analysis : 6 - 2



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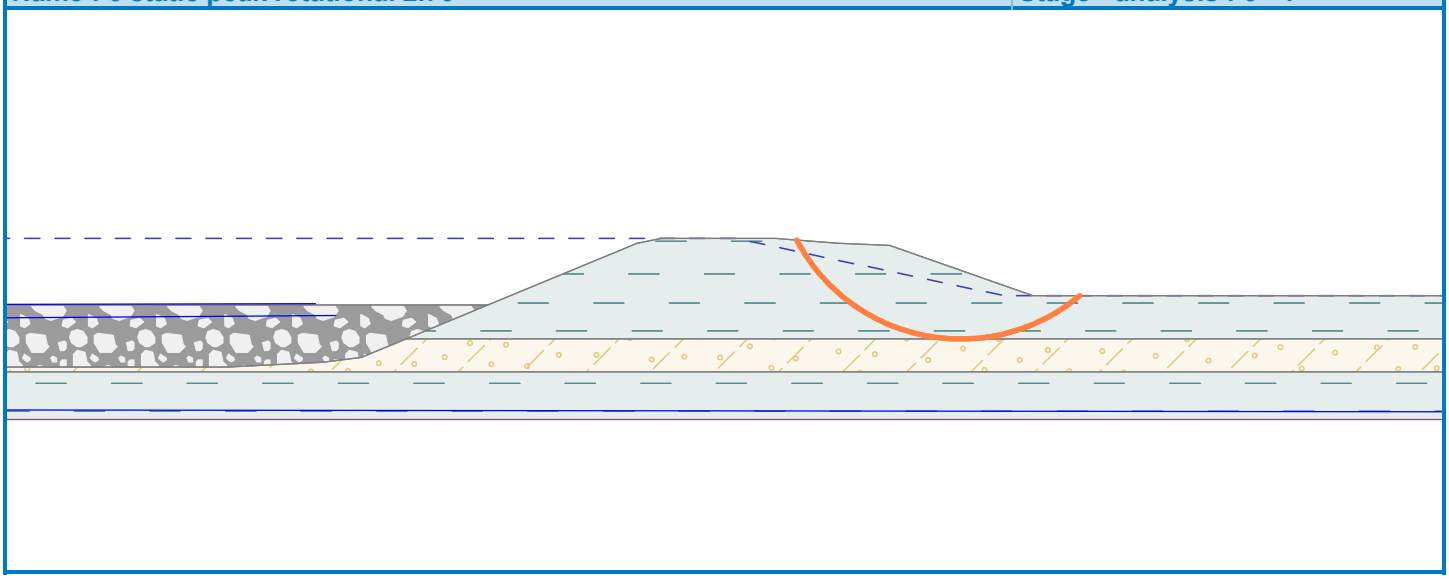
Name : 6 static peak rotational 2.76	Stage - analysis : 6 - 1



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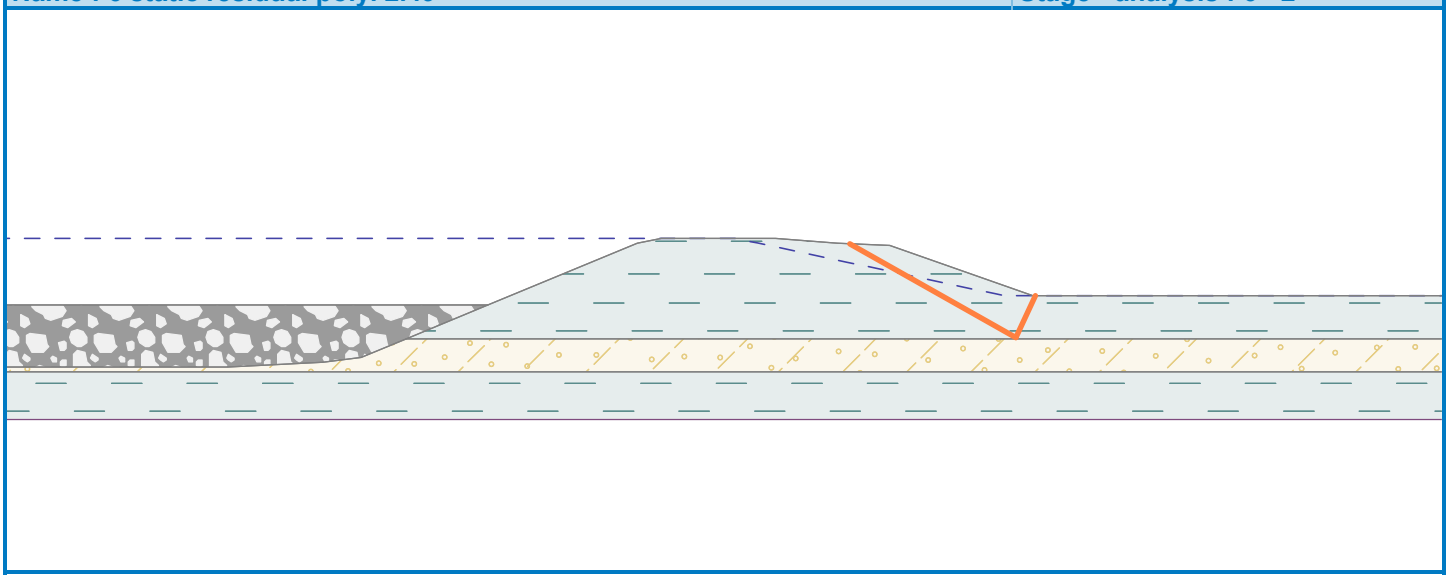
Name : 6 static residual poly. 2.49	Stage - analysis : 6 - 2



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Name : 6 static residual rotation 2.83	Stage - analysis : 6 - 1