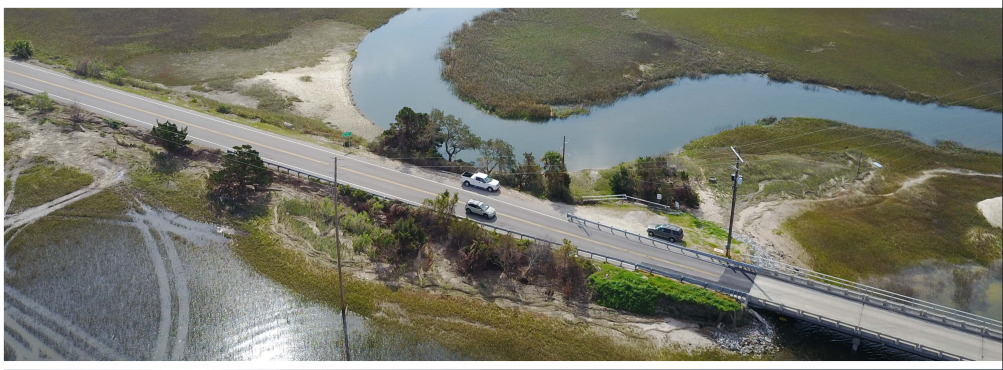
US 21 over Harbor River Bridge Replacement

Design-Build Project - P026862 - Beaufort County, SC

PRELIMINARY BRIDGE GEOTECHNICAL REPORT



October 16, 2017

UNITED INFRASTRUCTURE GROUP

INFRASTRUCTURE CONSULTING & ENGINEERING

Preliminary Bridge Geotechnical Services

US 21 Over Harbor River Bridge Replacement Project
Beaufort County, South Carolina

for

Infrastructure Consulting and Engineering

October 16, 2017

GeoEngineers
Earth Science + Technology

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File No. 18461-007-01

October 16, 2017

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1.0 INTRODUCTION

This report presents the results of GeoEngineers' preliminary bridge design analyses and recommendations for the US 21 over Harbor River Bridge replacement project in Beaufort County, South Carolina. The project site is shown relative to surrounding physical features on the Vicinity Map in Figure 1 and on the Preliminary Site Exploration Plan shown in Figures 2A through 2C. The project consists of two earthen roadway embankments and a new bridge that is 3,340 feet in length.

2.0 GEOTECHNICAL BRIDGE EMBANKMENT AND FOUNDATION DESIGN AND CONSTRUCTION ISSUES

Construction of the bridge embankments requires placing fill up to about 18 feet high at the bridge end bents. The weight of the fill and the traffic loading will cause the compressible soils to consolidate and settle. The bridge embankments for this project are classified as ROC I, and therefore will be designed to meet the performance limits at the Extreme Event I (EE I) Limit State per the South Carolina Department of Transportation (SCDOT) Geotechnical Design Manual (GDM). In order to meet the specified performance limits at both the Service Limit State (SLS) and EE I per SCDOT GDM and the project Request for Proposal (RFP), a ground improvement program consisting of closely spaced timber piles will be implemented at the bridge embankments. Key geotechnical embankment construction issues include sequence of bridge embankment and end bent foundation construction, and careful instrumentation and monitoring during construction to ensure that the objectives of the preload program are achieved and to prevent subsurface soil failure from occurring during construction.

For bridge foundation design, the main design issues are incorporating the effects of potential ground movement in the overbank slope to the lateral response of the pile or shaft foundations, and verification of foundation capacity by completing CAPWAP and shaft load test. The key geotechnical foundation construction issues include pile drivability, and the use of casing and slurry to enhance hole stability during drilling and shaft construction.

3.0 BRIDGE EMBANKMENT PERFORMANCE LIMITS AND FOUNDATION DESIGN APPROACH

The bridge design is completed to confirm that the bridge abutment global instability performance limits specified in the project RFP and in Chapter 10 of the SCDOT GDM are met. Note that settlement criteria for the bridge abutments (Roadway Bridge Embankments) are described in our "Preliminary Roadway Geotechnical Report" dated October 2, 2017, and are not included in this report. Table 1 below presents the bridge abutment performance limits at the EE I Limit State that are specified for this project. Tables 2 and 3 below present the resistance factors used in our foundation capacity calculations.

TABLE 1. BRIDGE ABUTMENT GLOBAL INSTABILITY PERFORMANCE LIMITS AT EE I LIMIT STATE

Deformation ID No.		Performance Limit Description	ROC
			I
Vertical Displacement	GI-01	Max. at top of the slope failure surface	FEE: 1.00” SEE: 2.00”
	GI-02	Max. at bottom of the slope failure surface	FEE: 1.00” SEE: 2.00”
Lateral Displacement	GI-03	Max. at top of the slope failure surface	FEE: 3.00” SEE: 4.00”
	GI-04	Max. at bottom of the slope failure surface	FEE: 3.00” SEE: 4.00”

The bearing capacities of the bridge foundations for the strength limit and extreme event limit states will be completed in accordance per SCDOT GDM, with the load and resistance factors as presented in Tables 2 and 3 below.

TABLE 2. DRIVEN PILES RESISTANCE FACTORS

Capacity	Strength Limit	Extreme Event	Basis
Axial	0.65	1.00	Dynamic Monitoring (PDA) of test pile installation and calibrated Wave Equation (Redundant)
Uplift	0.50	0.80	

TABLE 3. DRILLED SHAFTS RESISTANCE FACTORS

Capacity	Strength Limit	Extreme Event	Basis
Axial	0.70	1.00	Nominal Resistance Single Drilled Shaft in Axial Compression with Static Load Testing (Non-Redundant)
Uplift	0.60	1.00	

4.0 SUBSURFACE SOIL CONDITIONS

4.1. Geologic Setting

The geology of the site was described in more detail in the geotechnical baseline report prepared by F&ME Consultants, Inc. (F&ME 2017). Generally, the site soils are anticipated to be Holocene deposits consisting of silt, clay and sand, underlain by tertiary deposits consisting of a relatively thin layer of Hawthorn Marl of Miocene age (~23 MYA). The marl thickness at this site is expected to vary from 10 to 30 feet, which is underlain by the tertiary deposits consisting of calcareous, sandy limestone. The upper limestone is considered part of the Cooper Group, and consists of Oligocene (~36 MYA) and late Eocene (~40-50 MYA) age deposits.

The site is located within a seismically active region. According to the geologic map titled “Structural Features of South Carolina” produced by South Carolina Department of Natural Resources, Geologic Survey, the major sources identified in the site vicinity are the Garner-Edisto fault, an east-to-west trending

normal fault traversing Beaufort and Jasper Counties in South Carolina. Published geologic maps generally show that this area has a high potential for liquefaction during substantial seismic events.

4.2. Preliminary Field Exploration Program

A preliminary field exploration program was completed by F&ME for this project. The field exploration program included 27 borings and 11 cone penetration tests (CPTs). Figures 2A through 2C show the locations of these borings and CPTs completed along the project alignment. Boring and CPT logs of the preliminary field exploration program are presented in Appendix A, Field Explorations.

4.3. Subsurface Conditions

Subsurface conditions at the site were evaluated by reviewing the exploration logs and laboratory test results completed by F&ME for this project. In general, the soils observed in the explorations completed at the project site consist of Holocene Deposits, Hawthorn Marl and Cooper Limestone Formation. A generalized soil profile along the project alignment is presented in Figures 3A through 3C, US-21 Generalized Subsurface Profile.

Holocene deposits were encountered in all the explorations, and generally consist of interbedded soft to stiff silt, clay and very loose to very dense sand, generally consistent with the geologic map published for the region. The thickness of the Holocene deposits generally ranges from 50 to 65 feet within the bridge areas. The thickness of silt and clay soils encountered in the explorations range between 5 and 30 feet.

Hawthorn Marl was also encountered in all the explorations that were terminated below Elevation -40 feet mean sea level (MSL). The Hawthorn Marl was encountered to approximately Elevation -79 to -90 feet below ground surface or mudline and consists of stiff to hard clay of variable plasticity.

The Cooper Limestone Formation was encountered below the Hawthorn Marl and generally consists of very stiff to hard clay.

4.4. Groundwater Conditions

Groundwater level measurements were completed by F&ME as part of their preliminary geotechnical study. Based on the geotechnical baseline report, groundwater was encountered between Elevation 0 to +3 feet MSL. Groundwater was anticipated to fluctuate with tidal level in Harbor River and is expected to vary by location and season. For the preliminary design analyses, we assumed the design groundwater level at Elevation 0 feet MSL.

5.0 PRELIMINARY LABORATORY TESTING PROGRAM

A preliminary laboratory testing program was completed by F&ME for this project. The laboratory testing program included moisture content, Atterberg Limits, grain size distribution, consolidated undrained (CU) triaxial, consolidation, unconfined compression, electro-chemical, and resonant column tests. Data sheets presenting the results of the preliminary laboratory testing program are included in Appendix B, Laboratory Testing.

6.0 SOIL DESIGN PARAMETERS

Soil design parameters were developed for the general soil units encountered at the project site. The four general soil units include:

- Holocene silts and clays;
- Holocene sands;
- Hawthorn Marl; and
- Cooper Formation.

The soil design parameters developed for use in the engineering analyses consist of shear strength parameters of each soil unit.

6.1. Shear Strength Parameters

The subsurface soil shear strength properties were characterized based on standard penetration test (SPT) in-situ testing for sand, and laboratory testing results for clay. The following sections present the methods and preliminary soil shear strength parameters determined for this project.

6.1.1. Holocene Silts and Clays

The Holocene deposits encountered along the bridge profile generally consist of 5 to 30 feet thick of soft to medium stiff silts and clays. The shear strength of the cohesive silts and clays is dependent on the stress history of the soil itself. The stress history of the silts and clays was evaluated using the consolidation test results available in F&ME's report and shown in Figure 4, Over-Consolidation Ratio (OCR) with Depth. Also shown in Figure 4 is the design OCR profile developed for Holocene Silts and Clays and used in the preliminary geotechnical design analyses completed for this project.

The Stress History and Normalized Soil Engineering Parameters (SHANSEP) approach was used to define soil shear strength as a function of vertical effective stress and the OCR of the soil. Shear strength (S_u) of the silts and clays was determined using the following SHANSEP equation:

$$s_u = 0.22\sigma_v' OCR^{0.8}$$

6.1.2. Sands

The shear strength parameters of the Holocene sand unit encountered at the project site were expressed as internal friction angle (ϕ') for the static conditions and residual strength (Sr) for the earthquake conditions, if the sand is determined to be potentially liquefiable under the design earthquake events. The internal friction angle was derived using the correlation developed by Terzaghi et al, (1996) between SPT blow counts (corrected for depth and hammer efficiency) and relative density. Residual effective friction angle was also derived per SCDOT GDM recommendations using the Idriss and Boulanger (2008) correlations between SPT blow counts (corrected for depth and hammer efficiency as well as fines content). The Terzaghi et al. (1996) and Idriss & Boulanger (2008) correlations used are presented below:

Terzaghi et al. (1996) Correlation:

$$\phi' = -0.0027(N_{1\text{-}60})^2 + 0.4333(N_{1\text{-}60}) + 27.184$$

Idriss and Boulanger (2008) Correlation:

$$Sr/\sigma'_v = \exp\left(N_{1\text{-}60cs\text{-}Sr}/16 + \left(\left(N_{1\text{-}60cs\text{-}Sr} - 16\right) / 21.2\right)^3 - 3\right)$$

Sand shear strength parameters relevant to the proposed design were evaluated using area specific data. Specific layers were delineated using recorded blow count information. Area specific blow counts, friction angles, and residual strength parameters were determined using the information presented in Appendix C, Soil Parameter Determination.

6.1.3. Hawthorn Marl

The F&ME geotechnical baseline report does not present any laboratory testing for the Hawthorn Marl. Based on our assessment of the in-situ SPT and CPT data, it is our opinion that the Hawthorn Marl has similar shear strength characteristics to the Cooper Marl, which is a well-studied soil formation. For the preliminary analyses, we estimated that the Hawthorn Marl has an undrained shear strength of 4 kips per square foot (ksf), which is the average published shear strength for the Cooper Marl. The undrained shear strength was reduced by 15 percent under the seismic loading conditions. For final design analyses, laboratory tests will be completed to refine the shear strength parameters for the Hawthorn Marl soil unit.

6.1.4. Cooper Formation

The F&ME geotechnical baseline report does not include any laboratory shear strength tests for the Cooper Formation for depths of interest. We estimated the shear strength characteristics by comparing the shear wave velocities of the Hawthorn Marl and the Cooper Formation. Our comparison shows that the shear wave velocity of the Cooper Formation is at least 1.5 times higher than the shear wave velocity measured in the Hawthorn Marl. Since the shear strength and shear wave velocity (indicative of shear modulus) are directly related, we estimated a shear strength of 6 ksf for the Cooper Formation for use in our preliminary analyses. We will complete laboratory shear strength tests to refine the shear strength of the Cooper Formation for use in the final design analyses.

6.1.5. Embankment Fill

Since the embankment fill will meet the SCDOT material specification for structural fill and will be compacted to at least 95 percent of the maximum dry density (MDD) per ASTM D1557, we estimated an internal friction angle of 38 degrees to calculate the shear strength of the embankment fill. We will complete laboratory shear strength tests to refine the friction angle of the embankment fill for use in the final design analyses.

7.0 SEISMIC INPUT PARAMETERS FOR BRIDGE DESIGN

The seismic input parameters used in the bridge design analyses were provided in the RFP based on the site-specific response analyses completed by F&ME for the project. Figures 5 and 6 present the ground surface ADRS curves for the west and east end bridge embankments, respectively. Figure 7 presents the ADRS curves at the top of limestone for use in the structural seismic design of the bridge.

8.0 GEOTECHNICAL BRIDGE DESIGN ANALYSES

The bridge profile was delineated into five representative zones for use in the preliminary geotechnical foundation capacity analyses. These five analysis zones are delineated based on foundation type as well as subsurface soil conditions, as summarized in Table 4 below.

TABLE 4. BRIDGE ZONES

Bridge Analysis Zone	Foundation Type	Station Range	Representative Bridge Bents
West Bridge Abutment	HP 14x117	69+81 to 70+56	West End Bent (Begin Bridge)
West Overbank	24" Square Concrete Piles	70+56 to 83+00	Bent 2 through Bent 7
Channel	8' Diameter Drilled Shafts	83+00 to 95+00	Bent 8 through Bent 16
East Overbank	24" Square Concrete Piles	95+00 to 103+64	Bent 17 through Bent 20
East Bridge Abutment	HP 14x117	103+64 to 104+39	East End Bent (End Bridge)

For all analysis zones, we completed soil liquefaction analyses, using the explorations completed within each zone, under both FEE and SEE events to delineate zones of potentially liquefiable soils. Soil liquefaction potential was evaluated by comparing the cyclic shear stress ratio (CSR), and the Demand (D) induced by the design earthquake with the cyclic resistance ratio (CRR), the Capacity (C) of the soil to resist liquefaction. The ratio of CSR (Demand, D) to CRR (Capacity, C) results in the liquefaction triggering resistance ratio for Sand-Like soils $(D/C)_{SL\text{-}Sand}$, and is equivalent to the inverse of the factor of safety (1/FS) traditionally used for evaluating liquefaction potential. Full liquefaction occurs when $(D/C)_{SL\text{-}Sand} > \varphi_{SL\text{-}Sand}$, where $\varphi_{SL\text{-}Sand}$ is the triggering resistance factor for the onset of liquefaction required by the SCDOT GDM. The SCDOT GDM defines the onset of "Full Liquefaction" for the SEE design earthquake when $(D/C)_{SL\text{-}Sand} > 0.90$ and for the FEE design earthquake when $(D/C)_{SL\ Sand} > 0.85$. Soil liquefaction analyses were completed using the semi-empirical method developed by Idriss and Boulanger (2008) using an in-house spreadsheet. The liquefaction induced settlements of the saturated sands were estimated based on Idriss and Boulanger (2008). The preliminary liquefaction analysis calculations completed for this project are presented in Appendix D, Soil Liquefaction Analyses.

Axial capacities of the bridge foundation elements were estimated using in-house spreadsheets for all analysis zones. Resistance factors per the SCDOT GDM were incorporated into these analyses as presented in Tables 2 and 3 of this report. The side friction resistance was also neglected for cased portions of drilled shafts per SCDOT GDM guidelines. Based on past drilled shaft load tests in similar soil conditions, we estimated that the skin friction provided by the Hawthorn Marl and Cooper Formation would be equal to 4,000 pounds per square foot (psf). Therefore, soil strength properties that resulted in this skin friction value being calculated were used in our drilled shaft analysis spreadsheets. Lower skin friction values equal to 1,000 and 1,500 psf were used in our driven pile analysis spreadsheets for the Hawthorn Marl and Cooper Formation, respectively. These values were selected to represent pile capacity shortly after driving, as the strength gain can take considerable time as observed in past pile load tests completed in Cooper Marl. It is our understanding that the required single pile or shaft axial capacities for the abutments, overbanks, and channel are 255, 450, and 2,500 kips, respectively. The preliminary axial capacity calculations completed for this project are presented in Appendix E, Axial Capacity Analyses.

Lateral bridge foundation responses were evaluated under the EE I (Seismic) for all analysis zones. For bridge analysis zone within the channel, the Extreme Event II (EE II) (Ship Impact) limit state loading was

also evaluated. We computed the lateral pile response under these conditions using the computer programs LPILE 2016 developed by Ensoft, Inc. All lateral load analyses assumed a level ground surface site. Lateral loads were assumed to be resisted by passive soil pressure on the vertical piles. For this project, passive soil pressures on pile caps and the base friction along the bottom of the pile cap were not included in calculations for lateral response of piles. In addition, the foundation spacing in the preliminary bent configurations ranges from approximately 3 to 5 pile diameters, therefore pile group effects were applied to the single-pile models as P-y reduction factors in accordance with AASHTO Bridge Design Manual. Appendix F presents the preliminary lateral response calculations completed for this project. EE I (Seismic) pile lateral response was calculated by imposing set displacements, ranging from 0.5 to 6 inches, to the top of the foundations. EE II (Ship Impact) pile lateral response was calculated by imposing a set loading equivalent to the estimated ship impact to the top of the foundations. Ship impact loads were estimated to range from 200 to 250 kips in the longitudinal direction, and from 400 to 500 kips in the transverse direction. Note that the preliminary lateral pile analyses were completed using a very deep embedment to assess the tip depth with zero deflection. The final design analyses will be completed using the actual design pile tip elevation.

Preliminary global stability analyses were also completed for two static conditions (staged construction and end of construction) to check that the D/C ratios for slope stability are acceptable for the two bridge abutments. The preliminary global stability analyses were completed using the computer program SlopeW with the Morgenstein-Price analysis method. We included geotextile reinforcement in the SlopeW analyses. A reinforcement equivalent to a Mirafi 1000/100 was used underneath the West and East bridge abutment embankments. The SlopeW global stability calculations are presented in Appendix G, Global Stability Analyses.

In addition to static global stability analyses, preliminary pseudo-static global stability and Newmark analyses were also completed to check that the West and East bridge abutments meet the embankment global instability performance limits at EE I limit state as presented in Table 1 above. Pseudo-static global stability analyses were also completed for the West and East channel slopes to determine the depth of seismically induced soil movement. Pseudo-static global stability analyses were completed using the computer program SlopeW to determine the yield acceleration for each design section. The bridge embankment seismic deformations were estimated using the simplified Newmark Method described in Section 13.17.2 and Equation 13-106 of the SCDOT GDM. For ROC I bridge abutment, the calculated Newmark displacement will be multiplied by 2.

We also calculated seismic passive pressures for the West and East bridge abutments. A nonlinear soil-abutment-bridge structure interaction model was used to compute the mobilized passive resistance as a function of displacement. The analysis method used to develop this model is based on the work by Shamsabadi (2006) and Shamsabadi et al. (2007), assuming a wall height of 12.5 feet. The preliminary seismic passive pressure calculations completed for this project is presented in Appendix H, Seismic Passive Pressure Analyses.

The following sections present a summary of the results of the soil liquefaction, axial capacity, lateral capacity, global stability, Newmark, and seismic passive pressure analyses completed for the five delineated analysis zones for this project.

8.1. West Bridge Abutment

The West bridge abutment soil liquefaction analyses were completed using the soil profile encountered in boring B-9. The soil liquefaction analysis results are presented in Tables 5, 6 and 7 below:

TABLE 5. WEST BRIDGE ABUTMENT – SUMMARY OF LIQUEFACTION ANALYSIS RESULTS FOR SEE

Boring No.	Boring Elevation (feet)	Potentially Liquefiable Soil Layers $(D/C)_{SL\text{-}Sand} = 1/FS > 0.90$				
		Depth Intervals and Thickness Shown in Parenthesis (feet)				Total Thickness (feet)
		Layer 1	Layer 2	Layer 3	Layer 4	
B-9	2.6	1 – 16 (15)	41 – 51 (10)	-	-	25

TABLE 6. WEST BRIDGE ABUTMENT – SUMMARY OF LIQUEFACTION ANALYSIS RESULTS FOR FEE

Boring No.	Boring Elevation (feet)	Potentially Liquefiable Soil Layers $(D/C)_{SL\text{-}Sand} = 1/FS > 0.85$				
		Depth Intervals and Thickness Shown in Parenthesis (feet)				Total Thickness (feet)
		Layer 1	Layer 2	Layer 3	Layer 4	
B-9	2.6	1 – 16 (15)	41 – 51 (10)	-	-	25

TABLE 7. WEST BRIDGE ABUTMENT – LIQUEFACTION INDUCED SETTLEMENT AND DOWNDRAG FORCE

Boring	Settlement under SEE, inches	Settlement under FEE, inches	Downdrag Force, kips
B-9	16.4	16.4	42.0

Based on these results, liquefiable soils are present within the West bridge abutment zone, and liquefaction induced strength loss will need to be considered in pile capacity analyses.

Axial pile capacity and lateral response was calculated for an HP 14x117 pile using the interpolated soil profile at Station 70+40. The axial pile capacity results are presented in Figure 8 for a ground surface condition assuming no scour. The longitudinal and transverse lateral response results for EE I (Seismic) are presented in Figures 19 through 21 for ground surface conditions assuming no scour.

The preliminary slope stability cross section was developed longitudinally along bridge alignment centered at Station 70+40. Appendix G presents the soil layers and input parameters used in the preliminary slope stability analyses. Figures 49 and 50 present the results of the slope stability analyses for staged construction and end of construction conditions, respectively. The results indicate that the D/C is less than 0.67 (i.e. FS > 1.5), therefore, is satisfactory.

Figure 51 shows the results of the pseudo-static slope stability analysis with a yield acceleration of 0.29g. Using the Simplified Newmark Method, the estimated seismic lateral deformations under the FEE and SEE are negligible as the yield acceleration is higher than the design peak ground acceleration.

8.2. West Overbank

The West overbank soil liquefaction analyses were completed using the soil profiles encountered in borings B-10 and B-11. The soil liquefaction analysis results are presented in Tables 8, 9 and 10 and below:

TABLE 8. WEST OVERBANK – SUMMARY OF LIQUEFACTION ANALYSIS RESULTS FOR SEE

Boring No.	Boring Elevation (feet)	Potentially Liquefiable Soil Layers $(D/C)_{SL\text{-}Sand} = 1/FS > 0.90$				
		Depth Intervals and Thickness Shown in Parenthesis (feet)				Total Thickness (feet)
		Layer 1	Layer 2	Layer 3	Layer 4	
B-10	0.0	0 – 9 (9)	41 – 48 (7)	-	-	16
B-11	-22.0	3 – 5 (2)	7 – 12 (5)	23 – 34 (11)	-	18

TABLE 9. WEST OVERBANK – SUMMARY OF LIQUEFACTION ANALYSIS RESULTS FOR FEE

Boring No.	Boring Elevation (feet)	Potentially Liquefiable Soil Layers $(D/C)_{SL\text{-}Sand} = 1/FS > 0.85$				
		Depth Intervals and Thickness Shown in Parenthesis (feet)				Total Thickness (feet)
		Layer 1	Layer 2	Layer 3	Layer 4	
B-10	0.0	0 – 9 (9)	41 – 48 (7)	-	-	16
B-11	-22.0	3 – 5 (2)	7 – 12 (5)	23 – 34 (11)	-	18

TABLE 10. WEST OVERBANK – LIQUEFACTION INDUCED SETTLEMENT AND DOWNDRAG FORCE

Boring	Settlement under SEE, inches	Settlement under FEE, inches	Downdrag Force, kips[1]
B-10	8.2	7.6	74.0
B-11	9.1	9.1	

Notes:

[1] The downdrag force presented was estimated for the 'No scour' conditions. For 'Full Scour' and 'Half Scour' conditions downdrag forces refer to the Axial Resistance Plots (Figures 8 through 18).

Based on these results, liquefiable soils are present within the West overbank zone, and liquefaction induced strength loss will need to be considered in pile capacity analyses.

Axial pile capacity and lateral response were calculated for a 24-inch square concrete pile using the soil profile encountered at B-10. The axial pile capacity results are presented in Figures 9 through 11 for ground surface conditions assuming full scour, half scour, and no scour depths. The lateral response results for EE I (Seismic) are presented in Figures 22 through 27 for ground surface conditions assuming no scour, half scour, and full scour depths. Note that longitudinal and transverse lateral responses are the same for these piles.

The preliminary global stability cross section was developed for the west channel slope. Appendix G presents the soil layers and input parameters used in the preliminary global stability analyses. Figure 52 presents the results of the slope stability analysis for end of construction conditions. Figures 53 and 54 present the results of the pseudo-static global stability analyses under the FEE and SEE conditions,

respectively. The preliminary results indicate that the slope may experience some deformation under earthquake conditions, specifically under the SEE. The preliminary results also indicate that only the upper portion of the slope may exert additional soil loads to the piles and drilled shafts. Further analysis will be completed to evaluate the effect of laterally displacing soil on the piles and shafts during final design, after additional soil exploration and laboratory testing are completed.

8.3. Channel

The Channel soil liquefaction analyses were completed using the soil profiles encountered in borings B-12 and B-13. The soil liquefaction analysis results are presented in Tables 11, 12 and 13 below:

TABLE 11. CHANNEL – SUMMARY OF LIQUEFACTION ANALYSES RESULTS FOR SEE

Boring No.	Boring Elevation (feet)	Potentially Liquefiable Soil Layers $(D/C)_{SL\text{-}Sand} = 1/FS > 0.90$				
		Depth Intervals and Thickness Shown in Parenthesis (feet)				Total Thickness (feet)
		Layer 1	Layer 2	Layer 3	Layer 4	
B-12	-33.0	3 – 15 (12)	-	-	-	12
B-13	-28.0	0 – 11 (11)	22 – 27 (5)	-	-	16

TABLE 12. CHANNEL – SUMMARY OF LIQUEFACTION ANALYSES RESULTS FOR FEE

Boring No.	Boring Elevation (feet)	Potentially Liquefiable Soil Layers $(D/C)_{SL\text{-}Sand} = 1/FS > 0.85$				
		Depth Intervals and Thickness Shown in Parenthesis (feet)				Total Thickness (feet)
		Layer 1	Layer 2	Layer 3	Layer 4	
B-12	-33.0	3 – 15 (12)	-	-	-	12
B-13	-28.0	0 – 11 (11)	22 – 27 (5)	-	-	16

TABLE 13. CHANNEL – LIQUEFACTION INDUCED SETTLEMENT AND DOWNDRAG LOAD

Boring	Settlement under SEE, inches	Settlement under FEE, inches	Downdrag Force, kips[1]
B-12	4.6	4.6	0.0
B-13	7.9	7.9	

Notes:

[1] The downdrag force presented was estimated for the 'No scour' conditions. For 'Full Scour' and 'Half Scour' conditions downdrag forces refer to the Axial Resistance Plots (Figures 8 through 18).

Based on these results, liquefiable soils are present in the Channel zone, and liquefaction induced strength loss will need to be considered in shaft capacity analyses.

Axial pile capacity and lateral response were calculated for an 8-foot diameter concrete drilled shaft using the soil profile encountered at B-12. The axial pile capacity results are presented in Figures 16 through 18 for ground surface conditions assuming full scour, half scour, and no scour depths. The lateral response results are presented in Figures 31 through 39 for ground surface conditions assuming no scour, half scour, and full scour depths for the EE I (Seismic). The longitudinal and transverse lateral response results for the

EE II (Ship Impact) are presented in Figures 28 through 30 for ground surface conditions assuming half scour.

8.4. East Overbank

The East overbank soil liquefaction analyses were completed using the soil profiles encountered in borings B-14 and B-15. The soil liquefaction analysis results are presented in Tables 14, 15 and 16 below:

TABLE 14. EAST OVERBANK – SUMMARY OF LIQUEFACTION ANALYSIS RESULTS FOR SEE

Boring No.	Boring Elevation (feet)	Potentially Liquefiable Soil Layers $(D/C)_{SL\text{-}Sand} = 1/FS > 0.90$				
		Depth Intervals and Thickness Shown in Parenthesis (feet)				Total Thickness (feet)
		Layer 1	Layer 2	Layer 3	Layer 4	
B-14	0.1	0 – 5 (5)	7 – 11 (4)	16 – 31 (15)	46 – 51 (5)	29
B-15	1.6	0 – 3 (3)	7 – 11 (4)	16 – 36 (20)	41 – 66 (25)	52

TABLE 15. EAST OVERBANK – SUMMARY OF LIQUEFACTION ANALYSIS RESULTS FOR FEE

Boring No.	Boring Elevation (feet)	Potentially Liquefiable Soil Layers $(D/C)_{SL\text{-}Sand} = 1/FS > 0.85$					
		Depth Intervals and Thickness Shown in Parenthesis (feet)					Total Thickness (feet)
		Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	
B-14	0.1	0 – 5 (5)	7 – 11 (4)	16 – 21 (5)	26 – 31 (5)	46 – 51 (5)	24
B-15	1.6	0 – 3 (3)	26 – 36 (10)	41 – 46 (5)	56 – 66 (10)	-	28

TABLE 16. EAST OVERBANK – LIQUEFACTION INDUCED SETTLEMENT AND DOWNDRAG FORCE

Boring	Settlement under SEE, inches	Settlement under FEE, inches	Downdrag Force, kips[1]
B-14	12.3	10.9	197.0
B-15	21.5	16.4	

Notes:

[1] The downdrag force presented was estimated for the 'No scour' conditions. For 'Full Scour' and 'Half Scour' conditions downdrag forces refer to the Axial Resistance Plots (Figures 8 through 18).

Based on these results, liquefiable soils are present within the East overbank zone, and liquefaction induced strength loss will need to be considered in pile capacity analyses.

Axial pile capacity and lateral response were calculated for a 24-inch square concrete pile using the soil profile encountered at B-15. The axial pile capacity results are presented in Figures 12 through 14 for ground surface conditions assuming full scour, half scour, and no scour depths. The lateral response results for EE I (Seismic) are presented in Figures 40 through 45 for ground surface conditions assuming no scour, half scour, and full scour depths. Note that longitudinal and transverse lateral responses are the same for these piles.

The preliminary global stability cross section was developed for the east channel slope. Appendix G presents the soil layers and input parameters used in the preliminary global stability analyses. Figure 55 presents the results of the slope stability analysis for end of construction conditions. Figures 56 and 57 present the results of the pseudo-static global stability analyses under the FEE and SEE conditions, respectively. The preliminary results indicate that the slope may experience some deformation under earthquake conditions, specifically under the SEE. The preliminary results also indicate that only the upper portion of the slope may exert additional soil loads to the piles and drilled shafts. Further analysis will be completed to evaluate the effect of laterally displacing soil on the piles and shafts during final design, after additional soil exploration and laboratory testing are completed.

8.5. East Bridge Abutment

The East bridge abutment soil liquefaction analyses were completed using the soil profile encountered in boring B-16. The soil liquefaction analysis results are presented in Tables 17, 18 and 19 below:

TABLE 17. EAST BRIDGE ABUTMENT– SUMMARY OF LIQUEFACTION ANALYSES RESULTS FOR SEE

Boring No.	Boring Elevation (feet)	Potentially Liquefiable Soil Layers $(D/C)_{SL\text{-}Sand} = 1/FS > 0.90$				
		Depth Intervals and Thickness Shown in Parenthesis (feet)				Total Thickness (feet)
		Layer 1	Layer 2	Layer 3	Layer 4	
B-16	2.4	0 – 3 (3)	16 – 46 (30)	56 – 66 (10)	-	43

TABLE 18. EAST BRIDGE ABUTMENT– SUMMARY OF LIQUEFACTION ANALYSES RESULTS FOR FEE

Boring No.	Boring Elevation (feet)	Potentially Liquefiable Soil Layers $(D/C)_{SL\text{-}Sand} = 1/FS > 0.85$				
		Depth Intervals and Thickness Shown in Parenthesis (feet)				Total Thickness (feet)
		Layer 1	Layer 2	Layer 3	Layer 4	
B-16	2.4	0 – 3 (3)	21 – 26 (5)	31 – 46 (15)	56 – 66 (10)	33

TABLE 19. EAST BRIDGE ABUTMENT – LIQUEFACTION INDUCED SETTLEMENT AND DOWNDRAG FORCE

Boring	Settlement under SEE, inches	Settlement under FEE, inches	Downdrag Force, kips
B-16	18.2	14.6	139.0

Based on these results, liquefiable soils are present in the East bridge abutment zone, and liquefaction induced strength loss will need to be considered in pile capacity analyses.

Axial pile capacity and lateral response was calculated for an HP 14x117 pile using the soil profile encountered at CPT-8. The axial pile capacity results are presented in Figure 15 for a ground surface condition assuming no scour. The longitudinal and transverse lateral response results for EE I (Seismic) are presented in Figures 46 through 48 for ground surface conditions assuming no scour.

The preliminary slope stability cross section was developed longitudinally along bridge alignment centered at Station 103+50. Appendix G presents the soil layers and input parameters used in the preliminary slope

stability analyses. Figures 58 and 59 present the results of the slope stability analyses for both staged construction and end of construction conditions. The results indicate that the D/C is less than 0.67 (i.e. FS > 1.5), therefore, is satisfactory.

Figure 60 shows the results of the pseudo-static slope stability analysis with a yield acceleration of 0.29g. Using the Simplified Newmark Method, the estimated seismic lateral deformations under the FEE and SEE are negligible as the yield acceleration is higher than the design peak ground acceleration.

9.0 PRELIMINARY GEOTECHNICAL BRIDGE DESIGN RECOMMENDATIONS

Based on the results of our preliminary analyses, the following are our preliminary geotechnical bridge design recommendations for this project. Note that preliminary geotechnical design recommendations related to the bridge abutments (Roadway Bridge Embankments) are included in our "Preliminary Roadway Geotechnical Report" dated October 2, 2017.

- Based on our analyses, the pile tip elevation for the end bents is controlled by axial capacity of the piles. The preliminary estimate of the pile tip elevation at the west and east end bents is Elevation -85 feet.
- For the bridge bents within the overbank areas, the pile tip elevation is controlled by axial capacity. The preliminary estimate of the pile tip elevation within the west and east overbank areas is Elevation -90 feet.
- For the drilled shafts within the channel, the design is controlled by the lateral loading under EE II limit state. Our preliminary analysis results indicated that the shafts need to be embedded to Elevation -95 feet.
- For the overbank foundations, additional soil load may need to be included under the EE I limit state. Further analysis will be completed in the final design to incorporate this soil load, if appropriate.
- The construction casing for the drilled shafts within the channel zone should be embedded to about Elevation -63 feet, approximately 10 feet into the Hawthorn Marl layer.

10.0 FIELD EXPLORATION AND LABORATORY TESTING PROGRAM

A field exploration and laboratory testing program has been developed to supplement the preliminary exploration and laboratory testing program completed and to refine the soil input parameters used in the preliminary geotechnical design analyses for this project. Soil test borings (SPT) will be performed at each proposed bent location, except at bent 17 where existing boring information is sufficient. Four borings, four CPTs and two dilatometer tests (DMT) are also planned within the new roadway embankment footprint. Borings will be terminated a minimum of 20 feet below the planned foundation tip elevations for the bridge borings, and a minimum of two times the proposed embankment height. All borings will conform to the guidelines in the SCDOT GDM (2010). Table 20 below presents a summary of the borings, CPTs and DMTs planned along the project alignment. The proposed exploration locations are also shown in Figure 61, Proposed Field Investigation Plan.

TABLE 20. SUMMARY OF FIELD INVESTIGATION PLAN

Exploration ID	Exploration Type	Station	Proposed Termination Elevation (feet, below MSL)	Drilling Equipment and Access
EB1	Boring	70+40.50	-155	Marsh Buggy
B2	Boring	72+03	-131	Marsh Buggy
B3	Boring	73+70.50	-132	Marsh Buggy
B4	Boring	75+38	-132	Marsh Buggy
B5	Boring	77+05.50	-133	Marsh Buggy
B6	Boring	78+73	-155	Barge
B7	Boring	80+40.50	-155	Barge
B8	Boring	82+08	-155	Barge
B9	Boring	83+75.50	-155	Barge
B10	Boring	85+43	-155	Barge
B11	Boring	87+10.50	-155	Barge
B12	Boring	88+78	-155	Barge
B13	Boring	90+45.50	-155	Barge
B14	Boring	92+13	-155	Barge
B15	Boring	93+80.50	-155	Barge
B16	Boring	95+48	-155	Barge
B17	Boring	97+15.50	-135	NA
B18	Boring	98+83	-133	Marsh Buggy
B19	Boring	100+50.50	-133	Marsh Buggy
B20	Boring	102+18	-133	Marsh Buggy
EB21	Boring	103+80.50	-133	Marsh Buggy
101	Boring	66+00	-49	Marsh Buggy
102	Boring	68+00	-49	Marsh Buggy
103	Boring	105+00	-74	Marsh Buggy
104	Boring	107+00	-74	Marsh Buggy
CPT-1	Cone Penetration Test	63+00	-79	Marsh Buggy
CPT-2	Cone Penetration Test	67+00	-79	Marsh Buggy
CPT-3	Cone Penetration Test	109+00	-79	Marsh Buggy
CPT-4	Cone Penetration Test	112+00	-79	Marsh Buggy
DMT-1	Dilatometer Test	70+40.50	-64	Marsh Buggy
DMT-2	Dilatometer Test	103+80.50	-62	Marsh Buggy

We also developed a laboratory testing program consisting of performing laboratory tests using the soil samples obtained from the borings. The objective of the laboratory testing program is to evaluate pertinent physical and engineering characteristics of the soils encountered along the project alignment. Results of

the laboratory tests will be used to characterize soil conditions at the site and refine representative design soil profiles and parameters for use in the engineering analyses. Table 21 below presents a summary of the laboratory tests planned for this project.

TABLE 21. SUMMARY OF LABORATORY TESTING PROGRAM

Laboratory Tests	Soil Samples	Quantity
Moisture Content	Near Surface Soils, Holocene Silts/Clays, Hawthorn Marl	38
Proctor	Embankment Fill	4
Atterberg Limits	Near Surface Soils, Holocene Silts/Clays, Hawthorn Marl	40
Grain Size with No. 200 Wash	Near Surface Soils, Holocene Sand	30
Consolidation Test	Near Surface Soils, Holocene Silts/Clays, Hawthorn Marl	20
CU Triaxial Test with pore pressure measurement	Embankment Fill, Near Surface Soils, Holocene Silts/Clays, Hawthorn Marl, Cooper Formation	40
Organic content	Near Surface Soils (top 5 feet)	5

11.0 LIMITATIONS

We have prepared this Preliminary Bridge Geotechnical Report for use by UIG-ICE Design Build Team and the SCDOT for design and construction of the US 21 over Harbor River Bridge Replacement project in Beaufort County, South Carolina.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form or hard copy of this document (email, text, table, and/or figure), if provided, and any attachments are only a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Please refer to Appendix I titled "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

12.0 REFERENCES

F&ME Consultants, Inc, (2017) "Geotechnical Base Line Report – US 21 (Sea Islands Parkway) Bridge over Harbor River, Beaufort County, South Carolina," February 24, 2017.

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FIGURES

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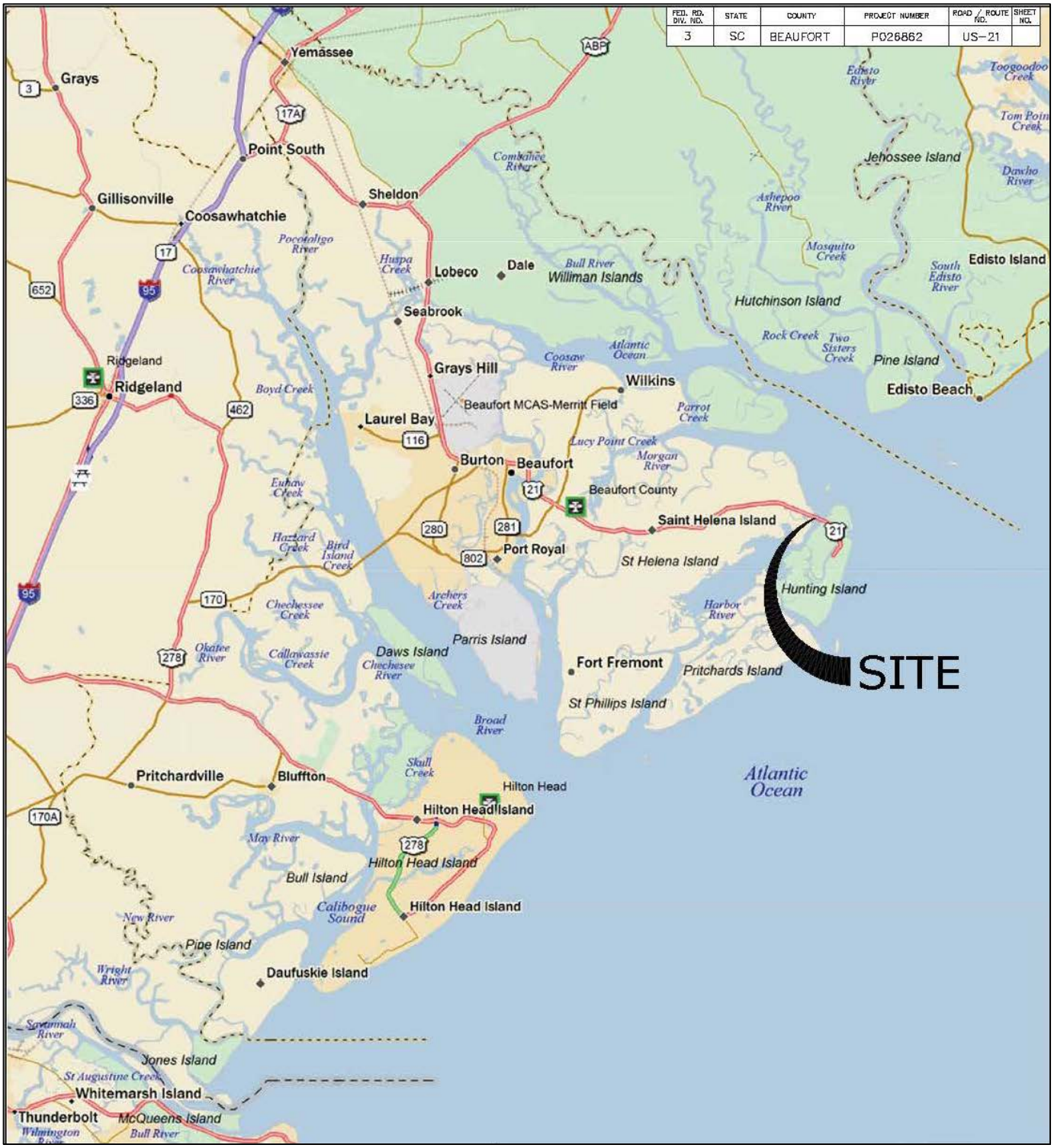

Vicinity Map

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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Figure 1

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: F&ME Consultants. Geotechnical Base Line Report, dated 2/24/2017.

18461-007-01

Legend

Cone Penetration Test Location

N
W
E
S

Not to Scale

Notes:

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Data Source: F&ME Consultants. Geotechnical Base Line Report, dated 2/24/2017.

Preliminary Site Exploration Plan

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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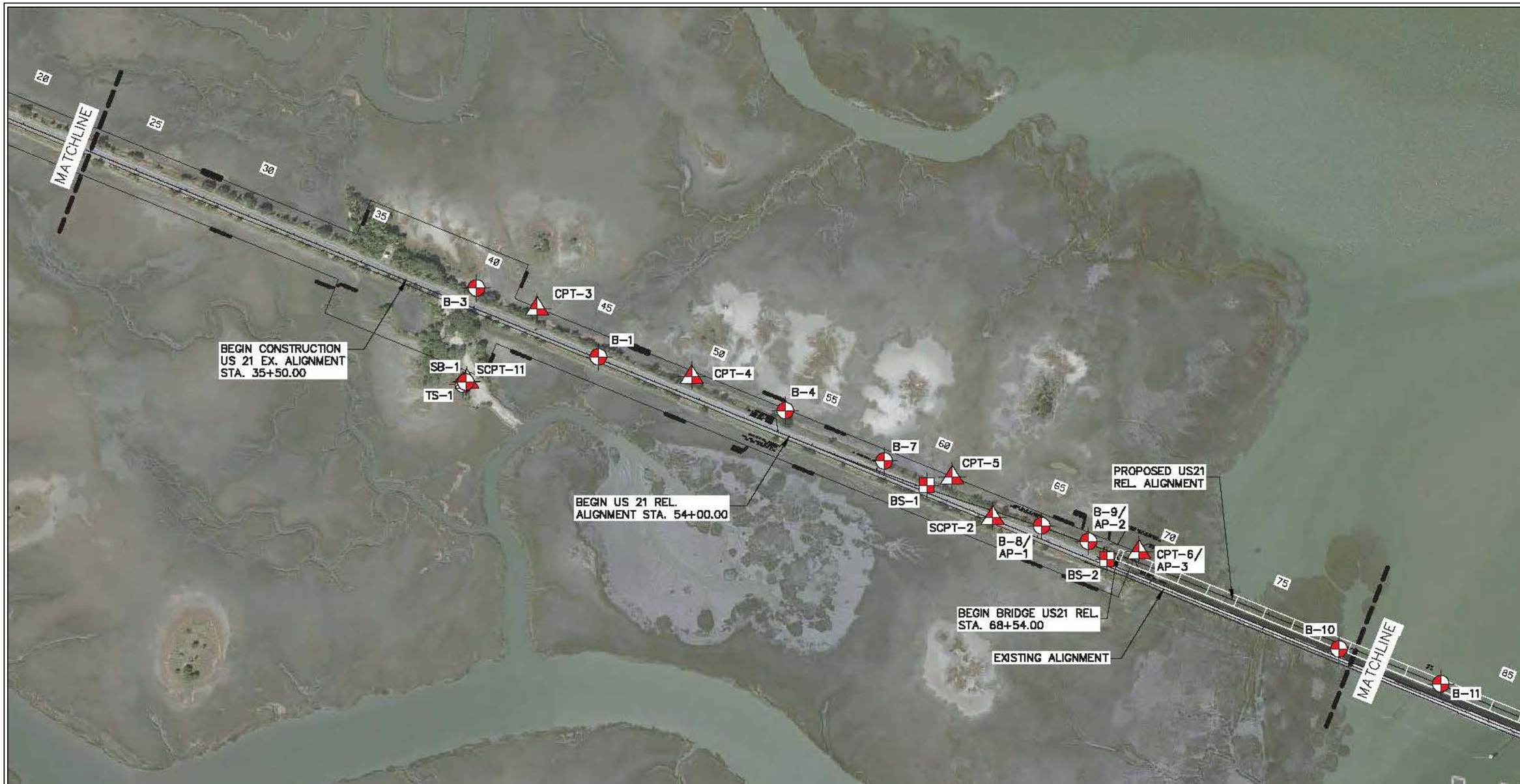
Figure 2A

18461-007-01



Legend

- Soil Test Boring Location
- Bulk Sample Location
- Cone Penetration Test Location

Notes:

1. The locations of all features shown are approximate.
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N
W E
S

Not to Scale

Preliminary Site Exploration Plan

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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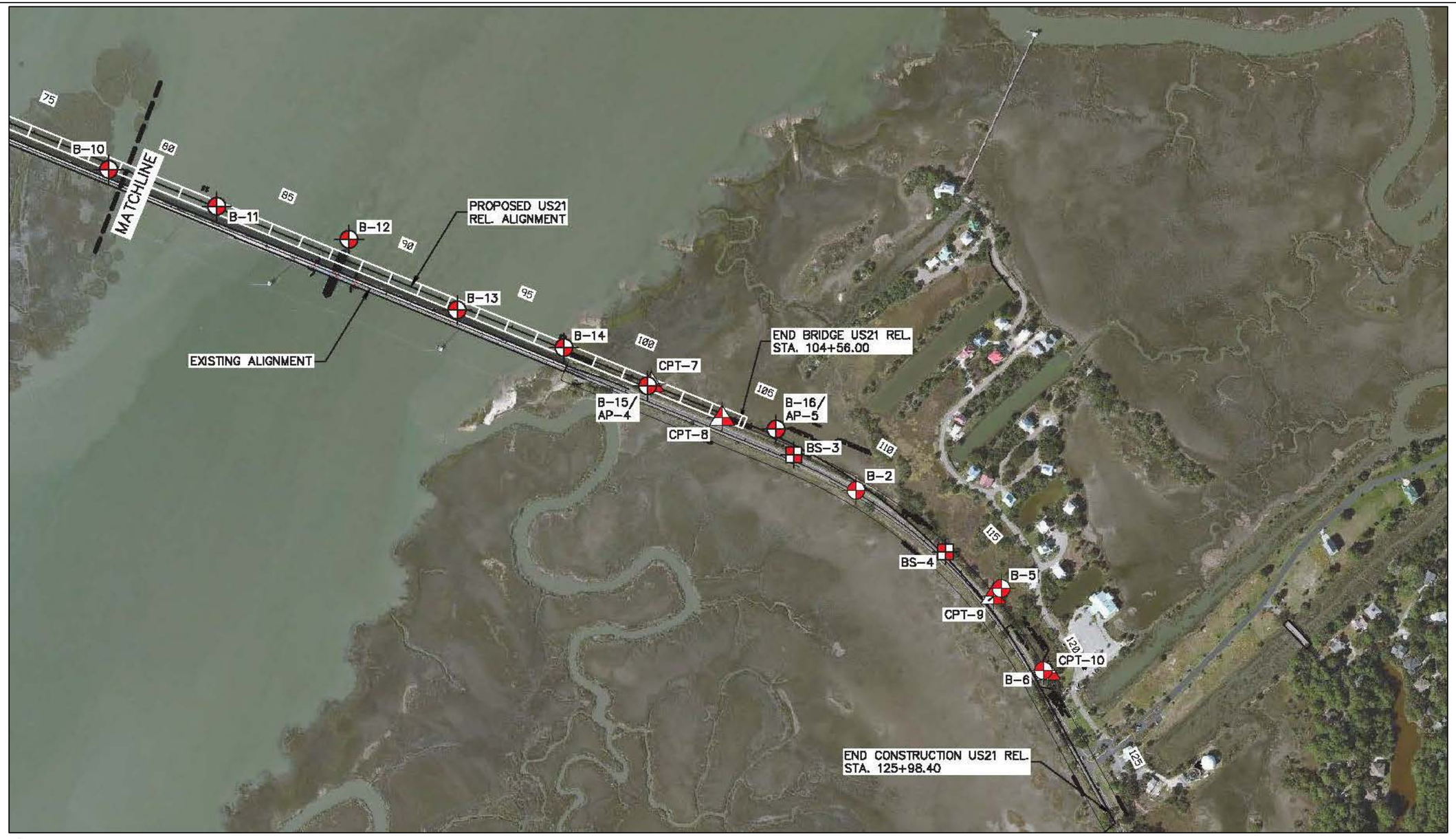
Figure 2B

18461-007-01



Legend

- Soil Test Boring Location
- Bulk Sample Location
- Cone Penetration Test Location

Notes:

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Data Source: F&ME Consultants. Geotechnical Base Line Report, dated 2/24/2017.

N
W E
S

Not to Scale

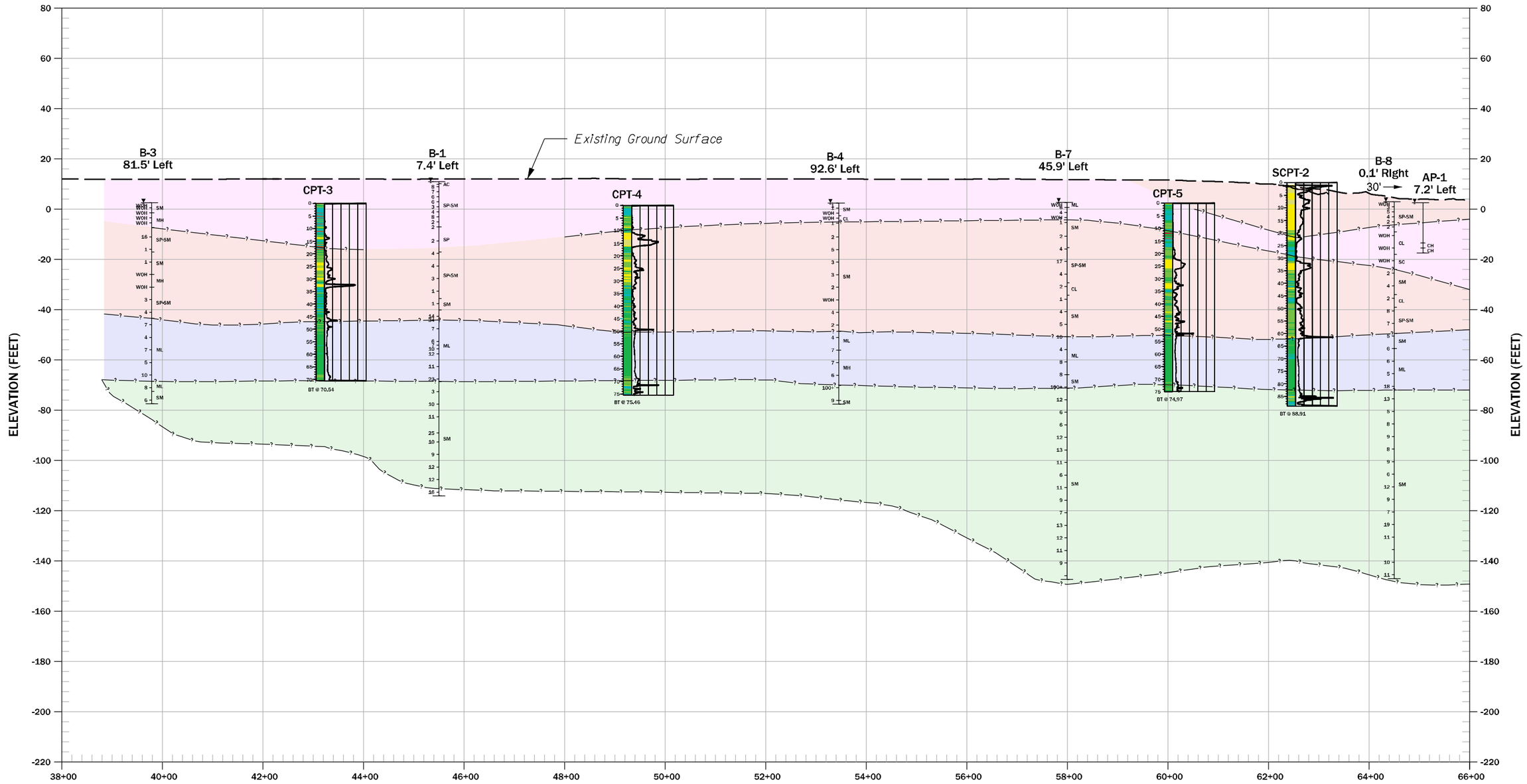
Preliminary Site Exploration Plan

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure 2C

18461-007-01



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Legend

- Surficial Holocene - Soft to Med. Stiff Silts and Clays
- Surficial Holocene - Loose to V. Dense Sands
- Hawthorn Marl
- Cooper Group Limestone

Horizontal Scale: 1"=200'
Vertical Scale: 1"=40'
Vertical Exaggeration: 5X

200 0 200
Feet

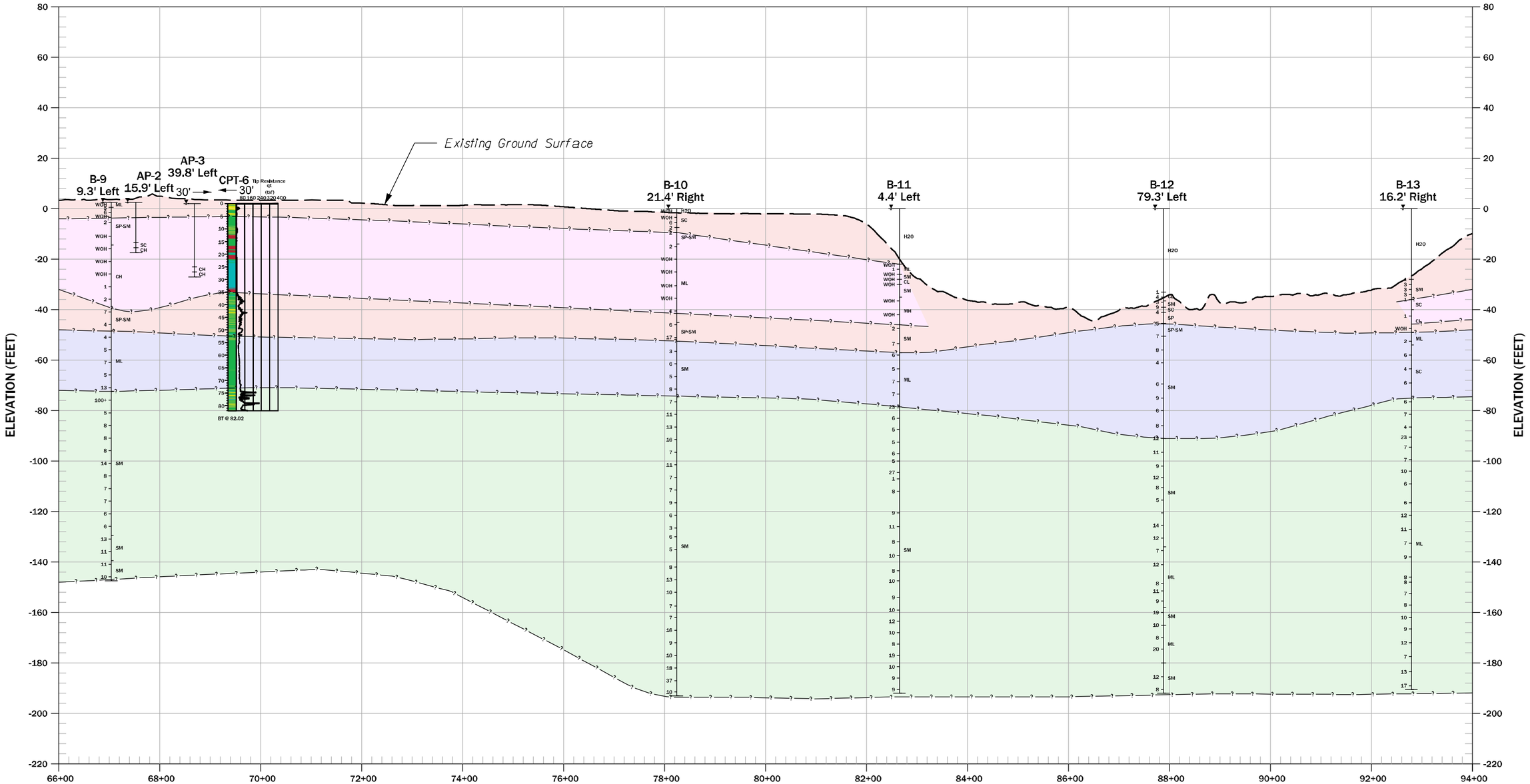
US-21 Generalized Subsurface Profile

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GEOENGINEERS

Figure 3A

P:\18\18461007\CAD\00\GeoTech Report\R00\01846100700_F03_Soil Profile.dgn 17x11 (in.) 200.0000 ft / in. 12:24:30 PM 10/2/2017 syl Figure 3A



Notes:
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Legend

- Surficial Holocene - Soft to Med. Stiff Silts and Clays
- Surficial Holocene - Loose to V. Dense Sands
- Hawthorn Marl
- Cooper Group Limestone

Horizontal Scale: 1"=200'
Vertical Scale: 1"=40'
Vertical Exaggeration: 5X

200 0 200
Feet

US-21 Generalized Subsurface Profile

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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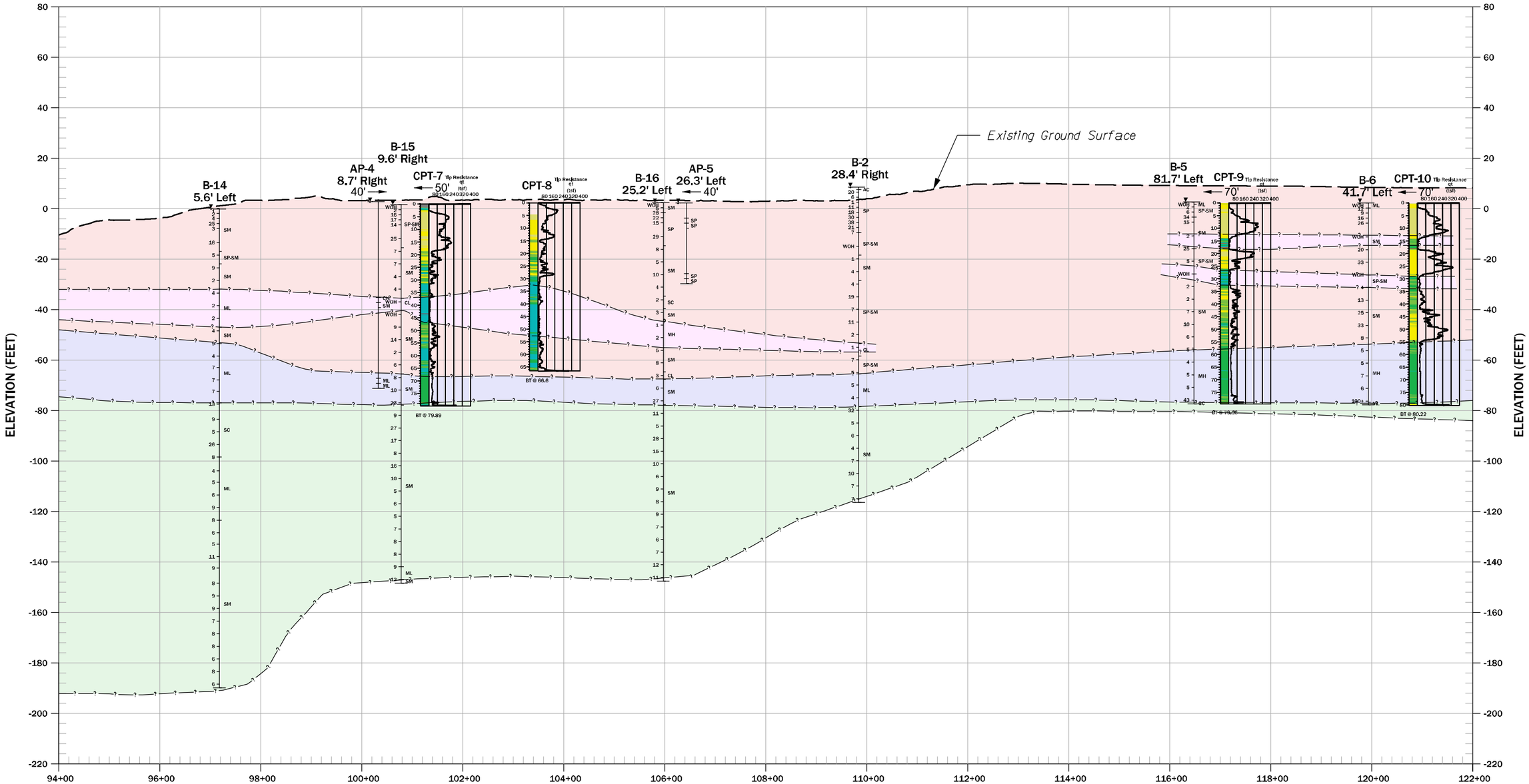
Figure 3B

P:\18\18461007\CAD\00\GeoTech Report\R00\01846100700_F03_Soil Profile.dgn syl Figure 3B 17x11 (In.) 200.0000 ft / in 12:30:48 PM10/2/2017



Notes:
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Legend

- Surficial Holocene - Soft to Med. Stiff Silts and Clays
- Surficial Holocene - Loose to V. Dense Sands
- Hawthorn Marl
- Cooper Group Limestone

Horizontal Scale: 1"=200'
Vertical Scale: 1"=40'
Vertical Exaggeration: 5X

200 0 200
Feet

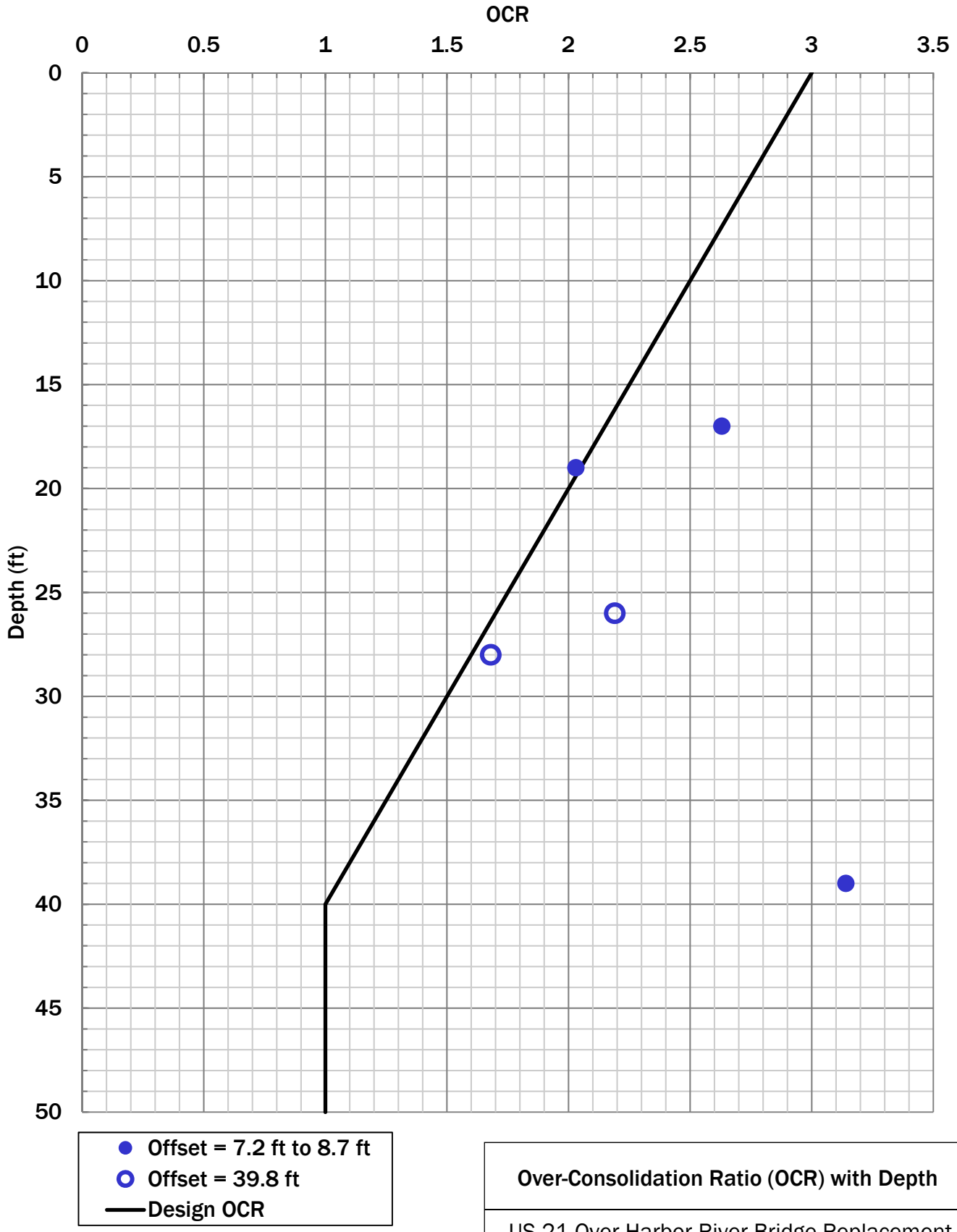
US-21 Generalized Subsurface Profile

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GEOENGINEERS

Figure 3C

P:\18\18461007\CAD\00\GeoTech Report\R00\018461007 00_F03_Soil Profile.dgn syl Figure 3C 17x11 (in.) 200.0000 ft / in 12:31:20 PM 10/2/2017



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Over-Consolidation Ratio (OCR) with Depth

US-21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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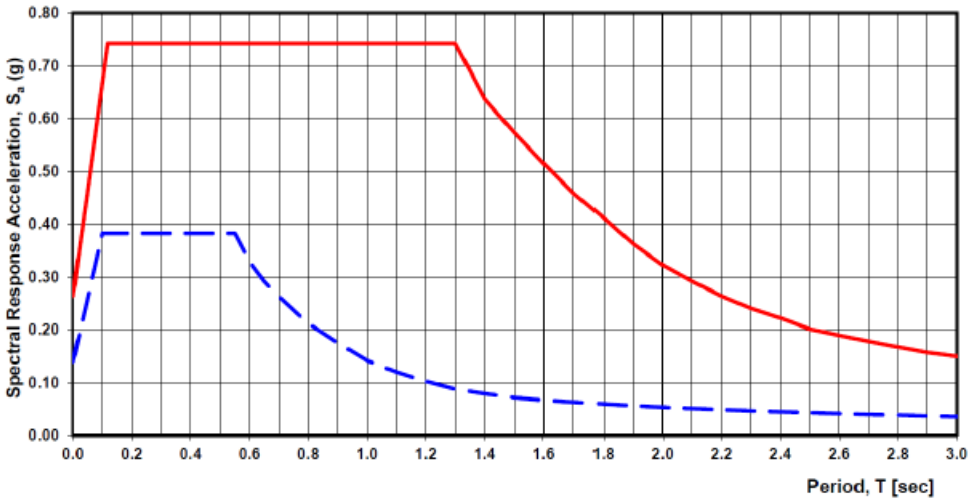
Figure 4

18461-007-01 Date Exported: 09/29/17

US 21 over Harbor River
Site-Specific ADRS Curves From Ground Surface
Begin Bridge Embankments



FEE ADRS Curve
Site-Specific

	T	S_a
	0.00	0.140
	0.05	0.261
To	0.10	0.383
	0.15	0.383
	0.20	0.383
	0.25	0.383
	0.30	0.383
	0.40	0.383
	0.50	0.383
Ts	0.55	0.383
	0.60	0.329
	0.65	0.292
	0.70	0.263
	0.80	0.211
	0.90	0.175
	1.00	0.142
	1.10	0.120
	1.20	0.102
	1.30	0.087
	1.40	0.079
	1.50	0.071
	1.60	0.067
	1.70	0.063
	1.80	0.059
	1.90	0.056
	2.00	0.053
	2.10	0.051
	2.20	0.049
	2.30	0.047
	2.40	0.045
	2.50	0.043
	2.60	0.042
	2.70	0.040
	2.80	0.038
	2.90	0.037
	3.00	0.036

SEE ADRS Curve
Site-Specific

	T	S_a
	0.00	0.264
	0.03	0.365
	0.05	0.466
To	0.12	0.742
	0.15	0.742
	0.20	0.742
	0.25	0.742
	0.30	0.742
	0.35	0.742
	0.40	0.742
	0.50	0.742
	0.60	0.742
	0.70	0.742
	0.80	0.742
	0.90	0.742
	1.00	0.742
	1.10	0.742
	1.20	0.742
Ts	1.30	0.742
	1.40	0.636
	1.50	0.573
	1.60	0.515
	1.70	0.459
	1.80	0.412
	1.90	0.362
	2.00	0.322
	2.10	0.291
	2.20	0.264
	2.30	0.241
	2.40	0.222
	2.50	0.201
	2.60	0.189
	2.70	0.178
	2.80	0.167
	2.90	0.157
	3.00	0.149

Legend

Notes:

1. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Request for Proposals US 21 Over Harbor River Bridge Replacement Design-Build Project ID P026862, Beaufort County, dated April 27, 2017

ADRS Curves for the West End Bridge Embankment

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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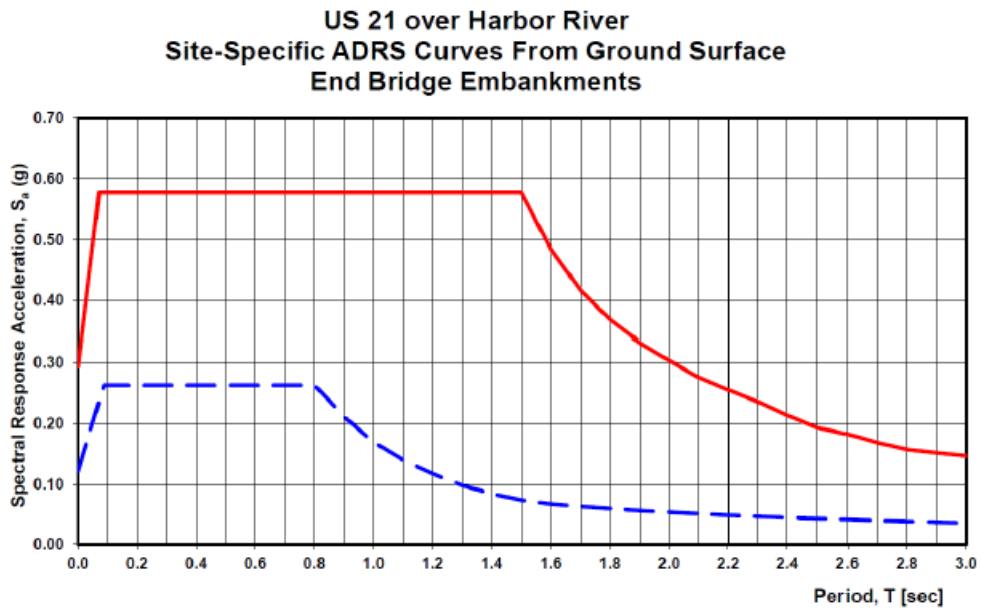
Figure 5



FEE ADRS Curve
Site-Specific

	T	S_a
	0.00	0.122
To	0.09	0.262
	0.20	0.262
	0.30	0.262
	0.40	0.262
	0.50	0.262
	0.60	0.262
	0.70	0.262
Ts	0.80	0.262
	0.90	0.211
	0.95	0.190
	1.00	0.169
	1.05	0.154
	1.10	0.140
	1.15	0.128
	1.20	0.117
	1.25	0.107
	1.30	0.098
	1.35	0.091
	1.40	0.084
	1.50	0.074
	1.60	0.067
	1.70	0.063
	1.80	0.059
	1.90	0.056
	2.00	0.053
	2.10	0.051
	2.20	0.049
	2.30	0.047
	2.40	0.045
	2.50	0.043
	2.60	0.042
	2.70	0.040
	2.80	0.038
	2.90	0.037
	3.00	0.036

SEE ADRS Curve
Site-Specific

	T	S_a
	0.00	0.293
	0.07	0.578
To	0.10	0.578
	0.15	0.578
	0.20	0.578
	0.25	0.578
	0.30	0.578
	0.35	0.578
	0.40	0.578
	0.45	0.578
	0.50	0.578
	0.60	0.578
	0.70	0.578
	0.80	0.578
	0.90	0.578
	1.00	0.578
	1.10	0.578
	1.20	0.578
	1.30	0.578
	1.40	0.578
Ts	1.50	0.578
	1.60	0.485
	1.70	0.417
	1.80	0.369
	1.90	0.332
	2.00	0.303
	2.10	0.276
	2.20	0.255
	2.30	0.236
	2.40	0.213
	2.50	0.193
	2.60	0.182
	2.70	0.168
	2.80	0.157
	2.90	0.151
	3.00	0.146

Legend

Notes:

1. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

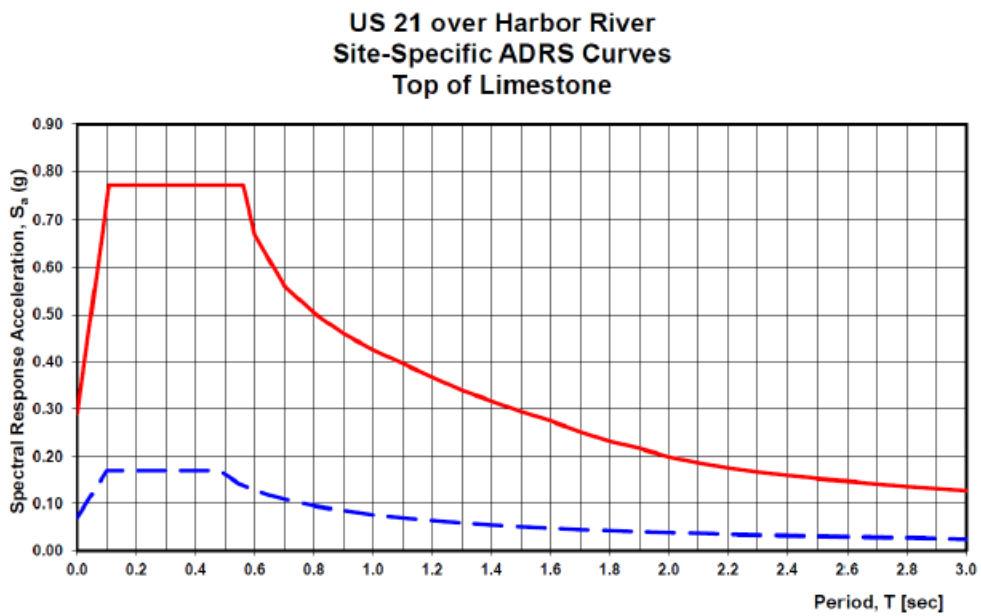
Data Source: Request for Proposals US 21 Over Harbor River Bridge Replacement Design-Build Project ID P026862, Beaufort County, dated April 27, 2017

ADRS Curves for the East End Bridge Embankment

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure 6



FEE ADRS Curve
Site-Specific

	T	S_a
	0.00	0.070
To	0.10	0.169
	0.20	0.169
	0.30	0.169
	0.40	0.169
	0.45	0.169
Ts	0.48	0.169
	0.55	0.141
	0.60	0.128
	0.65	0.117
	0.70	0.109
	0.75	0.102
	0.80	0.095
	0.85	0.090
	0.90	0.085
	1.00	0.076
	1.10	0.070
	1.20	0.064
	1.30	0.059
	1.40	0.054
	1.50	0.050
	1.60	0.047
	1.70	0.044
	1.80	0.042
	1.90	0.040
	2.00	0.038
	2.10	0.036
	2.20	0.035
	2.30	0.033
	2.40	0.032
	2.50	0.031
	2.60	0.029
	2.70	0.028
	2.80	0.027
	2.90	0.026
	3.00	0.025

SEE ADRS Curve
Site-Specific

	T	S_a
	0.00	0.292
To	0.11	0.770
	0.15	0.770
	0.20	0.770
	0.25	0.770
	0.30	0.770
	0.35	0.770
	0.40	0.770
	0.45	0.770
	0.50	0.770
Ts	0.56	0.770
	0.60	0.670
	0.70	0.561
	0.80	0.503
	0.90	0.459
	1.00	0.425
	1.10	0.396
	1.20	0.367
	1.30	0.339
	1.40	0.317
	1.50	0.295
	1.60	0.275
	1.70	0.252
	1.80	0.231
	1.90	0.217
	2.00	0.199
	2.10	0.186
	2.20	0.175
	2.30	0.166
	2.40	0.159
	2.50	0.153
	2.60	0.147
	2.70	0.141
	2.80	0.136
	2.90	0.132
	3.00	0.127

Legend

Notes:

1. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Request for Proposals US 21 Over Harbor River Bridge Replacement Design-Build Project ID P026862, Beaufort County, dated April 27, 2017

ADRS Curves Top of Limestone

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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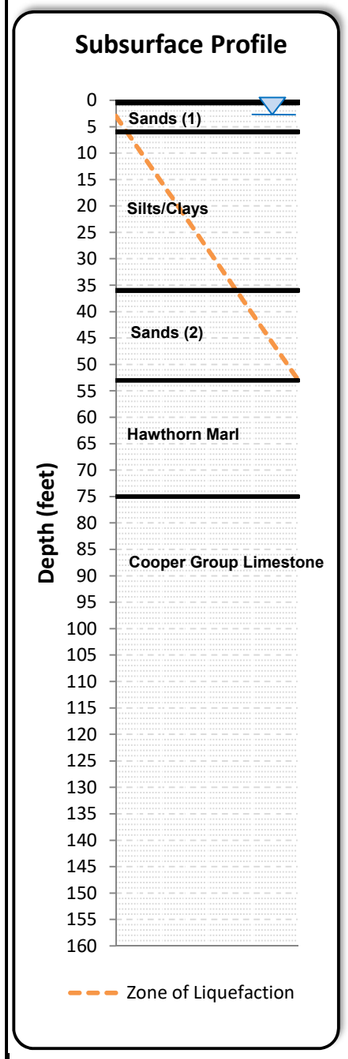
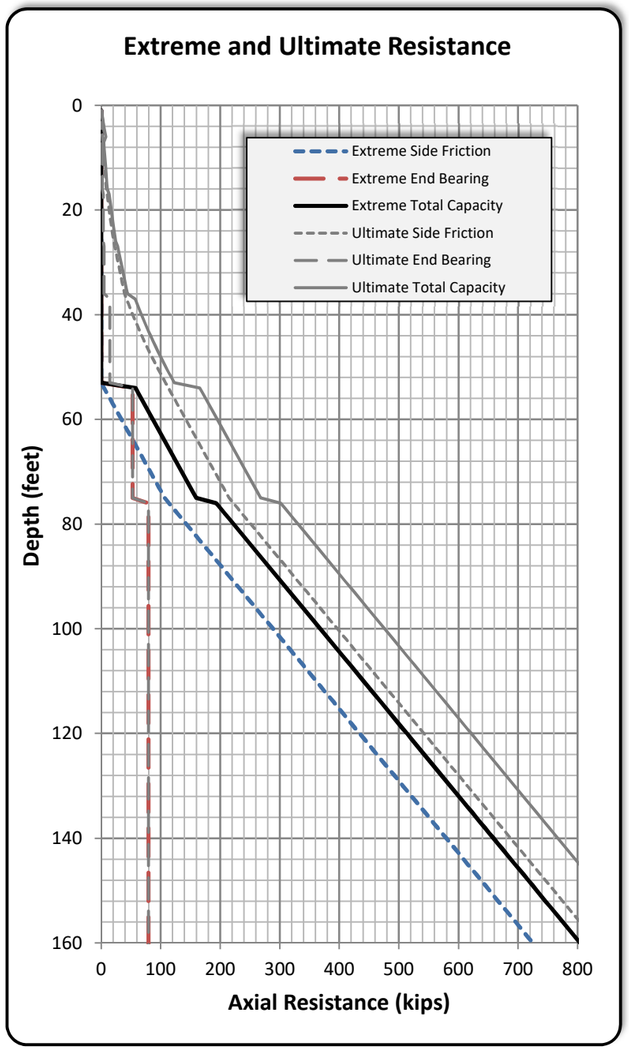
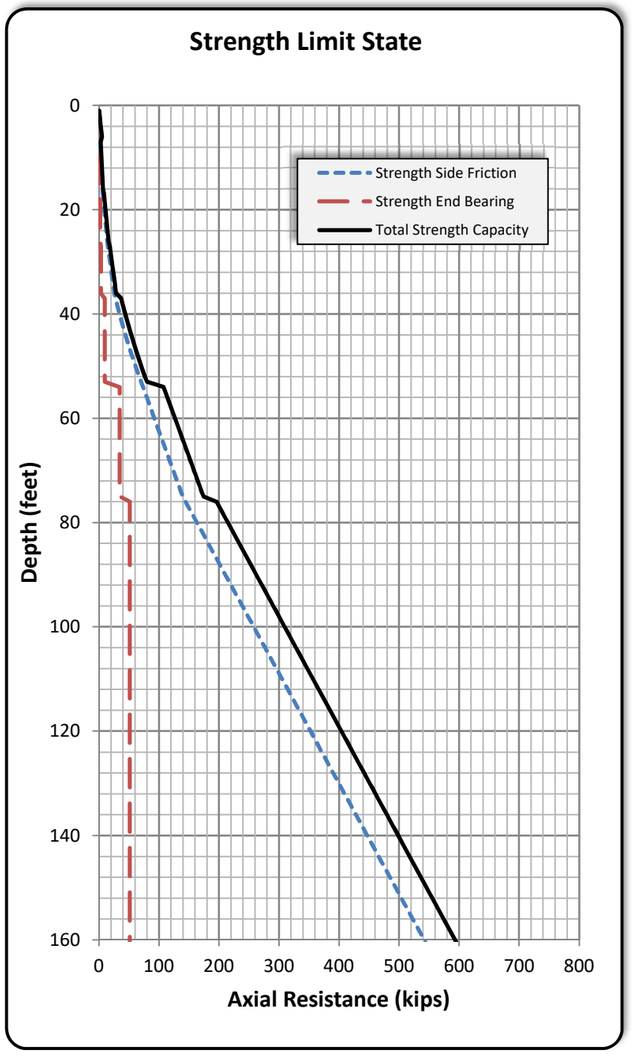
Figure 7

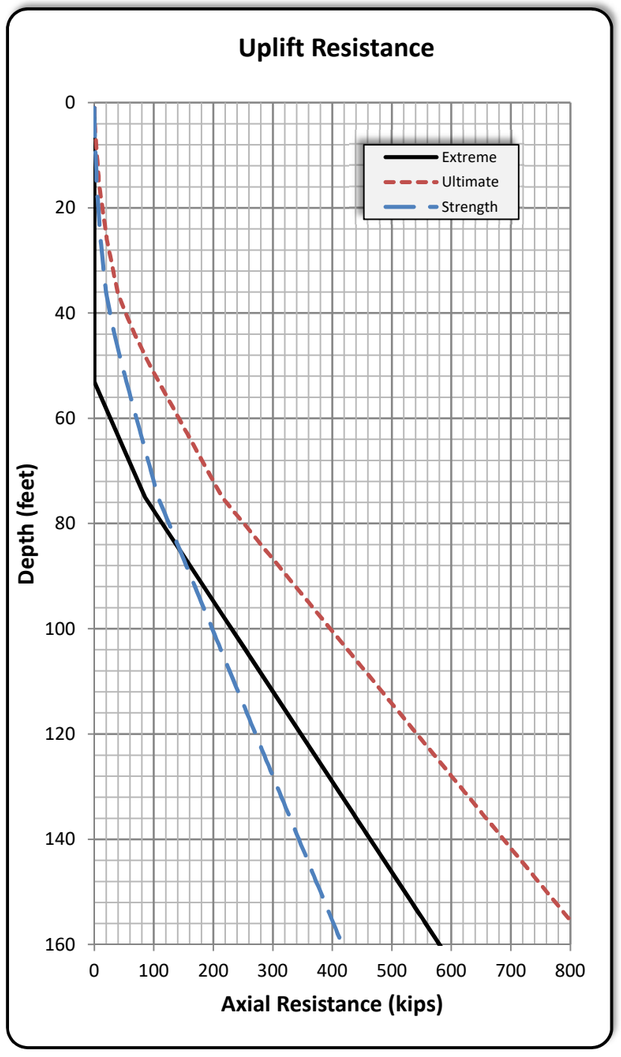
AASHTO DRIVEN PILE CAPACITY

HP 14x117 Steel









General Notes

1. The pile capacities were developed in accordance with the 2016 AASHTO LRFD Bridge Design Manual and the 2008 SCDOT Geotechnical Design Manual (GDM) following the α-method for cohesive soil and Nordland/Thurman method for frictional soil.
2. The plots are based on a single pile and do not consider group effects of closely spaced piles.
3. The service case for single piles is assumed to be equivalent to the ultimate (unfactored) resistance.
4. The appropriate LRFD resistance factors, as presented in the "Resistance Factors" table are included in the plots presented above.
5. Unfactored downdrag load for the Extreme Limit State is estimated to be 42 kips. A load factor of 1.05 is recommended to be applied with post-earthquake loading conditions in accordance with the 2008 SCDOT GDM.

Resistance Factors		
	Downward	Uplift
α–Method	0.65	0.50
N/T-Method	0.65	0.50

Axial Resistance Plots - No Scour

West Abutment (Station 70+40)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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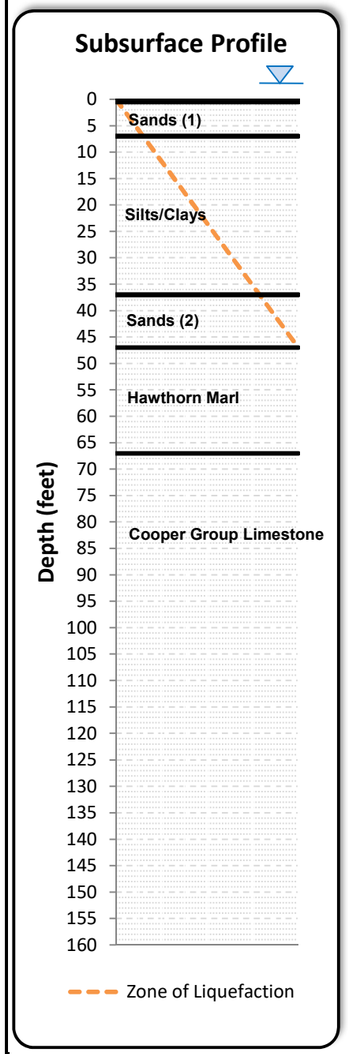
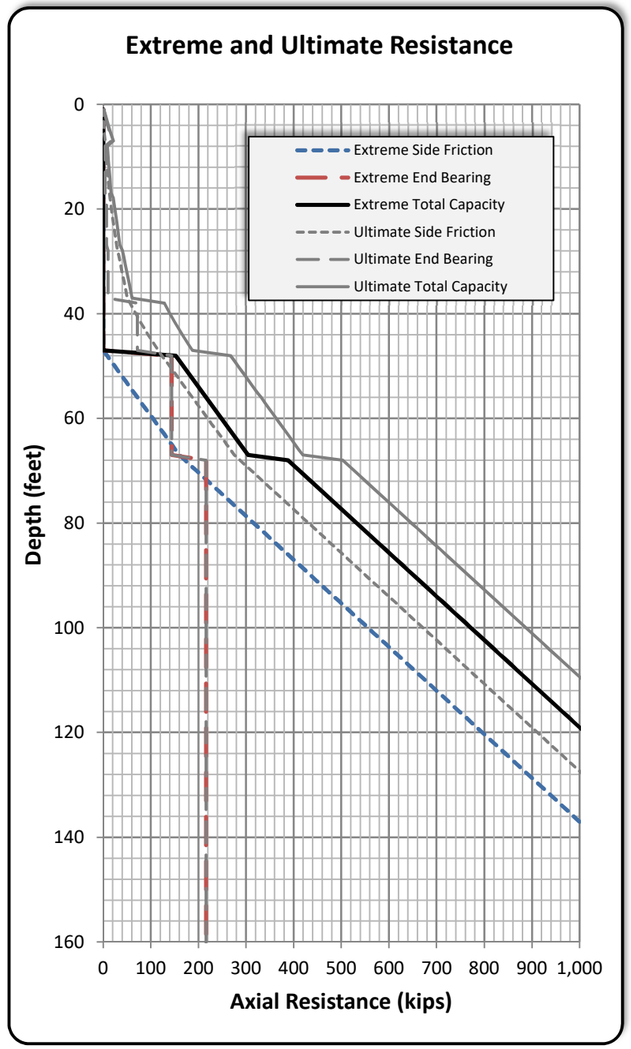
Figure 8

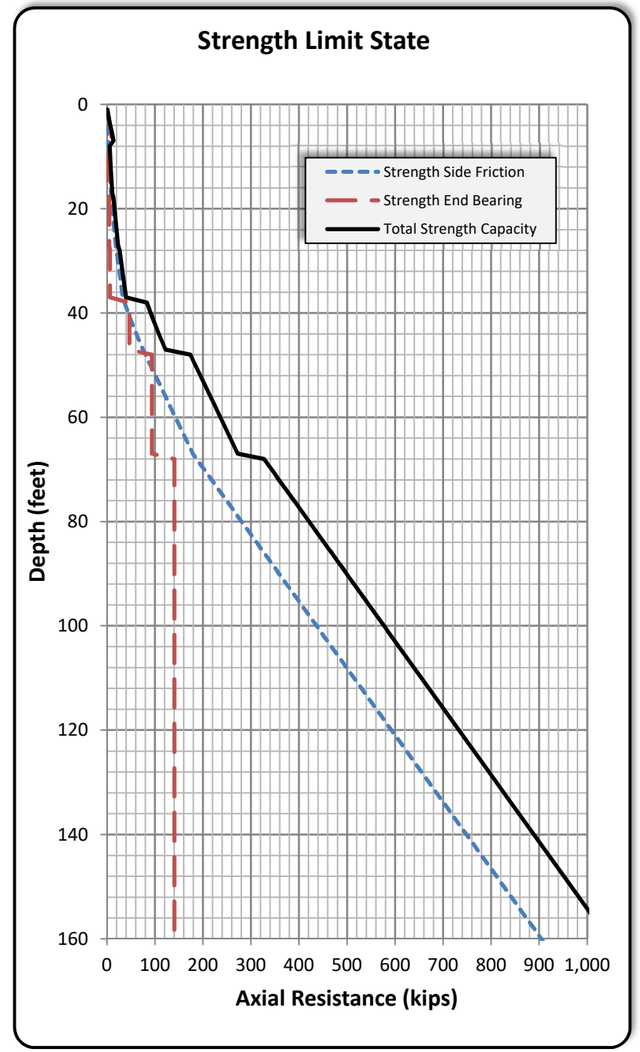
18461-007-01 HPC:ZAS 10/04/17

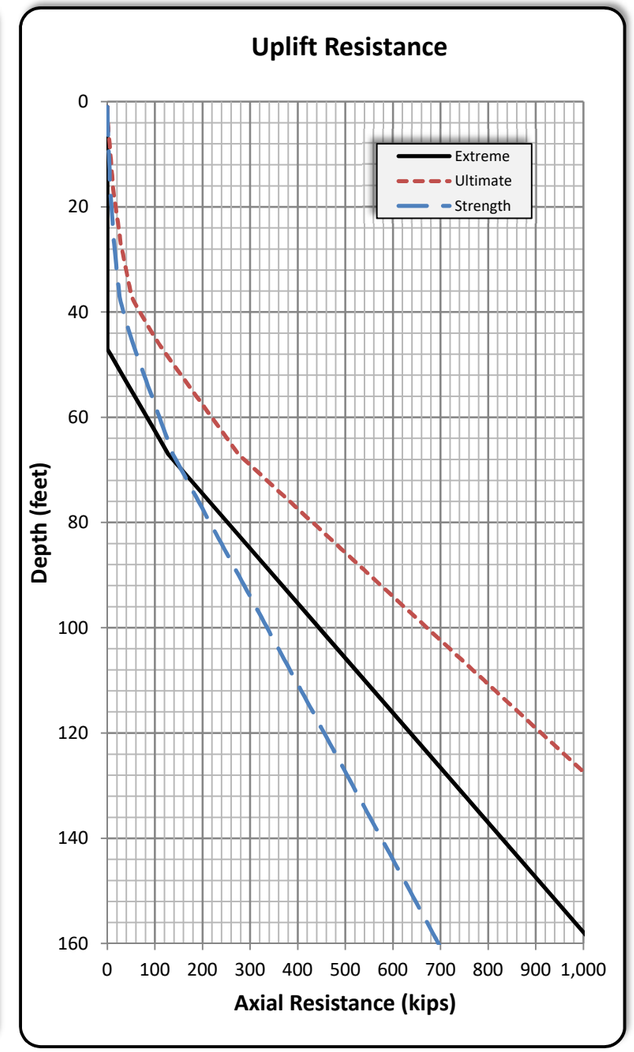
AASHTO DRIVEN PILE CAPACITY

24-Inch Pre-Cast Concrete Pile









General Notes

1. The pile capacities were developed in accordance with the 2016 AASHTO LRFD Bridge Design Manual and the 2008 SCDOT Geotechnical Design Manual (GDM) following the α-method for cohesive soil and Nordland/Thurman method for frictional soil.
2. The plots are based on a single pile and do not consider group effects of closely spaced piles.
3. The service case for single piles is assumed to be equivalent to the ultimate (unfactored) resistance.
4. The appropriate LRFD resistance factors, as presented in the "Resistance Factors" table are included in the plots presented above.
5. Unfactored downdrag load for the Extreme Limit State is estimated to be 50 kips. A load factor of 1.05 is recommended to be applied with post-earthquake loading conditions in accordance with the 2008 SCDOT GDM.

Resistance Factors		
	Downward	Uplift
α–Method	0.65	0.50
N/T-Method	0.65	0.50

Axial Resistance Plots - Full Scour

West Overbank (Station 70+56 to 83+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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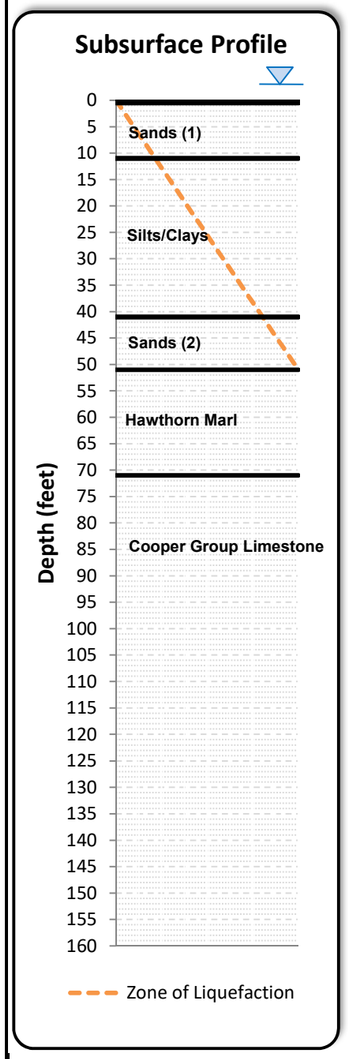
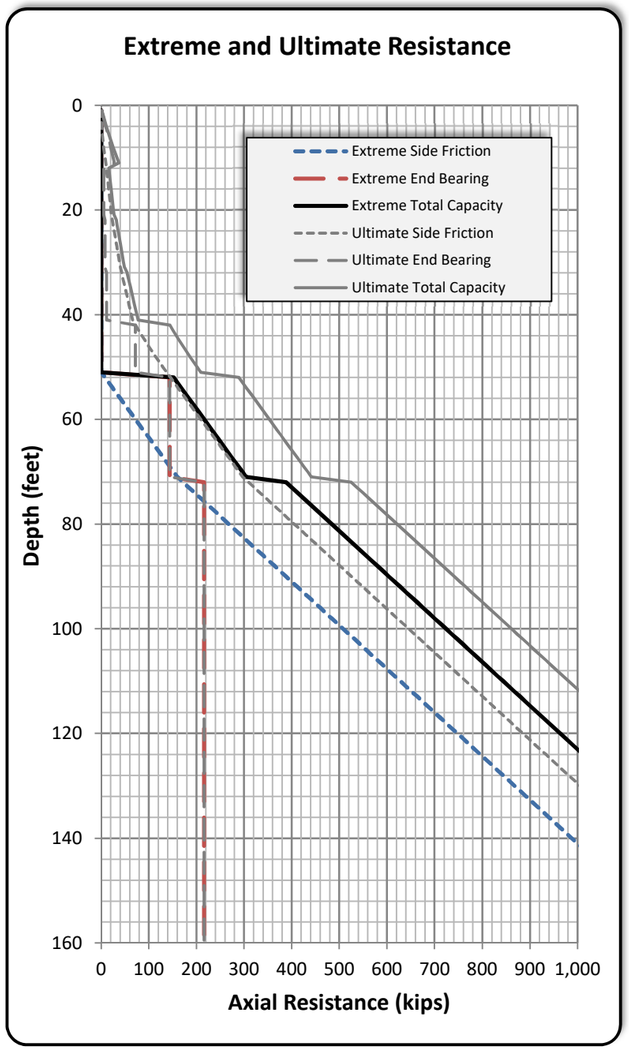
Figure 9

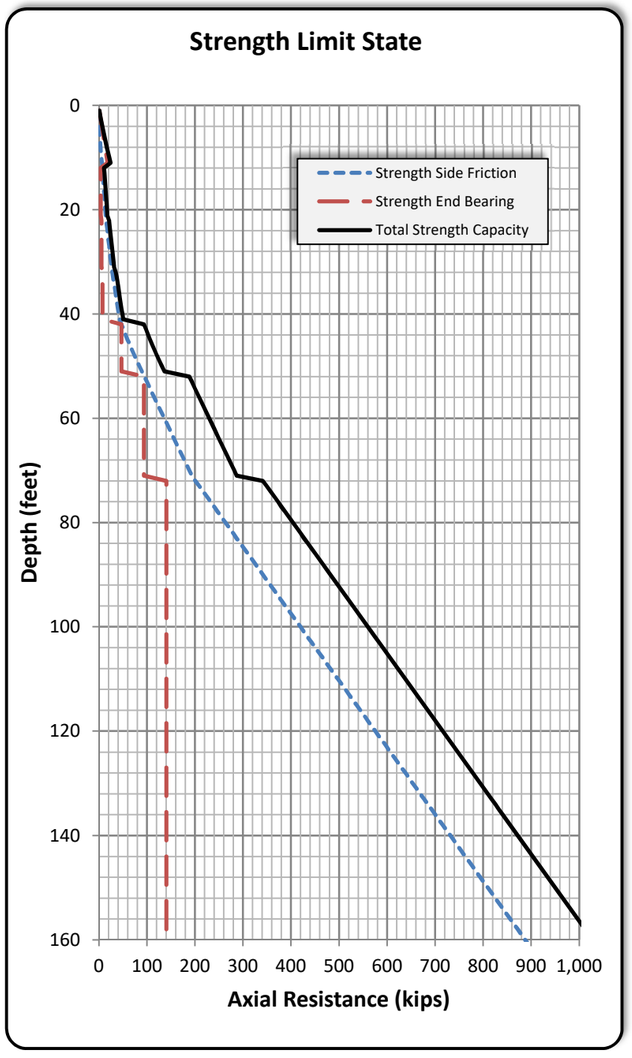
18461-007-01 HPC:ZAS 10/04/17

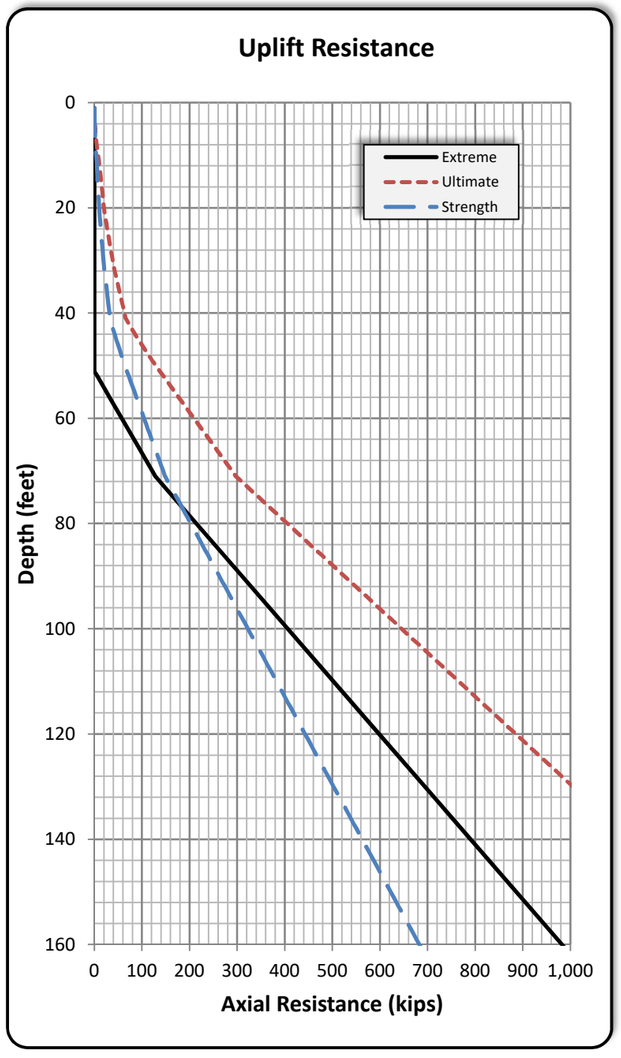
AASHTO DRIVEN PILE CAPACITY

24-Inch Pre-Cast Concrete Pile









General Notes

1. The pile capacities were developed in accordance with the 2016 AASHTO LRFD Bridge Design Manual and the 2008 SCDOT Geotechnical Design Manual (GDM) following the α-method for cohesive soil and Nordland/Thurman method for frictional soil.
2. The plots are based on a single pile and do not consider group effects of closely spaced piles.
3. The service case for single piles is assumed to be equivalent to the ultimate (unfactored) resistance.
4. The appropriate LRFD resistance factors, as presented in the "Resistance Factors" table are included in the plots presented above.
5. Unfactored downdrag load for the Extreme Limit State is estimated to be 62 kips. A load factor of 1.05 is recommended to be applied with post-earthquake loading conditions in accordance with the 2008 SCDOT GDM.

Resistance Factors		
	Downward	Uplift
α–Method	0.65	0.50
N/T-Method	0.65	0.50

Axial Resistance Plots - Half Scour

West Overbank (Station 70+56 to 83+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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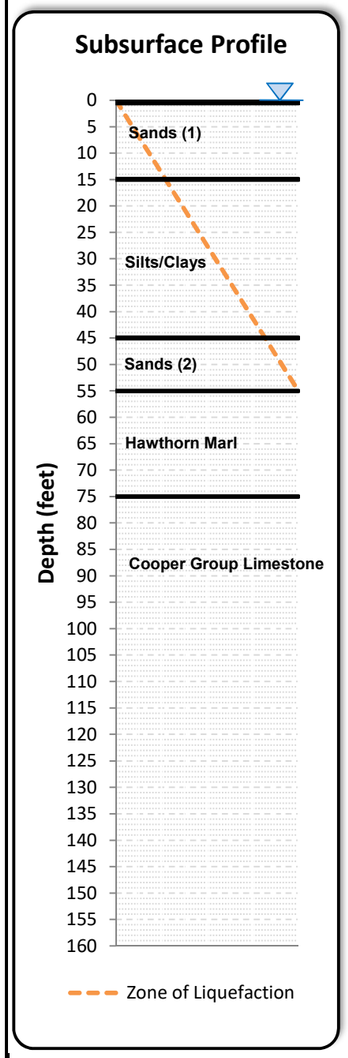
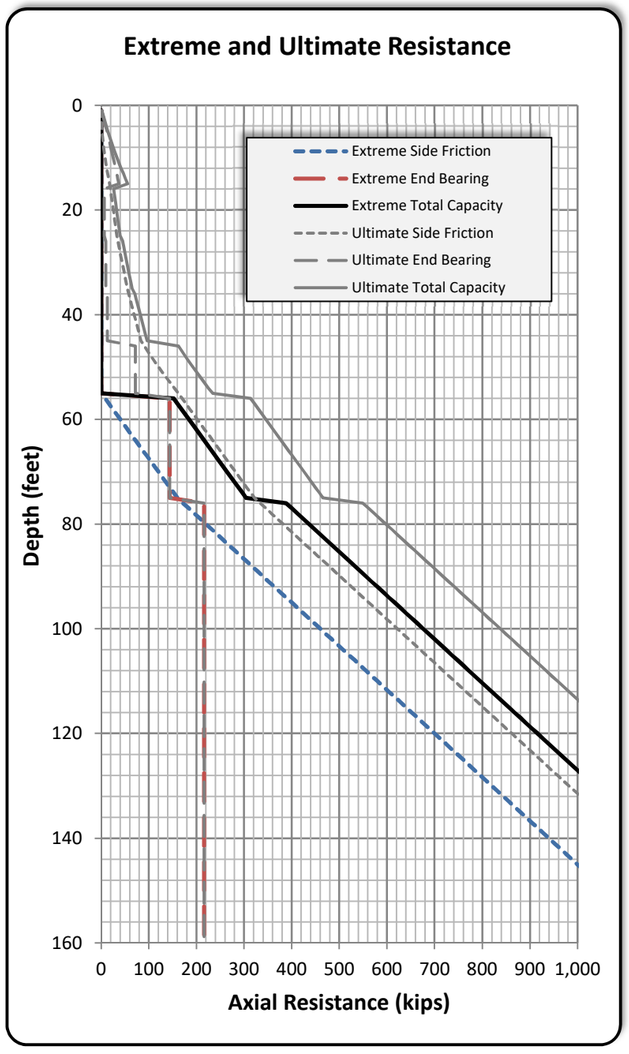
Figure 10

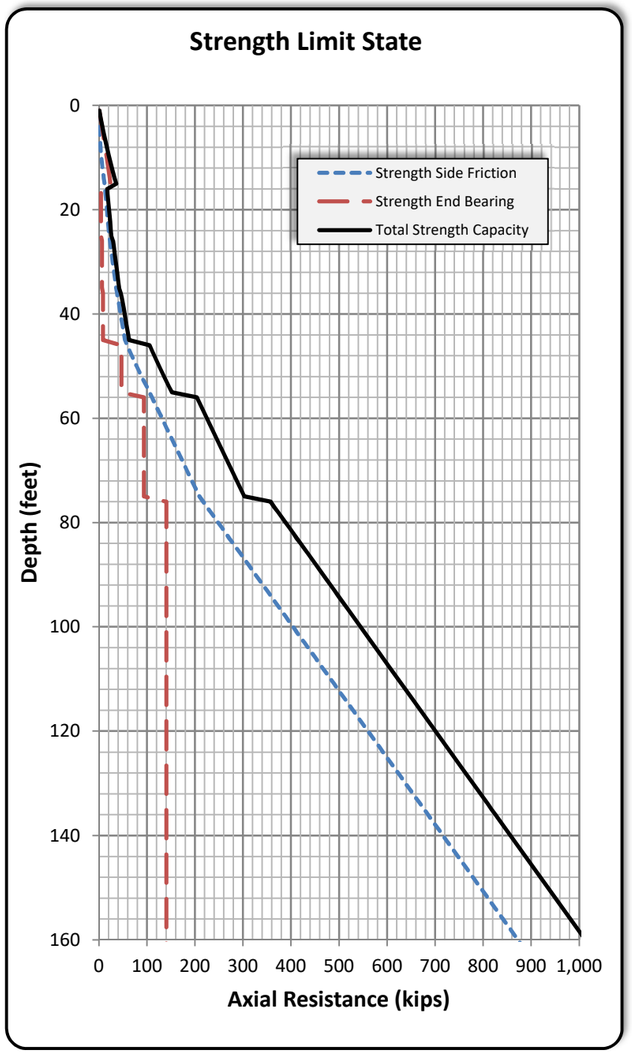
18461-007-01 HPC:ZAS 10/04/17

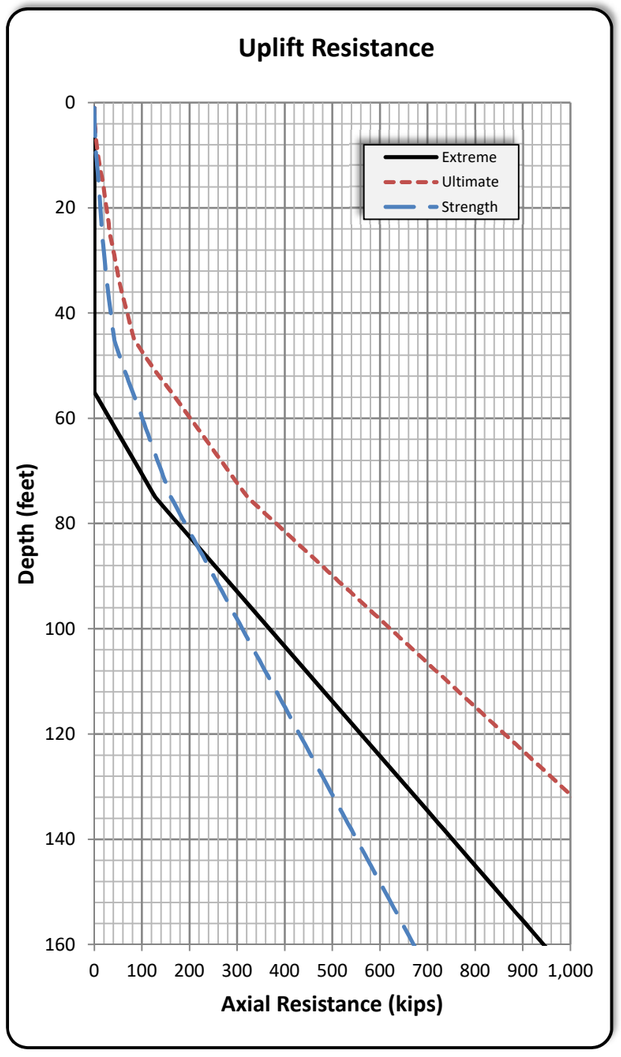
AASHTO DRIVEN PILE CAPACITY

24-Inch Pre-Cast Concrete Pile









General Notes

1. The pile capacities were developed in accordance with the 2016 AASHTO LRFD Bridge Design Manual and the 2008 SCDOT Geotechnical Design Manual (GDM) following the α-method for cohesive soil and Nordland/Thurman method for frictional soil.
2. The plots are based on a single pile and do not consider group effects of closely spaced piles.
3. The service case for single piles is assumed to be equivalent to the ultimate (unfactored) resistance.
4. The appropriate LRFD resistance factors, as presented in the "Resistance Factors" table are included in the plots presented above.
5. Unfactored downdrag load for the Extreme Limit State is estimated to be 74 kips. A load factor of 1.05 is recommended to be applied with post-earthquake loading conditions in accordance with the 2008 SCDOT GDM.

Resistance Factors		
	Downward	Uplift
α–Method	0.65	0.50
N/T-Method	0.65	0.50

Axial Resistance Plots - No Scour

West Overbank (Station 70+56 to 83+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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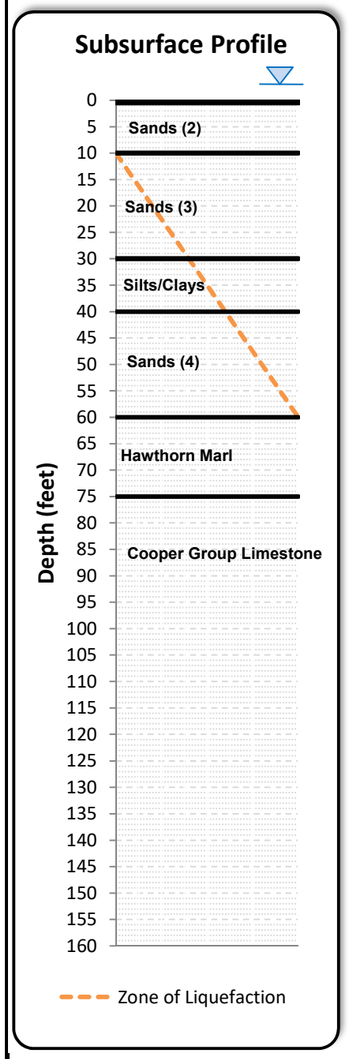
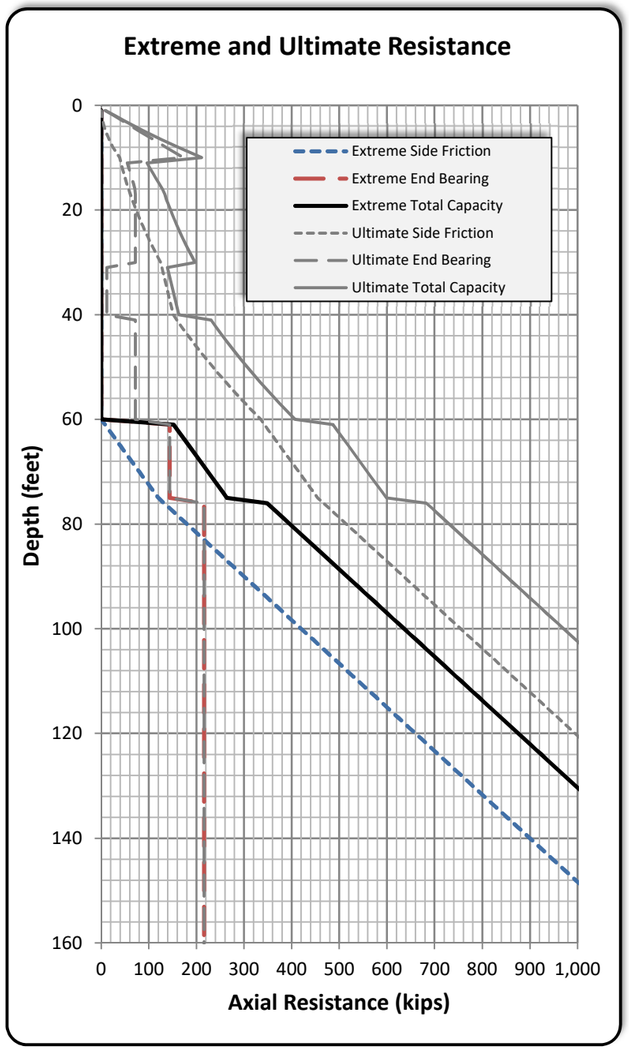
Figure 11

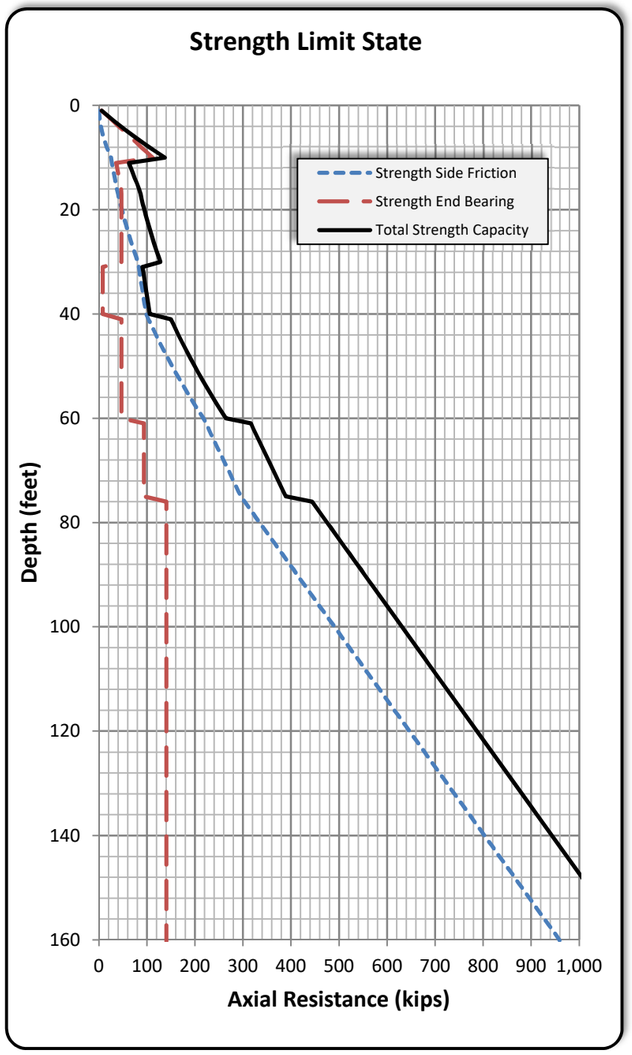
18461-007-01 HPC:ZAS 10/04/17

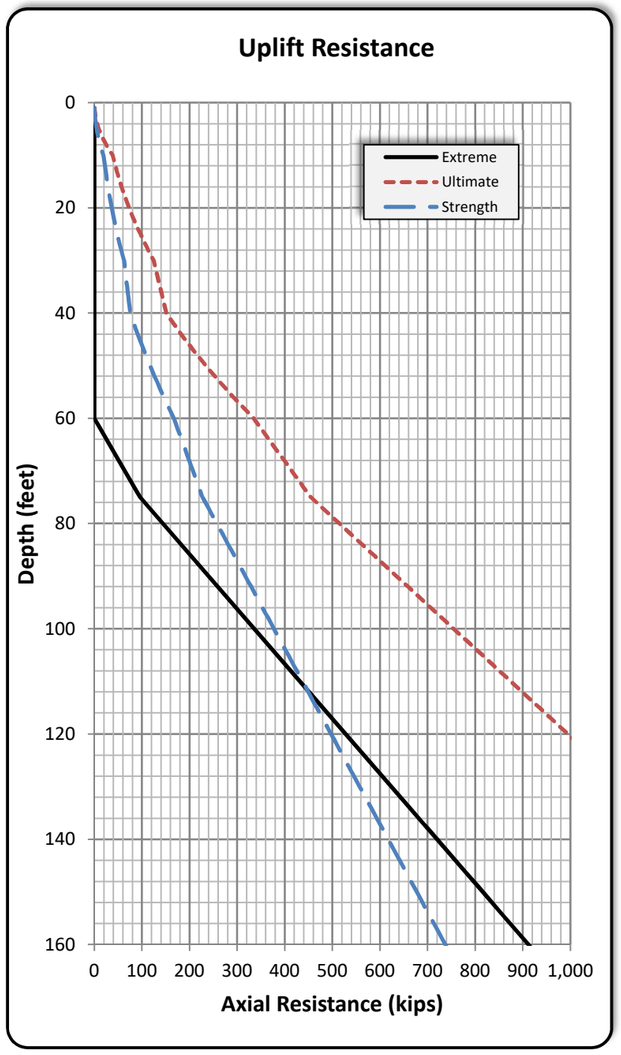
AASHTO DRIVEN PILE CAPACITY

24-Inch Pre-Cast Concrete Pile









General Notes

1. The pile capacities were developed in accordance with the 2016 AASHTO LRFD Bridge Design Manual and the 2008 SCDOT Geotechnical Design Manual (GDM) following the α-method for cohesive soil and Nordland/Thurman method for frictional soil.
2. The plots are based on a single pile and do not consider group effects of closely spaced piles.
3. The service case for single piles is assumed to be equivalent to the ultimate (unfactored) resistance.
4. The appropriate LRFD resistance factors, as presented in the "Resistance Factors" table are included in the plots presented above.
5. Unfactored downdrag load for the Extreme Limit State is estimated to be 106 kips. A load factor of 1.05 is recommended to be applied with post-earthquake loading conditions in accordance with the 2008 SCDOT GDM.

Resistance Factors		
	Downward	Uplift
α–Method	0.65	0.50
N/T-Method	0.65	0.50

Axial Resistance Plots - Full Scour

East Overbank (Station 95+00 to 103+64)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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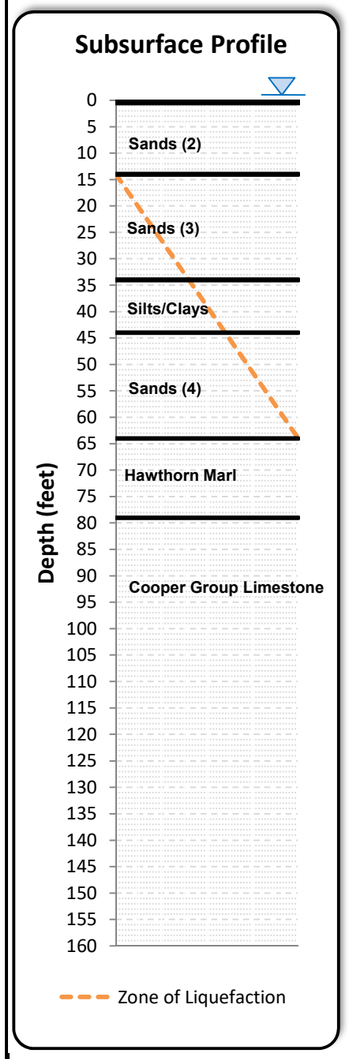
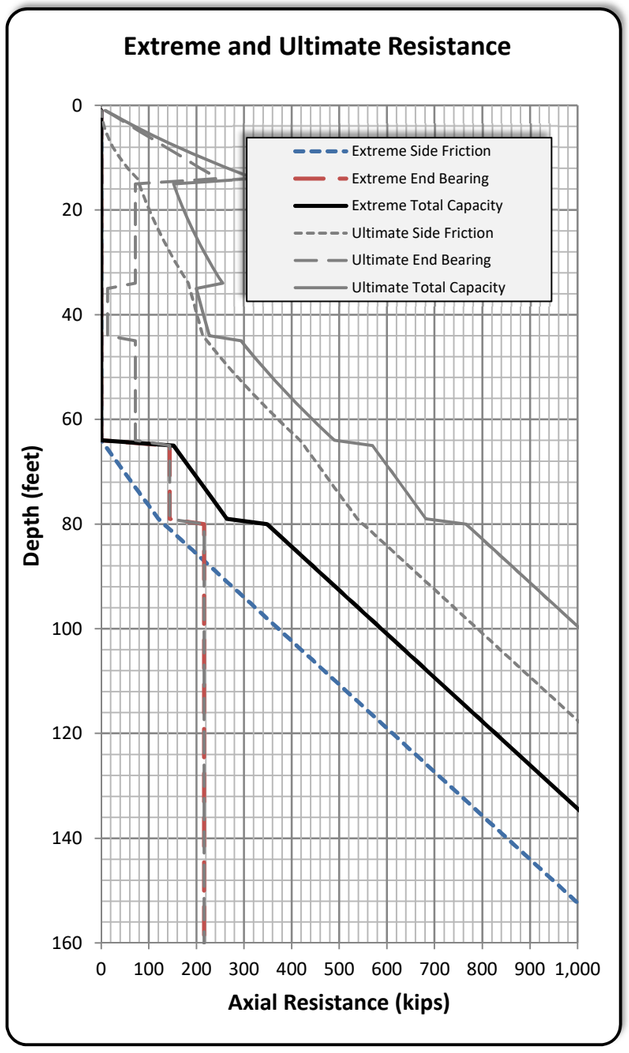
Figure 12

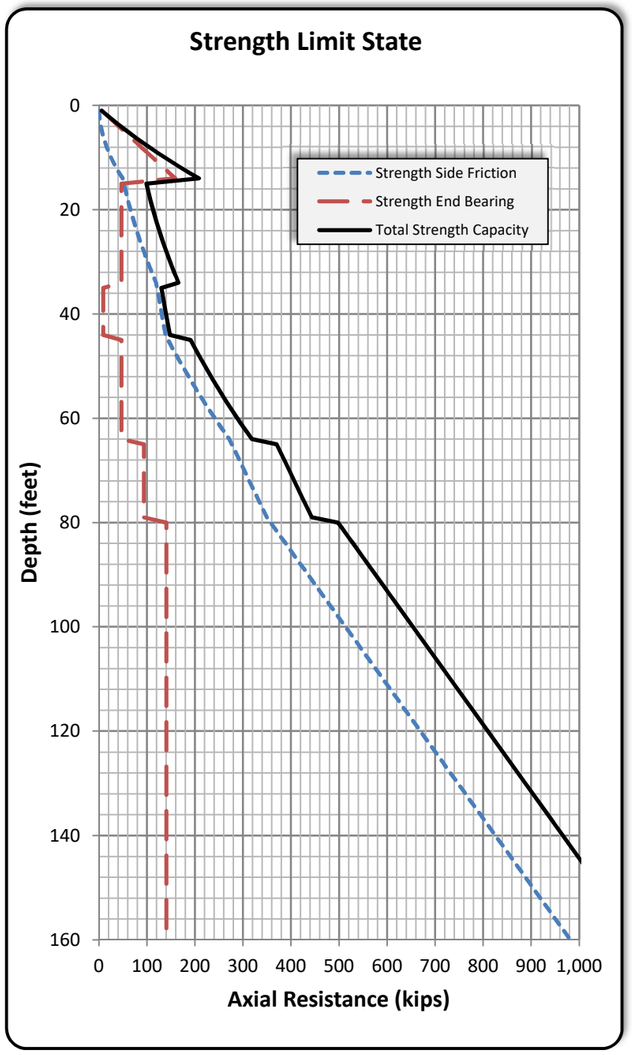
18461-007-01 HPC:ZAS 10/04/17

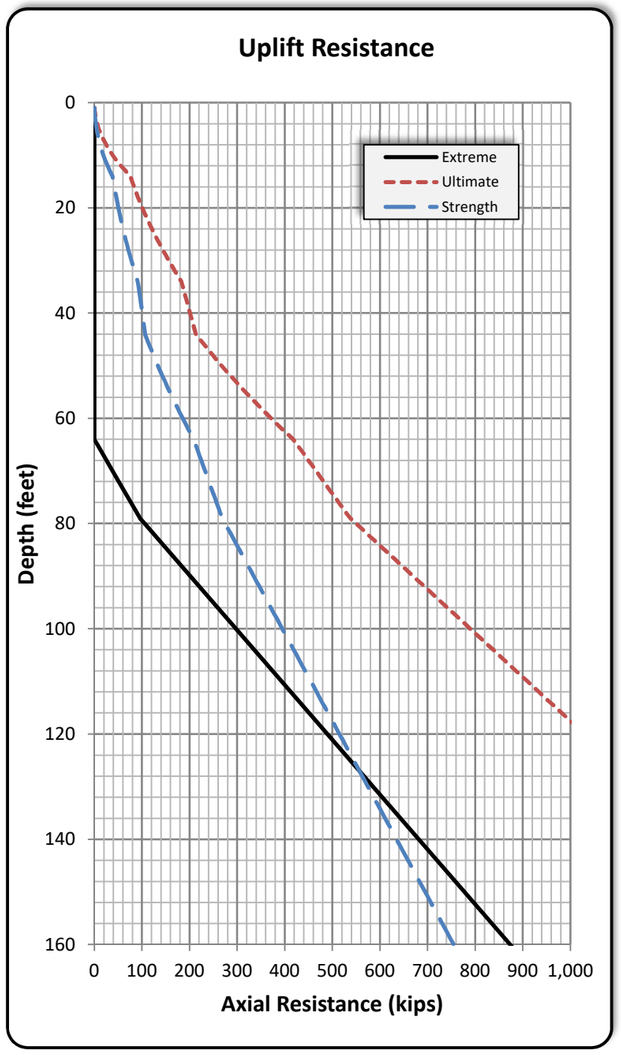
AASHTO DRIVEN PILE CAPACITY

24-Inch Pre-Cast Concrete Pile









General Notes

1. The pile capacities were developed in accordance with the 2016 AASHTO LRFD Bridge Design Manual and the 2008 SCDOT Geotechnical Design Manual (GDM) following the α-method for cohesive soil and Nordland/Thurman method for frictional soil.
2. The plots are based on a single pile and do not consider group effects of closely spaced piles.
3. The service case for single piles is assumed to be equivalent to the ultimate (unfactored) resistance.
4. The appropriate LRFD resistance factors, as presented in the "Resistance Factors" table are included in the plots presented above.
5. Unfactored downdrag load for the Extreme Limit State is estimated to be 154 kips. A load factor of 1.05 is recommended to be applied with post-earthquake loading conditions in accordance with the 2008 SCDOT GDM.

Resistance Factors		
	Downward	Uplift
α–Method	0.65	0.50
N/T-Method	0.65	0.50

Axial Resistance Plots - Half Scour

East Overbank (Station 95+00 to 103+64)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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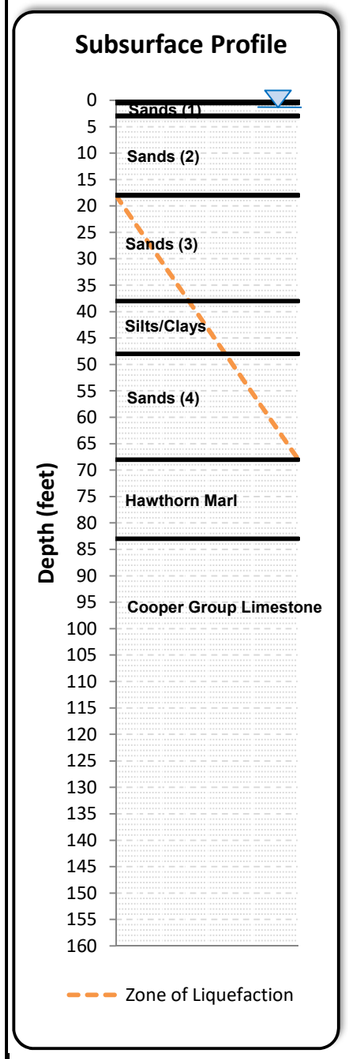
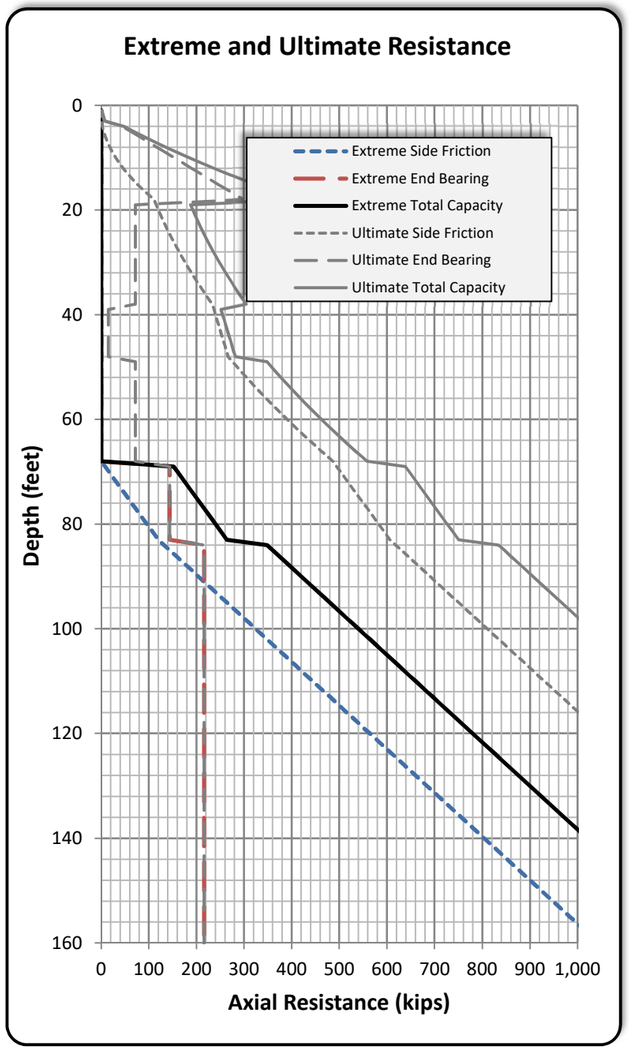
Figure 13

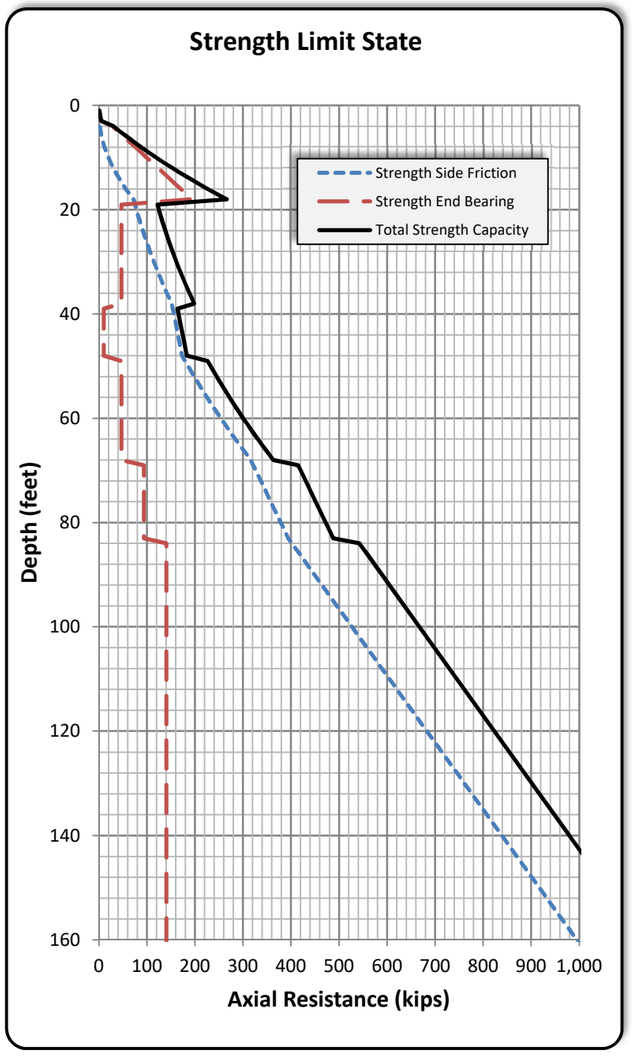
18461-007-01 HPC:ZAS 10/04/17

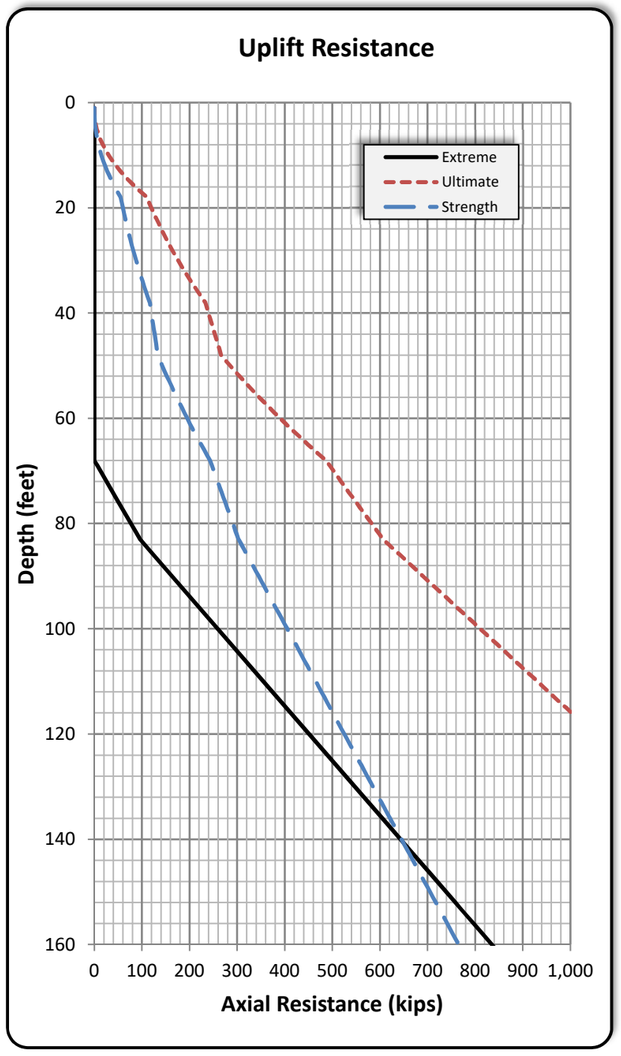
AASHTO DRIVEN PILE CAPACITY

24-Inch Pre-Cast Concrete Pile









General Notes

1. The pile capacities were developed in accordance with the 2016 AASHTO LRFD Bridge Design Manual and the 2008 SCDOT Geotechnical Design Manual (GDM) following the α-method for cohesive soil and Nordland/Thurman method for frictional soil.
2. The plots are based on a single pile and do not consider group effects of closely spaced piles.
3. The service case for single piles is assumed to be equivalent to the ultimate (unfactored) resistance.
4. The appropriate LRFD resistance factors, as presented in the "Resistance Factors" table are included in the plots presented above.
5. Unfactored downdrag load for the Extreme Limit State is estimated to be 197 kips. A load factor of 1.05 is recommended to be applied with post-earthquake loading conditions in accordance with the 2008 SCDOT GDM.

Resistance Factors		
	Downward	Uplift
α–Method	0.65	0.50
N/T-Method	0.65	0.50

Axial Resistance Plots - No Scour

East Overbank (Station 95+00 to 103+64)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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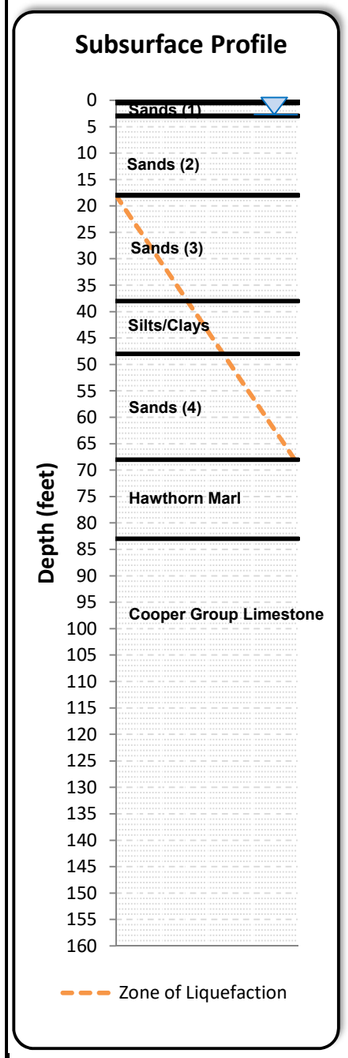
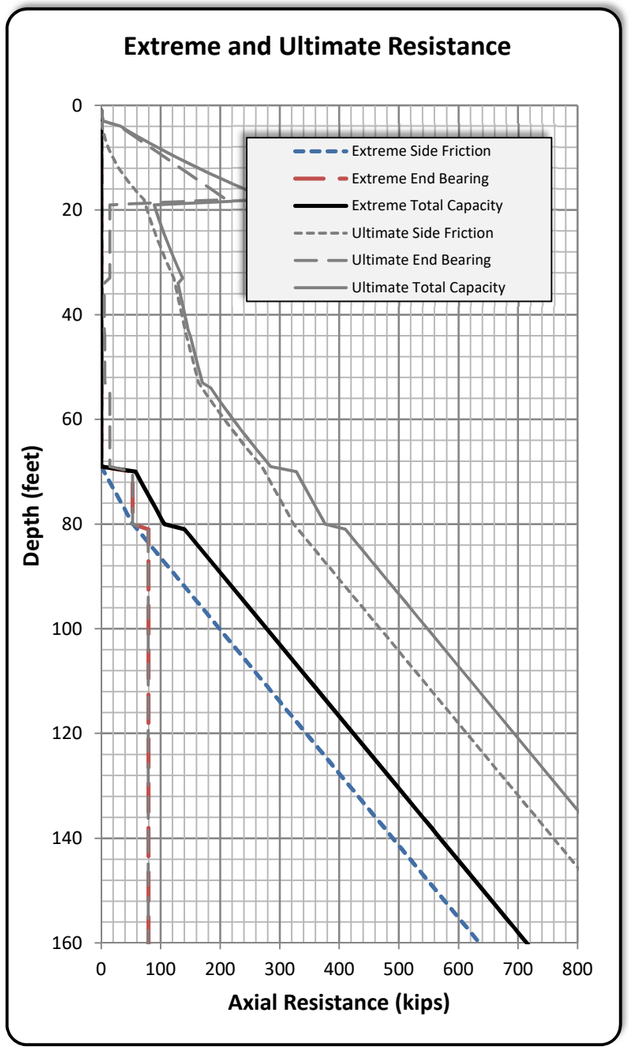
Figure 14

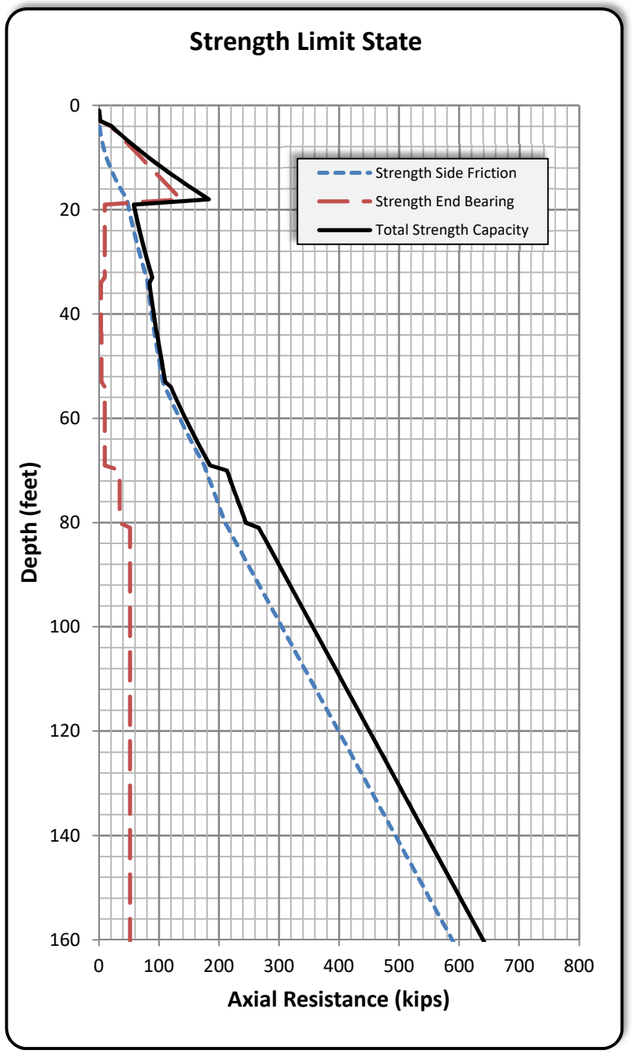
18461-007-01 HPC:ZAS 10/04/17

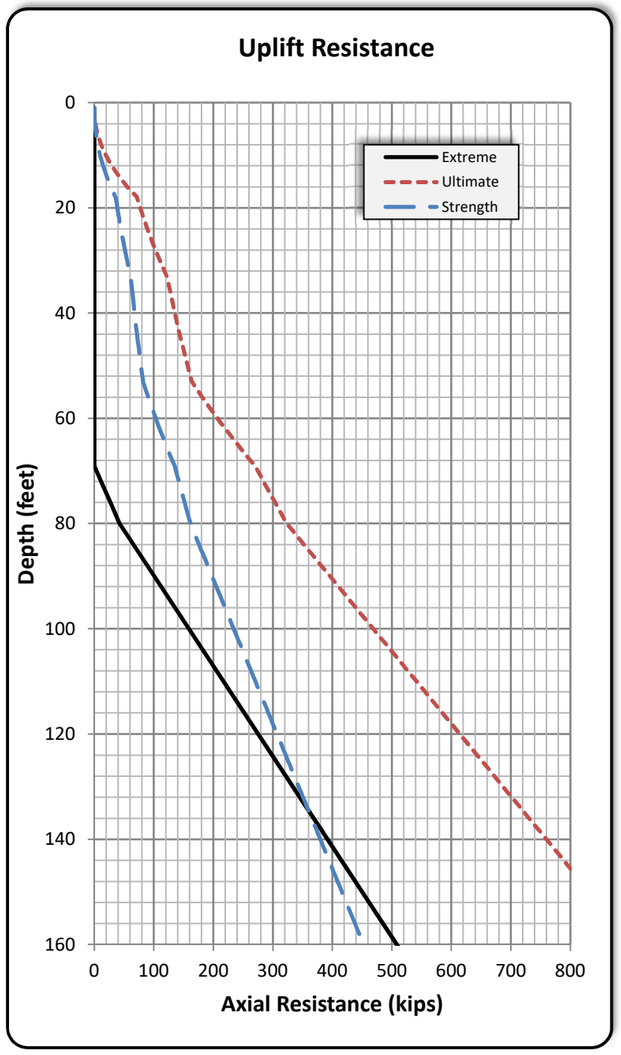
AASHTO DRIVEN PILE CAPACITY

HP 14x117 Steel









General Notes

1. The pile capacities were developed in accordance with the 2016 AASHTO LRFD Bridge Design Manual and the 2008 SCDOT Geotechnical Design Manual (GDM) following the α-method for cohesive soil and Nordland/Thurman method for frictional soil.
2. The plots are based on a single pile and do not consider group effects of closely spaced piles.
3. The service case for single piles is assumed to be equivalent to the ultimate (unfactored) resistance.
4. The appropriate LRFD resistance factors, as presented in the "Resistance Factors" table are included in the plots presented above.
5. Unfactored downdrag load for the Extreme Limit State is estimated to be 139 kips. A load factor of 1.05 is recommended to be applied with post-earthquake loading conditions in accordance with the 2008 SCDOT GDM.

Resistance Factors		
	Downward	Uplift
α–Method	0.65	0.50
N/T-Method	0.65	0.50

Axial Resistance Plots - No Scour

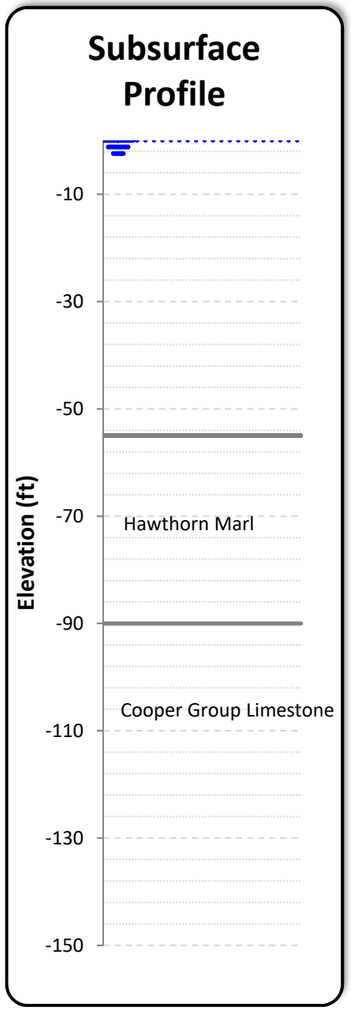
East Abutment (Station 103+50)

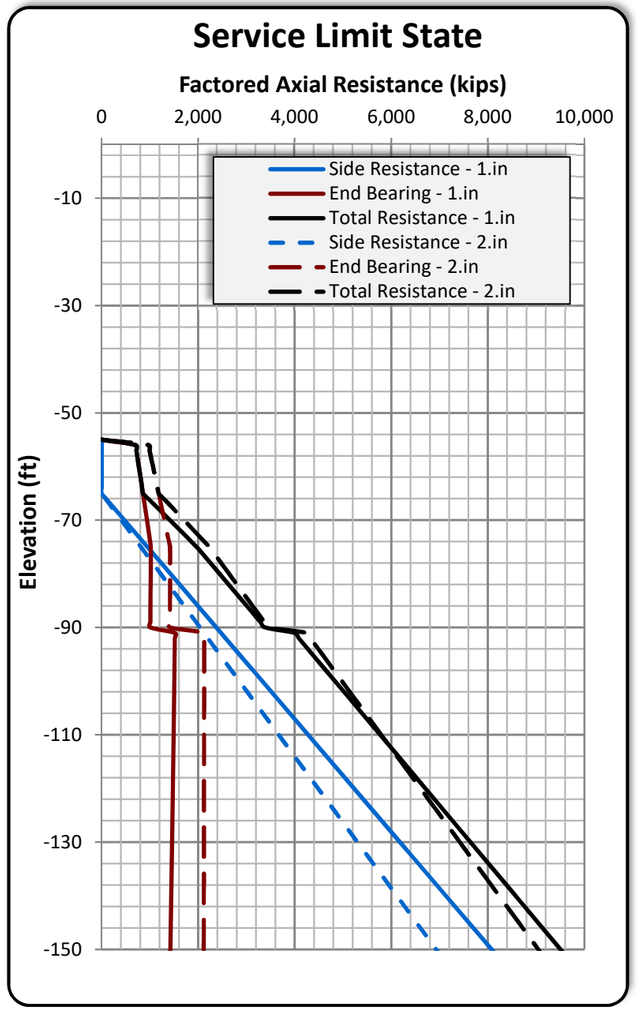
US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

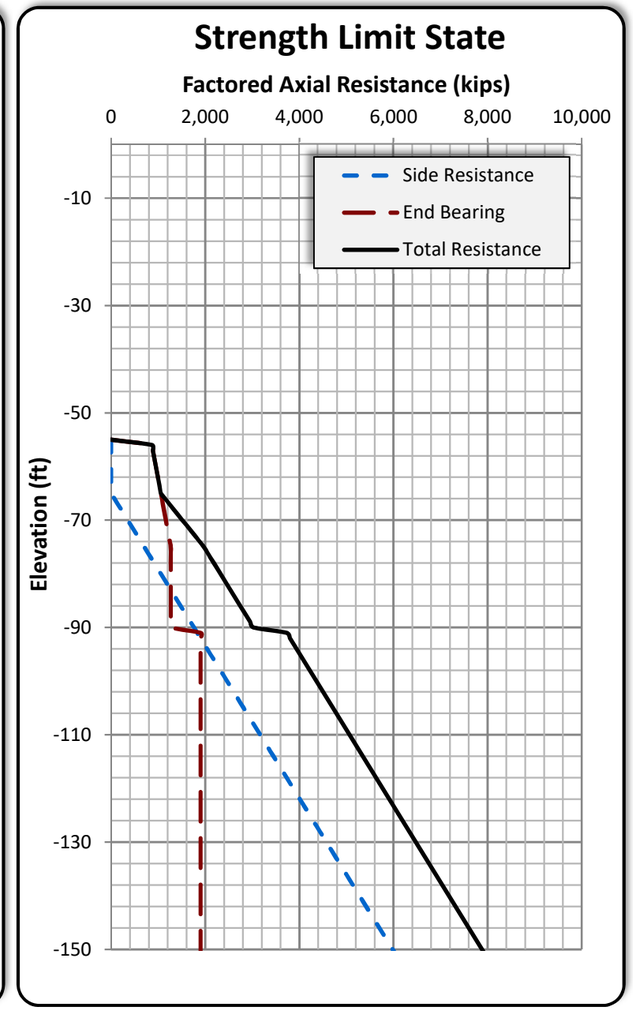
GEOENGINEERS

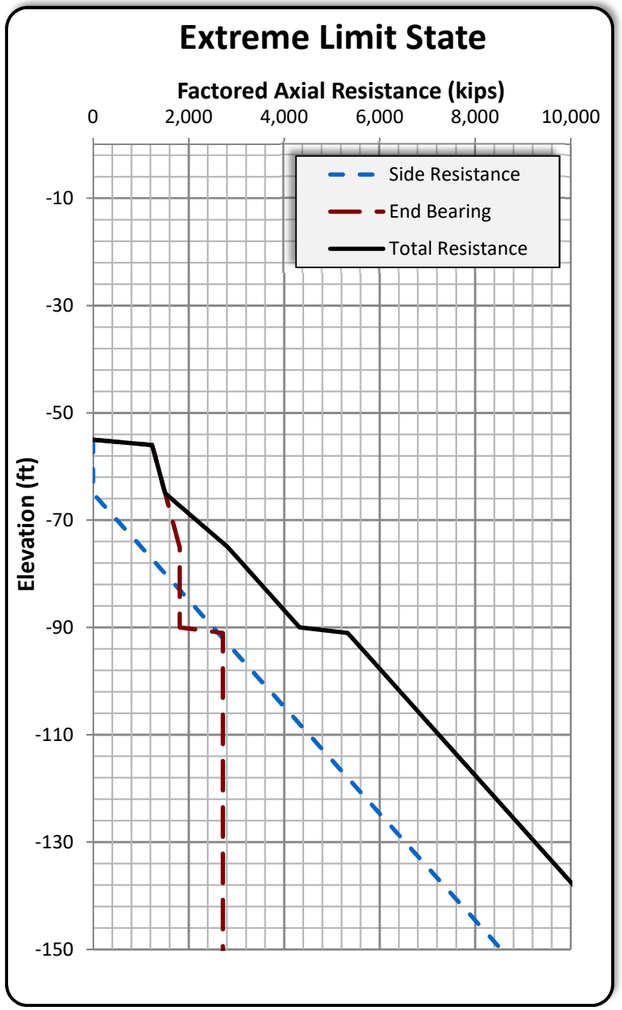
Figure 15

18461-007-01 HPC:ZAS 10/04/17









General Notes

1. Axial shaft resistance was developed in accordance with the 2016 AASHTO LRFD Bridge Design Manual and the 2008 SCDOT Geotechnical Design Manual (GDM).
2. The axial resistance plots assume a top of shaft Elevation of -55 feet and permanent steel casing to a depth of 10 below the ground surface. The geotechnical engineer should re-evaluate axial shaft resistance if permanent steel casing length or top of shaft Elevation changes.
3. The plots are based on a single shaft and do not consider group effects of closely spaced shafts.
4. The service case assumes 1-inch and 2-inch of shaft settlement.
5. The plots include resistance factors shown on the adjacent table for Strength, Extreme, and Service Limit States. Resistance factors for Strength Limit State do not include a 20 percent reduction for non-redundant shafts.
6. Unfactored downdrag load for the Extreme Limit State is estimated to be 0 kips. A load factor of 1.05 is recommended to be applied with post-earthquake loading conditions in accordance with the 2008 SCDOT GDM.

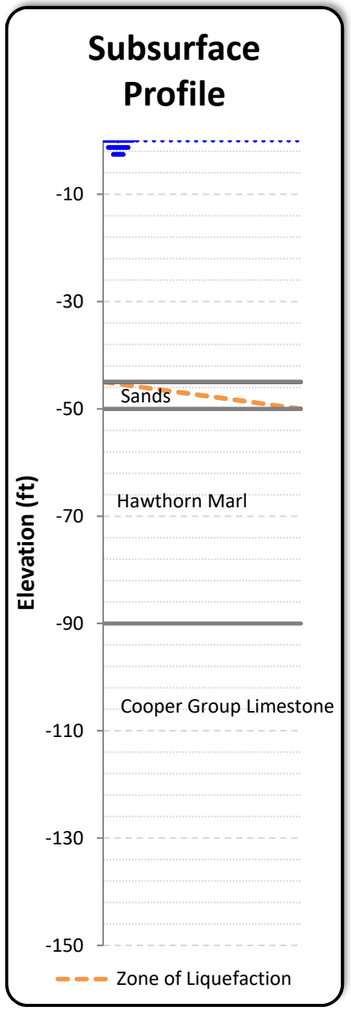
Resistance Factors						
	Strength			Extreme		
Soil Type	Side	Uplift	End	Comp.	Uplift	Service
Sand	0.7	0.6	0.7	1	1	1
Clay	0.7	0.6	0.7			
Rock	0.7	0.6	0.7			

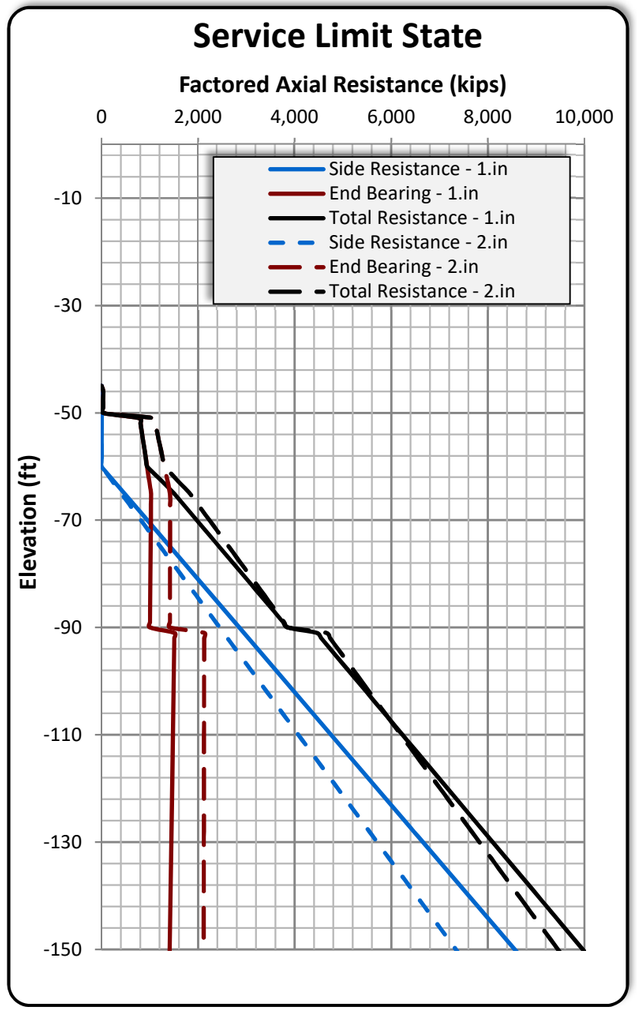
Axial Shaft Capacities - Full Scour Channel (Station 83+00 to 95+00)

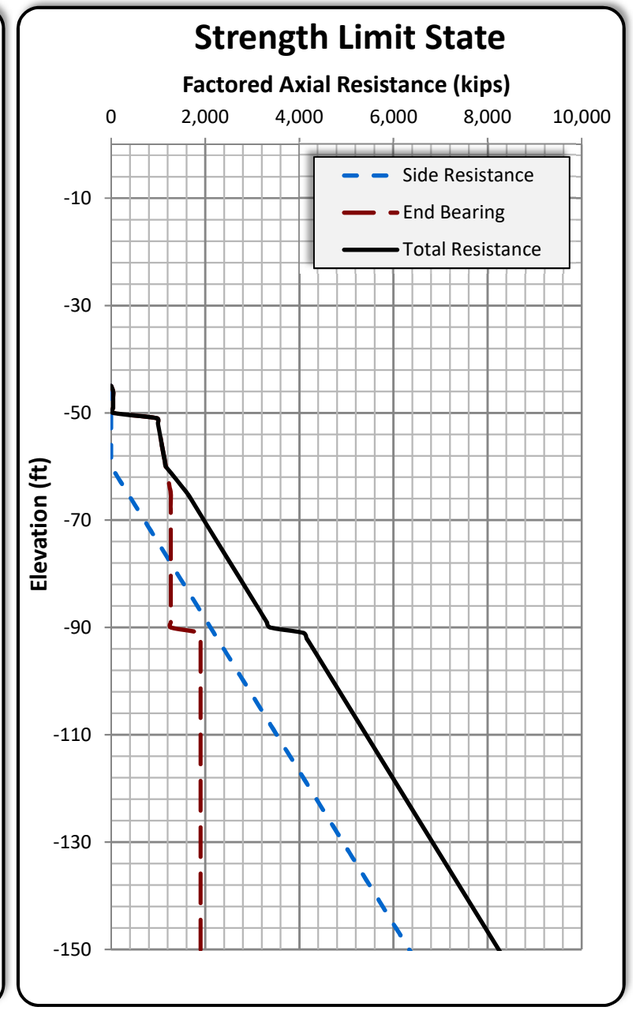
US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

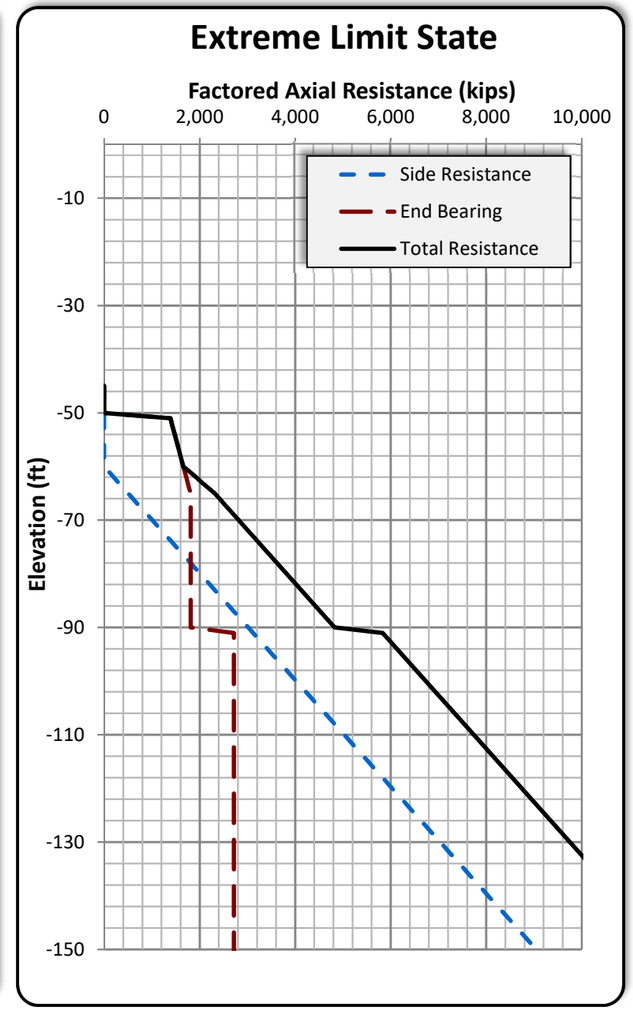
GEOENGINEERS

Figure 16









General Notes

1. Axial shaft resistance was developed in accordance with the 2016 AASHTO LRFD Bridge Design Manual and the 2008 SCDOT Geotechnical Design Manual (GDM).
2. The axial resistance plots assume a top of shaft Elevation of -45 feet and permanent steel casing to a depth of 15 below the ground surface. The geotechnical engineer should re-evaluate axial shaft resistance if permanent steel casing length or top of shaft Elevation changes.
3. The plots are based on a single shaft and do not consider group effects of closely spaced shafts.
4. The service case assumes 1-inch and 2-inch of shaft settlement.
5. The plots include resistance factors shown on the adjacent table for Strength, Extreme, and Service Limit States. Resistance factors for Strength Limit State do not include a 20 percent reduction for non-redundant shafts.
6. Unfactored downdrag load for the Extreme Limit State is estimated to be 0 kips. A load factor of 1.05 is recommended to be applied with post-earthquake loading conditions in accordance with the 2008 SCDOT GDM.

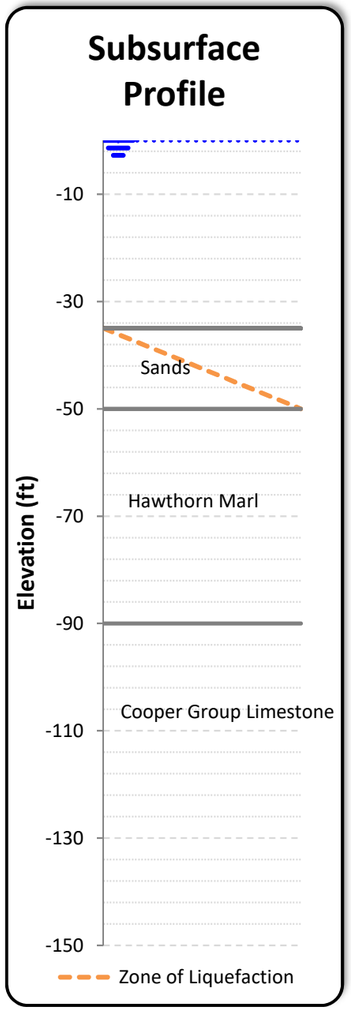
Resistance Factors						
	Strength			Extreme		
Soil Type	Side	Uplift	End	Comp.	Uplift	Service
Sand	0.7	0.6	0.7	1	1	1
Clay	0.7	0.6	0.7			
Rock	0.7	0.6	0.7			

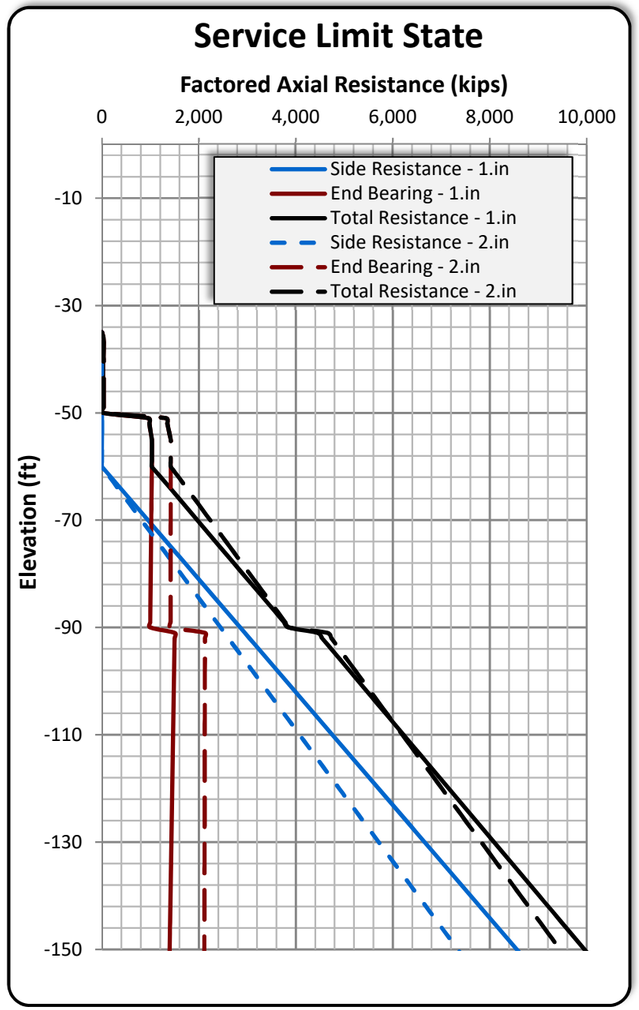
Axial Shaft Capacities - Half Scour Channel (Station 83+00 to 95+00)

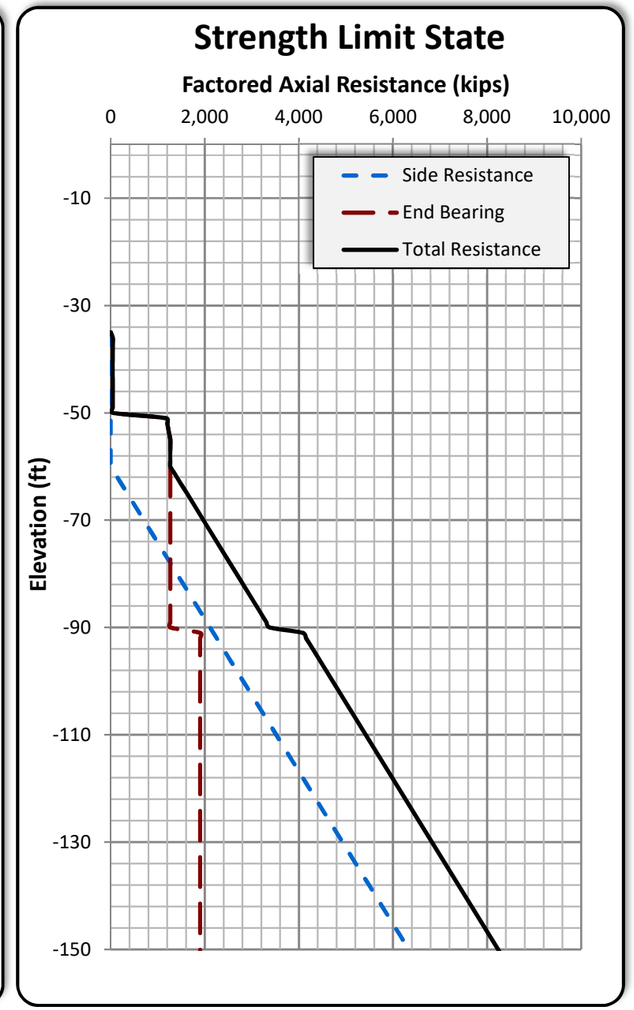
US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

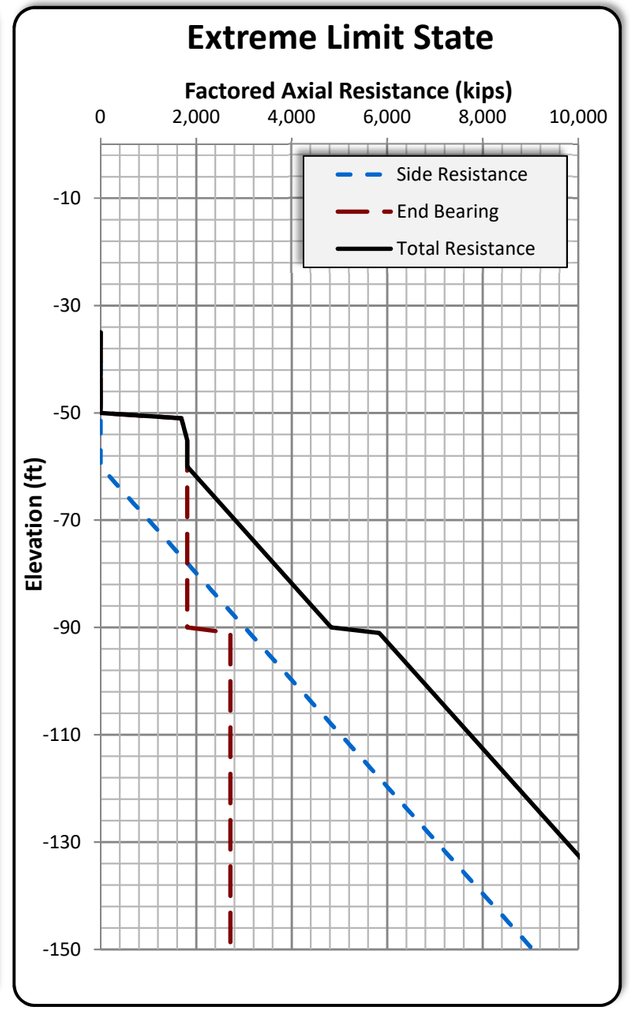
GEOENGINEERS

Figure 17









General Notes

1. Axial shaft resistance was developed in accordance with the 2016 AASHTO LRFD Bridge Design Manual and the 2008 SCDOT Geotechnical Design Manual (GDM).
2. The axial resistance plots assume a top of shaft Elevation of -35 feet and permanent steel casing to a depth of 25 below the ground surface. The geotechnical engineer should re-evaluate axial shaft resistance if permanent steel casing length or top of shaft Elevation changes.
3. The plots are based on a single shaft and do not consider group effects of closely spaced shafts.
4. The service case assumes 1-inch and 2-inch of shaft settlement.
5. The plots include resistance factors shown on the adjacent table for Strength, Extreme, and Service Limit States. Resistance factors for Strength Limit State do not include a 20 percent reduction for non-redundant shafts.
6. Unfactored downdrag load for the Extreme Limit State is estimated to be 0 kips. A load factor of 1.05 is recommended to be applied with post-earthquake loading conditions in accordance with the 2008 SCDOT GDM.

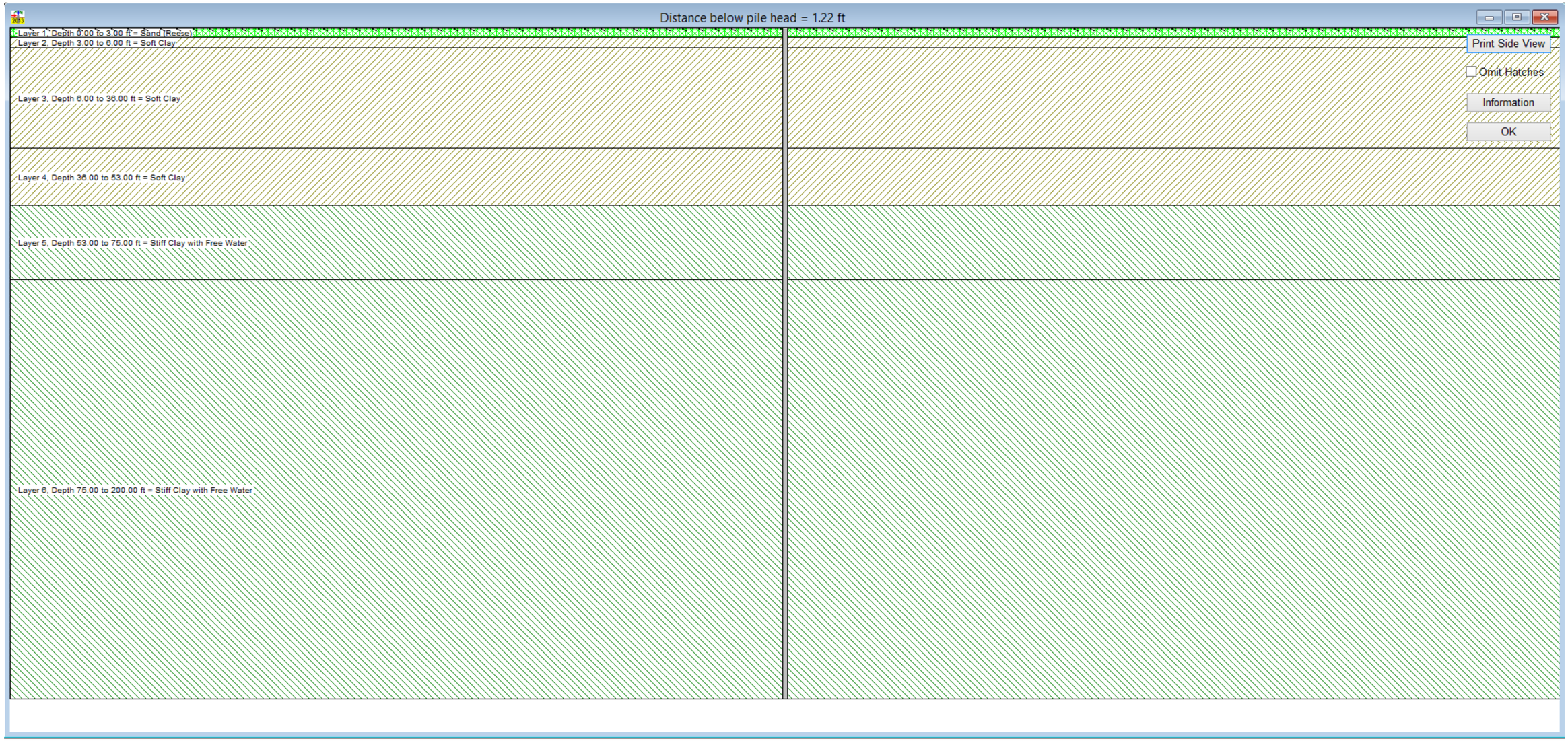
Resistance Factors						
	Strength			Extreme		
Soil Type	Side	Uplift	End	Comp.	Uplift	Service
Sand	0.7	0.6	0.7	1	1	1
Clay	0.7	0.6	0.7			
Rock	0.7	0.6	0.7			

Axial Shaft Capacities - No Scour
Channel (Station 83+00 to 95+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GEOENGINEERS

Figure 18



Layer	Model	Effective Unit Weight	Friction Angle	Cohesion	Residual Strength Ratio	Cohesion Ratio	k	Strain Factor	Pmult	
		(pcf)	(deg)	(psf)	Sr/Sigma'v	Su/Sigma'v	(lbs/in^3)	E50	(Longitudinal)	(Transverse)
1	Sand (Reese)	100	30				25		1	0.85
2	Soft Clay (Matlock)	37.6			0.08			0.02	0.1	0.085
3	Soft Clay (Matlock)	32.6				0.36		0.02	1	0.85
4	Soft Clay (Matlock)	37.6			0.08			0.02	0.1	0.085
5	Stiff Clay with Free Water (Reese)	57.6		3400			400	0.005	1	0.85
6	Stiff Clay with Free Water (Reese)	57.6		6000			800	0.005	1	0.85

Notes: Fixed Head Conditions, Pile Top Elevation = 3 ft, Ground Surface Elevation = 3 ft

Lateral Analysis – Earthquake (No Scour)
West Abutment (Station 70+40)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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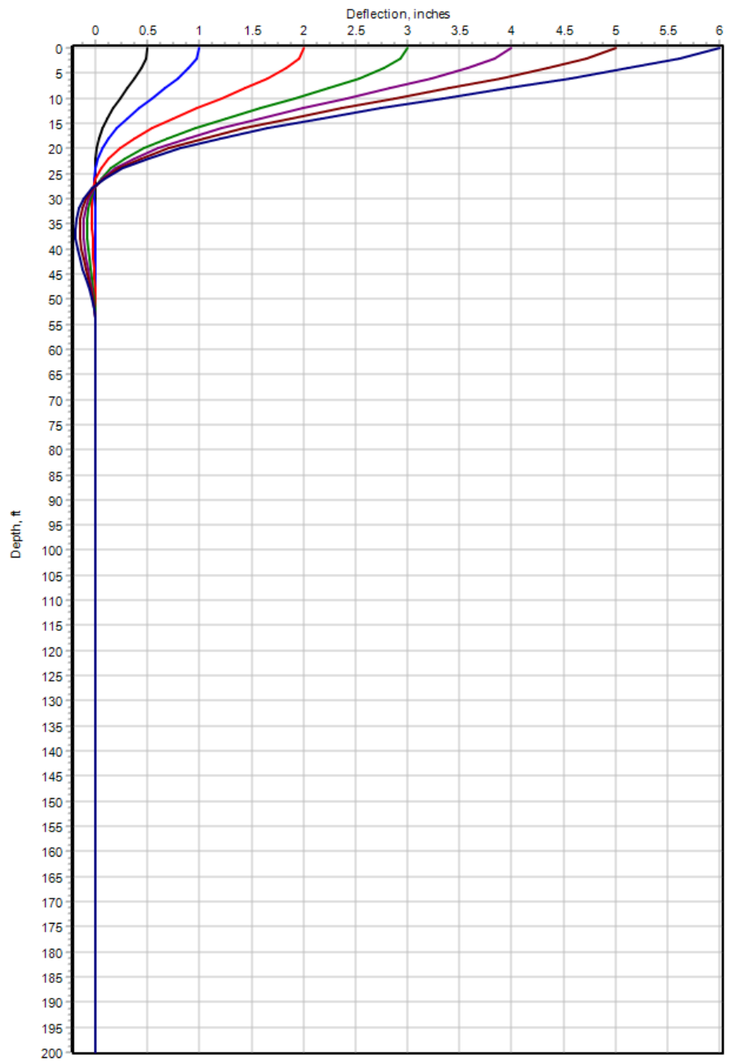
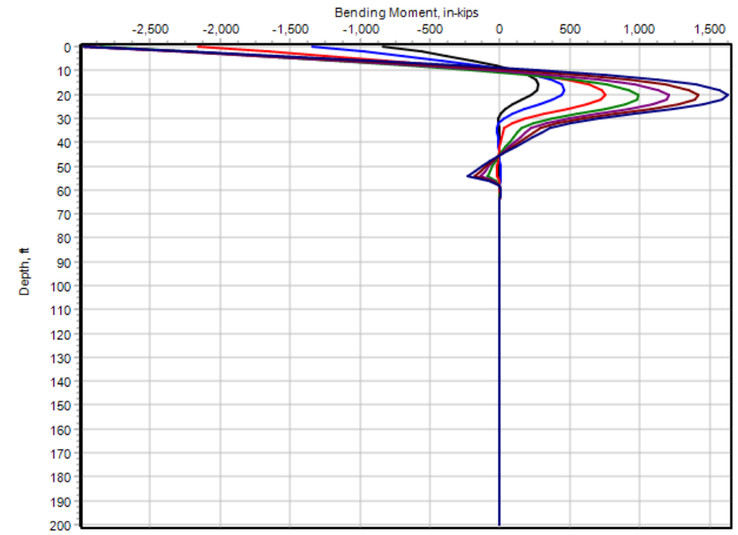
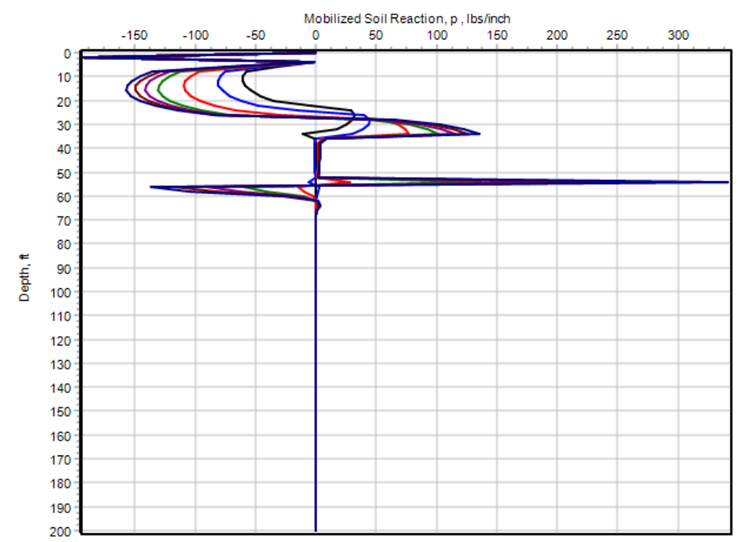
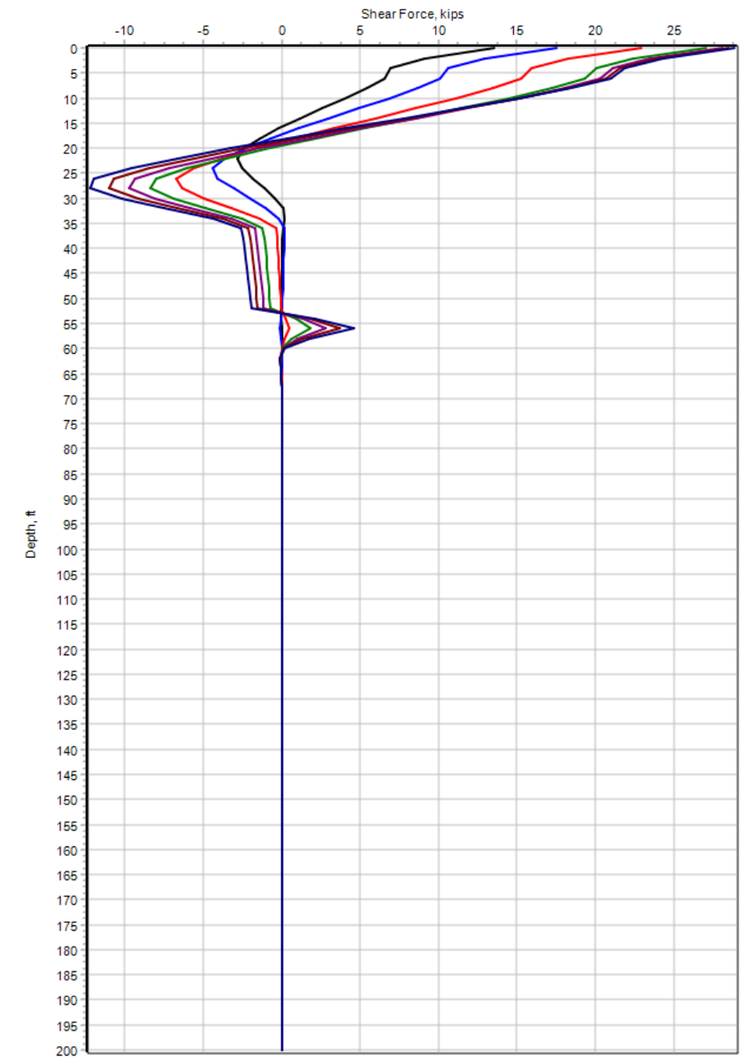
Figure 19

18461-007-01 Date Exported: 09/28/17





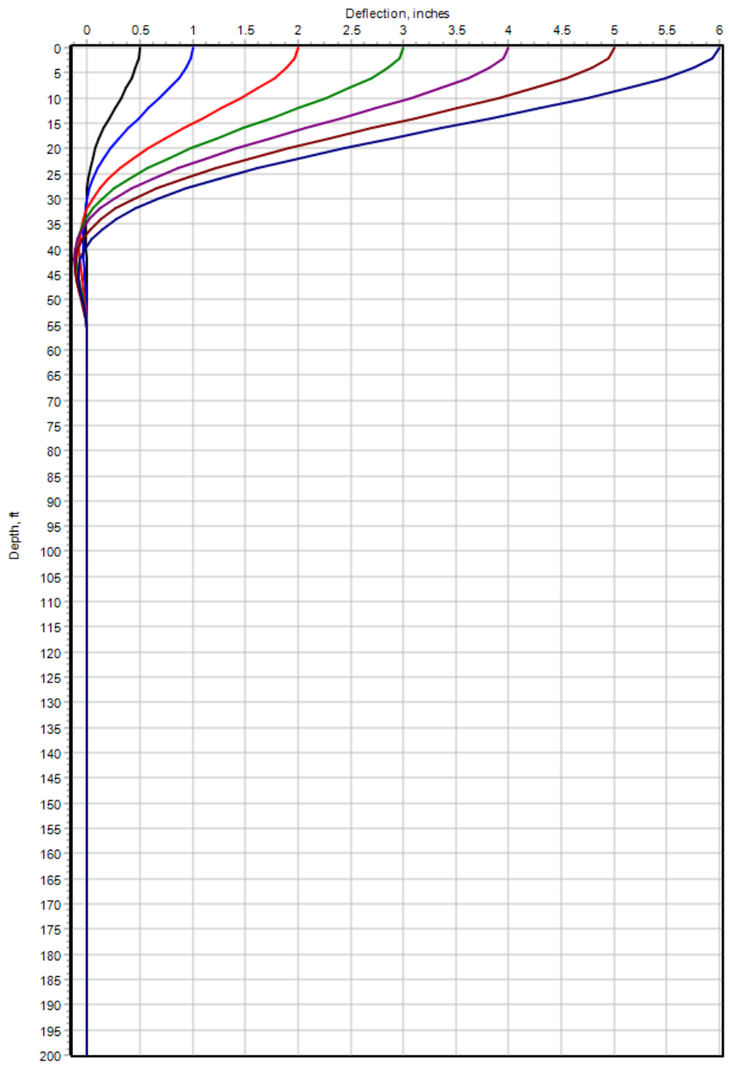


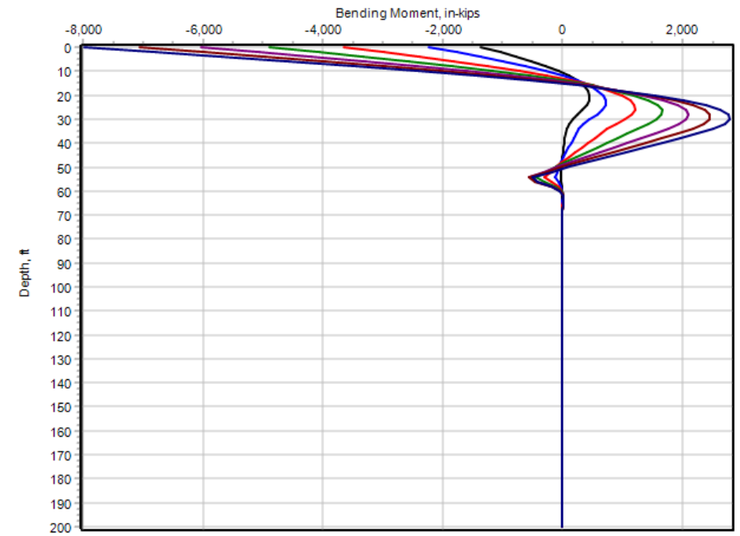


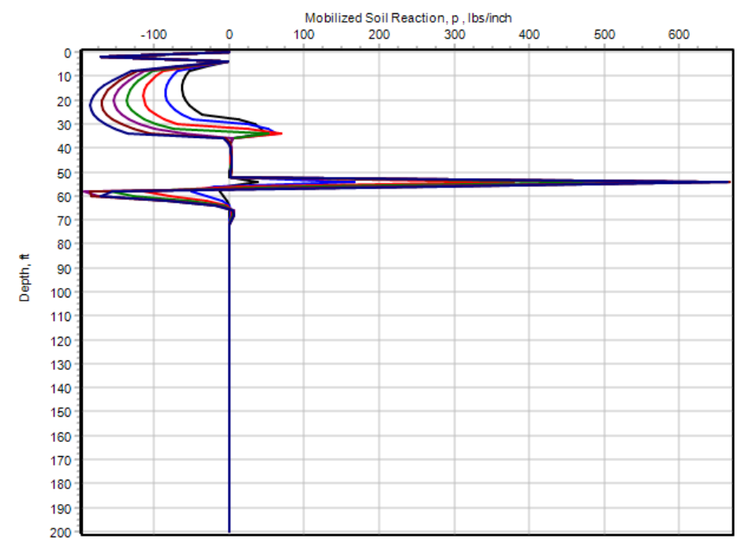
Longitudinal – HP 14x117 (Weak Axis)

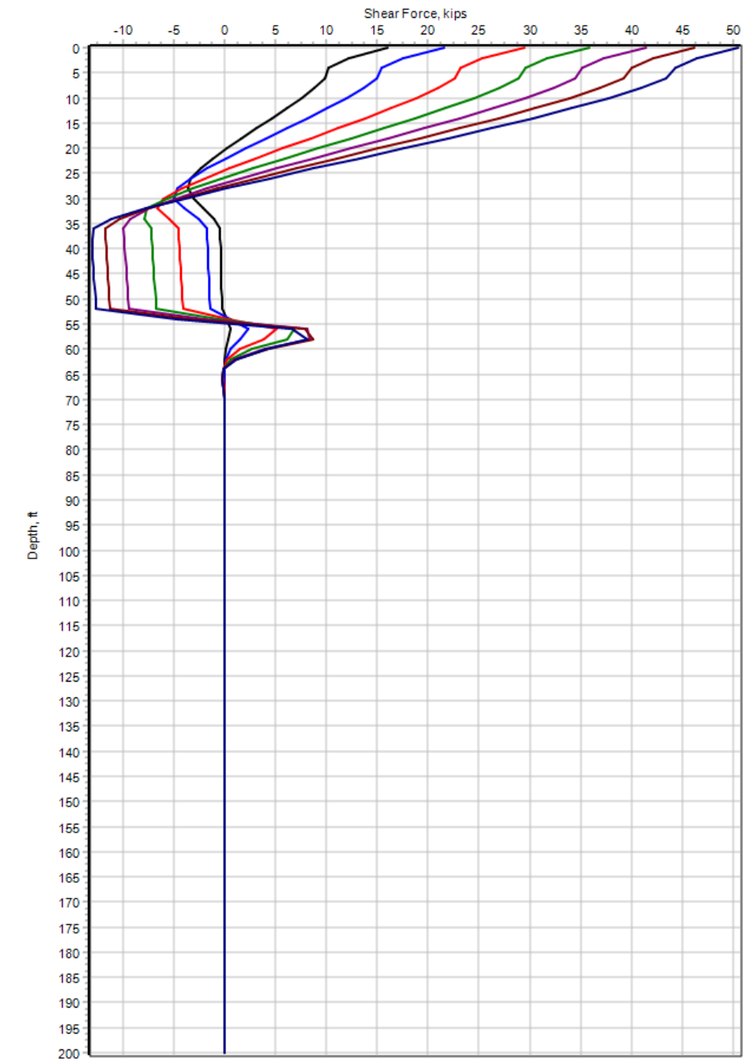
Lateral Analysis – Earthquake (No Scour) **West Abutment (Station 70+40)**
US 21 Over Harbor River Bridge Replacement Beaufort County, South Carolina
GEOENGINEERS — **Figure 20**

18461-007-01 Date Exported: 09/28/17





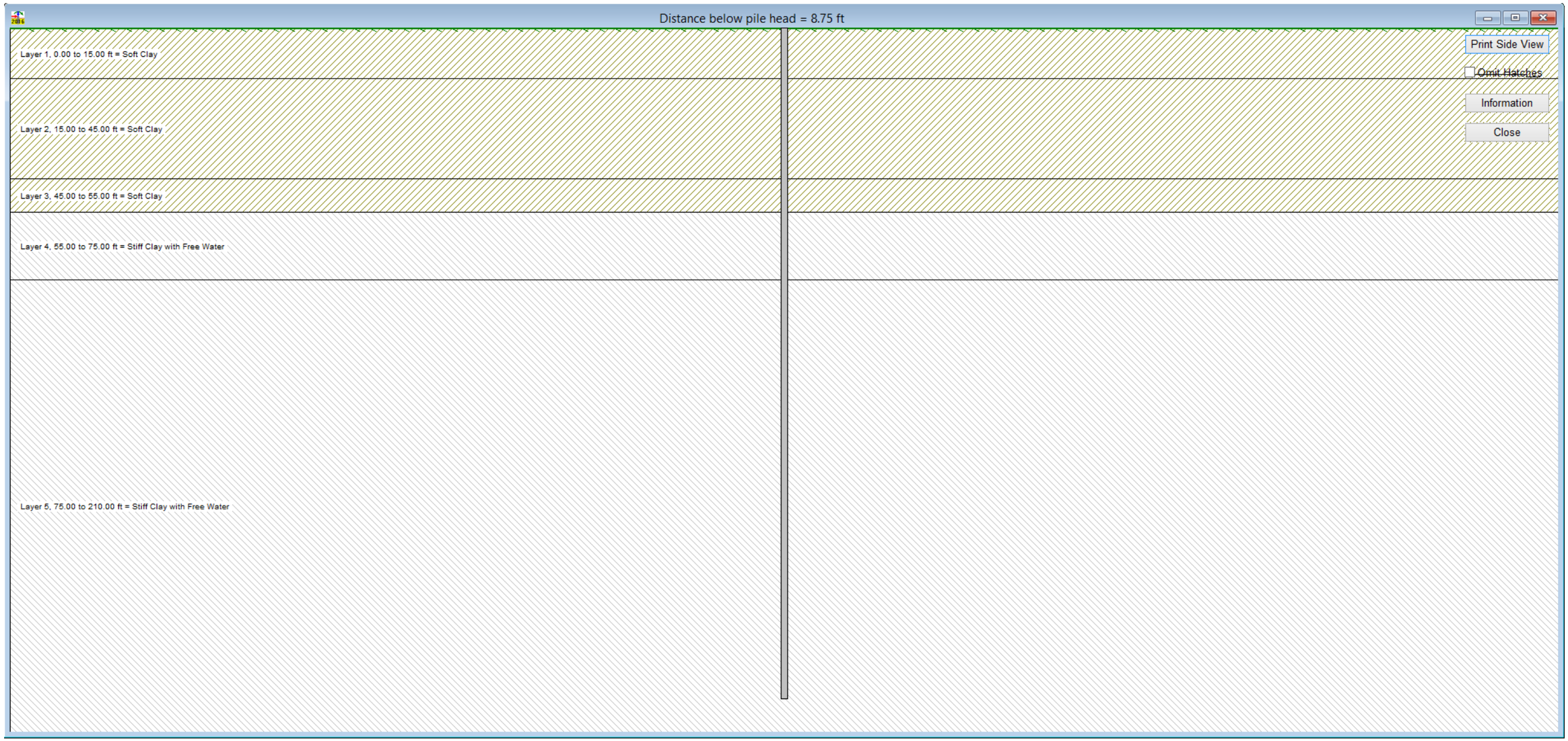




Transverse – HP 14x117 (Strong Axis)

Lateral Analysis – Earthquake (No Scour) **West Abutment (Station 70+40)**
US 21 Over Harbor River Bridge Replacement Beaufort County, South Carolina
GeoEngineers — **Figure 21**

18461-007-01 Date Exported: 09/28/17



Layer	Model	Effective Unit Weight	Friction Angle	Cohesion	Residual Strength Ratio	Cohesion Ratio	k	Strain Factor	Pmult	
		(pcf)	(deg)	(psf)	Sr/Sigma'v	Su/Sigma'v	(lbs/in^3)	E50	(Longitudinal)	(Transverse)
1	Soft Clay (Matlock)	37.6			0.06			0.02	0.085	0.085
2	Soft Clay (Matlock)	32.6				0.26		0.02	0.85	0.85
3	Soft Clay (Matlock)	37.6			0.09			0.02	0.085	0.085
4	Stiff Clay with Free Water (Reese)	57.6		3400			400	0.005	0.85	0.85
5	Stiff Clay with Free Water (Reese)	57.6		6000			800	0.005	0.85	0.85

Lateral Analysis – Earthquake (No Scour)
West Overbank (Station 78+24)

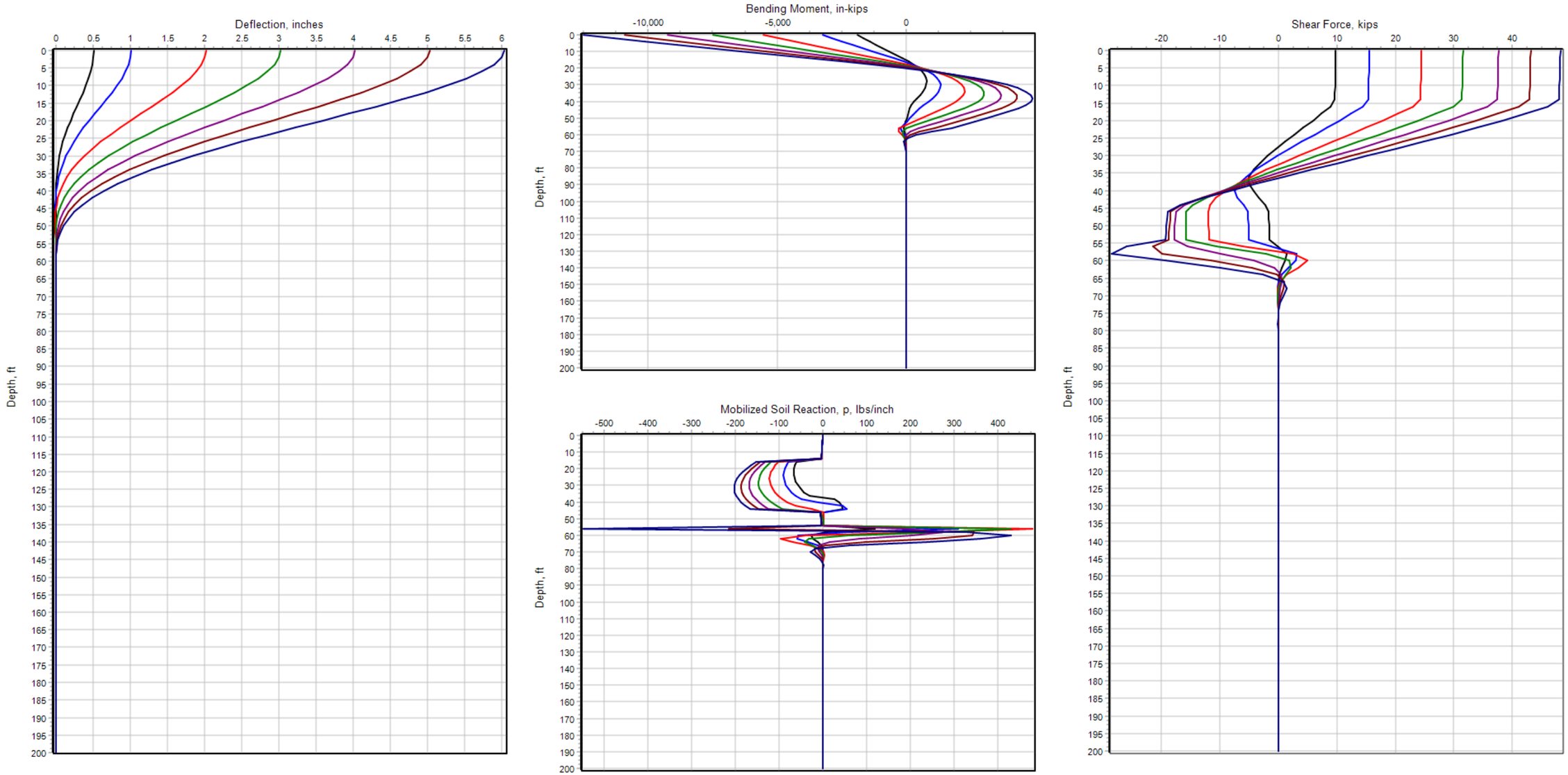
US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GEOENGINEERS

Figure 22

Notes: Fixed Head Conditions, Pile Top Elevation = 0 ft, Ground Surface Elevation = 0 ft

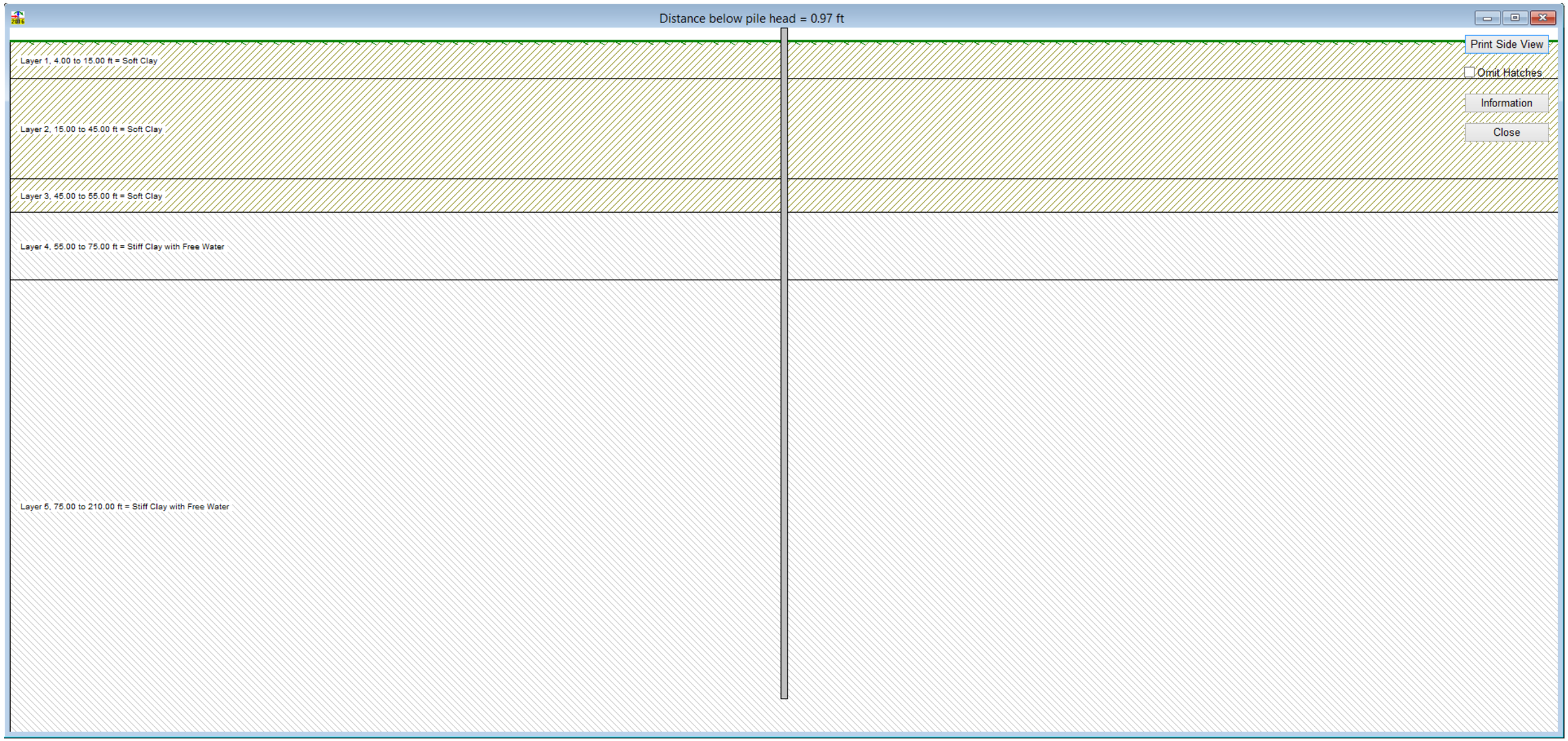
18461-007-01 Date Exported: 09/28/17



Longitudinal and Transverse – 24" Square Concrete

Lateral Analysis – Earthquake (No Scour) **West Overbank (Station 78+24)**
US 21 Over Harbor River Bridge Replacement Beaufort County, South Carolina
GEOENGINEERS — **Figure 23**

18461-007-01 Date Exported: 09/28/17



Layer	Model	Effective Unit Weight	Friction Angle	Cohesion	Residual Strength Ratio	Cohesion Ratio	k	Strain Factor	Pmult	
		(pcf)	(deg)	(psf)	Sr/Sigma'v	Su/Sigma'v	(lbs/in^3)	E50	(Longitudinal)	(Transverse)
1	Soft Clay (Matlock)	37.6			0.06			0.02	0.085	0.085
2	Soft Clay (Matlock)	32.6				0.26		0.02	0.85	0.85
3	Soft Clay (Matlock)	37.6			0.09			0.02	0.085	0.085
4	Stiff Clay with Free Water (Reese)	57.6		3400			400	0.005	0.85	0.85
5	Stiff Clay with Free Water (Reese)	57.6		6000			800	0.005	0.85	0.85

Notes: Fixed Head Conditions, Pile Top Elevation = 0 ft, Ground Surface Elevation = -4 ft

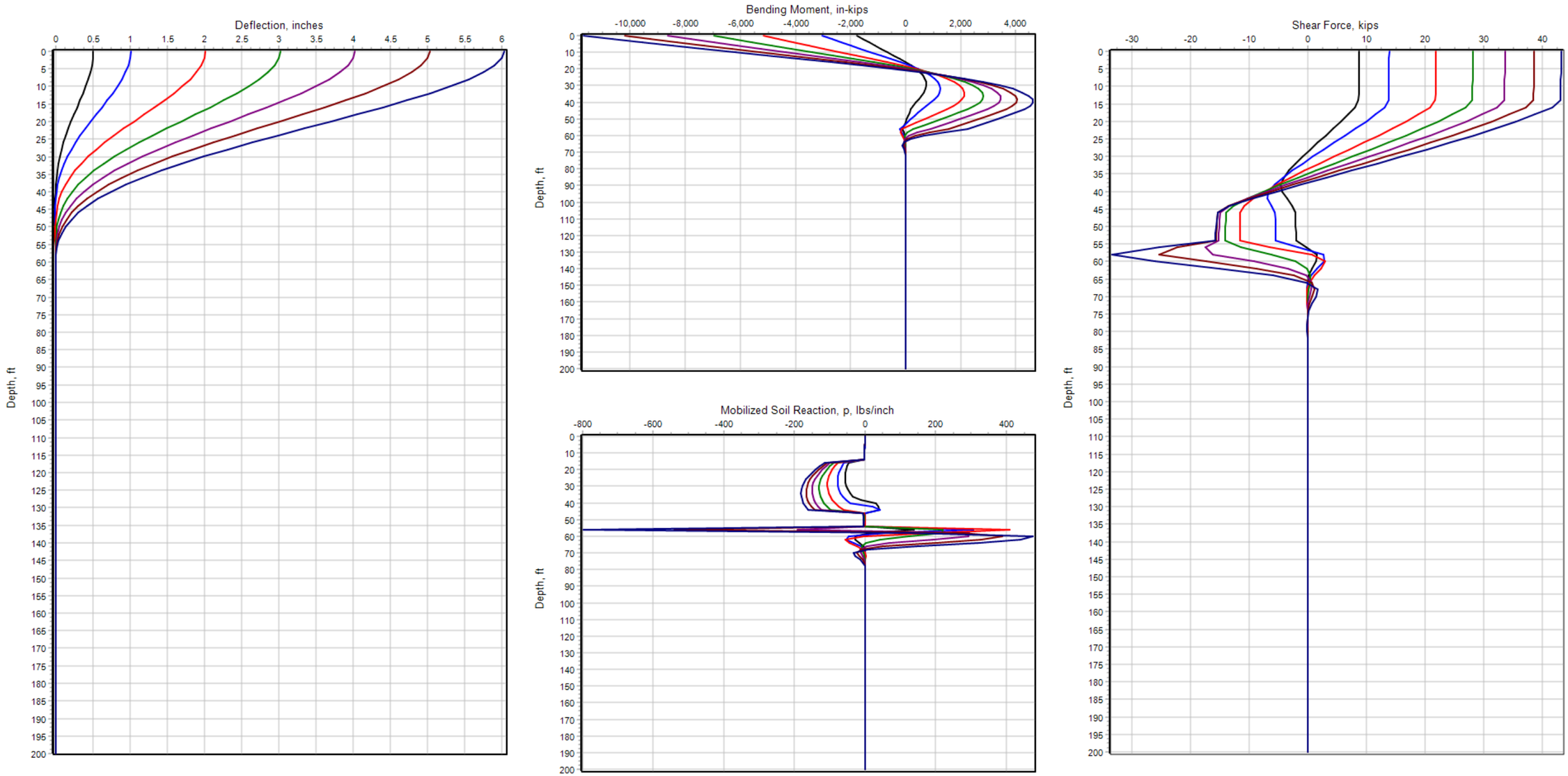
Lateral Analysis – Earthquake (Half Scour)
West Overbank (Station 78+24)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GEOENGINEERS

Figure 24

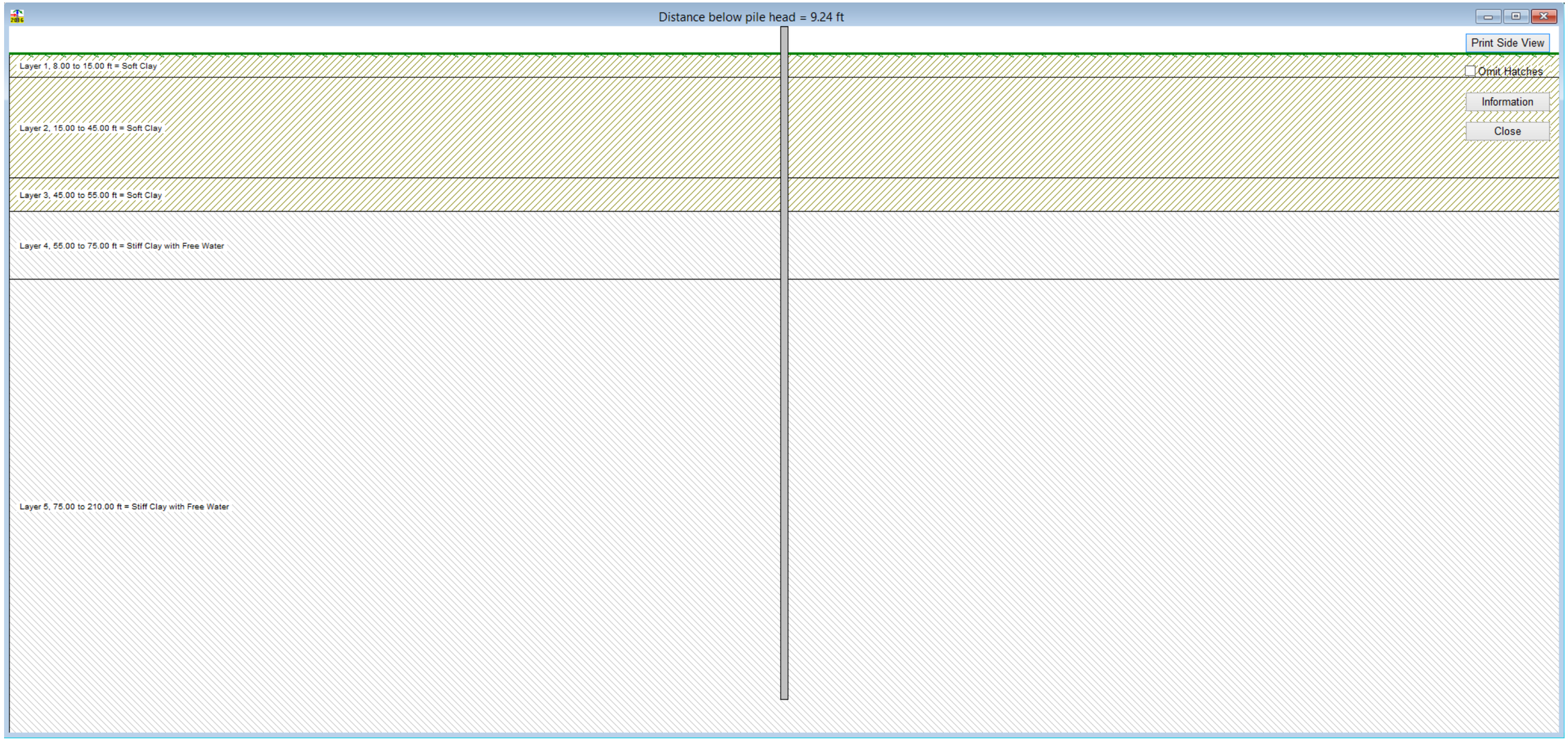
18461-007-01 Date Exported: 09/28/17



Longitudinal and Transverse – 24" Square Concrete

Lateral Analysis – Earthquake (Half Scour) **West Overbank (Station 78+24)**
US 21 Over Harbor River Bridge Replacement Beaufort County, South Carolina
GEOENGINEERS — **Figure 25**

18461-007-01 Date Exported: 09/28/17



Layer	Model	Effective Unit Weight	Friction Angle	Cohesion	Residual Strength Ratio	Cohesion Ratio	k	Strain Factor	Pmult	
		(pcf)	(deg)	(psf)	Sr/Sigma'v	Su/Sigma'v	(lbs/in^3)	E50	(Longitudinal)	(Transverse)
1	Soft Clay (Matlock)	37.6			0.06			0.02	0.085	0.085
2	Soft Clay (Matlock)	32.6				0.26		0.02	0.85	0.85
3	Soft Clay (Matlock)	37.6			0.09			0.02	0.085	0.085
4	Stiff Clay with Free Water (Reese)	57.6		3400			400	0.005	0.85	0.85
5	Stiff Clay with Free Water (Reese)	57.6		6000			800	0.005	0.85	0.85

Lateral Analysis – Earthquake (Full Scour)
West Overbank (Station 78+24)

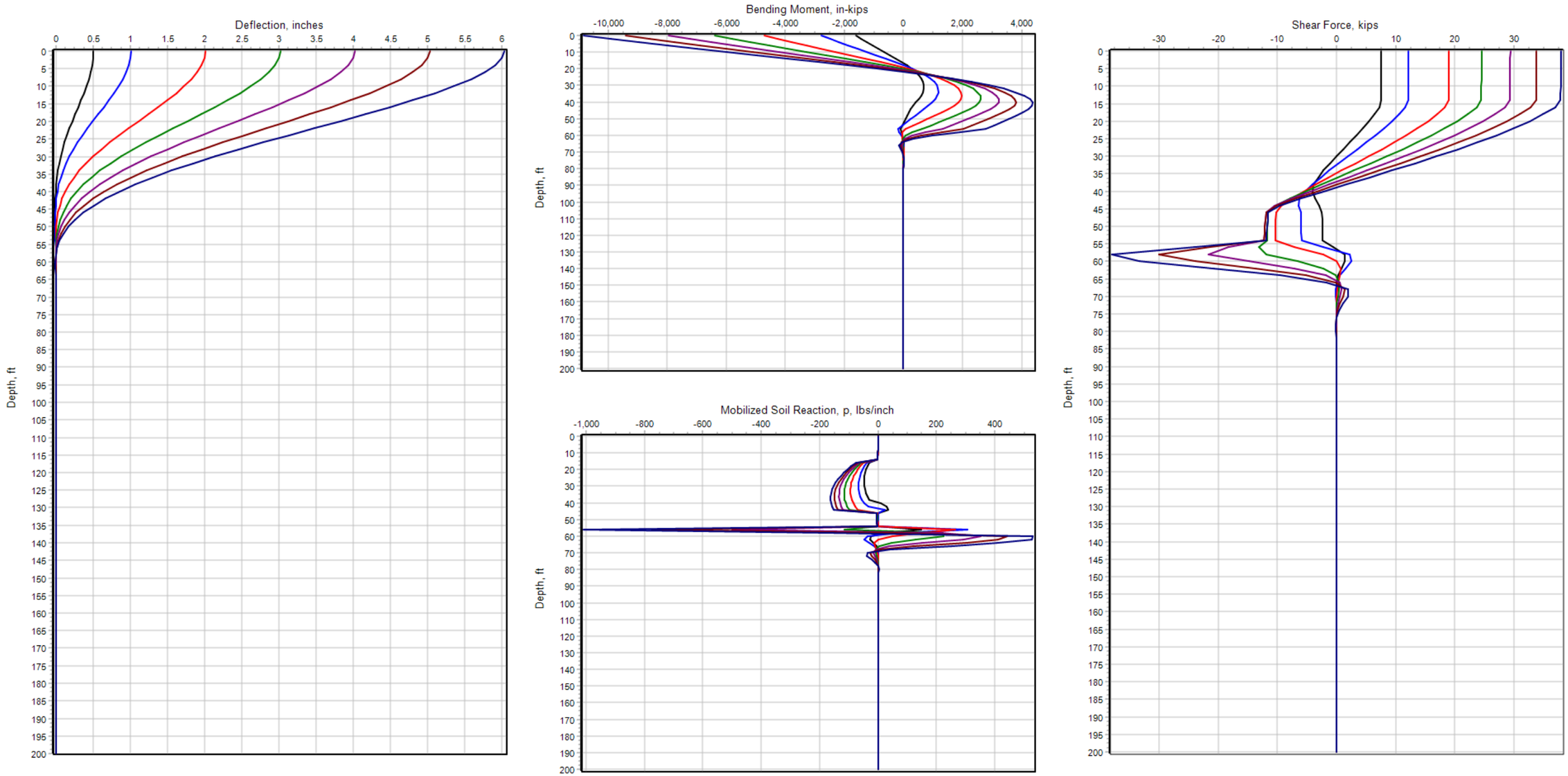
US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GEOENGINEERS

Figure 26

Notes: Fixed Head Conditions, Pile Top Elevation = 0 ft, Ground Surface Elevation = -8 ft

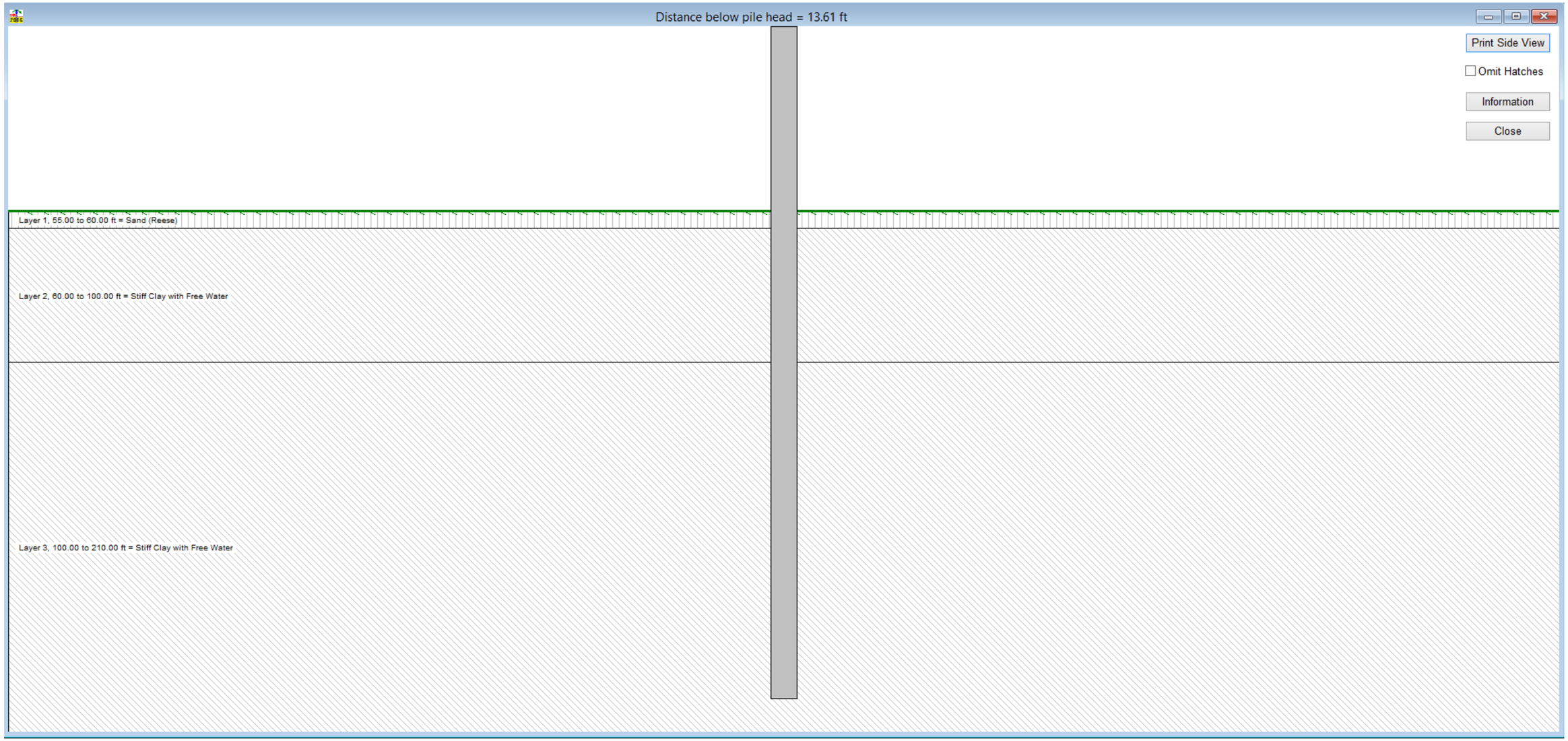
18461-007-01 Date Exported: 09/28/17



Longitudinal and Transverse – 24" Square Concrete

Lateral Analysis – Earthquake (Full Scour) **West Overbank (Station 78+24)**
US 21 Over Harbor River Bridge Replacement Beaufort County, South Carolina
GEOENGINEERS — **Figure 27**

18461-007-01 Date Exported: 09/28/17



Layer	Model	Effective Unit Weight	Friction Angle	Cohesion	Residual Strength Ratio	Cohesion Ratio	k	Strain Factor	Pmult	
		(pcf)	(deg)	(psf)	Sr/Sigma'v	Su/Sigma'v	(lbs/in^3)	E50	(Longitudinal)	(Transverse)
1	Sand (Reese)	37.6	30				20		0.8	0.45
2	Stiff Clay with Free Water (Reese)	57.6		4000			1000	0.005	0.8	0.45
3	Stiff Clay with Free Water (Reese)	57.6		6000			2000	0.005	0.8	0.45

Notes: Fixed Head Conditions, Pile Top Elevation = 10 ft, Ground Surface Elevation = -45 ft

Lateral Analysis – Ship Impact (Half Scour)
Channel (Station 87+88)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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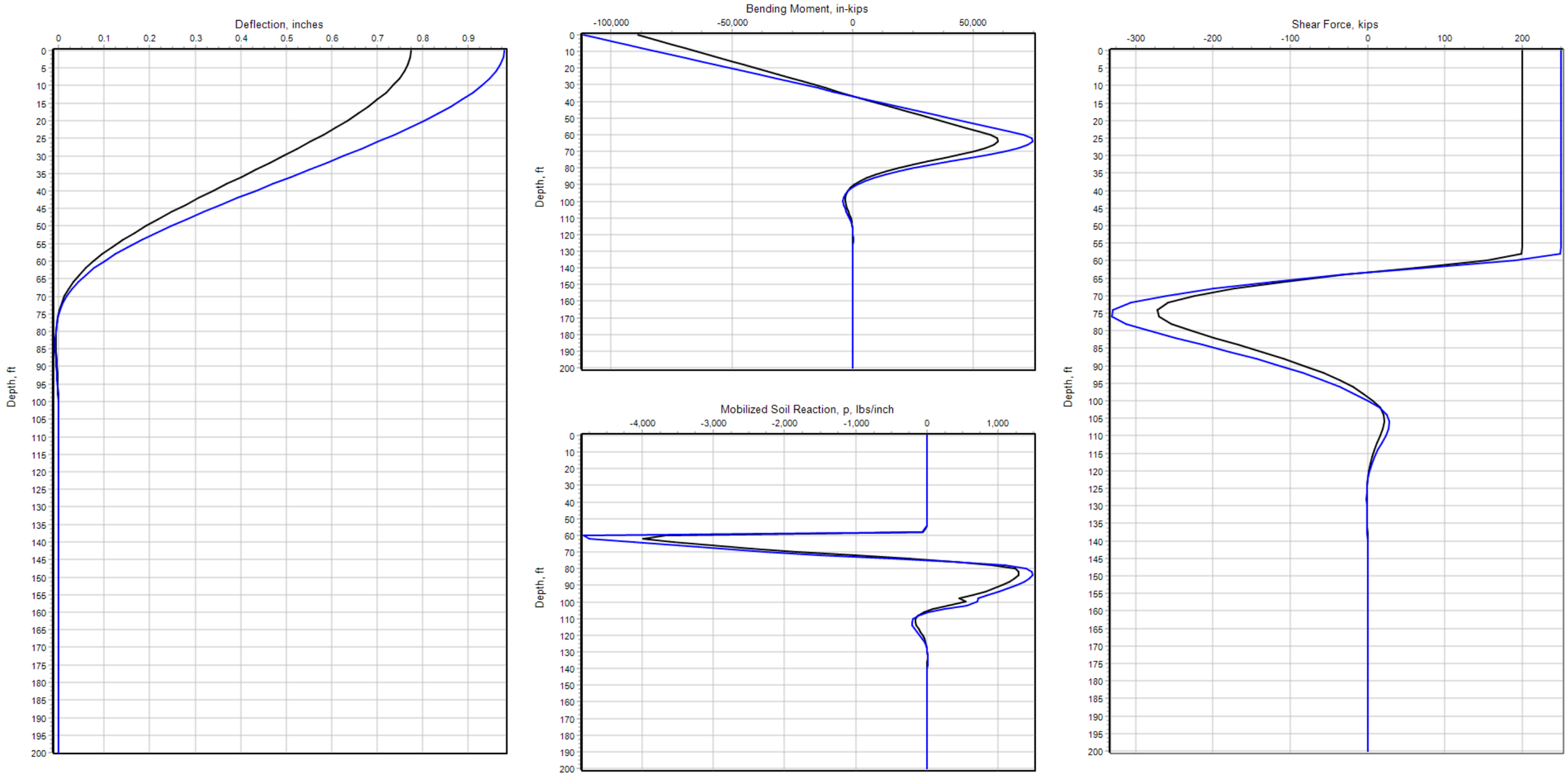
Figure 28

18461-007-01 Date Exported: 09/28/17



Longitudinal – 8' Diameter Shaft
200 and 250 kips Ship Impact Loading

Lateral Analysis – Ship Impact (Half Scour)
Channel (Station 87+88)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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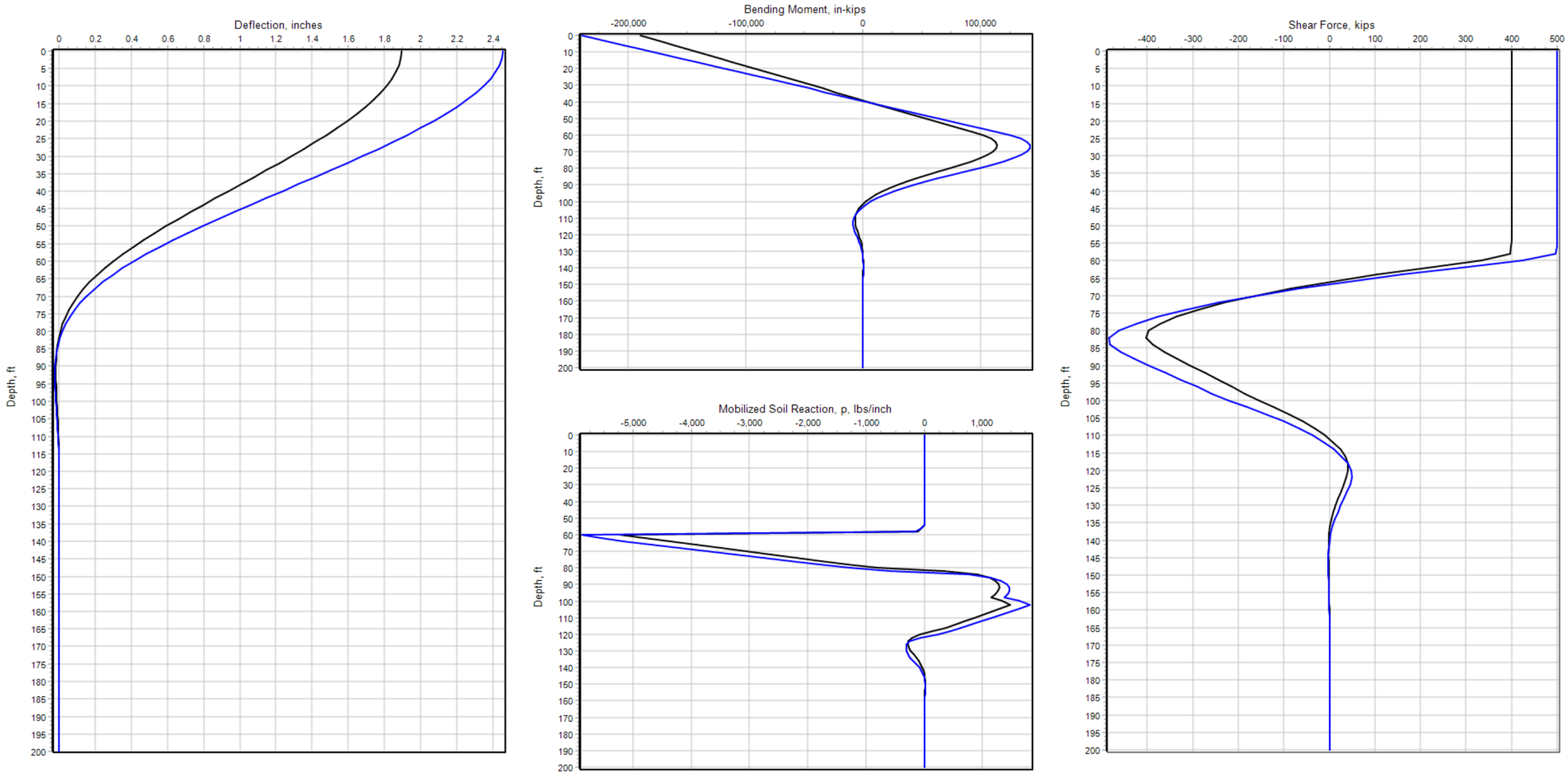
Figure 29

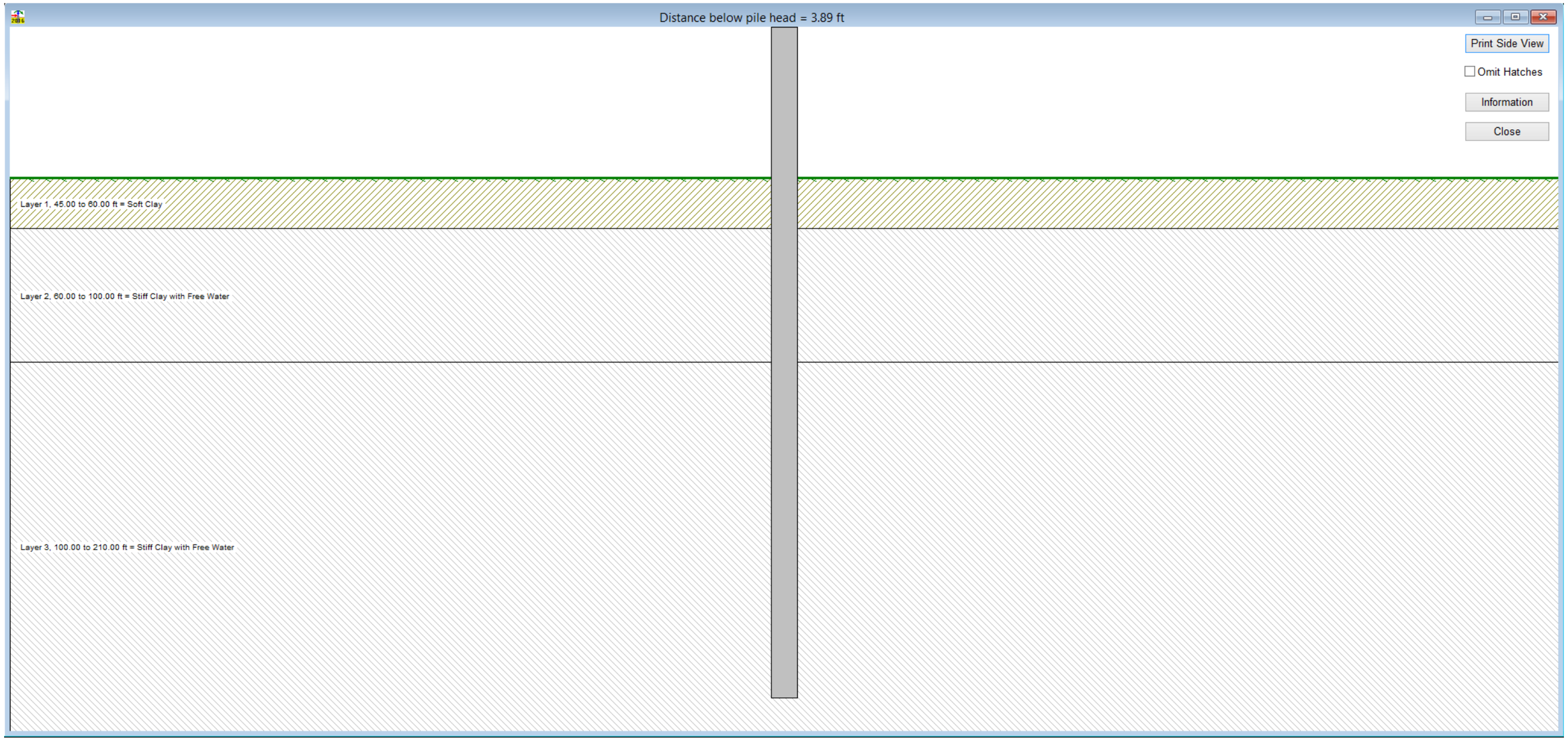
18461-007-01 Date Exported: 09/28/17



Transverse – 8' Diameter Shaft
400 and 500 kips Ship Impact Loading

Lateral Analysis – Ship Impact (Half Scour) Channel (Station 87+88)
US 21 Over Harbor River Bridge Replacement Beaufort County, South Carolina
GEOENGINEERS — **Figure 30**

18461-007-01 Date Exported: 09/28/17



Layer	Model	Effective Unit Weight	Friction Angle	Cohesion	Residual Strength Ratio	Cohesion Ratio	k	Strain Factor	Pmult	
		(pcf)	(deg)	(psf)	Sr/Sigma'v	Su/Sigma'v	(lbs/in^3)	E50	(Longitudinal)	(Transverse)
1	Soft Clay (Matlock)	37.6			0.08			0.02	0.08	0.045
2	Stiff Clay with Free Water (Reese)	57.6		3400			400	0.005	0.8	0.45
3	Stiff Clay with Free Water (Reese)	57.6		6000			800	0.005	0.8	0.45

Lateral Analysis –Earthquake (No Scour)
Channel (Station 87+88)

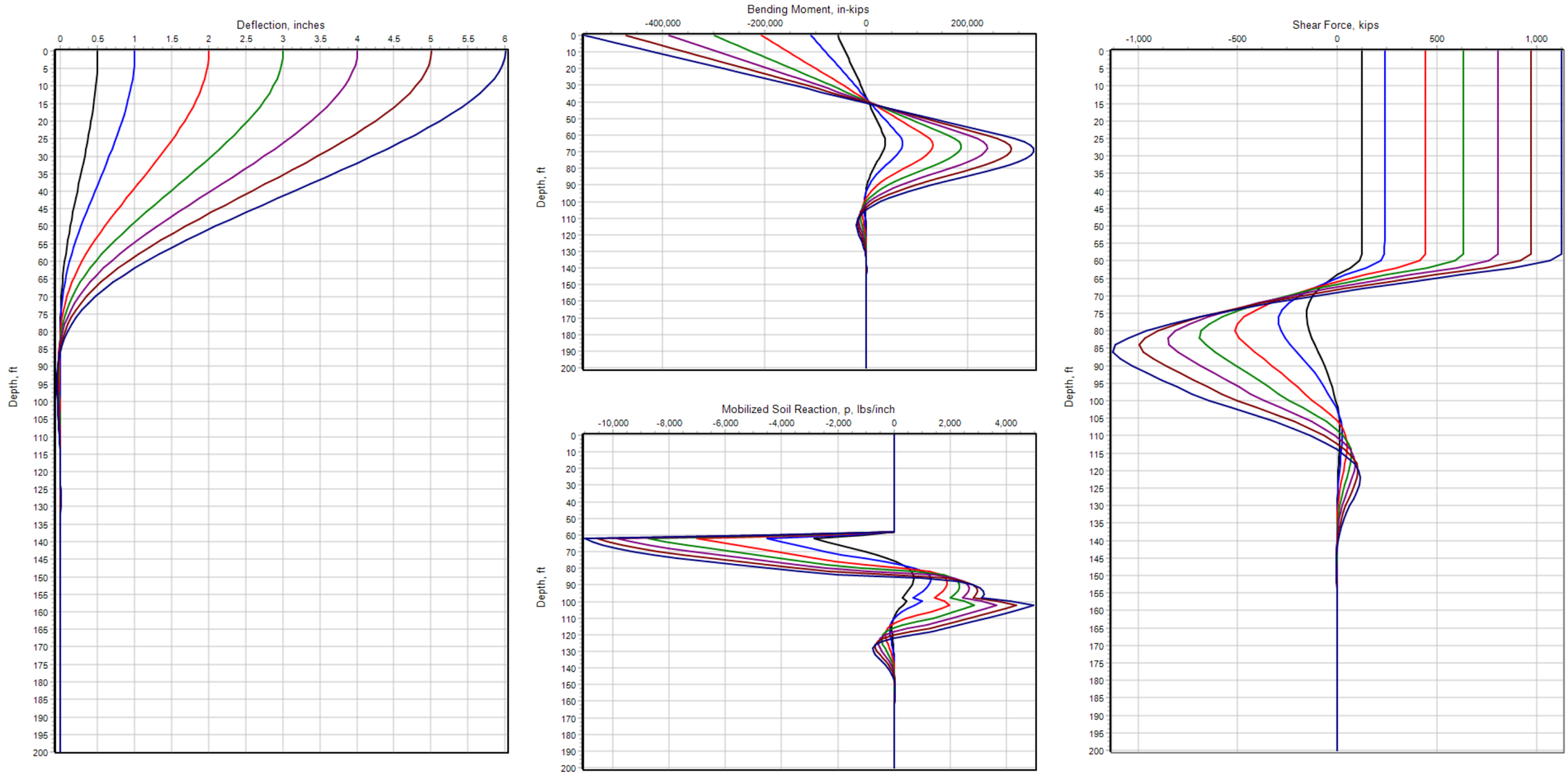
US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GEOENGINEERS

Figure 31

Notes: Fixed Head Conditions, Pile Top Elevation = 10 ft, Ground Surface Elevation = -35 ft

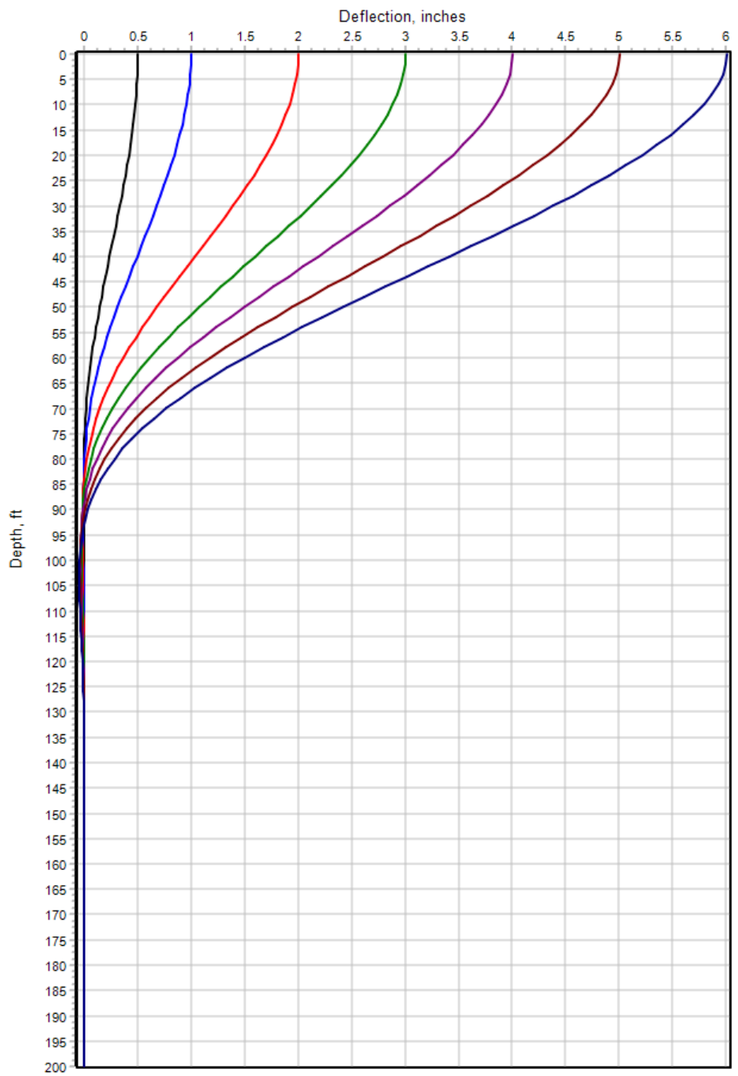
18461-007-01 Date Exported: 09/28/17

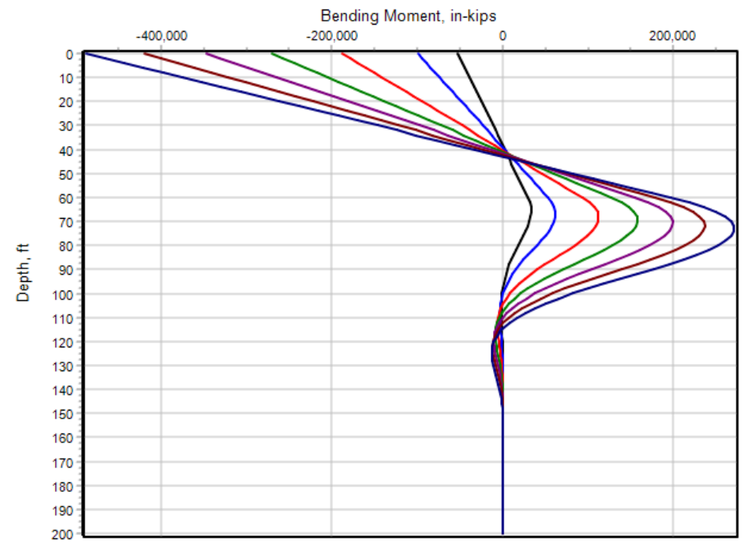


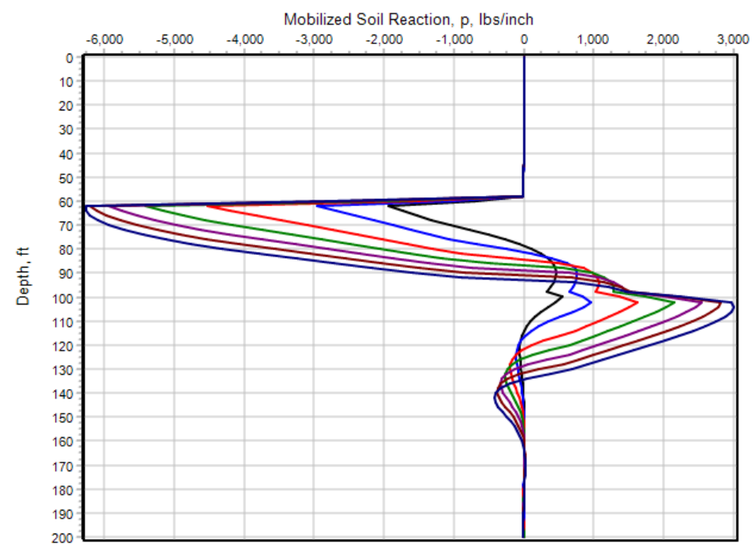
Longitudinal – 8' Diameter Shaft

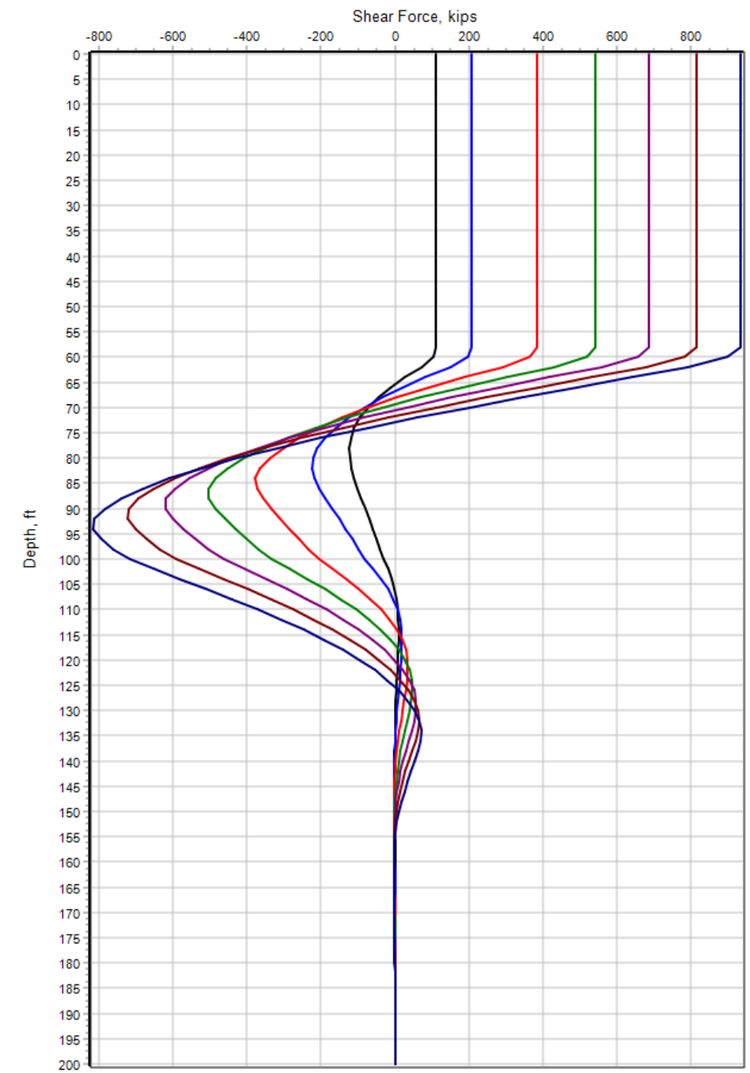
Lateral Analysis –Earthquake (No Scour) **Channel (Station 87+88)**
US 21 Over Harbor River Bridge Replacement Beaufort County, South Carolina
GEOENGINEERS **Figure 32**

18461-007-01 Date Exported: 09/28/17





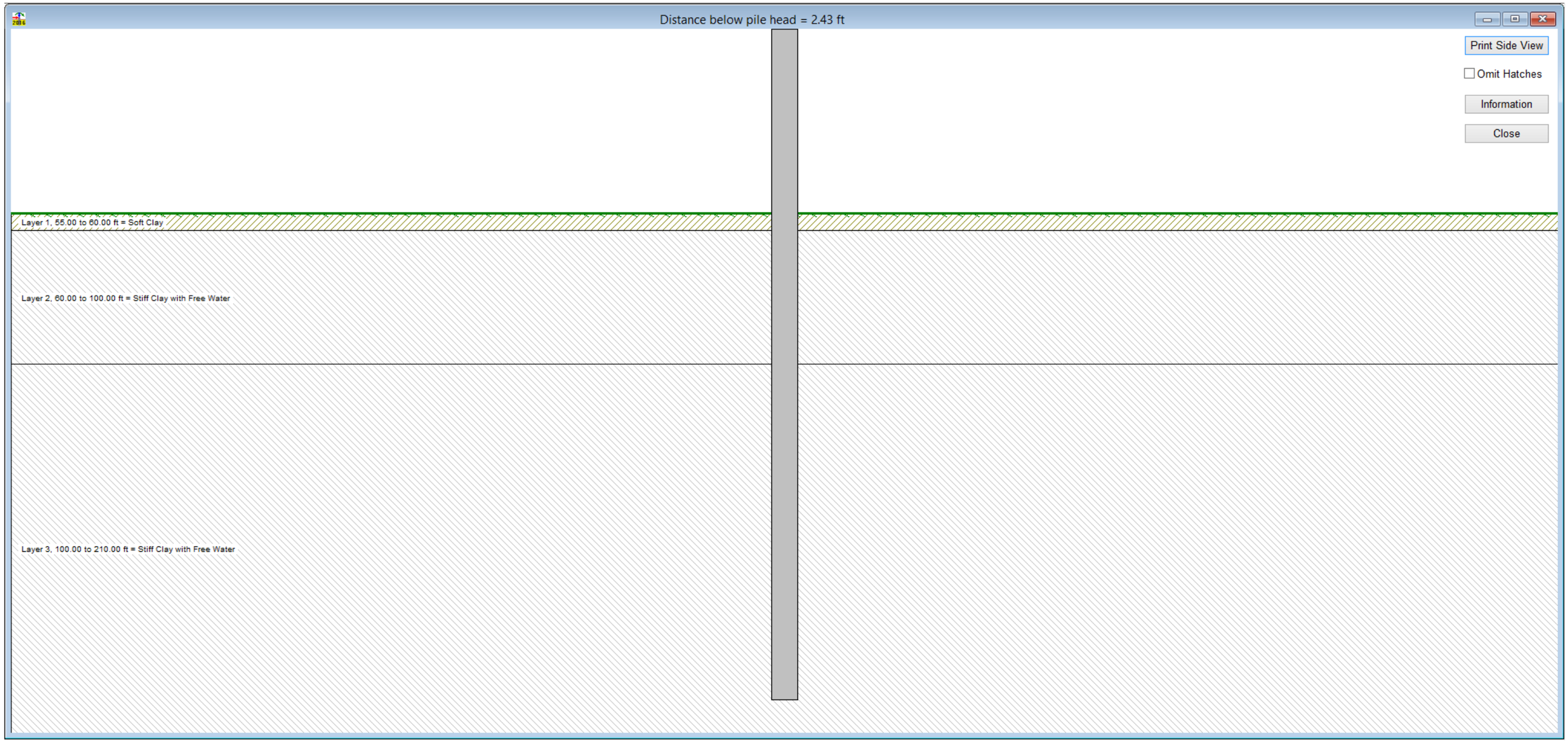




Transverse – 8' Diameter Shaft

Lateral Analysis –Earthquake (No Scour) **Channel (Station 87+88)**
US 21 Over Harbor River Bridge Replacement Beaufort County, South Carolina
GEOENGINEERS — **Figure 33**

18461-007-01 Date Exported: 09/28/17



Layer	Model	Effective Unit Weight	Friction Angle	Cohesion	Residual Strength Ratio	Cohesion Ratio	k	Strain Factor	Pmult	
		(pcf)	(deg)	(psf)	Sr/Sigma'v	Su/Sigma'v	(lbs/in^3)	E50	(Longitudinal)	(Transverse)
1	Soft Clay (Matlock)	37.6			0.08			0.02	0.08	0.045
2	Stiff Clay with Free Water (Reese)	57.6		3400			400	0.005	0.8	0.45
3	Stiff Clay with Free Water (Reese)	57.6		6000			800	0.005	0.8	0.45

Notes: Fixed Head Conditions, Pile Top Elevation = 10 ft, Ground Surface Elevation = -45 ft

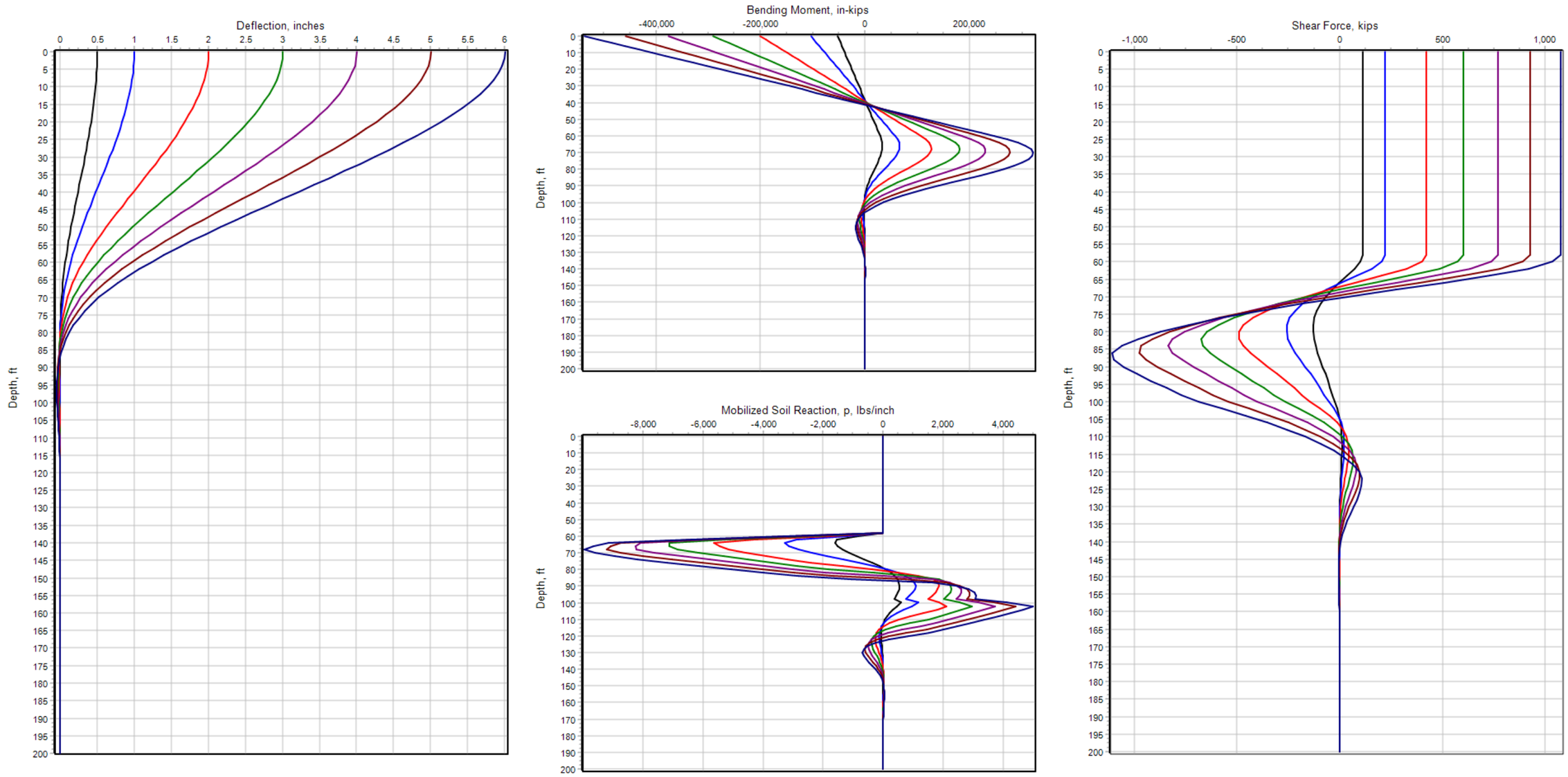
Lateral Analysis –Earthquake (Half Scour)
Channel (Station 87+88)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure 34

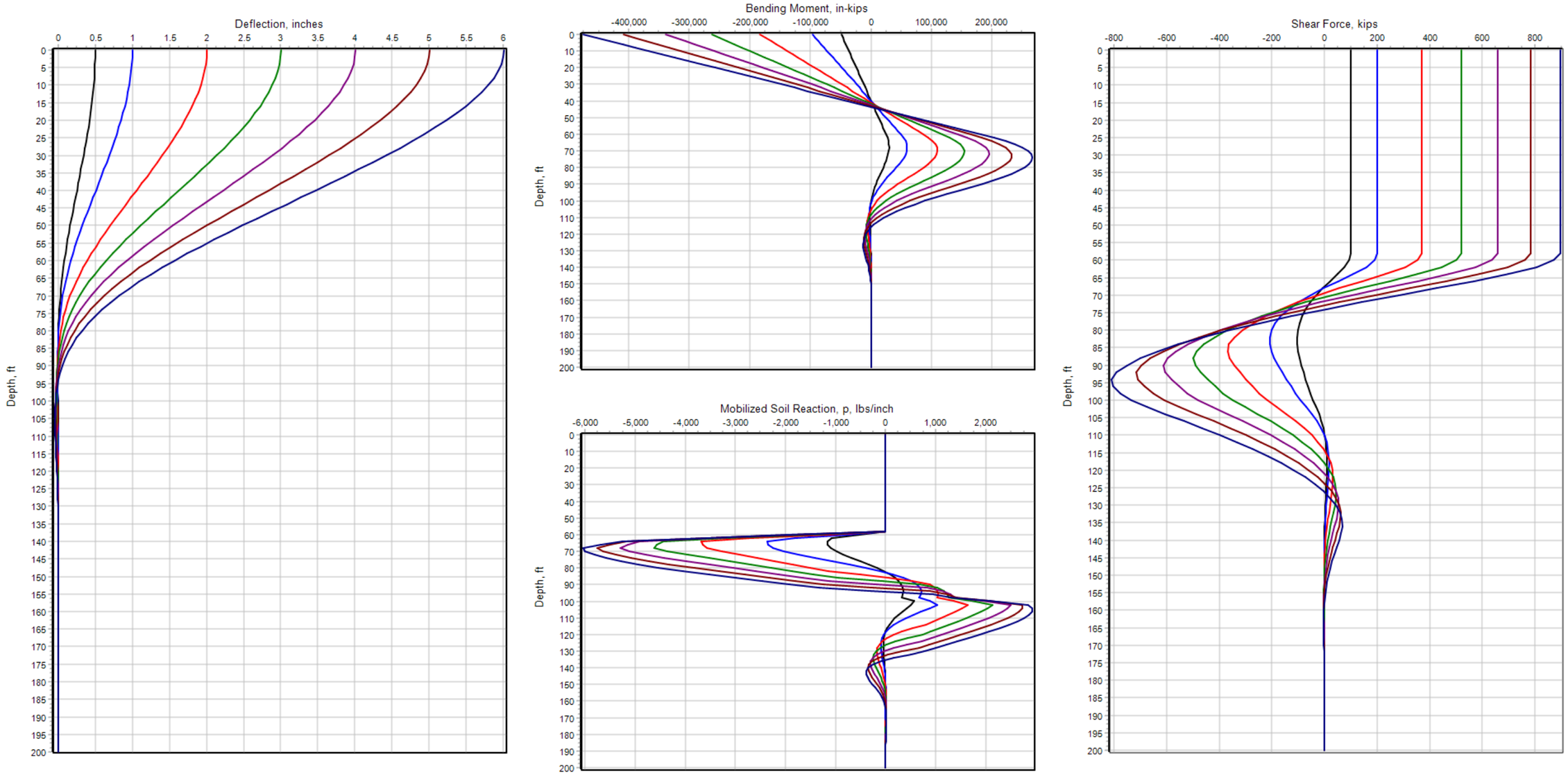
18461-007-01 Date Exported: 09/28/17



Longitudinal – 8' Diameter Shaft

Lateral Analysis –Earthquake (Half Scour) **Channel (Station 87+88)**
US 21 Over Harbor River Bridge Replacement Beaufort County, South Carolina
GEOENGINEERS — **Figure 35**

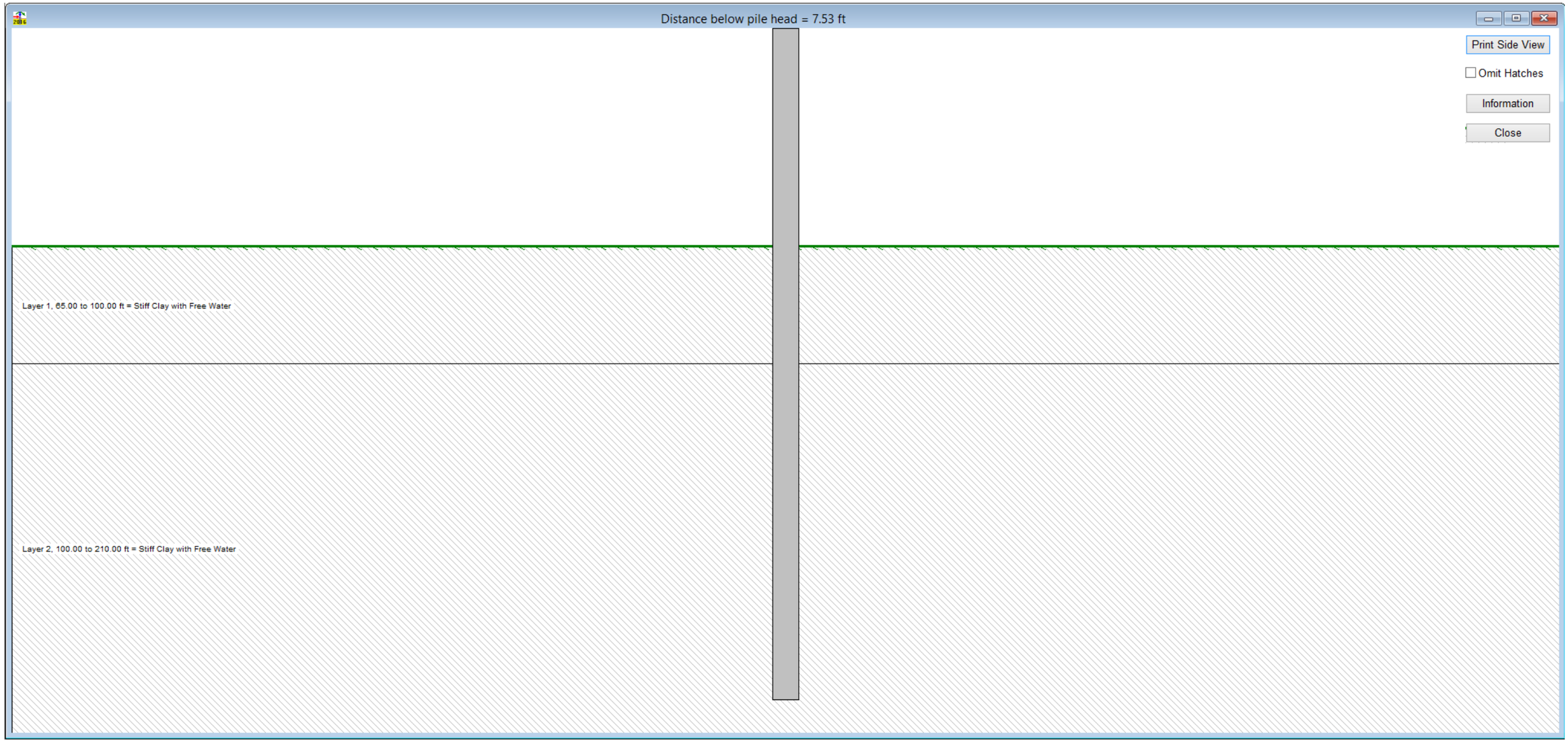
18461-007-01 Date Exported: 09/28/17



Transverse – 8' Diameter Shaft

Lateral Analysis –Earthquake (Half Scour) Channel (Station 87+88)	
US 21 Over Harbor River Bridge Replacement Beaufort County, South Carolina	
GEOENGINEERS	Figure 36

18461-007-01 Date Exported: 09/28/17



Layer	Model	Effective Unit Weight	Friction Angle	Cohesion	Residual Strength Ratio	Cohesion Ratio	k	Strain Factor	Pmult	
		(pcf)	(deg)	(psf)	Sr/Sigma'v	Su/Sigma'v	(lbs/in^3)	E50	(Longitudinal)	(Transverse)
1	Stiff Clay with Free Water (Reese)	57.6		3400			400	0.005	0.8	0.45
2	Stiff Clay with Free Water (Reese)	57.6		6000			800	0.005	0.8	0.45

Notes: Fixed Head Conditions, Pile Top Elevation = 10 ft, Ground Surface Elevation = -55 ft

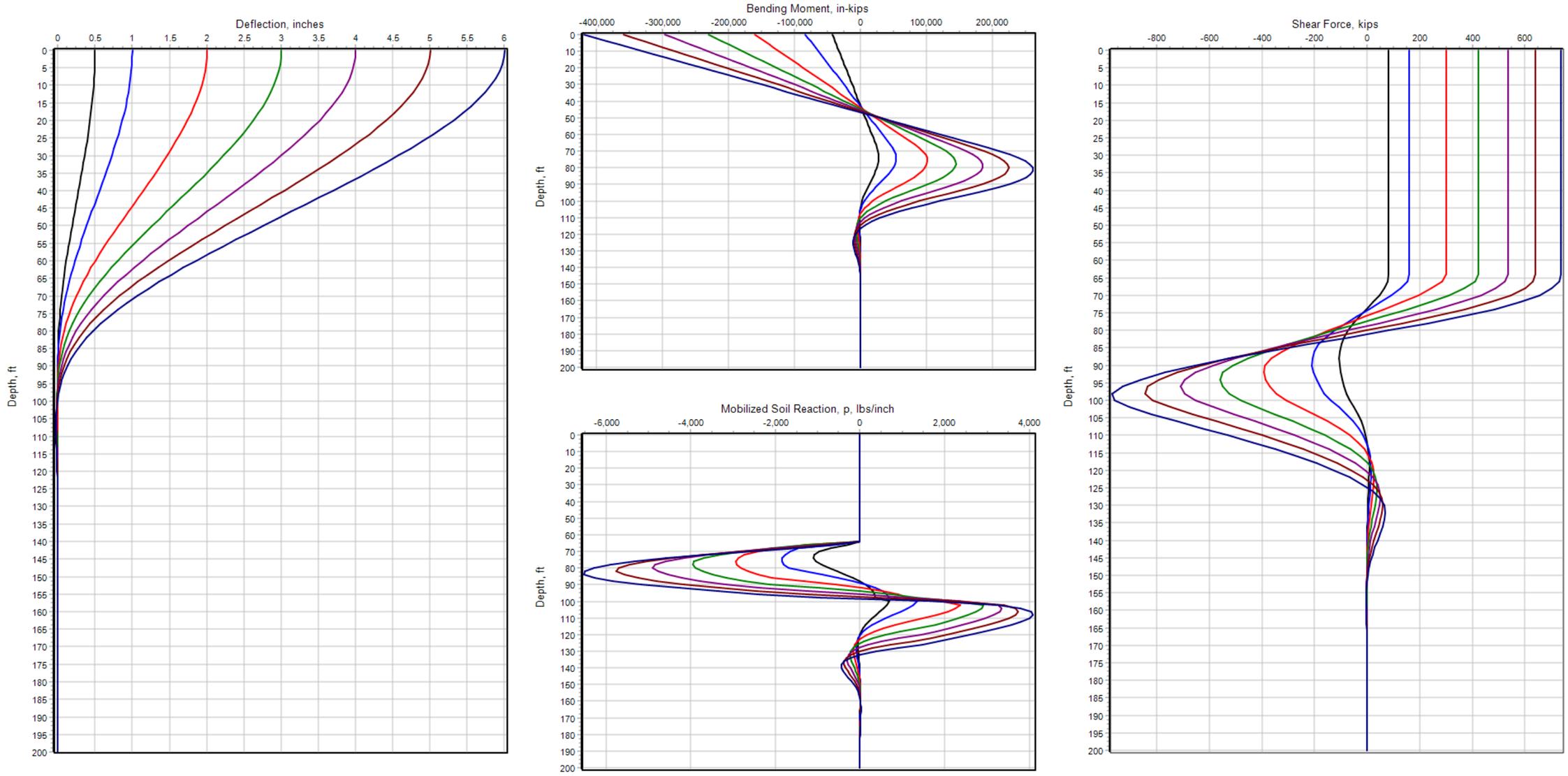
Lateral Analysis –Earthquake (Full Scour)
Channel (Station 87+88)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure 37

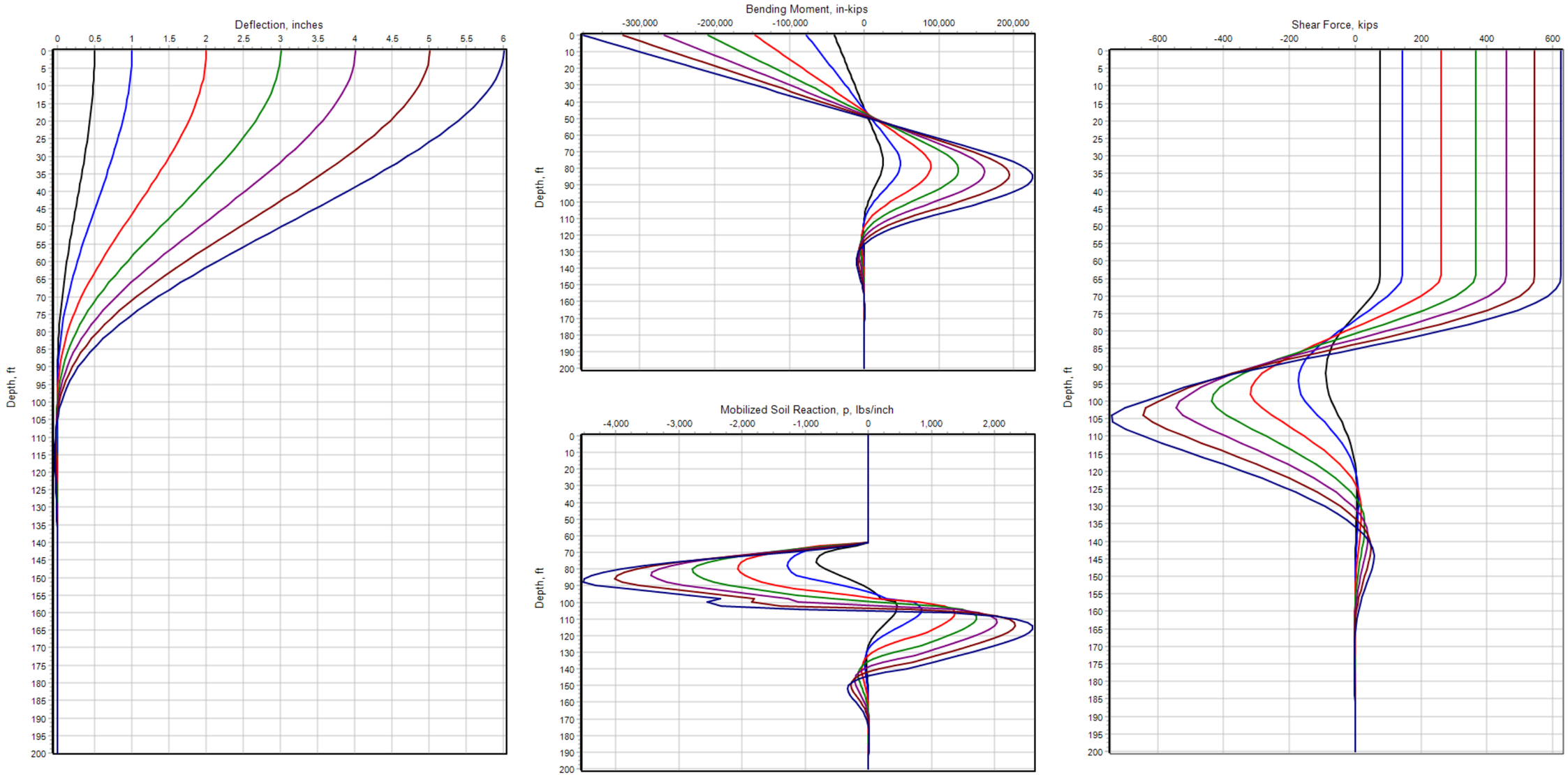
18461-007-01 Date Exported: 09/28/17



Longitudinal – 8' Diameter Shaft

Lateral Analysis –Earthquake (Full Scour) **Channel (Station 87+88)**
US 21 Over Harbor River Bridge Replacement Beaufort County, South Carolina
GEOENGINEERS — **Figure 38**

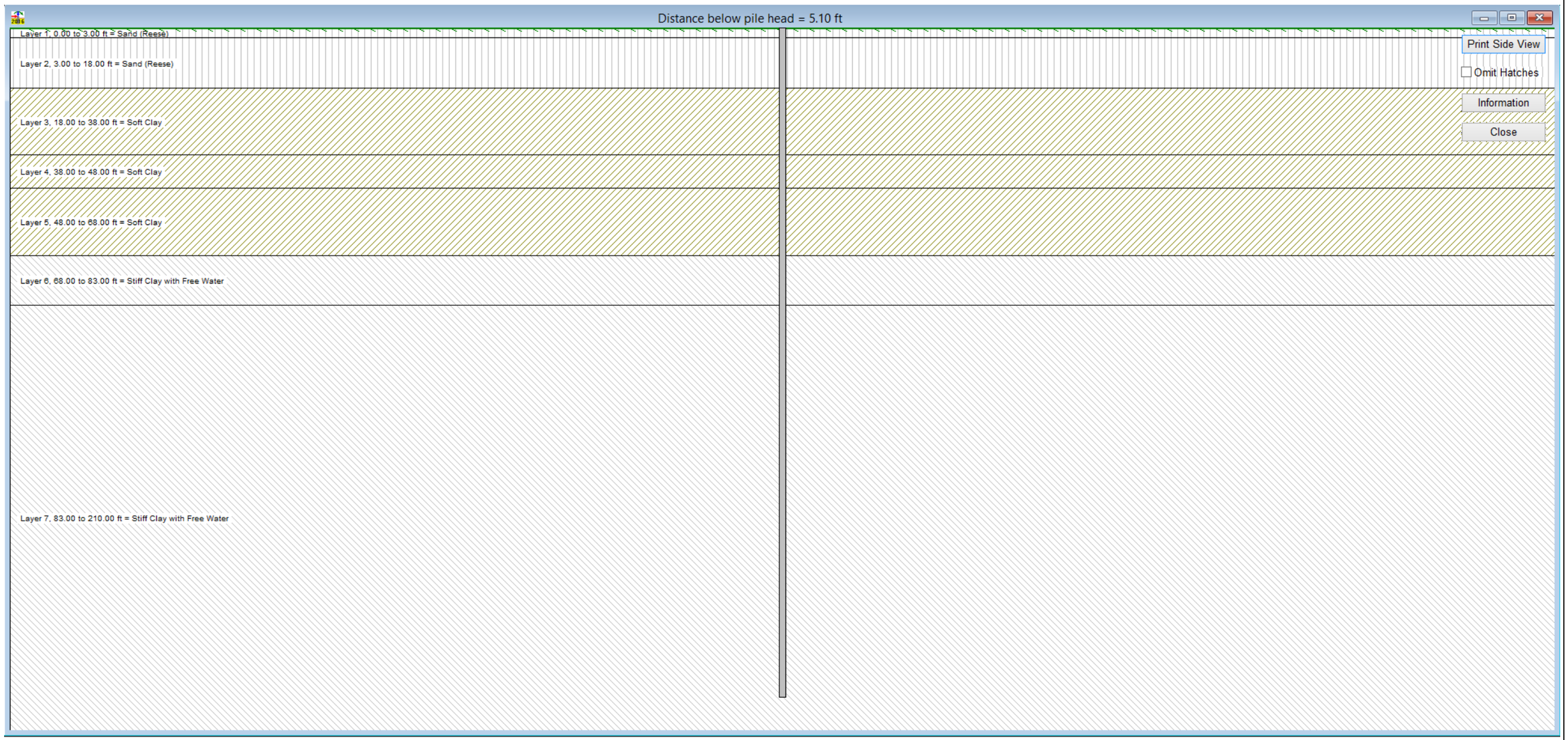
18461-007-01 Date Exported: 09/28/17



Transverse – 8' Diameter Shaft

Lateral Analysis –Earthquake (Full Scour) Channel (Station 87+88)
US 21 Over Harbor River Bridge Replacement Beaufort County, South Carolina
GEOENGINEERS — **Figure 39**

18461-007-01 Date Exported: 09/28/17



Layer	Model	Effective Unit Weight	Friction Angle	Cohesion	Residual Strength Ratio	Cohesion Ratio	k	Strain Factor	Pmult	
		(pcf)	(deg)	(psf)	Sr/Sigma'v	Su/Sigma'v	(lbs/in^3)	E50	(Longitudinal)	(Transverse)
1	Sand (Reese)	100	29				25		0.85	0.85
2	Sand (Reese)	57.6	38				150		0.85	0.85
3	Soft Clay (Matlock)	37.6			0.1			0.02	0.085	0.085
4	Soft Clay (Matlock)	32.6				0.22		0.02	0.85	0.85
5	Soft Clay (Matlock)	37.6			0.08			0.02	0.085	0.085
6	Stiff Clay with Free Water (Reese)	57.6		3400			400	0.005	0.85	0.85
7	Stiff Clay with Free Water (Reese)	57.6		6000			800	0.005	0.85	0.85

Notes: Fixed Head Conditions, Pile Top Elevation = 3 ft, Ground Surface Elevation = 3 ft

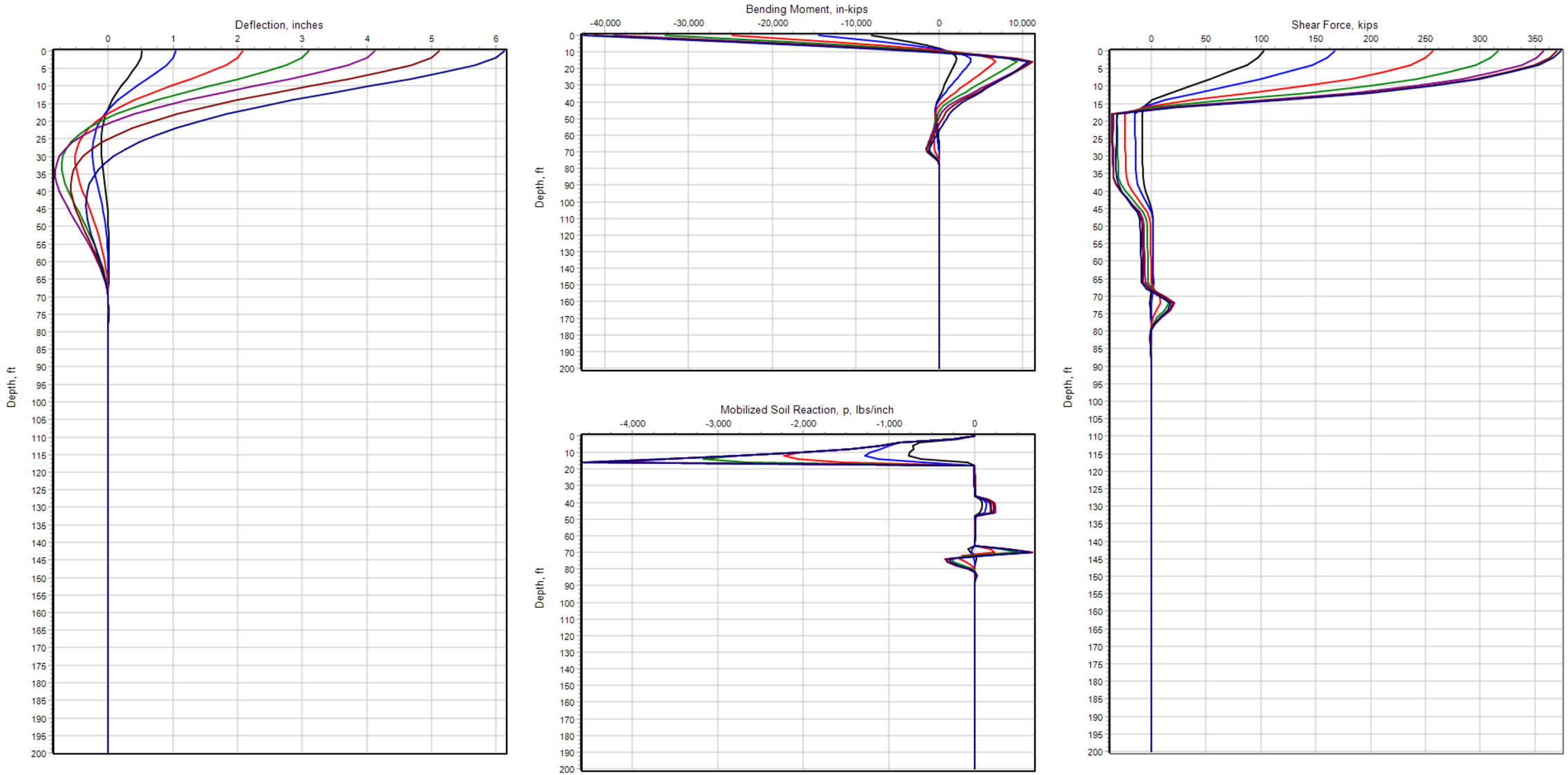
Lateral Analysis –Earthquake (No Scour)
East Overbank (Station 100+78)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure 40

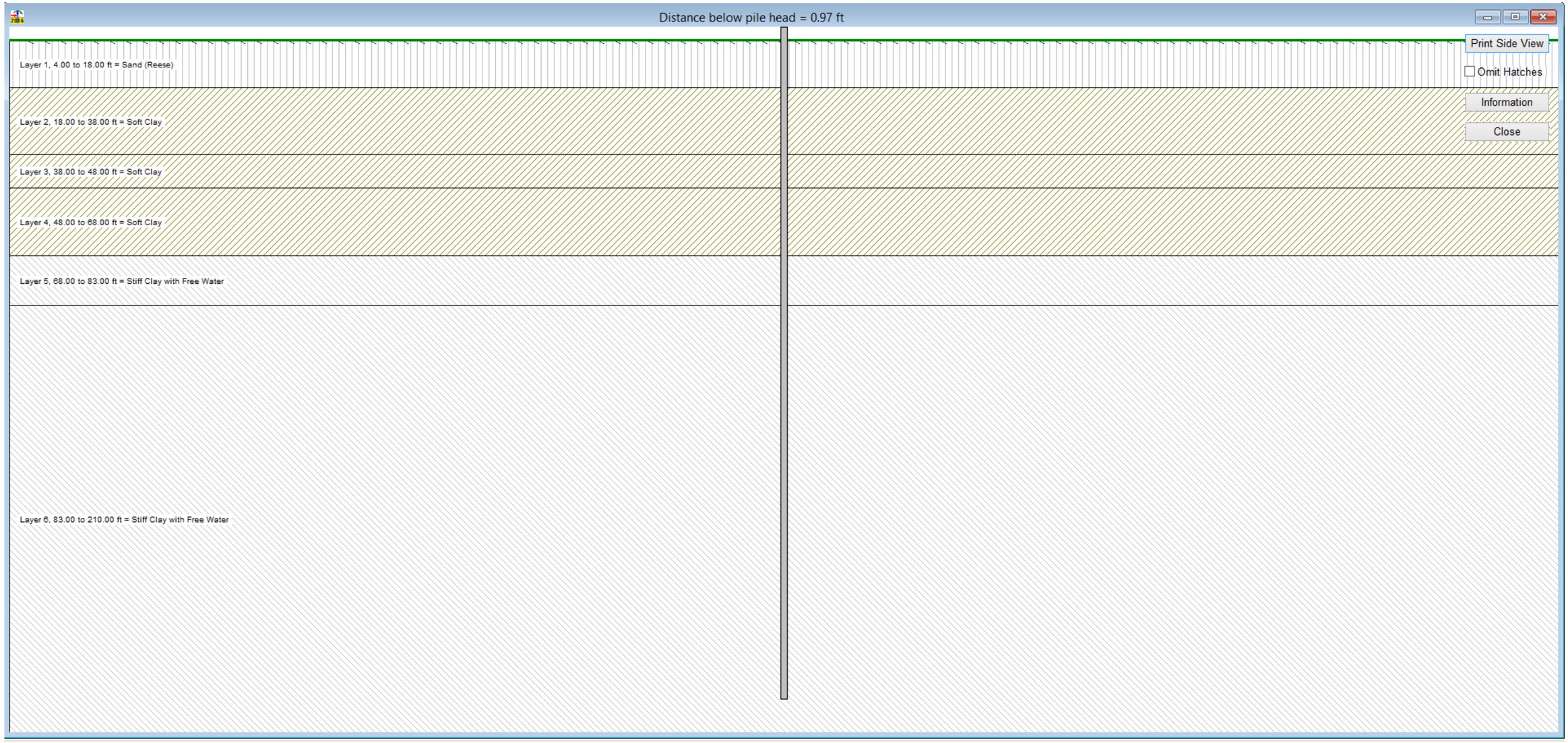
18461-007-01 Date Exported: 09/28/17



Longitudinal and Transverse – 24" Square Concrete

Lateral Analysis –Earthquake (No Scour) **East Overbank (Station 100+78)**
US 21 Over Harbor River Bridge Replacement Beaufort County, South Carolina
GEOENGINEERS — **Figure 41**

18461-007-01 Date Exported: 09/28/17



Layer	Model	Effective Unit Weight	Friction Angle	Cohesion	Residual Strength Ratio	Cohesion Ratio	k	Strain Factor	Pmult	
		(pcf)	(deg)	(psf)	Sr/Sigma'v	Su/Sigma'v	(lbs/in^3)	E50	(Longitudinal)	(Transverse)
1	Sand (Reese)	57.6	38				150		0.85	0.85
2	Soft Clay (Matlock)	37.6			0.1			0.02	0.085	0.085
3	Soft Clay (Matlock)	32.6				0.22		0.02	0.85	0.85
4	Soft Clay (Matlock)	37.6			0.08			0.02	0.085	0.085
5	Stiff Clay with Free Water (Reese)	57.6		3400			400	0.005	0.85	0.85
6	Stiff Clay with Free Water (Reese)	57.6		6000			800	0.005	0.85	0.85

Notes: Fixed Head Conditions, Pile Top Elevation = 3 ft, Ground Surface Elevation = -1 ft

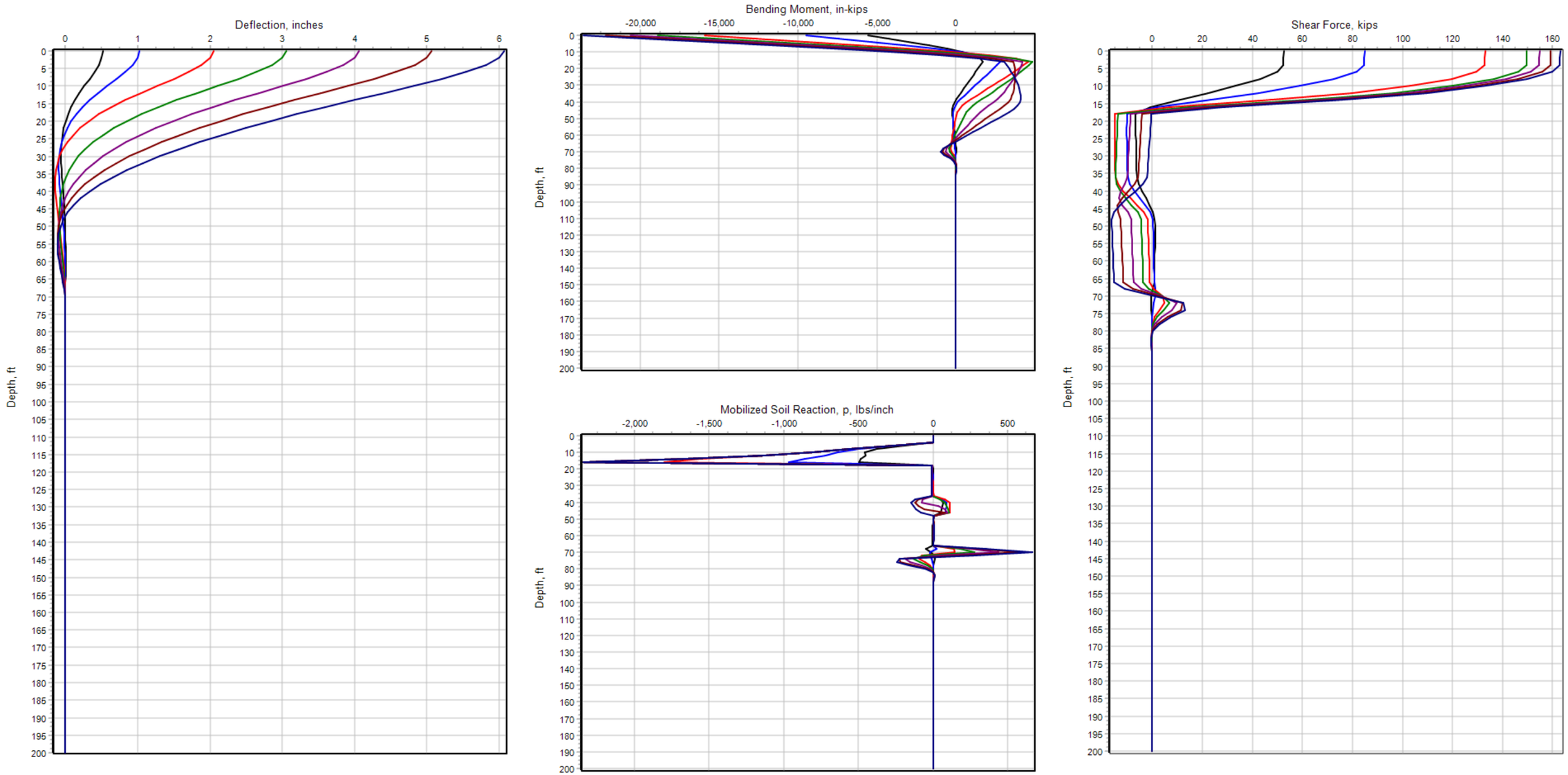
Lateral Analysis –Earthquake (Half Scour)
East Overbank (Station 100+78)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure 42

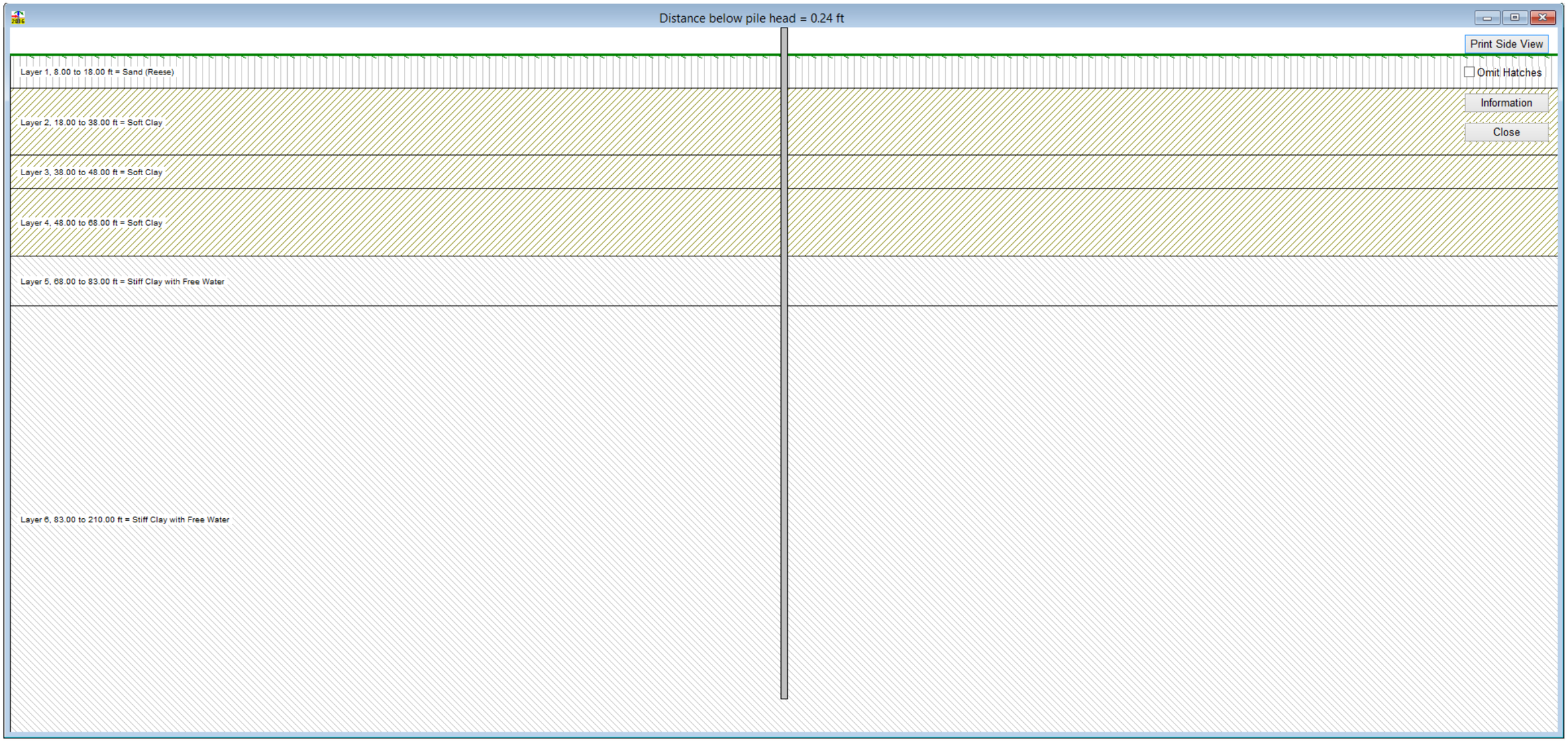
18461-007-01 Date Exported: 09/28/17



Longitudinal and Transverse – 24" Square Concrete

Lateral Analysis –Earthquake (Half Scour) **East Overbank (Station 100+78)**
US 21 Over Harbor River Bridge Replacement Beaufort County, South Carolina
GEOENGINEERS — **Figure 43**

18461-007-01 Date Exported: 09/28/17



Layer	Model	Effective Unit Weight	Friction Angle	Cohesion	Residual Strength Ratio	Cohesion Ratio	k	Strain Factor	Pmult	
		(pcf)	(deg)	(psf)	Sr/Sigma'v	Su/Sigma'v	(lbs/in^3)	E50	(Longitudinal)	(Transverse)
1	Sand (Reese)	57.6	38				150		0.85	0.85
2	Soft Clay (Matlock)	37.6			0.1			0.02	0.085	0.085
3	Soft Clay (Matlock)	32.6				0.22		0.02	0.85	0.85
4	Soft Clay (Matlock)	37.6			0.08			0.02	0.085	0.085
5	Stiff Clay with Free Water (Reese)	57.6		3400			400	0.005	0.85	0.85
6	Stiff Clay with Free Water (Reese)	57.6		6000			800	0.005	0.85	0.85

Notes: Fixed Head Conditions, Pile Top Elevation = 3 ft, Ground Surface Elevation = -5 ft

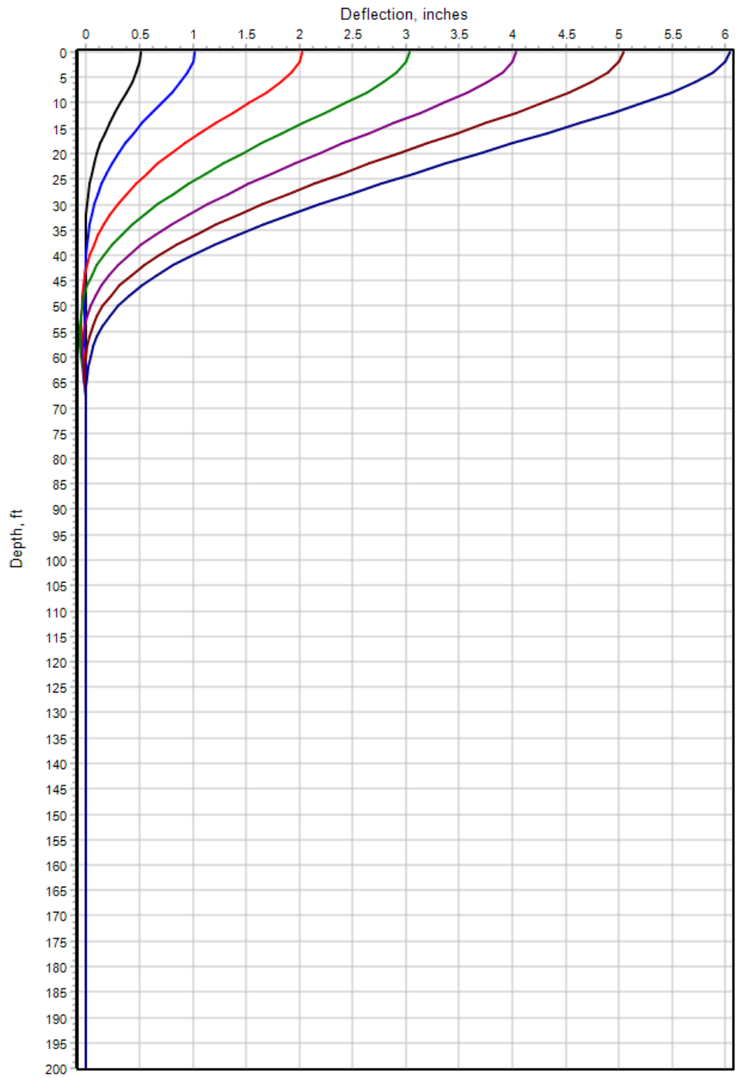
Lateral Analysis –Earthquake (Full Scour)
East Overbank (Station 100+78)

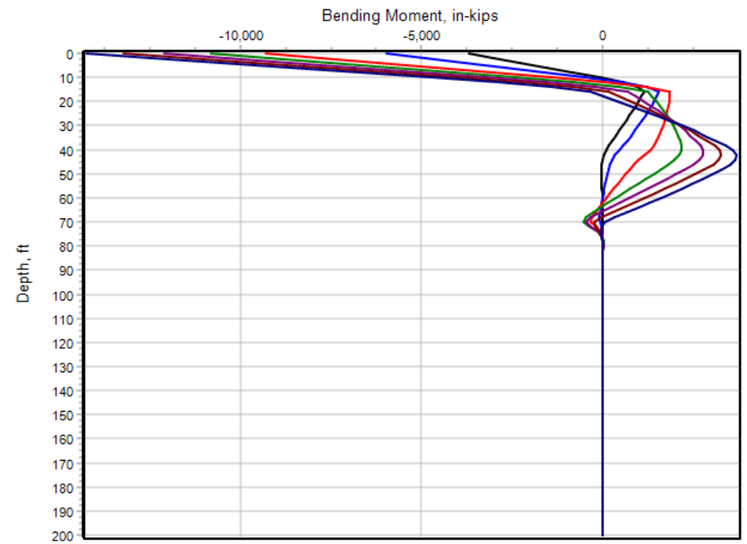
US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

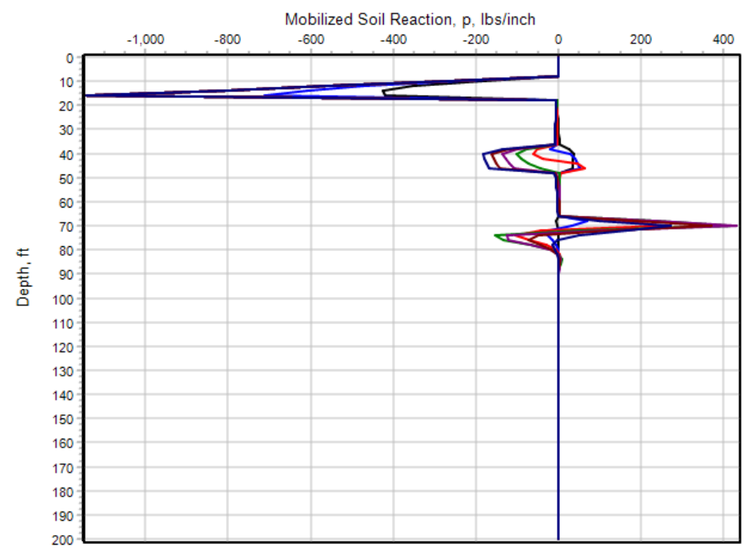
GeoEngineers

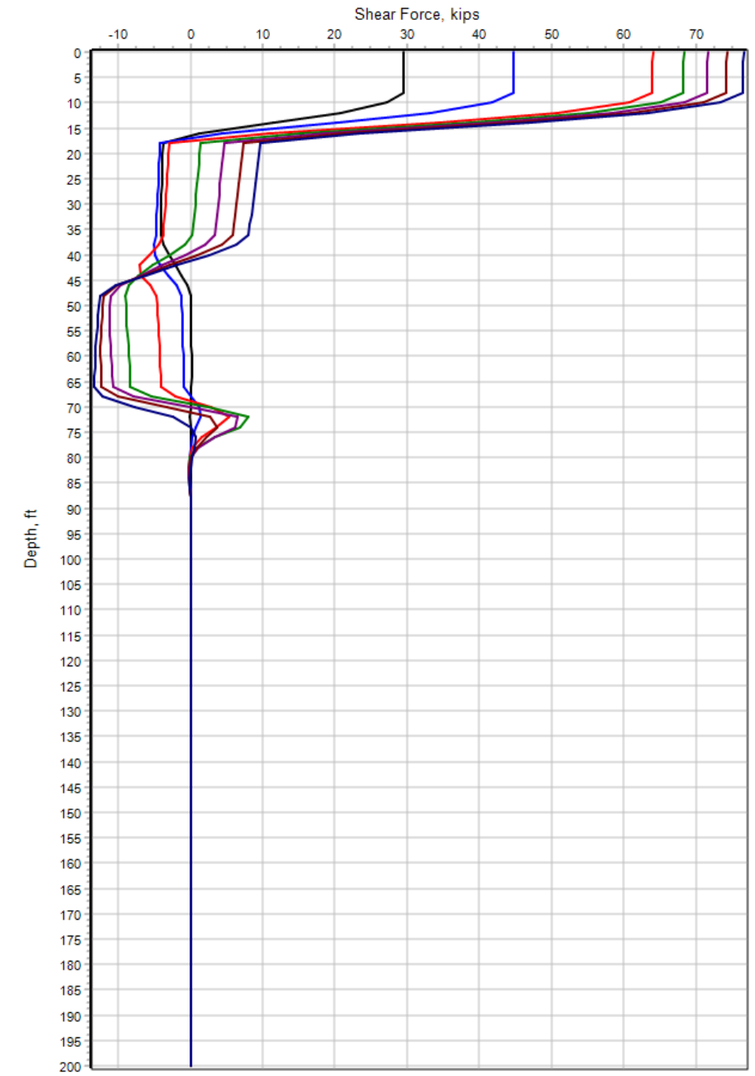
Figure 44

18461-007-01 Date Exported: 09/28/17





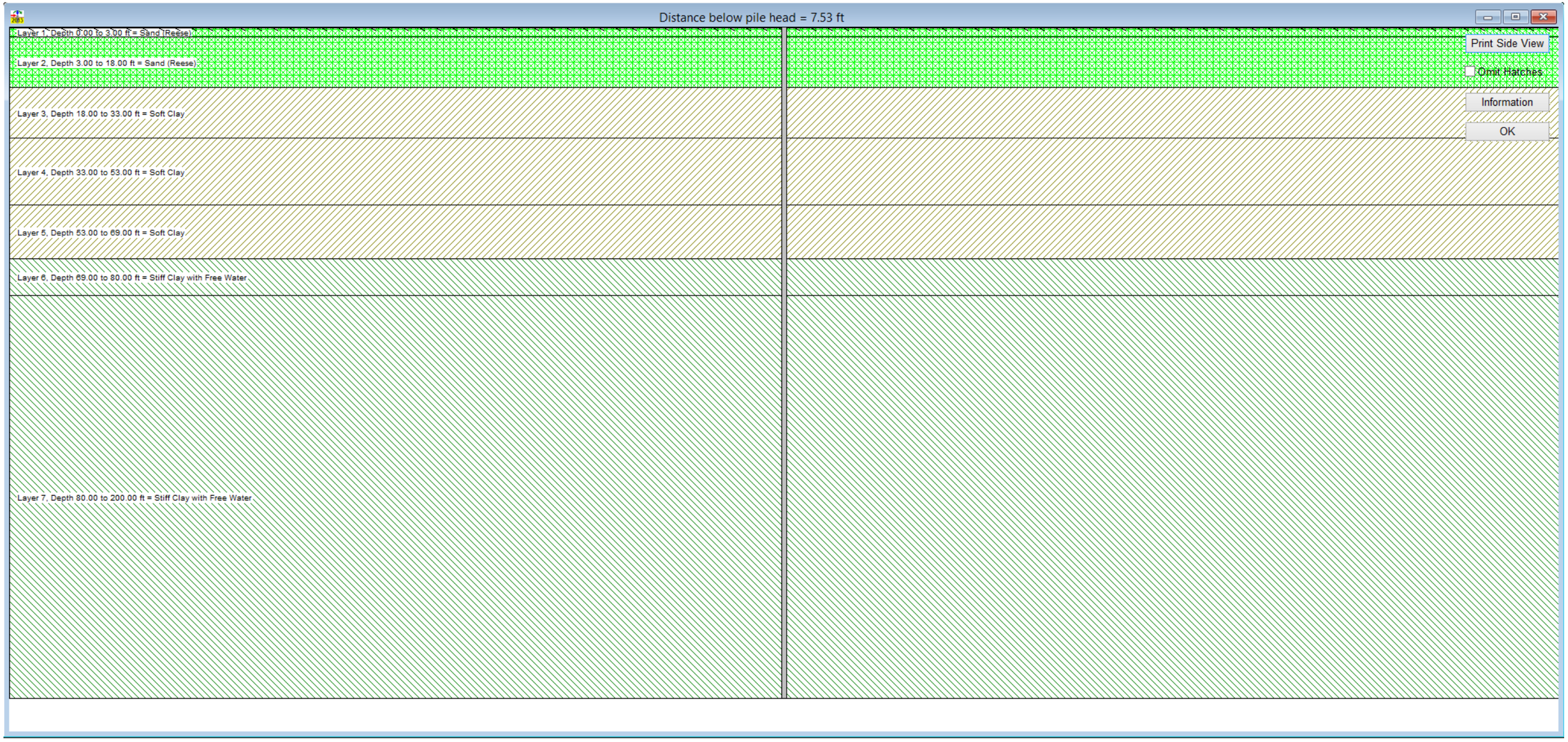




Longitudinal and Transverse – 24" Square Concrete

Lateral Analysis –Earthquake (Full Scour) **East Overbank (Station 100+78)**
US 21 Over Harbor River Bridge Replacement Beaufort County, South Carolina
GEOENGINEERS — **Figure 45**

18461-007-01 Date Exported: 09/28/17



Layer	Model	Effective Unit Weight	Friction Angle	Cohesion	Residual Strength Ratio	Cohesion Ratio	k	Strain Factor	Pmult	
		(pcf)	(deg)	(psf)	Sr/Sigma'v	Su/Sigma'v	(lbs/in^3)	E50	(Longitudinal)	(Transverse)
1	Sand (Reese)	100	30				25		1	0.85
2	Sand (Reese)	57.6	41				150		1	0.85
3	Soft Clay (Matlock)	37.6			0.09			0.02	0.1	0.085
4	Soft Clay (Matlock)	32.6				0.23		0.02	1	0.85
5	Soft Clay (Matlock)	37.6			0.09			0.02	0.1	0.085
6	Stiff Clay with Free Water (Reese)	57.6		3400			400	0.005	1	0.85
7	Stiff Clay with Free Water (Reese)	57.6		6000			800	0.005	1	0.85

Notes: Fixed Head Conditions, Pile Top Elevation = 3 ft, Ground Surface Elevation = 3 ft

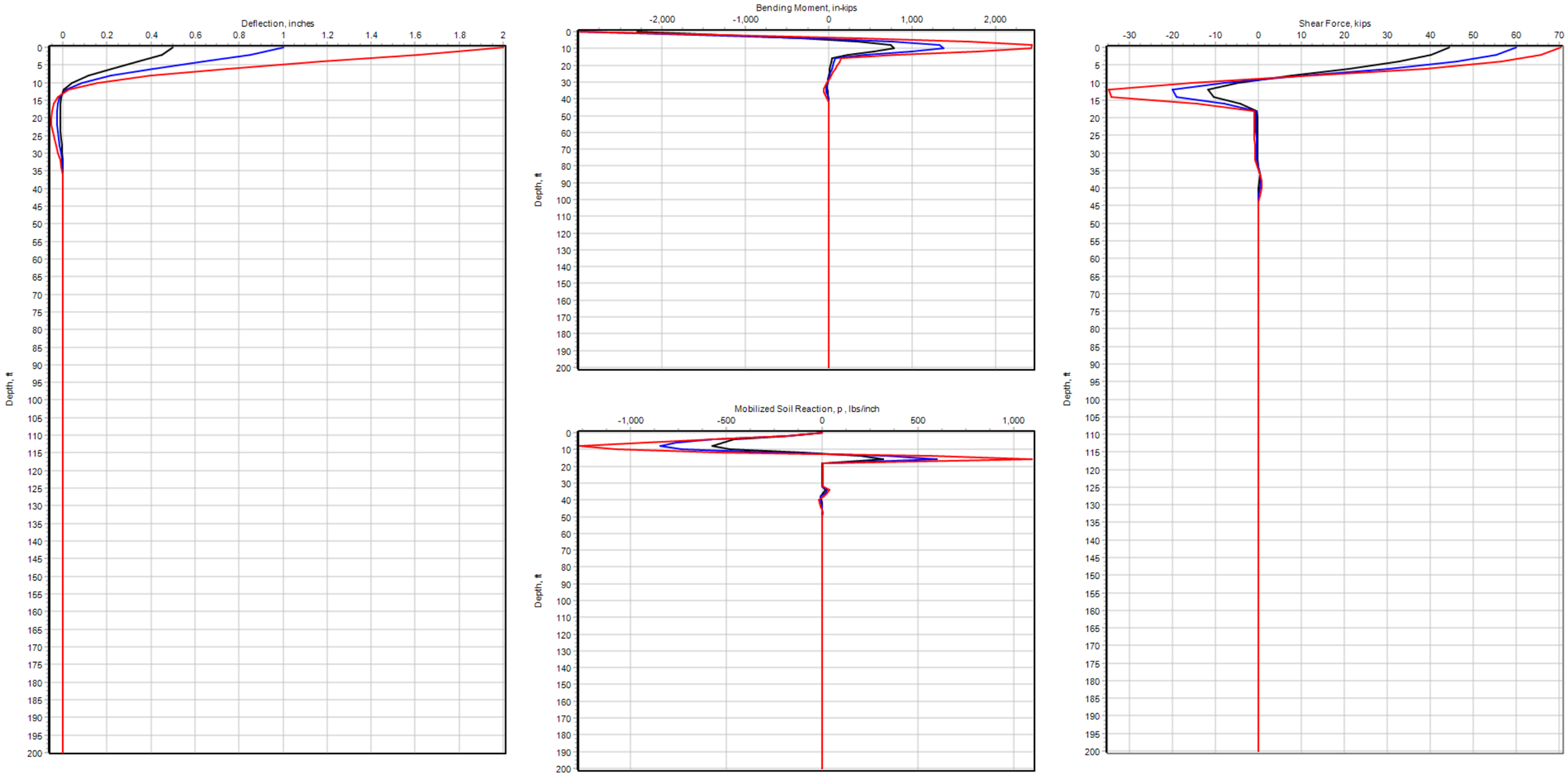
Lateral Analysis –Earthquake (No Scour)
East Abutment (Station 103+80)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GEOENGINEERS

Figure 46

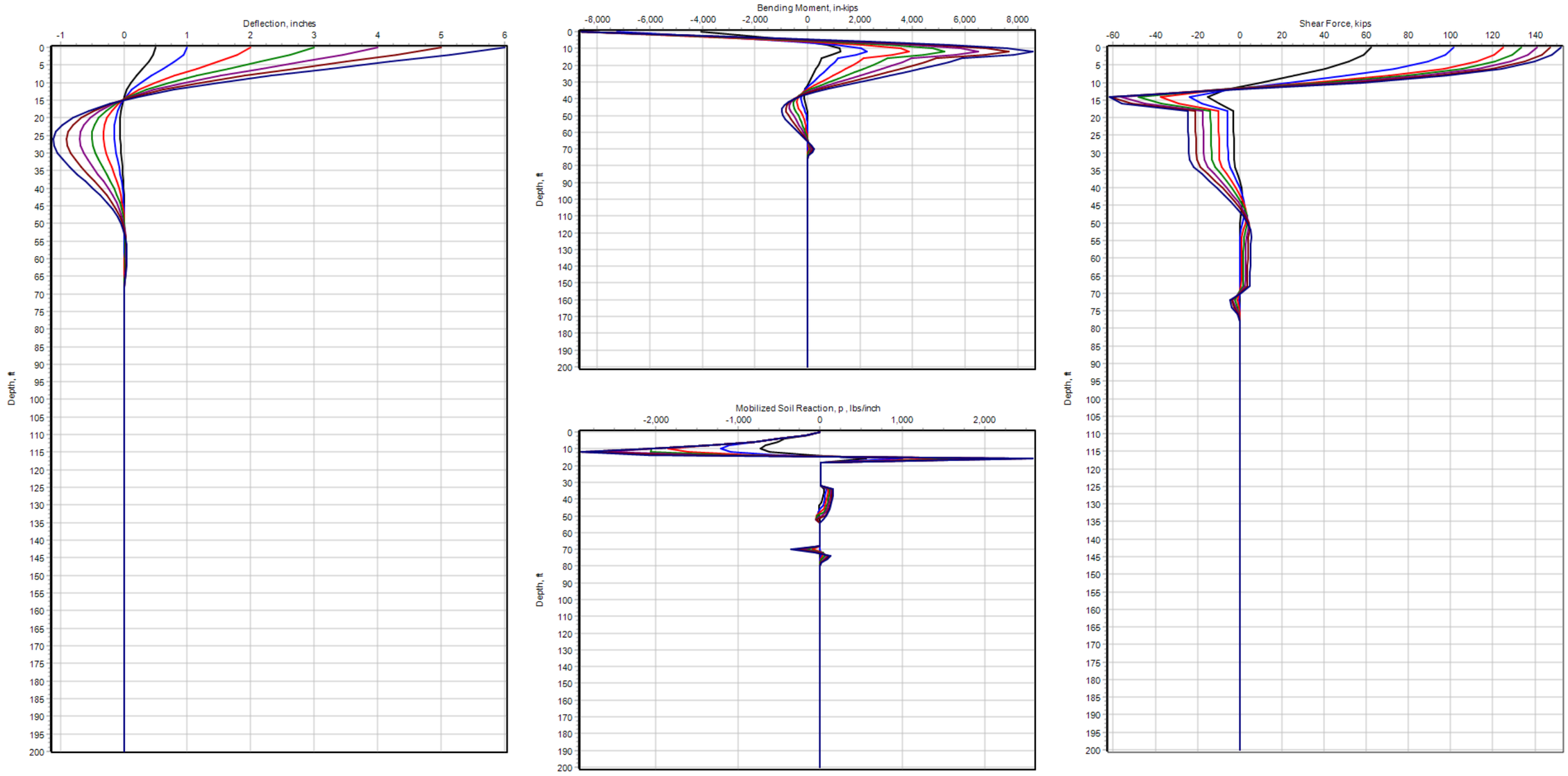
18461-007-01 Date Exported: 09/28/17



Longitudinal – HP 14x117 (Weak Axis)

Lateral Analysis – Earthquake (No Scour) **East Abutment (Station 103+80)**
US 21 Over Harbor River Bridge Replacement Beaufort County, South Carolina
GEOENGINEERS **Figure 47**

18461-007-01 Date Exported: 09/28/17



Transverse – HP 14x117 (Strong Axis)

Lateral Analysis – Earthquake (No Scour)
East Abutment (Station 103+80)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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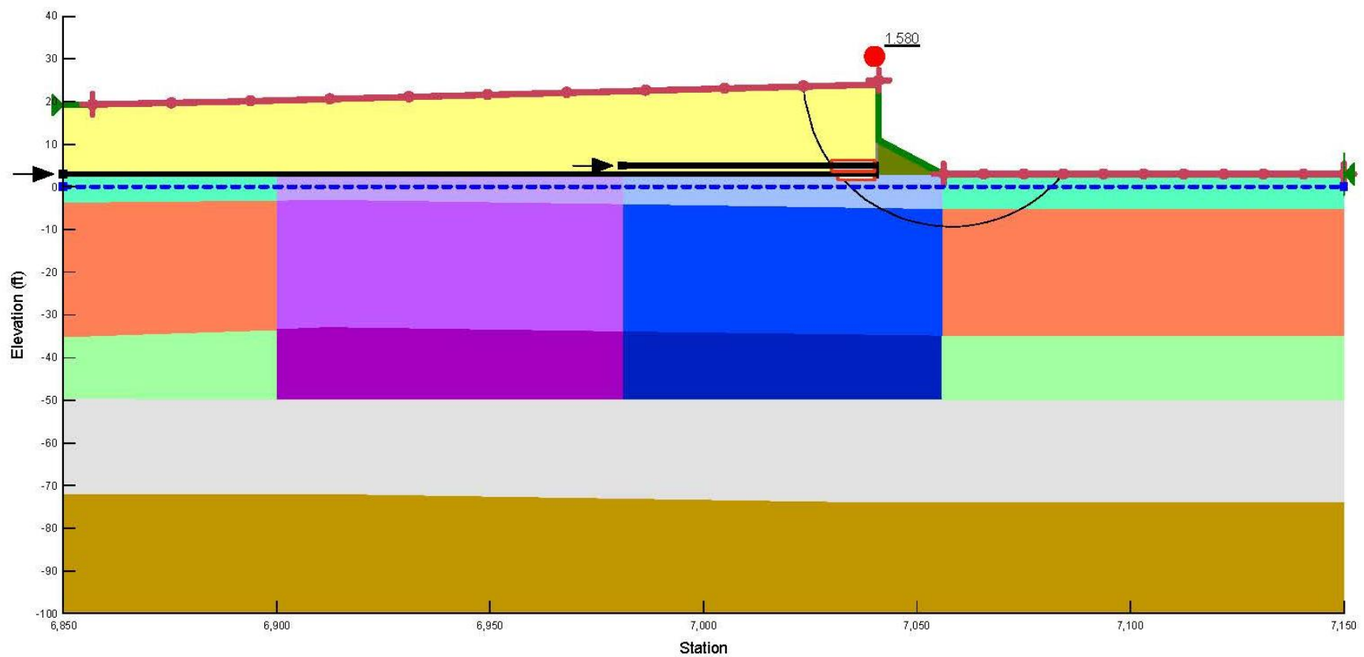
Figure 48

18461-007-01 Date Exported: 09/28/17

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Tau/Sigma Ratio	Cohesion (psf)
	Compacted Fill	Mohr-Coulomb	125	0	38		
	Sands (1)	Mohr-Coulomb	100	0	30		
	Silts/Clays	S=f(overburden)	95			0.36	
	Sands (2)	Mohr-Coulomb	100	0	30		
	Hawthorn Marl	Undrained (Phi=0)	120				4,000
	Cooper Group Limestone	Undrained (Phi=0)	120				6,000
	Sands (1) - Improved	Mohr-Coulomb	100	348	30		
	Silts/Clays - Improved	Mohr-Coulomb	95	348	19.8		
	Sands (2) - Improved	Mohr-Coulomb	100	348	30		
	Abutment	High Strength	150				
	Rip-Rap	High Strength	140				
	Sands (1) - Improved (2)	Mohr-Coulomb	100	200	30		
	Sands (2) - Improved (2)	Mohr-Coulomb	100	200	30		
	Silts/Clays - Improved (2)	Mohr-Coulomb	95	200	19.8		



Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: GeoStudio 2016 v. 8.16.1.13452 – Slope/W Analysis

Global Stability - Staged Construction (Improved)
West Abutment (Station 68+50 to 71+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

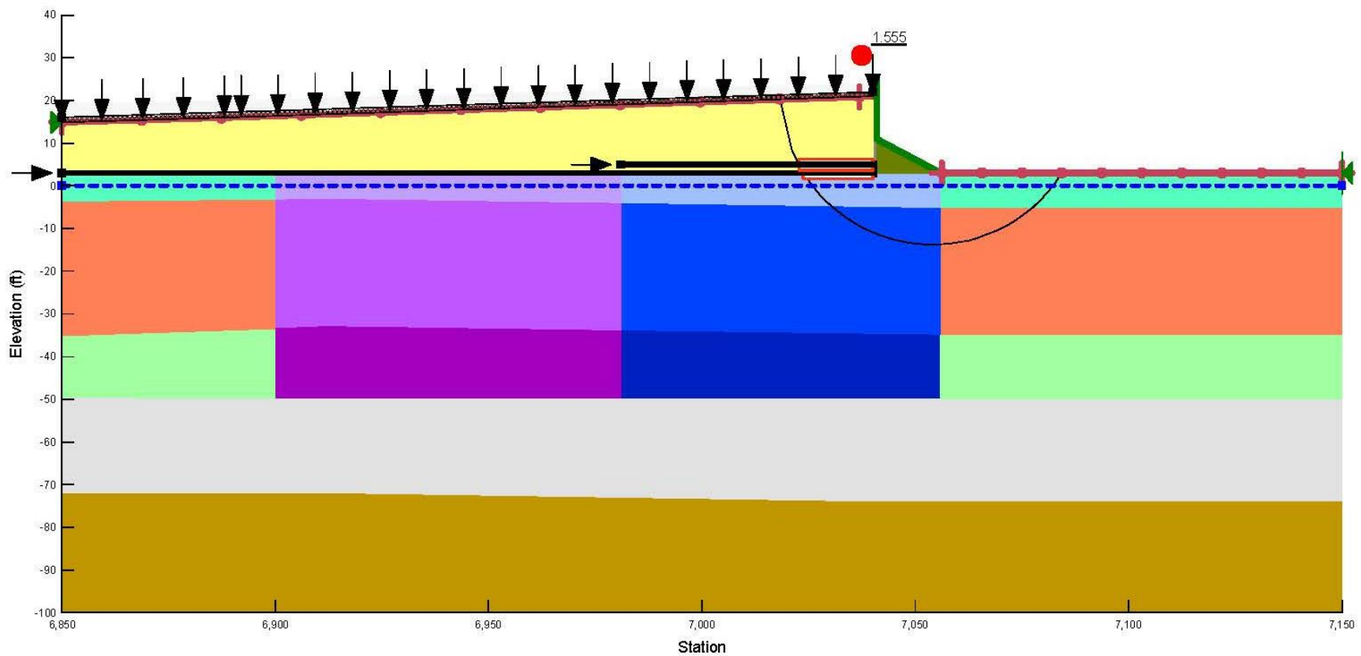
GeoEngineers

Figure 49

18461-007-01 Date Exported: 10/06/17

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Tau/Sigma Ratio	Cohesion (psf)
	Compacted Fill	Mohr-Coulomb	125	0	38		
	Sands (1)	Mohr-Coulomb	100	0	30		
	Silts/Clays	S=f(overburden)	95			0.36	
	Sands (2)	Mohr-Coulomb	100	0	30		
	Hawthorn Marl	Undrained (Phi=0)	120				4,000
	Cooper Group Limestone	Undrained (Phi=0)	120				6,000
	Sands (1) - Improved	Mohr-Coulomb	100	348	30		
	Silts/Clays - Improved	Mohr-Coulomb	95	348	19.8		
	Sands (2) - Improved	Mohr-Coulomb	100	348	30		
	Abutment	High Strength	150				
	Rip-Rap	High Strength	140				
	Sands (1) - Improved (2)	Mohr-Coulomb	100	200	30		
	Sands (2) - Improved (2)	Mohr-Coulomb	100	200	30		
	Silts/Clays - Improved (2)	Mohr-Coulomb	95	200	19.8		

Surcharge (Unit Weight): 400 pcf



Notes:

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Data Source: GeoStudio 2016 v. 8.16.1.13452 – Slope/W Analysis

Global Stability - End of Construction (Improved)
West Abutment (Station 68+50 to 71+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

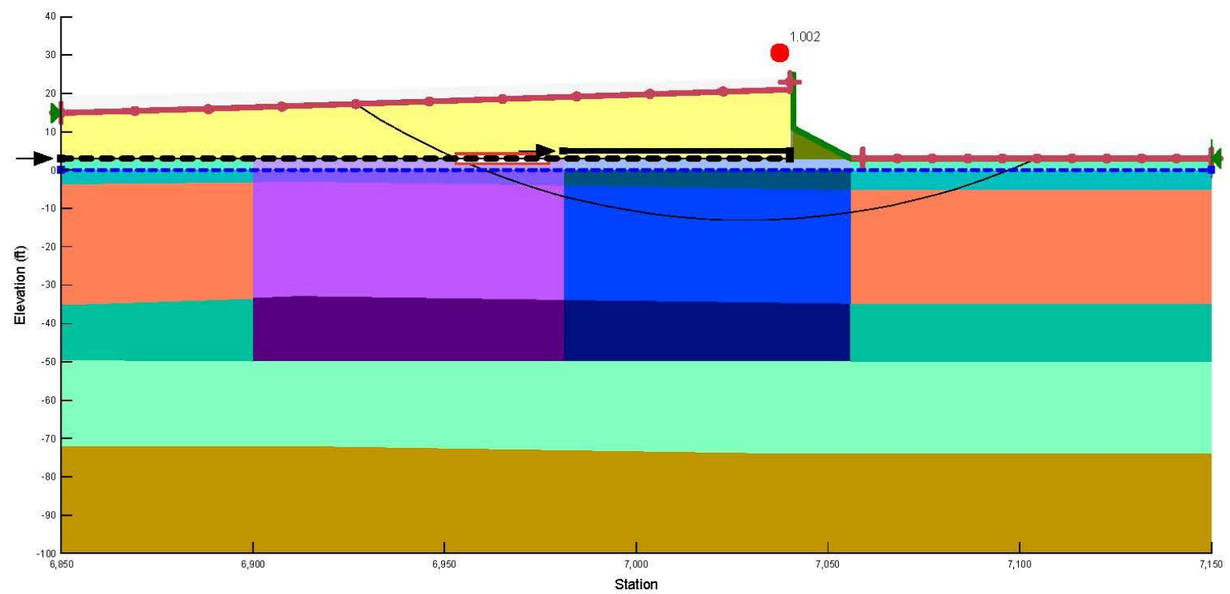
GeoEngineers

Figure 50

18461-007-01 Date Exported: 10/06/17

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Tau/Sigma Ratio	Cohesion (psf)
	Compacted Fill	Mohr-Coulomb	125	0	38		
	Sands (1)	Mohr-Coulomb	100	0	30		
	Silts/Clays	S=f(overburden)	95			0.36	
	Cooper Group Limestone	Undrained (Phi=0)	120				6,000
	Sands (1) - Improved	Mohr-Coulomb	100	348	30		
	Silts/Clays - Improved	Mohr-Coulomb	95	348	19.8		
	Sands (1) - Residual	S=f(overburden)	100			0.08	
	Sands (2) - Residual	S=f(overburden)	100			0.08	
	Hawthorn Marl - Seismic	Undrained (Phi=0)	120				3,400
	Sands (1) - Residual Improved	Mohr-Coulomb	100	348	4.6		
	Sands (2) - Residual Improved	Mohr-Coulomb	100	348	4.6		
	Abutment	High Strength	150				
	Rip-Rap	High Strength	140				
	Sands (1) - Improved (2)	Mohr-Coulomb	100	200	30		
	Sands (1) - Residual Improved (2)	Mohr-Coulomb	100	200	4.6		
	Sands (2) - Residual Improved (2)	Mohr-Coulomb	100	200	4.6		
	Silts/Clays - Improved (2)	Mohr-Coulomb	95	200	19.8		

Horz Seismic Coef.: 0.29



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Data Source: GeoStudio 2016 v. 8.16.1.13452 – Slope/W Analysis

Global Stability - Earthquake (Improved)
West Abutment (Station 68+50 to 71+00)

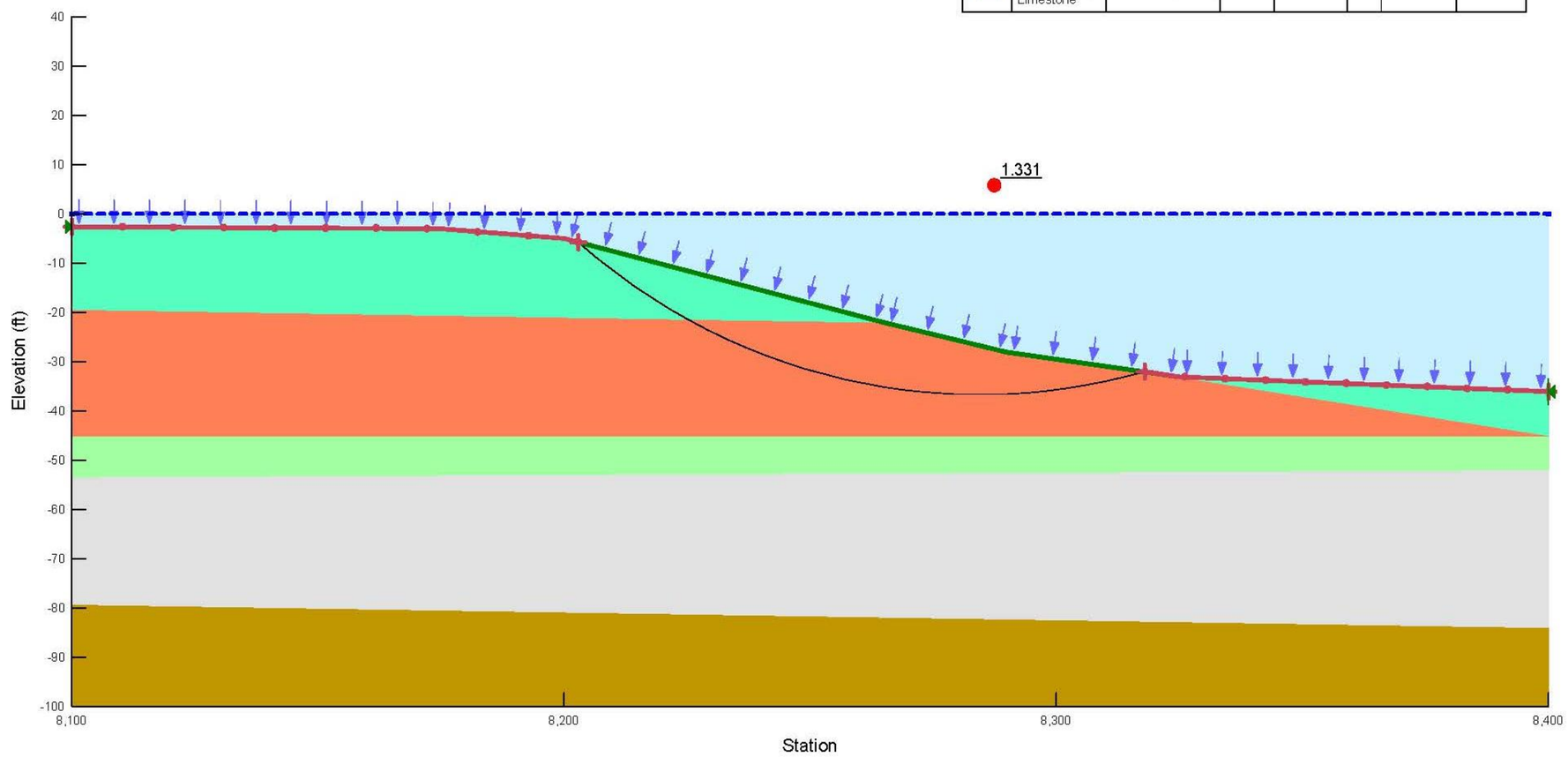
US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure 51

18461-007-01 Date Exported: 10/06/17

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Tau/Sigma Ratio	Cohesion (psf)
	Sands (1)	Mohr-Coulomb	100	0	30		
	Silts/Clays	S=f(overburden)	95			0.26	
	Sands (2)	Mohr-Coulomb	100	0	30		
	Hawthorn Marl	Undrained (Phi=0)	120				4,000
	Cooper Group Limestone	Undrained (Phi=0)	120				6,000



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Data Source: GeoStudio 2016 v. 8.16.1.13452 – Slope/W Analysis

Global Stability - End of Construction
West Channel (Station 81+00 to 84+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

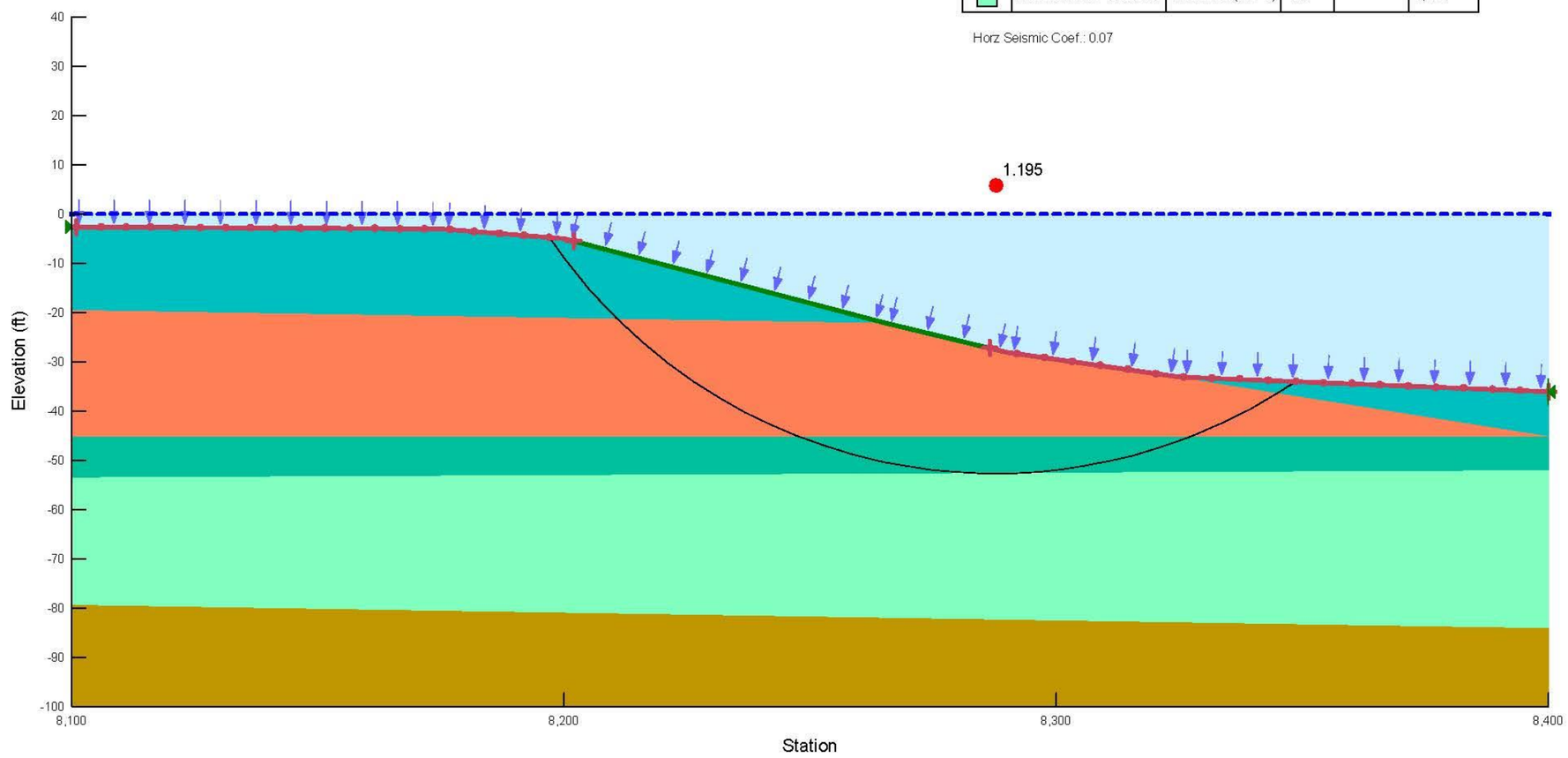
GeoEngineers

Figure 52

18461-007-01 Date Exported: 10/06/17

Color	Name	Model	Unit Weight (pcf)	Tau/Sigma Ratio	Cohesion (psf)
	Silts/Clays	S=f(overburden)	95	0.26	
	Cooper Group Limestone	Undrained (Phi=0)	120		6,000
	Sands (1) - Residual	S=f(overburden)	100	0.06	
	Sands (2) - Residual	S=f(overburden)	100	0.09	
	Hawthorn Marl - Seismic	Undrained (Phi=0)	120		3,400

Horz Seismic Coef.: 0.07



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Data Source: GeoStudio 2016 v. 8.16.1.13452 – Slope/W Analysis

Global Stability - Earthquake (FEE)
West Channel (Station 81+00 to 84+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

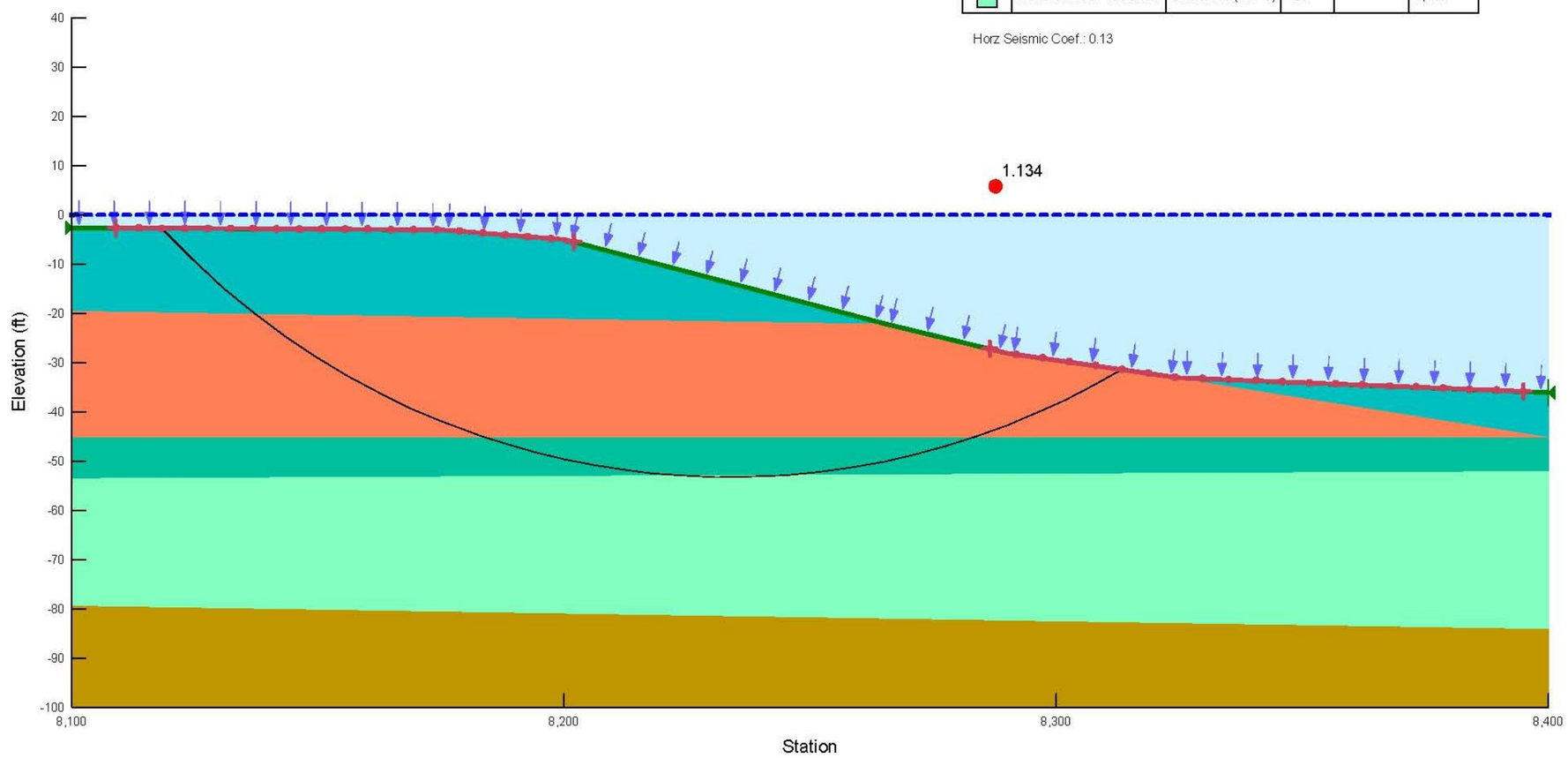
GEOENGINEERS

Figure 53

18461-007-01 Date Exported: 10/06/17

Color	Name	Model	Unit Weight (pcf)	Tau/Sigma Ratio	Cohesion (psf)
	Silts/Clays	S=f(overburden)	95	0.26	
	Cooper Group Limestone	Undrained (Phi=0)	120		6,000
	Sands (1) - Residual	S=f(overburden)	100	0.06	
	Sands (2) - Residual	S=f(overburden)	100	0.09	
	Hawthorn Marl - Seismic	Undrained (Phi=0)	120		3,400

Horz Seismic Coef.: 0.13



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Data Source: GeoStudio 2016 v. 8.16.1.13452 – Slope/W Analysis

Global Stability - Earthquake (SEE)
West Channel (Station 81+00 to 84+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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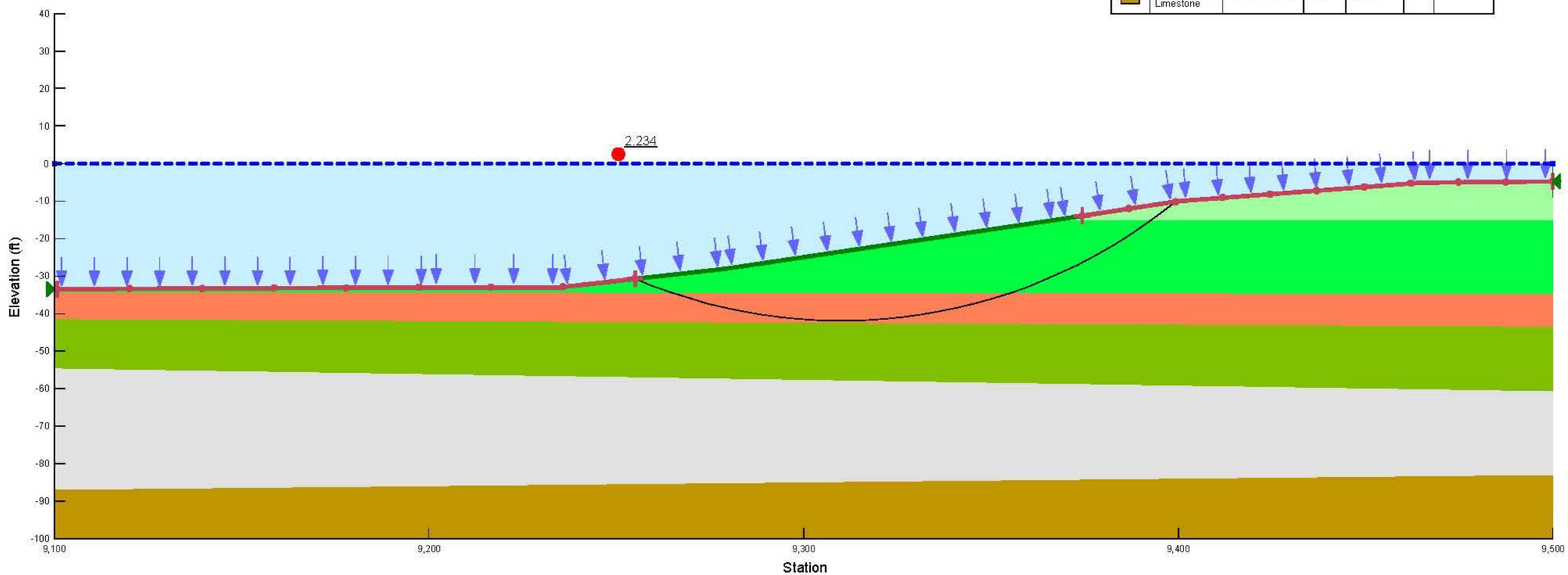
Figure 54

18461-007-01 Date Exported: 10/06/17

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Tau/Sigma Ratio
	Sands (2)	Mohr-Coulomb	120	0	41	
	Sands (3)	Mohr-Coulomb	100	0	30	
	Silts/Clays	S=f(overburden)	95			0.22
	Sands (4)	Mohr-Coulomb	100	0	30	
	Hawthorn Marl	Mohr-Coulomb	120	4,000	0	
	Cooper Group Limestone	Mohr-Coulomb	120	6,000	0	



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Data Source: GeoStudio 2016 v. 8.16.1.13452 – Slope/W Analysis

Global Stability - End of Construction
East Channel (Station 91+00 to 95+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

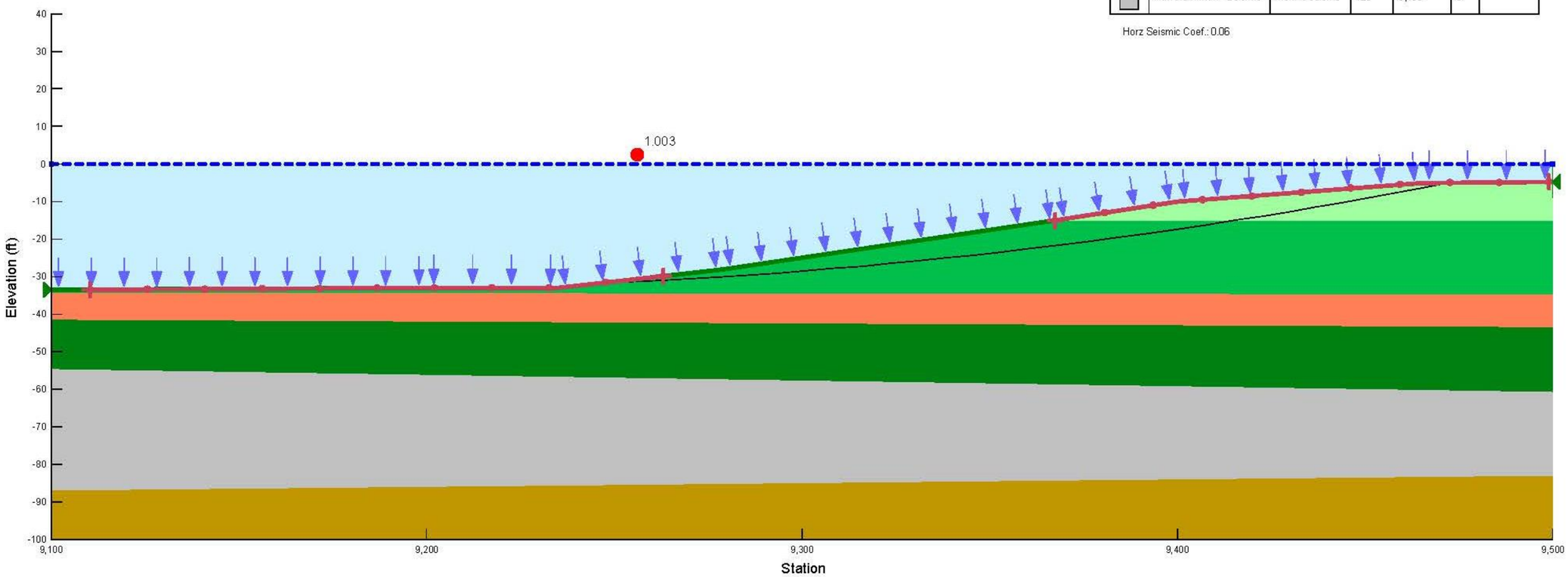
GeoEngineers

Figure 55

18461-007-01 Date Exported: 10/06/17

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Tau/Sigma Ratio
	Sands (2)	Mohr-Coulomb	120	0	41	
	Silts/Clays	S=f(overburden)	95			0.22
	Cooper Group Limestone	Mohr-Coulomb	120	6,000	0	
	Sands (3) - Residual	S=f(overburden)	100			0.1
	Sands (4) - Residual	S=f(overburden)	100			0.08
	Hawthorn Marl - Seismic	Mohr-Coulomb	120	3,400	0	

Horz Seismic Coef.: 0.06



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Data Source: GeoStudio 2016 v. 8.16.1.13452 – Slope/W Analysis

Global Stability - Earthquake (FEE)
East Channel (Station 91+00 to 95+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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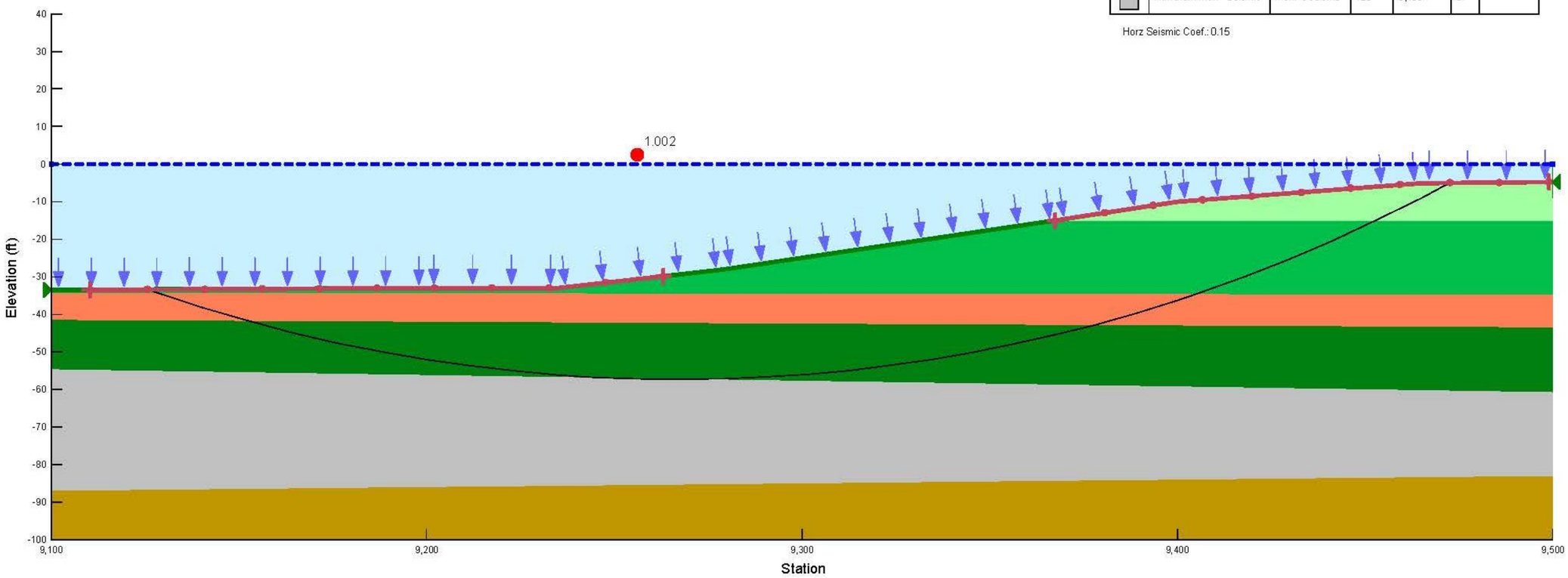
Figure 56

18461-007-01 Date Exported: 10/06/17

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Tau/Sigma Ratio
	Sands (2)	Mohr-Coulomb	120	0	41	
	Silts/Clays	S=f(overburden)	95			0.22
	Cooper Group Limestone	Mohr-Coulomb	120	6,000	0	
	Sands (3) - Residual	S=f(overburden)	100			0.1
	Sands (4) - Residual	S=f(overburden)	100			0.08
	Hawthorn Marl - Seismic	Mohr-Coulomb	120	3,400	0	

Horz Seismic Coef.: 0.15



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Data Source: GeoStudio 2016 v. 8.16.1.13452 – Slope/W Analysis

Global Stability - Earthquake (SEE)
East Channel (Station 91+00 to 95+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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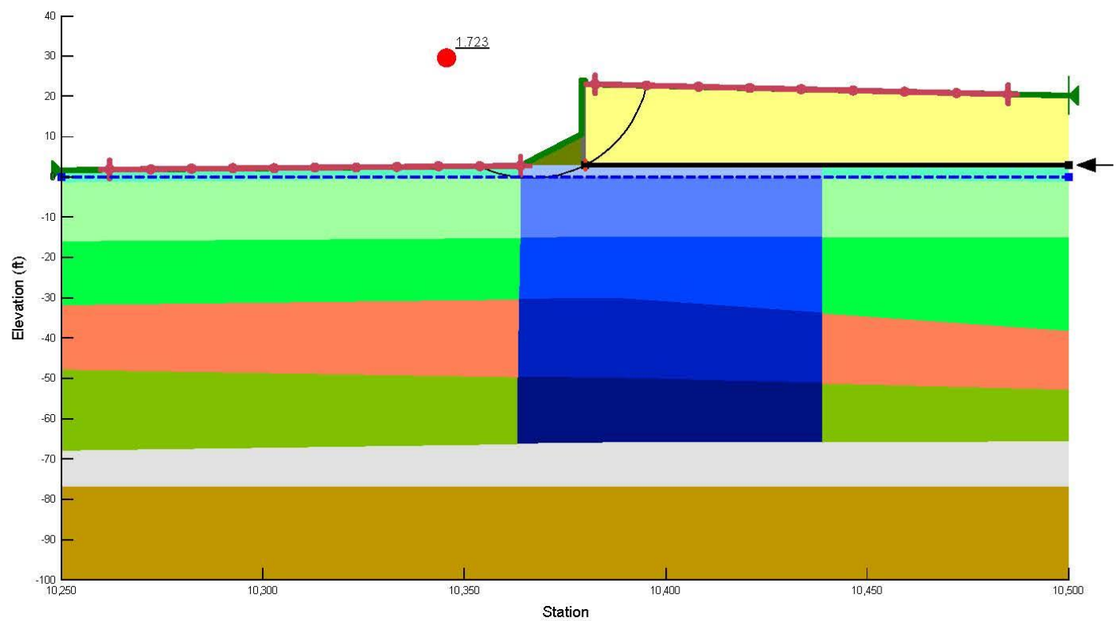
Figure 57

18461-007-01 Date Exported: 10/06/17

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Tau/Sigma Ratio
	Compacted Fill	Mohr-Coulomb	125	0	38	
	Sands (1)	Mohr-Coulomb	100	0	30	
	Sands (2)	Mohr-Coulomb	120	0	41	
	Sands (3)	Mohr-Coulomb	100	0	30	
	Silts/Clays	S=f(overburden)	95			0.23
	Sands (4)	Mohr-Coulomb	100	0	30	
	Hawthorn Marl	Mohr-Coulomb	120	4,000	0	
	Cooper Group Limestone	Mohr-Coulomb	120	6,000	0	
	Sands (1) - Improved	Mohr-Coulomb	100	348	30	
	Sands (2) - Improved	Mohr-Coulomb	120	348	41	
	Sands (3) - Improved	Mohr-Coulomb	100	348	30	
	Sands (4) - Improved	Mohr-Coulomb	100	348	30	
	Silts/Clays - Improved	Mohr-Coulomb	95	348	13	
	Abutment	High Strength	150			
	Rip-Rap	High Strength	140			



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Data Source: GeoStudio 2016 v. 8.16.1.13452 – Slope/W Analysis

Global Stability - Staged Construction (Improved)
East Abutment (Station 102+50 to 105+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

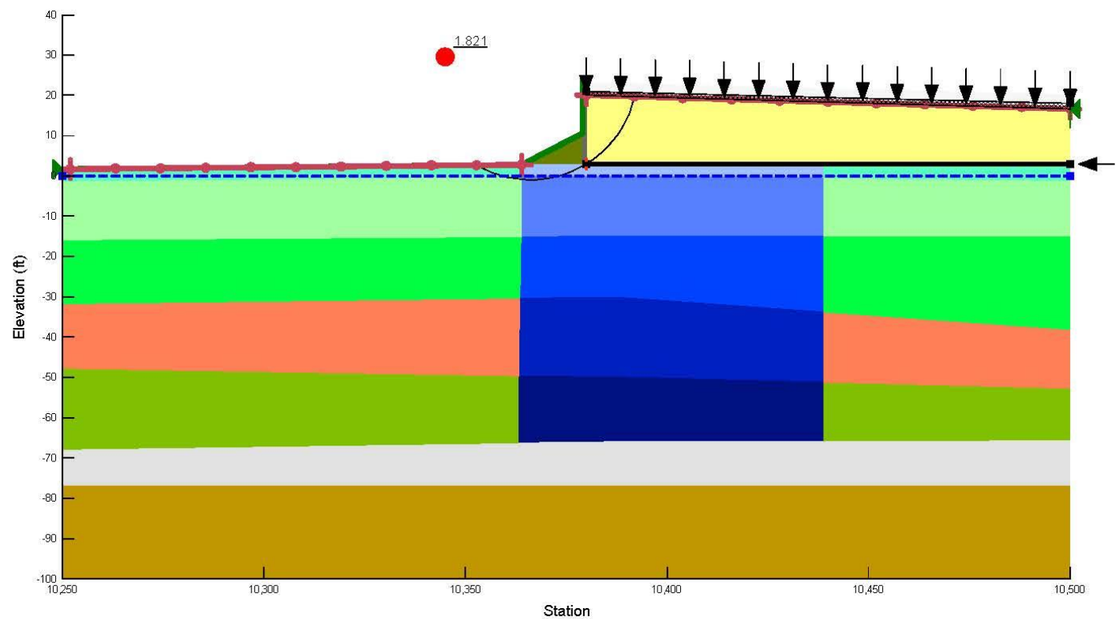
GeoEngineers

Figure 58

18461-007-01 Date Exported: 10/06/17

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Tau/Sigma Ratio
	Compacted Fill	Mohr-Coulomb	125	0	38	
	Sands (1)	Mohr-Coulomb	100	0	30	
	Sands (2)	Mohr-Coulomb	120	0	41	
	Sands (3)	Mohr-Coulomb	100	0	30	
	Silts/Clays	S=f(overburden)	95			0.23
	Sands (4)	Mohr-Coulomb	100	0	30	
	Hawthorn Marl	Mohr-Coulomb	120	4,000	0	
	Cooper Group Limestone	Mohr-Coulomb	120	6,000	0	
	Sands (1) - Improved	Mohr-Coulomb	100	348	30	
	Sands (2) - Improved	Mohr-Coulomb	120	348	41	
	Sands (3) - Improved	Mohr-Coulomb	100	348	30	
	Sands (4) - Improved	Mohr-Coulomb	100	348	30	
	Silts/Clays - Improved	Mohr-Coulomb	95	348	13	
	Abutment	High Strength	150			
	Rip-Rap	High Strength	140			

Surcharge (Unit Weight): 400 pcf



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Data Source: GeoStudio 2016 v. 8.16.1.13452 – Slope/W Analysis

Global Stability - End of Construction (Improved)
East Abutment (Station 102+50 to 105+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

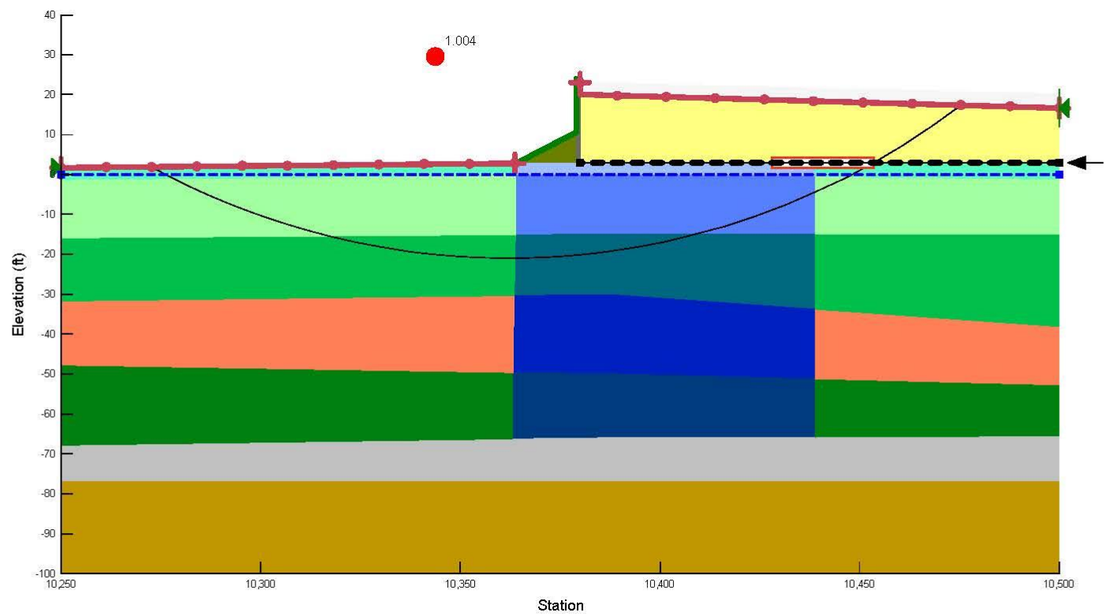
GeoEngineers

Figure 59

18461-007-01 Date Exported: 10/06/17

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Tau/Sigma Ratio
	Compacted Fill	Mohr-Coulomb	125	0	38	
	Sands (1)	Mohr-Coulomb	100	0	30	
	Sands (2)	Mohr-Coulomb	120	0	41	
	Silts/Clays	S=f(overburden)	95			0.23
	Cooper Group Limestone	Mohr-Coulomb	120	6,000	0	
	Sands (3) - Residual	S=f(overburden)	100			0.09
	Sands (4) - Residual	S=f(overburden)	100			0.09
	Hawthorn Marl - Seismic	Mohr-Coulomb	120	3,400	0	
	Sands (1) - Improved	Mohr-Coulomb	100	348	30	
	Sands (2) - Improved	Mohr-Coulomb	120	348	41	
	Silts/Clays - Improved	Mohr-Coulomb	95	348	13	
	Sands (3) - Residual Improved	Mohr-Coulomb	100	348	5.1	
	Sands (4) - Residual Improved	Mohr-Coulomb	100	348	5.1	
	Abutment	High Strength	150			
	Rip-Rap	High Strength	140			

Horz Seismic Coef.: 0.29



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Data Source: GeoStudio 2016 v. 8.16.1.13452 – Slope/W Analysis

Global Stability - Earthquake (Improved)
East Abutment (Station 102+50 to 105+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

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Figure 60

18461-007-01 Date Exported: 10/06/17

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Data Source: Aerial from Google Earth Pro dated 10/30/2016.

Projection: NAD83 South Carolina State Planes, US Foot

Legend

EB-1 Proposed Boring

CPT-1 Proposed Cone Penetrometer Test

DMT-1 Proposed Dilatometer Test

N E S W

400 0 400
Feet

Proposed Field Investigation Plan

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GEOENGINEERS

Figure 61

P:\18\18461007\CAD\01\Geotech\1849100701_F60_Proposed Field Investigation Plan.dwg TAB:F60 Date Exported: 10/10/17 - 13:42 by mwoods

APPENDICES

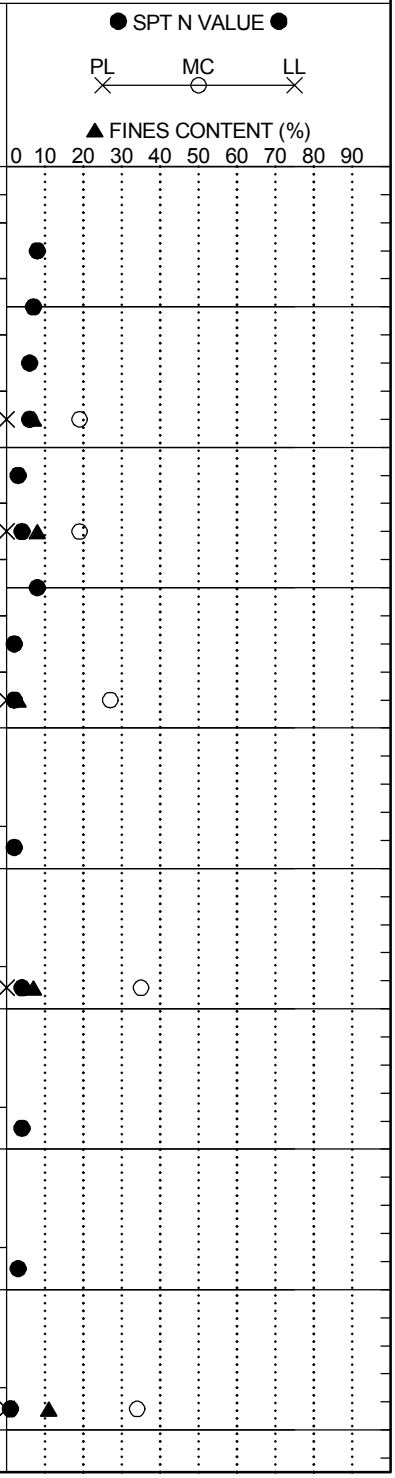
GeoEngineers

APPENDIX A
Field Explorations

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-1		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	R. Wessinger	**Boring Location:**	45+50	**Offset:**	7.4'-LT	**Alignment:**	ALT 1B
Elev.:	10.9 ft	**Latitude:**	32.408695	**Longitude:**	-80.465492	**Date Started:**	8/26/2014
Total Depth:	125 ft	**Soil Depth:**	125 ft	**Core Depth:**	N/A ft	**Date Completed:**	8/28/2014
Bore Hole Diameter (in):	6	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	82%
Core Size:	N/A	**Driller:**	Independence	**Groundwater:**	**TOB** NR	**24HR**	8.3 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	Road							
	0.8	Asphalt (9.5")							
		EMBANKMENT FILL	1.0						
		Loose to Very Loose, Moist, Dark Yellowish Brown, Non-Plastic, Strongly Reactive, Poorly Graded Fine to Coarse SAND (SP-SM/A-1-b) with Silt and Gravel and Trace of Organics, Munsell=10YR 4/4	2.0	SS-1	12	14			
			4.0	SS-2	6	4	4	4	8
5.9			6.0	SS-3	5	3	4	4	7
		@SS-3: Organics=1.15%	8.0	SS-4	5	2	4	4	6
		@SS-4: Organics=1.07%	10.0	SS-5	4	2	4	2	6
0.9		@SS-5: Dark Gray, Munsell=5Y 4/1, LL=NP, PL=NP, PI=NP, NMC=19.3%, %#200=7.3	12.0	SS-6	1	1	2	2	3
		@SS-6: Wet, Weakly Reactive	14.0	SS-7	3	2	2	4	4
-4.1		@SS-7: Fine Sand, (A-3), LL=NP, PL=NP, PI=NP, NMC=19.2%, %#200=8.0	16.0	SS-8	4	4	4	4	8
		@SS-8: Organics=0.31%	18.0	SS-9	1	1	1	2	2
	18.0	**ENGINEERED FILL**		SS-10	1	1	1	WOH	2
-9.1		Very Loose, Wet, Dark Gray, Non-Plastic, Weakly Reactive, Poorly Graded Fine SAND (SP/A-3), Munsell=5Y 4/1	23.5	SS-11	1	1	1		2
		@SS-10: LL=NP, PL=NP, PI=NP, NMC=27.4%, %#200=3.3							
-14.1									
	28.0	**HOLOCENE**	28.5	SS-12	1	2	2		4
-19.1		Very Loose, Wet, Very Dark Greenish Gray, Non-Plastic, Weakly Reactive, Poorly Graded Fine SAND (SP-SM/A-3) with Silt and Trace of Shell Fragments, Munsell=5GY 3/1	33.5	SS-13	2	2	2		4
		@SS-12: LL=NP, PL=NP, PI=NP, NMC=34.7%, %#200=7.4							
-24.1									
			38.5	SS-14	2	1	2		3
-29.1									
		@SS-15: (A-2-4), LL=NP, PL=NP, PI=NP, NMC=33.8%, %#200=11.0	43.5	SS-15	1/12"	1			1
-34.1									
	46.5								



LEGEND

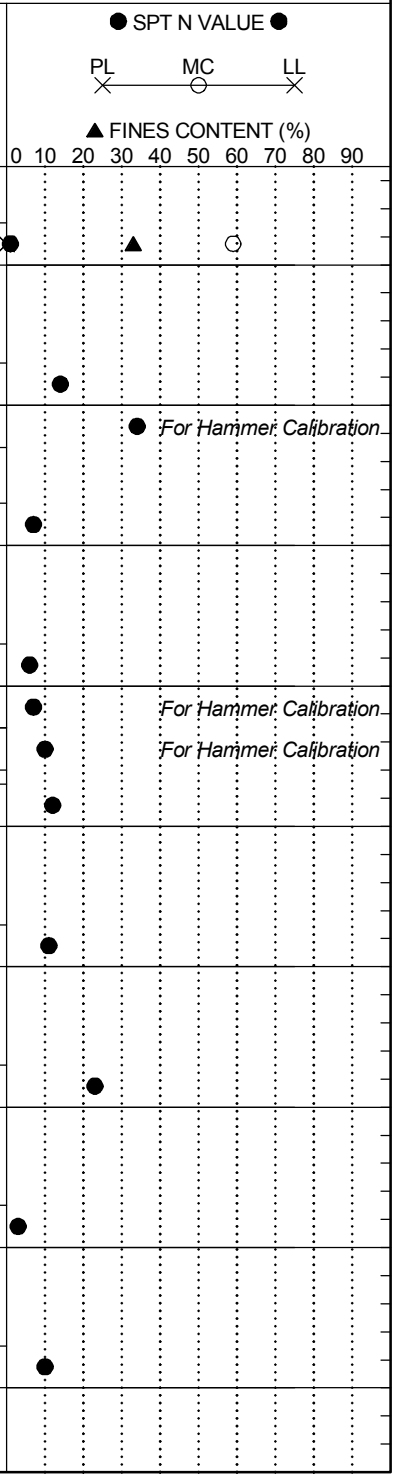
Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-1		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	R. Wessinger	**Boring Location:**	45+50	**Offset:**	7.4'-LT	**Alignment:**	ALT 1B
Elev.:	10.9 ft	**Latitude:**	32.408695	**Longitude:**	-80.465492	**Date Started:**	8/26/2014
Total Depth:	125 ft	**Soil Depth:**	125 ft	**Core Depth:**	N/A ft	**Date Completed:**	8/28/2014
Bore Hole Diameter (in):	6	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	82%
Core Size:	N/A	**Driller:**	Independence	**Groundwater:**	**TOB** NR	**24HR**	8.3 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	Remarks
		Very Loose, Wet, Very Dark Greenish Gray, Non-Plastic, Weakly Reactive, Silty Fine SAND (SM/A-2-4), Munsell=5GY 3/1	48.5	SS-16	WOH/12"				1	
-39.1	51.0	@SS-16: LL=NP, PL=NP, PI=NP, NMC=59.0%, %#200=33.2								
		HAWTHORN MARL	53.5							
		Stiff, Moist, Very Dark Greenish Olive, Low to Medium Plasticity, Weakly Reactive, SILT (ML/A-4) with Phosphate Nodules/Lenses, Munsell=5GY 3/2	55.0	SS-17	2	4	10		14	
-44.1				SS-18	4	26	8		34	For Hammer Calibration
		@SS-18: Hard	58.5							
		@SS-19: Firm to Stiff		SS-19	3	3	4		7	
-49.1			63.5							
			65.0	SS-20	3	3	3		6	
-54.1			66.5	SS-21	3	3	4		7	For Hammer Calibration
				SS-22	3	5	5		10	For Hammer Calibration
			68.5							
				SS-23	5	5	7		12	
-59.1			73.5							
				SS-24	2	4	7		11	
-64.1			78.5							
	79.5	@SS-25: Very Stiff		SS-25	5	5	18		23	
-69.1		**COOPER GROUP LIMESTONE**	83.5							
		Medium Dense, Moist, Light Greenish Gray, Non-Plastic to Low Plasticity, Strongly Reactive, Silty Fine to Coarse SAND (SM/A-2-4) with Phosphate Nodules and Trace of Shell Fragments, Munsell=5GY 7/1		SS-26	4	1	2		3	
-74.1		@SS-26: Very Loose to Loose	88.5							
				SS-27	3	3	7		10	
-79.1										



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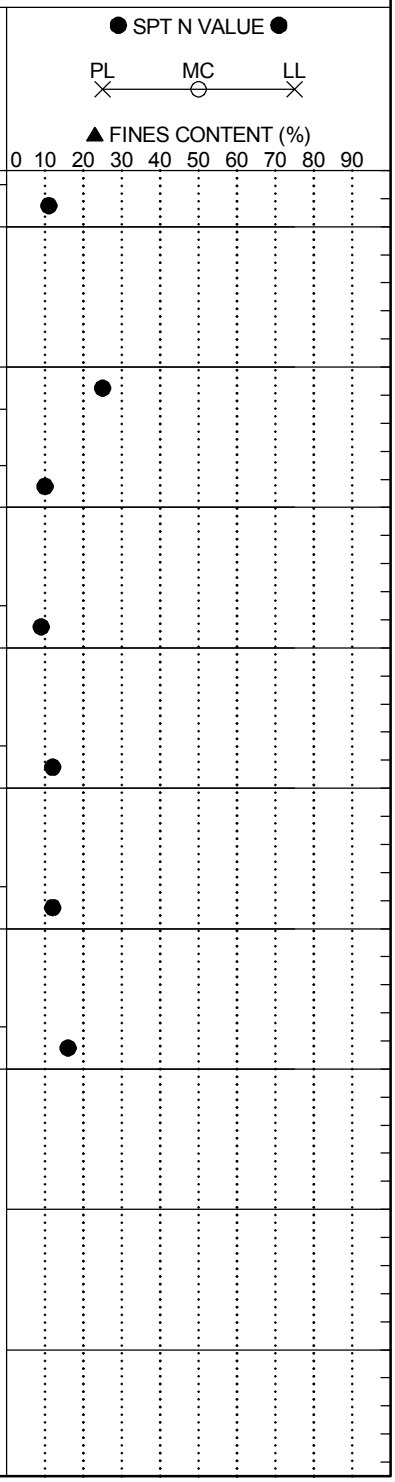
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-1		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	R. Wessinger	**Boring Location:**	45+50	**Offset:**	7.4'-LT	**Alignment:**	ALT 1B
Elev.:	10.9 ft	**Latitude:**	32.408695	**Longitude:**	-80.465492	**Date Started:**	8/26/2014
Total Depth:	125 ft	**Soil Depth:**	125 ft	**Core Depth:**	N/A ft	**Date Completed:**	8/28/2014
Bore Hole Diameter (in):	6	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	82%
Core Size:	N/A	**Driller:**	Independence	**Groundwater:**	**TOB** NR	**24HR**	8.3 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Medium Dense to Loose, Moist, Light Greenish Gray, Non-Plastic to Low Plasticity, Strongly Reactive, Silty Fine to Coarse SAND (SM/A-2-4) with Phosphate Nodules and Trace of Shell Fragments, Munsell=5GY 7/1		93.5	SS-28	2	4	7		11
-84.1										
-89.1				100.0	SS-29	6	12	13		25
				103.5	SS-30	2	5	5		10
-94.1										
				108.5	SS-31	2	4	5		9
-99.1										
				113.5	SS-32	3	4	8		12
-104.1		@SS-32: No Phosphate Nodules or Shell Fragments								
				118.5	SS-33	4	5	7		12
-109.1										
				123.5	SS-34	6	8	8		16
-114.1	125.0	Boring Terminated at 125.0 Feet								
-119.1										
-124.1										



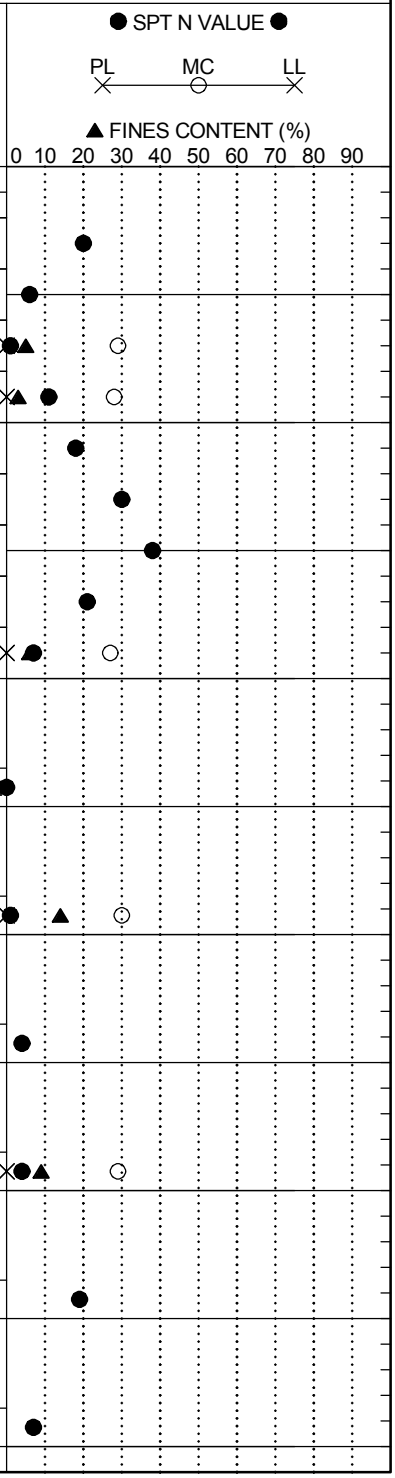
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862			**County:**	Beaufort	**Boring No.:**	B-2
Site Description:	US 21 Bridge Replacement over Harbor River					**Route:**	US 21
Eng./Geo.:	R. Wessinger	**Boring Location:**	109+84	**Offset:**	28.4'-RT	**Alignment:**	ALT 1B
Elev.:	8.6 ft	**Latitude:**	32.401896	**Longitude:**	-80.446292	**Date Started:**	9/2/2014
Total Depth:	125 ft	**Soil Depth:**	125 ft	**Core Depth:**	N/A ft	**Date Completed:**	9/3/2014
Bore Hole Diameter (in):	6	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	82%
Core Size:	N/A	**Driller:**	Independence	**Groundwater:**	**TOB** NR	**24HR**	5.9 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	Road							
	1.0	Asphalt (11.5")	1.0						
		EMBANKMENT FILL Medium Dense to Loose, Dry to Moist, Very Pale Brown, Non-Plastic, Weakly Reactive, Poorly Graded Fine SAND (SP/A-3) with Trace of Organics, Munsell=10YR 7/3	2.0	SS-1	11	15			
			4.0	SS-2	9	10	10	10	20
3.6			6.0	SS-3	3	4	2	2	6
		@SS-3: Dark Olive Brown, Munsell=2.5Y 3/3, Organics=0.56%	8.0	SS-4	1/12"	1	1		1
-1.4		@SS-4: Very Loose, Wet, Very Dark Grayish Brown, Munsell=2.5Y 3/2, LL=NP, PL=NP, PI=NP, NMC=28.7%, %#200=4.9	10.0	SS-5	7	6	5	4	11
		@SS-5: Medium Dense to Dense, LL=NP, PL=NP, PI=NP, NMC=27.9%, %#200=2.5	12.0	SS-6	3	4	14	16	18
-6.4		@SS-6: Organics=0.45%	14.0	SS-7	4	10	20	23	30
			16.0	SS-8	8	18	20	17	38
	18.0		18.0	SS-9	6	11	10	8	21
		ENGINEERED FILL Loose to Very Loose, Wet, Gray, Non-Plastic, Weakly Reactive, Fine SAND (SP-SM/A-3) with Silt and Trace of Organics, Munsell=5Y 5/1		SS-10	3	3	4	8	7
-11.4			23.5	SS-11	WOH/18"				WOH
-16.4		@SS-10: LL=NP, PL=NP, PI=NP, NMC=26.5%, %#200=6.3							
	27.0	@SS-11: Very Dark Greenish Gray, Munsell=5GY 3/1, Organics=1.25%	28.5	SS-12	1/12"	1			1
-21.4		**HOLOCENE** Very Loose, Wet, Very Dark Greenish Gray, Non-Plastic, Weakly Reactive, Silty Fine SAND (SM/A-2-4), Munsell=5GY 3/1	33.5	SS-13	1	2	2		4
-26.4		@SS-12: LL=NP, PL=NP, PI=NP, NMC=30.3%, %#200=14.0							
	37.0	Very Loose, Wet, Dark Gray, Non-Plastic, Weakly Reactive, Poorly Graded Fine SAND (SP-SM/A-3) with Silt and Trace of Shell Fragments, Munsell=10Y 4/1	38.5	SS-14	1	3	1		4
-31.4		@SS-14: LL=NP, PL=NP, PI=NP, NMC=29.3%, %#200=8.8	43.5	SS-15	3	9	10		19
-36.4		@SS-15: Medium Dense to Loose	48.5	SS-16	2	3	4		7
-41.4									



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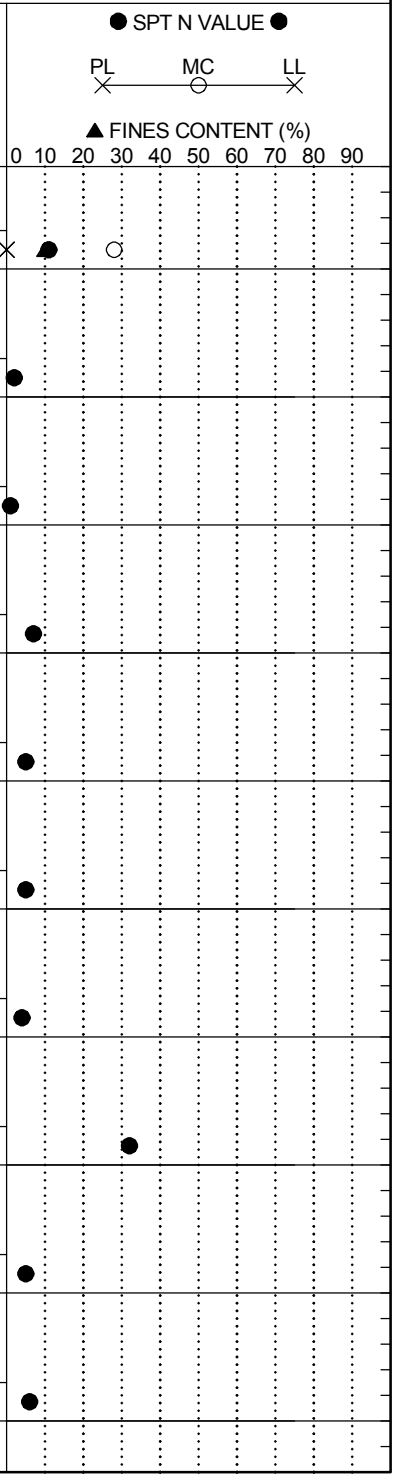
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-2		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	R. Wessinger	**Boring Location:**	109+84	**Offset:**	28.4'-RT	**Alignment:**	ALT 1B
Elev.:	8.6 ft	**Latitude:**	32.401896	**Longitude:**	-80.446292	**Date Started:**	9/2/2014
Total Depth:	125 ft	**Soil Depth:**	125 ft	**Core Depth:**	N/A ft	**Date Completed:**	9/3/2014
Bore Hole Diameter (in):	6	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	82%
Core Size:	N/A	**Driller:**	Independence	**Groundwater:**	**TOB** NR	**24HR**	5.9 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Medium Dense, Wet, Dark Gray, Non-Plastic, Weakly Reactive, Poorly Graded Fine SAND (SP-SM/A-3) with Silt and Trace of Shell Fragments, Munsell=10Y 4/1	53.5	SS-17	2	4	7		11
-46.4		@SS-17: Very Dark Grayish Green, Munsell=5Y 3/2, LL=NP, PL=NP, PI=NP, NMC=28.4%, %#200=10.0							
		@SS-18: Very Loose	58.5	SS-18	1	1	1		2
-51.4									
	62.0								
		Very Soft, Wet, Very Dark Gray, Low to Medium Plasticity, Weakly Reactive, CLAY (CL/A-6), Munsell=5Y 3/1	63.5	SS-19	WOH/12"		1		1
-56.4									
	67.0								
		Loose, Wet, Dark Gray, Non-Plastic, Weakly Reactive, Fine SAND (SP-SM/A-3) with Silt, Munsell=5Y 4/1	68.5	SS-20	1	3	4		7
-61.4									
	74.0		73.5	SS-21	1	2	3		5
-66.4		**HAWTHORN MARL** Firm to Soft, Moist, Dark Olive Gray, Non-Plastic to Low Plasticity, Weakly Reactive, SILT (ML/A-4), Munsell=5Y 3/2							
			78.5	SS-22	1	1	4		5
-71.4									
		@SS-23: Strongly Reactive	83.5	SS-23	2	2	2		4
-76.4									
	87.0								
		COOPER GROUP LIMESTONE Dense, Moist, Olive, Non-Plastic, Strongly Reactive, Silty Fine to Coarse SAND (SM/A-2-4) with Phosphate Nodules/Lenses, Munsell=5Y 4/3	88.5	SS-24	20	26	6		32
-81.4									
		@SS-25: Loose to Very Loose, Light Olive Gray, Munsell=5Y 6/2	93.5	SS-25	1	1	4		5
-86.4									
		@SS-26: Greenish Gray, Munsell=10Y 6/1	98.5	SS-26	2	2	4		6
-91.4									



LEGEND

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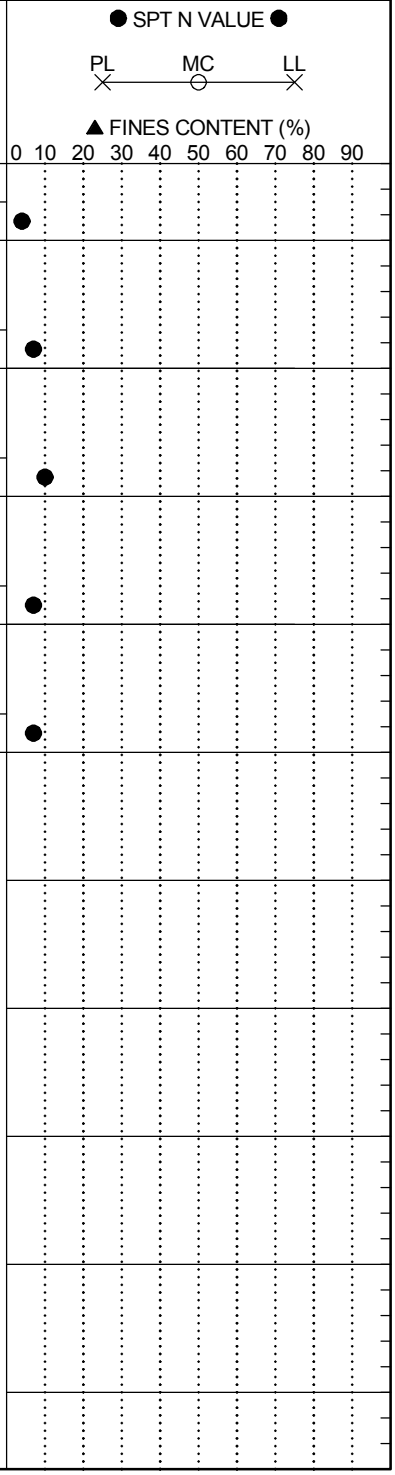
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-2		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	R. Wessinger	**Boring Location:**	109+84	**Offset:**	28.4'-RT	**Alignment:**	ALT 1B
Elev.:	8.6 ft	**Latitude:**	32.401896	**Longitude:**	-80.446292	**Date Started:**	9/2/2014
Total Depth:	125 ft	**Soil Depth:**	125 ft	**Core Depth:**	N/A ft	**Date Completed:**	9/3/2014
Bore Hole Diameter (in):	6	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	82%
Core Size:	N/A	**Driller:**	Independence	**Groundwater:**	**TOB** NR	**24HR**	5.9 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Very Loose to Loose, Moist, Olive, Non-Plastic, Strongly Reactive, Silty Fine to Coarse SAND (SM/A-2-4) with Phosphate Nodules/Lenses, Munsell=5Y 4/3		103.5	SS-27	1	2	2		4
-96.4				108.5	SS-28	1	2	5		7
-101.4				113.5	SS-29	1	4	6		10
-106.4				118.5	SS-30	2	2	5		7
-111.4				123.5	SS-31	2	3	4		7
-116.4	125.0	Boring Terminated at 125.0 Feet								
-121.4										
-126.4										
-131.4										
-136.4										
-141.4										



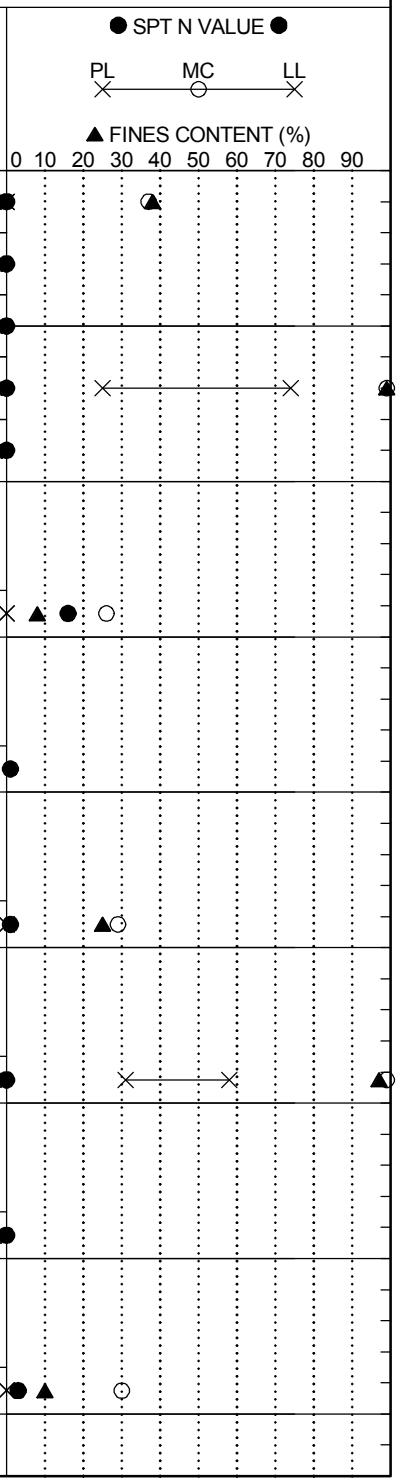
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-3		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	J. Stewart	**Boring Location:**	39+79	**Offset:**	81.5'-LT	**Alignment:**	ALT 1B
Elev.:	2.5 ft	**Latitude:**	32.409483	**Longitude:**	-80.467111	**Date Started:**	9/15/2015
Total Depth:	80 ft	**Soil Depth:**	80 ft	**Core Depth:**	N/A ft	**Date Completed:**	9/15/2015
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Deidrich D-25	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	80%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0.5 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	Marsh	0.0	SS-1	WOR/12"	WOH/12"			WOH
		HOLOCENE	2.0	SS-2	WOR/24"				WOR
		Very Loose, Wet, Black, Non-Plastic, Silty Fine SAND (SM/A-4(0)), Munsell=GLEY1 2.5/N	4.0	SS-3	WOR/24"				WOR
	4.0	@SS-1: LL=NP, PL=NP, PI=NP, NMC=36.9%, %#200=37.5	6.0	SS-4	WOR/24"				WOR
-2.5		@SS-2: No Recovery	8.0	SS-5	WOR/18"	1			WOR
		Very Soft, Wet, Black, High Plasticity, Elastic SILT (MH/A-7-5(36)) with Trace of Organics, Munsell=GLEY1 2.5/N							
	9.8	@SS-3: Organics=3.55%							
-7.5		@SS-4: LL=74, PL=49, PI=25, NMC=151.6%, %#200=98.5	13.5	SS-6	12	8	8		16
		Very Loose, Wet, Dark Greenish Gray, Non-Plastic, Poorly Graded Fine SAND (SP-SM/A-3) with Silt, Munsell=GLEY1 4/10Y							
-12.5		@SS-6: Medium Dense, Greenish Gray, Moist, Munsell=GLEY1 5/N, LL=NP, PL=NP, PI=NP, NMC=26.1%, %#200=7.7	18.5	SS-7	1	1/12"			1
	19.5	@SS-7: Very Loose, Moist to Wet							
-17.5		Very Loose, Moist to Wet, Black, Non-Plastic, Silty Fine to Coarse SAND (SM/A-2-4) with Gravel and Shells, Munsell=GLEY1 2.5N	23.5	SS-8	1/12"		1		1
-22.5		@SS-8: Very Dark Greenish Gray, Munsell=GLEY1 3/10Y, LL=NP, PL=NP, PI=NP, NMC=29.3%, %#200=24.5							
	28.5	Very Soft, Moist to Wet, Very Dark Greenish Gray, High Plasticity, Elastic SILT (MH/A-7-5(32)) with Trace of Shells, Munsell=GLEY1 3/10Y	28.5	SS-9	WOH/18"				WOH
-27.5		@SS-9: LL=58, PL=31, PI=27, NMC=101.1%, %#200=96.6	33.5	SS-10	WOH/18"				WOH
	33.5	Very Loose, Moist to Wet, Very Dark Greenish Gray, Non-Plastic, Poorly Graded Fine SAND (SP-SM/A-3) with Silt and Trace of Shells, Munsell=GLEY1 3/10Y							
-32.5		@SS-11: LL=NP, PL=NP, PI=NP, NMC=30.2%, %#200=10.4	38.5	SS-11	WOH	1	2		3
-37.5									



LEGEND

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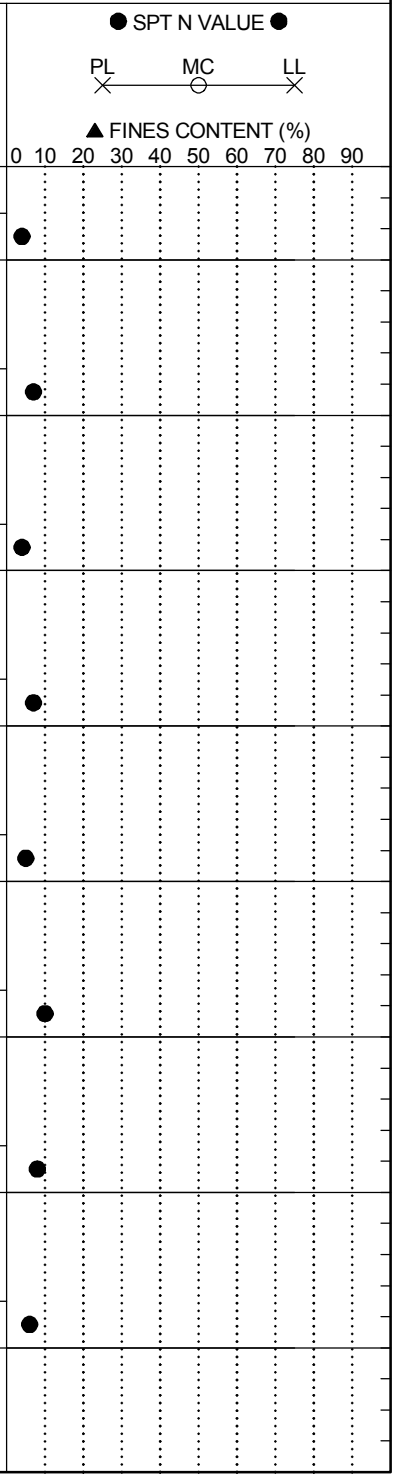
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-3		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	J. Stewart	**Boring Location:**	39+79	**Offset:**	81.5'-LT	**Alignment:**	ALT 1B
Elev.:	2.5 ft	**Latitude:**	32.409483	**Longitude:**	-80.467111	**Date Started:**	9/15/2015
Total Depth:	80 ft	**Soil Depth:**	80 ft	**Core Depth:**	N/A ft	**Date Completed:**	9/15/2015
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Deidrich D-25	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	80%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0.5 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Very Loose, Moist to Wet, Dark Gray, Non-Plastic, Poorly Graded Fine SAND (SP-SM/A-3) with Silt and Trace of Shells, Munsell=GLEY1 4/N	43.5	SS-12	4	3	1		4
-42.5	46.0	**HAWTHORN MARL** Firm to Soft, Moist, Dark Grayish Olive, Non-Plastic to Low Plasticity, SILT (ML/A-4), Munsell=10Y 4/2	48.5	SS-13	2	3	4		7
-47.5		@SS-14: Very Dark Grayish Brown, Munsell=10YR 3/2	53.5	SS-14	1	2	2		4
-52.5			58.5	SS-15	2	3	4		7
-57.5			63.5	SS-16	2	2	3		5
-62.5		@SS-17: Stiff, Olive Brown, Munsell=2.5Y 4/4	68.5	SS-17	4	4	6		10
-67.5	71.0	**COOPER GROUP LIMESTONE** Stiff to Firm, Moist, Light Greenish Gray, Non-Plastic, Strongly Reactive, SILT (ML/A-4) with Sand, Munsell=GLEY1 7/5GY	73.5	SS-18	4	5	3		8
-72.5	75.0	Loose, Moist, Light Gray/Black, Non-Plastic, Strongly Reactive, Silty Fine to Medium SAND (SM/A-2-4) with Trace of Shells, Munsell=GLEY1 7/N and 2.5/N	78.5	SS-19	4	2	4		6
-77.5	80.0	@SS-19: Light Greenish Gray, Munsell=GLEY1 7/5GY							
		Boring Terminated at 80.0 feet							



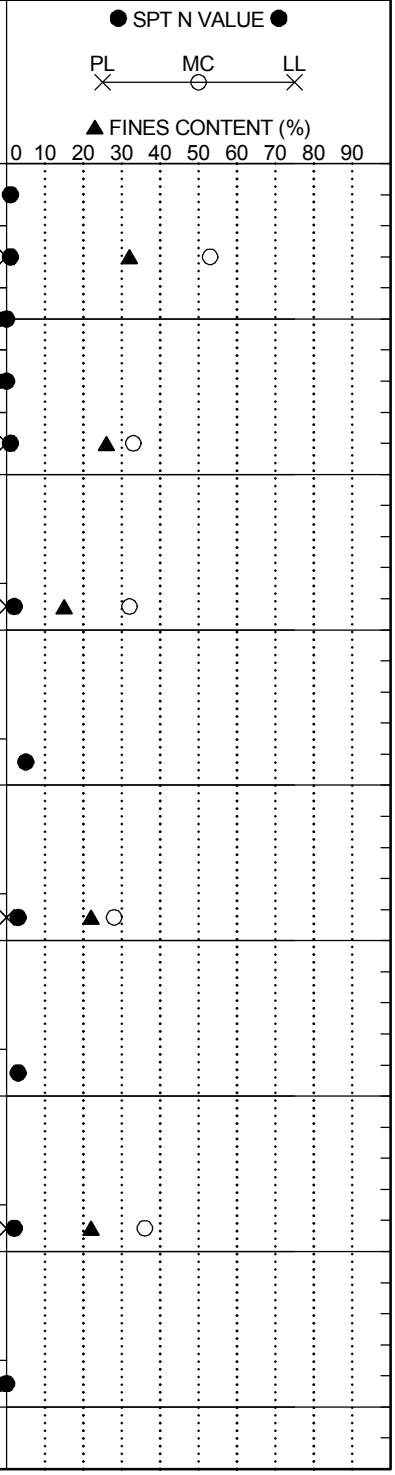
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-4		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	R. Wessinger	**Boring Location:**	53+45	**Offset:**	92.6'-LT	**Alignment:**	ALT 1B
Elev.:	2.4 ft	**Latitude:**	32.408077	**Longitude:**	-80.463008	**Date Started:**	9/16/2015
Total Depth:	80 ft	**Soil Depth:**	80 ft	**Core Depth:**	N/A ft	**Date Completed:**	9/16/2015
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Deidrich D-25	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	80%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 2 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	Marsh							
		HOLOCENE	0.0	SS-1	WOH/12"		12"		1
		Very Loose, Wet, Dark Grayish Brown, Non-Plastic, Silty Fine SAND (SM/A-2-4) with Trace of Organics, Munsell=2.5Y 4/2	2.0	SS-2	WOH/12"		1		1
		@SS-2: LL=NP, PL=NP, PI=NP, NMC=52.5%, %#200=31.9	4.0	SS-3	WOH/24"				WOH
-2.6	5.0	@SS-3: Organics=2.68%	6.0	SS-4	WOH/24"				WOH
	7.5	Very Soft, Wet, Dark Olive Gray, Medium to High Plasticity, CLAY (CL/A-7) with Trace of Shells, Munsell=5Y 3/2	8.0	SS-5	WOH/12"		1		1
-7.6		Very Loose to Loose, Wet, Dark Gray, Non-Plastic, Silty Fine SAND (SM/A-2-4), Munsell=5Y 4/1							
		@SS-5: LL=NP, PL=NP, PI=NP, NMC=32.9%, %#200=26.0	13.5	SS-6	1	1	1		2
-12.6		@SS-6: LL=NP, PL=NP, PI=NP, NMC=31.8%, %#200=15.1							
		@SS-7: Olive Gray, Munsell=5Y 5/2	18.5	SS-7	2	3	2		5
-17.6									
		@SS-8: Dark Olive Gray, with Trace of Shells, Munsell=5Y 3/2, LL=NP, PL=NP, PI=NP, NMC=27.8%, %#200=22.0	23.5	SS-8	2	2	1		3
-22.6									
		@SS-9: Greenish Gray, Munsell=GLEY1 5/1	28.5	SS-9	1	2	1		3
-27.6									
		@SS-10: LL=NP, PL=NP, PI=NP, NMC=35.8%, %#200=21.6	33.5	SS-10	WOH	1	1		2
-32.6									
			38.5	SS-11	WOH/18"				WOH
-37.6									



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LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-4		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	R. Wessinger	**Boring Location:**	53+45	**Offset:**	92.6'-LT	**Alignment:**	ALT 1B
Elev.:	2.4 ft	**Latitude:**	32.408077	**Longitude:**	-80.463008	**Date Started:**	9/16/2015
Total Depth:	80 ft	**Soil Depth:**	80 ft	**Core Depth:**	N/A ft	**Date Completed:**	9/16/2015
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Deidrich D-25	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	80%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 2 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%)
		Very Loose, Wet, Greenish Gray, Non-Plastic, Silty Fine SAND (SM/A-2-4), Munsell=GLEY1 5/1	43.5	SS-12	1	2	2		4	
-42.6			48.5	SS-13	2	1	1		2	
		@SS-13: LL=NP, PL=NP, PI=NP, NMC=31.8%, %#200=17.0								
-47.6	51.0	**HAWTHORN MARL** Very Soft to Soft, Wet, Olive Gray, Non-Plastic, SILT (ML/A-4) with Sand, Calcaceous, Munsell=5Y 4/2	53.5	SS-14	2	2	2		4	
-52.6			58.5	SS-15	1	3	4		7	
	58.5	Firm, Moist, Dark Olive Gray, High Plasticity, Sandy Elastic SILT (MH/A-7-5(16)), Calcaceous, Munsell=5Y 3/2								
-57.6			63.5	SS-16	3	3	4		7	
-62.6		@SS-16: Very Dark Grayish Brown, Munsell=2.5Y 3/2, LL=71, PL=35, PI=26, NMC=64.5%, %#200=53.1								
		@SS-17: Olive Gray, Munsell=5Y 4/2	68.5	SS-17	2	2	4		6	*Last Casing Shoe, Switched to*
-67.6	72.5	**COOPER GROUP LIMESTONE** @SS-18: No Recovery	73.5	SS-18	50/5"				100+	*Roller Cone*
-72.6			78.5	SS-19	3	4	5		9	
	78.5	Loose, Wet, Light Olive Gray, Non-Plastic, Strongly Reactive, Silty Fine SAND (SM/A-2-4) with Phosphate Nodules, Calcaceous, Munsell=5Y 6/2								
-77.6	80.0	Boring Terminated at 80.0 feet								

LEGEND

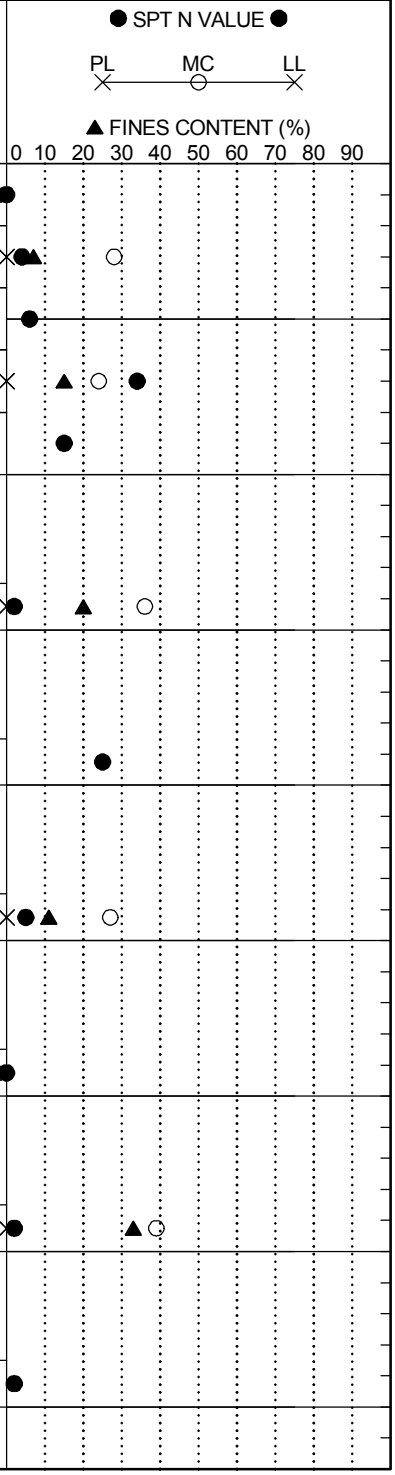
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-5		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	R. Wessinger	**Boring Location:**	116+48	**Offset:**	81.7'-LT	**Alignment:**	ALT 1B
Elev.:	2.7 ft	**Latitude:**	32.400844	**Longitude:**	-80.444475	**Date Started:**	9/17/2015
Total Depth:	80 ft	**Soil Depth:**	80 ft	**Core Depth:**	N/A ft	**Date Completed:**	9/17/2015
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Deidrich D-25	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	80%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION
	0.0	Marsh
	1.0	**HOLOCENE**
		Very Soft, Moist, Olive Brown, Medium to High Plasticity, SILT (ML/A-7), Munsell=2.5Y 4/3
-2.3	6.0	Very Loose to Loose, Wet, Dark Grayish Brown, Non-Plastic, Poorly Graded Fine SAND (SP-SM/A-3) with Silt and Trace of Organics, Munsell=2.5Y 4/2
		@SS-2: LL=NP, PL=NP, PI=NP, NMC=27.9%, %#200=6.6
-7.3		@SS-3: Dark Gray, Munsell=5Y 4/1
		Dense to Medium Dense, Wet, Gray, Non-Plastic, Silty Fine SAND (SM/A-2-4) with Trace of Shells and Organics, Munsell=5Y 5/1
-12.3		@SS-4: LL=NP, PL=NP, PI=NP, NMC=24.1%, %#200=14.6
		@SS-5: Greenish Gray, Munsell=GLEY1 5/10Y, Organics=0.27%
	18.5	@SS-6: Very Loose, LL=NP, PL=NP, PI=NP, NMC=36.1%, %#200=19.7
-17.3		Medium Dense to Loose, Wet, Greenish Gray, Non-Plastic, Poorly Graded Fine SAND (SP-SM/A-3) with Silt and Trace of Shells, Munsell=GLEY1 5/10Y
-22.3		@SS-8: LL=NP, PL=NP, PI=NP, NMC=26.8%, %#200=10.5
	28.5	
-27.3		Very Loose to Loose, Wet, Dark Greenish Gray, Non-Plastic, Silty Fine to Medium SAND (SM/A-2-4), Munsell=GLEY1 4/5GY
-32.3		@SS-10: LL=NP, PL=NP, PI=NP, NMC=39.0%, %#200=32.8
-37.3		

Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
0.0	SS-1	WOH/24"				WOH
2.0	SS-2	1	2	2	6	4
4.0	SS-3	2	3	3	4	6
6.0	SS-4	10	17	17	27	34
8.0	SS-5	5	5	10	15	15
13.5	SS-6	2	1	1		2
18.5	SS-7	4	11	14		25
23.5	SS-8	4	3	2		5
28.5	SS-9	WOH/18"				WOH
33.5	SS-10	WOH	1	1		2
38.5	SS-11	WOH	1	1		2



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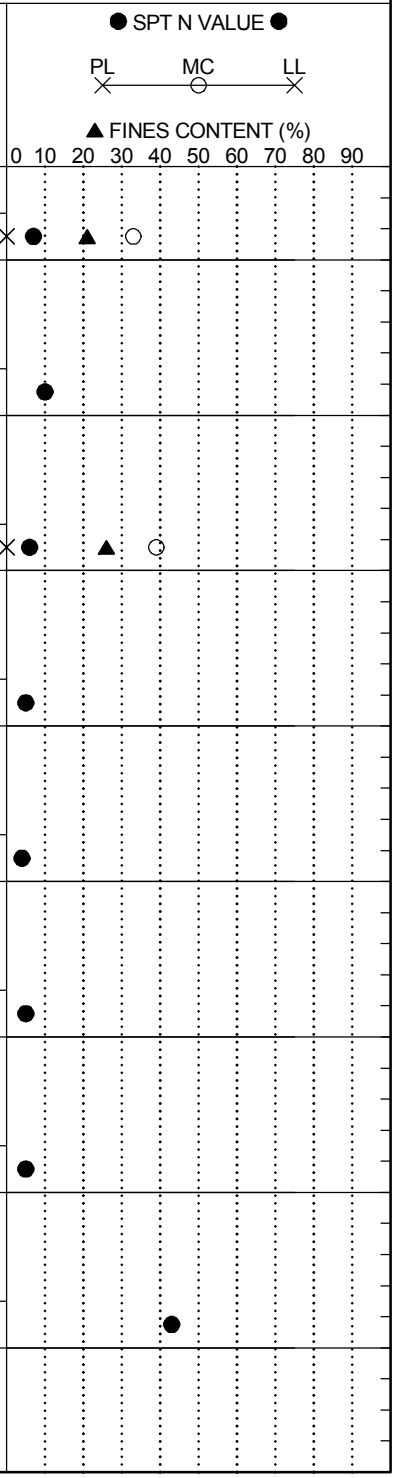
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-5		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	R. Wessinger	**Boring Location:**	116+48	**Offset:**	81.7'-LT	**Alignment:**	ALT 1B
Elev.:	2.7 ft	**Latitude:**	32.400844	**Longitude:**	-80.444475	**Date Started:**	9/17/2015
Total Depth:	80 ft	**Soil Depth:**	80 ft	**Core Depth:**	N/A ft	**Date Completed:**	9/17/2015
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Deidrich D-25	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	80%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Loose, Wet, Dark Greenish Gray, Non-Plastic, Silty Fine to Medium SAND (SM/A-2-4), Munsell=GLEY1 4/5GY	43.5	SS-12	2	3	4		7
-42.3		@SS-12: LL=NP, PL=NP, PI=NP, NMC=33.4%, %#200=20.9							
			48.5	SS-13	2	4	6		10
-47.3		@SS-13: Greenish Gray, with Trace of Shells, Munsell=GLEY1 5/10Y							
			53.5	SS-14	1	2	4		6
-52.3		@SS-14: LL=NP, PL=NP, PI=NP, NMC=38.9%, %#200=26.0							
	58.5	**HAWTHORN MARL**	58.5	SS-15	2	2	3		5
-57.3		Firm to Soft, Moist, Olive, Medium to High Plasticity, Elastic SILT (MH/A-7), Munsell=5Y 4/4							
		@SS-16: Non-Reactive	63.5	SS-16	1	2	2		4
-62.3									
			68.5	SS-17	2	2	3		5
-67.3									
			73.5	SS-18	2	2	3		5
-72.3									
	79.5		78.5	SS-19	3	10	33		43
-77.3	80.0	**COOPER GROUP LIMESTONE** Dense, Wet, Dark Gray, Clayey GRAVEL (GC), Munsell=5Y 4/1							
		Boring Terminated at 80.0 feet							



LEGEND

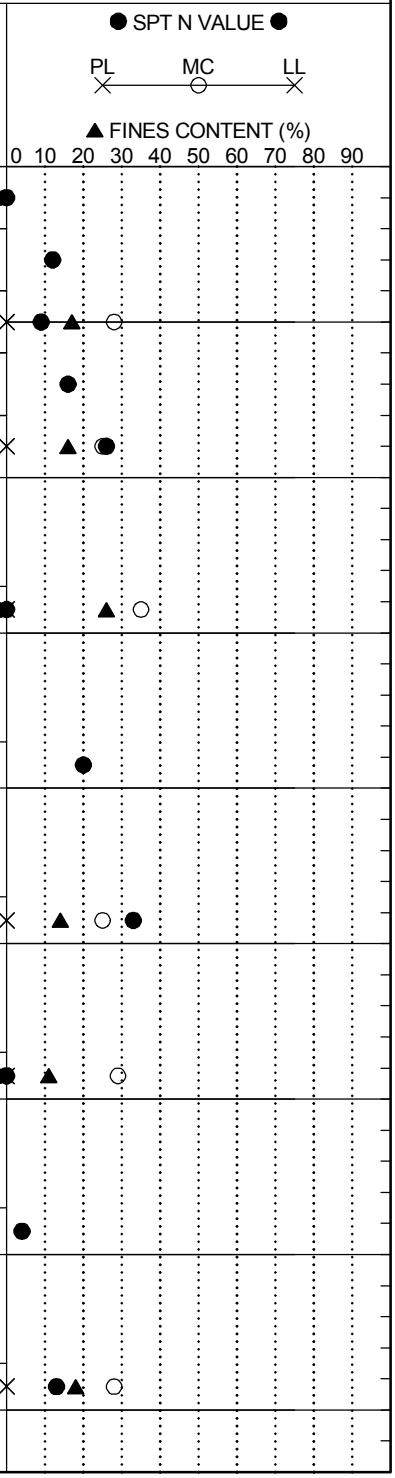
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-6		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	R. Wessinger	**Boring Location:**	119+93	**Offset:**	41.7'-LT	**Alignment:**	ALT 1B
Elev.:	2.3 ft	**Latitude:**	32.39997	**Longitude:**	-80.443953	**Date Started:**	9/18/2015
Total Depth:	80 ft	**Soil Depth:**	80 ft	**Core Depth:**	N/A ft	**Date Completed:**	9/18/2015
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Deidrich D-25	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	80%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION
	0.0	Marsh
		HOLOCENE
	2.0	Very Soft, Wet, Dark Olive, Non-Plastic to Low Plasticity, Sandy SILT (ML/A-4), Munsell=5Y 3/2
-2.7		Medium Dense to Loose, Wet, Dark Olive, Non-Plastic, Silty Fine SAND (SM/A-2-4) with Trace of Organics, Munsell=5Y 3/2
		@SS-2: Organics=0.53%
-7.7		@SS-3: Dark Grayish Brown, Munsell=2.5Y 4/2, LL=NP, PL=NP, PI=NP, NMC=28.4, %#200=17.2
		@SS-4: Grayish Olive/Greenish Gray, Munsell=10Y 5/2 & GLEY1 10Y 5/1
		@SS-5=> LL=NP, PL=NP, PI=NP, NMC=24.6%, %#200=15.7
-12.7		@SS-6: Very Loose, Dark Greenish Gray, Munsell=GLEY1 4/10Y, LL=NP, PL=NP, PI=NP, NMC=34.8%, %#200=26.1
-17.7		@SS-7: Medium Dense to Dense
-22.7		@SS-8: LL=NP, PL=NP, PI=NP, NMC=24.8%, %#200=13.7
	28.5	
-27.7		Very Loose, Wet, Greenish Gray, Non-Plastic, Poorly Graded Fine SAND (SP-SM/A-2-4) with Silt, Munsell=GLEY1 5/5GY
		@SS-9: LL=NP, PL=NP, PI=NP, NMC=28.8%, %#200=11.0
	33.5	
-32.7		Very Loose, Wet, Greenish Gray, Non-Plastic, Silty Fine SAND (SM/A-2-4), Munsell=GLEY1 5/5GY
-37.7		@SS-11: Medium Dense, LL=NP, PL=NP, PI=NP, NMC=27.5%, %#200=18.3

Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
0.0	SS-1	WOH/24"				WOH
2.0	SS-2	WOH	6	6	6	12
4.0	SS-3	2	2	7	7	9
6.0	SS-4	9	7	9	14	16
8.0	SS-5	6	10	16	20	26
13.5	SS-6	WOH/18"				WOH
18.5	SS-7	6	9	11		20
23.5	SS-8	11	14	19		33
28.5	SS-9	WOH/18"				WOH
33.5	SS-10	WOH	2	2		4
38.5	SS-11	3	3	10		13



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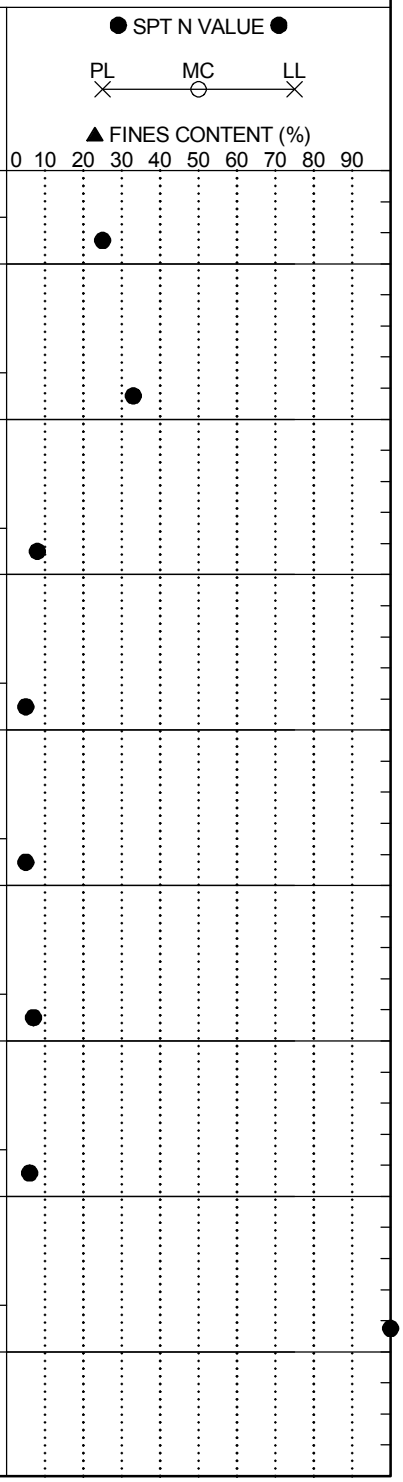
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-6		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	R. Wessinger	**Boring Location:**	119+93	**Offset:**	41.7'-LT	**Alignment:**	ALT 1B
Elev.:	2.3 ft	**Latitude:**	32.39997	**Longitude:**	-80.443953	**Date Started:**	9/18/2015
Total Depth:	80 ft	**Soil Depth:**	80 ft	**Core Depth:**	N/A ft	**Date Completed:**	9/18/2015
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Deidrich D-25	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	80%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Medium Dense to Dense, Wet, Greenish Gray, Non-Plastic, Silty Fine SAND (SM/A-2-4), Munsell=GLEY1 5/5GY	43.5	SS-12	9	10	15		25
-42.7			48.5	SS-13	8	17	16		33
-47.7		@SS-13: with Trace of Shell Fragments	53.5	SS-14	6	5	3		8
-52.7		@SS-14: Loose	58.5	SS-15	1	2	3		5
	56.0	**HAWTHORN MARL** Firm, Wet to Moist, Dark Olive Gray, Medium to High Plasticity, Sandy Elastic SILT (MH/A-7) with Phosphate Nodules, Calcaceous, Munsell=5Y 3/2	63.5	SS-16	1	2	3		5
-57.7			68.5	SS-17	2	3	4		7
-62.7			73.5	SS-18	1	2	4		6
-67.7			78.5	SS-19	4	50/5"			100+
-72.7									
	79.0								
-77.7	80.0	**COOPER GROUP LIMESTONE** Hard, Moist, Dark Olive Brown, Low Plasticity, Sandy SILT (ML/A-4) with Trace of Gravel, Calcaceous, Munsell=2.5Y 3/3							
		Boring Terminated at 80.0 feet							



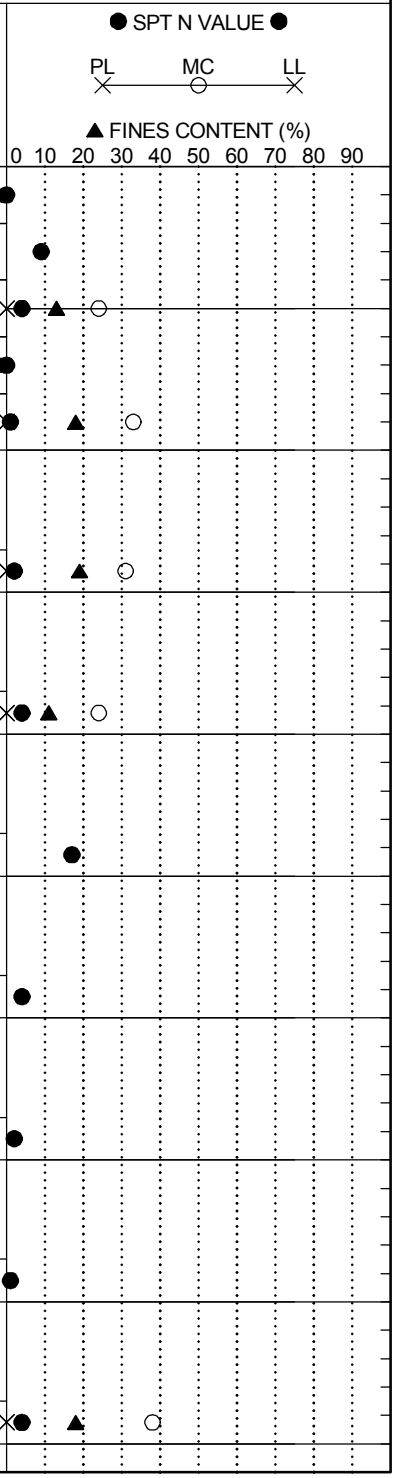
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-7		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	57+99	**Offset:**	45.9'-LT	**Alignment:**	ALT 1B
Elev.:	2.7 ft	**Latitude:**	32.407501	**Longitude:**	-80.461704	**Date Started:**	7/19/2016
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	N/A ft	**Date Completed:**	7/20/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	Marsh							
		HOLOCENE	0.0	SS-1	WOR/24"				WOR
	2.0	Very Soft, Wet, Dark Olive Gray, Low Plasticity, Weakly Reactive, SILT (ML) with Trace of Organics (Wood), Munsell=5Y 3/2	2.0	SS-2	2	4	5	4	9
-2.3		Loose to Very Loose, Wet, Gray, Non-Plastic, Strongly Reactive, Silty Fine to Medium SAND (SM/A-2-4) with Trace of Shell Fragments, Munsell=5Y 5/1	4.0	SS-3	2	3	1	1	4
		@SS-3: LL=NP, PL=NP, PI=NP, NMC=24.2%, %#200=12.8	6.0	SS-4	WOR/12"	WOH/12"			WOH
-7.3		@SS-4: No Recovery	8.0	SS-5	WOH/12"			2	1
		@SS-5: Very Dark Gray, Weakly Reactive, Munsell=5Y 3/1, LL=NP, PL=NP, PI=NP, NMC=33.1%, %#200=18.2	13.5	SS-6	WOH	1	1		2
-12.3		@SS-6: Weakly Reactive, Fine to Coarse Sand, LL=NP, PL=NP, PI=NP, NMC=31.3%, %#200=18.9							
	18.0	Very Loose, Wet, Very Dark Gray, Non-Plastic, Weakly Reactive, Poorly Graded Fine to Coarse SAND (SP-SM/A-2-4) with Silt, Munsell=5Y 3/1	18.5	SS-7	2	2	2		4
-17.3		@SS-7: LL=NP, PL=NP, PI=NP, NMC=24.2%, %#200=10.8	23.5	SS-8	7	8	9		17
-22.3		@SS-8: Medium Dense, Strongly Reactive	28.5	SS-9	3	2	2		4
-27.3		@SS-9: Very Loose, Dark Greenish Gray, Weakly Reactive, Munsell=GLEY1 4/10GY							
	32.0	Very Soft, Wet, Dark Greenish Gray, Low to Medium Plasticity, Weakly Reactive, Fine Sandy CLAY (CL), Munsell=GLEY1 4/5G	33.5	SS-10	2	1	1		2
-32.3									
	37.0	Very Loose to Loose, Wet, Dark Greenish Gray, Non-Plastic, Weakly Reactive, Silty Fine to Medium SAND (SM/A-2-4), Munsell=GLEY1 4/10GY	38.5	SS-11	1/12"		1		1
-37.3									
		@SS-12: LL=NP, PL=NP, PI=NP, NMC=38.0, %#200=17.9	43.5	SS-12	2	2	2		4
-42.3									



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LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-7		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	57+99	**Offset:**	45.9'-LT	**Alignment:**	ALT 1B
Elev.:	2.7 ft	**Latitude:**	32.407501	**Longitude:**	-80.461704	**Date Started:**	7/19/2016
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	N/A ft	**Date Completed:**	7/20/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	SPT N VALUE / FINES CONTENT (%)
		Loose, Wet, Dark Greenish Gray, Non-Plastic, Weakly Reactive, Silty Fine to Medium SAND (SM/A-2-4), Munsell=GLEY1 4/10GY	48.5	SS-13	1	2	3		5	Hard Lense from 52.5 to 53.0 feet
-47.3		@SS-13: Dark Gray, Munsell=GLEY1 4/N								
	53.5	**HAWTHORN MARL**	53.5	SS-14	4	5	5		10	
-52.3		Stiff, Wet, Olive Gray, Non-Plastic to Low Plasticity, Weakly Reactive, Sandy SILT (ML/A-4) with Phosphate Nodules, Munsell=5Y 4/2	58.5	SS-15	2	2	2		4	Hard Lense from 58.0 to 58.5 feet
-57.3		@SS-15: Soft to Firm	63.5	SS-16	3	4	4		8	
-62.3	68.5	Loose, Wet, Olive Gray, Non-Plastic to Low Plasticity, Non-Reactive, Silty Fine SAND (SM/A-2-4), Munsell=5Y 4/2	68.5	SS-17	3	4	4		8	
-67.3	74.0	**COOPER GROUP LIMESTONE**	73.5	SS-18	750/5.5"				100+	
-72.3		Very Dense, Wet, Dark Greenish Gray, Non-Plastic to Low Plasticity, Non-Reactive, Silty Fine SAND (SM/A-2-4) with Phosphate Nodules, Calcaceous, Munsell=GLEY1 4/5GY	78.5	SS-19	30	6	6		12	
-77.3		@SS-19: Medium Dense to Loose, Light Greenish Gray, Strongly Reactive, Munsell=GLEY1 7/5GY	83.5	SS-20	3	2	4		6	
-82.3		@SS-20: Greenish Gray, Fine to Medium Sand, Munsell=GLEY1 6/10Y	88.5	SS-21	2	3	3		6	
-87.3		@SS-21: No Recovery								

LEGEND

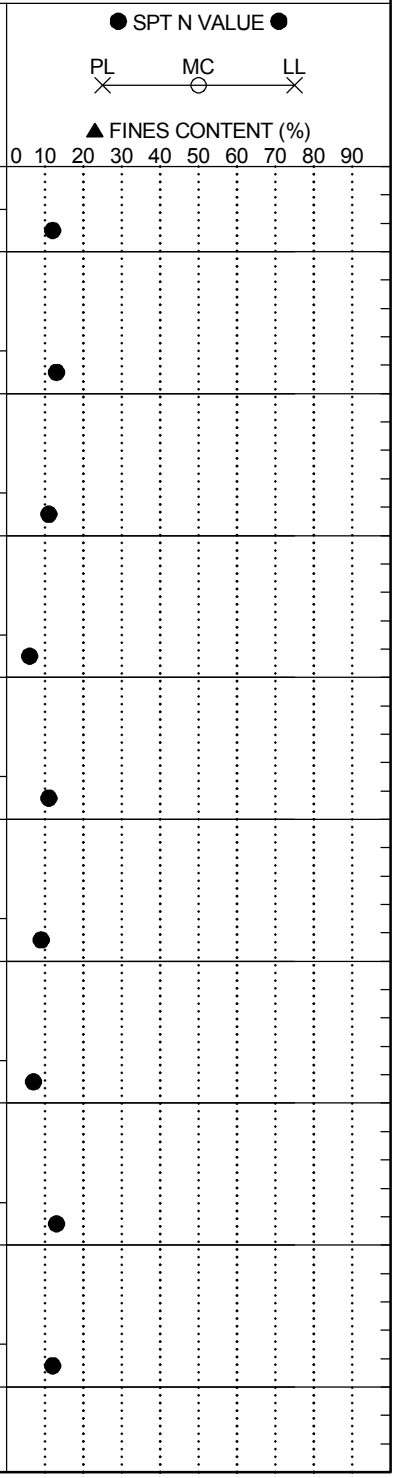
Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-7		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	57+99	**Offset:**	45.9'-LT	**Alignment:**	ALT 1B
Elev.:	2.7 ft	**Latitude:**	32.407501	**Longitude:**	-80.461704	**Date Started:**	7/19/2016
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	N/A ft	**Date Completed:**	7/20/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
				93.5	SS-22	3	5	7		12
-92.3		@SS-22: No Recovery								
				98.5	SS-23	4	6	7		13
-97.3		Medium Dense to Loose, Wet, Greenish Gray, Non-Plastic to Low Plasticity, Non-Reactive, Silty Fine to Medium SAND (SM/A-2-4) with Phosphate Nodules, Calcaceous, Munsell=GLEY1 6/10Y								
				103.5	SS-24	4	5	6		11
-102.3		@SS-24: Light Greenish Gray, Munsell=GLEY1 7/10Y								
				108.5	SS-25	3	3	3		6
-107.3										
				113.5	SS-26	4	5	6		11
-112.3										
				118.5	SS-27	3	3	6		9
-117.3										
				123.5	SS-28	3	3	4		7
-122.3		@SS-28: Fine Sand								
				128.5	SS-29	4	7	6		13
-127.3										
				133.5	SS-30	4	5	7		12
-132.3										



LEGEND

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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-7		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	57+99	**Offset:**	45.9'-LT	**Alignment:**	ALT 1B
Elev.:	2.7 ft	**Latitude:**	32.407501	**Longitude:**	-80.461704	**Date Started:**	7/19/2016
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	N/A ft	**Date Completed:**	7/20/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		Medium Dense to Loose, Wet, Light Greenish Gray, Non-Plastic to Low Plasticity, Non-Reactive, Silty Fine SAND (SM/A-2-4) with Phosphate Nodules, Calcaceous, Munsell=GLEY1 7/10Y		138.5	SS-31	4	5	6		11	
-137.3											
		@SS-32: Greenish Gray, Munsell=GLEY 1 6/5GY		143.5	SS-32	4	4	5		9	*Rod Slipped and Blow Counts*
-142.3											
				148.5	SS-33			6			*Not Recorded for Top Foot*
-147.3	150.0	Boring Terminated at 150.0 feet									
-152.3											
-157.3											
-162.3											
-167.3											
-172.3											
-177.3											

LEGEND

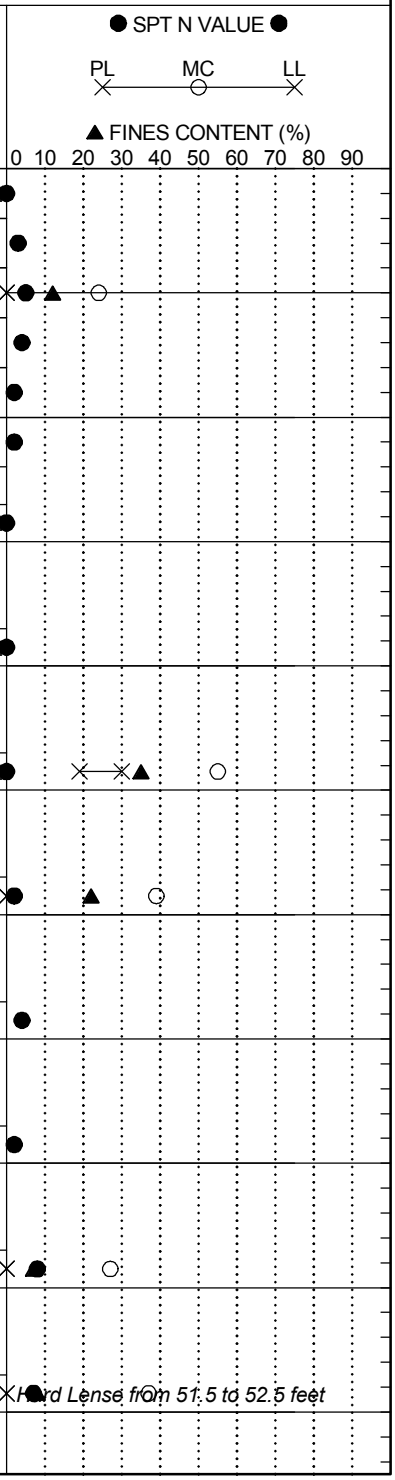
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-8		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	65+00	**Offset:**	0.1'-RT	**Alignment:**	ALT 1B
Elev.:	3.0 ft	**Latitude:**	32.406749	**Longitude:**	-80.459611	**Date Started:**	7/25/2016
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	N/A ft	**Date Completed:**	7/26/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	Marsh							
		HOLOCENE Very Loose to Loose, Wet, Dark Gray, Non-Plastic, Weakly Reactive, Poorly Graded Fine SAND (SP-SM/A-2-4) with Silt and Trace of Shell Fragments, Munsell=2.5Y 4/1	0.0	SS-1	WOH/24"				WOH
			2.0	SS-2	1	1	2	2	3
-2.0		@SS-2: Gray, Strongly Reactive, Munsell=5Y 5/1	4.0	SS-3	2	2	3	3	5
		@SS-3: LL=NP, PL=NP, PI=NP, NMC=24.0%, %#200=11.9	6.0	SS-4	2	3	1	1	4
-7.0			8.0	SS-5	2	1	1	2	2
	12.0		10.0	SS-6	2	1	1		2
		Very Soft, Wet, Very Dark Gray, Medium Plasticity, Weakly Reactive, Sandy Lean CLAY (CL/A-6(8)), Munsell=5Y 3/1	13.5	SS-7	WOH/18"				WOH
-12.0			18.5	SS-8	WOH/18"				WOH
-17.0		@SS-8: LL=34, PL=20, PI=14, NMC=73.8%, %#200=67.5							
	21.0	Very Loose, Wet, Very Dark Gray, Medium Plasticity, Weakly Reactive, Clayey Fine to Medium SAND (SC/A-2-6(0)), Munsell=5Y 3/1	23.5	SS-9	WOH/18"				WOH
-22.0		@SS-9: LL=30, PL=19, PI=11, NMC=54.5%, %#200=34.9							
	27.0	Very Loose, Wet, Dark Gray, Non-Plastic, Weakly Reactive, Silty Fine to Medium SAND (SM/A-2-4) with Trace of Shell Fragments, Munsell=5Y 4/1	28.5	SS-10	1	1	1		2
-27.0		@SS-10: LL=NP, PL=NP, PI=NP, NMC=38.8%, %#200=22.0	33.5	SS-11	1	2	2		4
-32.0									
	37.0	Very Soft, Wet, Dark Greenish Gray, Medium Plasticity, Weakly Reactive, Fine Sandy CLAY (CL), Munsell=GLEY1 4/10GY	38.5	SS-12	1	1	1		2
-37.0									
	42.0	Loose, Wet, Gray, Non-Plastic, Weakly Reactive, Poorly Graded Fine SAND (SP-SM/A-3) with Silt, Munsell=GLEY1 5/N	43.5	SS-13	5	3	5		8
-42.0		@SS-13: LL=NP, PL=NP, PI=NP, NMC=27.3%, %#200=6.5							
			48.5	SS-14	3	3	4		7
-47.0		@SS-14: LL=NP, PL=NP, PI=NP, NMC=37.1%, %#200=8.2							
	52.5								

Graphic Log



LEGEND

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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-8		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	65+00	**Offset:**	0.1'-RT	**Alignment:**	ALT 1B
Elev.:	3.0 ft	**Latitude:**	32.406749	**Longitude:**	-80.459611	**Date Started:**	7/25/2016
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	N/A ft	**Date Completed:**	7/26/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	SPT N VALUE (PL MC LL) / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		HAWTHORN MARL	53.5							
-52.0		Loose, Wet, Olive Gray, Medium Plasticity, Non-Reactive, Silty Fine to Medium SAND (SM/A-2-6) with Phosphate Nodules, Munsell=5Y 4/2		SS-15	3	3	2		5	
	58.5		58.5							
-57.0		Firm, Wet, Olive Gray, Low to Medium Plasticity, Non-Reactive, Fine Sandy SILT (ML/A-4), Munsell=5Y 4/2		SS-16	3	3	3		6	
			63.5							
-62.0				SS-17	3	2	4		6	
			68.5							
-67.0				SS-18	2	2	3		5	
			73.5							
-72.0	75.0	@SS-19: Very Stiff		SS-19	3	4	14		18	*Hard Dense from 75.0 to 75.5 feet*
		COOPER GROUP LIMESTONE								
		Medium Dense to Loose, Wet, Light Greenish Gray, Low Plasticity, Strongly Reactive, Silty Fine to Medium SAND (SM/A-2-4), Calcaceous, Munsell=GLEY1 7/5GY	78.5							
-77.0				SS-20	21	8	5		13	
			83.5							
-82.0				SS-21	3	2	3		5	
			88.5							
		@SS-22: No Recovery		SS-22	2	3	5		8	
-87.0										
			93.5							
		@SS-23: No Recovery		SS-23	2	4	5		9	
-92.0										
			98.5							
				SS-24	3	3	5		8	
-97.0										
		@SS-25: Greenish Gray, Munsell=GLEY1 6/5GY	103.5							
				SS-25	4	4	5		9	

LEGEND

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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-8		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	65+00	**Offset:**	0.1'-RT	**Alignment:**	ALT 1B
Elev.:	3.0 ft	**Latitude:**	32.406749	**Longitude:**	-80.459611	**Date Started:**	7/25/2016
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	N/A ft	**Date Completed:**	7/26/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	SPT N VALUE / FINES CONTENT (%)
		Loose to Medium Dense, Wet, Greenish Gray, Low Plasticity, Strongly Reactive, Silty Fine to Medium SAND (SM/A-2-4), Calcaceous, Munsell=GLEY1 6/5GY		108.5	SS-26	3	3	3		6	
-107.0				113.5	SS-27	3	4	8		12	
-112.0				118.5	SS-28	3	3	6		9	
-117.0				123.5	SS-29	3	3	4		7	
-122.0				128.5	SS-30	7	8	11		19	
-127.0				133.5	SS-31	4	5	6		11	
-132.0				138.5	SS-32			10			*Rod Slipped and Blow Counts*
-137.0				143.5	SS-33	3	4	6		10	*No Recorded for Top Foot*
-142.0				148.5	SS-34	3	4	7		11	
-147.0	150.0	Boring Terminated at 150.0 feet									
-152.0											

SPT N VALUE: PL ✕ — MC ○ — LL ✕

FINES CONTENT (%): 0 10 20 30 40 50 60 70 80 90

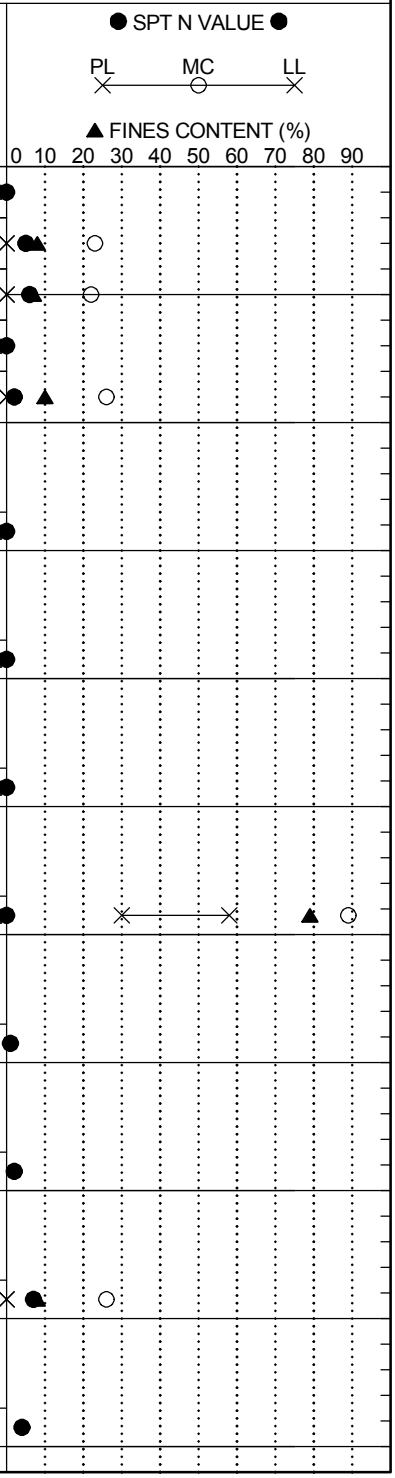
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-9		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	67+04	**Offset:**	9.3'-LT	**Alignment:**	ALT 1B
Elev.:	2.6 ft	**Latitude:**	32.406583	**Longitude:**	-80.458978	**Date Started:**	7/27/2016
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	N/A ft	**Date Completed:**	7/28/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	Marsh	0.0	SS-1	WOH/24"				WOH
	2.0	**HOLOCENE**	2.0	SS-2	WOH	2	3	2	5
-2.4		Very Soft, Wet, Dark Gray, Medium Plasticity, Weakly Reactive, SILT (ML/A-4) with Fine Sand and Trace of Organics (Wood), Munsell=10YR 4/1	4.0	SS-3	4	3	3	3	6
		Loose to Very Loose, Wet, Dark Gray, Non-Plastic, Strongly Reactive, Poorly Graded Fine to Coarse SAND (SP-SM/A-3) with Silt, Munsell=5Y 4/1	6.0	SS-4	WOH/24"				WOH
-7.4		@SS-2: LL-NP, PL=NP, PI=NP, NMC=22.6%, %#200=7.7	8.0	SS-5	1	1	1	2	2
		@SS-3: LL=NP, PL=NP, PI=NP, NMC=21.9%, %#200=7.2	13.5	SS-6	WOH/18"				WOH
-12.4		@SS-4: No Recovery							
	17.0	@SS-5: Weakly Reactive, Fine Sand, LL=NP, PL=NP, PI=NP, NMC=25.6%, %#200=10.3	18.5	SS-7	WOH/18"				WOH
-17.4		@SS-6: Very Dark Gray, Munsell=5Y 3/1							
		Very Soft, Wet, Very Dark Gray, High Plasticity, Weakly Reactive, Fat CLAY (CH/A-7-5(24)) with Fine Sand, Munsell=5Y 3/1	23.5	SS-8	WOH/18"				WOH
-22.4									
		@SS-9: LL=58, PL=30, PI=28, NMC=88.5%, %#200=79.1	28.5	SS-9	WOH/18"				WOH
-27.4									
			33.5	SS-10	WOH/12"		1		1
-32.4									
		@SS-11: Dark Gray, Munsell=5Y 4/1	38.5	SS-11	1	1	1		2
-37.4									
	42.0	Loose to Very Loose, Wet, Gray, Non-Plastic, Weakly Reactive, Poorly Graded Fine SAND (SP-SM/A-3) with Silt, Munsell=GLEY1 5/N	43.5	SS-12	2	3	4		7
-42.4		@SS-12: LL=NP, PL=NP, PI=NP, NMC=25.6%, %#200=7.5							
			48.5	SS-13	2	2	2		4
-47.4	51.0								



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LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-9		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	67+04	**Offset:**	9.3'-LT	**Alignment:**	ALT 1B
Elev.:	2.6 ft	**Latitude:**	32.406583	**Longitude:**	-80.458978	**Date Started:**	7/27/2016
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	N/A ft	**Date Completed:**	7/28/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%)
		HAWTHORN MARL								
		Soft to Firm, Wet, Olive, Low to Medium Plasticity, Non-Reactive, Fine to Medium Sandy SILT (ML/A-4), Munsell=5Y 5/3	53.5	SS-14	2	2	2		4	Hard Lense from 51.5 to 52.0 feet
-52.4										
		@SS-15: Olive Gray, Munsell=5Y 4/2	58.5	SS-15	1	2	3		5	
-57.4										
			63.5	SS-16	2	3	4		7	
-62.4										
			68.5	SS-17	2	2	3		5	
-67.4										
		@SS-18: Stiff, Weakly Reactive	73.5	SS-18	5	4	9		13	Hard Lense from 75.0 to 78.0 feet
-72.4	75.0									
		COOPER GROUP LIMESTONE								
		Very Dense, Wet, Light Greenish Gray, Low Plasticity, Strongly Reactive, Silty Fine to Medium SAND (SM/A-2-4), Calcaceous, Munsell=GLEY1 7/5GY	78.5	SS-19	750/5.5"				100+	
-77.4										
		@SS-20: Loose to Medium Dense, Greenish Gray, Munsell=GLEY1 6/10Y	83.5	SS-20	2	2	3		5	
-82.4										
		@SS-21: Light Greenish Gray, Munsell=GLEY1 7/5GY	88.5	SS-21	2	3	5		8	
-87.4										
		@SS-22: No Recovery	93.5	SS-22	2	3	5		8	
-92.4										
			98.5	SS-23	3	3	5		8	
-97.4										

Continued Next Page

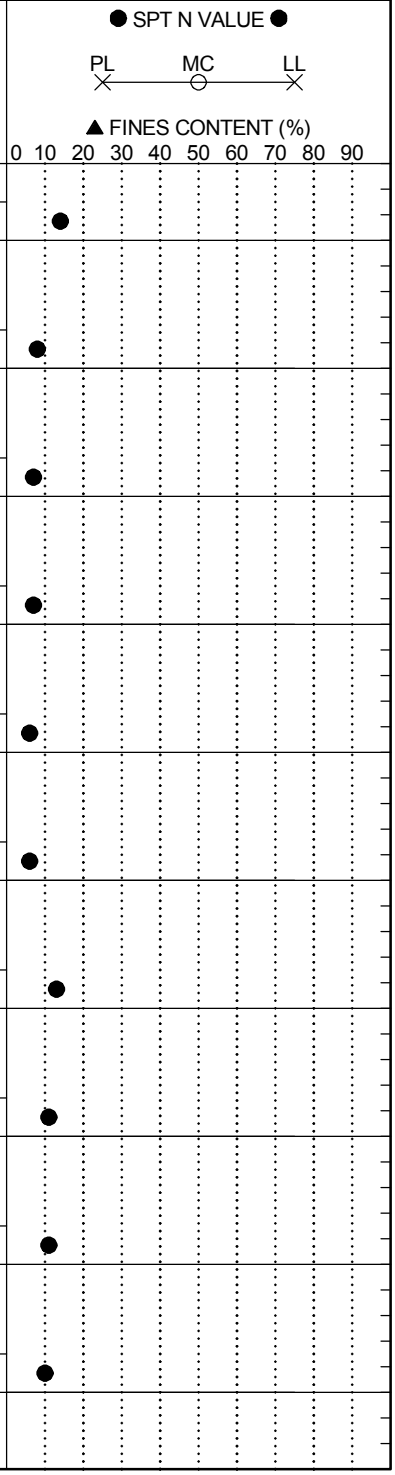
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-9		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	67+04	**Offset:**	9.3'-LT	**Alignment:**	ALT 1B
Elev.:	2.6 ft	**Latitude:**	32.406583	**Longitude:**	-80.458978	**Date Started:**	7/27/2016
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	N/A ft	**Date Completed:**	7/28/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Medium Dense to Loose, Wet, Light Greenish Gray, Low Plasticity, Strongly Reactive, Silty Fine to Medium SAND (SM/A-2-4), Calcaceous, Munsell=GLEY1 7/5GY		103.5	SS-24	4	5	9		14
-102.4				108.5	SS-25	3	3	5		8
-107.4				113.5	SS-26	3	3	4		7
-112.4				118.5	SS-27	4	3	4		7
-117.4				123.5	SS-28	3	2	4		6
-122.4				128.5	SS-29	2	2	4		6
-127.4	132.0	Stiff, Wet, Greenish Gray, Low Plasticity, Strongly Reactive, Fine Sandy SILT (ML/A-4), Calcaceous, Munsell=GLEY1 6/5GY		133.5	SS-30	4	5	8		13
-132.4				138.5	SS-31	5	5	6		11
-137.4	142.0	Medium Dense to Loose, Wet, Non-Plastic to Low Plasticity, Greenish Gray, Strongly Reactive, Silty Fine SAND (SM/A-2-4), Calcaceous, Munsell=GLEY1 6/5GY		143.5	SS-32	3	4	7		11
-142.4				148.5	SS-33	3	4	6		10
-147.4	150.0	Boring Terminated at 150.0 feet								



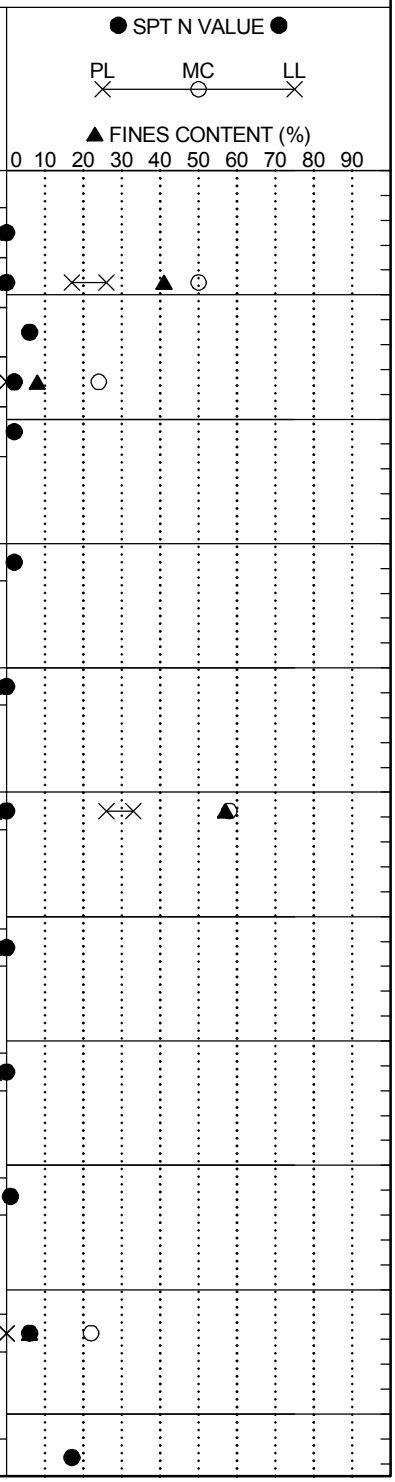
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-10		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	J. Wessinger	**Boring Location:**	78+24	**Offset:**	21.4'-RT	**Alignment:**	ALT 1B
Elev.:	0.0 ft	**Latitude:**	32.405352	**Longitude:**	-80.455652	**Date Started:**	6/23/2016
Total Depth:	193 ft	**Soil Depth:**	191.5 ft	**Core Depth:**	N/A ft	**Date Completed:**	6/27/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	▽River							
	1.5	WATER	1.5						
		HOLOCENE							
-5.0		Very Loose to Loose, Wet, Black, Low Plasticity, Clayey Fine SAND (SC/A-4(1)) with Trace of Shell Fragments/Organics, Munsell=5Y 2.5/1	3.5	SS-1	WOR/24"				WOR
			5.5	SS-2	WOH/24"				WOH
	7.5	@SS-2: LL=26, PL=17, PI=9, NMC=50.0%, %#200=41.1	7.5	SS-3	2	4	2	2	6
-10.0		@SS-3: Dark Greenish Gray, Munsell=GLEY1 4/10Y	9.5	SS-4	2	1	1	1	2
				SS-5	1	1	1	1	2
	14.0	Very Loose, Wet, Dark Greenish Gray, Non-Plastic, Fine SAND (SP-SM/A-3) with Silt and Trace of Shell Fragments, Munsell=GLEY1 4/10Y	15.0						
-15.0		@SS-4: LL=NP, PL=NP, PI=NP, NMC=24.1%, %#200=7.9		SS-6	1	1	1		2
-20.0		Very Soft, Wet, Greenish Gray, Low Plasticity, Sandy SILT (ML/A-4(2)) with Trace of Organics, Munsell=10GY 5/1	20.0	SS-7	WOH/18"				WOH
-25.0		@SS-8: LL=33, PL=26, PI=7, NMC=58.3%, %#200=57.2	25.0	SS-8	WOH/18"				WOH
-30.0		@SS-9: Dark Greenish Gray, Munsell=5GY 4/1	30.5	SS-9	WOH/18"				WOH
-35.0			35.5	SS-10	WOH/18"				WOH
-40.0			40.5	SS-11	WOH/12"		1		1
-45.0	45.0	Loose to Medium Dense, Wet, Greenish Gray, Non-Plastic, Fine to Coarse SAND (SP-SM/A-3) with Silt and Trace of Shell Fragments, Munsell=GLEY1 5/10Y	46.0	SS-12	2	3	3		6
-50.0		@SS-12: LL=NP, PL=NP, PI=NP, NMC=21.9%, %#200=6.0	51.0	SS-13	4	7	10		17
	52.5								



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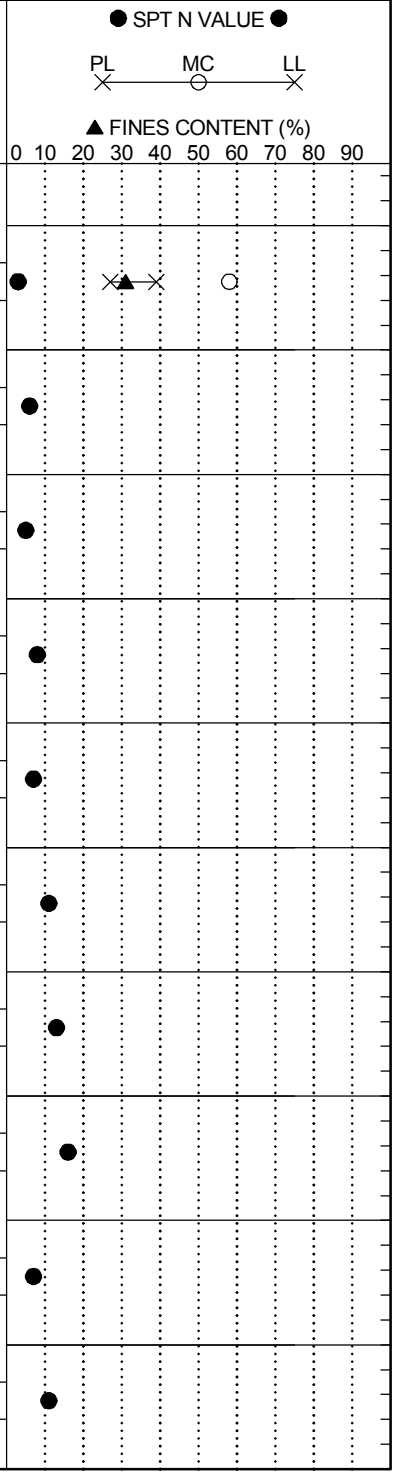
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-10		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	J. Wessinger	**Boring Location:**	78+24	**Offset:**	21.4'-RT	**Alignment:**	ALT 1B
Elev.:	0.0 ft	**Latitude:**	32.405352	**Longitude:**	-80.455652	**Date Started:**	6/23/2016
Total Depth:	193 ft	**Soil Depth:**	191.5 ft	**Core Depth:**	N/A ft	**Date Completed:**	6/27/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
-55.0		**HAWTHORN MARL** Very Loose to Loose, Wet, Dark Gray, Medium Plasticity, Strongly Reactive, Silty Fine to Medium SAND (SM/A-2-6(0)), Munsell=5Y 4/1 @SS-14: LL=39, PL=27, PI=12, NMC=58.1%, %#200=31.0 @SS-15: Weakly Reactive	56.5	SS-14	1	1	2		3
-60.0			61.5	SS-15	3	2	4		6
-65.0			66.5	SS-16	2	2	3		5
-70.0			71.5	SS-17	3	4	4		8
-75.0	74.5	**COOPER GROUP LIMESTONE** Loose to Medium Dense, Wet, Light Greenish Gray, Medium Plasticity, Strongly Reactive, Silty Fine to Medium SAND (SM/A-3), Calcaceous, Munsell=GLEY1 7/10Y	76.5	SS-18	1	1	6		7
-80.0			81.5	SS-19	3	6	5		11
-85.0			86.5	SS-20	34	7	6		13
-90.0			91.5	SS-21	2	4	12		16
-95.0			96.5	SS-22	2	3	4		7
-100.0			101.5	SS-23	5	5	6		11



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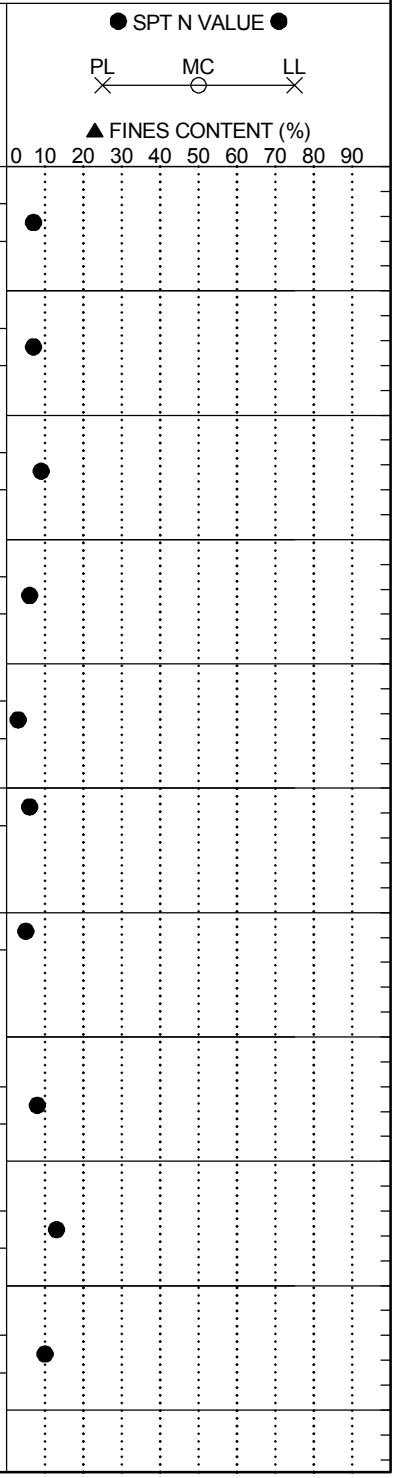
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-10		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	J. Wessinger	**Boring Location:**	78+24	**Offset:**	21.4'-RT	**Alignment:**	ALT 1B
Elev.:	0.0 ft	**Latitude:**	32.405352	**Longitude:**	-80.455652	**Date Started:**	6/23/2016
Total Depth:	193 ft	**Soil Depth:**	191.5 ft	**Core Depth:**	N/A ft	**Date Completed:**	6/27/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Loose to Very Loose, Wet, Light Greenish Gray, Medium Plasticity, Strongly Reactive, Silty Fine to Medium SAND (SM/A-3), Calcaceous, Munsell=GLEY1 7/10Y		106.5	SS-24	4	4	3		7
-110.0				111.5	SS-25	3	3	4		7
-115.0				116.5	SS-26	4	4	5		9
-120.0				121.5	SS-27	3	3	3		6
-125.0		@SS-28: Olive Gray, Munsell=5Y 4/2		126.5	SS-28	3	2	1		3
-130.0		@SS-29: Greenish Gray, Munsell=GLEY1 6/10Y		130.0	SS-29	3	3	3		6
-135.0				135.0	SS-30	2	2	3		5
-140.0				142.0	SS-31	3	4	4		8
-145.0		@SS-32: Medium Dense to Loose		147.0	SS-32	4	7	6		13
-150.0				152.0	SS-33	3	4	6		10
-155.0				157.5						



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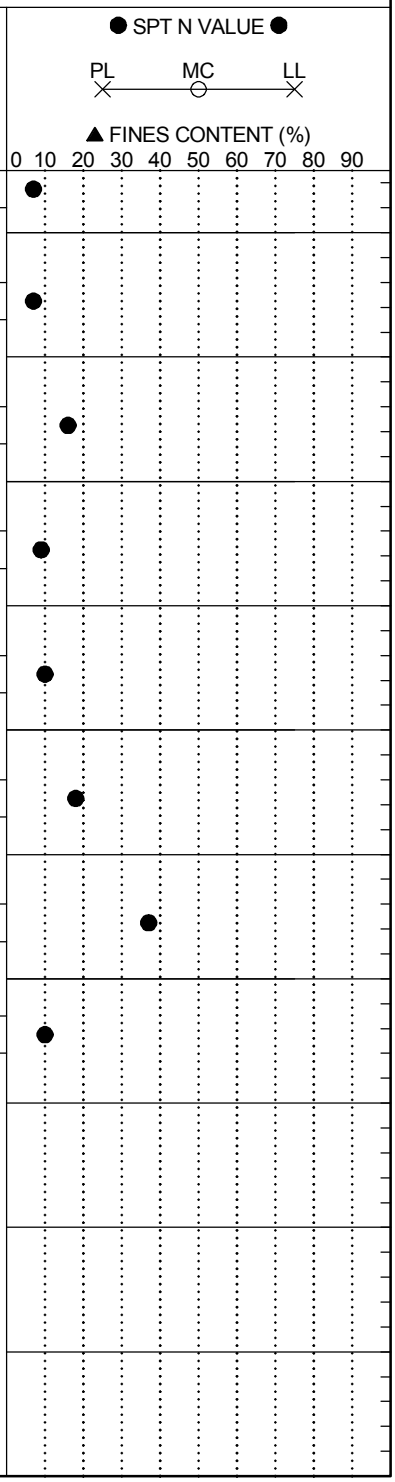
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-10		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	J. Wessinger	**Boring Location:**	78+24	**Offset:**	21.4'-RT	**Alignment:**	ALT 1B
Elev.:	0.0 ft	**Latitude:**	32.405352	**Longitude:**	-80.455652	**Date Started:**	6/23/2016
Total Depth:	193 ft	**Soil Depth:**	191.5 ft	**Core Depth:**	N/A ft	**Date Completed:**	6/27/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Loose to Medium Dense, Wet, Greenish Gray, Medium Plasticity, Strongly Reactive, Silty Fine to Medium SAND (SM/A-3), Calcaceous, Munsell=GLEY1 6/10Y			SS-34	3	3	4		7
-160.0				162.0	SS-35	3	3	4		7
-165.0				167.0	SS-36	4	7	9		16
-170.0				172.0	SS-37	4	4	5		9
-175.0				177.0	SS-38	4	5	5		10
-180.0				182.0	SS-39	5	9	9		18
-185.0		@SS-40: Dense		187.0	SS-40	12	8	29		37
-190.0				191.5						
	193.0	@SS-41: Loose			SS-41	4	5	5		10
		Boring Terminated at 193.0 feet								
-195.0										
-200.0										
-205.0										



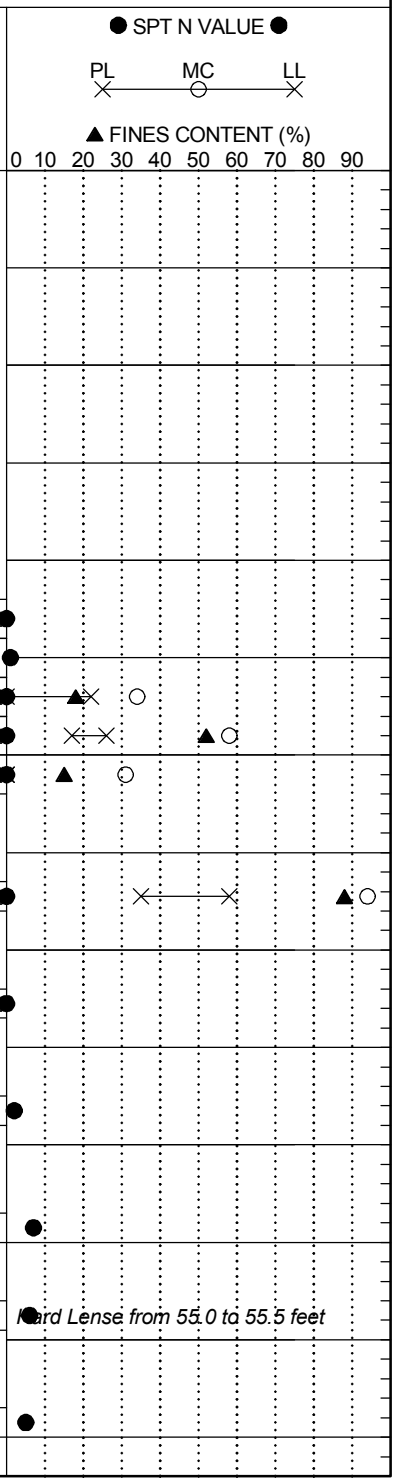
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-11		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	J. Wessinger	**Boring Location:**	82+65	**Offset:**	4.4'-LT	**Alignment:**	ALT 1B
Elev.:	0.0 ft	**Latitude:**	32.404954	**Longitude:**	-80.454298	**Date Started:**	6/29/2016
Total Depth:	192 ft	**Soil Depth:**	170 ft	**Core Depth:**	N/A ft	**Date Completed:**	6/30/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	River							
-5.0		WATER							
-10.0									
-15.0									
-20.0									
	22.0	**HOLOCENE**	22.0						
-25.0	26.0	Very Soft, Wet, Dark Greenish Gray, Low Plasticity, Sandy SILT (ML/A-4) with Trace of Shell Fragments/Organics, Munsell=GLEY1 4/10Y	24.0	SS-1	WOR/24"				WOH
			26.0	SS-2	4	1/18"			1
	28.0		28.0	SS-3	WOH/24"				WOH
-30.0	30.0	Very Loose, Wet, Dark Greenish Gray, Non-Plastic, Silty Fine SAND (SM/A-2-4) with Trace of Shell Fragments, Munsell=GLEY 1 4/10Y, LL=22, PL=NP, PI=NP, NMC=33.7%, %#200=18.1	30.0	SS-4	WOH/24"				WOH
				SS-5	WOH/24"				WOH
-35.0	35.0	Very Soft, Wet, Dark Greenish Gray, Low Plasticity, Sandy CLAY (CL/A-4(2)) with Trace of Organics, Munsell=GLEY1 4/5GY, LL=26, PL=17, PI=9, NMC=57.6%, %#200=52.1	36.5	SS-6	WOH/18"				WOH
-40.0			42.0	SS-7	WOH/18"				WOH
-45.0	46.0	Very Loose, Wet, Dark Greenish Gray, Non-Plastic, Silty Fine SAND (SM/A-2-4) with Trace of Shell Fragments, Munell=GLEY1 4/5GY, LL=NP, PL=NP, PI=NP, NMC=30.5%, %#200=15.3	47.5	SS-8	1	1	1		2
-50.0		Very Soft, Wet, Dark Greenish Gray, High Plasticity, Elastic SILT (MH/A-7-5(25)), Munsell=GLEY1 4/5GY	53.5	SS-9	4	3	4		7
-55.0	57.0	@SS-6: LL=58, PL=35, PI=23, NMC=93.7%, %#200=87.9	58.0	SS-10	2	3	3		6
-60.0		Very Loose to Loose, Wet, Gray, Low Plasticity, Silty Fine to Medium SAND (SM/A-2-4) with Trace of Shell Fragments, Munsell=GLEY1 5/N	63.5	SS-11	2	2	3		5
-65.0		**HAWTHORN MARL**							



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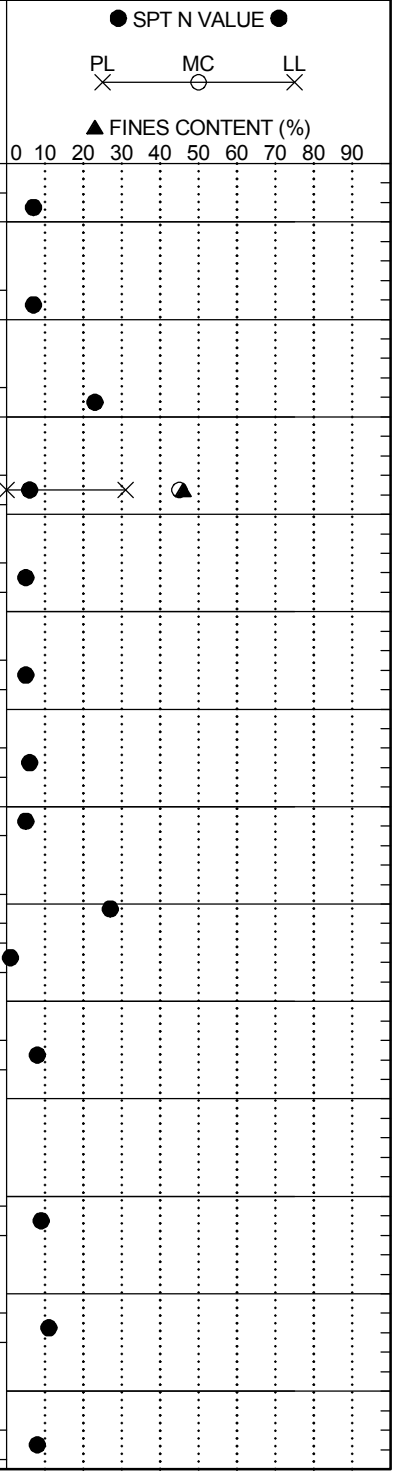
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-11		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	J. Wessinger	**Boring Location:**	82+65	**Offset:**	4.4'-LT	**Alignment:**	ALT 1B
Elev.:	0.0 ft	**Latitude:**	32.404954	**Longitude:**	-80.454298	**Date Started:**	6/29/2016
Total Depth:	192 ft	**Soil Depth:**	170 ft	**Core Depth:**	N/A ft	**Date Completed:**	6/30/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		HAWTHORNE MARL	68.5	SS-12	2	3	4		7
-70.0		Firm, Wet, Olive Gray, Low Plasticity, Strongly Reactive, Sandy SILT (ML/A-4), Munsell=5Y 4/2	73.5	SS-13	2	3	4		7
-75.0									
	78.5	**COOPER GROUP LIMESTONE**	78.5	SS-14	3	10	13		23
-80.0		Loose to Medium Dense, Wet, Very Dark Gray, Non-Plastic, Weakly to Strongly Reactive, Silty Fine SAND (SM/A-4(0)) with Phosphate Nodules, Calcaceous, Munsell=5Y 3/1	83.0	SS-15	2	2	4		6
-85.0		@SS-15: Light Brownish Gray, Munsell=2.5Y 6/2, LL=31, PL=NP, PI=NP, NMC=45.3%, %#200=46.0	87.5	SS-16	2	2	3		5
-90.0		@SS-16: No Recovery	92.5	SS-17	3	2	3		5
-95.0		@SS-17: Greenish Gray, Munsell=GLEY1 6/10Y	97.0	SS-18	7	3	3		6
-100.0			100.0	SS-19	3	2	3		5
-105.0			104.5	SS-20	3	7	20		27
		@SS-21: No Recovery	107.0	SS-21	1/18"				1
-110.0			112.0	SS-22	2	3	5		8
-115.0		@SS-22: Light Greenish Gray, Munsell=GLEY1 7/5GY							
-120.0			120.5	SS-23	3	4	5		9
-125.0			126.0	SS-24	4	5	6		11
-130.0			132.0	SS-25	3	3	5		8



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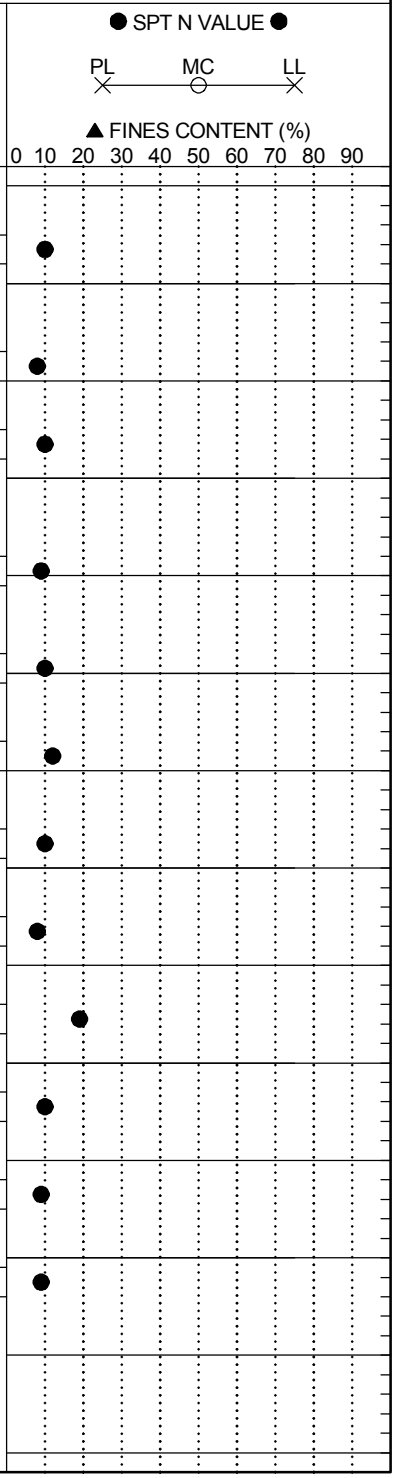
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-11		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	J. Wessinger	**Boring Location:**	82+65	**Offset:**	4.4'-LT	**Alignment:**	ALT 1B
Elev.:	0.0 ft	**Latitude:**	32.404954	**Longitude:**	-80.454298	**Date Started:**	6/29/2016
Total Depth:	192 ft	**Soil Depth:**	170 ft	**Core Depth:**	N/A ft	**Date Completed:**	6/30/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
-135.0		Loose to Medium Dense, Wet, Light Greenish Gray, Non-Plastic, Weakly to Strongly Reactive, Silty Fine SAND (SM/A-4(0)) with Phosphate Nodules, Calcaceous, Munsell=GLEY1 7/5GY		137.5	SS-26	4	4	6		10
-140.0				143.5	SS-27	3	3	5		8
-145.0		@SS-27: Greenish Gray, Munsell=GLEY1 5/10Y		147.5	SS-28	3	4	6		10
-150.0				154.0	SS-29	4	4	5		9
-155.0				159.0	SS-30	2	4	6		10
-160.0				163.5	SS-31	3	5	7		12
-165.0				168.0	SS-32	3	4	6		10
-170.0				172.5	SS-33	3	3	5		8
-175.0		@SS-34: Light Greenish Gray, Munsell=GLEY1 7/10Y		177.0	SS-34	4	8	11		19
-180.0				181.5	SS-35	3	4	6		10
-185.0				186.0	SS-36	1	4	5		9
-190.0		@SS-37: Munsell=GLEY1 7/5GY		190.5	SS-37	2	4	5		9
	192.0	Boring Terminated at 192.0 feet								
-195.0										
-200.0										



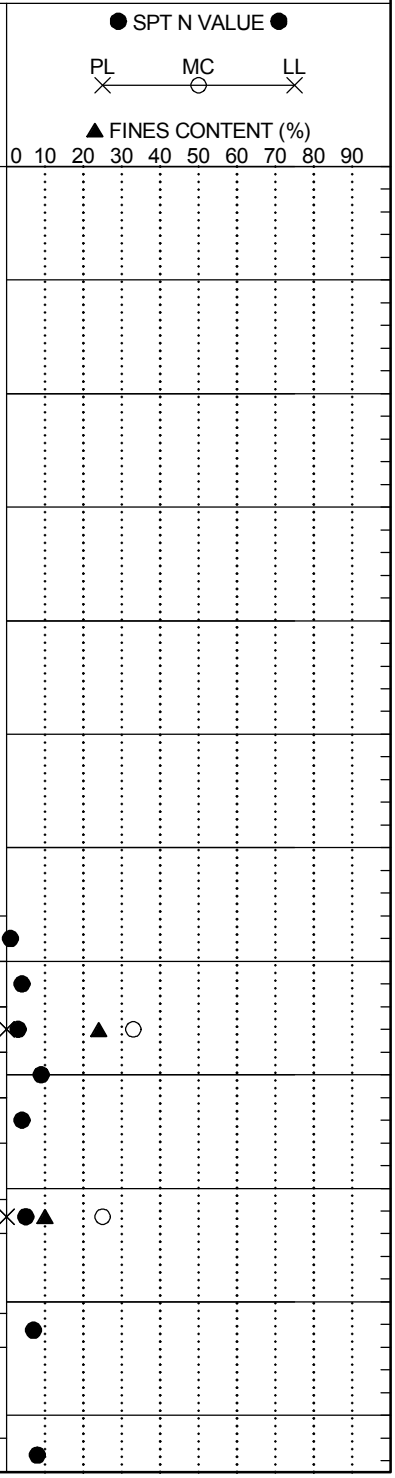
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-12		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	R. Wessinger	**Boring Location:**	87+88	**Offset:**	79.3'-LT	**Alignment:**	ALT 1B
Elev.:	0.0 ft	**Latitude:**	32.404595	**Longitude:**	-80.45264	**Date Started:**	7/6/2016
Total Depth:	192 ft	**Soil Depth:**	159 ft	**Core Depth:**	N/A ft	**Date Completed:**	7/11/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	River							
		WATER							
-5.0									
-10.0									
-15.0									
-20.0									
-25.0									
-30.0									
	33.0		33.0						
-35.0		Very Soft to Soft, Wet, Dark Gray, Low to Medium Plasticity, Sandy CLAY (CL/A-6), with Trace of Shell Fragments/Organics, Munsell=GLEY 1 4/N	35.0	SS-1	3	1/18"			1
	36.5		37.0	SS-2	1	2	2	2	4
	39.0	Very Loose, Wet, Dark Gray, Non-Plastic, Silty Fine SAND (SM/A-2-4), Munsell=GLEY1 4/N, LL=NP, PL=NP, PI=NP, NMC=32.9%, %#200=23.8	39.0	SS-3	2	2	1	1	3
-40.0	41.0		41.0	SS-4	2	6	3	3	9
				SS-5	4	2	2	1	4
		Loose, Wet, Dark Gray, Low Plasticity, Clayey Fine SAND (SC/A-2-4), Munsell=GLEY1 4/N							
-45.0	45.5		45.5	SS-6	1	4	1		5
		Very Loose, Wet, Gray, Non-Plastic, Fine SAND (SP/A-1), Munsell=GLEY1 5/N							
-50.0	50.5	Loose, Wet, Dark Gray, Non-Plastic, Fine to Coarse SAND (SP-SM/A-3) with Silt and Trace of Shell Fragments, Munsell=GLEY1 4/N, LL=NP, PL=NP, PI=NP, NMC=24.6%, %#200=10.4	50.5	SS-7	4	3	4		7
-55.0		**HAWTHORN MARL**	56.0	SS-8	4	2	6		8



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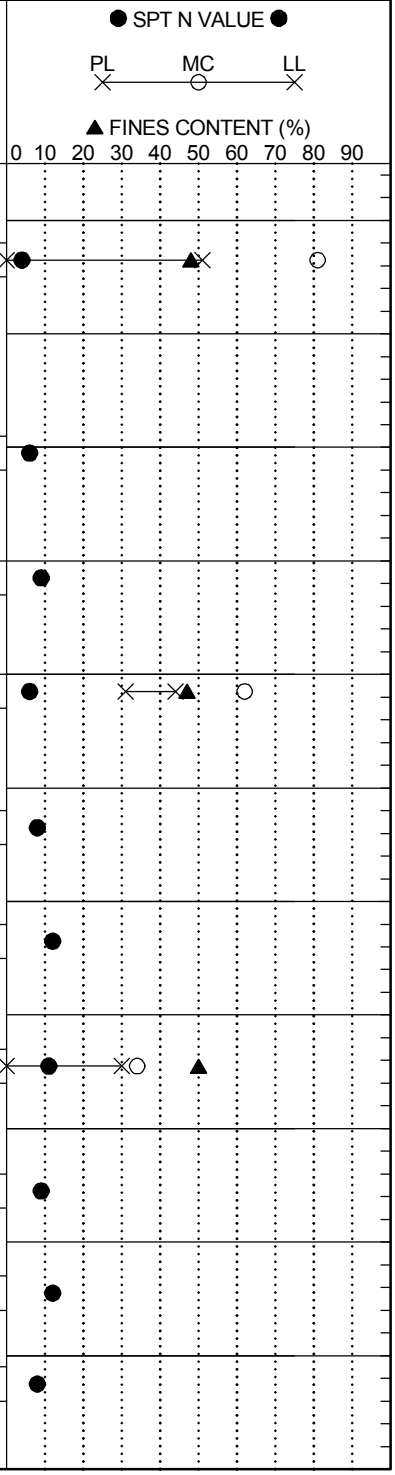
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-12		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	R. Wessinger	**Boring Location:**	87+88	**Offset:**	79.3'-LT	**Alignment:**	ALT 1B
Elev.:	0.0 ft	**Latitude:**	32.404595	**Longitude:**	-80.45264	**Date Started:**	7/6/2016
Total Depth:	192 ft	**Soil Depth:**	159 ft	**Core Depth:**	N/A ft	**Date Completed:**	7/11/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		HAWTHORN MARL							
-60.0		Loose to Very Loose, Wet, Olive Gray, Non-Plastic, Weakly Reactive, Silty Fine to Medium SAND (SM/A-5(0)) with Trace of Shell Fragments, Munsell=5Y 4/2	61.0	SS-9	2	2	2		4
-65.0		@SS-9: No Shell Fragments, LL=51, PL=NP, PI=NP, NMC=81.2%, %#200=48.0							
-70.0		@SS-10: Very Dark Greenish Gray, Munsell=GLEY1 3/10Y	69.5	SS-10	1	3	3		6
-75.0			75.0	SS-11	2	4	5		9
-80.0		@SS-12: Medium Plasticity, A-7-5(4), LL=44, PL=31, PI=13, NMC=61.8%, %#200=46.6	80.0	SS-12	2	3	3		6
-85.0			86.0	SS-13	WOH	3	5		8
-90.0	91.0		91.0	SS-14	26	5	7		12
		COOPER GROUP LIMESTONE							
-95.0		Medium Dense to Loose, Wet, Very Dark Greenish Gray, Non-Plastic, Non-Reactive to Strongly Reactive, Silty Fine to Coarse SAND (SM/A-4(0)) with Phosphate Nodules, Calcaceous, Munsell=GLEY1 3/10Y	96.5	SS-15	4	6	5		11
-100.0		@SS-15: Light Greenish Gray, Munsell=GLEY1 7/10Y, LL=30, PL=NP, PI=NP, NMC=33.7%, %#200=49.7	102.0	SS-16	2	4	5		9
-105.0		@SS-17: Greenish Gray, Munsell=5GY 6/1	106.5	SS-17	2	4	8		12
-110.0			110.5	SS-18	4	6	2		8



LEGEND

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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-12		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	R. Wessinger	**Boring Location:**	87+88	**Offset:**	79.3'-LT	**Alignment:**	ALT 1B
Elev.:	0.0 ft	**Latitude:**	32.404595	**Longitude:**	-80.45264	**Date Started:**	7/6/2016
Total Depth:	192 ft	**Soil Depth:**	159 ft	**Core Depth:**	N/A ft	**Date Completed:**	7/11/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		Loose to Medium Dense, Wet, Greenish Gray, Non-Plastic, Non-Reactive to Strongly Reactive, Silty Fine to Coarse SAND (SM/A-4(0)) with Phosphate Nodules, Calcaceous, Munsell=5GY 6/1	115.5	SS-19		2	3		5	*Not Recorded for Top 6"*
-120.0		@SS-20: Greenish Gray, Munsell=GLEY1 6/10Y	120.5	SS-20						*Rod Slipped and Blow Counts*
-125.0			125.5	SS-21	4	6	8		14	*Rod Slipped and Blow Counts*
-130.0			130.5	SS-22	5	4	8		12	*Not Recorded*
	134.0	Firm to Stiff, Greenish Gray, Medium to High Plasticity, Strongly Reactive, Fine Sandy SILT (ML/A-6), Munsell=GLEY1 6/10Y								
-135.0			135.5	SS-23	3	2	5		7	
-140.0			141.0	SS-24	3	4	8		12	
-145.0										
-150.0			148.5	SS-25	3	4	4		8	
			151.5	SS-26	4	5	6		11	
-155.0			155.5	SS-27	4	4	5		9	
	158.0	Medium Dense to Loose, Wet, Greenish Gray, Low Plasticity, Strongly Reactive, Silty Fine SAND (SM/A-2-4), Munsell=GLEY1 6/10Y								
-160.0			160.0	SS-28	5	7	12		19	
-165.0	165.0	Stiff to Firm, Wet, Light Greenish Gray, Low to Medium Plasticity, Strongly Reactive, Fine Sandy SILT (ML/A-4), Munsell=GLEY1 7/10Y	165.0	SS-29	4	4	6		10	
-170.0			170.0	SS-30	3	4	4		8	

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LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-12		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	R. Wessinger	**Boring Location:**	87+88	**Offset:**	79.3'-LT	**Alignment:**	ALT 1B
Elev.:	0.0 ft	**Latitude:**	32.404595	**Longitude:**	-80.45264	**Date Started:**	7/6/2016
Total Depth:	192 ft	**Soil Depth:**	159 ft	**Core Depth:**	N/A ft	**Date Completed:**	7/11/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
-175.0		Very Stiff, Wet, Light Greenish Gray, Low to Medium Plasticity, Strongly Reactive, Fine Sandy SILT (ML/A-4), Munsell=GLEY1 7/10Y		174.5	SS-31	4	7	13		20	
-180.0	180.0	Medium Dense, Wet, Greenish Gray, Low to Medium Plasticity, Strongly Reactive, Silty Fine SAND (SM/A-3), Munsell=GLEY1 6/10Y		180.0	SS-32						*Pushed Spoon for Sample, but*
-185.0				185.5	SS-33	4	5	7		12	*Blo Counts Not Recorded*
-190.0		@SS-34: Loose		190.5	SS-34	4	4	4		8	
	192.0	Boring Terminated at 192.0 feet									
-195.0											
-200.0											
-205.0											
-210.0											
-215.0											
-220.0											
-225.0											

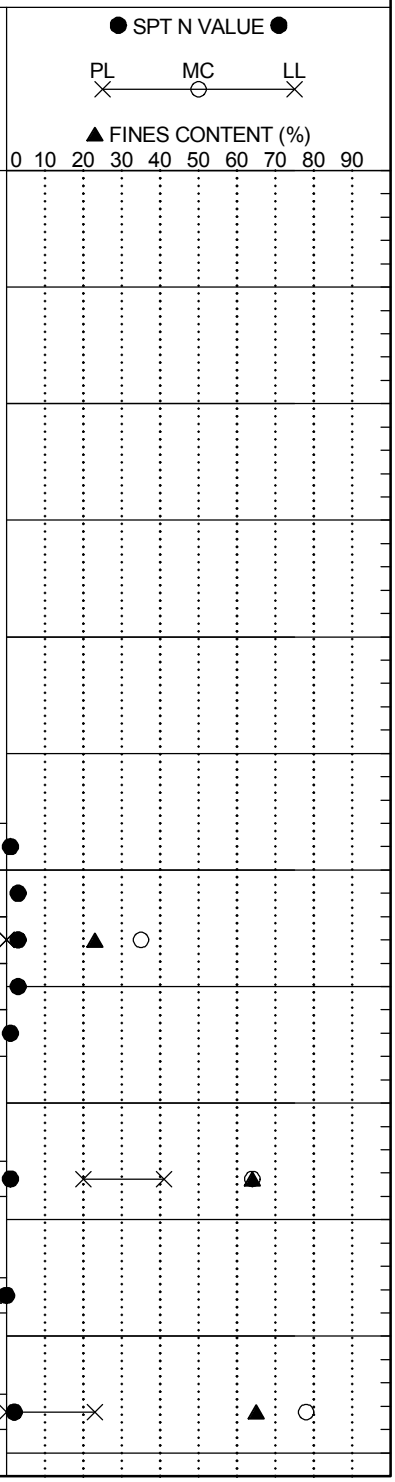
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-13		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	J. Wessinger	**Boring Location:**	92+79	**Offset:**	16.2'-RT	**Alignment:**	ALT 1B
Elev.:	0.0 ft	**Latitude:**	32.403837	**Longitude:**	-80.451288	**Date Started:**	6/16/2016
Total Depth:	190.5 ft	**Soil Depth:**	162.5 ft	**Core Depth:**	N/A ft	**Date Completed:**	6/21/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	River							
		WATER							
-5.0									
-10.0									
-15.0									
-20.0									
-25.0									
	28.0	**HOLOCENE**	28.0						
-30.0		Very Loose, Wet, Gray, Non-Plastic, Silty Fine to Medium SAND (SM/A-2-4) with Trace of Shell Fragments, Munsell=GLEY1 5/N	30.0	SS-1	WOH/12"		1	1	1
			32.0	SS-2	WOH	1	2	2	3
-35.0		@SS-3: Dark Gray, Munsell=5Y 4/1, LL=NP, PL=NP, PI=NP, NMC=34.6%, %#200=22.8	34.0	SS-3	1	1	2	1	3
	36.0	Very Loose, Wet, Dark Gray,Low Plasticity, Clayey Fine SAND (SC/A-2-4), Munsell=5Y 4/1	36.0	SS-4	1	2	1	2	3
				SS-5	1	1/18"			1
-40.0	40.0	Very Soft, Wet, Very Dark Greenish Gray, High Plasticity, Sandy Lean CLAY (CL/A-7-6(11)), Munsell=10Y 3/1	42.5						
		@SS-6: LL=41, PL=20, PI=21, NMC=63.6%, %#200=64.2		SS-6	2	1/12"			1
-45.0			47.5						
	49.0			SS-7	WOH/18"				WOH
-50.0		Very Soft, Wet, Very Dark Greenish Gray, Non-Plastic, Sandy SILT (ML/A-4(0)) with Trace of Shell Fragments, Munsell=10Y 3/1	52.5						
	54.0	@SS-8: LL=23, PL=NP, PI=NP, NMC=78.3%, %#200=65.3		SS-8	1	1	1		2
-55.0									



LEGEND

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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-13		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	J. Wessinger	**Boring Location:**	92+79	**Offset:**	16.2'-RT	**Alignment:**	ALT 1B
Elev.:	0.0 ft	**Latitude:**	32.403837	**Longitude:**	-80.451288	**Date Started:**	6/16/2016
Total Depth:	190.5 ft	**Soil Depth:**	162.5 ft	**Core Depth:**	N/A ft	**Date Completed:**	6/21/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		HAWTHORN MARL								
		Very Loose to Loose, Moist, Dark Greenish Gray, High Plasticity, Weakly Reactive, Clayey Fine to Medium SAND (SC/A-7-6(11)), Munsell=10Y 4/1	58.0	SS-9	7	3	3		6	
-60.0										
		@SS-10: LL=67, PL=29, PI=38, NMC=73.8%, %#200=43.9	63.5	SS-10	2	2	2		4	
-65.0										
		@SS-11: No Recovery	69.0	SS-11	3	2	4		6	
-70.0										
-75.0	75.0	**COOPER GROUP LIMESTONE**								
		Firm, Moist, Greenish Gray, Low Plasticity, Strongly Reactive, Sandy SILT (ML/A-4(1)) with Phosphate Nodules, Calcaceous, Munsell=GLEY1 6/1	76.5	SS-12	1	3	3		6	
-80.0										
		@SS-13: Olive Gray, Munsell=5Y 5/2	81.5	SS-13	3	3	4		7	
-85.0										
		@SS-14: No Recovery	86.5	SS-14	2	2	2		4	
-90.0										
		@SS-15: Very Stiff	90.5	SS-15		11	12		23	*Rod Slipped and Blow Counts*
-95.0		@SS-16: Firm to Stiff, Light Greenish Gray, Munsell=GLEY1 7/10Y	94.5	SS-16	3	3	4		7	*Not Recorded for Top 6"*
-100.0		@SS-17: LL=30, PL=24, PI=6, NMC=37.3%, %#200=50.2	99.5	SS-17	3	4	3		7	
-105.0			104.0	SS-18	3	3	7		10	
-110.0		@SS-19: No Recovery	109.0	SS-19	3	3	3		6	

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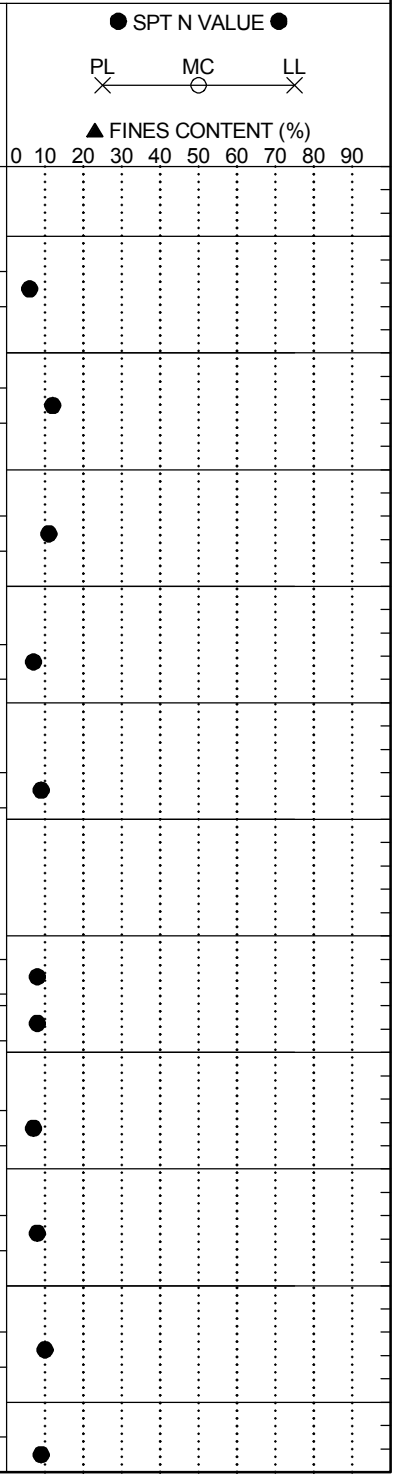
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-13		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	J. Wessinger	**Boring Location:**	92+79	**Offset:**	16.2'-RT	**Alignment:**	ALT 1B
Elev.:	0.0 ft	**Latitude:**	32.403837	**Longitude:**	-80.451288	**Date Started:**	6/16/2016
Total Depth:	190.5 ft	**Soil Depth:**	162.5 ft	**Core Depth:**	N/A ft	**Date Completed:**	6/21/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Firm to Stiff, Moist, Greenish Gray, Low Plasticity, Strongly Reactive, Sandy SILT (ML/A-4(1)) with Phosphate Nodules, Calcaceous, Munsell=5GY 6/1								
-115.0				116.5	SS-20	3	3	3		6
-120.0				121.5	SS-21	5	5	7		12
-125.0				127.0	SS-22	3	4	7		11
-130.0				132.5	SS-23	2	3	4		7
-135.0				138.0	SS-24	3	4	5		9
-140.0										
-145.0		@SS-25: Olive Gray, Munsell=5Y 5/2		146.0	SS-25	4	4	4		8
		@SS-26: No Recovery		148.0	SS-26	3	3	5		8
-150.0		@SS-27: Light Greenish Gray, Munsell=GLEY1 7/5Y		152.5	SS-27	3	3	4		7
-155.0				157.0	SS-28	4	4	4		8
-160.0				162.0	SS-29	3	5	5		10
-165.0		@SS-30: Greenish Gray, Munsell=GLEY1 6/10Y		166.5	SS-30	2	4	5		9



LEGEND

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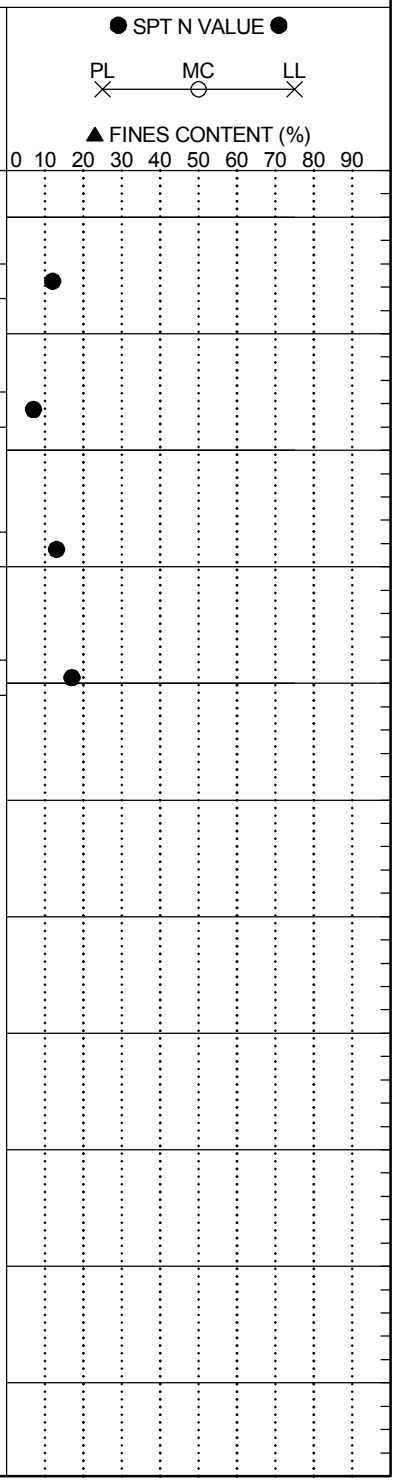
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-13		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	J. Wessinger	**Boring Location:**	92+79	**Offset:**	16.2'-RT	**Alignment:**	ALT 1B
Elev.:	0.0 ft	**Latitude:**	32.403837	**Longitude:**	-80.451288	**Date Started:**	6/16/2016
Total Depth:	190.5 ft	**Soil Depth:**	162.5 ft	**Core Depth:**	N/A ft	**Date Completed:**	6/21/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
-170.0		Stiff to Firm, Moist, Greenish Gray, Low Plasticity, Strongly Reactive, Sandy SILT (ML/A-4(1)) with Phosphate Nodules, Calcaceous, Munsell=GLEY1 6/10Y		172.0	SS-31	4	5	7		12
-175.0				177.5	SS-32	2	2	5		7
-180.0				183.5	SS-33	6	5	8		13
-185.0		@SS-34: Very Stiff		189.0	SS-34	7	9	8		17
-190.0	190.5	Boring Terminated at 190.5 feet								
-195.0										
-200.0										
-205.0										
-210.0										
-215.0										
-220.0										



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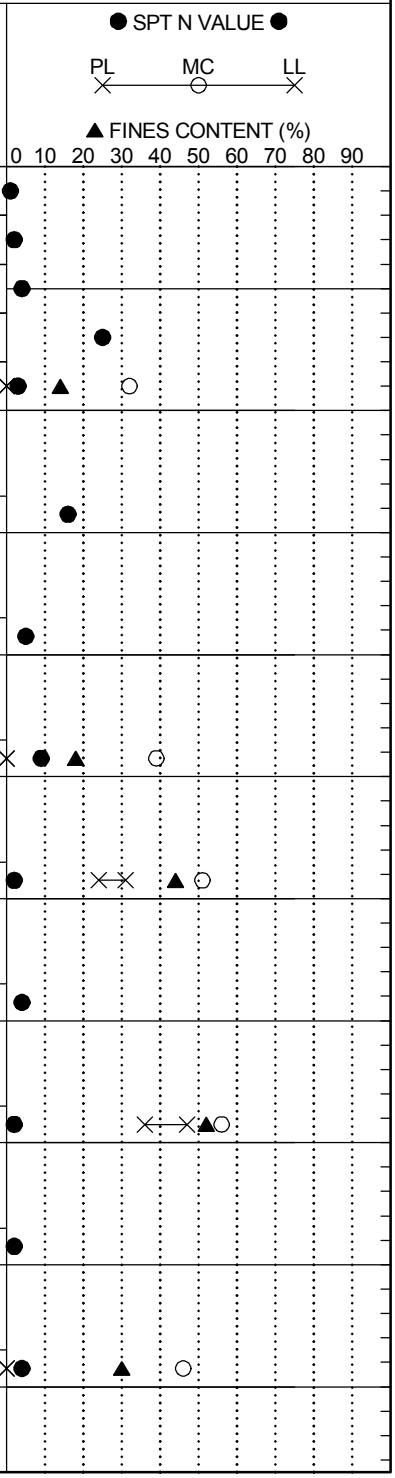
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-14		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	J. Wessinger	**Boring Location:**	97+18	**Offset:**	5.6'-LT	**Alignment:**	ALT 1B
Elev.:	0.1 ft	**Latitude:**	32.403431	**Longitude:**	-80.449948	**Date Started:**	6/13/2016
Total Depth:	190 ft	**Soil Depth:**	190 ft	**Core Depth:**	N/A ft	**Date Completed:**	6/15/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0.1 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	Marsh							
		HOLOCENE	0.0	SS-1	WOH/12"		1	2	1
		Very Loose, Wet, Dark Gray, Non-Plastic, Silty Fine SAND (SM/A-2-4) with Trace of Shell Fragments, Munsell=GLEY1 4/N	2.0	SS-2	2	1	1	1	2
-4.9			4.0	SS-3	1/12"		4	7	4
		@SS-4: Medium Dense, Light Gray, Munsell=GLEY1 7/N	6.0	SS-4	6	10	15	10	25
		@SS-5: Very Loose, LL=NP, PL=NP, PI=NP, NMC=32.4%, %#200=13.8	8.0	SS-5	1	2	1	2	3
-9.9									
		@SS-6: Medium Dense	13.5	SS-6	4	8	8		16
-14.9									
	17.0								
		Loose, Wet, Greenish Gray, Low Plasticity, Fine SAND (SP-SM/A-3) with Silt, Munsell=GLEY1 6/5GY	18.5	SS-7	3	1	4		5
-19.9									
	22.0								
		Loose to Very Loose, Wet, Dark Gray, Non-Plastic to Low Plasticity, Silty Fine SAND (SM/A-2-4) with Trace of Shell Fragments, Munsell=GLEY1 9/N	23.5	SS-8	2	2	7		9
-24.9									
		@SS-8: LL=NP, PL=NP, PI=NP, NMC=38.6%, %#200=17.6	28.5	SS-9	1	1	1		2
		@SS-9: Fine to Medium Sand, (A-4(1)), LL=31, PL=24, PI=7, NMC=50.9%, %#200=43.7							
-29.9									
	32.0								
		Soft to Very Soft, Wet, Dark Gray, Medium Plasticity, Sandy SILT (ML/A-7-5(4)), Munsell=GLEY1 4/N	33.5	SS-10	2	2	2		4
-34.9									
		@SS-11: LL=47, PL=36, PI=11, NMC=56.1%, %#200=52.0	38.5	SS-11	WOH/12"		2		2
-39.9									
			43.5	SS-12	1	1	1		2
-44.9									
	47.0								
		Very Loose, Wet, Greenish Black, Non-Plastic, Silty Fine SAND (SM/A-2-4), Munsell=GLEY1 2.5/10Y	48.5	SS-13	WOH	2	2		4
-49.9									
		@SS-13: LL=NP, PL=NP, PI=NP, NMC=46.2%, %#200=30.1							
	53.5		53.5						



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LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-14		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	J. Wessinger	**Boring Location:**	97+18	**Offset:**	5.6'-LT	**Alignment:**	ALT 1B
Elev.:	0.1 ft	**Latitude:**	32.403431	**Longitude:**	-80.449948	**Date Started:**	6/13/2016
Total Depth:	190 ft	**Soil Depth:**	190 ft	**Core Depth:**	N/A ft	**Date Completed:**	6/15/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0.1 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	SPT N VALUE (PL MC LL) / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
-54.9		**HAWTHORN MARL** Stiff to Firm, Moist, Dark Olive Gray, Low Plasticity, Non Reactive, SILT (ML/A-4), Calcaceous, Munsell=5Y 3/2		SS-14	2	5	4		9	
		@SS-15: Soft to Firm	58.5	SS-15	WOH	2	2		4	
-59.9										
			63.0	SS-16	3	3	4		7	
-64.9										
			68.0	SS-17	3	3	4		7	
-69.9										
			72.5	SS-18	3	3	4		7	
-74.9										
	77.0	**COOPER GROUP LIMESTONE** Medium Dense to Loose, Wet, Gray/Black, Low Plasticity, Weakly Reactive, Clayey Fine to Coarse SAND (SC/A-2-4) with Phosphate Nodules, Calcaceous, Munsell=5Y 6/1 & 2.5/1	77.5	SS-19	16	4	9		13	
-79.9										
		@SS-20: Light Olive Gray, Strongly Reactive, Munsell=5Y 6/2	83.5	SS-20	2	2	7		9	
-84.9										
			88.5	SS-21	2	2	3		5	Hard Lense from 87.0 to 88.0 feet
-89.9										
			93.5	SS-22	7	16	10		26	
-94.9										
	98.5	Firm to Soft, Wet, Greenish Gray, Non-Plastic to Low Plasticity, Strongly Reactive, Sandy SILT (ML/A-4), Calcaceous, Munsell=GLEY1 5/10Y	98.5	SS-23	2	3	5		8	
-99.9										
			104.0	SS-24	2	2	2		4	
-104.9										

LEGEND

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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-14		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	J. Wessinger	**Boring Location:**	97+18	**Offset:**	5.6'-LT	**Alignment:**	ALT 1B
Elev.:	0.1 ft	**Latitude:**	32.403431	**Longitude:**	-80.449948	**Date Started:**	6/13/2016
Total Depth:	190 ft	**Soil Depth:**	190 ft	**Core Depth:**	N/A ft	**Date Completed:**	6/15/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0.1 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		Firm, Wet, Greenish Gray, Non-Plastic to Low Plasticity, Strongly Reactive, Sandy SILT (ML/A-4), Calcaceous, Munsell=GLEY1 5/10Y		108.5	SS-25	3	2	3		5	
-109.9				113.5	SS-26	2	3	3		6	
-114.9				118.5	SS-27	4	4	5		9	
-119.9		@SS-27: Stiff									
	123.5	Loose, Moist, Gray, Strongly Reactive, Non-Plastic to Low Plasticity, Silty Fine SAND (SM/A-2-4), Calcaceous, Munsell=5Y 6/1		123.5	SS-28	3	3	5		8	
-124.9				128.5	SS-29	3	2	4		6	
-129.9				133.0	SS-30	3	2	3		5	
-134.9		@SS-30: No Recovery									
-139.9		@SS-31: Medium Dense, Greenish Gray, Munsell=GLEY1 7/10Y		138.0	SS-31		5	6		11	*Rod Slipped and Blow Count*
-144.9		@SS-32: No Recovery		142.5	SS-32	4	4	5		9	*No Recorded for Top 6"*
-149.9		@SS-33: Loose, Fine to Coarse Sand		148.5	SS-33	3	4	4		8	
-154.9		@SS-34: No Recovery		153.5	SS-34	4	4	5		9	
-159.9				158.5	SS-35	3	4	5		9	

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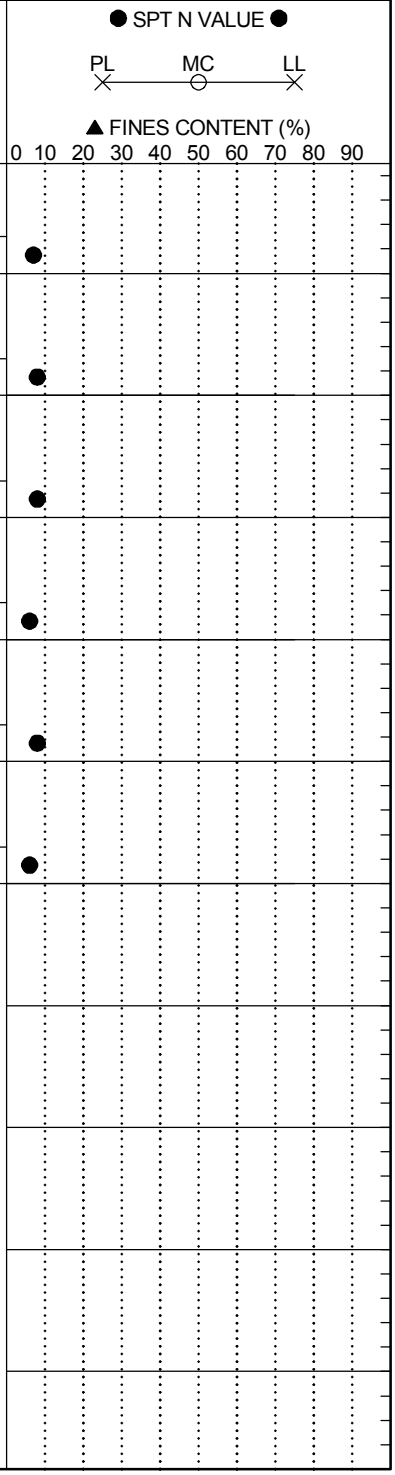
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-14		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	J. Wessinger	**Boring Location:**	97+18	**Offset:**	5.6'-LT	**Alignment:**	ALT 1B
Elev.:	0.1 ft	**Latitude:**	32.403431	**Longitude:**	-80.449948	**Date Started:**	6/13/2016
Total Depth:	190 ft	**Soil Depth:**	190 ft	**Core Depth:**	N/A ft	**Date Completed:**	6/15/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0.1 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Loose, Moist, Greenish Gray, Strongly Reactive, Non-Plastic to Low Plasticity, Silty Fine SAND (SM/A-2-4), Calcaceous, Munsell=GLEY1 7/10Y		163.5	SS-36	3	3	4		7
-164.9				168.5	SS-37	4	3	5		8
-169.9				173.5	SS-38	2	3	5		8
-174.9				178.5	SS-39	3	3	3		6
-179.9				183.5	SS-40	3	4	4		8
-184.9		@SS-40: No Recovery		188.5	SS-41	3	2	4		6
-189.9	190.0	Boring Terminated at 190.0 feet								
-194.9										
-199.9										
-204.9										
-209.9										



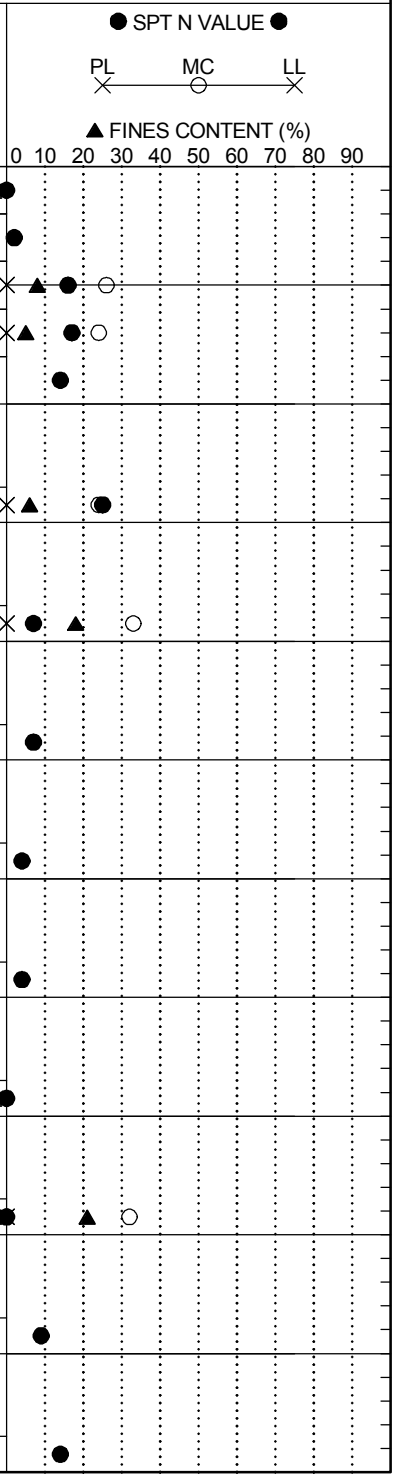
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-15		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	100+78	**Offset:**	9.6'-RT	**Alignment:**	ALT 1B
Elev.:	1.6 ft	**Latitude:**	32.403014	**Longitude:**	-80.448888	**Date Started:**	8/3/2016
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	N/A ft	**Date Completed:**	8/3/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	Marsh							
		HOLOCENE	0.0	SS-1	WOH/24"				WOH
		Very Loose, Wet, Very Dark Gray, Non-Plastic, Non-Reactive, Poorly Graded Fine SAND (SP-SM/A-3) with Silt, Munsell=5Y 3/1	2.0	SS-2	1	1	1	5	2
-3.4			4.0	SS-3	7	7	9	4	16
		@SS-2: Dark Gray, Munsell=5Y 4/1	6.0	SS-4	6	8	9	12	17
		@SS-3: Medium Dense, Gray, Weakly Reactive, Munsell=5Y 5/1, LL=NP, PL=NP, PI=NP, NMC=26.2%, %#200=8.2	8.0	SS-5	5	6	8	11	14
-8.4									
		@SS-4: LL=NP, PL=NP, PI=NP, NMC=23.5%, %#200=5.1							
		@SS-6: LL=NP, PL=NP, PI=NP, NMC=23.8%, %#200=5.5	13.5	SS-6	5	11	14		25
-13.4									
	17.0								
		Loose to Very Loose, Wet, Gray, Non-Plastic, Weakly Reactive, Silty Fine to Medium SAND (SM/A-2-4) with Trace of Shell Fragments, Munsell=5Y 5/1	18.5	SS-7	3	2	5		7
-18.4									
		@SS-7: LL=NP, PL=NP, PI=NP, NMC=33.2%, %#200=17.5	23.5	SS-8	3	3	4		7
-23.4									
			28.5	SS-9	3	2	2		4
-28.4									
		@SS-10: Dark Gray, Munsell=5Y 4/1	33.5	SS-10	WOH	1	3		4
-33.4									
	37.0								
		Very Soft, Wet, Dark Gray, Medium Plasticity, Weakly Reactive, Fine Sandy CLAY (CL/A-4) with Trace of Organics, Munsell=GLEY1 4/N	38.5	SS-11	WOH/18"				WOH
-38.4									
	42.0	@SS-11: Organics=4.15%							
		Very Loose to Loose, Wet, Dark Gray, Non-Plastic, Weakly Reactive, Silty Fine to Medium SAND (SM/A-2-4) with Trace of Shell Fragments, Munsell=5Y 4/1	43.5	SS-12	WOH/18"				WOH
-43.4									
		@SS-12: LL=NP, PL=NP, PI=NP, NMC=31.6%, %#200=20.7	48.5	SS-13	3	3	6		9
-48.4									
			53.5	SS-14	5	6	8		14
		@SS-14: Medium Dense							



LEGEND

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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-15		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	100+78	**Offset:**	9.6'-RT	**Alignment:**	ALT 1B
Elev.:	1.6 ft	**Latitude:**	32.403014	**Longitude:**	-80.448888	**Date Started:**	8/3/2016
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	N/A ft	**Date Completed:**	8/3/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	● SPT N VALUE ● / PL MC LL / ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		Very Loose to Loose, Wet, Dark Gray, Non-Plastic, Weakly Reactive, Silty Fine to Medium SAND (SM/A-2-4) with Trace of Shell Fragments, Munsell=5Y 4/1		58.5	SS-15	1	1	1		2	
-58.4											
				63.5	SS-16	3	3	3		6	
-63.4											
	67.0	**HAWTHORN MARL** Loose to Medium Dense, Wet, Olive Gray, Low Plasticity, Weakly Reactive, Silty Fine SAND (SM/A-2-4), Munsell=5Y 4/2		68.5	SS-17	3	3	5		8	
-68.4											
		@SS-18: Olive, Munsell=5Y 4/3		73.5	SS-18	4	5	5		10	
-73.4											
	79.5			78.5	SS-19	3	7	16		23	*Hard Lease from 79.5 to 81.5 feet*
-78.4		**COOPER GROUP LIMESTONE** Medium Dense to Loose, Dark Olive Gray, Low Plasticity, Weakly to Highly Reactive, Silty Fine to Medium SAND (SM/A-2-4) with Phosphate Nodules, Calcaceous, Munsell=5Y 3/2		83.5	SS-20	4	4	5		9	
-83.4		@SS-20: Greenish Gray, Munsell=GLEY1 6/10Y									
		@SS-21: Light Grayish Olive, Munsell=10Y 6/2		88.5	SS-21	2	14	13		27	
-88.4											
		@SS-22: Light Greenish Gray, Munsell=GLEY1 7/10Y		93.5	SS-22	3	5	12		17	
-93.4											
				98.5	SS-23	4	4	4		8	
-98.4											
				103.5	SS-24	3	4	12		16	
-103.4											
		@SS-25: Greenish Gray, Munsell=GLEY1 6/5GY		108.5	SS-25	3	4	6		10	

LEGEND

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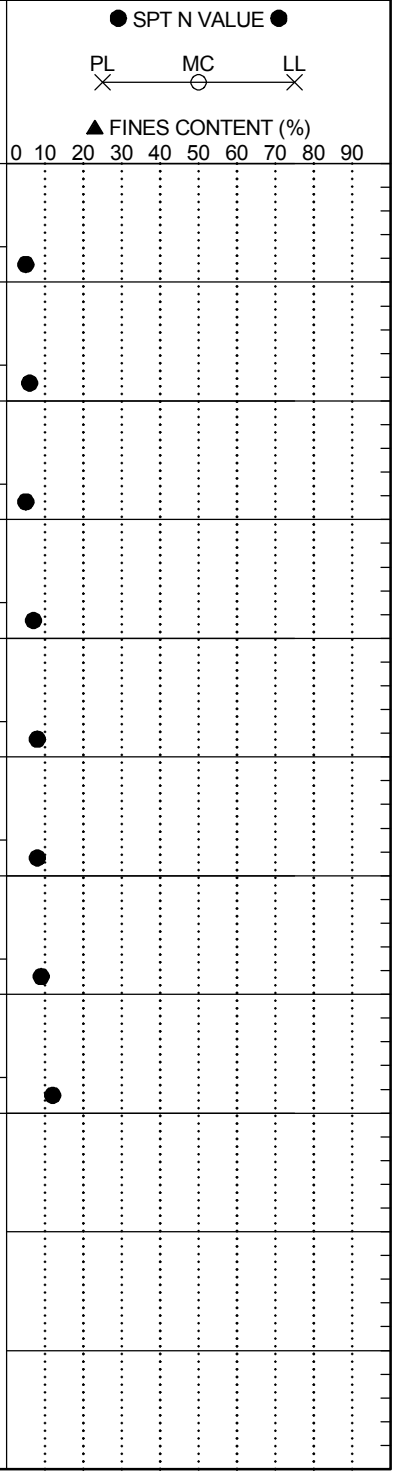
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC_DOT G5396 - HARBOR RIVER SPT AND CPT.GPJ FME2017.GDT 2/14/17

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-15		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	100+78	**Offset:**	9.6'-RT	**Alignment:**	ALT 1B
Elev.:	1.6 ft	**Latitude:**	32.403014	**Longitude:**	-80.448888	**Date Started:**	8/3/2016
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	N/A ft	**Date Completed:**	8/3/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Loose, Dark Greenish Gray, Low Plasticity, Weakly to Highly Reactive, Silty Fine to Medium SAND (SM/A-2-4) with Phosphate Nodules, Calcaceous, Munsell=GLEY1 6/5GY	113.5	SS-26	3	2	3		5
-113.4			118.5	SS-27	3	2	4		6
-118.4			123.5	SS-28	3	1	4		5
-123.4			128.5	SS-29	3	3	4		7
-128.4			133.5	SS-30	4	5	3		8
-133.4			138.5	SS-31	4	3	5		8
-138.4	143.5	Stiff, Wet, Greenish Gray, Low Plasticity, Strongly Reactive, Fine Sandy SILT (ML/A-4), Calcaceous, Munsell=GLEY1 6/10Y	143.5	SS-32	4	3	6		9
-143.4	148.5	Medium Dense, Wet, Greenish Gray, Low Plasticity, Strongly Reactive, Silty Fine SAND (SM/A-2-4), Calcaceous, Munsell=GLEY1 6/10Y	148.5	SS-33	4	4	8		12
-148.4	150.0	Boring Terminated at 150.0 feet							
-153.4									
-158.4									



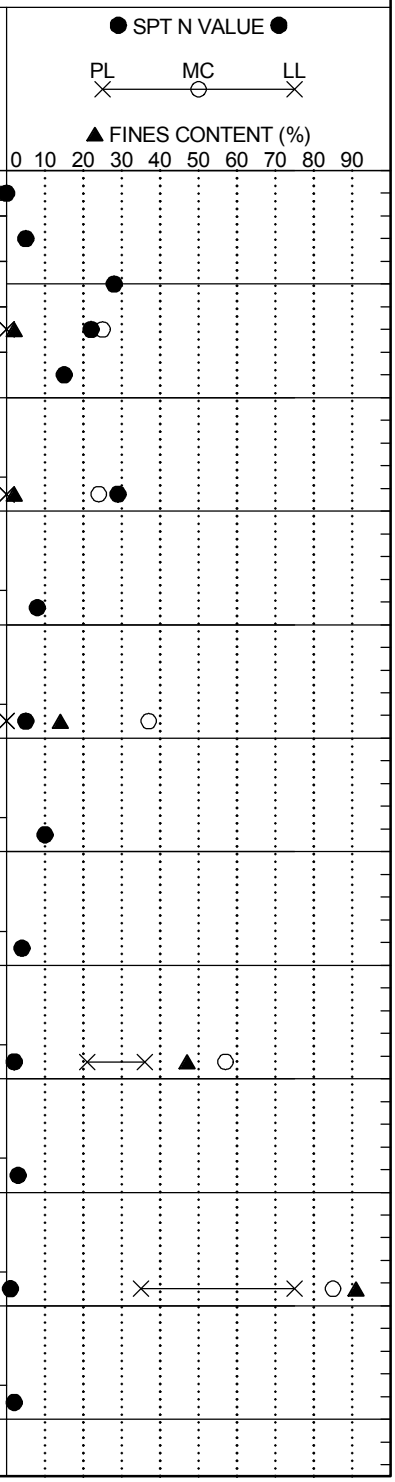
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-16		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	105+97	**Offset:**	25.2'-LT	**Alignment:**	ALT 1B
Elev.:	2.4 ft	**Latitude:**	32.402552	**Longitude:**	-80.447291	**Date Started:**	8/1/2016
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	N/A ft	**Date Completed:**	8/2/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	Marsh	0.0	SS-1	WOH/24"				WOH
	4.0	**HOLOCENE** Very Loose to Loose, Wet, Gray, Low Plasticity, Weakly Reactive, Silty Fine to Medium SAND (SM/A-2-4) with Trace of Organics (Wood), Munsell=5Y 5/1	2.0	SS-2	2	2	3	3	5
-2.6		@SS-2: Dark Grayish Brown, Munsell=2.5Y 4/2	4.0	SS-3	5	12	16	21	28
			6.0	SS-4	6	11	11	17	22
			8.0	SS-5	4	5	10	14	15
-7.6		Medium Dense, Wet, Gray, Non-Plastic, Weakly Reactive, Poorly Graded Fine SAND (SP/A-3) with Trace of Shell Fragments, Munsell=5Y 6/1							
-12.6		@SS-4: Non-Reactive, LL=NP, PL=NP, PI=NP, NMC=24.5%, %#200=2.1	13.5	SS-6	7	13	16		29
	17.0	@SS-6: LL=NP, PL=NP, PI=NP, NMC=24.3%, %#200=2.1							
-17.6		Loose to Very Loose, Wet, Dark Gray, Non-Plastic, Weakly Reactive, Silty Fine SAND (SM/A-2-4) with Trace of Shell Fragments, Munsell=5Y 4/1	18.5	SS-7	1	2	6		8
-22.6		@SS-8: Gray, Munsell=5Y 5/1, LL=NP, PL=NP, PI=NP, NMC=37.4%, %#200=13.9	23.5	SS-8	2	2	3		5
-27.6			28.5	SS-9	3	4	6		10
-32.6			33.5	SS-10	2	2	2		4
	37.0	Very Loose, Wet, Dark Gray, Medium Plasticity, Weakly Reactive, Clayey Fine SAND (SC/A-6(4)), Munsell=5Y 4/1	38.5	SS-11	1	1	1		2
-37.6	42.0	@SS-11: LL=36, PL=21, PI=15, NMC=56.7%, %#200=46.6							
-42.6		Very Loose, Wet, Dark Gray, Non-Plastic, Weakly Reactive, Silty Fine SAND (SM/A-2-4), Munsell=5Y 4/1	43.5	SS-12	2	1	2		3
	47.0	Very Soft, Wet, Dark Gray, High Plasticity, Weakly Reactive, Elastic SILT (MH/A-7-5(25)) with Few Organics, Munsell=GLEY1 4/N, LL=75	48.5	SS-13	WOH/12"				1
-47.6		@SS-13: LL=75, PL=35, PI=40, NMC=84.8%, %#200=91.0	53.5	SS-14	1	1	1		2
-52.6		@SS-14: Organics=7.22%							
	57.5								



LEGEND

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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-16		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	105+97	**Offset:**	25.2'-LT	**Alignment:**	ALT 1B
Elev.:	2.4 ft	**Latitude:**	32.402552	**Longitude:**	-80.447291	**Date Started:**	8/1/2016
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	N/A ft	**Date Completed:**	8/2/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	SPT N VALUE / FINES CONTENT (%)
-57.6		Loose, Wet, Dark Gray, Non-Plastic, Weakly Reactive, Silty Fine SAND (SM/A-2-4), Munsell=5Y 4/1	58.5	SS-15	WOH	2	3		5	
-62.6			63.5	SS-16	3	3	5		8	
	67.0									
-67.6	70.0	Soft, Wet, Dark Gray, Medium Plasticity, Weakly Reactive, Fine Sandy CLAY (CL/A-4), Munsell=5Y 4/1	68.5	SS-17	2	1	2		3	
-72.6		**HAWTHORN MARL** Very Loose to Loose, Wet, Olive Gray, Low Plasticity, Weakly Reactive, Silty Fine SAND (SM/A-2-4), Munsell=5Y 4/2	73.5	SS-18	3	2	4		6	
-77.6	80.0	@SS-19: Medium Dense, Dark Olive Gray, Munsell=5Y 3/2	78.5	SS-19	3	4	23		27	*Hard Lense from 81.0 to 81.5 feet*
-82.6		**COOPER GROUP LIMESTONE** Medium Dense to Loose, Wet, Light Greenish Gray, Low Plasticity, Strongly Reactive, Silty Fine to Medium SAND (SM/A-2-4), Calcaceous, Munsell=GLEY1 7/5GY	83.5	SS-20	4	6	5		11	
-87.6		@SS-21: Greenish Gray, Munsell=GLEY1 6/10Y	88.5	SS-21	3	2	3		5	
-92.6		@SS-22: Light Greenish Gray, Munsell=GLEY1 7/10Y	93.5	SS-22	24	20	8		28	
-97.6			98.5	SS-23	8	10	5		15	
-102.6		@SS-24: Greenish Gray, Munsell=GLEY1 6/5GY	103.5	SS-24	3	4	6		10	
-107.6			108.5	SS-25	3	2	4		6	
			113.5	SS-26	4	4	5		9	

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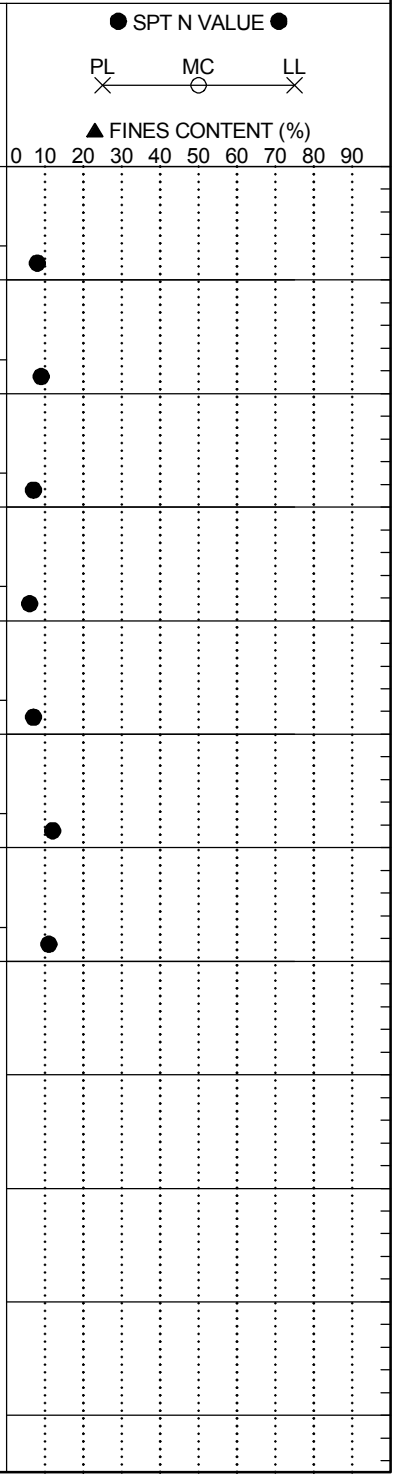
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	B-16		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	105+97	**Offset:**	25.2'-LT	**Alignment:**	ALT 1B
Elev.:	2.4 ft	**Latitude:**	32.402552	**Longitude:**	-80.447291	**Date Started:**	8/1/2016
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	N/A ft	**Date Completed:**	8/2/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Loose to Medium Dense, Wet, Greenish Gray, Low Plasticity, Strongly Reactive, Silty Fine to Medium SAND (SM/A-2-4), Calcaceous, Munsell=GLEY1 6/5GY		118.5	SS-27	3	3	5		8
-117.6				123.5	SS-28	5	3	6		9
-122.6				128.5	SS-29	3	3	4		7
-127.6		@SS-29: No Recovery		133.5	SS-30	4	3	3		6
-132.6		@SS-30: No Recovery		138.5	SS-31	3	4	3		7
-137.6				143.5	SS-32	5	6	6		12
-142.6				148.5	SS-33	3	4	7		11
-147.6	150.0	Boring Terminated at 150.0 feet								
-152.6										
-157.6										
-162.6										
-167.6										



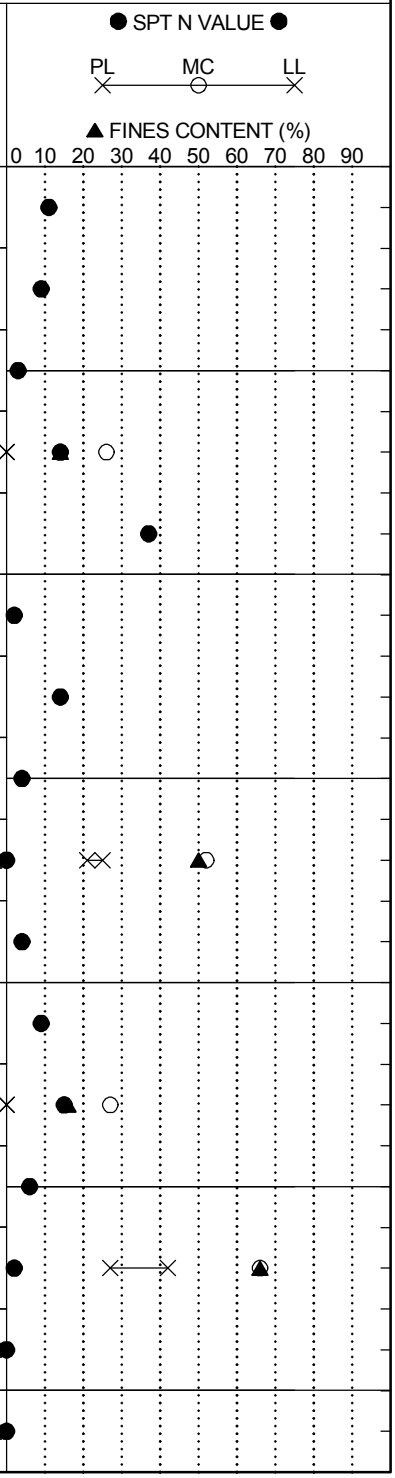
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	TS-1		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	M. Touchberry	**Boring Location:**	40+78	**Offset:**	305.9'-RT	**Alignment:**	ALT 1B
Elev.:	6.4 ft	**Latitude:**	32.408395	**Longitude:**	-80.467293	**Date Started:**	11/16/2015
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	0 ft	**Date Completed:**	11/17/2015
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	74%
Core Size:	N/A	**Driller:**	Ameridrill	**Groundwater:**	**TOB** 4 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	Grassed Parking Area								
		EMBANKMENT FILL Medium Dense, Dry to Moist, Dark Reddish Brown, Non-Plastic, Fine to Medium SAND (SP-SM/A-1) with Silt, Munsell= 5YR 2.5/2		0.0	SS-1	3	5	6	6	11
	3.0	Loose to Very Loose, Wet, Very Dark Gray, Non-Plastic, Silty Fine SAND (SM/A-2-4) with Trace of Shell Fragments, Munsell=GLEY1 3/N		2.0	SS-2	5	6	3	5	9
1.4		@SS-4: Medium Dense to Dense, Dark Greenish Gray, Munsell=GLEY1 4/10Y, LL=NP, PL=NP, PI=NP, NMC=25.9%, %#200=13.9		4.0	SS-3	2	2	1	1	3
		@SS-5: Greenish Gray, Munsell= GLEY1 5/10Y		6.0	SS-4	2	5	9	13	14
-3.6		@SS-6: Very Loose, Very Dark Greenish Gray, Munsell=GLEY1 3/10Y		8.0	SS-5	15	22	15	8	37
	12.0	**ENGINEERED FILL** Medium Dense, Wet, Greenish Gray, Non-Plastic, Fine SAND (SP-SM/A-1) with Silt, Munsell=GLEY1 5/10Y		10.0	SS-6	1	1	1	2	2
-8.6	15.5	@SS-8: Very Loose, Light Greenish Gray, Munsell=GLEY1 7/10Y		12.0	SS-7	3	7	7	11	14
		HOLOCENE Very Loose to Loose, Wet, Very Dark Greenish Gray, Low Plasticity, Silty, Clayey Fine SAND (SC-SM/A-4(0)), Munsell=GLEY1 3/10Y		14.0	SS-8	2	2	2	2	4
-13.6	21.0	@SS-9: LL=25, PL=21, PI=4, NMC=52.2%, %#200=49.7		16.0	SS-9	WOH/24"				WOH
		Loose to Medium Dense, Wet, Greenish Gray, Non-Plastic, Silty Fine SAND (SM/A-2-4), Munsell=GLEY1 5/10Y		18.0	SS-10	WOH	1	3	4	4
-18.6		@SS-12: LL=NP, PL=NP, PI=NP, NMC=26.7%, %#200=16.3		20.0	SS-11	WOH	3	6	4	9
	26.0	@SS-13: with Trace of Shell Fragments		22.0	SS-12	5	7	8	6	15
		Very Soft, Wet, Very Dark Greenish Gray, Medium Plasticity, Sandy SILT (ML/A-7-6(9)) with Trace of Shell Fragments, Munsell=GLEY1 3/10Y		24.0	SS-13	2	2	4	4	6
-23.6		@SS-14: LL=42, PL=27, PI=15, NMC=65.5%, %#200=65.6		26.0	SS-14	WOH	1	1	1	2
	32.0			28.0	SS-15	WOH/18"			1	WOH
				30.0	SS-16	WOH/24"				WOH
				32.0						



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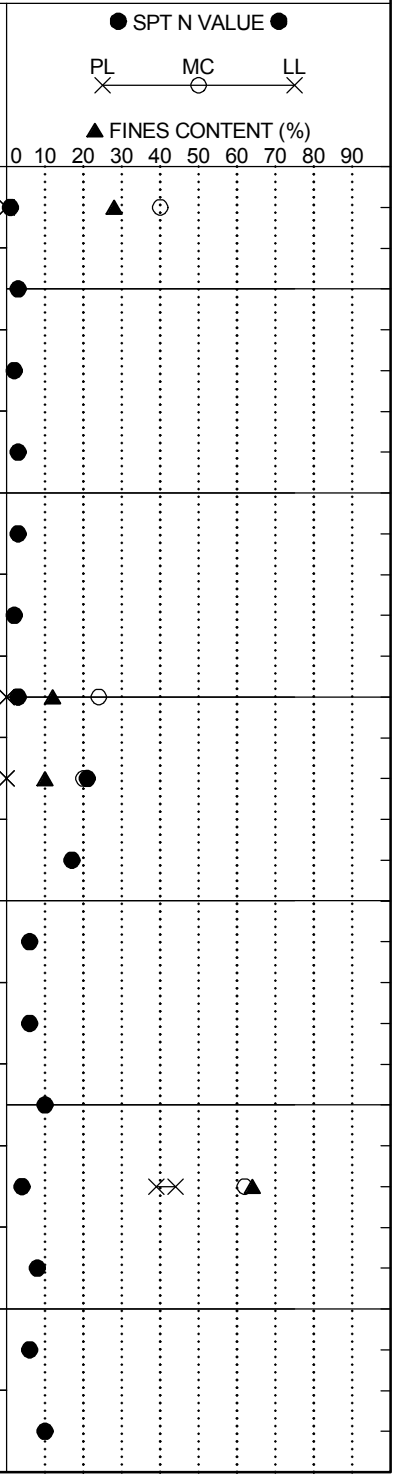
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	TS-1		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	M. Touchberry	**Boring Location:**	40+78	**Offset:**	305.9'-RT	**Alignment:**	ALT 1B
Elev.:	6.4 ft	**Latitude:**	32.408395	**Longitude:**	-80.467293	**Date Started:**	11/16/2015
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	0 ft	**Date Completed:**	11/17/2015
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	74%
Core Size:	N/A	**Driller:**	Ameridrill	**Groundwater:**	**TOB** 4 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Very Loose, Wet, Very Dark Greenish Gray, Non-Plastic, Silty Fine SAND (SM/A-2-4) with Shell Fragments, Munsell=GLEY1 3/10Y		SS-17	3	1/12"		1	1
-28.6		@SS-17: LL=NP, PL=NP, PI=NP, NMC=40.2%, %#200=28.3	34.0	SS-18	1	1	2	2	3
			36.0	SS-19	1	1	1	1	2
			38.0	SS-20	2	2	1	1	3
-33.6	41.0		40.0	SS-21	2	1	2	1	3
		Soft to Very Soft, Wet, Very Dark Greenish Gray, Non-Plastic to Low Plasticity, SILT (ML/A-4), Munsell=GLEY1 3/10Y	42.0	SS-22	1	1	1	WOH	2
	44.0	@SS-22: with Fine Sand and Trace of Shell Fragments	44.0						
-38.6		Very Loose, Wet, Very Dark Greenish Gray, Non-Plastic, Silty Fine to Coarse SAND (SM/A-2-4), Munsell=GLEY1 3/10Y, LL=NP, PL=NP, PI=NP, NMC=24.0%, %#200=12.2	46.0	SS-23	WOH	2	1	3	3
	46.0		46.0	SS-24	7	10	11	5	21
	48.0	Medium Dense, Wet, Gray, Non-Plastic, Poorly Graded Fine to Coarse SAND (SP-SM/A-1-b) with Silt and Trace of Shell Fragments, Munsell=GLEY1 5/N, LL=NP, PL=NP, PI=NP, NMC=20.1%, %#200=9.8	48.0	SS-25	2	6	11	8	17
-43.6		**HAWTHORN MARL**	50.0	SS-26	2	3	3	5	6
		Very Stiff, Moist, Olive/Dark Greenish Gray, Low Plasticity, Sandy SILT (ML/A-5(4)), Munsell=10Y 4/4 & 4/2	52.0	SS-27	3	3	3	4	6
		@SS-26: Firm	54.0						
-48.6		@SS-27: with Trace of Shell Fragments		SS-28	4	5	5	5	10
		@SS-28: Very Stiff, Dark Grayish Olive, Munsell=10Y 4/2	56.0						
		@SS-29: Soft to Firm, LL=44, PL=39, PI=5, NMC=62.4%, %#200=64.2	58.0	SS-29	WOH	2	2	3	4
			60.0	SS-30	4	4	4	5	8
-53.6			62.0	SS-31	2	2	4	5	6
		@SS-32: Stiff	64.0	SS-32	3	4	6	8	10



LEGEND

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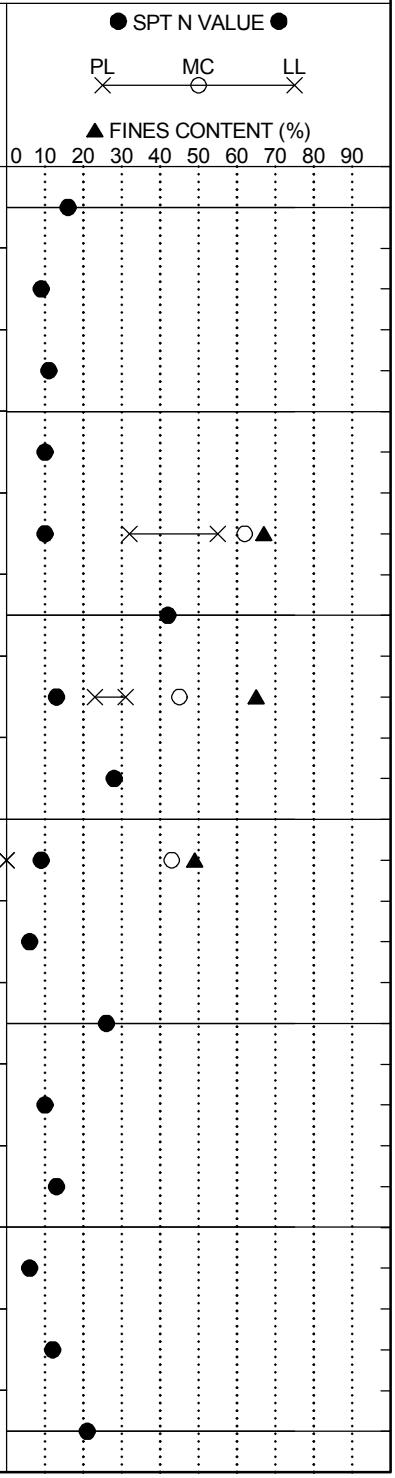
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	TS-1		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	M. Touchberry	**Boring Location:**	40+78	**Offset:**	305.9'-RT	**Alignment:**	ALT 1B
Elev.:	6.4 ft	**Latitude:**	32.408395	**Longitude:**	-80.467293	**Date Started:**	11/16/2015
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	0 ft	**Date Completed:**	11/17/2015
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	74%
Core Size:	N/A	**Driller:**	Ameridrill	**Groundwater:**	**TOB** 4 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
-58.6		Very Stiff to Stiff, Moist, Dark Grayish Olive, Low Plasticity, Sandy SILT (ML/A-5(4)), Munsell=10Y 4/2	66.0	SS-33	7	7	9	10	16
			68.0	SS-34	2	4	5	6	9
			70.0	SS-35	3	5	6	6	11
-63.6			72.0	SS-36	3	4	6	9	10
	72.0	Stiff, Moist, Dark Grayish Olive, High Plasticity, Sandy Elastic SILT (MH/A-7-5(16)), Munsell=10Y 4/2	74.0	SS-37	4	4	6	15	10
-68.6	75.0	@SS-37: LL=55, PL=32, PI=23, NMC=61.7%, %#200=67.4	76.0	SS-38	15	19	23	26	42
		=> Hard	78.0	SS-39	4	5	8	10	13
		COOPER GROUP LIMESTONE	80.0	SS-40	8	10	18	24	28
		Hard, Moist, White, Low Plasticity, Sandy SILT (ML/A-4(4)) with Phosphate Nodules, Munsell=GLEY1 8/N							
-73.6		@SS-39: Stiff to Very Stiff, LL=31, PL=23, PI=8, NMC=44.5%, %#200=64.7	82.0	SS-41	4	4	5	6	9
	81.0	Loose to Medium Dense, Moist, Gray, Non-Plastic, Silty Fine SAND (SM/A-4(0)), Munsell=5Y 6/1	84.0	SS-42	3	3	3	11	6
		@SS-41: LL=NP, PL=NP, PI=NP, NMC=42.6%, %#200=49.1	86.0	SS-43	3	8	18	24	26
-78.6			88.0	SS-44	3	4	6	12	10
			90.0	SS-45	5	6	7	10	13
-83.6		@SS-46: Light Olive Gray, Munsell=5Y 6/2	92.0	SS-46	2	2	4	5	6
			94.0	SS-47	5	6	6	9	12
-88.6	96.0		96.0	SS-48	6	7	14	18	21



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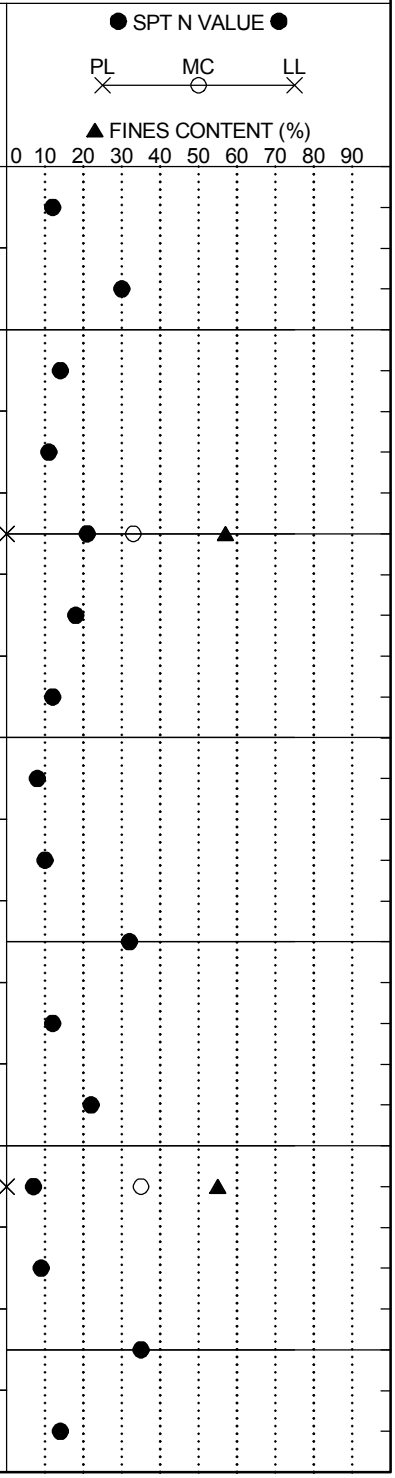
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862			**County:**	Beaufort	**Boring No.:**	TS-1
Site Description:	US 21 Bridge Replacement over Harbor River					**Route:**	US 21
Eng./Geo.:	M. Touchberry	**Boring Location:**	40+78	**Offset:**	305.9'-RT	**Alignment:**	ALT 1B
Elev.:	6.4 ft	**Latitude:**	32.408395	**Longitude:**	-80.467293	**Date Started:**	11/16/2015
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	0 ft	**Date Completed:**	11/17/2015
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	74%
Core Size:	N/A	**Driller:**	Ameridrill	**Groundwater:**	**TOB** 4 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Stiff to Very Stiff, Moist, Light Greenish Gray, Non-Plastic, Sandy SILT (ML/A-4(0)), Munsell=GLEY1 5GY 7/1		98.0	SS-49	2	4	8	12	12
-93.6				100.0	SS-50	9	11	19	29	30
				102.0	SS-51	11	6	8	25	14
				104.0	SS-52	4	5	6	17	11
-98.6		@SS-53: LL=NP, PL=NP, PI=NP, NMC=33.4%, %#200=56.8		106.0	SS-53	5	6	15	24	21
				108.0	SS-54	4	6	12	22	18
-103.6		@SS-56: Firm to Stiff		110.0	SS-55	5	5	7	16	12
				112.0	SS-56	1	4	4	13	8
				114.0	SS-57	4	4	6	10	10
-108.6		@SS-58: Hard		116.0	SS-58	7	13	19	29	32
		@SS-59: Stiff to Very Stiff		118.0	SS-59	4	5	7	17	12
				120.0	SS-60	4	9	13	20	22
-113.6		@SS-61: Firm to Stiff, LL=NP, PL=NP, PI=NP, NMC=35.4%, %#200=55.3		122.0	SS-61	3	3	4	13	7
				124.0	SS-62	3	4	5	8	9
-118.6		@SS-63: Hard		126.0	SS-63	7	14	21	30	35
		@SS-64: Stiff to Very Stiff		128.0	SS-64	WOH	5	9	25	14



LEGEND

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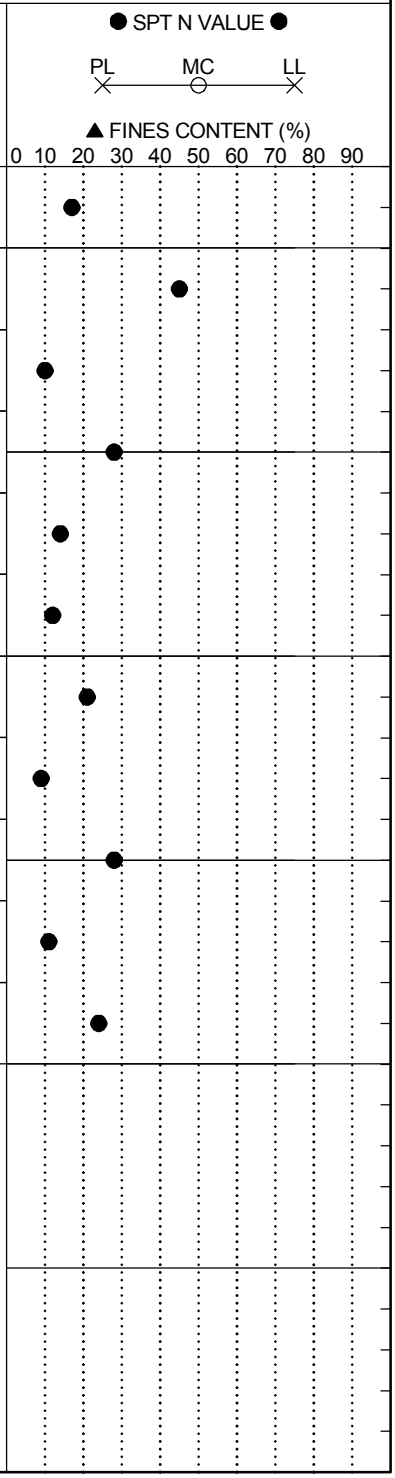
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	TS-1		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	M. Touchberry	**Boring Location:**	40+78	**Offset:**	305.9'-RT	**Alignment:**	ALT 1B
Elev.:	6.4 ft	**Latitude:**	32.408395	**Longitude:**	-80.467293	**Date Started:**	11/16/2015
Total Depth:	150 ft	**Soil Depth:**	150 ft	**Core Depth:**	0 ft	**Date Completed:**	11/17/2015
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	74%
Core Size:	N/A	**Driller:**	Ameridrill	**Groundwater:**	**TOB** 4 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Very Stiff to Hard, Moist, Light Greenish Gray, Non-Plastic, Sandy SILT (ML/A-4(0)), Munsell=GLEY1 5GY 7/1								
-123.6				130.0	SS-65	3	4	13	46	17
				132.0	SS-66	8	14	31	32	45
		@SS-67: Stiff to Very Stiff		134.0	SS-67	3	5	5	12	10
-128.6				136.0	SS-68	9	13	15	18	28
				138.0	SS-69	4	6	8	22	14
				140.0	SS-70	5	5	7	16	12
-133.6				142.0	SS-71	5	9	12	16	21
				144.0	SS-72	5	4	5	16	9
-138.6				146.0	SS-73	5	11	17	25	28
				148.0	SS-74	4	5	6	13	11
					SS-75	7	9	15	35	24
-143.6	150.0	Boring Terminated at 150.0 feet								
-148.6										



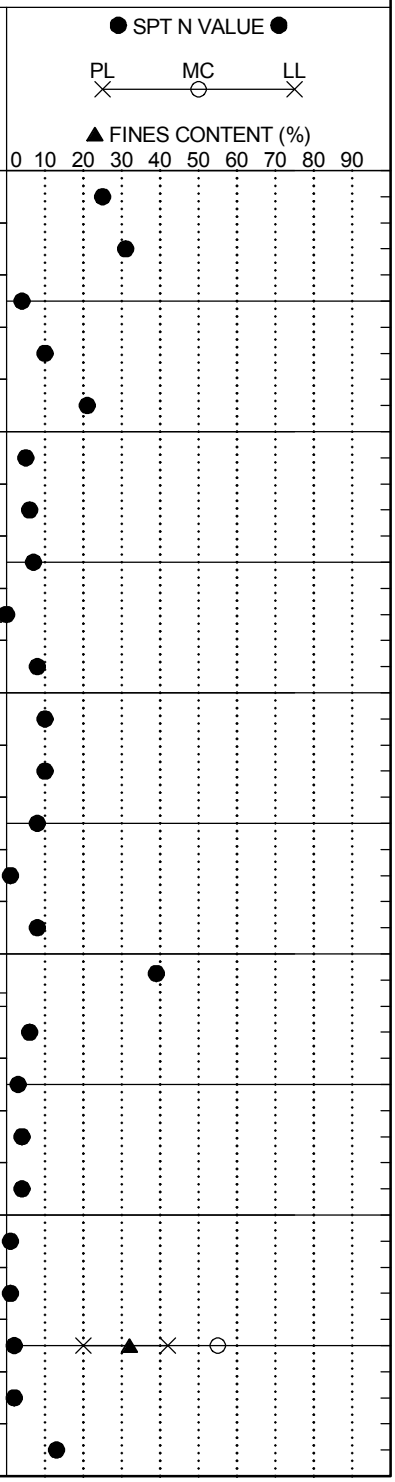
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	SB-1		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	M. Miller	**Boring Location:**	40+85	**Offset:**	293.6'-RT	**Alignment:**	ALT 1B
Elev.:	6.8 ft	**Latitude:**	32.408419	**Longitude:**	-80.467258	**Date Started:**	7/6/2016
Total Depth:	520 ft	**Soil Depth:**	520 ft	**Core Depth:**	250 ft	**Date Completed:**	7/14/2016
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Failing 1500	**Drill Method:**	RW/RC	**Hammer Type:**	Automatic	**Energy Ratio:**	75.4%
Core Size:	NQ	**Driller:**	Huss	**Groundwater:**	**TOB** 6 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	Gravel/Grassed Parking Area							
		EMBANKMENT FILL	0.0	SS-1	8	12	13	13	25
		Medium Dense to Dense, Dry, Gray, Non-Plastic, Silty Fine SAND (SM/A-2-4) with Gravel, Munsell=7.5YR 3/2	2.0	SS-2	11	14	17	18	31
1.8		@SS-2: Brown, Munsell=10YR 5/3	4.0	SS-3	1	2	2	2	4
		@SS-3: No Recovery, Very Loose	6.0	SS-4	1	3	7	13	10
			8.0	SS-5	6	9	12	11	21
-3.2	10.0	**ENGINEERED FILL**	10.0	SS-6	3	3	2	2	5
		Loose, Wet, Gray, Non-Plastic, Silty Fine to Medium SAND (SM/A-2-4) with Trace of Shells, Munsell=5Y 5/1	12.0	SS-7	1	2	4	7	6
-8.2	16.0		14.0	SS-8	7	5	2	3	7
		HOLOCENE	16.0	SS-9	1	WOH/18"			WOH
		Very Loose to Loose, Wet, Dark Gray, Non-Plastic, Silty Fine SAND (SM/A-2-4) with Trace of Shells, Munsell=5Y 4/1	18.0	SS-10	4	5	3	4	8
-13.2		@SS-10: Organics=1.92%	20.0	SS-11	8	5	5	7	10
		@SS-11: Gray, Fine to Medium Sand, Munsell=5Y 5/1	22.0	SS-12	2	2	8	5	10
-18.2			24.0	SS-13	3	2	6	6	8
		@SS-14: Dark Olive Gray, Fine Sand, Munsell=5Y 3/2	26.0	SS-14	2	WOH	1	1	1
		@SS-15: Gray, Munsell=5Y 6/1	28.0	SS-15	1	1	7	15	8
-23.2		@SS-16: Dense	30.0	SS-16	7	18	21		39
		@SS-17: Loose to Very Loose, Dark Gray, Fine to Coarse Sand, Munsell=5Y 4/1	32.0	SS-17	3	4	2	1	6
-28.2			34.0	SS-18	1	2	1	2	3
		@SS-19: Organics =1.42%	36.0	SS-19	2	2	2	1	4
			38.0	SS-20	2	2	2	4	4
-33.2	40.0	**HAWTHORN MARL**	40.0	SS-21	1	1/12"		2	1
		Very Loose, Wet, Dark Gray, Non-Reactive to Weakly Reactive, High Plasticity, Clayey Fine SAND (SC/A-2-7(2)) with Trace of Shell Fragments, Munsell=GLEY1 4/N	42.0	SS-22	1	1/12"		1	1
-38.2		@SS-23: LL=42, PL=20, PI=22, NMC=55.4%, %#200=31.9	44.0	SS-23	1/12"		1	1	2
			46.0	SS-24	WOH	1	1	6	2
		@SS-25: Medium Dense, Gray, Strongly Reactive, Munsell=5Y 4/1	48.0	SS-25	7	7	6	2	13
			50.0						



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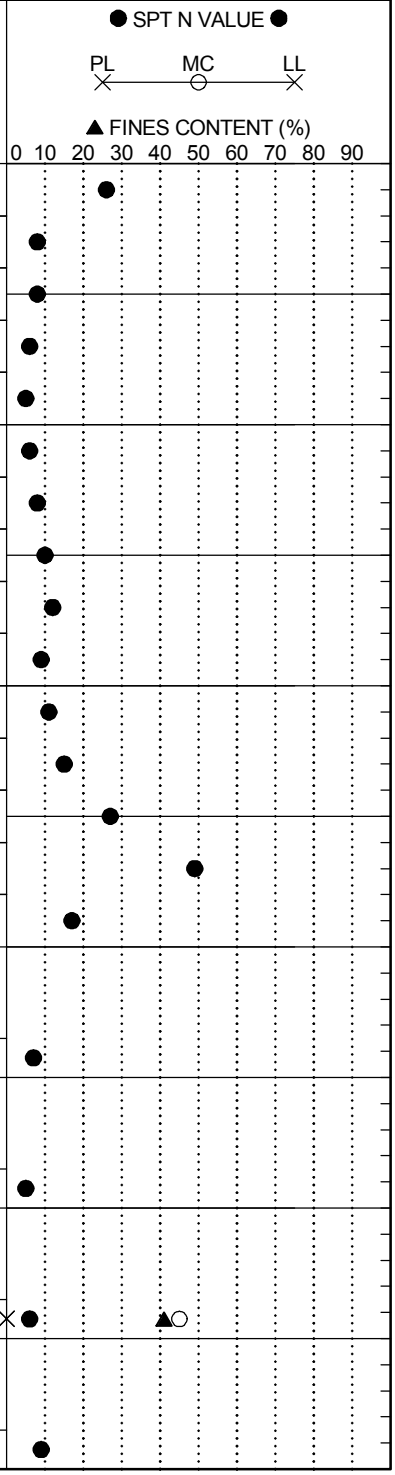
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	SB-1		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	M. Miller	**Boring Location:**	40+85	**Offset:**	293.6'-RT	**Alignment:**	ALT 1B
Elev.:	6.8 ft	**Latitude:**	32.408419	**Longitude:**	-80.467258	**Date Started:**	7/6/2016
Total Depth:	520 ft	**Soil Depth:**	520 ft	**Core Depth:**	250 ft	**Date Completed:**	7/14/2016
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Failing 1500	**Drill Method:**	RW/RC	**Hammer Type:**	Automatic	**Energy Ratio:**	75.4%
Core Size:	NQ	**Driller:**	Huss	**Groundwater:**	**TOB** 6 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Medium Dense to Loose, Wet, Olive, Non-Reactive, High Plasticity, Clayey Fine SAND (SC/A-2-7(2)) with Trace of Shell Fragments, Munsell=5Y 5/3		52.0	SS-26	6	13	13	12	26
				54.0	SS-27	2	4	4	5	8
-48.2		@SS-27: Olive Gray, Munsell=5Y 4/2		56.0	SS-28	3	4	4	6	8
				58.0	SS-29	3	3	3	5	6
				60.0	SS-30	2	2	3	4	5
-53.2		@SS-31: Dark Olive Gray, Munsell=5Y 3/2		62.0	SS-31	2	2	4	4	6
				64.0	SS-32	2	3	5	5	8
-58.2		@SS-33: Olive Gray, Munsell=5Y 4/2		66.0	SS-33	3	4	6	6	10
				68.0	SS-34	4	5	7	8	12
				70.0	SS-35	4	4	5	7	9
-63.2				72.0	SS-36	4	5	6	7	11
				74.0	SS-37	3	6	9	9	15
-68.2		@SS-39: Dense		76.0	SS-38	5	8	19	50/1.5"	27
	77.0	**COOPER GROUP LIMESTONE**		78.0	SS-39	33	21	28	20	49
					SS-40	2	6	11	13	17
-73.2		Dense to Medium Dense, Wet, Light Greenish Gray, Non-Plastic, Non-Reactive, Silty Fine SAND (SM/A-4(0)), Munsell=GLEY1 7/10Y								
				83.5						
		@SS-41: Loose			SS-41	3	3	4		7
-78.2										
				88.5						
		@SS-42: No Recovery			SS-42	2	2	3		5
-83.2										
				93.5						
		@SS-43: Weakly Reactive, LL=NP, PL=NP, PI=NP, NMC=44.7%, %#200=41.3			SS-43	6	4	2		6
-88.2										
				98.5						
		@SS-44: Non-Reactive			SS-44	4	4	5		9



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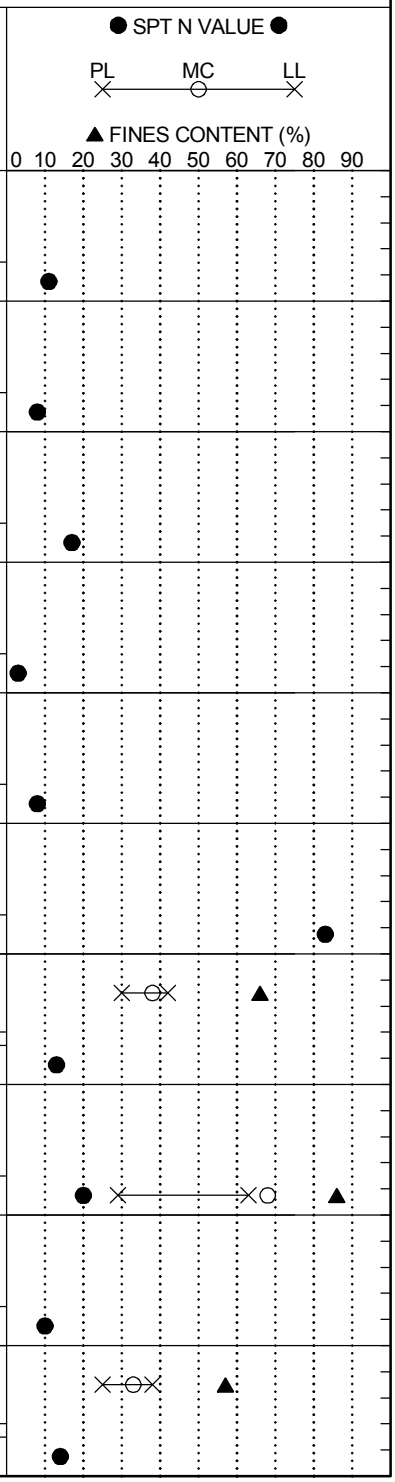
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	SB-1		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	M. Miller	**Boring Location:**	40+85	**Offset:**	293.6'-RT	**Alignment:**	ALT 1B
Elev.:	6.8 ft	**Latitude:**	32.408419	**Longitude:**	-80.467258	**Date Started:**	7/6/2016
Total Depth:	520 ft	**Soil Depth:**	520 ft	**Core Depth:**	250 ft	**Date Completed:**	7/14/2016
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Failing 1500	**Drill Method:**	RW/RC	**Hammer Type:**	Automatic	**Energy Ratio:**	75.4%
Core Size:	NQ	**Driller:**	Huss	**Groundwater:**	**TOB** 6 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		@SS-45: Medium Dense to Loose		103.5	SS-45	4	5	6		11
-98.2										
				108.5	SS-46	3	4	4		8
-103.2										
				113.5	SS-47	5	3	11		17
-108.2										
		@SS-48: Very Loose		118.5	SS-48	2	1	2		3
-113.2										
	122.0	Firm, Wet, Light Greenish Gray, Medium Plasticity, Non-Reactive to Strongly Reactive, Fine Sandy SILT (ML/A-7-5(8)), Munsell=GLEY1 7/10Y		123.5	SS-49	4	4	4		8
-118.2										
		@SS-50: Hard		128.5	SS-50	15	33	50/3.5"		83+
-123.2		@UD-1: LL=42, PL=30, PI=12, NMC=38.0%, %#200=66.3		130.0	UD-1	%REC=100				
		@SS-51: Stiff		133.5	SS-51	5	6	7		13
-128.2										
	138.5	Very Stiff to Stiff, Wet, Light Greenish Gray, High Plasticity, Strongly Reactive, Fat CLAY (CH/A-7-6(33)), Munsell=GLEY1 7/10Y		138.5	SS-52	12	12	8		20
-133.2		@SS-52: LL=63, PL=29, PI=34, NMC=68.0%, %#200=86.3		143.5	SS-53	4	5	5		10
-138.2	145.0	Stiff, Wet, Light Greenish Gray, Medium Plasticity, Strongly Reactive, Sandy SILT (ML/A-6(6)), Munsell=GLEY1 7/10Y		145.0	UD-2	%REC=100				
		@UD-2: LL=38, PI=25, PI=13, NMC=33.1%,		148.5	SS-54	5	7	7		14



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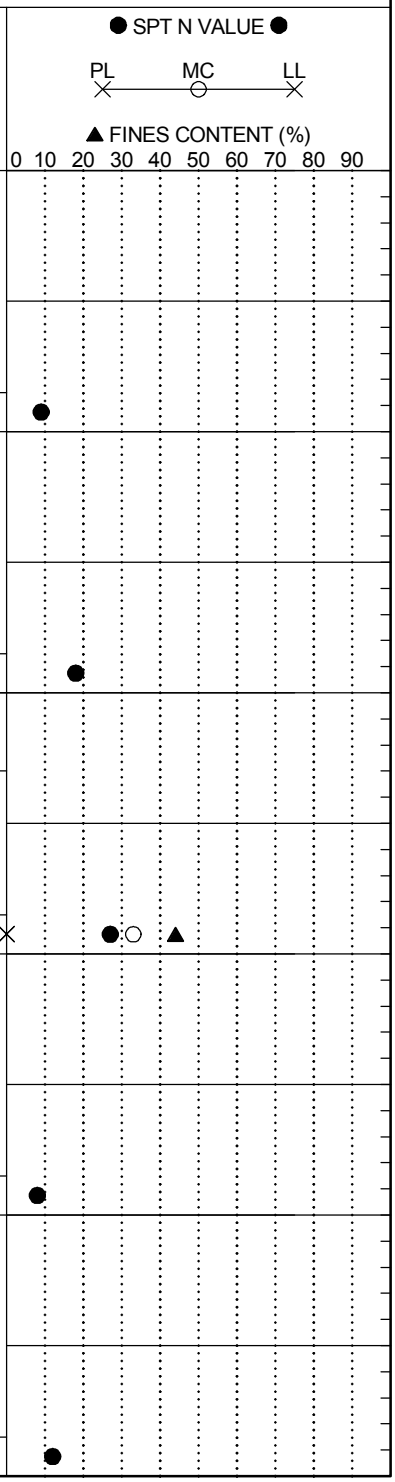
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	SB-1		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	M. Miller	**Boring Location:**	40+85	**Offset:**	293.6'-RT	**Alignment:**	ALT 1B
Elev.:	6.8 ft	**Latitude:**	32.408419	**Longitude:**	-80.467258	**Date Started:**	7/6/2016
Total Depth:	520 ft	**Soil Depth:**	520 ft	**Core Depth:**	250 ft	**Date Completed:**	7/14/2016
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Failing 1500	**Drill Method:**	RW/RC	**Hammer Type:**	Automatic	**Energy Ratio:**	75.4%
Core Size:	NQ	**Driller:**	Huss	**Groundwater:**	**TOB** 6 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		%#200=57.3 Stiff, Wet, Light Greenish Gray, Medium Plasticity, Strongly Reactive, Sandy SILT (ML/A-6(6)), Munsell=GLEY1 7/10Y								
-148.2										
				158.5	SS-55	4	4	5		9
-153.2										
-158.2										
	166.0	Loose to Medium Dense, Wet, Light Greenish Gray, Non-Plastic, Strongly Reactive, Silty Fine SAND (SM/A-4(0)), Munsell=GLEY1 7/10Y		168.5						
					SS-56	6	8	10		18
-163.2				170.0						
					UD-3	%REC=0				
-168.2										
				178.5						
		@SS-57: LL=NP, PL=NP, PI=NP, NMC=32.9%, %#200=43.5			SS-57	8	12	15		27
-173.2										
-178.2										
	188.5	Firm to Stiff, Wet, Greenish Gray, Medium Plasticity, Strongly Reactive, Fine Sandy SILT (ML/A-7-6(6)), Munsell=GLEY1 6/10Y		188.5						
					SS-58	4	3	5		8
-183.2										
-188.2										
				198.5						
				200.0	SS-59	5	5	7		12



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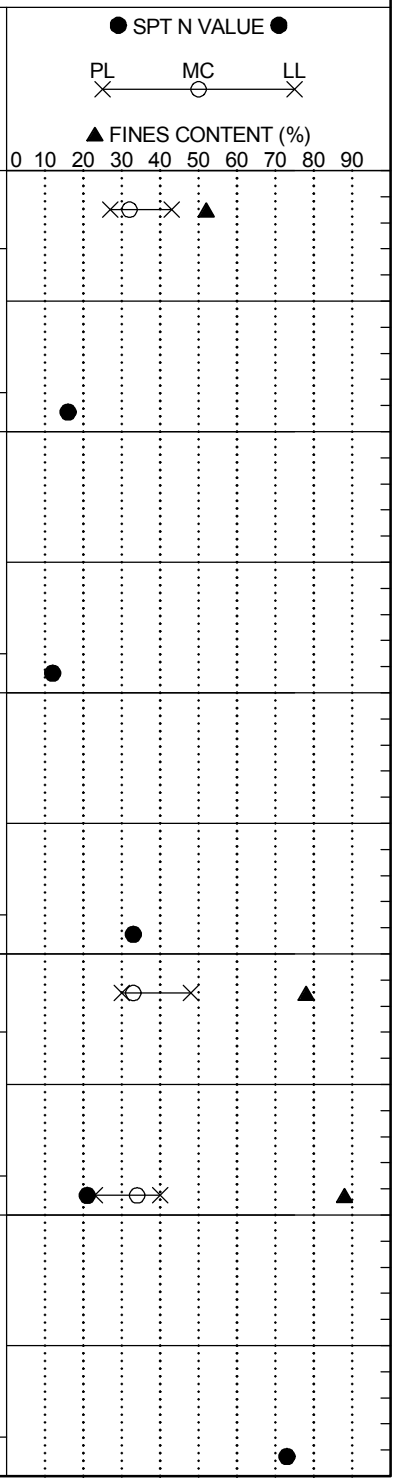
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	SB-1		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	M. Miller	**Boring Location:**	40+85	**Offset:**	293.6'-RT	**Alignment:**	ALT 1B
Elev.:	6.8 ft	**Latitude:**	32.408419	**Longitude:**	-80.467258	**Date Started:**	7/6/2016
Total Depth:	520 ft	**Soil Depth:**	520 ft	**Core Depth:**	250 ft	**Date Completed:**	7/14/2016
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Failing 1500	**Drill Method:**	RW/RC	**Hammer Type:**	Automatic	**Energy Ratio:**	75.4%
Core Size:	NQ	**Driller:**	Huss	**Groundwater:**	**TOB** 6 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Stiff to Very Stiff, Wet, Greenish Gray, Medium Plasticity, Strongly Reactive, Fine Sandy SILT (ML/A-7-6(6)), Munsell=GLEY1 6/10		UD-4	%REC=95				
-198.2		@UD-4: LL=43, PL=27, PI=16, NMC=32.0%, %#200=52.1							
			208.5	SS-60	5	7	9		16
-203.2									
-208.2									
			218.5	SS-61	5	6	6		12
-213.2	221.0								
		Very Stiff to Hard, Wet, Greenish Gray, Medium Plasticity, Strongly Reactive, SILT (ML/A-7-5(15)) with Sand, Munsell=GLEY1 6/10Y							
-218.2									
			228.5						
			230.0	SS-62	11	12	21		33
-223.2		@UD-5: LL=48, PL=30, PI=18, NMC=32.6%, %#200=77.7		UD-5	%REC=99				
-228.2									
	238.5		238.5						
		Very Stiff to Hard, Wet, Greenish Gray, Medium Plasticity, Strongly Reactive, Lean CLAY (CL/A-6(16)), Munsell=GLEY1 6/10Y		SS-63	8	9	12		21
-233.2		@SS-63: LL=40, PL=23, PI=17, NMC=34.4%, %#200=87.8							
-238.2									
			248.5						
	250.0		250.0	SS-64	26	39	34		73



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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	SB-1		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	M. Miller	**Boring Location:**	40+85	**Offset:**	293.6'-RT	**Alignment:**	ALT 1B
Elev.:	6.8 ft	**Latitude:**	32.408419	**Longitude:**	-80.467258	**Date Started:**	7/6/2016
Total Depth:	520 ft	**Soil Depth:**	520 ft	**Core Depth:**	250 ft	**Date Completed:**	7/14/2016
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Failing 1500	**Drill Method:**	RW/RC	**Hammer Type:**	Automatic	**Energy Ratio:**	75.4%
Core Size:	NQ	**Driller:**	Huss	**Groundwater:**	**TOB** 6 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE (PL, MC, LL) / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		END ROTARY WASH BORING. START NQ CORING					
		COOPER GROUP LIMESTONE		NQ-1			
-248.2		Greenish Gray, Very Plastic, Weakly to Strongly Reactive, Sandy Fat CLAY (CH/A-7-6(34)), Munsell=GLEY1 5/5GY	255.0				
		@252.6': UC Strength=143.5 psi	257.0	NQ-2			
		@UD-6: LL=76, PL=21, PI=55, NMC=31.6%, %#200=65.1	260.0	UD-6	%REC=100		
-253.2				NQ-3			
-258.2			265.0				
				NQ-4			
-263.2			270.0				
				NQ-5			
-268.2	275.0	Wet to Moist, Greenish Gray, Low Plasticity, Strongly Reactive, SILT (ML/A-4(1)) with Fine Sand, Munsell=GLEY1 5/5GY	275.0				
		@NQ-6: LL=32, PL=30, PI=2, NMC=30.1%, %#200=71.3	277.0	NQ-6			
			280.0	UD-7	%REC=100		*Pitcher Barrel Crimped, Damaged*
-273.2				NQ-7			*Sample*
-278.2			285.0				
				NQ-8			
-283.2			290.0				
				NQ-9			
-288.2			295.0				
			297.0	NQ-10			
			298.0	UD-8	%REC=100		*Encountered Refusal at 12"*
		@299.2': UC Strength=166.5 psi					

LEGEND

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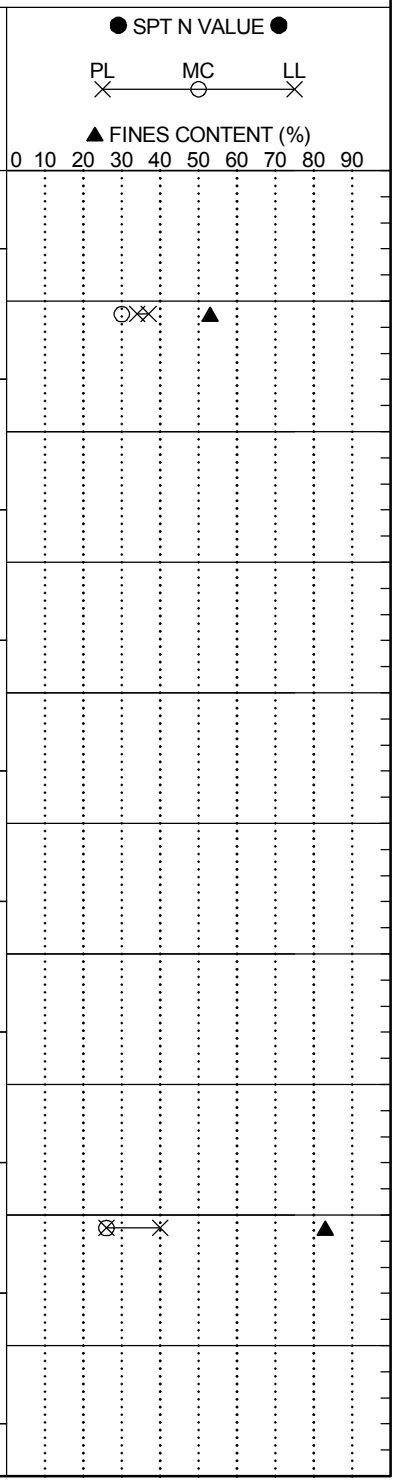
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	SB-1		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	M. Miller	**Boring Location:**	40+85	**Offset:**	293.6'-RT	**Alignment:**	ALT 1B
Elev.:	6.8 ft	**Latitude:**	32.408419	**Longitude:**	-80.467258	**Date Started:**	7/6/2016
Total Depth:	520 ft	**Soil Depth:**	520 ft	**Core Depth:**	250 ft	**Date Completed:**	7/14/2016
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Failing 1500	**Drill Method:**	RW/RC	**Hammer Type:**	Automatic	**Energy Ratio:**	75.4%
Core Size:	NQ	**Driller:**	Huss	**Groundwater:**	**TOB** 6 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	303.0	Wet to Moist, Greenish Gray, Low Plasticity, Strongly Reactive, SILT (ML/A-4(1)) with Fine Sand, Munsell=GLEY1 5/5GY	303.0	NQ-11					
-298.2		Wet to Moist, Greenish Gray, Low Plasticity, Strongly Reactive, Gravelly SILT (ML/A-4(1)) with Sand, Munsell=GLEY1 5/5GY @NQ-12: LL=37, PL=34, PI=3, NMC=30.3%, %#200=53.3	308.0	NQ-12					
-303.2			313.0	NQ-13					
-308.2			318.0	NQ-14					
-313.2			323.0	NQ-15					
-318.2		@324.3': UC Strength=85.9 psi	328.0	NQ-16					
-323.2		@NQ-17: Moderately Reactive	333.0	NQ-17					
-328.2			338.0	NQ-18					
-333.2		@NQ-19: Medium Plasticity, Strongly Reactive, A-6(12)), LL=40, PL=26, PI=14, NMC=25.9%, %#200=82.9	343.0	NQ-19					
-338.2			348.0	NQ-20					



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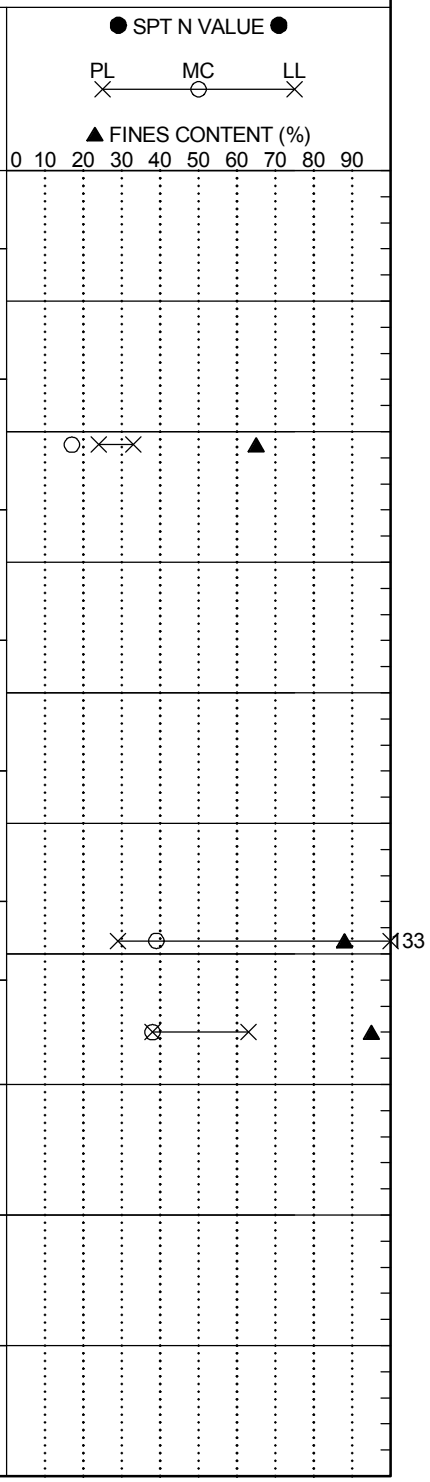
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	SB-1		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	M. Miller	**Boring Location:**	40+85	**Offset:**	293.6'-RT	**Alignment:**	ALT 1B
Elev.:	6.8 ft	**Latitude:**	32.408419	**Longitude:**	-80.467258	**Date Started:**	7/6/2016
Total Depth:	520 ft	**Soil Depth:**	520 ft	**Core Depth:**	250 ft	**Date Completed:**	7/14/2016
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Failing 1500	**Drill Method:**	RW/RC	**Hammer Type:**	Automatic	**Energy Ratio:**	75.4%
Core Size:	NQ	**Driller:**	Huss	**Groundwater:**	**TOB** 6 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Wet to Moist, Greenish Gray, Low Plasticity, Strongly Reactive, Gravelly SILT (ML/A-4(1)) with Sand, Munsell=GLEY1 5/5GY			NQ-21					
				353.0						
-348.2					NQ-22					
	358.0			358.0						
		Wet to Moist, Greenish Gray, Low Plasticity, Strongly Reactive, Sandy SILT (ML/A-4(4)), Munsell=GLEY1 5/5GY								
-353.2		@NQ-23: LL=33, PL=24, PI=9, NMC=17.4%, %#200=64.6			NQ-23					
				363.0						
		@359.0': UC Strength=236.4 psi								
-358.2					NQ-24					
				368.0						
-363.2					NQ-25					
	373.0			373.0						
		Wet to Moist, Greenish Gray, Very Plastic, Strongly Reactive, Fat CLAY (CH/A-7-6(104)), Munsell=GLEY1 5/5GY								
-368.2					NQ-26					
				378.0						
		@UD-9: LL=133, PL=29, PI=104, NMC=39.3%, %#200=87.8			UD-9	%REC=100				
-373.2	381.0			381.0						
		OCALA LIMESTONE								
		Wet to Moist, Greenish Gray, High Plasticity, Strongly Reactive, Elastic SILT (MH/A-7-5(31)), Munsell=GLEY1 5/5GY			NQ-27					
-378.2				385.0						
		@NQ-27: LL=63, PL=38, PI=25, NMC=38.3%, %#200=94.7			NQ-28					
		@381.3': UC Strength=233.5 psi								
-383.2				390.0						
					NQ-29					
-388.2				395.0						
					NQ-30					
				400.0						



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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	SB-1		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	M. Miller	**Boring Location:**	40+85	**Offset:**	293.6'-RT	**Alignment:**	ALT 1B
Elev.:	6.8 ft	**Latitude:**	32.408419	**Longitude:**	-80.467258	**Date Started:**	7/6/2016
Total Depth:	520 ft	**Soil Depth:**	520 ft	**Core Depth:**	250 ft	**Date Completed:**	7/14/2016
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Failing 1500	**Drill Method:**	RW/RC	**Hammer Type:**	Automatic	**Energy Ratio:**	75.4%
Core Size:	NQ	**Driller:**	Huss	**Groundwater:**	**TOB** 6 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		Wet to Moist, Greenish Gray, High Plasticity, Strongly Reactive, Elastic SILT (MH/A-7-5(31)), Munsell=GLEY1 5/5GY			NQ-31						
-398.2				405.0							
					NQ-32						
-403.2				410.0							
					NQ-33						
-408.2				415.0							
					NQ-34						
-413.2				420.0							
					NQ-35						
-418.2				425.0							
					NQ-36						
-423.2				430.0							
					NQ-37						
-428.2				435.0							
					NQ-38						
-433.2	440.0	Wet to Moist, Greenish Gray, Low Plasticity, Strongly Reactive, Fine Sandy SILT (ML/A-4)		440.0							
					NQ-39						
-438.2				445.0							
					NQ-40						
				450.0							

LEGEND

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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	SB-1		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	M. Miller	**Boring Location:**	40+85	**Offset:**	293.6'-RT	**Alignment:**	ALT 1B
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Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Failing 1500	**Drill Method:**	RW/RC	**Hammer Type:**	Automatic	**Energy Ratio:**	75.4%
Core Size:	NQ	**Driller:**	Huss	**Groundwater:**	**TOB** 6 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		Wet to Moist, Greenish Gray, Low Plasticity, Strongly Reactive, Fine Sandy SILT (ML/A-4)			NQ-41						
-448.2				455.0							
					NQ-42						
-453.2				460.0							
					NQ-43						
-458.2				465.0							
					NQ-44						
-463.2				470.0							
					NQ-45						
-468.2				475.0							
					NQ-46						
-473.2				480.0							
					NQ-47						
-478.2				485.0							
					NQ-48						
-483.2	490.0	**SANTEE LIMESTONE**		490.0							
		Wet to Moist, Greenish Gray, Low Plasticity, Strongly Reactive, Fine Sandy SILT (ML/A-4)			NQ-49						
-488.2				495.0							
					NQ-50						
	500.0										

LEGEND

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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	SB-1		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	M. Miller	**Boring Location:**	40+85	**Offset:**	293.6'-RT	**Alignment:**	ALT 1B
Elev.:	6.8 ft	**Latitude:**	32.408419	**Longitude:**	-80.467258	**Date Started:**	7/6/2016
Total Depth:	520 ft	**Soil Depth:**	520 ft	**Core Depth:**	250 ft	**Date Completed:**	7/14/2016
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Failing 1500	**Drill Method:**	RW/RC	**Hammer Type:**	Automatic	**Energy Ratio:**	75.4%
Core Size:	NQ	**Driller:**	Huss	**Groundwater:**	**TOB** 6 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		Core Sampling Terminated at 500 feet. Borehole advanced to 520 feet using roller cone to facilitate geophysical testing.									
-498.2											
-503.2											
-508.2											
-513.2	520.0	Boring Terminated at 520.0 feet									
-518.2											
-523.2											
-528.2											
-533.2											
-538.2											

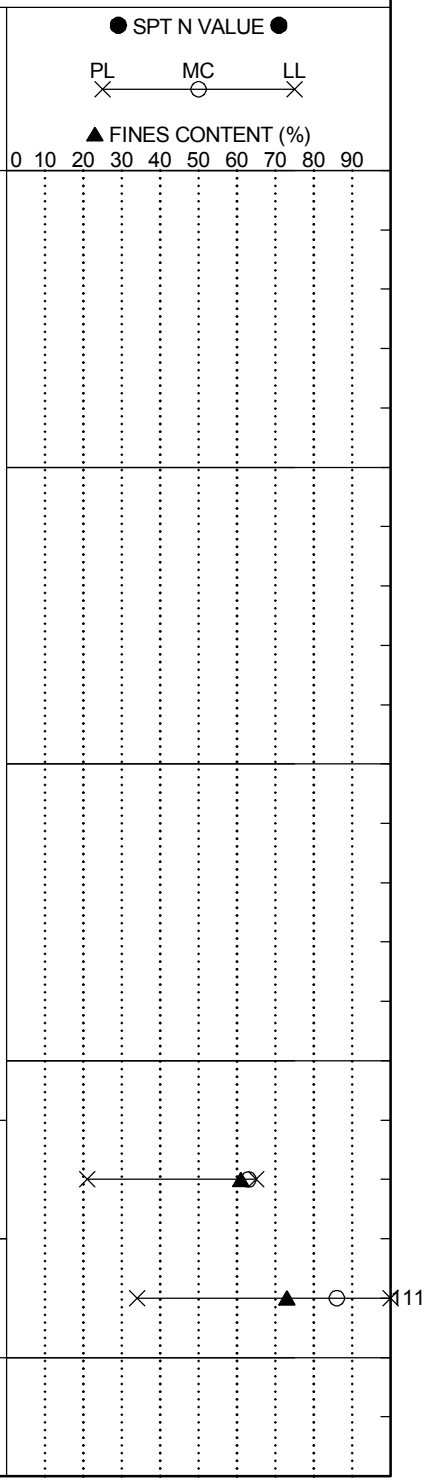
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	AP-1		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	65+07	**Offset:**	7.2'-LT	**Alignment:**	ALT 1B
Elev.:	2.5 ft	**Latitude:**	32.406761	**Longitude:**	-80.459581	**Date Started:**	7/27/2016
Total Depth:	20 ft	**Soil Depth:**	20 ft	**Core Depth:**	N/A ft	**Date Completed:**	7/27/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value
	0.0	▽Marsh					
		DRILL TO 16.0 FEET					
-2.5							
-7.5							
-12.5							
	16.0	Wet, Very Dark Gray, Very Plastic, Sandy Fat CLAY (CH/A-7-6(24)), Munsell=5Y 3/1, LL=65, PL=21, PI=44, NMC=63.0%, %#200=61.0		16.0	UD-1	%REC=100	
	18.0	Wet, Very Dark Gray, Very Plastic, Fat CLAY (CH/A-7-5(60)) with Sand, Munsell=5Y 3/1, LL=111, PL=34, PI=77, NMC=86.3%, %#200=73.3		18.0	UD-2	%REC=100	
-17.5	20.0	Boring Terminated at 20.0 Feet					



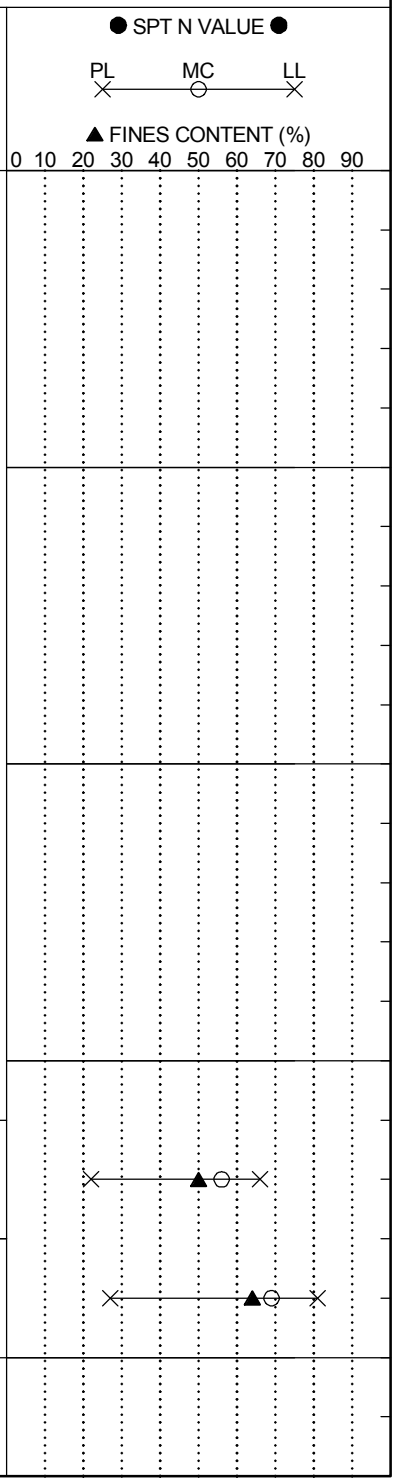
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	AP-2		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	67+03	**Offset:**	15.9'-LT	**Alignment:**	ALT 1B
Elev.:	2.6 ft	**Latitude:**	32.406601	**Longitude:**	-80.458973	**Date Started:**	7/28/2016
Total Depth:	20 ft	**Soil Depth:**	20 ft	**Core Depth:**	N/A ft	**Date Completed:**	7/28/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value
	0.0	▽Marsh					
		DRILL TO 16.0 FEET					
-2.4							
-7.4							
-12.4							
	16.0	Wet, Very Dark Gray, Very Plastic, Clayey SAND (SC/A-7-6(17)), Munsell=5Y 3/1, LL=66, PL=22, PI=44, NMC=56.0%, %#200=49.9		16.0	UD-1	%REC=100	
	18.0	Wet, Very Dark Gray, Very Plastic, Sandy Fat CLAY (CH/A-7-6(33)), Munsell=5Y 3/1, LL=81, PL=27, PI=54, NMC=69.3%, %#200=63.5		18.0	UD-2	%REC=100	
-17.4	20.0	Boring Terminated at 20.0 Feet					



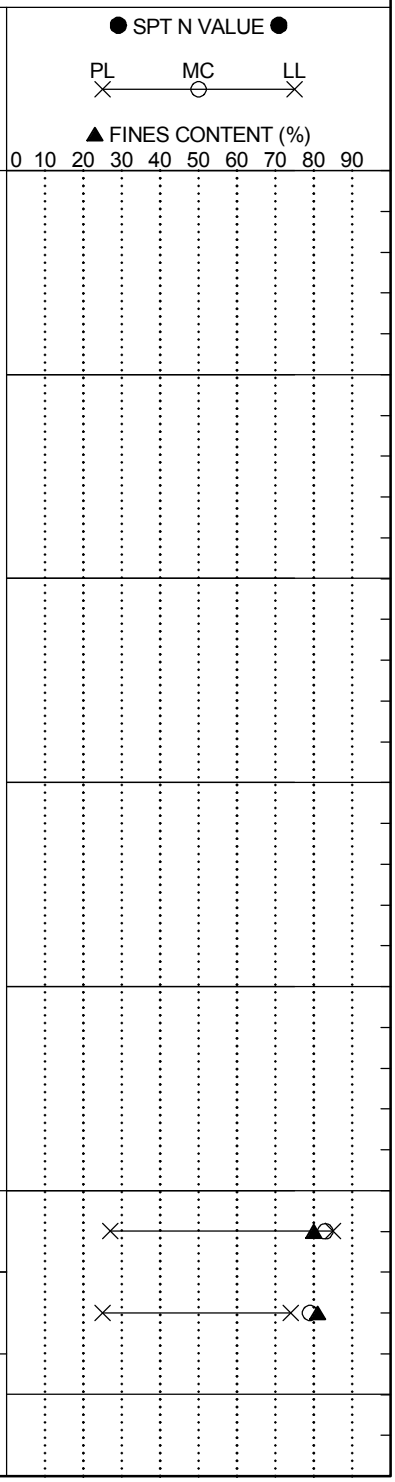
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	AP-3		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	69+09	**Offset:**	39.8'-LT	**Alignment:**	ALT 1B
Elev.:	2.0 ft	**Latitude:**	32.406462	**Longitude:**	-80.458322	**Date Started:**	7/28/2016
Total Depth:	29 ft	**Soil Depth:**	29 ft	**Core Depth:**	N/A ft	**Date Completed:**	7/28/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value
	0.0	▽Marsh					
		DRILL TO 25.0 FEET					
-3.0							
-8.0							
-13.0							
-18.0							
-23.0	25.0	Wet, Very Dark Gray, Very Plastic, Fat CLAY (CH/A-7-6(50)) with Sand, Munsell=5Y 3/1, LL=85, PL=27, PI=58, NMC=83.0%, %#200=79.5		25.0	UD-1	%REC=100	
	27.0	Wet, Very Dark Gray, Very Plastic, Fat CLAY (CH/A-7-6(43)) with Sand, Munsell=5Y 3/1, LL=74, PL=25, PI=49, NMC=78.8%, %#200=81.4		27.0	UD-2	%REC=100	
-28.0	29.0	Boring Terminated at 29.0 Feet					



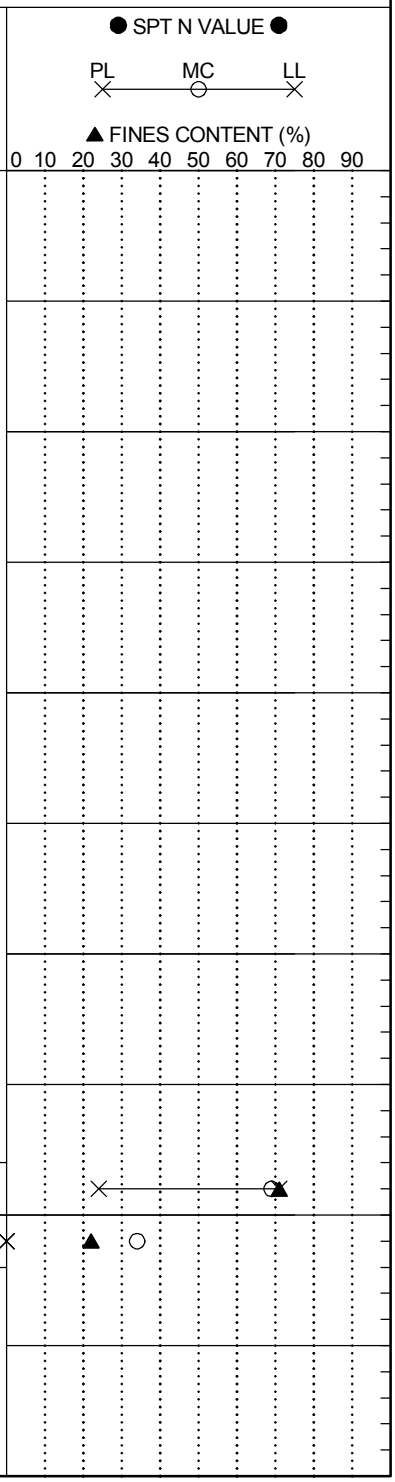
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	AP-4		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	100+73	**Offset:**	8.7'-RT	**Alignment:**	ALT 1B
Elev.:	1.6 ft	**Latitude:**	32.403021	**Longitude:**	-80.448901	**Date Started:**	8/4/2016
Total Depth:	74 ft	**Soil Depth:**	74 ft	**Core Depth:**	N/A ft	**Date Completed:**	8/4/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value
	0.0	Marsh					
		DRILL TO 38.0 FEET					
-3.4							
-8.4							
-13.4							
-18.4							
-23.4							
-28.4							
-33.4							
	38.0			38.0			
-38.4	40.0	Wet, Dark Gray, Very Plastic, Fat CLAY (CH/A-7-6(34)) with Sand, Munsell=GLEY1 4/N, LL=71, PL=24, PI=47, NMC=69.0%, %#200=71.3		40.0	UD-1	%REC=60	
	42.0				UD-2	%REC=100	
-43.4		Wet, Dark Gray, Non-Plastic, Silty Fine to Medium SAND (SM/A-2-4), Munsell=GLEY1 4/N, LL=NP, PL=NP, PI=NP, NMC=33.8%, %#200=21.5					
		DRILL TO 70.0 FEET					



LEGEND

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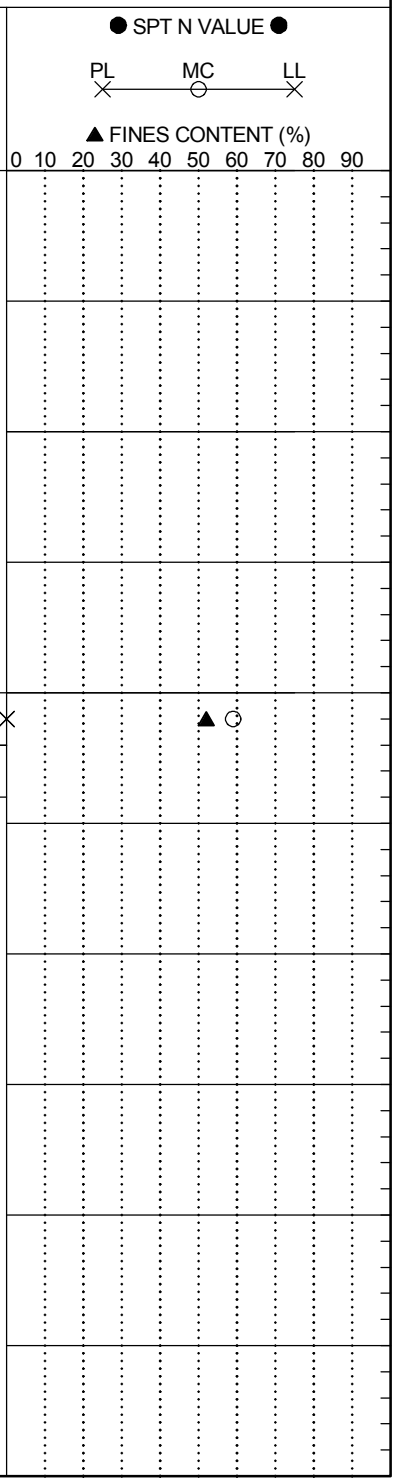
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	AP-4		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	100+73	**Offset:**	8.7'-RT	**Alignment:**	ALT 1B
Elev.:	1.6 ft	**Latitude:**	32.403021	**Longitude:**	-80.448901	**Date Started:**	8/4/2016
Total Depth:	74 ft	**Soil Depth:**	74 ft	**Core Depth:**	N/A ft	**Date Completed:**	8/4/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value
		DRILL TO 70.0 FEET					
-53.4							
-58.4							
-63.4							
-68.4	70.0			70.0			
	72.0	Wet, Olive Gray, Non-Plastic, Sandy Fine SILT (ML/A-4(0)), Munsell=5Y 4/2, LL=NP, PL=NP, PI=NP, NMC=58.8%, %#200=52.0		72.0	UD-3	%REC=100	
	74.0	Wet, Olive Gray, Non-Plastic, Sandy Fine SILT (ML/A-4(0)), Munsell=5Y 4/2			UD-4	%REC=100	
-73.4		Boring Terminated at 74.0 feet					
-78.4							
-83.4							
-88.4							
-93.4							



LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	AP-5		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	106+03	**Offset:**	26.3'-LT	**Alignment:**	ALT 1B
Elev.:	2.3 ft	**Latitude:**	32.402547	**Longitude:**	-80.44727	**Date Started:**	8/2/2016
Total Depth:	32 ft	**Soil Depth:**	32 ft	**Core Depth:**	N/A ft	**Date Completed:**	8/2/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	● SPT N VALUE ● (PL ✕ MC ○ LL ✕) ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
	0.0	▽Marsh DRILL TO 6.0 FEET						
-2.7	6.0	Wet, Gray, Non-Plastic, Poorly Graded Fine SAND (SP/A-3), Munsell=5Y 6/1, LL=NP, PL=NP, PI=NP, NMC=21.6%, %#200=3.0		6.0	UD-1	%REC=80		✕▲ ○
	8.0	Wet, Gray, Non-Plastic, Poorly Graded Fine SAND (SP/A-3), Munsell=5Y 6/1		8.0	UD-2	%REC=60		
-7.7	10.0	DRILL TO 28.0 FEET						
-12.7								

LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P026862	**County:**	Beaufort	**Boring No.:**	AP-5		
Site Description:	US 21 Bridge Replacement over Harbor River			**Route:**	US 21		
Eng./Geo.:	C. Piercy	**Boring Location:**	106+03	**Offset:**	26.3'-LT	**Alignment:**	ALT 1B
Elev.:	2.3 ft	**Latitude:**	32.402547	**Longitude:**	-80.44727	**Date Started:**	8/2/2016
Total Depth:	32 ft	**Soil Depth:**	32 ft	**Core Depth:**	N/A ft	**Date Completed:**	8/2/2016
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45B	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	83.1%
Core Size:	N/A	**Driller:**	M.A.D.	**Groundwater:**	**TOB** 0 ft	**24HR**	TIDAL

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		DRILL TO 28.0 FEET						
-17.7								
-22.7								
	28.0			28.0				
		Wet, Gray, Non-Plastic, Poorly Graded Fine SAND (SP/A-3), Munsell=5Y 5/1			UD-3	%REC=100		
-27.7	30.0			30.0				
		Wet, Gray, Non-Plastic, Poorly Graded Fine SAND (SP/A-3), Munsell=5Y 5/1, LL=NP, PL=NP, PI=NP, NMC=26.6%, %#200=2.9			UD-4	%REC=100		
	32.0							
		Boring Terminated at 32.0 feet						
-32.7								

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

F&ME CONSULTANTS

US 21 Bridge Replacement over Harbor River
Beaufort County, South Carolina
Project Number :P026862

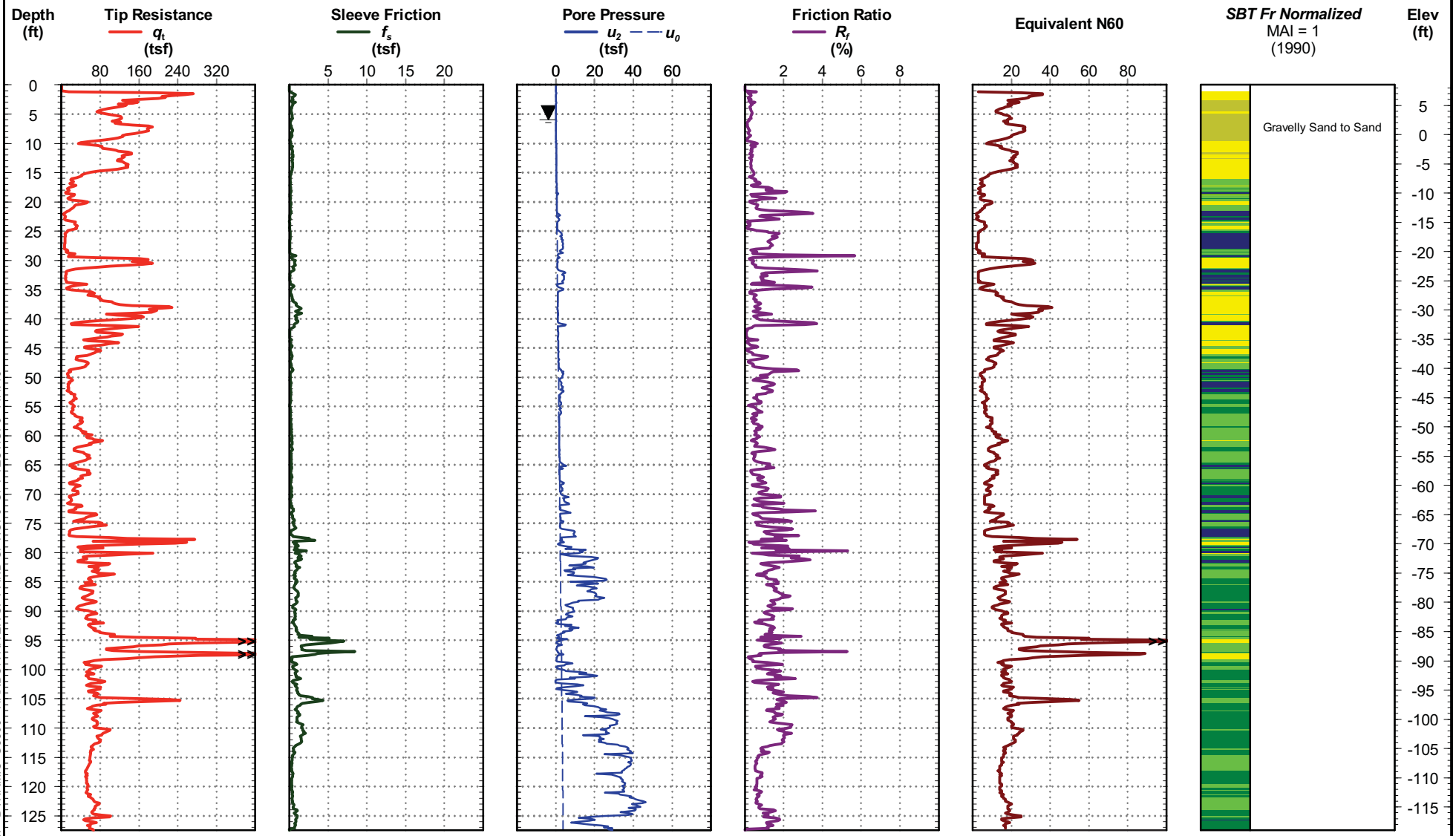
Cone Penetration Test

CPT-1

Date: Aug. 26, 2014
Estimated Water Depth: 6 ft
Rig/Operator: Conetec

Station: 13+72
Offset: 7.0'-LT
Elevation: 8.5

Total Depth: 127.5 ft
Termination Criteria: Target Depth
Cone Size:



CPT REPORT - DYNAMIC G5396 - HARBOR RIVER SPT AND CPT.GPJ CPT TEST.GPJ 11/1/16

Electronic File Name: 14-54074_CP01.cor

CPT-1

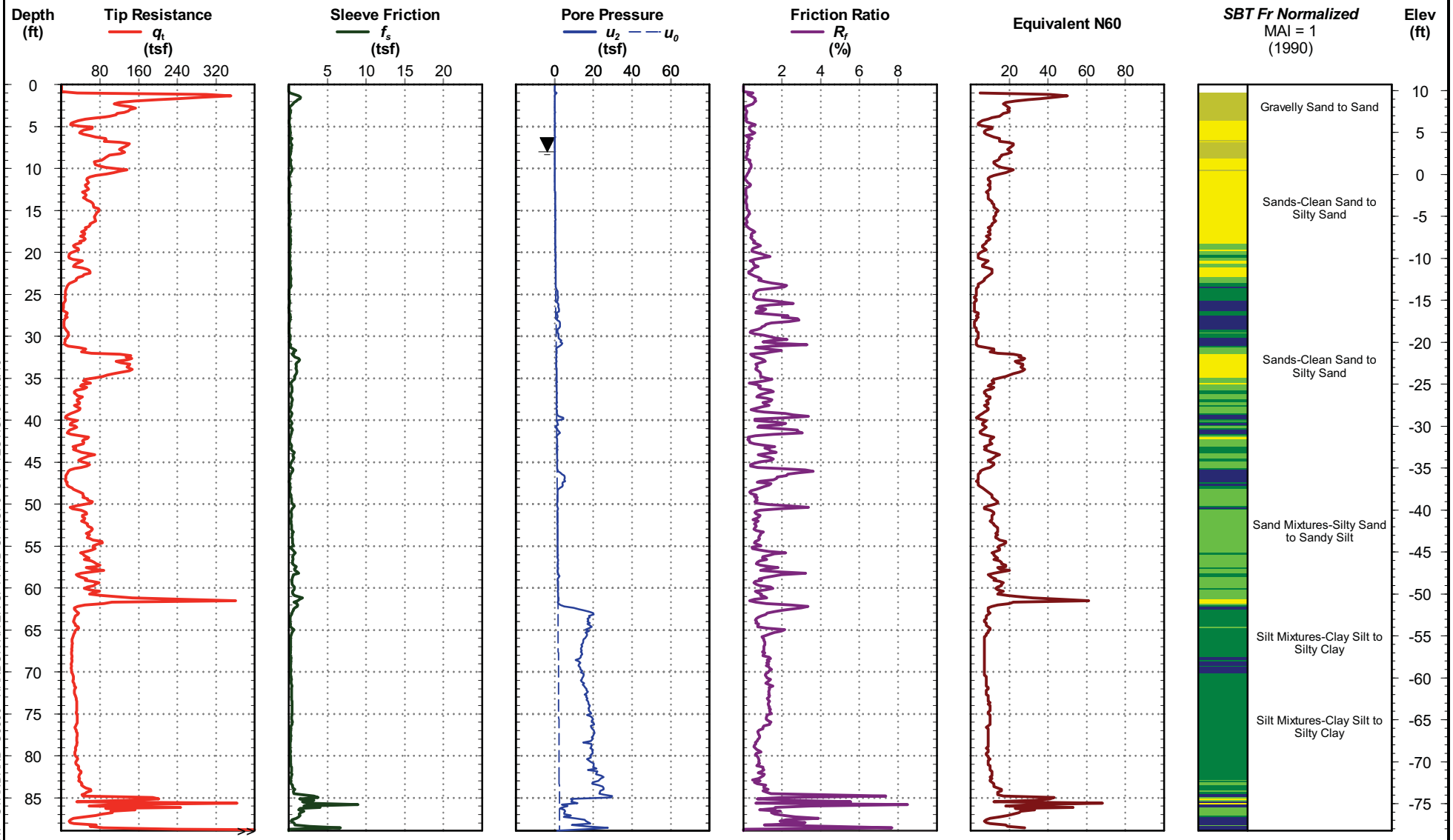
F&ME CONSULTANTS

US 21 Bridge Replacement over Harbor River
Beaufort County, South Carolina
Project Number :P026862

Cone Penetration Test

SCPT-2

Date:	Aug. 25, 2014	**Station:**	62+99	**Total Depth:**	88.9 ft
Estimated Water Depth:	8 ft	**Offset:**	27.1'-RT	**Termination Criteria:**	Maximum Reaction Force
Rig/Operator:	Conetec	**Elevation:**	10.7	**Cone Size:**	



SCPT-2

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CPT REPORT - STANDARD G5396 - HARBOR RIVER SPT AND CPT.GPJ CPT TEST.GPJ 11/3/16

F&ME CONSULTANTS

US 21 Bridge Replacement over Harbor River
Beaufort County, South Carolina
Project Number :P026862

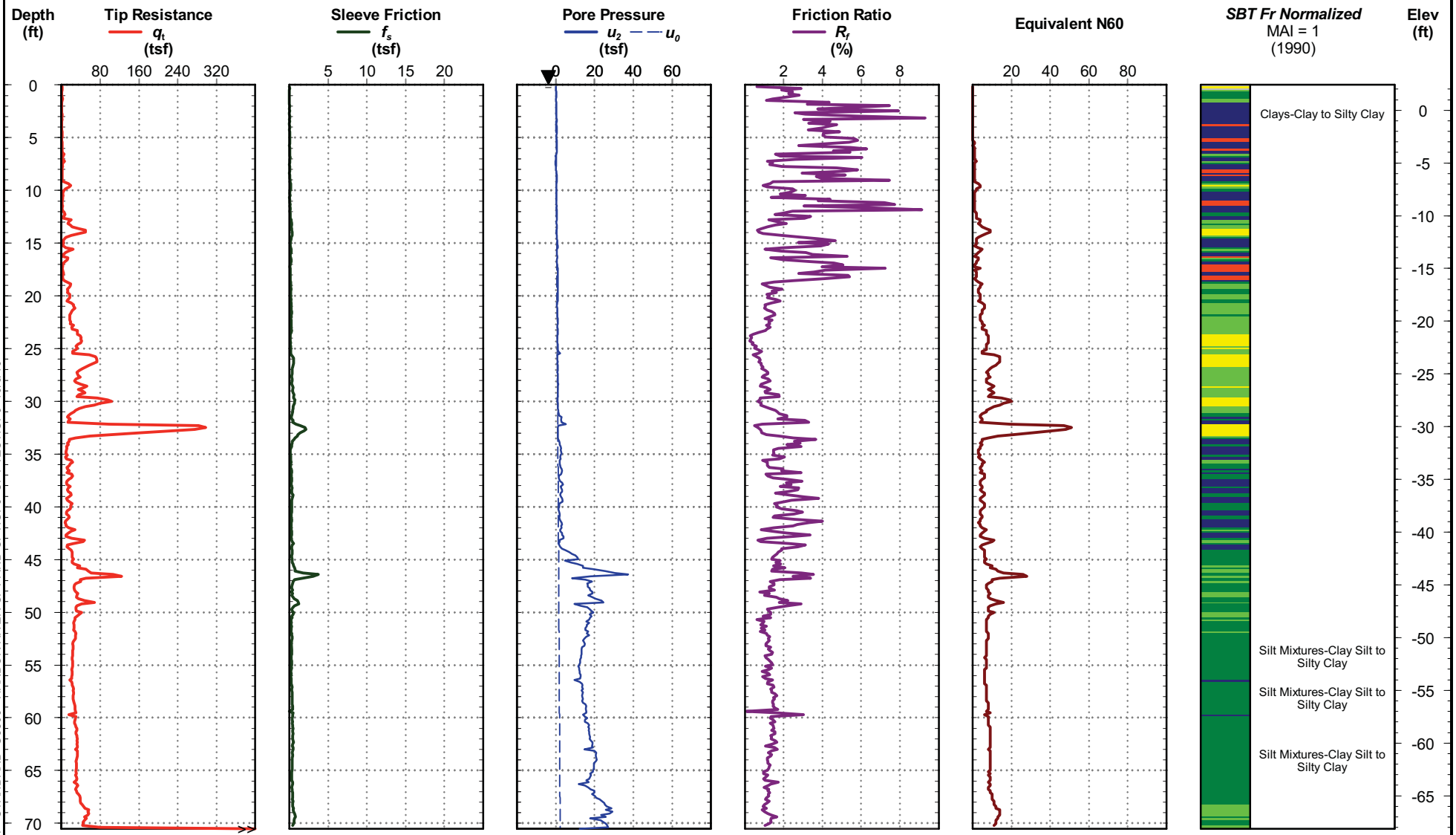
Cone Penetration Test

CPT-3

Date: Sep. 23, 2015
Estimated Water Depth: 0 ft
Rig/Operator: M.A.D.

Station: 42+42
Offset: 96.4'-LT
Elevation: 2.4

Total Depth: 70.5 ft
Termination Criteria: Maximum Reaction Force
Cone Size:



CPT-3

Electronic File Name: Habor River Hwy 21 CPT-03.cpt

CPT REPORT - STANDARD G5396 - HARBOR RIVER SPT AND CPT.GPJ CPT TEST.GPJ 10/6/16

F&ME CONSULTANTS

US 21 Bridge Replacement over Harbor River
Beaufort County, South Carolina
Project Number :P026862

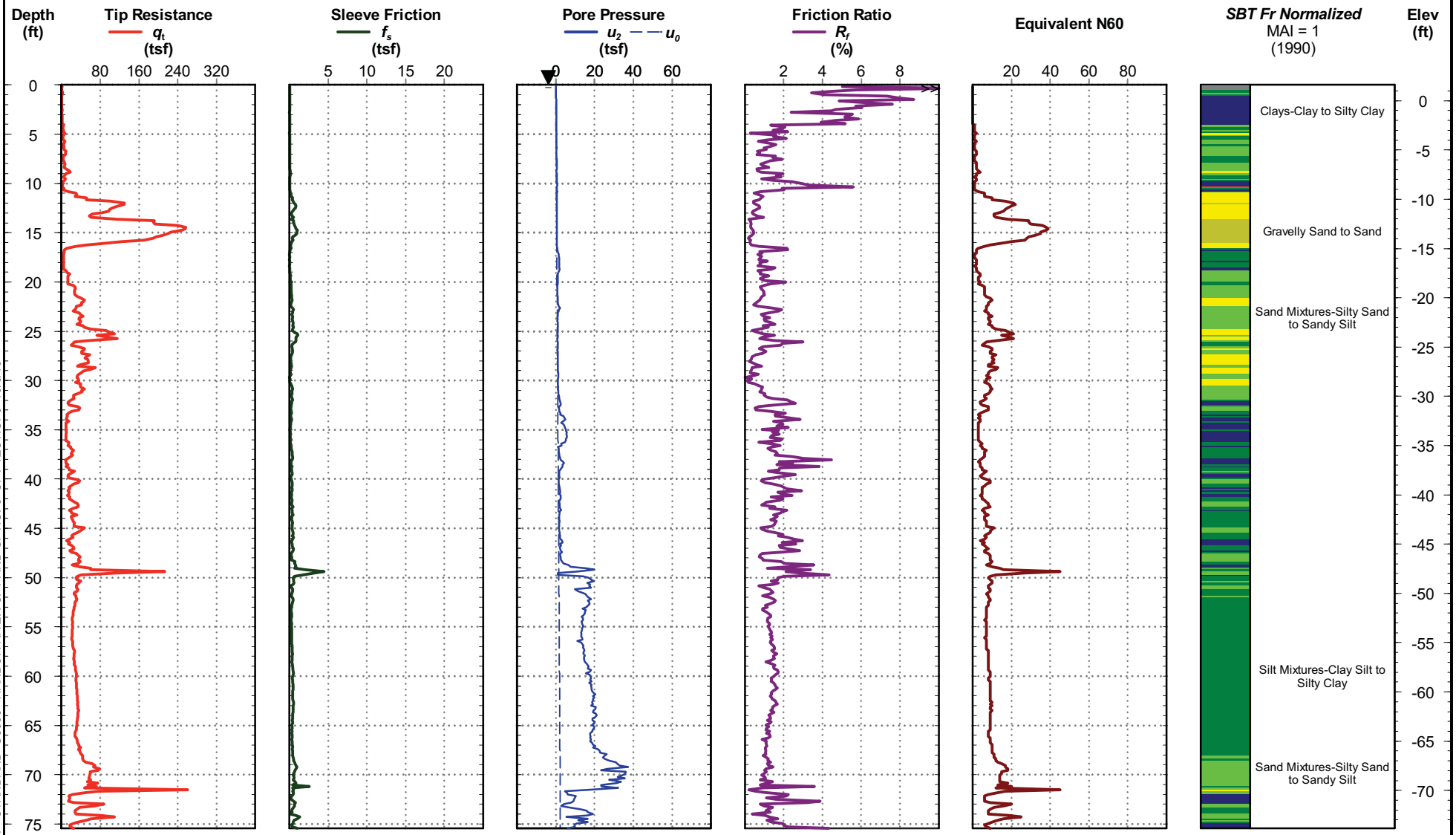
Cone Penetration Test

CPT-4

Date: Sep. 23, 2015
Estimated Water Depth: 0 ft
Rig/Operator: M.A.D.

Station: 49+36
Offset: 76.2'-LT
Elevation: 1.6

Total Depth: 75.5 ft
Termination Criteria: Maximum Reaction Force
Cone Size:



CPT REPORT - STANDARD G5396 - HARBOR RIVER SPT AND CPT.GPJ CPT TEST.GPJ 10/6/16

CPT-4

Electronic File Name: Habor River Hwy 21 CPT-04.cpt

F&ME CONSULTANTS

US 21 Bridge Replacement over Harbor River
Beaufort County, South Carolina
Project Number :P026862

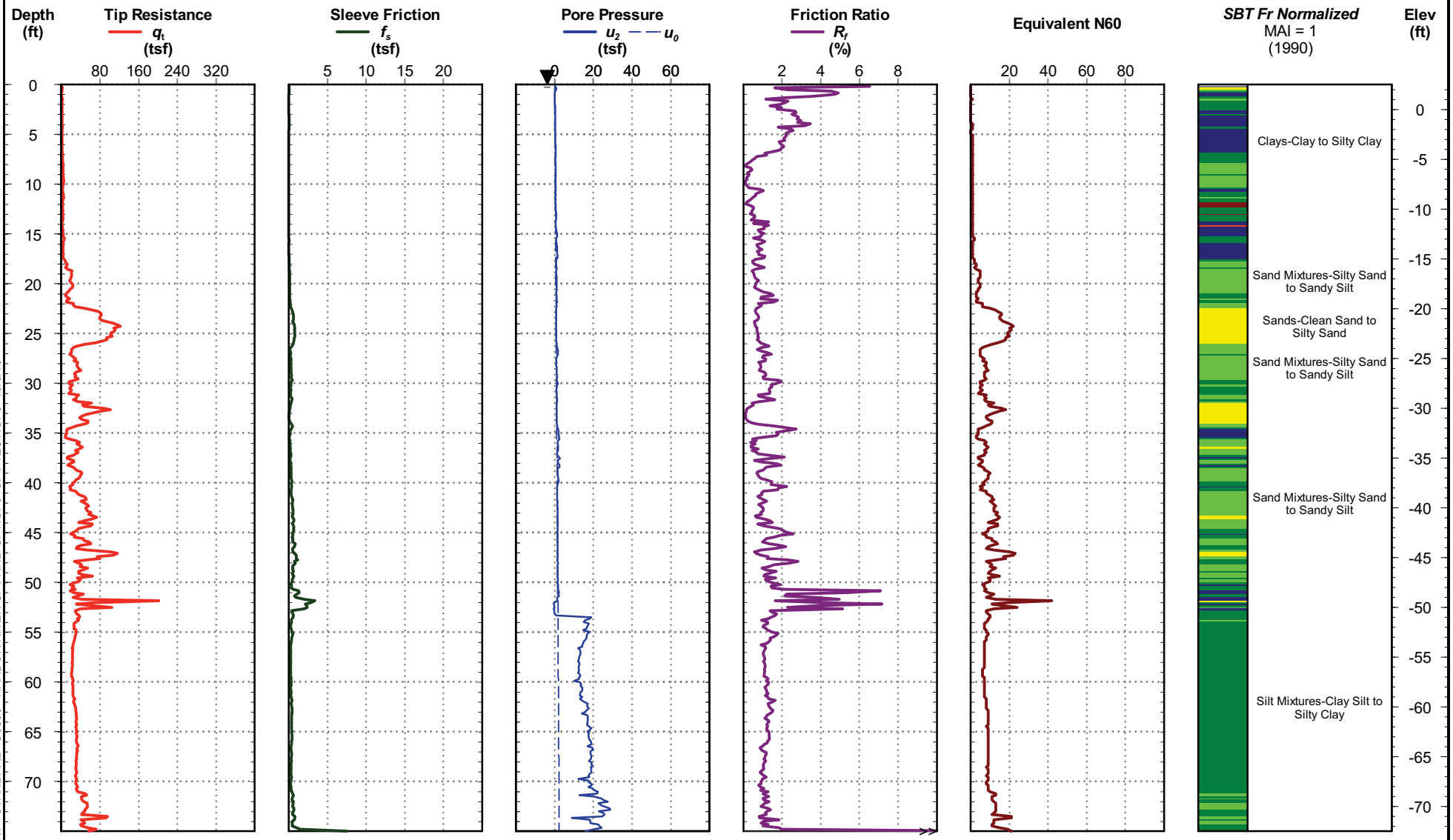
Cone Penetration Test

CPT-5

Date: Sep. 24, 2015
Estimated Water Depth: 0 ft
Rig/Operator: M.A.D.

Station: 60+88
Offset: 78.7'-LT
Elevation: 2.5

Total Depth: 75.0 ft
Termination Criteria: Maximum Reaction Force
Cone Size:



CPT REPORT - STANDARD G5396 - HARBOR RIVER SPT AND CPT.GPJ CPT TEST.GPJ 10/6/16

CPT-5

Electronic File Name: Habor River Hwy 21 CPT-05.cpt

F&ME CONSULTANTS

US 21 Bridge Replacement over Harbor River
Beaufort County, South Carolina
Project Number :P026862

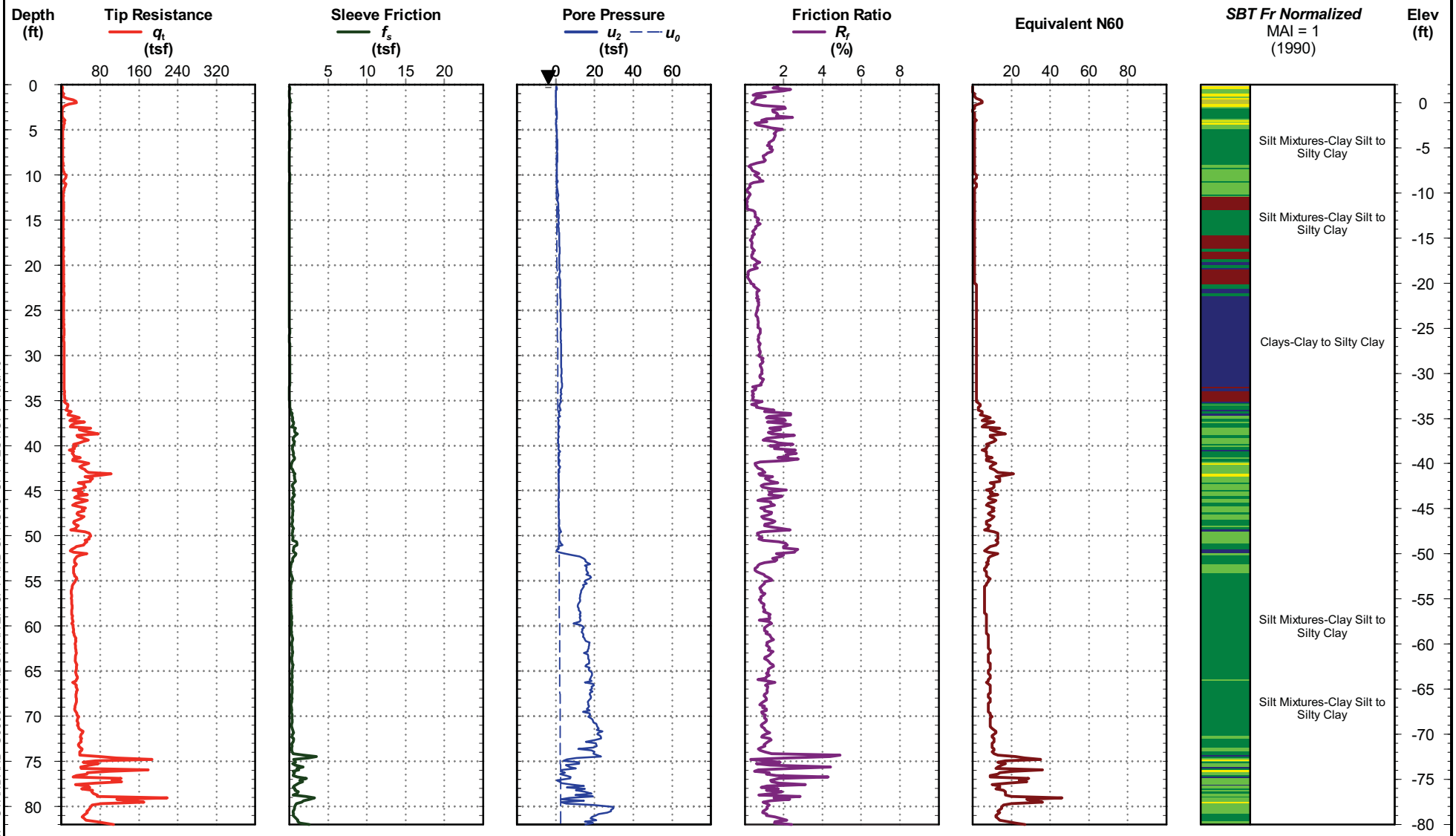
Cone Penetration Test

CPT-6

Date: Sep. 24, 2015
Estimated Water Depth: 0 ft
Rig/Operator: M.A.D.

Station: 69+12
Offset: 41.6'-LT
Elevation: 2.0

Total Depth: 82.0 ft
Termination Criteria: Maximum Reaction Force
Cone Size:



CPT REPORT - STANDARD G5396 - HARBOR RIVER SPT AND CPT.GPJ CPT TEST.GPJ 10/6/16

CPT-6

Electronic File Name: Habor River Hwy 21 CPT-06.cpt

F&ME CONSULTANTS

US 21 Bridge Replacement over Harbor River
Beaufort County, South Carolina
Project Number :P026862

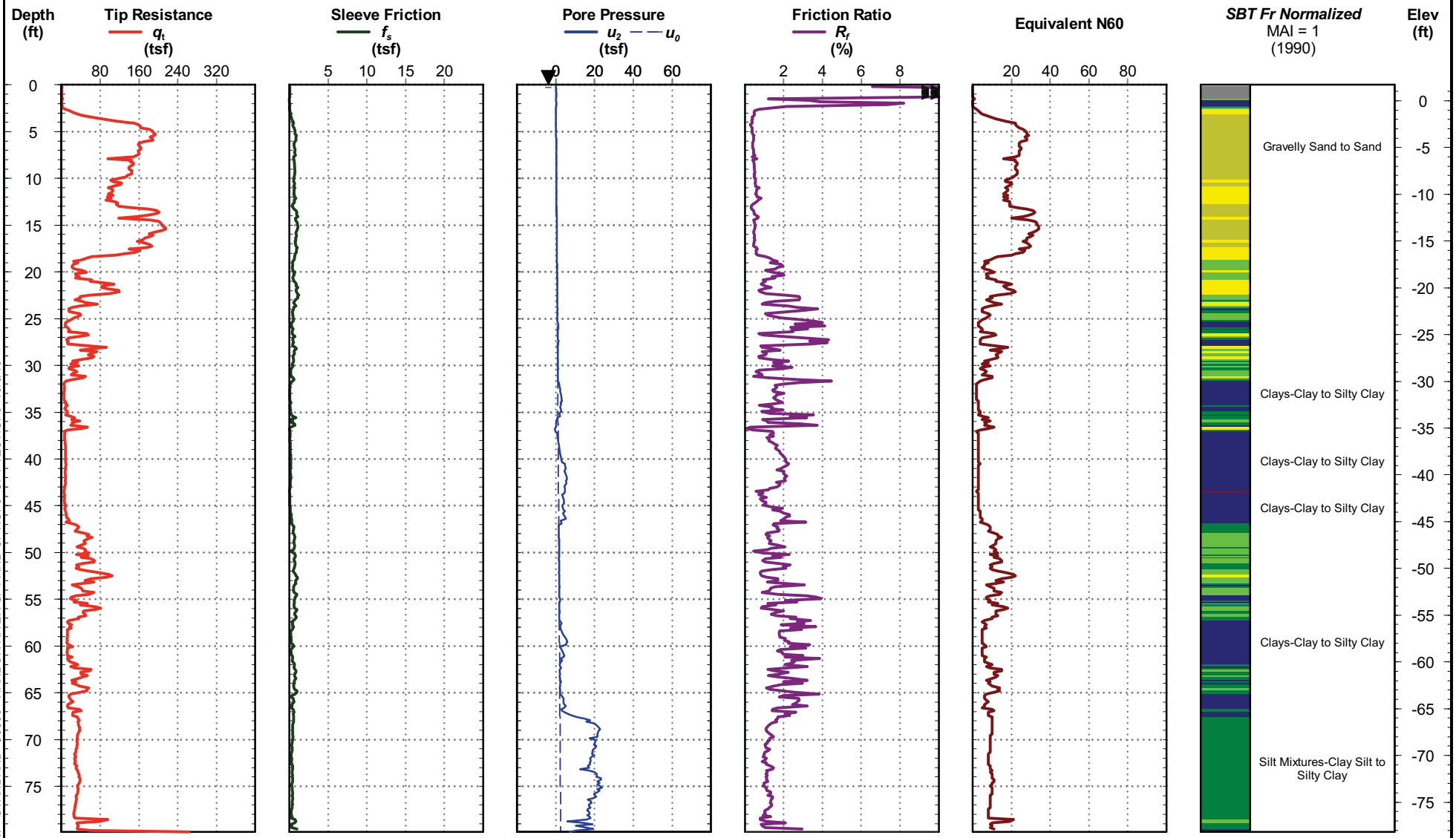
Cone Penetration Test

CPT-7

Date: Sep. 22, 2015
Estimated Water Depth: 0 ft
Rig/Operator: M.A.D.

Station: 100+84
Offset: 1.9'-LT
Elevation: 1.7

Total Depth: 79.9 ft
Termination Criteria: Maximum Reaction Force
Cone Size:



CPT REPORT - STANDARD G5396 - HARBOR RIVER SPT AND CPT.GPJ CPT TEST.GPJ 10/6/16

CPT-7

Electronic File Name: Habor River Hwy 21 CPT-07.cpt

F&ME CONSULTANTS

US 21 Bridge Replacement over Harbor River
Beaufort County, South Carolina
Project Number :P026862

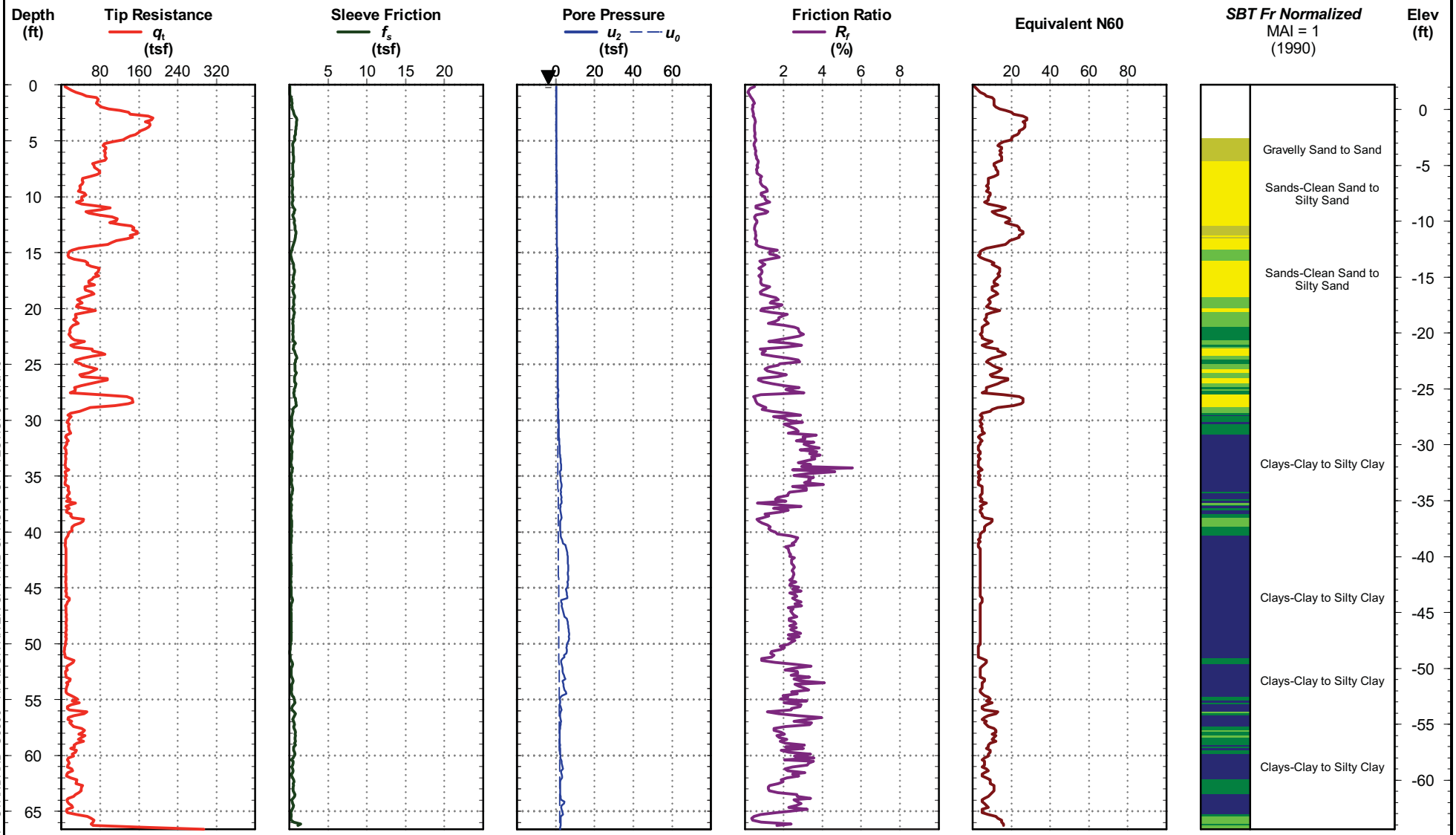
Cone Penetration Test

CPT-8

Date: Sep. 22, 2015
Estimated Water Depth: 0 ft
Rig/Operator: M.A.D.

Station: 103+87
Offset: 15.3'-RT
Elevation: 2.2

Total Depth: 66.6 ft
Termination Criteria: Maximum Reaction Force
Cone Size:



CPT REPORT - STANDARD G5396 - HARBOR RIVER SPT AND CPT.GPJ CPT TEST.GPJ 10/6/16

CPT-8

Electronic File Name: Habor River Hwy 21 CPT-08.cpt

F&ME CONSULTANTS

US 21 Bridge Replacement over Harbor River
Beaufort County, South Carolina
Project Number :P026862

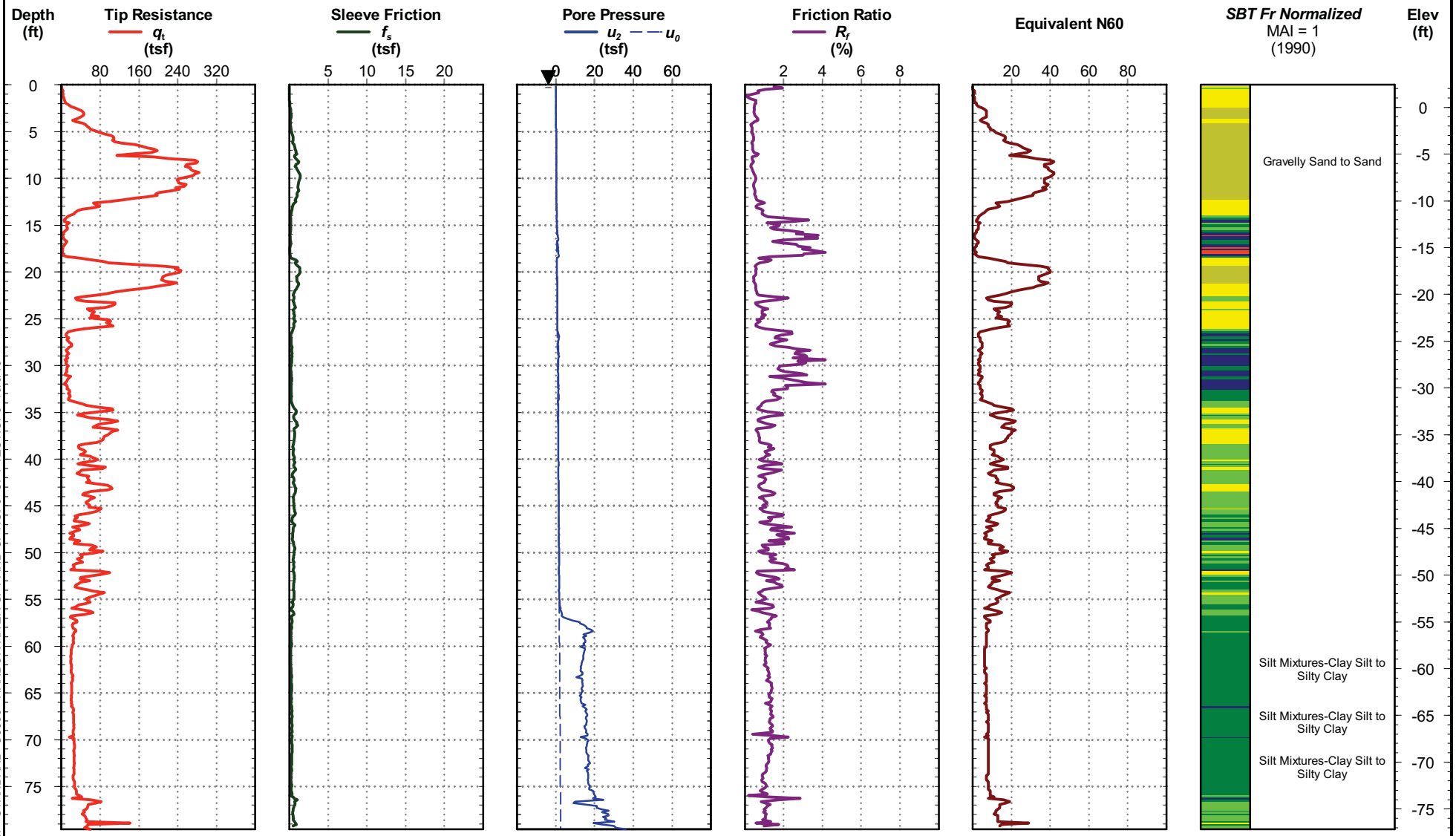
Cone Penetration Test

CPT-9

Date: Sep. 22, 2015
Estimated Water Depth: 0 ft
Rig/Operator: M.A.D.

Station: 116+53
Offset: 42.4'-LT
Elevation: 2.4

Total Depth: 79.6 ft
Termination Criteria: Maximum Reaction Force
Cone Size:



CPT REPORT - STANDARD G5396 - HARBOR RIVER SPT AND CPT.GPJ CPT TEST.GPJ 10/6/16

CPT-9

Electronic File Name: Habor River Hwy 21 CPT-09.cpt

F&ME CONSULTANTS

US 21 Bridge Replacement over Harbor River
Beaufort County, South Carolina
Project Number :P026862

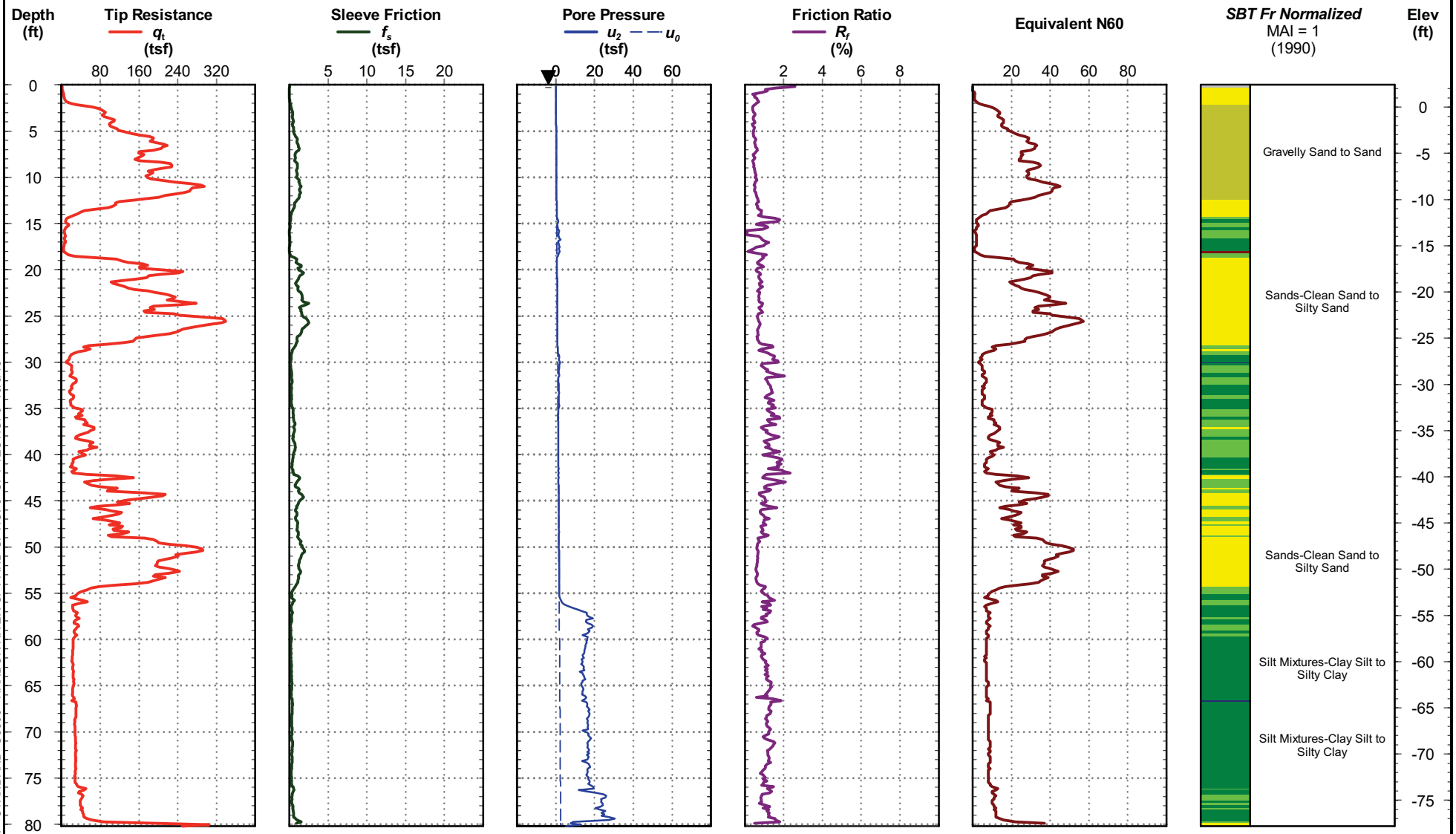
Cone Penetration Test

CPT-10

Date: Sep. 23, 2015
Estimated Water Depth: 0 ft
Rig/Operator: M.A.D.

Station: 120+07
Offset: 49.3'-LT
Elevation: 2.4

Total Depth: 80.2 ft
Termination Criteria: Maximum Reaction Force
Cone Size:



CPT REPORT - STANDARD G5396 - HARBOR RIVER SPT AND CPT.GPJ CPT TEST.GPJ 10/6/16

CPT-10

Electronic File Name: Habor River Hwy 21 CPT-10.cpt

F&ME CONSULTANTS

US 21 Bridge Replacement over Harbor River
Beaufort County, South Carolina
Project Number :P026862

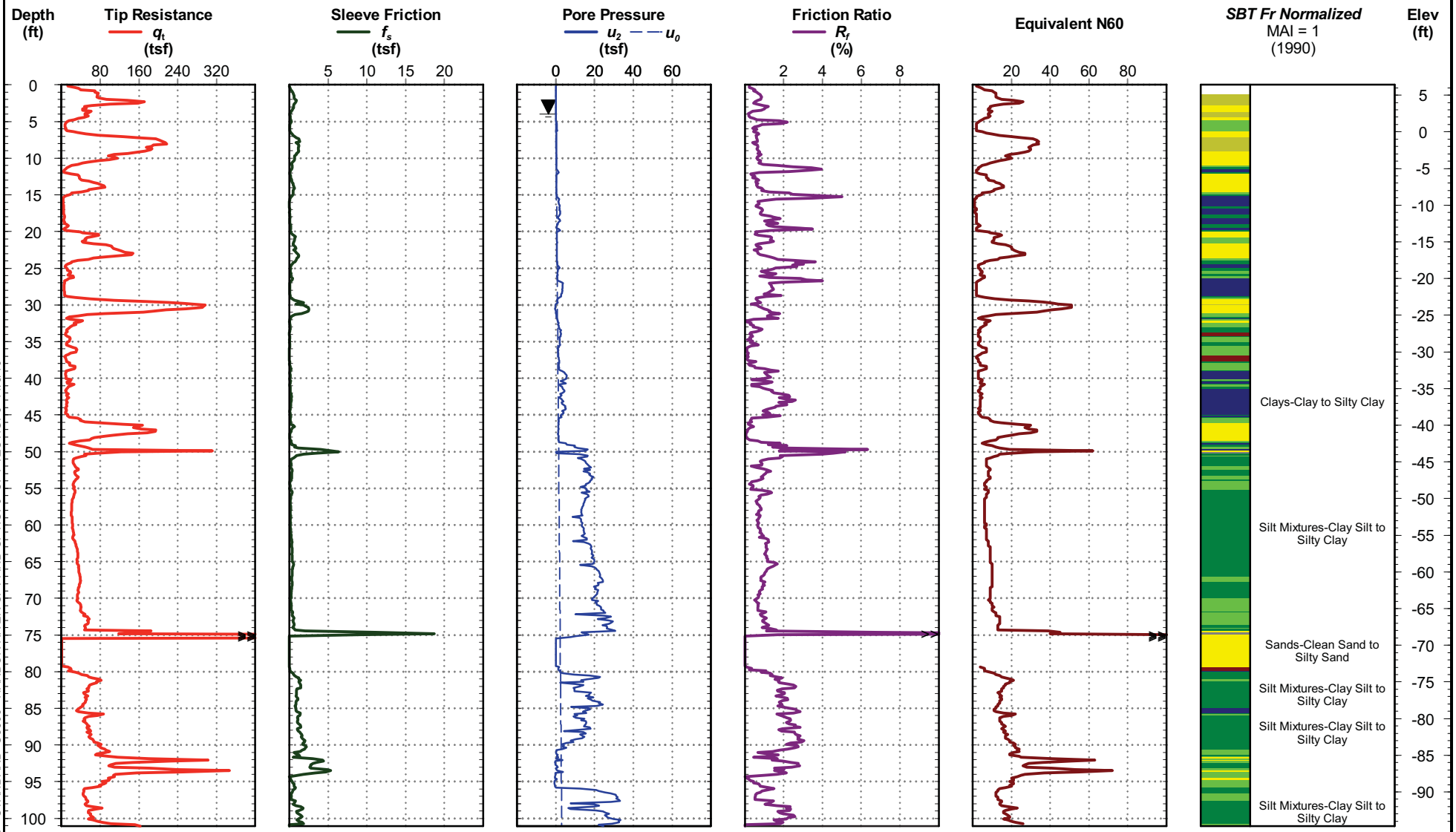
Cone Penetration Test

SCPT-11

Date: Nov. 18, 2015
Estimated Water Depth: 4 ft
Rig/Operator: Conetec

Station: 40+89
Offset: 292.5'-RT
Elevation: 6.4

Total Depth: 101.1 ft
Termination Criteria: Maximum Reaction Force
Cone Size:



SCPT-11

Electronic File Name: 15-54107_SP SCPT-11.cor

CPT REPORT - STANDARD G5396 - HARBOR RIVER SPT AND CPT.GPJ CPT TEST.GPJ 11/3/16

HARBOR RIVER

BOREHOLE GEOPHYSICS

BEAUFORT, SOUTH CAROLINA

BOREHOLE SB-1

August 24, 2016

Report 16248-01 rev 0

HARBOR RIVER

BOREHOLE GEOPHYSICS

BEAUFORT, SOUTH CAROLINA

BOREHOLE SB-1

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August 24, 2016
Report 16248-01 rev 0

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APPENDICES

APPENDIX A SUSPENSION VELOCITY MEASUREMENT QUALITY ASSURANCE SUSPENSION SOURCE TO RECEIVER ANALYSIS RESULTS

APPENDIX B ELOG, MECHANICAL CALIPER, AND NATURAL GAMMA LOGS

APPENDIX C GEOPHYSICAL LOGGING SYSTEMS - NIST TRACEABLE CALIBRATION RECORDS

INTRODUCTION

Borehole geophysical measurements were collected in one (1) boring at Harbor River in Beaufort, South Carolina. Data acquisition was performed on July 18th, 2016 by Jonathan Jordan of **GEO***Vision*. Data analysis and report preparation were performed by Emily Feldman and Victor Gonzalez and reviewed by John Diehl of **GEO***Vision*. The work was performed for F&ME Consultants, Inc. with Mike Miller serving as the point of contact.

This report describes the field measurements, data analysis, and results of this work.

SCOPE OF WORK

This report presents the results of borehole geophysical measurements collected on July 18th, 2016 as detailed in Table 1.

Robertson Geologging (RG) ELOG and 3-Arm Mechanical Caliper (CAL) probes were used to collect long and short normal resistivity, single point resistance, self-potential, and borehole diameter, respectively. Both probes also acquired natural gamma (NG). The probes acquire data at up to 0.05 foot sample rate.

Measurement procedures followed these ASTM standards:

- ASTM D5753-05 (Re-approved 2010), "Planning and Conducting Boring Geophysical Logging"
- ASTM D6274-98 (Re-approved 2004), "Conducting Boring Geophysical Logging – Gamma"

Data were combined and plotted as profiles of the preceding parameters versus depth.

INSTRUMENTATION

Suspension Velocity Instrumentation

Suspension velocity measurements were performed using the suspension PS logging system, manufactured by OYO Corporation, and their subsidiary, Robertson Geologging. This system directly determines the average velocity of a 3.3-foot high segment of the soil column surrounding the boring of interest by measuring the elapsed time between arrivals of a wave propagating upward through the soil column. The receivers that detect the wave, and the source that generates the wave, are moved as a unit in the boring producing relatively constant amplitude signals at all depths.

The suspension system probe consists of a combined reversible polarity solenoid horizontal shear-wave source (S_H) and compressional-wave source (P), joined to two biaxial receivers by a flexible isolation cylinder, as shown in Figure 1. The separation of the two receivers is 3.3 feet, allowing average wave velocity in the region between the receivers to be determined by inversion of the wave travel time between the two receivers. The total length of the probe as used in these surveys is approximately 22 feet, with the center point of the receiver pair 12.5 feet above the bottom end of the probe.

The probe receives control signals from, and sends the digitized receiver signals to, instrumentation on the surface via an armored conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured to provide probe depth data using a sheave of known circumference fitted with a digital rotary encoder.

The entire probe is suspended in the boring by the cable, therefore, source motion is not coupled directly to the boring walls; rather, the source motion creates a horizontally propagating impulsive pressure wave in the fluid filling the boring and surrounding the source. This pressure wave is converted to P and S_H-waves in the surrounding soil and rock as it passes through the casing and grout annulus and impinges upon the wall of the boring. These waves propagate through the soil and rock surrounding the boring, in turn causing a pressure wave to be generated in the fluid

surrounding the receivers as the soil waves pass their location. Separation of the P and S_H-waves at the receivers is performed using the following steps:

1. Orientation of the horizontal receivers is maintained parallel to the axis of the source, maximizing the amplitude of the recorded S_H -wave signals.
2. At each depth, S_H-wave signals are recorded with the source actuated in opposite directions, producing S_H-wave signals of opposite polarity, providing a characteristic S_H-wave signature distinct from the P-wave signal.
3. The 6.3 foot separation of source and receiver 1 permits the P-wave signal to pass and damp significantly before the slower S_H-wave signal arrives at the receiver.
4. In saturated soils, the received P-wave signal is typically of much higher frequency than the received S_H-wave signal, permitting additional separation of the two signals by low pass filtering.
5. Direct arrival of the original pressure pulse in the fluid is not detected at the receivers because the wavelength of the pressure pulse in fluid is significantly greater than the dimension of the fluid annulus surrounding the probe (feet versus inches scale), preventing significant energy transmission through the fluid medium.

In operation, a distinct, repeatable pattern of impulses is generated at each depth as follows:

1. The source is fired in one direction producing dominantly horizontal shear with some vertical compression, and the signals from the horizontal receivers situated parallel to the axis of motion of the source are recorded.
2. The source is fired again in the opposite direction and the horizontal receiver signals are recorded.
3. The source is fired again and the vertical receiver signals are recorded. The repeated source pattern facilitates the picking of the P and S_H-wave arrivals; reversal of the source changes the polarity of the S_H-wave pattern but not the P-wave pattern.

The data from each receiver during each source activation is recorded as a different channel on the recording system. The Suspension PS system has six channels (two simultaneous recording channels), each with a 1024 sample record. The recorded data are displayed as six channels with a common time scale. Data are stored on disk for further processing.

Review of the displayed data on the recorder or computer screen allows the operator to set the gains, filters, delay time, pulse length (energy), and sample rate to optimize the quality of the data before recording. Verification of the calibration of the Suspension PS digital recorder is performed every twelve months using a NIST traceable frequency source and counter, as presented in Appendix C.

Caliper / Natural Gamma Instrumentation

Caliper and natural gamma data were collected using a mechanical 3-arm caliper probe (CAL) manufactured by Robertson Geologging, Ltd. The probe is 6.82 feet long, and 1.5 inches in diameter. As configured, the probe can measure boring diameters between 1.6 and 12 inches.

This probe is useful in the following studies:

- Measurement of boring diameter and volume
- Location of hard and soft formations
- Location of fissures, caving, pinching and casing damage
- Bed boundary identification
- Strata correlation between borings

The probe receives control signals from, and sends the digitized measurement values to, a Robertson Micrologger II (MLII) on the surface via an armored cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured to provide probe depth using a sheave of known circumference fitted with a digital rotary encoder. Probe and depth data are transmitted by USB link from the MLII unit to a laptop computer where it is displayed and stored.

The caliper consists of three arms, each with a toothed quadrant at their base, pivoted in the lower probe body. A toothed rack engages with each quadrant, constraining the arms to move together. Linear movement of the rack is coupled to opening and closing of the arms. Springs hold the arms open in the operating position. A motor drive retracts the arms, allowing the probe to be lowered into the boring. The rack is coupled to a potentiometer which converts movement into a voltage sensed by the probe's microprocessor.

Natural gamma measurements rely on small quantities of radioactive material contained in soil and rocks to emit gamma radiation as they decay. Trace amounts of uranium and thorium are present

in a few minerals. Feldspar, mica and clays will include traces of a radioactive isotope of potassium. The radiation is detected by scintillation - the production of a tiny flash of light when gamma rays strike a crystal of sodium iodide. The light is converted into an electrical pulse by a photomultiplier tube. Pulses above a threshold value of 60 KeV are counted by the probe's microprocessor. The measurement is useful because the radioactive elements are concentrated in certain soil and rock types, e.g., clay or shale, and depleted in others, e.g., sandstone or coal.

Elog / Natural Gamma Instrumentation

Elog and natural gamma data were collected using an electric log probe (ELOG), manufactured by Robertson Geologging, Ltd. This probe measures Single Point Resistance (SPR), short normal (16 inch) resistivity, long normal (64 inch) resistivity, Spontaneous Potential (SP) and natural gamma. The ELGX probe is 8.20 feet long, and 1.73 inches in diameter. The addition of an insulated bridle cable makes the functional length of the tool 41 feet.

This probe is useful in the following studies:

- Bed boundary identification
- Strata correlation between borings
- Strata geometry and type (shale indication)

The probe receives control signals from, and sends the digitized measurement values to, a Robertson Micrologger II (MLII) on the surface via an armored cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured to provide probe depth using a sheave of known circumference fitted with a digital rotary encoder. The probe and depth data are transmitted by USB link from the MLII unit to a laptop computer where it is displayed and stored.

The resistivity section of the probe operates by driving an alternating current into the formation from the central SPR/DRIVE electrode. The current returns via the logging cable armor. However, to ensure adequate penetration of the formation, a 10 meter (32.8 feet) insulated bridle cable is

attached between the probe and cablehead, making the functional length of the probe 41 feet. The bridle is comprised of 10 meters of insulated cable with a remote, or reference, electrode located at the top. Voltages are measured between the 16 inch and 64 inch electrodes and the remote earth connection at surface, as noted below:

- Single Point Resistance (SPR): The current flowing to the cable armor is measured along with the voltage at the SPR electrode. The voltage divided by current gives resistance.

- Spontaneous Potential (SP): This is the DC bias of the 16 inch electrode with respect to the voltage return at the surface (ground stake).

Data quality depends on good grounding at the surface. This is achieved with a metal stake driven into the ground near the borehole.

Natural gamma measurements rely on small quantities of radioactive material contained in soil and rocks to emit gamma radiation as they decay. Trace amounts of uranium and thorium are present in a few minerals. Feldspar, mica and clays will include traces of a radioactive isotope of potassium. The radiation is detected by scintillation - the production of a tiny flash of light when gamma rays strike a crystal of sodium iodide. The light is converted into an electrical pulse by a photomultiplier tube. Pulses above a threshold value of 60 KeV are counted by the probe's microprocessor. The measurement is useful because the radioactive elements are concentrated in certain soil and rock types, e.g., clay or shale, and depleted in others, e.g., sandstone or coal.

MEASUREMENT PROCEDURES

Suspension Velocity Measurement Procedures

Boring SB-1 was logged uncased from 80 feet below ground surface, and filled with water. Measurements followed the **GEO***Vision* Procedure for P-S Suspension Seismic Velocity Logging, revision 1.5. Prior to each logging run, the probe was positioned with the top of the probe even with a stationary reference point. The electronic depth counter was set to the distance between the mid-point of the receiver and the top of the probe, minus the height of the stationary reference point, if any, verified with a tape measure, and recorded on the field logs. The probe was lowered to the bottom of the boring, stopping at 1.6 foot intervals to collect data, as summarized in Table 2.

At each measurement depth the measurement sequence of two opposite horizontal records and one vertical record was performed, and the gains were adjusted as required. The data from each depth were viewed on the computer display, checked, and recorded on disk before moving to the next depth.

Upon completion of the measurements, the probe zero depth indication at the depth reference point was verified prior to removal from the boring.

Caliper / Natural Gamma Measurement Procedures

Measurement procedures followed these ASTM standards:

- ASTM D5753-05 (Reapproved 2010), “Planning and Conducting Borehole Geophysical Logging”
- ASTM D6167-11, “Conducting Borehole Geophysical Logging – Mechanical - Caliper”
- ASTM D6274-10, “Conducting Borehole Geophysical Logging – Gamma”

The CAL probe does not require a fluid filled boring for proper operation. Prior to logging, measurement depths were referenced to ground level. This was done by placing the top of the probe even with a fixed reference point, such as top of casing or drill mud bucket. Then the electronic depth counter was set to the probe length minus the height of the reference point. Once verified with a tape measure, these calculations were recorded on a field log. Offset distances between probe tip and measurement points are corrected by the acquisition software. The probe was then lowered to the bottom of the boring, the caliper arms opened via software control, the software recorder turned on and data were acquired on ascent. The probe was returned to the surface at approximately 10-15 feet/minute, collecting data continuously at 0.05-foot spacing, as summarized in Table 2.

Prior to use, caliper tool operation was verified using **GEO***Vision* verification plate S/N 203. Plate S/N 203 is a circular aluminum plate with a series of four machined annular slots in the top surface for fitting the tips of the caliper arms. The slots have outside diameters from 2.1 to 8.0 inches. Methodically, the nose of the probe is centered through the central hole of the verification plate. The caliper probe arms are opened under program control, and a log recorded as the tips of the arms are sequentially placed in the four slots on the plate. The measured dimensions, as displayed on the computer screen, are recorded and compared to the verification plate know diameters.

If the verification records do not fall within +/- 0.05 inches of the verification plate values, the caliper tool is re-adjusted using the four point verification plate and the verification log repeated. As with the verification, the tips of the caliper arms are placed in the holes marked with the known diameter. During re-adjustment, the value of the current point, as stamped on the jig, is entered via the control computer. The system counts for 15 seconds to make an average of the response. The procedure is repeated for the remaining openings. The computation and generation of the adjustment file is entirely automatic. The adjustment file is simply the set of coefficients of a quadratic curve which fits the four data points.

Natural gamma was not calibrated in the field, as it is a qualitative measurement, not a quantitative value, and is used only to assist in picking transitions between stratigraphic units, as described in ASTM D6274-10, “Conducting Borehole Geophysical Logging – Gamma”.

Upon completion of the measurements, the probe zero depth indication at the depth reference point was verified prior to removal from the boring.

Natural gamma was not calibrated in the field, as it is a qualitative measurement, not a quantitative value, and is used only to assist in picking transitions between stratigraphic units, as described in ASTM D6274-10, “Conducting Borehole Geophysical Logging – Gamma”.

Upon completion of the measurements, the probe zero depth indication at the depth reference point was verified prior to removal from the boring.

Elog / Natural Gamma Measurement Procedures

Measurement procedures followed these ASTM standards:

- ASTM D5753-05 (Re-approved 2010), “Planning and Conducting Boring Geophysical Logging”
- ASTM D6274-10, “Conducting Boring Geophysical Logging – Gamma”

The ELOG probe requires a fluid filled boring for proper operation. Prior to logging, measurement depths were referenced to ground level. This was done by placing the top of the probe even with a fixed reference point, such as top of casing or drill mud bucket. Then the electronic depth counter was set to the probe length minus the height of the reference point. Once verified with a tape measure, these calculations were recorded on a field log. Offset distances between probe tip and measurement points are corrected by the acquisition software.

The probe is connected to the logging cable using a 32.8 foot long insulating cable section or “bridle”. The probe head was insulated by wrapping all exposed metal of the cable head and probe

with self-amalgamating insulation tape. The 32.8 foot insulating yoke was checked for any damage, and repaired with self-amalgamating insulation tape as needed. The functional length of the probe with the bridle cable is 41 feet.

Prior to logging, measurement depths were referenced to ground level. This was done by positioning the probe with the top of the yoke even with a fixed reference point, such as top of casing or drill mud bucket. Then the electronic depth counter was set to the probe and bridle length (41 feet) minus the height of the reference point. Once verified with a tape measure, these calculations were recorded on a field log. Offset distances between probe tip and measurement points are corrected by the acquisition software. The probe was then lowered to the bottom of the boring, the software recorder turned on and data were acquired on ascent.. The probe was then returned to the surface at approximately 10 feet/minute, collecting data continuously at 0.05 foot spacing, until the yoke electrode cleared the surface of the borehole fluid or the probe entered the surface casing, as summarized in Table 2.

The reference ground stake was driven firmly into the ground near the borehole and connected to the ground socket on the winch junction box.

This probe was not calibrated in the field, as it is used to provide qualitative measurements, not quantitative values, and is used only to assist in picking transitions between stratigraphic units, as described in ASTM D5753-05 (Reapproved 2010), Planning and Conducting Boring Geophysical Surveys. A functional test was performed prior to use by applying fixed resistance values across the probe electrodes, as well as a 100 millivolt signal across the SP electrodes, and recording the resultant output of the system.

Natural gamma was not calibrated in the field, as it is a qualitative measurement, not a quantitative value, and is used only to assist in picking transitions between stratigraphic units, as described in ASTM D6274-10, Conducting Boring Geophysical Logging - Gamma.

Upon completion of the measurements, the probe zero depth indication at the depth reference point was verified prior to removal from the boring.

DATA ANALYSIS

Suspension Velocity Analysis

Using the proprietary OYO program PSLOG.EXE version 1.0, the recorded digital waveforms were analyzed to locate the most prominent first minima, first maxima, or first break on the vertical axis records, indicating the arrival of P-wave energy. The difference in travel time between receiver 1 and receiver 2 (R1-R2) arrivals was used to calculate the P-wave velocity for that 1.0 meter segment of the soil column. When observable, P-wave arrivals on the horizontal axis records were used to verify the velocities determined from the vertical axis data. The time picks were then transferred into a Microsoft Excel® template (version 2003 SP2) to complete the velocity calculations based upon the arrival time picks made in PSLOG. The Microsoft Excel® analysis files are included on the data disk that accompanies this report.

The P-wave velocity over the 6.3-foot interval from source to receiver 1 (S-R1) was also picked using PSLOG, and calculated and plotted in Microsoft Excel®, for quality assurance of the velocity derived from the travel time between receivers. In this analysis, the depth values as recorded were increased by 4.8 feet to correspond to the mid-point of the 6.3-foot S-R1 interval. Travel times were obtained by picking the first break of the P-wave signal at receiver 1 and subtracting 4 milliseconds, the calculated and experimentally verified delay from source trigger pulse (beginning of record) to source impact. This delay corresponds to the duration of acceleration of the solenoid before impact.

As with the P-wave records, the recorded digital waveforms were analyzed to locate clear S_H-wave pulses, as indicated by the presence of opposite polarity pulses on each pair of horizontal records. Ideally, the S_H-wave signals from the 'normal' and 'reverse' source pulses are very nearly inverted images of each other. Digital Fast Fourier Transform – Inverse Fast Fourier Transform (FFT – IFFT) lowpass filtering was used to remove the higher frequency P-wave signal from the S_H-wave signal. Different filter cutoffs were used to separate P- and S_H-waves at different depths, ranging from 600 Hz in the slowest zones to 4000 Hz in the regions of highest velocity. At each depth, the

filter frequency was selected to be at least twice the fundamental frequency of the S_H-wave signal being filtered.

Generally, the first maxima were picked for the 'normal' signals and the first minima for the 'reverse' signals, although other points on the waveform were used if the first pulse was distorted. The absolute arrival time of the 'normal' and 'reverse' signals may vary by +/- 0.2 milliseconds, due to differences in the actuation time of the solenoid source caused by constant mechanical bias in the source or by boring inclination. This variation does not affect the R1-R2 velocity determinations, as the differential time is measured between arrivals of waves created by the same source actuation. The final velocity value is the average of the values obtained from the 'normal' and 'reverse' source actuations.

As with the P-wave data, S_H-wave velocity calculated from the travel time over the 6.3-foot interval from source to receiver 1 was calculated and plotted for verification of the velocity derived from the travel time between receivers. In this analysis, the depth values were increased by 4.8 feet to correspond to the mid-point of the 6.3-foot S-R1 interval. Travel times were obtained by picking the first break of the S_H-wave signal at the near receiver and subtracting 4 milliseconds, the calculated and experimentally verified delay from the beginning of the record at the source trigger pulse to source impact.

These data and analysis were reviewed by John Diehl as a component of **GEO***Vision*'s in-house data validation program.

Figure 2 shows an example of R1 - R2 measurements on a sample filtered suspension record. In Figure 2, the time difference over the 3.3 foot interval of 1.88 milliseconds for the horizontal signals is equivalent to an S_H-wave velocity of 1745 feet/second. Whenever possible, time differences were determined from several phase points on the S_H-waveform records to verify the data obtained from the first arrival of the S_H-wave pulse. Figure 3 displays the same record before filtering of the S_H-waveform record with a 1400 Hz FFT - IFFT digital lowpass filter, illustrating

the presence of higher frequency P-wave energy at the beginning of the record, and distortion of the lower frequency S_H-wave by residual P-wave signal.

Caliper / Natural Gamma

CAL and NG data do not require analysis; however depths to identifiable boring log features, such as distinct natural gamma transitions, were compared to verify consistent depth readings on all logs. Using WellCAD software version 5.1, CAL and NG data were combined with other line log data and converted to LAS 2.0 and PDF formats.

Elog / Natural Gamma Analysis

ELOG and NG data do not require analysis; however depths to identifiable boring log features, such as distinct natural gamma transitions, were compared to verify consistent depth readings on all logs. Using WellCAD software version 5.1, ELOG and NG data were combined with other line log data and converted to LAS 2.0 and PDF formats.

RESULTS

Suspension Velocity Results

Suspension R1-R2 P- and S_H-wave velocities for Boring SB-1 are plotted in Figure 5. The suspension velocity data presented in this figure are also presented in Table 3. The Microsoft Excel® analysis file is included in the electronic data that accompanies this report.

P- and S_H-wave velocity data from R1-R2 analysis and quality assurance analysis of S-R1 data are plotted together in Figure A-1 to aid in visual comparison. It should be noted that R1-R2 data are an average velocity over a 3.3-foot segment of the soil column; S-R1 data are an average over 6.3 feet, creating a significant smoothing relative to the R1-R2 plots. The S-R1 velocity data displayed in this figure are also presented in Table A-1 and included in the Microsoft Excel® analysis file that accompanies this report. The Microsoft Excel® analysis file includes Poisson's Ratio calculations, tabulated data and plots.

Caliper / Natural Gamma Results

Caliper (CAL) data are presented on combination line log plots with ELOG and NG data (Appendix B). All logs are scaled to the API 5-inch (1 inch = 20 feet) standard. Depths on all figures and tables are referenced to ground surface. LAS 2.0 data and Acrobat files of the plots are included in the boring specific sub-directories in the data directory that accompanies this report.

Elog / Natural Gamma Results

ELOG data are presented on combination line log plots with CAL and NG data (Appendix B). All logs are scaled to the API 5-inch (1 inch = 20 feet) standard. Depths on all figures and tables are referenced to ground surface. LAS 2.0 data and Acrobat files of the plots are included in the boring specific sub-directories in the data directory that accompanies this report.

SUMMARY

Discussion of Suspension Velocity Results

Suspension PS velocity data are ideally collected in an uncased fluid filled boring, drilled with rotary mud (rotary wash) methods, as found in the case of this boring.

Suspension PS velocity data quality is judged based upon 5 criteria.

- Consistent data between receiver to receiver (R1 – R2) and source to receiver (S – R1) data.
- Consistency between data from adjacent depth intervals.
- Consistent relationship between P-wave and S_H -wave (excluding transition to saturated soils)
- Clarity of P-wave and S_H-wave onset, as well as damping of later oscillations.
- Consistency of profile between adjacent borings, if available.

Good correspondence between the shapes of the P- and S_H-wave velocity curves are observed for this data set. The raw data was of excellent quality, obviating the need for any filtering or other post processing. The velocities derived from S-R1 and R1-R2 data are in good agreement for this borehole, providing verification of the higher resolution R1-R2 data.

There is an interesting drop in both P- and S-wave velocities at about 294 feet below ground surface (bgs). The P-wave velocity drops below water velocity, indicating possibly a thin unsaturated zone. Low Vs velocities continue down to about 400 feet bgs.

Discussion of Caliper / Natural Gamma Results

The caliper log for boring SB-1 shows fairly consistent 6” gauge below the casing to about 248’, where the gauge narrows to 5”, likely due to a change in bit size. The gauge narrows again to 4” at about 452’ bgs. The caliper log terminated at 475’ due to collapse of the hole. This was the final log to be run.

There were no significant variations in the Natural Gamma log, but notable correspondence between minor features, particularly the events at about 285’ and 400’.

Discussion of Elog / Natural Gamma Results

Elog data were acquired in this borehole to full depth, including long- and short-normal resistance, single-point resistance (SPR), and self-potential (SP). ELog data correlate well with other line logs, further assisting identification of lithologic variability with depth.

Natural Gamma data collected with this probe is not presented, as it is of lower vertical resolution than that collected with the CAL probe. However, the data correlates very well with the Caliper NG, and confirms the accuracy of the results.

Suspension Velocity Data Reliability

P- and S_H-wave velocity measurement using the Suspension Method gives average velocities over a 3.3-foot interval of depth. This high resolution results in the scatter of values shown in the graphs. Individual measurements are very reliable with estimated precision of +/- 5%. Standardized field procedures and quality assurance checks contribute to the reliability of these data.

Quality Assurance

These borehole geophysical measurements were performed using industry-standard or better methods for measurements and analyses. All work was performed under **GEO***Vision* quality assurance procedures, which include:

- Use of NIST-traceable calibrations, where applicable, for field and laboratory instrumentation
- Use of standard field data logs
- Independent review of calculations and results by a registered professional engineer, geologist, or geophysicist.

Table 1. Boring locations and logging dates

BORING DESIGNATION	DATES LOGGED	LOCATION[1]		ELEVATION (FEET)
		NORTHING	EASTING	
SB-1	7/18/2016	209678.36	2164427.494	6.4

(1) Coordinates provided by F&ME

Table 2. Logging dates and depth ranges

BORING NUMBER	TOOL AND RUN NUMBER	DEPTH RANGE (FEET)*	CASED OR UNCASED	SAMPLE INTERVAL (FEET)	DATE LOGGED
SB-1	SUSPENSION DOWN01	78.85 – 501.75	UNCASED	1.6	7/18/2016
SB-1	ELOG UP01	515.19 – 77.29	UNCASED	0.05	7/18/2016
SB-1	CALIPER UP01	474.69 – 46.69	UNCASED	0.05	7/18/2016

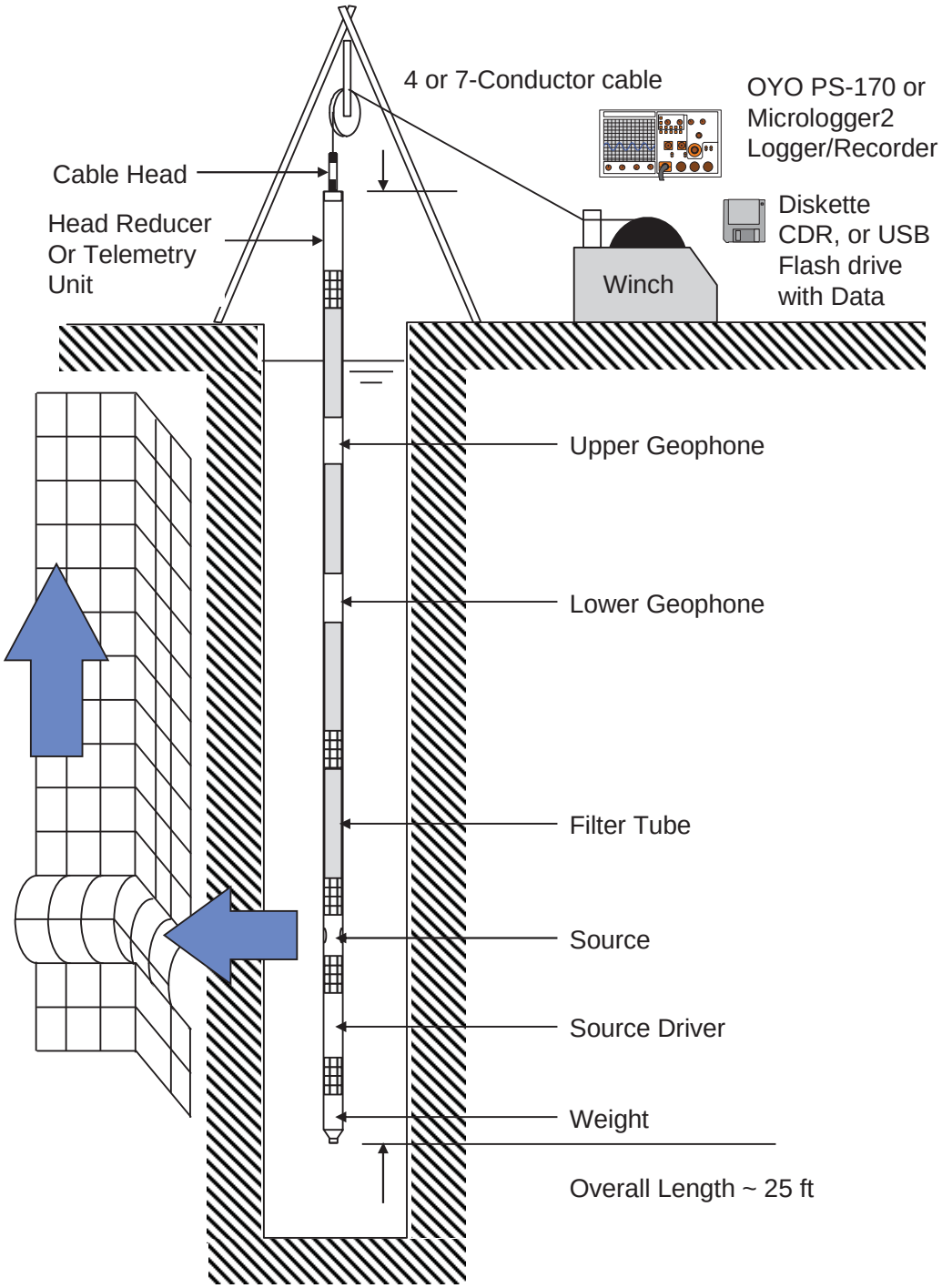


Figure 1: Concept illustration of P-S logging system

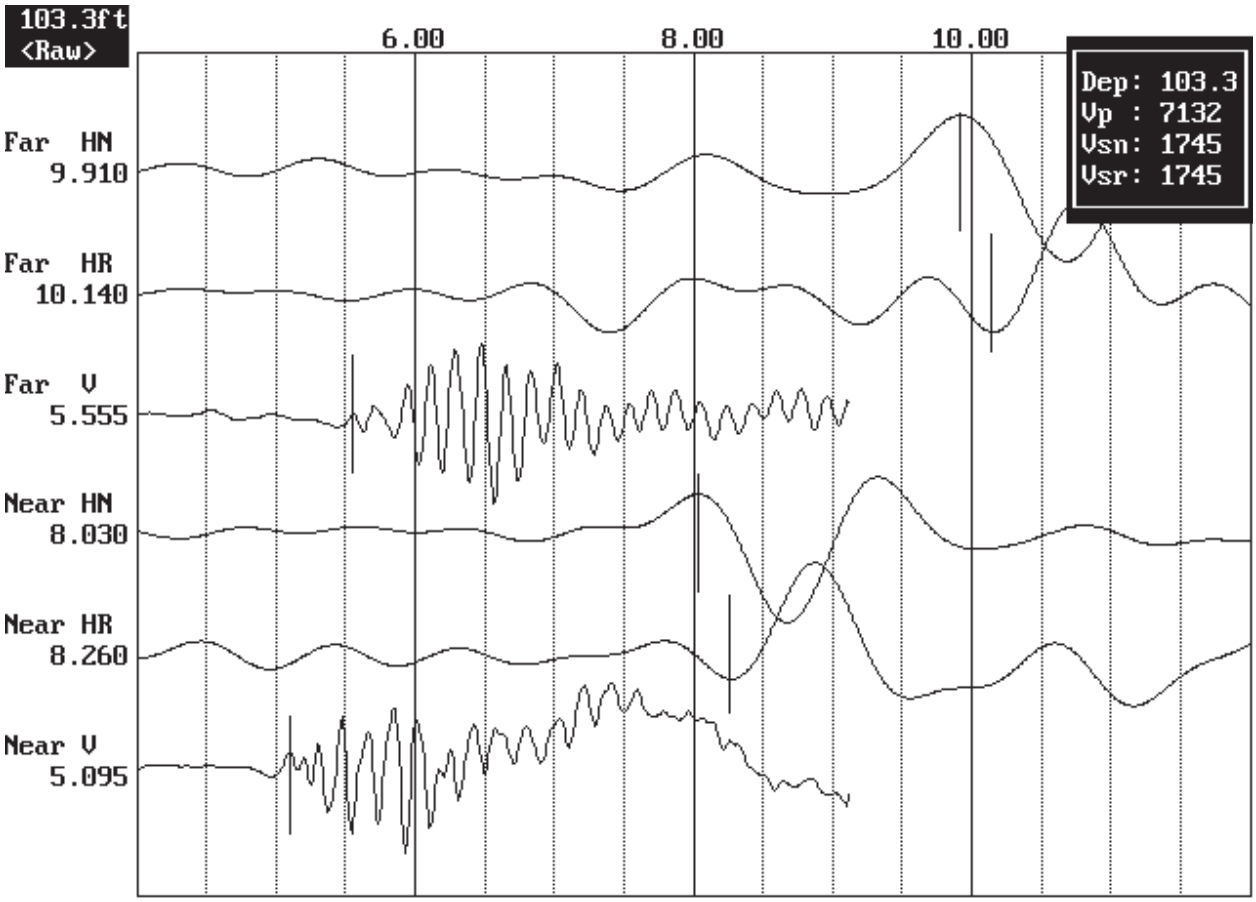


Figure 2: Example of filtered (1400 Hz lowpass) suspension record

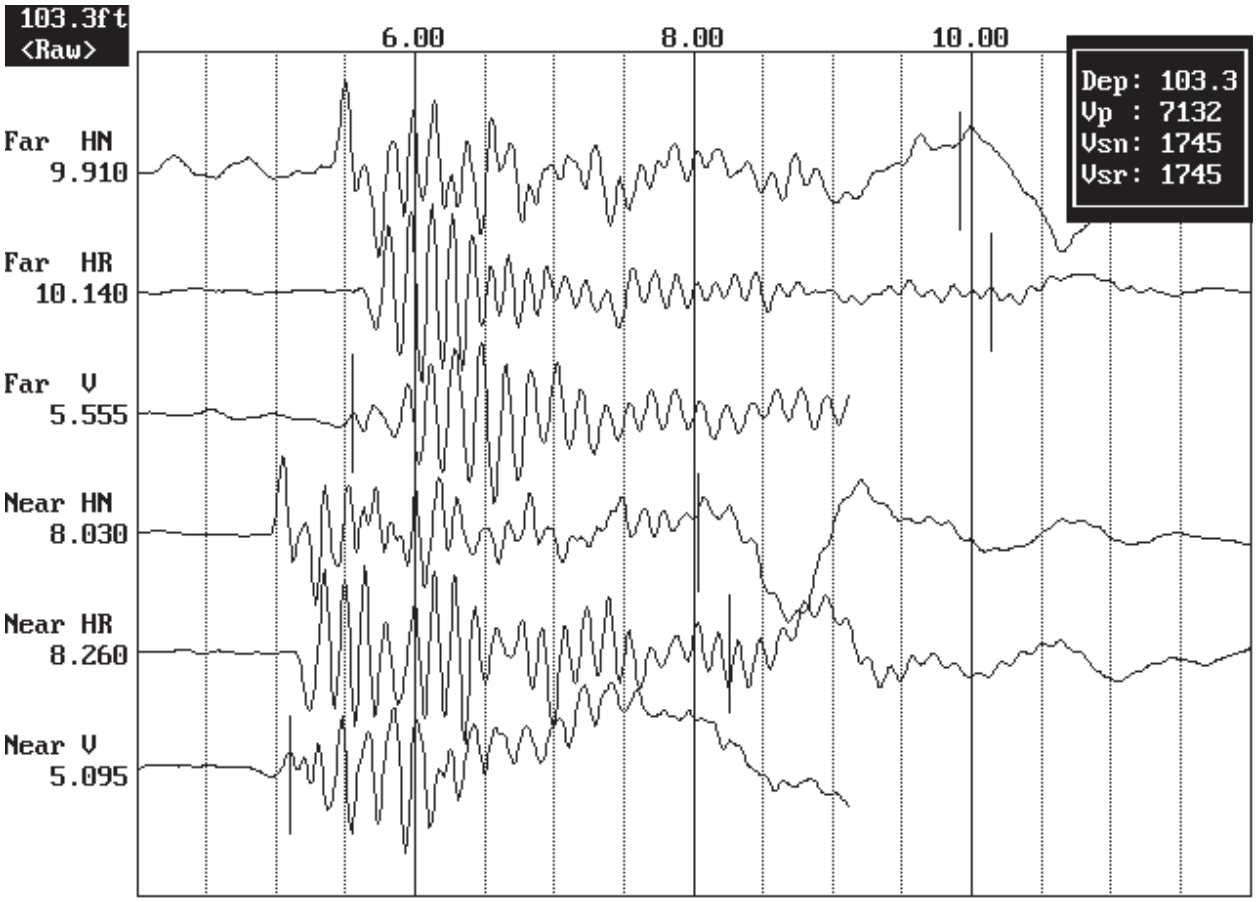


Figure 3. Example of unfiltered suspension record

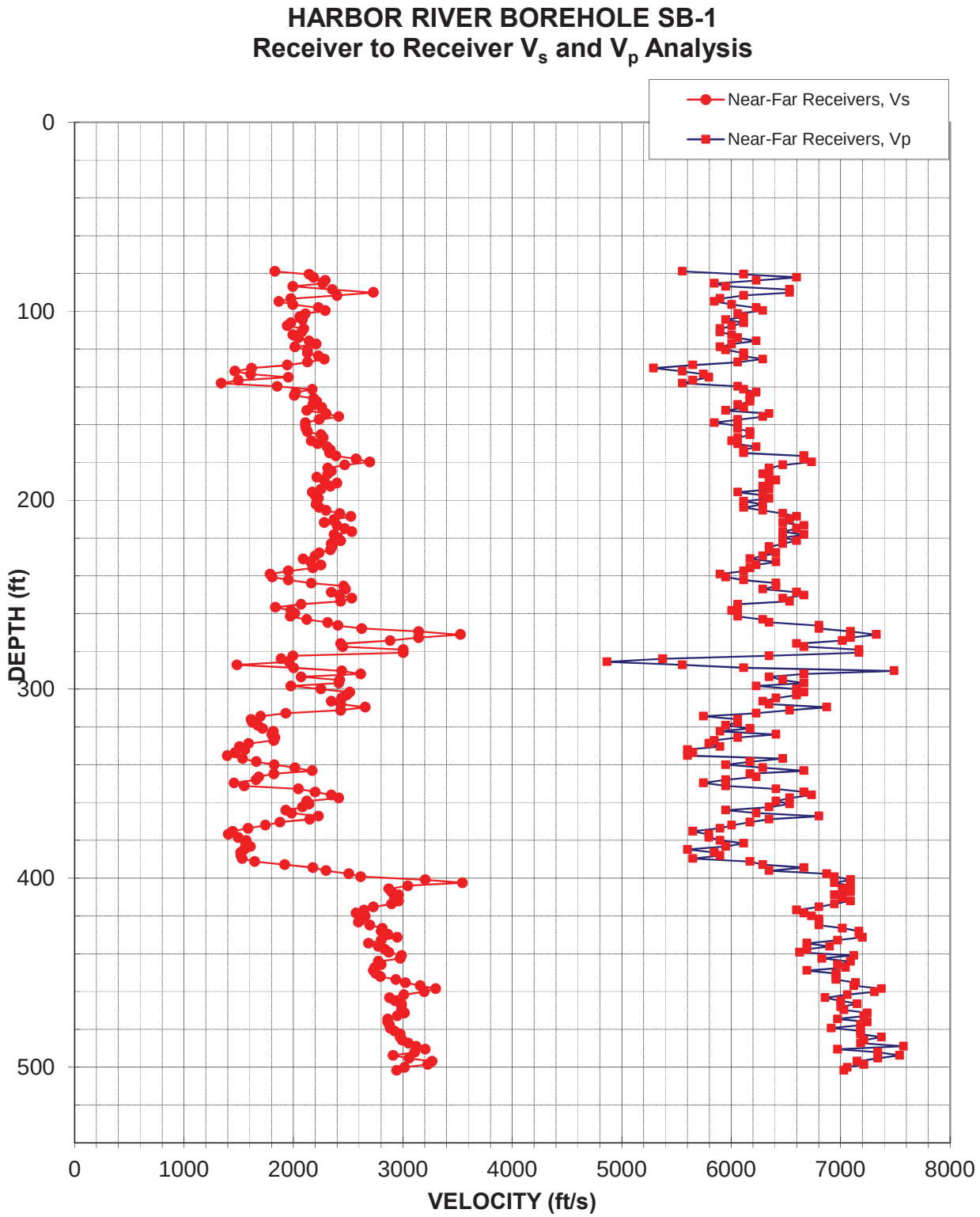


Figure 4: Boring SB-1, Suspension R1-R2 P- and S_H-wave velocities

Table 3. Boring SB-1, Suspension R1-R2 depths and P- and S_H-wave velocities

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio Based on Receiver-to-Receiver Travel Time Data - Borehole SB-1

American Units				Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio	Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
78.9	1830	5560	0.44	24.0	560	1690	0.44
80.5	2140	6120	0.43	24.5	650	1860	0.43
82.1	2190	6600	0.44	25.0	670	2010	0.44
83.7	2290	6230	0.42	25.5	700	1900	0.42
85.3	2270	5850	0.41	26.0	690	1780	0.41
86.9	2000	5950	0.44	26.5	610	1810	0.44
88.5	2360	6540	0.43	27.0	720	1990	0.43
90.1	2730	6540	0.39	27.5	830	1990	0.39
91.7	2400	6120	0.41	27.9	730	1860	0.41
93.3	1980	5900	0.44	28.4	600	1800	0.44
94.9	1870	5850	0.44	28.9	570	1780	0.44
96.5	2000	6010	0.44	29.4	610	1830	0.44
98.1	2230	6230	0.43	29.9	680	1900	0.43
99.7	2290	6290	0.42	30.4	700	1920	0.42
101.3	2110	6060	0.43	30.9	640	1850	0.43
102.9	2060	6120	0.44	31.4	630	1860	0.44
104.5	2080	5950	0.43	31.8	640	1810	0.43
106.1	1980	6120	0.44	32.3	600	1860	0.44
107.7	1940	6010	0.44	32.8	590	1830	0.44
109.3	2100	5900	0.43	33.3	640	1800	0.43
110.9	2080	5900	0.43	33.8	630	1800	0.43
112.5	2000	6010	0.44	34.3	610	1830	0.44
114.1	2040	6060	0.44	34.8	620	1850	0.44
115.7	2140	6230	0.43	35.3	650	1900	0.43
117.3	2210	6010	0.42	35.8	670	1830	0.42
118.9	2010	5900	0.43	36.2	610	1800	0.43
120.5	2130	5950	0.43	36.7	650	1810	0.43
122.1	2130	6120	0.43	37.2	650	1860	0.43
123.7	2230	6120	0.42	37.7	680	1860	0.42
125.3	2280	6290	0.42	38.2	700	1920	0.42
126.9	2130	6060	0.43	38.7	650	1850	0.43
128.5	1940	5650	0.43	39.2	590	1720	0.43
130.1	1620	5290	0.45	39.7	490	1610	0.45
131.7	1470	5560	0.46	40.1	450	1690	0.46
133.3	1610	5750	0.46	40.6	490	1750	0.46
134.9	1960	5800	0.44	41.1	600	1770	0.44
136.5	1500	5650	0.46	41.6	460	1720	0.46

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole SB-1

American Units				Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio	Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
138.1	1340	5560	0.47	42.1	410	1690	0.47
139.7	1850	6060	0.45	42.6	560	1850	0.45
141.3	2170	6120	0.43	43.1	660	1860	0.43
142.9	2020	6230	0.44	43.6	620	1900	0.44
144.5	2010	6170	0.44	44.1	610	1880	0.44
146.1	2190	6170	0.43	44.5	670	1880	0.43
147.7	2210	6170	0.43	45.0	680	1880	0.43
149.3	2180	6060	0.43	45.5	660	1850	0.43
150.9	2260	6120	0.42	46.0	690	1860	0.42
152.5	2120	5950	0.43	46.5	650	1810	0.43
154.1	2300	6350	0.42	47.0	700	1940	0.42
155.7	2420	6290	0.41	47.5	740	1920	0.41
157.3	2240	6060	0.42	48.0	680	1850	0.42
158.9	2110	5850	0.43	48.4	640	1780	0.43
160.5	2110	6060	0.43	48.9	640	1850	0.43
162.1	2120	6060	0.43	49.4	650	1850	0.43
163.8	2130	6170	0.43	49.9	650	1880	0.43
165.4	2250	6170	0.42	50.4	690	1880	0.42
167.0	2280	6060	0.42	50.9	690	1850	0.42
168.6	2160	6010	0.43	51.4	660	1830	0.43
170.2	2220	6060	0.42	51.9	680	1850	0.42
171.8	2310	6230	0.42	52.4	700	1900	0.42
173.4	2340	6120	0.41	52.8	710	1860	0.41
175.0	2330	6120	0.42	53.3	710	1860	0.42
176.6	2390	6670	0.43	53.8	730	2030	0.43
178.2	2570	6670	0.41	54.3	780	2030	0.41
179.8	2700	6730	0.40	54.8	820	2050	0.40
181.4	2470	6470	0.41	55.3	750	1970	0.41
183.0	2310	6350	0.42	55.8	710	1940	0.42
184.6	2350	6350	0.42	56.3	720	1940	0.42
186.2	2310	6290	0.42	56.7	710	1920	0.42
187.8	2210	6350	0.43	57.2	680	1940	0.43
189.4	2280	6410	0.43	57.7	700	1950	0.43
191.0	2400	6350	0.42	58.2	730	1940	0.42
192.6	2340	6290	0.42	58.7	710	1920	0.42
194.2	2250	6350	0.43	59.2	690	1940	0.43
195.8	2170	6060	0.43	59.7	660	1850	0.43
197.4	2200	6290	0.43	60.2	670	1920	0.43
199.0	2230	6350	0.43	60.7	680	1940	0.43
200.6	2210	6120	0.42	61.1	680	1860	0.42

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole SB-1

American Units				Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio	Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
202.2	2210	6290	0.43	61.6	670	1920	0.43
203.8	2240	6120	0.42	62.1	680	1860	0.42
205.4	2300	6290	0.42	62.6	700	1920	0.42
207.0	2420	6470	0.42	63.1	740	1970	0.42
208.6	2530	6600	0.41	63.6	770	2010	0.41
210.2	2370	6540	0.42	64.1	720	1990	0.42
211.8	2280	6470	0.43	64.6	700	1970	0.43
213.4	2400	6670	0.43	65.0	730	2030	0.43
215.0	2470	6600	0.42	65.5	750	2010	0.42
216.6	2530	6470	0.41	66.0	770	1970	0.41
218.2	2370	6670	0.43	66.5	720	2030	0.43
219.8	2410	6470	0.42	67.0	730	1970	0.42
221.4	2430	6600	0.42	67.5	740	2010	0.42
223.0	2350	6470	0.42	68.0	720	1970	0.42
224.6	2360	6350	0.42	68.5	720	1940	0.42
226.2	2340	6350	0.42	69.0	710	1940	0.42
227.8	2240	6410	0.43	69.4	680	1950	0.43
229.4	2200	6290	0.43	69.9	670	1920	0.43
231.0	2090	6170	0.44	70.4	640	1880	0.44
232.6	2160	6410	0.44	70.9	660	1950	0.44
234.2	2250	6230	0.42	71.4	690	1900	0.42
235.8	2180	6170	0.43	71.9	660	1880	0.43
237.4	1960	6120	0.44	72.4	600	1860	0.44
239.0	1790	5900	0.45	72.9	540	1800	0.45
240.6	1810	5950	0.45	73.3	550	1810	0.45
242.2	1960	6120	0.44	73.8	600	1860	0.44
243.8	2160	6410	0.44	74.3	660	1950	0.44
245.4	2460	6410	0.41	74.8	750	1950	0.41
247.0	2480	6290	0.41	75.3	760	1920	0.41
248.7	2350	6600	0.43	75.8	720	2010	0.43
250.3	2420	6670	0.42	76.3	740	2030	0.42
251.9	2530	6470	0.41	76.8	770	1970	0.41
253.5	2430	6540	0.42	77.3	740	1990	0.42
255.1	2070	6060	0.43	77.7	630	1850	0.43
256.7	1840	6060	0.45	78.2	560	1850	0.45
258.3	1980	6010	0.44	78.7	600	1830	0.44
259.9	2010	6060	0.44	79.2	610	1850	0.44
261.5	1970	6060	0.44	79.7	600	1850	0.44
263.1	2120	6290	0.44	80.2	650	1920	0.44
264.7	2310	6350	0.42	80.7	710	1940	0.42

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole SB-1

American Units				Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio	Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
266.3	2410	6800	0.43	81.2	730	2070	0.43
267.9	2620	6800	0.41	81.6	800	2070	0.41
269.5	3140	7090	0.38	82.1	960	2160	0.38
271.1	3530	7330	0.35	82.6	1080	2230	0.35
272.7	3140	7090	0.38	83.1	960	2160	0.38
274.3	2890	7020	0.40	83.6	880	2140	0.40
275.9	2430	6600	0.42	84.1	740	2010	0.42
277.5	2450	6670	0.42	84.6	750	2030	0.42
279.1	3000	7170	0.39	85.1	920	2180	0.39
280.7	3000	7170	0.39	85.6	920	2180	0.39
282.3	2000	6350	0.45	86.0	610	1940	0.45
283.9	1890	5380	0.43	86.5	580	1640	0.43
285.5	1960	4870	0.40	87.0	600	1480	0.40
287.1	1480	5560	0.46	87.5	450	1690	0.46
288.7	2000	6120	0.44	88.0	610	1860	0.44
290.3	2440	7490	0.44	88.5	740	2280	0.44
291.9	2610	6670	0.41	89.0	800	2030	0.41
293.5	2070	6350	0.44	89.5	630	1940	0.44
295.1	2420	6470	0.42	89.9	740	1970	0.42
296.7	2420	6670	0.42	90.4	740	2030	0.42
298.3	1980	6230	0.44	90.9	600	1900	0.44
299.9	2250	6600	0.43	91.4	690	2010	0.43
301.5	2520	6670	0.42	91.9	770	2030	0.42
303.1	2490	6600	0.42	92.4	760	2010	0.42
304.7	2440	6410	0.42	92.9	740	1950	0.42
306.3	2350	6290	0.42	93.4	720	1920	0.42
307.9	2430	6350	0.41	93.9	740	1940	0.41
309.5	2660	6870	0.41	94.3	810	2090	0.41
311.1	2430	6540	0.42	94.8	740	1990	0.42
312.7	1930	6230	0.45	95.3	590	1900	0.45
314.3	1700	5750	0.45	95.8	520	1750	0.45
315.9	1610	6060	0.46	96.3	490	1850	0.46
317.5	1630	6060	0.46	96.8	500	1850	0.46
319.1	1680	5950	0.46	97.3	510	1810	0.46
320.7	1720	6170	0.46	97.8	520	1880	0.46
322.3	1820	5900	0.45	98.2	550	1800	0.45
323.9	1800	6410	0.46	98.7	550	1950	0.46
325.5	1830	6060	0.45	99.2	560	1850	0.45
327.1	1820	5850	0.45	99.7	560	1780	0.45
328.7	1590	5800	0.46	100.2	480	1770	0.46

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole SB-1

American Units				Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio	Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
330.3	1510	5900	0.47	100.7	460	1800	0.47
331.9	1560	5600	0.46	101.2	470	1710	0.46
333.6	1470	5650	0.46	101.7	450	1720	0.46
335.2	1390	5600	0.47	102.2	430	1710	0.47
336.8	1540	6470	0.47	102.6	470	1970	0.47
338.4	1660	6170	0.46	103.1	510	1880	0.46
340.0	1830	5950	0.45	103.6	560	1810	0.45
341.6	2010	6290	0.44	104.1	610	1920	0.44
343.2	2170	6670	0.44	104.6	660	2030	0.44
344.8	1820	6170	0.45	105.1	560	1880	0.45
346.4	1680	6230	0.46	105.6	510	1900	0.46
348.0	1660	5950	0.46	106.1	510	1810	0.46
349.6	1460	5750	0.47	106.5	440	1750	0.47
351.2	1550	5950	0.46	107.0	470	1810	0.46
352.8	2040	6410	0.44	107.5	620	1950	0.44
354.4	2200	6670	0.44	108.0	670	2030	0.44
356.0	2350	6730	0.43	108.5	720	2050	0.43
357.6	2420	6540	0.42	109.0	740	1990	0.42
359.2	2120	6410	0.44	109.5	650	1950	0.44
360.8	2140	6540	0.44	110.0	650	1990	0.44
362.4	2080	6350	0.44	110.5	640	1940	0.44
364.0	1930	5950	0.44	110.9	590	1810	0.44
365.6	1980	6230	0.44	111.4	600	1900	0.44
367.2	2230	6800	0.44	111.9	680	2070	0.44
368.8	2150	6350	0.44	112.4	660	1940	0.44
370.4	1880	6170	0.45	112.9	570	1880	0.45
372.0	1750	6010	0.45	113.4	530	1830	0.45
373.6	1590	5900	0.46	113.9	480	1800	0.46
375.2	1450	5650	0.46	114.4	440	1720	0.46
376.8	1410	5800	0.47	114.8	430	1770	0.47
378.4	1490	5800	0.46	115.3	460	1770	0.46
380.0	1570	5900	0.46	115.8	480	1800	0.46
381.6	1560	6120	0.47	116.3	480	1860	0.47
383.2	1610	5950	0.46	116.8	490	1810	0.46
384.8	1550	5600	0.46	117.3	470	1710	0.46
386.4	1520	5850	0.46	117.8	460	1780	0.46
388.0	1520	5900	0.46	118.3	460	1800	0.46
389.6	1530	5650	0.46	118.8	470	1720	0.46
391.2	1650	6170	0.46	119.2	500	1880	0.46
392.8	1920	6290	0.45	119.7	590	1920	0.45

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole SB-1

American Units				Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio	Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
394.4	2180	6670	0.44	120.2	660	2030	0.44
396.0	2300	6350	0.42	120.7	700	1940	0.42
397.6	2510	6870	0.42	121.2	760	2090	0.42
399.2	2610	6940	0.42	121.7	800	2120	0.42
400.8	3210	7090	0.37	122.2	980	2160	0.37
402.4	3550	6940	0.32	122.7	1080	2120	0.32
404.0	3040	7090	0.39	123.1	930	2160	0.39
405.6	2870	7020	0.40	123.6	880	2140	0.40
407.2	2900	7090	0.40	124.1	880	2160	0.40
408.8	2960	6940	0.39	124.6	900	2120	0.39
410.4	2920	7020	0.39	125.1	890	2140	0.39
412.0	2960	7090	0.39	125.6	900	2160	0.39
413.6	2900	6940	0.39	126.1	880	2120	0.39
415.2	2730	6800	0.40	126.6	830	2070	0.40
416.8	2650	6600	0.40	127.1	810	2010	0.40
418.5	2570	6670	0.41	127.5	780	2030	0.41
420.1	2660	6730	0.41	128.0	810	2050	0.41
421.7	2610	6800	0.41	128.5	800	2070	0.41
423.3	2590	6800	0.41	129.0	790	2070	0.41
424.9	2700	6800	0.41	129.5	820	2070	0.41
426.5	2810	7020	0.40	130.0	860	2140	0.40
428.1	2800	7170	0.41	130.5	850	2180	0.41
429.7	2860	7170	0.41	131.0	870	2180	0.41
431.3	2950	7200	0.40	131.5	900	2190	0.40
432.9	2800	6970	0.40	131.9	850	2130	0.40
434.5	2690	6690	0.40	132.4	820	2040	0.40
436.1	2780	6900	0.40	132.9	850	2100	0.40
437.7	2840	6690	0.39	133.4	860	2040	0.39
439.3	2870	6630	0.38	133.9	880	2020	0.38
440.9	2990	7120	0.39	134.4	910	2170	0.39
442.5	2980	6830	0.38	134.9	910	2080	0.38
444.1	2780	7090	0.41	135.4	850	2160	0.41
445.7	2800	6970	0.40	135.8	850	2130	0.40
447.3	2740	7050	0.41	136.3	840	2150	0.41
448.9	2730	6690	0.40	136.8	830	2040	0.40
450.5	2750	6960	0.41	137.3	840	2120	0.41
452.1	2800	6960	0.40	137.8	850	2120	0.40
453.7	2940	6960	0.39	138.3	900	2120	0.39
455.3	3020	7140	0.39	138.8	920	2180	0.39
456.9	3160	7120	0.38	139.3	960	2170	0.38

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio Based on Receiver-to-Receiver Travel Time Data - Borehole SB-1

American Units				Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio	Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
458.5	3300	7370	0.37	139.8	1010	2250	0.37
460.1	3200	7310	0.38	140.2	970	2230	0.38
461.7	3010	7060	0.39	140.7	920	2150	0.39
463.3	2880	6860	0.39	141.2	880	2090	0.39
464.9	2930	7000	0.39	141.7	890	2130	0.39
466.5	2990	7150	0.39	142.2	910	2180	0.39
468.1	2990	7000	0.39	142.7	910	2130	0.39
469.7	2990	7030	0.39	143.2	910	2140	0.39
471.3	3020	7250	0.40	143.7	920	2210	0.40
472.9	2950	7220	0.40	144.1	900	2200	0.40
474.5	2860	6970	0.40	144.6	870	2130	0.40
476.1	2860	7250	0.41	145.1	870	2210	0.41
477.7	2880	7180	0.40	145.6	880	2190	0.40
479.3	2890	6920	0.39	146.1	880	2110	0.39
480.9	2920	7180	0.40	146.6	890	2190	0.40
482.5	2980	7180	0.40	147.1	910	2190	0.40
484.1	2980	7370	0.40	147.6	910	2250	0.40
485.7	3000	7220	0.40	148.1	910	2200	0.40
487.3	3050	7180	0.39	148.5	930	2190	0.39
488.9	3120	7580	0.40	149.0	950	2310	0.40
490.5	3210	6970	0.37	149.5	980	2130	0.37
492.1	3110	7340	0.39	150.0	950	2240	0.39
493.7	2910	7540	0.41	150.5	890	2300	0.41
495.3	3060	7340	0.40	151.0	930	2240	0.40
496.9	3270	7150	0.37	151.5	1000	2180	0.37
498.5	3230	7220	0.37	152.0	980	2200	0.37
500.1	3020	7060	0.39	152.4	920	2150	0.39
501.8	2940	7030	0.39	152.9	900	2140	0.39

APPENDIX A

SUSPENSION VELOCITY MEASUREMENT QUALITY ASSURANCE SUSPENSION SOURCE TO RECEIVER ANALYSIS RESULTS

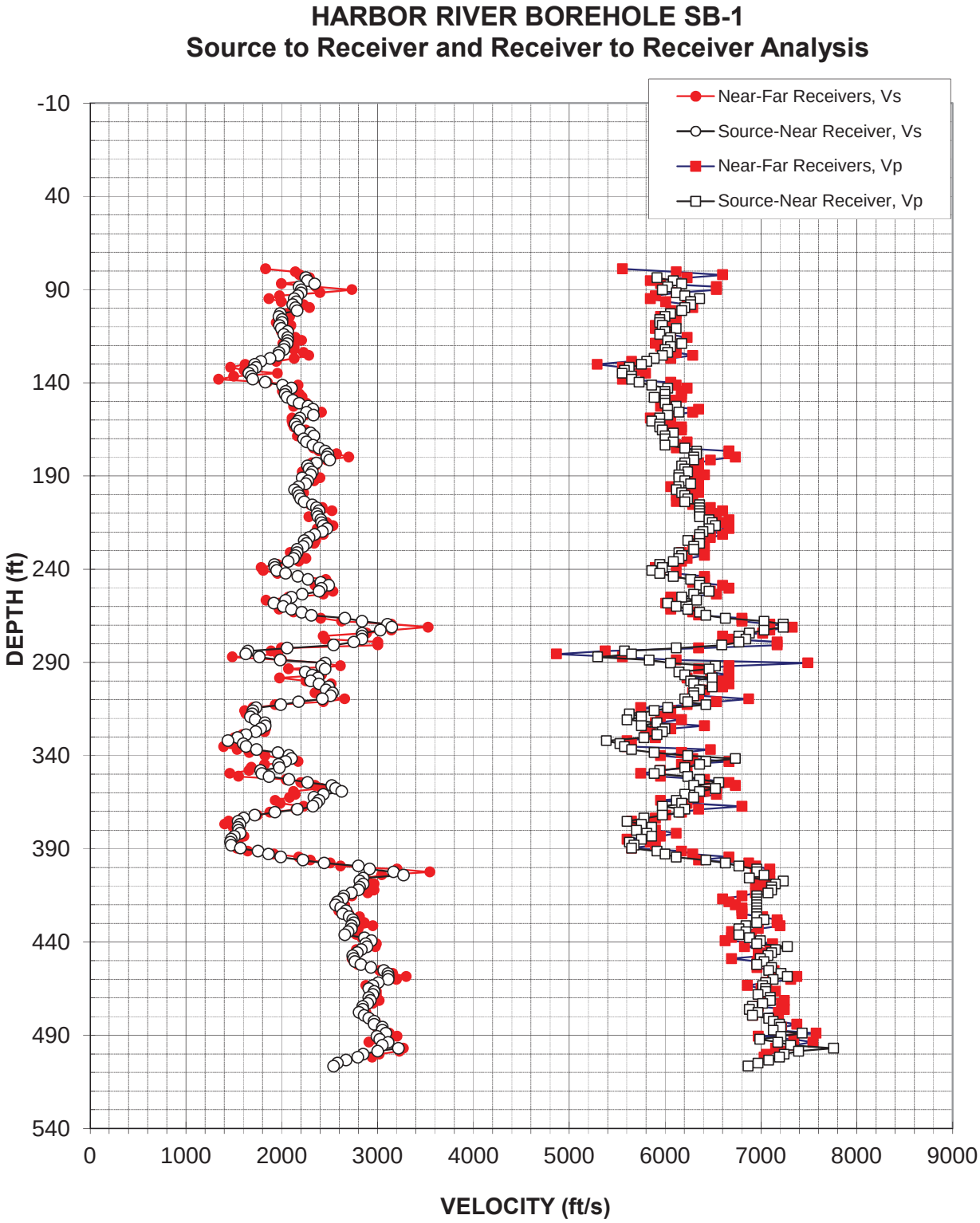


Figure A-1: Boring SB-1, Suspension S-R1 P- and S_H-wave velocities

Table A-1. Boring SB-1, S - R1 quality assurance analysis P- and S_H-wave data

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio Based on Source-to-Receiver Travel Time Data - Borehole SB-1

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
83.7	2250	5920	0.42	25.5	690	1800	0.42
85.3	2270	6090	0.42	26.0	690	1860	0.42
86.9	2340	6180	0.42	26.5	710	1880	0.42
88.5	2180	6030	0.42	27.0	670	1840	0.42
90.1	2210	5970	0.42	27.5	670	1820	0.42
91.7	2200	6120	0.43	27.9	670	1860	0.43
93.3	2170	6210	0.43	28.4	660	1890	0.43
94.9	2130	6360	0.44	28.9	650	1940	0.44
96.5	2150	6270	0.43	29.4	660	1910	0.43
98.1	2120	6270	0.44	29.9	650	1910	0.44
99.7	2150	6210	0.43	30.4	650	1890	0.43
101.3	2160	6180	0.43	30.9	660	1880	0.43
102.9	1980	6060	0.44	31.4	600	1850	0.44
104.5	1970	6000	0.44	31.9	600	1830	0.44
106.1	2000	5940	0.44	32.3	610	1810	0.44
107.7	2000	5940	0.44	32.8	610	1810	0.44
109.3	1980	5970	0.44	33.3	600	1820	0.44
110.9	2000	6120	0.44	33.8	610	1860	0.44
112.5	2060	6000	0.43	34.3	630	1830	0.43
114.1	2020	5940	0.43	34.8	620	1810	0.43
115.7	2060	6060	0.43	35.3	630	1850	0.43
117.3	2060	6030	0.43	35.8	630	1840	0.43
118.9	2060	6180	0.44	36.2	630	1880	0.44
120.5	2030	6060	0.44	36.7	620	1850	0.44
122.1	2020	6000	0.44	37.2	620	1830	0.44
123.7	1970	6030	0.44	37.7	600	1840	0.44
125.3	1970	5970	0.44	38.2	600	1820	0.44
126.9	1880	5890	0.44	38.7	570	1790	0.44
128.5	1780	5810	0.45	39.2	540	1770	0.45
130.1	1720	5750	0.45	39.7	520	1750	0.45
131.7	1730	5630	0.45	40.2	530	1720	0.45
133.3	1690	5580	0.45	40.6	520	1700	0.45
134.9	1660	5550	0.45	41.1	510	1690	0.45
136.5	1680	5650	0.45	41.6	510	1720	0.45
138.1	1700	5650	0.45	42.1	520	1720	0.45
139.7	1830	5730	0.44	42.6	560	1750	0.44
141.3	2010	5860	0.43	43.1	610	1790	0.43
143.0	2100	6030	0.43	43.6	640	1840	0.43
144.6	2050	6000	0.43	44.1	620	1830	0.43

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole SB-1

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
146.2	2040	6000	0.43	44.5	620	1830	0.43
147.8	2060	5890	0.43	45.0	630	1790	0.43
149.4	2120	6000	0.43	45.5	650	1830	0.43
151.0	2180	6000	0.42	46.0	670	1830	0.42
152.6	2280	6120	0.42	46.5	690	1860	0.42
154.2	2330	6030	0.41	47.0	710	1840	0.41
155.8	2260	6150	0.42	47.5	690	1870	0.42
157.4	2330	6030	0.41	48.0	710	1840	0.41
159.0	2190	5940	0.42	48.5	670	1810	0.42
160.6	2170	5860	0.42	48.9	660	1790	0.42
162.2	2140	5940	0.43	49.4	650	1810	0.43
163.8	2160	5940	0.42	49.9	660	1810	0.42
165.4	2190	5970	0.42	50.4	670	1820	0.42
167.0	2300	6090	0.42	50.9	700	1860	0.42
168.6	2340	6000	0.41	51.4	710	1830	0.41
170.2	2230	6000	0.42	51.9	680	1830	0.42
171.8	2260	6090	0.42	52.4	690	1860	0.42
173.4	2330	6000	0.41	52.8	710	1830	0.41
175.0	2390	6210	0.41	53.3	730	1890	0.41
176.6	2450	6330	0.41	53.8	750	1930	0.41
178.2	2480	6330	0.41	54.3	760	1930	0.41
179.8	2470	6300	0.41	54.8	750	1920	0.41
181.4	2500	6300	0.41	55.3	760	1920	0.41
183.0	2360	6210	0.42	55.8	720	1890	0.42
184.6	2270	6180	0.42	56.3	690	1880	0.42
186.2	2290	6210	0.42	56.8	700	1890	0.42
187.8	2320	6240	0.42	57.2	710	1900	0.42
189.4	2300	6150	0.42	57.7	700	1870	0.42
191.0	2210	6150	0.43	58.2	670	1870	0.43
192.6	2270	6210	0.42	58.7	690	1890	0.42
194.2	2250	6270	0.43	59.2	690	1910	0.43
195.8	2180	6150	0.43	59.7	660	1870	0.43
197.4	2130	6120	0.43	60.2	650	1860	0.43
199.0	2170	6180	0.43	60.7	660	1880	0.43
200.6	2180	6210	0.43	61.1	670	1890	0.43
202.2	2200	6240	0.43	61.6	670	1900	0.43
203.8	2240	6210	0.43	62.1	680	1890	0.43
205.4	2320	6360	0.42	62.6	710	1940	0.42
207.0	2360	6360	0.42	63.1	720	1940	0.42
208.6	2390	6360	0.42	63.6	730	1940	0.42

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole SB-1

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
210.2	2370	6360	0.42	64.1	720	1940	0.42
211.8	2380	6360	0.42	64.6	730	1940	0.42
213.4	2410	6460	0.42	65.1	730	1970	0.42
215.0	2420	6490	0.42	65.5	740	1980	0.42
216.6	2430	6530	0.42	66.0	740	1990	0.42
218.2	2470	6460	0.41	66.5	750	1970	0.41
219.8	2430	6390	0.42	67.0	740	1950	0.42
221.4	2340	6360	0.42	67.5	710	1940	0.42
223.0	2290	6360	0.43	68.0	700	1940	0.43
224.6	2240	6240	0.43	68.5	680	1900	0.43
226.3	2260	6360	0.43	69.0	690	1940	0.43
227.9	2220	6300	0.43	69.4	680	1920	0.43
229.5	2160	6300	0.43	69.9	660	1920	0.43
231.1	2160	6150	0.43	70.4	660	1870	0.43
232.7	2140	6180	0.43	70.9	650	1880	0.43
234.3	2120	6150	0.43	71.4	650	1870	0.43
235.9	2070	6090	0.43	71.9	630	1860	0.43
237.5	1920	5940	0.44	72.4	590	1810	0.44
239.1	1930	5970	0.44	72.9	590	1820	0.44
240.7	1950	5860	0.44	73.4	590	1790	0.44
242.3	2040	5940	0.43	73.8	620	1810	0.43
243.9	2170	6090	0.43	74.3	660	1860	0.43
245.5	2270	6270	0.42	74.8	690	1910	0.42
247.1	2410	6360	0.42	75.3	730	1940	0.42
248.7	2490	6360	0.41	75.8	760	1940	0.41
250.3	2420	6430	0.42	76.3	740	1960	0.42
251.9	2390	6460	0.42	76.8	730	1970	0.42
253.5	2210	6300	0.43	77.3	670	1920	0.43
255.1	2100	6180	0.43	77.7	640	1880	0.43
256.7	2040	6330	0.44	78.2	620	1930	0.44
258.3	1920	6030	0.44	78.7	580	1840	0.44
259.9	2020	6120	0.44	79.2	610	1860	0.44
261.5	2100	6240	0.44	79.7	640	1900	0.44
263.1	2210	6360	0.43	80.2	670	1940	0.43
264.7	2310	6430	0.43	80.7	700	1960	0.43
266.3	2660	6630	0.40	81.2	810	2020	0.40
267.9	2840	7030	0.40	81.7	870	2140	0.40
269.5	3100	7230	0.39	82.1	950	2210	0.39
271.1	3150	7230	0.38	82.6	960	2210	0.38
272.7	3030	7030	0.39	83.1	920	2140	0.39

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole SB-1

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
274.3	2840	6880	0.40	83.6	870	2100	0.40
275.9	2840	6770	0.39	84.1	870	2060	0.39
277.5	2840	6840	0.40	84.6	870	2090	0.40
279.1	2750	6770	0.40	85.1	840	2060	0.40
280.7	2540	6590	0.41	85.6	770	2010	0.41
282.3	2060	6120	0.44	86.1	630	1860	0.44
283.9	1650	5580	0.45	86.5	500	1700	0.45
285.5	1630	5650	0.45	87.0	500	1720	0.45
287.1	1770	5300	0.44	87.5	540	1610	0.44
288.7	1980	5830	0.43	88.0	600	1780	0.43
290.3	2450	6060	0.40	88.5	750	1850	0.40
291.9	2420	6530	0.42	89.0	740	1990	0.42
293.5	2450	6460	0.42	89.5	750	1970	0.42
295.1	2240	6150	0.42	90.0	680	1870	0.42
296.7	2320	6210	0.42	90.4	710	1890	0.42
298.3	2380	6490	0.42	90.9	730	1980	0.42
299.9	2300	6270	0.42	91.4	700	1910	0.42
301.5	2390	6300	0.42	91.9	730	1920	0.42
303.1	2490	6490	0.41	92.4	760	1980	0.41
304.7	2460	6360	0.41	92.9	750	1940	0.41
306.3	2530	6300	0.40	93.4	770	1920	0.40
307.9	2510	6300	0.41	93.9	770	1920	0.41
309.5	2430	6210	0.41	94.4	740	1890	0.41
311.2	2180	6240	0.43	94.8	660	1900	0.43
312.8	1990	6430	0.45	95.3	610	1960	0.45
314.4	1730	6030	0.45	95.8	530	1840	0.45
316.0	1700	5890	0.45	96.3	520	1790	0.45
317.6	1690	5630	0.45	96.8	520	1720	0.45
319.2	1670	5750	0.45	97.3	510	1750	0.45
320.8	1720	5600	0.45	97.8	530	1710	0.45
322.4	1820	5920	0.45	98.3	560	1800	0.45
324.0	1830	5750	0.44	98.7	560	1750	0.44
325.6	1780	6000	0.45	99.2	540	1830	0.45
327.2	1730	5970	0.45	99.7	530	1820	0.45
328.8	1630	5920	0.46	100.2	500	1800	0.46
330.4	1540	5780	0.46	100.7	470	1760	0.46
332.0	1440	5390	0.46	101.2	440	1640	0.46
333.6	1600	5530	0.45	101.7	490	1690	0.45
335.2	1630	5580	0.45	102.2	500	1700	0.45
336.8	1740	5650	0.45	102.7	530	1720	0.45

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole SB-1

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
338.4	1960	5890	0.44	103.1	600	1790	0.44
340.0	2080	6240	0.44	103.6	630	1900	0.44
341.6	2100	6730	0.45	104.1	640	2050	0.45
343.2	2040	6430	0.44	104.6	620	1960	0.44
344.8	1970	6360	0.45	105.1	600	1940	0.45
346.4	1980	6210	0.44	105.6	600	1890	0.44
348.0	1780	5940	0.45	106.1	540	1810	0.45
349.6	1790	5890	0.45	106.6	550	1790	0.45
351.2	1870	6240	0.45	107.0	570	1900	0.45
352.8	2080	6360	0.44	107.5	630	1940	0.44
354.4	2270	6560	0.43	108.0	690	2000	0.43
356.0	2520	6300	0.40	108.5	770	1920	0.40
357.6	2560	6530	0.41	109.0	780	1990	0.41
359.2	2630	6360	0.40	109.5	800	1940	0.40
360.8	2430	6210	0.41	110.0	740	1890	0.41
362.4	2340	6300	0.42	110.5	710	1920	0.42
364.0	2390	6120	0.41	111.0	730	1860	0.41
365.6	2360	6180	0.41	111.4	720	1880	0.41
367.2	2330	5970	0.41	111.9	710	1820	0.41
368.8	2160	6210	0.43	112.4	660	1890	0.43
370.4	1930	6150	0.45	112.9	590	1870	0.45
372.0	1720	5970	0.45	113.4	520	1820	0.45
373.6	1600	5780	0.46	113.9	490	1760	0.46
375.2	1550	5600	0.46	114.4	470	1710	0.46
376.8	1560	5750	0.46	114.9	480	1750	0.46
378.4	1540	5860	0.46	115.3	470	1790	0.46
380.0	1550	5700	0.46	115.8	470	1740	0.46
381.6	1570	5810	0.46	116.3	480	1770	0.46
383.2	1510	5860	0.46	116.8	460	1790	0.46
384.8	1470	5750	0.46	117.3	450	1750	0.46
386.4	1470	5630	0.46	117.8	450	1720	0.46
388.0	1470	5680	0.46	118.3	450	1730	0.46
389.6	1570	5650	0.46	118.8	480	1720	0.46
391.2	1750	5920	0.45	119.3	530	1800	0.45
392.8	1860	6000	0.45	119.7	570	1830	0.45
394.4	1990	6120	0.44	120.2	610	1860	0.44
396.1	2220	6430	0.43	120.7	680	1960	0.43
397.7	2440	6630	0.42	121.2	740	2020	0.42
399.3	2800	6770	0.40	121.7	850	2060	0.40
400.9	2920	6960	0.39	122.2	890	2120	0.39

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole SB-1

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
402.5	3170	6960	0.37	122.7	960	2120	0.37
404.1	3270	7030	0.36	123.2	1000	2140	0.36
405.7	2850	6880	0.40	123.6	870	2100	0.40
407.3	2810	7230	0.41	124.1	860	2210	0.41
408.9	2850	7150	0.41	124.6	870	2180	0.41
410.5	2810	7110	0.41	125.1	860	2170	0.41
412.1	2800	7110	0.41	125.6	850	2170	0.41
413.7	2730	7070	0.41	126.1	830	2160	0.41
415.3	2650	6960	0.42	126.6	810	2120	0.42
416.9	2640	6960	0.42	127.1	800	2120	0.42
418.5	2580	6960	0.42	127.6	790	2120	0.42
420.1	2560	6960	0.42	128.0	780	2120	0.42
421.7	2620	6960	0.42	128.5	800	2120	0.42
423.3	2670	6960	0.41	129.0	810	2120	0.41
424.9	2640	6960	0.42	129.5	800	2120	0.42
426.5	2710	6960	0.41	130.0	820	2120	0.41
428.1	2740	7030	0.41	130.5	840	2140	0.41
429.7	2750	6960	0.41	131.0	840	2120	0.41
431.3	2730	6840	0.41	131.5	830	2090	0.41
432.9	2730	6770	0.40	131.9	830	2060	0.40
434.5	2690	6840	0.41	132.4	820	2090	0.41
436.1	2660	6770	0.41	132.9	810	2060	0.41
437.7	2860	6880	0.40	133.4	870	2100	0.40
439.3	2940	6990	0.39	133.9	900	2130	0.39
440.9	2880	6960	0.40	134.4	880	2120	0.40
442.5	2890	7280	0.41	134.9	880	2220	0.41
444.1	2830	7150	0.41	135.4	860	2180	0.41
445.7	2790	7110	0.41	135.9	850	2170	0.41
447.3	2740	7070	0.41	136.3	840	2160	0.41
448.9	2750	6990	0.41	136.8	840	2130	0.41
450.5	2760	7030	0.41	137.3	840	2140	0.41
452.1	2830	6960	0.40	137.8	860	2120	0.40
453.7	2930	7110	0.40	138.3	890	2170	0.40
455.3	3070	7080	0.38	138.8	930	2160	0.38
456.9	3110	7210	0.39	139.3	950	2200	0.39
458.5	3110	7280	0.39	139.8	950	2220	0.39
460.1	3110	7130	0.38	140.2	950	2170	0.38
461.7	3010	7050	0.39	140.7	920	2150	0.39
463.3	2950	7020	0.39	141.2	900	2140	0.39
464.9	2910	7050	0.40	141.7	890	2150	0.40

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio Based on Source-to-Receiver Travel Time Data - Borehole SB-1

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
466.5	2960	7050	0.39	142.2	900	2150	0.39
468.1	2950	6970	0.39	142.7	900	2120	0.39
469.7	2910	7100	0.40	143.2	890	2160	0.40
471.3	2920	7100	0.40	143.7	890	2160	0.40
472.9	2900	7020	0.40	144.2	880	2140	0.40
474.5	2850	6910	0.40	144.6	870	2110	0.40
476.1	2840	6880	0.40	145.1	870	2100	0.40
477.7	2810	6970	0.40	145.6	860	2120	0.40
479.3	2860	6910	0.40	146.1	870	2110	0.40
481.0	2910	7080	0.40	146.6	890	2160	0.40
482.6	2960	7130	0.40	147.1	900	2170	0.40
484.2	2960	7190	0.40	147.6	900	2190	0.40
485.8	3050	7210	0.39	148.1	930	2200	0.39
487.4	3050	7130	0.39	148.5	930	2170	0.39
489.0	3090	7430	0.40	149.0	940	2260	0.40
490.6	2990	7210	0.40	149.5	910	2200	0.40
492.2	3020	6990	0.38	150.0	920	2130	0.38
493.8	3110	7180	0.38	150.5	950	2190	0.38
495.4	3050	7310	0.39	151.0	930	2230	0.39
497.0	3220	7760	0.40	151.5	980	2360	0.40
498.6	3000	7390	0.40	152.0	910	2250	0.40
500.2	2850	7240	0.41	152.5	870	2210	0.41
501.8	2790	7190	0.41	152.9	850	2190	0.41
503.4	2670	7080	0.42	153.4	810	2160	0.42
505.0	2580	6970	0.42	153.9	790	2120	0.42
506.6	2540	6870	0.42	154.4	770	2090	0.42

APPENDIX B

ELOG, MECHANICAL CALIPER, AND NATURAL GAMMA LOGS

GEOVision
geophysical services

COMPANY	F&ME
WELL ID	SB-1
FIELD	
COUNTRY	USA
STATE	SC

CO F&ME
WELL SB-1
FLD
CTY
STE SC
API No

LOCATION
LAT LONG

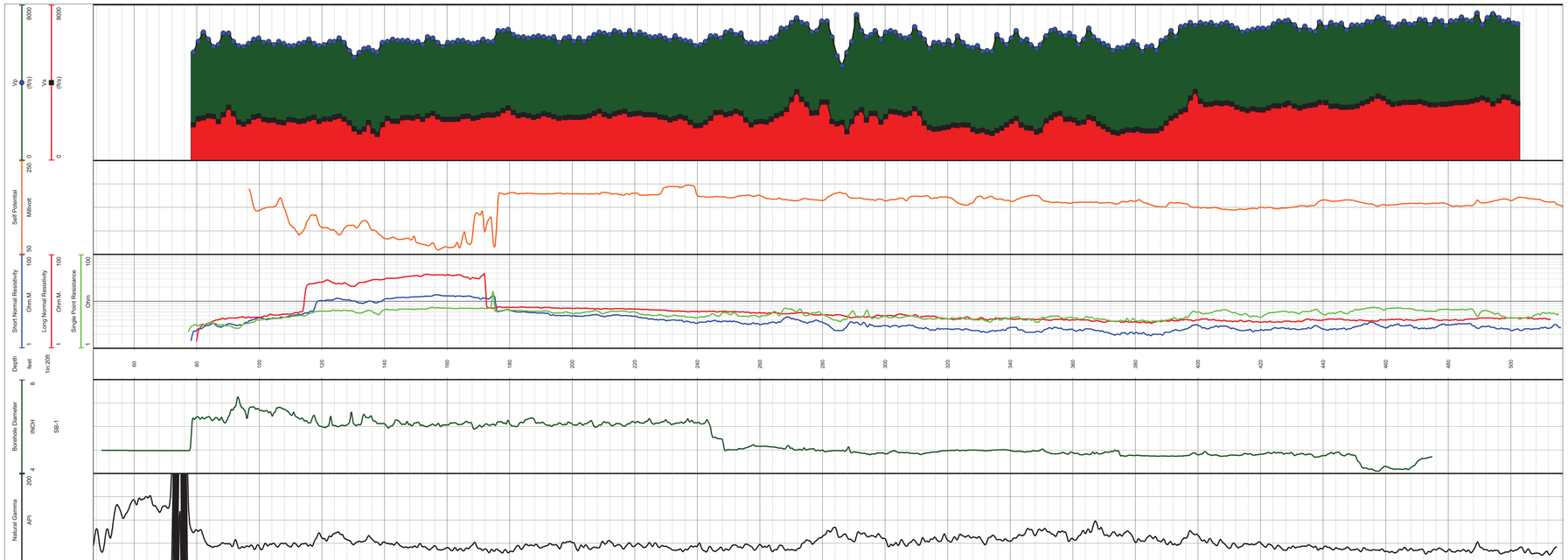
OTHER SERVICES
ELOG
CAL
NG
PSL

PERMANENT DATUM	NA	ELEVATION	NA
LOG MEAS. FROM	TOC		
DRILLING MEAS. FROM	NA		

K.B.
D.F.
G.L.

DATE	July 18, 2016	July 18, 2016	July 20, 2016	FLUID IN HOLE	MUD
RUN No	1	1	1	SALINITY	
TYPE LOG	ELOG NG	PSL	CAL NG	DENSITY	
DEPTH-DRILLER	518	518	518	LEVEL	
DEPTH-LOGGER	516	515	476		
LOG DEEPEST	516	503	476		
LOG SHALLOW	79	79	50		
OPERATING RIG TIME					
RECORDED BY	JJ	JJ	JJ		
WITNESSED BY					

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO



APPENDIX C

BORING GEOPHYSICAL LOGGING SYSTEMS - NIST TRACEABLE CALIBRATION RECORDS

MICRO PRECISION CALIBRATION INC.

MICRO PRECISION CALIBRATION, INC
2165 N. Glassell St.,
Orange, CA 92865
714-901-5659

Certificate of Calibration

Date: Jul 14, 2016 **Cert No. 222200812421163**

Customer:
GEOVISION
1124 OLYMPIC DRIVE
CORONA CA 92881

Work Order #: N/A

MPC Control #:	BG9698	Serial Number:	15014
Asset ID:	15014	Department:	N/A
Gage Type:	LOGGER	Performed By:	TYLER MCKEEN
Manufacturer:	OYO	Received Condition:	IN TOLERANCE
Model Number:	03331-0000	Returned Condition:	IN TOLERANCE
Size:	N/A	Cal. Date:	July 14, 2016
Temp/RH:	72.0°F / 54.0%	Cal. Interval:	12 MONTHS
		Cal. Due Date:	July 14, 2017

Calibration Notes:
See attached data sheet for calculations. (1 Page)

Calibrated IAW customer supplied data form Rev 2.1
Frequency measurement uncertainty = 0.0005 Hz
Unit calibrated with Laptop Panasonic Model CF-29,s/n: 4FKSA41798
Calibrated To 4:1 Accuracy Ratio

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
BD7715	UNIVERSAL COUNTER	53131A	3416A05377	HEWLETT PACKARD	Aug 26, 2016	222008122635161
T1100	UNIVERSAL COUNTER	53131A	3546A09912	HEWLETT PACKARD	Feb 2, 2017	222008122827657
AM4000	WAVEFORM GENERATOR	33250A	MY40000703	AGILENT	Jul 8, 2017	222200812420653

Procedures Used in this Event

Procedure Name	Description
GEOVISION SEISMIC	Suspension PS Seismic Logger/Recorder Calibration Procedure

Calibrating Technician: TYLER MCKEEN

QC Approval: JIM WILLIAMS

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA's Publication and NIST Technical Note 1297, 1994 Edition. Services rendered comply with ISO 17025:2005, ANSI/NCSL Z540-1, MPC Quality Manual, MPC CSD and with customer purchase order instructions.

Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. The information on this report, pertains only to the instrument identified.

All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. This report may not be reproduced in part or in a whole without the prior written approval of the issuing MPC lab.

BG 9698 15014

GEOVision geophysical services

SUSPENSION PS SEISMIC LOGGER/RECORDER CALIBRATION DATA FORM

INSTRUMENT DATA

System mfg.:	O/O	Model no.:	3331
Serial no.:	15014	Calibration date:	07/14/2016
By:	Emily Feldman	Due date:	07/14/2017
Counter mfg.:	Hewlett Packard	Model no.:	5313A
Serial no.:	3546A09912	Calibration date:	02/02/16
By:	Micro Precision	Due date:	02/02/17
Signal generator mfg.:	Agilent	Model no.:	~~07~~ 33250A
Serial no.:	MY40000703	Calibration date:	07/08/16
By:	Micro Precision	Due date:	07/08/17
Laptop controller mfg.:	Panasonic RG3	Model no.:	CF-29 Toughbook
Serial no.:	4FKSA41798	Calibration date:	N/A

SYSTEM SETTINGS:

Gain:	x10
Filter	open
Range:	200 – 5 μS
Delay:	4 msec
Stack (1 std)	1
System date = correct date and time	Yes, 12:25, 7/14/16

PROCEDURE:

Set sine wave frequency to target frequency with amplitude of approximately 0.25 volt peak
Note actual frequency on data form.
Set sample period and record data file to disk. Note file name on data form.
Pick duration of 9 cycles using PSLOG.EXE program, note duration on data form, and save as .sps file. Calculate average frequency for each channel pair and note on data form.

Average frequency must be within +/- 1% of actual frequency at all data points.

Maximum error ((AVG-ACT)/ACT*100)% As found 0.22% As left 0.22%

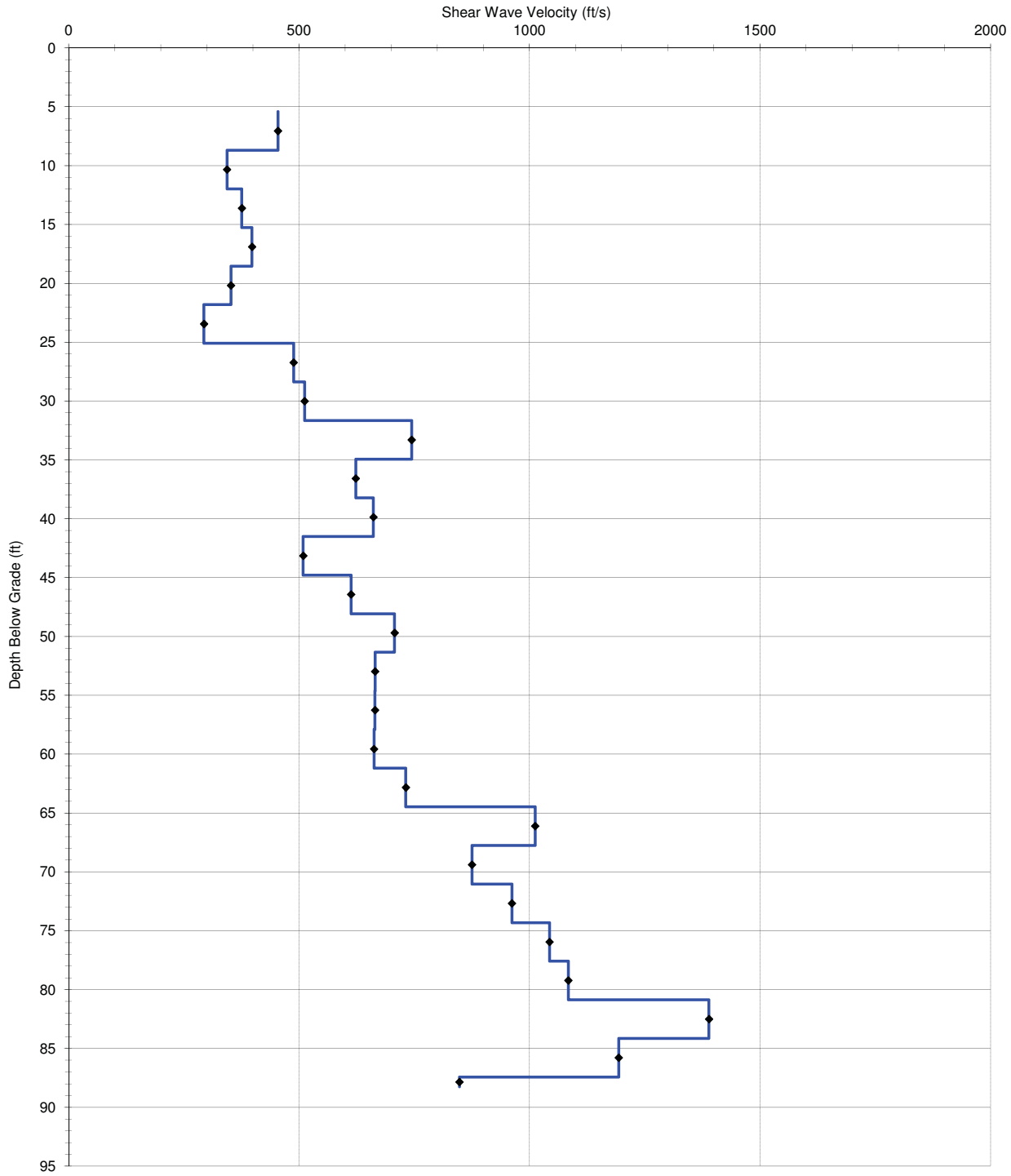
Target Frequency (Hz)	Actual Frequency (Hz)	Sample Period (microS)	File Name Cal2–	Time for 9 cycles Hn (msec)	Average Frequency Hn (Hz)	Time for 9 cycles Hr (msec)	Average Frequency Hr (Hz)	Time for 9 cycles V (msec)	Average Frequency V (Hz)
50.00	50.00	200	001	180	50.00	180	50.00	179.8	50.05
100.0	100.0	100	002	89.9	99.9	89.9	99.9	90.1	99.9
200.0	200.0	50	003	44.95	200.2	45	200.0	45	200.0
500.0	500.0	20	004	18.02	499.5	18.0	~~18.0~~ 500.0	17.98	500.6
1000	1,000	10	005	9.01	998.9	8.98	1002.2	9	1000
2000	2,000	5	006	4.505	1998	4.50	2000	4.495	2002

Calibrated by: Tyler McKean 7/14/16 [signature]
Name Date Signature

Witnessed by: Emily Feldman 7/14/16 [signature]
Name Date Signature

Suspension PS Seismic Recorder/Logger Calibration Data Form Rev 2.1 February 7, 2012

Shear Wave Velocity- SCPT-2
US 21 Replacement Bridge Over Harbor River
14-54074
August 25th , 2014



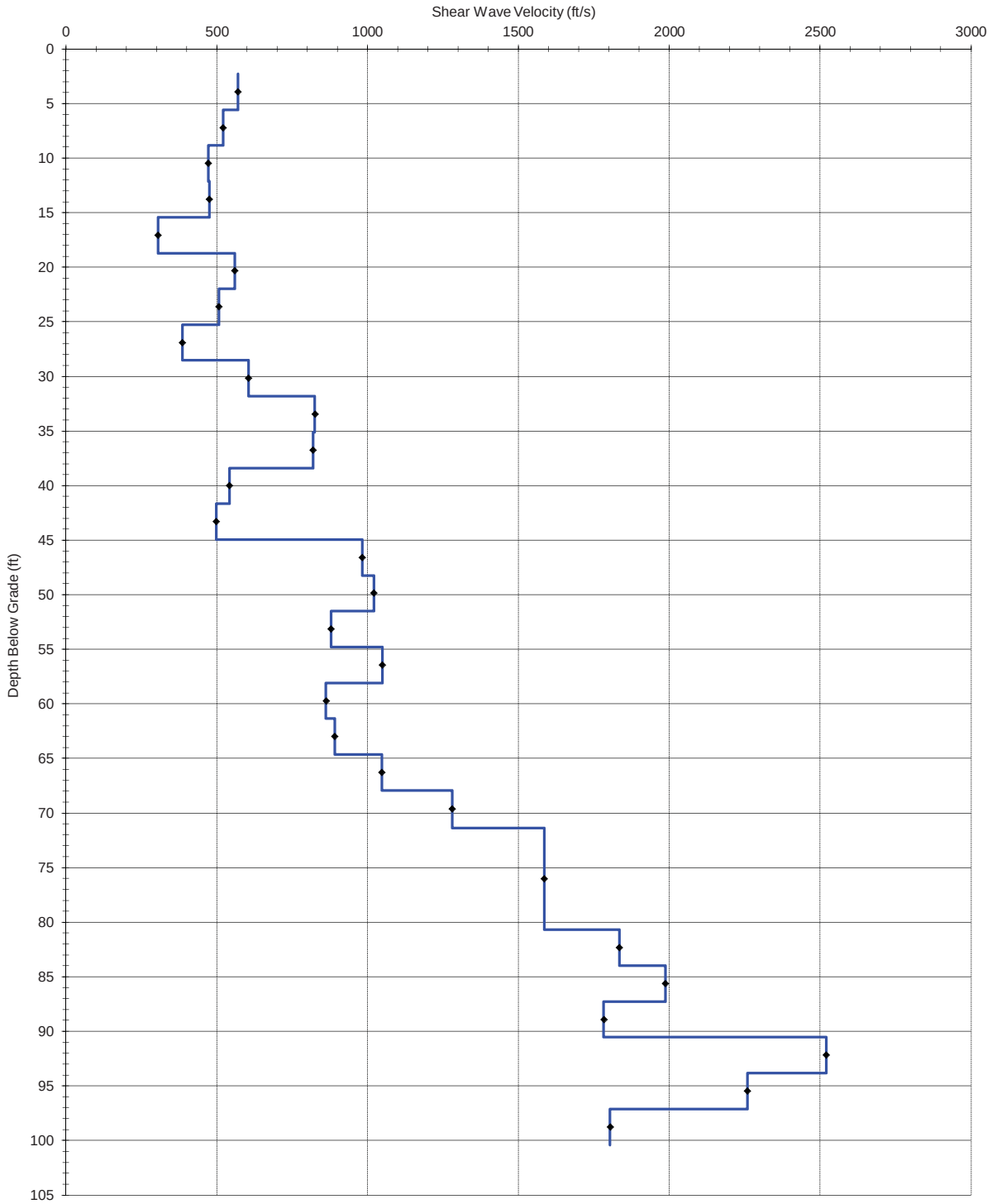
ConeTec Shear Wave Velocity Data Reduction Sheet

Hole: SCPT-2
Location: US 21 Replacement Bridge Over Harbor River
Cone: AD184
Date: 25-Aug-14
Source: Beam

Source Depth	0.00	m
Source Offset	2.15	m

Tip Depth (m)	Geophone Depth(m)	Travel Path (m)	Interval time (ms)	Velocity (m/s)	Velocity (ft/s)	Interval Depth (m)	Interval Depth (ft)
0.00							
1.85	1.65	2.71					
2.85	2.65	3.41	5.07	138.5	454.4	2.15	7.05
3.85	3.65	4.24	7.86	104.8	343.7	3.15	10.33
4.85	4.65	5.12	7.74	114.6	375.9	4.15	13.61
5.85	5.65	6.05	7.61	121.3	397.9	5.15	16.90
6.85	6.65	6.99	8.78	107.5	352.5	6.15	20.18
7.85	7.65	7.95	10.69	89.5	293.8	7.15	23.46
8.85	8.65	8.91	6.50	148.8	488.2	8.15	26.74
9.85	9.65	9.89	6.24	156.1	512.0	9.15	30.02
10.85	10.65	10.86	4.31	226.9	744.3	10.15	33.30
11.85	11.65	11.85	5.17	189.9	623.0	11.15	36.58
12.85	12.65	12.83	4.89	201.5	661.2	12.15	39.86
13.85	13.65	13.82	6.36	155.1	509.0	13.15	43.14
14.85	14.65	14.81	5.29	186.9	613.1	14.15	46.42
15.85	15.65	15.80	4.59	215.6	707.2	15.15	49.70
16.85	16.65	16.79	4.89	202.8	665.4	16.15	52.98
17.85	17.65	17.78	4.90	202.6	664.7	17.15	56.27
18.85	18.65	18.77	4.92	202.0	662.7	18.15	59.55
19.85	19.65	19.77	4.46	223.0	731.6	19.15	62.83
20.85	20.65	20.76	3.22	308.6	1012.3	20.15	66.11
21.85	21.65	21.76	3.73	266.7	875.1	21.15	69.39
22.85	22.65	22.75	3.39	293.2	962.0	22.15	72.67
23.85	23.65	23.75	3.13	318.1	1043.5	23.15	75.95
24.85	24.65	24.74	3.01	330.4	1084.0	24.15	79.23
25.85	25.65	25.74	2.35	423.4	1389.2	25.15	82.51
26.85	26.65	26.74	2.74	363.8	1193.5	26.15	85.79
27.10	26.90	26.99	0.96	258.5	848.0	26.78	87.84

Shear Wave Velocity- SCPT-11
US 21 Replacement Bridge Over Harbor River
15-54107
November 18th , 2015



Job No:	15-54107
Client:	F&ME
Project:	Harbor River
Sounding ID:	SCPT-11
Date:	11/18/2015

Seismic Source:	Beam
Source Offset (ft):	4.75
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
2.95	2.30	5.28			
6.23	5.58	7.33	2.05	3.59	571
9.51	8.86	10.05	2.73	5.23	521
12.80	12.14	13.04	2.98	6.32	472
16.08	15.42	16.13	3.10	6.52	475
19.36	18.70	19.29	3.16	10.35	305
22.64	21.98	22.49	3.19	5.71	559
25.92	25.26	25.71	3.22	6.34	507
29.20	28.54	28.94	3.23	8.38	386
32.48	31.82	32.18	3.24	5.36	605
35.76	35.10	35.42	3.25	3.94	825
39.04	38.39	38.68	3.25	3.97	820
42.32	41.67	41.94	3.26	6.00	543
45.60	44.95	45.20	3.26	6.55	498
48.88	48.23	48.46	3.26	3.32	982
52.17	51.51	51.73	3.27	3.20	1020
55.45	54.79	55.00	3.27	3.72	879
58.73	58.07	58.26	3.27	3.12	1049
62.01	61.35	61.53	3.27	3.79	862
65.29	64.63	64.81	3.27	3.67	892
68.57	67.91	68.08	3.27	3.12	1047
72.01	71.36	71.52	3.44	2.69	1280
81.36	80.71	80.85	9.33	5.89	1585
84.65	83.99	84.12	3.28	1.79	1834
87.93	87.27	87.40	3.28	1.65	1987
91.21	90.55	90.68	3.28	1.84	1783
94.49	93.83	93.95	3.28	1.30	2520
97.77	97.11	97.23	3.28	1.45	2260
101.05	100.39	100.51	3.28	1.82	1804

APPENDIX B
Laboratory Testing

US-21 BRIDGE REPLACEMENT OVER HARBOR RIVER
BEAUFORT COUNTY, SOUTH CAROLINA
F&ME PROJECT NO.: G5396.00

FINAL LABORATORY ANALYSIS SUMMARY

BORING NUMBER	SAMPLE DEPTH (ft)	% MOISTURE	% GRAVEL	% SAND	% FINES (SILT/CLAY)	LL	PL	PI	USCS	AASHTO Class	% ORGANICS	pH	Resistivity (Ohm-cm)	Sulfate (mg/kg)	Chloride (mg/kg)	Carbonate (% Calcite Equivalent)
B-1	4.0-6.0	--	--	--	--	--	--	--	--	--	1.15	--	--	--	--	--
	6.0-8.0	--	--	--	--	--	--	--	--	--	1.07	--	--	--	--	--
	8.0-10.0	19.3	16.7	76.0	7.3	NP	NP	NP	SP-SM	A-1-b	--	--	--	--	--	--
	12.0-14.0	19.2	8.4	83.7	8.0	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
	14.0-16.0	--	--	--	--	--	--	--	--	--	0.31	--	--	--	--	--
	18.0-20.0	27.4	0.0	96.7	3.3	NP	NP	NP	SP	A-3	--	--	--	--	--	--
	28.5-30.0	34.7	0.2	92.4	7.4	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
	43.5-45.0	33.8	0.4	88.6	11.0	NP	NP	NP	SP-SM	A-2-4	--	--	--	--	--	--
	48.5-50.0	59.0	0.0	66.8	33.2	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
B-2	4.0-6.0	--	--	--	--	--	--	--	--	--	0.56	--	--	--	--	--
	6.0-8.0	28.7	0.0	95.1	4.9	NP	NP	NP	SP	A-3	--	--	--	--	--	--
	8.0-10.0	27.9	0.0	97.5	2.5	NP	NP	NP	SP	A-3	--	--	--	--	--	--
	10.0-12.0	--	--	--	--	--	--	--	--	--	0.45	--	--	--	--	--
	18.0-20.0	26.5	0.0	93.7	6.3	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
	23.5-25.0	--	--	--	--	--	--	--	--	--	1.25	--	--	--	--	--
	28.5-30.0	30.3	0.3	85.7	14.0	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	38.5-40.0	29.3	0.1	91.1	8.8	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
	53.5-55.0	28.4	0.3	89.7	10.0	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
B-3	0.0-2.0	36.9	0.2	62.3	37.5	NP	NP	NP	SM	A-4(0)	--	--	--	--	--	--
	4.0-6.0	--	--	--	--	--	--	--	--	--	3.55	--	--	--	--	--
	6.0-8.0	151.6	0.0	1.5	98.5	74	49	25	MH	A-7-5(36)	--	--	--	--	--	--
	13.5-15.0	26.1	0.0	92.3	7.7	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
	18.5-20.0	--	--	--	--	--	--	--	--	--	--	7.9	200	126	5080	--
	23.5-25.0	29.3	15.8	59.7	24.5	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	28.5-30.0	101.1	0.0	3.4	96.6	58	31	27	MH	A-7-5(32)	--	--	--	--	--	--
	38.5-40.0	30.2	3.7	85.8	10.4	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
B-4	2.0-4.0	52.5	4.9	63.2	31.9	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	4.0-6.0	--	--	--	--	--	--	--	--	--	2.68	--	--	--	--	--
	8.0-10.0	32.9	1.2	72.9	26.0	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	13.5-15.0	31.8	0.0	84.9	15.1	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	23.5-25.0	27.8	1.1	76.9	22.0	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	33.5-35.0	35.8	1.6	76.8	21.6	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	38.5-40.0	--	--	--	--	--	--	--	--	--	--	8.0	180	559	8350	--
	48.5-50.0	31.8	0.6	82.4	17.0	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	63.5-65.0	64.5	0.0	46.9	53.1	71	35	36	MH	A-7-5(16)	--	--	--	--	--	--
B-5	2.0-4.0	27.9	0.0	93.4	6.6	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
	6.0-8.0	24.1	0.0	85.3	14.6	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	8.0-10.0	--	--	--	--	--	--	--	--	--	0.27	--	--	--	--	--
	13.5-15.0	36.1	0.3	79.9	19.7	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	23.5-25.0	26.8	0.1	89.4	10.5	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
	28.5-30.0	--	--	--	--	--	--	--	--	--	--	8.2	9.5	488	8360	--
	33.5-35.0	39.0	0.0	67.2	32.8	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	43.5-45.0	33.4	0.0	79.1	20.9	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	53.5-55.0	38.9	0.8	73.2	26.0	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
B-6	2.0-4.0	--	--	--	--	--	--	--	--	--	0.53	--	--	--	--	--
	4.0-6.0	28.4	0.0	82.8	17.2	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	8.0-10.0	24.6	0.0	84.3	15.7	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	13.5-15.0	34.8	0.3	73.6	26.1	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	23.5-25.0	24.8	0.0	86.3	13.7	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	28.5-30.0	28.8	0.0	89.0	11.0	NP	NP	NP	SP-SM	A-2-4	--	--	--	--	--	--
	38.5-40.0	27.5	0.0	81.7	18.3	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	58.5-60.0	--	--	--	--	--	--	--	--	--	--	7.7	85	763	16000	--

US-21 BRIDGE REPLACEMENT OVER HARBOR RIVER
BEAUFORT COUNTY, SOUTH CAROLINA
F&ME PROJECT NO.: G5396.00

FINAL LABORATORY ANALYSIS SUMMARY

BORING NUMBER	SAMPLE DEPTH (ft)	% MOISTURE	% GRAVEL	% SAND	% FINES (SILT/CLAY)	LL	PL	PI	USCS	AASHTO Class	% ORGANICS	pH	Resistivity (Ohm-cm)	Sulfate (mg/kg)	Chloride (mg/kg)	Carbonate (% Calcite Equivalent)
B-7	4.0-6.0	24.2	4.0	83.2	12.8	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	8.0-10.0	33.1	3.0	78.8	18.2	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	13.5-15.0	31.3	0.3	80.9	18.9	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	18.5-20.0	24.2	4.0	85.1	10.8	NP	NP	NP	SP-SM	A-2-4	--	--	--	--	--	--
	28.5-30.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8
	43.5-45.0	38.0	0.0	82.1	17.9	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
B-8	4.0-6.0	24.0	1.0	87.2	11.9	NP	NP	NP	SP-SM	A-2-4	--	--	--	--	--	--
	18.5-20.0	73.8	0.0	32.5	67.5	34	20	14	CL	A-6(8)	--	--	--	--	--	--
	23.5-25.0	54.5	0.2	64.8	34.9	30	19	11	SC	A-2-6(0)	--	--	--	--	--	--
	28.5-30.0	38.8	1.0	77.0	22.0	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	33.5-35.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	16
	43.5-45.0	27.3	0.0	93.5	6.5	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
	48.5-50.0	37.1	0.0	91.8	8.2	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
B-9	2.0-4.0	22.6	8.4	83.8	7.7	NP	NP	NP	SP-SM	A-1-b	--	--	--	--	--	--
	4.0-6.0	21.9	2.2	90.7	7.2	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
	8.0-10.0	25.6	0.1	89.6	10.3	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
	13.5-15.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5
	28.5-30.0	88.5	0.2	20.7	79.1	58	30	28	CH	A-7-5(24)	--	--	--	--	--	--
	43.5-45.0	25.6	1.2	91.4	7.5	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
B-10	3.5-5.5	50.0	0.0	58.9	41.1	26	17	9	SC	A-4(1)	--	--	--	--	--	--
	7.5-9.5	24.1	0.0	92.1	7.9	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
	25.0-26.5	58.3	0.0	42.8	57.2	33	26	7	ML	A-4(2)	--	--	--	--	--	--
	30.5-32.0	--	--	--	--	--	--	--	--	--	--	7.1	62	2400	8400	--
	46.0-47.5	21.9	7.0	87.0	6.0	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
	56.5-58.0	58.1	2.8	66.2	31.0	39	27	12	SM	A-2-6(0)	--	--	--	--	--	--
	86.5-88.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	460
B-11	26.0-28.0	33.7	0.0	81.8	18.1	22	NP	NP	SM	A-2-4	--	--	--	--	--	--
	28.0-30.0	57.6	0.5	47.4	52.1	26	17	9	CL	A-4(2)	--	--	--	--	--	--
	30.0-32.0	30.5	0.2	84.5	15.3	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	36.5-38.0	93.7	0.0	12.1	87.9	58	35	23	MH	A-7-5(25)	--	--	--	--	--	--
	68.5-70.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	451
	83.0-84.5	45.3	0.3	53.7	46.0	31	NP	NP	SM	A-4(0)	--	--	--	--	--	--
	92.5-94.0	--	--	--	--	--	--	--	--	--	--	7.0	101	2000	5700	--
B-12	37.0-39.0	32.9	1.3	74.9	23.8	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	45.5-47.0	24.6	6.4	83.2	10.4	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
	61.0-62.5	81.2	0.0	52.0	48.0	51	NP	NP	SM	A-5(0)	--	--	--	--	--	--
	80.0-81.5	61.8	0.0	53.4	46.6	44	31	13	SM	A-7-5(4)	--	--	--	--	--	--
	96.5-98.0	33.7	0.9	49.3	49.7	30	NP	NP	SM	A-4(0)	--	--	--	--	--	--
	115.5-117.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	493
B-13	32.0-34.0	34.6	4.4	72.8	22.8	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	42.5-44.0	63.6	0.0	35.8	64.2	41	20	21	CL	A-7-6(11)	--	--	--	--	--	--
	52.5-54.0	78.3	2.1	32.6	65.3	23	NP	NP	ML	A-4(0)	--	--	--	--	--	--
	58.0-59.5	--	--	--	--	--	--	--	--	--	--	7.2	76	1700	7600	--
	63.5-65.0	73.8	0.2	55.9	43.9	67	29	38	SC	A-7-6(11)	--	--	--	--	--	--
	94.5-96.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	460
	99.5-101.0	37.3	4.2	45.6	50.2	30	24	6	ML	A-4(1)	--	--	--	--	--	--
B-14	8.0-10.0	32.4	0.0	86.2	13.8	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	23.5-25.0	38.6	0.0	82.4	17.6	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	28.5-30.0	50.9	0.3	56.0	43.7	31	24	7	SM	A-4(1)	--	--	--	--	--	--
	33.5-35.0	--	--	--	--	--	--	--	--	--	--	7.4	71	1600	6900	--
	38.5-40.0	56.1	0.0	48.0	52.0	47	36	11	ML	A-7-5(4)	--	--	--	--	--	--
	48.5-50.0	46.2	0.0	69.8	30.1	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	72.5-74.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	40

US-21 BRIDGE REPLACEMENT OVER HARBOR RIVER
BEAUFORT COUNTY, SOUTH CAROLINA
F&ME PROJECT NO.: G5396.00

FINAL LABORATORY ANALYSIS SUMMARY

BORING NUMBER	SAMPLE DEPTH (ft)	% MOISTURE	% GRAVEL	% SAND	% FINES (SILT/CLAY)	LL	PL	PI	USCS	AASHTO Class	% ORGANICS	pH	Resistivity (Ohm-cm)	Sulfate (mg/kg)	Chloride (mg/kg)	Carbonate (% Calcite Equivalent)
B-15	4.0-6.0	26.2	0.0	91.8	8.2	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
	6.0-8.0	23.5	0.0	94.9	5.1	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
	13.5-15.0	23.8	0.0	94.5	5.5	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	--
	18.5-20.0	33.2	0.2	82.3	17.5	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	38.5-40.0	--	--	--	--	--	--	--	--	--	4.15	--	--	--	--	--
	43.5-45.0	31.6	0.6	78.7	20.7	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	58.5-60.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8
B-16	6.0-8.0	24.5	0.0	97.9	2.1	NP	NP	NP	SP	A-3	--	--	--	--	--	--
	13.5-15.0	24.3	0.0	97.9	2.1	NP	NP	NP	SP	A-3	--	--	--	--	--	--
	23.5-25.0	37.4	0.0	86.1	13.9	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	38.5-40.0	56.7	0.0	53.4	46.6	36	21	15	SC	A-6(4)	--	--	--	--	--	--
	48.5-50.0	84.8	0.0	9.0	91.0	75	35	40	MH	A-7-5(25)	--	--	--	--	--	--
	53.5-55.0	--	--	--	--	--	--	--	--	--	7.22	--	--	--	--	--
	78.5-80.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	15
TS-1	6.0-8.0	25.9	0.3	85.8	13.9	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	16.0-18.0	52.2	0.0	50.3	49.7	25	21	4	SC-SM	A-4(0)	--	--	--	--	--	--
	22.0-24.0	26.7	0.0	83.7	16.3	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	26.0-28.0	65.5	0.0	34.4	65.6	42	27	15	ML	A-7-6(9)	--	--	--	--	--	--
	32.0-34.0	40.2	1.0	70.7	28.3	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	44.0-46.0	24.0	3.7	84.1	12.2	NP	NP	NP	SM	A-2-4	--	--	--	--	--	--
	46.0-48.0	20.1	10.1	80.1	9.8	NP	NP	NP	SP-SM	A-1-b	--	--	--	--	--	--
	56.0-58.0	62.4	0.0	35.8	64.2	44	39	5	ML	A-5(4)	--	--	--	--	--	--
	72.0-74.0	61.7	0.6	32.1	67.4	55	32	23	MH	A-7-5(16)	--	--	--	--	--	--
	76.0-78.0	44.5	2.0	33.3	64.7	31	23	8	ML	A-4(4)	--	--	--	--	--	--
	80.0-82.0	42.6	0.0	50.9	49.1	NP	NP	NP	SM	A-4(0)	--	--	--	--	--	--
	104.0-106.0	33.4	0.0	43.2	56.8	NP	NP	NP	ML	A-4(0)	--	--	--	--	--	--
	120.0-122.0	35.4	0.2	44.5	55.3	NP	NP	NP	ML	A-4(0)	--	--	--	--	--	--
SB-1	18.0-20.0	--	--	--	--	--	--	--	--	--	1.92	--	--	--	--	--
	36.0-38.0	--	--	--	--	--	--	--	--	--	1.42	--	--	--	--	--
	44.0-46.0	55.4	0.6	67.5	31.9	42	20	22	SC	A-2-7(2)	--	--	--	--	--	--
	93.5-95.0	44.7	2.2	56.5	41.3	NP	NP	NP	SM	A-4(0)	--	--	--	--	--	--
	138.5-140.0	68.0	0.0	13.7	86.3	63	29	34	CH	A-7-6(33)	--	--	--	--	--	--
	168.5-170.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	509
	178.5-180.0	32.9	0.2	56.3	43.5	NP	NP	NP	SM	A-4(0)	--	--	--	--	--	--
	198.5-200.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	443
	238.5-240.0	34.4	0.0	12.2	87.8	40	23	17	CL	A-6(16)	--	--	--	--	--	--
	255.0-257.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	361
	275.0-277.0	30.1	0.0	28.7	71.3	32	30	2	ML	A-4(1)	--	--	--	--	--	--
	303.0-308.0	30.3	23.6	23.2	53.3	37	34	3	ML	A-4(1)	--	--	--	--	--	--
	308.0-313.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	320
	338.0-343.0	25.9	0.6	16.5	82.9	40	26	14	ML	A-6(12)	--	--	--	--	--	--
	358.0-363.0	17.4	8.6	26.8	64.6	33	24	9	ML	A-4(4)	--	--	--	--	--	--
	373.0-378.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	222
	381.0-385.0	38.3	0.0	5.3	94.7	63	38	25	MH	A-7-5(31)	--	--	--	--	--	--
H_20 - River West	--	--	--	--	--	--	--	--	--	--	--	6.8	27	22,715 mg/L	16,596 mg/L	--
H_20 - River East	--	--	--	--	--	--	--	--	--	--	--	6.9	26	23,227 mg/L	16,396 mg/L	--

US-21 Bridge Replacement over Harbor River
BEAUFORT COUNTY, SOUTH CAROLINA
F&ME PROJECT NO.: G5396.00

FINAL LABORATORY ANALYSIS SUMMARY

BORING NUMBER	SAMPLE DEPTH (ft)	% MOISTURE	% GRAVEL	% SAND	% FINES (SILT/CLAY)	LL	PL	PI	USCS	AASHTO Class	CU Triaxial Shear				UC Strength (psi)	Standard Proctor		Direct Shear (φ)	Consolidation	Resonant Column
											φ	C (psf)	φ'	C' (psi)		Optimum Moisture Content (%)	Maximum Dry Density (pcf)			
AP-1	16.0-18.0	63.0	0.0	39.0	61.0	65	21	44	CH	A-7-6(24)	--	--	29.0	0.878	--	--	--	--	See Results	--
	18.0-20.0	86.3	0.2	26.5	73.3	111	34	77	CH	A-7-5(60)	--	--	38.0	0.5	--	--	--	--	See Results	--
AP-2	16.0-18.0	56.0	2.1	48.0	49.9	66	22	44	SC	A-7-6(17)	--	--	31.5	0.435	--	--	--	--	See Results	--
	18.0-20.0	69.3	0.0	36.5	63.5	81	27	54	CH	A-7-6(33)	--	--	18.5	1.85	--	--	--	--	See Results	--
AP-3	25.0-27.0	83.0	0.1	20.4	79.5	85	27	58	CH	A-7-6(50)	--	--	26.0	1.5	--	--	--	--	See Results	--
	27.0-29.0	78.8	0.1	18.5	81.4	74	25	49	CH	A-7-6(43)	--	--	7.2	2.95	--	--	--	--	See Results	--
AP-4	38.0-40.0	69.0	0.0	28.7	71.3	71	24	47	CH	A-7-6(34)	--	--	--	--	--	--	--	--	See Results	--
	40.0-42.0	33.8	0.2	78.4	21.5	NP	NP	NP	SM	A-2-4	13.0	4.1	24.0	4.1	--	--	--	--	--	--
	70.0-72.0	58.8	0.0	48.0	52.0	NP	NP	NP	ML	A-4(0)	34.0	0.0	--	--	--	--	--	--	--	--
AP-5	6.0-10.0	21.6	0.0	97.0	3.0	NP	NP	NP	SP	A-3	--	--	--	--	--	--	--	32.1	--	--
	30.0-32.0	26.6	0.0	97.1	2.9	NP	NP	NP	SP	A-3	--	--	--	--	--	--	--	27.9	--	--
SB-1	130.0-133.0	38.0	0.0	33.7	66.3	42	30	12	ML	A-7-5(8)	--	--	--	--	--	--	--	--	--	See Results
	145.0-148.0	33.1	0.2	42.5	57.3	38	25	13	ML	A-6(6)	--	--	40.7	1.05	--	--	--	--	--	--
	200.0-203.0	32.0	0.1	47.8	52.1	43	27	16	ML	A-7-6(6)	--	--	--	--	--	--	--	--	--	See Results
	230.0-233.0	32.6	1.0	21.3	77.7	48	30	18	ML	A-7-5(15)			29.2	16.5	--	--	--	--	--	--
	250.0-255.0	29.0	--	--	--	--	--	--	--	--	--	--	--	--	143.5	--	--	--	--	--
	257.0-260.0	31.6	0.0	34.9	65.1	76	21	55	CH	A-7-6(34)	--	--	--	--	--	--	--	--	--	See Results
	298.0-303.0	31.7	--	--	--	--	--	--	--	--	--	--	--	--	166.5	--	--	--	--	--
	323.0-328.0	22.3	--	--	--	--	--	--	--	--	--	--	--	--	85.9	--	--	--	--	--
	358.0-363.0	26.8	--	--	--	--	--	--	--	--	--	--	--	--	236.4	--	--	--	--	--
	378.0-381.0	39.3	0.0	12.2	87.8	133	29	104	CH	A-7-6(104)	--	--	--	--	--	--	--	--	--	See Results
	381.0-385.0	32.3	--	--	--	--	--	--	--	--	--	--	--	--	233.5	--	--	--	--	--
BS-1	0.0-5.0	5.3	11.4	81.0	7.6	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	17.3	100.3	34.4	--	--
BS-2	0.0-5.0	5.6	5.4	86.2	8.3	NP	NP	NP	SP-SM	A-3	--	--	--	--	--	16.6	100.8	32.6	--	--
BS-3	0.0-5.0	1.3	0.1	98.2	1.7	NP	NP	NP	SP	A-3	--	--	--	--	--	18.1	97.8	33.5	--	--
BS-4	0.0-5.0	2.6	0.6	96.6	2.9	NP	NP	NP	SP	A-3	--	--	--	--	--	15.8	94.6	31.0	--	--

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	14-1273	**DATE SAMPLE RECEIVED:**	9/3/2014
DESCRIPTION OF SOIL:	Various		
TESTED BY:	KB	**DATE OF TESTING:**	9/3/2014
		DATE OF WEIGHING:	9/4/2014

BORING NO.	B-1	B-1	B-1	B-1	B-1
SAMPLE NO.	14-1273C	14-1273F	14-1273I	14-1273L	14-1273O
SAMPLE DEPTH	8.0'--10.0'	12.0'-14.0'	18.0'-20.0'	28.5'-30.0'	43.5'-45.0'
WATER CONTENT, W%	19.3	19.2	27.4	34.7	33.8

BORING NO.	B-1				
SAMPLE NO.	14-1273R				
SAMPLE DEPTH	48.5'-50.0'				
WATER CONTENT, W%	59.0				

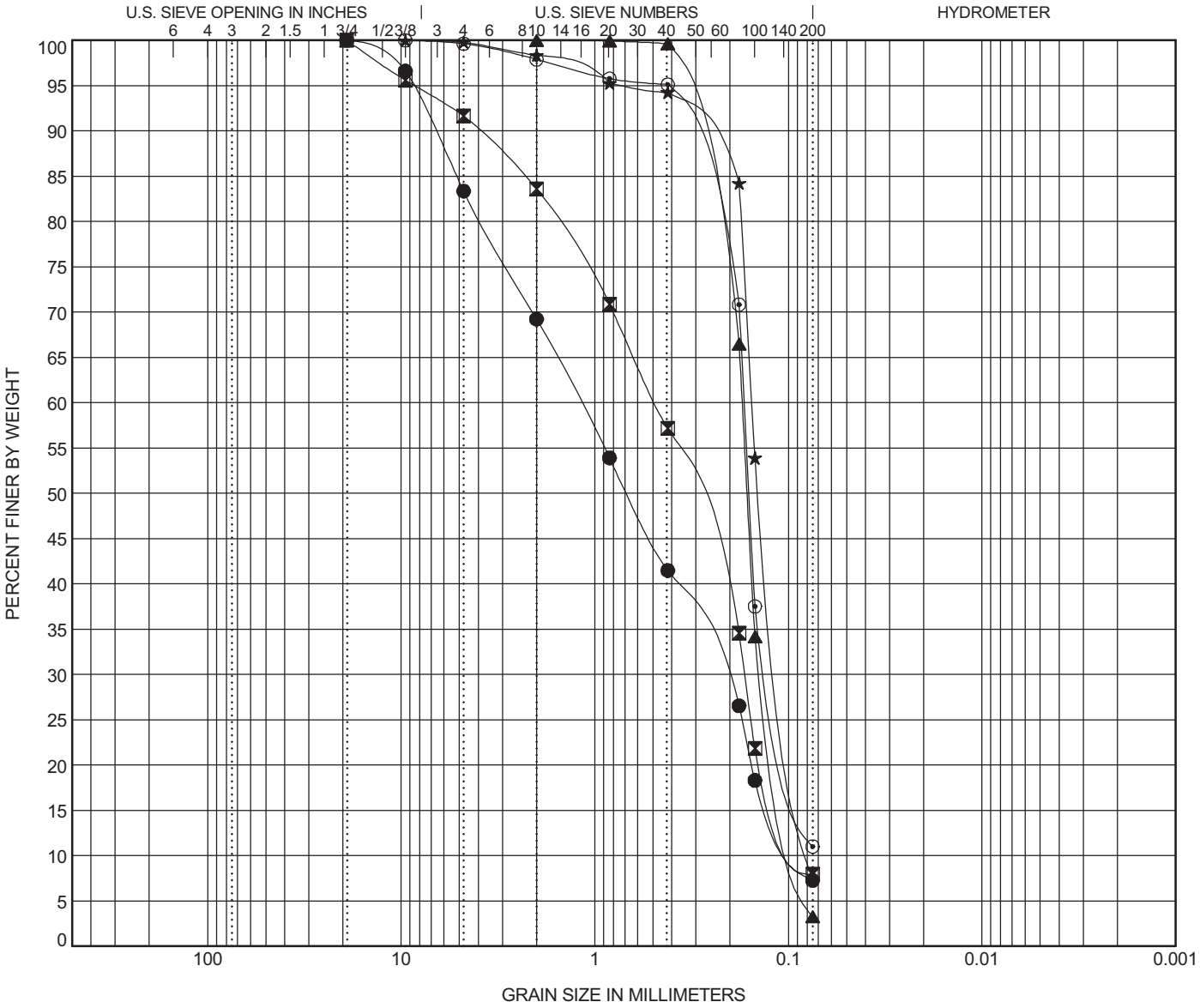
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

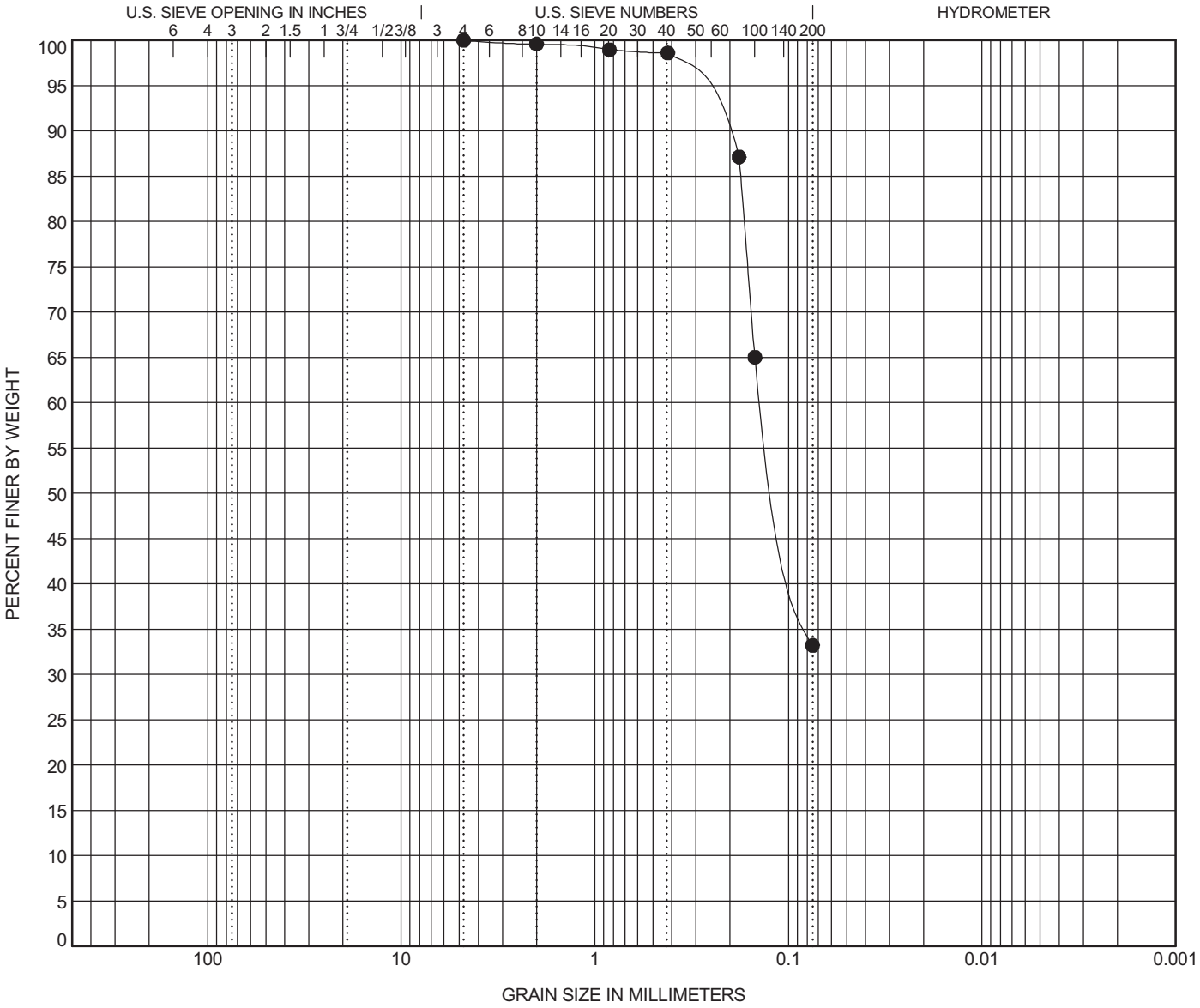
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-1	10.0	Poorly Graded F/C SAND (SP-SM) with Silt and Gravel A-1-b	NP	NP	NP	0.46	13.35
⊠	B-1	14.0	Poorly Graded Fine SAND (SP-SM) with Silt A-3	NP	NP	NP	0.70	5.84
▲	B-1	20.0	Poorly Graded Fine SAND (SP) A-3	NP	NP	NP	1.22	1.99
★	B-1	30.0	Poorly Graded Fine SAND (SP-SM) with Silt A-3	NP	NP	NP	0.91	1.99
⊙	B-1	45.0	Poorly Graded Fine SAND (SP-SM) with Silt A-2-4	NP	NP	NP	1.22	2.32

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	B-1	10.0	19.1	8.741	0.675	0.089	16.7	76.0	7.3	
⊠	B-1	14.0	19.1	8.544	0.321	0.083	8.4	83.7	8.0	
▲	B-1	20.0	2	0.373	0.163	0.087	0.0	96.7	3.3	
★	B-1	30.0	9.52	0.69	0.141	0.078	0.2	92.4	7.4	
⊙	B-1	45.0	9.52	0.418	0.16		0.4	88.6	11.0	

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**B-1**	**50.0**	**Silty Fine SAND (SM) A-2-4**	**NP**	**NP**	**NP**		

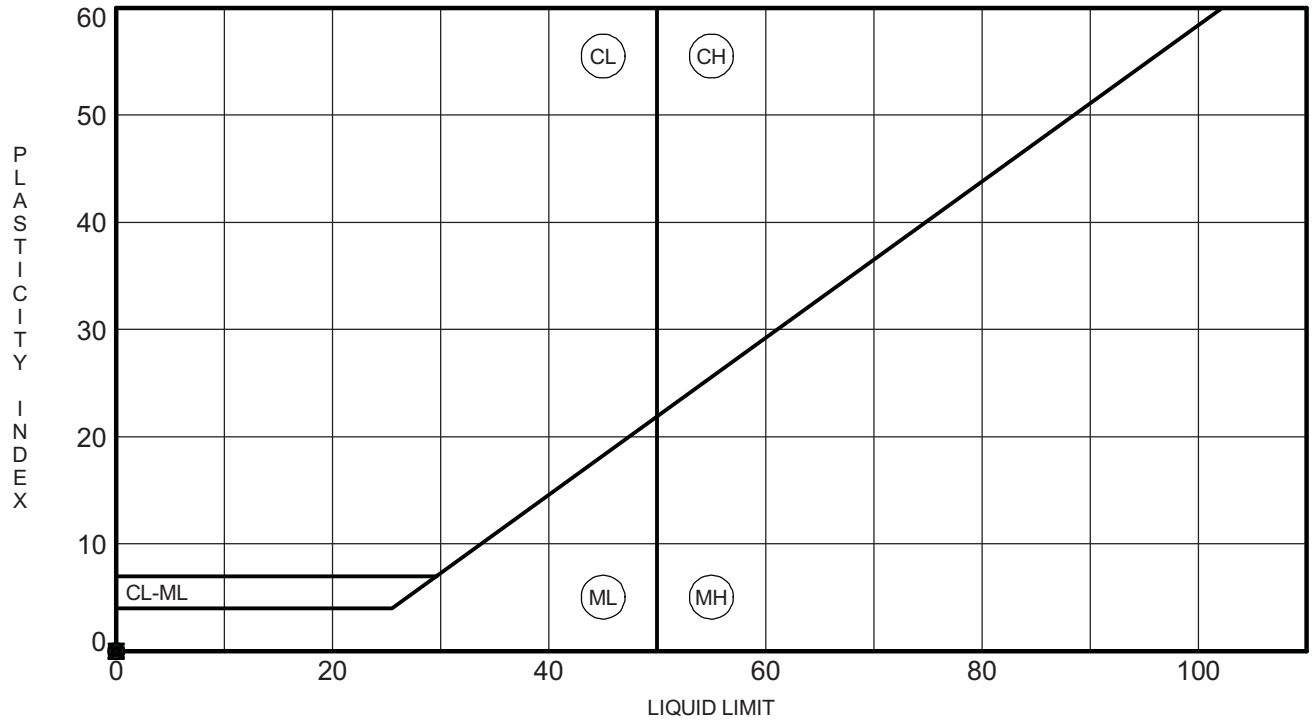
	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-1**	**50.0**	**4.76**	**0.322**	**0.108**		**0.0**	**66.8**	**33.2**	

GRAIN SIZE G5396 - HARBOR RIVER SPT AND CPT.GPJ GINT STD US LAB.GDT 10/5/16

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-1**	**10.0**	**NP**	**NP**	**NP**	**7**	**Poorly Graded F/C SAND (SP-SM) with Silt and Gravel A-1-b**
⊠	**B-1**	**14.0**	**NP**	**NP**	**NP**	**8**	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**
▲	**B-1**	**20.0**	**NP**	**NP**	**NP**	**3**	**Poorly Graded Fine SAND (SP) A-3**
★	**B-1**	**30.0**	**NP**	**NP**	**NP**	**7**	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**
⊙	**B-1**	**45.0**	**NP**	**NP**	**NP**	**11**	**Poorly Graded Fine SAND (SP-SM) with Silt A-2-4**
✿	**B-1**	**50.0**	**NP**	**NP**	**NP**	**33**	**Silty Fine SAND (SM) A-2-4**

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

ORGANIC IMPURITIES DETERMINATION
(AASHTO T267)

PROJECT: US 21 Bridge Replacement over Harbor River

PROJECT NO.: G5396

SAMPLE NUMBER: 14-1273

DATE SAMPLE RECEIVED: 9/4/2014

DESCRIPTION OF SOIL: Various

TESTED BY: JH

DATE OF TESTING: 9/8/2014

DATE OF WEIGHING: 9/8/2014

BORING NO.	B-1	B-1	B-1		
SAMPLE NO.	14-1273S	14-1273T	14-1273U		
SAMPLE DEPTH	4.0'-6.0'	6.0'-8.0'	14.0'-16.0'		
WT. OF CRUCIBLE + DRY SOIL (BEFORE IGNITION) (GRAMS)	171.13	173.78	149.23		
WT. OF CRUCIBLE + DRY SOIL (AFTER IGNITION) (GRAMS)	170.71	173.37	149.11		
WT. OF CRUCIBLE (GRAMS)	134.66	135.55	110.79		
WT. OF DRY SOIL (BEFORE IGNITION) (GRAMS)	36.47	38.23	38.44		
WT. OF DRY SOIL (AFTER IGNITION) (GRAMS)	36.05	37.82	38.32		
IGNITION LOSS (GRAMS)	0.42	0.41	0.12		
ORGANIC IMPURITIES %	1.15	1.07	0.31		

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Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	14-1328	**DATE SAMPLE RECEIVED:**	9/4/2014
DESCRIPTION OF SOIL:	Various		
TESTED BY:	KB	**DATE OF TESTING:**	9/5/2014
		DATE OF WEIGHING:	9/8/2014

BORING NO.	B-2	B-2	B-2	B-2	B-2
SAMPLE NO.	14-1328F	14-1328I	14-1328L	14-1328O	14-1328R
SAMPLE DEPTH	6.0'-8.0'	8.0'-10.0'	18.0'-20.0'	28.5'-30.0'	38.5'-40.0'
WATER CONTENT, W%	28.7	27.9	26.5	30.3	29.3

BORING NO.	B-2				
SAMPLE NO.	14-1328U				
SAMPLE DEPTH	53.5'-55.0'				
WATER CONTENT, W%	28.4				

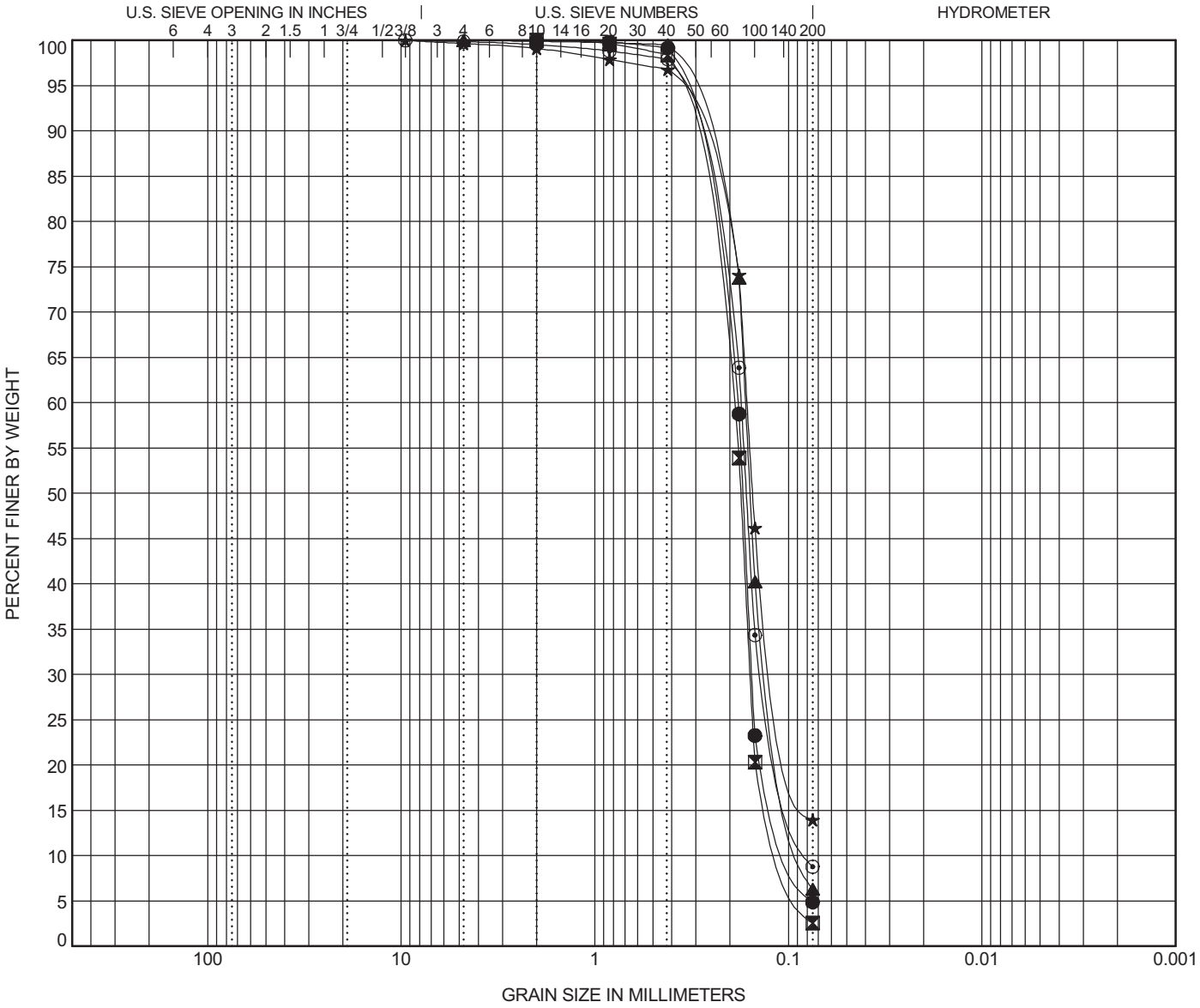
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

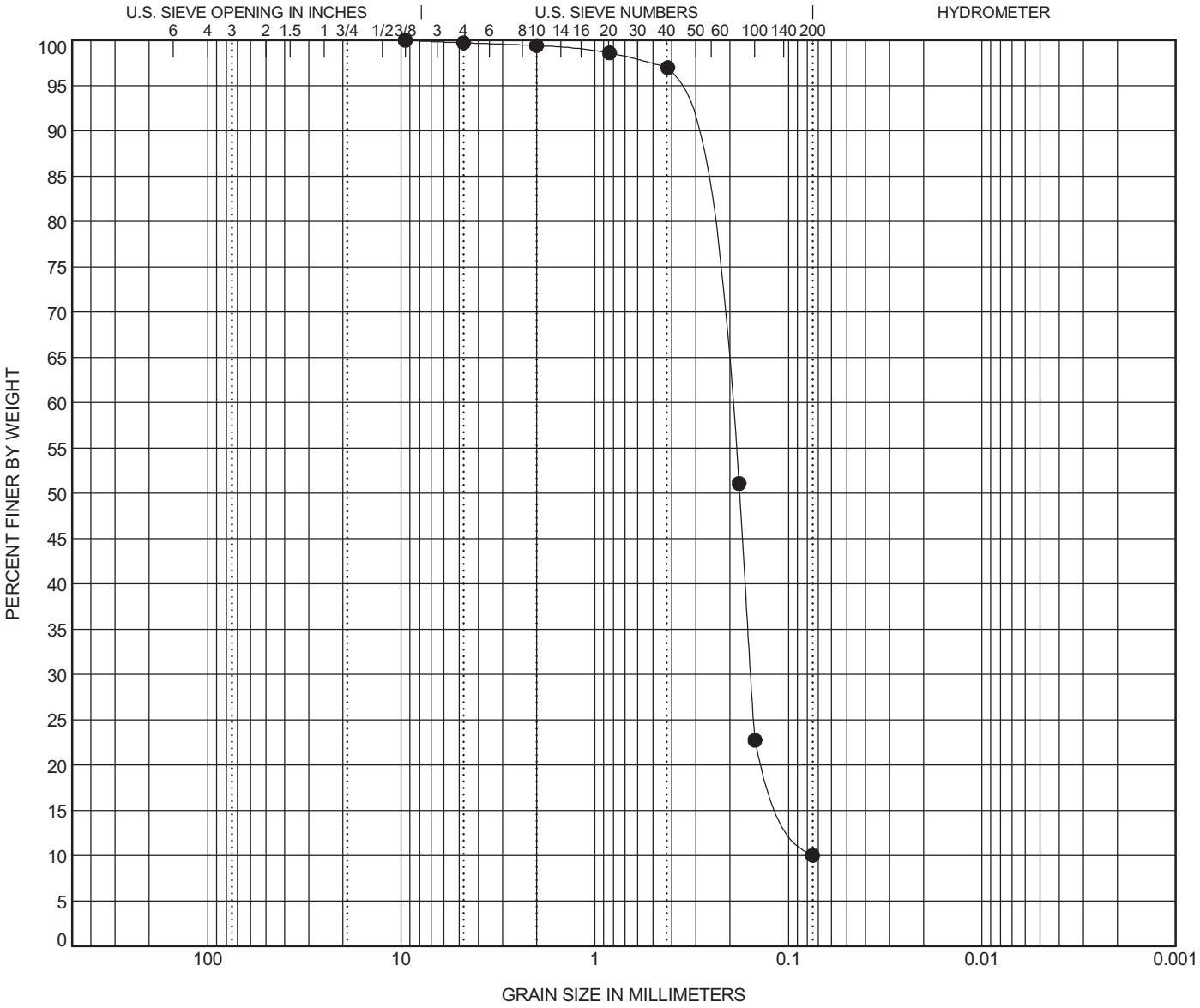
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-2	8.0	**Poorly Graded Fine SAND (SP) A-3**	**NP**	**NP**	**NP**	**1.42**	**2.03**
⊠	B-2	10.0	**Poorly Graded Fine SAND (SP) A-3**	**NP**	**NP**	**NP**	**1.22**	**2.02**
▲	B-2	20.0	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**	**NP**	**NP**	**NP**	**1.09**	**2.06**
★	B-2	30.0	**Silty Fine SAND (SM) A-2-4**	**NP**	**NP**	**NP**		
⊙	B-2	40.0	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**	**NP**	**NP**	**NP**	**1.29**	**2.27**

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	B-2	8.0	**2**	**0.385**	**0.172**	**0.091**	**0.0**	**95.1**	**4.9**	
⊠	B-2	10.0	**2**	**0.394**	**0.176**	**0.1**	**0.0**	**97.5**	**2.5**	
▲	B-2	20.0	**4.76**	**0.362**	**0.157**	**0.081**	**0.0**	**93.7**	**6.3**	
★	B-2	30.0	**9.52**	**0.393**	**0.153**		**0.3**	**85.7**	**14.0**	
⊙	B-2	40.0	**9.52**	**0.39**	**0.165**	**0.077**	**0.1**	**91.1**	**8.8**	

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

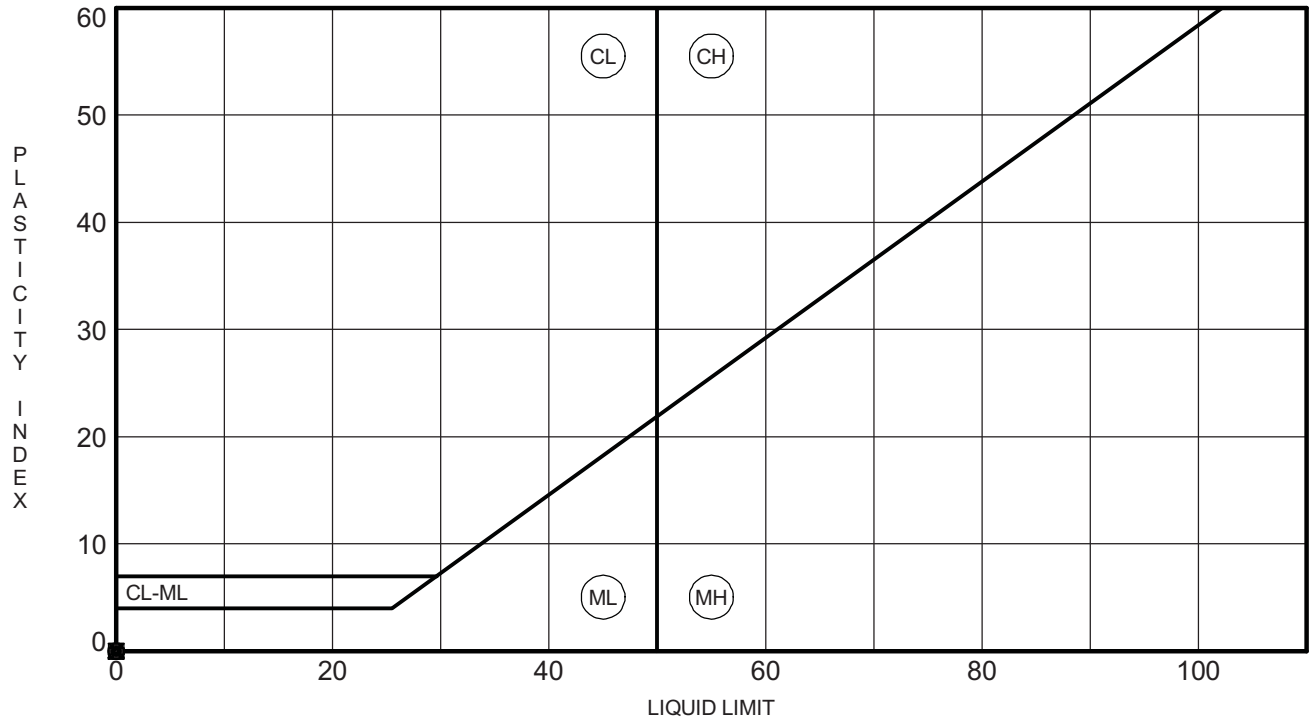
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**B-2**	**55.0**	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**	**NP**	**NP**	**NP**	**1.54**	**2.83**

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-2**	**55.0**	**9.52**	**0.405**	**0.179**		**0.3**	**89.7**	**10.0**	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-2**	**8.0**	**NP**	**NP**	**NP**	**5**	**Poorly Graded Fine SAND (SP) A-3**
⊠	**B-2**	**10.0**	**NP**	**NP**	**NP**	**3**	**Poorly Graded Fine SAND (SP) A-3**
▲	**B-2**	**20.0**	**NP**	**NP**	**NP**	**6**	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**
★	**B-2**	**30.0**	**NP**	**NP**	**NP**	**14**	**Silty Fine SAND (SM) A-2-4**
⊙	**B-2**	**40.0**	**NP**	**NP**	**NP**	**9**	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**
✿	**B-2**	**55.0**	**NP**	**NP**	**NP**	**10**	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**

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ORGANIC IMPURITIES DETERMINATION
(AASHTO T267)

PROJECT: US 21 Bridge Replacement over Harbor River

PROJECT NO.: G5396

SAMPLE NUMBER: 14-1328

DATE SAMPLE RECEIVED: 9/4/2014

DESCRIPTION OF SOIL: Various

TESTED BY: JH

DATE OF TESTING: 9/8/2014

DATE OF WEIGHING: 9/8/2014

BORING NO.	B-2	B-2	B-2		
SAMPLE NO.	14-1328A	14-1328B	14-1328C		
SAMPLE DEPTH	4.0'-6.0'	10.0'-12.0'	23.5'-25.0'		
WT. OF CRUCIBLE + DRY SOIL (BEFORE IGNITION) (GRAMS)	171.92	171.93	172.55		
WT. OF CRUCIBLE + DRY SOIL (AFTER IGNITION) (GRAMS)	171.71	171.75	172.09		
WT. OF CRUCIBLE (GRAMS)	134.66	132.08	135.70		
WT. OF DRY SOIL (BEFORE IGNITION) (GRAMS)	37.26	39.85	36.85		
WT. OF DRY SOIL (AFTER IGNITION) (GRAMS)	37.05	39.67	36.39		
IGNITION LOSS (GRAMS)	0.21	0.18	0.46		
ORGANIC IMPURITIES %	0.56	0.45	1.25		

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Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396.00
SAMPLE NUMBER:	15-1436	**DATE SAMPLE RECEIVED:**	10/1/2015
DESCRIPTION OF SOIL:	Various		
TESTED BY:	MM	**DATE OF TESTING:**	10/1/2015
		DATE OF WEIGHING:	10/2/2015

BORING NO.	B-3	B-3	B-3	B-3	B-3
SAMPLE NO.	15-1436C	15-1436G	15-1436J	15-1436Q	15-1436T
SAMPLE DEPTH	0.0-2.0'	6.0-8.0'	13.5-15.0'	23.5-25.0'	28.5-30.0'
WATER CONTENT, W%	36.9	151.6	26.1	29.3	101.1

BORING NO.	B-3				
SAMPLE NO.	15-1436W				
SAMPLE DEPTH	38.5-40.0'				
WATER CONTENT, W%	30.2				

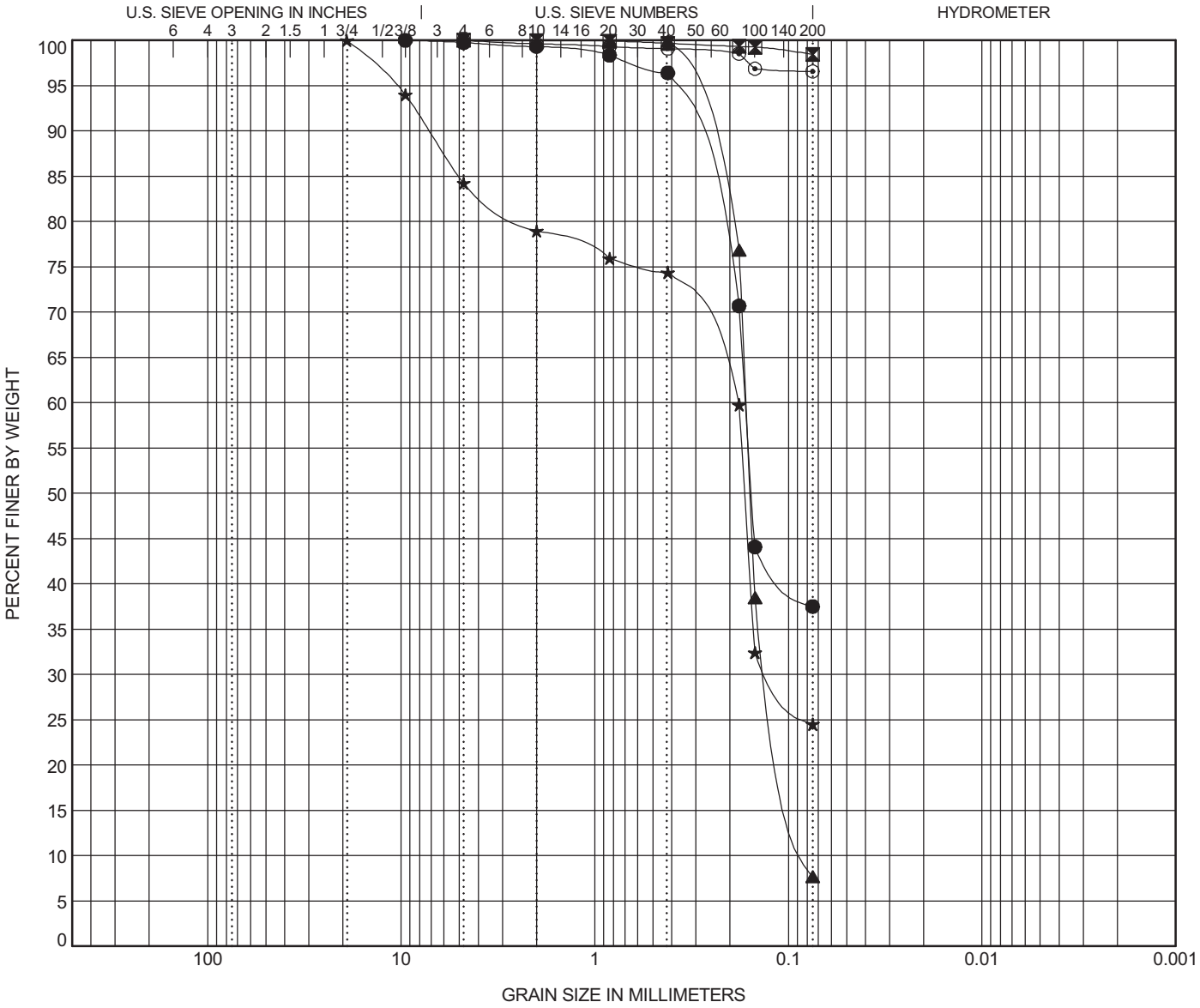
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

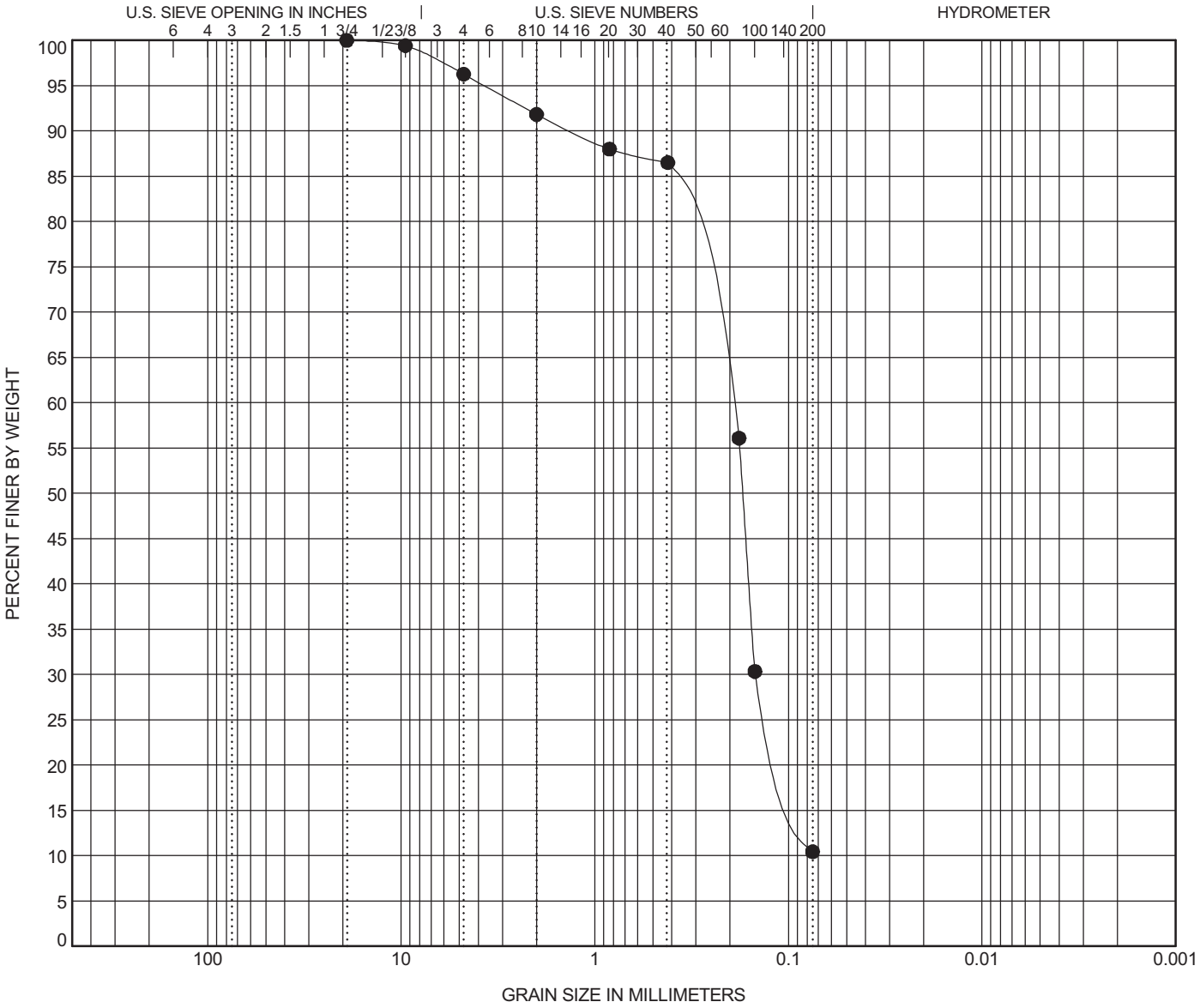
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-3	2.0	Silty Fine SAND (SM) A-4(0)	NP	NP	NP		
⊠	B-3	8.0	Elastic SILT (MH) A-7-5(36)	74	49	25		
▲	B-3	15.0	Poorly Graded Fine SAND (SP-SM) with Silt A-3	NP	NP	NP	1.16	2.10
★	B-3	25.0	Silty Fine SAND (SM) with Gravel A-2-4	NP	NP	NP		
⊙	B-3	30.0	Elastic SILT (MH) A-7-5(32)	58	31	27		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	B-3	2.0	9.52	0.401	0.155		0.2	62.3	37.5	
⊠	B-3	8.0	4.76				0.0	1.5	98.5	
▲	B-3	15.0	0.84	0.35	0.158	0.079	0.0	92.3	7.7	
★	B-3	25.0	19.1	10.692	0.168		15.8	59.7	24.5	
⊙	B-3	30.0	4.76				0.0	3.4	96.6	

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

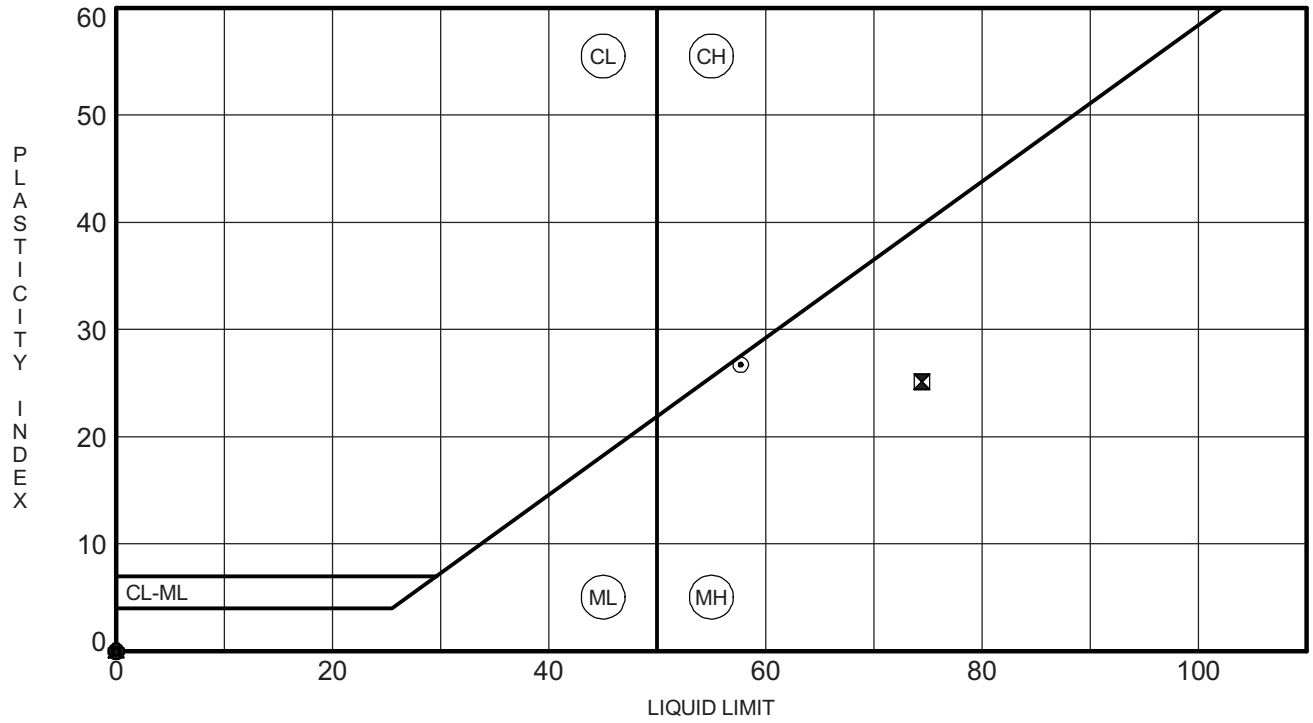
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**B-3**	**40.0**	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**	**NP**	**NP**	**NP**	**1.46**	**2.72**

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-3**	**40.0**	**19.1**	**3.709**	**0.172**		**3.7**	**85.8**	**10.4**	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-3**	**2.0**	**NP**	**NP**	**NP**	**38**	**Silty Fine SAND (SM) A-4(0)**
⊠	**B-3**	**8.0**	**74**	**49**	**25**	**98**	**Elastic SILT (MH) A-7-5(36)**
▲	**B-3**	**15.0**	**NP**	**NP**	**NP**	**8**	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**
★	**B-3**	**25.0**	**NP**	**NP**	**NP**	**25**	**Silty Fine SAND (SM) with Gravel A-2-4**
⊙	**B-3**	**30.0**	**58**	**31**	**27**	**97**	**Elastic SILT (MH) A-7-5(32)**
✿	**B-3**	**40.0**	**NP**	**NP**	**NP**	**10**	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

ORGANIC IMPURITIES DETERMINATION
(AASHTO T267)

PROJECT: US 21 Bridge Replacement over Harbor River

PROJECT NO.: G5396.00

SAMPLE NUMBER: 15-1436D

DATE SAMPLE RECEIVED:

DESCRIPTION OF SOIL:

TESTED BY: JH

DATE OF TESTING: 10/13/2015

DATE OF WEIGHING: 10/14/2015

BORING NO.	B-3				
SAMPLE NO.	15-1436D				
SAMPLE DEPTH	4.0'-6.0'				
WT. OF CRUCIBLE + DRY SOIL (BEFORE IGNITION) (GRAMS)	174.66				
WT. OF CRUCIBLE + DRY SOIL (AFTER IGNITION) (GRAMS)	173.24				
WT. OF CRUCIBLE (GRAMS)	134.66				
WT. OF DRY SOIL (BEFORE IGNITION) (GRAMS)	40.00				
WT. OF DRY SOIL (AFTER IGNITION) (GRAMS)	38.58				
IGNITION LOSS (GRAMS)	1.42				
ORGANIC IMPURITIES %	3.55				

Determining pH of Soil for Use in Corrosion Testing
AASHTO T 289

PROJECT TITLE	F&ME/HARBOR RIVER/SC	SAMPLE ID	B-3 15-1436M
PROJECT NO.	1524908.09	SAMPLE TYPE	Bag
REMARKS	F&ME Project No. G5396	SAMPLE DEPTH	18.5 - 20.0'

SAMPLE PREPARATION

Sieved through the #10 Sieve	YES
Air Dry	YES
Type of Water	DISTILLED

Trial	pH	Temperature
1	7.90	20.0
2	7.88	20.1
3	7.89	20.2
AVERAGE	7.89	20.1

Description SILTY SAND; dark gray, sea shells.

USCS (SM)

TECH	TJ
DATE	10/13/15
CHECK	
REVIEW	
APPROVE	

Determining Minimum Laboratory Soil Resistivity
AASHTO T 288

PROJECT TITLE	F&ME/HARBOR RIVER/SC	SAMPLE ID	B-3 15-1436N
PROJECT NO.	1524908.09	SAMPLE TYPE	Bag
REMARKS	F&ME Project No. G5396	SAMPLE DEPTH	18.5 - 20.0'

SAMPLE PREPARATION — Sieved through the #10 Sieve: Yes

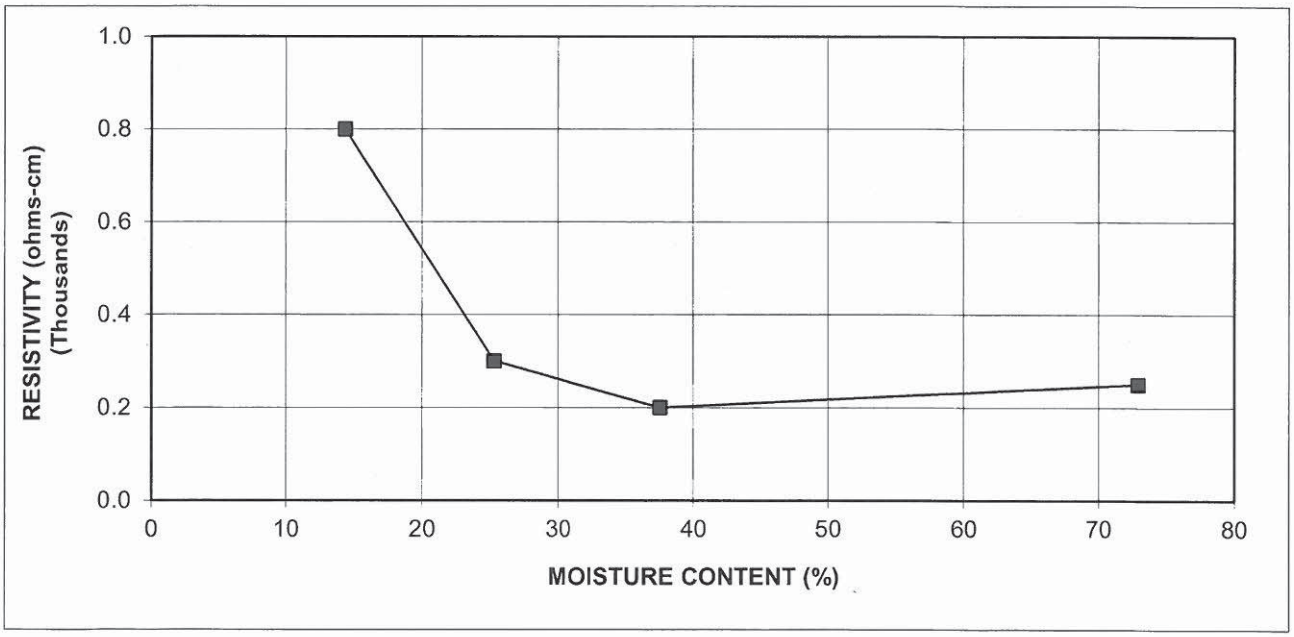
TEST APPARATUS — Miller Soilbox and Nilsson 400 Soil Resistance Meter.

Identification: Lowest resistivity

SPECIMEN (Point)	1	2	3	4
RESISTIVITY (ohms-cm)	800	300	200	250

MOISTURE CONTENT

WET WEIGHT & TARE	89.43	106.77	116.52	195.83
DRY WEIGHT & TARE	84.60	95.73	98.93	135.24
TARE WEIGHT	51.00	52.02	52.10	52.15
WEIGHT OF MOISTURE (gm)	4.83	11.04	17.59	60.59
WEIGHT OF DRY SOIL (gm)	33.60	43.71	46.83	83.09
MOISTURE CONTENT (%)	14.38	25.26	37.56	72.92



Description: SILTY SAND; dark gray, sea shells.

USCS: (SM)

TECH	TJ
DATE	10/13/15
CHECK	
REVIEW	
APPROVE	

ACL

ADVANCED CHEMISTRY LABS, INC.

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Client: Golder Associates, Inc.
3730 Chamblee Tucker Road
Atlanta, GA 30341-0000

Client Proj #: 1524908
ACL Project #: 68442
Date Received: 10/13/2015
Date Reported: 10/30/2015

Contact: Mr. Henry Mock

Sample ID: B-3 18.5-20'

Matrix: Soil

ACL #: 307835

Date/Time Sampled: 10/13/2015 11:15

Analyte (Method)	Result	PQL	Units	DF	Prep Date/Time	Analysis Date/Time	Analyst
Sol. Chloride (9252A)*	5080	500	mg/kg	50	10/16/2015 8:30	10/16/2015 8:30	MM
Sol. Sulfate (9038)*	126	50	mg/kg	5	10/19/2015 10:20	10/19/2015 10:20	MM

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396.00
SAMPLE NUMBER:	15-1437	**DATE SAMPLE RECEIVED:**	10/1/2015
DESCRIPTION OF SOIL:	Various		
TESTED BY:	MM	**DATE OF TESTING:**	10/1/2015
		DATE OF WEIGHING:	10/2/2015

BORING NO.	B-4	B-4	B-4	B-4	B-4
SAMPLE NO.	15-1437C	15-1437G	15-1437J	15-1437M	15-1437P
SAMPLE DEPTH	2.0-4.0'	8.0-10.0'	13.5-15.0'	23.5-25.0'	33.5-35.0'
WATER CONTENT, W%	52.5	32.9	31.8	27.8	35.8

BORING NO.	B-4	B-4			
SAMPLE NO.	15-1437W	15-1437Z			
SAMPLE DEPTH	48.5-50.0'	63.5-65.0'			
WATER CONTENT, W%	31.8	64.5			

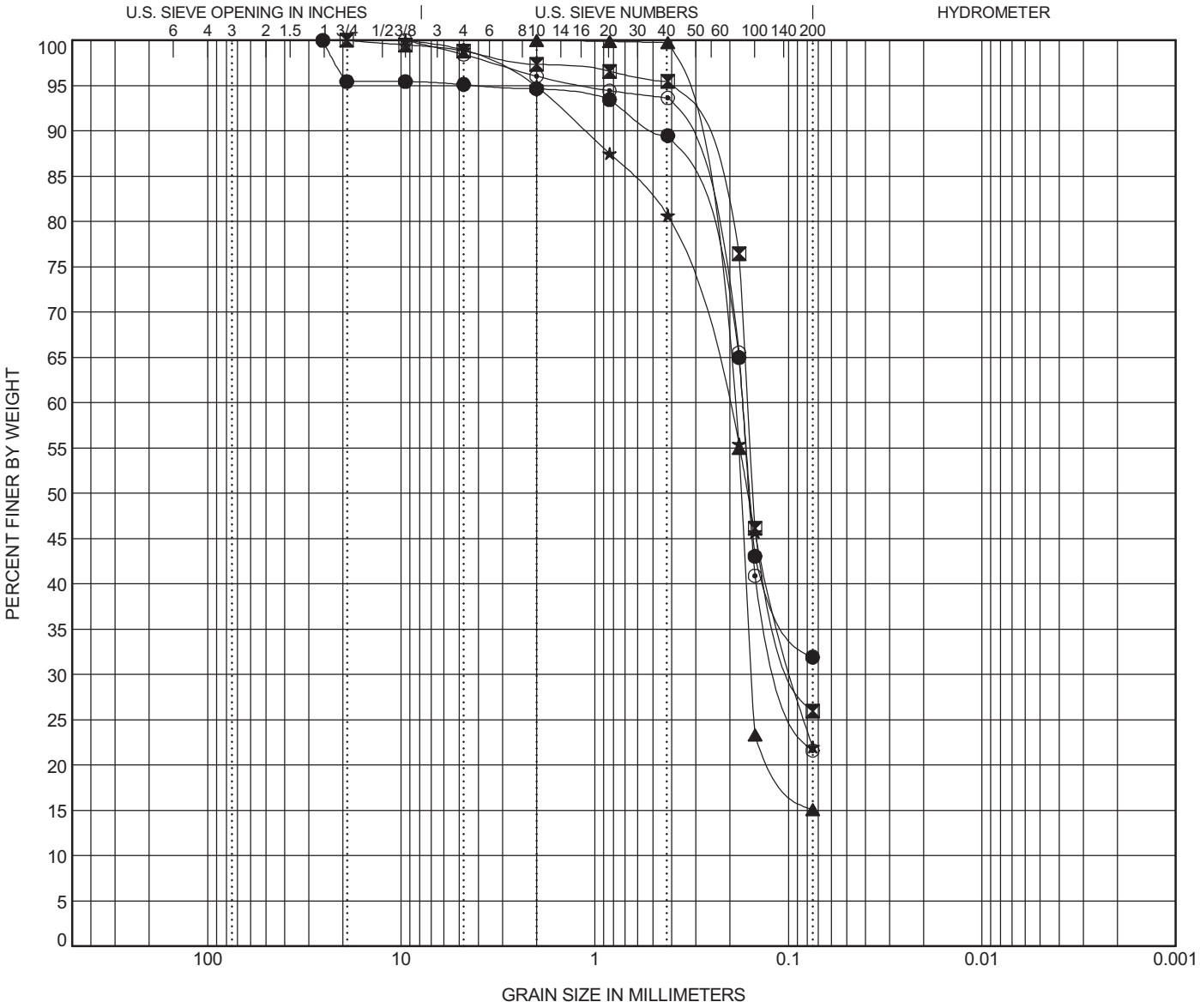
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

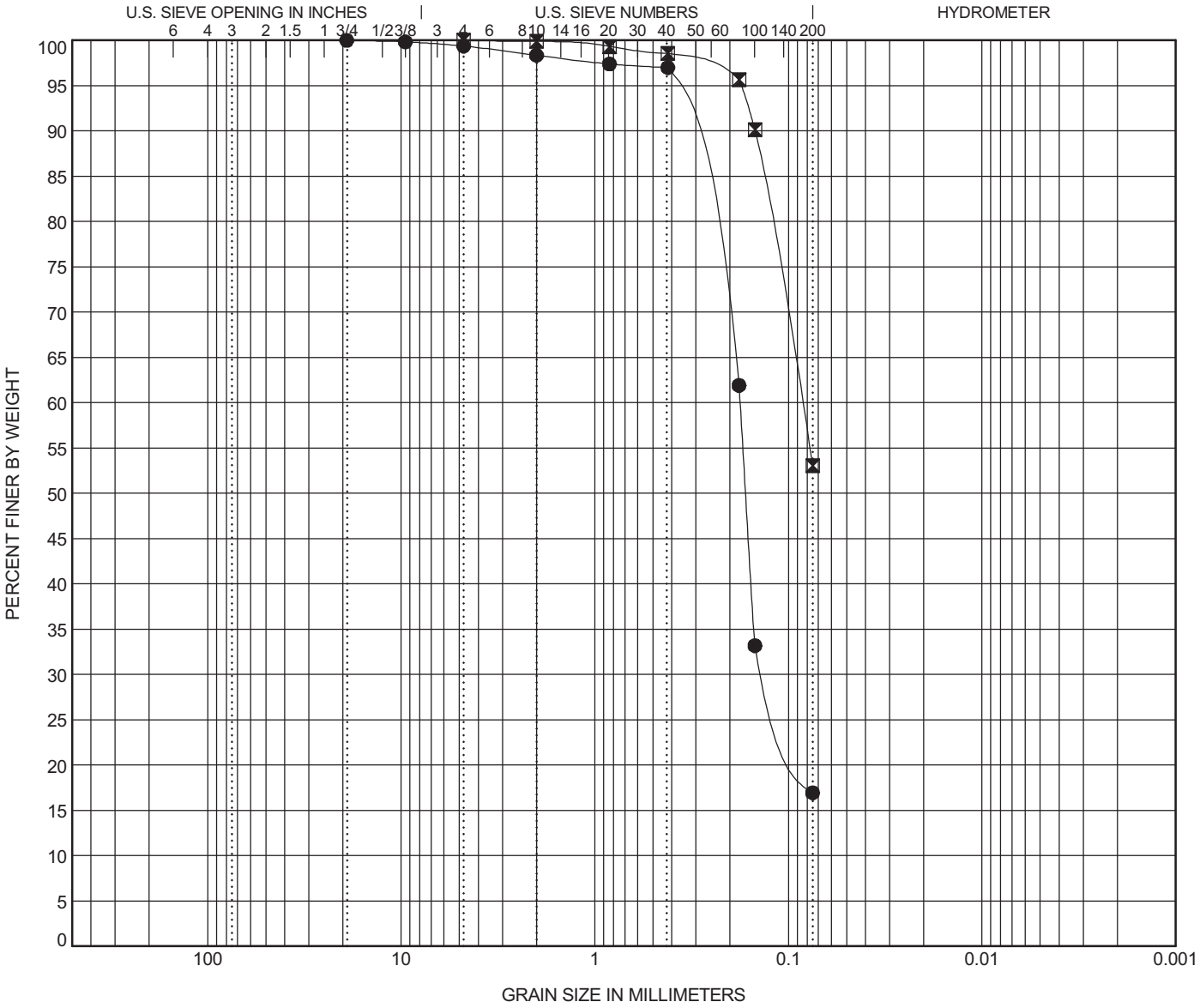
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-4	4.0	Silty Fine SAND (SM) A-2-4	NP	NP	NP		
⊠	B-4	10.0	Silty Fine SAND (SM) A-2-4	NP	NP	NP		
▲	B-4	15.0	Silty Fine SAND (SM) A-2-4	NP	NP	NP		
★	B-4	25.0	Silty Fine SAND (SM) A-2-4	NP	NP	NP		
⊙	B-4	35.0	Silty Fine SAND (SM) A-2-4	NP	NP	NP		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	B-4	4.0	25.4	3.699	0.158		4.9	63.2	31.9	
⊠	B-4	10.0	19.1	0.411	0.153		1.2	72.9	26.0	
▲	B-4	15.0	2	0.384	0.175		0.0	84.9	15.1	
★	B-4	25.0	9.52	2.034	0.162		1.1	76.9	22.0	
⊙	B-4	35.0	9.52	1.13	0.16		1.6	76.8	21.6	

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

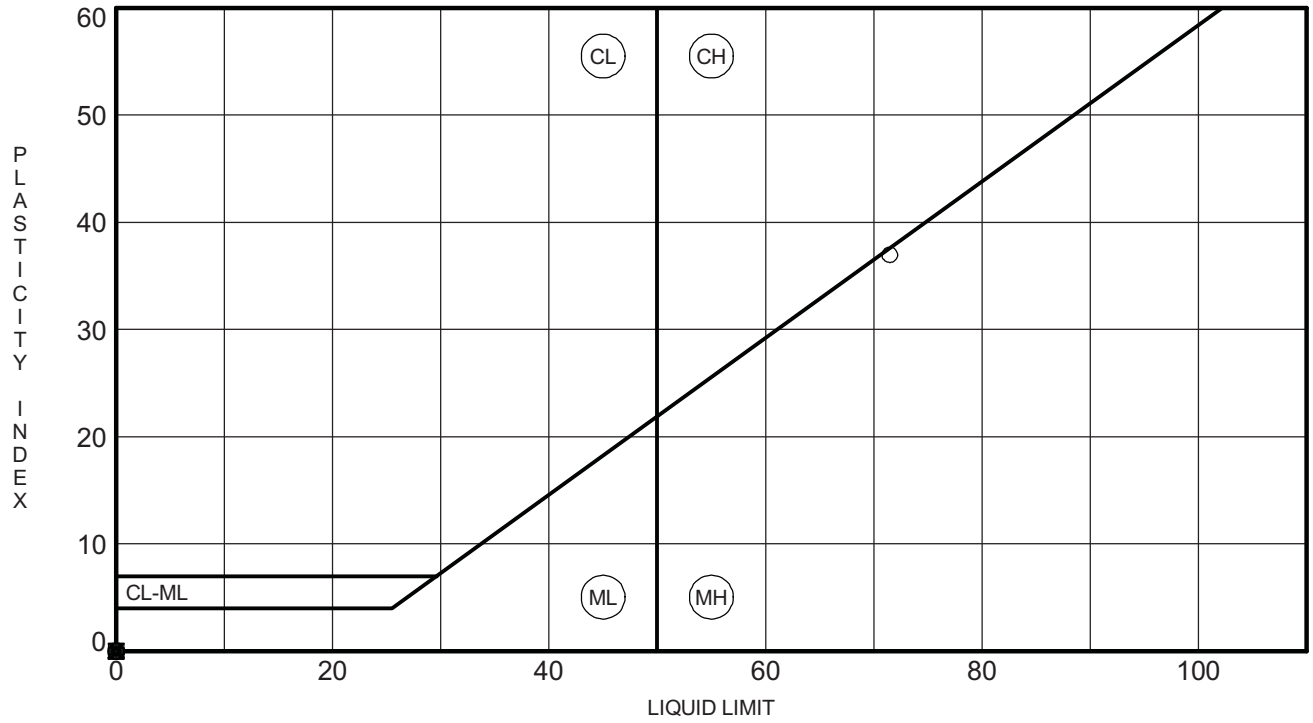
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**B-4**	**50.0**	**Silty Fine SAND (SM) A-2-4**	**NP**	**NP**	**NP**		
⊠	**B-4**	**65.0**	**Sandy Elastic SILT (MH) A-7-5(16)**	**71**	**35**	**36**		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-4**	**50.0**	**19.1**	**0.4**	**0.166**		**0.6**	**82.4**	**17.0**	
⊠	**B-4**	**65.0**	**4.76**	**0.176**			**0.0**	**46.9**	**53.1**	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-4**	**4.0**	**NP**	**NP**	**NP**	**32**	**Silty Fine SAND (SM) A-2-4**
⊠	**B-4**	**10.0**	**NP**	**NP**	**NP**	**26**	**Silty Fine SAND (SM) A-2-4**
▲	**B-4**	**15.0**	**NP**	**NP**	**NP**	**15**	**Silty Fine SAND (SM) A-2-4**
★	**B-4**	**25.0**	**NP**	**NP**	**NP**	**22**	**Silty Fine SAND (SM) A-2-4**
⊙	**B-4**	**35.0**	**NP**	**NP**	**NP**	**22**	**Silty Fine SAND (SM) A-2-4**
✿	**B-4**	**50.0**	**NP**	**NP**	**NP**	**17**	**Silty Fine SAND (SM) A-2-4**
○	**B-4**	**65.0**	**71**	**35**	**36**	**53**	**Sandy Elastic SILT (MH) A-7-5(16)**

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

ORGANIC IMPURITIES DETERMINATION
(AASHTO T267)

PROJECT: US 21 Bridge Replacement over Harbor River

PROJECT NO.: G5396.00

SAMPLE NUMBER: 15-1437D

DATE SAMPLE RECEIVED:

DESCRIPTION OF SOIL:

TESTED BY: JH

DATE OF TESTING: 10/13/2015

DATE OF WEIGHING: 10/14/2015

BORING NO.	B-4				
SAMPLE NO.	15-1437D				
SAMPLE DEPTH	4.0'-6.0'				
WT. OF CRUCIBLE + DRY SOIL (BEFORE IGNITION) (GRAMS)	172.08				
WT. OF CRUCIBLE + DRY SOIL (AFTER IGNITION) (GRAMS)	171.01				
WT. OF CRUCIBLE (GRAMS)	132.08				
WT. OF DRY SOIL (BEFORE IGNITION) (GRAMS)	40.00				
WT. OF DRY SOIL (AFTER IGNITION) (GRAMS)	38.93				
IGNITION LOSS (GRAMS)	1.07				
ORGANIC IMPURITIES %	2.68				

Determining pH of Soil for Use in Corrosion Testing
AASHTO T 289

PROJECT TITLE	F&ME/HARBOR RIVER/SC	SAMPLE ID	B-4 15-1437S
PROJECT NO.	1524908.09	SAMPLE TYPE	Bag
REMARKS	F&ME Project No. G5396	SAMPLE DEPTH	38.5 - 40.0'

SAMPLE PREPARATION

Sieved through the #10 Sieve	YES
Air Dry	YES
Type of Water	DISTILLED

Trial	pH	Temperature
1	8.03	20.1
2	8.04	20.2
3	8.04	20.2
AVERAGE	8.04	20.2

Description CLAYEY SAND; olive brown.

USCS (SC)

TECH	TJ
DATE	10/13/15
CHECK	
REVIEW	CWM
APPROVE	

Determining Minimum Laboratory Soil Resistivity
AASHTO T 288

PROJECT TITLE	F&ME/HARBOR RIVER/SC	SAMPLE ID	B-4 15-1437T
PROJECT NO.	1524908.09	SAMPLE TYPE	Bag
REMARKS	F&ME Project No. G5396	SAMPLE DEPTH	38.5 - 40.0'

SAMPLE PREPARATION — Sieved through the #10 Sieve: Yes

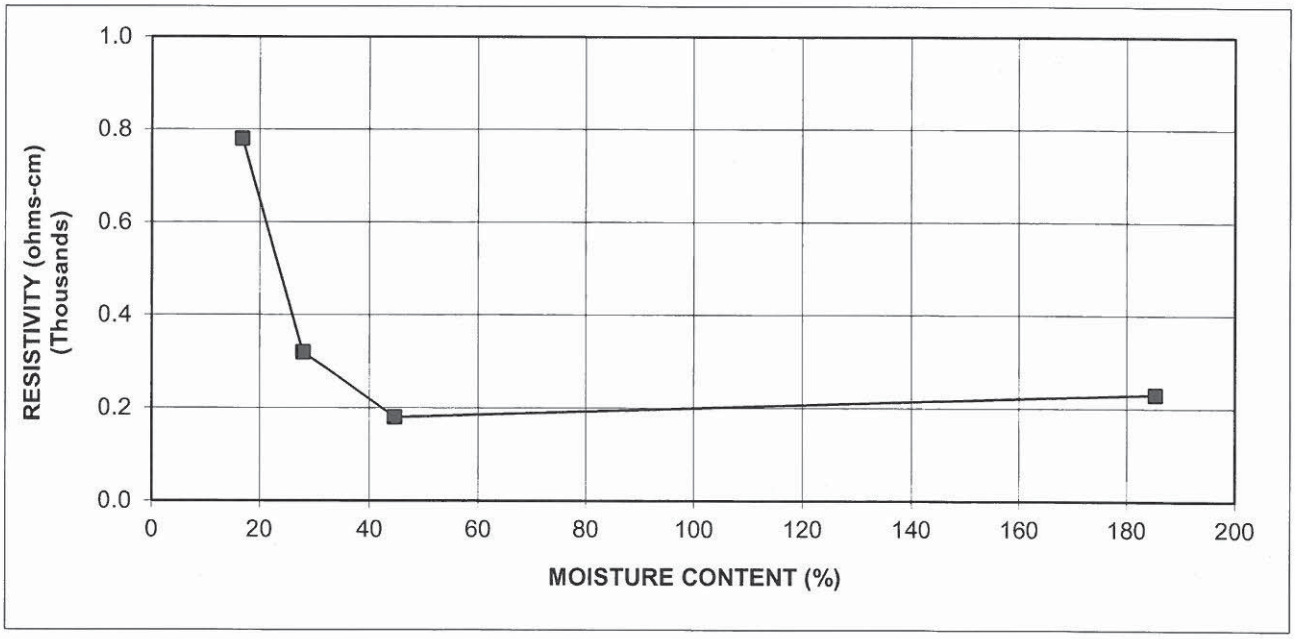
TEST APPARATUS — Miller Soilbox and Nilsson 400 Soil Resistance Meter.

Identification: Lowest resistivity

SPECIMEN (Point)	1	2	3	4
RESISTIVITY (ohms-cm)	780	320	180	230

MOISTURE CONTENT

WET WEIGHT & TARE	89.28	100.21	117.14	258.52
DRY WEIGHT & TARE	83.76	89.62	97.00	123.87
TARE WEIGHT	50.92	51.73	51.88	51.22
WEIGHT OF MOISTURE (gm)	5.52	10.59	20.14	134.65
WEIGHT OF DRY SOIL (gm)	32.84	37.89	45.12	72.65
MOISTURE CONTENT (%)	16.81	27.95	44.64	185.34



Description: CLAYEY SAND; olive brown.

USCS: (SC)

TECH	TJ
DATE	10/13/15
CHECK	
REVIEW	
APPROVE	

ACL

ADVANCED CHEMISTRY LABS, INC.

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e-mail: acl@acl-labs.net

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P.O. Box 88610 • Atlanta, GA 30356
www.acl-labs.com

Client: Golder Associates, Inc.
3730 Chamblee Tucker Road
Atlanta, GA 30341-0000

Client Proj #: 1524908
ACL Project #: 68442
Date Received: 10/13/2015
Date Reported: 10/30/2015

Contact: Mr. Henry Mock

Sample ID: B-4 38.5-40'

Matrix: Soil

ACL #: 307836

Date/Time Sampled: 10/13/2015 11:15

Analyte (Method)	Result	PQL	Units	DF	Prep Date/Time	Analysis Date/Time	Analyst
Sol. Chloride (9252A)*	8350	500	mg/kg	50	10/16/2015 8:30	10/16/2015 8:30	MM
Sol. Sulfate (9038)*	559	200	mg/kg	20	10/19/2015 10:20	10/19/2015 10:20	MM

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396.00
SAMPLE NUMBER:	15-1438	**DATE SAMPLE RECEIVED:**	10/1/2015
DESCRIPTION OF SOIL:	Various		
TESTED BY:	MM	**DATE OF TESTING:**	10/1/2015
		DATE OF WEIGHING:	10/2/2015

BORING NO.	B-5	B-5	B-5	B-5	B-5
SAMPLE NO.	15-1438C	15-1438F	15-1438J	15-1438M	15-1438T
SAMPLE DEPTH	2.0-4.0'	6.0-8.0'	13.5-15.0'	23.5-25.0'	33.5-35.0'
WATER CONTENT, W%	27.9	24.1	36.1	26.8	39.0

BORING NO.	B-5	B-5			
SAMPLE NO.	15-1438W	15-1438Z			
SAMPLE DEPTH	43.5-45.0'	53.5-55.0'			
WATER CONTENT, W%	33.4	38.9			

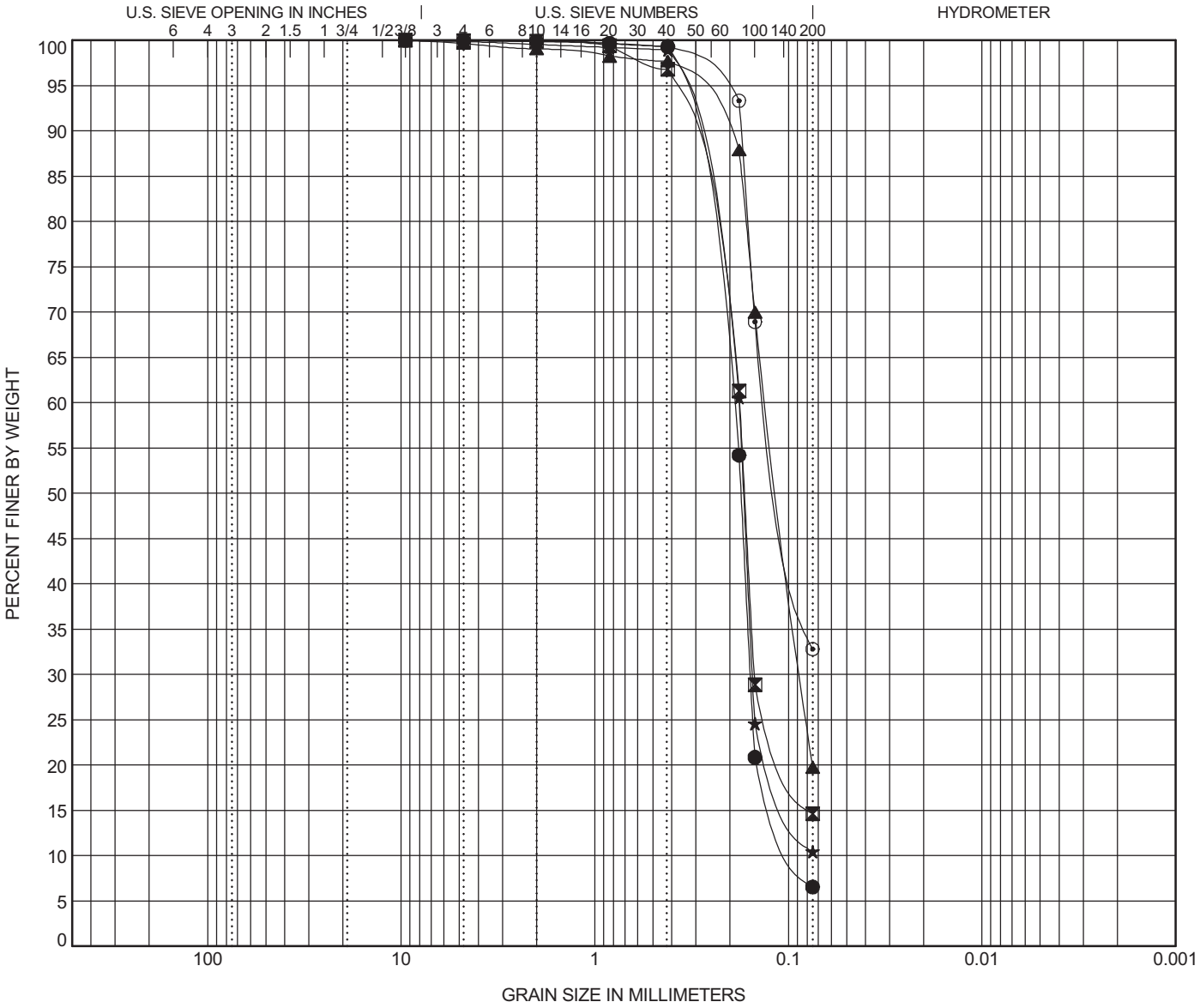
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

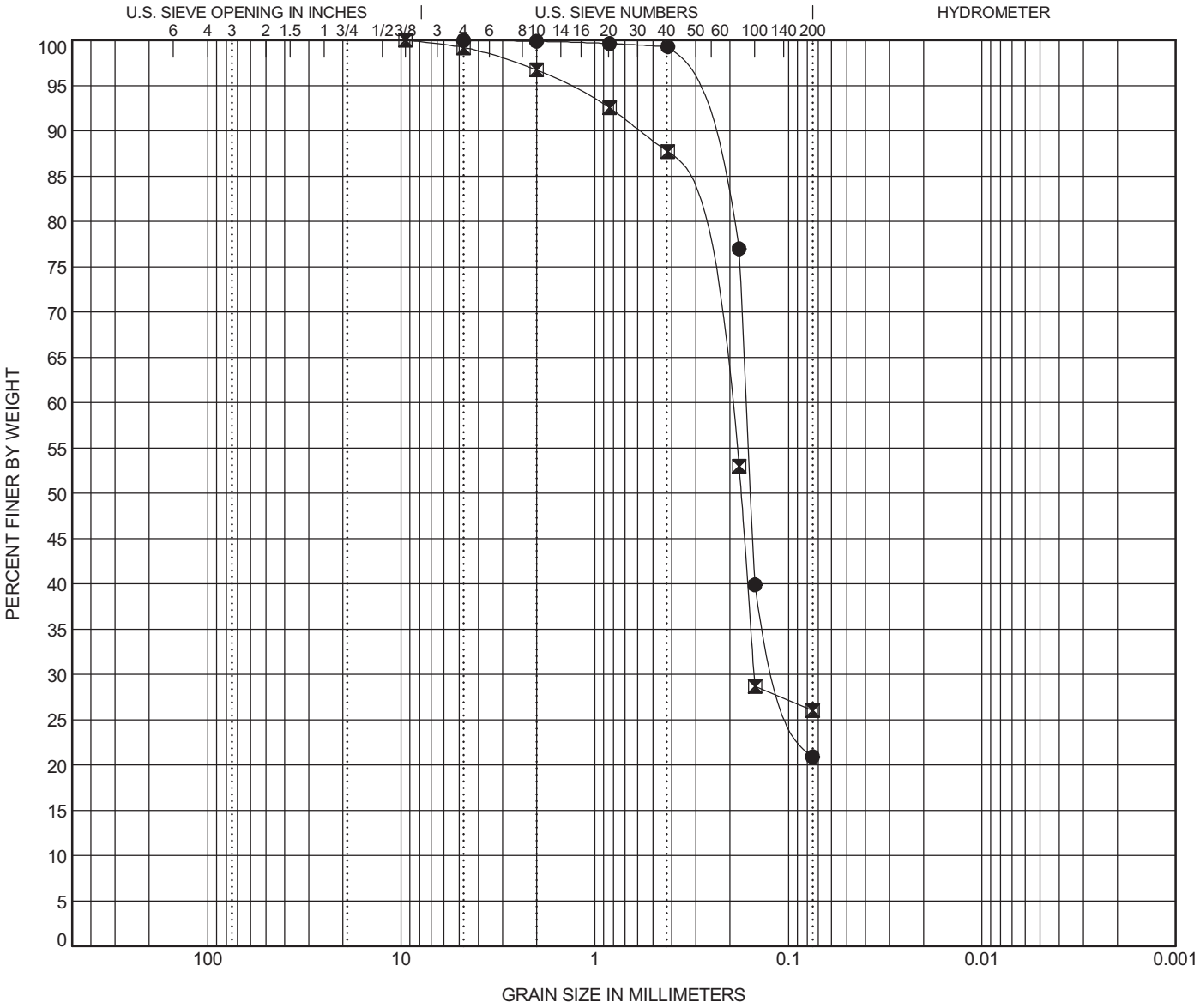
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-5	4.0	Poorly Graded Fine SAND (SP-SM) with Silt A-3	NP	NP	NP	1.39	2.27
⊠	B-5	8.0	Silty Fine SAND (SM) A-2-4	NP	NP	NP		
▲	B-5	15.0	Silty Fine SAND (SM) A-2-4	NP	NP	NP		
★	B-5	25.0	Poorly Graded Fine SAND (SP-SM) with Silt A-3	NP	NP	NP	1.79	2.45
⊙	B-5	35.0	Silty Fine SAND (SM) A-2-4	NP	NP	NP		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	B-5	4.0	9.52	0.387	0.176	0.088	0.0	93.4	6.6	
⊠	B-5	8.0	9.52	0.402	0.169		0.0	85.3	14.6	
▲	B-5	15.0	9.52	0.332	0.113		0.3	79.9	19.7	
★	B-5	25.0	9.52	0.385	0.17		0.1	89.4	10.5	
⊙	B-5	35.0	4.76	0.227	0.104		0.0	67.2	32.8	

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

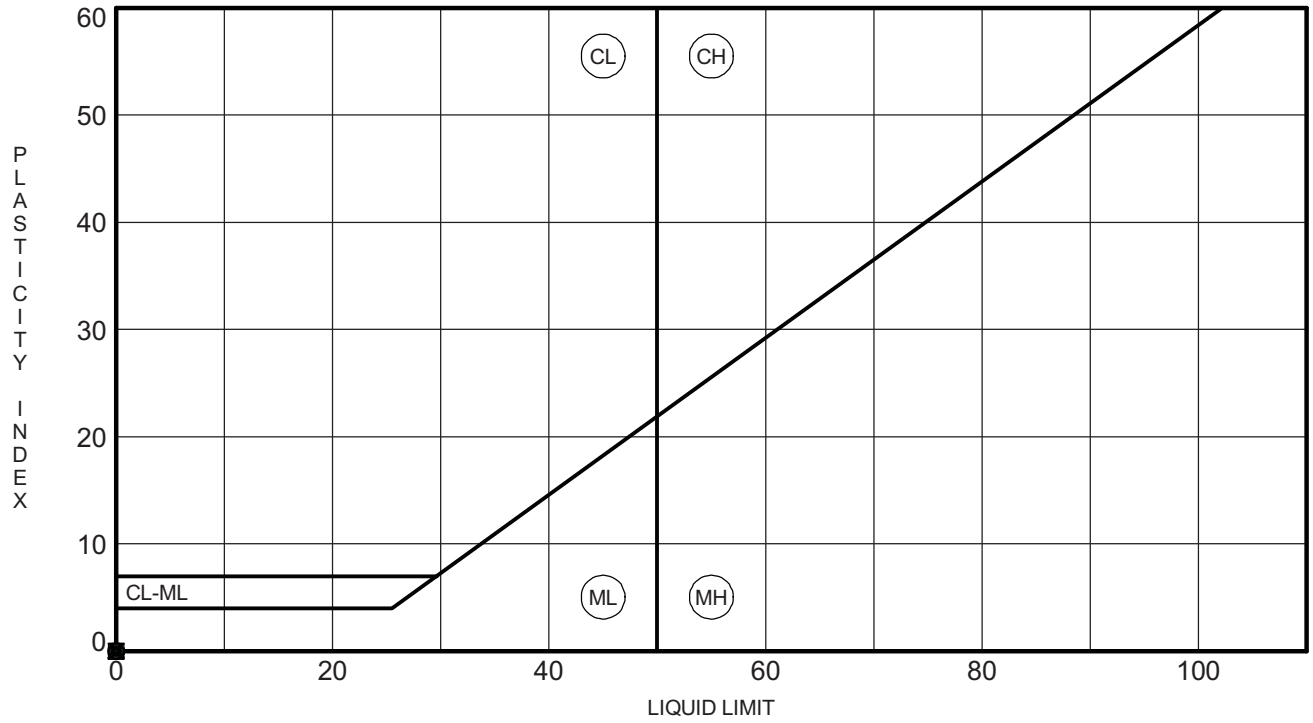
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**B-5**	**45.0**	**Silty Fine SAND (SM) A-2-4**	**NP**	**NP**	**NP**		
⊠	**B-5**	**55.0**	**Silty Fine SAND (SM) A-2-4**	**NP**	**NP**	**NP**		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-5**	**45.0**	**4.76**	**0.357**	**0.157**		**0.0**	**79.1**	**20.9**	
⊠	**B-5**	**55.0**	**9.52**	**1.393**	**0.176**		**0.8**	**73.2**	**26.0**	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-5**	**4.0**	**NP**	**NP**	**NP**	**7**	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**
⊠	**B-5**	**8.0**	**NP**	**NP**	**NP**	**15**	**Silty Fine SAND (SM) A-2-4**
▲	**B-5**	**15.0**	**NP**	**NP**	**NP**	**20**	**Silty Fine SAND (SM) A-2-4**
★	**B-5**	**25.0**	**NP**	**NP**	**NP**	**10**	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**
⊙	**B-5**	**35.0**	**NP**	**NP**	**NP**	**33**	**Silty Fine SAND (SM) A-2-4**
✿	**B-5**	**45.0**	**NP**	**NP**	**NP**	**21**	**Silty Fine SAND (SM) A-2-4**
○	**B-5**	**55.0**	**NP**	**NP**	**NP**	**26**	**Silty Fine SAND (SM) A-2-4**

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

ORGANIC IMPURITIES DETERMINATION
(AASHTO T267)

PROJECT: US 21 Bridge Replacement over Harbor River

PROJECT NO.: G5396.00

SAMPLE NUMBER: 15-1438G

DATE SAMPLE RECEIVED:

DESCRIPTION OF SOIL:

TESTED BY: JH

DATE OF TESTING: 10/13/2015

DATE OF WEIGHING: 10/14/2015

BORING NO.	B-5				
SAMPLE NO.	15-1438G				
SAMPLE DEPTH	8.0'-10.0'				
WT. OF CRUCIBLE + DRY SOIL (BEFORE IGNITION) (GRAMS)	169.97				
WT. OF CRUCIBLE + DRY SOIL (AFTER IGNITION) (GRAMS)	169.86				
WT. OF CRUCIBLE (GRAMS)	129.97				
WT. OF DRY SOIL (BEFORE IGNITION) (GRAMS)	40.00				
WT. OF DRY SOIL (AFTER IGNITION) (GRAMS)	39.89				
IGNITION LOSS (GRAMS)	0.11				
ORGANIC IMPURITIES %	0.27				

Determining pH of Soil for Use in Corrosion Testing
AASHTO T 289

PROJECT TITLE	F&ME/HARBOR RIVER/SC	SAMPLE ID	B-5 15-1438P
PROJECT NO.	1524908.09	SAMPLE TYPE	Bag
REMARKS	F&ME Project No. G5396	SAMPLE DEPTH	28.5 - 30.0'

SAMPLE PREPARATION

Sieved through the #10 Sieve	YES
Air Dry	YES
Type of Water	DISTILLED

Trial	pH	Temperature
1	8.20	20.1
2	8.19	20.2
3	8.21	20.2
AVERAGE	8.20	20.2

Description SILTY CLAY; olive brown.

USCS (CL)

TECH	TJ
DATE	10/13/15
CHECK	
REVIEW	
APPROVE	

Determining Minimum Laboratory Soil Resistivity
AASHTO T 288

PROJECT TITLE	F&ME/HARBOR RIVER/SC	SAMPLE ID	B-5 15-1438Q
PROJECT NO.	1524908.09	SAMPLE TYPE	Bag
REMARKS	F&ME Project No. G5396	SAMPLE DEPTH	28.5 - 30.0'

SAMPLE PREPARATION — Sieved through the #10 Sieve: Yes

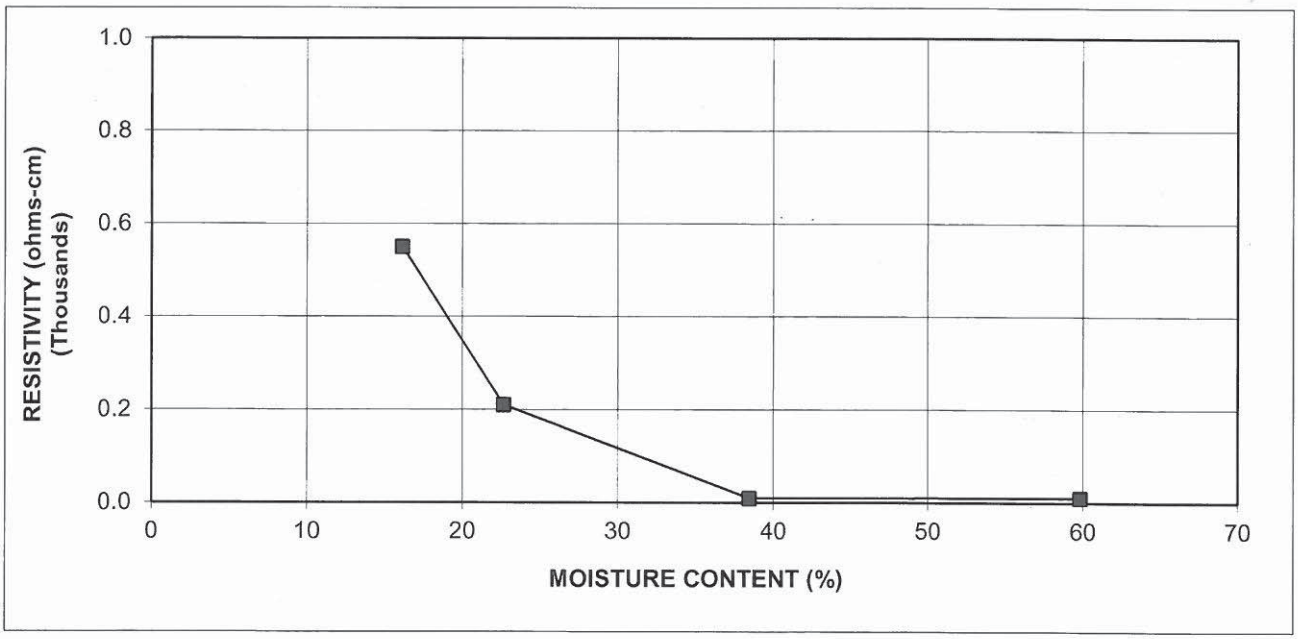
TEST APPARATUS — Miller Soilbox and Nilsson 400 Soil Resistance Meter.

Identification: Lowest resistivity

SPECIMEN (Point)	1	2	3	4
RESISTIVITY (ohms-cm)	550	210	9.5	10.0

MOISTURE CONTENT

WET WEIGHT & TARE	108.40	132.51	131.98	358.88
DRY WEIGHT & TARE	100.56	117.40	109.63	244.07
TARE WEIGHT	51.87	50.72	51.50	52.16
WEIGHT OF MOISTURE (gm)	7.84	15.11	22.35	114.81
WEIGHT OF DRY SOIL (gm)	48.69	66.68	58.13	191.91
MOISTURE CONTENT (%)	16.10	22.66	38.45	59.82



Description: SILTY CLAY; olive brown.

USCS: (CL)

TECH	TJ
DATE	10/13/15
CHECK	
REVIEW	
APPROVE	

ACL

ADVANCED CHEMISTRY LABS, INC.

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P.O. Box 88610 • Atlanta, GA 30356
www.acl-labs.com

Client: Golder Associates, Inc.
3730 Chamblee Tucker Road
Atlanta, GA 30341-0000

Client Proj #: 1524908
ACL Project #: 68442
Date Received: 10/13/2015
Date Reported: 10/30/2015

Contact: Mr. Henry Mock

Sample ID: B-5 28.5-30'

Matrix: Soil

ACL #: 307837

Date/Time Sampled: 10/13/2015 11:15

Analyte (Method)	Result	PQL	Units	DF	Prep Date/Time	Analysis Date/Time	Analyst
Sol. Chloride (9252A)*	8360	500	mg/kg	50	10/16/2015 8:30	10/16/2015 8:30	MM
Sol. Sulfate (9038)*	488	200	mg/kg	20	10/19/2015 10:20	10/19/2015 10:20	MM

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396.00
SAMPLE NUMBER:	15-1439	**DATE SAMPLE RECEIVED:**	10/1/2015
DESCRIPTION OF SOIL:	Various		
TESTED BY:	MM	**DATE OF TESTING:**	10/1/2015
		DATE OF WEIGHING:	10/2/2015

BORING NO.	B-6	B-6	B-6	B-6	B-6
SAMPLE NO.	15-1439D	15-1439G	15-1439J	15-1439M	15-1439P
SAMPLE DEPTH	4.0-6.0'	8.0-10.0'	13.5-15.0'	23.5-25.0'	28.5-30.0'
WATER CONTENT, W%	28.4	24.6	34.8	24.8	28.8

BORING NO.	B-6				
SAMPLE NO.	15-1439S				
SAMPLE DEPTH	38.5-40.0'				
WATER CONTENT, W%	27.5				

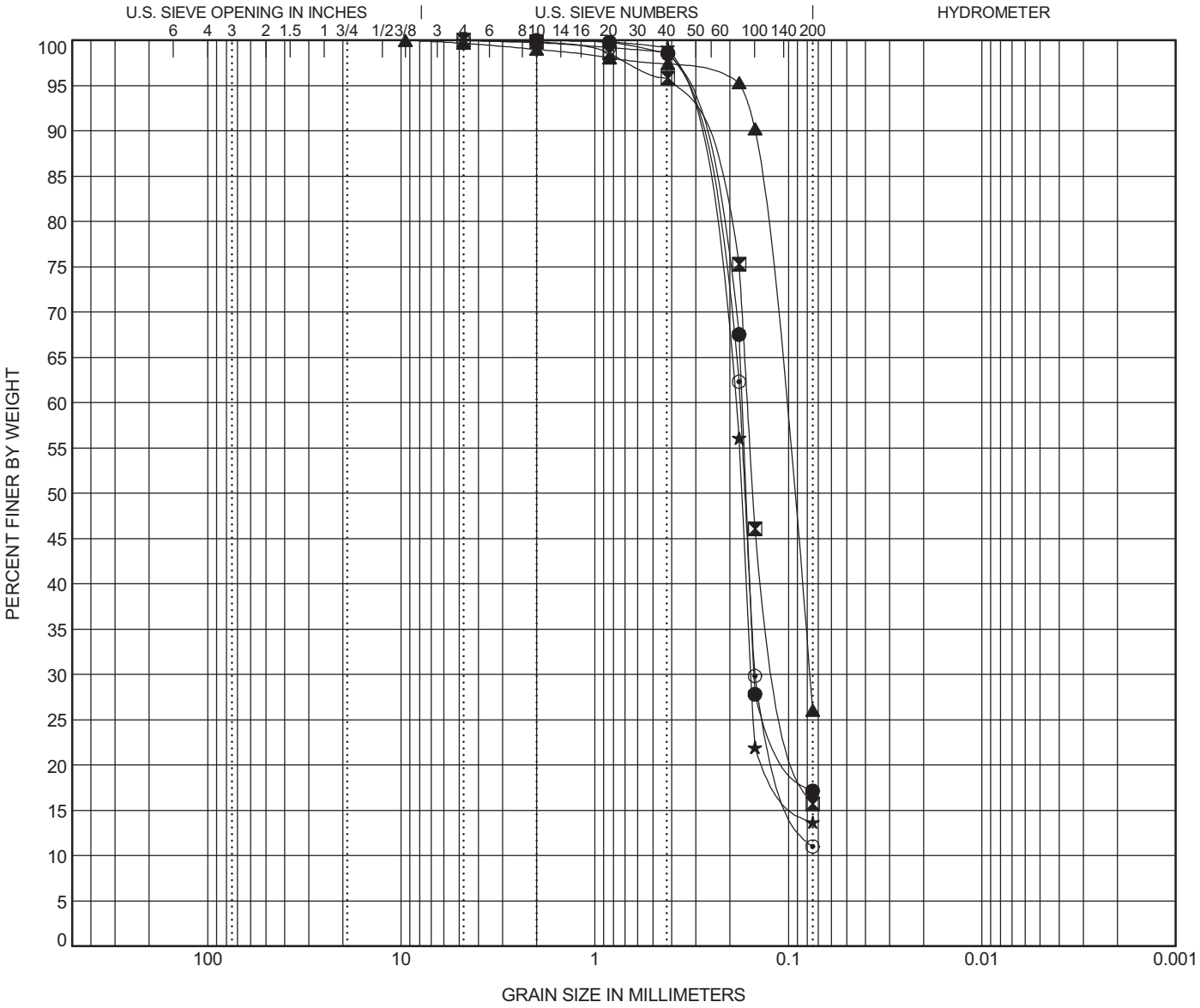
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

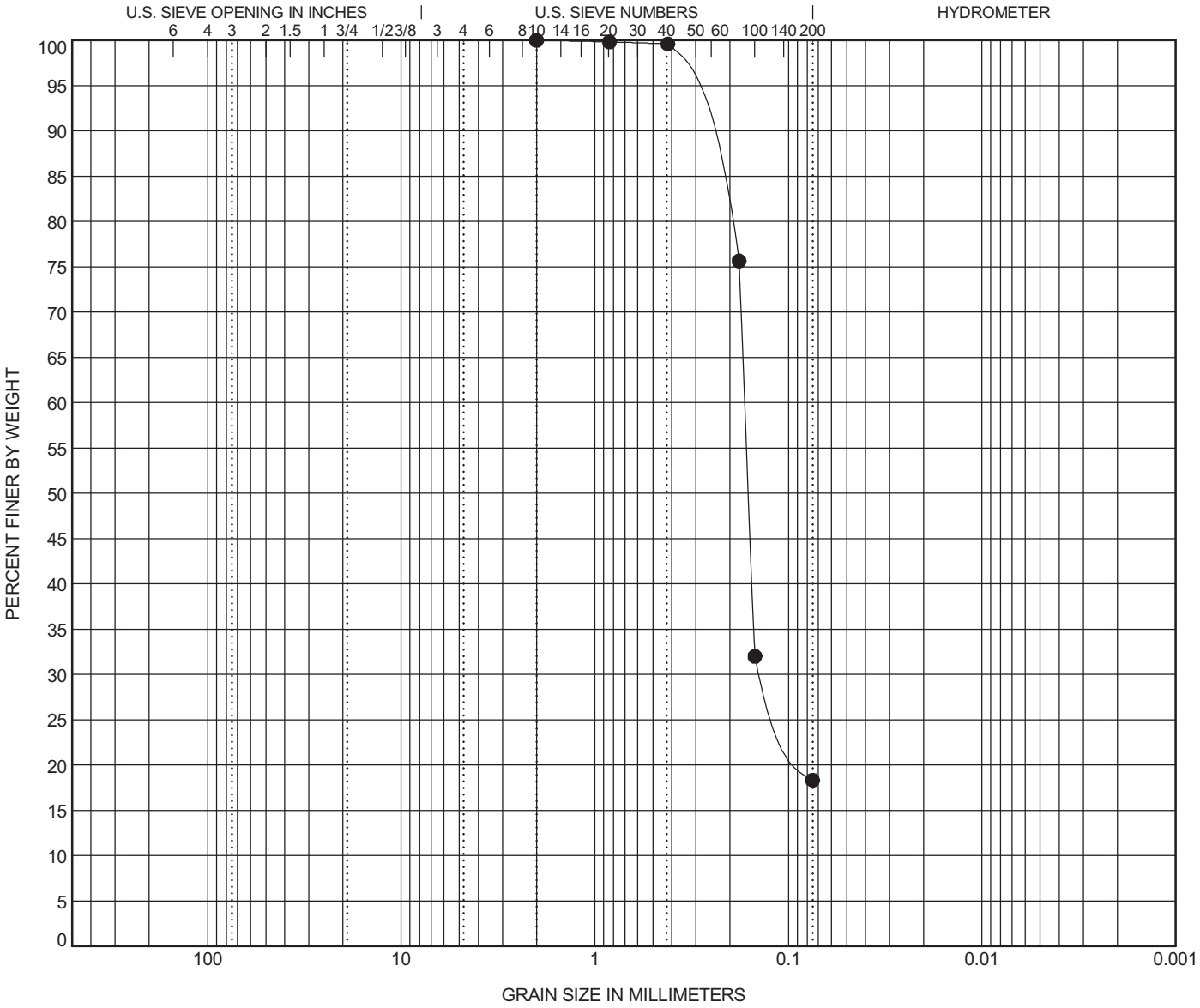
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**B-6**	**6.0**	**Silty Fine SAND (SM) A-2-4**	**NP**	**NP**	**NP**		
⊠	**B-6**	**10.0**	**Silty Fine SAND (SM) A-2-4**	**NP**	**NP**	**NP**		
▲	**B-6**	**15.0**	**Silty Fine SAND (SM) A-2-4**	**NP**	**NP**	**NP**		
★	**B-6**	**25.0**	**Silty Fine SAND (SM) A-2-4**	**NP**	**NP**	**NP**		
⊙	**B-6**	**30.0**	**Poorly Graded Fine SAND (SP-SM) with Silt A-2-4**	**NP**	**NP**	**NP**	**1.73**	**2.46**

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-6**	**6.0**	**2**	**0.381**	**0.166**		**0.0**	**82.8**	**17.2**	
⊠	**B-6**	**10.0**	**4.76**	**0.405**	**0.153**		**0.0**	**84.3**	**15.7**	
▲	**B-6**	**15.0**	**9.52**	**0.178**	**0.097**		**0.3**	**73.6**	**26.1**	
★	**B-6**	**25.0**	**4.76**	**0.387**	**0.174**		**0.0**	**86.3**	**13.7**	
⊙	**B-6**	**30.0**	**4.76**	**0.385**	**0.168**		**0.0**	**89.0**	**11.0**	

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

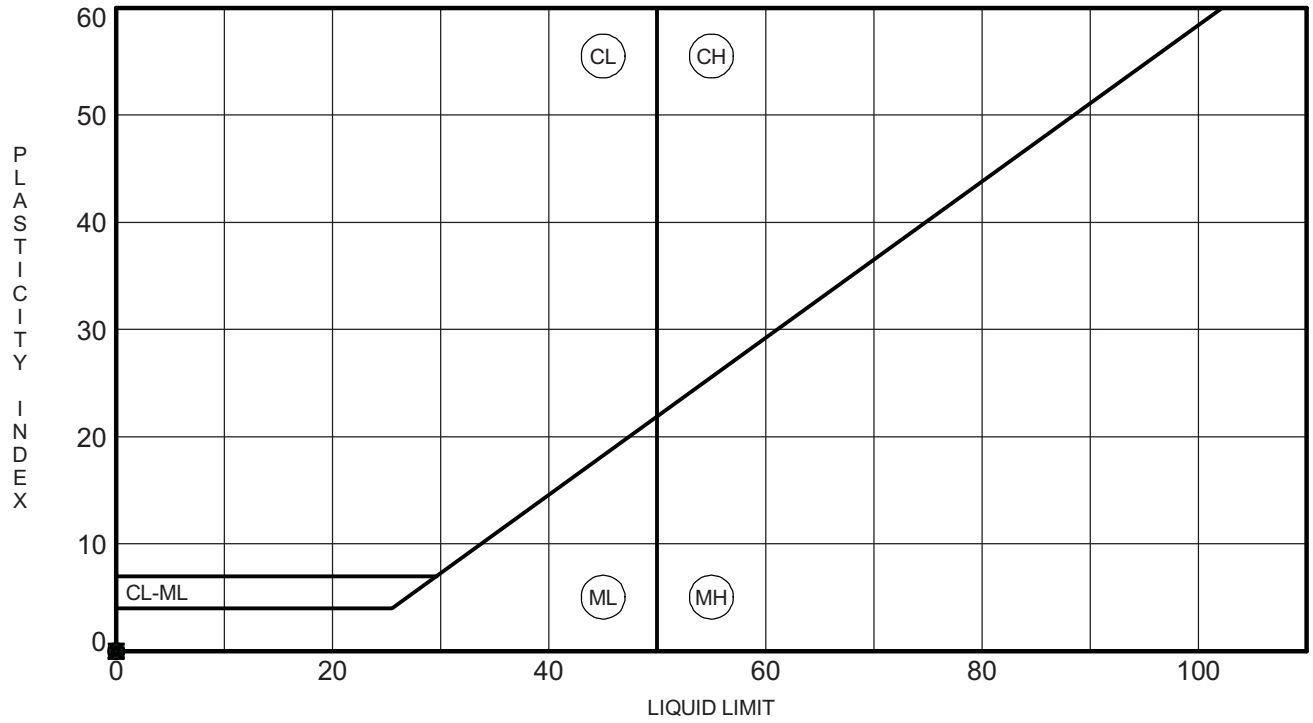
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**B-6**	**40.0**	**Silty Fine SAND (SM) A-2-4**	**NP**	**NP**	**NP**		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-6**	**40.0**	**2**	**0.357**	**0.161**		**0.0**	**81.7**	**18.3**	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-6**	**6.0**	**NP**	**NP**	**NP**	**17**	**Silty Fine SAND (SM) A-2-4**
⊠	**B-6**	**10.0**	**NP**	**NP**	**NP**	**16**	**Silty Fine SAND (SM) A-2-4**
▲	**B-6**	**15.0**	**NP**	**NP**	**NP**	**26**	**Silty Fine SAND (SM) A-2-4**
★	**B-6**	**25.0**	**NP**	**NP**	**NP**	**14**	**Silty Fine SAND (SM) A-2-4**
⊙	**B-6**	**30.0**	**NP**	**NP**	**NP**	**11**	**Poorly Graded Fine SAND (SP-SM) with Silt A-2-4**
✿	**B-6**	**40.0**	**NP**	**NP**	**NP**	**18**	**Silty Fine SAND (SM) A-2-4**

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

ORGANIC IMPURITIES DETERMINATION
(AASHTO T267)

PROJECT: US 21 Bridge Replacement over Harbor River

PROJECT NO.: G5396.00

SAMPLE NUMBER: 15-1439A

DATE SAMPLE RECEIVED:

DESCRIPTION OF SOIL:

TESTED BY: JH

DATE OF TESTING: 10/13/2015

DATE OF WEIGHING: 10/14/2015

BORING NO.	B-6				
SAMPLE NO.	15-1439A				
SAMPLE DEPTH	2.0'-4.0'				
WT. OF CRUCIBLE + DRY SOIL (BEFORE IGNITION) (GRAMS)	150.80				
WT. OF CRUCIBLE + DRY SOIL (AFTER IGNITION) (GRAMS)	150.59				
WT. OF CRUCIBLE (GRAMS)	110.80				
WT. OF DRY SOIL (BEFORE IGNITION) (GRAMS)	40.00				
WT. OF DRY SOIL (AFTER IGNITION) (GRAMS)	39.79				
IGNITION LOSS (GRAMS)	0.21				
ORGANIC IMPURITIES %	0.53				

Determining pH of Soil for Use in Corrosion Testing
AASHTO T 289

PROJECT TITLE	F&ME/HARBOR RIVER/SC	SAMPLE ID	B-6 15-1439V
PROJECT NO.	1524908.09	SAMPLE TYPE	Bag
REMARKS	F&ME Project No. G5396	SAMPLE DEPTH	58.5 - 60.0'

SAMPLE PREPARATION

Sieved through the #10 Sieve	YES
Air Dry	YES
Type of Water	DISTILLED

Trial	pH	Temperature
1	7.66	20.1
2	7.67	20.1
3	7.64	20.1
AVERAGE	7.66	20.1

Description SILTY CLAY; grayish brown.

USCS (CL)

TECH	TJ
DATE	10/13/15
CHECK	
REVIEW	
APPROVE	

Determining Minimum Laboratory Soil Resistivity
AASHTO T 288

PROJECT TITLE	F&ME/HARBOR RIVER/SC	SAMPLE ID	B-6	15-1439W
PROJECT NO.	1524908.09	SAMPLE TYPE	Bag	
REMARKS	F&ME Project No. G5396	SAMPLE DEPTH	58.5 - 60.0'	

SAMPLE PREPARATION — Sieved through the #10 Sieve: Yes

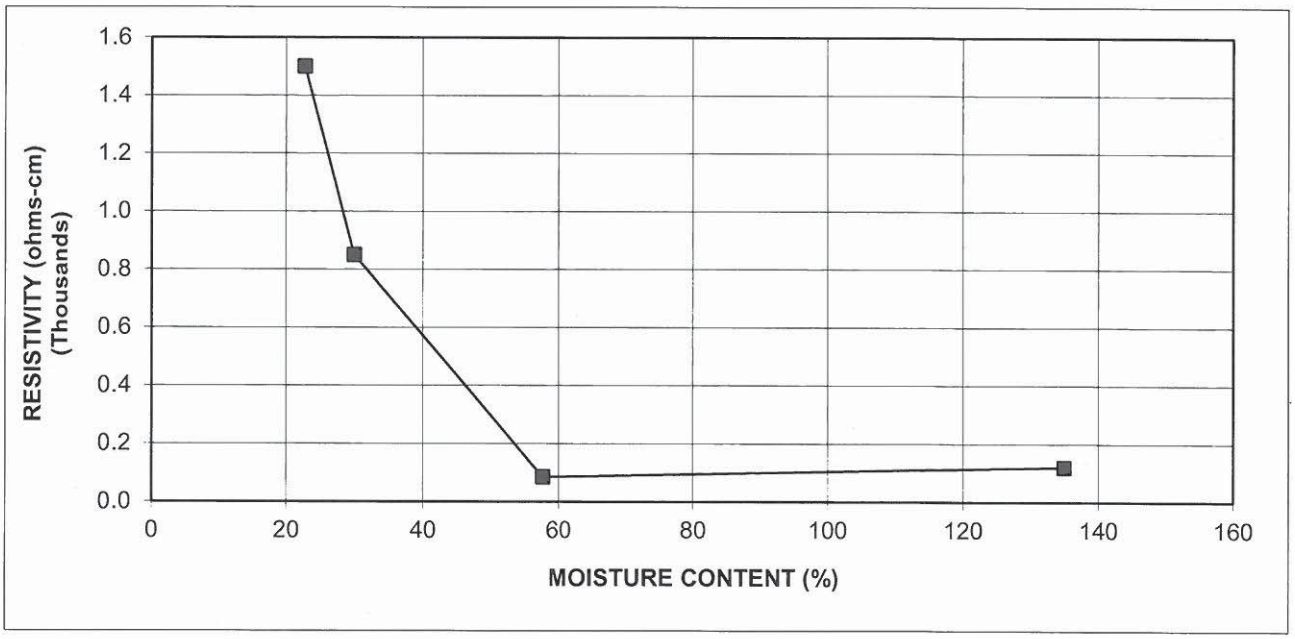
TEST APPARATUS — Miller Soilbox and Nilsson 400 Soil Resistance Meter.

Identification: Lowest resistivity

SPECIMEN (Point)	1	2	3	4
RESISTIVITY (ohms-cm)	1,500	850	85	120

MOISTURE CONTENT

WET WEIGHT & TARE	110.92	145.08	179.10	321.03
DRY WEIGHT & TARE	99.29	121.54	132.64	166.52
TARE WEIGHT	48.19	43.00	52.04	52.01
WEIGHT OF MOISTURE (gm)	11.63	23.54	46.46	154.51
WEIGHT OF DRY SOIL (gm)	51.10	78.54	80.60	114.51
MOISTURE CONTENT (%)	22.76	29.97	57.64	134.93



Description: SILTY CLAY; grayish brown.

USCS: (CL)

TECH	TJ
DATE	10/13/15
CHECK	
REVIEW	
APPROVE	

ACL

ADVANCED CHEMISTRY LABS, INC.

Phone: (770) 409-1444
Fax: (770) 409-1844
e-mail: acl@acl-labs.net

3039 Amwiler Road • Suite 100 • Atlanta, GA 30360
P.O. Box 88610 • Atlanta, GA 30356
www.acl-labs.com

Client: Golder Associates, Inc.
3730 Chamblee Tucker Road
Atlanta, GA 30341-0000

Client Proj #: 1524908
ACL Project #: 68442
Date Received: 10/13/2015
Date Reported: 10/30/2015

Contact: Mr. Henry Mock

Sample ID: B-6 58.5-60'

Matrix: Soil

ACL #: 307838

Date/Time Sampled: 10/13/2015 11:15

Analyte (Method)	Result	PQL	Units	DF	Prep Date/Time	Analysis Date/Time	Analyst
Sol. Chloride (9252A)*	16000	1000	mg/kg	100	10/16/2015 8:30	10/16/2015 8:30	MM
Sol. Sulfate (9038)*	763	200	mg/kg	20	10/19/2015 10:20	10/19/2015 10:20	MM

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	16-1197	**DATE SAMPLE RECEIVED:**	7/21/2016
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	MB	**DATE OF TESTING:**	7/25/2016
		DATE OF WEIGHING:	7/26/2016

BORING NO.	B-7	B-7	B-7	B-7	B-7
SAMPLE NO.	16-1197C	16-1197F	16-1197I	16-1197L	16-1197O
SAMPLE DEPTH	4.0-6.0'	8.0-10.0'	13.5-15.0'	18.5-20.0'	43.5-45.0'
WATER CONTENT, W%	24.2	33.1	31.3	24.2	38.0

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

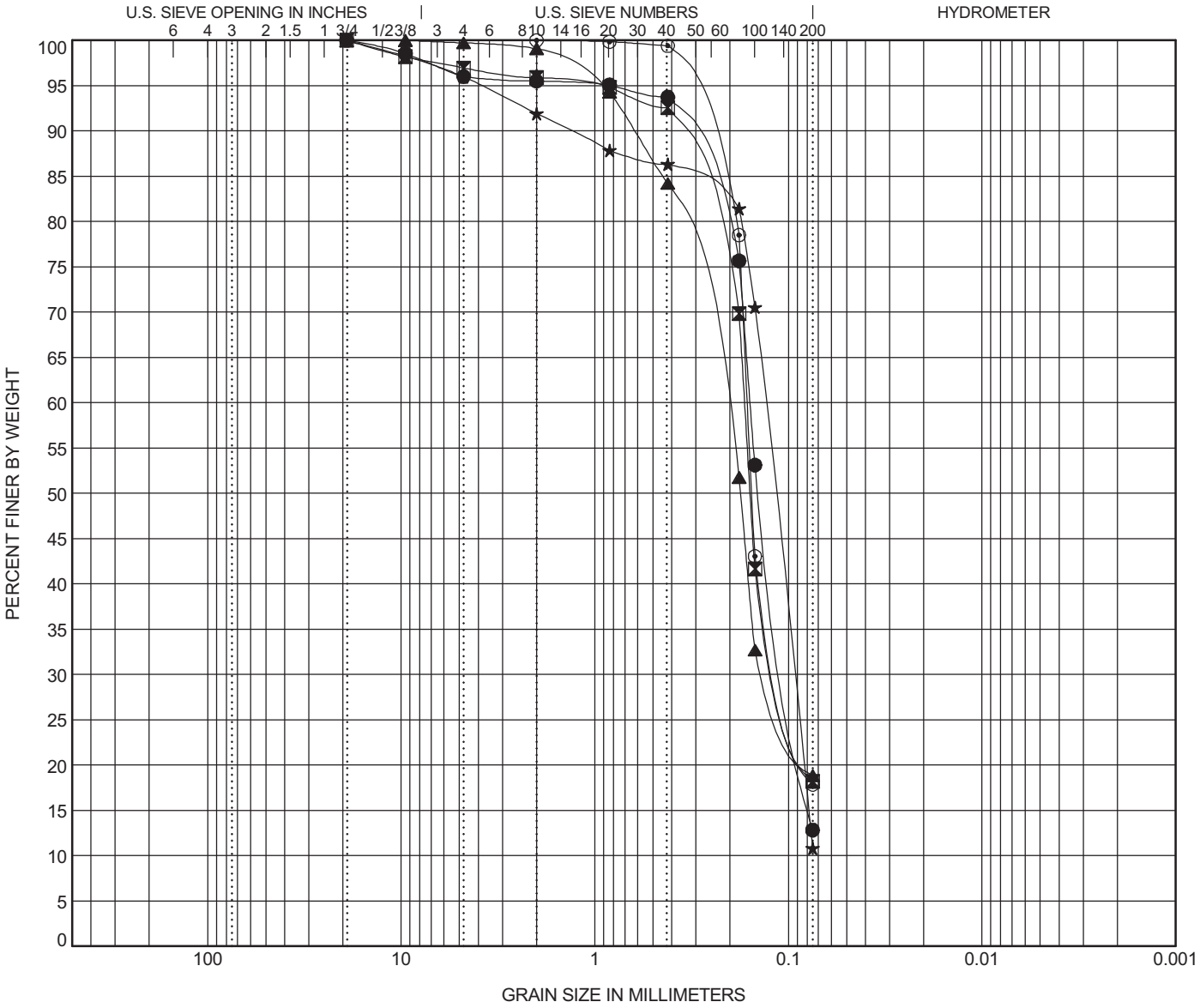
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

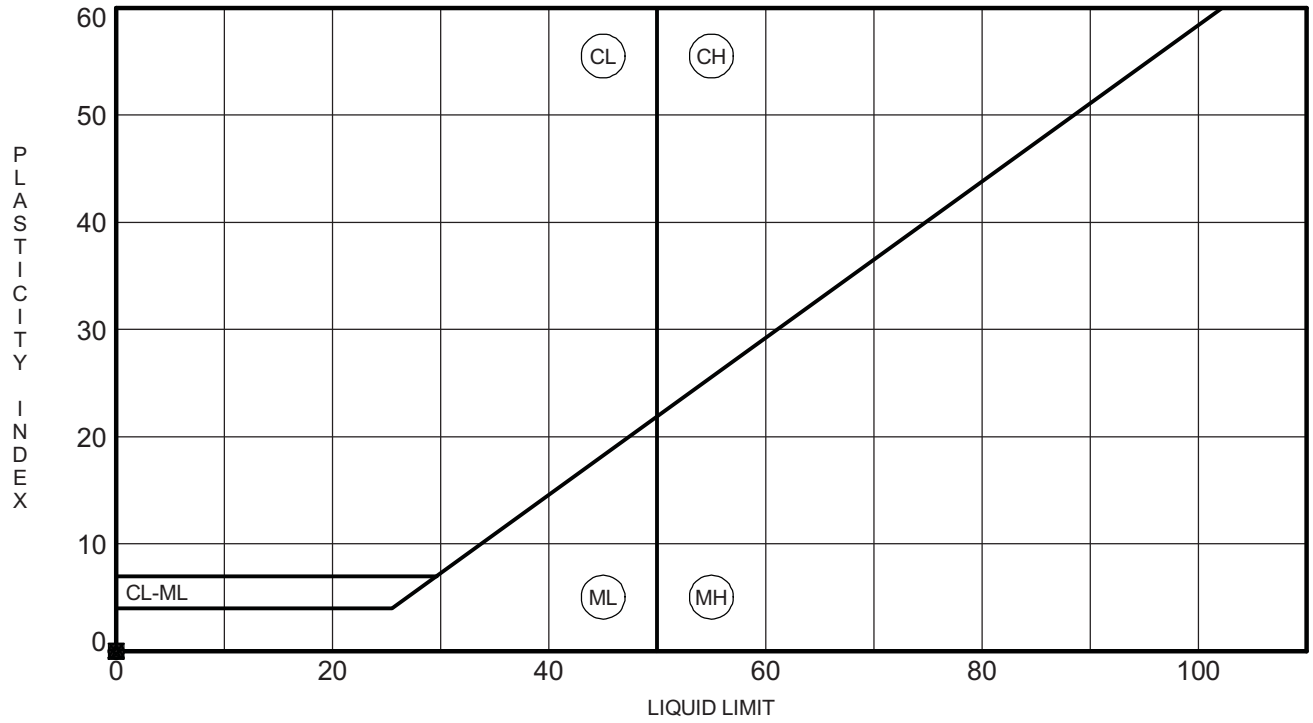
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-7	6.0	Silty Fine SAND (SM) A-2-4	NP	NP	NP		
⊠	B-7	10.0	Silty Fine SAND (SM) A-2-4	NP	NP	NP		
▲	B-7	15.0	Silty F/M SAND (SM) A-2-4	NP	NP	NP		
★	B-7	20.0	Poorly Graded F/C SAND (SP-SM) with Silt A-2-4	NP	NP	NP	0.89	1.78
⊙	B-7	45.0	Silty Fine SAND (SM) A-2-4	NP	NP	NP		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	B-7	6.0	19.1	0.801	0.141		4.0	83.2	12.8	
⊠	B-7	10.0	19.1	0.954	0.158		3.0	78.8	18.2	
▲	B-7	15.0	9.52	0.957	0.177		0.3	80.9	18.9	
★	B-7	20.0	19.1	3.859	0.118		4.0	85.1	10.8	
⊙	B-7	45.0	2	0.351	0.155		0.0	82.1	17.9	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-7**	**6.0**	**NP**	**NP**	**NP**	**13**	**Silty Fine SAND (SM) A-2-4**
⊠	**B-7**	**10.0**	**NP**	**NP**	**NP**	**18**	**Silty Fine SAND (SM) A-2-4**
▲	**B-7**	**15.0**	**NP**	**NP**	**NP**	**19**	**Silty F/M SAND (SM) A-2-4**
★	**B-7**	**20.0**	**NP**	**NP**	**NP**	**11**	**Poorly Graded F/C SAND (SP-SM) with Silt A-2-4**
⊙	**B-7**	**45.0**	**NP**	**NP**	**NP**	**18**	**Silty Fine SAND (SM) A-2-4**

Client:	FME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	08/23/16
Tested By:	jbr
Checked By:	jdt

Rapid Determination of Carbonate Content of Soils by ASTM D4373

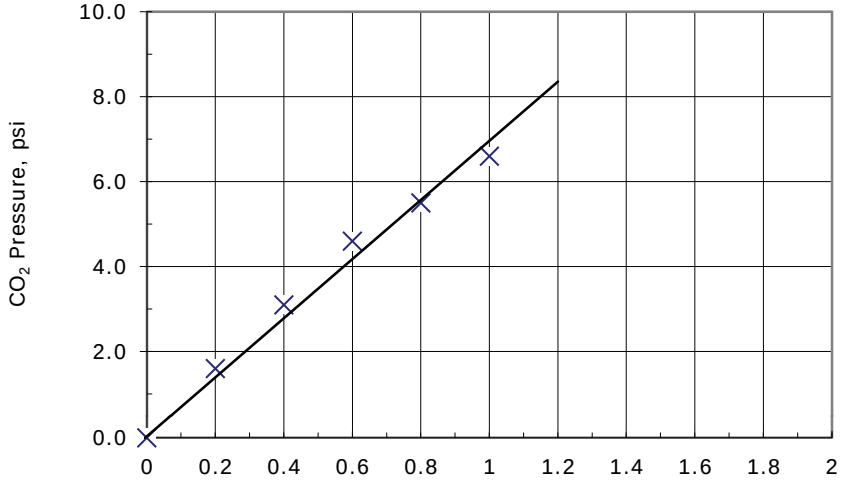
Boring ID	Sample ID	Depth, ft	*CO_2 Pressure, psi	Weight of Sample used, g	Weight $CaCO_3$, grams	Calcite Equivalent, %
B-7	16-1197P	28.5-30	0.20	2.00	0.08	8

Notes: Calcium Carbonate content precise to +/- 1.5%

*CO_2 Pressure is based on the weight of sample as indicated in the table.

The reported Calcite Equivalent (%) is based on one gram

Figure 1: Calibration Curve



Weight Calcium Carbonate, g

% Calcite Equivalent = Weight x 100

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	16-1242	**DATE SAMPLE RECEIVED:**	7/29/2016
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	JH	**DATE OF TESTING:**	8/1/2016
		DATE OF WEIGHING:	8/2/2016

BORING NO.	B-8	B-8	B-8	B-8	B-8
SAMPLE NO.	16-1242C	16-1242S	16-1242F	16-1242I	16-1242M
SAMPLE DEPTH	4.0-6.0'	18.5-20.0'	23.5-25.0'	28.5-30.0'	43.5-45.0'
WATER CONTENT, W%	24.0	73.8	54.5	38.8	27.3

BORING NO.	B-8				
SAMPLE NO.	16-1242P				
SAMPLE DEPTH	48.5-50.0'				
WATER CONTENT, W%	37.1				

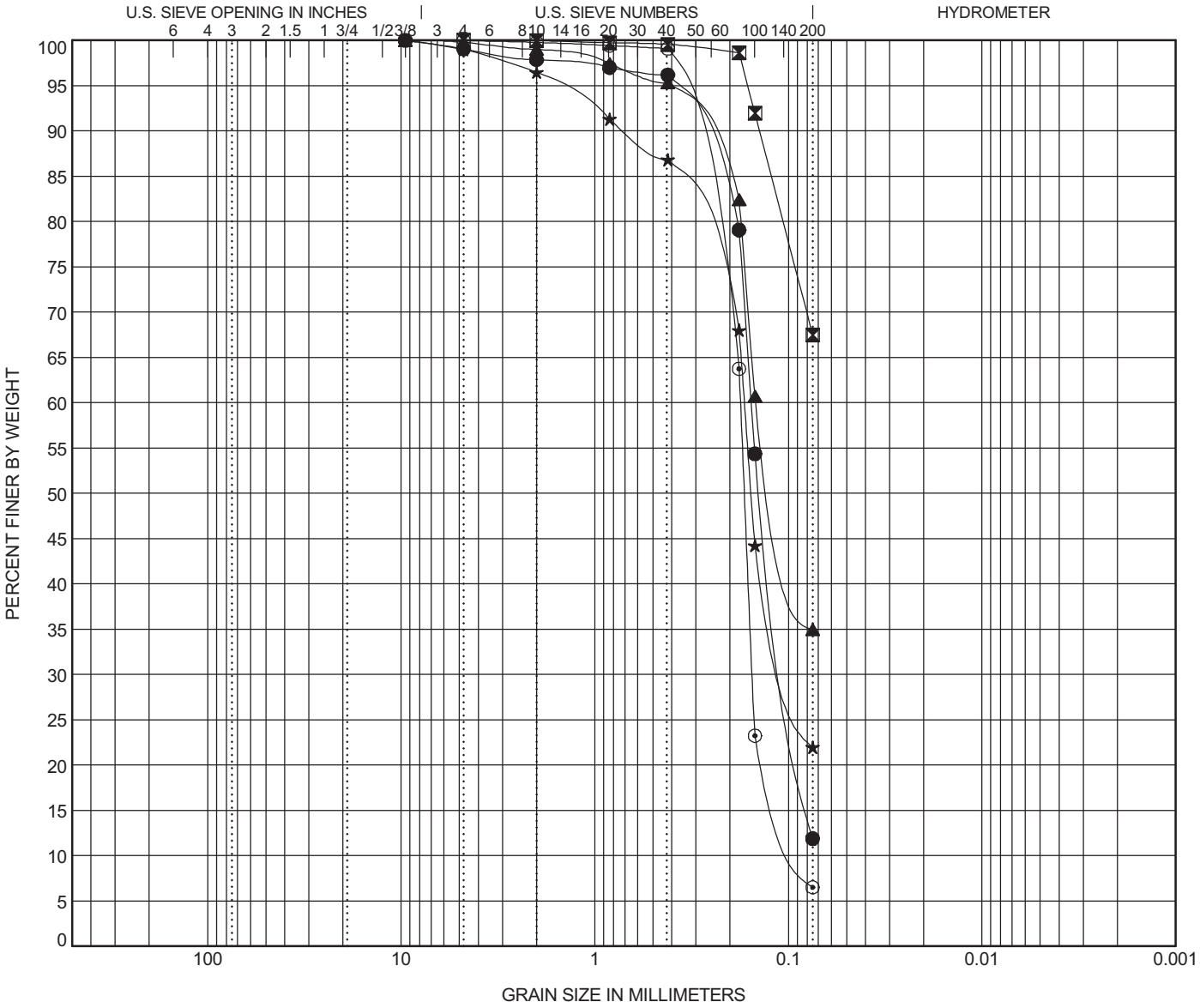
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

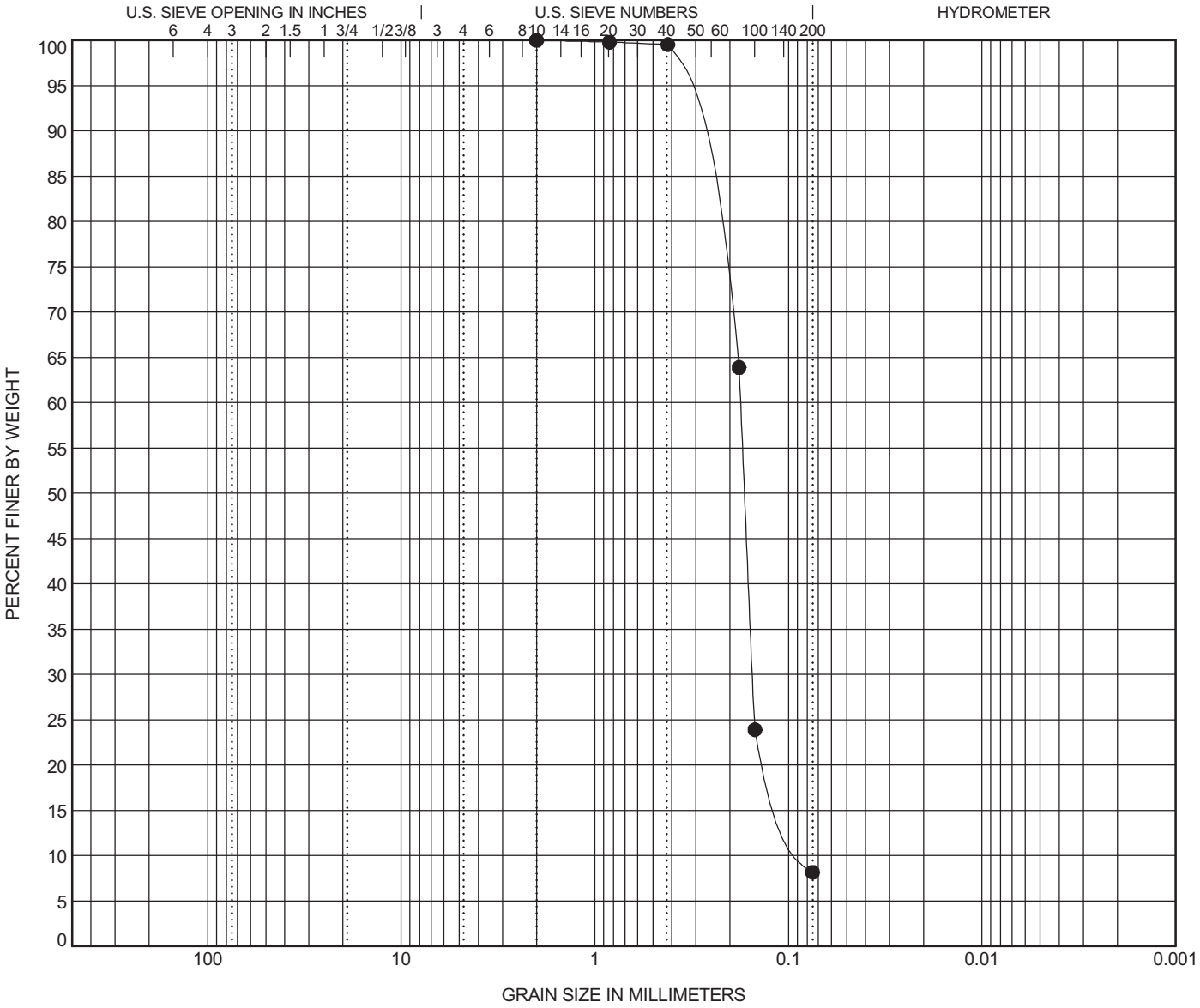
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-8	6.0	Poorly Graded F/M SAND (SP-SM) with Silt A-2-4	NP	NP	NP	0.89	2.14
⊠	B-8	20.0	Sandy Lean CLAY (CL) A-6(8)	34	20	14		
▲	B-8	25.0	Clayey F/M SAND (SC) A-2-6(0)	30	19	11		
★	B-8	30.0	Silty F/M SAND (SM) A-2-4	NP	NP	NP		
⊙	B-8	45.0	Poorly Graded F/M SAND (SP-SM) with Silt A-3	NP	NP	NP	1.54	2.04

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	B-8	6.0	9.52	0.396	0.139		1.0	87.2	11.9	
⊠	B-8	20.0	4.76	0.162			0.0	32.5	67.5	
▲	B-8	25.0	9.52	0.412	0.112		0.2	64.8	34.9	
★	B-8	30.0	9.52	1.559	0.156		1.0	77.0	22.0	
⊙	B-8	45.0	4.76	0.381	0.169	0.087	0.0	93.5	6.5	

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

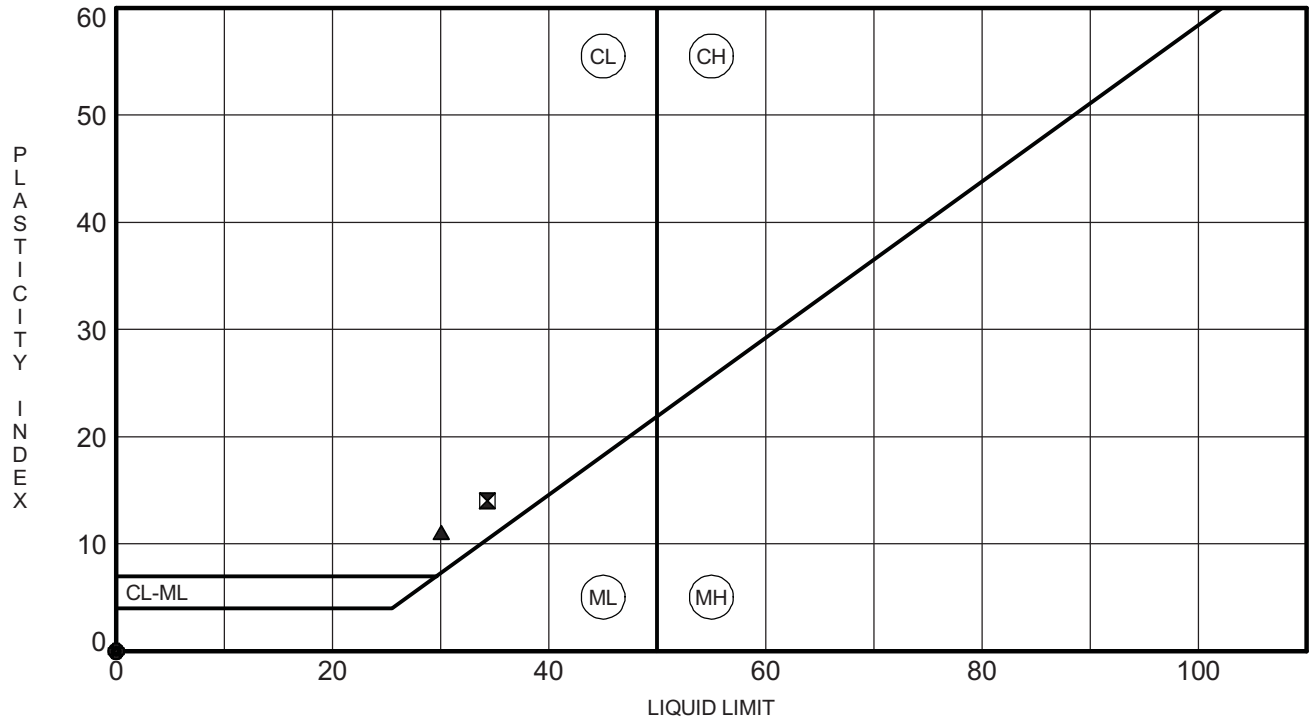
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**B-8**	**50.0**	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**	**NP**	**NP**	**NP**	**1.64**	**2.18**

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-8**	**50.0**	**2**	**0.377**	**0.169**	**0.081**	**0.0**	**91.8**	**8.2**	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-8**	**6.0**	**NP**	**NP**	**NP**	**12**	**Poorly Graded F/M SAND (SP-SM) with Silt A-2-4**
⊠	**B-8**	**20.0**	**34**	**20**	**14**	**68**	**Sandy Lean CLAY (CL) A-6(8)**
▲	**B-8**	**25.0**	**30**	**19**	**11**	**35**	**Clayey F/M SAND (SC) A-2-6(0)**
★	**B-8**	**30.0**	**NP**	**NP**	**NP**	**22**	**Silty F/M SAND (SM) A-2-4**
⊙	**B-8**	**45.0**	**NP**	**NP**	**NP**	**7**	**Poorly Graded F/M SAND (SP-SM) with Silt A-3**
✿	**B-8**	**50.0**	**NP**	**NP**	**NP**	**8**	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**

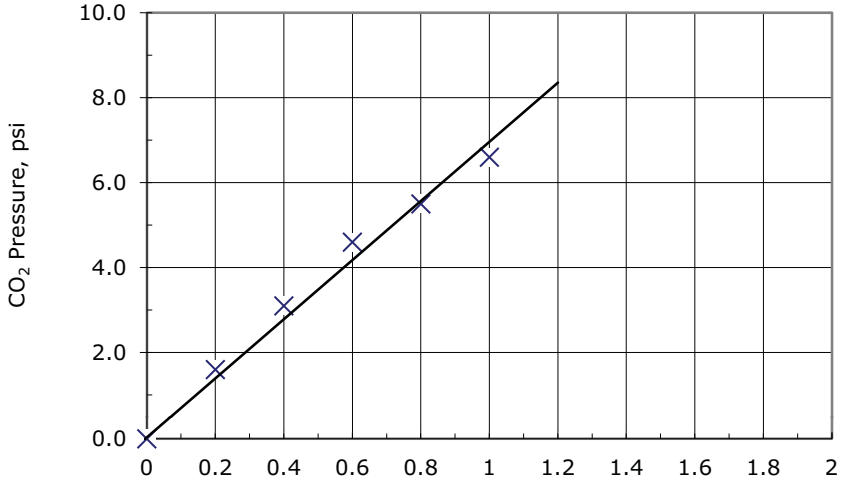
Client:	FME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	08/23/16
Tested By:	jbr
Checked By:	jdt

Rapid Determination of Carbonate Content of Soils by ASTM D4373

Boring ID	Sample ID	Depth, ft	*CO_2 Pressure, psi	Weight of Sample used, g	Weight $CaCO_3$, grams	Calcite Equivalent, %
B-8	16-1242J	33.5-35	0.20	1.00	0.16	16

Notes: Calcium Carbonate content precise to +/- 1.5%
*CO_2 Pressure is based on the weight of sample as indicated in the table.
The reported Calcite Equivalent (%) is based on one gram

Figure 1: Calibration Curve



Weight Calcium Carbonate, g
% Calcite Equivalent = Weight x 100

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	16-1243	**DATE SAMPLE RECEIVED:**	7/29/2016
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	MB	**DATE OF TESTING:**	8/1/2016
		DATE OF WEIGHING:	8/2/2016

BORING NO.	B-9	B-9	B-9	B-9	B-9
SAMPLE NO.	16-1243F	16-1243I	16-1243L	16-1243C	16-1243P
SAMPLE DEPTH	2.0-4.0'	4.0-6.0'	8.0-10.0'	28.5-30.0'	43.5-45.0'
WATER CONTENT, W%	22.6	21.9	25.6	88.5	25.6

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

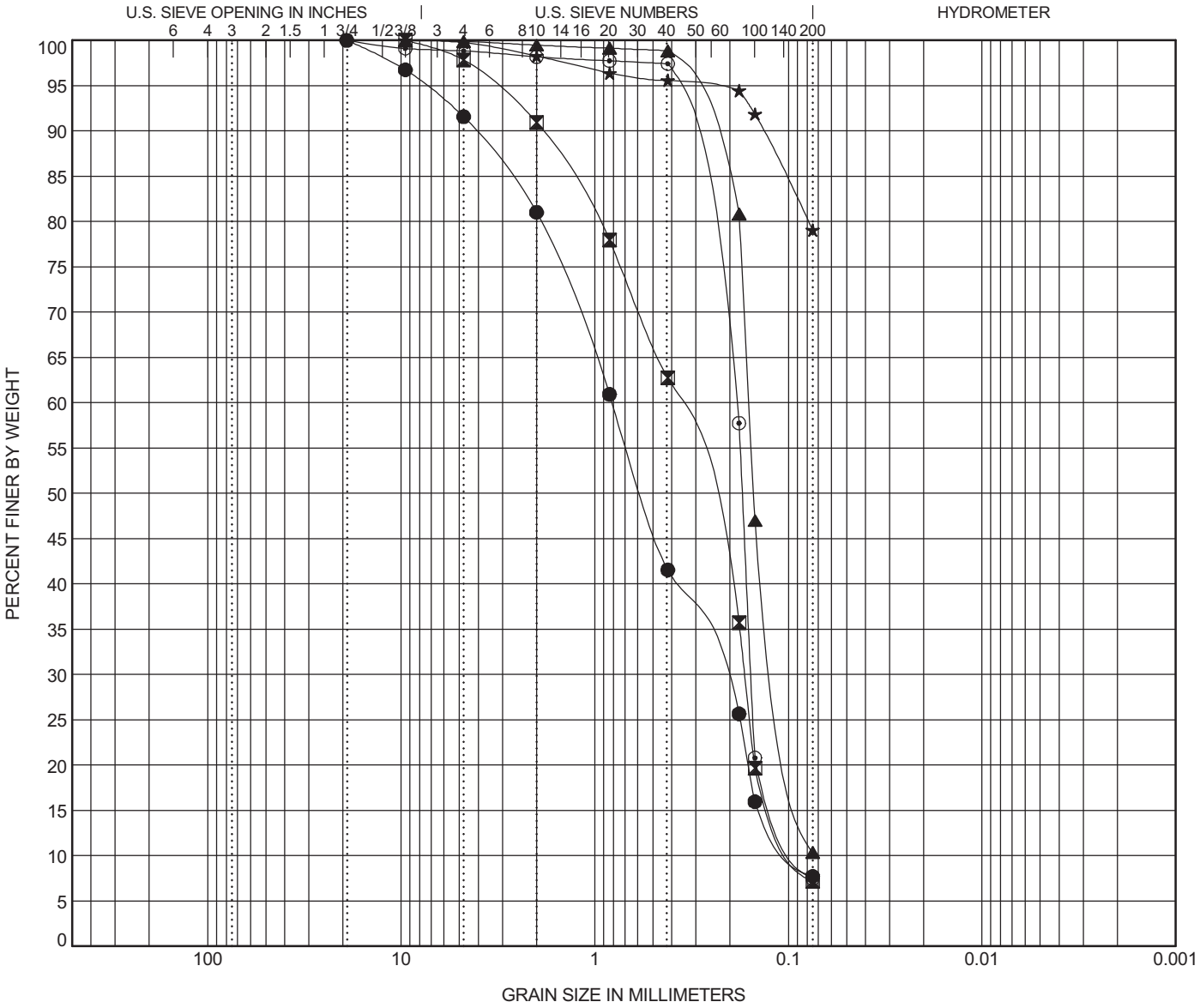
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

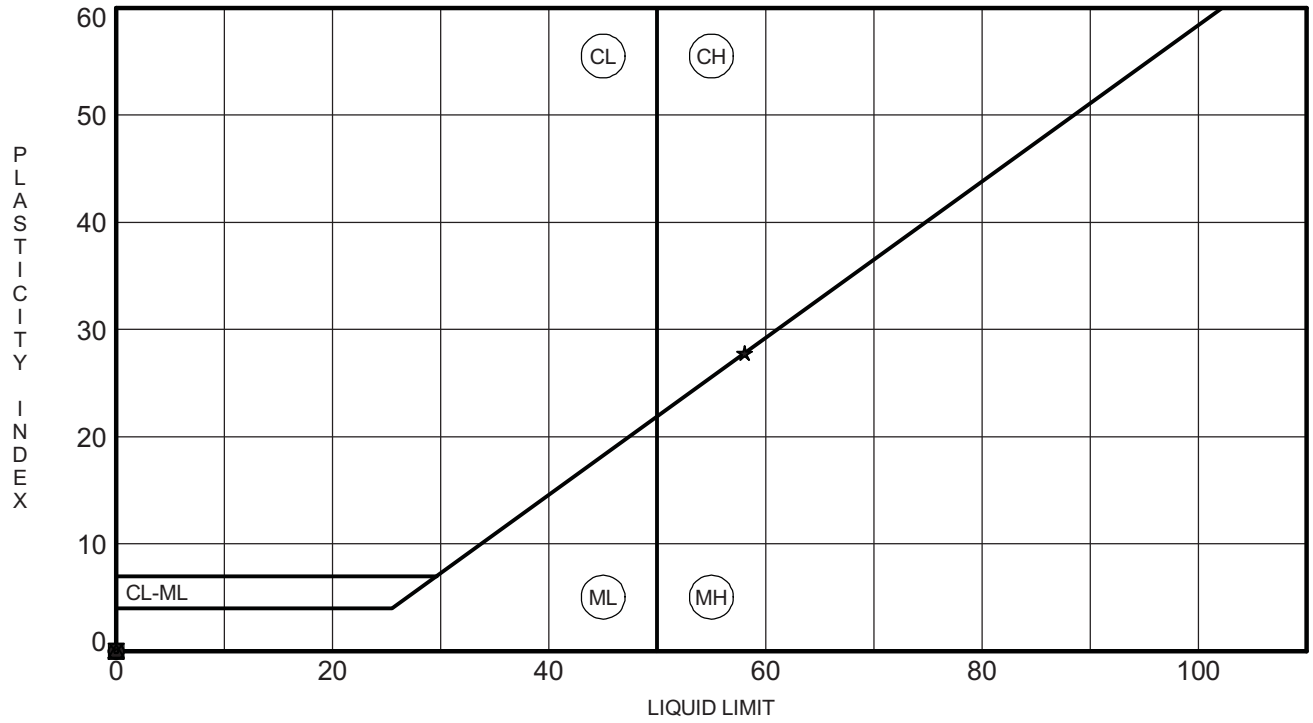
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-9	4.0	Poorly Graded F/C SAND (SP-SM) with Silt A-1-b	NP	NP	NP	0.70	8.97
⊠	B-9	6.0	Poorly Graded F/C SAND (SP-SM) with Silt A-3	NP	NP	NP	0.84	4.40
▲	B-9	10.0	Poorly Graded Fine SAND (SP-SM) with Silt A-3	NP	NP	NP	0.98	2.15
★	B-9	30.0	Fat CLAY with Fine Sand (CH) A-7-5(24)	58	30	28		
⊙	B-9	45.0	Poorly Graded Fine SAND (SP-SM) with Silt A-3	NP	NP	NP	1.51	2.21

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	B-9	4.0	19.1	7.521	0.568	0.091	8.4	83.8	7.7	
⊠	B-9	6.0	9.52	3.326	0.282	0.088	2.2	90.7	7.2	
▲	B-9	10.0	9.52	0.35	0.152		0.1	89.6	10.3	
★	B-9	30.0	9.52	0.27			0.2	20.7	79.1	
⊙	B-9	45.0	19.1	0.399	0.173	0.085	1.2	91.4	7.5	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-9**	**4.0**	**NP**	**NP**	**NP**	**8**	**Poorly Graded F/C SAND (SP-SM) with Silt A-1-b**
⊠	**B-9**	**6.0**	**NP**	**NP**	**NP**	**7**	**Poorly Graded F/C SAND (SP-SM) with Silt A-3**
▲	**B-9**	**10.0**	**NP**	**NP**	**NP**	**10**	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**
★	**B-9**	**30.0**	**58**	**30**	**28**	**79**	**Fat CLAY with Fine Sand (CH) A-7-5(24)**
⊙	**B-9**	**45.0**	**NP**	**NP**	**NP**	**7**	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**

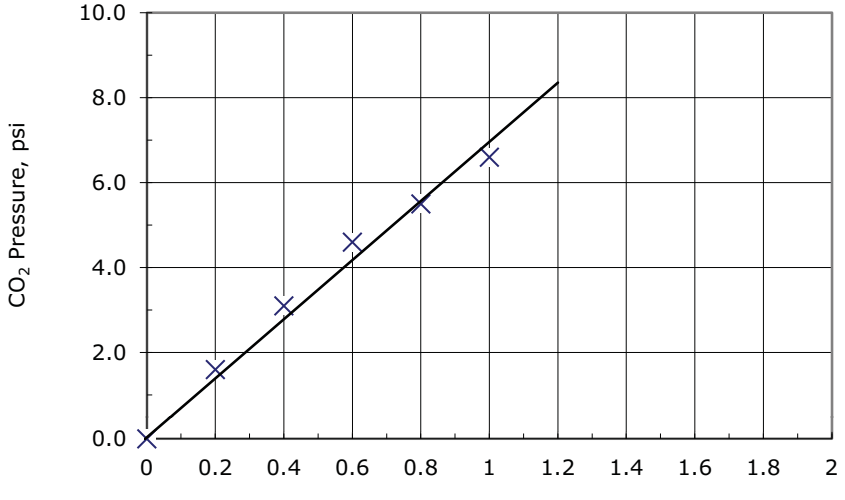
Client:	FME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	08/23/16
Tested By:	jbr
Checked By:	jdt

Rapid Determination of Carbonate Content of Soils by ASTM D4373

Boring ID	Sample ID	Depth, ft	*CO_2 Pressure, psi	Weight of Sample used, g	Weight $CaCO_3$, grams	Calcite Equivalent, %
B-9	16-1243M	13.5-15	0.30	5.00	0.05	5

Notes: Calcium Carbonate content precise to +/- 1.5%
*CO_2 Pressure is based on the weight of sample as indicated in the table.
The reported Calcite Equivalent (%) is based on one gram

Figure 1: Calibration Curve



Weight Calcium Carbonate, g
% Calcite Equivalent = Weight x 100

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	16-1110	**DATE SAMPLE RECEIVED:**	7/5/2016
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	MB	**DATE OF TESTING:**	7/12/2016
		DATE OF WEIGHING:	7/13/2016

BORING NO.	B-10	B-10	B-10	B-10	B-10
SAMPLE NO.	16-1110C	16-1110F	16-1110I	16-1110L	16-1110O
SAMPLE DEPTH	3.5-5.5'	7.5-9.5'	25.0-26.5'	46.0-47.5'	56.5-58.0'
WATER CONTENT, W%	50.0	24.1	58.3	21.9	58.1

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

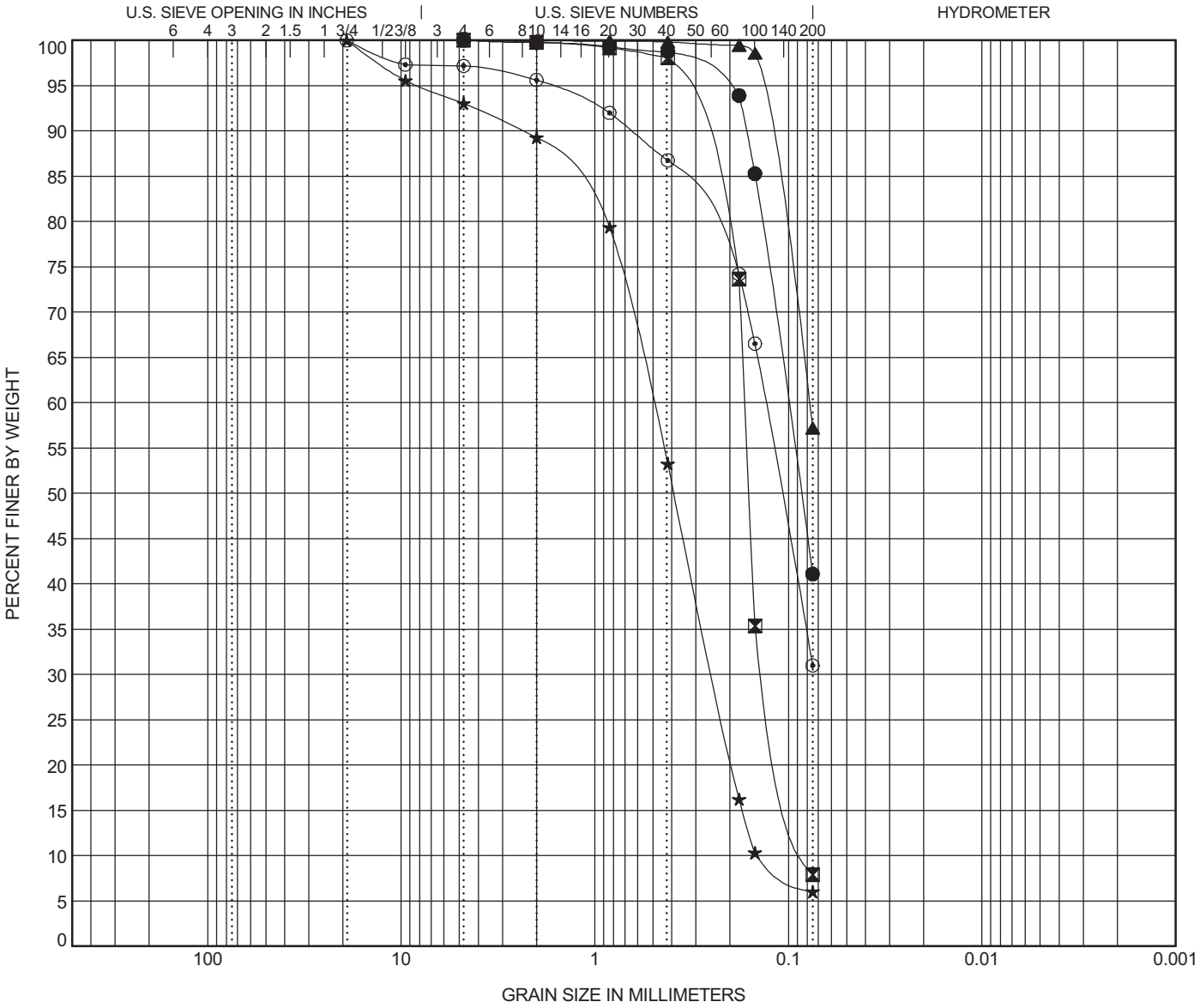
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

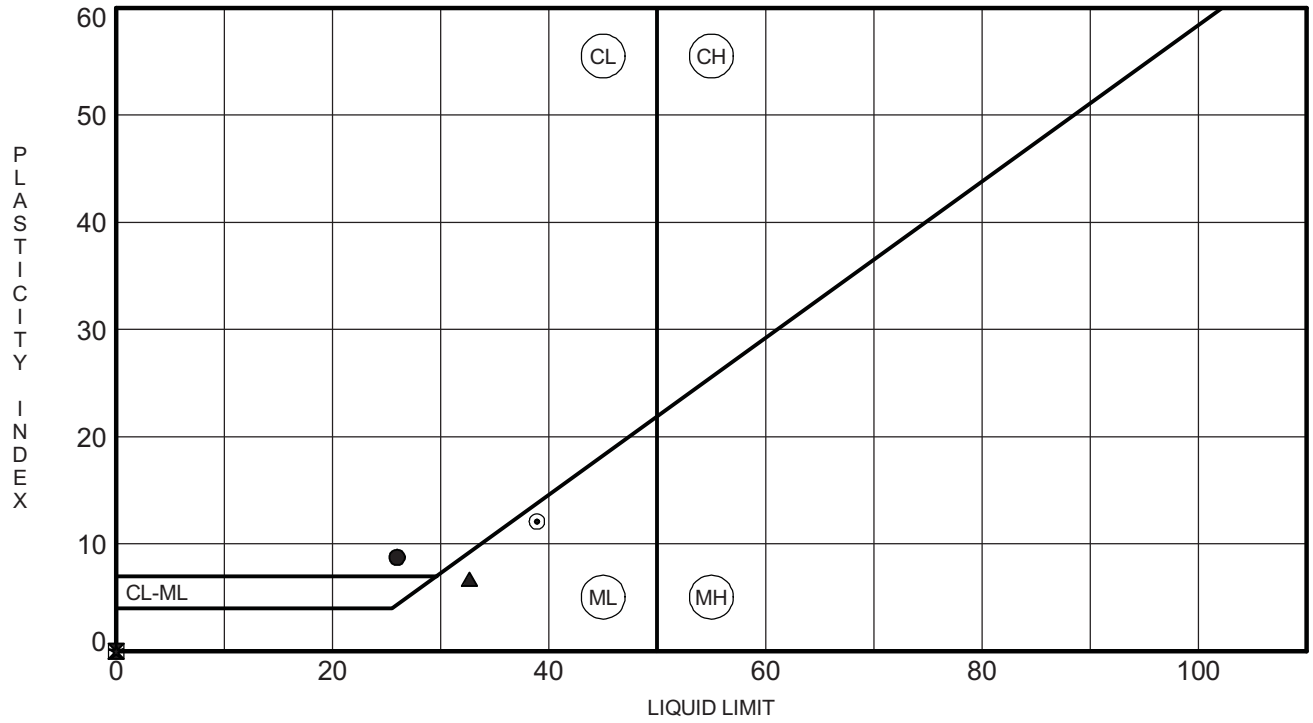
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-10	5.5	Clayey Fine SAND (SC) A-4(1)	26	17	9		
⊠	B-10	9.5	Poorly Graded Fine SAND (SP-SM) with Silt A-3	NP	NP	NP	1.28	2.13
▲	B-10	26.5	Sandy SILT (ML) A-4(2)	33	26	7		
★	B-10	47.5	Poorly Graded F/C SAND (SP-SM) with Silt A-3	NP	NP	NP	0.86	3.56
⊙	B-10	58.0	Silty F/M SAND (SM) A-2-6(0)	39	27	12		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	B-10	5.5	4.76	0.217	0.086		0.0	58.9	41.1	
⊠	B-10	9.5	4.76	0.377	0.16	0.079	0.0	92.1	7.9	
▲	B-10	26.5	2	0.14			0.0	42.8	57.2	
★	B-10	47.5	19.1	8.124	0.39	0.141	7.0	87.0	6.0	
⊙	B-10	58.0	19.1	1.721	0.108		2.8	66.2	31.0	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-10**	**5.5**	**26**	**17**	**9**	**41**	**Clayey Fine SAND (SC) A-4(1)**
⊠	**B-10**	**9.5**	**NP**	**NP**	**NP**	**8**	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**
▲	**B-10**	**26.5**	**33**	**26**	**7**	**57**	**Sandy SILT (ML) A-4(2)**
★	**B-10**	**47.5**	**NP**	**NP**	**NP**	**6**	**Poorly Graded F/C SAND (SP-SM) with Silt A-3**
⊙	**B-10**	**58.0**	**39**	**27**	**12**	**31**	**Silty F/M SAND (SM) A-2-6(0)**

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	---	Sample Type:	---	Tested By:	GA
Sample ID:	---	Test Date:	08/09/16	Checked By:	mcm
Depth :	---	Test Id:	386279		

pH of Soil by ASTM D4972

Boring ID	Sample ID	Depth	Visual Description	pH of Soil in Distilled Water	pH of Soil in Calcium Chloride
B-10	---	30.5-32 ft	Moist, dark gray silty sand	7.1	6.8

Notes: Sample Preparation: screened through #10 sieve

Method A, pH meter used

Client:	F&ME Consultants
Project:	US-21 Replacement Bridge over Harbor River
Location:	---
GTX#:	305005
Test Date:	08/09/16
Tested By:	jm
Checked By:	mcm

Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, $(ohm\text{-}cm)^{-1}$
B-10	---	30.5-32	Moist, dark gray silty sand	62	1.61E-02

Notes: Test Equipment: Nilsson Model 400 Soil Resistance Meter, MC Miller Soil Box
Water added to sample to create a thick slurry prior to testing (saturated condition).
Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)
Test conducted in standard laboratory atmosphere: 68-73 F

Project Name: US-21 REP. BRIDGE OVER HARBOR
Project Number: 305005

Lab Number: L1623916
Report Date: 08/08/16

SAMPLE RESULTS

Lab ID: L1623916-01
Client ID: B-10 / 30.5-32.0 FT
Sample Location: Not Specified
Matrix: Soil

Date Collected: 08/01/16 11:51
Date Received: 08/02/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	56.7		%	0.100	NA	1	-	08/03/16 02:46	121,2540G	VB
Chloride	8400		mg/kg	170	--	10	-	08/05/16 18:53	1,9251	
Sulfate	2400		mg/kg	880	--	5	-	08/04/16 11:30	1,9038	AW

Client:	FME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	08/23/16
Tested By:	jbr
Checked By:	jdt

Rapid Determination of Carbonate Content of Soils by ASTM D4373

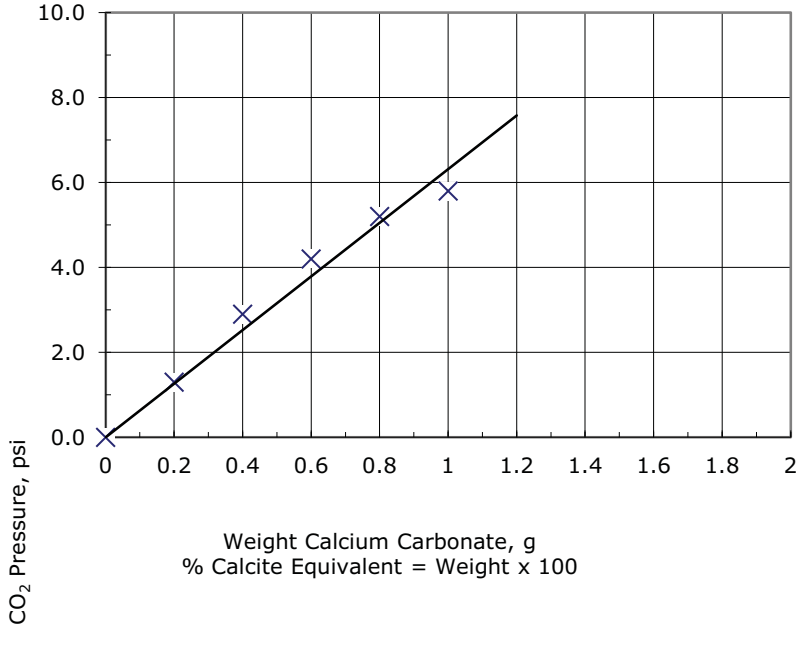
Boring ID	Sample ID	Depth, ft	*CO_2 Pressure, psi	Weight of Sample used, g	Weight $CaCO_3$, grams	Calcite Equivalent, %
B-10	---	86.5-88	5.60	1.00	4.60	460

Notes: Calcium Carbonate content precise to +/- 1.5%

*CO_2 Pressure is based on the weight of sample as indicated in the table.

The reported Calcite Equivalent (%) is based on one gram

Figure 1: Calibration Curve



F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	16-1111	**DATE SAMPLE RECEIVED:**	7/5/2016
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	MB	**DATE OF TESTING:**	7/12/2016
		DATE OF WEIGHING:	7/13/2016

BORING NO.	B-11	B-11	B-11	B-11	B-11
SAMPLE NO.	16-1111C	16-1111F	16-1111I	16-1111L	16-1111O
SAMPLE DEPTH	26.0-28.0'	28.0.-30.0'	30.0-32.0'	36.5-38.0'	83.0-84.5'
WATER CONTENT, W%	33.7	57.6	30.5	93.7	45.3

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

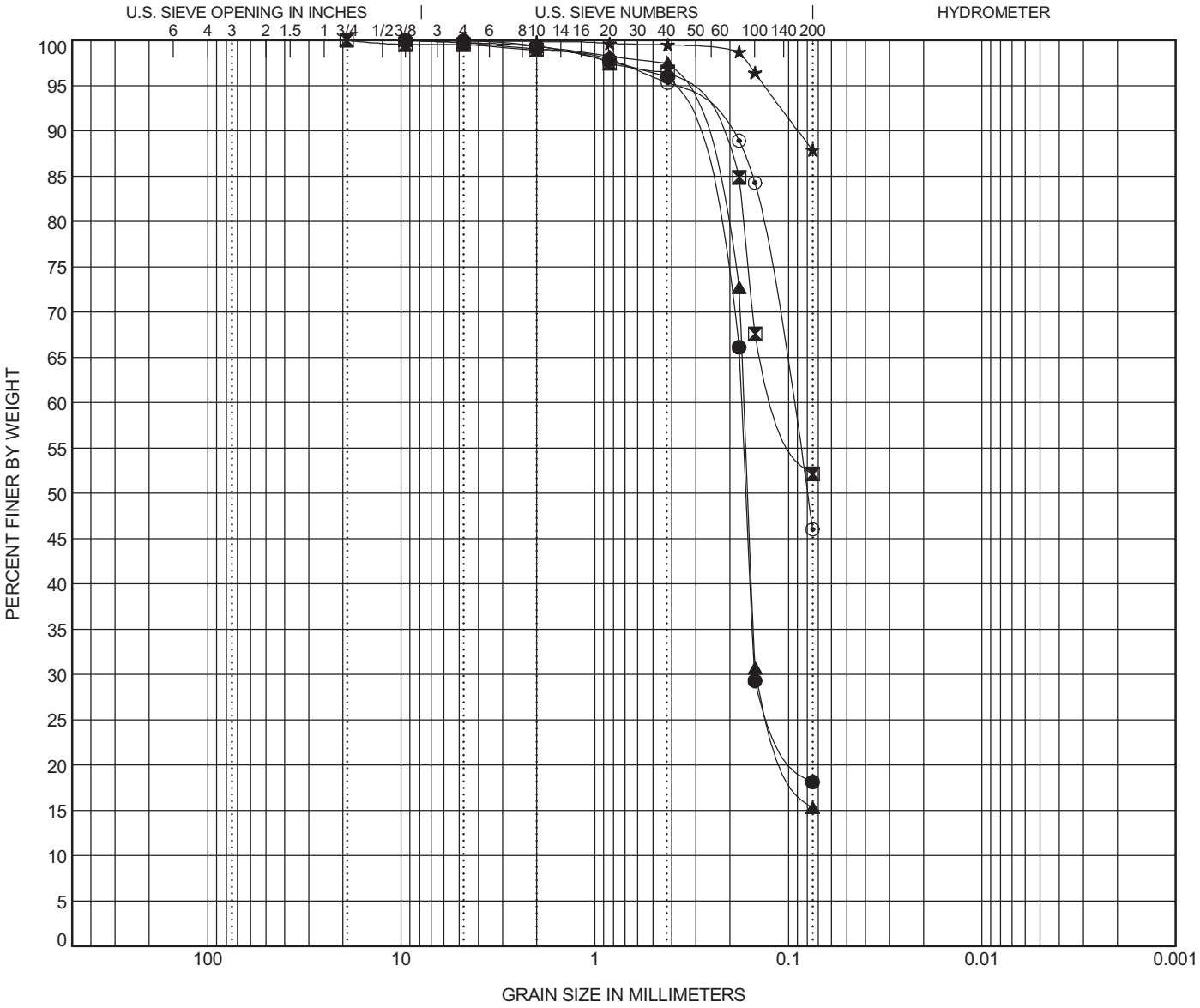
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

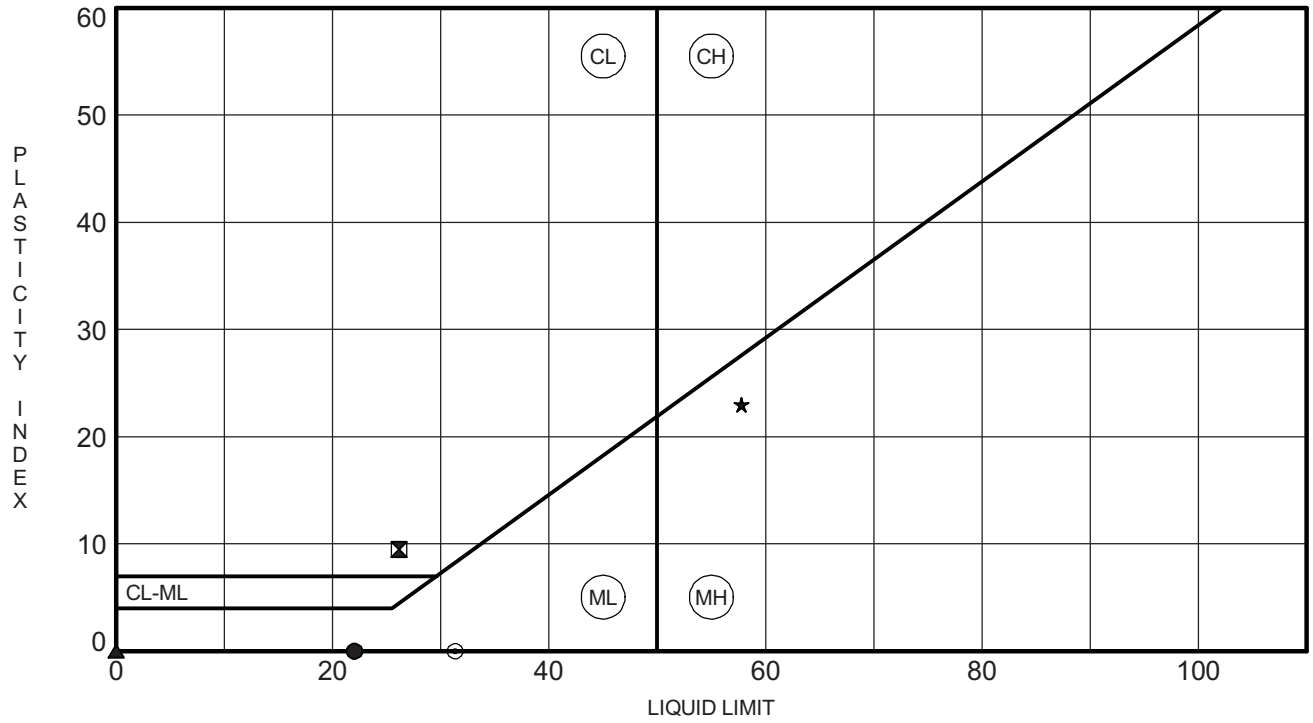
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**B-11**	**28.0**	**Silty Fine SAND (SM) A-2-4**	**22**	**NP**	**NP**		
⊠	**B-11**	**30.0**	**Sandy Lean CLAY (CL) A-4(2)**	**26**	**17**	**9**		
▲	**B-11**	**32.0**	**Silty Fine SAND (SM) A-2-4**	**NP**	**NP**	**NP**		
★	**B-11**	**38.0**	**Elastic SILT (MH) A-7-5(25)**	**58**	**35**	**23**		
⊙	**B-11**	**84.5**	**Silty Fine SAND (SM) A-4(0)**	**31**	**NP**	**NP**		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-11**	**28.0**	**9.52**	**0.409**	**0.166**		**0.0**	**81.8**	**18.1**	
⊠	**B-11**	**30.0**	**19.1**	**0.376**			**0.5**	**47.4**	**52.1**	
▲	**B-11**	**32.0**	**9.52**	**0.386**	**0.162**		**0.2**	**84.5**	**15.3**	
★	**B-11**	**38.0**	**9.52**	**0.133**			**0.0**	**12.1**	**87.9**	
⊙	**B-11**	**84.5**	**9.52**	**0.402**	**0.081**		**0.3**	**53.7**	**46.0**	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-11**	**28.0**	**22**	**NP**	**NP**	**18**	**Silty Fine SAND (SM) A-2-4**
⊠	**B-11**	**30.0**	**26**	**17**	**9**	**52**	**Sandy Lean CLAY (CL) A-4(2)**
▲	**B-11**	**32.0**	**NP**	**NP**	**NP**	**15**	**Silty Fine SAND (SM) A-2-4**
★	**B-11**	**38.0**	**58**	**35**	**23**	**88**	**Elastic SILT (MH) A-7-5(25)**
⊙	**B-11**	**84.5**	**31**	**NP**	**NP**	**46**	**Silty Fine SAND (SM) A-4(0)**

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	---	Sample Type:	---	Tested By:	GA
Sample ID:	---	Test Date:	08/09/16	Checked By:	mcm
Depth :	---	Test Id:	386279		

pH of Soil by ASTM D4972

Boring ID	Sample ID	Depth	Visual Description	pH of Soil in Distilled Water	pH of Soil in Calcium Chloride
B-11	---	92.5-94 ft	Moist, dark olive clay with sand	7.0	6.8

Notes: Sample Preparation: screened through #10 sieve

Method A, pH meter used

Client:	F&ME Consultants
Project:	US-21 Replacement Bridge over Harbor River
Location:	---
GTX#:	305005
Test Date:	08/09/16
Tested By:	jm
Checked By:	mcm

Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, $(ohm\text{-}cm)^{-1}$
B-11	---	92.5-94	Moist, olive clay with sand	101	9.91E-03

Notes: Test Equipment: Nilsson Model 400 Soil Resistance Meter, MC Miller Soil Box
Water added to sample to create a thick slurry prior to testing (saturated condition).
Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)
Test conducted in standard laboratory atmosphere: 68-73 F

Project Name: US-21 REP. BRIDGE OVER HARBOR
Project Number: 305005

Lab Number: L1623916
Report Date: 08/08/16

SAMPLE RESULTS

Lab ID: L1623916-02
Client ID: B-11 / 92.5-94.0 FT
Sample Location: Not Specified
Matrix: Soil

Date Collected: 08/01/16 11:59
Date Received: 08/02/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	62.2		%	0.100	NA	1	-	08/03/16 02:46	121,2540G	VB
Chloride	5700		mg/kg	140	--	10	-	08/05/16 17:53	1,9251	
Sulfate	2000		mg/kg	800	--	5	-	08/04/16 11:30	1,9038	AW

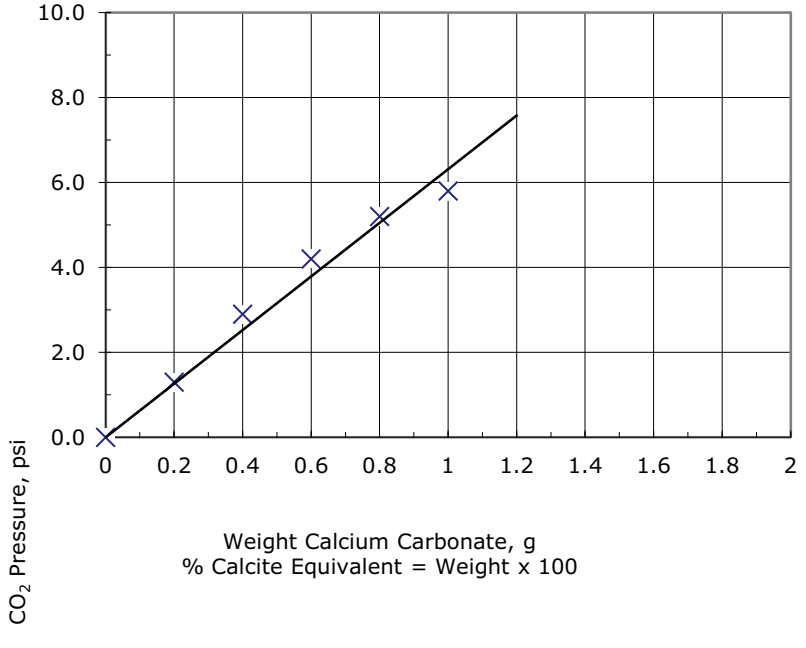
Client:	FME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	08/23/16
Tested By:	jbr
Checked By:	jdt

Rapid Determination of Carbonate Content of Soils by ASTM D4373

Boring ID	Sample ID	Depth, ft	*CO_2 Pressure, psi	Weight of Sample used, g	Weight $CaCO_3$, grams	Calcite Equivalent, %
B-11	---	68.5-70	5.50	1.00	4.51	451

Notes: Calcium Carbonate content precise to +/- 1.5%
*CO_2 Pressure is based on the weight of sample as indicated in the table.
The reported Calcite Equivalent (%) is based on one gram

Figure 1: Calibration Curve



F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	16-1182	**DATE SAMPLE RECEIVED:**	7/15/2016
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	MB	**DATE OF TESTING:**	7/20/2016
		DATE OF WEIGHING:	7/21/2016

BORING NO.	B-12	B-12	B-12	B-12	B-12
SAMPLE NO.	16-1182C	16-1182F	16-1182I	16-1182L	16-1182O
SAMPLE DEPTH	37.0-39.0'	45.5-47.0'	61.0-62.5'	80.0-81.5'	96.5-98.0'
WATER CONTENT, W%	32.9	24.6	81.2	61.8	33.7

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

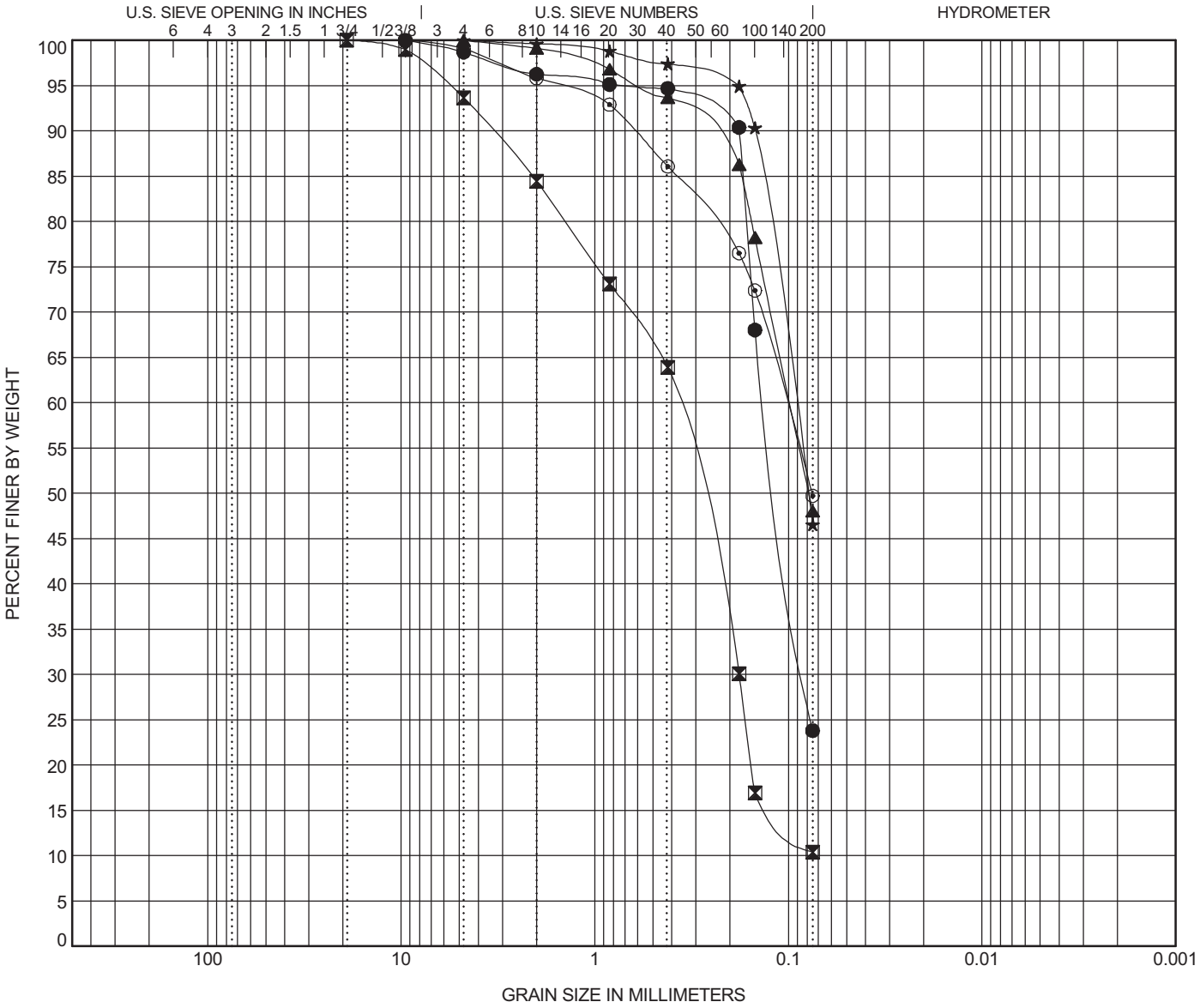
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

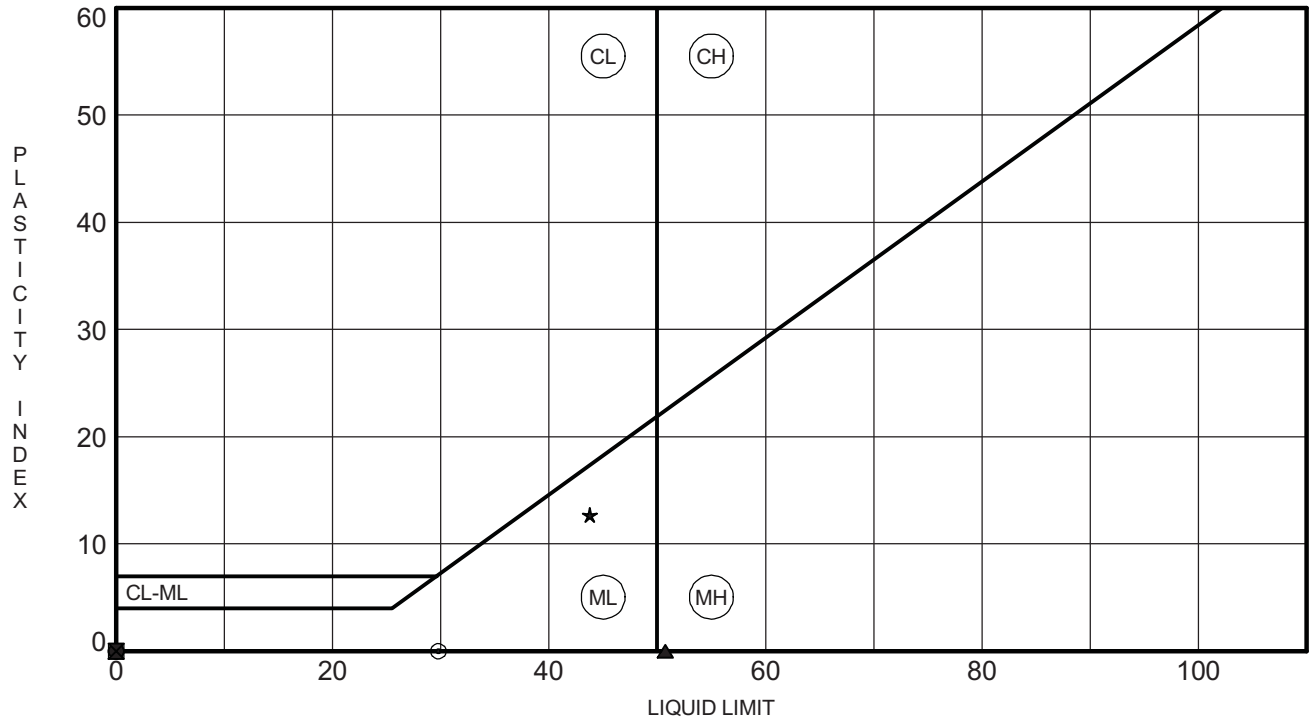
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**B-12**	**39.0**	**Silty F/M SAND (SM) A-2-4**	**NP**	**NP**	**NP**		
⊠	**B-12**	**47.0**	**Poorly Graded F/C SAND (SP-SM) with Silt A-3**	**NP**	**NP**	**NP**	**1.18**	**5.30**
▲	**B-12**	**62.5**	**Silty F/M SAND (SM) A-5(0)**	**51**	**NP**	**NP**		
★	**B-12**	**81.5**	**Silty Fine SAND (SM) A-7-5(4)**	**44**	**31**	**13**		
⊙	**B-12**	**98.0**	**Silty F/M SAND (SM) A-4(0)**	**30**	**NP**	**NP**		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-12**	**39.0**	**9.52**	**0.672**	**0.113**		**1.3**	**74.9**	**23.8**	
⊠	**B-12**	**47.0**	**19.1**	**5.662**	**0.296**		**6.4**	**83.2**	**10.4**	
▲	**B-12**	**62.5**	**4.76**	**0.561**	**0.078**		**0.0**	**52.0**	**48.0**	
★	**B-12**	**81.5**	**4.76**	**0.184**	**0.079**		**0.0**	**53.4**	**46.6**	
⊙	**B-12**	**98.0**	**9.52**	**1.56**	**0.076**		**0.9**	**49.3**	**49.7**	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-12**	**39.0**	**NP**	**NP**	**NP**	**24**	**Silty F/M SAND (SM) A-2-4**
⊠	**B-12**	**47.0**	**NP**	**NP**	**NP**	**10**	**Poorly Graded F/C SAND (SP-SM) with Silt A-3**
▲	**B-12**	**62.5**	**51**	**NP**	**NP**	**48**	**Silty F/M SAND (SM) A-5(0)**
★	**B-12**	**81.5**	**44**	**31**	**13**	**47**	**Silty Fine SAND (SM) A-7-5(4)**
⊙	**B-12**	**98.0**	**30**	**NP**	**NP**	**50**	**Silty F/M SAND (SM) A-4(0)**

Client:	FME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	08/23/16
Tested By:	jbr
Checked By:	jdt

Rapid Determination of Carbonate Content of Soils by ASTM D4373

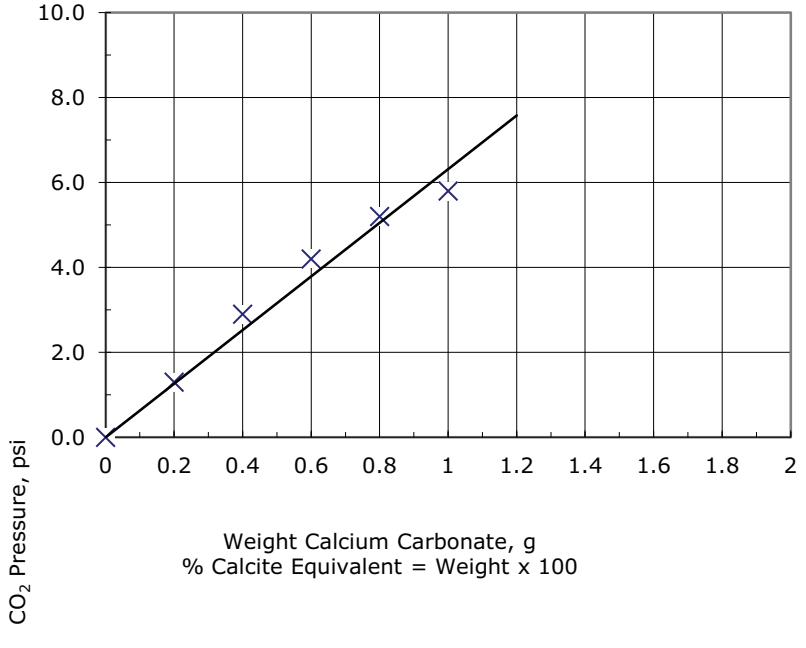
Boring ID	Sample ID	Depth, ft	*CO_2 Pressure, psi	Weight of Sample used, g	Weight $CaCO_3$, grams	Calcite Equivalent, %
B-12	---	115.5-117	6.00	1.00	4.93	493

Notes: Calcium Carbonate content precise to +/- 1.5%

*CO_2 Pressure is based on the weight of sample as indicated in the table.

The reported Calcite Equivalent (%) is based on one gram

Figure 1: Calibration Curve



F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	16-1039	**DATE SAMPLE RECEIVED:**	7/6/2016
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	MB	**DATE OF TESTING:**	7/6/2016
		DATE OF WEIGHING:	7/7/2016

BORING NO.	B-13	B-13	B-13	B-13	B-13
SAMPLE NO.	16-1039C	16-1039F	16-1039I	16-1039L	16-1039O
SAMPLE DEPTH	32.0-34.0'	42.5-44.0'	52.5-54.0'	63.5-65.0'	99.5-101.0'
WATER CONTENT, W%	34.6	63.6	78.3	73.8	37.3

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

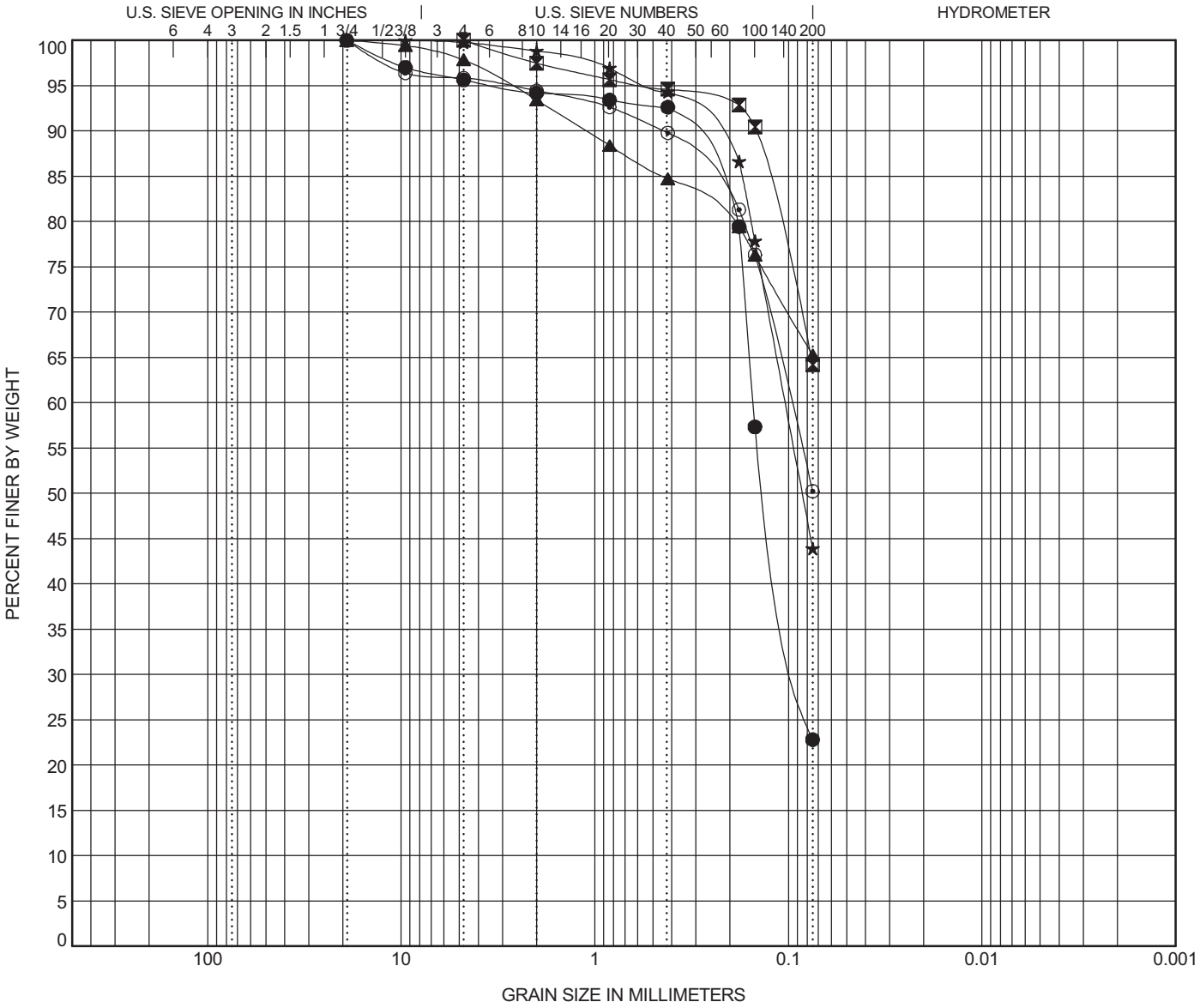
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

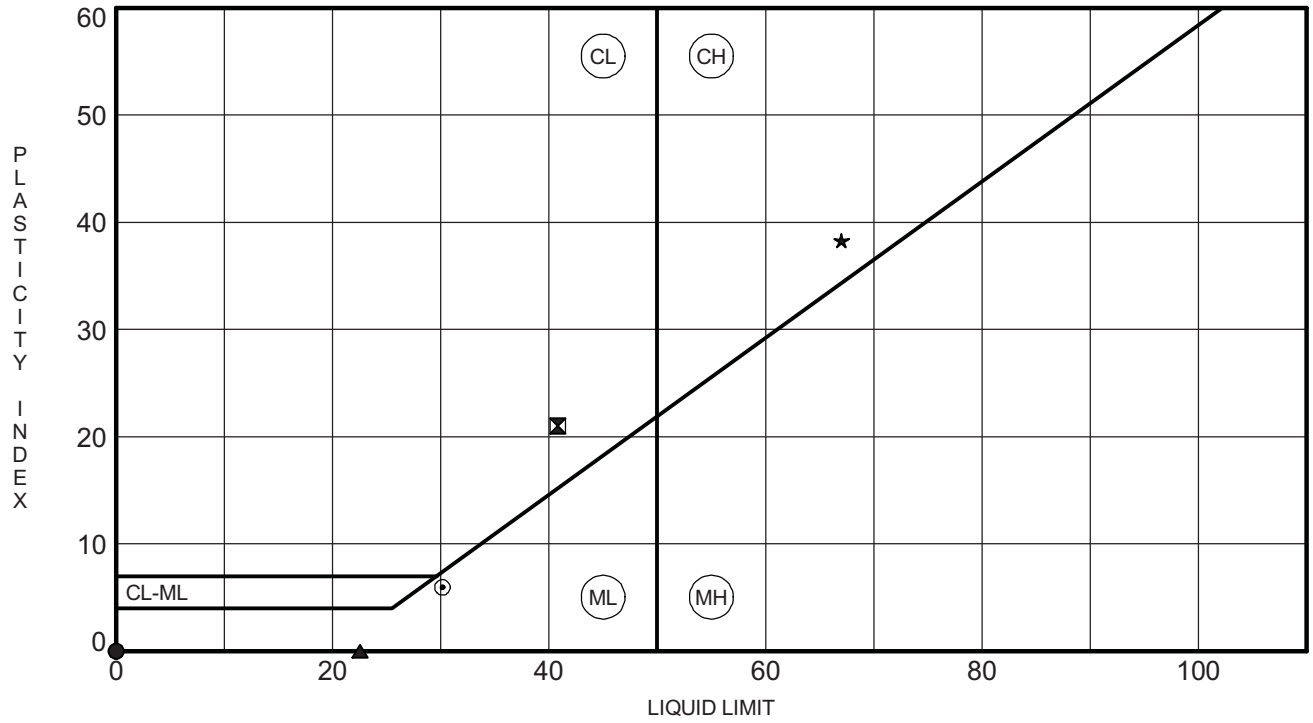
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-13	34.0	Silty F/M SAND (SM) A-2-4	NP	NP	NP		
⊠	B-13	44.0	Sandy Lean CLAY (CL) A-7-6(11)	41	20	21		
▲	B-13	54.0	Sandy SILT (ML) A-4(0)	23	NP	NP		
★	B-13	65.0	Clayey F/M SAND (SC) A-7-6(11)	67	29	38		
⊙	B-13	101.0	Sandy SILT (ML) A-4(1)	30	24	6		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	B-13	34.0	19.1	3.252	0.129		4.4	72.8	22.8	
⊠	B-13	44.0	4.76	0.54			0.0	35.8	64.2	
▲	B-13	54.0	19.1	2.717			2.1	32.6	65.3	
★	B-13	65.0	9.52	0.501	0.085		0.2	55.9	43.9	
⊙	B-13	101.0	19.1	2.809			4.2	45.6	50.2	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-13**	**34.0**	**NP**	**NP**	**NP**	**23**	**Silty F/M SAND (SM) A-2-4**
⊠	**B-13**	**44.0**	**41**	**20**	**21**	**64**	**Sandy Lean CLAY (CL) A-7-6(11)**
▲	**B-13**	**54.0**	**23**	**NP**	**NP**	**65**	**Sandy SILT (ML) A-4(0)**
★	**B-13**	**65.0**	**67**	**29**	**38**	**44**	**Clayey F/M SAND (SC) A-7-6(11)**
⊙	**B-13**	**101.0**	**30**	**24**	**6**	**50**	**Sandy SILT (ML) A-4(1)**

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	---	Sample Type:	---	Tested By:	GA
Sample ID:	---	Test Date:	08/09/16	Checked By:	mcm
Depth :	---	Test Id:	386279		

pH of Soil by ASTM D4972

Boring ID	Sample ID	Depth	Visual Description	pH of Soil in Distilled Water	pH of Soil in Calcium Chloride
B-13	---	58-59.5 ft	Moist, dark olive silty sand	7.2	7.0

Notes: Sample Preparation: screened through #10 sieve

Method A, pH meter used

Client:	F&ME Consultants
Project:	US-21 Replacement Bridge over Harbor River
Location:	---
GTX#:	305005
Test Date:	08/09/16
Tested By:	jm
Checked By:	mcm

Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, $(ohm\text{-}cm)^{-1}$
B-13	---	58-59.5	Moist, dark olive silty sand	76	1.31E-02

Notes: Test Equipment: Nilsson Model 400 Soil Resistance Meter, MC Miller Soil Box
Water added to sample to create a thick slurry prior to testing (saturated condition).
Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)
Test conducted in standard laboratory atmosphere: 68-73 F

Project Name: US-21 REP. BRIDGE OVER HARBOR
Project Number: 305005

Lab Number: L1623916
Report Date: 08/08/16

SAMPLE RESULTS

Lab ID: L1623916-03
Client ID: B-13 / 58.0-59.5 FT
Sample Location: Not Specified
Matrix: Soil

Date Collected: 08/01/16 12:04
Date Received: 08/02/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	67.4		%	0.100	NA	1	-	08/03/16 02:46	121,2540G	VB
Chloride	7600		mg/kg	140	--	10	-	08/05/16 17:55	1,9251	
Sulfate	1700		mg/kg	740	--	5	-	08/04/16 11:30	1,9038	AW

Client:	FME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	08/23/16
Tested By:	jbr
Checked By:	jdt

Rapid Determination of Carbonate Content of Soils by ASTM D4373

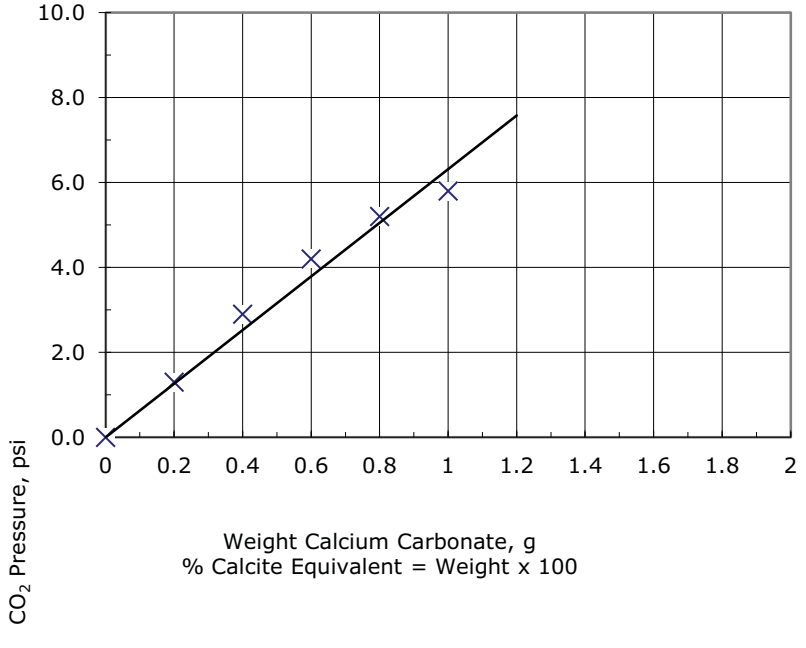
Boring ID	Sample ID	Depth, ft	*CO_2 Pressure, psi	Weight of Sample used, g	Weight $CaCO_3$, grams	Calcite Equivalent, %
B-13	---	94.5-96	5.60	1.00	4.60	460

Notes: Calcium Carbonate content precise to +/- 1.5%

*CO_2 Pressure is based on the weight of sample as indicated in the table.

The reported Calcite Equivalent (%) is based on one gram

Figure 1: Calibration Curve



F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	16-1008	**DATE SAMPLE RECEIVED:**	7/6/2016
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	MB	**DATE OF TESTING:**	7/6/2016
		DATE OF WEIGHING:	7/7/2016

BORING NO.	B-14	B-14	B-14	B-14	B-14
SAMPLE NO.	16-1008C	16-1008F	16-1008I	16-1008L	16-1008O
SAMPLE DEPTH	8.0-10.0'	23.5-25.0'	28.5-30.0'	38.5-40.0'	48.5-50.0'
WATER CONTENT, W%	32.4	38.6	50.9	56.1	46.2

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

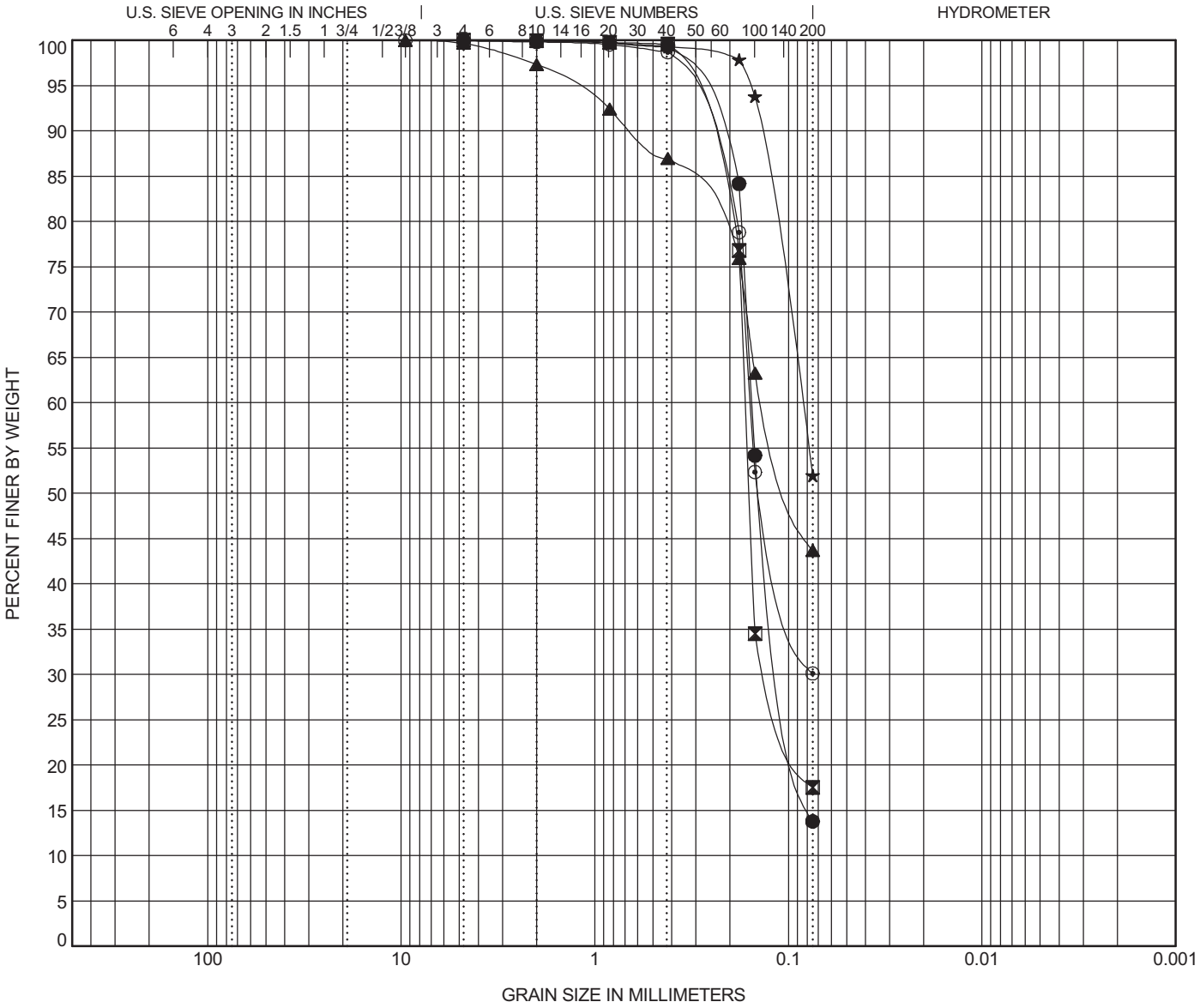
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

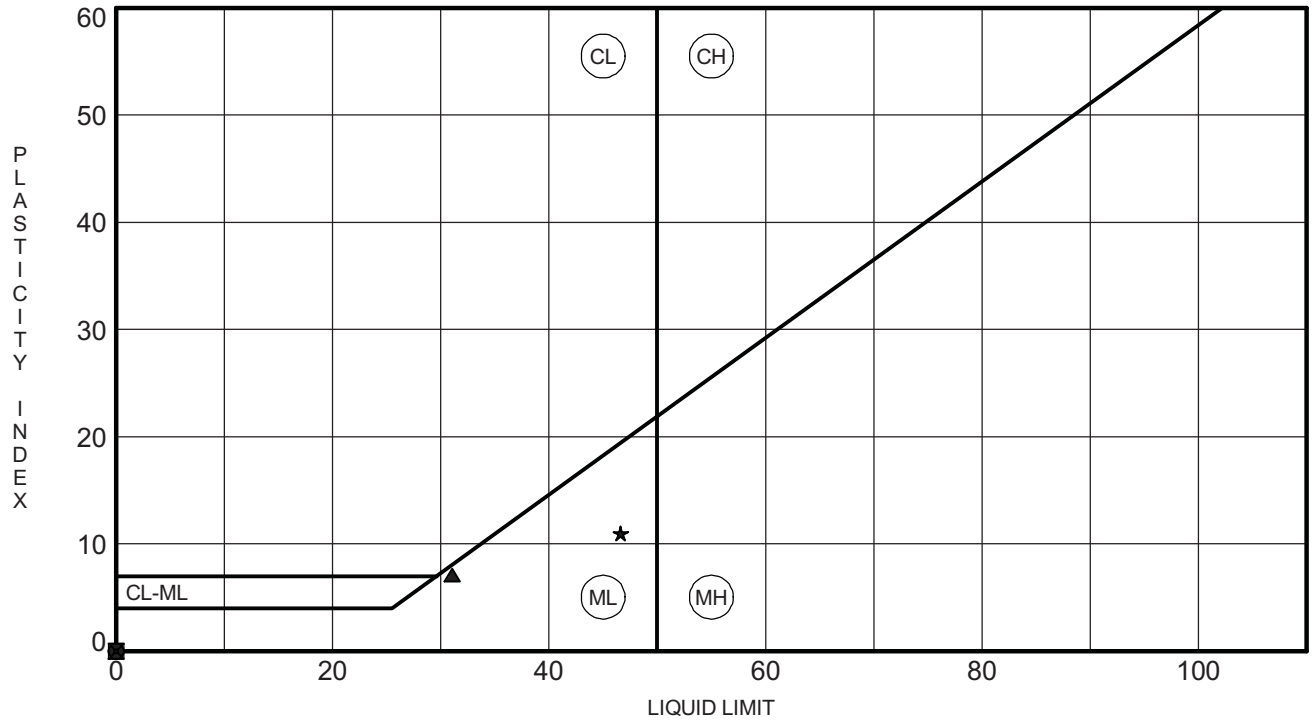
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**B-14**	**10.0**	**Silty Fine SAND (SM) A-2-4**	**NP**	**NP**	**NP**		
⊠	**B-14**	**25.0**	**Silty Fine SAND (SM) A-2-4**	**NP**	**NP**	**NP**		
▲	**B-14**	**30.0**	**Silty F/M SAND (SM) A-4(1)**	**31**	**24**	**7**		
★	**B-14**	**40.0**	**Sandy SILT (ML) A-7-5(4)**	**47**	**36**	**11**		
⊙	**B-14**	**50.0**	**Silty Fine SAND (SM) A-2-4**	**NP**	**NP**	**NP**		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-14**	**10.0**	**4.76**	**0.328**	**0.139**		**0.0**	**86.2**	**13.8**	
⊠	**B-14**	**25.0**	**4.76**	**0.354**	**0.16**		**0.0**	**82.4**	**17.6**	
▲	**B-14**	**30.0**	**9.52**	**1.321**	**0.094**		**0.3**	**56.0**	**43.7**	
★	**B-14**	**40.0**	**4.76**	**0.157**			**0.0**	**48.0**	**52.0**	
⊙	**B-14**	**50.0**	**9.52**	**0.359**	**0.139**		**0.0**	**69.8**	**30.1**	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-14**	**10.0**	**NP**	**NP**	**NP**	**14**	**Silty Fine SAND (SM) A-2-4**
⊠	**B-14**	**25.0**	**NP**	**NP**	**NP**	**18**	**Silty Fine SAND (SM) A-2-4**
▲	**B-14**	**30.0**	**31**	**24**	**7**	**44**	**Silty F/M SAND (SM) A-4(1)**
★	**B-14**	**40.0**	**47**	**36**	**11**	**52**	**Sandy SILT (ML) A-7-5(4)**
⊙	**B-14**	**50.0**	**NP**	**NP**	**NP**	**30**	**Silty Fine SAND (SM) A-2-4**

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	---	Sample Type:	---	Tested By:	GA
Sample ID:	---	Test Date:	08/09/16	Checked By:	mcm
Depth :	---	Test Id:	386279		

pH of Soil by ASTM D4972

Boring ID	Sample ID	Depth	Visual Description	pH of Soil in Distilled Water	pH of Soil in Calcium Chloride
B-14	---	33.5-35 ft	Moist, olive gray clay with sand	7.4	7.1

Notes: Sample Preparation: screened through #10 sieve

Method A, pH meter used

Client:	F&ME Consultants
Project:	US-21 Replacement Bridge over Harbor River
Location:	---
GTX#:	305005
Test Date:	08/09/16
Tested By:	jm
Checked By:	mcm

Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, $(ohm\text{-}cm)^{-1}$
B-14	---	33.5-35	Moist, olive gray clay with sand	71	1.40E-02

Notes: Test Equipment: Nilsson Model 400 Soil Resistance Meter, MC Miller Soil Box
Water added to sample to create a thick slurry prior to testing (saturated condition).
Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)
Test conducted in standard laboratory atmosphere: 68-73 F

Project Name: US-21 REP. BRIDGE OVER HARBOR
Project Number: 305005

Lab Number: L1623916
Report Date: 08/08/16

SAMPLE RESULTS

Lab ID: L1623916-04
Client ID: B-14 / 33.5-35.0 FT
Sample Location: Not Specified
Matrix: Soil

Date Collected: 08/01/16 12:11
Date Received: 08/02/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	73.8		%	0.100	NA	1	-	08/03/16 02:46	121,2540G	VB
Chloride	6900		mg/kg	130	--	10	-	08/05/16 17:59	1,9251	
Sulfate	1600		mg/kg	660	--	4.9	-	08/04/16 11:30	1,9038	AW

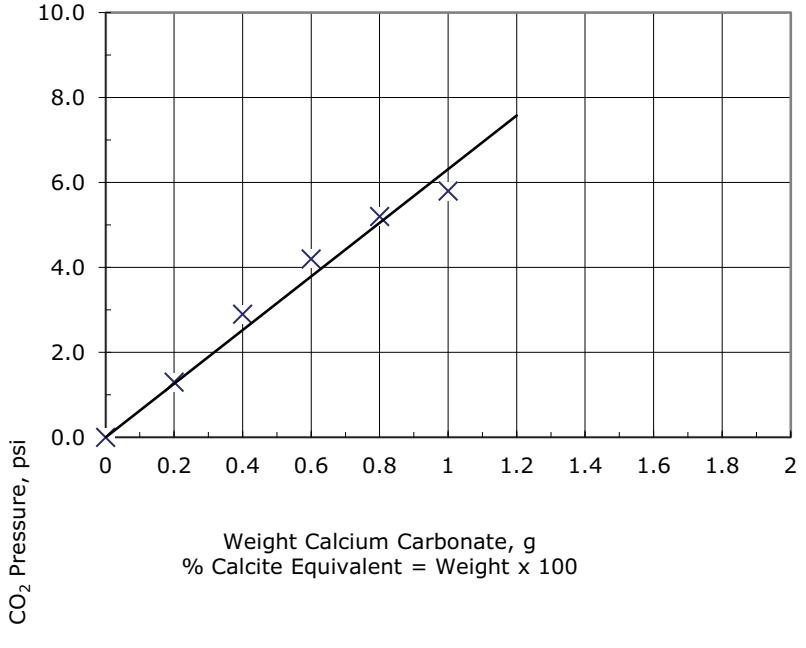
Client:	FME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	08/23/16
Tested By:	jbr
Checked By:	jdt

Rapid Determination of Carbonate Content of Soils by ASTM D4373

Boring ID	Sample ID	Depth, ft	*CO_2 Pressure, psi	Weight of Sample used, g	Weight $CaCO_3$, grams	Calcite Equivalent, %
B-14	---	72.5-74	4.90	10.00	0.40	40

Notes: Calcium Carbonate content precise to +/- 1.5%
*CO_2 Pressure is based on the weight of sample as indicated in the table.
The reported Calcite Equivalent (%) is based on one gram

Figure 1: Calibration Curve



F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	16-1285	**DATE SAMPLE RECEIVED:**	8/5/2016
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	MB	**DATE OF TESTING:**	8/9/2016
		DATE OF WEIGHING:	8/10/2016

BORING NO.	B-15	B-15	B-15	B-15	B-15
SAMPLE NO.	16-1285C	16-1285F	16-1285I	16-1285L	16-1285P
SAMPLE DEPTH	4.0-6.0'	6.0-8.0'	13.5-15.0'	18.5-20.0'	43.5-45.0'
WATER CONTENT, W%	26.2	23.5	23.8	33.2	31.6

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

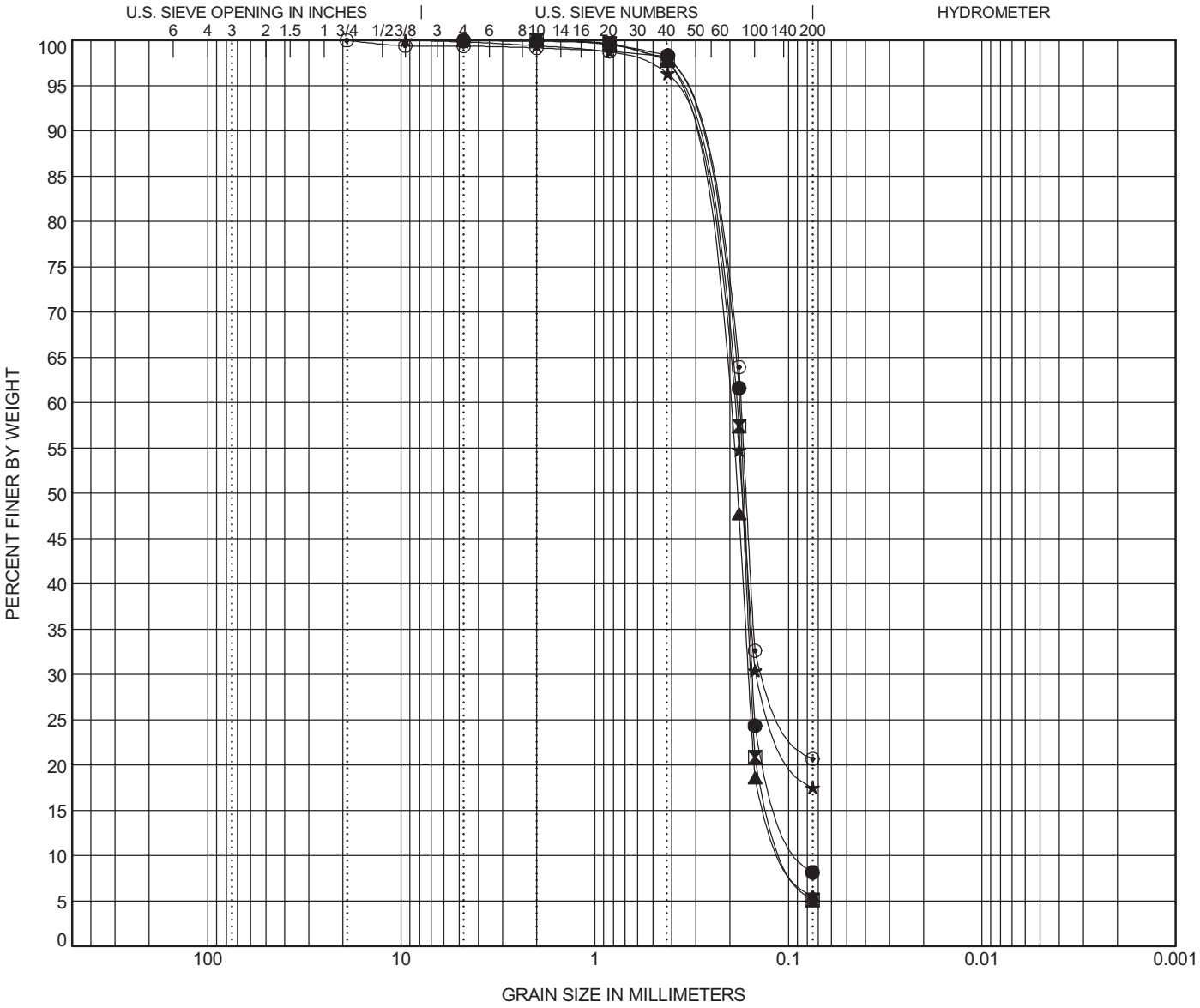
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

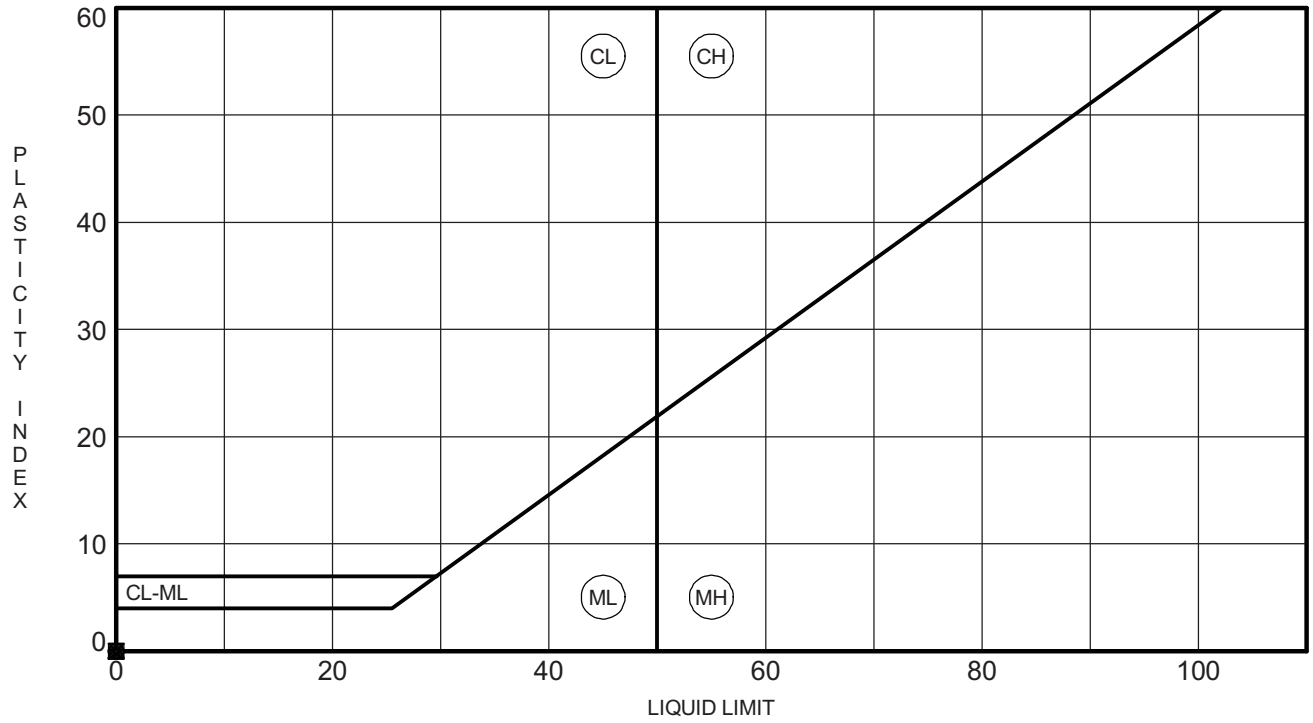
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-15	6.0	Poorly Graded Fine SAND (SP-SM) with Silt A-3	NP	NP	NP	1.62	2.20
⊠	B-15	8.0	Poorly Graded Fine SAND (SP-SM) with Silt A-3	NP	NP	NP	1.38	2.05
▲	B-15	15.0	Poorly Graded Fine SAND (SP-SM) with Silt A-3	NP	NP	NP	1.23	2.33
★	B-15	20.0	Silty Fine SAND (SM) A-2-4	NP	NP	NP		
⊙	B-15	45.0	Silty Fine SAND (SM) A-2-4	NP	NP	NP		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	B-15	6.0	4.76	0.389	0.17	0.081	0.0	91.8	8.2	
⊠	B-15	8.0	2	0.396	0.173	0.093	0.0	94.9	5.1	
▲	B-15	15.0	4.76	0.4	0.187	0.095	0.0	94.5	5.5	
★	B-15	20.0	9.52	0.409	0.173		0.2	82.3	17.5	
⊙	B-15	45.0	19.1	0.388	0.165		0.6	78.7	20.7	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-15**	**6.0**	**NP**	**NP**	**NP**	**8**	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**
⊠	**B-15**	**8.0**	**NP**	**NP**	**NP**	**5**	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**
▲	**B-15**	**15.0**	**NP**	**NP**	**NP**	**6**	**Poorly Graded Fine SAND (SP-SM) with Silt A-3**
★	**B-15**	**20.0**	**NP**	**NP**	**NP**	**18**	**Silty Fine SAND (SM) A-2-4**
⊙	**B-15**	**45.0**	**NP**	**NP**	**NP**	**21**	**Silty Fine SAND (SM) A-2-4**

ATTERBERG LIMITS G5396 - HARBOR RIVER SPT AND CPT.GPJ GINT STD US LAB.GDT 10/5/16

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

ORGANIC IMPURITIES DETERMINATION
(AASHTO T267)

PROJECT: US 21 Bridge Replacement over Harbor River

PROJECT NO.: G5396

SAMPLE NUMBER: 16-1285

DATE SAMPLE RECEIVED: 8/8/2016

DESCRIPTION OF SOIL:

TESTED BY: MB

DATE OF TESTING: 8/10/2016

DATE OF WEIGHING: 8/10/2016

BORING NO.	B-15				
SAMPLE NO.	16-1285M				
SAMPLE DEPTH	38.5-40.0'				
WT. OF CRUCIBLE + DRY SOIL (BEFORE IGNITION) (GRAMS)	177.48				
WT. OF CRUCIBLE + DRY SOIL (AFTER IGNITION) (GRAMS)	175.82				
WT. OF CRUCIBLE (GRAMS)	137.48				
WT. OF DRY SOIL (BEFORE IGNITION) (GRAMS)	40.00				
WT. OF DRY SOIL (AFTER IGNITION) (GRAMS)	38.34				
IGNITION LOSS (GRAMS)	1.66				
ORGANIC IMPURITIES %	4.15				

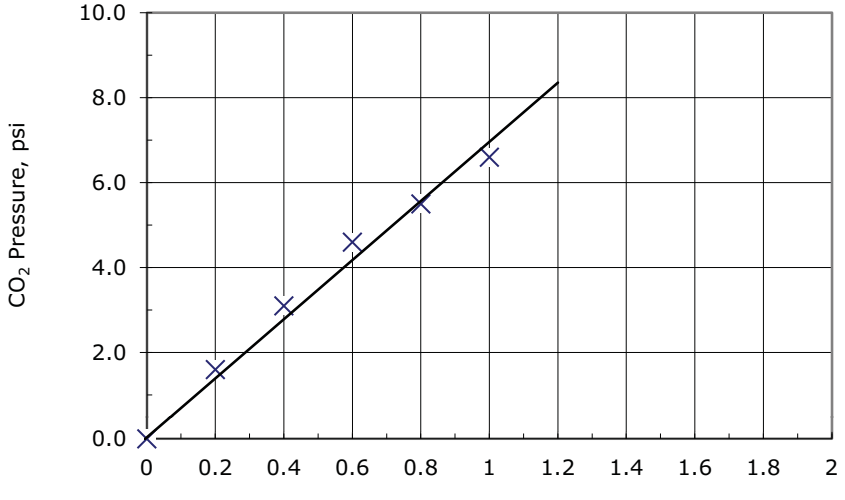
Client:	FME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	08/23/16
Tested By:	jbr
Checked By:	jdt

Rapid Determination of Carbonate Content of Soils by ASTM D4373

Boring ID	Sample ID	Depth, ft	*CO_2 Pressure, psi	Weight of Sample used, g	Weight $CaCO_3$, grams	Calcite Equivalent, %
B-15	16-1285Q	58.5-60	0.20	2.00	0.08	8

Notes: Calcium Carbonate content precise to +/- 1.5%
*CO_2 Pressure is based on the weight of sample as indicated in the table.
The reported Calcite Equivalent (%) is based on one gram

Figure 1: Calibration Curve



Weight Calcium Carbonate, g
% Calcite Equivalent = Weight x 100

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	16-1286	**DATE SAMPLE RECEIVED:**	8/5/2016
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	MB	**DATE OF TESTING:**	8/9/2016
		DATE OF WEIGHING:	8/10/2016

BORING NO.	B-16	B-16	B-16	B-16	B-16
SAMPLE NO.	16-1286C	16-1286F	16-1286I	16-1286L	16-1286O
SAMPLE DEPTH	6.0-8.0'	13.5-15.0'	23.5-25.0'	38.5-40.0'	48.5-50.0'
WATER CONTENT, W%	24.5	24.3	37.4	56.7	84.8

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

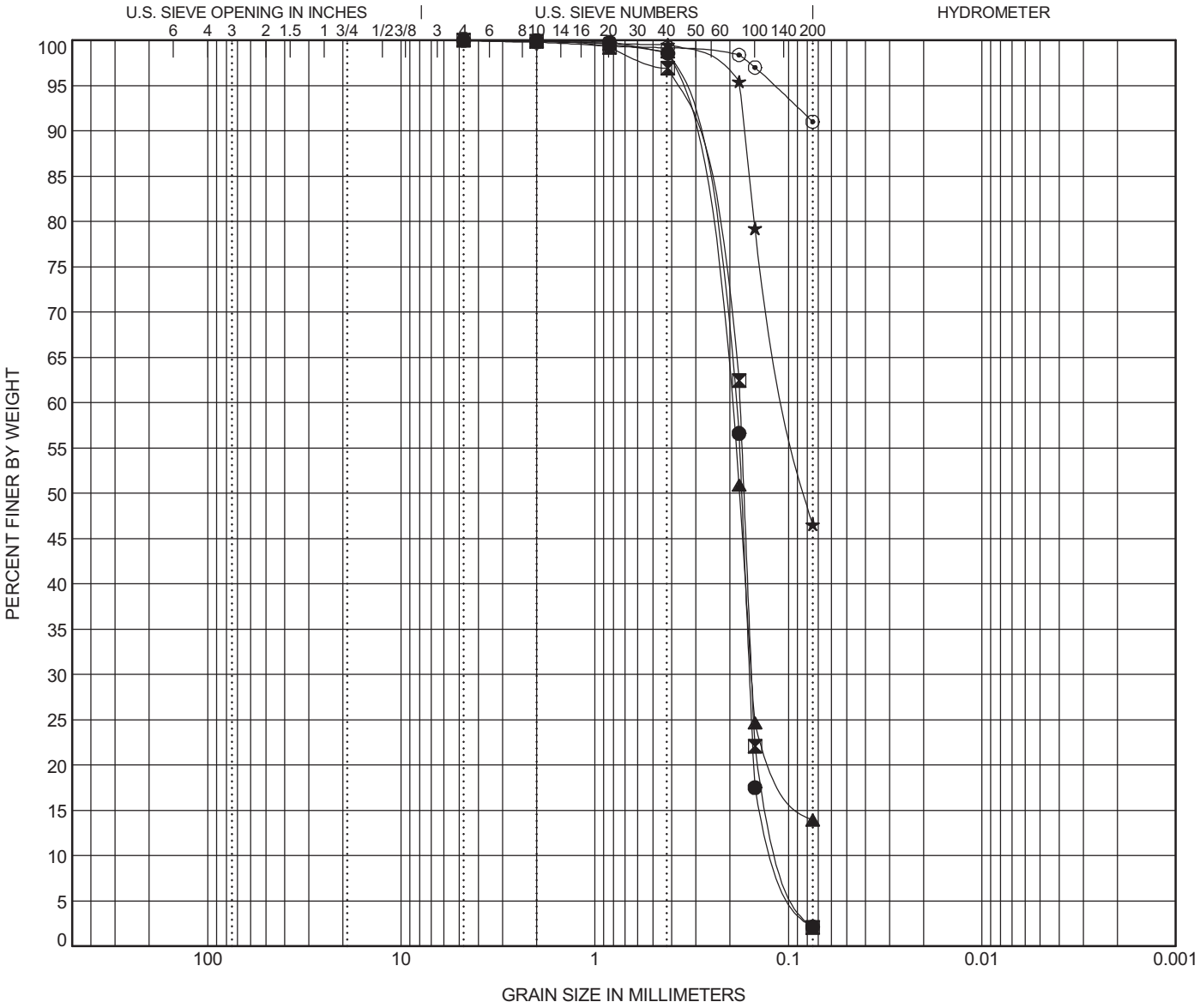
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

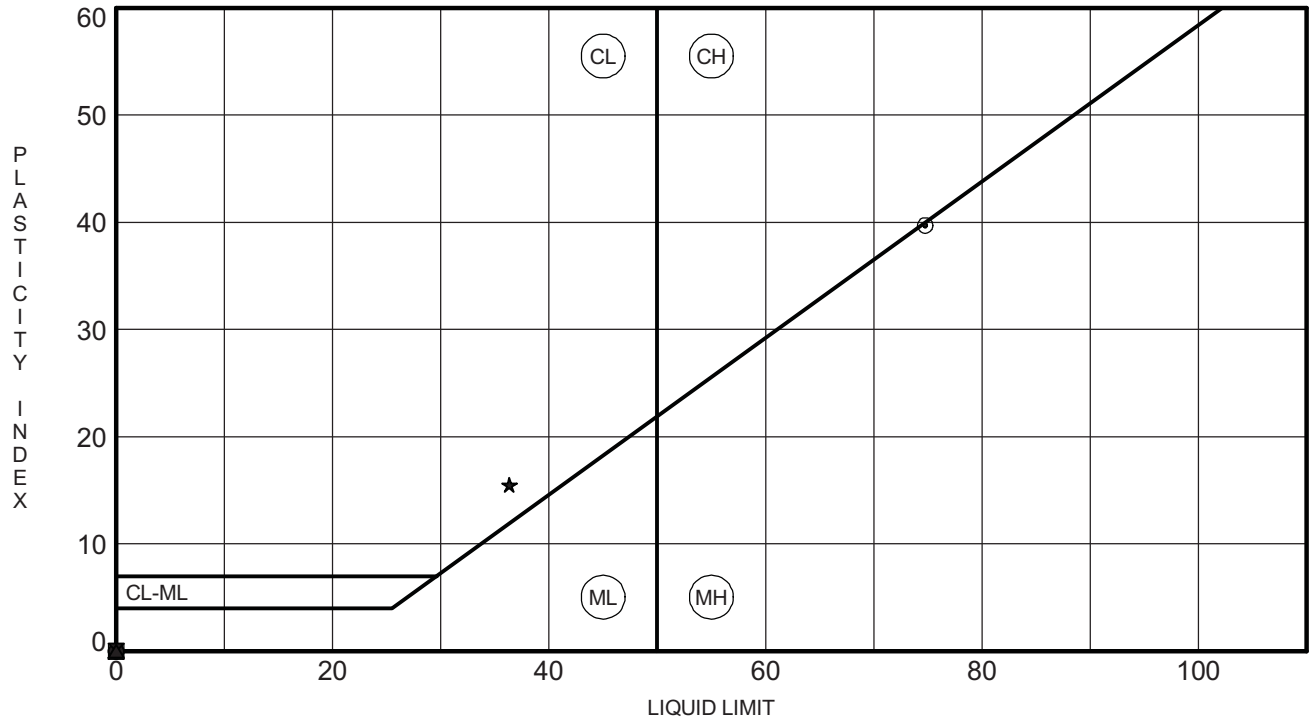
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-16	8.0	Poorly Graded Fine SAND (SP) A-3	NP	NP	NP	1.22	1.81
⊠	B-16	15.0	Poorly Graded Fine SAND (SP) A-3	NP	NP	NP	1.37	1.81
▲	B-16	25.0	Silty Fine SAND (SM) A-2-4	NP	NP	NP		
★	B-16	40.0	Clayey Fine SAND (SC) A-6(4)	36	21	15		
⊙	B-16	50.0	Elastic SILT (MH) A-7-5(25)	75	35	40		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	B-16	8.0	4.76	0.391	0.174	0.107	0.0	97.9	2.1	
⊠	B-16	15.0	4.76	0.4	0.17	0.098	0.0	97.9	2.1	
▲	B-16	25.0	4.76	0.393	0.179		0.0	86.1	13.9	
★	B-16	40.0	4.76	0.179	0.081		0.0	53.4	46.6	
⊙	B-16	50.0	4.76	0.118			0.0	9.0	91.0	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-16**	**8.0**	**NP**	**NP**	**NP**	**2**	**Poorly Graded Fine SAND (SP) A-3**
⊠	**B-16**	**15.0**	**NP**	**NP**	**NP**	**2**	**Poorly Graded Fine SAND (SP) A-3**
▲	**B-16**	**25.0**	**NP**	**NP**	**NP**	**14**	**Silty Fine SAND (SM) A-2-4**
★	**B-16**	**40.0**	**36**	**21**	**15**	**47**	**Clayey Fine SAND (SC) A-6(4)**
⊙	**B-16**	**50.0**	**75**	**35**	**40**	**91**	**Elastic SILT (MH) A-7-5(25)**

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

ORGANIC IMPURITIES DETERMINATION
(AASHTO T267)

PROJECT: US 21 Bridge Replacement over Harbor River

PROJECT NO.: G5396

SAMPLE NUMBER: 16-1286

DATE SAMPLE RECEIVED: 8/8/2016

DESCRIPTION OF SOIL:

TESTED BY: MB

DATE OF TESTING: 8/10/2016

DATE OF WEIGHING: 8/10/2016

BORING NO.	B-16				
SAMPLE NO.	16-1286P				
SAMPLE DEPTH	53.5-55.0'				
WT. OF CRUCIBLE + DRY SOIL (BEFORE IGNITION) (GRAMS)	139.63				
WT. OF CRUCIBLE + DRY SOIL (AFTER IGNITION) (GRAMS)	136.74				
WT. OF CRUCIBLE (GRAMS)	99.63				
WT. OF DRY SOIL (BEFORE IGNITION) (GRAMS)	40.00				
WT. OF DRY SOIL (AFTER IGNITION) (GRAMS)	37.11				
IGNITION LOSS (GRAMS)	2.89				
ORGANIC IMPURITIES %	7.22				

Client:	FME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	08/23/16
Tested By:	jbr
Checked By:	jdt

Rapid Determination of Carbonate Content of Soils by ASTM D4373

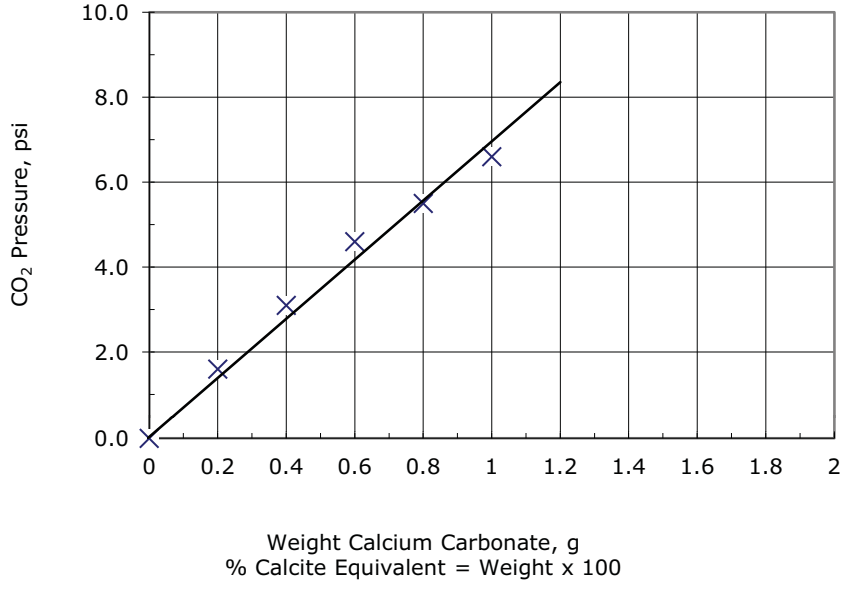
Boring ID	Sample ID	Depth, ft	*CO_2 Pressure, psi	Weight of Sample used, g	Weight $CaCO_3$, grams	Calcite Equivalent, %
B-16	16-1286Q	78.5-80	1.80	10.00	0.15	15

Notes: Calcium Carbonate content precise to +/- 1.5%

*CO_2 Pressure is based on the weight of sample as indicated in the table.

The reported Calcite Equivalent (%) is based on one gram

Figure 1: Calibration Curve



F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	15-1799	**DATE SAMPLE RECEIVED:**	12/3/2015
DESCRIPTION OF SOIL:	Various		
TESTED BY:	MB	**DATE OF TESTING:**	12/3/2015
		DATE OF WEIGHING:	12/4/2015

BORING NO.	TS-1	TS-1	TS-1	TS-1	TS-1
SAMPLE NO.	15-1799C	15-1799F	15-1799I	15-1799L	15-1799O
SAMPLE DEPTH	6.0-8.0'	16.0-18.0'	22.0-24.0'	26.0-28.0'	32.0-34.0'
WATER CONTENT, W%	25.9	52.2	26.7	65.5	40.2

BORING NO.	TS-1	TS-1	TS-1	TS-1	TS-1
SAMPLE NO.	15-1799R	15-1799U	15-1799X	15-1799AA	15-1799DD
SAMPLE DEPTH	44.0-46.0'	46.0-48.0'	56.0-58.0'	72.0-74.0'	76.0-78.0'
WATER CONTENT, W%	24.0	20.1	62.4	61.7	44.5

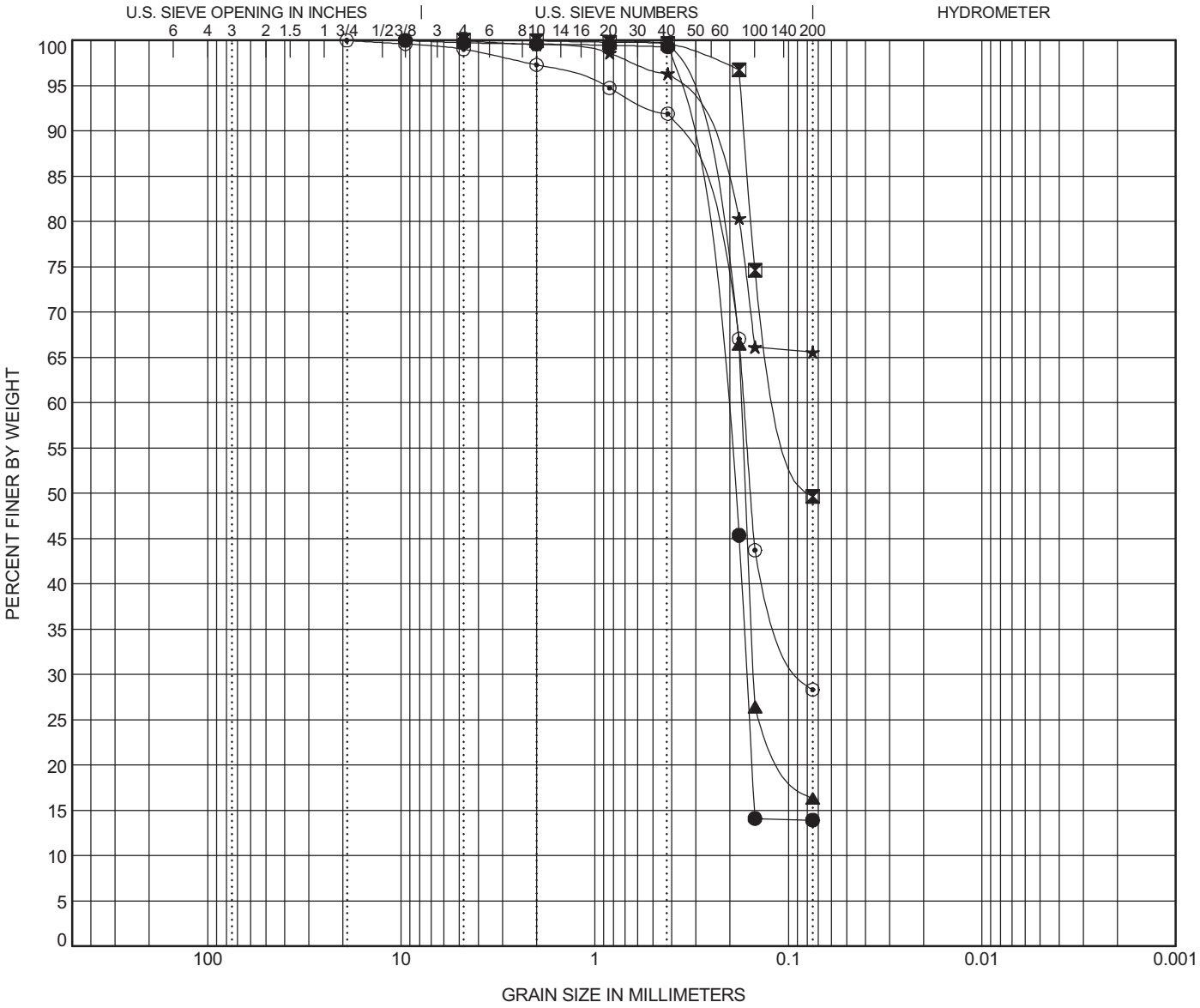
BORING NO.	TS-1	TS-1	TS-1		
SAMPLE NO.	15-1799GG	15-1799JJ	15-1799MM		
SAMPLE DEPTH	80.0-82.0'	104.0-106.0'	120.0-122.0'		
WATER CONTENT, W%	42.6	33.4	35.4		

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

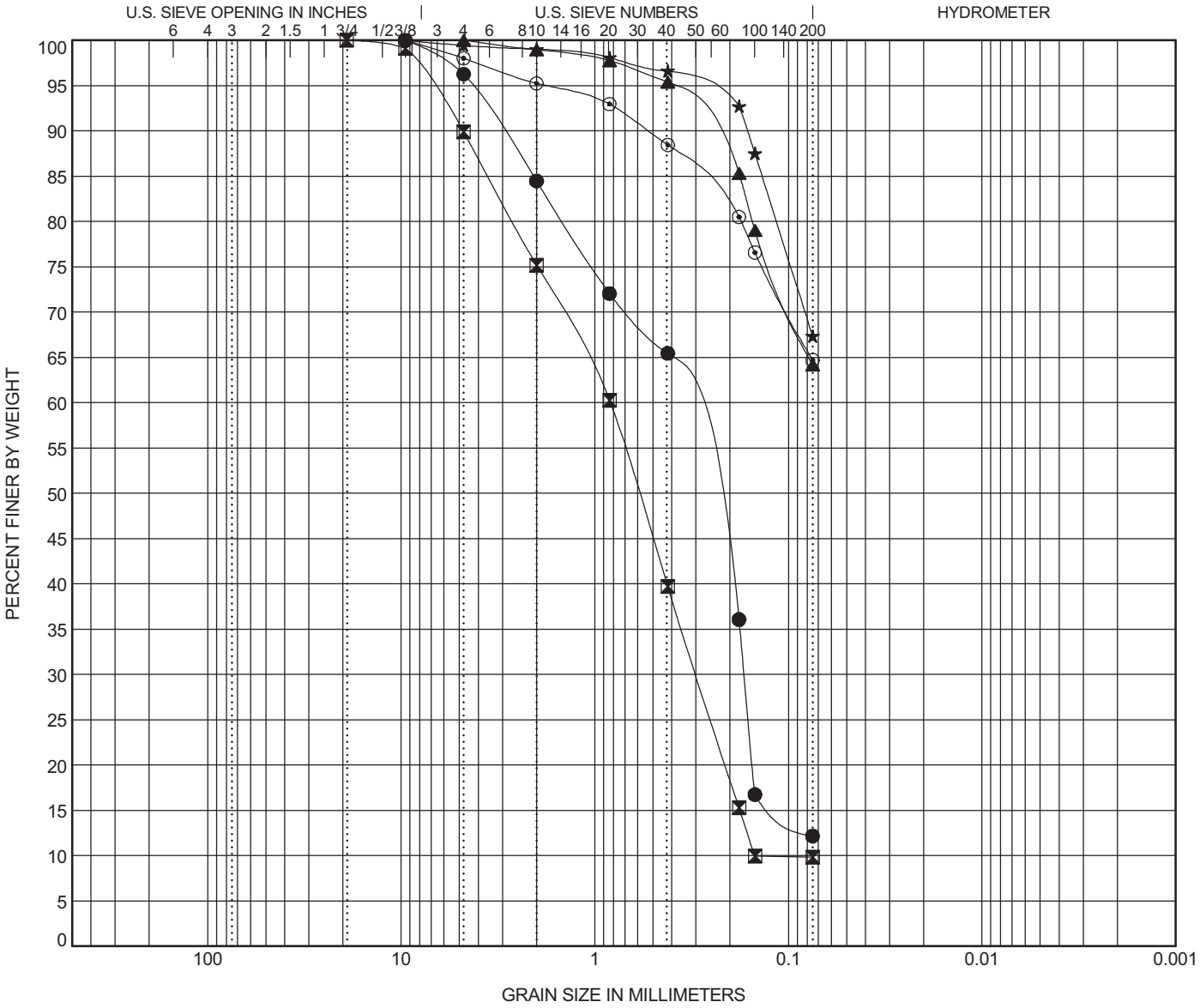
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	TS-1	8.0	Silty Fine SAND (SM) A-2-4	NP	NP	NP		
⊠	TS-1	18.0	Silty, Clayey Fine SAND (SC-SM) A-4(0)	25	21	4		
▲	TS-1	24.0	Silty Fine SAND (SM) A-2-4	NP	NP	NP		
★	TS-1	28.0	Sandy SILT (ML) A-7-6(9)	42	27	15		
⊙	TS-1	34.0	Silty Fine SAND (SM) A-2-4	NP	NP	NP		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	TS-1	8.0	9.52	0.393	0.194		0.3	85.8	13.9	
⊠	TS-1	18.0	4.76	0.177	0.076		0.0	50.3	49.7	
▲	TS-1	24.0	2	0.372	0.167		0.0	83.7	16.3	
★	TS-1	28.0	4.76	0.391			0.0	34.4	65.6	
⊙	TS-1	34.0	19.1	0.915	0.157		1.0	70.7	28.3	

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

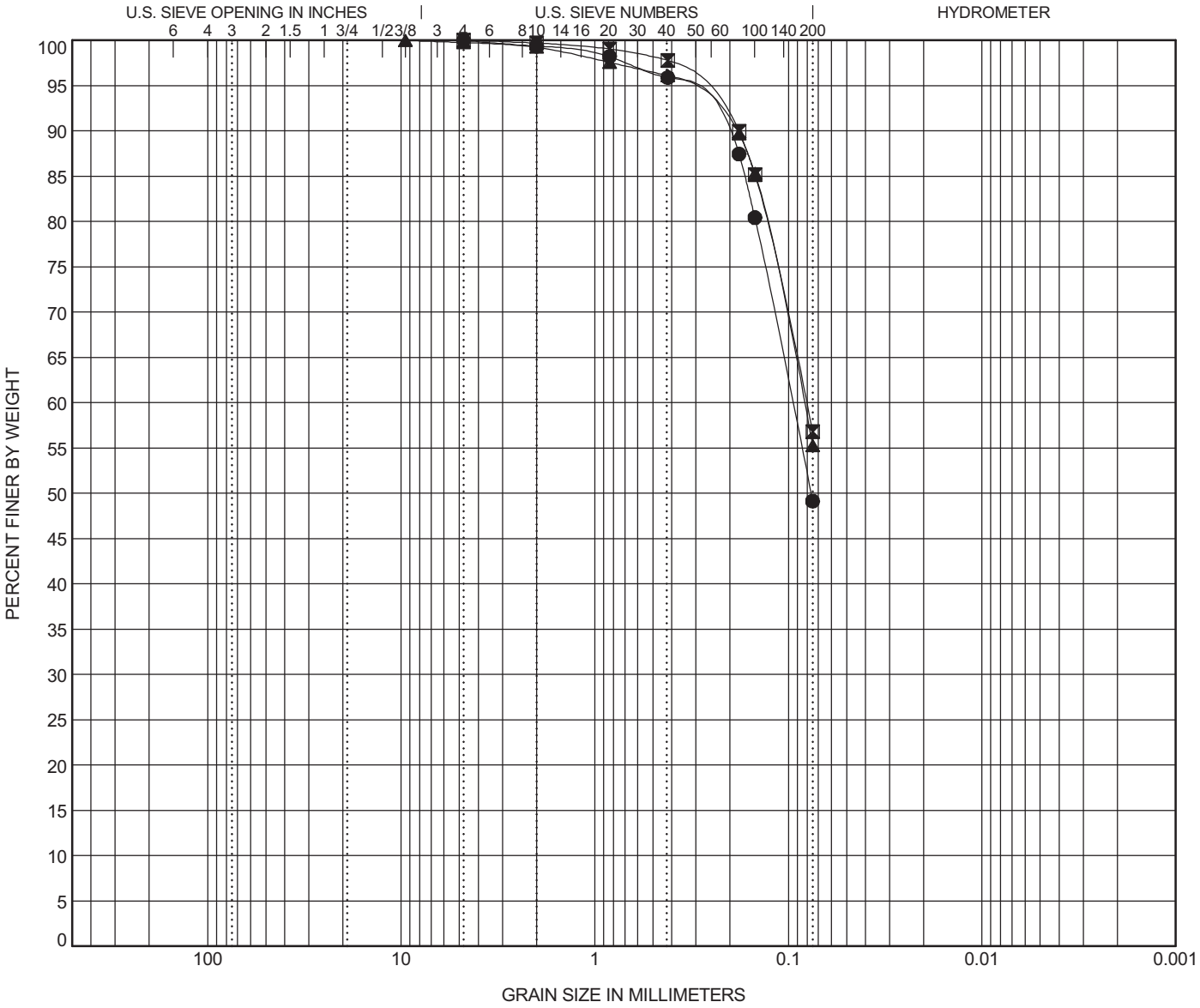
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**TS-1**	**46.0**	**Silty F/C SAND (SM) A-2-4**	**NP**	**NP**	**NP**	**1.48**	**6.62**
⊠	**TS-1**	**48.0**	**Poorly Graded F/C SAND (SP-SM)with Silt A-1-b**	**NP**	**NP**	**NP**	**0.72**	**5.57**
▲	**TS-1**	**58.0**	**Sandy SILT (ML) A-5(4)**	**44**	**39**	**5**		
★	**TS-1**	**74.0**	**Sandy Elastic SILT (MH) A-7-5(16)**	**55**	**32**	**23**		
⊙	**TS-1**	**78.0**	**Sandy SILT (ML) A-4(4)**	**31**	**23**	**8**		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**TS-1**	**46.0**	**9.52**	**4.333**	**0.269**		**3.7**	**84.1**	**12.2**	
⊠	**TS-1**	**48.0**	**19.1**	**6.971**	**0.594**	**0.149**	**10.1**	**80.1**	**9.8**	
▲	**TS-1**	**58.0**	**4.76**	**0.406**			**0.0**	**35.8**	**64.2**	
★	**TS-1**	**74.0**	**9.52**	**0.293**			**0.6**	**32.1**	**67.4**	
⊙	**TS-1**	**78.0**	**9.52**	**1.814**			**2.0**	**33.3**	**64.7**	

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

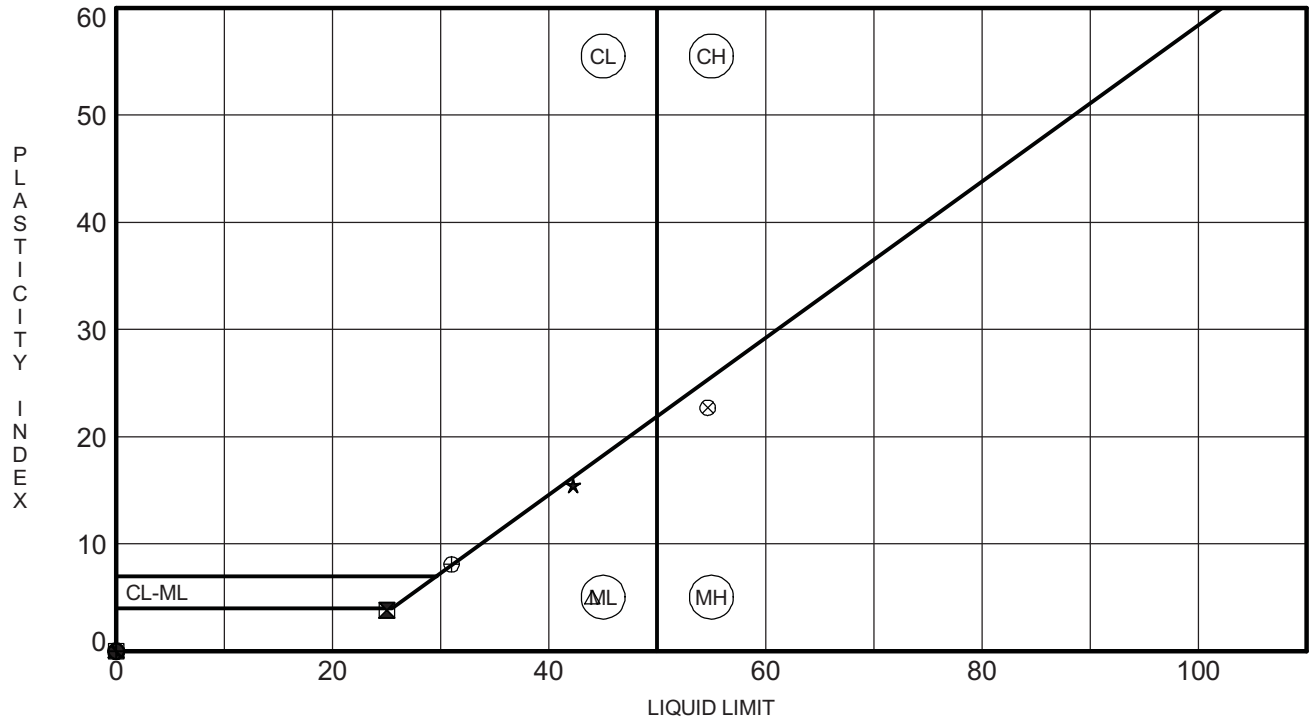
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**TS-1**	**82.0**	**Silty Fine SAND (SM) A-4(0)**	**NP**	**NP**	**NP**		
⊠	**TS-1**	**106.0**	**Sandy SILT (ML) A-4(0)**	**NP**	**NP**	**NP**		
▲	**TS-1**	**122.0**	**Sandy SILT (ML) A-4(0)**	**NP**	**NP**	**NP**		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**TS-1**	**82.0**	**4.76**	**0.384**	**0.076**		**0.0**	**50.9**	**49.1**	
⊠	**TS-1**	**106.0**	**4.76**	**0.31**			**0.0**	**43.2**	**56.8**	
▲	**TS-1**	**122.0**	**9.52**	**0.362**			**0.2**	**44.5**	**55.3**	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	TS-1	8.0	NP	NP	NP	14	Silty Fine SAND (SM) A-2-4
⊠	TS-1	18.0	25	21	4	50	Silty, Clayey Fine SAND (SC-SM) A-4(0)
▲	TS-1	24.0	NP	NP	NP	16	Silty Fine SAND (SM) A-2-4
★	TS-1	28.0	42	27	15	66	Sandy SILT (ML) A-7-6(9)
⊙	TS-1	34.0	NP	NP	NP	28	Silty Fine SAND (SM) A-2-4
✿	TS-1	46.0	NP	NP	NP	12	Silty F/C SAND (SM) A-2-4
○	TS-1	48.0	NP	NP	NP	10	Poorly Graded F/C SAND (SP-SM)with Silt A-1-b
△	TS-1	58.0	44	39	5	64	Sandy SILT (ML) A-5(4)
⊗	TS-1	74.0	55	32	23	67	Sandy Elastic SILT (MH) A-7-5(16)
⊕	TS-1	78.0	31	23	8	65	Sandy SILT (ML) A-4(4)
□	TS-1	82.0	NP	NP	NP	49	Silty Fine SAND (SM) A-4(0)
⊗	TS-1	106.0	NP	NP	NP	57	Sandy SILT (ML) A-4(0)
◕	TS-1	122.0	NP	NP	NP	55	Sandy SILT (ML) A-4(0)

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	16-1140 & 16-1212	**DATE SAMPLE RECEIVED:**	8/8/2016
DESCRIPTION OF SOIL:	Various		
TESTED BY:	MB	**DATE OF TESTING:**	8/10/2016
		DATE OF WEIGHING:	8/11/2016

BORING NO.	SB-1	SB-1	SB-1	SB-1	SB-1
SAMPLE NO.	16-1140A	16-1140D	16-1140G	16-1140J	16-1140M
SAMPLE DEPTH	44.0-46.0'	93.5-95.0'	138.5-140.0'	178.5-180.0'	238.5-240.0'
WATER CONTENT, W%	55.4	44.7	68.0	32.9	34.4

BORING NO.	SB-1	SB-1	SB-1	SB-1	SB-1
SAMPLE NO.	16-1212A	16-1212D	16-1212G	16-1212J	16-1212M
SAMPLE DEPTH	275.0-277.0'	303.0-308.0'	338.0-343.0'	358.0-363.0'	381.0-385.0'
WATER CONTENT, W%	30.1	30.3	25.9	17.4	38.3

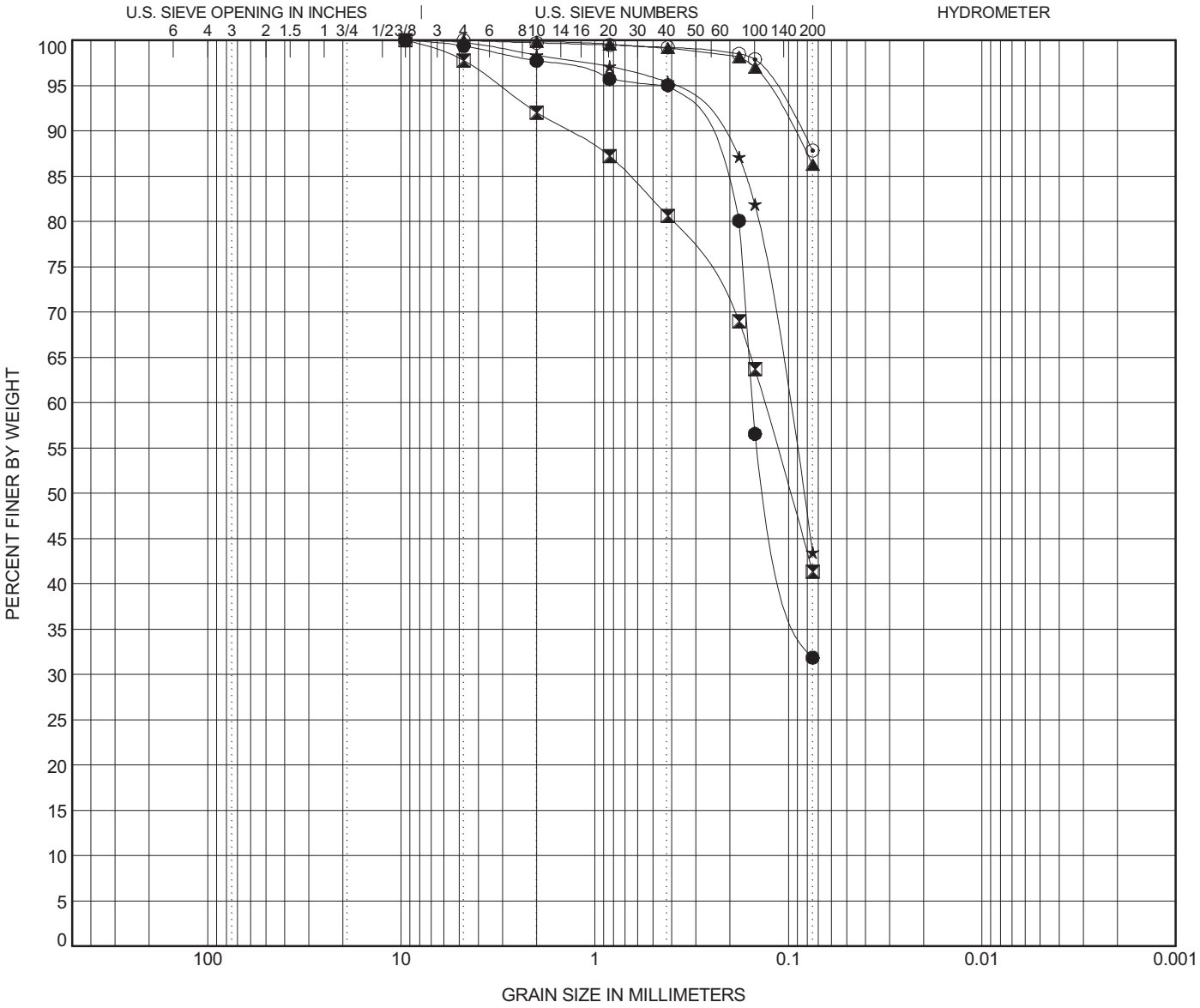
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

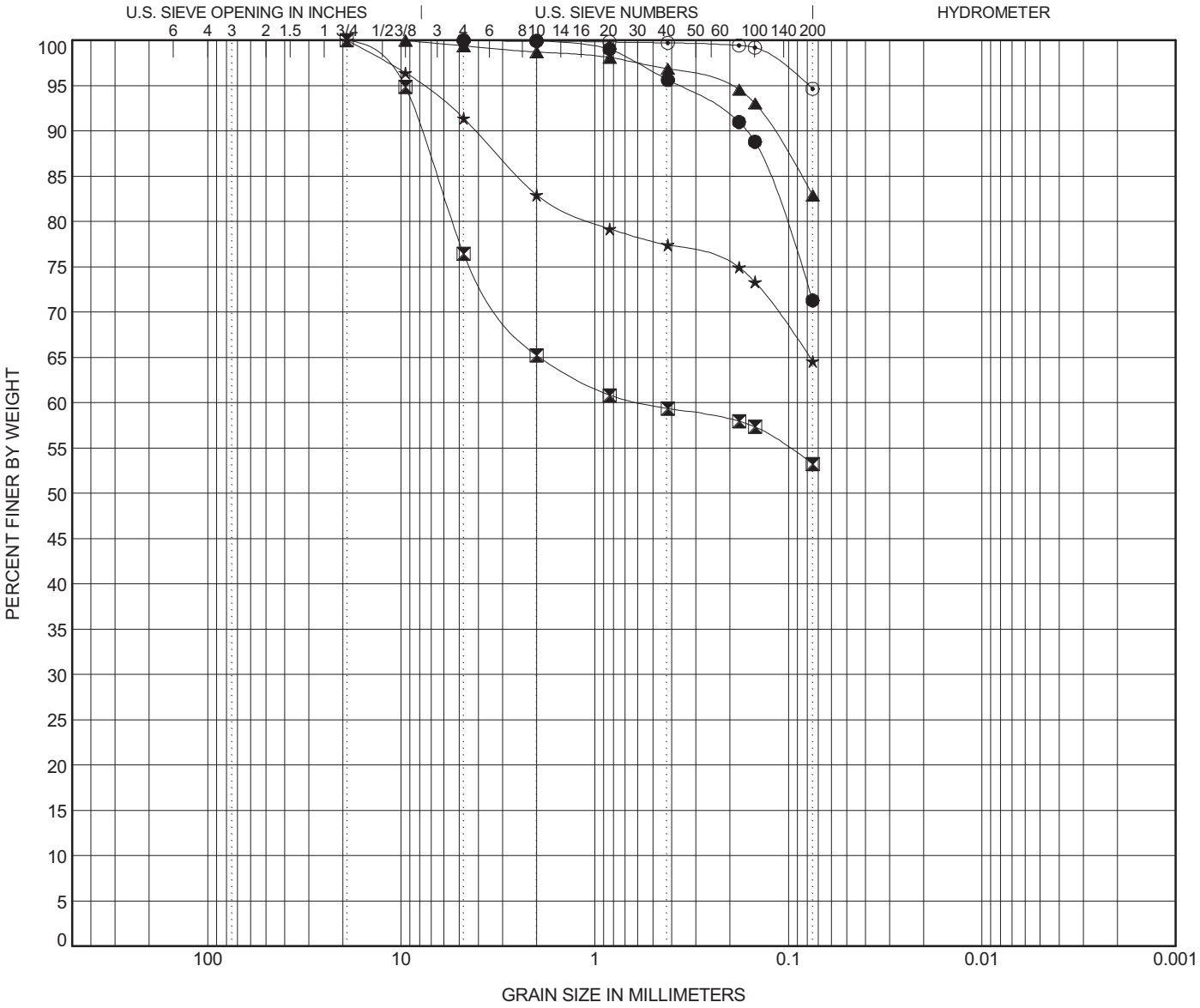
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	SB-1	46.0	Clayey Fine SAND (SC) A-2-7(2)	42	20	22		
⊠	SB-1	95.0	Silty Fine SAND (SM) A-4(0)	NP	NP	NP		
▲	SB-1	140.0	Fat CLAY (CH) A-7-6(33)	63	29	34		
★	SB-1	180.0	Silty Fine SAND (SM) A-4(0)	NP	NP	NP		
⊙	SB-1	240.0	Lean CLAY (CL) A-6(16)	40	23	17		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	SB-1	46.0	9.52	0.419	0.124		0.6	67.5	31.9	
⊠	SB-1	95.0	9.52	3.117	0.098		2.2	56.5	41.3	
▲	SB-1	140.0	4.76	0.131			0.0	13.7	86.3	
★	SB-1	180.0	9.52	0.402	0.084		0.2	56.3	43.5	
⊙	SB-1	240.0	4.76	0.122			0.0	12.2	87.8	

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

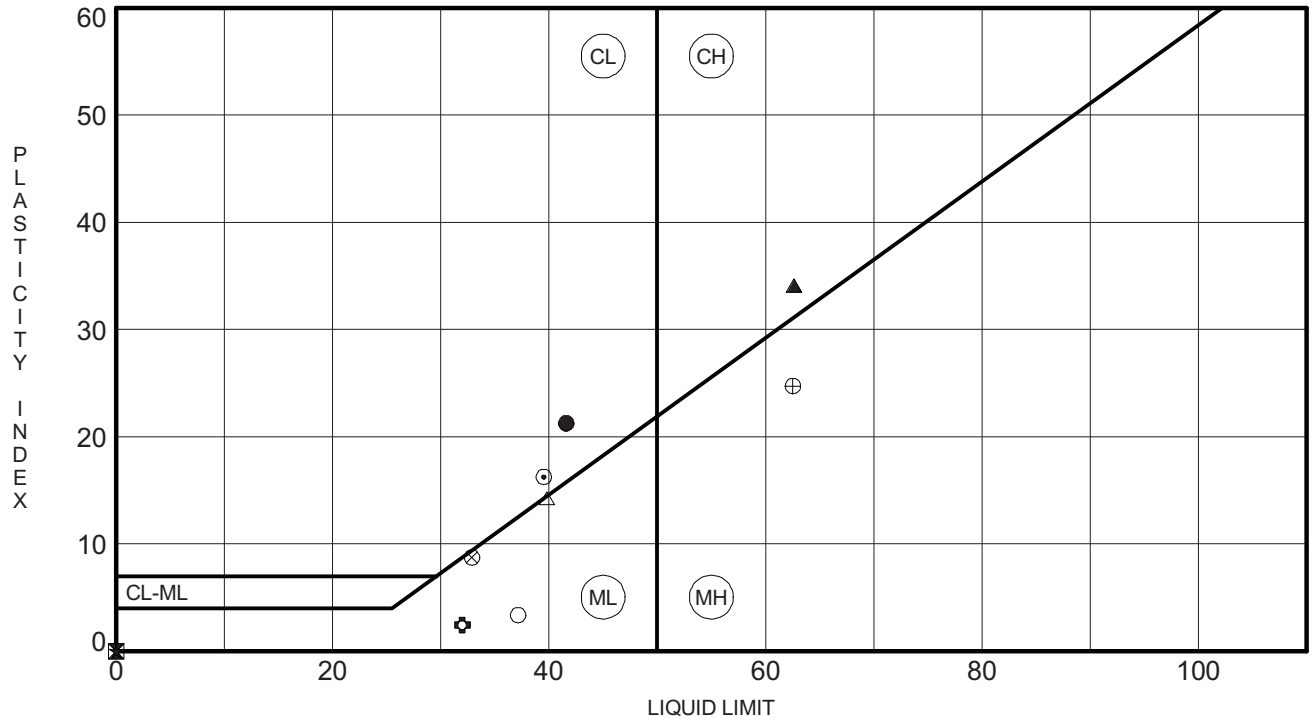
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**SB-1**	**277.0**	**SILT (ML) with Sand A-4(1)**	**32**	**30**	**2**		
⊠	**SB-1**	**308.0**	**Gravelly SILT (ML) with Sand A-4(1)**	**37**	**34**	**3**		
▲	**SB-1**	**343.0**	**SILT (ML) with Sand A-6(12)**	**40**	**26**	**14**		
★	**SB-1**	**363.0**	**Sandy SILT (ML) A-4(4)**	**33**	**24**	**9**		
⊙	**SB-1**	**385.0**	**Elastic SILT (MH) A-7-5(31)**	**63**	**38**	**25**		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**SB-1**	**277.0**	**4.76**	**0.374**			**0.0**	**28.7**	**71.3**	
⊠	**SB-1**	**308.0**	**19.1**	**9.69**			**23.6**	**23.2**	**53.3**	
▲	**SB-1**	**343.0**	**9.52**	**0.21**			**0.6**	**16.5**	**82.9**	
★	**SB-1**	**363.0**	**19.1**	**7.814**			**8.6**	**26.8**	**64.6**	
⊙	**SB-1**	**385.0**	**4.76**	**0.079**			**0.0**	**5.3**	**94.7**	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**SB-1**	**46.0**	**42**	**20**	**22**	**32**	**Clayey Fine SAND (SC) A-2-7(2)**
⊠	**SB-1**	**95.0**	**NP**	**NP**	**NP**	**41**	**Silty Fine SAND (SM) A-4(0)**
▲	**SB-1**	**140.0**	**63**	**29**	**34**	**86**	**Fat CLAY (CH) A-7-6(33)**
★	**SB-1**	**180.0**	**NP**	**NP**	**NP**	**43**	**Silty Fine SAND (SM) A-4(0)**
⊙	**SB-1**	**240.0**	**40**	**23**	**17**	**88**	**Lean CLAY (CL) A-6(16)**
✿	**SB-1**	**277.0**	**32**	**30**	**2**	**71**	**SILT (ML) with Sand A-4(1)**
○	**SB-1**	**308.0**	**37**	**34**	**3**	**53**	**Gravelly SILT (ML) with Sand A-4(1)**
△	**SB-1**	**343.0**	**40**	**26**	**14**	**83**	**SILT (ML) with Sand A-6(12)**
⊗	**SB-1**	**363.0**	**33**	**24**	**9**	**65**	**Sandy SILT (ML) A-4(4)**
⊕	**SB-1**	**385.0**	**63**	**38**	**25**	**95**	**Elastic SILT (MH) A-7-5(31)**

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

ORGANIC IMPURITIES DETERMINATION
(AASHTO T267)

PROJECT: US 21 Bridge Replacment over Harbor River

PROJECT NO.: G5396

SAMPLE NUMBER: 16-1140

DATE SAMPLE RECEIVED: 8/8/2016

DESCRIPTION OF SOIL: VARIOUS

TESTED BY: MB

DATE OF TESTING: 8/10/2016

DATE OF WEIGHING: 8/10/2016

BORING NO.	SB-1	SB-1			
SAMPLE NO.	16-1140R/SS-10	16-1140S/SS-19			
SAMPLE DEPTH	18.0-20.0'	36.0-38.0'			
WT. OF CRUCIBLE + DRY SOIL (BEFORE IGNITION) (GRAMS)	169.95	175.57			
WT. OF CRUCIBLE + DRY SOIL (AFTER IGNITION) (GRAMS)	169.18	175.00			
WT. OF CRUCIBLE (GRAMS)	129.95	135.57			
WT. OF DRY SOIL (BEFORE IGNITION) (GRAMS)	40.00	40.00			
WT. OF DRY SOIL (AFTER IGNITION) (GRAMS)	39.23	39.43			
IGNITION LOSS (GRAMS)	0.77	0.57			
ORGANIC IMPURITIES %	1.92	1.42			

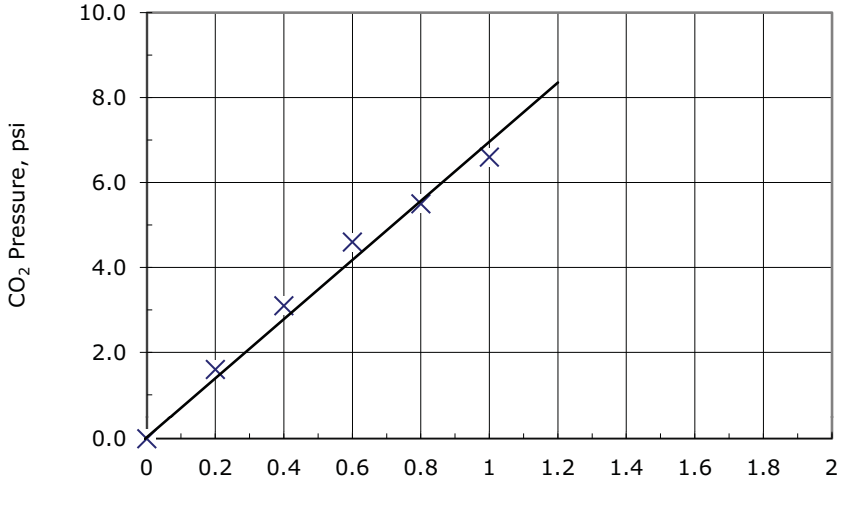
Client:	FME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	08/23/16
Tested By:	jbr
Checked By:	jdt

Rapid Determination of Carbonate Content of Soils by ASTM D4373

Boring ID	Sample ID	Depth, ft	*CO_2 Pressure, psi	Weight of Sample used, g	Weight $CaCO_3$, grams	Calcite Equivalent, %
SB-1	16-1140P	168.5-170	6.20	1.00	5.09	509
SB-1	16-1140Q	198.5-200	5.40	1.00	4.43	443
SB-1	16-1212U	255-257	4.40	1.00	3.61	361
SB-1	16-1212V	308-313	3.90	1.00	3.20	320
SB-1	16-1212W	373-378	2.70	1.00	2.22	222

Notes: Calcium Carbonate content precise to +/- 1.5%
*CO_2 Pressure is based on the weight of sample as indicated in the table.
The reported Calcite Equivalent (%) is based on one gram

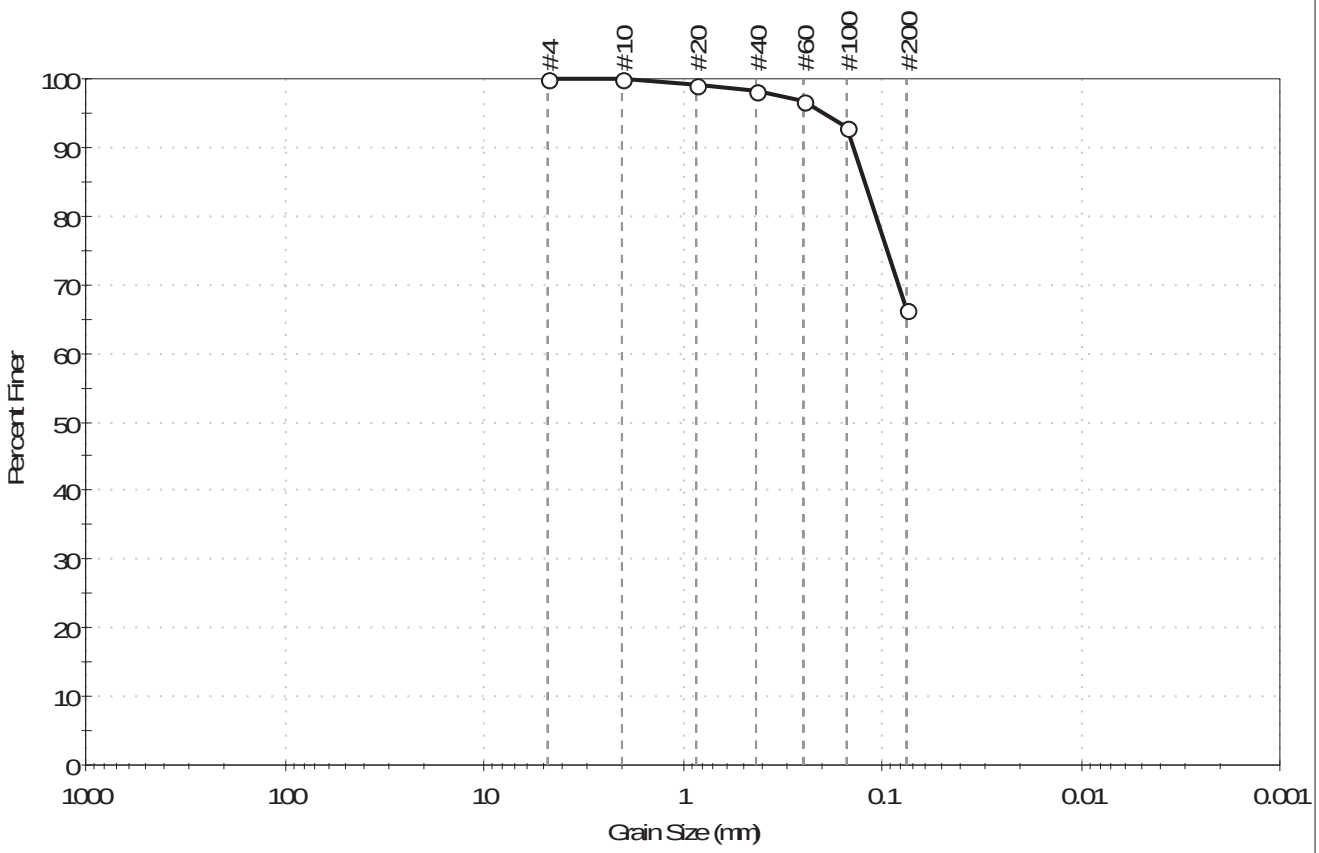
Figure 1: Calibration Curve



Weight Calcium Carbonate, g
% Calcite Equivalent = Weight x 100

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	SB-1	Sample Type:	tube	Tested By:	GA
Sample ID:	UD-1	Test Date:	11/04/16	Checked By:	mcm
Depth :	130.0-133.5 ft	Test Id:	397424		
Test Comment:	---				
Visual Description:	Moist, olive sandy silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



%Cobble	%Gravel	%Sand	%Silt & Clay Size
—	0.0	33.7	66.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	98		
#60	0.25	97		
#100	0.15	93		
#200	0.075	66		

Coefficients

D_{85} = 0.1220 mm	D_{30} = N/A
D_{60} = N/A	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Sandy Silt (ML)

AASHTO Clayey Soils (A-7-5 (8))

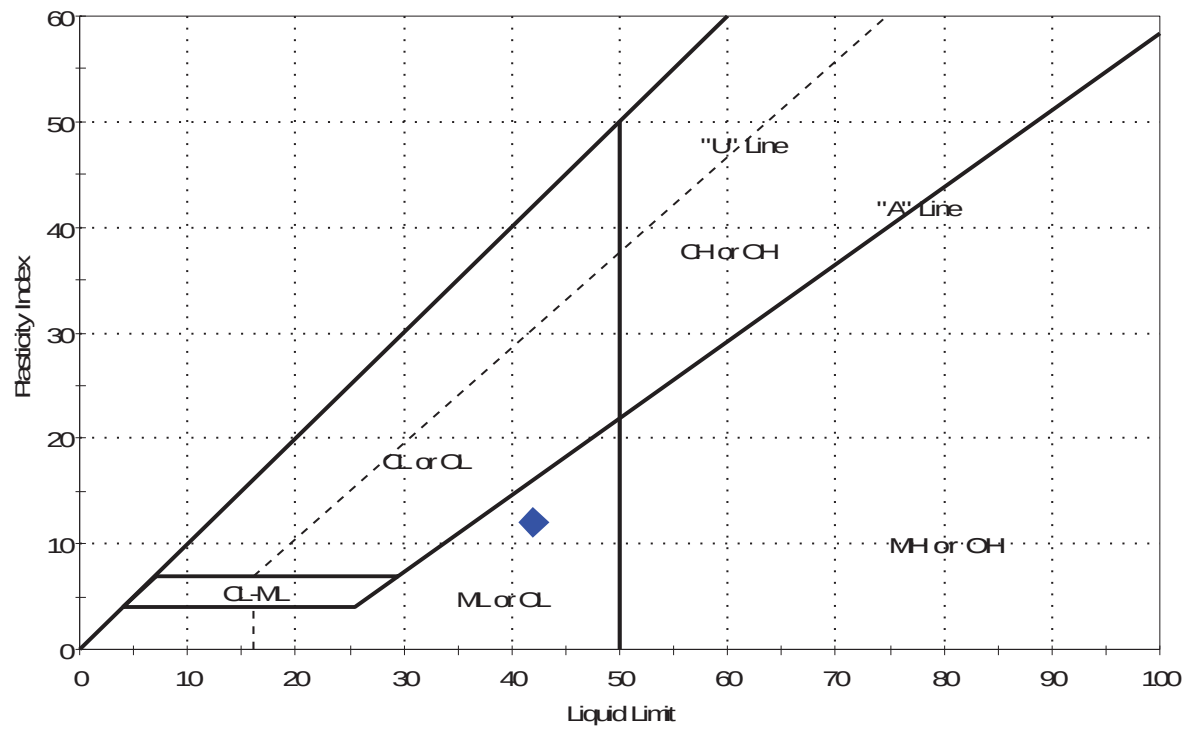
Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	SB-1	Sample Type:	tube	Tested By:	GA
Sample ID:	UD-1	Test Date:	11/04/16	Checked By:	mcm
Depth :	130.0-133.5 ft	Test Id:	397422		
Test Comment:	---				
Visual Description:	Moist, olive sandy silt				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UD-1	SB-1	30.0-133. ft	38	42	30	12	0.6	Sandy Silt (ML)

Sample Prepared using the WET method

2% Retained on #40 Sieve

Dry Strength: HIGH

Dilatancy: SLOW

Toughness: LOW

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Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	---	Sample Type:	---	Tested By:	jbr
Sample ID:	---	Test Date:	08/30/16	Checked By:	mcm
Depth :	---	Test Id:	387124		

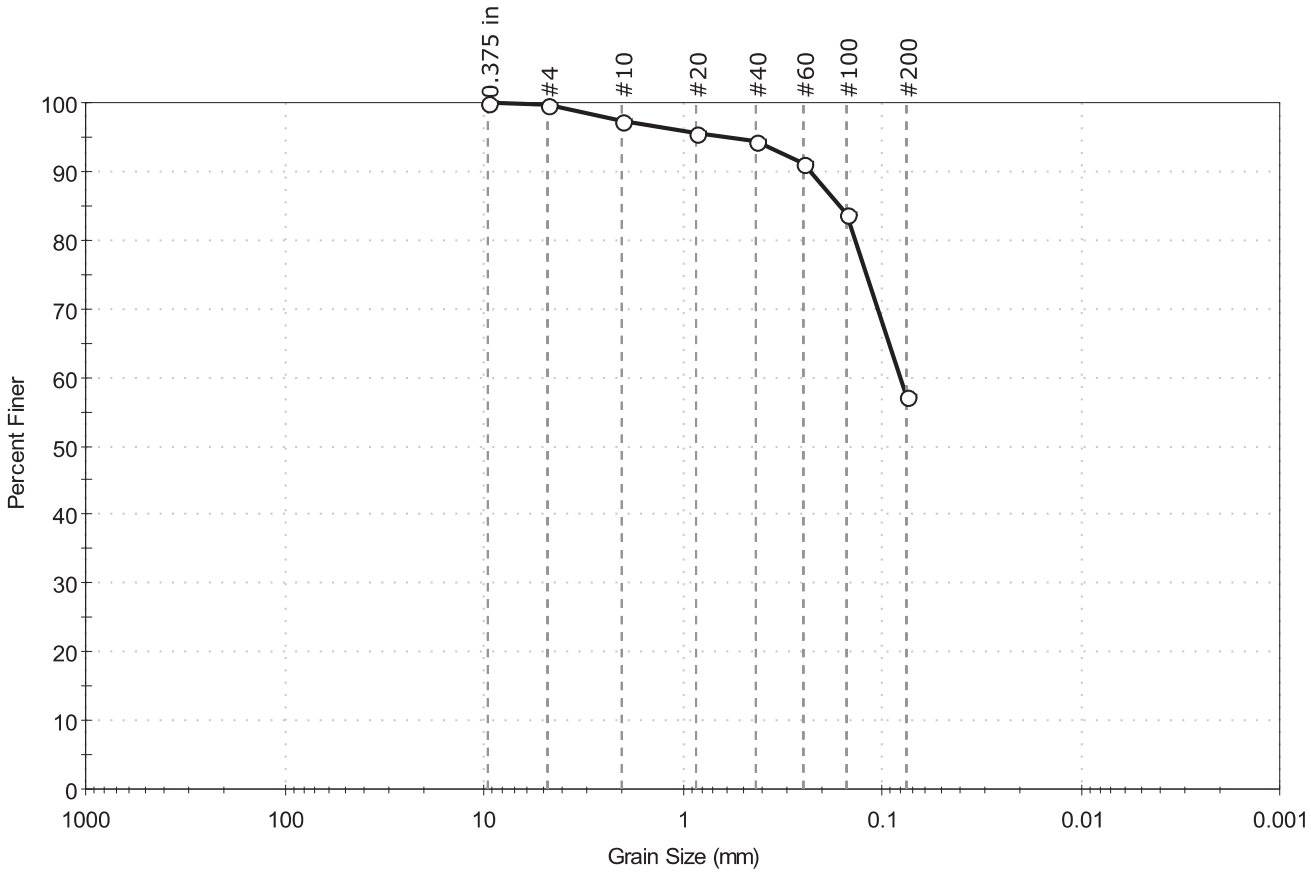
Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
SB-1	UD- 2	145.0-148.0 ft	Moist, olive sandy silt	33.1

Notes: Temperature of Drying : 110º Celsius

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	SB-1	Sample Type:	tube	Tested By:	jbr
Sample ID:	UD-2	Test Date:	08/31/16	Checked By:	mcm
Depth :	145.0-148.0 ft	Test Id:	387107		
Test Comment:	---				
Visual Description:	Moist, olive sandy silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.2	42.5	57.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	97		
#20	0.85	96		
#40	0.42	94		
#60	0.25	91		
#100	0.15	84		
#200	0.075	57		

Coefficients

D_{85} = 0.1641 mm	D_{30} = N/A
D_{60} = 0.0805 mm	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Sandy Silt (ML)

AASHTO Clayey Soils (A-6 (6))

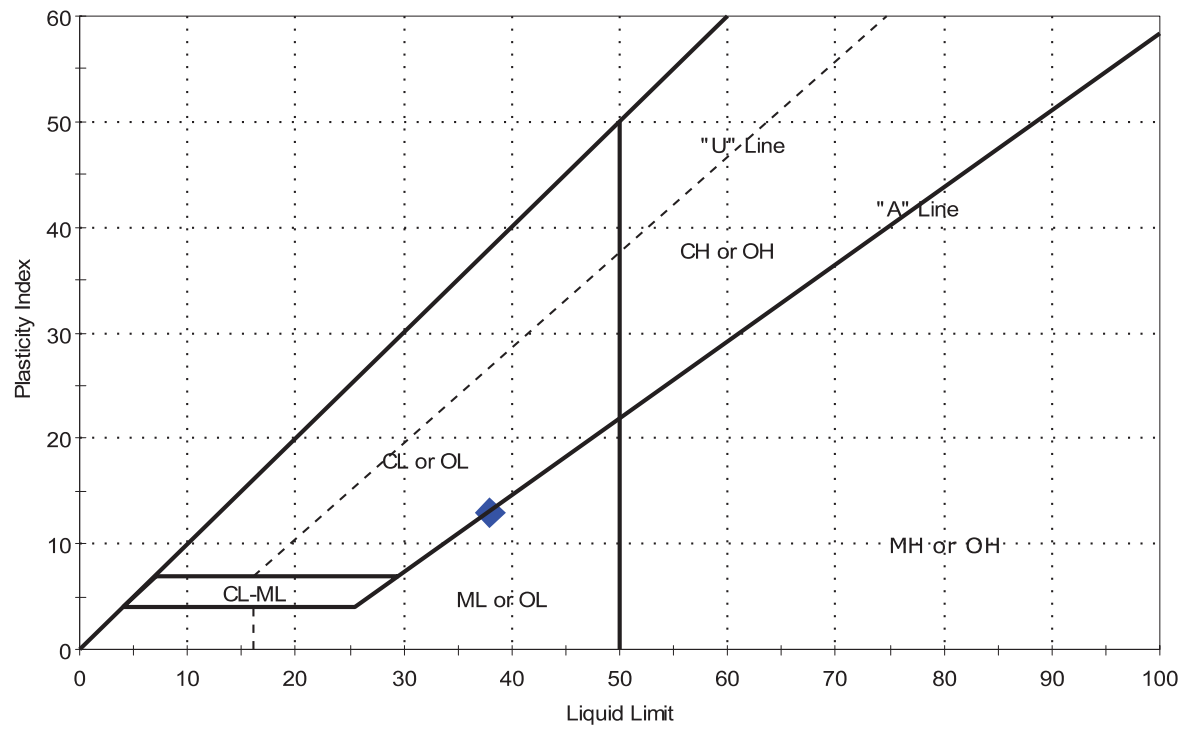
Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	SB-1	Sample Type:	tube	Tested By:	GA
Sample ID:	UD-2	Test Date:	08/31/16	Checked By:	mcm
Depth :	145.0-148.0 ft	Test Id:	387115		
Test Comment:	---				
Visual Description:	Moist, olive sandy silt				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UD-2	SB-1	45.0-148. ft	33	38	25	13	0.6	Sandy Silt (ML)

Sample Prepared using the WET method

6% Retained on #40 Sieve

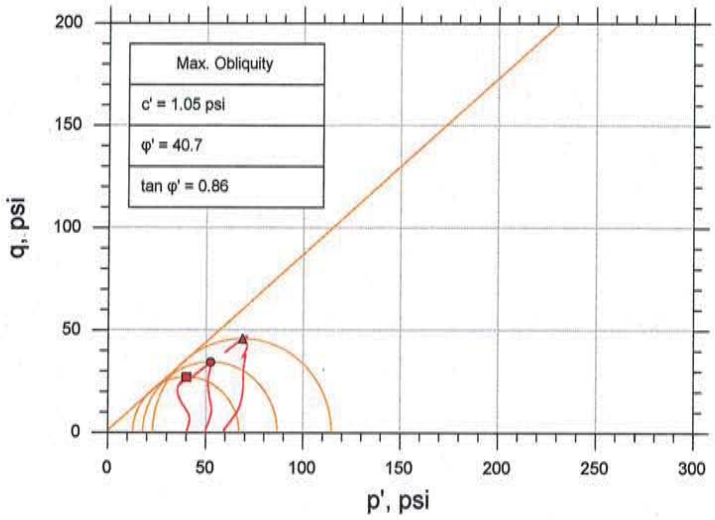
Dry Strength: VERY HIGH

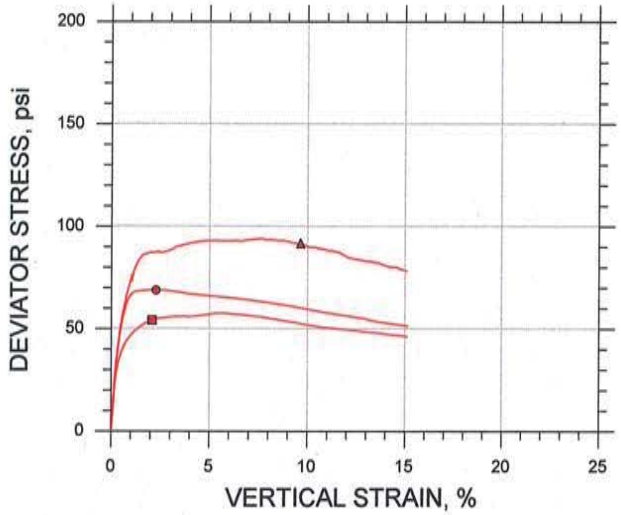
Dilatancy: RAPID

Toughness: LOW

Client: F&ME Consultants	
Project Name: US-21 Replacement Bridge	
Project Location: ---	
Project Number: GTX-305005	
Tested By: md	Checked By: mcm
Boring ID: SB-1	
Preparation: intact	
Description: Moist, olive sandy silt	
Classification: Sandy silt	
Group Symbol: ML	
Liquid Limit: 38	Plastic Limit: 25
Plasticity Index: 13	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





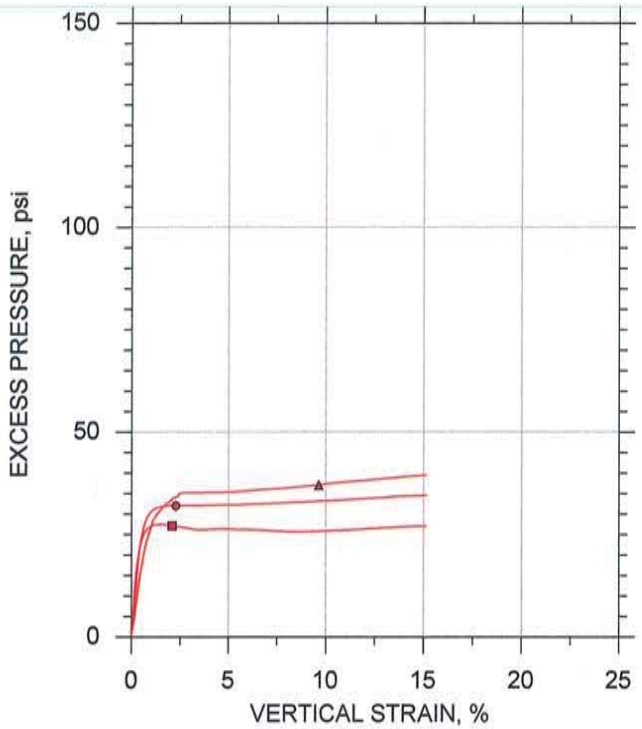
Symbol		■	●	▲	
Sample ID		UD-2	UD-2	UD-2	
Depth, ft		145.0-148.0 ft	145.0-148.0 ft	145.0-148.0 ft	
Test Number		CU-8-1	CU-8-2	CU-8-3	
Initial	Height, in	6.100	5.890	6.200	
	Diameter, in	2.860	2.850	2.850	
	Moisture Content (from Cuttings), %	33.8	33.2	29.9	
	Dry Density, pcf	85.9	88.2	93.1	
	Saturation (Wet Method), %	94.8	98.2	99.7	
	Void Ratio	0.963	0.912	0.810	
Before Shear	Moisture Content, %	33.3	31.2	25.8	
	Dry Density, pcf	88.8	91.5	99.3	
	Cross-sectional Area (Method A), in²	6.273	6.205	6.049	
	Saturation, %	100.0	100.0	100.0	
	Void Ratio	0.898	0.842	0.698	
	Back Pressure, psi	131.0	121.0	33.00	
Vertical Effective Consolidation Stress, psi		39.97	49.98	59.94	
Horizontal Effective Consolidation Stress, psi		40.00	50.00	59.99	
Vertical Strain after Consolidation, %		0.7774	0.7386	0.8643	
Volumetric Strain after Consolidation, %		2.735	3.028	5.571	
Time to 50% Consolidation, min		1.000	0.6400	1.000	
Shear Strength, psi		27.13	34.45	45.85	
Strain at Failure, %		2.08	2.27	9.63	
Strain Rate, %/min		0.01600	0.01600	0.01600	
Deviator Stress at Failure, psi		54.25	68.90	91.70	
Effective Minor Principal Stress at Failure, psi		12.82	17.93	22.91	
Effective Major Principal Stress at Failure, psi		67.07	86.84	114.6	
B-Value		0.96	0.95	1.00	

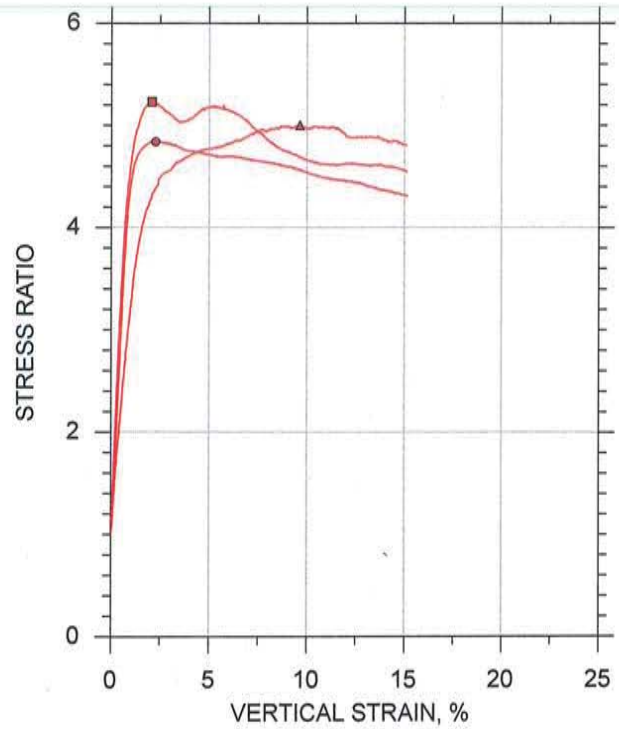
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

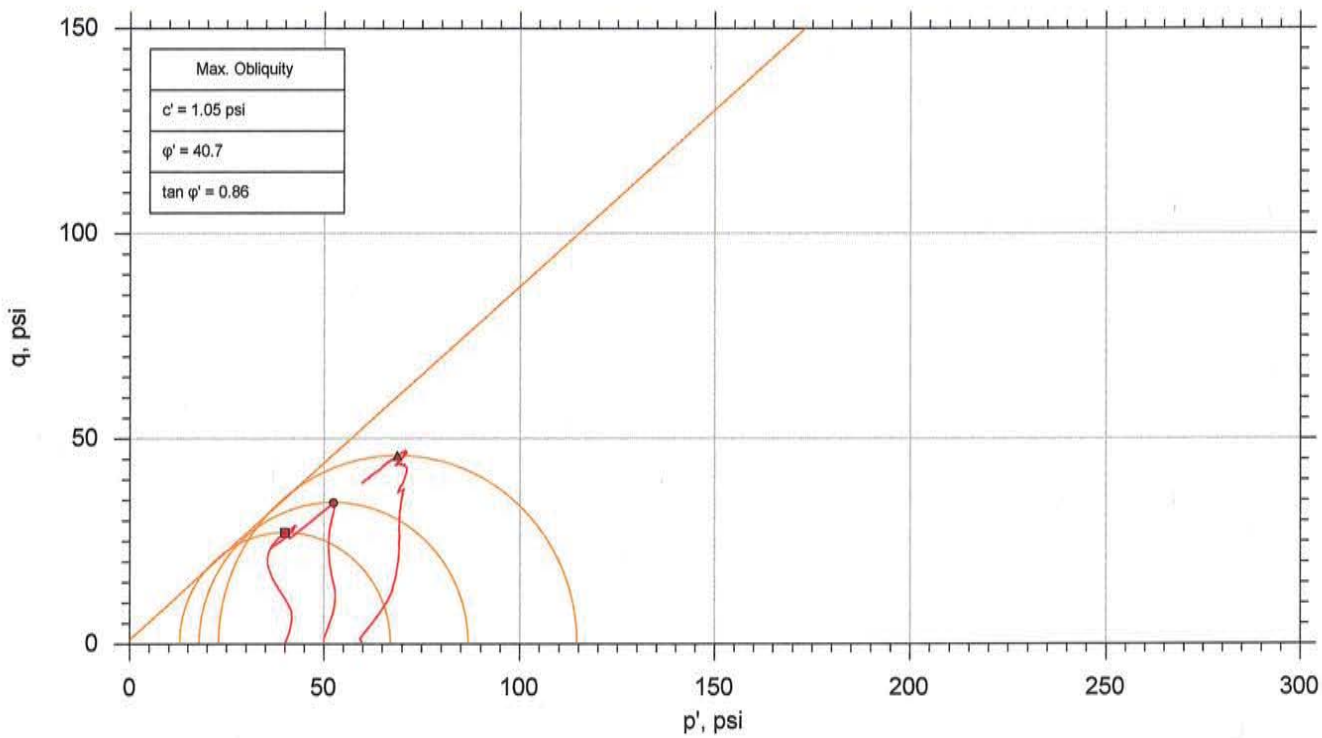
Remarks:

System O

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







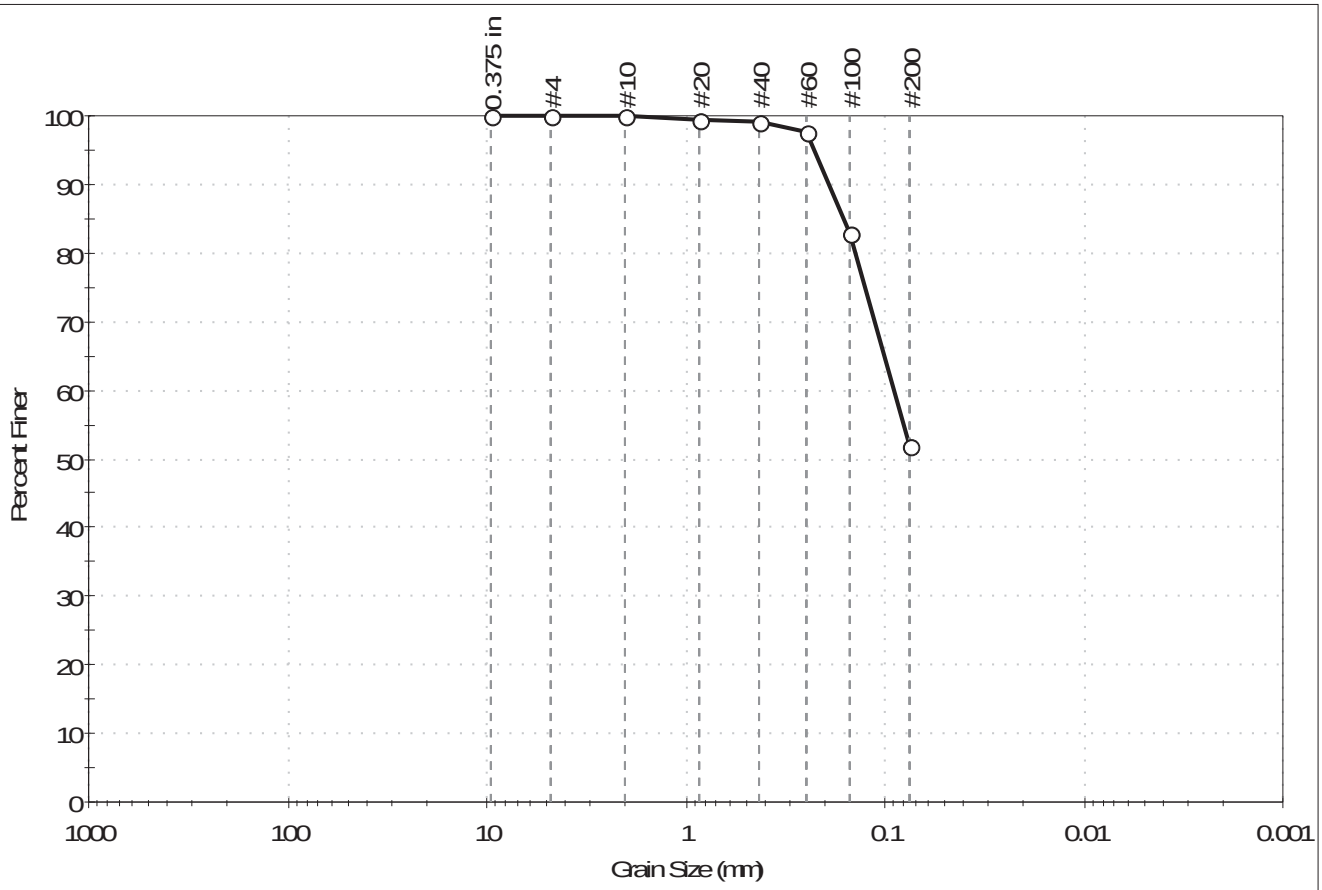
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	UD-2	CU-8-1	145.0-148.0 ft	md	8/28/16	mcm	9/9/16	305005-CU-8-1m.dat
●	UD-2	CU-8-2	145.0-148.0 ft	md	8/28/16	mcm	9/8/16	305005-CU-8-2m.dat
▲	UD-2	CU-8-3	145.0-148.0 ft	md	8/28/16	mm	9/9/16	305005-CU-8-3m.dat

GeoTesting EXPRESS

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: SB-1	Sample Type: intact	
Description: Moist, olive sandy silt		
Remarks: System O		

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	SB-1	Sample Type:	tube	Tested By:	GA
Sample ID:	UD-4	Test Date:	11/04/16	Checked By:	mcm
Depth :	200.0-203.0 ft	Test Id:	397425		
Test Comment:	---				
Visual Description:	Moist, olive sandy silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



%Cobble	%Gravel	%Sand	%Silt & Clay Size
—	0.1	47.8	52.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	98		
#100	0.15	83		
#200	0.075	52		

Coefficients

D_{85} = 0.1611 mm D_{30} = N/A

D_{60} = 0.0896 mm D_{15} = N/A

D_{50} = N/A D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM Sandy Silt (ML)

AASHTO Clayey Soils (A-7-6 (6))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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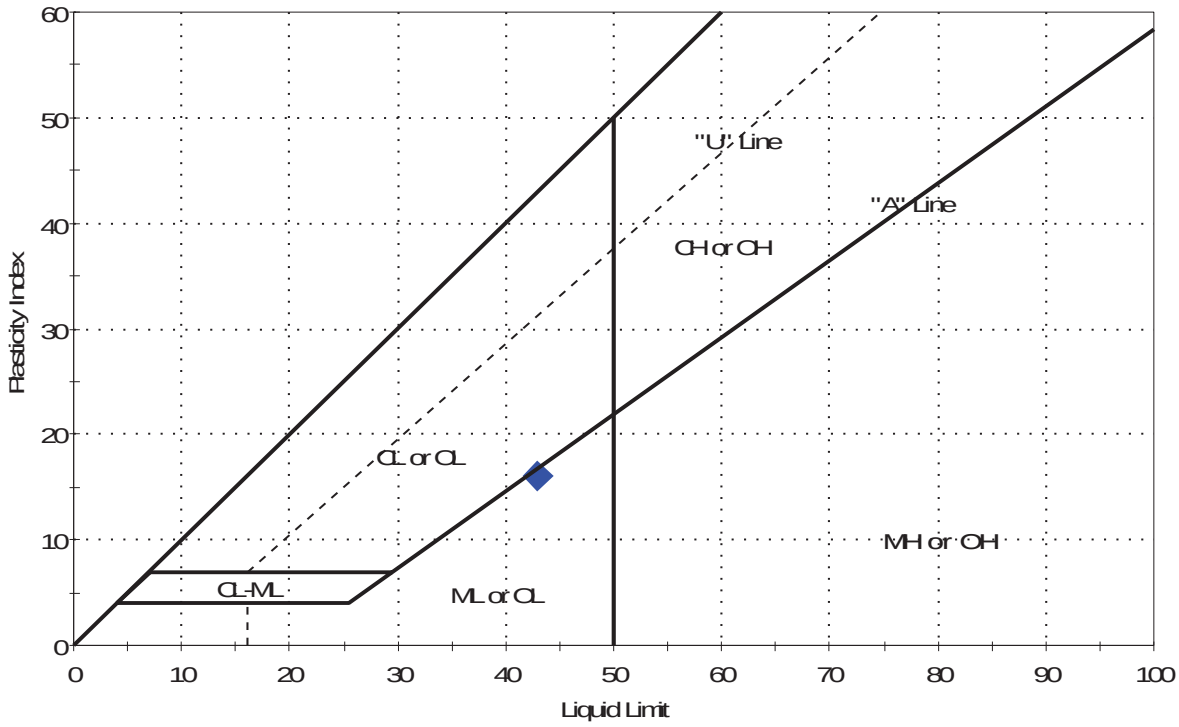
Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	SB-1	Sample Type:	tube	Tested By:	GA
Sample ID:	UD-4	Test Date:	11/04/16	Checked By:	mcm
Depth :	200.0-203.0 ft	Test Id:	397423		
Test Comment:	---				
Visual Description:	Moist, olive sandy silt				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UD-4	SB-1	00.0-203. ft	32	43	27	16	0.3	Sandy Silt (ML)

Sample Prepared using the WET method

1% Retained on #40 Sieve

Dry Strength: HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	---	Sample Type:	---	Tested By:	jbr
Sample ID:	---	Test Date:	08/30/16	Checked By:	mcm
Depth :	---	Test Id:	387124		

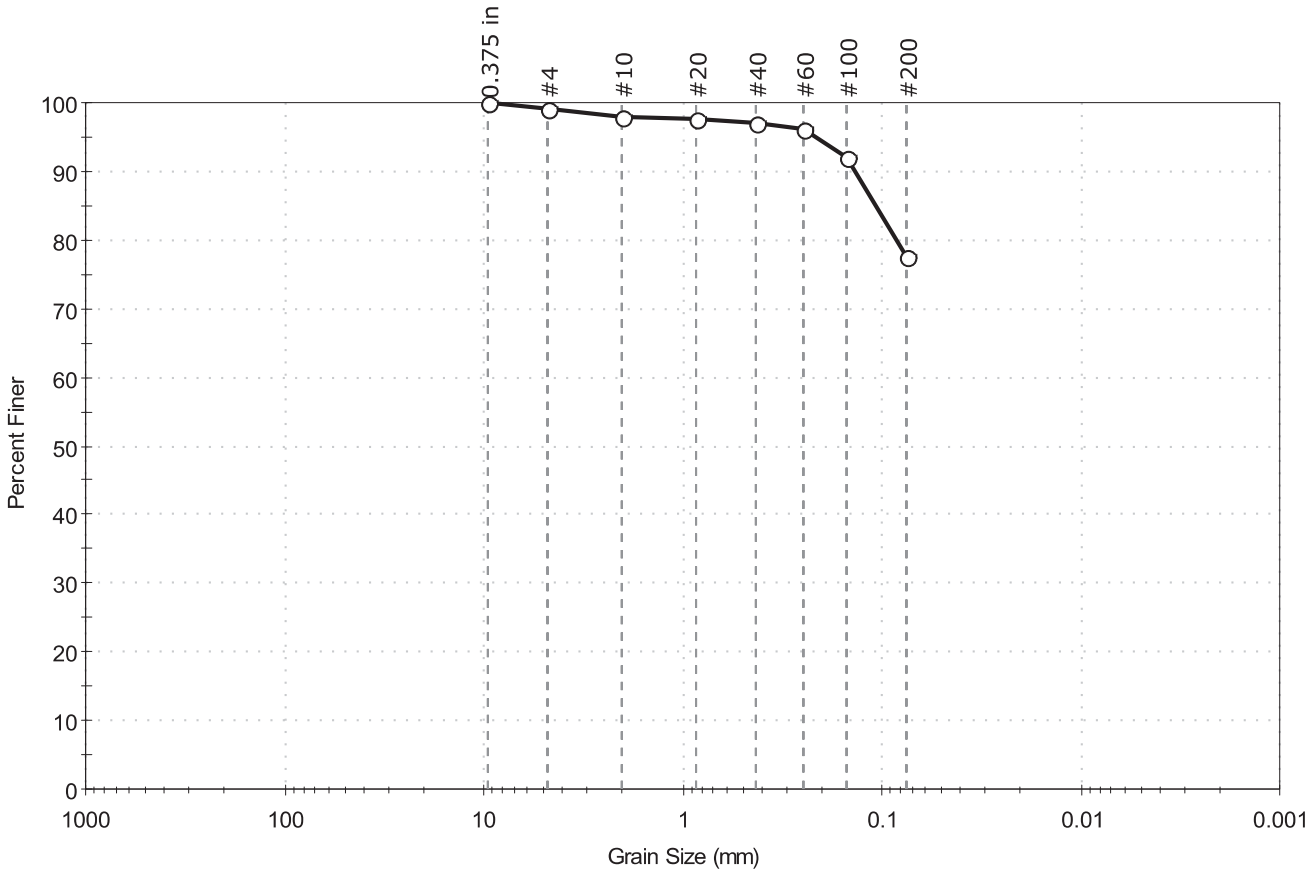
Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
SB-1	UD-5	230.0-233.0 ft	Moist, olive silt with sand	32.6

Notes: Temperature of Drying : 110º Celsius

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	SB-1	Sample Type:	tube	Tested By:	jbr
Sample ID:	UD-5	Test Date:	08/31/16	Checked By:	mcm
Depth :	230.0-233.0 ft	Test Id:	387108		
Test Comment:	---				
Visual Description:	Moist, olive silt with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	1.0	21.3	77.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	99		
#10	2.00	98		
#20	0.85	98		
#40	0.42	97		
#60	0.25	96		
#100	0.15	92		
#200	0.075	78		

Coefficients

D_{85} = 0.1069 mm	D_{30} = N/A
D_{60} = N/A	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Silt with sand (ML)

AASHTO Clayey Soils (A-7-5 (15))

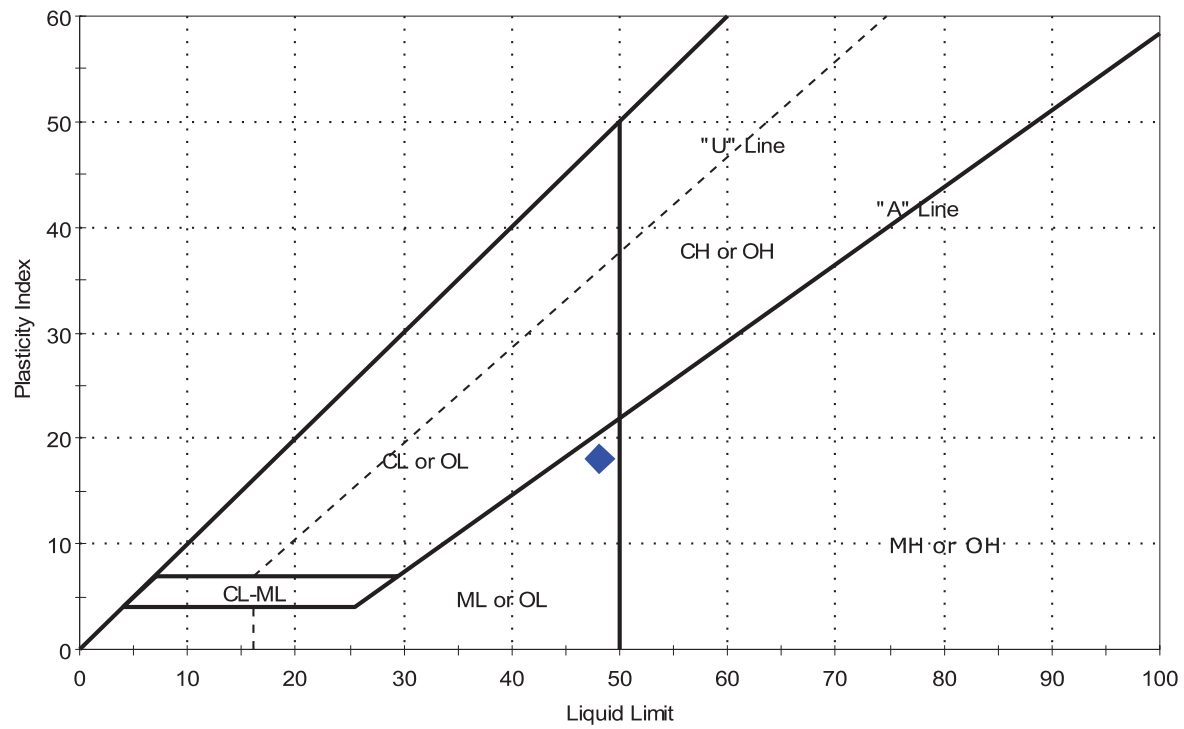
Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	SB-1	Sample Type:	tube	Tested By:	GA
Sample ID:	UD-5	Test Date:	08/31/16	Checked By:	mcm
Depth :	230.0-233.0 ft	Test Id:	387116		
Test Comment:	---				
Visual Description:	Moist, olive silt with sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UD-5	SB-1	30.0-233. ft	33	48	30	18	0.1	Silt with sand (ML)

Sample Prepared using the WET method

3% Retained on #40 Sieve

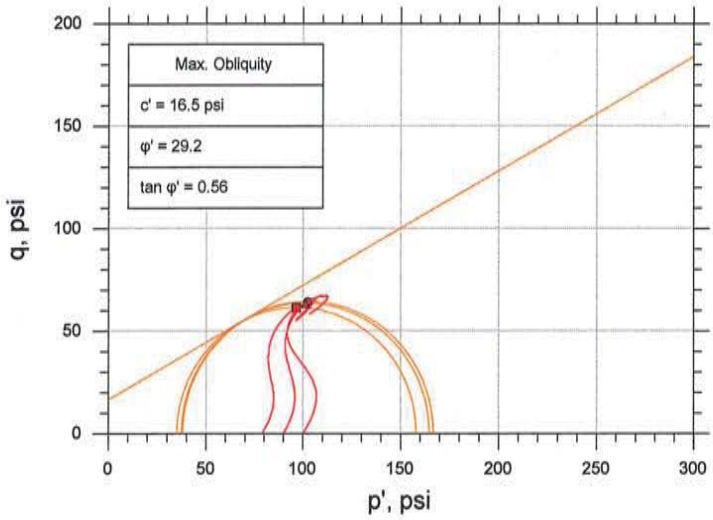
Dry Strength: VERY HIGH

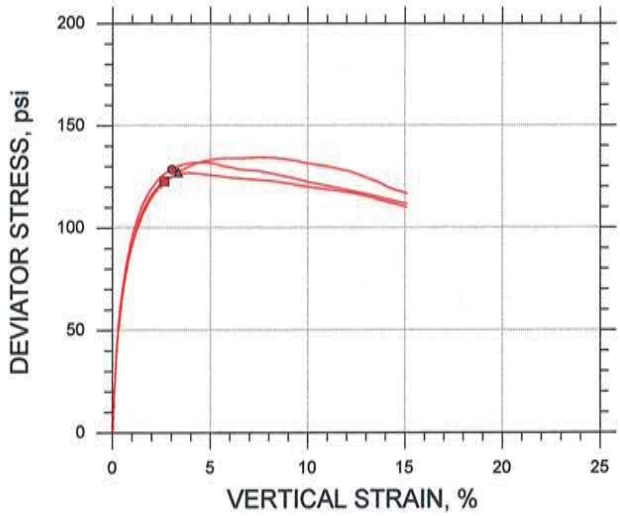
Dilatancy: RAPID

Toughness: LOW

Client: F&ME Consultants	
Project Name: US-21 Replacement Bridge	
Project Location: ---	
Project Number: GTX-305005	
Tested By: md	Checked By: mcm
Boring ID: SB-1	
Preparation: intact	
Description: Moist, olive silt with sand	
Classification: Silt with sand	
Group Symbol: ML	
Liquid Limit: 48	Plastic Limit: 30
Plasticity Index: 18	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





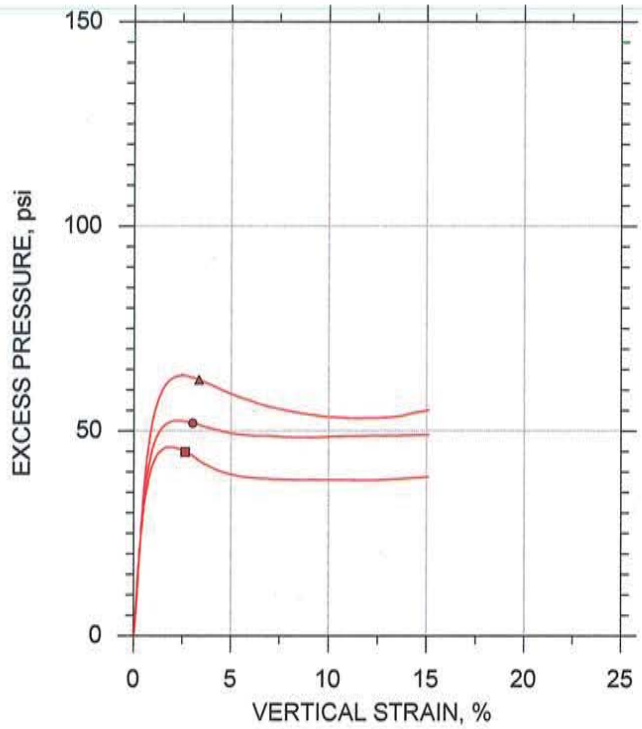
Symbol		■	●	▲	
Sample ID		UD-5	UD-5	UD-5	
Depth, ft		230.0-233.0 ft	230.0-233.0 ft	230.0-233.0 ft	
Test Number		CU-7-1	CU-7-2	CU-7-3	
Initial	Height, in	6.150	6.150	6.100	
	Diameter, in	2.850	2.840	2.830	
	Moisture Content (from Cuttings), %	31.0	29.5	29.4	
	Dry Density, pcf	89.8	89.9	90.8	
	Saturation (Wet Method), %	95.5	91.2	92.6	
	Void Ratio	0.876	0.875	0.857	
Before Shear	Moisture Content, %	31.5	29.1	27.8	
	Dry Density, pcf	91.1	94.4	96.3	
	Cross-sectional Area (Method A), in²	6.371	6.129	6.058	
	Saturation, %	100.0	100.0	100.0	
	Void Ratio	0.849	0.785	0.750	
	Back Pressure, psi	141.0	121.0	123.0	
Vertical Effective Consolidation Stress, psi		79.96	89.91	99.90	
Horizontal Effective Consolidation Stress, psi		80.02	90.00	100.0	
Vertical Strain after Consolidation, %		1.201	1.611	2.136	
Volumetric Strain after Consolidation, %		1.133	4.820	5.775	
Time to 50% Consolidation, min		0.2500	13.39	42.25	
Shear Strength, psi		61.43	64.32	63.57	
Strain at Failure, %		2.64	3.03	3.35	
Strain Rate, %/min		0.01600	0.01600	0.01600	
Deviator Stress at Failure, psi		122.9	128.6	127.1	
Effective Minor Principal Stress at Failure, psi		35.12	38.10	37.52	
Effective Major Principal Stress at Failure, psi		158.0	166.7	164.7	
B-Value		0.95	0.95	0.95	

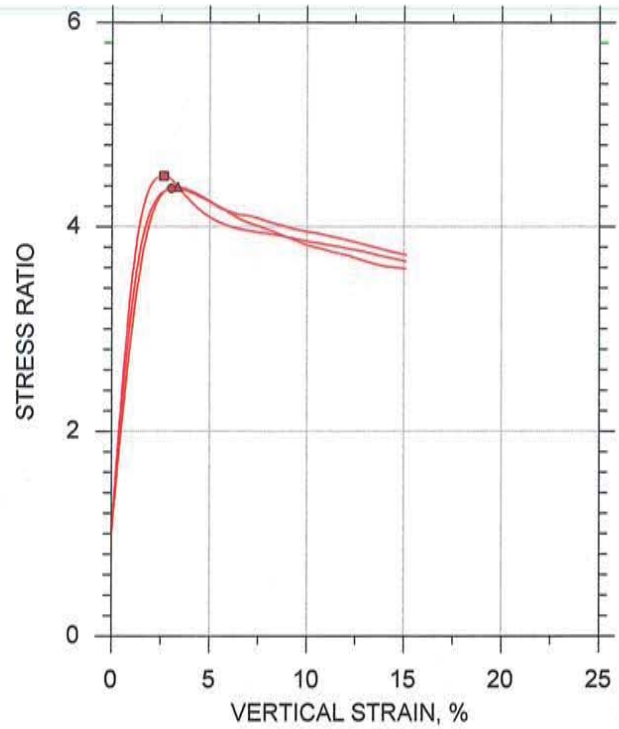
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

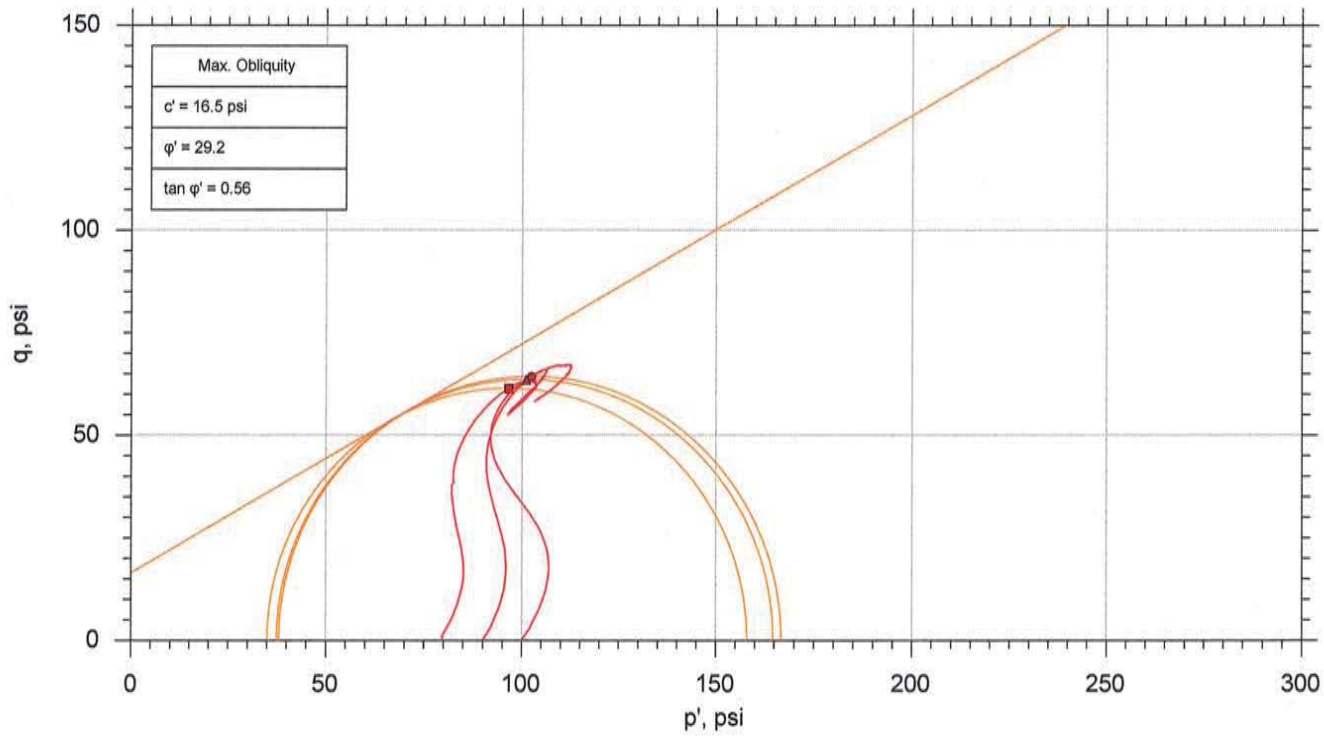
Remarks:

System K

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	UD-5	CU-7-1	230.0-233.0 ft	md	8/28/16	mcm	9/8/16	305005-CU-7-1m.dat
●	UD-5	CU-7-2	230.0-233.0 ft	md	8/26/16	mcm	9/8/16	305005-CU-7-2m.dat
▲	UD-5	CU-7-3	230.0-233.0 ft	md	8/26/16	mcm	9/8/16	305005-CU-7-3m.dat

GeoTesting EXPRESS

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: SB-1	Sample Type: intact	
Description: Moist, olive silt with sand		
Remarks: System K		

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT: US 21 Bridge Replacement over Harbor River

PROJECT NO.: G5396

SAMPLE NUMBER: 16-1208D

DATE SAMPLE RECEIVED:

DESCRIPTION OF SOIL: Sandy Fat Clay (CH) A-7-6(34)

TESTED BY: Fugro

DATE OF TESTING:

DATE OF WEIGHING:

BORING NO.	SB-1/UD-6				
SAMPLE NO.	16-1208D				
SAMPLE DEPTH	257.0-260.0'				
WATER CONTENT, W%	31.6				

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

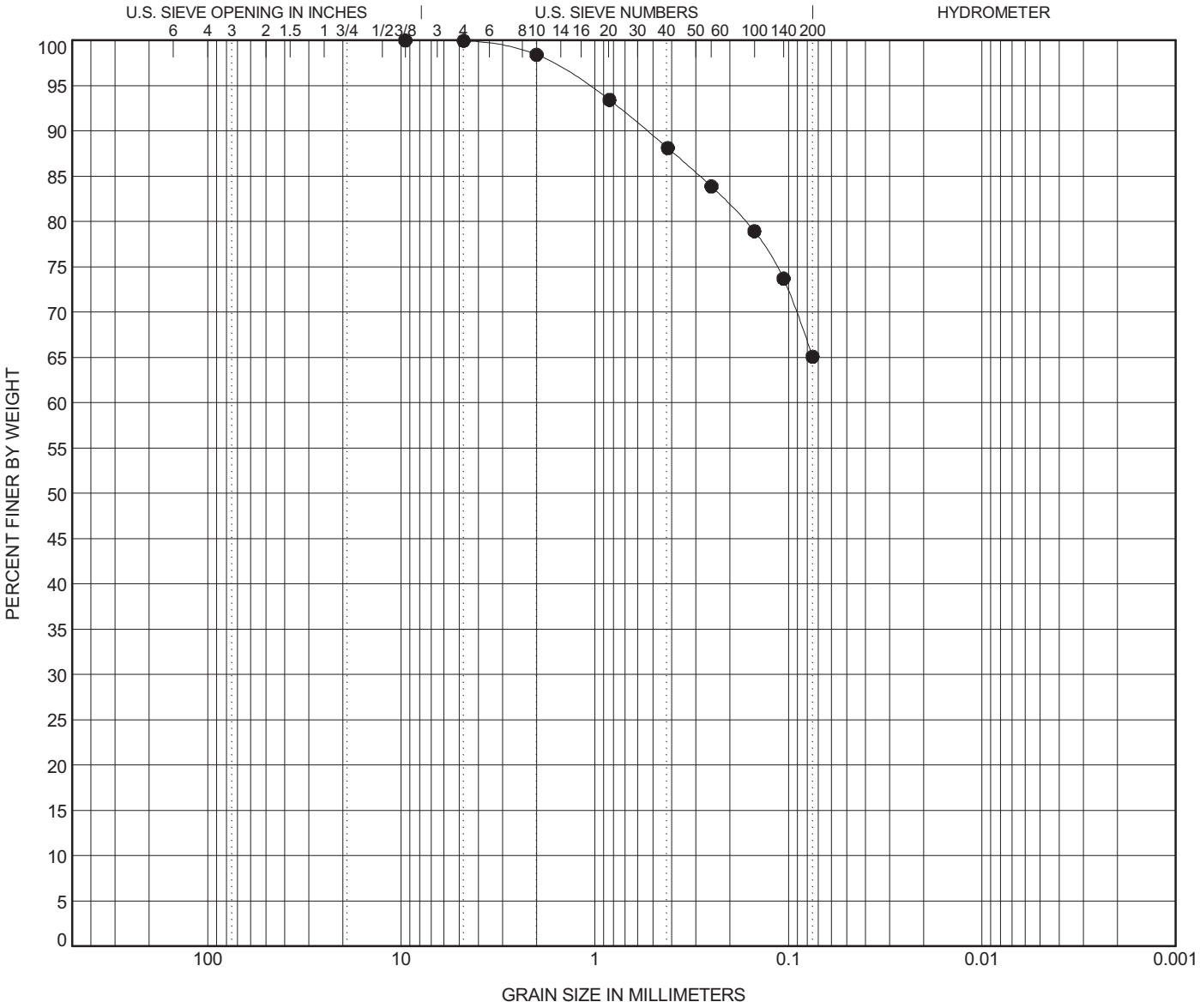
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

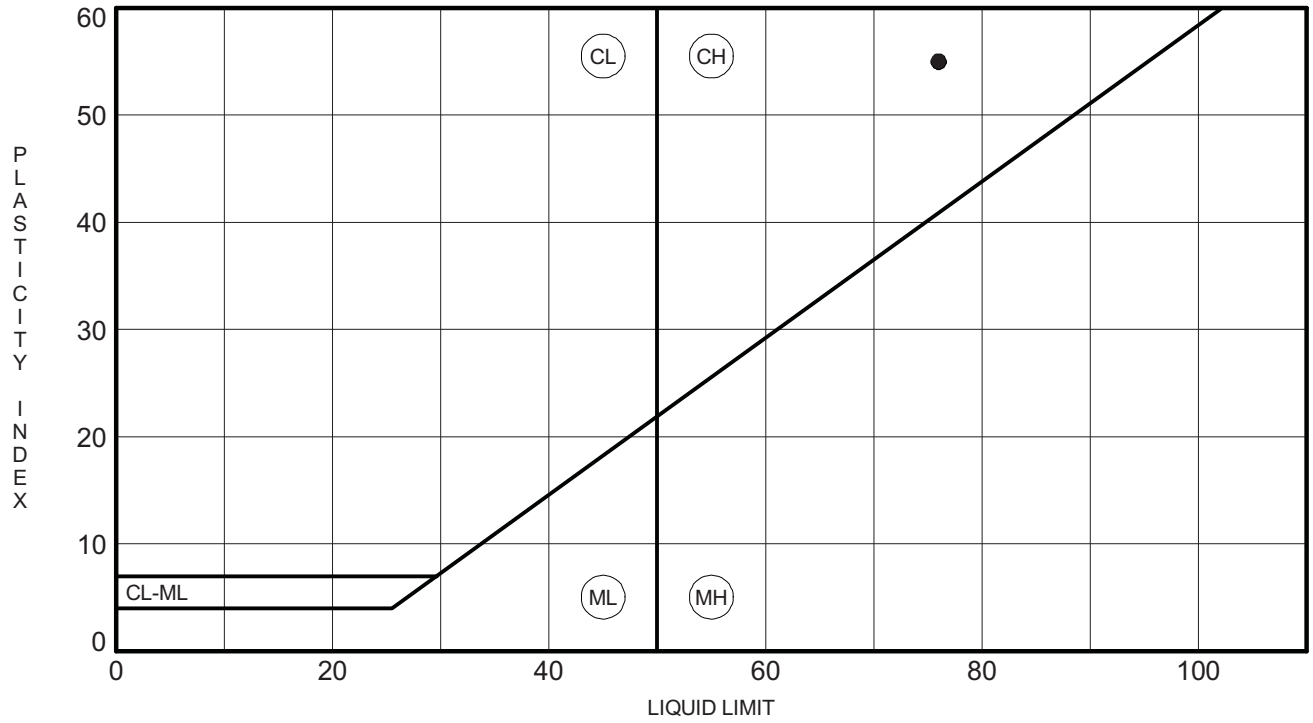
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**SB-1**	**260.0**	**Sandy Fat CLAY (CH) A-7-6(34)**	**76**	**21**	**55**		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**SB-1**	**260.0**	**9.52**	**1.102**			**0.0**	**34.9**	**65.1**	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**SB-1**	**260.0**	**76**	**21**	**55**	**65**	**Sandy Fat CLAY (CH) A-7-6(34)**

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT: US 21 Bridge Replacement over Harbor River **PROJECT NO.:** G5396

SAMPLE NUMBER: **DATE SAMPLE RECEIVED:**

DESCRIPTION OF SOIL: Fat Clay (CH) A-7-6(104)

TESTED BY: Fugro **DATE OF TESTING:**

DATE OF WEIGHING:

BORING NO.	SB-1/UD-9				
SAMPLE NO.	16-1211D				
SAMPLE DEPTH	378.0-381.0'				
WATER CONTENT, W%	39.3				

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

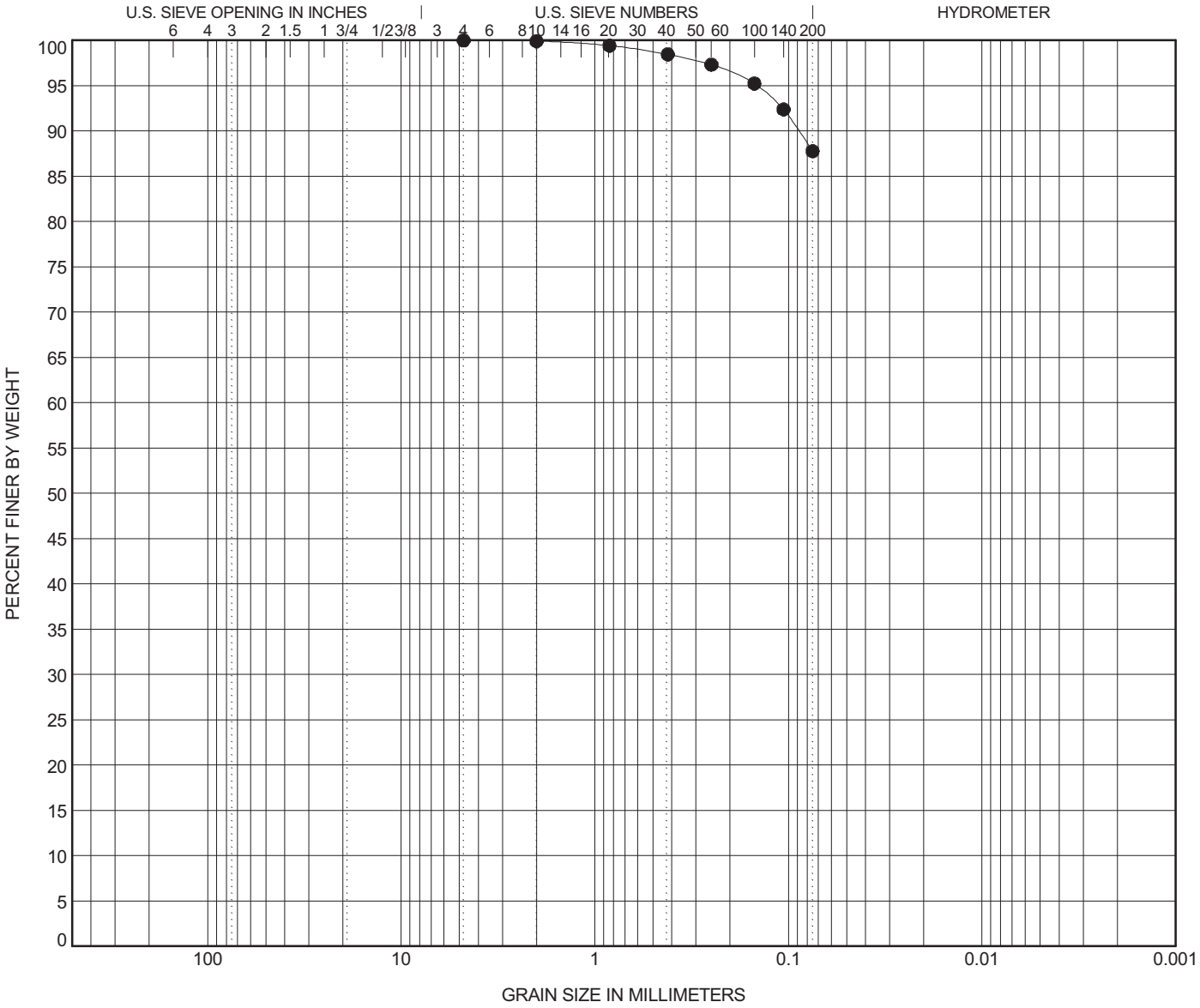
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

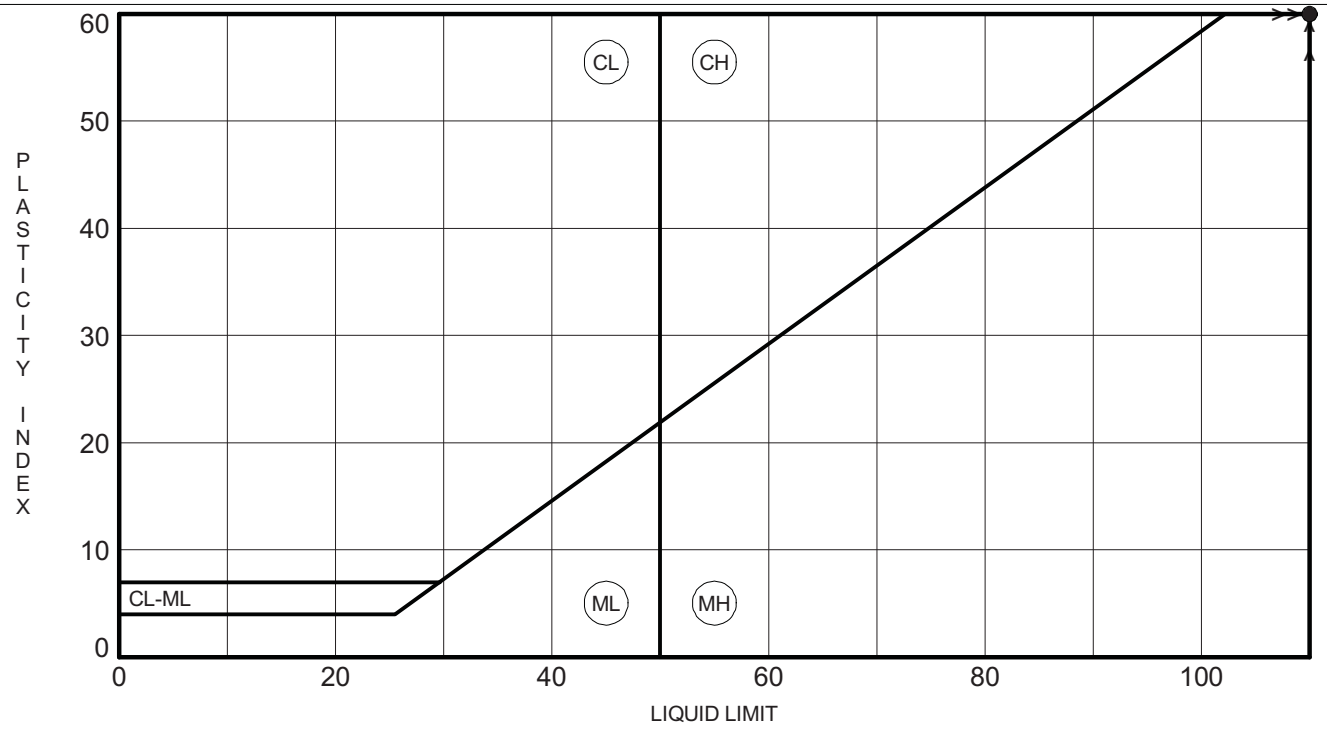
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**SB-1**	**381.0**	**Fat CLAY (CH) A-7-6(104)**	**133**	**29**	**104**		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**SB-1**	**381.0**	**4.76**	**0.146**			**0.0**	**12.2**	**87.8**	

ATTERBERG LIMITS' RESULTS

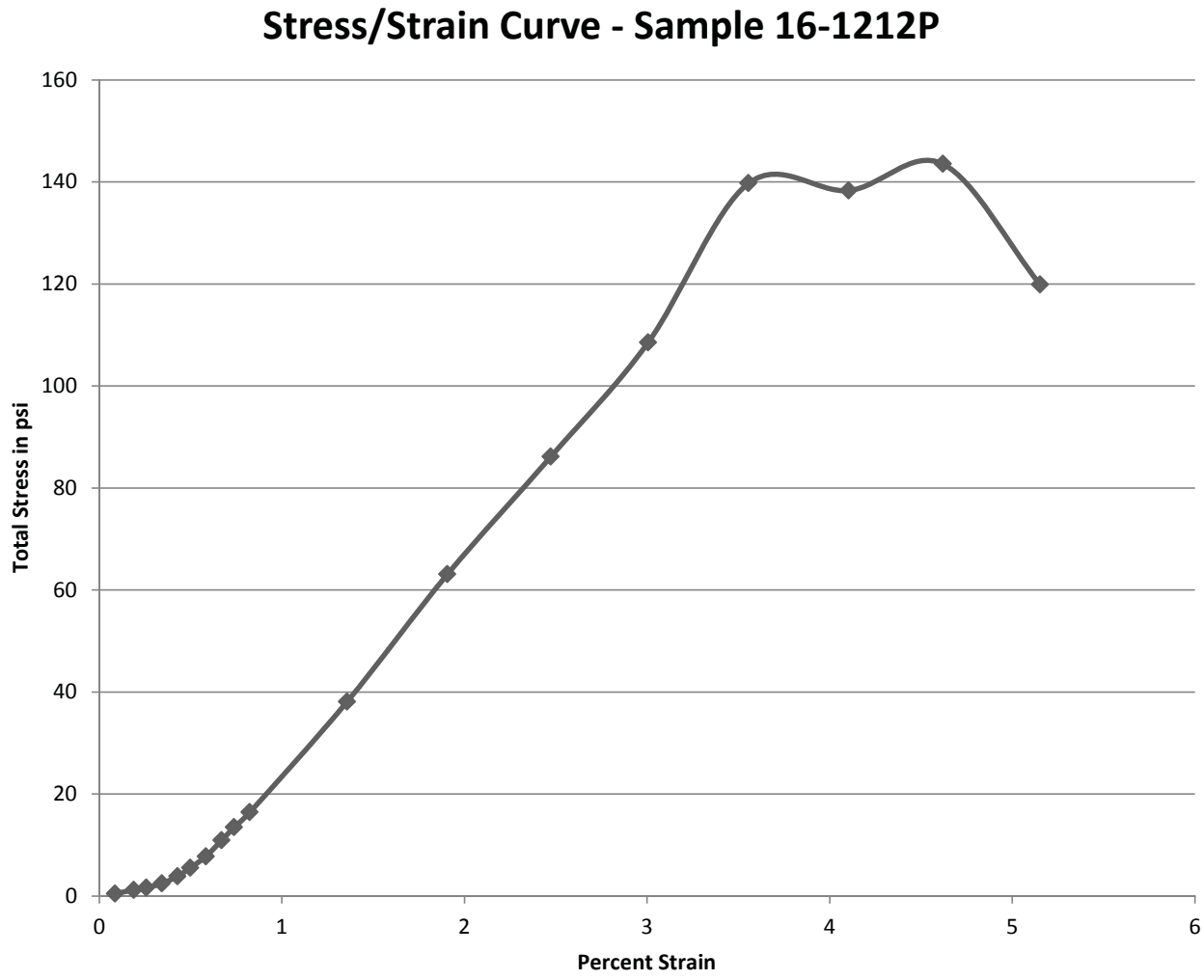
PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**SB-1**	**381.0**	**133**	**29**	**104**	**88**	**Fat CLAY (CH) A-7-6(104)**

UNCONFINED COMPRESSIVE STRENGTH TEST REPORT
ASTM D2166 / AASHTO T208



Average Initial Diameter (Do):	2.328 in.	Sample Volume:	21.142 in^3
Average Initial Height (Lo):	4.967 in.	Sample Volume:	0.012 ft^3
Average Initial Area (Ao):	4.257 in^2	Moist Sample Weight:	1.47 lbs.
In-Situ Moist Unit Weight:	119.7 pcf	In-Situ Dry Unit Weight:	92.8 pcf
Failure Mode:			

Project Name	US-21 Bridge Replacement over Harbor River		
Project Number	G5396.00	Date	8/11/2016
SCDOT File #	P026862	PIN #	
Sample/Location	SB-1 / NQ-1		
Depth/Elevation	250.0' - 255.0'		

Sample Type : Undisturbed - Shelby Tube
Target Strain Rate : 1% per minute

Description:

PI=	% Fines=
NMC = 29.0%	L/D Ratio = 2.13
$\sigma_{c\text{-}ULT}$ = 143.5	ε_{ULT} = 4.6%

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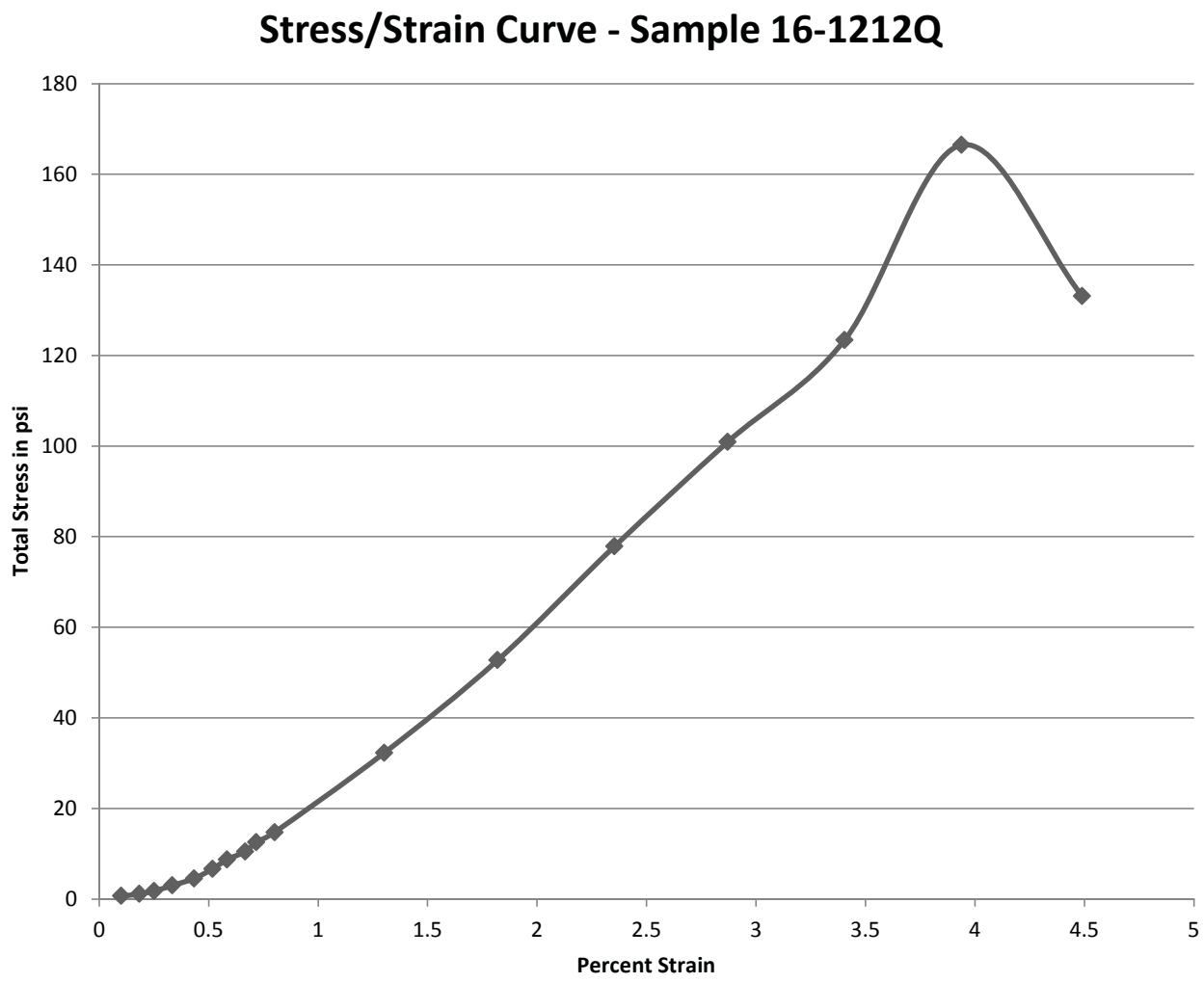
UNCONFINED COMPRESSIVE STRENGTH TEST REPORT
ASTM D2166 / AASHTO T208



Average Initial Diameter (Do):	2.395 in.	Sample Volume:	23.025 in^3
Average Initial Height (Lo):	5.111 in.	Sample Volume:	0.013 ft^3
Average Initial Area (Ao):	4.505 in^2	Moist Sample Weight:	1.56 lbs.
In-Situ Moist Unit Weight:	116.8 pcf	In-Situ Dry Unit Weight:	88.7 pcf
Failure Mode:			

Project Name	US-21 Bridge Replacement over Harbor River		
Project Number	G5396.00	Date	8/11/2016
SCDOT File #	P026862	PIN #	
Sample/Location	SB-1 / NQ-11		
Depth/Elevation	298.0' - 303.0'		

Sample Type : Undisturbed - Shelby Tube
Target Strain Rate : 1% per minute

Description:

PI=	% Fines=
NMC = 31.7%	L/D Ratio = 2.13
$\sigma_{c\text{-}ULT}$ = 166.5	ε_{ULT} = 3.9%

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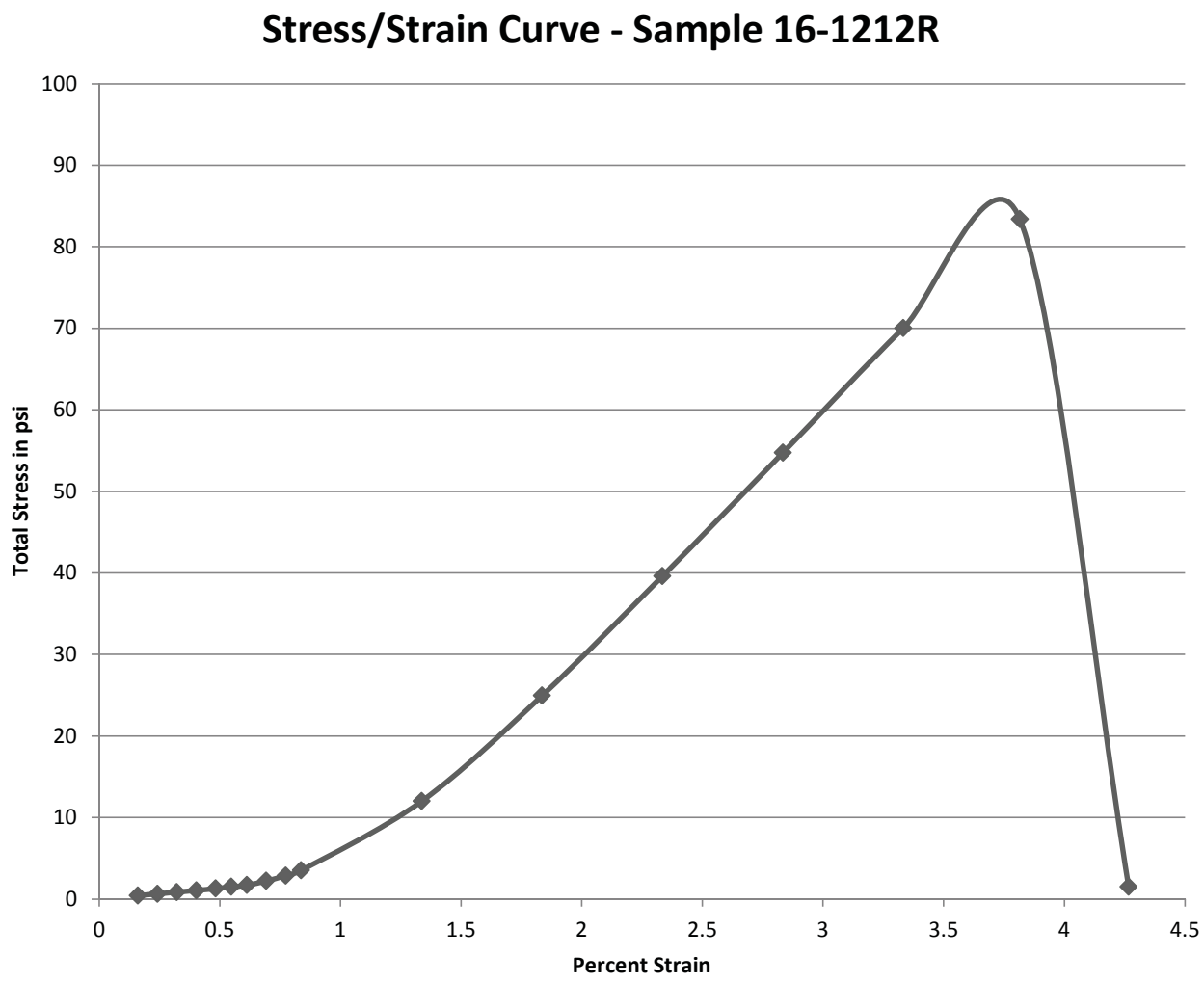
UNCONFINED COMPRESSIVE STRENGTH TEST REPORT
ASTM D2166 / AASHTO T208



Average Initial Diameter (Do):	2.445 in.	Sample Volume:	24.875 in^3
Average Initial Height (Lo):	5.298 in.	Sample Volume:	0.014 ft^3
Average Initial Area (Ao):	4.695 in^2	Moist Sample Weight:	1.63 lbs.
In-Situ Moist Unit Weight:	112.9 pcf	In-Situ Dry Unit Weight:	92.3 pcf
Failure Mode:			

Project Name	US-21 Bridge Replacement over Harbor River		
Project Number	G5396.00	Date	8/11/2016
SCDOT File #	P026862	PIN #	
Sample/Location	SB-1 / NQ-16		
Depth/Elevation	323.0' - 328.0'		

Sample Type : Undisturbed - Shelby Tube
Target Strain Rate : 1% per minute

Description:

PI=	% Fines=
NMC = 22.3%	L/D Ratio = 2.17
$\sigma_{c\text{-}ULT}$ = 85.9	ε_{ULT} = 3.7%

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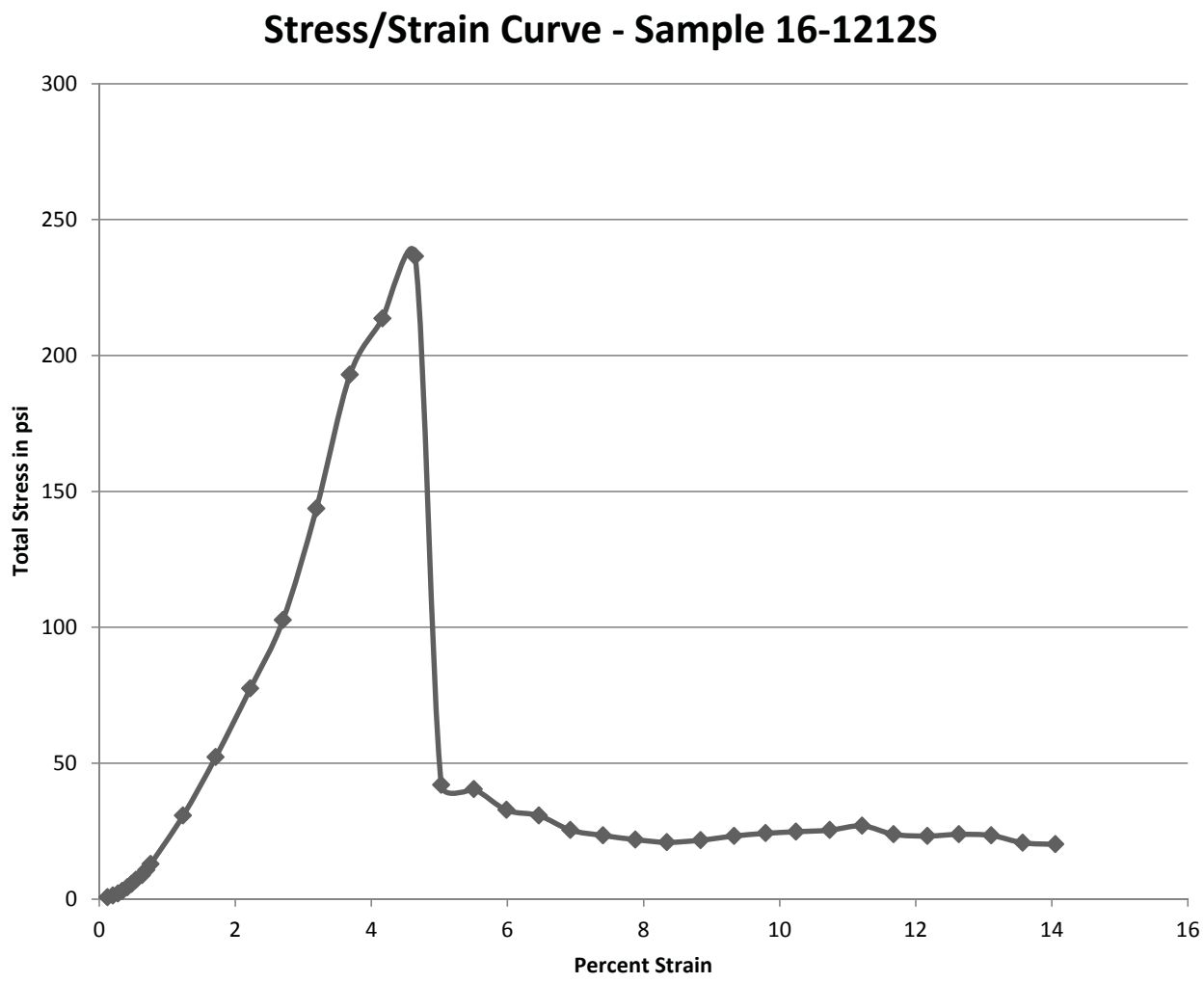
UNCONFINED COMPRESSIVE STRENGTH TEST REPORT
ASTM D2166 / AASHTO T208



Average Initial Diameter (Do):	2.416 in.	Sample Volume:	25.352 in^3
Average Initial Height (Lo):	5.53 in.	Sample Volume:	0.0147 ft^3
Average Initial Area (Ao):	4.584 in^2	Moist Sample Weight:	1.78 lbs.
In-Situ Moist Unit Weight:	121.5 pcf	In-Situ Dry Unit Weight:	95.9 pcf
Failure Mode:			

Project Name	US-21 Bridge Replacement over Harbor River		
Project Number	G5396.00	Date	8/11/2016
SCDOT File #	P026862	PIN #	
Sample/Location	SB-1 / NQ-23		
Depth/Elevation	358.0' - 363.0'		

Sample Type : Undisturbed - Shelby Tube
Target Strain Rate : 1% per minute

Description:

PI=	% Fines=
NMC = 26.8%	L/D Ratio = 2.29
$\sigma_{c\text{-}ULT}$ = 236.4	ε_{ULT} = 4.8%

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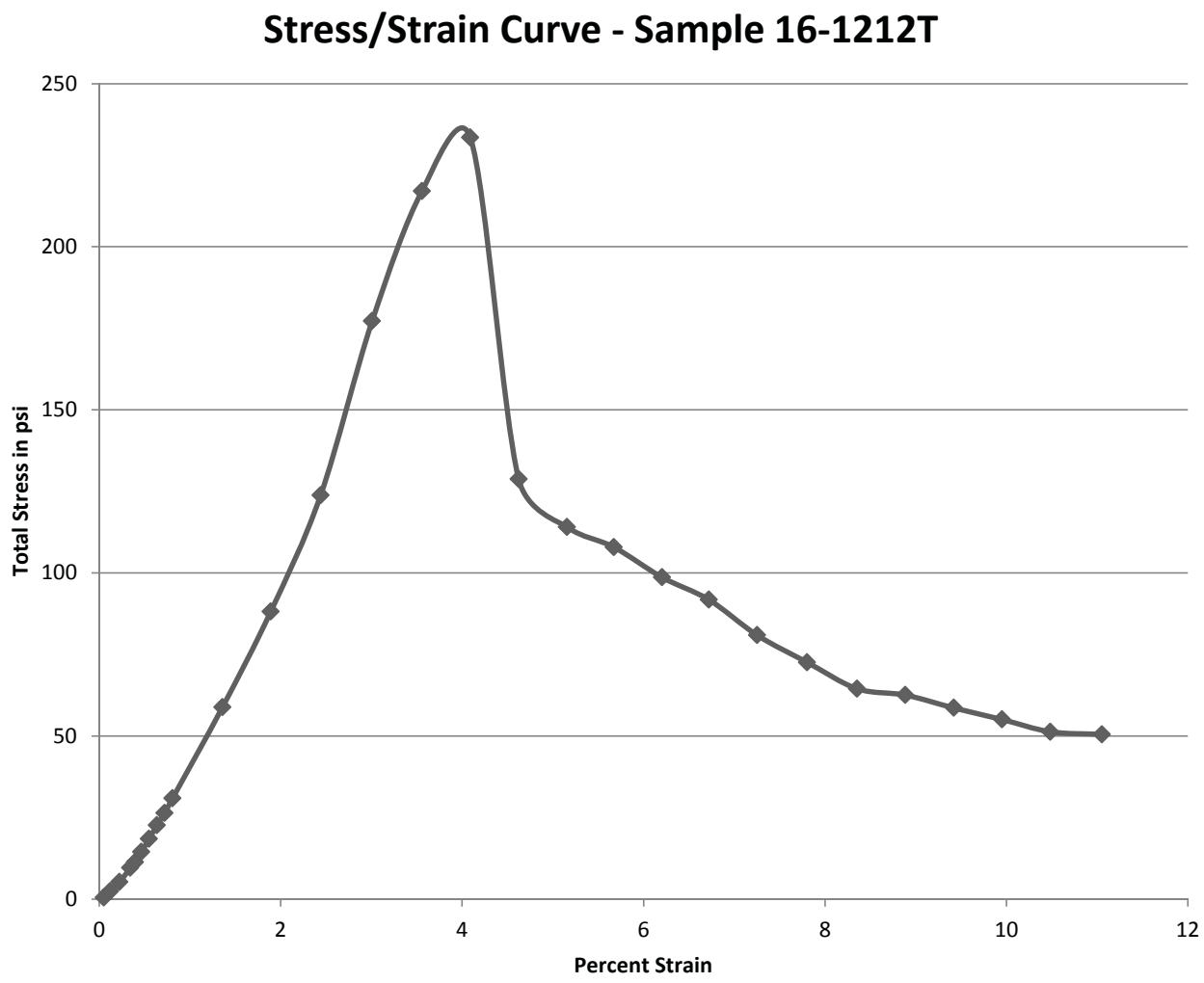
UNCONFINED COMPRESSIVE STRENGTH TEST REPORT
ASTM D2166 / AASHTO T208



Average Initial Diameter (Do):	2.391 in.	Sample Volume:	22.284 in^3
Average Initial Height (Lo):	4.963 in.	Sample Volume:	0.0129 ft^3
Average Initial Area (Ao):	4.490 in^2	Moist Sample Weight:	1.50 lbs.
In-Situ Moist Unit Weight:	116.4 pcf	In-Situ Dry Unit Weight:	88.0 pcf
Failure Mode:			

Project Name	US-21 Bridge Replacement over Harbor River		
Project Number	G5396.00	Date	8/11/2016
SCDOT File #	P026862	PIN #	
Sample/Location	SB-1 / NQ-27		
Depth/Elevation	381.0' - 385.0'		

Sample Type : Undisturbed - Shelby Tube
Target Strain Rate : 1% per minute

Description:

PI=	% Fines=
NMC = 32.3%	L/D Ratio = 2.08
$\sigma_{c\text{-}ULT}$ = 233.5	ε_{ULT} = 4.1%

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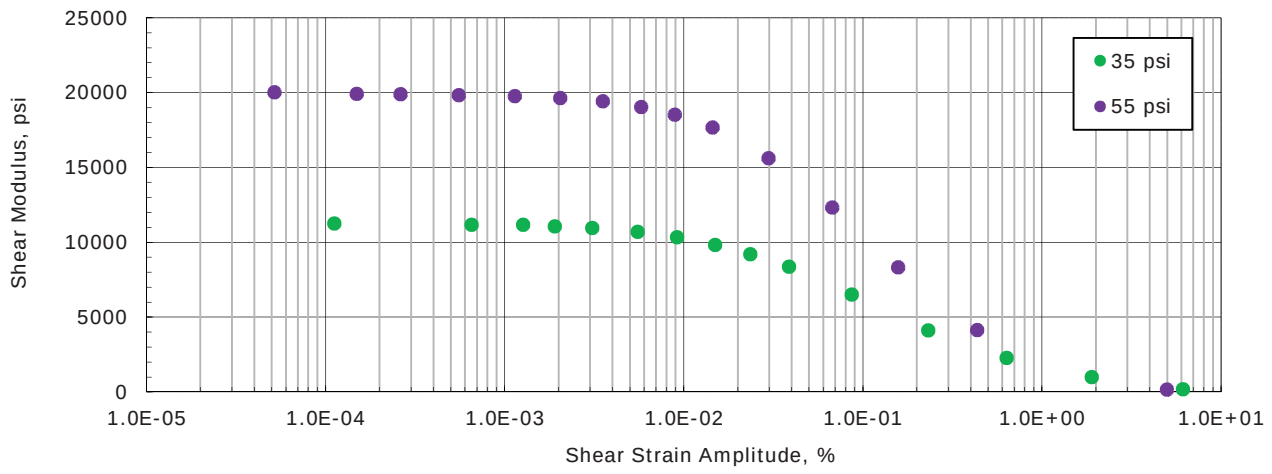
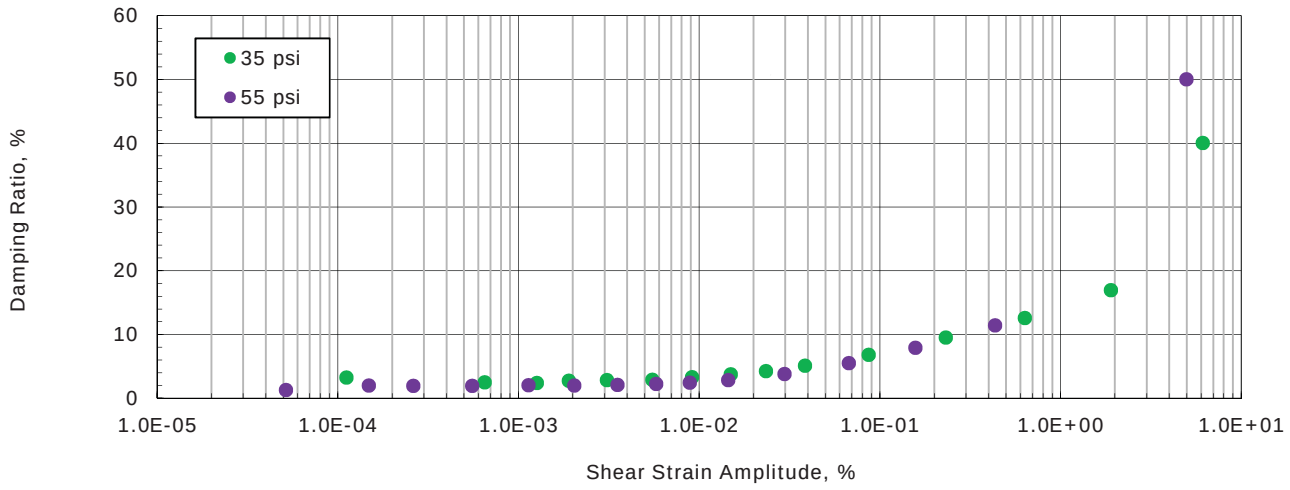
Client:	F&ME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	10/28/16, 11/3/16
Tested By:	sg
Checked By:	jdt
Boring ID:	SB-1
Sample ID:	UD-1
Depth, ft:	130.0-133.5
Test Confining Pressure, psi:	**35 55**
Visual Description:	Moist, olive sandy silt
Preparation:	Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content.

Modulus and Damping of Soils by Resonant-Column Method by ASTM D4015

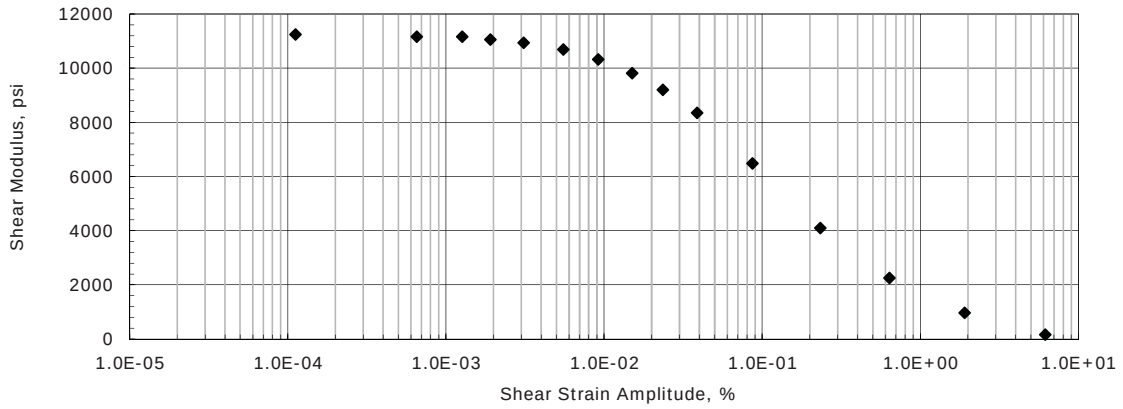


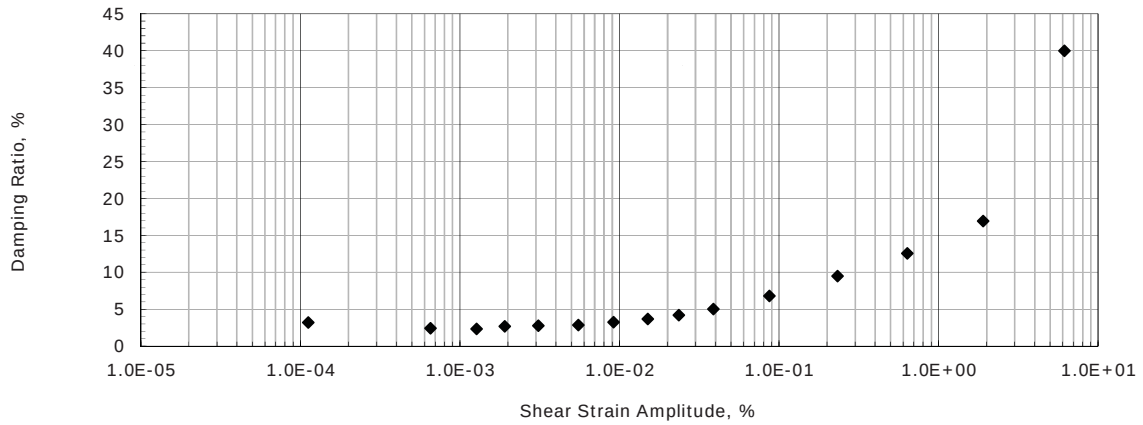


Notes: Data from two tests, each at a different confining pressure, plotted together on the same graph.

Client:	F&ME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	11/03/16
Tested By:	sg
Checked By:	jdt
Boring ID:	SB-1
Sample ID:	UD-1
Depth, ft:	130.0-133.5
Test Confining Pressure, psi:	**35**
Visual Description:	Moist, olive sandy silt
Preparation:	Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content.

Modulus and Damping of Soils by Resonant-Column Method by ASTM D4015





Initial Diameter, in:	2.49
Initial Height, in:	5.00
Initial Mass, grams:	699
Initial Moisture Content, %:	38.0
Initial Dry Density, pcf:	79.3
Initial Bulk Density, pcf:	109.4
Initial Degree of Saturation:	92.2
Initial Void Ratio:	1.10

Final Diameter, in:	2.45
Final Height, in:	4.90
Final Mass, grams:	698.39
Final Moisture Content, %:	36.6
Final Dry Density, pcf:	83.7
Final Bulk Density, pcf:	114.4
Final Degree of Saturation:	99.1
Final Void Ratio:	0.99

Notes: Moisture content obtained from sample trimmings
Isotropic stress conditions

Client:	F&ME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	11/03/16
Tested By:	sg
Checked By:	jdt
Boring ID:	SB-1
Sample ID:	UD-1
Depth, ft:	130.0-133.5
Test Confining Pressure, psi:	**35**
Visual Description:	Moist, olive sandy silt
Test Conditions:	Confining Stress of 35 psi over a range of strains from 0.000112 to 6.15% with a forced sinusoidal vibration.
Preparation:	Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content.

Modulus and Damping of Soils by Resonant-Column Method by ASTM D4015

Apparatus Used: Geocomp Corp. quasi-fixed/free boundry condition automated RCTS Test System

Active Mass, g:	2144.75	Torque Calibration Factor, N-m/V:	12.9
Passive Mass, g:	1053.2	Accelerometer Calibration Factor, rad/s^2/V:	3293
Active Inertia, kg-m^2:	1.66E-03		
Passive Inertia, kg-m^2:	0.0012425		

Elapsed Time	Excitation	Frequency	Axial Strain	Volumetric Strain	* Pore Pressure	Effective Confining Stress	Average Strain Amplitude	Shear Modulus, G	Damping Ratio, D
min	%	Hz	%	%	psi	psi	%	psi	%
0.31	0.040	116	2.91E-02	0.029	---	35	1.12E-04	1.12E+04	3.19
0.52	0.100	115	2.91E-02	0.029	---	35	6.53E-04	1.12E+04	2.43
0.62	0.158	115	2.91E-02	0.029	---	35	1.27E-03	1.12E+04	2.32
0.73	0.251	115	2.91E-02	0.029	---	35	1.91E-03	1.11E+04	2.68
0.83	0.398	114	2.91E-02	0.029	---	35	3.09E-03	1.09E+04	2.77
0.93	0.631	113	2.91E-02	0.029	---	35	5.53E-03	1.07E+04	2.86
1.04	1.000	111	2.91E-02	0.029	---	35	9.17E-03	1.03E+04	3.23
1.14	1.586	109	2.91E-02	0.029	---	35	1.50E-02	9.81E+03	3.68
1.24	2.515	106	2.91E-02	0.029	---	35	2.35E-02	9.20E+03	4.20
1.35	3.989	101	2.91E-02	0.029	---	35	3.87E-02	8.35E+03	5.03
1.56	6.338	90	2.91E-02	0.029	---	35	8.69E-02	6.49E+03	6.77
1.87	10.087	72	2.91E-02	0.029	---	35	2.33E-01	4.10E+03	9.48
2.18	16.021	54	2.91E-02	0.029	---	35	6.36E-01	2.25E+03	12.54
2.49	25.446	36	2.91E-02	0.029	---	35	1.91E+00	9.70E+02	16.91
2.80	40.386	20	2.91E-02	0.029	---	35	6.15E+00	1.66E+02	40.01

The Shear Wave Velocity can be determined by the following equation:

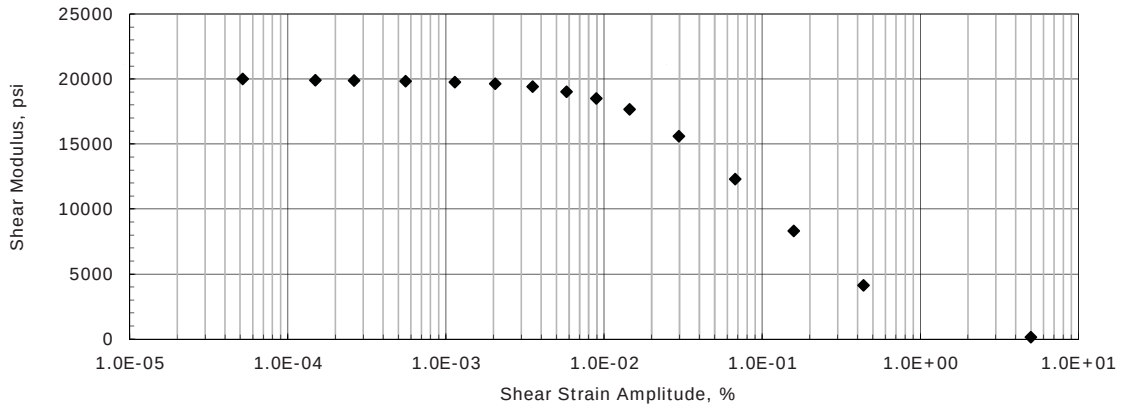
Vs = sqrt(G*g/bulk density)

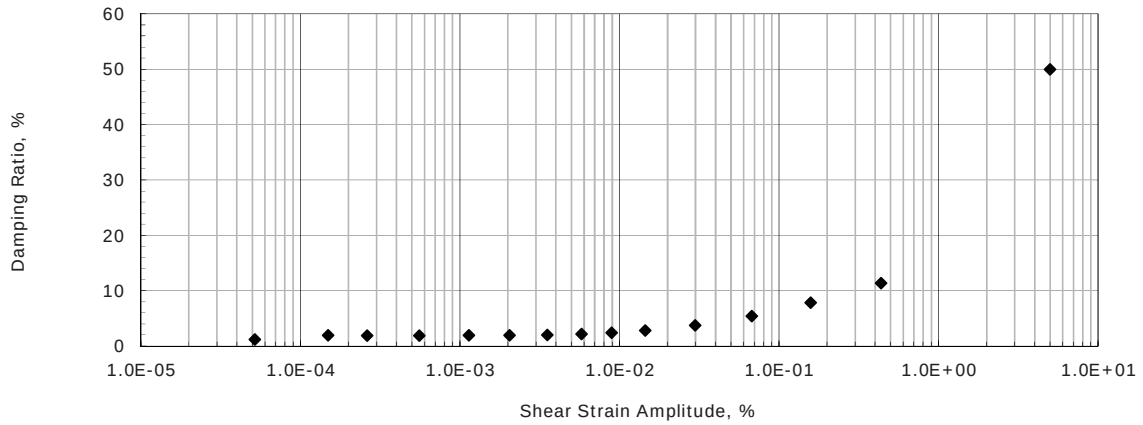
where: Vs = shear wave velocity
G = shear modulus
g = acceleration due to gravity, 9.81 m/sec^2
final bulk density

* Test is run with drainage valve open, but speed of test is such that excess pore pressure could develop, at higher shear strains within specimen.

Client:	F&ME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	10/28/16
Tested By:	sg
Checked By:	jdt
Boring ID:	SB-1
Sample ID:	UD-1
Depth, ft:	130.0-133.5
Test Confining Pressure, psi:	**55**
Visual Description:	Moist, olive sandy silt
Preparation:	Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content.

Modulus and Damping of Soils by Resonant-Column Method by ASTM D4015





Initial Diameter, in:	2.85
Initial Height, in:	6.00
Initial Mass, grams:	1106
Initial Moisture Content, %:	40.1
Initial Dry Density, pcf:	78.6
Initial Bulk Density, pcf:	110.1
Initial Degree of Saturation:	95.7
Initial Void Ratio:	1.12

Final Diameter, in:	2.79
Final Height, in:	5.87
Final Mass, grams:	1092
Final Moisture Content, %:	37.1
Final Dry Density, pcf:	83.5
Final Bulk Density, pcf:	114.5
Final Degree of Saturation:	99.9
Final Void Ratio:	0.99

Notes: Moisture content obtained from sample trimmings
Isotropic stress conditions

Client:	F&ME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	10/28/16
Tested By:	sg
Checked By:	jdt
Boring ID:	SB-1
Sample ID:	UD-1
Depth, ft:	130.0-133.5
Test Confining Pressure, psi:	**55**
Visual Description:	Moist, olive sandy silt
Test Conditions:	Confining Stress of 55 psi over a range of strains from 0.0000519 to 4.99% with a forced sinusoidal vibration.
Preparation:	Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content.

Modulus and Damping of Soils by Resonant-Column Method by ASTM D4015

Apparatus Used: Geocomp Corp. quasi-fixed/free boundry condition automated RCTS Test System

Active Mass, g:	2144.75	Torque Calibration Factor, N-m/V:	12.9
Passive Mass, g:	1053.2	Accelerometer Calibration Factor, rad/s^2/V:	3293
Active Inertia, kg-m^2:	1.66E-03		
Passive Inertia, kg-m^2:	0.0012425		

Elapsed Time	Excitation	Frequency	Axial Strain	Volumetric Strain	* Pore Pressure	Effective Confining Stress	Average Strain Amplitude	Shear Modulus, G	Damping Ratio, D
min	%	Hz	%	%	psi	psi	%	psi	%
0.31	0.039	172	4.35E-02	0.043	---	54	5.19E-05	2.00E+04	1.22
0.52	0.098	172	4.35E-02	0.043	---	54	1.49E-04	1.99E+04	1.95
0.62	0.156	172	4.35E-02	0.043	---	54	2.62E-04	1.99E+04	1.91
0.73	0.247	171	4.35E-02	0.043	---	54	5.55E-04	1.98E+04	1.89
0.83	0.392	171	4.35E-02	0.043	---	54	1.14E-03	1.98E+04	1.97
0.93	0.621	171	4.35E-02	0.043	---	54	2.05E-03	1.96E+04	1.93
1.04	0.983	170	4.35E-02	0.043	---	54	3.53E-03	1.94E+04	2.02
1.14	1.558	168	4.35E-02	0.043	---	54	5.79E-03	1.90E+04	2.17
1.24	2.470	166	4.35E-02	0.043	---	54	8.91E-03	1.85E+04	2.41
1.35	3.919	163	4.35E-02	0.043	---	54	1.45E-02	1.77E+04	2.81
1.56	6.230	154	4.35E-02	0.043	---	54	2.98E-02	1.56E+04	3.75
1.87	9.925	137	4.35E-02	0.043	---	54	6.75E-02	1.23E+04	5.44
2.28	15.835	114	4.35E-02	0.043	---	54	1.58E-01	8.31E+03	7.87
2.80	25.282	81	4.35E-02	0.043	---	54	4.36E-01	4.13E+03	11.39
3.52	40.388	20	4.35E-02	0.043	---	54	4.99E+00	1.38E+02	49.99

The Shear Wave Velocity can be determined by the following equation:

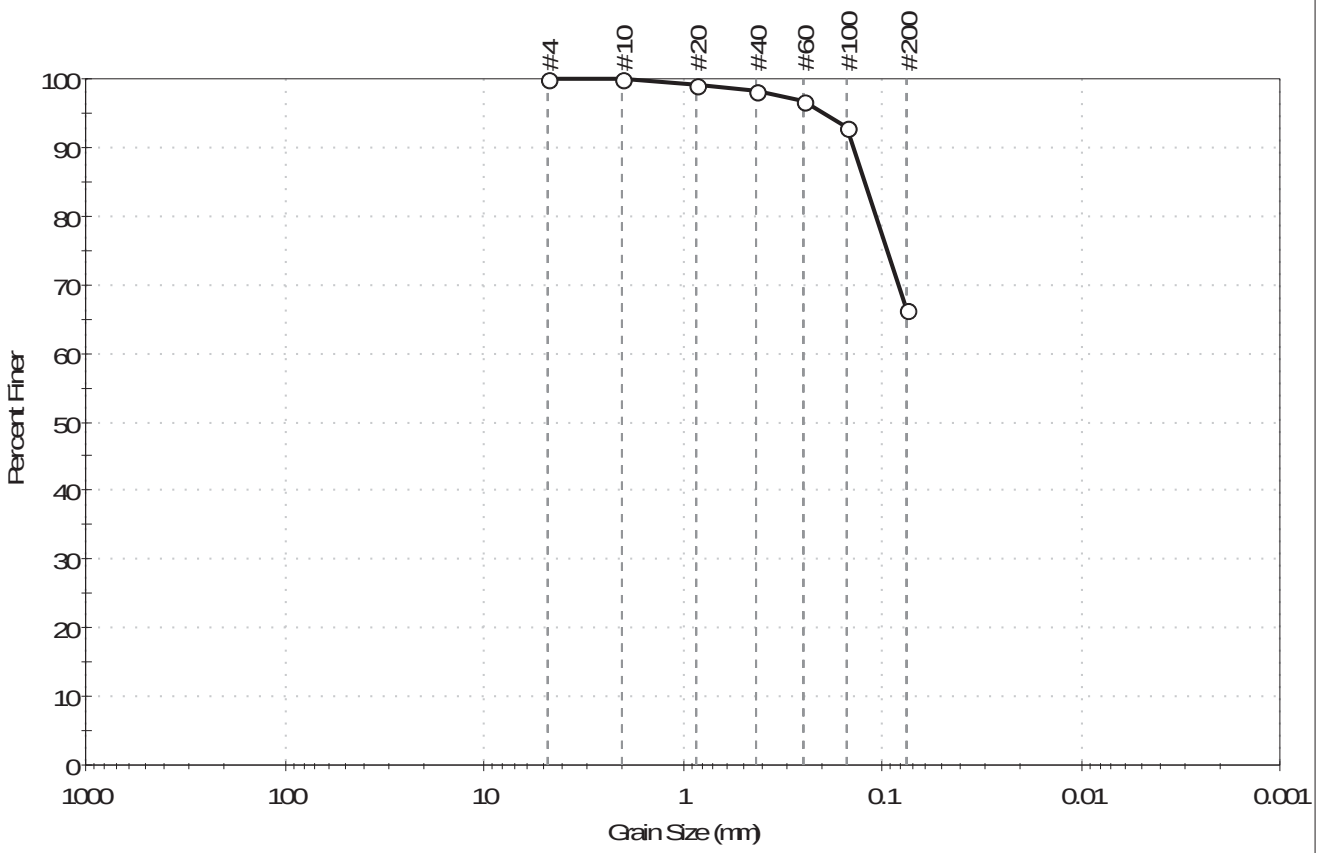
Vs = sqrt(G*g/bulk density)

where: Vs = shear wave velocity
G = shear modulus
g = acceleration due to gravity, 9.81 m/sec^2
final bulk density

* Test is run with drainage valve open, but speed of test is such that excess pore pressure could develop, at higher shear strains within specimen.

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	SB-1	Sample Type:	tube	Tested By:	GA
Sample ID:	UD-1	Test Date:	11/04/16	Checked By:	mcm
Depth :	130.0-133.5 ft	Test Id:	397424		
Test Comment:	---				
Visual Description:	Moist, olive sandy silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



%Cobble	%Gravel	%Sand	%Silt & Clay Size
—	0.0	33.7	66.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	98		
#60	0.25	97		
#100	0.15	93		
#200	0.075	66		

Coefficients

D_{85} = 0.1220 mm	D_{30} = N/A
D_{60} = N/A	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Sandy Silt (ML)

AASHTO Clayey Soils (A-7-5 (8))

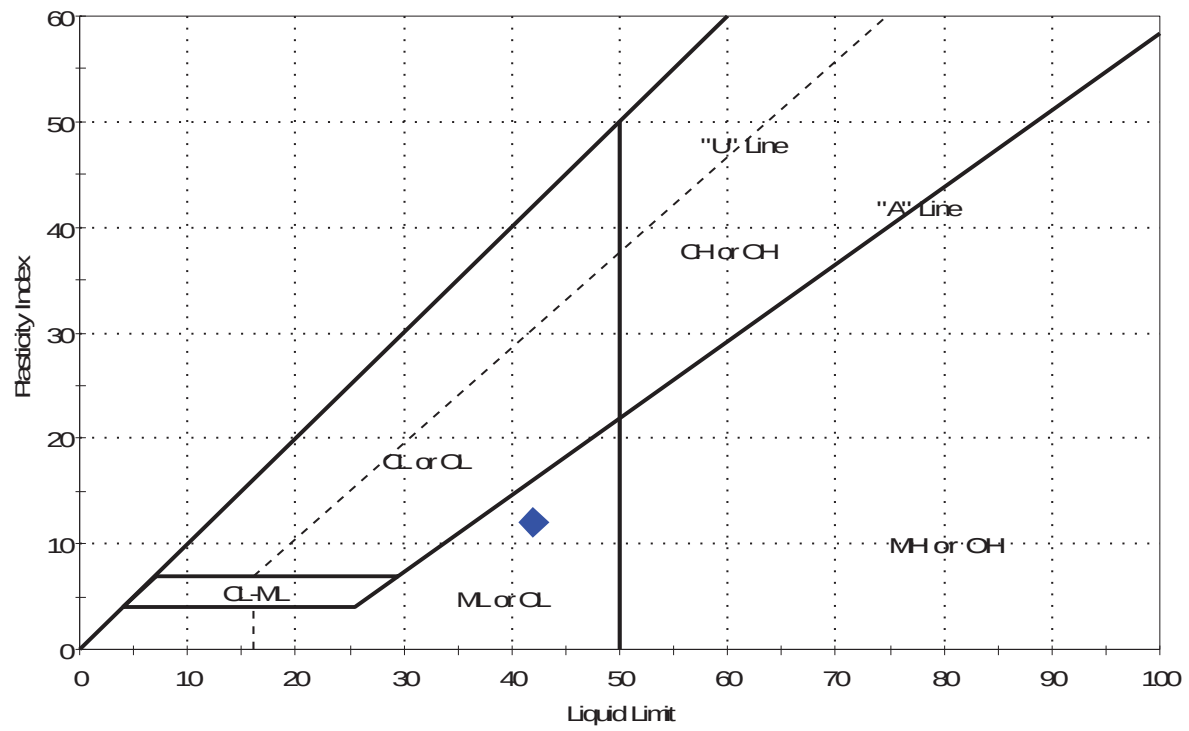
Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	SB-1	Sample Type:	tube	Tested By:	GA
Sample ID:	UD-1	Test Date:	11/04/16	Checked By:	mcm
Depth :	130.0-133.5 ft	Test Id:	397422		
Test Comment:	---				
Visual Description:	Moist, olive sandy silt				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UD-1	SB-1	30.0-133. ft	38	42	30	12	0.6	Sandy Silt (ML)

Sample Prepared using the WET method

2% Retained on #40 Sieve

Dry Strength: HIGH

Dilatancy: SLOW

Toughness: LOW

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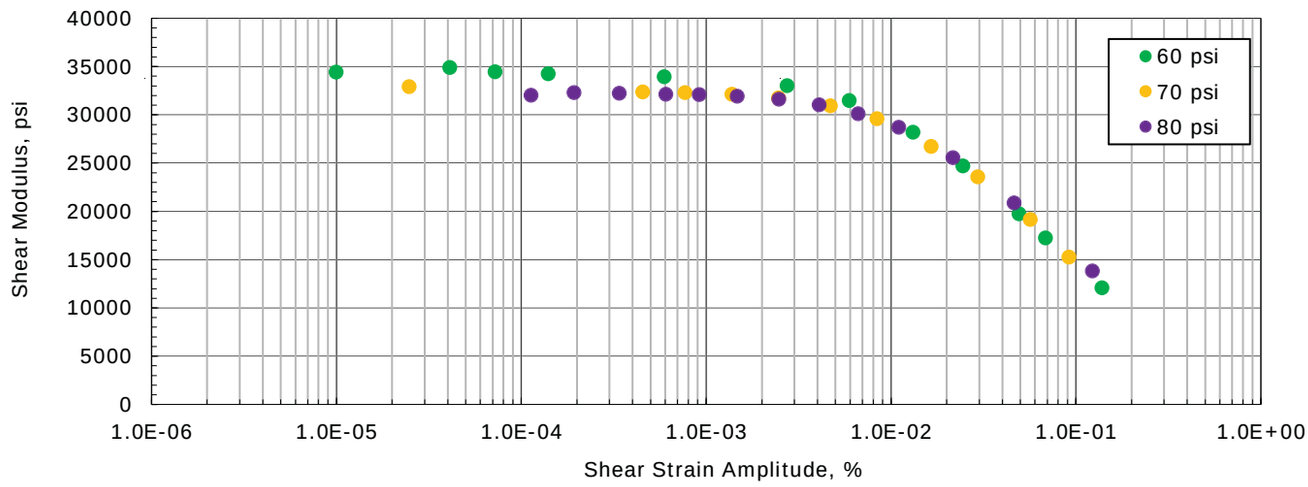
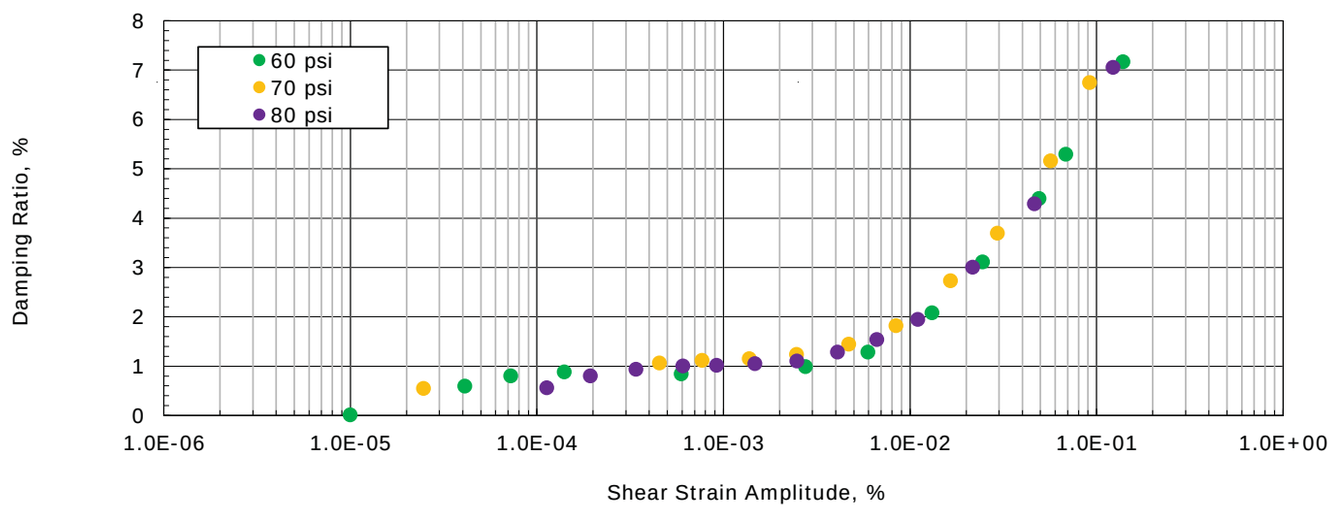
Client:	F&ME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	10/18/16, 10/19/16, 10/25/16
Tested By:	njh
Checked By:	jdt
Boring ID:	SB-1
Sample ID:	UD-4
Depth, ft:	200.0-203.0
Test Confining Pressure, psi:	**60 70 80**
Visual Description:	Moist, olive gray silty clay
Preparation:	Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content.

Modulus and Damping of Soils by Resonant-Column Method by ASTM D4015

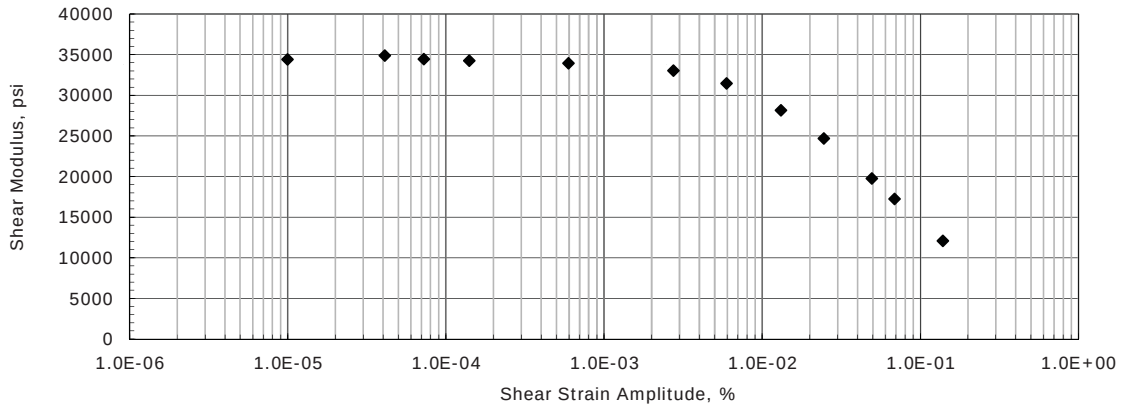


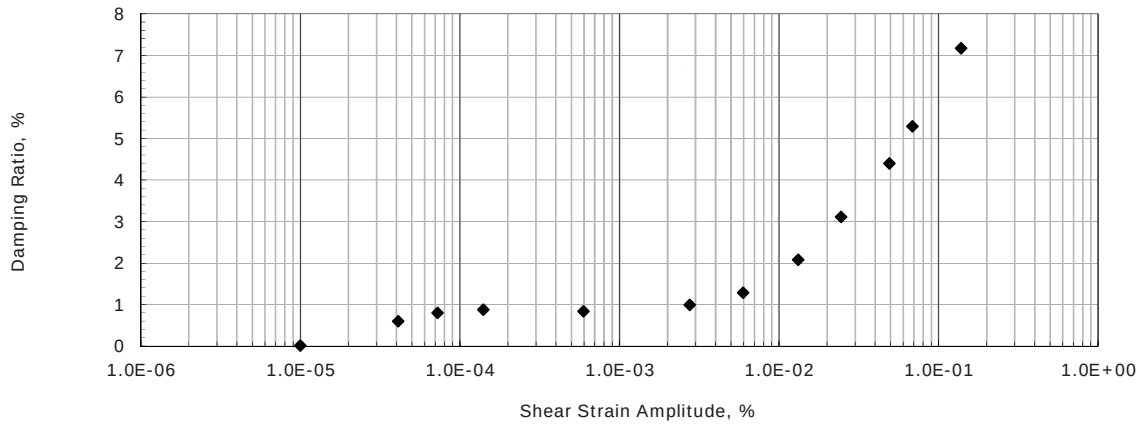


Notes: Data from three tests, each at a different confining pressure, plotted together on the same graph.

Client:	F&ME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	10/18/16
Tested By:	njh
Checked By:	jdt
Boring ID:	SB-1
Sample ID:	UD4
Depth, ft:	200.0-203.0
Test Confining Pressure, psi:	**60**
Visual Description:	Moist, olive gray clay
Preparation:	Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content.

Modulus and Damping of Soils by Resonant-Column Method by ASTM D4015





Initial Diameter, in:	2.83
Initial Height, in:	5.80
Initial Mass, grams:	1110
Initial Moisture Content, %:	31.7
Initial Dry Density, pcf:	88.0
Initial Bulk Density, pcf:	115.9
Initial Degree of Saturation:	95.1
Initial Void Ratio:	0.89

Final Diameter, in:	2.81
Final Height, in:	5.73
Final Mass, grams:	1095
Final Moisture Content, %:	27.4
Final Dry Density, pcf:	90.3
Final Bulk Density, pcf:	115.0
Final Degree of Saturation:	86.7
Final Void Ratio:	0.84

Notes: Moisture content obtained from sample trimmings
Isotropic stress conditions

Client:	F&ME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	10/18/16
Tested By:	njh
Checked By:	jdt
Boring ID:	SB-1
Sample ID:	UD4
Depth, ft:	200.0-203.0
Test Confining Pressure, psi:	**60**
Visual Description:	Moist, olive gray clay
Test Conditions:	Confining Stress of 60 psi over a range of strains from 0.00000997 to 7.17% with a forced sinusoidal vibration.
Preparation:	Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content.

Modulus and Damping of Soils by Resonant-Column Method by ASTM D4015

Apparatus Used: Geocomp Corp. quasi-fixed/free boundry condition automated RCTS Test System

Active Mass, g:	2144.75	Torque Calibration Factor, N-m/V:	12.9
Passive Mass, g:	1053.2	Accelerometer Calibration Factor, rad/s^2/V:	3293
Active Inertia, kg-m^2:	1.66E-03		
Passive Inertia, kg-m^2:	0.0012425		

Elapsed Time	Excitation	Frequency	Axial Strain	Volumetric Strain	* Pore Pressure	Effective Confining Stress	Average Strain Amplitude	Shear Modulus, G	Damping Ratio, D
min	%	Hz	%	%	psi	psi	%	psi	%
1.97	0.153	225	4.13E-02	0.041	---	60	9.97E-06	3.44E+04	0.01
2.38	0.963	226	4.13E-02	0.041	---	60	4.10E-05	3.49E+04	0.60
2.49	1.525	225	4.13E-02	0.041	---	60	7.23E-05	3.44E+04	0.80
2.59	2.418	225	4.13E-02	0.041	---	60	1.40E-04	3.43E+04	0.88
2.69	3.833	224	4.13E-02	0.041	---	60	5.94E-04	3.39E+04	0.84
2.80	6.078	221	4.13E-02	0.041	---	60	2.75E-03	3.30E+04	0.99
2.90	9.643	217	4.13E-02	0.041	---	60	5.96E-03	3.15E+04	1.28
3.11	15.359	206	4.13E-02	0.041	---	60	1.32E-02	2.82E+04	2.08
3.31	24.442	194	4.13E-02	0.041	---	60	2.45E-02	2.47E+04	3.11
3.62	39.145	175	4.13E-02	0.041	---	60	4.92E-02	1.97E+04	4.39
3.83	62.122	165	4.13E-02	0.041	---	60	6.85E-02	1.72E+04	5.29
4.25	99.226	139	4.13E-02	0.041	---	60	1.38E-01	1.21E+04	7.17

The Shear Wave Velocity can be determined by the following equation:

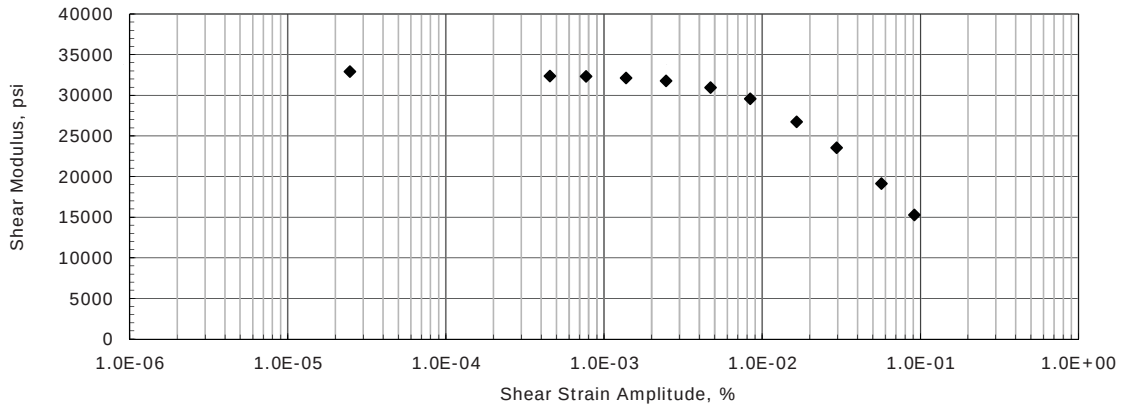
Vs = sqrt(G*g/bulk density)

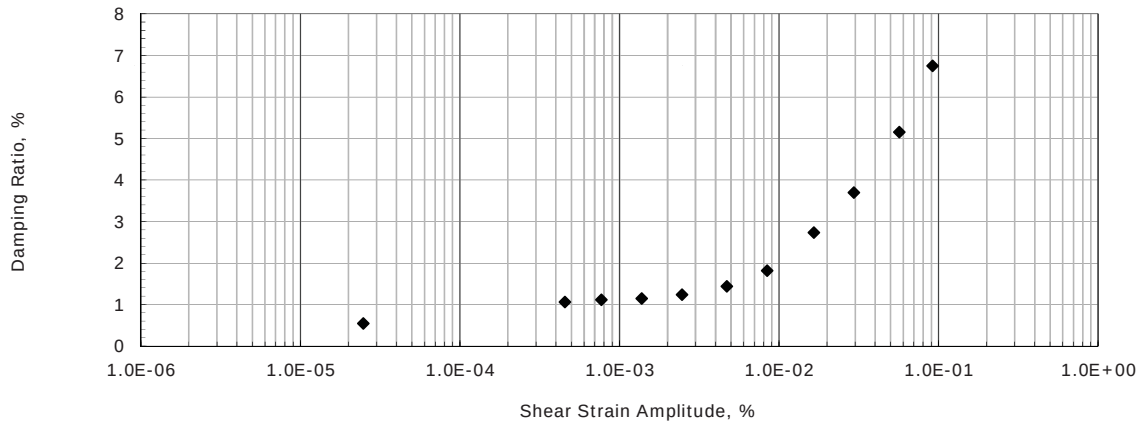
where: Vs = shear wave velocity
G = shear modulus
g = acceleration due to gravity, 9.81 m/sec^2
final bulk density

* Test is run with drainage valve open, but speed of test is such that excess pore pressure could develop, at higher shear strains within specimen.

Client:	F&ME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	10/18/16
Tested By:	njh
Checked By:	jdt
Boring ID:	SB-1
Sample ID:	UD4
Depth, ft:	200.0-203.0
Test Confining Pressure, psi:	**70**
Visual Description:	Moist, olive gray silty clay
Preparation:	Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content.

Modulus and Damping of Soils by Resonant-Column Method by ASTM D4015





Initial Diameter, in:	2.84
Initial Height, in:	5.89
Initial Mass, grams:	1132
Initial Moisture Content, %:	31.5
Initial Dry Density, pcf:	87.9
Initial Bulk Density, pcf:	115.6
Initial Degree of Saturation:	94.2
Initial Void Ratio:	0.89

Final Diameter, in:	2.81
Final Height, in:	5.78
Final Mass, grams:	1122
Final Moisture Content, %:	30.1
Final Dry Density, pcf:	91.5
Final Bulk Density, pcf:	119.1
Final Degree of Saturation:	98.3
Final Void Ratio:	0.82

Notes: Moisture content obtained from sample trimmings
Isotropic stress conditions

Client:	F&ME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	10/18/16
Tested By:	njh
Checked By:	jdt
Boring ID:	SB-1
Sample ID:	UD4
Depth, ft:	200.0-203.0
Test Confining Pressure, psi:	**70**
Visual Description:	Moist, olive gray silty clay
Test Conditions:	Confining Stress of 70 psi over a range of strains from 0.0000247 to 6.74% with a forced sinusoidal vibration.
Preparation:	Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content.

Modulus and Damping of Soils by Resonant-Column Method by ASTM D4015

Apparatus Used: Geocomp Corp. quasi-fixed/free boundry condition automated RCTS Test System

Active Mass, g:	2144.75	Torque Calibration Factor, N-m/V:	12.9
Passive Mass, g:	1053.2	Accelerometer Calibration Factor, rad/s^2/V:	3293
Active Inertia, kg-m^2:	1.66E-03		
Passive Inertia, kg-m^2:	0.0012425		

Elapsed Time	Excitation	Frequency	Axial Strain	Volumetric Strain	* Pore Pressure	Effective Confining Stress	Average Strain Amplitude	Shear Modulus, G	Damping Ratio, D
min	%	Hz	%	%	psi	psi	%	psi	%
0.73	0.243	219	4.41E-02	0.044	---	70	2.47E-05	3.29E+04	0.55
1.14	1.530	218	4.41E-02	0.044	---	70	4.54E-04	3.24E+04	1.06
1.24	2.424	218	4.41E-02	0.044	---	70	7.70E-04	3.23E+04	1.12
1.35	3.842	218	4.41E-02	0.044	---	70	1.38E-03	3.21E+04	1.15
1.45	6.091	217	4.41E-02	0.044	---	70	2.47E-03	3.18E+04	1.24
1.56	9.657	214	4.41E-02	0.044	---	70	4.70E-03	3.09E+04	1.44
1.66	15.321	210	4.41E-02	0.044	---	70	8.40E-03	2.96E+04	1.82
1.87	24.378	201	4.41E-02	0.044	---	70	1.65E-02	2.67E+04	2.73
2.07	38.803	190	4.41E-02	0.044	---	70	2.95E-02	2.36E+04	3.69
2.38	61.938	172	4.41E-02	0.044	---	70	5.67E-02	1.91E+04	5.16
2.69	98.715	155	4.41E-02	0.044	---	70	9.18E-02	1.53E+04	6.74

The Shear Wave Velocity can be determined by the following equation:

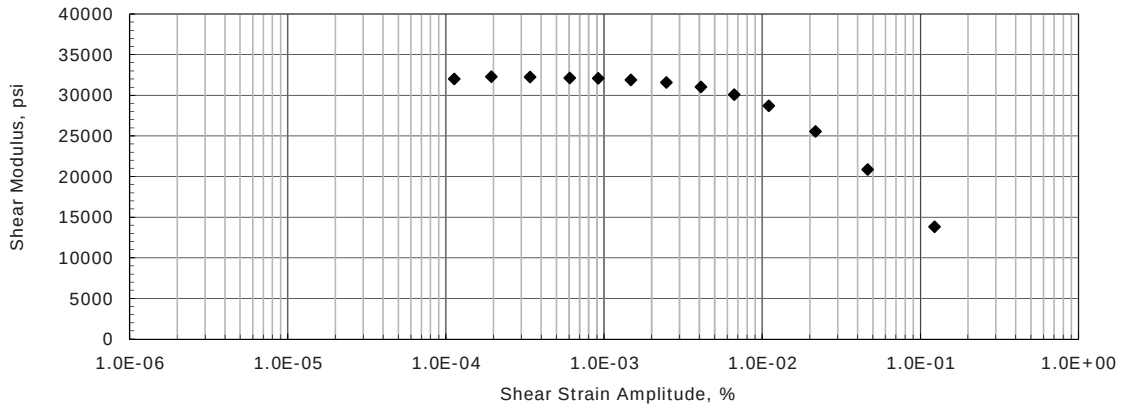
Vs = sqrt(G*g/bulk density)

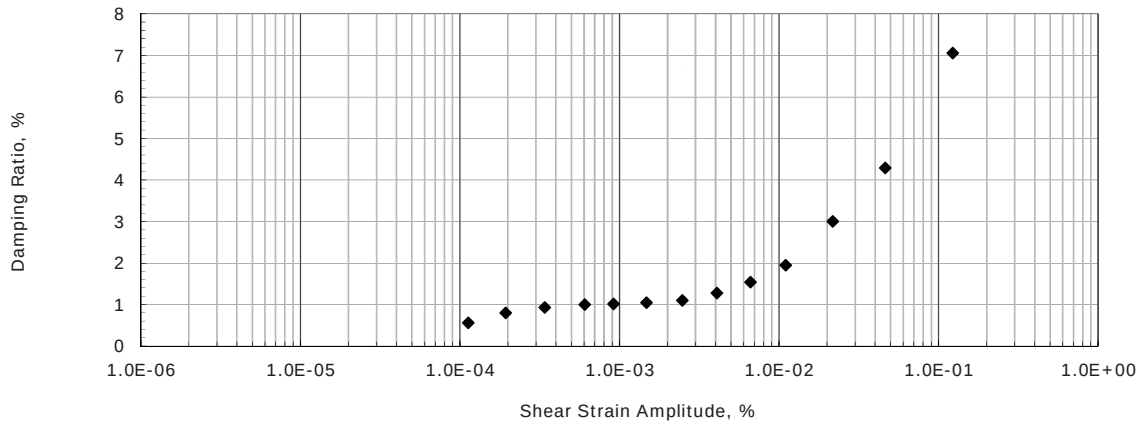
where: Vs = shear wave velocity
G = shear modulus
g = acceleration due to gravity, 9.81 m/sec^2
final bulk density

* Test is run with drainage valve open, but speed of test is such that excess pore pressure could develop, at higher shear strains within specimen.

Client:	F&ME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	10/18/16
Tested By:	njh
Checked By:	jdt
Boring ID:	SB-1
Sample ID:	UD4
Depth, ft:	200.0-203.0
Test Confining Pressure, psi:	**80**
Visual Description:	Moist, olive gray silty clay
Preparation:	Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content.

Modulus and Damping of Soils by Resonant-Column Method by ASTM D4015





Initial Diameter, in:	2.83
Initial Height, in:	5.99
Initial Mass, grams:	1130
Initial Moisture Content, %:	31.7
Initial Dry Density, pcf:	86.8
Initial Bulk Density, pcf:	114.3
Initial Degree of Saturation:	92.1
Initial Void Ratio:	0.92

Final Diameter, in:	2.79
Final Height, in:	5.85
Final Mass, grams:	1113
Final Moisture Content, %:	30.6
Final Dry Density, pcf:	91.3
Final Bulk Density, pcf:	119.3
Final Degree of Saturation:	99.5
Final Void Ratio:	0.82

Notes: Moisture content obtained from sample trimmings
Isotropic stress conditions

Client:	F&ME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	10/18/16
Tested By:	njh
Checked By:	jdt
Boring ID:	SB-1
Sample ID:	UD4
Depth, ft:	200.0-203.0
Test Confining Pressure, psi:	**80**
Visual Description:	Moist, olive gray silty clay
Test Conditions:	Confining Stress of 80 psi over a range of strains from 0.000113 to 7.05% with a forced sinusoidal vibration.
Preparation:	Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content.

Modulus and Damping of Soils by Resonant-Column Method by ASTM D4015

Apparatus Used: Geocomp Corp. quasi-fixed/free boundry condition automated RCTS Test System

Active Mass, g:	2144.75	Torque Calibration Factor, N-m/V:	12.9
Passive Mass, g:	1053.2	Accelerometer Calibration Factor, rad/s^2/V:	3293
Active Inertia, kg-m^2:	1.66E-03		
Passive Inertia, kg-m^2:	0.0012425		

Elapsed Time	Excitation	Frequency	Axial Strain	Volumetric Strain	* Pore Pressure	Effective Confining Stress	Average Strain Amplitude	Shear Modulus, G	Damping Ratio, D
min	%	Hz	%	%	psi	psi	%	psi	%
0.73	0.243	214	5.58E-02	0.056	---	80	1.13E-04	3.20E+04	0.56
0.93	0.611	215	5.58E-02	0.056	---	80	1.93E-04	3.23E+04	0.80
1.04	0.966	215	5.58E-02	0.056	---	80	3.40E-04	3.22E+04	0.93
1.14	1.532	215	5.58E-02	0.056	---	80	6.06E-04	3.21E+04	1.00
1.24	2.428	215	5.58E-02	0.056	---	80	9.19E-04	3.21E+04	1.02
1.35	3.847	214	5.58E-02	0.056	---	80	1.48E-03	3.19E+04	1.04
1.45	6.100	213	5.58E-02	0.056	---	80	2.48E-03	3.16E+04	1.10
1.55	9.672	212	5.58E-02	0.056	---	80	4.09E-03	3.10E+04	1.28
1.66	15.338	209	5.58E-02	0.056	---	80	6.64E-03	3.01E+04	1.54
1.76	24.337	205	5.58E-02	0.056	---	80	1.10E-02	2.87E+04	1.95
1.97	38.749	194	5.58E-02	0.056	---	80	2.17E-02	2.55E+04	3.00
2.28	61.840	177	5.58E-02	0.056	---	80	4.64E-02	2.09E+04	4.29
2.69	98.957	146	5.58E-02	0.056	---	80	1.23E-01	1.38E+04	7.05

The Shear Wave Velocity can be determined by the following equation:

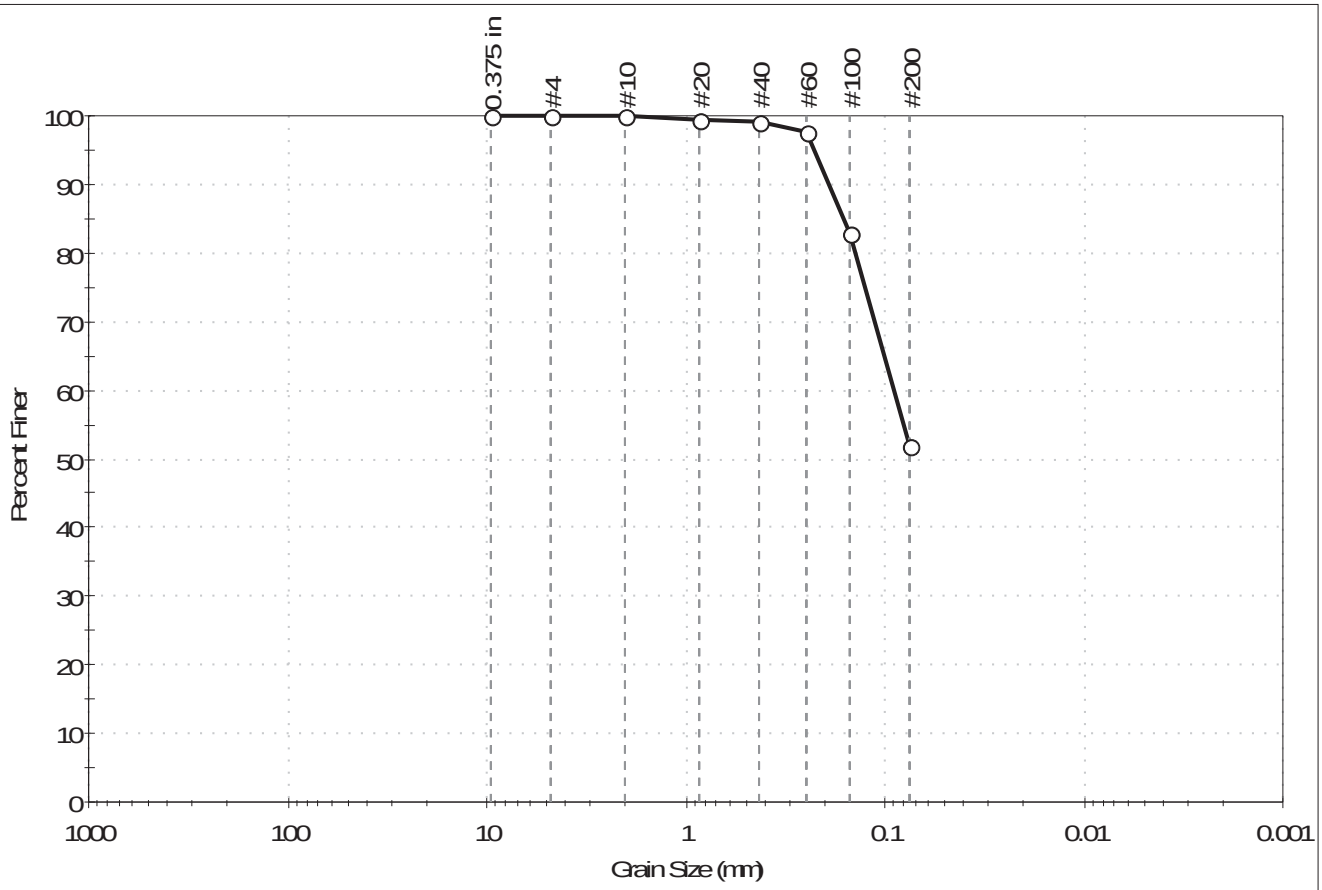
Vs = sqrt(G*g/bulk density)

where: Vs = shear wave velocity
G = shear modulus
g = acceleration due to gravity, 9.81 m/sec^2
final bulk density

* Test is run with drainage valve open, but speed of test is such that excess pore pressure could develop, at higher shear strains within specimen.

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	SB-1	Sample Type:	tube	Tested By:	GA
Sample ID:	UD-4	Test Date:	11/04/16	Checked By:	mcm
Depth :	200.0-203.0 ft	Test Id:	397425		
Test Comment:	---				
Visual Description:	Moist, olive sandy silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



%Cobble	%Gravel	%Sand	%Silt & Clay Size
—	0.1	47.8	52.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	98		
#100	0.15	83		
#200	0.075	52		

Coefficients

D_{85} = 0.1611 mm D_{30} = N/A

D_{60} = 0.0896 mm D_{15} = N/A

D_{50} = N/A D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM Sandy Silt (ML)

AASHTO Clayey Soils (A-7-6 (6))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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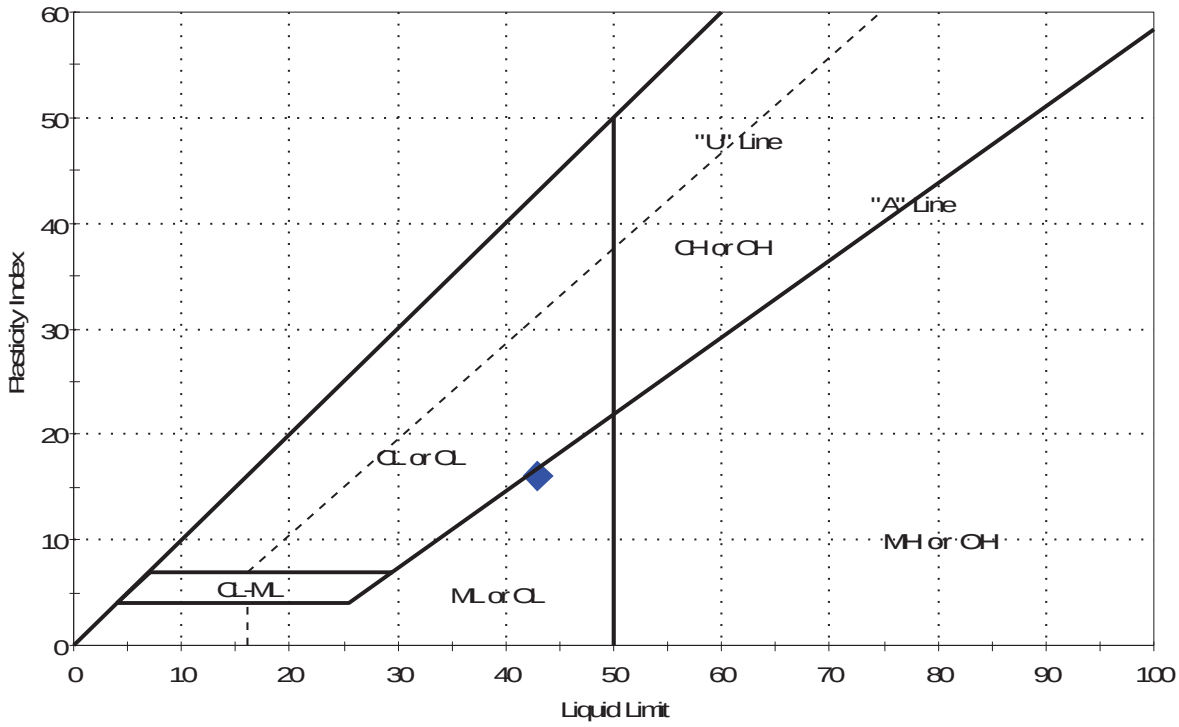
Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	SB-1	Sample Type:	tube	Tested By:	GA
Sample ID:	UD-4	Test Date:	11/04/16	Checked By:	mcm
Depth :	200.0-203.0 ft	Test Id:	397423		
Test Comment:	---				
Visual Description:	Moist, olive sandy silt				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UD-4	SB-1	00.0-203. ft	32	43	27	16	0.3	Sandy Silt (ML)

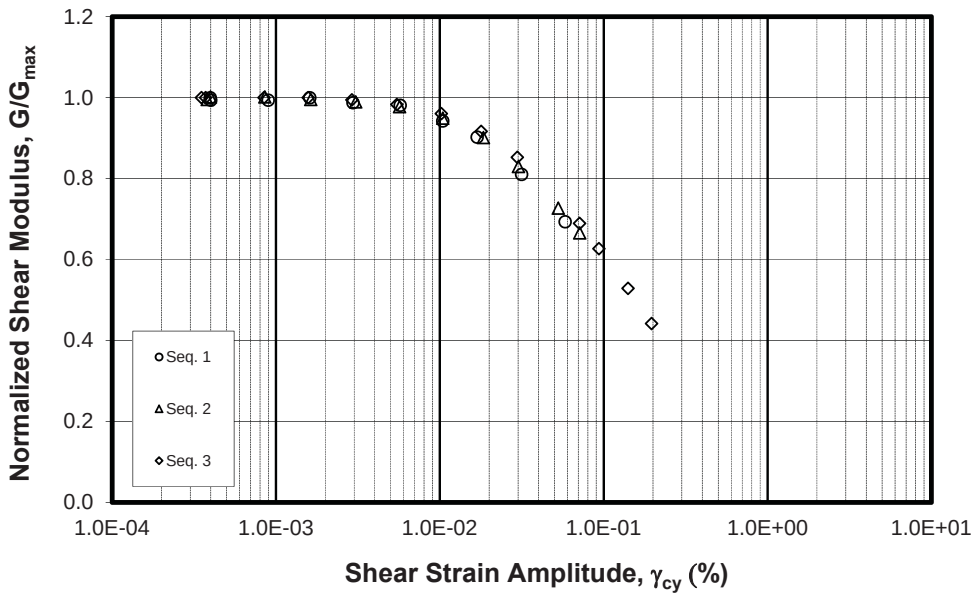
Sample Prepared using the WET method

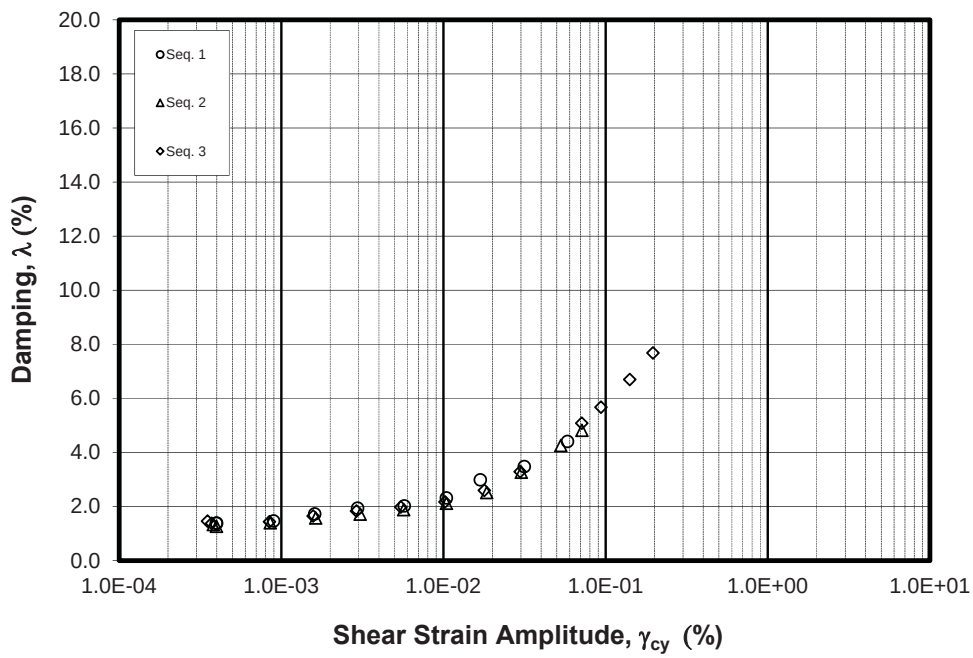
1% Retained on #40 Sieve

Dry Strength: HIGH

Dilatancy: SLOW

Toughness: LOW



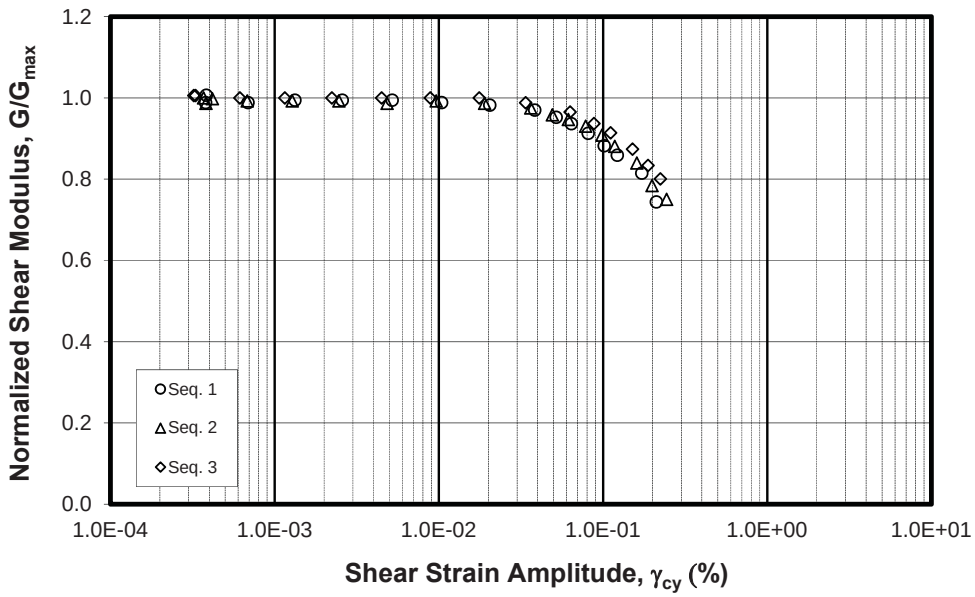


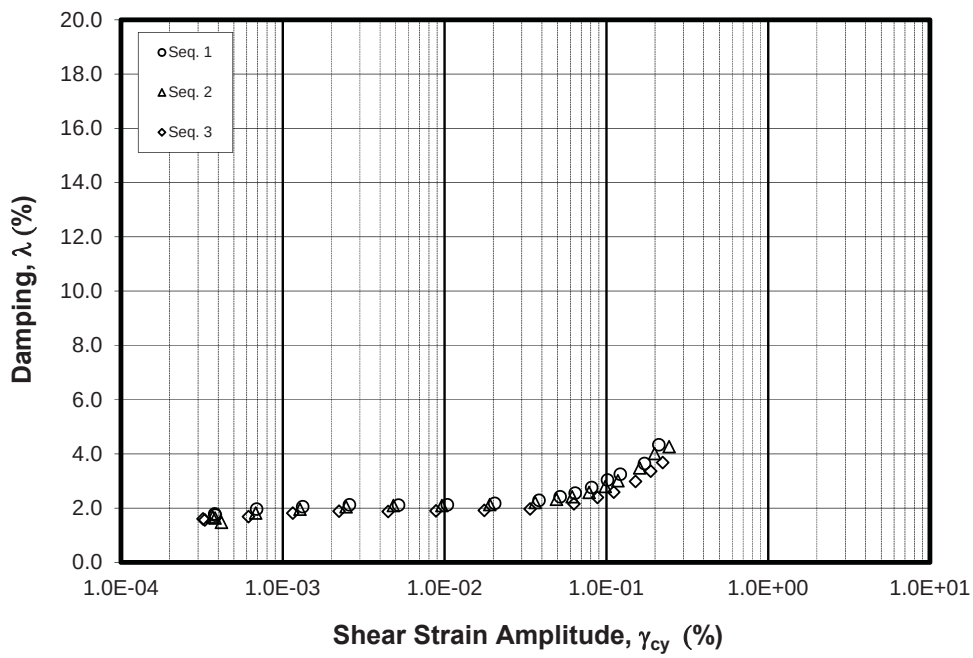
RESONANT COLUMN TEST

Three Stages of Isotropic Consolidation - OCR = 1

Sample: UD-6a Depth: 257.85 ft

Boring SB-1



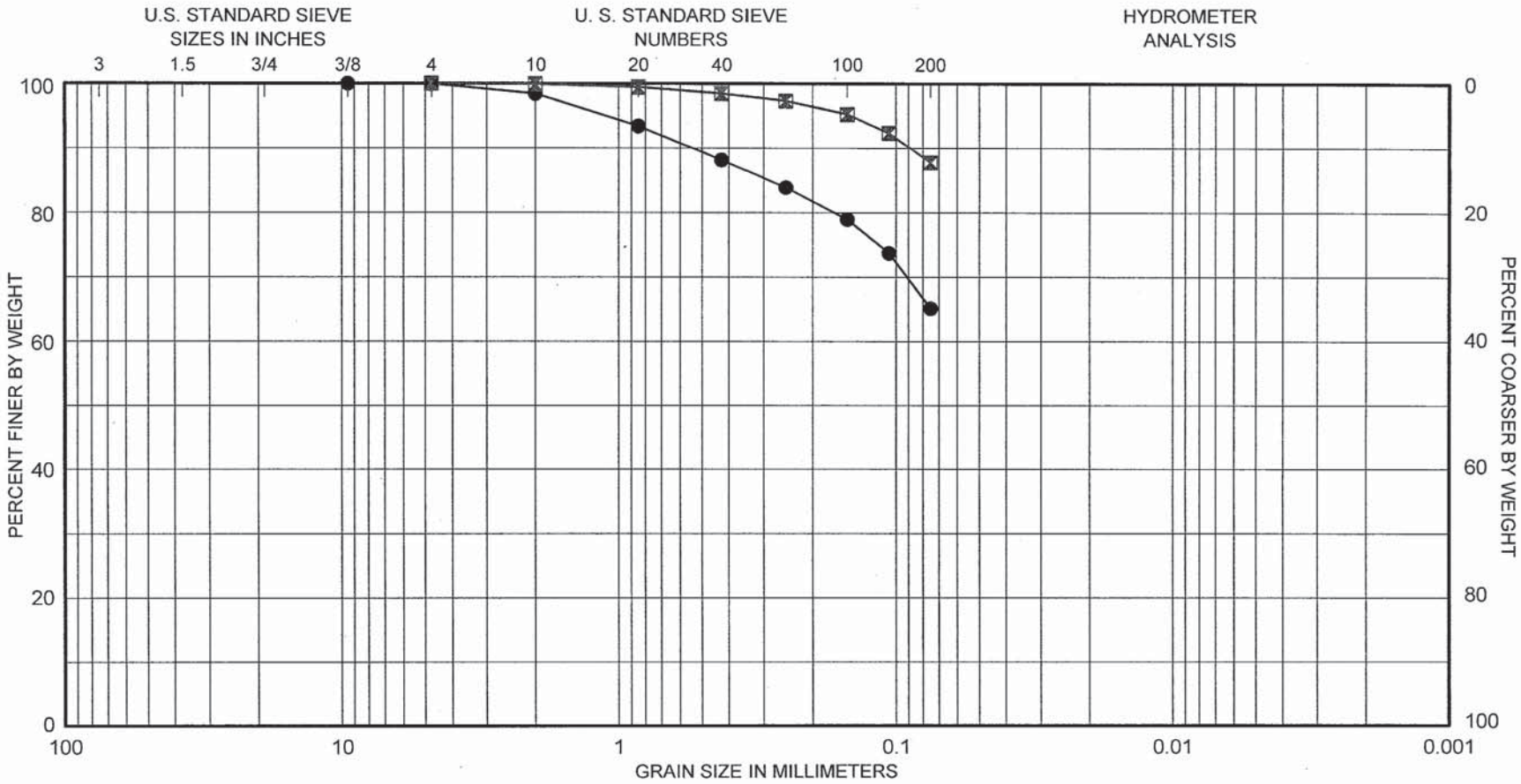


RESONANT COLUMN TEST

Three Stages of Isotropic Consolidation - OCR = 1

Sample: UD-9a Depth: 380.55 ft

Boring SB-1



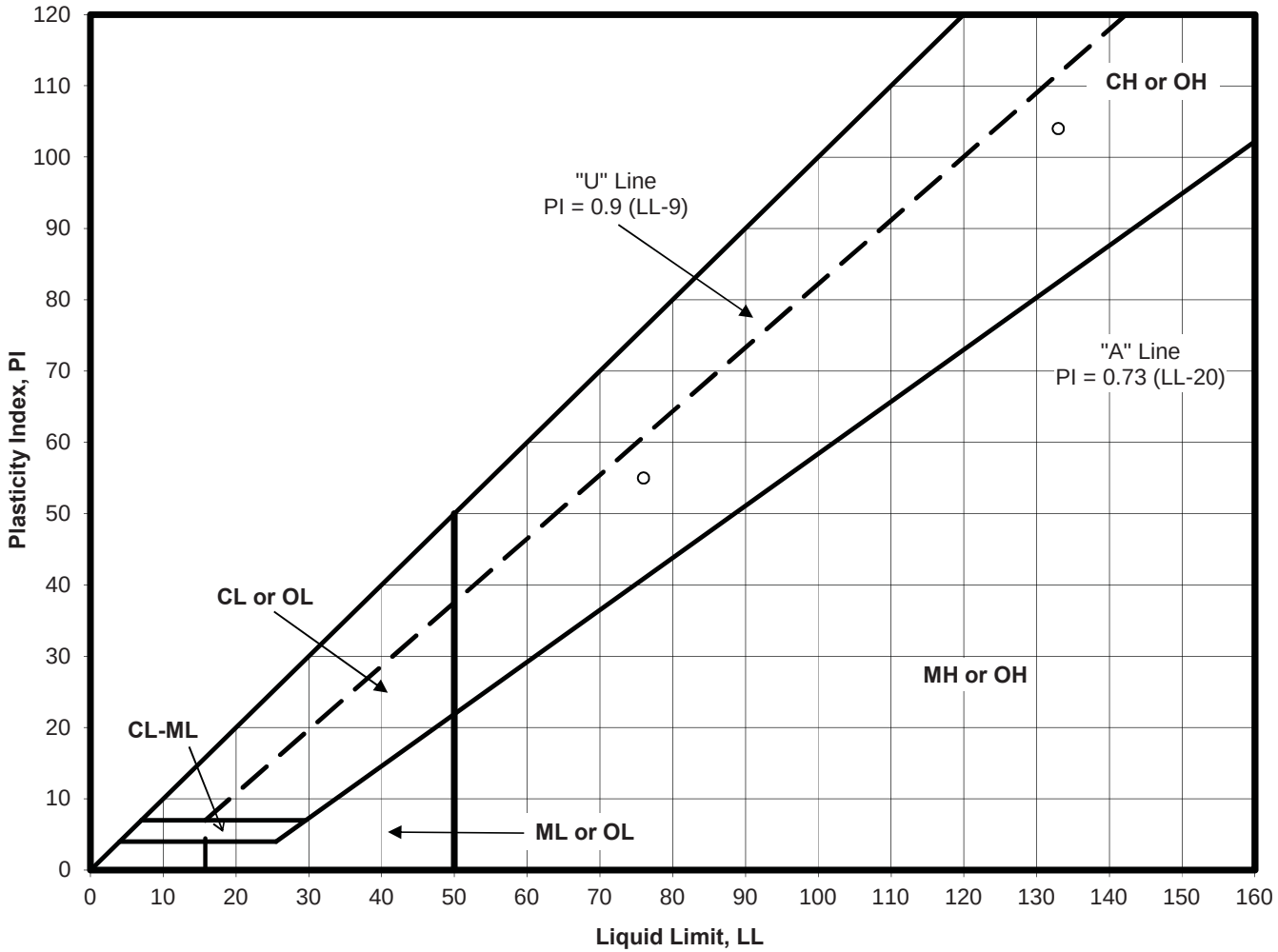
GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

SYMBOL	BORING	DEPTH, FT	C_c	C_u	D_{50}	D_{90}	CLASSIFICATION
●	SB-1_UD-6a	257.85				0.54	Sandy Clay, greenish gray
⊠	SB-1_UD-9a	380.55				0.09	Clay, olive gray and greenish gray, with san pockets and carbonate nodules
✳							
⊗							

GRAIN SIZE CURVE

Report No. 04.11160019

PLATE 1



PLASTICITY CHART
Project No. 04.11160019

Sample	LL	PL	PI
SB-1_UD-6a	76	21	55
SB-1_UD-9a	133	29	104

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	---	Sample Type:	---	Tested By:	jbr
Sample ID:	---	Test Date:	08/30/16	Checked By:	mcm
Depth :	---	Test Id:	387124		

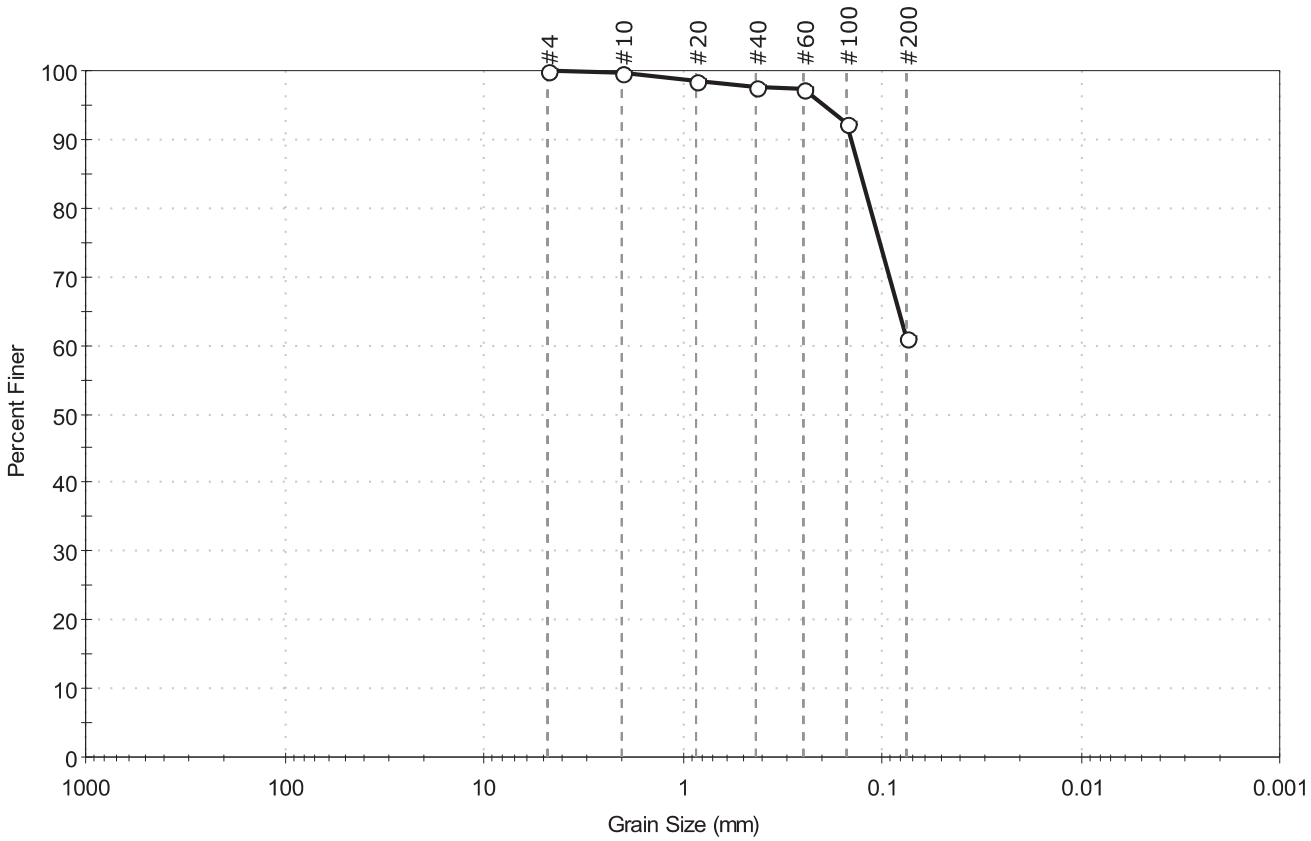
Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
AP-1	UD-1	16.0-18.0 ft	Moist, olive sandy clay	63.0

Notes: Temperature of Drying : 110º Celsius

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	AP-1	Sample Type:	tube	Tested By:	jbr
Sample ID:	UD-1	Test Date:	08/26/16	Checked By:	mcm
Depth :	16.0-18.0 ft	Test Id:	387101		
Test Comment:	---				
Visual Description:	Moist, olive sandy clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	39.0	61.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	98		
#60	0.25	97		
#100	0.15	92		
#200	0.075	61		

Coefficients

D_{85} = 0.1278 mm	D_{30} = N/A
D_{60} = N/A	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Sandy Fat clay (CH)

AASHTO Clayey Soils (A-7-6 (24))

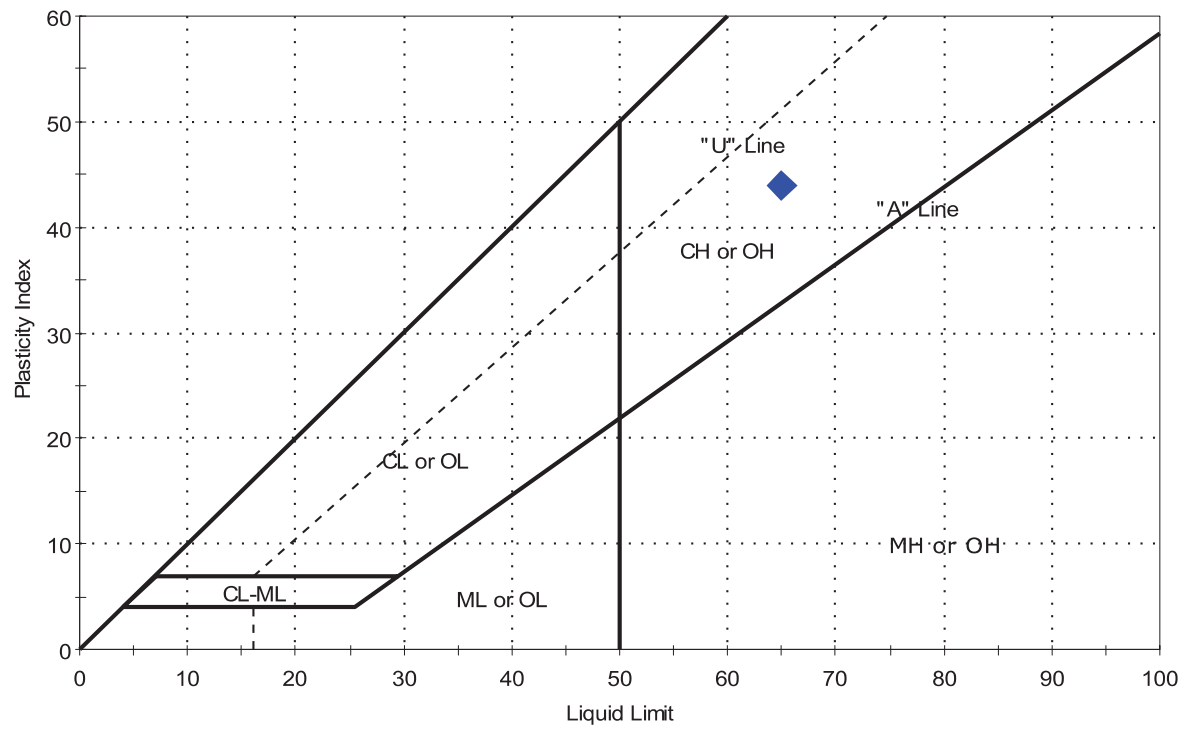
Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	AP-1	Sample Type:	tube	Tested By:	GA
Sample ID:	UD-1	Test Date:	08/31/16	Checked By:	mcm
Depth :	16.0-18.0 ft	Test Id:	387109		
Test Comment:	---				
Visual Description:	Moist, olive sandy clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UD-1	AP-1	16.0-18.0 ft	63	65	21	44	1	Sandy Fat clay (CH)

Sample Prepared using the WET method

2% Retained on #40 Sieve

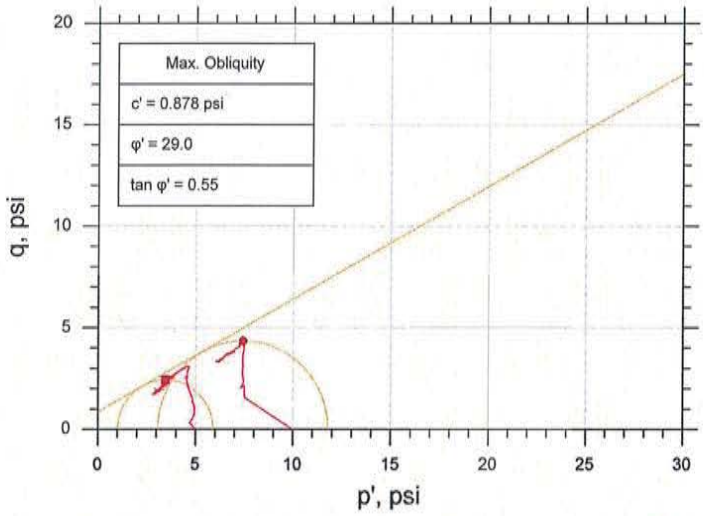
Dry Strength: VERY HIGH

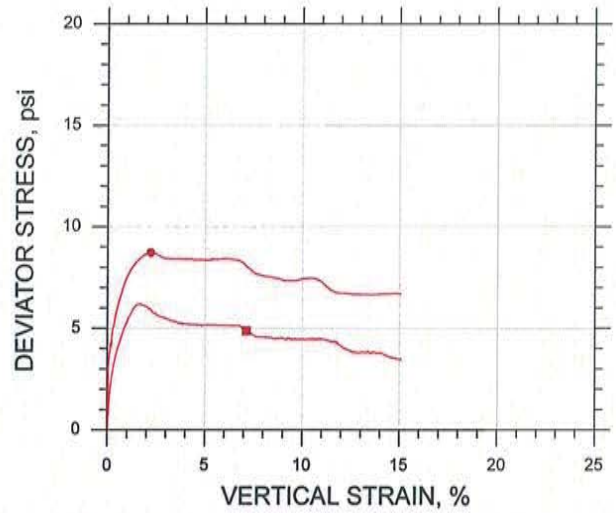
Dilatancy: NONE

Toughness: MEDIUM

Client: F&ME Consultants	
Project Name: US 21 Replacement Bridge	
Project Location: ---	
Project Number: GTX-305005	
Tested By: md	Checked By: mcm
Boring ID: AP-1	
Preparation: intact	
Description: Moist, gray clay with sand	
Classification: Fat clay	
Group Symbol: CH	
Liquid Limit: ---	Plastic Limit: ---
Plasticity Index: ---	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





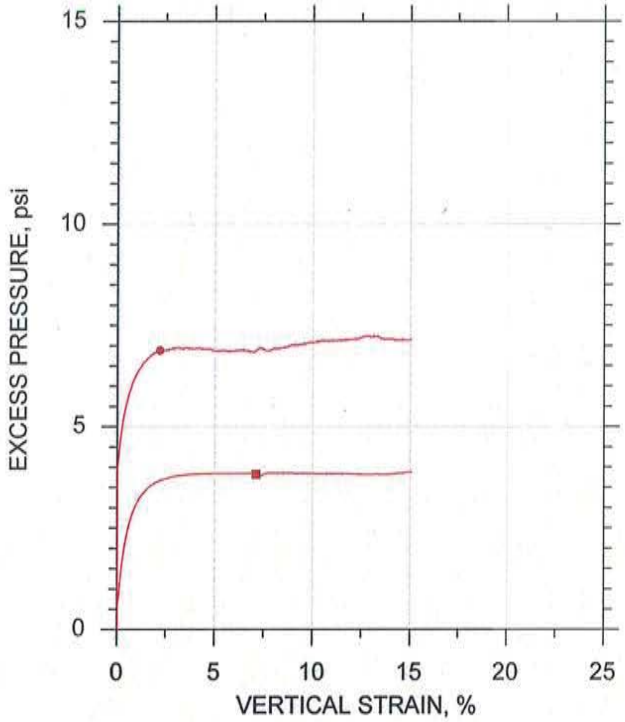
Symbol		■	●		
Sample ID		ST-1	ST-1		
Depth, ft		16.0-18.0 ft	16.0-18.0 ft		
Test Number		CU-5-1	CU-5-2		
Initial	Height, in	4.680	4.500		
	Diameter, in	2.020	2.030		
	Moisture Content (from Cuttings), %	50.2	60.1		
	Dry Density, pcf	66.5	63.3		
	Saturation (Wet Method), %	88.4	97.5		
	Void Ratio	1.53	1.66		
Before Shear	Moisture Content, %	51.2	59.6		
	Dry Density, pcf	70.7	64.6		
	Cross-sectional Area (Method A), in²	3.034	3.180		
	Saturation, %	100.0	100.0		
	Void Ratio	1.38	1.61		
	Back Pressure, psi	51.00	160.8		
Vertical Effective Consolidation Stress, psi		4.947	9.959		
Horizontal Effective Consolidation Stress, psi		4.994	9.982		
Vertical Strain after Consolidation, %		0.5866	0.3451		
Volumetric Strain after Consolidation, %		5.758	2.070		
Time to 50% Consolidation, min		262.4	18.06		
Shear Strength, psi		2.440	4.369		
Strain at Failure, %		7.12	2.18		
Strain Rate, %/min		0.01600	0.01600		
Deviator Stress at Failure, psi		4.880	8.738		
Effective Minor Principal Stress at Failure, psi		1.007	3.054		
Effective Major Principal Stress at Failure, psi		5.887	11.79		
B-Value		0.96	0.95		

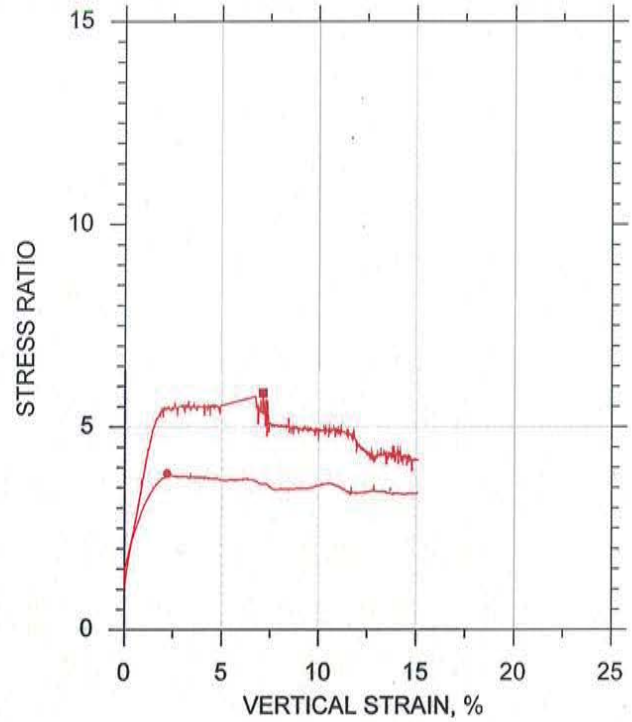
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

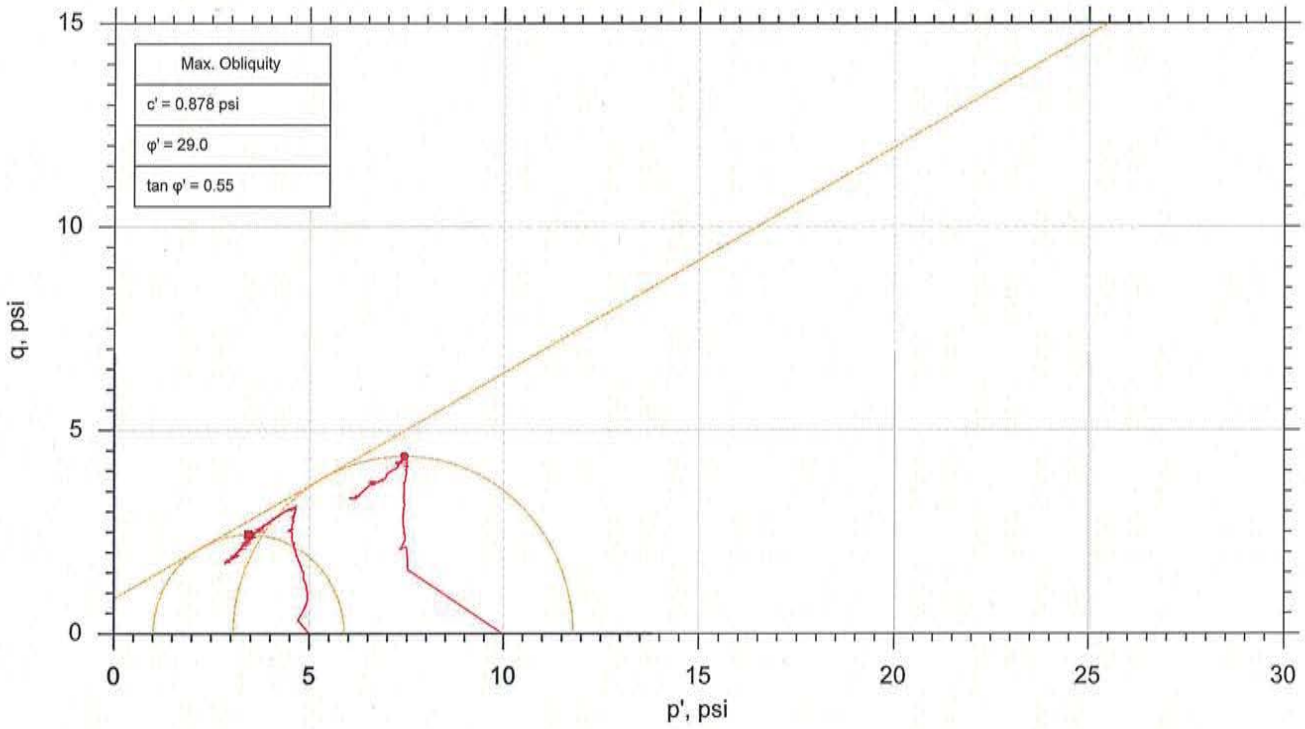
Remarks:

System B

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







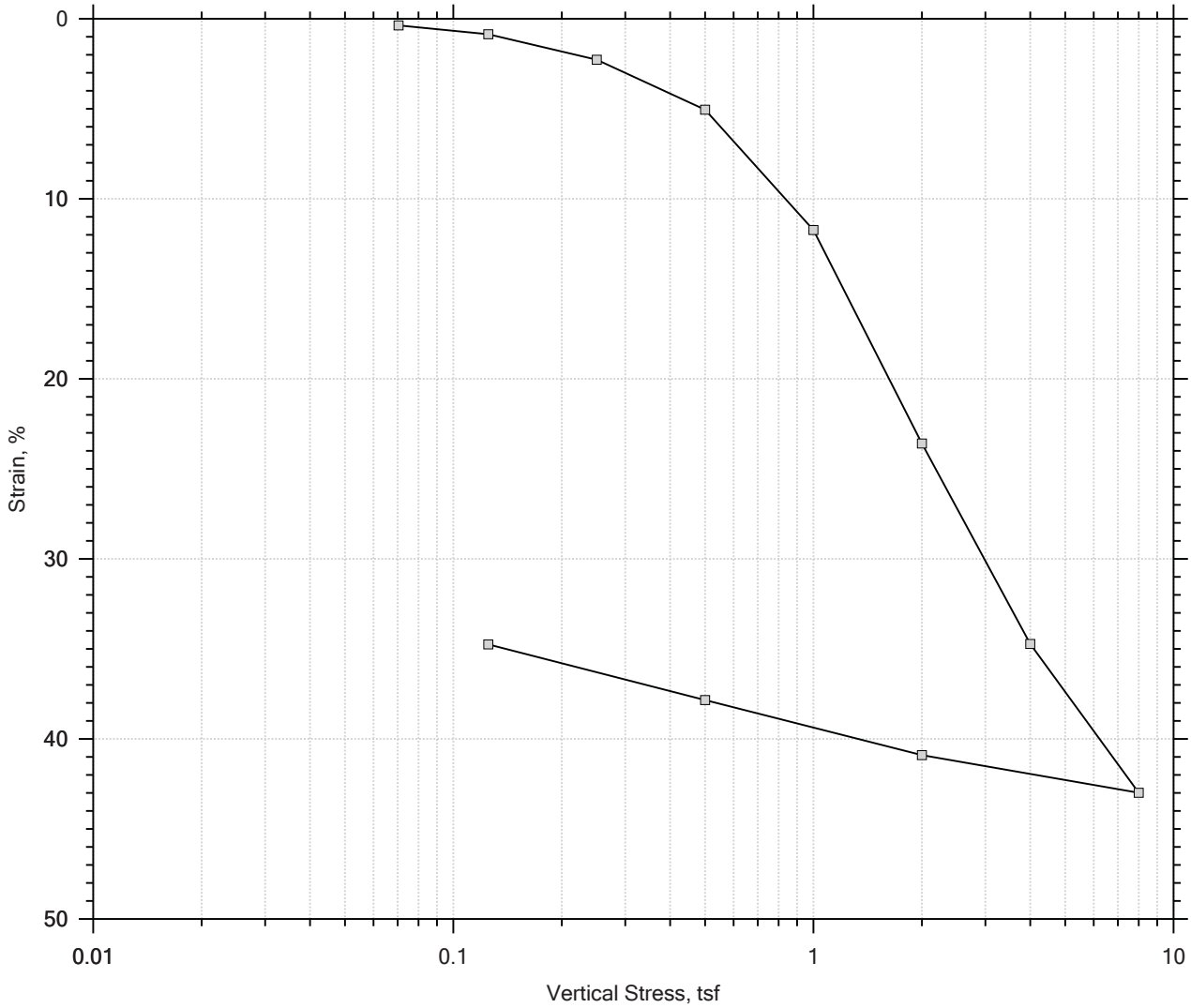
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	ST-1	CU-5-1	16.0-18.0 ft	md	8/24/16	mcm	9/7/16	305005-CU-5-1m.dat
●	ST-1	CU-5-2	16.0-18.0 ft	md	8/24/16	mcm	9/7/16	305005-CU-5-2m.dat

GeoTesting EXPRESS

Project: US 21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Sample Type: intact	
Description: Moist, gray clay with sand		
Remarks: System B		

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report

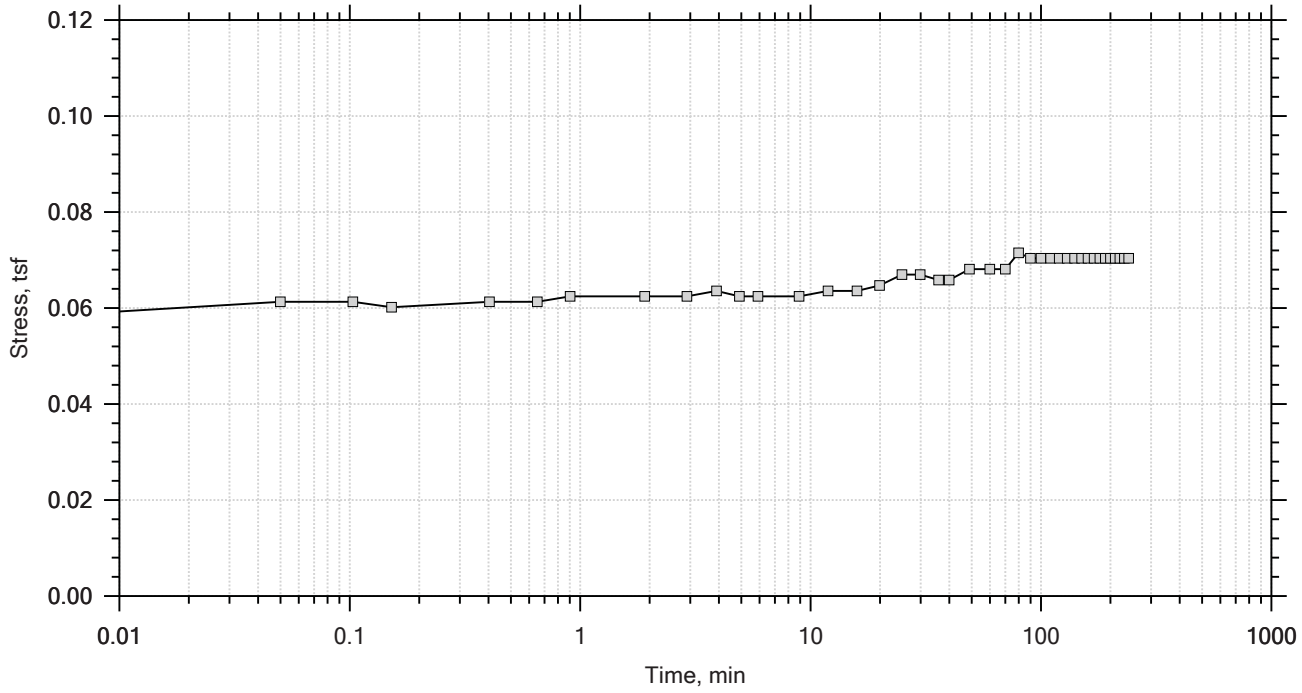


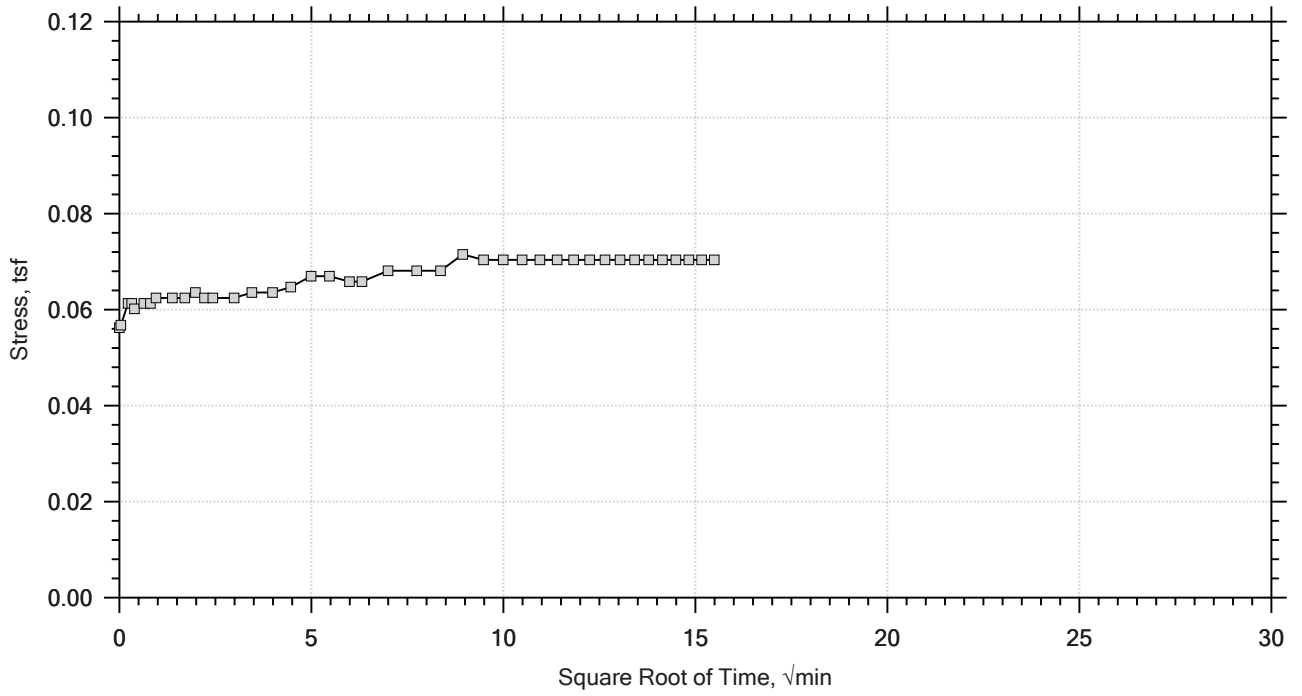
					Before Test	After Test
Current Vertical Effective Stress: ---				Water Content, %	85.59	49.46
Preconsolidation Stress: ---				Dry Unit Weight, pcf	50.811	72.587
Compression Ratio: ---				Saturation, %	99.16	100.00
Diameter: 2.5 in		Height: 1 in		Void Ratio	2.36	1.35
LL: 65	PL: 21	PI: 44	GS: 2.74			

Project: SU-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/24/16	Depth: 16.0-18.0 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System V, Swell Pressure = 0.0704 tsf		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 11
Constant Volume Step
Stress: 0.0704 tsf

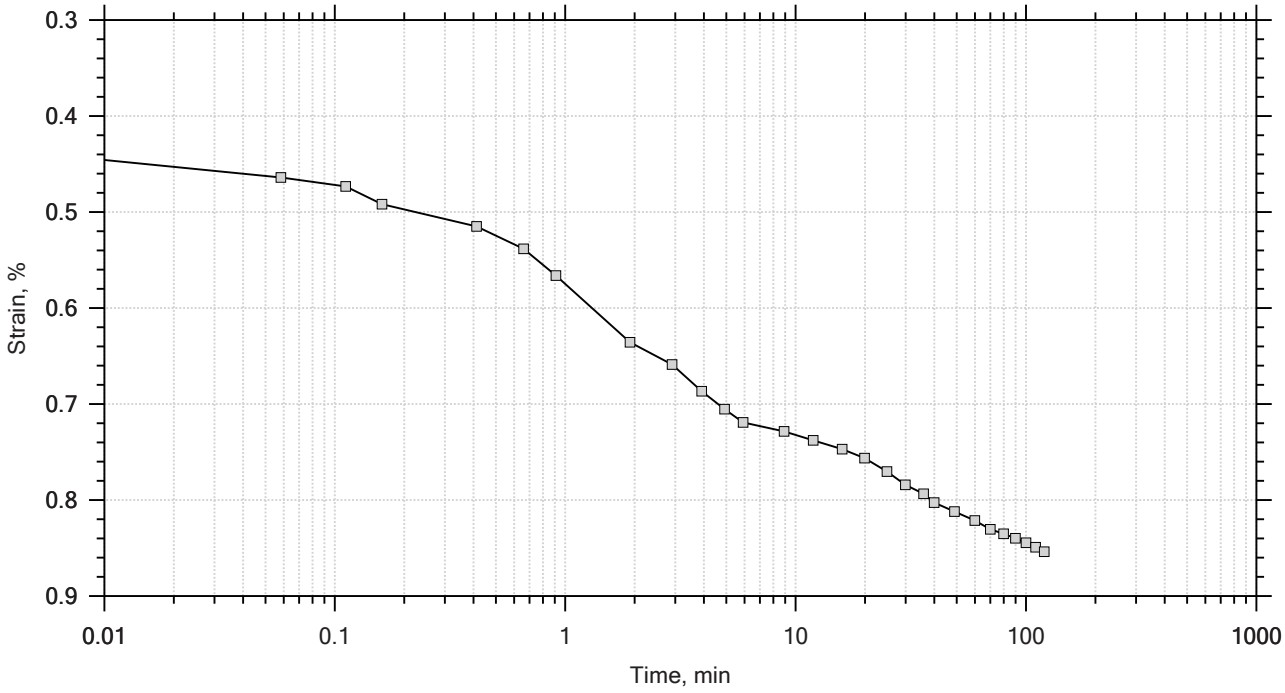


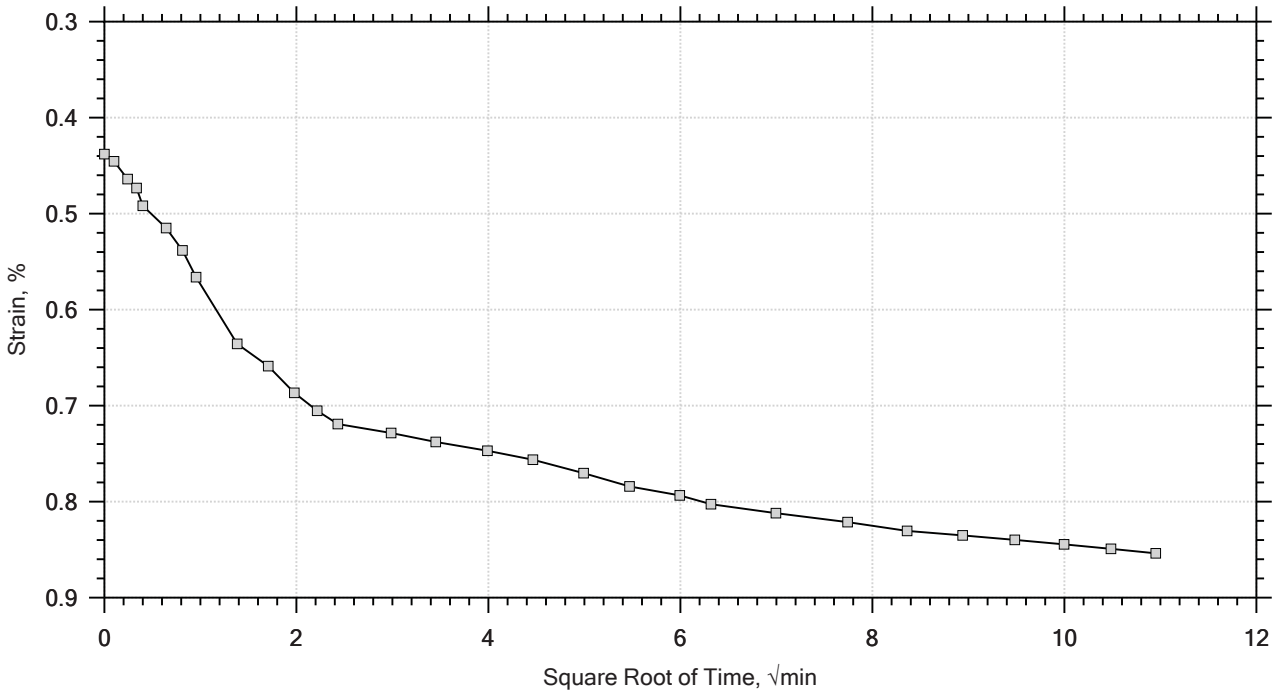


Project: SU-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/24/16	Depth: 16.0-18.0 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System V, Swell Pressure = 0.0704 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 11
Constant Load Step
Stress: 0.125 tsf

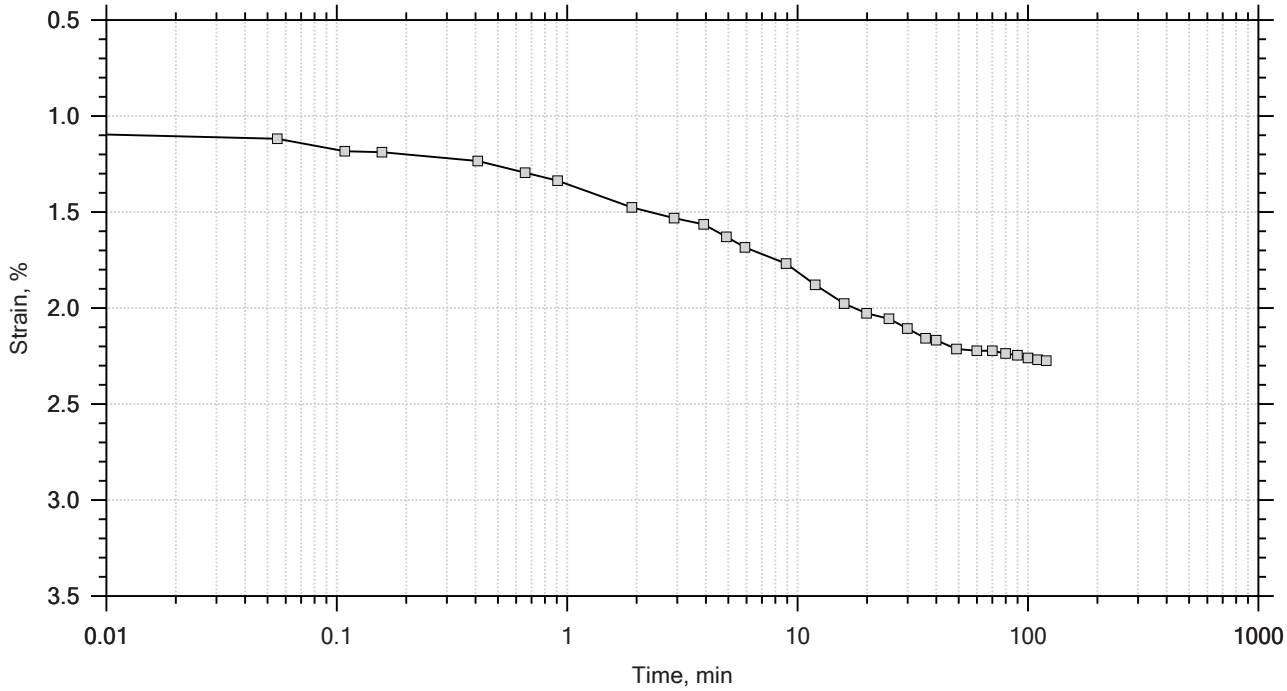


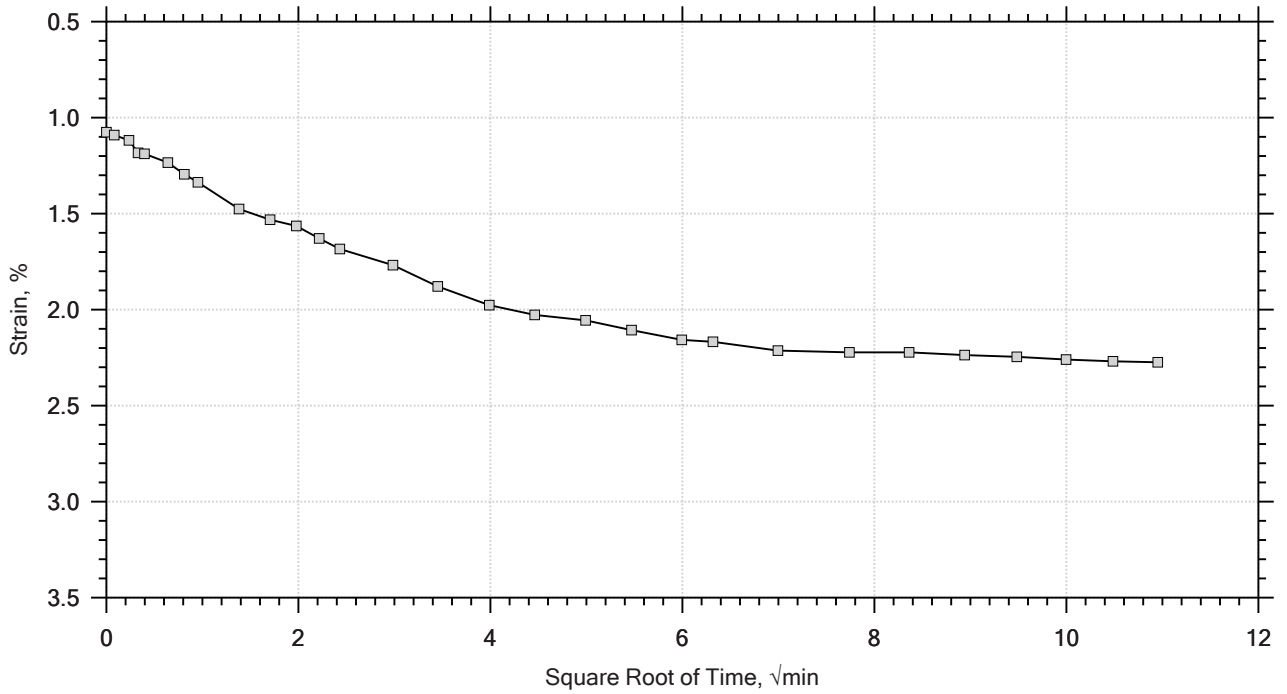


Project: SU-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/24/16	Depth: 16.0-18.0 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System V, Swell Pressure = 0.0704 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 11
Constant Load Step
Stress: 0.25 tsf

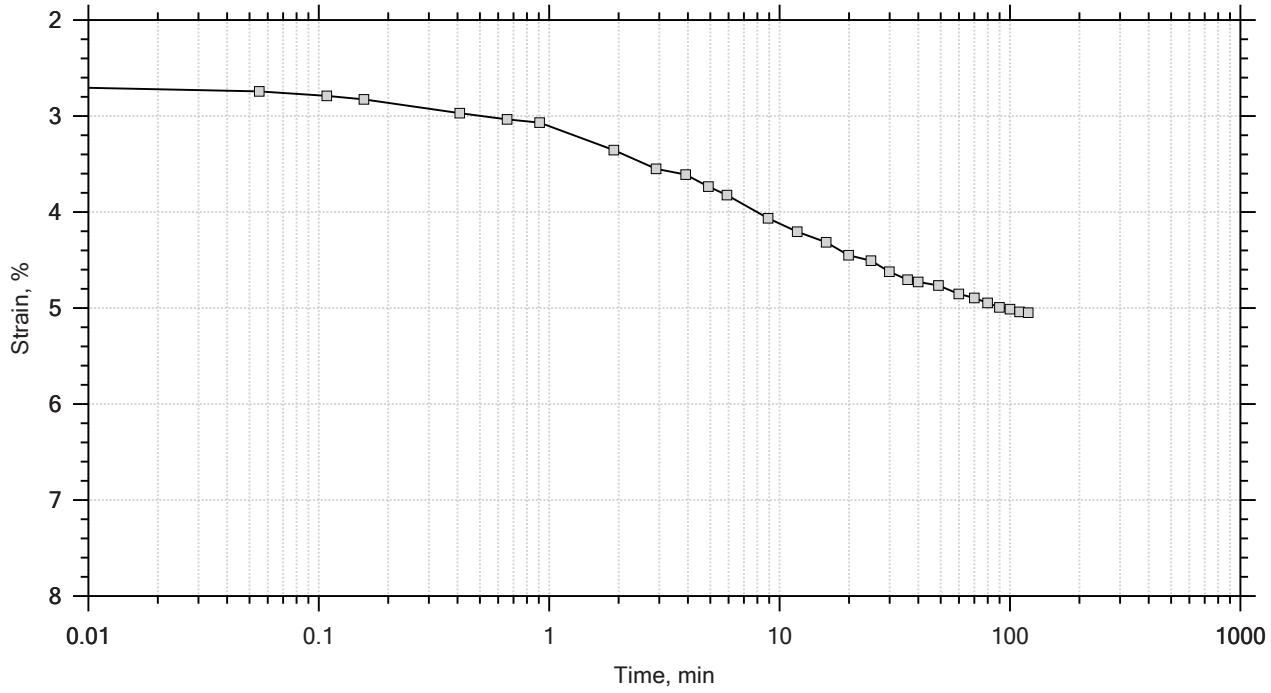


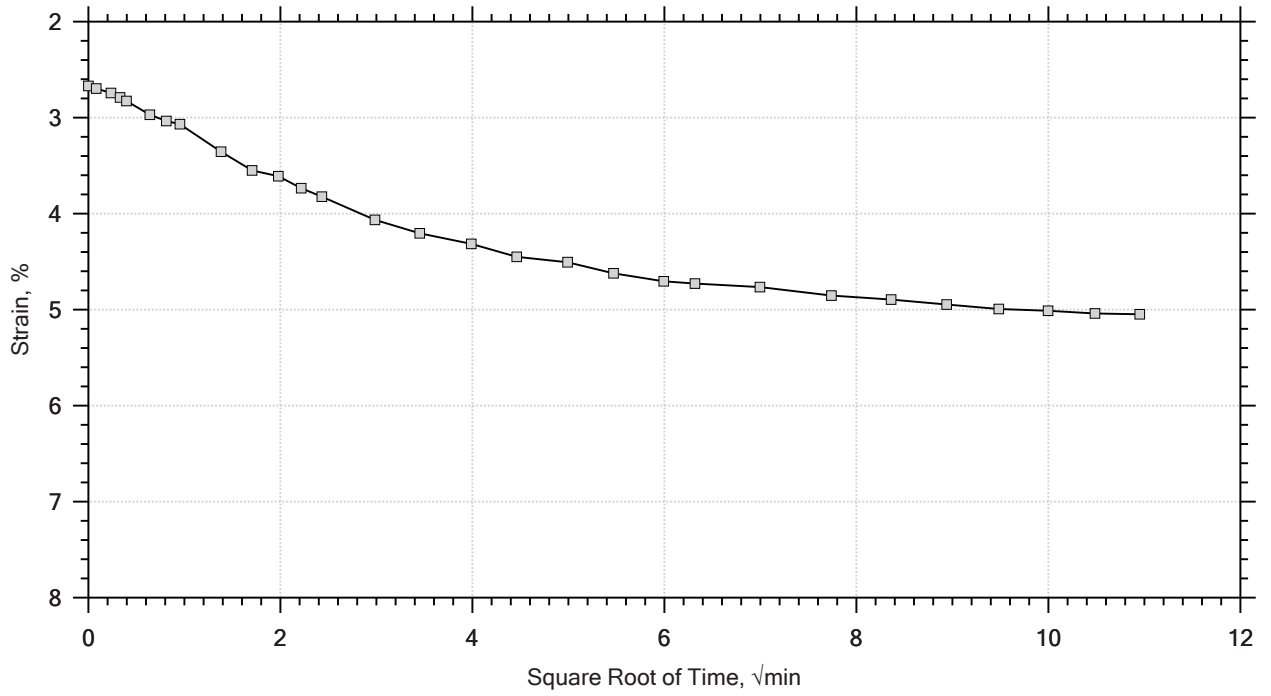


GeoTesting EXPRESS	Project: SU-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
	Boring No.: AP-1	Tested By: md	Checked By: mcm
	Sample No.: UD-1	Test Date: 08/24/16	Depth: 16.0-18.0 ft
	Test No.: IP-5	Sample Type: intact	Elevation: ---
	Description: Moist, olive sandy clay		
	Remarks: System V, Swell Pressure = 0.0704 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 11
Constant Load Step
Stress: 0.5 tsf

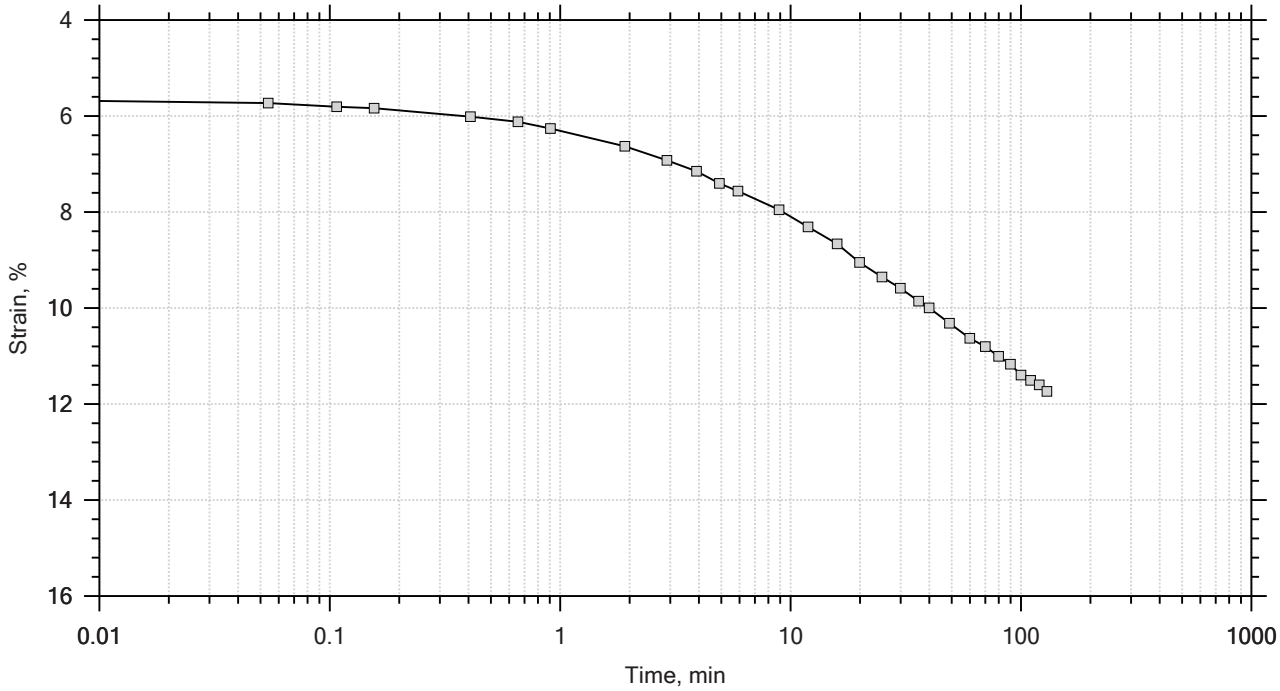


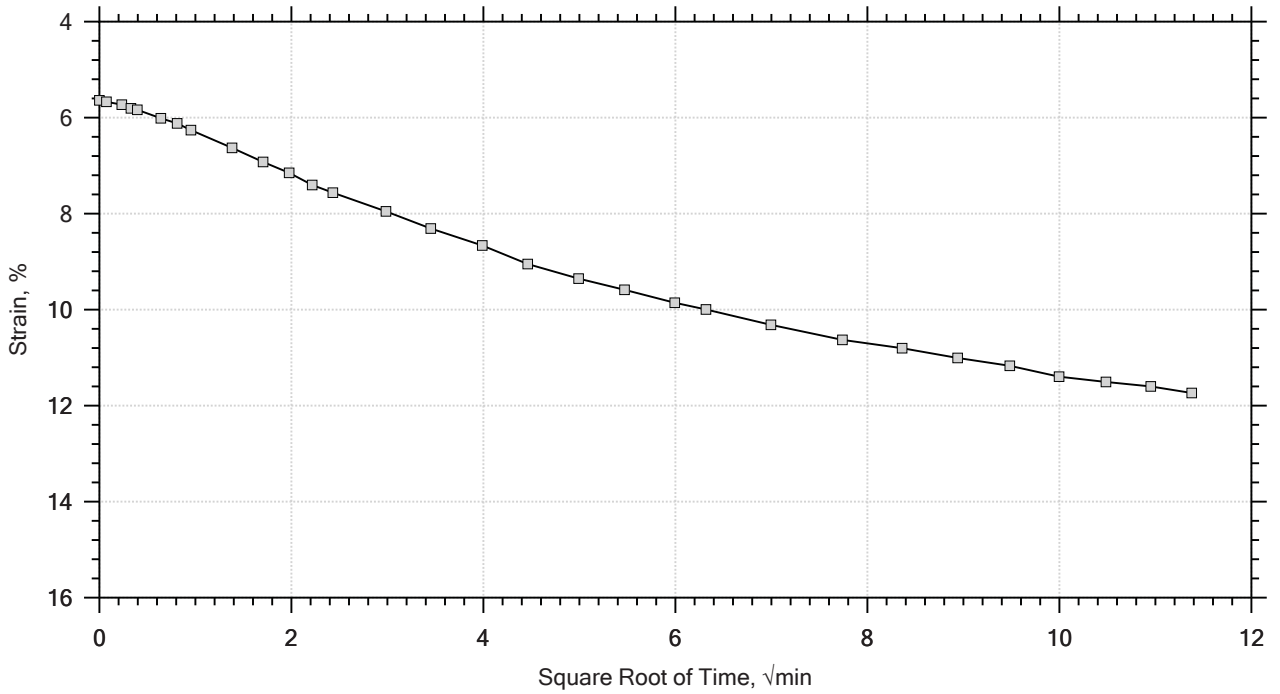


Project: SU-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/24/16	Depth: 16.0-18.0 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System V, Swell Pressure = 0.0704 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 11
Constant Load Step
Stress: 1 tsf

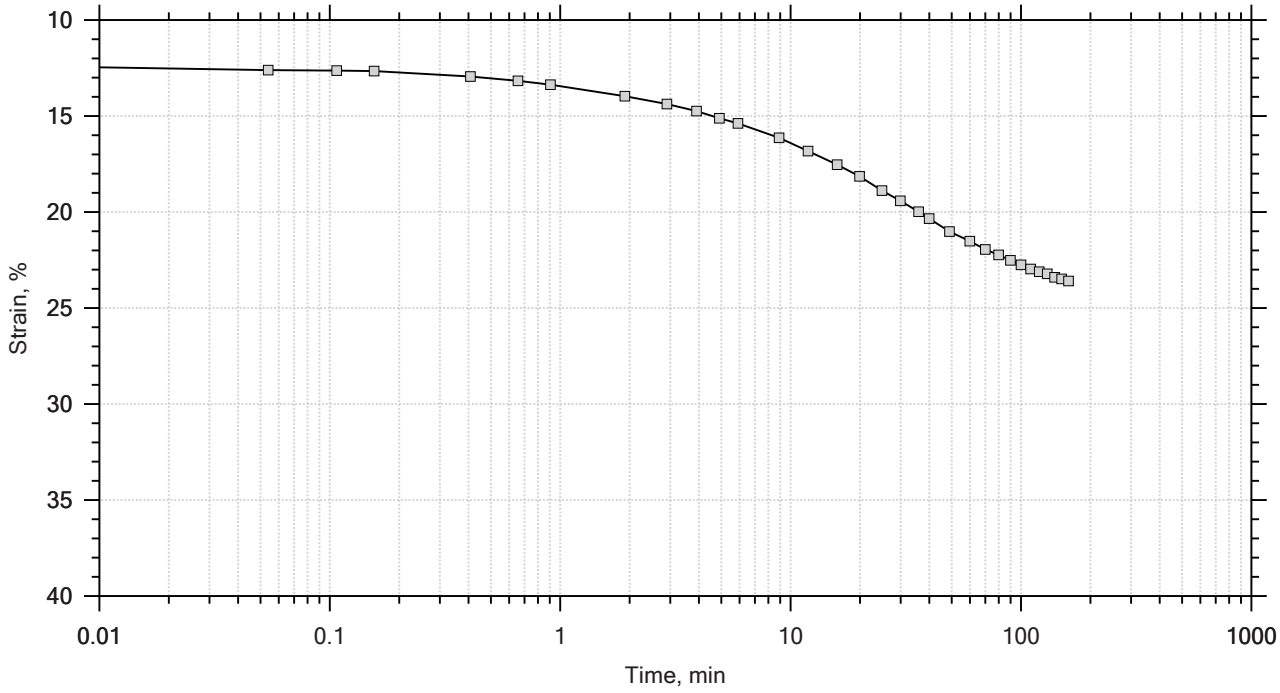


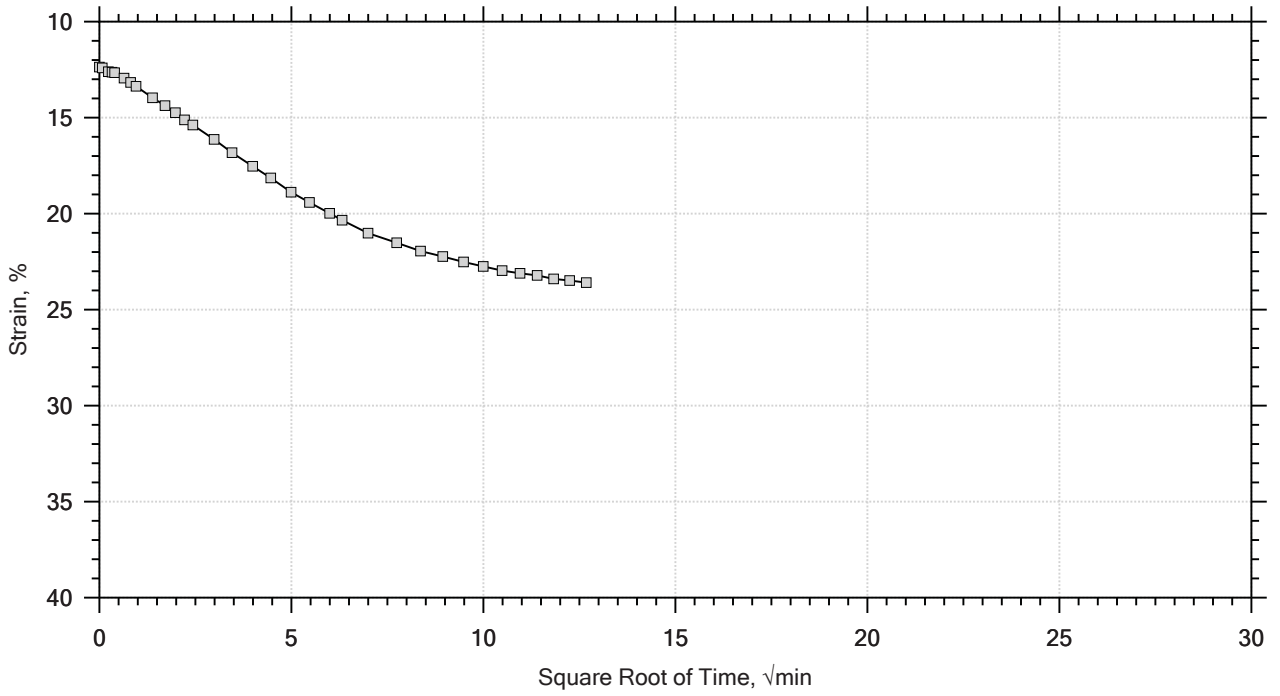


Project: SU-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/24/16	Depth: 16.0-18.0 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System V, Swell Pressure = 0.0704 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 11
Constant Load Step
Stress: 2 tsf

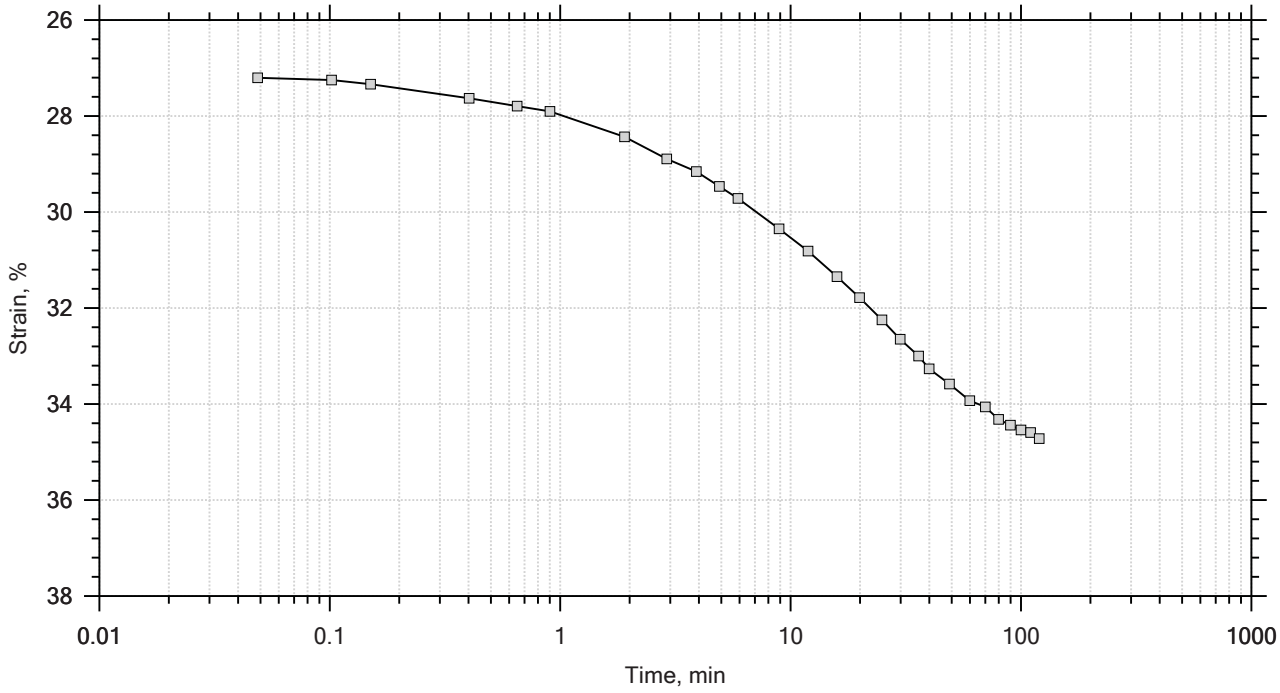


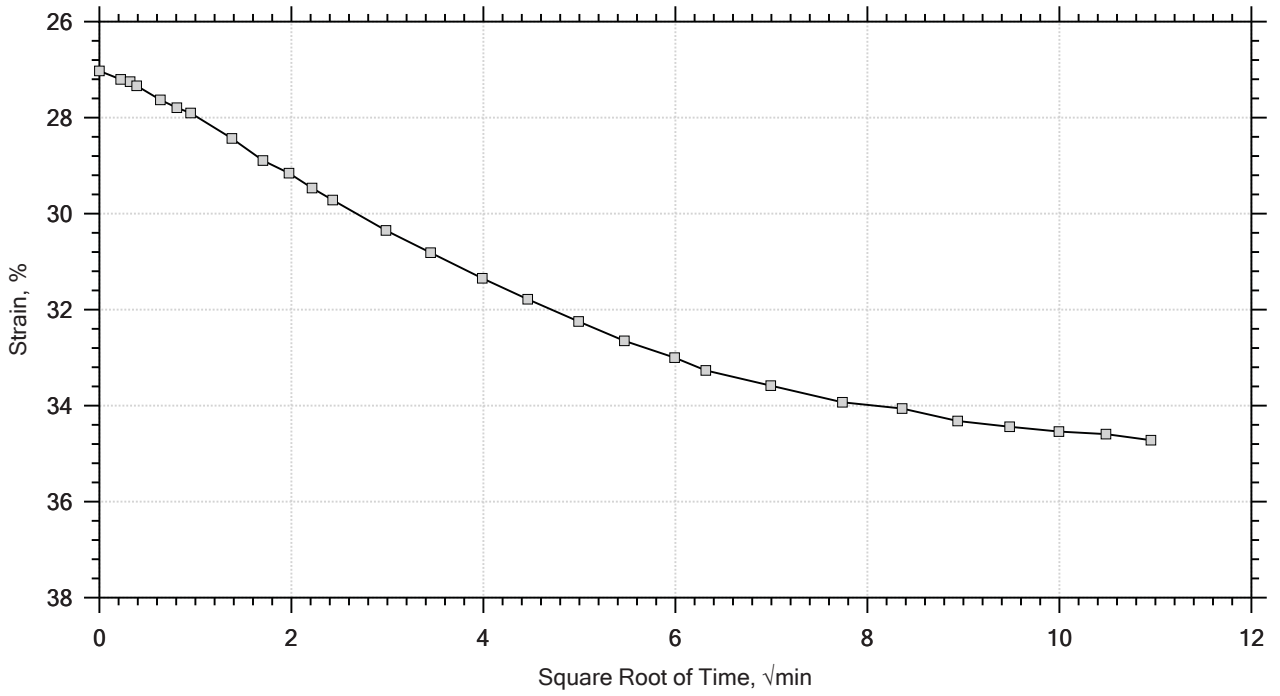


Project: SU-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/24/16	Depth: 16.0-18.0 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System V, Swell Pressure = 0.0704 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 11
Constant Load Step
Stress: 4 tsf

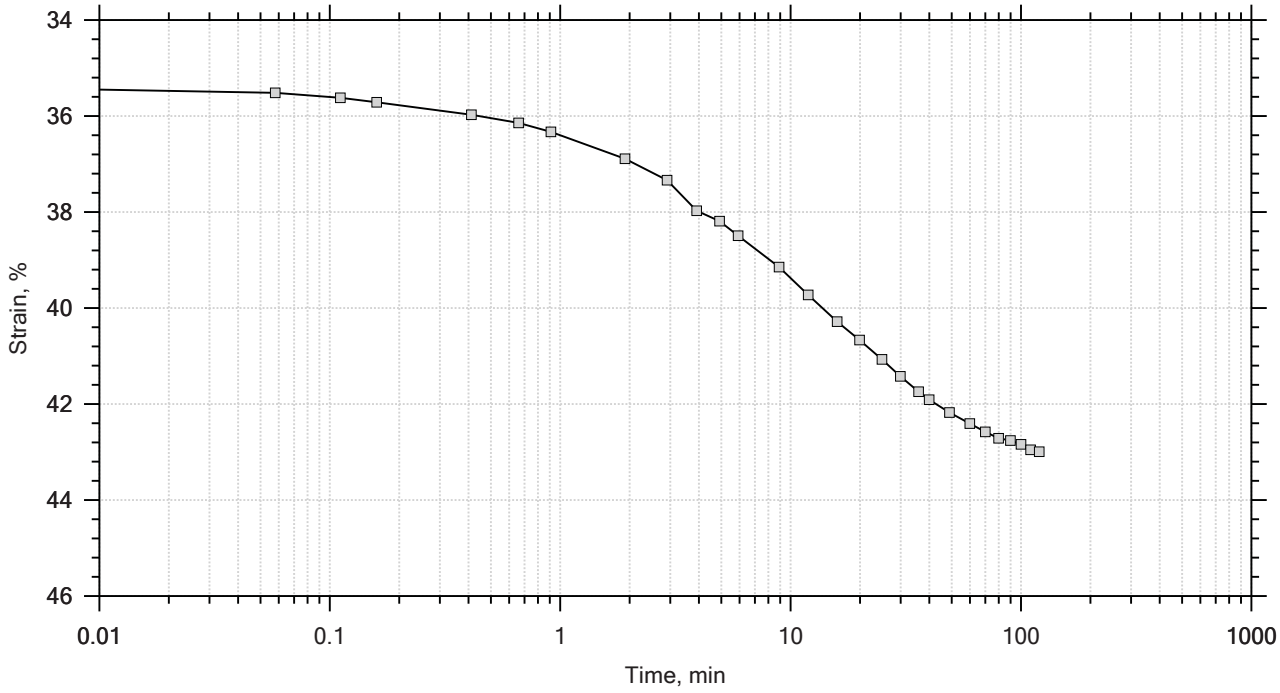


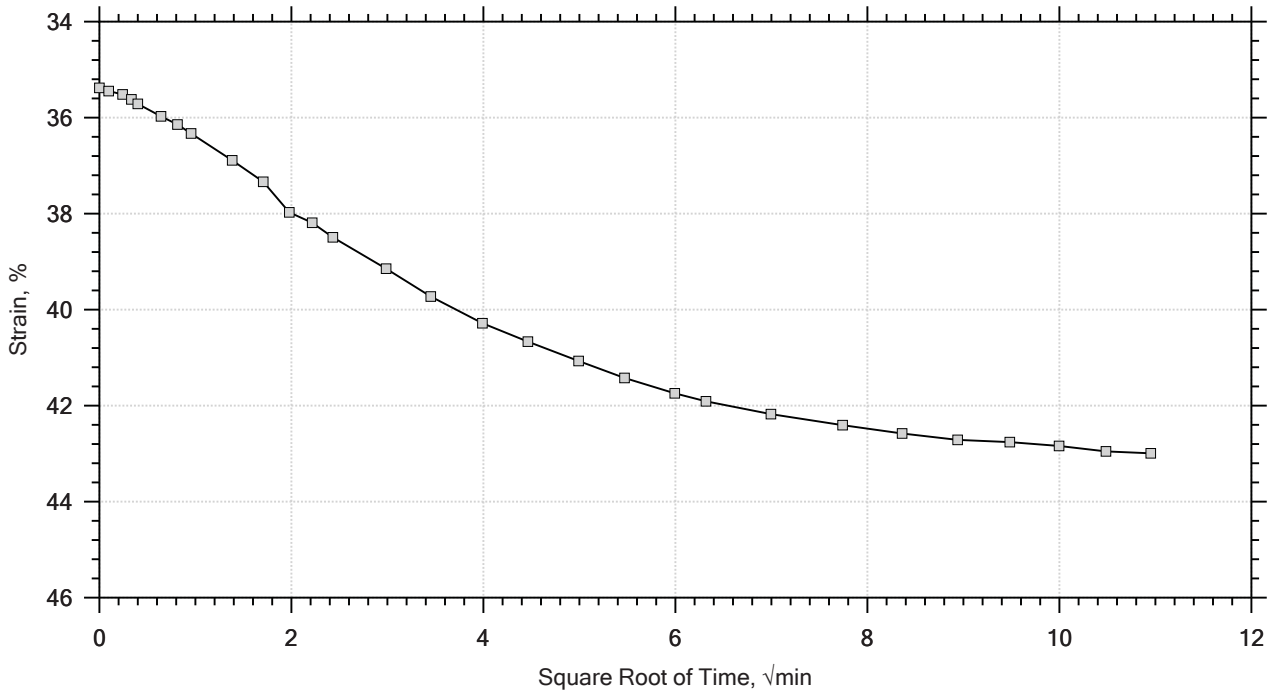


Project: SU-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/24/16	Depth: 16.0-18.0 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System V, Swell Pressure = 0.0704 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 11
Constant Load Step
Stress: 8 tsf

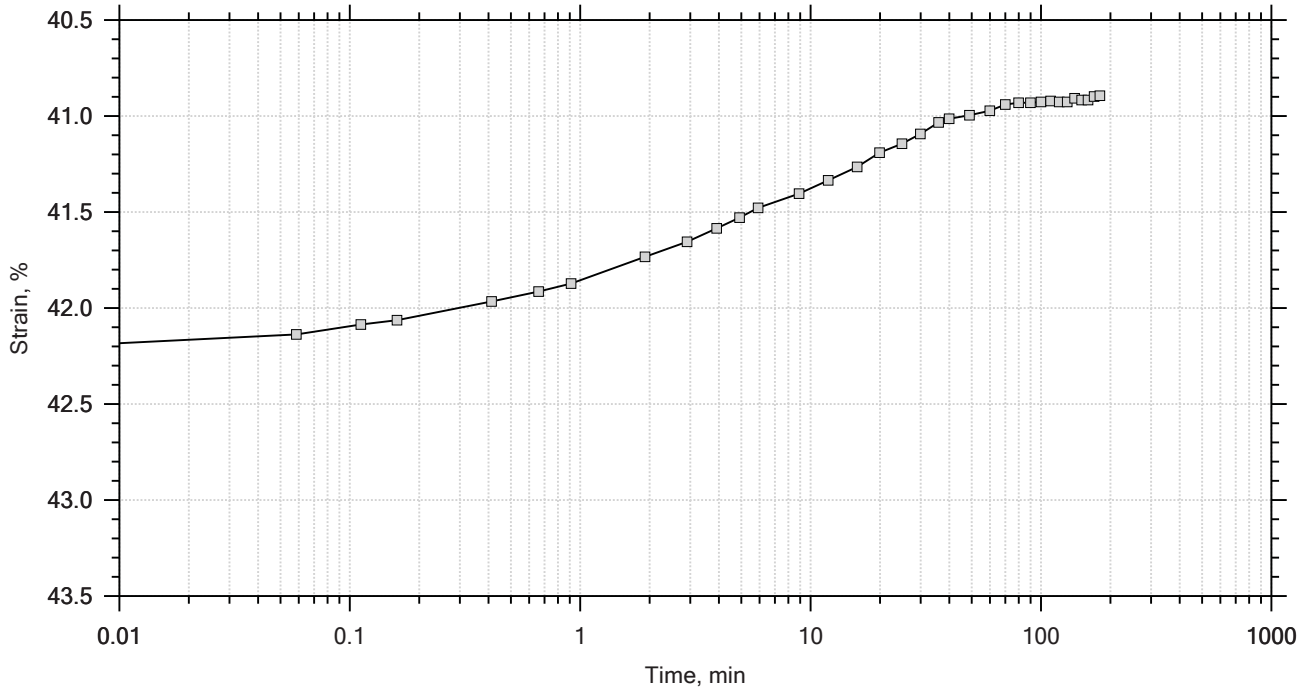


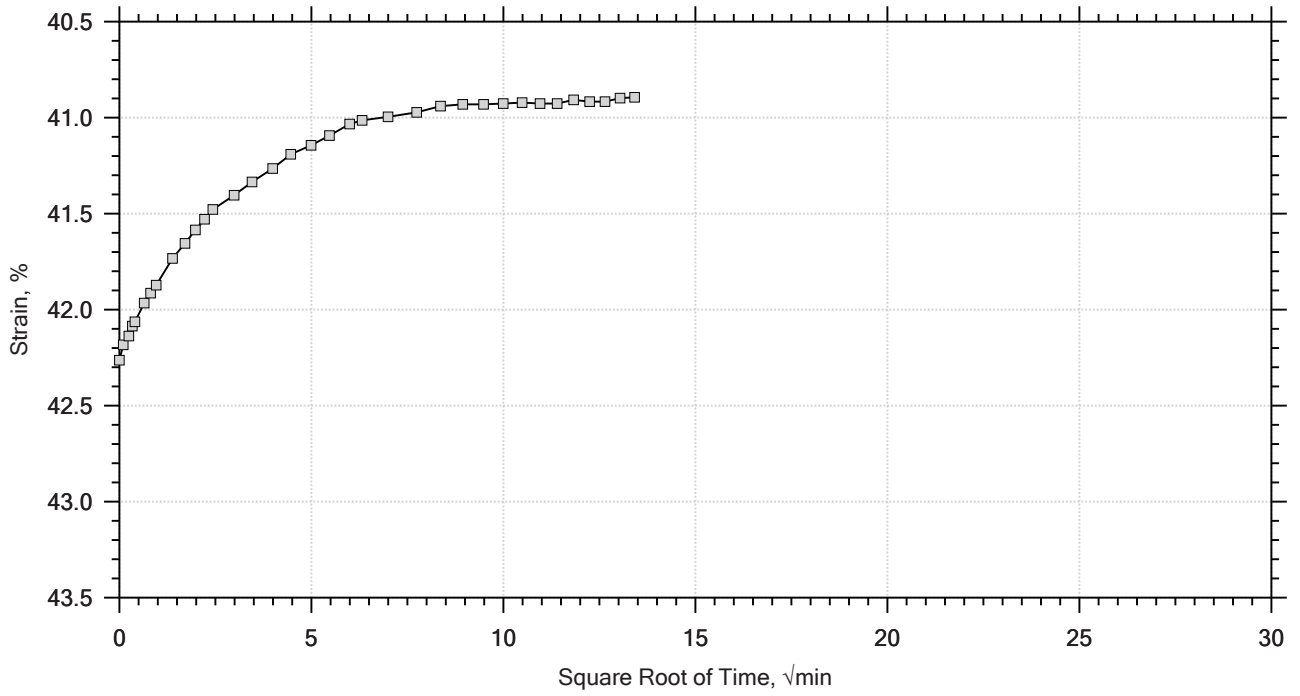


Project: SU-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/24/16	Depth: 16.0-18.0 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System V, Swell Pressure = 0.0704 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 11
Constant Load Step
Stress: 2 tsf

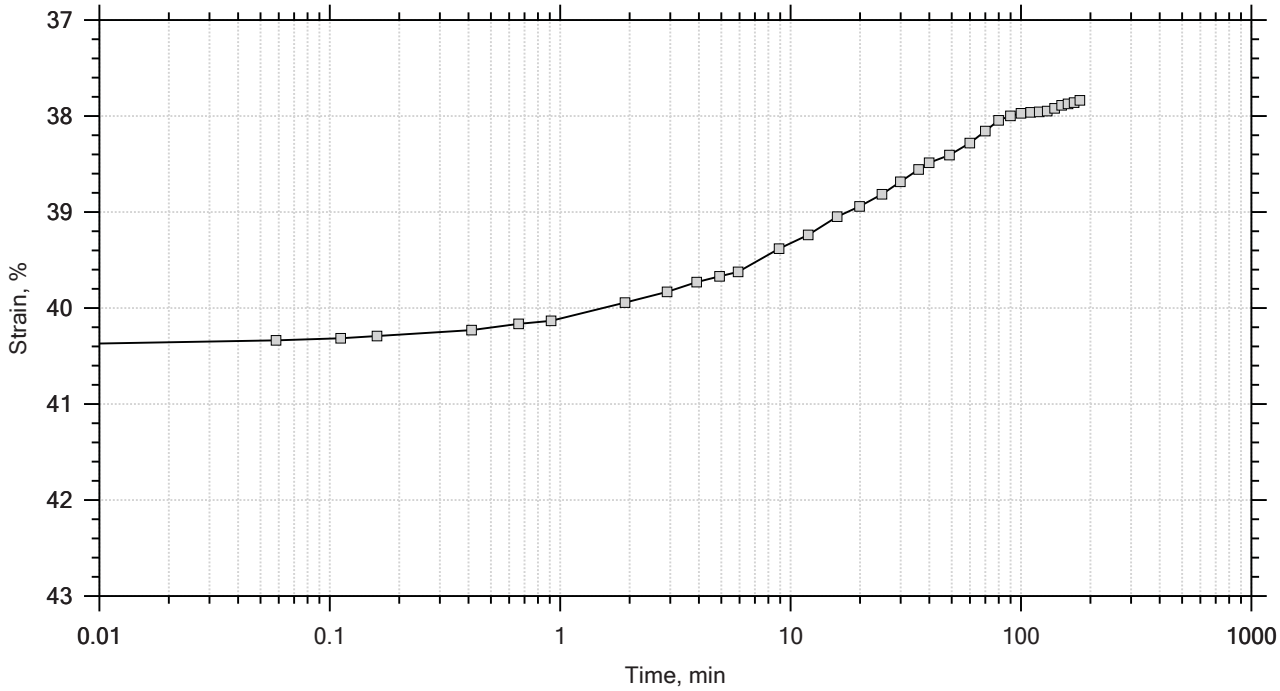


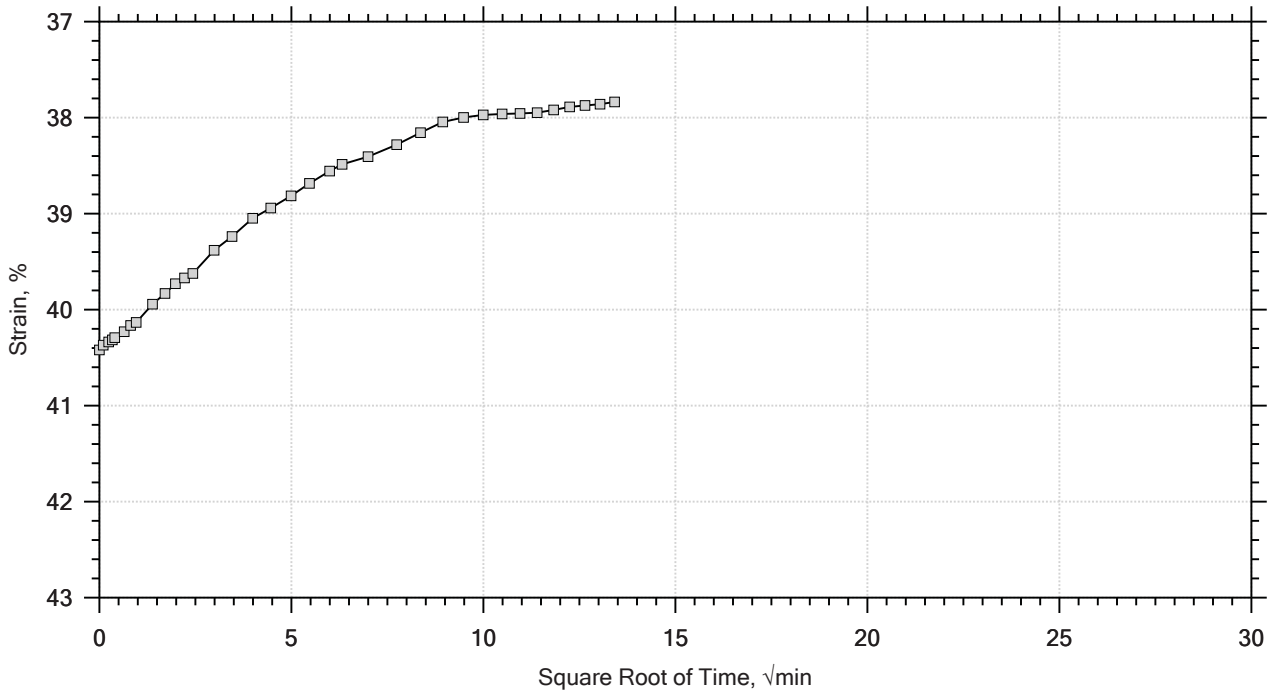


GeoTesting EXPRESS	Project: SU-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
	Boring No.: AP-1	Tested By: md	Checked By: mcm
	Sample No.: UD-1	Test Date: 08/24/16	Depth: 16.0-18.0 ft
	Test No.: IP-5	Sample Type: intact	Elevation: ---
	Description: Moist, olive sandy clay		
	Remarks: System V, Swell Pressure = 0.0704 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 11
Constant Load Step
Stress: 0.5 tsf

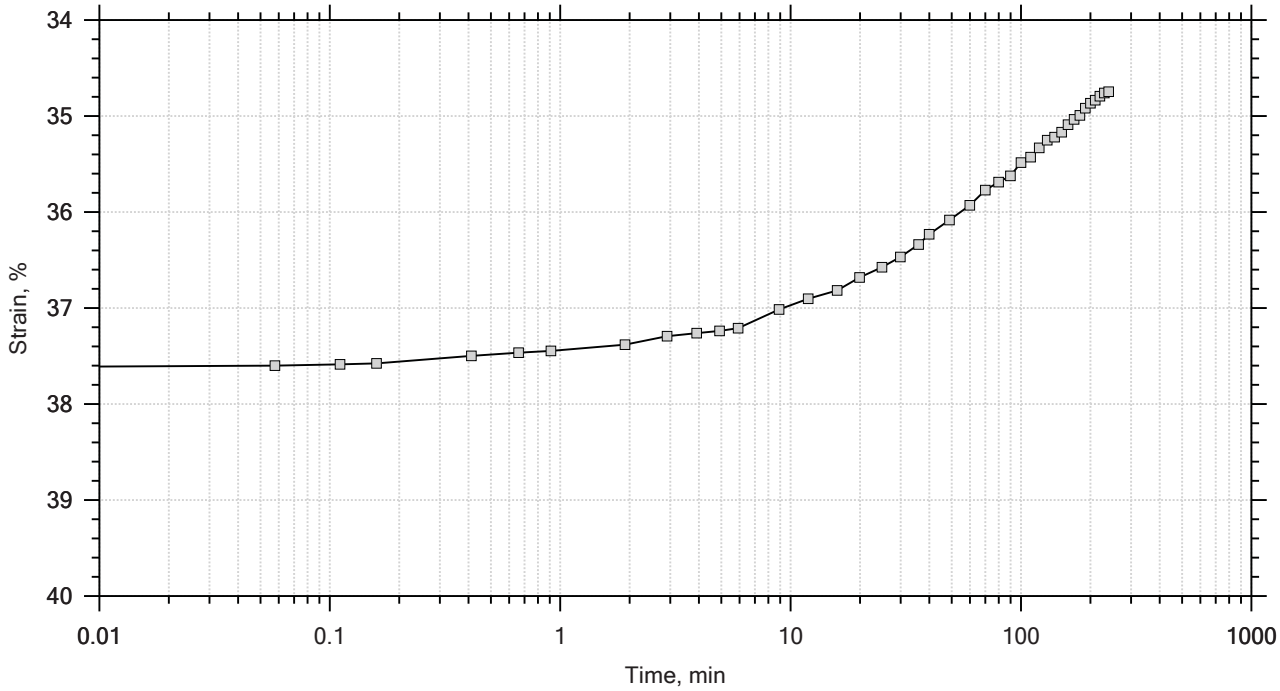


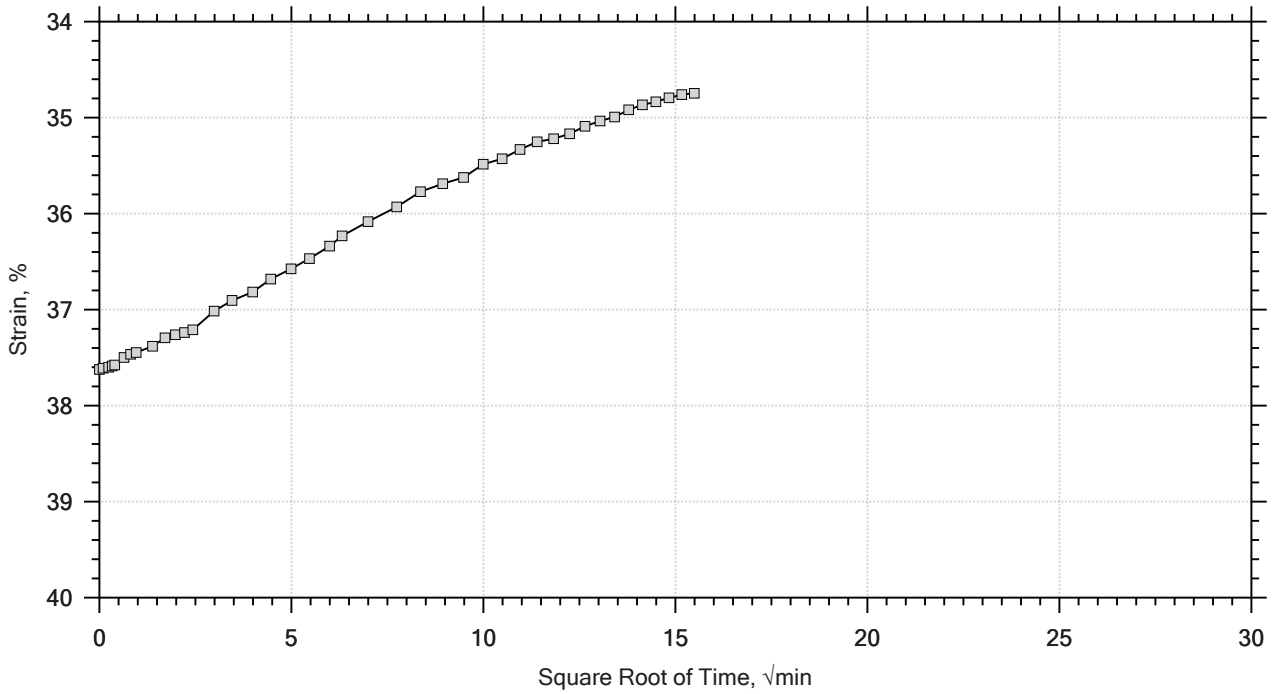


Project: SU-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/24/16	Depth: 16.0-18.0 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System V, Swell Pressure = 0.0704 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 11
Constant Load Step
Stress: 0.125 tsf





Project: SU-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/24/16	Depth: 16.0-18.0 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System V, Swell Pressure = 0.0704 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.74	Liquid Limit: 65
Initial Height: 1.00 in	Initial Void Ratio: 2.36	Plastic Limit: 21
Final Height: 0.70 in	Final Void Ratio: 1.35	Plasticity Index: 44

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	15994	RING		B-295
Mass Container, gm	8.45	110.11	110.11	8.28
Mass Container + Wet Soil, gm	133.6	231.62	207.96	105.89
Mass Container + Dry Soil, gm	78.91	175.58	175.58	73.59
Mass Dry Soil, gm	70.46	65.471	65.471	65.31
Water Content, %	77.62	85.59	49.46	49.46
Void Ratio	---	2.36	1.35	---
Degree of Saturation, %	---	99.16	100.00	---
Dry Unit Weight, pcf	---	50.811	72.587	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

Project: SU-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/24/16	Depth: 16.0-18.0 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System V, Swell Pressure = 0.0704 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Log of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/s	Mv 1/tsf	k ft/day	Ca %
1	0.0704	0.003665	2.35	0.367	0.000	0.00e+00	5.21e-02	0.00e+00	0.00e+00
2	0.125	0.008537	2.33	0.854	1.818	3.10e-06	8.92e-02	7.45e-04	0.00e+00
3	0.250	0.02273	2.29	2.27	0.000	0.00e+00	1.14e-01	0.00e+00	0.00e+00
4	0.500	0.05048	2.19	5.05	4.388	1.21e-06	1.11e-01	3.61e-04	0.00e+00
5	1.00	0.1173	1.97	11.7	0.000	0.00e+00	1.34e-01	0.00e+00	0.00e+00
6	2.00	0.2359	1.57	23.6	17.652	2.19e-07	1.19e-01	7.00e-05	0.00e+00
7	4.00	0.3472	1.19	34.7	0.000	0.00e+00	5.57e-02	0.00e+00	0.00e+00
8	8.00	0.4299	0.916	43.0	7.643	2.79e-07	2.07e-02	1.56e-05	0.00e+00
9	2.00	0.4089	0.987	40.9	0.000	0.00e+00	3.50e-03	0.00e+00	0.00e+00
10	0.500	0.3784	1.09	37.8	0.000	0.00e+00	2.04e-02	0.00e+00	0.00e+00
11	0.125	0.3475	1.19	34.7	0.000	0.00e+00	8.24e-02	0.00e+00	0.00e+00

GeoTesting EXPRESS

Project: SU-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/24/16	Depth: 16.0-18.0 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System V, Swell Pressure = 0.0704 tsf		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Square Root of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv ft²/s	Mv 1/tsf	k ft/day
1	0.0704	0.003665	2.35	0.367	5.902	4.14e-06	5.21e-02	5.82e-04
2	0.125	0.008537	2.33	0.854	13.764	1.76e-06	8.92e-02	4.24e-04
3	0.250	0.02273	2.29	2.27	21.383	1.11e-06	1.14e-01	3.41e-04
4	0.500	0.05048	2.19	5.05	18.440	1.24e-06	1.11e-01	3.70e-04
5	1.00	0.1173	1.97	11.7	55.324	3.72e-07	1.34e-01	1.34e-04
6	2.00	0.2359	1.57	23.6	78.285	2.13e-07	1.19e-01	6.79e-05
7	4.00	0.3472	1.19	34.7	50.153	2.46e-07	5.57e-02	3.69e-05
8	8.00	0.4299	0.916	43.0	32.140	2.85e-07	2.07e-02	1.59e-05
9	2.00	0.4089	0.987	40.9	20.221	4.09e-07	3.50e-03	3.86e-06
10	0.500	0.3784	1.09	37.8	52.762	1.71e-07	2.04e-02	9.40e-06
11	0.125	0.3475	1.19	34.7	233.771	4.26e-08	8.24e-02	9.47e-06

GeoTesting EXPRESS

Project: SU-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/24/16	Depth: 16.0-18.0 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System V, Swell Pressure = 0.0704 tsf		
Displacement at End of Increment		

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	---	Sample Type:	---	Tested By:	jbr
Sample ID:	---	Test Date:	08/30/16	Checked By:	mcm
Depth :	---	Test Id:	387124		

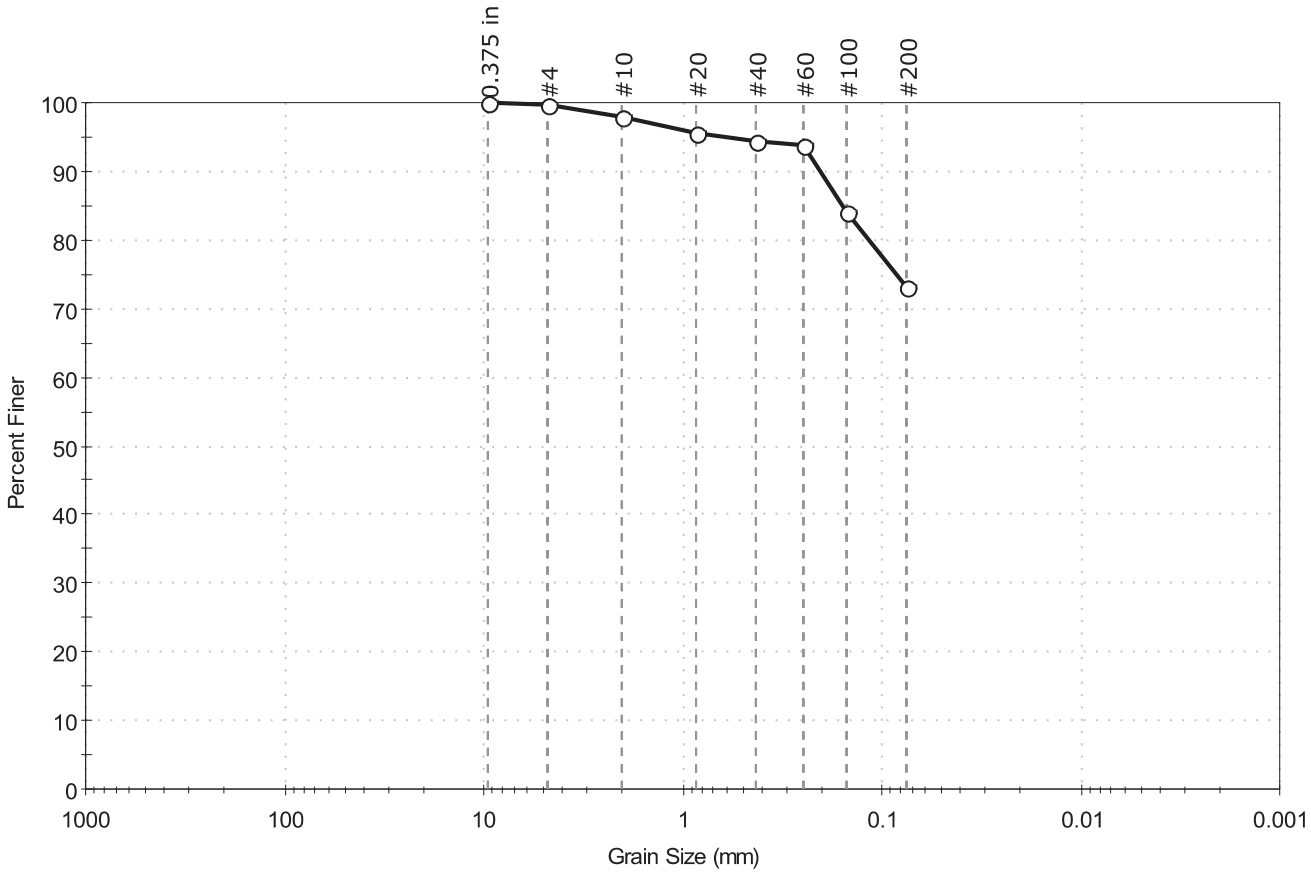
Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
AP-1	UD-2	18.0-20.0 ft	Moist, olive clay with sand	86.3

Notes: Temperature of Drying : 110º Celsius

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	AP-1	Sample Type:	tube	Tested By:	jbr
Sample ID:	UD-2	Test Date:	08/24/16	Checked By:	mcm
Depth :	18.0-20.0 ft	Test Id:	387102		
Test Comment:	---				
Visual Description:	Moist, olive clay with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.2	26.5	73.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	98		
#20	0.85	96		
#40	0.42	94		
#60	0.25	94		
#100	0.15	84		
#200	0.075	73		

Coefficients

D_{85} = 0.1582 mm D_{30} = N/A

D_{60} = N/A D_{15} = N/A

D_{50} = N/A D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM Fat clay with sand (CH)

AASHTO Clayey Soils (A-7-5 (60))

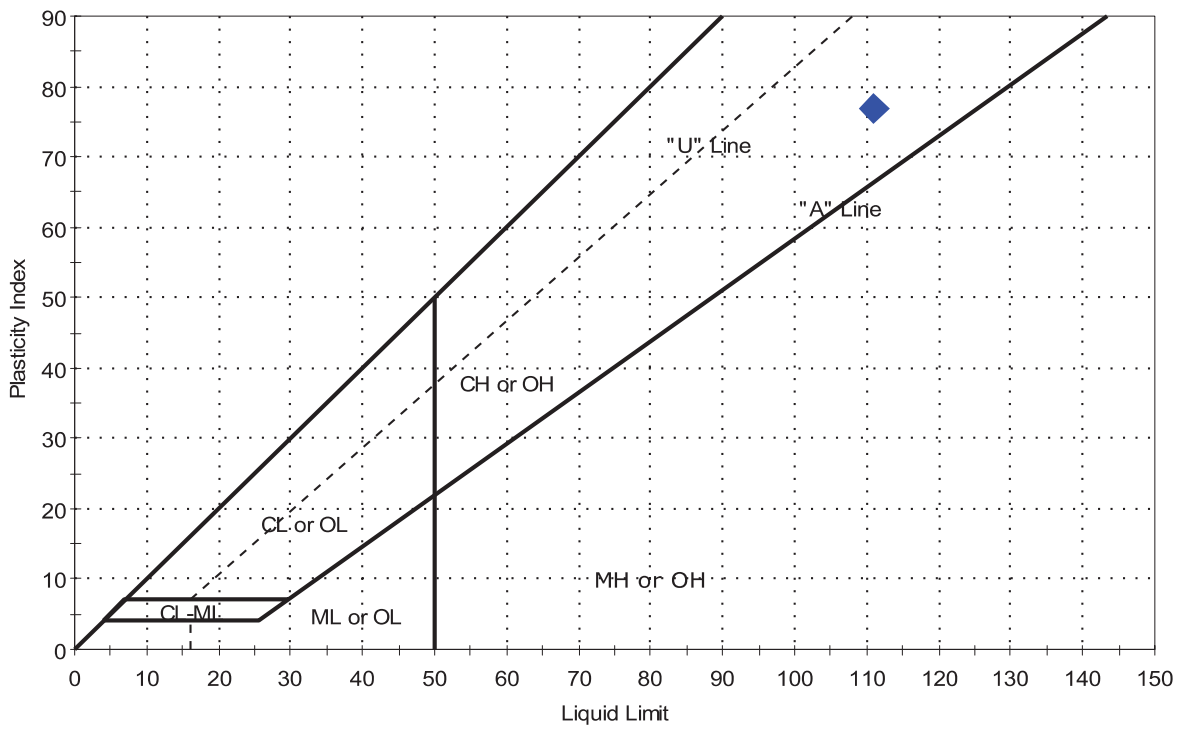
Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	AP-1	Sample Type:	tube	Tested By:	cam
Sample ID:	UD-2	Test Date:	08/26/16	Checked By:	mcm
Depth :	18.0-20.0 ft	Test Id:	387110		
Test Comment:	---				
Visual Description:	Moist, olive clay with sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UD-2	AP-1	18.0-20.0 ft	86	111	34	77	0.7	Fat clay with sand (CH)

Sample Prepared using the WET method

6% Retained on #40 Sieve

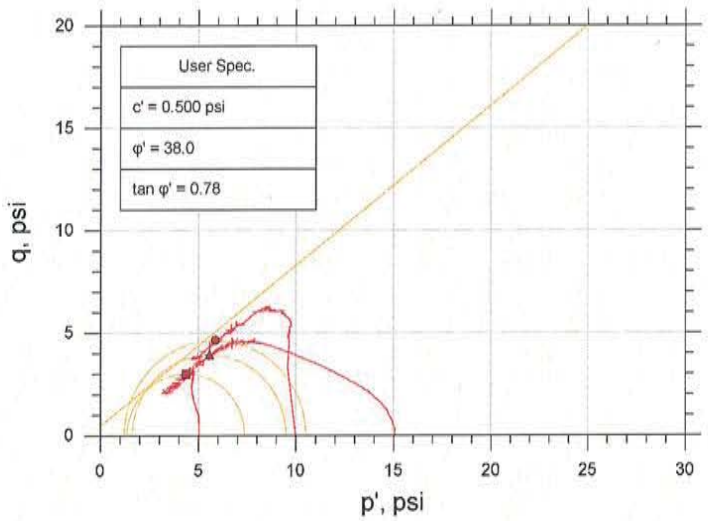
Dry Strength: VERY HIGH

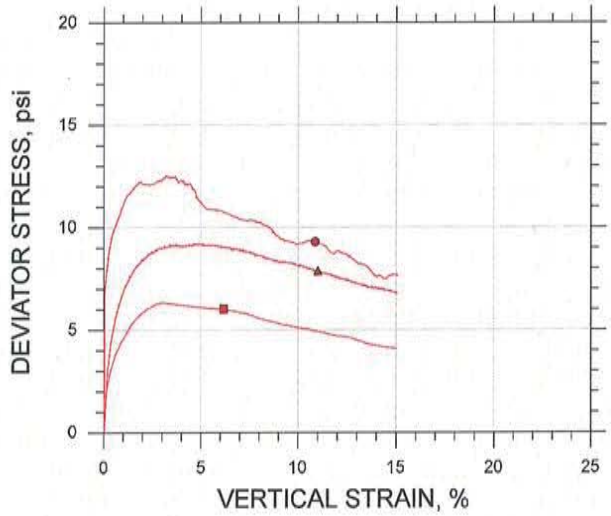
Dilatancy: SLOW

Toughness: LOW

Client: F&ME Consultants	
Project Name: US-21 Replacement Bridge	
Project Location: ---	
Project Number: GTX-305005	
Tested By: md	Checked By: mcm
Boring ID: AP-1	
Preparation: Intact	
Description: Moist, olive clay with sand	
Classification: Fat clay with sand	
Group Symbol: CH	
Liquid Limit: 111	Plastic Limit: 34
Plasticity Index: 77	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





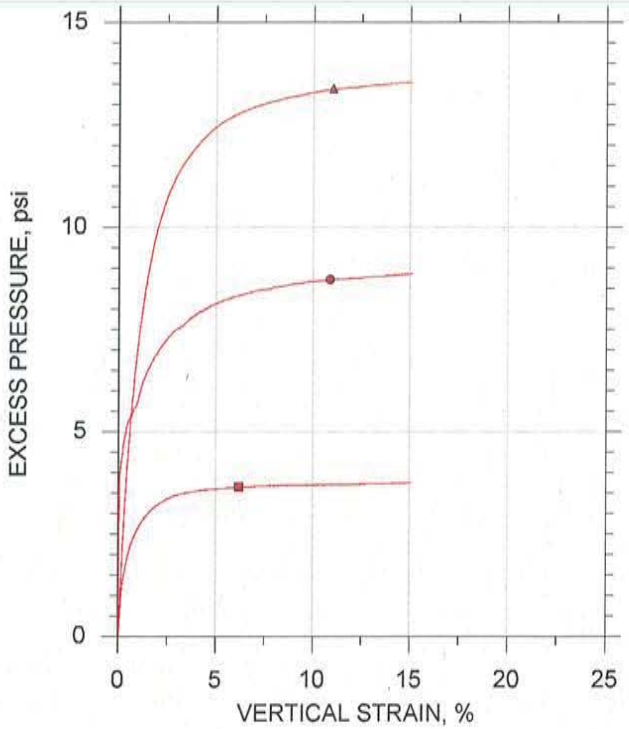
		■	●	▲	
Symbol		■	●	▲	
Sample ID		ST-2	ST-2	ST-2	
Depth, ft		18.0-20.0 ft	18.0-20.0 ft	18.0-20.0 ft	
Test Number		CU-3-1	CU-3-2	CU-3-3	
Initial	Height, in	4.550	4.540	4.490	
	Diameter, in	2.030	2.030	2.030	
	Moisture Content (from Cuttings), %	71.3	84.8	84.8	
	Dry Density, pcf	55.7	46.4	49.5	
	Saturation (Wet Method), %	95.0	87.0	95.0	
	Void Ratio	2.02	2.63	2.41	
Before Shear	Moisture Content, %	71.0	69.6	66.8	
	Dry Density, pcf	57.8	58.6	60.1	
	Cross-sectional Area (Method A), in²	3.123	2.614	2.723	
	Saturation, %	100.0	100.0	100.0	
	Void Ratio	1.92	1.88	1.80	
	Back Pressure, psi	127.0	29.02	28.99	
Vertical Effective Consolidation Stress, psi		5.008	9.831	14.86	
Horizontal Effective Consolidation Stress, psi		5.009	9.968	15.01	
Vertical Strain after Consolidation, %		0.03924	1.773	2.088	
Volumetric Strain after Consolidation, %		3.576	20.60	17.44	
Time to 50% Consolidation, min		148.8	458.0	342.3	
Shear Strength, psi		3.011	4.650	3.939	
Strain at Failure, %		6.18	10.9	11.0	
Strain Rate, %/min		0.01600	0.01600	0.01600	
Deviator Stress at Failure, psi		6.022	9.300	7.877	
Effective Minor Principal Stress at Failure, psi		1.355	1.207	1.622	
Effective Major Principal Stress at Failure, psi		7.376	10.51	9.499	
B-Value		0.95	0.99	0.95	

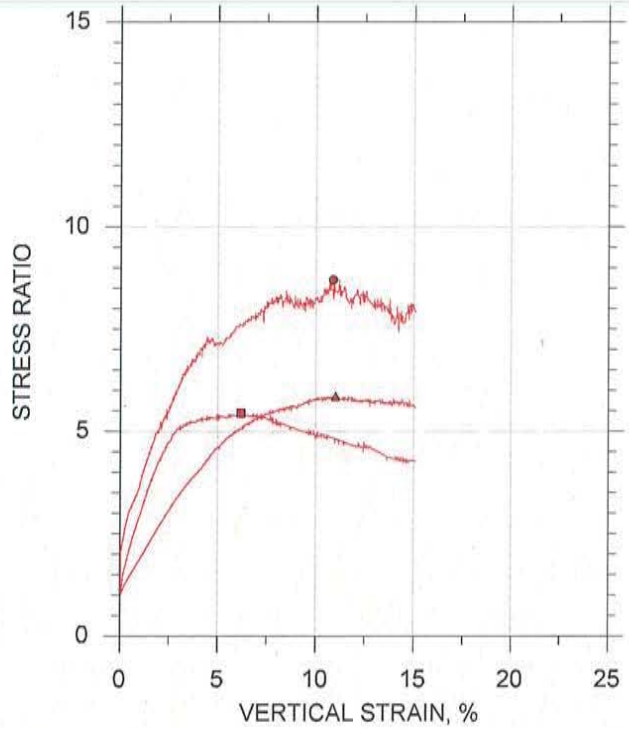
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

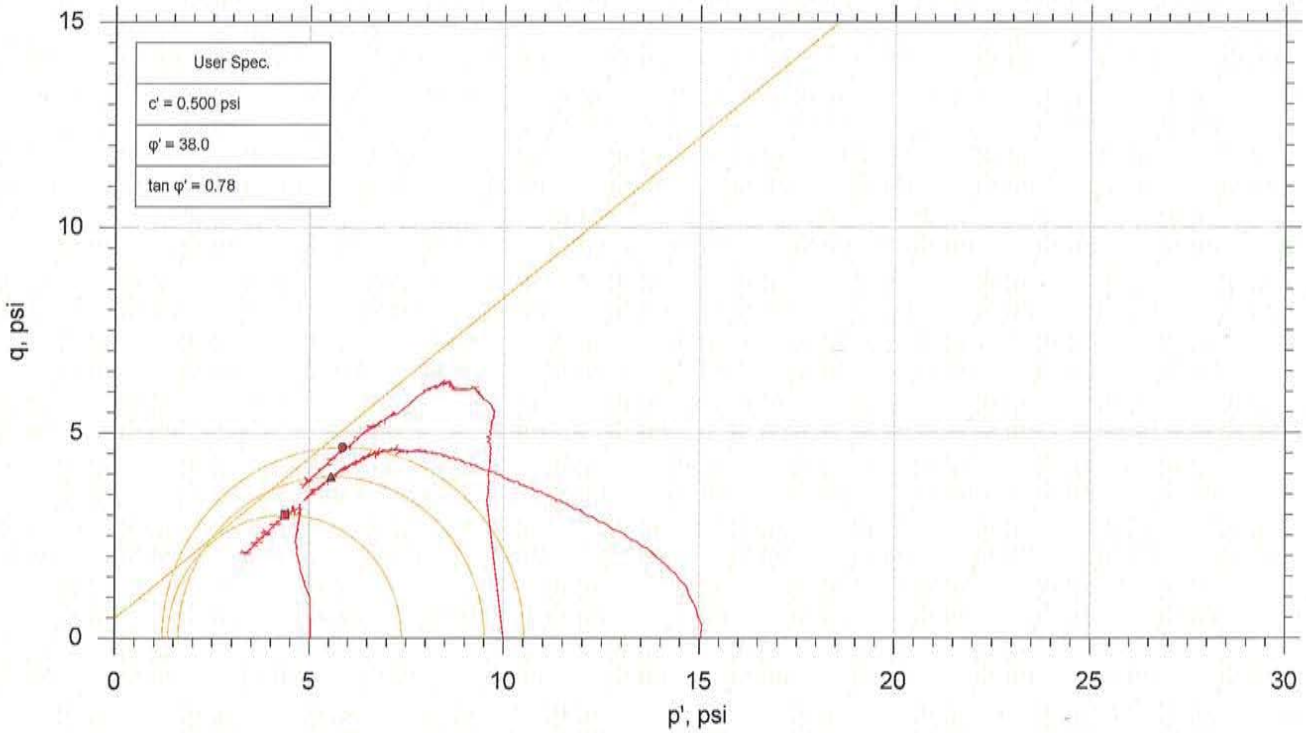
Remarks:

System T. Note CU-2-2 test specimen not used in determining cohesion or friction values.

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







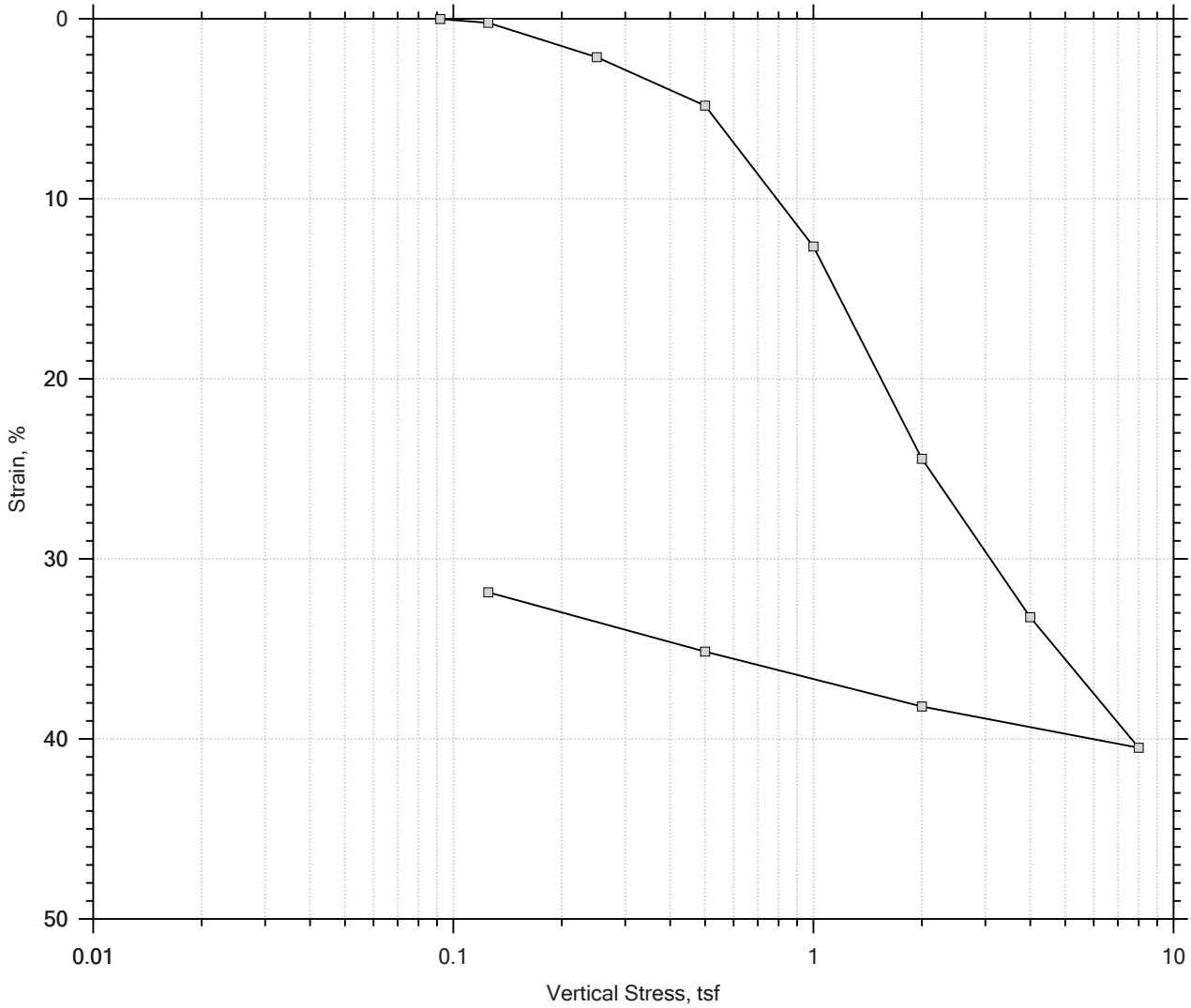
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	ST-2	CU-3-1	18.0-20.0 ft	md	8/22/16	mcm	8/29/16	305005-CU-3-1m.dat
●	ST-2	CU-3-2	18.0-20.0 ft	md	8/22/16	mcm	8/29/16	305005-CU-3-2m.dat
▲	ST-2	CU-3-3	18.0-20.0 ft	md	8/22/16	mcm	8/29/16	305005-CU-3-3m.dat

GeoTesting EXPRESS

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Sample Type: Intact	
Description: Moist, olive clay with sand		
Remarks: System T. Note CU-2-2 test specimen not used in determining cohesion or friction values.		

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report

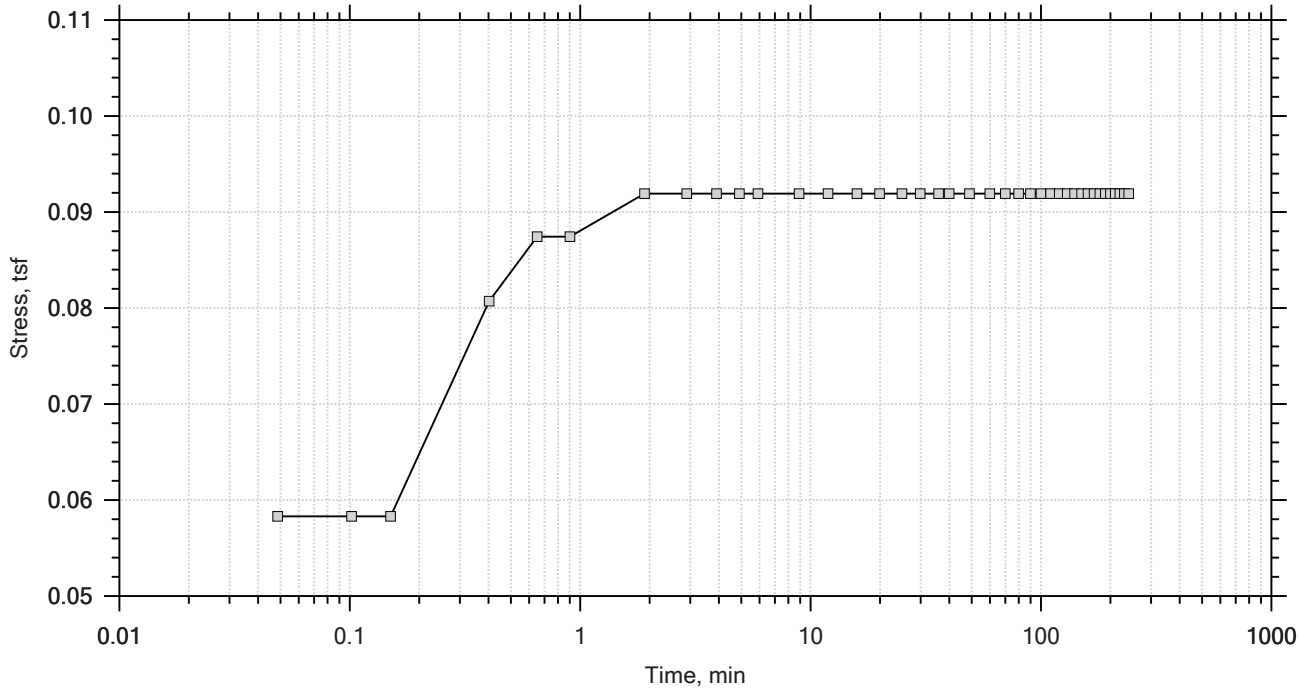


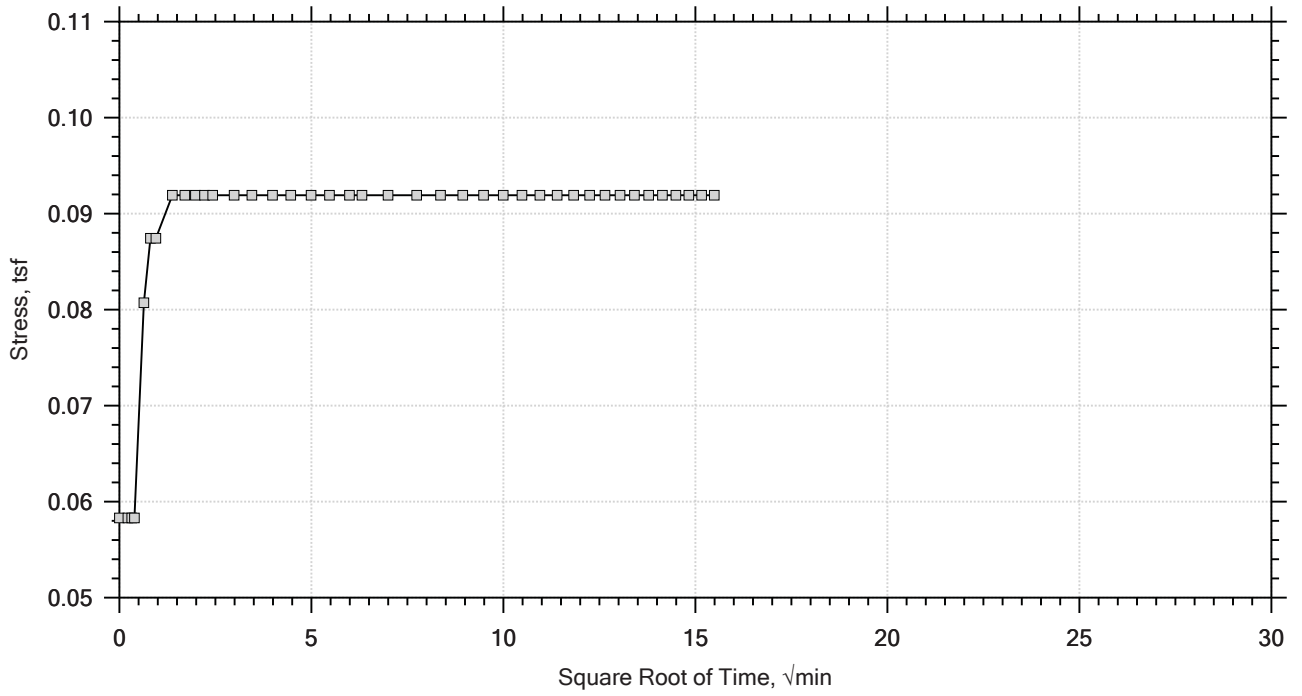
					Before Test	After Test
Current Vertical Effective Stress: ---				Water Content, %	89.14	52.62
Preconsolidation Stress: ---				Dry Unit Weight, pcf	48.913	69.876
Compression Ratio: ---				Saturation, %	98.06	100.00
Diameter: 2.5 in		Height: 1 in		Void Ratio	2.48	1.43
LL: 111	PL: 34	PI: 77	GS: 2.72			

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-3	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System R, Swell Pressure = 0.0919 tsf		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 11
Constant Volume Step
Stress: 0.0919 tsf

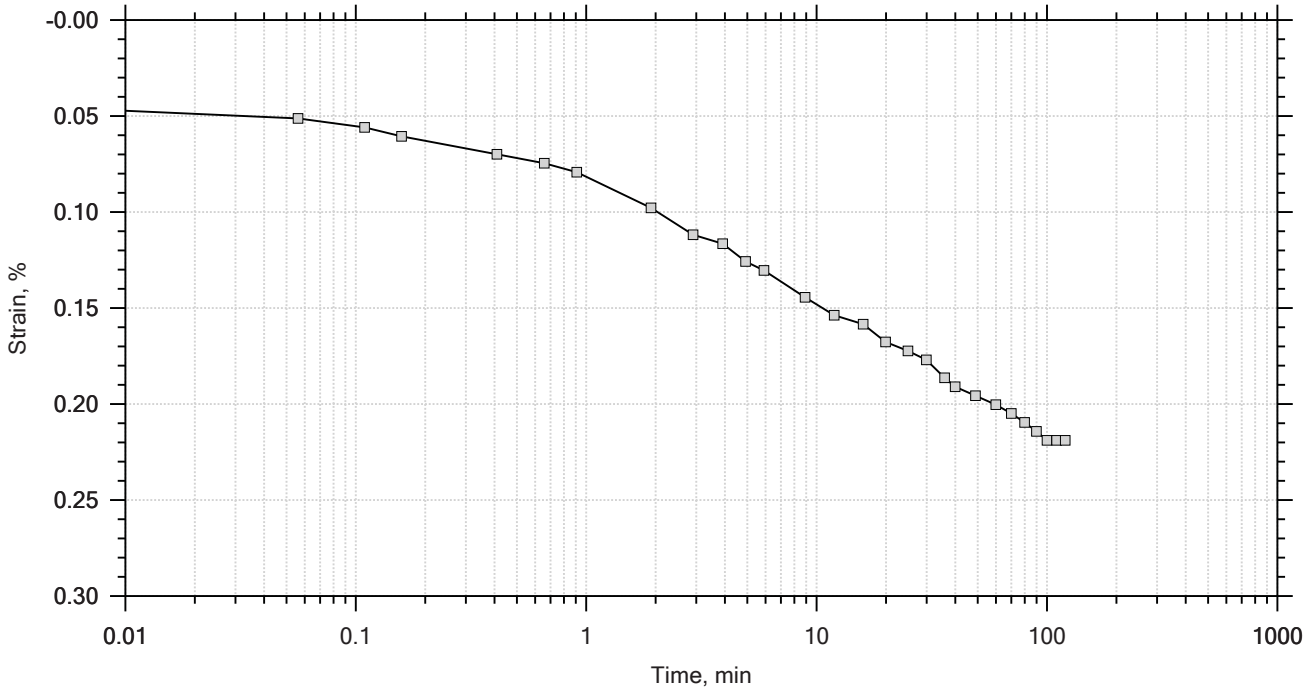


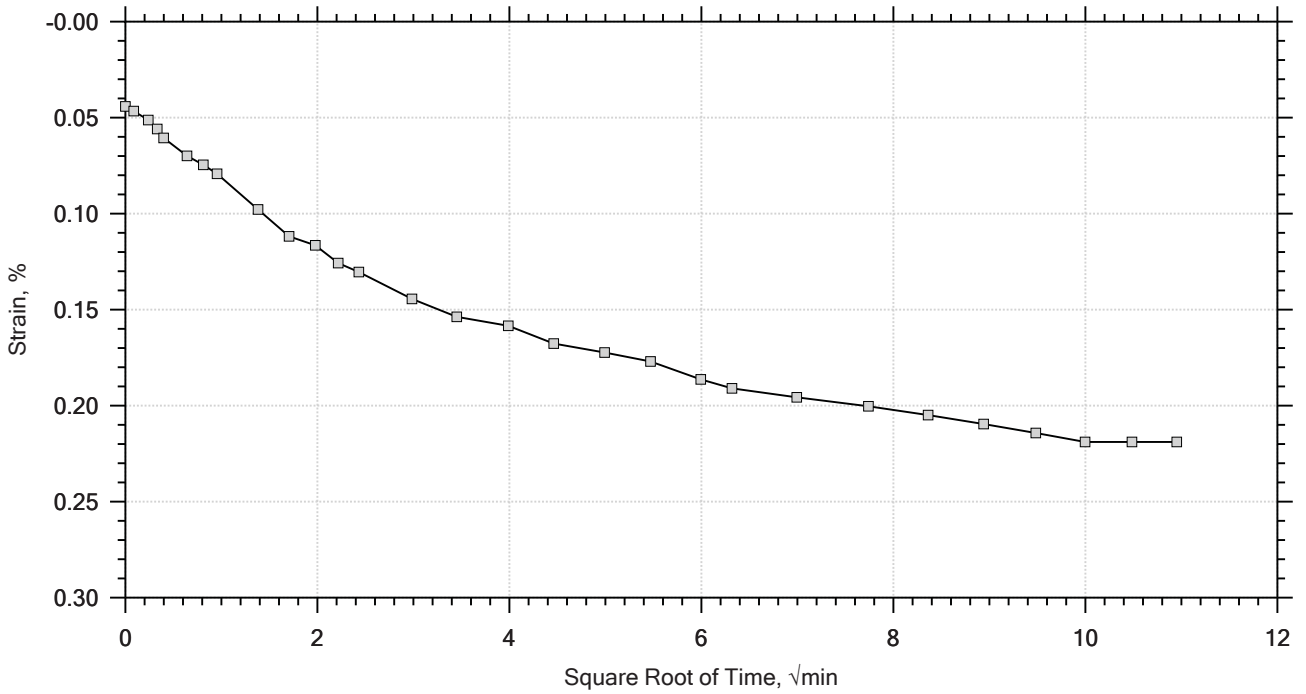


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-3	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System R, Swell Pressure = 0.0919 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 11
Constant Load Step
Stress: 0.125 tsf

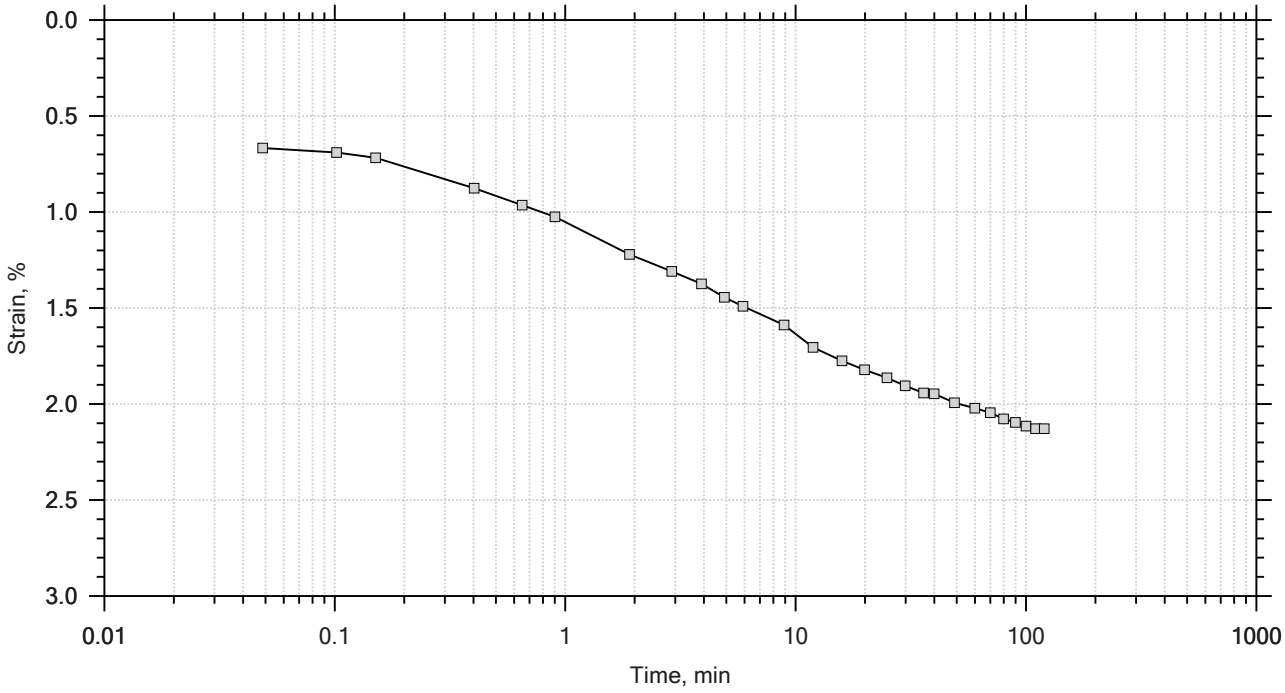


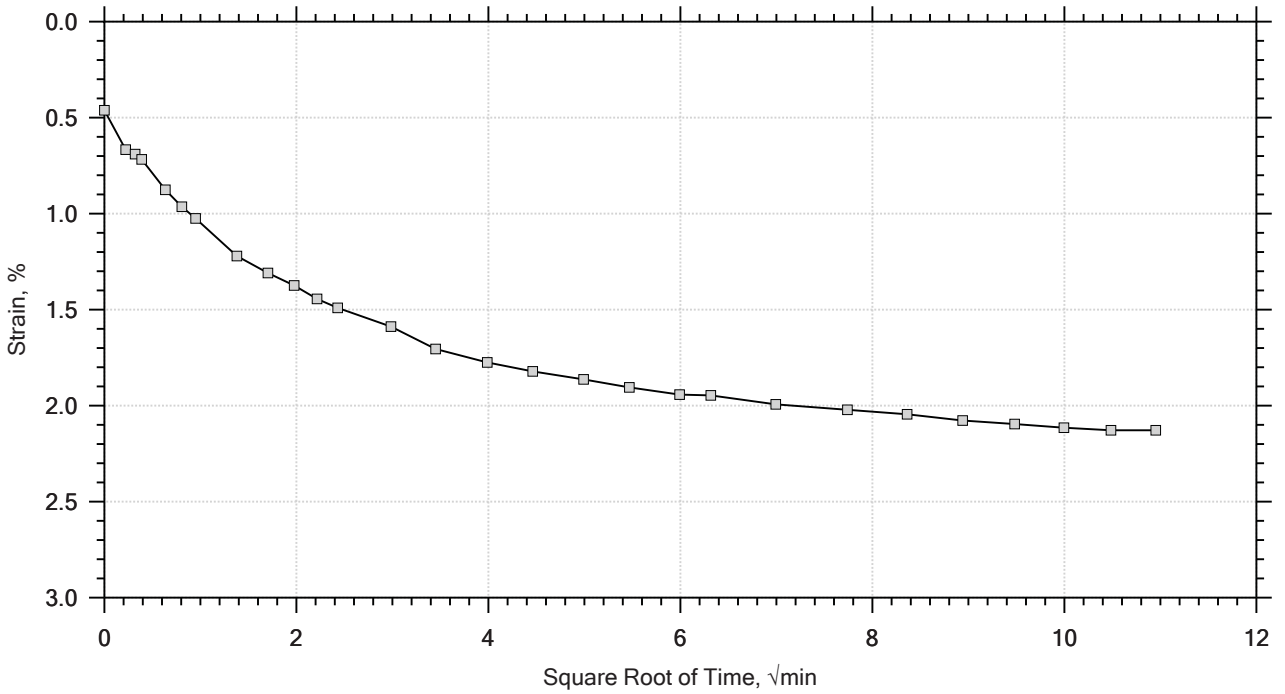


GeoTesting EXPRESS	Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
	Boring No.: AP-1	Tested By: md	Checked By: mcm
	Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, olive clay with sand		
	Remarks: System R, Swell Pressure = 0.0919 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 11
Constant Load Step
Stress: 0.25 tsf

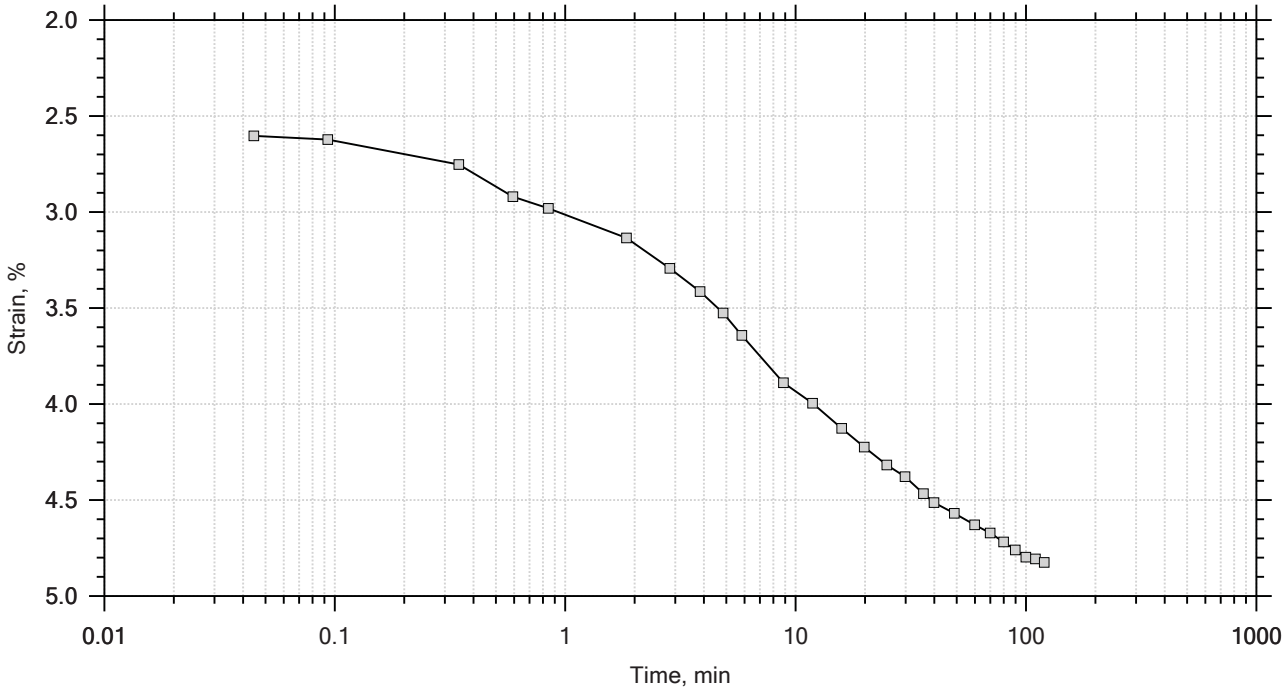


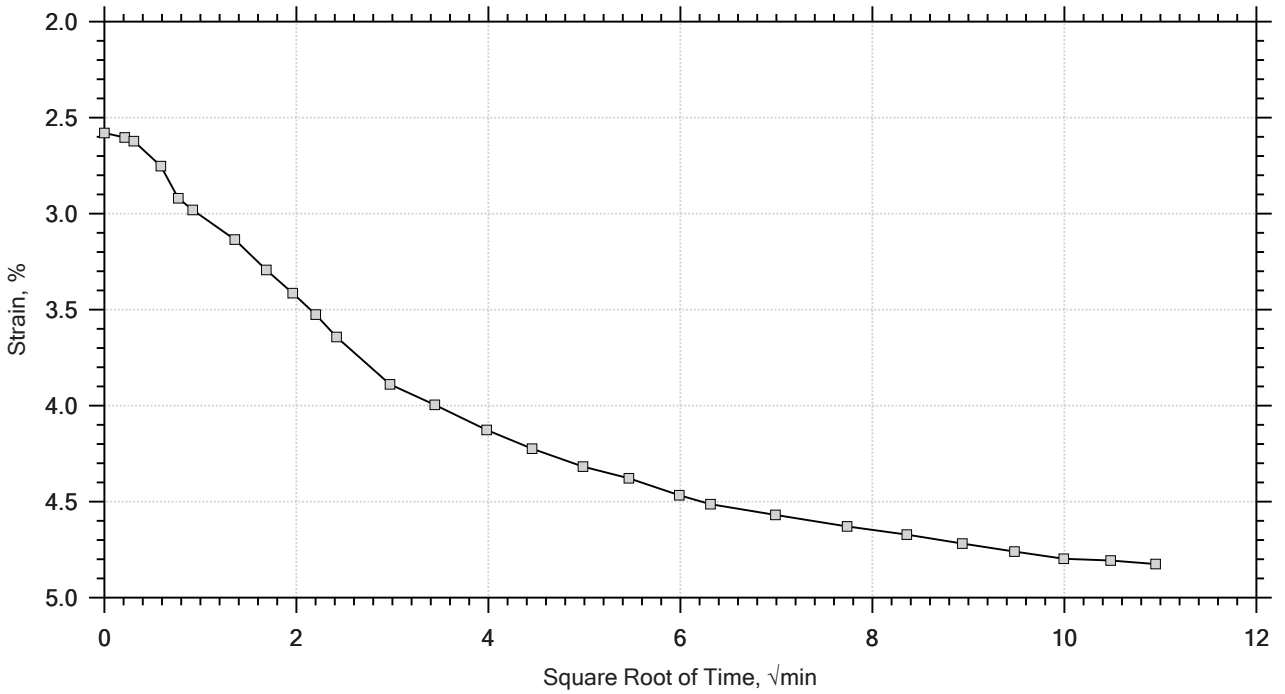


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-3	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System R, Swell Pressure = 0.0919 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 11
Constant Load Step
Stress: 0.5 tsf

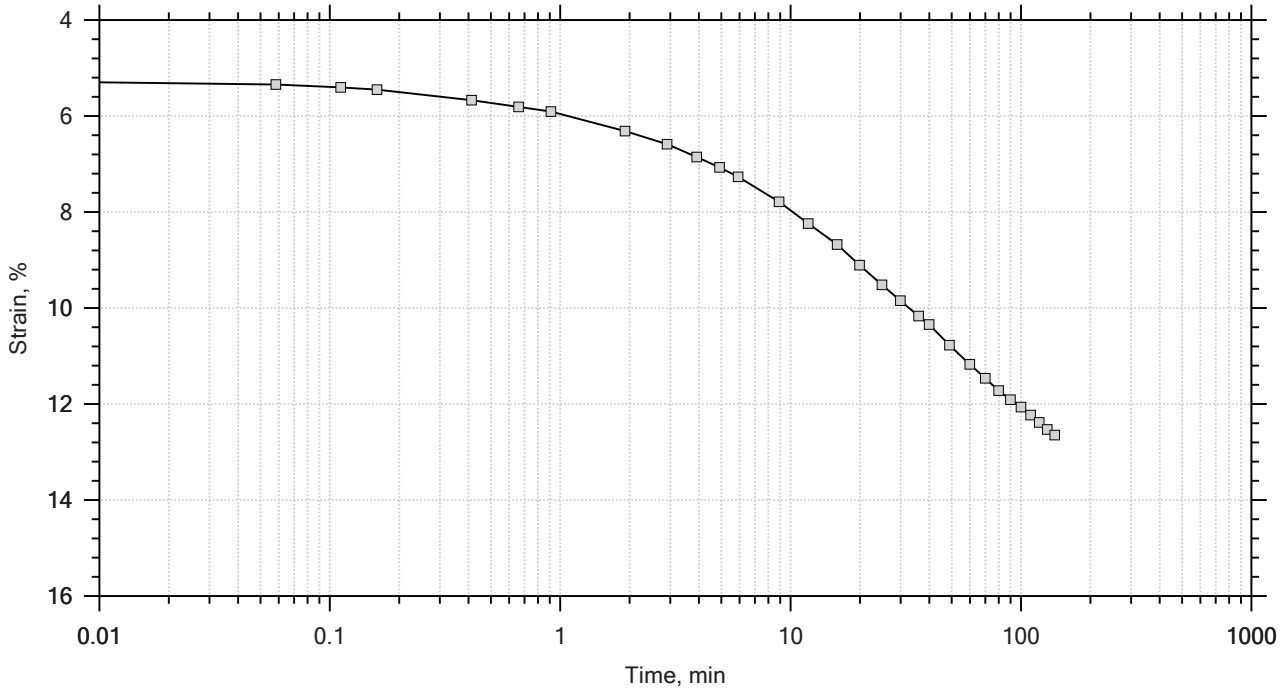


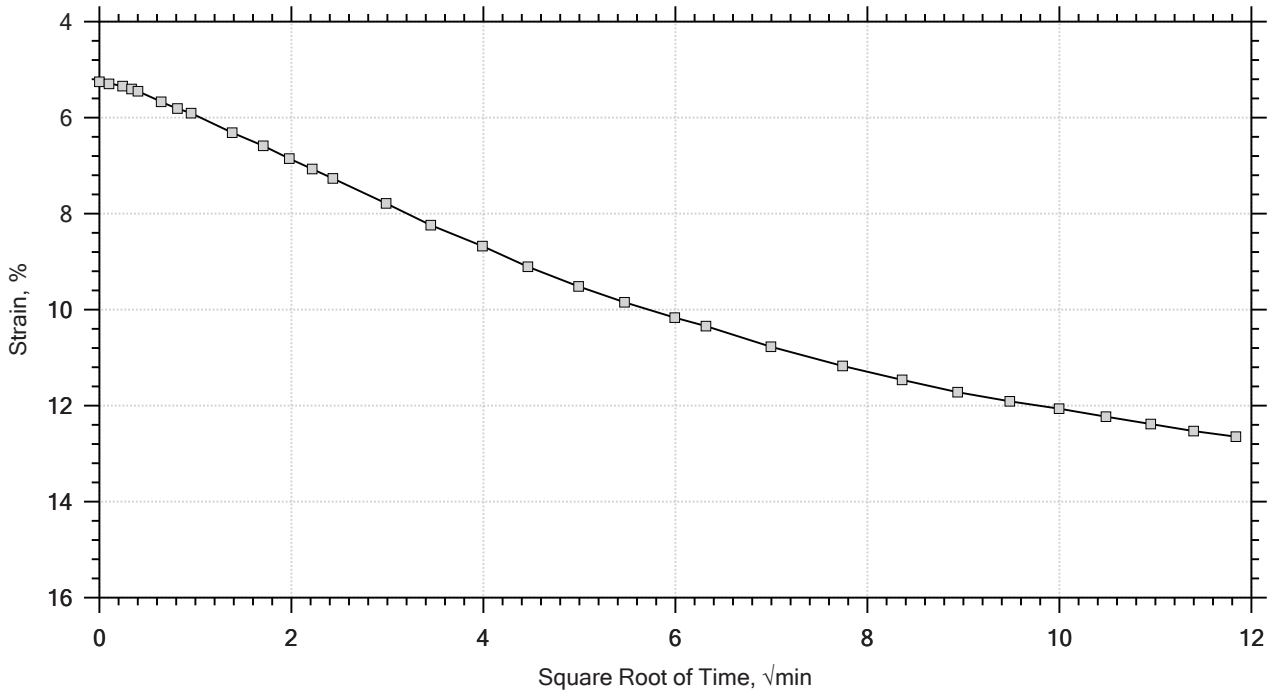


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-3	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System R, Swell Pressure = 0.0919 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 11
Constant Load Step
Stress: 1 tsf

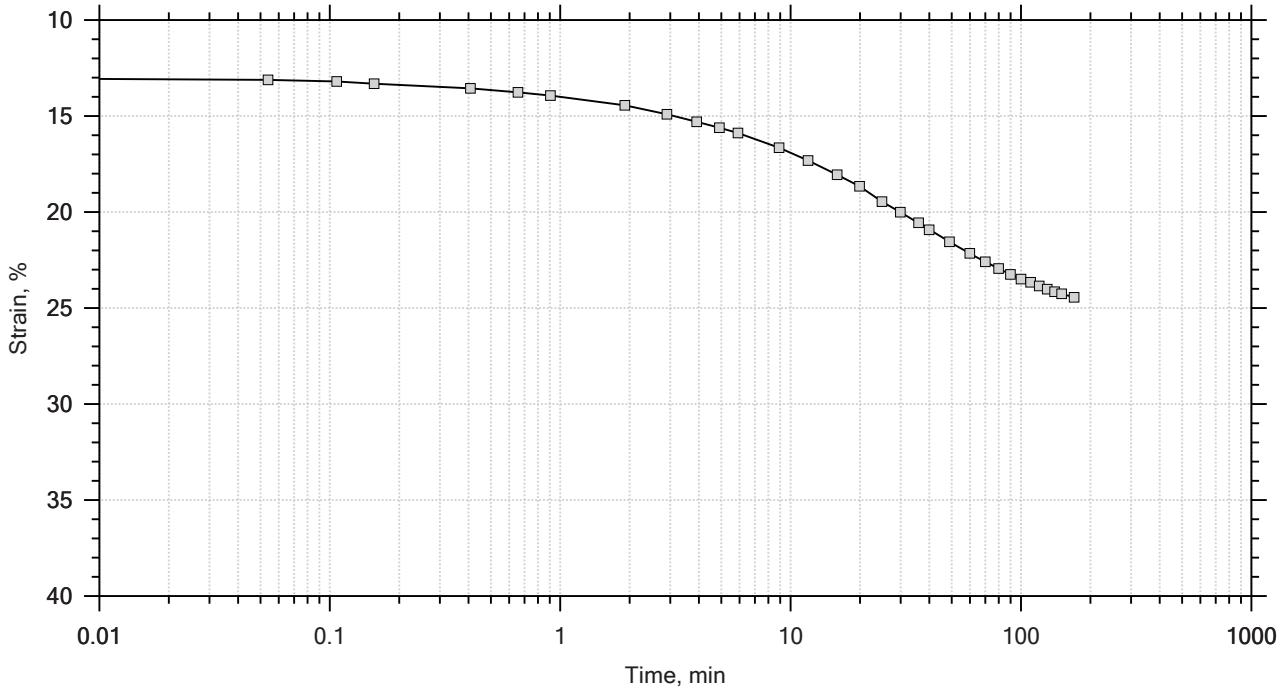


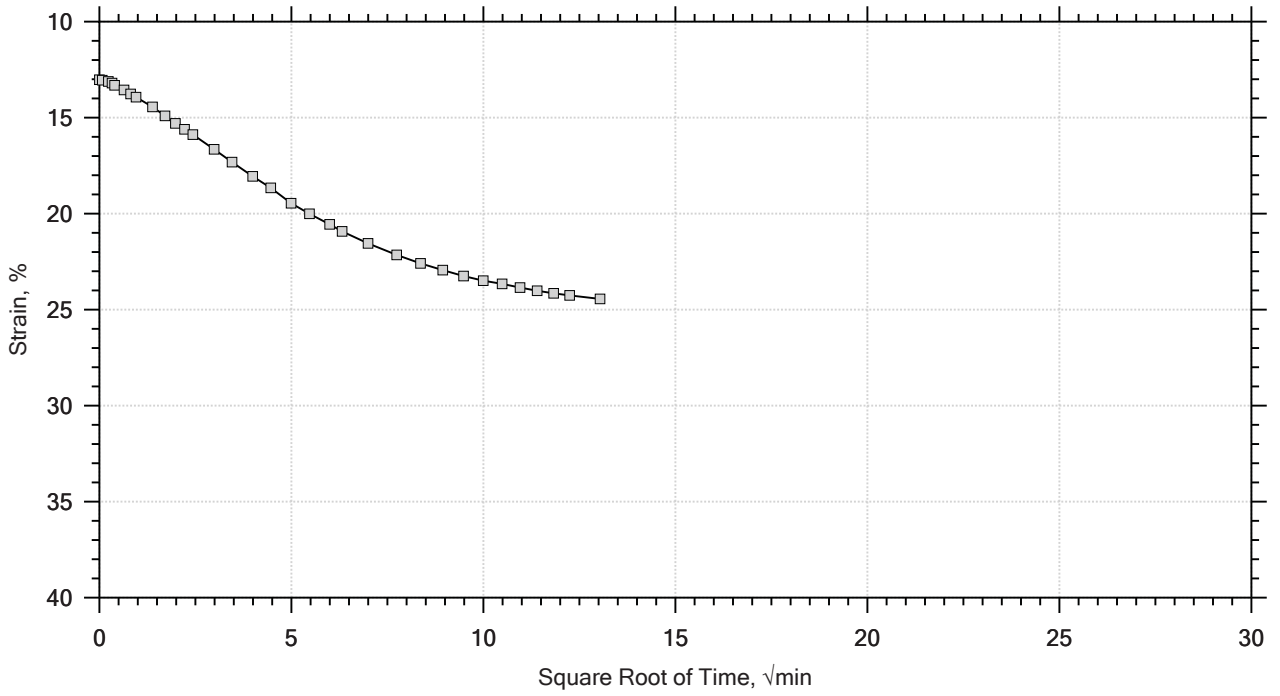


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-3	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System R, Swell Pressure = 0.0919 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 11
Constant Load Step
Stress: 2 tsf

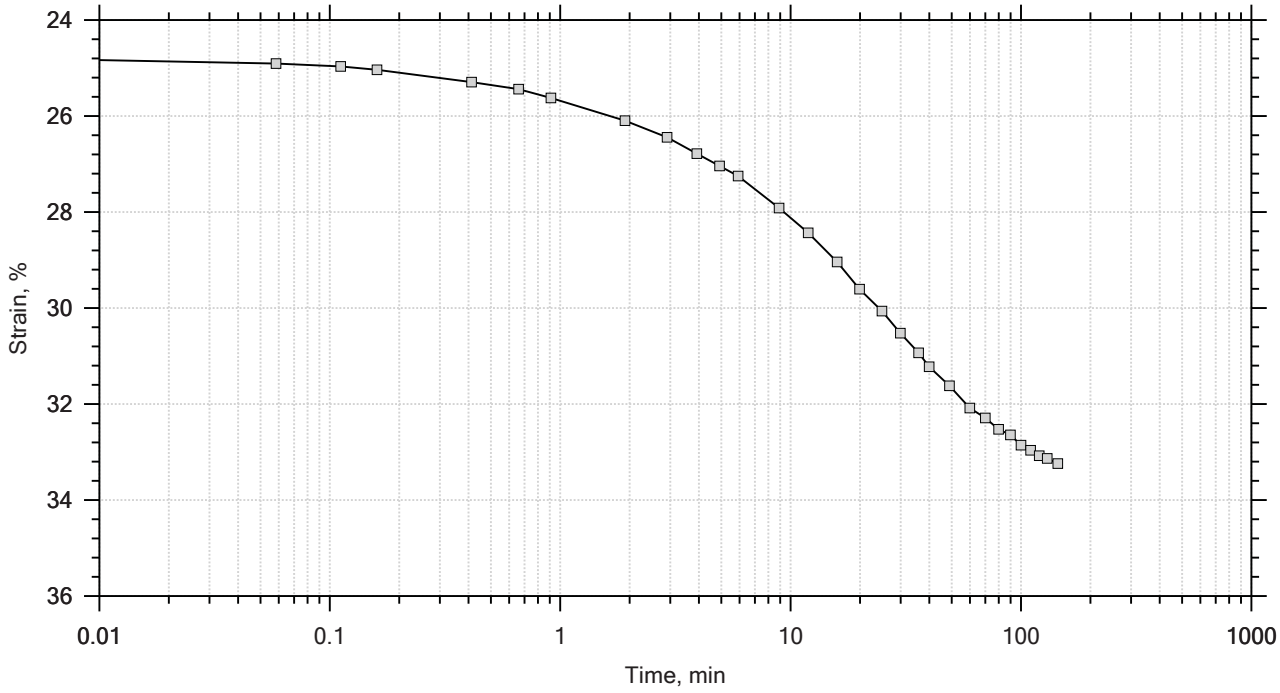


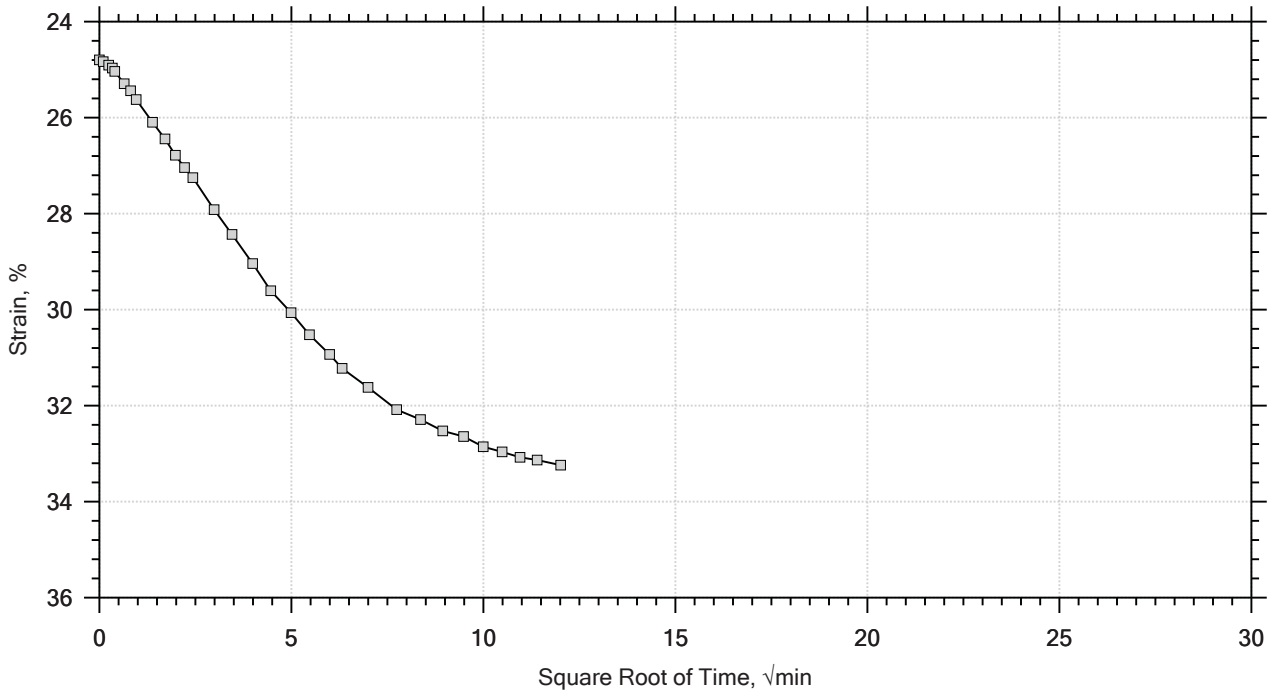


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-3	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System R, Swell Pressure = 0.0919 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 11
Constant Load Step
Stress: 4 tsf

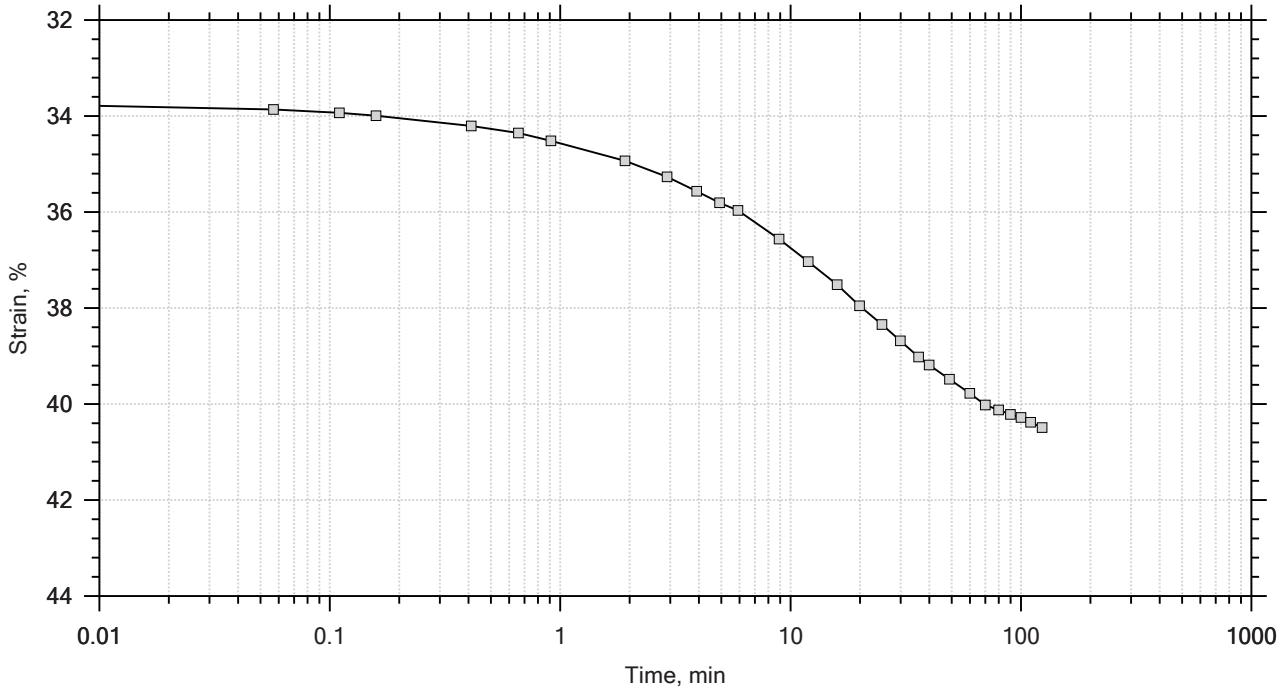


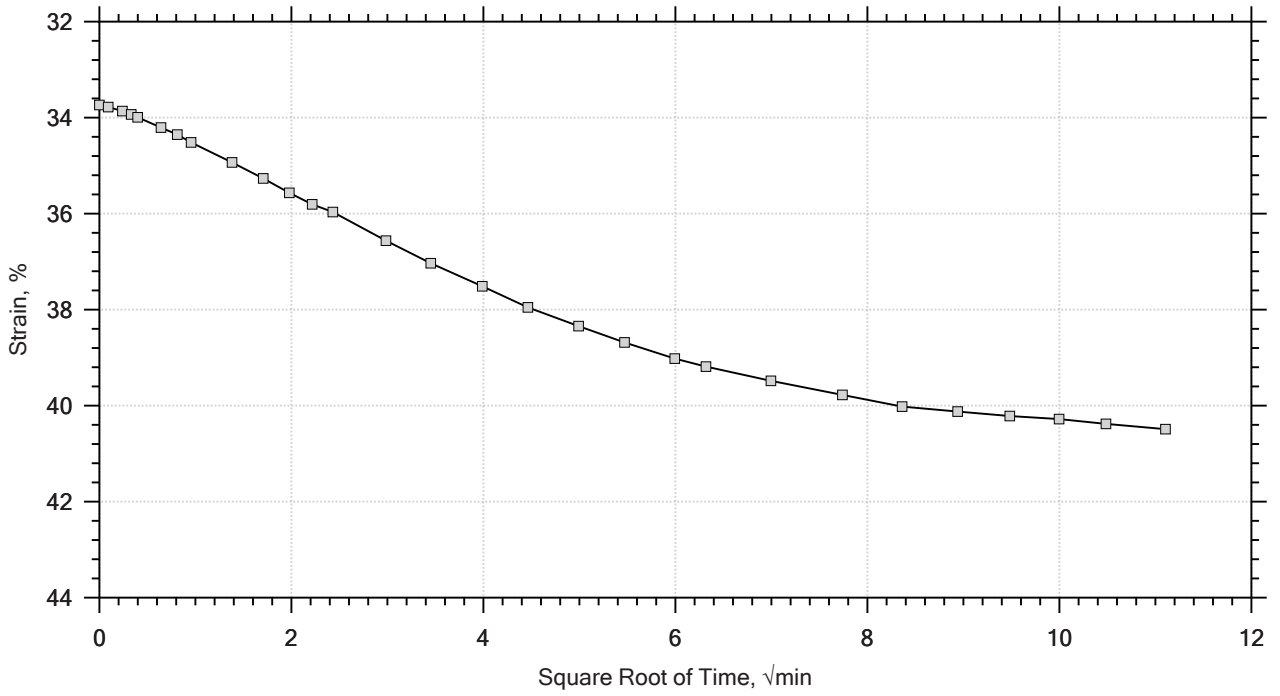


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-3	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System R, Swell Pressure = 0.0919 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 11
Constant Load Step
Stress: 8 tsf

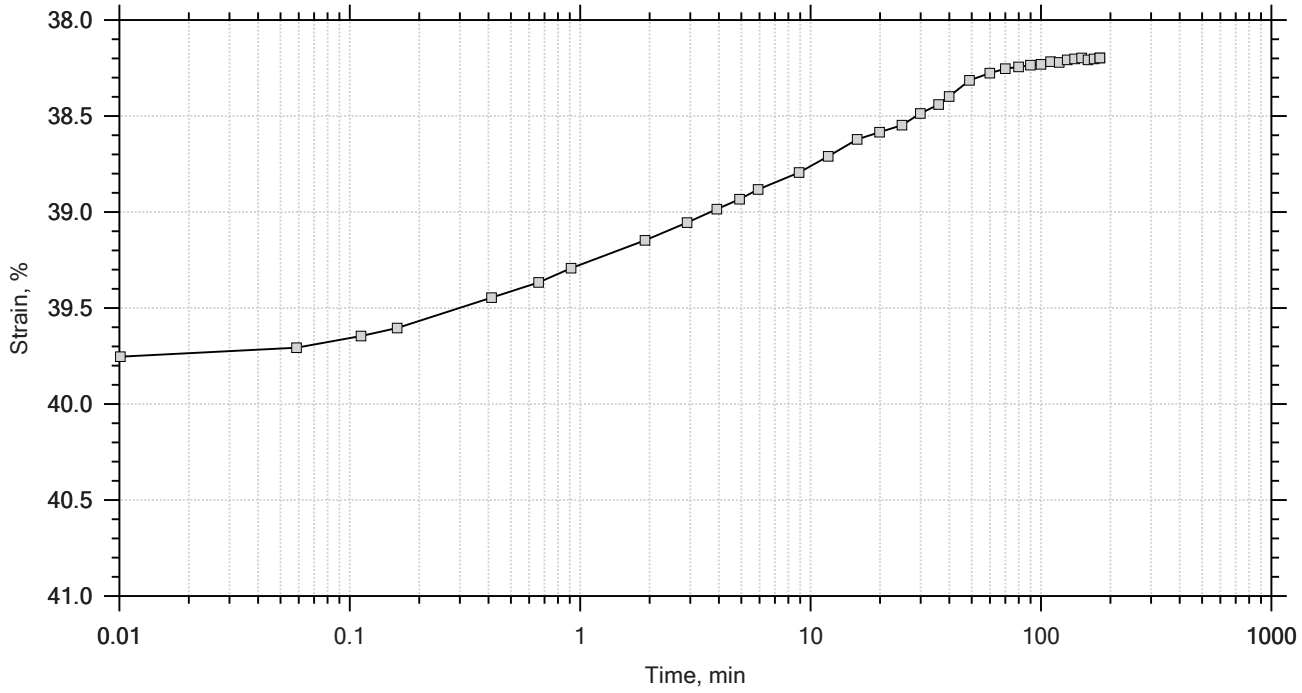


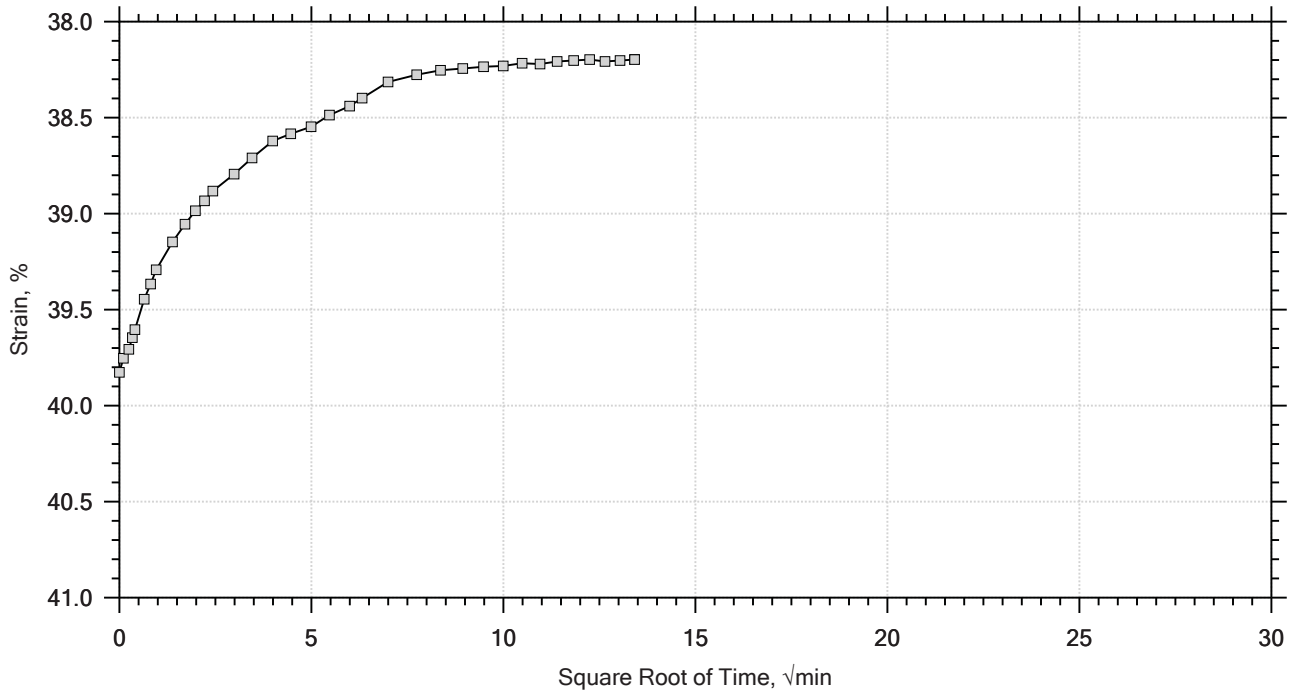


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-3	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System R, Swell Pressure = 0.0919 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 11
Constant Load Step
Stress: 2 tsf

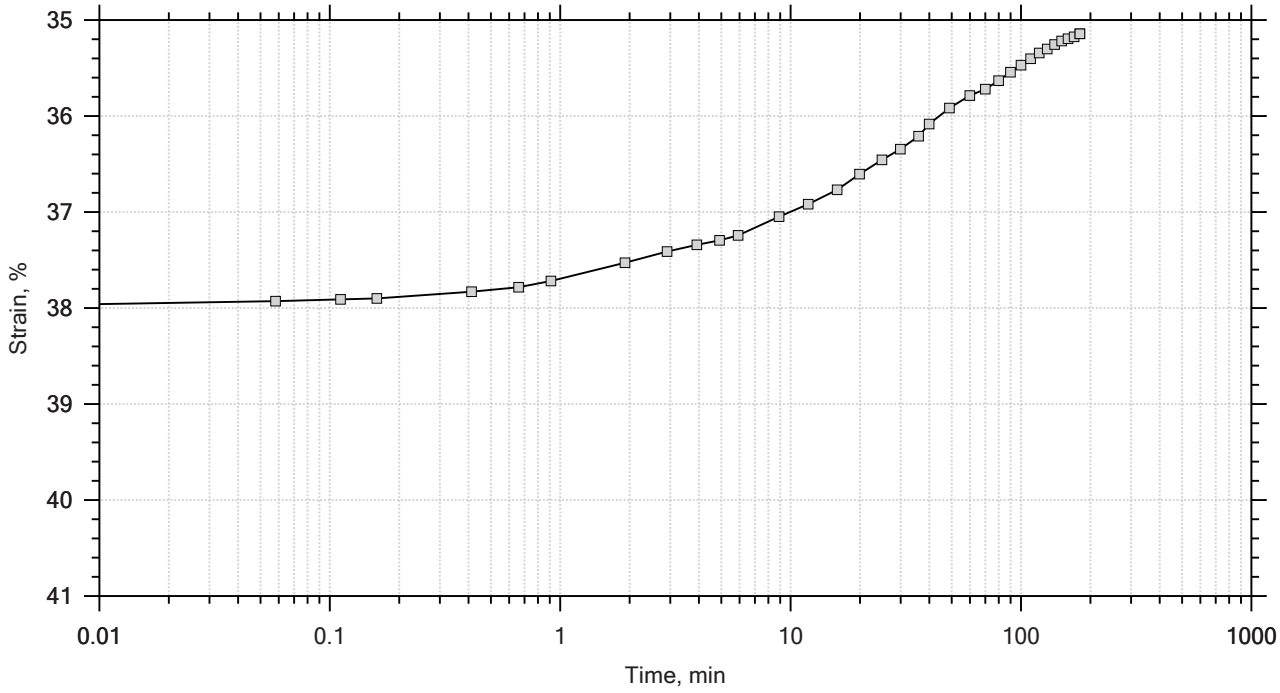


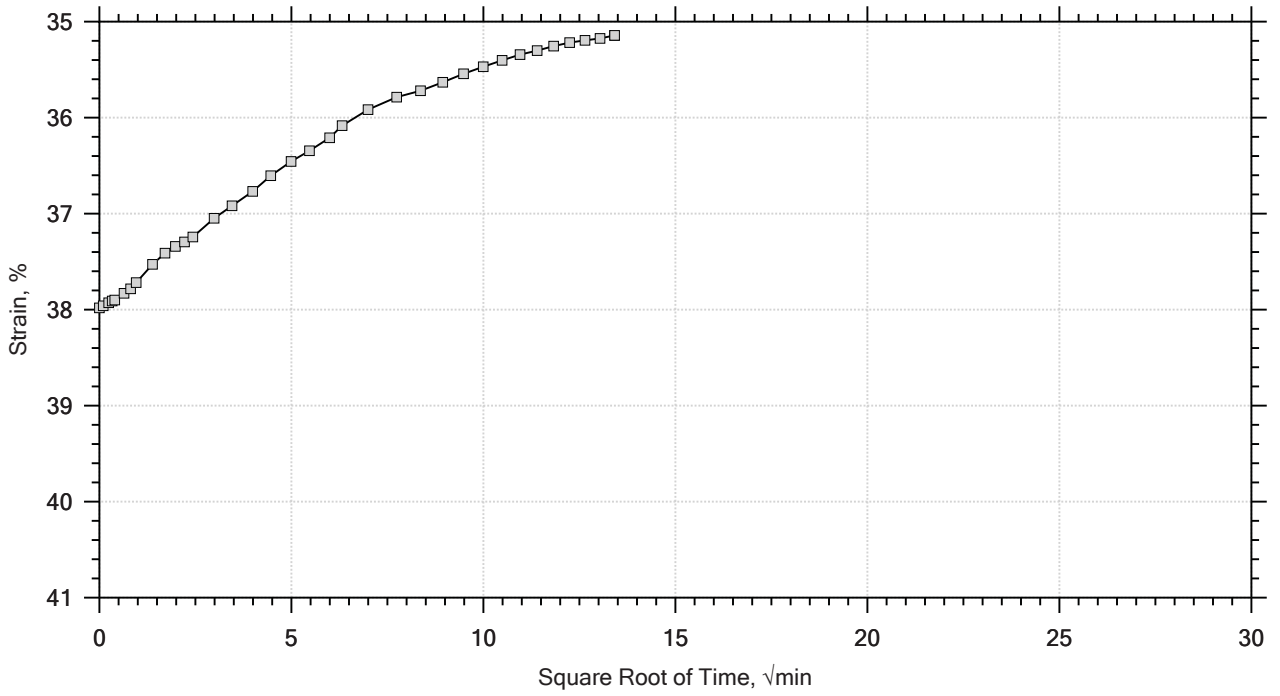


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-3	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System R, Swell Pressure = 0.0919 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 11
Constant Load Step
Stress: 0.5 tsf

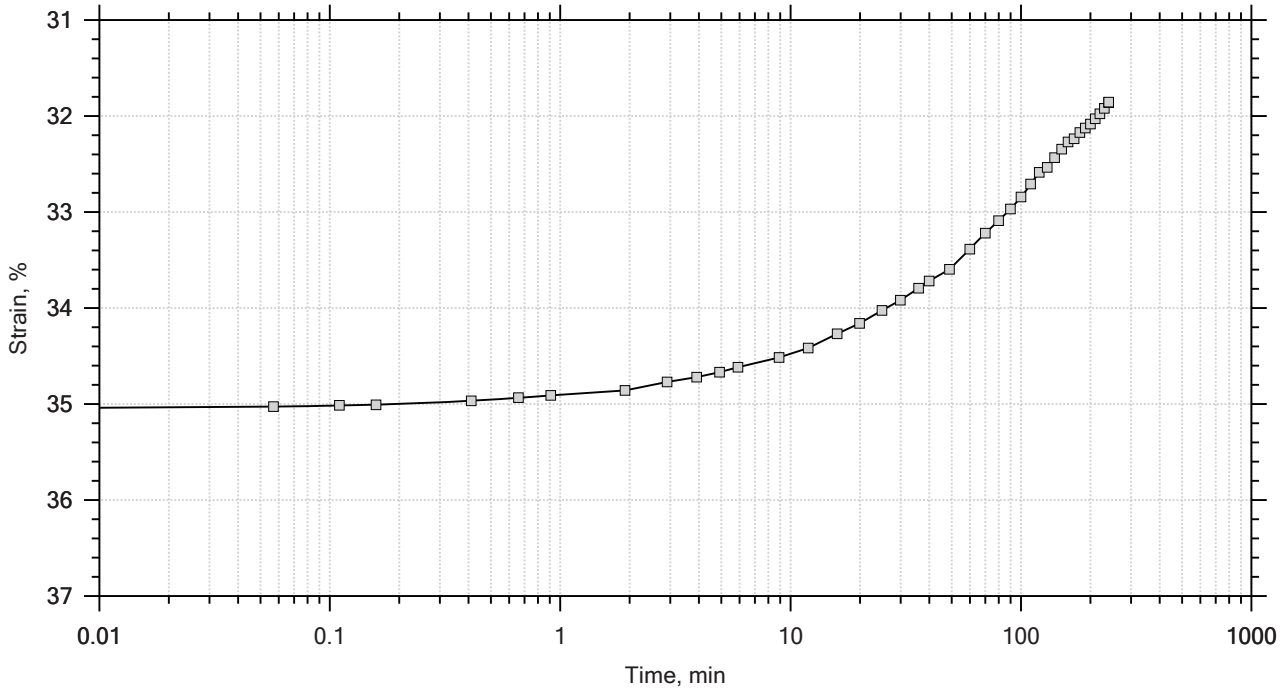


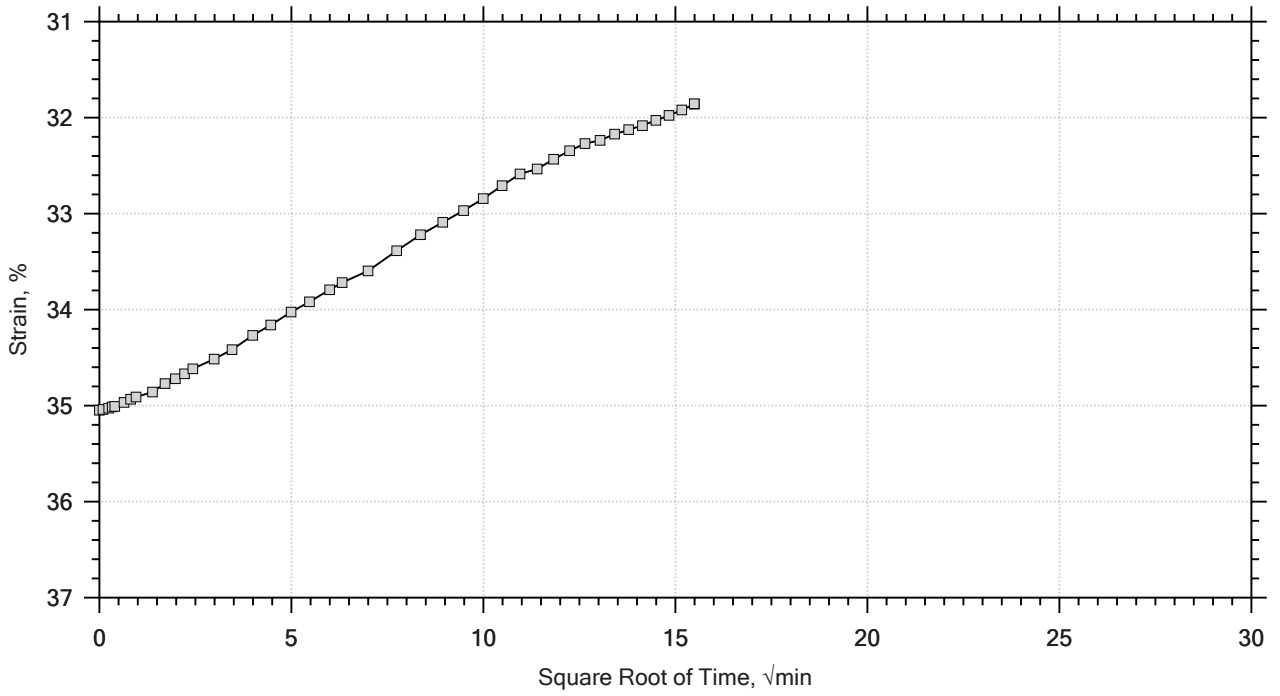


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-3	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System R, Swell Pressure = 0.0919 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 11
Constant Load Step
Stress: 0.125 tsf





Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-3	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System R, Swell Pressure = 0.0919 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.72	Liquid Limit: 111
Initial Height: 1.00 in	Initial Void Ratio: 2.48	Plastic Limit: 34
Final Height: 0.70 in	Final Void Ratio: 1.43	Plasticity Index: 77

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	15389	RING		C-1647
Mass Container, gm	8.21	109.02	109.02	8.42
Mass Container + Wet Soil, gm	241.13	228.23	205.21	99.61
Mass Container + Dry Soil, gm	141.82	172.05	172.05	68.17
Mass Dry Soil, gm	133.61	63.026	63.026	59.75
Water Content, %	74.33	89.14	52.62	52.62
Void Ratio	---	2.48	1.43	---
Degree of Saturation, %	---	98.06	100.00	---
Dry Unit Weight, pcf	---	48.913	69.876	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-3	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System R, Swell Pressure = 0.0919 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Log of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/s	Mv 1/tsf	k ft/day	Ca %
1	0.0919	0.0001397	2.48	0.0140	0.000	0.00e+00	1.52e-03	0.00e+00	0.00e+00
2	0.125	0.002189	2.47	0.219	0.000	0.00e+00	6.20e-02	0.00e+00	0.00e+00
3	0.250	0.02128	2.40	2.13	4.360	1.28e-06	1.53e-01	5.26e-04	0.00e+00
4	0.500	0.04825	2.31	4.82	4.805	1.11e-06	1.08e-01	3.22e-04	0.00e+00
5	1.00	0.1264	2.04	12.6	0.000	0.00e+00	1.56e-01	0.00e+00	0.00e+00
6	2.00	0.2444	1.63	24.4	18.156	2.08e-07	1.18e-01	6.63e-05	0.00e+00
7	4.00	0.3324	1.32	33.2	14.875	1.94e-07	4.40e-02	2.30e-05	0.00e+00
8	8.00	0.4049	1.07	40.5	11.940	1.90e-07	1.81e-02	9.30e-06	0.00e+00
9	2.00	0.3820	1.15	38.2	0.000	0.00e+00	3.82e-03	0.00e+00	0.00e+00
10	0.500	0.3514	1.25	35.1	19.511	1.17e-07	2.04e-02	6.44e-06	0.00e+00
11	0.125	0.3185	1.37	31.9	0.000	0.00e+00	8.77e-02	0.00e+00	0.00e+00

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-3	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System R, Swell Pressure = 0.0919 tsf		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Square Root of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv ft²/s	Mv 1/tsf	k ft/day
1	0.0919	0.0001397	2.48	0.0140	0.000	0.00e+00	1.52e-03	0.00e+00
2	0.125	0.002189	2.47	0.219	22.890	1.07e-06	6.20e-02	1.79e-04
3	0.250	0.02128	2.40	2.13	15.976	1.50e-06	1.53e-01	6.18e-04
4	0.500	0.04825	2.31	4.82	21.822	1.05e-06	1.08e-01	3.05e-04
5	1.00	0.1264	2.04	12.6	74.186	2.75e-07	1.56e-01	1.16e-04
6	2.00	0.2444	1.63	24.4	85.426	1.91e-07	1.18e-01	6.06e-05
7	4.00	0.3324	1.32	33.2	70.490	1.76e-07	4.40e-02	2.09e-05
8	8.00	0.4049	1.07	40.5	49.359	1.98e-07	1.81e-02	9.69e-06
9	2.00	0.3820	1.15	38.2	19.291	4.68e-07	3.82e-03	4.82e-06
10	0.500	0.3514	1.25	35.1	86.546	1.14e-07	2.04e-02	6.25e-06
11	0.125	0.3185	1.37	31.9	201.559	5.38e-08	8.77e-02	1.27e-05

GeoTesting EXPRESS

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-1	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-3	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System R, Swell Pressure = 0.0919 tsf		
Displacement at End of Increment		

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	---	Sample Type:	---	Tested By:	jbr
Sample ID:	---	Test Date:	08/30/16	Checked By:	mcm
Depth :	---	Test Id:	387124		

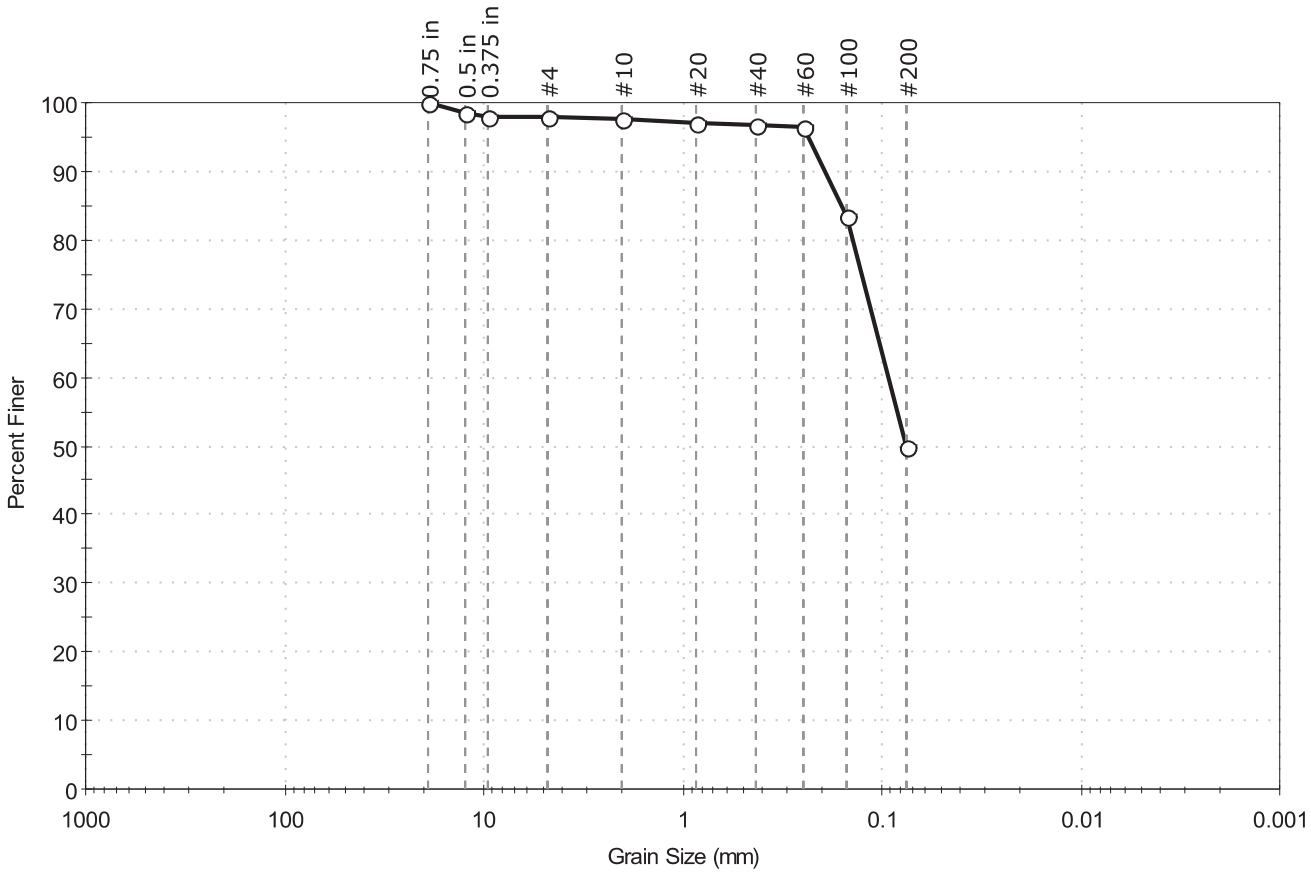
Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
AP-2	UD-1	16.0-18.0 ft	Moist, olive clayey sand	56.0

Notes: Temperature of Drying : 110º Celsius

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	AP-2	Sample Type:	tube	Tested By:	jbr
Sample ID:	UD-1	Test Date:	08/23/16	Checked By:	mcm
Depth :	16.0-18.0 ft	Test Id:	387103		
Test Comment:	---				
Visual Description:	Moist, olive clayey sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	2.1	48.0	49.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	98		
0.375 in	9.50	98		
#4	4.75	98		
#10	2.00	98		
#20	0.85	97		
#40	0.42	97		
#60	0.25	96		
#100	0.15	83		
#200	0.075	50		

Coefficients

D_{85} = 0.1600 mm D_{30} = N/A

D_{60} = 0.0925 mm D_{15} = N/A

D_{50} = 0.0752 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM Clayey sand (SC)

AASHTO Clayey Soils (A-7-6 (17))

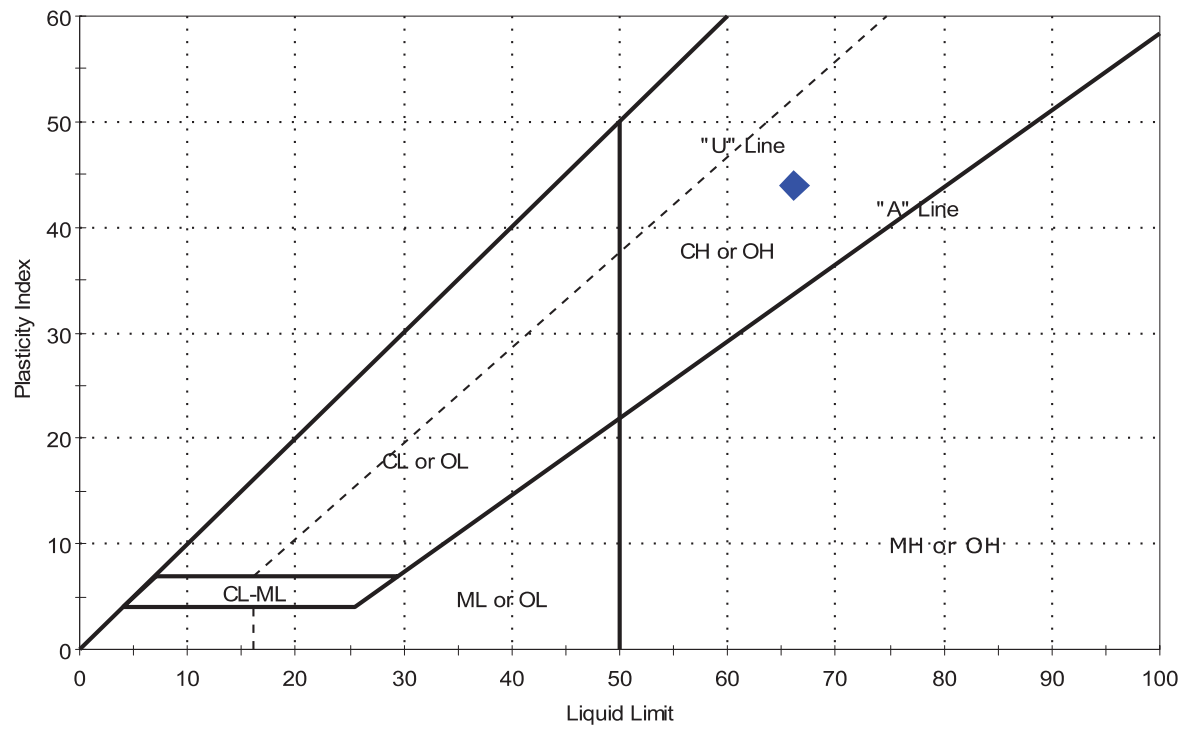
Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	AP-2	Sample Type:	tube	Tested By:	cam
Sample ID:	UD-1	Test Date:	08/22/16	Checked By:	mcm
Depth :	16.0-18.0 ft	Test Id:	387111		
Test Comment:	---				
Visual Description:	Moist, olive clayey sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UD-1	AP-2	16.0-18.0 ft	56	66	22	44	0.8	Clayey sand (SC)

Sample Prepared using the WET method

3% Retained on #40 Sieve

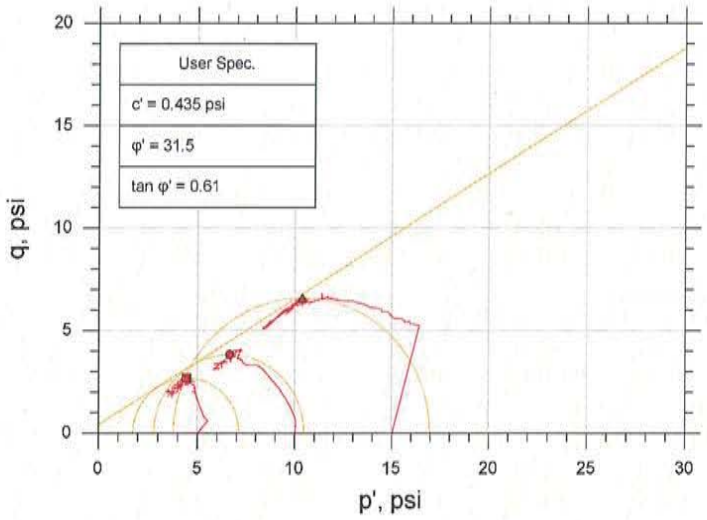
Dry Strength: VERY HIGH

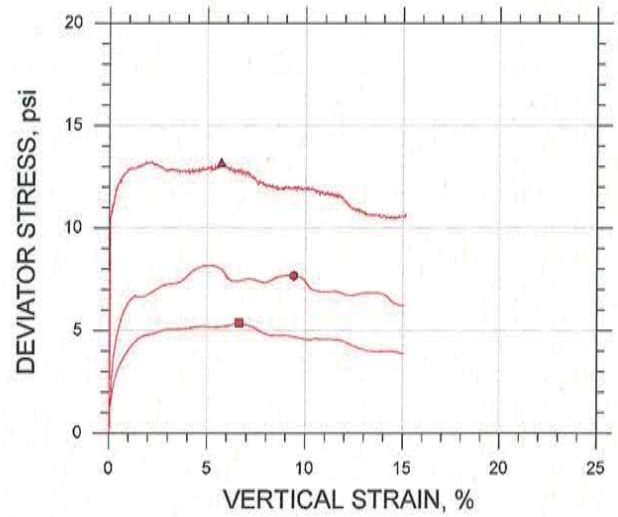
Dilatancy: SLOW

Toughness: LOW

Client: F&ME Consultants	
Project Name: US 21 Replacement Bridge	
Project Location: ---	
Project Number: GTX-305005	
Tested By: md	Checked By: mcm
Boring ID: AP-2	
Preparation: intact	
Description: Moist, olive clayey sand	
Classification: Clayey sand	
Group Symbol: SC	
Liquid Limit: 66	Plastic Limit: 22
Plasticity Index: 44	Estimated Specific Gravity: 2.7

CONSOLIDATED DRAINED TRIAXIAL TEST by ASTM D4767





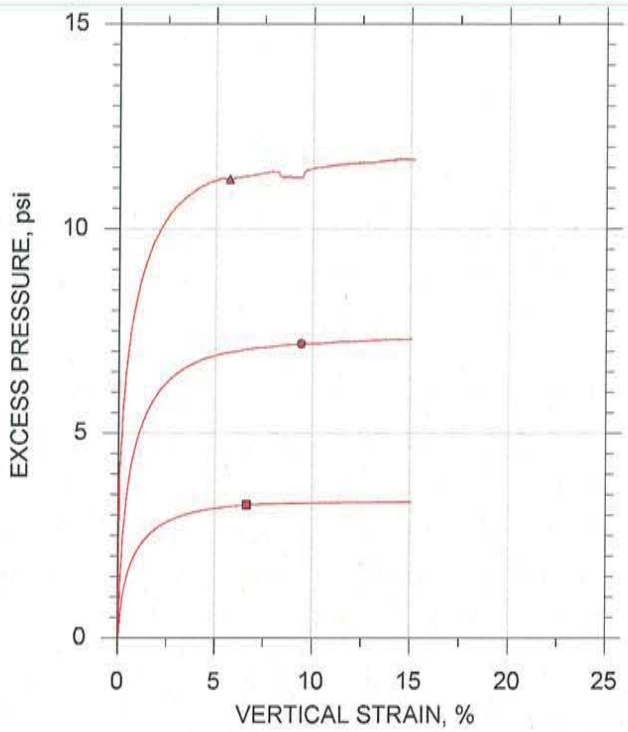
Symbol		■	●	▲	
Sample ID		ST-1	ST-1	ST-1	
Depth, ft		16.0-18.0 ft	16.0-18.0 ft	16.0-18.0 ft	
Test Number		CU-2-1	CU-2-2	CU-2-3	
Initial	Height, in	4.650	4.720	4.390	
	Diameter, in	2.050	2.030	2.030	
	Moisture Content (from Cuttings), %	72.9	49.2	52.1	
	Dry Density, pcf	56.4	69.3	66.4	
	Saturation (Wet Method), %	99.0	92.7	91.5	
	Void Ratio	1.99	1.43	1.54	
Before Shear	Moisture Content, %	70.4	47.1	47.2	
	Dry Density, pcf	58.1	74.2	74.1	
	Cross-sectional Area (Method A), in²	3.205	3.042	2.998	
	Saturation, %	100.0	100.0	100.0	
	Void Ratio	1.90	1.27	1.28	
	Back Pressure, psi	139.0	150.8	150.9	
Vertical Effective Consolidation Stress, psi		5.002	9.937	14.76	
Horizontal Effective Consolidation Stress, psi		5.002	9.987	14.99	
Vertical Strain after Consolidation, %		0.01752	0.6124	2.957	
Volumetric Strain after Consolidation, %		3.012	6.546	9.651	
Time to 50% Consolidation, min		92.16	45.56	161.3	
Shear Strength, psi		2.690	3.838	6.597	
Strain at Failure, %		6.63	9.40	5.69	
Strain Rate, %/min		0.01600	0.01600	0.01600	
Deviator Stress at Failure, psi		5.381	7.677	13.19	
Effective Minor Principal Stress at Failure, psi		1.747	2.795	3.775	
Effective Major Principal Stress at Failure, psi		7.128	10.47	16.97	
B-Value		0.95	0.95	0.95	

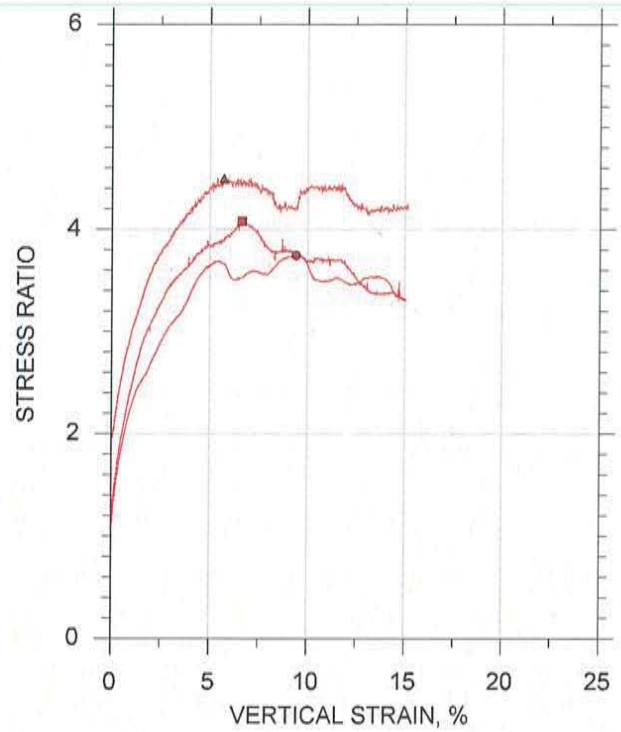
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

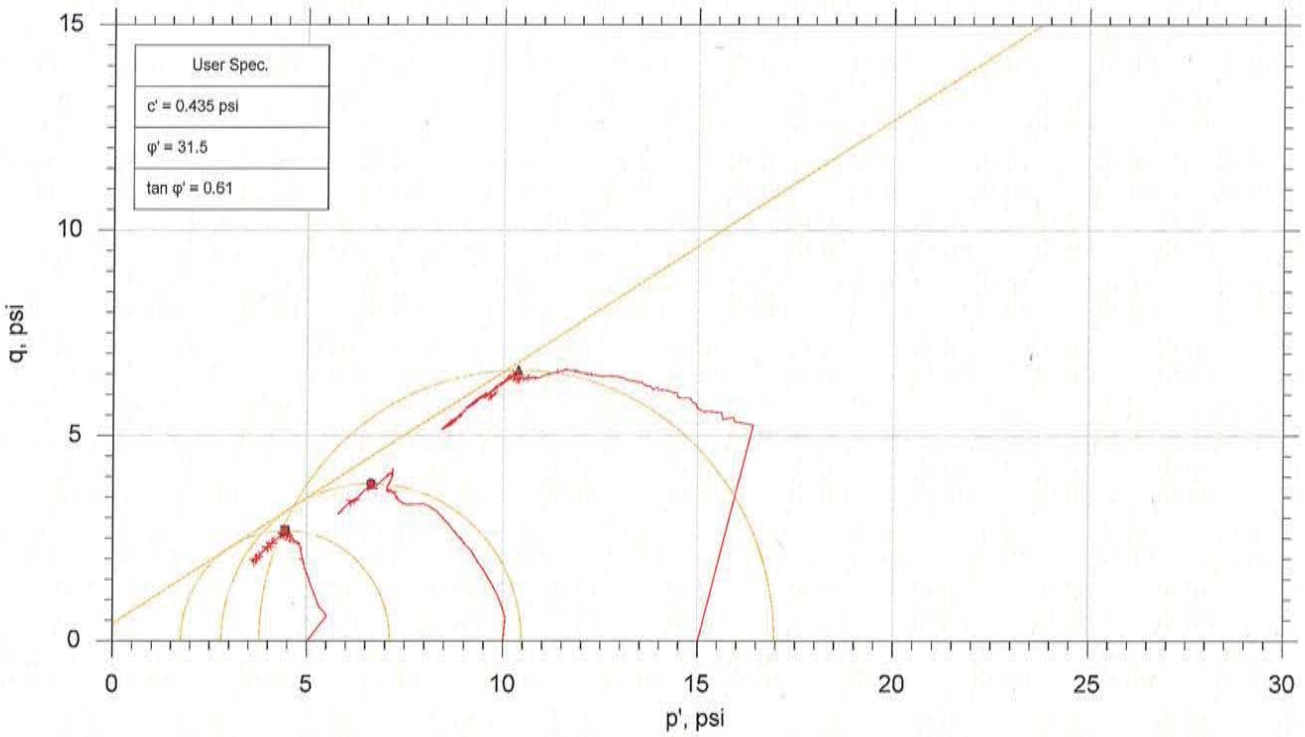
Remarks:

System B. Note CU-2-3 test specimen was not used in determining cohesion or friction values.

CONSOLIDATED DRAINED TRIAXIAL TEST by ASTM D4767







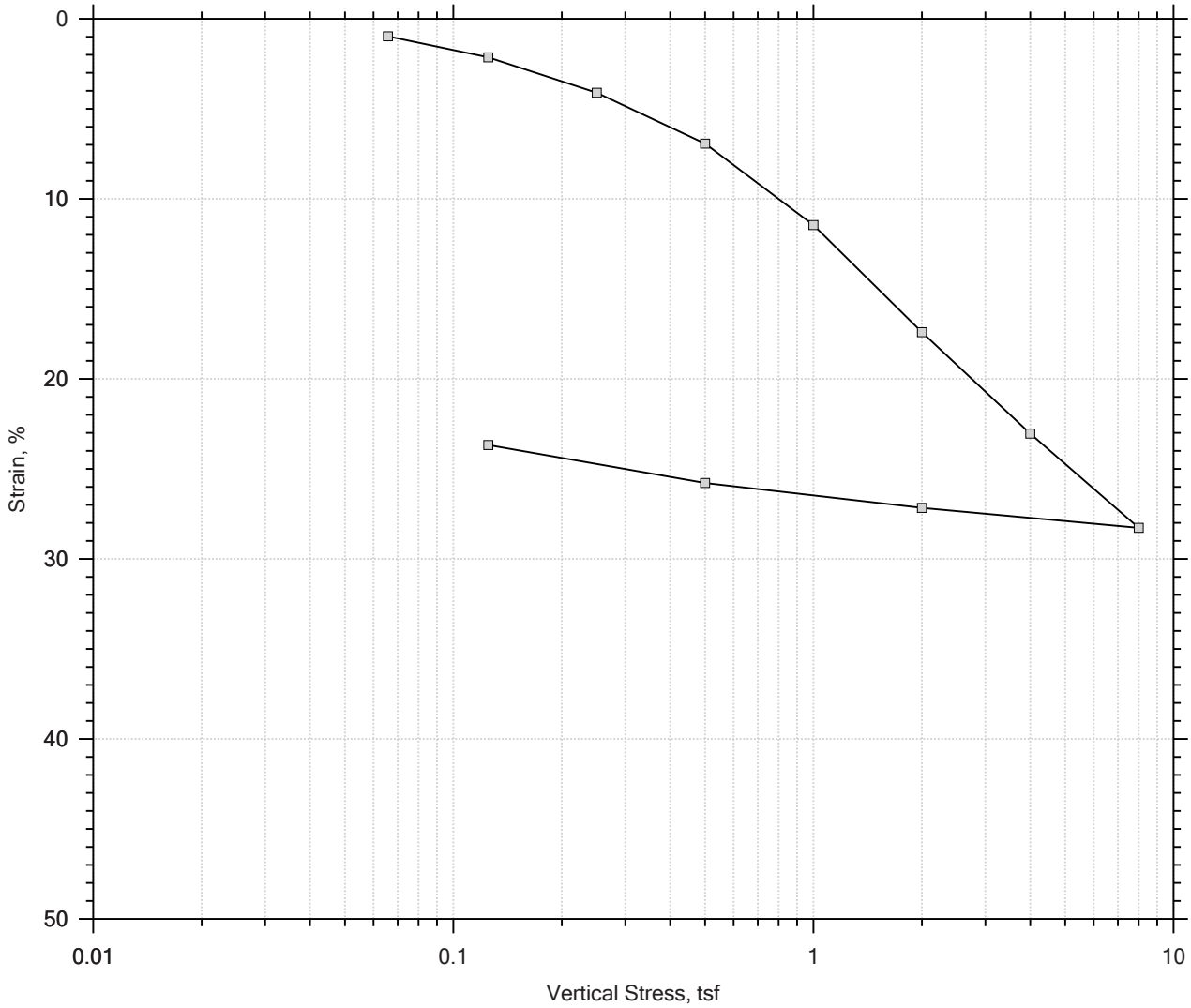
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	ST-1	CU-2-1	16.0-18.0 ft	md	8/19/16	mcm	8/31/16	305005-CU-2-1m.dat
●	ST-1	CU-2-2	16.0-18.0 ft	md	8/18/16	mcm	8/31/16	305005-CU-2-2m.dat
▲	ST-1	CU-2-3	16.0-18.0 ft	md	8/18/16	mcm	8/31/16	305005-CU-2-3m.dat

GeoTesting EXPRESS

Project: US 21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Sample Type: intact	
Description: Moist, olive clayey sand		
Remarks: System B. Note CU-2-3 test specimen was not used in determining cohesion or friction values.		

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report

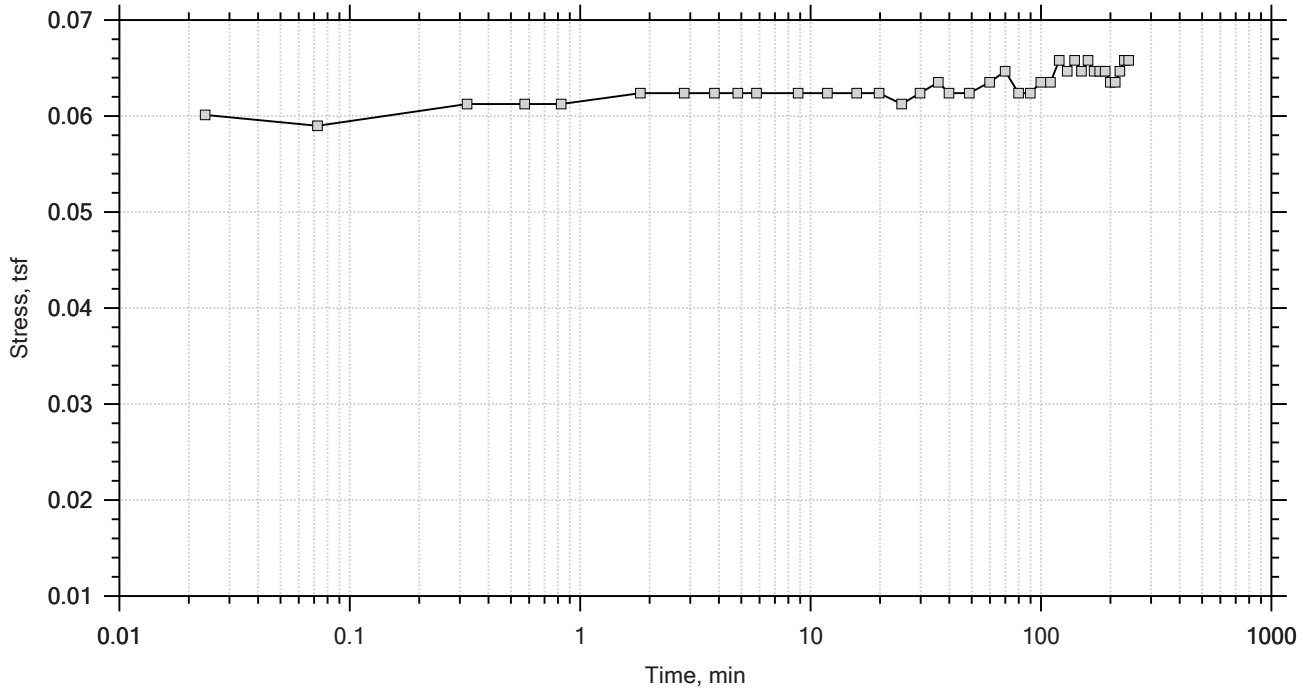


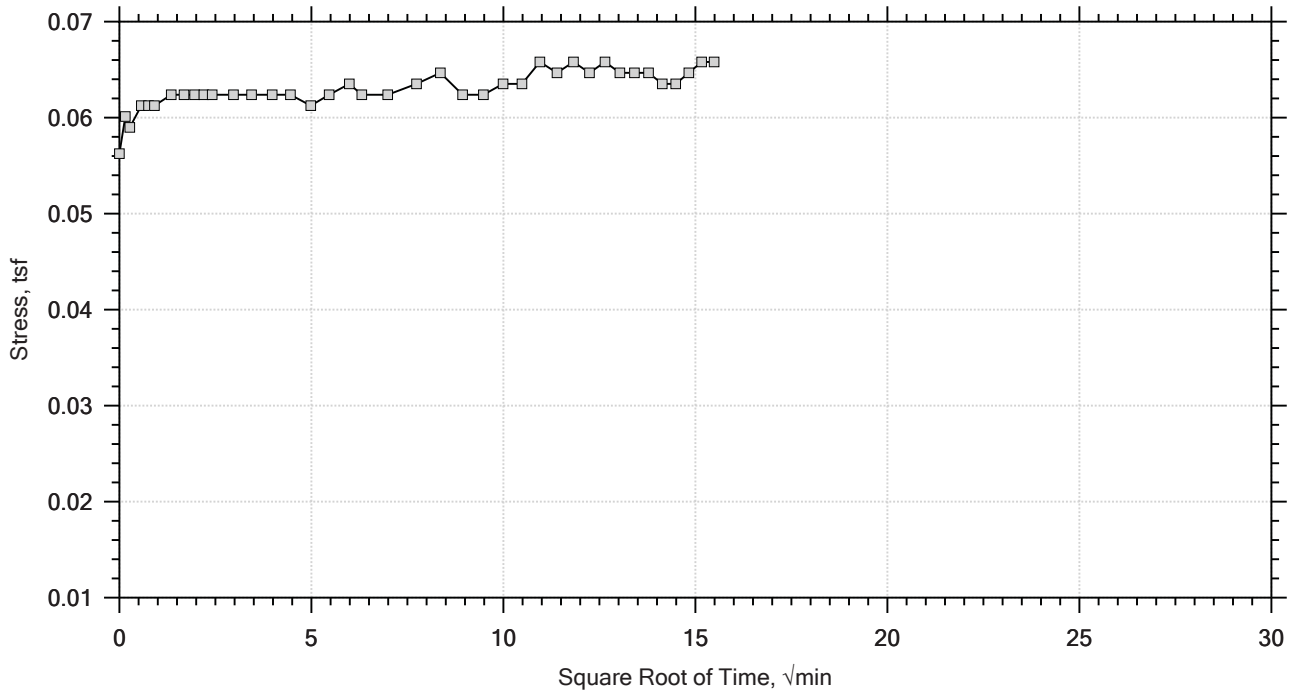
				Before Test	After Test
Current Vertical Effective Stress: ---				Water Content, %	51.80	34.90
Preconsolidation Stress: ---				Dry Unit Weight, pcf	69.92	87.4
Compression Ratio: ---				Saturation, %	98.17	100.00
Diameter: 2.5 in		Height: 1 in		Void Ratio	1.44	0.96
LL: 66	PL: 22	PI: 44	GS: 2.74			

GeoTesting EXPRESS	Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
	Boring No.: AP-2	Tested By: md	Checked By: mcm
	Sample No.: UD-1	Test Date: 08/19/16	Depth: 16.0-18.0 ft
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Moist, olive clayey sand		
	Remarks: System S, Swell Pressure = 0.0658 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 11
Constant Volume Step
Stress: 0.0658 tsf

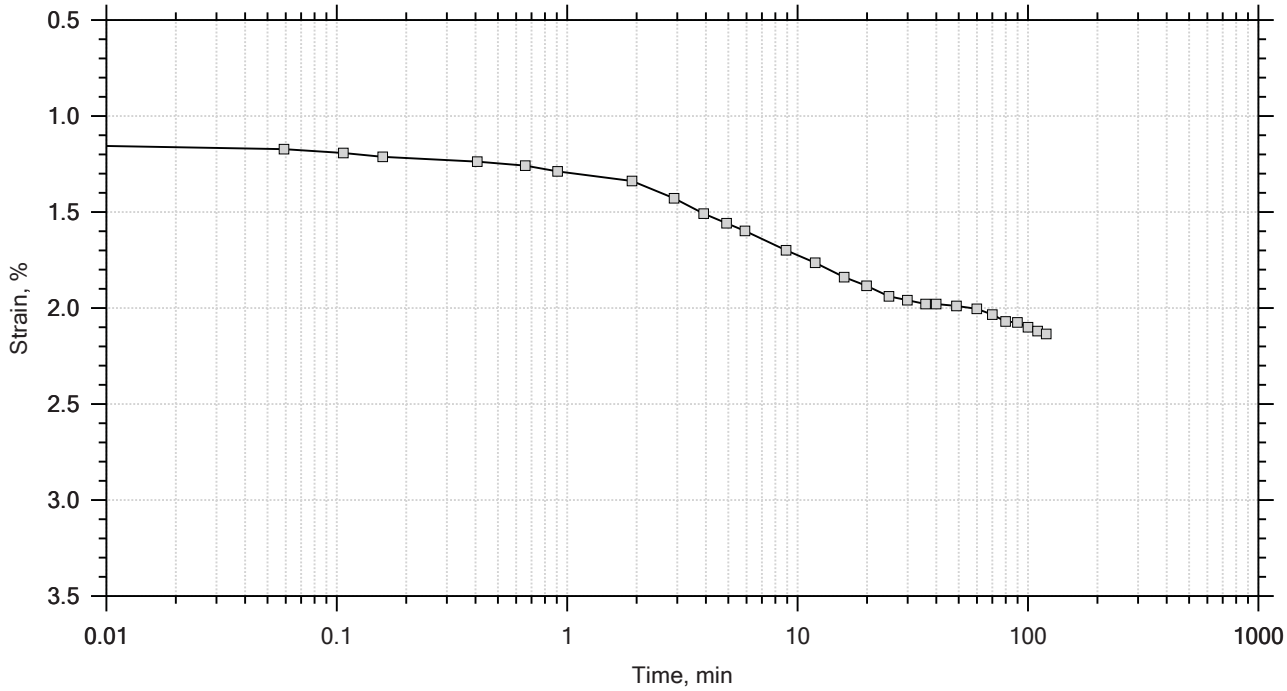


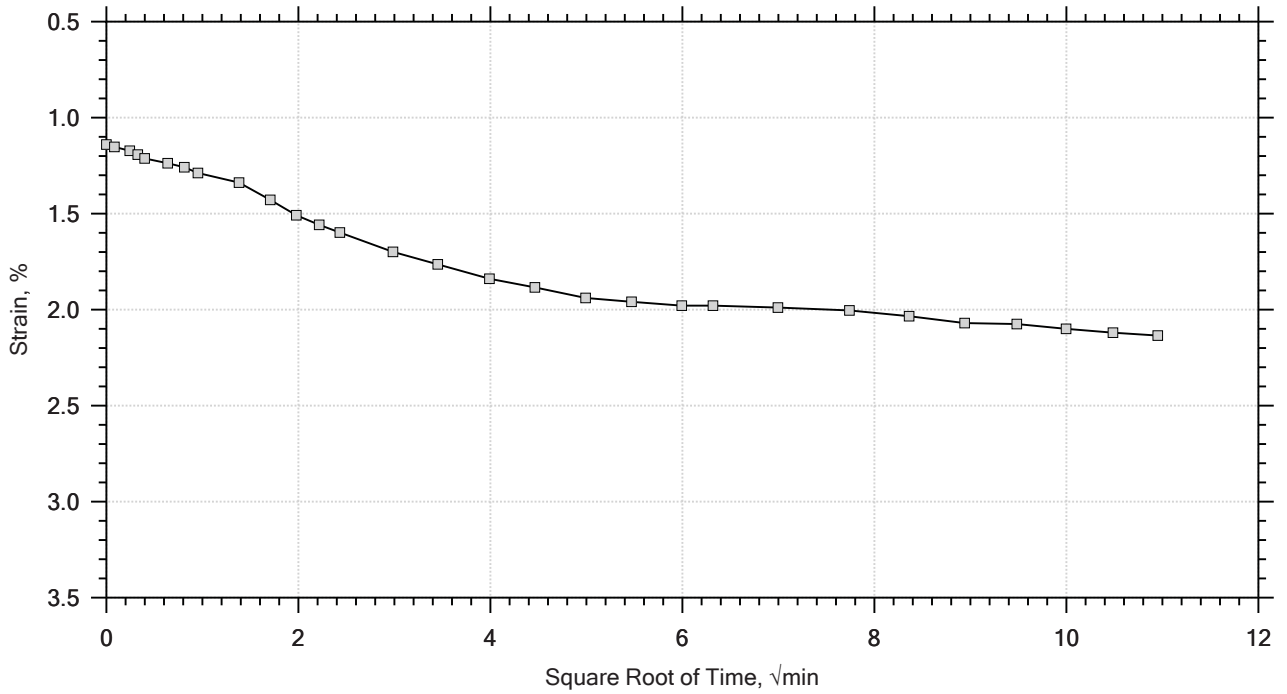


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/19/16	Depth: 16.0-18.0 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Moist, olive clayey sand		
Remarks: System S, Swell Pressure = 0.0658 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 11
Constant Load Step
Stress: 0.125 tsf

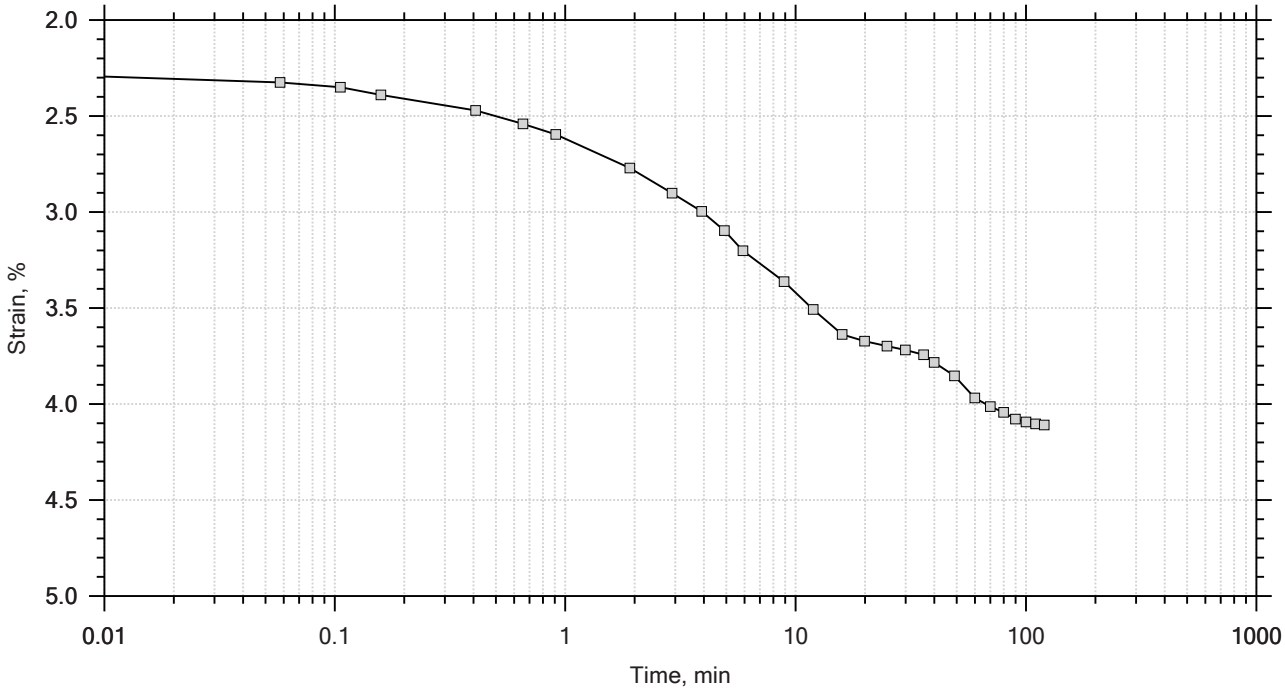


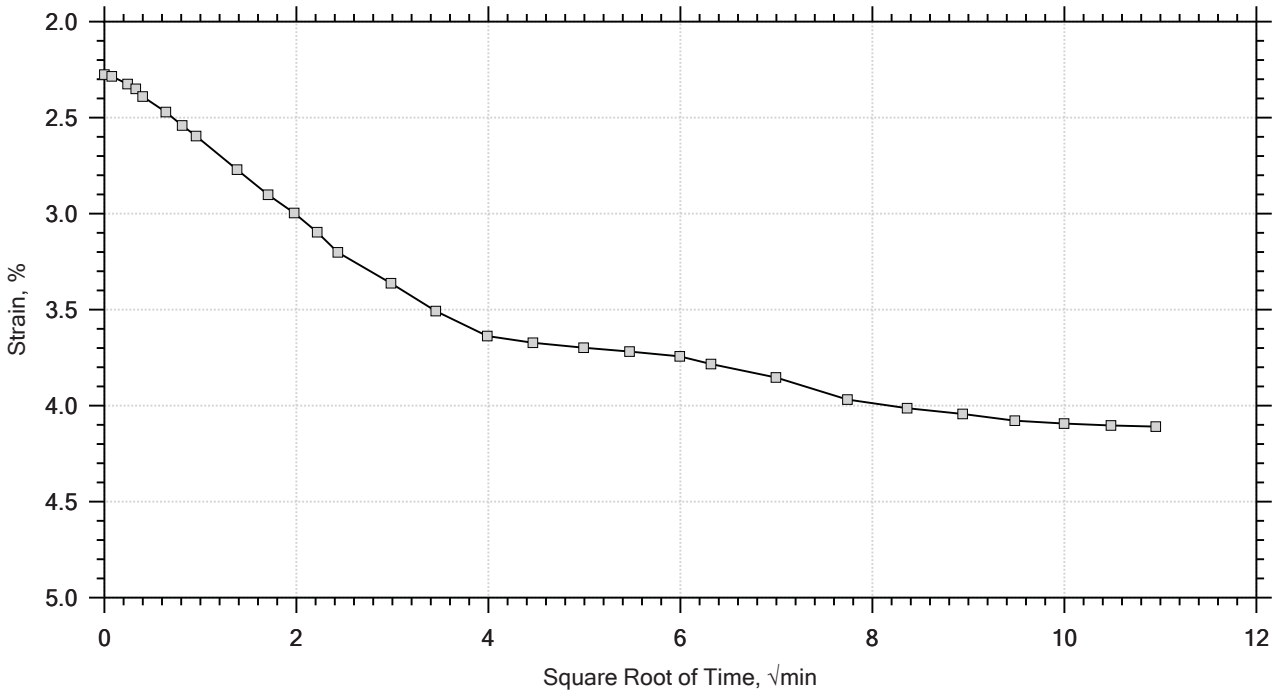


GeoTesting EXPRESS	Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
	Boring No.: AP-2	Tested By: md	Checked By: mcm
	Sample No.: UD-1	Test Date: 08/19/16	Depth: 16.0-18.0 ft
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Moist, olive clayey sand		
	Remarks: System S, Swell Pressure = 0.0658 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 11
Constant Load Step
Stress: 0.25 tsf

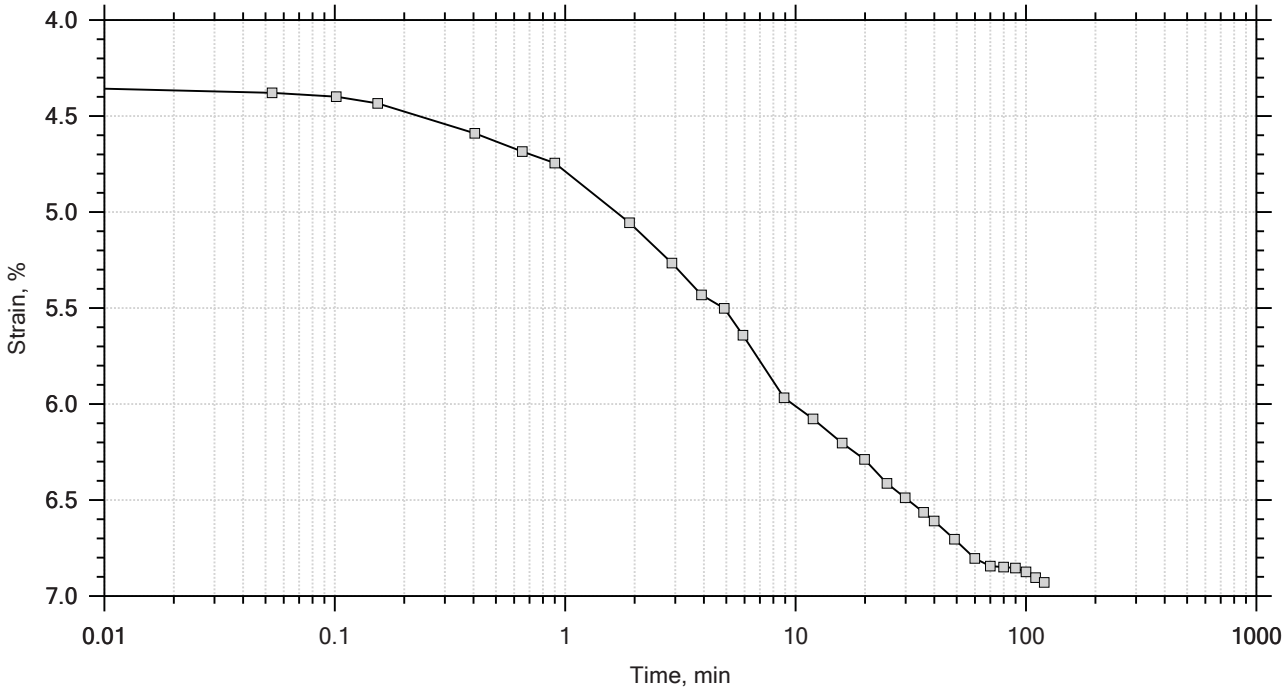


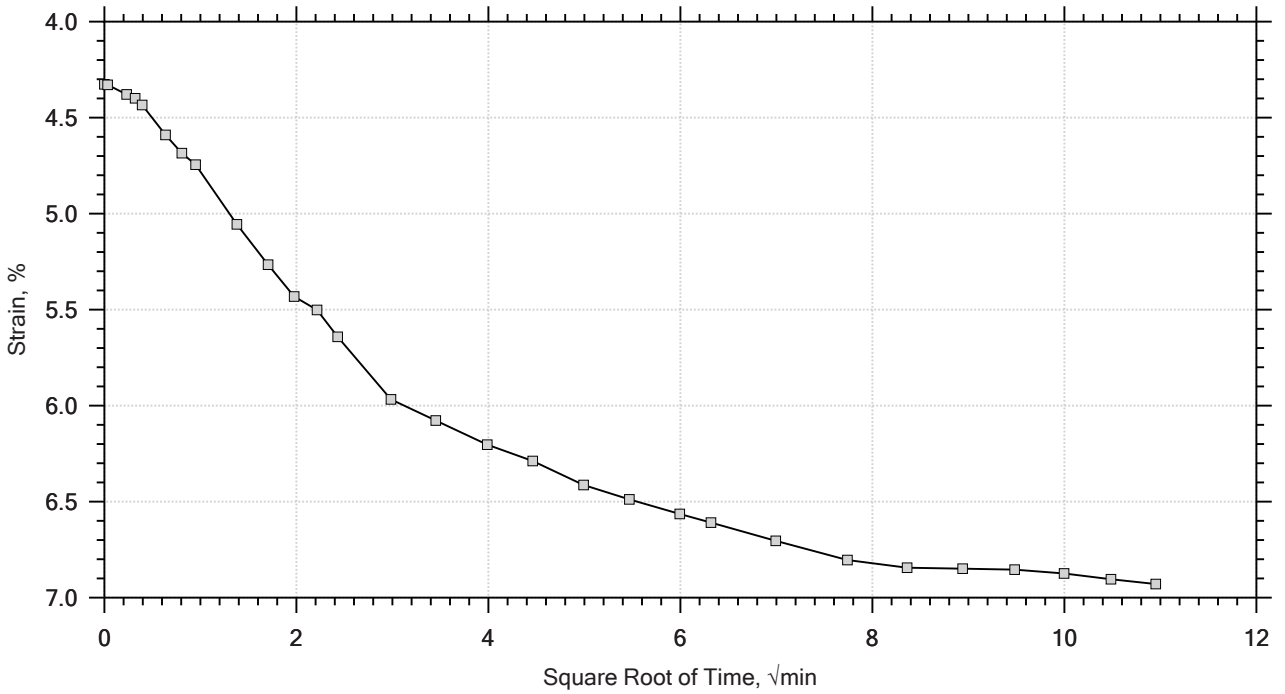


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/19/16	Depth: 16.0-18.0 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Moist, olive clayey sand		
Remarks: System S, Swell Pressure = 0.0658 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 11
Constant Load Step
Stress: 0.5 tsf

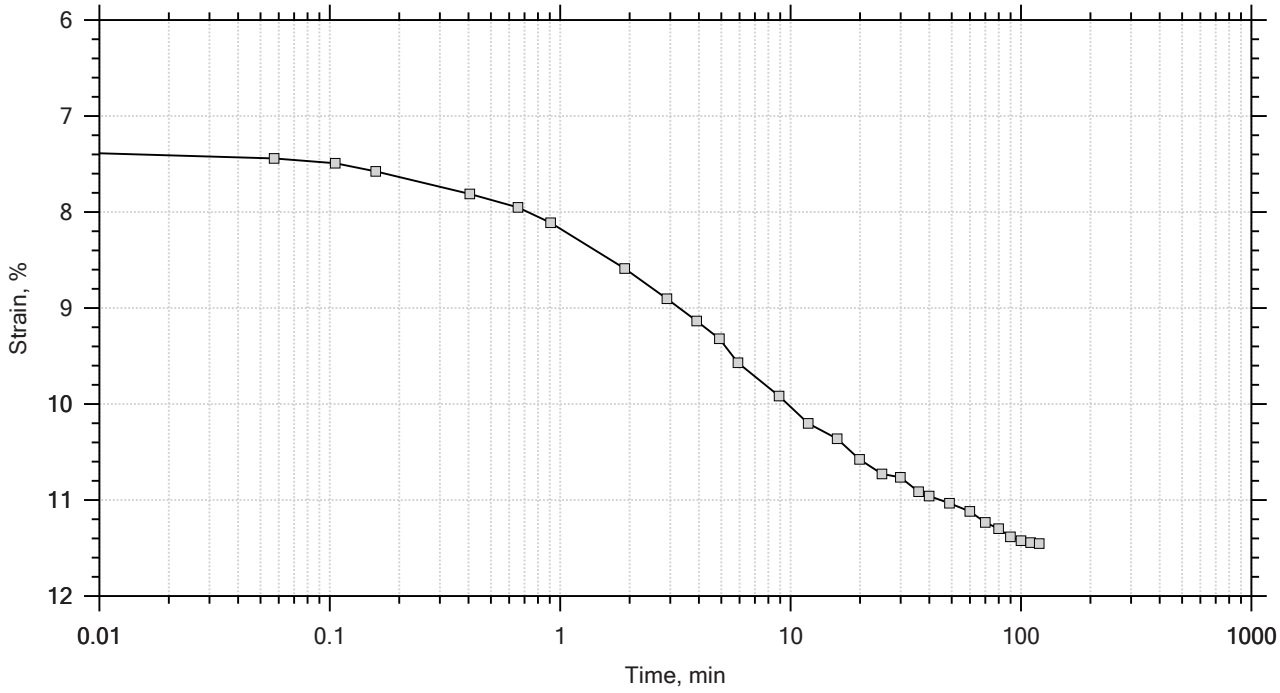


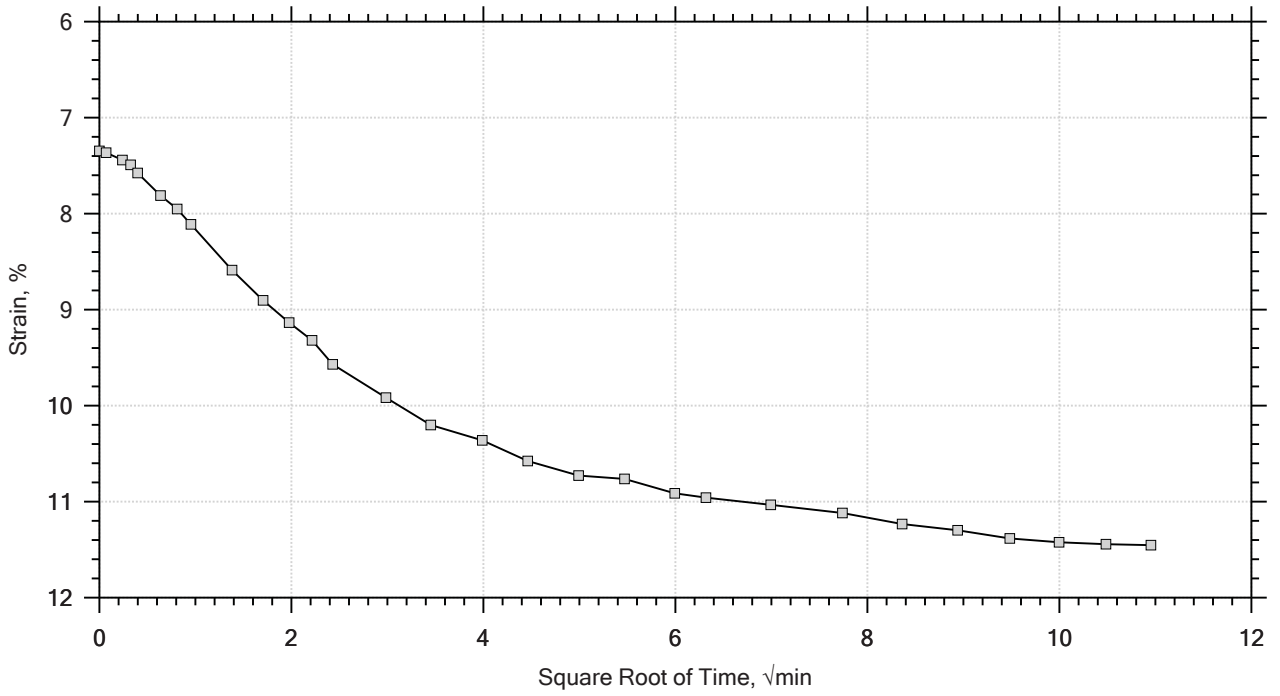


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/19/16	Depth: 16.0-18.0 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Moist, olive clayey sand		
Remarks: System S, Swell Pressure = 0.0658 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 11
Constant Load Step
Stress: 1 tsf

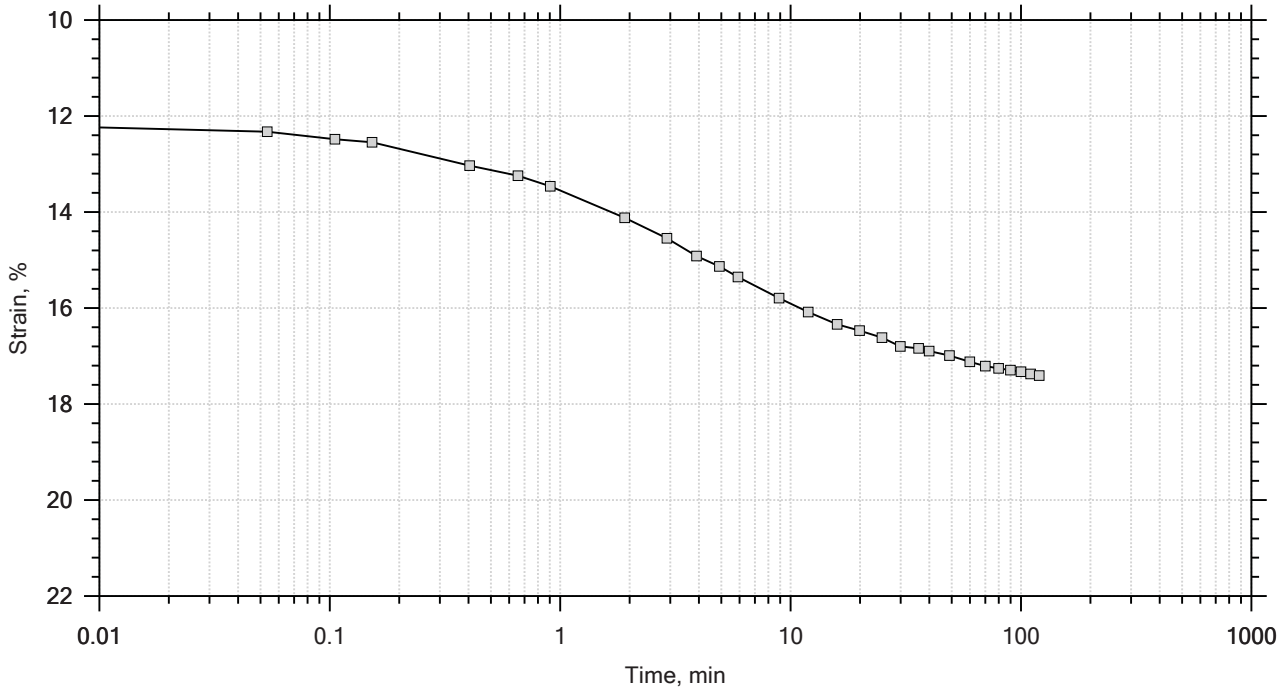


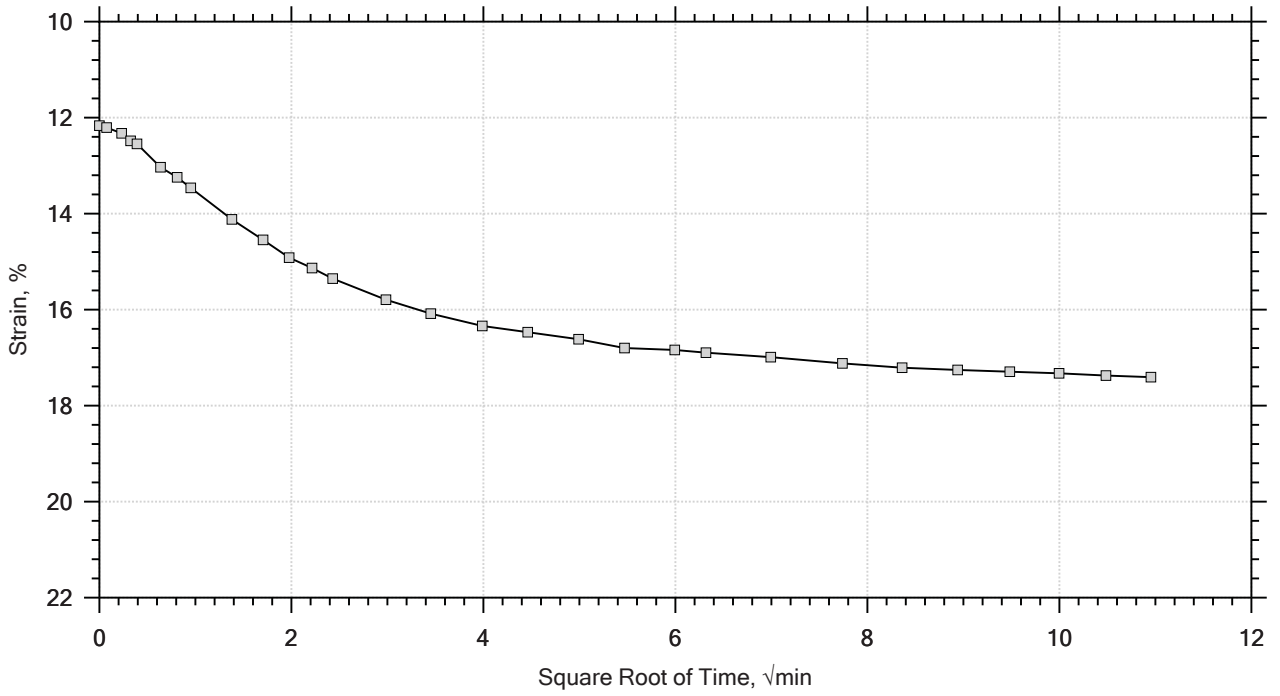


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/19/16	Depth: 16.0-18.0 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Moist, olive clayey sand		
Remarks: System S, Swell Pressure = 0.0658 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 11
Constant Load Step
Stress: 2 tsf

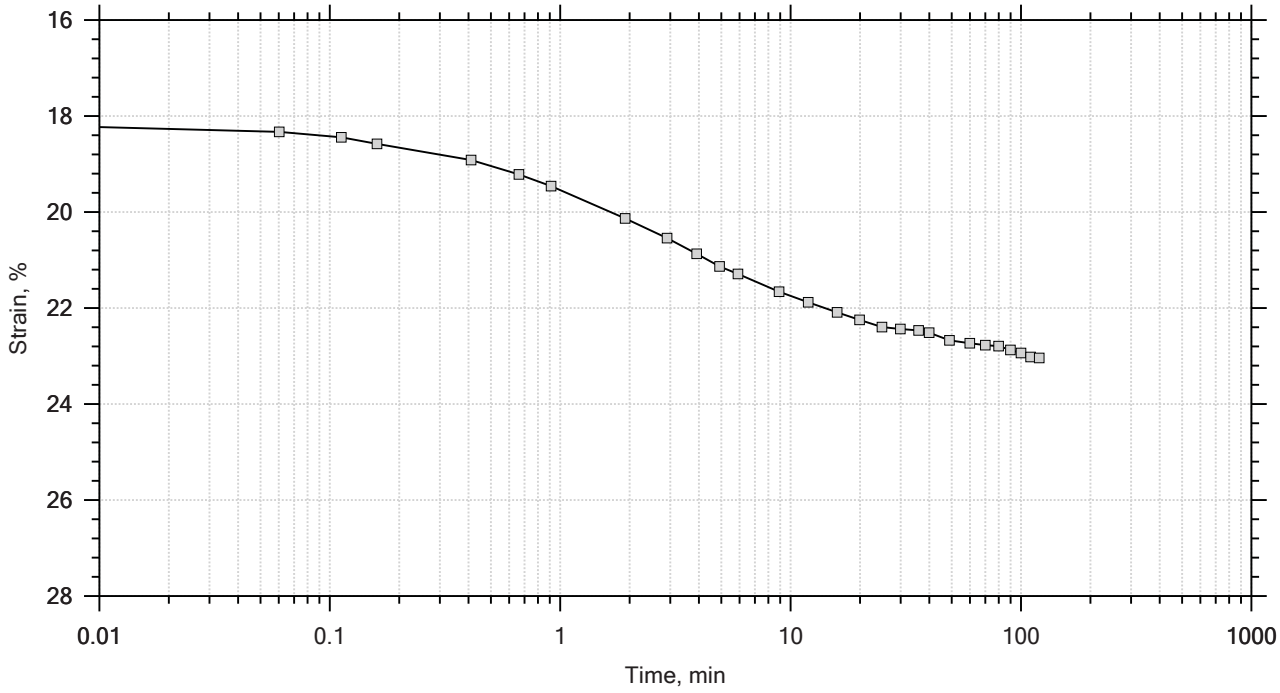


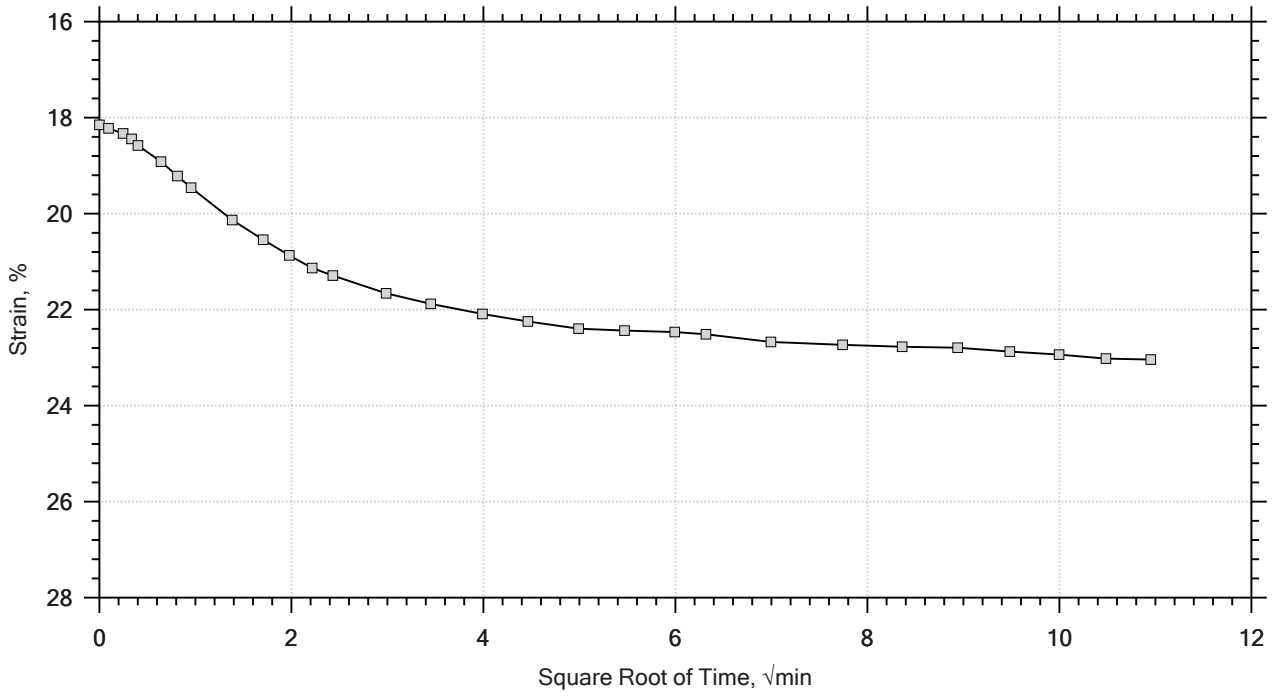


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/19/16	Depth: 16.0-18.0 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Moist, olive clayey sand		
Remarks: System S, Swell Pressure = 0.0658 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 11
Constant Load Step
Stress: 4 tsf

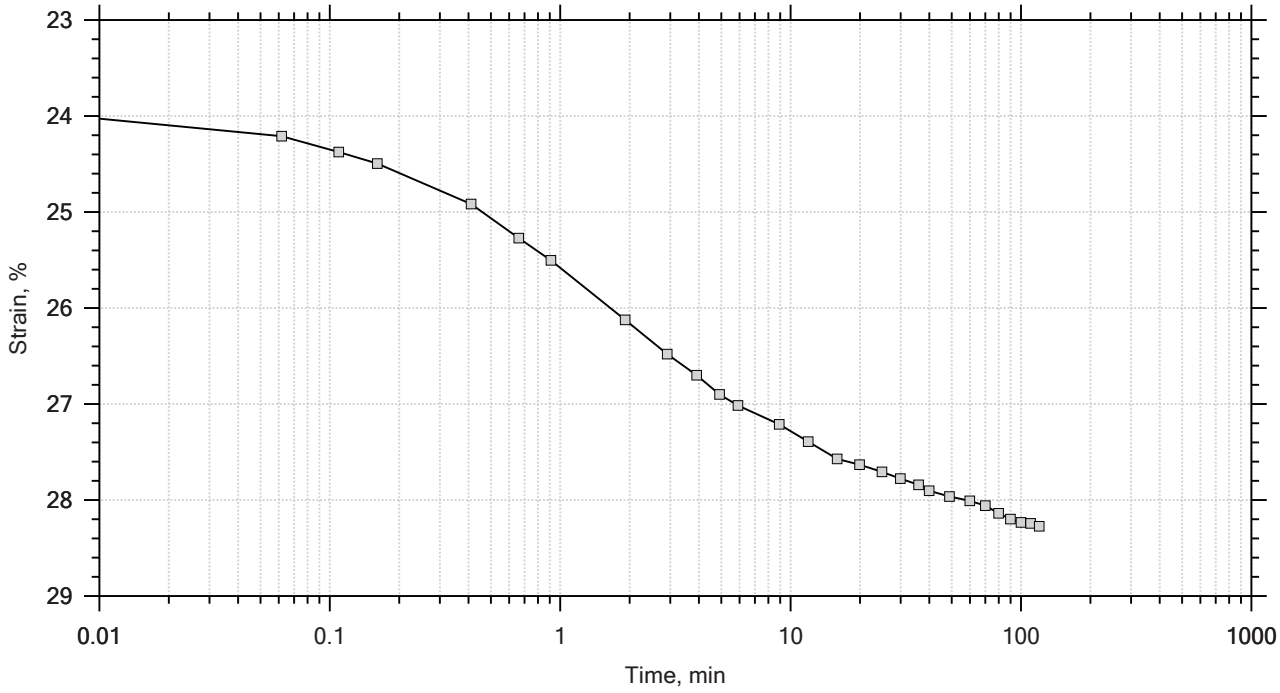


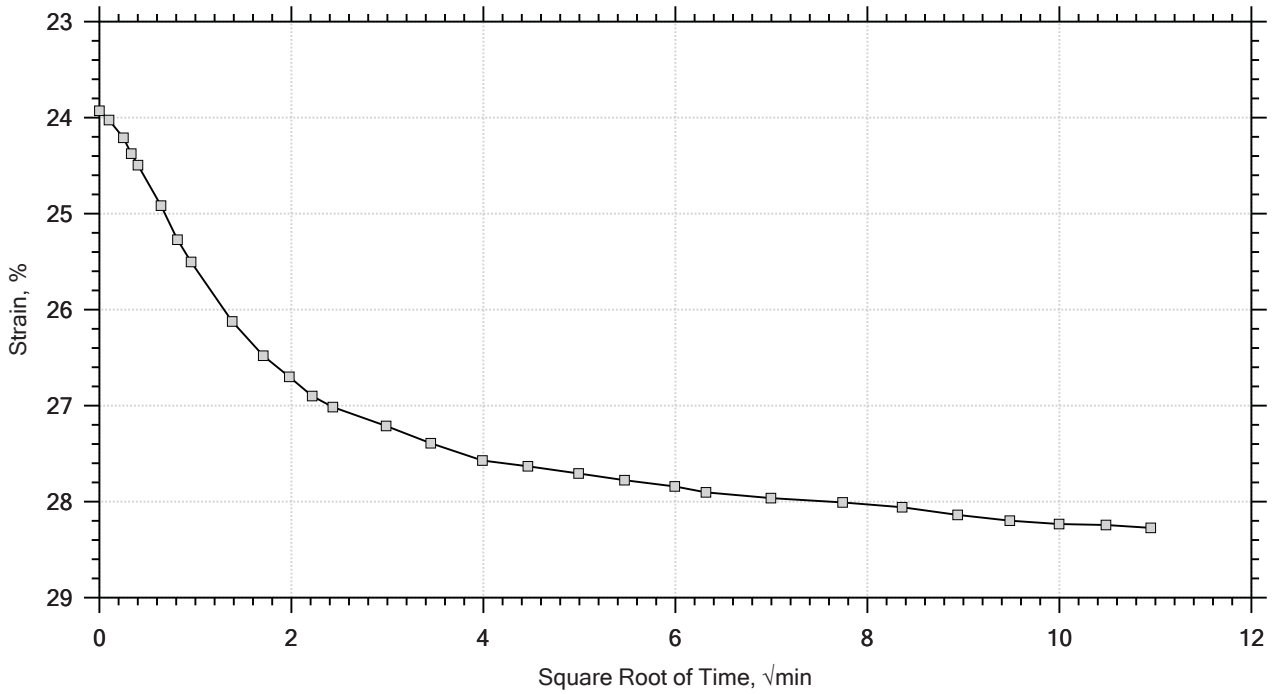


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/19/16	Depth: 16.0-18.0 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Moist, olive clayey sand		
Remarks: System S, Swell Pressure = 0.0658 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 11
Constant Load Step
Stress: 8 tsf

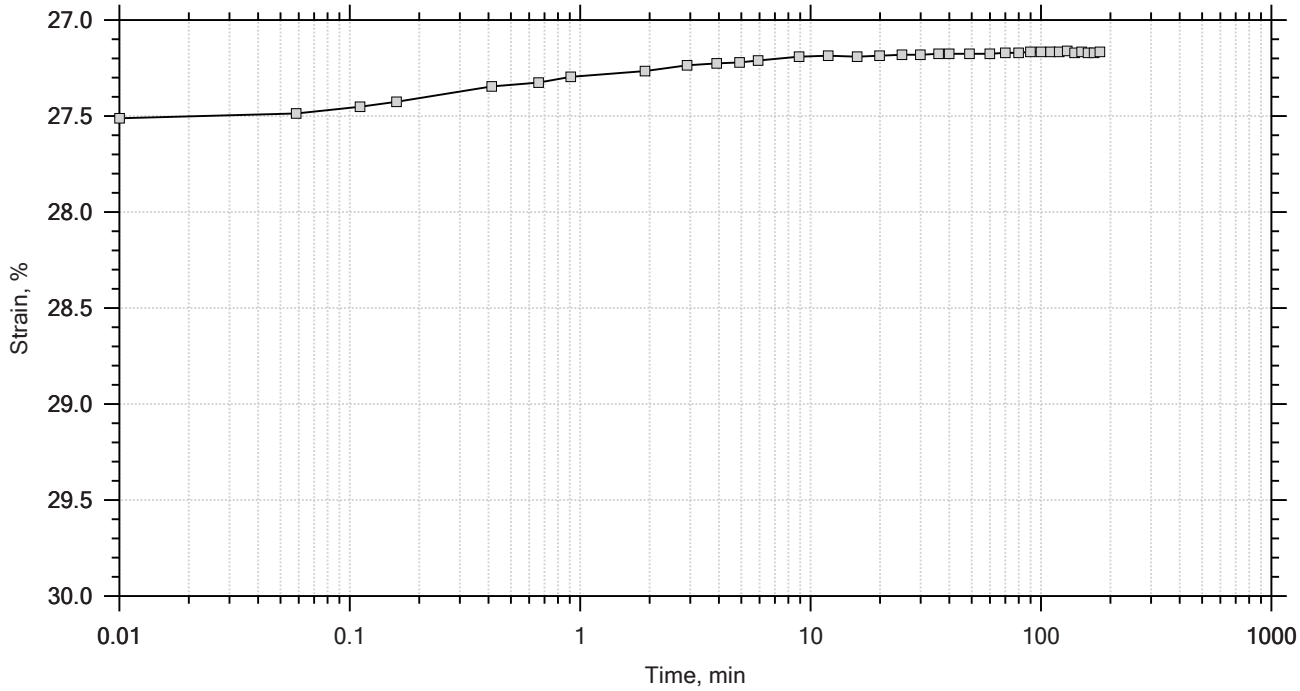


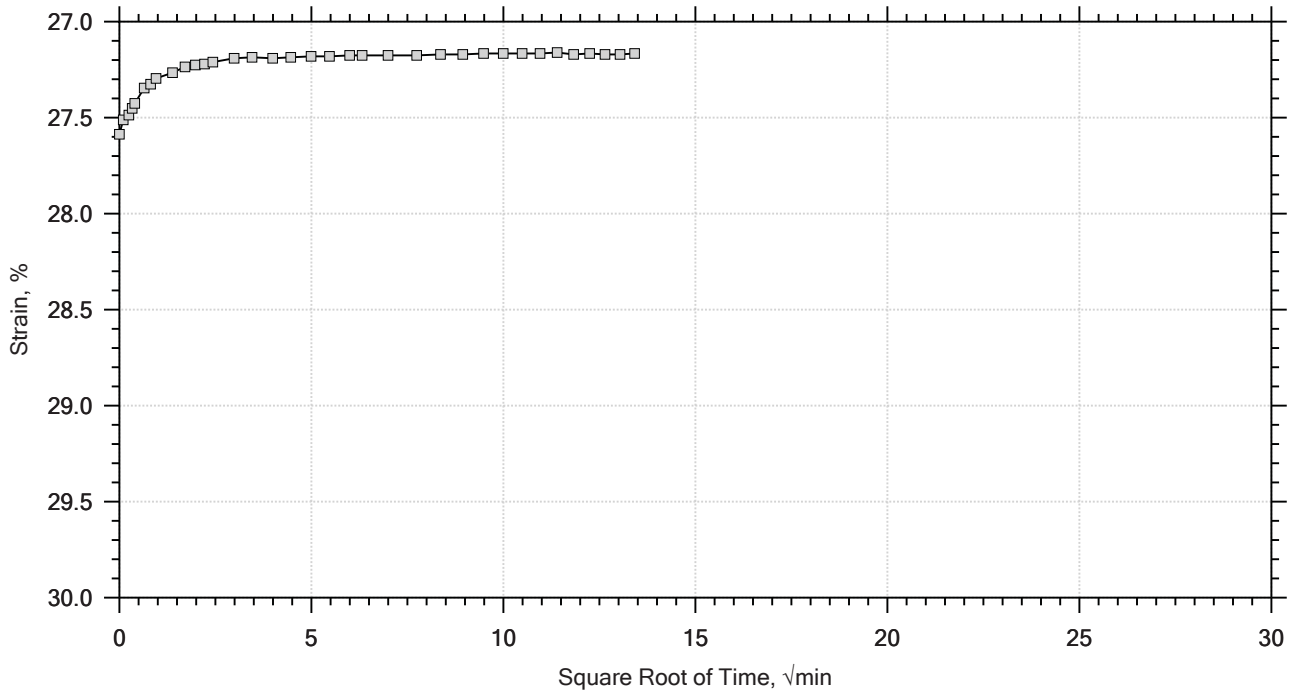


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/19/16	Depth: 16.0-18.0 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Moist, olive clayey sand		
Remarks: System S, Swell Pressure = 0.0658 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 11
Constant Load Step
Stress: 2 tsf

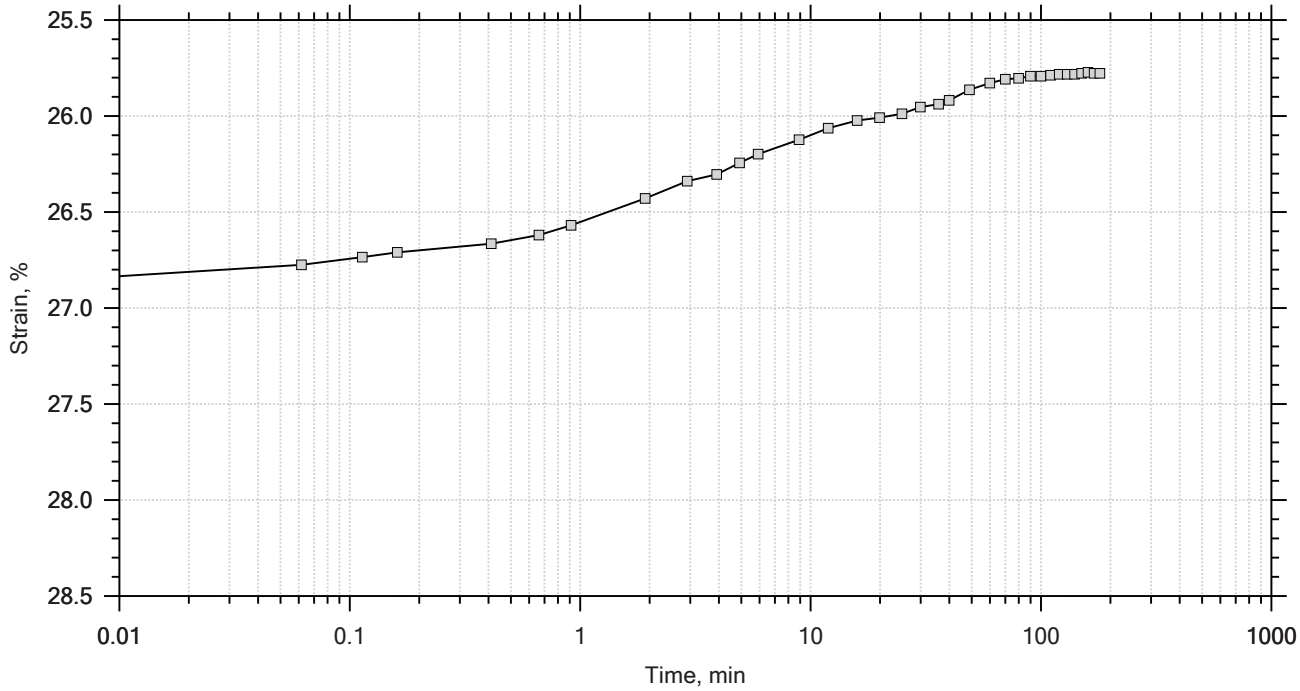


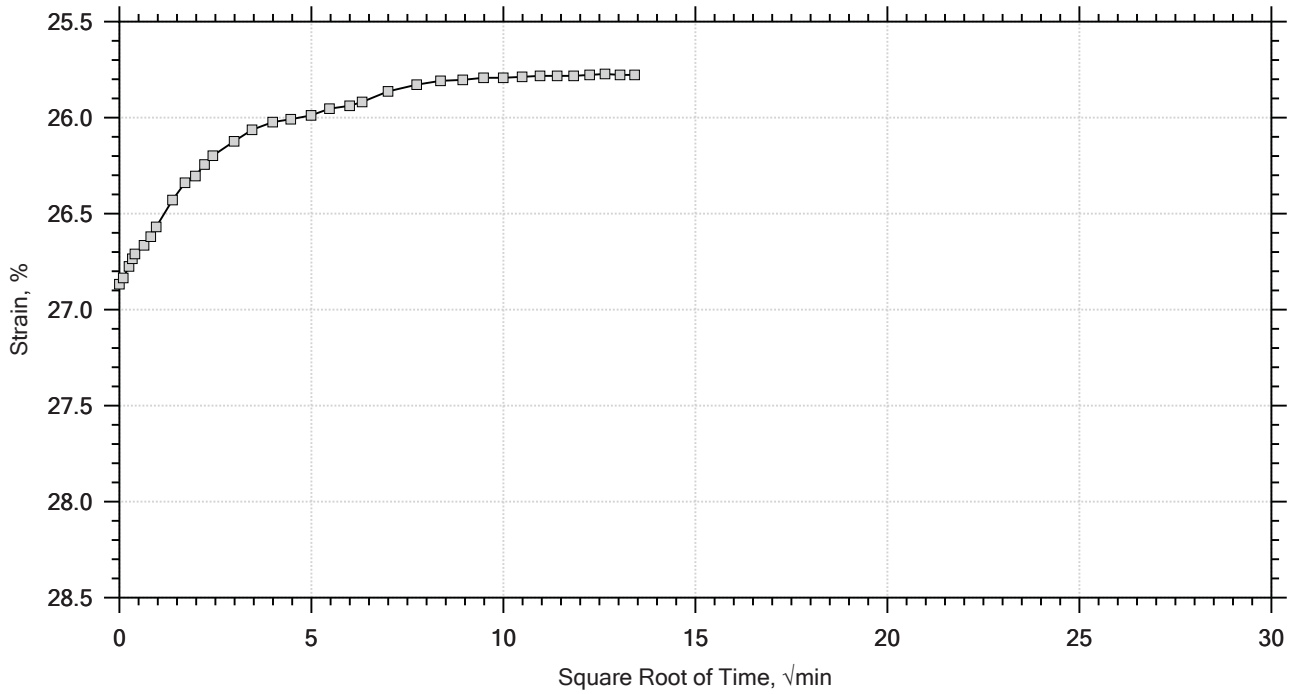


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/19/16	Depth: 16.0-18.0 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Moist, olive clayey sand		
Remarks: System S, Swell Pressure = 0.0658 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 11
Constant Load Step
Stress: 0.5 tsf

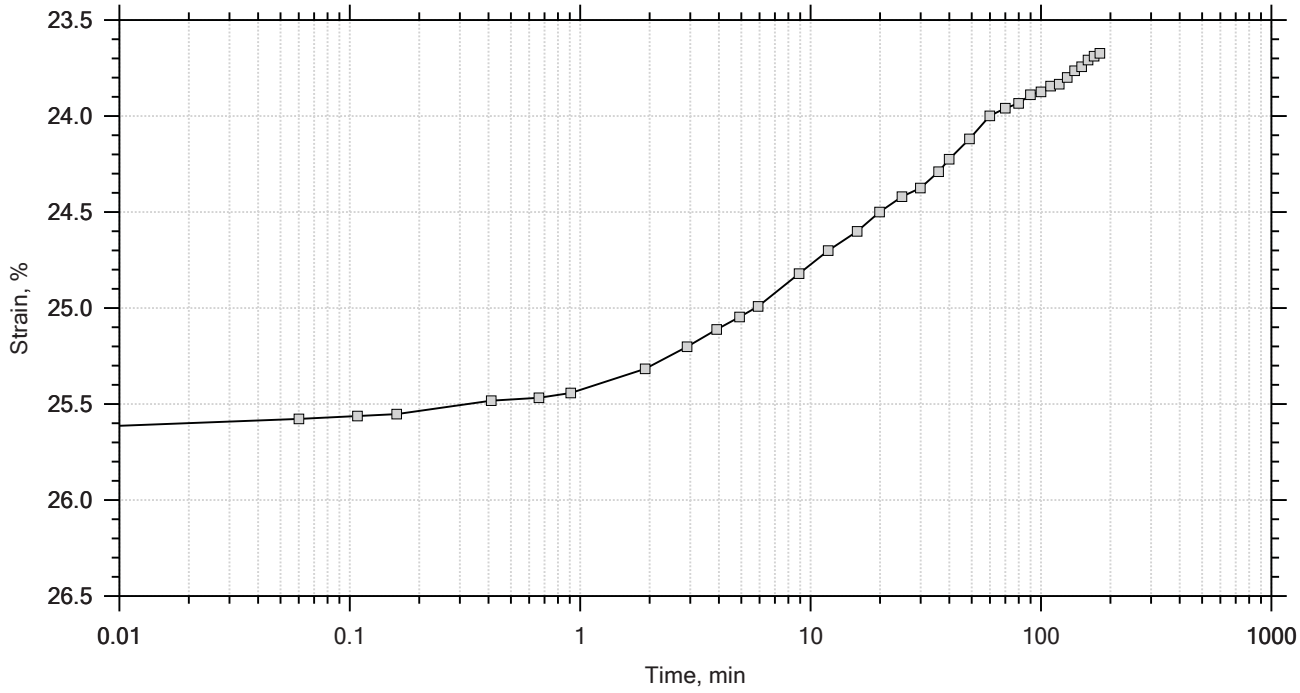


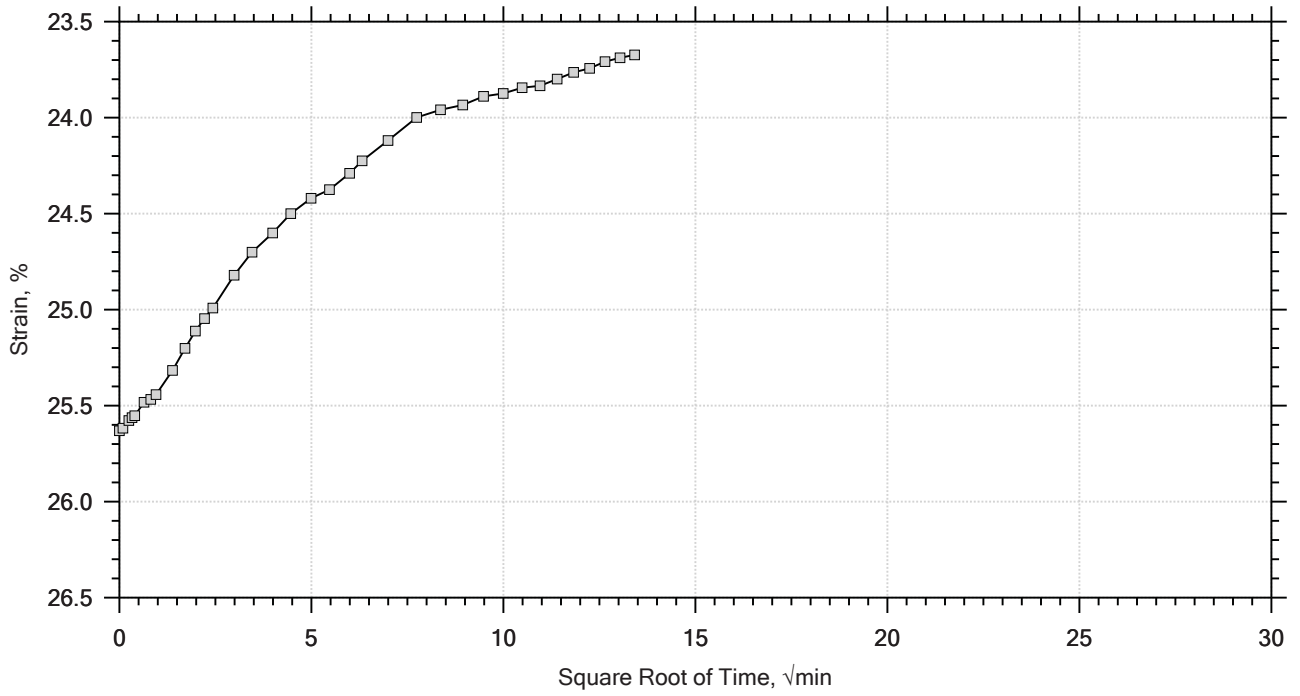


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/19/16	Depth: 16.0-18.0 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Moist, olive clayey sand		
Remarks: System S, Swell Pressure = 0.0658 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 11
Constant Load Step
Stress: 0.125 tsf





Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/19/16	Depth: 16.0-18.0 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Moist, olive clayey sand		
Remarks: System S, Swell Pressure = 0.0658 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.74	Liquid Limit: 66
Initial Height: 1.00 in	Initial Void Ratio: 1.44	Plastic Limit: 22
Final Height: 0.80 in	Final Void Ratio: 0.956	Plasticity Index: 44

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	16719	RING		9370
Mass Container, gm	8.86	111.44	111.44	8.57
Mass Container + Wet Soil, gm	211.34	248.2	232.98	128.77
Mass Container + Dry Soil, gm	128.42	201.53	201.53	97.67
Mass Dry Soil, gm	119.56	90.093	90.093	89.1
Water Content, %	69.35	51.80	34.90	34.90
Void Ratio	---	1.44	0.96	---
Degree of Saturation, %	---	98.17	100.00	---
Dry Unit Weight, pcf	---	69.92	87.4	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/19/16	Depth: 16.0-18.0 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Moist, olive clayey sand		
Remarks: System S, Swell Pressure = 0.0658 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Log of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/s	Mv 1/tsf	k ft/day	Ca %
1	0.0658	0.009670	1.42	0.967	0.000	0.00e+00	1.47e-01	0.00e+00	0.00e+00
2	0.125	0.02134	1.39	2.13	5.659	9.76e-07	1.97e-01	5.19e-04	0.00e+00
3	0.250	0.04108	1.34	4.11	0.000	0.00e+00	1.58e-01	0.00e+00	0.00e+00
4	0.500	0.06929	1.28	6.93	4.867	1.05e-06	1.13e-01	3.18e-04	0.00e+00
5	1.00	0.1145	1.16	11.5	3.045	1.54e-06	9.05e-02	3.77e-04	0.00e+00
6	2.00	0.1741	1.02	17.4	2.268	1.84e-06	5.95e-02	2.95e-04	0.00e+00
7	4.00	0.2304	0.881	23.0	2.275	1.59e-06	2.82e-02	1.21e-04	0.00e+00
8	8.00	0.2827	0.753	28.3	1.266	2.49e-06	1.31e-02	8.79e-05	0.00e+00
9	2.00	0.2717	0.781	27.2	0.000	0.00e+00	1.85e-03	0.00e+00	0.00e+00
10	0.500	0.2578	0.814	25.8	2.399	1.28e-06	9.25e-03	3.21e-05	0.00e+00
11	0.125	0.2367	0.866	23.7	0.000	0.00e+00	5.61e-02	0.00e+00	0.00e+00

GeoTesting EXPRESS

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/19/16	Depth: 16.0-18.0 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Moist, olive clayey sand		
Remarks: System S, Swell Pressure = 0.0658 tsf		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Square Root of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv ft²/s	Mv 1/tsf	k ft/day
1	0.0658	0.009670	1.42	0.967	48.028	5.06e-07	1.47e-01	2.01e-04
2	0.125	0.02134	1.39	2.13	26.995	8.81e-07	1.97e-01	4.69e-04
3	0.250	0.04108	1.34	4.11	19.010	1.21e-06	1.58e-01	5.16e-04
4	0.500	0.06929	1.28	6.93	18.500	1.18e-06	1.13e-01	3.60e-04
5	1.00	0.1145	1.16	11.5	17.554	1.15e-06	9.05e-02	2.81e-04
6	2.00	0.1741	1.02	17.4	11.121	1.62e-06	5.95e-02	2.59e-04
7	4.00	0.2304	0.881	23.0	9.520	1.64e-06	2.82e-02	1.25e-04
8	8.00	0.2827	0.753	28.3	5.535	2.45e-06	1.31e-02	8.65e-05
9	2.00	0.2717	0.781	27.2	2.193	5.84e-06	1.85e-03	2.91e-05
10	0.500	0.2578	0.814	25.8	10.719	1.24e-06	9.25e-03	3.09e-05
11	0.125	0.2367	0.866	23.7	40.735	3.41e-07	5.61e-02	5.17e-05

GeoTesting EXPRESS

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 08/19/16	Depth: 16.0-18.0 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Moist, olive clayey sand		
Remarks: System S, Swell Pressure = 0.0658 tsf		
Displacement at End of Increment		

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	---	Sample Type:	---	Tested By:	jbr
Sample ID:	---	Test Date:	08/30/16	Checked By:	mcm
Depth :	---	Test Id:	387124		

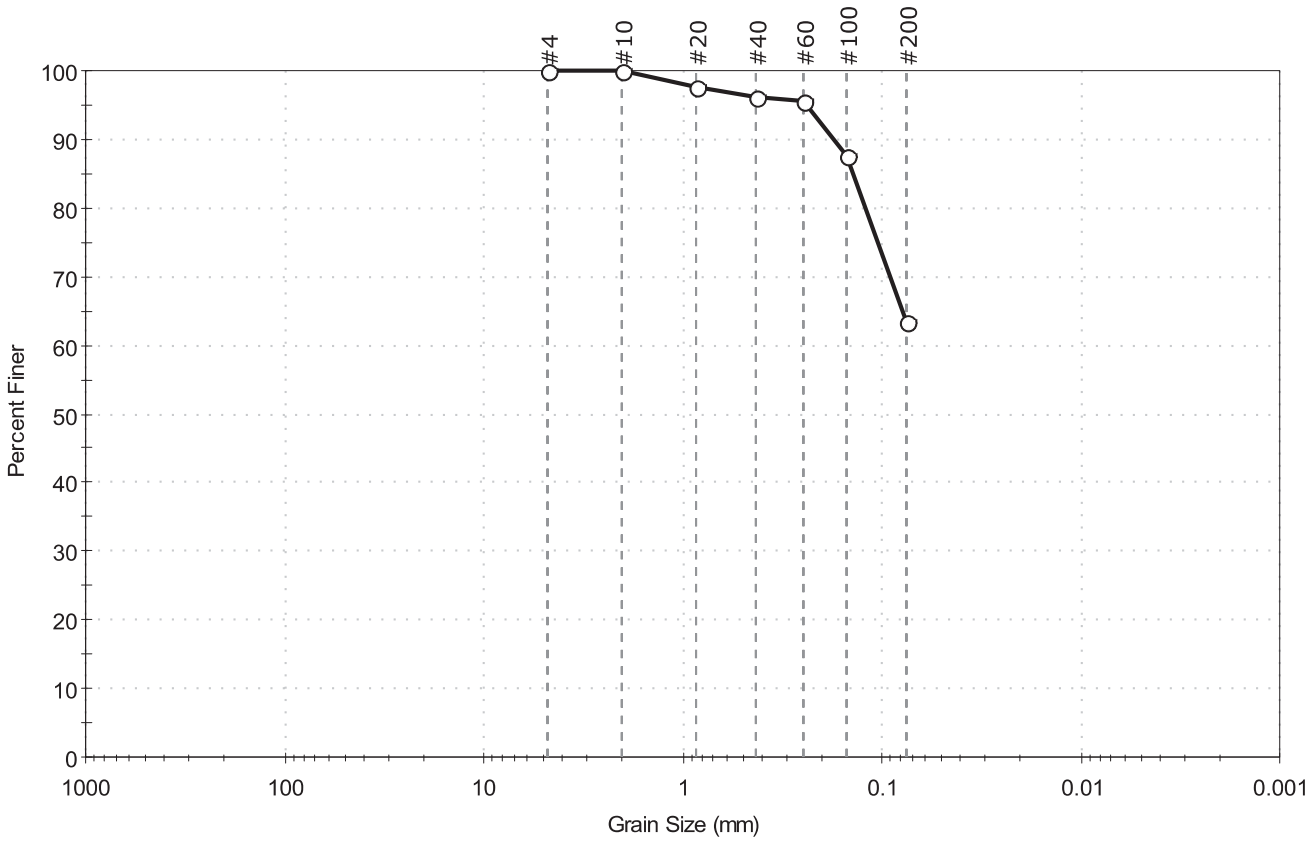
Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
AP-2	UD-2	18.0-20.0 ft	Moist, olive sandy clay	69.3

Notes: Temperature of Drying : 110º Celsius

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	AP-2	Sample Type:	tube	Tested By:	jbr
Sample ID:	UD-2	Test Date:	08/26/16	Checked By:	mcm
Depth :	18.0-20.0 ft	Test Id:	387104		
Test Comment:	---				
Visual Description:	Moist, olive sandy clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	36.5	63.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	98		
#40	0.42	96		
#60	0.25	96		
#100	0.15	88		
#200	0.075	64		

Coefficients

D_{85} = 0.1387 mm	D_{30} = N/A
D_{60} = N/A	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Sandy Fat clay (CH)

AASHTO Clayey Soils (A-7-6 (33))

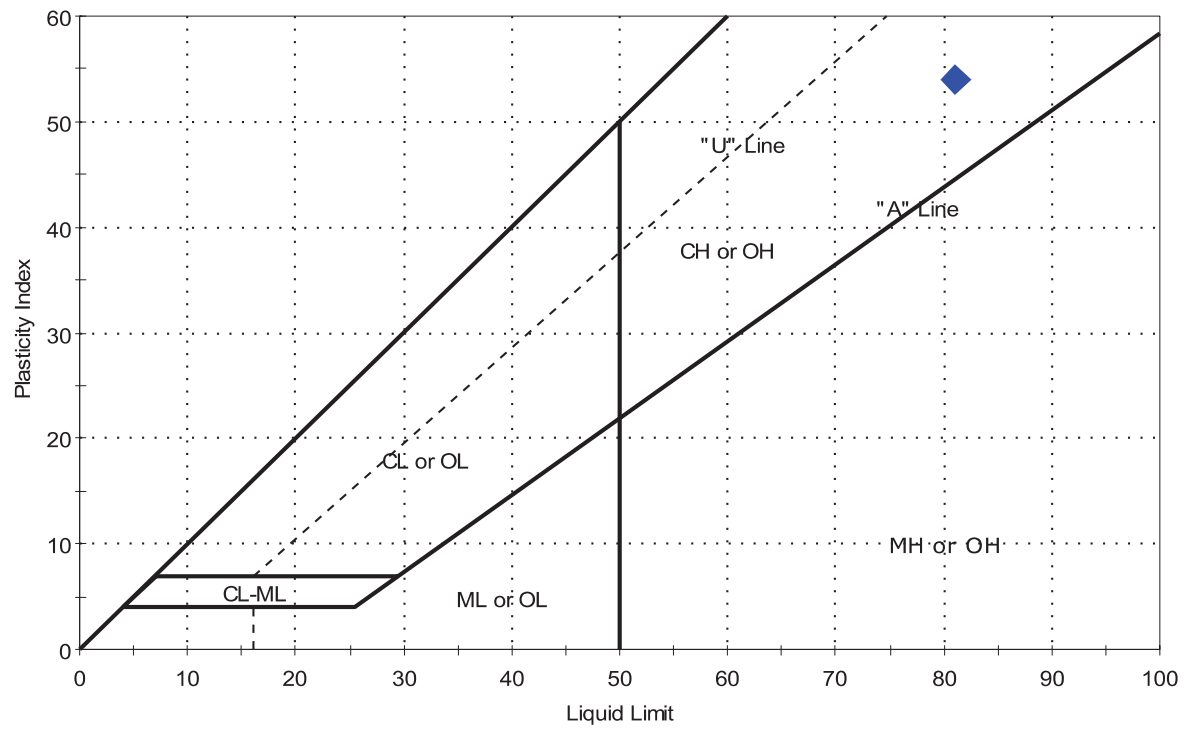
Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	AP-2	Sample Type:	tube	Tested By:	cam
Sample ID:	UD-2	Test Date:	08/29/16	Checked By:	mcm
Depth :	18.0-20.0 ft	Test Id:	387112		
Test Comment:	---				
Visual Description:	Moist, olive sandy clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UD-2	AP-2	18.0-20.0 ft	69	81	27	54	0.8	Sandy Fat clay (CH)

Sample Prepared using the WET method

4% Retained on #40 Sieve

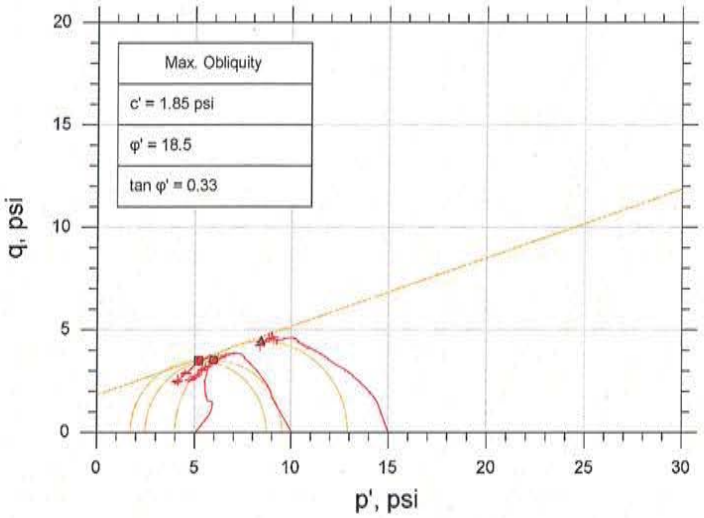
Dry Strength: VERY HIGH

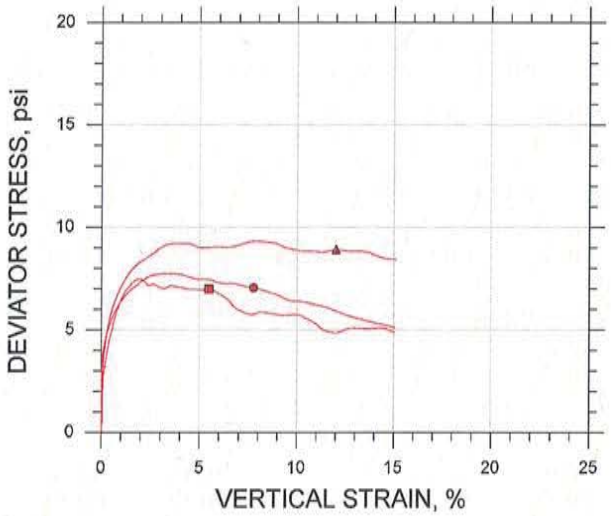
Dilatancy: SLOW

Toughness: LOW

Client: F&ME Consultants	
Project Name: US-21 Replacement Bridge	
Project Location: ---	
Project Number: GTX-305005	
Tested By: md	Checked By: mcm
Boring ID: AP-2	
Preparation: intact	
Description: Moist, olive sandy clay	
Classification: Sandy Fat clay	
Group Symbol: CH	
Liquid Limit: 81	Plastic Limit: 27
Plasticity Index: 54	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





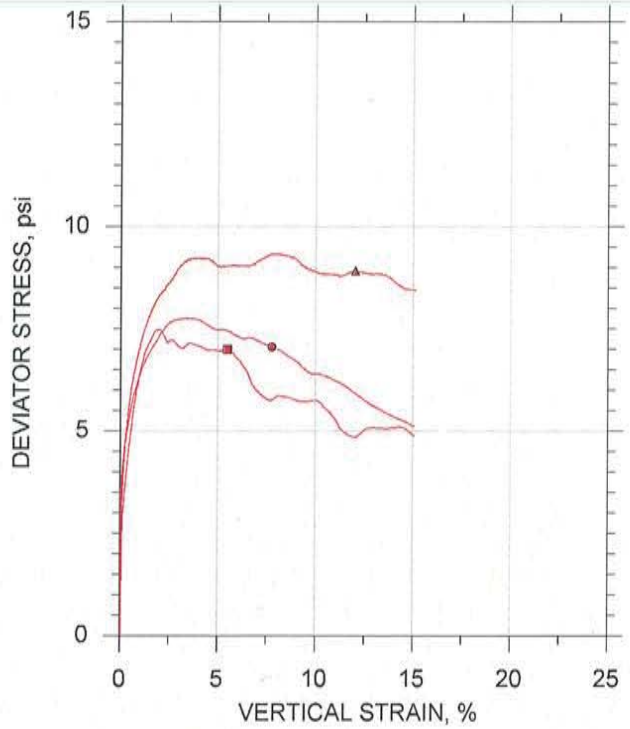
Symbol		■	●	▲
Sample ID		ST-2	ST-2	ST-2
Depth, ft		18.0-20.0 ft	18.0-20.0 ft	18.0-20.0 ft
Test Number		CU-4-1	CU-4-2	CU-4-3
Initial	Height, in	4.500	4.350	4.380
	Diameter, in	2.030	2.010	2.030
	Moisture Content (from Cuttings), %	64.9	70.2	80.2
	Dry Density, pcf	60.5	54.4	52.1
	Saturation (Wet Method), %	98.2	90.4	96.8
	Void Ratio	1.78	2.10	2.24
Before Shear	Moisture Content, %	63.4	70.4	70.2
	Dry Density, pcf	62.1	58.1	58.2
	Cross-sectional Area (Method A), in²	3.153	3.020	3.006
	Saturation, %	100.0	100.0	100.0
	Void Ratio	1.71	1.90	1.90
	Back Pressure, psi	96.99	151.0	150.7
Vertical Effective Consolidation Stress, psi		5.008	9.886	14.67
Horizontal Effective Consolidation Stress, psi		5.005	10.00	14.97
Vertical Strain after Consolidation, %		0.002069	1.405	3.740
Volumetric Strain after Consolidation, %		2.531	5.704	10.72
Time to 50% Consolidation, min		72.25	90.25	169.0
Shear Strength, psi		3.498	3.528	4.459
Strain at Failure, %		5.48	7.76	12.0
Strain Rate, %/min		0.01600	0.01600	0.01600
Deviator Stress at Failure, psi		6.995	7.055	8.918
Effective Minor Principal Stress at Failure, psi		1.703	2.455	3.977
Effective Major Principal Stress at Failure, psi		8.698	9.510	12.90
B-Value		0.95	0.95	0.95

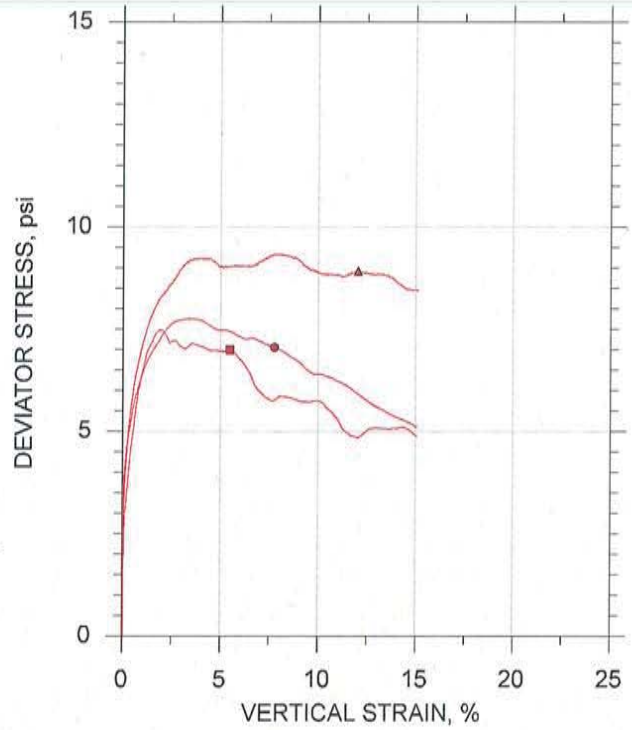
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

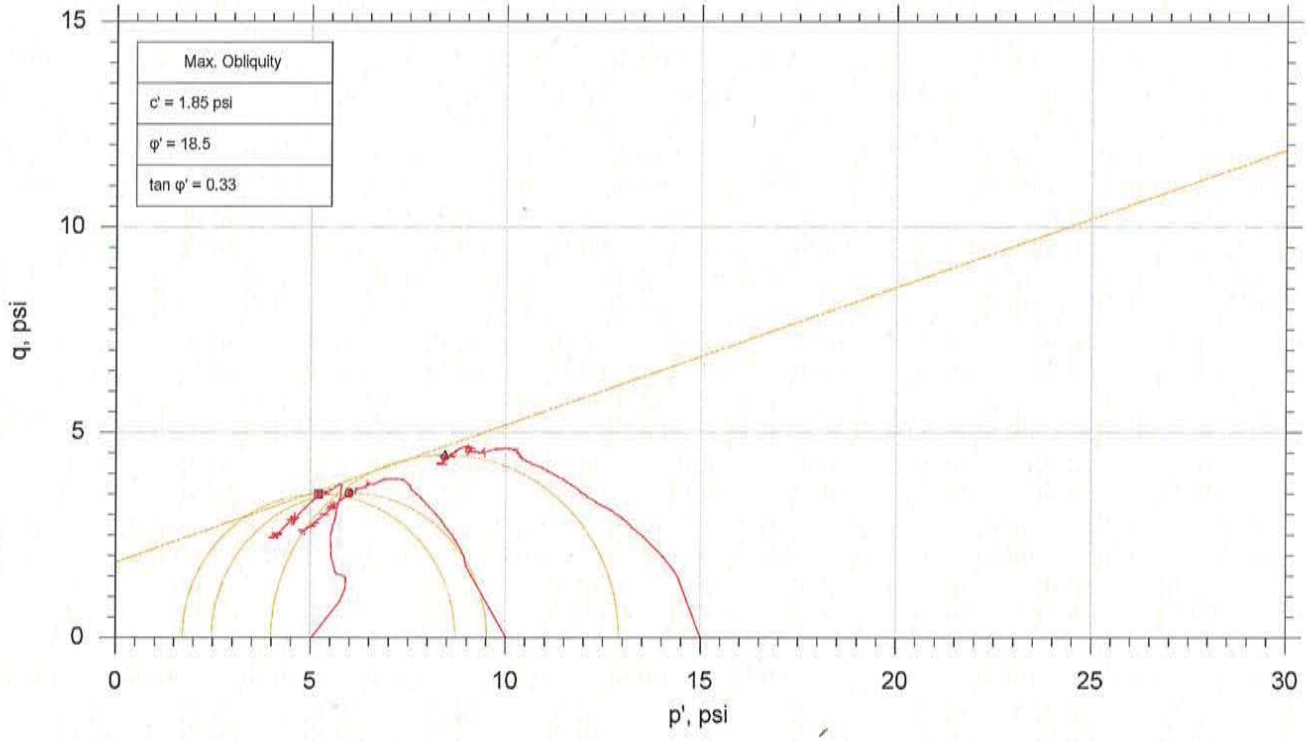
Remarks:

System X. Note CU-1-1 test specimen was not used in determining cohesion or friction values.

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







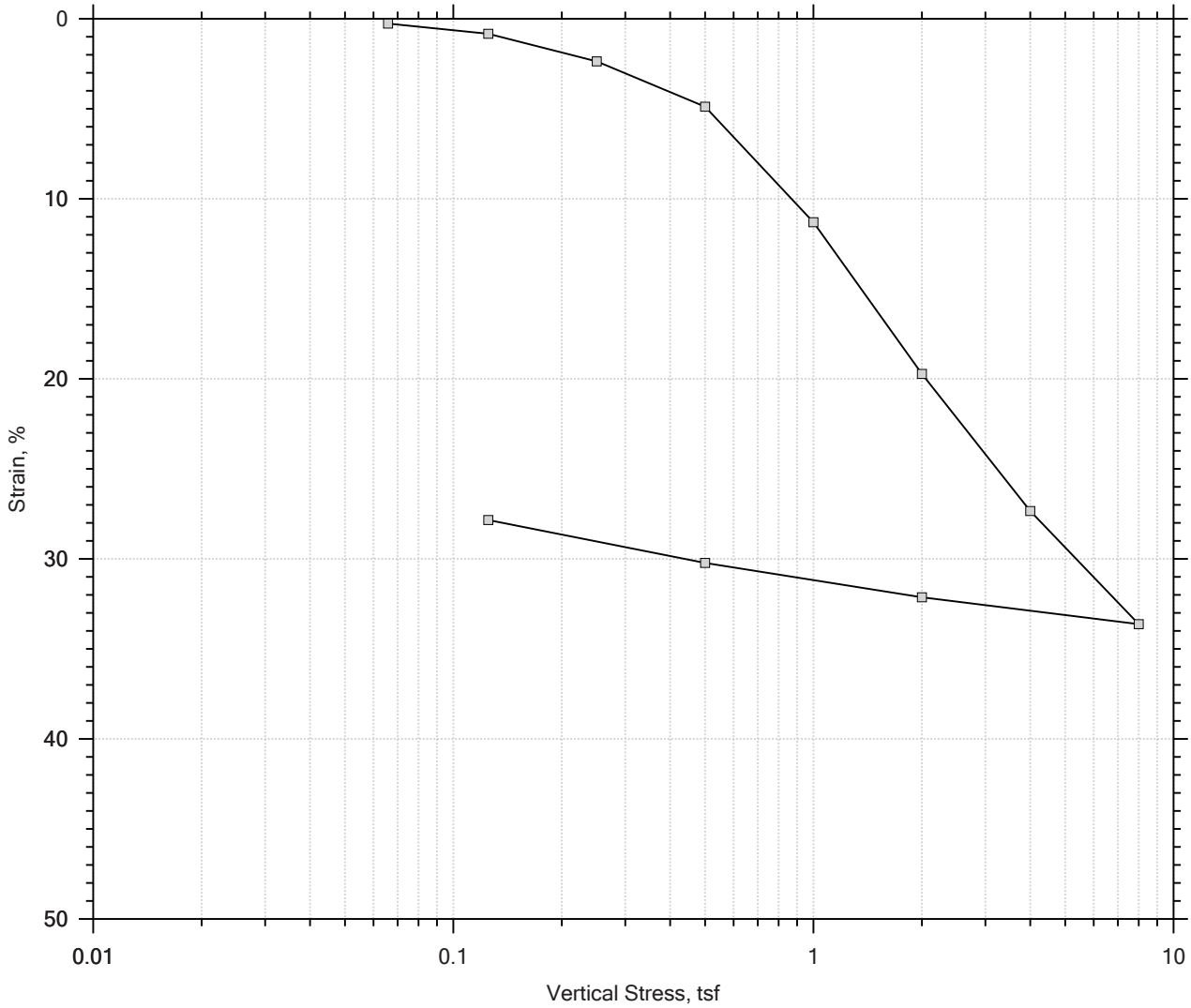
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	ST-2	CU-4-1	18.0-20.0 ft	md	8/23/16	mcm	8/30/16	305005-CU-4-1m.dat
●	ST-2	CU-4-2	18.0-20.0 ft	md	08/23/16	mcm	8/30/16	305005-CU-4-2m.dat
▲	ST-2	CU-4-3	18.0-20.0 ft	md	08/23/16	mcm	8/30/16	305005-CU-4-3m.dat

GeoTesting EXPRESS

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Sample Type: intact	
Description: Moist, olive sandy clay		
Remarks: System X. Note CU-1-1 test specimen was not used in determining cohesion or friction values.		

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report

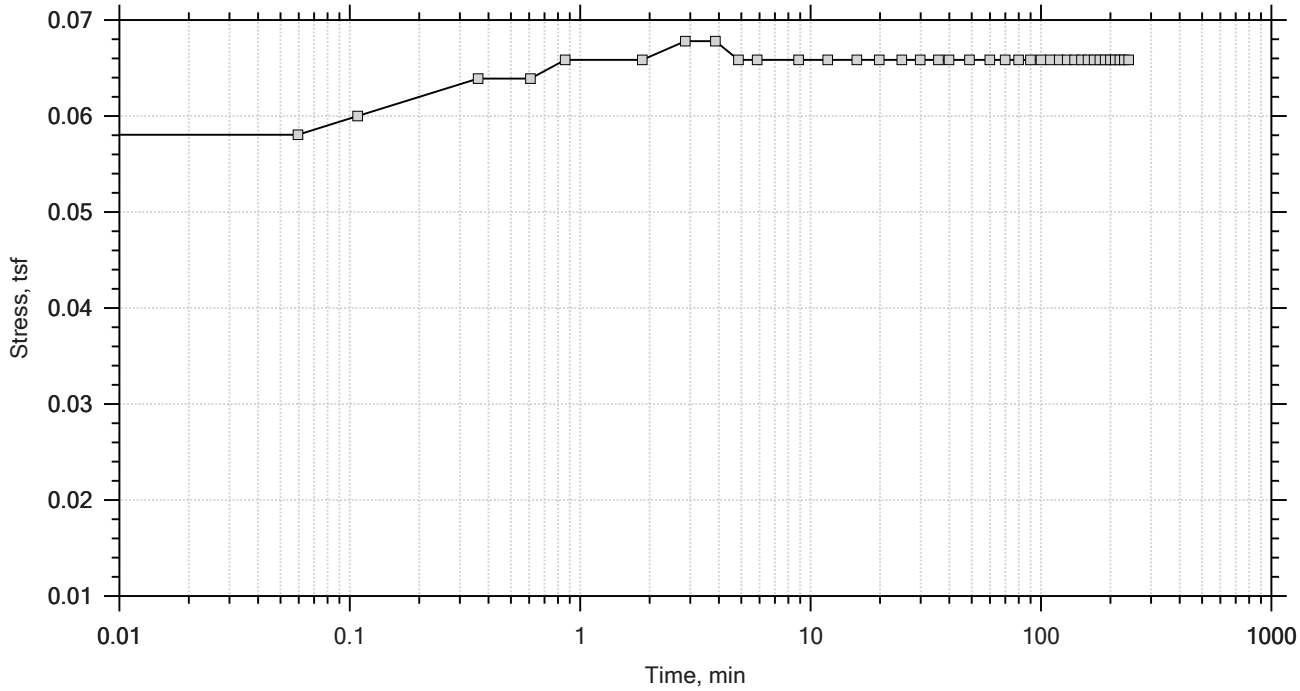


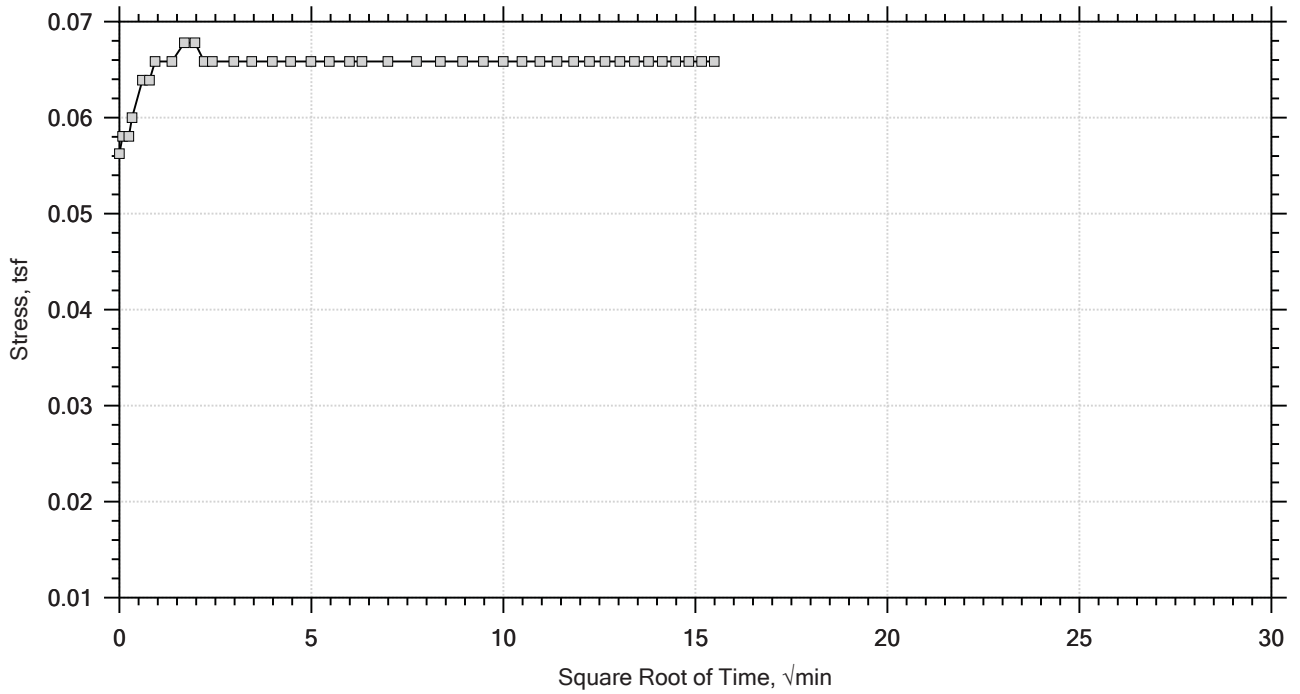
					Before Test	After Test
Current Vertical Effective Stress: ---				Water Content, %	57.55	32.34
Preconsolidation Stress: ---				Dry Unit Weight, pcf	65.031	90.12
Compression Ratio: ---				Saturation, %	97.45	100.00
Diameter: 2.5 in		Height: 1 in		Void Ratio	1.60	0.88
LL: 81	PL: 27	PI: 54	GS: 2.71			

GeoTesting EXPRESS	Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
	Boring No.: AP-2	Tested By: md	Checked By: mcm
	Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, olive sandy clay		
	Remarks: System Q, Swell Pressure = 0.0659 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 11
Constant Volume Step
Stress: 0.0659 tsf

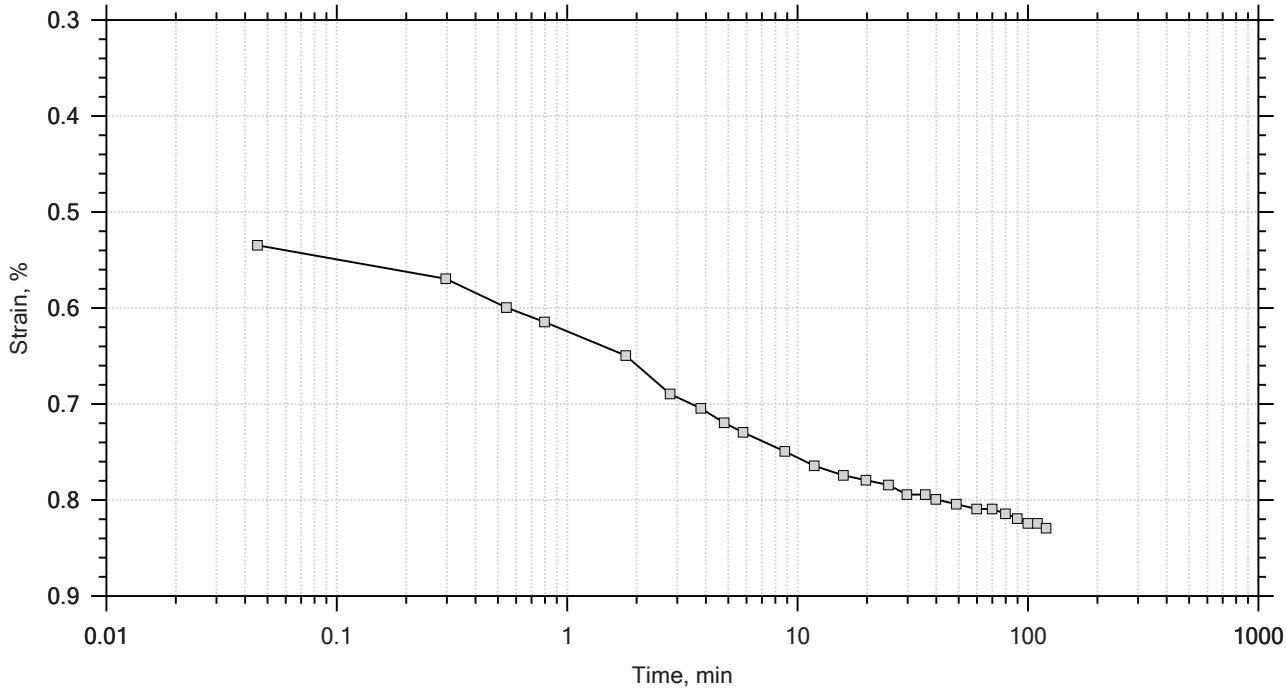


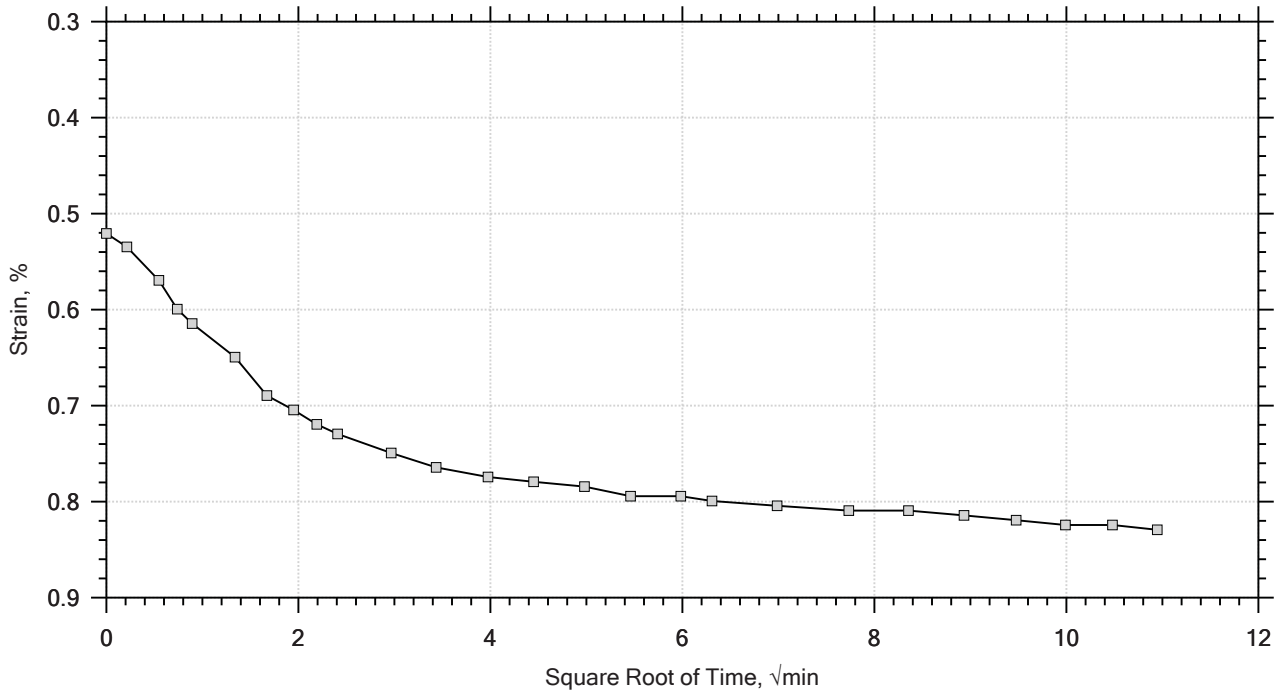


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-4	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System Q, Swell Pressure = 0.0659 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 11
Constant Load Step
Stress: 0.125 tsf

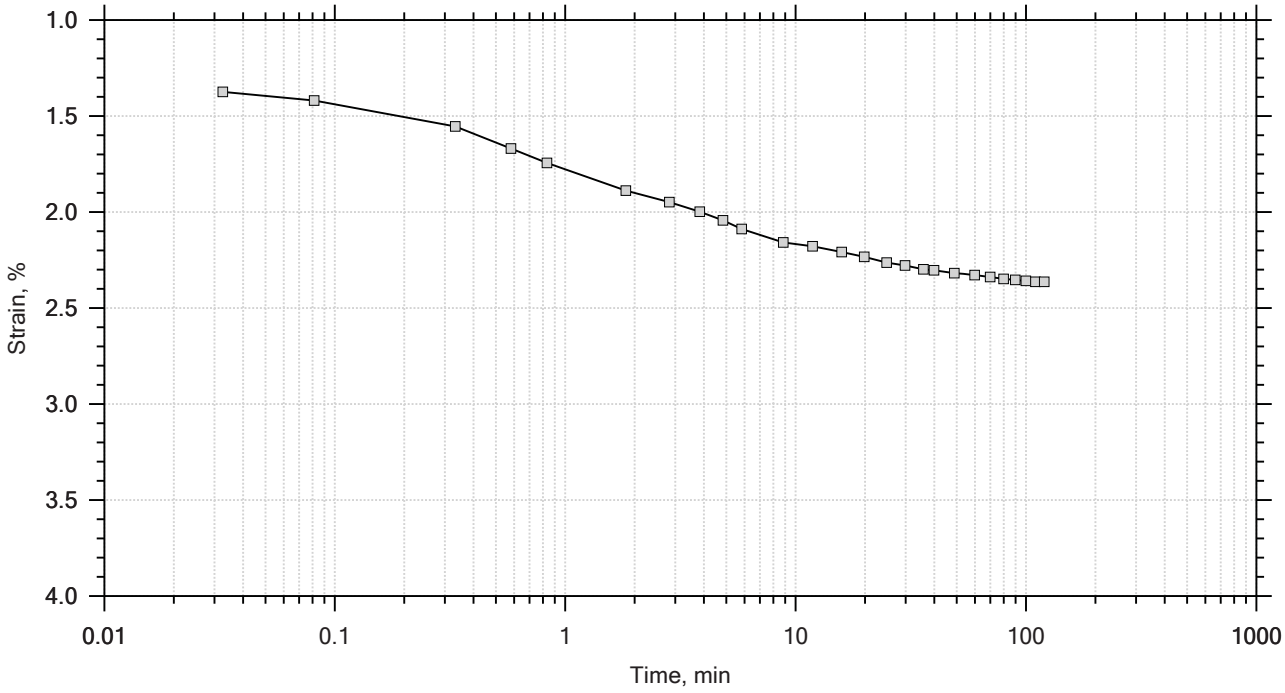


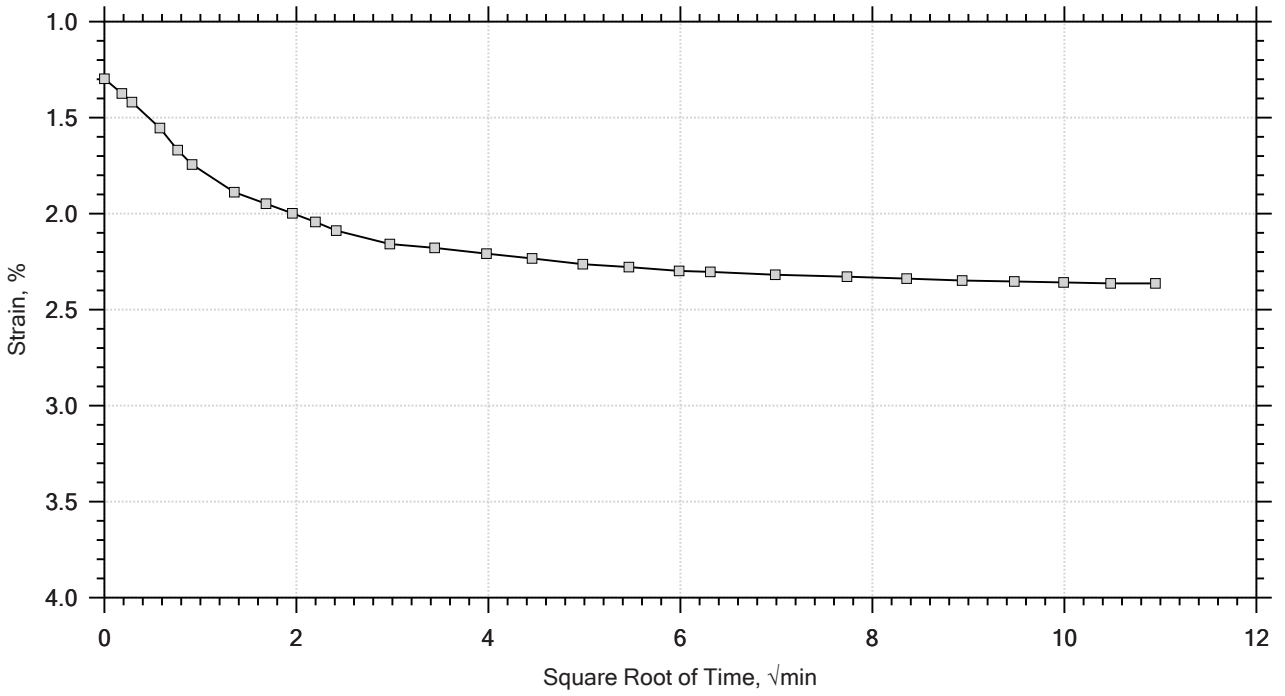


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-4	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System Q, Swell Pressure = 0.0659 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 11
Constant Load Step
Stress: 0.25 tsf

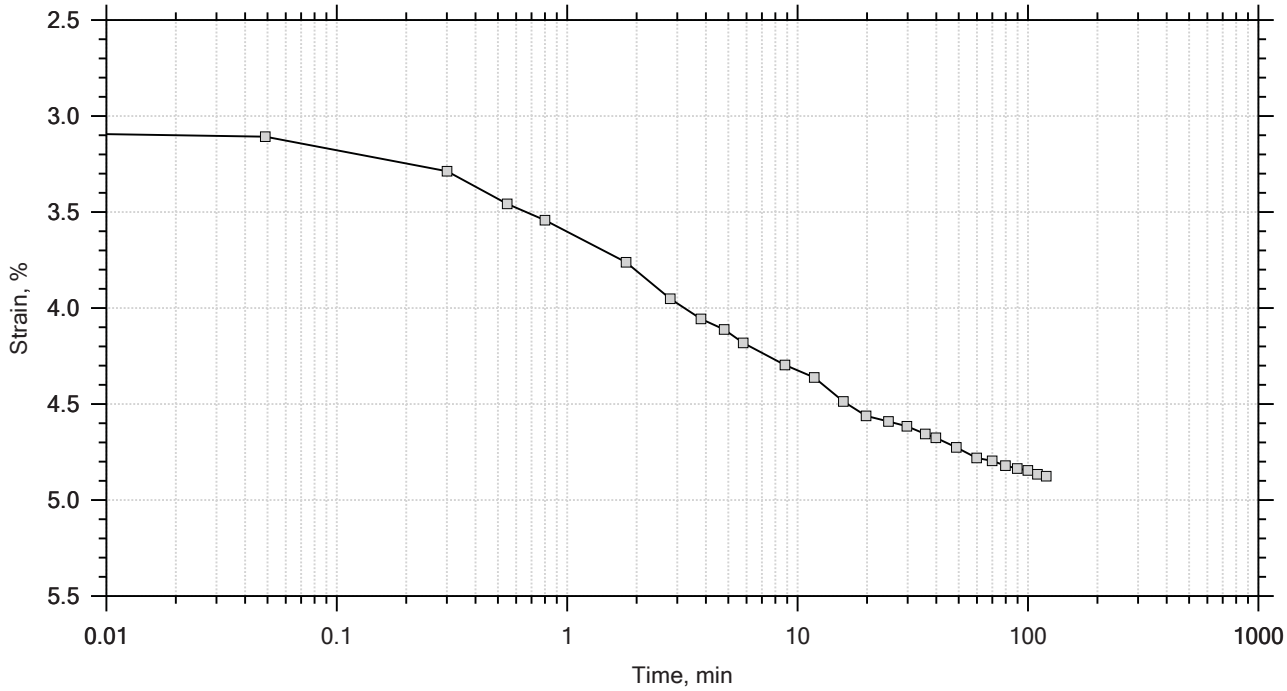


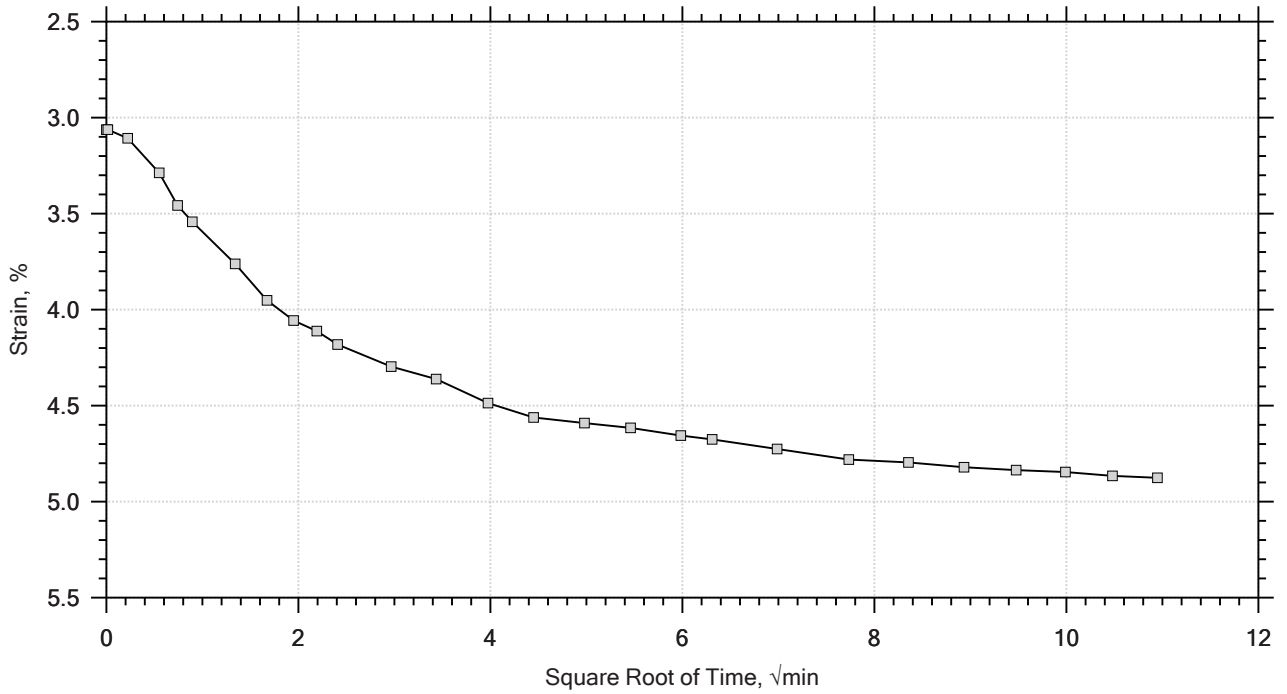


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-4	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System Q, Swell Pressure = 0.0659 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 11
Constant Load Step
Stress: 0.5 tsf

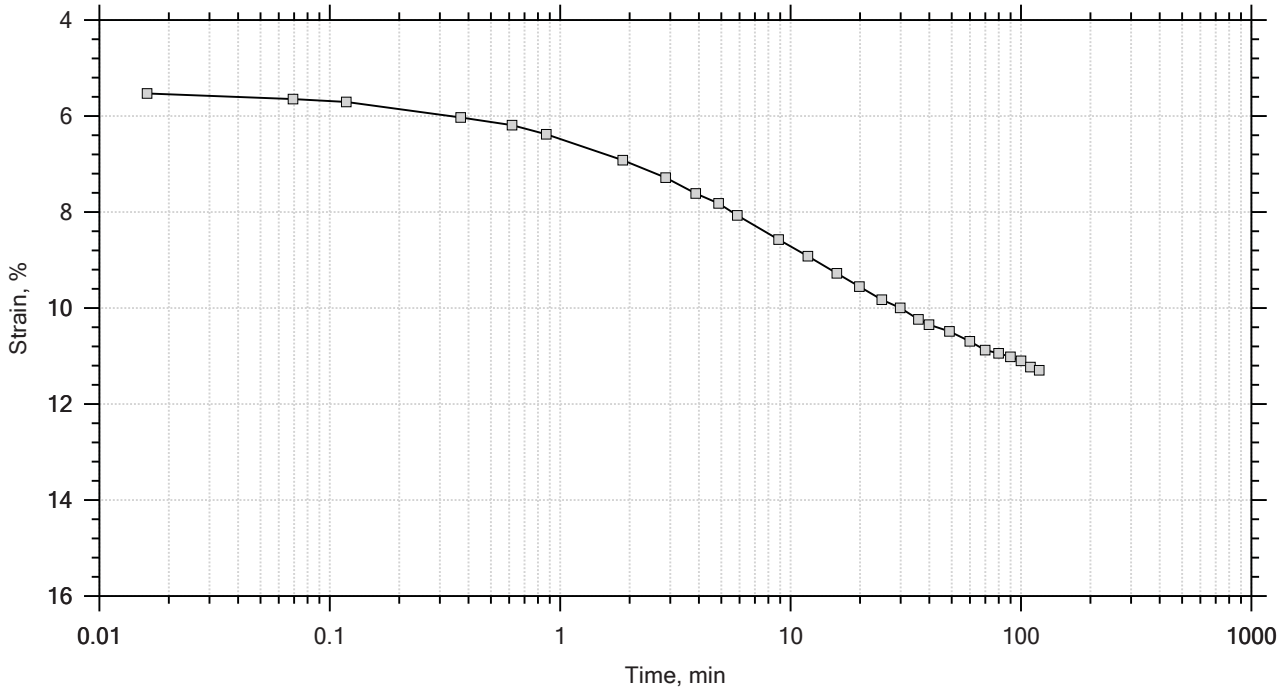


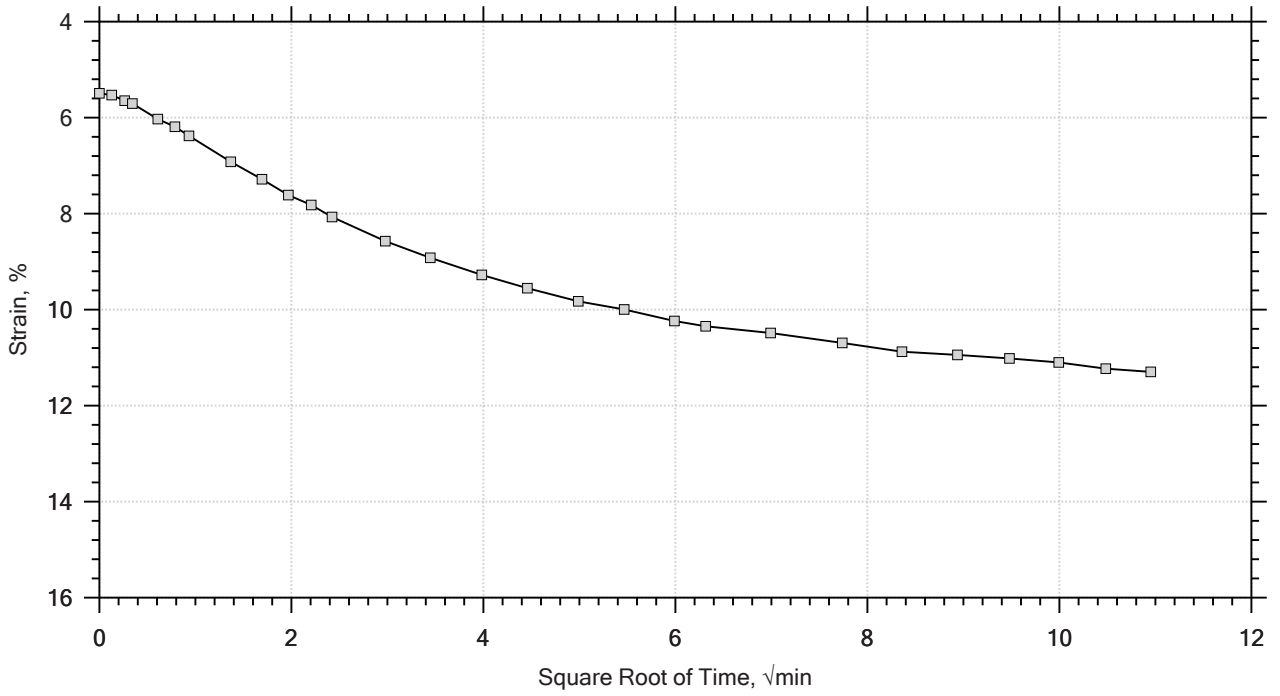


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-4	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System Q, Swell Pressure = 0.0659 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 11
Constant Load Step
Stress: 1 tsf

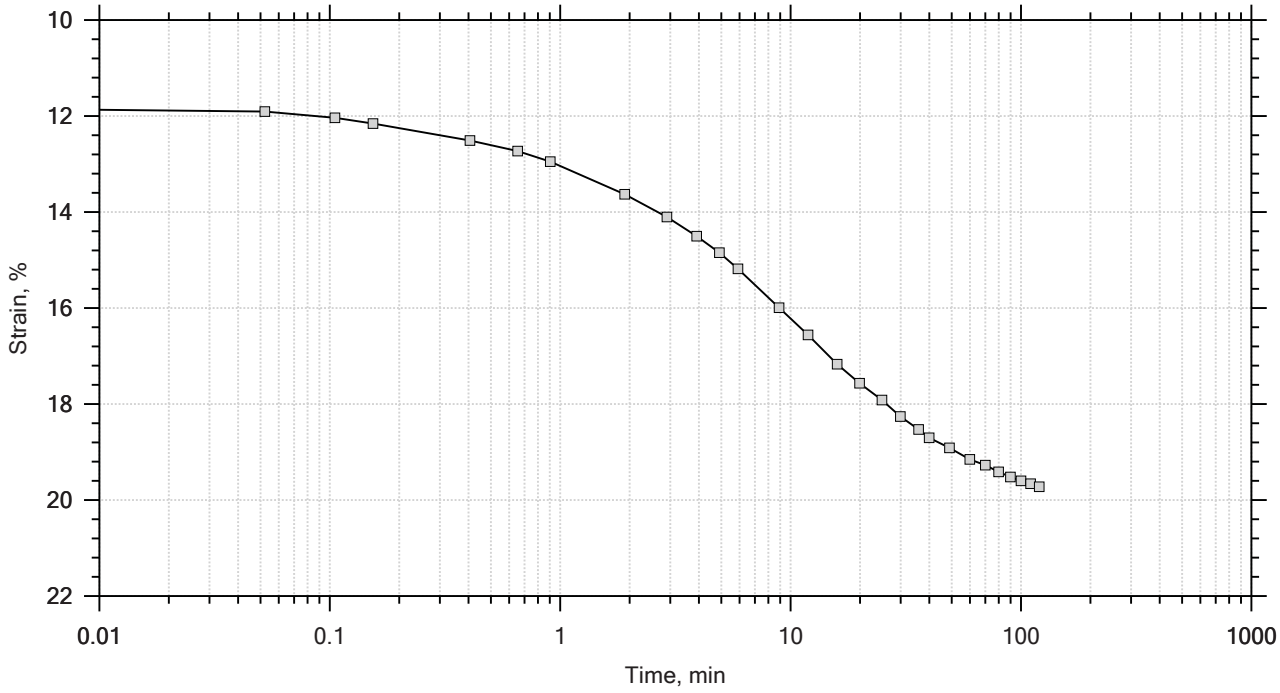


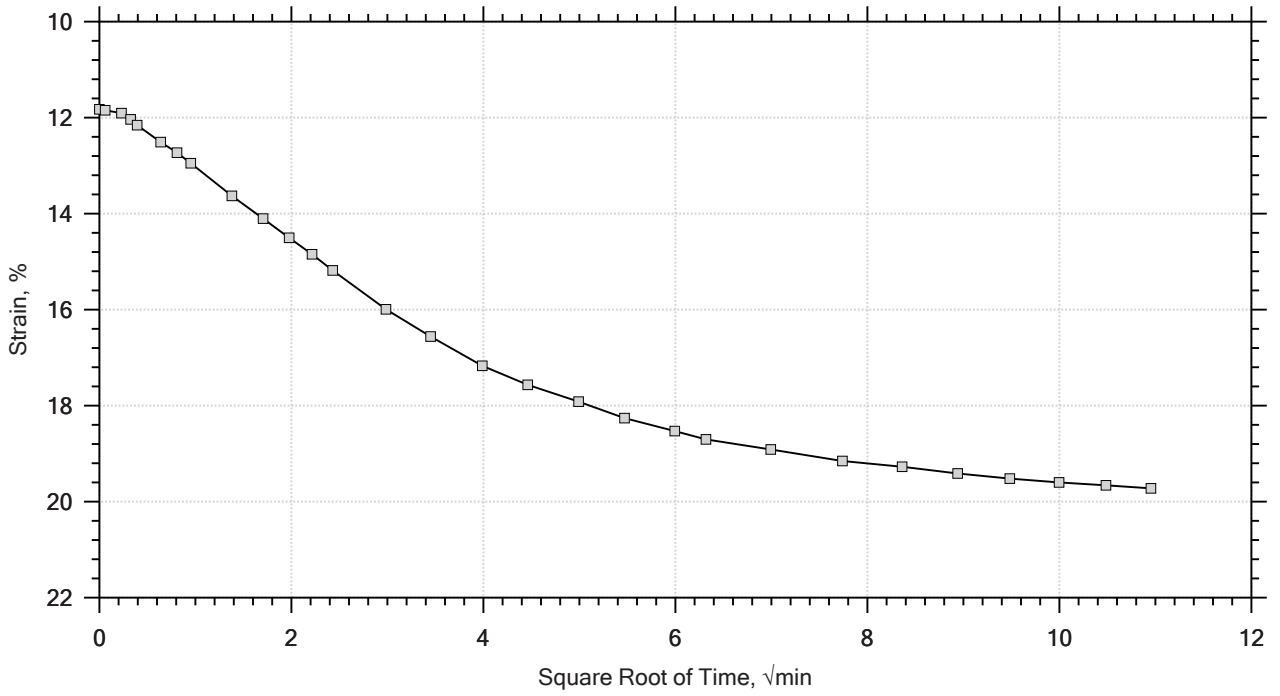


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-4	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System Q, Swell Pressure = 0.0659 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 11
Constant Load Step
Stress: 2 tsf

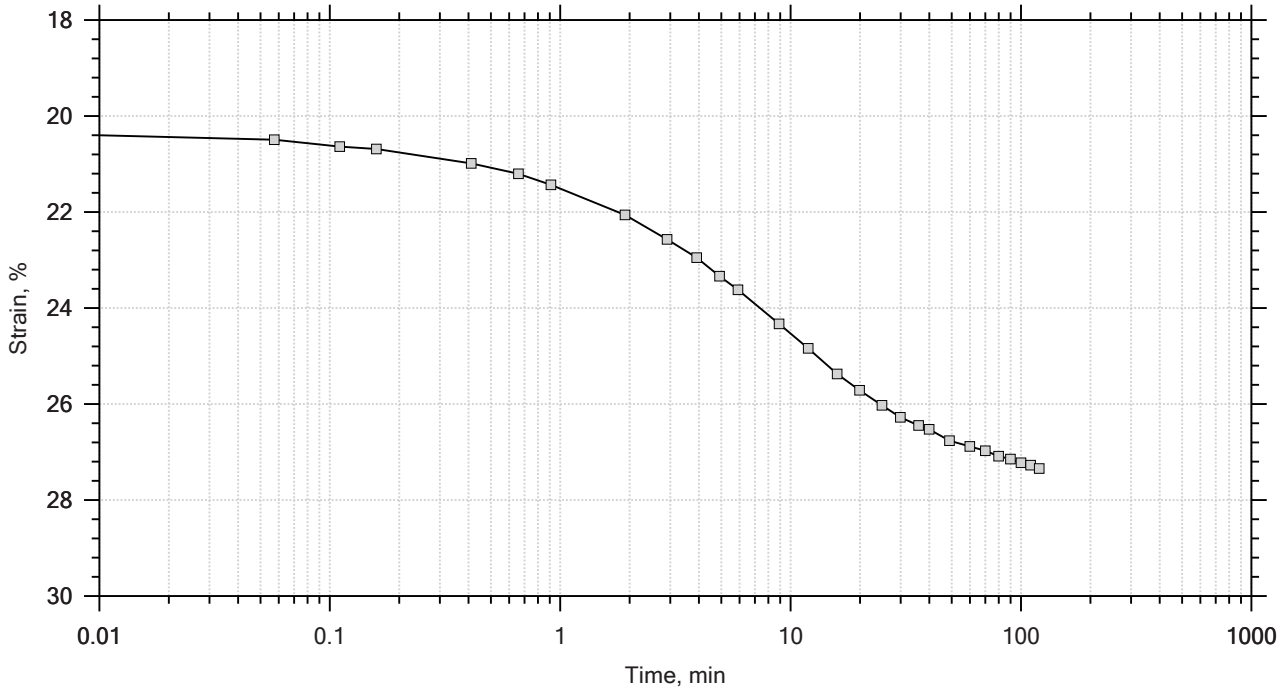


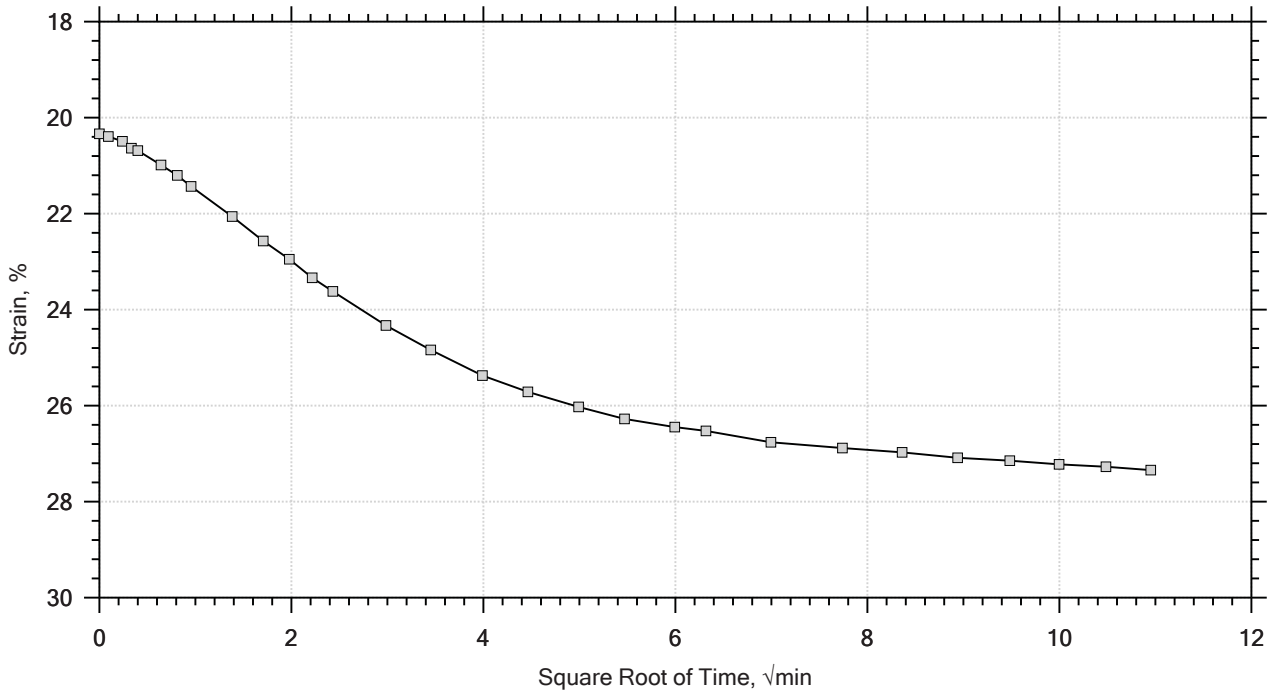


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-4	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System Q, Swell Pressure = 0.0659 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 11
Constant Load Step
Stress: 4 tsf

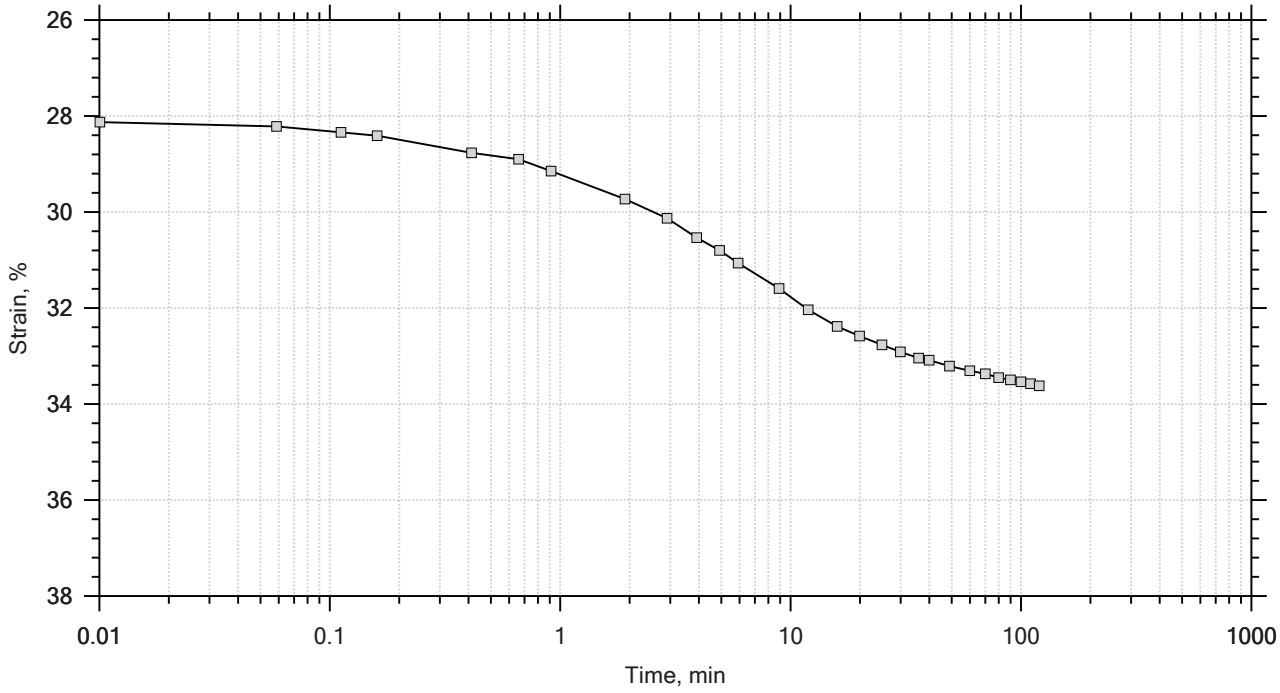


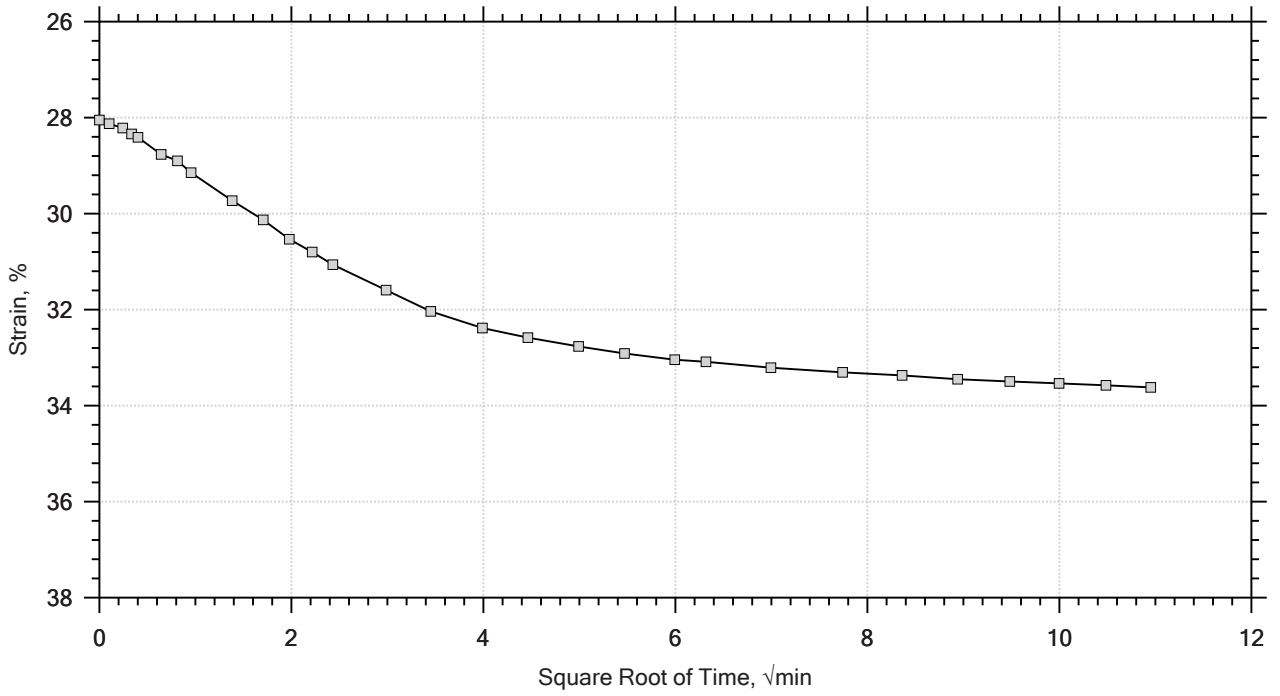


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-4	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System Q, Swell Pressure = 0.0659 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 11
Constant Load Step
Stress: 8 tsf

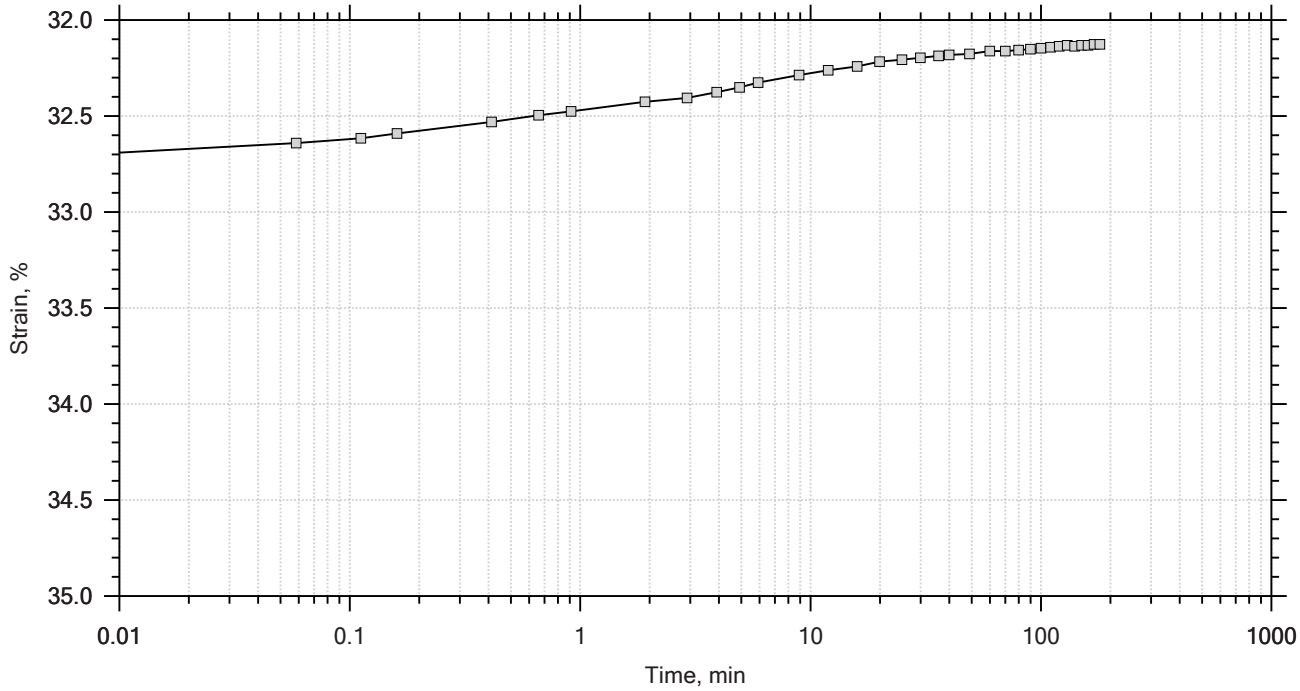


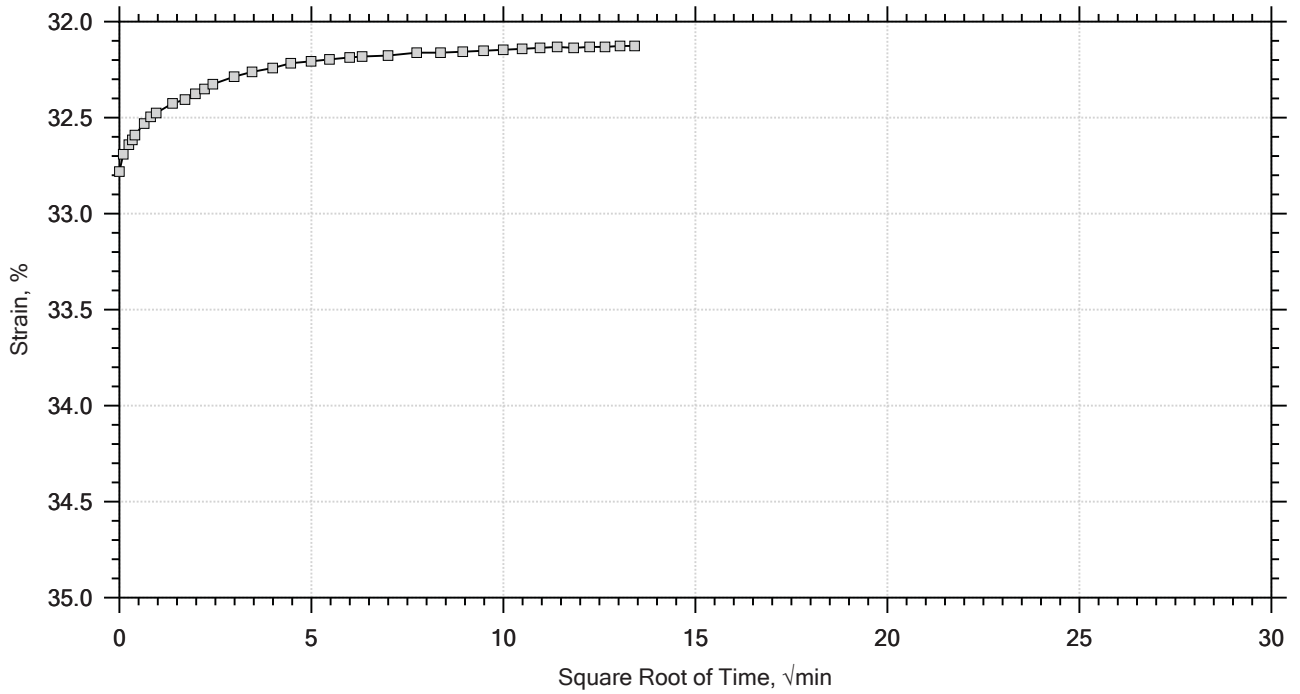


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-4	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System Q, Swell Pressure = 0.0659 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 11
Constant Load Step
Stress: 2 tsf

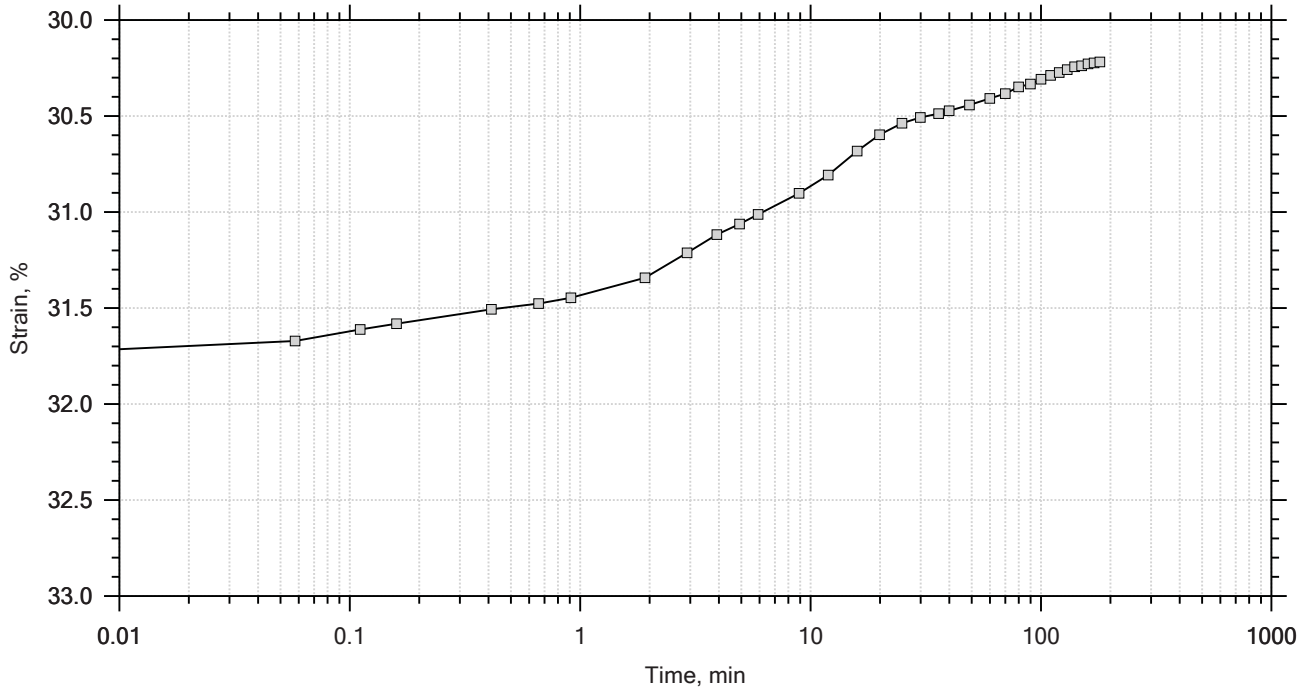


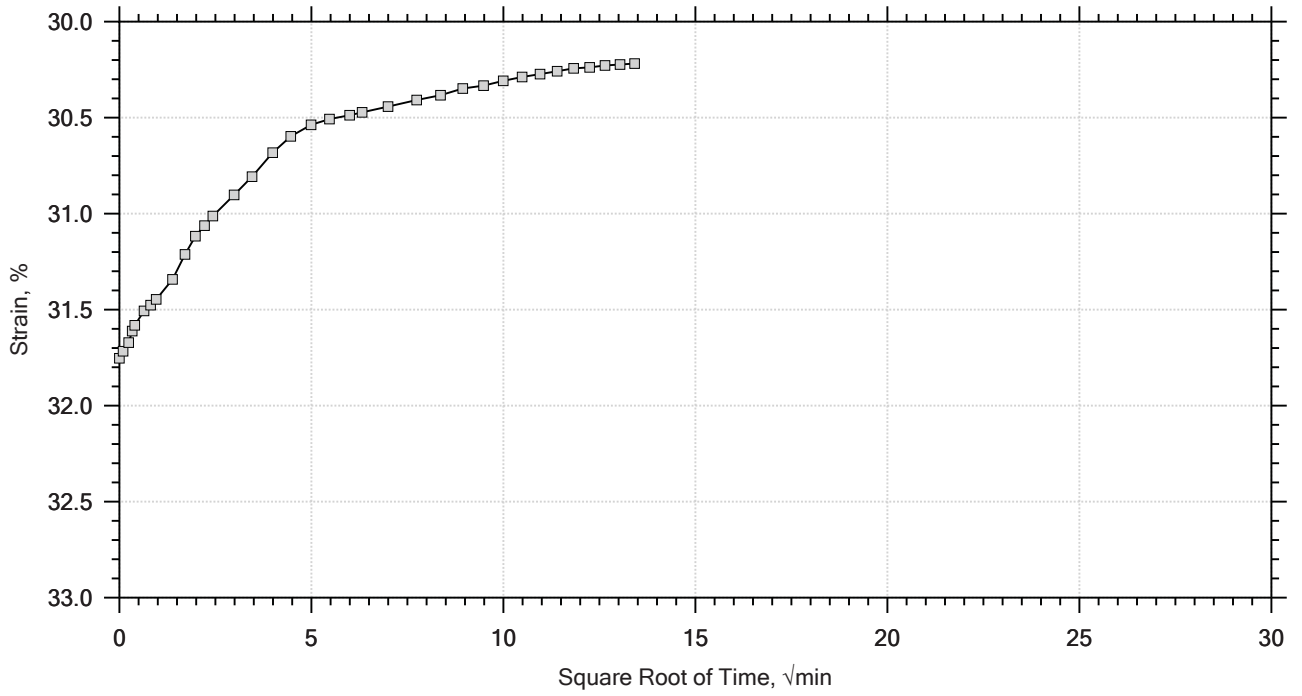


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-4	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System Q, Swell Pressure = 0.0659 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 11
Constant Load Step
Stress: 0.5 tsf

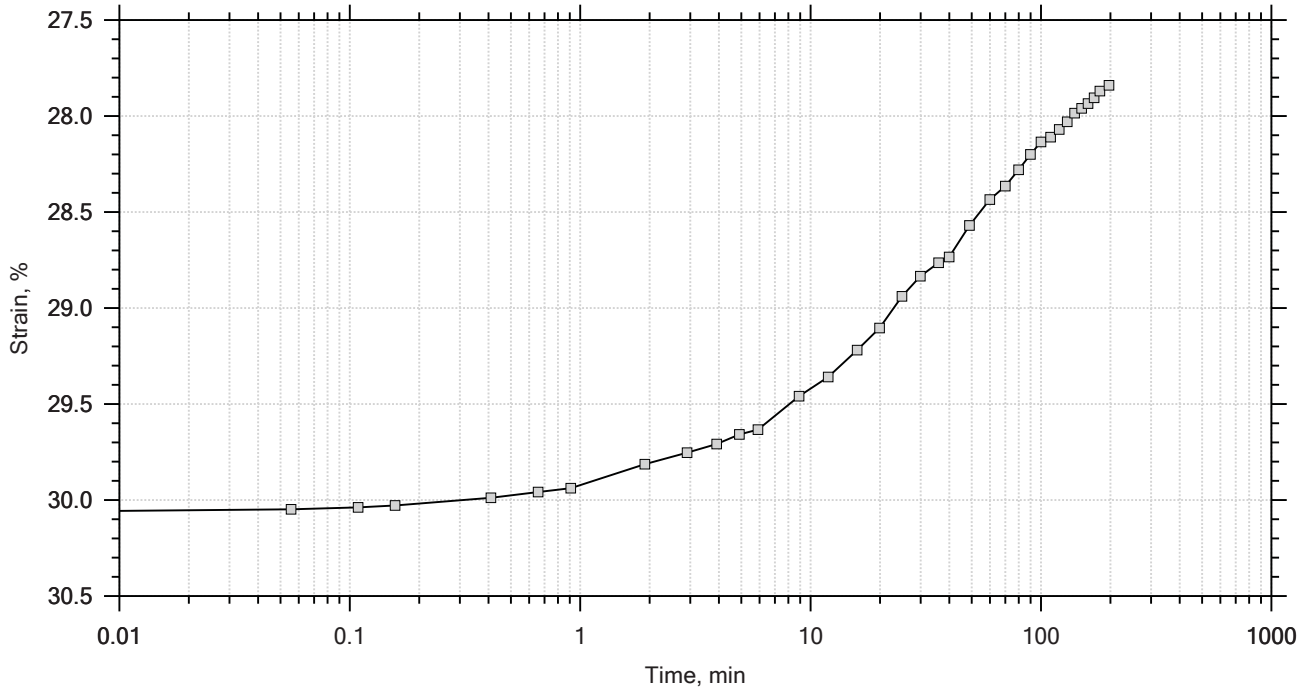


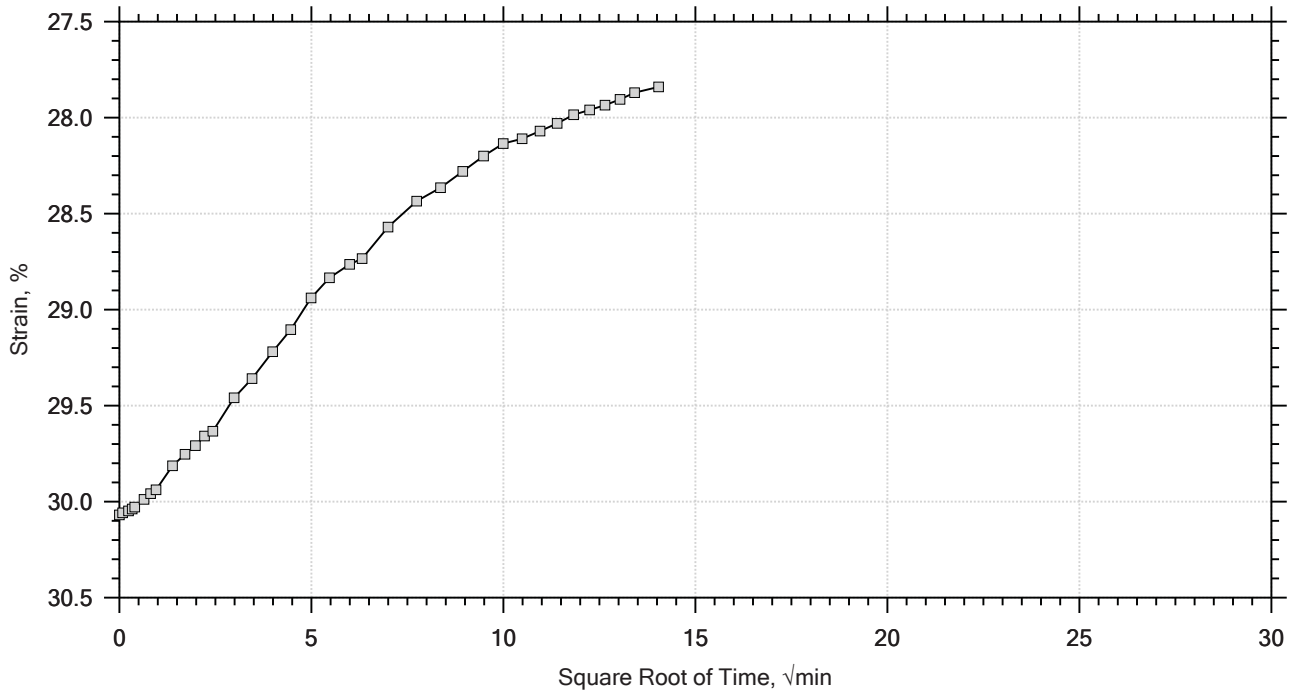


GeoTesting EXPRESS	Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
	Boring No.: AP-2	Tested By: md	Checked By: mcm
	Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, olive sandy clay		
	Remarks: System Q, Swell Pressure = 0.0659 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 11
Constant Load Step
Stress: 0.125 tsf





Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-4	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System Q, Swell Pressure = 0.0659 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.71	Liquid Limit: 81
Initial Height: 1.00 in	Initial Void Ratio: 1.60	Plastic Limit: 27
Final Height: 0.72 in	Final Void Ratio: 0.876	Plasticity Index: 54

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	C-2032	RING		C-1962
Mass Container, gm	8.52	111.14	111.14	8.44
Mass Container + Wet Soil, gm	220	243.16	222.03	119.18
Mass Container + Dry Soil, gm	127.93	194.93	194.93	92.12
Mass Dry Soil, gm	119.41	83.793	83.793	83.68
Water Content, %	77.10	57.55	32.34	32.34
Void Ratio	---	1.60	0.88	---
Degree of Saturation, %	---	97.45	100.00	---
Dry Unit Weight, pcf	---	65.031	90.12	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-4	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System Q, Swell Pressure = 0.0659 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Log of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/s	Mv 1/tsf	k ft/day	Ca %
1	0.0659	0.002648	1.59	0.265	0.000	0.00e+00	4.02e-02	0.00e+00	0.00e+00
2	0.125	0.008293	1.58	0.829	1.928	2.92e-06	9.54e-02	7.53e-04	0.00e+00
3	0.250	0.02363	1.54	2.36	1.789	3.08e-06	1.23e-01	1.02e-03	0.00e+00
4	0.500	0.04876	1.47	4.88	1.845	2.87e-06	1.01e-01	7.78e-04	0.00e+00
5	1.00	0.1129	1.31	11.3	7.718	6.24e-07	1.28e-01	2.16e-04	0.00e+00
6	2.00	0.1972	1.09	19.7	5.999	6.78e-07	8.43e-02	1.54e-04	0.00e+00
7	4.00	0.2734	0.889	27.3	5.715	5.83e-07	3.81e-02	5.99e-05	0.00e+00
8	8.00	0.3362	0.725	33.6	4.146	6.64e-07	1.57e-02	2.81e-05	0.00e+00
9	2.00	0.3213	0.764	32.1	1.793	1.43e-06	2.49e-03	9.62e-06	0.00e+00
10	0.500	0.3022	0.814	30.2	6.717	4.02e-07	1.27e-02	1.38e-05	0.00e+00
11	0.125	0.2784	0.876	27.8	0.000	0.00e+00	6.34e-02	0.00e+00	0.00e+00

GeoTesting EXPRESS	Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
	Boring No.: AP-2	Tested By: md	Checked By: mcm
	Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, olive sandy clay		
	Remarks: System Q, Swell Pressure = 0.0659 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Square Root of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv ft²/s	Mv 1/tsf	k ft/day
1	0.0659	0.002648	1.59	0.265	176.539	1.39e-07	4.02e-02	1.50e-05
2	0.125	0.008293	1.58	0.829	7.943	3.06e-06	9.54e-02	7.86e-04
3	0.250	0.02363	1.54	2.36	5.565	4.27e-06	1.23e-01	1.41e-03
4	0.500	0.04876	1.47	4.88	12.180	1.87e-06	1.01e-01	5.07e-04
5	1.00	0.1129	1.31	11.3	23.249	8.92e-07	1.28e-01	3.09e-04
6	2.00	0.1972	1.09	19.7	31.229	5.61e-07	8.43e-02	1.27e-04
7	4.00	0.2734	0.889	27.3	26.374	5.44e-07	3.81e-02	5.59e-05
8	8.00	0.3362	0.725	33.6	20.477	5.79e-07	1.57e-02	2.45e-05
9	2.00	0.3213	0.764	32.1	11.581	9.55e-07	2.49e-03	6.41e-06
10	0.500	0.3022	0.814	30.2	22.537	5.16e-07	1.27e-02	1.77e-05
11	0.125	0.2784	0.876	27.8	107.764	1.15e-07	6.34e-02	1.96e-05

GeoTesting EXPRESS

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-2	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 18.0-20.0 ft
Test No.: IP-4	Sample Type: intact	Elevation: ---
Description: Moist, olive sandy clay		
Remarks: System Q, Swell Pressure = 0.0659 tsf		
Displacement at End of Increment		

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	---	Sample Type:	---	Tested By:	jbr
Sample ID:	---	Test Date:	08/30/16	Checked By:	mcm
Depth :	---	Test Id:	387124		

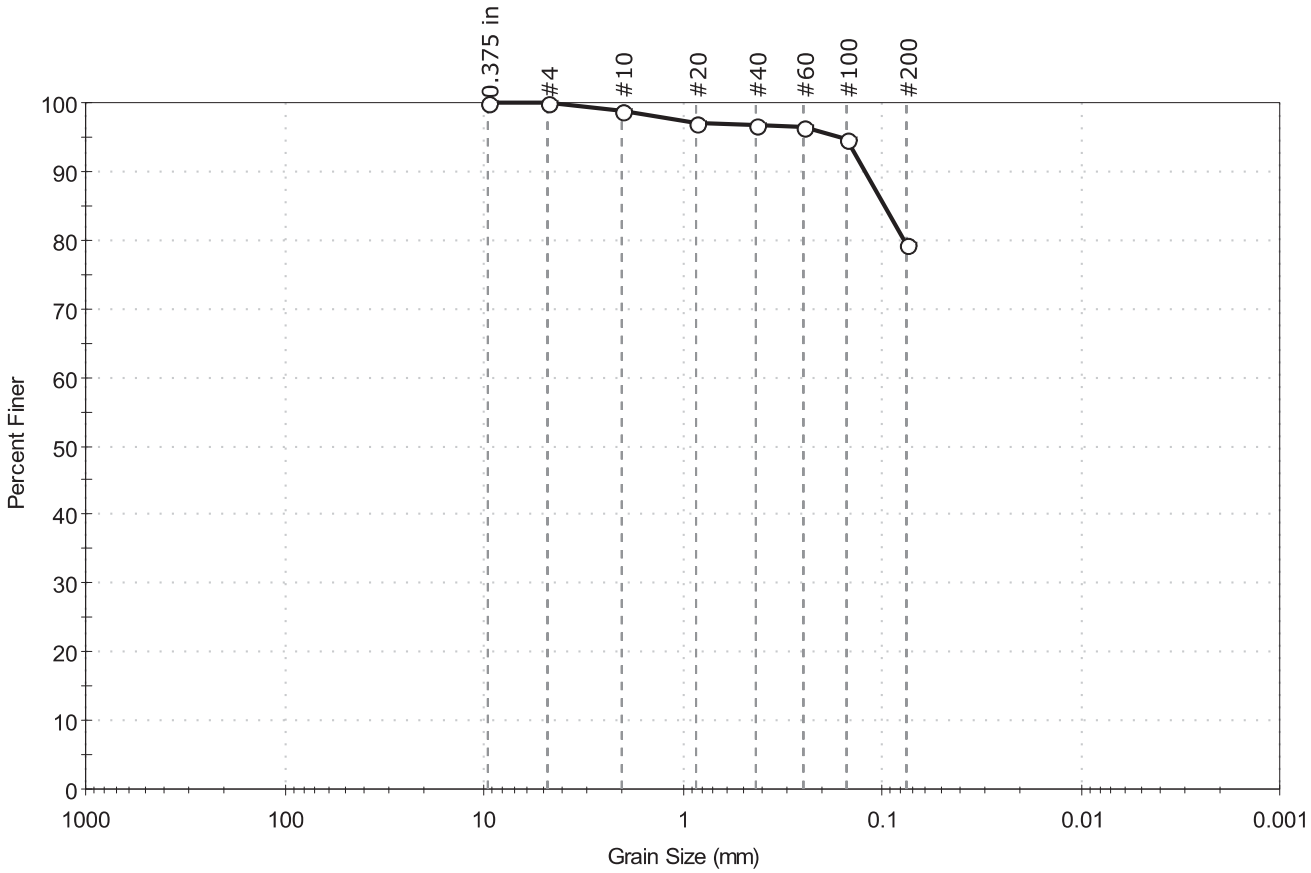
Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
AP-3	UD-1	25.0-27.0 ft	Moist, olive clay with sand	83.0

Notes: Temperature of Drying : 110º Celsius

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	AP-3	Sample Type:	tube	Tested By:	jbr
Sample ID:	UD-1	Test Date:	08/29/16	Checked By:	mcm
Depth :	25.0-27.0 ft	Test Id:	387105		
Test Comment:	---				
Visual Description:	Moist, olive clay with sand				
Sample Comment:	Sample contains shells and shell fragments				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.1	20.4	79.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	99		
#20	0.85	97		
#40	0.42	97		
#60	0.25	96		
#100	0.15	95		
#200	0.075	79		

Coefficients

D_{85} = 0.0966 mm	D_{30} = N/A
D_{60} = N/A	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Fat clay with sand (CH)

AASHTO Clayey Soils (A-7-6 (50))

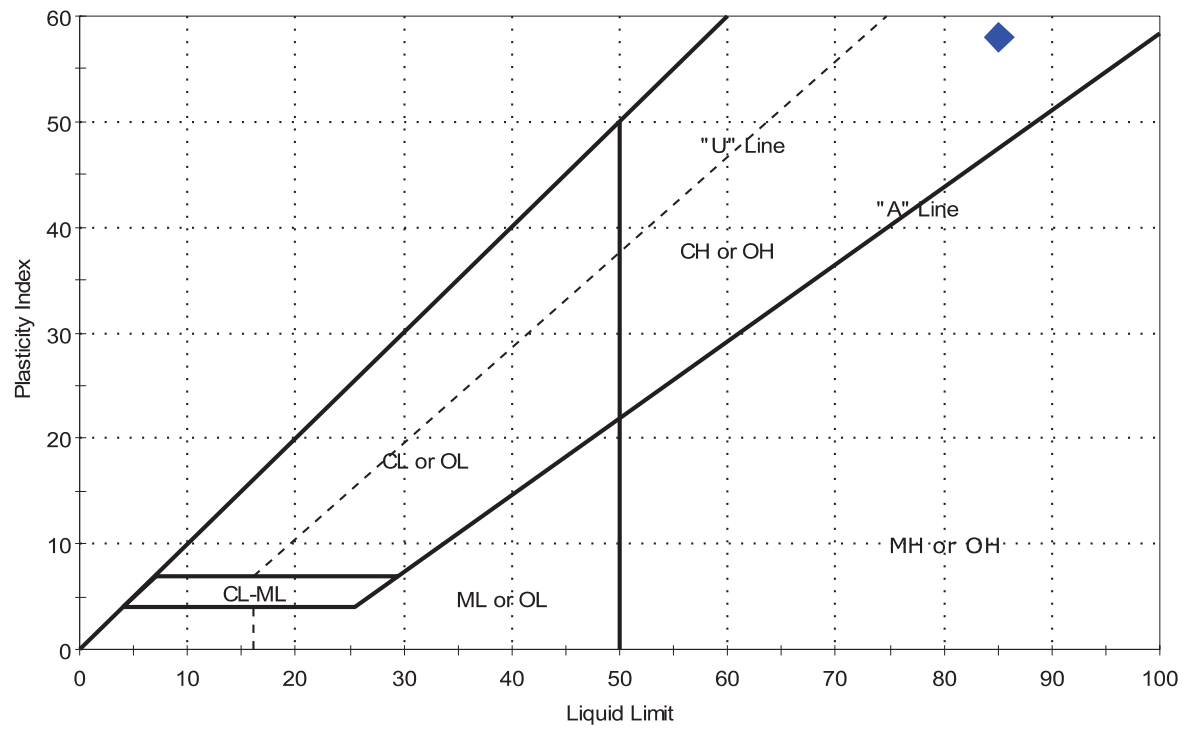
Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	AP-3	Sample Type:	tube	Tested By:	GA
Sample ID:	UD-1	Test Date:	08/31/16	Checked By:	mcm
Depth :	25.0-27.0 ft	Test Id:	387113		
Test Comment:	---				
Visual Description:	Moist, olive clay with sand				
Sample Comment:	Sample contains shells and shell fragments				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UD-1	AP-3	25.0-27.0 ft	83	85	27	58	1	Fat clay with sand (CH)

Sample Prepared using the WET method

3% Retained on #40 Sieve

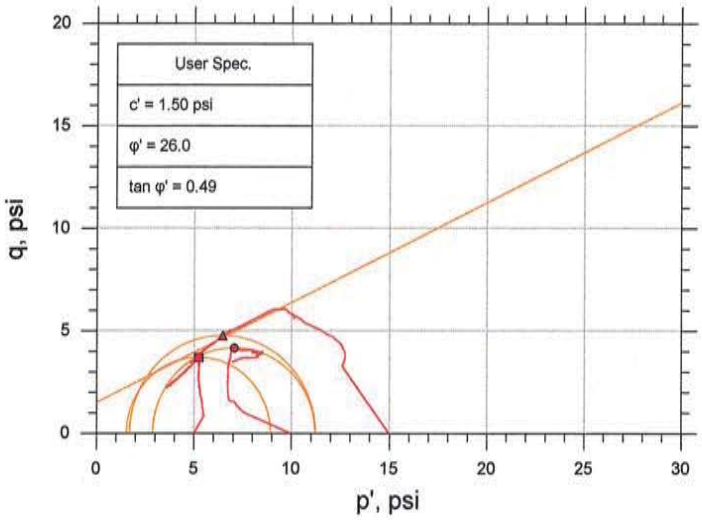
Dry Strength: VERY HIGH

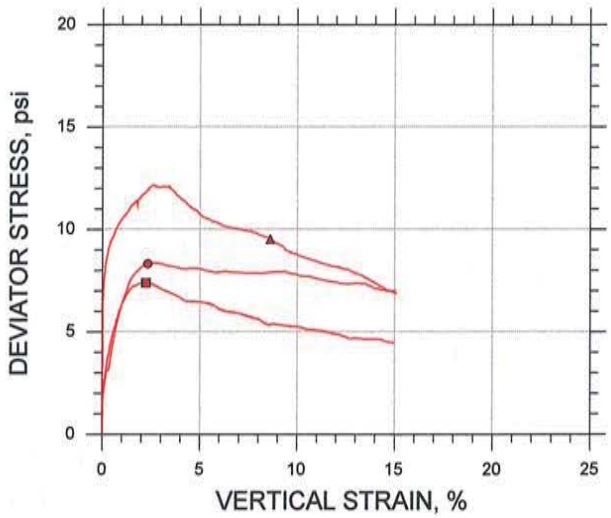
Dilatancy: NONE

Toughness: MEDIUM

Client: F&ME Consultants	
Project Name: US-21 Replacement Bridge	
Project Location: ---	
Project Number: GTX-305005	
Tested By: md	Checked By: mcm
Boring ID: AP-3	
Preparation: intact	
Description: Moist, olive clay with sand	
Classification: Fat clay with sand	
Group Symbol: CH	
Liquid Limit: 85	Plastic Limit: 27
Plasticity Index: 58	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





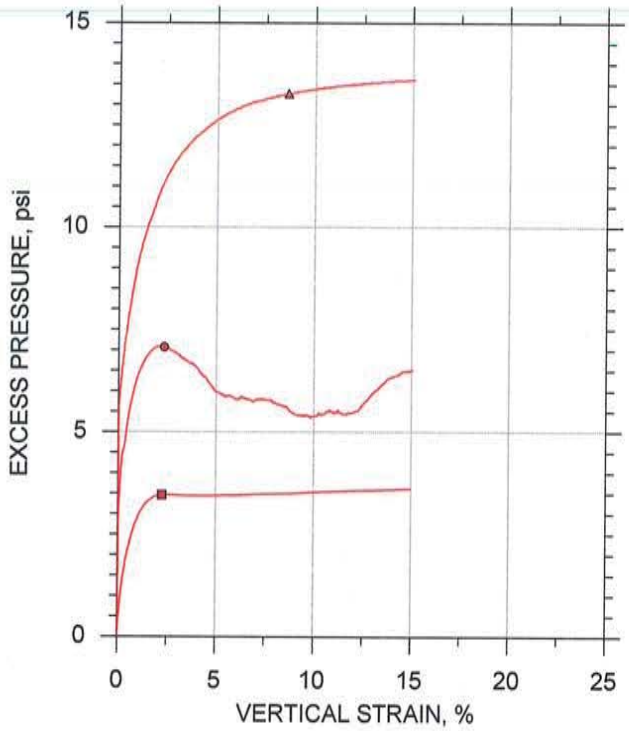
Symbol		■	●	▲	
Sample ID		ST-1	ST-1	ST-1	
Depth, ft		25.0-27.0 ft	25.0.-27.0 ft	25.0-27.0 ft	
Test Number		CU-6-1	CU-6-2	CU-6-3	
Initial	Height, in	4.720	4.620	4.580	
	Diameter, in	2.030	2.030	2.030	
	Moisture Content (from Cuttings), %	81.4	86.2	82.4	
	Dry Density, pcf	51.4	50.4	50.0	
	Saturation (Wet Method), %	96.3	99.3	93.8	
	Void Ratio	2.28	2.35	2.37	
Before Shear	Moisture Content, %	82.9	85.0	69.4	
	Dry Density, pcf	52.0	51.1	58.7	
	Cross-sectional Area (Method A), in²	3.214	3.191	2.870	
	Saturation, %	100.0	100.0	100.0	
	Void Ratio	2.24	2.30	1.87	
	Back Pressure, psi	152.9	160.8	39.02	
Vertical Effective Consolidation Stress, psi		4.946	9.960	14.65	
Horizontal Effective Consolidation Stress, psi		4.999	9.962	14.97	
Vertical Strain after Consolidation, %		0.6778	0.08763	3.850	
Volumetric Strain after Consolidation, %		1.541	1.531	14.69	
Time to 50% Consolidation, min		45.56	16.81	297.6	
Shear Strength, psi		3.695	4.164	4.763	
Strain at Failure, %		2.24	2.33	8.61	
Strain Rate, %/min		0.01600	0.01600	0.01600	
Deviator Stress at Failure, psi		7.391	8.329	9.526	
Effective Minor Principal Stress at Failure, psi		1.536	2.888	1.698	
Effective Major Principal Stress at Failure, psi		8.927	11.22	11.22	
B-Value		0.95	0.95	0.96	

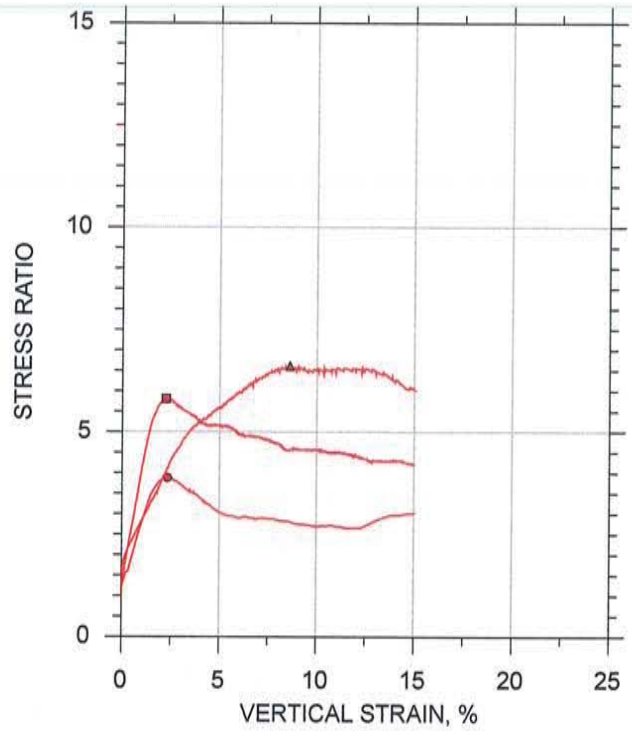
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

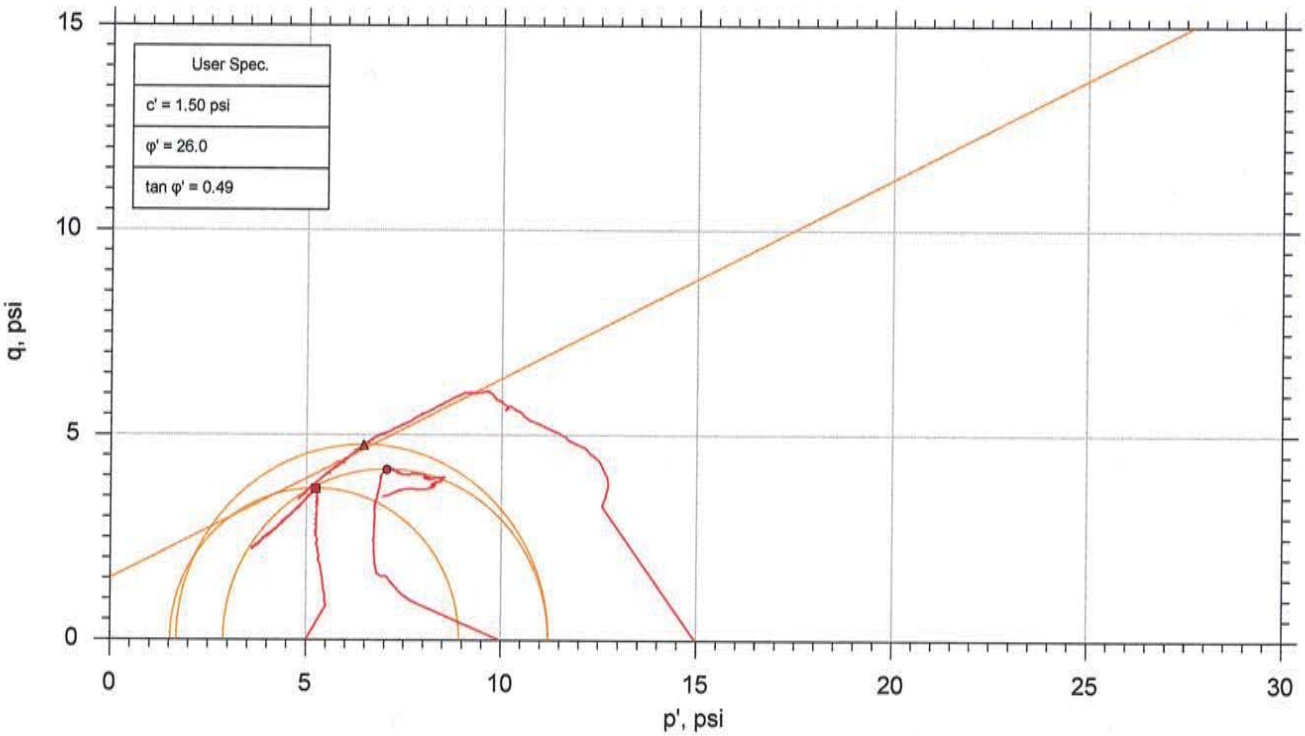
Remarks:

System X

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







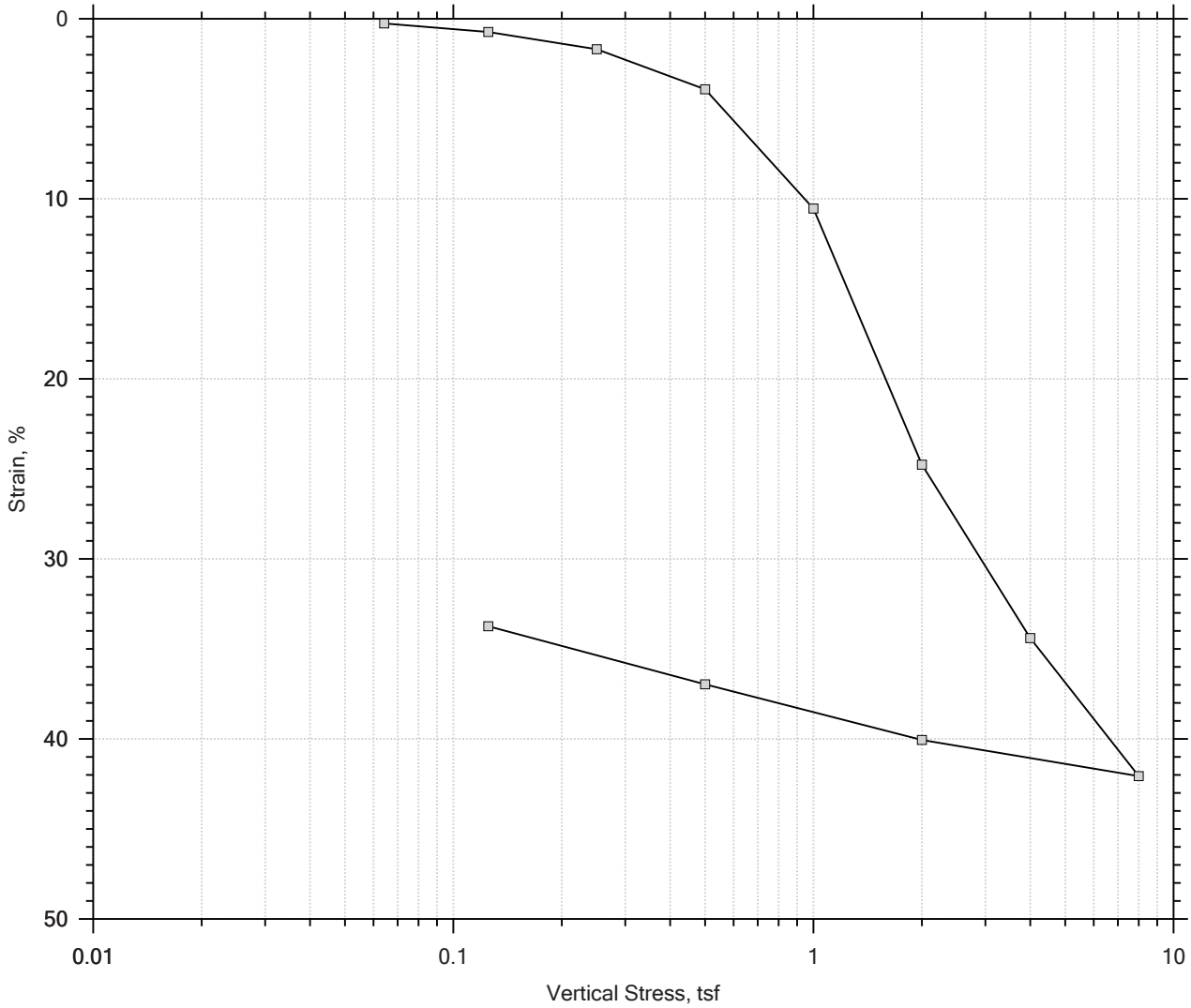
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	ST-1	CU-6-1	25.0-27.0 ft	md	8/25/16	mcm	9/7/16	305005-CU-6-1m.dat
●	ST-1	CU-6-2	25.0.-27.0 ft	md	08/26/16	mcm	9/7/16	305005-CU-6-2m.dat
▲	ST-1	CU-6-3	25.0-27.0 ft	md	08/25/16	mcm	9/7/16	305005-CU-6-3m.dat

GeoTesting EXPRESS

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Sample Type: intact	
Description: Moist, olive clay with sand		
Remarks: System X		

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report

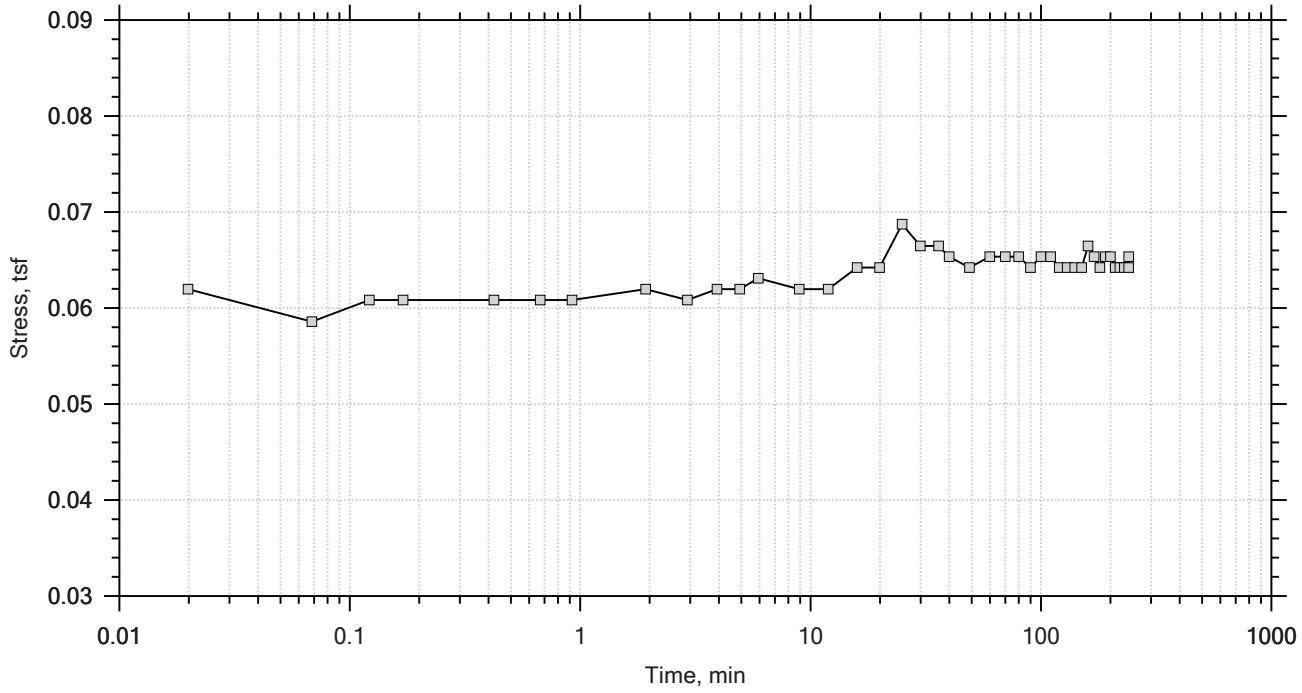


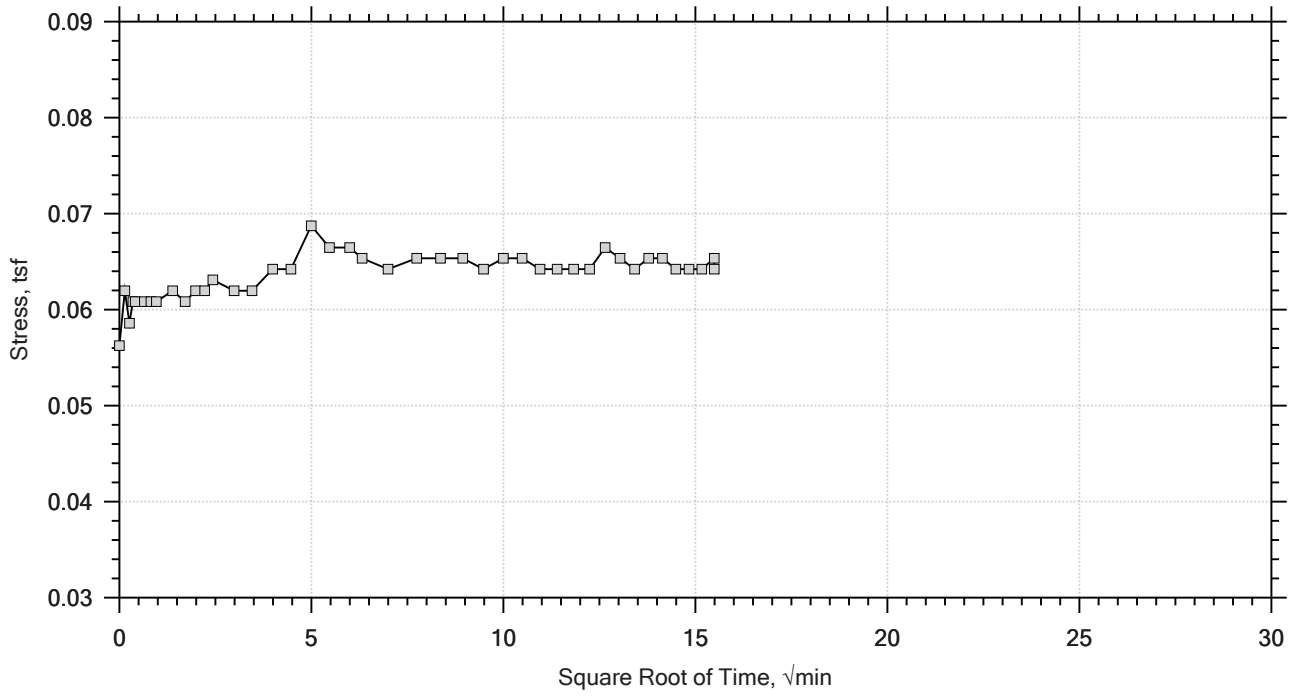
					Before Test	After Test
Current Vertical Effective Stress: ---				Water Content, %	105.01	58.58
Preconsolidation Stress: ---				Dry Unit Weight, pcf	43.621	65.827
Compression Ratio: ---				Saturation, %	98.28	100.00
Diameter: 2.5 in		Height: 1 in		Void Ratio	2.95	1.62
LL: 85	PL: 27	PI: 58	GS: 2.76			

GeoTesting EXPRESS	Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
	Boring No.: AP-3	Tested By: md	Checked By: mcm
	Sample No.: UD-1	Test Date: 8/26/16	Depth: 25-27 ft
	Test No.: IP-6	Sample Type: intact	Elevation: ---
	Description: Moist, grey clay		
	Remarks: System S, Swell Pressure =		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 11
Constant Volume Step
Stress: 0.0642 tsf

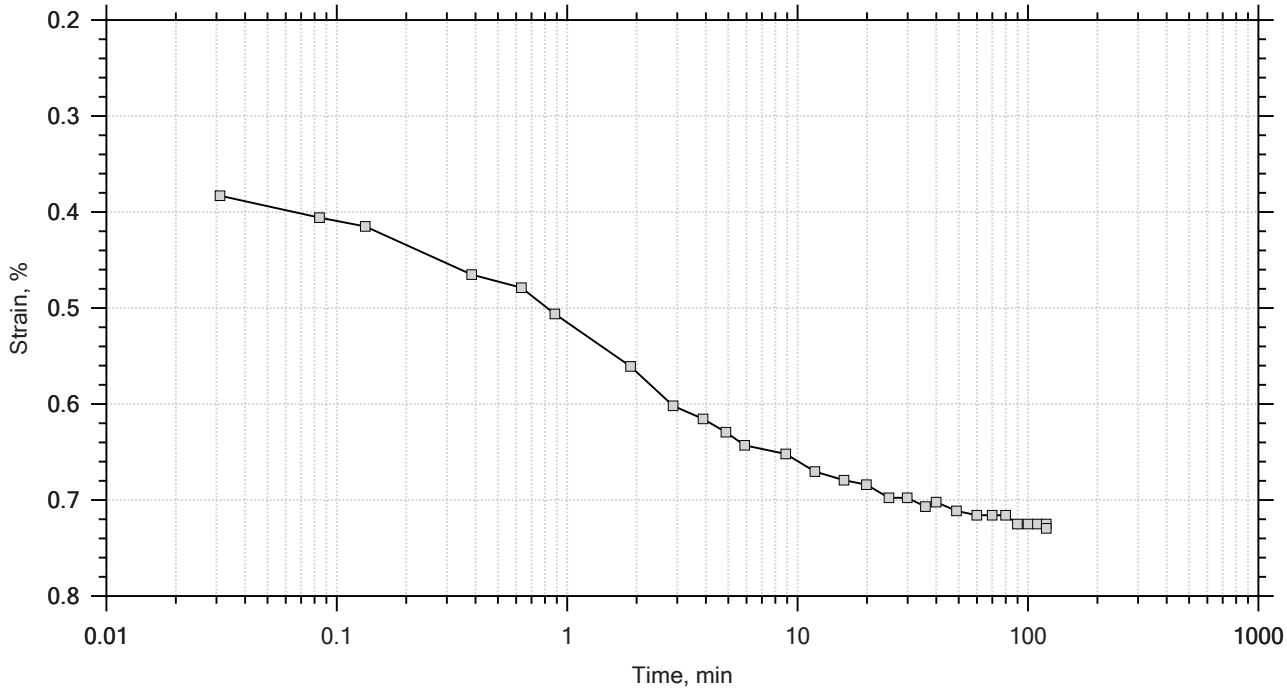


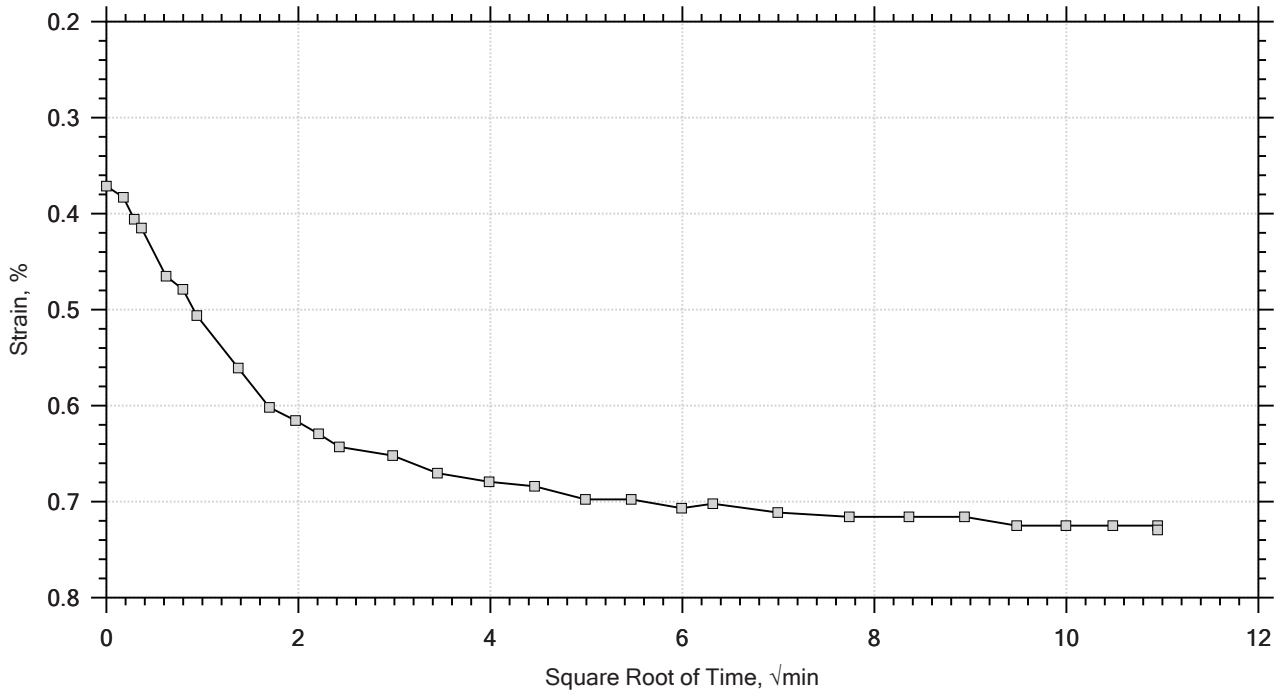


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 8/26/16	Depth: 25-27 ft
Test No.: IP-6	Sample Type: intact	Elevation: ---
Description: Moist, grey clay		
Remarks: System S, Swell Pressure =		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 11
Constant Load Step
Stress: 0.125 tsf

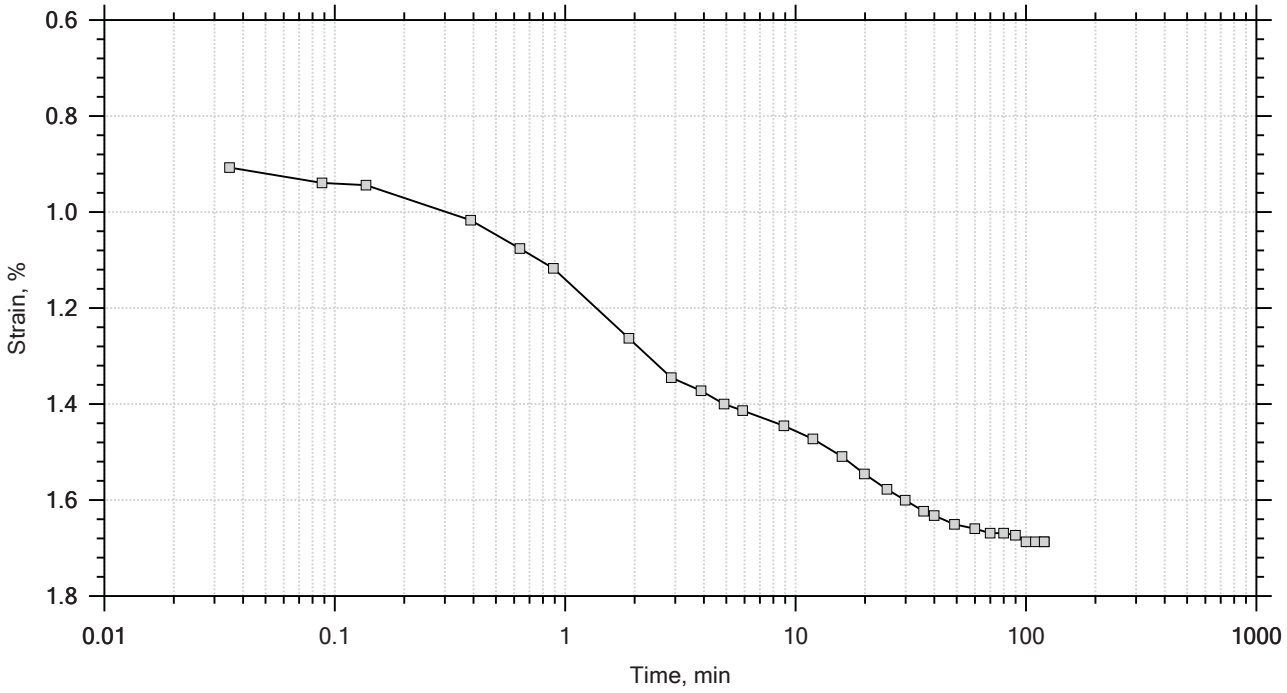


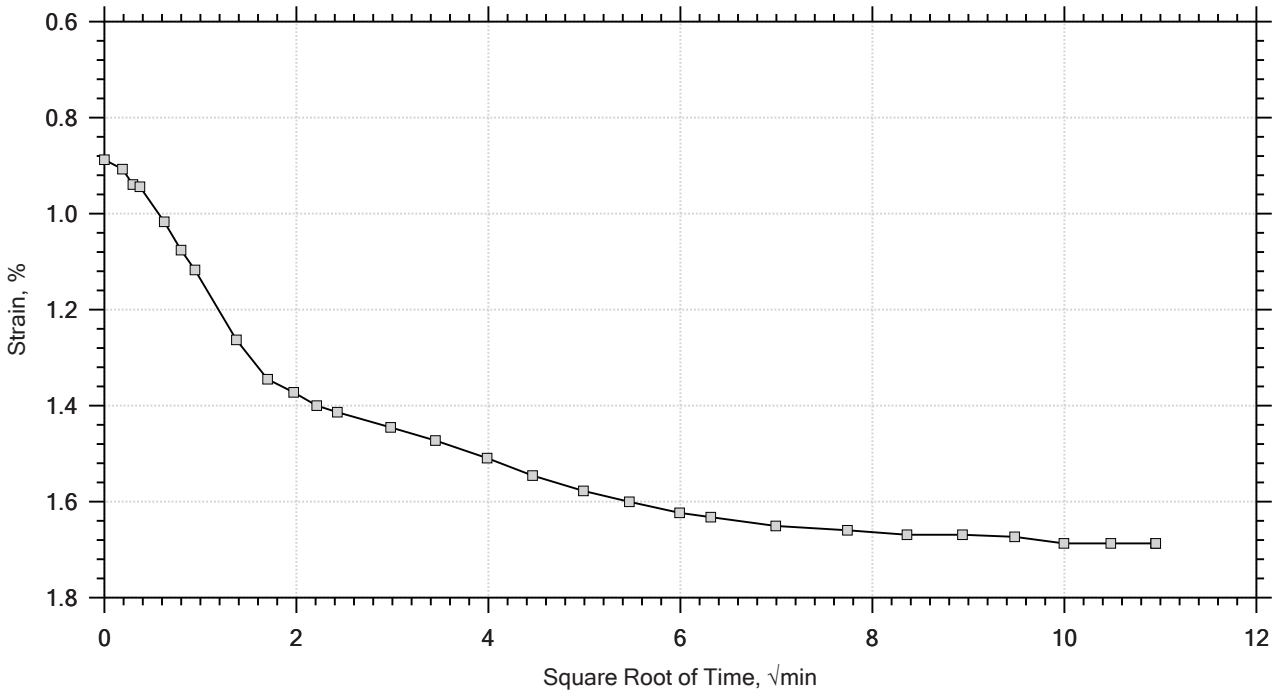


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 8/26/16	Depth: 25-27 ft
Test No.: IP-6	Sample Type: intact	Elevation: ---
Description: Moist, grey clay		
Remarks: System S, Swell Pressure =		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 11
Constant Load Step
Stress: 0.25 tsf

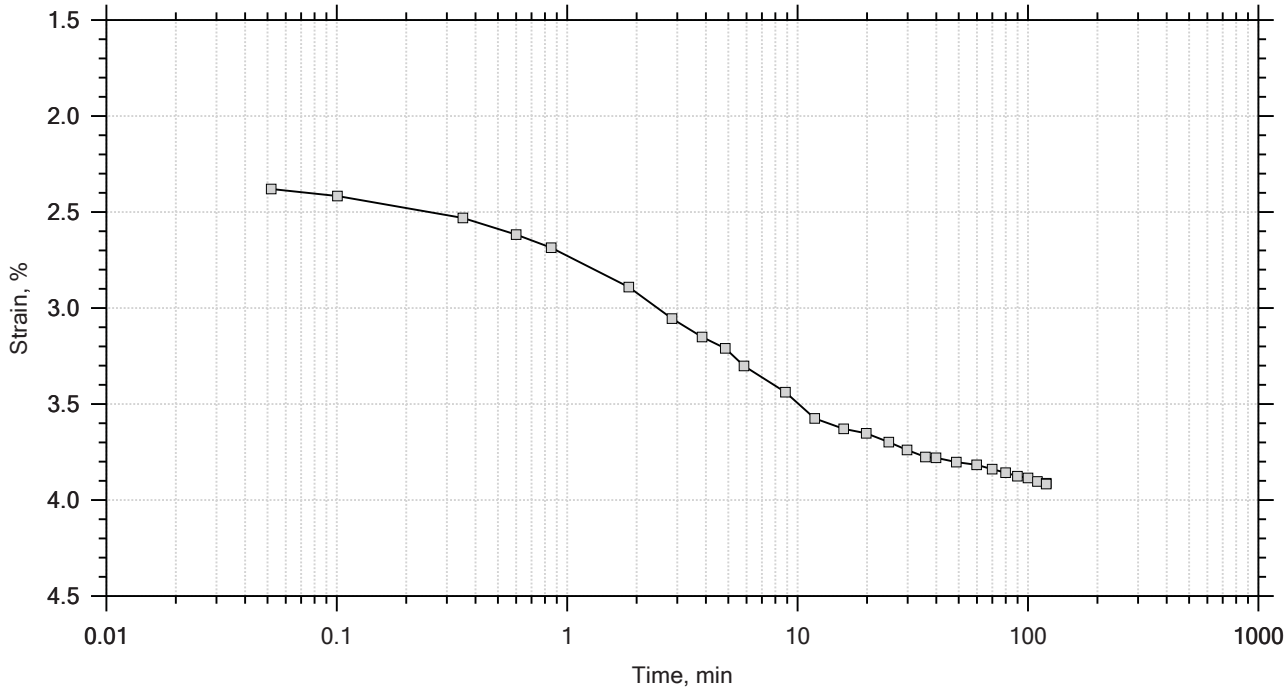


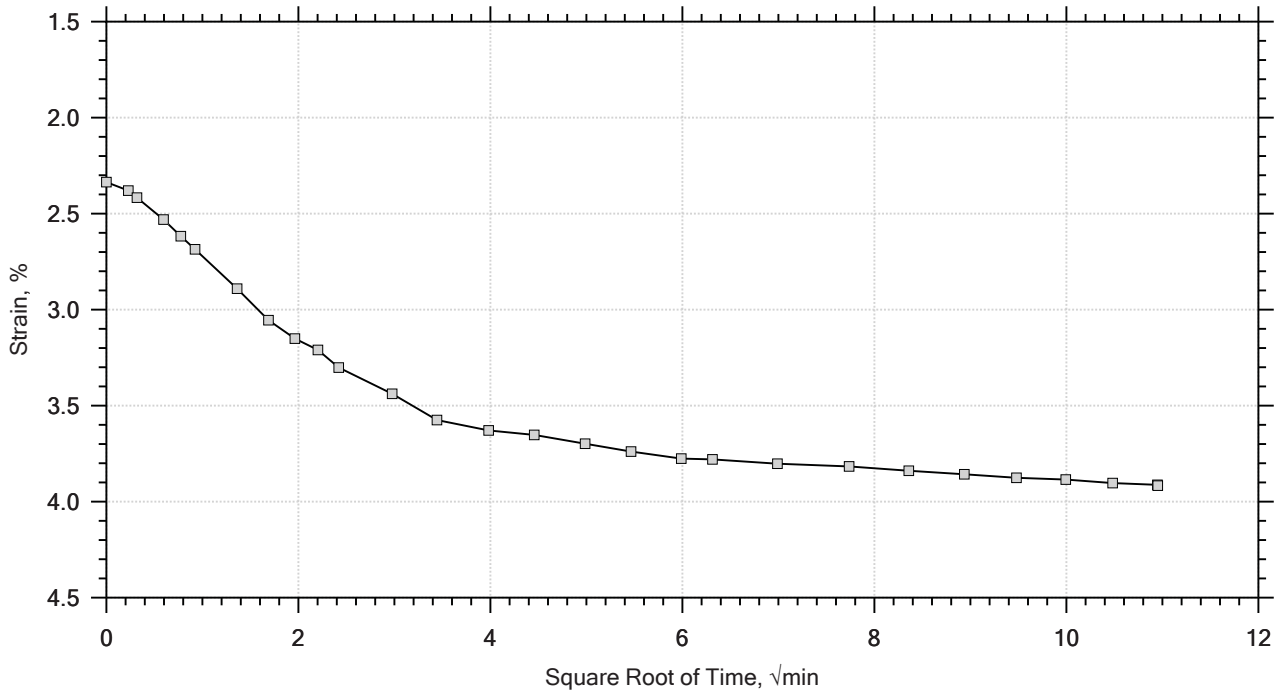


GeoTesting EXPRESS	Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
	Boring No.: AP-3	Tested By: md	Checked By: mcm
	Sample No.: UD-1	Test Date: 8/26/16	Depth: 25-27 ft
	Test No.: IP-6	Sample Type: intact	Elevation: ---
	Description: Moist, grey clay		
	Remarks: System S, Swell Pressure =		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 11
Constant Load Step
Stress: 0.5 tsf

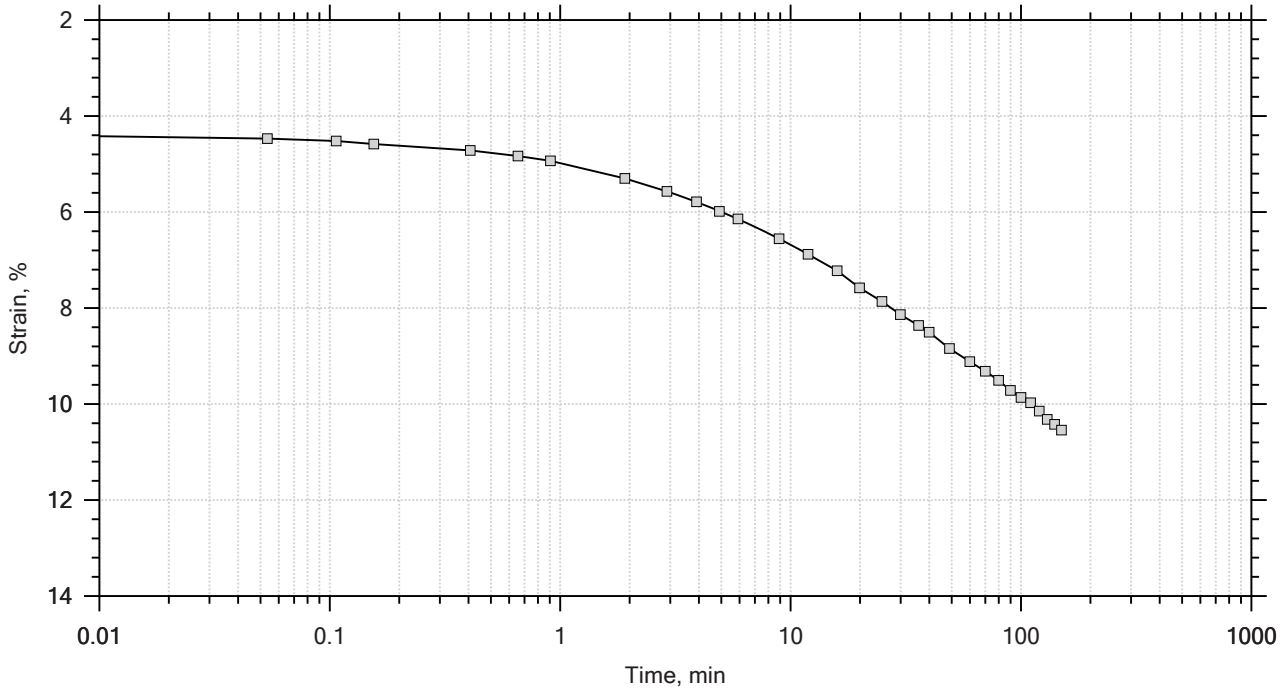


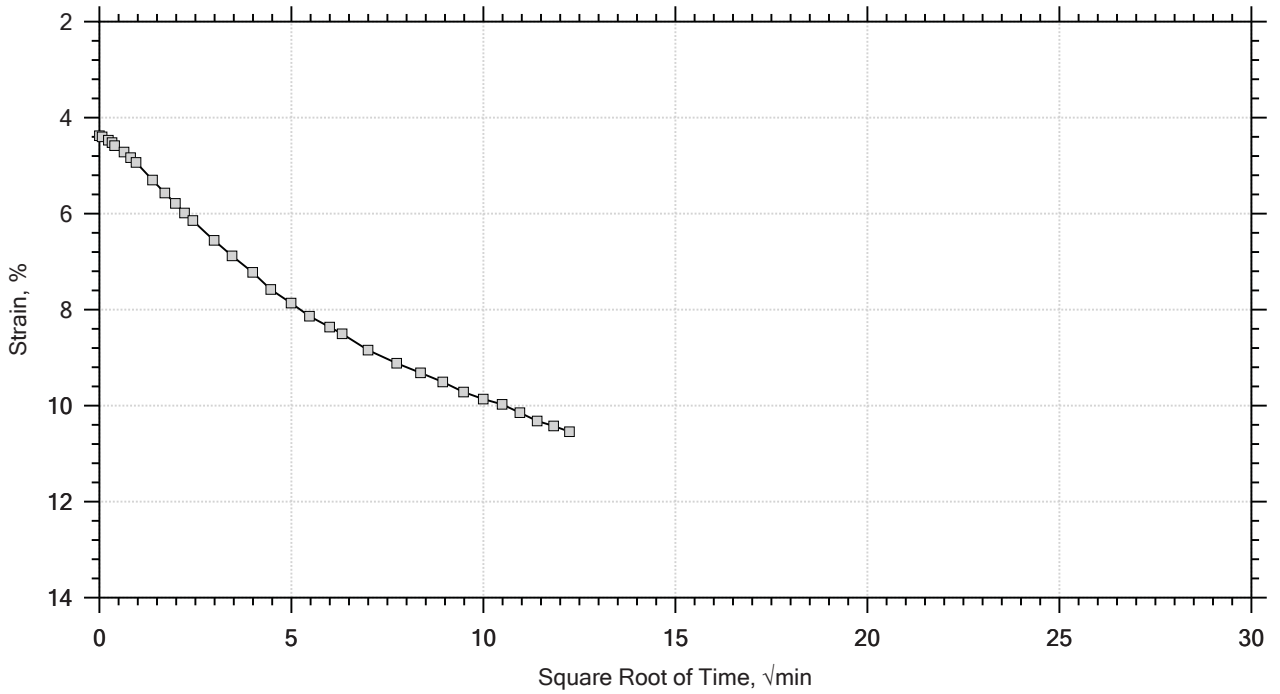


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 8/26/16	Depth: 25-27 ft
Test No.: IP-6	Sample Type: intact	Elevation: ---
Description: Moist, grey clay		
Remarks: System S, Swell Pressure =		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 11
Constant Load Step
Stress: 1 tsf

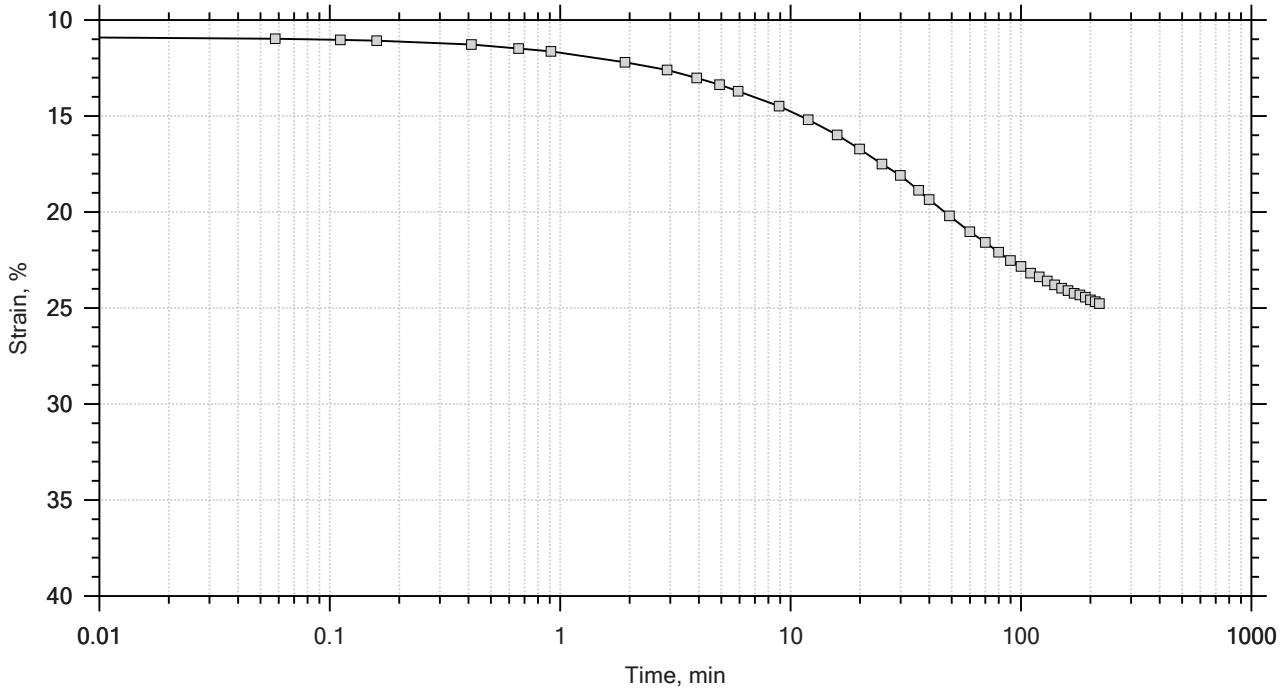


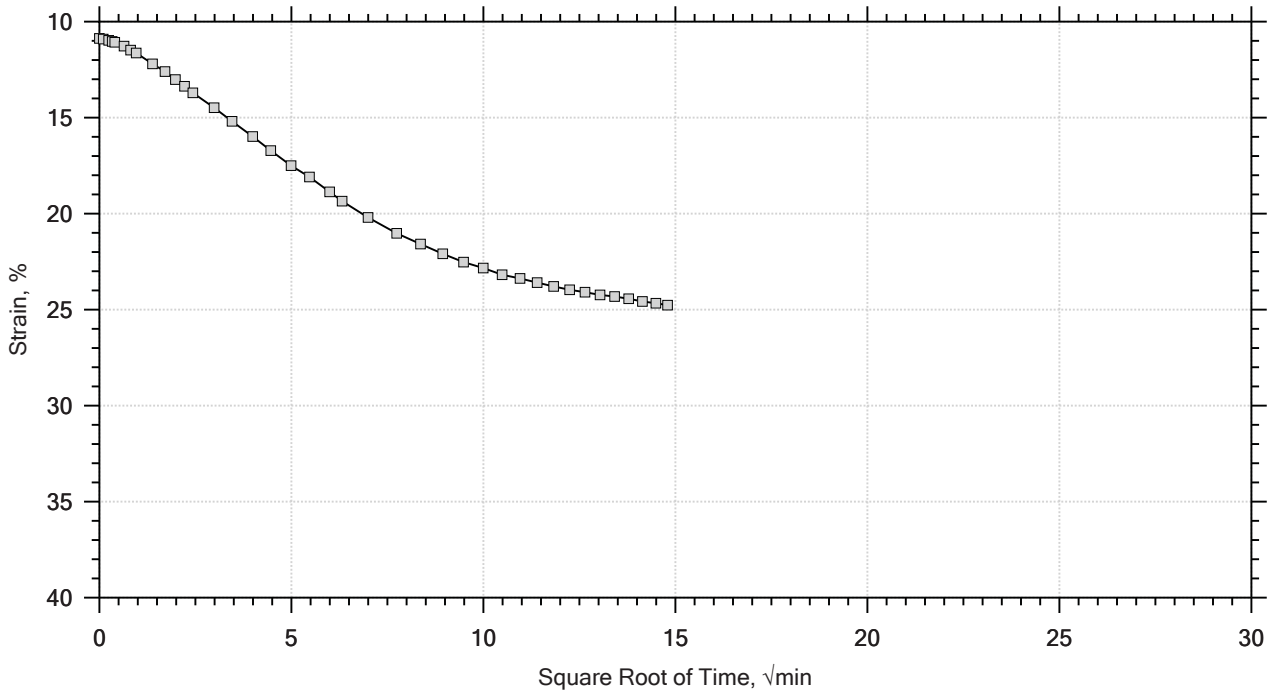


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 8/26/16	Depth: 25-27 ft
Test No.: IP-6	Sample Type: intact	Elevation: ---
Description: Moist, grey clay		
Remarks: System S, Swell Pressure =		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 11
Constant Load Step
Stress: 2 tsf

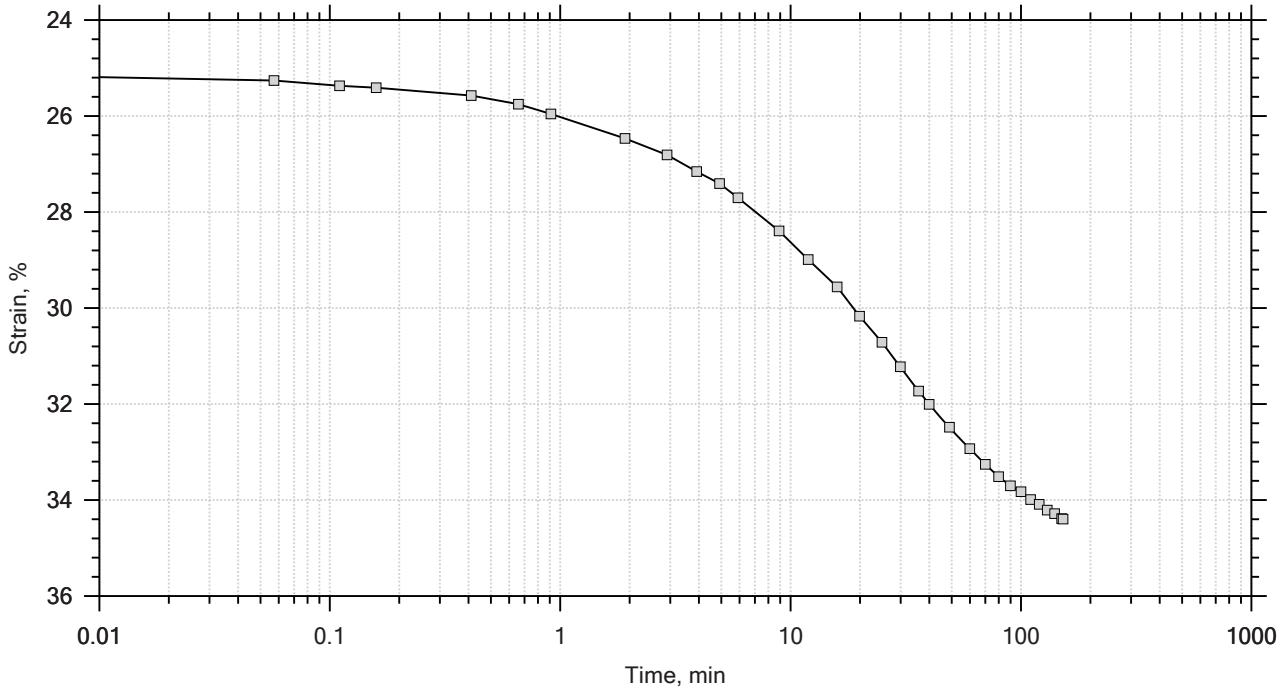


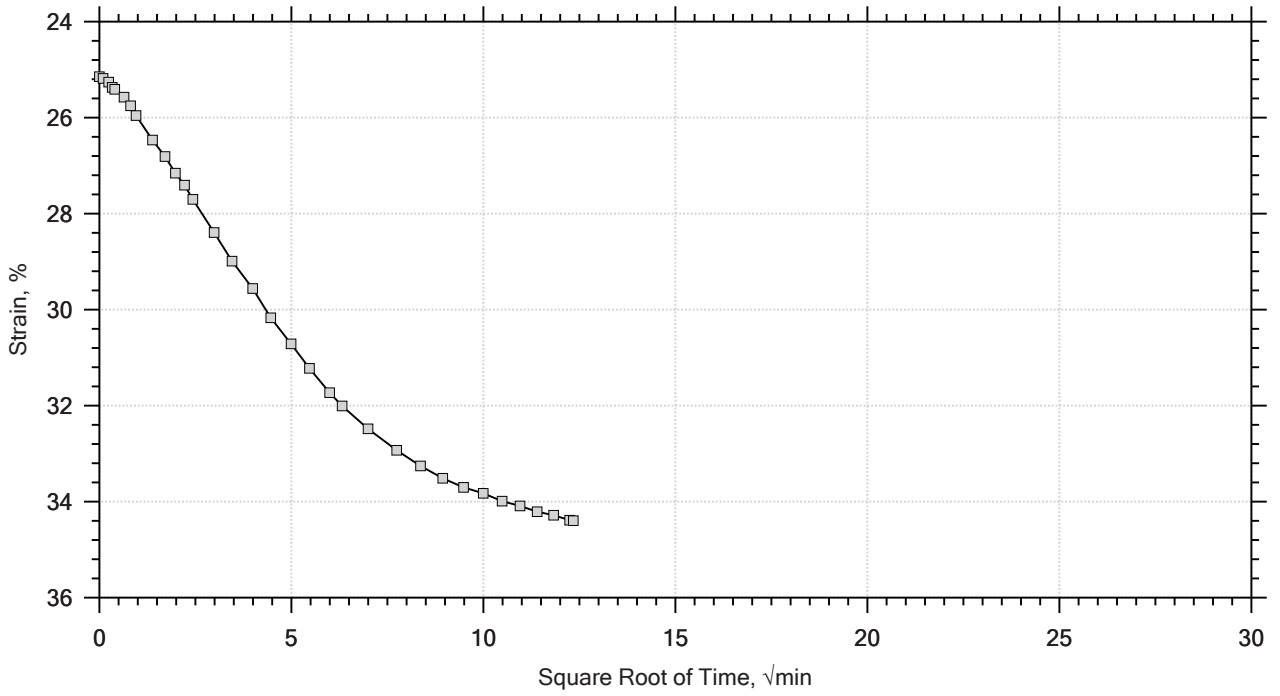


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 8/26/16	Depth: 25-27 ft
Test No.: IP-6	Sample Type: intact	Elevation: ---
Description: Moist, grey clay		
Remarks: System S, Swell Pressure =		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 11
Constant Load Step
Stress: 4 tsf

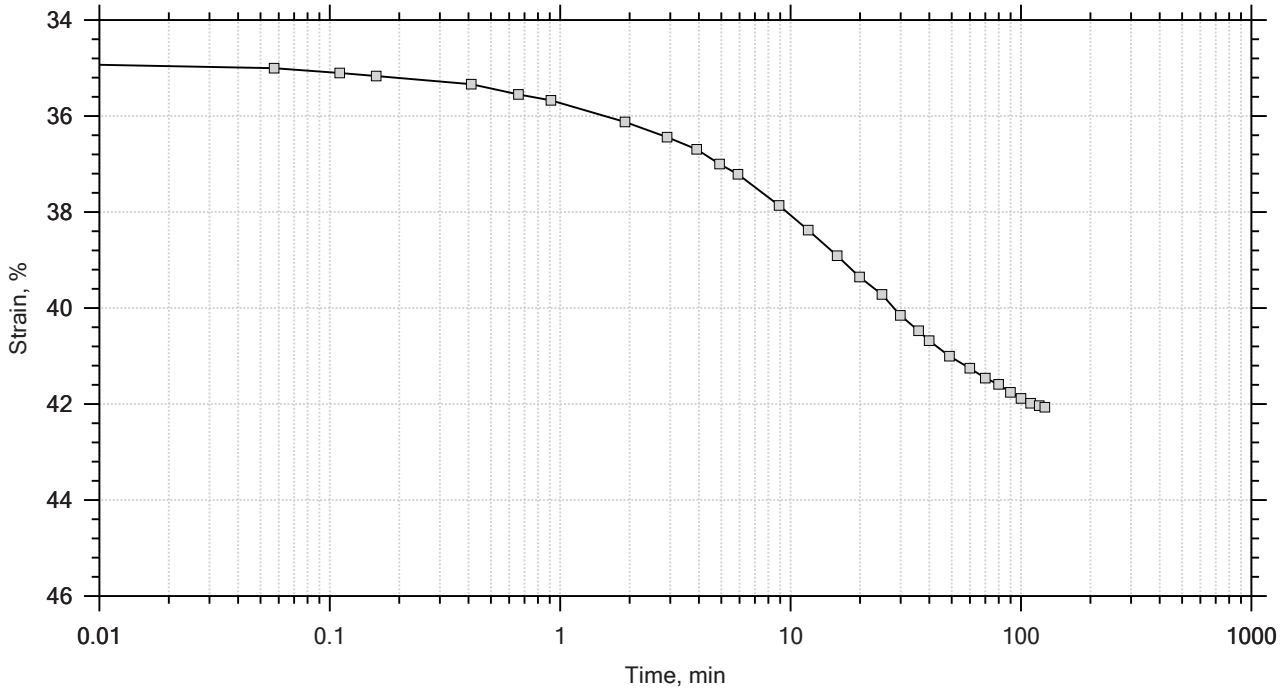


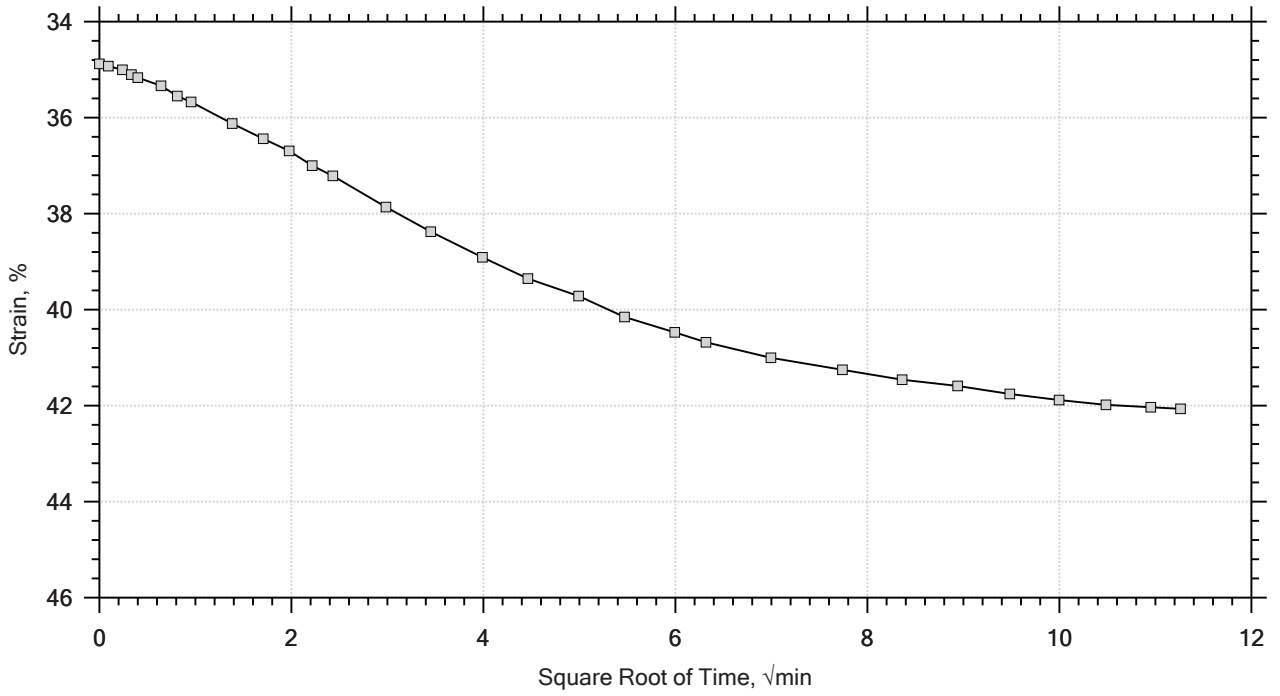


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 8/26/16	Depth: 25-27 ft
Test No.: IP-6	Sample Type: intact	Elevation: ---
Description: Moist, grey clay		
Remarks: System S, Swell Pressure =		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 11
Constant Load Step
Stress: 8 tsf

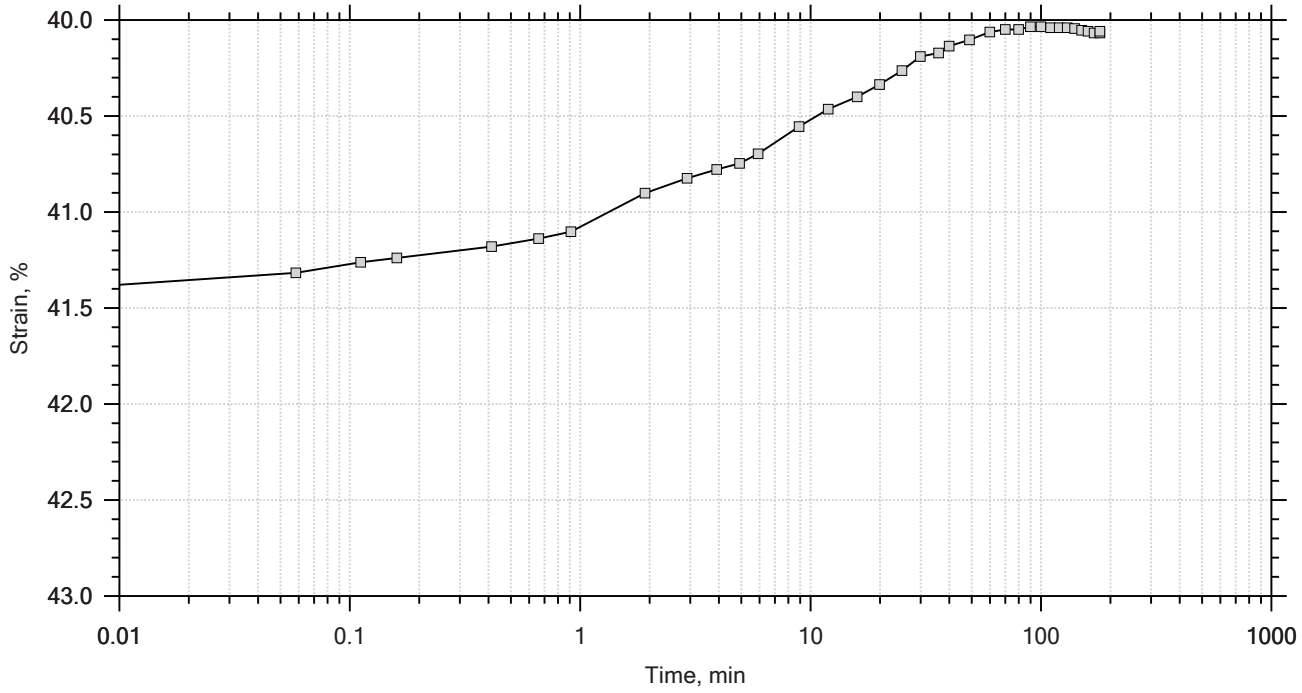


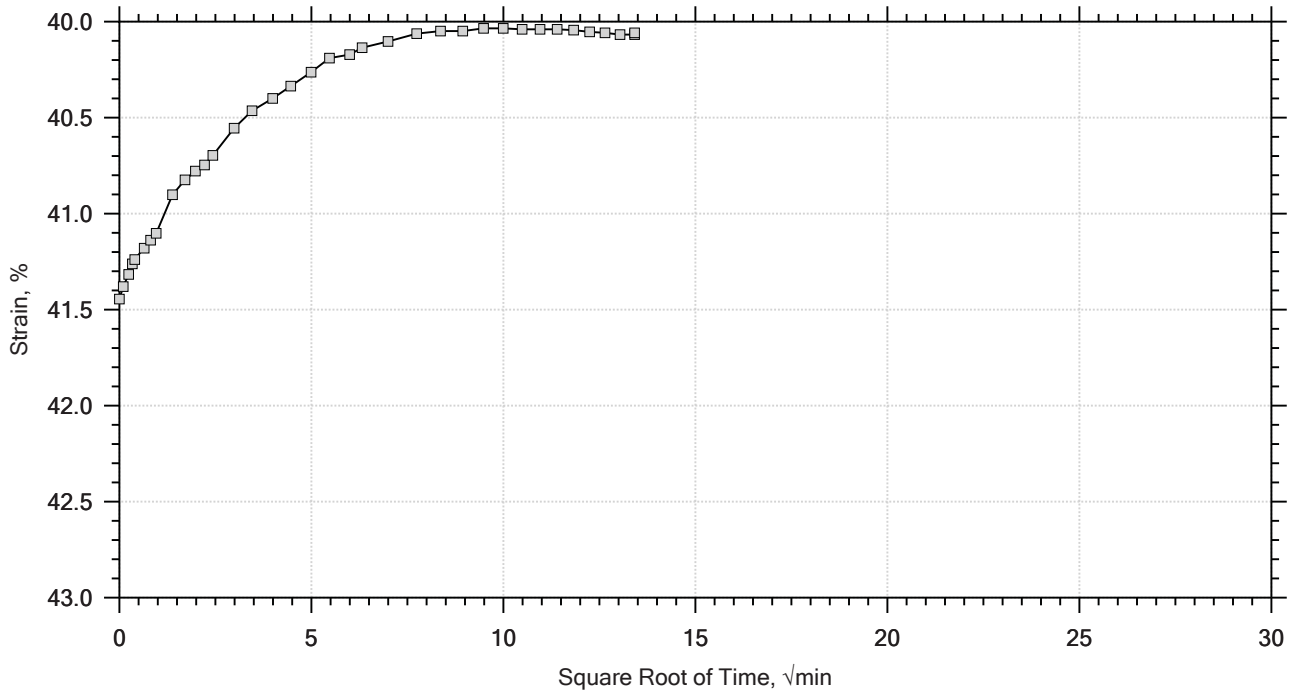


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 8/26/16	Depth: 25-27 ft
Test No.: IP-6	Sample Type: intact	Elevation: ---
Description: Moist, grey clay		
Remarks: System S, Swell Pressure =		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 11
Constant Load Step
Stress: 2 tsf

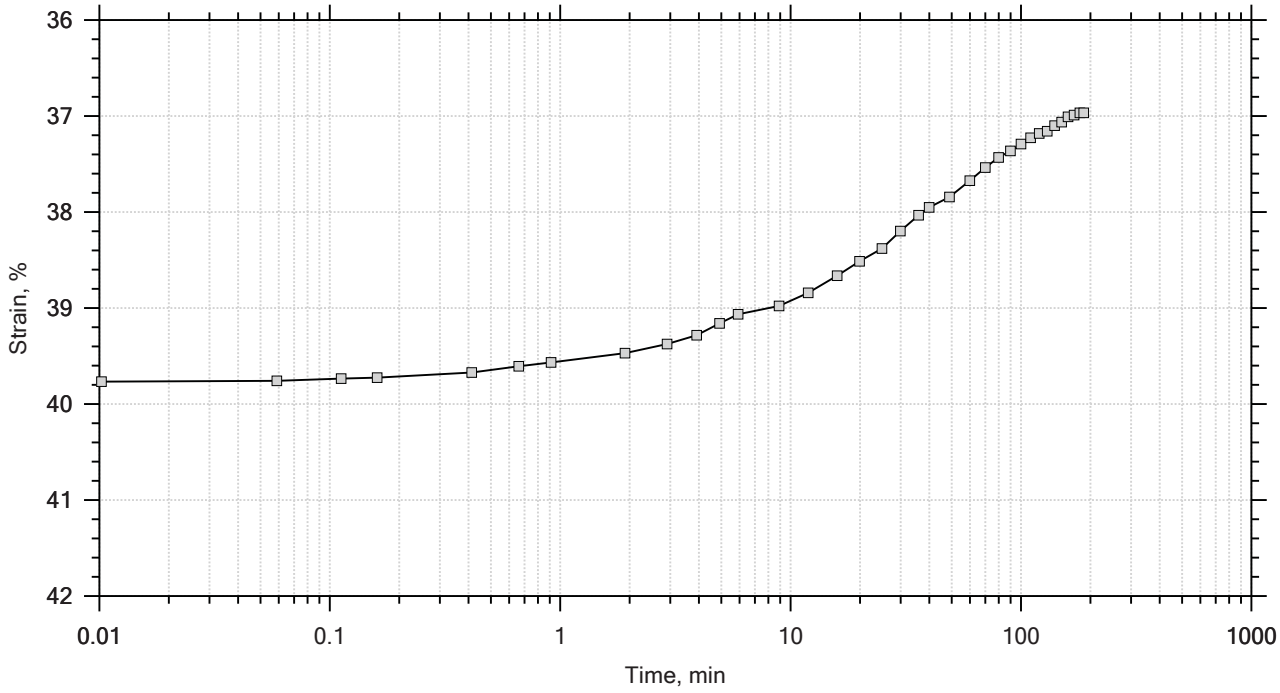


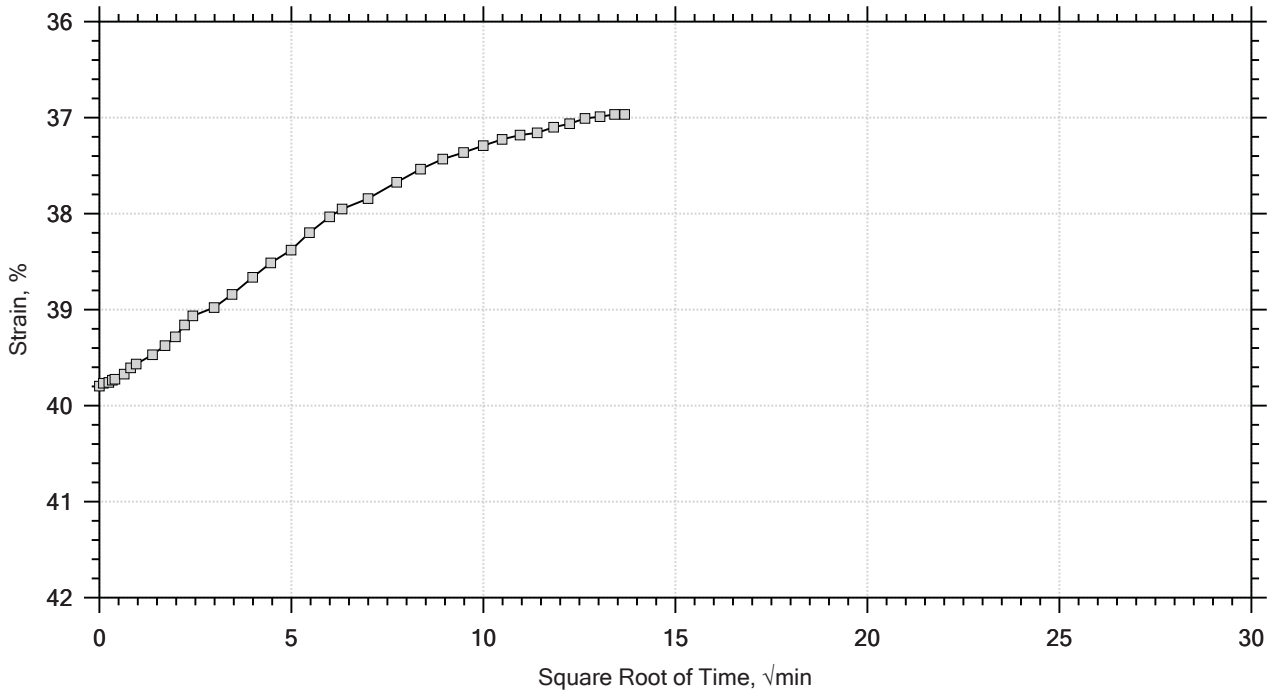


GeoTesting EXPRESS	Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
	Boring No.: AP-3	Tested By: md	Checked By: mcm
	Sample No.: UD-1	Test Date: 8/26/16	Depth: 25-27 ft
	Test No.: IP-6	Sample Type: intact	Elevation: ---
	Description: Moist, grey clay		
	Remarks: System S, Swell Pressure =		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 11
Constant Load Step
Stress: 0.5 tsf

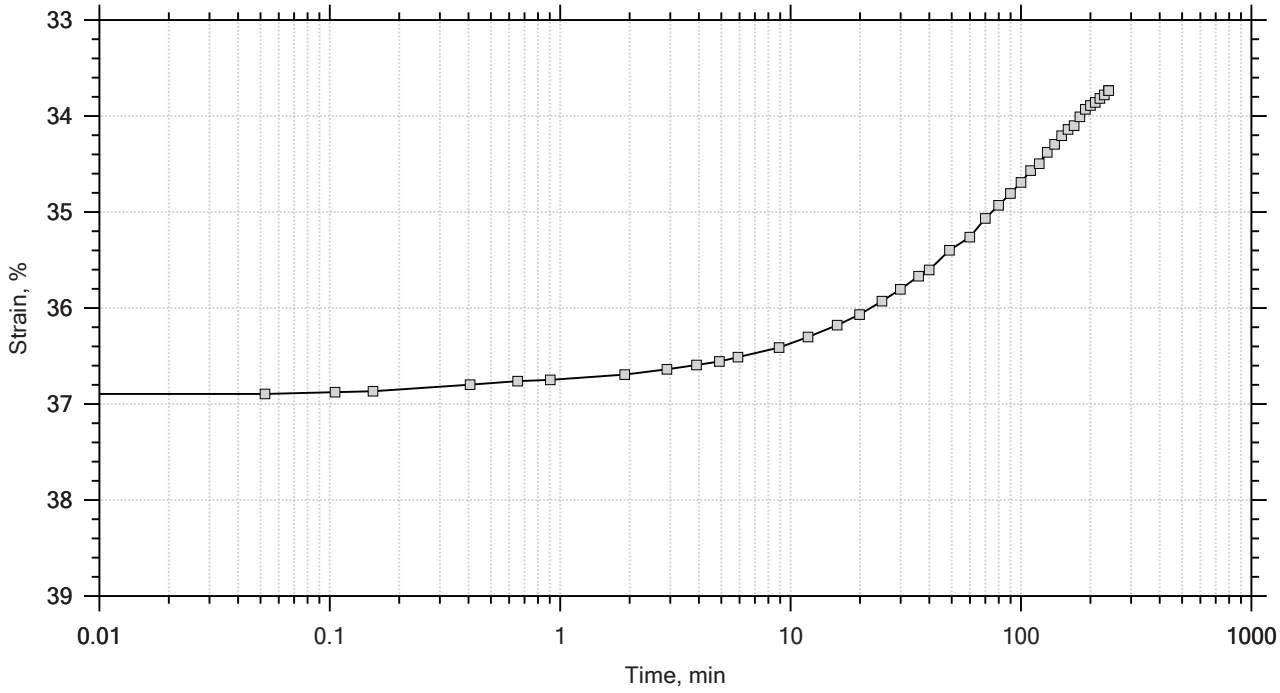


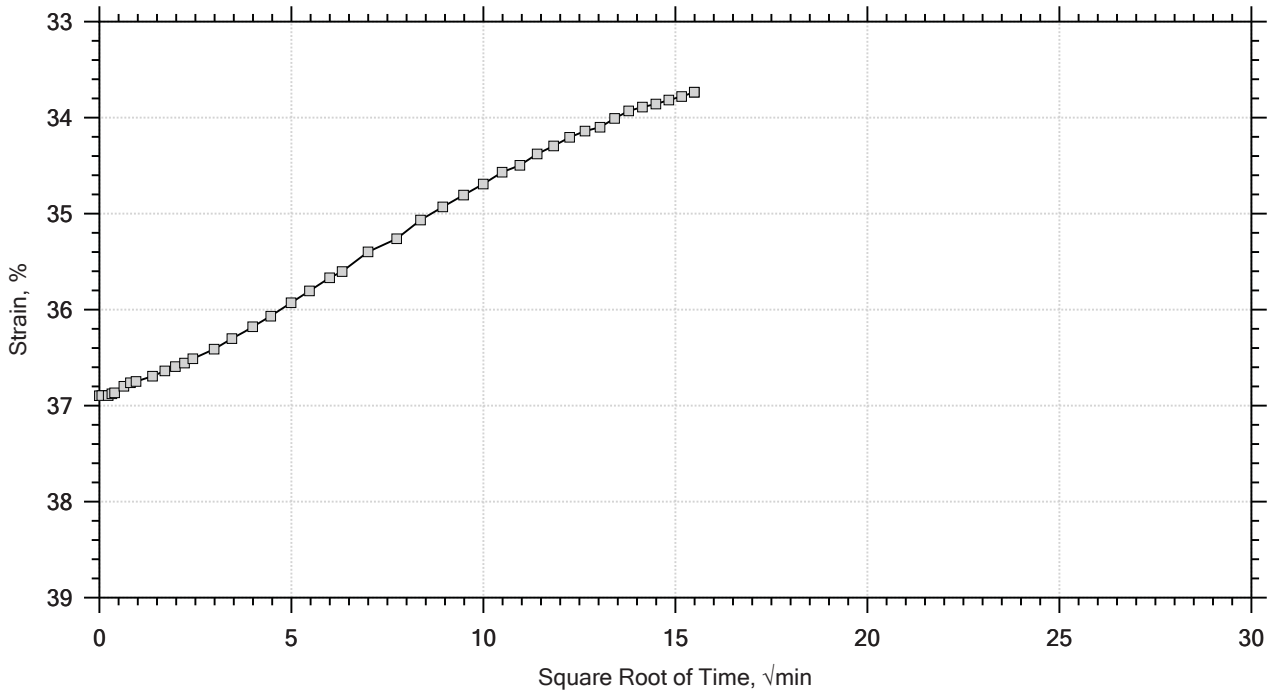


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 8/26/16	Depth: 25-27 ft
Test No.: IP-6	Sample Type: intact	Elevation: ---
Description: Moist, grey clay		
Remarks: System S, Swell Pressure =		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 11
Constant Load Step
Stress: 0.125 tsf





Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 8/26/16	Depth: 25-27 ft
Test No.: IP-6	Sample Type: intact	Elevation: ---
Description: Moist, grey clay		
Remarks: System S, Swell Pressure =		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.76	Liquid Limit: 85
Initial Height: 1.00 in	Initial Void Ratio: 2.95	Plastic Limit: 27
Final Height: 0.66 in	Final Void Ratio: 1.62	Plasticity Index: 58

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	C-1757	RING		C-1676
Mass Container, gm	8.34	108.89	108.89	8.64
Mass Container + Wet Soil, gm	169.13	224.12	198.02	97.49
Mass Container + Dry Soil, gm	93.83	165.1	165.1	64.67
Mass Dry Soil, gm	85.49	56.207	56.207	56.03
Water Content, %	88.08	105.01	58.58	58.58
Void Ratio	---	2.95	1.62	---
Degree of Saturation, %	---	98.28	100.00	---
Dry Unit Weight, pcf	---	43.621	65.827	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 8/26/16	Depth: 25-27 ft
Test No.: IP-6	Sample Type: intact	Elevation: ---
Description: Moist, grey clay		
Remarks: System S, Swell Pressure =		

One-Dimensional Consolidation by ASTM D2435 - Method B

Log of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/s	Mv 1/tsf	k ft/day	Ca %
1	0.0642	0.002508	2.94	0.251	0.000	0.00e+00	3.90e-02	0.00e+00	0.00e+00
2	0.125	0.007295	2.92	0.729	1.399	4.03e-06	7.88e-02	8.57e-04	0.00e+00
3	0.250	0.01687	2.88	1.69	1.511	3.68e-06	7.66e-02	7.61e-04	0.00e+00
4	0.500	0.03916	2.79	3.92	3.672	1.47e-06	8.92e-02	3.53e-04	0.00e+00
5	1.00	0.1054	2.53	10.5	0.000	0.00e+00	1.32e-01	0.00e+00	0.00e+00
6	2.00	0.2476	1.97	24.8	25.262	1.53e-07	1.42e-01	5.87e-05	0.00e+00
7	4.00	0.3440	1.59	34.4	15.415	1.83e-07	4.82e-02	2.38e-05	0.00e+00
8	8.00	0.4206	1.29	42.1	0.000	0.00e+00	1.92e-02	0.00e+00	0.00e+00
9	2.00	0.4006	1.37	40.1	0.000	0.00e+00	3.34e-03	0.00e+00	0.00e+00
10	0.500	0.3697	1.49	37.0	19.431	1.11e-07	2.06e-02	6.16e-06	0.00e+00
11	0.125	0.3373	1.62	33.7	0.000	0.00e+00	8.62e-02	0.00e+00	0.00e+00

GeoTesting EXPRESS

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 8/26/16	Depth: 25-27 ft
Test No.: IP-6	Sample Type: intact	Elevation: ---
Description: Moist, grey clay		
Remarks: System S, Swell Pressure =		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Square Root of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv ft²/s	Mv 1/tsf	k ft/day
1	0.0642	0.002508	2.94	0.251	184.101	1.33e-07	3.90e-02	1.40e-05
2	0.125	0.007295	2.92	0.729	6.160	3.94e-06	7.88e-02	8.38e-04
3	0.250	0.01687	2.88	1.69	12.448	1.92e-06	7.66e-02	3.97e-04
4	0.500	0.03916	2.79	3.92	13.265	1.75e-06	8.92e-02	4.20e-04
5	1.00	0.1054	2.53	10.5	54.411	3.88e-07	1.32e-01	1.39e-04
6	2.00	0.2476	1.97	24.8	118.237	1.41e-07	1.42e-01	5.40e-05
7	4.00	0.3440	1.59	34.4	72.960	1.67e-07	4.82e-02	2.17e-05
8	8.00	0.4206	1.29	42.1	58.751	1.59e-07	1.92e-02	8.24e-06
9	2.00	0.4006	1.37	40.1	12.642	6.74e-07	3.34e-03	6.08e-06
10	0.500	0.3697	1.49	37.0	105.455	8.80e-08	2.06e-02	4.89e-06
11	0.125	0.3373	1.62	33.7	189.648	5.41e-08	8.62e-02	1.26e-05

GeoTesting EXPRESS

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-1	Test Date: 8/26/16	Depth: 25-27 ft
Test No.: IP-6	Sample Type: intact	Elevation: ---
Description: Moist, grey clay		
Remarks: System S, Swell Pressure =		
Displacement at End of Increment		

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	---	Sample Type:	---	Tested By:	jbr
Sample ID:	---	Test Date:	08/30/16	Checked By:	mcm
Depth :	---	Test Id:	387124		

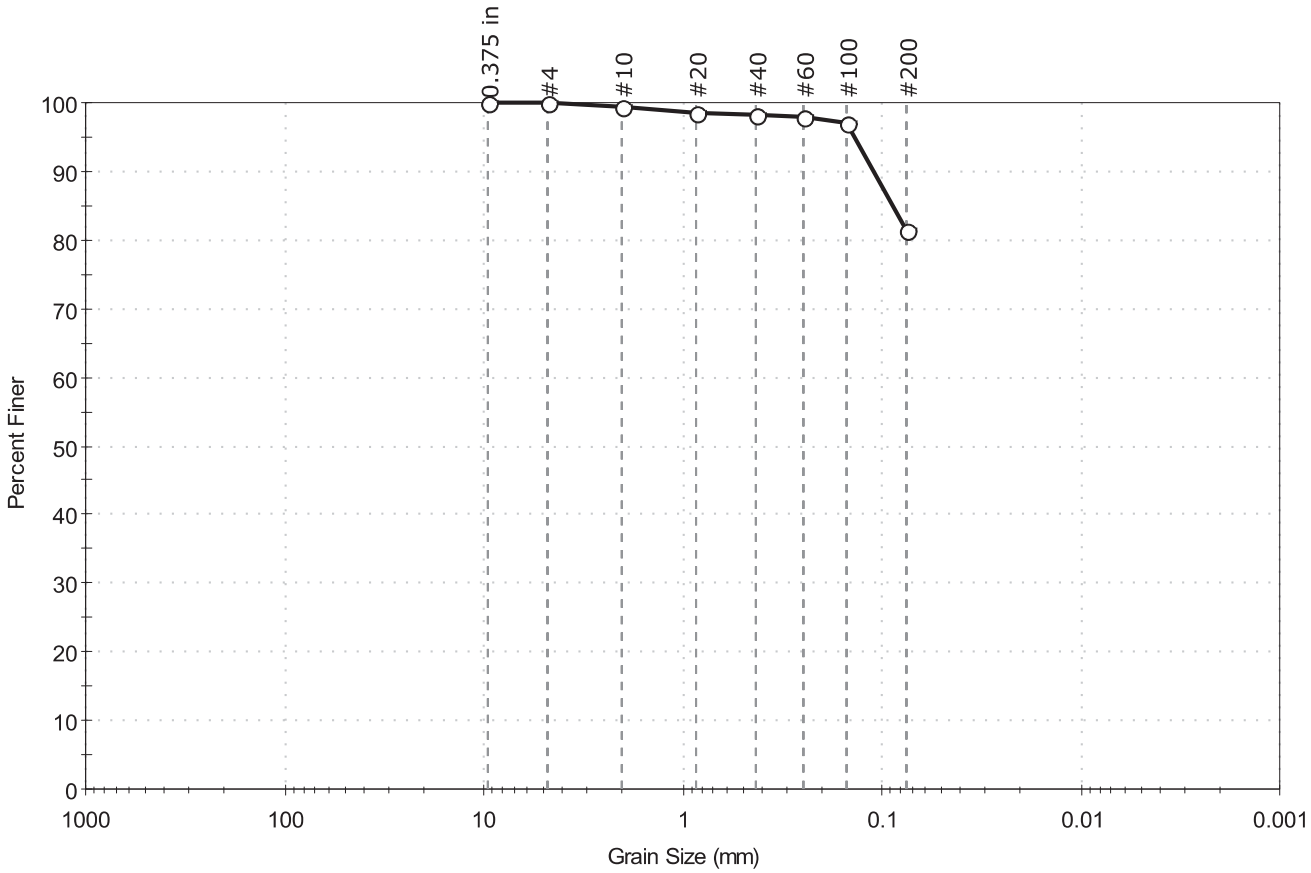
Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
AP-3	UD-2	27.0-29.0 ft	Moist, olive clay with sand	78.8

Notes: Temperature of Drying : 110º Celsius

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	AP-3	Sample Type:	tube	Tested By:	jbr
Sample ID:	UD-2	Test Date:	08/23/16	Checked By:	mcm
Depth :	27.0-29.0 ft	Test Id:	387106		
Test Comment:	---				
Visual Description:	Moist, olive clay with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.1	18.5	81.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	98		
#60	0.25	98		
#100	0.15	97		
#200	0.075	81		

Coefficients

D_{85} = 0.0878 mm D_{30} = N/A

D_{60} = N/A D_{15} = N/A

D_{50} = N/A D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM Fat clay with sand (CH)

AASHTO Clayey Soils (A-7-6 (43))

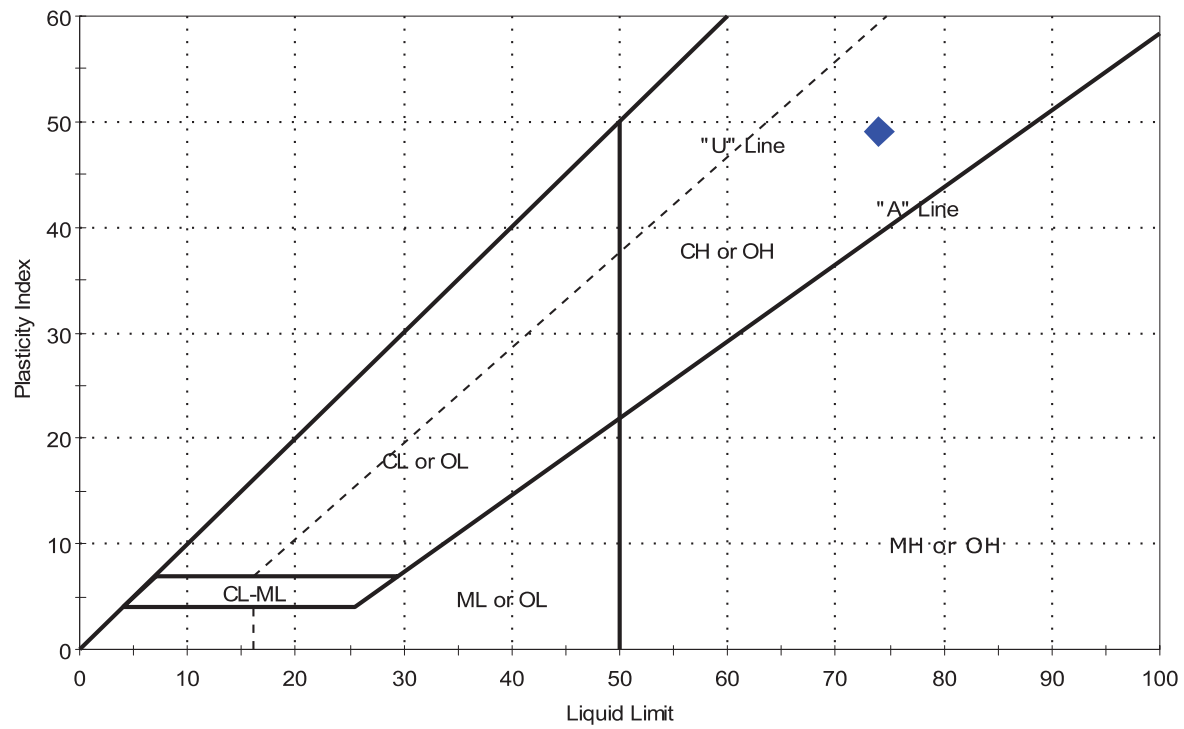
Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	AP-3	Sample Type:	tube	Tested By:	GA
Sample ID:	UD-2	Test Date:	08/31/16	Checked By:	mcm
Depth :	27.0-29.0 ft	Test Id:	387114		
Test Comment:	---				
Visual Description:	Moist, olive clay with sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UD-2	AP-3	27.0-29.0 ft	79	74	25	49	1.1	Fat clay with sand (CH)

Sample Prepared using the WET method

2% Retained on #40 Sieve

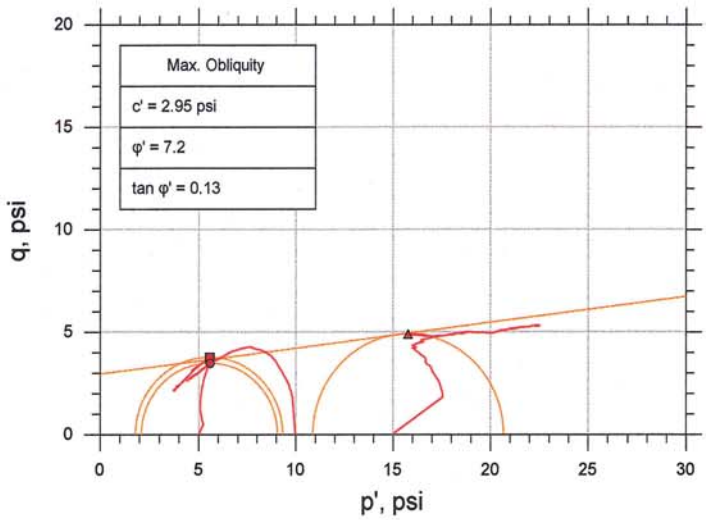
Dry Strength: VERY HIGH

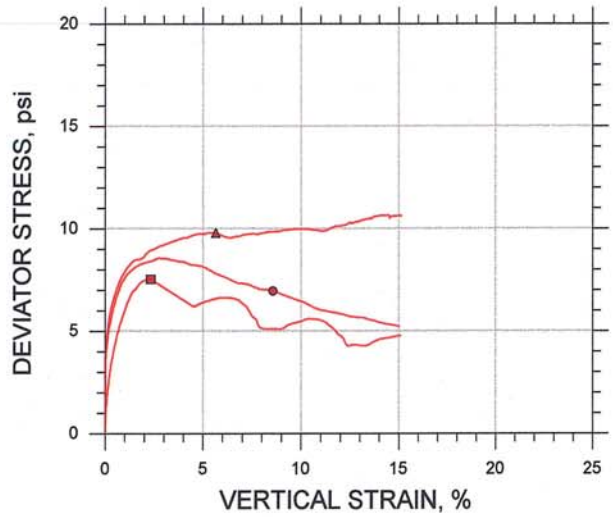
Dilatancy: NONE

Toughness: MEDIUM

Client: F&ME Consultants	
Project Name: US-21 Replacement Bridge	
Project Location: ---	
Project Number: GTX-305005	
Tested By: md	Checked By: mcm
Boring ID: AP-3	
Preparation: intact	
Description: Moist, olive clay with sand	
Classification: Fat clay with sand	
Group Symbol: CH	
Liquid Limit: 74	Plastic Limit: 25
Plasticity Index: 49	Estimated Specific Gravity: 2.7

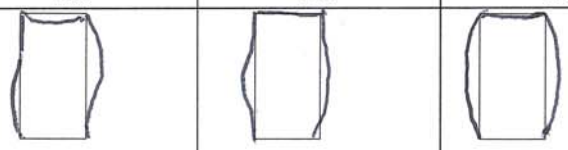
CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		■	●	▲
Sample ID		ST-2	ST-2	ST-2
Depth, ft		27.0-29.0 ft	27.0-29.0 ft	27.0-29.0 ft
Test Number		CU-1-1	CU-1-2	CU-1-3A
Initial	Height, in	4.550	4.750	4.410
	Diameter, in	2.030	2.030	2.040
	Moisture Content (from Cuttings), %	59.7	78.5	94.1
	Dry Density, pcf	62.0	51.8	47.3
	Saturation (Wet Method), %	93.8	94.1	99.3
	Void Ratio	1.72	2.25	2.56
Before Shear	Moisture Content, %	62.7	74.6	85.0
	Dry Density, pcf	62.6	55.9	51.2
	Cross-sectional Area (Method A), in²	3.208	3.048	3.185
	Saturation, %	100.0	100.0	100.0
	Void Ratio	1.69	2.02	2.29
	Back Pressure, psi	149.0	152.8	162.9
Vertical Effective Consolidation Stress, psi		4.995	9.855	14.56
Horizontal Effective Consolidation Stress, psi		5.004	9.975	14.97
Vertical Strain after Consolidation, %		0.1308	1.490	5.016
Volumetric Strain after Consolidation, %		1.243	7.152	7.479
Time to 50% Consolidation, min		9.610	121.0	30.25
Shear Strength, psi		3.769	3.482	4.897
Strain at Failure, %		2.33	8.55	5.65
Strain Rate, %/min		0.01600	0.01600	0.01600
Deviator Stress at Failure, psi		7.539	6.965	9.794
Effective Minor Principal Stress at Failure, psi		1.790	2.097	10.87
Effective Major Principal Stress at Failure, psi		9.329	9.062	20.67
B-Value		0.96	0.95	0.96

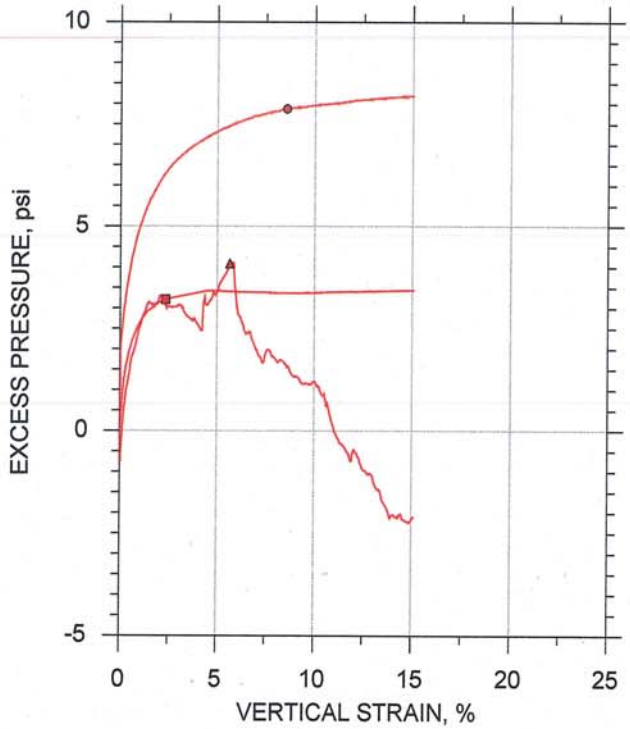
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

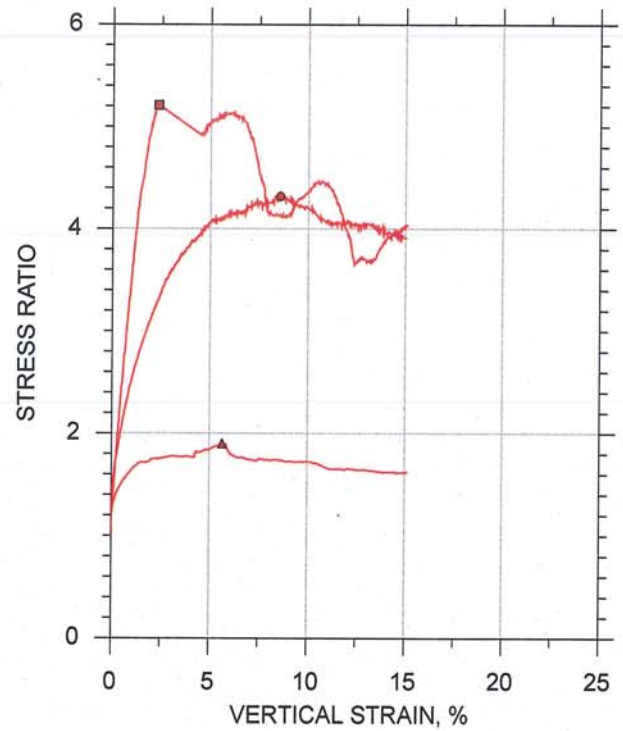


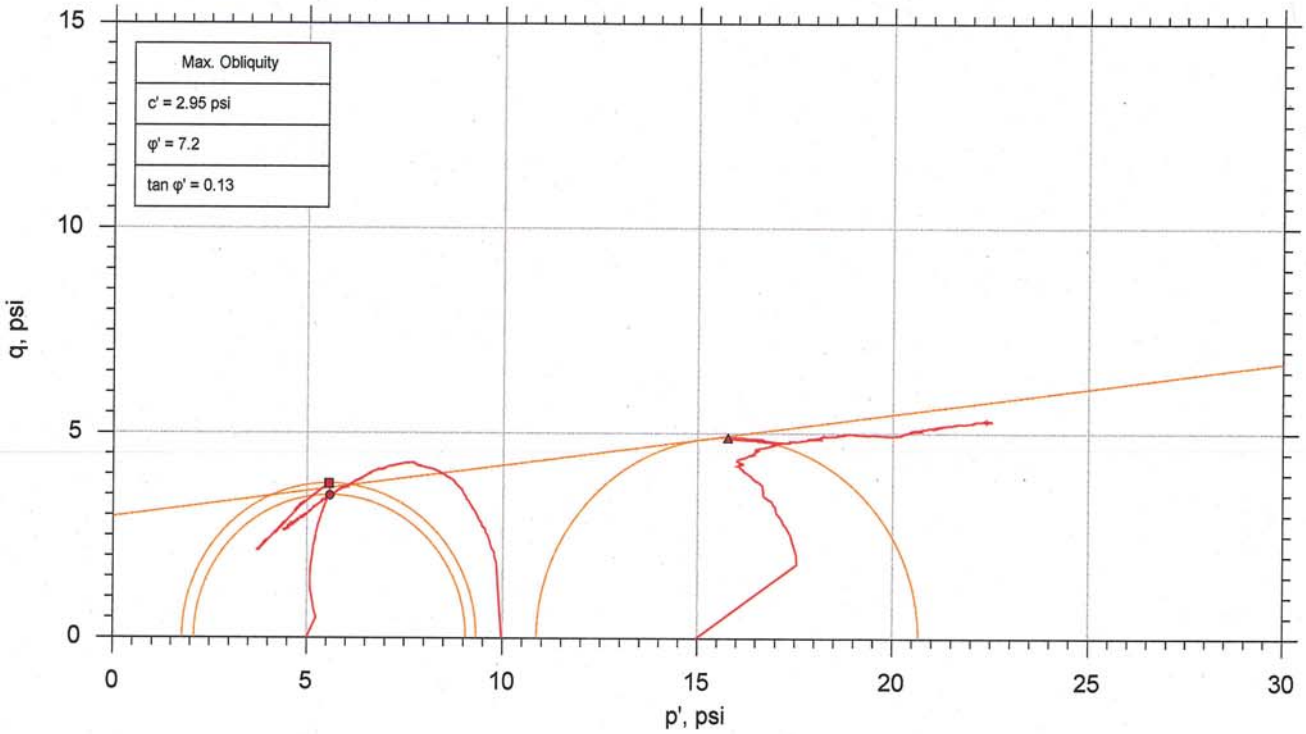
Remarks:

System X

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







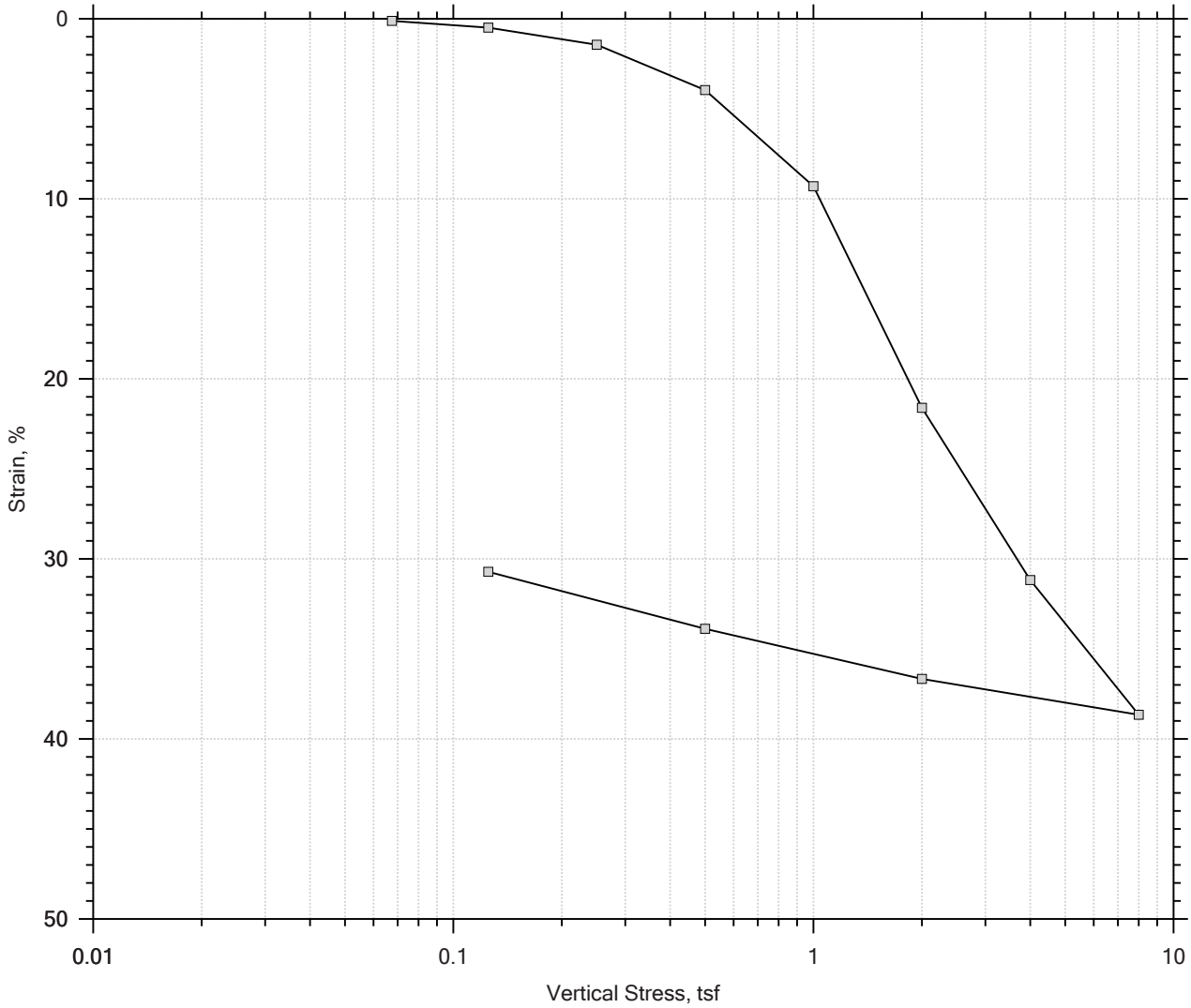
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	ST-2	CU-1-1	27.0-29.0 ft	md	8/16/16	mcm	9/8/16	305005-CU-1-1m.dat
●	ST-2	CU-1-2	27.0-29.0 ft	md	8/16/16	mcm	9/8/16	305005-CU-1-2m.dat
▲	ST-2	CU-1-3A	27.0-29.0 ft	md	8/22/16	mcm	9/8/16	305005-CU-1-3Am.dat

GeoTesting EXPRESS

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Sample Type: intact	
Description: Moist, olive clay with sand		
Remarks: System X		

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report

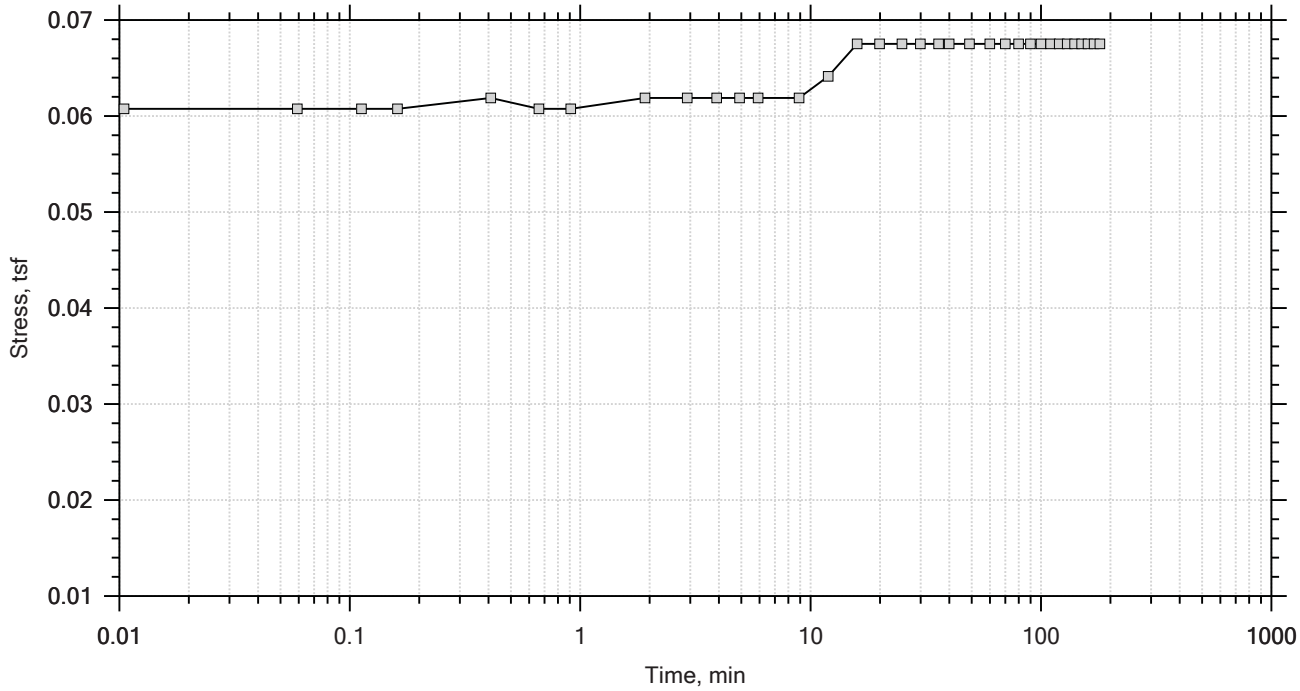


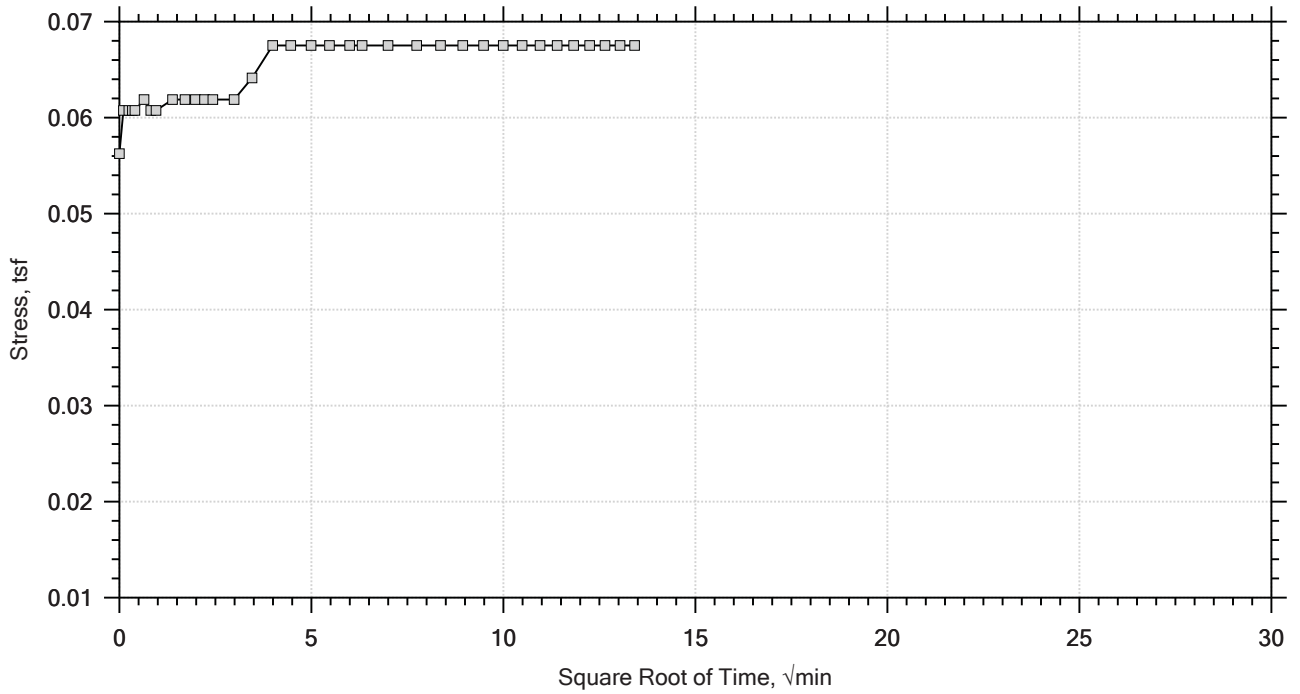
				Before Test	After Test
Current Vertical Effective Stress: ---				Water Content, %	83.73	52.10
Preconsolidation Stress: ---				Dry Unit Weight, pcf	51.8	70.476
Compression Ratio: ---				Saturation, %	99.63	100.00
Diameter: 2.5 in		Height: 1 in		Void Ratio	2.30	1.43
LL: ---	PL: ---	PI: ---	GS: 2.74			

GeoTesting EXPRESS	Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
	Boring No.: AP-3	Tested By: md	Checked By: mcm
	Sample No.: UD-2	Test Date: 8/19/16	Depth: 27.0-29.0 ft
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, olive clay with sand		
	Remarks: System W, Swell Pressure = 0.0675 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 11
Constant Volume Step
Stress: 0.0675 tsf

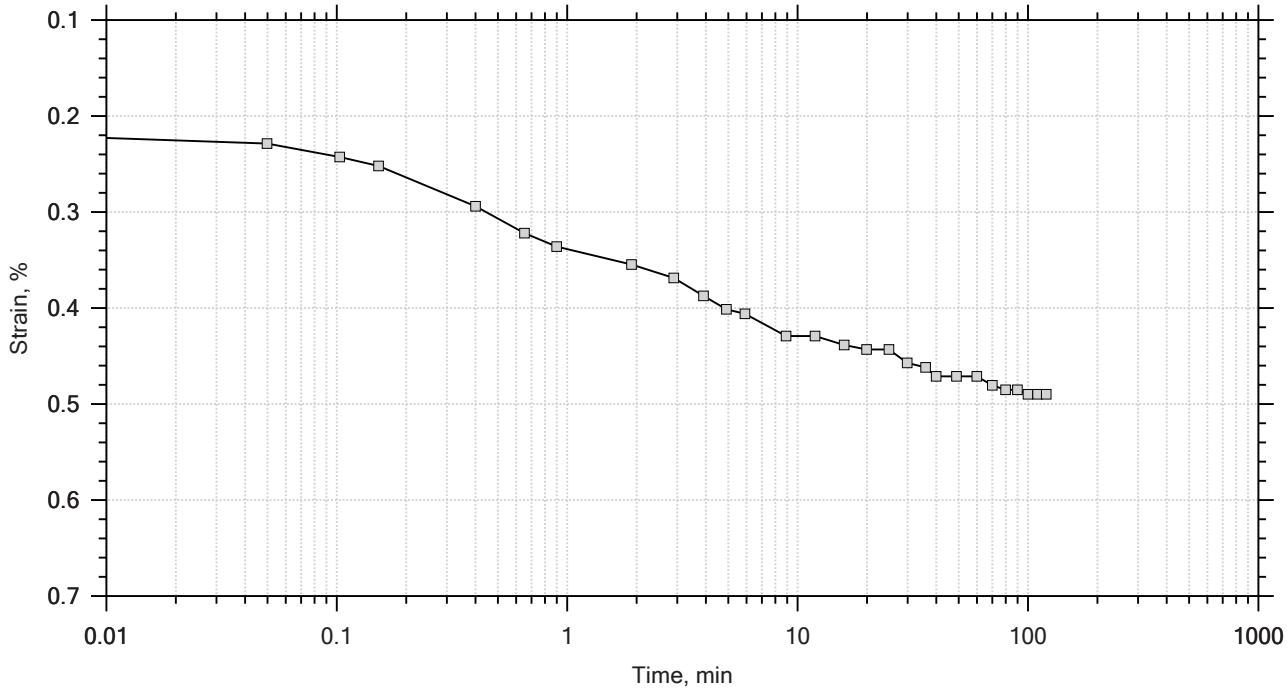


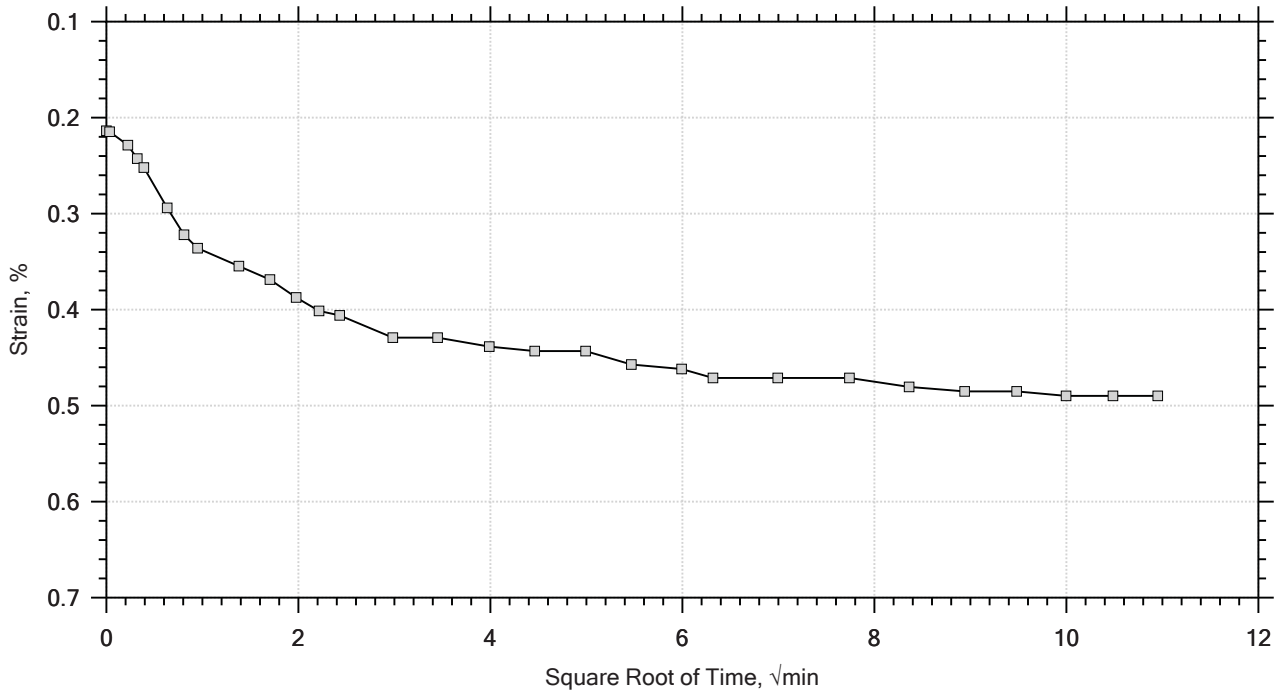


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 27.0-29.0 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System W, Swell Pressure = 0.0675 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 11
Constant Load Step
Stress: 0.125 tsf

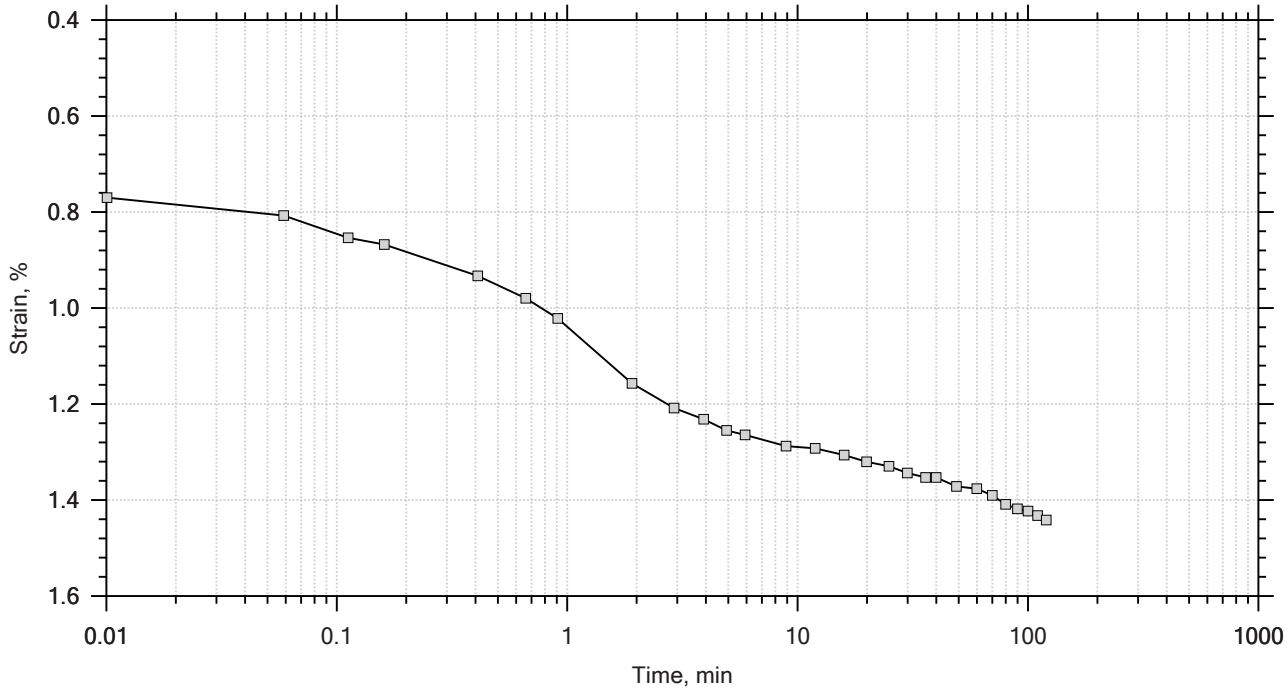


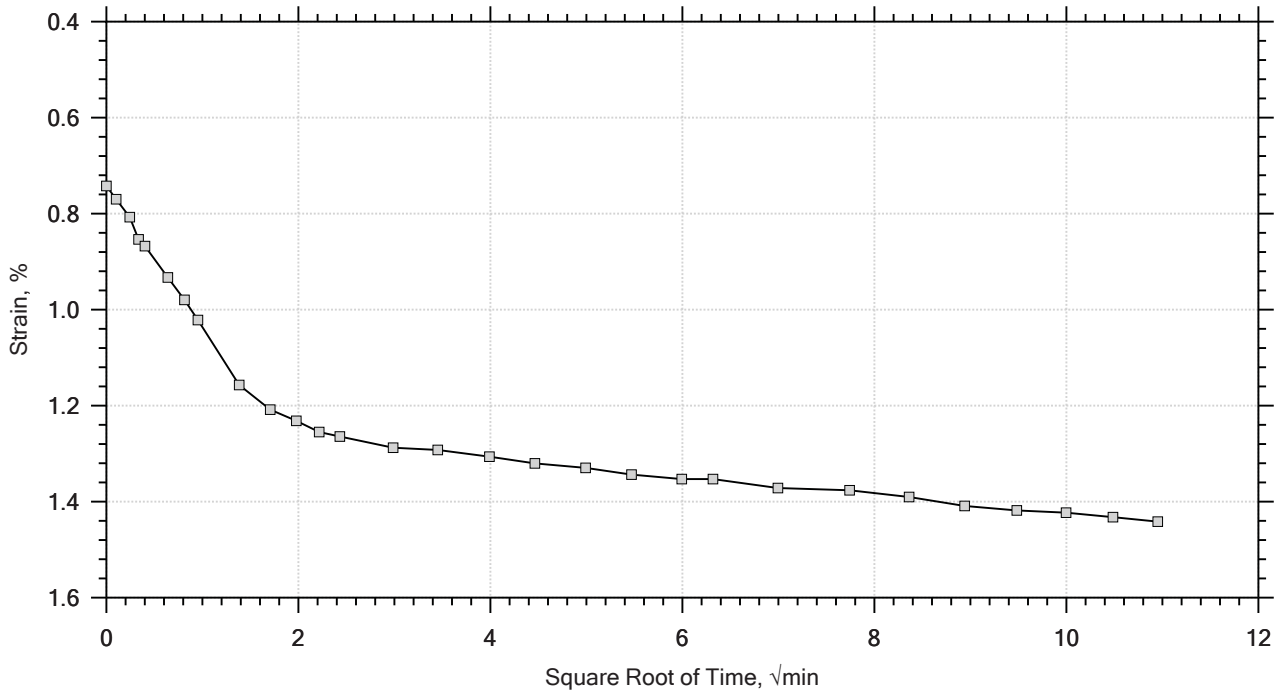


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 27.0-29.0 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System W, Swell Pressure = 0.0675 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 11
Constant Load Step
Stress: 0.25 tsf

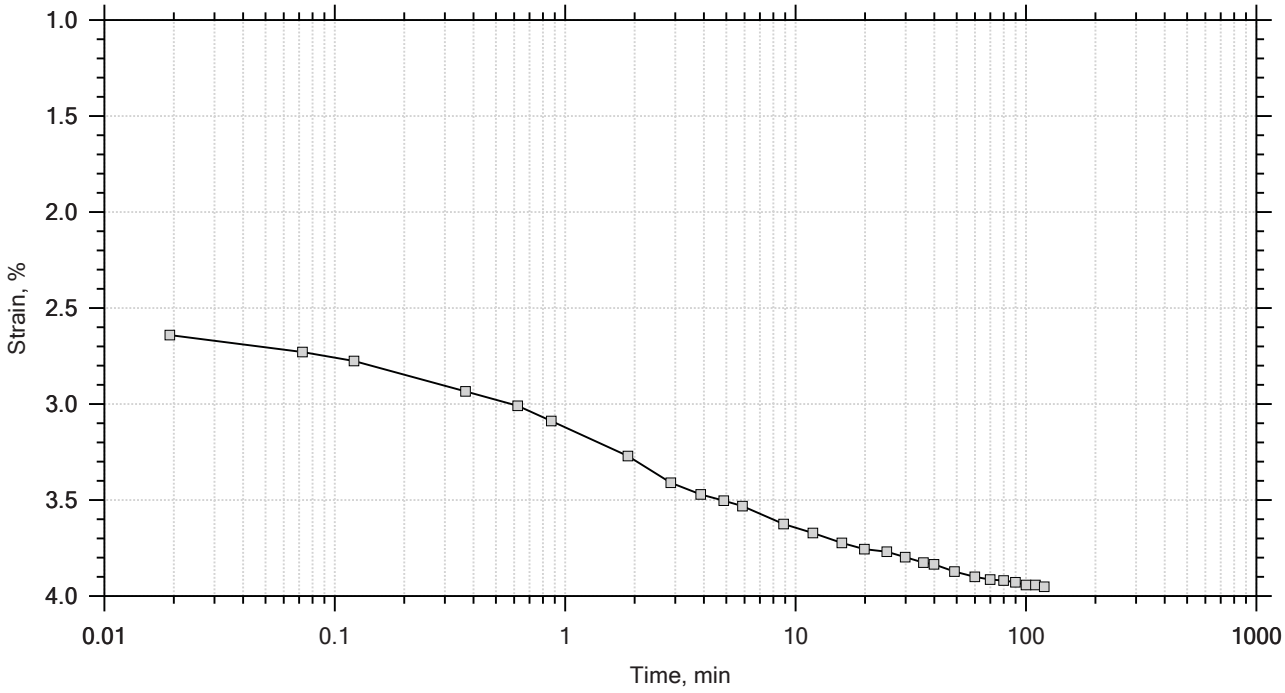


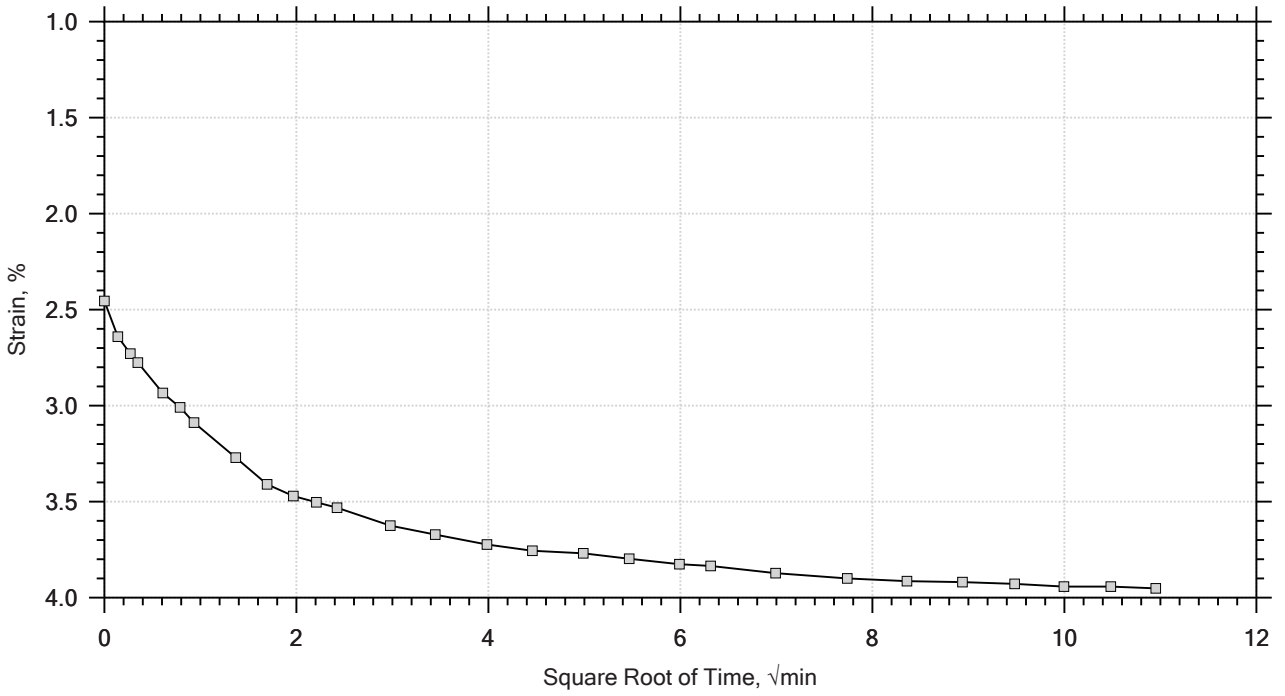


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 27.0-29.0 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System W, Swell Pressure = 0.0675 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 11
Constant Load Step
Stress: 0.5 tsf

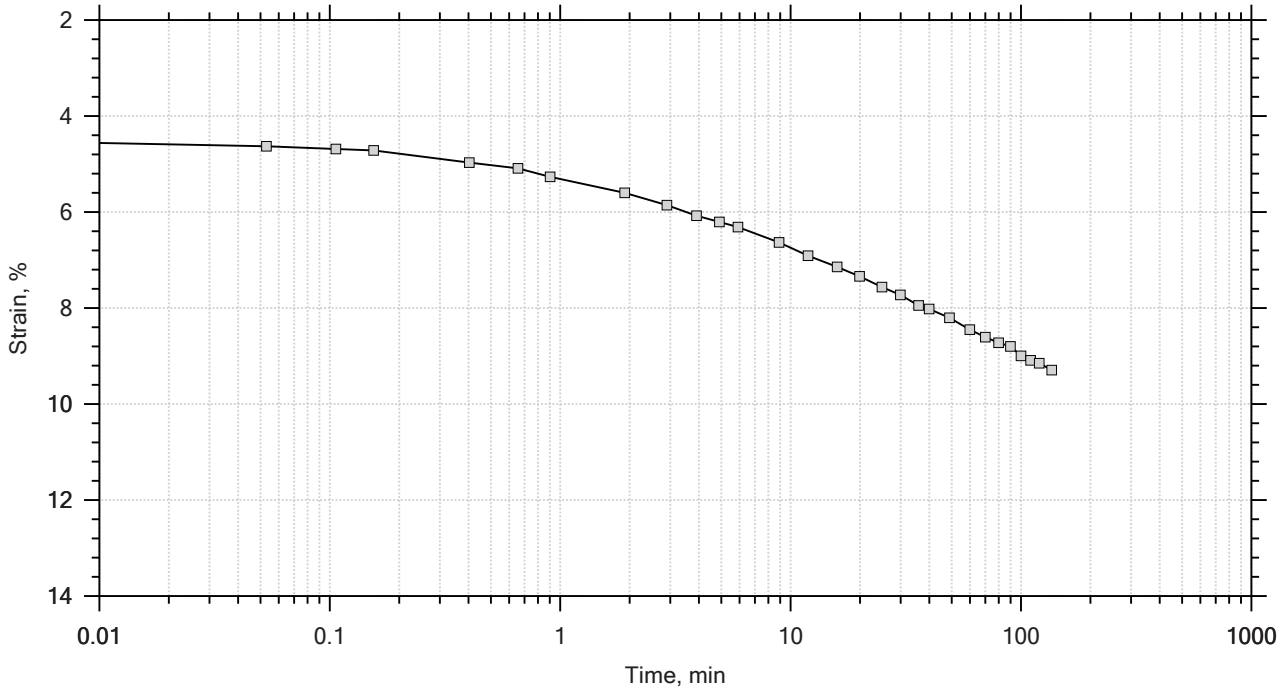


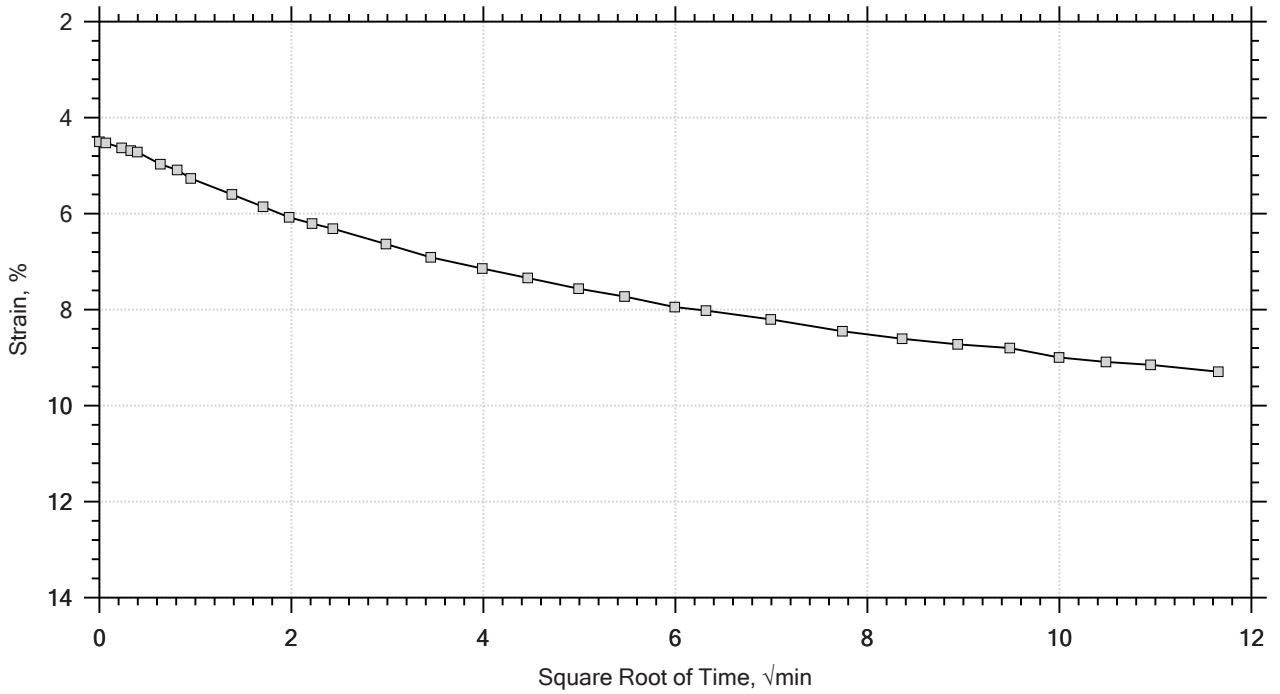


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 27.0-29.0 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System W, Swell Pressure = 0.0675 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 11
Constant Load Step
Stress: 1 tsf

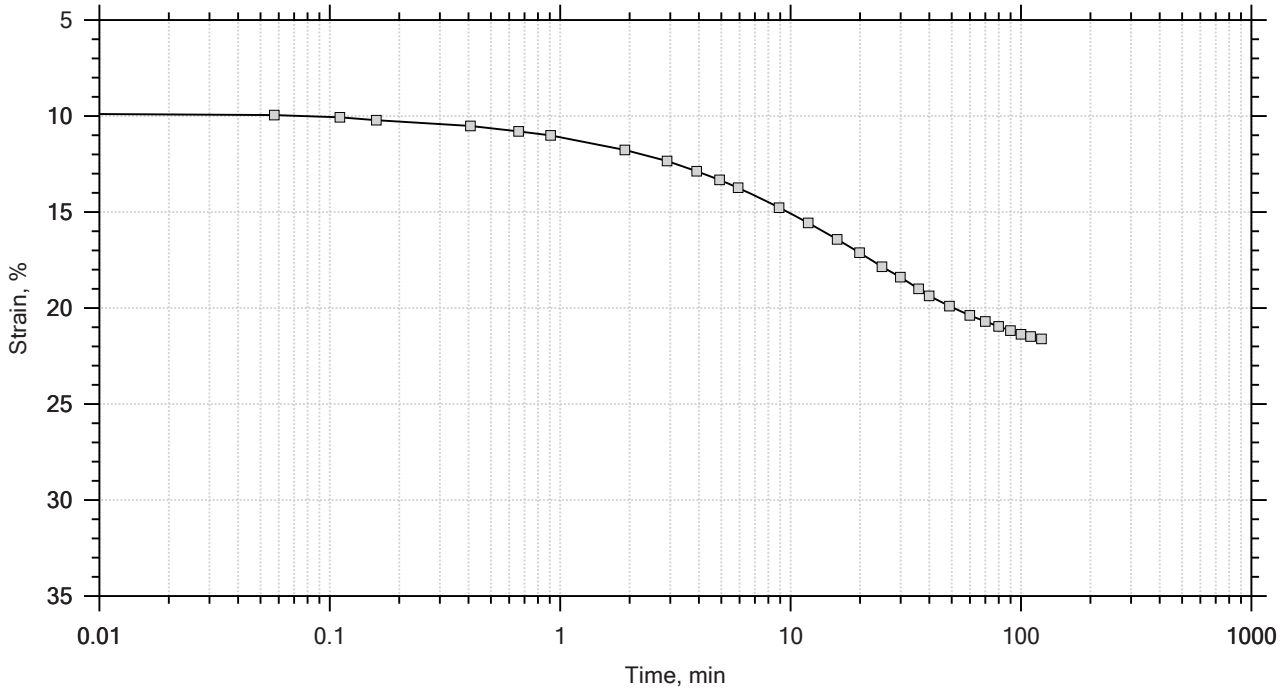


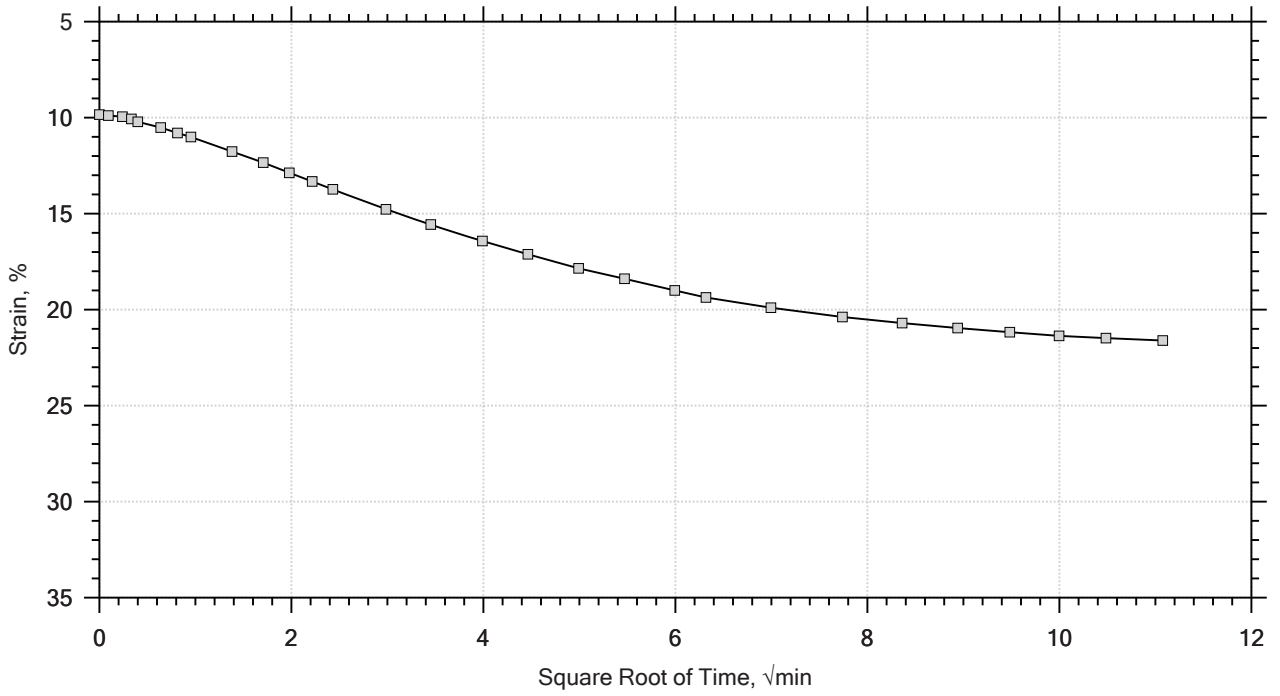


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 27.0-29.0 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System W, Swell Pressure = 0.0675 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 11
Constant Load Step
Stress: 2 tsf

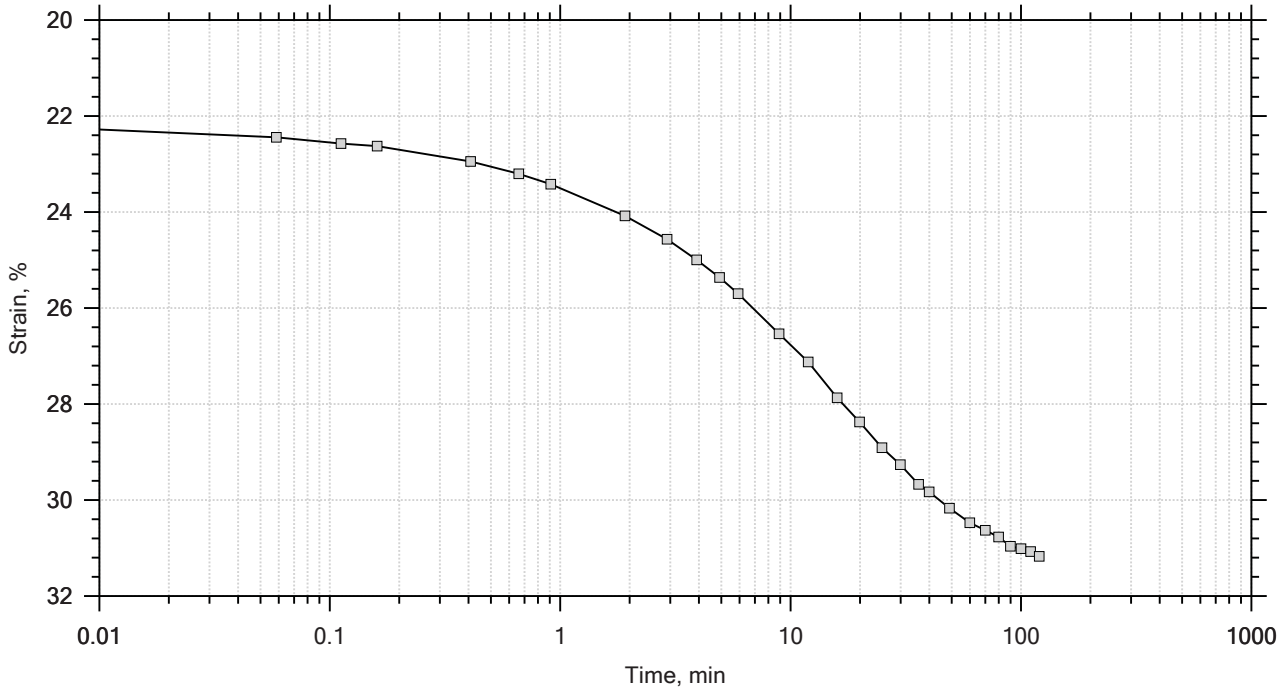


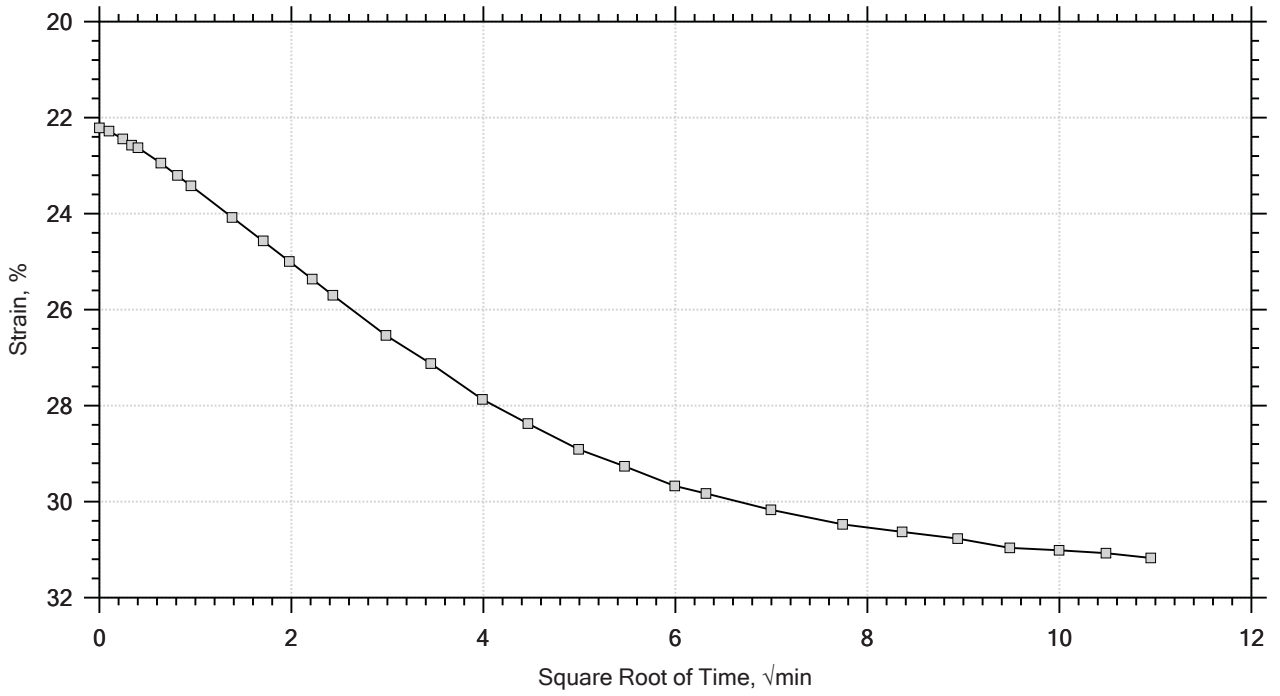


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 27.0-29.0 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System W, Swell Pressure = 0.0675 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 11
Constant Load Step
Stress: 4 tsf

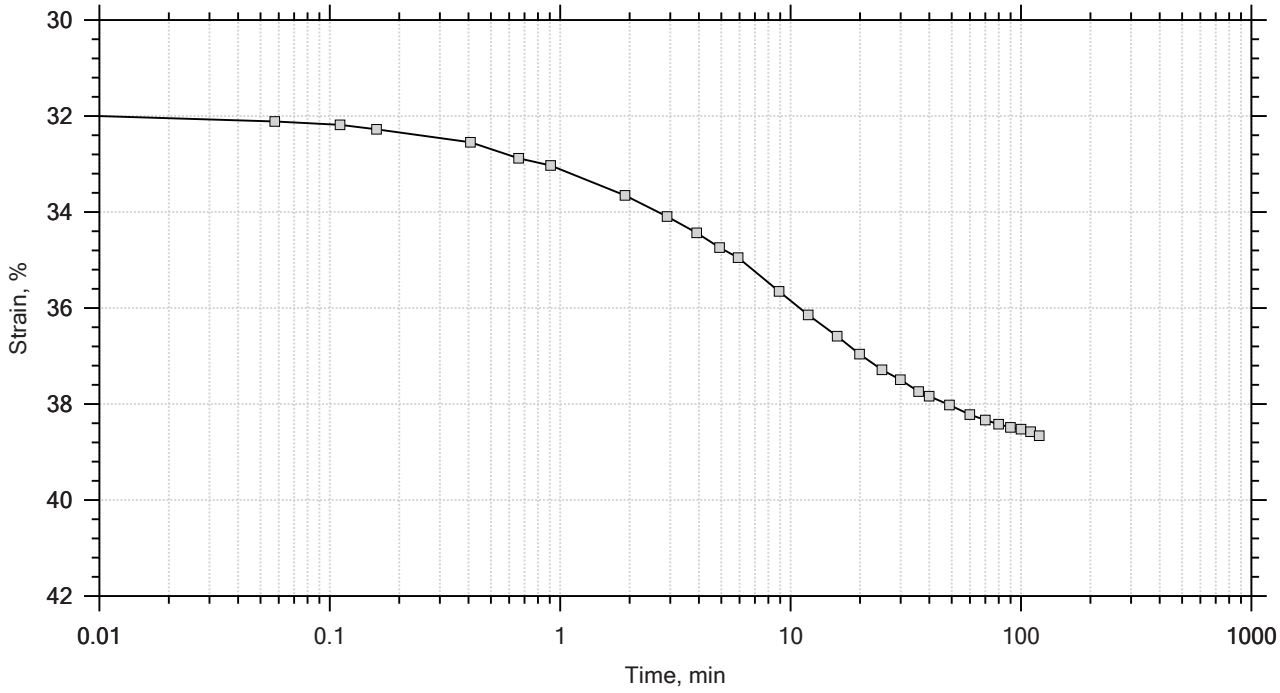


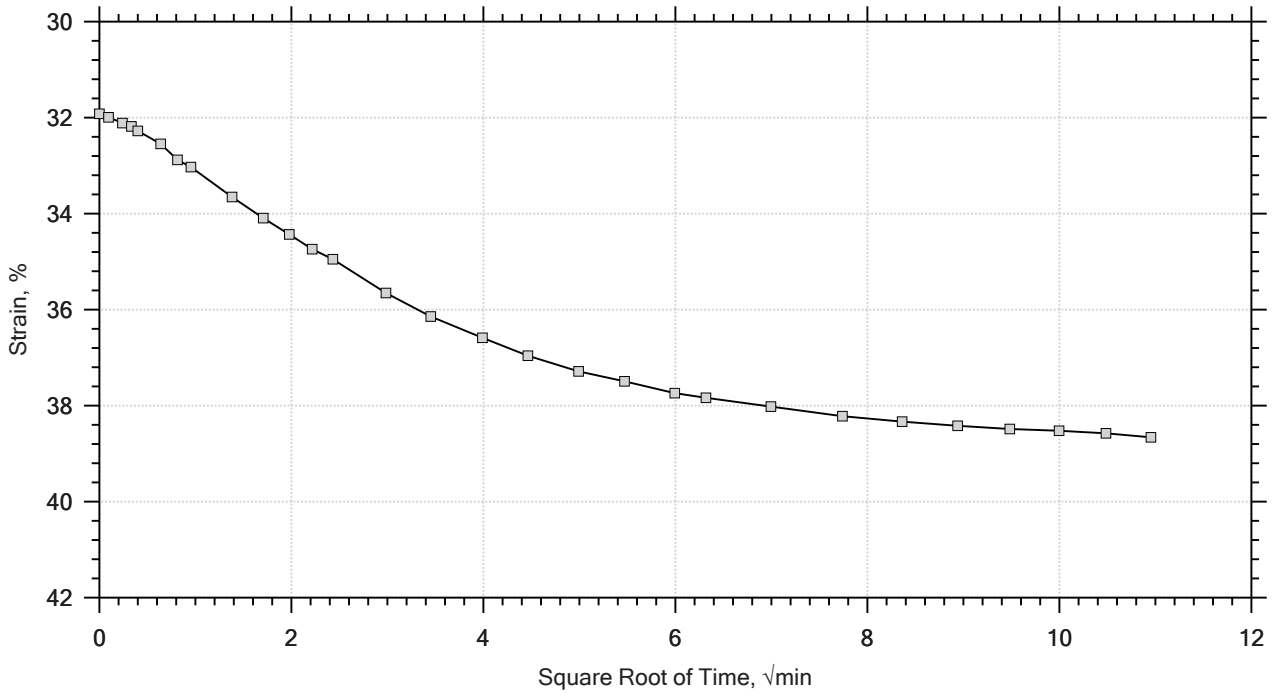


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 27.0-29.0 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System W, Swell Pressure = 0.0675 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 11
Constant Load Step
Stress: 8 tsf

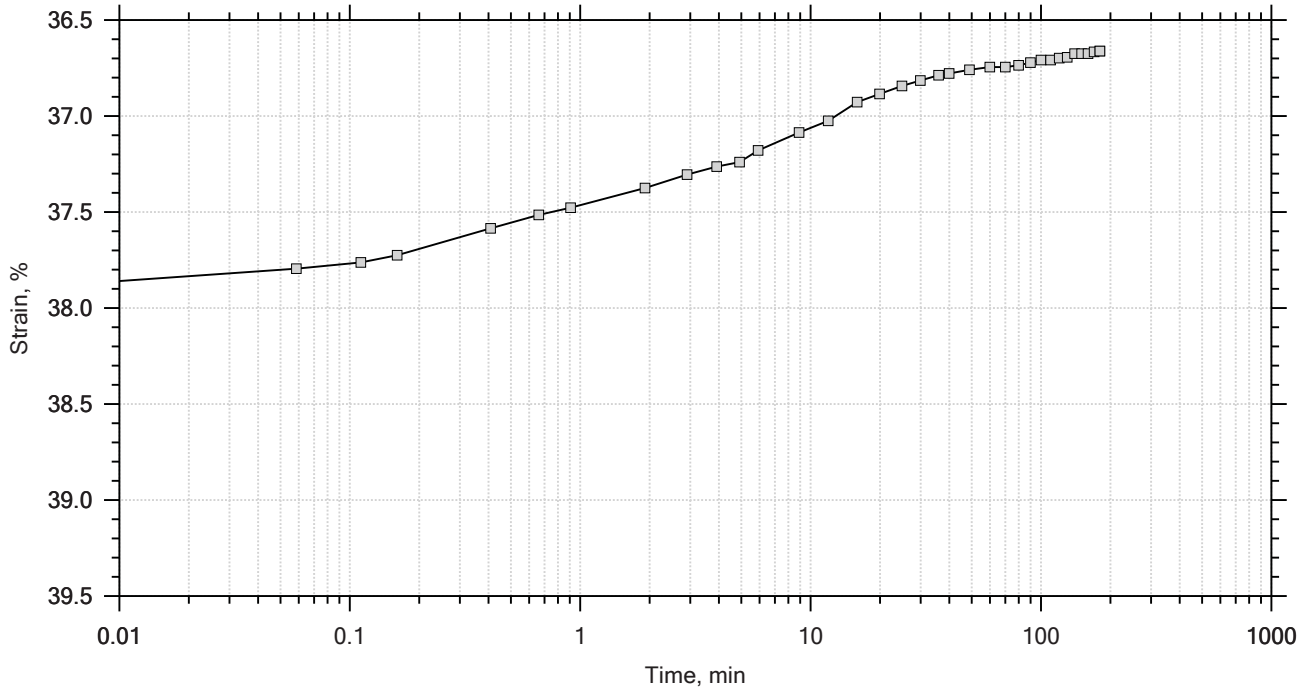


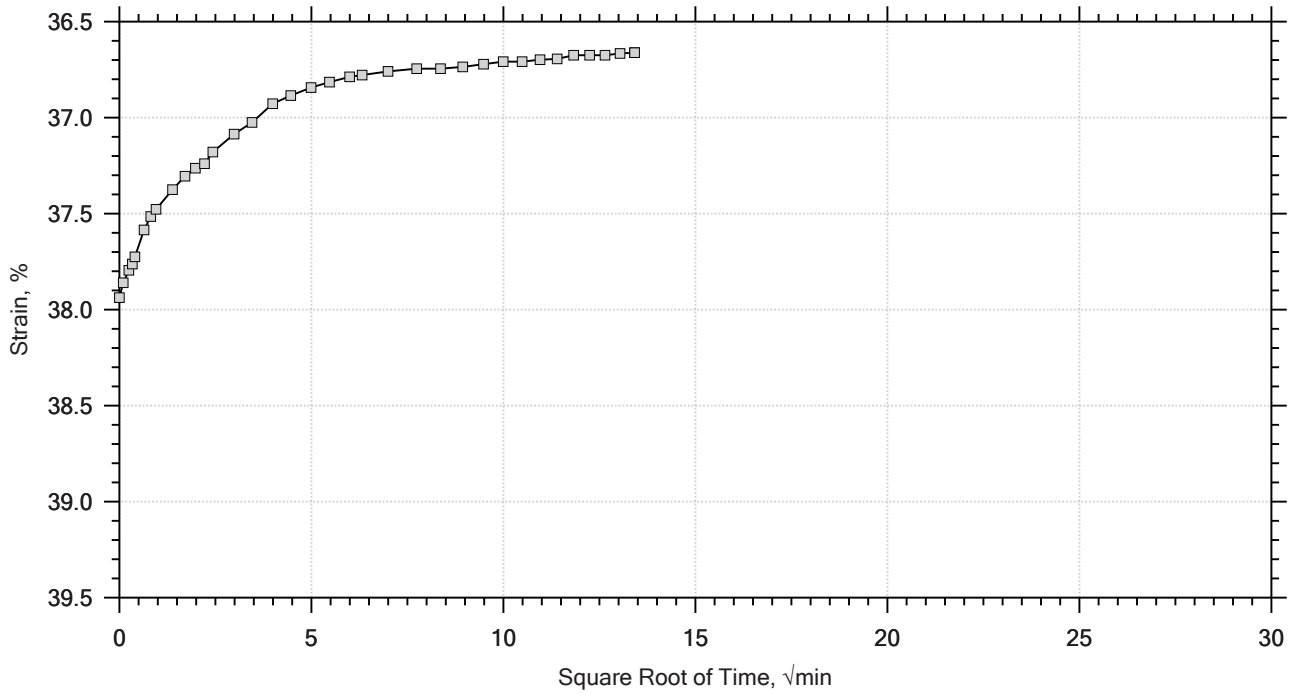


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 27.0-29.0 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System W, Swell Pressure = 0.0675 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 11
Constant Load Step
Stress: 2 tsf

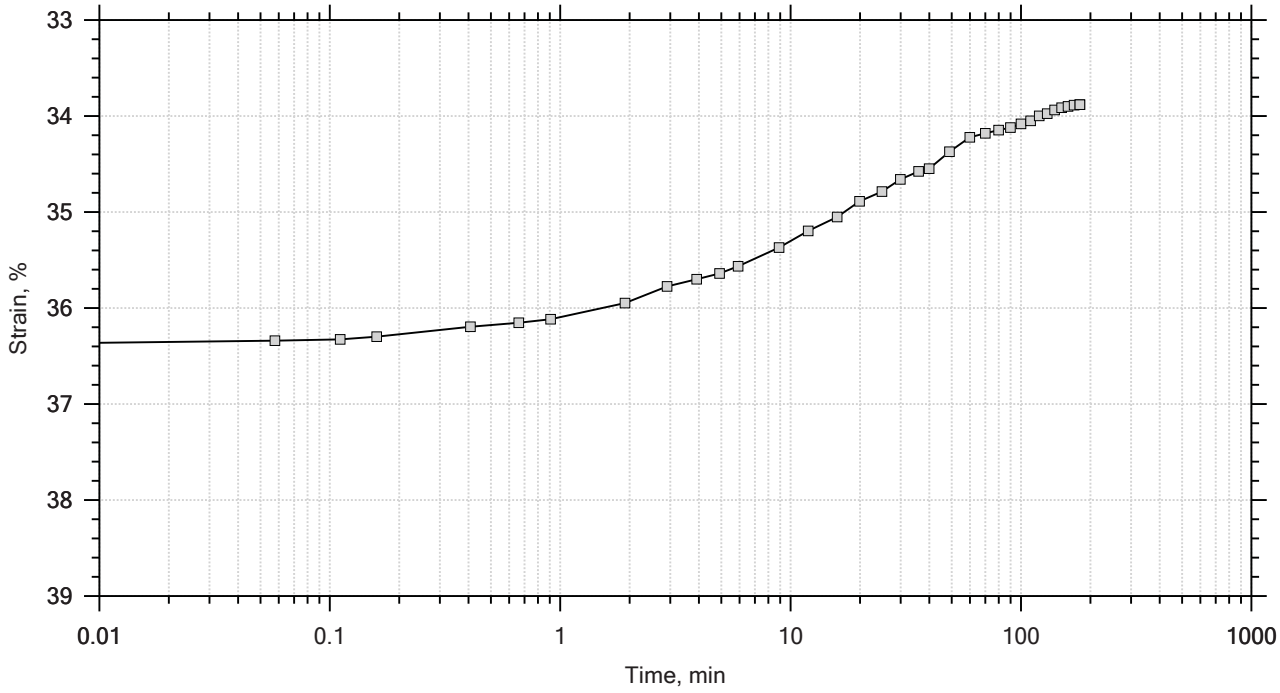


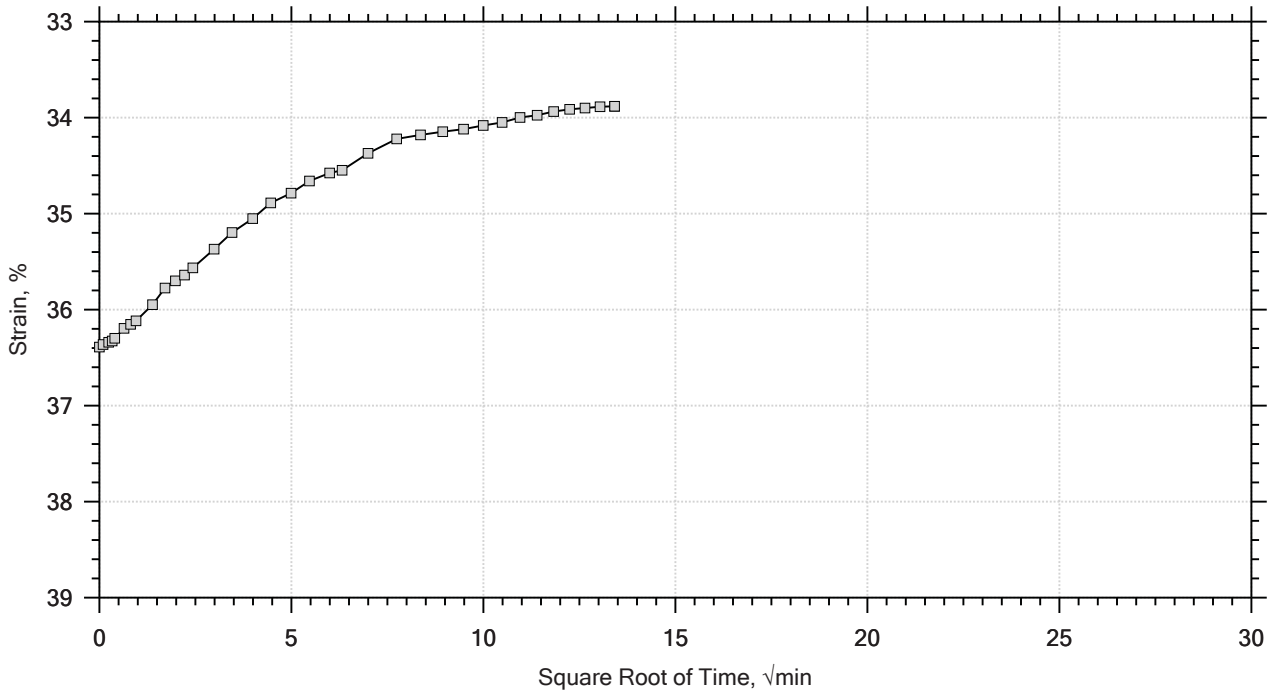


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 27.0-29.0 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System W, Swell Pressure = 0.0675 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 11
Constant Load Step
Stress: 0.5 tsf

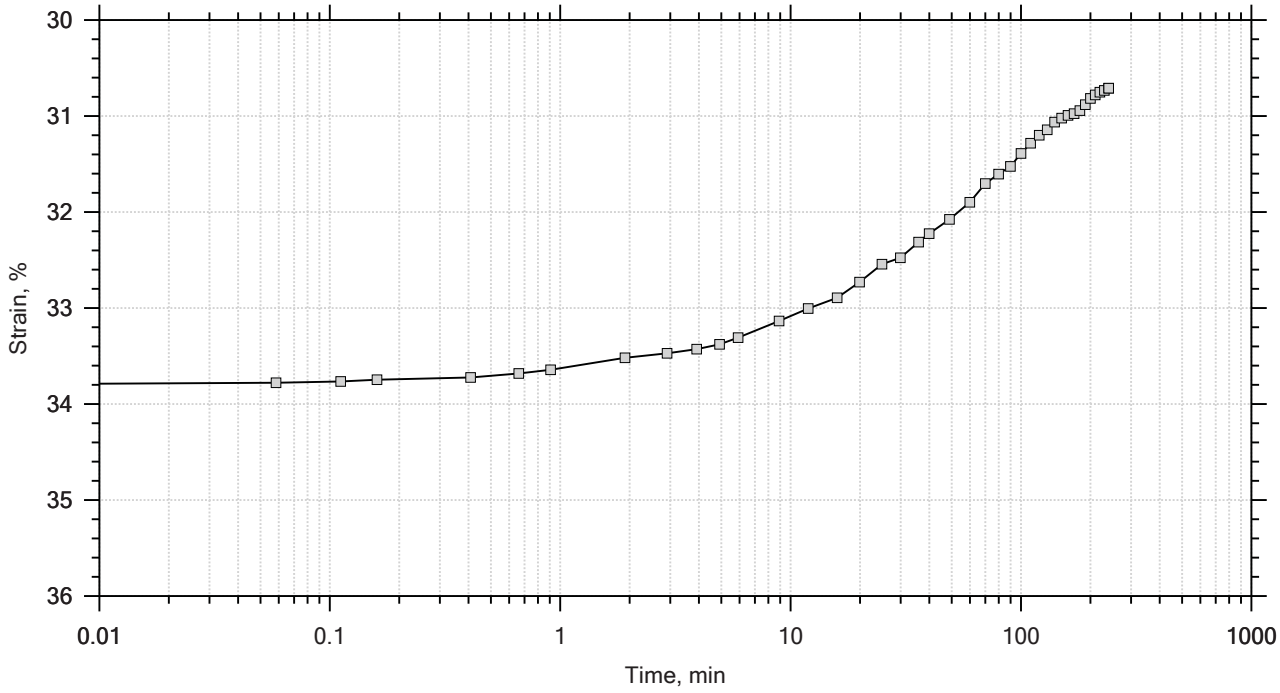


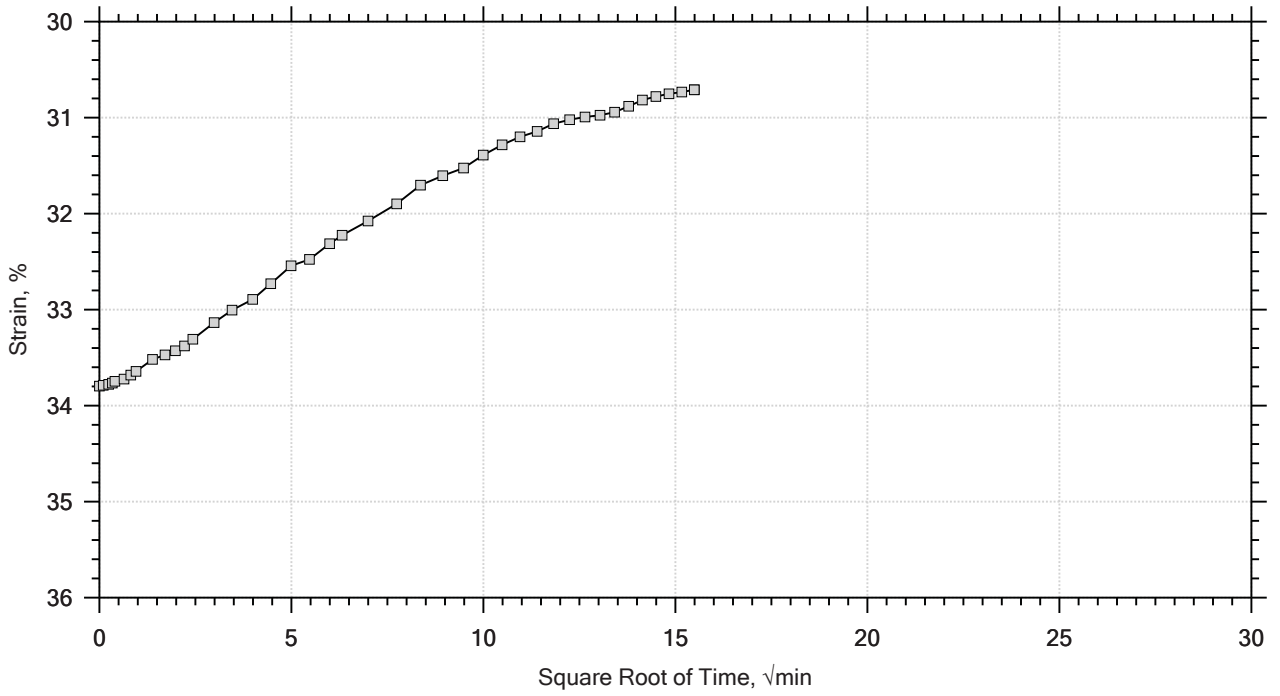


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 27.0-29.0 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System W, Swell Pressure = 0.0675 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 11
Constant Load Step
Stress: 0.125 tsf





Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 27.0-29.0 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System W, Swell Pressure = 0.0675 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.74	Liquid Limit: ---
Initial Height: 1.00 in	Initial Void Ratio: 2.30	Plastic Limit: ---
Final Height: 0.73 in	Final Void Ratio: 1.43	Plasticity Index: ---

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID		RING		B-990
Mass Container, gm	0	109.41	109.41	7.92
Mass Container + Wet Soil, gm	122.63	232.04	210.93	107.44
Mass Container + Dry Soil, gm	65.43	176.15	176.15	73.35
Mass Dry Soil, gm	65.43	66.745	66.745	65.43
Water Content, %	87.42	83.73	52.10	52.10
Void Ratio	---	2.30	1.43	---
Degree of Saturation, %	---	99.63	100.00	---
Dry Unit Weight, pcf	---	51.8	70.476	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 27.0-29.0 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System W, Swell Pressure = 0.0675 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Log of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/s	Mv 1/tsf	k ft/day	Ca %
1	0.0675	0.001166	2.30	0.117	0.000	0.00e+00	1.73e-02	0.00e+00	0.00e+00
2	0.125	0.004898	2.29	0.490	0.000	0.00e+00	6.49e-02	0.00e+00	0.00e+00
3	0.250	0.01441	2.26	1.44	1.040	5.37e-06	7.61e-02	1.10e-03	0.00e+00
4	0.500	0.03951	2.17	3.95	1.335	4.04e-06	1.00e-01	1.09e-03	0.00e+00
5	1.00	0.09292	2.00	9.29	0.000	0.00e+00	1.07e-01	0.00e+00	0.00e+00
6	2.00	0.2160	1.59	21.6	0.000	0.00e+00	1.23e-01	0.00e+00	0.00e+00
7	4.00	0.3117	1.27	31.2	9.347	3.30e-07	4.78e-02	4.26e-05	0.00e+00
8	8.00	0.3866	1.03	38.7	5.938	4.07e-07	1.87e-02	2.05e-05	0.00e+00
9	2.00	0.3666	1.09	36.7	3.892	5.69e-07	3.33e-03	5.11e-06	0.00e+00
10	0.500	0.3388	1.18	33.9	15.451	1.55e-07	1.85e-02	7.73e-06	0.00e+00
11	0.125	0.3071	1.29	30.7	42.917	6.09e-08	8.46e-02	1.39e-05	0.00e+00

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 27.0-29.0 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System W, Swell Pressure = 0.0675 tsf		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Square Root of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv ft²/s	Mv 1/tsf	k ft/day
1	0.0675	0.001166	2.30	0.117	48.912	5.01e-07	1.73e-02	2.33e-05
2	0.125	0.004898	2.29	0.490	8.899	2.74e-06	6.49e-02	4.80e-04
3	0.250	0.01441	2.26	1.44	4.112	5.85e-06	7.61e-02	1.20e-03
4	0.500	0.03951	2.17	3.95	8.449	2.75e-06	1.00e-01	7.44e-04
5	1.00	0.09292	2.00	9.29	37.237	5.75e-07	1.07e-01	1.66e-04
6	2.00	0.2160	1.59	21.6	52.562	3.34e-07	1.23e-01	1.11e-04
7	4.00	0.3117	1.27	31.2	37.716	3.53e-07	4.78e-02	4.55e-05
8	8.00	0.3866	1.03	38.7	25.023	4.15e-07	1.87e-02	2.10e-05
9	2.00	0.3666	1.09	36.7	19.766	4.82e-07	3.33e-03	4.33e-06
10	0.500	0.3388	1.18	33.9	58.196	1.77e-07	1.85e-02	8.83e-06
11	0.125	0.3071	1.29	30.7	188.851	5.96e-08	8.46e-02	1.36e-05

GeoTesting EXPRESS

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-3	Tested By: md	Checked By: mcm
Sample No.: UD-2	Test Date: 8/19/16	Depth: 27.0-29.0 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, olive clay with sand		
Remarks: System W, Swell Pressure = 0.0675 tsf		
Displacement at End of Increment		

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	---	Sample Type:	---	Tested By:	GA
Sample ID:	---	Test Date:	10/31/16	Checked By:	mcm
Depth :	---	Test Id:	397035		

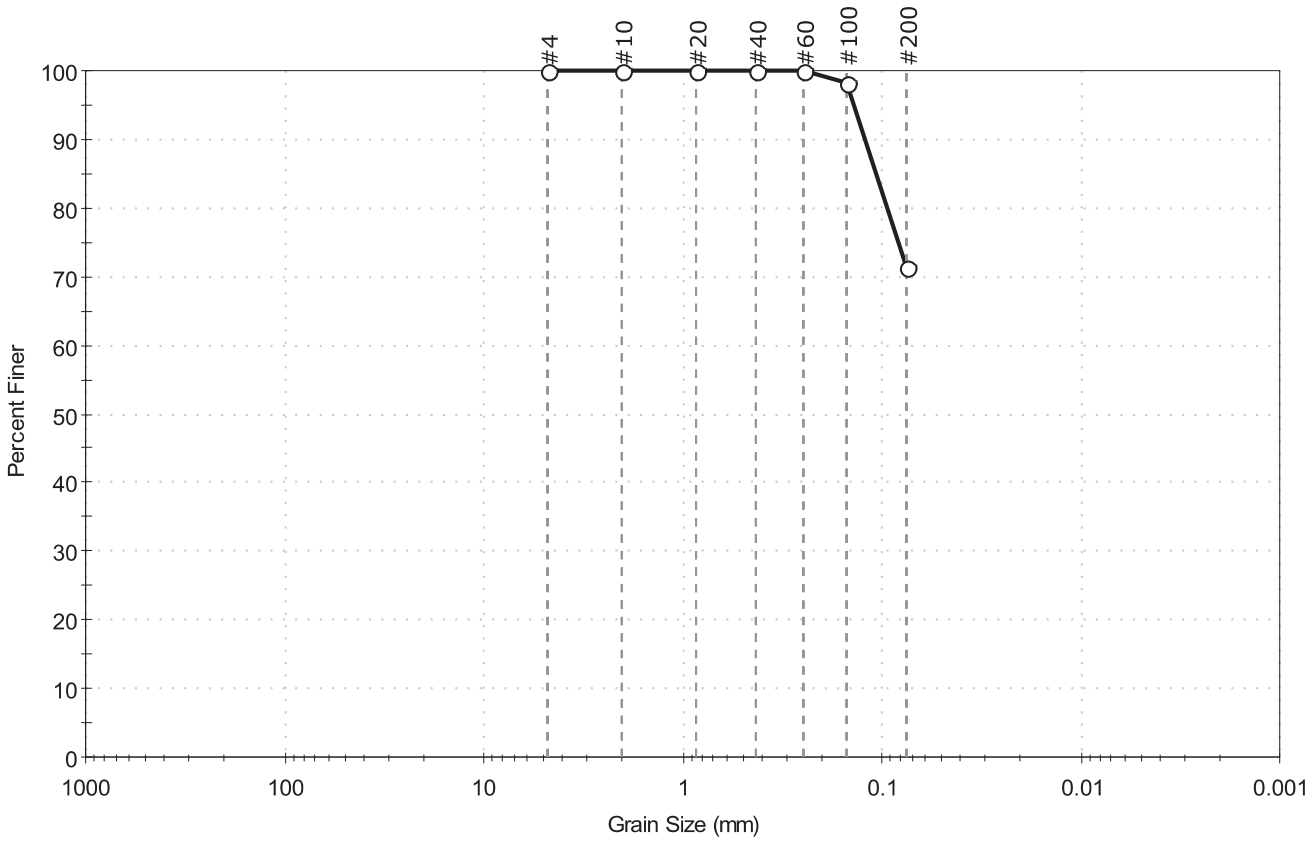
Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
AP-4	UD-1	38.0-40.0 ft	Moist, very dark greenish gray clay with sand	69.0

Notes: Temperature of Drying : 110º Celsius

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	AP-4	Sample Type:	tube	Tested By:	GA
Sample ID:	UD-1	Test Date:	10/31/16	Checked By:	mcm
Depth :	38.0-40.0 ft	Test Id:	397033		
Test Comment:	---				
Visual Description:	Moist, very dark greenish gray clay with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	28.7	71.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	98		
#200	0.075	71		

Coefficients

D_{85} = 0.1068 mm	D_{30} = N/A
D_{60} = N/A	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Fat clay with sand (CH)

AASHTO Clayey Soils (A-7-6 (34))

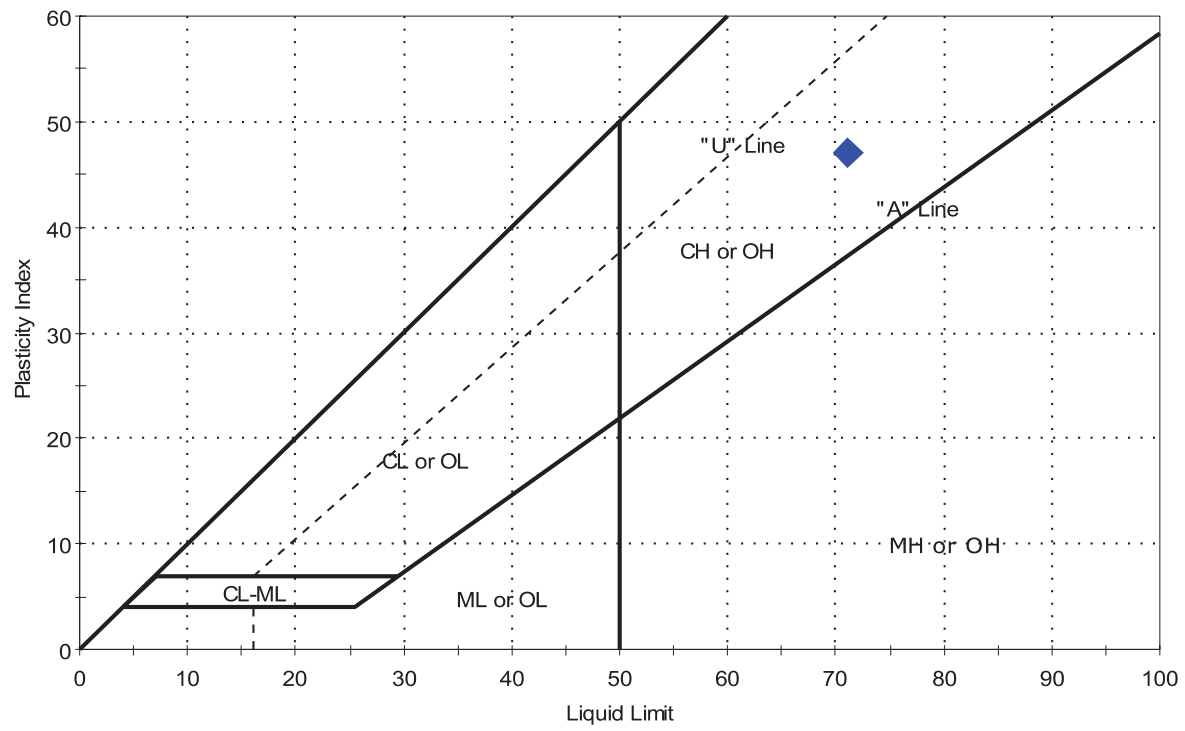
Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Client:	F&ME Consultants				
Project:	US-21 Replacement Bridge over Harbor River				
Location:	---			Project No:	GTX-305005
Boring ID:	AP-4	Sample Type:	tube	Tested By:	GA
Sample ID:	UD-1	Test Date:	10/31/16	Checked By:	mcm
Depth :	38.0-40.0 ft	Test Id:	397034		
Test Comment:	---				
Visual Description:	Moist, very dark greenish gray clay with sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UD-1	AP-4	38.0-40.0 ft	69	71	24	47	1	Fat clay with sand (CH)

Sample Prepared using the WET method

0% Retained on #40 Sieve

Dry Strength: HIGH

Dilatancy: SLOW

Toughness: LOW

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	16-1281	**DATE SAMPLE RECEIVED:**	8/8/2016
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	MB	**DATE OF TESTING:**	8/19/2016
		DATE OF WEIGHING:	8/22/2016

BORING NO.	AP-4/UD-2	AP-4/UD-3			
SAMPLE NO.	16-1281E	16-1281H			
SAMPLE DEPTH	40.0-42.0'	70.0-72.0'			
WATER CONTENT, W%	33.8	58.8			

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

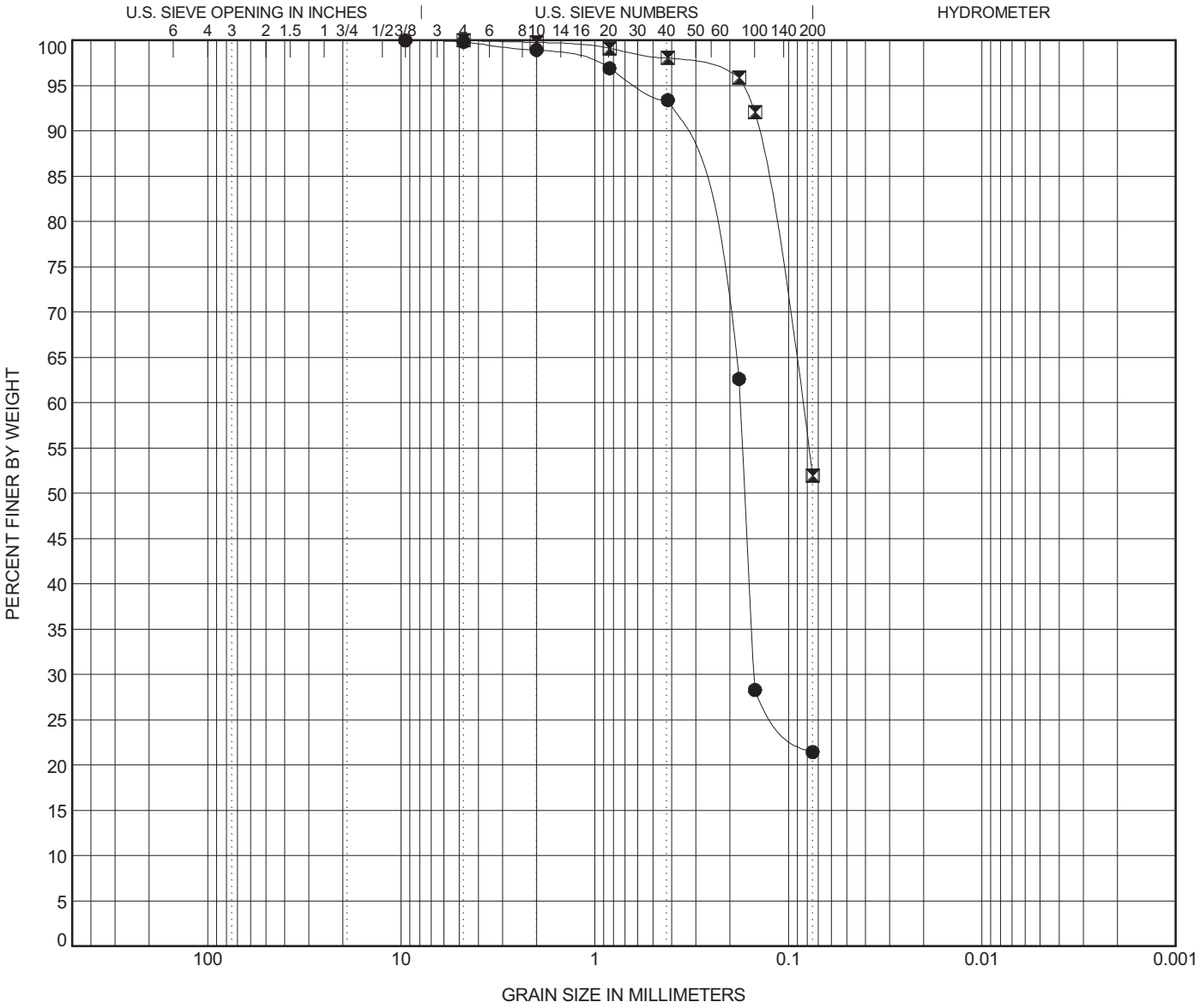
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

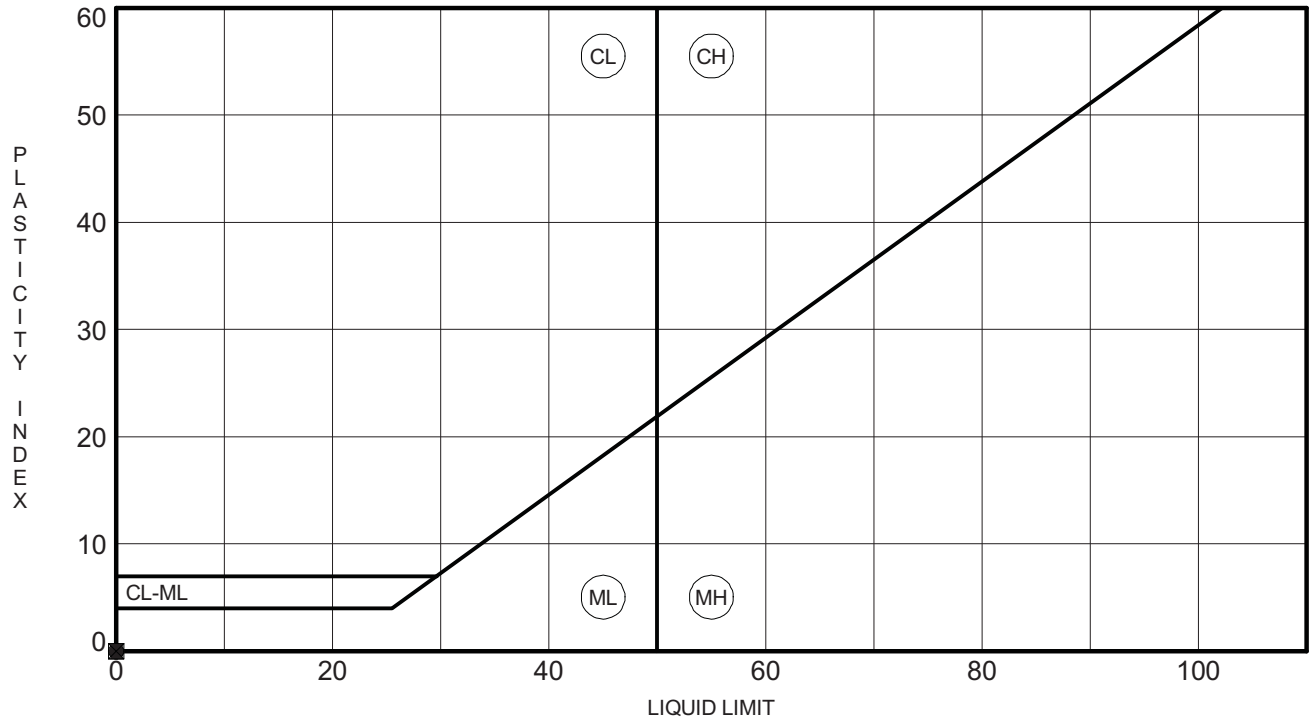
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**AP-4**	**42.0**	**Silty SAND (SM) A-2-4**	**NP**	**NP**	**NP**		
⊠	**AP-4**	**72.0**	**Sandy SILT (ML) A-4(0)**	**NP**	**NP**	**NP**		

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**AP-4**	**42.0**	**9.52**	**0.574**	**0.168**		**0.2**	**78.4**	**21.5**	
⊠	**AP-4**	**72.0**	**4.76**	**0.172**			**0.0**	**48.0**	**52.0**	

ATTERBERG LIMITS' RESULTS

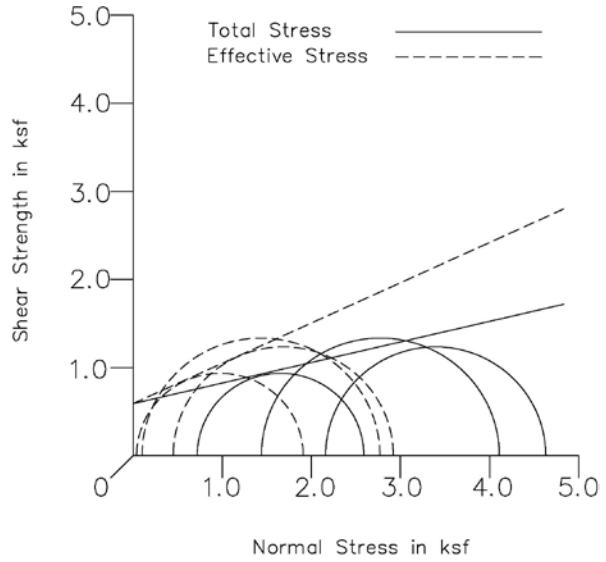
PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort

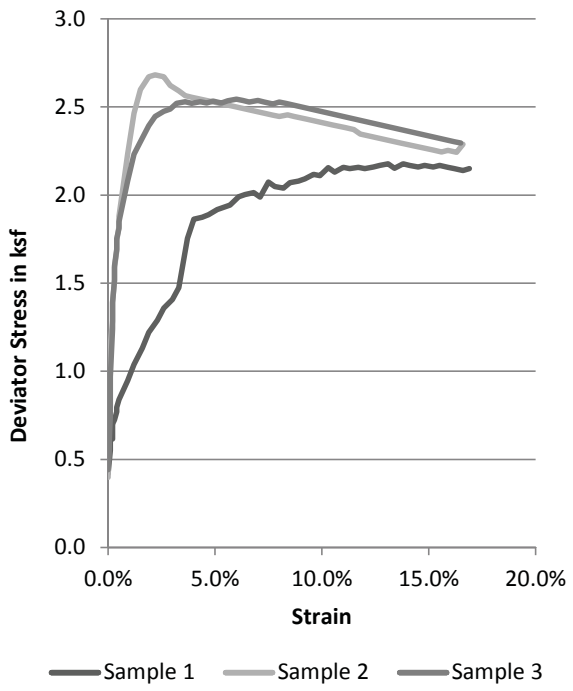


	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**AP-4**	**42.0**	**NP**	**NP**	**NP**	**21**	**Silty SAND (SM) A-2-4**
⊠	**AP-4**	**72.0**	**NP**	**NP**	**NP**	**52**	**Sandy SILT (ML) A-4(0)**

TRIAXIAL SHEAR TEST REPORT
ASTM D4767 / AASHTO T297



Stress-Strain Curves



		Sample 1	Sample 2	Sample 3
Initial	Water Content, %	33.8%	33.8%	33.8%
	Void Ratio	1.13	1.40	0.88
	Diameter, in.	2.84	2.84	2.85
	Height, in.	5.74	5.84	5.87
	Volume, in^3	36.47	36.94	37.35
Final	Water Content, %	59.5%	53.8%	33.8%
	Void Ratio	1.56	1.40	0.90
	Diameter, in.	2.84	2.84	2.85
	Height, in.	5.66	5.72	5.79
	Volume, in^3	35.95	36.19	36.84
	Saturation, %	100.0%	100.0%	100.0%
	Dry Density, PCF	64.9	69.1	87.0
	Cell Pressure (ksf)	5.76	6.48	7.20
	Sample Pressure (ksf)	5.04	5.04	5.04
	Stress at Failure (ksf)	1.87	2.67	2.47
	Strain at Failure, %	4.4%	1.9%	2.6%
	σ_1 at Failure (ksf)	2.59	4.11	4.63
	σ_3 at Failure (ksf)	0.72	1.44	2.16
	σ'_1 at Failure (ksf)	1.91	2.77	2.92
	σ'_3 at Failure (ksf)	0.04	0.10	0.45

Project Name: US 21 Bridge Replacement over Harbor River

Project Number: G5396 Date: 9/1/2016

SCDOT Project ID: P026862

Location/Sample: AP-4/UD-2 / Sample #16-1281A

Depth/Elevation: 40.0' - 42.0'

Type of Test : Consolidated Undrained

Sample Type : Undisturbed - Shelby Tube

Description: Dark Grey Silty Fine to Medium SAND (SM), A-2-4

PI= NP % Fines= 21.5

C= 0.59 ksf C'= 0.59 ksf

ϕ= 13° ϕ'= 24°

F&ME CONSULTANTS

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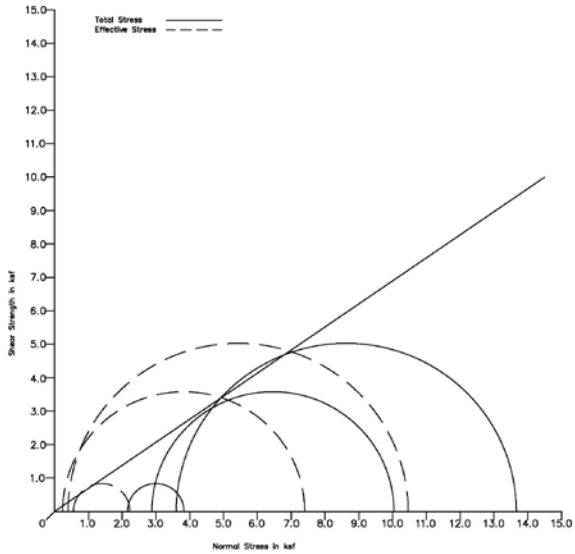
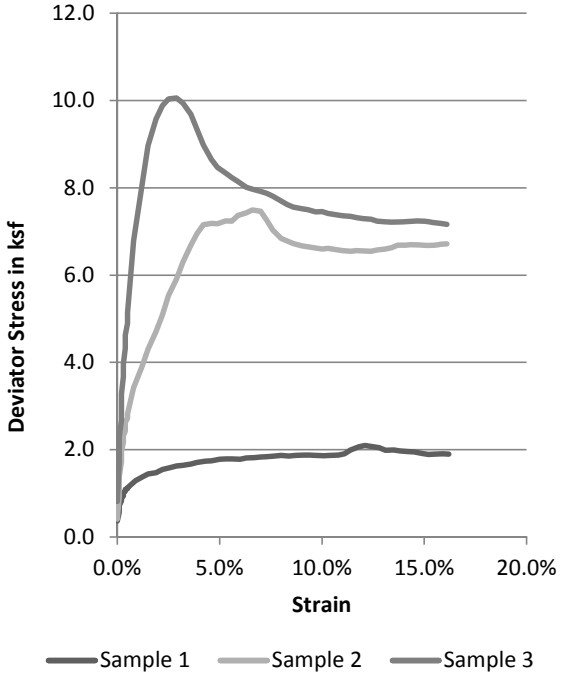
TRIAXIAL SHEAR TEST REPORT
ASTM D4767 / AASHTO T297



Stress-Strain Curves



		Sample 1	Sample 2	Sample 3
Initial	Water Content, %	58.8%	58.8%	58.8%
	Void Ratio	1.75	1.49	1.51
	Diameter, in.	2.87	2.87	2.86
	Height, in.	5.86	5.90	5.90
	Volume, in^3	37.81	38.26	37.79
Final	Water Content, %	57.0%	52.0%	56.6%
	Void Ratio	1.61	1.36	1.45
	Diameter, in.	2.87	2.87	2.86
	Height, in.	5.47	5.79	5.82
	Volume, in^3	35.31	37.56	37.31
	Saturation, %	93.9%	100.0%	100.0%
	Dry Density, PCF	63.5	70.3	67.7
	Cell Pressure (ksf)	7.20	7.92	8.64
	Sample Pressure (ksf)	5.04	5.04	5.04
	Stress at Failure (ksf)	1.67	7.16	10.06
	Strain at Failure, %	3.6%	4.2%	2.9%
	σ_1 at Failure (ksf)	3.83	10.04	13.66
	σ_3 at Failure (ksf)	2.16	2.88	3.60
	σ'_1 at Failure (ksf)	2.23	7.40	10.46
	σ'_3 at Failure (ksf)	0.56	0.24	0.40

Project Name	US 21 Bridge Replacement over Harbor River		
Project Number	G5396	Date	9/8/2016
SCDOT Project ID	P026862		
Location/Sample	AP-4/UD-3 / Sample #16-1281B		
Depth/Elevation	70.0' - 72.0'		

Type of Test : Consolidated Undrained
Sample Type : Undisturbed - Shelby Tube
Description: Dark Grey Fine Sandy SILT (ML), A-4(0)

PI= NP % Fines= 52.0
C= 0 C'= --
ϕ= 34° ϕ'= --

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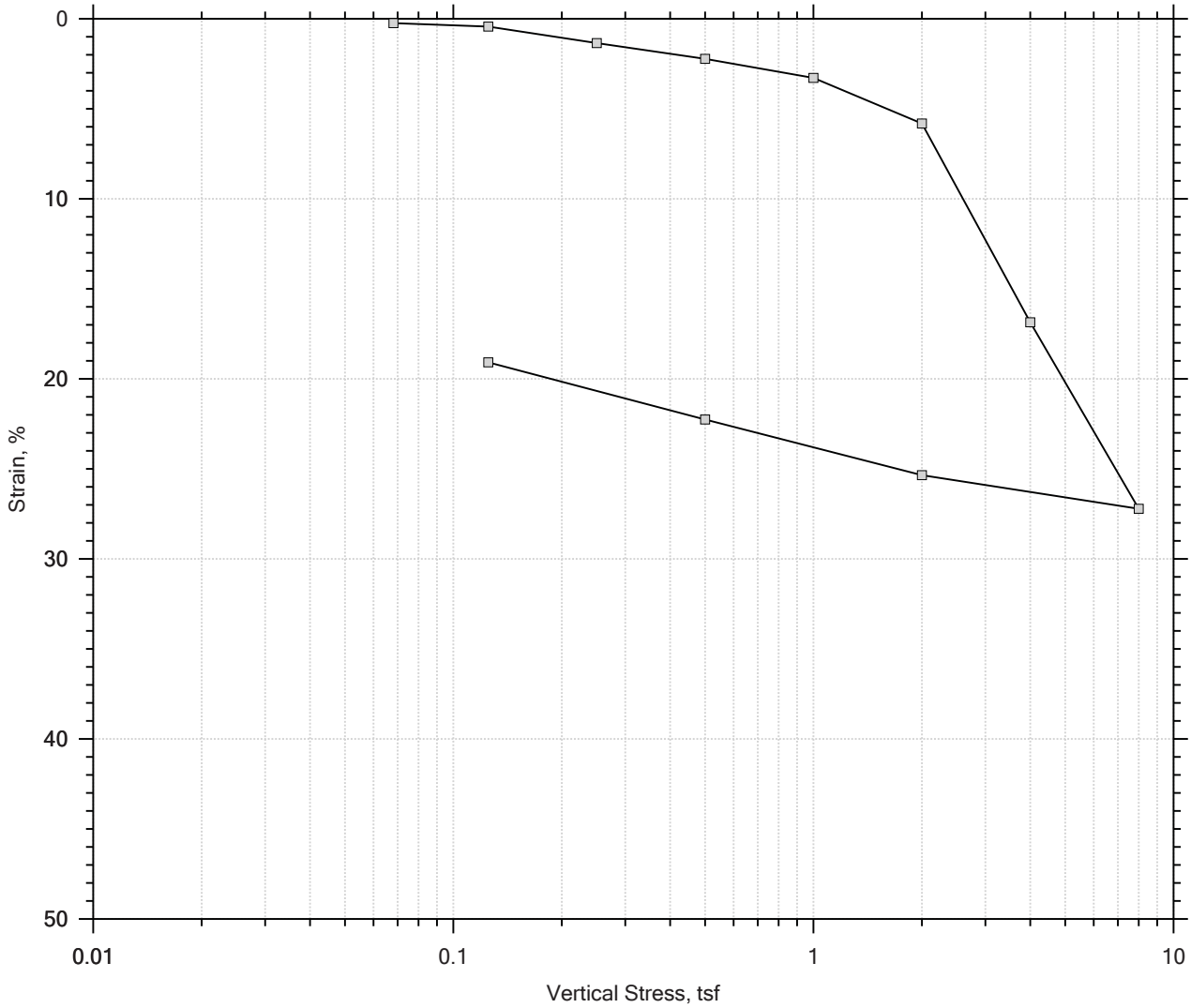
One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report

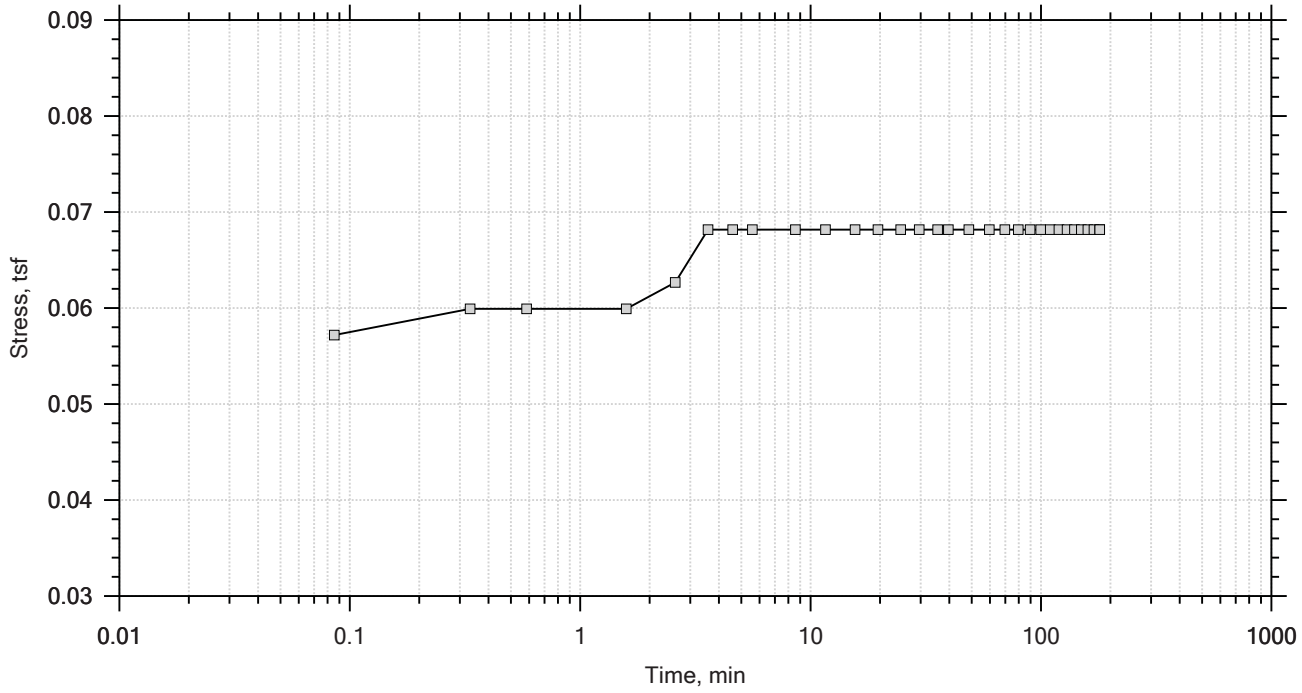


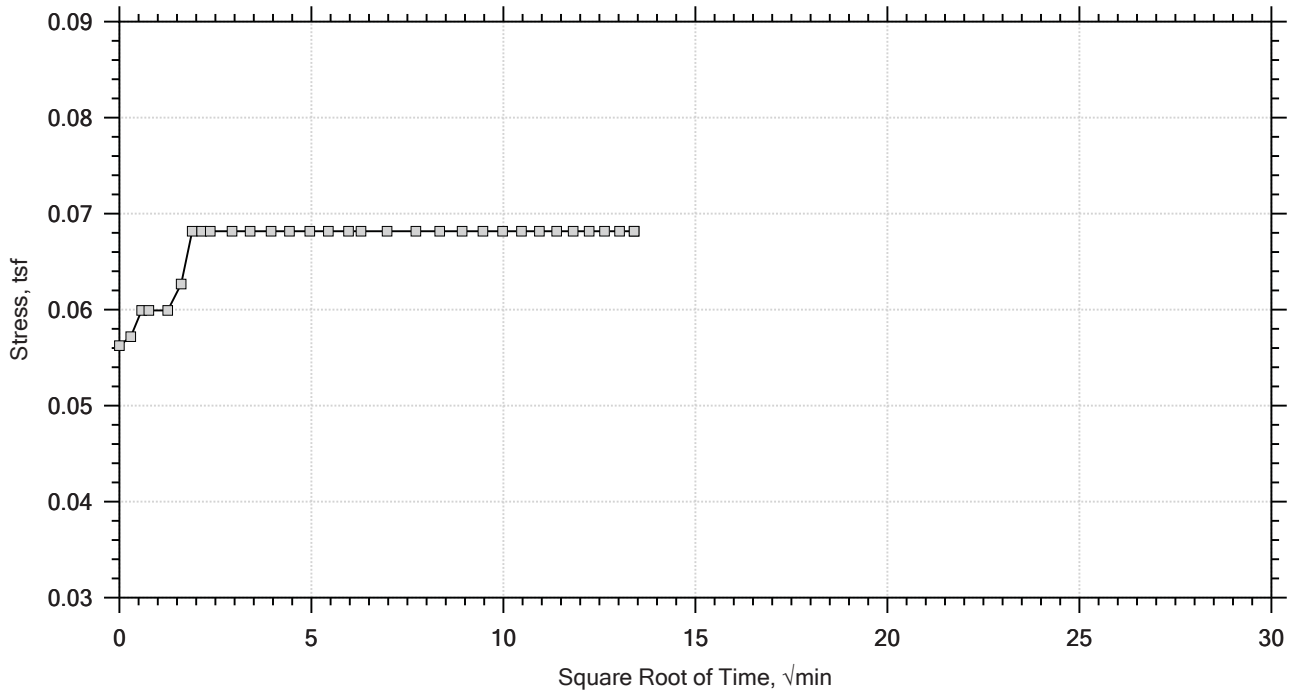
					Before Test	After Test
Current Vertical Effective Stress: ---				Water Content, %	76.63	57.24
Preconsolidation Stress: ---				Dry Unit Weight, pcf	53.798	66.486
Compression Ratio: ---				Saturation, %	96.53	100.00
Diameter: 2.5 in		Height: 1 in		Void Ratio	2.17	1.56
LL: ---	PL: ---	PI: ---	GS: 2.73			

GeoTesting EXPRESS	Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
	Boring No.: AP-4	Tested By: jm	Checked By: mcm
	Sample No.: UD-1	Test Date: 10/3/16	Depth: 38-40 ft
	Test No.: IP-7	Sample Type: intact	Elevation: ---
	Description: Moist, very dark greenish gray clay with sand		
	Remarks: System 5077 Swell Pressure = 0.0682 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 11
Constant Volume Step
Stress: 0.0682 tsf

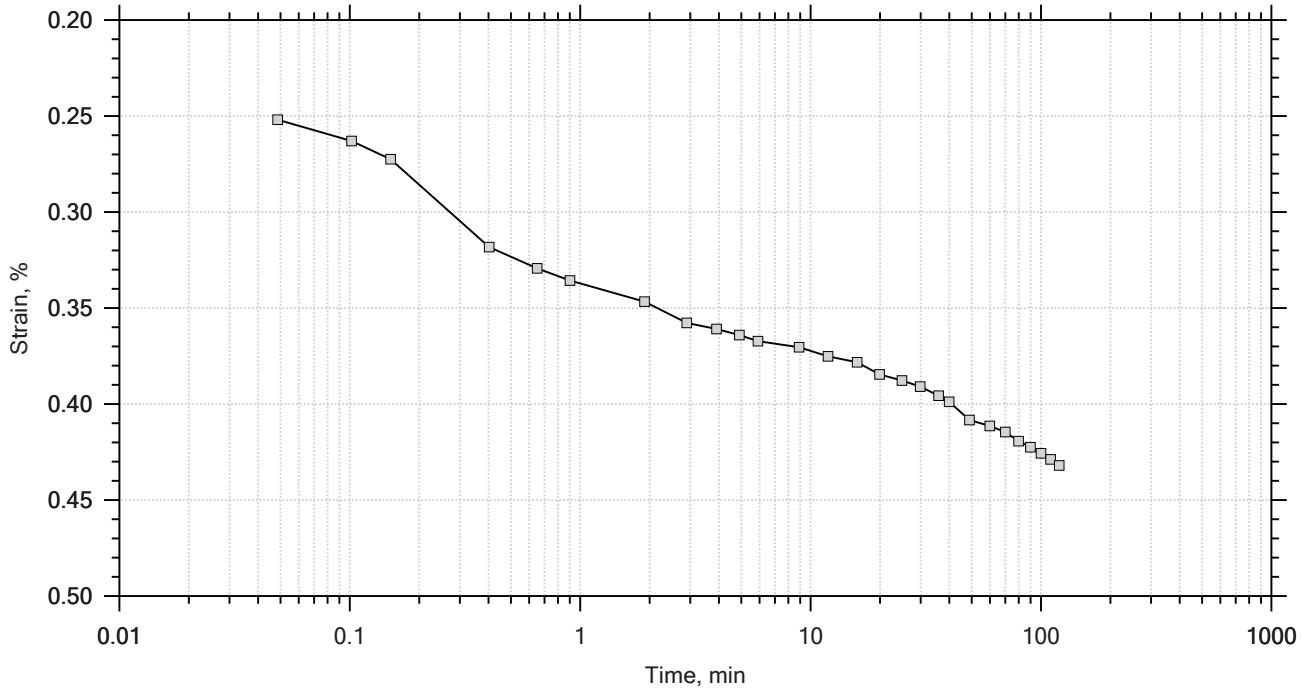


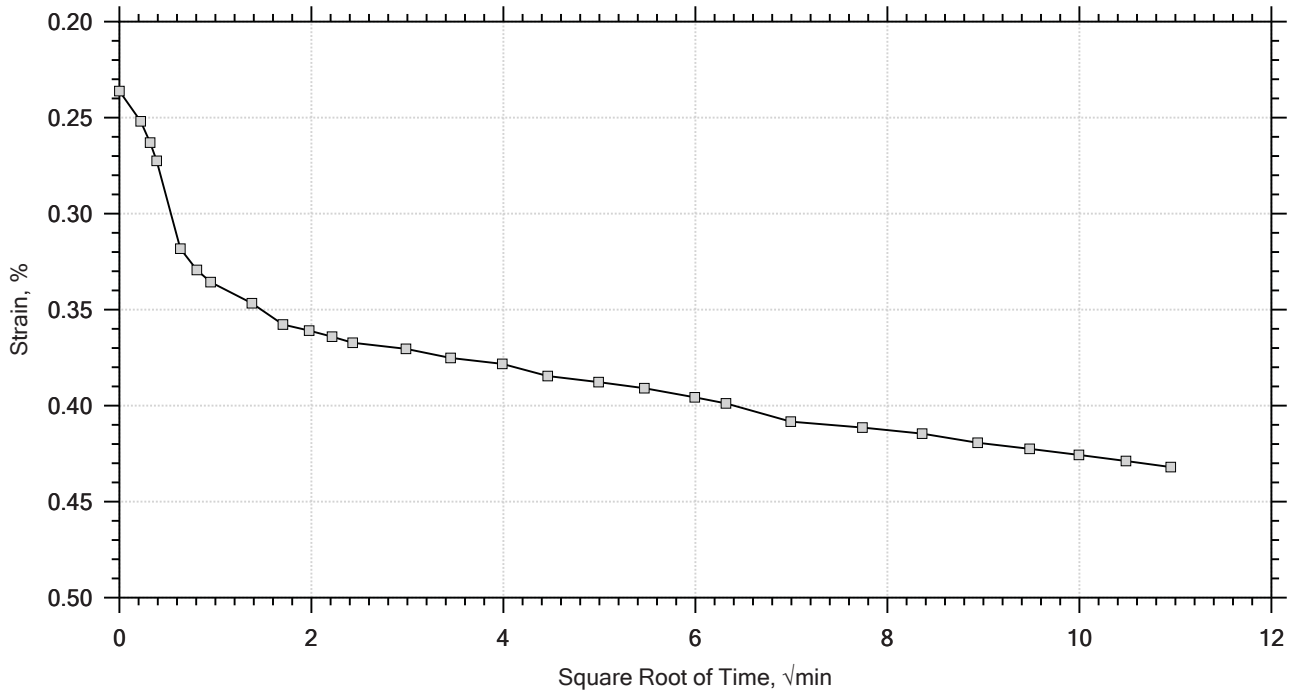


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-4	Tested By: jm	Checked By: mcm
Sample No.: UD-1	Test Date: 10/3/16	Depth: 38-40 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, very dark greenish gray clay with sand		
Remarks: System 5077 Swell Pressure = 0.0682 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 11
Constant Load Step
Stress: 0.125 tsf

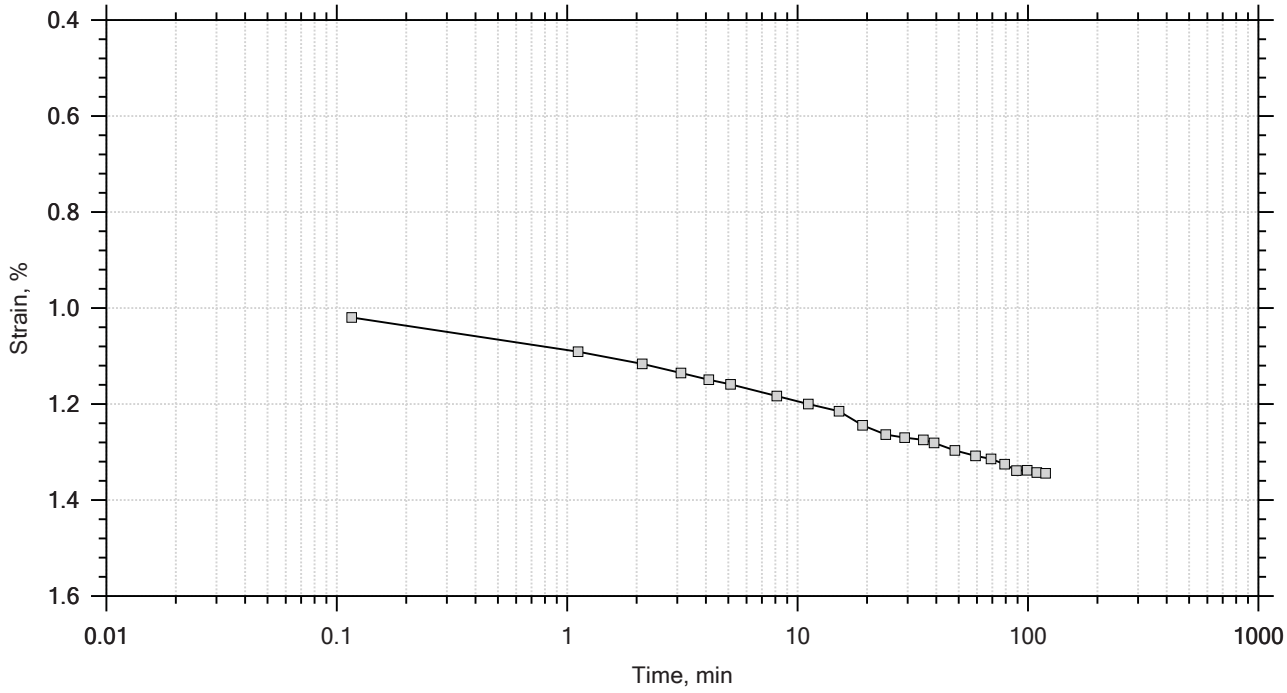


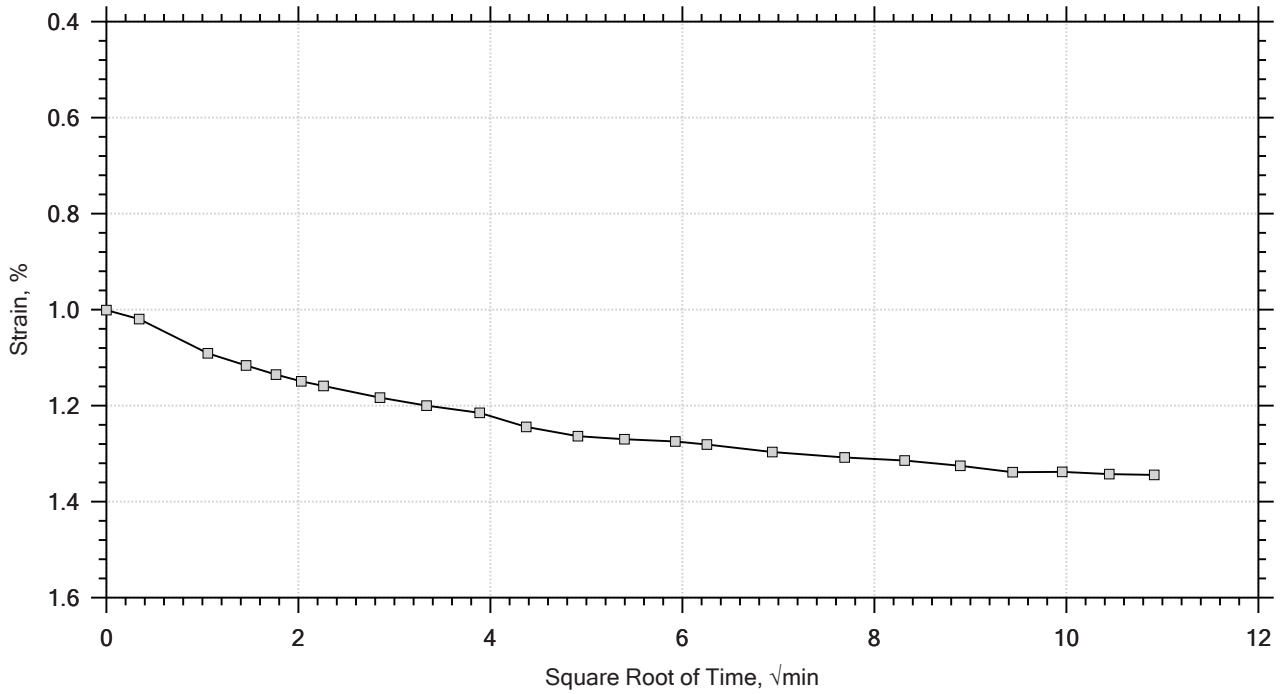


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-4	Tested By: jm	Checked By: mcm
Sample No.: UD-1	Test Date: 10/3/16	Depth: 38-40 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, very dark greenish gray clay with sand		
Remarks: System 5077 Swell Pressure = 0.0682 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 11
Constant Load Step
Stress: 0.25 tsf

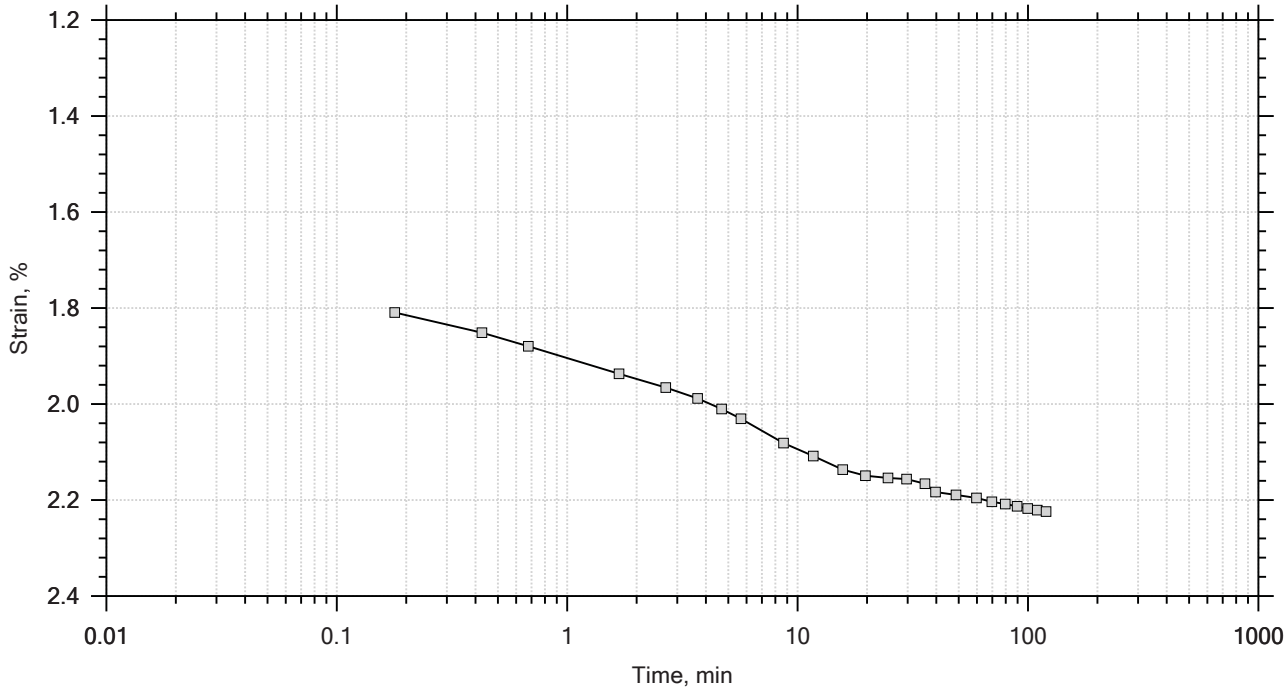


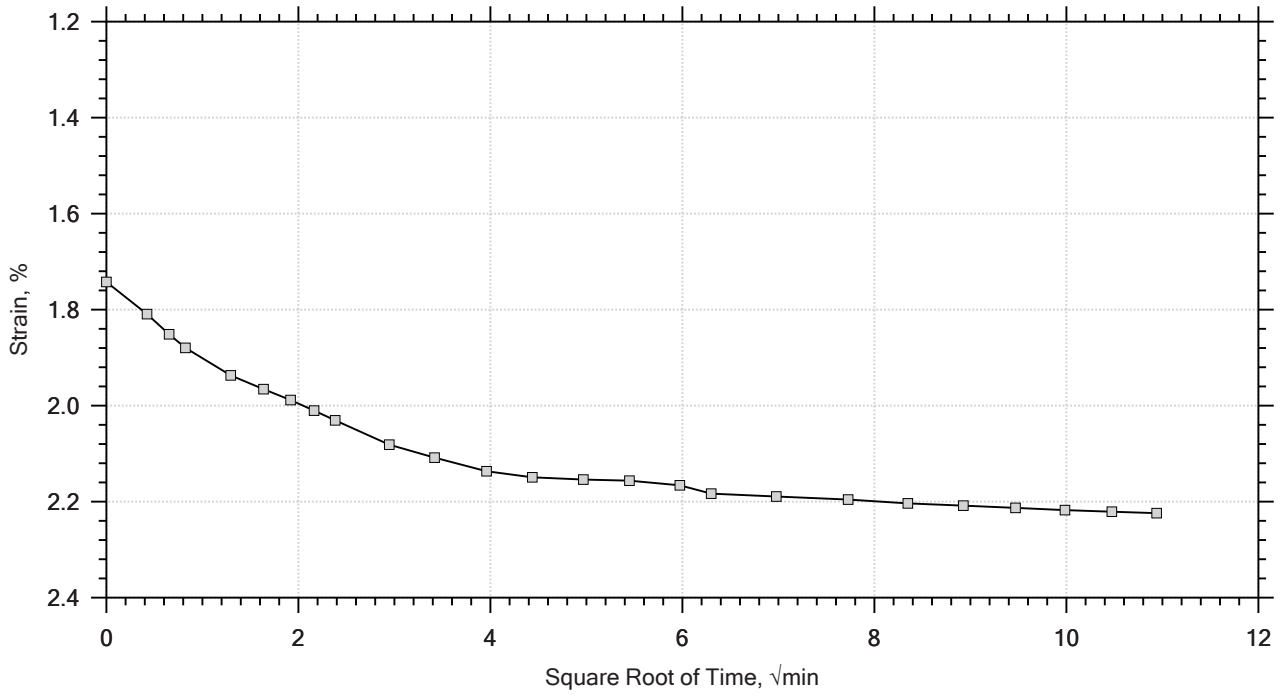


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-4	Tested By: jm	Checked By: mcm
Sample No.: UD-1	Test Date: 10/3/16	Depth: 38-40 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, very dark greenish gray clay with sand		
Remarks: System 5077 Swell Pressure = 0.0682 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 11
Constant Load Step
Stress: 0.5 tsf

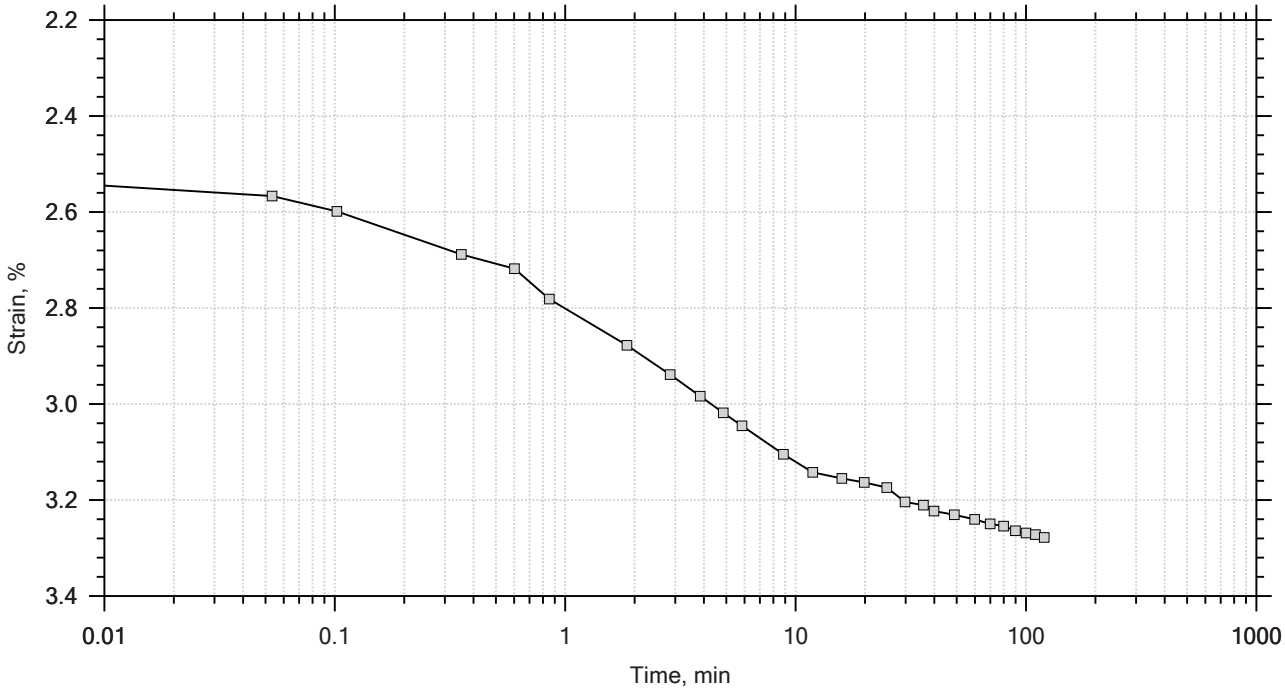


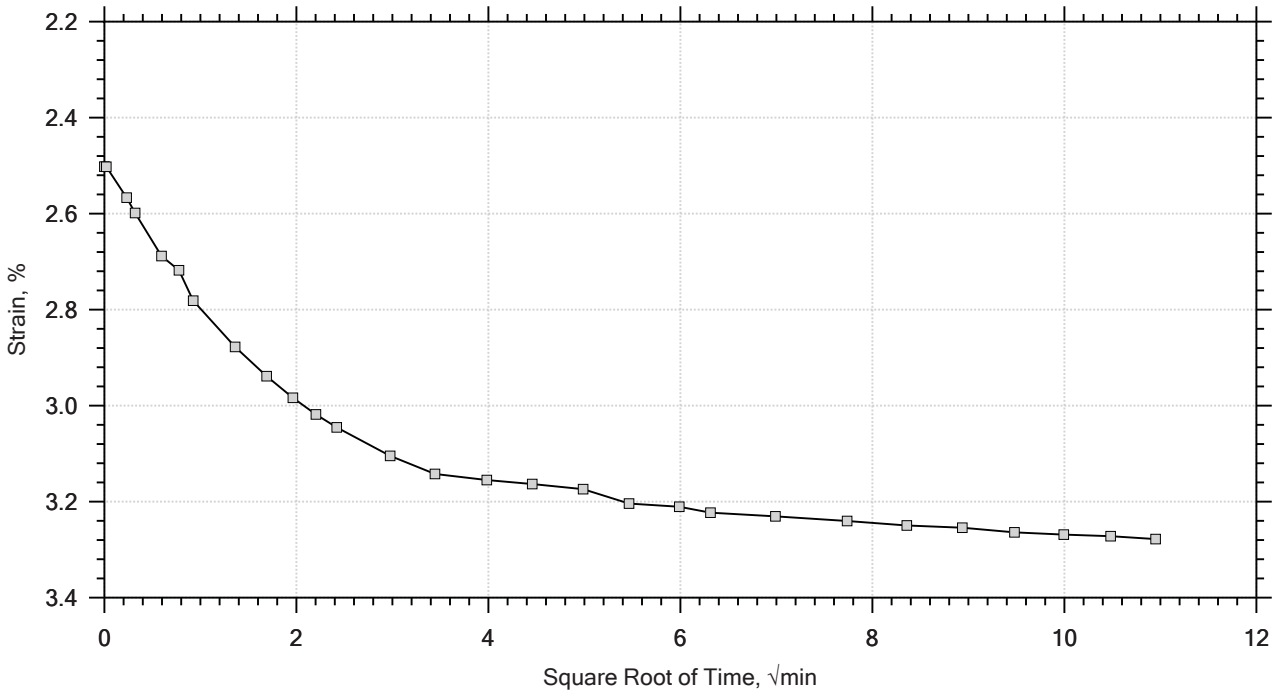


GeoTesting EXPRESS	Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
	Boring No.: AP-4	Tested By: jm	Checked By: mcm
	Sample No.: UD-1	Test Date: 10/3/16	Depth: 38-40 ft
	Test No.: IP-7	Sample Type: intact	Elevation: ---
	Description: Moist, very dark greenish gray clay with sand		
	Remarks: System 5077 Swell Pressure = 0.0682 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 11
Constant Load Step
Stress: 1 tsf

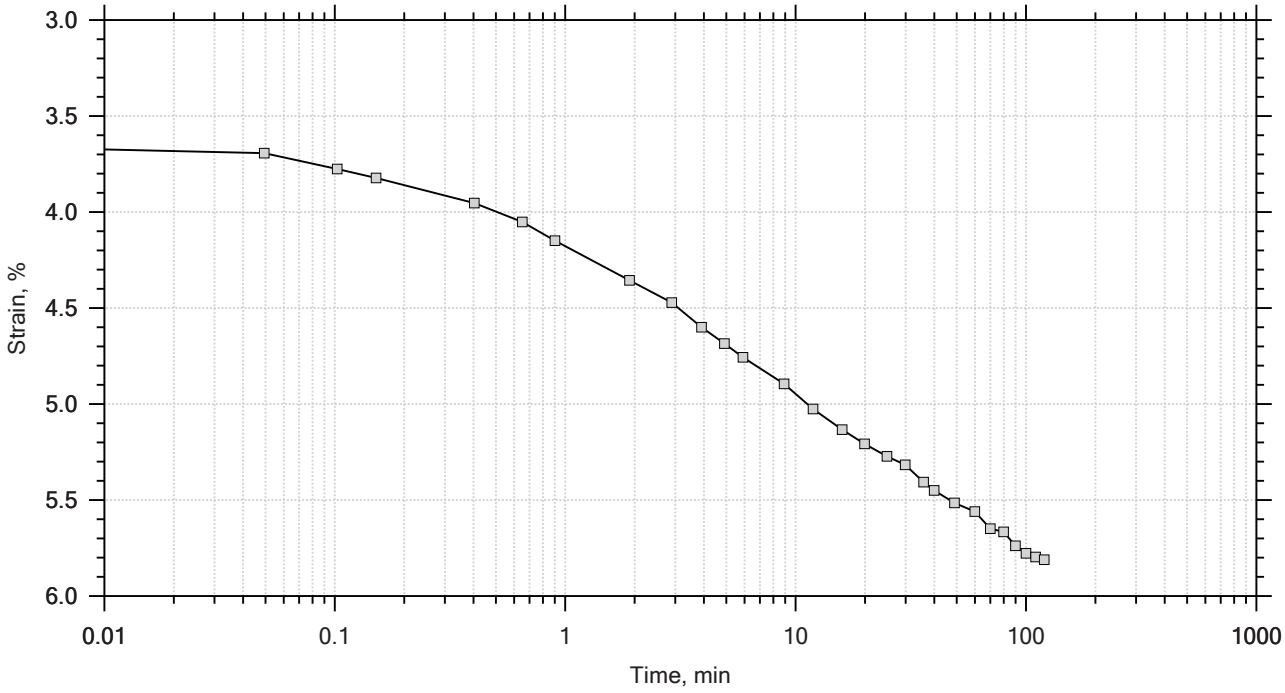


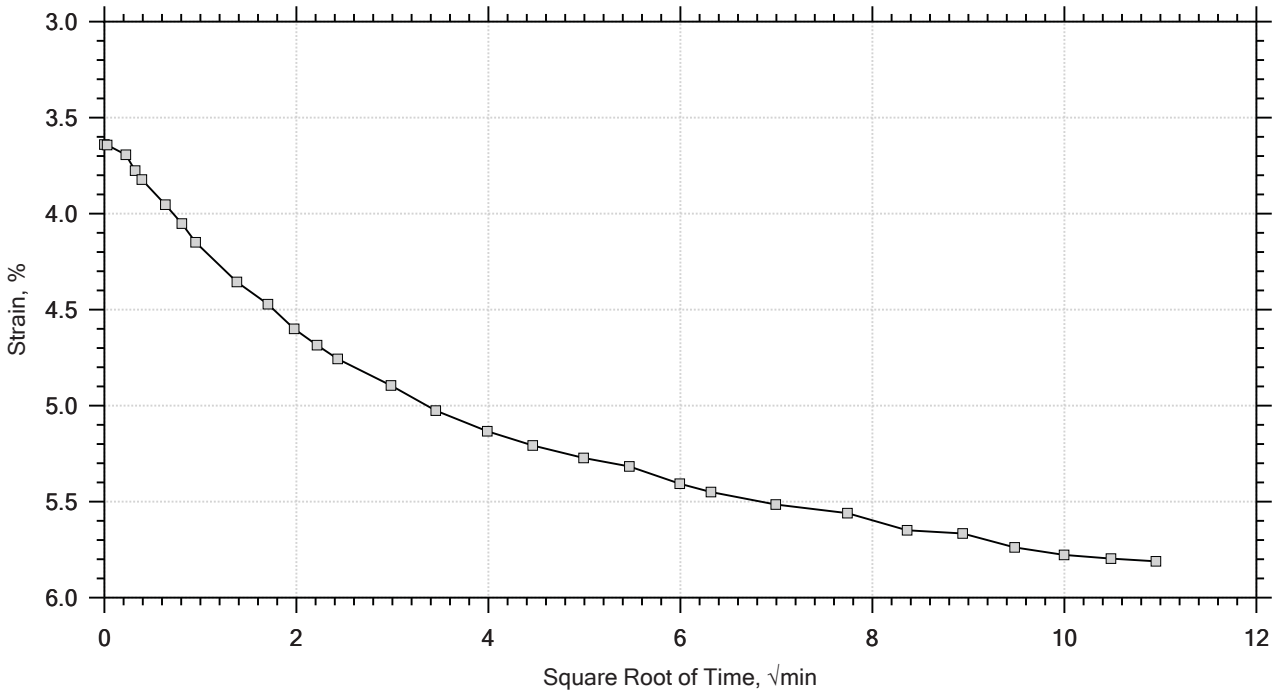


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-4	Tested By: jm	Checked By: mcm
Sample No.: UD-1	Test Date: 10/3/16	Depth: 38-40 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, very dark greenish gray clay with sand		
Remarks: System 5077 Swell Pressure = 0.0682 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 11
Constant Load Step
Stress: 2 tsf

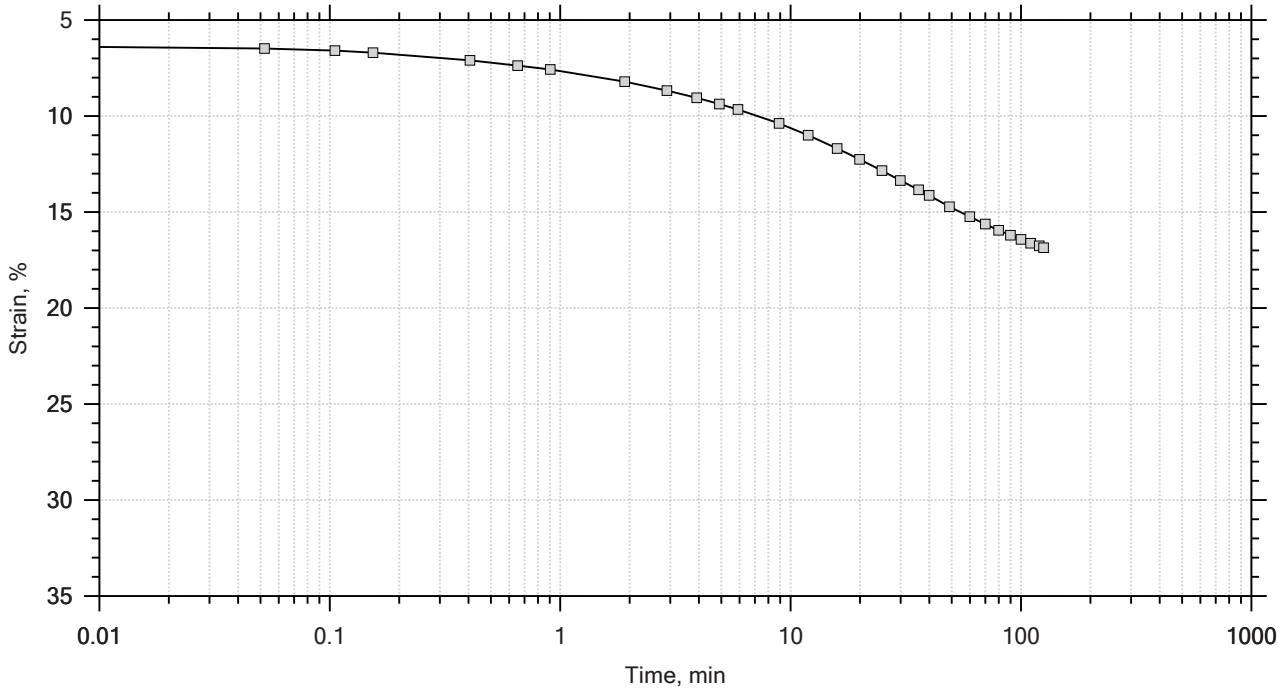


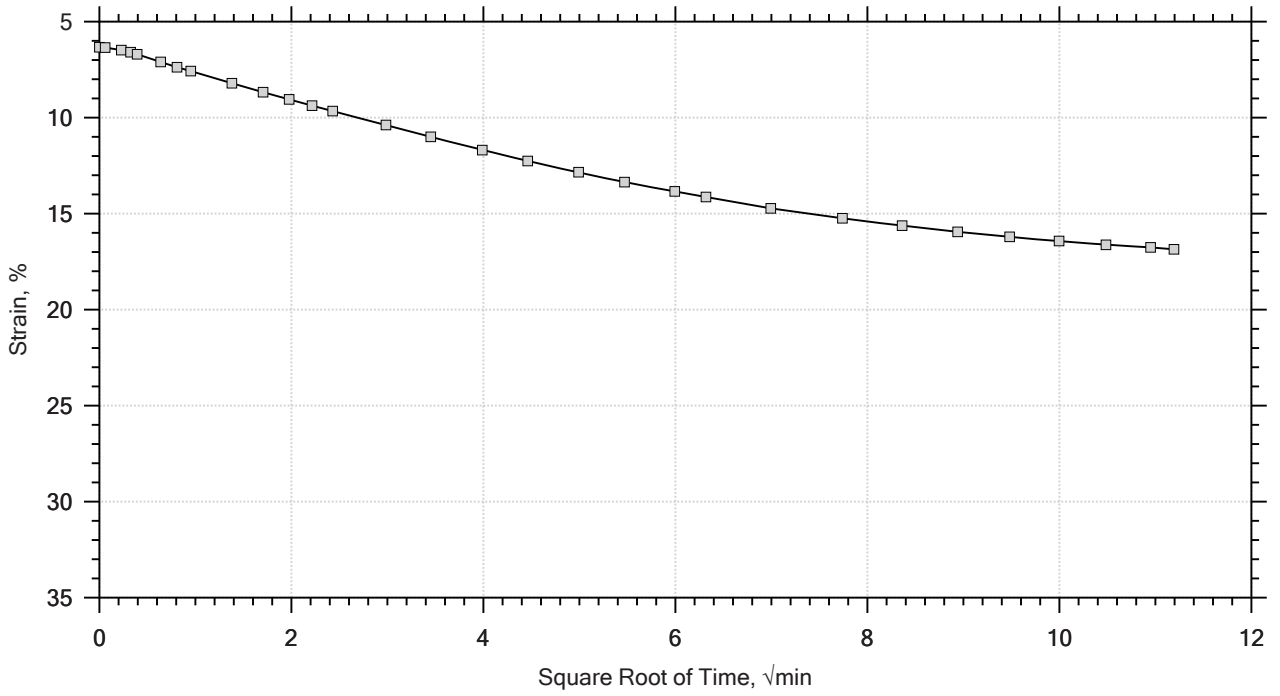


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-4	Tested By: jm	Checked By: mcm
Sample No.: UD-1	Test Date: 10/3/16	Depth: 38-40 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, very dark greenish gray clay with sand		
Remarks: System 5077 Swell Pressure = 0.0682 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 11
Constant Load Step
Stress: 4 tsf

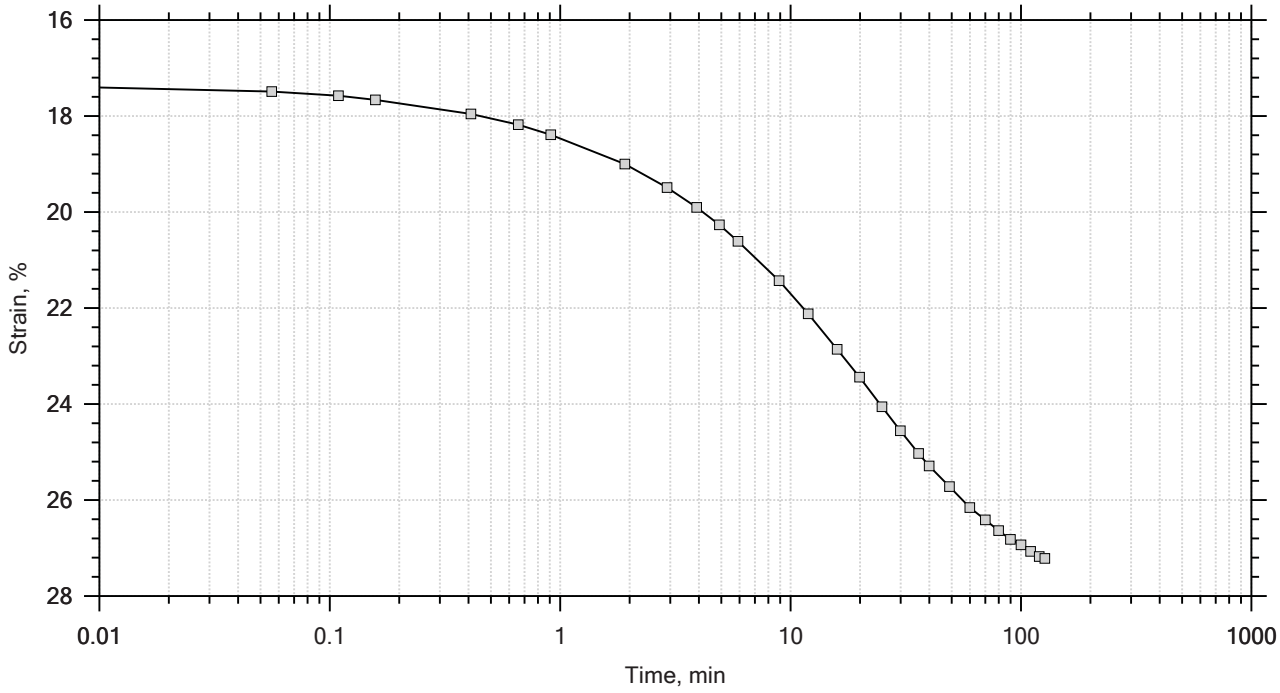


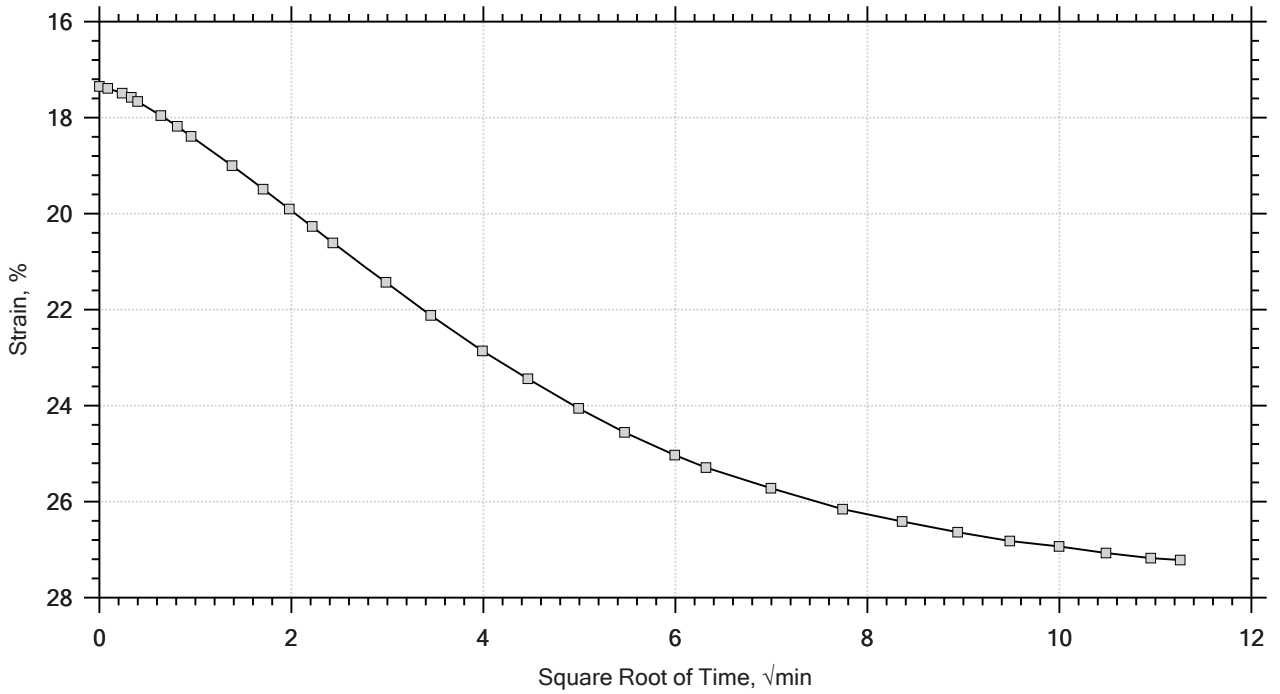


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-4	Tested By: jm	Checked By: mcm
Sample No.: UD-1	Test Date: 10/3/16	Depth: 38-40 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, very dark greenish gray clay with sand		
Remarks: System 5077 Swell Pressure = 0.0682 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 11
Constant Load Step
Stress: 8 tsf

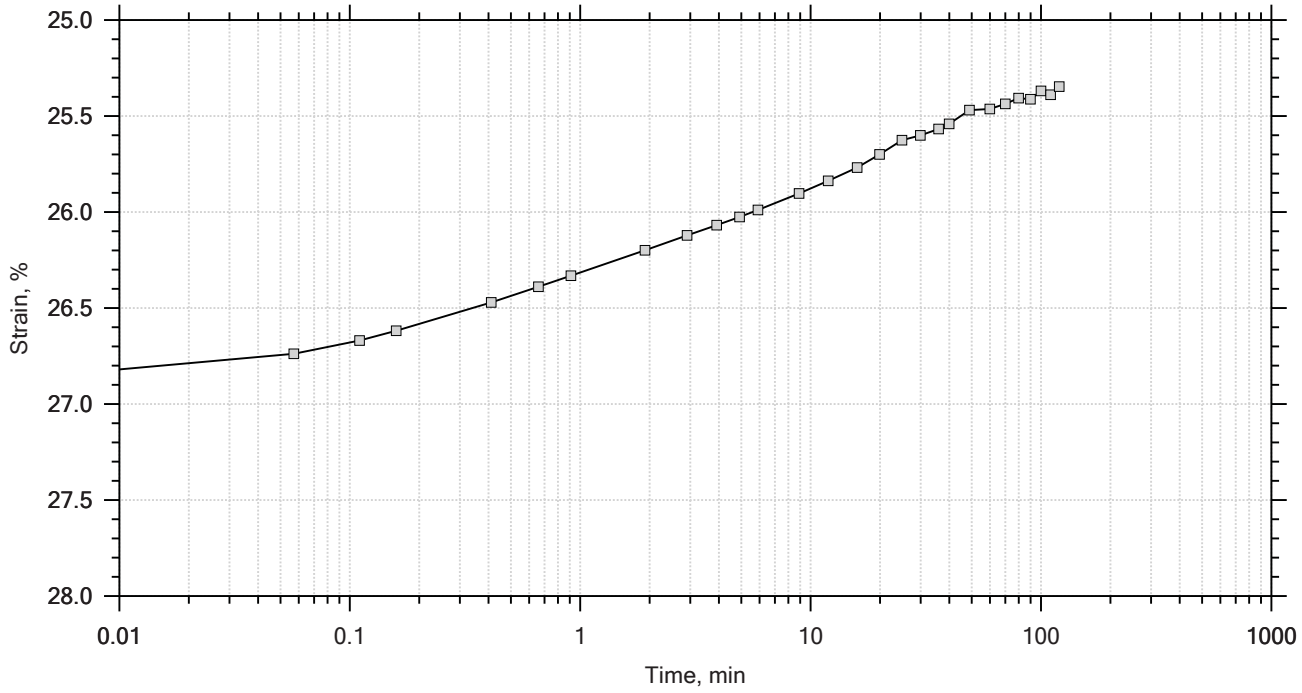


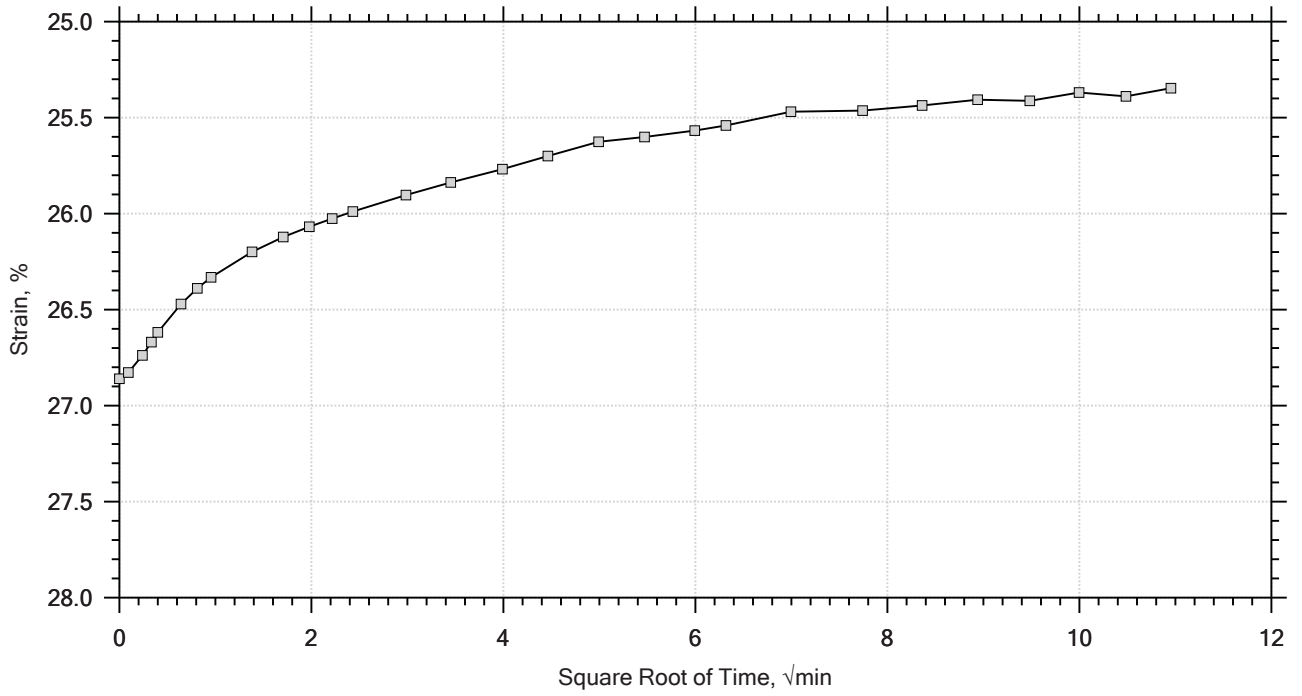


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-4	Tested By: jm	Checked By: mcm
Sample No.: UD-1	Test Date: 10/3/16	Depth: 38-40 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, very dark greenish gray clay with sand		
Remarks: System 5077 Swell Pressure = 0.0682 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 11
Constant Load Step
Stress: 2 tsf

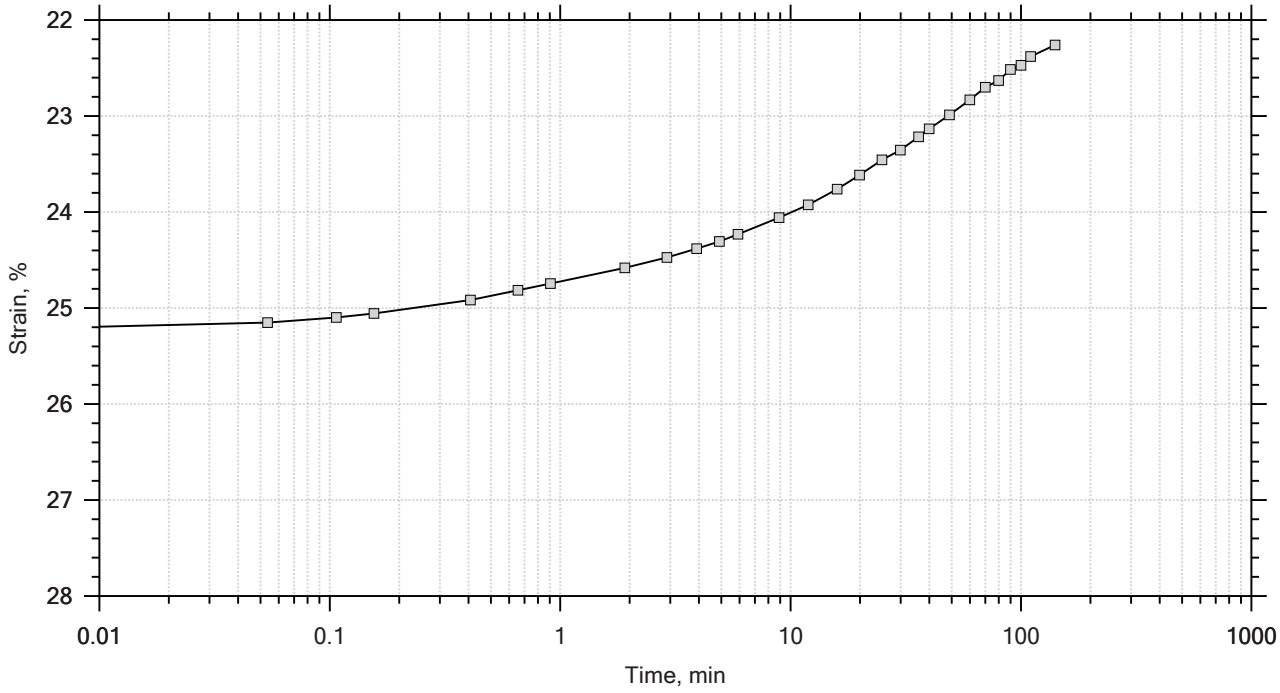


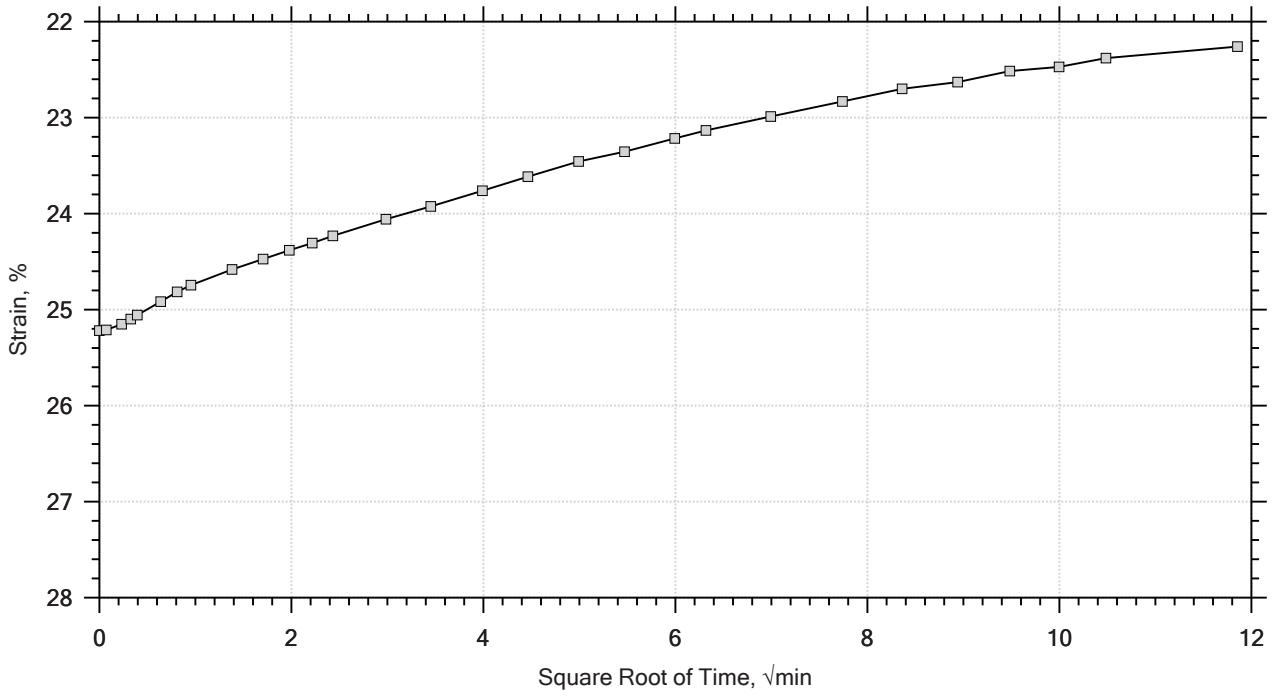


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-4	Tested By: jm	Checked By: mcm
Sample No.: UD-1	Test Date: 10/3/16	Depth: 38-40 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, very dark greenish gray clay with sand		
Remarks: System 5077 Swell Pressure = 0.0682 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 11
Constant Load Step
Stress: 0.5 tsf

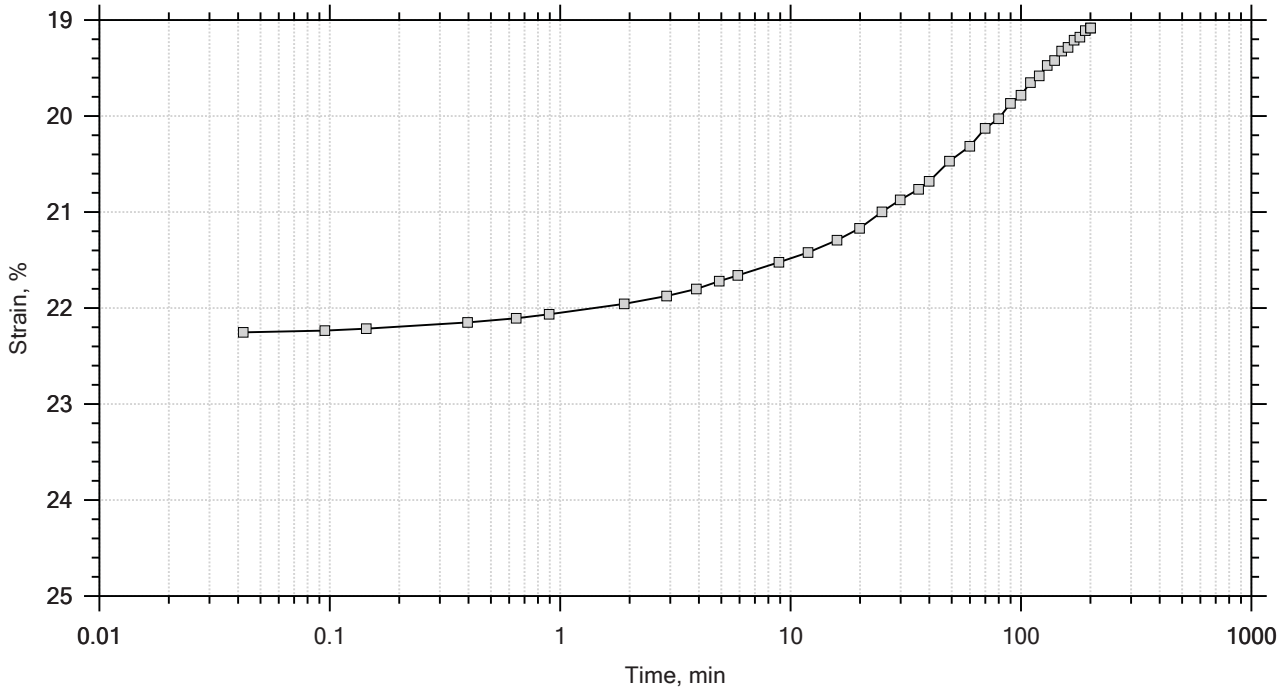


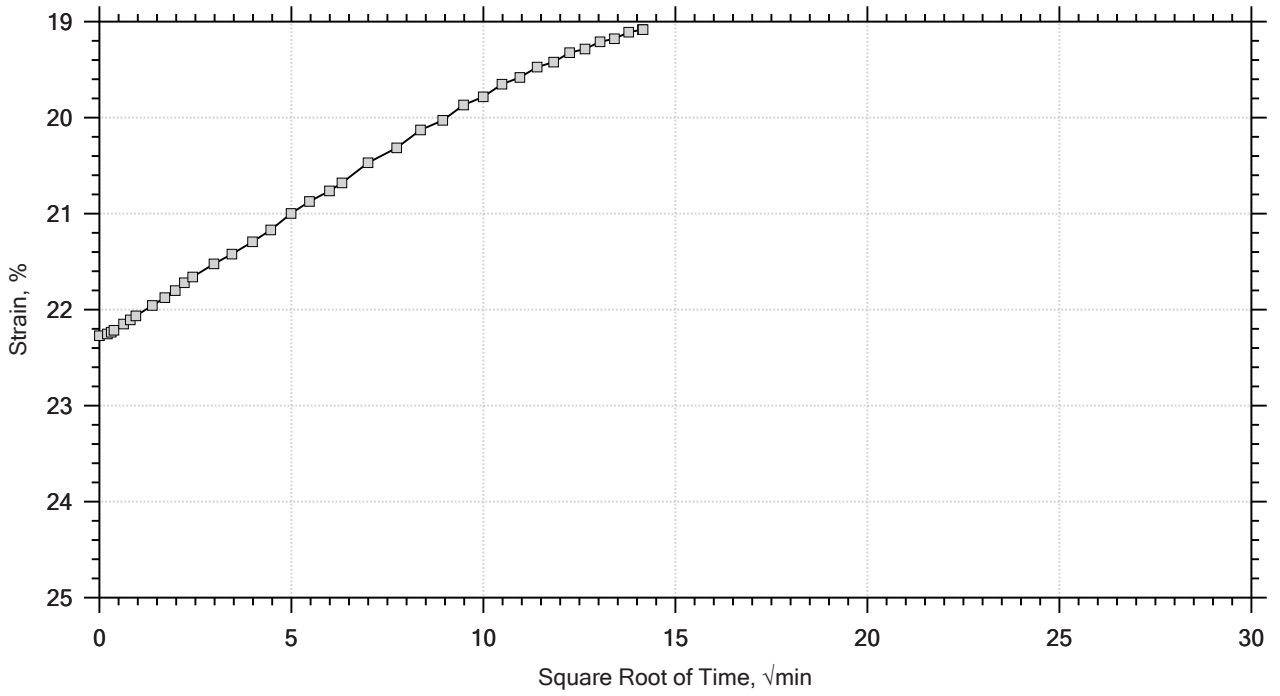


Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-4	Tested By: jm	Checked By: mcm
Sample No.: UD-1	Test Date: 10/3/16	Depth: 38-40 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, very dark greenish gray clay with sand		
Remarks: System 5077 Swell Pressure = 0.0682 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 11
Constant Load Step
Stress: 0.125 tsf





Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-4	Tested By: jm	Checked By: mcm
Sample No.: UD-1	Test Date: 10/3/16	Depth: 38-40 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, very dark greenish gray clay with sand		
Remarks: System 5077 Swell Pressure = 0.0682 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.73	Liquid Limit: ---
Initial Height: 1.00 in	Initial Void Ratio: 2.17	Plastic Limit: ---
Final Height: 0.81 in	Final Void Ratio: 1.56	Plasticity Index: ---

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	a31	RING	a34	a34
Mass Container, gm	16.39	17.08	17.08	17.08
Mass Container + Wet Soil, gm	92.25	139.52	126.08	126.08
Mass Container + Dry Soil, gm	61.37	86.4	86.4	86.4
Mass Dry Soil, gm	44.98	69.32	69.32	69.32
Water Content, %	68.65	76.63	57.24	57.24
Void Ratio	---	2.17	1.56	---
Degree of Saturation, %	---	96.53	100.00	---
Dry Unit Weight, pcf	---	53.798	66.486	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-4	Tested By: jm	Checked By: mcm
Sample No.: UD-1	Test Date: 10/3/16	Depth: 38-40 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, very dark greenish gray clay with sand		
Remarks: System 5077 Swell Pressure = 0.0682 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Log of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/s	Mv 1/tsf	k cm/s	Ca %
1	0.0682	0.002345	2.16	0.235	0.000	0.00e+00	3.44e-02	0.00e+00	0.00e+00
2	0.125	0.004319	2.15	0.432	0.000	0.00e+00	3.47e-02	0.00e+00	0.00e+00
3	0.250	0.01344	2.12	1.34	7.623	7.35e-07	7.30e-02	5.10e-08	0.00e+00
4	0.500	0.02224	2.10	2.22	4.343	1.27e-06	3.52e-02	4.24e-08	0.00e+00
5	1.00	0.03278	2.06	3.28	1.756	3.07e-06	2.11e-02	6.16e-08	0.00e+00
6	2.00	0.05810	1.98	5.81	0.000	0.00e+00	2.53e-02	0.00e+00	0.00e+00
7	4.00	0.1686	1.63	16.9	0.000	0.00e+00	5.52e-02	0.00e+00	0.00e+00
8	8.00	0.2721	1.30	27.2	13.862	2.50e-07	2.59e-02	6.16e-09	0.00e+00
9	2.00	0.2535	1.36	25.3	0.000	0.00e+00	3.11e-03	0.00e+00	0.00e+00
10	0.500	0.2226	1.46	22.3	0.000	0.00e+00	2.06e-02	0.00e+00	0.00e+00
11	0.125	0.1908	1.56	19.1	0.000	0.00e+00	8.47e-02	0.00e+00	0.00e+00

GeoTesting EXPRESS	Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
	Boring No.: AP-4	Tested By: jm	Checked By: mcm
	Sample No.: UD-1	Test Date: 10/3/16	Depth: 38-40 ft
	Test No.: IP-7	Sample Type: intact	Elevation: ---
	Description: Moist, very dark greenish gray clay with sand		
	Remarks: System 5077 Swell Pressure = 0.0682 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Square Root of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv ft²/s	Mv 1/tsf	k cm/s
1	0.0682	0.002345	2.16	0.235	156.469	1.56e-07	3.44e-02	5.12e-09
2	0.125	0.004319	2.15	0.432	93.234	2.61e-07	3.47e-02	8.64e-09
3	0.250	0.01344	2.12	1.34	20.743	1.16e-06	7.30e-02	8.07e-08
4	0.500	0.02224	2.10	2.22	17.290	1.37e-06	3.52e-02	4.58e-08
5	1.00	0.03278	2.06	3.28	5.957	3.90e-06	2.11e-02	7.81e-08
6	2.00	0.05810	1.98	5.81	23.280	9.60e-07	2.53e-02	2.31e-08
7	4.00	0.1686	1.63	16.9	53.337	3.62e-07	5.52e-02	1.90e-08
8	8.00	0.2721	1.30	27.2	49.954	2.99e-07	2.59e-02	7.35e-09
9	2.00	0.2535	1.36	25.3	14.786	9.02e-07	3.11e-03	2.67e-09
10	0.500	0.2226	1.46	22.3	40.501	3.52e-07	2.06e-02	6.89e-09
11	0.125	0.1908	1.56	19.1	182.068	8.48e-08	8.47e-02	6.83e-09

GeoTesting EXPRESS

Project: US-21 Replacement Bridge	Location: ---	Project No.: GTX-305005
Boring No.: AP-4	Tested By: jm	Checked By: mcm
Sample No.: UD-1	Test Date: 10/3/16	Depth: 38-40 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, very dark greenish gray clay with sand		
Remarks: System 5077 Swell Pressure = 0.0682 tsf		
Displacement at End of Increment		

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3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	16-1282	**DATE SAMPLE RECEIVED:**	8/29/2016
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	MB	**DATE OF TESTING:**	8/29/2016
		DATE OF WEIGHING:	9/1/2016

BORING NO.	AP-5/UD-1 & UD-2	AP-5/UD-4			
SAMPLE NO.	16-1282E	16-1282H			
SAMPLE DEPTH	6.0-10.0'	30.0-32.0'			
WATER CONTENT, W%	21.6	26.6			

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

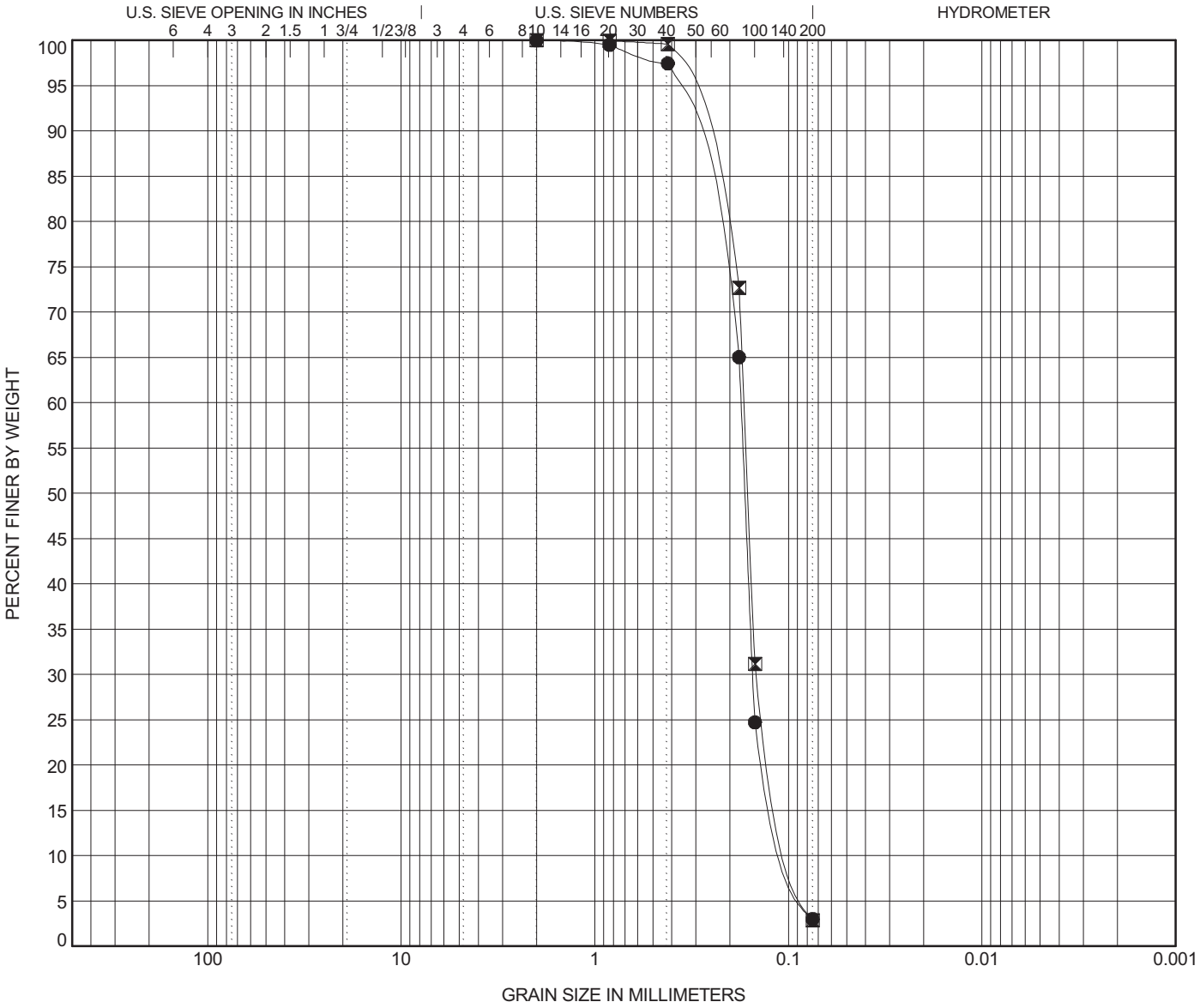
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

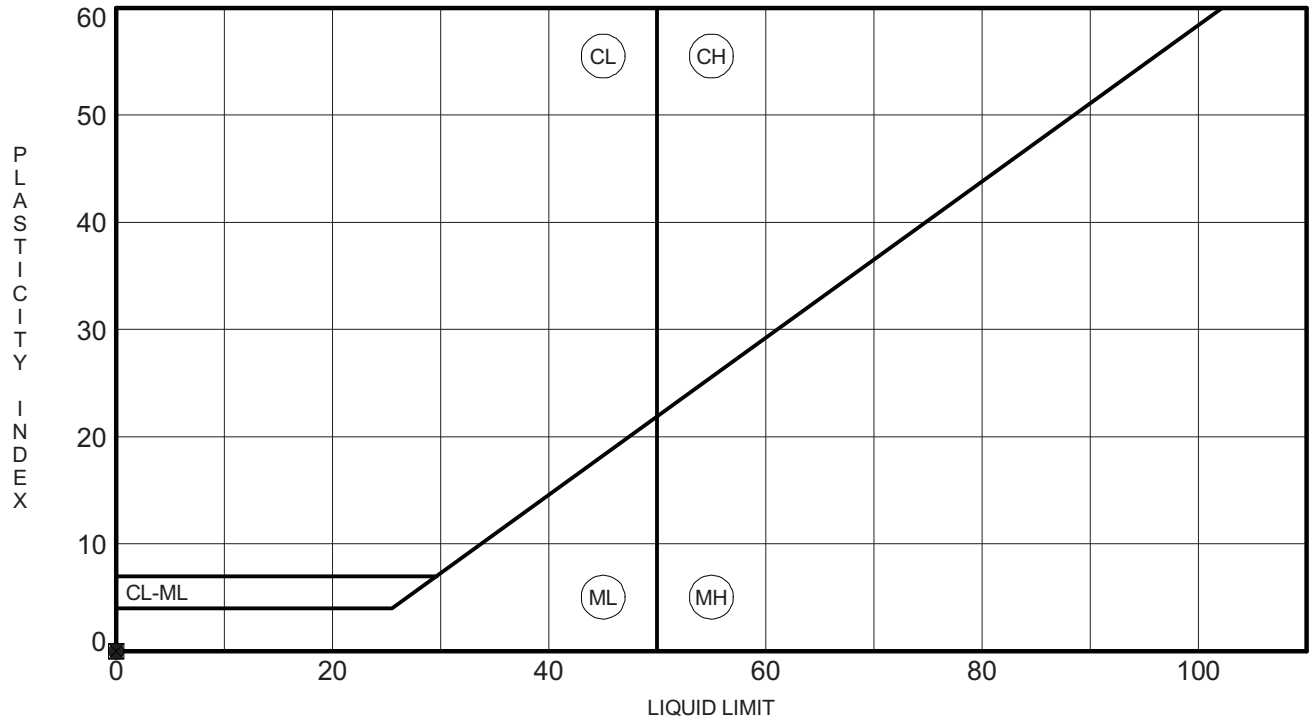
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**AP-5**	**10.0**	**Poorly Graded Fine SAND (SP) A-3**	**NP**	**NP**	**NP**	**1.42**	**1.88**
⊠	**AP-5**	**32.0**	**Poorly Graded Fine SAND (SP) A-3**	**NP**	**NP**	**NP**	**1.39**	**1.91**

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**AP-5**	**10.0**	**2**	**0.394**	**0.168**	**0.094**	**0.0**	**97.0**	**3.0**	
⊠	**AP-5**	**32.0**	**2**	**0.363**	**0.162**	**0.089**	**0.0**	**97.1**	**2.9**	

ATTERBERG LIMITS' RESULTS

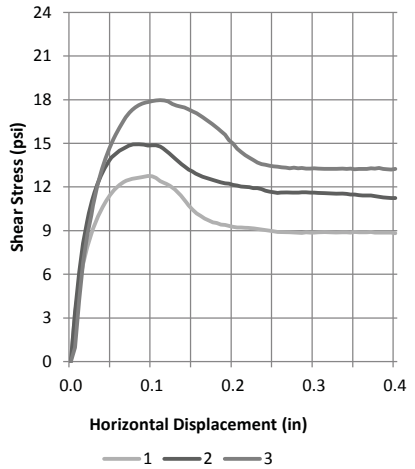
PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

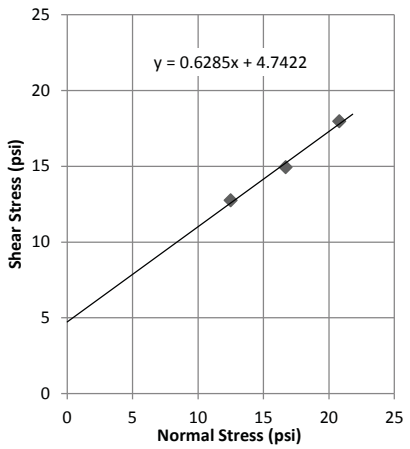
PROJECT COUNTY Beaufort



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**AP-5**	**10.0**	**NP**	**NP**	**NP**	**3**	**Poorly Graded Fine SAND (SP) A-3**
⊠	**AP-5**	**32.0**	**NP**	**NP**	**NP**	**3**	**Poorly Graded Fine SAND (SP) A-3**

DIRECT SHEAR TEST REPORT
ASTM - D3080 / AASHTO T236





Sample 1	
Normal Stress (psi)	12.5
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	23.6%
Wet Density (pcf)	121.0
Dry Density (pcf)	97.9
t50 (min.)	0.2
Saturation (%)	90.9%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	3.33
0.010	5.26
0.015	6.68
0.020	7.86
0.030	9.56
0.040	10.71
0.050	11.58
0.060	12.15
0.070	12.47
0.080	12.59
0.090	12.71
0.100	12.74
0.125	11.98
0.150	10.46
0.175	9.57
0.200	9.27
0.225	9.14
0.250	8.95
0.300	8.86
0.350	8.90
0.400	8.83
Max Shear Stress	**12.75**

Sample 2	
Normal Stress (psi)	16.7
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	24.4%
Wet Density (pcf)	122.0
Dry Density (pcf)	98.1
t50 (min)	0.2
Saturation (%)	94.2%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	3.38
0.010	6.12
0.015	8.12
0.020	9.63
0.030	11.79
0.040	13.12
0.050	14.03
0.060	14.49
0.070	14.81
0.080	14.93
0.090	14.91
0.100	14.88
0.125	14.13
0.150	13.06
0.175	12.48
0.200	12.13
0.225	11.92
0.250	11.64
0.300	11.61
0.350	11.48
0.400	11.25
Max Shear Stress	**14.93**

Sample 3	
Normal Stress (psi)	20.8
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	24.3%
Wet Density (pcf)	122.2
Dry Density (pcf)	98.3
t50 (min.)	0.2
Saturation (%)	94.4%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	0.96
0.010	4.22
0.015	6.77
0.020	8.66
0.030	11.48
0.040	13.54
0.050	14.98
0.060	16.09
0.070	16.96
0.080	17.49
0.090	17.77
0.100	17.90
0.125	17.71
0.150	17.19
0.175	16.30
0.200	14.97
0.225	13.85
0.250	13.43
0.300	13.29
0.350	13.22
0.400	13.25
Max Shear Stress	**17.97**

Project Name	US 21 Bridge Replacement over Harbor River		
Project Number	G5396	Date	9/8/16
SCDOT Project ID	P026862		
Location/Sample	AP-5, UD-1 & UD-2 / Sample #16-1282A		
Depth/Elevation	6.0' - 10.0'		

Type of Test : Direct Shear - 4" by 4" Square Shear Box
Sample Type : Remolded 1" Thick, Innundated

Description:		Grey Poorly Graded Fine SAND with Silt (SP-SM), A-3	
PI=	NP	% Fines=	3.0
SG=	2.65	Box Gap=	1.0 mm
ϕ=	32.1°	$C_{apparent}$=	4.74 psi

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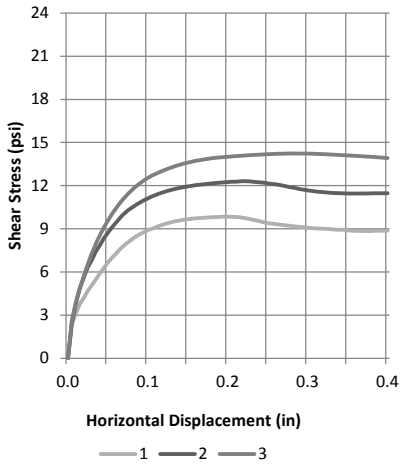
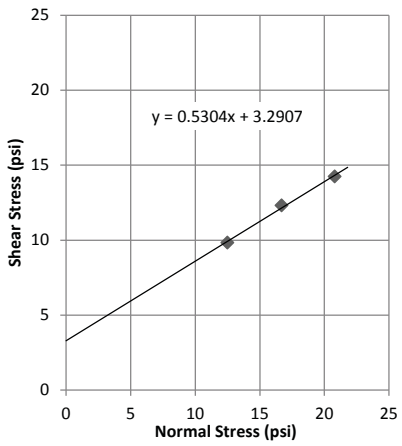
DIRECT SHEAR TEST REPORT
ASTM - D3080 / AASHTO T236





Sample 1	
Normal Stress (psi)	12.5
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	23.3%
Wet Density (pcf)	119.0
Dry Density (pcf)	96.5
t50 (min.)	0.2
Saturation (%)	86.6%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	2.35
0.010	3.13
0.015	3.77
0.020	4.22
0.030	5.09
0.040	5.91
0.050	6.64
0.060	7.27
0.070	7.83
0.080	8.27
0.090	8.61
0.100	8.91
0.125	9.38
0.150	9.66
0.175	9.79
0.200	9.84
0.225	9.71
0.250	9.41
0.300	9.08
0.350	8.89
0.400	8.88
Max Shear Stress	**9.84**

Sample 2	
Normal Stress (psi)	16.7
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	23.0%
Wet Density (pcf)	118.6
Dry Density (pcf)	96.4
t50 (min)	0.2
Saturation (%)	85.3%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	2.43
0.010	3.84
0.015	4.83
0.020	5.64
0.030	6.84
0.040	7.87
0.050	8.73
0.060	9.43
0.070	10.04
0.080	10.50
0.090	10.83
0.100	11.12
0.125	11.64
0.150	11.95
0.175	12.13
0.200	12.26
0.225	12.29
0.250	12.16
0.300	11.68
0.350	11.44
0.400	11.47
Max Shear Stress	**12.31**

Sample 3	
Normal Stress (psi)	20.8
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	22.8%
Wet Density (pcf)	119.6
Dry Density (pcf)	97.4
t50 (min.)	0.2
Saturation (%)	86.6%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	2.63
0.010	3.94
0.015	4.88
0.020	5.74
0.030	7.31
0.040	8.56
0.050	9.57
0.060	10.41
0.070	11.10
0.080	11.71
0.090	12.18
0.100	12.54
0.125	13.16
0.150	13.60
0.175	13.85
0.200	14.01
0.225	14.09
0.250	14.18
0.300	14.23
0.350	14.11
0.400	13.92
Max Shear Stress	**14.24**

Project Name	US 21 Bridge Replacement over Harbor River		
Project Number	G5396	Date	9/21/16
SCDOT Project ID	P026862		
Location/Sample	AP-5, UD-4 / Sample #16-1282B		
Depth/Elevation	30.0' - 32.0'		

Type of Test : Direct Shear - 4" by 4" Square Shear Box
Sample Type : Remolded 1" Thick, Innundated

Description:		Grey Poorly Graded Fine SAND with Silt (SP-SM), A-3	
PI=	NP	% Fines=	2.9
SG=	2.65	Box Gap=	1.0 mm
ϕ=	27.9°	$C_{apparent}$=	3.29 psi

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Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	16-1189	**DATE SAMPLE RECEIVED:**	7/19/2016
DESCRIPTION OF SOIL:	Poorly Graded F/M SAND (SP-SM) with Silt A-3		
TESTED BY:	MB	**DATE OF TESTING:**	7/25/2016
		DATE OF WEIGHING:	7/26/2016

BORING NO.	BS-1				
SAMPLE NO.	16-1189C				
SAMPLE DEPTH	0.0-5.0'				
WATER CONTENT, W%	5.3				

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

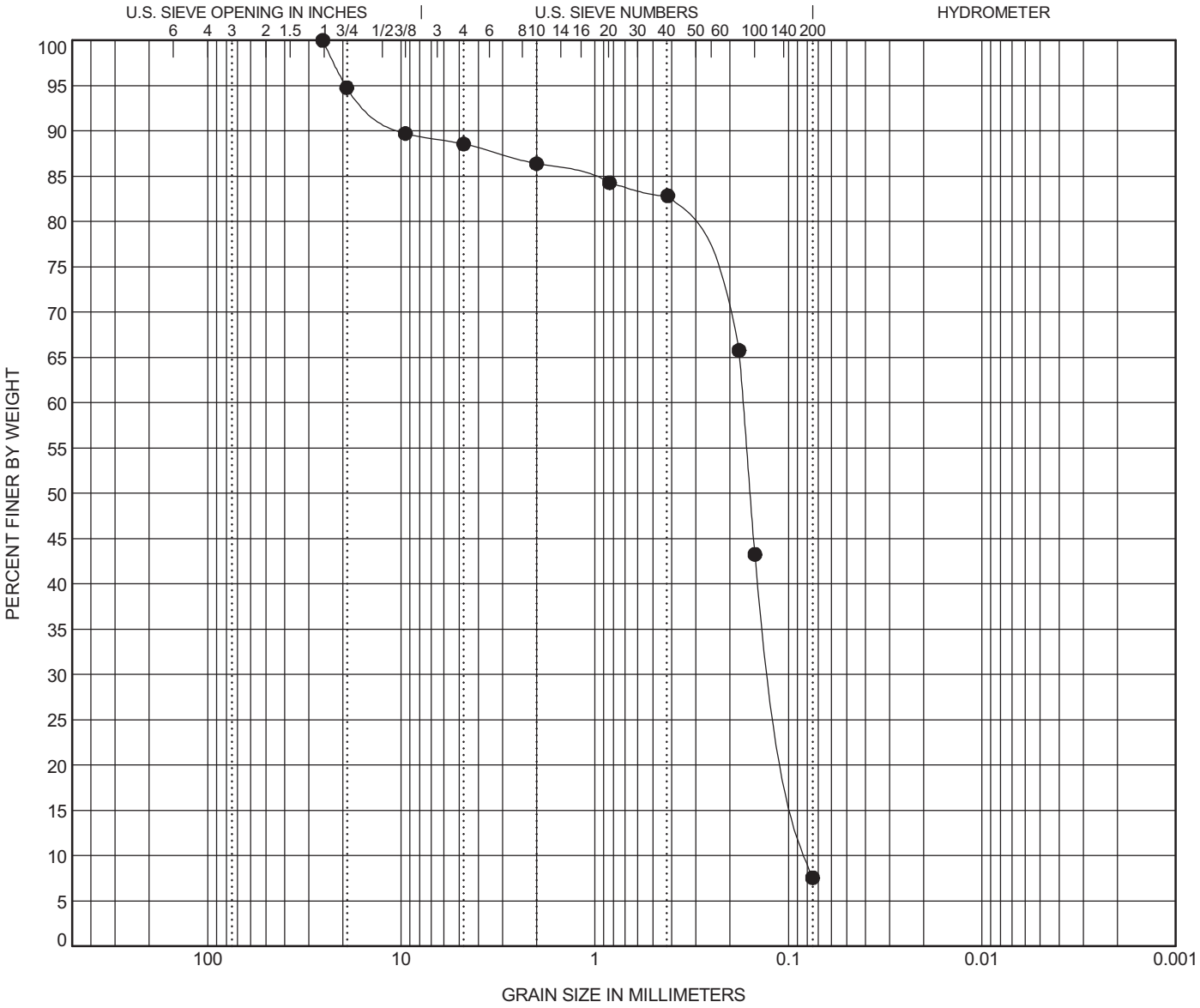
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**BS-1**	**5.0**	**Poorly Graded F/M SAND (SP-SM) with Silt A-3**	**NP**	**NP**	**NP**	**0.99**	**2.18**

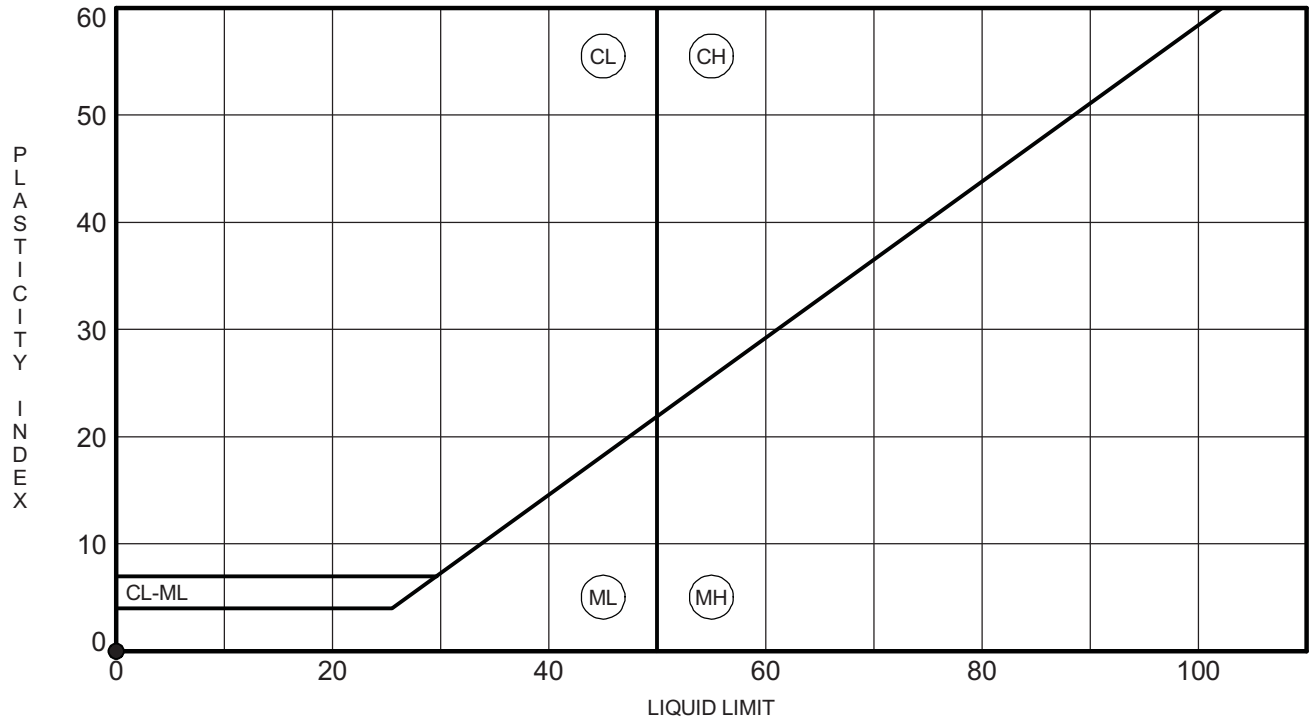
	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**BS-1**	**5.0**	**25.4**	**19.331**	**0.158**	**0.079**	**11.4**	**81.0**	**7.6**	

GRAIN SIZE G5396 - HARBOR RIVER SPT AND CPT.GPJ GINT STD US LAB.GDT 10/5/16

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



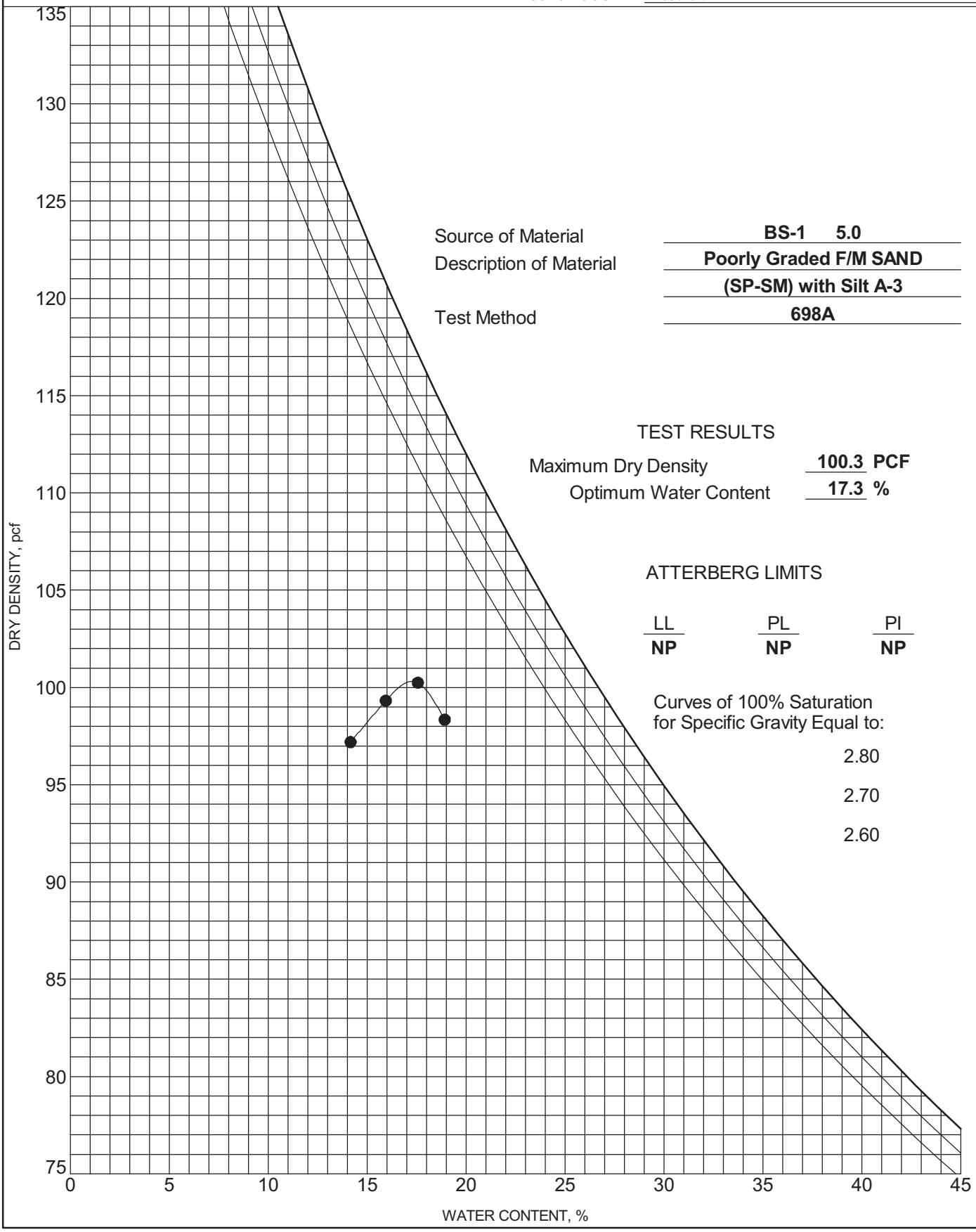
	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**BS-1**	**5.0**	**NP**	**NP**	**NP**	**8**	**Poorly Graded F/M SAND (SP-SM) with Silt A-3**

MOISTURE-DENSITY RELATIONSHIP

PROJECT ID P026862

PROJECT NAME US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



Source of Material	**BS-1 5.0**
Description of Material	**Poorly Graded F/M SAND (SP-SM) with Silt A-3**
Test Method	**698A**

TEST RESULTS

Maximum Dry Density	**100.3**	**PCF**
Optimum Water Content	**17.3**	**%**

ATTERBERG LIMITS

LL	PL	PI
NP	**NP**	**NP**

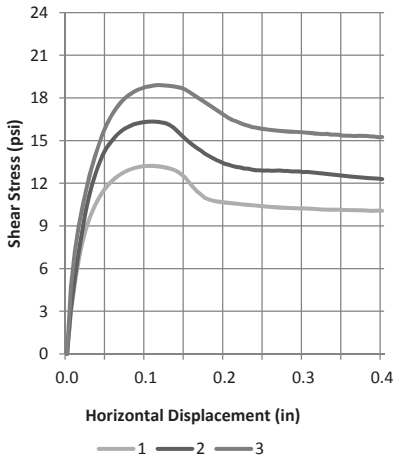
Curves of 100% Saturation for Specific Gravity Equal to:

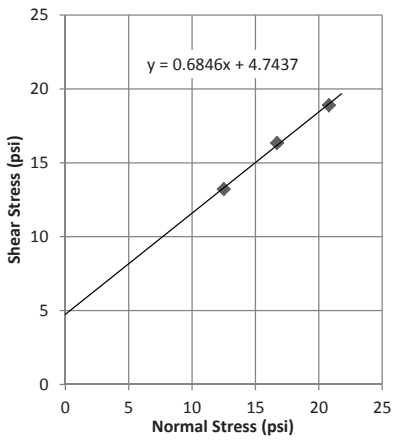
2.80

2.70

2.60

DIRECT SHEAR TEST REPORT
ASTM - D3080 / AASHTO T236





Sample 1	
Normal Stress (psi)	12.5
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	19.0%
Wet Density (pcf)	114.3
Dry Density (pcf)	96.0
t50 (min.)	0.2
Saturation (%)	69.8%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	2.94
0.010	4.93
0.015	6.73
0.020	7.92
0.030	9.75
0.040	10.91
0.050	11.75
0.060	12.31
0.070	12.70
0.080	12.95
0.090	13.13
0.100	13.22
0.125	13.11
0.150	12.40
0.175	10.97
0.200	10.64
0.225	10.51
0.250	10.37
0.300	10.23
0.350	10.12
0.400	10.06
Max Shear Stress	**13.22**

Sample 2	
Normal Stress (psi)	16.7
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	19.3%
Wet Density (pcf)	114.0
Dry Density (pcf)	95.6
t50 (min)	0.2
Saturation (%)	70.0%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	3.24
0.010	5.38
0.015	7.19
0.020	8.89
0.030	11.54
0.040	13.28
0.050	14.46
0.060	15.21
0.070	15.71
0.080	16.03
0.090	16.22
0.100	16.32
0.125	16.23
0.150	15.15
0.175	14.08
0.200	13.38
0.225	13.04
0.250	12.88
0.300	12.78
0.350	12.54
0.400	12.29
Max Shear Stress	**16.34**

Sample 3	
Normal Stress (psi)	20.8
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	18.9%
Wet Density (pcf)	114.8
Dry Density (pcf)	96.5
t50 (min.)	0.2
Saturation (%)	70.2%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	4.73
0.010	7.23
0.015	9.00
0.020	10.43
0.030	12.89
0.040	14.64
0.050	16.09
0.060	17.07
0.070	17.78
0.080	18.25
0.090	18.57
0.100	18.77
0.125	18.87
0.150	18.59
0.175	17.70
0.200	16.76
0.225	16.12
0.250	15.82
0.300	15.58
0.350	15.35
0.400	15.25
Max Shear Stress	**18.90**

Project Name	US 21 Bridge Replacement over Harbor River
Project Number	G5396
Date	8/3/2016
SCDOT Project ID	P026862
Location/Sample	BS-1 / Sample #16-1189
Depth/Elevation	0.0' - 5.0'

Type of Test : Direct Shear - 4" by 4" Square Shear Box
Sample Type : Remolded 1" Thick, Non-Innundated

Description: Grey Poorly Graded Fine to Medium SAND with Silt (SP-SM), A-3

PI=	NP	% Fines=	7.6
SG=	2.65	Box Gap=	0.75mm
ϕ=	34.4°	$C_{apparent}$=	4.74 psi

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MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	16-1190	**DATE SAMPLE RECEIVED:**	7/19/2016
DESCRIPTION OF SOIL:	Poorly Graded F/M SAND (SP-SM) with Silt A-3		
TESTED BY:	MB	**DATE OF TESTING:**	7/25/2016
		DATE OF WEIGHING:	7/26/2016

BORING NO.	BS-2				
SAMPLE NO.	16-1190C				
SAMPLE DEPTH	0.0-5.0'				
WATER CONTENT, W%	5.6				

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

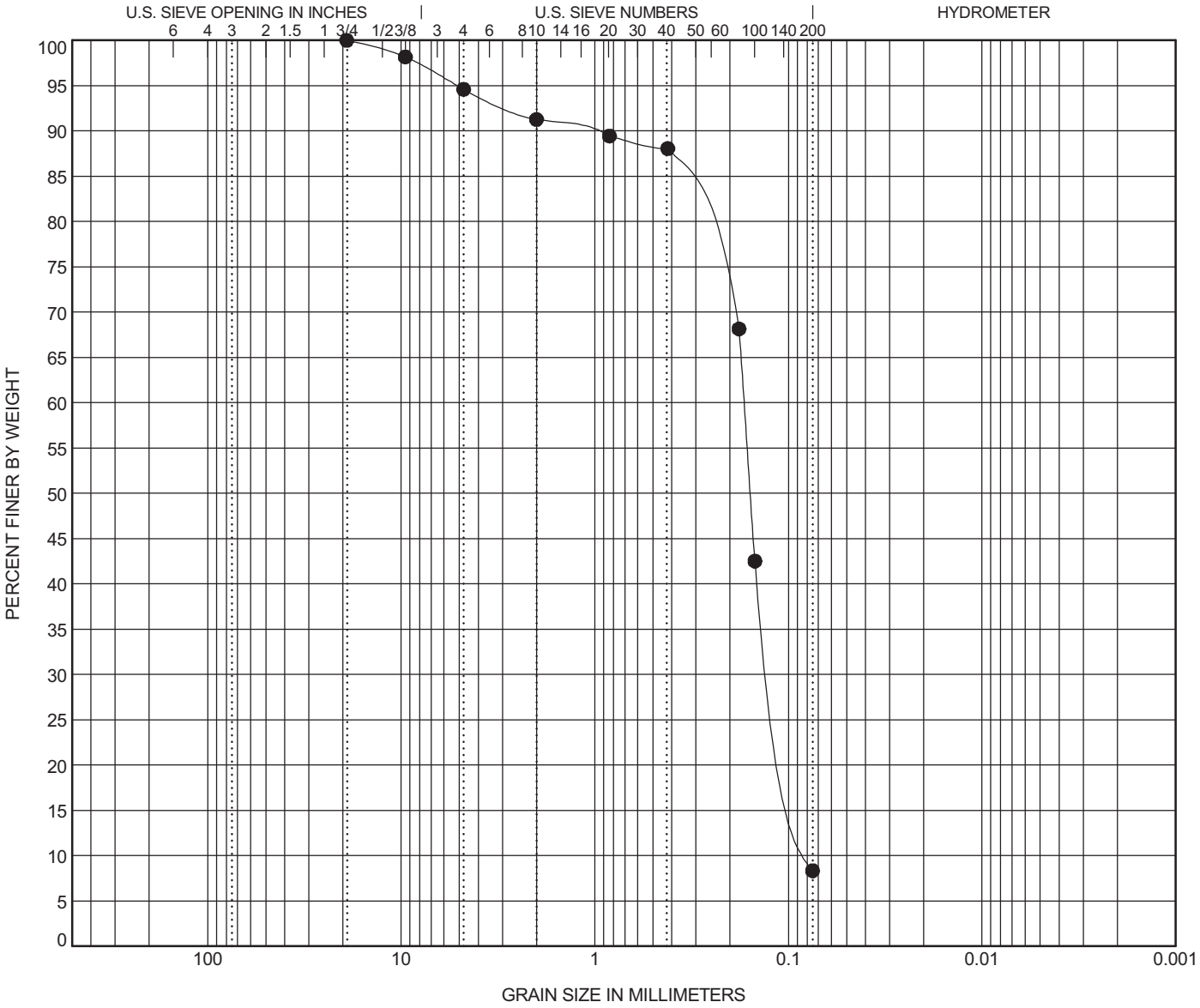
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

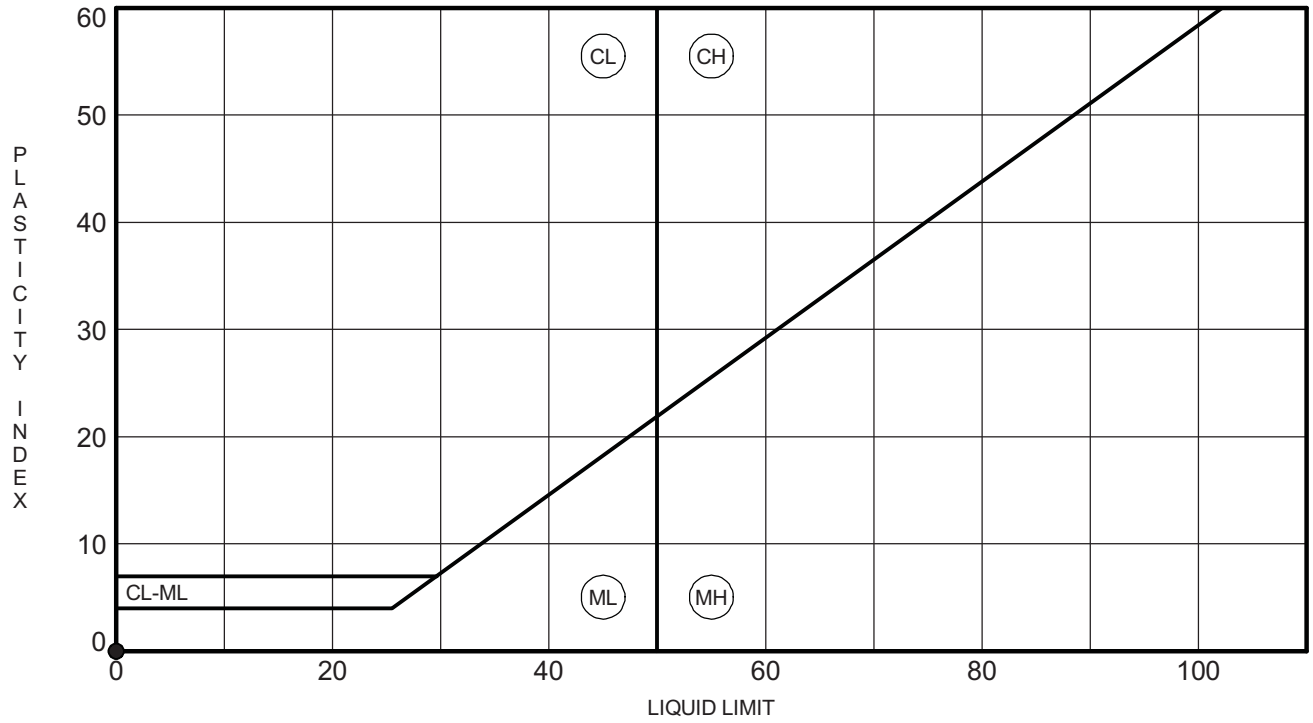
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**BS-2**	**5.0**	**Poorly Graded F/M SAND (SP-SM) with Silt A-3**	**NP**	**NP**	**NP**	**1.02**	**2.19**

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**BS-2**	**5.0**	**19.1**	**5.143**	**0.157**	**0.078**	**5.4**	**86.2**	**8.3**	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



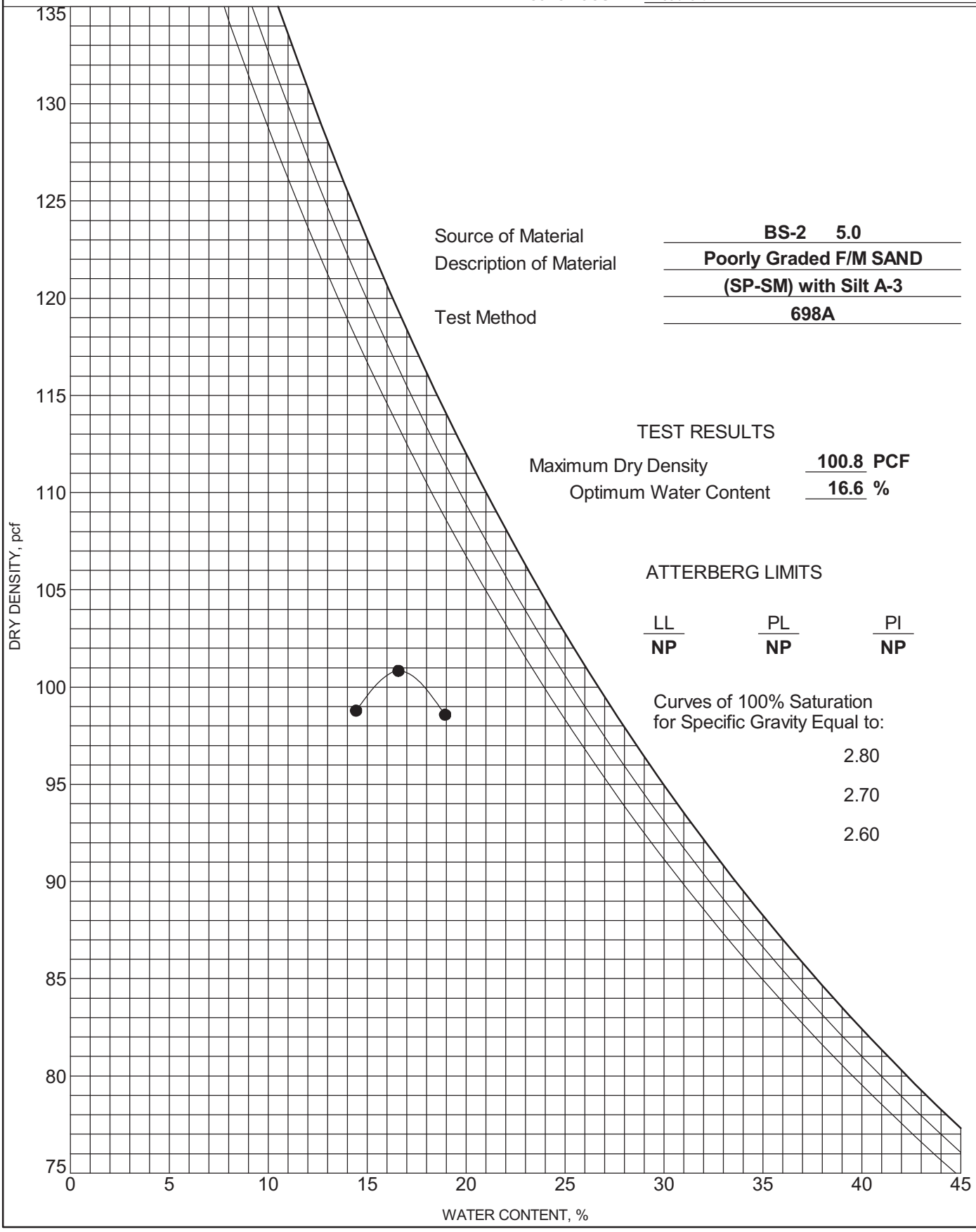
	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**BS-2**	**5.0**	**NP**	**NP**	**NP**	**8**	**Poorly Graded F/M SAND (SP-SM) with Silt A-3**

MOISTURE-DENSITY RELATIONSHIP

PROJECT ID P026862

PROJECT NAME US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



Source of Material	**BS-2 5.0**
Description of Material	**Poorly Graded F/M SAND (SP-SM) with Silt A-3**
Test Method	**698A**

TEST RESULTS

Maximum Dry Density	**100.8**	**PCF**
Optimum Water Content	**16.6**	**%**

ATTERBERG LIMITS

LL	PL	PI
NP	**NP**	**NP**

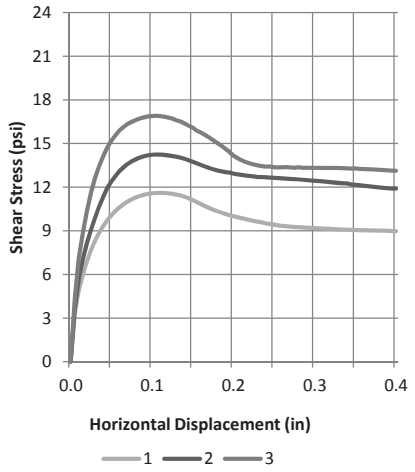
Curves of 100% Saturation for Specific Gravity Equal to:

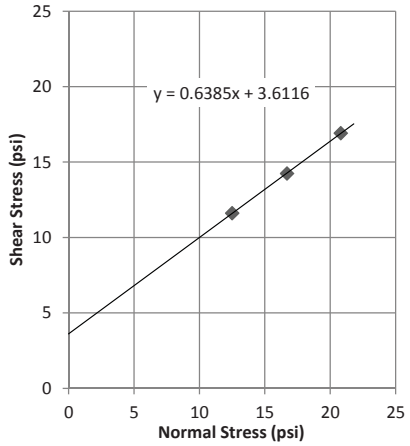
2.80

2.70

2.60

DIRECT SHEAR TEST REPORT
ASTM - D3080 / AASHTO T236





Sample 1	
Normal Stress (psi)	12.5
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	19.5%
Wet Density (pcf)	115.2
Dry Density (pcf)	96.4
t50 (min.)	0.2
Saturation (%)	72.2%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	3.34
0.010	4.94
0.015	6.00
0.020	6.88
0.030	8.32
0.040	9.34
0.050	10.09
0.060	10.61
0.070	11.01
0.080	11.30
0.090	11.49
0.100	11.57
0.125	11.54
0.150	11.12
0.175	10.46
0.200	10.00
0.225	9.68
0.250	9.42
0.300	9.18
0.350	9.06
0.400	8.98
Max Shear Stress	**11.61**

Sample 2	
Normal Stress (psi)	16.7
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	18.9%
Wet Density (pcf)	114.3
Dry Density (pcf)	96.2
t50 (min)	0.2
Saturation (%)	69.5%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	3.67
0.010	5.74
0.015	7.08
0.020	8.16
0.030	9.91
0.040	11.34
0.050	12.40
0.060	13.10
0.070	13.60
0.080	13.91
0.090	14.12
0.100	14.23
0.125	14.14
0.150	13.73
0.175	13.23
0.200	12.93
0.225	12.74
0.250	12.65
0.300	12.44
0.350	12.16
0.400	11.90
Max Shear Stress	**14.24**

Sample 3	
Normal Stress (psi)	20.8
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	18.6%
Wet Density (pcf)	114.3
Dry Density (pcf)	96.4
t50 (min.)	0.2
Saturation (%)	68.9%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	4.35
0.010	7.14
0.015	8.89
0.020	10.36
0.030	12.65
0.040	14.14
0.050	15.20
0.060	15.89
0.070	16.34
0.080	16.61
0.090	16.79
0.100	16.89
0.125	16.70
0.150	16.09
0.175	15.24
0.200	14.17
0.225	13.55
0.250	13.37
0.300	13.34
0.350	13.28
0.400	13.13
Max Shear Stress	**16.91**

Project Name	US 21 Bridge Replacement over Harbor River
Project Number	G5396
Date	8/12/16
SCDOT Project ID	P026862
Location/Sample	BS-2 / Sample #16-1190
Depth/Elevation	0.0' - 5.0'

Type of Test : Direct Shear - 4" by 4" Square Shear Box
Sample Type : Remolded 1" Thick, Non-Innundated

Description: Grey Poorly Graded Fine to Medium SAND with Silt (SP-SM), A-3

PI=	NP	% Fines=	8.3
SG=	2.65	Box Gap=	1.0 mm
ϕ=	32.6°	$C_{apparent}$=	3.61 psi

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MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	16-1191	**DATE SAMPLE RECEIVED:**	7/19/2016
DESCRIPTION OF SOIL:	Poorly Graded F/M SAND (SP) A-3		
TESTED BY:	MB	**DATE OF TESTING:**	7/25/2016
		DATE OF WEIGHING:	7/26/2016

BORING NO.	BS-3				
SAMPLE NO.	16-1191C				
SAMPLE DEPTH	0.0-5.0'				
WATER CONTENT, W%	1.3				

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

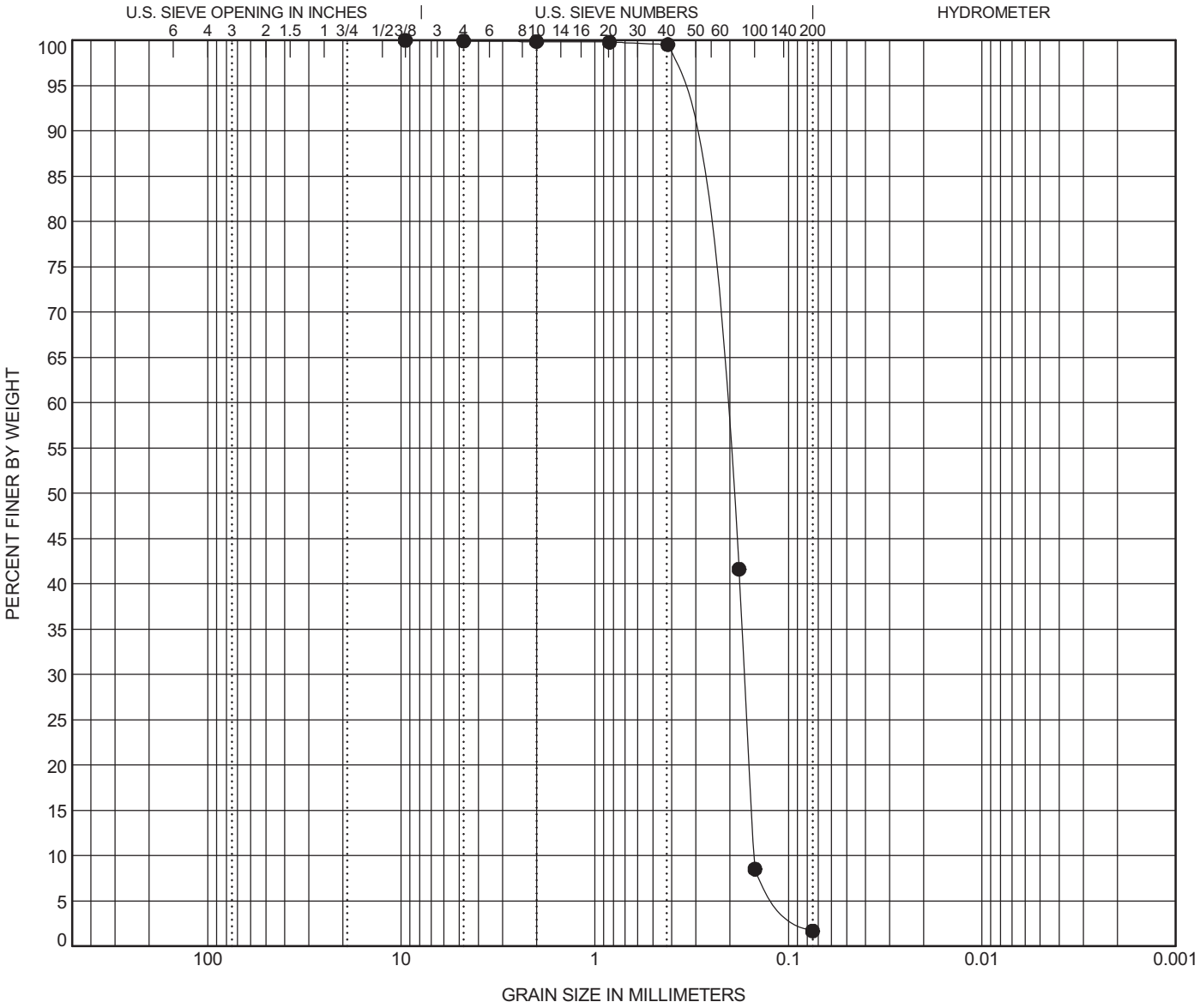
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

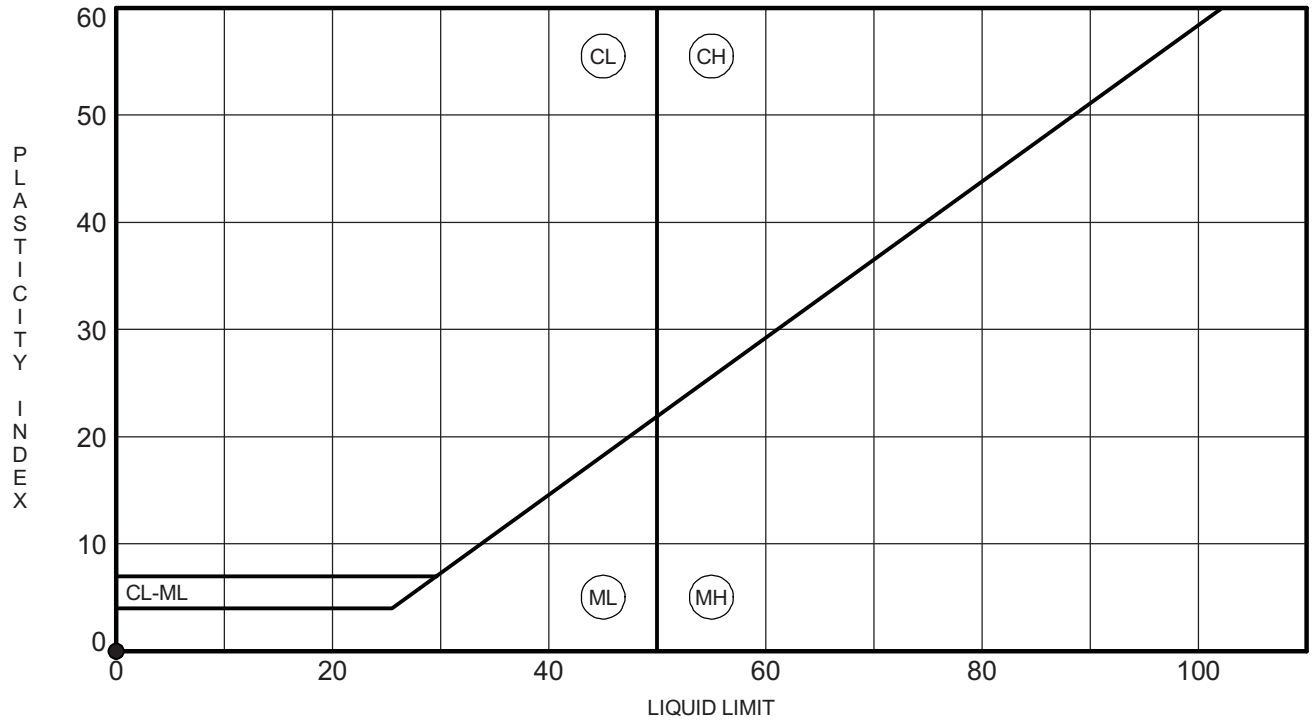
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**BS-3**	**5.0**	**Poorly Graded F/M SAND (SP) A-3**	**NP**	**NP**	**NP**	**0.80**	**1.57**

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**BS-3**	**5.0**	**9.52**	**0.393**	**0.203**	**0.15**	**0.1**	**98.2**	**1.7**	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



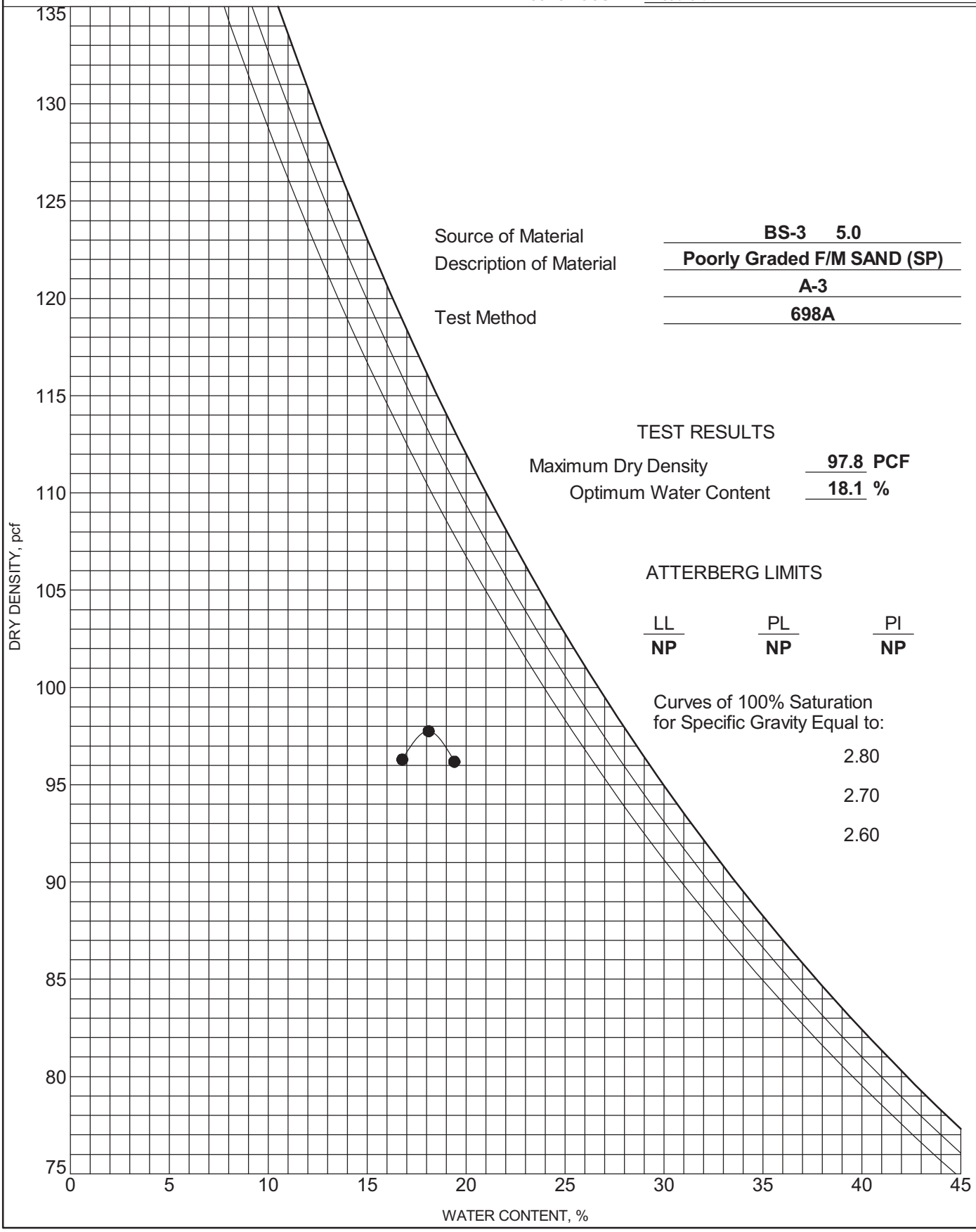
	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**BS-3**	**5.0**	**NP**	**NP**	**NP**	**2**	**Poorly Graded F/M SAND (SP) A-3**

MOISTURE-DENSITY RELATIONSHIP

PROJECT ID P026862

PROJECT NAME US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



Source of Material	**BS-3 5.0**
Description of Material	**Poorly Graded F/M SAND (SP)**
	A-3
Test Method	**698A**

TEST RESULTS

Maximum Dry Density	**97.8**	**PCF**
Optimum Water Content	**18.1**	**%**

ATTERBERG LIMITS

LL	PL	PI
NP	**NP**	**NP**

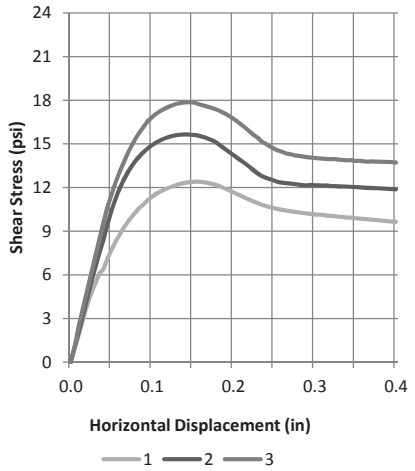
Curves of 100% Saturation for Specific Gravity Equal to:

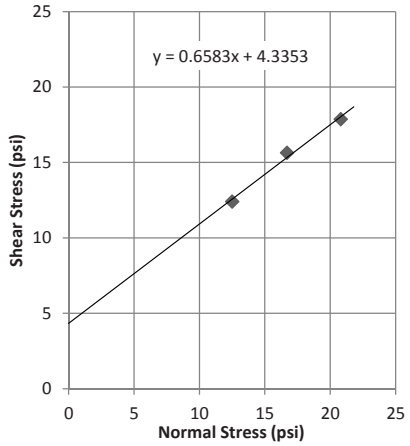
2.80

2.70

2.60

DIRECT SHEAR TEST REPORT
ASTM - D3080 / AASHTO T236





Sample 1	
Normal Stress (psi)	12.5
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	17.6%
Wet Density (pcf)	112.5
Dry Density (pcf)	95.7
t50 (min.)	0.2
Saturation (%)	64.0%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	0.98
0.010	1.93
0.015	2.88
0.020	3.83
0.030	5.35
0.040	6.38
0.050	7.68
0.060	8.76
0.070	9.63
0.080	10.31
0.090	10.87
0.100	11.38
0.125	12.08
0.150	12.39
0.175	12.24
0.200	11.68
0.225	11.04
0.250	10.59
0.300	10.14
0.350	9.89
0.400	9.64
Max Shear Stress	**12.41**

Sample 2	
Normal Stress (psi)	16.7
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	17.5%
Wet Density (pcf)	111.6
Dry Density (pcf)	95.0
t50 (min)	0.2
Saturation (%)	62.6%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	1.03
0.010	2.11
0.015	3.27
0.020	4.25
0.030	6.56
0.040	8.35
0.050	10.40
0.060	11.91
0.070	13.03
0.080	13.85
0.090	14.45
0.100	14.93
0.125	15.54
0.150	15.63
0.175	15.22
0.200	14.24
0.225	13.17
0.250	12.49
0.300	12.16
0.350	12.04
0.400	11.88
Max Shear Stress	**15.64**

Sample 3	
Normal Stress (psi)	20.8
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	18.1%
Wet Density (pcf)	112.5
Dry Density (pcf)	95.2
t50 (min.)	0.2
Saturation (%)	65.1%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	1.09
0.010	2.48
0.015	3.71
0.020	4.81
0.030	7.17
0.040	9.55
0.050	11.50
0.060	13.05
0.070	14.34
0.080	15.40
0.090	16.20
0.100	16.84
0.125	17.66
0.150	17.85
0.175	17.44
0.200	16.74
0.225	15.60
0.250	14.68
0.300	14.02
0.350	13.83
0.400	13.72
Max Shear Stress	**17.87**

Project Name	US 21 Bridge Replacement over Harbor River
Project Number	G5396
Date	8/31/16
SCDOT Project ID	P026862
Location/Sample	BS-3 / Sample #16-1191
Depth/Elevation	0.0' - 5.0'

Type of Test : Direct Shear - 4" by 4" Square Shear Box
Sample Type : Remolded 1" Thick, Non-Innundated

Description:		Grey Poorly Graded Fine to Medium SAND (SP), A-3	
PI=	NP	% Fines=	1.7
SG=	2.65	Box Gap=	1.0 mm
ϕ=	33.5°	$C_{apparent}$=	4.34 psi

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Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US 21 Bridge Replacement over Harbor River	**PROJECT NO.:**	G5396
SAMPLE NUMBER:	16-1192	**DATE SAMPLE RECEIVED:**	7/19/2016
DESCRIPTION OF SOIL:	Poorly Graded F/M SAND (SP) A-3		
TESTED BY:	MB	**DATE OF TESTING:**	7/25/2016
		DATE OF WEIGHING:	7/26/2016

BORING NO.	BS-4				
SAMPLE NO.	16-1192C				
SAMPLE DEPTH	0.0-5.0'				
WATER CONTENT, W%	2.6				

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

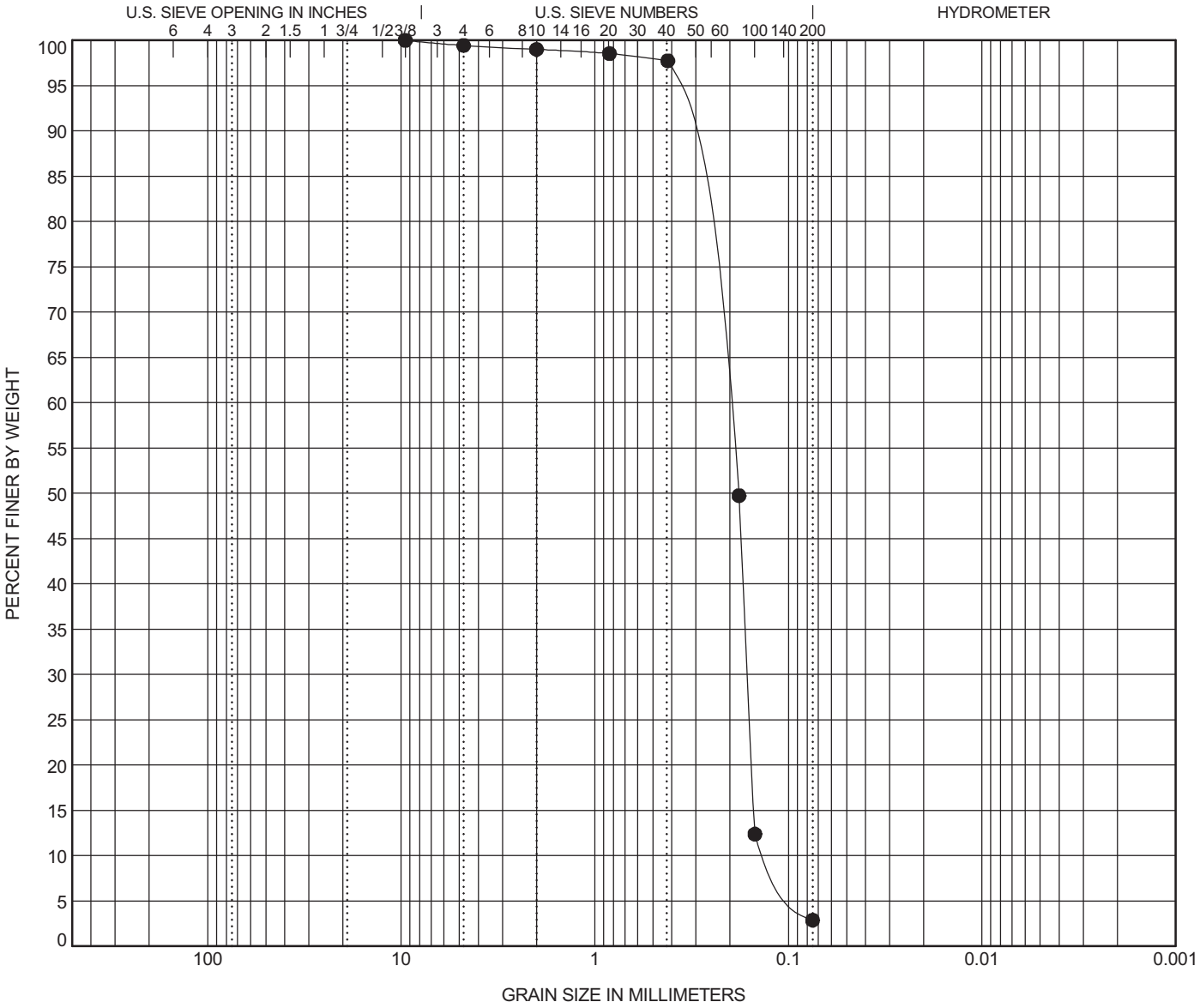
BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

GRAIN SIZE DISTRIBUTION

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

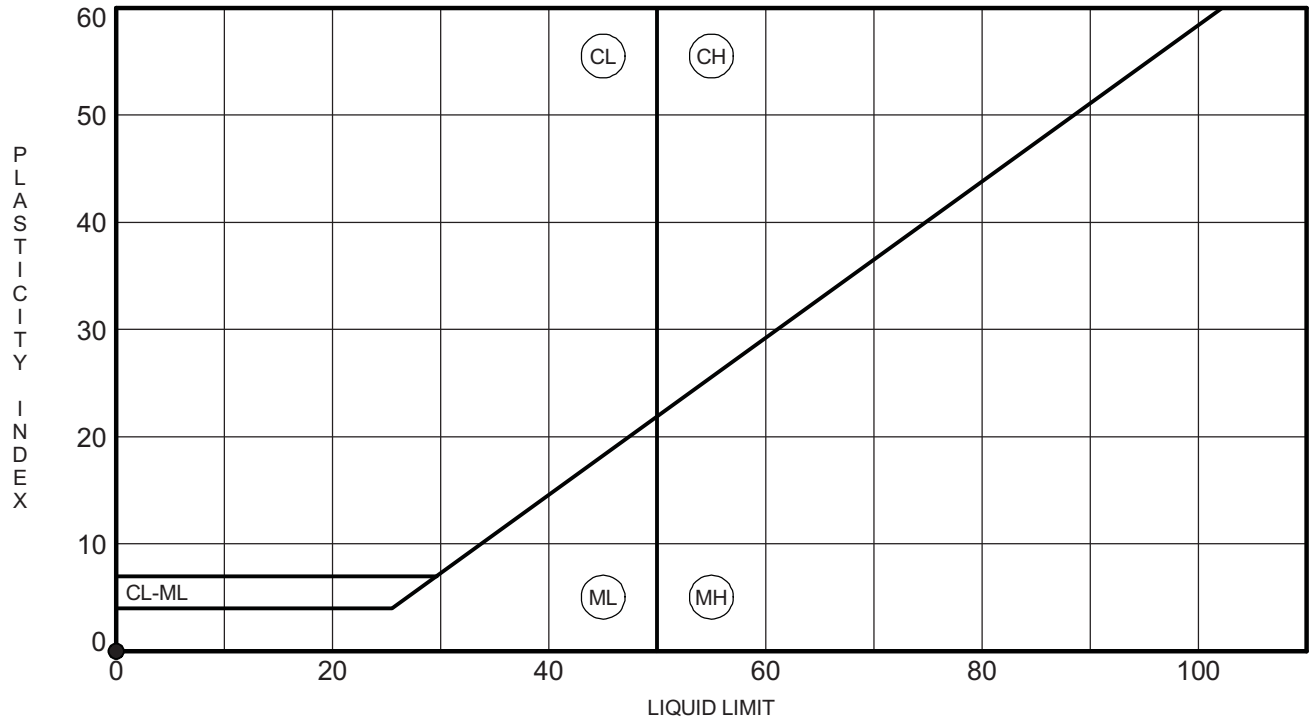
	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**BS-4**	**5.0**	**Poorly Graded F/M SAND (SP) A-3**	**NP**	**NP**	**NP**	**0.98**	**1.72**

	BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**BS-4**	**5.0**	**9.52**	**0.4**	**0.181**	**0.125**	**0.6**	**96.6**	**2.9**	

ATTERBERG LIMITS' RESULTS

PROJECT ID P026862 **PROJECT NAME** US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



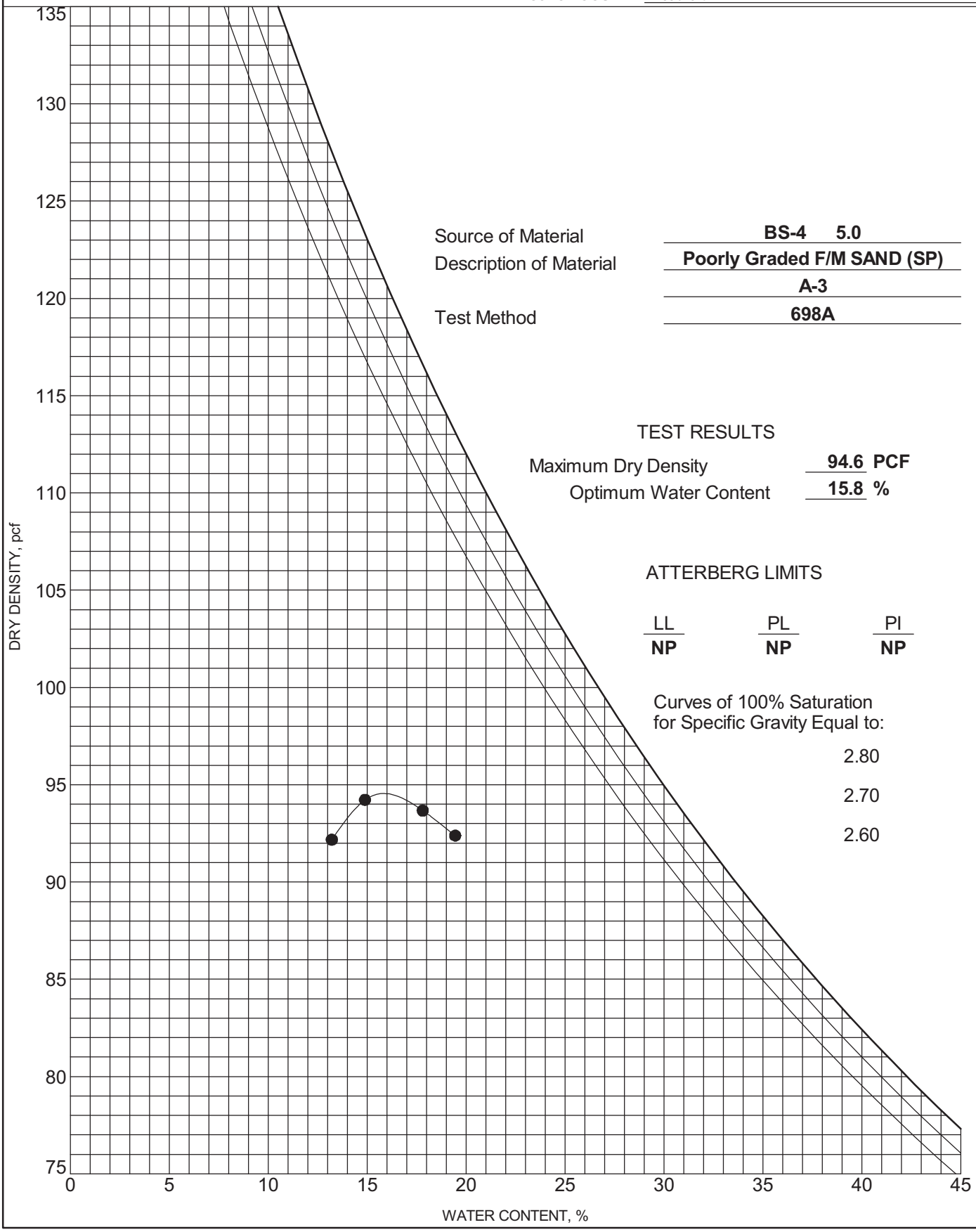
	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**BS-4**	**5.0**	**NP**	**NP**	**NP**	**3**	**Poorly Graded F/M SAND (SP) A-3**

MOISTURE-DENSITY RELATIONSHIP

PROJECT ID P026862

PROJECT NAME US 21 Bridge Replacement over Harbor River

PROJECT COUNTY Beaufort



Source of Material	**BS-4 5.0**
Description of Material	**Poorly Graded F/M SAND (SP)**
	A-3
Test Method	**698A**

TEST RESULTS

Maximum Dry Density	**94.6**	**PCF**
Optimum Water Content	**15.8**	**%**

ATTERBERG LIMITS

LL	PL	PI
NP	**NP**	**NP**

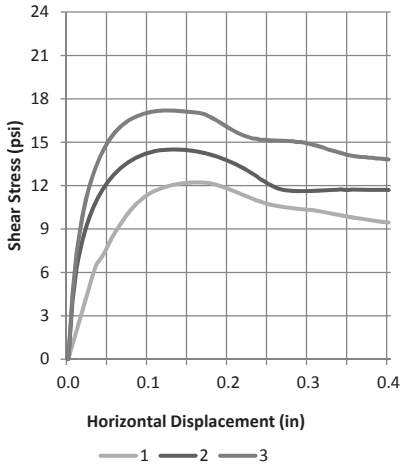
Curves of 100% Saturation for Specific Gravity Equal to:

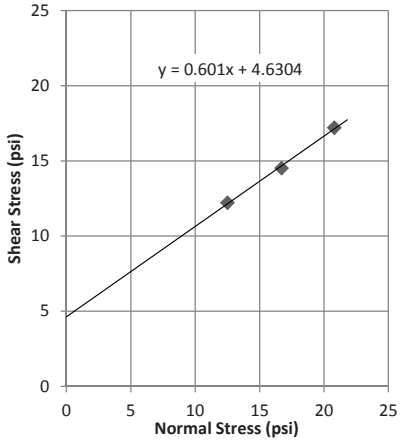
2.80

2.70

2.60

DIRECT SHEAR TEST REPORT
ASTM - D3080 / AASHTO T236





Sample 1	
Normal Stress (psi)	12.5
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	16.8%
Wet Density (pcf)	106.8
Dry Density (pcf)	91.5
t50 (min.)	0.2
Saturation (%)	55.1%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	0.99
0.010	1.94
0.015	2.89
0.020	3.81
0.030	5.74
0.040	6.94
0.050	7.94
0.060	8.92
0.070	9.74
0.080	10.45
0.090	10.98
0.100	11.40
0.125	11.97
0.150	12.20
0.175	12.19
0.200	11.77
0.225	11.22
0.250	10.72
0.300	10.33
0.350	9.84
0.400	9.45
Max Shear Stress	**12.22**

Sample 2	
Normal Stress (psi)	16.7
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	16.6%
Wet Density (pcf)	106.8
Dry Density (pcf)	91.6
t50 (min)	0.2
Saturation (%)	54.6%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	3.99
0.010	6.27
0.015	7.61
0.020	8.71
0.030	10.34
0.040	11.46
0.050	12.32
0.060	12.94
0.070	13.42
0.080	13.79
0.090	14.07
0.100	14.28
0.125	14.49
0.150	14.46
0.175	14.18
0.200	13.69
0.225	12.99
0.250	12.11
0.300	11.63
0.350	11.70
0.400	11.70
Max Shear Stress	**14.51**

Sample 3	
Normal Stress (psi)	20.8
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	16.3%
Wet Density (pcf)	108.0
Dry Density (pcf)	92.9
t50 (min.)	0.2
Saturation (%)	55.2%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	4.47
0.010	7.29
0.015	9.08
0.020	10.59
0.030	12.59
0.040	14.03
0.050	15.07
0.060	15.80
0.070	16.30
0.080	16.65
0.090	16.88
0.100	17.06
0.125	17.20
0.150	17.11
0.175	16.81
0.200	15.99
0.225	15.36
0.250	15.15
0.300	14.89
0.350	14.11
0.400	13.81
Max Shear Stress	**17.21**

Project Name	US 21 Bridge Replacement over Harbor River		
Project Number	G5396	Date	9/1/16
SCDOT Project ID	P026862		
Location/Sample	BS-4 / Sample #16-1192		
Depth/Elevation	0.0' - 5.0'		

Type of Test : Direct Shear - 4" by 4" Square Shear Box
Sample Type : Remolded 1" Thick, Non-Innundated

Description:	Grey Poorly Graded Fine to Medium SAND (SP), A-3		
PI=	NP	% Fines=	2.9
SG=	2.65	Box Gap=	1.0 mm
ϕ=	31.0°	$C_{apparent}$=	4.63 psi

F&ME CONSULTANTS
3112 Devine Street Columbia, SC 29205
Geotechnical · Environmental · Materials

Client:	FME Consultants
Project Name:	US-21 Replacement Bridge over Harbor River
Project Location:	---
GTX #:	305005
Test Date:	8/23/2016
Tested By:	jbr
Checked By:	emm

pH of Water by ASTM D1293

Boring ID	Sample ID	Depth, ft	Description	pH of water	Temperature, °C
East End	16-1283	---	Wet, clear water	6.9	19
West End	16-1284	---	Wet, clear water	6.8	19

Notes: Method B, pH meter used

Client:	FME Consultants
Project:	US-21 Replacement Bridge over Harbor River
Location:	---
GTX#:	305005
Test Date:	09/01/16
Tested By:	jbr
Checked By:	mcm

Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, $(ohm\text{-}cm)^{-1}$
East End	16-1283	---	Wet, clear water	26	3.87E-02
West End	16-1284	---	Wet, clear water	27	3.72E-02

Notes: Test Equipment: Nilsson Model 400 Soil Resistance Meter, MC Miller Soil Box
Water added to sample to create a thick slurry prior to testing (saturated condition).
Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)
Test conducted in standard laboratory atmosphere: 68-73 F

FUGRO CONSULTANTS, INC.

6100 HILLCROFT
PHONE (713) 369-5400

HOUSTON, TEXAS 77081
FAX (713) 369-5518

RESULTS OF TESTS

PROJECT: US-21 REPLACEMENT BRIDGE (GTX 305005)
SAMPLE ID: EAST END 16-1283

FOR: GEOTESTING EXPRESS, INC.
125 NAGOG PARK ACTION, MA 01720

REPORTED TO: ETHAN MARRO

LAB NUMBER: 0817030

REPORT DATE: 08-22-16
CLIENT NUMBER:
JOB NUMBER: 04.1115-0003
REPORT NUMBER:
DATE SAMPLED:
TIME SAMPLED:
SAMPLED BY: CLIENT
DATE RECEIVED:
TIME RECEIVED:
RECEIVED BY:

PARAMETER	RESULTS	UNITS	METHOD	TIME/DATE	ANALYST
Sulfate, Soluble	23,227	mg/L	ASTM D-516 **	1400/08-19-16	SD
Chloride, Soluble	16,396	mg/L	ASTM D-512 **	1100/08-22-16	SD

SO4CL 078-16

Respectfully submitted,

* Dry weight basis

Steve DeGregorio
Chemist

SD

** WATER EXTRACTION PERFORMED BY USING A 1:10 RATIO OF SAMPLE AND REAGENT WATER FOLLOWED BY CENTRIFUGE AND VACUUME FILTRATION. THE WATER EXTRACT IS THEN ANALYZED USING THE ASTM D-512 AND D-516 METHODS.

THE RESULTS RELATE AS TO THE LOCATION TESTED AND NO OTHER REFERENCE SHALL BE MADE.
THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF THE LABORATORY.

END OF REPORT

FUGRO CONSULTANTS, INC.

6100 HILLCROFT
PHONE (713) 369-5400

HOUSTON, TEXAS 77081
FAX (713) 369-5518

RESULTS OF TESTS

PROJECT: US-21 REPLACEMENT BRIDGE (GTX 305005)
SAMPLE ID: WEST END 16-1284

FOR: GEOTESTING EXPRESS, INC.
125 NAGOG PARK ACTION, MA 01720

REPORTED TO: ETHAN MARRO

LAB NUMBER: 0817031

REPORT DATE: 08-22-16
CLIENT NUMBER:
JOB NUMBER: 04.1115-0003
REPORT NUMBER:
DATE SAMPLED:
TIME SAMPLED:
SAMPLED BY: CLIENT
DATE RECEIVED:
TIME RECEIVED:
RECEIVED BY:

PARAMETER	RESULTS	UNITS	METHOD	TIME/DATE	ANALYST
Sulfate, Soluble	22,715	mg/L	ASTM D-516 **	1400/08-19-16	SD
Chloride, Soluble	16,596	mg/L	ASTM D-512 **	1100/08-22-16	SD

SO4CL 078-16

Respectfully submitted,

* Dry weight basis

Steve DeGregorio
Chemist

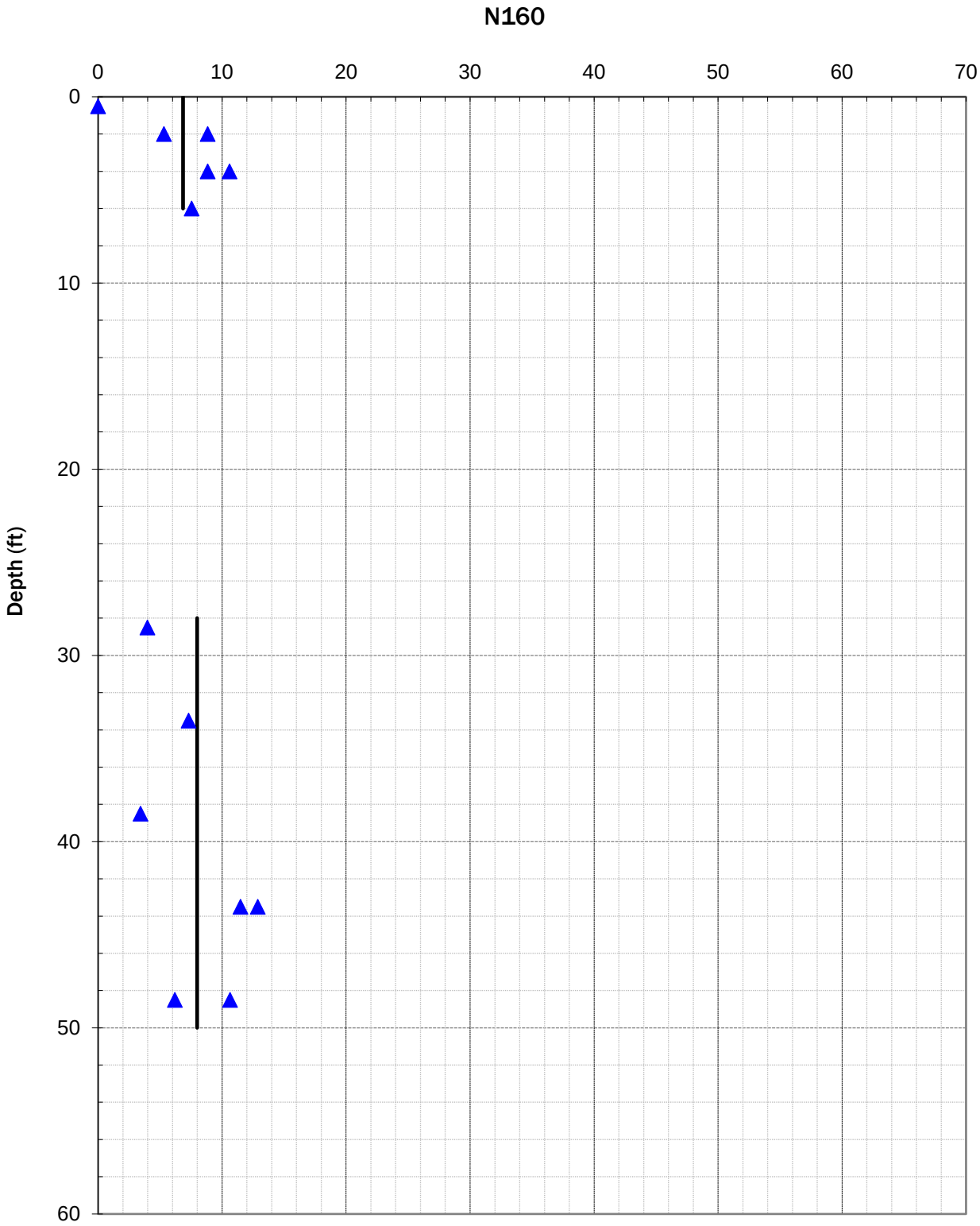
SD

** WATER EXTRACTION PERFORMED BY USING A 1:10 RATIO OF SAMPLE AND REAGENT WATER FOLLOWED BY CENTRIFUGE AND VACUUME FILTRATION. THE WATER EXTRACT IS THEN ANALYZED USING THE ASTM D-512 AND D-516 METHODS.

THE RESULTS RELATE AS TO THE LOCATION TESTED AND NO OTHER REFERENCE SHALL BE MADE.
THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF THE LABORATORY.

END OF REPORT

APPENDIX C
Soil Parameter Determination



Borings Included: B-8, B-9

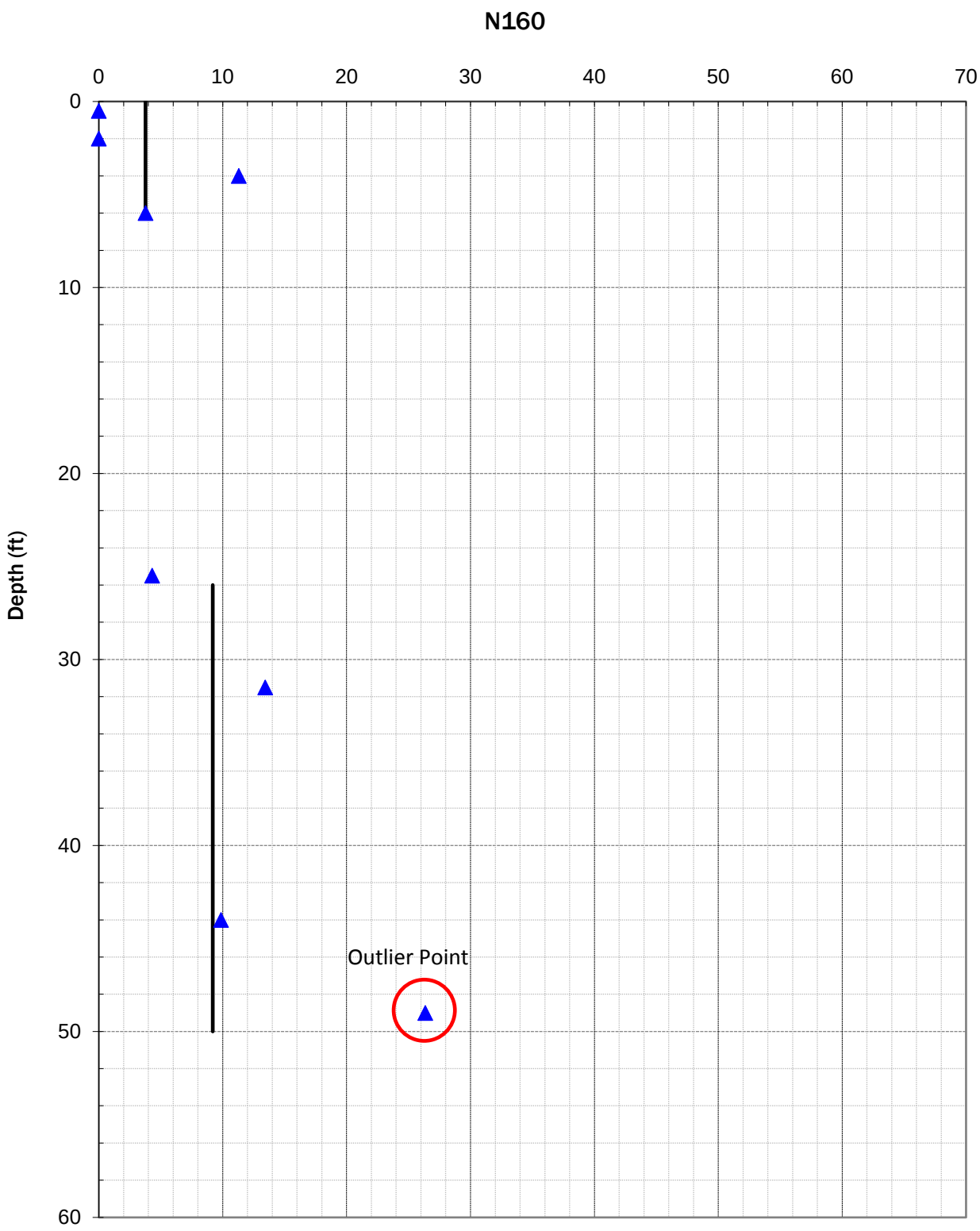
West Bridge Abutment
(69+81 to 70+56)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure C-1

18461-007-01



Surficial Holocene Sand

Average N160

Borings Included: B-10, B-11

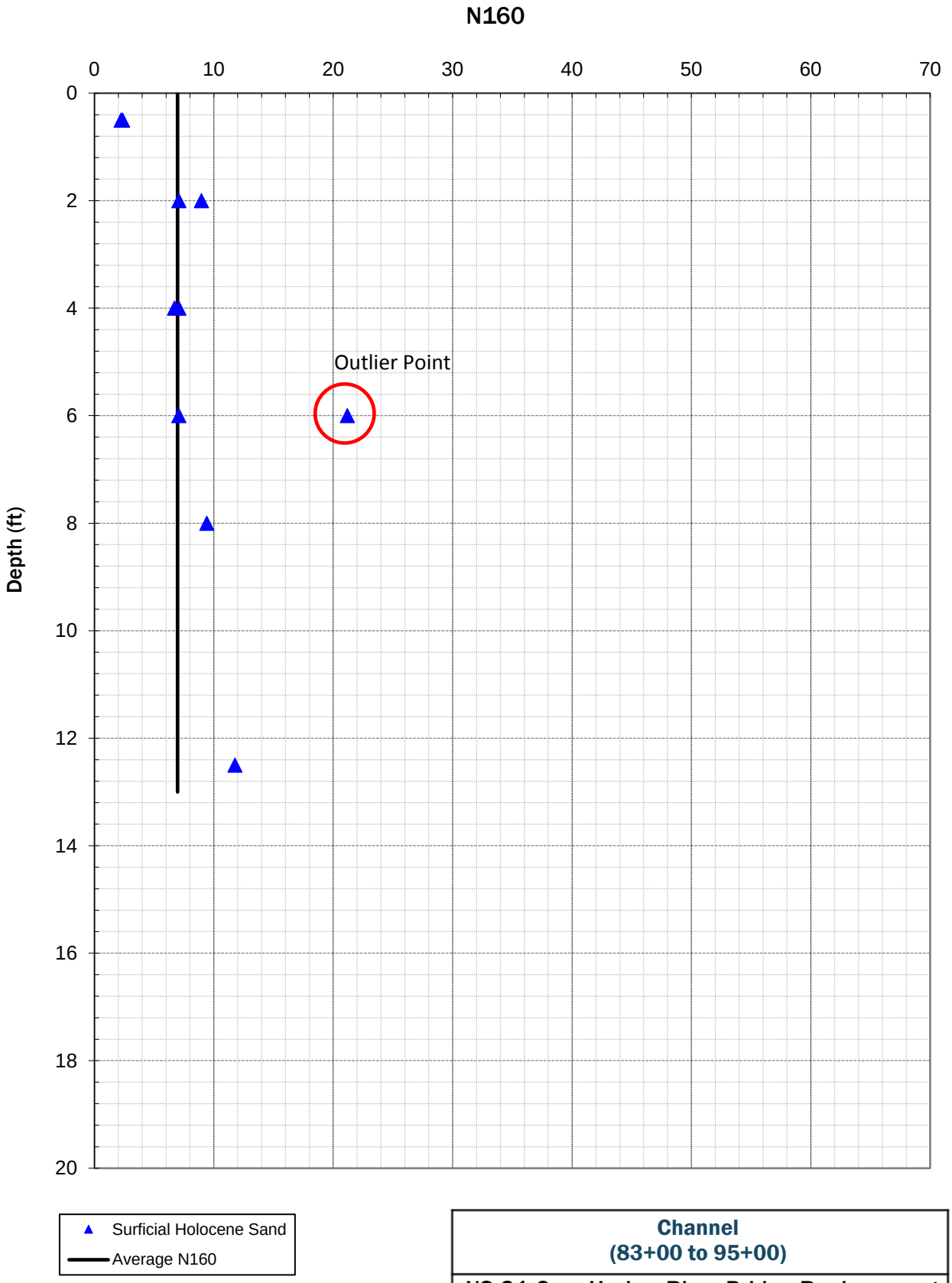
West Overbank
(70+56 to 83+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure C-2

18461-007-01



Borings Included: B-12, B-13

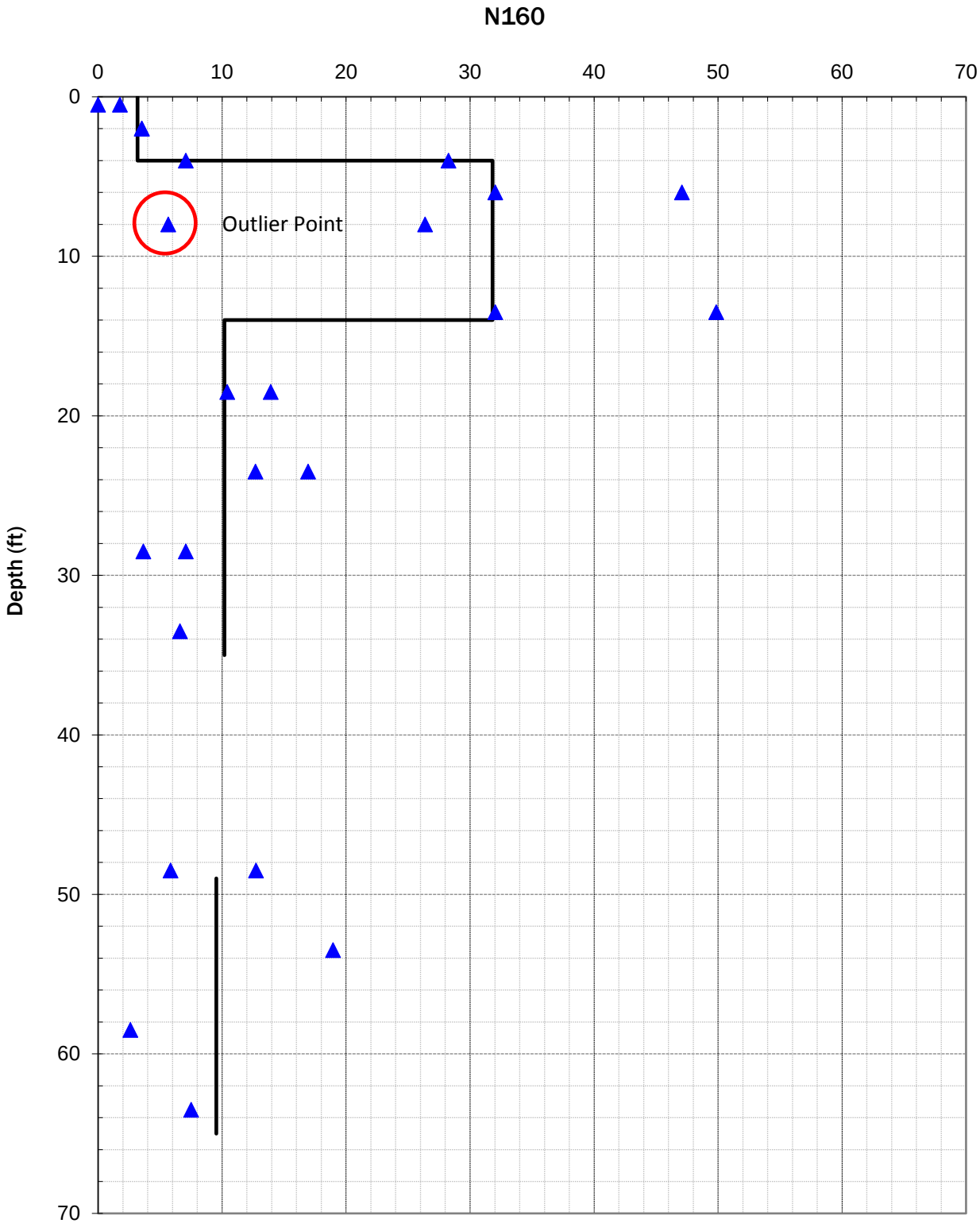
Channel
(83+00 to 95+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GEOENGINEERS

Figure C-3

18461-007-01



Surficial Holocene Sand

Average N160

Borings Included: B-14, B-15

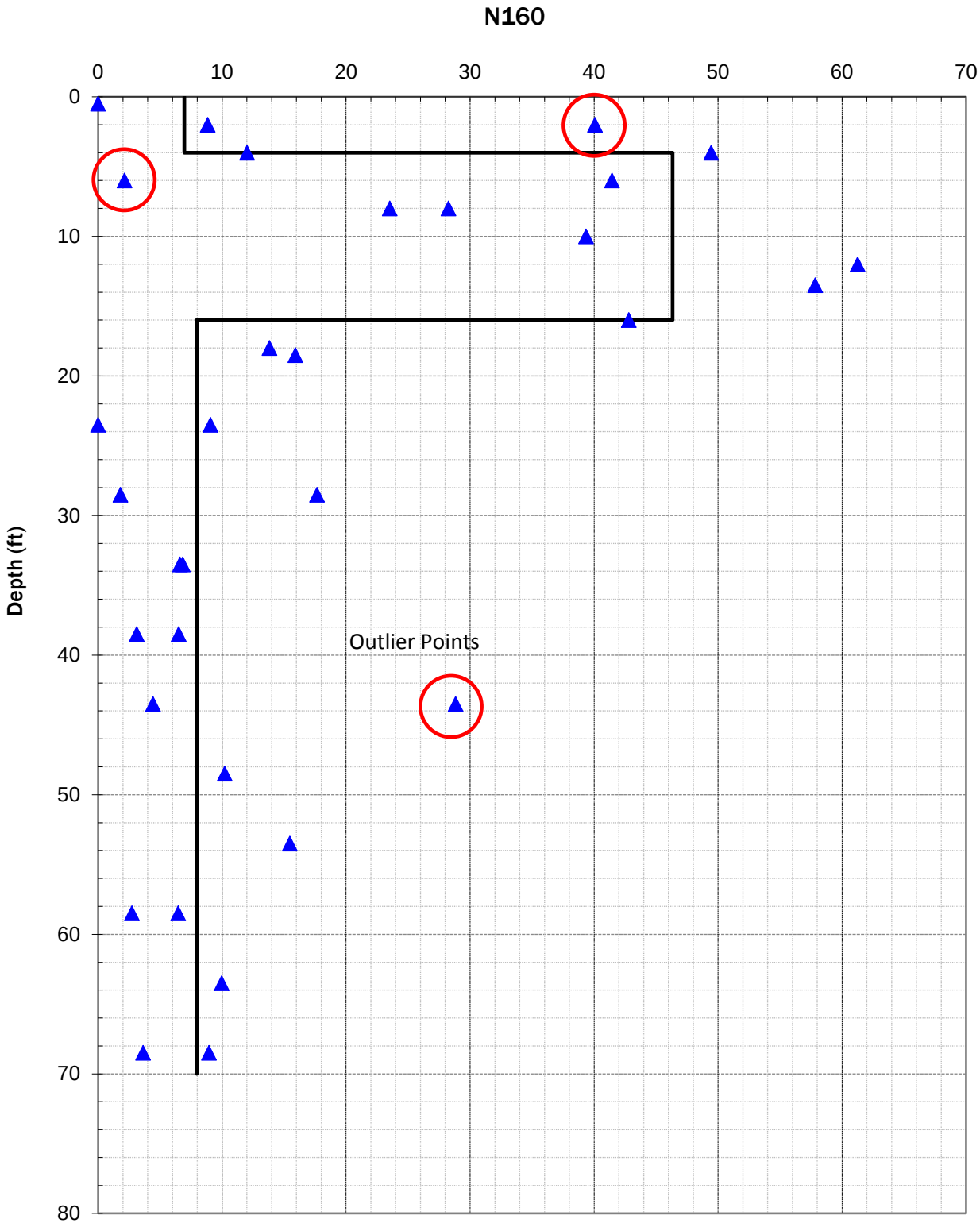
East Overbank
(95+00 to 103+64)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure C-4

18461-007-01



Surficial Holocene Sand

Average N160

Borings Included: B-2, B-16

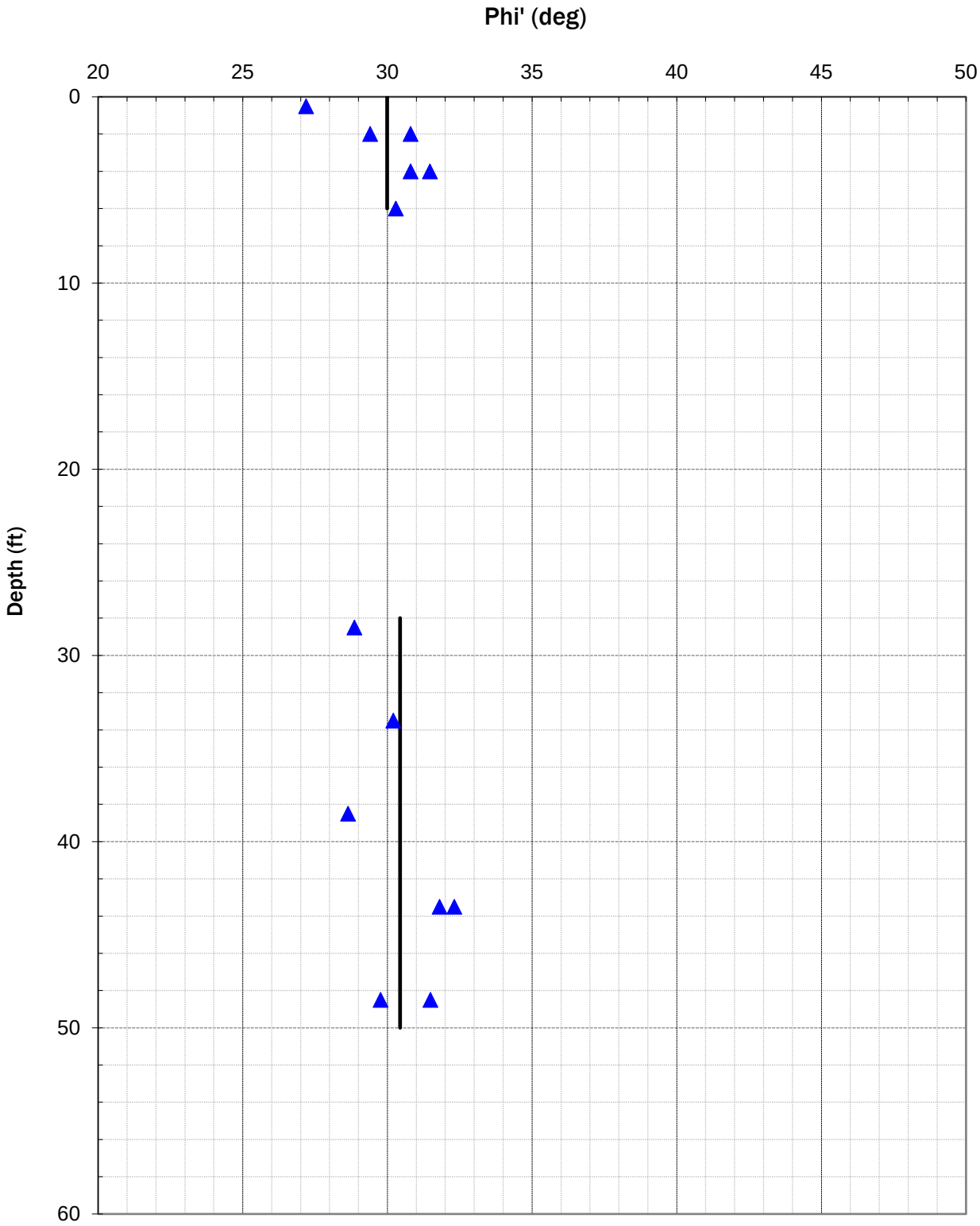
East Bridge Abutment
(103+64 to 104+39)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure C-5

18461-007-01



Surficial Holocene Sand

Average Phi'

Borings Included: B-8, B-9

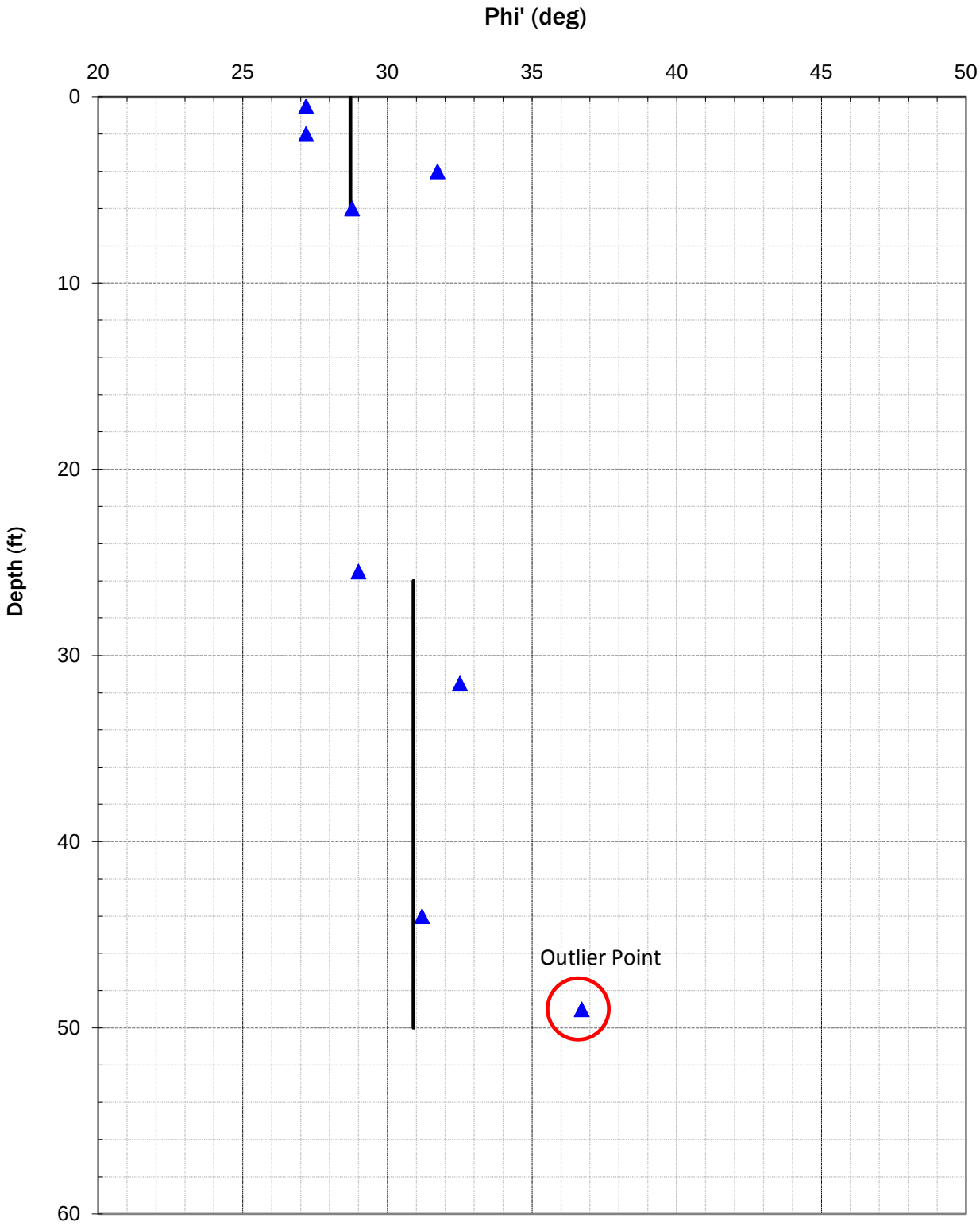
West Bridge Abutment
(69+81 to 70+56)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure C-6

18461-007-01



Surficial Holocene Sand

Average Phi'

Borings Included: B-10, B-11

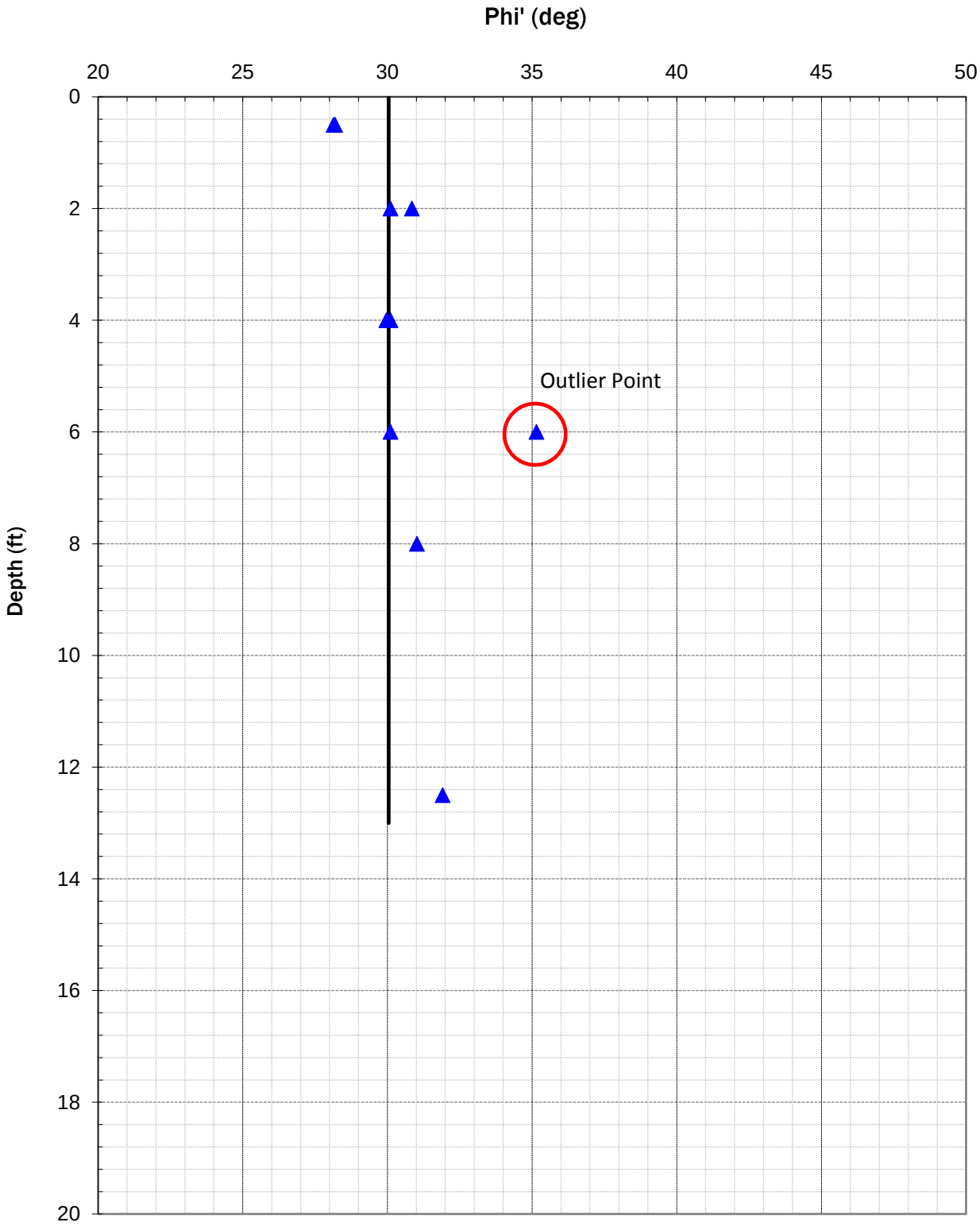
West Overbank
(70+56 to 83+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GEOENGINEERS

Figure C-7

18461-007-01



Surficial Holocene Sand

Average Phi'

Borings Included: B-12, B-13

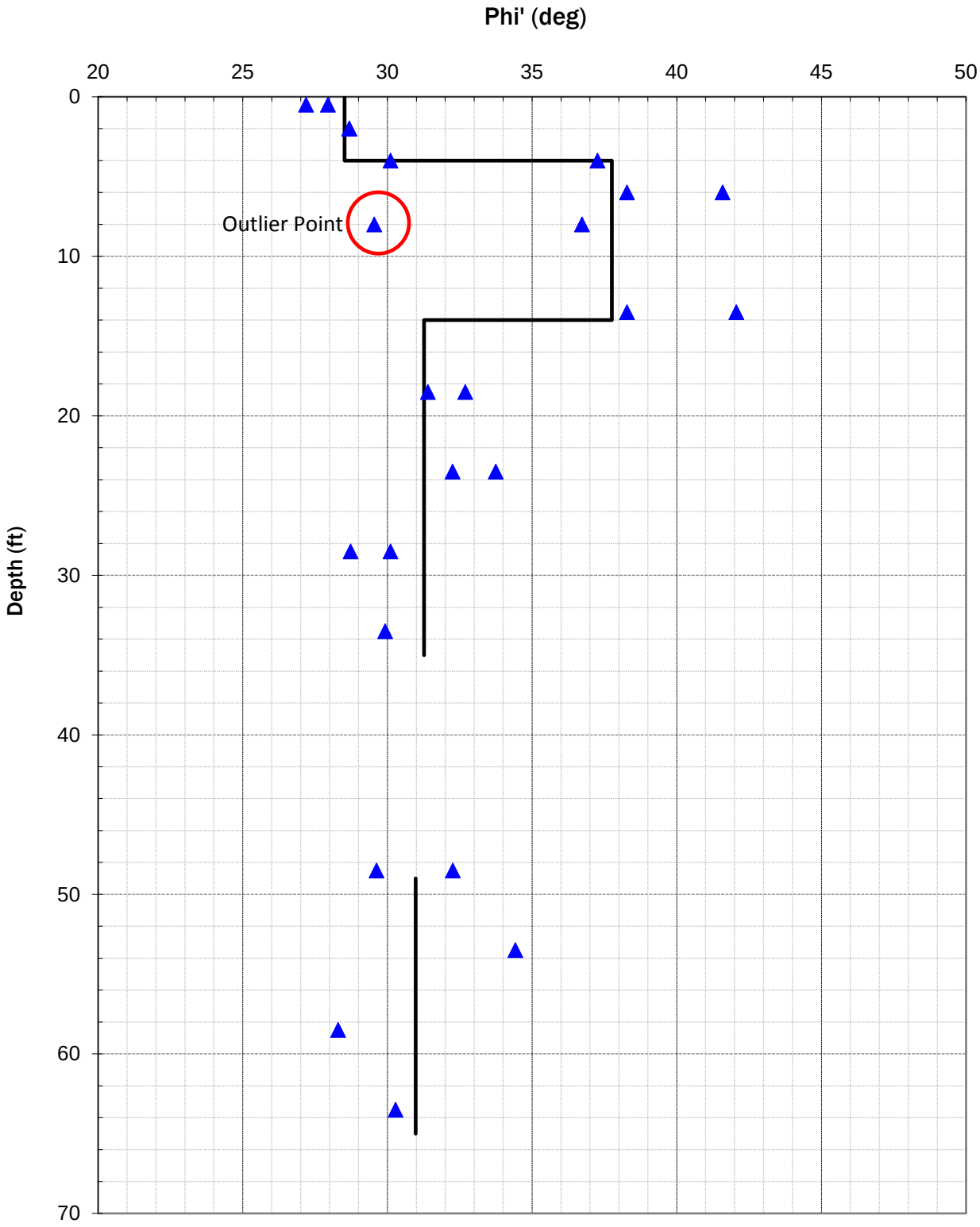
Channel
(83+00 to 95+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure C-8

18461-007-01



Surficial Holocene Sand

Average Phi'

Borings Included: B-14, B-15

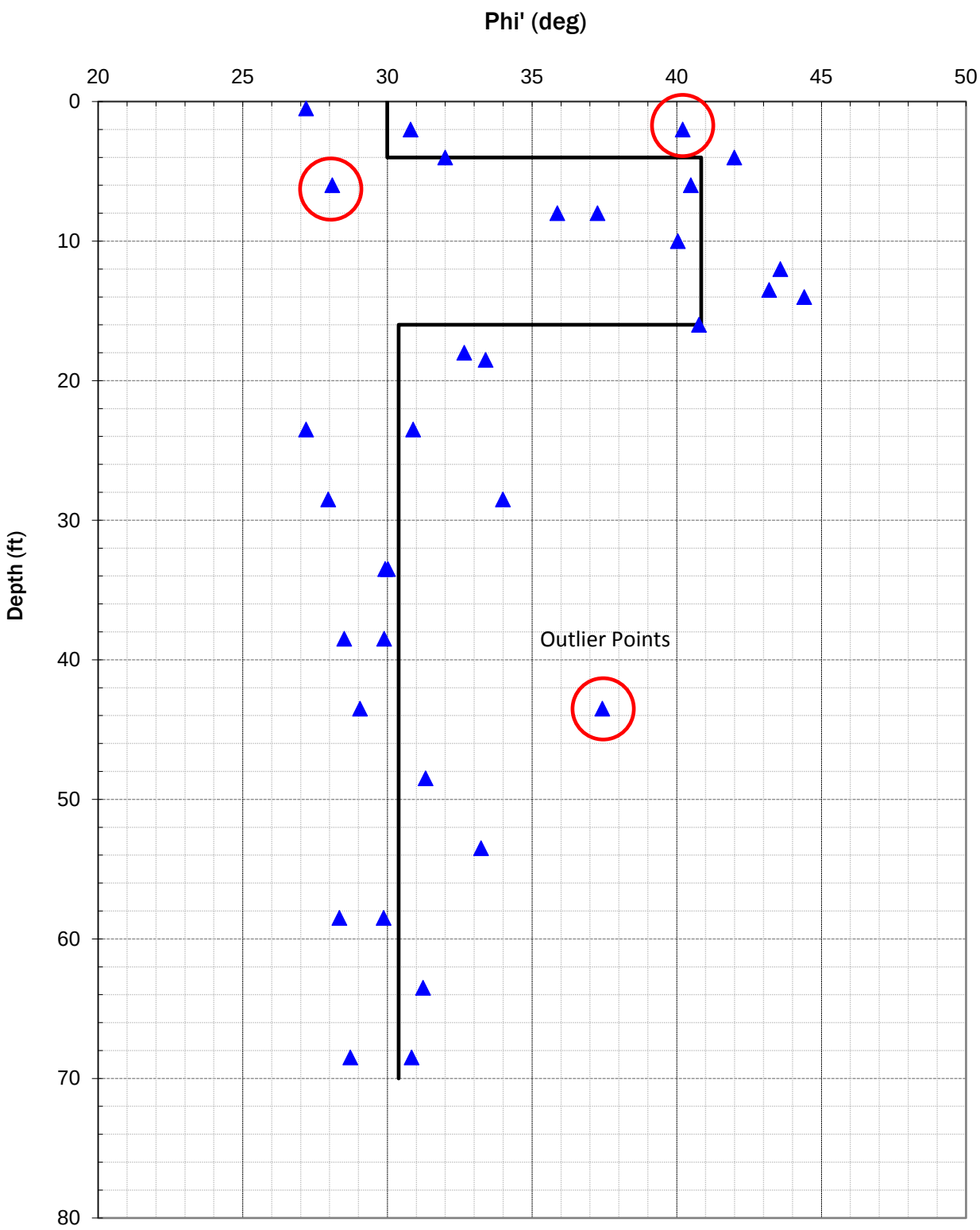
East Overbank
(95+00 to 103+64)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure C-9

18461-007-01



Surficial Holocene Sand

Average Phi'

Borings Included: B-2, B-16

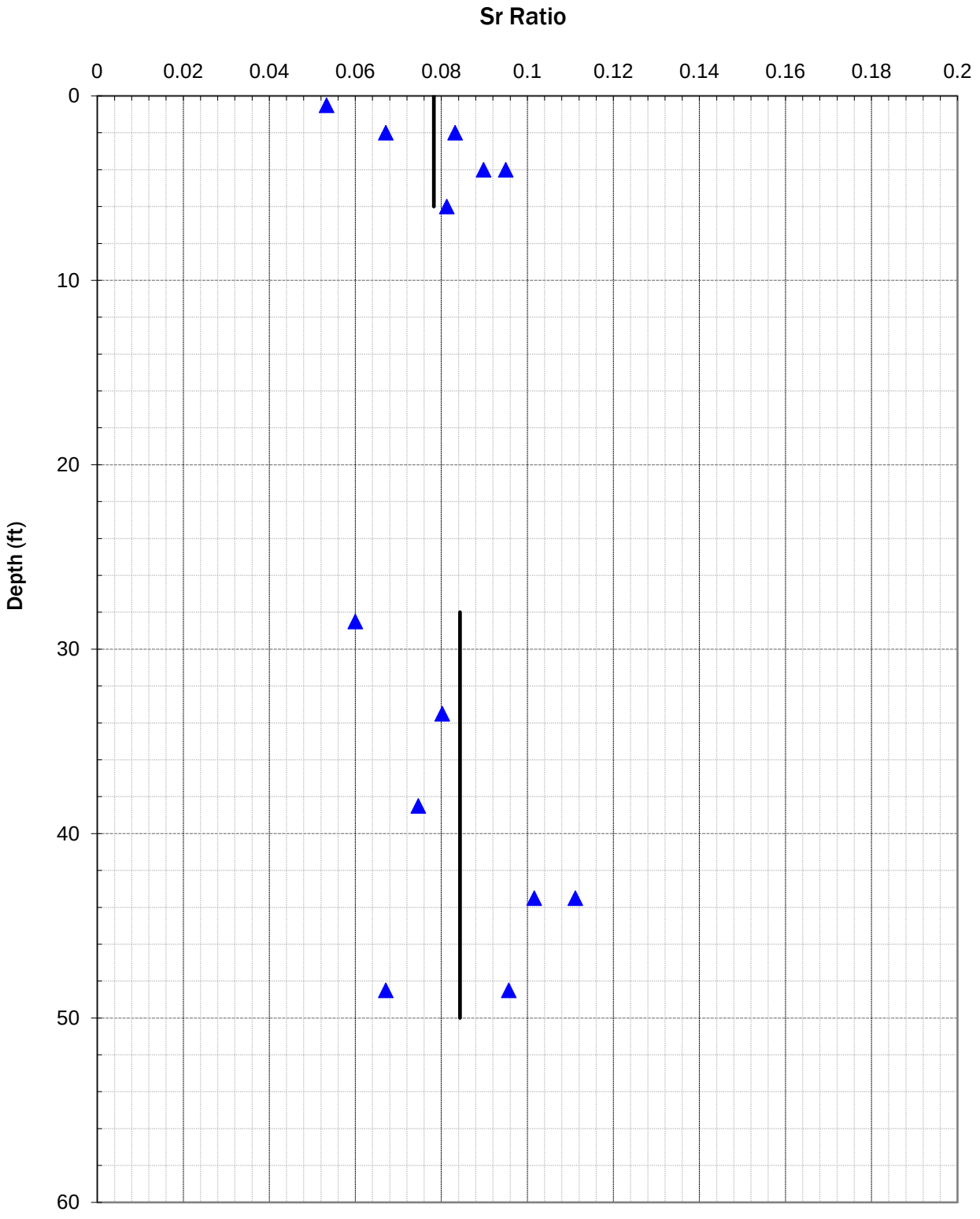
East Bridge Abutment
(103+64 to 104+39)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure C-10

18461-007-01



Surficial Holocene Sand

Average Sr

Borings Included: B-8, B-9

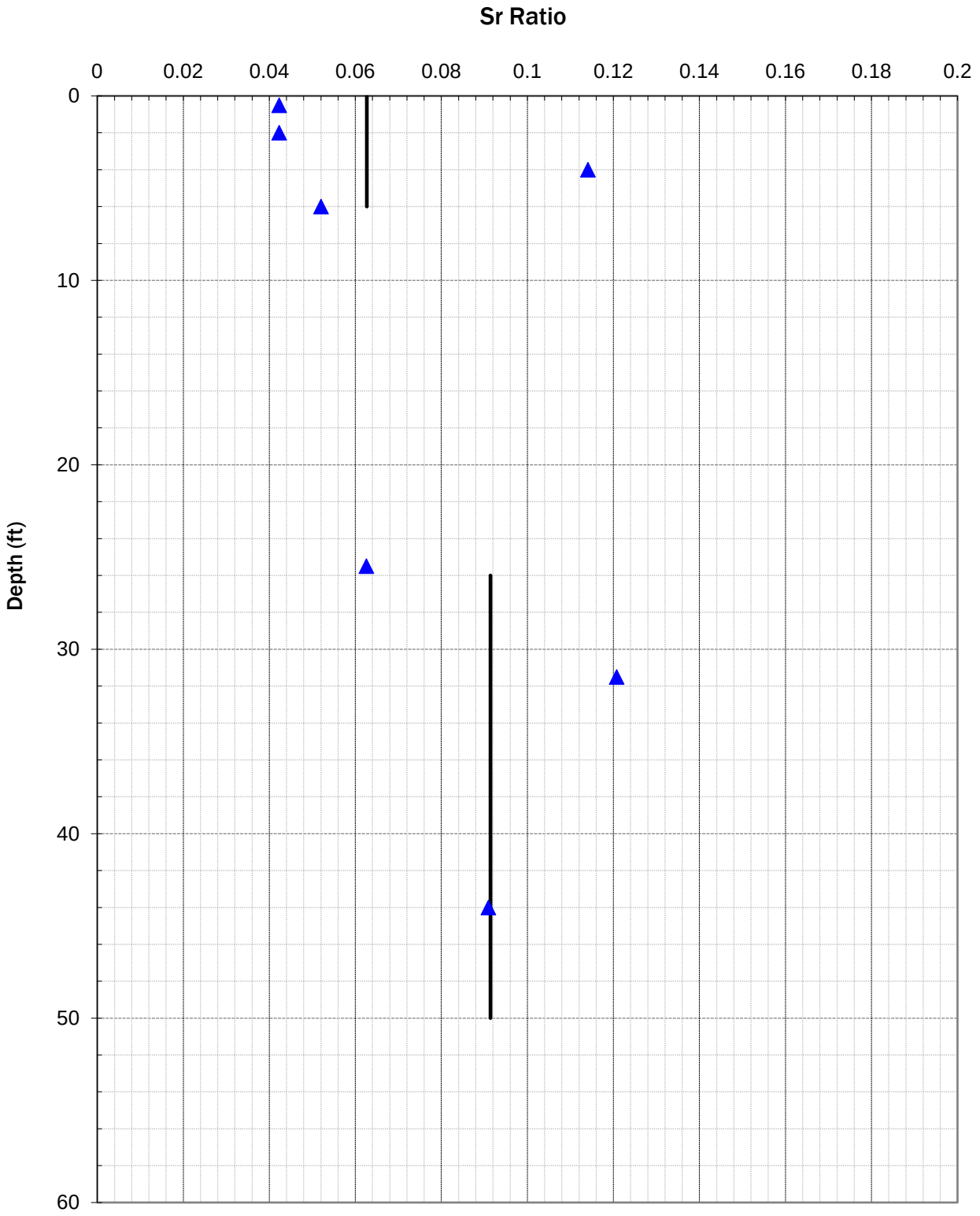
West Bridge Abutment
(69+81 to 70+56)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure C-11

18461-007-01



Surficial Holocene Sand

Average Sr

Borings Included: B-10, B-11

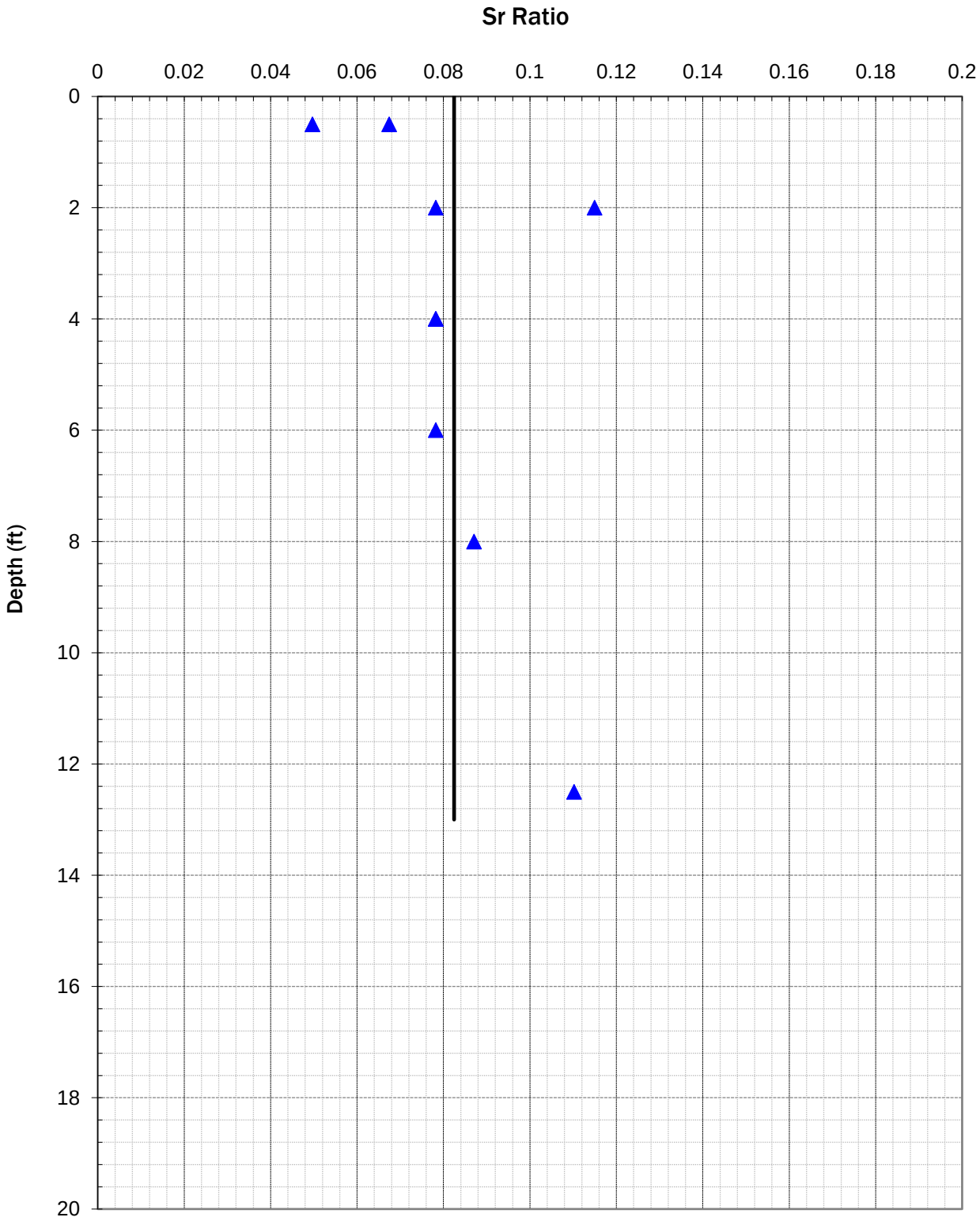
West Overbank
(70+56 to 83+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure C-12

18461-007-01



Surficial Holocene Sand

Average Sr

Borings Included: B-12, B-13

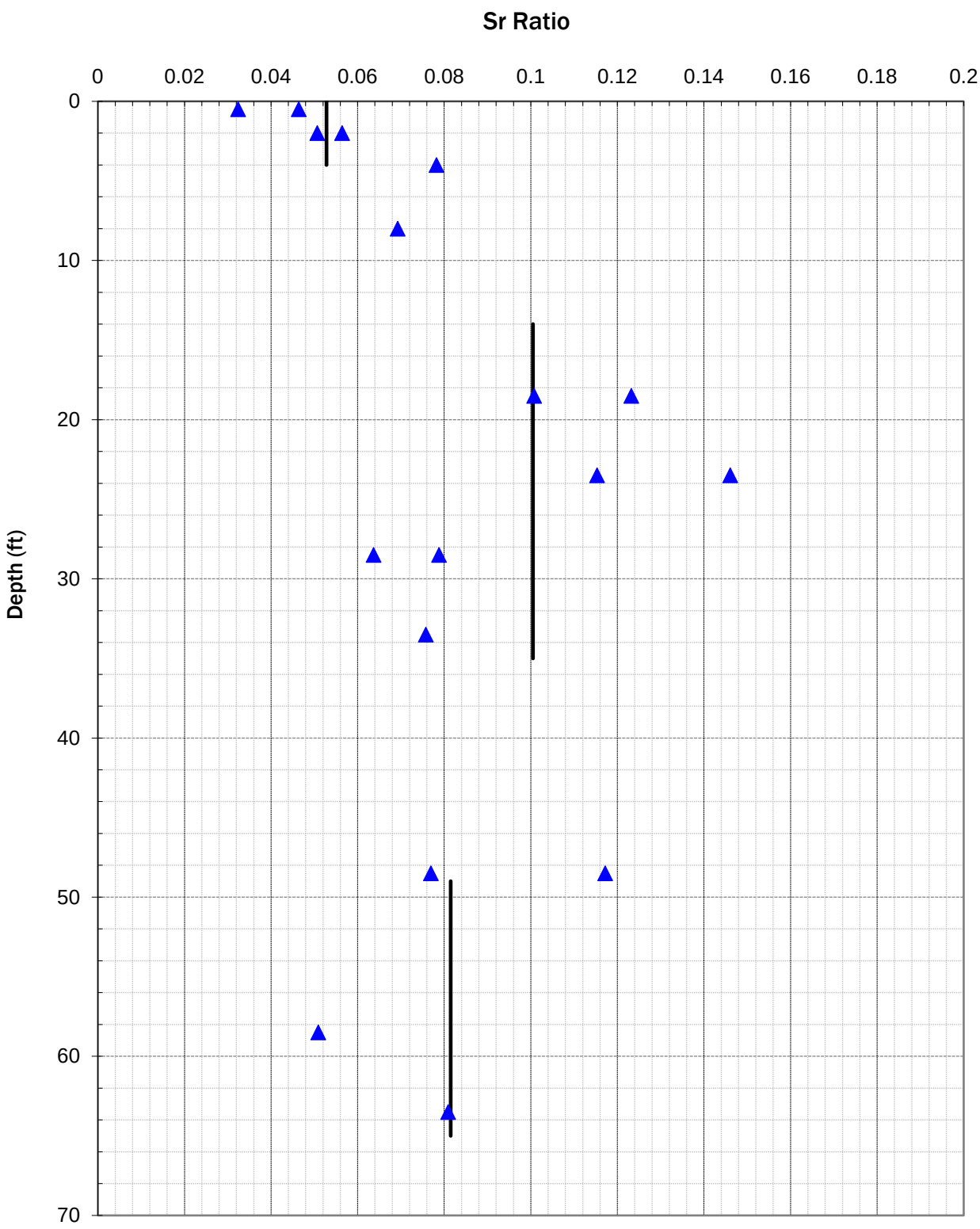
Channel
(83+00 to 95+00)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure C-13

18461-007-01



▲ Surficial Holocene Sand

Average Sr

Borings Included: B-14, B-15

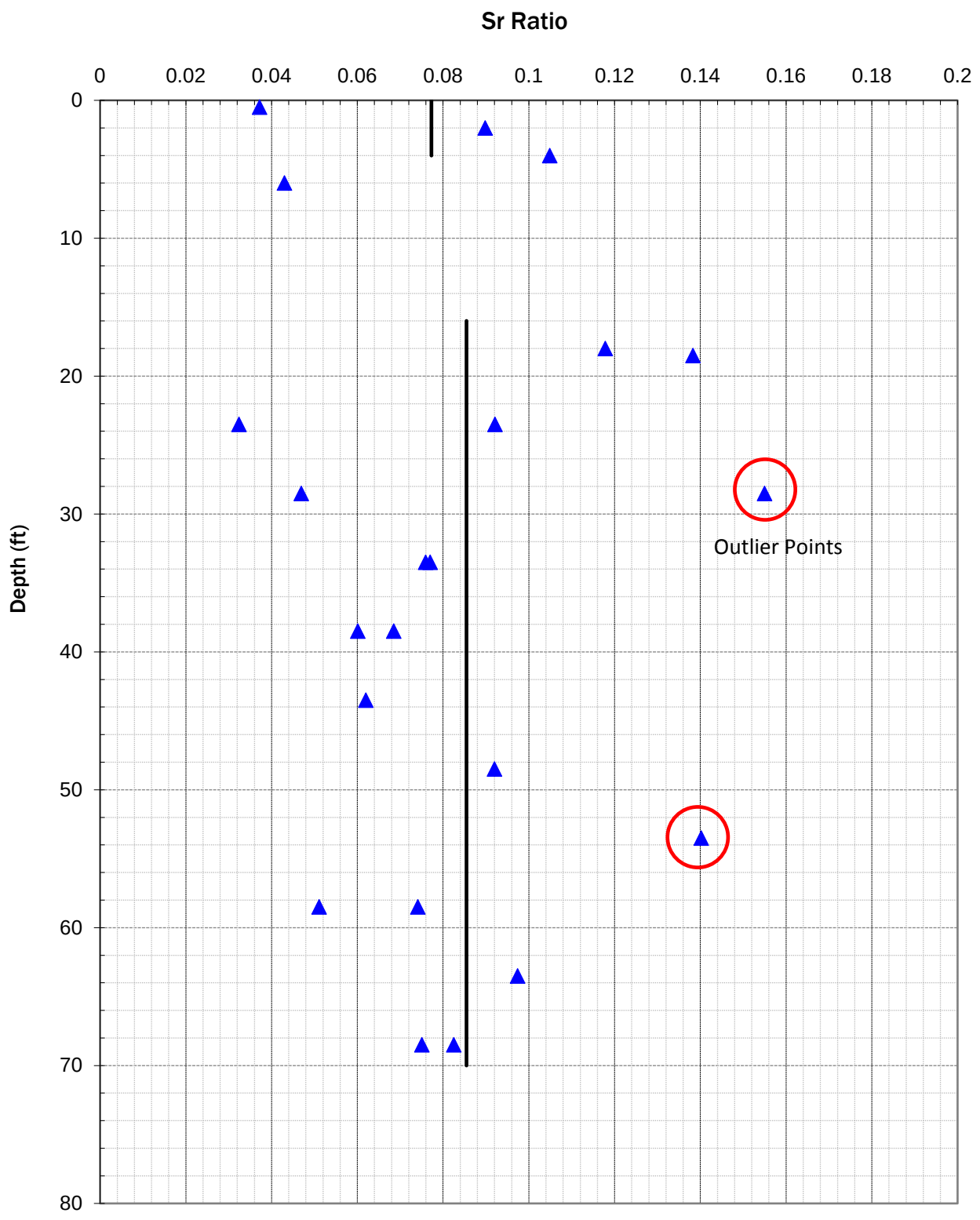
East Overbank
(95+00 to 103+64)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure C-14

18461-007-01



Surficial Holocene Sand

Average Sr

Borings Included: B-2, B-16

East Bridge Abutment
(103+64 to 104+39)

US 21 Over Harbor River Bridge Replacement
Beaufort County, South Carolina

GeoEngineers

Figure C-15

18461-007-01

APPENDIX D
Soil Liquefaction Analyses

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:59 PM
Boring Designation:	B-1
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	8
SPT Liner (Yes/No):	No
Hammer Energy, %:	82
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	6

Earthquake Information

Max Acceleration (g) :	0.26
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	2.0	8	SP-SM	8	100		Unsaturated
2	4.0	7	SP-SM	8	100		Unsaturated
3	6.0	6	SP-SM	8	100		Unsaturated
4	8.0	6	SP-SM	8	100		
5	10.0	3	SP-SM	8	100		
6	12.0	4	SP-SM	8	100		
7	14.0	8	SP-SM	8	100		
8	16.0	2	SP-SM	8	100		
9	18.0	2	SP	3	100		
10	23.5	2	SP	3	100		
11	28.5	4	SP-SM	7	100		
12	33.5	4	SP-SM	7	100		
13	38.5	3	SP-SM	7	100		
14	43.5	1	SP-SM	11	100		
15	48.5	1	SM	33	100		
16	53.5	14	ML	50	120		Clay
17	55.0	34	ML	50	120		Clay
18	58.5	7	ML	50	120		Clay
19	63.5	6	ML	50	120		Clay
20	65.0	7	ML	50	120		Clay
21	66.5	10	ML	50	120		Clay
22	68.5	12	ML	50	120		Clay
23	73.5	11	ML	50	120		Clay
24	78.5	23	ML	50	120		Clay
25	83.5	3	SM	15	120		Clay
26	88.5	10	SM	15	120		Clay
27	93.5	11	SM	15	120		Clay
28	100.0	25	SM	15	120		Clay
29	103.5	10	SM	15	120		Clay
30	108.5	9	SM	15	120		Clay
31	113.5	12	SM	15	120		Clay
32	118.5	12	SM	15	120		Clay
33	123.5	16	SM	15	120		Clay
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							

*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	2.0	8.0	SP-SM	8.0	100.0	Unsaturated	200	200	1.37	1.15	0.75	1.00	9.43	1.70	16.03	0.37	16.40	1.002	0.169
2	4.0	7.0	SP-SM	8.0	100.0	Unsaturated	400	400	1.37	1.15	0.75	1.00	8.25	1.70	14.03	0.37	14.39	0.997	0.168
3	6.0	6.0	SP-SM	8.0	100.0	Unsaturated	600	600	1.37	1.15	0.80	1.00	7.54	1.70	12.82	0.37	13.19	0.991	0.167
4	8.0	6.0	SP-SM	8.0	100.0		800	800	1.37	1.15	0.80	1.00	7.54	1.64	12.39	0.37	12.75	0.985	0.166
5	10.0	3.0	SP-SM	8.0	100.0		1000	875	1.37	1.15	0.85	1.00	4.01	1.67	6.69	0.37	7.06	0.978	0.189
6	12.0	4.0	SP-SM	8.0	100.0		1200	950	1.37	1.15	0.85	1.00	5.34	1.56	8.35	0.37	8.72	0.971	0.207
7	14.0	8.0	SP-SM	8.0	100.0		1400	1026	1.37	1.15	0.85	1.00	10.69	1.42	15.15	0.37	15.51	0.964	0.222
8	16.0	2.0	SP-SM	8.0	100.0		1600	1101	1.37	1.15	0.95	1.00	2.99	1.49	4.46	0.37	4.83	0.957	0.235
9	18.0	2.0	SP	3.3	100.0		1800	1176	1.37	1.15	0.95	1.00	2.99	1.44	4.31	0.00	4.31	0.949	0.245
10	23.5	2.0	SP	3.3	100.0		2350	1383	1.37	1.15	0.95	1.00	2.99	1.31	3.91	0.00	3.91	0.926	0.266
11	28.5	4.0	SP-SM	7.4	100.0		2850	1571	1.37	1.15	1.00	1.00	6.29	1.19	7.45	0.21	7.67	0.903	0.277
12	33.5	4.0	SP-SM	7.0	100.0		3350	1759	1.37	1.15	1.00	1.00	6.29	1.11	7.00	0.14	7.13	0.879	0.283
13	38.5	3.0	SP-SM	7.0	100.0		3850	1947	1.37	1.15	1.00	1.00	4.72	1.05	4.96	0.14	5.10	0.855	0.286
14	43.5	1.0	SP-SM	11.0	100.0		4350	2135	1.37	1.15	1.00	1.00	1.57	0.99	1.56	1.61	3.17	0.830	0.286
15	48.5	1.0	SM	33.2	100.0		4850	2323	1.37	1.15	1.00	1.00	1.57	0.95	1.49	5.47	6.95	0.805	0.284
16	53.5	14.0	ML	50.0	120.0	Clay	5450	2611	1.37	1.15	1.00	1.00	22.00	0.92	20.26	5.61	25.87	0.781	0.275
17	55.0	34.0	ML	50.0	120.0	Clay	5630	2697	1.37	1.15	1.00	1.00	53.44	0.94	50.13	5.61	55.75	0.773	0.273
18	58.5	7.0	ML	50.0	120.0	Clay	6050	2899	1.37	1.15	1.00	1.00	11.00	0.86	9.44	5.61	15.06	0.757	0.267
19	63.5	6.0	ML	50.0	120.0	Clay	6650	3187	1.37	1.15	1.00	1.00	9.43	0.81	7.67	5.61	13.29	0.734	0.259
20	65.0	7.0	ML	50.0	120.0	Clay	6830	3273	1.37	1.15	1.00	1.00	11.00	0.81	8.88	5.61	14.49	0.727	0.256
21	66.5	10.0	ML	50.0	120.0	Clay	7010	3360	1.37	1.15	1.00	1.00	15.72	0.81	12.74	5.61	18.35	0.720	0.254
22	68.5	12.0	ML	50.0	120.0	Clay	7250	3475	1.37	1.15	1.00	1.00	18.86	0.81	15.21	5.61	20.83	0.712	0.251
23	73.5	11.0	ML	50.0	120.0	Clay	7850	3763	1.37	1.15	1.00	1.00	17.29	0.77	13.35	5.61	18.96	0.691	0.244
24	78.5	23.0	ML	50.0	120.0	Clay	8450	4051	1.37	1.15	1.00	1.00	36.15	0.81	29.15	5.61	34.77	0.672	0.237
25	83.5	3.0	SM	15.0	120.0	Clay	9050	4339	1.37	1.15	1.00	1.00	4.72	0.65	3.09	3.26	6.35	0.654	0.231
26	88.5	10.0	SM	15.0	120.0	Clay	9650	4627	1.37	1.15	1.00	1.00	15.72	0.68	10.65	3.26	13.91	0.639	0.225
27	93.5	11.0	SM	15.0	120.0	Clay	10250	4915	1.37	1.15	1.00	1.00	17.29	0.66	11.44	3.26	14.71	0.625	0.220
28	100.0	25.0	SM	15.0	120.0	Clay	11030	5289	1.37	1.15	1.00	1.00	39.29	0.72	28.48	3.26	31.74	0.610	0.215
29	103.5	10.0	SM	15.0	120.0	Clay	11450	5491	1.37	1.15	1.00	1.00	15.72	0.62	9.69	3.26	12.95	0.603	0.213
30	108.5	9.0	SM	15.0	120.0	Clay	12050	5779	1.37	1.15	1.00	1.00	14.15	0.59	8.37	3.26	11.63	0.596	0.210
31	113.5	12.0	SM	15.0	120.0	Clay	12650	6067	1.37	1.15	1.00	1.00	18.86	0.60	11.24	3.26	14.50	0.590	0.208
32	118.5	12.0	SM	15.0	120.0	Clay	13250	6355	1.37	1.15	1.00	1.00	18.86	0.58	10.95	3.26	14.21	0.587	0.207
33	123.5	16.0	SM	15.0	120.0	Clay	13850	6643	1.37	1.15	1.00	1.00	25.15	0.59	14.92	3.26	18.18	0.586	0.207
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.36	1.02	1.10	0.168	0.190	2.00
1.30	1.02	1.10	0.151	0.170	2.00
1.27	1.02	1.10	0.142	0.158	2.00
1.25	1.02	1.10	0.138	0.154	0.93
1.14	1.01	1.07	0.099	0.107	0.56
1.17	1.01	1.07	0.109	0.118	0.57
1.33	1.02	1.08	0.161	0.178	0.80
1.11	1.01	1.05	0.085	0.090	0.38
1.11	1.01	1.04	0.082	0.086	0.35
1.11	1.01	1.03	0.080	0.083	0.31
1.15	1.01	1.03	0.102	0.106	0.38
1.14	1.01	1.02	0.099	0.102	0.36
1.12	1.01	1.01	0.087	0.088	0.31
1.10	1.01	1.00	0.076	0.077	0.27
1.14	1.01	0.99	0.098	0.098	0.35
1.76	1.05	0.96	0.312	0.317	2.00
2.20	1.08	0.93	2.000	2.000	2.00
1.32	1.02	0.97	0.157	0.154	2.00
1.27	1.02	0.96	0.142	0.139	2.00
1.30	1.02	0.95	0.152	0.148	2.00
1.43	1.03	0.94	0.187	0.182	2.00
1.53	1.04	0.93	0.216	0.209	2.00
1.45	1.03	0.93	0.194	0.185	2.00
2.20	1.08	0.83	1.057	0.951	2.00
1.13	1.01	0.94	0.094	0.090	2.00
1.29	1.02	0.92	0.147	0.138	2.00
1.31	1.02	0.91	0.154	0.142	2.00
2.11	1.08	0.80	0.619	0.531	2.00
1.26	1.02	0.90	0.140	0.128	2.00
1.23	1.02	0.90	0.130	0.119	2.00
1.30	1.02	0.89	0.152	0.137	2.00
1.29	1.02	0.88	0.150	0.135	2.00
1.42	1.03	0.86	0.186	0.164	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
2	0.0	0.000	0.00	25.34
4	0.0	0.000	0.00	25.34
6	0.0	0.000	0.00	25.34
8	1.0	0.027	0.33	25.34
10	2.0	0.045	1.08	25.02
12	2.0	0.040	0.97	23.94
14	2.0	0.028	0.67	22.97
16	2.0	0.053	1.28	22.30
18	3.8	0.056	2.51	21.02
23.5	5.3	0.058	3.65	18.51
28.5	5.0	0.043	2.59	14.86
33.5	5.0	0.045	2.69	12.27
38.5	5.0	0.052	3.13	9.58
43.5	5.0	0.062	3.73	6.45
48.5	5.0	0.045	2.72	2.72
53.5	3.3	0.000	0.00	0.00
55	2.5	0.000	0.00	0.00
58.5	4.3	0.000	0.00	0.00
63.5	3.3	0.000	0.00	0.00
65	1.5	0.000	0.00	0.00
66.5	1.8	0.000	0.00	0.00
68.5	3.5	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	5.0	0.000	0.00	0.00
83.5	5.0	0.000	0.00	0.00
88.5	5.0	0.000	0.00	0.00
93.5	5.8	0.000	0.00	0.00
100	5.0	0.000	0.00	0.00
103.5	4.3	0.000	0.00	0.00
108.5	5.0	0.000	0.00	0.00
113.5	5.0	0.000	0.00	0.00
118.5	5.0	0.000	0.00	0.00
123.5	4.0	0.000	0.00	0.00
126.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:55 PM
Boring Designation:	B-2
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	6
SPT Liner (Yes/No):	No
Hammer Energy, %:	82
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	6

Earthquake Information

Max Acceleration (g) :	0.29
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	2.0	20	SP	5	100		Unsaturated
2	4.0	6	SP	5	100		Unsaturated
3	6.0	1	SP	5	100		
4	8.0	11	SP	3	100		
5	10.0	18	SP	3	120		
6	12.0	30	SP	3	120		
7	14.0	38	SP	3	120		
8	16.0	21	SP	3	120		
9	18.0	7	SP-SM	6	100		
10	23.5	0	SP-SM	6	100		
11	28.5	1	SM	14	100		
12	33.5	4	SM	14	100		
13	38.5	4	SP-SM	9	100		
14	43.5	19	SP-SM	9	120		
15	48.5	7	SP-SM	9	100		
16	53.5	11	SP-SM	10	100		
17	58.5	2	SP-SM	10	100		
18	63.5	1	CL	50	100		Clay
19	68.5	7	SP-SM	5	100		
20	73.5	5	ML	50	120		Clay
21	78.5	5	ML	50	120		Clay
22	83.5	4	ML	50	120		Clay
23	88.5	32	SM	15	120		Clay
24	93.5	5	SM	15	120		Clay
25	98.5	6	SM	15	120		Clay
26	103.5	4	SM	15	120		Clay
27	108.5	7	SM	15	120		Clay
28	113.5	10	SM	15	120		Clay
29	118.5	7	SM	15	120		Clay
30	123.5	7	SM	15	120		Clay
31							Clay
32							Clay
33							Clay
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*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	2.0	20.0	SP	5.0	100.0	Unsaturated	200	200	1.37	1.15	0.75	1.00	23.58	1.70	40.08	0.00	40.08	1.002	0.189
2	4.0	6.0	SP	5.0	100.0	Unsaturated	400	400	1.37	1.15	0.75	1.00	7.07	1.70	12.02	0.00	12.03	0.997	0.188
3	6.0	1.0	SP	4.9	100.0		600	600	1.37	1.15	0.80	1.00	1.26	1.70	2.14	0.00	2.14	0.991	0.187
4	8.0	11.0	SP	2.5	100.0		800	675	1.37	1.15	0.80	1.00	13.83	1.62	22.37	0.00	22.37	0.985	0.220
5	10.0	18.0	SP	3.0	120.0		1040	790	1.37	1.15	0.85	1.00	24.05	1.40	33.58	0.00	33.58	0.978	0.243
6	12.0	30.0	SP	3.0	120.0		1280	906	1.37	1.15	0.85	1.00	40.08	1.25	50.10	0.00	50.10	0.971	0.259
7	14.0	38.0	SP	3.0	120.0		1520	1021	1.37	1.15	0.85	1.00	50.76	1.21	61.50	0.00	61.50	0.964	0.271
8	16.0	21.0	SP	3.0	120.0		1760	1136	1.37	1.15	0.95	1.00	31.35	1.21	38.03	0.00	38.03	0.957	0.279
9	18.0	7.0	SP-SM	6.3	100.0		1960	1211	1.37	1.15	0.95	1.00	10.45	1.32	13.80	0.05	13.85	0.949	0.289
10	23.5	0.0	SP-SM	6.0	100.0		2510	1418	1.37	1.15	0.95	1.00	0.00	1.36	0.00	0.03	0.03	0.926	0.309
11	28.5	1.0	SM	14.0	100.0		3010	1606	1.37	1.15	1.00	1.00	1.57	1.19	1.86	2.91	4.77	0.903	0.319
12	33.5	4.0	SM	14.0	100.0		3510	1794	1.37	1.15	1.00	1.00	6.29	1.09	6.88	2.91	9.78	0.879	0.324
13	38.5	4.0	SP-SM	8.8	100.0		4010	1982	1.37	1.15	1.00	1.00	6.29	1.04	6.53	0.64	7.17	0.855	0.326
14	43.5	19.0	SP-SM	9.0	120.0		4610	2270	1.37	1.15	1.00	1.00	29.86	0.97	29.11	0.72	29.83	0.830	0.318
15	48.5	7.0	SP-SM	9.0	100.0		5110	2458	1.37	1.15	1.00	1.00	11.00	0.92	10.16	0.72	10.88	0.805	0.316
16	53.5	11.0	SP-SM	10.0	100.0		5610	2646	1.37	1.15	1.00	1.00	17.29	0.90	15.56	1.15	16.71	0.781	0.312
17	58.5	2.0	SP-SM	10.0	100.0		6110	2834	1.37	1.15	1.00	1.00	3.14	0.83	2.61	1.15	3.76	0.757	0.308
18	63.5	1.0	CL	50.0	100.0	Clay	6610	3022	1.37	1.15	1.00	1.00	1.57	0.81	1.28	5.61	6.89	0.734	0.303
19	68.5	7.0	SP-SM	5.0	100.0		7110	3210	1.37	1.15	1.00	1.00	11.00	0.79	8.72	0.00	8.72	0.712	0.297
20	73.5	5.0	ML	50.0	120.0	Clay	7710	3498	1.37	1.15	1.00	1.00	7.86	0.77	6.05	5.61	11.66	0.691	0.287
21	78.5	5.0	ML	50.0	120.0	Clay	8310	3786	1.37	1.15	1.00	1.00	7.86	0.74	5.79	5.61	11.41	0.672	0.278
22	83.5	4.0	ML	50.0	120.0	Clay	8910	4074	1.37	1.15	1.00	1.00	6.29	0.70	4.41	5.61	10.03	0.654	0.270
23	88.5	32.0	SM	15.0	120.0	Clay	9510	4362	1.37	1.15	1.00	1.00	50.29	0.82	41.34	3.26	44.60	0.639	0.263
24	93.5	5.0	SM	15.0	120.0	Clay	10110	4650	1.37	1.15	1.00	1.00	7.86	0.64	5.05	3.26	8.31	0.625	0.256
25	98.5	6.0	SM	15.0	120.0	Clay	10710	4938	1.37	1.15	1.00	1.00	9.43	0.63	5.91	3.26	9.17	0.613	0.251
26	103.5	4.0	SM	15.0	120.0	Clay	11310	5226	1.37	1.15	1.00	1.00	6.29	0.59	3.72	3.26	6.98	0.603	0.246
27	108.5	7.0	SM	15.0	120.0	Clay	11910	5514	1.37	1.15	1.00	1.00	11.00	0.59	6.54	3.26	9.80	0.596	0.243
28	113.5	10.0	SM	15.0	120.0	Clay	12510	5802	1.37	1.15	1.00	1.00	15.72	0.60	9.39	3.26	12.65	0.590	0.240
29	118.5	7.0	SM	15.0	120.0	Clay	13110	6090	1.37	1.15	1.00	1.00	11.00	0.56	6.16	3.26	9.42	0.587	0.238
30	123.5	7.0	SM	15.0	120.0	Clay	13710	6378	1.37	1.15	1.00	1.00	11.00	0.54	5.99	3.26	9.26	0.586	0.237
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
2.20	1.08	1.10	2.000	2.000	2.00
1.24	1.02	1.10	0.133	0.148	2.00
1.09	1.01	1.08	0.071	0.077	0.41
1.59	1.04	1.10	0.239	0.273	1.24
2.20	1.08	1.10	0.840	1.000	2.00
2.20	1.08	1.10	2.000	2.000	2.00
2.20	1.08	1.10	2.000	2.000	2.00
2.20	1.08	1.10	2.000	2.000	2.00
1.28	1.02	1.06	0.147	0.158	0.55
1.09	1.01	1.02	0.061	0.063	0.20
1.11	1.01	1.02	0.085	0.087	0.27
1.19	1.01	1.02	0.117	0.120	0.37
1.14	1.01	1.01	0.099	0.101	0.31
1.99	1.07	0.99	0.474	0.499	1.57
1.21	1.01	0.99	0.124	0.124	0.39
1.37	1.03	0.97	0.171	0.171	0.55
1.10	1.01	0.98	0.079	0.078	0.25
1.14	1.01	0.97	0.098	0.096	2.00
1.17	1.01	0.96	0.109	0.107	0.36
1.23	1.02	0.95	0.130	0.125	2.00
1.22	1.02	0.94	0.128	0.123	2.00
1.19	1.01	0.94	0.118	0.113	2.00
2.20	1.08	0.79	2.000	1.701	2.00
1.16	1.01	0.93	0.107	0.100	2.00
1.17	1.01	0.92	0.112	0.105	2.00
1.14	1.01	0.93	0.098	0.092	2.00
1.19	1.01	0.91	0.117	0.108	2.00
1.25	1.02	0.90	0.137	0.125	2.00
1.18	1.01	0.90	0.114	0.104	2.00
1.18	1.01	0.90	0.113	0.103	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
2	0.0	0.000	0.00	27.39
4	0.0	0.000	0.00	27.39
6	1.0	0.070	0.84	27.39
8	2.0	0.005	0.12	26.55
10	2.0	0.000	0.00	26.43
12	2.0	0.000	0.00	26.43
14	2.0	0.000	0.00	26.43
16	2.0	0.000	0.00	26.43
18	3.8	0.030	1.37	26.43
23.5	5.3	0.113	7.11	25.06
28.5	5.0	0.054	3.22	17.95
33.5	5.0	0.038	2.27	14.73
38.5	5.0	0.045	2.68	12.46
43.5	5.0	0.002	0.12	9.78
48.5	5.0	0.036	2.13	9.67
53.5	5.0	0.027	1.59	7.53
58.5	5.0	0.059	3.52	5.94
63.5	5.0	0.000	0.00	2.42
68.5	5.0	0.040	2.42	2.42
73.5	5.0	0.000	0.00	0.00
78.5	5.0	0.000	0.00	0.00
83.5	5.0	0.000	0.00	0.00
88.5	5.0	0.000	0.00	0.00
93.5	5.0	0.000	0.00	0.00
98.5	5.0	0.000	0.00	0.00
103.5	5.0	0.000	0.00	0.00
108.5	5.0	0.000	0.00	0.00
113.5	5.0	0.000	0.00	0.00
118.5	5.0	0.000	0.00	0.00
123.5	4.0	0.000	0.00	0.00
126.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 6:00 PM
Boring Designation:	B-3
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	1
SPT Liner (Yes/No):	No
Hammer Energy, %:	80
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.26
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"	
1	2.0	0	SM	38	100			
2	4.0	0	SM	38	100			
3	6.0	0	MH	99	95		Clay	
4	8.0	0	MH	99	95		Clay	
5	13.5	16	SP-SM	8	100			
6	18.5	1	SP-SM	8	100			
7	23.5	1	SM	25	100			
8	28.5	0	MH	97	95		Clay	
9	33.5	0	SP-SM	10	100			
10	38.5	3	SP-SM	10	100			
11	43.5	4	SP-SM	10	100			
12	48.5	7	ML	50	120		Clay	*Assumes Marl/Limestone NonLiq
13	53.5	4	ML	50	120		Clay	
14	58.5	7	ML	50	120		Clay	
15	63.5	5	ML	50	120		Clay	
16	68.5	10	ML	50	120		Clay	
17	73.5	8	ML	50	120		Clay	
18	78.5	6	SM	15	120		Clay	
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SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	2.0	0.0	SM	37.5	100.0		200	106	1.33	1.00	0.75	1.00	0.00	1.70	0.00	5.55	5.55	1.002	0.318
2	4.0	0.0	SM	38.0	100.0		400	182	1.33	1.00	0.75	1.00	0.00	1.70	0.00	5.55	5.55	0.997	0.371
3	6.0	0.0	MH	98.8	95.0	Clay	590	247	1.33	1.00	0.80	1.00	0.00	1.70	0.00	5.49	5.49	0.991	0.400
4	8.0	0.0	MH	98.8	95.0	Clay	780	312	1.33	1.00	0.80	1.00	0.00	1.70	0.00	5.49	5.49	0.985	0.416
5	13.5	16.0	SP-SM	7.7	100.0		1330	519	1.33	1.00	0.85	1.00	18.13	1.66	30.11	0.28	30.39	0.966	0.419
6	18.5	1.0	SP-SM	7.7	100.0		1830	707	1.33	1.00	0.95	1.00	1.27	1.70	2.15	0.28	2.44	0.947	0.414
7	23.5	1.0	SM	24.5	100.0		2330	895	1.33	1.00	0.95	1.00	1.27	1.65	2.09	5.03	7.12	0.926	0.407
8	28.5	0.0	MH	96.6	95.0	Clay	2805	1058	1.33	1.00	1.00	1.00	0.00	1.52	0.00	5.50	5.50	0.903	0.405
9	33.5	0.0	SP-SM	10.4	100.0		3305	1246	1.33	1.00	1.00	1.00	0.00	1.45	0.00	1.33	1.33	0.879	0.394
10	38.5	3.0	SP-SM	10.4	100.0		3805	1434	1.33	1.00	1.00	1.00	4.00	1.26	5.03	1.33	6.37	0.855	0.383
11	43.5	4.0	SP-SM	10.4	100.0		4305	1622	1.33	1.00	1.00	1.00	5.33	1.16	6.21	1.33	7.54	0.830	0.372
12	48.5	7.0	ML	50.0	120.0	Clay	4905	1910	1.33	1.00	1.00	1.00	9.33	1.05	9.81	5.61	15.42	0.805	0.349
13	53.5	4.0	ML	50.0	120.0	Clay	5505	2198	1.33	1.00	1.00	1.00	5.33	0.98	5.23	5.61	10.84	0.781	0.330
14	58.5	7.0	ML	50.0	120.0	Clay	6105	2486	1.33	1.00	1.00	1.00	9.33	0.92	8.62	5.61	14.23	0.757	0.314
15	63.5	5.0	ML	50.0	120.0	Clay	6705	2774	1.33	1.00	1.00	1.00	6.67	0.87	5.78	5.61	11.40	0.734	0.300
16	68.5	10.0	ML	50.0	120.0	Clay	7305	3062	1.33	1.00	1.00	1.00	13.33	0.84	11.21	5.61	16.83	0.712	0.287
17	73.5	8.0	ML	50.0	120.0	Clay	7905	3350	1.33	1.00	1.00	1.00	10.67	0.80	8.50	5.61	14.11	0.691	0.276
18	78.5	6.0	SM	15.0	120.0	Clay	8505	3638	1.33	1.00	1.00	1.00	8.00	0.74	5.93	3.26	9.20	0.672	0.266
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.12	1.01	1.10	0.089	0.099	0.31
1.12	1.01	1.10	0.089	0.099	0.27
1.12	1.01	1.10	0.089	0.099	2.00
1.12	1.01	1.10	0.089	0.099	2.00
2.02	1.07	1.10	0.510	0.600	1.43
1.10	1.01	1.07	0.072	0.078	0.19
1.14	1.01	1.07	0.099	0.107	0.26
1.12	1.01	1.05	0.089	0.095	2.00
1.09	1.01	1.03	0.067	0.069	0.18
1.13	1.01	1.03	0.094	0.098	0.26
1.15	1.01	1.02	0.102	0.105	0.28
1.33	1.02	1.01	0.160	0.165	2.00
1.21	1.01	1.00	0.124	0.125	2.00
1.29	1.02	0.98	0.150	0.150	2.00
1.22	1.02	0.97	0.128	0.127	2.00
1.38	1.03	0.96	0.172	0.169	2.00
1.29	1.02	0.95	0.149	0.144	2.00
1.18	1.01	0.95	0.113	0.108	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
2	2.5	0.050	1.51	19.78
4	2.0	0.050	1.21	18.27
6	2.0	0.000	0.00	17.07
8	3.8	0.000	0.00	17.07
13.5	5.3	0.003	0.18	17.07
18.5	5.0	0.067	4.05	16.89
23.5	5.0	0.045	2.69	12.84
28.5	5.0	0.000	0.00	10.15
33.5	5.0	0.078	4.70	10.15
38.5	5.0	0.047	2.84	5.45
43.5	5.0	0.044	2.61	2.61
48.5	5.0	0.000	0.00	0.00
53.5	5.0	0.000	0.00	0.00
58.5	5.0	0.000	0.00	0.00
63.5	5.0	0.000	0.00	0.00
68.5	5.0	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	4.0	0.000	0.00	0.00
81.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 6:01 PM
Boring Designation:	B-4
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	2
SPT Liner (Yes/No):	No
Hammer Energy, %:	80
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.26
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"	
1	2.0	1	SM	32	100			
2	4.0	0	SM	32	100			
3	6.0	0	CL	50	95		Clay	
4	8.0	1	SM	26	100			
5	13.5	2	SM	15	100			
6	18.5	5	SM	15	100			
7	23.5	3	SM	15	100			
8	28.5	3	SM	22	100			
9	33.5	2	SM	22	100			
10	38.5	0	SM	22	100			
11	43.5	4	SM	17	100			
12	48.5	2	SM	17	100			
13	53.5	4	ML	50	120		Clay	*Assumes Marl/Limestone NonLiq
14	58.5	7	MH	53	120		Clay	
15	63.5	7	MH	53	120		Clay	
16	68.5	6	MH	53	120		Clay	
17	73.5	100	SM	15	120		Clay	
18	78.5	9	SM	15	120		Clay	
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SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	2.0	1.0	SM	31.9	100.0		200	200	1.33	1.00	0.75	1.00	1.00	1.70	1.70	5.43	7.13	1.002	0.169
2	4.0	0.0	SM	31.9	100.0		400	275	1.33	1.00	0.75	1.00	0.00	1.70	0.00	5.43	5.43	0.997	0.245
3	6.0	0.0	CL	50.0	95.0	Clay	590	340	1.33	1.00	0.80	1.00	0.00	1.70	0.00	5.61	5.61	0.991	0.290
4	8.0	1.0	SM	26.0	100.0		790	416	1.33	1.00	0.80	1.00	1.07	1.70	1.81	5.15	6.96	0.985	0.316
5	13.5	2.0	SM	15.1	100.0		1340	622	1.33	1.00	0.85	1.00	2.27	1.70	3.85	3.29	7.15	0.966	0.352
6	18.5	5.0	SM	15.0	100.0		1840	810	1.33	1.00	0.95	1.00	6.33	1.62	10.25	3.26	13.51	0.947	0.363
7	23.5	3.0	SM	15.0	100.0		2340	998	1.33	1.00	0.95	1.00	3.80	1.52	5.76	3.26	9.02	0.926	0.367
8	28.5	3.0	SM	22.0	100.0		2840	1186	1.33	1.00	1.00	1.00	4.00	1.37	5.46	4.77	10.23	0.903	0.365
9	33.5	2.0	SM	21.6	100.0		3340	1374	1.33	1.00	1.00	1.00	2.67	1.28	3.40	4.72	8.12	0.879	0.361
10	38.5	0.0	SM	22.0	100.0		3840	1562	1.33	1.00	1.00	1.00	0.00	1.21	0.00	4.77	4.77	0.855	0.355
11	43.5	4.0	SM	17.0	100.0		4340	1750	1.33	1.00	1.00	1.00	5.33	1.11	5.91	3.85	9.76	0.830	0.348
12	48.5	2.0	SM	17.0	100.0		4840	1938	1.33	1.00	1.00	1.00	2.67	1.05	2.81	3.85	6.66	0.805	0.340
13	53.5	4.0	ML	50.0	120.0	Clay	5440	2226	1.33	1.00	1.00	1.00	5.33	0.97	5.19	5.61	10.81	0.781	0.322
14	58.5	7.0	MH	53.1	120.0	Clay	6040	2514	1.33	1.00	1.00	1.00	9.33	0.92	8.57	5.61	14.18	0.757	0.307
15	63.5	7.0	MH	53.1	120.0	Clay	6640	2802	1.33	1.00	1.00	1.00	9.33	0.87	8.11	5.61	13.73	0.734	0.294
16	68.5	6.0	MH	53.1	120.0	Clay	7240	3090	1.33	1.00	1.00	1.00	8.00	0.82	6.58	5.61	12.19	0.712	0.282
17	73.5	100.0	SM	15.0	120.0	Clay	7840	3378	1.33	1.00	1.00	1.00	133.33	0.88	117.89	3.26	121.15	0.691	0.271
18	78.5	9.0	SM	15.0	120.0	Clay	8440	3666	1.33	1.00	1.00	1.00	12.00	0.75	9.04	3.26	12.30	0.672	0.261
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.14	1.01	1.10	0.099	0.110	0.65
1.12	1.01	1.10	0.089	0.098	0.40
1.12	1.01	1.10	0.090	0.100	2.00
1.14	1.01	1.10	0.098	0.109	0.34
1.14	1.01	1.10	0.099	0.110	0.31
1.27	1.02	1.10	0.144	0.161	0.44
1.17	1.01	1.07	0.111	0.120	0.33
1.20	1.01	1.05	0.120	0.128	0.35
1.16	1.01	1.04	0.105	0.110	0.31
1.11	1.01	1.02	0.085	0.087	0.25
1.19	1.01	1.02	0.116	0.120	0.34
1.13	1.01	1.01	0.096	0.098	0.29
1.21	1.01	1.00	0.124	0.125	2.00
1.29	1.02	0.98	0.149	0.150	2.00
1.28	1.02	0.97	0.146	0.144	2.00
1.24	1.02	0.96	0.134	0.131	2.00
2.20	1.08	0.86	2.000	1.864	2.00
1.24	1.02	0.94	0.135	0.129	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
2	1.0	0.045	0.54	23.84
4	2.0	0.051	1.22	23.31
6	2.0	0.000	0.00	22.09
8	3.8	0.045	2.04	22.09
13.5	5.3	0.045	2.82	20.05
18.5	5.0	0.031	1.85	17.23
23.5	5.0	0.040	2.38	15.37
28.5	5.0	0.037	2.21	13.00
33.5	5.0	0.042	2.52	10.78
38.5	5.0	0.054	3.22	8.27
43.5	5.0	0.038	2.27	5.05
48.5	5.0	0.046	2.78	2.78
53.5	5.0	0.000	0.00	0.00
58.5	5.0	0.000	0.00	0.00
63.5	5.0	0.000	0.00	0.00
68.5	5.0	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	4.0	0.000	0.00	0.00
81.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:56 PM
Boring Designation:	B-5
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	0
SPT Liner (Yes/No):	No
Hammer Energy, %:	80
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.29
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	2.0	4	SP-SM	7	100		
2	4.0	6	SP-SM	7	100		
3	6.0	34	SM	15	120		
4	8.0	15	SM	15	120		
5	13.5	2	SM	20	100		
6	18.5	25	SP-SM	11	120		
7	23.5	5	SP-SM	11	100		
8	28.5	0	SM	33	100		
9	33.5	2	SM	33	100		
10	38.5	2	SM	21	100		
11	43.5	7	SM	21	100		
12	48.5	10	SM	26	100		
13	53.5	6	SM	26	100		
14	58.5	5	MH	50	120		Clay
15	63.5	4	MH	50	120		Clay
16	68.5	5	MH	50	120		Clay
17	73.5	5	MH	50	120		Clay
18	78.5	43	GC	15	120		Clay
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*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	2.0	4.0	SP-SM	6.6	100.0		200	75	1.33	1.00	0.75	1.00	4.00	1.70	6.80	0.08	6.88	1.002	0.502
2	4.0	6.0	SP-SM	6.6	100.0		400	150	1.33	1.00	0.75	1.00	6.00	1.70	10.20	0.08	10.28	0.997	0.500
3	6.0	34.0	SM	14.6	120.0		640	266	1.33	1.00	0.80	1.00	36.27	1.70	61.65	3.12	64.78	0.991	0.450
4	8.0	15.0	SM	14.6	120.0		880	381	1.33	1.00	0.80	1.00	16.00	1.70	27.20	3.12	30.32	0.985	0.429
5	13.5	2.0	SM	19.7	100.0		1430	588	1.33	1.00	0.85	1.00	2.27	1.70	3.85	4.43	8.28	0.966	0.443
6	18.5	25.0	SP-SM	10.5	120.0		2030	876	1.33	1.00	0.95	1.00	31.67	1.29	40.74	1.38	42.12	0.947	0.414
7	23.5	5.0	SP-SM	10.5	100.0		2530	1064	1.33	1.00	0.95	1.00	6.33	1.44	9.15	1.38	10.53	0.926	0.415
8	28.5	0.0	SM	32.8	100.0		3030	1252	1.33	1.00	1.00	1.00	0.00	1.37	0.00	5.46	5.46	0.903	0.412
9	33.5	2.0	SM	32.8	100.0		3530	1440	1.33	1.00	1.00	1.00	2.67	1.24	3.30	5.46	8.76	0.879	0.406
10	38.5	2.0	SM	20.9	100.0		4030	1628	1.33	1.00	1.00	1.00	2.67	1.16	3.10	4.62	7.72	0.855	0.399
11	43.5	7.0	SM	20.9	100.0		4530	1816	1.33	1.00	1.00	1.00	9.33	1.08	10.06	4.62	14.68	0.830	0.390
12	48.5	10.0	SM	26.0	100.0		5030	2004	1.33	1.00	1.00	1.00	13.33	1.02	13.67	5.15	18.81	0.805	0.381
13	53.5	6.0	SM	26.0	100.0		5530	2192	1.33	1.00	1.00	1.00	8.00	0.98	7.86	5.15	13.01	0.781	0.371
14	58.5	5.0	MH	50.0	120.0	Clay	6130	2480	1.33	1.00	1.00	1.00	6.67	0.92	6.14	5.61	11.75	0.757	0.353
15	63.5	4.0	MH	50.0	120.0	Clay	6730	2768	1.33	1.00	1.00	1.00	5.33	0.87	4.62	5.61	10.23	0.734	0.336
16	68.5	5.0	MH	50.0	120.0	Clay	7330	3056	1.33	1.00	1.00	1.00	6.67	0.82	5.49	5.61	11.11	0.712	0.322
17	73.5	5.0	MH	50.0	120.0	Clay	7930	3344	1.33	1.00	1.00	1.00	6.67	0.78	5.23	5.61	10.84	0.691	0.309
18	78.5	43.0	GC	15.0	120.0	Clay	8530	3632	1.33	1.00	1.00	1.00	57.33	0.87	49.74	3.26	53.00	0.672	0.298
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.14	1.01	1.10	0.097	0.108	0.22
1.20	1.01	1.10	0.120	0.134	0.27
2.20	1.08	1.10	2.000	2.000	2.00
2.02	1.07	1.10	0.506	0.595	1.39
1.16	1.01	1.10	0.106	0.118	0.27
2.20	1.08	1.10	2.000	2.000	2.00
1.20	1.01	1.06	0.122	0.131	0.32
1.12	1.01	1.04	0.089	0.093	0.23
1.17	1.01	1.03	0.110	0.115	0.28
1.15	1.01	1.02	0.103	0.106	0.27
1.31	1.02	1.02	0.153	0.159	0.41
1.45	1.03	1.01	0.192	0.199	0.52
1.26	1.02	1.00	0.140	0.142	0.38
1.23	1.02	0.98	0.131	0.131	2.00
1.20	1.01	0.98	0.120	0.118	2.00
1.21	1.01	0.96	0.126	0.123	2.00
1.21	1.01	0.96	0.124	0.120	2.00
2.20	1.08	0.84	2.000	1.818	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
2	3.0	0.046	1.64	20.60
4	2.0	0.037	0.88	18.96
6	2.0	0.000	0.00	18.08
8	3.8	0.003	0.14	18.08
13.5	5.3	0.042	2.61	17.94
18.5	5.0	0.000	0.00	15.32
23.5	5.0	0.036	2.17	15.32
28.5	5.0	0.051	3.04	13.15
33.5	5.0	0.040	2.42	10.11
38.5	5.0	0.043	2.58	7.69
43.5	5.0	0.029	1.75	5.11
48.5	5.0	0.024	1.45	3.36
53.5	5.0	0.032	1.90	1.90
58.5	5.0	0.000	0.00	0.00
63.5	5.0	0.000	0.00	0.00
68.5	5.0	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	4.0	0.000	0.00	0.00
81.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:56 PM
Boring Designation:	B-6
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	0
SPT Liner (Yes/No):	No
Hammer Energy, %:	80
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.29
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	2.0	12	SM	17	100		
2	4.0	9	SM	17	100		
3	6.0	16	SM	16	120		
4	8.0	26	SM	16	120		
5	13.5	0	SM	26	100		
6	18.5	20	SM	14	120		
7	23.5	33	SM	14	120		
8	28.5	0	SP-SM	11	100		
9	33.5	4	SM	18	100		
10	38.5	13	SM	18	100		
11	43.5	25	SM	18	120		
12	48.5	33	SM	18	120		
13	53.5	8	SM	18	100		
14	58.5	5	MH	50	120		Clay
15	63.5	5	MH	50	120		Clay
16	68.5	7	MH	50	120		Clay
17	73.5	6	MH	50	120		Clay
18	78.5	100	ML	50	120		Clay
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*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	2.0	12.0	SM	17.2	100.0		200	75	1.33	1.00	0.75	1.00	12.00	1.70	20.40	3.90	24.30	1.002	0.502
2	4.0	9.0	SM	17.2	100.0		400	150	1.33	1.00	0.75	1.00	9.00	1.70	15.30	3.90	19.20	0.997	0.500
3	6.0	16.0	SM	15.7	120.0		640	266	1.33	1.00	0.80	1.00	17.07	1.70	29.01	3.49	32.50	0.991	0.450
4	8.0	26.0	SM	15.7	120.0		880	381	1.33	1.00	0.80	1.00	27.73	1.57	43.55	3.49	47.03	0.985	0.429
5	13.5	0.0	SM	26.1	100.0		1430	588	1.33	1.00	0.85	1.00	0.00	1.70	0.00	5.15	5.15	0.966	0.443
6	18.5	20.0	SM	13.7	120.0		2030	876	1.33	1.00	0.95	1.00	25.33	1.33	33.62	2.79	36.41	0.947	0.414
7	23.5	33.0	SM	13.7	120.0		2630	1164	1.33	1.00	0.95	1.00	41.80	1.17	48.92	2.79	51.71	0.926	0.394
8	28.5	0.0	SP-SM	11.0	100.0		3130	1352	1.33	1.00	1.00	1.00	0.00	1.36	0.00	1.61	1.61	0.903	0.394
9	33.5	4.0	SM	18.3	100.0		3630	1540	1.33	1.00	1.00	1.00	5.33	1.19	6.32	4.16	10.48	0.879	0.391
10	38.5	13.0	SM	18.3	100.0		4130	1728	1.33	1.00	1.00	1.00	17.33	1.09	18.86	4.16	23.01	0.855	0.385
11	43.5	25.0	SM	18.3	120.0		4730	2016	1.33	1.00	1.00	1.00	33.33	1.02	33.84	4.16	38.00	0.830	0.367
12	48.5	33.0	SM	18.3	120.0		5330	2304	1.33	1.00	1.00	1.00	44.00	0.98	43.03	4.16	47.18	0.805	0.351
13	53.5	8.0	SM	18.3	100.0		5830	2492	1.33	1.00	1.00	1.00	10.67	0.92	9.84	4.16	13.99	0.781	0.344
14	58.5	5.0	MH	50.0	120.0	Clay	6430	2780	1.33	1.00	1.00	1.00	6.67	0.87	5.78	5.61	11.39	0.757	0.330
15	63.5	5.0	MH	50.0	120.0	Clay	7030	3068	1.33	1.00	1.00	1.00	6.67	0.82	5.48	5.61	11.09	0.734	0.317
16	68.5	7.0	MH	50.0	120.0	Clay	7630	3356	1.33	1.00	1.00	1.00	9.33	0.79	7.39	5.61	13.00	0.712	0.305
17	73.5	6.0	MH	50.0	120.0	Clay	8230	3644	1.33	1.00	1.00	1.00	8.00	0.75	6.02	5.61	11.64	0.691	0.294
18	78.5	100.0	ML	50.0	120.0	Clay	8830	3932	1.33	1.00	1.00	1.00	133.33	0.85	113.28	5.61	118.89	0.672	0.284
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.69	1.05	1.10	0.274	0.316	0.63
1.46	1.03	1.10	0.197	0.223	0.45
2.15	1.08	1.10	0.698	0.828	1.84
2.20	1.08	1.10	2.000	2.000	2.00
1.12	1.01	1.10	0.087	0.096	0.22
2.20	1.08	1.10	1.514	1.802	2.00
2.20	1.08	1.10	2.000	2.000	2.00
1.09	1.01	1.03	0.068	0.071	0.18
1.20	1.01	1.03	0.121	0.127	0.32
1.62	1.04	1.03	0.250	0.268	0.70
2.20	1.08	1.01	2.000	2.000	2.00
2.20	1.08	0.97	2.000	2.000	2.00
1.29	1.02	0.98	0.148	0.148	0.43
1.22	1.01	0.97	0.128	0.126	2.00
1.21	1.01	0.96	0.126	0.123	2.00
1.26	1.02	0.95	0.140	0.136	2.00
1.23	1.02	0.95	0.130	0.125	2.00
2.20	1.08	0.82	2.000	1.768	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
2	3.0	0.019	0.70	14.28
4	2.0	0.024	0.57	13.58
6	2.0	0.001	0.01	13.01
8	3.8	0.000	0.00	13.00
13.5	5.3	0.052	3.27	13.00
18.5	5.0	0.000	0.00	9.72
23.5	5.0	0.000	0.00	9.72
28.5	5.0	0.075	4.51	9.72
33.5	5.0	0.036	2.18	5.22
38.5	5.0	0.020	1.23	3.04
43.5	5.0	0.000	0.00	1.81
48.5	5.0	0.000	0.00	1.81
53.5	5.0	0.030	1.81	1.81
58.5	5.0	0.000	0.00	0.00
63.5	5.0	0.000	0.00	0.00
68.5	5.0	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	4.0	0.000	0.00	0.00
81.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 6:01 PM
Boring Designation:	B-7
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	0
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.26
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"	
1	2.0	9	SM	13	100			
2	4.0	4	SM	13	100			
3	6.0	0	SM	18	100			
4	8.0	1	SM	18	100			
5	13.5	2	SM	31	100			
6	18.5	4	SP-SM	11	100			
7	23.5	17	SP-SM	11	100			
8	28.5	4	SP-SM	11	100			
9	33.5	2	CL	50	100		Clay	
10	38.5	1	SM	18	100			
11	43.5	4	SM	18	100			
12	48.5	5	SM	18	100			
13	53.5	10	ML	50	120		Clay	*Assumes Marl/Limestone NonLiq
14	58.5	4	ML	50	120		Clay	
15	63.5	8	ML	50	120		Clay	
16	68.5	8	SM	15	120		Clay	
17	73.5	100	SM	15	120		Clay	
18	78.5	12	SM	15	120		Clay	
19	83.5	6	SM	15	120		Clay	
20	88.5	6	SM	15	120		Clay	
21	93.5	12	SM	15	120		Clay	
22	98.5	13	SM	15	120		Clay	
23	103.5	11	SM	15	120		Clay	
24	108.5	6	SM	15	120		Clay	
25	113.5	11	SM	15	120		Clay	
26	118.5	9	SM	15	120		Clay	
27	123.5	7	SM	15	120		Clay	
28	128.5	13	SM	15	120		Clay	
29	133.5	12	SM	15	120		Clay	
30	138.5	11	SM	15	120		Clay	
31	143.5	9	SM	15	120		Clay	
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SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	2.0	9.0	SM	12.8	100.0		200	75	1.39	1.00	0.75	1.00	9.35	1.70	15.89	2.42	18.32	1.002	0.450
2	4.0	4.0	SM	12.8	100.0		400	150	1.39	1.00	0.75	1.00	4.16	1.70	7.06	2.42	9.49	0.997	0.448
3	6.0	0.0	SM	18.2	100.0		600	226	1.39	1.00	0.80	1.00	0.00	1.70	0.00	4.13	4.13	0.991	0.445
4	8.0	1.0	SM	18.2	100.0		800	301	1.39	1.00	0.80	1.00	1.11	1.70	1.88	4.13	6.02	0.985	0.443
5	13.5	2.0	SM	31.3	100.0		1350	508	1.39	1.00	0.85	1.00	2.35	1.70	4.00	5.41	9.41	0.966	0.434
6	18.5	4.0	SP-SM	10.8	100.0		1850	696	1.39	1.00	0.95	1.00	5.26	1.70	8.95	1.52	10.47	0.947	0.426
7	23.5	17.0	SP-SM	10.8	100.0		2350	884	1.39	1.00	0.95	1.00	22.37	1.36	30.37	1.52	31.89	0.926	0.416
8	28.5	4.0	SP-SM	10.8	100.0		2850	1072	1.39	1.00	1.00	1.00	5.54	1.45	8.04	1.52	9.55	0.903	0.406
9	33.5	2.0	CL	50.0	100.0	Clay	3350	1260	1.39	1.00	1.00	1.00	2.77	1.33	3.68	5.61	9.30	0.879	0.395
10	38.5	1.0	SM	17.9	100.0		3850	1448	1.39	1.00	1.00	1.00	1.39	1.26	1.74	4.07	5.81	0.855	0.384
11	43.5	4.0	SM	17.9	100.0		4350	1636	1.39	1.00	1.00	1.00	5.54	1.15	6.36	4.07	10.43	0.830	0.373
12	48.5	5.0	SM	17.9	100.0		4850	1824	1.39	1.00	1.00	1.00	6.93	1.08	7.49	4.07	11.55	0.805	0.362
13	53.5	10.0	ML	50.0	120.0	Clay	5450	2112	1.39	1.00	1.00	1.00	13.85	1.00	13.86	5.61	19.48	0.781	0.341
14	58.5	4.0	ML	50.0	120.0	Clay	6050	2400	1.39	1.00	1.00	1.00	5.54	0.94	5.18	5.61	10.80	0.757	0.322
15	63.5	8.0	ML	50.0	120.0	Clay	6650	2688	1.39	1.00	1.00	1.00	11.08	0.89	9.87	5.61	15.49	0.734	0.307
16	68.5	8.0	SM	15.0	120.0	Clay	7250	2976	1.39	1.00	1.00	1.00	11.08	0.84	9.31	3.26	12.57	0.712	0.293
17	73.5	100.0	SM	15.0	120.0	Clay	7850	3264	1.39	1.00	1.00	1.00	138.50	0.89	123.58	3.26	126.84	0.691	0.281
18	78.5	12.0	SM	15.0	120.0	Clay	8450	3552	1.39	1.00	1.00	1.00	16.62	0.78	13.00	3.26	16.26	0.672	0.270
19	83.5	6.0	SM	15.0	120.0	Clay	9050	3840	1.39	1.00	1.00	1.00	8.31	0.72	5.99	3.26	9.25	0.654	0.261
20	88.5	6.0	SM	15.0	120.0	Clay	9650	4128	1.39	1.00	1.00	1.00	8.31	0.69	5.74	3.26	9.00	0.639	0.252
21	93.5	12.0	SM	15.0	120.0	Clay	10250	4416	1.39	1.00	1.00	1.00	16.62	0.70	11.61	3.26	14.87	0.625	0.245
22	98.5	13.0	SM	15.0	120.0	Clay	10850	4704	1.39	1.00	1.00	1.00	18.01	0.68	12.26	3.26	15.52	0.613	0.239
23	103.5	11.0	SM	15.0	120.0	Clay	11450	4992	1.39	1.00	1.00	1.00	15.24	0.65	9.87	3.26	13.13	0.603	0.234
24	108.5	6.0	SM	15.0	120.0	Clay	12050	5280	1.39	1.00	1.00	1.00	8.31	0.60	4.96	3.26	8.22	0.596	0.230
25	113.5	11.0	SM	15.0	120.0	Clay	12650	5568	1.39	1.00	1.00	1.00	15.24	0.61	9.28	3.26	12.55	0.590	0.227
26	118.5	9.0	SM	15.0	120.0	Clay	13250	5856	1.39	1.00	1.00	1.00	12.47	0.58	7.23	3.26	10.49	0.587	0.224
27	123.5	7.0	SM	15.0	120.0	Clay	13850	6144	1.39	1.00	1.00	1.00	9.70	0.55	5.34	3.26	8.61	0.586	0.223
28	128.5	13.0	SM	15.0	120.0	Clay	14450	6432	1.39	1.00	1.00	1.00	18.01	0.57	10.32	3.26	13.58	0.588	0.223
29	133.5	12.0	SM	15.0	120.0	Clay	15050	6720	1.39	1.00	1.00	1.00	16.62	0.55	9.19	3.26	12.45	0.592	0.224
30	138.5	11.0	SM	15.0	120.0	Clay	15650	7008	1.39	1.00	1.00	1.00	15.24	0.53	8.13	3.26	11.39	0.598	0.226
31	143.5	9.0	SM	15.0	120.0	Clay	16250	7296	1.39	1.00	1.00	1.00	12.47	0.51	6.34	3.26	9.60	0.607	0.228
32																			
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.43	1.03	1.10	0.187	0.212	0.47
1.18	1.01	1.10	0.115	0.128	0.28
1.11	1.01	1.10	0.081	0.090	0.20
1.13	1.01	1.10	0.092	0.102	0.23
1.18	1.01	1.10	0.114	0.127	0.29
1.20	1.01	1.10	0.121	0.135	0.32
2.11	1.08	1.10	0.633	0.749	1.80
1.18	1.01	1.06	0.115	0.124	0.30
1.18	1.01	1.05	0.113	0.120	2.00
1.12	1.01	1.03	0.091	0.094	0.25
1.20	1.01	1.02	0.121	0.126	0.34
1.22	1.02	1.01	0.129	0.133	0.37
1.47	1.03	1.00	0.200	0.206	2.00
1.21	1.01	0.99	0.124	0.124	2.00
1.33	1.02	0.97	0.160	0.159	2.00
1.25	1.02	0.97	0.137	0.134	2.00
2.20	1.08	0.87	2.000	1.886	2.00
1.36	1.02	0.94	0.167	0.161	2.00
1.18	1.01	0.95	0.113	0.108	2.00
1.17	1.01	0.94	0.111	0.106	2.00
1.31	1.02	0.92	0.155	0.145	2.00
1.33	1.02	0.91	0.161	0.149	2.00
1.26	1.02	0.91	0.141	0.131	2.00
1.16	1.01	0.92	0.106	0.099	2.00
1.25	1.02	0.90	0.137	0.125	2.00
1.20	1.01	0.90	0.122	0.111	2.00
1.16	1.01	0.91	0.109	0.100	2.00
1.28	1.02	0.88	0.145	0.130	2.00
1.25	1.02	0.88	0.136	0.122	2.00
1.22	1.01	0.88	0.128	0.115	2.00
1.18	1.01	0.89	0.115	0.104	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
2	3.0	0.025	0.89	19.53
4	2.0	0.039	0.92	18.64
6	2.0	0.057	1.36	17.71
8	3.8	0.049	2.18	16.35
13.5	5.3	0.039	2.44	14.17
18.5	5.0	0.036	2.18	11.73
23.5	5.0	0.001	0.05	9.55
28.5	5.0	0.038	2.30	9.50
33.5	5.0	0.000	0.00	7.20
38.5	5.0	0.049	2.96	7.20
43.5	5.0	0.036	2.19	4.24
48.5	5.0	0.034	2.05	2.05
53.5	5.0	0.000	0.00	0.00
58.5	5.0	0.000	0.00	0.00
63.5	5.0	0.000	0.00	0.00
68.5	5.0	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	5.0	0.000	0.00	0.00
83.5	5.0	0.000	0.00	0.00
88.5	5.0	0.000	0.00	0.00
93.5	5.0	0.000	0.00	0.00
98.5	5.0	0.000	0.00	0.00
103.5	5.0	0.000	0.00	0.00
108.5	5.0	0.000	0.00	0.00
113.5	5.0	0.000	0.00	0.00
118.5	5.0	0.000	0.00	0.00
123.5	5.0	0.000	0.00	0.00
128.5	5.0	0.000	0.00	0.00
133.5	5.0	0.000	0.00	0.00
138.5	5.0	0.000	0.00	0.00
143.5	4.0	0.000	0.00	0.00
146.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 6:02 PM
Boring Designation:	B-8
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	0
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.26
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	2.0	3	SP-SM	12	100		
2	4.0	5	SP-SM	12	100		
3	6.0	4	SP-SM	12	100		
4	8.0	2	SP-SM	12	100		
5	10.0	2	SP-SM	12	100		
6	13.5	0	CL	68	95		Clay
7	18.5	0	CL	68	95		Clay
8	23.5	0	SC	35	100		
9	28.5	2	SM	22	100		
10	33.5	4	SM	22	100		
11	38.5	2	CL	50	95		Clay
12	43.5	8	SP-SM	7	100		
13	48.5	7	SP-SM	8	100		
14	53.5	5	SM	15	120		Clay
15	58.5	6	ML	50	120		Clay
16	63.5	6	ML	50	120		Clay
17	68.5	5	ML	50	120		Clay
18	73.5	18	ML	50	120		Clay
19	78.5	13	SM	15	120		Clay
20	83.5	5	SM	15	120		Clay
21	88.5	8	SM	15	120		Clay
22	93.5	9	SM	15	120		Clay
23	98.5	8	SM	15	120		Clay
24	103.5	9	SM	15	120		Clay
25	108.5	6	SM	15	120		Clay
26	113.5	12	SM	15	120		Clay
27	118.5	9	SM	15	120		Clay
28	123.5	7	SM	15	120		Clay
29	128.5	19	SM	15	120		Clay
30	133.5	11	SM	15	120		Clay
31	138.5		SM	15	120		Clay
32	143.5	10	SM	15	120		Clay
33	148.5	11	SM	15	120		Clay
34							
35							
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*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	2.0	3.0	SP-SM	11.9	100.0		200	75	1.39	1.00	0.75	1.00	3.12	1.70	5.30	2.03	7.32	1.002	0.450
2	4.0	5.0	SP-SM	11.9	100.0		400	150	1.39	1.00	0.75	1.00	5.19	1.70	8.83	2.03	10.86	0.997	0.448
3	6.0	4.0	SP-SM	11.9	100.0		600	226	1.39	1.00	0.80	1.00	4.43	1.70	7.53	2.03	9.56	0.991	0.445
4	8.0	2.0	SP-SM	11.9	100.0		800	301	1.39	1.00	0.80	1.00	2.22	1.70	3.77	2.03	5.79	0.985	0.443
5	10.0	2.0	SP-SM	11.9	100.0		1000	376	1.39	1.00	0.85	1.00	2.35	1.70	4.00	2.03	6.03	0.978	0.440
6	13.5	0.0	CL	67.5	95.0	Clay	1333	490	1.39	1.00	0.85	1.00	0.00	1.70	0.00	5.58	5.58	0.966	0.444
7	18.5	0.0	CL	67.5	95.0	Clay	1808	653	1.39	1.00	0.95	1.00	0.00	1.70	0.00	5.58	5.58	0.947	0.443
8	23.5	0.0	SC	34.9	100.0		2308	841	1.39	1.00	0.95	1.00	0.00	1.70	0.00	5.50	5.50	0.926	0.429
9	28.5	2.0	SM	22.0	100.0		2808	1029	1.39	1.00	1.00	1.00	2.77	1.49	4.13	4.77	8.90	0.903	0.416
10	33.5	4.0	SM	22.0	100.0		3308	1217	1.39	1.00	1.00	1.00	5.54	1.33	7.37	4.77	12.14	0.879	0.404
11	38.5	2.0	CL	50.0	95.0	Clay	3783	1380	1.39	1.00	1.00	1.00	2.77	1.27	3.51	5.61	9.12	0.855	0.396
12	43.5	8.0	SP-SM	6.5	100.0		4283	1568	1.39	1.00	1.00	1.00	11.08	1.16	12.90	0.07	12.97	0.830	0.383
13	48.5	7.0	SP-SM	8.2	100.0		4783	1756	1.39	1.00	1.00	1.00	9.70	1.10	10.70	0.43	11.13	0.805	0.371
14	53.5	5.0	SM	15.0	120.0	Clay	5383	2044	1.39	1.00	1.00	1.00	6.93	1.02	7.05	3.26	10.32	0.781	0.347
15	58.5	6.0	ML	50.0	120.0	Clay	5983	2332	1.39	1.00	1.00	1.00	8.31	0.95	7.91	5.61	13.53	0.757	0.328
16	63.5	6.0	ML	50.0	120.0	Clay	6583	2620	1.39	1.00	1.00	1.00	8.31	0.90	7.46	5.61	13.07	0.734	0.312
17	68.5	5.0	ML	50.0	120.0	Clay	7183	2908	1.39	1.00	1.00	1.00	6.93	0.85	5.86	5.61	11.48	0.712	0.297
18	73.5	18.0	ML	50.0	120.0	Clay	7783	3196	1.39	1.00	1.00	1.00	24.93	0.85	21.26	5.61	26.88	0.691	0.284
19	78.5	13.0	SM	15.0	120.0	Clay	8383	3484	1.39	1.00	1.00	1.00	18.01	0.79	14.30	3.26	17.56	0.672	0.273
20	83.5	5.0	SM	15.0	120.0	Clay	8983	3772	1.39	1.00	1.00	1.00	6.93	0.72	5.00	3.26	8.26	0.654	0.263
21	88.5	8.0	SM	15.0	120.0	Clay	9583	4060	1.39	1.00	1.00	1.00	11.08	0.71	7.85	3.26	11.12	0.639	0.255
22	93.5	9.0	SM	15.0	120.0	Clay	10183	4348	1.39	1.00	1.00	1.00	12.47	0.69	8.57	3.26	11.83	0.625	0.247
23	98.5	8.0	SM	15.0	120.0	Clay	10783	4636	1.39	1.00	1.00	1.00	11.08	0.66	7.29	3.26	10.55	0.613	0.241
24	103.5	9.0	SM	15.0	120.0	Clay	11383	4924	1.39	1.00	1.00	1.00	12.47	0.64	7.99	3.26	11.25	0.603	0.236
25	108.5	6.0	SM	15.0	120.0	Clay	11983	5212	1.39	1.00	1.00	1.00	8.31	0.60	5.00	3.26	8.26	0.596	0.231
26	113.5	12.0	SM	15.0	120.0	Clay	12583	5500	1.39	1.00	1.00	1.00	16.62	0.62	10.30	3.26	13.56	0.590	0.228
27	118.5	9.0	SM	15.0	120.0	Clay	13183	5788	1.39	1.00	1.00	1.00	12.47	0.58	7.28	3.26	10.54	0.587	0.226
28	123.5	7.0	SM	15.0	120.0	Clay	13783	6076	1.39	1.00	1.00	1.00	9.70	0.55	5.38	3.26	8.64	0.586	0.225
29	128.5	19.0	SM	15.0	120.0	Clay	14383	6364	1.39	1.00	1.00	1.00	26.32	0.61	16.10	3.26	19.36	0.588	0.224
30	133.5	11.0	SM	15.0	120.0	Clay	14983	6652	1.39	1.00	1.00	1.00	15.24	0.55	8.38	3.26	11.64	0.592	0.225
31	138.5	0.0	SM	15.0	120.0	Clay	15583	6940	1.39	1.00	1.00	1.00	0.00	0.46	0.00	3.26	3.26	0.598	0.227
32	143.5	10.0	SM	15.0	120.0	Clay	16183	7228	1.39	1.00	1.00	1.00	13.85	0.52	7.17	3.26	10.43	0.607	0.230
33	148.5	11.0	SM	15.0	120.0	Clay	16783	7516	1.39	1.00	1.00	1.00	15.24	0.51	7.80	3.26	11.06	0.618	0.233
34																			
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49																			
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.14	1.01	1.10	0.100	0.111	0.25
1.21	1.01	1.10	0.124	0.138	0.31
1.18	1.01	1.10	0.115	0.128	0.29
1.12	1.01	1.10	0.091	0.101	0.23
1.13	1.01	1.10	0.092	0.102	0.23
1.12	1.01	1.10	0.090	0.099	2.00
1.12	1.01	1.09	0.090	0.099	2.00
1.12	1.01	1.07	0.089	0.096	0.22
1.17	1.01	1.06	0.111	0.119	0.29
1.24	1.02	1.06	0.133	0.143	0.35
1.17	1.01	1.04	0.112	0.118	2.00
1.26	1.02	1.03	0.140	0.147	0.38
1.21	1.01	1.02	0.126	0.130	0.35
1.20	1.01	1.00	0.120	0.122	2.00
1.27	1.02	0.99	0.144	0.145	2.00
1.26	1.02	0.98	0.141	0.140	2.00
1.22	1.02	0.97	0.129	0.127	2.00
1.82	1.06	0.93	0.342	0.335	2.00
1.40	1.03	0.94	0.179	0.173	2.00
1.16	1.01	0.95	0.106	0.102	2.00
1.21	1.01	0.94	0.126	0.120	2.00
1.23	1.02	0.93	0.131	0.124	2.00
1.20	1.01	0.93	0.122	0.114	2.00
1.22	1.01	0.92	0.127	0.118	2.00
1.16	1.01	0.92	0.106	0.099	2.00
1.28	1.02	0.90	0.144	0.132	2.00
1.20	1.01	0.91	0.122	0.112	2.00
1.17	1.01	0.91	0.109	0.100	2.00
1.47	1.03	0.86	0.198	0.175	2.00
1.23	1.02	0.89	0.130	0.117	2.00
1.10	1.01	0.92	0.077	0.071	2.00
1.20	1.01	0.88	0.121	0.109	2.00
1.21	1.01	0.88	0.126	0.112	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
2	3.0	0.044	1.59	17.57
4	2.0	0.036	0.85	15.98
6	2.0	0.038	0.92	15.13
8	2.0	0.049	1.18	14.21
10	2.8	0.048	1.60	13.02
13.5	4.3	0.000	0.00	11.42
18.5	5.0	0.000	0.00	11.42
23.5	5.0	0.050	3.03	11.42
28.5	5.0	0.040	2.39	8.39
33.5	5.0	0.033	1.99	6.00
38.5	5.0	0.000	0.00	4.01
43.5	5.0	0.032	1.91	4.01
48.5	5.0	0.035	2.10	2.10
53.5	5.0	0.000	0.00	0.00
58.5	5.0	0.000	0.00	0.00
63.5	5.0	0.000	0.00	0.00
68.5	5.0	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	5.0	0.000	0.00	0.00
83.5	5.0	0.000	0.00	0.00
88.5	5.0	0.000	0.00	0.00
93.5	5.0	0.000	0.00	0.00
98.5	5.0	0.000	0.00	0.00
103.5	5.0	0.000	0.00	0.00
108.5	5.0	0.000	0.00	0.00
113.5	5.0	0.000	0.00	0.00
118.5	5.0	0.000	0.00	0.00
123.5	5.0	0.000	0.00	0.00
128.5	5.0	0.000	0.00	0.00
133.5	5.0	0.000	0.00	0.00
138.5	5.0	0.000	0.00	0.00
143.5	5.0	0.000	0.00	0.00
148.5	4.0	0.000	0.00	0.00
151.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 6:03 PM
Boring Designation:	B-9
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	0
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.26
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	0.5	0	ML	50	95		Clay
2	2.0	5	SP-SM	8	100		
3	4.0	6	SP-SM	7	100		
4	6.0	0	SP-SM	7	100		
5	8.0	2	SP-SM	10	100		
6	13.5	0	SP-SM	10	100		
7	18.5	0	CL	79	95		Clay
8	23.5	0	CL	79	95		Clay
9	28.5	0	CL	79	95		Clay
10	33.5	1	CL	79	95		Clay
11	38.5	2	CL	79	95		Clay
12	43.5	7	SP-SM	8	100		
13	48.5	4	SP-SM	8	100		
14	53.5	4	ML	50	120		Clay
15	58.5	5	ML	50	120		Clay
16	63.5	7	ML	50	120		Clay
17	68.5	5	ML	50	120		Clay
18	73.5	13	ML	50	120		Clay
19	78.5	100	SM	15	120		Clay
20	83.5	5	SM	15	120		Clay
21	88.5	8	SM	15	120		Clay
22	93.5	8	SM	15	120		Clay
23	98.5	8	SM	15	120		Clay
24	103.5	14	SM	15	120		Clay
25	108.5	8	SM	15	120		Clay
26	113.5	7	SM	15	120		Clay
27	118.5	7	SM	15	120		Clay
28	123.5	6	SM	15	120		Clay
29	128.5	6	SM	15	120		Clay
30	133.5	13	ML	50	120		Clay
31	138.5	11	ML	50	120		Clay
32	143.5	11	SM	15	120		Clay
33	148.5	10	SM	15	120		Clay
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*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	0.5	0.0	ML	50.0	95.0	Clay	48	16	1.39	1.00	0.75	1.00	0.00	1.70	0.00	5.61	5.61	1.005	0.495
2	2.0	5.0	SP-SM	7.7	100.0		198	73	1.39	1.00	0.75	1.00	5.19	1.70	8.83	0.28	9.11	1.002	0.460
3	4.0	6.0	SP-SM	7.2	100.0		398	148	1.39	1.00	0.75	1.00	6.23	1.70	10.60	0.17	10.77	0.997	0.453
4	6.0	0.0	SP-SM	7.0	100.0		598	223	1.39	1.00	0.80	1.00	0.00	1.70	0.00	0.14	0.14	0.991	0.448
5	8.0	2.0	SP-SM	10.3	100.0		798	298	1.39	1.00	0.80	1.00	2.22	1.70	3.77	1.29	5.05	0.985	0.445
6	13.5	0.0	SP-SM	10.0	100.0		1348	505	1.39	1.00	0.85	1.00	0.00	1.70	0.00	1.15	1.15	0.966	0.436
7	18.5	0.0	CL	79.0	95.0	Clay	1823	668	1.39	1.00	0.95	1.00	0.00	1.70	0.00	5.55	5.55	0.947	0.436
8	23.5	0.0	CL	79.0	95.0	Clay	2298	831	1.39	1.00	0.95	1.00	0.00	1.70	0.00	5.55	5.55	0.926	0.432
9	28.5	0.0	CL	79.1	95.0	Clay	2773	994	1.39	1.00	1.00	1.00	0.00	1.58	0.00	5.55	5.55	0.903	0.426
10	33.5	1.0	CL	79.0	95.0	Clay	3248	1157	1.39	1.00	1.00	1.00	1.39	1.41	1.96	5.55	7.51	0.879	0.417
11	38.5	2.0	CL	79.0	95.0	Clay	3723	1320	1.39	1.00	1.00	1.00	2.77	1.30	3.59	5.55	9.14	0.855	0.407
12	43.5	7.0	SP-SM	7.5	100.0		4223	1508	1.39	1.00	1.00	1.00	9.70	1.19	11.56	0.23	11.80	0.830	0.393
13	48.5	4.0	SP-SM	8.0	100.0		4723	1696	1.39	1.00	1.00	1.00	5.54	1.14	6.31	0.37	6.67	0.805	0.379
14	53.5	4.0	ML	50.0	120.0	Clay	5323	1984	1.39	1.00	1.00	1.00	5.54	1.03	5.73	5.61	11.35	0.781	0.354
15	58.5	5.0	ML	50.0	120.0	Clay	5923	2272	1.39	1.00	1.00	1.00	6.93	0.96	6.68	5.61	12.29	0.757	0.333
16	63.5	7.0	ML	50.0	120.0	Clay	6523	2560	1.39	1.00	1.00	1.00	9.70	0.91	8.83	5.61	14.44	0.734	0.316
17	68.5	5.0	ML	50.0	120.0	Clay	7123	2848	1.39	1.00	1.00	1.00	6.93	0.86	5.93	5.61	11.54	0.712	0.301
18	73.5	13.0	ML	50.0	120.0	Clay	7723	3136	1.39	1.00	1.00	1.00	18.01	0.84	15.18	5.61	20.79	0.691	0.288
19	78.5	100.0	SM	15.0	120.0	Clay	8323	3424	1.39	1.00	1.00	1.00	138.50	0.88	122.03	3.26	125.29	0.672	0.276
20	83.5	5.0	SM	15.0	120.0	Clay	8923	3712	1.39	1.00	1.00	1.00	6.93	0.73	5.05	3.26	8.31	0.654	0.266
21	88.5	8.0	SM	15.0	120.0	Clay	9523	4000	1.39	1.00	1.00	1.00	11.08	0.71	7.92	3.26	11.18	0.639	0.257
22	93.5	8.0	SM	15.0	120.0	Clay	10123	4288	1.39	1.00	1.00	1.00	11.08	0.69	7.62	3.26	10.88	0.625	0.249
23	98.5	8.0	SM	15.0	120.0	Clay	10723	4576	1.39	1.00	1.00	1.00	11.08	0.66	7.34	3.26	10.60	0.613	0.243
24	103.5	14.0	SM	15.0	120.0	Clay	11323	4864	1.39	1.00	1.00	1.00	19.39	0.67	13.07	3.26	16.33	0.603	0.237
25	108.5	8.0	SM	15.0	120.0	Clay	11923	5152	1.39	1.00	1.00	1.00	11.08	0.62	6.85	3.26	10.12	0.596	0.233
26	113.5	7.0	SM	15.0	120.0	Clay	12523	5440	1.39	1.00	1.00	1.00	9.70	0.59	5.75	3.26	9.01	0.590	0.230
27	118.5	7.0	SM	15.0	120.0	Clay	13123	5728	1.39	1.00	1.00	1.00	9.70	0.57	5.57	3.26	8.84	0.587	0.227
28	123.5	6.0	SM	15.0	120.0	Clay	13723	6016	1.39	1.00	1.00	1.00	8.31	0.55	4.59	3.26	7.85	0.586	0.226
29	128.5	6.0	SM	15.0	120.0	Clay	14323	6304	1.39	1.00	1.00	1.00	8.31	0.54	4.46	3.26	7.72	0.588	0.226
30	133.5	13.0	ML	50.0	120.0	Clay	14923	6592	1.39	1.00	1.00	1.00	18.01	0.58	10.48	5.61	16.10	0.592	0.226
31	138.5	11.0	ML	50.0	120.0	Clay	15523	6880	1.39	1.00	1.00	1.00	15.24	0.56	8.49	5.61	14.11	0.598	0.228
32	143.5	11.0	SM	15.0	120.0	Clay	16123	7168	1.39	1.00	1.00	1.00	15.24	0.53	8.02	3.26	11.28	0.607	0.231
33	148.5	10.0	SM	15.0	120.0	Clay	16723	7456	1.39	1.00	1.00	1.00	13.85	0.51	7.04	3.26	10.30	0.618	0.234
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.12	1.01	1.10	0.090	0.100	2.00
1.17	1.01	1.10	0.112	0.125	0.27
1.21	1.01	1.10	0.123	0.138	0.30
1.09	1.01	1.10	0.061	0.068	0.15
1.12	1.01	1.10	0.086	0.096	0.22
1.09	1.01	1.09	0.066	0.072	0.17
1.12	1.01	1.09	0.089	0.098	2.00
1.12	1.01	1.07	0.089	0.097	2.00
1.12	1.01	1.06	0.089	0.095	2.00
1.15	1.01	1.05	0.101	0.108	2.00
1.17	1.01	1.04	0.112	0.118	2.00
1.23	1.02	1.03	0.131	0.137	0.35
1.13	1.01	1.02	0.096	0.099	0.26
1.22	1.01	1.01	0.128	0.130	2.00
1.24	1.02	0.99	0.135	0.136	2.00
1.30	1.02	0.98	0.151	0.151	2.00
1.22	1.02	0.97	0.129	0.127	2.00
1.53	1.04	0.95	0.216	0.212	2.00
2.20	1.08	0.86	2.000	1.856	2.00
1.16	1.01	0.95	0.107	0.103	2.00
1.22	1.01	0.94	0.126	0.120	2.00
1.21	1.01	0.93	0.124	0.118	2.00
1.20	1.01	0.93	0.122	0.115	2.00
1.36	1.02	0.90	0.168	0.155	2.00
1.19	1.01	0.92	0.119	0.110	2.00
1.17	1.01	0.92	0.111	0.103	2.00
1.17	1.01	0.91	0.110	0.102	2.00
1.15	1.01	0.91	0.104	0.095	2.00
1.15	1.01	0.91	0.103	0.094	2.00
1.35	1.02	0.87	0.166	0.147	2.00
1.29	1.02	0.87	0.149	0.133	2.00
1.22	1.01	0.88	0.127	0.114	2.00
1.20	1.01	0.88	0.120	0.107	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
0.5	1.3	0.000	0.00	16.45
2	1.8	0.039	0.83	16.45
4	2.0	0.036	0.86	15.62
6	2.0	0.105	2.51	14.76
8	3.8	0.052	2.36	12.25
13.5	5.3	0.081	5.09	9.89
18.5	5.0	0.000	0.00	4.80
23.5	5.0	0.000	0.00	4.80
28.5	5.0	0.000	0.00	4.80
33.5	5.0	0.000	0.00	4.80
38.5	5.0	0.000	0.00	4.80
43.5	5.0	0.034	2.03	4.80
48.5	5.0	0.046	2.78	2.78
53.5	5.0	0.000	0.00	0.00
58.5	5.0	0.000	0.00	0.00
63.5	5.0	0.000	0.00	0.00
68.5	5.0	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	5.0	0.000	0.00	0.00
83.5	5.0	0.000	0.00	0.00
88.5	5.0	0.000	0.00	0.00
93.5	5.0	0.000	0.00	0.00
98.5	5.0	0.000	0.00	0.00
103.5	5.0	0.000	0.00	0.00
108.5	5.0	0.000	0.00	0.00
113.5	5.0	0.000	0.00	0.00
118.5	5.0	0.000	0.00	0.00
123.5	5.0	0.000	0.00	0.00
128.5	5.0	0.000	0.00	0.00
133.5	5.0	0.000	0.00	0.00
138.5	5.0	0.000	0.00	0.00
143.5	5.0	0.000	0.00	0.00
148.5	4.0	0.000	0.00	0.00
151.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 6:03 PM
Boring Designation:	B-10
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	-2
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	7
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.26
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	0.5	0	SC	41	100		
2	2.0	0	SC	41	100		
3	4.0	6	SC	41	100		
4	6.0	2	SP-SM	8	100		
5	8.0	2	SP-SM	8	100		
6	10.0	2	ML	57	95		Clay
7	13.0	0	ML	57	95		Clay
8	18.0	0	ML	57	95		Clay
9	23.0	0	ML	57	95		Clay
10	28.5	0	ML	57	95		Clay
11	33.5	0	ML	57	95		Clay
12	38.5	1	ML	57	95		Clay
13	44.0	6	SP-SM	6	100		
14	49.0	17	SP-SM	6	100		
15	54.5	3	SM	31	120		Clay
16	59.5	6	SM	31	120		Clay
17	64.5	5	SM	31	120		Clay
18	69.5	8	SM	31	120		Clay
19	74.5	7	SM	15	120		Clay
20	79.5	11	SM	15	120		Clay
21	84.5	13	SM	15	120		Clay
22	89.5	16	SM	15	120		Clay
23	94.5	7	SM	15	120		Clay
24	99.5	11	SM	15	120		Clay
25	104.5	7	SM	15	120		Clay
26	109.5	7	SM	15	120		Clay
27	114.5	9	SM	15	120		Clay
28	119.5	6	SM	15	120		Clay
29	124.5	3	SM	15	120		Clay
30	128.0	6	SM	15	120		Clay
31	133.0	5	SM	15	120		Clay
32	140.0	8	SM	15	120		Clay
33	145.0	13	SM	15	120		Clay
34	150.0	10	SM	15	120		Clay
35	155.5	7	SM	15	120		Clay
36	160.0	7	SM	15	120		Clay
37	165.0	16	SM	15	120		Clay
38	170.0	9	SM	15	120		Clay
39	175.0	10	SM	15	120		Clay
40	180.0	18	SM	15	120		Clay
41	185.0	37	SM	15	120		Clay
42	189.5	10	SM	15	120		Clay
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*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	0.5	0.0	SC	41.0	100.0		175	19	1.39	1.00	0.75	1.00	0.00	1.70	0.00	5.58	5.58	1.005	1.580
2	2.0	0.0	SC	41.1	100.0		325	75	1.39	1.00	0.75	1.00	0.00	1.70	0.00	5.59	5.59	1.002	0.731
3	4.0	6.0	SC	41.0	100.0		525	150	1.39	1.00	0.80	1.00	6.65	1.70	11.30	5.58	16.89	0.997	0.588
4	6.0	2.0	SP-SM	7.9	100.0		725	226	1.39	1.00	0.80	1.00	2.22	1.70	3.77	0.34	4.11	0.991	0.538
5	8.0	2.0	SP-SM	8.0	100.0		925	301	1.39	1.00	0.85	1.00	2.35	1.70	4.00	0.37	4.37	0.985	0.512
6	10.0	2.0	ML	57.0	95.0	Clay	1115	366	1.39	1.00	0.85	1.00	2.35	1.70	4.00	5.61	9.61	0.978	0.504
7	13.0	0.0	ML	57.0	95.0	Clay	1400	464	1.39	1.00	0.95	1.00	0.00	1.70	0.00	5.61	5.61	0.968	0.494
8	18.0	0.0	ML	57.2	95.0	Clay	1875	627	1.39	1.00	0.95	1.00	0.00	1.70	0.00	5.61	5.61	0.949	0.480
9	23.0	0.0	ML	57.0	95.0	Clay	2350	790	1.39	1.00	0.95	1.00	0.00	1.70	0.00	5.61	5.61	0.928	0.466
10	28.5	0.0	ML	57.0	95.0	Clay	2872	969	1.39	1.00	1.00	1.00	0.00	1.60	0.00	5.61	5.61	0.903	0.452
11	33.5	0.0	ML	57.0	95.0	Clay	3347	1132	1.39	1.00	1.00	1.00	0.00	1.46	0.00	5.61	5.61	0.879	0.439
12	38.5	1.0	ML	57.0	95.0	Clay	3822	1295	1.39	1.00	1.00	1.00	1.39	1.33	1.84	5.61	7.44	0.855	0.426
13	44.0	6.0	SP-SM	6.0	100.0		4372	1502	1.39	1.00	1.00	1.00	8.31	1.20	10.00	0.03	10.03	0.827	0.407
14	49.0	17.0	SP-SM	6.0	100.0		4872	1690	1.39	1.00	1.00	1.00	23.55	1.09	25.73	0.03	25.76	0.803	0.391
15	54.5	3.0	SM	31.0	120.0	Clay	5532	2007	1.39	1.00	1.00	1.00	4.16	1.03	4.28	5.40	9.68	0.776	0.361
16	59.5	6.0	SM	31.0	120.0	Clay	6132	2295	1.39	1.00	1.00	1.00	8.31	0.96	7.98	5.40	13.38	0.752	0.340
17	64.5	5.0	SM	31.0	120.0	Clay	6732	2583	1.39	1.00	1.00	1.00	6.93	0.90	6.24	5.40	11.64	0.729	0.321
18	69.5	8.0	SM	31.0	120.0	Clay	7332	2871	1.39	1.00	1.00	1.00	11.08	0.86	9.55	5.40	14.95	0.708	0.305
19	74.5	7.0	SM	15.0	120.0	Clay	7932	3159	1.39	1.00	1.00	1.00	9.70	0.81	7.85	3.26	11.11	0.687	0.292
20	79.5	11.0	SM	15.0	120.0	Clay	8532	3447	1.39	1.00	1.00	1.00	15.24	0.79	12.03	3.26	15.29	0.668	0.280
21	84.5	13.0	SM	15.0	120.0	Clay	9132	3735	1.39	1.00	1.00	1.00	18.01	0.77	13.81	3.26	17.07	0.651	0.269
22	89.5	16.0	SM	15.0	120.0	Clay	9732	4023	1.39	1.00	1.00	1.00	22.16	0.75	16.69	3.26	19.96	0.636	0.260
23	94.5	7.0	SM	15.0	120.0	Clay	10332	4311	1.39	1.00	1.00	1.00	9.70	0.68	6.59	3.26	9.85	0.622	0.252
24	99.5	11.0	SM	15.0	120.0	Clay	10932	4599	1.39	1.00	1.00	1.00	15.24	0.68	10.33	3.26	13.59	0.611	0.245
25	104.5	7.0	SM	15.0	120.0	Clay	11532	4887	1.39	1.00	1.00	1.00	9.70	0.63	6.12	3.26	9.39	0.602	0.240
26	109.5	7.0	SM	15.0	120.0	Clay	12132	5175	1.39	1.00	1.00	1.00	9.70	0.61	5.92	3.26	9.18	0.594	0.236
27	114.5	9.0	SM	15.0	120.0	Clay	12732	5463	1.39	1.00	1.00	1.00	12.47	0.60	7.53	3.26	10.79	0.589	0.232
28	119.5	6.0	SM	15.0	120.0	Clay	13332	5751	1.39	1.00	1.00	1.00	8.31	0.57	4.71	3.26	7.98	0.587	0.230
29	124.5	3.0	SM	15.0	120.0	Clay	13932	6039	1.39	1.00	1.00	1.00	4.16	0.53	2.20	3.26	5.47	0.586	0.229
30	128.0	6.0	SM	15.0	120.0	Clay	14352	6240	1.39	1.00	1.00	1.00	8.31	0.54	4.48	3.26	7.75	0.587	0.228
31	133.0	5.0	SM	15.0	120.0	Clay	14952	6528	1.39	1.00	1.00	1.00	6.93	0.52	3.59	3.26	6.85	0.591	0.229
32	140.0	8.0	SM	15.0	120.0	Clay	15792	6932	1.39	1.00	1.00	1.00	11.08	0.52	5.75	3.26	9.01	0.600	0.231
33	145.0	13.0	SM	15.0	120.0	Clay	16392	7220	1.39	1.00	1.00	1.00	18.01	0.54	9.65	3.26	12.91	0.610	0.234
34	150.0	10.0	SM	15.0	120.0	Clay	16992	7508	1.39	1.00	1.00	1.00	13.85	0.51	7.01	3.26	10.27	0.622	0.238
35	155.5	7.0	SM	15.0	120.0	Clay	17652	7824	1.39	1.00	1.00	1.00	9.70	0.48	4.61	3.26	7.87	0.639	0.244
36	160.0	7.0	SM	15.0	120.0	Clay	18192	8084	1.39	1.00	1.00	1.00	9.70	0.47	4.52	3.26	7.78	0.655	0.249
37	165.0	16.0	SM	15.0	120.0	Clay	18792	8372	1.39	1.00	1.00	1.00	22.16	0.51	11.28	3.26	14.54	0.675	0.256
38	170.0	9.0	SM	15.0	120.0	Clay	19392	8660	1.39	1.00	1.00	1.00	12.47	0.46	5.71	3.26	8.97	0.697	0.264
39	175.0	10.0	SM	15.0	120.0	Clay	19992	8948	1.39	1.00	1.00	1.00	13.85	0.45	6.30	3.26	9.56	0.722	0.273
40	180.0	18.0	SM	15.0	120.0	Clay	20592	9236	1.39	1.00	1.00	1.00	24.93	0.49	12.26	3.26	15.53	0.750	0.283
41	185.0	37.0	SM	15.0	120.0	Clay	21192	9524	1.39	1.00	1.00	1.00	51.25	0.60	30.98	3.26	34.24	0.780	0.293
42	189.5	10.0	SM	15.0	120.0	Clay	21732	9783	1.39	1.00	1.00	1.00	13.85	0.43	5.96	3.26	9.22	0.808	0.303
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.12	1.01	1.10	0.090	0.099	0.06
1.12	1.01	1.10	0.090	0.099	0.14
1.38	1.03	1.10	0.173	0.195	0.33
1.11	1.01	1.10	0.081	0.090	0.17
1.11	1.01	1.10	0.083	0.091	0.18
1.18	1.01	1.10	0.115	0.128	2.00
1.12	1.01	1.10	0.090	0.099	2.00
1.12	1.01	1.09	0.090	0.099	2.00
1.12	1.01	1.08	0.090	0.097	2.00
1.12	1.01	1.06	0.090	0.096	2.00
1.12	1.01	1.05	0.090	0.095	2.00
1.15	1.01	1.04	0.101	0.106	2.00
1.19	1.01	1.03	0.118	0.124	0.30
1.76	1.05	1.04	0.309	0.337	0.86
1.18	1.01	1.00	0.116	0.118	2.00
1.27	1.02	0.99	0.143	0.144	2.00
1.23	1.02	0.98	0.130	0.129	2.00
1.32	1.02	0.97	0.156	0.154	2.00
1.21	1.01	0.96	0.126	0.123	2.00
1.33	1.02	0.95	0.159	0.153	2.00
1.38	1.03	0.93	0.175	0.167	2.00
1.49	1.03	0.91	0.205	0.194	2.00
1.19	1.01	0.93	0.117	0.111	2.00
1.28	1.02	0.92	0.145	0.135	2.00
1.18	1.01	0.92	0.114	0.107	2.00
1.17	1.01	0.92	0.112	0.105	2.00
1.21	1.01	0.91	0.124	0.114	2.00
1.15	1.01	0.91	0.104	0.097	2.00
1.12	1.01	0.92	0.089	0.082	2.00
1.15	1.01	0.91	0.103	0.094	2.00
1.14	1.01	0.91	0.097	0.089	2.00
1.17	1.01	0.89	0.111	0.101	2.00
1.26	1.02	0.87	0.139	0.124	2.00
1.20	1.01	0.88	0.120	0.107	2.00
1.15	1.01	0.89	0.104	0.093	2.00
1.15	1.01	0.89	0.103	0.092	2.00
1.30	1.02	0.85	0.152	0.132	2.00
1.17	1.01	0.87	0.111	0.098	2.00
1.18	1.01	0.87	0.115	0.101	2.00
1.33	1.02	0.83	0.161	0.137	2.00
2.20	1.08	0.62	0.952	0.640	2.00
1.18	1.01	0.86	0.113	0.098	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
0.5	1.3	0.050	0.75	8.18
2	1.8	0.050	1.05	7.43
4	2.0	0.026	0.63	6.37
6	2.0	0.057	1.36	5.74
8	2.0	0.055	1.33	4.38
10	2.5	0.000	0.00	3.05
13	4.0	0.000	0.00	3.05
18	5.0	0.000	0.00	3.05
23	5.3	0.000	0.00	3.05
28.5	5.3	0.000	0.00	3.05
33.5	5.0	0.000	0.00	3.05
38.5	5.3	0.000	0.00	3.05
44	5.3	0.037	2.35	3.05
49	5.3	0.011	0.70	0.70
54.5	5.3	0.000	0.00	0.00
59.5	5.0	0.000	0.00	0.00
64.5	5.0	0.000	0.00	0.00
69.5	5.0	0.000	0.00	0.00
74.5	5.0	0.000	0.00	0.00
79.5	5.0	0.000	0.00	0.00
84.5	5.0	0.000	0.00	0.00
89.5	5.0	0.000	0.00	0.00
94.5	5.0	0.000	0.00	0.00
99.5	5.0	0.000	0.00	0.00
104.5	5.0	0.000	0.00	0.00
109.5	5.0	0.000	0.00	0.00
114.5	5.0	0.000	0.00	0.00
119.5	5.0	0.000	0.00	0.00
124.5	4.3	0.000	0.00	0.00
128	4.3	0.000	0.00	0.00
133	6.0	0.000	0.00	0.00
140	6.0	0.000	0.00	0.00
145	5.0	0.000	0.00	0.00
150	5.3	0.000	0.00	0.00
155.5	5.0	0.000	0.00	0.00
160	4.8	0.000	0.00	0.00
165	5.0	0.000	0.00	0.00
170	5.0	0.000	0.00	0.00
175	5.0	0.000	0.00	0.00
180	5.0	0.000	0.00	0.00
185	4.8	0.000	0.00	0.00
189.5	3.8	0.000	0.00	0.00
192.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 6:04 PM
Boring Designation:	B-11
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	-22
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	27
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.26
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"	
1	0.5	0	ML	50	95		Clay	
2	2.0	1	ML	50	95		Clay	
3	4.0	0	SM	18	100			
4	6.0	0	CL	52	95		Clay	
5	8.0	0	SM	15	100			
6	14.5	0	MH	94	95		Clay	
7	20.0	0	MH	94	95		Clay	
8	25.5	2	SM	15	100			
9	31.5	7	SM	15	100			
10	36.0	6	ML	50	120		Clay	*Assumes Marl/Limestone NonLiq
11	41.5	5	ML	50	120		Clay	
12	46.5	7	ML	50	120		Clay	
13	51.5	7	ML	50	120		Clay	
14	56.5	23	SM	15	120		Clay	
15	61.0	6	SM	45	120		Clay	
16	65.5	5	SM	15	120		Clay	
17	70.5	5	SM	15	120		Clay	
18	75.0	6	SM	15	120		Clay	
19	78.0	5	SM	15	120		Clay	
20	82.5	27	SM	15	120		Clay	
21	85.0	1	SM	15	120		Clay	
22	90.0	8	SM	15	120		Clay	
23	98.5	9	SM	15	120		Clay	
24	104.0	11	SM	15	120		Clay	
25	110.0	8	SM	15	120		Clay	
26	115.5	10	SM	15	120		Clay	
27	121.5	8	SM	15	120		Clay	
28	125.5	10	SM	15	120		Clay	
29	132.0	9	SM	15	120		Clay	
30	137.0	10	SM	15	120		Clay	
31	141.5	12	SM	15	120		Clay	
32	146.0	10	SM	15	120		Clay	
33	150.5	8	SM	15	120		Clay	
34	155.0	19	SM	15	120		Clay	
35	159.5	10	SM	15	120		Clay	
36	164.0	9	SM	15	120		Clay	
37	168.5	9	SM	15	120		Clay	
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SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	0.5	0.0	ML	50.0	95.0	Clay	1420	16	1.39	1.00	0.95	1.00	0.00	1.70	0.00	5.61	5.61	1.005	14.805
2	2.0	1.0	ML	50.0	95.0	Clay	1563	65	1.39	1.00	0.95	1.00	1.32	1.70	2.24	5.61	7.85	1.002	4.058
3	4.0	0.0	SM	18.1	100.0		1763	140	1.39	1.00	0.95	1.00	0.00	1.70	0.00	4.11	4.11	0.997	2.115
4	6.0	0.0	CL	52.1	95.0	Clay	1953	206	1.39	1.00	1.00	1.00	0.00	1.70	0.00	5.61	5.61	0.991	1.591
5	8.0	0.0	SM	15.3	100.0		2153	281	1.39	1.00	1.00	1.00	0.00	1.70	0.00	3.36	3.36	0.985	1.276
6	14.5	0.0	MH	93.7	95.0	Clay	2770	493	1.39	1.00	1.00	1.00	0.00	1.70	0.00	5.50	5.50	0.962	0.914
7	20.0	0.0	MH	94.0	95.0	Clay	3293	672	1.39	1.00	1.00	1.00	0.00	1.70	0.00	5.50	5.50	0.941	0.779
8	25.5	2.0	SM	15.0	100.0		3843	879	1.39	1.00	1.00	1.00	2.77	1.65	4.57	3.26	7.83	0.917	0.677
9	31.5	7.0	SM	15.0	100.0		4443	1104	1.39	1.00	1.00	1.00	9.70	1.36	13.18	3.26	16.44	0.889	0.604
10	36.0	6.0	ML	50.0	120.0	Clay	4983	1364	1.39	1.00	1.00	1.00	8.31	1.23	10.25	5.61	15.87	0.867	0.535
11	41.5	5.0	ML	50.0	120.0	Clay	5643	1680	1.39	1.00	1.00	1.00	6.93	1.12	7.78	5.61	13.39	0.840	0.477
12	46.5	7.0	ML	50.0	120.0	Clay	6243	1968	1.39	1.00	1.00	1.00	9.70	1.04	10.04	5.61	15.65	0.815	0.437
13	51.5	7.0	ML	50.0	120.0	Clay	6843	2256	1.39	1.00	1.00	1.00	9.70	0.97	9.40	5.61	15.01	0.790	0.405
14	56.5	23.0	SM	15.0	120.0	Clay	7443	2544	1.39	1.00	1.00	1.00	31.86	0.94	29.91	3.26	33.17	0.766	0.379
15	61.0	6.0	SM	45.3	120.0	Clay	7983	2804	1.39	1.00	1.00	1.00	8.31	0.87	7.20	5.61	12.81	0.745	0.359
16	65.5	5.0	SM	15.0	120.0	Clay	8523	3063	1.39	1.00	1.00	1.00	6.93	0.81	5.64	3.26	8.90	0.725	0.341
17	70.5	5.0	SM	15.0	120.0	Clay	9123	3351	1.39	1.00	1.00	1.00	6.93	0.77	5.36	3.26	8.62	0.703	0.324
18	75.0	6.0	SM	15.0	120.0	Clay	9663	3610	1.39	1.00	1.00	1.00	8.31	0.75	6.20	3.26	9.46	0.685	0.310
19	78.0	5.0	SM	15.0	120.0	Clay	10023	3783	1.39	1.00	1.00	1.00	6.93	0.72	4.99	3.26	8.25	0.674	0.302
20	82.5	27.0	SM	15.0	120.0	Clay	10563	4042	1.39	1.00	1.00	1.00	37.40	0.80	29.99	3.26	33.25	0.658	0.291
21	85.0	1.0	SM	15.0	120.0	Clay	10863	4186	1.39	1.00	1.00	1.00	1.39	0.65	0.90	3.26	4.16	0.650	0.285
22	90.0	8.0	SM	15.0	120.0	Clay	11463	4474	1.39	1.00	1.00	1.00	11.08	0.67	7.43	3.26	10.70	0.634	0.275
23	98.5	9.0	SM	15.0	120.0	Clay	12483	4964	1.39	1.00	1.00	1.00	12.47	0.64	7.95	3.26	11.22	0.613	0.261
24	104.0	11.0	SM	15.0	120.0	Clay	13143	5280	1.39	1.00	1.00	1.00	15.24	0.63	9.57	3.26	12.83	0.602	0.253
25	110.0	8.0	SM	15.0	120.0	Clay	13863	5626	1.39	1.00	1.00	1.00	11.08	0.59	6.51	3.26	9.77	0.594	0.247
26	115.5	10.0	SM	15.0	120.0	Clay	14523	5943	1.39	1.00	1.00	1.00	13.85	0.58	8.05	3.26	11.31	0.589	0.243
27	121.5	8.0	SM	15.0	120.0	Clay	15243	6288	1.39	1.00	1.00	1.00	11.08	0.55	6.09	3.26	9.35	0.586	0.240
28	125.5	10.0	SM	15.0	120.0	Clay	15723	6519	1.39	1.00	1.00	1.00	13.85	0.55	7.62	3.26	10.89	0.586	0.239
29	132.0	9.0	SM	15.0	120.0	Clay	16503	6893	1.39	1.00	1.00	1.00	12.47	0.53	6.56	3.26	9.82	0.590	0.239
30	137.0	10.0	SM	15.0	120.0	Clay	17103	7181	1.39	1.00	1.00	1.00	13.85	0.52	7.20	3.26	10.46	0.596	0.240
31	141.5	12.0	SM	15.0	120.0	Clay	17643	7440	1.39	1.00	1.00	1.00	16.62	0.52	8.66	3.26	11.92	0.603	0.242
32	146.0	10.0	SM	15.0	120.0	Clay	18183	7700	1.39	1.00	1.00	1.00	13.85	0.50	6.90	3.26	10.16	0.612	0.244
33	150.5	8.0	SM	15.0	120.0	Clay	18723	7959	1.39	1.00	1.00	1.00	11.08	0.48	5.28	3.26	8.54	0.624	0.248
34	155.0	19.0	SM	15.0	120.0	Clay	19263	8218	1.39	1.00	1.00	1.00	26.32	0.53	14.00	3.26	17.27	0.637	0.252
35	159.5	10.0	SM	15.0	120.0	Clay	19803	8477	1.39	1.00	1.00	1.00	13.85	0.47	6.51	3.26	9.77	0.653	0.258
36	164.0	9.0	SM	15.0	120.0	Clay	20343	8736	1.39	1.00	1.00	1.00	12.47	0.46	5.68	3.26	8.94	0.670	0.264
37	168.5	9.0	SM	15.0	120.0	Clay	20883	8996	1.39	1.00	1.00	1.00	12.47	0.45	5.58	3.26	8.84	0.690	0.271
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.12	1.01	1.10	0.090	0.100	2.00
1.15	1.01	1.10	0.104	0.115	2.00
1.11	1.01	1.10	0.081	0.090	0.04
1.12	1.01	1.10	0.090	0.100	2.00
1.10	1.01	1.10	0.077	0.085	0.07
1.12	1.01	1.10	0.089	0.099	2.00
1.12	1.01	1.09	0.089	0.098	2.00
1.15	1.01	1.07	0.103	0.112	0.17
1.36	1.02	1.08	0.169	0.186	0.31
1.34	1.02	1.05	0.164	0.176	2.00
1.27	1.02	1.02	0.143	0.149	2.00
1.34	1.02	1.01	0.162	0.167	2.00
1.32	1.02	0.99	0.156	0.158	2.00
2.20	1.08	0.96	0.782	0.809	2.00
1.26	1.02	0.97	0.139	0.137	2.00
1.17	1.01	0.97	0.111	0.108	2.00
1.16	1.01	0.96	0.109	0.105	2.00
1.18	1.01	0.95	0.114	0.110	2.00
1.16	1.01	0.95	0.106	0.102	2.00
2.20	1.08	0.85	0.792	0.725	2.00
1.11	1.01	0.95	0.081	0.078	2.00
1.21	1.01	0.93	0.123	0.116	2.00
1.22	1.01	0.92	0.127	0.118	2.00
1.26	1.02	0.91	0.139	0.128	2.00
1.19	1.01	0.91	0.116	0.107	2.00
1.22	1.01	0.90	0.127	0.116	2.00
1.18	1.01	0.90	0.114	0.104	2.00
1.21	1.01	0.89	0.124	0.113	2.00
1.19	1.01	0.89	0.117	0.106	2.00
1.20	1.01	0.89	0.121	0.109	2.00
1.23	1.02	0.88	0.132	0.117	2.00
1.19	1.01	0.88	0.119	0.106	2.00
1.16	1.01	0.88	0.108	0.097	2.00
1.39	1.03	0.84	0.176	0.152	2.00
1.19	1.01	0.87	0.116	0.103	2.00
1.17	1.01	0.87	0.111	0.098	2.00
1.17	1.01	0.87	0.110	0.097	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
0.5	1.3	0.000	0.00	9.12
2	1.8	0.000	0.00	9.12
4	2.0	0.057	1.36	9.12
6	2.0	0.000	0.00	7.75
8	4.3	0.061	3.11	7.75
14.5	6.0	0.000	0.00	4.64
20	5.5	0.000	0.00	4.64
25.5	5.8	0.043	2.95	4.64
31.5	5.3	0.027	1.69	1.69
36	5.0	0.000	0.00	0.00
41.5	5.3	0.000	0.00	0.00
46.5	5.0	0.000	0.00	0.00
51.5	5.0	0.000	0.00	0.00
56.5	4.8	0.000	0.00	0.00
61	4.5	0.000	0.00	0.00
65.5	4.8	0.000	0.00	0.00
70.5	4.8	0.000	0.00	0.00
75	3.8	0.000	0.00	0.00
78	3.8	0.000	0.00	0.00
82.5	3.5	0.000	0.00	0.00
85	3.8	0.000	0.00	0.00
90	6.8	0.000	0.00	0.00
98.5	7.0	0.000	0.00	0.00
104	5.8	0.000	0.00	0.00
110	5.8	0.000	0.00	0.00
115.5	5.8	0.000	0.00	0.00
121.5	5.0	0.000	0.00	0.00
125.5	5.3	0.000	0.00	0.00
132	5.8	0.000	0.00	0.00
137	4.8	0.000	0.00	0.00
141.5	4.5	0.000	0.00	0.00
146	4.5	0.000	0.00	0.00
150.5	4.5	0.000	0.00	0.00
155	4.5	0.000	0.00	0.00
159.5	4.5	0.000	0.00	0.00
164	4.5	0.000	0.00	0.00
168.5	3.8	0.000	0.00	0.00
171.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:53 PM
Boring Designation:	B-12
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	-33
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	38
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.29
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"	
1	0.5	1	CL	50	95		Clay	
2	2.0	4	CL	50	95		Clay	
3	4.0	3	SM	24	100			
4	6.0	9	SC	15	100			
5	8.0	4	SP	0	100			
6	12.5	5	SP-SM	10	100			
7	17.5	7	SM	48	120		Clay	*Assumes Marl/Limestone NonLiq
8	23.0	8	SM	48	120		Clay	
9	28.0	4	SM	48	120		Clay	
10	36.5	6	SM	48	120		Clay	
11	42.0	9	SM	48	120		Clay	
12	47.0	6	SM	47	120		Clay	
13	53.0	8	SM	47	120		Clay	
14	58.0	12	SM	15	120		Clay	
15	63.5	11	SM	50	120		Clay	
16	69.0	9	SM	15	120		Clay	
17	73.5	12	SM	15	120		Clay	
18	77.5	8	SM	15	120		Clay	
19	82.5	5	SM	15	120		Clay	
20	87.5		SM	15	120		Clay	
21	92.5	14	SM	15	120		Clay	
22	97.5	12	SM	15	120		Clay	
23	102.5	7	SM	15	120		Clay	
24	108.0	12	SM	15	120		Clay	
25	115.5	8	SM	15	120		Clay	
26	118.5	11	SM	15	120		Clay	
27	122.5	9	SM	15	120		Clay	
28	127.0	19	SM	15	120		Clay	
29	132.0	10	SM	15	120		Clay	
30	137.0	8	SM	15	120		Clay	
31	141.5	20	SM	15	120		Clay	
32	147.0		SM	15	120		Clay	
33	152.5	12	SM	15	120		Clay	
34	157.5	8	SM	15	120		Clay	
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SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	0.5	1.0	CL	50.0	95.0	Clay	2107	16	1.39	1.00	1.00	1.00	1.39	1.70	2.35	5.61	7.97	1.005	24.495
2	2.0	4.0	CL	50.0	95.0	Clay	2249	65	1.39	1.00	1.00	1.00	5.54	1.70	9.42	5.61	15.03	1.002	6.514
3	4.0	3.0	SM	23.8	100.0		2449	140	1.39	1.00	1.00	1.00	4.16	1.70	7.06	4.97	12.03	0.997	3.277
4	6.0	9.0	SC	15.0	100.0		2649	216	1.39	1.00	1.00	1.00	12.47	1.70	21.19	3.26	24.45	0.991	2.295
5	8.0	4.0	SP	0.0	100.0		2849	291	1.39	1.00	1.00	1.00	5.54	1.70	9.42	0.00	9.42	0.985	1.819
6	12.5	5.0	SP-SM	10.4	100.0		3299	460	1.39	1.00	1.00	1.00	6.93	1.70	11.77	1.33	13.11	0.970	1.311
7	17.5	7.0	SM	48.0	120.0	Clay	3899	748	1.39	1.00	1.00	1.00	9.70	1.57	15.22	5.61	20.83	0.951	0.934
8	23.0	8.0	SM	48.0	120.0	Clay	4559	1065	1.39	1.00	1.00	1.00	11.08	1.35	14.95	5.61	20.56	0.928	0.749
9	28.0	4.0	SM	48.0	120.0	Clay	5159	1353	1.39	1.00	1.00	1.00	5.54	1.26	6.96	5.61	12.58	0.905	0.651
10	36.5	6.0	SM	48.0	120.0	Clay	6179	1842	1.39	1.00	1.00	1.00	8.31	1.07	8.90	5.61	14.51	0.865	0.547
11	42.0	9.0	SM	48.0	120.0	Clay	6839	2159	1.39	1.00	1.00	1.00	12.47	0.99	12.35	5.61	17.96	0.837	0.500
12	47.0	6.0	SM	46.6	120.0	Clay	7439	2447	1.39	1.00	1.00	1.00	8.31	0.93	7.72	5.61	13.33	0.813	0.466
13	53.0	8.0	SM	47.0	120.0	Clay	8159	2793	1.39	1.00	1.00	1.00	11.08	0.87	9.69	5.61	15.30	0.783	0.431
14	58.0	12.0	SM	15.0	120.0	Clay	8759	3081	1.39	1.00	1.00	1.00	16.62	0.84	13.95	3.26	17.22	0.759	0.407
15	63.5	11.0	SM	49.7	120.0	Clay	9419	3398	1.39	1.00	1.00	1.00	15.24	0.80	12.26	5.61	17.87	0.734	0.383
16	69.0	9.0	SM	15.0	120.0	Clay	10079	3714	1.39	1.00	1.00	1.00	12.47	0.75	9.35	3.26	12.61	0.710	0.363
17	73.5	12.0	SM	15.0	120.0	Clay	10619	3974	1.39	1.00	1.00	1.00	16.62	0.74	12.27	3.26	15.53	0.691	0.348
18	77.5	8.0	SM	15.0	120.0	Clay	11099	4204	1.39	1.00	1.00	1.00	11.08	0.70	7.70	3.26	10.96	0.676	0.336
19	82.5	5.0	SM	15.0	120.0	Clay	11699	4492	1.39	1.00	1.00	1.00	6.93	0.65	4.51	3.26	7.77	0.658	0.323
20	87.5	0.0	SM	15.0	120.0	Clay	12299	4780	1.39	1.00	1.00	1.00	0.00	0.59	0.00	3.26	3.26	0.642	0.311
21	92.5	14.0	SM	15.0	120.0	Clay	12899	5068	1.39	1.00	1.00	1.00	19.39	0.66	12.79	3.26	16.05	0.628	0.301
22	97.5	12.0	SM	15.0	120.0	Clay	13499	5356	1.39	1.00	1.00	1.00	16.62	0.63	10.45	3.26	13.71	0.615	0.292
23	102.5	7.0	SM	15.0	120.0	Clay	14099	5644	1.39	1.00	1.00	1.00	9.70	0.58	5.62	3.26	8.89	0.605	0.285
24	108.0	12.0	SM	15.0	120.0	Clay	14759	5961	1.39	1.00	1.00	1.00	16.62	0.59	9.84	3.26	13.10	0.596	0.278
25	115.5	8.0	SM	15.0	120.0	Clay	15659	6393	1.39	1.00	1.00	1.00	11.08	0.54	6.03	3.26	9.29	0.589	0.272
26	118.5	11.0	SM	15.0	120.0	Clay	16019	6566	1.39	1.00	1.00	1.00	15.24	0.55	8.44	3.26	11.70	0.587	0.270
27	122.5	9.0	SM	15.0	120.0	Clay	16499	6796	1.39	1.00	1.00	1.00	12.47	0.53	6.62	3.26	9.88	0.586	0.268
28	127.0	19.0	SM	15.0	120.0	Clay	17039	7055	1.39	1.00	1.00	1.00	26.32	0.58	15.24	3.26	18.50	0.587	0.267
29	132.0	10.0	SM	15.0	120.0	Clay	17639	7343	1.39	1.00	1.00	1.00	13.85	0.51	7.10	3.26	10.36	0.590	0.267
30	137.0	8.0	SM	15.0	120.0	Clay	18239	7631	1.39	1.00	1.00	1.00	11.08	0.49	5.42	3.26	8.68	0.596	0.268
31	141.5	20.0	SM	15.0	120.0	Clay	18779	7890	1.39	1.00	1.00	1.00	27.70	0.55	15.25	3.26	18.51	0.603	0.270
32	147.0	0.0	SM	15.0	120.0	Clay	19439	8207	1.39	1.00	1.00	1.00	0.00	0.42	0.00	3.26	3.26	0.615	0.274
33	152.5	12.0	SM	15.0	120.0	Clay	20099	8524	1.39	1.00	1.00	1.00	16.62	0.48	7.98	3.26	11.24	0.629	0.280
34	157.5	8.0	SM	15.0	120.0	Clay	20699	8812	1.39	1.00	1.00	1.00	11.08	0.45	4.96	3.26	8.22	0.645	0.286
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.15	1.01	1.10	0.104	0.116	2.00
1.32	1.02	1.10	0.156	0.176	2.00
1.24	1.02	1.10	0.133	0.148	0.05
1.69	1.05	1.10	0.278	0.320	0.14
1.18	1.01	1.10	0.114	0.127	0.07
1.26	1.02	1.10	0.141	0.158	0.12
1.53	1.04	1.10	0.216	0.247	2.00
1.52	1.04	1.09	0.213	0.241	2.00
1.25	1.02	1.05	0.137	0.145	2.00
1.30	1.02	1.02	0.152	0.157	2.00
1.42	1.03	1.00	0.183	0.188	2.00
1.27	1.02	0.98	0.143	0.143	2.00
1.33	1.02	0.97	0.159	0.157	2.00
1.39	1.03	0.95	0.176	0.172	2.00
1.41	1.03	0.94	0.182	0.177	2.00
1.25	1.02	0.94	0.137	0.131	2.00
1.33	1.02	0.93	0.161	0.153	2.00
1.21	1.01	0.93	0.125	0.118	2.00
1.15	1.01	0.94	0.103	0.098	2.00
1.10	1.01	0.94	0.077	0.073	2.00
1.35	1.02	0.90	0.165	0.152	2.00
1.28	1.02	0.90	0.146	0.134	2.00
1.17	1.01	0.91	0.110	0.102	2.00
1.26	1.02	0.89	0.141	0.128	2.00
1.18	1.01	0.90	0.113	0.103	2.00
1.23	1.02	0.89	0.130	0.118	2.00
1.19	1.01	0.89	0.117	0.106	2.00
1.43	1.03	0.85	0.189	0.165	2.00
1.20	1.01	0.88	0.121	0.108	2.00
1.17	1.01	0.89	0.109	0.098	2.00
1.44	1.03	0.83	0.189	0.162	2.00
1.10	1.01	0.91	0.077	0.070	2.00
1.22	1.01	0.87	0.127	0.111	2.00
1.16	1.01	0.88	0.106	0.094	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
0.5	1.3	0.000	0.00	4.57
2	1.8	0.000	0.00	4.57
4	2.0	0.033	0.80	4.57
6	2.0	0.019	0.46	3.77
8	3.3	0.039	1.51	3.31
12.5	4.8	0.032	1.80	1.80
17.5	5.3	0.000	0.00	0.00
23	5.3	0.000	0.00	0.00
28	6.8	0.000	0.00	0.00
36.5	7.0	0.000	0.00	0.00
42	5.3	0.000	0.00	0.00
47	5.5	0.000	0.00	0.00
53	5.5	0.000	0.00	0.00
58	5.3	0.000	0.00	0.00
63.5	5.5	0.000	0.00	0.00
69	5.0	0.000	0.00	0.00
73.5	4.3	0.000	0.00	0.00
77.5	4.5	0.000	0.00	0.00
82.5	5.0	0.000	0.00	0.00
87.5	5.0	0.000	0.00	0.00
92.5	5.0	0.000	0.00	0.00
97.5	5.0	0.000	0.00	0.00
102.5	5.3	0.000	0.00	0.00
108	6.5	0.000	0.00	0.00
115.5	5.3	0.000	0.00	0.00
118.5	3.5	0.000	0.00	0.00
122.5	4.3	0.000	0.00	0.00
127	4.8	0.000	0.00	0.00
132	5.0	0.000	0.00	0.00
137	4.8	0.000	0.00	0.00
141.5	5.0	0.000	0.00	0.00
147	5.5	0.000	0.00	0.00
152.5	5.3	0.000	0.00	0.00
157.5	4.0	0.000	0.00	0.00
160.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:54 PM
Boring Designation:	B-13
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	-28
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	33
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.29
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	0.5	1	SM	23	100		
2	2.0	3	SM	23	100		
3	4.0	3	SM	23	100		
4	6.0	3	SM	23	100		
5	8.0	1	SC	15	100		
6	14.5	1	CL	64	95		Clay
7	19.5	0	CL	64	95		Clay
8	24.5	2	ML	65	95		
9	30.0	6	SC	44	120		Clay
10	35.5	4	SC	44	120		Clay
11	41.0	6	SC	44	120		Clay
12	48.5	6	ML	50	120		Clay
13	53.5	7	ML	50	120		Clay
14	58.5	4	ML	50	120		Clay
15	62.5	23	ML	50	120		Clay
16	66.5	7	ML	50	120		Clay
17	71.5	7	ML	50	120		Clay
18	76.0	10	ML	50	120		Clay
19	81.0	6	ML	50	120		Clay
20	88.5	6	ML	50	120		Clay
21	93.5	12	ML	50	120		Clay
22	99.0	11	ML	50	120		Clay
23	104.5	7	ML	50	120		Clay
24	110.0	9	ML	50	120		Clay
25	118.0	8	ML	50	120		Clay
26	120.0	8	ML	50	120		Clay
27	124.5	7	ML	50	120		Clay
28	129.0	8	ML	50	120		Clay
29	134.0	10	ML	50	120		Clay
30	138.5	9	ML	50	120		Clay
31	144.0	12	ML	50	120		Clay
32	149.5	7	ML	50	120		Clay
33	155.5	13	ML	50	120		Clay
34	161.0	17	ML	50	120		Clay
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*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR	MS
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB (MSFmax)
1	0.5	1.0	SM	23.0	100.0		1797	19	1.39	1.00	1.00	1.00	1.39	1.70	2.35	4.88	7.24	1.005	18.117	1.14
2	2.0	3.0	SM	23.0	100.0		1947	75	1.39	1.00	1.00	1.00	4.16	1.70	7.06	4.88	11.95	1.002	4.890	1.23
3	4.0	3.0	SM	22.8	100.0		2147	150	1.39	1.00	1.00	1.00	4.16	1.70	7.06	4.86	11.93	0.997	2.682	1.23
4	6.0	3.0	SM	23.0	100.0		2347	226	1.39	1.00	1.00	1.00	4.16	1.70	7.06	4.88	11.95	0.991	1.943	1.23
5	8.0	1.0	SC	15.0	100.0		2547	301	1.39	1.00	1.00	1.00	1.39	1.70	2.35	3.26	5.62	0.985	1.572	1.12
6	14.5	1.0	CL	64.2	95.0	Clay	3165	513	1.39	1.00	1.00	1.00	1.39	1.70	2.35	5.59	7.95	0.962	1.120	1.15
7	19.5	0.0	CL	64.0	95.0	Clay	3640	676	1.39	1.00	1.00	1.00	0.00	1.70	0.00	5.59	5.59	0.943	0.957	1.12
8	24.5	2.0	ML	65.3	95.0		4115	839	1.39	1.00	1.00	1.00	2.77	1.65	4.56	5.59	10.15	0.921	0.852	1.19
9	30.0	6.0	SC	44.0	120.0	Clay	4775	1156	1.39	1.00	1.00	1.00	8.31	1.33	11.05	5.60	16.65	0.896	0.698	1.37
10	35.5	4.0	SC	43.9	120.0	Clay	5435	1472	1.39	1.00	1.00	1.00	5.54	1.21	6.68	5.60	12.28	0.869	0.605	1.24
11	41.0	6.0	SC	44.0	120.0	Clay	6095	1789	1.39	1.00	1.00	1.00	8.31	1.09	9.02	5.60	14.62	0.842	0.541	1.31
12	48.5	6.0	ML	50.0	120.0	Clay	6995	2221	1.39	1.00	1.00	1.00	8.31	0.98	8.11	5.61	13.73	0.805	0.478	1.28
13	53.5	7.0	ML	50.0	120.0	Clay	7595	2509	1.39	1.00	1.00	1.00	9.70	0.92	8.92	5.61	14.53	0.781	0.445	1.30
14	58.5	4.0	ML	50.0	120.0	Clay	8195	2797	1.39	1.00	1.00	1.00	5.54	0.86	4.77	5.61	10.38	0.757	0.418	1.20
15	62.5	23.0	ML	50.0	120.0	Clay	8675	3028	1.39	1.00	1.00	1.00	31.86	0.89	28.23	5.61	33.85	0.738	0.399	2.20
16	66.5	7.0	ML	50.0	120.0	Clay	9155	3258	1.39	1.00	1.00	1.00	9.70	0.80	7.80	5.61	13.42	0.720	0.382	1.27
17	71.5	7.0	ML	50.2	120.0	Clay	9755	3546	1.39	1.00	1.00	1.00	9.70	0.77	7.47	5.61	13.08	0.699	0.363	1.26
18	76.0	10.0	ML	50.0	120.0	Clay	10295	3805	1.39	1.00	1.00	1.00	13.85	0.76	10.48	5.61	16.09	0.681	0.347	1.35
19	81.0	6.0	ML	50.0	120.0	Clay	10895	4093	1.39	1.00	1.00	1.00	8.31	0.71	5.88	5.61	11.50	0.663	0.333	1.22
20	88.5	6.0	ML	50.0	120.0	Clay	11795	4525	1.39	1.00	1.00	1.00	8.31	0.67	5.57	5.61	11.18	0.639	0.314	1.22
21	93.5	12.0	ML	50.0	120.0	Clay	12395	4813	1.39	1.00	1.00	1.00	16.62	0.68	11.31	5.61	16.93	0.625	0.303	1.38
22	99.0	11.0	ML	50.0	120.0	Clay	13055	5130	1.39	1.00	1.00	1.00	15.24	0.65	9.95	5.61	15.57	0.612	0.294	1.33
23	104.5	7.0	ML	50.0	120.0	Clay	13715	5447	1.39	1.00	1.00	1.00	9.70	0.61	5.91	5.61	11.53	0.602	0.286	1.22
24	110.0	9.0	ML	50.0	120.0	Clay	14375	5764	1.39	1.00	1.00	1.00	12.47	0.60	7.51	5.61	13.12	0.594	0.279	1.26
25	118.0	8.0	ML	50.0	120.0	Clay	15335	6224	1.39	1.00	1.00	1.00	11.08	0.57	6.33	5.61	11.95	0.587	0.273	1.23
26	120.0	8.0	ML	50.0	120.0	Clay	15575	6340	1.39	1.00	1.00	1.00	11.08	0.57	6.27	5.61	11.88	0.587	0.272	1.23
27	124.5	7.0	ML	50.0	120.0	Clay	16115	6599	1.39	1.00	1.00	1.00	9.70	0.55	5.30	5.61	10.92	0.586	0.270	1.21
28	129.0	8.0	ML	50.0	120.0	Clay	16655	6858	1.39	1.00	1.00	1.00	11.08	0.54	6.00	5.61	11.61	0.588	0.269	1.23
29	134.0	10.0	ML	50.0	120.0	Clay	17255	7146	1.39	1.00	1.00	1.00	13.85	0.54	7.48	5.61	13.10	0.592	0.269	1.26
30	138.5	9.0	ML	50.0	120.0	Clay	17795	7405	1.39	1.00	1.00	1.00	12.47	0.52	6.53	5.61	12.14	0.598	0.271	1.24
31	144.0	12.0	ML	50.0	120.0	Clay	18455	7722	1.39	1.00	1.00	1.00	16.62	0.53	8.78	5.61	14.40	0.608	0.274	1.30
32	149.5	7.0	ML	50.0	120.0	Clay	19115	8039	1.39	1.00	1.00	1.00	9.70	0.49	4.73	5.61	10.35	0.621	0.278	1.20
33	155.5	13.0	ML	50.0	120.0	Clay	19835	8384	1.39	1.00	1.00	1.00	18.01	0.51	9.19	5.61	14.80	0.639	0.285	1.31
34	161.0	17.0	ML	50.0	120.0	Clay	20495	8701	1.39	1.00	1.00	1.00	23.55	0.52	12.31	5.61	17.92	0.658	0.292	1.41
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;F	Ksig	CRR	Corrected CRR	Factor of Safety
IB	IB	IB	IB	IB
1.01	1.10	0.100	0.111	0.01
1.02	1.10	0.132	0.148	0.03
1.02	1.10	0.132	0.147	0.05
1.02	1.10	0.132	0.148	0.08
1.01	1.10	0.090	0.100	0.06
1.01	1.10	0.104	0.116	2.00
1.01	1.09	0.090	0.098	2.00
1.01	1.09	0.119	0.131	0.15
1.03	1.07	0.171	0.187	2.00
1.02	1.04	0.135	0.142	2.00
1.02	1.02	0.153	0.159	2.00
1.02	0.99	0.146	0.148	2.00
1.02	0.98	0.152	0.152	2.00
1.01	0.97	0.121	0.119	2.00
1.08	0.91	0.883	0.871	2.00
1.02	0.95	0.143	0.139	2.00
1.02	0.95	0.141	0.136	2.00
1.02	0.93	0.166	0.158	2.00
1.02	0.94	0.129	0.122	2.00
1.01	0.93	0.126	0.119	2.00
1.03	0.90	0.173	0.160	2.00
1.02	0.90	0.161	0.148	2.00
1.02	0.91	0.129	0.119	2.00
1.02	0.90	0.141	0.129	2.00
1.02	0.89	0.132	0.120	2.00
1.02	0.89	0.132	0.119	2.00
1.01	0.89	0.125	0.113	2.00
1.02	0.88	0.130	0.116	2.00
1.02	0.87	0.141	0.125	2.00
1.02	0.87	0.134	0.119	2.00
1.02	0.86	0.151	0.133	2.00
1.01	0.88	0.121	0.107	2.00
1.02	0.85	0.154	0.134	2.00
1.03	0.83	0.183	0.155	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
0.5	1.3	0.044	0.67	7.87
2	1.8	0.034	0.70	7.20
4	2.0	0.034	0.81	6.50
6	2.0	0.034	0.80	5.69
8	4.3	0.050	2.55	4.89
14.5	5.8	0.000	0.00	2.33
19.5	5.0	0.000	0.00	2.33
24.5	5.3	0.037	2.33	2.33
30	5.5	0.000	0.00	0.00
35.5	5.5	0.000	0.00	0.00
41	6.5	0.000	0.00	0.00
48.5	6.3	0.000	0.00	0.00
53.5	5.0	0.000	0.00	0.00
58.5	4.5	0.000	0.00	0.00
62.5	4.0	0.000	0.00	0.00
66.5	4.5	0.000	0.00	0.00
71.5	4.8	0.000	0.00	0.00
76	4.8	0.000	0.00	0.00
81	6.3	0.000	0.00	0.00
88.5	6.3	0.000	0.00	0.00
93.5	5.3	0.000	0.00	0.00
99	5.5	0.000	0.00	0.00
104.5	5.5	0.000	0.00	0.00
110	6.8	0.000	0.00	0.00
118	5.0	0.000	0.00	0.00
120	3.3	0.000	0.00	0.00
124.5	4.5	0.000	0.00	0.00
129	4.8	0.000	0.00	0.00
134	4.8	0.000	0.00	0.00
138.5	5.0	0.000	0.00	0.00
144	5.5	0.000	0.00	0.00
149.5	5.8	0.000	0.00	0.00
155.5	5.8	0.000	0.00	0.00
161	4.3	0.000	0.00	0.00
164				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:58 PM
Boring Designation:	B-14
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	0
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.29
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	0.5	1	SM	14	100		
2	2.0	2	SM	14	100		
3	4.0	4	SM	14	100		
4	6.0	25	SM	14	120		
5	8.0	3	SM	14	100		
6	13.5	16	SM	14	120		
7	18.5	5	SM	14	100		
8	23.5	9	SM	18	100		
9	28.5	2	SM	44	100		
10	33.5	4	ML	52	95		Clay
11	38.5	2	ML	52	95		Clay
12	43.5	2	ML	52	95		Clay
13	48.5	4	SM	30	100		
14	53.5	9	ML	50	120		Clay
15	58.5	4	ML	50	120		Clay
16	63.0	7	ML	50	120		Clay
17	68.0	7	ML	50	120		Clay
18	72.5	7	ML	50	120		Clay
19	77.5	13	SC	15	120		Clay
20	83.5	9	SC	15	120		Clay
21	88.5	5	SC	15	120		Clay
22	93.5	26	SC	15	120		Clay
23	98.5	8	ML	50	120		Clay
24	104.0	4	ML	50	120		Clay
25	108.5	5	ML	50	120		Clay
26	113.5	6	ML	50	120		Clay
27	118.5	9	ML	50	120		Clay
28	123.5	8	SM	15	120		Clay
29	128.5	6	SM	15	120		Clay
30	133.0	5	SM	15	120		Clay
31	138.0	11	SM	15	120		Clay
32	142.5	9	SM	15	120		Clay
33	148.5	8	SM	15	120		Clay
34	153.5	9	SM	15	120		Clay
35	158.5	9	SM	15	120		Clay
36	163.5	7	SM	15	120		Clay
37	168.5	8	SM	15	120		Clay
38	173.5	8	SM	15	120		Clay
39	178.5	6	SM	15	120		Clay
40	183.5	8	SM	15	120		Clay
41	188.5	6	SM	15	120		Clay
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*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	0.5	1.0	SM	14.0	100.0		50	19	1.39	1.00	0.75	1.00	1.04	1.70	1.77	2.91	4.67	1.005	0.504
2	2.0	2.0	SM	14.0	100.0		200	75	1.39	1.00	0.75	1.00	2.08	1.70	3.53	2.91	6.44	1.002	0.502
3	4.0	4.0	SM	14.0	100.0		400	150	1.39	1.00	0.75	1.00	4.16	1.70	7.06	2.91	9.97	0.997	0.500
4	6.0	25.0	SM	14.0	120.0		640	266	1.39	1.00	0.80	1.00	27.70	1.70	47.09	2.91	50.00	0.991	0.450
5	8.0	3.0	SM	13.8	100.0		840	341	1.39	1.00	0.80	1.00	3.32	1.70	5.65	2.83	8.48	0.985	0.458
6	13.5	16.0	SM	14.0	120.0		1500	658	1.39	1.00	0.85	1.00	18.84	1.51	28.48	2.91	31.39	0.966	0.415
7	18.5	5.0	SM	14.0	100.0		2000	846	1.39	1.00	0.95	1.00	6.58	1.59	10.44	2.91	13.35	0.947	0.422
8	23.5	9.0	SM	17.6	100.0		2500	1034	1.39	1.00	0.95	1.00	11.84	1.37	16.22	4.00	20.21	0.926	0.422
9	28.5	2.0	SM	43.7	100.0		3000	1222	1.39	1.00	1.00	1.00	2.77	1.35	3.75	5.60	9.35	0.903	0.418
10	33.5	4.0	ML	52.0	95.0	Clay	3475	1385	1.39	1.00	1.00	1.00	5.54	1.24	6.88	5.61	12.50	0.879	0.416
11	38.5	2.0	ML	52.0	95.0	Clay	3950	1548	1.39	1.00	1.00	1.00	2.77	1.19	3.29	5.61	8.91	0.855	0.411
12	43.5	2.0	ML	52.0	95.0	Clay	4425	1711	1.39	1.00	1.00	1.00	2.77	1.13	3.12	5.61	8.73	0.830	0.405
13	48.5	4.0	SM	30.1	100.0		4925	1899	1.39	1.00	1.00	1.00	5.54	1.06	5.87	5.37	11.23	0.805	0.394
14	53.5	9.0	ML	50.0	120.0	Clay	5525	2187	1.39	1.00	1.00	1.00	12.47	0.99	12.28	5.61	17.89	0.781	0.372
15	58.5	4.0	ML	50.0	120.0	Clay	6125	2475	1.39	1.00	1.00	1.00	5.54	0.92	5.10	5.61	10.71	0.757	0.353
16	63.0	7.0	ML	50.0	120.0	Clay	6665	2734	1.39	1.00	1.00	1.00	9.70	0.88	8.54	5.61	14.16	0.736	0.338
17	68.0	7.0	ML	50.0	120.0	Clay	7265	3022	1.39	1.00	1.00	1.00	9.70	0.84	8.11	5.61	13.73	0.714	0.324
18	72.5	7.0	ML	50.0	120.0	Clay	7805	3281	1.39	1.00	1.00	1.00	9.70	0.80	7.78	5.61	13.39	0.695	0.312
19	77.5	13.0	SC	15.0	120.0	Clay	8405	3569	1.39	1.00	1.00	1.00	18.01	0.78	14.13	3.26	17.39	0.676	0.300
20	83.5	9.0	SC	15.0	120.0	Clay	9125	3915	1.39	1.00	1.00	1.00	12.47	0.73	9.09	3.26	12.35	0.654	0.288
21	88.5	5.0	SC	15.0	120.0	Clay	9725	4203	1.39	1.00	1.00	1.00	6.93	0.68	4.69	3.26	7.95	0.639	0.279
22	93.5	26.0	SC	15.0	120.0	Clay	10325	4491	1.39	1.00	1.00	1.00	36.01	0.76	27.51	3.26	30.77	0.625	0.271
23	98.5	8.0	ML	50.0	120.0	Clay	10925	4779	1.39	1.00	1.00	1.00	11.08	0.66	7.33	5.61	12.94	0.613	0.264
24	104.0	4.0	ML	50.0	120.0	Clay	11585	5095	1.39	1.00	1.00	1.00	5.54	0.61	3.41	5.61	9.02	0.602	0.258
25	108.5	5.0	ML	50.0	120.0	Clay	12125	5355	1.39	1.00	1.00	1.00	6.93	0.60	4.18	5.61	9.80	0.596	0.254
26	113.5	6.0	ML	50.0	120.0	Clay	12725	5643	1.39	1.00	1.00	1.00	8.31	0.59	4.92	5.61	10.53	0.590	0.251
27	118.5	9.0	ML	50.0	120.0	Clay	13325	5931	1.39	1.00	1.00	1.00	12.47	0.59	7.39	5.61	13.01	0.587	0.249
28	123.5	8.0	SM	15.0	120.0	Clay	13925	6219	1.39	1.00	1.00	1.00	11.08	0.55	6.13	3.26	9.39	0.586	0.247
29	128.5	6.0	SM	15.0	120.0	Clay	14525	6507	1.39	1.00	1.00	1.00	8.31	0.53	4.37	3.26	7.63	0.588	0.247
30	133.0	5.0	SM	15.0	120.0	Clay	15065	6766	1.39	1.00	1.00	1.00	6.93	0.51	3.51	3.26	6.77	0.591	0.248
31	138.0	11.0	SM	15.0	120.0	Clay	15665	7054	1.39	1.00	1.00	1.00	15.24	0.53	8.10	3.26	11.36	0.597	0.250
32	142.5	9.0	SM	15.0	120.0	Clay	16205	7313	1.39	1.00	1.00	1.00	12.47	0.51	6.33	3.26	9.59	0.605	0.253
33	148.5	8.0	SM	15.0	120.0	Clay	16925	7659	1.39	1.00	1.00	1.00	11.08	0.49	5.41	3.26	8.67	0.618	0.258
34	153.5	9.0	SM	15.0	120.0	Clay	17525	7947	1.39	1.00	1.00	1.00	12.47	0.48	6.02	3.26	9.28	0.632	0.263
35	158.5	9.0	SM	15.0	120.0	Clay	18125	8235	1.39	1.00	1.00	1.00	12.47	0.47	5.89	3.26	9.15	0.649	0.269
36	163.5	7.0	SM	15.0	120.0	Clay	18725	8523	1.39	1.00	1.00	1.00	9.70	0.45	4.37	3.26	7.63	0.668	0.277
37	168.5	8.0	SM	15.0	120.0	Clay	19325	8811	1.39	1.00	1.00	1.00	11.08	0.45	4.96	3.26	8.22	0.690	0.285
38	173.5	8.0	SM	15.0	120.0	Clay	19925	9099	1.39	1.00	1.00	1.00	11.08	0.44	4.86	3.26	8.12	0.715	0.295
39	178.5	6.0	SM	15.0	120.0	Clay	20525	9387	1.39	1.00	1.00	1.00	8.31	0.42	3.48	3.26	6.74	0.741	0.306
40	183.5	8.0	SM	15.0	120.0	Clay	21125	9675	1.39	1.00	1.00	1.00	11.08	0.42	4.68	3.26	7.94	0.771	0.317
41	188.5	6.0	SM	15.0	120.0	Clay	21725	9963	1.39	1.00	1.00	1.00	8.31	0.40	3.35	3.26	6.61	0.802	0.330
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.11	1.01	1.10	0.084	0.093	0.19
1.13	1.01	1.10	0.095	0.105	0.21
1.19	1.01	1.10	0.118	0.131	0.26
2.20	1.08	1.10	2.000	2.000	2.00
1.16	1.01	1.10	0.108	0.120	0.26
2.08	1.07	1.10	0.587	0.693	1.67
1.27	1.02	1.10	0.143	0.159	0.38
1.50	1.03	1.10	0.208	0.236	0.56
1.18	1.01	1.05	0.114	0.121	0.29
1.25	1.02	1.04	0.136	0.144	2.00
1.17	1.01	1.03	0.111	0.115	2.00
1.17	1.01	1.02	0.109	0.113	2.00
1.22	1.01	1.01	0.127	0.130	0.33
1.41	1.03	1.00	0.183	0.187	2.00
1.21	1.01	0.99	0.123	0.123	2.00
1.29	1.02	0.97	0.149	0.148	2.00
1.28	1.02	0.96	0.146	0.143	2.00
1.27	1.02	0.95	0.143	0.139	2.00
1.39	1.03	0.94	0.178	0.171	2.00
1.24	1.02	0.94	0.135	0.129	2.00
1.15	1.01	0.94	0.104	0.099	2.00
2.04	1.07	0.84	0.537	0.484	2.00
1.26	1.02	0.92	0.140	0.130	2.00
1.17	1.01	0.92	0.111	0.104	2.00
1.19	1.01	0.91	0.117	0.108	2.00
1.20	1.01	0.91	0.122	0.112	2.00
1.26	1.02	0.89	0.140	0.127	2.00
1.18	1.01	0.90	0.114	0.104	2.00
1.15	1.01	0.91	0.102	0.093	2.00
1.14	1.01	0.91	0.097	0.088	2.00
1.22	1.01	0.88	0.128	0.114	2.00
1.18	1.01	0.89	0.115	0.104	2.00
1.17	1.01	0.89	0.109	0.098	2.00
1.18	1.01	0.88	0.113	0.101	2.00
1.17	1.01	0.88	0.112	0.100	2.00
1.15	1.01	0.88	0.102	0.091	2.00
1.16	1.01	0.88	0.106	0.094	2.00
1.16	1.01	0.87	0.105	0.093	2.00
1.14	1.01	0.88	0.097	0.086	2.00
1.15	1.01	0.87	0.104	0.092	2.00
1.13	1.01	0.87	0.096	0.085	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
0.5	1.3	0.054	0.81	12.29
2	1.8	0.047	0.99	11.48
4	2.0	0.037	0.90	10.49
6	2.0	0.000	0.00	9.59
8	3.8	0.041	1.84	9.59
13.5	5.3	0.001	0.09	7.75
18.5	5.0	0.031	1.87	7.66
23.5	5.0	0.023	1.37	5.79
28.5	5.0	0.039	2.33	4.42
33.5	5.0	0.000	0.00	2.09
38.5	5.0	0.000	0.00	2.09
43.5	5.0	0.000	0.00	2.09
48.5	5.0	0.035	2.09	2.09
53.5	5.0	0.000	0.00	0.00
58.5	4.8	0.000	0.00	0.00
63	4.8	0.000	0.00	0.00
68	4.8	0.000	0.00	0.00
72.5	4.8	0.000	0.00	0.00
77.5	5.5	0.000	0.00	0.00
83.5	5.5	0.000	0.00	0.00
88.5	5.0	0.000	0.00	0.00
93.5	5.0	0.000	0.00	0.00
98.5	5.3	0.000	0.00	0.00
104	5.0	0.000	0.00	0.00
108.5	4.8	0.000	0.00	0.00
113.5	5.0	0.000	0.00	0.00
118.5	5.0	0.000	0.00	0.00
123.5	5.0	0.000	0.00	0.00
128.5	4.8	0.000	0.00	0.00
133	4.8	0.000	0.00	0.00
138	4.8	0.000	0.00	0.00
142.5	5.3	0.000	0.00	0.00
148.5	5.5	0.000	0.00	0.00
153.5	5.0	0.000	0.00	0.00
158.5	5.0	0.000	0.00	0.00
163.5	5.0	0.000	0.00	0.00
168.5	5.0	0.000	0.00	0.00
173.5	5.0	0.000	0.00	0.00
178.5	5.0	0.000	0.00	0.00
183.5	5.0	0.000	0.00	0.00
188.5	4.0	0.000	0.00	0.00
191.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:58 PM
Boring Designation:	B-15
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	0
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.29
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	0.5	0	SP-SM	5	100		
2	2.0	2	SP-SM	5	100		
3	4.0	16	SP-SM	8	120		
4	6.0	17	SP-SM	5	120		
5	8.0	14	SP-SM	5	120		
6	13.5	25	SP-SM	6	120		
7	18.5	7	SM	18	100		
8	23.5	7	SM	18	100		
9	28.5	4	SM	18	100		
10	33.5	4	SM	18	100		
11	38.5	0	CL	50	95		Clay
12	43.5	0	SM	21	100		
13	48.5	9	SM	21	100		
14	53.5	14	SM	21	100		
15	58.5	2	SM	21	100		
16	63.5	6	SM	21	100		
17	68.5	8	SM	15	120		Clay
18	73.5	10	SM	15	120		Clay
19	78.5	23	SM	15	120		Clay
20	83.5	9	SM	15	120		Clay
21	88.5	27	SM	15	120		Clay
22	93.5	17	SM	15	120		Clay
23	98.5	8	SM	15	120		Clay
24	103.5	16	SM	15	120		Clay
25	108.5	10	SM	15	120		Clay
26	113.5	5	SM	15	120		Clay
27	118.5	6	SM	15	120		Clay
28	123.5	5	SM	15	120		Clay
29	128.5	7	SM	15	120		Clay
30	133.5	8	SM	15	120		Clay
31	138.5	8	SM	15	120		Clay
32	143.5	9	ML	50	120		Clay
33	148.5	12	SM	15	120		Clay
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*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	0.5	0.0	SP-SM	5.0	100.0		50	19	1.39	1.00	0.75	1.00	0.00	1.70	0.00	0.00	0.00	1.005	0.504
2	2.0	2.0	SP-SM	5.0	100.0		200	75	1.39	1.00	0.75	1.00	2.08	1.70	3.53	0.00	3.53	1.002	0.502
3	4.0	16.0	SP-SM	8.2	120.0		440	190	1.39	1.00	0.75	1.00	16.62	1.70	28.25	0.43	28.68	0.997	0.434
4	6.0	17.0	SP-SM	5.1	120.0		680	306	1.39	1.00	0.80	1.00	18.84	1.70	32.02	0.00	32.02	0.991	0.416
5	8.0	14.0	SP-SM	5.0	120.0		920	421	1.39	1.00	0.80	1.00	15.51	1.70	26.37	0.00	26.37	0.985	0.406
6	13.5	25.0	SP-SM	5.5	120.0		1580	738	1.39	1.00	0.85	1.00	29.43	1.37	40.24	0.01	40.25	0.966	0.390
7	18.5	7.0	SM	17.5	100.0		2080	926	1.39	1.00	0.95	1.00	9.21	1.47	13.51	3.97	17.48	0.947	0.401
8	23.5	7.0	SM	18.0	100.0		2580	1114	1.39	1.00	0.95	1.00	9.21	1.35	12.47	4.09	16.56	0.926	0.404
9	28.5	4.0	SM	18.0	100.0		3080	1302	1.39	1.00	1.00	1.00	5.54	1.29	7.16	4.09	11.25	0.903	0.403
10	33.5	4.0	SM	18.0	100.0		3580	1490	1.39	1.00	1.00	1.00	5.54	1.21	6.68	4.09	10.77	0.879	0.398
11	38.5	0.0	CL	50.0	95.0	Clay	4055	1653	1.39	1.00	1.00	1.00	0.00	1.16	0.00	5.61	5.61	0.855	0.395
12	43.5	0.0	SM	20.7	100.0		4555	1841	1.39	1.00	1.00	1.00	0.00	1.09	0.00	4.59	4.59	0.830	0.387
13	48.5	9.0	SM	21.0	100.0		5055	2029	1.39	1.00	1.00	1.00	12.47	1.02	12.71	4.63	17.34	0.805	0.378
14	53.5	14.0	SM	21.0	100.0		5555	2217	1.39	1.00	1.00	1.00	19.39	0.98	19.02	4.63	23.66	0.781	0.369
15	58.5	2.0	SM	21.0	100.0		6055	2405	1.39	1.00	1.00	1.00	2.77	0.93	2.57	4.63	7.21	0.757	0.359
16	63.5	6.0	SM	21.0	100.0		6555	2593	1.39	1.00	1.00	1.00	8.31	0.90	7.48	4.63	12.12	0.734	0.350
17	68.5	8.0	SM	15.0	120.0	Clay	7155	2881	1.39	1.00	1.00	1.00	11.08	0.85	9.47	3.26	12.73	0.712	0.333
18	73.5	10.0	SM	15.0	120.0	Clay	7755	3169	1.39	1.00	1.00	1.00	13.85	0.82	11.36	3.26	14.62	0.691	0.319
19	78.5	23.0	SM	15.0	120.0	Clay	8355	3457	1.39	1.00	1.00	1.00	31.86	0.84	26.64	3.26	29.91	0.672	0.306
20	83.5	9.0	SM	15.0	120.0	Clay	8955	3745	1.39	1.00	1.00	1.00	12.47	0.75	9.31	3.26	12.57	0.654	0.295
21	88.5	27.0	SM	15.0	120.0	Clay	9555	4033	1.39	1.00	1.00	1.00	37.40	0.80	30.01	3.26	33.27	0.639	0.285
22	93.5	17.0	SM	15.0	120.0	Clay	10155	4321	1.39	1.00	1.00	1.00	23.55	0.73	17.24	3.26	20.51	0.625	0.277
23	98.5	8.0	SM	15.0	120.0	Clay	10755	4609	1.39	1.00	1.00	1.00	11.08	0.66	7.31	3.26	10.57	0.613	0.270
24	103.5	16.0	SM	15.0	120.0	Clay	11355	4897	1.39	1.00	1.00	1.00	22.16	0.68	15.13	3.26	18.39	0.603	0.264
25	108.5	10.0	SM	15.0	120.0	Clay	11955	5185	1.39	1.00	1.00	1.00	13.85	0.63	8.70	3.26	11.97	0.596	0.259
26	113.5	5.0	SM	15.0	120.0	Clay	12555	5473	1.39	1.00	1.00	1.00	6.93	0.58	4.00	3.26	7.26	0.590	0.255
27	118.5	6.0	SM	15.0	120.0	Clay	13155	5761	1.39	1.00	1.00	1.00	8.31	0.57	4.71	3.26	7.97	0.587	0.253
28	123.5	5.0	SM	15.0	120.0	Clay	13755	6049	1.39	1.00	1.00	1.00	6.93	0.54	3.76	3.26	7.03	0.586	0.251
29	128.5	7.0	SM	15.0	120.0	Clay	14355	6337	1.39	1.00	1.00	1.00	9.70	0.54	5.25	3.26	8.51	0.588	0.251
30	133.5	8.0	SM	15.0	120.0	Clay	14955	6625	1.39	1.00	1.00	1.00	11.08	0.53	5.90	3.26	9.17	0.592	0.252
31	138.5	8.0	SM	15.0	120.0	Clay	15555	6913	1.39	1.00	1.00	1.00	11.08	0.52	5.75	3.26	9.02	0.598	0.254
32	143.5	9.0	ML	50.0	120.0	Clay	16155	7201	1.39	1.00	1.00	1.00	12.47	0.53	6.63	5.61	12.25	0.607	0.257
33	148.5	12.0	SM	15.0	120.0	Clay	16755	7489	1.39	1.00	1.00	1.00	16.62	0.52	8.62	3.26	11.88	0.618	0.261
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.09	1.01	1.10	0.061	0.067	0.13
1.10	1.01	1.10	0.078	0.086	0.17
1.92	1.06	1.10	0.414	0.483	1.11
2.12	1.08	1.10	0.647	0.766	1.84
1.79	1.05	1.10	0.327	0.379	0.93
2.20	1.08	1.10	2.000	2.000	2.00
1.40	1.03	1.10	0.179	0.202	0.50
1.37	1.02	1.08	0.170	0.187	0.46
1.22	1.01	1.05	0.127	0.135	0.33
1.21	1.01	1.03	0.123	0.129	0.32
1.12	1.01	1.02	0.090	0.092	2.00
1.11	1.01	1.01	0.084	0.085	0.22
1.39	1.03	1.01	0.177	0.183	0.48
1.65	1.04	0.99	0.261	0.271	0.74
1.14	1.01	0.99	0.099	0.099	0.28
1.24	1.02	0.98	0.133	0.133	0.38
1.25	1.02	0.97	0.138	0.136	2.00
1.31	1.02	0.96	0.153	0.149	2.00
1.99	1.07	0.90	0.479	0.461	2.00
1.25	1.02	0.94	0.137	0.131	2.00
2.20	1.08	0.85	0.796	0.729	2.00
1.51	1.03	0.90	0.212	0.198	2.00
1.20	1.01	0.93	0.122	0.115	2.00
1.43	1.03	0.89	0.188	0.173	2.00
1.23	1.02	0.91	0.132	0.122	2.00
1.14	1.01	0.92	0.100	0.093	2.00
1.15	1.01	0.91	0.104	0.096	2.00
1.14	1.01	0.91	0.098	0.091	2.00
1.16	1.01	0.90	0.108	0.099	2.00
1.17	1.01	0.90	0.112	0.102	2.00
1.17	1.01	0.89	0.111	0.101	2.00
1.24	1.02	0.88	0.134	0.120	2.00
1.23	1.02	0.87	0.132	0.117	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
0.5	1.3	0.118	1.77	21.53
2	1.8	0.060	1.26	19.76
4	2.0	0.006	0.14	18.50
6	2.0	0.001	0.01	18.36
8	3.8	0.009	0.41	18.35
13.5	5.3	0.000	0.00	17.94
18.5	5.0	0.026	1.54	17.94
23.5	5.0	0.027	1.60	16.40
28.5	5.0	0.035	2.09	14.79
33.5	5.0	0.036	2.15	12.70
38.5	5.0	0.000	0.00	10.56
43.5	5.0	0.054	3.27	10.56
48.5	5.0	0.026	1.55	7.29
53.5	5.0	0.018	1.08	5.74
58.5	5.0	0.045	2.67	4.67
63.5	5.0	0.033	1.99	1.99
68.5	5.0	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	5.0	0.000	0.00	0.00
83.5	5.0	0.000	0.00	0.00
88.5	5.0	0.000	0.00	0.00
93.5	5.0	0.000	0.00	0.00
98.5	5.0	0.000	0.00	0.00
103.5	5.0	0.000	0.00	0.00
108.5	5.0	0.000	0.00	0.00
113.5	5.0	0.000	0.00	0.00
118.5	5.0	0.000	0.00	0.00
123.5	5.0	0.000	0.00	0.00
128.5	5.0	0.000	0.00	0.00
133.5	5.0	0.000	0.00	0.00
138.5	5.0	0.000	0.00	0.00
143.5	5.0	0.000	0.00	0.00
148.5	4.0	0.000	0.00	0.00
151.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:57 PM
Boring Designation:	B-16
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	0
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.29
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	0.5	0	SM	15	100		
2	2.0	5	SM	15	100		
3	4.0	28	SP	2	120		
4	6.0	22	SP	2	120		
5	8.0	15	SP	2	120		
6	13.5	29	SP	2	120		
7	18.5	8	SM	14	100		
8	23.5	5	SM	14	100		
9	28.5	10	SM	14	100		
10	33.5	4	SM	14	100		
11	38.5	2	SC	47	100		
12	43.5	3	SM	15	100		
13	48.5	1	MH	91	100		Clay
14	53.5	2	MH	91	100		Clay
15	58.5	5	SM	15	100		
16	63.5	8	SM	15	100		
17	68.5	3	CL	50	95		Clay
18	73.5	6	SM	15	120		Clay
19	78.5	27	SM	15	120		Clay
20	83.5	11	SM	15	120		Clay
21	88.5	5	SM	15	120		Clay
22	93.5	28	SM	15	120		Clay
23	98.5	15	SM	15	120		Clay
24	103.5	10	SM	15	120		Clay
25	108.5	6	SM	15	120		Clay
26	113.5	9	SM	15	120		Clay
27	118.5	8	SM	15	120		Clay
28	123.5	9	SM	15	120		Clay
29	128.5	7	SM	15	120		Clay
30	133.5	6	SM	15	120		Clay
31	138.5	7	SM	15	120		Clay
32	143.5	12	SM	15	120		Clay
33	148.5	11	SM	15	120		Clay
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*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	0.5	0.0	SM	15.0	100.0		50	19	1.39	1.00	0.75	1.00	0.00	1.70	0.00	3.26	3.26	1.005	0.504
2	2.0	5.0	SM	15.0	100.0		200	75	1.39	1.00	0.75	1.00	5.19	1.70	8.83	3.26	12.09	1.002	0.502
3	4.0	28.0	SP	2.0	120.0		440	190	1.39	1.00	0.75	1.00	29.09	1.70	49.44	0.00	49.44	0.997	0.434
4	6.0	22.0	SP	2.1	120.0		680	306	1.39	1.00	0.80	1.00	24.38	1.70	41.44	0.00	41.44	0.991	0.416
5	8.0	15.0	SP	2.0	120.0		920	421	1.39	1.00	0.80	1.00	16.62	1.70	28.25	0.00	28.25	0.985	0.406
6	13.5	29.0	SP	2.1	120.0		1580	738	1.39	1.00	0.85	1.00	34.14	1.33	45.25	0.00	45.25	0.966	0.390
7	18.5	8.0	SM	14.0	100.0		2080	926	1.39	1.00	0.95	1.00	10.53	1.46	15.35	2.91	18.25	0.947	0.401
8	23.5	5.0	SM	13.9	100.0		2580	1114	1.39	1.00	0.95	1.00	6.58	1.39	9.17	2.87	12.04	0.926	0.404
9	28.5	10.0	SM	14.0	100.0		3080	1302	1.39	1.00	1.00	1.00	13.85	1.24	17.15	2.91	20.06	0.903	0.403
10	33.5	4.0	SM	14.0	100.0		3580	1490	1.39	1.00	1.00	1.00	5.54	1.21	6.71	2.91	9.62	0.879	0.398
11	38.5	2.0	SC	46.6	100.0		4080	1678	1.39	1.00	1.00	1.00	2.77	1.14	3.15	5.61	8.76	0.855	0.392
12	43.5	3.0	SM	15.0	100.0		4580	1866	1.39	1.00	1.00	1.00	4.16	1.07	4.46	3.26	7.73	0.830	0.384
13	48.5	1.0	MH	91.0	100.0	Clay	5080	2054	1.39	1.00	1.00	1.00	1.39	1.02	1.41	5.51	6.92	0.805	0.375
14	53.5	2.0	MH	91.0	100.0	Clay	5580	2242	1.39	1.00	1.00	1.00	2.77	0.97	2.68	5.51	8.19	0.781	0.366
15	58.5	5.0	SM	15.0	100.0		6080	2430	1.39	1.00	1.00	1.00	6.93	0.93	6.42	3.26	9.68	0.757	0.357
16	63.5	8.0	SM	15.0	100.0		6580	2618	1.39	1.00	1.00	1.00	11.08	0.90	9.95	3.26	13.21	0.734	0.348
17	68.5	3.0	CL	50.0	95.0	Clay	7055	2781	1.39	1.00	1.00	1.00	4.16	0.86	3.57	5.61	9.19	0.712	0.340
18	73.5	6.0	SM	15.0	120.0	Clay	7655	3069	1.39	1.00	1.00	1.00	8.31	0.82	6.80	3.26	10.06	0.691	0.325
19	78.5	27.0	SM	15.0	120.0	Clay	8255	3357	1.39	1.00	1.00	1.00	37.40	0.86	32.16	3.26	35.42	0.672	0.312
20	83.5	11.0	SM	15.0	120.0	Clay	8855	3645	1.39	1.00	1.00	1.00	15.24	0.77	11.69	3.26	14.95	0.654	0.300
21	88.5	5.0	SM	15.0	120.0	Clay	9455	3933	1.39	1.00	1.00	1.00	6.93	0.70	4.88	3.26	8.14	0.639	0.289
22	93.5	28.0	SM	15.0	120.0	Clay	10055	4221	1.39	1.00	1.00	1.00	38.78	0.79	30.75	3.26	34.01	0.625	0.281
23	98.5	15.0	SM	15.0	120.0	Clay	10655	4509	1.39	1.00	1.00	1.00	20.78	0.71	14.68	3.26	17.95	0.613	0.273
24	103.5	10.0	SM	15.0	120.0	Clay	11255	4797	1.39	1.00	1.00	1.00	13.85	0.66	9.09	3.26	12.36	0.603	0.267
25	108.5	6.0	SM	15.0	120.0	Clay	11855	5085	1.39	1.00	1.00	1.00	8.31	0.61	5.08	3.26	8.34	0.596	0.262
26	113.5	9.0	SM	15.0	120.0	Clay	12455	5373	1.39	1.00	1.00	1.00	12.47	0.61	7.60	3.26	10.86	0.590	0.258
27	118.5	8.0	SM	15.0	120.0	Clay	13055	5661	1.39	1.00	1.00	1.00	11.08	0.59	6.49	3.26	9.75	0.587	0.255
28	123.5	9.0	SM	15.0	120.0	Clay	13655	5949	1.39	1.00	1.00	1.00	12.47	0.57	7.16	3.26	10.42	0.586	0.254
29	128.5	7.0	SM	15.0	120.0	Clay	14255	6237	1.39	1.00	1.00	1.00	9.70	0.55	5.30	3.26	8.56	0.588	0.253
30	133.5	6.0	SM	15.0	120.0	Clay	14855	6525	1.39	1.00	1.00	1.00	8.31	0.53	4.36	3.26	7.63	0.592	0.254
31	138.5	7.0	SM	15.0	120.0	Clay	15455	6813	1.39	1.00	1.00	1.00	9.70	0.52	5.02	3.26	8.28	0.598	0.256
32	143.5	12.0	SM	15.0	120.0	Clay	16055	7101	1.39	1.00	1.00	1.00	16.62	0.54	8.90	3.26	12.16	0.607	0.259
33	148.5	11.0	SM	15.0	120.0	Clay	16655	7389	1.39	1.00	1.00	1.00	15.24	0.52	7.88	3.26	11.14	0.618	0.263
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.10	1.01	1.10	0.077	0.085	0.17
1.24	1.02	1.10	0.133	0.149	0.30
2.20	1.08	1.10	2.000	2.000	2.00
2.20	1.08	1.10	2.000	2.000	2.00
1.89	1.06	1.10	0.394	0.460	1.13
2.20	1.08	1.10	2.000	2.000	2.00
1.43	1.03	1.10	0.186	0.211	0.53
1.24	1.02	1.06	0.133	0.143	0.35
1.50	1.03	1.06	0.207	0.227	0.56
1.18	1.01	1.03	0.115	0.121	0.30
1.17	1.01	1.02	0.110	0.113	0.29
1.15	1.01	1.01	0.103	0.105	0.27
1.14	1.01	1.00	0.098	0.099	2.00
1.16	1.01	1.00	0.106	0.106	2.00
1.18	1.01	0.99	0.116	0.116	0.32
1.27	1.02	0.98	0.142	0.141	0.41
1.18	1.01	0.98	0.112	0.111	2.00
1.19	1.01	0.97	0.118	0.116	2.00
2.20	1.08	0.88	1.212	1.148	2.00
1.32	1.02	0.94	0.156	0.149	2.00
1.16	1.01	0.95	0.106	0.101	2.00
2.20	1.08	0.83	0.911	0.816	2.00
1.41	1.03	0.91	0.183	0.171	2.00
1.24	1.02	0.92	0.135	0.126	2.00
1.16	1.01	0.92	0.107	0.100	2.00
1.21	1.01	0.91	0.124	0.115	2.00
1.19	1.01	0.91	0.116	0.107	2.00
1.20	1.01	0.90	0.121	0.111	2.00
1.16	1.01	0.91	0.108	0.099	2.00
1.15	1.01	0.91	0.102	0.093	2.00
1.16	1.01	0.90	0.106	0.097	2.00
1.24	1.02	0.88	0.134	0.119	2.00
1.22	1.01	0.88	0.126	0.113	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
0.5	1.3	0.062	0.92	18.20
2	1.8	0.033	0.70	17.28
4	2.0	0.000	0.00	16.58
6	2.0	0.000	0.00	16.58
8	3.8	0.006	0.25	16.58
13.5	5.3	0.000	0.00	16.33
18.5	5.0	0.025	1.49	16.33
23.5	5.0	0.033	2.00	14.84
28.5	5.0	0.023	1.38	12.84
33.5	5.0	0.038	2.29	11.46
38.5	5.0	0.040	2.42	9.16
43.5	5.0	0.043	2.58	6.75
48.5	5.0	0.000	0.00	4.17
53.5	5.0	0.000	0.00	4.17
58.5	5.0	0.038	2.28	4.17
63.5	5.0	0.031	1.88	1.88
68.5	5.0	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	5.0	0.000	0.00	0.00
83.5	5.0	0.000	0.00	0.00
88.5	5.0	0.000	0.00	0.00
93.5	5.0	0.000	0.00	0.00
98.5	5.0	0.000	0.00	0.00
103.5	5.0	0.000	0.00	0.00
108.5	5.0	0.000	0.00	0.00
113.5	5.0	0.000	0.00	0.00
118.5	5.0	0.000	0.00	0.00
123.5	5.0	0.000	0.00	0.00
128.5	5.0	0.000	0.00	0.00
133.5	5.0	0.000	0.00	0.00
138.5	5.0	0.000	0.00	0.00
143.5	5.0	0.000	0.00	0.00
148.5	4.0	0.000	0.00	0.00
151.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:46 PM
Boring Designation:	B-1
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	8
SPT Liner (Yes/No):	No
Hammer Energy, %:	82
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	6

Earthquake Information

Max Acceleration (g) :	0.14
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	2.0	8	SP-SM	8	100		Unsaturated
2	4.0	7	SP-SM	8	100		Unsaturated
3	6.0	6	SP-SM	8	100		Unsaturated
4	8.0	6	SP-SM	8	100		
5	10.0	3	SP-SM	8	100		
6	12.0	4	SP-SM	8	100		
7	14.0	8	SP-SM	8	100		
8	16.0	2	SP-SM	8	100		
9	18.0	2	SP	3	100		
10	23.5	2	SP	3	100		
11	28.5	4	SP-SM	7	100		
12	33.5	4	SP-SM	7	100		
13	38.5	3	SP-SM	7	100		
14	43.5	1	SP-SM	11	100		
15	48.5	1	SM	33	100		
16	53.5	14	ML	50	120		Clay
17	55.0	34	ML	50	120		Clay
18	58.5	7	ML	50	120		Clay
19	63.5	6	ML	50	120		Clay
20	65.0	7	ML	50	120		Clay
21	66.5	10	ML	50	120		Clay
22	68.5	12	ML	50	120		Clay
23	73.5	11	ML	50	120		Clay
24	78.5	23	ML	50	120		Clay
25	83.5	3	SM	15	120		Clay
26	88.5	10	SM	15	120		Clay
27	93.5	11	SM	15	120		Clay
28	100.0	25	SM	15	120		Clay
29	103.5	10	SM	15	120		Clay
30	108.5	9	SM	15	120		Clay
31	113.5	12	SM	15	120		Clay
32	118.5	12	SM	15	120		Clay
33	123.5	16	SM	15	120		Clay
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*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	2.0	8.0	SP-SM	8.0	100.0	Unsaturated	200	200	1.37	1.15	0.75	1.00	9.43	1.70	16.03	0.37	16.40	1.002	0.091
2	4.0	7.0	SP-SM	8.0	100.0	Unsaturated	400	400	1.37	1.15	0.75	1.00	8.25	1.70	14.03	0.37	14.39	0.997	0.091
3	6.0	6.0	SP-SM	8.0	100.0	Unsaturated	600	600	1.37	1.15	0.80	1.00	7.54	1.70	12.82	0.37	13.19	0.991	0.090
4	8.0	6.0	SP-SM	8.0	100.0		800	800	1.37	1.15	0.80	1.00	7.54	1.64	12.39	0.37	12.75	0.985	0.090
5	10.0	3.0	SP-SM	8.0	100.0		1000	875	1.37	1.15	0.85	1.00	4.01	1.67	6.69	0.37	7.06	0.978	0.102
6	12.0	4.0	SP-SM	8.0	100.0		1200	950	1.37	1.15	0.85	1.00	5.34	1.56	8.35	0.37	8.72	0.971	0.112
7	14.0	8.0	SP-SM	8.0	100.0		1400	1026	1.37	1.15	0.85	1.00	10.69	1.42	15.15	0.37	15.51	0.964	0.120
8	16.0	2.0	SP-SM	8.0	100.0		1600	1101	1.37	1.15	0.95	1.00	2.99	1.49	4.46	0.37	4.83	0.957	0.127
9	18.0	2.0	SP	3.3	100.0		1800	1176	1.37	1.15	0.95	1.00	2.99	1.44	4.31	0.00	4.31	0.949	0.132
10	23.5	2.0	SP	3.3	100.0		2350	1383	1.37	1.15	0.95	1.00	2.99	1.31	3.91	0.00	3.91	0.926	0.143
11	28.5	4.0	SP-SM	7.4	100.0		2850	1571	1.37	1.15	1.00	1.00	6.29	1.19	7.45	0.21	7.67	0.903	0.149
12	33.5	4.0	SP-SM	7.0	100.0		3350	1759	1.37	1.15	1.00	1.00	6.29	1.11	7.00	0.14	7.13	0.879	0.152
13	38.5	3.0	SP-SM	7.0	100.0		3850	1947	1.37	1.15	1.00	1.00	4.72	1.05	4.96	0.14	5.10	0.855	0.154
14	43.5	1.0	SP-SM	11.0	100.0		4350	2135	1.37	1.15	1.00	1.00	1.57	0.99	1.56	1.61	3.17	0.830	0.154
15	48.5	1.0	SM	33.2	100.0		4850	2323	1.37	1.15	1.00	1.00	1.57	0.95	1.49	5.47	6.95	0.805	0.153
16	53.5	14.0	ML	50.0	120.0	Clay	5450	2611	1.37	1.15	1.00	1.00	22.00	0.92	20.26	5.61	25.87	0.781	0.148
17	55.0	34.0	ML	50.0	120.0	Clay	5630	2697	1.37	1.15	1.00	1.00	53.44	0.94	50.13	5.61	55.75	0.773	0.147
18	58.5	7.0	ML	50.0	120.0	Clay	6050	2899	1.37	1.15	1.00	1.00	11.00	0.86	9.44	5.61	15.06	0.757	0.144
19	63.5	6.0	ML	50.0	120.0	Clay	6650	3187	1.37	1.15	1.00	1.00	9.43	0.81	7.67	5.61	13.29	0.734	0.139
20	65.0	7.0	ML	50.0	120.0	Clay	6830	3273	1.37	1.15	1.00	1.00	11.00	0.81	8.88	5.61	14.49	0.727	0.138
21	66.5	10.0	ML	50.0	120.0	Clay	7010	3360	1.37	1.15	1.00	1.00	15.72	0.81	12.74	5.61	18.35	0.720	0.137
22	68.5	12.0	ML	50.0	120.0	Clay	7250	3475	1.37	1.15	1.00	1.00	18.86	0.81	15.21	5.61	20.83	0.712	0.135
23	73.5	11.0	ML	50.0	120.0	Clay	7850	3763	1.37	1.15	1.00	1.00	17.29	0.77	13.35	5.61	18.96	0.691	0.131
24	78.5	23.0	ML	50.0	120.0	Clay	8450	4051	1.37	1.15	1.00	1.00	36.15	0.81	29.15	5.61	34.77	0.672	0.128
25	83.5	3.0	SM	15.0	120.0	Clay	9050	4339	1.37	1.15	1.00	1.00	4.72	0.65	3.09	3.26	6.35	0.654	0.124
26	88.5	10.0	SM	15.0	120.0	Clay	9650	4627	1.37	1.15	1.00	1.00	15.72	0.68	10.65	3.26	13.91	0.639	0.121
27	93.5	11.0	SM	15.0	120.0	Clay	10250	4915	1.37	1.15	1.00	1.00	17.29	0.66	11.44	3.26	14.71	0.625	0.119
28	100.0	25.0	SM	15.0	120.0	Clay	11030	5289	1.37	1.15	1.00	1.00	39.29	0.72	28.48	3.26	31.74	0.610	0.116
29	103.5	10.0	SM	15.0	120.0	Clay	11450	5491	1.37	1.15	1.00	1.00	15.72	0.62	9.69	3.26	12.95	0.603	0.114
30	108.5	9.0	SM	15.0	120.0	Clay	12050	5779	1.37	1.15	1.00	1.00	14.15	0.59	8.37	3.26	11.63	0.596	0.113
31	113.5	12.0	SM	15.0	120.0	Clay	12650	6067	1.37	1.15	1.00	1.00	18.86	0.60	11.24	3.26	14.50	0.590	0.112
32	118.5	12.0	SM	15.0	120.0	Clay	13250	6355	1.37	1.15	1.00	1.00	18.86	0.58	10.95	3.26	14.21	0.587	0.111
33	123.5	16.0	SM	15.0	120.0	Clay	13850	6643	1.37	1.15	1.00	1.00	25.15	0.59	14.92	3.26	18.18	0.586	0.111
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.36	1.02	1.10	0.168	0.190	2.00
1.30	1.02	1.10	0.151	0.170	2.00
1.27	1.02	1.10	0.142	0.158	2.00
1.25	1.02	1.10	0.138	0.154	1.72
1.14	1.01	1.07	0.099	0.107	1.05
1.17	1.01	1.07	0.109	0.118	1.06
1.33	1.02	1.08	0.161	0.178	1.48
1.11	1.01	1.05	0.085	0.090	0.71
1.11	1.01	1.04	0.082	0.086	0.65
1.11	1.01	1.03	0.080	0.083	0.58
1.15	1.01	1.03	0.102	0.106	0.71
1.14	1.01	1.02	0.099	0.102	0.67
1.12	1.01	1.01	0.087	0.088	0.57
1.10	1.01	1.00	0.076	0.077	0.50
1.14	1.01	0.99	0.098	0.098	0.64
1.76	1.05	0.96	0.312	0.317	2.00
2.20	1.08	0.93	2.000	2.000	2.00
1.32	1.02	0.97	0.157	0.154	2.00
1.27	1.02	0.96	0.142	0.139	2.00
1.30	1.02	0.95	0.152	0.148	2.00
1.43	1.03	0.94	0.187	0.182	2.00
1.53	1.04	0.93	0.216	0.209	2.00
1.45	1.03	0.93	0.194	0.185	2.00
2.20	1.08	0.83	1.057	0.951	2.00
1.13	1.01	0.94	0.094	0.090	2.00
1.29	1.02	0.92	0.147	0.138	2.00
1.31	1.02	0.91	0.154	0.142	2.00
2.11	1.08	0.80	0.619	0.531	2.00
1.26	1.02	0.90	0.140	0.128	2.00
1.23	1.02	0.90	0.130	0.119	2.00
1.30	1.02	0.89	0.152	0.137	2.00
1.29	1.02	0.88	0.150	0.135	2.00
1.42	1.03	0.86	0.186	0.164	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
2	0.0	0.000	0.00	22.80
4	0.0	0.000	0.00	22.80
6	0.0	0.000	0.00	22.80
8	1.0	0.001	0.01	22.80
10	2.0	0.010	0.23	22.79
12	2.0	0.009	0.21	22.56
14	2.0	0.002	0.05	22.35
16	2.0	0.053	1.28	22.30
18	3.8	0.056	2.51	21.02
23.5	5.3	0.058	3.65	18.51
28.5	5.0	0.043	2.59	14.86
33.5	5.0	0.045	2.69	12.27
38.5	5.0	0.052	3.13	9.58
43.5	5.0	0.062	3.73	6.45
48.5	5.0	0.045	2.72	2.72
53.5	3.3	0.000	0.00	0.00
55	2.5	0.000	0.00	0.00
58.5	4.3	0.000	0.00	0.00
63.5	3.3	0.000	0.00	0.00
65	1.5	0.000	0.00	0.00
66.5	1.8	0.000	0.00	0.00
68.5	3.5	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	5.0	0.000	0.00	0.00
83.5	5.0	0.000	0.00	0.00
88.5	5.0	0.000	0.00	0.00
93.5	5.8	0.000	0.00	0.00
100	5.0	0.000	0.00	0.00
103.5	4.3	0.000	0.00	0.00
108.5	5.0	0.000	0.00	0.00
113.5	5.0	0.000	0.00	0.00
118.5	5.0	0.000	0.00	0.00
123.5	4.0	0.000	0.00	0.00
126.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:40 PM
Boring Designation:	B-2
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	6
SPT Liner (Yes/No):	No
Hammer Energy, %:	82
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	6

Earthquake Information

Max Acceleration (g) :	0.12
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	2.0	20	SP	5	100		Unsaturated
2	4.0	6	SP	5	100		Unsaturated
3	6.0	1	SP	5	100		
4	8.0	11	SP	3	100		
5	10.0	18	SP	3	120		
6	12.0	30	SP	3	120		
7	14.0	38	SP	3	120		
8	16.0	21	SP	3	120		
9	18.0	7	SP-SM	6	100		
10	23.5	0	SP-SM	6	100		
11	28.5	1	SM	14	100		
12	33.5	4	SM	14	100		
13	38.5	4	SP-SM	9	100		
14	43.5	19	SP-SM	9	120		
15	48.5	7	SP-SM	9	100		
16	53.5	11	SP-SM	10	100		
17	58.5	2	SP-SM	10	100		
18	63.5	1	CL	50	100		Clay
19	68.5	7	SP-SM	5	100		
20	73.5	5	ML	50	120		Clay
21	78.5	5	ML	50	120		Clay
22	83.5	4	ML	50	120		Clay
23	88.5	32	SM	15	120		Clay
24	93.5	5	SM	15	120		Clay
25	98.5	6	SM	15	120		Clay
26	103.5	4	SM	15	120		Clay
27	108.5	7	SM	15	120		Clay
28	113.5	10	SM	15	120		Clay
29	118.5	7	SM	15	120		Clay
30	123.5	7	SM	15	120		Clay
31							Clay
32							Clay
33							Clay
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*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	2.0	20.0	SP	5.0	100.0	Unsaturated	200	200	1.37	1.15	0.75	1.00	23.58	1.70	40.08	0.00	40.08	1.002	0.078
2	4.0	6.0	SP	5.0	100.0	Unsaturated	400	400	1.37	1.15	0.75	1.00	7.07	1.70	12.02	0.00	12.03	0.997	0.078
3	6.0	1.0	SP	4.9	100.0		600	600	1.37	1.15	0.80	1.00	1.26	1.70	2.14	0.00	2.14	0.991	0.077
4	8.0	11.0	SP	2.5	100.0		800	675	1.37	1.15	0.80	1.00	13.83	1.62	22.37	0.00	22.37	0.985	0.091
5	10.0	18.0	SP	3.0	120.0		1040	790	1.37	1.15	0.85	1.00	24.05	1.40	33.58	0.00	33.58	0.978	0.100
6	12.0	30.0	SP	3.0	120.0		1280	906	1.37	1.15	0.85	1.00	40.08	1.25	50.10	0.00	50.10	0.971	0.107
7	14.0	38.0	SP	3.0	120.0		1520	1021	1.37	1.15	0.85	1.00	50.76	1.21	61.50	0.00	61.50	0.964	0.112
8	16.0	21.0	SP	3.0	120.0		1760	1136	1.37	1.15	0.95	1.00	31.35	1.21	38.03	0.00	38.03	0.957	0.116
9	18.0	7.0	SP-SM	6.3	100.0		1960	1211	1.37	1.15	0.95	1.00	10.45	1.32	13.80	0.05	13.85	0.949	0.120
10	23.5	0.0	SP-SM	6.0	100.0		2510	1418	1.37	1.15	0.95	1.00	0.00	1.36	0.00	0.03	0.03	0.926	0.128
11	28.5	1.0	SM	14.0	100.0		3010	1606	1.37	1.15	1.00	1.00	1.57	1.19	1.86	2.91	4.77	0.903	0.132
12	33.5	4.0	SM	14.0	100.0		3510	1794	1.37	1.15	1.00	1.00	6.29	1.09	6.88	2.91	9.78	0.879	0.134
13	38.5	4.0	SP-SM	8.8	100.0		4010	1982	1.37	1.15	1.00	1.00	6.29	1.04	6.53	0.64	7.17	0.855	0.135
14	43.5	19.0	SP-SM	9.0	120.0		4610	2270	1.37	1.15	1.00	1.00	29.86	0.97	29.11	0.72	29.83	0.830	0.131
15	48.5	7.0	SP-SM	9.0	100.0		5110	2458	1.37	1.15	1.00	1.00	11.00	0.92	10.16	0.72	10.88	0.805	0.131
16	53.5	11.0	SP-SM	10.0	100.0		5610	2646	1.37	1.15	1.00	1.00	17.29	0.90	15.56	1.15	16.71	0.781	0.129
17	58.5	2.0	SP-SM	10.0	100.0		6110	2834	1.37	1.15	1.00	1.00	3.14	0.83	2.61	1.15	3.76	0.757	0.127
18	63.5	1.0	CL	50.0	100.0	Clay	6610	3022	1.37	1.15	1.00	1.00	1.57	0.81	1.28	5.61	6.89	0.734	0.125
19	68.5	7.0	SP-SM	5.0	100.0		7110	3210	1.37	1.15	1.00	1.00	11.00	0.79	8.72	0.00	8.72	0.712	0.123
20	73.5	5.0	ML	50.0	120.0	Clay	7710	3498	1.37	1.15	1.00	1.00	7.86	0.77	6.05	5.61	11.66	0.691	0.119
21	78.5	5.0	ML	50.0	120.0	Clay	8310	3786	1.37	1.15	1.00	1.00	7.86	0.74	5.79	5.61	11.41	0.672	0.115
22	83.5	4.0	ML	50.0	120.0	Clay	8910	4074	1.37	1.15	1.00	1.00	6.29	0.70	4.41	5.61	10.03	0.654	0.112
23	88.5	32.0	SM	15.0	120.0	Clay	9510	4362	1.37	1.15	1.00	1.00	50.29	0.82	41.34	3.26	44.60	0.639	0.109
24	93.5	5.0	SM	15.0	120.0	Clay	10110	4650	1.37	1.15	1.00	1.00	7.86	0.64	5.05	3.26	8.31	0.625	0.106
25	98.5	6.0	SM	15.0	120.0	Clay	10710	4938	1.37	1.15	1.00	1.00	9.43	0.63	5.91	3.26	9.17	0.613	0.104
26	103.5	4.0	SM	15.0	120.0	Clay	11310	5226	1.37	1.15	1.00	1.00	6.29	0.59	3.72	3.26	6.98	0.603	0.102
27	108.5	7.0	SM	15.0	120.0	Clay	11910	5514	1.37	1.15	1.00	1.00	11.00	0.59	6.54	3.26	9.80	0.596	0.100
28	113.5	10.0	SM	15.0	120.0	Clay	12510	5802	1.37	1.15	1.00	1.00	15.72	0.60	9.39	3.26	12.65	0.590	0.099
29	118.5	7.0	SM	15.0	120.0	Clay	13110	6090	1.37	1.15	1.00	1.00	11.00	0.56	6.16	3.26	9.42	0.587	0.099
30	123.5	7.0	SM	15.0	120.0	Clay	13710	6378	1.37	1.15	1.00	1.00	11.00	0.54	5.99	3.26	9.26	0.586	0.098
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
2.20	1.08	1.10	2.000	2.000	2.00
1.24	1.02	1.10	0.133	0.148	2.00
1.09	1.01	1.08	0.071	0.077	1.00
1.59	1.04	1.10	0.239	0.273	2.00
2.20	1.08	1.10	0.840	1.000	2.00
2.20	1.08	1.10	2.000	2.000	2.00
2.20	1.08	1.10	2.000	2.000	2.00
2.20	1.08	1.10	2.000	2.000	2.00
1.28	1.02	1.06	0.147	0.158	1.32
1.09	1.01	1.02	0.061	0.063	0.49
1.11	1.01	1.02	0.085	0.087	0.66
1.19	1.01	1.02	0.117	0.120	0.89
1.14	1.01	1.01	0.099	0.101	0.75
1.99	1.07	0.99	0.474	0.499	2.00
1.21	1.01	0.99	0.124	0.124	0.95
1.37	1.03	0.97	0.171	0.171	1.32
1.10	1.01	0.98	0.079	0.078	0.61
1.14	1.01	0.97	0.098	0.096	2.00
1.17	1.01	0.96	0.109	0.107	0.87
1.23	1.02	0.95	0.130	0.125	2.00
1.22	1.02	0.94	0.128	0.123	2.00
1.19	1.01	0.94	0.118	0.113	2.00
2.20	1.08	0.79	2.000	1.701	2.00
1.16	1.01	0.93	0.107	0.100	2.00
1.17	1.01	0.92	0.112	0.105	2.00
1.14	1.01	0.93	0.098	0.092	2.00
1.19	1.01	0.91	0.117	0.108	2.00
1.25	1.02	0.90	0.137	0.125	2.00
1.18	1.01	0.90	0.114	0.104	2.00
1.18	1.01	0.90	0.113	0.103	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
2	0.0	0.000	0.00	23.78
4	0.0	0.000	0.00	23.78
6	1.0	0.032	0.39	23.78
8	2.0	0.000	0.00	23.40
10	2.0	0.000	0.00	23.40
12	2.0	0.000	0.00	23.40
14	2.0	0.000	0.00	23.40
16	2.0	0.000	0.00	23.40
18	3.8	0.003	0.16	23.40
23.5	5.3	0.113	7.11	23.24
28.5	5.0	0.054	3.22	16.14
33.5	5.0	0.038	2.27	12.92
38.5	5.0	0.045	2.68	10.65
43.5	5.0	0.000	0.00	7.97
48.5	5.0	0.030	1.79	7.97
53.5	5.0	0.004	0.23	6.18
58.5	5.0	0.059	3.52	5.94
63.5	5.0	0.000	0.00	2.42
68.5	5.0	0.040	2.42	2.42
73.5	5.0	0.000	0.00	0.00
78.5	5.0	0.000	0.00	0.00
83.5	5.0	0.000	0.00	0.00
88.5	5.0	0.000	0.00	0.00
93.5	5.0	0.000	0.00	0.00
98.5	5.0	0.000	0.00	0.00
103.5	5.0	0.000	0.00	0.00
108.5	5.0	0.000	0.00	0.00
113.5	5.0	0.000	0.00	0.00
118.5	5.0	0.000	0.00	0.00
123.5	4.0	0.000	0.00	0.00
126.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:47 PM
Boring Designation:	B-3
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	1
SPT Liner (Yes/No):	No
Hammer Energy, %:	80
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.14
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"	
1	2.0	0	SM	38	100			
2	4.0	0	SM	38	100			
3	6.0	0	MH	99	95		Clay	
4	8.0	0	MH	99	95		Clay	
5	13.5	16	SP-SM	8	100			
6	18.5	1	SP-SM	8	100			
7	23.5	1	SM	25	100			
8	28.5	0	MH	97	95		Clay	
9	33.5	0	SP-SM	10	100			
10	38.5	3	SP-SM	10	100			
11	43.5	4	SP-SM	10	100			
12	48.5	7	ML	50	120		Clay	*Assumes Marl/Limestone NonLiq
13	53.5	4	ML	50	120		Clay	
14	58.5	7	ML	50	120		Clay	
15	63.5	5	ML	50	120		Clay	
16	68.5	10	ML	50	120		Clay	
17	73.5	8	ML	50	120		Clay	
18	78.5	6	SM	15	120		Clay	
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SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	2.0	0.0	SM	37.5	100.0		200	106	1.33	1.00	0.75	1.00	0.00	1.70	0.00	5.55	5.55	1.002	0.171
2	4.0	0.0	SM	38.0	100.0		400	182	1.33	1.00	0.75	1.00	0.00	1.70	0.00	5.55	5.55	0.997	0.200
3	6.0	0.0	MH	98.8	95.0	Clay	590	247	1.33	1.00	0.80	1.00	0.00	1.70	0.00	5.49	5.49	0.991	0.216
4	8.0	0.0	MH	98.8	95.0	Clay	780	312	1.33	1.00	0.80	1.00	0.00	1.70	0.00	5.49	5.49	0.985	0.224
5	13.5	16.0	SP-SM	7.7	100.0		1330	519	1.33	1.00	0.85	1.00	18.13	1.66	30.11	0.28	30.39	0.966	0.225
6	18.5	1.0	SP-SM	7.7	100.0		1830	707	1.33	1.00	0.95	1.00	1.27	1.70	2.15	0.28	2.44	0.947	0.223
7	23.5	1.0	SM	24.5	100.0		2330	895	1.33	1.00	0.95	1.00	1.27	1.65	2.09	5.03	7.12	0.926	0.219
8	28.5	0.0	MH	96.6	95.0	Clay	2805	1058	1.33	1.00	1.00	1.00	0.00	1.52	0.00	5.50	5.50	0.903	0.218
9	33.5	0.0	SP-SM	10.4	100.0		3305	1246	1.33	1.00	1.00	1.00	0.00	1.45	0.00	1.33	1.33	0.879	0.212
10	38.5	3.0	SP-SM	10.4	100.0		3805	1434	1.33	1.00	1.00	1.00	4.00	1.26	5.03	1.33	6.37	0.855	0.206
11	43.5	4.0	SP-SM	10.4	100.0		4305	1622	1.33	1.00	1.00	1.00	5.33	1.16	6.21	1.33	7.54	0.830	0.200
12	48.5	7.0	ML	50.0	120.0	Clay	4905	1910	1.33	1.00	1.00	1.00	9.33	1.05	9.81	5.61	15.42	0.805	0.188
13	53.5	4.0	ML	50.0	120.0	Clay	5505	2198	1.33	1.00	1.00	1.00	5.33	0.98	5.23	5.61	10.84	0.781	0.178
14	58.5	7.0	ML	50.0	120.0	Clay	6105	2486	1.33	1.00	1.00	1.00	9.33	0.92	8.62	5.61	14.23	0.757	0.169
15	63.5	5.0	ML	50.0	120.0	Clay	6705	2774	1.33	1.00	1.00	1.00	6.67	0.87	5.78	5.61	11.40	0.734	0.161
16	68.5	10.0	ML	50.0	120.0	Clay	7305	3062	1.33	1.00	1.00	1.00	13.33	0.84	11.21	5.61	16.83	0.712	0.155
17	73.5	8.0	ML	50.0	120.0	Clay	7905	3350	1.33	1.00	1.00	1.00	10.67	0.80	8.50	5.61	14.11	0.691	0.148
18	78.5	6.0	SM	15.0	120.0	Clay	8505	3638	1.33	1.00	1.00	1.00	8.00	0.74	5.93	3.26	9.20	0.672	0.143
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.12	1.01	1.10	0.089	0.099	0.58
1.12	1.01	1.10	0.089	0.099	0.50
1.12	1.01	1.10	0.089	0.099	2.00
1.12	1.01	1.10	0.089	0.099	2.00
2.02	1.07	1.10	0.510	0.600	2.00
1.10	1.01	1.07	0.072	0.078	0.35
1.14	1.01	1.07	0.099	0.107	0.49
1.12	1.01	1.05	0.089	0.095	2.00
1.09	1.01	1.03	0.067	0.069	0.33
1.13	1.01	1.03	0.094	0.098	0.48
1.15	1.01	1.02	0.102	0.105	0.52
1.33	1.02	1.01	0.160	0.165	2.00
1.21	1.01	1.00	0.124	0.125	2.00
1.29	1.02	0.98	0.150	0.150	2.00
1.22	1.02	0.97	0.128	0.127	2.00
1.38	1.03	0.96	0.172	0.169	2.00
1.29	1.02	0.95	0.149	0.144	2.00
1.18	1.01	0.95	0.113	0.108	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
2	2.5	0.050	1.51	19.61
4	2.0	0.050	1.21	18.10
6	2.0	0.000	0.00	16.89
8	3.8	0.000	0.00	16.89
13.5	5.3	0.000	0.00	16.89
18.5	5.0	0.067	4.05	16.89
23.5	5.0	0.045	2.69	12.84
28.5	5.0	0.000	0.00	10.15
33.5	5.0	0.078	4.70	10.15
38.5	5.0	0.047	2.84	5.45
43.5	5.0	0.044	2.61	2.61
48.5	5.0	0.000	0.00	0.00
53.5	5.0	0.000	0.00	0.00
58.5	5.0	0.000	0.00	0.00
63.5	5.0	0.000	0.00	0.00
68.5	5.0	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	4.0	0.000	0.00	0.00
81.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:47 PM
Boring Designation:	B-4
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	2
SPT Liner (Yes/No):	No
Hammer Energy, %:	80
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.14
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"	
1	2.0	1	SM	32	100			
2	4.0	0	SM	32	100			
3	6.0	0	CL	50	95		Clay	
4	8.0	1	SM	26	100			
5	13.5	2	SM	15	100			
6	18.5	5	SM	15	100			
7	23.5	3	SM	15	100			
8	28.5	3	SM	22	100			
9	33.5	2	SM	22	100			
10	38.5	0	SM	22	100			
11	43.5	4	SM	17	100			
12	48.5	2	SM	17	100			
13	53.5	4	ML	50	120		Clay	*Assumes Marl/Limestone NonLiq
14	58.5	7	MH	53	120		Clay	
15	63.5	7	MH	53	120		Clay	
16	68.5	6	MH	53	120		Clay	
17	73.5	100	SM	15	120		Clay	
18	78.5	9	SM	15	120		Clay	
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SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	2.0	1.0	SM	31.9	100.0		200	200	1.33	1.00	0.75	1.00	1.00	1.70	1.70	5.43	7.13	1.002	0.091
2	4.0	0.0	SM	31.9	100.0		400	275	1.33	1.00	0.75	1.00	0.00	1.70	0.00	5.43	5.43	0.997	0.132
3	6.0	0.0	CL	50.0	95.0	Clay	590	340	1.33	1.00	0.80	1.00	0.00	1.70	0.00	5.61	5.61	0.991	0.156
4	8.0	1.0	SM	26.0	100.0		790	416	1.33	1.00	0.80	1.00	1.07	1.70	1.81	5.15	6.96	0.985	0.170
5	13.5	2.0	SM	15.1	100.0		1340	622	1.33	1.00	0.85	1.00	2.27	1.70	3.85	3.29	7.15	0.966	0.189
6	18.5	5.0	SM	15.0	100.0		1840	810	1.33	1.00	0.95	1.00	6.33	1.62	10.25	3.26	13.51	0.947	0.196
7	23.5	3.0	SM	15.0	100.0		2340	998	1.33	1.00	0.95	1.00	3.80	1.52	5.76	3.26	9.02	0.926	0.197
8	28.5	3.0	SM	22.0	100.0		2840	1186	1.33	1.00	1.00	1.00	4.00	1.37	5.46	4.77	10.23	0.903	0.197
9	33.5	2.0	SM	21.6	100.0		3340	1374	1.33	1.00	1.00	1.00	2.67	1.28	3.40	4.72	8.12	0.879	0.194
10	38.5	0.0	SM	22.0	100.0		3840	1562	1.33	1.00	1.00	1.00	0.00	1.21	0.00	4.77	4.77	0.855	0.191
11	43.5	4.0	SM	17.0	100.0		4340	1750	1.33	1.00	1.00	1.00	5.33	1.11	5.91	3.85	9.76	0.830	0.187
12	48.5	2.0	SM	17.0	100.0		4840	1938	1.33	1.00	1.00	1.00	2.67	1.05	2.81	3.85	6.66	0.805	0.183
13	53.5	4.0	ML	50.0	120.0	Clay	5440	2226	1.33	1.00	1.00	1.00	5.33	0.97	5.19	5.61	10.81	0.781	0.174
14	58.5	7.0	MH	53.1	120.0	Clay	6040	2514	1.33	1.00	1.00	1.00	9.33	0.92	8.57	5.61	14.18	0.757	0.165
15	63.5	7.0	MH	53.1	120.0	Clay	6640	2802	1.33	1.00	1.00	1.00	9.33	0.87	8.11	5.61	13.73	0.734	0.158
16	68.5	6.0	MH	53.1	120.0	Clay	7240	3090	1.33	1.00	1.00	1.00	8.00	0.82	6.58	5.61	12.19	0.712	0.152
17	73.5	100.0	SM	15.0	120.0	Clay	7840	3378	1.33	1.00	1.00	1.00	133.33	0.88	117.89	3.26	121.15	0.691	0.146
18	78.5	9.0	SM	15.0	120.0	Clay	8440	3666	1.33	1.00	1.00	1.00	12.00	0.75	9.04	3.26	12.30	0.672	0.141
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.14	1.01	1.10	0.099	0.110	1.21
1.12	1.01	1.10	0.089	0.098	0.75
1.12	1.01	1.10	0.090	0.100	2.00
1.14	1.01	1.10	0.098	0.109	0.64
1.14	1.01	1.10	0.099	0.110	0.58
1.27	1.02	1.10	0.144	0.161	0.82
1.17	1.01	1.07	0.111	0.120	0.61
1.20	1.01	1.05	0.120	0.128	0.65
1.16	1.01	1.04	0.105	0.110	0.57
1.11	1.01	1.02	0.085	0.087	0.46
1.19	1.01	1.02	0.116	0.120	0.64
1.13	1.01	1.01	0.096	0.098	0.53
1.21	1.01	1.00	0.124	0.125	2.00
1.29	1.02	0.98	0.149	0.150	2.00
1.28	1.02	0.97	0.146	0.144	2.00
1.24	1.02	0.96	0.134	0.131	2.00
2.20	1.08	0.86	2.000	1.864	2.00
1.24	1.02	0.94	0.135	0.129	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
2	1.0	0.003	0.04	23.34
4	2.0	0.051	1.22	23.31
6	2.0	0.000	0.00	22.09
8	3.8	0.045	2.04	22.09
13.5	5.3	0.045	2.82	20.05
18.5	5.0	0.031	1.85	17.23
23.5	5.0	0.040	2.38	15.37
28.5	5.0	0.037	2.21	13.00
33.5	5.0	0.042	2.52	10.78
38.5	5.0	0.054	3.22	8.27
43.5	5.0	0.038	2.27	5.05
48.5	5.0	0.046	2.78	2.78
53.5	5.0	0.000	0.00	0.00
58.5	5.0	0.000	0.00	0.00
63.5	5.0	0.000	0.00	0.00
68.5	5.0	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	4.0	0.000	0.00	0.00
81.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:41 PM
Boring Designation:	B-5
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	0
SPT Liner (Yes/No):	No
Hammer Energy, %:	80
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.12
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	2.0	4	SP-SM	7	100		
2	4.0	6	SP-SM	7	100		
3	6.0	34	SM	15	120		
4	8.0	15	SM	15	120		
5	13.5	2	SM	20	100		
6	18.5	25	SP-SM	11	120		
7	23.5	5	SP-SM	11	100		
8	28.5	0	SM	33	100		
9	33.5	2	SM	33	100		
10	38.5	2	SM	21	100		
11	43.5	7	SM	21	100		
12	48.5	10	SM	26	100		
13	53.5	6	SM	26	100		
14	58.5	5	MH	50	120		Clay
15	63.5	4	MH	50	120		Clay
16	68.5	5	MH	50	120		Clay
17	73.5	5	MH	50	120		Clay
18	78.5	43	GC	15	120		Clay
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*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	2.0	4.0	SP-SM	6.6	100.0		200	75	1.33	1.00	0.75	1.00	4.00	1.70	6.80	0.08	6.88	1.002	0.208
2	4.0	6.0	SP-SM	6.6	100.0		400	150	1.33	1.00	0.75	1.00	6.00	1.70	10.20	0.08	10.28	0.997	0.207
3	6.0	34.0	SM	14.6	120.0		640	266	1.33	1.00	0.80	1.00	36.27	1.70	61.65	3.12	64.78	0.991	0.186
4	8.0	15.0	SM	14.6	120.0		880	381	1.33	1.00	0.80	1.00	16.00	1.70	27.20	3.12	30.32	0.985	0.178
5	13.5	2.0	SM	19.7	100.0		1430	588	1.33	1.00	0.85	1.00	2.27	1.70	3.85	4.43	8.28	0.966	0.183
6	18.5	25.0	SP-SM	10.5	120.0		2030	876	1.33	1.00	0.95	1.00	31.67	1.29	40.74	1.38	42.12	0.947	0.171
7	23.5	5.0	SP-SM	10.5	100.0		2530	1064	1.33	1.00	0.95	1.00	6.33	1.44	9.15	1.38	10.53	0.926	0.172
8	28.5	0.0	SM	32.8	100.0		3030	1252	1.33	1.00	1.00	1.00	0.00	1.37	0.00	5.46	5.46	0.903	0.170
9	33.5	2.0	SM	32.8	100.0		3530	1440	1.33	1.00	1.00	1.00	2.67	1.24	3.30	5.46	8.76	0.879	0.168
10	38.5	2.0	SM	20.9	100.0		4030	1628	1.33	1.00	1.00	1.00	2.67	1.16	3.10	4.62	7.72	0.855	0.165
11	43.5	7.0	SM	20.9	100.0		4530	1816	1.33	1.00	1.00	1.00	9.33	1.08	10.06	4.62	14.68	0.830	0.162
12	48.5	10.0	SM	26.0	100.0		5030	2004	1.33	1.00	1.00	1.00	13.33	1.02	13.67	5.15	18.81	0.805	0.158
13	53.5	6.0	SM	26.0	100.0		5530	2192	1.33	1.00	1.00	1.00	8.00	0.98	7.86	5.15	13.01	0.781	0.154
14	58.5	5.0	MH	50.0	120.0	Clay	6130	2480	1.33	1.00	1.00	1.00	6.67	0.92	6.14	5.61	11.75	0.757	0.146
15	63.5	4.0	MH	50.0	120.0	Clay	6730	2768	1.33	1.00	1.00	1.00	5.33	0.87	4.62	5.61	10.23	0.734	0.139
16	68.5	5.0	MH	50.0	120.0	Clay	7330	3056	1.33	1.00	1.00	1.00	6.67	0.82	5.49	5.61	11.11	0.712	0.133
17	73.5	5.0	MH	50.0	120.0	Clay	7930	3344	1.33	1.00	1.00	1.00	6.67	0.78	5.23	5.61	10.84	0.691	0.128
18	78.5	43.0	GC	15.0	120.0	Clay	8530	3632	1.33	1.00	1.00	1.00	57.33	0.87	49.74	3.26	53.00	0.672	0.123
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.14	1.01	1.10	0.097	0.108	0.52
1.20	1.01	1.10	0.120	0.134	0.65
2.20	1.08	1.10	2.000	2.000	2.00
2.02	1.07	1.10	0.506	0.595	2.00
1.16	1.01	1.10	0.106	0.118	0.65
2.20	1.08	1.10	2.000	2.000	2.00
1.20	1.01	1.06	0.122	0.131	0.77
1.12	1.01	1.04	0.089	0.093	0.55
1.17	1.01	1.03	0.110	0.115	0.68
1.15	1.01	1.02	0.103	0.106	0.64
1.31	1.02	1.02	0.153	0.159	0.99
1.45	1.03	1.01	0.192	0.199	1.26
1.26	1.02	1.00	0.140	0.142	0.92
1.23	1.02	0.98	0.131	0.131	2.00
1.20	1.01	0.98	0.120	0.118	2.00
1.21	1.01	0.96	0.126	0.123	2.00
1.21	1.01	0.96	0.124	0.120	2.00
2.20	1.08	0.84	2.000	1.818	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
2	3.0	0.046	1.64	18.07
4	2.0	0.037	0.88	16.43
6	2.0	0.000	0.00	15.55
8	3.8	0.000	0.00	15.55
13.5	5.3	0.042	2.61	15.55
18.5	5.0	0.000	0.00	12.93
23.5	5.0	0.036	2.17	12.93
28.5	5.0	0.051	3.04	10.76
33.5	5.0	0.040	2.42	7.72
38.5	5.0	0.043	2.58	5.30
43.5	5.0	0.014	0.83	2.72
48.5	5.0	0.005	0.29	1.89
53.5	5.0	0.027	1.61	1.61
58.5	5.0	0.000	0.00	0.00
63.5	5.0	0.000	0.00	0.00
68.5	5.0	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	4.0	0.000	0.00	0.00
81.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:42 PM
Boring Designation:	B-6
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	0
SPT Liner (Yes/No):	No
Hammer Energy, %:	80
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.12
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	2.0	12	SM	17	100		
2	4.0	9	SM	17	100		
3	6.0	16	SM	16	120		
4	8.0	26	SM	16	120		
5	13.5	0	SM	26	100		
6	18.5	20	SM	14	120		
7	23.5	33	SM	14	120		
8	28.5	0	SP-SM	11	100		
9	33.5	4	SM	18	100		
10	38.5	13	SM	18	100		
11	43.5	25	SM	18	120		
12	48.5	33	SM	18	120		
13	53.5	8	SM	18	100		
14	58.5	5	MH	50	120		Clay
15	63.5	5	MH	50	120		Clay
16	68.5	7	MH	50	120		Clay
17	73.5	6	MH	50	120		Clay
18	78.5	100	ML	50	120		Clay
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*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	2.0	12.0	SM	17.2	100.0		200	75	1.33	1.00	0.75	1.00	12.00	1.70	20.40	3.90	24.30	1.002	0.208
2	4.0	9.0	SM	17.2	100.0		400	150	1.33	1.00	0.75	1.00	9.00	1.70	15.30	3.90	19.20	0.997	0.207
3	6.0	16.0	SM	15.7	120.0		640	266	1.33	1.00	0.80	1.00	17.07	1.70	29.01	3.49	32.50	0.991	0.186
4	8.0	26.0	SM	15.7	120.0		880	381	1.33	1.00	0.80	1.00	27.73	1.57	43.55	3.49	47.03	0.985	0.178
5	13.5	0.0	SM	26.1	100.0		1430	588	1.33	1.00	0.85	1.00	0.00	1.70	0.00	5.15	5.15	0.966	0.183
6	18.5	20.0	SM	13.7	120.0		2030	876	1.33	1.00	0.95	1.00	25.33	1.33	33.62	2.79	36.41	0.947	0.171
7	23.5	33.0	SM	13.7	120.0		2630	1164	1.33	1.00	0.95	1.00	41.80	1.17	48.92	2.79	51.71	0.926	0.163
8	28.5	0.0	SP-SM	11.0	100.0		3130	1352	1.33	1.00	1.00	1.00	0.00	1.36	0.00	1.61	1.61	0.903	0.163
9	33.5	4.0	SM	18.3	100.0		3630	1540	1.33	1.00	1.00	1.00	5.33	1.19	6.32	4.16	10.48	0.879	0.162
10	38.5	13.0	SM	18.3	100.0		4130	1728	1.33	1.00	1.00	1.00	17.33	1.09	18.86	4.16	23.01	0.855	0.159
11	43.5	25.0	SM	18.3	120.0		4730	2016	1.33	1.00	1.00	1.00	33.33	1.02	33.84	4.16	38.00	0.830	0.152
12	48.5	33.0	SM	18.3	120.0		5330	2304	1.33	1.00	1.00	1.00	44.00	0.98	43.03	4.16	47.18	0.805	0.145
13	53.5	8.0	SM	18.3	100.0		5830	2492	1.33	1.00	1.00	1.00	10.67	0.92	9.84	4.16	13.99	0.781	0.142
14	58.5	5.0	MH	50.0	120.0	Clay	6430	2780	1.33	1.00	1.00	1.00	6.67	0.87	5.78	5.61	11.39	0.757	0.137
15	63.5	5.0	MH	50.0	120.0	Clay	7030	3068	1.33	1.00	1.00	1.00	6.67	0.82	5.48	5.61	11.09	0.734	0.131
16	68.5	7.0	MH	50.0	120.0	Clay	7630	3356	1.33	1.00	1.00	1.00	9.33	0.79	7.39	5.61	13.00	0.712	0.126
17	73.5	6.0	MH	50.0	120.0	Clay	8230	3644	1.33	1.00	1.00	1.00	8.00	0.75	6.02	5.61	11.64	0.691	0.122
18	78.5	100.0	ML	50.0	120.0	Clay	8830	3932	1.33	1.00	1.00	1.00	133.33	0.85	113.28	5.61	118.89	0.672	0.118
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.69	1.05	1.10	0.274	0.316	1.52
1.46	1.03	1.10	0.197	0.223	1.08
2.15	1.08	1.10	0.698	0.828	2.00
2.20	1.08	1.10	2.000	2.000	2.00
1.12	1.01	1.10	0.087	0.096	0.53
2.20	1.08	1.10	1.514	1.802	2.00
2.20	1.08	1.10	2.000	2.000	2.00
1.09	1.01	1.03	0.068	0.071	0.43
1.20	1.01	1.03	0.121	0.127	0.78
1.62	1.04	1.03	0.250	0.268	1.68
2.20	1.08	1.01	2.000	2.000	2.00
2.20	1.08	0.97	2.000	2.000	2.00
1.29	1.02	0.98	0.148	0.148	1.04
1.22	1.01	0.97	0.128	0.126	2.00
1.21	1.01	0.96	0.126	0.123	2.00
1.26	1.02	0.95	0.140	0.136	2.00
1.23	1.02	0.95	0.130	0.125	2.00
2.20	1.08	0.82	2.000	1.768	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
2	3.0	0.002	0.09	10.96
4	2.0	0.008	0.20	10.88
6	2.0	0.000	0.00	10.68
8	3.8	0.000	0.00	10.68
13.5	5.3	0.052	3.27	10.68
18.5	5.0	0.000	0.00	7.41
23.5	5.0	0.000	0.00	7.41
28.5	5.0	0.075	4.51	7.41
33.5	5.0	0.036	2.18	2.90
38.5	5.0	0.001	0.08	0.72
43.5	5.0	0.000	0.00	0.64
48.5	5.0	0.000	0.00	0.64
53.5	5.0	0.011	0.64	0.64
58.5	5.0	0.000	0.00	0.00
63.5	5.0	0.000	0.00	0.00
68.5	5.0	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	4.0	0.000	0.00	0.00
81.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:48 PM
Boring Designation:	B-7
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	0
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.14
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"	
1	2.0	9	SM	13	100			
2	4.0	4	SM	13	100			
3	6.0	0	SM	18	100			
4	8.0	1	SM	18	100			
5	13.5	2	SM	31	100			
6	18.5	4	SP-SM	11	100			
7	23.5	17	SP-SM	11	100			
8	28.5	4	SP-SM	11	100			
9	33.5	2	CL	50	100		Clay	
10	38.5	1	SM	18	100			
11	43.5	4	SM	18	100			
12	48.5	5	SM	18	100			
13	53.5	10	ML	50	120		Clay	*Assumes Marl/Limestone NonLiq
14	58.5	4	ML	50	120		Clay	
15	63.5	8	ML	50	120		Clay	
16	68.5	8	SM	15	120		Clay	
17	73.5	100	SM	15	120		Clay	
18	78.5	12	SM	15	120		Clay	
19	83.5	6	SM	15	120		Clay	
20	88.5	6	SM	15	120		Clay	
21	93.5	12	SM	15	120		Clay	
22	98.5	13	SM	15	120		Clay	
23	103.5	11	SM	15	120		Clay	
24	108.5	6	SM	15	120		Clay	
25	113.5	11	SM	15	120		Clay	
26	118.5	9	SM	15	120		Clay	
27	123.5	7	SM	15	120		Clay	
28	128.5	13	SM	15	120		Clay	
29	133.5	12	SM	15	120		Clay	
30	138.5	11	SM	15	120		Clay	
31	143.5	9	SM	15	120		Clay	
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SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	2.0	9.0	SM	12.8	100.0		200	75	1.39	1.00	0.75	1.00	9.35	1.70	15.89	2.42	18.32	1.002	0.242
2	4.0	4.0	SM	12.8	100.0		400	150	1.39	1.00	0.75	1.00	4.16	1.70	7.06	2.42	9.49	0.997	0.241
3	6.0	0.0	SM	18.2	100.0		600	226	1.39	1.00	0.80	1.00	0.00	1.70	0.00	4.13	4.13	0.991	0.240
4	8.0	1.0	SM	18.2	100.0		800	301	1.39	1.00	0.80	1.00	1.11	1.70	1.88	4.13	6.02	0.985	0.238
5	13.5	2.0	SM	31.3	100.0		1350	508	1.39	1.00	0.85	1.00	2.35	1.70	4.00	5.41	9.41	0.966	0.234
6	18.5	4.0	SP-SM	10.8	100.0		1850	696	1.39	1.00	0.95	1.00	5.26	1.70	8.95	1.52	10.47	0.947	0.229
7	23.5	17.0	SP-SM	10.8	100.0		2350	884	1.39	1.00	0.95	1.00	22.37	1.36	30.37	1.52	31.89	0.926	0.224
8	28.5	4.0	SP-SM	10.8	100.0		2850	1072	1.39	1.00	1.00	1.00	5.54	1.45	8.04	1.52	9.55	0.903	0.219
9	33.5	2.0	CL	50.0	100.0	Clay	3350	1260	1.39	1.00	1.00	1.00	2.77	1.33	3.68	5.61	9.30	0.879	0.213
10	38.5	1.0	SM	17.9	100.0		3850	1448	1.39	1.00	1.00	1.00	1.39	1.26	1.74	4.07	5.81	0.855	0.207
11	43.5	4.0	SM	17.9	100.0		4350	1636	1.39	1.00	1.00	1.00	5.54	1.15	6.36	4.07	10.43	0.830	0.201
12	48.5	5.0	SM	17.9	100.0		4850	1824	1.39	1.00	1.00	1.00	6.93	1.08	7.49	4.07	11.55	0.805	0.195
13	53.5	10.0	ML	50.0	120.0	Clay	5450	2112	1.39	1.00	1.00	1.00	13.85	1.00	13.86	5.61	19.48	0.781	0.183
14	58.5	4.0	ML	50.0	120.0	Clay	6050	2400	1.39	1.00	1.00	1.00	5.54	0.94	5.18	5.61	10.80	0.757	0.174
15	63.5	8.0	ML	50.0	120.0	Clay	6650	2688	1.39	1.00	1.00	1.00	11.08	0.89	9.87	5.61	15.49	0.734	0.165
16	68.5	8.0	SM	15.0	120.0	Clay	7250	2976	1.39	1.00	1.00	1.00	11.08	0.84	9.31	3.26	12.57	0.712	0.158
17	73.5	100.0	SM	15.0	120.0	Clay	7850	3264	1.39	1.00	1.00	1.00	138.50	0.89	123.58	3.26	126.84	0.691	0.151
18	78.5	12.0	SM	15.0	120.0	Clay	8450	3552	1.39	1.00	1.00	1.00	16.62	0.78	13.00	3.26	16.26	0.672	0.145
19	83.5	6.0	SM	15.0	120.0	Clay	9050	3840	1.39	1.00	1.00	1.00	8.31	0.72	5.99	3.26	9.25	0.654	0.140
20	88.5	6.0	SM	15.0	120.0	Clay	9650	4128	1.39	1.00	1.00	1.00	8.31	0.69	5.74	3.26	9.00	0.639	0.136
21	93.5	12.0	SM	15.0	120.0	Clay	10250	4416	1.39	1.00	1.00	1.00	16.62	0.70	11.61	3.26	14.87	0.625	0.132
22	98.5	13.0	SM	15.0	120.0	Clay	10850	4704	1.39	1.00	1.00	1.00	18.01	0.68	12.26	3.26	15.52	0.613	0.129
23	103.5	11.0	SM	15.0	120.0	Clay	11450	4992	1.39	1.00	1.00	1.00	15.24	0.65	9.87	3.26	13.13	0.603	0.126
24	108.5	6.0	SM	15.0	120.0	Clay	12050	5280	1.39	1.00	1.00	1.00	8.31	0.60	4.96	3.26	8.22	0.596	0.124
25	113.5	11.0	SM	15.0	120.0	Clay	12650	5568	1.39	1.00	1.00	1.00	15.24	0.61	9.28	3.26	12.55	0.590	0.122
26	118.5	9.0	SM	15.0	120.0	Clay	13250	5856	1.39	1.00	1.00	1.00	12.47	0.58	7.23	3.26	10.49	0.587	0.121
27	123.5	7.0	SM	15.0	120.0	Clay	13850	6144	1.39	1.00	1.00	1.00	9.70	0.55	5.34	3.26	8.61	0.586	0.120
28	128.5	13.0	SM	15.0	120.0	Clay	14450	6432	1.39	1.00	1.00	1.00	18.01	0.57	10.32	3.26	13.58	0.588	0.120
29	133.5	12.0	SM	15.0	120.0	Clay	15050	6720	1.39	1.00	1.00	1.00	16.62	0.55	9.19	3.26	12.45	0.592	0.121
30	138.5	11.0	SM	15.0	120.0	Clay	15650	7008	1.39	1.00	1.00	1.00	15.24	0.53	8.13	3.26	11.39	0.598	0.122
31	143.5	9.0	SM	15.0	120.0	Clay	16250	7296	1.39	1.00	1.00	1.00	12.47	0.51	6.34	3.26	9.60	0.607	0.123
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.43	1.03	1.10	0.187	0.212	0.87
1.18	1.01	1.10	0.115	0.128	0.53
1.11	1.01	1.10	0.081	0.090	0.38
1.13	1.01	1.10	0.092	0.102	0.43
1.18	1.01	1.10	0.114	0.127	0.54
1.20	1.01	1.10	0.121	0.135	0.59
2.11	1.08	1.10	0.633	0.749	2.00
1.18	1.01	1.06	0.115	0.124	0.57
1.18	1.01	1.05	0.113	0.120	2.00
1.12	1.01	1.03	0.091	0.094	0.46
1.20	1.01	1.02	0.121	0.126	0.63
1.22	1.02	1.01	0.129	0.133	0.68
1.47	1.03	1.00	0.200	0.206	2.00
1.21	1.01	0.99	0.124	0.124	2.00
1.33	1.02	0.97	0.160	0.159	2.00
1.25	1.02	0.97	0.137	0.134	2.00
2.20	1.08	0.87	2.000	1.886	2.00
1.36	1.02	0.94	0.167	0.161	2.00
1.18	1.01	0.95	0.113	0.108	2.00
1.17	1.01	0.94	0.111	0.106	2.00
1.31	1.02	0.92	0.155	0.145	2.00
1.33	1.02	0.91	0.161	0.149	2.00
1.26	1.02	0.91	0.141	0.131	2.00
1.16	1.01	0.92	0.106	0.099	2.00
1.25	1.02	0.90	0.137	0.125	2.00
1.20	1.01	0.90	0.122	0.111	2.00
1.16	1.01	0.91	0.109	0.100	2.00
1.28	1.02	0.88	0.145	0.130	2.00
1.25	1.02	0.88	0.136	0.122	2.00
1.22	1.01	0.88	0.128	0.115	2.00
1.18	1.01	0.89	0.115	0.104	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
2	3.0	0.018	0.65	19.24
4	2.0	0.039	0.92	18.59
6	2.0	0.057	1.36	17.66
8	3.8	0.049	2.18	16.30
13.5	5.3	0.039	2.44	14.12
18.5	5.0	0.036	2.18	11.68
23.5	5.0	0.000	0.00	9.50
28.5	5.0	0.038	2.30	9.50
33.5	5.0	0.000	0.00	7.20
38.5	5.0	0.049	2.96	7.20
43.5	5.0	0.036	2.19	4.24
48.5	5.0	0.034	2.05	2.05
53.5	5.0	0.000	0.00	0.00
58.5	5.0	0.000	0.00	0.00
63.5	5.0	0.000	0.00	0.00
68.5	5.0	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	5.0	0.000	0.00	0.00
83.5	5.0	0.000	0.00	0.00
88.5	5.0	0.000	0.00	0.00
93.5	5.0	0.000	0.00	0.00
98.5	5.0	0.000	0.00	0.00
103.5	5.0	0.000	0.00	0.00
108.5	5.0	0.000	0.00	0.00
113.5	5.0	0.000	0.00	0.00
118.5	5.0	0.000	0.00	0.00
123.5	5.0	0.000	0.00	0.00
128.5	5.0	0.000	0.00	0.00
133.5	5.0	0.000	0.00	0.00
138.5	5.0	0.000	0.00	0.00
143.5	4.0	0.000	0.00	0.00
146.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:49 PM
Boring Designation:	B-8
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	0
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.14
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	2.0	3	SP-SM	12	100		
2	4.0	5	SP-SM	12	100		
3	6.0	4	SP-SM	12	100		
4	8.0	2	SP-SM	12	100		
5	10.0	2	SP-SM	12	100		
6	13.5	0	CL	68	95		Clay
7	18.5	0	CL	68	95		Clay
8	23.5	0	SC	35	100		
9	28.5	2	SM	22	100		
10	33.5	4	SM	22	100		
11	38.5	2	CL	50	95		Clay
12	43.5	8	SP-SM	7	100		
13	48.5	7	SP-SM	8	100		
14	53.5	5	SM	15	120		Clay
15	58.5	6	ML	50	120		Clay
16	63.5	6	ML	50	120		Clay
17	68.5	5	ML	50	120		Clay
18	73.5	18	ML	50	120		Clay
19	78.5	13	SM	15	120		Clay
20	83.5	5	SM	15	120		Clay
21	88.5	8	SM	15	120		Clay
22	93.5	9	SM	15	120		Clay
23	98.5	8	SM	15	120		Clay
24	103.5	9	SM	15	120		Clay
25	108.5	6	SM	15	120		Clay
26	113.5	12	SM	15	120		Clay
27	118.5	9	SM	15	120		Clay
28	123.5	7	SM	15	120		Clay
29	128.5	19	SM	15	120		Clay
30	133.5	11	SM	15	120		Clay
31	138.5		SM	15	120		Clay
32	143.5	10	SM	15	120		Clay
33	148.5	11	SM	15	120		Clay
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*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	2.0	3.0	SP-SM	11.9	100.0		200	75	1.39	1.00	0.75	1.00	3.12	1.70	5.30	2.03	7.32	1.002	0.242
2	4.0	5.0	SP-SM	11.9	100.0		400	150	1.39	1.00	0.75	1.00	5.19	1.70	8.83	2.03	10.86	0.997	0.241
3	6.0	4.0	SP-SM	11.9	100.0		600	226	1.39	1.00	0.80	1.00	4.43	1.70	7.53	2.03	9.56	0.991	0.240
4	8.0	2.0	SP-SM	11.9	100.0		800	301	1.39	1.00	0.80	1.00	2.22	1.70	3.77	2.03	5.79	0.985	0.238
5	10.0	2.0	SP-SM	11.9	100.0		1000	376	1.39	1.00	0.85	1.00	2.35	1.70	4.00	2.03	6.03	0.978	0.237
6	13.5	0.0	CL	67.5	95.0	Clay	1333	490	1.39	1.00	0.85	1.00	0.00	1.70	0.00	5.58	5.58	0.966	0.239
7	18.5	0.0	CL	67.5	95.0	Clay	1808	653	1.39	1.00	0.95	1.00	0.00	1.70	0.00	5.58	5.58	0.947	0.238
8	23.5	0.0	SC	34.9	100.0		2308	841	1.39	1.00	0.95	1.00	0.00	1.70	0.00	5.50	5.50	0.926	0.231
9	28.5	2.0	SM	22.0	100.0		2808	1029	1.39	1.00	1.00	1.00	2.77	1.49	4.13	4.77	8.90	0.903	0.224
10	33.5	4.0	SM	22.0	100.0		3308	1217	1.39	1.00	1.00	1.00	5.54	1.33	7.37	4.77	12.14	0.879	0.217
11	38.5	2.0	CL	50.0	95.0	Clay	3783	1380	1.39	1.00	1.00	1.00	2.77	1.27	3.51	5.61	9.12	0.855	0.213
12	43.5	8.0	SP-SM	6.5	100.0		4283	1568	1.39	1.00	1.00	1.00	11.08	1.16	12.90	0.07	12.97	0.830	0.206
13	48.5	7.0	SP-SM	8.2	100.0		4783	1756	1.39	1.00	1.00	1.00	9.70	1.10	10.70	0.43	11.13	0.805	0.200
14	53.5	5.0	SM	15.0	120.0	Clay	5383	2044	1.39	1.00	1.00	1.00	6.93	1.02	7.05	3.26	10.32	0.781	0.187
15	58.5	6.0	ML	50.0	120.0	Clay	5983	2332	1.39	1.00	1.00	1.00	8.31	0.95	7.91	5.61	13.53	0.757	0.177
16	63.5	6.0	ML	50.0	120.0	Clay	6583	2620	1.39	1.00	1.00	1.00	8.31	0.90	7.46	5.61	13.07	0.734	0.168
17	68.5	5.0	ML	50.0	120.0	Clay	7183	2908	1.39	1.00	1.00	1.00	6.93	0.85	5.86	5.61	11.48	0.712	0.160
18	73.5	18.0	ML	50.0	120.0	Clay	7783	3196	1.39	1.00	1.00	1.00	24.93	0.85	21.26	5.61	26.88	0.691	0.153
19	78.5	13.0	SM	15.0	120.0	Clay	8383	3484	1.39	1.00	1.00	1.00	18.01	0.79	14.30	3.26	17.56	0.672	0.147
20	83.5	5.0	SM	15.0	120.0	Clay	8983	3772	1.39	1.00	1.00	1.00	6.93	0.72	5.00	3.26	8.26	0.654	0.142
21	88.5	8.0	SM	15.0	120.0	Clay	9583	4060	1.39	1.00	1.00	1.00	11.08	0.71	7.85	3.26	11.12	0.639	0.137
22	93.5	9.0	SM	15.0	120.0	Clay	10183	4348	1.39	1.00	1.00	1.00	12.47	0.69	8.57	3.26	11.83	0.625	0.133
23	98.5	8.0	SM	15.0	120.0	Clay	10783	4636	1.39	1.00	1.00	1.00	11.08	0.66	7.29	3.26	10.55	0.613	0.130
24	103.5	9.0	SM	15.0	120.0	Clay	11383	4924	1.39	1.00	1.00	1.00	12.47	0.64	7.99	3.26	11.25	0.603	0.127
25	108.5	6.0	SM	15.0	120.0	Clay	11983	5212	1.39	1.00	1.00	1.00	8.31	0.60	5.00	3.26	8.26	0.596	0.125
26	113.5	12.0	SM	15.0	120.0	Clay	12583	5500	1.39	1.00	1.00	1.00	16.62	0.62	10.30	3.26	13.56	0.590	0.123
27	118.5	9.0	SM	15.0	120.0	Clay	13183	5788	1.39	1.00	1.00	1.00	12.47	0.58	7.28	3.26	10.54	0.587	0.122
28	123.5	7.0	SM	15.0	120.0	Clay	13783	6076	1.39	1.00	1.00	1.00	9.70	0.55	5.38	3.26	8.64	0.586	0.121
29	128.5	19.0	SM	15.0	120.0	Clay	14383	6364	1.39	1.00	1.00	1.00	26.32	0.61	16.10	3.26	19.36	0.588	0.121
30	133.5	11.0	SM	15.0	120.0	Clay	14983	6652	1.39	1.00	1.00	1.00	15.24	0.55	8.38	3.26	11.64	0.592	0.121
31	138.5	0.0	SM	15.0	120.0	Clay	15583	6940	1.39	1.00	1.00	1.00	0.00	0.46	0.00	3.26	3.26	0.598	0.122
32	143.5	10.0	SM	15.0	120.0	Clay	16183	7228	1.39	1.00	1.00	1.00	13.85	0.52	7.17	3.26	10.43	0.607	0.124
33	148.5	11.0	SM	15.0	120.0	Clay	16783	7516	1.39	1.00	1.00	1.00	15.24	0.51	7.80	3.26	11.06	0.618	0.126
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.14	1.01	1.10	0.100	0.111	0.46
1.21	1.01	1.10	0.124	0.138	0.57
1.18	1.01	1.10	0.115	0.128	0.53
1.12	1.01	1.10	0.091	0.101	0.42
1.13	1.01	1.10	0.092	0.102	0.43
1.12	1.01	1.10	0.090	0.099	2.00
1.12	1.01	1.09	0.090	0.099	2.00
1.12	1.01	1.07	0.089	0.096	0.42
1.17	1.01	1.06	0.111	0.119	0.53
1.24	1.02	1.06	0.133	0.143	0.66
1.17	1.01	1.04	0.112	0.118	2.00
1.26	1.02	1.03	0.140	0.147	0.71
1.21	1.01	1.02	0.126	0.130	0.65
1.20	1.01	1.00	0.120	0.122	2.00
1.27	1.02	0.99	0.144	0.145	2.00
1.26	1.02	0.98	0.141	0.140	2.00
1.22	1.02	0.97	0.129	0.127	2.00
1.82	1.06	0.93	0.342	0.335	2.00
1.40	1.03	0.94	0.179	0.173	2.00
1.16	1.01	0.95	0.106	0.102	2.00
1.21	1.01	0.94	0.126	0.120	2.00
1.23	1.02	0.93	0.131	0.124	2.00
1.20	1.01	0.93	0.122	0.114	2.00
1.22	1.01	0.92	0.127	0.118	2.00
1.16	1.01	0.92	0.106	0.099	2.00
1.28	1.02	0.90	0.144	0.132	2.00
1.20	1.01	0.91	0.122	0.112	2.00
1.17	1.01	0.91	0.109	0.100	2.00
1.47	1.03	0.86	0.198	0.175	2.00
1.23	1.02	0.89	0.130	0.117	2.00
1.10	1.01	0.92	0.077	0.071	2.00
1.20	1.01	0.88	0.121	0.109	2.00
1.21	1.01	0.88	0.126	0.112	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
2	3.0	0.044	1.59	17.57
4	2.0	0.036	0.85	15.98
6	2.0	0.038	0.92	15.13
8	2.0	0.049	1.18	14.21
10	2.8	0.048	1.60	13.02
13.5	4.3	0.000	0.00	11.42
18.5	5.0	0.000	0.00	11.42
23.5	5.0	0.050	3.03	11.42
28.5	5.0	0.040	2.39	8.39
33.5	5.0	0.033	1.99	6.00
38.5	5.0	0.000	0.00	4.01
43.5	5.0	0.032	1.91	4.01
48.5	5.0	0.035	2.10	2.10
53.5	5.0	0.000	0.00	0.00
58.5	5.0	0.000	0.00	0.00
63.5	5.0	0.000	0.00	0.00
68.5	5.0	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	5.0	0.000	0.00	0.00
83.5	5.0	0.000	0.00	0.00
88.5	5.0	0.000	0.00	0.00
93.5	5.0	0.000	0.00	0.00
98.5	5.0	0.000	0.00	0.00
103.5	5.0	0.000	0.00	0.00
108.5	5.0	0.000	0.00	0.00
113.5	5.0	0.000	0.00	0.00
118.5	5.0	0.000	0.00	0.00
123.5	5.0	0.000	0.00	0.00
128.5	5.0	0.000	0.00	0.00
133.5	5.0	0.000	0.00	0.00
138.5	5.0	0.000	0.00	0.00
143.5	5.0	0.000	0.00	0.00
148.5	4.0	0.000	0.00	0.00
151.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 6:08 PM
Boring Designation:	B-9
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	0
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.14
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	0.5	0	ML	50	95		Clay
2	2.0	5	SP-SM	8	100		
3	4.0	6	SP-SM	7	100		
4	6.0	0	SP-SM	7	100		
5	8.0	2	SP-SM	10	100		
6	13.5	0	SP-SM	10	100		
7	18.5	0	CL	79	95		Clay
8	23.5	0	CL	79	95		Clay
9	28.5	0	CL	79	95		Clay
10	33.5	1	CL	79	95		Clay
11	38.5	2	CL	79	95		Clay
12	43.5	7	SP-SM	8	100		
13	48.5	4	SP-SM	8	100		
14	53.5	4	ML	50	120		Clay
15	58.5	5	ML	50	120		Clay
16	63.5	7	ML	50	120		Clay
17	68.5	5	ML	50	120		Clay
18	73.5	13	ML	50	120		Clay
19	78.5	100	SM	15	120		Clay
20	83.5	5	SM	15	120		Clay
21	88.5	8	SM	15	120		Clay
22	93.5	8	SM	15	120		Clay
23	98.5	8	SM	15	120		Clay
24	103.5	14	SM	15	120		Clay
25	108.5	8	SM	15	120		Clay
26	113.5	7	SM	15	120		Clay
27	118.5	7	SM	15	120		Clay
28	123.5	6	SM	15	120		Clay
29	128.5	6	SM	15	120		Clay
30	133.5	13	ML	50	120		Clay
31	138.5	11	ML	50	120		Clay
32	143.5	11	SM	15	120		Clay
33	148.5	10	SM	15	120		Clay
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*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	0.5	0.0	ML	50.0	95.0	Clay	48	16	1.39	1.00	0.75	1.00	0.00	1.70	0.00	5.61	5.61	1.005	0.267
2	2.0	5.0	SP-SM	7.7	100.0		198	73	1.39	1.00	0.75	1.00	5.19	1.70	8.83	0.28	9.11	1.002	0.248
3	4.0	6.0	SP-SM	7.2	100.0		398	148	1.39	1.00	0.75	1.00	6.23	1.70	10.60	0.17	10.77	0.997	0.244
4	6.0	0.0	SP-SM	7.0	100.0		598	223	1.39	1.00	0.80	1.00	0.00	1.70	0.00	0.14	0.14	0.991	0.241
5	8.0	2.0	SP-SM	10.3	100.0		798	298	1.39	1.00	0.80	1.00	2.22	1.70	3.77	1.29	5.05	0.985	0.240
6	13.5	0.0	SP-SM	10.0	100.0		1348	505	1.39	1.00	0.85	1.00	0.00	1.70	0.00	1.15	1.15	0.966	0.235
7	18.5	0.0	CL	79.0	95.0	Clay	1823	668	1.39	1.00	0.95	1.00	0.00	1.70	0.00	5.55	5.55	0.947	0.235
8	23.5	0.0	CL	79.0	95.0	Clay	2298	831	1.39	1.00	0.95	1.00	0.00	1.70	0.00	5.55	5.55	0.926	0.233
9	28.5	0.0	CL	79.1	95.0	Clay	2773	994	1.39	1.00	1.00	1.00	0.00	1.58	0.00	5.55	5.55	0.903	0.229
10	33.5	1.0	CL	79.0	95.0	Clay	3248	1157	1.39	1.00	1.00	1.00	1.39	1.41	1.96	5.55	7.51	0.879	0.225
11	38.5	2.0	CL	79.0	95.0	Clay	3723	1320	1.39	1.00	1.00	1.00	2.77	1.30	3.59	5.55	9.14	0.855	0.219
12	43.5	7.0	SP-SM	7.5	100.0		4223	1508	1.39	1.00	1.00	1.00	9.70	1.19	11.56	0.23	11.80	0.830	0.211
13	48.5	4.0	SP-SM	8.0	100.0		4723	1696	1.39	1.00	1.00	1.00	5.54	1.14	6.31	0.37	6.67	0.805	0.204
14	53.5	4.0	ML	50.0	120.0	Clay	5323	1984	1.39	1.00	1.00	1.00	5.54	1.03	5.73	5.61	11.35	0.781	0.191
15	58.5	5.0	ML	50.0	120.0	Clay	5923	2272	1.39	1.00	1.00	1.00	6.93	0.96	6.68	5.61	12.29	0.757	0.180
16	63.5	7.0	ML	50.0	120.0	Clay	6523	2560	1.39	1.00	1.00	1.00	9.70	0.91	8.83	5.61	14.44	0.734	0.170
17	68.5	5.0	ML	50.0	120.0	Clay	7123	2848	1.39	1.00	1.00	1.00	6.93	0.86	5.93	5.61	11.54	0.712	0.162
18	73.5	13.0	ML	50.0	120.0	Clay	7723	3136	1.39	1.00	1.00	1.00	18.01	0.84	15.18	5.61	20.79	0.691	0.155
19	78.5	100.0	SM	15.0	120.0	Clay	8323	3424	1.39	1.00	1.00	1.00	138.50	0.88	122.03	3.26	125.29	0.672	0.149
20	83.5	5.0	SM	15.0	120.0	Clay	8923	3712	1.39	1.00	1.00	1.00	6.93	0.73	5.05	3.26	8.31	0.654	0.143
21	88.5	8.0	SM	15.0	120.0	Clay	9523	4000	1.39	1.00	1.00	1.00	11.08	0.71	7.92	3.26	11.18	0.639	0.138
22	93.5	8.0	SM	15.0	120.0	Clay	10123	4288	1.39	1.00	1.00	1.00	11.08	0.69	7.62	3.26	10.88	0.625	0.134
23	98.5	8.0	SM	15.0	120.0	Clay	10723	4576	1.39	1.00	1.00	1.00	11.08	0.66	7.34	3.26	10.60	0.613	0.131
24	103.5	14.0	SM	15.0	120.0	Clay	11323	4864	1.39	1.00	1.00	1.00	19.39	0.67	13.07	3.26	16.33	0.603	0.128
25	108.5	8.0	SM	15.0	120.0	Clay	11923	5152	1.39	1.00	1.00	1.00	11.08	0.62	6.85	3.26	10.12	0.596	0.125
26	113.5	7.0	SM	15.0	120.0	Clay	12523	5440	1.39	1.00	1.00	1.00	9.70	0.59	5.75	3.26	9.01	0.590	0.124
27	118.5	7.0	SM	15.0	120.0	Clay	13123	5728	1.39	1.00	1.00	1.00	9.70	0.57	5.57	3.26	8.84	0.587	0.122
28	123.5	6.0	SM	15.0	120.0	Clay	13723	6016	1.39	1.00	1.00	1.00	8.31	0.55	4.59	3.26	7.85	0.586	0.122
29	128.5	6.0	SM	15.0	120.0	Clay	14323	6304	1.39	1.00	1.00	1.00	8.31	0.54	4.46	3.26	7.72	0.588	0.121
30	133.5	13.0	ML	50.0	120.0	Clay	14923	6592	1.39	1.00	1.00	1.00	18.01	0.58	10.48	5.61	16.10	0.592	0.122
31	138.5	11.0	ML	50.0	120.0	Clay	15523	6880	1.39	1.00	1.00	1.00	15.24	0.56	8.49	5.61	14.11	0.598	0.123
32	143.5	11.0	SM	15.0	120.0	Clay	16123	7168	1.39	1.00	1.00	1.00	15.24	0.53	8.02	3.26	11.28	0.607	0.124
33	148.5	10.0	SM	15.0	120.0	Clay	16723	7456	1.39	1.00	1.00	1.00	13.85	0.51	7.04	3.26	10.30	0.618	0.126
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.12	1.01	1.10	0.090	0.100	2.00
1.17	1.01	1.10	0.112	0.125	0.50
1.21	1.01	1.10	0.123	0.138	0.57
1.09	1.01	1.10	0.061	0.068	0.28
1.12	1.01	1.10	0.086	0.096	0.40
1.09	1.01	1.09	0.066	0.072	0.31
1.12	1.01	1.09	0.089	0.098	2.00
1.12	1.01	1.07	0.089	0.097	2.00
1.12	1.01	1.06	0.089	0.095	2.00
1.15	1.01	1.05	0.101	0.108	2.00
1.17	1.01	1.04	0.112	0.118	2.00
1.23	1.02	1.03	0.131	0.137	0.65
1.13	1.01	1.02	0.096	0.099	0.48
1.22	1.01	1.01	0.128	0.130	2.00
1.24	1.02	0.99	0.135	0.136	2.00
1.30	1.02	0.98	0.151	0.151	2.00
1.22	1.02	0.97	0.129	0.127	2.00
1.53	1.04	0.95	0.216	0.212	2.00
2.20	1.08	0.86	2.000	1.856	2.00
1.16	1.01	0.95	0.107	0.103	2.00
1.22	1.01	0.94	0.126	0.120	2.00
1.21	1.01	0.93	0.124	0.118	2.00
1.20	1.01	0.93	0.122	0.115	2.00
1.36	1.02	0.90	0.168	0.155	2.00
1.19	1.01	0.92	0.119	0.110	2.00
1.17	1.01	0.92	0.111	0.103	2.00
1.17	1.01	0.91	0.110	0.102	2.00
1.15	1.01	0.91	0.104	0.095	2.00
1.15	1.01	0.91	0.103	0.094	2.00
1.35	1.02	0.87	0.166	0.147	2.00
1.29	1.02	0.87	0.149	0.133	2.00
1.22	1.01	0.88	0.127	0.114	2.00
1.20	1.01	0.88	0.120	0.107	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
0.5	1.3	0.000	0.00	16.45
2	1.8	0.039	0.83	16.45
4	2.0	0.036	0.86	15.62
6	2.0	0.105	2.51	14.76
8	3.8	0.052	2.36	12.25
13.5	5.3	0.081	5.09	9.89
18.5	5.0	0.000	0.00	4.80
23.5	5.0	0.000	0.00	4.80
28.5	5.0	0.000	0.00	4.80
33.5	5.0	0.000	0.00	4.80
38.5	5.0	0.000	0.00	4.80
43.5	5.0	0.034	2.03	4.80
48.5	5.0	0.046	2.78	2.78
53.5	5.0	0.000	0.00	0.00
58.5	5.0	0.000	0.00	0.00
63.5	5.0	0.000	0.00	0.00
68.5	5.0	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	5.0	0.000	0.00	0.00
83.5	5.0	0.000	0.00	0.00
88.5	5.0	0.000	0.00	0.00
93.5	5.0	0.000	0.00	0.00
98.5	5.0	0.000	0.00	0.00
103.5	5.0	0.000	0.00	0.00
108.5	5.0	0.000	0.00	0.00
113.5	5.0	0.000	0.00	0.00
118.5	5.0	0.000	0.00	0.00
123.5	5.0	0.000	0.00	0.00
128.5	5.0	0.000	0.00	0.00
133.5	5.0	0.000	0.00	0.00
138.5	5.0	0.000	0.00	0.00
143.5	5.0	0.000	0.00	0.00
148.5	4.0	0.000	0.00	0.00
151.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:51 PM
Boring Designation:	B-10
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	-2
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	7
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.14
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	0.5	0	SC	41	100		
2	2.0	0	SC	41	100		
3	4.0	6	SC	41	100		
4	6.0	2	SP-SM	8	100		
5	8.0	2	SP-SM	8	100		
6	10.0	2	ML	57	95		Clay
7	13.0	0	ML	57	95		Clay
8	18.0	0	ML	57	95		Clay
9	23.0	0	ML	57	95		Clay
10	28.5	0	ML	57	95		Clay
11	33.5	0	ML	57	95		Clay
12	38.5	1	ML	57	95		Clay
13	44.0	6	SP-SM	6	100		
14	49.0	17	SP-SM	6	100		
15	54.5	3	SM	31	120		Clay
16	59.5	6	SM	31	120		Clay
17	64.5	5	SM	31	120		Clay
18	69.5	8	SM	31	120		Clay
19	74.5	7	SM	15	120		Clay
20	79.5	11	SM	15	120		Clay
21	84.5	13	SM	15	120		Clay
22	89.5	16	SM	15	120		Clay
23	94.5	7	SM	15	120		Clay
24	99.5	11	SM	15	120		Clay
25	104.5	7	SM	15	120		Clay
26	109.5	7	SM	15	120		Clay
27	114.5	9	SM	15	120		Clay
28	119.5	6	SM	15	120		Clay
29	124.5	3	SM	15	120		Clay
30	128.0	6	SM	15	120		Clay
31	133.0	5	SM	15	120		Clay
32	140.0	8	SM	15	120		Clay
33	145.0	13	SM	15	120		Clay
34	150.0	10	SM	15	120		Clay
35	155.5	7	SM	15	120		Clay
36	160.0	7	SM	15	120		Clay
37	165.0	16	SM	15	120		Clay
38	170.0	9	SM	15	120		Clay
39	175.0	10	SM	15	120		Clay
40	180.0	18	SM	15	120		Clay
41	185.0	37	SM	15	120		Clay
42	189.5	10	SM	15	120		Clay
43							
44							
45							
46							
47							
48							
49							
50							

*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	0.5	0.0	SC	41.0	100.0		175	19	1.39	1.00	0.75	1.00	0.00	1.70	0.00	5.58	5.58	1.005	0.851
2	2.0	0.0	SC	41.1	100.0		325	75	1.39	1.00	0.75	1.00	0.00	1.70	0.00	5.59	5.59	1.002	0.394
3	4.0	6.0	SC	41.0	100.0		525	150	1.39	1.00	0.80	1.00	6.65	1.70	11.30	5.58	16.89	0.997	0.316
4	6.0	2.0	SP-SM	7.9	100.0		725	226	1.39	1.00	0.80	1.00	2.22	1.70	3.77	0.34	4.11	0.991	0.290
5	8.0	2.0	SP-SM	8.0	100.0		925	301	1.39	1.00	0.85	1.00	2.35	1.70	4.00	0.37	4.37	0.985	0.276
6	10.0	2.0	ML	57.0	95.0	Clay	1115	366	1.39	1.00	0.85	1.00	2.35	1.70	4.00	5.61	9.61	0.978	0.271
7	13.0	0.0	ML	57.0	95.0	Clay	1400	464	1.39	1.00	0.95	1.00	0.00	1.70	0.00	5.61	5.61	0.968	0.266
8	18.0	0.0	ML	57.2	95.0	Clay	1875	627	1.39	1.00	0.95	1.00	0.00	1.70	0.00	5.61	5.61	0.949	0.258
9	23.0	0.0	ML	57.0	95.0	Clay	2350	790	1.39	1.00	0.95	1.00	0.00	1.70	0.00	5.61	5.61	0.928	0.251
10	28.5	0.0	ML	57.0	95.0	Clay	2872	969	1.39	1.00	1.00	1.00	0.00	1.60	0.00	5.61	5.61	0.903	0.244
11	33.5	0.0	ML	57.0	95.0	Clay	3347	1132	1.39	1.00	1.00	1.00	0.00	1.46	0.00	5.61	5.61	0.879	0.237
12	38.5	1.0	ML	57.0	95.0	Clay	3822	1295	1.39	1.00	1.00	1.00	1.39	1.33	1.84	5.61	7.44	0.855	0.230
13	44.0	6.0	SP-SM	6.0	100.0		4372	1502	1.39	1.00	1.00	1.00	8.31	1.20	10.00	0.03	10.03	0.827	0.219
14	49.0	17.0	SP-SM	6.0	100.0		4872	1690	1.39	1.00	1.00	1.00	23.55	1.09	25.73	0.03	25.76	0.803	0.211
15	54.5	3.0	SM	31.0	120.0	Clay	5532	2007	1.39	1.00	1.00	1.00	4.16	1.03	4.28	5.40	9.68	0.776	0.195
16	59.5	6.0	SM	31.0	120.0	Clay	6132	2295	1.39	1.00	1.00	1.00	8.31	0.96	7.98	5.40	13.38	0.752	0.183
17	64.5	5.0	SM	31.0	120.0	Clay	6732	2583	1.39	1.00	1.00	1.00	6.93	0.90	6.24	5.40	11.64	0.729	0.173
18	69.5	8.0	SM	31.0	120.0	Clay	7332	2871	1.39	1.00	1.00	1.00	11.08	0.86	9.55	5.40	14.95	0.708	0.164
19	74.5	7.0	SM	15.0	120.0	Clay	7932	3159	1.39	1.00	1.00	1.00	9.70	0.81	7.85	3.26	11.11	0.687	0.157
20	79.5	11.0	SM	15.0	120.0	Clay	8532	3447	1.39	1.00	1.00	1.00	15.24	0.79	12.03	3.26	15.29	0.668	0.151
21	84.5	13.0	SM	15.0	120.0	Clay	9132	3735	1.39	1.00	1.00	1.00	18.01	0.77	13.81	3.26	17.07	0.651	0.145
22	89.5	16.0	SM	15.0	120.0	Clay	9732	4023	1.39	1.00	1.00	1.00	22.16	0.75	16.69	3.26	19.96	0.636	0.140
23	94.5	7.0	SM	15.0	120.0	Clay	10332	4311	1.39	1.00	1.00	1.00	9.70	0.68	6.59	3.26	9.85	0.622	0.136
24	99.5	11.0	SM	15.0	120.0	Clay	10932	4599	1.39	1.00	1.00	1.00	15.24	0.68	10.33	3.26	13.59	0.611	0.132
25	104.5	7.0	SM	15.0	120.0	Clay	11532	4887	1.39	1.00	1.00	1.00	9.70	0.63	6.12	3.26	9.39	0.602	0.129
26	109.5	7.0	SM	15.0	120.0	Clay	12132	5175	1.39	1.00	1.00	1.00	9.70	0.61	5.92	3.26	9.18	0.594	0.127
27	114.5	9.0	SM	15.0	120.0	Clay	12732	5463	1.39	1.00	1.00	1.00	12.47	0.60	7.53	3.26	10.79	0.589	0.125
28	119.5	6.0	SM	15.0	120.0	Clay	13332	5751	1.39	1.00	1.00	1.00	8.31	0.57	4.71	3.26	7.98	0.587	0.124
29	124.5	3.0	SM	15.0	120.0	Clay	13932	6039	1.39	1.00	1.00	1.00	4.16	0.53	2.20	3.26	5.47	0.586	0.123
30	128.0	6.0	SM	15.0	120.0	Clay	14352	6240	1.39	1.00	1.00	1.00	8.31	0.54	4.48	3.26	7.75	0.587	0.123
31	133.0	5.0	SM	15.0	120.0	Clay	14952	6528	1.39	1.00	1.00	1.00	6.93	0.52	3.59	3.26	6.85	0.591	0.123
32	140.0	8.0	SM	15.0	120.0	Clay	15792	6932	1.39	1.00	1.00	1.00	11.08	0.52	5.75	3.26	9.01	0.600	0.124
33	145.0	13.0	SM	15.0	120.0	Clay	16392	7220	1.39	1.00	1.00	1.00	18.01	0.54	9.65	3.26	12.91	0.610	0.126
34	150.0	10.0	SM	15.0	120.0	Clay	16992	7508	1.39	1.00	1.00	1.00	13.85	0.51	7.01	3.26	10.27	0.622	0.128
35	155.5	7.0	SM	15.0	120.0	Clay	17652	7824	1.39	1.00	1.00	1.00	9.70	0.48	4.61	3.26	7.87	0.639	0.131
36	160.0	7.0	SM	15.0	120.0	Clay	18192	8084	1.39	1.00	1.00	1.00	9.70	0.47	4.52	3.26	7.78	0.655	0.134
37	165.0	16.0	SM	15.0	120.0	Clay	18792	8372	1.39	1.00	1.00	1.00	22.16	0.51	11.28	3.26	14.54	0.675	0.138
38	170.0	9.0	SM	15.0	120.0	Clay	19392	8660	1.39	1.00	1.00	1.00	12.47	0.46	5.71	3.26	8.97	0.697	0.142
39	175.0	10.0	SM	15.0	120.0	Clay	19992	8948	1.39	1.00	1.00	1.00	13.85	0.45	6.30	3.26	9.56	0.722	0.147
40	180.0	18.0	SM	15.0	120.0	Clay	20592	9236	1.39	1.00	1.00	1.00	24.93	0.49	12.26	3.26	15.53	0.750	0.152
41	185.0	37.0	SM	15.0	120.0	Clay	21192	9524	1.39	1.00	1.00	1.00	51.25	0.60	30.98	3.26	34.24	0.780	0.158
42	189.5	10.0	SM	15.0	120.0	Clay	21732	9783	1.39	1.00	1.00	1.00	13.85	0.43	5.96	3.26	9.22	0.808	0.163
43																			
44																			
45																			
46																			
47																			
48																			
49																			
50																			

MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.12	1.01	1.10	0.090	0.099	0.12
1.12	1.01	1.10	0.090	0.099	0.25
1.38	1.03	1.10	0.173	0.195	0.62
1.11	1.01	1.10	0.081	0.090	0.31
1.11	1.01	1.10	0.083	0.091	0.33
1.18	1.01	1.10	0.115	0.128	2.00
1.12	1.01	1.10	0.090	0.099	2.00
1.12	1.01	1.09	0.090	0.099	2.00
1.12	1.01	1.08	0.090	0.097	2.00
1.12	1.01	1.06	0.090	0.096	2.00
1.12	1.01	1.05	0.090	0.095	2.00
1.15	1.01	1.04	0.101	0.106	2.00
1.19	1.01	1.03	0.118	0.124	0.56
1.76	1.05	1.04	0.309	0.337	1.60
1.18	1.01	1.00	0.116	0.118	2.00
1.27	1.02	0.99	0.143	0.144	2.00
1.23	1.02	0.98	0.130	0.129	2.00
1.32	1.02	0.97	0.156	0.154	2.00
1.21	1.01	0.96	0.126	0.123	2.00
1.33	1.02	0.95	0.159	0.153	2.00
1.38	1.03	0.93	0.175	0.167	2.00
1.49	1.03	0.91	0.205	0.194	2.00
1.19	1.01	0.93	0.117	0.111	2.00
1.28	1.02	0.92	0.145	0.135	2.00
1.18	1.01	0.92	0.114	0.107	2.00
1.17	1.01	0.92	0.112	0.105	2.00
1.21	1.01	0.91	0.124	0.114	2.00
1.15	1.01	0.91	0.104	0.097	2.00
1.12	1.01	0.92	0.089	0.082	2.00
1.15	1.01	0.91	0.103	0.094	2.00
1.14	1.01	0.91	0.097	0.089	2.00
1.17	1.01	0.89	0.111	0.101	2.00
1.26	1.02	0.87	0.139	0.124	2.00
1.20	1.01	0.88	0.120	0.107	2.00
1.15	1.01	0.89	0.104	0.093	2.00
1.15	1.01	0.89	0.103	0.092	2.00
1.30	1.02	0.85	0.152	0.132	2.00
1.17	1.01	0.87	0.111	0.098	2.00
1.18	1.01	0.87	0.115	0.101	2.00
1.33	1.02	0.83	0.161	0.137	2.00
2.20	1.08	0.62	0.952	0.640	2.00
1.18	1.01	0.86	0.113	0.098	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
0.5	1.3	0.050	0.75	7.60
2	1.8	0.050	1.05	6.85
4	2.0	0.026	0.63	5.79
6	2.0	0.057	1.36	5.16
8	2.0	0.055	1.33	3.80
10	2.5	0.000	0.00	2.47
13	4.0	0.000	0.00	2.47
18	5.0	0.000	0.00	2.47
23	5.3	0.000	0.00	2.47
28.5	5.3	0.000	0.00	2.47
33.5	5.0	0.000	0.00	2.47
38.5	5.3	0.000	0.00	2.47
44	5.3	0.037	2.35	2.47
49	5.3	0.002	0.12	0.12
54.5	5.3	0.000	0.00	0.00
59.5	5.0	0.000	0.00	0.00
64.5	5.0	0.000	0.00	0.00
69.5	5.0	0.000	0.00	0.00
74.5	5.0	0.000	0.00	0.00
79.5	5.0	0.000	0.00	0.00
84.5	5.0	0.000	0.00	0.00
89.5	5.0	0.000	0.00	0.00
94.5	5.0	0.000	0.00	0.00
99.5	5.0	0.000	0.00	0.00
104.5	5.0	0.000	0.00	0.00
109.5	5.0	0.000	0.00	0.00
114.5	5.0	0.000	0.00	0.00
119.5	5.0	0.000	0.00	0.00
124.5	4.3	0.000	0.00	0.00
128	4.3	0.000	0.00	0.00
133	6.0	0.000	0.00	0.00
140	6.0	0.000	0.00	0.00
145	5.0	0.000	0.00	0.00
150	5.3	0.000	0.00	0.00
155.5	5.0	0.000	0.00	0.00
160	4.8	0.000	0.00	0.00
165	5.0	0.000	0.00	0.00
170	5.0	0.000	0.00	0.00
175	5.0	0.000	0.00	0.00
180	5.0	0.000	0.00	0.00
185	4.8	0.000	0.00	0.00
189.5	3.8	0.000	0.00	0.00
192.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:52 PM
Boring Designation:	B-11
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	-22
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	27
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.14
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"	
1	0.5	0	ML	50	95		Clay	
2	2.0	1	ML	50	95		Clay	
3	4.0	0	SM	18	100			
4	6.0	0	CL	52	95		Clay	
5	8.0	0	SM	15	100			
6	14.5	0	MH	94	95		Clay	
7	20.0	0	MH	94	95		Clay	
8	25.5	2	SM	15	100			
9	31.5	7	SM	15	100			
10	36.0	6	ML	50	120		Clay	*Assumes Marl/Limestone NonLiq
11	41.5	5	ML	50	120		Clay	
12	46.5	7	ML	50	120		Clay	
13	51.5	7	ML	50	120		Clay	
14	56.5	23	SM	15	120		Clay	
15	61.0	6	SM	45	120		Clay	
16	65.5	5	SM	15	120		Clay	
17	70.5	5	SM	15	120		Clay	
18	75.0	6	SM	15	120		Clay	
19	78.0	5	SM	15	120		Clay	
20	82.5	27	SM	15	120		Clay	
21	85.0	1	SM	15	120		Clay	
22	90.0	8	SM	15	120		Clay	
23	98.5	9	SM	15	120		Clay	
24	104.0	11	SM	15	120		Clay	
25	110.0	8	SM	15	120		Clay	
26	115.5	10	SM	15	120		Clay	
27	121.5	8	SM	15	120		Clay	
28	125.5	10	SM	15	120		Clay	
29	132.0	9	SM	15	120		Clay	
30	137.0	10	SM	15	120		Clay	
31	141.5	12	SM	15	120		Clay	
32	146.0	10	SM	15	120		Clay	
33	150.5	8	SM	15	120		Clay	
34	155.0	19	SM	15	120		Clay	
35	159.5	10	SM	15	120		Clay	
36	164.0	9	SM	15	120		Clay	
37	168.5	9	SM	15	120		Clay	
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SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	0.5	0.0	ML	50.0	95.0	Clay	1420	16	1.39	1.00	0.95	1.00	0.00	1.70	0.00	5.61	5.61	1.005	7.972
2	2.0	1.0	ML	50.0	95.0	Clay	1563	65	1.39	1.00	0.95	1.00	1.32	1.70	2.24	5.61	7.85	1.002	2.185
3	4.0	0.0	SM	18.1	100.0		1763	140	1.39	1.00	0.95	1.00	0.00	1.70	0.00	4.11	4.11	0.997	1.139
4	6.0	0.0	CL	52.1	95.0	Clay	1953	206	1.39	1.00	1.00	1.00	0.00	1.70	0.00	5.61	5.61	0.991	0.856
5	8.0	0.0	SM	15.3	100.0		2153	281	1.39	1.00	1.00	1.00	0.00	1.70	0.00	3.36	3.36	0.985	0.687
6	14.5	0.0	MH	93.7	95.0	Clay	2770	493	1.39	1.00	1.00	1.00	0.00	1.70	0.00	5.50	5.50	0.962	0.492
7	20.0	0.0	MH	94.0	95.0	Clay	3293	672	1.39	1.00	1.00	1.00	0.00	1.70	0.00	5.50	5.50	0.941	0.419
8	25.5	2.0	SM	15.0	100.0		3843	879	1.39	1.00	1.00	1.00	2.77	1.65	4.57	3.26	7.83	0.917	0.365
9	31.5	7.0	SM	15.0	100.0		4443	1104	1.39	1.00	1.00	1.00	9.70	1.36	13.18	3.26	16.44	0.889	0.325
10	36.0	6.0	ML	50.0	120.0	Clay	4983	1364	1.39	1.00	1.00	1.00	8.31	1.23	10.25	5.61	15.87	0.867	0.288
11	41.5	5.0	ML	50.0	120.0	Clay	5643	1680	1.39	1.00	1.00	1.00	6.93	1.12	7.78	5.61	13.39	0.840	0.257
12	46.5	7.0	ML	50.0	120.0	Clay	6243	1968	1.39	1.00	1.00	1.00	9.70	1.04	10.04	5.61	15.65	0.815	0.235
13	51.5	7.0	ML	50.0	120.0	Clay	6843	2256	1.39	1.00	1.00	1.00	9.70	0.97	9.40	5.61	15.01	0.790	0.218
14	56.5	23.0	SM	15.0	120.0	Clay	7443	2544	1.39	1.00	1.00	1.00	31.86	0.94	29.91	3.26	33.17	0.766	0.204
15	61.0	6.0	SM	45.3	120.0	Clay	7983	2804	1.39	1.00	1.00	1.00	8.31	0.87	7.20	5.61	12.81	0.745	0.193
16	65.5	5.0	SM	15.0	120.0	Clay	8523	3063	1.39	1.00	1.00	1.00	6.93	0.81	5.64	3.26	8.90	0.725	0.184
17	70.5	5.0	SM	15.0	120.0	Clay	9123	3351	1.39	1.00	1.00	1.00	6.93	0.77	5.36	3.26	8.62	0.703	0.174
18	75.0	6.0	SM	15.0	120.0	Clay	9663	3610	1.39	1.00	1.00	1.00	8.31	0.75	6.20	3.26	9.46	0.685	0.167
19	78.0	5.0	SM	15.0	120.0	Clay	10023	3783	1.39	1.00	1.00	1.00	6.93	0.72	4.99	3.26	8.25	0.674	0.162
20	82.5	27.0	SM	15.0	120.0	Clay	10563	4042	1.39	1.00	1.00	1.00	37.40	0.80	29.99	3.26	33.25	0.658	0.156
21	85.0	1.0	SM	15.0	120.0	Clay	10863	4186	1.39	1.00	1.00	1.00	1.39	0.65	0.90	3.26	4.16	0.650	0.153
22	90.0	8.0	SM	15.0	120.0	Clay	11463	4474	1.39	1.00	1.00	1.00	11.08	0.67	7.43	3.26	10.70	0.634	0.148
23	98.5	9.0	SM	15.0	120.0	Clay	12483	4964	1.39	1.00	1.00	1.00	12.47	0.64	7.95	3.26	11.22	0.613	0.140
24	104.0	11.0	SM	15.0	120.0	Clay	13143	5280	1.39	1.00	1.00	1.00	15.24	0.63	9.57	3.26	12.83	0.602	0.136
25	110.0	8.0	SM	15.0	120.0	Clay	13863	5626	1.39	1.00	1.00	1.00	11.08	0.59	6.51	3.26	9.77	0.594	0.133
26	115.5	10.0	SM	15.0	120.0	Clay	14523	5943	1.39	1.00	1.00	1.00	13.85	0.58	8.05	3.26	11.31	0.589	0.131
27	121.5	8.0	SM	15.0	120.0	Clay	15243	6288	1.39	1.00	1.00	1.00	11.08	0.55	6.09	3.26	9.35	0.586	0.129
28	125.5	10.0	SM	15.0	120.0	Clay	15723	6519	1.39	1.00	1.00	1.00	13.85	0.55	7.62	3.26	10.89	0.586	0.129
29	132.0	9.0	SM	15.0	120.0	Clay	16503	6893	1.39	1.00	1.00	1.00	12.47	0.53	6.56	3.26	9.82	0.590	0.129
30	137.0	10.0	SM	15.0	120.0	Clay	17103	7181	1.39	1.00	1.00	1.00	13.85	0.52	7.20	3.26	10.46	0.596	0.129
31	141.5	12.0	SM	15.0	120.0	Clay	17643	7440	1.39	1.00	1.00	1.00	16.62	0.52	8.66	3.26	11.92	0.603	0.130
32	146.0	10.0	SM	15.0	120.0	Clay	18183	7700	1.39	1.00	1.00	1.00	13.85	0.50	6.90	3.26	10.16	0.612	0.132
33	150.5	8.0	SM	15.0	120.0	Clay	18723	7959	1.39	1.00	1.00	1.00	11.08	0.48	5.28	3.26	8.54	0.624	0.133
34	155.0	19.0	SM	15.0	120.0	Clay	19263	8218	1.39	1.00	1.00	1.00	26.32	0.53	14.00	3.26	17.27	0.637	0.136
35	159.5	10.0	SM	15.0	120.0	Clay	19803	8477	1.39	1.00	1.00	1.00	13.85	0.47	6.51	3.26	9.77	0.653	0.139
36	164.0	9.0	SM	15.0	120.0	Clay	20343	8736	1.39	1.00	1.00	1.00	12.47	0.46	5.68	3.26	8.94	0.670	0.142
37	168.5	9.0	SM	15.0	120.0	Clay	20883	8996	1.39	1.00	1.00	1.00	12.47	0.45	5.58	3.26	8.84	0.690	0.146
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.12	1.01	1.10	0.090	0.100	2.00
1.15	1.01	1.10	0.104	0.115	2.00
1.11	1.01	1.10	0.081	0.090	0.08
1.12	1.01	1.10	0.090	0.100	2.00
1.10	1.01	1.10	0.077	0.085	0.12
1.12	1.01	1.10	0.089	0.099	2.00
1.12	1.01	1.09	0.089	0.098	2.00
1.15	1.01	1.07	0.103	0.112	0.31
1.36	1.02	1.08	0.169	0.186	0.57
1.34	1.02	1.05	0.164	0.176	2.00
1.27	1.02	1.02	0.143	0.149	2.00
1.34	1.02	1.01	0.162	0.167	2.00
1.32	1.02	0.99	0.156	0.158	2.00
2.20	1.08	0.96	0.782	0.809	2.00
1.26	1.02	0.97	0.139	0.137	2.00
1.17	1.01	0.97	0.111	0.108	2.00
1.16	1.01	0.96	0.109	0.105	2.00
1.18	1.01	0.95	0.114	0.110	2.00
1.16	1.01	0.95	0.106	0.102	2.00
2.20	1.08	0.85	0.792	0.725	2.00
1.11	1.01	0.95	0.081	0.078	2.00
1.21	1.01	0.93	0.123	0.116	2.00
1.22	1.01	0.92	0.127	0.118	2.00
1.26	1.02	0.91	0.139	0.128	2.00
1.19	1.01	0.91	0.116	0.107	2.00
1.22	1.01	0.90	0.127	0.116	2.00
1.18	1.01	0.90	0.114	0.104	2.00
1.21	1.01	0.89	0.124	0.113	2.00
1.19	1.01	0.89	0.117	0.106	2.00
1.20	1.01	0.89	0.121	0.109	2.00
1.23	1.02	0.88	0.132	0.117	2.00
1.19	1.01	0.88	0.119	0.106	2.00
1.16	1.01	0.88	0.108	0.097	2.00
1.39	1.03	0.84	0.176	0.152	2.00
1.19	1.01	0.87	0.116	0.103	2.00
1.17	1.01	0.87	0.111	0.098	2.00
1.17	1.01	0.87	0.110	0.097	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
0.5	1.3	0.000	0.00	9.12
2	1.8	0.000	0.00	9.12
4	2.0	0.057	1.36	9.12
6	2.0	0.000	0.00	7.75
8	4.3	0.061	3.11	7.75
14.5	6.0	0.000	0.00	4.64
20	5.5	0.000	0.00	4.64
25.5	5.8	0.043	2.95	4.64
31.5	5.3	0.027	1.69	1.69
36	5.0	0.000	0.00	0.00
41.5	5.3	0.000	0.00	0.00
46.5	5.0	0.000	0.00	0.00
51.5	5.0	0.000	0.00	0.00
56.5	4.8	0.000	0.00	0.00
61	4.5	0.000	0.00	0.00
65.5	4.8	0.000	0.00	0.00
70.5	4.8	0.000	0.00	0.00
75	3.8	0.000	0.00	0.00
78	3.8	0.000	0.00	0.00
82.5	3.5	0.000	0.00	0.00
85	3.8	0.000	0.00	0.00
90	6.8	0.000	0.00	0.00
98.5	7.0	0.000	0.00	0.00
104	5.8	0.000	0.00	0.00
110	5.8	0.000	0.00	0.00
115.5	5.8	0.000	0.00	0.00
121.5	5.0	0.000	0.00	0.00
125.5	5.3	0.000	0.00	0.00
132	5.8	0.000	0.00	0.00
137	4.8	0.000	0.00	0.00
141.5	4.5	0.000	0.00	0.00
146	4.5	0.000	0.00	0.00
150.5	4.5	0.000	0.00	0.00
155	4.5	0.000	0.00	0.00
159.5	4.5	0.000	0.00	0.00
164	4.5	0.000	0.00	0.00
168.5	3.8	0.000	0.00	0.00
171.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:38 PM
Boring Designation:	B-12
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	-33
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	38
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.12
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"	
1	0.5	1	CL	50	95		Clay	
2	2.0	4	CL	50	95		Clay	
3	4.0	3	SM	24	100			
4	6.0	9	SC	15	100			
5	8.0	4	SP	0	100			
6	12.5	5	SP-SM	10	100			
7	17.5	7	SM	48	120		Clay	*Assumes Marl/Limestone NonLiq
8	23.0	8	SM	48	120		Clay	
9	28.0	4	SM	48	120		Clay	
10	36.5	6	SM	48	120		Clay	
11	42.0	9	SM	48	120		Clay	
12	47.0	6	SM	47	120		Clay	
13	53.0	8	SM	47	120		Clay	
14	58.0	12	SM	15	120		Clay	
15	63.5	11	SM	50	120		Clay	
16	69.0	9	SM	15	120		Clay	
17	73.5	12	SM	15	120		Clay	
18	77.5	8	SM	15	120		Clay	
19	82.5	5	SM	15	120		Clay	
20	87.5		SM	15	120		Clay	
21	92.5	14	SM	15	120		Clay	
22	97.5	12	SM	15	120		Clay	
23	102.5	7	SM	15	120		Clay	
24	108.0	12	SM	15	120		Clay	
25	115.5	8	SM	15	120		Clay	
26	118.5	11	SM	15	120		Clay	
27	122.5	9	SM	15	120		Clay	
28	127.0	19	SM	15	120		Clay	
29	132.0	10	SM	15	120		Clay	
30	137.0	8	SM	15	120		Clay	
31	141.5	20	SM	15	120		Clay	
32	147.0		SM	15	120		Clay	
33	152.5	12	SM	15	120		Clay	
34	157.5	8	SM	15	120		Clay	
35								
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SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	0.5	1.0	CL	50.0	95.0	Clay	2107	16	1.39	1.00	1.00	1.00	1.39	1.70	2.35	5.61	7.97	1.005	10.136
2	2.0	4.0	CL	50.0	95.0	Clay	2249	65	1.39	1.00	1.00	1.00	5.54	1.70	9.42	5.61	15.03	1.002	2.696
3	4.0	3.0	SM	23.8	100.0		2449	140	1.39	1.00	1.00	1.00	4.16	1.70	7.06	4.97	12.03	0.997	1.356
4	6.0	9.0	SC	15.0	100.0		2649	216	1.39	1.00	1.00	1.00	12.47	1.70	21.19	3.26	24.45	0.991	0.950
5	8.0	4.0	SP	0.0	100.0		2849	291	1.39	1.00	1.00	1.00	5.54	1.70	9.42	0.00	9.42	0.985	0.753
6	12.5	5.0	SP-SM	10.4	100.0		3299	460	1.39	1.00	1.00	1.00	6.93	1.70	11.77	1.33	13.11	0.970	0.542
7	17.5	7.0	SM	48.0	120.0	Clay	3899	748	1.39	1.00	1.00	1.00	9.70	1.57	15.22	5.61	20.83	0.951	0.387
8	23.0	8.0	SM	48.0	120.0	Clay	4559	1065	1.39	1.00	1.00	1.00	11.08	1.35	14.95	5.61	20.56	0.928	0.310
9	28.0	4.0	SM	48.0	120.0	Clay	5159	1353	1.39	1.00	1.00	1.00	5.54	1.26	6.96	5.61	12.58	0.905	0.269
10	36.5	6.0	SM	48.0	120.0	Clay	6179	1842	1.39	1.00	1.00	1.00	8.31	1.07	8.90	5.61	14.51	0.865	0.226
11	42.0	9.0	SM	48.0	120.0	Clay	6839	2159	1.39	1.00	1.00	1.00	12.47	0.99	12.35	5.61	17.96	0.837	0.207
12	47.0	6.0	SM	46.6	120.0	Clay	7439	2447	1.39	1.00	1.00	1.00	8.31	0.93	7.72	5.61	13.33	0.813	0.193
13	53.0	8.0	SM	47.0	120.0	Clay	8159	2793	1.39	1.00	1.00	1.00	11.08	0.87	9.69	5.61	15.30	0.783	0.178
14	58.0	12.0	SM	15.0	120.0	Clay	8759	3081	1.39	1.00	1.00	1.00	16.62	0.84	13.95	3.26	17.22	0.759	0.168
15	63.5	11.0	SM	49.7	120.0	Clay	9419	3398	1.39	1.00	1.00	1.00	15.24	0.80	12.26	5.61	17.87	0.734	0.159
16	69.0	9.0	SM	15.0	120.0	Clay	10079	3714	1.39	1.00	1.00	1.00	12.47	0.75	9.35	3.26	12.61	0.710	0.150
17	73.5	12.0	SM	15.0	120.0	Clay	10619	3974	1.39	1.00	1.00	1.00	16.62	0.74	12.27	3.26	15.53	0.691	0.144
18	77.5	8.0	SM	15.0	120.0	Clay	11099	4204	1.39	1.00	1.00	1.00	11.08	0.70	7.70	3.26	10.96	0.676	0.139
19	82.5	5.0	SM	15.0	120.0	Clay	11699	4492	1.39	1.00	1.00	1.00	6.93	0.65	4.51	3.26	7.77	0.658	0.134
20	87.5	0.0	SM	15.0	120.0	Clay	12299	4780	1.39	1.00	1.00	1.00	0.00	0.59	0.00	3.26	3.26	0.642	0.129
21	92.5	14.0	SM	15.0	120.0	Clay	12899	5068	1.39	1.00	1.00	1.00	19.39	0.66	12.79	3.26	16.05	0.628	0.125
22	97.5	12.0	SM	15.0	120.0	Clay	13499	5356	1.39	1.00	1.00	1.00	16.62	0.63	10.45	3.26	13.71	0.615	0.121
23	102.5	7.0	SM	15.0	120.0	Clay	14099	5644	1.39	1.00	1.00	1.00	9.70	0.58	5.62	3.26	8.89	0.605	0.118
24	108.0	12.0	SM	15.0	120.0	Clay	14759	5961	1.39	1.00	1.00	1.00	16.62	0.59	9.84	3.26	13.10	0.596	0.115
25	115.5	8.0	SM	15.0	120.0	Clay	15659	6393	1.39	1.00	1.00	1.00	11.08	0.54	6.03	3.26	9.29	0.589	0.112
26	118.5	11.0	SM	15.0	120.0	Clay	16019	6566	1.39	1.00	1.00	1.00	15.24	0.55	8.44	3.26	11.70	0.587	0.112
27	122.5	9.0	SM	15.0	120.0	Clay	16499	6796	1.39	1.00	1.00	1.00	12.47	0.53	6.62	3.26	9.88	0.586	0.111
28	127.0	19.0	SM	15.0	120.0	Clay	17039	7055	1.39	1.00	1.00	1.00	26.32	0.58	15.24	3.26	18.50	0.587	0.111
29	132.0	10.0	SM	15.0	120.0	Clay	17639	7343	1.39	1.00	1.00	1.00	13.85	0.51	7.10	3.26	10.36	0.590	0.111
30	137.0	8.0	SM	15.0	120.0	Clay	18239	7631	1.39	1.00	1.00	1.00	11.08	0.49	5.42	3.26	8.68	0.596	0.111
31	141.5	20.0	SM	15.0	120.0	Clay	18779	7890	1.39	1.00	1.00	1.00	27.70	0.55	15.25	3.26	18.51	0.603	0.112
32	147.0	0.0	SM	15.0	120.0	Clay	19439	8207	1.39	1.00	1.00	1.00	0.00	0.42	0.00	3.26	3.26	0.615	0.114
33	152.5	12.0	SM	15.0	120.0	Clay	20099	8524	1.39	1.00	1.00	1.00	16.62	0.48	7.98	3.26	11.24	0.629	0.116
34	157.5	8.0	SM	15.0	120.0	Clay	20699	8812	1.39	1.00	1.00	1.00	11.08	0.45	4.96	3.26	8.22	0.645	0.118
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.15	1.01	1.10	0.104	0.116	2.00
1.32	1.02	1.10	0.156	0.176	2.00
1.24	1.02	1.10	0.133	0.148	0.11
1.69	1.05	1.10	0.278	0.320	0.34
1.18	1.01	1.10	0.114	0.127	0.17
1.26	1.02	1.10	0.141	0.158	0.29
1.53	1.04	1.10	0.216	0.247	2.00
1.52	1.04	1.09	0.213	0.241	2.00
1.25	1.02	1.05	0.137	0.145	2.00
1.30	1.02	1.02	0.152	0.157	2.00
1.42	1.03	1.00	0.183	0.188	2.00
1.27	1.02	0.98	0.143	0.143	2.00
1.33	1.02	0.97	0.159	0.157	2.00
1.39	1.03	0.95	0.176	0.172	2.00
1.41	1.03	0.94	0.182	0.177	2.00
1.25	1.02	0.94	0.137	0.131	2.00
1.33	1.02	0.93	0.161	0.153	2.00
1.21	1.01	0.93	0.125	0.118	2.00
1.15	1.01	0.94	0.103	0.098	2.00
1.10	1.01	0.94	0.077	0.073	2.00
1.35	1.02	0.90	0.165	0.152	2.00
1.28	1.02	0.90	0.146	0.134	2.00
1.17	1.01	0.91	0.110	0.102	2.00
1.26	1.02	0.89	0.141	0.128	2.00
1.18	1.01	0.90	0.113	0.103	2.00
1.23	1.02	0.89	0.130	0.118	2.00
1.19	1.01	0.89	0.117	0.106	2.00
1.43	1.03	0.85	0.189	0.165	2.00
1.20	1.01	0.88	0.121	0.108	2.00
1.17	1.01	0.89	0.109	0.098	2.00
1.44	1.03	0.83	0.189	0.162	2.00
1.10	1.01	0.91	0.077	0.070	2.00
1.22	1.01	0.87	0.127	0.111	2.00
1.16	1.01	0.88	0.106	0.094	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
0.5	1.3	0.000	0.00	4.57
2	1.8	0.000	0.00	4.57
4	2.0	0.033	0.80	4.57
6	2.0	0.019	0.46	3.77
8	3.3	0.039	1.51	3.31
12.5	4.8	0.032	1.80	1.80
17.5	5.3	0.000	0.00	0.00
23	5.3	0.000	0.00	0.00
28	6.8	0.000	0.00	0.00
36.5	7.0	0.000	0.00	0.00
42	5.3	0.000	0.00	0.00
47	5.5	0.000	0.00	0.00
53	5.5	0.000	0.00	0.00
58	5.3	0.000	0.00	0.00
63.5	5.5	0.000	0.00	0.00
69	5.0	0.000	0.00	0.00
73.5	4.3	0.000	0.00	0.00
77.5	4.5	0.000	0.00	0.00
82.5	5.0	0.000	0.00	0.00
87.5	5.0	0.000	0.00	0.00
92.5	5.0	0.000	0.00	0.00
97.5	5.0	0.000	0.00	0.00
102.5	5.3	0.000	0.00	0.00
108	6.5	0.000	0.00	0.00
115.5	5.3	0.000	0.00	0.00
118.5	3.5	0.000	0.00	0.00
122.5	4.3	0.000	0.00	0.00
127	4.8	0.000	0.00	0.00
132	5.0	0.000	0.00	0.00
137	4.8	0.000	0.00	0.00
141.5	5.0	0.000	0.00	0.00
147	5.5	0.000	0.00	0.00
152.5	5.3	0.000	0.00	0.00
157.5	4.0	0.000	0.00	0.00
160.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:39 PM
Boring Designation:	B-13
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	-28
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	33
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.12
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"	
1	0.5	1	SM	23	100			
2	2.0	3	SM	23	100			
3	4.0	3	SM	23	100			
4	6.0	3	SM	23	100			
5	8.0	1	SC	15	100			
6	14.5	1	CL	64	95		Clay	
7	19.5	0	CL	64	95		Clay	
8	24.5	2	ML	65	95			
9	30.0	6	SC	44	120		Clay	*Assumes Marl/Limestone NonLiq
10	35.5	4	SC	44	120		Clay	
11	41.0	6	SC	44	120		Clay	
12	48.5	6	ML	50	120		Clay	
13	53.5	7	ML	50	120		Clay	
14	58.5	4	ML	50	120		Clay	
15	62.5	23	ML	50	120		Clay	
16	66.5	7	ML	50	120		Clay	
17	71.5	7	ML	50	120		Clay	
18	76.0	10	ML	50	120		Clay	
19	81.0	6	ML	50	120		Clay	
20	88.5	6	ML	50	120		Clay	
21	93.5	12	ML	50	120		Clay	
22	99.0	11	ML	50	120		Clay	
23	104.5	7	ML	50	120		Clay	
24	110.0	9	ML	50	120		Clay	
25	118.0	8	ML	50	120		Clay	
26	120.0	8	ML	50	120		Clay	
27	124.5	7	ML	50	120		Clay	
28	129.0	8	ML	50	120		Clay	
29	134.0	10	ML	50	120		Clay	
30	138.5	9	ML	50	120		Clay	
31	144.0	12	ML	50	120		Clay	
32	149.5	7	ML	50	120		Clay	
33	155.5	13	ML	50	120		Clay	
34	161.0	17	ML	50	120		Clay	
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SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	0.5	1.0	SM	23.0	100.0		1797	19	1.39	1.00	1.00	1.00	1.39	1.70	2.35	4.88	7.24	1.005	7.497
2	2.0	3.0	SM	23.0	100.0		1947	75	1.39	1.00	1.00	1.00	4.16	1.70	7.06	4.88	11.95	1.002	2.023
3	4.0	3.0	SM	22.8	100.0		2147	150	1.39	1.00	1.00	1.00	4.16	1.70	7.06	4.86	11.93	0.997	1.110
4	6.0	3.0	SM	23.0	100.0		2347	226	1.39	1.00	1.00	1.00	4.16	1.70	7.06	4.88	11.95	0.991	0.804
5	8.0	1.0	SC	15.0	100.0		2547	301	1.39	1.00	1.00	1.00	1.39	1.70	2.35	3.26	5.62	0.985	0.650
6	14.5	1.0	CL	64.2	95.0	Clay	3165	513	1.39	1.00	1.00	1.00	1.39	1.70	2.35	5.59	7.95	0.962	0.463
7	19.5	0.0	CL	64.0	95.0	Clay	3640	676	1.39	1.00	1.00	1.00	0.00	1.70	0.00	5.59	5.59	0.943	0.396
8	24.5	2.0	ML	65.3	95.0		4115	839	1.39	1.00	1.00	1.00	2.77	1.65	4.56	5.59	10.15	0.921	0.352
9	30.0	6.0	SC	44.0	120.0	Clay	4775	1156	1.39	1.00	1.00	1.00	8.31	1.33	11.05	5.60	16.65	0.896	0.289
10	35.5	4.0	SC	43.9	120.0	Clay	5435	1472	1.39	1.00	1.00	1.00	5.54	1.21	6.68	5.60	12.28	0.869	0.250
11	41.0	6.0	SC	44.0	120.0	Clay	6095	1789	1.39	1.00	1.00	1.00	8.31	1.09	9.02	5.60	14.62	0.842	0.224
12	48.5	6.0	ML	50.0	120.0	Clay	6995	2221	1.39	1.00	1.00	1.00	8.31	0.98	8.11	5.61	13.73	0.805	0.198
13	53.5	7.0	ML	50.0	120.0	Clay	7595	2509	1.39	1.00	1.00	1.00	9.70	0.92	8.92	5.61	14.53	0.781	0.184
14	58.5	4.0	ML	50.0	120.0	Clay	8195	2797	1.39	1.00	1.00	1.00	5.54	0.86	4.77	5.61	10.38	0.757	0.173
15	62.5	23.0	ML	50.0	120.0	Clay	8675	3028	1.39	1.00	1.00	1.00	31.86	0.89	28.23	5.61	33.85	0.738	0.165
16	66.5	7.0	ML	50.0	120.0	Clay	9155	3258	1.39	1.00	1.00	1.00	9.70	0.80	7.80	5.61	13.42	0.720	0.158
17	71.5	7.0	ML	50.2	120.0	Clay	9755	3546	1.39	1.00	1.00	1.00	9.70	0.77	7.47	5.61	13.08	0.699	0.150
18	76.0	10.0	ML	50.0	120.0	Clay	10295	3805	1.39	1.00	1.00	1.00	13.85	0.76	10.48	5.61	16.09	0.681	0.144
19	81.0	6.0	ML	50.0	120.0	Clay	10895	4093	1.39	1.00	1.00	1.00	8.31	0.71	5.88	5.61	11.50	0.663	0.138
20	88.5	6.0	ML	50.0	120.0	Clay	11795	4525	1.39	1.00	1.00	1.00	8.31	0.67	5.57	5.61	11.18	0.639	0.130
21	93.5	12.0	ML	50.0	120.0	Clay	12395	4813	1.39	1.00	1.00	1.00	16.62	0.68	11.31	5.61	16.93	0.625	0.126
22	99.0	11.0	ML	50.0	120.0	Clay	13055	5130	1.39	1.00	1.00	1.00	15.24	0.65	9.95	5.61	15.57	0.612	0.121
23	104.5	7.0	ML	50.0	120.0	Clay	13715	5447	1.39	1.00	1.00	1.00	9.70	0.61	5.91	5.61	11.53	0.602	0.118
24	110.0	9.0	ML	50.0	120.0	Clay	14375	5764	1.39	1.00	1.00	1.00	12.47	0.60	7.51	5.61	13.12	0.594	0.116
25	118.0	8.0	ML	50.0	120.0	Clay	15335	6224	1.39	1.00	1.00	1.00	11.08	0.57	6.33	5.61	11.95	0.587	0.113
26	120.0	8.0	ML	50.0	120.0	Clay	15575	6340	1.39	1.00	1.00	1.00	11.08	0.57	6.27	5.61	11.88	0.587	0.112
27	124.5	7.0	ML	50.0	120.0	Clay	16115	6599	1.39	1.00	1.00	1.00	9.70	0.55	5.30	5.61	10.92	0.586	0.112
28	129.0	8.0	ML	50.0	120.0	Clay	16655	6858	1.39	1.00	1.00	1.00	11.08	0.54	6.00	5.61	11.61	0.588	0.111
29	134.0	10.0	ML	50.0	120.0	Clay	17255	7146	1.39	1.00	1.00	1.00	13.85	0.54	7.48	5.61	13.10	0.592	0.112
30	138.5	9.0	ML	50.0	120.0	Clay	17795	7405	1.39	1.00	1.00	1.00	12.47	0.52	6.53	5.61	12.14	0.598	0.112
31	144.0	12.0	ML	50.0	120.0	Clay	18455	7722	1.39	1.00	1.00	1.00	16.62	0.53	8.78	5.61	14.40	0.608	0.113
32	149.5	7.0	ML	50.0	120.0	Clay	19115	8039	1.39	1.00	1.00	1.00	9.70	0.49	4.73	5.61	10.35	0.621	0.115
33	155.5	13.0	ML	50.0	120.0	Clay	19835	8384	1.39	1.00	1.00	1.00	18.01	0.51	9.19	5.61	14.80	0.639	0.118
34	161.0	17.0	ML	50.0	120.0	Clay	20495	8701	1.39	1.00	1.00	1.00	23.55	0.52	12.31	5.61	17.92	0.658	0.121
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.14	1.01	1.10	0.100	0.111	0.01
1.23	1.02	1.10	0.132	0.148	0.07
1.23	1.02	1.10	0.132	0.147	0.13
1.23	1.02	1.10	0.132	0.148	0.18
1.12	1.01	1.10	0.090	0.100	0.15
1.15	1.01	1.10	0.104	0.116	2.00
1.12	1.01	1.09	0.090	0.098	2.00
1.19	1.01	1.09	0.119	0.131	0.37
1.37	1.03	1.07	0.171	0.187	2.00
1.24	1.02	1.04	0.135	0.142	2.00
1.31	1.02	1.02	0.153	0.159	2.00
1.28	1.02	0.99	0.146	0.148	2.00
1.30	1.02	0.98	0.152	0.152	2.00
1.20	1.01	0.97	0.121	0.119	2.00
2.20	1.08	0.91	0.883	0.871	2.00
1.27	1.02	0.95	0.143	0.139	2.00
1.26	1.02	0.95	0.141	0.136	2.00
1.35	1.02	0.93	0.166	0.158	2.00
1.22	1.02	0.94	0.129	0.122	2.00
1.22	1.01	0.93	0.126	0.119	2.00
1.38	1.03	0.90	0.173	0.160	2.00
1.33	1.02	0.90	0.161	0.148	2.00
1.22	1.02	0.91	0.129	0.119	2.00
1.26	1.02	0.90	0.141	0.129	2.00
1.23	1.02	0.89	0.132	0.120	2.00
1.23	1.02	0.89	0.132	0.119	2.00
1.21	1.01	0.89	0.125	0.113	2.00
1.23	1.02	0.88	0.130	0.116	2.00
1.26	1.02	0.87	0.141	0.125	2.00
1.24	1.02	0.87	0.134	0.119	2.00
1.30	1.02	0.86	0.151	0.133	2.00
1.20	1.01	0.88	0.121	0.107	2.00
1.31	1.02	0.85	0.154	0.134	2.00
1.41	1.03	0.83	0.183	0.155	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
0.5	1.3	0.044	0.67	7.87
2	1.8	0.034	0.70	7.20
4	2.0	0.034	0.81	6.50
6	2.0	0.034	0.80	5.69
8	4.3	0.050	2.55	4.89
14.5	5.8	0.000	0.00	2.33
19.5	5.0	0.000	0.00	2.33
24.5	5.3	0.037	2.33	2.33
30	5.5	0.000	0.00	0.00
35.5	5.5	0.000	0.00	0.00
41	6.5	0.000	0.00	0.00
48.5	6.3	0.000	0.00	0.00
53.5	5.0	0.000	0.00	0.00
58.5	4.5	0.000	0.00	0.00
62.5	4.0	0.000	0.00	0.00
66.5	4.5	0.000	0.00	0.00
71.5	4.8	0.000	0.00	0.00
76	4.8	0.000	0.00	0.00
81	6.3	0.000	0.00	0.00
88.5	6.3	0.000	0.00	0.00
93.5	5.3	0.000	0.00	0.00
99	5.5	0.000	0.00	0.00
104.5	5.5	0.000	0.00	0.00
110	6.8	0.000	0.00	0.00
118	5.0	0.000	0.00	0.00
120	3.3	0.000	0.00	0.00
124.5	4.5	0.000	0.00	0.00
129	4.8	0.000	0.00	0.00
134	4.8	0.000	0.00	0.00
138.5	5.0	0.000	0.00	0.00
144	5.5	0.000	0.00	0.00
149.5	5.8	0.000	0.00	0.00
155.5	5.8	0.000	0.00	0.00
161	4.3	0.000	0.00	0.00
164				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:44 PM
Boring Designation:	B-14
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	0
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.12
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	0.5	1	SM	14	100		
2	2.0	2	SM	14	100		
3	4.0	4	SM	14	100		
4	6.0	25	SM	14	120		
5	8.0	3	SM	14	100		
6	13.5	16	SM	14	120		
7	18.5	5	SM	14	100		
8	23.5	9	SM	18	100		
9	28.5	2	SM	44	100		
10	33.5	4	ML	52	95		Clay
11	38.5	2	ML	52	95		Clay
12	43.5	2	ML	52	95		Clay
13	48.5	4	SM	30	100		
14	53.5	9	ML	50	120		Clay
15	58.5	4	ML	50	120		Clay
16	63.0	7	ML	50	120		Clay
17	68.0	7	ML	50	120		Clay
18	72.5	7	ML	50	120		Clay
19	77.5	13	SC	15	120		Clay
20	83.5	9	SC	15	120		Clay
21	88.5	5	SC	15	120		Clay
22	93.5	26	SC	15	120		Clay
23	98.5	8	ML	50	120		Clay
24	104.0	4	ML	50	120		Clay
25	108.5	5	ML	50	120		Clay
26	113.5	6	ML	50	120		Clay
27	118.5	9	ML	50	120		Clay
28	123.5	8	SM	15	120		Clay
29	128.5	6	SM	15	120		Clay
30	133.0	5	SM	15	120		Clay
31	138.0	11	SM	15	120		Clay
32	142.5	9	SM	15	120		Clay
33	148.5	8	SM	15	120		Clay
34	153.5	9	SM	15	120		Clay
35	158.5	9	SM	15	120		Clay
36	163.5	7	SM	15	120		Clay
37	168.5	8	SM	15	120		Clay
38	173.5	8	SM	15	120		Clay
39	178.5	6	SM	15	120		Clay
40	183.5	8	SM	15	120		Clay
41	188.5	6	SM	15	120		Clay
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*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	0.5	1.0	SM	14.0	100.0		50	19	1.39	1.00	0.75	1.00	1.04	1.70	1.77	2.91	4.67	1.005	0.209
2	2.0	2.0	SM	14.0	100.0		200	75	1.39	1.00	0.75	1.00	2.08	1.70	3.53	2.91	6.44	1.002	0.208
3	4.0	4.0	SM	14.0	100.0		400	150	1.39	1.00	0.75	1.00	4.16	1.70	7.06	2.91	9.97	0.997	0.207
4	6.0	25.0	SM	14.0	120.0		640	266	1.39	1.00	0.80	1.00	27.70	1.70	47.09	2.91	50.00	0.991	0.186
5	8.0	3.0	SM	13.8	100.0		840	341	1.39	1.00	0.80	1.00	3.32	1.70	5.65	2.83	8.48	0.985	0.189
6	13.5	16.0	SM	14.0	120.0		1500	658	1.39	1.00	0.85	1.00	18.84	1.51	28.48	2.91	31.39	0.966	0.172
7	18.5	5.0	SM	14.0	100.0		2000	846	1.39	1.00	0.95	1.00	6.58	1.59	10.44	2.91	13.35	0.947	0.175
8	23.5	9.0	SM	17.6	100.0		2500	1034	1.39	1.00	0.95	1.00	11.84	1.37	16.22	4.00	20.21	0.926	0.175
9	28.5	2.0	SM	43.7	100.0		3000	1222	1.39	1.00	1.00	1.00	2.77	1.35	3.75	5.60	9.35	0.903	0.173
10	33.5	4.0	ML	52.0	95.0	Clay	3475	1385	1.39	1.00	1.00	1.00	5.54	1.24	6.88	5.61	12.50	0.879	0.172
11	38.5	2.0	ML	52.0	95.0	Clay	3950	1548	1.39	1.00	1.00	1.00	2.77	1.19	3.29	5.61	8.91	0.855	0.170
12	43.5	2.0	ML	52.0	95.0	Clay	4425	1711	1.39	1.00	1.00	1.00	2.77	1.13	3.12	5.61	8.73	0.830	0.167
13	48.5	4.0	SM	30.1	100.0		4925	1899	1.39	1.00	1.00	1.00	5.54	1.06	5.87	5.37	11.23	0.805	0.163
14	53.5	9.0	ML	50.0	120.0	Clay	5525	2187	1.39	1.00	1.00	1.00	12.47	0.99	12.28	5.61	17.89	0.781	0.154
15	58.5	4.0	ML	50.0	120.0	Clay	6125	2475	1.39	1.00	1.00	1.00	5.54	0.92	5.10	5.61	10.71	0.757	0.146
16	63.0	7.0	ML	50.0	120.0	Clay	6665	2734	1.39	1.00	1.00	1.00	9.70	0.88	8.54	5.61	14.16	0.736	0.140
17	68.0	7.0	ML	50.0	120.0	Clay	7265	3022	1.39	1.00	1.00	1.00	9.70	0.84	8.11	5.61	13.73	0.714	0.134
18	72.5	7.0	ML	50.0	120.0	Clay	7805	3281	1.39	1.00	1.00	1.00	9.70	0.80	7.78	5.61	13.39	0.695	0.129
19	77.5	13.0	SC	15.0	120.0	Clay	8405	3569	1.39	1.00	1.00	1.00	18.01	0.78	14.13	3.26	17.39	0.676	0.124
20	83.5	9.0	SC	15.0	120.0	Clay	9125	3915	1.39	1.00	1.00	1.00	12.47	0.73	9.09	3.26	12.35	0.654	0.119
21	88.5	5.0	SC	15.0	120.0	Clay	9725	4203	1.39	1.00	1.00	1.00	6.93	0.68	4.69	3.26	7.95	0.639	0.115
22	93.5	26.0	SC	15.0	120.0	Clay	10325	4491	1.39	1.00	1.00	1.00	36.01	0.76	27.51	3.26	30.77	0.625	0.112
23	98.5	8.0	ML	50.0	120.0	Clay	10925	4779	1.39	1.00	1.00	1.00	11.08	0.66	7.33	5.61	12.94	0.613	0.109
24	104.0	4.0	ML	50.0	120.0	Clay	11585	5095	1.39	1.00	1.00	1.00	5.54	0.61	3.41	5.61	9.02	0.602	0.107
25	108.5	5.0	ML	50.0	120.0	Clay	12125	5355	1.39	1.00	1.00	1.00	6.93	0.60	4.18	5.61	9.80	0.596	0.105
26	113.5	6.0	ML	50.0	120.0	Clay	12725	5643	1.39	1.00	1.00	1.00	8.31	0.59	4.92	5.61	10.53	0.590	0.104
27	118.5	9.0	ML	50.0	120.0	Clay	13325	5931	1.39	1.00	1.00	1.00	12.47	0.59	7.39	5.61	13.01	0.587	0.103
28	123.5	8.0	SM	15.0	120.0	Clay	13925	6219	1.39	1.00	1.00	1.00	11.08	0.55	6.13	3.26	9.39	0.586	0.102
29	128.5	6.0	SM	15.0	120.0	Clay	14525	6507	1.39	1.00	1.00	1.00	8.31	0.53	4.37	3.26	7.63	0.588	0.102
30	133.0	5.0	SM	15.0	120.0	Clay	15065	6766	1.39	1.00	1.00	1.00	6.93	0.51	3.51	3.26	6.77	0.591	0.103
31	138.0	11.0	SM	15.0	120.0	Clay	15665	7054	1.39	1.00	1.00	1.00	15.24	0.53	8.10	3.26	11.36	0.597	0.103
32	142.5	9.0	SM	15.0	120.0	Clay	16205	7313	1.39	1.00	1.00	1.00	12.47	0.51	6.33	3.26	9.59	0.605	0.105
33	148.5	8.0	SM	15.0	120.0	Clay	16925	7659	1.39	1.00	1.00	1.00	11.08	0.49	5.41	3.26	8.67	0.618	0.107
34	153.5	9.0	SM	15.0	120.0	Clay	17525	7947	1.39	1.00	1.00	1.00	12.47	0.48	6.02	3.26	9.28	0.632	0.109
35	158.5	9.0	SM	15.0	120.0	Clay	18125	8235	1.39	1.00	1.00	1.00	12.47	0.47	5.89	3.26	9.15	0.649	0.111
36	163.5	7.0	SM	15.0	120.0	Clay	18725	8523	1.39	1.00	1.00	1.00	9.70	0.45	4.37	3.26	7.63	0.668	0.115
37	168.5	8.0	SM	15.0	120.0	Clay	19325	8811	1.39	1.00	1.00	1.00	11.08	0.45	4.96	3.26	8.22	0.690	0.118
38	173.5	8.0	SM	15.0	120.0	Clay	19925	9099	1.39	1.00	1.00	1.00	11.08	0.44	4.86	3.26	8.12	0.715	0.122
39	178.5	6.0	SM	15.0	120.0	Clay	20525	9387	1.39	1.00	1.00	1.00	8.31	0.42	3.48	3.26	6.74	0.741	0.126
40	183.5	8.0	SM	15.0	120.0	Clay	21125	9675	1.39	1.00	1.00	1.00	11.08	0.42	4.68	3.26	7.94	0.771	0.131
41	188.5	6.0	SM	15.0	120.0	Clay	21725	9963	1.39	1.00	1.00	1.00	8.31	0.40	3.35	3.26	6.61	0.802	0.136
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.11	1.01	1.10	0.084	0.093	0.45
1.13	1.01	1.10	0.095	0.105	0.51
1.19	1.01	1.10	0.118	0.131	0.64
2.20	1.08	1.10	2.000	2.000	2.00
1.16	1.01	1.10	0.108	0.120	0.63
2.08	1.07	1.10	0.587	0.693	2.00
1.27	1.02	1.10	0.143	0.159	0.91
1.50	1.03	1.10	0.208	0.236	1.35
1.18	1.01	1.05	0.114	0.121	0.70
1.25	1.02	1.04	0.136	0.144	2.00
1.17	1.01	1.03	0.111	0.115	2.00
1.17	1.01	1.02	0.109	0.113	2.00
1.22	1.01	1.01	0.127	0.130	0.80
1.41	1.03	1.00	0.183	0.187	2.00
1.21	1.01	0.99	0.123	0.123	2.00
1.29	1.02	0.97	0.149	0.148	2.00
1.28	1.02	0.96	0.146	0.143	2.00
1.27	1.02	0.95	0.143	0.139	2.00
1.39	1.03	0.94	0.178	0.171	2.00
1.24	1.02	0.94	0.135	0.129	2.00
1.15	1.01	0.94	0.104	0.099	2.00
2.04	1.07	0.84	0.537	0.484	2.00
1.26	1.02	0.92	0.140	0.130	2.00
1.17	1.01	0.92	0.111	0.104	2.00
1.19	1.01	0.91	0.117	0.108	2.00
1.20	1.01	0.91	0.122	0.112	2.00
1.26	1.02	0.89	0.140	0.127	2.00
1.18	1.01	0.90	0.114	0.104	2.00
1.15	1.01	0.91	0.102	0.093	2.00
1.14	1.01	0.91	0.097	0.088	2.00
1.22	1.01	0.88	0.128	0.114	2.00
1.18	1.01	0.89	0.115	0.104	2.00
1.17	1.01	0.89	0.109	0.098	2.00
1.18	1.01	0.88	0.113	0.101	2.00
1.17	1.01	0.88	0.112	0.100	2.00
1.15	1.01	0.88	0.102	0.091	2.00
1.16	1.01	0.88	0.106	0.094	2.00
1.16	1.01	0.87	0.105	0.093	2.00
1.14	1.01	0.88	0.097	0.086	2.00
1.15	1.01	0.87	0.104	0.092	2.00
1.13	1.01	0.87	0.096	0.085	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
0.5	1.3	0.054	0.81	10.92
2	1.8	0.047	0.99	10.10
4	2.0	0.037	0.90	9.12
6	2.0	0.000	0.00	8.22
8	3.8	0.041	1.84	8.22
13.5	5.3	0.000	0.00	6.37
18.5	5.0	0.029	1.73	6.37
23.5	5.0	0.004	0.23	4.65
28.5	5.0	0.039	2.33	4.42
33.5	5.0	0.000	0.00	2.09
38.5	5.0	0.000	0.00	2.09
43.5	5.0	0.000	0.00	2.09
48.5	5.0	0.035	2.09	2.09
53.5	5.0	0.000	0.00	0.00
58.5	4.8	0.000	0.00	0.00
63	4.8	0.000	0.00	0.00
68	4.8	0.000	0.00	0.00
72.5	4.8	0.000	0.00	0.00
77.5	5.5	0.000	0.00	0.00
83.5	5.5	0.000	0.00	0.00
88.5	5.0	0.000	0.00	0.00
93.5	5.0	0.000	0.00	0.00
98.5	5.3	0.000	0.00	0.00
104	5.0	0.000	0.00	0.00
108.5	4.8	0.000	0.00	0.00
113.5	5.0	0.000	0.00	0.00
118.5	5.0	0.000	0.00	0.00
123.5	5.0	0.000	0.00	0.00
128.5	4.8	0.000	0.00	0.00
133	4.8	0.000	0.00	0.00
138	4.8	0.000	0.00	0.00
142.5	5.3	0.000	0.00	0.00
148.5	5.5	0.000	0.00	0.00
153.5	5.0	0.000	0.00	0.00
158.5	5.0	0.000	0.00	0.00
163.5	5.0	0.000	0.00	0.00
168.5	5.0	0.000	0.00	0.00
173.5	5.0	0.000	0.00	0.00
178.5	5.0	0.000	0.00	0.00
183.5	5.0	0.000	0.00	0.00
188.5	4.0	0.000	0.00	0.00
191.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:45 PM
Boring Designation:	B-15
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	0
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.12
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	0.5	0	SP-SM	5	100		
2	2.0	2	SP-SM	5	100		
3	4.0	16	SP-SM	8	120		
4	6.0	17	SP-SM	5	120		
5	8.0	14	SP-SM	5	120		
6	13.5	25	SP-SM	6	120		
7	18.5	7	SM	18	100		
8	23.5	7	SM	18	100		
9	28.5	4	SM	18	100		
10	33.5	4	SM	18	100		
11	38.5	0	CL	50	95		Clay
12	43.5	0	SM	21	100		
13	48.5	9	SM	21	100		
14	53.5	14	SM	21	100		
15	58.5	2	SM	21	100		
16	63.5	6	SM	21	100		
17	68.5	8	SM	15	120		Clay
18	73.5	10	SM	15	120		Clay
19	78.5	23	SM	15	120		Clay
20	83.5	9	SM	15	120		Clay
21	88.5	27	SM	15	120		Clay
22	93.5	17	SM	15	120		Clay
23	98.5	8	SM	15	120		Clay
24	103.5	16	SM	15	120		Clay
25	108.5	10	SM	15	120		Clay
26	113.5	5	SM	15	120		Clay
27	118.5	6	SM	15	120		Clay
28	123.5	5	SM	15	120		Clay
29	128.5	7	SM	15	120		Clay
30	133.5	8	SM	15	120		Clay
31	138.5	8	SM	15	120		Clay
32	143.5	9	ML	50	120		Clay
33	148.5	12	SM	15	120		Clay
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*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	0.5	0.0	SP-SM	5.0	100.0		50	19	1.39	1.00	0.75	1.00	0.00	1.70	0.00	0.00	0.00	1.005	0.209
2	2.0	2.0	SP-SM	5.0	100.0		200	75	1.39	1.00	0.75	1.00	2.08	1.70	3.53	0.00	3.53	1.002	0.208
3	4.0	16.0	SP-SM	8.2	120.0		440	190	1.39	1.00	0.75	1.00	16.62	1.70	28.25	0.43	28.68	0.997	0.180
4	6.0	17.0	SP-SM	5.1	120.0		680	306	1.39	1.00	0.80	1.00	18.84	1.70	32.02	0.00	32.02	0.991	0.172
5	8.0	14.0	SP-SM	5.0	120.0		920	421	1.39	1.00	0.80	1.00	15.51	1.70	26.37	0.00	26.37	0.985	0.168
6	13.5	25.0	SP-SM	5.5	120.0		1580	738	1.39	1.00	0.85	1.00	29.43	1.37	40.24	0.01	40.25	0.966	0.161
7	18.5	7.0	SM	17.5	100.0		2080	926	1.39	1.00	0.95	1.00	9.21	1.47	13.51	3.97	17.48	0.947	0.166
8	23.5	7.0	SM	18.0	100.0		2580	1114	1.39	1.00	0.95	1.00	9.21	1.35	12.47	4.09	16.56	0.926	0.167
9	28.5	4.0	SM	18.0	100.0		3080	1302	1.39	1.00	1.00	1.00	5.54	1.29	7.16	4.09	11.25	0.903	0.167
10	33.5	4.0	SM	18.0	100.0		3580	1490	1.39	1.00	1.00	1.00	5.54	1.21	6.68	4.09	10.77	0.879	0.165
11	38.5	0.0	CL	50.0	95.0	Clay	4055	1653	1.39	1.00	1.00	1.00	0.00	1.16	0.00	5.61	5.61	0.855	0.164
12	43.5	0.0	SM	20.7	100.0		4555	1841	1.39	1.00	1.00	1.00	0.00	1.09	0.00	4.59	4.59	0.830	0.160
13	48.5	9.0	SM	21.0	100.0		5055	2029	1.39	1.00	1.00	1.00	12.47	1.02	12.71	4.63	17.34	0.805	0.156
14	53.5	14.0	SM	21.0	100.0		5555	2217	1.39	1.00	1.00	1.00	19.39	0.98	19.02	4.63	23.66	0.781	0.153
15	58.5	2.0	SM	21.0	100.0		6055	2405	1.39	1.00	1.00	1.00	2.77	0.93	2.57	4.63	7.21	0.757	0.149
16	63.5	6.0	SM	21.0	100.0		6555	2593	1.39	1.00	1.00	1.00	8.31	0.90	7.48	4.63	12.12	0.734	0.145
17	68.5	8.0	SM	15.0	120.0	Clay	7155	2881	1.39	1.00	1.00	1.00	11.08	0.85	9.47	3.26	12.73	0.712	0.138
18	73.5	10.0	SM	15.0	120.0	Clay	7755	3169	1.39	1.00	1.00	1.00	13.85	0.82	11.36	3.26	14.62	0.691	0.132
19	78.5	23.0	SM	15.0	120.0	Clay	8355	3457	1.39	1.00	1.00	1.00	31.86	0.84	26.64	3.26	29.91	0.672	0.127
20	83.5	9.0	SM	15.0	120.0	Clay	8955	3745	1.39	1.00	1.00	1.00	12.47	0.75	9.31	3.26	12.57	0.654	0.122
21	88.5	27.0	SM	15.0	120.0	Clay	9555	4033	1.39	1.00	1.00	1.00	37.40	0.80	30.01	3.26	33.27	0.639	0.118
22	93.5	17.0	SM	15.0	120.0	Clay	10155	4321	1.39	1.00	1.00	1.00	23.55	0.73	17.24	3.26	20.51	0.625	0.115
23	98.5	8.0	SM	15.0	120.0	Clay	10755	4609	1.39	1.00	1.00	1.00	11.08	0.66	7.31	3.26	10.57	0.613	0.112
24	103.5	16.0	SM	15.0	120.0	Clay	11355	4897	1.39	1.00	1.00	1.00	22.16	0.68	15.13	3.26	18.39	0.603	0.109
25	108.5	10.0	SM	15.0	120.0	Clay	11955	5185	1.39	1.00	1.00	1.00	13.85	0.63	8.70	3.26	11.97	0.596	0.107
26	113.5	5.0	SM	15.0	120.0	Clay	12555	5473	1.39	1.00	1.00	1.00	6.93	0.58	4.00	3.26	7.26	0.590	0.106
27	118.5	6.0	SM	15.0	120.0	Clay	13155	5761	1.39	1.00	1.00	1.00	8.31	0.57	4.71	3.26	7.97	0.587	0.105
28	123.5	5.0	SM	15.0	120.0	Clay	13755	6049	1.39	1.00	1.00	1.00	6.93	0.54	3.76	3.26	7.03	0.586	0.104
29	128.5	7.0	SM	15.0	120.0	Clay	14355	6337	1.39	1.00	1.00	1.00	9.70	0.54	5.25	3.26	8.51	0.588	0.104
30	133.5	8.0	SM	15.0	120.0	Clay	14955	6625	1.39	1.00	1.00	1.00	11.08	0.53	5.90	3.26	9.17	0.592	0.104
31	138.5	8.0	SM	15.0	120.0	Clay	15555	6913	1.39	1.00	1.00	1.00	11.08	0.52	5.75	3.26	9.02	0.598	0.105
32	143.5	9.0	ML	50.0	120.0	Clay	16155	7201	1.39	1.00	1.00	1.00	12.47	0.53	6.63	5.61	12.25	0.607	0.106
33	148.5	12.0	SM	15.0	120.0	Clay	16755	7489	1.39	1.00	1.00	1.00	16.62	0.52	8.62	3.26	11.88	0.618	0.108
34																			
35																			
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.09	1.01	1.10	0.061	0.067	0.32
1.10	1.01	1.10	0.078	0.086	0.42
1.92	1.06	1.10	0.414	0.483	2.00
2.12	1.08	1.10	0.647	0.766	2.00
1.79	1.05	1.10	0.327	0.379	2.00
2.20	1.08	1.10	2.000	2.000	2.00
1.40	1.03	1.10	0.179	0.202	1.22
1.37	1.02	1.08	0.170	0.187	1.12
1.22	1.01	1.05	0.127	0.135	0.81
1.21	1.01	1.03	0.123	0.129	0.79
1.12	1.01	1.02	0.090	0.092	2.00
1.11	1.01	1.01	0.084	0.085	0.53
1.39	1.03	1.01	0.177	0.183	1.17
1.65	1.04	0.99	0.261	0.271	1.78
1.14	1.01	0.99	0.099	0.099	0.67
1.24	1.02	0.98	0.133	0.133	0.92
1.25	1.02	0.97	0.138	0.136	2.00
1.31	1.02	0.96	0.153	0.149	2.00
1.99	1.07	0.90	0.479	0.461	2.00
1.25	1.02	0.94	0.137	0.131	2.00
2.20	1.08	0.85	0.796	0.729	2.00
1.51	1.03	0.90	0.212	0.198	2.00
1.20	1.01	0.93	0.122	0.115	2.00
1.43	1.03	0.89	0.188	0.173	2.00
1.23	1.02	0.91	0.132	0.122	2.00
1.14	1.01	0.92	0.100	0.093	2.00
1.15	1.01	0.91	0.104	0.096	2.00
1.14	1.01	0.91	0.098	0.091	2.00
1.16	1.01	0.90	0.108	0.099	2.00
1.17	1.01	0.90	0.112	0.102	2.00
1.17	1.01	0.89	0.111	0.101	2.00
1.24	1.02	0.88	0.134	0.120	2.00
1.23	1.02	0.87	0.132	0.117	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
0.5	1.3	0.118	1.77	16.41
2	1.8	0.060	1.26	14.64
4	2.0	0.000	0.00	13.38
6	2.0	0.000	0.00	13.38
8	3.8	0.000	0.00	13.38
13.5	5.3	0.000	0.00	13.38
18.5	5.0	0.005	0.33	13.38
23.5	5.0	0.007	0.45	13.05
28.5	5.0	0.035	2.09	12.60
33.5	5.0	0.036	2.15	10.51
38.5	5.0	0.000	0.00	8.37
43.5	5.0	0.054	3.27	8.37
48.5	5.0	0.006	0.38	5.10
53.5	5.0	0.001	0.05	4.72
58.5	5.0	0.045	2.67	4.67
63.5	5.0	0.033	1.99	1.99
68.5	5.0	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	5.0	0.000	0.00	0.00
83.5	5.0	0.000	0.00	0.00
88.5	5.0	0.000	0.00	0.00
93.5	5.0	0.000	0.00	0.00
98.5	5.0	0.000	0.00	0.00
103.5	5.0	0.000	0.00	0.00
108.5	5.0	0.000	0.00	0.00
113.5	5.0	0.000	0.00	0.00
118.5	5.0	0.000	0.00	0.00
123.5	5.0	0.000	0.00	0.00
128.5	5.0	0.000	0.00	0.00
133.5	5.0	0.000	0.00	0.00
138.5	5.0	0.000	0.00	0.00
143.5	5.0	0.000	0.00	0.00
148.5	4.0	0.000	0.00	0.00
151.5				

Project:	Harbor River Bridge
Owner:	SC DOT
Job Number:	18461-007-00
Analysis by:	ZAS
Date/Time:	9/29/17 5:43 PM
Boring Designation:	B-16
Checked by:	CDL

Sampling Information

Depth to Groundwater (ft):	0
SPT Liner (Yes/No):	No
Hammer Energy, %:	83.1
Distance from sample hammer to ground surface (ft):	5
Borehole Diameter (in)	4

Earthquake Information

Max Acceleration (g) :	0.12
Earthquake Magnitude:	7.30

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Thickness of Liquefiable Unit (ft)	Flag "Clay" "Unsaturated" "Unreliable"
1	0.5	0	SM	15	100		
2	2.0	5	SM	15	100		
3	4.0	28	SP	2	120		
4	6.0	22	SP	2	120		
5	8.0	15	SP	2	120		
6	13.5	29	SP	2	120		
7	18.5	8	SM	14	100		
8	23.5	5	SM	14	100		
9	28.5	10	SM	14	100		
10	33.5	4	SM	14	100		
11	38.5	2	SC	47	100		
12	43.5	3	SM	15	100		
13	48.5	1	MH	91	100		Clay
14	53.5	2	MH	91	100		Clay
15	58.5	5	SM	15	100		
16	63.5	8	SM	15	100		
17	68.5	3	CL	50	95		Clay
18	73.5	6	SM	15	120		Clay
19	78.5	27	SM	15	120		Clay
20	83.5	11	SM	15	120		Clay
21	88.5	5	SM	15	120		Clay
22	93.5	28	SM	15	120		Clay
23	98.5	15	SM	15	120		Clay
24	103.5	10	SM	15	120		Clay
25	108.5	6	SM	15	120		Clay
26	113.5	9	SM	15	120		Clay
27	118.5	8	SM	15	120		Clay
28	123.5	9	SM	15	120		Clay
29	128.5	7	SM	15	120		Clay
30	133.5	6	SM	15	120		Clay
31	138.5	7	SM	15	120		Clay
32	143.5	12	SM	15	120		Clay
33	148.5	11	SM	15	120		Clay
34							Clay
35							
36							
37							
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*Assumes Marl/Limestone NonLiq

SPT Sample Number	Depth (ft)	Measured N	Soil Type	Fines Content (%)	Unit Weight (pcf)	Flag "Clay" "Unsaturated" "Unreliable"	σ_v (psf)	σ_v' (psf)	C_E	C_B	C_R	C_S	N_{60}	C_N	$N_{1,60}$	Fines Correction	N1,60cs	r_d	CSR
									IB	IB	IB	IB	IB	IB	IB	IB	IB	IB	IB
1	0.5	0.0	SM	15.0	100.0		50	19	1.39	1.00	0.75	1.00	0.00	1.70	0.00	3.26	3.26	1.005	0.209
2	2.0	5.0	SM	15.0	100.0		200	75	1.39	1.00	0.75	1.00	5.19	1.70	8.83	3.26	12.09	1.002	0.208
3	4.0	28.0	SP	2.0	120.0		440	190	1.39	1.00	0.75	1.00	29.09	1.70	49.44	0.00	49.44	0.997	0.180
4	6.0	22.0	SP	2.1	120.0		680	306	1.39	1.00	0.80	1.00	24.38	1.70	41.44	0.00	41.44	0.991	0.172
5	8.0	15.0	SP	2.0	120.0		920	421	1.39	1.00	0.80	1.00	16.62	1.70	28.25	0.00	28.25	0.985	0.168
6	13.5	29.0	SP	2.1	120.0		1580	738	1.39	1.00	0.85	1.00	34.14	1.33	45.25	0.00	45.25	0.966	0.161
7	18.5	8.0	SM	14.0	100.0		2080	926	1.39	1.00	0.95	1.00	10.53	1.46	15.35	2.91	18.25	0.947	0.166
8	23.5	5.0	SM	13.9	100.0		2580	1114	1.39	1.00	0.95	1.00	6.58	1.39	9.17	2.87	12.04	0.926	0.167
9	28.5	10.0	SM	14.0	100.0		3080	1302	1.39	1.00	1.00	1.00	13.85	1.24	17.15	2.91	20.06	0.903	0.167
10	33.5	4.0	SM	14.0	100.0		3580	1490	1.39	1.00	1.00	1.00	5.54	1.21	6.71	2.91	9.62	0.879	0.165
11	38.5	2.0	SC	46.6	100.0		4080	1678	1.39	1.00	1.00	1.00	2.77	1.14	3.15	5.61	8.76	0.855	0.162
12	43.5	3.0	SM	15.0	100.0		4580	1866	1.39	1.00	1.00	1.00	4.16	1.07	4.46	3.26	7.73	0.830	0.159
13	48.5	1.0	MH	91.0	100.0	Clay	5080	2054	1.39	1.00	1.00	1.00	1.39	1.02	1.41	5.51	6.92	0.805	0.155
14	53.5	2.0	MH	91.0	100.0	Clay	5580	2242	1.39	1.00	1.00	1.00	2.77	0.97	2.68	5.51	8.19	0.781	0.152
15	58.5	5.0	SM	15.0	100.0		6080	2430	1.39	1.00	1.00	1.00	6.93	0.93	6.42	3.26	9.68	0.757	0.148
16	63.5	8.0	SM	15.0	100.0		6580	2618	1.39	1.00	1.00	1.00	11.08	0.90	9.95	3.26	13.21	0.734	0.144
17	68.5	3.0	CL	50.0	95.0	Clay	7055	2781	1.39	1.00	1.00	1.00	4.16	0.86	3.57	5.61	9.19	0.712	0.141
18	73.5	6.0	SM	15.0	120.0	Clay	7655	3069	1.39	1.00	1.00	1.00	8.31	0.82	6.80	3.26	10.06	0.691	0.134
19	78.5	27.0	SM	15.0	120.0	Clay	8255	3357	1.39	1.00	1.00	1.00	37.40	0.86	32.16	3.26	35.42	0.672	0.129
20	83.5	11.0	SM	15.0	120.0	Clay	8855	3645	1.39	1.00	1.00	1.00	15.24	0.77	11.69	3.26	14.95	0.654	0.124
21	88.5	5.0	SM	15.0	120.0	Clay	9455	3933	1.39	1.00	1.00	1.00	6.93	0.70	4.88	3.26	8.14	0.639	0.120
22	93.5	28.0	SM	15.0	120.0	Clay	10055	4221	1.39	1.00	1.00	1.00	38.78	0.79	30.75	3.26	34.01	0.625	0.116
23	98.5	15.0	SM	15.0	120.0	Clay	10655	4509	1.39	1.00	1.00	1.00	20.78	0.71	14.68	3.26	17.95	0.613	0.113
24	103.5	10.0	SM	15.0	120.0	Clay	11255	4797	1.39	1.00	1.00	1.00	13.85	0.66	9.09	3.26	12.36	0.603	0.110
25	108.5	6.0	SM	15.0	120.0	Clay	11855	5085	1.39	1.00	1.00	1.00	8.31	0.61	5.08	3.26	8.34	0.596	0.108
26	113.5	9.0	SM	15.0	120.0	Clay	12455	5373	1.39	1.00	1.00	1.00	12.47	0.61	7.60	3.26	10.86	0.590	0.107
27	118.5	8.0	SM	15.0	120.0	Clay	13055	5661	1.39	1.00	1.00	1.00	11.08	0.59	6.49	3.26	9.75	0.587	0.106
28	123.5	9.0	SM	15.0	120.0	Clay	13655	5949	1.39	1.00	1.00	1.00	12.47	0.57	7.16	3.26	10.42	0.586	0.105
29	128.5	7.0	SM	15.0	120.0	Clay	14255	6237	1.39	1.00	1.00	1.00	9.70	0.55	5.30	3.26	8.56	0.588	0.105
30	133.5	6.0	SM	15.0	120.0	Clay	14855	6525	1.39	1.00	1.00	1.00	8.31	0.53	4.36	3.26	7.63	0.592	0.105
31	138.5	7.0	SM	15.0	120.0	Clay	15455	6813	1.39	1.00	1.00	1.00	9.70	0.52	5.02	3.26	8.28	0.598	0.106
32	143.5	12.0	SM	15.0	120.0	Clay	16055	7101	1.39	1.00	1.00	1.00	16.62	0.54	8.90	3.26	12.16	0.607	0.107
33	148.5	11.0	SM	15.0	120.0	Clay	16655	7389	1.39	1.00	1.00	1.00	15.24	0.52	7.88	3.26	11.14	0.618	0.109
34						Clay													
35																			
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MSF		Ksig	CRR	Corrected CRR	Factor of Safety
IB (MSFmax)	IB	IB	IB	IB	IB
1.10	1.01	1.10	0.077	0.085	0.41
1.24	1.02	1.10	0.133	0.149	0.72
2.20	1.08	1.10	2.000	2.000	2.00
2.20	1.08	1.10	2.000	2.000	2.00
1.89	1.06	1.10	0.394	0.460	2.00
2.20	1.08	1.10	2.000	2.000	2.00
1.43	1.03	1.10	0.186	0.211	1.27
1.24	1.02	1.06	0.133	0.143	0.86
1.50	1.03	1.06	0.207	0.227	1.36
1.18	1.01	1.03	0.115	0.121	0.73
1.17	1.01	1.02	0.110	0.113	0.70
1.15	1.01	1.01	0.103	0.105	0.66
1.14	1.01	1.00	0.098	0.099	2.00
1.16	1.01	1.00	0.106	0.106	2.00
1.18	1.01	0.99	0.116	0.116	0.78
1.27	1.02	0.98	0.142	0.141	0.98
1.18	1.01	0.98	0.112	0.111	2.00
1.19	1.01	0.97	0.118	0.116	2.00
2.20	1.08	0.88	1.212	1.148	2.00
1.32	1.02	0.94	0.156	0.149	2.00
1.16	1.01	0.95	0.106	0.101	2.00
2.20	1.08	0.83	0.911	0.816	2.00
1.41	1.03	0.91	0.183	0.171	2.00
1.24	1.02	0.92	0.135	0.126	2.00
1.16	1.01	0.92	0.107	0.100	2.00
1.21	1.01	0.91	0.124	0.115	2.00
1.19	1.01	0.91	0.116	0.107	2.00
1.20	1.01	0.90	0.121	0.111	2.00
1.16	1.01	0.91	0.108	0.099	2.00
1.15	1.01	0.91	0.102	0.093	2.00
1.16	1.01	0.90	0.106	0.097	2.00
1.24	1.02	0.88	0.134	0.119	2.00
1.22	1.01	0.88	0.126	0.113	2.00

Temporary Depth Number	ΔH_i	ε_v	ΔS_i (in)	Cummulative Settlement (in)
0.5	1.3	0.062	0.92	14.64
2	1.8	0.033	0.70	13.72
4	2.0	0.000	0.00	13.02
6	2.0	0.000	0.00	13.02
8	3.8	0.000	0.00	13.02
13.5	5.3	0.000	0.00	13.02
18.5	5.0	0.005	0.28	13.02
23.5	5.0	0.033	2.00	12.74
28.5	5.0	0.004	0.22	10.74
33.5	5.0	0.038	2.29	10.52
38.5	5.0	0.040	2.42	8.22
43.5	5.0	0.043	2.58	5.81
48.5	5.0	0.000	0.00	3.23
53.5	5.0	0.000	0.00	3.23
58.5	5.0	0.038	2.28	3.23
63.5	5.0	0.016	0.94	0.94
68.5	5.0	0.000	0.00	0.00
73.5	5.0	0.000	0.00	0.00
78.5	5.0	0.000	0.00	0.00
83.5	5.0	0.000	0.00	0.00
88.5	5.0	0.000	0.00	0.00
93.5	5.0	0.000	0.00	0.00
98.5	5.0	0.000	0.00	0.00
103.5	5.0	0.000	0.00	0.00
108.5	5.0	0.000	0.00	0.00
113.5	5.0	0.000	0.00	0.00
118.5	5.0	0.000	0.00	0.00
123.5	5.0	0.000	0.00	0.00
128.5	5.0	0.000	0.00	0.00
133.5	5.0	0.000	0.00	0.00
138.5	5.0	0.000	0.00	0.00
143.5	5.0	0.000	0.00	0.00
148.5	4.0	0.000	0.00	0.00
151.5				

APPENDIX E
Axial Capacity Analyses

AXIAL PILE CAPACITY

Project Information

Project:	Harbor River Bridge	Pile Tip Area (square feet):	1.47
Owner:	SCDOT	Pile Perimeter (ft):	4.85
Job Number:	18461-007-01	Side and End Friction Resistance Factor α Method	0.65
Analysis by:	HPC	Side and End Friction Resistance Factor Nordlund/Thurman Method	0.65
Date/Time:	10/16/2017 11:46	Uplift Side Friction Resistance Factor α Method	0.5
Run Designation:	West Abutment - No Scour	Uplift Friction Resistance Factor Nordlund/Thurman Method	0.5
Pile Diameter (ft):	1.2	Depth to Top of Liquefied Layer (ft):	3
Ground Surface Elevation (ft):	3	Depth to Bottom of Liquefied Layer (ft)	53
Pile Type:	HP 14x117 Steel	Residual Shear Strength of Liquefiable Layer (psf):	186
Checked by:	ZAS	Enter "1" to calculate downdrag from residual shear strength, "2" average of residual & non-liqufied, "3" non-liquefied strength parameters	1
		Calculated Unfactored Downdrag Load (kips)[4]:	41.9

Soil Profile

Soil Type	Depth at Bottom of Soil Unit (feet)	Bouyant Unit Weight (pcf) (total weight above GWT)	ϕ (degrees)	S_u, Undrained Shear Strength (psf)	α, Empirical Adhesion Factor	Friction Ratio, C_f	Earth Pressure Coefficient, K_δ
Sands (1)	6	37.6	30			0.95	1.15
Silts/Clays	16	32.6		140	1		
Silts/Clays	26	32.6		257	1		
Silts/Clays	36	32.6		375	1		
Sands (2)	53	37.6	30			0.95	1.15
Hawthorn Marl	75	57.6		4000	0.25		
Cooper Group Limestone	200	57.6		6000	0.25		

Notes:
1. Spreadsheet programed for α method for undrained shear strength and Nordlund/Thurman Method for friction angle
2. Refer to AASHTO LRFD Section 10.7.3.8.6b to determine α
3. Refer to AASHTO LRFD Section 10.7.3.8.6f to determine C_f and K_δ
4. The structural engineer should include the unfactored downdrag load in accordance with Section 3.11.8 of the AASHTO LRFD Manual

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
Sands (1)	1	2	18.8	0.1	0.1	FALSE	0.1	0.1	0.0	0	0.0	0.0	1	0	0.4	1	0	0.4	0	0	0.0	0.0
Sands (1)	2	1	56.4	0.2	0.2	FALSE	0.2	0.2	0.0	0	0.1	0.1	2	0	1.1	2	0	1.2	0	0	0.1	0.1
Sands (1)	3	0	94	0.3	0.5	FALSE	0.3	0.5	0.0	0	0.2	0.3	3	0	1.8	3	0	2.1	0	0	0.1	0.2
Sands (1)	4	-1	131.6	0.4	0.8	TRUE	0.4	0.8	0.0	0	0.2	0.5	4	0	2.5	5	0	3.0	1	0	0.2	0.4
Sands (1)	5	-2	169.2	0.5	1.3	TRUE	0.5	1.3	0.0	0	0.3	0.8	5	0	3.2	6	0	4.0	1	0	0.2	0.6
Sands (1)	6	-3	206.8	0.6	1.8	TRUE	0.6	1.8	0.0	0	0.4	1.2	6	0	3.9	8	0	5.1	2	0	0.3	0.9
Silts/Clays	7	-4	241.9	0.7	2.5	TRUE	0.7	2.5	0.0	0	0.4	1.6	2	0	1.2	4	0	2.8	2	0	0.3	1.2
Silts/Clays	8	-5	274.5	0.7	3.2	TRUE	0.7	3.2	0.0	0	0.4	2.1	2	0	1.2	5	0	3.3	3	0	0.3	1.6
Silts/Clays	9	-6	307.1	0.7	3.8	TRUE	0.7	3.8	0.0	0	0.4	2.5	2	0	1.2	6	0	3.7	4	0	0.3	1.9
Silts/Clays	10	-7	339.7	0.7	4.5	TRUE	0.7	4.5	0.0	0	0.4	2.9	2	0	1.2	6	0	4.1	5	0	0.3	2.3
Silts/Clays	11	-8	372.3	0.7	5.2	TRUE	0.7	5.2	0.0	0	0.4	3.4	2	0	1.2	7	0	4.6	5	0	0.3	2.6
Silts/Clays	12	-9	404.9	0.7	5.9	TRUE	0.7	5.9	0.0	0	0.4	3.8	2	0	1.2	8	0	5.0	6	0	0.3	2.9
Silts/Clays	13	-10	437.5	0.7	6.6	TRUE	0.7	6.6	0.0	0	0.4	4.3	2	0	1.2	8	0	5.5	7	0	0.3	3.3
Silts/Clays	14	-11	470.1	0.7	7.2	TRUE	0.7	7.2	0.0	0	0.4	4.7	2	0	1.2	9	0	5.9	7	0	0.3	3.6
Silts/Clays	15	-12	502.7	0.7	7.9	TRUE	0.7	7.9	0.0	0	0.4	5.1	2	0	1.2	10	0	6.3	8	0	0.3	4.0
Silts/Clays	16	-13	535.3	0.7	8.6	TRUE	0.7	8.6	0.0	0	0.4	5.6	2	0	1.2	10	0	6.8	9	0	0.3	4.3
Silts/Clays	17	-14	567.9	1.2	9.8	TRUE	0.9	9.5	0.0	0	0.8	6.4	3	0	2.2	13	0	8.6	10	0	0.6	4.9
Silts/Clays	18	-15	600.5	1.2	11.1	TRUE	0.9	10.4	0.0	0	0.8	7.2	3	0	2.2	14	0	9.4	11	0	0.6	5.5
Silts/Clays	19	-16	633.1	1.2	12.3	TRUE	0.9	11.3	0.0	0	0.8	8.0	3	0	2.2	16	0	10.2	12	0	0.6	6.2
Silts/Clays	20	-17	665.7	1.2	13.6	TRUE	0.9	12.2	0.0	0	0.8	8.8	3	0	2.2	17	0	11.0	14	0	0.6	6.8
Silts/Clays	21	-18	698.3	1.2	14.8	TRUE	0.9	13.1	0.0	0	0.8	9.6	3	0	2.2	18	0	11.8	15	0	0.6	7.4
Silts/Clays	22	-19	730.9	1.2	16.1	TRUE	0.9	14.0	0.0	0	0.8	10.4	3	0	2.2	19	0	12.7	16	0	0.6	8.0
Silts/Clays	23	-20	763.5	1.2	17.3	TRUE	0.9	14.9	0.0	0	0.8	11.3	3	0	2.2	21	0	13.5	17	0	0.6	8.7
Silts/Clays	24	-21	796.1	1.2	18.6	TRUE	0.9	15.8	0.0	0	0.8	12.1	3	0	2.2	22	0	14.3	19	0	0.6	9.3
Silts/Clays	25	-22	828.7	1.2	19.8	TRUE	0.9	16.7	0.0	0	0.8	12.9	3	0	2.2	23	0	15.1	20	0	0.6	9.9
Silts/Clays	26	-23	861.3	1.2	21.1	TRUE	0.9	17.6	0.0	0	0.8	13.7	3	0	2.2	24	0	15.9	21	0	0.6	10.5
Silts/Clays	27	-24	893.9	1.8	22.9	TRUE	0.9	18.5	0.0	0	1.2	14.9	5	0	3.2	28	0	18.1	23	0	0.9	11.4
Silts/Clays	28	-25	926.5	1.8	24.7	TRUE	0.9	19.4	0.0	0	1.2	16.1	5	0	3.2	30	0	19.3	25	0	0.9	12.3
Silts/Clays	29	-26	959.1	1.8	26.5	TRUE	0.9	20.3	0.0	0	1.2	17.2	5	0	3.2	31	0	20.5	27	0	0.9	13.3
Silts/Clays	30	-27	991.7	1.8	28.3	TRUE	0.9	21.2	0.0	0	1.2	18.4	5	0	3.2	33	0	21.6	28	0	0.9	14.2
Silts/Clays	31	-28	1024.3	1.8	30.1	TRUE	0.9	22.1	0.0	0	1.2	19.6	5	0	3.2	35	0	22.8	30	0	0.9	15.1
Silts/Clays	32	-29	1056.9	1.8	32.0	TRUE	0.9	23.0	0.0	0	1.2	20.8	5	0	3.2	37	0	24.0	32	0	0.9	16.0
Silts/Clays	33	-30	1089.5	1.8	33.8	TRUE	0.9	23.9	0.0	0	1.2	22.0	5	0	3.2	39	0	25.2	34	0	0.9	16.9
Silts/Clays	34	-31	1122.1	1.8	35.6	TRUE	0.9	24.8	0.0	0	1.2	23.1	5	0	3.2	41	0	26.4	36	0	0.9	17.8
Silts/Clays	35	-32	1154.7	1.8	37.4	TRUE	0.9	25.7	0.0	0	1.2	24.3	5	0	3.2	42	0	27.5	37	0	0.9	18.7
Silts/Clays	36	-33	1187.3	1.8	39.2	TRUE	0.9	26.6	0.0	0	1.2	25.5	5	0	3.2	44	0	28.7	39	0	0.9	19.6
Sands (2)	37	-34	1222.4	3.3	42.5	TRUE	0.9	27.5	0.0	0	2.1	27.6	15	0	9.6	57	0	37.2	42	0	1.6	21.2
Sands (2)	38	-35	1260	3.4	45.8	TRUE	0.9	28.4	0.0	0	2.2	29.8	15	0	9.6	61	0	39.3	46	0	1.7	22.9
Sands (2)	39	-36	1297.6	3.5	49.3	TRUE	0.9	29.3	0.0	0	2.2	32.0	15	0	9.6	64	0	41.6	49	0	1.7	24.6
Sands (2)	40	-37	1335.2	3.6	52.8	TRUE	0.9	30.2	0.0	0	2.3	34.3	15	0	9.6	68	0	43.9	53	0	1.8	26.4
Sands (2)	41	-38	1372.8	3.7	56.5	TRUE	0.9	31.1	0.0	0	2.4	36.7	15	0	9.6	71	0	46.3	56	0	1.8	28.2
Sands (2)	42	-39	1410.4	3.8	60.3	TRUE	0.9	32.0	0.0	0	2.4	39.2	15	0	9.6	75	0	48.7	60	0	1.9	30.1
Sands (2)	43	-40	1448	3.9	64.1	TRUE	0.9	32.9	0.0	0	2.5	41.7	15	0	9.6	79	0	51.2	64	0	1.9	32.1
Sands (2)	44	-41	1485.6	4.0	68.1	TRUE	0.9	33.8	0.0	0	2.6	44.2	15	0	9.6	83	0	53.8	68	0	2.0	34.0
Sands (2)	45	-42	1523.2	4.1	72.1	TRUE	0.9	34.7	0.0	0	2.6	46.9	15	0	9.6	87	0	56.4	72	0	2.0	36.1
Sands (2)	46	-43	1560.8	4.2	76.3	TRUE	0.9	35.6	0.0	0	2.7	49.6	15	0	9.6	91	0	59.1	76	0	2.1	38.1
Sands (2)	47	-44	1598.4	4.3	80.5	TRUE	0.9	36.5	0.0	0	2.8	52.3	15	0	9.6	95	0	61.9	81	0	2.1	40.3
Sands (2)	48	-45	1636	4.4	84.9	TRUE	0.9	37.4	0.0	0	2.8	55.2	15	0	9.6	100	0	64.7	85	0	2.2	42.4
Sands (2)	49	-46	1673.6	4.5	89.3	TRUE	0.9	38.3	0.0	0	2.9	58.1	15	0	9.6	104	0	67.6	89	0	2.2	44.7
Sands (2)	50	-47	1711.2	4.6	93.9	TRUE	0.9	39.2	0.0	0	3.0	61.0	15	0	9.6	109	0	70.6	94	0	2.3	46.9
Sands (2)	51	-48	1748.8	4.7	98.5	TRUE	0.9	40.1	0.0	0	3.0	64.0	15	0	9.6	113	0	73.6	99	0	2.3	49.3

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
Sands (2)	52	-49	1786.4	4.8	103.3	TRUE	0.9	41.0	0.0	0	3.1	67.1	15	0	9.6	118	0	76.7	103	0	2.4	51.6
Sands (2)	53	-50	1824	4.9	108.1	TRUE	0.9	41.9	0.0	0	3.2	70.3	15	0	9.6	123	0	79.8	108	0	2.4	54.1
Hawthorn Mar	54	-51	1871.6	4.9	113.0	FALSE	0.0	41.9	4.9	5	3.2	73.4	53	53	34.4	166	58	107.8	113	4	2.4	56.5
Hawthorn Mar	55	-52	1929.2	4.9	117.8	FALSE	0.0	41.9	4.9	10	3.2	76.6	53	53	34.4	171	63	111.0	118	8	2.4	58.9
Hawthorn Mar	56	-53	1986.8	4.9	122.7	FALSE	0.0	41.9	4.9	15	3.2	79.8	53	53	34.4	176	67	114.1	123	12	2.4	61.3
Hawthorn Mar	57	-54	2044.4	4.9	127.5	FALSE	0.0	41.9	4.9	19	3.2	82.9	53	53	34.4	180	72	117.3	128	16	2.4	63.8
Hawthorn Mar	58	-55	2102	4.9	132.4	FALSE	0.0	41.9	4.9	24	3.2	86.1	53	53	34.4	185	77	120.4	132	19	2.4	66.2
Hawthorn Mar	59	-56	2159.6	4.9	137.2	FALSE	0.0	41.9	4.9	29	3.2	89.2	53	53	34.4	190	82	123.6	137	23	2.4	68.6
Hawthorn Mar	60	-57	2217.2	4.9	142.1	FALSE	0.0	41.9	4.9	34	3.2	92.4	53	53	34.4	195	87	126.7	142	27	2.4	71.0
Hawthorn Mar	61	-58	2274.8	4.9	146.9	FALSE	0.0	41.9	4.9	39	3.2	95.5	53	53	34.4	200	92	129.9	147	31	2.4	73.5
Hawthorn Mar	62	-59	2332.4	4.9	151.8	FALSE	0.0	41.9	4.9	44	3.2	98.7	53	53	34.4	205	97	133.0	152	35	2.4	75.9
Hawthorn Mar	63	-60	2390	4.9	156.6	FALSE	0.0	41.9	4.9	49	3.2	101.8	53	53	34.4	210	101	136.2	157	39	2.4	78.3
Hawthorn Mar	64	-61	2447.6	4.9	161.5	FALSE	0.0	41.9	4.9	53	3.2	105.0	53	53	34.4	214	106	139.4	161	43	2.4	80.7
Hawthorn Mar	65	-62	2505.2	4.9	166.3	FALSE	0.0	41.9	4.9	58	3.2	108.1	53	53	34.4	219	111	142.5	166	47	2.4	83.2
Hawthorn Mar	66	-63	2562.8	4.9	171.2	FALSE	0.0	41.9	4.9	63	3.2	111.3	53	53	34.4	224	116	145.7	171	50	2.4	85.6
Hawthorn Mar	67	-64	2620.4	4.9	176.0	FALSE	0.0	41.9	4.9	68	3.2	114.4	53	53	34.4	229	121	148.8	176	54	2.4	88.0
Hawthorn Mar	68	-65	2678	4.9	180.9	FALSE	0.0	41.9	4.9	73	3.2	117.6	53	53	34.4	234	126	152.0	181	58	2.4	90.4
Hawthorn Mar	69	-66	2735.6	4.9	185.7	FALSE	0.0	41.9	4.9	78	3.2	120.7	53	53	34.4	239	130	155.1	186	62	2.4	92.9
Hawthorn Mar	70	-67	2793.2	4.9	190.6	FALSE	0.0	41.9	4.9	82	3.2	123.9	53	53	34.4	243	135	158.3	191	66	2.4	95.3
Hawthorn Mar	71	-68	2850.8	4.9	195.4	FALSE	0.0	41.9	4.9	87	3.2	127.0	53	53	34.4	248	140	161.4	195	70	2.4	97.7
Hawthorn Mar	72	-69	2908.4	4.9	200.3	FALSE	0.0	41.9	4.9	92	3.2	130.2	53	53	34.4	253	145	164.6	200	74	2.4	100.1
Hawthorn Mar	73	-70	2966	4.9	205.1	FALSE	0.0	41.9	4.9	97	3.2	133.3	53	53	34.4	258	150	167.7	205	78	2.4	102.6
Hawthorn Mar	74	-71	3023.6	4.9	210.0	FALSE	0.0	41.9	4.9	102	3.2	136.5	53	53	34.4	263	155	170.9	210	81	2.4	105.0
Hawthorn Mar	75	-72	3081.2	4.9	214.8	FALSE	0.0	41.9	4.9	107	3.2	139.6	53	53	34.4	268	160	174.0	215	85	2.4	107.4
er Group Lime	76	-73	3138.8	7.3	222.1	FALSE	0.0	41.9	7.3	114	4.7	144.4	79	79	51.6	301	193	196.0	222	91	3.6	111.1
er Group Lime	77	-74	3196.4	7.3	229.4	FALSE	0.0	41.9	7.3	121	4.7	149.1	79	79	51.6	309	201	200.7	229	97	3.6	114.7
er Group Lime	78	-75	3254	7.3	236.7	FALSE	0.0	41.9	7.3	129	4.7	153.8	79	79	51.6	316	208	205.4	237	103	3.6	118.3
er Group Lime	79	-76	3311.6	7.3	243.9	FALSE	0.0	41.9	7.3	136	4.7	158.6	79	79	51.6	323	215	210.1	244	109	3.6	122.0
er Group Lime	80	-77	3369.2	7.3	251.2	FALSE	0.0	41.9	7.3	143	4.7	163.3	79	79	51.6	331	222	214.9	251	114	3.6	125.6
er Group Lime	81	-78	3426.8	7.3	258.5	FALSE	0.0	41.9	7.3	150	4.7	168.0	79	79	51.6	338	230	219.6	258	120	3.6	129.2
er Group Lime	82	-79	3484.4	7.3	265.8	FALSE	0.0	41.9	7.3	158	4.7	172.8	79	79	51.6	345	237	224.3	266	126	3.6	132.9
er Group Lime	83	-80	3542	7.3	273.0	FALSE	0.0	41.9	7.3	165	4.7	177.5	79	79	51.6	352	244	229.1	273	132	3.6	136.5
er Group Lime	84	-81	3599.6	7.3	280.3	FALSE	0.0	41.9	7.3	172	4.7	182.2	79	79	51.6	360	252	233.8	280	138	3.6	140.2
er Group Lime	85	-82	3657.2	7.3	287.6	FALSE	0.0	41.9	7.3	179	4.7	186.9	79	79	51.6	367	259	238.5	288	144	3.6	143.8
er Group Lime	86	-83	3714.8	7.3	294.9	FALSE	0.0	41.9	7.3	187	4.7	191.7	79	79	51.6	374	266	243.2	295	149	3.6	147.4
er Group Lime	87	-84	3772.4	7.3	302.1	FALSE	0.0	41.9	7.3	194	4.7	196.4	79	79	51.6	381	273	248.0	302	155	3.6	151.1
er Group Lime	88	-85	3830	7.3	309.4	FALSE	0.0	41.9	7.3	201	4.7	201.1	79	79	51.6	389	281	252.7	309	161	3.6	154.7
er Group Lime	89	-86	3887.6	7.3	316.7	FALSE	0.0	41.9	7.3	209	4.7	205.9	79	79	51.6	396	288	257.4	317	167	3.6	158.3
er Group Lime	90	-87	3945.2	7.3	324.0	FALSE	0.0	41.9	7.3	216	4.7	210.6	79	79	51.6	403	295	262.2	324	173	3.6	162.0
er Group Lime	91	-88	4002.8	7.3	331.2	FALSE	0.0	41.9	7.3	223	4.7	215.3	79	79	51.6	411	302	266.9	331	178	3.6	165.6
er Group Lime	92	-89	4060.4	7.3	338.5	FALSE	0.0	41.9	7.3	230	4.7	220.0	79	79	51.6	418	310	271.6	339	184	3.6	169.3
er Group Lime	93	-90	4118	7.3	345.8	FALSE	0.0	41.9	7.3	238	4.7	224.8	79	79	51.6	425	317	276.3	346	190	3.6	172.9
er Group Lime	94	-91	4175.6	7.3	353.1	FALSE	0.0	41.9	7.3	245	4.7	229.5	79	79	51.6	432	324	281.1	353	196	3.6	176.5
er Group Lime	95	-92	4233.2	7.3	360.3	FALSE	0.0	41.9	7.3	252	4.7	234.2	79	79	51.6	440	332	285.8	360	202	3.6	180.2
er Group Lime	96	-93	4290.8	7.3	367.6	FALSE	0.0	41.9	7.3	259	4.7	239.0	79	79	51.6	447	339	290.5	368	208	3.6	183.8
er Group Lime	97	-94	4348.4	7.3	374.9	FALSE	0.0	41.9	7.3	267	4.7	243.7	79	79	51.6	454	346	295.3	375	213	3.6	187.4
er Group Lime	98	-95	4406	7.3	382.2	FALSE	0.0	41.9	7.3	274	4.7	248.4	79	79	51.6	462	353	300.0	382	219	3.6	191.1
er Group Lime	99	-96	4463.6	7.3	389.4	FALSE	0.0	41.9	7.3	281	4.7	253.1	79	79	51.6	469	361	304.7	389	225	3.6	194.7
er Group Lime	100	-97	4521.2	7.3	396.7	FALSE	0.0	41.9	7.3	289	4.7	257.9	79	79	51.6	476	368	309.4	397	231	3.6	198.4
er Group Lime	101	-98	4578.8	7.3	404.0	FALSE	0.0	41.9	7.3	296	4.7	262.6	79	79	51.6	483	375	314.2	404	237	3.6	202.0
er Group Lime	102	-99	4636.4	7.3	411.3	FALSE	0.0	41.9	7.3	303	4.7	267.3	79	79	51.6	491	382	318.9	411	243	3.6	205.6

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
er Group Lime	103	-100	4694	7.3	418.5	FALSE	0.0	41.9	7.3	310	4.7	272.1	79	79	51.6	498	390	323.6	419	248	3.6	209.3
er Group Lime	104	-101	4751.6	7.3	425.8	FALSE	0.0	41.9	7.3	318	4.7	276.8	79	79	51.6	505	397	328.4	426	254	3.6	212.9
er Group Lime	105	-102	4809.2	7.3	433.1	FALSE	0.0	41.9	7.3	325	4.7	281.5	79	79	51.6	512	404	333.1	433	260	3.6	216.5
er Group Lime	106	-103	4866.8	7.3	440.4	FALSE	0.0	41.9	7.3	332	4.7	286.2	79	79	51.6	520	412	337.8	440	266	3.6	220.2
er Group Lime	107	-104	4924.4	7.3	447.6	FALSE	0.0	41.9	7.3	340	4.7	291.0	79	79	51.6	527	419	342.5	448	272	3.6	223.8
er Group Lime	108	-105	4982	7.3	454.9	FALSE	0.0	41.9	7.3	347	4.7	295.7	79	79	51.6	534	426	347.3	455	277	3.6	227.5
er Group Lime	109	-106	5039.6	7.3	462.2	FALSE	0.0	41.9	7.3	354	4.7	300.4	79	79	51.6	542	433	352.0	462	283	3.6	231.1
er Group Lime	110	-107	5097.2	7.3	469.5	FALSE	0.0	41.9	7.3	361	4.7	305.2	79	79	51.6	549	441	356.7	469	289	3.6	234.7
er Group Lime	111	-108	5154.8	7.3	476.7	FALSE	0.0	41.9	7.3	369	4.7	309.9	79	79	51.6	556	448	361.5	477	295	3.6	238.4
er Group Lime	112	-109	5212.4	7.3	484.0	FALSE	0.0	41.9	7.3	376	4.7	314.6	79	79	51.6	563	455	366.2	484	301	3.6	242.0
er Group Lime	113	-110	5270	7.3	491.3	FALSE	0.0	41.9	7.3	383	4.7	319.3	79	79	51.6	571	462	370.9	491	307	3.6	245.6
er Group Lime	114	-111	5327.6	7.3	498.6	FALSE	0.0	41.9	7.3	390	4.7	324.1	79	79	51.6	578	470	375.6	499	312	3.6	249.3
er Group Lime	115	-112	5385.2	7.3	505.8	FALSE	0.0	41.9	7.3	398	4.7	328.8	79	79	51.6	585	477	380.4	506	318	3.6	252.9
er Group Lime	116	-113	5442.8	7.3	513.1	FALSE	0.0	41.9	7.3	405	4.7	333.5	79	79	51.6	592	484	385.1	513	324	3.6	256.6
er Group Lime	117	-114	5500.4	7.3	520.4	FALSE	0.0	41.9	7.3	412	4.7	338.3	79	79	51.6	600	492	389.8	520	330	3.6	260.2
er Group Lime	118	-115	5558	7.3	527.7	FALSE	0.0	41.9	7.3	420	4.7	343.0	79	79	51.6	607	499	394.6	528	336	3.6	263.8
er Group Lime	119	-116	5615.6	7.3	534.9	FALSE	0.0	41.9	7.3	427	4.7	347.7	79	79	51.6	614	506	399.3	535	341	3.6	267.5
er Group Lime	120	-117	5673.2	7.3	542.2	FALSE	0.0	41.9	7.3	434	4.7	352.4	79	79	51.6	622	513	404.0	542	347	3.6	271.1
er Group Lime	121	-118	5730.8	7.3	549.5	FALSE	0.0	41.9	7.3	441	4.7	357.2	79	79	51.6	629	521	408.7	549	353	3.6	274.7
er Group Lime	122	-119	5788.4	7.3	556.8	FALSE	0.0	41.9	7.3	449	4.7	361.9	79	79	51.6	636	528	413.5	557	359	3.6	278.4
er Group Lime	123	-120	5846	7.3	564.0	FALSE	0.0	41.9	7.3	456	4.7	366.6	79	79	51.6	643	535	418.2	564	365	3.6	282.0
er Group Lime	124	-121	5903.6	7.3	571.3	FALSE	0.0	41.9	7.3	463	4.7	371.4	79	79	51.6	651	543	422.9	571	371	3.6	285.7
er Group Lime	125	-122	5961.2	7.3	578.6	FALSE	0.0	41.9	7.3	470	4.7	376.1	79	79	51.6	658	550	427.7	579	376	3.6	289.3
er Group Lime	126	-123	6018.8	7.3	585.9	FALSE	0.0	41.9	7.3	478	4.7	380.8	79	79	51.6	665	557	432.4	586	382	3.6	292.9
er Group Lime	127	-124	6076.4	7.3	593.1	FALSE	0.0	41.9	7.3	485	4.7	385.5	79	79	51.6	672	564	437.1	593	388	3.6	296.6
er Group Lime	128	-125	6134	7.3	600.4	FALSE	0.0	41.9	7.3	492	4.7	390.3	79	79	51.6	680	572	441.8	600	394	3.6	300.2
er Group Lime	129	-126	6191.6	7.3	607.7	FALSE	0.0	41.9	7.3	500	4.7	395.0	79	79	51.6	687	579	446.6	608	400	3.6	303.8
er Group Lime	130	-127	6249.2	7.3	615.0	FALSE	0.0	41.9	7.3	507	4.7	399.7	79	79	51.6	694	586	451.3	615	405	3.6	307.5
er Group Lime	131	-128	6306.8	7.3	622.2	FALSE	0.0	41.9	7.3	514	4.7	404.5	79	79	51.6	702	593	456.0	622	411	3.6	311.1
er Group Lime	132	-129	6364.4	7.3	629.5	FALSE	0.0	41.9	7.3	521	4.7	409.2	79	79	51.6	709	601	460.8	630	417	3.6	314.8
er Group Lime	133	-130	6422	7.3	636.8	FALSE	0.0	41.9	7.3	529	4.7	413.9	79	79	51.6	716	608	465.5	637	423	3.6	318.4
er Group Lime	134	-131	6479.6	7.3	644.1	FALSE	0.0	41.9	7.3	536	4.7	418.6	79	79	51.6	723	615	470.2	644	429	3.6	322.0
er Group Lime	135	-132	6537.2	7.3	651.3	FALSE	0.0	41.9	7.3	543	4.7	423.4	79	79	51.6	731	623	474.9	651	435	3.6	325.7
er Group Lime	136	-133	6594.8	7.3	658.6	FALSE	0.0	41.9	7.3	550	4.7	428.1	79	79	51.6	738	630	479.7	659	440	3.6	329.3
er Group Lime	137	-134	6652.4	7.3	665.9	FALSE	0.0	41.9	7.3	558	4.7	432.8	79	79	51.6	745	637	484.4	666	446	3.6	332.9
er Group Lime	138	-135	6710	7.3	673.2	FALSE	0.0	41.9	7.3	565	4.7	437.6	79	79	51.6	753	644	489.1	673	452	3.6	336.6
er Group Lime	139	-136	6767.6	7.3	680.4	FALSE	0.0	41.9	7.3	572	4.7	442.3	79	79	51.6	760	652	493.9	680	458	3.6	340.2
er Group Lime	140	-137	6825.2	7.3	687.7	FALSE	0.0	41.9	7.3	580	4.7	447.0	79	79	51.6	767	659	498.6	688	464	3.6	343.9
er Group Lime	141	-138	6882.8	7.3	695.0	FALSE	0.0	41.9	7.3	587	4.7	451.7	79	79	51.6	774	666	503.3	695	469	3.6	347.5
er Group Lime	142	-139	6940.4	7.3	702.3	FALSE	0.0	41.9	7.3	594	4.7	456.5	79	79	51.6	782	673	508.0	702	475	3.6	351.1
er Group Lime	143	-140	6998	7.3	709.5	FALSE	0.0	41.9	7.3	601	4.7	461.2	79	79	51.6	789	681	512.8	710	481	3.6	354.8
er Group Lime	144	-141	7055.6	7.3	716.8	FALSE	0.0	41.9	7.3	609	4.7	465.9	79	79	51.6	796	688	517.5	717	487	3.6	358.4
er Group Lime	145	-142	7113.2	7.3	724.1	FALSE	0.0	41.9	7.3	616	4.7	470.7	79	79	51.6	803	695	522.2	724	493	3.6	362.0
er Group Lime	146	-143	7170.8	7.3	731.4	FALSE	0.0	41.9	7.3	623	4.7	475.4	79	79	51.6	811	703	527.0	731	499	3.6	365.7
er Group Lime	147	-144	7228.4	7.3	738.6	FALSE	0.0	41.9	7.3	630	4.7	480.1	79	79	51.6	818	710	531.7	739	504	3.6	369.3
er Group Lime	148	-145	7286	7.3	745.9	FALSE	0.0	41.9	7.3	638	4.7	484.8	79	79	51.6	825	717	536.4	746	510	3.6	373.0
er Group Lime	149	-146	7343.6	7.3	753.2	FALSE	0.0	41.9	7.3	645	4.7	489.6	79	79	51.6	833	724	541.2	753	516	3.6	376.6
er Group Lime	150	-147	7401.2	7.3	760.5	FALSE	0.0	41.9	7.3	652	4.7	494.3	79	79	51.6	840	732	545.9	760	522	3.6	380.2
er Group Lime	151	-148	7458.8	7.3	767.7	FALSE	0.0	41.9	7.3	660	4.7	499.0	79	79	51.6	847	739	550.6	768	528	3.6	383.9
er Group Lime	152	-149	7516.4	7.3	775.0	FALSE	0.0	41.9	7.3	667	4.7	503.8	79	79	51.6	854	746	555.3	775	533	3.6	387.5
er Group Lime	153	-150	7574	7.3	782.3	FALSE	0.0	41.9	7.3	674	4.7	508.5	79	79	51.6	862	753	560.1	782	539	3.6	391.1

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
er Group Lime	154	-151	7631.6	7.3	789.6	FALSE	0.0	41.9	7.3	681	4.7	513.2	79	79	51.6	869	761	564.8	790	545	3.6	394.8
er Group Lime	155	-152	7689.2	7.3	796.8	FALSE	0.0	41.9	7.3	689	4.7	517.9	79	79	51.6	876	768	569.5	797	551	3.6	398.4
er Group Lime	156	-153	7746.8	7.3	804.1	FALSE	0.0	41.9	7.3	696	4.7	522.7	79	79	51.6	883	775	574.3	804	557	3.6	402.1
er Group Lime	157	-154	7804.4	7.3	811.4	FALSE	0.0	41.9	7.3	703	4.7	527.4	79	79	51.6	891	783	579.0	811	563	3.6	405.7
er Group Lime	158	-155	7862	7.3	818.7	FALSE	0.0	41.9	7.3	711	4.7	532.1	79	79	51.6	898	790	583.7	819	568	3.6	409.3
er Group Lime	159	-156	7919.6	7.3	825.9	FALSE	0.0	41.9	7.3	718	4.7	536.9	79	79	51.6	905	797	588.4	826	574	3.6	413.0
er Group Lime	160	-157	7977.2	7.3	833.2	FALSE	0.0	41.9	7.3	725	4.7	541.6	79	79	51.6	913	804	593.2	833	580	3.6	416.6
er Group Lime	161	-158	8034.8	7.3	840.5	FALSE	0.0	41.9	7.3	732	4.7	546.3	79	79	51.6	920	812	597.9	840	586	3.6	420.2
er Group Lime	162	-159	8092.4	7.3	847.8	FALSE	0.0	41.9	7.3	740	4.7	551.1	79	79	51.6	927	819	602.6	848	592	3.6	423.9
er Group Lime	163	-160	8150	7.3	855.0	FALSE	0.0	41.9	7.3	747	4.7	555.8	79	79	51.6	934	826	607.4	855	598	3.6	427.5
er Group Lime	164	-161	8207.6	7.3	862.3	FALSE	0.0	41.9	7.3	754	4.7	560.5	79	79	51.6	942	834	612.1	862	603	3.6	431.2
er Group Lime	165	-162	8265.2	7.3	869.6	FALSE	0.0	41.9	7.3	761	4.7	565.2	79	79	51.6	949	841	616.8	870	609	3.6	434.8
er Group Lime	166	-163	8322.8	7.3	876.9	FALSE	0.0	41.9	7.3	769	4.7	570.0	79	79	51.6	956	848	621.5	877	615	3.6	438.4
er Group Lime	167	-164	8380.4	7.3	884.1	FALSE	0.0	41.9	7.3	776	4.7	574.7	79	79	51.6	963	855	626.3	884	621	3.6	442.1
er Group Lime	168	-165	8438	7.3	891.4	FALSE	0.0	41.9	7.3	783	4.7	579.4	79	79	51.6	971	863	631.0	891	627	3.6	445.7
er Group Lime	169	-166	8495.6	7.3	898.7	FALSE	0.0	41.9	7.3	791	4.7	584.2	79	79	51.6	978	870	635.7	899	632	3.6	449.3
er Group Lime	170	-167	8553.2	7.3	906.0	FALSE	0.0	41.9	7.3	798	4.7	588.9	79	79	51.6	985	877	640.5	906	638	3.6	453.0
er Group Lime	171	-168	8610.8	7.3	913.2	FALSE	0.0	41.9	7.3	805	4.7	593.6	79	79	51.6	993	884	645.2	913	644	3.6	456.6
er Group Lime	172	-169	8668.4	7.3	920.5	FALSE	0.0	41.9	7.3	812	4.7	598.3	79	79	51.6	1000	892	649.9	921	650	3.6	460.3
er Group Lime	173	-170	8726	7.3	927.8	FALSE	0.0	41.9	7.3	820	4.7	603.1	79	79	51.6	1007	899	654.6	928	656	3.6	463.9
er Group Lime	174	-171	8783.6	7.3	935.1	FALSE	0.0	41.9	7.3	827	4.7	607.8	79	79	51.6	1014	906	659.4	935	662	3.6	467.5
er Group Lime	175	-172	8841.2	7.3	942.3	FALSE	0.0	41.9	7.3	834	4.7	612.5	79	79	51.6	1022	914	664.1	942	667	3.6	471.2
er Group Lime	176	-173	8898.8	7.3	949.6	FALSE	0.0	41.9	7.3	841	4.7	617.3	79	79	51.6	1029	921	668.8	950	673	3.6	474.8
er Group Lime	177	-174	8956.4	7.3	956.9	FALSE	0.0	41.9	7.3	849	4.7	622.0	79	79	51.6	1036	928	673.6	957	679	3.6	478.4
er Group Lime	178	-175	9014	7.3	964.2	FALSE	0.0	41.9	7.3	856	4.7	626.7	79	79	51.6	1044	935	678.3	964	685	3.6	482.1
er Group Lime	179	-176	9071.6	7.3	971.4	FALSE	0.0	41.9	7.3	863	4.7	631.4	79	79	51.6	1051	943	683.0	971	691	3.6	485.7
er Group Lime	180	-177	9129.2	7.3	978.7	FALSE	0.0	41.9	7.3	871	4.7	636.2	79	79	51.6	1058	950	687.7	979	696	3.6	489.4
er Group Lime	181	-178	9186.8	7.3	986.0	FALSE	0.0	41.9	7.3	878	4.7	640.9	79	79	51.6	1065	957	692.5	986	702	3.6	493.0
er Group Lime	182	-179	9244.4	7.3	993.3	FALSE	0.0	41.9	7.3	885	4.7	645.6	79	79	51.6	1073	964	697.2	993	708	3.6	496.6
er Group Lime	183	-180	9302	7.3	1000.5	FALSE	0.0	41.9	7.3	892	4.7	650.4	79	79	51.6	1080	972	701.9	1001	714	3.6	500.3
er Group Lime	184	-181	9359.6	7.3	1007.8	FALSE	0.0	41.9	7.3	900	4.7	655.1	79	79	51.6	1087	979	706.7	1008	720	3.6	503.9
er Group Lime	185	-182	9417.2	7.3	1015.1	FALSE	0.0	41.9	7.3	907	4.7	659.8	79	79	51.6	1094	986	711.4	1015	726	3.6	507.5
er Group Lime	186	-183	9474.8	7.3	1022.4	FALSE	0.0	41.9	7.3	914	4.7	664.5	79	79	51.6	1102	994	716.1	1022	731	3.6	511.2
er Group Lime	187	-184	9532.4	7.3	1029.6	FALSE	0.0	41.9	7.3	921	4.7	669.3	79	79	51.6	1109	1001	720.8	1030	737	3.6	514.8
er Group Lime	188	-185	9590	7.3	1036.9	FALSE	0.0	41.9	7.3	929	4.7	674.0	79	79	51.6	1116	1008	725.6	1037	743	3.6	518.5
er Group Lime	189	-186	9647.6	7.3	1044.2	FALSE	0.0	41.9	7.3	936	4.7	678.7	79	79	51.6	1124	1015	730.3	1044	749	3.6	522.1
er Group Lime	190	-187	9705.2	7.3	1051.5	FALSE	0.0	41.9	7.3	943	4.7	683.5	79	79	51.6	1131	1023	735.0	1051	755	3.6	525.7
er Group Lime	191	-188	9762.8	7.3	1058.7	FALSE	0.0	41.9	7.3	951	4.7	688.2	79	79	51.6	1138	1030	739.8	1059	760	3.6	529.4
er Group Lime	192	-189	9820.4	7.3	1066.0	FALSE	0.0	41.9	7.3	958	4.7	692.9	79	79	51.6	1145	1037	744.5	1066	766	3.6	533.0
er Group Lime	193	-190	9878	7.3	1073.3	FALSE	0.0	41.9	7.3	965	4.7	697.6	79	79	51.6	1153	1044	749.2	1073	772	3.6	536.6
er Group Lime	194	-191	9935.6	7.3	1080.6	FALSE	0.0	41.9	7.3	972	4.7	702.4	79	79	51.6	1160	1052	753.9	1081	778	3.6	540.3
er Group Lime	195	-192	9993.2	7.3	1087.8	FALSE	0.0	41.9	7.3	980	4.7	707.1	79	79	51.6	1167	1059	758.7	1088	784	3.6	543.9
er Group Lime	196	-193	10050.8	7.3	1095.1	FALSE	0.0	41.9	7.3	987	4.7	711.8	79	79	51.6	1174	1066	763.4	1095	790	3.6	547.6
er Group Lime	197	-194	10108.4	7.3	1102.4	FALSE	0.0	41.9	7.3	994	4.7	716.6	79	79	51.6	1182	1074	768.1	1102	795	3.6	551.2
er Group Lime	198	-195	10166	7.3	1109.7	FALSE	0.0	41.9	7.3	1002	4.7	721.3	79	79	51.6	1189	1081	772.9	1110	801	3.6	554.8
er Group Lime	199	-196	10223.6	7.3	1116.9	FALSE	0.0	41.9	7.3	1009	4.7	726.0	79	79	51.6	1196	1088	777.6	1117	807	3.6	558.5
er Group Lime	200	-197	10281.2	7.3	1124.2	FALSE	0.0	41.9	7.3	1016	4.7	730.7	79	79	51.6	1204	1095	782.3	1124	813	3.6	562.1

AXIAL PILE CAPACITY

Project Information

Project:	Harbor River Bridge	Pile Tip Area (square feet):	4.00
Owner:	SCDOT	Pile Perimeter (ft):	8.00
Job Number:	18461-007-01	Side and End Friction Resistance Factor α Method	0.65
Analysis by:	HPC	Side and End Friction Resistance Factor Nordlund/Thurman Method	0.65
Date/Time:	10/16/2017 11:48	Uplift Side Friction Resistance Factor α Method	0.5
Run Designation:	West Overbank - Full Scour	Uplift Friction Resistance Factor Nordlund/Thurman Method	0.5
Pile Diameter (ft):	2.0	Depth to Top of Liquefied Layer (ft):	0
Ground Surface Elevation (ft):	-8	Depth to Bottom of Liquefied Layer (ft):	47
Pile Type:	Square Precast Concrete	Residual Shear Strength of Liquefiable Layer (psf):	153
Checked by:	ZAS	Enter "1" to calculate downdrag from residual shear strength, "2" average of residual & non-liqufied, "3" non-liquefied strength parameters	1
		Calculated Unfactored Downdrag Load (kips)[4]:	49.6

Soil Profile

Soil Type	Depth at Bottom of Soil Unit (feet)	Bouyant Unit Weight (pcf) (total weight above GWT)	ϕ (degrees)	S_u, Undrained Shear Strength (psf)	α, Empirical Adhesion Factor	Friction Ratio, C_f	Earth Pressure Coefficient, K_δ
Sands (1)	7	37.6	29			0.95	1.15
Silts/Clays	17	32.6		111	1		
Silts/Clays	27	32.6		196	1		
Silts/Clays	37	32.6		280	1		
Sands (2)	47	37.6	31			0.95	1.15
Hawthorn Marl	67	57.6		4000	0.25		
Cooper Group Limestone	200	57.6		6000	0.25		

Notes:
1. Spreadsheet programed for α method for undrained shear strength and Nordlund/Thurman Method for friction angle
2. Refer to AASHTO LRFD Section 10.7.3.8.6b to determine α
3. Refer to AASHTO LRFD Section 10.7.3.8.6f to determine C_f and K_δ
4. The structural engineer should include the unfactored downdrag load in accordance with Section 3.11.8 of the AASHTO LRFD Manual

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
Sands (1)	1	-9	18.8	0.1	0.1	TRUE	0.1	0.1	0.0	0	0.1	0.1	1	0	0.9	1	0	0.9	0	0	0.0	0.0
Sands (1)	2	-10	56.4	0.2	0.3	TRUE	0.2	0.3	0.0	0	0.2	0.2	4	0	2.7	4	0	2.9	0	0	0.1	0.2
Sands (1)	3	-11	94	0.4	0.7	TRUE	0.4	0.7	0.0	0	0.3	0.5	7	0	4.5	8	0	4.9	1	0	0.2	0.4
Sands (1)	4	-12	131.6	0.6	1.3	TRUE	0.6	1.3	0.0	0	0.4	0.8	10	0	6.2	11	0	7.0	1	0	0.3	0.6
Sands (1)	5	-13	169.2	0.7	2.0	TRUE	0.7	2.0	0.0	0	0.5	1.3	12	0	8.0	14	0	9.3	2	0	0.4	1.0
Sands (1)	6	-14	206.8	0.9	2.9	TRUE	0.9	2.9	0.0	0	0.6	1.9	15	0	9.6	18	0	11.5	3	0	0.4	1.4
Sands (1)	7	-15	244.4	1.0	3.9	TRUE	1.0	3.9	0.0	0	0.7	2.5	18	0	11.4	21	0	13.9	4	0	0.5	2.0
Silts/Clays	8	-16	279.5	0.9	4.8	TRUE	0.9	4.8	0.0	0	0.6	3.1	4	0	2.6	9	0	5.7	5	0	0.4	2.4
Silts/Clays	9	-17	312.1	0.9	5.7	TRUE	0.9	5.7	0.0	0	0.6	3.7	4	0	2.6	10	0	6.3	6	0	0.4	2.8
Silts/Clays	10	-18	344.7	0.9	6.6	TRUE	0.9	6.6	0.0	0	0.6	4.3	4	0	2.6	11	0	6.9	7	0	0.4	3.3
Silts/Clays	11	-19	377.3	0.9	7.5	TRUE	0.9	7.5	0.0	0	0.6	4.9	4	0	2.6	11	0	7.4	7	0	0.4	3.7
Silts/Clays	12	-20	409.9	0.9	8.4	TRUE	0.9	8.4	0.0	0	0.6	5.4	4	0	2.6	12	0	8.0	8	0	0.4	4.2
Silts/Clays	13	-21	442.5	0.9	9.2	TRUE	0.9	9.2	0.0	0	0.6	6.0	4	0	2.6	13	0	8.6	9	0	0.4	4.6
Silts/Clays	14	-22	475.1	0.9	10.1	TRUE	0.9	10.1	0.0	0	0.6	6.6	4	0	2.6	14	0	9.2	10	0	0.4	5.1
Silts/Clays	15	-23	507.7	0.9	11.0	TRUE	0.9	11.0	0.0	0	0.6	7.2	4	0	2.6	15	0	9.8	11	0	0.4	5.5
Silts/Clays	16	-24	540.3	0.9	11.9	TRUE	0.9	11.9	0.0	0	0.6	7.7	4	0	2.6	16	0	10.3	12	0	0.4	5.9
Silts/Clays	17	-25	572.9	0.9	12.8	TRUE	0.9	12.8	0.0	0	0.6	8.3	4	0	2.6	17	0	10.9	13	0	0.4	6.4
Silts/Clays	18	-26	605.5	1.6	14.3	TRUE	1.2	14.0	0.0	0	1.0	9.3	7	0	4.6	21	0	13.9	14	0	0.8	7.2
Silts/Clays	19	-27	638.1	1.6	15.9	TRUE	1.2	15.2	0.0	0	1.0	10.3	7	0	4.6	23	0	14.9	16	0	0.8	8.0
Silts/Clays	20	-28	670.7	1.6	17.5	TRUE	1.2	16.5	0.0	0	1.0	11.4	7	0	4.6	25	0	15.9	17	0	0.8	8.7
Silts/Clays	21	-29	703.3	1.6	19.0	TRUE	1.2	17.7	0.0	0	1.0	12.4	7	0	4.6	26	0	17.0	19	0	0.8	9.5
Silts/Clays	22	-30	735.9	1.6	20.6	TRUE	1.2	18.9	0.0	0	1.0	13.4	7	0	4.6	28	0	18.0	21	0	0.8	10.3
Silts/Clays	23	-31	768.5	1.6	22.2	TRUE	1.2	20.1	0.0	0	1.0	14.4	7	0	4.6	29	0	19.0	22	0	0.8	11.1
Silts/Clays	24	-32	801.1	1.6	23.7	TRUE	1.2	21.4	0.0	0	1.0	15.4	7	0	4.6	31	0	20.0	24	0	0.8	11.9
Silts/Clays	25	-33	833.7	1.6	25.3	TRUE	1.2	22.6	0.0	0	1.0	16.4	7	0	4.6	32	0	21.0	25	0	0.8	12.7
Silts/Clays	26	-34	866.3	1.6	26.9	TRUE	1.2	23.8	0.0	0	1.0	17.5	7	0	4.6	34	0	22.0	27	0	0.8	13.4
Silts/Clays	27	-35	898.9	1.6	28.4	TRUE	1.2	25.0	0.0	0	1.0	18.5	7	0	4.6	35	0	23.1	28	0	0.8	14.2
Silts/Clays	28	-36	931.5	2.2	30.7	TRUE	1.2	26.3	0.0	0	1.5	19.9	10	0	6.6	41	0	26.5	31	0	1.1	15.3
Silts/Clays	29	-37	964.1	2.2	32.9	TRUE	1.2	27.5	0.0	0	1.5	21.4	10	0	6.6	43	0	28.0	33	0	1.1	16.5
Silts/Clays	30	-38	996.7	2.2	35.2	TRUE	1.2	28.7	0.0	0	1.5	22.9	10	0	6.6	45	0	29.4	35	0	1.1	17.6
Silts/Clays	31	-39	1029.3	2.2	37.4	TRUE	1.2	29.9	0.0	0	1.5	24.3	10	0	6.6	47	0	30.9	37	0	1.1	18.7
Silts/Clays	32	-40	1061.9	2.2	39.6	TRUE	1.2	31.2	0.0	0	1.5	25.8	10	0	6.6	50	0	32.3	40	0	1.1	19.8
Silts/Clays	33	-41	1094.5	2.2	41.9	TRUE	1.2	32.4	0.0	0	1.5	27.2	10	0	6.6	52	0	33.8	42	0	1.1	20.9
Silts/Clays	34	-42	1127.1	2.2	44.1	TRUE	1.2	33.6	0.0	0	1.5	28.7	10	0	6.6	54	0	35.2	44	0	1.1	22.1
Silts/Clays	35	-43	1159.7	2.2	46.4	TRUE	1.2	34.8	0.0	0	1.5	30.1	10	0	6.6	56	0	36.7	46	0	1.1	23.2
Silts/Clays	36	-44	1192.3	2.2	48.6	TRUE	1.2	36.1	0.0	0	1.5	31.6	10	0	6.6	59	0	38.2	49	0	1.1	24.3
Silts/Clays	37	-45	1224.9	2.2	50.9	TRUE	1.2	37.3	0.0	0	1.5	33.1	10	0	6.6	61	0	39.6	51	0	1.1	25.4
Sands (2)	38	-46	1260	5.7	56.6	TRUE	1.2	38.5	0.0	0	3.7	36.8	72	0	46.8	129	0	83.6	57	0	2.8	28.3
Sands (2)	39	-47	1297.6	5.9	62.4	TRUE	1.2	39.7	0.0	0	3.8	40.6	72	0	46.8	134	0	87.4	62	0	2.9	31.2
Sands (2)	40	-48	1335.2	6.0	68.5	TRUE	1.2	41.0	0.0	0	3.9	44.5	72	0	46.8	140	0	91.3	68	0	3.0	34.2
Sands (2)	41	-49	1372.8	6.2	74.7	TRUE	1.2	42.2	0.0	0	4.0	48.5	72	0	46.8	147	0	95.3	75	0	3.1	37.3
Sands (2)	42	-50	1410.4	6.4	81.1	TRUE	1.2	43.4	0.0	0	4.1	52.7	72	0	46.8	153	0	99.5	81	0	3.2	40.5
Sands (2)	43	-51	1448	6.5	87.6	TRUE	1.2	44.7	0.0	0	4.3	56.9	72	0	46.8	160	0	103.7	88	0	3.3	43.8
Sands (2)	44	-52	1485.6	6.7	94.3	TRUE	1.2	45.9	0.0	0	4.4	61.3	72	0	46.8	166	0	108.1	94	0	3.4	47.2
Sands (2)	45	-53	1523.2	6.9	101.2	TRUE	1.2	47.1	0.0	0	4.5	65.8	72	0	46.8	173	0	112.6	101	0	3.4	50.6
Sands (2)	46	-54	1560.8	7.1	108.3	TRUE	1.2	48.3	0.0	0	4.6	70.4	72	0	46.8	180	0	117.2	108	0	3.5	54.1
Sands (2)	47	-55	1598.4	7.2	115.5	TRUE	1.2	49.6	0.0	0	4.7	75.1	72	0	46.8	188	0	121.9	116	0	3.6	57.8
Hawthorn Mar	48	-56	1646	8.0	123.5	FALSE	0.0	49.6	8.0	8	5.2	80.3	144	144	93.6	268	152	173.9	124	6	4.0	61.8
Hawthorn Mar	49	-57	1703.6	8.0	131.5	FALSE	0.0	49.6	8.0	16	5.2	85.5	144	144	93.6	276	160	179.1	132	13	4.0	65.8
Hawthorn Mar	50	-58	1761.2	8.0	139.5	FALSE	0.0	49.6	8.0	24	5.2	90.7	144	144	93.6	284	168	184.3	140	19	4.0	69.8
Hawthorn Mar	51	-59	1818.8	8.0	147.5	FALSE	0.0	49.6	8.0	32	5.2	95.9	144	144	93.6	292	176	189.5	148	26	4.0	73.8

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
Hawthorn Mar	52	-60	1876.4	8.0	155.5	FALSE	0.0	49.6	8.0	40	5.2	101.1	144	144	93.6	300	184	194.7	156	32	4.0	77.8
Hawthorn Mar	53	-61	1934	8.0	163.5	FALSE	0.0	49.6	8.0	48	5.2	106.3	144	144	93.6	308	192	199.9	164	38	4.0	81.8
Hawthorn Mar	54	-62	1991.6	8.0	171.5	FALSE	0.0	49.6	8.0	56	5.2	111.5	144	144	93.6	316	200	205.1	172	45	4.0	85.8
Hawthorn Mar	55	-63	2049.2	8.0	179.5	FALSE	0.0	49.6	8.0	64	5.2	116.7	144	144	93.6	324	208	210.3	180	51	4.0	89.8
Hawthorn Mar	56	-64	2106.8	8.0	187.5	FALSE	0.0	49.6	8.0	72	5.2	121.9	144	144	93.6	332	216	215.5	188	58	4.0	93.8
Hawthorn Mar	57	-65	2164.4	8.0	195.5	FALSE	0.0	49.6	8.0	80	5.2	127.1	144	144	93.6	340	224	220.7	196	64	4.0	97.8
Hawthorn Mar	58	-66	2222	8.0	203.5	FALSE	0.0	49.6	8.0	88	5.2	132.3	144	144	93.6	348	232	225.9	204	70	4.0	101.8
Hawthorn Mar	59	-67	2279.6	8.0	211.5	FALSE	0.0	49.6	8.0	96	5.2	137.5	144	144	93.6	356	240	231.1	212	77	4.0	105.8
Hawthorn Mar	60	-68	2337.2	8.0	219.5	FALSE	0.0	49.6	8.0	104	5.2	142.7	144	144	93.6	364	248	236.3	220	83	4.0	109.8
Hawthorn Mar	61	-69	2394.8	8.0	227.5	FALSE	0.0	49.6	8.0	112	5.2	147.9	144	144	93.6	372	256	241.5	228	90	4.0	113.8
Hawthorn Mar	62	-70	2452.4	8.0	235.5	FALSE	0.0	49.6	8.0	120	5.2	153.1	144	144	93.6	380	264	246.7	236	96	4.0	117.8
Hawthorn Mar	63	-71	2510	8.0	243.5	FALSE	0.0	49.6	8.0	128	5.2	158.3	144	144	93.6	388	272	251.9	244	102	4.0	121.8
Hawthorn Mar	64	-72	2567.6	8.0	251.5	FALSE	0.0	49.6	8.0	136	5.2	163.5	144	144	93.6	396	280	257.1	252	109	4.0	125.8
Hawthorn Mar	65	-73	2625.2	8.0	259.5	FALSE	0.0	49.6	8.0	144	5.2	168.7	144	144	93.6	404	288	262.3	260	115	4.0	129.8
Hawthorn Mar	66	-74	2682.8	8.0	267.5	FALSE	0.0	49.6	8.0	152	5.2	173.9	144	144	93.6	412	296	267.5	268	122	4.0	133.8
Hawthorn Mar	67	-75	2740.4	8.0	275.5	FALSE	0.0	49.6	8.0	160	5.2	179.1	144	144	93.6	420	304	272.7	276	128	4.0	137.8
er Group Lime	68	-76	2798	12.0	287.5	FALSE	0.0	49.6	12.0	172	7.8	186.9	216	216	140.4	504	388	327.3	288	138	6.0	143.8
er Group Lime	69	-77	2855.6	12.0	299.5	FALSE	0.0	49.6	12.0	184	7.8	194.7	216	216	140.4	516	400	335.1	300	147	6.0	149.8
er Group Lime	70	-78	2913.2	12.0	311.5	FALSE	0.0	49.6	12.0	196	7.8	202.5	216	216	140.4	528	412	342.9	312	157	6.0	155.8
er Group Lime	71	-79	2970.8	12.0	323.5	FALSE	0.0	49.6	12.0	208	7.8	210.3	216	216	140.4	540	424	350.7	324	166	6.0	161.8
er Group Lime	72	-80	3028.4	12.0	335.5	FALSE	0.0	49.6	12.0	220	7.8	218.1	216	216	140.4	552	436	358.5	336	176	6.0	167.8
er Group Lime	73	-81	3086	12.0	347.5	FALSE	0.0	49.6	12.0	232	7.8	225.9	216	216	140.4	564	448	366.3	348	186	6.0	173.8
er Group Lime	74	-82	3143.6	12.0	359.5	FALSE	0.0	49.6	12.0	244	7.8	233.7	216	216	140.4	576	460	374.1	360	195	6.0	179.8
er Group Lime	75	-83	3201.2	12.0	371.5	FALSE	0.0	49.6	12.0	256	7.8	241.5	216	216	140.4	588	472	381.9	372	205	6.0	185.8
er Group Lime	76	-84	3258.8	12.0	383.5	FALSE	0.0	49.6	12.0	268	7.8	249.3	216	216	140.4	600	484	389.7	384	214	6.0	191.8
er Group Lime	77	-85	3316.4	12.0	395.5	FALSE	0.0	49.6	12.0	280	7.8	257.1	216	216	140.4	612	496	397.5	396	224	6.0	197.8
er Group Lime	78	-86	3374	12.0	407.5	FALSE	0.0	49.6	12.0	292	7.8	264.9	216	216	140.4	624	508	405.3	408	234	6.0	203.8
er Group Lime	79	-87	3431.6	12.0	419.5	FALSE	0.0	49.6	12.0	304	7.8	272.7	216	216	140.4	636	520	413.1	420	243	6.0	209.8
er Group Lime	80	-88	3489.2	12.0	431.5	FALSE	0.0	49.6	12.0	316	7.8	280.5	216	216	140.4	648	532	420.9	432	253	6.0	215.8
er Group Lime	81	-89	3546.8	12.0	443.5	FALSE	0.0	49.6	12.0	328	7.8	288.3	216	216	140.4	660	544	428.7	444	262	6.0	221.8
er Group Lime	82	-90	3604.4	12.0	455.5	FALSE	0.0	49.6	12.0	340	7.8	296.1	216	216	140.4	672	556	436.5	456	272	6.0	227.8
er Group Lime	83	-91	3662	12.0	467.5	FALSE	0.0	49.6	12.0	352	7.8	303.9	216	216	140.4	684	568	444.3	468	282	6.0	233.8
er Group Lime	84	-92	3719.6	12.0	479.5	FALSE	0.0	49.6	12.0	364	7.8	311.7	216	216	140.4	696	580	452.1	480	291	6.0	239.8
er Group Lime	85	-93	3777.2	12.0	491.5	FALSE	0.0	49.6	12.0	376	7.8	319.5	216	216	140.4	708	592	459.9	492	301	6.0	245.8
er Group Lime	86	-94	3834.8	12.0	503.5	FALSE	0.0	49.6	12.0	388	7.8	327.3	216	216	140.4	720	604	467.7	504	310	6.0	251.8
er Group Lime	87	-95	3892.4	12.0	515.5	FALSE	0.0	49.6	12.0	400	7.8	335.1	216	216	140.4	732	616	475.5	516	320	6.0	257.8
er Group Lime	88	-96	3950	12.0	527.5	FALSE	0.0	49.6	12.0	412	7.8	342.9	216	216	140.4	744	628	483.3	528	330	6.0	263.8
er Group Lime	89	-97	4007.6	12.0	539.5	FALSE	0.0	49.6	12.0	424	7.8	350.7	216	216	140.4	756	640	491.1	540	339	6.0	269.8
er Group Lime	90	-98	4065.2	12.0	551.5	FALSE	0.0	49.6	12.0	436	7.8	358.5	216	216	140.4	768	652	498.9	552	349	6.0	275.8
er Group Lime	91	-99	4122.8	12.0	563.5	FALSE	0.0	49.6	12.0	448	7.8	366.3	216	216	140.4	780	664	506.7	564	358	6.0	281.8
er Group Lime	92	-100	4180.4	12.0	575.5	FALSE	0.0	49.6	12.0	460	7.8	374.1	216	216	140.4	792	676	514.5	576	368	6.0	287.8
er Group Lime	93	-101	4238	12.0	587.5	FALSE	0.0	49.6	12.0	472	7.8	381.9	216	216	140.4	804	688	522.3	588	378	6.0	293.8
er Group Lime	94	-102	4295.6	12.0	599.5	FALSE	0.0	49.6	12.0	484	7.8	389.7	216	216	140.4	816	700	530.1	600	387	6.0	299.8
er Group Lime	95	-103	4353.2	12.0	611.5	FALSE	0.0	49.6	12.0	496	7.8	397.5	216	216	140.4	828	712	537.9	612	397	6.0	305.8
er Group Lime	96	-104	4410.8	12.0	623.5	FALSE	0.0	49.6	12.0	508	7.8	405.3	216	216	140.4	840	724	545.7	624	406	6.0	311.8
er Group Lime	97	-105	4468.4	12.0	635.5	FALSE	0.0	49.6	12.0	520	7.8	413.1	216	216	140.4	852	736	553.5	636	416	6.0	317.8
er Group Lime	98	-106	4526	12.0	647.5	FALSE	0.0	49.6	12.0	532	7.8	420.9	216	216	140.4	864	748	561.3	648	426	6.0	323.8
er Group Lime	99	-107	4583.6	12.0	659.5	FALSE	0.0	49.6	12.0	544	7.8	428.7	216	216	140.4	876	760	569.1	660	435	6.0	329.8
er Group Lime	100	-108	4641.2	12.0	671.5	FALSE	0.0	49.6	12.0	556	7.8	436.5	216	216	140.4	888	772	576.9	672	445	6.0	335.8
er Group Lime	101	-109	4698.8	12.0	683.5	FALSE	0.0	49.6	12.0	568	7.8	444.3	216	216	140.4	900	784	584.7	684	454	6.0	341.8
er Group Lime	102	-110	4756.4	12.0	695.5	FALSE	0.0	49.6	12.0	580	7.8	452.1	216	216	140.4	912	796	592.5	696	464	6.0	347.8

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
er Group Lime	103	-111	4814	12.0	707.5	FALSE	0.0	49.6	12.0	592	7.8	459.9	216	216	140.4	924	808	600.3	708	474	6.0	353.8
er Group Lime	104	-112	4871.6	12.0	719.5	FALSE	0.0	49.6	12.0	604	7.8	467.7	216	216	140.4	936	820	608.1	720	483	6.0	359.8
er Group Lime	105	-113	4929.2	12.0	731.5	FALSE	0.0	49.6	12.0	616	7.8	475.5	216	216	140.4	948	832	615.9	732	493	6.0	365.8
er Group Lime	106	-114	4986.8	12.0	743.5	FALSE	0.0	49.6	12.0	628	7.8	483.3	216	216	140.4	960	844	623.7	744	502	6.0	371.8
er Group Lime	107	-115	5044.4	12.0	755.5	FALSE	0.0	49.6	12.0	640	7.8	491.1	216	216	140.4	972	856	631.5	756	512	6.0	377.8
er Group Lime	108	-116	5102	12.0	767.5	FALSE	0.0	49.6	12.0	652	7.8	498.9	216	216	140.4	984	868	639.3	768	522	6.0	383.8
er Group Lime	109	-117	5159.6	12.0	779.5	FALSE	0.0	49.6	12.0	664	7.8	506.7	216	216	140.4	996	880	647.1	780	531	6.0	389.8
er Group Lime	110	-118	5217.2	12.0	791.5	FALSE	0.0	49.6	12.0	676	7.8	514.5	216	216	140.4	1008	892	654.9	792	541	6.0	395.8
er Group Lime	111	-119	5274.8	12.0	803.5	FALSE	0.0	49.6	12.0	688	7.8	522.3	216	216	140.4	1020	904	662.7	804	550	6.0	401.8
er Group Lime	112	-120	5332.4	12.0	815.5	FALSE	0.0	49.6	12.0	700	7.8	530.1	216	216	140.4	1032	916	670.5	816	560	6.0	407.8
er Group Lime	113	-121	5390	12.0	827.5	FALSE	0.0	49.6	12.0	712	7.8	537.9	216	216	140.4	1044	928	678.3	828	570	6.0	413.8
er Group Lime	114	-122	5447.6	12.0	839.5	FALSE	0.0	49.6	12.0	724	7.8	545.7	216	216	140.4	1056	940	686.1	840	579	6.0	419.8
er Group Lime	115	-123	5505.2	12.0	851.5	FALSE	0.0	49.6	12.0	736	7.8	553.5	216	216	140.4	1068	952	693.9	852	589	6.0	425.8
er Group Lime	116	-124	5562.8	12.0	863.5	FALSE	0.0	49.6	12.0	748	7.8	561.3	216	216	140.4	1080	964	701.7	864	598	6.0	431.8
er Group Lime	117	-125	5620.4	12.0	875.5	FALSE	0.0	49.6	12.0	760	7.8	569.1	216	216	140.4	1092	976	709.5	876	608	6.0	437.8
er Group Lime	118	-126	5678	12.0	887.5	FALSE	0.0	49.6	12.0	772	7.8	576.9	216	216	140.4	1104	988	717.3	888	618	6.0	443.8
er Group Lime	119	-127	5735.6	12.0	899.5	FALSE	0.0	49.6	12.0	784	7.8	584.7	216	216	140.4	1116	1000	725.1	900	627	6.0	449.8
er Group Lime	120	-128	5793.2	12.0	911.5	FALSE	0.0	49.6	12.0	796	7.8	592.5	216	216	140.4	1128	1012	732.9	912	637	6.0	455.8
er Group Lime	121	-129	5850.8	12.0	923.5	FALSE	0.0	49.6	12.0	808	7.8	600.3	216	216	140.4	1140	1024	740.7	924	646	6.0	461.8
er Group Lime	122	-130	5908.4	12.0	935.5	FALSE	0.0	49.6	12.0	820	7.8	608.1	216	216	140.4	1152	1036	748.5	936	656	6.0	467.8
er Group Lime	123	-131	5966	12.0	947.5	FALSE	0.0	49.6	12.0	832	7.8	615.9	216	216	140.4	1164	1048	756.3	948	666	6.0	473.8
er Group Lime	124	-132	6023.6	12.0	959.5	FALSE	0.0	49.6	12.0	844	7.8	623.7	216	216	140.4	1176	1060	764.1	960	675	6.0	479.8
er Group Lime	125	-133	6081.2	12.0	971.5	FALSE	0.0	49.6	12.0	856	7.8	631.5	216	216	140.4	1188	1072	771.9	972	685	6.0	485.8
er Group Lime	126	-134	6138.8	12.0	983.5	FALSE	0.0	49.6	12.0	868	7.8	639.3	216	216	140.4	1200	1084	779.7	984	694	6.0	491.8
er Group Lime	127	-135	6196.4	12.0	995.5	FALSE	0.0	49.6	12.0	880	7.8	647.1	216	216	140.4	1212	1096	787.5	996	704	6.0	497.8
er Group Lime	128	-136	6254	12.0	1007.5	FALSE	0.0	49.6	12.0	892	7.8	654.9	216	216	140.4	1224	1108	795.3	1008	714	6.0	503.8
er Group Lime	129	-137	6311.6	12.0	1019.5	FALSE	0.0	49.6	12.0	904	7.8	662.7	216	216	140.4	1236	1120	803.1	1020	723	6.0	509.8
er Group Lime	130	-138	6369.2	12.0	1031.5	FALSE	0.0	49.6	12.0	916	7.8	670.5	216	216	140.4	1248	1132	810.9	1032	733	6.0	515.8
er Group Lime	131	-139	6426.8	12.0	1043.5	FALSE	0.0	49.6	12.0	928	7.8	678.3	216	216	140.4	1260	1144	818.7	1044	742	6.0	521.8
er Group Lime	132	-140	6484.4	12.0	1055.5	FALSE	0.0	49.6	12.0	940	7.8	686.1	216	216	140.4	1272	1156	826.5	1056	752	6.0	527.8
er Group Lime	133	-141	6542	12.0	1067.5	FALSE	0.0	49.6	12.0	952	7.8	693.9	216	216	140.4	1284	1168	834.3	1068	762	6.0	533.8
er Group Lime	134	-142	6599.6	12.0	1079.5	FALSE	0.0	49.6	12.0	964	7.8	701.7	216	216	140.4	1296	1180	842.1	1080	771	6.0	539.8
er Group Lime	135	-143	6657.2	12.0	1091.5	FALSE	0.0	49.6	12.0	976	7.8	709.5	216	216	140.4	1308	1192	849.9	1092	781	6.0	545.8
er Group Lime	136	-144	6714.8	12.0	1103.5	FALSE	0.0	49.6	12.0	988	7.8	717.3	216	216	140.4	1320	1204	857.7	1104	790	6.0	551.8
er Group Lime	137	-145	6772.4	12.0	1115.5	FALSE	0.0	49.6	12.0	1000	7.8	725.1	216	216	140.4	1332	1216	865.5	1116	800	6.0	557.8
er Group Lime	138	-146	6830	12.0	1127.5	FALSE	0.0	49.6	12.0	1012	7.8	732.9	216	216	140.4	1344	1228	873.3	1128	810	6.0	563.8
er Group Lime	139	-147	6887.6	12.0	1139.5	FALSE	0.0	49.6	12.0	1024	7.8	740.7	216	216	140.4	1356	1240	881.1	1140	819	6.0	569.8
er Group Lime	140	-148	6945.2	12.0	1151.5	FALSE	0.0	49.6	12.0	1036	7.8	748.5	216	216	140.4	1368	1252	888.9	1152	829	6.0	575.8
er Group Lime	141	-149	7002.8	12.0	1163.5	FALSE	0.0	49.6	12.0	1048	7.8	756.3	216	216	140.4	1380	1264	896.7	1164	838	6.0	581.8
er Group Lime	142	-150	7060.4	12.0	1175.5	FALSE	0.0	49.6	12.0	1060	7.8	764.1	216	216	140.4	1392	1276	904.5	1176	848	6.0	587.8
er Group Lime	143	-151	7118	12.0	1187.5	FALSE	0.0	49.6	12.0	1072	7.8	771.9	216	216	140.4	1404	1288	912.3	1188	858	6.0	593.8
er Group Lime	144	-152	7175.6	12.0	1199.5	FALSE	0.0	49.6	12.0	1084	7.8	779.7	216	216	140.4	1416	1300	920.1	1200	867	6.0	599.8
er Group Lime	145	-153	7233.2	12.0	1211.5	FALSE	0.0	49.6	12.0	1096	7.8	787.5	216	216	140.4	1428	1312	927.9	1212	877	6.0	605.8
er Group Lime	146	-154	7290.8	12.0	1223.5	FALSE	0.0	49.6	12.0	1108	7.8	795.3	216	216	140.4	1440	1324	935.7	1224	886	6.0	611.8
er Group Lime	147	-155	7348.4	12.0	1235.5	FALSE	0.0	49.6	12.0	1120	7.8	803.1	216	216	140.4	1452	1336	943.5	1236	896	6.0	617.8
er Group Lime	148	-156	7406	12.0	1247.5	FALSE	0.0	49.6	12.0	1132	7.8	810.9	216	216	140.4	1464	1348	951.3	1248	906	6.0	623.8
er Group Lime	149	-157	7463.6	12.0	1259.5	FALSE	0.0	49.6	12.0	1144	7.8	818.7	216	216	140.4	1476	1360	959.1	1260	915	6.0	629.8
er Group Lime	150	-158	7521.2	12.0	1271.5	FALSE	0.0	49.6	12.0	1156	7.8	826.5	216	216	140.4	1488	1372	966.9	1272	925	6.0	635.8
er Group Lime	151	-159	7578.8	12.0	1283.5	FALSE	0.0	49.6	12.0	1168	7.8	834.3	216	216	140.4	1500	1384	974.7	1284	934	6.0	641.8
er Group Lime	152	-160	7636.4	12.0	1295.5	FALSE	0.0	49.6	12.0	1180	7.8	842.1	216	216	140.4	1512	1396	982.5	1296	944	6.0	647.8
er Group Lime	153	-161	7694	12.0	1307.5	FALSE	0.0	49.6	12.0	1192	7.8	849.9	216	216	140.4	1524	1408	990.3	1308	954	6.0	653.8

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
er Group Lime	154	-162	7751.6	12.0	1319.5	FALSE	0.0	49.6	12.0	1204	7.8	857.7	216	216	140.4	1536	1420	998.1	1320	963	6.0	659.8
er Group Lime	155	-163	7809.2	12.0	1331.5	FALSE	0.0	49.6	12.0	1216	7.8	865.5	216	216	140.4	1548	1432	1005.9	1332	973	6.0	665.8
er Group Lime	156	-164	7866.8	12.0	1343.5	FALSE	0.0	49.6	12.0	1228	7.8	873.3	216	216	140.4	1560	1444	1013.7	1344	982	6.0	671.8
er Group Lime	157	-165	7924.4	12.0	1355.5	FALSE	0.0	49.6	12.0	1240	7.8	881.1	216	216	140.4	1572	1456	1021.5	1356	992	6.0	677.8
er Group Lime	158	-166	7982	12.0	1367.5	FALSE	0.0	49.6	12.0	1252	7.8	888.9	216	216	140.4	1584	1468	1029.3	1368	1002	6.0	683.8
er Group Lime	159	-167	8039.6	12.0	1379.5	FALSE	0.0	49.6	12.0	1264	7.8	896.7	216	216	140.4	1596	1480	1037.1	1380	1011	6.0	689.8
er Group Lime	160	-168	8097.2	12.0	1391.5	FALSE	0.0	49.6	12.0	1276	7.8	904.5	216	216	140.4	1608	1492	1044.9	1392	1021	6.0	695.8
er Group Lime	161	-169	8154.8	12.0	1403.5	FALSE	0.0	49.6	12.0	1288	7.8	912.3	216	216	140.4	1620	1504	1052.7	1404	1030	6.0	701.8
er Group Lime	162	-170	8212.4	12.0	1415.5	FALSE	0.0	49.6	12.0	1300	7.8	920.1	216	216	140.4	1632	1516	1060.5	1416	1040	6.0	707.8
er Group Lime	163	-171	8270	12.0	1427.5	FALSE	0.0	49.6	12.0	1312	7.8	927.9	216	216	140.4	1644	1528	1068.3	1428	1050	6.0	713.8
er Group Lime	164	-172	8327.6	12.0	1439.5	FALSE	0.0	49.6	12.0	1324	7.8	935.7	216	216	140.4	1656	1540	1076.1	1440	1059	6.0	719.8
er Group Lime	165	-173	8385.2	12.0	1451.5	FALSE	0.0	49.6	12.0	1336	7.8	943.5	216	216	140.4	1668	1552	1083.9	1452	1069	6.0	725.8
er Group Lime	166	-174	8442.8	12.0	1463.5	FALSE	0.0	49.6	12.0	1348	7.8	951.3	216	216	140.4	1680	1564	1091.7	1464	1078	6.0	731.8
er Group Lime	167	-175	8500.4	12.0	1475.5	FALSE	0.0	49.6	12.0	1360	7.8	959.1	216	216	140.4	1692	1576	1099.5	1476	1088	6.0	737.8
er Group Lime	168	-176	8558	12.0	1487.5	FALSE	0.0	49.6	12.0	1372	7.8	966.9	216	216	140.4	1704	1588	1107.3	1488	1098	6.0	743.8
er Group Lime	169	-177	8615.6	12.0	1499.5	FALSE	0.0	49.6	12.0	1384	7.8	974.7	216	216	140.4	1716	1600	1115.1	1500	1107	6.0	749.8
er Group Lime	170	-178	8673.2	12.0	1511.5	FALSE	0.0	49.6	12.0	1396	7.8	982.5	216	216	140.4	1728	1612	1122.9	1512	1117	6.0	755.8
er Group Lime	171	-179	8730.8	12.0	1523.5	FALSE	0.0	49.6	12.0	1408	7.8	990.3	216	216	140.4	1740	1624	1130.7	1524	1126	6.0	761.8
er Group Lime	172	-180	8788.4	12.0	1535.5	FALSE	0.0	49.6	12.0	1420	7.8	998.1	216	216	140.4	1752	1636	1138.5	1536	1136	6.0	767.8
er Group Lime	173	-181	8846	12.0	1547.5	FALSE	0.0	49.6	12.0	1432	7.8	1005.9	216	216	140.4	1764	1648	1146.3	1548	1146	6.0	773.8
er Group Lime	174	-182	8903.6	12.0	1559.5	FALSE	0.0	49.6	12.0	1444	7.8	1013.7	216	216	140.4	1776	1660	1154.1	1560	1155	6.0	779.8
er Group Lime	175	-183	8961.2	12.0	1571.5	FALSE	0.0	49.6	12.0	1456	7.8	1021.5	216	216	140.4	1788	1672	1161.9	1572	1165	6.0	785.8
er Group Lime	176	-184	9018.8	12.0	1583.5	FALSE	0.0	49.6	12.0	1468	7.8	1029.3	216	216	140.4	1800	1684	1169.7	1584	1174	6.0	791.8
er Group Lime	177	-185	9076.4	12.0	1595.5	FALSE	0.0	49.6	12.0	1480	7.8	1037.1	216	216	140.4	1812	1696	1177.5	1596	1184	6.0	797.8
er Group Lime	178	-186	9134	12.0	1607.5	FALSE	0.0	49.6	12.0	1492	7.8	1044.9	216	216	140.4	1824	1708	1185.3	1608	1194	6.0	803.8
er Group Lime	179	-187	9191.6	12.0	1619.5	FALSE	0.0	49.6	12.0	1504	7.8	1052.7	216	216	140.4	1836	1720	1193.1	1620	1203	6.0	809.8
er Group Lime	180	-188	9249.2	12.0	1631.5	FALSE	0.0	49.6	12.0	1516	7.8	1060.5	216	216	140.4	1848	1732	1200.9	1632	1213	6.0	815.8
er Group Lime	181	-189	9306.8	12.0	1643.5	FALSE	0.0	49.6	12.0	1528	7.8	1068.3	216	216	140.4	1860	1744	1208.7	1644	1222	6.0	821.8
er Group Lime	182	-190	9364.4	12.0	1655.5	FALSE	0.0	49.6	12.0	1540	7.8	1076.1	216	216	140.4	1872	1756	1216.5	1656	1232	6.0	827.8
er Group Lime	183	-191	9422	12.0	1667.5	FALSE	0.0	49.6	12.0	1552	7.8	1083.9	216	216	140.4	1884	1768	1224.3	1668	1242	6.0	833.8
er Group Lime	184	-192	9479.6	12.0	1679.5	FALSE	0.0	49.6	12.0	1564	7.8	1091.7	216	216	140.4	1896	1780	1232.1	1680	1251	6.0	839.8
er Group Lime	185	-193	9537.2	12.0	1691.5	FALSE	0.0	49.6	12.0	1576	7.8	1099.5	216	216	140.4	1908	1792	1239.9	1692	1261	6.0	845.8
er Group Lime	186	-194	9594.8	12.0	1703.5	FALSE	0.0	49.6	12.0	1588	7.8	1107.3	216	216	140.4	1920	1804	1247.7	1704	1270	6.0	851.8
er Group Lime	187	-195	9652.4	12.0	1715.5	FALSE	0.0	49.6	12.0	1600	7.8	1115.1	216	216	140.4	1932	1816	1255.5	1716	1280	6.0	857.8
er Group Lime	188	-196	9710	12.0	1727.5	FALSE	0.0	49.6	12.0	1612	7.8	1122.9	216	216	140.4	1944	1828	1263.3	1728	1290	6.0	863.8
er Group Lime	189	-197	9767.6	12.0	1739.5	FALSE	0.0	49.6	12.0	1624	7.8	1130.7	216	216	140.4	1956	1840	1271.1	1740	1299	6.0	869.8
er Group Lime	190	-198	9825.2	12.0	1751.5	FALSE	0.0	49.6	12.0	1636	7.8	1138.5	216	216	140.4	1968	1852	1278.9	1752	1309	6.0	875.8
er Group Lime	191	-199	9882.8	12.0	1763.5	FALSE	0.0	49.6	12.0	1648	7.8	1146.3	216	216	140.4	1980	1864	1286.7	1764	1318	6.0	881.8
er Group Lime	192	-200	9940.4	12.0	1775.5	FALSE	0.0	49.6	12.0	1660	7.8	1154.1	216	216	140.4	1992	1876	1294.5	1776	1328	6.0	887.8
er Group Lime	193	-201	9998	12.0	1787.5	FALSE	0.0	49.6	12.0	1672	7.8	1161.9	216	216	140.4	2004	1888	1302.3	1788	1338	6.0	893.8
er Group Lime	194	-202	10055.6	12.0	1799.5	FALSE	0.0	49.6	12.0	1684	7.8	1169.7	216	216	140.4	2016	1900	1310.1	1800	1347	6.0	899.8
er Group Lime	195	-203	10113.2	12.0	1811.5	FALSE	0.0	49.6	12.0	1696	7.8	1177.5	216	216	140.4	2028	1912	1317.9	1812	1357	6.0	905.8
er Group Lime	196	-204	10170.8	12.0	1823.5	FALSE	0.0	49.6	12.0	1708	7.8	1185.3	216	216	140.4	2040	1924	1325.7	1824	1366	6.0	911.8
er Group Lime	197	-205	10228.4	12.0	1835.5	FALSE	0.0	49.6	12.0	1720	7.8	1193.1	216	216	140.4	2052	1936	1333.5	1836	1376	6.0	917.8
er Group Lime	198	-206	10286	12.0	1847.5	FALSE	0.0	49.6	12.0	1732	7.8	1200.9	216	216	140.4	2064	1948	1341.3	1848	1386	6.0	923.8
er Group Lime	199	-207	10343.6	12.0	1859.5	FALSE	0.0	49.6	12.0	1744	7.8	1208.7	216	216	140.4	2076	1960	1349.1	1860	1395	6.0	929.8
er Group Lime	200	-208	10401.2	12.0	1871.5	FALSE	0.0	49.6	12.0	1756	7.8	1216.5	216	216	140.4	2088	1972	1356.9	1872	1405	6.0	935.8

AXIAL PILE CAPACITY

Project Information

Project:	Harbor River Bridge	Pile Tip Area (square feet):	4.00
Owner:	SCDOT	Pile Perimeter (ft):	8.00
Job Number:	18461-007-01	Side and End Friction Resistance Factor α Method	0.65
Analysis by:	HPC	Side and End Friction Resistance Factor Nordlund/Thurman Method	0.65
Date/Time:	10/16/2017 11:48	Uplift Side Friction Resistance Factor α Method	0.5
Run Designation:	West Overbank - Half Scour	Uplift Friction Resistance Factor Nordlund/Thurman Method	0.5
Pile Diameter (ft):	2.0	Depth to Top of Liquefied Layer (ft):	0
Ground Surface Elevation (ft):	-4	Depth to Bottom of Liquefied Layer (ft):	51
Pile Type:	Square Precast Concrete	Residual Shear Strength of Liquefiable Layer (psf):	169
Checked by:	ZAS	Enter "1" to calculate downdrag from residual shear strength, "2" average of residual & non-liqufied, "3" non-liquefied strength parameters	1
		Calculated Unfactored Downdrag Load (kips)[4]:	61.6

Soil Profile

Soil Type	Depth at Bottom of Soil Unit (feet)	Bouyant Unit Weight (pcf) (total weight above GWT)	ϕ (degrees)	S_u, Undrained Shear Strength (psf)	α, Empirical Adhesion Factor	Friction Ratio, C_f	Earth Pressure Coefficient, K_δ
Sands (1)	11	37.6	29			0.95	1.15
Silts/Clays	21	32.6		150	1		
Silts/Clays	31	32.6		235	1		
Silts/Clays	41	32.6		319	1		
Sands (2)	51	37.6	31			0.95	1.15
Hawthorn Marl	71	57.6		4000	0.25		
Cooper Group Limestone	200	57.6		6000	0.25		

Notes:
1. Spreadsheet programed for α method for undrained shear strength and Nordlund/Thurman Method for friction angle
2. Refer to AASHTO LRFD Section 10.7.3.8.6b to determine α
3. Refer to AASHTO LRFD Section 10.7.3.8.6f to determine C_f and K_δ
4. The structural engineer should include the unfactored downdrag load in accordance with Section 3.11.8 of the AASHTO LRFD Manual

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
Sands (1)	1	-5	18.8	0.1	0.1	TRUE	0.1	0.1	0.0	0	0.1	0.1	1	0	0.9	1	0	0.9	0	0	0.0	0.0
Sands (1)	2	-6	56.4	0.2	0.3	TRUE	0.2	0.3	0.0	0	0.2	0.2	4	0	2.7	4	0	2.9	0	0	0.1	0.2
Sands (1)	3	-7	94	0.4	0.7	TRUE	0.4	0.7	0.0	0	0.3	0.5	7	0	4.5	8	0	4.9	1	0	0.2	0.4
Sands (1)	4	-8	131.6	0.6	1.3	TRUE	0.6	1.3	0.0	0	0.4	0.8	10	0	6.2	11	0	7.0	1	0	0.3	0.6
Sands (1)	5	-9	169.2	0.7	2.0	TRUE	0.7	2.0	0.0	0	0.5	1.3	12	0	8.0	14	0	9.3	2	0	0.4	1.0
Sands (1)	6	-10	206.8	0.9	2.9	TRUE	0.9	2.9	0.0	0	0.6	1.9	15	0	9.6	18	0	11.5	3	0	0.4	1.4
Sands (1)	7	-11	244.4	1.0	3.9	TRUE	1.0	3.9	0.0	0	0.7	2.5	18	0	11.4	21	0	13.9	4	0	0.5	2.0
Sands (1)	8	-12	282	1.2	5.1	TRUE	1.2	5.1	0.0	0	0.8	3.3	20	0	13.0	25	0	16.3	5	0	0.6	2.6
Sands (1)	9	-13	319.6	1.4	6.5	TRUE	1.3	6.5	0.0	0	0.9	4.2	23	0	14.7	29	0	18.9	6	0	0.7	3.2
Sands (1)	10	-14	357.2	1.5	8.0	TRUE	1.3	7.8	0.0	0	1.0	5.2	25	0	16.3	33	0	21.5	8	0	0.8	4.0
Sands (1)	11	-15	394.8	1.7	9.7	TRUE	1.3	9.2	0.0	0	1.1	6.3	28	0	18.0	37	0	24.3	10	0	0.8	4.8
Silts/Clays	12	-16	429.9	1.2	10.9	TRUE	1.2	10.4	0.0	0	0.8	7.1	5	0	3.5	16	0	10.6	11	0	0.6	5.4
Silts/Clays	13	-17	462.5	1.2	12.1	TRUE	1.2	11.6	0.0	0	0.8	7.9	5	0	3.5	17	0	11.4	12	0	0.6	6.0
Silts/Clays	14	-18	495.1	1.2	13.3	TRUE	1.2	12.8	0.0	0	0.8	8.6	5	0	3.5	19	0	12.1	13	0	0.6	6.6
Silts/Clays	15	-19	527.7	1.2	14.5	TRUE	1.2	14.0	0.0	0	0.8	9.4	5	0	3.5	20	0	12.9	14	0	0.6	7.2
Silts/Clays	16	-20	560.3	1.2	15.7	TRUE	1.2	15.2	0.0	0	0.8	10.2	5	0	3.5	21	0	13.7	16	0	0.6	7.8
Silts/Clays	17	-21	592.9	1.2	16.9	TRUE	1.2	16.4	0.0	0	0.8	11.0	5	0	3.5	22	0	14.5	17	0	0.6	8.4
Silts/Clays	18	-22	625.5	1.2	18.1	TRUE	1.2	17.6	0.0	0	0.8	11.7	5	0	3.5	23	0	15.3	18	0	0.6	9.0
Silts/Clays	19	-23	658.1	1.2	19.3	TRUE	1.2	18.8	0.0	0	0.8	12.5	5	0	3.5	25	0	16.0	19	0	0.6	9.6
Silts/Clays	20	-24	690.7	1.2	20.5	TRUE	1.2	20.0	0.0	0	0.8	13.3	5	0	3.5	26	0	16.8	20	0	0.6	10.2
Silts/Clays	21	-25	723.3	1.2	21.7	TRUE	1.2	21.2	0.0	0	0.8	14.1	5	0	3.5	27	0	17.6	22	0	0.6	10.8
Silts/Clays	22	-26	755.9	1.9	23.6	TRUE	1.3	22.5	0.0	0	1.2	15.3	8	0	5.5	32	0	20.8	24	0	0.9	11.8
Silts/Clays	23	-27	788.5	1.9	25.4	TRUE	1.3	23.9	0.0	0	1.2	16.5	8	0	5.5	34	0	22.0	25	0	0.9	12.7
Silts/Clays	24	-28	821.1	1.9	27.3	TRUE	1.3	25.2	0.0	0	1.2	17.7	8	0	5.5	36	0	23.2	27	0	0.9	13.7
Silts/Clays	25	-29	853.7	1.9	29.2	TRUE	1.3	26.6	0.0	0	1.2	19.0	8	0	5.5	38	0	24.5	29	0	0.9	14.6
Silts/Clays	26	-30	886.3	1.9	31.1	TRUE	1.3	27.9	0.0	0	1.2	20.2	8	0	5.5	40	0	25.7	31	0	0.9	15.5
Silts/Clays	27	-31	918.9	1.9	32.9	TRUE	1.3	29.3	0.0	0	1.2	21.4	8	0	5.5	41	0	26.9	33	0	0.9	16.5
Silts/Clays	28	-32	951.5	1.9	34.8	TRUE	1.3	30.6	0.0	0	1.2	22.6	8	0	5.5	43	0	28.1	35	0	0.9	17.4
Silts/Clays	29	-33	984.1	1.9	36.7	TRUE	1.3	31.9	0.0	0	1.2	23.8	8	0	5.5	45	0	29.3	37	0	0.9	18.3
Silts/Clays	30	-34	1016.7	1.9	38.6	TRUE	1.3	33.3	0.0	0	1.2	25.1	8	0	5.5	47	0	30.6	39	0	0.9	19.3
Silts/Clays	31	-35	1049.3	1.9	40.4	TRUE	1.3	34.6	0.0	0	1.2	26.3	8	0	5.5	49	0	31.8	40	0	0.9	20.2
Silts/Clays	32	-36	1081.9	2.6	43.0	TRUE	1.3	36.0	0.0	0	1.7	28.0	11	0	7.5	55	0	35.4	43	0	1.3	21.5
Silts/Clays	33	-37	1114.5	2.6	45.6	TRUE	1.3	37.3	0.0	0	1.7	29.6	11	0	7.5	57	0	37.1	46	0	1.3	22.8
Silts/Clays	34	-38	1147.1	2.6	48.1	TRUE	1.3	38.7	0.0	0	1.7	31.3	11	0	7.5	60	0	38.7	48	0	1.3	24.1
Silts/Clays	35	-39	1179.7	2.6	50.7	TRUE	1.3	40.0	0.0	0	1.7	32.9	11	0	7.5	62	0	40.4	51	0	1.3	25.3
Silts/Clays	36	-40	1212.3	2.6	53.2	TRUE	1.3	41.4	0.0	0	1.7	34.6	11	0	7.5	65	0	42.1	53	0	1.3	26.6
Silts/Clays	37	-41	1244.9	2.6	55.8	TRUE	1.3	42.7	0.0	0	1.7	36.3	11	0	7.5	67	0	43.7	56	0	1.3	27.9
Silts/Clays	38	-42	1277.5	2.6	58.3	TRUE	1.3	44.1	0.0	0	1.7	37.9	11	0	7.5	70	0	45.4	58	0	1.3	29.2
Silts/Clays	39	-43	1310.1	2.6	60.9	TRUE	1.3	45.4	0.0	0	1.7	39.6	11	0	7.5	72	0	47.1	61	0	1.3	30.4
Silts/Clays	40	-44	1342.7	2.6	63.4	TRUE	1.3	46.8	0.0	0	1.7	41.2	11	0	7.5	75	0	48.7	63	0	1.3	31.7
Silts/Clays	41	-45	1375.3	2.6	66.0	TRUE	1.3	48.1	0.0	0	1.7	42.9	11	0	7.5	78	0	50.4	66	0	1.3	33.0
Sands (2)	42	-46	1410.4	6.4	72.4	TRUE	1.3	49.5	0.0	0	4.1	47.0	72	0	46.8	144	0	93.8	72	0	3.2	36.2
Sands (2)	43	-47	1448	6.5	78.9	TRUE	1.3	50.8	0.0	0	4.3	51.3	72	0	46.8	151	0	98.1	79	0	3.3	39.5
Sands (2)	44	-48	1485.6	6.7	85.7	TRUE	1.3	52.2	0.0	0	4.4	55.7	72	0	46.8	158	0	102.5	86	0	3.4	42.8
Sands (2)	45	-49	1523.2	6.9	92.5	TRUE	1.3	53.5	0.0	0	4.5	60.2	72	0	46.8	165	0	107.0	93	0	3.4	46.3
Sands (2)	46	-50	1560.8	7.1	99.6	TRUE	1.3	54.9	0.0	0	4.6	64.7	72	0	46.8	172	0	111.5	100	0	3.5	49.8
Sands (2)	47	-51	1598.4	7.2	106.8	TRUE	1.3	56.2	0.0	0	4.7	69.4	72	0	46.8	179	0	116.2	107	0	3.6	53.4
Sands (2)	48	-52	1636	7.4	114.2	TRUE	1.3	57.6	0.0	0	4.8	74.3	72	0	46.8	186	0	121.1	114	0	3.7	57.1
Sands (2)	49	-53	1673.6	7.6	121.8	TRUE	1.3	58.9	0.0	0	4.9	79.2	72	0	46.8	194	0	126.0	122	0	3.8	60.9
Sands (2)	50	-54	1711.2	7.7	129.5	TRUE	1.3	60.3	0.0	0	5.0	84.2	72	0	46.8	202	0	131.0	130	0	3.9	64.8
Sands (2)	51	-55	1748.8	7.9	137.5	TRUE	1.3	61.6	0.0	0	5.1	89.3	72	0	46.8	209	0	136.1	137	0	4.0	68.7

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
Hawthorn Mar	52	-56	1796.4	8.0	145.5	FALSE	0.0	61.6	8.0	8	5.2	94.5	144	144	93.6	289	152	188.1	145	6	4.0	72.7
Hawthorn Mar	53	-57	1854	8.0	153.5	FALSE	0.0	61.6	8.0	16	5.2	99.7	144	144	93.6	297	160	193.3	153	13	4.0	76.7
Hawthorn Mar	54	-58	1911.6	8.0	161.5	FALSE	0.0	61.6	8.0	24	5.2	104.9	144	144	93.6	305	168	198.5	161	19	4.0	80.7
Hawthorn Mar	55	-59	1969.2	8.0	169.5	FALSE	0.0	61.6	8.0	32	5.2	110.1	144	144	93.6	313	176	203.7	169	26	4.0	84.7
Hawthorn Mar	56	-60	2026.8	8.0	177.5	FALSE	0.0	61.6	8.0	40	5.2	115.3	144	144	93.6	321	184	208.9	177	32	4.0	88.7
Hawthorn Mar	57	-61	2084.4	8.0	185.5	FALSE	0.0	61.6	8.0	48	5.2	120.5	144	144	93.6	329	192	214.1	185	38	4.0	92.7
Hawthorn Mar	58	-62	2142	8.0	193.5	FALSE	0.0	61.6	8.0	56	5.2	125.7	144	144	93.6	337	200	219.3	193	45	4.0	96.7
Hawthorn Mar	59	-63	2199.6	8.0	201.5	FALSE	0.0	61.6	8.0	64	5.2	130.9	144	144	93.6	345	208	224.5	201	51	4.0	100.7
Hawthorn Mar	60	-64	2257.2	8.0	209.5	FALSE	0.0	61.6	8.0	72	5.2	136.1	144	144	93.6	353	216	229.7	209	58	4.0	104.7
Hawthorn Mar	61	-65	2314.8	8.0	217.5	FALSE	0.0	61.6	8.0	80	5.2	141.3	144	144	93.6	361	224	234.9	217	64	4.0	108.7
Hawthorn Mar	62	-66	2372.4	8.0	225.5	FALSE	0.0	61.6	8.0	88	5.2	146.5	144	144	93.6	369	232	240.1	225	70	4.0	112.7
Hawthorn Mar	63	-67	2430	8.0	233.5	FALSE	0.0	61.6	8.0	96	5.2	151.7	144	144	93.6	377	240	245.3	233	77	4.0	116.7
Hawthorn Mar	64	-68	2487.6	8.0	241.5	FALSE	0.0	61.6	8.0	104	5.2	156.9	144	144	93.6	385	248	250.5	241	83	4.0	120.7
Hawthorn Mar	65	-69	2545.2	8.0	249.5	FALSE	0.0	61.6	8.0	112	5.2	162.1	144	144	93.6	393	256	255.7	249	90	4.0	124.7
Hawthorn Mar	66	-70	2602.8	8.0	257.5	FALSE	0.0	61.6	8.0	120	5.2	167.3	144	144	93.6	401	264	260.9	257	96	4.0	128.7
Hawthorn Mar	67	-71	2660.4	8.0	265.5	FALSE	0.0	61.6	8.0	128	5.2	172.5	144	144	93.6	409	272	266.1	265	102	4.0	132.7
Hawthorn Mar	68	-72	2718	8.0	273.5	FALSE	0.0	61.6	8.0	136	5.2	177.7	144	144	93.6	417	280	271.3	273	109	4.0	136.7
Hawthorn Mar	69	-73	2775.6	8.0	281.5	FALSE	0.0	61.6	8.0	144	5.2	182.9	144	144	93.6	425	288	276.5	281	115	4.0	140.7
Hawthorn Mar	70	-74	2833.2	8.0	289.5	FALSE	0.0	61.6	8.0	152	5.2	188.1	144	144	93.6	433	296	281.7	289	122	4.0	144.7
Hawthorn Mar	71	-75	2890.8	8.0	297.5	FALSE	0.0	61.6	8.0	160	5.2	193.3	144	144	93.6	441	304	286.9	297	128	4.0	148.7
er Group Lime	72	-76	2948.4	12.0	309.5	FALSE	0.0	61.6	12.0	172	7.8	201.1	216	216	140.4	525	388	341.5	309	138	6.0	154.7
er Group Lime	73	-77	3006	12.0	321.5	FALSE	0.0	61.6	12.0	184	7.8	208.9	216	216	140.4	537	400	349.3	321	147	6.0	160.7
er Group Lime	74	-78	3063.6	12.0	333.5	FALSE	0.0	61.6	12.0	196	7.8	216.7	216	216	140.4	549	412	357.1	333	157	6.0	166.7
er Group Lime	75	-79	3121.2	12.0	345.5	FALSE	0.0	61.6	12.0	208	7.8	224.5	216	216	140.4	561	424	364.9	345	166	6.0	172.7
er Group Lime	76	-80	3178.8	12.0	357.5	FALSE	0.0	61.6	12.0	220	7.8	232.3	216	216	140.4	573	436	372.7	357	176	6.0	178.7
er Group Lime	77	-81	3236.4	12.0	369.5	FALSE	0.0	61.6	12.0	232	7.8	240.1	216	216	140.4	585	448	380.5	369	186	6.0	184.7
er Group Lime	78	-82	3294	12.0	381.5	FALSE	0.0	61.6	12.0	244	7.8	247.9	216	216	140.4	597	460	388.3	381	195	6.0	190.7
er Group Lime	79	-83	3351.6	12.0	393.5	FALSE	0.0	61.6	12.0	256	7.8	255.7	216	216	140.4	609	472	396.1	393	205	6.0	196.7
er Group Lime	80	-84	3409.2	12.0	405.5	FALSE	0.0	61.6	12.0	268	7.8	263.5	216	216	140.4	621	484	403.9	405	214	6.0	202.7
er Group Lime	81	-85	3466.8	12.0	417.5	FALSE	0.0	61.6	12.0	280	7.8	271.3	216	216	140.4	633	496	411.7	417	224	6.0	208.7
er Group Lime	82	-86	3524.4	12.0	429.5	FALSE	0.0	61.6	12.0	292	7.8	279.1	216	216	140.4	645	508	419.5	429	234	6.0	214.7
er Group Lime	83	-87	3582	12.0	441.5	FALSE	0.0	61.6	12.0	304	7.8	286.9	216	216	140.4	657	520	427.3	441	243	6.0	220.7
er Group Lime	84	-88	3639.6	12.0	453.5	FALSE	0.0	61.6	12.0	316	7.8	294.7	216	216	140.4	669	532	435.1	453	253	6.0	226.7
er Group Lime	85	-89	3697.2	12.0	465.5	FALSE	0.0	61.6	12.0	328	7.8	302.5	216	216	140.4	681	544	442.9	465	262	6.0	232.7
er Group Lime	86	-90	3754.8	12.0	477.5	FALSE	0.0	61.6	12.0	340	7.8	310.3	216	216	140.4	693	556	450.7	477	272	6.0	238.7
er Group Lime	87	-91	3812.4	12.0	489.5	FALSE	0.0	61.6	12.0	352	7.8	318.1	216	216	140.4	705	568	458.5	489	282	6.0	244.7
er Group Lime	88	-92	3870	12.0	501.5	FALSE	0.0	61.6	12.0	364	7.8	325.9	216	216	140.4	717	580	466.3	501	291	6.0	250.7
er Group Lime	89	-93	3927.6	12.0	513.5	FALSE	0.0	61.6	12.0	376	7.8	333.7	216	216	140.4	729	592	474.1	513	301	6.0	256.7
er Group Lime	90	-94	3985.2	12.0	525.5	FALSE	0.0	61.6	12.0	388	7.8	341.5	216	216	140.4	741	604	481.9	525	310	6.0	262.7
er Group Lime	91	-95	4042.8	12.0	537.5	FALSE	0.0	61.6	12.0	400	7.8	349.3	216	216	140.4	753	616	489.7	537	320	6.0	268.7
er Group Lime	92	-96	4100.4	12.0	549.5	FALSE	0.0	61.6	12.0	412	7.8	357.1	216	216	140.4	765	628	497.5	549	330	6.0	274.7
er Group Lime	93	-97	4158	12.0	561.5	FALSE	0.0	61.6	12.0	424	7.8	364.9	216	216	140.4	777	640	505.3	561	339	6.0	280.7
er Group Lime	94	-98	4215.6	12.0	573.5	FALSE	0.0	61.6	12.0	436	7.8	372.7	216	216	140.4	789	652	513.1	573	349	6.0	286.7
er Group Lime	95	-99	4273.2	12.0	585.5	FALSE	0.0	61.6	12.0	448	7.8	380.5	216	216	140.4	801	664	520.9	585	358	6.0	292.7
er Group Lime	96	-100	4330.8	12.0	597.5	FALSE	0.0	61.6	12.0	460	7.8	388.3	216	216	140.4	813	676	528.7	597	368	6.0	298.7
er Group Lime	97	-101	4388.4	12.0	609.5	FALSE	0.0	61.6	12.0	472	7.8	396.1	216	216	140.4	825	688	536.5	609	378	6.0	304.7
er Group Lime	98	-102	4446	12.0	621.5	FALSE	0.0	61.6	12.0	484	7.8	403.9	216	216	140.4	837	700	544.3	621	387	6.0	310.7
er Group Lime	99	-103	4503.6	12.0	633.5	FALSE	0.0	61.6	12.0	496	7.8	411.7	216	216	140.4	849	712	552.1	633	397	6.0	316.7
er Group Lime	100	-104	4561.2	12.0	645.5	FALSE	0.0	61.6	12.0	508	7.8	419.5	216	216	140.4	861	724	559.9	645	406	6.0	322.7
er Group Lime	101	-105	4618.8	12.0	657.5	FALSE	0.0	61.6	12.0	520	7.8	427.3	216	216	140.4	873	736	567.7	657	416	6.0	328.7
er Group Lime	102	-106	4676.4	12.0	669.5	FALSE	0.0	61.6	12.0	532	7.8	435.1	216	216	140.4	885	748	575.5	669	426	6.0	334.7

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
er Group Lime	103	-107	4734	12.0	681.5	FALSE	0.0	61.6	12.0	544	7.8	442.9	216	216	140.4	897	760	583.3	681	435	6.0	340.7
er Group Lime	104	-108	4791.6	12.0	693.5	FALSE	0.0	61.6	12.0	556	7.8	450.7	216	216	140.4	909	772	591.1	693	445	6.0	346.7
er Group Lime	105	-109	4849.2	12.0	705.5	FALSE	0.0	61.6	12.0	568	7.8	458.5	216	216	140.4	921	784	598.9	705	454	6.0	352.7
er Group Lime	106	-110	4906.8	12.0	717.5	FALSE	0.0	61.6	12.0	580	7.8	466.3	216	216	140.4	933	796	606.7	717	464	6.0	358.7
er Group Lime	107	-111	4964.4	12.0	729.5	FALSE	0.0	61.6	12.0	592	7.8	474.1	216	216	140.4	945	808	614.5	729	474	6.0	364.7
er Group Lime	108	-112	5022	12.0	741.5	FALSE	0.0	61.6	12.0	604	7.8	481.9	216	216	140.4	957	820	622.3	741	483	6.0	370.7
er Group Lime	109	-113	5079.6	12.0	753.5	FALSE	0.0	61.6	12.0	616	7.8	489.7	216	216	140.4	969	832	630.1	753	493	6.0	376.7
er Group Lime	110	-114	5137.2	12.0	765.5	FALSE	0.0	61.6	12.0	628	7.8	497.5	216	216	140.4	981	844	637.9	765	502	6.0	382.7
er Group Lime	111	-115	5194.8	12.0	777.5	FALSE	0.0	61.6	12.0	640	7.8	505.3	216	216	140.4	993	856	645.7	777	512	6.0	388.7
er Group Lime	112	-116	5252.4	12.0	789.5	FALSE	0.0	61.6	12.0	652	7.8	513.1	216	216	140.4	1005	868	653.5	789	522	6.0	394.7
er Group Lime	113	-117	5310	12.0	801.5	FALSE	0.0	61.6	12.0	664	7.8	520.9	216	216	140.4	1017	880	661.3	801	531	6.0	400.7
er Group Lime	114	-118	5367.6	12.0	813.5	FALSE	0.0	61.6	12.0	676	7.8	528.7	216	216	140.4	1029	892	669.1	813	541	6.0	406.7
er Group Lime	115	-119	5425.2	12.0	825.5	FALSE	0.0	61.6	12.0	688	7.8	536.5	216	216	140.4	1041	904	676.9	825	550	6.0	412.7
er Group Lime	116	-120	5482.8	12.0	837.5	FALSE	0.0	61.6	12.0	700	7.8	544.3	216	216	140.4	1053	916	684.7	837	560	6.0	418.7
er Group Lime	117	-121	5540.4	12.0	849.5	FALSE	0.0	61.6	12.0	712	7.8	552.1	216	216	140.4	1065	928	692.5	849	570	6.0	424.7
er Group Lime	118	-122	5598	12.0	861.5	FALSE	0.0	61.6	12.0	724	7.8	559.9	216	216	140.4	1077	940	700.3	861	579	6.0	430.7
er Group Lime	119	-123	5655.6	12.0	873.5	FALSE	0.0	61.6	12.0	736	7.8	567.7	216	216	140.4	1089	952	708.1	873	589	6.0	436.7
er Group Lime	120	-124	5713.2	12.0	885.5	FALSE	0.0	61.6	12.0	748	7.8	575.5	216	216	140.4	1101	964	715.9	885	598	6.0	442.7
er Group Lime	121	-125	5770.8	12.0	897.5	FALSE	0.0	61.6	12.0	760	7.8	583.3	216	216	140.4	1113	976	723.7	897	608	6.0	448.7
er Group Lime	122	-126	5828.4	12.0	909.5	FALSE	0.0	61.6	12.0	772	7.8	591.1	216	216	140.4	1125	988	731.5	909	618	6.0	454.7
er Group Lime	123	-127	5886	12.0	921.5	FALSE	0.0	61.6	12.0	784	7.8	598.9	216	216	140.4	1137	1000	739.3	921	627	6.0	460.7
er Group Lime	124	-128	5943.6	12.0	933.5	FALSE	0.0	61.6	12.0	796	7.8	606.7	216	216	140.4	1149	1012	747.1	933	637	6.0	466.7
er Group Lime	125	-129	6001.2	12.0	945.5	FALSE	0.0	61.6	12.0	808	7.8	614.5	216	216	140.4	1161	1024	754.9	945	646	6.0	472.7
er Group Lime	126	-130	6058.8	12.0	957.5	FALSE	0.0	61.6	12.0	820	7.8	622.3	216	216	140.4	1173	1036	762.7	957	656	6.0	478.7
er Group Lime	127	-131	6116.4	12.0	969.5	FALSE	0.0	61.6	12.0	832	7.8	630.1	216	216	140.4	1185	1048	770.5	969	666	6.0	484.7
er Group Lime	128	-132	6174	12.0	981.5	FALSE	0.0	61.6	12.0	844	7.8	637.9	216	216	140.4	1197	1060	778.3	981	675	6.0	490.7
er Group Lime	129	-133	6231.6	12.0	993.5	FALSE	0.0	61.6	12.0	856	7.8	645.7	216	216	140.4	1209	1072	786.1	993	685	6.0	496.7
er Group Lime	130	-134	6289.2	12.0	1005.5	FALSE	0.0	61.6	12.0	868	7.8	653.5	216	216	140.4	1221	1084	793.9	1005	694	6.0	502.7
er Group Lime	131	-135	6346.8	12.0	1017.5	FALSE	0.0	61.6	12.0	880	7.8	661.3	216	216	140.4	1233	1096	801.7	1017	704	6.0	508.7
er Group Lime	132	-136	6404.4	12.0	1029.5	FALSE	0.0	61.6	12.0	892	7.8	669.1	216	216	140.4	1245	1108	809.5	1029	714	6.0	514.7
er Group Lime	133	-137	6462	12.0	1041.5	FALSE	0.0	61.6	12.0	904	7.8	676.9	216	216	140.4	1257	1120	817.3	1041	723	6.0	520.7
er Group Lime	134	-138	6519.6	12.0	1053.5	FALSE	0.0	61.6	12.0	916	7.8	684.7	216	216	140.4	1269	1132	825.1	1053	733	6.0	526.7
er Group Lime	135	-139	6577.2	12.0	1065.5	FALSE	0.0	61.6	12.0	928	7.8	692.5	216	216	140.4	1281	1144	832.9	1065	742	6.0	532.7
er Group Lime	136	-140	6634.8	12.0	1077.5	FALSE	0.0	61.6	12.0	940	7.8	700.3	216	216	140.4	1293	1156	840.7	1077	752	6.0	538.7
er Group Lime	137	-141	6692.4	12.0	1089.5	FALSE	0.0	61.6	12.0	952	7.8	708.1	216	216	140.4	1305	1168	848.5	1089	762	6.0	544.7
er Group Lime	138	-142	6750	12.0	1101.5	FALSE	0.0	61.6	12.0	964	7.8	715.9	216	216	140.4	1317	1180	856.3	1101	771	6.0	550.7
er Group Lime	139	-143	6807.6	12.0	1113.5	FALSE	0.0	61.6	12.0	976	7.8	723.7	216	216	140.4	1329	1192	864.1	1113	781	6.0	556.7
er Group Lime	140	-144	6865.2	12.0	1125.5	FALSE	0.0	61.6	12.0	988	7.8	731.5	216	216	140.4	1341	1204	871.9	1125	790	6.0	562.7
er Group Lime	141	-145	6922.8	12.0	1137.5	FALSE	0.0	61.6	12.0	1000	7.8	739.3	216	216	140.4	1353	1216	879.7	1137	800	6.0	568.7
er Group Lime	142	-146	6980.4	12.0	1149.5	FALSE	0.0	61.6	12.0	1012	7.8	747.1	216	216	140.4	1365	1228	887.5	1149	810	6.0	574.7
er Group Lime	143	-147	7038	12.0	1161.5	FALSE	0.0	61.6	12.0	1024	7.8	754.9	216	216	140.4	1377	1240	895.3	1161	819	6.0	580.7
er Group Lime	144	-148	7095.6	12.0	1173.5	FALSE	0.0	61.6	12.0	1036	7.8	762.7	216	216	140.4	1389	1252	903.1	1173	829	6.0	586.7
er Group Lime	145	-149	7153.2	12.0	1185.5	FALSE	0.0	61.6	12.0	1048	7.8	770.5	216	216	140.4	1401	1264	910.9	1185	838	6.0	592.7
er Group Lime	146	-150	7210.8	12.0	1197.5	FALSE	0.0	61.6	12.0	1060	7.8	778.3	216	216	140.4	1413	1276	918.7	1197	848	6.0	598.7
er Group Lime	147	-151	7268.4	12.0	1209.5	FALSE	0.0	61.6	12.0	1072	7.8	786.1	216	216	140.4	1425	1288	926.5	1209	858	6.0	604.7
er Group Lime	148	-152	7326	12.0	1221.5	FALSE	0.0	61.6	12.0	1084	7.8	793.9	216	216	140.4	1437	1300	934.3	1221	867	6.0	610.7
er Group Lime	149	-153	7383.6	12.0	1233.5	FALSE	0.0	61.6	12.0	1096	7.8	801.7	216	216	140.4	1449	1312	942.1	1233	877	6.0	616.7
er Group Lime	150	-154	7441.2	12.0	1245.5	FALSE	0.0	61.6	12.0	1108	7.8	809.5	216	216	140.4	1461	1324	949.9	1245	886	6.0	622.7
er Group Lime	151	-155	7498.8	12.0	1257.5	FALSE	0.0	61.6	12.0	1120	7.8	817.3	216	216	140.4	1473	1336	957.7	1257	896	6.0	628.7
er Group Lime	152	-156	7556.4	12.0	1269.5	FALSE	0.0	61.6	12.0	1132	7.8	825.1	216	216	140.4	1485	1348	965.5	1269	906	6.0	634.7
er Group Lime	153	-157	7614	12.0	1281.5	FALSE	0.0	61.6	12.0	1144	7.8	832.9	216	216	140.4	1497	1360	973.3	1281	915	6.0	640.7

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
er Group Lime	154	-158	7671.6	12.0	1293.5	FALSE	0.0	61.6	12.0	1156	7.8	840.7	216	216	140.4	1509	1372	981.1	1293	925	6.0	646.7
er Group Lime	155	-159	7729.2	12.0	1305.5	FALSE	0.0	61.6	12.0	1168	7.8	848.5	216	216	140.4	1521	1384	988.9	1305	934	6.0	652.7
er Group Lime	156	-160	7786.8	12.0	1317.5	FALSE	0.0	61.6	12.0	1180	7.8	856.3	216	216	140.4	1533	1396	996.7	1317	944	6.0	658.7
er Group Lime	157	-161	7844.4	12.0	1329.5	FALSE	0.0	61.6	12.0	1192	7.8	864.1	216	216	140.4	1545	1408	1004.5	1329	954	6.0	664.7
er Group Lime	158	-162	7902	12.0	1341.5	FALSE	0.0	61.6	12.0	1204	7.8	871.9	216	216	140.4	1557	1420	1012.3	1341	963	6.0	670.7
er Group Lime	159	-163	7959.6	12.0	1353.5	FALSE	0.0	61.6	12.0	1216	7.8	879.7	216	216	140.4	1569	1432	1020.1	1353	973	6.0	676.7
er Group Lime	160	-164	8017.2	12.0	1365.5	FALSE	0.0	61.6	12.0	1228	7.8	887.5	216	216	140.4	1581	1444	1027.9	1365	982	6.0	682.7
er Group Lime	161	-165	8074.8	12.0	1377.5	FALSE	0.0	61.6	12.0	1240	7.8	895.3	216	216	140.4	1593	1456	1035.7	1377	992	6.0	688.7
er Group Lime	162	-166	8132.4	12.0	1389.5	FALSE	0.0	61.6	12.0	1252	7.8	903.1	216	216	140.4	1605	1468	1043.5	1389	1002	6.0	694.7
er Group Lime	163	-167	8190	12.0	1401.5	FALSE	0.0	61.6	12.0	1264	7.8	910.9	216	216	140.4	1617	1480	1051.3	1401	1011	6.0	700.7
er Group Lime	164	-168	8247.6	12.0	1413.5	FALSE	0.0	61.6	12.0	1276	7.8	918.7	216	216	140.4	1629	1492	1059.1	1413	1021	6.0	706.7
er Group Lime	165	-169	8305.2	12.0	1425.5	FALSE	0.0	61.6	12.0	1288	7.8	926.5	216	216	140.4	1641	1504	1066.9	1425	1030	6.0	712.7
er Group Lime	166	-170	8362.8	12.0	1437.5	FALSE	0.0	61.6	12.0	1300	7.8	934.3	216	216	140.4	1653	1516	1074.7	1437	1040	6.0	718.7
er Group Lime	167	-171	8420.4	12.0	1449.5	FALSE	0.0	61.6	12.0	1312	7.8	942.1	216	216	140.4	1665	1528	1082.5	1449	1050	6.0	724.7
er Group Lime	168	-172	8478	12.0	1461.5	FALSE	0.0	61.6	12.0	1324	7.8	949.9	216	216	140.4	1677	1540	1090.3	1461	1059	6.0	730.7
er Group Lime	169	-173	8535.6	12.0	1473.5	FALSE	0.0	61.6	12.0	1336	7.8	957.7	216	216	140.4	1689	1552	1098.1	1473	1069	6.0	736.7
er Group Lime	170	-174	8593.2	12.0	1485.5	FALSE	0.0	61.6	12.0	1348	7.8	965.5	216	216	140.4	1701	1564	1105.9	1485	1078	6.0	742.7
er Group Lime	171	-175	8650.8	12.0	1497.5	FALSE	0.0	61.6	12.0	1360	7.8	973.3	216	216	140.4	1713	1576	1113.7	1497	1088	6.0	748.7
er Group Lime	172	-176	8708.4	12.0	1509.5	FALSE	0.0	61.6	12.0	1372	7.8	981.1	216	216	140.4	1725	1588	1121.5	1509	1098	6.0	754.7
er Group Lime	173	-177	8766	12.0	1521.5	FALSE	0.0	61.6	12.0	1384	7.8	988.9	216	216	140.4	1737	1600	1129.3	1521	1107	6.0	760.7
er Group Lime	174	-178	8823.6	12.0	1533.5	FALSE	0.0	61.6	12.0	1396	7.8	996.7	216	216	140.4	1749	1612	1137.1	1533	1117	6.0	766.7
er Group Lime	175	-179	8881.2	12.0	1545.5	FALSE	0.0	61.6	12.0	1408	7.8	1004.5	216	216	140.4	1761	1624	1144.9	1545	1126	6.0	772.7
er Group Lime	176	-180	8938.8	12.0	1557.5	FALSE	0.0	61.6	12.0	1420	7.8	1012.3	216	216	140.4	1773	1636	1152.7	1557	1136	6.0	778.7
er Group Lime	177	-181	8996.4	12.0	1569.5	FALSE	0.0	61.6	12.0	1432	7.8	1020.1	216	216	140.4	1785	1648	1160.5	1569	1146	6.0	784.7
er Group Lime	178	-182	9054	12.0	1581.5	FALSE	0.0	61.6	12.0	1444	7.8	1027.9	216	216	140.4	1797	1660	1168.3	1581	1155	6.0	790.7
er Group Lime	179	-183	9111.6	12.0	1593.5	FALSE	0.0	61.6	12.0	1456	7.8	1035.7	216	216	140.4	1809	1672	1176.1	1593	1165	6.0	796.7
er Group Lime	180	-184	9169.2	12.0	1605.5	FALSE	0.0	61.6	12.0	1468	7.8	1043.5	216	216	140.4	1821	1684	1183.9	1605	1174	6.0	802.7
er Group Lime	181	-185	9226.8	12.0	1617.5	FALSE	0.0	61.6	12.0	1480	7.8	1051.3	216	216	140.4	1833	1696	1191.7	1617	1184	6.0	808.7
er Group Lime	182	-186	9284.4	12.0	1629.5	FALSE	0.0	61.6	12.0	1492	7.8	1059.1	216	216	140.4	1845	1708	1199.5	1629	1194	6.0	814.7
er Group Lime	183	-187	9342	12.0	1641.5	FALSE	0.0	61.6	12.0	1504	7.8	1066.9	216	216	140.4	1857	1720	1207.3	1641	1203	6.0	820.7
er Group Lime	184	-188	9399.6	12.0	1653.5	FALSE	0.0	61.6	12.0	1516	7.8	1074.7	216	216	140.4	1869	1732	1215.1	1653	1213	6.0	826.7
er Group Lime	185	-189	9457.2	12.0	1665.5	FALSE	0.0	61.6	12.0	1528	7.8	1082.5	216	216	140.4	1881	1744	1222.9	1665	1222	6.0	832.7
er Group Lime	186	-190	9514.8	12.0	1677.5	FALSE	0.0	61.6	12.0	1540	7.8	1090.3	216	216	140.4	1893	1756	1230.7	1677	1232	6.0	838.7
er Group Lime	187	-191	9572.4	12.0	1689.5	FALSE	0.0	61.6	12.0	1552	7.8	1098.1	216	216	140.4	1905	1768	1238.5	1689	1242	6.0	844.7
er Group Lime	188	-192	9630	12.0	1701.5	FALSE	0.0	61.6	12.0	1564	7.8	1105.9	216	216	140.4	1917	1780	1246.3	1701	1251	6.0	850.7
er Group Lime	189	-193	9687.6	12.0	1713.5	FALSE	0.0	61.6	12.0	1576	7.8	1113.7	216	216	140.4	1929	1792	1254.1	1713	1261	6.0	856.7
er Group Lime	190	-194	9745.2	12.0	1725.5	FALSE	0.0	61.6	12.0	1588	7.8	1121.5	216	216	140.4	1941	1804	1261.9	1725	1270	6.0	862.7
er Group Lime	191	-195	9802.8	12.0	1737.5	FALSE	0.0	61.6	12.0	1600	7.8	1129.3	216	216	140.4	1953	1816	1269.7	1737	1280	6.0	868.7
er Group Lime	192	-196	9860.4	12.0	1749.5	FALSE	0.0	61.6	12.0	1612	7.8	1137.1	216	216	140.4	1965	1828	1277.5	1749	1290	6.0	874.7
er Group Lime	193	-197	9918	12.0	1761.5	FALSE	0.0	61.6	12.0	1624	7.8	1144.9	216	216	140.4	1977	1840	1285.3	1761	1299	6.0	880.7
er Group Lime	194	-198	9975.6	12.0	1773.5	FALSE	0.0	61.6	12.0	1636	7.8	1152.7	216	216	140.4	1989	1852	1293.1	1773	1309	6.0	886.7
er Group Lime	195	-199	10033.2	12.0	1785.5	FALSE	0.0	61.6	12.0	1648	7.8	1160.5	216	216	140.4	2001	1864	1300.9	1785	1318	6.0	892.7
er Group Lime	196	-200	10090.8	12.0	1797.5	FALSE	0.0	61.6	12.0	1660	7.8	1168.3	216	216	140.4	2013	1876	1308.7	1797	1328	6.0	898.7
er Group Lime	197	-201	10148.4	12.0	1809.5	FALSE	0.0	61.6	12.0	1672	7.8	1176.1	216	216	140.4	2025	1888	1316.5	1809	1338	6.0	904.7
er Group Lime	198	-202	10206	12.0	1821.5	FALSE	0.0	61.6	12.0	1684	7.8	1183.9	216	216	140.4	2037	1900	1324.3	1821	1347	6.0	910.7
er Group Lime	199	-203	10263.6	12.0	1833.5	FALSE	0.0	61.6	12.0	1696	7.8	1191.7	216	216	140.4	2049	1912	1332.1	1833	1357	6.0	916.7
er Group Lime	200	-204	10321.2	12.0	1845.5	FALSE	0.0	61.6	12.0	1708	7.8	1199.5	216	216	140.4	2061	1924	1339.9	1845	1366	6.0	922.7

AXIAL PILE CAPACITY

Project Information

Project:	Harbor River Bridge	Pile Tip Area (square feet):	4.00
Owner:	SCDOT	Pile Perimeter (ft):	8.00
Job Number:	18461-007-01	Side and End Friction Resistance Factor α Method	0.65
Analysis by:	HPC	Side and End Friction Resistance Factor Nordlund/Thurman Method	0.65
Date/Time:	10/16/2017 11:49	Uplift Side Friction Resistance Factor α Method	0.5
Run Designation:	West Overbank - No Scour	Uplift Friction Resistance Factor Nordlund/Thurman Method	0.5
Pile Diameter (ft):	2.0	Depth to Top of Liquefied Layer (ft):	0
Ground Surface Elevation (ft):	0	Depth to Bottom of Liquefied Layer (ft):	55
Pile Type:	Square Precast Concrete	Residual Shear Strength of Liquefiable Layer (psf):	182
Checked by:	ZAS	Enter "1" to calculate downdrag from residual shear strength, "2" average of residual & non-liqufied, "3" non-liquefied strength parameters	1
		Calculated Unfactored Downdrag Load (kips)[4]:	73.6

Soil Profile

Soil Type	Depth at Bottom of Soil Unit (feet)	Bouyant Unit Weight (pcf) (total weight above GWT)	ϕ (degrees)	S_u, Undrained Shear Strength (psf)	α, Empirical Adhesion Factor	Friction Ratio, C_f	Earth Pressure Coefficient, K_δ
Sands (1)	15	37.6	29			0.95	1.15
Silts/Clays	25	32.6		189	1		
Silts/Clays	35	32.6		274	1		
Silts/Clays	45	32.6		359	1		
Sands (2)	55	37.6	31			0.95	1.15
Hawthorn Marl	75	57.6		4000	0.25		
Cooper Group Limestone	200	57.6		6000	0.25		

Notes:
1. Spreadsheet programed for α method for undrained shear strength and Nordlund/Thurman Method for friction angle
2. Refer to AASHTO LRFD Section 10.7.3.8.6b to determine α
3. Refer to AASHTO LRFD Section 10.7.3.8.6f to determine C_f and K_δ
4. The structural engineer should include the unfactored downdrag load in accordance with Section 3.11.8 of the AASHTO LRFD Manual

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
Sands (1)	1	-1	18.8	0.1	0.1	TRUE	0.1	0.1	0.0	0	0.1	0.1	1	0	0.9	1	0	0.9	0	0	0.0	0.0
Sands (1)	2	-2	56.4	0.2	0.3	TRUE	0.2	0.3	0.0	0	0.2	0.2	4	0	2.7	4	0	2.9	0	0	0.1	0.2
Sands (1)	3	-3	94	0.4	0.7	TRUE	0.4	0.7	0.0	0	0.3	0.5	7	0	4.5	8	0	4.9	1	0	0.2	0.4
Sands (1)	4	-4	131.6	0.6	1.3	TRUE	0.6	1.3	0.0	0	0.4	0.8	10	0	6.2	11	0	7.0	1	0	0.3	0.6
Sands (1)	5	-5	169.2	0.7	2.0	TRUE	0.7	2.0	0.0	0	0.5	1.3	12	0	8.0	14	0	9.3	2	0	0.4	1.0
Sands (1)	6	-6	206.8	0.9	2.9	TRUE	0.9	2.9	0.0	0	0.6	1.9	15	0	9.6	18	0	11.5	3	0	0.4	1.4
Sands (1)	7	-7	244.4	1.0	3.9	TRUE	1.0	3.9	0.0	0	0.7	2.5	18	0	11.4	21	0	13.9	4	0	0.5	2.0
Sands (1)	8	-8	282	1.2	5.1	TRUE	1.2	5.1	0.0	0	0.8	3.3	20	0	13.0	25	0	16.3	5	0	0.6	2.6
Sands (1)	9	-9	319.6	1.4	6.5	TRUE	1.4	6.5	0.0	0	0.9	4.2	23	0	14.7	29	0	18.9	6	0	0.7	3.2
Sands (1)	10	-10	357.2	1.5	8.0	TRUE	1.5	7.9	0.0	0	1.0	5.2	25	0	16.3	33	0	21.5	8	0	0.8	4.0
Sands (1)	11	-11	394.8	1.7	9.7	TRUE	1.5	9.4	0.0	0	1.1	6.3	28	0	18.0	37	0	24.3	10	0	0.8	4.8
Sands (1)	12	-12	432.4	1.8	11.5	TRUE	1.5	10.9	0.0	0	1.2	7.5	30	0	19.5	42	0	27.0	12	0	0.9	5.8
Sands (1)	13	-13	470	2.0	13.5	TRUE	1.5	12.3	0.0	0	1.3	8.8	33	0	21.2	46	0	30.0	14	0	1.0	6.8
Sands (1)	14	-14	507.6	2.2	15.7	TRUE	1.5	13.8	0.0	0	1.4	10.2	35	0	22.7	51	0	32.9	16	0	1.1	7.8
Sands (1)	15	-15	545.2	2.3	18.0	TRUE	1.5	15.2	0.0	0	1.5	11.7	37	0	24.4	55	0	36.1	18	0	1.2	9.0
Silts/Clays	16	-16	580.3	1.5	19.5	TRUE	1.5	16.7	0.0	0	1.0	12.7	7	0	4.4	26	0	17.1	20	0	0.8	9.8
Silts/Clays	17	-17	612.9	1.5	21.0	TRUE	1.5	18.1	0.0	0	1.0	13.7	7	0	4.4	28	0	18.1	21	0	0.8	10.5
Silts/Clays	18	-18	645.5	1.5	22.5	TRUE	1.5	19.6	0.0	0	1.0	14.6	7	0	4.4	29	0	19.1	23	0	0.8	11.3
Silts/Clays	19	-19	678.1	1.5	24.0	TRUE	1.5	21.1	0.0	0	1.0	15.6	7	0	4.4	31	0	20.1	24	0	0.8	12.0
Silts/Clays	20	-20	710.7	1.5	25.6	TRUE	1.5	22.5	0.0	0	1.0	16.6	7	0	4.4	32	0	21.0	26	0	0.8	12.8
Silts/Clays	21	-21	743.3	1.5	27.1	TRUE	1.5	24.0	0.0	0	1.0	17.6	7	0	4.4	34	0	22.0	27	0	0.8	13.5
Silts/Clays	22	-22	775.9	1.5	28.6	TRUE	1.5	25.4	0.0	0	1.0	18.6	7	0	4.4	35	0	23.0	29	0	0.8	14.3
Silts/Clays	23	-23	808.5	1.5	30.1	TRUE	1.5	26.9	0.0	0	1.0	19.6	7	0	4.4	37	0	24.0	30	0	0.8	15.0
Silts/Clays	24	-24	841.1	1.5	31.6	TRUE	1.5	28.4	0.0	0	1.0	20.5	7	0	4.4	38	0	25.0	32	0	0.8	15.8
Silts/Clays	25	-25	873.7	1.5	33.1	TRUE	1.5	29.8	0.0	0	1.0	21.5	7	0	4.4	40	0	26.0	33	0	0.8	16.6
Silts/Clays	26	-26	906.3	2.2	35.3	TRUE	1.5	31.3	0.0	0	1.4	23.0	10	0	6.4	45	0	29.4	35	0	1.1	17.7
Silts/Clays	27	-27	938.9	2.2	37.5	TRUE	1.5	32.7	0.0	0	1.4	24.4	10	0	6.4	47	0	30.8	38	0	1.1	18.8
Silts/Clays	28	-28	971.5	2.2	39.7	TRUE	1.5	34.2	0.0	0	1.4	25.8	10	0	6.4	50	0	32.2	40	0	1.1	19.8
Silts/Clays	29	-29	1004.1	2.2	41.9	TRUE	1.5	35.6	0.0	0	1.4	27.2	10	0	6.4	52	0	33.6	42	0	1.1	20.9
Silts/Clays	30	-30	1036.7	2.2	44.1	TRUE	1.5	37.1	0.0	0	1.4	28.6	10	0	6.4	54	0	35.1	44	0	1.1	22.0
Silts/Clays	31	-31	1069.3	2.2	46.3	TRUE	1.5	38.6	0.0	0	1.4	30.1	10	0	6.4	56	0	36.5	46	0	1.1	23.1
Silts/Clays	32	-32	1101.9	2.2	48.5	TRUE	1.5	40.0	0.0	0	1.4	31.5	10	0	6.4	58	0	37.9	48	0	1.1	24.2
Silts/Clays	33	-33	1134.5	2.2	50.6	TRUE	1.5	41.5	0.0	0	1.4	32.9	10	0	6.4	60	0	39.3	51	0	1.1	25.3
Silts/Clays	34	-34	1167.1	2.2	52.8	TRUE	1.5	42.9	0.0	0	1.4	34.3	10	0	6.4	63	0	40.7	53	0	1.1	26.4
Silts/Clays	35	-35	1199.7	2.2	55.0	TRUE	1.5	44.4	0.0	0	1.4	35.8	10	0	6.4	65	0	42.2	55	0	1.1	27.5
Silts/Clays	36	-36	1232.3	2.9	57.9	TRUE	1.5	45.8	0.0	0	1.9	37.6	13	0	8.4	71	0	46.0	58	0	1.4	28.9
Silts/Clays	37	-37	1264.9	2.9	60.8	TRUE	1.5	47.3	0.0	0	1.9	39.5	13	0	8.4	74	0	47.9	61	0	1.4	30.4
Silts/Clays	38	-38	1297.5	2.9	63.6	TRUE	1.5	48.8	0.0	0	1.9	41.4	13	0	8.4	77	0	49.7	64	0	1.4	31.8
Silts/Clays	39	-39	1330.1	2.9	66.5	TRUE	1.5	50.2	0.0	0	1.9	43.2	13	0	8.4	79	0	51.6	66	0	1.4	33.2
Silts/Clays	40	-40	1362.7	2.9	69.4	TRUE	1.5	51.7	0.0	0	1.9	45.1	13	0	8.4	82	0	53.5	69	0	1.4	34.7
Silts/Clays	41	-41	1395.3	2.9	72.2	TRUE	1.5	53.1	0.0	0	1.9	47.0	13	0	8.4	85	0	55.3	72	0	1.4	36.1
Silts/Clays	42	-42	1427.9	2.9	75.1	TRUE	1.5	54.6	0.0	0	1.9	48.8	13	0	8.4	88	0	57.2	75	0	1.4	37.6
Silts/Clays	43	-43	1460.5	2.9	78.0	TRUE	1.5	56.1	0.0	0	1.9	50.7	13	0	8.4	91	0	59.1	78	0	1.4	39.0
Silts/Clays	44	-44	1493.1	2.9	80.8	TRUE	1.5	57.5	0.0	0	1.9	52.5	13	0	8.4	94	0	60.9	81	0	1.4	40.4
Silts/Clays	45	-45	1525.7	2.9	83.7	TRUE	1.5	59.0	0.0	0	1.9	54.4	13	0	8.4	97	0	62.8	84	0	1.4	41.9
Sands (2)	46	-46	1560.8	7.1	90.8	TRUE	1.5	60.4	0.0	0	4.6	59.0	72	0	46.8	163	0	105.8	91	0	3.5	45.4
Sands (2)	47	-47	1598.4	7.2	98.0	TRUE	1.5	61.9	0.0	0	4.7	63.7	72	0	46.8	170	0	110.5	98	0	3.6	49.0
Sands (2)	48	-48	1636	7.4	105.4	TRUE	1.5	63.3	0.0	0	4.8	68.5	72	0	46.8	177	0	115.3	105	0	3.7	52.7
Sands (2)	49	-49	1673.6	7.6	113.0	TRUE	1.5	64.8	0.0	0	4.9	73.4	72	0	46.8	185	0	120.2	113	0	3.8	56.5
Sands (2)	50	-50	1711.2	7.7	120.7	TRUE	1.5	66.3	0.0	0	5.0	78.5	72	0	46.8	193	0	125.3	121	0	3.9	60.4
Sands (2)	51	-51	1748.8	7.9	128.6	TRUE	1.5	67.7	0.0	0	5.1	83.6	72	0	46.8	201	0	130.4	129	0	4.0	64.3

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
Sands (2)	52	-52	1786.4	8.1	136.7	TRUE	1.5	69.2	0.0	0	5.3	88.9	72	0	46.8	209	0	135.7	137	0	4.0	68.3
Sands (2)	53	-53	1824	8.3	144.9	TRUE	1.5	70.6	0.0	0	5.4	94.2	72	0	46.8	217	0	141.0	145	0	4.1	72.5
Sands (2)	54	-54	1861.6	8.4	153.4	TRUE	1.5	72.1	0.0	0	5.5	99.7	72	0	46.8	225	0	146.5	153	0	4.2	76.7
Sands (2)	55	-55	1899.2	8.6	162.0	TRUE	1.5	73.6	0.0	0	5.6	105.3	72	0	46.8	234	0	152.1	162	0	4.3	81.0
Hawthorn Mar	56	-56	1946.8	8.0	170.0	FALSE	0.0	73.6	8.0	8	5.2	110.5	144	144	93.6	314	152	204.1	170	6	4.0	85.0
Hawthorn Mar	57	-57	2004.4	8.0	178.0	FALSE	0.0	73.6	8.0	16	5.2	115.7	144	144	93.6	322	160	209.3	178	13	4.0	89.0
Hawthorn Mar	58	-58	2062	8.0	186.0	FALSE	0.0	73.6	8.0	24	5.2	120.9	144	144	93.6	330	168	214.5	186	19	4.0	93.0
Hawthorn Mar	59	-59	2119.6	8.0	194.0	FALSE	0.0	73.6	8.0	32	5.2	126.1	144	144	93.6	338	176	219.7	194	26	4.0	97.0
Hawthorn Mar	60	-60	2177.2	8.0	202.0	FALSE	0.0	73.6	8.0	40	5.2	131.3	144	144	93.6	346	184	224.9	202	32	4.0	101.0
Hawthorn Mar	61	-61	2234.8	8.0	210.0	FALSE	0.0	73.6	8.0	48	5.2	136.5	144	144	93.6	354	192	230.1	210	38	4.0	105.0
Hawthorn Mar	62	-62	2292.4	8.0	218.0	FALSE	0.0	73.6	8.0	56	5.2	141.7	144	144	93.6	362	200	235.3	218	45	4.0	109.0
Hawthorn Mar	63	-63	2350	8.0	226.0	FALSE	0.0	73.6	8.0	64	5.2	146.9	144	144	93.6	370	208	240.5	226	51	4.0	113.0
Hawthorn Mar	64	-64	2407.6	8.0	234.0	FALSE	0.0	73.6	8.0	72	5.2	152.1	144	144	93.6	378	216	245.7	234	58	4.0	117.0
Hawthorn Mar	65	-65	2465.2	8.0	242.0	FALSE	0.0	73.6	8.0	80	5.2	157.3	144	144	93.6	386	224	250.9	242	64	4.0	121.0
Hawthorn Mar	66	-66	2522.8	8.0	250.0	FALSE	0.0	73.6	8.0	88	5.2	162.5	144	144	93.6	394	232	256.1	250	70	4.0	125.0
Hawthorn Mar	67	-67	2580.4	8.0	258.0	FALSE	0.0	73.6	8.0	96	5.2	167.7	144	144	93.6	402	240	261.3	258	77	4.0	129.0
Hawthorn Mar	68	-68	2638	8.0	266.0	FALSE	0.0	73.6	8.0	104	5.2	172.9	144	144	93.6	410	248	266.5	266	83	4.0	133.0
Hawthorn Mar	69	-69	2695.6	8.0	274.0	FALSE	0.0	73.6	8.0	112	5.2	178.1	144	144	93.6	418	256	271.7	274	90	4.0	137.0
Hawthorn Mar	70	-70	2753.2	8.0	282.0	FALSE	0.0	73.6	8.0	120	5.2	183.3	144	144	93.6	426	264	276.9	282	96	4.0	141.0
Hawthorn Mar	71	-71	2810.8	8.0	290.0	FALSE	0.0	73.6	8.0	128	5.2	188.5	144	144	93.6	434	272	282.1	290	102	4.0	145.0
Hawthorn Mar	72	-72	2868.4	8.0	298.0	FALSE	0.0	73.6	8.0	136	5.2	193.7	144	144	93.6	442	280	287.3	298	109	4.0	149.0
Hawthorn Mar	73	-73	2926	8.0	306.0	FALSE	0.0	73.6	8.0	144	5.2	198.9	144	144	93.6	450	288	292.5	306	115	4.0	153.0
Hawthorn Mar	74	-74	2983.6	8.0	314.0	FALSE	0.0	73.6	8.0	152	5.2	204.1	144	144	93.6	458	296	297.7	314	122	4.0	157.0
Hawthorn Mar	75	-75	3041.2	8.0	322.0	FALSE	0.0	73.6	8.0	160	5.2	209.3	144	144	93.6	466	304	302.9	322	128	4.0	161.0
er Group Lime	76	-76	3098.8	12.0	334.0	FALSE	0.0	73.6	12.0	172	7.8	217.1	216	216	140.4	550	388	357.5	334	138	6.0	167.0
er Group Lime	77	-77	3156.4	12.0	346.0	FALSE	0.0	73.6	12.0	184	7.8	224.9	216	216	140.4	562	400	365.3	346	147	6.0	173.0
er Group Lime	78	-78	3214	12.0	358.0	FALSE	0.0	73.6	12.0	196	7.8	232.7	216	216	140.4	574	412	373.1	358	157	6.0	179.0
er Group Lime	79	-79	3271.6	12.0	370.0	FALSE	0.0	73.6	12.0	208	7.8	240.5	216	216	140.4	586	424	380.9	370	166	6.0	185.0
er Group Lime	80	-80	3329.2	12.0	382.0	FALSE	0.0	73.6	12.0	220	7.8	248.3	216	216	140.4	598	436	388.7	382	176	6.0	191.0
er Group Lime	81	-81	3386.8	12.0	394.0	FALSE	0.0	73.6	12.0	232	7.8	256.1	216	216	140.4	610	448	396.5	394	186	6.0	197.0
er Group Lime	82	-82	3444.4	12.0	406.0	FALSE	0.0	73.6	12.0	244	7.8	263.9	216	216	140.4	622	460	404.3	406	195	6.0	203.0
er Group Lime	83	-83	3502	12.0	418.0	FALSE	0.0	73.6	12.0	256	7.8	271.7	216	216	140.4	634	472	412.1	418	205	6.0	209.0
er Group Lime	84	-84	3559.6	12.0	430.0	FALSE	0.0	73.6	12.0	268	7.8	279.5	216	216	140.4	646	484	419.9	430	214	6.0	215.0
er Group Lime	85	-85	3617.2	12.0	442.0	FALSE	0.0	73.6	12.0	280	7.8	287.3	216	216	140.4	658	496	427.7	442	224	6.0	221.0
er Group Lime	86	-86	3674.8	12.0	454.0	FALSE	0.0	73.6	12.0	292	7.8	295.1	216	216	140.4	670	508	435.5	454	234	6.0	227.0
er Group Lime	87	-87	3732.4	12.0	466.0	FALSE	0.0	73.6	12.0	304	7.8	302.9	216	216	140.4	682	520	443.3	466	243	6.0	233.0
er Group Lime	88	-88	3790	12.0	478.0	FALSE	0.0	73.6	12.0	316	7.8	310.7	216	216	140.4	694	532	451.1	478	253	6.0	239.0
er Group Lime	89	-89	3847.6	12.0	490.0	FALSE	0.0	73.6	12.0	328	7.8	318.5	216	216	140.4	706	544	458.9	490	262	6.0	245.0
er Group Lime	90	-90	3905.2	12.0	502.0	FALSE	0.0	73.6	12.0	340	7.8	326.3	216	216	140.4	718	556	466.7	502	272	6.0	251.0
er Group Lime	91	-91	3962.8	12.0	514.0	FALSE	0.0	73.6	12.0	352	7.8	334.1	216	216	140.4	730	568	474.5	514	282	6.0	257.0
er Group Lime	92	-92	4020.4	12.0	526.0	FALSE	0.0	73.6	12.0	364	7.8	341.9	216	216	140.4	742	580	482.3	526	291	6.0	263.0
er Group Lime	93	-93	4078	12.0	538.0	FALSE	0.0	73.6	12.0	376	7.8	349.7	216	216	140.4	754	592	490.1	538	301	6.0	269.0
er Group Lime	94	-94	4135.6	12.0	550.0	FALSE	0.0	73.6	12.0	388	7.8	357.5	216	216	140.4	766	604	497.9	550	310	6.0	275.0
er Group Lime	95	-95	4193.2	12.0	562.0	FALSE	0.0	73.6	12.0	400	7.8	365.3	216	216	140.4	778	616	505.7	562	320	6.0	281.0
er Group Lime	96	-96	4250.8	12.0	574.0	FALSE	0.0	73.6	12.0	412	7.8	373.1	216	216	140.4	790	628	513.5	574	330	6.0	287.0
er Group Lime	97	-97	4308.4	12.0	586.0	FALSE	0.0	73.6	12.0	424	7.8	380.9	216	216	140.4	802	640	521.3	586	339	6.0	293.0
er Group Lime	98	-98	4366	12.0	598.0	FALSE	0.0	73.6	12.0	436	7.8	388.7	216	216	140.4	814	652	529.1	598	349	6.0	299.0
er Group Lime	99	-99	4423.6	12.0	610.0	FALSE	0.0	73.6	12.0	448	7.8	396.5	216	216	140.4	826	664	536.9	610	358	6.0	305.0
er Group Lime	100	-100	4481.2	12.0	622.0	FALSE	0.0	73.6	12.0	460	7.8	404.3	216	216	140.4	838	676	544.7	622	368	6.0	311.0
er Group Lime	101	-101	4538.8	12.0	634.0	FALSE	0.0	73.6	12.0	472	7.8	412.1	216	216	140.4	850	688	552.5	634	378	6.0	317.0
er Group Lime	102	-102	4596.4	12.0	646.0	FALSE	0.0	73.6	12.0	484	7.8	419.9	216	216	140.4	862	700	560.3	646	387	6.0	323.0

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
er Group Lime	103	-103	4654	12.0	658.0	FALSE	0.0	73.6	12.0	496	7.8	427.7	216	216	140.4	874	712	568.1	658	397	6.0	329.0
er Group Lime	104	-104	4711.6	12.0	670.0	FALSE	0.0	73.6	12.0	508	7.8	435.5	216	216	140.4	886	724	575.9	670	406	6.0	335.0
er Group Lime	105	-105	4769.2	12.0	682.0	FALSE	0.0	73.6	12.0	520	7.8	443.3	216	216	140.4	898	736	583.7	682	416	6.0	341.0
er Group Lime	106	-106	4826.8	12.0	694.0	FALSE	0.0	73.6	12.0	532	7.8	451.1	216	216	140.4	910	748	591.5	694	426	6.0	347.0
er Group Lime	107	-107	4884.4	12.0	706.0	FALSE	0.0	73.6	12.0	544	7.8	458.9	216	216	140.4	922	760	599.3	706	435	6.0	353.0
er Group Lime	108	-108	4942	12.0	718.0	FALSE	0.0	73.6	12.0	556	7.8	466.7	216	216	140.4	934	772	607.1	718	445	6.0	359.0
er Group Lime	109	-109	4999.6	12.0	730.0	FALSE	0.0	73.6	12.0	568	7.8	474.5	216	216	140.4	946	784	614.9	730	454	6.0	365.0
er Group Lime	110	-110	5057.2	12.0	742.0	FALSE	0.0	73.6	12.0	580	7.8	482.3	216	216	140.4	958	796	622.7	742	464	6.0	371.0
er Group Lime	111	-111	5114.8	12.0	754.0	FALSE	0.0	73.6	12.0	592	7.8	490.1	216	216	140.4	970	808	630.5	754	474	6.0	377.0
er Group Lime	112	-112	5172.4	12.0	766.0	FALSE	0.0	73.6	12.0	604	7.8	497.9	216	216	140.4	982	820	638.3	766	483	6.0	383.0
er Group Lime	113	-113	5230	12.0	778.0	FALSE	0.0	73.6	12.0	616	7.8	505.7	216	216	140.4	994	832	646.1	778	493	6.0	389.0
er Group Lime	114	-114	5287.6	12.0	790.0	FALSE	0.0	73.6	12.0	628	7.8	513.5	216	216	140.4	1006	844	653.9	790	502	6.0	395.0
er Group Lime	115	-115	5345.2	12.0	802.0	FALSE	0.0	73.6	12.0	640	7.8	521.3	216	216	140.4	1018	856	661.7	802	512	6.0	401.0
er Group Lime	116	-116	5402.8	12.0	814.0	FALSE	0.0	73.6	12.0	652	7.8	529.1	216	216	140.4	1030	868	669.5	814	522	6.0	407.0
er Group Lime	117	-117	5460.4	12.0	826.0	FALSE	0.0	73.6	12.0	664	7.8	536.9	216	216	140.4	1042	880	677.3	826	531	6.0	413.0
er Group Lime	118	-118	5518	12.0	838.0	FALSE	0.0	73.6	12.0	676	7.8	544.7	216	216	140.4	1054	892	685.1	838	541	6.0	419.0
er Group Lime	119	-119	5575.6	12.0	850.0	FALSE	0.0	73.6	12.0	688	7.8	552.5	216	216	140.4	1066	904	692.9	850	550	6.0	425.0
er Group Lime	120	-120	5633.2	12.0	862.0	FALSE	0.0	73.6	12.0	700	7.8	560.3	216	216	140.4	1078	916	700.7	862	560	6.0	431.0
er Group Lime	121	-121	5690.8	12.0	874.0	FALSE	0.0	73.6	12.0	712	7.8	568.1	216	216	140.4	1090	928	708.5	874	570	6.0	437.0
er Group Lime	122	-122	5748.4	12.0	886.0	FALSE	0.0	73.6	12.0	724	7.8	575.9	216	216	140.4	1102	940	716.3	886	579	6.0	443.0
er Group Lime	123	-123	5806	12.0	898.0	FALSE	0.0	73.6	12.0	736	7.8	583.7	216	216	140.4	1114	952	724.1	898	589	6.0	449.0
er Group Lime	124	-124	5863.6	12.0	910.0	FALSE	0.0	73.6	12.0	748	7.8	591.5	216	216	140.4	1126	964	731.9	910	598	6.0	455.0
er Group Lime	125	-125	5921.2	12.0	922.0	FALSE	0.0	73.6	12.0	760	7.8	599.3	216	216	140.4	1138	976	739.7	922	608	6.0	461.0
er Group Lime	126	-126	5978.8	12.0	934.0	FALSE	0.0	73.6	12.0	772	7.8	607.1	216	216	140.4	1150	988	747.5	934	618	6.0	467.0
er Group Lime	127	-127	6036.4	12.0	946.0	FALSE	0.0	73.6	12.0	784	7.8	614.9	216	216	140.4	1162	1000	755.3	946	627	6.0	473.0
er Group Lime	128	-128	6094	12.0	958.0	FALSE	0.0	73.6	12.0	796	7.8	622.7	216	216	140.4	1174	1012	763.1	958	637	6.0	479.0
er Group Lime	129	-129	6151.6	12.0	970.0	FALSE	0.0	73.6	12.0	808	7.8	630.5	216	216	140.4	1186	1024	770.9	970	646	6.0	485.0
er Group Lime	130	-130	6209.2	12.0	982.0	FALSE	0.0	73.6	12.0	820	7.8	638.3	216	216	140.4	1198	1036	778.7	982	656	6.0	491.0
er Group Lime	131	-131	6266.8	12.0	994.0	FALSE	0.0	73.6	12.0	832	7.8	646.1	216	216	140.4	1210	1048	786.5	994	666	6.0	497.0
er Group Lime	132	-132	6324.4	12.0	1006.0	FALSE	0.0	73.6	12.0	844	7.8	653.9	216	216	140.4	1222	1060	794.3	1006	675	6.0	503.0
er Group Lime	133	-133	6382	12.0	1018.0	FALSE	0.0	73.6	12.0	856	7.8	661.7	216	216	140.4	1234	1072	802.1	1018	685	6.0	509.0
er Group Lime	134	-134	6439.6	12.0	1030.0	FALSE	0.0	73.6	12.0	868	7.8	669.5	216	216	140.4	1246	1084	809.9	1030	694	6.0	515.0
er Group Lime	135	-135	6497.2	12.0	1042.0	FALSE	0.0	73.6	12.0	880	7.8	677.3	216	216	140.4	1258	1096	817.7	1042	704	6.0	521.0
er Group Lime	136	-136	6554.8	12.0	1054.0	FALSE	0.0	73.6	12.0	892	7.8	685.1	216	216	140.4	1270	1108	825.5	1054	714	6.0	527.0
er Group Lime	137	-137	6612.4	12.0	1066.0	FALSE	0.0	73.6	12.0	904	7.8	692.9	216	216	140.4	1282	1120	833.3	1066	723	6.0	533.0
er Group Lime	138	-138	6670	12.0	1078.0	FALSE	0.0	73.6	12.0	916	7.8	700.7	216	216	140.4	1294	1132	841.1	1078	733	6.0	539.0
er Group Lime	139	-139	6727.6	12.0	1090.0	FALSE	0.0	73.6	12.0	928	7.8	708.5	216	216	140.4	1306	1144	848.9	1090	742	6.0	545.0
er Group Lime	140	-140	6785.2	12.0	1102.0	FALSE	0.0	73.6	12.0	940	7.8	716.3	216	216	140.4	1318	1156	856.7	1102	752	6.0	551.0
er Group Lime	141	-141	6842.8	12.0	1114.0	FALSE	0.0	73.6	12.0	952	7.8	724.1	216	216	140.4	1330	1168	864.5	1114	762	6.0	557.0
er Group Lime	142	-142	6900.4	12.0	1126.0	FALSE	0.0	73.6	12.0	964	7.8	731.9	216	216	140.4	1342	1180	872.3	1126	771	6.0	563.0
er Group Lime	143	-143	6958	12.0	1138.0	FALSE	0.0	73.6	12.0	976	7.8	739.7	216	216	140.4	1354	1192	880.1	1138	781	6.0	569.0
er Group Lime	144	-144	7015.6	12.0	1150.0	FALSE	0.0	73.6	12.0	988	7.8	747.5	216	216	140.4	1366	1204	887.9	1150	790	6.0	575.0
er Group Lime	145	-145	7073.2	12.0	1162.0	FALSE	0.0	73.6	12.0	1000	7.8	755.3	216	216	140.4	1378	1216	895.7	1162	800	6.0	581.0
er Group Lime	146	-146	7130.8	12.0	1174.0	FALSE	0.0	73.6	12.0	1012	7.8	763.1	216	216	140.4	1390	1228	903.5	1174	810	6.0	587.0
er Group Lime	147	-147	7188.4	12.0	1186.0	FALSE	0.0	73.6	12.0	1024	7.8	770.9	216	216	140.4	1402	1240	911.3	1186	819	6.0	593.0
er Group Lime	148	-148	7246	12.0	1198.0	FALSE	0.0	73.6	12.0	1036	7.8	778.7	216	216	140.4	1414	1252	919.1	1198	829	6.0	599.0
er Group Lime	149	-149	7303.6	12.0	1210.0	FALSE	0.0	73.6	12.0	1048	7.8	786.5	216	216	140.4	1426	1264	926.9	1210	838	6.0	605.0
er Group Lime	150	-150	7361.2	12.0	1222.0	FALSE	0.0	73.6	12.0	1060	7.8	794.3	216	216	140.4	1438	1276	934.7	1222	848	6.0	611.0
er Group Lime	151	-151	7418.8	12.0	1234.0	FALSE	0.0	73.6	12.0	1072	7.8	802.1	216	216	140.4	1450	1288	942.5	1234	858	6.0	617.0
er Group Lime	152	-152	7476.4	12.0	1246.0	FALSE	0.0	73.6	12.0	1084	7.8	809.9	216	216	140.4	1462	1300	950.3	1246	867	6.0	623.0
er Group Lime	153	-153	7534	12.0	1258.0	FALSE	0.0	73.6	12.0	1096	7.8	817.7	216	216	140.4	1474	1312	958.1	1258	877	6.0	629.0

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
er Group Lime	154	-154	7591.6	12.0	1270.0	FALSE	0.0	73.6	12.0	1108	7.8	825.5	216	216	140.4	1486	1324	965.9	1270	886	6.0	635.0
er Group Lime	155	-155	7649.2	12.0	1282.0	FALSE	0.0	73.6	12.0	1120	7.8	833.3	216	216	140.4	1498	1336	973.7	1282	896	6.0	641.0
er Group Lime	156	-156	7706.8	12.0	1294.0	FALSE	0.0	73.6	12.0	1132	7.8	841.1	216	216	140.4	1510	1348	981.5	1294	906	6.0	647.0
er Group Lime	157	-157	7764.4	12.0	1306.0	FALSE	0.0	73.6	12.0	1144	7.8	848.9	216	216	140.4	1522	1360	989.3	1306	915	6.0	653.0
er Group Lime	158	-158	7822	12.0	1318.0	FALSE	0.0	73.6	12.0	1156	7.8	856.7	216	216	140.4	1534	1372	997.1	1318	925	6.0	659.0
er Group Lime	159	-159	7879.6	12.0	1330.0	FALSE	0.0	73.6	12.0	1168	7.8	864.5	216	216	140.4	1546	1384	1004.9	1330	934	6.0	665.0
er Group Lime	160	-160	7937.2	12.0	1342.0	FALSE	0.0	73.6	12.0	1180	7.8	872.3	216	216	140.4	1558	1396	1012.7	1342	944	6.0	671.0
er Group Lime	161	-161	7994.8	12.0	1354.0	FALSE	0.0	73.6	12.0	1192	7.8	880.1	216	216	140.4	1570	1408	1020.5	1354	954	6.0	677.0
er Group Lime	162	-162	8052.4	12.0	1366.0	FALSE	0.0	73.6	12.0	1204	7.8	887.9	216	216	140.4	1582	1420	1028.3	1366	963	6.0	683.0
er Group Lime	163	-163	8110	12.0	1378.0	FALSE	0.0	73.6	12.0	1216	7.8	895.7	216	216	140.4	1594	1432	1036.1	1378	973	6.0	689.0
er Group Lime	164	-164	8167.6	12.0	1390.0	FALSE	0.0	73.6	12.0	1228	7.8	903.5	216	216	140.4	1606	1444	1043.9	1390	982	6.0	695.0
er Group Lime	165	-165	8225.2	12.0	1402.0	FALSE	0.0	73.6	12.0	1240	7.8	911.3	216	216	140.4	1618	1456	1051.7	1402	992	6.0	701.0
er Group Lime	166	-166	8282.8	12.0	1414.0	FALSE	0.0	73.6	12.0	1252	7.8	919.1	216	216	140.4	1630	1468	1059.5	1414	1002	6.0	707.0
er Group Lime	167	-167	8340.4	12.0	1426.0	FALSE	0.0	73.6	12.0	1264	7.8	926.9	216	216	140.4	1642	1480	1067.3	1426	1011	6.0	713.0
er Group Lime	168	-168	8398	12.0	1438.0	FALSE	0.0	73.6	12.0	1276	7.8	934.7	216	216	140.4	1654	1492	1075.1	1438	1021	6.0	719.0
er Group Lime	169	-169	8455.6	12.0	1450.0	FALSE	0.0	73.6	12.0	1288	7.8	942.5	216	216	140.4	1666	1504	1082.9	1450	1030	6.0	725.0
er Group Lime	170	-170	8513.2	12.0	1462.0	FALSE	0.0	73.6	12.0	1300	7.8	950.3	216	216	140.4	1678	1516	1090.7	1462	1040	6.0	731.0
er Group Lime	171	-171	8570.8	12.0	1474.0	FALSE	0.0	73.6	12.0	1312	7.8	958.1	216	216	140.4	1690	1528	1098.5	1474	1050	6.0	737.0
er Group Lime	172	-172	8628.4	12.0	1486.0	FALSE	0.0	73.6	12.0	1324	7.8	965.9	216	216	140.4	1702	1540	1106.3	1486	1059	6.0	743.0
er Group Lime	173	-173	8686	12.0	1498.0	FALSE	0.0	73.6	12.0	1336	7.8	973.7	216	216	140.4	1714	1552	1114.1	1498	1069	6.0	749.0
er Group Lime	174	-174	8743.6	12.0	1510.0	FALSE	0.0	73.6	12.0	1348	7.8	981.5	216	216	140.4	1726	1564	1121.9	1510	1078	6.0	755.0
er Group Lime	175	-175	8801.2	12.0	1522.0	FALSE	0.0	73.6	12.0	1360	7.8	989.3	216	216	140.4	1738	1576	1129.7	1522	1088	6.0	761.0
er Group Lime	176	-176	8858.8	12.0	1534.0	FALSE	0.0	73.6	12.0	1372	7.8	997.1	216	216	140.4	1750	1588	1137.5	1534	1098	6.0	767.0
er Group Lime	177	-177	8916.4	12.0	1546.0	FALSE	0.0	73.6	12.0	1384	7.8	1004.9	216	216	140.4	1762	1600	1145.3	1546	1107	6.0	773.0
er Group Lime	178	-178	8974	12.0	1558.0	FALSE	0.0	73.6	12.0	1396	7.8	1012.7	216	216	140.4	1774	1612	1153.1	1558	1117	6.0	779.0
er Group Lime	179	-179	9031.6	12.0	1570.0	FALSE	0.0	73.6	12.0	1408	7.8	1020.5	216	216	140.4	1786	1624	1160.9	1570	1126	6.0	785.0
er Group Lime	180	-180	9089.2	12.0	1582.0	FALSE	0.0	73.6	12.0	1420	7.8	1028.3	216	216	140.4	1798	1636	1168.7	1582	1136	6.0	791.0
er Group Lime	181	-181	9146.8	12.0	1594.0	FALSE	0.0	73.6	12.0	1432	7.8	1036.1	216	216	140.4	1810	1648	1176.5	1594	1146	6.0	797.0
er Group Lime	182	-182	9204.4	12.0	1606.0	FALSE	0.0	73.6	12.0	1444	7.8	1043.9	216	216	140.4	1822	1660	1184.3	1606	1155	6.0	803.0
er Group Lime	183	-183	9262	12.0	1618.0	FALSE	0.0	73.6	12.0	1456	7.8	1051.7	216	216	140.4	1834	1672	1192.1	1618	1165	6.0	809.0
er Group Lime	184	-184	9319.6	12.0	1630.0	FALSE	0.0	73.6	12.0	1468	7.8	1059.5	216	216	140.4	1846	1684	1199.9	1630	1174	6.0	815.0
er Group Lime	185	-185	9377.2	12.0	1642.0	FALSE	0.0	73.6	12.0	1480	7.8	1067.3	216	216	140.4	1858	1696	1207.7	1642	1184	6.0	821.0
er Group Lime	186	-186	9434.8	12.0	1654.0	FALSE	0.0	73.6	12.0	1492	7.8	1075.1	216	216	140.4	1870	1708	1215.5	1654	1194	6.0	827.0
er Group Lime	187	-187	9492.4	12.0	1666.0	FALSE	0.0	73.6	12.0	1504	7.8	1082.9	216	216	140.4	1882	1720	1223.3	1666	1203	6.0	833.0
er Group Lime	188	-188	9550	12.0	1678.0	FALSE	0.0	73.6	12.0	1516	7.8	1090.7	216	216	140.4	1894	1732	1231.1	1678	1213	6.0	839.0
er Group Lime	189	-189	9607.6	12.0	1690.0	FALSE	0.0	73.6	12.0	1528	7.8	1098.5	216	216	140.4	1906	1744	1238.9	1690	1222	6.0	845.0
er Group Lime	190	-190	9665.2	12.0	1702.0	FALSE	0.0	73.6	12.0	1540	7.8	1106.3	216	216	140.4	1918	1756	1246.7	1702	1232	6.0	851.0
er Group Lime	191	-191	9722.8	12.0	1714.0	FALSE	0.0	73.6	12.0	1552	7.8	1114.1	216	216	140.4	1930	1768	1254.5	1714	1242	6.0	857.0
er Group Lime	192	-192	9780.4	12.0	1726.0	FALSE	0.0	73.6	12.0	1564	7.8	1121.9	216	216	140.4	1942	1780	1262.3	1726	1251	6.0	863.0
er Group Lime	193	-193	9838	12.0	1738.0	FALSE	0.0	73.6	12.0	1576	7.8	1129.7	216	216	140.4	1954	1792	1270.1	1738	1261	6.0	869.0
er Group Lime	194	-194	9895.6	12.0	1750.0	FALSE	0.0	73.6	12.0	1588	7.8	1137.5	216	216	140.4	1966	1804	1277.9	1750	1270	6.0	875.0
er Group Lime	195	-195	9953.2	12.0	1762.0	FALSE	0.0	73.6	12.0	1600	7.8	1145.3	216	216	140.4	1978	1816	1285.7	1762	1280	6.0	881.0
er Group Lime	196	-196	10010.8	12.0	1774.0	FALSE	0.0	73.6	12.0	1612	7.8	1153.1	216	216	140.4	1990	1828	1293.5	1774	1290	6.0	887.0
er Group Lime	197	-197	10068.4	12.0	1786.0	FALSE	0.0	73.6	12.0	1624	7.8	1160.9	216	216	140.4	2002	1840	1301.3	1786	1299	6.0	893.0
er Group Lime	198	-198	10126	12.0	1798.0	FALSE	0.0	73.6	12.0	1636	7.8	1168.7	216	216	140.4	2014	1852	1309.1	1798	1309	6.0	899.0
er Group Lime	199	-199	10183.6	12.0	1810.0	FALSE	0.0	73.6	12.0	1648	7.8	1176.5	216	216	140.4	2026	1864	1316.9	1810	1318	6.0	905.0
er Group Lime	200	-200	10241.2	12.0	1822.0	FALSE	0.0	73.6	12.0	1660	7.8	1184.3	216	216	140.4	2038	1876	1324.7	1822	1328	6.0	911.0

AXIAL PILE CAPACITY

Project Information

Project:	Harbor River Bridge	Pile Tip Area (square feet):	4.00
Owner:	SCDOT	Pile Perimeter (ft):	8.00
Job Number:	18461-007-01	Side and End Friction Resistance Factor α Method	0.65
Analysis by:	HPC	Side and End Friction Resistance Factor Nordlund/Thurman Method	0.65
Date/Time:	10/16/2017 11:51	Uplift Side Friction Resistance Factor α Method	0.5
Run Designation:	East Overbank - Full Scour	Uplift Friction Resistance Factor Nordlund/Thurman Method	0.5
Pile Diameter (ft):	2.0	Depth to Top of Liquefied Layer (ft):	10
Ground Surface Elevation (ft):	-5	Depth to Bottom of Liquefied Layer (ft):	60
Pile Type:	Square Precast Concrete	Residual Shear Strength of Liquefiable Layer (psf):	169
Checked by:	ZAS	Enter "1" to calculate downdrag from residual shear strength, "2" average of residual & non-liqufied, "3" non-liquefied strength parameters	1
		Calculated Unfactored Downdrag Load (kips)[4]:	106.3

Soil Profile

Soil Type	Depth at Bottom of Soil Unit (feet)	Bouyant Unit Weight (pcf) (total weight above GWT)	ϕ (degrees)	S_u, Undrained Shear Strength (psf)	α, Empirical Adhesion Factor	Friction Ratio, C_f	Earth Pressure Coefficient, K_δ
Sands (2)	10	57.6	38			0.90	3.00
Sands (3)	30	37.6	31			0.95	1.15
Silts/Clays	40	32.6		328	1		
Sands (4)	60	37.6	31			0.95	1.15
Hawthorn Marl	75	57.6		4000	0.25		
Cooper Group Limestone	200	57.6		6000	0.25		

Notes:
1. Spreadsheet programed for α method for undrained shear strength and Nordlund/Thurman Method for friction angle
2. Refer to AASHTO LRFD Section 10.7.3.8.6b to determine α
3. Refer to AASHTO LRFD Section 10.7.3.8.6f to determine C_f and K_δ
4. The structural engineer should include the unfactored downdrag load in accordance with Section 3.11.8 of the AASHTO LRFD Manual

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
Sands (2)	1	-6	28.8	0.4	0.4	FALSE	0.4	0.4	0.0	0	0.3	0.3	9	0	5.6	9	0	5.8	0	0	0.2	0.2
Sands (2)	2	-7	86.4	1.2	1.6	FALSE	1.2	1.6	0.0	0	0.8	1.0	27	0	17.7	29	0	18.7	2	0	0.6	0.8
Sands (2)	3	-8	144	1.9	3.5	FALSE	1.9	3.5	0.0	0	1.3	2.3	45	0	29.4	49	0	31.7	3	0	1.0	1.7
Sands (2)	4	-9	201.6	2.7	6.2	FALSE	2.7	6.2	0.0	0	1.8	4.0	63	0	41.2	70	0	45.3	6	0	1.4	3.1
Sands (2)	5	-10	259.2	3.5	9.7	FALSE	3.5	9.7	0.0	0	2.3	6.3	82	0	53.0	91	0	59.3	10	0	1.7	4.9
Sands (2)	6	-11	316.8	4.3	14.0	FALSE	4.3	14.0	0.0	0	2.8	9.1	100	0	64.8	114	0	73.9	14	0	2.1	7.0
Sands (2)	7	-12	374.4	5.1	19.0	FALSE	5.1	19.0	0.0	0	3.3	12.4	118	0	76.6	137	0	88.9	19	0	2.5	9.5
Sands (2)	8	-13	432	5.8	24.9	FALSE	5.8	24.9	0.0	0	3.8	16.2	136	0	88.3	161	0	104.5	25	0	2.9	12.4
Sands (2)	9	-14	489.6	6.6	31.5	FALSE	6.6	31.5	0.0	0	4.3	20.5	154	0	100.1	185	0	120.6	31	0	3.3	15.7
Sands (2)	10	-15	547.2	7.4	38.9	FALSE	7.4	38.9	0.0	0	4.8	25.3	172	0	111.9	211	0	137.2	39	0	3.7	19.4
Sands (3)	11	-16	594.8	2.7	41.5	TRUE	1.3	40.2	0.0	0	1.7	27.0	55	0	35.7	97	0	62.7	42	0	1.3	20.8
Sands (3)	12	-17	632.4	2.9	44.4	TRUE	1.3	41.5	0.0	0	1.9	28.9	58	0	37.8	102	0	66.6	44	0	1.4	22.2
Sands (3)	13	-18	670	3.0	47.4	TRUE	1.3	42.9	0.0	0	2.0	30.8	62	0	40.0	109	0	70.8	47	0	1.5	23.7
Sands (3)	14	-19	707.6	3.2	50.6	TRUE	1.3	44.2	0.0	0	2.1	32.9	65	0	42.0	115	0	74.9	51	0	1.6	25.3
Sands (3)	15	-20	745.2	3.4	54.0	TRUE	1.3	45.6	0.0	0	2.2	35.1	68	0	44.2	122	0	79.3	54	0	1.7	27.0
Sands (3)	16	-21	782.8	3.5	57.5	TRUE	1.3	46.9	0.0	0	2.3	37.4	71	0	46.2	129	0	83.6	58	0	1.8	28.8
Sands (3)	17	-22	820.4	3.7	61.3	TRUE	1.3	48.3	0.0	0	2.4	39.8	72	0	46.8	133	0	86.6	61	0	1.9	30.6
Sands (3)	18	-23	858	3.9	65.1	TRUE	1.3	49.6	0.0	0	2.5	42.3	72	0	46.8	137	0	89.1	65	0	1.9	32.6
Sands (3)	19	-24	895.6	4.1	69.2	TRUE	1.3	51.0	0.0	0	2.6	45.0	72	0	46.8	141	0	91.8	69	0	2.0	34.6
Sands (3)	20	-25	933.2	4.2	73.4	TRUE	1.3	52.3	0.0	0	2.7	47.7	72	0	46.8	145	0	94.5	73	0	2.1	36.7
Sands (3)	21	-26	970.8	4.4	77.8	TRUE	1.3	53.7	0.0	0	2.9	50.6	72	0	46.8	150	0	97.4	78	0	2.2	38.9
Sands (3)	22	-27	1008.4	4.6	82.4	TRUE	1.3	55.0	0.0	0	3.0	53.5	72	0	46.8	154	0	100.3	82	0	2.3	41.2
Sands (3)	23	-28	1046	4.7	87.1	TRUE	1.3	56.4	0.0	0	3.1	56.6	72	0	46.8	159	0	103.4	87	0	2.4	43.5
Sands (3)	24	-29	1083.6	4.9	92.0	TRUE	1.3	57.7	0.0	0	3.2	59.8	72	0	46.8	164	0	106.6	92	0	2.5	46.0
Sands (3)	25	-30	1121.2	5.1	97.1	TRUE	1.3	59.1	0.0	0	3.3	63.1	72	0	46.8	169	0	109.9	97	0	2.5	48.5
Sands (3)	26	-31	1158.8	5.2	102.3	TRUE	1.3	60.4	0.0	0	3.4	66.5	72	0	46.8	174	0	113.3	102	0	2.6	51.2
Sands (3)	27	-32	1196.4	5.4	107.7	TRUE	1.3	61.8	0.0	0	3.5	70.0	72	0	46.8	180	0	116.8	108	0	2.7	53.9
Sands (3)	28	-33	1234	5.6	113.3	TRUE	1.3	63.1	0.0	0	3.6	73.6	72	0	46.8	185	0	120.4	113	0	2.8	56.7
Sands (3)	29	-34	1271.6	5.8	119.1	TRUE	1.3	64.5	0.0	0	3.7	77.4	72	0	46.8	191	0	124.2	119	0	2.9	59.5
Sands (3)	30	-35	1309.2	5.9	125.0	TRUE	1.3	65.8	0.0	0	3.8	81.2	72	0	46.8	197	0	128.0	125	0	3.0	62.5
Silts/Clays	31	-36	1344.3	2.6	127.6	TRUE	1.3	67.2	0.0	0	1.7	82.9	12	0	7.7	139	0	90.6	128	0	1.3	63.8
Silts/Clays	32	-37	1376.9	2.6	130.2	TRUE	1.3	68.5	0.0	0	1.7	84.6	12	0	7.7	142	0	92.3	130	0	1.3	65.1
Silts/Clays	33	-38	1409.5	2.6	132.8	TRUE	1.3	69.9	0.0	0	1.7	86.4	12	0	7.7	145	0	94.0	133	0	1.3	66.4
Silts/Clays	34	-39	1442.1	2.6	135.5	TRUE	1.3	71.2	0.0	0	1.7	88.1	12	0	7.7	147	0	95.7	135	0	1.3	67.7
Silts/Clays	35	-40	1474.7	2.6	138.1	TRUE	1.3	72.6	0.0	0	1.7	89.8	12	0	7.7	150	0	97.4	138	0	1.3	69.0
Silts/Clays	36	-41	1507.3	2.6	140.7	TRUE	1.3	73.9	0.0	0	1.7	91.5	12	0	7.7	153	0	99.1	141	0	1.3	70.4
Silts/Clays	37	-42	1539.9	2.6	143.3	TRUE	1.3	75.3	0.0	0	1.7	93.2	12	0	7.7	155	0	100.8	143	0	1.3	71.7
Silts/Clays	38	-43	1572.5	2.6	146.0	TRUE	1.3	76.6	0.0	0	1.7	94.9	12	0	7.7	158	0	102.6	146	0	1.3	73.0
Silts/Clays	39	-44	1605.1	2.6	148.6	TRUE	1.3	78.0	0.0	0	1.7	96.6	12	0	7.7	160	0	104.3	149	0	1.3	74.3
Silts/Clays	40	-45	1637.7	2.6	151.2	TRUE	1.3	79.3	0.0	0	1.7	98.3	12	0	7.7	163	0	106.0	151	0	1.3	75.6
Sands (4)	41	-46	1672.8	7.6	158.8	TRUE	1.3	80.7	0.0	0	4.9	103.2	72	0	46.8	231	0	150.0	159	0	3.8	79.4
Sands (4)	42	-47	1710.4	7.7	166.5	TRUE	1.3	82.0	0.0	0	5.0	108.2	72	0	46.8	239	0	155.0	167	0	3.9	83.3
Sands (4)	43	-48	1748	7.9	174.4	TRUE	1.3	83.4	0.0	0	5.1	113.4	72	0	46.8	246	0	160.2	174	0	4.0	87.2
Sands (4)	44	-49	1785.6	8.1	182.5	TRUE	1.3	84.7	0.0	0	5.2	118.6	72	0	46.8	255	0	165.4	183	0	4.0	91.3
Sands (4)	45	-50	1823.2	8.2	190.8	TRUE	1.3	86.1	0.0	0	5.4	124.0	72	0	46.8	263	0	170.8	191	0	4.1	95.4
Sands (4)	46	-51	1860.8	8.4	199.2	TRUE	1.3	87.4	0.0	0	5.5	129.5	72	0	46.8	271	0	176.3	199	0	4.2	99.6
Sands (4)	47	-52	1898.4	8.6	207.8	TRUE	1.3	88.8	0.0	0	5.6	135.0	72	0	46.8	280	0	181.8	208	0	4.3	103.9
Sands (4)	48	-53	1936	8.8	216.5	TRUE	1.3	90.1	0.0	0	5.7	140.7	72	0	46.8	289	0	187.5	217	0	4.4	108.3
Sands (4)	49	-54	1973.6	8.9	225.4	TRUE	1.3	91.5	0.0	0	5.8	146.5	72	0	46.8	297	0	193.3	225	0	4.5	112.7
Sands (4)	50	-55	2011.2	9.1	234.5	TRUE	1.3	92.8	0.0	0	5.9	152.4	72	0	46.8	307	0	199.2	235	0	4.5	117.3
Sands (4)	51	-56	2048.8	9.3	243.8	TRUE	1.3	94.2	0.0	0	6.0	158.5	72	0	46.8	316	0	205.3	244	0	4.6	121.9

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
Sands (4)	52	-57	2086.4	9.4	253.2	TRUE	1.3	95.5	0.0	0	6.1	164.6	72	0	46.8	325	0	211.4	253	0	4.7	126.6
Sands (4)	53	-58	2124	9.6	262.8	TRUE	1.3	96.9	0.0	0	6.2	170.9	72	0	46.8	335	0	217.7	263	0	4.8	131.4
Sands (4)	54	-59	2161.6	9.8	272.6	TRUE	1.3	98.2	0.0	0	6.4	177.2	72	0	46.8	345	0	224.0	273	0	4.9	136.3
Sands (4)	55	-60	2199.2	9.9	282.6	TRUE	1.3	99.6	0.0	0	6.5	183.7	72	0	46.8	355	0	230.5	283	0	5.0	141.3
Sands (4)	56	-61	2236.8	10.1	292.7	TRUE	1.3	100.9	0.0	0	6.6	190.2	72	0	46.8	365	0	237.0	293	0	5.1	146.3
Sands (4)	57	-62	2274.4	10.3	303.0	TRUE	1.3	102.3	0.0	0	6.7	196.9	72	0	46.8	375	0	243.7	303	0	5.1	151.5
Sands (4)	58	-63	2312	10.5	313.4	TRUE	1.3	103.6	0.0	0	6.8	203.7	72	0	46.8	385	0	250.5	313	0	5.2	156.7
Sands (4)	59	-64	2349.6	10.6	324.1	TRUE	1.3	105.0	0.0	0	6.9	210.6	72	0	46.8	396	0	257.4	324	0	5.3	162.0
Sands (4)	60	-65	2387.2	10.8	334.9	TRUE	1.3	106.3	0.0	0	7.0	217.7	72	0	46.8	407	0	264.5	335	0	5.4	167.4
Hawthorn Mar	61	-66	2434.8	8.0	342.9	FALSE	0.0	106.3	8.0	8	5.2	222.9	144	144	93.6	487	152	316.5	343	6	4.0	171.4
Hawthorn Mar	62	-67	2492.4	8.0	350.9	FALSE	0.0	106.3	8.0	16	5.2	228.1	144	144	93.6	495	160	321.7	351	13	4.0	175.4
Hawthorn Mar	63	-68	2550	8.0	358.9	FALSE	0.0	106.3	8.0	24	5.2	233.3	144	144	93.6	503	168	326.9	359	19	4.0	179.4
Hawthorn Mar	64	-69	2607.6	8.0	366.9	FALSE	0.0	106.3	8.0	32	5.2	238.5	144	144	93.6	511	176	332.1	367	26	4.0	183.4
Hawthorn Mar	65	-70	2665.2	8.0	374.9	FALSE	0.0	106.3	8.0	40	5.2	243.7	144	144	93.6	519	184	337.3	375	32	4.0	187.4
Hawthorn Mar	66	-71	2722.8	8.0	382.9	FALSE	0.0	106.3	8.0	48	5.2	248.9	144	144	93.6	527	192	342.5	383	38	4.0	191.4
Hawthorn Mar	67	-72	2780.4	8.0	390.9	FALSE	0.0	106.3	8.0	56	5.2	254.1	144	144	93.6	535	200	347.7	391	45	4.0	195.4
Hawthorn Mar	68	-73	2838	8.0	398.9	FALSE	0.0	106.3	8.0	64	5.2	259.3	144	144	93.6	543	208	352.9	399	51	4.0	199.4
Hawthorn Mar	69	-74	2895.6	8.0	406.9	FALSE	0.0	106.3	8.0	72	5.2	264.5	144	144	93.6	551	216	358.1	407	58	4.0	203.4
Hawthorn Mar	70	-75	2953.2	8.0	414.9	FALSE	0.0	106.3	8.0	80	5.2	269.7	144	144	93.6	559	224	363.3	415	64	4.0	207.4
Hawthorn Mar	71	-76	3010.8	8.0	422.9	FALSE	0.0	106.3	8.0	88	5.2	274.9	144	144	93.6	567	232	368.5	423	70	4.0	211.4
Hawthorn Mar	72	-77	3068.4	8.0	430.9	FALSE	0.0	106.3	8.0	96	5.2	280.1	144	144	93.6	575	240	373.7	431	77	4.0	215.4
Hawthorn Mar	73	-78	3126	8.0	438.9	FALSE	0.0	106.3	8.0	104	5.2	285.3	144	144	93.6	583	248	378.9	439	83	4.0	219.4
Hawthorn Mar	74	-79	3183.6	8.0	446.9	FALSE	0.0	106.3	8.0	112	5.2	290.5	144	144	93.6	591	256	384.1	447	90	4.0	223.4
Hawthorn Mar	75	-80	3241.2	8.0	454.9	FALSE	0.0	106.3	8.0	120	5.2	295.7	144	144	93.6	599	264	389.3	455	96	4.0	227.4
er Group Lime	76	-81	3298.8	12.0	466.9	FALSE	0.0	106.3	12.0	132	7.8	303.5	216	216	140.4	683	348	443.9	467	106	6.0	233.4
er Group Lime	77	-82	3356.4	12.0	478.9	FALSE	0.0	106.3	12.0	144	7.8	311.3	216	216	140.4	695	360	451.7	479	115	6.0	239.4
er Group Lime	78	-83	3414	12.0	490.9	FALSE	0.0	106.3	12.0	156	7.8	319.1	216	216	140.4	707	372	459.5	491	125	6.0	245.4
er Group Lime	79	-84	3471.6	12.0	502.9	FALSE	0.0	106.3	12.0	168	7.8	326.9	216	216	140.4	719	384	467.3	503	134	6.0	251.4
er Group Lime	80	-85	3529.2	12.0	514.9	FALSE	0.0	106.3	12.0	180	7.8	334.7	216	216	140.4	731	396	475.1	515	144	6.0	257.4
er Group Lime	81	-86	3586.8	12.0	526.9	FALSE	0.0	106.3	12.0	192	7.8	342.5	216	216	140.4	743	408	482.9	527	154	6.0	263.4
er Group Lime	82	-87	3644.4	12.0	538.9	FALSE	0.0	106.3	12.0	204	7.8	350.3	216	216	140.4	755	420	490.7	539	163	6.0	269.4
er Group Lime	83	-88	3702	12.0	550.9	FALSE	0.0	106.3	12.0	216	7.8	358.1	216	216	140.4	767	432	498.5	551	173	6.0	275.4
er Group Lime	84	-89	3759.6	12.0	562.9	FALSE	0.0	106.3	12.0	228	7.8	365.9	216	216	140.4	779	444	506.3	563	182	6.0	281.4
er Group Lime	85	-90	3817.2	12.0	574.9	FALSE	0.0	106.3	12.0	240	7.8	373.7	216	216	140.4	791	456	514.1	575	192	6.0	287.4
er Group Lime	86	-91	3874.8	12.0	586.9	FALSE	0.0	106.3	12.0	252	7.8	381.5	216	216	140.4	803	468	521.9	587	202	6.0	293.4
er Group Lime	87	-92	3932.4	12.0	598.9	FALSE	0.0	106.3	12.0	264	7.8	389.3	216	216	140.4	815	480	529.7	599	211	6.0	299.4
er Group Lime	88	-93	3990	12.0	610.9	FALSE	0.0	106.3	12.0	276	7.8	397.1	216	216	140.4	827	492	537.5	611	221	6.0	305.4
er Group Lime	89	-94	4047.6	12.0	622.9	FALSE	0.0	106.3	12.0	288	7.8	404.9	216	216	140.4	839	504	545.3	623	230	6.0	311.4
er Group Lime	90	-95	4105.2	12.0	634.9	FALSE	0.0	106.3	12.0	300	7.8	412.7	216	216	140.4	851	516	553.1	635	240	6.0	317.4
er Group Lime	91	-96	4162.8	12.0	646.9	FALSE	0.0	106.3	12.0	312	7.8	420.5	216	216	140.4	863	528	560.9	647	250	6.0	323.4
er Group Lime	92	-97	4220.4	12.0	658.9	FALSE	0.0	106.3	12.0	324	7.8	428.3	216	216	140.4	875	540	568.7	659	259	6.0	329.4
er Group Lime	93	-98	4278	12.0	670.9	FALSE	0.0	106.3	12.0	336	7.8	436.1	216	216	140.4	887	552	576.5	671	269	6.0	335.4
er Group Lime	94	-99	4335.6	12.0	682.9	FALSE	0.0	106.3	12.0	348	7.8	443.9	216	216	140.4	899	564	584.3	683	278	6.0	341.4
er Group Lime	95	-100	4393.2	12.0	694.9	FALSE	0.0	106.3	12.0	360	7.8	451.7	216	216	140.4	911	576	592.1	695	288	6.0	347.4
er Group Lime	96	-101	4450.8	12.0	706.9	FALSE	0.0	106.3	12.0	372	7.8	459.5	216	216	140.4	923	588	599.9	707	298	6.0	353.4
er Group Lime	97	-102	4508.4	12.0	718.9	FALSE	0.0	106.3	12.0	384	7.8	467.3	216	216	140.4	935	600	607.7	719	307	6.0	359.4
er Group Lime	98	-103	4566	12.0	730.9	FALSE	0.0	106.3	12.0	396	7.8	475.1	216	216	140.4	947	612	615.5	731	317	6.0	365.4
er Group Lime	99	-104	4623.6	12.0	742.9	FALSE	0.0	106.3	12.0	408	7.8	482.9	216	216	140.4	959	624	623.3	743	326	6.0	371.4
er Group Lime	100	-105	4681.2	12.0	754.9	FALSE	0.0	106.3	12.0	420	7.8	490.7	216	216	140.4	971	636	631.1	755	336	6.0	377.4
er Group Lime	101	-106	4738.8	12.0	766.9	FALSE	0.0	106.3	12.0	432	7.8	498.5	216	216	140.4	983	648	638.9	767	346	6.0	383.4
er Group Lime	102	-107	4796.4	12.0	778.9	FALSE	0.0	106.3	12.0	444	7.8	506.3	216	216	140.4	995	660	646.7	779	355	6.0	389.4

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
er Group Lime	103	-108	4854	12.0	790.9	FALSE	0.0	106.3	12.0	456	7.8	514.1	216	216	140.4	1007	672	654.5	791	365	6.0	395.4
er Group Lime	104	-109	4911.6	12.0	802.9	FALSE	0.0	106.3	12.0	468	7.8	521.9	216	216	140.4	1019	684	662.3	803	374	6.0	401.4
er Group Lime	105	-110	4969.2	12.0	814.9	FALSE	0.0	106.3	12.0	480	7.8	529.7	216	216	140.4	1031	696	670.1	815	384	6.0	407.4
er Group Lime	106	-111	5026.8	12.0	826.9	FALSE	0.0	106.3	12.0	492	7.8	537.5	216	216	140.4	1043	708	677.9	827	394	6.0	413.4
er Group Lime	107	-112	5084.4	12.0	838.9	FALSE	0.0	106.3	12.0	504	7.8	545.3	216	216	140.4	1055	720	685.7	839	403	6.0	419.4
er Group Lime	108	-113	5142	12.0	850.9	FALSE	0.0	106.3	12.0	516	7.8	553.1	216	216	140.4	1067	732	693.5	851	413	6.0	425.4
er Group Lime	109	-114	5199.6	12.0	862.9	FALSE	0.0	106.3	12.0	528	7.8	560.9	216	216	140.4	1079	744	701.3	863	422	6.0	431.4
er Group Lime	110	-115	5257.2	12.0	874.9	FALSE	0.0	106.3	12.0	540	7.8	568.7	216	216	140.4	1091	756	709.1	875	432	6.0	437.4
er Group Lime	111	-116	5314.8	12.0	886.9	FALSE	0.0	106.3	12.0	552	7.8	576.5	216	216	140.4	1103	768	716.9	887	442	6.0	443.4
er Group Lime	112	-117	5372.4	12.0	898.9	FALSE	0.0	106.3	12.0	564	7.8	584.3	216	216	140.4	1115	780	724.7	899	451	6.0	449.4
er Group Lime	113	-118	5430	12.0	910.9	FALSE	0.0	106.3	12.0	576	7.8	592.1	216	216	140.4	1127	792	732.5	911	461	6.0	455.4
er Group Lime	114	-119	5487.6	12.0	922.9	FALSE	0.0	106.3	12.0	588	7.8	599.9	216	216	140.4	1139	804	740.3	923	470	6.0	461.4
er Group Lime	115	-120	5545.2	12.0	934.9	FALSE	0.0	106.3	12.0	600	7.8	607.7	216	216	140.4	1151	816	748.1	935	480	6.0	467.4
er Group Lime	116	-121	5602.8	12.0	946.9	FALSE	0.0	106.3	12.0	612	7.8	615.5	216	216	140.4	1163	828	755.9	947	490	6.0	473.4
er Group Lime	117	-122	5660.4	12.0	958.9	FALSE	0.0	106.3	12.0	624	7.8	623.3	216	216	140.4	1175	840	763.7	959	499	6.0	479.4
er Group Lime	118	-123	5718	12.0	970.9	FALSE	0.0	106.3	12.0	636	7.8	631.1	216	216	140.4	1187	852	771.5	971	509	6.0	485.4
er Group Lime	119	-124	5775.6	12.0	982.9	FALSE	0.0	106.3	12.0	648	7.8	638.9	216	216	140.4	1199	864	779.3	983	518	6.0	491.4
er Group Lime	120	-125	5833.2	12.0	994.9	FALSE	0.0	106.3	12.0	660	7.8	646.7	216	216	140.4	1211	876	787.1	995	528	6.0	497.4
er Group Lime	121	-126	5890.8	12.0	1006.9	FALSE	0.0	106.3	12.0	672	7.8	654.5	216	216	140.4	1223	888	794.9	1007	538	6.0	503.4
er Group Lime	122	-127	5948.4	12.0	1018.9	FALSE	0.0	106.3	12.0	684	7.8	662.3	216	216	140.4	1235	900	802.7	1019	547	6.0	509.4
er Group Lime	123	-128	6006	12.0	1030.9	FALSE	0.0	106.3	12.0	696	7.8	670.1	216	216	140.4	1247	912	810.5	1031	557	6.0	515.4
er Group Lime	124	-129	6063.6	12.0	1042.9	FALSE	0.0	106.3	12.0	708	7.8	677.9	216	216	140.4	1259	924	818.3	1043	566	6.0	521.4
er Group Lime	125	-130	6121.2	12.0	1054.9	FALSE	0.0	106.3	12.0	720	7.8	685.7	216	216	140.4	1271	936	826.1	1055	576	6.0	527.4
er Group Lime	126	-131	6178.8	12.0	1066.9	FALSE	0.0	106.3	12.0	732	7.8	693.5	216	216	140.4	1283	948	833.9	1067	586	6.0	533.4
er Group Lime	127	-132	6236.4	12.0	1078.9	FALSE	0.0	106.3	12.0	744	7.8	701.3	216	216	140.4	1295	960	841.7	1079	595	6.0	539.4
er Group Lime	128	-133	6294	12.0	1090.9	FALSE	0.0	106.3	12.0	756	7.8	709.1	216	216	140.4	1307	972	849.5	1091	605	6.0	545.4
er Group Lime	129	-134	6351.6	12.0	1102.9	FALSE	0.0	106.3	12.0	768	7.8	716.9	216	216	140.4	1319	984	857.3	1103	614	6.0	551.4
er Group Lime	130	-135	6409.2	12.0	1114.9	FALSE	0.0	106.3	12.0	780	7.8	724.7	216	216	140.4	1331	996	865.1	1115	624	6.0	557.4
er Group Lime	131	-136	6466.8	12.0	1126.9	FALSE	0.0	106.3	12.0	792	7.8	732.5	216	216	140.4	1343	1008	872.9	1127	634	6.0	563.4
er Group Lime	132	-137	6524.4	12.0	1138.9	FALSE	0.0	106.3	12.0	804	7.8	740.3	216	216	140.4	1355	1020	880.7	1139	643	6.0	569.4
er Group Lime	133	-138	6582	12.0	1150.9	FALSE	0.0	106.3	12.0	816	7.8	748.1	216	216	140.4	1367	1032	888.5	1151	653	6.0	575.4
er Group Lime	134	-139	6639.6	12.0	1162.9	FALSE	0.0	106.3	12.0	828	7.8	755.9	216	216	140.4	1379	1044	896.3	1163	662	6.0	581.4
er Group Lime	135	-140	6697.2	12.0	1174.9	FALSE	0.0	106.3	12.0	840	7.8	763.7	216	216	140.4	1391	1056	904.1	1175	672	6.0	587.4
er Group Lime	136	-141	6754.8	12.0	1186.9	FALSE	0.0	106.3	12.0	852	7.8	771.5	216	216	140.4	1403	1068	911.9	1187	682	6.0	593.4
er Group Lime	137	-142	6812.4	12.0	1198.9	FALSE	0.0	106.3	12.0	864	7.8	779.3	216	216	140.4	1415	1080	919.7	1199	691	6.0	599.4
er Group Lime	138	-143	6870	12.0	1210.9	FALSE	0.0	106.3	12.0	876	7.8	787.1	216	216	140.4	1427	1092	927.5	1211	701	6.0	605.4
er Group Lime	139	-144	6927.6	12.0	1222.9	FALSE	0.0	106.3	12.0	888	7.8	794.9	216	216	140.4	1439	1104	935.3	1223	710	6.0	611.4
er Group Lime	140	-145	6985.2	12.0	1234.9	FALSE	0.0	106.3	12.0	900	7.8	802.7	216	216	140.4	1451	1116	943.1	1235	720	6.0	617.4
er Group Lime	141	-146	7042.8	12.0	1246.9	FALSE	0.0	106.3	12.0	912	7.8	810.5	216	216	140.4	1463	1128	950.9	1247	730	6.0	623.4
er Group Lime	142	-147	7100.4	12.0	1258.9	FALSE	0.0	106.3	12.0	924	7.8	818.3	216	216	140.4	1475	1140	958.7	1259	739	6.0	629.4
er Group Lime	143	-148	7158	12.0	1270.9	FALSE	0.0	106.3	12.0	936	7.8	826.1	216	216	140.4	1487	1152	966.5	1271	749	6.0	635.4
er Group Lime	144	-149	7215.6	12.0	1282.9	FALSE	0.0	106.3	12.0	948	7.8	833.9	216	216	140.4	1499	1164	974.3	1283	758	6.0	641.4
er Group Lime	145	-150	7273.2	12.0	1294.9	FALSE	0.0	106.3	12.0	960	7.8	841.7	216	216	140.4	1511	1176	982.1	1295	768	6.0	647.4
er Group Lime	146	-151	7330.8	12.0	1306.9	FALSE	0.0	106.3	12.0	972	7.8	849.5	216	216	140.4	1523	1188	989.9	1307	778	6.0	653.4
er Group Lime	147	-152	7388.4	12.0	1318.9	FALSE	0.0	106.3	12.0	984	7.8	857.3	216	216	140.4	1535	1200	997.7	1319	787	6.0	659.4
er Group Lime	148	-153	7446	12.0	1330.9	FALSE	0.0	106.3	12.0	996	7.8	865.1	216	216	140.4	1547	1212	1005.5	1331	797	6.0	665.4
er Group Lime	149	-154	7503.6	12.0	1342.9	FALSE	0.0	106.3	12.0	1008	7.8	872.9	216	216	140.4	1559	1224	1013.3	1343	806	6.0	671.4
er Group Lime	150	-155	7561.2	12.0	1354.9	FALSE	0.0	106.3	12.0	1020	7.8	880.7	216	216	140.4	1571	1236	1021.1	1355	816	6.0	677.4
er Group Lime	151	-156	7618.8	12.0	1366.9	FALSE	0.0	106.3	12.0	1032	7.8	888.5	216	216	140.4	1583	1248	1028.9	1367	826	6.0	683.4
er Group Lime	152	-157	7676.4	12.0	1378.9	FALSE	0.0	106.3	12.0	1044	7.8	896.3	216	216	140.4	1595	1260	1036.7	1379	835	6.0	689.4
er Group Lime	153	-158	7734	12.0	1390.9	FALSE	0.0	106.3	12.0	1056	7.8	904.1	216	216	140.4	1607	1272	1044.5	1391	845	6.0	695.4

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
er Group Lime	154	-159	7791.6	12.0	1402.9	FALSE	0.0	106.3	12.0	1068	7.8	911.9	216	216	140.4	1619	1284	1052.3	1403	854	6.0	701.4
er Group Lime	155	-160	7849.2	12.0	1414.9	FALSE	0.0	106.3	12.0	1080	7.8	919.7	216	216	140.4	1631	1296	1060.1	1415	864	6.0	707.4
er Group Lime	156	-161	7906.8	12.0	1426.9	FALSE	0.0	106.3	12.0	1092	7.8	927.5	216	216	140.4	1643	1308	1067.9	1427	874	6.0	713.4
er Group Lime	157	-162	7964.4	12.0	1438.9	FALSE	0.0	106.3	12.0	1104	7.8	935.3	216	216	140.4	1655	1320	1075.7	1439	883	6.0	719.4
er Group Lime	158	-163	8022	12.0	1450.9	FALSE	0.0	106.3	12.0	1116	7.8	943.1	216	216	140.4	1667	1332	1083.5	1451	893	6.0	725.4
er Group Lime	159	-164	8079.6	12.0	1462.9	FALSE	0.0	106.3	12.0	1128	7.8	950.9	216	216	140.4	1679	1344	1091.3	1463	902	6.0	731.4
er Group Lime	160	-165	8137.2	12.0	1474.9	FALSE	0.0	106.3	12.0	1140	7.8	958.7	216	216	140.4	1691	1356	1099.1	1475	912	6.0	737.4
er Group Lime	161	-166	8194.8	12.0	1486.9	FALSE	0.0	106.3	12.0	1152	7.8	966.5	216	216	140.4	1703	1368	1106.9	1487	922	6.0	743.4
er Group Lime	162	-167	8252.4	12.0	1498.9	FALSE	0.0	106.3	12.0	1164	7.8	974.3	216	216	140.4	1715	1380	1114.7	1499	931	6.0	749.4
er Group Lime	163	-168	8310	12.0	1510.9	FALSE	0.0	106.3	12.0	1176	7.8	982.1	216	216	140.4	1727	1392	1122.5	1511	941	6.0	755.4
er Group Lime	164	-169	8367.6	12.0	1522.9	FALSE	0.0	106.3	12.0	1188	7.8	989.9	216	216	140.4	1739	1404	1130.3	1523	950	6.0	761.4
er Group Lime	165	-170	8425.2	12.0	1534.9	FALSE	0.0	106.3	12.0	1200	7.8	997.7	216	216	140.4	1751	1416	1138.1	1535	960	6.0	767.4
er Group Lime	166	-171	8482.8	12.0	1546.9	FALSE	0.0	106.3	12.0	1212	7.8	1005.5	216	216	140.4	1763	1428	1145.9	1547	970	6.0	773.4
er Group Lime	167	-172	8540.4	12.0	1558.9	FALSE	0.0	106.3	12.0	1224	7.8	1013.3	216	216	140.4	1775	1440	1153.7	1559	979	6.0	779.4
er Group Lime	168	-173	8598	12.0	1570.9	FALSE	0.0	106.3	12.0	1236	7.8	1021.1	216	216	140.4	1787	1452	1161.5	1571	989	6.0	785.4
er Group Lime	169	-174	8655.6	12.0	1582.9	FALSE	0.0	106.3	12.0	1248	7.8	1028.9	216	216	140.4	1799	1464	1169.3	1583	998	6.0	791.4
er Group Lime	170	-175	8713.2	12.0	1594.9	FALSE	0.0	106.3	12.0	1260	7.8	1036.7	216	216	140.4	1811	1476	1177.1	1595	1008	6.0	797.4
er Group Lime	171	-176	8770.8	12.0	1606.9	FALSE	0.0	106.3	12.0	1272	7.8	1044.5	216	216	140.4	1823	1488	1184.9	1607	1018	6.0	803.4
er Group Lime	172	-177	8828.4	12.0	1618.9	FALSE	0.0	106.3	12.0	1284	7.8	1052.3	216	216	140.4	1835	1500	1192.7	1619	1027	6.0	809.4
er Group Lime	173	-178	8886	12.0	1630.9	FALSE	0.0	106.3	12.0	1296	7.8	1060.1	216	216	140.4	1847	1512	1200.5	1631	1037	6.0	815.4
er Group Lime	174	-179	8943.6	12.0	1642.9	FALSE	0.0	106.3	12.0	1308	7.8	1067.9	216	216	140.4	1859	1524	1208.3	1643	1046	6.0	821.4
er Group Lime	175	-180	9001.2	12.0	1654.9	FALSE	0.0	106.3	12.0	1320	7.8	1075.7	216	216	140.4	1871	1536	1216.1	1655	1056	6.0	827.4
er Group Lime	176	-181	9058.8	12.0	1666.9	FALSE	0.0	106.3	12.0	1332	7.8	1083.5	216	216	140.4	1883	1548	1223.9	1667	1066	6.0	833.4
er Group Lime	177	-182	9116.4	12.0	1678.9	FALSE	0.0	106.3	12.0	1344	7.8	1091.3	216	216	140.4	1895	1560	1231.7	1679	1075	6.0	839.4
er Group Lime	178	-183	9174	12.0	1690.9	FALSE	0.0	106.3	12.0	1356	7.8	1099.1	216	216	140.4	1907	1572	1239.5	1691	1085	6.0	845.4
er Group Lime	179	-184	9231.6	12.0	1702.9	FALSE	0.0	106.3	12.0	1368	7.8	1106.9	216	216	140.4	1919	1584	1247.3	1703	1094	6.0	851.4
er Group Lime	180	-185	9289.2	12.0	1714.9	FALSE	0.0	106.3	12.0	1380	7.8	1114.7	216	216	140.4	1931	1596	1255.1	1715	1104	6.0	857.4
er Group Lime	181	-186	9346.8	12.0	1726.9	FALSE	0.0	106.3	12.0	1392	7.8	1122.5	216	216	140.4	1943	1608	1262.9	1727	1114	6.0	863.4
er Group Lime	182	-187	9404.4	12.0	1738.9	FALSE	0.0	106.3	12.0	1404	7.8	1130.3	216	216	140.4	1955	1620	1270.7	1739	1123	6.0	869.4
er Group Lime	183	-188	9462	12.0	1750.9	FALSE	0.0	106.3	12.0	1416	7.8	1138.1	216	216	140.4	1967	1632	1278.5	1751	1133	6.0	875.4
er Group Lime	184	-189	9519.6	12.0	1762.9	FALSE	0.0	106.3	12.0	1428	7.8	1145.9	216	216	140.4	1979	1644	1286.3	1763	1142	6.0	881.4
er Group Lime	185	-190	9577.2	12.0	1774.9	FALSE	0.0	106.3	12.0	1440	7.8	1153.7	216	216	140.4	1991	1656	1294.1	1775	1152	6.0	887.4
er Group Lime	186	-191	9634.8	12.0	1786.9	FALSE	0.0	106.3	12.0	1452	7.8	1161.5	216	216	140.4	2003	1668	1301.9	1787	1162	6.0	893.4
er Group Lime	187	-192	9692.4	12.0	1798.9	FALSE	0.0	106.3	12.0	1464	7.8	1169.3	216	216	140.4	2015	1680	1309.7	1799	1171	6.0	899.4
er Group Lime	188	-193	9750	12.0	1810.9	FALSE	0.0	106.3	12.0	1476	7.8	1177.1	216	216	140.4	2027	1692	1317.5	1811	1181	6.0	905.4
er Group Lime	189	-194	9807.6	12.0	1822.9	FALSE	0.0	106.3	12.0	1488	7.8	1184.9	216	216	140.4	2039	1704	1325.3	1823	1190	6.0	911.4
er Group Lime	190	-195	9865.2	12.0	1834.9	FALSE	0.0	106.3	12.0	1500	7.8	1192.7	216	216	140.4	2051	1716	1333.1	1835	1200	6.0	917.4
er Group Lime	191	-196	9922.8	12.0	1846.9	FALSE	0.0	106.3	12.0	1512	7.8	1200.5	216	216	140.4	2063	1728	1340.9	1847	1210	6.0	923.4
er Group Lime	192	-197	9980.4	12.0	1858.9	FALSE	0.0	106.3	12.0	1524	7.8	1208.3	216	216	140.4	2075	1740	1348.7	1859	1219	6.0	929.4
er Group Lime	193	-198	10038	12.0	1870.9	FALSE	0.0	106.3	12.0	1536	7.8	1216.1	216	216	140.4	2087	1752	1356.5	1871	1229	6.0	935.4
er Group Lime	194	-199	10095.6	12.0	1882.9	FALSE	0.0	106.3	12.0	1548	7.8	1223.9	216	216	140.4	2099	1764	1364.3	1883	1238	6.0	941.4
er Group Lime	195	-200	10153.2	12.0	1894.9	FALSE	0.0	106.3	12.0	1560	7.8	1231.7	216	216	140.4	2111	1776	1372.1	1895	1248	6.0	947.4
er Group Lime	196	-201	10210.8	12.0	1906.9	FALSE	0.0	106.3	12.0	1572	7.8	1239.5	216	216	140.4	2123	1788	1379.9	1907	1258	6.0	953.4
er Group Lime	197	-202	10268.4	12.0	1918.9	FALSE	0.0	106.3	12.0	1584	7.8	1247.3	216	216	140.4	2135	1800	1387.7	1919	1267	6.0	959.4
er Group Lime	198	-203	10326	12.0	1930.9	FALSE	0.0	106.3	12.0	1596	7.8	1255.1	216	216	140.4	2147	1812	1395.5	1931	1277	6.0	965.4
er Group Lime	199	-204	10383.6	12.0	1942.9	FALSE	0.0	106.3	12.0	1608	7.8	1262.9	216	216	140.4	2159	1824	1403.3	1943	1286	6.0	971.4
er Group Lime	200	-205	10441.2	12.0	1954.9	FALSE	0.0	106.3	12.0	1620	7.8	1270.7	216	216	140.4	2171	1836	1411.1	1955	1296	6.0	977.4

AXIAL PILE CAPACITY

Project Information

Project:	Harbor River Bridge	Pile Tip Area (square feet):	4.00
Owner:	SCDOT	Pile Perimeter (ft):	8.00
Job Number:	18461-007-01	Side and End Friction Resistance Factor α Method	0.65
Analysis by:	HPC	Side and End Friction Resistance Factor Nordlund/Thurman Method	0.65
Date/Time:	10/16/2017 11:51	Uplift Side Friction Resistance Factor α Method	0.5
Run Designation:	East Overbank - Half Scour	Uplift Friction Resistance Factor Nordlund/Thurman Method	0.5
Pile Diameter (ft):	2.0	Depth to Top of Liquefied Layer (ft):	14
Ground Surface Elevation (ft):	-1	Depth to Bottom of Liquefied Layer (ft):	64
Pile Type:	Square Precast Concrete	Residual Shear Strength of Liquefiable Layer (psf):	195
Checked by:	ZAS	Enter "1" to calculate downdrag from residual shear strength, "2" average of residual & non-liqufied, "3" non-liquefied strength parameters	1
		Calculated Unfactored Downdrag Load (kips)[4]:	154.3

Soil Profile

Soil Type	Depth at Bottom of Soil Unit (feet)	Bouyant Unit Weight (pcf) (total weight above GWT)	ϕ (degrees)	S_u, Undrained Shear Strength (psf)	α, Empirical Adhesion Factor	Friction Ratio, C_f	Earth Pressure Coefficient, K_δ
Sands (2)	14	57.6	38			0.90	3.00
Sands (3)	34	37.6	31			0.95	1.15
Silts/Clays	44	32.6		379	1		
Sands (4)	64	37.6	31			0.95	1.15
Hawthorn Marl	79	57.6		4000	0.25		
Cooper Group Limestone	200	57.6		6000	0.25		

Notes:
1. Spreadsheet programed for α method for undrained shear strength and Nordlund/Thurman Method for friction angle
2. Refer to AASHTO LRFD Section 10.7.3.8.6b to determine α
3. Refer to AASHTO LRFD Section 10.7.3.8.6f to determine C_f and K_δ
4. The structural engineer should include the unfactored downdrag load in accordance with Section 3.11.8 of the AASHTO LRFD Manual

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
Sands (2)	1	-2	28.8	0.4	0.4	FALSE	0.4	0.4	0.0	0	0.3	0.3	9	0	5.6	9	0	5.8	0	0	0.2	0.2
Sands (2)	2	-3	86.4	1.2	1.6	FALSE	1.2	1.6	0.0	0	0.8	1.0	27	0	17.7	29	0	18.7	2	0	0.6	0.8
Sands (2)	3	-4	144	1.9	3.5	FALSE	1.9	3.5	0.0	0	1.3	2.3	45	0	29.4	49	0	31.7	3	0	1.0	1.7
Sands (2)	4	-5	201.6	2.7	6.2	FALSE	2.7	6.2	0.0	0	1.8	4.0	63	0	41.2	70	0	45.3	6	0	1.4	3.1
Sands (2)	5	-6	259.2	3.5	9.7	FALSE	3.5	9.7	0.0	0	2.3	6.3	82	0	53.0	91	0	59.3	10	0	1.7	4.9
Sands (2)	6	-7	316.8	4.3	14.0	FALSE	4.3	14.0	0.0	0	2.8	9.1	100	0	64.8	114	0	73.9	14	0	2.1	7.0
Sands (2)	7	-8	374.4	5.1	19.0	FALSE	5.1	19.0	0.0	0	3.3	12.4	118	0	76.6	137	0	88.9	19	0	2.5	9.5
Sands (2)	8	-9	432	5.8	24.9	FALSE	5.8	24.9	0.0	0	3.8	16.2	136	0	88.3	161	0	104.5	25	0	2.9	12.4
Sands (2)	9	-10	489.6	6.6	31.5	FALSE	6.6	31.5	0.0	0	4.3	20.5	154	0	100.1	185	0	120.6	31	0	3.3	15.7
Sands (2)	10	-11	547.2	7.4	38.9	FALSE	7.4	38.9	0.0	0	4.8	25.3	172	0	111.9	211	0	137.2	39	0	3.7	19.4
Sands (2)	11	-12	604.8	8.2	47.0	FALSE	8.2	47.0	0.0	0	5.3	30.6	190	0	123.7	237	0	154.2	47	0	4.1	23.5
Sands (2)	12	-13	662.4	8.9	55.9	FALSE	8.9	55.9	0.0	0	5.8	36.4	208	0	135.5	264	0	171.8	56	0	4.5	28.0
Sands (2)	13	-14	720	9.7	65.7	FALSE	9.7	65.7	0.0	0	6.3	42.7	227	0	147.2	292	0	189.9	66	0	4.9	32.8
Sands (2)	14	-15	777.6	10.5	76.1	FALSE	10.5	76.1	0.0	0	6.8	49.5	245	0	159.0	321	0	208.5	76	0	5.2	38.1
Sands (3)	15	-16	825.2	3.7	79.9	TRUE	1.6	77.7	0.0	0	2.4	51.9	72	0	46.8	152	0	98.7	80	0	1.9	39.9
Sands (3)	16	-17	862.8	3.9	83.8	TRUE	1.6	79.3	0.0	0	2.5	54.5	72	0	46.8	156	0	101.3	84	0	2.0	41.9
Sands (3)	17	-18	900.4	4.1	87.9	TRUE	1.6	80.8	0.0	0	2.6	57.1	72	0	46.8	160	0	103.9	88	0	2.0	43.9
Sands (3)	18	-19	938	4.2	92.1	TRUE	1.6	82.4	0.0	0	2.8	59.9	72	0	46.8	164	0	106.7	92	0	2.1	46.0
Sands (3)	19	-20	975.6	4.4	96.5	TRUE	1.6	84.0	0.0	0	2.9	62.7	72	0	46.8	169	0	109.5	97	0	2.2	48.3
Sands (3)	20	-21	1013.2	4.6	101.1	TRUE	1.6	85.5	0.0	0	3.0	65.7	72	0	46.8	173	0	112.5	101	0	2.3	50.5
Sands (3)	21	-22	1050.8	4.8	105.8	TRUE	1.6	87.1	0.0	0	3.1	68.8	72	0	46.8	178	0	115.6	106	0	2.4	52.9
Sands (3)	22	-23	1088.4	4.9	110.8	TRUE	1.6	88.7	0.0	0	3.2	72.0	72	0	46.8	183	0	118.8	111	0	2.5	55.4
Sands (3)	23	-24	1126	5.1	115.9	TRUE	1.6	90.2	0.0	0	3.3	75.3	72	0	46.8	188	0	122.1	116	0	2.5	57.9
Sands (3)	24	-25	1163.6	5.3	121.1	TRUE	1.6	91.8	0.0	0	3.4	78.7	72	0	46.8	193	0	125.5	121	0	2.6	60.6
Sands (3)	25	-26	1201.2	5.4	126.6	TRUE	1.6	93.3	0.0	0	3.5	82.3	72	0	46.8	199	0	129.1	127	0	2.7	63.3
Sands (3)	26	-27	1238.8	5.6	132.2	TRUE	1.6	94.9	0.0	0	3.6	85.9	72	0	46.8	204	0	132.7	132	0	2.8	66.1
Sands (3)	27	-28	1276.4	5.8	137.9	TRUE	1.6	96.5	0.0	0	3.8	89.7	72	0	46.8	210	0	136.5	138	0	2.9	69.0
Sands (3)	28	-29	1314	5.9	143.9	TRUE	1.6	98.0	0.0	0	3.9	93.5	72	0	46.8	216	0	140.3	144	0	3.0	71.9
Sands (3)	29	-30	1351.6	6.1	150.0	TRUE	1.6	99.6	0.0	0	4.0	97.5	72	0	46.8	222	0	144.3	150	0	3.1	75.0
Sands (3)	30	-31	1389.2	6.3	156.3	TRUE	1.6	101.2	0.0	0	4.1	101.6	72	0	46.8	228	0	148.4	156	0	3.1	78.1
Sands (3)	31	-32	1426.8	6.5	162.7	TRUE	1.6	102.7	0.0	0	4.2	105.8	72	0	46.8	235	0	152.6	163	0	3.2	81.4
Sands (3)	32	-33	1464.4	6.6	169.4	TRUE	1.6	104.3	0.0	0	4.3	110.1	72	0	46.8	241	0	156.9	169	0	3.3	84.7
Sands (3)	33	-34	1502	6.8	176.2	TRUE	1.6	105.8	0.0	0	4.4	114.5	72	0	46.8	248	0	161.3	176	0	3.4	88.1
Sands (3)	34	-35	1539.6	7.0	183.1	TRUE	1.6	107.4	0.0	0	4.5	119.0	72	0	46.8	255	0	165.8	183	0	3.5	91.6
Silts/Clays	35	-36	1574.7	3.0	186.1	TRUE	1.6	109.0	0.0	0	2.0	121.0	14	0	8.9	200	0	129.9	186	0	1.5	93.1
Silts/Clays	36	-37	1607.3	3.0	189.2	TRUE	1.6	110.5	0.0	0	2.0	123.0	14	0	8.9	203	0	131.8	189	0	1.5	94.6
Silts/Clays	37	-38	1639.9	3.0	192.2	TRUE	1.6	112.1	0.0	0	2.0	124.9	14	0	8.9	206	0	133.8	192	0	1.5	96.1
Silts/Clays	38	-39	1672.5	3.0	195.2	TRUE	1.6	113.7	0.0	0	2.0	126.9	14	0	8.9	209	0	135.8	195	0	1.5	97.6
Silts/Clays	39	-40	1705.1	3.0	198.3	TRUE	1.6	115.2	0.0	0	2.0	128.9	14	0	8.9	212	0	137.7	198	0	1.5	99.1
Silts/Clays	40	-41	1737.7	3.0	201.3	TRUE	1.6	116.8	0.0	0	2.0	130.8	14	0	8.9	215	0	139.7	201	0	1.5	100.6
Silts/Clays	41	-42	1770.3	3.0	204.3	TRUE	1.6	118.3	0.0	0	2.0	132.8	14	0	8.9	218	0	141.7	204	0	1.5	102.2
Silts/Clays	42	-43	1802.9	3.0	207.4	TRUE	1.6	119.9	0.0	0	2.0	134.8	14	0	8.9	221	0	143.6	207	0	1.5	103.7
Silts/Clays	43	-44	1835.5	3.0	210.4	TRUE	1.6	121.5	0.0	0	2.0	136.7	14	0	8.9	224	0	145.6	210	0	1.5	105.2
Silts/Clays	44	-45	1868.1	3.0	213.4	TRUE	1.6	123.0	0.0	0	2.0	138.7	14	0	8.9	227	0	147.6	213	0	1.5	106.7
Sands (4)	45	-46	1903.2	8.6	222.0	TRUE	1.6	124.6	0.0	0	5.6	144.3	72	0	46.8	294	0	191.1	222	0	4.3	111.0
Sands (4)	46	-47	1940.8	8.8	230.8	TRUE	1.6	126.2	0.0	0	5.7	150.0	72	0	46.8	303	0	196.8	231	0	4.4	115.4
Sands (4)	47	-48	1978.4	8.9	239.7	TRUE	1.6	127.7	0.0	0	5.8	155.8	72	0	46.8	312	0	202.6	240	0	4.5	119.9
Sands (4)	48	-49	2016	9.1	248.9	TRUE	1.6	129.3	0.0	0	5.9	161.8	72	0	46.8	321	0	208.6	249	0	4.6	124.4
Sands (4)	49	-50	2053.6	9.3	258.2	TRUE	1.6	130.9	0.0	0	6.0	167.8	72	0	46.8	330	0	214.6	258	0	4.6	129.1
Sands (4)	50	-51	2091.2	9.5	267.6	TRUE	1.6	132.4	0.0	0	6.1	174.0	72	0	46.8	340	0	220.8	268	0	4.7	133.8
Sands (4)	51	-52	2128.8	9.6	277.2	TRUE	1.6	134.0	0.0	0	6.3	180.2	72	0	46.8	349	0	227.0	277	0	4.8	138.6

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
Sands (4)	52	-53	2166.4	9.8	287.0	TRUE	1.6	135.5	0.0	0	6.4	186.6	72	0	46.8	359	0	233.4	287	0	4.9	143.5
Sands (4)	53	-54	2204	10.0	297.0	TRUE	1.6	137.1	0.0	0	6.5	193.1	72	0	46.8	369	0	239.9	297	0	5.0	148.5
Sands (4)	54	-55	2241.6	10.1	307.2	TRUE	1.6	138.7	0.0	0	6.6	199.6	72	0	46.8	379	0	246.4	307	0	5.1	153.6
Sands (4)	55	-56	2279.2	10.3	317.5	TRUE	1.6	140.2	0.0	0	6.7	206.4	72	0	46.8	389	0	253.2	317	0	5.2	158.7
Sands (4)	56	-57	2316.8	10.5	327.9	TRUE	1.6	141.8	0.0	0	6.8	213.2	72	0	46.8	400	0	260.0	328	0	5.2	164.0
Sands (4)	57	-58	2354.4	10.6	338.6	TRUE	1.6	143.4	0.0	0	6.9	220.1	72	0	46.8	411	0	266.9	339	0	5.3	169.3
Sands (4)	58	-59	2392	10.8	349.4	TRUE	1.6	144.9	0.0	0	7.0	227.1	72	0	46.8	421	0	273.9	349	0	5.4	174.7
Sands (4)	59	-60	2429.6	11.0	360.4	TRUE	1.6	146.5	0.0	0	7.1	234.3	72	0	46.8	432	0	281.1	360	0	5.5	180.2
Sands (4)	60	-61	2467.2	11.2	371.6	TRUE	1.6	148.0	0.0	0	7.3	241.5	72	0	46.8	444	0	288.3	372	0	5.6	185.8
Sands (4)	61	-62	2504.8	11.3	382.9	TRUE	1.6	149.6	0.0	0	7.4	248.9	72	0	46.8	455	0	295.7	383	0	5.7	191.4
Sands (4)	62	-63	2542.4	11.5	394.4	TRUE	1.6	151.2	0.0	0	7.5	256.4	72	0	46.8	466	0	303.2	394	0	5.8	197.2
Sands (4)	63	-64	2580	11.7	406.1	TRUE	1.6	152.7	0.0	0	7.6	263.9	72	0	46.8	478	0	310.7	406	0	5.8	203.0
Sands (4)	64	-65	2617.6	11.8	417.9	TRUE	1.6	154.3	0.0	0	7.7	271.6	72	0	46.8	490	0	318.4	418	0	5.9	209.0
Hawthorn Mar	65	-66	2665.2	8.0	425.9	FALSE	0.0	154.3	8.0	8	5.2	276.8	144	144	93.6	570	152	370.4	426	6	4.0	213.0
Hawthorn Mar	66	-67	2722.8	8.0	433.9	FALSE	0.0	154.3	8.0	16	5.2	282.0	144	144	93.6	578	160	375.6	434	13	4.0	217.0
Hawthorn Mar	67	-68	2780.4	8.0	441.9	FALSE	0.0	154.3	8.0	24	5.2	287.2	144	144	93.6	586	168	380.8	442	19	4.0	221.0
Hawthorn Mar	68	-69	2838	8.0	449.9	FALSE	0.0	154.3	8.0	32	5.2	292.4	144	144	93.6	594	176	386.0	450	26	4.0	225.0
Hawthorn Mar	69	-70	2895.6	8.0	457.9	FALSE	0.0	154.3	8.0	40	5.2	297.6	144	144	93.6	602	184	391.2	458	32	4.0	229.0
Hawthorn Mar	70	-71	2953.2	8.0	465.9	FALSE	0.0	154.3	8.0	48	5.2	302.8	144	144	93.6	610	192	396.4	466	38	4.0	233.0
Hawthorn Mar	71	-72	3010.8	8.0	473.9	FALSE	0.0	154.3	8.0	56	5.2	308.0	144	144	93.6	618	200	401.6	474	45	4.0	237.0
Hawthorn Mar	72	-73	3068.4	8.0	481.9	FALSE	0.0	154.3	8.0	64	5.2	313.2	144	144	93.6	626	208	406.8	482	51	4.0	241.0
Hawthorn Mar	73	-74	3126	8.0	489.9	FALSE	0.0	154.3	8.0	72	5.2	318.4	144	144	93.6	634	216	412.0	490	58	4.0	245.0
Hawthorn Mar	74	-75	3183.6	8.0	497.9	FALSE	0.0	154.3	8.0	80	5.2	323.6	144	144	93.6	642	224	417.2	498	64	4.0	249.0
Hawthorn Mar	75	-76	3241.2	8.0	505.9	FALSE	0.0	154.3	8.0	88	5.2	328.8	144	144	93.6	650	232	422.4	506	70	4.0	253.0
Hawthorn Mar	76	-77	3298.8	8.0	513.9	FALSE	0.0	154.3	8.0	96	5.2	334.0	144	144	93.6	658	240	427.6	514	77	4.0	257.0
Hawthorn Mar	77	-78	3356.4	8.0	521.9	FALSE	0.0	154.3	8.0	104	5.2	339.2	144	144	93.6	666	248	432.8	522	83	4.0	261.0
Hawthorn Mar	78	-79	3414	8.0	529.9	FALSE	0.0	154.3	8.0	112	5.2	344.4	144	144	93.6	674	256	438.0	530	90	4.0	265.0
Hawthorn Mar	79	-80	3471.6	8.0	537.9	FALSE	0.0	154.3	8.0	120	5.2	349.6	144	144	93.6	682	264	443.2	538	96	4.0	269.0
er Group Lime	80	-81	3529.2	12.0	549.9	FALSE	0.0	154.3	12.0	132	7.8	357.4	216	216	140.4	766	348	497.8	550	106	6.0	275.0
er Group Lime	81	-82	3586.8	12.0	561.9	FALSE	0.0	154.3	12.0	144	7.8	365.2	216	216	140.4	778	360	505.6	562	115	6.0	281.0
er Group Lime	82	-83	3644.4	12.0	573.9	FALSE	0.0	154.3	12.0	156	7.8	373.0	216	216	140.4	790	372	513.4	574	125	6.0	287.0
er Group Lime	83	-84	3702	12.0	585.9	FALSE	0.0	154.3	12.0	168	7.8	380.8	216	216	140.4	802	384	521.2	586	134	6.0	293.0
er Group Lime	84	-85	3759.6	12.0	597.9	FALSE	0.0	154.3	12.0	180	7.8	388.6	216	216	140.4	814	396	529.0	598	144	6.0	299.0
er Group Lime	85	-86	3817.2	12.0	609.9	FALSE	0.0	154.3	12.0	192	7.8	396.4	216	216	140.4	826	408	536.8	610	154	6.0	305.0
er Group Lime	86	-87	3874.8	12.0	621.9	FALSE	0.0	154.3	12.0	204	7.8	404.2	216	216	140.4	838	420	544.6	622	163	6.0	311.0
er Group Lime	87	-88	3932.4	12.0	633.9	FALSE	0.0	154.3	12.0	216	7.8	412.0	216	216	140.4	850	432	552.4	634	173	6.0	317.0
er Group Lime	88	-89	3990	12.0	645.9	FALSE	0.0	154.3	12.0	228	7.8	419.8	216	216	140.4	862	444	560.2	646	182	6.0	323.0
er Group Lime	89	-90	4047.6	12.0	657.9	FALSE	0.0	154.3	12.0	240	7.8	427.6	216	216	140.4	874	456	568.0	658	192	6.0	329.0
er Group Lime	90	-91	4105.2	12.0	669.9	FALSE	0.0	154.3	12.0	252	7.8	435.4	216	216	140.4	886	468	575.8	670	202	6.0	335.0
er Group Lime	91	-92	4162.8	12.0	681.9	FALSE	0.0	154.3	12.0	264	7.8	443.2	216	216	140.4	898	480	583.6	682	211	6.0	341.0
er Group Lime	92	-93	4220.4	12.0	693.9	FALSE	0.0	154.3	12.0	276	7.8	451.0	216	216	140.4	910	492	591.4	694	221	6.0	347.0
er Group Lime	93	-94	4278	12.0	705.9	FALSE	0.0	154.3	12.0	288	7.8	458.8	216	216	140.4	922	504	599.2	706	230	6.0	353.0
er Group Lime	94	-95	4335.6	12.0	717.9	FALSE	0.0	154.3	12.0	300	7.8	466.6	216	216	140.4	934	516	607.0	718	240	6.0	359.0
er Group Lime	95	-96	4393.2	12.0	729.9	FALSE	0.0	154.3	12.0	312	7.8	474.4	216	216	140.4	946	528	614.8	730	250	6.0	365.0
er Group Lime	96	-97	4450.8	12.0	741.9	FALSE	0.0	154.3	12.0	324	7.8	482.2	216	216	140.4	958	540	622.6	742	259	6.0	371.0
er Group Lime	97	-98	4508.4	12.0	753.9	FALSE	0.0	154.3	12.0	336	7.8	490.0	216	216	140.4	970	552	630.4	754	269	6.0	377.0
er Group Lime	98	-99	4566	12.0	765.9	FALSE	0.0	154.3	12.0	348	7.8	497.8	216	216	140.4	982	564	638.2	766	278	6.0	383.0
er Group Lime	99	-100	4623.6	12.0	777.9	FALSE	0.0	154.3	12.0	360	7.8	505.6	216	216	140.4	994	576	646.0	778	288	6.0	389.0
er Group Lime	100	-101	4681.2	12.0	789.9	FALSE	0.0	154.3	12.0	372	7.8	513.4	216	216	140.4	1006	588	653.8	790	298	6.0	395.0
er Group Lime	101	-102	4738.8	12.0	801.9	FALSE	0.0	154.3	12.0	384	7.8	521.2	216	216	140.4	1018	600	661.6	802	307	6.0	401.0
er Group Lime	102	-103	4796.4	12.0	813.9	FALSE	0.0	154.3	12.0	396	7.8	529.0	216	216	140.4	1030	612	669.4	814	317	6.0	407.0

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
er Group Lime	103	-104	4854	12.0	825.9	FALSE	0.0	154.3	12.0	408	7.8	536.8	216	216	140.4	1042	624	677.2	826	326	6.0	413.0
er Group Lime	104	-105	4911.6	12.0	837.9	FALSE	0.0	154.3	12.0	420	7.8	544.6	216	216	140.4	1054	636	685.0	838	336	6.0	419.0
er Group Lime	105	-106	4969.2	12.0	849.9	FALSE	0.0	154.3	12.0	432	7.8	552.4	216	216	140.4	1066	648	692.8	850	346	6.0	425.0
er Group Lime	106	-107	5026.8	12.0	861.9	FALSE	0.0	154.3	12.0	444	7.8	560.2	216	216	140.4	1078	660	700.6	862	355	6.0	431.0
er Group Lime	107	-108	5084.4	12.0	873.9	FALSE	0.0	154.3	12.0	456	7.8	568.0	216	216	140.4	1090	672	708.4	874	365	6.0	437.0
er Group Lime	108	-109	5142	12.0	885.9	FALSE	0.0	154.3	12.0	468	7.8	575.8	216	216	140.4	1102	684	716.2	886	374	6.0	443.0
er Group Lime	109	-110	5199.6	12.0	897.9	FALSE	0.0	154.3	12.0	480	7.8	583.6	216	216	140.4	1114	696	724.0	898	384	6.0	449.0
er Group Lime	110	-111	5257.2	12.0	909.9	FALSE	0.0	154.3	12.0	492	7.8	591.4	216	216	140.4	1126	708	731.8	910	394	6.0	455.0
er Group Lime	111	-112	5314.8	12.0	921.9	FALSE	0.0	154.3	12.0	504	7.8	599.2	216	216	140.4	1138	720	739.6	922	403	6.0	461.0
er Group Lime	112	-113	5372.4	12.0	933.9	FALSE	0.0	154.3	12.0	516	7.8	607.0	216	216	140.4	1150	732	747.4	934	413	6.0	467.0
er Group Lime	113	-114	5430	12.0	945.9	FALSE	0.0	154.3	12.0	528	7.8	614.8	216	216	140.4	1162	744	755.2	946	422	6.0	473.0
er Group Lime	114	-115	5487.6	12.0	957.9	FALSE	0.0	154.3	12.0	540	7.8	622.6	216	216	140.4	1174	756	763.0	958	432	6.0	479.0
er Group Lime	115	-116	5545.2	12.0	969.9	FALSE	0.0	154.3	12.0	552	7.8	630.4	216	216	140.4	1186	768	770.8	970	442	6.0	485.0
er Group Lime	116	-117	5602.8	12.0	981.9	FALSE	0.0	154.3	12.0	564	7.8	638.2	216	216	140.4	1198	780	778.6	982	451	6.0	491.0
er Group Lime	117	-118	5660.4	12.0	993.9	FALSE	0.0	154.3	12.0	576	7.8	646.0	216	216	140.4	1210	792	786.4	994	461	6.0	497.0
er Group Lime	118	-119	5718	12.0	1005.9	FALSE	0.0	154.3	12.0	588	7.8	653.8	216	216	140.4	1222	804	794.2	1006	470	6.0	503.0
er Group Lime	119	-120	5775.6	12.0	1017.9	FALSE	0.0	154.3	12.0	600	7.8	661.6	216	216	140.4	1234	816	802.0	1018	480	6.0	509.0
er Group Lime	120	-121	5833.2	12.0	1029.9	FALSE	0.0	154.3	12.0	612	7.8	669.4	216	216	140.4	1246	828	809.8	1030	490	6.0	515.0
er Group Lime	121	-122	5890.8	12.0	1041.9	FALSE	0.0	154.3	12.0	624	7.8	677.2	216	216	140.4	1258	840	817.6	1042	499	6.0	521.0
er Group Lime	122	-123	5948.4	12.0	1053.9	FALSE	0.0	154.3	12.0	636	7.8	685.0	216	216	140.4	1270	852	825.4	1054	509	6.0	527.0
er Group Lime	123	-124	6006	12.0	1065.9	FALSE	0.0	154.3	12.0	648	7.8	692.8	216	216	140.4	1282	864	833.2	1066	518	6.0	533.0
er Group Lime	124	-125	6063.6	12.0	1077.9	FALSE	0.0	154.3	12.0	660	7.8	700.6	216	216	140.4	1294	876	841.0	1078	528	6.0	539.0
er Group Lime	125	-126	6121.2	12.0	1089.9	FALSE	0.0	154.3	12.0	672	7.8	708.4	216	216	140.4	1306	888	848.8	1090	538	6.0	545.0
er Group Lime	126	-127	6178.8	12.0	1101.9	FALSE	0.0	154.3	12.0	684	7.8	716.2	216	216	140.4	1318	900	856.6	1102	547	6.0	551.0
er Group Lime	127	-128	6236.4	12.0	1113.9	FALSE	0.0	154.3	12.0	696	7.8	724.0	216	216	140.4	1330	912	864.4	1114	557	6.0	557.0
er Group Lime	128	-129	6294	12.0	1125.9	FALSE	0.0	154.3	12.0	708	7.8	731.8	216	216	140.4	1342	924	872.2	1126	566	6.0	563.0
er Group Lime	129	-130	6351.6	12.0	1137.9	FALSE	0.0	154.3	12.0	720	7.8	739.6	216	216	140.4	1354	936	880.0	1138	576	6.0	569.0
er Group Lime	130	-131	6409.2	12.0	1149.9	FALSE	0.0	154.3	12.0	732	7.8	747.4	216	216	140.4	1366	948	887.8	1150	586	6.0	575.0
er Group Lime	131	-132	6466.8	12.0	1161.9	FALSE	0.0	154.3	12.0	744	7.8	755.2	216	216	140.4	1378	960	895.6	1162	595	6.0	581.0
er Group Lime	132	-133	6524.4	12.0	1173.9	FALSE	0.0	154.3	12.0	756	7.8	763.0	216	216	140.4	1390	972	903.4	1174	605	6.0	587.0
er Group Lime	133	-134	6582	12.0	1185.9	FALSE	0.0	154.3	12.0	768	7.8	770.8	216	216	140.4	1402	984	911.2	1186	614	6.0	593.0
er Group Lime	134	-135	6639.6	12.0	1197.9	FALSE	0.0	154.3	12.0	780	7.8	778.6	216	216	140.4	1414	996	919.0	1198	624	6.0	599.0
er Group Lime	135	-136	6697.2	12.0	1209.9	FALSE	0.0	154.3	12.0	792	7.8	786.4	216	216	140.4	1426	1008	926.8	1210	634	6.0	605.0
er Group Lime	136	-137	6754.8	12.0	1221.9	FALSE	0.0	154.3	12.0	804	7.8	794.2	216	216	140.4	1438	1020	934.6	1222	643	6.0	611.0
er Group Lime	137	-138	6812.4	12.0	1233.9	FALSE	0.0	154.3	12.0	816	7.8	802.0	216	216	140.4	1450	1032	942.4	1234	653	6.0	617.0
er Group Lime	138	-139	6870	12.0	1245.9	FALSE	0.0	154.3	12.0	828	7.8	809.8	216	216	140.4	1462	1044	950.2	1246	662	6.0	623.0
er Group Lime	139	-140	6927.6	12.0	1257.9	FALSE	0.0	154.3	12.0	840	7.8	817.6	216	216	140.4	1474	1056	958.0	1258	672	6.0	629.0
er Group Lime	140	-141	6985.2	12.0	1269.9	FALSE	0.0	154.3	12.0	852	7.8	825.4	216	216	140.4	1486	1068	965.8	1270	682	6.0	635.0
er Group Lime	141	-142	7042.8	12.0	1281.9	FALSE	0.0	154.3	12.0	864	7.8	833.2	216	216	140.4	1498	1080	973.6	1282	691	6.0	641.0
er Group Lime	142	-143	7100.4	12.0	1293.9	FALSE	0.0	154.3	12.0	876	7.8	841.0	216	216	140.4	1510	1092	981.4	1294	701	6.0	647.0
er Group Lime	143	-144	7158	12.0	1305.9	FALSE	0.0	154.3	12.0	888	7.8	848.8	216	216	140.4	1522	1104	989.2	1306	710	6.0	653.0
er Group Lime	144	-145	7215.6	12.0	1317.9	FALSE	0.0	154.3	12.0	900	7.8	856.6	216	216	140.4	1534	1116	997.0	1318	720	6.0	659.0
er Group Lime	145	-146	7273.2	12.0	1329.9	FALSE	0.0	154.3	12.0	912	7.8	864.4	216	216	140.4	1546	1128	1004.8	1330	730	6.0	665.0
er Group Lime	146	-147	7330.8	12.0	1341.9	FALSE	0.0	154.3	12.0	924	7.8	872.2	216	216	140.4	1558	1140	1012.6	1342	739	6.0	671.0
er Group Lime	147	-148	7388.4	12.0	1353.9	FALSE	0.0	154.3	12.0	936	7.8	880.0	216	216	140.4	1570	1152	1020.4	1354	749	6.0	677.0
er Group Lime	148	-149	7446	12.0	1365.9	FALSE	0.0	154.3	12.0	948	7.8	887.8	216	216	140.4	1582	1164	1028.2	1366	758	6.0	683.0
er Group Lime	149	-150	7503.6	12.0	1377.9	FALSE	0.0	154.3	12.0	960	7.8	895.6	216	216	140.4	1594	1176	1036.0	1378	768	6.0	689.0
er Group Lime	150	-151	7561.2	12.0	1389.9	FALSE	0.0	154.3	12.0	972	7.8	903.4	216	216	140.4	1606	1188	1043.8	1390	778	6.0	695.0
er Group Lime	151	-152	7618.8	12.0	1401.9	FALSE	0.0	154.3	12.0	984	7.8	911.2	216	216	140.4	1618	1200	1051.6	1402	787	6.0	701.0
er Group Lime	152	-153	7676.4	12.0	1413.9	FALSE	0.0	154.3	12.0	996	7.8	919.0	216	216	140.4	1630	1212	1059.4	1414	797	6.0	707.0
er Group Lime	153	-154	7734	12.0	1425.9	FALSE	0.0	154.3	12.0	1008	7.8	926.8	216	216	140.4	1642	1224	1067.2	1426	806	6.0	713.0

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
er Group Lime	154	-155	7791.6	12.0	1437.9	FALSE	0.0	154.3	12.0	1020	7.8	934.6	216	216	140.4	1654	1236	1075.0	1438	816	6.0	719.0
er Group Lime	155	-156	7849.2	12.0	1449.9	FALSE	0.0	154.3	12.0	1032	7.8	942.4	216	216	140.4	1666	1248	1082.8	1450	826	6.0	725.0
er Group Lime	156	-157	7906.8	12.0	1461.9	FALSE	0.0	154.3	12.0	1044	7.8	950.2	216	216	140.4	1678	1260	1090.6	1462	835	6.0	731.0
er Group Lime	157	-158	7964.4	12.0	1473.9	FALSE	0.0	154.3	12.0	1056	7.8	958.0	216	216	140.4	1690	1272	1098.4	1474	845	6.0	737.0
er Group Lime	158	-159	8022	12.0	1485.9	FALSE	0.0	154.3	12.0	1068	7.8	965.8	216	216	140.4	1702	1284	1106.2	1486	854	6.0	743.0
er Group Lime	159	-160	8079.6	12.0	1497.9	FALSE	0.0	154.3	12.0	1080	7.8	973.6	216	216	140.4	1714	1296	1114.0	1498	864	6.0	749.0
er Group Lime	160	-161	8137.2	12.0	1509.9	FALSE	0.0	154.3	12.0	1092	7.8	981.4	216	216	140.4	1726	1308	1121.8	1510	874	6.0	755.0
er Group Lime	161	-162	8194.8	12.0	1521.9	FALSE	0.0	154.3	12.0	1104	7.8	989.2	216	216	140.4	1738	1320	1129.6	1522	883	6.0	761.0
er Group Lime	162	-163	8252.4	12.0	1533.9	FALSE	0.0	154.3	12.0	1116	7.8	997.0	216	216	140.4	1750	1332	1137.4	1534	893	6.0	767.0
er Group Lime	163	-164	8310	12.0	1545.9	FALSE	0.0	154.3	12.0	1128	7.8	1004.8	216	216	140.4	1762	1344	1145.2	1546	902	6.0	773.0
er Group Lime	164	-165	8367.6	12.0	1557.9	FALSE	0.0	154.3	12.0	1140	7.8	1012.6	216	216	140.4	1774	1356	1153.0	1558	912	6.0	779.0
er Group Lime	165	-166	8425.2	12.0	1569.9	FALSE	0.0	154.3	12.0	1152	7.8	1020.4	216	216	140.4	1786	1368	1160.8	1570	922	6.0	785.0
er Group Lime	166	-167	8482.8	12.0	1581.9	FALSE	0.0	154.3	12.0	1164	7.8	1028.2	216	216	140.4	1798	1380	1168.6	1582	931	6.0	791.0
er Group Lime	167	-168	8540.4	12.0	1593.9	FALSE	0.0	154.3	12.0	1176	7.8	1036.0	216	216	140.4	1810	1392	1176.4	1594	941	6.0	797.0
er Group Lime	168	-169	8598	12.0	1605.9	FALSE	0.0	154.3	12.0	1188	7.8	1043.8	216	216	140.4	1822	1404	1184.2	1606	950	6.0	803.0
er Group Lime	169	-170	8655.6	12.0	1617.9	FALSE	0.0	154.3	12.0	1200	7.8	1051.6	216	216	140.4	1834	1416	1192.0	1618	960	6.0	809.0
er Group Lime	170	-171	8713.2	12.0	1629.9	FALSE	0.0	154.3	12.0	1212	7.8	1059.4	216	216	140.4	1846	1428	1199.8	1630	970	6.0	815.0
er Group Lime	171	-172	8770.8	12.0	1641.9	FALSE	0.0	154.3	12.0	1224	7.8	1067.2	216	216	140.4	1858	1440	1207.6	1642	979	6.0	821.0
er Group Lime	172	-173	8828.4	12.0	1653.9	FALSE	0.0	154.3	12.0	1236	7.8	1075.0	216	216	140.4	1870	1452	1215.4	1654	989	6.0	827.0
er Group Lime	173	-174	8886	12.0	1665.9	FALSE	0.0	154.3	12.0	1248	7.8	1082.8	216	216	140.4	1882	1464	1223.2	1666	998	6.0	833.0
er Group Lime	174	-175	8943.6	12.0	1677.9	FALSE	0.0	154.3	12.0	1260	7.8	1090.6	216	216	140.4	1894	1476	1231.0	1678	1008	6.0	839.0
er Group Lime	175	-176	9001.2	12.0	1689.9	FALSE	0.0	154.3	12.0	1272	7.8	1098.4	216	216	140.4	1906	1488	1238.8	1690	1018	6.0	845.0
er Group Lime	176	-177	9058.8	12.0	1701.9	FALSE	0.0	154.3	12.0	1284	7.8	1106.2	216	216	140.4	1918	1500	1246.6	1702	1027	6.0	851.0
er Group Lime	177	-178	9116.4	12.0	1713.9	FALSE	0.0	154.3	12.0	1296	7.8	1114.0	216	216	140.4	1930	1512	1254.4	1714	1037	6.0	857.0
er Group Lime	178	-179	9174	12.0	1725.9	FALSE	0.0	154.3	12.0	1308	7.8	1121.8	216	216	140.4	1942	1524	1262.2	1726	1046	6.0	863.0
er Group Lime	179	-180	9231.6	12.0	1737.9	FALSE	0.0	154.3	12.0	1320	7.8	1129.6	216	216	140.4	1954	1536	1270.0	1738	1056	6.0	869.0
er Group Lime	180	-181	9289.2	12.0	1749.9	FALSE	0.0	154.3	12.0	1332	7.8	1137.4	216	216	140.4	1966	1548	1277.8	1750	1066	6.0	875.0
er Group Lime	181	-182	9346.8	12.0	1761.9	FALSE	0.0	154.3	12.0	1344	7.8	1145.2	216	216	140.4	1978	1560	1285.6	1762	1075	6.0	881.0
er Group Lime	182	-183	9404.4	12.0	1773.9	FALSE	0.0	154.3	12.0	1356	7.8	1153.0	216	216	140.4	1990	1572	1293.4	1774	1085	6.0	887.0
er Group Lime	183	-184	9462	12.0	1785.9	FALSE	0.0	154.3	12.0	1368	7.8	1160.8	216	216	140.4	2002	1584	1301.2	1786	1094	6.0	893.0
er Group Lime	184	-185	9519.6	12.0	1797.9	FALSE	0.0	154.3	12.0	1380	7.8	1168.6	216	216	140.4	2014	1596	1309.0	1798	1104	6.0	899.0
er Group Lime	185	-186	9577.2	12.0	1809.9	FALSE	0.0	154.3	12.0	1392	7.8	1176.4	216	216	140.4	2026	1608	1316.8	1810	1114	6.0	905.0
er Group Lime	186	-187	9634.8	12.0	1821.9	FALSE	0.0	154.3	12.0	1404	7.8	1184.2	216	216	140.4	2038	1620	1324.6	1822	1123	6.0	911.0
er Group Lime	187	-188	9692.4	12.0	1833.9	FALSE	0.0	154.3	12.0	1416	7.8	1192.0	216	216	140.4	2050	1632	1332.4	1834	1133	6.0	917.0
er Group Lime	188	-189	9750	12.0	1845.9	FALSE	0.0	154.3	12.0	1428	7.8	1199.8	216	216	140.4	2062	1644	1340.2	1846	1142	6.0	923.0
er Group Lime	189	-190	9807.6	12.0	1857.9	FALSE	0.0	154.3	12.0	1440	7.8	1207.6	216	216	140.4	2074	1656	1348.0	1858	1152	6.0	929.0
er Group Lime	190	-191	9865.2	12.0	1869.9	FALSE	0.0	154.3	12.0	1452	7.8	1215.4	216	216	140.4	2086	1668	1355.8	1870	1162	6.0	935.0
er Group Lime	191	-192	9922.8	12.0	1881.9	FALSE	0.0	154.3	12.0	1464	7.8	1223.2	216	216	140.4	2098	1680	1363.6	1882	1171	6.0	941.0
er Group Lime	192	-193	9980.4	12.0	1893.9	FALSE	0.0	154.3	12.0	1476	7.8	1231.0	216	216	140.4	2110	1692	1371.4	1894	1181	6.0	947.0
er Group Lime	193	-194	10038	12.0	1905.9	FALSE	0.0	154.3	12.0	1488	7.8	1238.8	216	216	140.4	2122	1704	1379.2	1906	1190	6.0	953.0
er Group Lime	194	-195	10095.6	12.0	1917.9	FALSE	0.0	154.3	12.0	1500	7.8	1246.6	216	216	140.4	2134	1716	1387.0	1918	1200	6.0	959.0
er Group Lime	195	-196	10153.2	12.0	1929.9	FALSE	0.0	154.3	12.0	1512	7.8	1254.4	216	216	140.4	2146	1728	1394.8	1930	1210	6.0	965.0
er Group Lime	196	-197	10210.8	12.0	1941.9	FALSE	0.0	154.3	12.0	1524	7.8	1262.2	216	216	140.4	2158	1740	1402.6	1942	1219	6.0	971.0
er Group Lime	197	-198	10268.4	12.0	1953.9	FALSE	0.0	154.3	12.0	1536	7.8	1270.0	216	216	140.4	2170	1752	1410.4	1954	1229	6.0	977.0
er Group Lime	198	-199	10326	12.0	1965.9	FALSE	0.0	154.3	12.0	1548	7.8	1277.8	216	216	140.4	2182	1764	1418.2	1966	1238	6.0	983.0
er Group Lime	199	-200	10383.6	12.0	1977.9	FALSE	0.0	154.3	12.0	1560	7.8	1285.6	216	216	140.4	2194	1776	1426.0	1978	1248	6.0	989.0
er Group Lime	200	-201	10441.2	12.0	1989.9	FALSE	0.0	154.3	12.0	1572	7.8	1293.4	216	216	140.4	2206	1788	1433.8	1990	1258	6.0	995.0

AXIAL PILE CAPACITY

Project Information

Project:	Harbor River Bridge	Pile Tip Area (square feet):	4.00
Owner:	SCDOT	Pile Perimeter (ft):	8.00
Job Number:	18461-007-01	Side and End Friction Resistance Factor α Method	0.65
Analysis by:	HPC	Side and End Friction Resistance Factor Nordlund/Thurman Method	0.65
Date/Time:	10/16/2017 11:52	Uplift Side Friction Resistance Factor α Method	0.5
Run Designation:	East Overbank - No Scour	Uplift Friction Resistance Factor Nordlund/Thurman Method	0.5
Pile Diameter (ft):	2.0	Depth to Top of Liquefied Layer (ft):	18
Ground Surface Elevation (ft):	3	Depth to Bottom of Liquefied Layer (ft):	68
Pile Type:	Square Precast Concrete	Residual Shear Strength of Liquefiable Layer (psf):	215
Checked by:	ZAS	Enter "1" to calculate downdrag from residual shear strength, "2" average of residual & non-liqufied, "3" non-liquefied strength parameters	1
		Calculated Unfactored Downdrag Load (kips)[4]:	197.0

Soil Profile

Soil Type	Depth at Bottom of Soil Unit (feet)	Bouyant Unit Weight (pcf) (total weight above GWT)	ϕ (degrees)	S_u, Undrained Shear Strength (psf)	α, Empirical Adhesion Factor	Friction Ratio, C_f	Earth Pressure Coefficient, K_δ
Sands (1)	3	37.6	29			0.95	1.15
Sands (2)	18	57.6	38			0.9	3
Sands (3)	38	37.6	31			0.95	1.15
Silts/Clays	48	32.6		416	1		
Sands (4)	68	37.6	31			0.95	1.15
Hawthorn Marl	83	57.6		4000	0.25		
Cooper Group Limestone	200	57.6		6000	0.25		

Notes:
1. Spreadsheet programed for α method for undrained shear strength and Nordlund/Thurman Method for friction angle
2. Refer to AASHTO LRFD Section 10.7.3.8.6b to determine α
3. Refer to AASHTO LRFD Section 10.7.3.8.6f to determine C_f and K_δ
4. The structural engineer should include the unfactored downdrag load in accordance with Section 3.11.8 of the AASHTO LRFD Manual

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
Sands (1)	1	2	18.8	0.1	0.1	FALSE	0.1	0.1	0.0	0	0.1	0.1	1	0	0.9	1	0	0.9	0	0	0.0	0.0
Sands (1)	2	1	56.4	0.2	0.3	FALSE	0.2	0.3	0.0	0	0.2	0.2	4	0	2.7	4	0	2.9	0	0	0.1	0.2
Sands (1)	3	0	94	0.4	0.7	FALSE	0.4	0.7	0.0	0	0.3	0.5	7	0	4.5	8	0	4.9	1	0	0.2	0.4
Sands (2)	4	-1	141.6	1.9	2.6	FALSE	1.9	2.6	0.0	0	1.2	1.7	45	0	29.0	47	0	30.7	3	0	1.0	1.3
Sands (2)	5	-2	199.2	2.7	5.3	FALSE	2.7	5.3	0.0	0	1.7	3.5	63	0	40.7	68	0	44.2	5	0	1.3	2.7
Sands (2)	6	-3	256.8	3.5	8.8	FALSE	3.5	8.8	0.0	0	2.3	5.7	81	0	52.5	90	0	58.2	9	0	1.7	4.4
Sands (2)	7	-4	314.4	4.2	13.0	FALSE	4.2	13.0	0.0	0	2.8	8.5	99	0	64.3	112	0	72.8	13	0	2.1	6.5
Sands (2)	8	-5	372	5.0	18.0	FALSE	5.0	18.0	0.0	0	3.3	11.7	117	0	76.1	135	0	87.8	18	0	2.5	9.0
Sands (2)	9	-6	429.6	5.8	23.8	FALSE	5.8	23.8	0.0	0	3.8	15.5	135	0	87.8	159	0	103.3	24	0	2.9	11.9
Sands (2)	10	-7	487.2	6.6	30.4	FALSE	6.6	30.4	0.0	0	4.3	19.8	153	0	99.6	184	0	119.4	30	0	3.3	15.2
Sands (2)	11	-8	544.8	7.3	37.8	FALSE	7.3	37.8	0.0	0	4.8	24.5	171	0	111.4	209	0	135.9	38	0	3.7	18.9
Sands (2)	12	-9	602.4	8.1	45.9	FALSE	8.1	45.9	0.0	0	5.3	29.8	190	0	123.2	235	0	153.0	46	0	4.1	22.9
Sands (2)	13	-10	660	8.9	54.8	FALSE	8.9	54.8	0.0	0	5.8	35.6	208	0	135.0	262	0	170.6	55	0	4.5	27.4
Sands (2)	14	-11	717.6	9.7	64.5	FALSE	9.7	64.5	0.0	0	6.3	41.9	226	0	146.7	290	0	188.6	64	0	4.8	32.2
Sands (2)	15	-12	775.2	10.5	74.9	FALSE	10.5	74.9	0.0	0	6.8	48.7	244	0	158.5	319	0	207.2	75	0	5.2	37.5
Sands (2)	16	-13	832.8	11.2	86.2	FALSE	11.2	86.2	0.0	0	7.3	56.0	262	0	170.3	348	0	226.3	86	0	5.6	43.1
Sands (2)	17	-14	890.4	12.0	98.2	FALSE	12.0	98.2	0.0	0	7.8	63.8	280	0	182.1	378	0	245.9	98	0	6.0	49.1
Sands (2)	18	-15	948	12.8	111.0	FALSE	12.8	111.0	0.0	0	8.3	72.1	298	0	193.9	409	0	266.0	111	0	6.4	55.5
Sands (3)	19	-16	995.6	4.5	115.5	TRUE	1.7	112.7	0.0	0	2.9	75.1	72	0	46.8	187	0	121.9	115	0	2.3	57.7
Sands (3)	20	-17	1033.2	4.7	120.1	TRUE	1.7	114.4	0.0	0	3.0	78.1	72	0	46.8	192	0	124.9	120	0	2.3	60.1
Sands (3)	21	-18	1070.8	4.8	125.0	TRUE	1.7	116.1	0.0	0	3.1	81.2	72	0	46.8	197	0	128.0	125	0	2.4	62.5
Sands (3)	22	-19	1108.4	5.0	130.0	TRUE	1.7	117.8	0.0	0	3.3	84.5	72	0	46.8	202	0	131.3	130	0	2.5	65.0
Sands (3)	23	-20	1146	5.2	135.2	TRUE	1.7	119.6	0.0	0	3.4	87.9	72	0	46.8	207	0	134.7	135	0	2.6	67.6
Sands (3)	24	-21	1183.6	5.4	140.5	TRUE	1.7	121.3	0.0	0	3.5	91.3	72	0	46.8	213	0	138.1	141	0	2.7	70.3
Sands (3)	25	-22	1221.2	5.5	146.1	TRUE	1.7	123.0	0.0	0	3.6	94.9	72	0	46.8	218	0	141.7	146	0	2.8	73.0
Sands (3)	26	-23	1258.8	5.7	151.7	TRUE	1.7	124.7	0.0	0	3.7	98.6	72	0	46.8	224	0	145.4	152	0	2.8	75.9
Sands (3)	27	-24	1296.4	5.9	157.6	TRUE	1.7	126.5	0.0	0	3.8	102.4	72	0	46.8	230	0	149.2	158	0	2.9	78.8
Sands (3)	28	-25	1334	6.0	163.6	TRUE	1.7	128.2	0.0	0	3.9	106.4	72	0	46.8	236	0	153.2	164	0	3.0	81.8
Sands (3)	29	-26	1371.6	6.2	169.9	TRUE	1.7	129.9	0.0	0	4.0	110.4	72	0	46.8	242	0	157.2	170	0	3.1	84.9
Sands (3)	30	-27	1409.2	6.4	176.2	TRUE	1.7	131.6	0.0	0	4.1	114.5	72	0	46.8	248	0	161.3	176	0	3.2	88.1
Sands (3)	31	-28	1446.8	6.5	182.8	TRUE	1.7	133.3	0.0	0	4.3	118.8	72	0	46.8	255	0	165.6	183	0	3.3	91.4
Sands (3)	32	-29	1484.4	6.7	189.5	TRUE	1.7	135.1	0.0	0	4.4	123.2	72	0	46.8	261	0	170.0	189	0	3.4	94.7
Sands (3)	33	-30	1522	6.9	196.4	TRUE	1.7	136.8	0.0	0	4.5	127.6	72	0	46.8	268	0	174.4	196	0	3.4	98.2
Sands (3)	34	-31	1559.6	7.1	203.4	TRUE	1.7	138.5	0.0	0	4.6	132.2	72	0	46.8	275	0	179.0	203	0	3.5	101.7
Sands (3)	35	-32	1597.2	7.2	210.6	TRUE	1.7	140.2	0.0	0	4.7	136.9	72	0	46.8	283	0	183.7	211	0	3.6	105.3
Sands (3)	36	-33	1634.8	7.4	218.0	TRUE	1.7	141.9	0.0	0	4.8	141.7	72	0	46.8	290	0	188.5	218	0	3.7	109.0
Sands (3)	37	-34	1672.4	7.6	225.6	TRUE	1.7	143.7	0.0	0	4.9	146.6	72	0	46.8	298	0	193.4	226	0	3.8	112.8
Sands (3)	38	-35	1710	7.7	233.3	TRUE	1.7	145.4	0.0	0	5.0	151.7	72	0	46.8	305	0	198.5	233	0	3.9	116.7
Silts/Clays	39	-36	1745.1	3.3	236.7	TRUE	1.7	147.1	0.0	0	2.2	153.8	15	0	9.7	252	0	163.6	237	0	1.7	118.3
Silts/Clays	40	-37	1777.7	3.3	240.0	TRUE	1.7	148.8	0.0	0	2.2	156.0	15	0	9.7	255	0	165.7	240	0	1.7	120.0
Silts/Clays	41	-38	1810.3	3.3	243.3	TRUE	1.7	150.5	0.0	0	2.2	158.2	15	0	9.7	258	0	167.9	243	0	1.7	121.7
Silts/Clays	42	-39	1842.9	3.3	246.7	TRUE	1.7	152.3	0.0	0	2.2	160.3	15	0	9.7	262	0	170.1	247	0	1.7	123.3
Silts/Clays	43	-40	1875.5	3.3	250.0	TRUE	1.7	154.0	0.0	0	2.2	162.5	15	0	9.7	265	0	172.2	250	0	1.7	125.0
Silts/Clays	44	-41	1908.1	3.3	253.3	TRUE	1.7	155.7	0.0	0	2.2	164.7	15	0	9.7	268	0	174.4	253	0	1.7	126.7
Silts/Clays	45	-42	1940.7	3.3	256.6	TRUE	1.7	157.4	0.0	0	2.2	166.8	15	0	9.7	272	0	176.6	257	0	1.7	128.3
Silts/Clays	46	-43	1973.3	3.3	260.0	TRUE	1.7	159.2	0.0	0	2.2	169.0	15	0	9.7	275	0	178.7	260	0	1.7	130.0
Silts/Clays	47	-44	2005.9	3.3	263.3	TRUE	1.7	160.9	0.0	0	2.2	171.2	15	0	9.7	278	0	180.9	263	0	1.7	131.7
Silts/Clays	48	-45	2038.5	3.3	266.6	TRUE	1.7	162.6	0.0	0	2.2	173.3	15	0	9.7	282	0	183.1	267	0	1.7	133.3
Sands (4)	49	-46	2073.6	9.4	276.0	TRUE	1.7	164.3	0.0	0	6.1	179.4	72	0	46.8	348	0	226.2	276	0	4.7	138.0
Sands (4)	50	-47	2111.2	9.5	285.6	TRUE	1.7	166.0	0.0	0	6.2	185.6	72	0	46.8	358	0	232.4	286	0	4.8	142.8
Sands (4)	51	-48	2148.8	9.7	295.3	TRUE	1.7	167.8	0.0	0	6.3	191.9	72	0	46.8	367	0	238.7	295	0	4.9	147.6

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
Sands (4)	52	-49	2186.4	9.9	305.2	TRUE	1.7	169.5	0.0	0	6.4	198.4	72	0	46.8	377	0	245.2	305	0	4.9	152.6
Sands (4)	53	-50	2224	10.1	315.2	TRUE	1.7	171.2	0.0	0	6.5	204.9	72	0	46.8	387	0	251.7	315	0	5.0	157.6
Sands (4)	54	-51	2261.6	10.2	325.5	TRUE	1.7	172.9	0.0	0	6.6	211.6	72	0	46.8	397	0	258.4	325	0	5.1	162.7
Sands (4)	55	-52	2299.2	10.4	335.9	TRUE	1.7	174.6	0.0	0	6.8	218.3	72	0	46.8	408	0	265.1	336	0	5.2	167.9
Sands (4)	56	-53	2336.8	10.6	346.4	TRUE	1.7	176.4	0.0	0	6.9	225.2	72	0	46.8	418	0	272.0	346	0	5.3	173.2
Sands (4)	57	-54	2374.4	10.7	357.2	TRUE	1.7	178.1	0.0	0	7.0	232.2	72	0	46.8	429	0	279.0	357	0	5.4	178.6
Sands (4)	58	-55	2412	10.9	368.1	TRUE	1.7	179.8	0.0	0	7.1	239.3	72	0	46.8	440	0	286.1	368	0	5.5	184.0
Sands (4)	59	-56	2449.6	11.1	379.2	TRUE	1.7	181.5	0.0	0	7.2	246.5	72	0	46.8	451	0	293.3	379	0	5.5	189.6
Sands (4)	60	-57	2487.2	11.3	390.4	TRUE	1.7	183.2	0.0	0	7.3	253.8	72	0	46.8	462	0	300.6	390	0	5.6	195.2
Sands (4)	61	-58	2524.8	11.4	401.8	TRUE	1.7	185.0	0.0	0	7.4	261.2	72	0	46.8	474	0	308.0	402	0	5.7	200.9
Sands (4)	62	-59	2562.4	11.6	413.4	TRUE	1.7	186.7	0.0	0	7.5	268.7	72	0	46.8	485	0	315.5	413	0	5.8	206.7
Sands (4)	63	-60	2600	11.8	425.2	TRUE	1.7	188.4	0.0	0	7.6	276.4	72	0	46.8	497	0	323.2	425	0	5.9	212.6
Sands (4)	64	-61	2637.6	11.9	437.1	TRUE	1.7	190.1	0.0	0	7.8	284.1	72	0	46.8	509	0	330.9	437	0	6.0	218.6
Sands (4)	65	-62	2675.2	12.1	449.2	TRUE	1.7	191.9	0.0	0	7.9	292.0	72	0	46.8	521	0	338.8	449	0	6.1	224.6
Sands (4)	66	-63	2712.8	12.3	461.5	TRUE	1.7	193.6	0.0	0	8.0	300.0	72	0	46.8	533	0	346.8	461	0	6.1	230.7
Sands (4)	67	-64	2750.4	12.4	473.9	TRUE	1.7	195.3	0.0	0	8.1	308.1	72	0	46.8	546	0	354.9	474	0	6.2	237.0
Sands (4)	68	-65	2788	12.6	486.5	TRUE	1.7	197.0	0.0	0	8.2	316.3	72	0	46.8	559	0	363.1	487	0	6.3	243.3
Hawthorn Mar	69	-66	2835.6	8.0	494.5	FALSE	0.0	197.0	8.0	8	5.2	321.5	144	144	93.6	639	152	415.1	495	6	4.0	247.3
Hawthorn Mar	70	-67	2893.2	8.0	502.5	FALSE	0.0	197.0	8.0	16	5.2	326.7	144	144	93.6	647	160	420.3	503	13	4.0	251.3
Hawthorn Mar	71	-68	2950.8	8.0	510.5	FALSE	0.0	197.0	8.0	24	5.2	331.9	144	144	93.6	655	168	425.5	511	19	4.0	255.3
Hawthorn Mar	72	-69	3008.4	8.0	518.5	FALSE	0.0	197.0	8.0	32	5.2	337.1	144	144	93.6	663	176	430.7	519	26	4.0	259.3
Hawthorn Mar	73	-70	3066	8.0	526.5	FALSE	0.0	197.0	8.0	40	5.2	342.3	144	144	93.6	671	184	435.9	527	32	4.0	263.3
Hawthorn Mar	74	-71	3123.6	8.0	534.5	FALSE	0.0	197.0	8.0	48	5.2	347.5	144	144	93.6	679	192	441.1	535	38	4.0	267.3
Hawthorn Mar	75	-72	3181.2	8.0	542.5	FALSE	0.0	197.0	8.0	56	5.2	352.7	144	144	93.6	687	200	446.3	543	45	4.0	271.3
Hawthorn Mar	76	-73	3238.8	8.0	550.5	FALSE	0.0	197.0	8.0	64	5.2	357.9	144	144	93.6	695	208	451.5	551	51	4.0	275.3
Hawthorn Mar	77	-74	3296.4	8.0	558.5	FALSE	0.0	197.0	8.0	72	5.2	363.1	144	144	93.6	703	216	456.7	559	58	4.0	279.3
Hawthorn Mar	78	-75	3354	8.0	566.5	FALSE	0.0	197.0	8.0	80	5.2	368.3	144	144	93.6	711	224	461.9	567	64	4.0	283.3
Hawthorn Mar	79	-76	3411.6	8.0	574.5	FALSE	0.0	197.0	8.0	88	5.2	373.5	144	144	93.6	719	232	467.1	575	70	4.0	287.3
Hawthorn Mar	80	-77	3469.2	8.0	582.5	FALSE	0.0	197.0	8.0	96	5.2	378.7	144	144	93.6	727	240	472.3	583	77	4.0	291.3
Hawthorn Mar	81	-78	3526.8	8.0	590.5	FALSE	0.0	197.0	8.0	104	5.2	383.9	144	144	93.6	735	248	477.5	591	83	4.0	295.3
Hawthorn Mar	82	-79	3584.4	8.0	598.5	FALSE	0.0	197.0	8.0	112	5.2	389.1	144	144	93.6	743	256	482.7	599	90	4.0	299.3
Hawthorn Mar	83	-80	3642	8.0	606.5	FALSE	0.0	197.0	8.0	120	5.2	394.3	144	144	93.6	751	264	487.9	607	96	4.0	303.3
er Group Lime	84	-81	3699.6	12.0	618.5	FALSE	0.0	197.0	12.0	132	7.8	402.1	216	216	140.4	835	348	542.5	619	106	6.0	309.3
er Group Lime	85	-82	3757.2	12.0	630.5	FALSE	0.0	197.0	12.0	144	7.8	409.9	216	216	140.4	847	360	550.3	631	115	6.0	315.3
er Group Lime	86	-83	3814.8	12.0	642.5	FALSE	0.0	197.0	12.0	156	7.8	417.7	216	216	140.4	859	372	558.1	643	125	6.0	321.3
er Group Lime	87	-84	3872.4	12.0	654.5	FALSE	0.0	197.0	12.0	168	7.8	425.5	216	216	140.4	871	384	565.9	655	134	6.0	327.3
er Group Lime	88	-85	3930	12.0	666.5	FALSE	0.0	197.0	12.0	180	7.8	433.3	216	216	140.4	883	396	573.7	667	144	6.0	333.3
er Group Lime	89	-86	3987.6	12.0	678.5	FALSE	0.0	197.0	12.0	192	7.8	441.1	216	216	140.4	895	408	581.5	679	154	6.0	339.3
er Group Lime	90	-87	4045.2	12.0	690.5	FALSE	0.0	197.0	12.0	204	7.8	448.9	216	216	140.4	907	420	589.3	691	163	6.0	345.3
er Group Lime	91	-88	4102.8	12.0	702.5	FALSE	0.0	197.0	12.0	216	7.8	456.7	216	216	140.4	919	432	597.1	703	173	6.0	351.3
er Group Lime	92	-89	4160.4	12.0	714.5	FALSE	0.0	197.0	12.0	228	7.8	464.5	216	216	140.4	931	444	604.9	715	182	6.0	357.3
er Group Lime	93	-90	4218	12.0	726.5	FALSE	0.0	197.0	12.0	240	7.8	472.3	216	216	140.4	943	456	612.7	727	192	6.0	363.3
er Group Lime	94	-91	4275.6	12.0	738.5	FALSE	0.0	197.0	12.0	252	7.8	480.1	216	216	140.4	955	468	620.5	739	202	6.0	369.3
er Group Lime	95	-92	4333.2	12.0	750.5	FALSE	0.0	197.0	12.0	264	7.8	487.9	216	216	140.4	967	480	628.3	751	211	6.0	375.3
er Group Lime	96	-93	4390.8	12.0	762.5	FALSE	0.0	197.0	12.0	276	7.8	495.7	216	216	140.4	979	492	636.1	763	221	6.0	381.3
er Group Lime	97	-94	4448.4	12.0	774.5	FALSE	0.0	197.0	12.0	288	7.8	503.5	216	216	140.4	991	504	643.9	775	230	6.0	387.3
er Group Lime	98	-95	4506	12.0	786.5	FALSE	0.0	197.0	12.0	300	7.8	511.3	216	216	140.4	1003	516	651.7	787	240	6.0	393.3
er Group Lime	99	-96	4563.6	12.0	798.5	FALSE	0.0	197.0	12.0	312	7.8	519.1	216	216	140.4	1015	528	659.5	799	250	6.0	399.3
er Group Lime	100	-97	4621.2	12.0	810.5	FALSE	0.0	197.0	12.0	324	7.8	526.9	216	216	140.4	1027	540	667.3	811	259	6.0	405.3
er Group Lime	101	-98	4678.8	12.0	822.5	FALSE	0.0	197.0	12.0	336	7.8	534.7	216	216	140.4	1039	552	675.1	823	269	6.0	411.3
er Group Lime	102	-99	4736.4	12.0	834.5	FALSE	0.0	197.0	12.0	348	7.8	542.5	216	216	140.4	1051	564	682.9	835	278	6.0	417.3

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
er Group Lime	103	-100	4794	12.0	846.5	FALSE	0.0	197.0	12.0	360	7.8	550.3	216	216	140.4	1063	576	690.7	847	288	6.0	423.3
er Group Lime	104	-101	4851.6	12.0	858.5	FALSE	0.0	197.0	12.0	372	7.8	558.1	216	216	140.4	1075	588	698.5	859	298	6.0	429.3
er Group Lime	105	-102	4909.2	12.0	870.5	FALSE	0.0	197.0	12.0	384	7.8	565.9	216	216	140.4	1087	600	706.3	871	307	6.0	435.3
er Group Lime	106	-103	4966.8	12.0	882.5	FALSE	0.0	197.0	12.0	396	7.8	573.7	216	216	140.4	1099	612	714.1	883	317	6.0	441.3
er Group Lime	107	-104	5024.4	12.0	894.5	FALSE	0.0	197.0	12.0	408	7.8	581.5	216	216	140.4	1111	624	721.9	895	326	6.0	447.3
er Group Lime	108	-105	5082	12.0	906.5	FALSE	0.0	197.0	12.0	420	7.8	589.3	216	216	140.4	1123	636	729.7	907	336	6.0	453.3
er Group Lime	109	-106	5139.6	12.0	918.5	FALSE	0.0	197.0	12.0	432	7.8	597.1	216	216	140.4	1135	648	737.5	919	346	6.0	459.3
er Group Lime	110	-107	5197.2	12.0	930.5	FALSE	0.0	197.0	12.0	444	7.8	604.9	216	216	140.4	1147	660	745.3	931	355	6.0	465.3
er Group Lime	111	-108	5254.8	12.0	942.5	FALSE	0.0	197.0	12.0	456	7.8	612.7	216	216	140.4	1159	672	753.1	943	365	6.0	471.3
er Group Lime	112	-109	5312.4	12.0	954.5	FALSE	0.0	197.0	12.0	468	7.8	620.5	216	216	140.4	1171	684	760.9	955	374	6.0	477.3
er Group Lime	113	-110	5370	12.0	966.5	FALSE	0.0	197.0	12.0	480	7.8	628.3	216	216	140.4	1183	696	768.7	967	384	6.0	483.3
er Group Lime	114	-111	5427.6	12.0	978.5	FALSE	0.0	197.0	12.0	492	7.8	636.1	216	216	140.4	1195	708	776.5	979	394	6.0	489.3
er Group Lime	115	-112	5485.2	12.0	990.5	FALSE	0.0	197.0	12.0	504	7.8	643.9	216	216	140.4	1207	720	784.3	991	403	6.0	495.3
er Group Lime	116	-113	5542.8	12.0	1002.5	FALSE	0.0	197.0	12.0	516	7.8	651.7	216	216	140.4	1219	732	792.1	1003	413	6.0	501.3
er Group Lime	117	-114	5600.4	12.0	1014.5	FALSE	0.0	197.0	12.0	528	7.8	659.5	216	216	140.4	1231	744	799.9	1015	422	6.0	507.3
er Group Lime	118	-115	5658	12.0	1026.5	FALSE	0.0	197.0	12.0	540	7.8	667.3	216	216	140.4	1243	756	807.7	1027	432	6.0	513.3
er Group Lime	119	-116	5715.6	12.0	1038.5	FALSE	0.0	197.0	12.0	552	7.8	675.1	216	216	140.4	1255	768	815.5	1039	442	6.0	519.3
er Group Lime	120	-117	5773.2	12.0	1050.5	FALSE	0.0	197.0	12.0	564	7.8	682.9	216	216	140.4	1267	780	823.3	1051	451	6.0	525.3
er Group Lime	121	-118	5830.8	12.0	1062.5	FALSE	0.0	197.0	12.0	576	7.8	690.7	216	216	140.4	1279	792	831.1	1063	461	6.0	531.3
er Group Lime	122	-119	5888.4	12.0	1074.5	FALSE	0.0	197.0	12.0	588	7.8	698.5	216	216	140.4	1291	804	838.9	1075	470	6.0	537.3
er Group Lime	123	-120	5946	12.0	1086.5	FALSE	0.0	197.0	12.0	600	7.8	706.3	216	216	140.4	1303	816	846.7	1087	480	6.0	543.3
er Group Lime	124	-121	6003.6	12.0	1098.5	FALSE	0.0	197.0	12.0	612	7.8	714.1	216	216	140.4	1315	828	854.5	1099	490	6.0	549.3
er Group Lime	125	-122	6061.2	12.0	1110.5	FALSE	0.0	197.0	12.0	624	7.8	721.9	216	216	140.4	1327	840	862.3	1111	499	6.0	555.3
er Group Lime	126	-123	6118.8	12.0	1122.5	FALSE	0.0	197.0	12.0	636	7.8	729.7	216	216	140.4	1339	852	870.1	1123	509	6.0	561.3
er Group Lime	127	-124	6176.4	12.0	1134.5	FALSE	0.0	197.0	12.0	648	7.8	737.5	216	216	140.4	1351	864	877.9	1135	518	6.0	567.3
er Group Lime	128	-125	6234	12.0	1146.5	FALSE	0.0	197.0	12.0	660	7.8	745.3	216	216	140.4	1363	876	885.7	1147	528	6.0	573.3
er Group Lime	129	-126	6291.6	12.0	1158.5	FALSE	0.0	197.0	12.0	672	7.8	753.1	216	216	140.4	1375	888	893.5	1159	538	6.0	579.3
er Group Lime	130	-127	6349.2	12.0	1170.5	FALSE	0.0	197.0	12.0	684	7.8	760.9	216	216	140.4	1387	900	901.3	1171	547	6.0	585.3
er Group Lime	131	-128	6406.8	12.0	1182.5	FALSE	0.0	197.0	12.0	696	7.8	768.7	216	216	140.4	1399	912	909.1	1183	557	6.0	591.3
er Group Lime	132	-129	6464.4	12.0	1194.5	FALSE	0.0	197.0	12.0	708	7.8	776.5	216	216	140.4	1411	924	916.9	1195	566	6.0	597.3
er Group Lime	133	-130	6522	12.0	1206.5	FALSE	0.0	197.0	12.0	720	7.8	784.3	216	216	140.4	1423	936	924.7	1207	576	6.0	603.3
er Group Lime	134	-131	6579.6	12.0	1218.5	FALSE	0.0	197.0	12.0	732	7.8	792.1	216	216	140.4	1435	948	932.5	1219	586	6.0	609.3
er Group Lime	135	-132	6637.2	12.0	1230.5	FALSE	0.0	197.0	12.0	744	7.8	799.9	216	216	140.4	1447	960	940.3	1231	595	6.0	615.3
er Group Lime	136	-133	6694.8	12.0	1242.5	FALSE	0.0	197.0	12.0	756	7.8	807.7	216	216	140.4	1459	972	948.1	1243	605	6.0	621.3
er Group Lime	137	-134	6752.4	12.0	1254.5	FALSE	0.0	197.0	12.0	768	7.8	815.5	216	216	140.4	1471	984	955.9	1255	614	6.0	627.3
er Group Lime	138	-135	6810	12.0	1266.5	FALSE	0.0	197.0	12.0	780	7.8	823.3	216	216	140.4	1483	996	963.7	1267	624	6.0	633.3
er Group Lime	139	-136	6867.6	12.0	1278.5	FALSE	0.0	197.0	12.0	792	7.8	831.1	216	216	140.4	1495	1008	971.5	1279	634	6.0	639.3
er Group Lime	140	-137	6925.2	12.0	1290.5	FALSE	0.0	197.0	12.0	804	7.8	838.9	216	216	140.4	1507	1020	979.3	1291	643	6.0	645.3
er Group Lime	141	-138	6982.8	12.0	1302.5	FALSE	0.0	197.0	12.0	816	7.8	846.7	216	216	140.4	1519	1032	987.1	1303	653	6.0	651.3
er Group Lime	142	-139	7040.4	12.0	1314.5	FALSE	0.0	197.0	12.0	828	7.8	854.5	216	216	140.4	1531	1044	994.9	1315	662	6.0	657.3
er Group Lime	143	-140	7098	12.0	1326.5	FALSE	0.0	197.0	12.0	840	7.8	862.3	216	216	140.4	1543	1056	1002.7	1327	672	6.0	663.3
er Group Lime	144	-141	7155.6	12.0	1338.5	FALSE	0.0	197.0	12.0	852	7.8	870.1	216	216	140.4	1555	1068	1010.5	1339	682	6.0	669.3
er Group Lime	145	-142	7213.2	12.0	1350.5	FALSE	0.0	197.0	12.0	864	7.8	877.9	216	216	140.4	1567	1080	1018.3	1351	691	6.0	675.3
er Group Lime	146	-143	7270.8	12.0	1362.5	FALSE	0.0	197.0	12.0	876	7.8	885.7	216	216	140.4	1579	1092	1026.1	1363	701	6.0	681.3
er Group Lime	147	-144	7328.4	12.0	1374.5	FALSE	0.0	197.0	12.0	888	7.8	893.5	216	216	140.4	1591	1104	1033.9	1375	710	6.0	687.3
er Group Lime	148	-145	7386	12.0	1386.5	FALSE	0.0	197.0	12.0	900	7.8	901.3	216	216	140.4	1603	1116	1041.7	1387	720	6.0	693.3
er Group Lime	149	-146	7443.6	12.0	1398.5	FALSE	0.0	197.0	12.0	912	7.8	909.1	216	216	140.4	1615	1128	1049.5	1399	730	6.0	699.3
er Group Lime	150	-147	7501.2	12.0	1410.5	FALSE	0.0	197.0	12.0	924	7.8	916.9	216	216	140.4	1627	1140	1057.3	1411	739	6.0	705.3
er Group Lime	151	-148	7558.8	12.0	1422.5	FALSE	0.0	197.0	12.0	936	7.8	924.7	216	216	140.4	1639	1152	1065.1	1423	749	6.0	711.3
er Group Lime	152	-149	7616.4	12.0	1434.5	FALSE	0.0	197.0	12.0	948	7.8	932.5	216	216	140.4	1651	1164	1072.9	1435	758	6.0	717.3
er Group Lime	153	-150	7674	12.0	1446.5	FALSE	0.0	197.0	12.0	960	7.8	940.3	216	216	140.4	1663	1176	1080.7	1447	768	6.0	723.3

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
er Group Lime	154	-151	7731.6	12.0	1458.5	FALSE	0.0	197.0	12.0	972	7.8	948.1	216	216	140.4	1675	1188	1088.5	1459	778	6.0	729.3
er Group Lime	155	-152	7789.2	12.0	1470.5	FALSE	0.0	197.0	12.0	984	7.8	955.9	216	216	140.4	1687	1200	1096.3	1471	787	6.0	735.3
er Group Lime	156	-153	7846.8	12.0	1482.5	FALSE	0.0	197.0	12.0	996	7.8	963.7	216	216	140.4	1699	1212	1104.1	1483	797	6.0	741.3
er Group Lime	157	-154	7904.4	12.0	1494.5	FALSE	0.0	197.0	12.0	1008	7.8	971.5	216	216	140.4	1711	1224	1111.9	1495	806	6.0	747.3
er Group Lime	158	-155	7962	12.0	1506.5	FALSE	0.0	197.0	12.0	1020	7.8	979.3	216	216	140.4	1723	1236	1119.7	1507	816	6.0	753.3
er Group Lime	159	-156	8019.6	12.0	1518.5	FALSE	0.0	197.0	12.0	1032	7.8	987.1	216	216	140.4	1735	1248	1127.5	1519	826	6.0	759.3
er Group Lime	160	-157	8077.2	12.0	1530.5	FALSE	0.0	197.0	12.0	1044	7.8	994.9	216	216	140.4	1747	1260	1135.3	1531	835	6.0	765.3
er Group Lime	161	-158	8134.8	12.0	1542.5	FALSE	0.0	197.0	12.0	1056	7.8	1002.7	216	216	140.4	1759	1272	1143.1	1543	845	6.0	771.3
er Group Lime	162	-159	8192.4	12.0	1554.5	FALSE	0.0	197.0	12.0	1068	7.8	1010.5	216	216	140.4	1771	1284	1150.9	1555	854	6.0	777.3
er Group Lime	163	-160	8250	12.0	1566.5	FALSE	0.0	197.0	12.0	1080	7.8	1018.3	216	216	140.4	1783	1296	1158.7	1567	864	6.0	783.3
er Group Lime	164	-161	8307.6	12.0	1578.5	FALSE	0.0	197.0	12.0	1092	7.8	1026.1	216	216	140.4	1795	1308	1166.5	1579	874	6.0	789.3
er Group Lime	165	-162	8365.2	12.0	1590.5	FALSE	0.0	197.0	12.0	1104	7.8	1033.9	216	216	140.4	1807	1320	1174.3	1591	883	6.0	795.3
er Group Lime	166	-163	8422.8	12.0	1602.5	FALSE	0.0	197.0	12.0	1116	7.8	1041.7	216	216	140.4	1819	1332	1182.1	1603	893	6.0	801.3
er Group Lime	167	-164	8480.4	12.0	1614.5	FALSE	0.0	197.0	12.0	1128	7.8	1049.5	216	216	140.4	1831	1344	1189.9	1615	902	6.0	807.3
er Group Lime	168	-165	8538	12.0	1626.5	FALSE	0.0	197.0	12.0	1140	7.8	1057.3	216	216	140.4	1843	1356	1197.7	1627	912	6.0	813.3
er Group Lime	169	-166	8595.6	12.0	1638.5	FALSE	0.0	197.0	12.0	1152	7.8	1065.1	216	216	140.4	1855	1368	1205.5	1639	922	6.0	819.3
er Group Lime	170	-167	8653.2	12.0	1650.5	FALSE	0.0	197.0	12.0	1164	7.8	1072.9	216	216	140.4	1867	1380	1213.3	1651	931	6.0	825.3
er Group Lime	171	-168	8710.8	12.0	1662.5	FALSE	0.0	197.0	12.0	1176	7.8	1080.7	216	216	140.4	1879	1392	1221.1	1663	941	6.0	831.3
er Group Lime	172	-169	8768.4	12.0	1674.5	FALSE	0.0	197.0	12.0	1188	7.8	1088.5	216	216	140.4	1891	1404	1228.9	1675	950	6.0	837.3
er Group Lime	173	-170	8826	12.0	1686.5	FALSE	0.0	197.0	12.0	1200	7.8	1096.3	216	216	140.4	1903	1416	1236.7	1687	960	6.0	843.3
er Group Lime	174	-171	8883.6	12.0	1698.5	FALSE	0.0	197.0	12.0	1212	7.8	1104.1	216	216	140.4	1915	1428	1244.5	1699	970	6.0	849.3
er Group Lime	175	-172	8941.2	12.0	1710.5	FALSE	0.0	197.0	12.0	1224	7.8	1111.9	216	216	140.4	1927	1440	1252.3	1711	979	6.0	855.3
er Group Lime	176	-173	8998.8	12.0	1722.5	FALSE	0.0	197.0	12.0	1236	7.8	1119.7	216	216	140.4	1939	1452	1260.1	1723	989	6.0	861.3
er Group Lime	177	-174	9056.4	12.0	1734.5	FALSE	0.0	197.0	12.0	1248	7.8	1127.5	216	216	140.4	1951	1464	1267.9	1735	998	6.0	867.3
er Group Lime	178	-175	9114	12.0	1746.5	FALSE	0.0	197.0	12.0	1260	7.8	1135.3	216	216	140.4	1963	1476	1275.7	1747	1008	6.0	873.3
er Group Lime	179	-176	9171.6	12.0	1758.5	FALSE	0.0	197.0	12.0	1272	7.8	1143.1	216	216	140.4	1975	1488	1283.5	1759	1018	6.0	879.3
er Group Lime	180	-177	9229.2	12.0	1770.5	FALSE	0.0	197.0	12.0	1284	7.8	1150.9	216	216	140.4	1987	1500	1291.3	1771	1027	6.0	885.3
er Group Lime	181	-178	9286.8	12.0	1782.5	FALSE	0.0	197.0	12.0	1296	7.8	1158.7	216	216	140.4	1999	1512	1299.1	1783	1037	6.0	891.3
er Group Lime	182	-179	9344.4	12.0	1794.5	FALSE	0.0	197.0	12.0	1308	7.8	1166.5	216	216	140.4	2011	1524	1306.9	1795	1046	6.0	897.3
er Group Lime	183	-180	9402	12.0	1806.5	FALSE	0.0	197.0	12.0	1320	7.8	1174.3	216	216	140.4	2023	1536	1314.7	1807	1056	6.0	903.3
er Group Lime	184	-181	9459.6	12.0	1818.5	FALSE	0.0	197.0	12.0	1332	7.8	1182.1	216	216	140.4	2035	1548	1322.5	1819	1066	6.0	909.3
er Group Lime	185	-182	9517.2	12.0	1830.5	FALSE	0.0	197.0	12.0	1344	7.8	1189.9	216	216	140.4	2047	1560	1330.3	1831	1075	6.0	915.3
er Group Lime	186	-183	9574.8	12.0	1842.5	FALSE	0.0	197.0	12.0	1356	7.8	1197.7	216	216	140.4	2059	1572	1338.1	1843	1085	6.0	921.3
er Group Lime	187	-184	9632.4	12.0	1854.5	FALSE	0.0	197.0	12.0	1368	7.8	1205.5	216	216	140.4	2071	1584	1345.9	1855	1094	6.0	927.3
er Group Lime	188	-185	9690	12.0	1866.5	FALSE	0.0	197.0	12.0	1380	7.8	1213.3	216	216	140.4	2083	1596	1353.7	1867	1104	6.0	933.3
er Group Lime	189	-186	9747.6	12.0	1878.5	FALSE	0.0	197.0	12.0	1392	7.8	1221.1	216	216	140.4	2095	1608	1361.5	1879	1114	6.0	939.3
er Group Lime	190	-187	9805.2	12.0	1890.5	FALSE	0.0	197.0	12.0	1404	7.8	1228.9	216	216	140.4	2107	1620	1369.3	1891	1123	6.0	945.3
er Group Lime	191	-188	9862.8	12.0	1902.5	FALSE	0.0	197.0	12.0	1416	7.8	1236.7	216	216	140.4	2119	1632	1377.1	1903	1133	6.0	951.3
er Group Lime	192	-189	9920.4	12.0	1914.5	FALSE	0.0	197.0	12.0	1428	7.8	1244.5	216	216	140.4	2131	1644	1384.9	1915	1142	6.0	957.3
er Group Lime	193	-190	9978	12.0	1926.5	FALSE	0.0	197.0	12.0	1440	7.8	1252.3	216	216	140.4	2143	1656	1392.7	1927	1152	6.0	963.3
er Group Lime	194	-191	10035.6	12.0	1938.5	FALSE	0.0	197.0	12.0	1452	7.8	1260.1	216	216	140.4	2155	1668	1400.5	1939	1162	6.0	969.3
er Group Lime	195	-192	10093.2	12.0	1950.5	FALSE	0.0	197.0	12.0	1464	7.8	1267.9	216	216	140.4	2167	1680	1408.3	1951	1171	6.0	975.3
er Group Lime	196	-193	10150.8	12.0	1962.5	FALSE	0.0	197.0	12.0	1476	7.8	1275.7	216	216	140.4	2179	1692	1416.1	1963	1181	6.0	981.3
er Group Lime	197	-194	10208.4	12.0	1974.5	FALSE	0.0	197.0	12.0	1488	7.8	1283.5	216	216	140.4	2191	1704	1423.9	1975	1190	6.0	987.3
er Group Lime	198	-195	10266	12.0	1986.5	FALSE	0.0	197.0	12.0	1500	7.8	1291.3	216	216	140.4	2203	1716	1431.7	1987	1200	6.0	993.3
er Group Lime	199	-196	10323.6	12.0	1998.5	FALSE	0.0	197.0	12.0	1512	7.8	1299.1	216	216	140.4	2215	1728	1439.5	1999	1210	6.0	999.3
er Group Lime	200	-197	10381.2	12.0	2010.5	FALSE	0.0	197.0	12.0	1524	7.8	1306.9	216	216	140.4	2227	1740	1447.3	2011	1219	6.0	1005.3

AXIAL PILE CAPACITY

Project Information

Project:	Harbor River Bridge	Pile Tip Area (square feet):	1.47
Owner:	SCDOT	Pile Perimeter (ft):	4.85
Job Number:	18461-007-01	Side and End Friction Resistance Factor α Method	0.65
Analysis by:	HPC	Side and End Friction Resistance Factor Nordlund/Thurman Method	0.65
Date/Time:	10/16/2017 11:53	Uplift Side Friction Resistance Factor α Method	0.5
Run Designation:	East Abutment - No Scour	Uplift Friction Resistance Factor Nordlund/Thurman Method	0.5
Pile Diameter (ft):	1.2	Depth to Top of Liquefied Layer (ft):	18
Ground Surface Elevation (ft):	3	Depth to Bottom of Liquefied Layer (ft):	69
Pile Type:	HP 14x117 Steel	Residual Shear Strength of Liquefiable Layer (psf):	272
Checked by:	ZAS	Enter "1" to calculate downdrag from residual shear strength, "2" average of residual & non-liqufied, "3" non-liquefied strength parameters	1
		Calculated Unfactored Downdrag Load (kips)[4]:	139.1

Soil Profile

Soil Type	Depth at Bottom of Soil Unit (feet)	Bouyant Unit Weight (pcf) (total weight above GWT)	ϕ (degrees)	S_u, Undrained Shear Strength (psf)	α, Empirical Adhesion Factor	Friction Ratio, C_f	Earth Pressure Coefficient, K_δ
Sands (1)	3	37.6	30			0.95	1.15
Sands (2)	18	57.6	41			0.90	3.00
Sands (3)	33	37.6	30			0.95	1.15
Silts/Clays	43	32.6		392	1		
Silts/Clays	53	32.6		467	1		
Sands (4)	69	37.6	30			0.95	1.15
Hawthorn Marl	80	57.6		4000	0.25		
Cooper Group Limestone	200	57.6		6000	0.25		

Notes:
1. Spreadsheet programed for α method for undrained shear strength and Nordlund/Thurman Method for friction angle
2. Refer to AASHTO LRFD Section 10.7.3.8.6b to determine α
3. Refer to AASHTO LRFD Section 10.7.3.8.6f to determine C_f and K_δ
4. The structural engineer should include the unfactored downdrag load in accordance with Section 3.11.8 of the AASHTO LRFD Manual

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
Sands (1)	1	2	18.8	0.1	0.1	FALSE	0.1	0.1	0.0	0	0.0	0.0	1	0	0.4	1	0	0.4	0	0	0.0	0.0
Sands (1)	2	1	56.4	0.2	0.2	FALSE	0.2	0.2	0.0	0	0.1	0.1	2	0	1.1	2	0	1.2	0	0	0.1	0.1
Sands (1)	3	0	94	0.3	0.5	FALSE	0.3	0.5	0.0	0	0.2	0.3	3	0	1.8	3	0	2.1	0	0	0.1	0.2
Sands (2)	4	-1	141.6	1.2	1.7	FALSE	1.2	1.7	0.0	0	0.8	1.1	31	0	20.4	33	0	21.5	2	0	0.6	0.8
Sands (2)	5	-2	199.2	1.7	3.4	FALSE	1.7	3.4	0.0	0	1.1	2.2	44	0	28.7	48	0	30.9	3	0	0.9	1.7
Sands (2)	6	-3	256.8	2.2	5.7	FALSE	2.2	5.7	0.0	0	1.5	3.7	57	0	36.9	62	0	40.6	6	0	1.1	2.8
Sands (2)	7	-4	314.4	2.7	8.4	FALSE	2.7	8.4	0.0	0	1.8	5.5	70	0	45.2	78	0	50.7	8	0	1.4	4.2
Sands (2)	8	-5	372	3.2	11.7	FALSE	3.2	11.7	0.0	0	2.1	7.6	82	0	53.5	94	0	61.1	12	0	1.6	5.8
Sands (2)	9	-6	429.6	3.8	15.4	FALSE	3.8	15.4	0.0	0	2.4	10.0	95	0	61.8	110	0	71.8	15	0	1.9	7.7
Sands (2)	10	-7	487.2	4.3	19.7	FALSE	4.3	19.7	0.0	0	2.8	12.8	108	0	70.1	127	0	82.9	20	0	2.1	9.8
Sands (2)	11	-8	544.8	4.8	24.4	FALSE	4.8	24.4	0.0	0	3.1	15.9	121	0	78.4	145	0	94.2	24	0	2.4	12.2
Sands (2)	12	-9	602.4	5.3	29.7	FALSE	5.3	29.7	0.0	0	3.4	19.3	133	0	86.6	163	0	105.9	30	0	2.6	14.8
Sands (2)	13	-10	660	5.8	35.5	FALSE	5.8	35.5	0.0	0	3.7	23.1	146	0	94.9	182	0	118.0	35	0	2.9	17.7
Sands (2)	14	-11	717.6	6.3	41.7	FALSE	6.3	41.7	0.0	0	4.1	27.1	159	0	103.2	201	0	130.3	42	0	3.1	20.9
Sands (2)	15	-12	775.2	6.8	48.5	FALSE	6.8	48.5	0.0	0	4.4	31.5	172	0	111.5	220	0	143.0	49	0	3.4	24.3
Sands (2)	16	-13	832.8	7.3	55.8	FALSE	7.3	55.8	0.0	0	4.7	36.3	184	0	119.8	240	0	156.0	56	0	3.6	27.9
Sands (2)	17	-14	890.4	7.8	63.6	FALSE	7.8	63.6	0.0	0	5.1	41.3	197	0	128.1	261	0	169.4	64	0	3.9	31.8
Sands (2)	18	-15	948	8.3	71.8	FALSE	8.3	71.8	0.0	0	5.4	46.7	210	0	136.4	282	0	183.0	72	0	4.1	35.9
Sands (3)	19	-16	995.6	2.6	74.5	TRUE	1.3	73.2	0.0	0	1.7	48.4	15	0	9.6	89	0	58.0	74	0	1.3	37.2
Sands (3)	20	-17	1033.2	2.7	77.2	TRUE	1.3	74.5	0.0	0	1.8	50.2	15	0	9.6	92	0	59.8	77	0	1.4	38.6
Sands (3)	21	-18	1070.8	2.8	80.1	TRUE	1.3	75.8	0.0	0	1.9	52.1	15	0	9.6	95	0	61.6	80	0	1.4	40.0
Sands (3)	22	-19	1108.4	2.9	83.0	TRUE	1.3	77.1	0.0	0	1.9	54.0	15	0	9.6	98	0	63.5	83	0	1.5	41.5
Sands (3)	23	-20	1146	3.0	86.1	TRUE	1.3	78.4	0.0	0	2.0	56.0	15	0	9.6	101	0	65.5	86	0	1.5	43.0
Sands (3)	24	-21	1183.6	3.1	89.2	TRUE	1.3	79.8	0.0	0	2.0	58.0	15	0	9.6	104	0	67.6	89	0	1.6	44.6
Sands (3)	25	-22	1221.2	3.3	92.5	TRUE	1.3	81.1	0.0	0	2.1	60.1	15	0	9.6	107	0	69.7	92	0	1.6	46.2
Sands (3)	26	-23	1258.8	3.4	95.8	TRUE	1.3	82.4	0.0	0	2.2	62.3	15	0	9.6	111	0	71.8	96	0	1.7	47.9
Sands (3)	27	-24	1296.4	3.5	99.3	TRUE	1.3	83.7	0.0	0	2.2	64.5	15	0	9.6	114	0	74.1	99	0	1.7	49.6
Sands (3)	28	-25	1334	3.6	102.8	TRUE	1.3	85.0	0.0	0	2.3	66.8	15	0	9.6	118	0	76.4	103	0	1.8	51.4
Sands (3)	29	-26	1371.6	3.7	106.5	TRUE	1.3	86.4	0.0	0	2.4	69.2	15	0	9.6	121	0	78.8	106	0	1.8	53.2
Sands (3)	30	-27	1409.2	3.8	110.2	TRUE	1.3	87.7	0.0	0	2.4	71.7	15	0	9.6	125	0	81.2	110	0	1.9	55.1
Sands (3)	31	-28	1446.8	3.9	114.1	TRUE	1.3	89.0	0.0	0	2.5	74.2	15	0	9.6	129	0	83.7	114	0	1.9	57.0
Sands (3)	32	-29	1484.4	4.0	118.0	TRUE	1.3	90.3	0.0	0	2.6	76.7	15	0	9.6	133	0	86.3	118	0	2.0	59.0
Sands (3)	33	-30	1522	4.1	122.1	TRUE	1.3	91.6	0.0	0	2.6	79.4	15	0	9.6	137	0	88.9	122	0	2.0	61.0
Silts/Clays	34	-31	1557.1	1.9	124.0	TRUE	1.3	93.0	0.0	0	1.2	80.6	5	0	3.4	129	0	84.0	124	0	1.0	62.0
Silts/Clays	35	-32	1589.7	1.9	125.9	TRUE	1.3	94.3	0.0	0	1.2	81.8	5	0	3.4	131	0	85.2	126	0	1.0	62.9
Silts/Clays	36	-33	1622.3	1.9	127.8	TRUE	1.3	95.6	0.0	0	1.2	83.1	5	0	3.4	133	0	86.4	128	0	1.0	63.9
Silts/Clays	37	-34	1654.9	1.9	129.7	TRUE	1.3	96.9	0.0	0	1.2	84.3	5	0	3.4	135	0	87.7	130	0	1.0	64.8
Silts/Clays	38	-35	1687.5	1.9	131.6	TRUE	1.3	98.2	0.0	0	1.2	85.5	5	0	3.4	137	0	88.9	132	0	1.0	65.8
Silts/Clays	39	-36	1720.1	1.9	133.5	TRUE	1.3	99.6	0.0	0	1.2	86.8	5	0	3.4	139	0	90.1	133	0	1.0	66.7
Silts/Clays	40	-37	1752.7	1.9	135.4	TRUE	1.3	100.9	0.0	0	1.2	88.0	5	0	3.4	141	0	91.4	135	0	1.0	67.7
Silts/Clays	41	-38	1785.3	1.9	137.3	TRUE	1.3	102.2	0.0	0	1.2	89.2	5	0	3.4	142	0	92.6	137	0	1.0	68.6
Silts/Clays	42	-39	1817.9	1.9	139.2	TRUE	1.3	103.5	0.0	0	1.2	90.5	5	0	3.4	144	0	93.8	139	0	1.0	69.6
Silts/Clays	43	-40	1850.5	1.9	141.1	TRUE	1.3	104.8	0.0	0	1.2	91.7	5	0	3.4	146	0	95.1	141	0	1.0	70.5
Silts/Clays	44	-41	1883.1	2.3	143.4	TRUE	1.3	106.2	0.0	0	1.5	93.2	6	0	4.0	150	0	97.2	143	0	1.1	71.7
Silts/Clays	45	-42	1915.7	2.3	145.6	TRUE	1.3	107.5	0.0	0	1.5	94.7	6	0	4.0	152	0	98.7	146	0	1.1	72.8
Silts/Clays	46	-43	1948.3	2.3	147.9	TRUE	1.3	108.8	0.0	0	1.5	96.1	6	0	4.0	154	0	100.1	148	0	1.1	73.9
Silts/Clays	47	-44	1980.9	2.3	150.2	TRUE	1.3	110.1	0.0	0	1.5	97.6	6	0	4.0	156	0	101.6	150	0	1.1	75.1
Silts/Clays	48	-45	2013.5	2.3	152.4	TRUE	1.3	111.4	0.0	0	1.5	99.1	6	0	4.0	159	0	103.1	152	0	1.1	76.2
Silts/Clays	49	-46	2046.1	2.3	154.7	TRUE	1.3	112.8	0.0	0	1.5	100.5	6	0	4.0	161	0	104.6	155	0	1.1	77.3
Silts/Clays	50	-47	2078.7	2.3	156.9	TRUE	1.3	114.1	0.0	0	1.5	102.0	6	0	4.0	163	0	106.0	157	0	1.1	78.5
Silts/Clays	51	-48	2111.3	2.3	159.2	TRUE	1.3	115.4	0.0	0	1.5	103.5	6	0	4.0	165	0	107.5	159	0	1.1	79.6

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
Silts/Clays	52	-49	2143.9	2.3	161.5	TRUE	1.3	116.7	0.0	0	1.5	105.0	6	0	4.0	168	0	109.0	161	0	1.1	80.7
Silts/Clays	53	-50	2176.5	2.3	163.7	TRUE	1.3	118.0	0.0	0	1.5	106.4	6	0	4.0	170	0	110.4	164	0	1.1	81.9
Sands (4)	54	-51	2211.6	5.9	169.6	TRUE	1.3	119.4	0.0	0	3.8	110.3	15	0	9.6	184	0	119.8	170	0	2.9	84.8
Sands (4)	55	-52	2249.2	6.0	175.6	TRUE	1.3	120.7	0.0	0	3.9	114.1	15	0	9.6	190	0	123.7	176	0	3.0	87.8
Sands (4)	56	-53	2286.8	6.1	181.7	TRUE	1.3	122.0	0.0	0	4.0	118.1	15	0	9.6	196	0	127.7	182	0	3.0	90.8
Sands (4)	57	-54	2324.4	6.2	187.9	TRUE	1.3	123.3	0.0	0	4.0	122.1	15	0	9.6	203	0	131.7	188	0	3.1	93.9
Sands (4)	58	-55	2362	6.3	194.2	TRUE	1.3	124.6	0.0	0	4.1	126.2	15	0	9.6	209	0	135.8	194	0	3.1	97.1
Sands (4)	59	-56	2399.6	6.4	200.6	TRUE	1.3	126.0	0.0	0	4.2	130.4	15	0	9.6	215	0	139.9	201	0	3.2	100.3
Sands (4)	60	-57	2437.2	6.5	207.0	TRUE	1.3	127.3	0.0	0	4.2	134.6	15	0	9.6	222	0	144.1	207	0	3.2	103.5
Sands (4)	61	-58	2474.8	6.6	213.6	TRUE	1.3	128.6	0.0	0	4.3	138.9	15	0	9.6	228	0	148.4	214	0	3.3	106.8
Sands (4)	62	-59	2512.4	6.7	220.3	TRUE	1.3	129.9	0.0	0	4.3	143.2	15	0	9.6	235	0	152.8	220	0	3.3	110.2
Sands (4)	63	-60	2550	6.8	227.1	TRUE	1.3	131.2	0.0	0	4.4	147.6	15	0	9.6	242	0	157.2	227	0	3.4	113.6
Sands (4)	64	-61	2587.6	6.9	234.0	TRUE	1.3	132.5	0.0	0	4.5	152.1	15	0	9.6	249	0	161.6	234	0	3.4	117.0
Sands (4)	65	-62	2625.2	7.0	241.0	TRUE	1.3	133.9	0.0	0	4.5	156.6	15	0	9.6	256	0	166.2	241	0	3.5	120.5
Sands (4)	66	-63	2662.8	7.1	248.1	TRUE	1.3	135.2	0.0	0	4.6	161.2	15	0	9.6	263	0	170.8	248	0	3.5	124.0
Sands (4)	67	-64	2700.4	7.2	255.2	TRUE	1.3	136.5	0.0	0	4.7	165.9	15	0	9.6	270	0	175.5	255	0	3.6	127.6
Sands (4)	68	-65	2738	7.3	262.5	TRUE	1.3	137.8	0.0	0	4.7	170.6	15	0	9.6	277	0	180.2	263	0	3.6	131.3
Sands (4)	69	-66	2775.6	7.4	269.9	TRUE	1.3	139.1	0.0	0	4.8	175.5	15	0	9.6	285	0	185.0	270	0	3.7	135.0
Hawthorn Mar	70	-67	2823.2	4.9	274.8	FALSE	0.0	139.1	4.9	5	3.2	178.6	53	53	34.4	328	58	213.0	275	4	2.4	137.4
Hawthorn Mar	71	-68	2880.8	4.9	279.6	FALSE	0.0	139.1	4.9	10	3.2	181.8	53	53	34.4	333	63	216.1	280	8	2.4	139.8
Hawthorn Mar	72	-69	2938.4	4.9	284.5	FALSE	0.0	139.1	4.9	15	3.2	184.9	53	53	34.4	337	67	219.3	284	12	2.4	142.2
Hawthorn Mar	73	-70	2996	4.9	289.3	FALSE	0.0	139.1	4.9	19	3.2	188.1	53	53	34.4	342	72	222.4	289	16	2.4	144.7
Hawthorn Mar	74	-71	3053.6	4.9	294.2	FALSE	0.0	139.1	4.9	24	3.2	191.2	53	53	34.4	347	77	225.6	294	19	2.4	147.1
Hawthorn Mar	75	-72	3111.2	4.9	299.0	FALSE	0.0	139.1	4.9	29	3.2	194.4	53	53	34.4	352	82	228.7	299	23	2.4	149.5
Hawthorn Mar	76	-73	3168.8	4.9	303.9	FALSE	0.0	139.1	4.9	34	3.2	197.5	53	53	34.4	357	87	231.9	304	27	2.4	151.9
Hawthorn Mar	77	-74	3226.4	4.9	308.7	FALSE	0.0	139.1	4.9	39	3.2	200.7	53	53	34.4	362	92	235.1	309	31	2.4	154.4
Hawthorn Mar	78	-75	3284	4.9	313.6	FALSE	0.0	139.1	4.9	44	3.2	203.8	53	53	34.4	366	97	238.2	314	35	2.4	156.8
Hawthorn Mar	79	-76	3341.6	4.9	318.4	FALSE	0.0	139.1	4.9	49	3.2	207.0	53	53	34.4	371	101	241.4	318	39	2.4	159.2
Hawthorn Mar	80	-77	3399.2	4.9	323.3	FALSE	0.0	139.1	4.9	53	3.2	210.1	53	53	34.4	376	106	244.5	323	43	2.4	161.6
er Group Lime	81	-78	3456.8	7.3	330.5	FALSE	0.0	139.1	7.3	61	4.7	214.9	79	79	51.6	410	140	266.4	331	49	3.6	165.3
er Group Lime	82	-79	3514.4	7.3	337.8	FALSE	0.0	139.1	7.3	68	4.7	219.6	79	79	51.6	417	147	271.2	338	54	3.6	168.9
er Group Lime	83	-80	3572	7.3	345.1	FALSE	0.0	139.1	7.3	75	4.7	224.3	79	79	51.6	424	155	275.9	345	60	3.6	172.5
er Group Lime	84	-81	3629.6	7.3	352.4	FALSE	0.0	139.1	7.3	82	4.7	229.0	79	79	51.6	432	162	280.6	352	66	3.6	176.2
er Group Lime	85	-82	3687.2	7.3	359.6	FALSE	0.0	139.1	7.3	90	4.7	233.8	79	79	51.6	439	169	285.3	360	72	3.6	179.8
er Group Lime	86	-83	3744.8	7.3	366.9	FALSE	0.0	139.1	7.3	97	4.7	238.5	79	79	51.6	446	176	290.1	367	78	3.6	183.5
er Group Lime	87	-84	3802.4	7.3	374.2	FALSE	0.0	139.1	7.3	104	4.7	243.2	79	79	51.6	454	184	294.8	374	83	3.6	187.1
er Group Lime	88	-85	3860	7.3	381.5	FALSE	0.0	139.1	7.3	112	4.7	248.0	79	79	51.6	461	191	299.5	381	89	3.6	190.7
er Group Lime	89	-86	3917.6	7.3	388.7	FALSE	0.0	139.1	7.3	119	4.7	252.7	79	79	51.6	468	198	304.3	389	95	3.6	194.4
er Group Lime	90	-87	3975.2	7.3	396.0	FALSE	0.0	139.1	7.3	126	4.7	257.4	79	79	51.6	475	205	309.0	396	101	3.6	198.0
er Group Lime	91	-88	4032.8	7.3	403.3	FALSE	0.0	139.1	7.3	133	4.7	262.1	79	79	51.6	483	213	313.7	403	107	3.6	201.6
er Group Lime	92	-89	4090.4	7.3	410.6	FALSE	0.0	139.1	7.3	141	4.7	266.9	79	79	51.6	490	220	318.4	411	113	3.6	205.3
er Group Lime	93	-90	4148	7.3	417.8	FALSE	0.0	139.1	7.3	148	4.7	271.6	79	79	51.6	497	227	323.2	418	118	3.6	208.9
er Group Lime	94	-91	4205.6	7.3	425.1	FALSE	0.0	139.1	7.3	155	4.7	276.3	79	79	51.6	504	235	327.9	425	124	3.6	212.6
er Group Lime	95	-92	4263.2	7.3	432.4	FALSE	0.0	139.1	7.3	162	4.7	281.1	79	79	51.6	512	242	332.6	432	130	3.6	216.2
er Group Lime	96	-93	4320.8	7.3	439.7	FALSE	0.0	139.1	7.3	170	4.7	285.8	79	79	51.6	519	249	337.4	440	136	3.6	219.8
er Group Lime	97	-94	4378.4	7.3	446.9	FALSE	0.0	139.1	7.3	177	4.7	290.5	79	79	51.6	526	256	342.1	447	142	3.6	223.5
er Group Lime	98	-95	4436	7.3	454.2	FALSE	0.0	139.1	7.3	184	4.7	295.2	79	79	51.6	534	264	346.8	454	147	3.6	227.1
er Group Lime	99	-96	4493.6	7.3	461.5	FALSE	0.0	139.1	7.3	192	4.7	300.0	79	79	51.6	541	271	351.5	461	153	3.6	230.7
er Group Lime	100	-97	4551.2	7.3	468.8	FALSE	0.0	139.1	7.3	199	4.7	304.7	79	79	51.6	548	278	356.3	469	159	3.6	234.4
er Group Lime	101	-98	4608.8	7.3	476.0	FALSE	0.0	139.1	7.3	206	4.7	309.4	79	79	51.6	555	285	361.0	476	165	3.6	238.0
er Group Lime	102	-99	4666.4	7.3	483.3	FALSE	0.0	139.1	7.3	213	4.7	314.2	79	79	51.6	563	293	365.7	483	171	3.6	241.7

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
er Group Lime	103	-100	4724	7.3	490.6	FALSE	0.0	139.1	7.3	221	4.7	318.9	79	79	51.6	570	300	370.5	491	177	3.6	245.3
er Group Lime	104	-101	4781.6	7.3	497.9	FALSE	0.0	139.1	7.3	228	4.7	323.6	79	79	51.6	577	307	375.2	498	182	3.6	248.9
er Group Lime	105	-102	4839.2	7.3	505.1	FALSE	0.0	139.1	7.3	235	4.7	328.3	79	79	51.6	584	315	379.9	505	188	3.6	252.6
er Group Lime	106	-103	4896.8	7.3	512.4	FALSE	0.0	139.1	7.3	243	4.7	333.1	79	79	51.6	592	322	384.6	512	194	3.6	256.2
er Group Lime	107	-104	4954.4	7.3	519.7	FALSE	0.0	139.1	7.3	250	4.7	337.8	79	79	51.6	599	329	389.4	520	200	3.6	259.8
er Group Lime	108	-105	5012	7.3	527.0	FALSE	0.0	139.1	7.3	257	4.7	342.5	79	79	51.6	606	336	394.1	527	206	3.6	263.5
er Group Lime	109	-106	5069.6	7.3	534.2	FALSE	0.0	139.1	7.3	264	4.7	347.3	79	79	51.6	614	344	398.8	534	211	3.6	267.1
er Group Lime	110	-107	5127.2	7.3	541.5	FALSE	0.0	139.1	7.3	272	4.7	352.0	79	79	51.6	621	351	403.6	542	217	3.6	270.8
er Group Lime	111	-108	5184.8	7.3	548.8	FALSE	0.0	139.1	7.3	279	4.7	356.7	79	79	51.6	628	358	408.3	549	223	3.6	274.4
er Group Lime	112	-109	5242.4	7.3	556.1	FALSE	0.0	139.1	7.3	286	4.7	361.4	79	79	51.6	635	365	413.0	556	229	3.6	278.0
er Group Lime	113	-110	5300	7.3	563.3	FALSE	0.0	139.1	7.3	293	4.7	366.2	79	79	51.6	643	373	417.7	563	235	3.6	281.7
er Group Lime	114	-111	5357.6	7.3	570.6	FALSE	0.0	139.1	7.3	301	4.7	370.9	79	79	51.6	650	380	422.5	571	241	3.6	285.3
er Group Lime	115	-112	5415.2	7.3	577.9	FALSE	0.0	139.1	7.3	308	4.7	375.6	79	79	51.6	657	387	427.2	578	246	3.6	288.9
er Group Lime	116	-113	5472.8	7.3	585.2	FALSE	0.0	139.1	7.3	315	4.7	380.4	79	79	51.6	665	395	431.9	585	252	3.6	292.6
er Group Lime	117	-114	5530.4	7.3	592.4	FALSE	0.0	139.1	7.3	323	4.7	385.1	79	79	51.6	672	402	436.7	592	258	3.6	296.2
er Group Lime	118	-115	5588	7.3	599.7	FALSE	0.0	139.1	7.3	330	4.7	389.8	79	79	51.6	679	409	441.4	600	264	3.6	299.9
er Group Lime	119	-116	5645.6	7.3	607.0	FALSE	0.0	139.1	7.3	337	4.7	394.5	79	79	51.6	686	416	446.1	607	270	3.6	303.5
er Group Lime	120	-117	5703.2	7.3	614.3	FALSE	0.0	139.1	7.3	344	4.7	399.3	79	79	51.6	694	424	450.9	614	275	3.6	307.1
er Group Lime	121	-118	5760.8	7.3	621.5	FALSE	0.0	139.1	7.3	352	4.7	404.0	79	79	51.6	701	431	455.6	622	281	3.6	310.8
er Group Lime	122	-119	5818.4	7.3	628.8	FALSE	0.0	139.1	7.3	359	4.7	408.7	79	79	51.6	708	438	460.3	629	287	3.6	314.4
er Group Lime	123	-120	5876	7.3	636.1	FALSE	0.0	139.1	7.3	366	4.7	413.5	79	79	51.6	715	446	465.0	636	293	3.6	318.0
er Group Lime	124	-121	5933.6	7.3	643.4	FALSE	0.0	139.1	7.3	373	4.7	418.2	79	79	51.6	723	453	469.8	643	299	3.6	321.7
er Group Lime	125	-122	5991.2	7.3	650.6	FALSE	0.0	139.1	7.3	381	4.7	422.9	79	79	51.6	730	460	474.5	651	305	3.6	325.3
er Group Lime	126	-123	6048.8	7.3	657.9	FALSE	0.0	139.1	7.3	388	4.7	427.7	79	79	51.6	737	467	479.2	658	310	3.6	329.0
er Group Lime	127	-124	6106.4	7.3	665.2	FALSE	0.0	139.1	7.3	395	4.7	432.4	79	79	51.6	745	475	484.0	665	316	3.6	332.6
er Group Lime	128	-125	6164	7.3	672.5	FALSE	0.0	139.1	7.3	403	4.7	437.1	79	79	51.6	752	482	488.7	672	322	3.6	336.2
er Group Lime	129	-126	6221.6	7.3	679.7	FALSE	0.0	139.1	7.3	410	4.7	441.8	79	79	51.6	759	489	493.4	680	328	3.6	339.9
er Group Lime	130	-127	6279.2	7.3	687.0	FALSE	0.0	139.1	7.3	417	4.7	446.6	79	79	51.6	766	496	498.1	687	334	3.6	343.5
er Group Lime	131	-128	6336.8	7.3	694.3	FALSE	0.0	139.1	7.3	424	4.7	451.3	79	79	51.6	774	504	502.9	694	340	3.6	347.1
er Group Lime	132	-129	6394.4	7.3	701.6	FALSE	0.0	139.1	7.3	432	4.7	456.0	79	79	51.6	781	511	507.6	702	345	3.6	350.8
er Group Lime	133	-130	6452	7.3	708.8	FALSE	0.0	139.1	7.3	439	4.7	460.8	79	79	51.6	788	518	512.3	709	351	3.6	354.4
er Group Lime	134	-131	6509.6	7.3	716.1	FALSE	0.0	139.1	7.3	446	4.7	465.5	79	79	51.6	795	526	517.1	716	357	3.6	358.1
er Group Lime	135	-132	6567.2	7.3	723.4	FALSE	0.0	139.1	7.3	453	4.7	470.2	79	79	51.6	803	533	521.8	723	363	3.6	361.7
er Group Lime	136	-133	6624.8	7.3	730.7	FALSE	0.0	139.1	7.3	461	4.7	474.9	79	79	51.6	810	540	526.5	731	369	3.6	365.3
er Group Lime	137	-134	6682.4	7.3	737.9	FALSE	0.0	139.1	7.3	468	4.7	479.7	79	79	51.6	817	547	531.2	738	374	3.6	369.0
er Group Lime	138	-135	6740	7.3	745.2	FALSE	0.0	139.1	7.3	475	4.7	484.4	79	79	51.6	825	555	536.0	745	380	3.6	372.6
er Group Lime	139	-136	6797.6	7.3	752.5	FALSE	0.0	139.1	7.3	483	4.7	489.1	79	79	51.6	832	562	540.7	752	386	3.6	376.2
er Group Lime	140	-137	6855.2	7.3	759.8	FALSE	0.0	139.1	7.3	490	4.7	493.9	79	79	51.6	839	569	545.4	760	392	3.6	379.9
er Group Lime	141	-138	6912.8	7.3	767.0	FALSE	0.0	139.1	7.3	497	4.7	498.6	79	79	51.6	846	576	550.2	767	398	3.6	383.5
er Group Lime	142	-139	6970.4	7.3	774.3	FALSE	0.0	139.1	7.3	504	4.7	503.3	79	79	51.6	854	584	554.9	774	404	3.6	387.2
er Group Lime	143	-140	7028	7.3	781.6	FALSE	0.0	139.1	7.3	512	4.7	508.0	79	79	51.6	861	591	559.6	782	409	3.6	390.8
er Group Lime	144	-141	7085.6	7.3	788.9	FALSE	0.0	139.1	7.3	519	4.7	512.8	79	79	51.6	868	598	564.3	789	415	3.6	394.4
er Group Lime	145	-142	7143.2	7.3	796.1	FALSE	0.0	139.1	7.3	526	4.7	517.5	79	79	51.6	875	606	569.1	796	421	3.6	398.1
er Group Lime	146	-143	7200.8	7.3	803.4	FALSE	0.0	139.1	7.3	533	4.7	522.2	79	79	51.6	883	613	573.8	803	427	3.6	401.7
er Group Lime	147	-144	7258.4	7.3	810.7	FALSE	0.0	139.1	7.3	541	4.7	527.0	79	79	51.6	890	620	578.5	811	433	3.6	405.3
er Group Lime	148	-145	7316	7.3	818.0	FALSE	0.0	139.1	7.3	548	4.7	531.7	79	79	51.6	897	627	583.3	818	438	3.6	409.0
er Group Lime	149	-146	7373.6	7.3	825.2	FALSE	0.0	139.1	7.3	555	4.7	536.4	79	79	51.6	905	635	588.0	825	444	3.6	412.6
er Group Lime	150	-147	7431.2	7.3	832.5	FALSE	0.0	139.1	7.3	563	4.7	541.1	79	79	51.6	912	642	592.7	833	450	3.6	416.3
er Group Lime	151	-148	7488.8	7.3	839.8	FALSE	0.0	139.1	7.3	570	4.7	545.9	79	79	51.6	919	649	597.4	840	456	3.6	419.9
er Group Lime	152	-149	7546.4	7.3	847.1	FALSE	0.0	139.1	7.3	577	4.7	550.6	79	79	51.6	926	656	602.2	847	462	3.6	423.5
er Group Lime	153	-150	7604	7.3	854.3	FALSE	0.0	139.1	7.3	584	4.7	555.3	79	79	51.6	934	664	606.9	854	468	3.6	427.2

Soil Type	Depth (feet)	Elev. (feet)	Ave. Eff. Stress (psf)	Ultimate Layer Side (kips)	Ultimate Side (kips)	Lique-faction	Downdrag Layer Load (kips)	Downdrag Load (kips)	Extreme Layer Side(kips)	Extreme Total Side(kips)	Strength Limit State Layer Side (kips)	Strength Limit State Side (kips)	Ultimate End Bearing (kips)	Extreme End Bearing (kips)	Strength Limit State End (kips)	Total Ultimate Pile Capacity (kips)	Total Extreme Pile Capacity (kips)	Total Strength Limit State (kips)	Ultimate Uplift Capacity (kips)	Extreme Uplift Capacity (kips)	Strength Uplift Layer (kips)	Strength Uplift Capacity (kips)
er Group Lime	154	-151	7661.6	7.3	861.6	FALSE	0.0	139.1	7.3	592	4.7	560.1	79	79	51.6	941	671	611.6	862	473	3.6	430.8
er Group Lime	155	-152	7719.2	7.3	868.9	FALSE	0.0	139.1	7.3	599	4.7	564.8	79	79	51.6	948	678	616.4	869	479	3.6	434.4
er Group Lime	156	-153	7776.8	7.3	876.2	FALSE	0.0	139.1	7.3	606	4.7	569.5	79	79	51.6	956	686	621.1	876	485	3.6	438.1
er Group Lime	157	-154	7834.4	7.3	883.4	FALSE	0.0	139.1	7.3	614	4.7	574.2	79	79	51.6	963	693	625.8	883	491	3.6	441.7
er Group Lime	158	-155	7892	7.3	890.7	FALSE	0.0	139.1	7.3	621	4.7	579.0	79	79	51.6	970	700	630.5	891	497	3.6	445.4
er Group Lime	159	-156	7949.6	7.3	898.0	FALSE	0.0	139.1	7.3	628	4.7	583.7	79	79	51.6	977	707	635.3	898	502	3.6	449.0
er Group Lime	160	-157	8007.2	7.3	905.3	FALSE	0.0	139.1	7.3	635	4.7	588.4	79	79	51.6	985	715	640.0	905	508	3.6	452.6
er Group Lime	161	-158	8064.8	7.3	912.5	FALSE	0.0	139.1	7.3	643	4.7	593.2	79	79	51.6	992	722	644.7	913	514	3.6	456.3
er Group Lime	162	-159	8122.4	7.3	919.8	FALSE	0.0	139.1	7.3	650	4.7	597.9	79	79	51.6	999	729	649.5	920	520	3.6	459.9
er Group Lime	163	-160	8180	7.3	927.1	FALSE	0.0	139.1	7.3	657	4.7	602.6	79	79	51.6	1006	737	654.2	927	526	3.6	463.5
er Group Lime	164	-161	8237.6	7.3	934.4	FALSE	0.0	139.1	7.3	664	4.7	607.3	79	79	51.6	1014	744	658.9	934	532	3.6	467.2
er Group Lime	165	-162	8295.2	7.3	941.6	FALSE	0.0	139.1	7.3	672	4.7	612.1	79	79	51.6	1021	751	663.6	942	537	3.6	470.8
er Group Lime	166	-163	8352.8	7.3	948.9	FALSE	0.0	139.1	7.3	679	4.7	616.8	79	79	51.6	1028	758	668.4	949	543	3.6	474.5
er Group Lime	167	-164	8410.4	7.3	956.2	FALSE	0.0	139.1	7.3	686	4.7	621.5	79	79	51.6	1036	766	673.1	956	549	3.6	478.1
er Group Lime	168	-165	8468	7.3	963.5	FALSE	0.0	139.1	7.3	694	4.7	626.3	79	79	51.6	1043	773	677.8	963	555	3.6	481.7
er Group Lime	169	-166	8525.6	7.3	970.7	FALSE	0.0	139.1	7.3	701	4.7	631.0	79	79	51.6	1050	780	682.6	971	561	3.6	485.4
er Group Lime	170	-167	8583.2	7.3	978.0	FALSE	0.0	139.1	7.3	708	4.7	635.7	79	79	51.6	1057	787	687.3	978	566	3.6	489.0
er Group Lime	171	-168	8640.8	7.3	985.3	FALSE	0.0	139.1	7.3	715	4.7	640.4	79	79	51.6	1065	795	692.0	985	572	3.6	492.6
er Group Lime	172	-169	8698.4	7.3	992.6	FALSE	0.0	139.1	7.3	723	4.7	645.2	79	79	51.6	1072	802	696.7	993	578	3.6	496.3
er Group Lime	173	-170	8756	7.3	999.8	FALSE	0.0	139.1	7.3	730	4.7	649.9	79	79	51.6	1079	809	701.5	1000	584	3.6	499.9
er Group Lime	174	-171	8813.6	7.3	1007.1	FALSE	0.0	139.1	7.3	737	4.7	654.6	79	79	51.6	1086	817	706.2	1007	590	3.6	503.6
er Group Lime	175	-172	8871.2	7.3	1014.4	FALSE	0.0	139.1	7.3	744	4.7	659.4	79	79	51.6	1094	824	710.9	1014	596	3.6	507.2
er Group Lime	176	-173	8928.8	7.3	1021.7	FALSE	0.0	139.1	7.3	752	4.7	664.1	79	79	51.6	1101	831	715.7	1022	601	3.6	510.8
er Group Lime	177	-174	8986.4	7.3	1028.9	FALSE	0.0	139.1	7.3	759	4.7	668.8	79	79	51.6	1108	838	720.4	1029	607	3.6	514.5
er Group Lime	178	-175	9044	7.3	1036.2	FALSE	0.0	139.1	7.3	766	4.7	673.5	79	79	51.6	1116	846	725.1	1036	613	3.6	518.1
er Group Lime	179	-176	9101.6	7.3	1043.5	FALSE	0.0	139.1	7.3	774	4.7	678.3	79	79	51.6	1123	853	729.8	1043	619	3.6	521.7
er Group Lime	180	-177	9159.2	7.3	1050.8	FALSE	0.0	139.1	7.3	781	4.7	683.0	79	79	51.6	1130	860	734.6	1051	625	3.6	525.4
er Group Lime	181	-178	9216.8	7.3	1058.0	FALSE	0.0	139.1	7.3	788	4.7	687.7	79	79	51.6	1137	867	739.3	1058	630	3.6	529.0
er Group Lime	182	-179	9274.4	7.3	1065.3	FALSE	0.0	139.1	7.3	795	4.7	692.5	79	79	51.6	1145	875	744.0	1065	636	3.6	532.7
er Group Lime	183	-180	9332	7.3	1072.6	FALSE	0.0	139.1	7.3	803	4.7	697.2	79	79	51.6	1152	882	748.8	1073	642	3.6	536.3
er Group Lime	184	-181	9389.6	7.3	1079.9	FALSE	0.0	139.1	7.3	810	4.7	701.9	79	79	51.6	1159	889	753.5	1080	648	3.6	539.9
er Group Lime	185	-182	9447.2	7.3	1087.1	FALSE	0.0	139.1	7.3	817	4.7	706.6	79	79	51.6	1166	897	758.2	1087	654	3.6	543.6
er Group Lime	186	-183	9504.8	7.3	1094.4	FALSE	0.0	139.1	7.3	824	4.7	711.4	79	79	51.6	1174	904	762.9	1094	660	3.6	547.2
er Group Lime	187	-184	9562.4	7.3	1101.7	FALSE	0.0	139.1	7.3	832	4.7	716.1	79	79	51.6	1181	911	767.7	1102	665	3.6	550.8
er Group Lime	188	-185	9620	7.3	1109.0	FALSE	0.0	139.1	7.3	839	4.7	720.8	79	79	51.6	1188	918	772.4	1109	671	3.6	554.5
er Group Lime	189	-186	9677.6	7.3	1116.2	FALSE	0.0	139.1	7.3	846	4.7	725.6	79	79	51.6	1196	926	777.1	1116	677	3.6	558.1
er Group Lime	190	-187	9735.2	7.3	1123.5	FALSE	0.0	139.1	7.3	854	4.7	730.3	79	79	51.6	1203	933	781.9	1124	683	3.6	561.8
er Group Lime	191	-188	9792.8	7.3	1130.8	FALSE	0.0	139.1	7.3	861	4.7	735.0	79	79	51.6	1210	940	786.6	1131	689	3.6	565.4
er Group Lime	192	-189	9850.4	7.3	1138.1	FALSE	0.0	139.1	7.3	868	4.7	739.7	79	79	51.6	1217	947	791.3	1138	695	3.6	569.0
er Group Lime	193	-190	9908	7.3	1145.3	FALSE	0.0	139.1	7.3	875	4.7	744.5	79	79	51.6	1225	955	796.0	1145	700	3.6	572.7
er Group Lime	194	-191	9965.6	7.3	1152.6	FALSE	0.0	139.1	7.3	883	4.7	749.2	79	79	51.6	1232	962	800.8	1153	706	3.6	576.3
er Group Lime	195	-192	10023.2	7.3	1159.9	FALSE	0.0	139.1	7.3	890	4.7	753.9	79	79	51.6	1239	969	805.5	1160	712	3.6	579.9
er Group Lime	196	-193	10080.8	7.3	1167.2	FALSE	0.0	139.1	7.3	897	4.7	758.7	79	79	51.6	1247	977	810.2	1167	718	3.6	583.6
er Group Lime	197	-194	10138.4	7.3	1174.4	FALSE	0.0	139.1	7.3	905	4.7	763.4	79	79	51.6	1254	984	815.0	1174	724	3.6	587.2
er Group Lime	198	-195	10196	7.3	1181.7	FALSE	0.0	139.1	7.3	912	4.7	768.1	79	79	51.6	1261	991	819.7	1182	729	3.6	590.9
er Group Lime	199	-196	10253.6	7.3	1189.0	FALSE	0.0	139.1	7.3	919	4.7	772.8	79	79	51.6	1268	998	824.4	1189	735	3.6	594.5
er Group Lime	200	-197	10311.2	7.3	1196.3	FALSE	0.0	139.1	7.3	926	4.7	777.6	79	79	51.6	1276	1006	829.2	1196	741	3.6	598.1

AASHTO Drilled Shaft Design

Project Information	
Project:	HRB
Owner:	SCDOT
Job Number:	18461-007-01
Location:	Beaufort County, South Carolina
Analysis by:	HPC
Date/Time:	10/6/2017 10:24
Run Designation:	Channel - Full Scour
Checked by:	ZAS

Shaft Information	
Shaft Diameter, D_s (ft):	8.00
Shaft Base Area (ft^2):	50.3
Shaft Perimeter (ft):	25.1
Length of Permanent Steel Casing Below Grade (ft):	10
Casing Reduction Factor	0.00
Top of Shaft Elevation (ft):	-55
Apply 20% Reduction for Shaft (Y/N):	N
Concrete Elastic Modulus (psi):	3.60E+06

Load/Seismic Information	
Bottom Elevation of Liquefaction (ft):	-55
Service Working Load, Qu (kips):	2500
Assumed Settlement-1, s (inches):	1
Assumed Settlement-2, s (inches):	2
Ground Water Elevation (ft):	0
Ground Surface Elevation (ft):	-55
If Manually Assign K_0:	N
Downdrage Load (kips):	0.0

Output Information	
Discretize Sublayer Thickness (ft):	0.1
Output Sublayer Thickness (ft):	1
Maximum Cohesive Side Resistance (ksf):	4
Maximum Sand Side Resistance (ksf):	4
Maximum Sand/Gravel Side Resistance (ksf):	4
Maximum Rock (intact/strong) Side Resistance (ksf):	4
Maximum Rock (fractured/weak) Side Resistance (ksf):	4
Plots in Elevation or Depth:	Elevation

Compute

Resistance Factor	Strength Limit State - Sand		Strength Limit State - Clay		Strength Limit State - Rock		Extreme Limit State	Service Limit State
	Side	End	Side	End	Side	End		
Compression	0.7	0.7	0.7	0.7	0.7	0.7	1	1
Uplift	0.6	-	0.6	-	0.6	-	1	1

Inputs are required

No Inputs should be assigned

Soil Profile

Layer ID	Soil Description	Elevation at Bottom of Soil Unit (feet)	Total Unit Weight, γ (pcf)	Residual Strength / Static Strength for Downdrag Load	Residual Strength (psf)	Static Strength Reduction Factor for Extreme Limit State	Cohesive		Cohesionless		Rock					If Liquefiable? [Y/N]	Soil Model	
							Su_{side} (psf)	Su_{Tip} (psf)	Average N_{60}	% Fines	q_u (ksf)	α_E	GSI	m_i	D			
1	Hawthorn Marl	-90	120				8,889	4,000								N	1	Cohesive
2	Cooper Group Limestone	-200	120				8,889	6,000								N	1	Cohesive

Shaft	Profile			Side Resistance					Tip Resistance					Total Shaft Resistance					Uplift Shaft Capacity						
	Elevation (feet)	Depth (feet)	Soil Type	Cumulative Nominal Side Resistance (kips)	Cummulative Extreme Limit State (Liquified) Side Resistance (kips)	Cumulative Strength Limit State Side Resistance (kips)	Cumulative Service Limit State Side Resistance - 1 (kips)	Cumulative Service Limit State Side Resistance - 2 (kips)	Nominal End Bearing (kips)	Extreme Limit State (Liquified) End Bearing (kips)	Strength Limit State End Bearing (kips)	Service Limit State End Bearing - 1 (kips)	Service Limit State End Bearing - 2 (kips)	Nominal (Unfactored) (kips)	Extreme Limit State (Liquefied) (kips)	Strength Limit State (kips)	Service Limit State - 1 (kips)	Service Limit State - 2 (kips)	Nominal (Unfactored) (kips)	Extreme Limit State (liquefied) (kips)	Strength Limit State (kips)	Service Limit State - 1 (kips)	Service Limit State - 2 (kips)	Layer Downdrag Load (kips)	Cummulative Downdrag Load (kips)
	-55	0	1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-56	1	1	0.0000	0.0000	0.0000	0.0000	0.0000	1236.5309	1236.5309	865.5716	703.2769	969.9898	1236.5309	1236.5309	865.5716	703.2769	969.9898	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-57	2	1	0.0000	0.0000	0.0000	0.0000	0.0000	1266.6902	1266.6902	886.6831	720.4300	993.6481	1266.6902	1266.6902	886.6831	720.4300	993.6481	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-58	3	1	0.0000	0.0000	0.0000	0.0000	0.0000	1296.8494	1296.8494	907.7946	737.5831	1017.3063	1296.8494	1296.8494	907.7946	737.5831	1017.3063	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-59	4	1	0.0000	0.0000	0.0000	0.0000	0.0000	1327.0087	1327.0087	928.9061	754.7362	1040.9646	1327.0087	1327.0087	928.9061	754.7362	1040.9646	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-60	5	1	0.0000	0.0000	0.0000	0.0000	0.0000	1357.1680	1357.1680	950.0176	771.8893	1064.6229	1357.1680	1357.1680	950.0176	771.8893	1064.6229	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-61	6	1	0.0000	0.0000	0.0000	0.0000	0.0000	1387.3273	1387.3273	971.1291	789.0424	1088.2812	1387.3273	1387.3273	971.1291	789.0424	1088.2812	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-62	7	1	0.0000	0.0000	0.0000	0.0000	0.0000	1417.4866	1417.4866	992.2406	806.1955	1111.9395	1417.4866	1417.4866	992.2406	806.1955	1111.9395	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-63	8	1	0.0000	0.0000	0.0000	0.0000	0.0000	1447.6459	1447.6459	1013.3521	823.3486	1135.5978	1447.6459	1447.6459	1013.3521	823.3486	1135.5978	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-64	9	1	0.0000	0.0000	0.0000	0.0000	0.0000	1477.8052	1477.8052	1034.4636	840.5017	1159.2561	1477.8052	1477.8052	1034.4636	840.5017	1159.2561	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-65	10	1	0.0000	0.0000	0.0000	0.0000	0.0000	1507.9645	1507.9645	1055.5751	857.6548	1182.9144	1507.9645	1507.9645	1055.5751	857.6548	1182.9144	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-66	11	1	100.5310	100.5310	70.3717	95.0855	81.5418	1538.1238	1538.1238	1076.6866	874.2477	1206.5062	1638.6547	1638.6547	1147.0583	969.3333	1288.0480	100.5310	100.5310	60.3186	95.0855	81.5418	0.0000	0.0000
	-67	12	1	201.0619	201.0619	140.7434	190.1711	163.0836	1568.2831	1568.2831	1097.7981	890.8069	1230.0941	1769.3450	1769.3450	1238.5415	1080.9779	1393.1777	201.0619	201.0619	120.6372	190.1711	163.0836	0.0000	0.0000
	-68	13	1	301.5929	301.5929	211.1150	285.2566	244.6253	1598.4423	1598.4423	1118.9096	907.3341	1253.6782	1900.0352	1900.0352	1330.0247	1192.5907	1498.3036	301.5929	301.5929	180.9557	285.2566	244.6253	0.0000	0.0000
	-69	14	1	402.1239	402.1239	281.4867	380.3422	326.1671	1628.6016	1628.6016	1140.0211	923.8306	1277.2587	2030.7255	2030.7255	1421.5078	1304.1728	1603.4259	402.1239	402.1239	241.2743	380.3422	326.1671	0.0000	0.0000
	-70	15	1	502.6548	502.6548	351.8584	475.4277	407.7089	1658.7609	1658.7609	1161.1326	940.2975	1300.8357	2161.4157	2161.4157	1512.9910	1415.7252	1708.5446	502.6548	502.6548	301.5929	475.4277	407.7089	0.0000	0.0000
	-71	16	1	603.1858	603.1858	422.2301	570.5132	489.2507	1688.9202	1688.9202	1182.2441	956.7357	1324.4092	2292.1060	2292.1060	1604.4742	1527.2489	1813.6599	603.1858	603.1858	361.9115	570.5132	489.2507	0.0000	0.0000
	-72	17	1	703.7168	703.7168	492.6017	665.5988	570.7925	1719.0795	1719.0795	1203.3557	973.1455	1347.9794	2422.7963	2422.7963	1695.9574	1638.7443	1918.7719	703.7168	703.7168	422.2301	665.5988	570.7925	0.0000	0.0000
	-73	18	1	804.2477	804.2477	562.9734	760.6843	652.3343	1749.2388	1749.2388	1224.4672	989.5277	1371.5464	2553.4865	2553.4865	1787.4406	1750.2120	2023.8806	804.2477	804.2477	482.5486	760.6843	652.3343	0.0000	0.0000
	-74	19	1	904.7787	904.7787	633.3451	855.7698	733.8760	1779.3981	1779.3981	1245.5787	1005.8825	1395.1100	2684.1768	2684.1768	1878.9237	1861.6523	2128.9861	904.7787	904.7787	542.8672	855.7698	733.8760	0.0000	0.0000
	-75	20	1	1005.3096	1005.3096	703.7168	950.8554	815.4178	1809.5574	1809.5574	1266.6902	1022.2103	1418.6705	2814.8670	2814.8670	1970.4069	1973.0657	2234.0883	1005.3096	1005.3096	603.1858	950.8554	815.4178	0.0000	0.0000
	-76	21	1	1105.8406	1105.8406	774.0884	1045.9409	896.9596	1809.5574	1809.5574	1266.6902	1021.4069	1418.5753	2915.3980	2915.3980	2040.7786	2067.3478	2315.5349	1105.8406	1105.8406	663.5044	1045.9409	896.9596	0.0000	0.0000
	-77	22	1	1206.3716	1206.3716	844.4601	1141.0265	978.5014	1809.5574	1809.5574	1266.6902	1020.5920	1418.4787	3015.9289	3015.9289	2111.1503	2161.6185	2396.9801	1206.3716	1206.3716	723.8229	1141.0265	978.5014	0.0000	0.0000
	-78	23	1	1306.9025	1306.9025	914.8318	1236.1120	1060.0432	1809.5574	1809.5574	1266.6902	1019.7667	1418.3809	3116.4599	3116.4599	2181.5219	2255.8786	2478.4241	1306.9025	1306.9025	784.1415	1236.1120	1060.0432	0.0000	0.0000
	-79	24	1	1407.4335	1407.4335	985.2035	1331.1975	1141.5850	1809.5574	1809.5574	1266.6902	1018.9318	1418.2819	3216.9909	3216.9909	2251.8936	2350.1294	2559.8669	1407.4335	1407.4335	844.4601	1331.1975	1141.5850	0.0000	0.0000
	-80	25	1	1507.9645	1507.9645	1055.5751	1426.2831	1223.1267	1809.5574	1809.5574	1266.6902	1018.0885	1418.1820	3317.5218	3317.5218	2322.2653	2444.3715	2641.3087	1507.9645	1507.9645	904.7787	1426.2831	1223.1267	0.0000	0.0000
	-81	26	1	1608.4954	1608.4954	1125.9468	1521.3686	1304.6685	1809.5574	1809.5574	1266.6902	1017.2372	1418.0811	3418.0528	3418.0528	2392.6370	2538.6058	2722.7496	1608.4954	1608.4954	965.0973	1521.3686	1304.6685	0.0000	0.0000
	-82	27	1	1709.0264	1709.0264	1196.3185	1616.4541	1386.2103	1809.5574	1809.5574	1266.6902	1016.3788	1417.9794	3518.5838	3518.5838	2463.0086	2632.8330	2804.1897	1709.0264	1709.0264	1025.4158	1616.4541	1386.2103	0.0000	0.0000
	-83	28	1	1809.5574	1809.5574	1266.6902	1711.5397	1467.7521	1809.5574	1809.5574	1266.6902	1015.5139	1417.8769	3619.1147	3619.1147	2533.3803	2727.0536	2885.6289	1809.5574	1809.5574	1085.7344	1711.5397	1467.7521	0.0000	0.0000
	-84	29	1	1910.0883	1910.0883	1337.0618	1806.6252	1549.2939	1809.5574	1809.5574	1266.6902	1014.6429	1417.7736	3719.6457	3719.6457	2603.7520	2821.2681	2967.0675	1910.0883	1910.0883	1146.0530	1806.6252	1549.2939	0.0000	0.0000
	-85	30	1	2010.6193	2010.6193	1407.4335	1901.7108	1630.8357	1809.5574	1809.5574	1266.6902	1013.7663	1417.6697	3820.1767	3820.1767	2674.1237	2915.4771	3048.5054	2010.6193	2010.6193	1206.3716	1901.7108	1630.8357	0.0000	0.0000
	-86	31	1	2111.1503	2111.1503	1477.8052	1996.7963	1712.3774	1809.5574	1809.5574	1266.6902	1012.8847	1417.5652	3920.7076	3920.7076	2744.4953	3009.6810	3129.9427	2111.1503	2111.1503	1266.6902	1996.7963	1712.3774	0.0000	0.0000
	-87	32	1	2211.6812	2211.6812	1548.1769	2091.8818	1793.9192	1809.5574	1809.5574	1266.6902	1011.9983	1417.4602	4021.2386	4021.2386	2814.8670	3103.8801	3211.3794	2211.6812	2211.6812	1327.0087	2091.8818	1793.9192	0.0000	0.0000
	-88	33	1	2312.2122	2312.2122	1618.5485	2186.9674	1875.4610	1809.5574	1809.5574	1266.6902	1011.1074	1417.3546	4121.7696	4121.7696	2885.2387	3198.0748	3292.8156	2312.2122	2312.2122	1387.3273	2186.9674	1875.4610	0.0000	0.0000
	-89	34	1	2412.7432	2412.7432	1688.9202	2282.0529	1957.0028	1809.5574	1809.5574	1266.6902	1010.2125	1417.2485	4222.3005	4222.3005	2955.6104	3292.2654	3374.2513	2412.7432	2412.7432	1447.6459	2282.0529	1957.0028	0.0000	0.0000
	-90	35	1	2513.2741	2513.2741	1759.2919	2377.1384	2038.5446	1809.5574	1809.5574	1266.6902	1009.3138	1417.1420	4322.8315	4322.8315	3025.9820	3386.4523	3455.6866	2513.2741	2513.2741	1507.9645	2377.1384	2038.5446	0.0000	0.0000
	-91	36	1	2613.8051	2613.8051	1829.6636	2472.2240	2120.0863	2714.3361	2714.3361	1900.0352	1517.9089	2126.1798	5328.1411	5328.1411	3729.6988	3990.1329	4246.2661	2613.8051	2613.8051	1568.2831	2472.2240	2120.0863	0.0000	0.0000
	-92	37	1	2714.3361	2714.3361	1900.0352	2567.3095	2201.6281	2714.3361	2714.3361	1900.0352	1516.6790	2126.0340	5428.6721	5428.6721	3800.0705	4083.9885	4327.6622	2714.3361	2714.3361	1628.6016	2567.3095	2201.6281	0.0000	0.0000
	-93	38	1	2814.8670	2814.8670	1970.4069	2662.3951	2283.1699	2714.3361	2714.3361	1900.0352	1515.4406	2125.8873	5529.2031	5529.2031	3870.4421	4177.8356	4409.0572	2814.8670	2814.8670	1688.9202	2662.3951	2283.1699	0.0000	0.0000
	-94	39	1	2915.3980	2915.3980	2040.7786	2757.4806	2364.7117	2714.3361	2714.3361	1900.0352	1514.1940	2125.7395	5629.7340	5629.7340	3940.8138	4271.6746	4490.4512	2915.3980	2915.3980	1749.2388	2757.4806	2364.7117	0.0000	0.0000
	-95	40	1	3015.9289	3015.9289	2111.1503	2852.5661	2446.2535	2714.3361	2714.3361	1900.0352	1512.9398	2125.5909	5730.2650	5730.2650	4011.1855	4365.5059	4571.8443	3015.9289	3015.9289	1809.5574	2852.5661	2446.2535	0.0000	0.0000
	-96	41	1	3116.4599	3116.4599	2181.5219	2947.6517	2527.7953	2714.3361	2714.3361	1900.0352	1511.6783	2125.4414	5830.7960	5830.7960	4081.5572	4459.3300	4653.2366	3116.4599	3116.4599	1869.8759	2947.6517	2527.7953	0.0000	0.0000
	-97	42	1	3216.9909	3216.9909	2251.8936	3042.7372	2609.3370	2714.3361	2714.3361	1900.0352	1510.4100	2125.2910	5931.3269	5931.3269	4151.9289	4553.1472	4734.6281	3216.9909	3216.9909	1930.1945	3042.7372	2609.3370	0.0000	0.0000
	-98	43	1	3317.5218	3317.5218	2322.2653	3137.8227	2690.8788	2714.3361	2714.3361	1900.0352	1509.1351	2125.1399	6031.8579	6031.8579	4222.3005	4646.9578	4816.0188	3317.5218	3317.5218	1990.5131	3137.8227	2690.8788	0.0000	0.0000
	-99	44	1	3418.0528	3418.0528	2392.6370	3232.9083	2772.4206	2714.3361	2714.3361	1900.0352	1507.8539	2124.9881	6132.3889	6132.3889	4292.6722	4740.7622	4897.4087	3418.0528	3418.0528	2050.8317	3232.9083	2772.4206	0.0000	0.0000
	-100	45	1	3518.5838	3518.5838	2463.0086	3327.9938	2853.9624	2714.3361	2714.3361	1900.0352	1506.5669	2124.8356	6232.9198	6232.9198	4363.0439	4834.5607	4978.7979	3518.5838	3518.5838	2111.1503	3327.9938	2853.9624	0.0000	0.0000
	-101	46	1	3619.1147	3619.1147	2533.3803	3423.0794	2935.5042	2714.3361	2714.3361	1900.0352	1505.2742	2124.6823	6333.4508	6333.4508	4433.4156	4928.3535	5060.1865	3619.1147	3619.1147	2171.4688	3423.0794	2935.5042	0.0000	0.0000
	-102	47	1	3719.6457	3719.6457	2603.7520	3518.1649	3017.0460	2714.3361	2714.3361	1900.0352	1503.9761	2124.5285	6433.9818	6433.9818	4503.7872	5022.1410	5141.5745	3719.6457	3719.6457	2231.7874	3518.1649	3017.0460	0.0000	0.0000
	-103	48	1	3820.1767	3820.1767	2674.1237	3613.2504	3098.5877	2714.3361	2714.3361	1900.0352	1502.6729	2124.3740	6534.5127	6534.5127	4574.1589	5115.9233	5222.9618	3820.1767	3820.1767	2292.1060	3613.2504	3098.5877	0.0000	0.0000
	-104	49	1	3920.7076	3920.7076	2744.4953	3708.3360	3180.1295	2714.3361	2714.3361	1900.0352	1501.3647	2124.2190	6635.0437	6635.0437	4644.5306	5209.7007	5304.3485	3920.7076	3920.7076	2352.4246	3708.3360	3180.1295	0.0000	0.0000
	-105	50	1	4021.2386	4021.2386	2814.8670	3803.4215	3261.6713	2714.3361	2714.3361	1900.0352	1500.0520	2124.0634	6735.5746	6735.5746	4714.9023	5303.4735	5385.7347	4021.2386	4021.2386	2412.7432	3803.4215	3261.6713	0.0000	0.0000
	-106	51	1	4121.7696	4121.7696	2885.2387	3898.5070	3343.2131	2714.3361	2714.3361	1900.0352	1498.7347	2123.9073	6836.1056	6836.1056	4785.2739	5397.2417	5467.1204	4121.7696	4121.7696	2473.0617	3898.5070	3343.2131	0.0000	0.0000
	-107	52	1	4222.3005	4222.3005	2955.6104	3993.5926	3424.7549	2714.3361	2714.3361	1900.0352	1497.4131	2123.7507	6936.6366	6936.6366	4855.6456	5491.0057	5548.5055	4222.3005	4222.3005	2533.3803	3993.5926	3424.7549	0.0000	0.0000
	-108	53	1	4322.8315	4322.8315	3025.9820	4088.6781	3506.2967	2714.3361	2714.3361	1900.0352	1496.0875	2123.5936	7037.1675	7037.1675	4926.0173	5584.7656	5629.8902	4322.8315	4322.8315	2593.6989	4088.6781	3506.2967	0.0000	0.0000
	-109	54	1	4423.3625	4423.3625	3096.3537	4183.7637	3587.8384	2714.3361	2714.3361	1900.0352	1494.7579	2123.4360	7137.6985	7137.6985	4996.3890	5678.5216	5711.2744	4423.3625	4423.3625	2654.0175	4183.7637	3587.8384	0.0000	0.0000
	-110	55	1	4523.8934	4523.8934	3166.7254	4278.8492	3669.3802	2714.3361	2714.3361	1900.0352	1493.4246	2123.2780	7238.2295	7238.2295	5066.7606	5772.2738	5792.6582	4523.8934	4523.8934	2714.3361	4278.8492	3669.3802	0.0000	0.0000
	-111	56	1	4624.4244	4624.4244	3237.0971	4373.9347	3750.9220	2714.3361	2714.3361	1900.0352	1491.9106	2123.1195	7338.7604	7338.7604	5137.1323	5865.8453	5874.0415	4624.4244	4624.4244	2774.6546	4373.9347	3750.9220	0.0000	0.0000
	-112	57	1	4724.9554	4724.9554	3307.4687	4469.0203	3832.4638	2714.3361	2714.3361	1900.0352	1490.2723	2122.9606	7439.2914	7439.2914	5207.5040	5959.2926	5955.4244	4724.9554	4724.9554	2834.9732	4469.0203	3832.4638	0.0000	0.0000
	-113	58	1	4825.4863	4825.4863	3377.8404	4564.1058	3914.0056	2714.3361	2714.3361	1900.0352	1488.6300	2122.8014	7539.8224	7539.8224	5277.8757	6052.7358	6036.8070	4825.4863	4825.4863	2895.2918	4564.1058	3914.0056	0.0000	0.0000
	-114	59	1	4926.0173	4926.0173	3448.2121	4659.1913	3995.5474	2714.3361	2714.3361	1900.0352	1486.9838	2122.6418	7640.3533	7640.3533	5348.2473	6146.1752	6118.1891	4926.0173	4926.0173	2955.6104	4659.1913	3995.5474	0.0000	0.0000
	-115	60	1	5026.5482	5026.5482	3518.5838	4754.2769	4077.0891	2714.3361	2714.3361	1900.0352	1485.3339	2122.4818	7740.8843	7740.8843	5418.6190	6239.6108	6199.5709	5026.5482	5026.5482	3015.9289	4754.2769	4077.0891	0.0000	0.0000
	-116	61	1	5127.0792	5127.0792	3588.9554	4849.3624	4158.6309	2714.3361	2714.3361	1900.0352	1483.6804	2122.3214	7841.4153	7841.4153	5488.9907	6333.0428	6280.9523	5127.0792	5127.0792	3076.2475	4849.3624	4158.6309	0.0000	0.0000
	-117	62	1	5227.6102	5227.6102	3659.3271	4944.4480	4240.1727	2714.3361	2714.3361	1900.0352	1482.0234	2122.1607	7941.9462	7941.9462	5559.3624	6426.4713	6362.3334	5227.6102	5227.6102	3136.5661	4944.4480	4240.1727	0.0000	0.0000
	-118	63	1	5328.1411	5328.1411	3729.6988	5039.5335	4321.7145	2714.3361	2714.3361	1900.0352	1480.3630	2121.9997	8042.4772	8042.4772	5629.7340	6519.8965	6443.7142	5328.1411	5328.1411	3196.8847	5039.5335	4321.7145	0.0000	0.0000
	-119	64	1	5428.6721	5428.6721	3800.0705	5134.6190	4403.2563	2714.3361	2714.3361	1900.0352	1478.6995	2121.8384	8143.0082	8143.0082	5700.1057	6613.3185	6525.0947	5428.6721	5428.6721	3257.2033	5134.6190	4403.2563	0.0000	0.0000
	-120	65	1	5529.2031	5529.2031	3870.4421	5229.7046	4484.7980	2714.3361	2714.3361	1900.0352	1477.0328	2121.6768	8243.5391	8243.5391	5770.4774	6706.7374	6606.4749	5529.2031	5529.2031	3317.5218	5229.7046	4484.7980	0.0000	0.0000
	-121	66	1	5629.7340	5629.7340	3940.8138	5324.7901	4566.3398	2714.3361	2714.3361	1900.0352	1475.3632	2121.5149	8344.0701	8344.0701	5840.8491	6800.1533	6687.8547	5629.7340	5629.7340	3377.8404	5324.7901	4566.3398	0.0000	0.0000
	-122	67	1	5730.2650	5730.2650	4011.1855	5419.8756	4647.8816	2714.3361	2714.3361	1900.0352	1473.6907	2121.3527	8444.6011	8444.6011	5911.2207	6893.5664	6769.2343	5730.2650	5730.2650	3438.1590	5419.8756	4647.8816	0.0000	0.0000
	-123	68	1	5830.7960	5830.7960	4081.5572	5514.9612	4729.4234	2714.3361	2714.3361	1900.0352	1472.0154	2121.1903	8545.1320	8545.1320	5981.5924	6986.9766	6850.6137	5830.7960	5830.7960	3498.4776	5514.9612	4729.4234	0.0000	0.0000
	-124	69	1	5931.3269	5931.3269	4151.9289	5610.0467	4810.9652	2714.3361	2714.3361	1900.0352	1470.3375	2121.0276	8645.6630	8645.6630	6051.9641	7080.3842	6931.9927	5931.3269	5931.3269	3558.7962	5610.0467	4810.9652	0.0000	0.0000
	-125	70	1	6031.8579	6031.8579	4222.3005	5705.1323	4892.5070	2714.3361	2714.3361	1900.0352	1468.6570	2120.8646	8746.1939	8746.1939	6122.3358	7173.7892	7013.3716	6031.8579	6031.8579	3619.1147	5705.1323	4892.5070	0.0000	0.0000
	-126	71	1	6132.3889	6132.3889	4292.6722	5800.2178	4974.0487	2714.3361	2714.3361	1900.0352	1466.9739	2120.7014	8846.7249	8846.7249	6192.7074	7267.1917	7094.7502	6132.3889	6132.3889	3679.4333	5800.2178	4974.0487	0.0000	0.0000
	-127	72	1	6232.9198	6232.9198	4363.0439	5895.3033	5055.5905	2714.3361	2714.3361	1900.0352	1465.2885	2120.5380	8947.2559	8947.2559	6263.0791	7360.5918	7176.1285	6232.9198	6232.9198	3739.7519	5895.3033	5055.5905	0.0000	0.0000
	-128	73	1	6333.4508	6333.4508	4433.4156	5990.3889	5137.1323	2714.3361	2714.3361	1900.0352	1463.6007	2120.3743	9047.7868	9047.7868	6333.4508	7453.9896	7257.5066	6333.4508	6333.4508	3800.0705	5990.3889	5137.1323	0.0000	0.0000
	-129	74	1	6433.9818	6433.9818	4503.7872	6085.4744	5218.6741	2714.3361	2714.3361	1900.0352	1461.9107	2120.2104	9148.3178	9148.3178	6403.8225	7547.3851	7338.8845	6433.9818	6433.9818	3860.3891	6085.4744	5218.6741	0.0000	0.0000
	-130	75	1	6534.5127	6534.5127	4574.1589	6180.5599	5300.2159	2714.3361	2714.3361	1900.0352	1460.2185	2120.0463	9248.8488	9248.8488	6474.1941	7640.7784	7420.2622	6534.5127	6534.5127	3920.7076	6180.5599	5300.2159	0.0000	0.0000
	-131	76	1	6635.0437	6635.0437	4644.5306	6275.6455	5381.7577	2714.3361	2714.3361	1900.0352	1458.5242	2119.8820	9349.3797	9349.3797	6544.5658	7734.1697	7501.6397	6635.0437	6635.0437	3981.0262	6275.6455	5381.7577	0.0000	0.0000
	-132	77	1	6735.5746	6735.5746	4714.9023	6370.7310	5463.2994	2714.3361	2714.3361	1900.0352	1456.8278	2119.7175	9449.9107	9449.9107	6614.9375	7827.5588	7583.0170	6735.5746	6735.5746	4041.3448	6370.7310	5463.2994	0.0000	0.0000
	-133	78	1	6836.1056	6836.1056	4785.2739	6465.8166	5544.8412	2714.3361	2714.3361	1900.0352	1455.1295	2119.5529	9550.4417	9550.4417	6685.3092	7920.9460	7664.3941	6836.1056	6836.1056	4101.6634	6465.8166	5544.8412	0.0000	0.0000
	-134	79	1	6936.6366	6936.6366	4855.6456	6560.9021	5626.3830	2714.3361	2714.3361	1900.0352	1453.4292	2119.3880	9650.9726	9650.9726	6755.6808	8014.3313	7745.7710	6936.6366	6936.6366	4161.9819	6560.9021	5626.3830	0.0000	0.0000
	-135	80	1	7037.1675	7037.1675	4926.0173	6655.9876	5707.9248	2714.3361	2714.3361	1900.0352	1451.7271	2119.2229	9751.5036	9751.5036	6826.0525	8107.7147	7827.1477	7037.1675	7037.1675	4222.3005	6655.9876	5707.9248	0.0000	0.0000
	-136	81	1	7137.6985	7137.6985	4996.3890	6751.0732	5789.4666	2714.3361	2714.3361	1900.0352	1450.0232	2119.0577	9852.0346	9852.0346	6896.4242	8201.0964	7908.5243	7137.6985	7137.6985	4282.6191	6751.0732	5789.4666	0.0000	0.0000
	-137	82	1	7238.2295	7238.2295	5066.7606	6846.1587	5871.0084	2714.3361	2714.3361	1900.0352	1448.3175	2118.8923	9952.5655	9952.5655	6966.7959	8294.4762	7989.9007	7238.2295	7238.2295	4342.9377	6846.1587	5871.0084	0.0000	0.0000
	-138	83	1	7338.7604	7338.7604	5137.1323	6941.2442	5952.5501	2714.3361	2714.3361	1900.0352	1446.6102	2118.7267	10053.0965	10053.0965	7037.1675	8387.8544	8071.2769	7338.7604	7338.7604	4403.2563	6941.2442	5952.5501	0.0000	0.0000
	-139	84	1	7439.2914	7439.2914	5207.5040	7036.3298	6034.0919	2714.3361	2714.3361	1900.0352	1444.9012	2118.5610	10153.6275	10153.6275	7107.5392	8481.2310	8152.6529	7439.2914	7439.2914	4463.5748	7036.3298	6034.0919	0.0000	0.0000
	-140	85	1	7539.8224	7539.8224	5277.8757	7131.4153	6115.6337	2714.3361	2714.3361	1900.0352	1443.1906	2118.3951	10254.1584	10254.1584	7177.9109	8574.6059	8234.0288	7539.8224	7539.8224	4523.8934	7131.4153	6115.6337	0.0000	0.0000
	-141	86	1	7640.3533	7640.3533	5348.2473	7226.5009	6197.1755	2714.3361	2714.3361	1900.0352	1441.4784	2118.2291	10354.6894	10354.6894	7248.2826	8667.9793	8315.4046	7640.3533	7640.3533	4584.2120	7226.5009	6197.1755	0.0000	0.0000
	-142	87	1	7740.8843	7740.8843	5418.6190	7321.5864	6278.7173	2714.3361	2714.3361	1900.0352	1439.7648	2118.0629	10455.2204	10455.2204	7318.6542	8761.3512	8396.7802	7740.8843	7740.8843	4644.5306	7321.5864	6278.7173	0.0000	0.0000
	-143	88	1	7841.4153	7841.4153	5488.9907	7416.6719	6360.2590	2714.3361	2714.3361	1900.0352	1438.0497	2117.8966	10555.7513	10555.7513	7389.0259	8854.7216	8478.1557	7841.4153	7841.4153	4704.8492	7416.6719	6360.2590	0.0000	0.0000
	-144	89	1	7941.9462	7941.9462	5559.3624	7511.7575	6441.8008	2714.3361	2714.3361	1900.0352	1436.3331	2117.7302	10656.2823	10656.2823	7459.3976	8948.0906	8559.5310	7941.9462	7941.9462	4765.1677	7511.7575	6441.8008	0.0000	0.0000
	-145	90	1	8042.4772	8042.4772	5629.7340	7606.8430	6523.3426	2714.3361	2714.3361	1900.0352	1434.6152	2117.5636	10756.8132	10756.8132	7529.7693	9041.4582	8640.9062	8042.4772	8042.4772	4825.4863	7606.8430	6523.3426	0.0000	0.0000
	-146	91	1	8143.0082	8143.0082	5700.1057	7701.9285	6604.8844	2714.3361	2714.3361	1900.0352	1432.8960	2117.3969	10857.3442	10857.3442	7600.1409	9134.8245	8722.2813	8143.0082	8143.0082	4885.8049	7701.9285	6604.8844	0.0000	0.0000

-147	92	1	8243.5391	8243.5391	5770.4774	7797.0141	6686.4262	2714.3361	2714.3361	1900.0352	1431.1754	2117.2300	10957.8752	10957.8752	7670.5126	9228.1895	8803.6562	8243.5391	8243.5391	4946.1235	7797.0141	6686.4262	0.0000	0.0000
-148	93	1	8344.0701	8344.0701	5840.8491	7892.0996	6767.9680	2714.3361	2714.3361	1900.0352	1429.4536	2116.9589	11058.4061	11058.4061	7740.8843	9321.5532	8884.9269	8344.0701	8344.0701	5006.4421	7892.0996	6767.9680	0.0000	0.0000
-149	94	1	8444.6011	8444.6011	5911.2207	7987.1852	6849.5097	2714.3361	2714.3361	1900.0352	1427.7305	2116.6456	11158.9371	11158.9371	7811.2560	9414.9157	8966.1554	8444.6011	8444.6011	5066.7606	7987.1852	6849.5097	0.0000	0.0000
-150	95	1	8545.1320	8545.1320	5981.5924	8082.2707	6931.0515	2714.3361	2714.3361	1900.0352	1426.0063	2116.3321	11259.4681	11259.4681	7881.6276	9508.2770	9047.3836	8545.1320	8545.1320	5127.0792	8082.2707	6931.0515	0.0000	0.0000
-151	96	1	8645.6630	8645.6630	6051.9641	8177.3562	7012.5933	2714.3361	2714.3361	1900.0352	1424.2808	2116.0184	11359.9990	11359.9990	7951.9993	9601.6371	9128.6117	8645.6630	8645.6630	5187.3978	8177.3562	7012.5933	0.0000	0.0000
-152	97	1	8746.1939	8746.1939	6122.3358	8272.4418	7094.1351	2714.3361	2714.3361	1900.0352	1422.5543	2115.7045	11460.5300	11460.5300	8022.3710	9694.9960	9209.8396	8746.1939	8746.1939	5247.7164	8272.4418	7094.1351	0.0000	0.0000
-153	98	1	8846.7249	8846.7249	6192.7074	8367.5273	7175.6769	2714.3361	2714.3361	1900.0352	1420.8266	2115.3904	11561.0610	11561.0610	8092.7427	9788.3539	9291.0672	8846.7249	8846.7249	5308.0349	8367.5273	7175.6769	0.0000	0.0000
-154	99	1	8947.2559	8947.2559	6263.0791	8462.6129	7257.2187	2714.3361	2714.3361	1900.0352	1419.0978	2115.0760	11661.5919	11661.5919	8163.1144	9881.7107	9372.2947	8947.2559	8947.2559	5368.3535	8462.6129	7257.2187	0.0000	0.0000
-155	100	1	9047.7868	9047.7868	6333.4508	8557.6984	7338.7604	2714.3361	2714.3361	1900.0352	1417.3680	2114.7615	11762.1229	11762.1229	8233.4860	9975.0664	9453.5220	9047.7868	9047.7868	5428.6721	8557.6984	7338.7604	0.0000	0.0000
-156	101	1	9148.3178	9148.3178	6403.8225	8652.7839	7420.3022	2714.3361	2714.3361	1900.0352	1415.6372	2114.4468	11862.6539	11862.6539	8303.8577	10068.4211	9534.7490	9148.3178	9148.3178	5488.9907	8652.7839	7420.3022	0.0000	0.0000
-157	102	1	9248.8488	9248.8488	6474.1941	8747.8695	7501.8440	2714.3361	2714.3361	1900.0352	1413.9053	2114.1319	11963.1848	11963.1848	8374.2294	10161.7748	9615.9759	9248.8488	9248.8488	5549.3093	8747.8695	7501.8440	0.0000	0.0000
-158	103	1	9349.3797	9349.3797	6544.5658	8842.9550	7583.3858	2714.3361	2714.3361	1900.0352	1412.1725	2113.8169	12063.7158	12063.7158	8444.6011	10255.1275	9697.2027	9349.3797	9349.3797	5609.6278	8842.9550	7583.3858	0.0000	0.0000
-159	104	1	9449.9107	9449.9107	6614.9375	8938.0405	7664.9276	2714.3361	2714.3361	1900.0352	1410.4387	2113.5017	12164.2468	12164.2468	8514.9727	10348.4793	9778.4292	9449.9107	9449.9107	5669.9464	8938.0405	7664.9276	0.0000	0.0000
-160	105	1	9550.4417	9550.4417	6685.3092	9033.1261	7746.4694	2714.3361	2714.3361	1900.0352	1408.7040	2113.1863	12264.7777	12264.7777	8585.3444	10441.8301	9859.6556	9550.4417	9550.4417	5730.2650	9033.1261	7746.4694	0.0000	0.0000
-161	106	1	9650.9726	9650.9726	6755.6808	9128.2116	7828.0111	2714.3361	2714.3361	1900.0352	1406.9684	2112.8707	12365.3087	12365.3087	8655.7161	10535.1801	9940.8818	9650.9726	9650.9726	5790.5836	9128.2116	7828.0111	0.0000	0.0000
-162	107	1	9751.5036	9751.5036	6826.0525	9223.2972	7909.5529	2714.3361	2714.3361	1900.0352	1405.2320	2112.5550	12465.8396	12465.8396	8726.0878	10628.5291	10022.1079	9751.5036	9751.5036	5850.9022	9223.2972	7909.5529	0.0000	0.0000
-163	108	1	9852.0346	9852.0346	6896.4242	9318.3827	7991.0947	2714.3361	2714.3361	1900.0352	1403.4946	2112.2391	12566.3706	12566.3706	8796.4594	10721.8773	10103.3338	9852.0346	9852.0346	5911.2207	9318.3827	7991.0947	0.0000	0.0000
-164	109	1	9952.5655	9952.5655	6966.7959	9413.4682	8072.6365	2714.3361	2714.3361	1900.0352	1401.7564	2111.9231	12666.9016	12666.9016	8866.8311	10815.2247	10184.5595	9952.5655	9952.5655	5971.5393	9413.4682	8072.6365	0.0000	0.0000
-165	110	1	10053.0965	10053.0965	7037.1675	9508.5538	8154.1783	2714.3361	2714.3361	1900.0352	1400.0174	2111.6069	12767.4325	12767.4325	8937.2028	10908.5712	10265.7851	10053.0965	10053.0965	6031.8579	9508.5538	8154.1783	0.0000	0.0000
-166	111	1	10153.6275	10153.6275	7107.5392	9603.6393	8235.7200	2714.3361	2714.3361	1900.0352	1398.2776	2111.2905	12867.9635	12867.9635	9007.5745	11001.9169	10347.0106	10153.6275	10153.6275	6092.1765	9603.6393	8235.7200	0.0000	0.0000
-167	112	1	10254.1584	10254.1584	7177.9109	9698.7248	8317.2618	2714.3361	2714.3361	1900.0352	1396.5370	2110.9741	12968.4945	12968.4945	9077.9461	11095.2618	10428.2359	10254.1584	10254.1584	6152.4951	9698.7248	8317.2618	0.0000	0.0000
-168	113	1	10354.6894	10354.6894	7248.2826	9793.8104	8398.8036	2714.3361	2714.3361	1900.0352	1394.7956	2110.6575	13069.0254	13069.0254	9148.3178	11188.6060	10509.4611	10354.6894	10354.6894	6212.8136	9793.8104	8398.8036	0.0000	0.0000
-169	114	1	10455.2204	10455.2204	7318.6542	9888.8959	8480.3454	2714.3361	2714.3361	1900.0352	1393.0535	2110.3407	13169.5564	13169.5564	9218.6895	11281.9495	10590.6861	10455.2204	10455.2204	6273.1322	9888.8959	8480.3454	0.0000	0.0000
-170	115	1	10555.7513	10555.7513	7389.0259	9983.9815	8561.8872	2714.3361	2714.3361	1900.0352	1391.3107	2110.0238	13270.0874	13270.0874	9289.0612	11375.2921	10671.9110	10555.7513	10555.7513	6333.4508	9983.9815	8561.8872	0.0000	0.0000
-171	116	1	10656.2823	10656.2823	7459.3976	10079.0670	8643.4290	2714.3361	2714.3361	1900.0352	1389.5671	2109.7068	13370.6183	13370.6183	9359.4328	11468.6341	10753.1358	10656.2823	10656.2823	6393.7694	10079.0670	8643.4290	0.0000	0.0000
-172	117	1	10756.8132	10756.8132	7529.7693	10174.1525	8724.9707	2714.3361	2714.3361	1900.0352	1387.8229	2109.3897	13471.1493	13471.1493	9429.8045	11561.9754	10834.3604	10756.8132	10756.8132	6454.0879	10174.1525	8724.9707	0.0000	0.0000
-173	118	1	10857.3442	10857.3442	7600.1409	10269.2381	8806.5125	2714.3361	2714.3361	1900.0352	1386.0779	2109.0724	13571.6803	13571.6803	9500.1762	11655.3160	10915.5849	10857.3442	10857.3442	6514.4065	10269.2381	8806.5125	0.0000	0.0000
-174	119	1	10957.8752	10957.8752	7670.5126	10364.3236	8888.0543	2714.3361	2714.3361	1900.0352	1384.3323	2108.7550	13672.2112	13672.2112	9570.5479	11748.6559	10996.8093	10957.8752	10957.8752	6574.7251	10364.3236	8888.0543	0.0000	0.0000
-175	120	1	11058.4061	11058.4061	7740.8843	10459.4091	8969.5961	2714.3361	2714.3361	1900.0352	1382.5861	2108.4375	13772.7422	13772.7422	9640.9195	11841.9952	11078.0336	11058.4061	11058.4061	6635.0437	10459.4091	8969.5961	0.0000	0.0000
-176	121	1	11158.9371	11158.9371	7811.2560	10554.4947	9051.1379	2714.3361	2714.3361	1900.0352	1380.8392	2108.1199	13873.2732	13873.2732	9711.2912	11935.3339	11159.2578	11158.9371	11158.9371	6695.3623	10554.4947	9051.1379	0.0000	0.0000
-177	122	1	11259.4681	11259.4681	7881.6276	10649.5802	9132.6797	2714.3361	2714.3361	1900.0352	1379.0917	2107.8022	13973.8041	13973.8041	9781.6629	12028.6719	11240.4818	11259.4681	11259.4681	6755.6808	10649.5802	9132.6797	0.0000	0.0000
-178	123	1	11359.9990	11359.9990	7951.9993	10744.6658	9214.2214	2714.3361	2714.3361	1900.0352	1377.3435	2107.4843	14074.3351	14074.3351	9852.0346	12122.0093	11321.7058	11359.9990	11359.9990	6815.9994	10744.6658	9214.2214	0.0000	0.0000
-179	124	1	11460.5300	11460.5300	8022.3710	10839.7513	9295.7632	2714.3361	2714.3361	1900.0352	1375.5948	2107.1664	14174.8661	14174.8661	9922.4062	12215.3461	11402.9296	11460.5300	11460.5300	6876.3180	10839.7513	9295.7632	0.0000	0.0000
-180	125	1	11561.0610	11561.0610	8092.7427	10934.8368	9377.3050	2714.3361	2714.3361	1900.0352	1373.8455	2106.8483	14275.3970	14275.3970	9992.7779	12308.6823	11484.1533	11561.0610	11561.0610	6936.6366	10934.8368	9377.3050	0.0000	0.0000
-181	126	1	11661.5919	11661.5919	8163.1144	11029.9224	9458.8468	2714.3361	2714.3361	1900.0352	1372.0956	2106.5302	14375.9280	14375.9280	10063.1496	12402.0179	11565.3770	11661.5919	11661.5919	6996.9552	11029.9224	9458.8468	0.0000	0.0000
-182	127	1	11762.1229	11762.1229	8233.4860	11125.0079	9540.3886	2714.3361	2714.3361	1900.0352	1370.3451	2106.2119	14476.4589	14476.4589	10133.5213	12495.3530	11646.6005	11762.1229	11762.1229	7057.2737	11125.0079	9540.3886	0.0000	0.0000
-183	128	1	11862.6539	11862.6539	8303.8577	11220.0934	9621.9304	2714.3361	2714.3361	1900.0352	1368.5941	2105.8935	14576.9899	14576.9899	10203.8929	12588.6876	11727.8239	11862.6539	11862.6539	7117.5923	11220.0934	9621.9304	0.0000	0.0000
-184	129	1	11963.1848	11963.1848	8374.2294	11315.1790	9703.4721	2714.3361	2714.3361	1900.0352	1366.8426	2105.5751	14677.5209	14677.5209	10274.2646	12682.0215	11809.0472	11963.1848	11963.1848	7177.9109	11315.1790	9703.4721	0.0000	0.0000
-185	130	1	12063.7158	12063.7158	8444.6011	11410.2645	9785.0139	2714.3361	2714.3361	1900.0352	1365.0905	2105.2565	14778.0518	14778.0518	10344.6363	12775.3550	11890.2704	12063.7158	12063.7158	7238.2295	11410.2645	9785.0139	0.0000	0.0000
-186	131	1	12164.2468	12164.2468	8514.9727	11505.3501	9866.5557	2714.3361	2714.3361	1900.0352	1363.3379	2104.9379	14878.5828	14878.5828	10415.0080	12868.6880	11971.4936	12164.2468	12164.2468	7298.5481	11505.3501	9866.5557	0.0000	0.0000
-187	132	1	12264.7777	12264.7777	8585.3444	11600.4356	9948.0975	2714.3361	2714.3361	1900.0352	1361.5848	2104.6191	14979.1138	14979.1138	10485.3796	12962.0204	12052.7166	12264.7777	12264.7777	7358.8666	11600.4356	9948.0975	0.0000	0.0000
-188	133	1	12365.3087	12365.3087	8655.7161	11695.5211	10029.6393	2714.3361	2714.3361	1900.0352	1359.8312	2104.3003	15079.6447	15079.6447	10555.7513	13055.3523	12133.9396	12365.3087	12365.3087	7419.1852	11695.5211	10029.6393	0.0000	0.0000
-189	134	1	12465.8396	12465.8396	8726.0878	11790.6067	10111.1810	2714.3361	2714.3361	1900.0352	1358.0771	2103.9814	15180.1757	15180.1757	10626.1230	13148.6838	12215.1624	12465.8396	12465.8396	7479.5038	11790.6067	10111.1810	0.0000	0.0000
-190	135	1	12566.3706	12566.3706	8796.4594	11885.6922	10192.7228	2714.3361	2714.3361	1900.0352	1356.3226	2103.6624	15280.7067	15280.7067	10696.4947	13242.0148	12296.3852	12566.3706	12566.3706	7539.8224	11885.6922	10192.7228	0.0000	0.0000
-191	136	1	12666.9016	12666.9016	8866.8311	11980.7777	10274.2646	2714.3361	2714.3361	1900.0352	1354.5675	2103.3433	15381.2376	15381.2376	10766.8663	13335.3453	12377.6079	12666.9016	12666.9016	7600.1409	11980.7777	10274.2646	0.0000	0.0000
-192	137	1	12767.4325	12767.4325	8937.2028	12075.8633	10355.8064	2714.3361	2714.3361	1900.0352	1352.8120	2103.0241	15481.7686	15481.7686	10837.2380	13428.6753	12458.8305	12767.4325	12767.4325	7660.4595	12075.8633	10355.8064	0.0000	0.0000
-193	138	1	12867.9635	12867.9635	9007.5745	12170.9488	10437.3482	2714.3361	2714.3361	1900.0352	1351.0561	2102.7048	15582.2996	15582.2996	10907.6097	13522.0049	12540.0530	12867.9635	12867.9635	7720.7781	12170.9488	10437.3482	0.0000	0.0000
-194	139	1	12968.4945	12968.4945	9077.9461	12266.0344	10518.8900	2714.3361	2714.3361	1900.0352	1349.2997	2102.3855	15682.8305	15682.8305	10977.9814	13615.3341	12621.2754	12968.4945	12968.4945	7781.0967	12266.0344	10518.8900	0.0000	0.0000
-195	140	1	13069.0254	13069.0254	9148.3178	12361.1199	10600.4317	2714.3361	2714.3361	1900.0352	1347.5429	2102.0661	15783.3615	15783.3615	11048.3530	13708.6628	12702.4978	13069.0254	13069.0254	7841.4153	12361.1199	10600.4317	0.0000	0.0000
-196	141	1	13169.5564	13169.5564	9218.6895	12456.2054	10681.9735	2714.3361	2714.3361	1900.0352	1345.7857	2101.7466	15883.8925	15883.8925	11118.7247	13801.9911	12783.7201	13169.5564	13169.5564	7901.7338	12456.2054	10681.9735	0.0000	0.0000
-197	142	1	13270.0874	13270.0874	9289.0612	12551.2910	10763.5153	2714.3361	2714.3361	1900.0352	1344.0280	2101.4270	15984.4234	15984.4234	11189.0964	13895.3190	12864.9423	13270.0874	13270.0874	7962.0524	12551.2910	10763.5153	0.0000	0.0000
-198	143	1	13370.6183	13370.6183	9359.4328	12646.3765	10845.0571	2714.3361	2714.3361	1900.0352	1342.2700	2101.1073	16084.9544	16084.9544	11259.4681	13988.6465	12946.1644	13370.6183	13370.6183	8022.3710	12646.3765	10845.0571	0.0000	0.0000
-199	144	1	13471.1493	13471.1493	9429.8045	12741.4620	10926.5989	2714.3361	2714.3361	1900.0352	1340.5115	2100.7876	16185.4854	16185.4854	11329.8397	14081.9735	13027.3865	13471.1493	13471.1493	8082.6896	12741.4620	10926.5989	0.0000	0.0000
-200	145	1	13571.6803	13571.6803	9500.1762	12836.5476	11008.1407	2714.3361	2714.3361	1900.0352	1338.7526	2100.4678	16286.0163	16286.0163	11400.2114	14175.3002	13108.6085	13571.6803	13571.6803	8143.0082	12836.5476	11008.1407	0.0000	0.0000

AASHTO Drilled Shaft Design

Project Information	
Project:	HRB
Owner:	SCDOT
Job Number:	18461-007-01
Location:	Beaufort County, South Carolina
Analysis by:	HPC
Date/Time:	10/6/2017 10:27
Run Designation:	Channel - Half Scour
Checked by:	ZAS

Shaft Information	
Shaft Diameter, D_s (ft):	8.00
Shaft Base Area (ft^2):	50.3
Shaft Perimeter (ft):	25.1
Length of Permanent Steel Casing Below Grade (ft):	15
Casing Reduction Factor	0.00
Top of Shaft Elevation (ft):	-45
Apply 20% Reduction for Shaft (Y/N):	N
Concrete Elastic Modulus (psi):	3.60E+06

Load/Seismic Information	
Bottom Elevation of Liquefaction (ft):	-50
Service Working Load, Qu (kips):	2500
Assumed Settlement-1, s (inches):	1
Assumed Settlement-2, s (inches):	2
Ground Water Elevation (ft):	0
Ground Surface Elevation (ft):	-45
If Manually Assign K_0:	N
Downdrage Load (kips):	0.0

Output Information	
Discretize Sublayer Thickness (ft):	0.1
Output Sublayer Thickness (ft):	1
Maximum Cohesive Side Resistance (ksf):	4
Maximum Sand Side Resistance (ksf):	4
Maximum Sand/Gravel Side Resistance (ksf):	4
Maximum Rock (intact/strong) Side Resistance (ksf):	4
Maximum Rock (fractured/weak) Side Resistance (ksf):	4
Plots in Elevation or Depth:	Elevation

Compute

Resistance Factor	Strength Limit State - Sand		Strength Limit State - Clay		Strength Limit State - Rock		Extreme Limit State	Service Limit State
	Side	End	Side	End	Side	End		
Compression	0.7	0.7	0.7	0.7	0.7	0.7	1	1
Uplift	0.6	-	0.6	-	0.6	-	1	1

Inputs are required

No Inputs should be assigned

Soil Profile

Layer ID	Soil Description	Elevation at Bottom of Soil Unit (feet)	Total Unit Weight, γ (pcf)	Residual Strength / Static Strength for Downdrag Load	Residual Strength (psf)	Static Strength Reduction Factor for Extreme Limit State	Cohesive		Cohesionless		Rock					If Liquefiable? [Y/N]	Soil Model	
							Su_{side} (psf)	Su_{Tip} (psf)	Average N_{60}	% Fines	q_u (ksf)	α_E	GSI	m_i	D			
1	Sands	-50	100		38				1	15						Y	2	Cohesionless - Sand
2	Hawthorn Marl	-90	120				8,889	4,000								N	1	Cohesive
3	Cooper Group Limestone	-200	120				8,889	6,000								N	1	Cohesive

Shaft	Profile			Side Resistance					Tip Resistance					Total Shaft Resistance					Uplift Shaft Capacity						
	Elevation (feet)	Depth (feet)	Soil Type	Cumulative Nominal Side Resistance (kips)	Cummulative Extreme Limit State (Liquified) Side Resistance (kips)	Cumulative Strength Limit State Side Resistance (kips)	Cumulative Service Limit State Side Resistance - 1 (kips)	Cumulative Service Limit State Side Resistance - 2 (kips)	Nominal End Bearing (kips)	Extreme Limit State (Liquified) End Bearing (kips)	Strength Limit State End Bearing (kips)	Service Limit State End Bearing - 1 (kips)	Service Limit State End Bearing - 2 (kips)	Nominal (Unfactored) (kips)	Extreme Limit State (Liquefied) (kips)	Strength Limit State (kips)	Service Limit State - 1 (kips)	Service Limit State - 2 (kips)	Nominal (Unfactored) (kips)	Extreme Limit State (liquefied) (kips)	Strength Limit State (kips)	Service Limit State - 1 (kips)	Service Limit State - 2 (kips)	Layer Downdrag Load (kips)	Cummulative Downdrag Load (kips)
	-45	0	2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-46	1	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-47	2	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-48	3	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-49	4	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-50	5	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-51	6	1	0.0000	0.0000	0.0000	0.0000	0.0000	1387.3273	1387.3273	971.1291	789.0424	1088.2812	1387.3273	1387.3273	971.1291	789.0424	1088.2812	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-52	7	1	0.0000	0.0000	0.0000	0.0000	0.0000	1417.4866	1417.4866	992.2406	806.1955	1111.9395	1417.4866	1417.4866	992.2406	806.1955	1111.9395	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-53	8	1	0.0000	0.0000	0.0000	0.0000	0.0000	1447.6459	1447.6459	1013.3521	823.3486	1135.5978	1447.6459	1447.6459	1013.3521	823.3486	1135.5978	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-54	9	1	0.0000	0.0000	0.0000	0.0000	0.0000	1477.8052	1477.8052	1034.4636	840.5017	1159.2561	1477.8052	1477.8052	1034.4636	840.5017	1159.2561	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-55	10	1	0.0000	0.0000	0.0000	0.0000	0.0000	1507.9645	1507.9645	1055.5751	857.6548	1182.9144	1507.9645	1507.9645	1055.5751	857.6548	1182.9144	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-56	11	1	0.0000	0.0000	0.0000	0.0000	0.0000	1538.1238	1538.1238	1076.6866	874.8079	1206.5726	1538.1238	1538.1238	1076.6866	874.8079	1206.5726	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-57	12	1	0.0000	0.0000	0.0000	0.0000	0.0000	1568.2831	1568.2831	1097.7981	891.9610	1230.2309	1568.2831	1568.2831	1097.7981	891.9610	1230.2309	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-58	13	1	0.0000	0.0000	0.0000	0.0000	0.0000	1598.4423	1598.4423	1118.9096	909.1141	1253.8892	1598.4423	1598.4423	1118.9096	909.1141	1253.8892	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-59	14	1	0.0000	0.0000	0.0000	0.0000	0.0000	1628.6016	1628.6016	1140.0211	926.2672	1277.5475	1628.6016	1628.6016	1140.0211	926.2672	1277.5475	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-60	15	1	0.0000	0.0000	0.0000	0.0000	0.0000	1658.7609	1658.7609	1161.1326	943.4203	1301.2058	1658.7609	1658.7609	1161.1326	943.4203	1301.2058	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-61	16	1	100.5310	100.5310	70.3717	95.0855	81.5418	1688.9202	1688.9202	1182.2441	959.7541	1324.7670	1789.4512	1789.4512	1252.6158	1054.8396	1406.3088	100.5310	100.5310	60.3186	95.0855	81.5418	0.0000	0.0000
	-62	17	1	201.0619	201.0619	140.7434	190.1711	163.0836	1719.0795	1719.0795	1203.3557	976.0750	1348.3266	1920.1414	1920.1414	1344.0990	1166.2461	1511.4102	201.0619	201.0619	120.6372	190.1711	163.0836	0.0000	0.0000
	-63	18	1	301.5929	301.5929	211.1150	285.2566	244.6253	1749.2388	1749.2388	1224.4672	992.3807	1371.8845	2050.8317	2050.8317	1435.5822	1277.6373	1616.5098	301.5929	301.5929	180.9557	285.2566	244.6253	0.0000	0.0000
	-64	19	1	402.1239	402.1239	281.4867	380.3422	326.1671	1779.3981	1779.3981	1245.5787	1008.6694	1395.4403	2181.5219	2181.5219	1527.0654	1389.0116	1721.6075	402.1239	402.1239	241.2743	380.3422	326.1671	0.0000	0.0000
	-65	20	1	502.6548	502.6548	351.8584	475.4277	407.7089	1809.5574	1809.5574	1266.6902	1024.9398	1418.9940	2312.2122	2312.2122	1618.5485	1500.3675	1826.7029	502.6548	502.6548	301.5929	475.4277	407.7089	0.0000	0.0000
	-66	21	1	603.1858	603.1858	422.2301	570.5132	489.2507	1809.5574	1809.5574	1266.6902	1024.0588	1418.8896	2412.7432	2412.7432	1688.9202	1594.5720	1908.1403	603.1858	603.1858	361.9115	570.5132	489.2507	0.0000	0.0000
	-67	22	1	703.7168	703.7168	492.6017	665.5988	570.7925	1809.5574	1809.5574	1266.6902	1023.1701	1418.7843	2513.2741	2513.2741	1759.2919	1688.7689	1989.5767	703.7168	703.7168	422.2301	665.5988	570.7925	0.0000	0.0000
	-68	23	1	804.2477	804.2477	562.9734	760.6843	652.3343	1809.5574	1809.5574	1266.6902	1022.2747	1418.6781	2613.8051	2613.8051	1829.6636	1782.9590	2071.0124	804.2477	804.2477	482.5486	760.6843	652.3343	0.0000	0.0000
	-69	24	1	904.7787	904.7787	633.3451	855.7698	733.8760	1809.5574	1809.5574	1266.6902	1021.3733	1418.5713	2714.3361	2714.3361	1900.0352	1877.1431	2152.4473	904.7787	904.7787	542.8672	855.7698	733.8760	0.0000	0.0000
	-70	25	1	1005.3096	1005.3096	703.7168	950.8554	815.4178	1809.5574	1809.5574	1266.6902	1020.4664	1418.4638	2814.8670	2814.8670	1970.4069	1971.3218	2233.8817	1005.3096	1005.3096	603.1858	950.8554	815.4178	0.0000	0.0000
	-71	26	1	1105.8406	1105.8406	774.0884	1045.9409	896.9596	1809.5574	1809.5574	1266.6902	1019.5548	1418.3558	2915.3980	2915.3980	2040.7786	2065.4957	2315.3154	1105.8406	1105.8406	663.5044	1045.9409	896.9596	0.0000	0.0000
	-72	27	1	1206.3716	1206.3716	844.4601	1141.0265	978.5014	1809.5574	1809.5574	1266.6902	1018.6389	1418.2472	3015.9289	3015.9289	2111.1503	2159.6653	2396.7486	1206.3716	1206.3716	723.8229	1141.0265	978.5014	0.0000	0.0000
	-73	28	1	1306.9025	1306.9025	914.8318	1236.1120	1060.0432	1809.5574	1809.5574	1266.6902	1017.7190	1418.1382	3116.4599	3116.4599	2181.5219	2253.8310	2478.1814	1306.9025	1306.9025	784.1415	1236.1120	1060.0432	0.0000	0.0000
	-74	29	1	1407.4335	1407.4335	985.2035	1331.1975	1141.5850	1809.5574	1809.5574	1266.6902	1016.7956	1418.0288	3216.9909	3216.9909	2251.8936	2347.9931	2559.6137	1407.4335	1407.4335	844.4601	1331.1975	1141.5850	0.0000	0.0000
	-75	30	1	1507.9645	1507.9645	1055.5751	1426.2831	1223.1267	1809.5574	1809.5574	1266.6902	1015.8690	1417.9189	3317.5218	3317.5218	2322.2653	2442.1521	2641.0457	1507.9645	1507.9645	904.7787	1426.2831	1223.1267	0.0000	0.0000
	-76	31	1	1608.4954	1608.4954	1125.9468	1521.3686	1304.6685	1809.5574	1809.5574	1266.6902	1014.9394	1417.8088	3418.0528	3418.0528	2392.6370	2536.3080	2722.4773	1608.4954	1608.4954	965.0973	1521.3686	1304.6685	0.0000	0.0000
	-77	32	1	1709.0264	1709.0264	1196.3185	1616.4541	1386.2103	1809.5574	1809.5574	1266.6902	1014.0072	1417.6983	3518.5838	3518.5838	2463.0086	2630.4613	2803.9086	1709.0264	1709.0264	1025.4158	1616.4541	1386.2103	0.0000	0.0000
	-78	33	1	1809.5574	1809.5574	1266.6902	1711.5397	1467.7521	1809.5574	1809.5574	1266.6902	1013.0725	1417.5875	3619.1147	3619.1147	2533.3803	2724.6121	2885.3396	1809.5574	1809.5574	1085.7344	1711.5397	1467.7521	0.0000	0.0000
	-79	34	1	1910.0883	1910.0883	1337.0618	1806.6252	1549.2939	1809.5574	1809.5574	1266.6902	1012.1355	1417.4765	3719.6457	3719.6457	2603.7520	2818.7607	2966.7703	1910.0883	1910.0883	1146.0530	1806.6252	1549.2939	0.0000	0.0000
	-80	35	1	2010.6193	2010.6193	1407.4335	1901.7108	1630.8357	1809.5574	1809.5574	1266.6902	1011.1964	1417.3652	3820.1767	3820.1767	2674.1237	2912.9072	3048.2008	2010.6193	2010.6193	1206.3716	1901.7108	1630.8357	0.0000	0.0000
	-81	36	1	2111.1503	2111.1503	1477.8052	1996.7963	1712.3774	1809.5574	1809.5574	1266.6902	1010.2555	1417.2536	3920.7076	3920.7076	2744.4953	3007.0518	3129.6311	2111.1503	2111.1503	1266.6902	1996.7963	1712.3774	0.0000	0.0000
	-82	37	1	2211.6812	2211.6812	1548.1769	2091.8818	1793.9192	1809.5574	1809.5574	1266.6902	1009.3127	1417.1419	4021.2386	4021.2386	2814.8670	3101.1945	3211.0611	2211.6812	2211.6812	1327.0087	2091.8818	1793.9192	0.0000	0.0000
	-83	38	1	2312.2122	2312.2122	1618.5485	2186.9674	1875.4610	1809.5574	1809.5574	1266.6902	1008.3683	1417.0300	4121.7696	4121.7696	2885.2387	3195.3357	3292.4910	2312.2122	2312.2122	1387.3273	2186.9674	1875.4610	0.0000	0.0000
	-84	39	1	2412.7432	2412.7432	1688.9202	2282.0529	1957.0028	1809.5574	1809.5574	1266.6902	1007.4224	1416.9179	4222.3005	4222.3005	2955.6104	3289.4753	3373.9206	2412.7432	2412.7432	1447.6459	2282.0529	1957.0028	0.0000	0.0000
	-85	40	1	2513.2741	2513.2741	1759.2919	2377.1384	2038.5446	1809.5574	1809.5574	1266.6902	1006.4750	1416.8056	4322.8315	4322.8315	3025.9820	3383.6134	3455.3501	2513.2741	2513.2741	1507.9645	2377.1384	2038.5446	0.0000	0.0000
	-86	41	1	2613.8051	2613.8051	1829.6636	2472.2240	2120.0863	1809.5574	1809.5574	1266.6902	1005.5263	1416.6931	4423.3625	4423.3625	3096.3537	3477.7503	3536.7795	2613.8051	2613.8051	1568.2831	2472.2240	2120.0863	0.0000	0.0000
	-87	42	1	2714.3361	2714.3361	1900.0352	2567.3095	2201.6281	1809.5574	1809.5574	1266.6902	1004.5764	1416.5806	4523.8934	4523.8934	3166.7254	3571.8859	3618.2087	2714.3361	2714.3361	1628.6016	2567.3095	2201.6281	0.0000	0.0000
	-88	43	1	2814.8670	2814.8670	1970.4069	2662.3951	2283.1699	1809.5574	1809.5574	1266.6902	1003.6253	1416.4678	4624.4244	4624.4244	3237.0971	3666.0203	3699.6378	2814.8670	2814.8670	1688.9202	2662.3951	2283.1699	0.0000	0.0000
	-89	44	1	2915.3980	2915.3980	2040.7786	2757.4806	2364.7117	1809.5574	1809.5574	1266.6902	1002.6731	1416.3550	4724.9554	4724.9554	3307.4687	3760.1537	3781.0667	2915.3980	2915.3980	1749.2388	2757.4806	2364.7117	0.0000	0.0000
	-90	45	1	3015.9289	3015.9289	2111.1503	2852.5661	2446.2535	1809.5574	1809.5574	1266.6902	1001.7199	1416.2420	4825.4863	4825.4863	3377.8404	3854.2861	3862.4955	3015.9289	3015.9289	1809.5574	2852.5661	2446.2535	0.0000	0.0000
	-91	46	1	3116.4599	3116.4599	2181.5219	2947.6517	2527.7953	2714.3361	2714.3361	1900.0352	1507.7637	2124.9774	5830.7960	5830.7960	4081.5572	4455.4153	4652.7727	3116.4599	3116.4599	1869.8759	2947.6517	2527.7953	0.0000	0.0000
	-92	47	1	3216.9909	3216.9909	2251.8936	3042.7372	2609.3370	2714.3361	2714.3361	1900.0352	1506.4375	2124.8202	5931.3269	5931.3269	4151.9289	4549.1747	4734.1573	3216.9909	3216.9909	1930.1945	3042.7372	2609.3370	0.0000	0.0000
	-93	48	1	3317.5218	3317.5218	2322.2653	3137.8227	2690.8788	2714.3361	2714.3361	1900.0352	1505.1068	2124.6625	6031.8579	6031.8579	4222.3005	4642.9295	4815.5413	3317.5218	3317.5218	1990.5131	3137.8227	2690.8788	0.0000	0.0000
	-94	49	1	3418.0528	3418.0528	2392.6370	3232.9083	2772.4206	2714.3361	2714.3361	1900.0352	1503.7716	2124.5043	6132.3889	6132.3889	4292.6722	4736.6799	4896.9249	3418.0528	3418.0528	2050.8317	3232.9083	2772.4206	0.0000	0.0000
	-95	50	1	3518.5838	3518.5838	2463.0086	3327.9938	2853.9624	2714.3361	2714.3361	1900.0352	1502.4322	2124.3455	6232.9198	6232.9198	4363.0439	4830.4261	4978.3079	3518.5838	3518.5838	2111.1503	3327.9938	2853.9624	0.0000	0.0000
	-96	51	1	3619.1147	3619.1147	2533.3803	3423.0794	2935.5042	2714.3361	2714.3361	1900.0352	1501.0889	2124.1863	6333.4508	6333.4508	4433.4156	4924.1683	5059.6905	3619.1147	3619.1147	2171.4688	3423.0794	2935.5042	0.0000	0.0000
	-97	52	1	3719.6457	3719.6457	2603.7520	3518.1649	3017.0460	2714.3361	2714.3361	1900.0352	1499.7418	2124.0267	6433.9818	6433.9818	4503.7872	5017.9067	5141.0726	3719.6457	3719.6457	2231.7874	3518.1649	3017.0460	0.0000	0.0000
	-98	53	1	3820.1767	3820.1767	2674.1237	3613.2504	3098.5877	2714.3361	2714.3361	1900.0352	1498.3910	2123.8666	6534.5127	6534.5127	4574.1589	5111.6414	5222.4543	3820.1767	3820.1767	2292.1060	3613.2504	3098.5877	0.0000	0.0000
	-99	54	1	3920.7076	3920.7076	2744.4953	3708.3360	3180.1295	2714.3361	2714.3361	1900.0352	1497.0368	2123.7061	6635.0437	6635.0437	4644.5306	5205.3728	5303.8356	3920.7076	3920.7076	2352.4246	3708.3360	3180.1295	0.0000	0.0000
	-100	55	1	4021.2386	4021.2386	2814.8670	3803.4215	3261.6713	2714.3361	2714.3361	1900.0352	1495.6793	2123.5452	6735.5746	6735.5746	4714.9023	5299.1008	5385.2165	4021.2386	4021.2386	2412.7432	3803.4215	3261.6713	0.0000	0.0000
	-101	56	1	4121.7696	4121.7696	2885.2387	3898.5070	3343.2131	2714.3361	2714.3361	1900.0352	1494.3186	2123.3839	6836.1056	6836.1056	4785.2739	5392.8257	5466.5970	4121.7696	4121.7696	2473.0617	3898.5070	3343.2131	0.0000	0.0000
	-102	57	1	4222.3005	4222.3005	2955.6104	3993.5926	3424.7549	2714.3361	2714.3361	1900.0352	1492.9549	2123.2223	6936.6366	6936.6366	4855.6456	5486.5475	5547.9772	4222.3005	4222.3005	2533.3803	3993.5926	3424.7549	0.0000	0.0000
	-103	58	1	4322.8315	4322.8315	3025.9820	4088.6781	3506.2967	2714.3361	2714.3361	1900.0352	1491.3002	2123.0603	7037.1675	7037.1675	4926.0173	5579.9783	5629.3570	4322.8315	4322.8315	2593.6989	4088.6781	3506.2967	0.0000	0.0000
	-104	59	1	4423.3625	4423.3625	3096.3537	4183.7637	3587.8384	2714.3361	2714.3361	1900.0352	1489.6266	2122.8980	7137.6985	7137.6985	4996.3890	5673.3902	5710.7365	4423.3625	4423.3625	2654.0175	4183.7637	3587.8384	0.0000	0.0000
	-105	60	1	4523.8934	4523.8934	3166.7254	4278.8492	3669.3802	2714.3361	2714.3361	1900.0352	1487.9497	2122.7354	7238.2295	7238.2295	5066.7606	5766.7989	5792.1156	4523.8934	4523.8934	2714.3361	4278.8492	3669.3802	0.0000	0.0000
	-106	61	1	4624.4244	4624.4244	3237.0971	4373.9347	3750.9220	2714.3361	2714.3361	1900.0352	1486.2697	2122.5725	7338.7604	7338.7604	5137.1323	5860.2044	5873.4945	4624.4244	4624.4244	2774.6546	4373.9347	3750.9220	0.0000	0.0000
	-107	62	1	4724.9554	4724.9554	3307.4687	4469.0203	3832.4638	2714.3361	2714.3361	1900.0352	1484.5867	2122.4093	7439.2914	7439.2914	5207.5040	5953.6070	5954.8731	4724.9554	4724.9554	2834.9732	4469.0203	3832.4638	0.0000	0.0000
	-108	63	1	4825.4863	4825.4863	3377.8404	4564.1058	3914.0056	2714.3361	2714.3361	1900.0352	1482.9009	2122.2458	7539.8224	7539.8224	5277.8757	6047.0067	6036.2514	4825.4863	4825.4863	2895.2918	4564.1058	3914.0056	0.0000	0.0000
	-109	64	1	4926.0173	4926.0173	3448.2121	4659.1913	3995.5474	2714.3361	2714.3361	1900.0352	1481.2123	2122.0821	7640.3533	7640.3533	5348.2473	6140.4036	6117.6294	4926.0173	4926.0173	2955.6104	4659.1913	3995.5474	0.0000	0.0000
	-110	65	1	5026.5482	5026.5482	3518.5838	4754.2769	4077.0891	2714.3361	2714.3361	1900.0352	1479.5210	2121.9181	7740.8843	7740.8843	5418.6190	6233.7979	6199.0072	5026.5482	5026.5482	3015.9289	4754.2769	4077.0891	0.0000	0.0000
	-111	66	1	5127.0792	5127.0792	3588.9554	4849.3624	4158.6309	2714.3361	2714.3361	1900.0352	1477.8272	2121.7538	7841.4153	7841.4153	5488.9907	6327.1897	6280.3848	5127.0792	5127.0792	3076.2475	4849.3624	4158.6309	0.0000	0.0000
	-112	67	1	5227.6102	5227.6102	3659.3271	4944.4480	4240.1727	2714.3361	2714.3361	1900.0352	1476.1310	2121.5894	7941.9462	7941.9462	5559.3624	6420.5790	6361.7621	5227.6102	5227.6102	3136.5661	4944.4480	4240.1727	0.0000	0.0000
	-113	68	1	5328.1411	5328.1411	3729.6988	5039.5335	4321.7145	2714.3361	2714.3361	1900.0352	1474.4324	2121.4247	8042.4772	8042.4772	5629.7340	6513.9659	6443.1391	5328.1411	5328.1411	3196.8847	5039.5335	4321.7145	0.0000	0.0000
	-114	69	1	5428.6721	5428.6721	3800.0705	5134.6190	4403.2563	2714.3361	2714.3361	1900.0352	1472.7316	2121.2597	8143.0082	8143.0082	5700.1057	6607.3506	6524.5160	5428.6721	5428.6721	3257.2033	5134.6190	4403.2563	0.0000	0.0000
	-115	70	1	5529.2031	5529.2031	3870.4421	5229.7046	4484.7980	2714.3361	2714.3361	1900.0352	1471.0286	2121.0946	8243.5391	8243.5391	5770.4774	6700.7331	6605.8926	5529.2031	5529.2031	3317.5218	5229.7046	4484.7980	0.0000	0.0000
	-116	71	1	5629.7340	5629.7340	3940.8138	5324.7901	4566.3398	2714.3361	2714.3361	1900.0352	1469.3234	2120.9292	8344.0701	8344.0701	5840.8491	6794.1135	6687.2691	5629.7340	5629.7340	3377.8404	5324.7901	4566.3398	0.0000	0.0000
	-117	72	1	5730.2650	5730.2650	4011.1855	5419.8756	4647.8816	2714.3361	2714.3361	1900.0352	1467.6163	2120.7637	8444.6011	8444.6011	5911.2207	6887.4919	6768.6453	5730.2650	5730.2650	3438.1590	5419.8756	4647.8816	0.0000	0.0000
	-118	73	1	5830.7960	5830.7960	4081.5572	5514.9612	4729.4234	2714.3361	2714.3361	1900.0352	1465.9071	2120.5980	8545.1320	8545.1320	5981.5924	6980.8683	6850.0214	5830.7960	5830.7960	3498.4776	5514.9612	4729.4234	0.0000	0.0000
	-119	74	1	5931.3269	5931.3269	4151.9289	5610.0467	4810.9652	2714.3361	2714.3361	1900.0352	1464.1961	2120.4320	8645.6630	8645.6630	6051.9641	7074.2429	6931.3972	5931.3269	5931.3269	3558.7962	5610.0467	4810.9652	0.0000	0.0000
	-120	75	1	6031.8579	6031.8579	4222.3005	5705.1323	4892.5070	2714.3361	2714.3361	1900.0352	1462.4833	2120.2660	8746.1939	8746.1939	6122.3358	7167.6156	7012.7729	6031.8579	6031.8579	3619.1147	5705.1323	4892.5070	0.0000	0.0000
	-121	76	1	6132.3889	6132.3889	4292.6722	5800.2178	4974.0487	2714.3361	2714.3361	1900.0352	1460.7687	2120.0997	8846.7249	8846.7249	6192.7074	7260.9865	7094.1484	6132.3889	6132.3889	3679.4333	5800.2178	4974.0487	0.0000	0.0000
	-122	77	1	6232.9198	6232.9198	4363.0439	5895.3033	5055.5905	2714.3361	2714.3361	1900.0352	1459.0524	2119.9333	8947.2559	8947.2559	6263.0791	7354.3557	7175.5238	6232.9198	6232.9198	3739.7519	5895.3033	5055.5905	0.0000	0.0000
	-123	78	1	6333.4508	6333.4508	4433.4156	5990.3889	5137.1323	2714.3361	2714.3361	1900.0352	1457.3345	2119.7667	9047.7868	9047.7868	6333.4508	7447.7233	7256.8990	6333.4508	6333.4508	3800.0705	5990.3889	5137.1323	0.0000	0.0000
	-124	79	1	6433.9818	6433.9818	4503.7872	6085.4744	5218.6741	2714.3361	2714.3361	1900.0352	1455.6149	2119.5999	9148.3178	9148.3178	6403.8225	7541.0893	7338.2740	6433.9818	6433.9818	3860.3891	6085.4744	5218.6741	0.0000	0.0000
	-125	80	1	6534.5127	6534.5127	4574.1589	6180.5599	5300.2159	2714.3361	2714.3361	1900.0352	1453.8938	2119.4330	9248.8488	9248.8488	6474.1941	7634.4538	7419.6489	6534.5127	6534.5127	3920.7076	6180.5599	5300.2159	0.0000	0.0000
	-126	81	1	6635.0437	6635.0437	4644.5306	6275.6455	5381.7577	2714.3361	2714.3361	1900.0352	1452.1713	2119.2660	9349.3797	9349.3797	6544.5658	7727.8168	7501.0237	6635.0437	6635.0437	3981.0262	6275.6455	5381.7577	0.0000	0.0000
	-127	82	1	6735.5746	6735.5746	4714.9023	6370.7310	5463.2994	2714.3361	2714.3361	1900.0352	1450.4473	2119.0988	9449.9107	9449.9107	6614.9375	7821.1783	7582.3983	6735.5746	6735.5746	4041.3448	6370.7310	5463.2994	0.0000	0.0000
	-128	83	1	6836.1056	6836.1056	4785.2739	6465.8166	5544.8412	2714.3361	2714.3361	1900.0352	1448.7219	2118.9315	9550.4417	9550.4417	6685.3092	7914.5384	7663.7727	6836.1056	6836.1056	4101.6634	6465.8166	5544.8412	0.0000	0.0000
	-129	84	1	6936.6366	6936.6366	4855.6456	6560.9021	5626.3830	2714.3361	2714.3361	1900.0352	1446.9951	2118.7641	9650.9726	9650.9726	6755.6808	8007.8972	7745.1471	6936.6366	6936.6366	4161.9819	6560.9021	5626.3830	0.0000	0.0000
	-130	85	1	7037.1675	7037.1675	4926.0173	6655.9876	5707.9248	2714.3361	2714.3361	1900.0352	1445.2670	2118.5965	9751.5036	9751.5036	6826.0525	8101.2547	7826.5213	7037.1675	7037.1675	4222.3005	6655.9876	5707.9248	0.0000	0.0000
	-131	86	1	7137.6985	7137.6985	4996.3890	6751.0732	5789.4666	2714.3361	2714.3361	1900.0352	1443.5377	2118.4288	9852.0346	9852.0346	6896.4242	8194.6109	7907.8954	7137.6985	7137.6985	4282.6191	6751.0732	5789.4666	0.0000	0.0000
	-132	87	1	7238.2295	7238.2295	5066.7606	6846.1587	5871.0084	2714.3361	2714.3361	1900.0352	1441.8071	2118.2610	9952.5655	9952.5655	6966.7959	8287.9658	7989.2693	7238.2295	7238.2295	4342.9377	6846.1587	5871.0084	0.0000	0.0000
	-133	88	1	7338.7604	7338.7604	5137.1323	6941.2442	5952.5501	2714.3361	2714.3361	1900.0352	1440.0753	2118.0931	10053.0965	10053.0965	7037.1675	8381.3196	8070.6432	7338.7604	7338.7604	4403.2563	6941.2442	5952.5501	0.0000	0.0000
	-134	89	1	7439.2914	7439.2914	5207.5040	7036.3298	6034.0919	2714.3361	2714.3361	1900.0352	1438.3424	2117.9250	10153.6275	10153.6275	7107.5392	8474.6722	8152.0169	7439.2914	7439.2914	4463.5748	7036.3298	6034.0919	0.0000	0.0000
	-135	90	1	7539.8224	7539.8224	5277.8757	7131.4153	6115.6337	2714.3361	2714.3361	1900.0352	1436.6084	2117.7569	10254.1584	10254.1584	7177.9109	8568.0237	8233.3906	7539.8224	7539.8224	4523.8934	7131.4153	6115.6337	0.0000	0.0000
	-136	91	1	7640.3533	7640.3533	5348.2473	7226.5009	6197.1755	2714.3361	2714.3361	1900.0352	1434.8732	2117.5886	10354.6894	10354.6894	7248.2826	8661.3741	8314.7641	7640.3533	7640.3533	4584.2120	7226.5009	6197.1755	0.0000	0.0000

-137	92	1	7740.8843	7740.8843	5418.6190	7321.5864	6278.7173	2714.3361	2714.3361	1900.0352	1433.1370	2117.4202	10455.2204	10455.2204	7318.6542	8754.7234	8396.1375	7740.8843	7740.8843	4644.5306	7321.5864	6278.7173	0.0000	0.0000
-138	93	1	7841.4153	7841.4153	5488.9907	7416.6719	6360.2590	2714.3361	2714.3361	1900.0352	1431.3997	2117.2518	10555.7513	10555.7513	7389.0259	8848.0717	8477.5108	7841.4153	7841.4153	4704.8492	7416.6719	6360.2590	0.0000	0.0000
-139	94	1	7941.9462	7941.9462	5559.3624	7511.7575	6441.8008	2714.3361	2714.3361	1900.0352	1429.6615	2116.9967	10656.2823	10656.2823	7459.3976	8941.4190	8558.7975	7941.9462	7941.9462	4765.1677	7511.7575	6441.8008	0.0000	0.0000
-140	95	1	8042.4772	8042.4772	5629.7340	7606.8430	6523.3426	2714.3361	2714.3361	1900.0352	1427.9223	2116.6805	10756.8132	10756.8132	7529.7693	9034.7653	8640.0231	8042.4772	8042.4772	4825.4863	7606.8430	6523.3426	0.0000	0.0000
-141	96	1	8143.0082	8143.0082	5700.1057	7701.9285	6604.8844	2714.3361	2714.3361	1900.0352	1426.1821	2116.3641	10857.3442	10857.3442	7600.1409	9128.1107	8721.2485	8143.0082	8143.0082	4885.8049	7701.9285	6604.8844	0.0000	0.0000
-142	97	1	8243.5391	8243.5391	5770.4774	7797.0141	6686.4262	2714.3361	2714.3361	1900.0352	1424.4410	2116.0475	10957.8752	10957.8752	7670.5126	9221.4551	8802.4737	8243.5391	8243.5391	4946.1235	7797.0141	6686.4262	0.0000	0.0000
-143	98	1	8344.0701	8344.0701	5840.8491	7892.0996	6767.9680	2714.3361	2714.3361	1900.0352	1422.6990	2115.7308	11058.4061	11058.4061	7740.8843	9314.7987	8883.6988	8344.0701	8344.0701	5006.4421	7892.0996	6767.9680	0.0000	0.0000
-144	99	1	8444.6011	8444.6011	5911.2207	7987.1852	6849.5097	2714.3361	2714.3361	1900.0352	1420.9562	2115.4139	11158.9371	11158.9371	7811.2560	9408.1413	8964.9237	8444.6011	8444.6011	5066.7606	7987.1852	6849.5097	0.0000	0.0000
-145	100	1	8545.1320	8545.1320	5981.5924	8082.2707	6931.0515	2714.3361	2714.3361	1900.0352	1419.2125	2115.0969	11259.4681	11259.4681	7881.6276	9501.4832	9046.1484	8545.1320	8545.1320	5127.0792	8082.2707	6931.0515	0.0000	0.0000
-146	101	1	8645.6630	8645.6630	6051.9641	8177.3562	7012.5933	2714.3361	2714.3361	1900.0352	1417.4679	2114.7797	11359.9990	11359.9990	7951.9993	9594.8242	9127.3730	8645.6630	8645.6630	5187.3978	8177.3562	7012.5933	0.0000	0.0000
-147	102	1	8746.1939	8746.1939	6122.3358	8272.4418	7094.1351	2714.3361	2714.3361	1900.0352	1415.7226	2114.4624	11460.5300	11460.5300	8022.3710	9688.1644	9208.5975	8746.1939	8746.1939	5247.7164	8272.4418	7094.1351	0.0000	0.0000
-148	103	1	8846.7249	8846.7249	6192.7074	8367.5273	7175.6769	2714.3361	2714.3361	1900.0352	1413.9765	2114.1449	11561.0610	11561.0610	8092.7427	9781.5038	9289.8218	8846.7249	8846.7249	5308.0349	8367.5273	7175.6769	0.0000	0.0000
-149	104	1	8947.2559	8947.2559	6263.0791	8462.6129	7257.2187	2714.3361	2714.3361	1900.0352	1412.2296	2113.8273	11661.5919	11661.5919	8163.1144	9874.8425	9371.0459	8947.2559	8947.2559	5368.3535	8462.6129	7257.2187	0.0000	0.0000
-150	105	1	9047.7868	9047.7868	6333.4508	8557.6984	7338.7604	2714.3361	2714.3361	1900.0352	1410.4820	2113.5095	11762.1229	11762.1229	8233.4860	9968.1804	9452.2700	9047.7868	9047.7868	5428.6721	8557.6984	7338.7604	0.0000	0.0000
-151	106	1	9148.3178	9148.3178	6403.8225	8652.7839	7420.3022	2714.3361	2714.3361	1900.0352	1408.7336	2113.1916	11862.6539	11862.6539	8303.8577	10061.5176	9533.4939	9148.3178	9148.3178	5488.9907	8652.7839	7420.3022	0.0000	0.0000
-152	107	1	9248.8488	9248.8488	6474.1941	8747.8695	7501.8440	2714.3361	2714.3361	1900.0352	1406.9846	2112.8736	11963.1848	11963.1848	8374.2294	10154.8541	9614.7176	9248.8488	9248.8488	5549.3093	8747.8695	7501.8440	0.0000	0.0000
-153	108	1	9349.3797	9349.3797	6544.5658	8842.9550	7583.3858	2714.3361	2714.3361	1900.0352	1405.2348	2112.5555	12063.7158	12063.7158	8444.6011	10248.1898	9695.9413	9349.3797	9349.3797	5609.6278	8842.9550	7583.3858	0.0000	0.0000
-154	109	1	9449.9107	9449.9107	6614.9375	8938.0405	7664.9276	2714.3361	2714.3361	1900.0352	1403.4844	2112.2372	12164.2468	12164.2468	8514.9727	10341.5250	9777.1648	9449.9107	9449.9107	5669.9464	8938.0405	7664.9276	0.0000	0.0000
-155	110	1	9550.4417	9550.4417	6685.3092	9033.1261	7746.4694	2714.3361	2714.3361	1900.0352	1401.7334	2111.9189	12264.7777	12264.7777	8585.3444	10434.8594	9858.3882	9550.4417	9550.4417	5730.2650	9033.1261	7746.4694	0.0000	0.0000
-156	111	1	9650.9726	9650.9726	6755.6808	9128.2116	7828.0111	2714.3361	2714.3361	1900.0352	1399.9817	2111.6004	12365.3087	12365.3087	8655.7161	10528.1933	9939.6115	9650.9726	9650.9726	5790.5836	9128.2116	7828.0111	0.0000	0.0000
-157	112	1	9751.5036	9751.5036	6826.0525	9223.2972	7909.5529	2714.3361	2714.3361	1900.0352	1398.2293	2111.2818	12465.8396	12465.8396	8726.0878	10621.5265	10020.8347	9751.5036	9751.5036	5850.9022	9223.2972	7909.5529	0.0000	0.0000
-158	113	1	9852.0346	9852.0346	6896.4242	9318.3827	7991.0947	2714.3361	2714.3361	1900.0352	1396.4764	2110.9630	12566.3706	12566.3706	8796.4594	10714.8591	10102.0577	9852.0346	9852.0346	5911.2207	9318.3827	7991.0947	0.0000	0.0000
-159	114	1	9952.5655	9952.5655	6966.7959	9413.4682	8072.6365	2714.3361	2714.3361	1900.0352	1394.7229	2110.6442	12666.9016	12666.9016	8866.8311	10808.1911	10183.2807	9952.5655	9952.5655	5971.5393	9413.4682	8072.6365	0.0000	0.0000
-160	115	1	10053.0965	10053.0965	7037.1675	9508.5538	8154.1783	2714.3361	2714.3361	1900.0352	1392.9687	2110.3253	12767.4325	12767.4325	8937.2028	10901.5225	10264.5036	10053.0965	10053.0965	6031.8579	9508.5538	8154.1783	0.0000	0.0000
-161	116	1	10153.6275	10153.6275	7107.5392	9603.6393	8235.7200	2714.3361	2714.3361	1900.0352	1391.2141	2110.0063	12867.9635	12867.9635	9007.5745	10994.8534	10345.7263	10153.6275	10153.6275	6092.1765	9603.6393	8235.7200	0.0000	0.0000
-162	117	1	10254.1584	10254.1584	7177.9109	9698.7248	8317.2618	2714.3361	2714.3361	1900.0352	1389.4588	2109.6871	12968.4945	12968.4945	9077.9461	11088.1837	10426.9490	10254.1584	10254.1584	6152.4951	9698.7248	8317.2618	0.0000	0.0000
-163	118	1	10354.6894	10354.6894	7248.2826	9793.8104	8398.8036	2714.3361	2714.3361	1900.0352	1387.7030	2109.3679	13069.0254	13069.0254	9148.3178	11181.5134	10508.1715	10354.6894	10354.6894	6212.8136	9793.8104	8398.8036	0.0000	0.0000
-164	119	1	10455.2204	10455.2204	7318.6542	9888.8959	8480.3454	2714.3361	2714.3361	1900.0352	1385.9467	2109.0486	13169.5564	13169.5564	9218.6895	11274.8427	10589.3940	10455.2204	10455.2204	6273.1322	9888.8959	8480.3454	0.0000	0.0000
-165	120	1	10555.7513	10555.7513	7389.0259	9983.9815	8561.8872	2714.3361	2714.3361	1900.0352	1384.1899	2108.7291	13270.0874	13270.0874	9289.0612	11368.1714	10670.6163	10555.7513	10555.7513	6333.4508	9983.9815	8561.8872	0.0000	0.0000
-166	121	1	10656.2823	10656.2823	7459.3976	10079.0670	8643.4290	2714.3361	2714.3361	1900.0352	1382.4326	2108.4096	13370.6183	13370.6183	9359.4328	11461.4996	10751.8386	10656.2823	10656.2823	6393.7694	10079.0670	8643.4290	0.0000	0.0000
-167	122	1	10756.8132	10756.8132	7529.7693	10174.1525	8724.9707	2714.3361	2714.3361	1900.0352	1380.6748	2108.0900	13471.1493	13471.1493	9429.8045	11554.8273	10833.0608	10756.8132	10756.8132	6454.0879	10174.1525	8724.9707	0.0000	0.0000
-168	123	1	10857.3442	10857.3442	7600.1409	10269.2381	8806.5125	2714.3361	2714.3361	1900.0352	1378.9165	2107.7703	13571.6803	13571.6803	9500.1762	11648.1546	10914.2829	10857.3442	10857.3442	6514.4065	10269.2381	8806.5125	0.0000	0.0000
-169	124	1	10957.8752	10957.8752	7670.5126	10364.3236	8888.0543	2714.3361	2714.3361	1900.0352	1377.1577	2107.4506	13672.2112	13672.2112	9570.5479	11741.4813	10995.5049	10957.8752	10957.8752	6574.7251	10364.3236	8888.0543	0.0000	0.0000
-170	125	1	11058.4061	11058.4061	7740.8843	10459.4091	8969.5961	2714.3361	2714.3361	1900.0352	1375.3985	2107.1307	13772.7422	13772.7422	9640.9195	11834.8076	11076.7268	11058.4061	11058.4061	6635.0437	10459.4091	8969.5961	0.0000	0.0000
-171	126	1	11158.9371	11158.9371	7811.2560	10554.4947	9051.1379	2714.3361	2714.3361	1900.0352	1373.6388	2106.8108	13873.2732	13873.2732	9711.2912	11928.1335	11157.9486	11158.9371	11158.9371	6695.3623	10554.4947	9051.1379	0.0000	0.0000
-172	127	1	11259.4681	11259.4681	7881.6276	10649.5802	9132.6797	2714.3361	2714.3361	1900.0352	1371.8787	2106.4907	13973.8041	13973.8041	9781.6629	12021.4589	11239.1704	11259.4681	11259.4681	6755.6808	10649.5802	9132.6797	0.0000	0.0000
-173	128	1	11359.9990	11359.9990	7951.9993	10744.6658	9214.2214	2714.3361	2714.3361	1900.0352	1370.1181	2106.1706	14074.3351	14074.3351	9852.0346	12114.7839	11320.3921	11359.9990	11359.9990	6815.9994	10744.6658	9214.2214	0.0000	0.0000
-174	129	1	11460.5300	11460.5300	8022.3710	10839.7513	9295.7632	2714.3361	2714.3361	1900.0352	1368.3571	2105.8505	14174.8661	14174.8661	9922.4062	12208.1084	11401.6137	11460.5300	11460.5300	6876.3180	10839.7513	9295.7632	0.0000	0.0000
-175	130	1	11561.0610	11561.0610	8092.7427	10934.8368	9377.3050	2714.3361	2714.3361	1900.0352	1366.5958	2105.5302	14275.3970	14275.3970	9992.7779	12301.4326	11482.8352	11561.0610	11561.0610	6936.6366	10934.8368	9377.3050	0.0000	0.0000
-176	131	1	11661.5919	11661.5919	8163.1144	11029.9224	9458.8468	2714.3361	2714.3361	1900.0352	1364.8340	2105.2099	14375.9280	14375.9280	10063.1496	12394.7563	11564.0567	11661.5919	11661.5919	6996.9552	11029.9224	9458.8468	0.0000	0.0000
-177	132	1	11762.1229	11762.1229	8233.4860	11125.0079	9540.3886	2714.3361	2714.3361	1900.0352	1363.0718	2104.8895	14476.4589	14476.4589	10133.5213	12488.0797	11645.2780	11762.1229	11762.1229	7057.2737	11125.0079	9540.3886	0.0000	0.0000
-178	133	1	11862.6539	11862.6539	8303.8577	11220.0934	9621.9304	2714.3361	2714.3361	1900.0352	1361.3092	2104.5690	14576.9899	14576.9899	10203.8929	12581.4026	11726.4994	11862.6539	11862.6539	7117.5923	11220.0934	9621.9304	0.0000	0.0000
-179	134	1	11963.1848	11963.1848	8374.2294	11315.1790	9703.4721	2714.3361	2714.3361	1900.0352	1359.5462	2104.2485	14677.5209	14677.5209	10274.2646	12674.7252	11807.7206	11963.1848	11963.1848	7177.9109	11315.1790	9703.4721	0.0000	0.0000
-180	135	1	12063.7158	12063.7158	8444.6011	11410.2645	9785.0139	2714.3361	2714.3361	1900.0352	1357.7829	2103.9279	14778.0518	14778.0518	10344.6363	12768.0474	11888.9418	12063.7158	12063.7158	7238.2295	11410.2645	9785.0139	0.0000	0.0000
-181	136	1	12164.2468	12164.2468	8514.9727	11505.3501	9866.5557	2714.3361	2714.3361	1900.0352	1356.0192	2103.6072	14878.5828	14878.5828	10415.0080	12861.3692	11970.1629	12164.2468	12164.2468	7298.5481	11505.3501	9866.5557	0.0000	0.0000
-182	137	1	12264.7777	12264.7777	8585.3444	11600.4356	9948.0975	2714.3361	2714.3361	1900.0352	1354.2551	2103.2865	14979.1138	14979.1138	10485.3796	12954.6907	12051.3839	12264.7777	12264.7777	7358.8666	11600.4356	9948.0975	0.0000	0.0000
-183	138	1	12365.3087	12365.3087	8655.7161	11695.5211	10029.6393	2714.3361	2714.3361	1900.0352	1352.4907	2102.9657	15079.6447	15079.6447	10555.7513	13048.0118	12132.6049	12365.3087	12365.3087	7419.1852	11695.5211	10029.6393	0.0000	0.0000
-184	139	1	12465.8396	12465.8396	8726.0878	11790.6067	10111.1810	2714.3361	2714.3361	1900.0352	1350.7260	2102.6448	15180.1757	15180.1757	10626.1230	13141.3326	12213.8258	12465.8396	12465.8396	7479.5038	11790.6067	10111.1810	0.0000	0.0000
-185	140	1	12566.3706	12566.3706	8796.4594	11885.6922	10192.7228	2714.3361	2714.3361	1900.0352	1348.9609	2102.3239	15280.7067	15280.7067	10696.4947	13234.6531	12295.0467	12566.3706	12566.3706	7539.8224	11885.6922	10192.7228	0.0000	0.0000
-186	141	1	12666.9016	12666.9016	8866.8311	11980.7777	10274.2646	2714.3361	2714.3361	1900.0352	1347.1954	2102.0029	15381.2376	15381.2376	10766.8663	13327.9732	12376.2675	12666.9016	12666.9016	7600.1409	11980.7777	10274.2646	0.0000	0.0000
-187	142	1	12767.4325	12767.4325	8937.2028	12075.8633	10355.8064	2714.3361	2714.3361	1900.0352	1345.4297	2101.6818	15481.7686	15481.7686	10837.2380	13421.2930	12457.4882	12767.4325	12767.4325	7660.4595	12075.8633	10355.8064	0.0000	0.0000
-188	143	1	12867.9635	12867.9635	9007.5745	12170.9488	10437.3482	2714.3361	2714.3361	1900.0352	1343.6636	2101.3607	15582.2996	15582.2996	10907.6097	13514.6125	12538.7089	12867.9635	12867.9635	7720.7781	12170.9488	10437.3482	0.0000	0.0000
-189	144	1	12968.4945	12968.4945	9077.9461	12266.0344	10518.8900	2714.3361	2714.3361	1900.0352	1341.8973	2101.0396	15682.8305	15682.8305	10977.9814	13607.9316	12619.9295	12968.4945	12968.4945	7781.0967	12266.0344	10518.8900	0.0000	0.0000
-190	145	1	13069.0254	13069.0254	9148.3178	12361.1199	10600.4317	2714.3361	2714.3361	1900.0352	1340.1306	2100.7184	15783.3615	15783.3615	11048.3530	13701.2505	12701.1501	13069.0254	13069.0254	7841.4153	12361.1199	10600.4317	0.0000	0.0000
-191	146	1	13169.5564	13169.5564	9218.6895	12456.2054	10681.9735	2714.3361	2714.3361	1900.0352	1338.3636	2100.3971	15883.8925	15883.8925	11118.7247	13794.5690	12782.3706	13169.5564	13169.5564	7901.7338	12456.2054	10681.9735	0.0000	0.0000
-192	147	1	13270.0874	13270.0874	9289.0612	12551.2910	10763.5153	2714.3361	2714.3361	1900.0352	1336.5963	2100.0758	15984.4234	15984.4234	11189.0964	13887.8873	12863.5911	13270.0874	13270.0874	7962.0524	12551.2910	10763.5153	0.0000	0.0000
-193	148	1	13370.6183	13370.6183	9359.4328	12646.3765	10845.0571	2714.3361	2714.3361	1900.0352	1334.8288	2099.7544	16084.9544	16084.9544	11259.4681	13981.2053	12944.8115	13370.6183	13370.6183	8022.3710	12646.3765	10845.0571	0.0000	0.0000
-194	149	1	13471.1493	13471.1493	9429.8045	12741.4620	10926.5989	2714.3361	2714.3361	1900.0352	1333.0609	2099.4330	16185.4854	16185.4854	11329.8397	14074.5230	13026.0318	13471.1493	13471.1493	8082.6896	12741.4620	10926.5989	0.0000	0.0000
-195	150	1	13571.6803	13571.6803	9500.1762	12836.5476	11008.1407	2714.3361	2714.3361	1900.0352	1331.2928	2099.1115	16286.0163	16286.0163	11400.2114	14167.8404	13107.2521	13571.6803	13571.6803	8143.0082	12836.5476	11008.1407	0.0000	0.0000
-196	151	1	13672.2112	13672.2112	9570.5479	12931.6331	11089.6824	2714.3361	2714.3361	1900.0352	1329.5244	2098.7900	16386.5473	16386.5473	11470.5831	14261.1575	13188.4724	13672.2112	13672.2112	8203.3267	12931.6331	11089.6824	0.0000	0.0000
-197	152	1	13772.7422	13772.7422	9640.9195	13026.7187	11171.2242	2714.3361	2714.3361	1900.0352	1327.7557	2098.4684	16487.0782	16487.0782	11540.9548	14354.4744	13269.6926	13772.7422	13772.7422	8263.6453	13026.7187	11171.2242	0.0000	0.0000
-198	153	1	13873.2732	13873.2732	9711.2912	13121.8042	11252.7660	2714.3361	2714.3361	1900.0352	1325.9868	2098.1468	16587.6092	16587.6092	11611.3264	14447.7910	13350.9128	13873.2732	13873.2732	8323.9639	13121.8042	11252.7660	0.0000	0.0000
-199	154	1	13973.8041	13973.8041	9781.6629	13216.8897	11334.3078	2714.3361	2714.3361	1900.0352	1324.2176	2097.8251	16688.1402	16688.1402	11681.6981	14541.1073	13432.1329	13973.8041	13973.8041	8384.2825	13216.8897	11334.3078	0.0000	0.0000
-200	155	1	14074.3351	14074.3351	9852.0346	13311.9753	11415.8496	2714.3361	2714.3361	1900.0352	1322.4482	2097.5034	16788.6711	16788.6711	11752.0698	14634.4234	13513.3529	14074.3351	14074.3351	8444.6011	13311.9753	11415.8496	0.0000	0.0000

AASHTO Drilled Shaft Design

Project Information	
Project:	HRB
Owner:	SCDOT
Job Number:	18461-007-01
Location:	Beaufort County, South Carolina
Analysis by:	HPC
Date/Time:	10/6/2017 10:30
Run Designation:	Channel - No Scour
Checked by:	ZAS

Shaft Information	
Shaft Diameter, D_s (ft):	8.00
Shaft Base Area (ft^2):	50.3
Shaft Perimeter (ft):	25.1
Length of Permanent Steel Casing Below Grade (ft):	25
Casing Reduction Factor	0.00
Top of Shaft Elevation (ft):	-35
Apply 20% Reduction for Shaft (Y/N):	N
Concrete Elastic Modulus (psi):	3.60E+06

Load/Seismic Information	
Bottom Elevation of Liquefaction (ft):	-50
Service Working Load, Qu (kips):	2500
Assumed Settlement-1, s (inches):	1
Assumed Settlement-2, s (inches):	2
Ground Water Elevation (ft):	0
Ground Surface Elevation (ft):	-35
If Manually Assign K_0:	N
Downdrage Load (kips):	0.0

Output Information	
Discretize Sublayer Thickness (ft):	0.1
Output Sublayer Thickness (ft):	1
Maximum Cohesive Side Resistance (ksf):	4
Maximum Sand Side Resistance (ksf):	4
Maximum Sand/Gravel Side Resistance (ksf):	4
Maximum Rock (intact/strong) Side Resistance (ksf):	4
Maximum Rock (fractured/weak) Side Resistance (ksf):	4
Plots in Elevation or Depth:	Elevation

Compute

Resistance Factor	Strength Limit State - Sand		Strength Limit State - Clay		Strength Limit State - Rock		Extreme Limit State	Service Limit State
	Side	End	Side	End	Side	End		
Compression	0.7	0.7	0.7	0.7	0.7	0.7	1	1
Uplift	0.6	-	0.6	-	0.6	-	1	1

Inputs are required

No Inputs should be assigned

Soil Profile

Layer ID	Soil Description	Elevation at Bottom of Soil Unit (feet)	Total Unit Weight, γ (pcf)	Residual Strength / Static Strength for Downdrag Load	Residual Strength (psf)	Static Strength Reduction Factor for Extreme Limit State	Cohesive		Cohesionless		Rock					If Liquefiable? [Y/N]	Soil Model	
							Su_{side} (psf)	Su_{Tip} (psf)	Average N_{60}	% Fines	q_u (ksf)	α_E	GSI	m_i	D			
1	Sands	-50	100		338				1	15						Y	2	Cohesionless - Sand
2	Hawthorn Marl	-90	120				8,889	4,000								N	1	Cohesive
3	Cooper Group Limestone	-200	120				8,889	6,000								N	1	Cohesive

Shaft	Profile			Side Resistance					Tip Resistance					Total Shaft Resistance					Uplift Shaft Capacity						
	Elevation (feet)	Depth (feet)	Soil Type	Cumulative Nominal Side Resistance (kips)	Cummulative Extreme Limit State (Liquified) Side Resistance (kips)	Cumulative Strength Limit State Side Resistance (kips)	Cumulative Service Limit State Side Resistance - 1 (kips)	Cumulative Service Limit State Side Resistance - 2 (kips)	Nominal End Bearing (kips)	Extreme Limit State (Liquified) End Bearing (kips)	Strength Limit State End Bearing (kips)	Service Limit State End Bearing - 1 (kips)	Service Limit State End Bearing - 2 (kips)	Nominal (Unfactored) (kips)	Extreme Limit State (Liquefied) (kips)	Strength Limit State (kips)	Service Limit State - 1 (kips)	Service Limit State - 2 (kips)	Nominal (Unfactored) (kips)	Extreme Limit State (liquefied) (kips)	Strength Limit State (kips)	Service Limit State - 1 (kips)	Service Limit State - 2 (kips)	Layer Downdrag Load (kips)	Cummulative Downdrag Load (kips)
	-35	0	2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-36	1	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-37	2	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-38	3	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-39	4	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-40	5	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-41	6	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-42	7	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-43	8	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-44	9	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-45	10	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-46	11	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-47	12	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-48	13	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-49	14	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-50	15	2	0.0000	0.0000	0.0000	0.0000	0.0000	60.3186	0.0000	42.2230	20.4832	34.4821	60.3186	0.0000	42.2230	20.4832	34.4821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-51	16	1	0.0000	0.0000	0.0000	0.0000	0.0000	1688.9202	1688.9202	1182.2441	960.5734	1324.8641	1688.9202	1688.9202	1182.2441	960.5734	1324.8641	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-52	17	1	0.0000	0.0000	0.0000	0.0000	0.0000	1719.0795	1719.0795	1203.3557	977.7265	1348.5224	1719.0795	1719.0795	1203.3557	977.7265	1348.5224	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-53	18	1	0.0000	0.0000	0.0000	0.0000	0.0000	1749.2388	1749.2388	1224.4672	994.8796	1372.1807	1749.2388	1749.2388	1224.4672	994.8796	1372.1807	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-54	19	1	0.0000	0.0000	0.0000	0.0000	0.0000	1779.3981	1779.3981	1245.5787	1012.0327	1395.8389	1779.3981	1779.3981	1245.5787	1012.0327	1395.8389	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-55	20	1	0.0000	0.0000	0.0000	0.0000	0.0000	1809.5574	1809.5574	1266.6902	1029.1858	1419.4972	1809.5574	1809.5574	1266.6902	1029.1858	1419.4972	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-56	21	1	0.0000	0.0000	0.0000	0.0000	0.0000	1809.5574	1809.5574	1266.6902	1029.1858	1419.4972	1809.5574	1809.5574	1266.6902	1029.1858	1419.4972	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-57	22	1	0.0000	0.0000	0.0000	0.0000	0.0000	1809.5574	1809.5574	1266.6902	1029.1858	1419.4972	1809.5574	1809.5574	1266.6902	1029.1858	1419.4972	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-58	23	1	0.0000	0.0000	0.0000	0.0000	0.0000	1809.5574	1809.5574	1266.6902	1029.1858	1419.4972	1809.5574	1809.5574	1266.6902	1029.1858	1419.4972	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-59	24	1	0.0000	0.0000	0.0000	0.0000	0.0000	1809.5574	1809.5574	1266.6902	1029.1858	1419.4972	1809.5574	1809.5574	1266.6902	1029.1858	1419.4972	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-60	25	1	0.0000	0.0000	0.0000	0.0000	0.0000	1809.5574	1809.5574	1266.6902	1029.1858	1419.4972	1809.5574	1809.5574	1266.6902	1029.1858	1419.4972	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	-61	26	1	100.5310	100.5310	70.3717	95.0855	81.5418	1809.5574	1809.5574	1266.6902	1027.8494	1419.3388	1910.0883	1910.0883	1337.0618	1122.9349	1500.8806	100.5310	100.5310	60.3186	95.0855	81.5418	0.0000	0.0000
	-62	27	1	201.0619	201.0619	140.7434	190.1711	163.0836	1809.5574	1809.5574	1266.6902	1026.5490	1419.1847	2010.6193	2010.6193	1407.4335	1216.7201	1582.2683	201.0619	201.0619	120.6372	190.1711	163.0836	0.0000	0.0000
	-63	28	1	301.5929	301.5929	211.1150	285.2566	244.6253	1809.5574	1809.5574	1266.6902	1025.2795	1419.0343	2111.1503	2111.1503	1477.8052	1310.5361	1663.6596	301.5929	301.5929	180.9557	285.2566	244.6253	0.0000	0.0000
	-64	29	1	402.1239	402.1239	281.4867	380.3422	326.1671	1809.5574	1809.5574	1266.6902	1024.0366	1418.8870	2211.6812	2211.6812	1548.1769	1404.3788	1745.0541	402.1239	402.1239	241.2743	380.3422	326.1671	0.0000	0.0000
	-65	30	1	502.6548	502.6548	351.8584	475.4277	407.7089	1809.5574	1809.5574	1266.6902	1022.8169	1418.7424	2312.2122	2312.2122	1618.5485	1498.2446	1826.4513	502.6548	502.6548	301.5929	475.4277	407.7089	0.0000	0.0000
	-66	31	1	603.1858	603.1858	422.2301	570.5132	489.2507	1809.5574	1809.5574	1266.6902	1021.6174	1418.6002	2412.7432	2412.7432	1688.9202	1592.1306	1907.8509	603.1858	603.1858	361.9115	570.5132	489.2507	0.0000	0.0000
	-67	32	1	703.7168	703.7168	492.6017	665.5988	570.7925	1809.5574	1809.5574	1266.6902	1020.4358	1418.4602	2513.2741	2513.2741	1759.2919	1686.0345	1989.2527	703.7168	703.7168	422.2301	665.5988	570.7925	0.0000	0.0000
	-68	33	1	804.2477	804.2477	562.9734	760.6843	652.3343	1809.5574	1809.5574	1266.6902	1019.2699	1418.3220	2613.8051	2613.8051	1829.6636	1779.9542	2070.6563	804.2477	804.2477	482.5486	760.6843	652.3343	0.0000	0.0000
	-69	34	1	904.7787	904.7787	633.3451	855.7698	733.8760	1809.5574	1809.5574	1266.6902	1018.1180	1418.1855	2714.3361	2714.3361	1900.0352	1873.8879	2152.0615	904.7787	904.7787	542.8672	855.7698	733.8760	0.0000	0.0000
	-70	35	1	1005.3096	1005.3096	703.7168	950.8554	815.4178	1809.5574	1809.5574	1266.6902	1016.9787	1418.0505	2814.8670	2814.8670	1970.4069	1967.8341	2233.4683	1005.3096	1005.3096	603.1858	950.8554	815.4178	0.0000	0.0000
	-71	36	1	1105.8406	1105.8406	774.0884	1045.9409	896.9596	1809.5574	1809.5574	1266.6902	1015.8506	1417.9168	2915.3980	2915.3980	2040.7786	2061.7915	2314.8764	1105.8406	1105.8406	663.5044	1045.9409	896.9596	0.0000	0.0000
	-72	37	1	1206.3716	1206.3716	844.4601	1141.0265	978.5014	1809.5574	1809.5574	1266.6902	1014.7326	1417.7843	3015.9289	3015.9289	2111.1503	2155.7591	2396.2857	1206.3716	1206.3716	723.8229	1141.0265	978.5014	0.0000	0.0000
	-73	38	1	1306.9025	1306.9025	914.8318	1236.1120	1060.0432	1809.5574	1809.5574	1266.6902	1013.6238	1417.6528	3116.4599	3116.4599	2181.5219	2249.7357	2477.6960	1306.9025	1306.9025	784.1415	1236.1120	1060.0432	0.0000	0.0000
	-74	39	1	1407.4335	1407.4335	985.2035	1331.1975	1141.5850	1809.5574	1809.5574	1266.6902	1012.5232	1417.5224	3216.9909	3216.9909	2251.8936	2343.7207	2559.1074	1407.4335	1407.4335	844.4601	1331.1975	1141.5850	0.0000	0.0000
	-75	40	1	1507.9645	1507.9645	1055.5751	1426.2831	1223.1267	1809.5574	1809.5574	1266.6902	1011.4301	1417.3928	3317.5218	3317.5218	2322.2653	2437.7131	2640.5196	1507.9645	1507.9645	904.7787	1426.2831	1223.1267	0.0000	0.0000
	-76	41	1	1608.4954	1608.4954	1125.9468	1521.3686	1304.6685	1809.5574	1809.5574	1266.6902	1010.3438	1417.2641	3418.0528	3418.0528	2392.6370	2531.7124	2721.9326	1608.4954	1608.4954	965.0973	1521.3686	1304.6685	0.0000	0.0000
	-77	42	1	1709.0264	1709.0264	1196.3185	1616.4541	1386.2103	1809.5574	1809.5574	1266.6902	1009.2639	1417.1361	3518.5838	3518.5838	2463.0086	2625.7180	2803.3464	1709.0264	1709.0264	1025.4158	1616.4541	1386.2103	0.0000	0.0000
	-78	43	1	1809.5574	1809.5574	1266.6902	1711.5397	1467.7521	1809.5574	1809.5574	1266.6902	1008.1897	1417.0088	3619.1147	3619.1147	2533.3803	2719.7293	2884.7609	1809.5574	1809.5574	1085.7344	1711.5397	1467.7521	0.0000	0.0000
	-79	44	1	1910.0883	1910.0883	1337.0618	1806.6252	1549.2939	1809.5574	1809.5574	1266.6902	1007.1207	1416.8821	3719.6457	3719.6457	2603.7520	2813.7459	2966.1760	1910.0883	1910.0883	1146.0530	1806.6252	1549.2939	0.0000	0.0000
	-80	45	1	2010.6193	2010.6193	1407.4335	1901.7108	1630.8357	1809.5574	1809.5574	1266.6902	1006.0566	1416.7560	3820.1767	3820.1767	2674.1237	2907.7674	3047.5916	2010.6193	2010.6193	1206.3716	1901.7108	1630.8357	0.0000	0.0000
	-81	46	1	2111.1503	2111.1503	1477.8052	1996.7963	1712.3774	1809.5574	1809.5574	1266.6902	1004.9971	1416.6304	3920.7076	3920.7076	2744.4953	3001.7933	3129.0079	2111.1503	2111.1503	1266.6902	1996.7963	1712.3774	0.0000	0.0000
	-82	47	1	2211.6812	2211.6812	1548.1769	2091.8818	1793.9192	1809.5574	1809.5574	1266.6902	1003.9416	1416.5053	4021.2386	4021.2386	2814.8670	3095.8234	3210.4245	2211.6812	2211.6812	1327.0087	2091.8818	1793.9192	0.0000	0.0000
	-83	48	1	2312.2122	2312.2122	1618.5485	2186.9674	1875.4610	1809.5574	1809.5574	1266.6902	1002.8900	1416.3807	4121.7696	4121.7696	2885.2387	3189.8574	3291.8417	2312.2122	2312.2122	1387.3273	2186.9674	1875.4610	0.0000	0.0000
	-84	49	1	2412.7432	2412.7432	1688.9202	2282.0529	1957.0028	1809.5574	1809.5574	1266.6902	1001.8420	1416.2565	4222.3005	4222.3005	2955.6104	3283.8949	3373.2593	2412.7432	2412.7432	1447.6459	2282.0529	1957.0028	0.0000	0.0000
	-85	50	1	2513.2741	2513.2741	1759.2919	2377.1384	2038.5446	1809.5574	1809.5574	1266.6902	1000.7973	1416.1327	4322.8315	4322.8315	3025.9820	3377.9357	3454.6772	2513.2741	2513.2741	1507.9645	2377.1384	2038.5446	0.0000	0.0000
	-86	51	1	2613.8051	2613.8051	1829.6636	2472.2240	2120.0863	1809.5574	1809.5574	1266.6902	999.7557	1416.0092	4423.3625	4423.3625	3096.3537	3471.9797	3536.0956	2613.8051	2613.8051	1568.2831	2472.2240	2120.0863	0.0000	0.0000
	-87	52	1	2714.3361	2714.3361	1900.0352	2567.3095	2201.6281	1809.5574	1809.5574	1266.6902	998.7170	1415.8861	4523.8934	4523.8934	3166.7254	3566.0265	3617.5142	2714.3361	2714.3361	1628.6016	2567.3095	2201.6281	0.0000	0.0000
	-88	53	1	2814.8670	2814.8670	1970.4069	2662.3951	2283.1699	1809.5574	1809.5574	1266.6902	997.6810	1415.7633	4624.4244	4624.4244	3237.0971	3660.0761	3698.9332	2814.8670	2814.8670	1688.9202	2662.3951	2283.1699	0.0000	0.0000
	-89	54	1	2915.3980	2915.3980	2040.7786	2757.4806	2364.7117	1809.5574	1809.5574	1266.6902	996.6475	1415.6408	4724.9554	4724.9554	3307.4687	3754.1281	3780.3525	2915.3980	2915.3980	1749.2388	2757.4806	2364.7117	0.0000	0.0000
	-90	55	1	3015.9289	3015.9289	2111.1503	2852.5661	2446.2535	1809.5574	1809.5574	1266.6902	995.6164	1415.5186	4825.4863	4825.4863	3377.8404	3848.1825	3861.7721	3015.9289	3015.9289	1809.5574	2852.5661	2446.2535	0.0000	0.0000
	-91	56	1	3116.4599	3116.4599	2181.5219	2947.6517	2527.7953	2714.3361	2714.3361	1900.0352	1499.9343	2124.0495	5830.7960	5830.7960	4081.5572	4447.5860	4651.8447	3116.4599	3116.4599	1869.8759	2947.6517	2527.7953	0.0000	0.0000
	-92	57	1	3216.9909	3216.9909	2251.8936	3042.7372	2609.3370	2714.3361	2714.3361	1900.0352	1498.4926	2123.8786	5931.3269	5931.3269	4151.9289	4541.2298	4733.2157	3216.9909	3216.9909	1930.1945	3042.7372	2609.3370	0.0000	0.0000
	-93	58	1	3317.5218	3317.5218	2322.2653	3137.8227	2690.8788	2714.3361	2714.3361	1900.0352	1497.0501	2123.7076	6031.8579	6031.8579	4222.3005	4634.8729	4814.5865	3317.5218	3317.5218	1990.5131	3137.8227	2690.8788	0.0000	0.0000
	-94	59	1	3418.0528	3418.0528	2392.6370	3232.9083	2772.4206	2714.3361	2714.3361	1900.0352	1495.6069	2123.5366	6132.3889	6132.3889	4292.6722	4728.5152	4895.9572	3418.0528	3418.0528	2050.8317	3232.9083	2772.4206	0.0000	0.0000
	-95	60	1	3518.5838	3518.5838	2463.0086	3327.9938	2853.9624	2714.3361	2714.3361	1900.0352	1494.1630	2123.3655	6232.9198	6232.9198	4363.0439	4822.1568	4977.3279	3518.5838	3518.5838	2111.1503	3327.9938	2853.9624	0.0000	0.0000
	-96	61	1	3619.1147	3619.1147	2533.3803	3423.0794	2935.5042	2714.3361	2714.3361	1900.0352	1492.6814	2123.1942	6333.4508	6333.4508	4433.4156	4915.7607	5058.6984	3619.1147	3619.1147	2171.4688	3423.0794	2935.5042	0.0000	0.0000
	-97	62	1	3719.6457	3719.6457	2603.7520	3518.1649	3017.0460	2714.3361	2714.3361	1900.0352	1490.9150	2123.0230	6433.9818	6433.9818	4503.7872	5009.0799	5140.0689	3719.6457	3719.6457	2231.7874	3518.1649	3017.0460	0.0000	0.0000
	-98	63	1	3820.1767	3820.1767	2674.1237	3613.2504	3098.5877	2714.3361	2714.3361	1900.0352	1489.1479	2122.8516	6534.5127	6534.5127	4574.1589	5102.3983	5221.4393	3820.1767	3820.1767	2292.1060	3613.2504	3098.5877	0.0000	0.0000
	-99	64	1	3920.7076	3920.7076	2744.4953	3708.3360	3180.1295	2714.3361	2714.3361	1900.0352	1487.3800	2122.6802	6635.0437	6635.0437	4644.5306	5195.7160	5302.8097	3920.7076	3920.7076	2352.4246	3708.3360	3180.1295	0.0000	0.0000
	-100	65	1	4021.2386	4021.2386	2814.8670	3803.4215	3261.6713	2714.3361	2714.3361	1900.0352	1485.6115	2122.5087	6735.5746	6735.5746	4714.9023	5289.0330	5384.1800	4021.2386	4021.2386	2412.7432	3803.4215	3261.6713	0.0000	0.0000
	-101	66	1	4121.7696	4121.7696	2885.2387	3898.5070	3343.2131	2714.3361	2714.3361	1900.0352	1483.8424	2122.3371	6836.1056	6836.1056	4785.2739	5382.3494	5465.5502	4121.7696	4121.7696	2473.0617	3898.5070	3343.2131	0.0000	0.0000
	-102	67	1	4222.3005	4222.3005	2955.6104	3993.5926	3424.7549	2714.3361	2714.3361	1900.0352	1482.0726	2122.1655	6936.6366	6936.6366	4855.6456	5475.6652	5546.9204	4222.3005	4222.3005	2533.3803	3993.5926	3424.7549	0.0000	0.0000
	-103	68	1	4322.8315	4322.8315	3025.9820	4088.6781	3506.2967	2714.3361	2714.3361	1900.0352	1480.3023	2121.9939	7037.1675	7037.1675	4926.0173	5568.9804	5628.2905	4322.8315	4322.8315	2593.6989	4088.6781	3506.2967	0.0000	0.0000
	-104	69	1	4423.3625	4423.3625	3096.3537	4183.7637	3587.8384	2714.3361	2714.3361	1900.0352	1478.5314	2121.8221	7137.6985	7137.6985	4996.3890	5662.2950	5709.6606	4423.3625	4423.3625	2654.0175	4183.7637	3587.8384	0.0000	0.0000
	-105	70	1	4523.8934	4523.8934	3166.7254	4278.8492	3669.3802	2714.3361	2714.3361	1900.0352	1476.7599	2121.6504	7238.2295	7238.2295	5066.7606	5755.6091	5791.0306	4523.8934	4523.8934	2714.3361	4278.8492	3669.3802	0.0000	0.0000
	-106	71	1	4624.4244	4624.4244	3237.0971	4373.9347	3750.9220	2714.3361	2714.3361	1900.0352	1474.9879	2121.4785	7338.7604	7338.7604	5137.1323	5848.9227	5872.4005	4624.4244	4624.4244	2774.6546	4373.9347	3750.9220	0.0000	0.0000
	-107	72	1	4724.9554	4724.9554	3307.4687	4469.0203	3832.4638	2714.3361	2714.3361	1900.0352	1473.2155	2121.3066	7439.2914	7439.2914	5207.5040	5942.2357	5953.7704	4724.9554	4724.9554	2834.9732	4469.0203	3832.4638	0.0000	0.0000
	-108	73	1	4825.4863	4825.4863	3377.8404	4564.1058	3914.0056	2714.3361	2714.3361	1900.0352	1471.4425	2121.1347	7539.8224	7539.8224	5277.8757	6035.5483	6035.1403	4825.4863	4825.4863	2895.2918	4564.1058	3914.0056	0.0000	0.0000
	-109	74	1	4926.0173	4926.0173	3448.2121	4659.1913	3995.5474	2714.3361	2714.3361	1900.0352	1469.6691	2120.9628	7640.3533	7640.3533	5348.2473	6128.8605	6116.5101	4926.0173	4926.0173	2955.6104	4659.1913	3995.5474	0.0000	0.0000
	-110	75	1	5026.5482	5026.5482	3518.5838	4754.2769	4077.0891	2714.3361	2714.3361	1900.0352	1467.8953	2120.7908	7740.8843	7740.8843	5418.6190	6222.1722	6197.8799	5026.5482	5026.5482	3015.9289	4754.2769	4077.0891	0.0000	0.0000
	-111	76	1	5127.0792	5127.0792	3588.9554	4849.3624	4158.6309	2714.3361	2714.3361	1900.0352	1466.1210	2120.6187	7841.4153	7841.4153	5488.9907	6315.4834	6279.2496	5127.0792	5127.0792	3076.2475	4849.3624	4158.6309	0.0000	0.0000
	-112	77	1	5227.6102	5227.6102	3659.3271	4944.4480	4240.1727	2714.3361	2714.3361	1900.0352	1464.3463	2120.4466	7941.9462	7941.9462	5559.3624	6408.7943	6360.6193	5227.6102	5227.6102	3136.5661	4944.4480	4240.1727	0.0000	0.0000
	-113	78	1	5328.1411	5328.1411	3729.6988	5039.5335	4321.7145	2714.3361	2714.3361	1900.0352	1462.5713	2120.2745	8042.4772	8042.4772	5629.7340	6502.1048	6441.9890	5328.1411	5328.1411	3196.8847	5039.5335	4321.7145	0.0000	0.0000
	-114	79	1	5428.6721	5428.6721	3800.0705	5134.6190	4403.2563	2714.3361	2714.3361	1900.0352	1460.7958	2120.1023	8143.0082	8143.0082	5700.1057	6595.4149	6523.3586	5428.6721	5428.6721	3257.2033	5134.6190	4403.2563	0.0000	0.0000
	-115	80	1	5529.2031	5529.2031	3870.4421	5229.7046	4484.7980	2714.3361	2714.3361	1900.0352	1459.0200	2119.9301	8243.5391	8243.5391	5770.4774	6688.7246	6604.7282	5529.2031	5529.2031	3317.5218	5229.7046	4484.7980	0.0000	0.0000
	-116	81	1	5629.7340	5629.7340	3940.8138	5324.7901	4566.3398	2714.3361	2714.3361	1900.0352	1457.2439	2119.7579	8344.0701	8344.0701	5840.8491	6782.0340	6686.0977	5629.7340	5629.7340	3377.8404	5324.7901	4566.3398	0.0000	0.0000
	-117	82	1	5730.2650	5730.2650	4011.1855	5419.8756	4647.8816	2714.3361	2714.3361	1900.0352	1455.4674	2119.5856	8444.6011	8444.6011	5911.2207	6875.3430	6767.4672	5730.2650	5730.2650	3438.1590	5419.8756	4647.8816	0.0000	0.0000
	-118	83	1	5830.7960	5830.7960	4081.5572	5514.9612	4729.4234	2714.3361	2714.3361	1900.0352	1453.6905	2119.4133	8545.1320	8545.1320	5981.5924	6968.6517	6848.8367	5830.7960	5830.7960	3498.4776	5514.9612	4729.4234	0.0000	0.0000
	-119	84	1	5931.3269	5931.3269	4151.9289	5610.0467	4810.9652	2714.3361	2714.3361	1900.0352	1451.9134	2119.2410	8645.6630	8645.6630	6051.9641	7061.9601	6930.2062	5931.3269	5931.3269	3558.7962	5610.0467	4810.9652	0.0000	0.0000
	-120	85	1	6031.8579	6031.8579	4222.3005	5705.1323	4892.5070	2714.3361	2714.3361	1900.0352	1450.1360	2119.0686	8746.1939	8746.1939	6122.3358	7155.2682	7011.5756	6031.8579	6031.8579	3619.1147	5705.1323	4892.5070	0.0000	0.0000
	-121	86	1	6132.3889	6132.3889	4292.6722	5800.2178	4974.0487	2714.3361	2714.3361	1900.0352	1448.3582	2118.8962	8846.7249	8846.7249	6192.7074	7248.5760	7092.9450	6132.3889	6132.3889	3679.4333	5800.2178	4974.0487	0.0000	0.0000
	-122	87	1	6232.9198	6232.9198	4363.0439	5895.3033	5055.5905	2714.3361	2714.3361	1900.0352	1446.5802	2118.7238	8947.2559	8947.2559	6263.0791	7341.8835	7174.3144	6232.9198	6232.9198	3739.7519	5895.3033	5055.5905	0.0000	0.0000
	-123	88	1	6333.4508	6333.4508	4433.4156	5990.3889	5137.1323	2714.3361	2714.3361	1900.0352	1444.8019	2118.5514	9047.7868	9047.7868	6333.4508	7435.1908	7255.6837	6333.4508	6333.4508	3800.0705	5990.3889	5137.1323	0.0000	0.0000
	-124	89	1	6433.9818	6433.9818	4503.7872	6085.4744	5218.6741	2714.3361	2714.3361	1900.0352	1443.0233	2118.3789	9148.3178	9148.3178	6403.8225	7528.4978	7337.0530	6433.9818	6433.9818	3860.3891	6085.4744	5218.6741	0.0000	0.0000
	-125	90	1	6534.5127	6534.5127	4574.1589	6180.5599	5300.2159	2714.3361	2714.3361	1900.0352	1441.2445	2118.2064	9248.8488	9248.8488	6474.1941	7621.8045	7418.4223	6534.5127	6534.5127	3920.7076	6180.5599	5300.2159	0.0000	0.0000
	-126	91	1	6635.0437	6635.0437	4644.5306	6275.6455	5381.7577	2714.3361	2714.3361	1900.0352	1439.4655	2118.0339	9349.3797	9349.3797	6544.5658	7715.1109	7499.7916	6635.0437	6635.0437	3981.0262	6275.6455	5381.7577	0.0000	0.0000

-127	92	1	6735.5746	6735.5746	4714.9023	6370.7310	5463.2994	2714.3361	2714.3361	1900.0352	1437.6862	2117.8614	9449.9107	9449.9107	6614.9375	7808.4172	7581.1608	6735.5746	6735.5746	4041.3448	6370.7310	5463.2994	0.0000	0.0000
-128	93	1	6836.1056	6836.1056	4785.2739	6465.8166	5544.8412	2714.3361	2714.3361	1900.0352	1435.9066	2117.6888	9550.4417	9550.4417	6685.3092	7901.7232	7662.5300	6836.1056	6836.1056	4101.6634	6465.8166	5544.8412	0.0000	0.0000
-129	94	1	6936.6366	6936.6366	4855.6456	6560.9021	5626.3830	2714.3361	2714.3361	1900.0352	1434.1269	2117.5162	9650.9726	9650.9726	6755.6808	7995.0290	7743.8992	6936.6366	6936.6366	4161.9819	6560.9021	5626.3830	0.0000	0.0000
-130	95	1	7037.1675	7037.1675	4926.0173	6655.9876	5707.9248	2714.3361	2714.3361	1900.0352	1432.3469	2117.3436	9751.5036	9751.5036	6826.0525	8088.3345	7825.2684	7037.1675	7037.1675	4222.3005	6655.9876	5707.9248	0.0000	0.0000
-131	96	1	7137.6985	7137.6985	4996.3890	6751.0732	5789.4666	2714.3361	2714.3361	1900.0352	1430.5667	2117.1613	9852.0346	9852.0346	6896.4242	8181.6399	7906.6279	7137.6985	7137.6985	4282.6191	6751.0732	5789.4666	0.0000	0.0000
-132	97	1	7238.2295	7238.2295	5066.7606	6846.1587	5871.0084	2714.3361	2714.3361	1900.0352	1428.7863	2116.8376	9952.5655	9952.5655	6966.7959	8274.9450	7987.8459	7238.2295	7238.2295	4342.9377	6846.1587	5871.0084	0.0000	0.0000
-133	98	1	7338.7604	7338.7604	5137.1323	6941.2442	5952.5501	2714.3361	2714.3361	1900.0352	1427.0057	2116.5138	10053.0965	10053.0965	7037.1675	8368.2499	8069.0640	7338.7604	7338.7604	4403.2563	6941.2442	5952.5501	0.0000	0.0000
-134	99	1	7439.2914	7439.2914	5207.5040	7036.3298	6034.0919	2714.3361	2714.3361	1900.0352	1425.2249	2116.1900	10153.6275	10153.6275	7107.5392	8461.5547	8150.2820	7439.2914	7439.2914	4463.5748	7036.3298	6034.0919	0.0000	0.0000
-135	100	1	7539.8224	7539.8224	5277.8757	7131.4153	6115.6337	2714.3361	2714.3361	1900.0352	1423.4439	2115.8662	10254.1584	10254.1584	7177.9109	8554.8592	8231.4999	7539.8224	7539.8224	4523.8934	7131.4153	6115.6337	0.0000	0.0000
-136	101	1	7640.3533	7640.3533	5348.2473	7226.5009	6197.1755	2714.3361	2714.3361	1900.0352	1421.6627	2115.5424	10354.6894	10354.6894	7248.2826	8648.1636	8312.7179	7640.3533	7640.3533	4584.2120	7226.5009	6197.1755	0.0000	0.0000
-137	102	1	7740.8843	7740.8843	5418.6190	7321.5864	6278.7173	2714.3361	2714.3361	1900.0352	1419.8814	2115.2185	10455.2204	10455.2204	7318.6542	8741.4678	8393.9358	7740.8843	7740.8843	4644.5306	7321.5864	6278.7173	0.0000	0.0000
-138	103	1	7841.4153	7841.4153	5488.9907	7416.6719	6360.2590	2714.3361	2714.3361	1900.0352	1418.0999	2114.8946	10555.7513	10555.7513	7389.0259	8834.7718	8475.1536	7841.4153	7841.4153	4704.8492	7416.6719	6360.2590	0.0000	0.0000
-139	104	1	7941.9462	7941.9462	5559.3624	7511.7575	6441.8008	2714.3361	2714.3361	1900.0352	1416.3182	2114.5707	10656.2823	10656.2823	7459.3976	8928.0757	8556.3715	7941.9462	7941.9462	4765.1677	7511.7575	6441.8008	0.0000	0.0000
-140	105	1	8042.4772	8042.4772	5629.7340	7606.8430	6523.3426	2714.3361	2714.3361	1900.0352	1414.5364	2114.2467	10756.8132	10756.8132	7529.7693	9021.3794	8637.5893	8042.4772	8042.4772	4825.4863	7606.8430	6523.3426	0.0000	0.0000
-141	106	1	8143.0082	8143.0082	5700.1057	7701.9285	6604.8844	2714.3361	2714.3361	1900.0352	1412.7544	2113.9227	10857.3442	10857.3442	7600.1409	9114.6829	8718.8071	8143.0082	8143.0082	4885.8049	7701.9285	6604.8844	0.0000	0.0000
-142	107	1	8243.5391	8243.5391	5770.4774	7797.0141	6686.4262	2714.3361	2714.3361	1900.0352	1410.9722	2113.5987	10957.8752	10957.8752	7670.5126	9207.9863	8800.0248	8243.5391	8243.5391	4946.1235	7797.0141	6686.4262	0.0000	0.0000
-143	108	1	8344.0701	8344.0701	5840.8491	7892.0996	6767.9680	2714.3361	2714.3361	1900.0352	1409.1899	2113.2746	11058.4061	11058.4061	7740.8843	9301.2896	8881.2426	8344.0701	8344.0701	5006.4421	7892.0996	6767.9680	0.0000	0.0000
-144	109	1	8444.6011	8444.6011	5911.2207	7987.1852	6849.5097	2714.3361	2714.3361	1900.0352	1407.4075	2112.9505	11158.9371	11158.9371	7811.2560	9394.5926	8962.4603	8444.6011	8444.6011	5066.7606	7987.1852	6849.5097	0.0000	0.0000
-145	110	1	8545.1320	8545.1320	5981.5924	8082.2707	6931.0515	2714.3361	2714.3361	1900.0352	1405.6249	2112.6264	11259.4681	11259.4681	7881.6276	9487.8956	9043.6779	8545.1320	8545.1320	5127.0792	8082.2707	6931.0515	0.0000	0.0000
-146	111	1	8645.6630	8645.6630	6051.9641	8177.3562	7012.5933	2714.3361	2714.3361	1900.0352	1403.8422	2112.3023	11359.9990	11359.9990	7951.9993	9581.1984	9124.8956	8645.6630	8645.6630	5187.3978	8177.3562	7012.5933	0.0000	0.0000
-147	112	1	8746.1939	8746.1939	6122.3358	8272.4418	7094.1351	2714.3361	2714.3361	1900.0352	1402.0593	2111.9781	11460.5300	11460.5300	8022.3710	9674.5011	9206.1132	8746.1939	8746.1939	5247.7164	8272.4418	7094.1351	0.0000	0.0000
-148	113	1	8846.7249	8846.7249	6192.7074	8367.5273	7175.6769	2714.3361	2714.3361	1900.0352	1400.2763	2111.6539	11561.0610	11561.0610	8092.7427	9767.8036	9287.3308	8846.7249	8846.7249	5308.0349	8367.5273	7175.6769	0.0000	0.0000
-149	114	1	8947.2559	8947.2559	6263.0791	8462.6129	7257.2187	2714.3361	2714.3361	1900.0352	1398.4932	2111.3297	11661.5919	11661.5919	8163.1144	9861.1060	9368.5484	8947.2559	8947.2559	5368.3535	8462.6129	7257.2187	0.0000	0.0000
-150	115	1	9047.7868	9047.7868	6333.4508	8557.6984	7338.7604	2714.3361	2714.3361	1900.0352	1396.7100	2111.0055	11762.1229	11762.1229	8233.4860	9954.4083	9449.7660	9047.7868	9047.7868	5428.6721	8557.6984	7338.7604	0.0000	0.0000
-151	116	1	9148.3178	9148.3178	6403.8225	8652.7839	7420.3022	2714.3361	2714.3361	1900.0352	1394.9266	2110.6813	11862.6539	11862.6539	8303.8577	10047.7105	9530.9835	9148.3178	9148.3178	5488.9907	8652.7839	7420.3022	0.0000	0.0000
-152	117	1	9248.8488	9248.8488	6474.1941	8747.8695	7501.8440	2714.3361	2714.3361	1900.0352	1393.1431	2110.3570	11963.1848	11963.1848	8374.2294	10141.0126	9612.2010	9248.8488	9248.8488	5549.3093	8747.8695	7501.8440	0.0000	0.0000
-153	118	1	9349.3797	9349.3797	6544.5658	8842.9550	7583.3858	2714.3361	2714.3361	1900.0352	1391.3595	2110.0327	12063.7158	12063.7158	8444.6011	10234.3145	9693.4185	9349.3797	9349.3797	5609.6278	8842.9550	7583.3858	0.0000	0.0000
-154	119	1	9449.9107	9449.9107	6614.9375	8938.0405	7664.9276	2714.3361	2714.3361	1900.0352	1389.5758	2109.7084	12164.2468	12164.2468	8514.9727	10327.6164	9774.6360	9449.9107	9449.9107	5669.9464	8938.0405	7664.9276	0.0000	0.0000
-155	120	1	9550.4417	9550.4417	6685.3092	9033.1261	7746.4694	2714.3361	2714.3361	1900.0352	1387.7920	2109.3841	12264.7777	12264.7777	8585.3444	10420.9181	9855.8534	9550.4417	9550.4417	5730.2650	9033.1261	7746.4694	0.0000	0.0000
-156	121	1	9650.9726	9650.9726	6755.6808	9128.2116	7828.0111	2714.3361	2714.3361	1900.0352	1386.0081	2109.0597	12365.3087	12365.3087	8655.7161	10514.2197	9937.0709	9650.9726	9650.9726	5790.5836	9128.2116	7828.0111	0.0000	0.0000
-157	122	1	9751.5036	9751.5036	6826.0525	9223.2972	7909.5529	2714.3361	2714.3361	1900.0352	1384.2241	2108.7353	12465.8396	12465.8396	8726.0878	10607.5212	10018.2883	9751.5036	9751.5036	5850.9022	9223.2972	7909.5529	0.0000	0.0000
-158	123	1	9852.0346	9852.0346	6896.4242	9318.3827	7991.0947	2714.3361	2714.3361	1900.0352	1382.4399	2108.4110	12566.3706	12566.3706	8796.4594	10700.8226	10099.5057	9852.0346	9852.0346	5911.2207	9318.3827	7991.0947	0.0000	0.0000
-159	124	1	9952.5655	9952.5655	6966.7959	9413.4682	8072.6365	2714.3361	2714.3361	1900.0352	1380.6557	2108.0866	12666.9016	12666.9016	8866.8311	10794.1239	10180.7230	9952.5655	9952.5655	5971.5393	9413.4682	8072.6365	0.0000	0.0000
-160	125	1	10053.0965	10053.0965	7037.1675	9508.5538	8154.1783	2714.3361	2714.3361	1900.0352	1378.8714	2107.7621	12767.4325	12767.4325	8937.2028	10887.4251	10261.9404	10053.0965	10053.0965	6031.8579	9508.5538	8154.1783	0.0000	0.0000
-161	126	1	10153.6275	10153.6275	7107.5392	9603.6393	8235.7200	2714.3361	2714.3361	1900.0352	1377.0870	2107.4377	12867.9635	12867.9635	9007.5745	10980.7263	10343.1577	10153.6275	10153.6275	6092.1765	9603.6393	8235.7200	0.0000	0.0000
-162	127	1	10254.1584	10254.1584	7177.9109	9698.7248	8317.2618	2714.3361	2714.3361	1900.0352	1375.3025	2107.1132	12968.4945	12968.4945	9077.9461	11074.0273	10424.3751	10254.1584	10254.1584	6152.4951	9698.7248	8317.2618	0.0000	0.0000
-163	128	1	10354.6894	10354.6894	7248.2826	9793.8104	8398.8036	2714.3361	2714.3361	1900.0352	1373.5179	2106.7888	13069.0254	13069.0254	9148.3178	11167.3282	10505.5924	10354.6894	10354.6894	6212.8136	9793.8104	8398.8036	0.0000	0.0000
-164	129	1	10455.2204	10455.2204	7318.6542	9888.8959	8480.3454	2714.3361	2714.3361	1900.0352	1371.7332	2106.4643	13169.5564	13169.5564	9218.6895	11260.6291	10586.8097	10455.2204	10455.2204	6273.1322	9888.8959	8480.3454	0.0000	0.0000
-165	130	1	10555.7513	10555.7513	7389.0259	9983.9815	8561.8872	2714.3361	2714.3361	1900.0352	1369.9484	2106.1398	13270.0874	13270.0874	9289.0612	11353.9298	10668.0270	10555.7513	10555.7513	6333.4508	9983.9815	8561.8872	0.0000	0.0000
-166	131	1	10656.2823	10656.2823	7459.3976	10079.0670	8643.4290	2714.3361	2714.3361	1900.0352	1368.1635	2105.8153	13370.6183	13370.6183	9359.4328	11447.2305	10749.2442	10656.2823	10656.2823	6393.7694	10079.0670	8643.4290	0.0000	0.0000
-167	132	1	10756.8132	10756.8132	7529.7693	10174.1525	8724.9707	2714.3361	2714.3361	1900.0352	1366.3786	2105.4907	13471.1493	13471.1493	9429.8045	11540.5311	10830.4615	10756.8132	10756.8132	6454.0879	10174.1525	8724.9707	0.0000	0.0000
-168	133	1	10857.3442	10857.3442	7600.1409	10269.2381	8806.5125	2714.3361	2714.3361	1900.0352	1364.5936	2105.1662	13571.6803	13571.6803	9500.1762	11633.8316	10911.6787	10857.3442	10857.3442	6514.4065	10269.2381	8806.5125	0.0000	0.0000
-169	134	1	10957.8752	10957.8752	7670.5126	10364.3236	8888.0543	2714.3361	2714.3361	1900.0352	1362.8085	2104.8416	13672.2112	13672.2112	9570.5479	11727.1321	10992.8959	10957.8752	10957.8752	6574.7251	10364.3236	8888.0543	0.0000	0.0000
-170	135	1	11058.4061	11058.4061	7740.8843	10459.4091	8969.5961	2714.3361	2714.3361	1900.0352	1361.0233	2104.5170	13772.7422	13772.7422	9640.9195	11820.4324	11074.1131	11058.4061	11058.4061	6635.0437	10459.4091	8969.5961	0.0000	0.0000
-171	136	1	11158.9371	11158.9371	7811.2560	10554.4947	9051.1379	2714.3361	2714.3361	1900.0352	1359.2380	2104.1924	13873.2732	13873.2732	9711.2912	11913.7327	11155.3303	11158.9371	11158.9371	6695.3623	10554.4947	9051.1379	0.0000	0.0000
-172	137	1	11259.4681	11259.4681	7881.6276	10649.5802	9132.6797	2714.3361	2714.3361	1900.0352	1357.4527	2103.8678	13973.8041	13973.8041	9781.6629	12007.0329	11236.5475	11259.4681	11259.4681	6755.6808	10649.5802	9132.6797	0.0000	0.0000
-173	138	1	11359.9990	11359.9990	7951.9993	10744.6658	9214.2214	2714.3361	2714.3361	1900.0352	1355.6673	2103.5432	14074.3351	14074.3351	9852.0346	12100.3331	11317.7647	11359.9990	11359.9990	6815.9994	10744.6658	9214.2214	0.0000	0.0000
-174	139	1	11460.5300	11460.5300	8022.3710	10839.7513	9295.7632	2714.3361	2714.3361	1900.0352	1353.8819	2103.2186	14174.8661	14174.8661	9922.4062	12193.6332	11398.9818	11460.5300	11460.5300	6876.3180	10839.7513	9295.7632	0.0000	0.0000
-175	140	1	11561.0610	11561.0610	8092.7427	10934.8368	9377.3050	2714.3361	2714.3361	1900.0352	1352.0963	2102.8939	14275.3970	14275.3970	9992.7779	12286.9332	11480.1989	11561.0610	11561.0610	6936.6366	10934.8368	9377.3050	0.0000	0.0000
-176	141	1	11661.5919	11661.5919	8163.1144	11029.9224	9458.8468	2714.3361	2714.3361	1900.0352	1350.3107	2102.5693	14375.9280	14375.9280	10063.1496	12380.2331	11561.4161	11661.5919	11661.5919	6996.9552	11029.9224	9458.8468	0.0000	0.0000
-177	142	1	11762.1229	11762.1229	8233.4860	11125.0079	9540.3886	2714.3361	2714.3361	1900.0352	1348.5250	2102.2446	14476.4589	14476.4589	10133.5213	12473.5330	11642.6332	11762.1229	11762.1229	7057.2737	11125.0079	9540.3886	0.0000	0.0000
-178	143	1	11862.6539	11862.6539	8303.8577	11220.0934	9621.9304	2714.3361	2714.3361	1900.0352	1346.7393	2101.9199	14576.9899	14576.9899	10203.8929	12566.8328	11723.8503	11862.6539	11862.6539	7117.5923	11220.0934	9621.9304	0.0000	0.0000
-179	144	1	11963.1848	11963.1848	8374.2294	11315.1790	9703.4721	2714.3361	2714.3361	1900.0352	1344.9535	2101.5953	14677.5209	14677.5209	10274.2646	12660.1325	11805.0674	11963.1848	11963.1848	7177.9109	11315.1790	9703.4721	0.0000	0.0000
-180	145	1	12063.7158	12063.7158	8444.6011	11410.2645	9785.0139	2714.3361	2714.3361	1900.0352	1343.1677	2101.2706	14778.0518	14778.0518	10344.6363	12753.4322	11886.2845	12063.7158	12063.7158	7238.2295	11410.2645	9785.0139	0.0000	0.0000
-181	146	1	12164.2468	12164.2468	8514.9727	11505.3501	9866.5557	2714.3361	2714.3361	1900.0352	1341.3817	2100.9458	14878.5828	14878.5828	10415.0080	12846.7318	11967.5015	12164.2468	12164.2468	7298.5481	11505.3501	9866.5557	0.0000	0.0000
-182	147	1	12264.7777	12264.7777	8585.3444	11600.4356	9948.0975	2714.3361	2714.3361	1900.0352	1339.5958	2100.6211	14979.1138	14979.1138	10485.3796	12940.0313	12048.7186	12264.7777	12264.7777	7358.8666	11600.4356	9948.0975	0.0000	0.0000
-183	148	1	12365.3087	12365.3087	8655.7161	11695.5211	10029.6393	2714.3361	2714.3361	1900.0352	1337.8097	2100.2964	15079.6447	15079.6447	10555.7513	13033.3308	12129.9356	12365.3087	12365.3087	7419.1852	11695.5211	10029.6393	0.0000	0.0000
-184	149	1	12465.8396	12465.8396	8726.0878	11790.6067	10111.1810	2714.3361	2714.3361	1900.0352	1336.0236	2099.9716	15180.1757	15180.1757	10626.1230	13126.6303	12211.1527	12465.8396	12465.8396	7479.5038	11790.6067	10111.1810	0.0000	0.0000
-185	150	1	12566.3706	12566.3706	8796.4594	11885.6922	10192.7228	2714.3361	2714.3361	1900.0352	1334.2375	2099.6469	15280.7067	15280.7067	10696.4947	13219.9297	12292.3697	12566.3706	12566.3706	7539.8224	11885.6922	10192.7228	0.0000	0.0000
-186	151	1	12666.9016	12666.9016	8866.8311	11980.7777	10274.2646	2714.3361	2714.3361	1900.0352	1332.4513	2099.3221	15381.2376	15381.2376	10766.8663	13313.2290	12373.5867	12666.9016	12666.9016	7600.1409	11980.7777	10274.2646	0.0000	0.0000
-187	152	1	12767.4325	12767.4325	8937.2028	12075.8633	10355.8064	2714.3361	2714.3361	1900.0352	1330.6650	2098.9973	15481.7686	15481.7686	10837.2380	13406.5283	12454.8037	12767.4325	12767.4325	7660.4595	12075.8633	10355.8064	0.0000	0.0000
-188	153	1	12867.9635	12867.9635	9007.5745	12170.9488	10437.3482	2714.3361	2714.3361	1900.0352	1328.8787	2098.6726	15582.2996	15582.2996	10907.6097	13499.8275	12536.0207	12867.9635	12867.9635	7720.7781	12170.9488	10437.3482	0.0000	0.0000
-189	154	1	12968.4945	12968.4945	9077.9461	12266.0344	10518.8900	2714.3361	2714.3361	1900.0352	1327.0923	2098.3478	15682.8305	15682.8305	10977.9814	13593.1267	12617.2377	12968.4945	12968.4945	7781.0967	12266.0344	10518.8900	0.0000	0.0000
-190	155	1	13069.0254	13069.0254	9148.3178	12361.1199	10600.4317	2714.3361	2714.3361	1900.0352	1325.3059	2098.0230	15783.3615	15783.3615	11048.3530	13686.4258	12698.4547	13069.0254	13069.0254	7841.4153	12361.1199	10600.4317	0.0000	0.0000
-191	156	1	13169.5564	13169.5564	9218.6895	12456.2054	10681.9735	2714.3361	2714.3361	1900.0352	1323.5194	2097.6981	15883.8925	15883.8925	11118.7247	13779.7249	12779.6717	13169.5564	13169.5564	7901.7338	12456.2054	10681.9735	0.0000	0.0000
-192	157	1	13270.0874	13270.0874	9289.0612	12551.2910	10763.5153	2714.3361	2714.3361	1900.0352	1321.7329	2097.3733	15984.4234	15984.4234	11189.0964	13873.0239	12860.8886	13270.0874	13270.0874	7962.0524	12551.2910	10763.5153	0.0000	0.0000
-193	158	1	13370.6183	13370.6183	9359.4328	12646.3765	10845.0571	2714.3361	2714.3361	1900.0352	1319.9464	2097.0485	16084.9544	16084.9544	11259.4681	13966.3229	12942.1056	13370.6183	13370.6183	8022.3710	12646.3765	10845.0571	0.0000	0.0000
-194	159	1	13471.1493	13471.1493	9429.8045	12741.4620	10926.5989	2714.3361	2714.3361	1900.0352	1318.1597	2096.7237	16185.4854	16185.4854	11329.8397	14059.6218	13023.3225	13471.1493	13471.1493	8082.6896	12741.4620	10926.5989	0.0000	0.0000
-195	160	1	13571.6803	13571.6803	9500.1762	12836.5476	11008.1407	2714.3361	2714.3361	1900.0352	1316.3731	2096.3988	16286.0163	16286.0163	11400.2114	14152.9207	13104.5395	13571.6803	13571.6803	8143.0082	12836.5476	11008.1407	0.0000	0.0000
-196	161	1	13672.2112	13672.2112	9570.5479	12931.6331	11089.6824	2714.3361	2714.3361	1900.0352	1314.5864	2096.0740	16386.5473	16386.5473	11470.5831	14246.2195	13185.7564	13672.2112	13672.2112	8203.3267	12931.6331	11089.6824	0.0000	0.0000
-197	162	1	13772.7422	13772.7422	9640.9195	13026.7187	11171.2242	2714.3361	2714.3361	1900.0352	1312.7996	2095.7491	16487.0782	16487.0782	11540.9548	14339.5183	13266.9733	13772.7422	13772.7422	8263.6453	13026.7187	11171.2242	0.0000	0.0000
-198	163	1	13873.2732	13873.2732	9711.2912	13121.8042	11252.7660	2714.3361	2714.3361	1900.0352	1311.0128	2095.4242	16587.6092	16587.6092	11611.3264	14432.8170	13348.1902	13873.2732	13873.2732	8323.9639	13121.8042	11252.7660	0.0000	0.0000
-199	164	1	13973.8041	13973.8041	9781.6629	13216.8897	11334.3078	2714.3361	2714.3361	1900.0352	1309.2260	2095.0993	16688.1402	16688.1402	11681.6981	14526.1157	13429.4071	13973.8041	13973.8041	8384.2825	13216.8897	11334.3078	0.0000	0.0000
-200	165	1	14074.3351	14074.3351	9852.0346	13311.9753	11415.8496	2714.3361	2714.3361	1900.0352	1307.4391	2094.7745	16788.6711	16788.6711	11752.0698	14619.4144	13510.6240	14074.3351	14074.3351	8444.6011	13311.9753	11415.8496	0.0000	0.0000

APPENDIX F
Lateral Response Analyses

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LPile Plus for Windows, Version 2013-07.007

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

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Files Used for Analysis

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Path to file locations: Z:\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis\L-Pile\$Point of Fixity Runs (Report)\West Abutment\Longitudinal\Post Seismic (No Scour)\
Name of input data file: West Abutment.lp7d
Name of output report file: West Abutment.lp7o
Name of plot output file: West Abutment.lp7p
Name of runtime messeage file: West Abutment.lp7r

--
Date and Time of Analysis

--

Date: October 5, 2017 Time: 9:49:27

--
Problem Title

--

Project Name: SR 21 Harbor River Bridge
Job Number:
Client:
Engineer:
Description:

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--
                            Program Options and Settings
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--

Engineering Units of Input Data and Computations:
 - Engineering units are US Customary Units (pounds, feet, inches)

Analysis Control Options:
- Maximum number of iterations allowed                  =          750
- Deflection tolerance for convergence                  =   1.0000E-05 in
- Maximum allowable deflection                          =     100.0000 in
- Number of pile increments                             =          100

Loading Type and Number of Cycles of Loading:
 - Static loading specified

Computational Options:
 - Use unfactored loads in computations (conventional analysis)
 - Compute pile response under loading and nonlinear bending properties of
 pile
   (only if nonlinear pile properties are input)
 - Analysis uses p-y modification factors for p-y curves
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Computation of pile-head foundation stiffness matrix not selected
 - Push-over analysis of pile not selected
 - Buckling analysis of pile not selected

Output Options:
 - No p-y curves to be computed and reported for user-specified depths
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1


--------------------------------------------------------------------------------
--
                     Pile Structural Properties and Geometry
--------------------------------------------------------------------------------
--

Total number of pile sections                           =          1

Total length of pile                                    =     200.00 ft

Depth of ground surface below top of pile               =       0.00 ft

Pile diameter values used for p-y curve computations are defined using 2
points.

p-y curves are computed using pile diameter values interpolated with depth
over
the length of the pile.

Point         Depth              Pile
                X              Diameter
                ft                in
-----       ---------        -----------
  1           0.00000         14.2000000
  2         200.000000        14.2000000
```

Input Structural Properties:

Pile Section No. 1:

Section Type	=	Elastic with Specified Moment Capacity
Cross-sectional Shape	=	Weak H-Pile
Section Length	=	200.00000 ft
Flange Width	=	14.90000 in
Section Depth	=	14.20000 in
Flange Thickness	=	0.80500 in
Web Thickness	=	0.80500 in
Section Area	=	34.12395 Sq. in
Moment of Inertia	=	444.36380 in^4
Elastic Modulus	=	29000000. lbs/in^2
Plastic Moment Capacity	=	2975000. in-lb
Top Elastic Bending Stiffness	=	1.2887E+10 lbs-in^2
Bot Elastic Bending Stiffness	=	1.2887E+10 lbs-in^2

--
Ground Slope and Pile Batter Angles

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Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

--
Soil and Rock Layering Information

--

The soil profile is modelled using 6 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	0.0000 ft
Distance from top of pile to bottom of layer	=	3.00000 ft
Effective unit weight at top of layer	=	100.00000 pcf
Effective unit weight at bottom of layer	=	100.00000 pcf
Friction angle at top of layer	=	30.00000 deg.
Friction angle at bottom of layer	=	30.00000 deg.
Subgrade k at top of layer	=	25.00000 pci
Subgrade k at bottom of layer	=	25.00000 pci

Layer 2 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	3.00000 ft
Distance from top of pile to bottom of layer	=	6.00000 ft
Effective unit weight at top of layer	=	37.60000 pcf
Effective unit weight at bottom of layer	=	37.60000 pcf
Undrained cohesion at top of layer	=	24.00000 psf

```
   Undrained cohesion at bottom of layer              =     33.00000 psf
   Epsilon-50 at top of layer                         =      0.02000
   Epsilon-50 at bottom of layer                      =      0.02000


Layer 3 is soft clay, p-y criteria by Matlock, 1970

   Distance from top of pile to top of layer          =      6.00000 ft
   Distance from top of pile to bottom of layer       =     36.00000 ft
   Effective unit weight at top of layer              =     32.60000 pcf
   Effective unit weight at bottom of layer           =     32.60000 pcf
   Undrained cohesion at top of layer                 =    149.00000 psf
   Undrained cohesion at bottom of layer              =    501.00000 psf
   Epsilon-50 at top of layer                         =      0.02000
   Epsilon-50 at bottom of layer                      =      0.02000


Layer 4 is soft clay, p-y criteria by Matlock, 1970

   Distance from top of pile to top of layer          =     36.00000 ft
   Distance from top of pile to bottom of layer       =     53.00000 ft
   Effective unit weight at top of layer              =     37.60000 pcf
   Effective unit weight at bottom of layer           =     37.60000 pcf
   Undrained cohesion at top of layer                 =    111.00000 psf
   Undrained cohesion at bottom of layer              =    162.00000 psf
   Epsilon-50 at top of layer                         =      0.02000
   Epsilon-50 at bottom of layer                      =      0.02000


Layer 5 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer          =     53.00000 ft
   Distance from top of pile to bottom of layer       =     75.00000 ft
   Effective unit weight at top of layer              =     57.60000 pcf
   Effective unit weight at bottom of layer           =     57.60000 pcf
   Undrained cohesion at top of layer                 =   3400.00000 psf
   Undrained cohesion at bottom of layer              =   3400.00000 psf
   Epsilon-50 at top of layer                         =      0.00500
   Epsilon-50 at bottom of layer                      =      0.00500
   Subgrade k at top of layer                         =    400.00000 pci
   Subgrade k at bottom of layer                      =    400.00000 pci


Layer 6 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer          =     75.00000 ft
   Distance from top of pile to bottom of layer       =    200.00000 ft
   Effective unit weight at top of layer              =     57.60000 pcf
   Effective unit weight at bottom of layer           =     57.60000 pcf
   Undrained cohesion at top of layer                 =   6000.00000 psf
   Undrained cohesion at bottom of layer              =   6000.00000 psf
   Epsilon-50 at top of layer                         =      0.00500
   Epsilon-50 at bottom of layer                      =      0.00500
   Subgrade k at top of layer                         =   2000.00000 pci
   Subgrade k at bottom of layer                      =   2000.00000 pci


   (Depth of lowest soil layer extends    0.00 ft below pile tip)


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--
```

Summary of Soil Properties

Layer Num.	Soil Type (p-y Curve Criteria)	Layer Undrained Cohesion	Angle of Friction deg.	Factor Epsilon 50	Layer Strain kpy pci	Depth ft	Effective Unit Wt. pcf	psf
1	Sand (Reese, et al.)					0.00	100.000	--
			30.000	--	25.000			
						3.000	100.000	--
						30.000	--	
						25.000		
2	Soft Clay					3.000	37.600	
			24.000	--	0.02000	--		
						6.000	37.600	
						33.000	--	
						0.02000	--	
3	Soft Clay					6.000	32.600	
			149.000	--	0.02000	--		
						36.000	32.600	
						501.000	--	
						0.02000	--	
4	Soft Clay					36.000	37.600	
			111.000	--	0.02000	--		
						53.000	37.600	
						162.000	--	
						0.02000	--	
5	Stiff Clay with Free Water					53.000	57.600	
			3400.000	--	0.00500	400.000		
						75.000	57.600	
						3400.000	--	
						0.00500	400.000	
6	Stiff Clay with Free Water					75.000	57.600	
			6000.000	--	0.00500	2000.000		
						200.000	57.600	
						6000.000	--	
						0.00500	2000.000	

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 10 points

Point No.	Depth X ft	p-mult	y-mult
1	0.000	1.0000	1.0000
2	3.000	1.0000	1.0000
3	3.000	0.1000	1.0000
4	6.000	0.1000	1.0000
5	6.000	1.0000	1.0000
6	36.000	1.0000	1.0000
7	36.000	0.1000	1.0000

```
  8           53.000         0.1000         1.0000
  9           53.000         1.0000         1.0000
 10          210.000         1.0000         1.0000


--------------------------------------------------------------------------------
--
                                  Loading Type
--------------------------------------------------------------------------------
--

Static loading criteria were used when computing p-y curves for all analyses.


--------------------------------------------------------------------------------
--
               Pile-head Loading and Pile-head Fixity Conditions
--------------------------------------------------------------------------------
--

Number of loads specified = 7

Load    Load         Condition               Condition            Axial Thrust
Compute
 No.    Type             1                       2                 Force, lbs
 Top y vs. Pile Length
-----   ----   --------------------   -----------------------
----------------   ---------------------
   1     5     y =      0.50000 in    S =       0.0000 in/in
   255000.             No
   2     5     y =      1.00000 in    S =       0.0000 in/in
   255000.             No
   3     5     y =      2.00000 in    S =       0.0000 in/in
   255000.             No
   4     5     y =      3.00000 in    S =       0.0000 in/in
   255000.             No
   5     5     y =      4.00000 in    S =       0.0000 in/in
   255000.             No
   6     5     y =      5.00000 in    S =       0.0000 in/in
   255000.             No
   7     5     y =      6.00000 in    S =       0.0000 in/in
   255000.             No

V = perpendicular shear force applied to pile head
M = bending moment applied to pile head
y = lateral deflection relative to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applie to pile head
Axial thrust is assumed to be acting axially for all pile batter angles.


--------------------------------------------------------------------------------
--
    Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness
--------------------------------------------------------------------------------
--

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1
```

Pile Section No. 1:

Moment-curvature properties were derived from elastic-plastic section properties

---
--
Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 255000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.5000	-834538.	13544.	0.000	20807.	1.289E+10	0.000	0.000	0.000
2.000	0.4813	-557423.	9153.0697	-0.001296	16379.	1.289E+10	-182.9353	9121.1311	0.000
4.000	0.4378	-379326.	6945.6088	-0.002169	13534.	1.289E+10	-1.0198	55.9056	0.000
6.000	0.3773	-197492.	6540.8870	-0.002706	10628.	1.289E+10	-32.7070	2080.7065	0.000
8.000	0.3079	-32246.	5453.2477	-0.002920	7987.9817	1.289E+10	-57.9296	4515.2855	0.000
10.000	0.2371	100000.	4034.2126	-0.002856	9070.5427	1.289E+10	-60.3234	6105.5656	0.000
12.000	0.1708	196359.	2583.7211	-0.002581	10610.	1.289E+10	-60.5509	8508.2877	0.000
14.000	0.1133	255604.	1155.7197	-0.002160	11557.	1.289E+10	-58.4492	12386.	0.000
16.000	0.0671	278268.	-191.8008	-0.001662	11919.	1.289E+10	-53.8442	19248.	0.000
18.000	0.0335	266746.	-1395.3329	-0.001155	11735.	1.289E+10	-46.4501	33320.	0.000
20.000	0.0117	225429.	-2377.2276	-0.000697	11075.	1.289E+10	-35.3744	72567.	0.000
22.000	1.762E-05	161166.	-2852.5122	-0.000337	10048.	1.289E+10	-4.2326	5766676.	0.000
24.000	-0.004460	92629.	-2549.2859	-0.000100	8952.7747	1.289E+10	29.5015	158739.	0.000
26.000	-0.004798	40029.	-1808.8528	2.320E-05	8112.3320	1.289E+10	32.2013	161072.	0.000
28.000	-0.003347	5520.0685	-1058.6774	6.562E-05	7560.9565	1.289E+10	30.3133	217395.	0.000
30.000	-0.001648	-11591.	-390.8563	5.997E-05	7657.9573	1.289E+10	25.3384	368943.	0.000
32.000	-0.000468	-13975.	124.5402	3.616E-05	7696.0490	1.289E+10	17.6113	902901.	0.000
34.000	8.738E-05	-6055.6683	210.8956	1.751E-05	7569.5143	1.289E+10			

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-10.4150   2860581.      0.000
36.000   0.000372 -4066.3268    72.7754  8.081E-06  7537.7288  1.289E+10
-1.0950     70606.      0.000
38.000   0.000475 -2661.3649    54.1719  1.817E-06  7515.2804  1.289E+10
-0.4553     22990.      0.000
40.000   0.000459 -1488.3109    43.0171 -2.048E-06  7496.5375  1.289E+10
-0.4743     24777.      0.000
42.000   0.000377  -571.4826    31.7210 -3.966E-06  7481.8885  1.289E+10
-0.4671     29733.      0.000
44.000   0.000269    82.8377    20.8526 -4.421E-06  7474.0810  1.289E+10
-0.4386     39128.      0.000
46.000   0.000165   483.5544    10.8886 -3.893E-06  7480.4836  1.289E+10
-0.3917     57041.      0.000
48.000  8.217E-05   653.1445     2.2577 -2.835E-06  7483.1933  1.289E+10
-0.3275     95668.      0.000
50.000  2.873E-05   626.6229    -4.6217 -1.643E-06  7482.7695  1.289E+10
-0.2457    205268.      0.000
52.000  3.301E-06   451.4152   -10.3975 -6.392E-07  7479.9701  1.289E+10
-0.2356   1712775.      0.000
54.000 -1.952E-06   135.3677    -9.3735 -9.283E-08  7474.9203  1.289E+10
0.3209   3945321.      0.000
56.000 -1.155E-06     2.6247    -3.1115  3.567E-08  7472.7993  1.289E+10
0.2009   4175721.      0.000
58.000 -2.400E-07   -14.4209    -0.1717  2.469E-08  7472.9878  1.289E+10
0.0441   4406121.      0.000
60.000  3.012E-08    -5.9193     0.2873  5.744E-09  7472.8520  1.289E+10
-0.005818   4636521.      0.000
62.000  3.568E-08    -0.7015     0.1306 -4.212E-10  7472.7686  1.289E+10
-0.007236   4866921.      0.000
64.000  9.898E-09     0.3563     0.0186 -7.426E-10  7472.7631  1.289E+10
-0.002102   5097321.      0.000
66.000  3.770E-11     0.1992  -0.006752 -2.253E-10  7472.7606  1.289E+10
-8.369E-06   5327721.      0.000
68.000 -9.189E-10     0.0350  -0.004298 -7.287E-12  7472.7580  1.289E+10
0.000213   5558121.      0.000
70.000 -3.121E-10  -0.007048  -0.000841  1.872E-11  7472.7575  1.289E+10
7.527E-05   5788521.      0.000
72.000 -2.027E-11  -0.005640   0.000123  6.906E-12  7472.7575  1.289E+10
5.085E-06   6018921.      0.000
74.000  1.942E-11  -0.001239   0.000123      0.000  7472.7574  1.289E+10
-5.057E-06   6249321.      0.000
76.000  3.730E-12   0.000263  2.755E-05      0.000  7472.7574  1.289E+10
-2.907E-06  18703431.      0.000
78.000      0.000  8.836E-05 -5.453E-06      0.000  7472.7574  1.289E+10
1.566E-07  19855431.      0.000
80.000      0.000  2.574E-06 -1.899E-06      0.000  7472.7574  1.289E+10
1.396E-07  21007431.      0.000
82.000      0.000 -2.839E-06 -6.230E-08      0.000  7472.7574  1.289E+10
1.347E-08  22159431.      0.000
84.000      0.000 -4.582E-07  5.999E-08      0.000  7472.7574  1.289E+10
-3.283E-09  23311431.      0.000
86.000      0.000  3.660E-08  9.923E-09      0.000  7472.7574  1.289E+10
-8.890E-10  24463431.      0.000
88.000      0.000  1.894E-08 -7.449E-10      0.000  7472.7574  1.289E+10
0.000  25615431.      0.000
90.000      0.000  1.077E-09 -4.038E-10      0.000  7472.7574  1.289E+10
2.841E-11  26767431.      0.000
92.000      0.000 -4.363E-10 -2.392E-11      0.000  7472.7574  1.289E+10
3.242E-12  27919431.      0.000
94.000      0.000 -7.763E-11  9.185E-12      0.000  7472.7574  1.289E+10
0.000  29071431.      0.000
96.000      0.000  3.836E-12  1.666E-12      0.000  7472.7574  1.289E+10
0.000  30223431.      0.000
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 98.000      0.000  2.441E-12      0.000      0.000  7472.7574  1.289E+10
 0.000  31375431.      0.000
100.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  32527431.      0.000
102.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  33679431.      0.000
104.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  34831431.      0.000
106.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  35983431.      0.000
108.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  37135431.      0.000
110.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  38287431.      0.000
112.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  39439431.      0.000
114.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  40591431.      0.000
116.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  41743431.      0.000
118.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  42895431.      0.000
120.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  44047431.      0.000
122.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  45199431.      0.000
124.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  46351431.      0.000
126.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  47503431.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  48655431.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  49807431.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  50959431.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  52111431.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  53263431.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  54415431.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  55567431.      0.000
142.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  56719431.      0.000
144.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  57871431.      0.000
146.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  59023431.      0.000
148.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  60175431.      0.000
150.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  61327431.      0.000
152.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  62479431.      0.000
154.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  63631431.      0.000
156.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  64783431.      0.000
158.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  65935431.      0.000
160.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
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   0.000  67087431.      0.000
   162.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  68239431.      0.000
   164.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  69391431.      0.000
   166.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  70543431.      0.000
   168.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  71695431.      0.000
   170.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  72847431.      0.000
   172.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  73999431.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  75151431.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  76303431.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  77455431.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  78607431.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  79759431.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  80911431.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  82063431.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  83215431.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  84367431.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  85519431.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  86671431.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  87823431.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  88975431.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  45063715.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 1:

Pile-head deflection             =      0.5000000 inches
Computed slope at pile head      =     -0.0002581 radians
Maximum bending moment           =       -834538. inch-lbs
Maximum shear force              =         13544. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             17
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Number of zero deflection points = 33

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Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 1.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 255000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	1.0000	-1340613.	17553.	0.000	28893.	1.289E+10	0.000	0.000	0.000
2.000	0.9700	-967085.	12937.	-0.002149	22925.	1.289E+10	-192.3311	4758.5172	0.000
4.000	0.8969	-693317.	10614.	-0.003695	18551.	1.289E+10	-1.2952	34.6588	0.000
6.000	0.7927	-412392.	10096.	-0.004725	14062.	1.289E+10	-41.8914	1268.3584	0.000
8.000	0.6701	-150897.	8692.0813	-0.005249	9883.7678	1.289E+10	-75.0694	2688.7982	0.000
10.000	0.5407	69079.	6838.4617	-0.005325	8576.4943	1.289E+10	-79.3990	3524.2224	0.000
12.000	0.4144	242533.	4909.2829	-0.005035	11348.	1.289E+10	-81.3659	4711.8548	0.000
14.000	0.2990	366357.	2963.5033	-0.004468	13326.	1.289E+10	-80.7824	6483.9094	0.000
16.000	0.2000	439474.	1064.4926	-0.003718	14495.	1.289E+10	-77.4685	9297.9917	0.000
18.000	0.1206	462959.	-719.6487	-0.002878	14870.	1.289E+10	-71.2099	14177.	0.000
20.000	0.0618	440152.	-2313.5864	-0.002037	14505.	1.289E+10	-61.6182	23914.	0.000
22.000	0.0228	376835.	-3622.8755	-0.001276	13494.	1.289E+10	-47.4892	49993.	0.000
24.000	0.000601	281869.	-4373.2636	-0.000662	11976.	1.289E+10	-15.0432	600823.	0.000
26.000	-0.008997	175026.	-4077.2618	-0.000237	10269.	1.289E+10	39.7100	105923.	0.000
28.000	-0.0108	89061.	-3063.7963	8.972E-06	8895.7666	1.289E+10	44.7455	99688.	0.000
30.000	-0.008567	27854.	-2000.6146	0.000118	7917.8093	1.289E+10	43.8530	122855.	0.000
32.000	-0.005116	-8410.8151	-1006.8510	0.000136	7607.1446	1.289E+10	38.9606	182770.	0.000
34.000	-0.002041	-22139.	-176.7501	0.000108	7826.4867	1.289E+10	30.2145	355257.	0.000
36.000	4.409E-05	-18211.	180.0453	6.993E-05	7763.7253	1.289E+10	-0.4815	262115.	0.000
38.000	0.001315	-14352.	166.6433	3.961E-05	7702.0788	1.289E+10			

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 -0.6353     11592.      0.000
 40.000   0.001945    -10697.   149.8744  1.628E-05  7643.6657  1.289E+10
 -0.7621  9402.6914      0.000
 42.000   0.002097 -7357.7137   130.8907 -5.319E-07  7590.3182  1.289E+10
 -0.8199  9384.3801      0.000
 44.000   0.001920 -4407.2827   111.0519 -1.149E-05  7543.1765  1.289E+10
 -0.8333     10419.      0.000
 46.000   0.001545 -1886.6168    91.3346 -1.735E-05  7502.9016  1.289E+10
 -0.8098     12575.      0.000
 48.000   0.001087   189.1234    72.6075 -1.893E-05  7475.7792  1.289E+10
 -0.7508     16579.      0.000
 50.000   0.000637  1830.2366    55.7505 -1.705E-05  7502.0007  1.289E+10
 -0.6539     24644.      0.000
 52.000   0.000269  3073.8232    41.7877 -1.248E-05  7521.8706  1.289E+10
 -0.5096     45540.      0.000
 54.000  3.771E-05  3988.8253   -38.7232 -5.905E-06  7536.4905  1.289E+10
 -6.1996   3945321.      0.000
 56.000 -1.487E-05  1287.3907   -82.0790 -9.920E-07  7493.3272  1.289E+10
 2.5866   4175721.      0.000
 58.000 -9.903E-06    61.1736   -29.2230  2.638E-07  7473.7348  1.289E+10
 1.8181   4406121.      0.000
 60.000 -2.205E-06  -118.5428    -2.2950  2.104E-07  7474.6515  1.289E+10
 0.4259   4636521.      0.000
 62.000  1.946E-07   -51.5635     2.3427  5.196E-08  7473.5813  1.289E+10
 -0.0395   4866921.      0.000
 64.000  2.893E-07    -6.7314     1.1316 -2.323E-09  7472.8650  1.289E+10
 -0.0614   5097321.      0.000
 66.000  8.312E-08     2.7837     0.1728 -5.999E-09  7472.8019  1.289E+10
 -0.0185   5327721.      0.000
 68.000  1.346E-09     1.6388    -0.0523 -1.881E-09  7472.7836  1.289E+10
 -0.000312   5558121.      0.000
 70.000 -7.175E-09     0.2957    -0.0353 -7.966E-11  7472.7621  1.289E+10
 0.001730   5788521.      0.000
 72.000 -2.477E-09    -0.0540  -0.007067  1.454E-10  7472.7583  1.289E+10
 0.000621   6018921.      0.000
 74.000 -1.933E-10    -0.0452   0.000993  5.303E-11  7472.7581  1.289E+10
 5.034E-05   6249321.      0.000
 76.000  6.814E-11  -0.006992   0.000960  4.383E-12  7472.7575  1.289E+10
 -5.310E-05  18703431.      0.000
 78.000  1.706E-11   0.000759   0.000153 -1.421E-12  7472.7574  1.289E+10
 -1.411E-05  19855431.      0.000
 80.000      0.000   0.000372 -1.543E-05      0.000  7472.7574  1.289E+10
 7.337E-08  21007431.      0.000
 82.000      0.000  2.311E-05 -7.957E-06      0.000  7472.7574  1.289E+10
 5.492E-07  22159431.      0.000
 84.000      0.000 -9.833E-06 -5.198E-07      0.000  7472.7574  1.289E+10
 7.061E-08  23311431.      0.000
 86.000      0.000 -1.993E-06  2.068E-07      0.000  7472.7574  1.289E+10
 -1.006E-08  24463431.      0.000
 88.000      0.000  7.247E-08  4.291E-08      0.000  7472.7574  1.289E+10
 -3.590E-09  25615431.      0.000
 90.000      0.000  6.921E-08 -1.411E-09      0.000  7472.7574  1.289E+10
 -1.034E-10  26767431.      0.000
 92.000      0.000  5.605E-09 -1.471E-09      0.000  7472.7574  1.289E+10
 9.846E-11  27919431.      0.000
 94.000      0.000 -1.356E-09 -1.225E-10      0.000  7472.7574  1.289E+10
 1.390E-11  29071431.      0.000
 96.000      0.000 -2.950E-10  2.845E-11      0.000  7472.7574  1.289E+10
 -1.326E-12  30223431.      0.000
 98.000      0.000  6.069E-12  6.310E-12      0.000  7472.7574  1.289E+10
 0.000  31375431.      0.000
100.000      0.000  8.148E-12      0.000      0.000  7472.7574  1.289E+10
0.000  32527431.      0.000
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102.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  33679431.      0.000
104.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  34831431.      0.000
106.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  35983431.      0.000
108.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  37135431.      0.000
110.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  38287431.      0.000
112.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  39439431.      0.000
114.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  40591431.      0.000
116.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  41743431.      0.000
118.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  42895431.      0.000
120.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  44047431.      0.000
122.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  45199431.      0.000
124.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  46351431.      0.000
126.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  47503431.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  48655431.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  49807431.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  50959431.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  52111431.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  53263431.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  54415431.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  55567431.      0.000
142.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  56719431.      0.000
144.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  57871431.      0.000
146.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  59023431.      0.000
148.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  60175431.      0.000
150.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  61327431.      0.000
152.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  62479431.      0.000
154.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  63631431.      0.000
156.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  64783431.      0.000
158.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  65935431.      0.000
160.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  67087431.      0.000
162.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  68239431.      0.000
164.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
```

```
   0.000  69391431.      0.000
   166.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  70543431.      0.000
   168.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  71695431.      0.000
   170.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  72847431.      0.000
   172.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  73999431.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  75151431.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  76303431.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  77455431.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  78607431.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  79759431.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  80911431.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  82063431.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  83215431.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  84367431.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  85519431.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  86671431.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  87823431.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  88975431.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  45063715.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 2:

Pile-head deflection             =      1.0000000 inches
Computed slope at pile head      =     -0.0003478 radians
Maximum bending moment           =      -1340613. inch-lbs
Maximum shear force              =         17553. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             19
Number of zero deflection points =             32
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 3
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     2.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     255000.0 lbs

   Depth    Deflect.    Bending    Shear       Slope      Total    Bending
   Soil Res.  Soil Spr.   Distrib.
     X         y        Moment     Force         S       Stress   Stiffness
     p         Es*h    Lat. Load
   feet      inches     in-lbs      lbs       radians     psi*      lb-in^2
   lb/in      lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     2.0000  -2161642.     22912.      0.000     42011.  1.289E+10
      0.000      0.000      0.000
     2.000     1.9517  -1654826.     18296.  -0.003554     33913.  1.289E+10
     -192.3311  2365.1023      0.000
     4.000     1.8294  -1239932.     15968.  -0.006250     27284.  1.289E+10
     -1.6426    21.5486      0.000
     6.000     1.6517   -811851.     15307.  -0.008160     20444.  1.289E+10
     -53.5063   777.4664      0.000
     8.000     1.4377   -405336.     13503.  -0.009294     13949.  1.289E+10
     -96.8239  1616.2838      0.000
    10.000     1.2056    -49972.     11096.  -0.009718  8271.2055  1.289E+10
    -103.7282  2064.8923      0.000
    12.000     0.9713    246214.  8554.3137  -0.009535     11407.  1.289E+10
    -108.0777  2670.5588      0.000
    14.000     0.7479    477341.  5941.4793  -0.008861     15100.  1.289E+10
    -109.6585  3518.6962      0.000
    16.000     0.5460    639865.  3326.2844  -0.007821     17696.  1.289E+10
    -108.2744  4759.7421      0.000
    18.000     0.3726    732729.   782.3149  -0.006543     19180.  1.289E+10
    -103.7230  6681.8518      0.000
    20.000     0.2319    757496. -1611.1594  -0.005155     19576.  1.289E+10
    -95.7332  9907.3263      0.000
    22.000     0.1251    718488. -3765.2149  -0.003780     18953.  1.289E+10
    -83.7714     16068.      0.000
    24.000     0.0504    623038. -5564.8180  -0.002531     17428.  1.289E+10
    -66.1955     31491.      0.000
    26.000   0.003626    482358. -6710.3516  -0.001502     15180.  1.289E+10
    -29.2657    193727.      0.000
    28.000    -0.0216    319324. -6384.1454  -0.000755     12575.  1.289E+10
    56.4495     62612.      0.000
    30.000    -0.0326    185164. -4885.2774  -0.000286     10431.  1.289E+10
    68.4562     50353.      0.000
    32.000    -0.0353     88325. -3174.1990 -3.084E-05  8884.0060  1.289E+10
    74.1337     50342.      0.000
    34.000    -0.0341     33180. -1360.0350  8.231E-05  8002.9061  1.289E+10
    77.0466     54213.      0.000
    36.000    -0.0314     22036.  -377.8473   0.000134  7824.8444  1.289E+10
    4.8024  3671.5875      0.000
    38.000    -0.0277     13407.  -299.0874   0.000167  7686.9671  1.289E+10
    1.7610  1526.3341      0.000
    40.000    -0.0234  5638.8829  -256.9558   0.000184  7562.8549  1.289E+10
    1.7500  1795.7567      0.000
    42.000    -0.0188 -1185.1353  -215.4651   0.000189  7491.6934  1.289E+10
```

```
 1.7076  2175.8121      0.000
 44.000    -0.0143 -7012.0873  -175.3958   0.000181  7584.7958  1.289E+10
 1.6315  2731.6042      0.000
 46.000    -0.0101    -11819.  -137.5925   0.000163  7661.6057  1.289E+10
 1.5187  3591.8159      0.000
 48.000  -0.006489    -15617.  -102.9980   0.000138  7722.2858  1.289E+10
 1.3641  5045.0281      0.000
 50.000  -0.003529    -18451.   -72.7214   0.000106  7767.5673  1.289E+10
 1.1589  7881.6291      0.000
 52.000  -0.001393    -20407.   -48.2125  6.999E-05  7798.8228  1.289E+10
 0.8835     15220.      0.000
 54.000  -0.000170    -21622.   296.8645  3.085E-05  7818.2307  1.289E+10
 27.8729   3945321.      0.000
 56.000  8.760E-05 -6535.3737   448.4377  4.629E-06  7577.1789  1.289E+10
 -15.2418   4175721.      0.000
 58.000  5.264E-05  -153.5967   149.5590 -1.600E-06  7475.2116  1.289E+10
 -9.6647   4406121.      0.000
 60.000  1.082E-05   663.0386     8.5004 -1.125E-06  7483.3514  1.289E+10
 -2.0901   4636521.      0.000
 62.000 -1.369E-06   268.1943   -13.2504 -2.581E-07  7477.0426  1.289E+10
 0.2776   4866921.      0.000
 64.000 -1.569E-06    30.1788    -5.9202  1.976E-08  7473.2396  1.289E+10
 0.3333   5097321.      0.000
 66.000 -4.205E-07   -16.2192    -0.8008  3.276E-08  7473.0166  1.289E+10
 0.0934   5327721.      0.000
 68.000  3.110E-09    -8.6609     0.3108  9.587E-09  7472.8958  1.289E+10
 -0.000720   5558121.      0.000
 70.000  3.963E-08    -1.4187     0.1874  2.006E-10  7472.7801  1.289E+10
 -0.009559   5788521.      0.000
 72.000  1.274E-08     0.3338     0.0344 -8.097E-10  7472.7627  1.289E+10
 -0.003195   6018921.      0.000
 74.000  7.676E-10     0.2421  -0.006346 -2.734E-10  7472.7613  1.289E+10
 -0.000200   6249321.      0.000
 76.000 -3.846E-10     0.0325  -0.005148 -1.775E-11  7472.7579  1.289E+10
 0.000300  18703431.      0.000
 78.000 -8.419E-11  -0.004790  -0.000715  8.058E-12  7472.7575  1.289E+10
 6.965E-05  19855431.      0.000
 80.000  2.144E-12  -0.001909  9.847E-05  1.820E-12  7472.7574  1.289E+10
 -1.877E-06  21007431.      0.000
 82.000  3.164E-12 -8.619E-05  4.089E-05      0.000  7472.7574  1.289E+10
 -2.921E-06  22159431.      0.000
 84.000      0.000  5.465E-05  1.980E-06      0.000  7472.7574  1.289E+10
 -3.215E-07  23311431.      0.000
 86.000      0.000  9.679E-06 -1.152E-06      0.000  7472.7574  1.289E+10
 6.047E-08  24463431.      0.000
 88.000      0.000 -5.707E-07 -2.089E-07      0.000  7472.7574  1.289E+10
 1.815E-08  25615431.      0.000
 90.000      0.000 -3.615E-07  1.149E-08      0.000  7472.7574  1.289E+10
 2.161E-10  26767431.      0.000
 92.000      0.000 -2.362E-08  7.692E-09      0.000  7472.7574  1.289E+10
 -5.326E-10  27919431.      0.000
 94.000      0.000  7.694E-09  5.198E-10      0.000  7472.7574  1.289E+10
 -6.505E-11  29071431.      0.000
 96.000      0.000  1.450E-09 -1.618E-10      0.000  7472.7574  1.289E+10
 8.254E-12  30223431.      0.000
 98.000      0.000 -5.702E-11 -3.106E-11      0.000  7472.7574  1.289E+10
 2.639E-12  31375431.      0.000
100.000      0.000 -4.271E-11  1.144E-12      0.000  7472.7574  1.289E+10
0.000  32527431.      0.000
102.000      0.000 -2.645E-12      0.000      0.000  7472.7574  1.289E+10
0.000  33679431.      0.000
104.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  34831431.      0.000
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106.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  35983431.      0.000
108.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  37135431.      0.000
110.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  38287431.      0.000
112.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  39439431.      0.000
114.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  40591431.      0.000
116.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  41743431.      0.000
118.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  42895431.      0.000
120.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  44047431.      0.000
122.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  45199431.      0.000
124.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  46351431.      0.000
126.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  47503431.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  48655431.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  49807431.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  50959431.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  52111431.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  53263431.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  54415431.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  55567431.      0.000
142.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  56719431.      0.000
144.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  57871431.      0.000
146.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  59023431.      0.000
148.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  60175431.      0.000
150.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  61327431.      0.000
152.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  62479431.      0.000
154.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  63631431.      0.000
156.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  64783431.      0.000
158.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  65935431.      0.000
160.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  67087431.      0.000
162.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  68239431.      0.000
164.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  69391431.      0.000
166.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  70543431.      0.000
168.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
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   0.000  71695431.      0.000
   170.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  72847431.      0.000
   172.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  73999431.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  75151431.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  76303431.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  77455431.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  78607431.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  79759431.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  80911431.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  82063431.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  83215431.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  84367431.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  85519431.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  86671431.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  87823431.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  88975431.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  45063715.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 3:

Pile-head deflection             =      2.0000000 inches
Computed slope at pile head      =     -0.0004719 radians
Maximum bending moment           =      -2161642. inch-lbs
Maximum shear force              =         22912. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             22
Number of zero deflection points =             31


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--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 4
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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     3.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     255000.0 lbs

   Depth    Deflect.    Bending    Shear       Slope      Total    Bending
   Soil Res.  Soil Spr.   Distrib.
     X         y        Moment     Force         S       Stress   Stiffness
     p         Es*h    Lat. Load
   feet      inches     in-lbs      lbs       radians     psi*      lb-in^2
   lb/in      lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     3.0000  -2859655.     27051.      0.000     53164.  1.289E+10
      0.000      0.000      0.000
     2.000     2.9361  -2249525.     22435.  -0.004758     43415.  1.289E+10
     -192.3311  1572.1406      0.000
     4.000     2.7716  -1724538.     20104.  -0.008458     35027.  1.289E+10
     -1.8865    16.3357      0.000
     6.000     2.5301  -1180982.     19342.    -0.0112     26342.  1.289E+10
     -61.6792   585.0786      0.000
     8.000     2.2358   -659492.     17255.    -0.0129     18010.  1.289E+10
     -112.1758  1204.1623      0.000
    10.000     1.9120   -195098.     14458.    -0.0137     10590.  1.289E+10
    -120.9630  1518.4017      0.000
    12.000     1.5794    201845.     11481.    -0.0137     10698.  1.289E+10
    -127.0930  1931.2276      0.000
    14.000     1.2559    523281.  8391.8791    -0.0130     15834.  1.289E+10
    -130.3387  2490.7063      0.000
    16.000     0.9558    763678.  5261.8537    -0.0118     19675.  1.289E+10
    -130.4967  3276.7376      0.000
    18.000     0.6898    920205.  2167.4735    -0.0102     22176.  1.289E+10
    -127.3683  4431.3343      0.000
    20.000     0.4650    992879.  -809.5639  -0.008444     23337.  1.289E+10
    -120.7181  6230.9674      0.000
    22.000     0.2845    984703. -3580.1143  -0.006603     23206.  1.289E+10
    -110.1611  9292.9226      0.000
    24.000     0.1480    901850. -6039.4065  -0.004846     21882.  1.289E+10
    -94.7800     15365.      0.000
    26.000     0.0519    754125. -8030.9324  -0.003304     19522.  1.289E+10
    -71.1805     32915.      0.000
    28.000    -0.0105    556804. -8352.0959  -0.002083     16369.  1.289E+10
    44.4169    101164.      0.000
    30.000    -0.0481    378721. -6884.3520  -0.001212     13524.  1.289E+10
    77.8951     38877.      0.000
    32.000    -0.0687    241189. -4839.4498  -0.000635     11326.  1.289E+10
    92.5134     32314.      0.000
    34.000    -0.0786    154196. -2508.4906  -0.000266  9936.4832  1.289E+10
    101.7332     31083.      0.000
    36.000    -0.0815    124043. -1208.4981 -7.384E-06  9454.7094  1.289E+10
    6.5995  1943.3965      0.000
    38.000    -0.0789     96278. -1099.3484   0.000198  9011.0828  1.289E+10
    2.4963   759.2639      0.000
    40.000    -0.0720     68854. -1038.8476   0.000352  8572.8964  1.289E+10
    2.5455   848.3963      0.000
    42.000    -0.0620     42111.  -977.8201   0.000455  8145.5972  1.289E+10
    2.5402   982.7875      0.000
    44.000    -0.0502     16351.  -917.6165   0.000509  7734.0068  1.289E+10
    2.4768  1184.7587      0.000
    46.000    -0.0376 -8169.0346  -859.7023   0.000517  7603.2814  1.289E+10
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```
 2.3494  1500.2372      0.000
 48.000    -0.0254    -31242.  -805.7297   0.000480  7971.9451  1.289E+10
 2.1483  2033.1039      0.000
 50.000    -0.0145    -52722.  -757.6627   0.000402  8315.1474  1.289E+10
 1.8573  3067.1739      0.000
 52.000  -0.006062    -72531.  -718.0705   0.000285  8631.6554  1.289E+10
 1.4421  5709.6768      0.000
 54.000  -0.000833    -90683.   941.8777   0.000133  8921.6824  1.289E+10
 136.8869   3945321.      0.000
 56.000   0.000343    -28954.  1868.4969  2.202E-05  7935.3873  1.289E+10
 -59.6687   4175721.      0.000
 58.000   0.000224 -1264.7806   658.1032 -6.117E-06  7492.9659  1.289E+10
 -41.1975   4406121.      0.000
 60.000  4.932E-05  2709.4642    49.3881 -4.772E-06  7516.0489  1.289E+10
 -9.5288   4636521.      0.000
 62.000 -4.647E-06  1164.2551   -53.6490 -1.165E-06  7491.3598  1.289E+10
 0.9423   4866921.      0.000
 64.000 -6.578E-06   148.5684   -25.5756  5.789E-08  7475.1312  1.289E+10
 1.3971   5097321.      0.000
 66.000 -1.868E-06   -64.0843    -3.8333  1.366E-07  7473.7813  1.289E+10
 0.4148   5327721.      0.000
 68.000 -2.324E-08   -37.1003     1.2085  4.233E-08  7473.3502  1.289E+10
 0.005383   5558121.      0.000
 70.000  1.636E-07    -6.5928     0.7995  1.647E-09  7472.8627  1.289E+10
 -0.0395   5788521.      0.000
 72.000  5.583E-08     1.2566     0.1579 -3.322E-09  7472.7775  1.289E+10
 -0.0140   6018921.      0.000
 74.000  4.197E-09     1.0264    -0.0233 -1.196E-09  7472.7738  1.289E+10
 -0.001093   6249321.      0.000
 76.000 -1.560E-09     0.1551    -0.0218 -9.539E-11  7472.7599  1.289E+10
 0.001216  18703431.      0.000
 78.000 -3.820E-10    -0.0177  -0.003398  3.256E-11  7472.7577  1.289E+10
 0.000316  19855431.      0.000
 80.000  3.101E-12  -0.008383   0.000361  8.239E-12  7472.7575  1.289E+10
 -2.715E-06  21007431.      0.000
 82.000  1.348E-11  -0.000498   0.000179      0.000  7472.7574  1.289E+10
 -1.245E-05  22159431.      0.000
 84.000  1.608E-12   0.000225  1.122E-05      0.000  7472.7574  1.289E+10
 -1.562E-06  23311431.      0.000
 86.000      0.000  4.451E-05 -4.723E-06      0.000  7472.7574  1.289E+10
 2.330E-07  24463431.      0.000
 88.000      0.000 -1.773E-06 -9.588E-07      0.000  7472.7574  1.289E+10
 8.069E-08  25615431.      0.000
 90.000      0.000 -1.564E-06  3.480E-08      0.000  7472.7574  1.289E+10
 2.107E-09  26767431.      0.000
 92.000      0.000 -1.226E-07  3.324E-08      0.000  7472.7574  1.289E+10
 -2.238E-09  27919431.      0.000
 94.000      0.000  3.108E-08  2.682E-09      0.000  7472.7574  1.289E+10
 -3.087E-10  29071431.      0.000
 96.000      0.000  6.601E-09 -6.521E-10      0.000  7472.7574  1.289E+10
 3.090E-11  30223431.      0.000
 98.000      0.000 -1.550E-10 -1.412E-10      0.000  7472.7574  1.289E+10
 1.167E-11  31375431.      0.000
100.000      0.000 -1.842E-10  2.994E-12      0.000  7472.7574  1.289E+10
0.000  32527431.      0.000
102.000      0.000 -1.366E-11  3.905E-12      0.000  7472.7574  1.289E+10
0.000  33679431.      0.000
104.000      0.000  3.172E-12      0.000      0.000  7472.7574  1.289E+10
0.000  34831431.      0.000
106.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  35983431.      0.000
108.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  37135431.      0.000
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   110.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  38287431.      0.000
   112.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  39439431.      0.000
   114.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  40591431.      0.000
   116.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  41743431.      0.000
   118.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  42895431.      0.000
   120.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  44047431.      0.000
   122.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  45199431.      0.000
   124.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  46351431.      0.000
   126.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  47503431.      0.000
   128.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  48655431.      0.000
   130.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  49807431.      0.000
   132.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  50959431.      0.000
   134.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  52111431.      0.000
   136.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  53263431.      0.000
   138.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  54415431.      0.000
   140.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  55567431.      0.000
   142.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  56719431.      0.000
   144.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  57871431.      0.000
   146.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  59023431.      0.000
   148.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  60175431.      0.000
   150.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  61327431.      0.000
   152.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  62479431.      0.000
   154.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  63631431.      0.000
   156.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  64783431.      0.000
   158.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  65935431.      0.000
   160.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  67087431.      0.000
   162.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  68239431.      0.000
   164.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  69391431.      0.000
   166.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  70543431.      0.000
   168.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  71695431.      0.000
   170.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  72847431.      0.000
   172.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
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   0.000  73999431.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  75151431.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  76303431.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  77455431.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  78607431.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  79759431.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  80911431.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  82063431.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  83215431.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  84367431.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  85519431.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  86671431.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  87823431.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  88975431.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  45063715.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 4:

Pile-head deflection             =      3.0000000 inches
Computed slope at pile head      =     -0.0005682 radians
Maximum bending moment           =      -2859655. inch-lbs
Maximum shear force              =         27051. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             23
Number of zero deflection points =             31



-----------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 5
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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
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Displacement of pile head = 4.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 255000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	4.0000	-2975052.	28099.	0.000	55008.	5.287E+09	0.000	0.000	0.000
2.000	3.8379	-2314747.	23483.	-0.008908	44458.	1.289E+10	-192.3310	1202.7132	0.000
4.000	3.5724	-1738841.	21150.	-0.0127	35256.	1.289E+10	-2.0531	13.7928	0.000
6.000	3.2292	-1144299.	20323.	-0.0154	25756.	1.289E+10	-66.9047	497.2522	0.000
8.000	2.8348	-575251.	18063.	-0.0170	16664.	1.289E+10	-121.4124	1027.9095	0.000
10.000	2.4147	-69580.	15037.	-0.0176	8584.4991	1.289E+10	-130.7513	1299.5657	0.000
12.000	1.9915	361571.	11820.	-0.0173	13250.	1.289E+10	-137.3024	1654.6940	0.000
14.000	1.5844	709515.	8482.7107	-0.0163	18809.	1.289E+10	-140.8340	2133.3004	0.000
16.000	1.2091	968252.	5099.1158	-0.0147	22943.	1.289E+10	-141.1322	2801.4755	0.000
18.000	0.8770	1134660.	1749.7701	-0.0128	25602.	1.289E+10	-137.9799	3775.9346	0.000
20.000	0.5957	1208659.	-1479.2883	-0.0106	26785.	1.289E+10	-131.1083	5282.5251	0.000
22.000	0.3683	1193364.	-4493.3729	-0.008360	26540.	1.289E+10	-120.0654	7823.0896	0.000
24.000	0.1944	1095309.	-7179.5572	-0.006229	24973.	1.289E+10	-103.7832	12815.	0.000
26.000	0.0693	924990.	-9365.7707	-0.004348	22252.	1.289E+10	-78.4012	27136.	0.000
28.000	-0.0143	698970.	-9716.1715	-0.002836	18641.	1.289E+10	49.2012	82370.	0.000
30.000	-0.0668	493322.	-8083.0212	-0.001725	15355.	1.289E+10	86.8947	31234.	0.000
32.000	-0.0972	332103.	-5794.3105	-0.000957	12779.	1.289E+10	103.8312	25650.	0.000
34.000	-0.1127	226906.	-3171.5360	-0.000436	11098.	1.289E+10	114.7334	24435.	0.000
36.000	-0.1181	185208.	-1705.1249	-5.242E-05	10432.	1.289E+10	7.4676	1517.6648	0.000
38.000	-0.1152	145701.	-1581.5322	0.000256	9800.7591	1.289E+10	2.8318	589.9172	0.000
40.000	-0.1058	106165.	-1512.8243	0.000490	9169.0475	1.289E+10	2.8938	656.3492	0.000
42.000	-0.0917	67085.	-1443.3787	0.000652	8544.6345	1.289E+10	2.8933	757.4371	0.000
44.000	-0.0745	28907.	-1374.7464	0.000741	7934.6322	1.289E+10	2.8260	909.9272	0.000
46.000	-0.0561	-7972.4561	-1308.6135	0.000760	7600.1405	1.289E+10	2.6850	1148.4803	0.000
48.000	-0.0380	-43215.	-1246.8846	0.000713	8163.2354	1.289E+10	2.4591	1551.6031	0.000
50.000	-0.0219	-76548.	-1191.8273	0.000601	8695.8290	1.289E+10			

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    2.1291  2333.7887      0.000
    52.000  -0.009174   -107782. -1146.4105   0.000430  9194.8879  1.289E+10
    1.6557  4331.1589      0.000
    54.000  -0.001272   -136834.  1382.6243   0.000202  9659.0803  1.289E+10
    209.0972   3945321.      0.000
    56.000   0.000514    -43887.  2817.8652  3.356E-05  8173.9751  1.289E+10
    -89.4938   4175721.      0.000
    58.000   0.000339 -1987.4761   996.9577 -9.155E-06  7504.5131  1.289E+10
    -62.2485   4406121.      0.000
    60.000  7.493E-05  4079.3025    76.2721 -7.207E-06  7537.9361  1.289E+10
    -14.4753   4636521.      0.000
    62.000 -6.873E-06  1761.7983   -80.7075 -1.768E-06  7500.9072  1.289E+10
    1.3937   4866921.      0.000
    64.000 -9.925E-06   226.9797   -38.6868  8.417E-08  7476.3841  1.289E+10
    2.1080   5097321.      0.000
    66.000 -2.833E-06   -96.1970    -5.8446  2.060E-07  7474.2944  1.289E+10
    0.6288   5327721.      0.000
    68.000 -3.969E-08   -56.0804     1.8115  6.415E-08  7473.6535  1.289E+10
    0.009192   5558121.      0.000
    70.000  2.466E-07   -10.0299     1.2081  2.588E-09  7472.9177  1.289E+10
    -0.0595   5788521.      0.000
    72.000  8.455E-08     1.8779     0.2400 -5.003E-09  7472.7874  1.289E+10
    -0.0212   6018921.      0.000
    74.000  6.457E-09     1.5502    -0.0347 -1.810E-09  7472.7822  1.289E+10
    -0.001681   6249321.      0.000
    76.000 -2.347E-09     0.2365    -0.0329 -1.466E-10  7472.7612  1.289E+10
    0.001829  18703431.      0.000
    78.000 -5.801E-10    -0.0265  -0.005179  4.898E-11  7472.7578  1.289E+10
    0.000480  19855431.      0.000
    80.000  3.930E-12    -0.0127   0.000539  1.251E-11  7472.7576  1.289E+10
    -3.440E-06  21007431.      0.000
    82.000  2.037E-11  -0.000768   0.000272      0.000  7472.7574  1.289E+10
    -1.880E-05  22159431.      0.000
    84.000  2.455E-12   0.000338  1.731E-05      0.000  7472.7574  1.289E+10
    -2.384E-06  23311431.      0.000
    86.000      0.000  6.767E-05 -7.113E-06      0.000  7472.7574  1.289E+10
    3.490E-07  24463431.      0.000
    88.000      0.000 -2.597E-06 -1.457E-06      0.000  7472.7574  1.289E+10
    1.223E-07  25615431.      0.000
    90.000      0.000 -2.366E-06  5.081E-08      0.000  7472.7574  1.289E+10
    3.332E-09  26767431.      0.000
    92.000      0.000 -1.880E-07  5.028E-08      0.000  7472.7574  1.289E+10
    -3.377E-09  27919431.      0.000
    94.000      0.000  4.675E-08  4.111E-09      0.000  7472.7574  1.289E+10
    -4.704E-10  29071431.      0.000
    96.000      0.000  1.003E-08 -9.807E-10      0.000  7472.7574  1.289E+10
    4.615E-11  30223431.      0.000
    98.000      0.000 -2.232E-10 -2.145E-10      0.000  7472.7574  1.289E+10
    1.769E-11  31375431.      0.000
   100.000      0.000 -2.786E-10  4.288E-12      0.000  7472.7574  1.289E+10
   0.000  32527431.      0.000
   102.000      0.000 -2.094E-11  5.906E-12      0.000  7472.7574  1.289E+10
   0.000  33679431.      0.000
   104.000      0.000  4.771E-12      0.000      0.000  7472.7574  1.289E+10
   0.000  34831431.      0.000
   106.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  35983431.      0.000
   108.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  37135431.      0.000
   110.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  38287431.      0.000
   112.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  39439431.      0.000
```

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   114.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  40591431.      0.000
   116.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  41743431.      0.000
   118.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  42895431.      0.000
   120.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  44047431.      0.000
   122.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  45199431.      0.000
   124.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  46351431.      0.000
   126.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  47503431.      0.000
   128.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  48655431.      0.000
   130.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  49807431.      0.000
   132.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  50959431.      0.000
   134.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  52111431.      0.000
   136.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  53263431.      0.000
   138.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  54415431.      0.000
   140.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  55567431.      0.000
   142.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  56719431.      0.000
   144.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  57871431.      0.000
   146.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  59023431.      0.000
   148.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  60175431.      0.000
   150.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  61327431.      0.000
   152.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  62479431.      0.000
   154.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  63631431.      0.000
   156.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  64783431.      0.000
   158.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  65935431.      0.000
   160.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  67087431.      0.000
   162.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  68239431.      0.000
   164.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  69391431.      0.000
   166.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  70543431.      0.000
   168.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  71695431.      0.000
   170.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  72847431.      0.000
   172.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  73999431.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  75151431.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
```

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   0.000  76303431.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  77455431.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  78607431.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  79759431.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  80911431.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  82063431.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  83215431.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  84367431.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  85519431.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  86671431.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  87823431.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  88975431.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  45063715.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 5:

Pile-head deflection             =      4.0000000 inches
Computed slope at pile head      =     -0.0045969 radians
Maximum bending moment           =      -2975052. inch-lbs
Maximum shear force              =         28099. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             46
Number of zero deflection points =             31


-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 6
-------------------------------------------------------------------------------
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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     5.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     255000.0 lbs
```

```
   Depth    Deflect.    Bending    Shear       Slope      Total    Bending
   Soil Res.  Soil Spr.   Distrib.
     X         y        Moment     Force         S       Stress   Stiffness
     p         Es*h    Lat. Load
   feet      inches     in-lbs      lbs       radians     psi*      lb-in^2
   lb/in      lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     5.0000  -2975025.     28510.      0.000     55007.  3.099E+09
      0.000      0.000      0.000
     2.000     4.7235  -2275653.     23894.    -0.0136     43833.  1.289E+10
     -192.3310   977.2338      0.000
     4.000     4.3452  -1661126.     21560.    -0.0173     34014.  1.289E+10
     -2.1916    12.1046      0.000
     6.000     3.8928  -1028928.     20679.    -0.0198     23913.  1.289E+10
     -71.2053   439.0018      0.000
     8.000     3.3943   -426017.     18278.    -0.0212     14280.  1.289E+10
     -128.9257   911.5971      0.000
    10.000     2.8768    107489.     15067.    -0.0215  9190.2102  1.289E+10
    -138.6100  1156.3833      0.000
    12.000     2.3640    559931.     11660.    -0.0208     16419.  1.289E+10
    -145.3807  1475.9160      0.000
    14.000     1.8764    922251.  8126.9833    -0.0195     22208.  1.289E+10
    -149.0017  1905.8373      0.000
    16.000     1.4299   1188234.  4547.9761    -0.0175     26458.  1.289E+10
    -149.2489  2505.0559      0.000
    18.000     1.0365   1354707.  1006.3659    -0.0151     29118.  1.289E+10
    -145.8853  3377.8020      0.000
    20.000     0.7037   1421709. -2407.4787    -0.0125     30189.  1.289E+10
    -138.6018  4726.7685      0.000
    22.000     0.4345   1392671. -5593.0333  -0.009922     29725.  1.289E+10
    -126.8611  7007.4002      0.000
    24.000     0.2275   1274688. -8427.8399  -0.007438     27840.  1.289E+10
    -109.3728     11539.      0.000
    26.000     0.0775   1079178.    -10716.  -0.005246     24716.  1.289E+10
    -81.3487     25204.      0.000
    28.000    -0.0243    824510.    -10988.  -0.003474     20647.  1.289E+10
    58.6878     57894.      0.000
    30.000    -0.0893    594249. -9135.4532  -0.002152     16968.  1.289E+10
    95.7268     25737.      0.000
    32.000    -0.1276    412353. -6622.0727  -0.001215     14061.  1.289E+10
    113.7216     21383.      0.000
    34.000    -0.1476    291261. -3751.0715  -0.000560     12126.  1.289E+10
    125.5285     20413.      0.000
    36.000    -0.1545    239154. -2146.7171 -6.587E-05     11294.  1.289E+10
    8.1677  1268.6664      0.000
    38.000    -0.1507    189025. -2011.5369   0.000333     10493.  1.289E+10
    3.0974   493.1189      0.000
    40.000    -0.1385    138526. -1936.3795   0.000638  9686.1050  1.289E+10
    3.1658   548.4435      0.000
    42.000    -0.1201     88271. -1860.3968   0.000849  8883.1422  1.289E+10
    3.1661   632.5398      0.000
    44.000    -0.0978     38834. -1785.2796   0.000967  8093.2426  1.289E+10
    3.0936   759.3354      0.000
    46.000    -0.0737 -9263.7392 -1712.8703   0.000995  7620.7725  1.289E+10
    2.9405   957.6312      0.000
    48.000    -0.0500    -55562. -1645.2550   0.000935  8360.5238  1.289E+10
    2.6942  1292.6427      0.000
    50.000    -0.0288    -99675. -1584.9210   0.000790  9065.3614  1.289E+10
    2.3337  1942.5173      0.000
    52.000    -0.0121   -141308. -1535.1288   0.000566  9730.5692  1.289E+10
    1.8157  3601.4983      0.000
    54.000  -0.001682   -180285.  1805.4357   0.000266     10353.  1.289E+10
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    276.5647   3945321.      0.000
    56.000   0.000676    -57905.  3712.0026  4.436E-05  8397.9634  1.289E+10
    -117.6841   4175721.      0.000
    58.000   0.000447 -2651.8107  1315.1864 -1.203E-05  7515.1278  1.289E+10
    -82.0506   4406121.      0.000
    60.000  9.893E-05  5370.8381   101.2272 -9.498E-06  7558.5721  1.289E+10
    -19.1127   4636521.      0.000
    62.000 -8.996E-06  2323.3569  -106.2327 -2.334E-06  7509.8798  1.289E+10
    1.8244   4866921.      0.000
    64.000 -1.308E-05   300.2332   -51.0114  1.096E-07  7477.5545  1.289E+10
    2.7774   5097321.      0.000
    66.000 -3.738E-06  -126.5328    -7.7259  2.713E-07  7474.7791  1.289E+10
    0.8297   5327721.      0.000
    68.000 -5.424E-08   -73.9300     2.3817  8.464E-08  7473.9386  1.289E+10
    0.0126   5558121.      0.000
    70.000  3.248E-07   -13.2492     1.5925  3.454E-09  7472.9691  1.289E+10
    -0.0783   5788521.      0.000
    72.000  1.115E-07     2.4665     0.3169 -6.587E-09  7472.7968  1.289E+10
    -0.0280   6018921.      0.000
    74.000  8.560E-09     2.0431    -0.0455 -2.388E-09  7472.7900  1.289E+10
    -0.002229   6249321.      0.000
    76.000 -3.089E-09     0.3126    -0.0433 -1.943E-10  7472.7624  1.289E+10
    0.002408  18703431.      0.000
    78.000 -7.658E-10    -0.0347  -0.006845  6.446E-11  7472.7580  1.289E+10
    0.000634  19855431.      0.000
    80.000  4.862E-12    -0.0168   0.000707  1.651E-11  7472.7577  1.289E+10
    -4.256E-06  21007431.      0.000
    82.000  2.684E-11  -0.001020   0.000358      0.000  7472.7574  1.289E+10
    -2.479E-05  22159431.      0.000
    84.000  3.246E-12   0.000445  2.296E-05      0.000  7472.7574  1.289E+10
    -3.153E-06  23311431.      0.000
    86.000      0.000  8.937E-05 -9.365E-06      0.000  7472.7574  1.289E+10
    4.587E-07  24463431.      0.000
    88.000      0.000 -3.389E-06 -1.924E-06      0.000  7472.7574  1.289E+10
    1.614E-07  25615431.      0.000
    90.000      0.000 -3.120E-06  6.623E-08      0.000  7472.7574  1.289E+10
    4.455E-09  26767431.      0.000
    92.000      0.000 -2.490E-07  6.630E-08      0.000  7472.7574  1.289E+10
    -4.449E-09  27919431.      0.000
    94.000      0.000  6.153E-08  5.443E-09      0.000  7472.7574  1.289E+10
    -6.218E-10  29071431.      0.000
    96.000      0.000  1.324E-08 -1.291E-09      0.000  7472.7574  1.289E+10
    6.061E-11  30223431.      0.000
    98.000      0.000 -2.896E-10 -2.832E-10      0.000  7472.7574  1.289E+10
    2.334E-11  31375431.      0.000
   100.000      0.000 -3.673E-10  5.553E-12      0.000  7472.7574  1.289E+10
   0.000  32527431.      0.000
   102.000      0.000 -2.773E-11  7.787E-12      0.000  7472.7574  1.289E+10
   0.000  33679431.      0.000
   104.000      0.000  6.280E-12      0.000      0.000  7472.7574  1.289E+10
   0.000  34831431.      0.000
   106.000      0.000  1.211E-12      0.000      0.000  7472.7574  1.289E+10
   0.000  35983431.      0.000
   108.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  37135431.      0.000
   110.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  38287431.      0.000
   112.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  39439431.      0.000
   114.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  40591431.      0.000
   116.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  41743431.      0.000
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118.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  42895431.      0.000
120.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  44047431.      0.000
122.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  45199431.      0.000
124.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  46351431.      0.000
126.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  47503431.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  48655431.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  49807431.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  50959431.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  52111431.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  53263431.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  54415431.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  55567431.      0.000
142.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  56719431.      0.000
144.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  57871431.      0.000
146.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  59023431.      0.000
148.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  60175431.      0.000
150.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  61327431.      0.000
152.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  62479431.      0.000
154.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  63631431.      0.000
156.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  64783431.      0.000
158.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  65935431.      0.000
160.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  67087431.      0.000
162.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  68239431.      0.000
164.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  69391431.      0.000
166.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  70543431.      0.000
168.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  71695431.      0.000
170.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  72847431.      0.000
172.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  73999431.      0.000
174.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  75151431.      0.000
176.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  76303431.      0.000
178.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  77455431.      0.000
180.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
```

```
   0.000  78607431.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  79759431.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  80911431.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  82063431.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  83215431.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  84367431.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  85519431.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  86671431.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  87823431.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  88975431.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  45063715.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 6:

Pile-head deflection             =      5.0000000 inches
Computed slope at pile head      =     -0.0094026 radians
Maximum bending moment           =      -2975025. inch-lbs
Maximum shear force              =         28510. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             30
Number of zero deflection points =             31



-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 7
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     6.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     255000.0 lbs

   Depth    Deflect.    Bending    Shear       Slope      Total    Bending
   Soil Res.  Soil Spr.   Distrib.
     X         y        Moment     Force         S       Stress   Stiffness
     p         Es*h    Lat. Load
```

```
   feet       inches     in-lbs      lbs       radians     psi*      lb-in^2
   lb/in      lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     6.0000  -2975019.     28865.      0.000     55007.  2.199E+09
      0.000      0.000      0.000
     2.000     5.6104  -2238302.     24249.    -0.0183     43236.  1.289E+10
     -192.3310   822.7430      0.000
     4.000     5.1208  -1586856.     21914.    -0.0219     32827.  1.289E+10
     -2.3149    10.8493      0.000
     6.000     4.5603   -918657.     20985.    -0.0242     22151.  1.289E+10
     -75.0626   395.0425      0.000
     8.000     3.9587   -283223.     18456.    -0.0253     11998.  1.289E+10
     -135.7084   822.7513      0.000
    10.000     3.3444    277272.     15078.    -0.0253     11903.  1.289E+10
    -145.7470  1045.9040      0.000
    12.000     2.7425    750655.     11496.    -0.0244     19467.  1.289E+10
    -152.7585  1336.7939      0.000
    14.000     2.1742   1127494.  7785.2138    -0.0226     25488.  1.289E+10
    -156.5019  1727.5410      0.000
    16.000     1.6563   1401337.  4026.2729    -0.0203     29863.  1.289E+10
    -156.7431  2271.2368      0.000
    18.000     1.2010   1568923.   306.6528    -0.0175     32541.  1.289E+10
    -153.2252  3061.9321      0.000
    20.000     0.8159   1630369. -3279.2706    -0.0145     33523.  1.289E+10
    -145.6017  4283.1907      0.000
    22.000     0.5036   1589366. -6625.5577    -0.0115     32867.  1.289E+10
    -133.2555  6350.9721      0.000
    24.000     0.2623   1453492. -9600.9242  -0.008698     30697.  1.289E+10
    -114.6917     10493.      0.000
    26.000     0.0860   1234989.    -11988.  -0.006195     27205.  1.289E+10
    -84.2480     23498.      0.000
    28.000    -0.0350    953883.    -12204.  -0.004156     22714.  1.289E+10
    66.2694     45408.      0.000
    30.000    -0.1135    700075.    -10164.  -0.002616     18658.  1.289E+10
    103.6960     21934.      0.000
    32.000    -0.1606    498017. -7446.7176  -0.001501     15430.  1.289E+10
    122.7739     18346.      0.000
    34.000    -0.1855    361001. -4347.7977  -0.000701     13241.  1.289E+10
    135.4694     17527.      0.000
    36.000    -0.1942    297900. -2616.3830 -8.716E-05     12233.  1.289E+10
    8.8152  1089.1593      0.000
    38.000    -0.1897    236481. -2470.4747   0.000410     11251.  1.289E+10
    3.3439   423.0988      0.000
    40.000    -0.1745    174293. -2389.3173   0.000793     10258.  1.289E+10
    3.4192   470.1521      0.000
    42.000    -0.1516    112088. -2307.2273   0.001060  9263.6878  1.289E+10
    3.4216   541.6182      0.000
    44.000    -0.1237     50576. -2226.0196   0.001211  8280.8572  1.289E+10
    3.3457   649.2351      0.000
    46.000    -0.0935 -9585.1144 -2147.6736   0.001249  7625.9074  1.289E+10
    3.1831   817.2081      0.000
    48.000    -0.0637    -67804. -2074.4308   0.001177  8556.1165  1.289E+10
    2.9205  1100.0927      0.000
    50.000    -0.0370   -123567. -2008.9602   0.000999  9447.0998  1.289E+10
    2.5354  1645.6942      0.000
    52.000    -0.0158   -176462. -1954.7397   0.000720     10292.  1.289E+10
    1.9829  3019.6138      0.000
    54.000  -0.002433   -226203.  2165.3179   0.000345     11087.  1.289E+10
    341.3552   3367368.      0.000
    56.000   0.000784    -76745.  4624.9550  6.257E-05  8698.9861  1.289E+10
    -136.3854   4175721.      0.000
    58.000   0.000570 -4970.9328  1731.8657 -1.353E-05  7552.1825  1.289E+10
```

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 -104.7053   4406121.      0.000
 60.000   0.000135  6549.8222   163.3944 -1.206E-05  7577.4098  1.289E+10
 -26.0006   4636521.      0.000
 62.000 -8.390E-06  3019.5711  -128.1950 -3.146E-06  7521.0038  1.289E+10
 1.7015   4866921.      0.000
 64.000 -1.640E-05   434.9646   -65.9797  7.132E-08  7479.7072  1.289E+10
 3.4831   5097321.      0.000
 66.000 -4.967E-06  -148.3262   -10.9508  3.382E-07  7475.1273  1.289E+10
 1.1026   5327721.      0.000
 68.000 -1.642E-07   -94.8160     2.7369  1.118E-07  7474.2724  1.289E+10
 0.0380   5558121.      0.000
 70.000  4.006E-07   -18.3261     2.0336  6.468E-09  7473.0502  1.289E+10
 -0.0966   5788521.      0.000
 72.000  1.463E-07     2.7154     0.4338 -8.069E-09  7472.8008  1.289E+10
 -0.0367   6018921.      0.000
 74.000  1.333E-08     2.5930    -0.0482 -3.126E-09  7472.7988  1.289E+10
 -0.003471   6249321.      0.000
 76.000 -3.735E-09     0.4421    -0.0549 -2.993E-10  7472.7645  1.289E+10
 0.002911  18703431.      0.000
 78.000 -1.037E-09    -0.0374  -0.009649  7.761E-11  7472.7580  1.289E+10
 0.000858  19855431.      0.000
 80.000 -9.505E-12    -0.0220   0.000750  2.233E-11  7472.7578  1.289E+10
 8.320E-06  21007431.      0.000
 82.000  3.424E-11  -0.001641   0.000470      0.000  7472.7574  1.289E+10
 -3.161E-05  22159431.      0.000
 84.000  4.655E-12   0.000546  3.655E-05      0.000  7472.7574  1.289E+10
 -4.522E-06  23311431.      0.000
 86.000      0.000   0.000123 -1.146E-05      0.000  7472.7574  1.289E+10
 5.209E-07  24463431.      0.000
 88.000      0.000 -2.609E-06 -2.634E-06      0.000  7472.7574  1.289E+10
 2.147E-07  25615431.      0.000
 90.000      0.000 -4.041E-06  4.764E-08      0.000  7472.7574  1.289E+10
 8.770E-09  26767431.      0.000
 92.000      0.000 -3.749E-07  8.577E-08      0.000  7472.7574  1.289E+10
 -5.593E-09  27919431.      0.000
 94.000      0.000  7.405E-08  8.159E-09      0.000  7472.7574  1.289E+10
 -8.752E-10  29071431.      0.000
 96.000      0.000  1.799E-08 -1.550E-09      0.000  7472.7574  1.289E+10
 6.621E-11  30223431.      0.000
 98.000      0.000 -1.407E-10 -3.844E-10      0.000  7472.7574  1.289E+10
 3.089E-11  31375431.      0.000
100.000      0.000 -4.744E-10  2.192E-12      0.000  7472.7574  1.289E+10
1.321E-12  32527431.      0.000
102.000      0.000 -4.160E-11  1.005E-11      0.000  7472.7574  1.289E+10
0.000  33679431.      0.000
104.000      0.000  7.576E-12      0.000      0.000  7472.7574  1.289E+10
0.000  34831431.      0.000
106.000      0.000  1.652E-12      0.000      0.000  7472.7574  1.289E+10
0.000  35983431.      0.000
108.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  37135431.      0.000
110.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  38287431.      0.000
112.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  39439431.      0.000
114.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  40591431.      0.000
116.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  41743431.      0.000
118.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  42895431.      0.000
120.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  44047431.      0.000
```

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   122.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  45199431.      0.000
   124.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  46351431.      0.000
   126.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  47503431.      0.000
   128.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  48655431.      0.000
   130.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  49807431.      0.000
   132.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  50959431.      0.000
   134.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  52111431.      0.000
   136.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  53263431.      0.000
   138.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  54415431.      0.000
   140.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  55567431.      0.000
   142.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  56719431.      0.000
   144.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  57871431.      0.000
   146.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  59023431.      0.000
   148.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  60175431.      0.000
   150.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  61327431.      0.000
   152.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  62479431.      0.000
   154.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  63631431.      0.000
   156.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  64783431.      0.000
   158.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  65935431.      0.000
   160.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  67087431.      0.000
   162.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  68239431.      0.000
   164.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  69391431.      0.000
   166.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  70543431.      0.000
   168.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  71695431.      0.000
   170.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  72847431.      0.000
   172.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  73999431.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  75151431.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  76303431.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  77455431.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  78607431.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  79759431.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
```

```
   0.000  80911431.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  82063431.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  83215431.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  84367431.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  85519431.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  86671431.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  87823431.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  88975431.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  45063715.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 7:

Pile-head deflection             =      6.0000000 inches
Computed slope at pile head      =     -0.0141477 radians
Maximum bending moment           =      -2975019. inch-lbs
Maximum shear force              =         28865. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             30
Number of zero deflection points =             31



--------------------------------------------------------------------------------
--
                           Summary of Pile Response(s)
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Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs
Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians
Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/
radian
Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs
Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians


                Pile-head      Pile-head
                Maximum        Maximum
```

```
Load  Load    Condition 1    Condition 2        Axial        Pile-head
Moment          Shear        Pile-head
Case  Type    V(lbs) or     in-lb, rad.,       Loading      Deflection
in Pile        in Pile       Rotation
 No.   No.    y(inches)     or in-lb/rad.        lbs          inches
 in-lbs           lbs          radians
----  ----  --------------  --------------  -------------  -------------
-------------  -------------  -------------
  1     5   y =     0.5000  S =      0.000        255000.     0.50000000
  -834538.         13544.    -0.00025805
  2     5   y =     1.0000  S =      0.000        255000.     1.00000000
  -1340613.        17553.    -0.00034783
  3     5   y =     2.0000  S =      0.000        255000.     2.00000000
  -2161642.        22912.    -0.00047195
  4     5   y =     3.0000  S =      0.000        255000.     3.00000000
  -2859655.        27051.    -0.00056815
  5     5   y =     4.0000  S =      0.000        255000.     4.00000000
  -2975052.        28099.    -0.00459694
  6     5   y =     5.0000  S =      0.000        255000.     5.00000000
  -2975025.        28510.    -0.00940259
  7     5   y =     6.0000  S =      0.000        255000.     6.00000000
  -2975019.        28865.    -0.01414765
```

The analysis ended normally.

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==

LPile Plus for Windows, Version 2013-07.007

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

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--
Files Used for Analysis

--

Path to file locations: Z:\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis\L-Pile\West Abutment\Transverse\Post Seismic (No Scour)\
Name of input data file: West Abutment.lp7d
Name of output report file: West Abutment.lp7o
Name of plot output file: West Abutment.lp7p
Name of runtime messeage file: West Abutment.lp7r

--
Date and Time of Analysis

--

Date: October 3, 2017 Time: 13:32:46

--
Problem Title

--

Project Name: SR 21 Harbor River Bridge
Job Number:
Client:
Engineer:
Description:

```
--------------------------------------------------------------------------------
--
                            Program Options and Settings
--------------------------------------------------------------------------------
--

Engineering Units of Input Data and Computations:
 - Engineering units are US Customary Units (pounds, feet, inches)

Analysis Control Options:
- Maximum number of iterations allowed                  =          750
- Deflection tolerance for convergence                  =   1.0000E-05 in
- Maximum allowable deflection                          =     100.0000 in
- Number of pile increments                             =          100

Loading Type and Number of Cycles of Loading:
 - Static loading specified

Computational Options:
 - Use unfactored loads in computations (conventional analysis)
 - Compute pile response under loading and nonlinear bending properties of
 pile
   (only if nonlinear pile properties are input)
 - Analysis uses p-y modification factors for p-y curves
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Computation of pile-head foundation stiffness matrix not selected
 - Push-over analysis of pile not selected
 - Buckling analysis of pile not selected

Output Options:
 - No p-y curves to be computed and reported for user-specified depths
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1


--------------------------------------------------------------------------------
--
                     Pile Structural Properties and Geometry
--------------------------------------------------------------------------------
--

Total number of pile sections                           =          1

Total length of pile                                    =     200.00 ft

Depth of ground surface below top of pile               =       0.00 ft

Pile diameter values used for p-y curve computations are defined using 2
points.

p-y curves are computed using pile diameter values interpolated with depth
over
the length of the pile.

Point         Depth              Pile
                X              Diameter
                ft                in
-----       ---------        -----------
  1           0.00000         14.9000000
  2         200.000000        14.9000000
```

Input Structural Properties:

Pile Section No. 1:

Section Type	=	Elastic with Specified Moment Capacity
Cross-sectional Shape	=	Strong H-Pile
Section Length	=	200.00000 ft
Flange Width	=	14.90000 in
Section Depth	=	14.20000 in
Flange Thickness	=	0.80500 in
Web Thickness	=	0.80500 in
Section Area	=	34.12395 Sq. in
Moment of Inertia	=	1211.23082 in^4
Elastic Modulus	=	29000000. lbs/in^2
Plastic Moment Capacity	=	8600000. in-lb
Top Elastic Bending Stiffness	=	3.5126E+10 lbs-in^2
Bot Elastic Bending Stiffness	=	3.5126E+10 lbs-in^2

--
Ground Slope and Pile Batter Angles

--

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

--
Soil and Rock Layering Information

--

The soil profile is modelled using 6 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	0.0000 ft
Distance from top of pile to bottom of layer	=	3.00000 ft
Effective unit weight at top of layer	=	100.00000 pcf
Effective unit weight at bottom of layer	=	100.00000 pcf
Friction angle at top of layer	=	30.00000 deg.
Friction angle at bottom of layer	=	30.00000 deg.
Subgrade k at top of layer	=	25.00000 pci
Subgrade k at bottom of layer	=	25.00000 pci

Layer 2 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	3.00000 ft
Distance from top of pile to bottom of layer	=	6.00000 ft
Effective unit weight at top of layer	=	37.60000 pcf
Effective unit weight at bottom of layer	=	37.60000 pcf
Undrained cohesion at top of layer	=	24.00000 psf

```
   Undrained cohesion at bottom of layer              =     33.00000 psf
   Epsilon-50 at top of layer                         =      0.02000
   Epsilon-50 at bottom of layer                      =      0.02000


Layer 3 is soft clay, p-y criteria by Matlock, 1970

   Distance from top of pile to top of layer          =      6.00000 ft
   Distance from top of pile to bottom of layer       =     36.00000 ft
   Effective unit weight at top of layer              =     32.60000 pcf
   Effective unit weight at bottom of layer           =     32.60000 pcf
   Undrained cohesion at top of layer                 =    149.00000 psf
   Undrained cohesion at bottom of layer              =    501.00000 psf
   Epsilon-50 at top of layer                         =      0.02000
   Epsilon-50 at bottom of layer                      =      0.02000


Layer 4 is soft clay, p-y criteria by Matlock, 1970

   Distance from top of pile to top of layer          =     36.00000 ft
   Distance from top of pile to bottom of layer       =     53.00000 ft
   Effective unit weight at top of layer              =     37.60000 pcf
   Effective unit weight at bottom of layer           =     37.60000 pcf
   Undrained cohesion at top of layer                 =    111.00000 psf
   Undrained cohesion at bottom of layer              =    162.00000 psf
   Epsilon-50 at top of layer                         =      0.02000
   Epsilon-50 at bottom of layer                      =      0.02000


Layer 5 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer          =     53.00000 ft
   Distance from top of pile to bottom of layer       =     75.00000 ft
   Effective unit weight at top of layer              =     57.60000 pcf
   Effective unit weight at bottom of layer           =     57.60000 pcf
   Undrained cohesion at top of layer                 =   3400.00000 psf
   Undrained cohesion at bottom of layer              =   3400.00000 psf
   Epsilon-50 at top of layer                         =      0.00500
   Epsilon-50 at bottom of layer                      =      0.00500
   Subgrade k at top of layer                         =    400.00000 pci
   Subgrade k at bottom of layer                      =    400.00000 pci


Layer 6 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer          =     75.00000 ft
   Distance from top of pile to bottom of layer       =    200.00000 ft
   Effective unit weight at top of layer              =     57.60000 pcf
   Effective unit weight at bottom of layer           =     57.60000 pcf
   Undrained cohesion at top of layer                 =   6000.00000 psf
   Undrained cohesion at bottom of layer              =   6000.00000 psf
   Epsilon-50 at top of layer                         =      0.00500
   Epsilon-50 at bottom of layer                      =      0.00500
   Subgrade k at top of layer                         =   2000.00000 pci
   Subgrade k at bottom of layer                      =   2000.00000 pci


   (Depth of lowest soil layer extends    0.00 ft below pile tip)


--------------------------------------------------------------------------------
--
```

Summary of Soil Properties

Layer Num.	Soil Type (p-y Curve Criteria)	Layer Undrained Factor	Angle of Friction	Layer Strain Depth	Effective Unit Wt.	Cohesion	kpy	deg.	Epsilon 50	pci
1	Sand (Reese, et al.)			0.00	100.000	--	30.000	--	25.000	
				3.000	100.000	--	30.000	--	25.000	
2	Soft Clay			3.000	37.600	24.000	--	0.02000	--	
				6.000	37.600	33.000	--	0.02000	--	
3	Soft Clay			6.000	32.600	149.000	--	0.02000	--	
				36.000	32.600	501.000	--	0.02000	--	
4	Soft Clay			36.000	37.600	111.000	--	0.02000	--	
				53.000	37.600	162.000	--	0.02000	--	
5	Stiff Clay with Free Water			53.000	57.600	3400.000	--	0.00500	400.000	
				75.000	57.600	3400.000	--	0.00500	400.000	
6	Stiff Clay with Free Water			75.000	57.600	6000.000	--	0.00500	2000.000	
				200.000	57.600	6000.000	--	0.00500	2000.000	

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 10 points

Point No.	Depth X ft	p-mult	y-mult
1	0.000	0.8500	1.0000
2	3.000	0.8500	1.0000
3	3.000	0.0850	1.0000
4	6.000	0.0850	1.0000
5	6.000	0.8500	1.0000
6	36.000	0.8500	1.0000
7	36.000	0.0850	1.0000

```
  8           53.000         0.0850         1.0000
  9           53.000         0.8500         1.0000
 10          210.000         0.8500         1.0000


--------------------------------------------------------------------------------
--
                                  Loading Type
--------------------------------------------------------------------------------
--

Static loading criteria were used when computing p-y curves for all analyses.


--------------------------------------------------------------------------------
--
               Pile-head Loading and Pile-head Fixity Conditions
--------------------------------------------------------------------------------
--

Number of loads specified = 7

Load    Load         Condition               Condition            Axial Thrust
Compute
 No.    Type            1                       2                  Force, lbs
 Top y vs. Pile Length
-----   ----   --------------------   -----------------------
----------------   ---------------------
   1     5     y =      0.50000 in    S =       0.0000 in/in
   255000.             No
   2     5     y =      1.00000 in    S =       0.0000 in/in
   255000.             No
   3     5     y =      2.00000 in    S =       0.0000 in/in
   255000.             No
   4     5     y =      3.00000 in    S =       0.0000 in/in
   255000.             No
   5     5     y =      4.00000 in    S =       0.0000 in/in
   255000.             No
   6     5     y =      5.00000 in    S =       0.0000 in/in
   255000.             No
   7     5     y =      6.00000 in    S =       0.0000 in/in
   255000.             No

V = perpendicular shear force applied to pile head
M = bending moment applied to pile head
y = lateral deflection relative to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applie to pile head
Axial thrust is assumed to be acting axially for all pile batter angles.


--------------------------------------------------------------------------------
--
    Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness
--------------------------------------------------------------------------------
--

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1
```

Pile Section No. 1:

Moment-curvature properties were derived from elastic-plastic section properties

---
--
Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 255000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.5000	-1371974.	16020.	0.000	15911.	3.513E+10	0.000	0.000	0.000
2.000	0.4888	-1030929.	12162.	-0.000821	13814.	3.513E+10	-160.7544	7893.8068	0.000
4.000	0.4606	-778168.	10222.	-0.001439	12259.	3.513E+10	-0.9103	47.4349	0.000
6.000	0.4197	-522677.	9853.7771	-0.001883	10688.	3.513E+10	-29.7453	1701.0209	0.000
8.000	0.3702	-282135.	8848.0485	-0.002158	9208.1015	3.513E+10	-54.0654	3505.0934	0.000
10.000	0.3161	-71554.	7500.0211	-0.002279	7912.8665	3.513E+10	-58.2702	4424.4222	0.000
12.000	0.2608	105763.	6066.3937	-0.002267	8123.2816	3.513E+10	-61.1988	5631.8488	0.000
14.000	0.2072	247387.	4579.0291	-0.002147	8994.3771	3.513E+10	-62.7483	7266.5441	0.000
16.000	0.1578	351833.	3072.1095	-0.001942	9636.8025	3.513E+10	-62.8283	9558.6237	0.000
18.000	0.1140	418619.	1581.9285	-0.001679	10048.	3.513E+10	-61.3534	12914.	0.000
20.000	0.0772	448315.	146.9608	-0.001383	10230.	3.513E+10	-58.2272	18110.	0.000
22.000	0.0477	442598.	-1191.3638	-0.001078	10195.	3.513E+10	-53.2998	26843.	0.000
24.000	0.0254	404329.	-2385.6917	-0.000789	9959.6902	3.513E+10	-46.2275	43673.	0.000
26.000	0.009783	337742.	-3370.2419	-0.000535	9550.1305	3.513E+10	-35.8184	87871.	0.000
28.000	-0.000300	249112.	-3656.0560	-0.000335	9004.9854	3.513E+10	12.0005	961130.	0.000
30.000	-0.006297	166352.	-3095.2237	-0.000193	8495.9492	3.513E+10	34.7355	132382.	0.000
32.000	-0.009567	102904.	-2173.1647	-0.000101	8105.6968	3.513E+10	42.1028	105618.	0.000
34.000	-0.0111	63277.	-1108.7875	-4.431E-05	7861.9612	3.513E+10			

```
46.5953    100299.      0.000
36.000    -0.0117     50225.  -513.2397 -5.538E-06  7781.6781  3.513E+10
3.0336  6225.9050      0.000
38.000    -0.0114     38710.  -463.0287  2.484E-05  7710.8508  3.513E+10
1.1506  2419.1063      0.000
40.000    -0.0105     27695.  -435.1037  4.753E-05  7643.1045  3.513E+10
1.1765  2688.6149      0.000
42.000  -0.009134     17243.  -406.8529  6.288E-05  7578.8138  3.513E+10
1.1778  3094.6951      0.000
44.000  -0.007483  7396.6343  -378.8796  7.130E-05  7518.2524  3.513E+10
1.1533  3698.8944      0.000
46.000  -0.005711 -1816.1348  -351.8293  7.321E-05  7483.9280  3.513E+10
1.1009  4625.8469      0.000
48.000  -0.003969    -10387.  -326.4196  6.904E-05  7536.6468  3.513E+10
1.0166  6146.6863      0.000
50.000  -0.002398    -18329.  -303.4867  5.923E-05  7585.4966  3.513E+10
0.8945  8953.1333      0.000
52.000  -0.001127    -25680.  -284.0817  4.419E-05  7630.7062  3.513E+10
0.7226     15395.      0.000
54.000  -0.000276    -32506.   189.2914  2.431E-05  7672.6950  3.513E+10
38.7251   3361659.      0.000
56.000  4.055E-05    -16891.   581.8669  7.439E-06  7576.6509  3.513E+10
-6.0105   3557499.      0.000
58.000  8.058E-05 -4667.5663   358.5117  7.355E-08  7501.4665  3.513E+10
-12.6024   3753339.      0.000
60.000  4.408E-05   316.5227   120.2446 -1.413E-06  7474.7043  3.513E+10
-7.2532   3949179.      0.000
62.000  1.276E-05  1121.4698     6.7521 -9.216E-07  7479.6553  3.513E+10
-2.2046   4145019.      0.000
64.000 -1.597E-07   651.9028   -19.3560 -3.158E-07  7476.7671  3.513E+10
0.0289   4340859.      0.000
66.000 -2.394E-06   196.2480   -13.5791 -2.605E-08  7473.9645  3.513E+10
0.4525   4536699.      0.000
68.000 -1.410E-06     0.4229    -4.8125  4.114E-08  7472.7600  3.513E+10
0.2780   4732539.      0.000
70.000 -4.191E-07   -35.2564    -0.4433  2.924E-08  7472.9743  3.513E+10
0.0861   4928379.      0.000
72.000 -6.417E-09   -21.2132     0.6060  9.949E-09  7472.8879  3.513E+10
0.001370   5124219.      0.000
74.000  5.844E-08    -6.2920     0.4670  5.527E-10  7472.7961  3.513E+10
-0.0130   5320059.      0.000
76.000  2.011E-08     1.1942     0.1512 -1.189E-09  7472.7647  3.513E+10
-0.0134  15938594.      0.000
78.000  1.371E-09     0.9817    -0.0207 -4.455E-10  7472.7634  3.513E+10
-0.000967  16917794.      0.000
80.000 -1.271E-09     0.2084    -0.0209 -3.890E-11  7472.7587  3.513E+10
0.000948  17896994.      0.000
82.000 -4.959E-10    -0.0198  -0.004820  2.555E-11  7472.7575  3.513E+10
0.000390  18876194.      0.000
84.000 -4.493E-11    -0.0232   0.000307  1.085E-11  7472.7575  3.513E+10
3.717E-05  19855394.      0.000
86.000  2.512E-11  -0.005177   0.000491  1.150E-12  7472.7574  3.513E+10
-2.180E-05  20834594.      0.000
88.000  1.026E-11   0.000338   0.000118      0.000  7472.7574  3.513E+10
-9.325E-06  21813794.      0.000
90.000      0.000   0.000481 -4.941E-06      0.000  7472.7574  3.513E+10
-9.007E-07  22792994.      0.000
92.000      0.000   0.000104 -1.018E-05      0.000  7472.7574  3.513E+10
4.639E-07  23772194.      0.000
94.000      0.000 -7.087E-06 -2.346E-06      0.000  7472.7574  3.513E+10
1.892E-07  24751394.      0.000
96.000      0.000 -8.942E-06  1.144E-07      0.000  7472.7574  3.513E+10
1.582E-08  25730594.      0.000
```

```
 98.000      0.000 -1.645E-06  1.898E-07      0.000  7472.7574  3.513E+10
 -9.542E-09  31423287.      0.000
100.000      0.000  1.624E-07  3.687E-08      0.000  7472.7574  3.513E+10
-3.200E-09  32575287.      0.000
102.000      0.000  1.263E-07 -3.044E-09      0.000  7472.7574  3.513E+10
-1.263E-10  33727287.      0.000
104.000      0.000  1.692E-08 -2.702E-09      0.000  7472.7574  3.513E+10
1.548E-10  34879287.      0.000
106.000      0.000 -3.354E-09 -3.838E-10      0.000  7472.7574  3.513E+10
3.833E-11  36031287.      0.000
108.000      0.000 -1.532E-09  6.748E-11      0.000  7472.7574  3.513E+10
0.000  37183287.      0.000
110.000      0.000 -1.217E-10  3.303E-11      0.000  7472.7574  3.513E+10
-2.146E-12  38335287.      0.000
112.000      0.000  5.322E-11  2.852E-12      0.000  7472.7574  3.513E+10
0.000  39487287.      0.000
114.000      0.000  1.558E-11 -1.104E-12      0.000  7472.7574  3.513E+10
0.000  40639287.      0.000
116.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  41791287.      0.000
118.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42943287.      0.000
120.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  44095287.      0.000
122.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  45247287.      0.000
124.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  46399287.      0.000
126.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  47551287.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  48703287.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  49855287.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  51007287.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  52159287.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  53311287.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  54463287.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  55615287.      0.000
142.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  56767287.      0.000
144.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  57919287.      0.000
146.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  59071287.      0.000
148.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  60223287.      0.000
150.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  61375287.      0.000
152.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  62527287.      0.000
154.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  63679287.      0.000
156.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  64831287.      0.000
158.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  65983287.      0.000
160.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
```

```
   0.000  67135287.      0.000
   162.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  68287287.      0.000
   164.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  69439287.      0.000
   166.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  70591287.      0.000
   168.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  71743287.      0.000
   170.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  72895287.      0.000
   172.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  74047287.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  75199287.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  76351287.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  77503287.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  78655287.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  79807287.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  80959287.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  82111287.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  83263287.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  84415287.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  85567287.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  86719287.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  87871287.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  89023287.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  45087644.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 1:

Pile-head deflection             =      0.5000000 inches
Computed slope at pile head      =     -0.0001165 radians
Maximum bending moment           =      -1371974. inch-lbs
Maximum shear force              =         16020. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             14
```

Number of zero deflection points = 28

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 1.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 255000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	1.0000	-2224361.	21595.	0.000	21154.	3.513E+10	0.000	0.000	0.000
2.000	0.9818	-1750855.	17476.	-0.001358	18242.	3.513E+10	-171.6195	4195.3838	0.000
4.000	0.9348	-1368880.	15403.	-0.002424	15892.	3.513E+10	-1.1526	29.5911	0.000
6.000	0.8654	-981846.	14935.	-0.003227	13512.	3.513E+10	-37.8605	1049.9590	0.000
8.000	0.7799	-612513.	13649.	-0.003772	11240.	3.513E+10	-69.3094	2132.8147	0.000
10.000	0.6844	-280542.	11912.	-0.004077	9198.3034	3.513E+10	-75.3838	2643.5779	0.000
12.000	0.5842	9182.0400	10047.	-0.004169	7529.2340	3.513E+10	-80.0765	3289.4672	0.000
14.000	0.4842	252743.	8086.8008	-0.004080	9027.3222	3.513E+10	-83.2651	4126.7284	0.000
16.000	0.3884	447287.	6069.5578	-0.003841	10224.	3.513E+10	-84.8385	5242.3048	0.000
18.000	0.2999	591093.	4035.2245	-0.003486	11108.	3.513E+10	-84.6893	6777.5989	0.000
20.000	0.2211	683647.	2026.5559	-0.003051	11678.	3.513E+10	-82.6998	8978.0135	0.000
22.000	0.1535	725706.	89.6177	-0.002569	11936.	3.513E+10	-78.7117	12310.	0.000
24.000	0.0978	719394.	-1724.2865	-0.002075	11898.	3.513E+10	-72.4470	17786.	0.000
26.000	0.0538	668343.	-3352.7566	-0.001601	11584.	3.513E+10	-63.2589	28195.	0.000
28.000	0.0209	578061.	-4699.5209	-0.001175	11028.	3.513E+10	-48.9715	56246.	0.000
30.000	-0.002576	457154.	-4978.6019	-0.000822	10285.	3.513E+10	25.7147	239596.	0.000
32.000	-0.0186	349147.	-4040.4689	-0.000546	9620.2807	3.513E+10	52.4630	67873.	0.000
34.000	-0.0288	269899.	-2644.1741	-0.000335	9132.8435	3.513E+10	63.8949	53244.	0.000
36.000	-0.0346	226326.	-1825.1906	-0.000165	8864.8340	3.513E+10	4.3537	3017.7625	0.000
38.000	-0.0367	184314.	-1752.5710	-2.506E-05	8606.4281	3.513E+10			

```
    1.6979  1109.2033      0.000
    40.000    -0.0358    142509. -1710.9547  8.659E-05  8349.2970  3.513E+10
    1.7701  1185.7589      0.000
    42.000    -0.0326    101128. -1668.1296   0.000170  8094.7720  3.513E+10
    1.7986  1324.9135      0.000
    44.000    -0.0277     60360. -1625.1541   0.000225  7844.0182  3.513E+10
    1.7827  1545.8766      0.000
    46.000    -0.0218     20367. -1583.1338   0.000253  7598.0277  3.513E+10
    1.7190  1894.1286      0.000
    48.000    -0.0156    -18722. -1543.2833   0.000253  7587.9112  3.513E+10
    1.6018  2471.9005      0.000
    50.000  -0.009631    -56809. -1507.0082   0.000227  7822.1787  3.513E+10
    1.4211  3541.3285      0.000
    52.000  -0.004641    -93841. -1476.0618   0.000176  8049.9504  3.513E+10
    1.1578  5987.7656      0.000
    54.000  -0.001189   -129813.   536.7446  9.946E-05  8271.2067  3.513E+10
    166.5761   3361659.      0.000
    56.000   0.000133    -69294.  2298.3391  3.144E-05  7898.9714  3.513E+10
    -19.7765   3557499.      0.000
    58.000   0.000320    -19877.  1460.9147  9.740E-07  7595.0190  3.513E+10
    -50.0088   3753339.      0.000
    60.000   0.000180   817.5495   505.0483 -5.537E-06  7477.7860  3.513E+10
    -29.6467   3949179.      0.000
    62.000  5.397E-05  4432.6380    37.4278 -3.744E-06  7500.0215  3.513E+10
    -9.3217   4145019.      0.000
    64.000  4.647E-07  2659.9086   -75.4408 -1.321E-06  7489.1179  3.513E+10
    -0.0840   4340859.      0.000
    66.000 -9.426E-06   827.6472   -55.0677 -1.294E-07  7477.8481  3.513E+10
    1.7818   4536699.      0.000
    68.000 -5.745E-06    18.2412   -20.0924  1.596E-07  7472.8696  3.513E+10
    1.1328   4732539.      0.000
    70.000 -1.764E-06  -138.7402    -2.1507  1.185E-07  7473.6108  3.513E+10
    0.3623   4928379.      0.000
    72.000 -5.917E-08   -86.4412     2.3488  4.152E-08  7473.2891  3.513E+10
    0.0126   5124219.      0.000
    74.000  2.286E-07   -26.5038     1.8923  2.937E-09  7472.9204  3.513E+10
    -0.0507   5320059.      0.000
    76.000  8.178E-08     4.3548     0.6325 -4.630E-09  7472.7842  3.513E+10
    -0.0543  15938594.      0.000
    78.000  6.365E-09     3.9108    -0.0731 -1.806E-09  7472.7815  3.513E+10
    -0.004487  16917794.      0.000
    80.000 -4.923E-09     0.8662    -0.0829 -1.744E-10  7472.7627  3.513E+10
    0.003671  17896994.      0.000
    82.000 -2.006E-09    -0.0676    -0.0199  9.841E-11  7472.7578  3.513E+10
    0.001578  18876194.      0.000
    84.000 -1.992E-10    -0.0922   0.000974  4.382E-11  7472.7580  3.513E+10
    0.000165  19855394.      0.000
    86.000  9.668E-11    -0.0214   0.001944  5.013E-12  7472.7575  3.513E+10
    -8.393E-05  20834594.      0.000
    88.000  4.143E-11   0.001097   0.000485 -1.927E-12  7472.7574  3.513E+10
    -3.766E-05  21813794.      0.000
    90.000  4.172E-12   0.001908 -1.414E-05      0.000  7472.7574  3.513E+10
    -3.962E-06  22792994.      0.000
    92.000 -1.802E-12   0.000429 -4.026E-05      0.000  7472.7574  3.513E+10
    1.785E-06  23772194.      0.000
    94.000      0.000 -2.343E-05 -9.665E-06      0.000  7472.7574  3.513E+10
    7.646E-07  24751394.      0.000
    96.000      0.000 -3.536E-05  3.433E-07      0.000  7472.7574  3.513E+10
    6.944E-08  25730594.      0.000
    98.000      0.000 -7.147E-06  7.491E-07      0.000  7472.7574  3.513E+10
    -3.562E-08  26709794.      0.000
   100.000      0.000  5.780E-07  1.612E-07      0.000  7472.7574  3.513E+10
   -1.337E-08  27688994.      0.000
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102.000      0.000  5.982E-07 -1.022E-08      0.000  7472.7574  3.513E+10
-9.122E-10  33727287.      0.000
104.000      0.000  9.058E-08 -1.276E-08      0.000  7472.7574  3.513E+10
7.008E-10  34879287.      0.000
106.000      0.000 -1.380E-08 -2.039E-09      0.000  7472.7574  3.513E+10
1.923E-10  36031287.      0.000
108.000      0.000 -7.395E-09  2.735E-10      0.000  7472.7574  3.513E+10
0.000  37183287.      0.000
110.000      0.000 -7.080E-10  1.589E-10      0.000  7472.7574  3.513E+10
-9.978E-12  38335287.      0.000
112.000      0.000  2.343E-10  1.632E-11      0.000  7472.7574  3.513E+10
-1.908E-12  39487287.      0.000
114.000      0.000  7.696E-11 -4.833E-12      0.000  7472.7574  3.513E+10
0.000  40639287.      0.000
116.000      0.000  2.643E-12 -1.667E-12      0.000  7472.7574  3.513E+10
0.000  41791287.      0.000
118.000      0.000 -3.100E-12      0.000      0.000  7472.7574  3.513E+10
0.000  42943287.      0.000
120.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  44095287.      0.000
122.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  45247287.      0.000
124.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  46399287.      0.000
126.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  47551287.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  48703287.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  49855287.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  51007287.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  52159287.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  53311287.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  54463287.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  55615287.      0.000
142.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  56767287.      0.000
144.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  57919287.      0.000
146.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  59071287.      0.000
148.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  60223287.      0.000
150.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  61375287.      0.000
152.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  62527287.      0.000
154.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  63679287.      0.000
156.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  64831287.      0.000
158.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  65983287.      0.000
160.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  67135287.      0.000
162.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  68287287.      0.000
164.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
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   0.000  69439287.      0.000
   166.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  70591287.      0.000
   168.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  71743287.      0.000
   170.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  72895287.      0.000
   172.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  74047287.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  75199287.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  76351287.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  77503287.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  78655287.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  79807287.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  80959287.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  82111287.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  83263287.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  84415287.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  85567287.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  86719287.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  87871287.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  89023287.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  45087644.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 2:

Pile-head deflection             =      1.0000000 inches
Computed slope at pile head      =     -0.0001618 radians
Maximum bending moment           =      -2224361. inch-lbs
Maximum shear force              =         21595. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             19
Number of zero deflection points =             28
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 3
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     2.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     255000.0 lbs

   Depth    Deflect.    Bending    Shear       Slope      Total    Bending
   Soil Res.  Soil Spr.   Distrib.
     X         y        Moment     Force         S       Stress   Stiffness
     p         Es*h    Lat. Load
   feet      inches     in-lbs      lbs       radians     psi*      lb-in^2
   lb/in      lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     2.0000  -3644100.     29450.      0.000     29887.  3.513E+10
      0.000      0.000      0.000
     2.000     1.9701  -2979099.     25331.  -0.002263     25797.  3.513E+10
     -171.6195  2090.6674      0.000
     4.000     1.8914  -2400493.     23255.  -0.004101     22238.  3.513E+10
     -1.4578    18.4980      0.000
     6.000     1.7733  -1812689.     22660.  -0.005540     18622.  3.513E+10
     -48.0882   650.8311      0.000
     8.000     1.6255  -1245004.     21021.  -0.006584     15130.  3.513E+10
     -88.5324  1307.1712      0.000
    10.000     1.4572   -723108.     18794.  -0.007257     11920.  3.513E+10
    -96.9816  1597.2341      0.000
    12.000     1.2771   -254049.     16384.  -0.007591  9035.3547  3.513E+10
    -103.9252  1952.9470      0.000
    14.000     1.0929    156211.     13826.  -0.007624  8433.5745  3.513E+10
    -109.2188  2398.4577      0.000
    16.000     0.9112    502908.     11162.  -0.007399     10566.  3.513E+10
    -112.7285  2969.1641      0.000
    18.000     0.7377    782570.  8437.7916  -0.006960     12286.  3.513E+10
    -114.3243  3719.1583      0.000
    20.000     0.5771    993109.  5699.4572  -0.006353     13581.  3.513E+10
    -113.8702  4735.3419      0.000
    22.000     0.4328   1133906.  2998.5667  -0.005626     14447.  3.513E+10
    -111.2040  6166.6783      0.000
    24.000     0.3071   1205908.   390.9879  -0.004827     14890.  3.513E+10
    -106.0943  8292.5383      0.000
    26.000     0.2011   1211758. -2059.7854  -0.004001     14926.  3.513E+10
    -98.1368     11713.      0.000
    28.000     0.1150   1156013. -4274.7264  -0.003192     14583.  3.513E+10
    -86.4416     18040.      0.000
    30.000     0.0479   1045644. -6131.1850  -0.002440     13904.  3.513E+10
    -68.2633     34230.      0.000
    32.000  -0.002127    891583. -6645.1127  -0.001778     12957.  3.513E+10
    25.4360    286952.      0.000
    34.000    -0.0375    748445. -5502.6163  -0.001218     12076.  3.513E+10
    69.7720     44658.      0.000
    36.000    -0.0606    642366. -4602.3898  -0.000743     11424.  3.513E+10
    5.2468  2078.2205      0.000
    38.000    -0.0732    536623. -4513.7930  -0.000340     10773.  3.513E+10
    2.1362   700.8338      0.000
    40.000    -0.0769    429867. -4460.7546 -9.917E-06     10117.  3.513E+10
    2.2836   712.5533      0.000
    42.000    -0.0736    322628. -4405.0254   0.000247  9457.1698  3.513E+10
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 2.3604   769.3915      0.000
 44.000    -0.0651    215400. -4348.2560   0.000431  8797.6355  3.513E+10
 2.3703   874.4827      0.000
 46.000    -0.0529    108637. -4292.0748   0.000542  8140.9589  3.513E+10
 2.3114  1047.7847      0.000
 48.000    -0.0391  2750.8362 -4238.2097   0.000580  7489.6772  3.513E+10
 2.1773  1338.0623      0.000
 50.000    -0.0251   -101893. -4188.6076   0.000546  8099.4762  3.513E+10
 1.9562  1869.1202      0.000
 52.000    -0.0129   -204984. -4145.6219   0.000441  8733.5636  3.513E+10
 1.6260  3036.2069      0.000
 54.000  -0.003949   -306281.   417.7156   0.000266  9356.6183  3.513E+10
 378.6521   2301179.      0.000
 56.000 -6.800E-05   -188193.  5082.4886  9.742E-05  8630.2907  3.513E+10
 10.0789   3557499.      0.000
 58.000   0.000727    -63514.  3838.9170  1.143E-05  7863.4147  3.513E+10
 -113.7099   3753339.      0.000
 60.000   0.000481 -4065.1884  1525.2601 -1.166E-05  7497.7614  3.513E+10
 -79.0948   3949179.      0.000
 62.000   0.000168  9841.5808   228.7817 -9.683E-06  7533.2907  3.513E+10
 -28.9450   4145019.      0.000
 64.000  1.590E-05  7034.8541  -153.0619 -3.917E-06  7516.0272  3.513E+10
 -2.8753   4340859.      0.000
 66.000 -2.044E-05  2542.5574  -141.1979 -6.455E-07  7488.3961  3.513E+10
 3.8639   4536699.      0.000
 68.000 -1.509E-05   265.2567   -59.1346  3.138E-07  7474.3889  3.513E+10
 2.9747   4732539.      0.000
 70.000 -5.380E-06  -299.7422   -10.1811  3.020E-07  7474.6010  3.513E+10
 1.1048   4928379.      0.000
 72.000 -5.900E-07  -227.1306     4.5879  1.220E-07  7474.1544  3.513E+10
 0.1260   5124219.      0.000
 74.000  4.756E-07   -81.0157     4.8344  1.672E-08  7473.2557  3.513E+10
 -0.1054   5320059.      0.000
 76.000  2.126E-07     4.7147     1.8749 -9.347E-09  7472.7864  3.513E+10
 -0.1412  15938594.      0.000
 78.000  2.695E-08     9.0963    -0.0474 -4.628E-09  7472.8134  3.513E+10
 -0.0190  16917794.      0.000
 80.000 -9.552E-09     2.4983    -0.1898 -6.673E-10  7472.7728  3.513E+10
 0.007123  17896994.      0.000
 82.000 -5.084E-09  -0.007243    -0.0564  1.837E-10  7472.7574  3.513E+10
 0.003999  18876194.      0.000
 84.000 -7.352E-10    -0.2094  -0.001079  1.097E-10  7472.7587  3.513E+10
 0.000608  19855394.      0.000
 86.000  1.795E-10    -0.0604   0.004350  1.748E-11  7472.7578  3.513E+10
 -0.000156  20834594.      0.000
 88.000  1.040E-10  -0.000822   0.001347 -3.426E-12  7472.7574  3.513E+10
 -9.451E-05  21813794.      0.000
 90.000  1.501E-11   0.004307  4.174E-05 -2.236E-12  7472.7574  3.513E+10
 -1.425E-05  22792994.      0.000
 92.000 -3.338E-12   0.001208 -8.962E-05      0.000  7472.7574  3.513E+10
 3.306E-06  23772194.      0.000
 94.000 -1.867E-12  9.386E-06 -2.684E-05      0.000  7472.7574  3.513E+10
 1.926E-06  24751394.      0.000
 96.000      0.000 -8.055E-05 -6.118E-07      0.000  7472.7574  3.513E+10
 2.599E-07  25730594.      0.000
 98.000      0.000 -2.047E-05  1.686E-06      0.000  7472.7574  3.513E+10
 -6.839E-08  26709794.      0.000
100.000      0.000  3.050E-07  4.555E-07      0.000  7472.7574  3.513E+10
-3.415E-08  27688994.      0.000
102.000      0.000  1.407E-06 -8.778E-10      0.000  7472.7574  3.513E+10
-3.876E-09  33727287.      0.000
104.000      0.000  2.707E-07 -2.977E-08      0.000  7472.7574  3.513E+10
1.469E-09  34879287.      0.000
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106.000      0.000 -2.098E-08 -6.013E-09      0.000  7472.7574  3.513E+10
5.112E-10  36031287.      0.000
108.000      0.000 -1.815E-08  3.891E-10      0.000  7472.7574  3.513E+10
2.231E-11  37183287.      0.000
110.000      0.000 -2.392E-09  3.877E-10      0.000  7472.7574  3.513E+10
-2.244E-11  38335287.      0.000
112.000      0.000  4.533E-10  5.389E-11      0.000  7472.7574  3.513E+10
-5.379E-12  39487287.      0.000
114.000      0.000  1.983E-10 -9.172E-12      0.000  7472.7574  3.513E+10
0.000  40639287.      0.000
116.000      0.000  1.394E-11 -4.272E-12      0.000  7472.7574  3.513E+10
0.000  41791287.      0.000
118.000      0.000 -6.744E-12      0.000      0.000  7472.7574  3.513E+10
0.000  42943287.      0.000
120.000      0.000 -1.786E-12      0.000      0.000  7472.7574  3.513E+10
0.000  44095287.      0.000
122.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  45247287.      0.000
124.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  46399287.      0.000
126.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  47551287.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  48703287.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  49855287.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  51007287.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  52159287.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  53311287.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  54463287.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  55615287.      0.000
142.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  56767287.      0.000
144.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  57919287.      0.000
146.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  59071287.      0.000
148.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  60223287.      0.000
150.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  61375287.      0.000
152.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  62527287.      0.000
154.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  63679287.      0.000
156.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  64831287.      0.000
158.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  65983287.      0.000
160.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  67135287.      0.000
162.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  68287287.      0.000
164.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  69439287.      0.000
166.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  70591287.      0.000
168.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
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   0.000  71743287.      0.000
   170.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  72895287.      0.000
   172.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  74047287.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  75199287.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  76351287.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  77503287.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  78655287.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  79807287.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  80959287.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  82111287.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  83263287.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  84415287.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  85567287.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  86719287.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  87871287.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  89023287.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  45087644.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 3:

Pile-head deflection             =      2.0000000 inches
Computed slope at pile head      =     -0.0002272 radians
Maximum bending moment           =      -3644100. inch-lbs
Maximum shear force              =         29450. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             21
Number of zero deflection points =             28


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                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 4
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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     3.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     255000.0 lbs

   Depth    Deflect.    Bending    Shear       Slope      Total    Bending
   Soil Res.  Soil Spr.   Distrib.
     X         y        Moment     Force         S       Stress   Stiffness
     p         Es*h    Lat. Load
   feet      inches     in-lbs      lbs       radians     psi*      lb-in^2
   lb/in      lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     3.0000  -4888526.     35826.      0.000     37541.  3.513E+10
      0.000      0.000      0.000
     2.000     2.9599  -4067907.     31707.  -0.003060     32494.  3.513E+10
     -171.6195  1391.5481      0.000
     4.000     2.8531  -3329131.     29628.  -0.005587     27949.  3.513E+10
     -1.6719    14.0636      0.000
     6.000     2.6918  -2577396.     28944.  -0.007605     23326.  3.513E+10
     -55.2658   492.7569      0.000
     8.000     2.4881  -1846718.     27057.  -0.009116     18831.  3.513E+10
     -102.0308   984.1785      0.000
    10.000     2.2542  -1167087.     24487.    -0.0101     14651.  3.513E+10
    -112.1608  1194.1647      0.000
    12.000     2.0011   -547180.     21692.    -0.0107     10838.  3.513E+10
    -120.7065  1447.6732      0.000
    14.000     1.7391  5487.2713     18714.    -0.0109  7506.5083  3.513E+10
    -127.5100  1759.6962      0.000
    16.000     1.4771    484686.     15594.    -0.0107     10454.  3.513E+10
    -132.4245  2151.6061      0.000
    18.000     1.2231    885582.     12382.    -0.0103     12920.  3.513E+10
    -135.3087  2655.0159      0.000
    20.000     0.9836   1204837.  9125.5998  -0.009567     14883.  3.513E+10
    -136.0185  3318.7266      0.000
    22.000     0.7639   1440707.  5880.6702  -0.008663     16334.  3.513E+10
    -134.3923  4222.1779      0.000
    24.000     0.5678   1593143.  2705.2852  -0.007626     17272.  3.513E+10
    -130.2231  5504.0773      0.000
    26.000     0.3979   1663908.  -335.7658  -0.006514     17707.  3.513E+10
    -123.1978  7431.7446      0.000
    28.000     0.2552   1656754. -3167.0522  -0.005379     17663.  3.513E+10
    -112.7428     10604.      0.000
    30.000     0.1396   1577732. -5690.4090  -0.004274     17177.  3.513E+10
    -97.5370     16763.      0.000
    32.000     0.0500   1435931. -7737.3205  -0.003245     16305.  3.513E+10
    -73.0390     35058.      0.000
    34.000    -0.0161   1246056. -7982.2443  -0.002328     15137.  3.513E+10
    52.6287     78460.      0.000
    36.000    -0.0618   1081284. -7287.3338  -0.001533     14123.  3.513E+10
    5.2805  2051.8508      0.000
    38.000    -0.0897    915033. -7196.5294  -0.000851     13101.  3.513E+10
    2.2865   611.7661      0.000
    40.000    -0.1026    746272. -7138.9218  -0.000284     12063.  3.513E+10
    2.5141   587.9211      0.000
    42.000    -0.1033    575838. -7077.0396   0.000168     11015.  3.513E+10
    2.6427   613.8423      0.000
    44.000    -0.0946    404519. -7013.1040   0.000503  9960.8629  3.513E+10
    2.6853   681.4285      0.000
    46.000    -0.0792    233056. -6949.1593   0.000721  8906.2288  3.513E+10
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 2.6435   801.1300      0.000
 48.000    -0.0600     62140. -6887.2906   0.000821  7854.9659  3.513E+10
 2.5123  1005.1161      0.000
 50.000    -0.0398   -107589. -6829.7848   0.000806  8134.5095  3.513E+10
 2.2799  1376.0660      0.000
 52.000    -0.0213   -275554. -6779.3341   0.000675  9167.6257  3.513E+10
 1.9243  2167.8282      0.000
 54.000  -0.007363   -441259.  -551.5912   0.000430     10187.  3.513E+10
 517.0542   1685271.      0.000
 56.000  -0.000658   -307295.  6824.2201   0.000174  9362.8575  3.513E+10
 97.5967   3557499.      0.000
 58.000   0.001007   -115831.  6104.7324  2.984E-05  8185.2048  3.513E+10
 -157.5540   3753339.      0.000
 60.000   0.000774    -14633.  2685.9592 -1.473E-05  7562.7620  3.513E+10
 -127.3438   3949179.      0.000
 62.000   0.000300     13276.   535.2833 -1.519E-05  7554.4132  3.513E+10
 -51.8792   4145019.      0.000
 64.000  4.457E-05     11247.  -184.0105 -6.817E-06  7541.9321  3.513E+10
 -8.0619   4340859.      0.000
 66.000 -2.682E-05  4526.6353  -219.9266 -1.428E-06  7500.5997  3.513E+10
 5.0689   4536699.      0.000
 68.000 -2.398E-05   707.5188  -102.3678  3.601E-07  7477.1092  3.513E+10
 4.7277   4732539.      0.000
 70.000 -9.533E-06  -391.4260   -22.1450  4.680E-07  7475.1650  3.513E+10
 1.9576   4928379.      0.000
 72.000 -1.509E-06  -361.1681     5.2131  2.109E-07  7474.9789  3.513E+10
 0.3223   5124219.      0.000
 74.000  5.918E-07  -143.7809     7.5060  3.843E-08  7473.6418  3.513E+10
 -0.1312   5320059.      0.000
 76.000  3.351E-07    -1.3485     3.2616 -1.116E-08  7472.7657  3.513E+10
 -0.2225  15938594.      0.000
 78.000  5.629E-08    12.9132     0.1151 -7.205E-09  7472.8368  3.513E+10
 -0.0397  16917794.      0.000
 80.000 -1.074E-08     4.2649    -0.2649 -1.336E-09  7472.7836  3.513E+10
 0.008010  17896994.      0.000
 82.000 -7.838E-09     0.2126    -0.0948  1.936E-10  7472.7587  3.513E+10
 0.006164  18876194.      0.000
 84.000 -1.448E-09    -0.2900  -0.006500  1.672E-10  7472.7592  3.513E+10
 0.001198  19855394.      0.000
 86.000  1.874E-10    -0.1014   0.005921  3.347E-11  7472.7580  3.513E+10
 -0.000163  20834594.      0.000
 88.000  1.589E-10  -0.006177   0.002236 -3.295E-12  7472.7574  3.513E+10
 -0.000144  21813794.      0.000
 90.000  2.918E-11   0.005920   0.000170 -3.383E-12  7472.7574  3.513E+10
 -2.771E-05  22792994.      0.000
 92.000 -3.470E-12   0.002028  -0.000121      0.000  7472.7574  3.513E+10
 3.438E-06  23772194.      0.000
 94.000 -2.863E-12   0.000108 -4.457E-05      0.000  7472.7574  3.513E+10
 2.952E-06  24751394.      0.000
 96.000      0.000  -0.000112 -2.963E-06      0.000  7472.7574  3.513E+10
 5.150E-07  25730594.      0.000
 98.000      0.000 -3.478E-05  2.310E-06      0.000  7472.7574  3.513E+10
 -7.560E-08  26709794.      0.000
100.000      0.000 -1.111E-06  7.663E-07      0.000  7472.7574  3.513E+10
-5.302E-08  27688994.      0.000
102.000      0.000  2.021E-06  3.275E-08      0.000  7472.7574  3.513E+10
-8.109E-09  33727287.      0.000
104.000      0.000  4.734E-07 -4.242E-08      0.000  7472.7574  3.513E+10
1.845E-09  34879287.      0.000
106.000      0.000 -1.326E-08 -1.042E-08      0.000  7472.7574  3.513E+10
8.207E-10  36031287.      0.000
108.000      0.000 -2.718E-08  1.854E-10      0.000  7472.7574  3.513E+10
6.334E-11  37183287.      0.000
```

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110.000      0.000 -4.502E-09  5.770E-10      0.000  7472.7574  3.513E+10
-3.070E-11  38335287.      0.000
112.000      0.000  5.074E-10  1.002E-10      0.000  7472.7574  3.513E+10
-9.036E-12  39487287.      0.000
114.000      0.000  3.103E-10 -9.948E-12      0.000  7472.7574  3.513E+10
0.000  40639287.      0.000
116.000      0.000  3.135E-11 -6.651E-12      0.000  7472.7574  3.513E+10
0.000  41791287.      0.000
118.000      0.000 -8.883E-12      0.000      0.000  7472.7574  3.513E+10
0.000  42943287.      0.000
120.000      0.000 -2.941E-12      0.000      0.000  7472.7574  3.513E+10
0.000  44095287.      0.000
122.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  45247287.      0.000
124.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  46399287.      0.000
126.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  47551287.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  48703287.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  49855287.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  51007287.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  52159287.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  53311287.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  54463287.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  55615287.      0.000
142.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  56767287.      0.000
144.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  57919287.      0.000
146.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  59071287.      0.000
148.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  60223287.      0.000
150.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  61375287.      0.000
152.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  62527287.      0.000
154.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  63679287.      0.000
156.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  64831287.      0.000
158.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  65983287.      0.000
160.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  67135287.      0.000
162.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  68287287.      0.000
164.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  69439287.      0.000
166.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  70591287.      0.000
168.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  71743287.      0.000
170.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  72895287.      0.000
172.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
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   0.000  74047287.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  75199287.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  76351287.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  77503287.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  78655287.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  79807287.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  80959287.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  82111287.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  83263287.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  84415287.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  85567287.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  86719287.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  87871287.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  89023287.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  45087644.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 4:

Pile-head deflection             =      3.0000000 inches
Computed slope at pile head      =     -0.0002803 radians
Maximum bending moment           =      -4888526. inch-lbs
Maximum shear force              =         35826. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             22
Number of zero deflection points =             28



-----------------------------------------------------------------------------
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                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 5
-----------------------------------------------------------------------------
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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
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Displacement of pile head = 4.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 255000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	4.0000	-6034704.	41403.	0.000	44591.	3.513E+10	0.000	0.000	0.000
2.000	3.9505	-5077839.	37284.	-0.003796	38705.	3.513E+10	-171.6195	1042.6141	0.000
4.000	3.8178	-4198594.	35203.	-0.006965	33297.	3.513E+10	-1.8423	11.5817	0.000
6.000	3.6162	-3302853.	34449.	-0.009528	27788.	3.513E+10	-60.9810	404.7213	0.000
8.000	3.3604	-2428426.	32364.	-0.0115	22409.	3.513E+10	-112.7819	805.4847	0.000
10.000	3.0648	-1608807.	29519.	-0.0129	17368.	3.513E+10	-124.2551	973.0108	0.000
12.000	2.7429	-854032.	26419.	-0.0137	12726.	3.513E+10	-134.0836	1173.2218	0.000
14.000	2.4069	-172917.	23105.	-0.0141	8536.3311	3.513E+10	-142.0992	1416.9103	0.000
16.000	2.0681	427071.	19622.	-0.0140	10100.	3.513E+10	-148.1450	1719.1920	0.000
18.000	1.7363	939942.	16019.	-0.0135	13254.	3.513E+10	-152.0705	2101.9770	0.000
20.000	1.4199	1361290.	12350.	-0.0127	15846.	3.513E+10	-153.7236	2598.2748	0.000
22.000	1.1259	1688401.	8669.9397	-0.0117	17858.	3.513E+10	-152.9395	3260.1960	0.000
24.000	0.8595	1920359.	5040.4401	-0.0104	19284.	3.513E+10	-149.5188	4175.0855	0.000
26.000	0.6246	2058163.	1528.0018	-0.009084	20132.	3.513E+10	-143.1843	5501.7355	0.000
28.000	0.4235	2104888.	-1791.9811	-0.007662	20419.	3.513E+10	-133.4809	7564.9240	0.000
30.000	0.2569	2065925.	-4827.7920	-0.006237	20180.	3.513E+10	-119.5033	11166.	0.000
32.000	0.1241	1949490.	-7448.4912	-0.004865	19464.	3.513E+10	-98.8883	19122.	0.000
34.000	0.0233	1767943.	-9350.2684	-0.003595	18347.	3.513E+10	-59.5932	61271.	0.000
36.000	-0.0484	1544678.	-10007.	-0.002463	16974.	3.513E+10	4.8695	2412.7579	0.000
38.000	-0.0949	1317758.	-9920.5606	-0.001485	15578.	3.513E+10	2.3298	589.2628	0.000
40.000	-0.1197	1086671.	-9860.8434	-0.000664	14157.	3.513E+10	2.6467	530.5248	0.000
42.000	-0.1268	852563.	-9795.1351	-1.338E-06	12717.	3.513E+10	2.8290	535.6613	0.000
44.000	-0.1198	616521.	-9726.3217	0.000501	11265.	3.513E+10	2.9054	582.0794	0.000
46.000	-0.1027	379573.	-9656.8608	0.000841	9807.4246	3.513E+10	2.8830	673.5519	0.000
48.000	-0.0794	142699.	-9589.1595	0.001019	8350.4681	3.513E+10	2.7588	833.5269	0.000
50.000	-0.0538	-93182.	-9525.7942	0.001036	8045.8995	3.513E+10			

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    2.5217  1124.8654      0.000
    52.000    -0.0297   -327222. -9469.7384   0.000893  9485.4218  3.513E+10
    2.1496  1737.2283      0.000
    54.000    -0.0110   -558655. -1874.3915   0.000590     10909.  3.513E+10
    630.7959   1381411.      0.000
    56.000  -0.001382   -424413.  8152.7105   0.000254     10083.  3.513E+10
    204.7959   3557499.      0.000
    58.000   0.001236   -170434.  8290.1579  5.085E-05  8521.0593  3.513E+10
    -193.3420   3753339.      0.000
    60.000   0.001059    -27108.  3878.2365 -1.663E-05  7639.4917  3.513E+10
    -174.3181   3949179.      0.000
    62.000   0.000438     15925.   878.8108 -2.045E-05  7570.7061  3.513E+10
    -75.6340   4145019.      0.000
    64.000  7.762E-05     15325.  -197.2696 -9.777E-06  7567.0202  3.513E+10
    -14.0394   4340859.      0.000
    66.000 -3.137E-05  6575.3594  -294.5743 -2.295E-06  7513.2009  3.513E+10
    5.9306   4536699.      0.000
    68.000 -3.255E-05  1213.9013  -146.3943  3.659E-07  7480.2238  3.513E+10
    6.4177   4732539.      0.000
    70.000 -1.381E-05  -456.0473   -35.3479  6.248E-07  7475.5624  3.513E+10
    2.8362   4928379.      0.000
    72.000 -2.556E-06  -490.4444     5.2342  3.014E-07  7475.7740  3.513E+10
    0.5457   5124219.      0.000
    74.000  6.578E-07  -208.4951    10.0322  6.267E-08  7474.0398  3.513E+10
    -0.1458   5320059.      0.000
    76.000  4.524E-07    -9.6676     4.6773 -1.186E-08  7472.8169  3.513E+10
    -0.3004  15938594.      0.000
    78.000  8.835E-08    16.1612     0.3250 -9.646E-09  7472.8568  3.513E+10
    -0.0623  16917794.      0.000
    80.000 -1.065E-08     6.0504    -0.3271 -2.058E-09  7472.7946  3.513E+10
    0.007939  17896994.      0.000
    82.000 -1.042E-08     0.4872    -0.1334  1.757E-10  7472.7604  3.513E+10
    0.008199  18876194.      0.000
    84.000 -2.213E-09    -0.3556    -0.0131  2.207E-10  7472.7596  3.513E+10
    0.001831  19855394.      0.000
    86.000  1.676E-10    -0.1426   0.007157  5.047E-11  7472.7583  3.513E+10
    -0.000145  20834594.      0.000
    88.000  2.101E-10    -0.0127   0.003120 -2.567E-12  7472.7575  3.513E+10
    -0.000191  21813794.      0.000
    90.000  4.434E-11   0.007216   0.000323 -4.441E-12  7472.7574  3.513E+10
    -4.211E-05  22792994.      0.000
    92.000 -3.085E-12   0.002849  -0.000146 -1.003E-12  7472.7574  3.513E+10
    3.056E-06  23772194.      0.000
    94.000 -3.793E-12   0.000230 -6.220E-05      0.000  7472.7574  3.513E+10
    3.912E-06  24751394.      0.000
    96.000      0.000  -0.000137 -5.787E-06      0.000  7472.7574  3.513E+10
    7.895E-07  25730594.      0.000
    98.000      0.000 -4.919E-05  2.807E-06      0.000  7472.7574  3.513E+10
    -7.329E-08  26709794.      0.000
   100.000      0.000 -2.922E-06  1.078E-06      0.000  7472.7574  3.513E+10
   -7.085E-08  27688994.      0.000
   102.000      0.000  2.553E-06  7.472E-08      0.000  7472.7574  3.513E+10
   -1.274E-08  33727287.      0.000
   104.000      0.000  6.810E-07 -5.324E-08      0.000  7472.7574  3.513E+10
   2.072E-09  34879287.      0.000
   106.000      0.000 -1.957E-10 -1.492E-08      0.000  7472.7574  3.513E+10
   1.121E-09  36031287.      0.000
   108.000      0.000 -3.542E-08 -1.321E-10      0.000  7472.7574  3.513E+10
   1.107E-10  37183287.      0.000
   110.000      0.000 -6.733E-09  7.487E-10      0.000  7472.7574  3.513E+10
   -3.729E-11  38335287.      0.000
   112.000      0.000  4.999E-10  1.488E-10      0.000  7472.7574  3.513E+10
   -1.270E-11  39487287.      0.000
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114.000      0.000  4.169E-10 -9.400E-12      0.000  7472.7574  3.513E+10
0.000  40639287.      0.000
116.000      0.000  5.072E-11 -8.904E-12      0.000  7472.7574  3.513E+10
0.000  41791287.      0.000
118.000      0.000 -1.043E-11 -1.140E-12      0.000  7472.7574  3.513E+10
0.000  42943287.      0.000
120.000      0.000 -4.083E-12      0.000      0.000  7472.7574  3.513E+10
0.000  44095287.      0.000
122.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  45247287.      0.000
124.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  46399287.      0.000
126.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  47551287.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  48703287.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  49855287.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  51007287.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  52159287.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  53311287.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  54463287.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  55615287.      0.000
142.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  56767287.      0.000
144.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  57919287.      0.000
146.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  59071287.      0.000
148.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  60223287.      0.000
150.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  61375287.      0.000
152.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  62527287.      0.000
154.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  63679287.      0.000
156.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  64831287.      0.000
158.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  65983287.      0.000
160.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  67135287.      0.000
162.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  68287287.      0.000
164.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  69439287.      0.000
166.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  70591287.      0.000
168.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  71743287.      0.000
170.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  72895287.      0.000
172.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  74047287.      0.000
174.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  75199287.      0.000
176.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
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   0.000  76351287.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  77503287.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  78655287.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  79807287.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  80959287.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  82111287.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  83263287.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  84415287.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  85567287.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  86719287.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  87871287.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  89023287.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  45087644.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 5:

Pile-head deflection             =      4.0000000 inches
Computed slope at pile head      =     -0.0003269 radians
Maximum bending moment           =      -6034704. inch-lbs
Maximum shear force              =         41403. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             21
Number of zero deflection points =             27



-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 6
-------------------------------------------------------------------------------
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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     5.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     255000.0 lbs
```

```
   Depth    Deflect.    Bending    Shear       Slope      Total    Bending
   Soil Res.  Soil Spr.   Distrib.
     X         y        Moment     Force         S       Stress   Stiffness
     p         Es*h    Lat. Load
   feet      inches     in-lbs      lbs       radians     psi*      lb-in^2
   lb/in      lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     5.0000  -7054710.     46221.      0.000     50865.  3.513E+10
      0.000      0.000      0.000
     2.000     4.9422  -5980080.     42102.  -0.004453     44255.  3.513E+10
     -171.6195   833.4151      0.000
     4.000     4.7863  -4979297.     40019.  -0.008197     38099.  3.513E+10
     -1.9865     9.9613      0.000
     6.000     4.5487  -3958837.     39205.    -0.0113     31823.  3.513E+10
     -65.8274   347.3212      0.000
     8.000     4.2462  -2959739.     36952.    -0.0136     25677.  3.513E+10
     -121.9296   689.1567      0.000
    10.000     3.8952  -2018497.     33874.    -0.0153     19888.  3.513E+10
    -134.5928   829.2819      0.000
    12.000     3.5111  -1146339.     30512.    -0.0164     14524.  3.513E+10
    -145.5865   995.1510      0.000
    14.000     3.1082   -353246.     26908.    -0.0169  9645.4917  3.513E+10
    -154.7417  1194.8421      0.000
    16.000     2.6995    352193.     23108.    -0.0169  9639.0152  3.513E+10
    -161.9036  1439.4130      0.000
    18.000     2.2966    962903.     19162.    -0.0165     13395.  3.513E+10
    -166.9277  1744.4571      0.000
    20.000     1.9094   1473436.     15123.    -0.0156     16536.  3.513E+10
    -169.6757  2132.6823      0.000
    22.000     1.5465   1880075.     11047.    -0.0145     19037.  3.513E+10
    -170.0082  2638.4090      0.000
    24.000     1.2143   2180927.  6993.1990    -0.0131     20887.  3.513E+10
    -167.7744  3315.9232      0.000
    26.000     0.9179   2376021.  3026.4153    -0.0115     22087.  3.513E+10
    -162.7909  4256.2582      0.000
    28.000     0.6605   2467413.  -784.6778  -0.009883     22649.  3.513E+10
    -154.8002  5624.6543      0.000
    30.000     0.4436   2459322. -4362.7544  -0.008200     22599.  3.513E+10
    -143.3729  7757.4790      0.000
    32.000     0.2669   2358364. -7614.9545  -0.006554     21979.  3.513E+10
    -127.6438     11476.      0.000
    34.000     0.1290   2174022.    -10411.  -0.005005     20845.  3.513E+10
    -105.3413     19601.      0.000
    36.000     0.0267   1919913.    -11723.  -0.003607     19282.  3.513E+10
    -3.9925  3591.4631      0.000
    38.000    -0.0441   1655476.    -11749.  -0.002385     17655.  3.513E+10
    1.8051   981.4629      0.000
    40.000    -0.0878   1385156.    -11699.  -0.001347     15993.  3.513E+10
    2.3868   652.3190      0.000
    42.000    -0.1088   1110418.    -11638.  -0.000494     14303.  3.513E+10
    2.6884   593.1656      0.000
    44.000    -0.1115    832586.    -11572.   0.000170     12594.  3.513E+10
    2.8370   610.5075      0.000
    46.000    -0.1006    552907.    -11503.   0.000643     10874.  3.513E+10
    2.8632   682.9061      0.000
    48.000    -0.0807    272564.    -11435.   0.000925  9149.2377  3.513E+10
    2.7728   825.1001      0.000
    50.000    -0.0562 -7320.5741    -11372.   0.001016  7517.7846  3.513E+10
    2.5588  1092.4291      0.000
    52.000    -0.0319   -285701.    -11314.   0.000916  9230.0382  3.513E+10
    2.2015  1656.4071      0.000
    54.000    -0.0123   -561619. -3280.5750   0.000626     10927.  3.513E+10
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    667.2828   1305853.      0.000
    56.000  -0.001840   -450833.  7828.3195   0.000280     10246.  3.513E+10
    258.4584   3371150.      0.000
    58.000   0.001191   -189290.  8694.8506  6.162E-05  8637.0389  3.513E+10
    -186.2475   3753339.      0.000
    60.000   0.001118    -34235.  4252.6025 -1.474E-05  7683.3268  3.513E+10
    -183.9398   3949179.      0.000
    62.000   0.000483     15015.  1043.5345 -2.131E-05  7565.1107  3.513E+10
    -83.4825   4145019.      0.000
    64.000  9.512E-05     16116.  -164.7033 -1.067E-05  7571.8819  3.513E+10
    -17.2040   4340859.      0.000
    66.000 -2.886E-05  7239.7852  -305.6794 -2.693E-06  7517.2876  3.513E+10
    5.4560   4536699.      0.000
    68.000 -3.412E-05  1476.1412  -159.4594  2.851E-07  7481.8368  3.513E+10
    6.7290   4732539.      0.000
    70.000 -1.518E-05  -417.7558   -41.3041  6.466E-07  7475.3269  3.513E+10
    3.1172   4928379.      0.000
    72.000 -3.086E-06  -514.3716     4.0100  3.282E-07  7475.9212  3.513E+10
    0.6589   5124219.      0.000
    74.000  5.731E-07  -229.2930    10.3928  7.414E-08  7474.1677  3.513E+10
    -0.1270   5320059.      0.000
    76.000  4.723E-07   -16.4242     5.1046 -9.809E-09  7472.8584  3.513E+10
    -0.3137  15938594.      0.000
    78.000  1.022E-07    15.8476     0.4761 -1.001E-08  7472.8549  3.513E+10
    -0.0720  16917794.      0.000
    80.000 -8.005E-09     6.5533    -0.3168 -2.353E-09  7472.7977  3.513E+10
    0.005970  17896994.      0.000
    82.000 -1.076E-08     0.6702    -0.1436  1.143E-10  7472.7615  3.513E+10
    0.008461  18876194.      0.000
    84.000 -2.519E-09    -0.3424    -0.0171  2.263E-10  7472.7595  3.513E+10
    0.002084  19855394.      0.000
    86.000  1.061E-10    -0.1534   0.006797  5.696E-11  7472.7583  3.513E+10
    -9.210E-05  20834594.      0.000
    88.000  2.158E-10    -0.0168   0.003339 -1.163E-12  7472.7575  3.513E+10
    -0.000196  21813794.      0.000
    90.000  5.028E-11   0.006908   0.000412 -4.536E-12  7472.7574  3.513E+10
    -4.775E-05  22792994.      0.000
    92.000 -1.930E-12   0.003064  -0.000138 -1.129E-12  7472.7574  3.513E+10
    1.911E-06  23772194.      0.000
    94.000 -3.902E-12   0.000307 -6.658E-05      0.000  7472.7574  3.513E+10
    4.025E-06  24751394.      0.000
    96.000      0.000  -0.000133 -7.483E-06      0.000  7472.7574  3.513E+10
    9.004E-07  25730594.      0.000
    98.000      0.000 -5.316E-05  2.681E-06      0.000  7472.7574  3.513E+10
    -5.329E-08  26709794.      0.000
   100.000      0.000 -4.154E-06  1.157E-06      0.000  7472.7574  3.513E+10
   -7.374E-08  27688994.      0.000
   102.000      0.000  2.394E-06  1.027E-07      0.000  7472.7574  3.513E+10
   -1.413E-08  28668194.      0.000
   104.000      0.000  7.943E-07 -4.930E-08      0.000  7472.7574  3.513E+10
   1.457E-09  34879287.      0.000
   106.000      0.000  3.087E-08 -1.728E-08      0.000  7472.7574  3.513E+10
   1.211E-09  36031287.      0.000
   108.000      0.000 -3.525E-08 -8.111E-10      0.000  7472.7574  3.513E+10
   1.614E-10  37183287.      0.000
   110.000      0.000 -8.277E-09  7.393E-10      0.000  7472.7574  3.513E+10
   -3.217E-11  38335287.      0.000
   112.000      0.000  2.043E-10  1.815E-10      0.000  7472.7574  3.513E+10
   -1.432E-11  39487287.      0.000
   114.000      0.000  4.377E-10 -2.879E-12      0.000  7472.7574  3.513E+10
   -1.043E-12  40639287.      0.000
   116.000      0.000  6.842E-11 -9.296E-12      0.000  7472.7574  3.513E+10
   0.000  41791287.      0.000
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118.000      0.000 -8.303E-12 -1.518E-12      0.000  7472.7574  3.513E+10
0.000  42943287.      0.000
120.000      0.000 -4.521E-12      0.000      0.000  7472.7574  3.513E+10
0.000  44095287.      0.000
122.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  45247287.      0.000
124.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  46399287.      0.000
126.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  47551287.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  48703287.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  49855287.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  51007287.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  52159287.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  53311287.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  54463287.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  55615287.      0.000
142.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  56767287.      0.000
144.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  57919287.      0.000
146.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  59071287.      0.000
148.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  60223287.      0.000
150.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  61375287.      0.000
152.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  62527287.      0.000
154.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  63679287.      0.000
156.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  64831287.      0.000
158.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  65983287.      0.000
160.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  67135287.      0.000
162.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  68287287.      0.000
164.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  69439287.      0.000
166.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  70591287.      0.000
168.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  71743287.      0.000
170.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  72895287.      0.000
172.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  74047287.      0.000
174.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  75199287.      0.000
176.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  76351287.      0.000
178.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  77503287.      0.000
180.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
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   0.000  78655287.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  79807287.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  80959287.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  82111287.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  83263287.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  84415287.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  85567287.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  86719287.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  87871287.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  89023287.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  45087644.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 6:

Pile-head deflection             =      5.0000000 inches
Computed slope at pile head      =     -0.0003671 radians
Maximum bending moment           =      -7054710. inch-lbs
Maximum shear force              =         46221. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             21
Number of zero deflection points =             27



-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 7
-------------------------------------------------------------------------------
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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     6.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     255000.0 lbs

   Depth    Deflect.    Bending    Shear       Slope      Total    Bending
   Soil Res.  Soil Spr.   Distrib.
     X         y        Moment     Force         S       Stress   Stiffness
     p         Es*h    Lat. Load
```

```
   feet       inches     in-lbs      lbs       radians     psi*      lb-in^2
   lb/in      lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     6.0000  -7989266.     50502.      0.000     56613.  3.513E+10
      0.000      0.000      0.000
     2.000     5.9345  -6809930.     46384.  -0.005056     49359.  3.513E+10
     -171.6195   694.0555      0.000
     4.000     5.7573  -5700972.     44299.  -0.009330     42538.  3.513E+10
     -2.1127     8.8071      0.000
     6.000     5.4867  -4569391.     43433.    -0.0128     35578.  3.513E+10
     -70.0724   306.5142      0.000
     8.000     5.1411  -3459065.     41032.    -0.0156     28749.  3.513E+10
     -129.9549   606.6677      0.000
    10.000     4.7388  -2409129.     37749.    -0.0176     22291.  3.513E+10
    -143.6811   727.6909      0.000
    12.000     4.2969  -1431879.     34156.    -0.0189     16280.  3.513E+10
    -155.7254   869.7859      0.000
    14.000     3.8316   -538339.     30296.    -0.0196     10784.  3.513E+10
    -165.9202  1039.2664      0.000
    16.000     3.3575    261882.     26216.    -0.0197  9083.5311  3.513E+10
    -174.1143  1244.5992      0.000
    18.000     2.8877    960717.     21964.    -0.0192     13382.  3.513E+10
    -180.1709  1497.4370      0.000
    20.000     2.4336   1551757.     17594.    -0.0184     17017.  3.513E+10
    -183.9644  1814.2537      0.000
    22.000     2.0050   2030345.     13162.    -0.0172     19961.  3.513E+10
    -185.3782  2219.0407      0.000
    24.000     1.6096   2393665.  8726.2634    -0.0157     22196.  3.513E+10
    -184.2988  2747.9675      0.000
    26.000     1.2535   2640820.  4347.3807    -0.0139     23716.  3.513E+10
    -180.6081  3457.9174      0.000
    28.000     0.9407   2772901.    90.0752    -0.0121     24528.  3.513E+10
    -174.1673  4443.3041      0.000
    30.000     0.6734   2793068. -3977.3303    -0.0102     24652.  3.513E+10
    -164.7831  5872.5895      0.000
    32.000     0.4519   2706639. -7780.2961  -0.008305     24121.  3.513E+10
    -152.1307  8079.1233      0.000
    34.000     0.2748   2521266.    -11232.  -0.006519     22980.  3.513E+10
    -135.5460     11838.      0.000
    36.000     0.1390   2247275.    -12942.  -0.004890     21295.  3.513E+10
    -6.9209  1194.8555      0.000
    38.000     0.0401   1959901.    -13046.  -0.003453     19528.  3.513E+10
    -1.7484  1046.8498      0.000
    40.000    -0.0267   1663324.    -13048.  -0.002215     17703.  3.513E+10
    1.6049  1442.1348      0.000
    42.000    -0.0662   1360716.    -13001.  -0.001182     15842.  3.513E+10
    2.2784   825.7128      0.000
    44.000    -0.0834   1053731.    -12943.  -0.000357     13954.  3.513E+10
    2.5753   740.8374      0.000
    46.000    -0.0834    743823.    -12880.   0.000257     12048.  3.513E+10
    2.6889   774.2434      0.000
    48.000    -0.0711    432353.    -12816.   0.000659     10132.  3.513E+10
    2.6584   897.6314      0.000
    50.000    -0.0517    120607.    -12754.   0.000848  8214.5812  3.513E+10
    2.4886  1154.9340      0.000
    52.000    -0.0304   -190211.    -12698.   0.000824  8642.6985  3.513E+10
    2.1657  1711.3922      0.000
    54.000    -0.0121   -498985. -4702.3125   0.000589     10542.  3.513E+10
    664.1396   1311975.      0.000
    56.000  -0.002109   -423128.  6587.7876   0.000274     10075.  3.513E+10
    276.7021   3148536.      0.000
    58.000   0.000992   -186122.  8046.2112  6.564E-05  8617.5520  3.513E+10
```

```
 -155.1668   3753339.      0.000
 60.000   0.001041    -37714.  4127.7218 -1.083E-05  7704.7260  3.513E+10
 -171.3740   3949179.      0.000
 62.000   0.000472     12141.  1092.3286 -1.957E-05  7547.4339  3.513E+10
 -81.5755   4145019.      0.000
 64.000   0.000102     14958.  -108.5512 -1.031E-05  7564.7576  3.513E+10
 -18.4979   4340859.      0.000
 66.000 -2.251E-05  7056.7216  -279.4711 -2.788E-06  7516.1617  3.513E+10
 4.2545   4536699.      0.000
 68.000 -3.157E-05  1577.0312  -153.7165  1.612E-07  7482.4574  3.513E+10
 6.2250   4732539.      0.000
 70.000 -1.477E-05  -323.6421   -42.6209  5.894E-07  7474.7481  3.513E+10
 3.0329   4928379.      0.000
 72.000 -3.278E-06  -475.9845     2.1726  3.162E-07  7475.6851  3.513E+10
 0.6998   5124219.      0.000
 74.000  4.088E-07  -223.2278     9.4833  7.735E-08  7474.1304  3.513E+10
 -0.0906   5320059.      0.000
 76.000  4.348E-07   -21.7322     4.9306 -6.339E-09  7472.8911  3.513E+10
 -0.2888  15938594.      0.000
 78.000  1.045E-07    13.5192     0.5813 -9.145E-09  7472.8406  3.513E+10
 -0.0737  16917794.      0.000
 80.000 -4.123E-09     6.2802    -0.2659 -2.381E-09  7472.7960  3.513E+10
 0.003074  17896994.      0.000
 82.000 -9.772E-09     0.7857    -0.1368  3.305E-11  7472.7622  3.513E+10
 0.007686  18876194.      0.000
 84.000 -2.536E-09    -0.2850    -0.0194  2.041E-10  7472.7592  3.513E+10
 0.002098  19855394.      0.000
 86.000  2.577E-11    -0.1459   0.005554  5.690E-11  7472.7583  3.513E+10
 -2.237E-05  20834594.      0.000
 88.000  1.949E-10    -0.0191   0.003159      0.000  7472.7575  3.513E+10
 -0.000177  21813794.      0.000
 90.000  5.046E-11   0.005707   0.000458 -4.070E-12  7472.7574  3.513E+10
 -4.792E-05  22792994.      0.000
 92.000      0.000   0.002914  -0.000112 -1.125E-12  7472.7574  3.513E+10
 4.245E-07  23772194.      0.000
 94.000 -3.533E-12   0.000353 -6.301E-05      0.000  7472.7574  3.513E+10
 3.643E-06  24751394.      0.000
 96.000      0.000  -0.000111 -8.395E-06      0.000  7472.7574  3.513E+10
 9.083E-07  25730594.      0.000
 98.000      0.000 -5.083E-05  2.207E-06      0.000  7472.7574  3.513E+10
 -2.482E-08  26709794.      0.000
100.000      0.000 -5.018E-06  1.101E-06      0.000  7472.7574  3.513E+10
-6.731E-08  27688994.      0.000
102.000      0.000  2.043E-06  1.203E-07      0.000  7472.7574  3.513E+10
-1.445E-08  28668194.      0.000
104.000      0.000  7.716E-07 -4.169E-08      0.000  7472.7574  3.513E+10
9.509E-10  34879287.      0.000
106.000      0.000  4.505E-08 -1.673E-08      0.000  7472.7574  3.513E+10
1.129E-09  36031287.      0.000
108.000      0.000 -3.131E-08 -1.106E-09      0.000  7472.7574  3.513E+10
1.724E-10  37183287.      0.000
110.000      0.000 -8.246E-09  6.533E-10      0.000  7472.7574  3.513E+10
-2.576E-11  38335287.      0.000
112.000      0.000  1.499E-11  1.801E-10      0.000  7472.7574  3.513E+10
-1.367E-11  39487287.      0.000
114.000      0.000  4.017E-10  1.120E-12      0.000  7472.7574  3.513E+10
-1.243E-12  40639287.      0.000
116.000      0.000  7.096E-11 -8.503E-12      0.000  7472.7574  3.513E+10
0.000  41791287.      0.000
118.000      0.000 -6.194E-12 -1.566E-12      0.000  7472.7574  3.513E+10
0.000  42943287.      0.000
120.000      0.000 -4.275E-12      0.000      0.000  7472.7574  3.513E+10
0.000  44095287.      0.000
```

```
122.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  45247287.      0.000
124.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  46399287.      0.000
126.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  47551287.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  48703287.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  49855287.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  51007287.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  52159287.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  53311287.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  54463287.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  55615287.      0.000
142.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  56767287.      0.000
144.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  57919287.      0.000
146.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  59071287.      0.000
148.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  60223287.      0.000
150.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  61375287.      0.000
152.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  62527287.      0.000
154.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  63679287.      0.000
156.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  64831287.      0.000
158.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  65983287.      0.000
160.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  67135287.      0.000
162.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  68287287.      0.000
164.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  69439287.      0.000
166.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  70591287.      0.000
168.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  71743287.      0.000
170.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  72895287.      0.000
172.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  74047287.      0.000
174.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  75199287.      0.000
176.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  76351287.      0.000
178.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  77503287.      0.000
180.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  78655287.      0.000
182.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  79807287.      0.000
184.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
```

```
   0.000  80959287.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  82111287.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  83263287.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  84415287.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  85567287.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  86719287.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  87871287.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  89023287.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  45087644.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 7:

Pile-head deflection             =      6.0000000 inches
Computed slope at pile head      =     -0.0004029 radians
Maximum bending moment           =      -7989266. inch-lbs
Maximum shear force              =         50502. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             20
Number of zero deflection points =             27



--------------------------------------------------------------------------------
--
                           Summary of Pile Response(s)
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Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs
Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians
Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/
radian
Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs
Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians


                Pile-head      Pile-head
                Maximum        Maximum
```

```
Load  Load    Condition 1    Condition 2        Axial        Pile-head
Moment          Shear        Pile-head
Case  Type    V(lbs) or     in-lb, rad.,       Loading      Deflection
in Pile        in Pile       Rotation
 No.   No.    y(inches)     or in-lb/rad.        lbs          inches
 in-lbs           lbs          radians
----  ----  --------------  --------------  -------------  -------------
-------------  -------------  -------------
  1     5   y =     0.5000  S =      0.000        255000.     0.50000000
  -1371974.         16020.    -0.00011651
  2     5   y =     1.0000  S =      0.000        255000.     1.00000000
  -2224361.         21595.    -0.00016176
  3     5   y =     2.0000  S =      0.000        255000.     2.00000000
  -3644100.         29450.    -0.00022718
  4     5   y =     3.0000  S =      0.000        255000.     3.00000000
  -4888526.         35826.    -0.00028035
  5     5   y =     4.0000  S =      0.000        255000.     4.00000000
  -6034704.         41403.    -0.00032689
  6     5   y =     5.0000  S =      0.000        255000.     5.00000000
  -7054710.         46221.    -0.00036713
  7     5   y =     6.0000  S =      0.000        255000.     6.00000000
  -7989266.         50502.    -0.00040290
```

The analysis ended normally.

File name is incorrect below, run designation is "W.Overbank Post Seismic (Full scour) 24in"

==========
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LPile for Windows, Version 2016-09.009

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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--
Files Used for Analysis

--

Path to file locations:
\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis
\L-Pile\West Overbank\Post Seismic (Full Scour)\

Name of input data file:
West Overbank Static 24in.lp9d

Name of output report file:
West Overbank Static 24in.lp9o

Name of plot output file:
West Overbank Static 24in.lp9p

Name of runtime message file:
West Overbank Static 24in.lp9r

--
Date and Time of Analysis

--

Date: October 3, 2017 Time: 11:50:04

--

Problem Title

Project Name: Harbor River Bridge
Job Number: 18461-007-01
Client: SCDOT
Engineer: HPC
Description: West Overbank - Post Seismic

Program Options and Settings

Computational Options:
- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:
- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed	=	500
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	100

Loading Type and Number of Cycles of Loading:
- Static loading specified

- Analysis uses p-y modification factors for p-y curves
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined	=	1
Total length of pile	=	200.000 ft
Depth of ground surface below top of pile	=	8.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	24.0000
2	200.000	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile

Cross-sectional shape	=	rectangular
Length of section	=	200.000000 ft
Width of top of section	=	24.000000 in
Width of bottom of section	=	24.000000 in
Top Section Depth	=	24.000000 in
Bottom Section Depth	=	24.000000 in
Top Area	=	576.000000 sq. in
Bottom Area	=	576.000000 sq. in
Moment of Inertia at Top	=	27648. in^4
Moment of Inertia at Bottom	=	27648. in^4
Elastic Modulus	=	3600000. psi

--
Ground Slope and Pile Batter Angles

--

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

--
Soil and Rock Layering Information

--

The soil profile is modelled using 5 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	8.000000 ft
Distance from top of pile to bottom of layer	=	15.000000 ft
Effective unit weight at top of layer	=	37.600000 pcf
Effective unit weight at bottom of layer	=	37.600000 pcf
Undrained cohesion at top of layer	=	0.0000 psf
Undrained cohesion at bottom of layer	=	16.000000 psf

```
   Epsilon-50 at top of layer                          =     0.020000
   Epsilon-50 at bottom of layer                       =     0.020000


Layer 2 is soft clay, p-y criteria by Matlock, 1970

   Distance from top of pile to top of layer           =    15.000000 ft
   Distance from top of pile to bottom of layer        =    45.000000 ft
   Effective unit weight at top of layer               =    32.600000 pcf
   Effective unit weight at bottom of layer            =    32.600000 pcf
   Undrained cohesion at top of layer                  =    69.000000 psf
   Undrained cohesion at bottom of layer               =   323.000000 psf
   Epsilon-50 at top of layer                          =     0.020000
   Epsilon-50 at bottom of layer                       =     0.020000


Layer 3 is soft clay, p-y criteria by Matlock, 1970

   Distance from top of pile to top of layer           =    45.000000 ft
   Distance from top of pile to bottom of layer        =    55.000000 ft
   Effective unit weight at top of layer               =    37.600000 pcf
   Effective unit weight at bottom of layer            =    37.600000 pcf
   Undrained cohesion at top of layer                  =   112.000000 psf
   Undrained cohesion at bottom of layer               =   145.000000 psf
   Epsilon-50 at top of layer                          =     0.020000
   Epsilon-50 at bottom of layer                       =     0.020000


Layer 4 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer           =    55.000000 ft
   Distance from top of pile to bottom of layer        =    75.000000 ft
   Effective unit weight at top of layer               =    57.600000 pcf
   Effective unit weight at bottom of layer            =    57.600000 pcf
   Undrained cohesion at top of layer                  =        3400. psf
   Undrained cohesion at bottom of layer               =        3400. psf
   Epsilon-50 at top of layer                          =     0.005000
   Epsilon-50 at bottom of layer                       =     0.005000
   Subgrade k at top of layer                          =   400.000000 pci
   Subgrade k at bottom of layer                       =   400.000000 pci


Layer 5 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer           =    75.000000 ft
   Distance from top of pile to bottom of layer        =   210.000000 ft
   Effective unit weight at top of layer               =    57.600000 pcf
   Effective unit weight at bottom of layer            =    57.600000 pcf
   Undrained cohesion at top of layer                  =        6000. psf
   Undrained cohesion at bottom of layer               =        6000. psf
   Epsilon-50 at top of layer                          =     0.005000
   Epsilon-50 at bottom of layer                       =     0.005000
   Subgrade k at top of layer                          =   800.000000 pci
   Subgrade k at bottom of layer                       =   800.000000 pci


 (Depth of the lowest soil layer extends 10.000 ft below the pile tip)


--------------------------------------------------------------------------------
--
                        Summary of Input Soil Properties
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Full scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

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Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	E50 or krm	Layer kpy pci
1	Soft --	8.0000	37.6000	0.00	0.02000	
	Clay 0.02000 --	15.0000	37.6000	16.0000		
2	Soft --	15.0000	32.6000	69.0000	0.02000	
	Clay 0.02000 --	45.0000	32.6000	323.0000		
3	Soft --	45.0000	37.6000	112.0000	0.02000	
	Clay 0.02000 --	55.0000	37.6000	145.0000		
4	Stiff Clay with Free Water 0.00500 400.0000	55.0000	57.6000	3400.	0.00500	400.0000
		75.0000	57.6000	3400.		
5	Stiff Clay with Free Water 0.00500 800.0000	75.0000	57.6000	6000.	0.00500	800.0000
		210.0000	57.6000	6000.		

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p-y Modification Factors for Group Action

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Distribution of p-y modifiers with depth defined using 8 points

Point No.	Depth X ft	p-mult	y-mult
1	8.000	0.0850	1.0000
2	15.000	0.0850	1.0000
3	15.000	0.8500	1.0000
4	45.000	0.8500	1.0000
5	45.000	0.0850	1.0000
6	55.000	0.0850	1.0000
7	55.000	0.8500	1.0000
8	210.000	0.8500	1.0000

--

Static Loading Type

--

Static loading criteria were used when computing p-y curves for all analyses.

--
Pile-head Loading and Pile-head Fixity Conditions

--

Number of loads specified = 7

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	5	y = 0.500000 in	S = 0.0000 in/in	450000.	N.A.
2	5	y = 1.000000 in	S = 0.0000 in/in	450000.	N.A.
3	5	y = 2.000000 in	S = 0.0000 in/in	450000.	N.A.
4	5	y = 3.000000 in	S = 0.0000 in/in	450000.	N.A.
5	5	y = 4.000000 in	S = 0.0000 in/in	450000.	N.A.
6	5	y = 5.000000 in	S = 0.0000 in/in	450000.	N.A.
7	5	y = 6.000000 in	S = 0.0000 in/in	450000.	N.A.

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

--
Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness
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--

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

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Layering Correction Equivalent Depths of Soil & Rock Layers

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File name is incorrect below, run designation is "W.Overbank Post Seismic (Full scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	8.0000	0.00	N.A.	No	0.00	1019.
2	15.0000	7.0000	Yes	No	1019.	105553.
3	45.0000	37.0000	Yes	No	106572.	24170.
4	55.0000	75.7698	No	No	130742.	131132.
5	75.0000	95.7698	Yes	No	261874.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 450000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				
0.00	0.5047	-1610577.	7598.	0.00	1480.	9.95E+10
0.00	0.00	0.00				
2.0000	0.5000	-1426371.	7588.	-3.66E-04	1400.	9.95E+10
0.00	0.00	0.00				
4.0000	0.4871	-1238451.	7588.	-6.87E-04	1319.	9.95E+10
0.00	0.00	0.00				
6.0000	0.4670	-1047305.	7588.	-9.63E-04	1236.	9.95E+10
0.00	0.00	0.00				
8.0000	0.4409	-853432.	7588.	-0.00119	1152.	9.95E+10
0.00	0.00	0.00				
10.0000	0.4098	-657337.	7585.	-0.00137	1067.	9.95E+10
-0.2037	11.9303	0.00				
12.0000	0.3749	-459647.	7578.	-0.00151	980.7496	9.95E+10
-0.3955	25.3188	0.00				
14.0000	0.3373	-260988.	7567.	-0.00160	894.5260	9.95E+10
-0.5727	40.7462	0.00				
16.0000	0.2983	-61979.	7195.	-0.00163	808.1507	9.95E+10
-30.4253	2448.	0.00				
18.0000	0.2589	119666.	6396.	-0.00163	833.1884	9.95E+10
-36.0936	3346.	0.00				
20.0000	0.2202	280210.	5479.	-0.00158	902.8689	9.95E+10

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-40.3302      4397.       0.00
22.0000     0.1831    416794.      4471.   -0.00150   962.1500   9.95E+10
-43.6925      5728.       0.00
24.0000     0.1484    527125.      3393.   -0.00138      1010.   9.95E+10
-46.1157      7460.       0.00
26.0000     0.1167    609521.      2270.   -0.00124      1046.   9.95E+10
-47.5381      9774.       0.00
28.0000    0.08862    662948.      1124.   -0.00109      1069.   9.95E+10
-47.8970     12971.       0.00
30.0000    0.06435    687060.   -15.9435  -9.29E-04      1079.   9.95E+10
-47.1222     17576.       0.00
32.0000    0.04405    682240.     -1123.  -7.63E-04      1077.   9.95E+10
-45.1200     24584.       0.00
34.0000    0.02770    649655.     -2165.  -6.03E-04      1063.   9.95E+10
-41.7332     36160.       0.00
36.0000    0.01511    591339.     -3105.  -4.53E-04      1038.   9.95E+10
-36.6171     58165.       0.00
38.0000    0.00594    510392.     -3889.  -3.20E-04      1003.   9.95E+10
-28.6829    115874.       0.00
40.0000  -2.74E-04    411594.     -4104.  -2.09E-04   959.8934   9.95E+10
10.7219    940756.       0.00
42.0000   -0.00411    317901.     -3633.  -1.21E-04   919.2277   9.95E+10
28.5556    166909.       0.00
44.0000   -0.00610    239827.     -2877.  -5.41E-05   885.3416   9.95E+10
34.4518    135574.       0.00
46.0000   -0.00670    180973.     -2448.  -3.39E-06   859.7974   9.95E+10
1.3036      4667.       0.00
48.0000   -0.00626    122399.     -2416.   3.32E-05   834.3746   9.95E+10
1.3473      5164.       0.00
50.0000   -0.00511     64282.     -2384.   5.57E-05   809.1502   9.95E+10
1.3274      6234.       0.00
52.0000   -0.00359      6762.     -2353.   6.43E-05   784.1850   9.95E+10
1.2404      8297.       0.00
54.0000   -0.00203    -50061.     -2325.   5.90E-05   802.9778   9.95E+10
1.0753     12738.       0.00
56.0000  -7.54E-04   -106134.  -540.9178   4.02E-05   827.3151   9.95E+10
147.6344   4700160.       0.00
58.0000  -9.59E-05    -76893.      1465.   1.81E-05   814.6239   9.95E+10
19.5630   4896000.       0.00
60.0000   1.17E-04    -36184.      1402.   4.51E-06   796.9550   9.95E+10
-24.8382   5091840.       0.00
62.0000   1.21E-04     -9688.   785.1293  -1.02E-06   785.4547   9.95E+10
-26.5801   5287680.       0.00
64.0000   6.82E-05      1524.   279.3139  -2.00E-06   781.9115   9.95E+10
-15.5711   5483520.       0.00
66.0000   2.45E-05      3763.    22.9505  -1.37E-06   782.8831   9.95E+10
-5.7925   5679360.       0.00
68.0000   2.58E-06      2655.   -54.1376  -5.92E-07   782.4024   9.95E+10
-0.6315   5875200.       0.00
70.0000  -3.95E-06      1177.   -49.7160  -1.30E-07   781.7608   9.95E+10
1.0000   6071040.       0.00
72.0000  -3.68E-06   271.5591   -26.1987   4.43E-08   781.3679   9.95E+10
0.9598   6266880.       0.00
74.0000  -1.83E-06   -81.6255    -8.7793   6.72E-08   781.2854   9.95E+10
0.4918   6462720.       0.00
76.0000  -4.50E-07  -151.2971     0.1176   3.91E-08   781.3157   9.95E+10
0.2496   1.33E+07       0.00
78.0000   5.14E-08   -76.8256     2.7600   1.16E-08   781.2833   9.95E+10
-0.02937   1.37E+07       0.00
80.0000   1.08E-07   -19.0702     1.6461   5.86E-11   781.2583   9.95E+10
-0.06345   1.41E+07       0.00
82.0000   5.42E-08     2.1860     0.4917  -1.98E-09   781.2509   9.95E+10
-0.03274   1.45E+07       0.00
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 84.0000   1.31E-08     4.5760    0.00130  -1.16E-09   781.2520   9.95E+10
 -0.00813   1.49E+07       0.00
 86.0000  -1.54E-09     2.2737   -0.08445  -3.36E-10   781.2510   9.95E+10
 9.80E-04   1.53E+07       0.00
 88.0000  -3.02E-09     0.5299   -0.04900   2.05E-12   781.2502   9.95E+10
 0.00197   1.57E+07       0.00
 90.0000  -1.44E-09   -0.07843   -0.01374   5.65E-11   781.2500   9.95E+10
 9.64E-04   1.61E+07       0.00
 92.0000  -3.13E-10    -0.1311   3.98E-04   3.12E-11   781.2501   9.95E+10
 2.14E-04   1.65E+07       0.00
 94.0000   5.73E-11   -0.05998    0.00249   8.18E-12   781.2500   9.95E+10
 -4.02E-05   1.68E+07       0.00
 96.0000   8.02E-11   -0.01189    0.00131       0.00   781.2500   9.95E+10
 -5.76E-05   1.72E+07       0.00
 98.0000   3.42E-11    0.00305   3.20E-04  -1.55E-12   781.2500   9.95E+10
 -2.51E-05   1.76E+07       0.00
100.0000   5.92E-12    0.00351  -3.48E-05       0.00   781.2500   9.95E+10
-4.44E-06   1.80E+07       0.00
102.0000  -2.07E-12    0.00140  -6.90E-05       0.00   781.2500   9.95E+10
1.59E-06   1.84E+07       0.00
104.0000  -1.97E-12   2.00E-04  -3.14E-05       0.00   781.2500   9.95E+10
1.55E-06   1.88E+07       0.00
106.0000       0.00  -1.07E-04  -5.95E-06       0.00   781.2500   9.95E+10
5.72E-07   1.92E+07       0.00
108.0000       0.00  -8.58E-05   1.66E-06       0.00   781.2500   9.95E+10
6.23E-08   1.96E+07       0.00
110.0000       0.00  -2.82E-05   1.75E-06       0.00   781.2500   9.95E+10
-5.44E-08   2.00E+07       0.00
112.0000       0.00  -1.72E-06   6.54E-07       0.00   781.2500   9.95E+10
-3.73E-08   2.04E+07       0.00
114.0000       0.00   3.24E-06   7.45E-08       0.00   781.2500   9.95E+10
-1.10E-08   2.08E+07       0.00
116.0000       0.00   1.88E-06  -5.85E-08       0.00   781.2500   9.95E+10
-1.22E-10   2.49E+07       0.00
118.0000       0.00   4.39E-07  -4.00E-08       0.00   781.2500   9.95E+10
1.66E-09   2.53E+07       0.00
120.0000       0.00  -4.31E-08  -1.07E-08       0.00   781.2500   9.95E+10
7.80E-10   2.58E+07       0.00
122.0000       0.00  -7.57E-08   3.13E-10       0.00   781.2500   9.95E+10
1.38E-10   2.63E+07       0.00
124.0000       0.00  -2.84E-08   1.51E-09       0.00   781.2500   9.95E+10
-3.83E-11   2.67E+07       0.00
126.0000       0.00  -3.09E-09   6.37E-10       0.00   781.2500   9.95E+10
-3.48E-11   2.72E+07       0.00
128.0000       0.00   2.17E-09   9.19E-11       0.00   781.2500   9.95E+10
-1.06E-11   2.76E+07       0.00
130.0000       0.00   1.33E-09  -3.89E-11       0.00   781.2500   9.95E+10
0.00   2.81E+07       0.00
132.0000       0.00   3.10E-10  -2.83E-11       0.00   781.2500   9.95E+10
1.19E-12   2.86E+07       0.00
134.0000       0.00  -2.79E-11  -7.47E-12       0.00   781.2500   9.95E+10
0.00   2.90E+07       0.00
136.0000       0.00  -4.90E-11       0.00       0.00   781.2500   9.95E+10
0.00   2.95E+07       0.00
138.0000       0.00  -1.74E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.00E+07       0.00
140.0000       0.00  -1.51E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.04E+07       0.00
142.0000       0.00   1.40E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
144.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
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  0.00   3.18E+07       0.00
  148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.23E+07       0.00
  150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.27E+07       0.00
  152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.32E+07       0.00
  154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.36E+07       0.00
  156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.41E+07       0.00
  158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.46E+07       0.00
  160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.50E+07       0.00
  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.55E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.59E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.64E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.69E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.21E+07       0.00

* The above values of total stress are combined axial and bending stresses.


Output Summary for Load Case No. 1:

Pile-head deflection             =     0.50466024 inches
Computed slope at pile head      =       0.000000 radians
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File name is incorrect below, run designation is "W.Overbank Post Seismic (Full scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

Maximum bending moment = -1610577. inch-lbs
Maximum shear force = 7598. lbs
Depth of maximum bending moment = 0.000000 feet below pile head
Depth of maximum shear force = 0.000000 feet below pile head
Number of iterations = 16
Number of zero deflection points = 21

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 1.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 450000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	1.0080	-2776165.	12134.	0.00	1986.	9.95E+10	0.00	0.00	0.00
2.0000	1.0000	-2481712.	12118.	-6.34E-04	1858.	9.95E+10	0.00	0.00	0.00
4.0000	0.9776	-2180797.	12118.	-0.00120	1728.	9.95E+10	0.00	0.00	0.00
6.0000	0.9426	-1874202.	12118.	-0.00168	1595.	9.95E+10	0.00	0.00	0.00
8.0000	0.8967	-1562727.	12118.	-0.00210	1460.	9.95E+10	0.00	0.00	0.00
10.0000	0.8418	-1247182.	12115.	-0.00244	1323.	9.95E+10	-0.2589	7.3825	0.00
12.0000	0.7797	-928539.	12106.	-0.00270	1184.	9.95E+10	-0.5048	15.5392	0.00
14.0000	0.7122	-607768.	12091.	-0.00289	1045.	9.95E+10	-0.7347	24.7591	0.00
16.0000	0.6412	-285837.	11611.	-0.00299	905.3113	9.95E+10	-39.2658	1470.	0.00
18.0000	0.5685	14220.	10577.	-0.00303	787.4220	9.95E+10	-46.9149	1980.	0.00
20.0000	0.4959	287218.	9380.	-0.00299	905.9106	9.95E+10	-52.8678	2558.	0.00
22.0000	0.4250	529016.	8051.	-0.00289	1011.	9.95E+10	-57.8549	3267.	0.00
24.0000	0.3572	736112.	6615.	-0.00274	1101.	9.95E+10	-61.8033	4153.	0.00
26.0000	0.2936	905692.	5098.	-0.00254	1174.	9.95E+10	-64.6442	5285.	0.00
28.0000	0.2352	1035678.	3526.	-0.00231	1231.	9.95E+10	-66.3113	6767.	0.00
30.0000	0.1828	1124772.	1930.	-0.00205	1269.	9.95E+10	-66.7377	8761.	0.00
32.0000	0.1370	1172496.	338.4733	-0.00177	1290.	9.95E+10	-65.8504	11538.	0.00

File name is incorrect below, run designation is "W.Overbank Post Seismic (Full scour) 24in"


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34.0000    0.09790   1179237.     -1214.   -0.00149      1293.   9.95E+10
-63.5597     15581.       0.00
36.0000    0.06565   1146297.     -2694.   -0.00121      1279.   9.95E+10
-59.7336     21836.       0.00
38.0000    0.04004   1075964.     -4060.  -9.38E-04      1248.   9.95E+10
-54.1339     32447.       0.00
40.0000    0.02065    971649.     -5264.  -6.91E-04      1203.   9.95E+10
-46.2061     53694.       0.00
42.0000    0.00689    838189.     -6227.  -4.72E-04      1145.   9.95E+10
-33.9903    118422.       0.00
44.0000   -0.00203    682967.     -6349.  -2.89E-04      1078.   9.95E+10
23.8304    282408.       0.00
46.0000   -0.00699    539693.     -6047.  -1.42E-04      1015.   9.95E+10
1.3217      4540.       0.00
48.0000   -0.00882    395775.     -6013.  -2.89E-05   953.0274   9.95E+10
1.5108      4109.       0.00
50.0000   -0.00837    251697.     -5976.   4.92E-05   890.4933   9.95E+10
1.5650      4486.       0.00
52.0000   -0.00646    107864.     -5939.   9.25E-05   828.0661   9.95E+10
1.5095      5604.       0.00
54.0000   -0.00393    -35380.     -5905.   1.01E-04   796.6058   9.95E+10
1.3414      8189.       0.00
56.0000   -0.00160   -177759.     -2215.   7.56E-05   858.4023   9.95E+10
306.1292   4583495.       0.00
58.0000  -3.03E-04   -143345.      2201.   3.69E-05   843.4656   9.95E+10
61.9073   4896000.       0.00
60.0000   1.66E-04    -72899.      2520.   1.08E-05   812.8900   9.95E+10
-35.3187   5091840.       0.00
62.0000   2.15E-04    -22606.      1529.  -7.22E-07   791.0617   9.95E+10
-47.2685   5287680.       0.00
64.0000   1.32E-04   518.3458   600.6216  -3.39E-06   781.4750   9.95E+10
-30.1125   5483520.       0.00
66.0000   5.20E-05      6297.    91.4830  -2.56E-06   783.9830   9.95E+10
-12.3158   5679360.       0.00
68.0000   8.73E-06      4965.   -81.9612  -1.21E-06   783.4049   9.95E+10
-2.1379   5875200.       0.00
70.0000  -5.85E-06      2389.   -89.8724  -3.19E-07   782.2868   9.95E+10
1.4787   6071040.       0.00
72.0000  -6.60E-06   657.9304   -51.4450   4.78E-08   781.5356   9.95E+10
1.7236   6266880.       0.00
74.0000  -3.55E-06   -81.7200   -19.2939   1.17E-07   781.2855   9.95E+10
0.9556   6462720.       0.00
76.0000  -9.70E-07  -270.7094    -1.3689   7.48E-08   781.3675   9.95E+10
0.5381   1.33E+07       0.00
78.0000   4.27E-08  -149.0448     4.7955   2.42E-08   781.3147   9.95E+10
-0.02440   1.37E+07       0.00
80.0000   1.93E-07   -41.0488     3.1441   1.30E-09   781.2678   9.95E+10
-0.1132   1.41E+07       0.00
82.0000   1.05E-07     1.8452     1.0240  -3.43E-09   781.2508   9.95E+10
-0.06347   1.45E+07       0.00
84.0000   2.82E-08     8.1774    0.05254  -2.22E-09   781.2535   9.95E+10
-0.01749   1.49E+07       0.00
86.0000  -1.38E-09     4.4150    -0.1468  -7.00E-10   781.2519   9.95E+10
8.81E-04   1.53E+07       0.00
88.0000  -5.42E-09     1.1483   -0.09376  -2.96E-11   781.2505   9.95E+10
0.00354   1.57E+07       0.00
90.0000  -2.81E-09   -0.08470   -0.02880   9.86E-11   781.2500   9.95E+10
0.00188   1.61E+07       0.00
92.0000  -6.84E-10    -0.2363  -6.53E-04   5.99E-11   781.2501   9.95E+10
4.69E-04   1.65E+07       0.00
94.0000   7.04E-11    -0.1173    0.00438   1.73E-11   781.2501   9.95E+10
-4.94E-05   1.68E+07       0.00
96.0000   1.46E-10   -0.02649    0.00253       0.00   781.2500   9.95E+10
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 -1.04E-04   1.72E+07       0.00
 98.0000   6.73E-11    0.00421   6.85E-04  -2.75E-12   781.2500   9.95E+10
 -4.94E-05   1.76E+07       0.00
100.0000   1.35E-11    0.00643  -3.06E-05  -1.47E-12   781.2500   9.95E+10
-1.02E-05   1.80E+07       0.00
102.0000  -3.09E-12    0.00277  -1.24E-04       0.00   781.2500   9.95E+10
2.37E-06   1.84E+07       0.00
104.0000  -3.65E-12   4.80E-04  -6.13E-05       0.00   781.2500   9.95E+10
2.86E-06   1.88E+07       0.00
106.0000  -1.43E-12  -1.70E-04  -1.33E-05       0.00   781.2500   9.95E+10
1.14E-06   1.92E+07       0.00
108.0000       0.00  -1.60E-04   2.37E-06       0.00   781.2500   9.95E+10
1.61E-07   1.96E+07       0.00
110.0000       0.00  -5.71E-05   3.23E-06       0.00   781.2500   9.95E+10
-8.98E-08   2.00E+07       0.00
112.0000       0.00  -5.53E-06   1.30E-06       0.00   781.2500   9.95E+10
-7.04E-08   2.04E+07       0.00
114.0000       0.00   5.54E-06   1.89E-07       0.00   781.2500   9.95E+10
-2.25E-08   2.08E+07       0.00
116.0000       0.00   3.60E-06  -9.62E-08       0.00   781.2500   9.95E+10
-1.26E-09   2.49E+07       0.00
118.0000       0.00   9.31E-07  -7.59E-08       0.00   781.2500   9.95E+10
2.95E-09   2.53E+07       0.00
120.0000       0.00  -4.22E-08  -2.23E-08       0.00   781.2500   9.95E+10
1.52E-09   2.58E+07       0.00
122.0000       0.00  -1.38E-07  -2.86E-10       0.00   781.2500   9.95E+10
3.08E-10   2.63E+07       0.00
124.0000       0.00  -5.66E-08   2.72E-09       0.00   781.2500   9.95E+10
-5.74E-11   2.67E+07       0.00
126.0000       0.00  -7.71E-09   1.25E-09       0.00   781.2500   9.95E+10
-6.51E-11   2.72E+07       0.00
128.0000       0.00   3.65E-09   2.13E-10       0.00   781.2500   9.95E+10
-2.16E-11   2.76E+07       0.00
130.0000       0.00   2.54E-09  -6.25E-11       0.00   781.2500   9.95E+10
-1.35E-12   2.81E+07       0.00
132.0000       0.00   6.54E-10  -5.35E-11       0.00   781.2500   9.95E+10
2.10E-12   2.86E+07       0.00
134.0000       0.00  -2.67E-11  -1.55E-11       0.00   781.2500   9.95E+10
1.07E-12   2.90E+07       0.00
136.0000       0.00  -8.98E-11       0.00       0.00   781.2500   9.95E+10
0.00   2.95E+07       0.00
138.0000       0.00  -3.47E-11   1.79E-12       0.00   781.2500   9.95E+10
0.00   3.00E+07       0.00
140.0000       0.00  -3.98E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.04E+07       0.00
142.0000       0.00   2.40E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
144.0000       0.00   1.45E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
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  160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.50E+07       0.00
  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.55E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.59E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.64E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.69E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.21E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 2:

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Pile-head deflection             =     1.00803288 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -2776165. inch-lbs
Maximum shear force              =         12134. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             18
Number of zero deflection points =             21
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Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 3

File name is incorrect below, run designation is "W.Overbank Post Seismic (Full scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 2.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 450000.0 lbs

Depth X feet	Deflect. y inches	Bending Distrib. Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Lat. Load lb/inch				
0.00	2.0136	-4711957.	19024.	0.00	2826.	9.95E+10
0.00	0.00	0.00				
2.0000	2.0000	-4249843.	18999.	-0.00108	2626.	9.95E+10
0.00	0.00	0.00				
4.0000	1.9618	-3776662.	18999.	-0.00205	2420.	9.95E+10
0.00	0.00	0.00				
6.0000	1.9017	-3293646.	18999.	-0.00290	2211.	9.95E+10
0.00	0.00	0.00				
8.0000	1.8225	-2802053.	18999.	-0.00364	1997.	9.95E+10
0.00	0.00	0.00				
10.0000	1.7272	-2303163.	18995.	-0.00425	1781.	9.95E+10
-0.3290	4.5722	0.00				
12.0000	1.6185	-1798464.	18983.	-0.00475	1562.	9.95E+10
-0.6440	9.5493	0.00				
14.0000	1.4994	-1289453.	18964.	-0.00512	1341.	9.95E+10
-0.9417	15.0728	0.00				
16.0000	1.3728	-777627.	18346.	-0.00537	1119.	9.95E+10
-50.6085	884.7382	0.00				
18.0000	1.2418	-292925.	17008.	-0.00550	908.3878	9.95E+10
-60.8707	1176.	0.00				
20.0000	1.1090	157477.	15448.	-0.00551	849.5994	9.95E+10
-69.1344	1496.	0.00				
22.0000	0.9772	567648.	13702.	-0.00542	1028.	9.95E+10
-76.3593	1875.	0.00				
24.0000	0.8486	932358.	11796.	-0.00524	1186.	9.95E+10
-82.4699	2332.	0.00				
26.0000	0.7255	1247137.	9758.	-0.00498	1323.	9.95E+10
-87.3980	2891.	0.00				
28.0000	0.6095	1508327.	7616.	-0.00465	1436.	9.95E+10
-91.0827	3586.	0.00				
30.0000	0.5023	1713125.	5401.	-0.00426	1525.	9.95E+10
-93.4698	4466.	0.00				
32.0000	0.4050	1859624.	3146.	-0.00383	1588.	9.95E+10
-94.5129	5601.	0.00				
34.0000	0.3185	1946841.	881.3210	-0.00337	1626.	9.95E+10
-94.1728	7097.	0.00				
36.0000	0.2432	1974744.	-1358.	-0.00290	1638.	9.95E+10
-92.4186	9121.	0.00				
38.0000	0.1793	1944271.	-3538.	-0.00243	1625.	9.95E+10
-89.2271	11940.	0.00				
40.0000	0.1268	1857340.	-5623.	-0.00197	1587.	9.95E+10
-84.5827	16015.	0.00				
42.0000	0.08491	1716853.	-7580.	-0.00154	1526.	9.95E+10
-78.4740	22182.	0.00				
44.0000	0.05300	1526694.	-9372.	-0.00115	1444.	9.95E+10
-70.8823	32099.	0.00				
46.0000	0.02992	1291731.	-10249.	-8.06E-04	1342.	9.95E+10

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 -2.1476      1723.       0.00
 48.0000    0.01432   1052167.    -10296.  -5.23E-04      1238.   9.95E+10
 -1.7763      2977.       0.00
 50.0000    0.00481    808840.    -10333.  -2.99E-04      1132.   9.95E+10
 -1.3019      6494.       0.00
 52.0000  -1.87E-05    562657.    -10346.  -1.33E-04      1025.   9.95E+10
 0.2021    259583.       0.00
 54.0000   -0.00159    315124.    -10331.  -2.76E-05   918.0227   9.95E+10
 0.9923     14954.       0.00
 56.0000   -0.00134     67343.     -7163.   1.85E-05   810.4787   9.95E+10
 263.0083   4700160.       0.00
 58.0000  -7.04E-04    -29121.     -2285.   2.31E-05   793.8893   9.95E+10
 143.5315   4896000.       0.00
 60.0000  -2.33E-04    -42835.    29.9027   1.45E-05   799.8415   9.95E+10
 49.3738   5091840.       0.00
 62.0000  -9.74E-06    -27998.   648.1400   5.92E-06   793.4018   9.95E+10
 2.1459   5287680.       0.00
 64.0000   5.12E-05    -11852.   533.4712   1.11E-06   786.3940   9.95E+10
 -11.7017   5483520.       0.00
 66.0000   4.36E-05     -2415.   269.2870  -6.09E-07   782.2982   9.95E+10
 -10.3137   5679360.       0.00
 68.0000   2.20E-05      1087.    80.9672  -7.69E-07   781.7218   9.95E+10
 -5.3796   5875200.       0.00
 70.0000   6.66E-06      1488.    -3.8013  -4.59E-07   781.8958   9.95E+10
 -1.6844   6071040.       0.00
 72.0000  -4.78E-08   914.5628   -23.8641  -1.69E-07   781.6469   9.95E+10
 0.01249   6266880.       0.00
 74.0000  -1.46E-06   346.0571   -18.9908  -1.72E-08   781.4002   9.95E+10
 0.3936   6462720.       0.00
 76.0000  -8.73E-07     3.3772    -8.4540   2.49E-08   781.2515   9.95E+10
 0.4844   1.33E+07       0.00
 78.0000  -2.65E-07   -60.2734    -0.8256   1.81E-08   781.2762   9.95E+10
 0.1513   1.37E+07       0.00
 80.0000  -5.36E-09   -36.6434     1.0272   6.39E-09   781.2659   9.95E+10
 0.00315   1.41E+07       0.00
 82.0000   4.20E-08   -11.1051     0.7604   6.36E-10   781.2548   9.95E+10
 -0.02538   1.45E+07       0.00
 84.0000   2.52E-08    -0.1572     0.2686  -7.22E-10   781.2501   9.95E+10
 -0.01560   1.49E+07       0.00
 86.0000   7.37E-09     1.8047    0.02511  -5.23E-10   781.2508   9.95E+10
 -0.00469   1.53E+07       0.00
 88.0000   3.09E-11     1.0593   -0.03144  -1.78E-10   781.2505   9.95E+10
 -2.02E-05   1.57E+07       0.00
 90.0000  -1.18E-09     0.2994   -0.02221  -1.44E-11   781.2501   9.95E+10
 7.90E-04   1.61E+07       0.00
 92.0000  -6.58E-10   -0.00638   -0.00732   2.10E-11   781.2500   9.95E+10
 4.51E-04   1.65E+07       0.00
 94.0000  -1.74E-10   -0.05219  -4.37E-04   1.39E-11   781.2500   9.95E+10
 1.22E-04   1.68E+07       0.00
 96.0000   9.02E-12   -0.02764   9.49E-04   4.28E-12   781.2500   9.95E+10
 -6.48E-06   1.72E+07       0.00
 98.0000   3.18E-11   -0.00675   5.91E-04       0.00   781.2500   9.95E+10
 -2.34E-05   1.76E+07       0.00
100.0000   1.56E-11   7.03E-04   1.70E-04       0.00   781.2500   9.95E+10
-1.17E-05   1.80E+07       0.00
102.0000   3.38E-12    0.00142  -1.39E-06       0.00   781.2500   9.95E+10
-2.59E-06   1.84E+07       0.00
104.0000       0.00   6.44E-04  -2.71E-05       0.00   781.2500   9.95E+10
4.47E-07   1.88E+07       0.00
106.0000       0.00   1.21E-04  -1.41E-05       0.00   781.2500   9.95E+10
6.39E-07   1.92E+07       0.00
108.0000       0.00  -3.39E-05  -3.25E-06       0.00   781.2500   9.95E+10
2.66E-07   1.96E+07       0.00
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110.0000       0.00  -3.54E-05   4.37E-07       0.00   781.2500   9.95E+10
4.13E-08   2.00E+07       0.00
112.0000       0.00  -1.31E-05   7.08E-07       0.00   781.2500   9.95E+10
-1.87E-08   2.04E+07       0.00
114.0000       0.00  -1.45E-06   2.99E-07       0.00   781.2500   9.95E+10
-1.55E-08   2.08E+07       0.00
116.0000       0.00   1.26E-06   4.62E-08       0.00   781.2500   9.95E+10
-5.56E-09   2.49E+07       0.00
118.0000       0.00   7.70E-07  -2.24E-08       0.00   781.2500   9.95E+10
-1.55E-10   2.53E+07       0.00
120.0000       0.00   1.87E-07  -1.63E-08       0.00   781.2500   9.95E+10
6.63E-10   2.58E+07       0.00
122.0000       0.00  -1.41E-08  -4.53E-09       0.00   781.2500   9.95E+10
3.22E-10   2.63E+07       0.00
124.0000       0.00  -3.01E-08   5.48E-11       0.00   781.2500   9.95E+10
5.98E-11   2.67E+07       0.00
126.0000       0.00  -1.16E-08   5.99E-10       0.00   781.2500   9.95E+10
-1.44E-11   2.72E+07       0.00
128.0000       0.00  -1.35E-09   2.59E-10       0.00   781.2500   9.95E+10
-1.40E-11   2.76E+07       0.00
130.0000       0.00   8.38E-10   3.90E-11       0.00   781.2500   9.95E+10
-4.34E-12   2.81E+07       0.00
132.0000       0.00   5.28E-10  -1.49E-11       0.00   781.2500   9.95E+10
0.00   2.86E+07       0.00
134.0000       0.00   1.25E-10  -1.12E-11       0.00   781.2500   9.95E+10
0.00   2.90E+07       0.00
136.0000       0.00  -1.01E-11  -3.00E-12       0.00   781.2500   9.95E+10
0.00   2.95E+07       0.00
138.0000       0.00  -1.91E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.00E+07       0.00
140.0000       0.00  -6.81E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.04E+07       0.00
142.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
144.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.73E+07       0.00
172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
```

```
  0.00   3.78E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.21E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 3:

```
Pile-head deflection             =     2.01363413 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -4711957. inch-lbs
Maximum shear force              =         19024. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             16
Number of zero deflection points =             21
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 4
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                              =     3.000000 inches
Rotation of pile head                                  =    0.000E+00 radians
Axial load on pile head                                =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Full scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

```
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     3.0185  -6387605.     24529.       0.00      3554.   9.95E+10
      0.00       0.00       0.00
    2.0000     3.0000  -5791359.     24497.   -0.00147      3295.   9.95E+10
    0.00       0.00       0.00
    4.0000     2.9480  -5180030.     24497.   -0.00279      3030.   9.95E+10
    0.00       0.00       0.00
    6.0000     2.8660  -4555213.     24497.   -0.00396      2758.   9.95E+10
    0.00       0.00       0.00
    8.0000     2.7577  -3918532.     24497.   -0.00499      2482.   9.95E+10
    0.00       0.00       0.00
   10.0000     2.6267  -3271647.     24493.   -0.00585      2201.   9.95E+10
   -0.3784     3.4574       0.00
   12.0000     2.4767  -2616460.     24479.   -0.00656      1917.   9.95E+10
   -0.7421     7.1911       0.00
   14.0000     2.3116  -1954887.     24457.   -0.00711      1630.   9.95E+10
   -1.0878    11.2942       0.00
   16.0000     2.1352  -1288850.     23740.   -0.00751      1341.   9.95E+10
   -58.6362   659.0662       0.00
   18.0000     1.9514   -653231.     22188.   -0.00774      1065.   9.95E+10
   -70.7686   870.3778       0.00
   20.0000     1.7637    -56673.     20370.   -0.00783   805.8477   9.95E+10
   -80.6971      1098.       0.00
   22.0000     1.5758    493551.     18327.   -0.00777   995.4647   9.95E+10
   -89.5434      1364.       0.00
   24.0000     1.3907    990912.     16086.   -0.00759      1211.   9.95E+10
   -97.2290      1678.       0.00
   26.0000     1.2113   1429689.     13675.   -0.00730      1402.   9.95E+10
   -103.6837      2054.       0.00
   28.0000     1.0402   1805021.     11125.   -0.00691      1565.   9.95E+10
   -108.8448      2511.       0.00
   30.0000     0.8795   2112958.      8466.   -0.00644      1698.   9.95E+10
   -112.6582      3074.       0.00
   32.0000     0.7311   2350502.      5734.   -0.00590      1801.   9.95E+10
   -115.0783      3778.       0.00
   34.0000     0.5963   2515639.      2960.   -0.00531      1873.   9.95E+10
   -116.0690      4672.       0.00
   36.0000     0.4760   2607369.   179.8024   -0.00470      1913.   9.95E+10
   -115.6046      5829.       0.00
   38.0000     0.3708   2625721.     -2572.   -0.00407      1921.   9.95E+10
   -113.6708      7357.       0.00
   40.0000     0.2808   2571761.     -5259.   -0.00344      1897.   9.95E+10
   -110.2657      9423.       0.00
   42.0000     0.2057   2447590.     -7847.   -0.00283      1844.   9.95E+10
   -105.3992     12295.       0.00
   44.0000     0.1448   2256336.    -10301.   -0.00227      1761.   9.95E+10
   -99.0894     16423.       0.00
   46.0000    0.09693   2002130.    -11528.   -0.00175      1650.   9.95E+10
   -3.1774   786.7482       0.00
   48.0000    0.06064   1740880.    -11600.   -0.00130      1537.   9.95E+10
   -2.8731      1137.       0.00
   50.0000    0.03442   1473442.    -11665.  -9.15E-04      1421.   9.95E+10
   -2.5076      1749.       0.00
   52.0000    0.01672   1200722.    -11720.  -5.92E-04      1302.   9.95E+10
   -2.0728      2974.       0.00
   54.0000    0.00598    923681.    -11763.  -3.36E-04      1182.   9.95E+10
   -1.5432      6192.       0.00
   56.0000   5.83E-04    643347.    -13152.  -1.47E-04      1060.   9.95E+10
   -114.1832   4700160.       0.00
   58.0000   -0.00109    295567.    -11849.  -3.42E-05   909.5342   9.95E+10
   222.7535   4896000.       0.00
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Full scour) 24in"


```
 60.0000   -0.00106     75323.     -6487.   1.06E-05   813.9424   9.95E+10
 224.1355   5091840.       0.00
 62.0000  -5.85E-04    -16014.     -2250.   1.77E-05   788.2006   9.95E+10
 128.9010   5287680.       0.00
 64.0000  -2.06E-04    -33063.  -137.4955   1.18E-05   795.6003   9.95E+10
 47.1478   5483520.       0.00
 66.0000  -1.90E-05    -22869.   482.1837   5.05E-06   791.1756   9.95E+10
 4.4921   5679360.       0.00
 68.0000   3.60E-05    -10027.   430.1990   1.08E-06   785.6021   9.95E+10
 -8.8242   5875200.       0.00
 70.0000   3.30E-05     -2243.   223.9929  -3.95E-07   782.2233   9.95E+10
 -8.3597   6071040.       0.00
 72.0000   1.71E-05   732.8902    70.1865  -5.77E-07   781.5681   9.95E+10
 -4.4575   6266880.       0.00
 74.0000   5.34E-06      1139.    -0.5440  -3.52E-07   781.7443   9.95E+10
 -1.4367   6462720.       0.00
 76.0000   1.91E-07   714.3744   -19.0540  -1.28E-07   781.5601   9.95E+10
 -0.1058   1.33E+07       0.00
 78.0000  -8.20E-07   227.0623   -14.7039  -1.47E-08   781.3486   9.95E+10
 0.4683   1.37E+07       0.00
 80.0000  -5.16E-07     8.9048    -5.4435   1.37E-08   781.2539   9.95E+10
 0.3034   1.41E+07       0.00
 82.0000  -1.61E-07   -34.5222    -0.6334   1.06E-08   781.2650   9.95E+10
 0.09745   1.45E+07       0.00
 84.0000  -6.16E-09   -21.7270     0.5819   3.85E-09   781.2594   9.95E+10
 0.00382   1.49E+07       0.00
 86.0000   2.33E-08    -6.6744     0.4496   4.24E-10   781.2529   9.95E+10
 -0.01485   1.53E+07       0.00
 88.0000   1.42E-08    -0.1575     0.1602  -4.00E-10   781.2501   9.95E+10
 -0.00927   1.57E+07       0.00
 90.0000   4.15E-09     1.0218    0.01562  -2.95E-10   781.2504   9.95E+10
 -0.00278   1.61E+07       0.00
 92.0000   1.95E-11     0.5986   -0.01787  -1.00E-10   781.2503   9.95E+10
 -1.34E-05   1.65E+07       0.00
 94.0000  -6.48E-10     0.1660   -0.01258  -7.80E-12   781.2501   9.95E+10
 4.55E-04   1.68E+07       0.00
 96.0000  -3.55E-10   -0.00492   -0.00406   1.16E-11   781.2500   9.95E+10
 2.55E-04   1.72E+07       0.00
 98.0000  -9.03E-11   -0.02903  -2.04E-04   7.53E-12   781.2500   9.95E+10
 6.63E-05   1.76E+07       0.00
100.0000   6.40E-12   -0.01486   5.34E-04   2.24E-12   781.2500   9.95E+10
-4.80E-06   1.80E+07       0.00
102.0000   1.71E-11   -0.00342   3.19E-04       0.00   781.2500   9.95E+10
-1.31E-05   1.84E+07       0.00
104.0000   7.98E-12   4.72E-04   8.72E-05       0.00   781.2500   9.95E+10
-6.25E-06   1.88E+07       0.00
106.0000   1.59E-12   7.67E-04  -3.10E-06       0.00   781.2500   9.95E+10
-1.27E-06   1.92E+07       0.00
108.0000       0.00   3.27E-04  -1.49E-05       0.00   781.2500   9.95E+10
2.92E-07   1.96E+07       0.00
110.0000       0.00   5.41E-05  -7.24E-06       0.00   781.2500   9.95E+10
3.44E-07   2.00E+07       0.00
112.0000       0.00  -2.05E-05  -1.50E-06       0.00   781.2500   9.95E+10
1.33E-07   2.04E+07       0.00
114.0000       0.00  -1.83E-05   3.00E-07       0.00   781.2500   9.95E+10
1.69E-08   2.08E+07       0.00
116.0000       0.00  -6.21E-06   3.75E-07       0.00   781.2500   9.95E+10
-1.08E-08   2.12E+07       0.00
118.0000       0.00  -3.20E-07   1.43E-07       0.00   781.2500   9.95E+10
-8.53E-09   2.53E+07       0.00
120.0000       0.00   6.58E-07   1.36E-08       0.00   781.2500   9.95E+10
-2.25E-09   2.58E+07       0.00
122.0000       0.00   3.38E-07  -1.23E-08       0.00   781.2500   9.95E+10
```

```
8.80E-11   2.63E+07       0.00
124.0000       0.00   6.78E-08  -7.31E-09       0.00   781.2500   9.95E+10
3.30E-10   2.67E+07       0.00
126.0000       0.00  -1.24E-08  -1.70E-09       0.00   781.2500   9.95E+10
1.37E-10   2.72E+07       0.00
128.0000       0.00  -1.39E-08   1.65E-10       0.00   781.2500   9.95E+10
1.88E-11   2.76E+07       0.00
130.0000       0.00  -4.53E-09   2.84E-10       0.00   781.2500   9.95E+10
-8.87E-12   2.81E+07       0.00
132.0000       0.00  -2.64E-10   1.03E-10       0.00   781.2500   9.95E+10
-6.20E-12   2.86E+07       0.00
134.0000       0.00   4.35E-10   9.98E-12       0.00   781.2500   9.95E+10
-1.59E-12   2.90E+07       0.00
136.0000       0.00   2.17E-10  -8.25E-12       0.00   781.2500   9.95E+10
0.00   2.95E+07       0.00
138.0000       0.00   3.99E-11  -4.70E-12       0.00   781.2500   9.95E+10
0.00   3.00E+07       0.00
140.0000       0.00  -8.83E-12  -1.00E-12       0.00   781.2500   9.95E+10
0.00   3.04E+07       0.00
142.0000       0.00  -8.32E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
144.0000       0.00  -2.41E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.73E+07       0.00
172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.78E+07       0.00
174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.82E+07       0.00
176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.87E+07       0.00
178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.92E+07       0.00
180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.96E+07       0.00
182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.01E+07       0.00
184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.06E+07       0.00
```

```
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.21E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 4:

```
Pile-head deflection             =     3.01848265 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -6387605. inch-lbs
Maximum shear force              =         24529. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             14
Number of zero deflection points =             21
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 5
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     4.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     4.0230  -7941327.     29381.       0.00      4228.   9.95E+10
      0.00       0.00       0.00
    2.0000     4.0000  -7226780.     29342.   -0.00183      3918.   9.95E+10
    0.00       0.00       0.00
    4.0000     3.9352  -6493413.     29342.   -0.00348      3600.   9.95E+10
    0.00       0.00       0.00
    6.0000     3.8328  -5743137.     29342.   -0.00496      3274.   9.95E+10
    0.00       0.00       0.00
    8.0000     3.6972  -4977905.     29342.   -0.00625      2942.   9.95E+10
    0.00       0.00       0.00
```

```
10.0000     3.5328  -4199709.     29337.   -0.00736      2604.   9.95E+10
-0.4177     2.8375       0.00
12.0000     3.3441  -3410817.     29322.   -0.00827      2262.   9.95E+10
-0.8202     5.8866       0.00
14.0000     3.1356  -2613515.     29298.   -0.00900      1916.   9.95E+10
-1.2042     9.2170       0.00
16.0000     2.9120  -1810101.     28503.   -0.00953      1567.   9.95E+10
-65.0251   535.9184       0.00
18.0000     2.6780  -1039427.     26779.   -0.00988      1232.   9.95E+10
-78.6429   704.8038       0.00
20.0000     2.4379   -311345.     24757.   -0.01004   916.3825   9.95E+10
-89.8909   884.9442       0.00
22.0000     2.1960    365771.     22478.   -0.01003   940.0046   9.95E+10
-100.0179      1093.       0.00
24.0000     1.9562    984324.     19970.   -0.00987      1208.   9.95E+10
-108.9415      1337.       0.00
26.0000     1.7222   1537563.     17264.   -0.00957      1449.   9.95E+10
-116.5872      1625.       0.00
28.0000     1.4970   2019644.     14390.   -0.00914      1658.   9.95E+10
-122.8878      1970.       0.00
30.0000     1.2835   2425682.     11382.   -0.00860      1834.   9.95E+10
-127.7841      2389.       0.00
32.0000     1.0841   2751800.      8274.   -0.00798      1976.   9.95E+10
-131.2251      2905.       0.00
34.0000     0.9006   2995166.      5101.   -0.00729      2081.   9.95E+10
-133.1680      3549.       0.00
36.0000     0.7344   3154027.      1900.   -0.00654      2150.   9.95E+10
-133.5787      4366.       0.00
38.0000     0.5864   3227733.     -1292.   -0.00577      2182.   9.95E+10
-132.4319      5420.       0.00
40.0000     0.4572   3216753.     -4438.   -0.00500      2177.   9.95E+10
-129.7104      6809.       0.00
42.0000     0.3465   3122682.     -7499.   -0.00423      2137.   9.95E+10
-125.4026      8685.       0.00
44.0000     0.2540   2948248.    -10438.   -0.00350      2061.   9.95E+10
-119.4957     11292.       0.00
46.0000     0.1785   2697307.    -11918.   -0.00282      1952.   9.95E+10
-3.8944   523.7138       0.00
48.0000     0.1186   2437098.    -12008.   -0.00220      1839.   9.95E+10
-3.5927   727.2066       0.00
50.0000    0.07278   2168473.    -12090.   -0.00165      1722.   9.95E+10
-3.2186      1061.       0.00
52.0000    0.03953   1892347.    -12162.   -0.00116      1603.   9.95E+10
-2.7610      1676.       0.00
54.0000    0.01724   1609703.    -12221.  -7.35E-04      1480.   9.95E+10
-2.1961      3057.       0.00
56.0000    0.00426   1321602.    -18240.  -3.81E-04      1355.   9.95E+10
-499.3401   2811351.       0.00
58.0000   -0.00107    742440.    -21621.  -1.33E-04      1103.   9.95E+10
217.5564   4896000.       0.00
60.0000   -0.00210    286656.    -14806.  -8.47E-06   905.6667   9.95E+10
350.3772   4005919.       0.00
62.0000   -0.00147     31943.     -7079.   2.99E-05   795.1143   9.95E+10
293.5086   4782306.       0.00
64.0000  -6.62E-04    -53792.     -1742.   2.73E-05   804.5971   9.95E+10
151.2380   5483520.       0.00
66.0000  -1.62E-04    -52274.   533.1793   1.45E-05   803.9382   9.95E+10
38.3794   5679360.       0.00
68.0000   3.51E-05    -28513.   890.7639   4.78E-06   793.6254   9.95E+10
-8.5807   5875200.       0.00
70.0000   6.73E-05     -9620.   583.5540   1.83E-07   785.4255   9.95E+10
-17.0201   6071040.       0.00
72.0000   4.38E-05  -506.1971   241.9330  -1.04E-06   781.4697   9.95E+10
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Full scour) 24in"


```
 -11.4483   6266880.       0.00
 74.0000   1.75E-05      2015.    48.0924  -8.56E-07   782.1245   9.95E+10
 -4.7051   6462720.       0.00
 76.0000   2.76E-06      1821.   -26.7684  -3.93E-07   782.0402   9.95E+10
 -1.5333   1.33E+07       0.00
 78.0000  -1.41E-06   738.5682   -35.5055  -8.48E-08   781.5706   9.95E+10
 0.8052   1.37E+07       0.00
 80.0000  -1.31E-06   118.2897   -16.6176   1.85E-08   781.3013   9.95E+10
 0.7688   1.41E+07       0.00
 82.0000  -5.23E-07   -59.4745    -3.6036   2.56E-08   781.2758   9.95E+10
 0.3157   1.45E+07       0.00
 84.0000  -8.13E-08   -55.2335     0.7903   1.17E-08   781.2740   9.95E+10
 0.05044   1.49E+07       0.00
 86.0000   4.05E-08   -21.7959     1.0859   2.45E-09   781.2595   9.95E+10
 -0.02580   1.53E+07       0.00
 88.0000   3.63E-08    -3.1635     0.4921  -5.59E-10   781.2514   9.95E+10
 -0.02368   1.57E+07       0.00
 90.0000   1.37E-08     1.8367    0.09787  -7.19E-10   781.2508   9.95E+10
 -0.00917   1.61E+07       0.00
 92.0000   1.77E-09     1.5496   -0.02671  -3.11E-10   781.2507   9.95E+10
 -0.00121   1.65E+07       0.00
 94.0000  -1.21E-09     0.5612   -0.03107  -5.62E-11   781.2502   9.95E+10
 8.47E-04   1.68E+07       0.00
 96.0000  -9.33E-10    0.05942   -0.01287   1.86E-11   781.2500   9.95E+10
 6.70E-04   1.72E+07       0.00
 98.0000  -3.14E-10   -0.05676   -0.00206   1.89E-11   781.2500   9.95E+10
 2.31E-04   1.76E+07       0.00
100.0000  -2.42E-11   -0.03990   9.26E-04   7.27E-12   781.2500   9.95E+10
1.81E-05   1.80E+07       0.00
102.0000   3.50E-11   -0.01247   8.22E-04       0.00   781.2500   9.95E+10
-2.68E-05   1.84E+07       0.00
104.0000   2.19E-11  -4.68E-04   2.94E-04       0.00   781.2500   9.95E+10
-1.72E-05   1.88E+07       0.00
106.0000   6.16E-12    0.00165   2.88E-05       0.00   781.2500   9.95E+10
-4.92E-06   1.92E+07       0.00
108.0000       0.00   9.26E-04  -2.96E-05       0.00   781.2500   9.95E+10
5.32E-08   1.96E+07       0.00
110.0000       0.00   2.31E-04  -1.97E-05       0.00   781.2500   9.95E+10
7.74E-07   2.00E+07       0.00
112.0000       0.00  -1.86E-05  -5.70E-06       0.00   781.2500   9.95E+10
3.90E-07   2.04E+07       0.00
114.0000       0.00  -4.30E-05  -1.87E-09       0.00   781.2500   9.95E+10
8.41E-08   2.08E+07       0.00
116.0000       0.00  -1.89E-05   8.29E-07       0.00   781.2500   9.95E+10
-1.48E-08   2.12E+07       0.00
118.0000       0.00  -3.25E-06   4.19E-07       0.00   781.2500   9.95E+10
-1.94E-08   2.15E+07       0.00
120.0000       0.00   1.22E-06   8.76E-08       0.00   781.2500   9.95E+10
-8.19E-09   2.58E+07       0.00
122.0000       0.00   9.67E-07  -1.97E-08       0.00   781.2500   9.95E+10
-7.52E-10   2.63E+07       0.00
124.0000       0.00   2.78E-07  -2.01E-08       0.00   781.2500   9.95E+10
7.18E-10   2.67E+07       0.00
126.0000       0.00   1.80E-09  -6.49E-09       0.00   781.2500   9.95E+10
4.18E-10   2.72E+07       0.00
128.0000       0.00  -3.38E-08  -3.46E-10       0.00   781.2500   9.95E+10
9.43E-11   2.76E+07       0.00
130.0000       0.00  -1.50E-08   6.56E-10       0.00   781.2500   9.95E+10
-1.09E-11   2.81E+07       0.00
132.0000       0.00  -2.35E-09   3.29E-10       0.00   781.2500   9.95E+10
-1.64E-11   2.86E+07       0.00
134.0000       0.00   8.03E-10   6.18E-11       0.00   781.2500   9.95E+10
-5.78E-12   2.90E+07       0.00
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Full scour) 24in"


```
136.0000       0.00   6.23E-10  -1.33E-11       0.00   781.2500   9.95E+10
0.00   2.95E+07       0.00
138.0000       0.00   1.68E-10  -1.31E-11       0.00   781.2500   9.95E+10
0.00   3.00E+07       0.00
140.0000       0.00  -3.12E-12  -3.93E-12       0.00   781.2500   9.95E+10
0.00   3.04E+07       0.00
142.0000       0.00  -2.09E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
144.0000       0.00  -8.24E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.73E+07       0.00
172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.78E+07       0.00
174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.82E+07       0.00
176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.87E+07       0.00
178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.92E+07       0.00
180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.96E+07       0.00
182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.01E+07       0.00
184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.06E+07       0.00
186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.10E+07       0.00
188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.15E+07       0.00
190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.19E+07       0.00
192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.24E+07       0.00
194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.29E+07       0.00
196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.33E+07       0.00
198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
```

```
  0.00   4.38E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.21E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 5:

```
Pile-head deflection             =     4.02297838 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -7941327. inch-lbs
Maximum shear force              =         29381. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             15
Number of zero deflection points =             20
```

```
--------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 6
--------------------------------------------------------------------------------
--
```

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)

```
Displacement of pile head                                =     5.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     450000.0 lbs
```

```
   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     5.0272  -9414192.     33812.       0.00      4867.   9.95E+10
      0.00       0.00       0.00
    2.0000     5.0000  -8591528.     33767.   -0.00217      4510.   9.95E+10
    0.00       0.00       0.00
    4.0000     4.9230  -7746490.     33767.   -0.00414      4143.   9.95E+10
    0.00       0.00       0.00
    6.0000     4.8013  -6881280.     33767.   -0.00590      3768.   9.95E+10
    0.00       0.00       0.00
    8.0000     4.6396  -5998149.     33767.   -0.00746      3385.   9.95E+10
    0.00       0.00       0.00
   10.0000     4.4433  -5099398.     33761.   -0.00879      2995.   9.95E+10
   -0.4509     2.4353       0.00
   12.0000     4.2175  -4187627.     33745.   -0.00991      2599.   9.95E+10
   -0.8862     5.0429       0.00
   14.0000     3.9674  -3265461.     33719.   -0.01081      2199.   9.95E+10
   -1.3025     7.8789       0.00
   16.0000     3.6985  -2335542.     32859.   -0.01149      1795.   9.95E+10
   -70.4190   456.9626       0.00
   18.0000     3.4160  -1440102.     30990.   -0.01194      1406.   9.95E+10
   -85.2897   599.2300       0.00
   20.0000     3.1252   -590038.     28795.   -0.01219      1037.   9.95E+10
   -97.6493   749.9086       0.00
   22.0000     2.8309    205316.     26317.   -0.01223   870.3628   9.95E+10
```

```
-108.8538   922.8383       0.00
24.0000     2.5379    937435.     23585.   -0.01210      1188.   9.95E+10
-118.8167      1124.       0.00
26.0000     2.2503   1598675.     20629.   -0.01179      1475.   9.95E+10
-127.4591      1359.       0.00
28.0000     1.9719   2182336.     17483.   -0.01134      1728.   9.95E+10
-134.7093      1640.       0.00
30.0000     1.7062   2682720.     14181.   -0.01075      1946.   9.95E+10
-140.5026      1976.       0.00
32.0000     1.4560   3095189.     10757.   -0.01005      2125.   9.95E+10
-144.7820      2387.       0.00
34.0000     1.2237   3416203.      7250.   -0.00927      2264.   9.95E+10
-147.4975      2893.       0.00
36.0000     1.0111   3643362.      3697.   -0.00842      2363.   9.95E+10
-148.6061      3527.       0.00
38.0000     0.8197   3775436.   136.6627   -0.00752      2420.   9.95E+10
-148.0712      4335.       0.00
40.0000     0.6501   3812389.     -3391.   -0.00661      2436.   9.95E+10
-145.8610      5385.       0.00
42.0000     0.5026   3755399.     -6844.   -0.00569      2411.   9.95E+10
-141.9449      6779.       0.00
44.0000     0.3768   3606868.    -10183.   -0.00481      2347.   9.95E+10
-136.2847      8681.       0.00
46.0000     0.2718   3370444.    -11872.   -0.00397      2244.   9.95E+10
-4.4808   395.5957       0.00
48.0000     0.1864   3122662.    -11976.   -0.00318      2137.   9.95E+10
-4.1776   537.8271       0.00
50.0000     0.1191   2864342.    -12072.   -0.00246      2024.   9.95E+10
-3.7925   764.4322       0.00
52.0000    0.06829   2596379.    -12157.   -0.00180      1908.   9.95E+10
-3.3129      1164.       0.00
54.0000    0.03254   2319745.    -12229.   -0.00121      1788.   9.95E+10
-2.7141      2002.       0.00
56.0000    0.01022   2035508.    -21539.  -6.85E-04      1665.   9.95E+10
-773.0921   1815671.       0.00
58.0000  -3.27E-04   1300668.    -30016.  -2.83E-04      1346.   9.95E+10
66.6673   4896000.       0.00
60.0000   -0.00335    600842.    -23908.  -5.33E-05      1042.   9.95E+10
442.3411   3173262.       0.00
62.0000   -0.00289    154239.    -13669.   3.77E-05   848.1942   9.95E+10
410.9302   3415963.       0.00
64.0000   -0.00154    -56069.     -5140.   4.95E-05   805.5855   9.95E+10
299.7538   4683177.       0.00
66.0000  -5.10E-04    -93573.   -96.1653   3.15E-05   821.8633   9.95E+10
120.6052   5679360.       0.00
68.0000  -2.47E-05    -61365.      1424.   1.28E-05   807.8841   9.95E+10
6.0389   5875200.       0.00
70.0000   1.05E-04    -25519.      1177.   2.33E-06   792.3259   9.95E+10
-26.6108   6071040.       0.00
72.0000   8.74E-05     -4934.   583.5527  -1.34E-06   783.3914   9.95E+10
-22.8182   6266880.       0.00
74.0000   4.10E-05      2521.   177.1802  -1.63E-06   782.3440   9.95E+10
-11.0462   6462720.       0.00
76.0000   9.24E-06      3606.   -16.9248  -8.89E-07   782.8151   9.95E+10
-5.1292   1.33E+07       0.00
78.0000  -1.67E-06      1727.   -67.0561  -2.46E-07   781.9998   9.95E+10
0.9516   1.37E+07       0.00
80.0000  -2.58E-06   392.5694   -37.4545   9.29E-09   781.4204   9.95E+10
1.5152   1.41E+07       0.00
82.0000  -1.22E-06   -70.5756   -10.4309   4.81E-08   781.2806   9.95E+10
0.7368   1.45E+07       0.00
84.0000  -2.70E-07  -109.1550     0.4178   2.64E-08   781.2974   9.95E+10
0.1673   1.49E+07       0.00
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Full scour) 24in"


```
   86.0000   4.90E-08   -51.0902     2.0514   7.12E-09   781.2722   9.95E+10
   -0.03116   1.53E+07       0.00
   88.0000   7.20E-08   -10.8392     1.1135  -3.46E-10   781.2547   9.95E+10
   -0.04700   1.57E+07       0.00
   90.0000   3.23E-08     2.3666     0.2900  -1.37E-09   781.2510   9.95E+10
   -0.02163   1.61E+07       0.00
   92.0000   6.34E-09     3.1087   -0.02170  -7.08E-10   781.2513   9.95E+10
   -0.00434   1.65E+07       0.00
   94.0000  -1.65E-09     1.3401   -0.05991  -1.72E-10   781.2506   9.95E+10
   0.00116   1.68E+07       0.00
   96.0000  -1.89E-09     0.2368   -0.02966   1.86E-11   781.2501   9.95E+10
   0.00136   1.72E+07       0.00
   98.0000  -7.61E-10   -0.08390   -0.00663   3.71E-11   781.2500   9.95E+10
   5.59E-04   1.76E+07       0.00
  100.0000  -1.15E-10   -0.08235    0.00111   1.70E-11   781.2500   9.95E+10
  8.62E-05   1.80E+07       0.00
  102.0000   5.50E-11   -0.03091    0.00164   3.35E-12   781.2500   9.95E+10
  -4.22E-05   1.84E+07       0.00
  104.0000   4.60E-11   -0.00370   7.01E-04       0.00   781.2500   9.95E+10
  -3.61E-05   1.88E+07       0.00
  106.0000   1.57E-11    0.00276   1.18E-04       0.00   781.2500   9.95E+10
  -1.25E-05   1.92E+07       0.00
  108.0000   1.27E-12    0.00199  -4.49E-05       0.00   781.2500   9.95E+10
  -1.04E-06   1.96E+07       0.00
  110.0000  -1.64E-12   6.11E-04  -4.10E-05       0.00   781.2500   9.95E+10
  1.36E-06   2.00E+07       0.00
  112.0000  -1.01E-12   1.91E-05  -1.44E-05       0.00   781.2500   9.95E+10
  8.57E-07   2.04E+07       0.00
  114.0000       0.00  -7.93E-05  -1.27E-06       0.00   781.2500   9.95E+10
  2.35E-07   2.08E+07       0.00
  116.0000       0.00  -4.23E-05   1.45E-06       0.00   781.2500   9.95E+10
  -7.94E-09   2.49E+07       0.00
  118.0000       0.00  -9.80E-06   9.06E-07       0.00   781.2500   9.95E+10
  -3.75E-08   2.15E+07       0.00
  120.0000       0.00   1.16E-06   2.46E-07       0.00   781.2500   9.95E+10
  -1.75E-08   2.19E+07       0.00
  122.0000       0.00   2.01E-06  -8.69E-09       0.00   781.2500   9.95E+10
  -3.64E-09   2.63E+07       0.00
  124.0000       0.00   7.51E-07  -4.02E-08       0.00   781.2500   9.95E+10
  1.02E-09   2.67E+07       0.00
  126.0000       0.00   8.11E-08  -1.69E-08       0.00   781.2500   9.95E+10
  9.23E-10   2.72E+07       0.00
  128.0000       0.00  -5.78E-08  -2.42E-09       0.00   781.2500   9.95E+10
  2.80E-10   2.76E+07       0.00
  130.0000       0.00  -3.52E-08   1.04E-09       0.00   781.2500   9.95E+10
  7.56E-12   2.81E+07       0.00
  132.0000       0.00  -8.18E-09   7.50E-10       0.00   781.2500   9.95E+10
  -3.15E-11   2.86E+07       0.00
  134.0000       0.00   7.52E-10   1.97E-10       0.00   781.2500   9.95E+10
  -1.46E-11   2.90E+07       0.00
  136.0000       0.00   1.30E-09  -6.21E-12       0.00   781.2500   9.95E+10
  -2.41E-12   2.95E+07       0.00
  138.0000       0.00   4.60E-10  -2.63E-11       0.00   781.2500   9.95E+10
  0.00   3.00E+07       0.00
  140.0000       0.00   3.95E-11  -1.04E-11       0.00   781.2500   9.95E+10
  0.00   3.04E+07       0.00
  142.0000       0.00  -3.73E-11  -1.23E-12       0.00   781.2500   9.95E+10
  0.00   3.09E+07       0.00
  144.0000       0.00  -1.99E-11       0.00       0.00   781.2500   9.95E+10
  0.00   3.13E+07       0.00
  146.0000       0.00  -3.88E-12       0.00       0.00   781.2500   9.95E+10
  0.00   3.18E+07       0.00
  148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
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  0.00   3.23E+07       0.00
  150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.27E+07       0.00
  152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.32E+07       0.00
  154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.36E+07       0.00
  156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.41E+07       0.00
  158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.46E+07       0.00
  160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.50E+07       0.00
  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.55E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.59E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.64E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.69E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.21E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 6:

```
Pile-head deflection             =     5.02724014 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -9414192. inch-lbs
Maximum shear force              =         33812. lbs
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Full scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

Depth of maximum bending moment = 0.000000 feet below pile head
Depth of maximum shear force = 0.000000 feet below pile head
Number of iterations = 15
Number of zero deflection points = 20

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 7

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 6.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 450000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				
0.00	6.0313	-1.08E+07	37962.	0.00	5483.	9.95E+10
0.00	0.00	0.00				
2.0000	6.0000	-9909824.	37912.	-0.00250	5082.	9.95E+10
0.00	0.00	0.00				
4.0000	5.9113	-8960031.	37912.	-0.00478	4670.	9.95E+10
0.00	0.00	0.00				
6.0000	5.7708	-7986905.	37912.	-0.00682	4248.	9.95E+10
0.00	0.00	0.00				
8.0000	5.5840	-6992980.	37912.	-0.00863	3816.	9.95E+10
0.00	0.00	0.00				
10.0000	5.3567	-5980843.	37906.	-0.01019	3377.	9.95E+10
-0.4799	2.1499	0.00				
12.0000	5.0949	-4953408.	37889.	-0.01151	2931.	9.95E+10
-0.9438	4.4459	0.00				
14.0000	4.8044	-3913617.	37861.	-0.01258	2480.	9.95E+10
-1.3883	6.9350	0.00				
16.0000	4.4912	-2864434.	36943.	-0.01339	2024.	9.95E+10
-75.1284	401.4681	0.00				
18.0000	4.1615	-1851066.	34948.	-0.01396	1585.	9.95E+10
-91.0908	525.3367	0.00				
20.0000	3.8210	-885345.	32602.	-0.01429	1166.	9.95E+10
-104.4172	655.8472	0.00				
22.0000	3.4755	22537.	29950.	-0.01440	791.0315	9.95E+10
-116.5569	804.8912	0.00				
24.0000	3.1300	863223.	27022.	-0.01429	1156.	9.95E+10
-127.4194	977.0136	0.00				
26.0000	2.7896	1628268.	23850.	-0.01399	1488.	9.95E+10
-136.9214	1178.	0.00				
28.0000	2.4585	2310206.	20468.	-0.01351	1784.	9.95E+10
-144.9864	1415.	0.00				
30.0000	2.1409	2902615.	16909.	-0.01289	2041.	9.95E+10
-151.5446	1699.	0.00				
32.0000	1.8400	3400176.	13212.	-0.01213	2257.	9.95E+10
-156.5327	2042.	0.00				
34.0000	1.5588	3798720.	9415.	-0.01126	2430.	9.95E+10
-159.8933	2462.	0.00				

File name is incorrect below, run designation is "W.Overbank Post Seismic (Full scour) 24in"


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36.0000     1.2996   4095272.      5557.   -0.01031      2559.   9.95E+10
-161.5748      2984.       0.00
38.0000     1.0641   4288093.      1680.   -0.00930      2642.   9.95E+10
-161.5297      3643.       0.00
40.0000     0.8535   4376705.     -2175.   -0.00825      2681.   9.95E+10
-159.7126      4491.       0.00
42.0000     0.6681   4361926.     -5964.   -0.00720      2674.   9.95E+10
-156.0755      5607.       0.00
44.0000     0.5080   4245888.     -9644.   -0.00616      2624.   9.95E+10
-150.5587      7113.       0.00
46.0000     0.3724   4032071.    -11510.   -0.00516      2531.   9.95E+10
-4.9767   320.6932       0.00
48.0000     0.2602   3804887.    -11626.   -0.00422      2433.   9.95E+10
-4.6689   430.5875       0.00
50.0000     0.1700   3565105.    -11733.   -0.00333      2329.   9.95E+10
-4.2709   602.7852       0.00
52.0000     0.1005   3313580.    -11830.   -0.00250      2219.   9.95E+10
-3.7680   899.9525       0.00
54.0000    0.05010   3051254.    -11912.   -0.00173      2106.   9.95E+10
-3.1339      1501.       0.00
56.0000    0.01738   2779178.    -24048.   -0.00103      1987.   9.95E+10
-1008.   1392259.       0.00
58.0000   7.38E-04   1919146.    -37953.  -4.62E-04      1614.   9.95E+10
-150.5208   4896000.       0.00
60.0000   -0.00480    967417.    -33402.  -1.14E-04      1201.   9.95E+10
529.7260   2650007.       0.00
62.0000   -0.00473    318290.    -20731.   4.10E-05   919.3967   9.95E+10
526.2468   2667703.       0.00
64.0000   -0.00283    -28547.     -9534.   7.59E-05   793.6403   9.95E+10
406.8425   3451107.       0.00
66.0000   -0.00109   -140969.     -1622.   5.55E-05   842.4345   9.95E+10
252.4930   5562412.       0.00
68.0000  -1.65E-04   -107588.      1894.   2.55E-05   827.9460   9.95E+10
40.4758   5875200.       0.00
70.0000   1.36E-04    -50612.      1966.   6.46E-06   803.2170   9.95E+10
-34.4348   6071040.       0.00
72.0000   1.45E-04    -13339.      1100.  -1.25E-06   787.0395   9.95E+10
-37.7851   6266880.       0.00
74.0000   7.61E-05      2205.   400.4961  -2.59E-06   782.2068   9.95E+10
-20.4886   6462720.       0.00
76.0000   2.02E-05      5941.    19.9480  -1.61E-06   783.8285   9.95E+10
-11.2237   1.33E+07       0.00
78.0000  -1.25E-06      3197.  -106.1514  -5.10E-07   782.6375   9.95E+10
0.7154   1.37E+07       0.00
80.0000  -4.23E-06   856.5597   -67.7283  -2.09E-08   781.6218   9.95E+10
2.4865   1.41E+07       0.00
82.0000  -2.25E-06   -53.6994   -21.5509   7.59E-08   781.2733   9.95E+10
1.3616   1.45E+07       0.00
84.0000  -5.88E-07  -179.5223    -0.8321   4.78E-08   781.3279   9.95E+10
0.3649   1.49E+07       0.00
86.0000   3.91E-08   -94.6729     3.2484   1.47E-08   781.2911   9.95E+10
-0.02490   1.53E+07       0.00
88.0000   1.19E-07   -23.9197     2.0187   4.37E-10   781.2604   9.95E+10
-0.07757   1.57E+07       0.00
90.0000   6.01E-08     2.2142     0.6051  -2.18E-09   781.2510   9.95E+10
-0.04022   1.61E+07       0.00
92.0000   1.42E-08     5.1742    0.00560  -1.29E-09   781.2522   9.95E+10
-0.00974   1.65E+07       0.00
94.0000  -1.75E-09     2.5107   -0.09654  -3.62E-10   781.2511   9.95E+10
0.00123   1.68E+07       0.00
96.0000  -3.18E-09     0.5481   -0.05440   6.49E-12   781.2502   9.95E+10
0.00228   1.72E+07       0.00
98.0000  -1.44E-09    -0.1004   -0.01431   6.05E-11   781.2500   9.95E+10
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 0.00106   1.76E+07       0.00
100.0000  -2.78E-10    -0.1401   8.74E-04   3.15E-11   781.2501   9.95E+10
2.09E-04   1.80E+07       0.00
102.0000   7.18E-11   -0.05915    0.00272   7.45E-12   781.2500   9.95E+10
-5.50E-05   1.84E+07       0.00
104.0000   7.93E-11   -0.00976    0.00131       0.00   781.2500   9.95E+10
-6.21E-05   1.88E+07       0.00
106.0000   3.04E-11    0.00387   2.75E-04  -1.57E-12   781.2500   9.95E+10
-2.43E-05   1.92E+07       0.00
108.0000   3.95E-12    0.00347  -5.58E-05       0.00   781.2500   9.95E+10
-3.22E-06   1.96E+07       0.00
110.0000  -2.42E-12    0.00121  -7.02E-05       0.00   781.2500   9.95E+10
2.02E-06   2.00E+07       0.00
112.0000  -1.79E-12   1.06E-04  -2.78E-05       0.00   781.2500   9.95E+10
1.52E-06   2.04E+07       0.00
114.0000       0.00  -1.23E-04  -3.78E-06       0.00   781.2500   9.95E+10
4.76E-07   2.08E+07       0.00
116.0000       0.00  -7.68E-05   2.14E-06       0.00   781.2500   9.95E+10
1.71E-08   2.12E+07       0.00
118.0000       0.00  -2.06E-05   1.61E-06       0.00   781.2500   9.95E+10
-6.06E-08   2.15E+07       0.00
120.0000       0.00   7.11E-07   4.99E-07       0.00   781.2500   9.95E+10
-3.23E-08   2.19E+07       0.00
122.0000       0.00   3.38E-06   1.45E-08       0.00   781.2500   9.95E+10
-8.02E-09   2.63E+07       0.00
124.0000       0.00   1.42E-06  -6.62E-08       0.00   781.2500   9.95E+10
1.29E-09   2.67E+07       0.00
126.0000       0.00   2.07E-07  -3.14E-08       0.00   781.2500   9.95E+10
1.60E-09   2.72E+07       0.00
128.0000       0.00  -8.63E-08  -5.61E-09       0.00   781.2500   9.95E+10
5.48E-10   2.76E+07       0.00
130.0000       0.00  -6.31E-08   1.45E-09       0.00   781.2500   9.95E+10
3.99E-11   2.81E+07       0.00
132.0000       0.00  -1.68E-08   1.32E-09       0.00   781.2500   9.95E+10
-5.06E-11   2.86E+07       0.00
134.0000       0.00   4.40E-10   3.95E-10       0.00   781.2500   9.95E+10
-2.68E-11   2.90E+07       0.00
136.0000       0.00   2.20E-09   8.86E-12       0.00   781.2500   9.95E+10
-5.33E-12   2.95E+07       0.00
138.0000       0.00   8.75E-10  -4.36E-11       0.00   781.2500   9.95E+10
0.00   3.00E+07       0.00
140.0000       0.00   1.08E-10  -1.94E-11       0.00   781.2500   9.95E+10
1.05E-12   3.04E+07       0.00
142.0000       0.00  -5.73E-11  -2.99E-12       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
144.0000       0.00  -3.61E-11   1.02E-12       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
146.0000       0.00  -8.20E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
150.0000       0.00   1.24E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
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  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.55E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.59E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.64E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.69E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.21E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 7:

```
Pile-head deflection             =     6.03134783 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -10833810. inch-lbs
Maximum shear force              =         37962. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             14
Number of zero deflection points =             20
```

--
Summary of Pile-head Responses for Conventional Analyses

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Definitions of Pile-head Loading Conditions:

File name is incorrect below, run designation is "W.Overbank Post Seismic (Full scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type 1	Load 1	Load Type 2	Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	y, in	0.5000	S, rad	0.00	450000.	0.5047	0.00	7598.	-1610577.
2	y, in	1.0000	S, rad	0.00	450000.	1.0080	0.00	12134.	-2776165.
3	y, in	2.0000	S, rad	0.00	450000.	2.0136	0.00	19024.	-4711957.
4	y, in	3.0000	S, rad	0.00	450000.	3.0185	0.00	24529.	-6387605.
5	y, in	4.0000	S, rad	0.00	450000.	4.0230	0.00	29381.	-7941327.
6	y, in	5.0000	S, rad	0.00	450000.	5.0272	0.00	33812.	-9414192.
7	y, in	6.0000	S, rad	0.00	450000.	6.0313	0.00	37962.	-1.08E+07

Maximum pile-head deflection = 6.0313478293 inches
Maximum pile-head rotation = 0.0000000000 radians = 0.000000 deg.

The analysis ended normally.

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"

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LPile for Windows, Version 2016-09.009

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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--
Files Used for Analysis

--

Path to file locations:
\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis
\L-Pile\West Overbank\Post Seismic (Half Scour)\

Name of input data file:
West Overbank Static 24in.lp9d

Name of output report file:
West Overbank Static 24in.lp9o

Name of plot output file:
West Overbank Static 24in.lp9p

Name of runtime message file:
West Overbank Static 24in.lp9r

--
Date and Time of Analysis

--

Date: October 3, 2017 Time: 11:49:11

--

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"

Problem Title

Project Name: Harbor River Bridge
Job Number: 18461-007-01
Client: SCDOT
Engineer: HPC
Description: West Overbank - Post Seismic

Program Options and Settings

Computational Options:
 - Use unfactored loads in computations (conventional analysis)
Engineering Units Used for Data Input and Computations:
 - US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed	=	500
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	100

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Computation of pile-head foundation stiffness matrix not selected
 - Push-over analysis of pile not selected
 - Buckling analysis of pile not selected

Output Options:
 - Output files use decimal points to denote decimal symbols.
 - Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1
 - No p-y curves to be computed and reported for user-specified depths
 - Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined	=	1
Total length of pile	=	200.000 ft
Depth of ground surface below top of pile	=	4.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	24.0000
2	200.000	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile

Cross-sectional shape	=	rectangular
Length of section	=	200.000000 ft
Width of top of section	=	24.000000 in
Width of bottom of section	=	24.000000 in
Top Section Depth	=	24.000000 in
Bottom Section Depth	=	24.000000 in
Top Area	=	576.000000 sq. in
Bottom Area	=	576.000000 sq. in
Moment of Inertia at Top	=	27648. in^4
Moment of Inertia at Bottom	=	27648. in^4
Elastic Modulus	=	3600000. psi

--
Ground Slope and Pile Batter Angles

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Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

--
Soil and Rock Layering Information

--

The soil profile is modelled using 5 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	4.000000 ft
Distance from top of pile to bottom of layer	=	15.000000 ft
Effective unit weight at top of layer	=	37.600000 pcf
Effective unit weight at bottom of layer	=	37.600000 pcf
Undrained cohesion at top of layer	=	0.0000 psf
Undrained cohesion at bottom of layer	=	25.000000 psf

```
   Epsilon-50 at top of layer                          =     0.020000
   Epsilon-50 at bottom of layer                       =     0.020000


Layer 2 is soft clay, p-y criteria by Matlock, 1970

   Distance from top of pile to top of layer           =    15.000000 ft
   Distance from top of pile to bottom of layer        =    45.000000 ft
   Effective unit weight at top of layer               =    32.600000 pcf
   Effective unit weight at bottom of layer            =    32.600000 pcf
   Undrained cohesion at top of layer                  =   108.000000 psf
   Undrained cohesion at bottom of layer               =   362.000000 psf
   Epsilon-50 at top of layer                          =     0.020000
   Epsilon-50 at bottom of layer                       =     0.020000


Layer 3 is soft clay, p-y criteria by Matlock, 1970

   Distance from top of pile to top of layer           =    45.000000 ft
   Distance from top of pile to bottom of layer        =    55.000000 ft
   Effective unit weight at top of layer               =    37.600000 pcf
   Effective unit weight at bottom of layer            =    37.600000 pcf
   Undrained cohesion at top of layer                  =   125.000000 psf
   Undrained cohesion at bottom of layer               =   159.000000 psf
   Epsilon-50 at top of layer                          =     0.020000
   Epsilon-50 at bottom of layer                       =     0.020000


Layer 4 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer           =    55.000000 ft
   Distance from top of pile to bottom of layer        =    75.000000 ft
   Effective unit weight at top of layer               =    57.600000 pcf
   Effective unit weight at bottom of layer            =    57.600000 pcf
   Undrained cohesion at top of layer                  =        3400. psf
   Undrained cohesion at bottom of layer               =        3400. psf
   Epsilon-50 at top of layer                          =     0.005000
   Epsilon-50 at bottom of layer                       =     0.005000
   Subgrade k at top of layer                          =   400.000000 pci
   Subgrade k at bottom of layer                       =   400.000000 pci


Layer 5 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer           =    75.000000 ft
   Distance from top of pile to bottom of layer        =   210.000000 ft
   Effective unit weight at top of layer               =    57.600000 pcf
   Effective unit weight at bottom of layer            =    57.600000 pcf
   Undrained cohesion at top of layer                  =        6000. psf
   Undrained cohesion at bottom of layer               =        6000. psf
   Epsilon-50 at top of layer                          =     0.005000
   Epsilon-50 at bottom of layer                       =     0.005000
   Subgrade k at top of layer                          =   800.000000 pci
   Subgrade k at bottom of layer                       =   800.000000 pci


 (Depth of the lowest soil layer extends 10.000 ft below the pile tip)


--------------------------------------------------------------------------------
--
                        Summary of Input Soil Properties
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

```
-------------------------------------------------------------------------------
--

Layer         Soil Type          Layer      Effective    Undrained       E50
Layer           Name             Depth       Unit Wt.    Cohesion        or
kpy
 Num.     (p-y Curve Type)        ft           pcf          psf          krm
 pci
-----   -------------------   ----------   ----------   ----------
----------   ----------
  1            Soft               4.0000      37.6000         0.00
  0.02000       --
               Clay              15.0000      37.6000      25.0000
               0.02000       --
  2            Soft              15.0000      32.6000     108.0000
  0.02000       --
               Clay              45.0000      32.6000     362.0000
               0.02000       --
  3            Soft              45.0000      37.6000     125.0000
  0.02000       --
               Clay              55.0000      37.6000     159.0000
               0.02000       --
  4         Stiff Clay           55.0000      57.6000        3400.
  0.00500     400.0000
          with Free Water        75.0000      57.6000        3400.
          0.00500     400.0000
  5         Stiff Clay           75.0000      57.6000        6000.
  0.00500     800.0000
          with Free Water       210.0000      57.6000        6000.
          0.00500     800.0000


-------------------------------------------------------------------------------
--
                    p-y Modification Factors for Group Action
-------------------------------------------------------------------------------
--

Distribution of p-y modifiers with depth defined using 8 points

Point      Depth X         p-mult         y-mult
 No.          ft
-----     ----------     ----------     ----------
  1            4.000         0.0850         1.0000
  2           15.000         0.0850         1.0000
  3           15.000         0.8500         1.0000
  4           45.000         0.8500         1.0000
  5           45.000         0.0850         1.0000
  6           55.000         0.0850         1.0000
  7           55.000         0.8500         1.0000
  8          210.000         0.8500         1.0000



-------------------------------------------------------------------------------
--
                                Static Loading Type
-------------------------------------------------------------------------------
--

Static loading criteria were used when computing p-y curves for all analyses.
```

```
--------------------------------------------------------------------------------
                 Pile-head Loading and Pile-head Fixity Conditions
--------------------------------------------------------------------------------

Number of loads specified = 7

Load    Load         Condition               Condition            Axial Thrust
Compute Top y
 No.    Type            1                       2                  Force, lbs
 vs. Pile Length
-----   ----   --------------------   ------------------------
----------------   ---------------
   1     5     y =     0.500000 in    S =       0.0000 in/in
   450000.          N.A.
   2     5     y =     1.000000 in    S =       0.0000 in/in
   450000.          N.A.
   3     5     y =     2.000000 in    S =       0.0000 in/in
   450000.          N.A.
   4     5     y =     3.000000 in    S =       0.0000 in/in
   450000.          N.A.
   5     5     y =     4.000000 in    S =       0.0000 in/in
   450000.          N.A.
   6     5     y =     5.000000 in    S =       0.0000 in/in
   450000.          N.A.
   7     5     y =     6.000000 in    S =       0.0000 in/in
   450000.          N.A.

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with
specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.


--------------------------------------------------------------------------------
     Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness
--------------------------------------------------------------------------------

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:
-------------------
Moment-curvature properties were derived from elastic section properties


--------------------------------------------------------------------------------
           Layering Correction Equivalent Depths of Soil & Rock Layers
--------------------------------------------------------------------------------
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	4.0000	0.00	N.A.	No	0.00	2502.
2	15.0000	11.0000	Yes	No	2502.	126612.
3	45.0000	41.0000	Yes	No	129114.	26603.
4	55.0000	79.3878	No	No	155718.	131133.
5	75.0000	99.3878	Yes	No	286851.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 450000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				
0.00	0.5051	-1761816.	8744.	0.00	1546.	9.95E+10
0.00	0.00	0.00				
2.0000	0.5000	-1549944.	8732.	-3.99E-04	1454.	9.95E+10
0.00	0.00	0.00				
4.0000	0.4859	-1334036.	8732.	-7.47E-04	1360.	9.95E+10
0.00	0.00	0.00				
6.0000	0.4641	-1114654.	8730.	-0.00104	1265.	9.95E+10
-0.2111	10.9171	0.00				
8.0000	0.4359	-892491.	8722.	-0.00128	1169.	9.95E+10
-0.4135	22.7672	0.00				
10.0000	0.4025	-668242.	8710.	-0.00147	1071.	9.95E+10
-0.6040	36.0151	0.00				
12.0000	0.3652	-442600.	8694.	-0.00161	973.3507	9.95E+10
-0.7797	51.2338	0.00				
14.0000	0.3254	-216255.	8673.	-0.00169	875.1107	9.95E+10
-0.9378	69.1674	0.00				
16.0000	0.2843	10113.	8110.	-0.00171	785.6393	9.95E+10
-45.9440	3878.	0.00				
18.0000	0.2433	209991.	6960.	-0.00168	872.3919	9.95E+10
-49.9605	4928.	0.00				
20.0000	0.2035	380545.	5723.	-0.00161	946.4170	9.95E+10

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"


```
-53.0472      6257.       0.00
22.0000     0.1659    519552.      4425.   -0.00150      1007.   9.95E+10
-55.1365      7977.       0.00
24.0000     0.1313    625448.      3090.   -0.00137      1053.   9.95E+10
-56.1640     10268.       0.00
26.0000     0.1003    697365.      1743.   -0.00121      1084.   9.95E+10
-56.0651     13416.       0.00
28.0000    0.07335    735173.   412.8805   -0.00103      1100.   9.95E+10
-54.7668     17919.       0.00
30.0000    0.05066    739520.  -870.3830  -8.56E-04      1102.   9.95E+10
-52.1718     24715.       0.00
32.0000    0.03225    711890.     -2074.  -6.81E-04      1090.   9.95E+10
-48.1179     35807.       0.00
34.0000    0.01796    654690.     -3158.  -5.17E-04      1065.   9.95E+10
-42.2551     56466.       0.00
36.0000    0.00746    571447.     -4068.  -3.69E-04      1029.   9.95E+10
-33.5253    107895.       0.00
38.0000   2.62E-04    467405.     -4613.  -2.43E-04   984.1167   9.95E+10
-11.8865   1089912.       0.00
40.0000   -0.00423    355299.     -4384.  -1.44E-04   935.4596   9.95E+10
30.9724    175774.       0.00
42.0000   -0.00666    260108.     -3556.  -7.01E-05   894.1441   9.95E+10
37.9715    136763.       0.00
44.0000   -0.00759    186111.     -2601.  -1.63E-05   862.0274   9.95E+10
41.6633    131693.       0.00
46.0000   -0.00745    135628.     -2083.   2.25E-05   840.1162   9.95E+10
1.5034      4846.       0.00
48.0000   -0.00651     85657.     -2046.   4.92E-05   818.4275   9.95E+10
1.5141      5580.       0.00
50.0000   -0.00508     36335.     -2011.   6.39E-05   797.0206   9.95E+10
1.4643      6912.       0.00
52.0000   -0.00345    -12237.     -1977.   6.68E-05   786.5614   9.95E+10
1.3478      9388.       0.00
54.0000   -0.00188    -60002.     -1947.   5.81E-05   807.2925   9.95E+10
1.1513     14715.       0.00
56.0000  -6.57E-04   -106947.  -259.8565   3.80E-05   827.6680   9.95E+10
139.4422   5091840.       0.00
58.0000  -5.56E-05    -73295.      1561.   1.62E-05   813.0621   9.95E+10
12.2547   5287680.       0.00
60.0000   1.22E-04    -32393.      1373.   3.49E-06   795.3096   9.95E+10
-27.8391   5483520.       0.00
62.0000   1.12E-04     -7443.   721.8055  -1.31E-06   784.4804   9.95E+10
-26.4682   5679360.       0.00
64.0000   5.88E-05      2282.   231.5037  -1.94E-06   782.2403   9.95E+10
-14.3903   5875200.       0.00
66.0000   1.89E-05      3711.     1.3836  -1.21E-06   782.8608   9.95E+10
-4.7864   6071040.       0.00
68.0000   5.36E-07      2374.   -57.7338  -4.80E-07   782.2805   9.95E+10
-0.1401   6266880.       0.00
70.0000  -4.11E-06   950.3979   -46.1372  -7.90E-08   781.6625   9.95E+10
1.1064   6462720.       0.00
72.0000  -3.25E-06   161.3741   -22.0260   5.51E-08   781.3200   9.95E+10
0.9028   6658560.       0.00
74.0000  -1.47E-06  -108.0412    -6.1695   6.15E-08   781.2969   9.95E+10
0.4186   6854400.       0.00
76.0000  -3.02E-07  -136.0892     0.9833   3.21E-08   781.3091   9.95E+10
0.1775   1.41E+07       0.00
78.0000   7.37E-08   -61.5353     2.5795   8.24E-09   781.2767   9.95E+10
-0.04449   1.45E+07       0.00
80.0000   9.34E-08   -12.4499     1.3505  -6.79E-10   781.2554   9.95E+10
-0.05793   1.49E+07       0.00
82.0000   4.11E-08     3.3028     0.3417  -1.78E-09   781.2514   9.95E+10
-0.02614   1.53E+07       0.00
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"


```
   84.0000   7.86E-09     3.9885   -0.03362  -9.03E-10   781.2517   9.95E+10
   -0.00513   1.57E+07       0.00
   86.0000  -2.28E-09     1.7088   -0.07690  -2.16E-10   781.2507   9.95E+10
   0.00152   1.61E+07       0.00
   88.0000  -2.52E-09     0.3018   -0.03788   2.61E-11   781.2501   9.95E+10
   0.00173   1.65E+07       0.00
   90.0000  -1.02E-09    -0.1102   -0.00854   4.92E-11   781.2500   9.95E+10
   7.17E-04   1.68E+07       0.00
   92.0000  -1.59E-10    -0.1090    0.00144   2.28E-11   781.2500   9.95E+10
   1.14E-04   1.72E+07       0.00
   94.0000   7.31E-11   -0.04178    0.00216   4.63E-12   781.2500   9.95E+10
   -5.37E-05   1.76E+07       0.00
   96.0000   6.33E-11   -0.00540   9.45E-04  -1.06E-12   781.2500   9.95E+10
   -4.76E-05   1.80E+07       0.00
   98.0000   2.23E-11    0.00360   1.69E-04  -1.27E-12   781.2500   9.95E+10
   -1.71E-05   1.84E+07       0.00
  100.0000   2.15E-12    0.00273  -5.69E-05       0.00   781.2500   9.95E+10
  -1.69E-06   1.88E+07       0.00
  102.0000  -2.21E-12   8.84E-04  -5.60E-05       0.00   781.2500   9.95E+10
  1.76E-06   1.92E+07       0.00
  104.0000  -1.45E-12   4.79E-05  -2.06E-05       0.00   781.2500   9.95E+10
  1.18E-06   1.96E+07       0.00
  106.0000       0.00  -1.07E-04  -2.26E-06       0.00   781.2500   9.95E+10
  3.47E-07   2.00E+07       0.00
  108.0000       0.00  -6.14E-05   1.90E-06       0.00   781.2500   9.95E+10
  8.93E-10   2.40E+07       0.00
  110.0000       0.00  -1.55E-05   1.30E-06       0.00   781.2500   9.95E+10
  -5.10E-08   2.08E+07       0.00
  112.0000       0.00   1.10E-06   3.82E-07       0.00   781.2500   9.95E+10
  -2.57E-08   2.12E+07       0.00
  114.0000       0.00   2.87E-06   1.20E-09       0.00   781.2500   9.95E+10
  -6.03E-09   2.53E+07       0.00
  116.0000       0.00   1.17E-06  -5.66E-08       0.00   781.2500   9.95E+10
  1.22E-09   2.58E+07       0.00
  118.0000       0.00   1.59E-07  -2.59E-08       0.00   781.2500   9.95E+10
  1.34E-09   2.63E+07       0.00
  120.0000       0.00  -7.71E-08  -4.42E-09       0.00   781.2500   9.95E+10
  4.49E-10   2.67E+07       0.00
  122.0000       0.00  -5.41E-08   1.31E-09       0.00   781.2500   9.95E+10
  2.92E-11   2.72E+07       0.00
  124.0000       0.00  -1.42E-08   1.14E-09       0.00   781.2500   9.95E+10
  -4.38E-11   2.76E+07       0.00
  126.0000       0.00   4.69E-10   3.36E-10       0.00   781.2500   9.95E+10
  -2.29E-11   2.81E+07       0.00
  128.0000       0.00   1.94E-09   6.20E-12       0.00   781.2500   9.95E+10
  -4.57E-12   2.86E+07       0.00
  130.0000       0.00   7.75E-10  -3.84E-11       0.00   781.2500   9.95E+10
  0.00   2.90E+07       0.00
  132.0000       0.00   9.76E-11  -1.72E-11       0.00   781.2500   9.95E+10
  0.00   2.95E+07       0.00
  134.0000       0.00  -5.09E-11  -2.71E-12       0.00   781.2500   9.95E+10
  0.00   3.00E+07       0.00
  136.0000       0.00  -3.28E-11       0.00       0.00   781.2500   9.95E+10
  0.00   3.04E+07       0.00
  138.0000       0.00  -7.69E-12       0.00       0.00   781.2500   9.95E+10
  0.00   3.09E+07       0.00
  140.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.13E+07       0.00
  142.0000       0.00   1.14E-12       0.00       0.00   781.2500   9.95E+10
  0.00   3.18E+07       0.00
  144.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.23E+07       0.00
  146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
```

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  0.00   3.27E+07       0.00
  148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.32E+07       0.00
  150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.36E+07       0.00
  152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.41E+07       0.00
  154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.46E+07       0.00
  156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.50E+07       0.00
  158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.55E+07       0.00
  160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.59E+07       0.00
  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.64E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.69E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.26E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.50509785 inches
Computed slope at pile head      =       0.000000 radians
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

```
Maximum bending moment          =      -1761816. inch-lbs
Maximum shear force             =          8744. lbs
Depth of maximum bending moment =       0.000000 feet below pile head
Depth of maximum shear force    =       0.000000 feet below pile head
Number of iterations            =             14
Number of zero deflection points =            22
```

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Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                              =     1.000000 inches
Rotation of pile head                                  =    0.000E+00 radians
Axial load on pile head                                =     450000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	1.0087	-3020850.	13891.	0.00	2092.	9.95E+10	0.00	0.00	0.00
2.0000	1.0000	-2683981.	13872.	-6.88E-04	1946.	9.95E+10	0.00	0.00	0.00
4.0000	0.9757	-2340122.	13872.	-0.00129	1797.	9.95E+10	0.00	0.00	0.00
6.0000	0.9379	-1990170.	13869.	-0.00182	1645.	9.95E+10	-0.2669	6.8302	0.00
8.0000	0.8886	-1635188.	13860.	-0.00225	1491.	9.95E+10	-0.5243	14.1615	0.00
10.0000	0.8298	-1276250.	13844.	-0.00260	1335.	9.95E+10	-0.7687	22.2341	0.00
12.0000	0.7636	-914431.	13823.	-0.00287	1178.	9.95E+10	-0.9970	31.3346	0.00
14.0000	0.6921	-550805.	13796.	-0.00304	1020.	9.95E+10	-1.2060	41.8204	0.00
16.0000	0.6175	-186439.	13068.	-0.00313	862.1698	9.95E+10	-59.4969	2313.	0.00
18.0000	0.5417	144142.	11571.	-0.00314	843.8115	9.95E+10	-65.2386	2890.	0.00
20.0000	0.4668	436770.	9949.	-0.00307	970.8202	9.95E+10	-69.9619	3597.	0.00
22.0000	0.3944	687962.	8226.	-0.00293	1080.	9.95E+10	-73.5915	4478.	0.00
24.0000	0.3260	894975.	6430.	-0.00274	1170.	9.95E+10	-76.0573	5598.	0.00
26.0000	0.2628	1055848.	4590.	-0.00251	1240.	9.95E+10	-77.2921	7058.	0.00
28.0000	0.2057	1169450.	2736.	-0.00224	1289.	9.95E+10	-77.2286	9010.	0.00
30.0000	0.1554	1235524.	899.6806	-0.00195	1318.	9.95E+10	-75.7939	11707.	0.00
32.0000	0.1122	1254723.	-884.6140	-0.00165	1326.	9.95E+10	-72.8973	15594.	0.00

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"


```
34.0000    0.07627   1228666.     -2580.   -0.00135      1315.   9.95E+10
-68.4054     21526.       0.00
36.0000    0.04745   1160007.     -4146.   -0.00106      1285.   9.95E+10
-62.0762     31399.       0.00
38.0000    0.02534   1052572.     -5531.  -7.94E-04      1238.   9.95E+10
-53.3540     50526.       0.00
40.0000    0.00933    911663.     -6656.  -5.57E-04      1177.   9.95E+10
-40.3868    103895.       0.00
42.0000   -0.00141    745118.     -6870.  -3.58E-04      1105.   9.95E+10
22.5815    384794.       0.00
44.0000   -0.00783    589639.     -6093.  -1.97E-04      1037.   9.95E+10
42.1070    128993.       0.00
46.0000   -0.01085    456879.     -5568.  -7.05E-05   979.5481   9.95E+10
1.7048      3772.       0.00
48.0000   -0.01122    323910.     -5525.   2.37E-05   921.8361   9.95E+10
1.8153      3884.       0.00
50.0000   -0.00971    191144.     -5482.   8.57E-05   864.2118   9.95E+10
1.8173      4490.       0.00
52.0000   -0.00710     58927.     -5440.   1.16E-04   806.8258   9.95E+10
1.7156      5798.       0.00
54.0000   -0.00415    -72456.     -5401.   1.14E-04   812.6979   9.95E+10
1.4998      8674.       0.00
56.0000   -0.00162   -202786.     -1693.   8.11E-05   869.2648   9.95E+10
307.4780   4563787.       0.00
58.0000  -2.58E-04   -155481.      2678.   3.79E-05   848.7330   9.95E+10
56.7949   5287680.       0.00
60.0000   2.02E-04    -75057.      2807.   1.01E-05   813.8267   9.95E+10
-46.0667   5483520.       0.00
62.0000   2.27E-04    -20971.      1610.  -1.48E-06   790.3522   9.95E+10
-53.6400   5679360.       0.00
64.0000   1.30E-04      2272.   583.7070  -3.74E-06   782.2360   9.95E+10
-31.9125   5875200.       0.00
66.0000   4.72E-05      7127.    57.4931  -2.61E-06   784.3434   9.95E+10
-11.9386   6071040.       0.00
68.0000   5.28E-06      5088.  -102.3013  -1.13E-06   783.4582   9.95E+10
-1.3776   6266880.       0.00
70.0000  -7.20E-06      2241.   -95.5580  -2.50E-07   782.2228   9.95E+10
1.9395   6462720.       0.00
72.0000  -6.71E-06   506.2119   -49.9433   8.15E-08   781.4697   9.95E+10
1.8617   6658560.       0.00
74.0000  -3.29E-06  -157.7901   -16.3313   1.24E-07   781.3185   9.95E+10
0.9393   6854400.       0.00
76.0000  -7.80E-07  -280.3568     0.4416   7.07E-08   781.3717   9.95E+10
0.4585   1.41E+07       0.00
78.0000   1.06E-07  -138.1207     5.1773   2.03E-08   781.3099   9.95E+10
-0.06382   1.45E+07       0.00
80.0000   1.92E-07   -32.2862     2.9795  -2.79E-10   781.2640   9.95E+10
-0.1193   1.49E+07       0.00
82.0000   9.23E-08     4.9023     0.8428  -3.58E-09   781.2521   9.95E+10
-0.05873   1.53E+07       0.00
84.0000   2.05E-08     8.2471   -0.02274  -2.00E-09   781.2536   9.95E+10
-0.01340   1.57E+07       0.00
86.0000  -3.51E-09     3.8540    -0.1553  -5.37E-10   781.2517   9.95E+10
0.00235   1.61E+07       0.00
88.0000  -5.24E-09     0.8038   -0.08404   2.49E-11   781.2503   9.95E+10
0.00359   1.65E+07       0.00
90.0000  -2.32E-09    -0.1803   -0.02145   1.00E-10   781.2501   9.95E+10
0.00162   1.68E+07       0.00
92.0000  -4.35E-10    -0.2281    0.00179   5.08E-11   781.2501   9.95E+10
3.12E-04   1.72E+07       0.00
94.0000   1.25E-10   -0.09542    0.00443   1.18E-11   781.2500   9.95E+10
-9.21E-05   1.76E+07       0.00
96.0000   1.34E-10   -0.01560    0.00212  -1.54E-12   781.2500   9.95E+10
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 -1.00E-04   1.80E+07       0.00
 98.0000   5.15E-11    0.00648   4.45E-04  -2.64E-12   781.2500   9.95E+10
 -3.95E-05   1.84E+07       0.00
100.0000   6.82E-12    0.00582  -9.26E-05  -1.16E-12   781.2500   9.95E+10
-5.35E-06   1.88E+07       0.00
102.0000  -4.12E-12    0.00206  -1.17E-04       0.00   781.2500   9.95E+10
3.29E-06   1.92E+07       0.00
104.0000  -3.12E-12   1.96E-04  -4.72E-05       0.00   781.2500   9.95E+10
2.55E-06   1.96E+07       0.00
106.0000       0.00  -2.06E-04  -6.84E-06       0.00   781.2500   9.95E+10
8.22E-07   2.00E+07       0.00
108.0000       0.00  -1.34E-04   3.52E-06       0.00   781.2500   9.95E+10
4.10E-08   2.04E+07       0.00
110.0000       0.00  -3.76E-05   2.80E-06       0.00   781.2500   9.95E+10
-1.01E-07   2.08E+07       0.00
112.0000       0.00   4.85E-07   8.98E-07       0.00   781.2500   9.95E+10
-5.71E-08   2.12E+07       0.00
114.0000       0.00   5.61E-06   4.51E-08       0.00   781.2500   9.95E+10
-1.40E-08   2.15E+07       0.00
116.0000       0.00   2.68E-06  -1.07E-07       0.00   781.2500   9.95E+10
1.31E-09   2.58E+07       0.00
118.0000       0.00   4.90E-07  -5.83E-08       0.00   781.2500   9.95E+10
2.74E-09   2.63E+07       0.00
120.0000       0.00  -1.21E-07  -1.26E-08       0.00   781.2500   9.95E+10
1.07E-09   2.67E+07       0.00
122.0000       0.00  -1.15E-07   1.78E-09       0.00   781.2500   9.95E+10
1.28E-10   2.72E+07       0.00
124.0000       0.00  -3.56E-08   2.37E-09       0.00   781.2500   9.95E+10
-7.87E-11   2.76E+07       0.00
126.0000       0.00  -1.35E-09   8.20E-10       0.00   781.2500   9.95E+10
-5.06E-11   2.81E+07       0.00
128.0000       0.00   3.77E-09   6.47E-11       0.00   781.2500   9.95E+10
-1.23E-11   2.86E+07       0.00
130.0000       0.00   1.78E-09  -7.22E-11       0.00   781.2500   9.95E+10
0.00   2.90E+07       0.00
132.0000       0.00   3.06E-10  -3.88E-11       0.00   781.2500   9.95E+10
1.89E-12   2.95E+07       0.00
134.0000       0.00  -8.22E-11  -7.82E-12       0.00   781.2500   9.95E+10
0.00   3.00E+07       0.00
136.0000       0.00  -7.04E-11   1.31E-12       0.00   781.2500   9.95E+10
0.00   3.04E+07       0.00
138.0000       0.00  -1.97E-11   1.47E-12       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
140.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
142.0000       0.00   2.27E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
144.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
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  160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.59E+07       0.00
  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.64E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.69E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.26E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     1.00874089 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -3020850. inch-lbs
Maximum shear force              =         13891. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             19
Number of zero deflection points =             21
```

--

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 3

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 2.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 450000.0 lbs

Depth X feet	Deflect. y inches	Bending Distrib. Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Lat. Load lb/inch				
0.00	2.0149	-5149965.	21872.	0.00	3016.	9.95E+10
0.00	0.00	0.00				
2.0000	2.0000	-4619014.	21844.	-0.00118	2786.	9.95E+10
0.00	0.00	0.00				
4.0000	1.9584	-4076035.	21844.	-0.00223	2550.	9.95E+10
0.00	0.00	0.00				
6.0000	1.8931	-3522442.	21839.	-0.00314	2310.	9.95E+10
-0.3373	4.2765	0.00				
8.0000	1.8075	-2959869.	21827.	-0.00392	2066.	9.95E+10
-0.6643	8.8209	0.00				
10.0000	1.7048	-2389971.	21808.	-0.00457	1819.	9.95E+10
-0.9773	13.7577	0.00				
12.0000	1.5882	-1814412.	21781.	-0.00508	1569.	9.95E+10
-1.2726	19.2305	0.00				
14.0000	1.4612	-1234861.	21747.	-0.00544	1317.	9.95E+10
-1.5472	25.4122	0.00				
16.0000	1.3270	-652986.	20807.	-0.00567	1065.	9.95E+10
-76.7790	1389.	0.00				
18.0000	1.1890	-113635.	18868.	-0.00576	830.5706	9.95E+10
-84.7816	1711.	0.00				
20.0000	1.0503	377178.	16751.	-0.00573	944.9558	9.95E+10
-91.6753	2095.	0.00				
22.0000	0.9139	814204.	14482.	-0.00559	1135.	9.95E+10
-97.3776	2557.	0.00				
24.0000	0.7821	1193020.	12092.	-0.00535	1299.	9.95E+10
-101.8128	3124.	0.00				
26.0000	0.6573	1510085.	9611.	-0.00502	1437.	9.95E+10
-104.9110	3831.	0.00				
28.0000	0.5412	1762788.	7073.	-0.00463	1546.	9.95E+10
-106.6075	4728.	0.00				
30.0000	0.4353	1949496.	4512.	-0.00418	1627.	9.95E+10
-106.8413	5891.	0.00				
32.0000	0.3406	2069585.	1963.	-0.00369	1680.	9.95E+10
-105.5530	7437.	0.00				
34.0000	0.2580	2123487.	-535.9509	-0.00319	1703.	9.95E+10
-102.6812	9553.	0.00				
36.0000	0.1876	2112714.	-2946.	-0.00268	1698.	9.95E+10
-98.1557	12556.	0.00				
38.0000	0.1295	2039902.	-5226.	-0.00218	1667.	9.95E+10
-91.8819	17031.	0.00				
40.0000	0.08315	1908854.	-7334.	-0.00170	1610.	9.95E+10
-83.7069	24161.	0.00				
42.0000	0.04787	1724620.	-9218.	-0.00126	1530.	9.95E+10
-73.3247	36764.	0.00				
44.0000	0.02256	1493659.	-10817.	-8.74E-04	1430.	9.95E+10
-59.9417	63754.	0.00				
46.0000	0.00591	1224282.	-11553.	-5.47E-04	1313.	9.95E+10

```
 -1.3931      5661.       0.00
 48.0000   -0.00367    950915.    -11555.  -2.84E-04      1194.   9.95E+10
 1.2500      8180.       0.00
 50.0000   -0.00774    675791.    -11520.  -8.81E-05      1075.   9.95E+10
 1.6845      5225.       0.00
 52.0000   -0.00790    399877.    -11478.   4.15E-05   954.8078   9.95E+10
 1.7774      5401.       0.00
 54.0000   -0.00574    123946.    -11437.   1.05E-04   835.0461   9.95E+10
 1.6715      6984.       0.00
 56.0000   -0.00287   -151345.     -6499.   1.01E-04   846.9378   9.95E+10
 409.8191   3424225.       0.00
 58.0000  -8.77E-04   -190186.   736.9321   6.02E-05   863.7959   9.95E+10
 193.1575   5287680.       0.00
 60.0000   1.83E-05   -117273.      3005.   2.32E-05   832.1496   9.95E+10
 -4.1896   5483520.       0.00
 62.0000   2.35E-04    -46468.      2288.   3.41E-06   801.4182   9.95E+10
 -55.5454   5679360.       0.00
 64.0000   1.82E-04     -7536.      1086.  -3.10E-06   784.5207   9.95E+10
 -44.6034   5875200.       0.00
 66.0000   8.61E-05      5724.   289.4255  -3.32E-06   783.7346   9.95E+10
 -21.7730   6071040.       0.00
 68.0000   2.31E-05      6428.   -44.1382  -1.85E-06   784.0401   9.95E+10
 -6.0240   6266880.       0.00
 70.0000  -2.73E-06      3646.  -107.5995  -6.36E-07   782.8324   9.95E+10
 0.7356   6462720.       0.00
 72.0000  -7.43E-06      1277.   -74.0205  -4.20E-08   781.8044   9.95E+10
 2.0627   6658560.       0.00
 74.0000  -4.75E-06    93.7144   -33.0039   1.23E-07   781.2907   9.95E+10
 1.3554   6854400.       0.00
 76.0000  -1.51E-06  -309.4866    -6.0631   9.73E-08   781.3843   9.95E+10
 0.8897   1.41E+07       0.00
 78.0000  -7.40E-08  -199.4150     5.1494   3.60E-08   781.3366   9.95E+10
 0.04467   1.45E+07       0.00
 80.0000   2.12E-07   -63.0912     4.1053   4.32E-09   781.2774   9.95E+10
 -0.1317   1.49E+07       0.00
 82.0000   1.34E-07    -2.4530     1.5051  -3.58E-09   781.2511   9.95E+10
 -0.08500   1.53E+07       0.00
 84.0000   4.06E-08     9.2300     0.1673  -2.76E-09   781.2540   9.95E+10
 -0.02648   1.57E+07       0.00
 86.0000   9.99E-10     5.6350    -0.1586  -9.69E-10   781.2524   9.95E+10
 -6.68E-04   1.61E+07       0.00
 88.0000  -5.96E-09     1.6403    -0.1176  -9.22E-11   781.2507   9.95E+10
 0.00409   1.65E+07       0.00
 90.0000  -3.43E-09   -0.00557   -0.03968   1.05E-10   781.2500   9.95E+10
 0.00240   1.68E+07       0.00
 92.0000  -9.25E-10    -0.2664   -0.00285   7.21E-11   781.2501   9.95E+10
 6.64E-04   1.72E+07       0.00
 94.0000   3.44E-11    -0.1440    0.00482   2.26E-11   781.2501   9.95E+10
 -2.52E-05   1.76E+07       0.00
 96.0000   1.60E-10   -0.03575    0.00307       0.00   781.2500   9.95E+10
 -1.20E-04   1.80E+07       0.00
 98.0000   7.94E-11    0.00328   8.94E-04  -2.98E-12   781.2500   9.95E+10
 -6.09E-05   1.84E+07       0.00
100.0000   1.74E-11    0.00722  -6.59E-07  -1.71E-12   781.2500   9.95E+10
-1.36E-05   1.88E+07       0.00
102.0000  -2.78E-12    0.00328  -1.38E-04       0.00   781.2500   9.95E+10
2.23E-06   1.92E+07       0.00
104.0000  -3.99E-12   6.18E-04  -7.19E-05       0.00   781.2500   9.95E+10
3.26E-06   1.96E+07       0.00
106.0000  -1.63E-12  -1.70E-04  -1.65E-05       0.00   781.2500   9.95E+10
1.35E-06   2.00E+07       0.00
108.0000       0.00  -1.78E-04   2.21E-06       0.00   781.2500   9.95E+10
2.08E-07   2.04E+07       0.00
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"


```
110.0000       0.00  -6.49E-05   3.56E-06       0.00   781.2500   9.95E+10
-9.51E-08   2.08E+07       0.00
112.0000       0.00  -6.91E-06   1.47E-06       0.00   781.2500   9.95E+10
-7.86E-08   2.12E+07       0.00
114.0000       0.00   5.85E-06   2.24E-07       0.00   781.2500   9.95E+10
-2.55E-08   2.15E+07       0.00
116.0000       0.00   3.89E-06  -1.01E-07       0.00   781.2500   9.95E+10
-1.60E-09   2.58E+07       0.00
118.0000       0.00   1.01E-06  -8.20E-08       0.00   781.2500   9.95E+10
3.19E-09   2.63E+07       0.00
120.0000       0.00  -4.27E-08  -2.40E-08       0.00   781.2500   9.95E+10
1.65E-09   2.67E+07       0.00
122.0000       0.00  -1.46E-07  -3.20E-10       0.00   781.2500   9.95E+10
3.29E-10   2.72E+07       0.00
124.0000       0.00  -5.88E-08   2.88E-09       0.00   781.2500   9.95E+10
-6.25E-11   2.76E+07       0.00
126.0000       0.00  -7.68E-09   1.30E-09       0.00   781.2500   9.95E+10
-6.87E-11   2.81E+07       0.00
128.0000       0.00   3.85E-09   2.13E-10       0.00   781.2500   9.95E+10
-2.22E-11   2.86E+07       0.00
130.0000       0.00   2.58E-09  -6.72E-11       0.00   781.2500   9.95E+10
-1.16E-12   2.90E+07       0.00
132.0000       0.00   6.37E-10  -5.46E-11       0.00   781.2500   9.95E+10
2.21E-12   2.95E+07       0.00
134.0000       0.00  -3.77E-11  -1.52E-11       0.00   781.2500   9.95E+10
1.08E-12   3.00E+07       0.00
136.0000       0.00  -9.08E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.04E+07       0.00
138.0000       0.00  -3.33E-11   1.83E-12       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
140.0000       0.00  -3.24E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
142.0000       0.00   2.50E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
144.0000       0.00   1.38E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.73E+07       0.00
168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.78E+07       0.00
170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.82E+07       0.00
172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
```

```
  0.00   3.87E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.26E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 3:

```
Pile-head deflection             =     2.01490152 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -5149965. inch-lbs
Maximum shear force              =         21872. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             18
Number of zero deflection points =             21
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 4
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                              =     3.000000 inches
Rotation of pile head                                  =    0.000E+00 radians
Axial load on pile head                                =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

```
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     3.0201  -6959815.     28159.       0.00      3802.   9.95E+10
      0.00       0.00       0.00
    2.0000     3.0000  -6275820.     28122.   -0.00160      3505.   9.95E+10
    0.00       0.00       0.00
    4.0000     2.9435  -5575482.     28122.   -0.00302      3201.   9.95E+10
    0.00       0.00       0.00
    6.0000     2.8548  -4860624.     28118.   -0.00428      2891.   9.95E+10
    -0.3868     3.2520       0.00
    8.0000     2.7380  -4133331.     28104.   -0.00537      2575.   9.95E+10
    -0.7630     6.6878       0.00
   10.0000     2.5972  -3395714.     28081.   -0.00627      2255.   9.95E+10
   -1.1245    10.3911       0.00
   12.0000     2.4368  -2649902.     28050.   -0.00700      1931.   9.95E+10
   -1.4678    14.4563       0.00
   14.0000     2.2610  -1898034.     28011.   -0.00755      1605.   9.95E+10
   -1.7895    18.9951       0.00
   16.0000     2.0743  -1142254.     26920.   -0.00792      1277.   9.95E+10
   -89.1068      1031.       0.00
   18.0000     1.8809   -434825.     24665.   -0.00811   969.9761   9.95E+10
   -98.7871      1260.       0.00
   20.0000     1.6851    216835.     22192.   -0.00814   875.3625   9.95E+10
   -107.3201      1529.       0.00
   22.0000     1.4904    806114.     19529.   -0.00801      1131.   9.95E+10
   -114.6223      1846.       0.00
   24.0000     1.3005   1327271.     16706.   -0.00775      1357.   9.95E+10
   -120.6185      2226.       0.00
   26.0000     1.1182   1775496.     13756.   -0.00738      1552.   9.95E+10
   -125.2418      2688.       0.00
   28.0000     0.9462   2146958.     10712.   -0.00691      1713.   9.95E+10
   -128.4334      3258.       0.00
   30.0000     0.7867   2438851.      7609.   -0.00635      1840.   9.95E+10
   -130.1432      3970.       0.00
   32.0000     0.6412   2649430.      4483.   -0.00574      1931.   9.95E+10
   -130.3298      4878.       0.00
   34.0000     0.5111   2778040.      1371.   -0.00509      1987.   9.95E+10
   -128.9620      6056.       0.00
   36.0000     0.3971   2825133.     -1688.   -0.00441      2007.   9.95E+10
   -126.0190      7617.       0.00
   38.0000     0.2994   2792282.     -4658.   -0.00373      1993.   9.95E+10
   -121.4925      9740.       0.00
   40.0000     0.2178   2682180.     -7501.   -0.00307      1945.   9.95E+10
   -115.3873     12713.       0.00
   42.0000     0.1518   2498630.    -10178.   -0.00245      1866.   9.95E+10
   -107.7228     17030.       0.00
   44.0000     0.1003   2246525.    -12653.   -0.00188      1756.   9.95E+10
   -98.5284     23587.       0.00
   46.0000    0.06170   1931817.    -13872.   -0.00137      1620.   9.95E+10
   -3.0439      1184.       0.00
   48.0000    0.03433   1610325.    -13940.  -9.46E-04      1480.   9.95E+10
   -2.6361      1843.       0.00
   50.0000    0.01627   1283121.    -13998.  -5.98E-04      1338.   9.95E+10
   -2.1588      3184.       0.00
   52.0000    0.00564    951332.    -14043.  -3.28E-04      1194.   9.95E+10
   -1.5892      6762.       0.00
   54.0000   5.16E-04    616151.    -14071.  -1.39E-04      1049.   9.95E+10
   -0.7492     34835.       0.00
   56.0000   -0.00104    278933.    -11425.  -3.13E-05   902.3147   9.95E+10
   221.2510   5091840.       0.00
   58.0000  -9.88E-04     68430.     -6159.   1.05E-05   810.9504   9.95E+10
   217.6071   5287680.       0.00
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"


```
   60.0000  -5.37E-04    -16910.     -2076.   1.68E-05   788.5896   9.95E+10
   122.5838   5483520.       0.00
   62.0000  -1.83E-04    -31598.   -85.1010   1.09E-05   794.9644   9.95E+10
   43.3552   5679360.       0.00
   64.0000  -1.28E-05    -21231.   472.6552   4.54E-06   790.4648   9.95E+10
   3.1245   5875200.       0.00
   66.0000   3.48E-05     -9009.   404.4501   8.97E-07   785.1600   9.95E+10
   -8.8083   6071040.       0.00
   68.0000   3.03E-05     -1837.   203.8982  -4.11E-07   782.0472   9.95E+10
   -7.9044   6266880.       0.00
   70.0000   1.51E-05   787.2740    60.2748  -5.38E-07   781.5917   9.95E+10
   -4.0642   6462720.       0.00
   72.0000   4.47E-06      1068.    -3.3793  -3.14E-07   781.7136   9.95E+10
   -1.2403   6658560.       0.00
   74.0000   2.97E-08   631.8445   -18.3648  -1.09E-07   781.5242   9.95E+10
   -0.00848   6854400.       0.00
   76.0000  -7.55E-07   188.9983   -13.1463  -9.89E-09   781.3320   9.95E+10
   0.4434   1.41E+07       0.00
   78.0000  -4.45E-07     1.0350    -4.5999   1.30E-08   781.2504   9.95E+10
   0.2688   1.45E+07       0.00
   80.0000  -1.30E-07   -32.0775    -0.4076   9.27E-09   781.2639   9.95E+10
   0.08051   1.49E+07       0.00
   82.0000  -6.32E-11   -18.7309     0.5590   3.15E-09   781.2581   9.95E+10
   4.02E-05   1.53E+07       0.00
   84.0000   2.13E-08    -5.3124     0.3926   2.50E-10   781.2523   9.95E+10
   -0.01391   1.57E+07       0.00
   86.0000   1.19E-08     0.1097     0.1300  -3.77E-10   781.2500   9.95E+10
   -0.00798   1.61E+07       0.00
   88.0000   3.18E-09     0.9350    0.00804  -2.52E-10   781.2504   9.95E+10
   -0.00218   1.65E+07       0.00
   90.0000  -1.47E-10     0.5009   -0.01691  -7.84E-11   781.2502   9.95E+10
   1.03E-04   1.68E+07       0.00
   92.0000  -5.80E-10     0.1250   -0.01068  -2.95E-12   781.2501   9.95E+10
   4.16E-04   1.72E+07       0.00
   94.0000  -2.89E-10   -0.01154   -0.00314   1.07E-11   781.2500   9.95E+10
   2.12E-04   1.76E+07       0.00
   96.0000  -6.49E-11   -0.02583  -6.45E-06   6.22E-12   781.2500   9.95E+10
   4.87E-05   1.80E+07       0.00
   98.0000   9.63E-12   -0.01199   4.89E-04   1.66E-12   781.2500   9.95E+10
   -7.39E-06   1.84E+07       0.00
  100.0000   1.48E-11   -0.00237   2.62E-04       0.00   781.2500   9.95E+10
  -1.16E-05   1.88E+07       0.00
  102.0000   6.23E-12   5.79E-04   6.29E-05       0.00   781.2500   9.95E+10
  -4.98E-06   1.92E+07       0.00
  104.0000   1.02E-12   6.56E-04  -6.89E-06       0.00   781.2500   9.95E+10
  -8.34E-07   1.96E+07       0.00
  106.0000       0.00   2.51E-04  -1.30E-05       0.00   781.2500   9.95E+10
  3.23E-07   2.00E+07       0.00
  108.0000       0.00   3.16E-05  -5.66E-06       0.00   781.2500   9.95E+10
  2.91E-07   2.04E+07       0.00
  110.0000       0.00  -2.07E-05  -9.68E-07       0.00   781.2500   9.95E+10
  1.00E-07   2.08E+07       0.00
  112.0000       0.00  -1.51E-05   3.39E-07       0.00   781.2500   9.95E+10
  8.70E-09   2.49E+07       0.00
  114.0000       0.00  -4.44E-06   3.16E-07       0.00   781.2500   9.95E+10
  -1.07E-08   2.15E+07       0.00
  116.0000       0.00   6.91E-08   1.05E-07       0.00   781.2500   9.95E+10
  -6.91E-09   2.58E+07       0.00
  118.0000       0.00   6.01E-07   3.92E-09       0.00   781.2500   9.95E+10
  -1.51E-09   2.63E+07       0.00
  120.0000       0.00   2.60E-07  -1.17E-08       0.00   781.2500   9.95E+10
  2.10E-10   2.67E+07       0.00
  122.0000       0.00   3.99E-08  -5.72E-09       0.00   781.2500   9.95E+10
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"


```
2.87E-10   2.72E+07       0.00
124.0000       0.00  -1.48E-08  -1.07E-09       0.00   781.2500   9.95E+10
1.01E-10   2.76E+07       0.00
126.0000       0.00  -1.14E-08   2.44E-10       0.00   781.2500   9.95E+10
8.35E-12   2.81E+07       0.00
128.0000       0.00  -3.11E-09   2.38E-10       0.00   781.2500   9.95E+10
-8.88E-12   2.86E+07       0.00
130.0000       0.00   4.00E-11   7.30E-11       0.00   781.2500   9.95E+10
-4.87E-12   2.90E+07       0.00
132.0000       0.00   3.90E-10   2.46E-12       0.00   781.2500   9.95E+10
-1.01E-12   2.95E+07       0.00
134.0000       0.00   1.60E-10  -7.70E-12       0.00   781.2500   9.95E+10
0.00   3.00E+07       0.00
136.0000       0.00   2.11E-11  -3.54E-12       0.00   781.2500   9.95E+10
0.00   3.04E+07       0.00
138.0000       0.00  -9.91E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
140.0000       0.00  -6.53E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
142.0000       0.00  -1.53E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
144.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.73E+07       0.00
168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.78E+07       0.00
170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.82E+07       0.00
172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.87E+07       0.00
174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.92E+07       0.00
176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.96E+07       0.00
178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.01E+07       0.00
180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.06E+07       0.00
182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.10E+07       0.00
184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.15E+07       0.00
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"


```
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.26E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 4:

```
Pile-head deflection             =     3.02013835 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -6959815. inch-lbs
Maximum shear force              =         28159. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             16
Number of zero deflection points =             21
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 5
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     4.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     4.0250  -8623942.     33640.       0.00      4524.   9.95E+10
      0.00       0.00       0.00
    2.0000     4.0000  -7806424.     33595.   -0.00198      4169.   9.95E+10
    0.00       0.00       0.00
    4.0000     3.9299  -6968577.     33595.   -0.00376      3806.   9.95E+10
    0.00       0.00       0.00
    6.0000     3.8194  -6112582.     33590.   -0.00534      3434.   9.95E+10
    -0.4262     2.6784       0.00
    8.0000     3.6736  -5240914.     33575.   -0.00671      3056.   9.95E+10
    -0.8415     5.4977       0.00
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"


```
10.0000     3.4974  -4356083.     33550.   -0.00787      2672.   9.95E+10
-1.2418     8.5211       0.00
12.0000     3.2961  -3460623.     33516.   -0.00881      2283.   9.95E+10
-1.6233    11.8197       0.00
14.0000     3.0747  -2557086.     33472.   -0.00953      1891.   9.95E+10
-1.9826    15.4756       0.00
16.0000     2.8385  -1648032.     32261.   -0.01004      1497.   9.95E+10
-98.9273   836.4577       0.00
18.0000     2.5927   -791669.     29755.   -0.01033      1125.   9.95E+10
-109.9416      1018.       0.00
20.0000     2.3424      3430.     26998.   -0.01043   782.7387   9.95E+10
-119.7743      1227.       0.00
22.0000     2.0921    729530.     24021.   -0.01034      1098.   9.95E+10
-128.3392      1472.       0.00
24.0000     1.8461   1379807.     20854.   -0.01009      1380.   9.95E+10
-135.5580      1762.       0.00
26.0000     1.6080   1948409.     17531.   -0.00969      1627.   9.95E+10
-141.3614      2110.       0.00
28.0000     1.3812   2430513.     14087.   -0.00916      1836.   9.95E+10
-145.6884      2532.       0.00
30.0000     1.1684   2822371.     10557.   -0.00852      2006.   9.95E+10
-148.4869      3050.       0.00
32.0000     0.9720   3121350.      6978.   -0.00781      2136.   9.95E+10
-149.7143      3697.       0.00
34.0000     0.7937   3325966.      3390.   -0.00703      2225.   9.95E+10
-149.3378      4516.       0.00
36.0000     0.6346   3435901.  -170.5107   -0.00621      2273.   9.95E+10
-147.3356      5572.       0.00
38.0000     0.4953   3452024.     -3663.   -0.00538      2280.   9.95E+10
-143.6979      6962.       0.00
40.0000     0.3761   3376387.     -7048.   -0.00456      2247.   9.95E+10
-138.4272      8833.       0.00
42.0000     0.2764   3212223.    -10288.   -0.00377      2175.   9.95E+10
-131.5377     11422.       0.00
44.0000     0.1953   2963929.    -13343.   -0.00302      2068.   9.95E+10
-123.0496     15122.       0.00
46.0000     0.1313   2637039.    -14867.   -0.00235      1926.   9.95E+10
-3.9154   715.5281       0.00
48.0000    0.08263   2301027.    -14956.   -0.00175      1780.   9.95E+10
-3.5328      1026.       0.00
50.0000    0.04725   1956987.    -15035.   -0.00124      1631.   9.95E+10
-3.0797      1564.       0.00
52.0000    0.02319   1606077.    -15103.  -8.09E-04      1478.   9.95E+10
-2.5457      2634.       0.00
54.0000    0.00843   1249519.    -15156.  -4.64E-04      1324.   9.95E+10
-1.8998      5409.       0.00
56.0000   8.97E-04    888612.    -17463.  -2.07E-04      1167.   9.95E+10
-190.3710   5091840.       0.00
58.0000   -0.00149    415738.    -16203.  -4.94E-05   961.6917   9.95E+10
295.3991   4751893.       0.00
60.0000   -0.00148    111930.     -9133.   1.42E-05   829.8309   9.95E+10
293.7508   4778679.       0.00
62.0000  -8.11E-04    -22968.     -3306.   2.49E-05   791.2188   9.95E+10
191.8962   5679360.       0.00
64.0000  -2.79E-04    -47274.  -181.8819   1.64E-05   801.7684   9.95E+10
68.4097   5875200.       0.00
66.0000  -2.16E-05    -32054.   704.4820   6.88E-06   795.1622   9.95E+10
5.4540   6071040.       0.00
68.0000   5.08E-05    -13608.   610.6425   1.38E-06   787.1562   9.95E+10
-13.2739   6266880.       0.00
70.0000   4.45E-05     -2772.   307.6220  -5.99E-07   782.4533   9.95E+10
-11.9778   6462720.       0.00
72.0000   2.21E-05      1171.    90.3707  -7.92E-07   781.7582   9.95E+10
```

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 -6.1265   6658560.       0.00
 74.0000   6.46E-06      1582.    -5.2874  -4.60E-07   781.9368   9.95E+10
 -1.8450   6854400.       0.00
 76.0000  -4.63E-09   927.0708   -27.3947  -1.58E-07   781.6524   9.95E+10
 0.00272   1.41E+07       0.00
 78.0000  -1.10E-06   270.8774   -19.3598  -1.32E-08   781.3676   9.95E+10
 0.6668   1.45E+07       0.00
 80.0000  -6.36E-07    -1.9168    -6.6210   1.93E-08   781.2508   9.95E+10
 0.3947   1.49E+07       0.00
 82.0000  -1.80E-07   -47.3476    -0.5118   1.33E-08   781.2706   9.95E+10
 0.1144   1.53E+07       0.00
 84.0000   3.06E-09   -26.7721     0.8367   4.39E-09   781.2616   9.95E+10
 -0.00200   1.57E+07       0.00
 86.0000   3.09E-08    -7.2787     0.5646   2.82E-10   781.2532   9.95E+10
 -0.02068   1.61E+07       0.00
 88.0000   1.66E-08     0.3231     0.1798  -5.56E-10   781.2501   9.95E+10
 -0.01139   1.65E+07       0.00
 90.0000   4.21E-09     1.3618    0.00761  -3.53E-10   781.2506   9.95E+10
 -0.00295   1.68E+07       0.00
 92.0000  -3.24E-10     0.6961   -0.02504  -1.05E-10   781.2503   9.95E+10
 2.32E-04   1.72E+07       0.00
 94.0000  -8.27E-10     0.1624   -0.01496  -1.40E-12   781.2501   9.95E+10
 6.08E-04   1.76E+07       0.00
 96.0000  -3.91E-10   -0.02177   -0.00414   1.56E-11   781.2500   9.95E+10
 2.94E-04   1.80E+07       0.00
 98.0000  -8.07E-11   -0.03681   1.22E-04   8.49E-12   781.2500   9.95E+10
 6.19E-05   1.84E+07       0.00
100.0000   1.66E-11   -0.01611   7.09E-04   2.11E-12   781.2500   9.95E+10
-1.30E-05   1.88E+07       0.00
102.0000   2.06E-11   -0.00285   3.55E-04       0.00   781.2500   9.95E+10
-1.65E-05   1.92E+07       0.00
104.0000   8.13E-12   9.44E-04   7.80E-05       0.00   781.2500   9.95E+10
-6.64E-06   1.96E+07       0.00
106.0000   1.14E-12   9.08E-04  -1.30E-05       0.00   781.2500   9.95E+10
-9.49E-07   2.00E+07       0.00
108.0000       0.00   3.24E-04  -1.83E-05       0.00   781.2500   9.95E+10
5.08E-07   2.04E+07       0.00
110.0000       0.00   3.14E-05  -7.39E-06       0.00   781.2500   9.95E+10
4.00E-07   2.08E+07       0.00
112.0000       0.00  -3.10E-05  -1.07E-06       0.00   781.2500   9.95E+10
1.27E-07   2.12E+07       0.00
114.0000       0.00  -2.00E-05   5.34E-07       0.00   781.2500   9.95E+10
6.18E-09   2.53E+07       0.00
116.0000       0.00  -5.41E-06   4.24E-07       0.00   781.2500   9.95E+10
-1.54E-08   2.19E+07       0.00
118.0000       0.00   3.23E-07   1.30E-07       0.00   781.2500   9.95E+10
-9.07E-09   2.63E+07       0.00
120.0000       0.00   8.31E-07   2.64E-11       0.00   781.2500   9.95E+10
-1.75E-09   2.67E+07       0.00
122.0000       0.00   3.28E-07  -1.65E-08       0.00   781.2500   9.95E+10
3.76E-10   2.72E+07       0.00
124.0000       0.00   4.09E-08  -7.30E-09       0.00   781.2500   9.95E+10
3.88E-10   2.76E+07       0.00
126.0000       0.00  -2.26E-08  -1.16E-09       0.00   781.2500   9.95E+10
1.24E-10   2.81E+07       0.00
128.0000       0.00  -1.48E-08   3.96E-10       0.00   781.2500   9.95E+10
5.75E-12   2.86E+07       0.00
130.0000       0.00  -3.61E-09   3.13E-10       0.00   781.2500   9.95E+10
-1.27E-11   2.90E+07       0.00
132.0000       0.00   2.36E-10   8.60E-11       0.00   781.2500   9.95E+10
-6.16E-12   2.95E+07       0.00
134.0000       0.00   5.28E-10       0.00       0.00   781.2500   9.95E+10
-1.09E-12   3.00E+07       0.00
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"


```
136.0000       0.00   1.93E-10  -1.06E-11       0.00   781.2500   9.95E+10
0.00   3.04E+07       0.00
138.0000       0.00   1.87E-11  -4.33E-12       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
140.0000       0.00  -1.46E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
142.0000       0.00  -8.14E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
144.0000       0.00  -1.64E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.73E+07       0.00
168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.78E+07       0.00
170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.82E+07       0.00
172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.87E+07       0.00
174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.92E+07       0.00
176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.96E+07       0.00
178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.01E+07       0.00
180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.06E+07       0.00
182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.10E+07       0.00
184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.15E+07       0.00
186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.19E+07       0.00
188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.24E+07       0.00
190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.29E+07       0.00
192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.33E+07       0.00
194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.38E+07       0.00
196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.42E+07       0.00
198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"


```
  0.00   4.47E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.26E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 5:

```
Pile-head deflection             =     4.02495354 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -8623942. inch-lbs
Maximum shear force              =         33640. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             15
Number of zero deflection points =             21
```

```
--------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 6
--------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     5.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     5.0295  -1.02E+07     38610.       0.00      5205.   9.95E+10
      0.00       0.00       0.00
    2.0000     5.0000  -9253780.     38559.   -0.00234      4798.   9.95E+10
    0.00       0.00       0.00
    4.0000     4.9170  -8290988.     38559.   -0.00446      4380.   9.95E+10
    0.00       0.00       0.00
    6.0000     4.7859  -7306605.     38554.   -0.00634      3953.   9.95E+10
    -0.4595     2.3044       0.00
    8.0000     4.6126  -6303460.     38537.   -0.00798      3517.   9.95E+10
    -0.9078     4.7236       0.00
   10.0000     4.4028  -5284421.     38510.   -0.00938      3075.   9.95E+10
   -1.3408     7.3087       0.00
   12.0000     4.1625  -4252394.     38473.   -0.01053      2627.   9.95E+10
   -1.7546    10.1166       0.00
   14.0000     3.8975  -3210303.     38426.   -0.01143      2175.   9.95E+10
   -2.1457    13.2126       0.00
   16.0000     3.6139  -2161088.     37114.   -0.01208      1719.   9.95E+10
   -107.2215   712.0531       0.00
   18.0000     3.3179  -1168005.     34395.   -0.01248      1288.   9.95E+10
   -119.3611   863.4030       0.00
   20.0000     3.0151   -240632.     31399.   -0.01265   885.6912   9.95E+10
   -130.2889      1037.       0.00
   22.0000     2.7108    612321.     28157.   -0.01260      1047.   9.95E+10
```

```
-139.9152      1239.       0.00
24.0000     2.4102   1383088.     24700.   -0.01236      1382.   9.95E+10
-148.1585      1475.       0.00
26.0000     2.1175   2064914.     21063.   -0.01195      1677.   9.95E+10
-154.9459      1756.       0.00
28.0000     1.8368   2652114.     17281.   -0.01138      1932.   9.95E+10
-160.2129      2093.       0.00
30.0000     1.5714   3140125.     13391.   -0.01068      2144.   9.95E+10
-163.9032      2503.       0.00
32.0000     1.3242   3525550.      9433.   -0.00987      2311.   9.95E+10
-165.9697      3008.       0.00
34.0000     1.0974   3806196.      5445.   -0.00899      2433.   9.95E+10
-166.3743      3638.       0.00
36.0000     0.8927   3981098.      1467.   -0.00805      2509.   9.95E+10
-165.0882      4438.       0.00
38.0000     0.7109   4050542.     -2459.   -0.00708      2539.   9.95E+10
-162.0925      5472.       0.00
40.0000     0.5527   4016072.     -6293.   -0.00611      2524.   9.95E+10
-157.3770      6834.       0.00
42.0000     0.4176   3880494.     -9992.   -0.00516      2465.   9.95E+10
-150.9380      8674.       0.00
44.0000     0.3050   3647871.    -13517.   -0.00425      2365.   9.95E+10
-142.7700     11233.       0.00
46.0000     0.2135   3323513.    -15285.   -0.00341      2224.   9.95E+10
-4.6043   517.4597       0.00
48.0000     0.1413   2987847.    -15391.   -0.00265      2078.   9.95E+10
-4.2247   717.5564       0.00
50.0000    0.08635   2641967.    -15487.   -0.00197      1928.   9.95E+10
-3.7654      1047.       0.00
52.0000    0.04668   2287039.    -15571.   -0.00138      1774.   9.95E+10
-3.2144      1653.       0.00
54.0000    0.02025   1924302.    -15640.  -8.69E-04      1616.   9.95E+10
-2.5448      3016.       0.00
56.0000    0.00496   1555089.    -22134.  -4.50E-04      1456.   9.95E+10
-538.6294   2607730.       0.00
58.0000   -0.00134    871576.    -25244.  -1.57E-04      1160.   9.95E+10
279.4480   5013449.       0.00
60.0000   -0.00259    346755.    -17223.  -1.03E-05   931.7513   9.95E+10
388.9944   3606131.       0.00
62.0000   -0.00183     45092.     -8627.   3.69E-05   800.8211   9.95E+10
327.3760   4285637.       0.00
64.0000  -8.17E-04    -68120.     -2299.   3.41E-05   810.8161   9.95E+10
199.9630   5875200.       0.00
66.0000  -1.95E-04    -65976.   691.5937   1.80E-05   809.8856   9.95E+10
49.2161   6071040.       0.00
68.0000   4.59E-05    -35312.      1138.   5.76E-06   796.5764   9.95E+10
-11.9889   6266880.       0.00
70.0000   8.20E-05    -11461.   729.3699   1.23E-07   786.2246   9.95E+10
-22.0903   6462720.       0.00
72.0000   5.18E-05  -304.9795   291.7334  -1.30E-06   781.3824   9.95E+10
-14.3794   6658560.       0.00
74.0000   1.99E-05      2570.    51.1245  -1.02E-06   782.3653   9.95E+10
-5.6714   6854400.       0.00
76.0000   2.76E-06      2171.   -36.3762  -4.51E-07   782.1923   9.95E+10
-1.6204   1.41E+07       0.00
78.0000  -1.78E-06   833.4288   -42.9390  -8.85E-08   781.6117   9.95E+10
1.0735   1.45E+07       0.00
80.0000  -1.49E-06   111.9183   -18.9669   2.55E-08   781.2986   9.95E+10
0.9242   1.49E+07       0.00
82.0000  -5.55E-07   -77.5307    -3.6356   2.96E-08   781.2837   9.95E+10
0.3534   1.53E+07       0.00
84.0000  -6.88E-08   -63.2311     1.1438   1.26E-08   781.2774   9.95E+10
0.04491   1.57E+07       0.00
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"


```
 86.0000   5.17E-08   -22.9001     1.2676   2.26E-09   781.2599   9.95E+10
 -0.03460   1.61E+07       0.00
 88.0000   3.97E-08    -2.4365     0.5261  -7.95E-10   781.2511   9.95E+10
 -0.02720   1.65E+07       0.00
 90.0000   1.35E-08     2.3690    0.08566  -8.03E-10   781.2510   9.95E+10
 -0.00951   1.68E+07       0.00
 92.0000   1.13E-09     1.6924   -0.03816  -3.13E-10   781.2507   9.95E+10
 -8.11E-04   1.72E+07       0.00
 94.0000  -1.50E-09     0.5444   -0.03470  -4.37E-11   781.2502   9.95E+10
 0.00110   1.76E+07       0.00
 96.0000  -9.70E-10    0.02760   -0.01278   2.52E-11   781.2500   9.95E+10
 7.28E-04   1.80E+07       0.00
 98.0000  -2.85E-10   -0.06975   -0.00142   2.01E-11   781.2500   9.95E+10
 2.18E-04   1.84E+07       0.00
100.0000  -3.12E-12   -0.04109    0.00123   6.78E-12   781.2500   9.95E+10
2.44E-06   1.88E+07       0.00
102.0000   4.07E-11   -0.01092   8.67E-04       0.00   781.2500   9.95E+10
-3.26E-05   1.92E+07       0.00
104.0000   2.14E-11   5.05E-04   2.66E-04       0.00   781.2500   9.95E+10
-1.74E-05   1.96E+07       0.00
106.0000   4.95E-12    0.00188   7.71E-06       0.00   781.2500   9.95E+10
-4.12E-06   2.00E+07       0.00
108.0000       0.00   8.85E-04  -3.57E-05       0.00   781.2500   9.95E+10
5.00E-07   2.04E+07       0.00
110.0000  -1.00E-12   1.73E-04  -1.93E-05       0.00   781.2500   9.95E+10
8.66E-07   2.08E+07       0.00
112.0000       0.00  -4.11E-05  -4.53E-06       0.00   781.2500   9.95E+10
3.64E-07   2.12E+07       0.00
114.0000       0.00  -4.51E-05   5.18E-07       0.00   781.2500   9.95E+10
5.65E-08   2.15E+07       0.00
116.0000       0.00  -1.64E-05   9.04E-07       0.00   781.2500   9.95E+10
-2.43E-08   2.19E+07       0.00
118.0000       0.00  -1.70E-06   3.74E-07       0.00   781.2500   9.95E+10
-1.98E-08   2.23E+07       0.00
120.0000       0.00   1.57E-06   5.43E-08       0.00   781.2500   9.95E+10
-6.83E-09   2.67E+07       0.00
122.0000       0.00   9.13E-07  -2.86E-08       0.00   781.2500   9.95E+10
-7.50E-11   2.72E+07       0.00
124.0000       0.00   2.06E-07  -1.95E-08       0.00   781.2500   9.95E+10
8.32E-10   2.76E+07       0.00
126.0000       0.00  -2.28E-08  -5.01E-09       0.00   781.2500   9.95E+10
3.75E-10   2.81E+07       0.00
128.0000       0.00  -3.50E-08   2.23E-10       0.00   781.2500   9.95E+10
6.04E-11   2.86E+07       0.00
130.0000       0.00  -1.22E-08   7.08E-10       0.00   781.2500   9.95E+10
-2.00E-11   2.90E+07       0.00
132.0000       0.00  -1.02E-09   2.76E-10       0.00   781.2500   9.95E+10
-1.59E-11   2.95E+07       0.00
134.0000       0.00   1.02E-09   3.26E-11       0.00   781.2500   9.95E+10
-4.37E-12   3.00E+07       0.00
136.0000       0.00   5.49E-10  -1.91E-11       0.00   781.2500   9.95E+10
0.00   3.04E+07       0.00
138.0000       0.00   1.09E-10  -1.18E-11       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
140.0000       0.00  -1.87E-11  -2.68E-12       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
142.0000       0.00  -2.01E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
144.0000       0.00  -6.04E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
```

```
  0.00   3.32E+07       0.00
  150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.36E+07       0.00
  152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.41E+07       0.00
  154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.46E+07       0.00
  156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.50E+07       0.00
  158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.55E+07       0.00
  160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.59E+07       0.00
  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.64E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.69E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.26E+07       0.00

* The above values of total stress are combined axial and bending stresses.


Output Summary for Load Case No. 6:

Pile-head deflection             =     5.02949211 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -10192473. inch-lbs
Maximum shear force              =         38610. lbs
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

Depth of maximum bending moment = 0.000000 feet below pile head
Depth of maximum shear force = 0.000000 feet below pile head
Number of iterations = 16
Number of zero deflection points = 21

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 7

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 6.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 450000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	6.0338	-1.17E+07	43221.	0.00	5856.	9.95E+10	0.00	0.00	0.00
2.0000	6.0000	-1.06E+07	43164.	-0.00269	5400.	9.95E+10	0.00	0.00	0.00
4.0000	5.9046	-9562750.	43164.	-0.00513	4932.	9.95E+10	0.00	0.00	0.00
6.0000	5.7538	-8458965.	43158.	-0.00730	4453.	9.95E+10	-0.4886	2.0382	0.00
8.0000	5.5541	-7333433.	43141.	-0.00921	3964.	9.95E+10	-0.9658	4.1734	0.00
10.0000	5.3120	-6189360.	43112.	-0.01084	3468.	9.95E+10	-1.4274	6.4490	0.00
12.0000	5.0340	-5029990.	43073.	-0.01219	2964.	9.95E+10	-1.8694	8.9124	0.00
14.0000	4.7269	-3858599.	43023.	-0.01326	2456.	9.95E+10	-2.2882	11.6179	0.00
16.0000	4.3975	-2678477.	41622.	-0.01405	1944.	9.95E+10	-114.4698	624.7324	0.00
18.0000	4.0526	-1557314.	38717.	-0.01456	1457.	9.95E+10	-127.5913	755.6081	0.00
20.0000	3.6987	-505589.	35512.	-0.01481	1001.	9.95E+10	-139.4735	905.0108	0.00
22.0000	3.3419	467117.	32038.	-0.01481	983.9917	9.95E+10	-150.0233	1077.	0.00
24.0000	2.9877	1352192.	28328.	-0.01459	1368.	9.95E+10	-159.1560	1278.	0.00
26.0000	2.6414	2142073.	24417.	-0.01417	1711.	9.95E+10	-166.7948	1516.	0.00
28.0000	2.3075	2830301.	20341.	-0.01357	2010.	9.95E+10	-172.8712	1798.	0.00
30.0000	1.9899	3411585.	16138.	-0.01282	2262.	9.95E+10	-177.3245	2139.	0.00
32.0000	1.6921	3881845.	11849.	-0.01194	2466.	9.95E+10	-180.1022	2554.	0.00
34.0000	1.4168	4238258.	7514.	-0.01096	2621.	9.95E+10	-181.1600	3069.	0.00

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"


```
36.0000     1.1660   4479285.      3175.   -0.00991      2725.   9.95E+10
-180.4613      3714.       0.00
38.0000     0.9411   4604702.     -1127.   -0.00881      2780.   9.95E+10
-177.9772      4539.       0.00
40.0000     0.7429   4615613.     -5347.   -0.00770      2785.   9.95E+10
-173.6844      5611.       0.00
42.0000     0.5714   4514462.     -9441.   -0.00660      2741.   9.95E+10
-167.5615      7038.       0.00
44.0000     0.4260   4305038.    -13367.   -0.00554      2650.   9.95E+10
-159.5798      8991.       0.00
46.0000     0.3055   3992486.    -15344.   -0.00454      2514.   9.95E+10
-5.1878   407.5778       0.00
48.0000     0.2081   3666548.    -15464.   -0.00362      2373.   9.95E+10
-4.8064   554.3264       0.00
50.0000     0.1319   3328294.    -15574.   -0.00277      2226.   9.95E+10
-4.3368   788.8907       0.00
52.0000    0.07503   2978874.    -15671.   -0.00201      2074.   9.95E+10
-3.7651      1204.       0.00
54.0000    0.03537   2619528.    -15753.   -0.00134      1918.   9.95E+10
-3.0642      2079.       0.00
56.0000    0.01087   2251596.    -25356.  -7.50E-04      1759.   9.95E+10
-797.1850   1760820.       0.00
58.0000  -6.08E-04   1418621.    -33314.  -3.07E-04      1397.   9.95E+10
134.0412   5287680.       0.00
60.0000   -0.00387    659160.    -25994.  -5.65E-05      1067.   9.95E+10
475.9271   2949340.       0.00
62.0000   -0.00332    172116.    -14993.   4.37E-05   855.9531   9.95E+10
440.8388   3184238.       0.00
64.0000   -0.00178    -61453.     -5835.   5.70E-05   807.9223   9.95E+10
322.3496   4354953.       0.00
66.0000  -5.86E-04   -109188.  -188.1766   3.64E-05   828.6408   9.95E+10
148.2065   6071040.       0.00
68.0000  -2.72E-05    -71273.      1676.   1.47E-05   812.1843   9.95E+10
7.1019   6266880.       0.00
70.0000   1.19E-04    -29081.      1376.   2.59E-06   793.8717   9.95E+10
-32.0539   6462720.       0.00
72.0000   9.70E-05     -5276.   668.5820  -1.56E-06   783.5398   9.95E+10
-26.9060   6658560.       0.00
74.0000   4.44E-05      3045.   193.5682  -1.82E-06   782.5716   9.95E+10
-12.6785   6854400.       0.00
76.0000   9.43E-06      4055.   -25.0389  -9.68E-07   783.0100   9.95E+10
-5.5387   1.41E+07       0.00
78.0000  -2.07E-06      1864.   -76.4929  -2.54E-07   782.0591   9.95E+10
1.2509   1.45E+07       0.00
80.0000  -2.78E-06   388.8151   -40.7706   1.72E-08   781.4188   9.95E+10
1.7260   1.49E+07       0.00
82.0000  -1.24E-06   -93.2978   -10.5541   5.29E-08   781.2905   9.95E+10
0.7921   1.53E+07       0.00
84.0000  -2.46E-07  -118.9239     0.8765   2.73E-08   781.3016   9.95E+10
0.1605   1.57E+07       0.00
86.0000   6.46E-08   -51.8126     2.2830   6.69E-09   781.2725   9.95E+10
-0.04326   1.61E+07       0.00
88.0000   7.53E-08    -9.4822     1.1449  -7.01E-10   781.2541   9.95E+10
-0.05159   1.65E+07       0.00
90.0000   3.10E-08     3.1579     0.2647  -1.46E-09   781.2514   9.95E+10
-0.02176   1.68E+07       0.00
92.0000   5.02E-09     3.2570   -0.03964  -6.90E-10   781.2514   9.95E+10
-0.00361   1.72E+07       0.00
94.0000  -2.11E-09     1.2700   -0.06432  -1.44E-10   781.2506   9.95E+10
0.00155   1.76E+07       0.00
96.0000  -1.90E-09     0.1729   -0.02863   2.98E-11   781.2501   9.95E+10
0.00142   1.80E+07       0.00
98.0000  -6.80E-10    -0.1048   -0.00529   3.80E-11   781.2500   9.95E+10
```

```
 5.21E-04   1.84E+07       0.00
100.0000  -7.06E-11   -0.08194    0.00163   1.55E-11   781.2500   9.95E+10
5.53E-05   1.88E+07       0.00
102.0000   6.46E-11   -0.02698    0.00167   2.38E-12   781.2500   9.95E+10
-5.16E-05   1.92E+07       0.00
104.0000   4.35E-11   -0.00169   6.27E-04  -1.08E-12   781.2500   9.95E+10
-3.55E-05   1.96E+07       0.00
106.0000   1.28E-11    0.00314   7.33E-05       0.00   781.2500   9.95E+10
-1.06E-05   2.00E+07       0.00
108.0000       0.00    0.00185  -5.57E-05       0.00   781.2500   9.95E+10
-1.31E-07   2.04E+07       0.00
110.0000  -1.75E-12   4.76E-04  -3.91E-05       0.00   781.2500   9.95E+10
1.51E-06   2.08E+07       0.00
112.0000       0.00  -2.80E-05  -1.16E-05       0.00   781.2500   9.95E+10
7.82E-07   2.12E+07       0.00
114.0000       0.00  -8.19E-05  -1.65E-07       0.00   781.2500   9.95E+10
1.72E-07   2.15E+07       0.00
116.0000       0.00  -3.64E-05   1.58E-06       0.00   781.2500   9.95E+10
-2.70E-08   2.19E+07       0.00
118.0000       0.00  -6.28E-06   7.99E-07       0.00   781.2500   9.95E+10
-3.79E-08   2.23E+07       0.00
120.0000       0.00   2.00E-06   1.69E-07       0.00   781.2500   9.95E+10
-1.46E-08   2.27E+07       0.00
122.0000       0.00   1.86E-06  -3.00E-08       0.00   781.2500   9.95E+10
-2.00E-09   2.72E+07       0.00
124.0000       0.00   5.71E-07  -3.85E-08       0.00   781.2500   9.95E+10
1.29E-09   2.76E+07       0.00
126.0000       0.00   1.93E-08  -1.32E-08       0.00   781.2500   9.95E+10
8.18E-10   2.81E+07       0.00
128.0000       0.00  -6.14E-08  -9.94E-10       0.00   781.2500   9.95E+10
1.97E-10   2.86E+07       0.00
130.0000       0.00  -2.87E-08   1.18E-09       0.00   781.2500   9.95E+10
-1.55E-11   2.90E+07       0.00
132.0000       0.00  -4.85E-09   6.26E-10       0.00   781.2500   9.95E+10
-3.06E-11   2.95E+07       0.00
134.0000       0.00   1.36E-09   1.25E-10       0.00   781.2500   9.95E+10
-1.12E-11   3.00E+07       0.00
136.0000       0.00   1.14E-09  -2.19E-11       0.00   781.2500   9.95E+10
-1.05E-12   3.04E+07       0.00
138.0000       0.00   3.15E-10  -2.38E-11       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
140.0000       0.00  -1.94E-12  -7.33E-12       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
142.0000       0.00  -3.69E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
144.0000       0.00  -1.48E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
146.0000       0.00  -1.79E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
```

```
  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.64E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.69E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.26E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 7:

```
Pile-head deflection             =     6.03383334 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -11692802. inch-lbs
Maximum shear force              =         43221. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             15
Number of zero deflection points =             21
```

--
Summary of Pile-head Responses for Conventional Analyses

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Definitions of Pile-head Loading Conditions:

File name is incorrect below, run designation is "W.Overbank Post Seismic (Half scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type 1	Load 1	Load Type 2	Pile-head Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	y, in	0.5000	S, rad	0.00	450000.	0.5051	0.00	8744.	-1761816.
2	y, in	1.0000	S, rad	0.00	450000.	1.0087	0.00	13891.	-3020850.
3	y, in	2.0000	S, rad	0.00	450000.	2.0149	0.00	21872.	-5149965.
4	y, in	3.0000	S, rad	0.00	450000.	3.0201	0.00	28159.	-6959815.
5	y, in	4.0000	S, rad	0.00	450000.	4.0250	0.00	33640.	-8623942.
6	y, in	5.0000	S, rad	0.00	450000.	5.0295	0.00	38610.	-1.02E+07
7	y, in	6.0000	S, rad	0.00	450000.	6.0338	0.00	43221.	-1.17E+07

Maximum pile-head deflection = 6.0338333397 inches
Maximum pile-head rotation = 0.0000000000 radians = 0.000000 deg.

The analysis ended normally.

File name is incorrect below, run designation is "W.Overbank Post Seismic (No scour) 24in"

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LPile for Windows, Version 2016-09.009

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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--
Files Used for Analysis

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Path to file locations:
\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis
\L-Pile\West Overbank\Post Seismic (No Scour)\

Name of input data file:
West Overbank Static 24in.lp9d

Name of output report file:
West Overbank Static 24in.lp9o

Name of plot output file:
West Overbank Static 24in.lp9p

Name of runtime message file:
West Overbank Static 24in.lp9r

--
Date and Time of Analysis

--

Date: October 3, 2017 Time: 11:48:06

--

Problem Title

Project Name: Harbor River Bridge
Job Number: 18461-007-01
Client: SCDOT
Engineer: HPC
Description: West Overbank - Post Seismic

Program Options and Settings

Computational Options:
- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:
- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed	=	500
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	100

Loading Type and Number of Cycles of Loading:
- Static loading specified

- Analysis uses p-y modification factors for p-y curves
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined	=	1
Total length of pile	=	200.000 ft
Depth of ground surface below top of pile	=	0.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	24.0000
2	200.000	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile

Cross-sectional shape	=	rectangular
Length of section	=	200.000000 ft
Width of top of section	=	24.000000 in
Width of bottom of section	=	24.000000 in
Top Section Depth	=	24.000000 in
Bottom Section Depth	=	24.000000 in
Top Area	=	576.000000 sq. in
Bottom Area	=	576.000000 sq. in
Moment of Inertia at Top	=	27648. in^4
Moment of Inertia at Bottom	=	27648. in^4
Elastic Modulus	=	3600000. psi

Ground Slope and Pile Batter Angles

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 5 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	0.0000 ft
Distance from top of pile to bottom of layer	=	15.000000 ft
Effective unit weight at top of layer	=	37.600000 pcf
Effective unit weight at bottom of layer	=	37.600000 pcf
Undrained cohesion at top of layer	=	0.0000 psf
Undrained cohesion at bottom of layer	=	34.000000 psf

```
   Epsilon-50 at top of layer                          =     0.020000
   Epsilon-50 at bottom of layer                       =     0.020000


Layer 2 is soft clay, p-y criteria by Matlock, 1970

   Distance from top of pile to top of layer           =    15.000000 ft
   Distance from top of pile to bottom of layer        =    45.000000 ft
   Effective unit weight at top of layer               =    32.600000 pcf
   Effective unit weight at bottom of layer            =    32.600000 pcf
   Undrained cohesion at top of layer                  =   147.000000 psf
   Undrained cohesion at bottom of layer               =   401.000000 psf
   Epsilon-50 at top of layer                          =     0.020000
   Epsilon-50 at bottom of layer                       =     0.020000


Layer 3 is soft clay, p-y criteria by Matlock, 1970

   Distance from top of pile to top of layer           =    45.000000 ft
   Distance from top of pile to bottom of layer        =    55.000000 ft
   Effective unit weight at top of layer               =    37.600000 pcf
   Effective unit weight at bottom of layer            =    37.600000 pcf
   Undrained cohesion at top of layer                  =   139.000000 psf
   Undrained cohesion at bottom of layer               =   173.000000 psf
   Epsilon-50 at top of layer                          =     0.020000
   Epsilon-50 at bottom of layer                       =     0.020000


Layer 4 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer           =    55.000000 ft
   Distance from top of pile to bottom of layer        =    75.000000 ft
   Effective unit weight at top of layer               =    57.600000 pcf
   Effective unit weight at bottom of layer            =    57.600000 pcf
   Undrained cohesion at top of layer                  =        3400. psf
   Undrained cohesion at bottom of layer               =        3400. psf
   Epsilon-50 at top of layer                          =     0.005000
   Epsilon-50 at bottom of layer                       =     0.005000
   Subgrade k at top of layer                          =   400.000000 pci
   Subgrade k at bottom of layer                       =   400.000000 pci


Layer 5 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer           =    75.000000 ft
   Distance from top of pile to bottom of layer        =   210.000000 ft
   Effective unit weight at top of layer               =    57.600000 pcf
   Effective unit weight at bottom of layer            =    57.600000 pcf
   Undrained cohesion at top of layer                  =        6000. psf
   Undrained cohesion at bottom of layer               =        6000. psf
   Epsilon-50 at top of layer                          =     0.005000
   Epsilon-50 at bottom of layer                       =     0.005000
   Subgrade k at top of layer                          =   800.000000 pci
   Subgrade k at bottom of layer                       =   800.000000 pci


 (Depth of the lowest soil layer extends 10.000 ft below the pile tip)


--------------------------------------------------------------------------------
--
                        Summary of Input Soil Properties
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (No scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

```
-------------------------------------------------------------------------------
--

Layer          Soil Type          Layer      Effective    Undrained       E50
Layer            Name             Depth       Unit Wt.    Cohesion        or
kpy
 Num.     (p-y Curve Type)         ft           pcf          psf          krm
 pci
-----   -------------------   ----------   ----------   ----------
----------   ----------
  1            Soft                 0.00      37.6000         0.00
  0.02000       --
               Clay              15.0000      37.6000      34.0000
               0.02000       --
  2            Soft              15.0000      32.6000     147.0000
  0.02000       --
               Clay              45.0000      32.6000     401.0000
               0.02000       --
  3            Soft              45.0000      37.6000     139.0000
  0.02000       --
               Clay              55.0000      37.6000     173.0000
               0.02000       --
  4         Stiff Clay           55.0000      57.6000        3400.
  0.00500     400.0000
         with Free Water        75.0000      57.6000        3400.
         0.00500     400.0000
  5         Stiff Clay           75.0000      57.6000        6000.
  0.00500     800.0000
         with Free Water       210.0000      57.6000        6000.
         0.00500     800.0000


-------------------------------------------------------------------------------
--
                    p-y Modification Factors for Group Action
-------------------------------------------------------------------------------
--

Distribution of p-y modifiers with depth defined using 8 points

Point      Depth X         p-mult         y-mult
 No.          ft
-----     ----------     ----------     ----------
  1            0.000         0.0850         1.0000
  2           15.000         0.0850         1.0000
  3           15.000         0.8500         1.0000
  4           45.000         0.8500         1.0000
  5           45.000         0.0850         1.0000
  6           55.000         0.0850         1.0000
  7           55.000         0.8500         1.0000
  8          210.000         0.8500         1.0000



-------------------------------------------------------------------------------
--
                                Static Loading Type
-------------------------------------------------------------------------------
--

Static loading criteria were used when computing p-y curves for all analyses.
```

```
--------------------------------------------------------------------------------
                 Pile-head Loading and Pile-head Fixity Conditions
--------------------------------------------------------------------------------

Number of loads specified = 7

Load    Load         Condition               Condition            Axial Thrust
Compute Top y
 No.    Type            1                       2                  Force, lbs
 vs. Pile Length
-----   ----   --------------------   ------------------------
----------------   ---------------
   1     5     y =     0.500000 in    S =       0.0000 in/in
   450000.          N.A.
   2     5     y =     1.000000 in    S =       0.0000 in/in
   450000.          N.A.
   3     5     y =     2.000000 in    S =       0.0000 in/in
   450000.          N.A.
   4     5     y =     3.000000 in    S =       0.0000 in/in
   450000.          N.A.
   5     5     y =     4.000000 in    S =       0.0000 in/in
   450000.          N.A.
   6     5     y =     5.000000 in    S =       0.0000 in/in
   450000.          N.A.
   7     5     y =     6.000000 in    S =       0.0000 in/in
   450000.          N.A.

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with
specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.


--------------------------------------------------------------------------------
     Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness
--------------------------------------------------------------------------------

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:
-------------------
Moment-curvature properties were derived from elastic section properties


--------------------------------------------------------------------------------
           Layering Correction Equivalent Depths of Soil & Rock Layers
--------------------------------------------------------------------------------
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (No scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.00	0.00	N.A.	No	0.00	4641.
2	15.0000	15.0000	Yes	No	4641.	147622.
3	45.0000	45.0000	Yes	No	152263.	29127.
4	55.0000	82.8106	No	No	181390.	131134.
5	75.0000	102.8106	Yes	No	312524.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 450000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				
0.00	0.5055	-1891981.	9784.	0.00	1602.	9.95E+10
0.00	0.00	0.00				
2.0000	0.5000	-1655067.	9766.	-4.28E-04	1500.	9.95E+10
-0.2159	10.3610	0.00				
4.0000	0.4849	-1413968.	9758.	-7.98E-04	1395.	9.95E+10
-0.4273	21.1486	0.00				
6.0000	0.4617	-1169432.	9746.	-0.00111	1289.	9.95E+10
-0.6306	32.7785	0.00				
8.0000	0.4317	-922215.	9728.	-0.00136	1182.	9.95E+10
-0.8222	45.7069	0.00				
10.0000	0.3964	-673069.	9706.	-0.00155	1073.	9.95E+10
-0.9989	60.4810	0.00				
12.0000	0.3571	-422746.	9681.	-0.00169	964.7334	9.95E+10
-1.1577	77.8000	0.00				
14.0000	0.3155	-171989.	9651.	-0.00176	855.8978	9.95E+10
-1.2959	98.5957	0.00				
16.0000	0.2728	78470.	8910.	-0.00177	815.3082	9.95E+10
-60.4873	5322.	0.00				
18.0000	0.2306	293884.	7423.	-0.00172	908.8036	9.95E+10
-63.4193	6602.	0.00				
20.0000	0.1900	472002.	5878.	-0.00163	986.1121	9.95E+10

File name is incorrect below, run designation is "W.Overbank Post Seismic (No scour) 24in"


```
-65.3028      8247.       0.00
22.0000     0.1522    611278.      4302.   -0.00150      1047.   9.95E+10
-66.0754     10416.       0.00
24.0000     0.1180    710901.      2721.   -0.00134      1090.   9.95E+10
-65.6769     13359.       0.00
26.0000    0.08785    770844.      1164.   -0.00116      1116.   9.95E+10
-64.0442     17496.       0.00
28.0000    0.06218    791890.  -337.7430  -9.74E-04      1125.   9.95E+10
-61.0995     23585.       0.00
30.0000    0.04108    775680.     -1752.  -7.85E-04      1118.   9.95E+10
-56.7240     33139.       0.00
32.0000    0.02447    724777.     -3041.  -6.05E-04      1096.   9.95E+10
-50.6840     49701.       0.00
34.0000    0.01206    642793.     -4157.  -4.40E-04      1060.   9.95E+10
-42.3745     84307.       0.00
36.0000    0.00337    534727.     -5017.  -2.98E-04      1013.   9.95E+10
-29.2563    208290.       0.00
38.0000   -0.00223    408417.     -5047.  -1.84E-04   958.5144   9.95E+10
26.7173    288010.       0.00
40.0000   -0.00546    296433.     -4272.  -9.90E-05   909.9100   9.95E+10
37.8616    166418.       0.00
42.0000   -0.00698    205485.     -3302.  -3.85E-05   870.4360   9.95E+10
43.0379    148010.       0.00
44.0000   -0.00731    138791.     -2237.   3.01E-06   841.4892   9.95E+10
45.6790    150016.       0.00
46.0000   -0.00683     98047.     -1669.   3.16E-05   823.8053   9.95E+10
1.6206      5691.       0.00
48.0000   -0.00579     57982.     -1631.   5.04E-05   806.4157   9.95E+10
1.6070      6658.       0.00
50.0000   -0.00442     18691.     -1593.   5.96E-05   789.3623   9.95E+10
1.5349      8342.       0.00
52.0000   -0.00293    -19765.     -1558.   5.95E-05   789.8285   9.95E+10
1.3973     11443.       0.00
54.0000   -0.00156    -57364.     -1527.   5.02E-05   806.1476   9.95E+10
1.1797     18149.       0.00
56.0000  -5.21E-04    -94135.   -83.2964   3.19E-05   822.1070   9.95E+10
119.1106   5483520.       0.00
58.0000  -2.74E-05    -62052.      1424.   1.31E-05   808.1823   9.95E+10
6.4793   5679360.       0.00
60.0000   1.07E-04    -26076.      1186.   2.47E-06   792.5677   9.95E+10
-26.3059   5875200.       0.00
62.0000   9.14E-05     -5184.   592.7602  -1.29E-06   783.5000   9.95E+10
-23.1194   6071040.       0.00
64.0000   4.53E-05      2405.   173.2815  -1.63E-06   782.2936   9.95E+10
-11.8371   6266880.       0.00
66.0000   1.32E-05      3169.   -11.3652  -9.57E-07   782.6253   9.95E+10
-3.5501   6462720.       0.00
68.0000  -6.28E-07      1880.   -51.8768  -3.49E-07   782.0658   9.95E+10
0.1741   6658560.       0.00
70.0000  -3.56E-06   686.0973   -37.5819  -3.95E-08   781.5478   9.95E+10
1.0171   6854400.       0.00
72.0000  -2.52E-06    76.5915   -16.4776   5.24E-08   781.2832   9.95E+10
0.7416   7050240.       0.00
74.0000  -1.04E-06  -105.9613    -3.7948   4.89E-08   781.2960   9.95E+10
0.3153   7246080.       0.00
76.0000  -1.78E-07  -106.6138     1.3101   2.33E-08   781.2963   9.95E+10
0.1101   1.49E+07       0.00
78.0000   7.24E-08   -43.5800     2.0782   5.16E-09   781.2689   9.95E+10
-0.04607   1.53E+07       0.00
80.0000   7.01E-08    -6.9697     0.9764  -9.36E-10   781.2530   9.95E+10
-0.04575   1.57E+07       0.00
82.0000   2.74E-08     3.3076     0.2071  -1.38E-09   781.2514   9.95E+10
-0.01836   1.61E+07       0.00
```

```
 84.0000   3.94E-09     2.9998   -0.04571  -6.17E-10   781.2513   9.95E+10
 -0.00270   1.65E+07       0.00
 86.0000  -2.19E-09     1.1268   -0.05969  -1.20E-10   781.2505   9.95E+10
 0.00154   1.68E+07       0.00
 88.0000  -1.81E-09     0.1372   -0.02563   3.25E-11   781.2501   9.95E+10
 0.00130   1.72E+07       0.00
 90.0000  -6.33E-10    -0.1042   -0.00446   3.65E-11   781.2500   9.95E+10
 4.65E-04   1.76E+07       0.00
 92.0000  -5.93E-11   -0.07767    0.00165   1.45E-11   781.2500   9.95E+10
 4.45E-05   1.80E+07       0.00
 94.0000   6.48E-11   -0.02526    0.00159   2.13E-12   781.2500   9.95E+10
 -4.97E-05   1.84E+07       0.00
 96.0000   4.28E-11   -0.00143   5.90E-04  -1.09E-12   781.2500   9.95E+10
 -3.35E-05   1.88E+07       0.00
 98.0000   1.25E-11    0.00309   6.71E-05       0.00   781.2500   9.95E+10
 -1.00E-05   1.92E+07       0.00
100.0000       0.00    0.00182  -5.46E-05       0.00   781.2500   9.95E+10
-1.12E-07   1.96E+07       0.00
102.0000  -1.76E-12   4.75E-04  -3.84E-05       0.00   781.2500   9.95E+10
1.46E-06   2.00E+07       0.00
104.0000       0.00  -2.53E-05  -1.16E-05       0.00   781.2500   9.95E+10
7.70E-07   2.04E+07       0.00
106.0000       0.00  -8.19E-05  -2.42E-07       0.00   781.2500   9.95E+10
1.75E-07   2.08E+07       0.00
108.0000       0.00  -3.74E-05   1.57E-06       0.00   781.2500   9.95E+10
-2.46E-08   2.12E+07       0.00
110.0000       0.00  -6.86E-06   8.18E-07       0.00   781.2500   9.95E+10
-3.78E-08   2.15E+07       0.00
112.0000       0.00   1.91E-06   1.83E-07       0.00   781.2500   9.95E+10
-1.52E-08   2.19E+07       0.00
114.0000       0.00   1.94E-06  -2.68E-08       0.00   781.2500   9.95E+10
-2.32E-09   2.63E+07       0.00
116.0000       0.00   6.25E-07  -3.97E-08       0.00   781.2500   9.95E+10
1.25E-09   2.67E+07       0.00
118.0000       0.00   3.39E-08  -1.43E-08       0.00   781.2500   9.95E+10
8.58E-10   2.72E+07       0.00
120.0000       0.00  -6.29E-08  -1.36E-09       0.00   781.2500   9.95E+10
2.22E-10   2.76E+07       0.00
122.0000       0.00  -3.16E-08   1.19E-09       0.00   781.2500   9.95E+10
-9.94E-12   2.81E+07       0.00
124.0000       0.00  -6.00E-09   6.85E-10       0.00   781.2500   9.95E+10
-3.19E-11   2.86E+07       0.00
126.0000       0.00   1.25E-09   1.51E-10       0.00   781.2500   9.95E+10
-1.26E-11   2.90E+07       0.00
128.0000       0.00   1.25E-09  -1.82E-11       0.00   781.2500   9.95E+10
-1.51E-12   2.95E+07       0.00
130.0000       0.00   3.80E-10  -2.58E-11       0.00   781.2500   9.95E+10
0.00   3.00E+07       0.00
132.0000       0.00   1.18E-11  -8.73E-12       0.00   781.2500   9.95E+10
0.00   3.04E+07       0.00
134.0000       0.00  -3.94E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
136.0000       0.00  -1.76E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
138.0000       0.00  -2.69E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
140.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
142.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
144.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (No scour) 24in"


```
  0.00   3.36E+07       0.00
  148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.41E+07       0.00
  150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.46E+07       0.00
  152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.50E+07       0.00
  154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.55E+07       0.00
  156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.59E+07       0.00
  158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.64E+07       0.00
  160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.69E+07       0.00
  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.52E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.56E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.30E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.50547448 inches
Computed slope at pile head      =       0.000000 radians
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (No scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

```
Maximum bending moment          =      -1891981. inch-lbs
Maximum shear force             =          9784. lbs
Depth of maximum bending moment =       0.000000 feet below pile head
Depth of maximum shear force    =       0.000000 feet below pile head
Number of iterations            =             18
Number of zero deflection points =            22
```

```
--------------------------------------------------------------------------------
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 2
--------------------------------------------------------------------------------

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     1.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     1.0094  -3242460.     15526.       0.00      2189.   9.95E+10
      0.00       0.00       0.00
    2.0000     1.0000  -2866187.     15499.  -7.36E-04      2025.   9.95E+10
   -0.2720     6.5270       0.00
    4.0000     0.9740  -2482606.     15489.   -0.00138      1859.   9.95E+10
   -0.5392    13.2851       0.00
    6.0000     0.9337  -2092871.     15473.   -0.00193      1690.   9.95E+10
   -0.7974    20.4975       0.00
    8.0000     0.8812  -1698145.     15451.   -0.00239      1518.   9.95E+10
   -1.0430    28.4039       0.00
   10.0000     0.8190  -1299597.     15423.   -0.00275      1345.   9.95E+10
   -1.2722    37.2826       0.00
   12.0000     0.7492   -898398.     15390.   -0.00302      1171.   9.95E+10
   -1.4820    47.4764       0.00
   14.0000     0.6742   -495713.     15352.   -0.00318   996.4030   9.95E+10
   -1.6693    59.4242       0.00
   16.0000     0.5963    -92698.     14390.   -0.00326   821.4835   9.95E+10
   -78.5031      3159.       0.00
   18.0000     0.5179    265340.     12452.   -0.00323   896.4151   9.95E+10
   -83.0581      3849.       0.00
   20.0000     0.4411    574846.     10417.   -0.00313      1031.   9.95E+10
   -86.4603      4705.       0.00
   22.0000     0.3675    833054.      8316.   -0.00296      1143.   9.95E+10
   -88.6371      5788.       0.00
   24.0000     0.2988   1038037.      6178.   -0.00274      1232.   9.95E+10
   -89.5194      7190.       0.00
   26.0000     0.2361   1188754.      4036.   -0.00247      1297.   9.95E+10
   -89.0384      9051.       0.00
   28.0000     0.1803   1285089.      1922.   -0.00217      1339.   9.95E+10
   -87.1193     11599.       0.00
   30.0000     0.1319   1327896.  -127.7565   -0.00186      1358.   9.95E+10
   -83.6699     15228.       0.00
   32.0000    0.09116   1319052.     -2074.   -0.00154      1354.   9.95E+10
   -78.5546     20681.       0.00
```

```
34.0000    0.05809   1261525.     -3875.   -0.00123      1329.   9.95E+10
-71.5322     29555.       0.00
36.0000    0.03231   1159511.     -5479.  -9.34E-04      1285.   9.95E+10
-62.0669     46100.       0.00
38.0000    0.01325   1018726.     -6806.  -6.72E-04      1223.   9.95E+10
-48.5153     87888.       0.00
40.0000   7.92E-05    847344.     -7500.  -4.47E-04      1149.   9.95E+10
-9.3271   2825891.       0.00
42.0000   -0.00819    668383.     -7067.  -2.64E-04      1071.   9.95E+10
45.4119    133136.       0.00
44.0000   -0.01258    513838.     -5865.  -1.21E-04      1004.   9.95E+10
54.7747    104468.       0.00
46.0000   -0.01401    389505.     -5183.  -1.24E-05   950.3061   9.95E+10
2.0594      3528.       0.00
48.0000   -0.01318    265344.     -5132.   6.66E-05   896.4169   9.95E+10
2.1143      3851.       0.00
50.0000   -0.01081    141711.     -5082.   1.16E-04   842.7563   9.95E+10
2.0695      4594.       0.00
52.0000   -0.00763     18900.     -5034.   1.35E-04   789.4529   9.95E+10
1.9225      6051.       0.00
54.0000   -0.00433   -102853.     -4991.   1.25E-04   825.8911   9.95E+10
1.6586      9192.       0.00
56.0000   -0.00163   -223383.     -1265.   8.56E-05   878.2043   9.95E+10
308.8624   4545750.       0.00
58.0000  -2.23E-04   -165426.      3076.   3.87E-05   853.0494   9.95E+10
52.8718   5679360.       0.00
60.0000   2.27E-04    -76584.      3045.   9.51E-06   814.4895   9.95E+10
-55.4492   5875200.       0.00
62.0000   2.33E-04    -19481.      1671.  -2.07E-06   789.7054   9.95E+10
-59.0027   6071040.       0.00
64.0000   1.27E-04      3686.   564.6008  -3.97E-06   782.8500   9.95E+10
-33.2280   6266880.       0.00
66.0000   4.26E-05      7705.    28.2482  -2.60E-06   784.5943   9.95E+10
-11.4681   6462720.       0.00
68.0000   2.52E-06      5099.  -117.7434  -1.05E-06   783.4629   9.95E+10
-0.6979   6658560.       0.00
70.0000  -8.05E-06      2076.   -98.5231  -1.90E-07   782.1512   9.95E+10
2.2996   6854400.       0.00
72.0000  -6.60E-06   373.5279   -47.6544   1.05E-07   781.4121   9.95E+10
1.9395   7050240.       0.00
74.0000  -2.99E-06  -213.2305   -13.5431   1.25E-07   781.3425   9.95E+10
0.9031   7246080.       0.00
76.0000  -6.14E-07  -279.2362     1.8651   6.54E-08   781.3712   9.95E+10
0.3809   1.49E+07       0.00
78.0000   1.47E-07  -125.1174     5.3137   1.66E-08   781.3043   9.95E+10
-0.09351   1.53E+07       0.00
80.0000   1.84E-07   -24.5355     2.7504  -1.41E-09   781.2606   9.95E+10
-0.1201   1.57E+07       0.00
82.0000   7.90E-08     6.9333     0.6746  -3.54E-09   781.2530   9.95E+10
-0.05289   1.61E+07       0.00
84.0000   1.42E-08     7.9203   -0.07716  -1.75E-09   781.2534   9.95E+10
-0.00976   1.65E+07       0.00
86.0000  -4.74E-09     3.2673    -0.1543  -3.97E-10   781.2514   9.95E+10
0.00333   1.68E+07       0.00
88.0000  -4.81E-09     0.5227   -0.07292   6.03E-11   781.2502   9.95E+10
0.00345   1.72E+07       0.00
90.0000  -1.85E-09    -0.2343   -0.01519   9.50E-11   781.2501   9.95E+10
0.00136   1.76E+07       0.00
92.0000  -2.47E-10    -0.2082    0.00334   4.17E-11   781.2501   9.95E+10
1.86E-04   1.80E+07       0.00
94.0000   1.51E-10   -0.07472    0.00418   7.56E-12   781.2500   9.95E+10
-1.15E-04   1.84E+07       0.00
96.0000   1.16E-10   -0.00752    0.00171  -2.35E-12   781.2500   9.95E+10
```

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 -9.08E-05   1.88E+07       0.00
 98.0000   3.77E-11    0.00740   2.59E-04  -2.37E-12   781.2500   9.95E+10
 -3.01E-05   1.92E+07       0.00
100.0000   2.28E-12    0.00497  -1.24E-04       0.00   781.2500   9.95E+10
-1.86E-06   1.96E+07       0.00
102.0000  -4.33E-12    0.00146  -1.03E-04       0.00   781.2500   9.95E+10
3.60E-06   2.00E+07       0.00
104.0000  -2.51E-12   1.01E-05  -3.46E-05       0.00   781.2500   9.95E+10
2.13E-06   2.04E+07       0.00
106.0000       0.00  -2.07E-04  -2.37E-06       0.00   781.2500   9.95E+10
5.52E-07   2.08E+07       0.00
108.0000       0.00  -1.05E-04   3.84E-06       0.00   781.2500   9.95E+10
-3.42E-08   2.12E+07       0.00
110.0000       0.00  -2.26E-05   2.26E-06       0.00   781.2500   9.95E+10
-9.74E-08   2.15E+07       0.00
112.0000       0.00   3.70E-06   5.77E-07       0.00   781.2500   9.95E+10
-4.32E-08   2.19E+07       0.00
114.0000       0.00   5.14E-06  -3.95E-08       0.00   781.2500   9.95E+10
-8.20E-09   2.63E+07       0.00
116.0000       0.00   1.83E-06  -1.04E-07       0.00   781.2500   9.95E+10
2.86E-09   2.67E+07       0.00
118.0000       0.00   1.66E-07  -4.13E-08       0.00   781.2500   9.95E+10
2.33E-09   2.72E+07       0.00
120.0000       0.00  -1.55E-07  -5.27E-09       0.00   781.2500   9.95E+10
6.71E-10   2.76E+07       0.00
122.0000       0.00  -8.79E-08   2.83E-09       0.00   781.2500   9.95E+10
3.19E-12   2.81E+07       0.00
124.0000       0.00  -1.91E-08   1.88E-09       0.00   781.2500   9.95E+10
-8.20E-11   2.86E+07       0.00
126.0000       0.00   2.42E-09   4.68E-10       0.00   781.2500   9.95E+10
-3.58E-11   2.90E+07       0.00
128.0000       0.00   3.32E-09  -2.74E-11       0.00   781.2500   9.95E+10
-5.39E-12   2.95E+07       0.00
130.0000       0.00   1.12E-09  -6.77E-11       0.00   781.2500   9.95E+10
2.03E-12   3.00E+07       0.00
132.0000       0.00   7.62E-11  -2.53E-11       0.00   781.2500   9.95E+10
1.50E-12   3.04E+07       0.00
134.0000       0.00  -9.85E-11  -2.61E-12       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
136.0000       0.00  -4.94E-11   1.87E-12       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
138.0000       0.00  -8.93E-12   1.07E-12       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
140.0000       0.00   1.99E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
142.0000       0.00   1.81E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
144.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
```

```
  160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.69E+07       0.00
  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.52E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.56E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.30E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     1.00938212 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -3242460. inch-lbs
Maximum shear force              =         15526. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             12
Number of zero deflection points =             22
```

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Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 3

File name is incorrect below, run designation is "W.Overbank Post Seismic (No scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 2.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 450000.0 lbs

Depth X feet	Deflect. y inches	Bending Distrib. Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Lat. Load lb/inch				
0.00	2.0160	-5533482.	24468.	0.00	3183.	9.95E+10
0.00	0.00	0.00				
2.0000	2.0000	-4939909.	24428.	-0.00126	2925.	9.95E+10
-0.3426	4.1118	0.00				
4.0000	1.9554	-4333669.	24416.	-0.00238	2662.	9.95E+10
-0.6802	8.3481	0.00				
6.0000	1.8857	-3716535.	24395.	-0.00335	2394.	9.95E+10
-1.0080	12.8288	0.00				
8.0000	1.7945	-3090303.	24367.	-0.00417	2123.	9.95E+10
-1.3220	17.6797	0.00				
10.0000	1.6855	-2456785.	24332.	-0.00484	1848.	9.95E+10
-1.6183	23.0430	0.00				
12.0000	1.5622	-1817801.	24290.	-0.00536	1570.	9.95E+10
-1.8934	29.0879	0.00				
14.0000	1.4284	-1175174.	24242.	-0.00572	1291.	9.95E+10
-2.1440	36.0235	0.00				
16.0000	1.2878	-530721.	22998.	-0.00592	1012.	9.95E+10
-101.4699	1891.	0.00				
18.0000	1.1441	56667.	20482.	-0.00598	805.8451	9.95E+10
-108.1712	2269.	0.00				
20.0000	1.0007	581601.	17821.	-0.00590	1034.	9.95E+10
-113.6115	2725.	0.00				
22.0000	0.8608	1039580.	15045.	-0.00571	1232.	9.95E+10
-117.7093	3282.	0.00				
24.0000	0.7268	1427051.	12188.	-0.00541	1401.	9.95E+10
-120.3887	3975.	0.00				
26.0000	0.6011	1741462.	9284.	-0.00503	1537.	9.95E+10
-121.5773	4854.	0.00				
28.0000	0.4854	1981309.	6371.	-0.00458	1641.	9.95E+10
-121.2040	5992.	0.00				
30.0000	0.3813	2146183.	3486.	-0.00408	1713.	9.95E+10
-119.1949	7503.	0.00				
32.0000	0.2895	2236812.	670.3677	-0.00355	1752.	9.95E+10
-115.4660	9571.	0.00				
34.0000	0.2107	2255108.	-2034.	-0.00301	1760.	9.95E+10
-109.9099	12518.	0.00				
36.0000	0.1450	2204223.	-4581.	-0.00247	1738.	9.95E+10
-102.3658	16946.	0.00				
38.0000	0.09198	2088634.	-6920.	-0.00196	1688.	9.95E+10
-92.5486	24148.	0.00				
40.0000	0.05107	1914299.	-8989.	-0.00147	1612.	9.95E+10
-79.8408	37518.	0.00				
42.0000	0.02124	1688990.	-10696.	-0.00104	1514.	9.95E+10
-62.4203	70523.	0.00				
44.0000	0.00119	1423329.	-11746.	-6.64E-04	1399.	9.95E+10
-25.0319	506353.	0.00				
46.0000	-0.01063	1139543.	-12024.	-3.55E-04	1276.	9.95E+10

File name is incorrect below, run designation is "W.Overbank Post Seismic (No scour) 24in"


```
 1.8778      4238.       0.00
 48.0000   -0.01586    853870.    -11974.  -1.15E-04      1152.   9.95E+10
 2.2482      3403.       0.00
 50.0000   -0.01614    567269.    -11919.   5.66E-05      1027.   9.95E+10
 2.3648      3516.       0.00
 52.0000   -0.01314    280553.    -11863.   1.59E-04   903.0180   9.95E+10
 2.3044      4208.       0.00
 54.0000   -0.00852     -5566.    -11810.   1.92E-04   783.6658   9.95E+10
 2.0777      5854.       0.00
 56.0000   -0.00393   -290474.     -6034.   1.56E-04   907.3238   9.95E+10
 479.2493   2928215.       0.00
 58.0000   -0.00102   -298578.      2608.   8.52E-05   910.8411   9.95E+10
 240.9489   5679360.       0.00
 60.0000   1.64E-04   -167118.      5019.   2.91E-05   853.7838   9.95E+10
 -40.0704   5875200.       0.00
 62.0000   3.78E-04    -58303.      3389.   1.92E-06   806.5551   9.95E+10
 -95.7362   6071040.       0.00
 64.0000   2.56E-04     -4480.      1439.  -5.65E-06   783.1946   9.95E+10
 -66.8047   6266880.       0.00
 66.0000   1.07E-04     10874.   290.3149  -4.88E-06   785.9697   9.95E+10
 -28.8900   6462720.       0.00
 68.0000   2.17E-05      9560.  -128.4867  -2.42E-06   785.3993   9.95E+10
 -6.0101   6658560.       0.00
 70.0000  -8.64E-06      4759.  -171.0101  -6.89E-07   783.3156   9.95E+10
 2.4665   6854400.       0.00
 72.0000  -1.14E-05      1366.  -101.2448   4.98E-08   781.8431   9.95E+10
 3.3472   7050240.       0.00
 74.0000  -6.25E-06  -101.7644   -38.4512   2.02E-07   781.2942   9.95E+10
 1.8856   7246080.       0.00
 76.0000  -1.68E-06  -483.6074    -3.2864   1.32E-07   781.4599   9.95E+10
 1.0449   1.49E+07       0.00
 78.0000   7.69E-08  -262.3571     8.6642   4.18E-08   781.3639   9.95E+10
 -0.04896   1.53E+07       0.00
 80.0000   3.20E-07   -68.6263     5.5668   1.87E-09   781.2798   9.95E+10
 -0.2092   1.57E+07       0.00
 82.0000   1.67E-07     4.8110     1.7184  -5.82E-09   781.2521   9.95E+10
 -0.1116   1.61E+07       0.00
 84.0000   4.09E-08    13.9810    0.04347  -3.56E-09   781.2561   9.95E+10
 -0.02802   1.65E+07       0.00
 86.0000  -4.05E-09     6.9744    -0.2587  -1.03E-09   781.2530   9.95E+10
 0.00284   1.68E+07       0.00
 88.0000  -8.61E-09     1.5856    -0.1504       0.00   781.2507   9.95E+10
 0.00619   1.72E+07       0.00
 90.0000  -4.00E-09    -0.2447   -0.04089   1.63E-10   781.2501   9.95E+10
 0.00294   1.76E+07       0.00
 92.0000  -8.10E-10    -0.3806    0.00170   8.72E-11   781.2502   9.95E+10
 6.08E-04   1.80E+07       0.00
 94.0000   1.80E-10    -0.1651    0.00734   2.14E-11   781.2501   9.95E+10
 -1.38E-04   1.84E+07       0.00
 96.0000   2.16E-10   -0.02881    0.00365  -1.98E-12   781.2500   9.95E+10
 -1.69E-04   1.88E+07       0.00
 98.0000   8.52E-11    0.00998   7.96E-04  -4.26E-12   781.2500   9.95E+10
 -6.81E-05   1.92E+07       0.00
100.0000   1.19E-11    0.00950  -1.38E-04  -1.91E-12   781.2500   9.95E+10
-9.73E-06   1.96E+07       0.00
102.0000  -6.35E-12    0.00340  -1.91E-04       0.00   781.2500   9.95E+10
5.28E-06   2.00E+07       0.00
104.0000  -4.92E-12   3.36E-04  -7.76E-05       0.00   781.2500   9.95E+10
4.18E-06   2.04E+07       0.00
106.0000  -1.56E-12  -3.26E-04  -1.14E-05       0.00   781.2500   9.95E+10
1.35E-06   2.08E+07       0.00
108.0000       0.00  -2.12E-04   5.59E-06       0.00   781.2500   9.95E+10
6.62E-08   2.12E+07       0.00
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110.0000       0.00  -5.85E-05   4.43E-06       0.00   781.2500   9.95E+10
-1.63E-07   2.15E+07       0.00
112.0000       0.00   1.13E-06   1.40E-06       0.00   781.2500   9.95E+10
-9.02E-08   2.19E+07       0.00
114.0000       0.00   8.76E-06   6.00E-08       0.00   781.2500   9.95E+10
-2.14E-08   2.23E+07       0.00
116.0000       0.00   4.05E-06  -1.68E-07       0.00   781.2500   9.95E+10
2.36E-09   2.67E+07       0.00
118.0000       0.00   6.98E-07  -8.85E-08       0.00   781.2500   9.95E+10
4.27E-09   2.72E+07       0.00
120.0000       0.00  -1.97E-07  -1.81E-08       0.00   781.2500   9.95E+10
1.60E-09   2.76E+07       0.00
122.0000       0.00  -1.72E-07   3.08E-09       0.00   781.2500   9.95E+10
1.67E-10   2.81E+07       0.00
124.0000       0.00  -5.04E-08   3.57E-09       0.00   781.2500   9.95E+10
-1.26E-10   2.86E+07       0.00
126.0000       0.00  -7.86E-10   1.17E-09       0.00   781.2500   9.95E+10
-7.48E-11   2.90E+07       0.00
128.0000       0.00   5.70E-09   6.79E-11       0.00   781.2500   9.95E+10
-1.68E-11   2.95E+07       0.00
130.0000       0.00   2.50E-09  -1.11E-10       0.00   781.2500   9.95E+10
1.88E-12   3.00E+07       0.00
132.0000       0.00   3.76E-10  -5.49E-11       0.00   781.2500   9.95E+10
2.80E-12   3.04E+07       0.00
134.0000       0.00  -1.35E-10  -9.88E-12       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
136.0000       0.00  -9.93E-11   2.31E-12       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
138.0000       0.00  -2.51E-11   2.09E-12       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
140.0000       0.00   1.10E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
142.0000       0.00   3.27E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
144.0000       0.00   1.19E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.73E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.78E+07       0.00
166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.82E+07       0.00
168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.87E+07       0.00
170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.92E+07       0.00
172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
```

```
  0.00   3.96E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.52E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.56E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.30E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 3:

```
Pile-head deflection             =     2.01601123 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -5533482. inch-lbs
Maximum shear force              =         24468. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             18
Number of zero deflection points =             22
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 4
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                              =     3.000000 inches
Rotation of pile head                                  =    0.000E+00 radians
Axial load on pile head                                =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (No scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

lb/inch	lb/inch	lb/inch						
0.00	3.0217	-7488877.	31579.	0.00	4032.	9.95E+10	0.00	0.00	0.00
2.0000	3.0000	-6722351.	31528.	-0.00171	3699.	9.95E+10	-0.3922	3.1379	0.00
4.0000	2.9394	-5938546.	31513.	-0.00324	3359.	9.95E+10	-0.7792	6.3617	0.00
6.0000	2.8445	-5139724.	31490.	-0.00458	3012.	9.95E+10	-1.1560	9.7536	0.00
8.0000	2.7198	-4328183.	31458.	-0.00572	2660.	9.95E+10	-1.5185	13.3993	0.00
10.0000	2.5701	-3506246.	31418.	-0.00666	2303.	9.95E+10	-1.8626	17.3935	0.00
12.0000	2.4001	-2676250.	31369.	-0.00741	1943.	9.95E+10	-2.1847	21.8467	0.00
14.0000	2.2146	-1840544.	31313.	-0.00795	1580.	9.95E+10	-2.4814	26.8920	0.00
16.0000	2.0184	-1001474.	29869.	-0.00829	1216.	9.95E+10	-117.8671	1402.	0.00
18.0000	1.8164	-227687.	26940.	-0.00844	880.0727	9.95E+10	-126.1918	1667.	0.00
20.0000	1.6132	474006.	23827.	-0.00841	986.9816	9.95E+10	-133.2112	1982.	0.00
22.0000	1.4126	1097735.	20563.	-0.00822	1258.	9.95E+10	-138.8438	2359.	0.00
24.0000	1.2185	1638631.	17180.	-0.00789	1492.	9.95E+10	-143.0163	2817.	0.00
26.0000	1.0338	2092883.	13716.	-0.00744	1690.	9.95E+10	-145.6626	3382.	0.00
28.0000	0.8612	2457783.	10208.	-0.00689	1848.	9.95E+10	-146.7235	4089.	0.00
30.0000	0.7028	2731769.	6693.	-0.00627	1967.	9.95E+10	-146.1466	4991.	0.00
32.0000	0.5603	2914461.	3213.	-0.00559	2046.	9.95E+10	-143.8856	6164.	0.00
34.0000	0.4346	3006686.	-192.6785	-0.00487	2086.	9.95E+10	-139.8988	7726.	0.00
36.0000	0.3263	3010498.	-3481.	-0.00415	2088.	9.95E+10	-134.1480	9867.	0.00
38.0000	0.2354	2929202.	-6610.	-0.00343	2053.	9.95E+10	-126.5936	12904.	0.00
40.0000	0.1615	2767360.	-9535.	-0.00275	1982.	9.95E+10	-117.1863	17411.	0.00
42.0000	0.1036	2530811.	-12212.	-0.00211	1880.	9.95E+10	-105.8445	24511.	0.00
44.0000	0.06039	2226706.	-14591.	-0.00153	1748.	9.95E+10	-92.3929	36720.	0.00
46.0000	0.03002	1863583.	-15731.	-0.00104	1590.	9.95E+10	-2.6554	2123.	0.00
48.0000	0.01044	1494078.	-15787.	-6.36E-04	1430.	9.95E+10	-1.9570	4497.	0.00
50.0000	-4.89E-04	1119555.	-15801.	-3.21E-04	1267.	9.95E+10	0.7341	35999.	0.00
52.0000	-0.00494	742539.	-15773.	-9.61E-05	1104.	9.95E+10	1.6632	8074.	0.00
54.0000	-0.00510	364548.	-15732.	3.74E-05	939.4739	9.95E+10	1.7510	8239.	0.00
56.0000	-0.00315	-13384.	-10562.	7.97E-05	787.0592	9.95E+10	429.0251	3270448.	0.00
58.0000	-0.00127	-144163.	-2140.	6.07E-05	843.8209	9.95E+10	272.8304	5142312.	0.00

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 60.0000  -2.33E-04   -117417.      1817.   2.92E-05   832.2121   9.95E+10
 56.9378   5875200.       0.00
 62.0000   1.29E-04    -57568.      2110.   8.11E-06   806.2360   9.95E+10
 -32.5487   6071040.       0.00
 64.0000   1.57E-04    -16317.      1228.  -7.96E-07   788.3321   9.95E+10
 -40.9396   6266880.       0.00
 66.0000   9.05E-05      1395.   444.4104  -2.59E-06   781.8553   9.95E+10
 -24.3617   6462720.       0.00
 68.0000   3.22E-05      5071.    44.7803  -1.82E-06   783.4508   9.95E+10
 -8.9408   6658560.       0.00
 70.0000   3.33E-06      3583.   -73.9062  -7.72E-07   782.8053   9.95E+10
 -0.9498   6854400.       0.00
 72.0000  -4.84E-06      1540.   -68.2487  -1.55E-07   781.9183   9.95E+10
 1.4212   7050240.       0.00
 74.0000  -4.09E-06   310.7380   -36.3715   6.86E-08   781.3849   9.95E+10
 1.2352   7246080.       0.00
 76.0000  -1.55E-06  -207.5849   -10.0438   8.10E-08   781.3401   9.95E+10
 0.9588   1.49E+07       0.00
 78.0000  -2.02E-07  -173.1144     3.0055   3.51E-08   781.3251   9.95E+10
 0.1287   1.53E+07       0.00
 80.0000   1.40E-07   -64.0788     3.4539   6.53E-09   781.2778   9.95E+10
 -0.09131   1.57E+07       0.00
 82.0000   1.11E-07    -7.4693     1.4663  -2.10E-09   781.2532   9.95E+10
 -0.07432   1.61E+07       0.00
 84.0000   3.91E-08     6.3509     0.2533  -2.24E-09   781.2528   9.95E+10
 -0.02677   1.65E+07       0.00
 86.0000   3.78E-09     4.7368   -0.09976  -8.98E-10   781.2521   9.95E+10
 -0.00265   1.68E+07       0.00
 88.0000  -4.08E-09     1.5818   -0.09649  -1.37E-10   781.2507   9.95E+10
 0.00293   1.72E+07       0.00
 90.0000  -2.78E-09     0.1084   -0.03688   6.71E-11   781.2500   9.95E+10
 0.00204   1.76E+07       0.00
 92.0000  -8.55E-10    -0.1898   -0.00469   5.73E-11   781.2501   9.95E+10
 6.41E-04   1.80E+07       0.00
 94.0000  -2.89E-11    -0.1181    0.00327   2.02E-11   781.2501   9.95E+10
 2.22E-05   1.84E+07       0.00
 96.0000   1.13E-10   -0.03327    0.00247   1.91E-12   781.2500   9.95E+10
 -8.88E-05   1.88E+07       0.00
 98.0000   6.30E-11   5.12E-04   8.02E-04  -2.03E-12   781.2500   9.95E+10
 -5.04E-05   1.92E+07       0.00
100.0000   1.57E-11    0.00526   4.35E-05  -1.34E-12   781.2500   9.95E+10
-1.28E-05   1.96E+07       0.00
102.0000  -1.20E-12    0.00263  -9.80E-05       0.00   781.2500   9.95E+10
1.00E-06   2.00E+07       0.00
104.0000  -2.87E-12   5.65E-04  -5.68E-05       0.00   781.2500   9.95E+10
2.43E-06   2.04E+07       0.00
106.0000  -1.26E-12  -9.73E-05  -1.45E-05       0.00   781.2500   9.95E+10
1.09E-06   2.08E+07       0.00
108.0000       0.00  -1.30E-04   9.81E-07       0.00   781.2500   9.95E+10
1.95E-07   2.12E+07       0.00
110.0000       0.00  -5.08E-05   2.58E-06       0.00   781.2500   9.95E+10
-6.15E-08   2.15E+07       0.00
112.0000       0.00  -6.58E-06   1.14E-06       0.00   781.2500   9.95E+10
-5.85E-08   2.19E+07       0.00
114.0000       0.00   3.90E-06   1.96E-07       0.00   781.2500   9.95E+10
-2.00E-08   2.23E+07       0.00
116.0000       0.00   2.84E-06  -6.54E-08       0.00   781.2500   9.95E+10
-1.74E-09   2.67E+07       0.00
118.0000       0.00   7.69E-07  -5.95E-08       0.00   781.2500   9.95E+10
2.23E-09   2.72E+07       0.00
120.0000       0.00  -1.47E-08  -1.81E-08       0.00   781.2500   9.95E+10
1.21E-09   2.76E+07       0.00
122.0000       0.00  -1.01E-07  -5.58E-10       0.00   781.2500   9.95E+10
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (No scour) 24in"


```
  2.53E-10   2.81E+07       0.00
  124.0000       0.00  -4.20E-08   1.99E-09       0.00   781.2500   9.95E+10
  -4.02E-11   2.86E+07       0.00
  126.0000       0.00  -5.78E-09   9.29E-10       0.00   781.2500   9.95E+10
  -4.84E-11   2.90E+07       0.00
  128.0000       0.00   2.58E-09   1.57E-10       0.00   781.2500   9.95E+10
  -1.59E-11   2.95E+07       0.00
  130.0000       0.00   1.77E-09  -4.47E-11       0.00   781.2500   9.95E+10
  0.00   3.00E+07       0.00
  132.0000       0.00   4.40E-10  -3.75E-11       0.00   781.2500   9.95E+10
  1.51E-12   3.04E+07       0.00
  134.0000       0.00  -2.43E-11  -1.04E-11       0.00   781.2500   9.95E+10
  0.00   3.09E+07       0.00
  136.0000       0.00  -6.09E-11       0.00       0.00   781.2500   9.95E+10
  0.00   3.13E+07       0.00
  138.0000       0.00  -2.21E-11   1.23E-12       0.00   781.2500   9.95E+10
  0.00   3.18E+07       0.00
  140.0000       0.00  -2.06E-12       0.00       0.00   781.2500   9.95E+10
  0.00   3.23E+07       0.00
  142.0000       0.00   1.66E-12       0.00       0.00   781.2500   9.95E+10
  0.00   3.27E+07       0.00
  144.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.32E+07       0.00
  146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.36E+07       0.00
  148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.41E+07       0.00
  150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.46E+07       0.00
  152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.50E+07       0.00
  154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.55E+07       0.00
  156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.59E+07       0.00
  158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.64E+07       0.00
  160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.69E+07       0.00
  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
```

```
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.52E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.56E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.30E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 4:

```
Pile-head deflection             =     3.02166920 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -7488877. inch-lbs
Maximum shear force              =         31579. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             18
Number of zero deflection points =             21
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 5
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     4.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     4.0268  -9256981.     37675.       0.00      4799.   9.95E+10
      0.00       0.00       0.00
    2.0000     4.0000  -8342051.     37615.   -0.00212      4402.   9.95E+10
   -0.4317     2.5903       0.00
    4.0000     3.9249  -7405646.     37599.   -0.00402      3996.   9.95E+10
   -0.8580     5.2463       0.00
    6.0000     3.8070  -6450449.     37574.   -0.00569      3581.   9.95E+10
   -1.2740     8.0312       0.00
    8.0000     3.6518  -5479188.     37538.   -0.00713      3159.   9.95E+10
   -1.6752    11.0096       0.00
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (No scour) 24in"


```
10.0000     3.4648  -4494623.     37493.   -0.00833      2732.   9.95E+10
-2.0576    14.2527       0.00
12.0000     3.2519  -3499539.     37440.   -0.00930      2300.   9.95E+10
-2.4175    17.8421       0.00
14.0000     3.0186  -2496734.     37378.   -0.01002      1865.   9.95E+10
-2.7513    21.8746       0.00
16.0000     2.7710  -1489011.     35773.   -0.01050      1428.   9.95E+10
-130.9990      1135.       0.00
18.0000     2.5147   -552867.     32513.   -0.01075      1021.   9.95E+10
-140.6432      1342.       0.00
20.0000     2.2552    303707.     29038.   -0.01078   913.0673   9.95E+10
-148.9507      1585.       0.00
22.0000     1.9975   1073694.     25380.   -0.01061      1247.   9.95E+10
-155.8392      1872.       0.00
24.0000     1.7460   1751122.     21575.   -0.01027      1541.   9.95E+10
-161.2353      2216.       0.00
26.0000     1.5046   2331119.     17660.   -0.00978      1793.   9.95E+10
-165.0742      2633.       0.00
28.0000     1.2767   2809961.     13671.   -0.00916      2001.   9.95E+10
-167.3002      3145.       0.00
30.0000     1.0651   3185122.      9649.   -0.00843      2164.   9.95E+10
-167.8669      3783.       0.00
32.0000     0.8719   3455296.      5634.   -0.00763      2281.   9.95E+10
-166.7378      4590.       0.00
34.0000     0.6987   3620431.      1667.   -0.00678      2353.   9.95E+10
-163.8871      5630.       0.00
36.0000     0.5464   3681739.     -2212.   -0.00590      2379.   9.95E+10
-159.3010      6997.       0.00
38.0000     0.4155   3641702.     -5959.   -0.00502      2362.   9.95E+10
-152.9795      8836.       0.00
40.0000     0.3056   3504065.     -9534.   -0.00416      2302.   9.95E+10
-144.9377     11381.       0.00
42.0000     0.2160   3273819.    -12896.   -0.00334      2202.   9.95E+10
-135.2069     15020.       0.00
44.0000     0.1454   2957168.    -16004.   -0.00259      2065.   9.95E+10
-123.8308     20439.       0.00
46.0000    0.09188   2561490.    -17537.   -0.00192      1893.   9.95E+10
-3.8548      1007.       0.00
48.0000    0.05317   2156920.    -17623.   -0.00135      1717.   9.95E+10
-3.3658      1519.       0.00
50.0000    0.02695   1744795.    -17697.  -8.82E-04      1539.   9.95E+10
-2.8059      2499.       0.00
52.0000    0.01082   1326510.    -17757.  -5.12E-04      1357.   9.95E+10
-2.1606      4790.       0.00
54.0000    0.00238    903526.    -17799.  -2.43E-04      1173.   9.95E+10
-1.3578     13715.       0.00
56.0000  -8.44E-04    477407.    -15502.  -7.66E-05   988.4581   9.95E+10
192.7851   5483520.       0.00
58.0000   -0.00130    161089.     -9878.   3.72E-07   851.1673   9.95E+10
275.8358   5088605.       0.00
60.0000  -8.26E-04      3233.     -4142.   2.02E-05   782.6533   9.95E+10
202.1833   5875200.       0.00
62.0000  -3.32E-04    -38174.  -707.7663   1.60E-05   797.8184   9.95E+10
84.0222   6071040.       0.00
64.0000  -5.93E-05    -31084.   486.3516   7.62E-06   794.7415   9.95E+10
15.4877   6266880.       0.00
66.0000   3.36E-05    -14993.   563.4874   2.07E-06   787.7576   9.95E+10
-9.0597   6462720.       0.00
68.0000   3.98E-05     -4082.   322.1563  -2.34E-07   783.0216   9.95E+10
-11.0513   6658560.       0.00
70.0000   2.24E-05   475.1248   112.7691  -6.69E-07   781.4562   9.95E+10
-6.3977   6854400.       0.00
72.0000   7.72E-06      1346.     8.7891  -4.50E-07   781.8341   9.95E+10
```

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 -2.2673   7050240.       0.00
 74.0000   8.23E-07   906.7130   -21.4009  -1.78E-07   781.6435   9.95E+10
 -0.2485   7246080.       0.00
 76.0000  -8.25E-07   322.2612   -18.2444  -2.98E-08   781.3899   9.95E+10
 0.5116   1.49E+07       0.00
 78.0000  -6.08E-07    31.6263    -7.4625   1.29E-08   781.2637   9.95E+10
 0.3869   1.53E+07       0.00
 80.0000  -2.08E-07   -36.2175    -1.1903   1.23E-08   781.2657   9.95E+10
 0.1358   1.57E+07       0.00
 82.0000  -1.76E-08   -25.7733     0.5799   4.83E-09   781.2612   9.95E+10
 0.01176   1.61E+07       0.00
 84.0000   2.37E-08    -8.4888     0.5264   6.94E-10   781.2537   9.95E+10
 -0.01621   1.65E+07       0.00
 86.0000   1.58E-08    -0.5217     0.1991  -3.92E-10   781.2502   9.95E+10
 -0.01106   1.68E+07       0.00
 88.0000   4.84E-09     1.0765    0.02465  -3.25E-10   781.2505   9.95E+10
 -0.00348   1.72E+07       0.00
 90.0000   1.59E-10     0.6683   -0.01850  -1.15E-10   781.2503   9.95E+10
 -1.17E-04   1.76E+07       0.00
 92.0000  -6.59E-10     0.1910   -0.01396  -1.11E-11   781.2501   9.95E+10
 4.95E-04   1.80E+07       0.00
 94.0000  -3.72E-10   -0.00182   -0.00460   1.17E-11   781.2500   9.95E+10
 2.85E-04   1.84E+07       0.00
 96.0000  -9.55E-11   -0.03027  -2.83E-04   7.87E-12   781.2500   9.95E+10
 7.48E-05   1.88E+07       0.00
 98.0000   5.86E-12   -0.01557   5.58E-04   2.34E-12   781.2500   9.95E+10
 -4.69E-06   1.92E+07       0.00
100.0000   1.71E-11   -0.00353   3.35E-04       0.00   781.2500   9.95E+10
-1.39E-05   1.96E+07       0.00
102.0000   7.83E-12   4.99E-04   8.95E-05       0.00   781.2500   9.95E+10
-6.52E-06   2.00E+07       0.00
104.0000   1.49E-12   7.74E-04  -3.85E-06       0.00   781.2500   9.95E+10
-1.26E-06   2.04E+07       0.00
106.0000       0.00   3.18E-04  -1.51E-05       0.00   781.2500   9.95E+10
3.23E-07   2.08E+07       0.00
108.0000       0.00   4.77E-05  -7.08E-06       0.00   781.2500   9.95E+10
3.49E-07   2.12E+07       0.00
110.0000       0.00  -2.17E-05  -1.35E-06       0.00   781.2500   9.95E+10
1.28E-07   2.15E+07       0.00
112.0000       0.00  -1.75E-05   3.40E-07       0.00   781.2500   9.95E+10
1.33E-08   2.19E+07       0.00
114.0000       0.00  -5.50E-06   3.62E-07       0.00   781.2500   9.95E+10
-1.14E-08   2.23E+07       0.00
116.0000       0.00  -9.82E-08   1.28E-07       0.00   781.2500   9.95E+10
-8.09E-09   2.67E+07       0.00
118.0000       0.00   6.48E-07   8.17E-09       0.00   781.2500   9.95E+10
-1.90E-09   2.72E+07       0.00
120.0000       0.00   2.97E-07  -1.25E-08       0.00   781.2500   9.95E+10
1.80E-10   2.76E+07       0.00
122.0000       0.00   4.98E-08  -6.50E-09       0.00   781.2500   9.95E+10
3.18E-10   2.81E+07       0.00
124.0000       0.00  -1.47E-08  -1.29E-09       0.00   781.2500   9.95E+10
1.16E-10   2.86E+07       0.00
126.0000       0.00  -1.24E-08   2.35E-10       0.00   781.2500   9.95E+10
1.12E-11   2.90E+07       0.00
128.0000       0.00  -3.49E-09   2.57E-10       0.00   781.2500   9.95E+10
-9.35E-12   2.95E+07       0.00
130.0000       0.00  -6.12E-12   8.11E-11       0.00   781.2500   9.95E+10
-5.33E-12   3.00E+07       0.00
132.0000       0.00   4.08E-10   3.64E-12       0.00   781.2500   9.95E+10
-1.13E-12   3.04E+07       0.00
134.0000       0.00   1.70E-10  -8.04E-12       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
```

```
136.0000       0.00   2.30E-11  -3.76E-12       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
138.0000       0.00  -1.01E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
140.0000       0.00  -6.72E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
142.0000       0.00  -1.57E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
144.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.73E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.78E+07       0.00
166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.82E+07       0.00
168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.87E+07       0.00
170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.92E+07       0.00
172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.96E+07       0.00
174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.01E+07       0.00
176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.06E+07       0.00
178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.10E+07       0.00
180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.15E+07       0.00
182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.19E+07       0.00
184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.24E+07       0.00
186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.29E+07       0.00
188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.33E+07       0.00
190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.38E+07       0.00
192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.42E+07       0.00
194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.47E+07       0.00
196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.52E+07       0.00
198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
```

```
  0.00   4.56E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.30E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 5:

```
Pile-head deflection             =     4.02678525 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -9256981. inch-lbs
Maximum shear force              =         37675. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             16
Number of zero deflection points =             21
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 6
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     5.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     5.0316  -1.09E+07     43190.       0.00      5522.   9.95E+10
      0.00       0.00       0.00
    2.0000     5.0000  -9873031.     43122.   -0.00251      5066.   9.95E+10
   -0.4650     2.2322       0.00
    4.0000     4.9113  -8798299.     43106.   -0.00476      4600.   9.95E+10
   -0.9246     4.5180       0.00
    6.0000     4.7716  -7701187.     43078.   -0.00675      4124.   9.95E+10
   -1.3736     6.9087       0.00
    8.0000     4.5874  -6584811.     43040.   -0.00847      3639.   9.95E+10
   -1.8075     9.4565       0.00
   10.0000     4.3651  -5452329.     42991.   -0.00992      3148.   9.95E+10
   -2.2223    12.2187       0.00
   12.0000     4.1112  -4306927.     42933.   -0.01110      2651.   9.95E+10
   -2.6140    15.2601       0.00
   14.0000     3.8324  -3151816.     42866.   -0.01200      2149.   9.95E+10
   -2.9791    18.6567       0.00
   16.0000     3.5353  -1990212.     41126.   -0.01262      1645.   9.95E+10
   -142.0802   964.5310       0.00
   18.0000     3.2268   -905264.     37587.   -0.01297      1174.   9.95E+10
   -152.8314      1137.       0.00
   20.0000     2.9130     94011.     33806.   -0.01306   822.0532   9.95E+10
   -162.2153      1337.       0.00
   22.0000     2.5997    999604.     29818.   -0.01293      1215.   9.95E+10
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-170.1467      1571.       0.00
24.0000     2.2922   1804591.     25657.   -0.01259      1564.   9.95E+10
-176.5496      1849.       0.00
26.0000     1.9952   2503185.     21362.   -0.01207      1868.   9.95E+10
-181.3571      2182.       0.00
28.0000     1.7126   3090799.     16972.   -0.01140      2123.   9.95E+10
-184.5111      2586.       0.00
30.0000     1.4480   3564085.     12526.   -0.01060      2328.   9.95E+10
-185.9630      3082.       0.00
32.0000     1.2040   3920976.      8067.   -0.00970      2483.   9.95E+10
-185.6742      3701.       0.00
34.0000     0.9826   4160707.      3635.   -0.00872      2587.   9.95E+10
-183.6166      4485.       0.00
36.0000     0.7854   4283839.  -725.4371   -0.00770      2641.   9.95E+10
-179.7736      5494.       0.00
38.0000     0.6129   4292267.     -4972.   -0.00667      2644.   9.95E+10
-174.1411      6819.       0.00
40.0000     0.4652   4189211.     -9063.   -0.00565      2599.   9.95E+10
-166.7279      8601.       0.00
42.0000     0.3419   3979211.    -12954.   -0.00466      2508.   9.95E+10
-157.5544     11061.       0.00
44.0000     0.2415   3668096.    -16605.   -0.00374      2373.   9.95E+10
-146.6460     14574.       0.00
46.0000     0.1624   3262962.    -18420.   -0.00290      2197.   9.95E+10
-4.6605   688.9060       0.00
48.0000     0.1021   2846645.    -18526.   -0.00217      2017.   9.95E+10
-4.1836   983.3279       0.00
50.0000    0.05833   2420506.    -18620.   -0.00153      1832.   9.95E+10
-3.6295      1493.       0.00
52.0000    0.02856   1985972.    -18700.   -0.00100      1643.   9.95E+10
-2.9854      2509.       0.00
54.0000    0.01028   1544548.    -18762.  -5.75E-04      1452.   9.95E+10
-2.2125      5164.       0.00
56.0000   9.43E-04   1097826.    -21375.  -2.57E-04      1258.   9.95E+10
-215.5054   5483520.       0.00
58.0000   -0.00204    524115.    -19812.  -6.12E-05      1009.   9.95E+10
345.6788   4061092.       0.00
60.0000   -0.00200    148149.    -11564.   1.98E-05   845.5510   9.95E+10
341.6907   4108740.       0.00
62.0000   -0.00109    -31388.     -4431.   3.39E-05   794.8732   9.95E+10
252.7038   5556199.       0.00
64.0000  -3.69E-04    -65286.  -243.0555   2.22E-05   809.5860   9.95E+10
96.3181   6266880.       0.00
66.0000  -2.40E-05    -43535.   990.2779   9.12E-06   800.1454   9.95E+10
6.4597   6462720.       0.00
68.0000   6.89E-05    -17950.   838.2438   1.71E-06   789.0407   9.95E+10
-19.1292   6658560.       0.00
70.0000   5.80E-05     -3336.   409.8772  -8.58E-07   782.6980   9.95E+10
-16.5680   6854400.       0.00
72.0000   2.78E-05      1743.   113.1795  -1.05E-06   782.0065   9.95E+10
-8.1568   7050240.       0.00
74.0000   7.61E-06      2119.   -12.2694  -5.84E-07   782.1698   9.95E+10
-2.2973   7246080.       0.00
76.0000  -2.86E-07      1167.   -37.7115  -1.88E-07   781.7563   9.95E+10
0.1771   1.49E+07       0.00
78.0000  -1.43E-06   313.0517   -24.6729  -9.89E-09   781.3859   9.95E+10
0.9094   1.53E+07       0.00
80.0000  -7.60E-07   -17.4801    -7.8022   2.57E-08   781.2576   9.95E+10
0.4965   1.57E+07       0.00
82.0000  -1.93E-07   -62.0090    -0.2927   1.62E-08   781.2769   9.95E+10
0.1293   1.61E+07       0.00
84.0000   1.51E-08   -31.8778     1.1355   4.84E-09   781.2638   9.95E+10
-0.01032   1.65E+07       0.00
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   86.0000   3.89E-08    -7.6096     0.6837   7.75E-11   781.2533   9.95E+10
  -0.02732   1.68E+07       0.00
   88.0000   1.88E-08     0.9393     0.1940  -7.27E-10   781.2504   9.95E+10
  -0.01348   1.72E+07       0.00
   90.0000   4.05E-09     1.7186   -0.00354  -4.06E-10   781.2507   9.95E+10
  -0.00298   1.76E+07       0.00
   92.0000  -7.23E-10     0.7782   -0.03276  -1.05E-10   781.2503   9.95E+10
   5.43E-04   1.80E+07       0.00
   94.0000  -9.98E-10     0.1484   -0.01706   6.46E-12   781.2501   9.95E+10
   7.65E-04   1.84E+07       0.00
   96.0000  -4.13E-10   -0.04100   -0.00400   1.94E-11   781.2500   9.95E+10
   3.23E-04   1.88E+07       0.00
   98.0000  -6.56E-11   -0.04400   5.11E-04   9.17E-12   781.2500   9.95E+10
   5.25E-05   1.92E+07       0.00
  100.0000   2.71E-11   -0.01667   8.75E-04   1.85E-12   781.2500   9.95E+10
  -2.21E-05   1.96E+07       0.00
  102.0000   2.34E-11   -0.00203   3.77E-04       0.00   781.2500   9.95E+10
  -1.94E-05   2.00E+07       0.00
  104.0000   7.88E-12    0.00142   6.31E-05       0.00   781.2500   9.95E+10
  -6.68E-06   2.04E+07       0.00
  106.0000       0.00    0.00101  -2.33E-05       0.00   781.2500   9.95E+10
  -5.21E-07   2.08E+07       0.00
  108.0000       0.00   3.02E-04  -2.10E-05       0.00   781.2500   9.95E+10
   7.19E-07   2.12E+07       0.00
  110.0000       0.00   5.51E-06  -7.12E-06       0.00   781.2500   9.95E+10
   4.36E-07   2.15E+07       0.00
  112.0000       0.00  -4.00E-05  -5.31E-07       0.00   781.2500   9.95E+10
   1.13E-07   2.19E+07       0.00
  114.0000       0.00  -2.02E-05   7.44E-07       0.00   781.2500   9.95E+10
  -6.92E-09   2.63E+07       0.00
  116.0000       0.00  -4.33E-06   4.39E-07       0.00   781.2500   9.95E+10
  -1.86E-08   2.27E+07       0.00
  118.0000       0.00   8.54E-07   1.09E-07       0.00   781.2500   9.95E+10
  -8.89E-09   2.72E+07       0.00
  120.0000       0.00   9.15E-07  -1.17E-08       0.00   781.2500   9.95E+10
  -1.18E-09   2.76E+07       0.00
  122.0000       0.00   2.94E-07  -1.87E-08       0.00   781.2500   9.95E+10
   5.96E-10   2.81E+07       0.00
  124.0000       0.00   1.54E-08  -6.72E-09       0.00   781.2500   9.95E+10
   4.06E-10   2.86E+07       0.00
  126.0000       0.00  -2.89E-08  -6.13E-10       0.00   781.2500   9.95E+10
   1.02E-10   2.90E+07       0.00
  128.0000       0.00  -1.42E-08   5.51E-10       0.00   781.2500   9.95E+10
  -5.54E-12   2.95E+07       0.00
  130.0000       0.00  -2.54E-09   3.08E-10       0.00   781.2500   9.95E+10
  -1.47E-11   3.00E+07       0.00
  132.0000       0.00   6.02E-10   6.42E-11       0.00   781.2500   9.95E+10
  -5.55E-12   3.04E+07       0.00
  134.0000       0.00   5.47E-10  -9.35E-12       0.00   781.2500   9.95E+10
  0.00   3.09E+07       0.00
  136.0000       0.00   1.56E-10  -1.14E-11       0.00   781.2500   9.95E+10
  0.00   3.13E+07       0.00
  138.0000       0.00   1.04E-12  -3.60E-12       0.00   781.2500   9.95E+10
  0.00   3.18E+07       0.00
  140.0000       0.00  -1.73E-11       0.00       0.00   781.2500   9.95E+10
  0.00   3.23E+07       0.00
  142.0000       0.00  -7.08E-12       0.00       0.00   781.2500   9.95E+10
  0.00   3.27E+07       0.00
  144.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.32E+07       0.00
  146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.36E+07       0.00
  148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (No scour) 24in"


```
  0.00   3.41E+07       0.00
  150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.46E+07       0.00
  152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.50E+07       0.00
  154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.55E+07       0.00
  156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.59E+07       0.00
  158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.64E+07       0.00
  160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.69E+07       0.00
  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.52E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.56E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.30E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 6:

```
Pile-head deflection             =     5.03160393 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -10922320. inch-lbs
Maximum shear force              =         43190. lbs
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (No scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

Depth of maximum bending moment = 0.000000 feet below pile head
Depth of maximum shear force = 0.000000 feet below pile head
Number of iterations = 15
Number of zero deflection points = 21

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 7

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 6.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 450000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	6.0362	-1.25E+07	48279.	0.00	6210.	9.95E+10	0.00	0.00	0.00
2.0000	6.0000	-1.13E+07	48204.	-0.00287	5700.	9.95E+10	-0.4942	1.9767	0.00
4.0000	5.8982	-1.01E+07	48186.	-0.00546	5179.	9.95E+10	-0.9827	3.9988	0.00
6.0000	5.7378	-8903012.	48157.	-0.00776	4645.	9.95E+10	-1.4606	6.1095	0.00
8.0000	5.5259	-7652305.	48116.	-0.00975	4103.	9.95E+10	-1.9232	8.3530	0.00
10.0000	5.2697	-6382778.	48065.	-0.01145	3552.	9.95E+10	-2.3663	10.7770	0.00
12.0000	4.9765	-5097992.	48003.	-0.01283	2994.	9.95E+10	-2.7859	13.4354	0.00
14.0000	4.6539	-3801535.	47931.	-0.01390	2431.	9.95E+10	-3.1784	16.3910	0.00
16.0000	4.3092	-2497009.	46072.	-0.01466	1865.	9.95E+10	-151.7712	845.2874	0.00
18.0000	3.9501	-1273400.	42289.	-0.01512	1334.	9.95E+10	-163.4906	993.3385	0.00
20.0000	3.5836	-140646.	38241.	-0.01529	842.2943	9.95E+10	-173.8151	1164.	0.00
22.0000	3.2163	892357.	33963.	-0.01520	1169.	9.95E+10	-182.6568	1363.	0.00
24.0000	2.8542	1817826.	29492.	-0.01487	1570.	9.95E+10	-189.9368	1597.	0.00
26.0000	2.5026	2629157.	24866.	-0.01433	1922.	9.95E+10	-195.5853	1876.	0.00
28.0000	2.1662	3320985.	20124.	-0.01362	2223.	9.95E+10	-199.5412	2211.	0.00
30.0000	1.8490	3889228.	15309.	-0.01275	2469.	9.95E+10	-201.7527	2619.	0.00
32.0000	1.5544	4331134.	10462.	-0.01176	2661.	9.95E+10	-202.1772	3122.	0.00
34.0000	1.2848	4645306.	5626.	-0.01067	2797.	9.95E+10	-200.7822	3751.	0.00

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36.0000     1.0420   4831731.   846.2019   -0.00953      2878.   9.95E+10
-197.5454      4550.       0.00
38.0000     0.8273   4891787.     -3834.   -0.00836      2904.   9.95E+10
-192.4549      5583.       0.00
40.0000     0.6408   4828250.     -8369.   -0.00719      2877.   9.95E+10
-185.5088      6947.       0.00
42.0000     0.4823   4645286.    -12716.   -0.00604      2797.   9.95E+10
-176.7121      8793.       0.00
44.0000     0.3507   4348439.    -16829.   -0.00496      2669.   9.95E+10
-166.0680     11364.       0.00
46.0000     0.2443   3944613.    -18886.   -0.00396      2493.   9.95E+10
-5.3401   524.7055       0.00
48.0000     0.1606   3527439.    -19009.   -0.00306      2312.   9.95E+10
-4.8656   726.9951       0.00
50.0000    0.09741   3098276.    -19119.   -0.00226      2126.   9.95E+10
-4.3061      1061.       0.00
52.0000    0.05212   2658564.    -19214.   -0.00157      1935.   9.95E+10
-3.6483      1680.       0.00
54.0000    0.02222   2209827.    -19292.  -9.80E-04      1740.   9.95E+10
-2.8605      3090.       0.00
56.0000    0.00510   1753688.    -25883.  -5.02E-04      1542.   9.95E+10
-546.3864   2570056.       0.00
58.0000   -0.00186    978264.    -28480.  -1.72E-04      1206.   9.95E+10
329.9852   4249828.       0.00
60.0000   -0.00317    390363.    -19356.  -7.30E-06   950.6784   9.95E+10
430.3758   3260295.       0.00
62.0000   -0.00221     49342.     -9874.   4.57E-05   802.6659   9.95E+10
359.7671   3900476.       0.00
64.0000  -9.74E-04    -84581.     -2694.   4.15E-05   817.9605   9.95E+10
238.6062   5881263.       0.00
66.0000  -2.23E-04    -80847.   890.8325   2.15E-05   816.3399   9.95E+10
60.0979   6462720.       0.00
68.0000   5.95E-05    -42286.      1414.   6.68E-06   799.6033   9.95E+10
-16.4991   6658560.       0.00
70.0000   9.74E-05    -13118.   882.1948  -8.59E-10   786.9438   9.95E+10
-27.8194   6854400.       0.00
72.0000   5.94E-05    59.2979   338.8710  -1.58E-06   781.2757   9.95E+10
-17.4575   7050240.       0.00
74.0000   2.18E-05      3181.    50.4278  -1.18E-06   782.6308   9.95E+10
-6.5794   7246080.       0.00
76.0000   2.57E-06      2505.   -47.6255  -4.99E-07   782.3374   9.95E+10
-1.5917   1.49E+07       0.00
78.0000  -2.16E-06   906.1241   -50.2303  -8.77E-08   781.6433   9.95E+10
1.3746   1.53E+07       0.00
80.0000  -1.64E-06    96.2600   -20.8694   3.32E-08   781.2918   9.95E+10
1.0721   1.57E+07       0.00
82.0000  -5.68E-07   -96.3242    -3.4449   3.32E-08   781.2918   9.95E+10
0.3799   1.61E+07       0.00
84.0000  -5.08E-08   -69.8125     1.5319   1.31E-08   781.2803   9.95E+10
0.03479   1.65E+07       0.00
86.0000   6.23E-08   -23.0788     1.4248   1.93E-09   781.2600   9.95E+10
-0.04372   1.68E+07       0.00
88.0000   4.18E-08    -1.4656     0.5401  -1.03E-09   781.2506   9.95E+10
-0.03001   1.72E+07       0.00
90.0000   1.28E-08     2.8661    0.06710  -8.62E-10   781.2512   9.95E+10
-0.00940   1.76E+07       0.00
92.0000   4.05E-10     1.7736   -0.04940  -3.03E-10   781.2508   9.95E+10
-3.04E-04   1.80E+07       0.00
94.0000  -1.73E-09     0.5014   -0.03711  -2.86E-11   781.2502   9.95E+10
0.00133   1.84E+07       0.00
96.0000  -9.66E-10   -0.00727   -0.01210   3.10E-11   781.2500   9.95E+10
7.57E-04   1.88E+07       0.00
98.0000  -2.43E-10   -0.07992  -6.80E-04   2.05E-11   781.2500   9.95E+10
```

File name is incorrect below, run designation is "W.Overbank Post Seismic (No scour) 24in"


```
 1.94E-04   1.92E+07       0.00
100.0000   1.74E-11   -0.04037    0.00148   5.99E-12   781.2500   9.95E+10
-1.42E-05   1.96E+07       0.00
102.0000   4.43E-11   -0.00887   8.71E-04       0.00   781.2500   9.95E+10
-3.69E-05   2.00E+07       0.00
104.0000   1.98E-11    0.00142   2.26E-04       0.00   781.2500   9.95E+10
-1.68E-05   2.04E+07       0.00
106.0000   3.60E-12    0.00201  -1.30E-05       0.00   781.2500   9.95E+10
-3.11E-06   2.08E+07       0.00
108.0000  -1.02E-12   8.01E-04  -3.96E-05       0.00   781.2500   9.95E+10
9.01E-07   2.12E+07       0.00
110.0000  -1.01E-12   1.11E-04  -1.79E-05       0.00   781.2500   9.95E+10
9.04E-07   2.15E+07       0.00
112.0000       0.00  -5.86E-05  -3.22E-06       0.00   781.2500   9.95E+10
3.19E-07   2.19E+07       0.00
114.0000       0.00  -4.41E-05   9.48E-07       0.00   781.2500   9.95E+10
2.83E-08   2.23E+07       0.00
116.0000       0.00  -1.33E-05   9.13E-07       0.00   781.2500   9.95E+10
-3.12E-08   2.27E+07       0.00
118.0000       0.00  -3.08E-07   3.12E-07       0.00   781.2500   9.95E+10
-1.89E-08   2.31E+07       0.00
120.0000       0.00   1.75E-06   2.30E-08       0.00   781.2500   9.95E+10
-5.22E-09   2.76E+07       0.00
122.0000       0.00   8.03E-07  -3.38E-08       0.00   781.2500   9.95E+10
4.91E-10   2.81E+07       0.00
124.0000       0.00   1.33E-07  -1.76E-08       0.00   781.2500   9.95E+10
8.62E-10   2.86E+07       0.00
126.0000       0.00  -4.00E-08  -3.46E-09       0.00   781.2500   9.95E+10
3.13E-10   2.90E+07       0.00
128.0000       0.00  -3.30E-08   6.44E-10       0.00   781.2500   9.95E+10
2.91E-11   2.95E+07       0.00
130.0000       0.00  -9.18E-09   6.88E-10       0.00   781.2500   9.95E+10
-2.54E-11   3.00E+07       0.00
132.0000       0.00   3.84E-11   2.14E-10       0.00   781.2500   9.95E+10
-1.42E-11   3.04E+07       0.00
134.0000       0.00   1.09E-09   8.33E-12       0.00   781.2500   9.95E+10
-2.93E-12   3.09E+07       0.00
136.0000       0.00   4.44E-10  -2.15E-11       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
138.0000       0.00   5.69E-11  -9.81E-12       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
140.0000       0.00  -2.73E-11  -1.54E-12       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
142.0000       0.00  -1.74E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
144.0000       0.00  -3.91E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
```

```
  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.52E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.56E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.30E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 7:

```
Pile-head deflection             =     6.03618992 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -12507236. inch-lbs
Maximum shear force              =         48279. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             16
Number of zero deflection points =             21
```

--
Summary of Pile-head Responses for Conventional Analyses

--

Definitions of Pile-head Loading Conditions:

File name is incorrect below, run designation is "W.Overbank Post Seismic (No scour) 24in"

West Overbank Static 24in.lp9o 10/3/2017

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type 1	Load 1	Load Type 2	Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	y, in	0.5000	S, rad	0.00	450000.	0.5055	0.00	9784.	-1891981.
2	y, in	1.0000	S, rad	0.00	450000.	1.0094	0.00	15526.	-3242460.
3	y, in	2.0000	S, rad	0.00	450000.	2.0160	0.00	24468.	-5533482.
4	y, in	3.0000	S, rad	0.00	450000.	3.0217	0.00	31579.	-7488877.
5	y, in	4.0000	S, rad	0.00	450000.	4.0268	0.00	37675.	-9256981.
6	y, in	5.0000	S, rad	0.00	450000.	5.0316	0.00	43190.	-1.09E+07
7	y, in	6.0000	S, rad	0.00	450000.	6.0362	0.00	48279.	-1.25E+07

Maximum pile-head deflection = 6.0361899185 inches
Maximum pile-head rotation = 0.0000000000 radians = 0.000000 deg.

The analysis ended normally.

File name is incorrect below, run designation is "E.Overbank Post Seismic (Full scour) 24in"

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LPile for Windows, Version 2016-09.009

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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--
Files Used for Analysis

--

Path to file locations:
\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis
\L-Pile\East Overbank\Post Seismic (Full Scour)\

Name of input data file:
East Overbank Static 24in.lp9d

Name of output report file:
East Overbank Static 24in.lp9o

Name of plot output file:
East Overbank Static 24in.lp9p

Name of runtime message file:
East Overbank Static 24in.lp9r

--
Date and Time of Analysis

--

Date: October 3, 2017 Time: 11:57:47

--

File name is incorrect below, run designation is "E.Overbank Post Seismic (Full scour) 24in"

Problem Title

Project Name: Harbor River Bridge
Job Number: 18461-007-01
Client: SCDOT
Engineer: HPC
Description: East Overbank - Post Seismic

Program Options and Settings

Computational Options:
- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:
- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed	=	500
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	100

Loading Type and Number of Cycles of Loading:
- Static loading specified

- Analysis uses p-y modification factors for p-y curves
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined	=	1
Total length of pile	=	200.000 ft
Depth of ground surface below top of pile	=	8.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

File name is incorrect below, run designation is "E.Overbank Post Seismic (Full scour) 24in"

East Overbank Static 24in.lp9o 10/3/2017

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	24.0000
2	200.000	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile

Cross-sectional shape	=	rectangular
Length of section	=	200.000000 ft
Width of top of section	=	24.000000 in
Width of bottom of section	=	24.000000 in
Top Section Depth	=	24.000000 in
Bottom Section Depth	=	24.000000 in
Top Area	=	576.000000 sq. in
Bottom Area	=	576.000000 sq. in
Moment of Inertia at Top	=	27648. in^4
Moment of Inertia at Bottom	=	27648. in^4
Elastic Modulus	=	3600000. psi

--
Ground Slope and Pile Batter Angles

--

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

--
Soil and Rock Layering Information

--

The soil profile is modelled using 6 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	8.000000 ft
Distance from top of pile to bottom of layer	=	18.000000 ft
Effective unit weight at top of layer	=	57.600000 pcf
Effective unit weight at bottom of layer	=	57.600000 pcf
Friction angle at top of layer	=	38.000000 deg.
Friction angle at bottom of layer	=	38.000000 deg.

File name is incorrect below, run designation is "E.Overbank Post Seismic (Full scour) 24in"

East Overbank Static 24in.lp9o 10/3/2017

```
   Subgrade k at top of layer                          =   150.000000 pci
   Subgrade k at bottom of layer                       =   150.000000 pci


Layer 2 is soft clay, p-y criteria by Matlock, 1970

   Distance from top of pile to top of layer           =    18.000000 ft
   Distance from top of pile to bottom of layer        =    38.000000 ft
   Effective unit weight at top of layer               =    37.600000 pcf
   Effective unit weight at bottom of layer            =    37.600000 pcf
   Undrained cohesion at top of layer                  =    58.000000 psf
   Undrained cohesion at bottom of layer               =   133.000000 psf
   Epsilon-50 at top of layer                          =     0.020000
   Epsilon-50 at bottom of layer                       =     0.020000


Layer 3 is soft clay, p-y criteria by Matlock, 1970

   Distance from top of pile to top of layer           =    38.000000 ft
   Distance from top of pile to bottom of layer        =    48.000000 ft
   Effective unit weight at top of layer               =    32.600000 pcf
   Effective unit weight at bottom of layer            =    32.600000 pcf
   Undrained cohesion at top of layer                  =   292.000000 psf
   Undrained cohesion at bottom of layer               =   364.000000 psf
   Epsilon-50 at top of layer                          =     0.020000
   Epsilon-50 at bottom of layer                       =     0.020000


Layer 4 is soft clay, p-y criteria by Matlock, 1970

   Distance from top of pile to top of layer           =    48.000000 ft
   Distance from top of pile to bottom of layer        =    68.000000 ft
   Effective unit weight at top of layer               =    37.600000 pcf
   Effective unit weight at bottom of layer            =    37.600000 pcf
   Undrained cohesion at top of layer                  =   132.000000 psf
   Undrained cohesion at bottom of layer               =   192.000000 psf
   Epsilon-50 at top of layer                          =     0.020000
   Epsilon-50 at bottom of layer                       =     0.020000


Layer 5 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer           =    68.000000 ft
   Distance from top of pile to bottom of layer        =    83.000000 ft
   Effective unit weight at top of layer               =    57.600000 pcf
   Effective unit weight at bottom of layer            =    57.600000 pcf
   Undrained cohesion at top of layer                  =        3400. psf
   Undrained cohesion at bottom of layer               =        3400. psf
   Epsilon-50 at top of layer                          =     0.005000
   Epsilon-50 at bottom of layer                       =     0.005000
   Subgrade k at top of layer                          =   400.000000 pci
   Subgrade k at bottom of layer                       =   400.000000 pci


Layer 6 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer           =    83.000000 ft
   Distance from top of pile to bottom of layer        =   210.000000 ft
   Effective unit weight at top of layer               =    57.600000 pcf
   Effective unit weight at bottom of layer            =    57.600000 pcf
   Undrained cohesion at top of layer                  =        6000. psf
   Undrained cohesion at bottom of layer               =        6000. psf
   Epsilon-50 at top of layer                          =     0.005000
```

```
   Epsilon-50 at bottom of layer                        =     0.005000
   Subgrade k at top of layer                           =   800.000000 pci
   Subgrade k at bottom of layer                        =   800.000000 pci


 (Depth of the lowest soil layer extends 10.000 ft below the pile tip)



--------------------------------------------------------------------------------
--
                        Summary of Input Soil Properties
--------------------------------------------------------------------------------
--

Layer         Soil Type          Layer      Effective    Undrained    Angle of
E50
Layer           Name             Depth       Unit Wt.    Cohesion     Friction
or           kpy
 Num.     (p-y Curve Type)        ft           pcf          psf          deg.
 krm          pci
-----   -------------------   ----------   ----------   ----------
----------   ----------   ----------
  1            Sand               8.0000      57.6000       --
  38.0000       --         150.0000
          (Reese, et al.)        18.0000      57.6000       --
          38.0000       --         150.0000
  2            Soft              18.0000      37.6000      58.0000       --
  0.02000       --
               Clay              38.0000      37.6000     133.0000       --
               0.02000       --
  3            Soft              38.0000      32.6000     292.0000       --
  0.02000       --
               Clay              48.0000      32.6000     364.0000       --
               0.02000       --
  4            Soft              48.0000      37.6000     132.0000       --
  0.02000       --
               Clay              68.0000      37.6000     192.0000       --
               0.02000       --
  5         Stiff Clay           68.0000      57.6000        3400.       --
  0.00500     400.0000
          with Free Water        83.0000      57.6000        3400.       --
          0.00500     400.0000
  6         Stiff Clay           83.0000      57.6000        6000.       --
  0.00500     800.0000
          with Free Water       210.0000      57.6000        6000.       --
          0.00500     800.0000


--------------------------------------------------------------------------------
--
                    p-y Modification Factors for Group Action
--------------------------------------------------------------------------------
--

Distribution of p-y modifiers with depth defined using 10 points

Point      Depth X         p-mult         y-mult
 No.          ft
-----     ----------     ----------     ----------
  1            8.000         0.8500         1.0000
  2           18.000         0.8500         1.0000
  3           18.000         0.0850         1.0000
```

4	38.000	0.0850	1.0000
5	38.000	0.8500	1.0000
6	48.000	0.8500	1.0000
7	48.000	0.0850	1.0000
8	68.000	0.0850	1.0000
9	68.000	0.8500	1.0000
10	210.000	0.8500	1.0000

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 7

```
Load    Load         Condition                Condition            Axial Thrust
Compute Top y
 No.    Type            1                        2                  Force, lbs
 vs. Pile Length
-----   ----   --------------------   ------------------------
----------------   ---------------
   1     5     y =     0.500000 in    S =       0.0000 in/in
   450000.          N.A.
   2     5     y =     1.000000 in    S =       0.0000 in/in
   450000.          N.A.
   3     5     y =     2.000000 in    S =       0.0000 in/in
   450000.          N.A.
   4     5     y =     3.000000 in    S =       0.0000 in/in
   450000.          N.A.
   5     5     y =     4.000000 in    S =       0.0000 in/in
   450000.          N.A.
   6     5     y =     5.000000 in    S =       0.0000 in/in
   450000.          N.A.
   7     5     y =     6.000000 in    S =       0.0000 in/in
   450000.          N.A.
```

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

File name is incorrect below, run designation is "E.Overbank Post Seismic (Full scour) 24in"

East Overbank Static 24in.lp9o 10/3/2017

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

---

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

---

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	8.0000	0.00	N.A.	No	0.00	100054.
2	18.0000	10.0000	No	No	100054.	34475.
3	38.0000	30.0000	Yes	No	134530.	58923.
4	48.0000	40.0000	Yes	No	193452.	60384.
5	68.0000	108.9289	No	No	253836.	98351.
6	83.0000	123.9289	Yes	No	352188.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 450000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				
0.00	0.5107	-3700326.	29504.	0.00	2387.	9.95E+10

```
   0.00       0.00       0.00
 2.0000     0.5000  -2988340.     29465.  -8.06E-04      2078.   9.95E+10
 0.00       0.00       0.00
 4.0000     0.4720  -2268572.     29465.   -0.00144      1766.   9.95E+10
 0.00       0.00       0.00
 6.0000     0.4309  -1542897.     29465.   -0.00190      1451.   9.95E+10
 0.00       0.00       0.00
 8.0000     0.3808   -813203.     29465.   -0.00218      1134.   9.95E+10
 0.00       0.00       0.00
10.0000     0.3260    -81392.     27241.   -0.00229   816.5763   9.95E+10
-185.3781     13645.       0.00
12.0000     0.2708    543854.     20779.   -0.00224      1017.   9.95E+10
-353.0789     31290.       0.00
14.0000     0.2187    964310.     11421.   -0.00205      1200.   9.95E+10
-426.7680     46828.       0.00
16.0000     0.1722   1136436.      1257.   -0.00180      1274.   9.95E+10
-420.2584     58566.       0.00
18.0000     0.1323   1063534.     -3808.   -0.00154      1243.   9.95E+10
-1.7729   321.6392       0.00
20.0000    0.09851    986841.     -3851.   -0.00129      1210.   9.95E+10
-1.8147   442.1100       0.00
22.0000    0.07045    906533.     -3894.   -0.00106      1175.   9.95E+10
-1.8086   616.1504       0.00
24.0000    0.04763    822823.     -3937.  -8.52E-04      1138.   9.95E+10
-1.7504   882.0138       0.00
26.0000    0.02957    735961.     -3977.  -6.64E-04      1101.   9.95E+10
-1.6324      1325.       0.00
28.0000    0.01578    646243.     -4014.  -4.97E-04      1062.   9.95E+10
-1.4365      2185.       0.00
30.0000    0.00572    554014.     -4045.  -3.52E-04      1022.   9.95E+10
-1.1041      4635.       0.00
32.0000   -0.00113    459707.     -4050.  -2.30E-04   980.7754   9.95E+10
0.6940     14683.       0.00
34.0000   -0.00533    364602.     -4026.  -1.31E-04   939.4973   9.95E+10
1.2373      5575.       0.00
36.0000   -0.00741    269260.     -3994.  -5.43E-05   898.1164   9.95E+10
1.4686      4758.       0.00
38.0000   -0.00793    174063.     -3671.  -8.24E-07   856.7983   9.95E+10
25.4377     76975.       0.00
40.0000   -0.00745     93065.     -2935.   3.14E-05   821.6428   9.95E+10
35.9176    115750.       0.00
42.0000   -0.00642     32513.     -2074.   4.65E-05   795.3616   9.95E+10
35.8018    133738.       0.00
44.0000   -0.00521     -7502.     -1226.   4.95E-05   784.5060   9.95E+10
34.8978    160627.       0.00
46.0000   -0.00405    -27396.  -405.5932   4.53E-05   793.1406   9.95E+10
33.4537    198388.       0.00
48.0000   -0.00304    -27949.    21.7379   3.87E-05   793.3808   9.95E+10
2.1573     17040.       0.00
50.0000   -0.00219    -27187.    60.5461   3.20E-05   793.0501   9.95E+10
1.0768     11792.       0.00
52.0000   -0.00150    -25735.    85.3578   2.56E-05   792.4195   9.95E+10
0.9909     15833.       0.00
54.0000  -9.61E-04    -23644.   107.9264   1.97E-05   791.5121   9.95E+10
0.8898     22215.       0.00
56.0000  -5.58E-04    -20979.   127.8700   1.43E-05   790.3555   9.95E+10
0.7721     33239.       0.00
58.0000  -2.75E-04    -17815.   144.7459   9.62E-06   788.9822   9.95E+10
0.6342     55323.       0.00
60.0000  -9.58E-05    -14239.   157.9209   5.75E-06   787.4301   9.95E+10
0.4637    116159.       0.00
62.0000   1.09E-06    -10359.   162.4637   2.79E-06   785.7461   9.95E+10
-0.08517   1874358.       0.00
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  64.0000   3.80E-05     -6501.   157.0920   7.56E-07   784.0716   9.95E+10
  -0.3625    228651.       0.00
  66.0000   3.74E-05     -2835.   148.2652  -3.70E-07   782.4804   9.95E+10
  -0.3731    239537.       0.00
  68.0000   2.03E-05   623.6829    84.1272  -6.36E-07   781.5207   9.95E+10
  -4.9718   5875200.       0.00
  70.0000   6.85E-06      1217.     3.6811  -4.14E-07   781.7782   9.95E+10
  -1.7321   6071040.       0.00
  72.0000   4.28E-07   809.3245   -18.4435  -1.70E-07   781.6013   9.95E+10
  -0.1116   6266880.       0.00
  74.0000  -1.31E-06   335.3126   -15.5543  -3.19E-08   781.3955   9.95E+10
  0.3524   6462720.       0.00
  76.0000  -1.10E-06    63.4064    -7.6489   1.62E-08   781.2775   9.95E+10
  0.3064   6658560.       0.00
  78.0000  -5.33E-07   -32.1832    -2.1451   1.99E-08   781.2640   9.95E+10
  0.1523   6854400.       0.00
  80.0000  -1.48E-07   -39.9884     0.2042   1.12E-08   781.2674   9.95E+10
  0.04351   7050240.       0.00
  82.0000   5.45E-09   -22.6256     0.7066   3.67E-09   781.2598   9.95E+10
  -0.00165   7246080.       0.00
  84.0000   2.81E-08    -6.1515     0.4778   2.02E-10   781.2527   9.95E+10
  -0.01742   1.49E+07       0.00
  86.0000   1.51E-08     0.3040     0.1532  -5.03E-10   781.2501   9.95E+10
  -0.00963   1.53E+07       0.00
  88.0000   3.93E-09     1.2108    0.00675  -3.21E-10   781.2505   9.95E+10
  -0.00257   1.57E+07       0.00
  90.0000  -2.57E-10     0.6350   -0.02200  -9.81E-11   781.2503   9.95E+10
  1.72E-04   1.61E+07       0.00
  92.0000  -7.74E-10     0.1568   -0.01357  -2.63E-12   781.2501   9.95E+10
  5.31E-04   1.65E+07       0.00
  94.0000  -3.84E-10   -0.01619   -0.00397   1.43E-11   781.2500   9.95E+10
  2.69E-04   1.68E+07       0.00
  96.0000  -8.68E-11   -0.03407   8.61E-06   8.26E-12   781.2500   9.95E+10
  6.23E-05   1.72E+07       0.00
  98.0000   1.29E-11   -0.01596   6.43E-04   2.23E-12   781.2500   9.95E+10
  -9.45E-06   1.76E+07       0.00
 100.0000   2.02E-11   -0.00325   3.48E-04       0.00   781.2500   9.95E+10
 -1.52E-05   1.80E+07       0.00
 102.0000   8.70E-12   7.44E-04   8.61E-05       0.00   781.2500   9.95E+10
 -6.67E-06   1.84E+07       0.00
 104.0000   1.51E-12   8.91E-04  -8.21E-06       0.00   781.2500   9.95E+10
 -1.19E-06   1.88E+07       0.00
 106.0000       0.00   3.54E-04  -1.76E-05       0.00   781.2500   9.95E+10
 4.07E-07   1.92E+07       0.00
 108.0000       0.00   4.96E-05  -7.93E-06       0.00   781.2500   9.95E+10
 3.95E-07   1.96E+07       0.00
 110.0000       0.00  -2.71E-05  -1.47E-06       0.00   781.2500   9.95E+10
 1.43E-07   2.00E+07       0.00
 112.0000       0.00  -2.11E-05   4.26E-07       0.00   781.2500   9.95E+10
 1.45E-08   2.04E+07       0.00
 114.0000       0.00  -6.72E-06   4.33E-07       0.00   781.2500   9.95E+10
 -1.39E-08   2.08E+07       0.00
 116.0000       0.00  -3.27E-07   1.58E-07       0.00   781.2500   9.95E+10
 -9.06E-09   2.12E+07       0.00
 118.0000       0.00   8.50E-07   1.57E-08       0.00   781.2500   9.95E+10
 -2.77E-09   2.53E+07       0.00
 120.0000       0.00   4.29E-07  -1.60E-08       0.00   781.2500   9.95E+10
 1.34E-10   2.58E+07       0.00
 122.0000       0.00   8.49E-08  -9.29E-09       0.00   781.2500   9.95E+10
 4.22E-10   2.63E+07       0.00
 124.0000       0.00  -1.65E-08  -2.14E-09       0.00   781.2500   9.95E+10
 1.73E-10   2.67E+07       0.00
 126.0000       0.00  -1.80E-08   2.22E-10       0.00   781.2500   9.95E+10
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  2.36E-11   2.72E+07       0.00
  128.0000       0.00  -5.86E-09   3.68E-10       0.00   781.2500   9.95E+10
  -1.15E-11   2.76E+07       0.00
  130.0000       0.00  -3.41E-10   1.34E-10       0.00   781.2500   9.95E+10
  -8.01E-12   2.81E+07       0.00
  132.0000       0.00   5.68E-10   1.30E-11       0.00   781.2500   9.95E+10
  -2.07E-12   2.86E+07       0.00
  134.0000       0.00   2.85E-10  -1.08E-11       0.00   781.2500   9.95E+10
  0.00   2.90E+07       0.00
  136.0000       0.00   5.32E-11  -6.18E-12       0.00   781.2500   9.95E+10
  0.00   2.95E+07       0.00
  138.0000       0.00  -1.14E-11  -1.34E-12       0.00   781.2500   9.95E+10
  0.00   3.00E+07       0.00
  140.0000       0.00  -1.10E-11       0.00       0.00   781.2500   9.95E+10
  0.00   3.04E+07       0.00
  142.0000       0.00  -3.26E-12       0.00       0.00   781.2500   9.95E+10
  0.00   3.09E+07       0.00
  144.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.13E+07       0.00
  146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.18E+07       0.00
  148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.23E+07       0.00
  150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.27E+07       0.00
  152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.32E+07       0.00
  154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.36E+07       0.00
  156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.41E+07       0.00
  158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.46E+07       0.00
  160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.50E+07       0.00
  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.55E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.59E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.64E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.69E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
```

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  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.21E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.51070696 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -3700326. inch-lbs
Maximum shear force              =         29504. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             18
Number of zero deflection points =             21
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 2
-------------------------------------------------------------------------------
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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     1.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     1.0172  -5959968.     44713.       0.00      3368.   9.95E+10
      0.00       0.00       0.00
    2.0000     1.0000  -4880504.     44654.   -0.00131      2900.   9.95E+10
    0.00       0.00       0.00
    4.0000     0.9545  -3788330.     44654.   -0.00235      2425.   9.95E+10
    0.00       0.00       0.00
    6.0000     0.8871  -2686290.     44654.   -0.00313      1947.   9.95E+10
    0.00       0.00       0.00
    8.0000     0.8041  -1577255.     44654.   -0.00365      1466.   9.95E+10
    0.00       0.00       0.00
   10.0000     0.7121   -464113.     41745.   -0.00389   982.6878   9.95E+10
   -242.4405      8172.       0.00
   12.0000     0.6173    510593.     33164.   -0.00389      1003.   9.95E+10
   -472.6074     18375.       0.00
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14.0000     0.5255   1211747.     20192.   -0.00368      1307.   9.95E+10
-608.4576     27790.       0.00
16.0000     0.4407   1559273.      4358.   -0.00335      1458.   9.95E+10
-711.0428     38726.       0.00
18.0000     0.3649   1493179.     -4205.   -0.00298      1429.   9.95E+10
-2.4864   163.5388       0.00
20.0000     0.2977   1421763.     -4266.   -0.00263      1398.   9.95E+10
-2.6238   211.4984       0.00
22.0000     0.2388   1345134.     -4330.   -0.00229      1365.   9.95E+10
-2.7171   273.0363       0.00
24.0000     0.1877   1263437.     -4396.   -0.00198      1330.   9.95E+10
-2.7650   353.5379       0.00
26.0000     0.1439   1176857.     -4462.   -0.00168      1292.   9.95E+10
-2.7663   461.4073       0.00
28.0000     0.1069   1085619.     -4528.   -0.00141      1252.   9.95E+10
-2.7188   610.4881       0.00
30.0000    0.07616    989988.     -4592.   -0.00116      1211.   9.95E+10
-2.6191   825.3193       0.00
32.0000    0.05117    890270.     -4653.  -9.34E-04      1168.   9.95E+10
-2.4608      1154.       0.00
34.0000    0.03133    786816.     -4709.  -7.32E-04      1123.   9.95E+10
-2.2313      1709.       0.00
36.0000    0.01604    680028.     -4759.  -5.55E-04      1076.   9.95E+10
-1.8982      2840.       0.00
38.0000    0.00469    570376.     -5037.  -4.04E-04      1029.   9.95E+10
-21.3125    109161.       0.00
40.0000   -0.00337    446962.     -4962.  -2.82E-04   975.2441   9.95E+10
27.5838    196658.       0.00
42.0000   -0.00883    338273.     -4154.  -1.87E-04   928.0699   9.95E+10
39.7997    108154.       0.00
44.0000   -0.01234    251628.     -3118.  -1.16E-04   890.4634   9.95E+10
46.4839     90409.       0.00
46.0000   -0.01439    191101.     -1948.  -6.24E-05   864.1933   9.95E+10
51.0280     85098.       0.00
48.0000   -0.01534    159470.     -1291.  -2.02E-05   850.4643   9.95E+10
3.6973      5786.       0.00
50.0000   -0.01536    129553.     -1222.   1.47E-05   837.4794   9.95E+10
2.0584      3216.       0.00
52.0000   -0.01463    100483.     -1172.   4.24E-05   824.8626   9.95E+10
2.1134      3466.       0.00
54.0000   -0.01332     72370.     -1121.   6.32E-05   812.6606   9.95E+10
2.1338      3843.       0.00
56.0000   -0.01160     45297.     -1070.   7.74E-05   800.9103   9.95E+10
2.1188      4384.       0.00
58.0000   -0.00961     19327.     -1020.   8.52E-05   789.6384   9.95E+10
2.0665      5162.       0.00
60.0000   -0.00751     -5504.  -971.5197   8.69E-05   783.6387   9.95E+10
1.9738      6310.       0.00
62.0000   -0.00544    -29183.  -925.8027   8.27E-05   793.9161   9.95E+10
1.8360      8103.       0.00
64.0000   -0.00354    -51728.  -884.0229   7.29E-05   803.7016   9.95E+10
1.6457     11164.       0.00
66.0000   -0.00194    -73191.  -847.5807   5.79E-05   813.0171   9.95E+10
1.3912     17239.       0.00
68.0000  -7.59E-04    -93663.    14.0893   3.78E-05   821.9022   9.95E+10
70.4147   2225593.       0.00
70.0000  -1.24E-04    -73331.      1235.   1.76E-05   813.0777   9.95E+10
31.3423   6071040.       0.00
72.0000   8.72E-05    -34755.      1338.   4.60E-06   796.3348   9.95E+10
-22.7575   6266880.       0.00
74.0000   9.71E-05     -9197.   751.4034  -6.95E-07   785.2419   9.95E+10
-26.1414   6462720.       0.00
76.0000   5.38E-05      1327.   258.6626  -1.64E-06   781.8260   9.95E+10
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 -14.9204   6658560.       0.00
 78.0000   1.82E-05      3254.    17.3844  -1.09E-06   782.6623   9.95E+10
 -5.1862   6854400.       0.00
 80.0000   1.37E-06      2185.   -49.6781  -4.36E-07   782.1984   9.95E+10
 -0.4024   7050240.       0.00
 82.0000  -2.77E-06   878.8525   -44.4574  -6.67E-08   781.6314   9.95E+10
 0.8374   7246080.       0.00
 84.0000  -1.83E-06    52.6337   -20.7801   4.56E-08   781.2728   9.95E+10
 1.1357   1.49E+07       0.00
 86.0000  -5.84E-07  -119.5760    -2.6901   3.75E-08   781.3019   9.95E+10
 0.3718   1.53E+07       0.00
 88.0000  -2.91E-08   -77.2998     2.0001   1.38E-08   781.2836   9.95E+10
 0.01902   1.57E+07       0.00
 90.0000   7.86E-08   -23.8679     1.5973   1.61E-09   781.2604   9.95E+10
 -0.05259   1.61E+07       0.00
 92.0000   4.82E-08    -0.6655     0.5697  -1.35E-09   781.2503   9.95E+10
 -0.03304   1.65E+07       0.00
 94.0000   1.40E-08     3.5088    0.05579  -1.00E-09   781.2515   9.95E+10
 -0.00979   1.68E+07       0.00
 96.0000   1.12E-11     2.0340   -0.06181  -3.36E-10   781.2509   9.95E+10
 -8.07E-06   1.72E+07       0.00
 98.0000  -2.16E-09     0.5492   -0.04287  -2.42E-11   781.2502   9.95E+10
 0.00159   1.76E+07       0.00
100.0000  -1.15E-09   -0.02338   -0.01346   3.92E-11   781.2500   9.95E+10
8.65E-04   1.80E+07       0.00
102.0000  -2.80E-10   -0.09770  -5.03E-04   2.46E-11   781.2500   9.95E+10
2.15E-04   1.84E+07       0.00
104.0000   2.67E-11   -0.04804    0.00182   6.99E-12   781.2500   9.95E+10
-2.09E-05   1.88E+07       0.00
106.0000   5.55E-11   -0.01032    0.00104       0.00   781.2500   9.95E+10
-4.44E-05   1.92E+07       0.00
108.0000   2.46E-11    0.00186   2.66E-04  -1.06E-12   781.2500   9.95E+10
-2.00E-05   1.96E+07       0.00
110.0000   4.42E-12    0.00249  -1.83E-05       0.00   781.2500   9.95E+10
-3.68E-06   2.00E+07       0.00
112.0000  -1.32E-12   9.95E-04  -4.90E-05       0.00   781.2500   9.95E+10
1.12E-06   2.04E+07       0.00
114.0000  -1.29E-12   1.40E-04  -2.23E-05       0.00   781.2500   9.95E+10
1.12E-06   2.08E+07       0.00
116.0000       0.00  -7.34E-05  -4.08E-06       0.00   781.2500   9.95E+10
4.00E-07   2.12E+07       0.00
118.0000       0.00  -5.64E-05   1.17E-06       0.00   781.2500   9.95E+10
3.79E-08   2.15E+07       0.00
120.0000       0.00  -1.74E-05   1.16E-06       0.00   781.2500   9.95E+10
-3.86E-08   2.19E+07       0.00
122.0000       0.00  -6.08E-07   4.09E-07       0.00   781.2500   9.95E+10
-2.42E-08   2.23E+07       0.00
124.0000       0.00   2.25E-06   3.48E-08       0.00   781.2500   9.95E+10
-6.99E-09   2.67E+07       0.00
126.0000       0.00   1.07E-06  -4.29E-08       0.00   781.2500   9.95E+10
5.14E-10   2.72E+07       0.00
128.0000       0.00   1.93E-07  -2.34E-08       0.00   781.2500   9.95E+10
1.11E-09   2.76E+07       0.00
130.0000       0.00  -4.84E-08  -4.94E-09       0.00   781.2500   9.95E+10
4.25E-10   2.81E+07       0.00
132.0000       0.00  -4.45E-08   7.36E-10       0.00   781.2500   9.95E+10
4.73E-11   2.86E+07       0.00
134.0000       0.00  -1.32E-08   9.21E-10       0.00   781.2500   9.95E+10
-3.19E-11   2.90E+07       0.00
136.0000       0.00  -3.01E-10   3.06E-10       0.00   781.2500   9.95E+10
-1.94E-11   2.95E+07       0.00
138.0000       0.00   1.45E-09   1.95E-11       0.00   781.2500   9.95E+10
-4.42E-12   3.00E+07       0.00
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Full scour) 24in"


```
140.0000       0.00   6.41E-10  -2.81E-11       0.00   781.2500   9.95E+10
0.00   3.04E+07       0.00
142.0000       0.00   9.76E-11  -1.40E-11       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
144.0000       0.00  -3.39E-11  -2.55E-12       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
146.0000       0.00  -2.50E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
148.0000       0.00  -6.32E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.73E+07       0.00
172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.78E+07       0.00
174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.82E+07       0.00
176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.87E+07       0.00
178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.92E+07       0.00
180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.96E+07       0.00
182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.01E+07       0.00
184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.06E+07       0.00
186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.10E+07       0.00
188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.15E+07       0.00
190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.19E+07       0.00
192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.24E+07       0.00
194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.29E+07       0.00
196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.33E+07       0.00
198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.38E+07       0.00
200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   2.21E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     1.01724528 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -5959968. inch-lbs
Maximum shear force              =         44713. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             19
Number of zero deflection points =             20
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 3

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)

```
Displacement of pile head                                =     2.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     450000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	2.0269	-9290829.	64076.	0.00	4814.	9.95E+10	0.00	0.00	0.00
2.0000	2.0000	-7742922.	63992.	-0.00205	4142.	9.95E+10	0.00	0.00	0.00
4.0000	1.9283	-6174851.	63992.	-0.00373	3461.	9.95E+10	0.00	0.00	0.00
6.0000	1.8209	-4590700.	63992.	-0.00503	2774.	9.95E+10	0.00	0.00	0.00
8.0000	1.6869	-2994594.	63992.	-0.00594	2081.	9.95E+10	0.00	0.00	0.00
10.0000	1.5356	-1390689.	60754.	-0.00647	1385.	9.95E+10	-269.8415	4217.	0.00
12.0000	1.3762	61409.	50730.	-0.00663	807.9030	9.95E+10	-565.5112	9862.	0.00
14.0000	1.2172	1187612.	34243.	-0.00648	1297.	9.95E+10	-808.4046	15940.	0.00
16.0000	1.0650	1845081.	10831.	-0.00612	1582.	9.95E+10	-1143.	25747.	0.00
18.0000	0.9236	1839627.	-2920.	-0.00567	1580.	9.95E+10	-3.3885	88.0532	0.00
20.0000	0.7928	1827431.	-3005.	-0.00523	1574.	9.95E+10	-3.6367	110.0982	0.00
22.0000	0.6725	1808381.	-3094.	-0.00479	1566.	9.95E+10	-3.8369	136.9267	0.00
24.0000	0.5627	1782411.	-3188.	-0.00436	1555.	9.95E+10	-3.9871	170.0433	0.00
26.0000	0.4633	1749503.	-3285.	-0.00393	1541.	9.95E+10			

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-4.0849   211.6210       0.00
28.0000     0.3739   1709687.     -3384.   -0.00352      1523.   9.95E+10
-4.1276   264.9161       0.00
30.0000     0.2945   1663040.     -3483.   -0.00311      1503.   9.95E+10
-4.1111   335.0377       0.00
32.0000     0.2247   1609695.     -3580.   -0.00272      1480.   9.95E+10
-4.0300   430.4988       0.00
34.0000     0.1642   1549837.     -3675.   -0.00233      1454.   9.95E+10
-3.8762   566.6809       0.00
36.0000     0.1126   1483710.     -3765.   -0.00197      1425.   9.95E+10
-3.6361   774.8075       0.00
38.0000    0.06968   1411624.     -4438.   -0.00162      1394.   9.95E+10
-52.4614     18070.       0.00
40.0000    0.03490   1305645.     -5789.   -0.00129      1348.   9.95E+10
-60.0754     41315.       0.00
42.0000    0.00767   1161662.     -6966.  -9.94E-04      1285.   9.95E+10
-37.9798    118801.       0.00
44.0000   -0.01283    992778.     -6857.  -7.35E-04      1212.   9.95E+10
47.0601     88033.       0.00
46.0000   -0.02759    848415.     -5531.  -5.13E-04      1149.   9.95E+10
63.3620     55124.       0.00
48.0000   -0.03743    738339.     -4711.  -3.21E-04      1102.   9.95E+10
4.9764      3191.       0.00
50.0000   -0.04301    629207.     -4617.  -1.56E-04      1054.   9.95E+10
2.9004      1618.       0.00
52.0000   -0.04494    520106.     -4545.  -1.78E-05      1007.   9.95E+10
3.0712      1640.       0.00
54.0000   -0.04387    411421.     -4470.   9.45E-05   959.8181   9.95E+10
3.1734      1736.       0.00
56.0000   -0.04041    303492.     -4394.   1.81E-04   912.9738   9.95E+10
3.2113      1907.       0.00
58.0000   -0.03519    196622.     -4317.   2.41E-04   866.5893   9.95E+10
3.1847      2172.       0.00
60.0000   -0.02884     91074.     -4242.   2.76E-04   820.7788   9.95E+10
3.0907      2572.       0.00
62.0000   -0.02196    -12930.     -4169.   2.85E-04   786.8620   9.95E+10
2.9231      3194.       0.00
64.0000   -0.01516   -115217.     -4102.   2.70E-04   831.2575   9.95E+10
2.6724      4231.       0.00
66.0000   -0.00902   -215665.     -4042.   2.30E-04   874.8545   9.95E+10
2.3229      6179.       0.00
68.0000   -0.00413   -314213.     -2043.   1.66E-04   917.6271   9.95E+10
164.2633    953632.       0.00
70.0000   -0.00106   -317327.      2920.   8.97E-05   918.9788   9.95E+10
249.3558   5628116.       0.00
72.0000   1.71E-04   -175986.      5377.   3.02E-05   857.6328   9.95E+10
-44.6423   6266880.       0.00
74.0000   3.87E-04    -59900.      3591.   1.77E-06   807.2484   9.95E+10
-104.1633   6462720.       0.00
76.0000   2.56E-04     -3657.      1489.  -5.89E-06   782.8372   9.95E+10
-71.0337   6658560.       0.00
78.0000   1.04E-04     11681.   279.5090  -4.92E-06   786.3197   9.95E+10
-29.7255   6854400.       0.00
80.0000   1.97E-05      9866.  -146.7283  -2.33E-06   785.5320   9.95E+10
-5.7943   7050240.       0.00
82.0000  -7.54E-06      4688.  -188.9503  -5.71E-07   783.2846   9.95E+10
2.2758   7246080.       0.00
84.0000  -7.67E-06   808.5100  -104.5499   9.19E-08   781.6009   9.95E+10
4.7576   1.49E+07       0.00
86.0000  -3.13E-06  -332.5548   -23.5805   1.49E-07   781.3943   9.95E+10
1.9899   1.53E+07       0.00
88.0000  -5.06E-07  -326.5793     4.2602   6.98E-08   781.3917   9.95E+10
0.3302   1.57E+07       0.00
```

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 90.0000   2.25E-07  -129.5747     6.4163   1.48E-08   781.3062   9.95E+10
 -0.1505   1.61E+07       0.00
 92.0000   2.06E-07   -18.9167     2.9181  -3.08E-09   781.2582   9.95E+10
 -0.1410   1.65E+07       0.00
 94.0000   7.71E-08    10.5585     0.5764  -4.09E-09   781.2546   9.95E+10
 -0.05411   1.68E+07       0.00
 96.0000   9.58E-09     8.8365    -0.1556  -1.75E-09   781.2538   9.95E+10
 -0.00688   1.72E+07       0.00
 98.0000  -6.82E-09     3.1297    -0.1780  -3.06E-10   781.2514   9.95E+10
 0.00501   1.76E+07       0.00
100.0000  -5.10E-09     0.2989   -0.07195   1.08E-10   781.2501   9.95E+10
0.00383   1.80E+07       0.00
102.0000  -1.66E-09    -0.3262   -0.01073   1.04E-10   781.2501   9.95E+10
0.00127   1.84E+07       0.00
104.0000  -9.97E-11    -0.2183    0.00546   3.86E-11   781.2501   9.95E+10
7.81E-05   1.88E+07       0.00
106.0000   1.95E-10   -0.06474    0.00453   4.47E-12   781.2500   9.95E+10
-1.56E-04   1.92E+07       0.00
108.0000   1.15E-10  -8.01E-04    0.00154  -3.43E-12   781.2500   9.95E+10
-9.36E-05   1.96E+07       0.00
110.0000   3.00E-11    0.00921   1.16E-04  -2.42E-12   781.2500   9.95E+10
-2.50E-05   2.00E+07       0.00
112.0000  -1.41E-12    0.00481  -1.70E-04       0.00   781.2500   9.95E+10
1.20E-06   2.04E+07       0.00
114.0000  -4.99E-12    0.00109  -1.03E-04       0.00   781.2500   9.95E+10
4.32E-06   2.08E+07       0.00
116.0000  -2.28E-12  -1.49E-04  -2.74E-05       0.00   781.2500   9.95E+10
2.01E-06   2.12E+07       0.00
118.0000       0.00  -2.29E-04   1.21E-06       0.00   781.2500   9.95E+10
3.77E-07   2.15E+07       0.00
120.0000       0.00  -9.18E-05   4.51E-06       0.00   781.2500   9.95E+10
-1.02E-07   2.19E+07       0.00
122.0000       0.00  -1.27E-05   2.05E-06       0.00   781.2500   9.95E+10
-1.04E-07   2.23E+07       0.00
124.0000       0.00   6.57E-06   3.68E-07       0.00   781.2500   9.95E+10
-3.62E-08   2.27E+07       0.00
126.0000       0.00   4.98E-06  -1.09E-07       0.00   781.2500   9.95E+10
-3.47E-09   2.72E+07       0.00
128.0000       0.00   1.37E-06  -1.04E-07       0.00   781.2500   9.95E+10
3.86E-09   2.76E+07       0.00
130.0000       0.00  -1.50E-08  -3.22E-08       0.00   781.2500   9.95E+10
2.13E-09   2.81E+07       0.00
132.0000       0.00  -1.74E-07  -1.19E-09       0.00   781.2500   9.95E+10
4.51E-10   2.86E+07       0.00
134.0000       0.00  -7.29E-08   3.42E-09       0.00   781.2500   9.95E+10
-6.71E-11   2.90E+07       0.00
136.0000       0.00  -1.02E-08   1.61E-09       0.00   781.2500   9.95E+10
-8.37E-11   2.95E+07       0.00
138.0000       0.00   4.37E-09   2.74E-10       0.00   781.2500   9.95E+10
-2.75E-11   3.00E+07       0.00
140.0000       0.00   3.03E-09  -7.57E-11       0.00   781.2500   9.95E+10
-1.61E-12   3.04E+07       0.00
142.0000       0.00   7.47E-10  -6.39E-11       0.00   781.2500   9.95E+10
2.59E-12   3.09E+07       0.00
144.0000       0.00  -4.18E-11  -1.77E-11       0.00   781.2500   9.95E+10
1.26E-12   3.13E+07       0.00
146.0000       0.00  -1.03E-10       0.00       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
148.0000       0.00  -3.70E-11   2.07E-12       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
150.0000       0.00  -3.31E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
152.0000       0.00   2.81E-12       0.00       0.00   781.2500   9.95E+10
```

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  0.00   3.32E+07       0.00
  154.0000       0.00   1.48E-12       0.00       0.00   781.2500   9.95E+10
  0.00   3.36E+07       0.00
  156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.41E+07       0.00
  158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.46E+07       0.00
  160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.50E+07       0.00
  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.55E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.59E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.64E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.69E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.21E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 3:

```
Pile-head deflection             =     2.02688319 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -9290829. inch-lbs
Maximum shear force              =         64076. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             19
Number of zero deflection points =             20
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Full scour) 24in"

--

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 4

--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 3.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 450000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				
0.00	3.0313	-1.08E+07	68395.	0.00	5480.	9.95E+10
0.00	0.00	0.00				
2.0000	3.0000	-9172722.	68305.	-0.00241	4762.	9.95E+10
0.00	0.00	0.00				
4.0000	2.9156	-7495408.	68305.	-0.00442	4034.	9.95E+10
0.00	0.00	0.00				
6.0000	2.7878	-5798575.	68305.	-0.00602	3298.	9.95E+10
0.00	0.00	0.00				
8.0000	2.6265	-4086642.	68305.	-0.00722	2555.	9.95E+10
0.00	0.00	0.00				
10.0000	2.4415	-2364067.	65067.	-0.00799	1807.	9.95E+10
-269.8414	2653.	0.00				
12.0000	2.2428	-790763.	55043.	-0.00837	1124.	9.95E+10
-565.5109	6051.	0.00				
14.0000	2.0396	458865.	38556.	-0.00841	980.4101	9.95E+10
-808.4039	9513.	0.00				
16.0000	1.8390	1241658.	15144.	-0.00821	1320.	9.95E+10
-1143.	14911.	0.00				
18.0000	1.6456	1363099.	1384.	-0.00789	1373.	9.95E+10
-4.1079	59.9126	0.00				
20.0000	1.4600	1478625.	1282.	-0.00755	1423.	9.95E+10
-4.4578	73.2764	0.00				
22.0000	1.2831	1587732.	1171.	-0.00718	1470.	9.95E+10
-4.7588	89.0130	0.00				
24.0000	1.1153	1689964.	1054.	-0.00679	1515.	9.95E+10
-5.0082	107.7706	0.00				
26.0000	0.9573	1784910.	931.2669	-0.00637	1556.	9.95E+10
-5.2030	130.4411	0.00				
28.0000	0.8096	1872211.	804.7534	-0.00593	1594.	9.95E+10
-5.3398	158.2854	0.00				
30.0000	0.6728	1951561.	675.7021	-0.00547	1628.	9.95E+10
-5.4145	193.1411	0.00				
32.0000	0.5473	2022709.	545.6599	-0.00499	1659.	9.95E+10
-5.4224	237.7891	0.00				
34.0000	0.4334	2085467.	416.3031	-0.00449	1686.	9.95E+10
-5.3574	296.6384	0.00				
36.0000	0.3317	2139709.	289.4744	-0.00398	1710.	9.95E+10
-5.2117	377.1065	0.00				
38.0000	0.2423	2185376.	-726.7913	-0.00346	1730.	9.95E+10
-79.4771	7872.	0.00				

File name is incorrect below, run designation is "E.Overbank Post Seismic (Full scour) 24in"


```
  40.0000     0.1656   2179573.     -2892.   -0.00293      1727.   9.95E+10
  -100.9373     14631.       0.00
  42.0000     0.1015   2109954.     -5180.   -0.00242      1697.   9.95E+10
  -89.7632     21234.       0.00
  44.0000    0.04955   1983137.     -7144.   -0.00192      1642.   9.95E+10
  -73.8640     35780.       0.00
  46.0000    0.00911   1808610.     -8556.   -0.00147      1566.   9.95E+10
  -43.8290    115429.       0.00
  48.0000   -0.02085   1604128.     -9033.   -0.00106      1477.   9.95E+10
  4.0942      4712.       0.00
  50.0000   -0.04154   1397826.     -8949.  -6.93E-04      1388.   9.95E+10
  2.8668      1656.       0.00
  52.0000   -0.05413   1189536.     -8876.  -3.81E-04      1298.   9.95E+10
  3.2676      1449.       0.00
  54.0000   -0.05984    980030.     -8794.  -1.20E-04      1207.   9.95E+10
  3.5195      1412.       0.00
  56.0000   -0.05988    769999.     -8708.   9.12E-05      1115.   9.95E+10
  3.6611      1467.       0.00
  58.0000   -0.05546    560071.     -8620.   2.52E-04      1024.   9.95E+10
  3.7060      1604.       0.00
  60.0000   -0.04780    350820.     -8531.   3.61E-04   933.5157   9.95E+10
  3.6575      1836.       0.00
  62.0000   -0.03811    142762.     -8445.   4.21E-04   843.2127   9.95E+10
  3.5126      2212.       0.00
  64.0000   -0.02759    -63645.     -8364.   4.30E-04   808.8735   9.95E+10
  3.2630      2838.       0.00
  66.0000   -0.01745   -268006.     -8290.   3.90E-04   897.5720   9.95E+10
  2.8940      3981.       0.00
  68.0000   -0.00885   -470003.     -5371.   3.02E-04   985.2442   9.95E+10
  240.3581    651745.       0.00
  70.0000   -0.00297   -532329.      2518.   1.81E-04      1012.   9.95E+10
  417.0817   3365052.       0.00
  72.0000  -1.79E-04   -353030.      8084.   7.39E-05   934.4748   9.95E+10
  46.7320   6266880.       0.00
  74.0000   5.74E-04   -145894.      6791.   1.38E-05   844.5720   9.95E+10
  -154.4994   6462720.       0.00
  76.0000   4.82E-04    -27370.      3331.  -7.12E-06   793.1292   9.95E+10
  -133.7745   6658560.       0.00
  78.0000   2.32E-04     14172.   930.3742  -8.71E-06   787.4009   9.95E+10
  -66.3192   6854400.       0.00
  80.0000   6.43E-05     17476.   -91.9721  -4.89E-06   788.8352   9.95E+10
  -18.8763   7050240.       0.00
  82.0000  -2.56E-06      9863.  -309.2202  -1.59E-06   785.5307   9.95E+10
  0.7723   7246080.       0.00
  84.0000  -1.23E-05      2668.  -208.4321  -8.41E-08   782.4081   9.95E+10
  7.6267   1.49E+07       0.00
  86.0000  -6.60E-06  -140.1951   -66.5301   2.21E-07   781.3108   9.95E+10
  4.1985   1.53E+07       0.00
  88.0000  -1.71E-06  -529.9532    -2.7821   1.40E-07   781.4800   9.95E+10
  1.1138   1.57E+07       0.00
  90.0000   1.17E-07  -276.7592     9.6440   4.26E-08   781.3701   9.95E+10
  -0.07833   1.61E+07       0.00
  92.0000   3.39E-07   -67.9622     5.9176   1.04E-09   781.2795   9.95E+10
  -0.2322   1.65E+07       0.00
  94.0000   1.67E-07     7.2639     1.7235  -6.27E-09   781.2532   9.95E+10
  -0.1173   1.68E+07       0.00
  96.0000   3.76E-08    14.9023   -0.00813  -3.60E-09   781.2565   9.95E+10
  -0.02700   1.72E+07       0.00
  98.0000  -5.73E-09     6.9515    -0.2816  -9.67E-10   781.2530   9.95E+10
  0.00421   1.76E+07       0.00
 100.0000  -8.82E-09     1.4053    -0.1517   4.04E-11   781.2506   9.95E+10
 0.00662   1.80E+07       0.00
 102.0000  -3.79E-09    -0.3290   -0.03732   1.70E-10   781.2501   9.95E+10
```

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0.00290   1.84E+07       0.00
104.0000  -6.54E-10    -0.3896    0.00368   8.36E-11   781.2502   9.95E+10
5.12E-04   1.88E+07       0.00
106.0000   2.24E-10    -0.1540    0.00768   1.80E-11   781.2501   9.95E+10
-1.79E-04   1.92E+07       0.00
108.0000   2.11E-10   -0.02137    0.00345  -3.11E-12   781.2500   9.95E+10
-1.73E-04   1.96E+07       0.00
110.0000   7.50E-11    0.01190   6.35E-04  -4.25E-12   781.2500   9.95E+10
-6.24E-05   2.00E+07       0.00
112.0000   7.31E-12    0.00921  -1.88E-04  -1.71E-12   781.2500   9.95E+10
-6.20E-06   2.04E+07       0.00
114.0000  -7.05E-12    0.00292  -1.89E-04       0.00   781.2500   9.95E+10
6.10E-06   2.08E+07       0.00
116.0000  -4.53E-12   1.33E-04  -6.80E-05       0.00   781.2500   9.95E+10
3.99E-06   2.12E+07       0.00
118.0000  -1.24E-12  -3.50E-04  -6.72E-06       0.00   781.2500   9.95E+10
1.11E-06   2.15E+07       0.00
120.0000       0.00  -1.91E-04   6.39E-06       0.00   781.2500   9.95E+10
-2.19E-08   2.19E+07       0.00
122.0000       0.00  -4.43E-05   4.09E-06       0.00   781.2500   9.95E+10
-1.70E-07   2.23E+07       0.00
124.0000       0.00   5.09E-06   1.10E-06       0.00   781.2500   9.95E+10
-7.97E-08   2.27E+07       0.00
126.0000       0.00   8.55E-06  -3.77E-08       0.00   781.2500   9.95E+10
-1.50E-08   2.31E+07       0.00
128.0000       0.00   3.32E-06  -1.70E-07       0.00   781.2500   9.95E+10
4.02E-09   2.76E+07       0.00
130.0000       0.00   3.94E-07  -7.40E-08       0.00   781.2500   9.95E+10
3.99E-09   2.81E+07       0.00
132.0000       0.00  -2.35E-07  -1.13E-08       0.00   781.2500   9.95E+10
1.24E-09   2.86E+07       0.00
134.0000       0.00  -1.48E-07   4.17E-09       0.00   781.2500   9.95E+10
4.61E-11   2.90E+07       0.00
136.0000       0.00  -3.50E-08   3.15E-09       0.00   781.2500   9.95E+10
-1.31E-10   2.95E+07       0.00
138.0000       0.00   2.85E-09   8.39E-10       0.00   781.2500   9.95E+10
-6.14E-11   3.00E+07       0.00
140.0000       0.00   5.31E-09  -2.07E-11       0.00   781.2500   9.95E+10
-1.02E-11   3.04E+07       0.00
142.0000       0.00   1.88E-09  -1.07E-10       0.00   781.2500   9.95E+10
3.00E-12   3.09E+07       0.00
144.0000       0.00   1.59E-10  -4.22E-11       0.00   781.2500   9.95E+10
2.45E-12   3.13E+07       0.00
146.0000       0.00  -1.50E-10  -4.94E-12       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
148.0000       0.00  -7.90E-11   2.82E-12       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
150.0000       0.00  -1.49E-11   1.71E-12       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
152.0000       0.00   2.87E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
154.0000       0.00   2.79E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
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  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.64E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.69E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.21E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 4:

```
Pile-head deflection             =     3.03132566 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -10826148. inch-lbs
Maximum shear force              =         68395. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             21
Number of zero deflection points =             20
```

```
-----------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 5
-----------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     4.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Full scour) 24in"

East Overbank Static 24in.lp9o 10/3/2017

Axial load on pile head = 450000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment lb/inch	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load in-lb/inch				
0.00	4.0350	-1.21E+07	71648.	0.00	6029.	9.95E+10
0.00	0.00	0.00				
2.0000	4.0000	-1.04E+07	71554.	-0.00271	5277.	9.95E+10
0.00	0.00	0.00				
4.0000	3.9051	-8597068.	71554.	-0.00499	4513.	9.95E+10
0.00	0.00	0.00				
6.0000	3.7604	-6814673.	71554.	-0.00685	3739.	9.95E+10
0.00	0.00	0.00				
8.0000	3.5763	-5014531.	71554.	-0.00828	2958.	9.95E+10
0.00	0.00	0.00				
10.0000	3.3632	-3201330.	68316.	-0.00927	2171.	9.95E+10
-269.8413	1926.	0.00				
12.0000	3.1315	-1535221.	58292.	-0.00984	1448.	9.95E+10
-565.5106	4334.	0.00				
14.0000	2.8910	-190849.	41805.	-0.01005	864.0837	9.95E+10
-808.4034	6711.	0.00				
16.0000	2.6493	688380.	18393.	-0.00999	1080.	9.95E+10
-1143.	10350.	0.00				
18.0000	2.4117	907700.	4626.	-0.00979	1175.	9.95E+10
-4.6661	46.4351	0.00				
20.0000	2.1793	1121968.	4509.	-0.00955	1268.	9.95E+10
-5.0945	56.1045	0.00				
22.0000	1.9534	1330380.	4382.	-0.00925	1359.	9.95E+10
-5.4744	67.2614	0.00				
24.0000	1.7351	1532174.	4247.	-0.00891	1446.	9.95E+10
-5.8031	80.2669	0.00				
26.0000	1.5258	1726635.	4104.	-0.00851	1531.	9.95E+10
-6.0777	95.5981	0.00				
28.0000	1.3264	1913099.	3956.	-0.00808	1612.	9.95E+10
-6.2949	113.8961	0.00				
30.0000	1.1382	2090956.	3803.	-0.00759	1689.	9.95E+10
-6.4515	136.0400	0.00				
32.0000	0.9620	2259651.	3647.	-0.00707	1762.	9.95E+10
-6.5439	163.2617	0.00				
34.0000	0.7989	2418692.	3490.	-0.00650	1831.	9.95E+10
-6.5684	197.3316	0.00				
36.0000	0.6498	2567651.	3333.	-0.00590	1896.	9.95E+10
-6.5210	240.8652	0.00				
38.0000	0.5155	2706168.	2028.	-0.00527	1956.	9.95E+10
-102.2180	4759.	0.00				
40.0000	0.3969	2778759.	-819.9582	-0.00461	1987.	9.95E+10
-135.0870	8168.	0.00				
42.0000	0.2944	2766304.	-3977.	-0.00394	1982.	9.95E+10
-128.0298	10437.	0.00				
44.0000	0.2079	2672900.	-6943.	-0.00328	1941.	9.95E+10
-119.1306	13752.	0.00				
46.0000	0.1369	2503917.	-9670.	-0.00266	1868.	9.95E+10
-108.0887	18952.	0.00				
48.0000	0.08034	2266153.	-11044.	-0.00208	1765.	9.95E+10
-6.4199	1918.	0.00				
50.0000	0.03691	2018790.	-11154.	-0.00157	1657.	9.95E+10
-2.7566	1792.	0.00				
52.0000	0.00516	1764582.	-11205.	-0.00111	1547.	9.95E+10

```
 -1.4939      6942.       0.00
 54.0000   -0.01637   1504918.    -11196.  -7.16E-04      1434.   9.95E+10
 2.2845      3350.       0.00
 56.0000   -0.02919   1242651.    -11134.  -3.85E-04      1321.   9.95E+10
 2.8814      2369.       0.00
 58.0000   -0.03483    978808.    -11061.  -1.17E-04      1206.   9.95E+10
 3.1736      2187.       0.00
 60.0000   -0.03479    714244.    -10983.   8.74E-05      1091.   9.95E+10
 3.2901      2269.       0.00
 62.0000   -0.03063    449714.    -10905.   2.28E-04   976.4386   9.95E+10
 3.2659      2559.       0.00
 64.0000   -0.02386    185895.    -10828.   3.04E-04   861.9337   9.95E+10
 3.1087      3127.       0.00
 66.0000   -0.01602    -76617.    -10757.   3.18E-04   814.5041   9.95E+10
 2.8127      4214.       0.00
 68.0000   -0.00862   -337310.     -7877.   2.68E-04   927.6521   9.95E+10
 237.1912    660452.       0.00
 70.0000   -0.00317   -460503.   137.0870   1.71E-04   981.1210   9.95E+10
 430.6635   3258965.       0.00
 72.0000  -3.89E-04   -334434.      6523.   7.56E-05   926.4036   9.95E+10
 101.5199   6266880.       0.00
 74.0000   4.59E-04   -149019.      6260.   1.73E-05   845.9282   9.95E+10
 -123.4868   6462720.       0.00
 76.0000   4.44E-04    -34344.      3301.  -4.77E-06   796.1561   9.95E+10
 -123.0649   6658560.       0.00
 78.0000   2.30E-04      9536.      1037.  -7.76E-06   785.3887   9.95E+10
 -65.6359   6854400.       0.00
 80.0000   7.12E-05     15584.    -2.1188  -4.73E-06   788.0137   9.95E+10
 -20.9288   7050240.       0.00
 82.0000   2.85E-06      9536.  -263.6040  -1.70E-06   785.3889   9.95E+10
 -0.8617   7246080.       0.00
 84.0000  -1.04E-05      2967.  -196.9083  -1.92E-07   782.5379   9.95E+10
 6.4196   1.49E+07       0.00
 86.0000  -6.39E-06    88.5315   -71.1025   1.76E-07   781.2884   9.95E+10
 4.0642   1.53E+07       0.00
 88.0000  -1.91E-06  -449.4579    -7.3942   1.32E-07   781.4451   9.95E+10
 1.2448   1.57E+07       0.00
 90.0000  -2.95E-08  -269.2509     7.7803   4.58E-08   781.3669   9.95E+10
 0.01971   1.61E+07       0.00
 92.0000   2.90E-07   -76.9907     5.6328   4.02E-09   781.2834   9.95E+10
 -0.1987   1.65E+07       0.00
 94.0000   1.64E-07     1.0353     1.8711  -5.14E-09   781.2504   9.95E+10
 -0.1148   1.68E+07       0.00
 96.0000   4.33E-08    12.9311     0.1200  -3.45E-09   781.2556   9.95E+10
 -0.03112   1.72E+07       0.00
 98.0000  -2.09E-09     6.8681    -0.2351  -1.06E-09   781.2530   9.95E+10
 0.00153   1.76E+07       0.00
100.0000  -7.77E-09     1.6698    -0.1467  -3.53E-11   781.2507   9.95E+10
0.00583   1.80E+07       0.00
102.0000  -3.78E-09    -0.1750   -0.04199   1.45E-10   781.2501   9.95E+10
0.00290   1.84E+07       0.00
104.0000  -8.10E-10    -0.3488   4.33E-04   8.17E-11   781.2502   9.95E+10
6.35E-04   1.88E+07       0.00
106.0000   1.43E-10    -0.1560    0.00668   2.09E-11   781.2501   9.95E+10
-1.14E-04   1.92E+07       0.00
108.0000   1.93E-10   -0.02855    0.00343  -1.36E-12   781.2500   9.95E+10
-1.57E-04   1.96E+07       0.00
110.0000   7.72E-11    0.00851   7.71E-04  -3.78E-12   781.2500   9.95E+10
-6.43E-05   2.00E+07       0.00
112.0000   1.12E-11    0.00854  -1.14E-04  -1.72E-12   781.2500   9.95E+10
-9.49E-06   2.04E+07       0.00
114.0000  -5.44E-12    0.00307  -1.72E-04       0.00   781.2500   9.95E+10
4.70E-06   2.08E+07       0.00
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Full scour) 24in"


```
116.0000  -4.28E-12   3.07E-04  -6.99E-05       0.00   781.2500   9.95E+10
3.77E-06   2.12E+07       0.00
118.0000  -1.34E-12  -2.86E-04  -1.02E-05       0.00   781.2500   9.95E+10
1.21E-06   2.15E+07       0.00
120.0000       0.00  -1.84E-04   4.93E-06       0.00   781.2500   9.95E+10
5.57E-08   2.19E+07       0.00
122.0000       0.00  -4.99E-05   3.87E-06       0.00   781.2500   9.95E+10
-1.44E-07   2.23E+07       0.00
124.0000       0.00   1.41E-06   1.19E-06       0.00   781.2500   9.95E+10
-7.84E-08   2.27E+07       0.00
126.0000       0.00   7.54E-06   4.00E-08       0.00   781.2500   9.95E+10
-1.79E-08   2.31E+07       0.00
128.0000       0.00   3.37E-06  -1.46E-07       0.00   781.2500   9.95E+10
2.35E-09   2.76E+07       0.00
130.0000       0.00   5.40E-07  -7.39E-08       0.00   781.2500   9.95E+10
3.67E-09   2.81E+07       0.00
132.0000       0.00  -1.78E-07  -1.42E-08       0.00   781.2500   9.95E+10
1.31E-09   2.86E+07       0.00
134.0000       0.00  -1.42E-07   2.90E-09       0.00   781.2500   9.95E+10
1.15E-10   2.90E+07       0.00
136.0000       0.00  -3.90E-08   2.96E-09       0.00   781.2500   9.95E+10
-1.10E-10   2.95E+07       0.00
138.0000       0.00   3.75E-10   9.10E-10       0.00   781.2500   9.95E+10
-6.07E-11   3.00E+07       0.00
140.0000       0.00   4.74E-09   3.19E-11       0.00   781.2500   9.95E+10
-1.25E-11   3.04E+07       0.00
142.0000       0.00   1.93E-09  -9.38E-11       0.00   781.2500   9.95E+10
1.98E-12   3.09E+07       0.00
144.0000       0.00   2.46E-10  -4.26E-11       0.00   781.2500   9.95E+10
2.28E-12   3.13E+07       0.00
146.0000       0.00  -1.20E-10  -6.71E-12       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
148.0000       0.00  -7.68E-11   2.15E-12       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
150.0000       0.00  -1.74E-11   1.63E-12       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
152.0000       0.00   1.63E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
154.0000       0.00   2.57E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.73E+07       0.00
172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.78E+07       0.00
174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.82E+07       0.00
176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.87E+07       0.00
178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
```

```
  0.00   3.92E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.21E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 5:

```
Pile-head deflection             =     4.03498296 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -12090111. inch-lbs
Maximum shear force              =         71648. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             20
Number of zero deflection points =             20
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 6
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     5.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     5.0382  -1.32E+07     74310.       0.00      6512.   9.95E+10
      0.00       0.00       0.00
    2.0000     5.0000  -1.14E+07     74212.   -0.00297      5732.   9.95E+10
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Full scour) 24in"


```
 0.00       0.00       0.00
 4.0000     4.8958  -9577400.     74212.   -0.00550      4938.   9.95E+10
 0.00       0.00       0.00
 6.0000     4.7362  -7724474.     74212.   -0.00758      4134.   9.95E+10
 0.00       0.00       0.00
 8.0000     4.5318  -5851432.     74212.   -0.00922      3321.   9.95E+10
 0.00       0.00       0.00
10.0000     4.2936  -3963152.     70974.   -0.01040      2501.   9.95E+10
-269.8413      1508.       0.00
12.0000     4.0325  -2219980.     60950.   -0.01115      1745.   9.95E+10
-565.5106      3366.       0.00
14.0000     3.7585   -796761.     44463.   -0.01151      1127.   9.95E+10
-808.4034      5162.       0.00
16.0000     3.4799    162893.     21051.   -0.01159   851.9501   9.95E+10
-1143.      7880.       0.00
18.0000     3.2023    464006.      7279.   -0.01151   982.6413   9.95E+10
-5.1286    38.4373       0.00
20.0000     2.9273    760956.      7150.   -0.01137      1112.   9.95E+10
-5.6211    46.0850       0.00
22.0000     2.6568   1052687.      7010.   -0.01115      1238.   9.95E+10
-6.0654    54.7924       0.00
24.0000     2.3923   1338182.      6859.   -0.01086      1362.   9.95E+10
-6.4588    64.7965       0.00
26.0000     2.1356   1616473.      6700.   -0.01050      1483.   9.95E+10
-6.7984    76.4022       0.00
28.0000     1.8882   1886638.      6534.   -0.01008      1600.   9.95E+10
-7.0812    90.0057       0.00
30.0000     1.6517   2147812.      6361.   -0.00959      1713.   9.95E+10
-7.3042   106.1305       0.00
32.0000     1.4277   2399184.      6184.   -0.00904      1823.   9.95E+10
-7.4645   125.4771       0.00
34.0000     1.2176   2640010.      6004.   -0.00844      1927.   9.95E+10
-7.5591   148.9980       0.00
36.0000     1.0227   2869606.      5822.   -0.00777      2027.   9.95E+10
-7.5855   178.0063       0.00
38.0000     0.8445   3087360.      4285.   -0.00705      2121.   9.95E+10
-120.4971      3425.       0.00
40.0000     0.6841   3227668.   895.3755   -0.00629      2182.   9.95E+10
-161.9630      5682.       0.00
42.0000     0.5424   3266280.     -2932.   -0.00551      2199.   9.95E+10
-156.9495      6945.       0.00
44.0000     0.4196   3205983.     -6622.   -0.00473      2173.   9.95E+10
-150.5449      8611.       0.00
46.0000     0.3153   3050623.    -10141.   -0.00398      2105.   9.95E+10
-142.7526     10865.       0.00
48.0000     0.2287   2805093.    -11963.   -0.00327      1999.   9.95E+10
-9.0988   954.7079       0.00
50.0000     0.1584   2547018.    -12126.   -0.00262      1887.   9.95E+10
-4.4792   678.7976       0.00
52.0000     0.1027   2279729.    -12229.   -0.00204      1771.   9.95E+10
-4.0462   945.1553       0.00
54.0000    0.06031   2004174.    -12319.   -0.00153      1651.   9.95E+10
-3.5291      1404.       0.00
56.0000    0.02948   1721366.    -12396.   -0.00108      1528.   9.95E+10
-2.8912      2354.       0.00
58.0000    0.00861   1432410.    -12455.  -6.97E-04      1403.   9.95E+10
-1.9920      5555.       0.00
60.0000   -0.00398   1138577.    -12460.  -3.87E-04      1275.   9.95E+10
1.5962      9633.       0.00
62.0000   -0.00997    842698.    -12414.  -1.48E-04      1147.   9.95E+10
2.2464      5407.       0.00
64.0000   -0.01109    545918.    -12358.   1.93E-05      1018.   9.95E+10
2.4077      5212.       0.00
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Full scour) 24in"


```
 66.0000   -0.00904    249103.    -12301.   1.15E-04   889.3678   9.95E+10
 2.3247      6168.       0.00
 68.0000   -0.00556    -47021.     -9987.   1.39E-04   801.6583   9.95E+10
 190.5140    822217.       0.00
 70.0000   -0.00235   -233287.     -3253.   1.06E-04   882.5028   9.95E+10
 370.6318   3786555.       0.00
 72.0000  -4.87E-04   -205461.      2721.   5.28E-05   870.4257   9.95E+10
 127.2542   6266880.       0.00
 74.0000   1.85E-04   -103802.      3649.   1.55E-05   826.3028   9.95E+10
 -49.9394   6462720.       0.00
 76.0000   2.58E-04    -30637.      2192.  -6.90E-07   794.5474   9.95E+10
 -71.4538   6658560.       0.00
 78.0000   1.52E-04      1450.   812.8760  -4.21E-06   781.8792   9.95E+10
 -43.5085   6854400.       0.00
 80.0000   5.55E-05      8472.    95.0446  -3.01E-06   784.9270   9.95E+10
 -16.3108   7050240.       0.00
 82.0000   7.73E-06      6077.  -128.7066  -1.26E-06   783.8876   9.95E+10
 -2.3352   7246080.       0.00
 84.0000  -4.89E-06      2321.  -120.3542  -2.46E-07   782.2574   9.95E+10
 3.0312   1.49E+07       0.00
 86.0000  -4.08E-06   305.2524   -52.8362   7.06E-08   781.3825   9.95E+10
 2.5953   1.53E+07       0.00
 88.0000  -1.50E-06  -216.5336    -9.9360   8.13E-08   781.3440   9.95E+10
 0.9797   1.57E+07       0.00
 90.0000  -1.77E-07  -173.4285     3.2434   3.42E-08   781.3253   9.95E+10
 0.1185   1.61E+07       0.00
 92.0000   1.43E-07   -61.5897     3.4910   5.91E-09   781.2767   9.95E+10
 -0.09792   1.65E+07       0.00
 94.0000   1.06E-07    -5.9896     1.4196  -2.24E-09   781.2526   9.95E+10
 -0.07470   1.68E+07       0.00
 96.0000   3.54E-08     6.5999     0.2184  -2.17E-09   781.2529   9.95E+10
 -0.02540   1.72E+07       0.00
 98.0000   2.50E-09     4.5399    -0.1085  -8.22E-10   781.2520   9.95E+10
 -0.00184   1.76E+07       0.00
100.0000  -4.10E-09     1.4094   -0.09364  -1.05E-10   781.2506   9.95E+10
0.00308   1.80E+07       0.00
102.0000  -2.54E-09    0.04734   -0.03332   7.05E-11   781.2500   9.95E+10
0.00195   1.84E+07       0.00
104.0000  -7.14E-10    -0.1913   -0.00320   5.32E-11   781.2501   9.95E+10
5.59E-04   1.88E+07       0.00
106.0000   8.35E-12    -0.1073    0.00343   1.72E-11   781.2500   9.95E+10
-6.68E-06   1.92E+07       0.00
108.0000   1.09E-10   -0.02695    0.00228       0.00   781.2500   9.95E+10
-8.93E-05   1.96E+07       0.00
110.0000   5.45E-11    0.00210   6.65E-04  -2.04E-12   781.2500   9.95E+10
-4.53E-05   2.00E+07       0.00
112.0000   1.17E-11    0.00503   2.30E-06  -1.17E-12   781.2500   9.95E+10
-9.93E-06   2.04E+07       0.00
114.0000  -1.93E-12    0.00224  -9.68E-05       0.00   781.2500   9.95E+10
1.67E-06   2.08E+07       0.00
116.0000  -2.61E-12   3.94E-04  -4.92E-05       0.00   781.2500   9.95E+10
2.30E-06   2.12E+07       0.00
118.0000  -1.01E-12  -1.24E-04  -1.06E-05       0.00   781.2500   9.95E+10
9.11E-07   2.15E+07       0.00
120.0000       0.00  -1.17E-04   1.76E-06       0.00   781.2500   9.95E+10
1.21E-07   2.19E+07       0.00
122.0000       0.00  -3.96E-05   2.37E-06       0.00   781.2500   9.95E+10
-7.03E-08   2.23E+07       0.00
124.0000       0.00  -3.00E-06   9.07E-07       0.00   781.2500   9.95E+10
-5.14E-08   2.27E+07       0.00
126.0000       0.00   4.01E-06   1.10E-07       0.00   781.2500   9.95E+10
-1.51E-08   2.31E+07       0.00
128.0000       0.00   2.33E-06  -7.28E-08       0.00   781.2500   9.95E+10
```

```
-2.07E-10   2.76E+07       0.00
130.0000       0.00   5.21E-07  -4.97E-08       0.00   781.2500   9.95E+10
2.13E-09   2.81E+07       0.00
132.0000       0.00  -5.86E-08  -1.27E-08       0.00   781.2500   9.95E+10
9.55E-10   2.86E+07       0.00
134.0000       0.00  -8.82E-08   5.94E-10       0.00   781.2500   9.95E+10
1.51E-10   2.90E+07       0.00
136.0000       0.00  -3.05E-08   1.79E-09       0.00   781.2500   9.95E+10
-5.15E-11   2.95E+07       0.00
138.0000       0.00  -2.40E-09   6.89E-10       0.00   781.2500   9.95E+10
-4.01E-11   3.00E+07       0.00
140.0000       0.00   2.58E-09   7.79E-11       0.00   781.2500   9.95E+10
-1.08E-11   3.04E+07       0.00
142.0000       0.00   1.35E-09  -4.85E-11       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
144.0000       0.00   2.59E-10  -2.92E-11       0.00   781.2500   9.95E+10
1.37E-12   3.13E+07       0.00
146.0000       0.00  -4.91E-11  -6.42E-12       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
148.0000       0.00  -4.94E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
150.0000       0.00  -1.44E-11   1.03E-12       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
154.0000       0.00   1.50E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.73E+07       0.00
172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.78E+07       0.00
174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.82E+07       0.00
176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.87E+07       0.00
178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.92E+07       0.00
180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.96E+07       0.00
182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.01E+07       0.00
184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.06E+07       0.00
186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.10E+07       0.00
188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.15E+07       0.00
190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.19E+07       0.00
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Full scour) 24in"


```
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.21E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 6:

```
Pile-head deflection             =     5.03820506 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -13203669. inch-lbs
Maximum shear force              =         74310. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             18
Number of zero deflection points =             20
```

```
--------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 7
--------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     6.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     6.0412  -1.42E+07     76664.       0.00      6962.   9.95E+10
      0.00       0.00       0.00
    2.0000     6.0000  -1.24E+07     76563.   -0.00321      6156.   9.95E+10
    0.00       0.00       0.00
    4.0000     5.8871  -1.05E+07     76563.   -0.00597      5336.   9.95E+10
    0.00       0.00       0.00
    6.0000     5.7135  -8579613.     76563.   -0.00827      4505.   9.95E+10
    0.00       0.00       0.00
    8.0000     5.4903  -6641627.     76563.   -0.01010      3664.   9.95E+10
    0.00       0.00       0.00
   10.0000     5.2286  -4686345.     73325.   -0.01147      2815.   9.95E+10
   -269.8413      1239.       0.00
   12.0000     4.9398  -2874288.     63301.   -0.01238      2029.   9.95E+10
   -565.5105      2748.       0.00
   14.0000     4.6343  -1380480.     46814.   -0.01289      1380.   9.95E+10
   -808.4033      4187.       0.00
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Full scour) 24in"


```
   16.0000     4.3209   -348717.     23403.   -0.01310   932.6028   9.95E+10
   -1143.      6346.       0.00
   18.0000     4.0055     25837.      9625.   -0.01314   792.4641   9.95E+10
   -5.5258    33.1099       0.00
   20.0000     3.6902    397141.      9486.   -0.01309   953.6203   9.95E+10
   -6.0722    39.4920       0.00
   22.0000     3.3772    763913.      9335.   -0.01295      1113.   9.95E+10
   -6.5704    46.6932       0.00
   24.0000     3.0686   1124912.      9171.   -0.01272      1269.   9.95E+10
   -7.0177    54.8870       0.00
   26.0000     2.7665   1478938.      8998.   -0.01241      1423.   9.95E+10
   -7.4110    64.2925       0.00
   28.0000     2.4730   1824845.      8816.   -0.01201      1573.   9.95E+10
   -7.7475    75.1889       0.00
   30.0000     2.1900   2161537.      8627.   -0.01153      1719.   9.95E+10
   -8.0243    87.9363       0.00
   32.0000     1.9196   2487977.      8432.   -0.01097      1861.   9.95E+10
   -8.2386   103.0042       0.00
   34.0000     1.6635   2803193.      8233.   -0.01033      1998.   9.95E+10
   -8.3878   121.0107       0.00
   36.0000     1.4237   3106278.      8030.   -0.00962      2129.   9.95E+10
   -8.4698   142.7771       0.00
   38.0000     1.2019   3396395.      6302.   -0.00883      2255.   9.95E+10
   -135.5397      2707.       0.00
   40.0000     0.9997   3599596.      2470.   -0.00799      2344.   9.95E+10
   -183.7939      4412.       0.00
   42.0000     0.8183   3687558.     -1896.   -0.00711      2382.   9.95E+10
   -180.0105      5279.       0.00
   44.0000     0.6583   3662231.     -6155.   -0.00623      2371.   9.95E+10
   -174.9315      6378.       0.00
   46.0000     0.5195   3526607.    -10277.   -0.00536      2312.   9.95E+10
   -168.5967      7789.       0.00
   48.0000     0.4011   3284687.    -12432.   -0.00454      2207.   9.95E+10
   -10.9718   656.5714       0.00
   50.0000     0.3016   3027893.    -12630.   -0.00378      2095.   9.95E+10
   -5.5523   441.7552       0.00
   52.0000     0.2198   2760016.    -12759.   -0.00308      1979.   9.95E+10
   -5.2132   569.3341       0.00
   54.0000     0.1538   2481948.    -12880.   -0.00245      1858.   9.95E+10
   -4.8218   752.2148       0.00
   56.0000     0.1023   2194640.    -12990.   -0.00188      1734.   9.95E+10
   -4.3769      1027.       0.00
   58.0000    0.06344   1899095.    -13089.   -0.00139      1606.   9.95E+10
   -3.8762      1466.       0.00
   60.0000    0.03558   1596373.    -13176.  -9.68E-04      1474.   9.95E+10
   -3.3150      2236.       0.00
   62.0000    0.01696   1287583.    -13248.  -6.21E-04      1340.   9.95E+10
   -2.6819      3796.       0.00
   64.0000    0.00578    973896.    -13303.  -3.48E-04      1204.   9.95E+10
   -1.9387      8045.       0.00
   66.0000   2.48E-04    656556.    -13335.  -1.52E-04      1066.   9.95E+10
   -0.7035     68092.       0.00
   68.0000   -0.00149    337101.    -12161.  -3.17E-05   927.5610   9.95E+10
   98.5424   1588851.       0.00
   70.0000   -0.00127     73528.     -7703.   1.78E-05   813.1632   9.95E+10
   272.9282   5140852.       0.00
   72.0000  -6.34E-04    -33029.     -2440.   2.27E-05   795.5857   9.95E+10
   165.6300   6266880.       0.00
   74.0000  -1.86E-04    -44098.   146.9398   1.34E-05   800.3898   9.95E+10
   49.9765   6462720.       0.00
   76.0000   7.92E-06    -26265.   720.2796   4.90E-06   792.6499   9.95E+10
   -2.1981   6658560.       0.00
   78.0000   4.94E-05     -9630.   524.4604   5.69E-07   785.4299   9.95E+10
```

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 -14.1201   6854400.       0.00
 80.0000   3.52E-05     -1104.   230.8431  -7.25E-07   781.7290   9.95E+10
 -10.3480   7050240.       0.00
 82.0000   1.46E-05      1466.    53.6789  -6.82E-07   781.8862   9.95E+10
 -4.4157   7246080.       0.00
 84.0000   2.51E-06      1488.   -17.9670  -3.26E-07   781.8957   9.95E+10
 -1.5548   1.49E+07       0.00
 86.0000  -1.00E-06   610.3482   -28.9751  -7.26E-08   781.5149   9.95E+10
 0.6375   1.53E+07       0.00
 88.0000  -9.78E-07    98.5221   -13.6641   1.29E-08   781.2928   9.95E+10
 0.6385   1.57E+07       0.00
 90.0000  -3.84E-07   -45.8085    -2.9163   1.92E-08   781.2699   9.95E+10
 0.2572   1.61E+07       0.00
 92.0000  -5.58E-08   -41.8735     0.6293   8.64E-09   781.2682   9.95E+10
 0.03827   1.65E+07       0.00
 94.0000   3.04E-08   -15.7870     0.8326   1.69E-09   781.2569   9.95E+10
 -0.02133   1.68E+07       0.00
 96.0000   2.53E-08    -1.9470     0.3588  -4.49E-10   781.2508   9.95E+10
 -0.01814   1.72E+07       0.00
 98.0000   8.87E-09     1.4469    0.06293  -5.09E-10   781.2506   9.95E+10
 -0.00651   1.76E+07       0.00
100.0000   8.46E-10     1.0848   -0.02286  -2.04E-10   781.2505   9.95E+10
-6.35E-04   1.80E+07       0.00
102.0000  -9.01E-10     0.3541   -0.02218  -3.01E-11   781.2502   9.95E+10
6.91E-04   1.84E+07       0.00
104.0000  -5.98E-10    0.02065   -0.00827   1.51E-11   781.2500   9.95E+10
4.69E-04   1.88E+07       0.00
106.0000  -1.76E-10   -0.04295  -9.54E-04   1.24E-11   781.2500   9.95E+10
1.41E-04   1.92E+07       0.00
108.0000  -2.31E-12   -0.02539   7.58E-04   4.18E-12   781.2500   9.95E+10
1.88E-06   1.96E+07       0.00
110.0000   2.45E-11   -0.00667   5.36E-04       0.00   781.2500   9.95E+10
-2.04E-05   2.00E+07       0.00
112.0000   1.27E-11   3.38E-04   1.62E-04       0.00   781.2500   9.95E+10
-1.08E-05   2.04E+07       0.00
114.0000   2.85E-12    0.00114   3.72E-06       0.00   781.2500   9.95E+10
-2.46E-06   2.08E+07       0.00
116.0000       0.00   5.23E-04  -2.18E-05       0.00   781.2500   9.95E+10
3.37E-07   2.12E+07       0.00
118.0000       0.00   9.65E-05  -1.14E-05       0.00   781.2500   9.95E+10
5.27E-07   2.15E+07       0.00
120.0000       0.00  -2.64E-05  -2.56E-06       0.00   781.2500   9.95E+10
2.13E-07   2.19E+07       0.00
122.0000       0.00  -2.64E-05   3.61E-07       0.00   781.2500   9.95E+10
2.99E-08   2.23E+07       0.00
124.0000       0.00  -9.13E-06   5.34E-07       0.00   781.2500   9.95E+10
-1.55E-08   2.27E+07       0.00
126.0000       0.00  -7.64E-07   2.10E-07       0.00   781.2500   9.95E+10
-1.16E-08   2.31E+07       0.00
128.0000       0.00   9.46E-07   2.64E-08       0.00   781.2500   9.95E+10
-3.73E-09   2.76E+07       0.00
130.0000       0.00   5.07E-07  -1.76E-08       0.00   781.2500   9.95E+10
6.51E-11   2.81E+07       0.00
132.0000       0.00   1.04E-07  -1.09E-08       0.00   781.2500   9.95E+10
4.91E-10   2.86E+07       0.00
134.0000       0.00  -1.68E-08  -2.57E-09       0.00   781.2500   9.95E+10
2.04E-10   2.90E+07       0.00
136.0000       0.00  -1.96E-08   2.21E-10       0.00   781.2500   9.95E+10
2.79E-11   2.95E+07       0.00
138.0000       0.00  -6.28E-09   4.02E-10       0.00   781.2500   9.95E+10
-1.28E-11   3.00E+07       0.00
140.0000       0.00  -3.22E-10   1.43E-10       0.00   781.2500   9.95E+10
-8.74E-12   3.04E+07       0.00
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Full scour) 24in"

East Overbank Static 24in.lp9o 10/3/2017

142.0000	0.00	5.98E-10	1.26E-11	0.00	781.2500	9.95E+10	-2.14E-12	3.09E+07	0.00
144.0000	0.00	2.84E-10	-1.15E-11	0.00	781.2500	9.95E+10	0.00	3.13E+07	0.00
146.0000	0.00	4.76E-11	-6.19E-12	0.00	781.2500	9.95E+10	0.00	3.18E+07	0.00
148.0000	0.00	-1.30E-11	-1.21E-12	0.00	781.2500	9.95E+10	0.00	3.23E+07	0.00
150.0000	0.00	-1.06E-11	0.00	0.00	781.2500	9.95E+10	0.00	3.27E+07	0.00
152.0000	0.00	-2.78E-12	0.00	0.00	781.2500	9.95E+10	0.00	3.32E+07	0.00
154.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	3.36E+07	0.00
156.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	3.41E+07	0.00
158.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	3.46E+07	0.00
160.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	3.50E+07	0.00
162.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	3.55E+07	0.00
164.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	3.59E+07	0.00
166.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	3.64E+07	0.00
168.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	3.69E+07	0.00
170.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	3.73E+07	0.00
172.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	3.78E+07	0.00
174.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	3.82E+07	0.00
176.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	3.87E+07	0.00
178.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	3.92E+07	0.00
180.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	3.96E+07	0.00
182.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	4.01E+07	0.00
184.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	4.06E+07	0.00
186.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	4.10E+07	0.00
188.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	4.15E+07	0.00
190.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	4.19E+07	0.00
192.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	4.24E+07	0.00
194.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	4.29E+07	0.00
196.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	4.33E+07	0.00
198.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	4.38E+07	0.00
200.0000	0.00	0.00	0.00	0.00	781.2500	9.95E+10	0.00	2.21E+07	0.00

* The above values of total stress are combined axial and bending stresses.

File name is incorrect below, run designation is "E.Overbank Post Seismic (Full scour) 24in"

East Overbank Static 24in.lp9o 10/3/2017

Output Summary for Load Case No. 7:

```
Pile-head deflection             =     6.04120263 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -14239630. inch-lbs
Maximum shear force              =         76664. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             17
Number of zero deflection points =             19
```

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Summary of Pile-head Responses for Conventional Analyses

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Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case	Load Type	Pile-head Load 1	Load Type 2	Pile-head Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile No. 1 lbs	Max Moment in Pile 1 in-lbs
1	y, in	0.5000	S, rad	0.00	450000.	0.5107	0.00	29504.	-3700326.
2	y, in	1.0000	S, rad	0.00	450000.	1.0172	0.00	44713.	-5959968.
3	y, in	2.0000	S, rad	0.00	450000.	2.0269	0.00	64076.	-9290829.
4	y, in	3.0000	S, rad	0.00	450000.	3.0313	0.00	68395.	-1.08E+07
5	y, in	4.0000	S, rad	0.00	450000.	4.0350	0.00	71648.	-1.21E+07
6	y, in	5.0000	S, rad	0.00	450000.	5.0382	0.00	74310.	-1.32E+07
7	y, in	6.0000	S, rad	0.00	450000.	6.0412	0.00	76664.	-1.42E+07

Maximum pile-head deflection = 6.0412026336 inches
Maximum pile-head rotation = 0.0000000000 radians = 0.000000 deg.

The analysis ended normally.

File name is incorrect below, run designation is "E.Overbank Post Seismic (Half scour) 24in"

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LPile for Windows, Version 2016-09.009

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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Files Used for Analysis

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Path to file locations:
\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis
\L-Pile\East Overbank\Post Seismic (Half Scour)\

Name of input data file:
East Overbank Static 24in.lp9d

Name of output report file:
East Overbank Static 24in.lp9o

Name of plot output file:
East Overbank Static 24in.lp9p

Name of runtime message file:
East Overbank Static 24in.lp9r

--
Date and Time of Analysis

--

Date: October 3, 2017 Time: 11:56:47

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Problem Title

Project Name: Harbor River Bridge
Job Number: 18461-007-01
Client: SCDOT
Engineer: HPC
Description: East Overbank - Post Seismic

Program Options and Settings

Computational Options:
- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:
- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed	=	500
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	100

Loading Type and Number of Cycles of Loading:
- Static loading specified

- Analysis uses p-y modification factors for p-y curves
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined	=	1
Total length of pile	=	200.000 ft
Depth of ground surface below top of pile	=	4.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

File name is incorrect below, run designation is "E.Overbank Post Seismic (Half scour) 24in"

East Overbank Static 24in.lp9o 10/3/2017

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	24.0000
2	200.000	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile

Cross-sectional shape	=	rectangular
Length of section	=	200.000000 ft
Width of top of section	=	24.000000 in
Width of bottom of section	=	24.000000 in
Top Section Depth	=	24.000000 in
Bottom Section Depth	=	24.000000 in
Top Area	=	576.000000 sq. in
Bottom Area	=	576.000000 sq. in
Moment of Inertia at Top	=	27648. in^4
Moment of Inertia at Bottom	=	27648. in^4
Elastic Modulus	=	3600000. psi

--
Ground Slope and Pile Batter Angles

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Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

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Soil and Rock Layering Information

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The soil profile is modelled using 6 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	4.000000 ft
Distance from top of pile to bottom of layer	=	18.000000 ft
Effective unit weight at top of layer	=	57.600000 pcf
Effective unit weight at bottom of layer	=	57.600000 pcf
Friction angle at top of layer	=	38.000000 deg.
Friction angle at bottom of layer	=	38.000000 deg.

```
   Subgrade k at top of layer                          =   150.000000 pci
   Subgrade k at bottom of layer                       =   150.000000 pci


Layer 2 is soft clay, p-y criteria by Matlock, 1970

   Distance from top of pile to top of layer           =    18.000000 ft
   Distance from top of pile to bottom of layer        =    38.000000 ft
   Effective unit weight at top of layer               =    37.600000 pcf
   Effective unit weight at bottom of layer            =    37.600000 pcf
   Undrained cohesion at top of layer                  =    81.000000 psf
   Undrained cohesion at bottom of layer               =   156.000000 psf
   Epsilon-50 at top of layer                          =     0.020000
   Epsilon-50 at bottom of layer                       =     0.020000


Layer 3 is soft clay, p-y criteria by Matlock, 1970

   Distance from top of pile to top of layer           =    38.000000 ft
   Distance from top of pile to bottom of layer        =    48.000000 ft
   Effective unit weight at top of layer               =    32.600000 pcf
   Effective unit weight at bottom of layer            =    32.600000 pcf
   Undrained cohesion at top of layer                  =   343.000000 psf
   Undrained cohesion at bottom of layer               =   414.000000 psf
   Epsilon-50 at top of layer                          =     0.020000
   Epsilon-50 at bottom of layer                       =     0.020000


Layer 4 is soft clay, p-y criteria by Matlock, 1970

   Distance from top of pile to top of layer           =    48.000000 ft
   Distance from top of pile to bottom of layer        =    68.000000 ft
   Effective unit weight at top of layer               =    37.600000 pcf
   Effective unit weight at bottom of layer            =    37.600000 pcf
   Undrained cohesion at top of layer                  =   151.000000 psf
   Undrained cohesion at bottom of layer               =   211.000000 psf
   Epsilon-50 at top of layer                          =     0.020000
   Epsilon-50 at bottom of layer                       =     0.020000


Layer 5 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer           =    68.000000 ft
   Distance from top of pile to bottom of layer        =    83.000000 ft
   Effective unit weight at top of layer               =    57.600000 pcf
   Effective unit weight at bottom of layer            =    57.600000 pcf
   Undrained cohesion at top of layer                  =        3400. psf
   Undrained cohesion at bottom of layer               =        3400. psf
   Epsilon-50 at top of layer                          =     0.005000
   Epsilon-50 at bottom of layer                       =     0.005000
   Subgrade k at top of layer                          =   400.000000 pci
   Subgrade k at bottom of layer                       =   400.000000 pci


Layer 6 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer           =    83.000000 ft
   Distance from top of pile to bottom of layer        =   210.000000 ft
   Effective unit weight at top of layer               =    57.600000 pcf
   Effective unit weight at bottom of layer            =    57.600000 pcf
   Undrained cohesion at top of layer                  =        6000. psf
   Undrained cohesion at bottom of layer               =        6000. psf
   Epsilon-50 at top of layer                          =     0.005000
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Half scour) 24in"


```
   Epsilon-50 at bottom of layer                        =     0.005000
   Subgrade k at top of layer                           =   800.000000 pci
   Subgrade k at bottom of layer                        =   800.000000 pci


 (Depth of the lowest soil layer extends 10.000 ft below the pile tip)



--------------------------------------------------------------------------------
--
                        Summary of Input Soil Properties
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Layer         Soil Type          Layer      Effective    Undrained    Angle of
E50
Layer           Name             Depth       Unit Wt.    Cohesion     Friction
or           kpy
 Num.     (p-y Curve Type)        ft           pcf          psf          deg.
 krm          pci
-----   -------------------   ----------   ----------   ----------
----------   ----------   ----------
  1            Sand               4.0000      57.6000       --
  38.0000       --         150.0000
          (Reese, et al.)        18.0000      57.6000       --
          38.0000       --         150.0000
  2            Soft              18.0000      37.6000      81.0000       --
  0.02000       --
               Clay              38.0000      37.6000     156.0000       --
               0.02000       --
  3            Soft              38.0000      32.6000     343.0000       --
  0.02000       --
               Clay              48.0000      32.6000     414.0000       --
               0.02000       --
  4            Soft              48.0000      37.6000     151.0000       --
  0.02000       --
               Clay              68.0000      37.6000     211.0000       --
               0.02000       --
  5         Stiff Clay           68.0000      57.6000        3400.       --
  0.00500     400.0000
          with Free Water        83.0000      57.6000        3400.       --
          0.00500     400.0000
  6         Stiff Clay           83.0000      57.6000        6000.       --
  0.00500     800.0000
          with Free Water       210.0000      57.6000        6000.       --
          0.00500     800.0000


--------------------------------------------------------------------------------
--
                    p-y Modification Factors for Group Action
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--

Distribution of p-y modifiers with depth defined using 10 points

Point      Depth X         p-mult         y-mult
 No.          ft
-----     ----------     ----------     ----------
  1            4.000         0.8500         1.0000
  2           18.000         0.8500         1.0000
  3           18.000         0.0850         1.0000
```

4	38.000	0.0850	1.0000
5	38.000	0.8500	1.0000
6	48.000	0.8500	1.0000
7	48.000	0.0850	1.0000
8	68.000	0.0850	1.0000
9	68.000	0.8500	1.0000
10	210.000	0.8500	1.0000

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 7

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	5	y = 0.500000 in	S = 0.0000 in/in	450000.	N.A.
2	5	y = 1.000000 in	S = 0.0000 in/in	450000.	N.A.
3	5	y = 2.000000 in	S = 0.0000 in/in	450000.	N.A.
4	5	y = 3.000000 in	S = 0.0000 in/in	450000.	N.A.
5	5	y = 4.000000 in	S = 0.0000 in/in	450000.	N.A.
6	5	y = 5.000000 in	S = 0.0000 in/in	450000.	N.A.
7	5	y = 6.000000 in	S = 0.0000 in/in	450000.	N.A.

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

File name is incorrect below, run designation is "E.Overbank Post Seismic (Half scour) 24in"

East Overbank Static 24in.lp9o 10/3/2017

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

---

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	4.0000	0.00	N.A.	No	0.00	233395.
2	18.0000	14.0000	No	No	233395.	42772.
3	38.0000	34.0000	Yes	No	276168.	67995.
4	48.0000	44.0000	Yes	No	344163.	67231.
5	68.0000	133.8674	No	No	411394.	98352.
6	83.0000	148.8674	Yes	No	509746.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)

Displacement of pile head = 0.500000 inches

Rotation of pile head = 0.000E+00 radians

Axial load on pile head = 450000.0 lbs

Depth X feet	Deflect. y inches	Bending Soil Res. Distrib. Moment lb/inch	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
		p Es*h Lat. Load lb/inch				
0.00	0.5160	-5535658.	52526.	0.00	3184.	9.95E+10

File name is incorrect below, run designation is "E.Overbank Post Seismic (Half scour) 24in"


```
   0.00       0.00       0.00
  2.0000     0.5000  -4269471.     52457.   -0.00118      2634.   9.95E+10
  0.00       0.00       0.00
  4.0000     0.4593  -2992165.     52457.   -0.00206      2080.   9.95E+10
  0.00       0.00       0.00
  6.0000     0.4012  -1707067.     50092.   -0.00262      1522.   9.95E+10
  -197.1256     11791.       0.00
  8.0000     0.3333   -531067.     43191.   -0.00289      1012.   9.95E+10
  -377.9361     27213.       0.00
 10.0000     0.2623    428624.     33154.   -0.00291   967.2846   9.95E+10
 -458.4809     41947.       0.00
 12.0000     0.1938   1123114.     22266.   -0.00272      1269.   9.95E+10
 -448.9138     55591.       0.00
 14.0000     0.1318   1556104.     11066.   -0.00240      1457.   9.95E+10
 -484.3826     88206.       0.00
 16.0000    0.07879   1706039.  -694.8776   -0.00200      1522.   9.95E+10
 -495.6861    150994.       0.00
 18.0000    0.03565   1566015.     -6662.   -0.00161      1461.   9.95E+10
 -1.5992      1077.       0.00
 20.0000    0.00158   1420991.     -6689.   -0.00125      1398.   9.95E+10
 -0.6175      9377.       0.00
 22.0000   -0.02427   1271912.     -6676.  -9.24E-04      1333.   9.95E+10
 1.6676      1649.       0.00
 24.0000   -0.04276   1120481.     -6630.  -6.35E-04      1268.   9.95E+10
 2.1714      1219.       0.00
 26.0000   -0.05476    967382.     -6574.  -3.84E-04      1201.   9.95E+10
 2.5289      1108.       0.00
 28.0000   -0.06117    813221.     -6510.  -1.69E-04      1134.   9.95E+10
 2.8012      1099.       0.00
 30.0000   -0.06287    658556.     -6440.   8.58E-06      1067.   9.95E+10
 3.0058      1148.       0.00
 32.0000   -0.06076    503907.     -6366.   1.49E-04   999.9597   9.95E+10
 3.1487      1244.       0.00
 34.0000   -0.05573    349760.     -6290.   2.52E-04   933.0554   9.95E+10
 3.2313      1392.       0.00
 36.0000   -0.04868    196563.     -6212.   3.18E-04   866.5636   9.95E+10
 3.2532      1604.       0.00
 38.0000   -0.04049     44727.     -5556.   3.47E-04   800.6630   9.95E+10
 51.4039     30471.       0.00
 40.0000   -0.03204    -77616.     -4122.   3.43E-04   814.9373   9.95E+10
 68.0734     50992.       0.00
 42.0000   -0.02404   -160546.     -2534.   3.14E-04   850.9315   9.95E+10
 64.3216     64213.       0.00
 44.0000   -0.01697   -206009.     -1048.   2.70E-04   870.6638   9.95E+10
 59.4680     84098.       0.00
 46.0000   -0.01109   -216683.   307.7250   2.19E-04   875.2963   9.95E+10
 53.5201    115785.       0.00
 48.0000   -0.00647   -195964.   987.8944   1.69E-04   866.3039   9.95E+10
 3.1607     11724.       0.00
 50.0000   -0.00298   -172915.      1042.   1.25E-04   856.2997   9.95E+10
 1.3578     10933.       0.00
 52.0000  -4.92E-04   -148633.      1068.   8.58E-05   845.7607   9.95E+10
 0.7792     38017.       0.00
 54.0000    0.00114   -123515.      1064.   5.30E-05   834.8589   9.95E+10
 -1.0544     22261.       0.00
 56.0000    0.00205    -98683.      1036.   2.62E-05   824.0812   9.95E+10
 -1.3316     15584.       0.00
 58.0000    0.00239    -74361.      1002.   5.32E-06   813.5247   9.95E+10
 -1.4508     14548.       0.00
 60.0000    0.00231    -50681.   967.2579  -9.76E-06   803.2469   9.95E+10
 -1.4807     15411.       0.00
 62.0000    0.00193    -27722.   932.2198  -1.92E-05   793.2820   9.95E+10
 -1.4391     17942.       0.00
```

```
 64.0000    0.00138     -5519.   898.9981  -2.32E-05   783.6456   9.95E+10
 -1.3293     23055.       0.00
 66.0000   8.11E-04     15932.   869.2963  -2.20E-05   788.1648   9.95E+10
 -1.1458     33924.       0.00
 68.0000   3.30E-04     36681.   296.3305  -1.56E-05   797.1707   9.95E+10
 -46.6013   3393112.       0.00
 70.0000   6.09E-05     30493.  -459.6450  -7.52E-06   794.4847   9.95E+10
 -16.3966   6462720.       0.00
 72.0000  -3.14E-05     14781.  -551.9527  -2.06E-06   787.6652   9.95E+10
 8.7043   6658560.       0.00
 74.0000  -3.81E-05      4044.  -316.9182   2.07E-07   783.0051   9.95E+10
 10.8819   6854400.       0.00
 76.0000  -2.14E-05  -435.8809  -110.7959   6.42E-07   781.4392   9.95E+10
 6.2950   7050240.       0.00
 78.0000  -7.28E-06     -1288.    -8.8853   4.34E-07   781.8092   9.95E+10
 2.1976   7246080.       0.00
 80.0000  -5.84E-07  -871.7552    19.6595   1.74E-07   781.6284   9.95E+10
 0.1812   7441920.       0.00
 82.0000   1.07E-06  -348.4927    17.7655   2.67E-08   781.4013   9.95E+10
 -0.3390   7637760.       0.00
 84.0000   6.98E-07   -19.5865     8.2298  -1.77E-08   781.2585   9.95E+10
 -0.4556   1.57E+07       0.00
 86.0000   2.17E-07    46.9188     1.0165  -1.44E-08   781.2704   9.95E+10
 -0.1455   1.61E+07       0.00
 88.0000   8.32E-09    29.5158    -0.7975  -5.15E-09   781.2628   9.95E+10
 -0.00570   1.65E+07       0.00
 90.0000  -2.99E-08     8.7510    -0.6138  -5.39E-10   781.2538   9.95E+10
 0.02101   1.68E+07       0.00
 92.0000  -1.76E-08    0.06691    -0.2103   5.24E-10   781.2500   9.95E+10
 0.01261   1.72E+07       0.00
 94.0000  -4.80E-09    -1.3526   -0.01662   3.69E-10   781.2506   9.95E+10
 0.00352   1.76E+07       0.00
 96.0000   1.41E-10    -0.7390    0.02439   1.17E-10   781.2503   9.95E+10
 -1.06E-04   1.80E+07       0.00
 98.0000   8.03E-10    -0.1843    0.01573   5.37E-12   781.2501   9.95E+10
 -6.16E-04   1.84E+07       0.00
100.0000   3.99E-10    0.01602    0.00459  -1.49E-11   781.2500   9.95E+10
-3.12E-04   1.88E+07       0.00
102.0000   8.72E-11    0.03637   5.29E-06  -8.60E-12   781.2500   9.95E+10
-6.97E-05   1.92E+07       0.00
104.0000  -1.39E-11    0.01646  -6.95E-04  -2.23E-12   781.2500   9.95E+10
1.14E-05   1.96E+07       0.00
106.0000  -1.98E-11    0.00306  -3.61E-04       0.00   781.2500   9.95E+10
1.65E-05   2.00E+07       0.00
108.0000  -7.98E-12  -8.64E-04  -8.19E-05       0.00   781.2500   9.95E+10
6.77E-06   2.04E+07       0.00
110.0000  -1.16E-12  -8.81E-04   1.15E-05       0.00   781.2500   9.95E+10
1.01E-06   2.08E+07       0.00
112.0000       0.00  -3.17E-04   1.77E-05       0.00   781.2500   9.95E+10
-4.87E-07   2.12E+07       0.00
114.0000       0.00  -3.14E-05   7.21E-06       0.00   781.2500   9.95E+10
-3.90E-07   2.15E+07       0.00
116.0000       0.00   2.93E-05   1.04E-06       0.00   781.2500   9.95E+10
-1.23E-07   2.19E+07       0.00
118.0000       0.00   1.88E-05  -5.08E-07       0.00   781.2500   9.95E+10
-5.76E-09   2.63E+07       0.00
120.0000       0.00   5.00E-06  -3.99E-07       0.00   781.2500   9.95E+10
1.48E-08   2.27E+07       0.00
122.0000       0.00  -3.36E-07  -1.20E-07       0.00   781.2500   9.95E+10
8.51E-09   2.72E+07       0.00
124.0000       0.00  -7.70E-07   9.29E-10       0.00   781.2500   9.95E+10
1.58E-09   2.76E+07       0.00
126.0000       0.00  -2.95E-07   1.54E-08       0.00   781.2500   9.95E+10
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Half scour) 24in"


```
-3.74E-10   2.81E+07       0.00
128.0000       0.00  -3.34E-08   6.58E-09       0.00   781.2500   9.95E+10
-3.59E-10   2.86E+07       0.00
130.0000       0.00   2.13E-08   9.66E-10       0.00   781.2500   9.95E+10
-1.09E-10   2.90E+07       0.00
132.0000       0.00   1.31E-08  -3.83E-10       0.00   781.2500   9.95E+10
-3.16E-12   2.95E+07       0.00
134.0000       0.00   2.99E-09  -2.78E-10       0.00   781.2500   9.95E+10
1.18E-11   3.00E+07       0.00
136.0000       0.00  -2.87E-10  -7.19E-11       0.00   781.2500   9.95E+10
5.37E-12   3.04E+07       0.00
138.0000       0.00  -4.68E-10   2.70E-12       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
140.0000       0.00  -1.60E-10   9.52E-12       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
142.0000       0.00  -1.17E-11   3.61E-12       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
144.0000       0.00   1.34E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
146.0000       0.00   6.72E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
148.0000       0.00   1.19E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.73E+07       0.00
168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.78E+07       0.00
170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.82E+07       0.00
172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.87E+07       0.00
174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.92E+07       0.00
176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.96E+07       0.00
178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.01E+07       0.00
180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.06E+07       0.00
182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.10E+07       0.00
184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.15E+07       0.00
186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.19E+07       0.00
188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.24E+07       0.00
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Half scour) 24in"


```
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.26E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.51601753 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -5535658. inch-lbs
Maximum shear force              =         52526. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             19
Number of zero deflection points =             21
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 2
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     1.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     1.0274  -9453268.     84858.       0.00      4884.   9.95E+10
      0.00       0.00       0.00
    2.0000     1.0000  -7407027.     84747.   -0.00203      3996.   9.95E+10
    0.00       0.00       0.00
    4.0000     0.9298  -5341496.     84747.   -0.00357      3100.   9.95E+10
    0.00       0.00       0.00
    6.0000     0.8287  -3262056.     81634.   -0.00461      2197.   9.95E+10
    -259.4394      7514.       0.00
    8.0000     0.7086  -1323557.     72489.   -0.00516      1356.   9.95E+10
    -502.6298     17023.       0.00
   10.0000     0.5810    328873.     58800.   -0.00528   923.9902   9.95E+10
   -638.0930     26359.       0.00
   12.0000     0.4552   1612906.     42447.   -0.00505      1481.   9.95E+10
   -724.7143     38209.       0.00
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Half scour) 24in"


```
14.0000     0.3388   2475303.     23430.   -0.00455      1856.   9.95E+10
-859.9739     60921.       0.00
16.0000     0.2367   2835909.      1501.   -0.00391      2012.   9.95E+10
-967.5104     98107.       0.00
18.0000     0.1510   2631843.    -10141.   -0.00325      1924.   9.95E+10
-2.5875   411.2903       0.00
20.0000    0.08053   2419434.    -10199.   -0.00264      1831.   9.95E+10
-2.2926   683.2915       0.00
22.0000    0.02406   2199403.    -10247.   -0.00209      1736.   9.95E+10
-1.6626      1658.       0.00
24.0000   -0.01967   1972687.    -10246.   -0.00158      1637.   9.95E+10
1.6763      2045.       0.00
26.0000   -0.05199   1741800.    -10196.   -0.00114      1537.   9.95E+10
2.4854      1147.       0.00
28.0000   -0.07422   1507808.    -10131.  -7.45E-04      1436.   9.95E+10
2.9877   966.0738       0.00
30.0000   -0.08773   1271610.    -10055.  -4.10E-04      1333.   9.95E+10
3.3589   918.8387       0.00
32.0000   -0.09389   1034036.     -9971.  -1.32E-04      1230.   9.95E+10
3.6402   930.5205       0.00
34.0000   -0.09406    795866.     -9881.   8.89E-05      1127.   9.95E+10
3.8470   981.6232       0.00
36.0000   -0.08962    557838.     -9787.   2.52E-04      1023.   9.95E+10
3.9869      1068.       0.00
38.0000   -0.08195    320655.     -8959.   3.58E-04   920.4232   9.95E+10
65.0184     19041.       0.00
40.0000   -0.07243    120087.     -7107.   4.11E-04   833.3712   9.95E+10
89.3311     29599.       0.00
42.0000   -0.06222    -29338.     -4975.   4.22E-04   793.9837   9.95E+10
88.2935     34059.       0.00
44.0000   -0.05217   -127831.     -2878.   4.03E-04   836.7321   9.95E+10
86.4440     39766.       0.00
46.0000   -0.04286   -176199.  -833.4699   3.67E-04   857.7251   9.95E+10
83.9466     47002.       0.00
48.0000   -0.03458   -175754.   240.1516   3.24E-04   857.5322   9.95E+10
5.5219      3833.       0.00
50.0000   -0.02731   -171671.   340.4538   2.82E-04   855.7602   9.95E+10
2.8367      2493.       0.00
52.0000   -0.02103   -165508.   406.8888   2.42E-04   853.0850   9.95E+10
2.6996      3080.       0.00
54.0000   -0.01571   -157358.   469.7623   2.03E-04   849.5478   9.95E+10
2.5399      3879.       0.00
56.0000   -0.01131   -147336.   528.5220   1.66E-04   845.1979   9.95E+10
2.3568      5002.       0.00
58.0000   -0.00775   -135572.   582.5969   1.32E-04   840.0921   9.95E+10
2.1495      6655.       0.00
60.0000   -0.00498   -122218.   631.3875   1.01E-04   834.2958   9.95E+10
1.9164      9233.       0.00
62.0000   -0.00292   -107441.   674.2459   7.30E-05   827.8823   9.95E+10
1.6551     13610.       0.00
64.0000   -0.00148    -91431.   710.4286   4.90E-05   820.9335   9.95E+10
1.3601     22096.       0.00
66.0000  -5.65E-04    -74399.   738.9560   2.90E-05   813.5414   9.95E+10
1.0172     43202.       0.00
68.0000  -8.34E-05    -56588.      1012.   1.32E-05   805.8108   9.95E+10
21.7775   6266880.       0.00
70.0000   7.08E-05    -26086.      1045.   3.28E-06   792.5720   9.95E+10
-19.0631   6462720.       0.00
72.0000   7.40E-05     -6496.   569.8536  -6.48E-07   784.0694   9.95E+10
-20.5379   6658560.       0.00
74.0000   3.97E-05      1281.   187.4459  -1.28E-06   781.8061   9.95E+10
-11.3294   6854400.       0.00
76.0000   1.27E-05      2529.     6.6366  -8.18E-07   782.3477   9.95E+10
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 -3.7381   7050240.       0.00
 78.0000   4.17E-07      1617.   -39.7327  -3.18E-07   781.9520   9.95E+10
 -0.1260   7246080.       0.00
 80.0000  -2.53E-06   628.8367   -31.8307  -4.70E-08   781.5229   9.95E+10
 0.7845   7441920.       0.00
 82.0000  -1.84E-06    90.5344   -15.3950   3.97E-08   781.2893   9.95E+10
 0.5851   7637760.       0.00
 84.0000  -6.23E-07  -110.9825    -3.4926   3.73E-08   781.2982   9.95E+10
 0.4068   1.57E+07       0.00
 86.0000  -4.99E-08   -77.9163     1.7891   1.45E-08   781.2838   9.95E+10
 0.03338   1.61E+07       0.00
 88.0000   7.24E-08   -25.4176     1.5941   2.03E-09   781.2610   9.95E+10
 -0.04963   1.65E+07       0.00
 90.0000   4.76E-08    -1.4411     0.5975  -1.21E-09   781.2506   9.95E+10
 -0.03342   1.68E+07       0.00
 92.0000   1.45E-08     3.2898    0.07162  -9.84E-10   781.2514   9.95E+10
 -0.01041   1.72E+07       0.00
 94.0000   4.02E-10     2.0179   -0.05681  -3.44E-10   781.2509   9.95E+10
 -2.95E-04   1.76E+07       0.00
 96.0000  -2.01E-09     0.5705   -0.04224  -3.18E-11   781.2502   9.95E+10
 0.00151   1.80E+07       0.00
 98.0000  -1.12E-09   -0.00879   -0.01379   3.60E-11   781.2500   9.95E+10
 8.61E-04   1.84E+07       0.00
100.0000  -2.85E-10   -0.09220  -7.84E-04   2.38E-11   781.2500   9.95E+10
2.23E-04   1.88E+07       0.00
102.0000   1.94E-11   -0.04694    0.00171   7.01E-12   781.2500   9.95E+10
-1.55E-05   1.92E+07       0.00
104.0000   5.19E-11   -0.01050    0.00101       0.00   781.2500   9.95E+10
-4.23E-05   1.96E+07       0.00
106.0000   2.36E-11    0.00158   2.67E-04       0.00   781.2500   9.95E+10
-1.96E-05   2.00E+07       0.00
108.0000   4.41E-12    0.00235  -1.32E-05       0.00   781.2500   9.95E+10
-3.74E-06   2.04E+07       0.00
110.0000  -1.16E-12   9.56E-04  -4.61E-05       0.00   781.2500   9.95E+10
1.01E-06   2.08E+07       0.00
112.0000  -1.20E-12   1.40E-04  -2.13E-05       0.00   781.2500   9.95E+10
1.06E-06   2.12E+07       0.00
114.0000       0.00  -6.69E-05  -4.01E-06       0.00   781.2500   9.95E+10
3.84E-07   2.15E+07       0.00
116.0000       0.00  -5.28E-05   1.06E-06       0.00   781.2500   9.95E+10
3.83E-08   2.19E+07       0.00
118.0000       0.00  -1.64E-05   1.09E-06       0.00   781.2500   9.95E+10
-3.58E-08   2.23E+07       0.00
120.0000       0.00  -6.33E-07   3.85E-07       0.00   781.2500   9.95E+10
-2.27E-08   2.27E+07       0.00
122.0000       0.00   2.07E-06   3.36E-08       0.00   781.2500   9.95E+10
-6.56E-09   2.72E+07       0.00
124.0000       0.00   9.90E-07  -3.95E-08       0.00   781.2500   9.95E+10
4.69E-10   2.76E+07       0.00
126.0000       0.00   1.77E-07  -2.15E-08       0.00   781.2500   9.95E+10
1.03E-09   2.81E+07       0.00
128.0000       0.00  -4.45E-08  -4.51E-09       0.00   781.2500   9.95E+10
3.91E-10   2.86E+07       0.00
130.0000       0.00  -4.04E-08   6.82E-10       0.00   781.2500   9.95E+10
4.24E-11   2.90E+07       0.00
132.0000       0.00  -1.19E-08   8.39E-10       0.00   781.2500   9.95E+10
-2.94E-11   2.95E+07       0.00
134.0000       0.00  -2.12E-10   2.75E-10       0.00   781.2500   9.95E+10
-1.76E-11   3.00E+07       0.00
136.0000       0.00   1.31E-09   1.61E-11       0.00   781.2500   9.95E+10
-3.92E-12   3.04E+07       0.00
138.0000       0.00   5.69E-10  -2.56E-11       0.00   781.2500   9.95E+10
0.00   3.09E+07       0.00
```

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140.0000       0.00   8.31E-11  -1.25E-11       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
142.0000       0.00  -3.12E-11  -2.19E-12       0.00   781.2500   9.95E+10
0.00   3.18E+07       0.00
144.0000       0.00  -2.21E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
146.0000       0.00  -5.40E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
148.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.73E+07       0.00
168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.78E+07       0.00
170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.82E+07       0.00
172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.87E+07       0.00
174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.92E+07       0.00
176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.96E+07       0.00
178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.01E+07       0.00
180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.06E+07       0.00
182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.10E+07       0.00
184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.15E+07       0.00
186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.19E+07       0.00
188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.24E+07       0.00
190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.29E+07       0.00
192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.33E+07       0.00
194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.38E+07       0.00
196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.42E+07       0.00
198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.47E+07       0.00
200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   2.26E+07       0.00
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Half scour) 24in"

East Overbank Static 24in.lp9o 10/3/2017

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     1.02735321 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -9453268. inch-lbs
Maximum shear force              =         84858. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             20
Number of zero deflection points =             20
```

--

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 3

--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)

```
Displacement of pile head                                =     2.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     450000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	2.0460	-1.59E+07	133095.	0.00	7674.	9.95E+10	0.00	0.00	0.00
2.0000	2.0000	-1.27E+07	132920.	-0.00344	6281.	9.95E+10	0.00	0.00	0.00
4.0000	1.8807	-9427083.	132920.	-0.00611	4873.	9.95E+10	0.00	0.00	0.00
6.0000	1.7069	-6158768.	129682.	-0.00799	3454.	9.95E+10	-269.8412	3794.	0.00
8.0000	1.4974	-3029843.	119658.	-0.00909	2096.	9.95E+10	-565.5102	9064.	0.00
10.0000	1.2704	-218761.	103171.	-0.00949	876.1984	9.95E+10	-808.4025	15272.	0.00
12.0000	1.0421	2127250.	79760.	-0.00926	1705.	9.95E+10	-1143.	26313.	0.00
14.0000	0.8262	3809606.	47238.	-0.00854	2435.	9.95E+10	-1568.	45539.	0.00
16.0000	0.6322	4579101.	6814.	-0.00753	2769.	9.95E+10	-1801.	68367.	0.00
18.0000	0.4648	4299293.	-14843.	-0.00646	2647.	9.95E+10	-3.7641	194.3539	0.00
20.0000	0.3223	4006121.	-14932.	-0.00546	2520.	9.95E+10	-3.6400	271.0724	0.00
22.0000	0.2029	3700419.	-15016.	-0.00453	2387.	9.95E+10	-3.3842	400.2635	0.00
24.0000	0.1050	3383132.	-15092.	-0.00367	2250.	9.95E+10	-2.9290	669.6140	0.00
26.0000	0.02662	3055347.	-15151.	-0.00290	2107.	9.95E+10			

```
-1.9880      1793.       0.00
28.0000   -0.03407   2718461.    -15147.   -0.00220      1961.   9.95E+10
2.3047      1624.       0.00
30.0000   -0.07902   2375823.    -15080.   -0.00159      1812.   9.95E+10
3.2438   985.2443       0.00
32.0000    -0.1102   2028866.    -14995.   -0.00106      1662.   9.95E+10
3.8400   836.1691       0.00
34.0000    -0.1297   1678837.    -14898.  -6.08E-04      1510.   9.95E+10
4.2816   792.4177       0.00
36.0000    -0.1394   1326903.    -14791.  -2.46E-04      1357.   9.95E+10
4.6196   795.2124       0.00
38.0000    -0.1415    974174.    -13800.   3.14E-05      1204.   9.95E+10
77.9966     13230.       0.00
40.0000    -0.1379    663835.    -11535.   2.29E-04      1069.   9.95E+10
110.7173     19267.       0.00
42.0000    -0.1305    415539.     -8850.   3.59E-04   961.6056   9.95E+10
113.0181     20785.       0.00
44.0000    -0.1207    231260.     -6122.   4.37E-04   881.6234   9.95E+10
114.3196     22734.       0.00
46.0000    -0.1095    112227.     -3373.   4.78E-04   829.9597   9.95E+10
114.7585     25146.       0.00
48.0000   -0.09772     59003.     -1903.   4.99E-04   806.8587   9.95E+10
7.8064      1917.       0.00
50.0000   -0.08557     10121.     -1759.   5.07E-04   785.6427   9.95E+10
4.1506      1164.       0.00
52.0000   -0.07337    -36396.     -1660.   5.04E-04   797.0470   9.95E+10
4.0938      1339.       0.00
54.0000   -0.06137    -80461.     -1563.   4.90E-04   816.1722   9.95E+10
3.9993      1564.       0.00
56.0000   -0.04984   -122012.     -1469.   4.66E-04   834.2067   9.95E+10
3.8638      1860.       0.00
58.0000   -0.03902   -161020.     -1378.   4.32E-04   851.1372   9.95E+10
3.6831      2265.       0.00
60.0000   -0.02913   -197487.     -1293.   3.88E-04   866.9651   9.95E+10
3.4518      2844.       0.00
62.0000   -0.02038   -231452.     -1213.   3.37E-04   881.7067   9.95E+10
3.1627      3725.       0.00
64.0000   -0.01297   -262993.     -1142.   2.77E-04   895.3961   9.95E+10
2.8049      5191.       0.00
66.0000   -0.00708   -292232.     -1080.   2.10E-04   908.0870   9.95E+10
2.3617      8005.       0.00
68.0000   -0.00288   -319351.   604.0401   1.36E-04   919.8571   9.95E+10
137.9410   1147882.       0.00
70.0000  -5.36E-04   -266184.      3990.   6.58E-05   896.7811   9.95E+10
144.2521   6462720.       0.00
72.0000   2.72E-04   -129234.      4815.   1.81E-05   837.3412   9.95E+10
-75.5404   6658560.       0.00
74.0000   3.32E-04    -35459.      2769.  -1.77E-06   796.6403   9.95E+10
-94.9237   6854400.       0.00
76.0000   1.87E-04      3732.   970.1616  -5.60E-06   782.8698   9.95E+10
-55.0070   7050240.       0.00
78.0000   6.37E-05     11229.    79.1648  -3.79E-06   786.1239   9.95E+10
-19.2427   7246080.       0.00
80.0000   5.20E-06      7614.  -171.1073  -1.52E-06   784.5546   9.95E+10
-1.6133   7441920.       0.00
82.0000  -9.27E-06      3049.  -155.0754  -2.35E-07   782.5734   9.95E+10
2.9493   7637760.       0.00
84.0000  -6.09E-06   175.3004   -71.9610   1.53E-07   781.3261   9.95E+10
3.9769   1.57E+07       0.00
86.0000  -1.90E-06  -408.2936    -8.9634   1.25E-07   781.4272   9.95E+10
1.2729   1.61E+07       0.00
88.0000  -7.53E-08  -257.6492     6.9307   4.51E-08   781.3618   9.95E+10
0.05163   1.65E+07       0.00
```

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  90.0000   2.61E-07   -76.5956     5.3553   4.76E-09   781.2832   9.95E+10
  -0.1829   1.68E+07       0.00
  92.0000   1.53E-07    -0.6973     1.8391  -4.55E-09   781.2503   9.95E+10
  -0.1101   1.72E+07       0.00
  94.0000   4.20E-08    11.7782     0.1475  -3.22E-09   781.2551   9.95E+10
  -0.03085  1.76E+07       0.00
  96.0000  -1.17E-09     6.4528    -0.2122  -1.02E-09   781.2528   9.95E+10
  8.75E-04  1.80E+07       0.00
  98.0000  -7.00E-09     1.6145    -0.1373  -4.83E-11   781.2507   9.95E+10
  0.00537   1.84E+07       0.00
 100.0000  -3.48E-09    -0.1372   -0.04018   1.30E-10   781.2501   9.95E+10
 0.00273   1.88E+07       0.00
 102.0000  -7.64E-10    -0.3169  -1.04E-04   7.51E-11   781.2501   9.95E+10
 6.11E-04   1.92E+07       0.00
 104.0000   1.20E-10    -0.1438    0.00605   1.95E-11   781.2501   9.95E+10
 -9.81E-05  1.96E+07       0.00
 106.0000   1.73E-10   -0.02682    0.00315  -1.05E-12   781.2500   9.95E+10
 -1.44E-04  2.00E+07       0.00
 108.0000   6.97E-11    0.00749   7.17E-04  -3.38E-12   781.2500   9.95E+10
 -5.92E-05  2.04E+07       0.00
 110.0000   1.02E-11    0.00769  -9.90E-05  -1.55E-12   781.2500   9.95E+10
 -8.85E-06  2.08E+07       0.00
 112.0000  -4.79E-12    0.00277  -1.55E-04       0.00   781.2500   9.95E+10
 4.23E-06   2.12E+07       0.00
 114.0000  -3.79E-12   2.77E-04  -6.30E-05       0.00   781.2500   9.95E+10
 3.40E-06   2.15E+07       0.00
 116.0000  -1.18E-12  -2.55E-04  -9.14E-06       0.00   781.2500   9.95E+10
 1.08E-06   2.19E+07       0.00
 118.0000       0.00  -1.63E-04   4.41E-06       0.00   781.2500   9.95E+10
 4.77E-08   2.23E+07       0.00
 120.0000       0.00  -4.37E-05   3.43E-06       0.00   781.2500   9.95E+10
 -1.29E-07  2.27E+07       0.00
 122.0000       0.00   1.47E-06   1.05E-06       0.00   781.2500   9.95E+10
 -6.93E-08  2.31E+07       0.00
 124.0000       0.00   6.66E-06   2.95E-08       0.00   781.2500   9.95E+10
 -1.55E-08  2.35E+07       0.00
 126.0000       0.00   2.92E-06  -1.29E-07       0.00   781.2500   9.95E+10
 2.22E-09   2.81E+07       0.00
 128.0000       0.00   4.49E-07  -6.41E-08       0.00   781.2500   9.95E+10
 3.23E-09   2.86E+07       0.00
 130.0000       0.00  -1.60E-07  -1.19E-08       0.00   781.2500   9.95E+10
 1.12E-09   2.90E+07       0.00
 132.0000       0.00  -1.22E-07   2.67E-09       0.00   781.2500   9.95E+10
 8.86E-11   2.95E+07       0.00
 134.0000       0.00  -3.25E-08   2.56E-09       0.00   781.2500   9.95E+10
 -9.79E-11  3.00E+07       0.00
 136.0000       0.00   7.57E-10   7.62E-10       0.00   781.2500   9.95E+10
 -5.19E-11  3.04E+07       0.00
 138.0000       0.00   4.10E-09   1.73E-11       0.00   781.2500   9.95E+10
 -1.01E-11  3.09E+07       0.00
 140.0000       0.00   1.60E-09  -8.17E-11       0.00   781.2500   9.95E+10
 1.88E-12   3.13E+07       0.00
 142.0000       0.00   1.86E-10  -3.57E-11       0.00   781.2500   9.95E+10
 1.96E-12   3.18E+07       0.00
 144.0000       0.00  -1.07E-10  -5.20E-12       0.00   781.2500   9.95E+10
 0.00   3.23E+07       0.00
 146.0000       0.00  -6.41E-11   1.95E-12       0.00   781.2500   9.95E+10
 0.00   3.27E+07       0.00
 148.0000       0.00  -1.37E-11   1.37E-12       0.00   781.2500   9.95E+10
 0.00   3.32E+07       0.00
 150.0000       0.00   1.68E-12       0.00       0.00   781.2500   9.95E+10
 0.00   3.36E+07       0.00
 152.0000       0.00   2.16E-12       0.00       0.00   781.2500   9.95E+10
```

```
  0.00   3.41E+07       0.00
  154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.46E+07       0.00
  156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.50E+07       0.00
  158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.55E+07       0.00
  160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.59E+07       0.00
  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.64E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.69E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.26E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 3:

```
Pile-head deflection             =     2.04595375 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -15881617. inch-lbs
Maximum shear force              =        133095. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             19
Number of zero deflection points =             20
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 4
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     3.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     3.0547  -1.89E+07    149775.       0.00      8987.   9.95E+10
      0.00       0.00       0.00
    2.0000     3.0000  -1.53E+07    149579.   -0.00412      7418.   9.95E+10
    0.00       0.00       0.00
    4.0000     2.8568  -1.16E+07    149579.   -0.00737      5832.   9.95E+10
    0.00       0.00       0.00
    6.0000     2.6463  -7951831.    146341.   -0.00973      4233.   9.95E+10
    -269.8413      2447.       0.00
    8.0000     2.3897  -4401908.    136317.   -0.01122      2692.   9.95E+10
    -565.5107      5679.       0.00
   10.0000     2.1077  -1166255.    119830.   -0.01189      1287.   9.95E+10
   -808.4036      9205.       0.00
   12.0000     1.8189   1606794.     96418.   -0.01184      1479.   9.95E+10
   -1143.     15076.       0.00
   14.0000     1.5395   3717541.     62615.   -0.01120      2395.   9.95E+10
   -1674.     26104.       0.00
   16.0000     1.2815   4854158.     14409.   -0.01016      2888.   9.95E+10
   -2343.     43876.       0.00
   18.0000     1.0516   4628694.    -13764.   -0.00902      2790.   9.95E+10
   -4.9415   112.7742       0.00
   20.0000     0.8485   4388330.    -13883.   -0.00793      2686.   9.95E+10
   -5.0264   142.1653       0.00
   22.0000     0.6709   4133643.    -14004.   -0.00691      2575.   9.95E+10
   -5.0416   180.3649       0.00
   24.0000     0.5171   3865287.    -14124.   -0.00594      2459.   9.95E+10
   -4.9837   231.3118       0.00
   26.0000     0.3857   3583994.    -14242.   -0.00504      2337.   9.95E+10
   -4.8472   301.6236       0.00
   28.0000     0.2750   3290577.    -14356.   -0.00421      2209.   9.95E+10
   -4.6232   403.4267       0.00
   30.0000     0.1834   2985927.    -14463.   -0.00346      2077.   9.95E+10
   -4.2949   561.9708       0.00
   32.0000     0.1091   2671027.    -14561.   -0.00278      1941.   9.95E+10
   -3.8268   841.9471       0.00
   34.0000    0.05021   2346967.    -14644.   -0.00217      1800.   9.95E+10
   -3.1208      1492.       0.00
   36.0000    0.00491   2014998.    -14700.   -0.00164      1656.   9.95E+10
   -1.5158      7405.       0.00
   38.0000   -0.02872   1676909.    -14168.   -0.00120      1509.   9.95E+10
   45.8314     38297.       0.00
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Half scour) 24in"


```
 40.0000   -0.05265   1360851.    -12654.  -8.33E-04      1372.   9.95E+10
 80.3097     36607.       0.00
 42.0000   -0.06871   1087508.    -10595.  -5.38E-04      1253.   9.95E+10
 91.2506     31875.       0.00
 44.0000   -0.07847    863893.     -8312.  -3.03E-04      1156.   9.95E+10
 99.0299     30289.       0.00
 46.0000   -0.08323    695070.     -5867.  -1.15E-04      1083.   9.95E+10
 104.7137     30195.       0.00
 48.0000   -0.08397    584751.     -4521.   3.97E-05      1035.   9.95E+10
 7.4210      2121.       0.00
 50.0000   -0.08132    477185.     -4383.   1.68E-04   988.3615   9.95E+10
 4.0805      1204.       0.00
 52.0000   -0.07592    370726.     -4285.   2.70E-04   942.1554   9.95E+10
 4.1404      1309.       0.00
 54.0000   -0.06837    265687.     -4185.   3.47E-04   896.5653   9.95E+10
 4.1455      1455.       0.00
 56.0000   -0.05928    162343.     -4086.   3.98E-04   851.7114   9.95E+10
 4.0933      1657.       0.00
 58.0000   -0.04925     60934.     -3990.   4.25E-04   807.6972   9.95E+10
 3.9800      1940.       0.00
 60.0000   -0.03887    -38340.     -3896.   4.28E-04   797.8908   9.95E+10
 3.8000      2346.       0.00
 62.0000   -0.02871   -135326.     -3808.   4.07E-04   839.9854   9.95E+10
 3.5452      2964.       0.00
 64.0000   -0.01933   -229918.     -3727.   3.63E-04   881.0408   9.95E+10
 3.2040      3977.       0.00
 66.0000   -0.01129   -322065.     -3656.   2.96E-04   921.0354   9.95E+10
 2.7587      5865.       0.00
 68.0000   -0.00511   -411785.     -1420.   2.08E-04   959.9762   9.95E+10
 183.5333    862594.       0.00
 70.0000   -0.00131   -394717.      4101.   1.11E-04   952.5683   9.95E+10
 276.5500   5075046.       0.00
 72.0000   2.07E-04   -217329.      6732.   3.69E-05   875.5767   9.95E+10
 -57.3164   6658560.       0.00
 74.0000   4.63E-04    -72388.      4456.   1.97E-06   812.6686   9.95E+10
 -132.3189   6854400.       0.00
 76.0000   3.01E-04     -3475.      1807.  -7.18E-06   782.7584   9.95E+10
 -88.4507   7050240.       0.00
 78.0000   1.19E-04     14499.   315.1660  -5.85E-06   787.5431   9.95E+10
 -35.8630   7246080.       0.00
 80.0000   2.04E-05     11779.  -191.0041  -2.68E-06   786.3624   9.95E+10
 -6.3179   7441920.       0.00
 82.0000  -9.87E-06      5389.  -229.1340  -6.10E-07   783.5889   9.95E+10
 3.1404   7637760.       0.00
 84.0000  -8.93E-06   793.6758  -121.5327   1.35E-07   781.5945   9.95E+10
 5.8264   1.57E+07       0.00
 86.0000  -3.39E-06  -447.5992   -24.4004   1.77E-07   781.4443   9.95E+10
 2.2680   1.61E+07       0.00
 88.0000  -4.44E-07  -381.3615     6.4670   7.68E-08   781.4155   9.95E+10
 0.3043   1.65E+07       0.00
 90.0000   2.95E-07  -138.8400     7.6385   1.40E-08   781.3103   9.95E+10
 -0.2067   1.68E+07       0.00
 92.0000   2.30E-07   -15.0190     3.1794  -4.52E-09   781.2565   9.95E+10
 -0.1649   1.72E+07       0.00
 94.0000   7.78E-08    13.8691     0.5155  -4.66E-09   781.2560   9.95E+10
 -0.05711   1.76E+07       0.00
 96.0000   6.17E-09     9.8264    -0.2254  -1.80E-09   781.2543   9.95E+10
 -0.00463   1.80E+07       0.00
 98.0000  -8.55E-09     3.0896    -0.2022  -2.41E-10   781.2513   9.95E+10
 0.00656   1.84E+07       0.00
100.0000  -5.40E-09     0.1246   -0.07272   1.46E-10   781.2501   9.95E+10
0.00423   1.88E+07       0.00
102.0000  -1.53E-09    -0.4039   -0.00730   1.13E-10   781.2502   9.95E+10
```

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0.00122   1.92E+07       0.00
104.0000   1.13E-11    -0.2282    0.00724   3.66E-11   781.2501   9.95E+10
-9.24E-06   1.96E+07       0.00
106.0000   2.28E-10   -0.05729    0.00485   2.13E-12   781.2500   9.95E+10
-1.90E-04   2.00E+07       0.00
108.0000   1.14E-10    0.00438    0.00141  -4.25E-12   781.2500   9.95E+10
-9.63E-05   2.04E+07       0.00
110.0000   2.42E-11    0.01055   4.58E-06  -2.45E-12   781.2500   9.95E+10
-2.09E-05   2.08E+07       0.00
112.0000  -4.07E-12    0.00465  -2.03E-04       0.00   781.2500   9.95E+10
3.58E-06   2.12E+07       0.00
114.0000  -5.39E-12   8.03E-04  -1.02E-04       0.00   781.2500   9.95E+10
4.84E-06   2.15E+07       0.00
116.0000  -2.06E-12  -2.62E-04  -2.17E-05       0.00   781.2500   9.95E+10
1.89E-06   2.19E+07       0.00
118.0000       0.00  -2.40E-04   3.82E-06       0.00   781.2500   9.95E+10
2.40E-07   2.23E+07       0.00
120.0000       0.00  -8.00E-05   4.90E-06       0.00   781.2500   9.95E+10
-1.49E-07   2.27E+07       0.00
122.0000       0.00  -5.39E-06   1.84E-06       0.00   781.2500   9.95E+10
-1.06E-07   2.31E+07       0.00
124.0000       0.00   8.34E-06   2.09E-07       0.00   781.2500   9.95E+10
-3.02E-08   2.35E+07       0.00
126.0000       0.00   4.68E-06  -1.53E-07       0.00   781.2500   9.95E+10
-2.05E-12   2.81E+07       0.00
128.0000       0.00   1.01E-06  -1.00E-07       0.00   781.2500   9.95E+10
4.40E-09   2.86E+07       0.00
130.0000       0.00  -1.34E-07  -2.46E-08       0.00   781.2500   9.95E+10
1.90E-09   2.90E+07       0.00
132.0000       0.00  -1.78E-07   1.58E-09       0.00   781.2500   9.95E+10
2.81E-10   2.95E+07       0.00
134.0000       0.00  -5.91E-08   3.63E-09       0.00   781.2500   9.95E+10
-1.10E-10   3.00E+07       0.00
136.0000       0.00  -3.82E-09   1.34E-09       0.00   781.2500   9.95E+10
-8.02E-11   3.04E+07       0.00
138.0000       0.00   5.31E-09   1.34E-10       0.00   781.2500   9.95E+10
-2.05E-11   3.09E+07       0.00
140.0000       0.00   2.63E-09  -1.01E-10       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
142.0000       0.00   4.68E-10  -5.71E-11       0.00   781.2500   9.95E+10
2.76E-12   3.18E+07       0.00
144.0000       0.00  -1.09E-10  -1.17E-11       0.00   781.2500   9.95E+10
1.02E-12   3.23E+07       0.00
146.0000       0.00  -9.67E-11   1.73E-12       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
148.0000       0.00  -2.65E-11   2.02E-12       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
152.0000       0.00   2.99E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
154.0000       0.00   1.15E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
```

```
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.26E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 4:

```
Pile-head deflection             =     3.05470294 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -18905336. inch-lbs
Maximum shear force              =        149775. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             17
Number of zero deflection points =             20
```

```
-----------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 5
-----------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     4.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Half scour) 24in"

East Overbank Static 24in.lp9o 10/3/2017

Axial load on pile head = 450000.0 lbs

```
   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     4.0596  -2.06E+07    154872.       0.00      9722.   9.95E+10
      0.00       0.00       0.00
    2.0000     4.0000  -1.69E+07    154669.   -0.00452      8099.   9.95E+10
    0.00       0.00       0.00
    4.0000     3.8428  -1.31E+07    154669.   -0.00813      6458.   9.95E+10
    0.00       0.00       0.00
    6.0000     3.6100  -9261237.    151431.   -0.01082      4801.   9.95E+10
    -269.8413      1794.       0.00
    8.0000     3.3235  -5575702.    141407.   -0.01261      3201.   9.95E+10
    -565.5106      4084.       0.00
   10.0000     3.0048  -2201381.    124920.   -0.01355      1737.   9.95E+10
   -808.4035      6457.       0.00
   12.0000     2.6733    713033.    101508.   -0.01373      1091.   9.95E+10
   -1143.     10258.       0.00
   14.0000     2.3460   2967472.     67705.   -0.01328      2069.   9.95E+10
   -1674.     17130.       0.00
   16.0000     2.0358   4249735.     19499.   -0.01241      2626.   9.95E+10
   -2343.     27619.       0.00
   18.0000     1.7502   4171492.     -8685.   -0.01140      2592.   9.95E+10
   -5.8560    80.3008       0.00
   20.0000     1.4888   4079012.     -8828.   -0.01040      2552.   9.95E+10
   -6.0624    97.7278       0.00
   22.0000     1.2510   3972418.     -8975.   -0.00943      2505.   9.95E+10
   -6.2055   119.0526       0.00
   24.0000     1.0361   3851905.     -9125.   -0.00849      2453.   9.95E+10
   -6.2830   145.5334       0.00
   26.0000     0.8436   3717742.     -9276.   -0.00757      2395.   9.95E+10
   -6.2920   179.0070       0.00
   28.0000     0.6726   3570273.     -9426.   -0.00670      2331.   9.95E+10
   -6.2285   222.2633       0.00
   30.0000     0.5222   3409919.     -9574.   -0.00585      2261.   9.95E+10
   -6.0870   279.7632       0.00
   32.0000     0.3915   3237179.     -9717.   -0.00505      2186.   9.95E+10
   -5.8592   359.1395       0.00
   34.0000     0.2796   3052634.     -9854.   -0.00429      2106.   9.95E+10
   -5.5316   474.7414       0.00
   36.0000     0.1854   2856953.     -9981.   -0.00358      2021.   9.95E+10
   -5.0801   657.5943       0.00
   38.0000     0.1077   2650905.    -10897.   -0.00292      1932.   9.95E+10
   -71.2177     15870.       0.00
   40.0000    0.04534   2396934.    -12669.   -0.00231      1822.   9.95E+10
   -76.4199     40455.       0.00
   42.0000   -0.00316   2092702.    -13194.   -0.00177      1690.   9.95E+10
   32.6202    248025.       0.00
   44.0000   -0.03954   1801809.    -11857.   -0.00130      1563.   9.95E+10
   78.7951     47829.       0.00
   46.0000   -0.06549   1551611.     -9752.  -8.94E-04      1455.   9.95E+10
   96.6701     35424.       0.00
   48.0000   -0.08247   1353054.     -8503.  -5.44E-04      1369.   9.95E+10
   7.3764      2147.       0.00
   50.0000   -0.09162   1155222.     -8364.  -2.42E-04      1283.   9.95E+10
   4.2457      1112.       0.00
   52.0000   -0.09408    956827.     -8259.   1.28E-05      1197.   9.95E+10
```

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 4.4471      1135.       0.00
 54.0000   -0.09100    758502.     -8151.   2.20E-04      1110.   9.95E+10
 4.5600      1203.       0.00
 56.0000   -0.08353    560828.     -8041.   3.79E-04      1025.   9.95E+10
 4.5891      1319.       0.00
 58.0000   -0.07282    364337.     -7932.   4.90E-04   939.3825   9.95E+10
 4.5342      1494.       0.00
 60.0000   -0.06000    169509.     -7825.   5.55E-04   854.8217   9.95E+10
 4.3917      1757.       0.00
 62.0000   -0.04620    -23231.     -7722.   5.72E-04   791.3327   9.95E+10
 4.1544      2158.       0.00
 64.0000   -0.03253   -213517.     -7627.   5.44E-04   873.9223   9.95E+10
 3.8109      2811.       0.00
 66.0000   -0.02010   -401052.     -7541.   4.70E-04   955.3178   9.95E+10
 3.3437      3992.       0.00
 68.0000   -0.00999   -585617.     -4420.   3.51E-04      1035.   9.95E+10
 256.7167    616688.       0.00
 70.0000   -0.00327   -620788.      3908.   2.05E-04      1051.   9.95E+10
 437.2631   3209751.       0.00
 72.0000  -1.41E-04   -402479.      9623.   8.18E-05   955.9370   9.95E+10
 39.0499   6658560.       0.00
 74.0000   6.59E-04   -160629.      7834.   1.40E-05   850.9674   9.95E+10
 -188.1670   6854400.       0.00
 76.0000   5.29E-04    -26745.      3712.  -8.64E-06   792.8580   9.95E+10
 -155.3644   7050240.       0.00
 78.0000   2.44E-04     17719.   962.7854  -9.73E-06   788.9406   9.95E+10
 -73.7116   7246080.       0.00
 80.0000   6.19E-05     19679.  -152.2496  -5.22E-06   789.7913   9.95E+10
 -19.2080   7441920.       0.00
 82.0000  -6.37E-06     10524.  -358.4235  -1.58E-06   785.8177   9.95E+10
 2.0268   7637760.       0.00
 84.0000  -1.38E-05      2509.  -226.1501  -6.35E-09   782.3389   9.95E+10
 8.9960   1.57E+07       0.00
 86.0000  -6.67E-06  -331.1432   -64.6129   2.56E-07   781.3937   9.95E+10
 4.4655   1.61E+07       0.00
 88.0000  -1.48E-06  -598.1293     1.1717   1.44E-07   781.5096   9.95E+10
 1.0166   1.65E+07       0.00
 90.0000   2.46E-07  -278.0153    11.2981   3.85E-08   781.3707   9.95E+10
 -0.1727   1.68E+07       0.00
 92.0000   3.66E-07   -56.6512     6.0686  -1.82E-09   781.2746   9.95E+10
 -0.2631   1.72E+07       0.00
 94.0000   1.59E-07    13.3182     1.5117  -7.04E-09   781.2558   9.95E+10
 -0.1166   1.76E+07       0.00
 96.0000   2.84E-08    16.0628    -0.1436  -3.50E-09   781.2570   9.95E+10
 -0.02129   1.80E+07       0.00
 98.0000  -9.16E-09     6.5019    -0.3148  -7.79E-10   781.2528   9.95E+10
 0.00703   1.84E+07       0.00
100.0000  -9.05E-09     0.9705    -0.1454   1.21E-10   781.2504   9.95E+10
0.00709   1.88E+07       0.00
102.0000  -3.33E-09    -0.4790   -0.02835   1.81E-10   781.2502   9.95E+10
0.00266   1.92E+07       0.00
104.0000  -3.77E-10    -0.3943    0.00727   7.54E-11   781.2502   9.95E+10
3.07E-04   1.96E+07       0.00
106.0000   2.93E-10    -0.1315    0.00803   1.21E-11   781.2501   9.95E+10
-2.44E-04   2.00E+07       0.00
108.0000   2.02E-10   -0.00900    0.00304  -4.88E-12   781.2500   9.95E+10
-1.72E-04   2.04E+07       0.00
110.0000   5.93E-11    0.01460   3.65E-04  -4.20E-12   781.2500   9.95E+10
-5.13E-05   2.08E+07       0.00
112.0000       0.00    0.00861  -2.59E-04  -1.40E-12   781.2500   9.95E+10
-6.98E-07   2.12E+07       0.00
114.0000  -7.92E-12    0.00219  -1.82E-04       0.00   781.2500   9.95E+10
7.11E-06   2.15E+07       0.00
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Half scour) 24in"


```
116.0000  -3.98E-12  -1.39E-04  -5.33E-05       0.00   781.2500   9.95E+10
3.63E-06   2.19E+07       0.00
118.0000       0.00  -3.74E-04  -4.30E-07       0.00   781.2500   9.95E+10
7.75E-07   2.23E+07       0.00
120.0000       0.00  -1.62E-04   7.26E-06       0.00   781.2500   9.95E+10
-1.34E-07   2.27E+07       0.00
122.0000       0.00  -2.63E-05   3.57E-06       0.00   781.2500   9.95E+10
-1.73E-07   2.31E+07       0.00
124.0000       0.00   9.51E-06   7.18E-07       0.00   781.2500   9.95E+10
-6.44E-08   2.35E+07       0.00
126.0000       0.00   8.20E-06  -1.49E-07       0.00   781.2500   9.95E+10
-7.79E-09   2.81E+07       0.00
128.0000       0.00   2.39E-06  -1.70E-07       0.00   781.2500   9.95E+10
6.02E-09   2.86E+07       0.00
130.0000       0.00   3.20E-08  -5.54E-08       0.00   781.2500   9.95E+10
3.56E-09   2.90E+07       0.00
132.0000       0.00  -2.72E-07  -3.12E-09       0.00   781.2500   9.95E+10
7.94E-10   2.95E+07       0.00
134.0000       0.00  -1.19E-07   5.31E-09       0.00   781.2500   9.95E+10
-9.17E-11   3.00E+07       0.00
136.0000       0.00  -1.77E-08   2.61E-09       0.00   781.2500   9.95E+10
-1.34E-10   3.04E+07       0.00
138.0000       0.00   6.51E-09   4.66E-10       0.00   781.2500   9.95E+10
-4.51E-11   3.09E+07       0.00
140.0000       0.00   4.73E-09  -1.11E-10       0.00   781.2500   9.95E+10
-3.04E-12   3.13E+07       0.00
142.0000       0.00   1.19E-09  -9.98E-11       0.00   781.2500   9.95E+10
4.00E-12   3.18E+07       0.00
144.0000       0.00  -5.50E-11  -2.80E-11       0.00   781.2500   9.95E+10
1.98E-12   3.23E+07       0.00
146.0000       0.00  -1.56E-10       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
148.0000       0.00  -5.63E-11   3.15E-12       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
150.0000       0.00  -5.04E-12   1.26E-12       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
152.0000       0.00   4.20E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
154.0000       0.00   2.19E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.73E+07       0.00
168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.78E+07       0.00
170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.82E+07       0.00
172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.87E+07       0.00
174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.92E+07       0.00
176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.96E+07       0.00
178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
```

```
  0.00   4.01E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.26E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 5:

```
Pile-head deflection             =     4.05960576 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -20599752. inch-lbs
Maximum shear force              =        154872. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             20
Number of zero deflection points =             20
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 6
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     5.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     5.0642  -2.22E+07    159360.       0.00     10405.   9.95E+10
      0.00       0.00       0.00
    2.0000     5.0000  -1.83E+07    159151.   -0.00488      8734.   9.95E+10
```

```
 0.00       0.00       0.00
 4.0000     4.8298  -1.44E+07    159151.   -0.00883      7043.   9.95E+10
 0.00       0.00       0.00
 6.0000     4.5761  -1.05E+07    155913.   -0.01184      5336.   9.95E+10
 -269.8413      1415.       0.00
 8.0000     4.2617  -6688382.    145889.   -0.01391      3684.   9.95E+10
 -565.5106      3185.       0.00
10.0000     3.9086  -3191013.    129402.   -0.01510      2166.   9.95E+10
-808.4034      4964.       0.00
12.0000     3.5370   -150975.    105990.   -0.01550   846.7775   9.95E+10
-1143.      7753.       0.00
14.0000     3.1645   2231339.     72187.   -0.01525      1750.   9.95E+10
-1674.     12699.       0.00
16.0000     2.8049   3643394.     23981.   -0.01454      2363.   9.95E+10
-2343.     20046.       0.00
18.0000     2.4665   3696523.     -4211.   -0.01366      2386.   9.95E+10
-6.5654    63.8852       0.00
20.0000     2.1494   3736244.     -4372.   -0.01276      2403.   9.95E+10
-6.8518    76.5066       0.00
22.0000     1.8539   3762289.     -4540.   -0.01186      2414.   9.95E+10
-7.0749    91.5886       0.00
24.0000     1.5802   3774460.     -4711.   -0.01095      2419.   9.95E+10
-7.2322   109.8391       0.00
26.0000     1.3284   3772637.     -4886.   -0.01004      2419.   9.95E+10
-7.3202   132.2523       0.00
28.0000     1.0984   3756773.     -5062.   -0.00913      2412.   9.95E+10
-7.3349   160.2682       0.00
30.0000     0.8901   3726900.     -5237.   -0.00823      2399.   9.95E+10
-7.2712   196.0524       0.00
32.0000     0.7034   3683134.     -5410.   -0.00734      2380.   9.95E+10
-7.1227   243.0191       0.00
34.0000     0.5380   3625674.     -5578.   -0.00645      2355.   9.95E+10
-6.8799   306.8908       0.00
36.0000     0.3936   3554809.     -5739.   -0.00559      2324.   9.95E+10
-6.5290   398.0852       0.00
38.0000     0.2698   3470926.     -6978.   -0.00474      2288.   9.95E+10
-96.7184      8604.       0.00
40.0000     0.1660   3322294.     -9552.   -0.00392      2223.   9.95E+10
-117.7844     17025.       0.00
42.0000    0.08152   3097167.    -12124.   -0.00315      2126.   9.95E+10
-96.6168     28444.       0.00
44.0000    0.01492   2808323.    -13968.   -0.00244      2000.   9.95E+10
-56.9763     91621.       0.00
46.0000   -0.03542   2479347.    -13706.   -0.00180      1857.   9.95E+10
78.7557     53362.       0.00
48.0000   -0.07142   2189278.    -12677.   -0.00124      1731.   9.95E+10
7.0309      2363.       0.00
50.0000   -0.09475   1897557.    -12541.  -7.43E-04      1605.   9.95E+10
4.2936      1088.       0.00
52.0000    -0.1071   1603368.    -12434.  -3.21E-04      1477.   9.95E+10
4.6435      1041.       0.00
54.0000    -0.1102   1307679.    -12320.   2.98E-05      1349.   9.95E+10
4.8600      1059.       0.00
56.0000    -0.1057   1011383.    -12202.   3.09E-04      1220.   9.95E+10
4.9631      1127.       0.00
58.0000   -0.09531    715312.    -12083.   5.18E-04      1092.   9.95E+10
4.9598      1249.       0.00
60.0000   -0.08082    420235.    -11965.   6.54E-04   963.6436   9.95E+10
4.8501      1440.       0.00
62.0000   -0.06390    126857.    -11851.   7.20E-04   836.3096   9.95E+10
4.6287      1739.       0.00
64.0000   -0.04624   -164184.    -11744.   7.16E-04   852.5106   9.95E+10
4.2848      2224.       0.00
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Half scour) 24in"


```
   66.0000   -0.02953   -452331.    -11647.   6.42E-04   977.5741   9.95E+10
   3.8012      3089.       0.00
   68.0000   -0.01544   -737110.     -7772.   4.98E-04      1101.   9.95E+10
   319.1368    496078.       0.00
   70.0000   -0.00562   -836146.      2934.   3.09E-04      1144.   9.95E+10
   573.0540   2449235.       0.00
   72.0000  -6.30E-04   -602926.     11908.   1.35E-04      1043.   9.95E+10
   174.7385   6658560.       0.00
   74.0000   8.67E-04   -267486.     11303.   3.01E-05   897.3465   9.95E+10
   -225.1139   6234834.       0.00
   76.0000   8.15E-04    -61016.      5982.  -9.51E-06   807.7326   9.95E+10
   -218.3080   6429086.       0.00
   78.0000   4.10E-04     19868.      1876.  -1.45E-05   789.8733   9.95E+10
   -123.8661   7246080.       0.00
   80.0000   1.21E-04     29354.   -58.7650  -8.53E-06   793.9903   9.95E+10
   -37.3798   7441920.       0.00
   82.0000   7.07E-07     17232.  -510.0229  -2.92E-06   788.7291   9.95E+10
   -0.2250   7637760.       0.00
   84.0000  -1.94E-05      4935.  -360.6373  -2.43E-07   783.3921   9.95E+10
   12.6738   1.57E+07       0.00
   86.0000  -1.10E-05   -73.6023  -120.4346   3.43E-07   781.2819   9.95E+10
   7.3431   1.61E+07       0.00
   88.0000  -2.96E-06  -852.8213    -7.9700   2.31E-07   781.6201   9.95E+10
   2.0289   1.65E+07       0.00
   90.0000   1.19E-07  -461.1523    15.3761   7.27E-08   781.4502   9.95E+10
   -0.08343   1.68E+07       0.00
   92.0000   5.29E-07  -116.3388     9.8155   3.07E-09   781.3005   9.95E+10
   -0.3800   1.72E+07       0.00
   94.0000   2.66E-07     9.9259     2.9110  -9.76E-09   781.2543   9.95E+10
   -0.1954   1.76E+07       0.00
   96.0000   6.05E-08    23.6022    0.02085  -5.72E-09   781.2602   9.95E+10
   -0.04543   1.80E+07       0.00
   98.0000  -8.48E-09    11.0501    -0.4462  -1.54E-09   781.2548   9.95E+10
   0.00651   1.84E+07       0.00
  100.0000  -1.35E-08     2.2169    -0.2410   5.69E-11   781.2510   9.95E+10
  0.01060   1.88E+07       0.00
  102.0000  -5.75E-09    -0.5170   -0.05859   2.62E-10   781.2502   9.95E+10
  0.00460   1.92E+07       0.00
  104.0000  -9.61E-10    -0.6012    0.00599   1.27E-10   781.2503   9.95E+10
  7.84E-04   1.96E+07       0.00
  106.0000   3.49E-10    -0.2322    0.01191   2.66E-11   781.2501   9.95E+10
  -2.90E-04   2.00E+07       0.00
  108.0000   3.15E-10   -0.02988    0.00523  -5.03E-12   781.2500   9.95E+10
  -2.67E-04   2.04E+07       0.00
  110.0000   1.08E-10    0.01872   9.05E-04  -6.37E-12   781.2500   9.95E+10
  -9.30E-05   2.08E+07       0.00
  112.0000   8.83E-12    0.01368  -3.05E-04  -2.46E-12   781.2500   9.95E+10
  -7.79E-06   2.12E+07       0.00
  114.0000  -1.07E-11    0.00412  -2.83E-04       0.00   781.2500   9.95E+10
  9.63E-06   2.15E+07       0.00
  116.0000  -6.46E-12   9.35E-05  -9.68E-05       0.00   781.2500   9.95E+10
  5.90E-06   2.19E+07       0.00
  118.0000  -1.65E-12  -5.31E-04  -7.51E-06       0.00   781.2500   9.95E+10
  1.53E-06   2.23E+07       0.00
  120.0000       0.00  -2.70E-04   9.90E-06       0.00   781.2500   9.95E+10
  -8.40E-08   2.27E+07       0.00
  122.0000       0.00  -5.67E-05   5.83E-06       0.00   781.2500   9.95E+10
  -2.55E-07   2.31E+07       0.00
  124.0000       0.00   9.78E-06   1.43E-06       0.00   781.2500   9.95E+10
  -1.11E-07   2.35E+07       0.00
  126.0000       0.00   1.23E-05  -1.14E-07       0.00   781.2500   9.95E+10
  -1.81E-08   2.39E+07       0.00
  128.0000       0.00   4.35E-06  -2.48E-07       0.00   781.2500   9.95E+10
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Half scour) 24in"


```
6.92E-09   2.86E+07       0.00
130.0000       0.00   3.79E-07  -9.81E-08       0.00   781.2500   9.95E+10
5.61E-09   2.90E+07       0.00
132.0000       0.00  -3.60E-07  -1.20E-08       0.00   781.2500   9.95E+10
1.56E-09   2.95E+07       0.00
134.0000       0.00  -1.97E-07   6.68E-09       0.00   781.2500   9.95E+10
-1.15E-11   3.00E+07       0.00
136.0000       0.00  -4.01E-08   4.24E-09       0.00   781.2500   9.95E+10
-1.92E-10   3.04E+07       0.00
138.0000       0.00   6.31E-09   9.86E-10       0.00   781.2500   9.95E+10
-7.90E-11   3.09E+07       0.00
140.0000       0.00   7.24E-09  -8.54E-11       0.00   781.2500   9.95E+10
-1.03E-11   3.13E+07       0.00
142.0000       0.00   2.24E-09  -1.49E-10       0.00   781.2500   9.95E+10
4.96E-12   3.18E+07       0.00
144.0000       0.00   8.60E-11  -5.12E-11       0.00   781.2500   9.95E+10
3.21E-12   3.23E+07       0.00
146.0000       0.00  -2.18E-10  -3.78E-12       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
148.0000       0.00  -9.67E-11   4.25E-12       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
150.0000       0.00  -1.43E-11   2.12E-12       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
152.0000       0.00   5.02E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
154.0000       0.00   3.52E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.73E+07       0.00
168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.78E+07       0.00
170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.82E+07       0.00
172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.87E+07       0.00
174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.92E+07       0.00
176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.96E+07       0.00
178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.01E+07       0.00
180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.06E+07       0.00
182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.10E+07       0.00
184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.15E+07       0.00
186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.19E+07       0.00
188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.24E+07       0.00
190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.29E+07       0.00
```

```
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.26E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 6:

```
Pile-head deflection             =     5.06415671 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -22172558. inch-lbs
Maximum shear force              =        159360. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             21
Number of zero deflection points =             20
```

```
--------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 7
--------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     6.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     6.0683  -2.36E+07    163187.       0.00     11020.   9.95E+10
      0.00       0.00       0.00
    2.0000     6.0000  -1.96E+07    162973.   -0.00521      9309.   9.95E+10
    0.00       0.00       0.00
    4.0000     5.8180  -1.57E+07    162973.   -0.00947      7576.   9.95E+10
    0.00       0.00       0.00
    6.0000     5.5455  -1.16E+07    159735.   -0.01276      5825.   9.95E+10
    -269.8413      1168.       0.00
    8.0000     5.2057  -7711317.    149710.   -0.01509      4128.   9.95E+10
    -565.5105      2607.       0.00
   10.0000     4.8213  -4108145.    133223.   -0.01651      2564.   9.95E+10
   -808.4032      4024.       0.00
   12.0000     4.4131   -959914.    109812.   -0.01712      1198.   9.95E+10
   -1143.      6214.       0.00
   14.0000     3.9993   1532699.     76008.   -0.01705      1446.   9.95E+10
   -1674.     10048.       0.00
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Half scour) 24in"


```
   16.0000     3.5945   3056873.     27802.   -0.01650      2108.   9.95E+10
   -2343.     15643.       0.00
   18.0000     3.2073   3223649.  -396.7758   -0.01574      2180.   9.95E+10
   -7.1661    53.6240       0.00
   20.0000     2.8387   3377903.  -572.9789   -0.01495      2247.   9.95E+10
   -7.5175    63.5561       0.00
   22.0000     2.4898   3519029.  -756.8567   -0.01412      2309.   9.95E+10
   -7.8057    75.2428       0.00
   24.0000     2.1611   3646496.  -946.8566   -0.01325      2364.   9.95E+10
   -8.0276    89.1492       0.00
   26.0000     1.8536   3759842.     -1141.   -0.01236      2413.   9.95E+10
   -8.1799   105.9111       0.00
   28.0000     1.5679   3858686.     -1339.   -0.01144      2456.   9.95E+10
   -8.2586   126.4190       0.00
   30.0000     1.3044   3942724.     -1537.   -0.01050      2493.   9.95E+10
   -8.2591   151.9576       0.00
   32.0000     1.0638   4011737.     -1734.   -0.00954      2522.   9.95E+10
   -8.1757   184.4461       0.00
   34.0000     0.8464   4065594.     -1928.   -0.00857      2546.   9.95E+10
   -8.0015   226.8793       0.00
   36.0000     0.6526   4104254.     -2117.   -0.00758      2563.   9.95E+10
   -7.7272   284.1954       0.00
   38.0000     0.4824   4127776.     -3618.   -0.00659      2573.   9.95E+10
   -117.3927      5840.       0.00
   40.0000     0.3362   4072930.     -6815.   -0.00560      2549.   9.95E+10
   -149.0068     10637.       0.00
   42.0000     0.2135   3921649.    -10201.   -0.00464      2483.   9.95E+10
   -133.1790     14968.       0.00
   44.0000     0.1136   3683444.    -13144.   -0.00372      2380.   9.95E+10
   -112.0326     23673.       0.00
   46.0000    0.03493   3371117.    -15429.   -0.00287      2244.   9.95E+10
   -78.4151     53873.       0.00
   48.0000   -0.02421   3004843.    -16311.   -0.00210      2085.   9.95E+10
   4.9016      4860.       0.00
   50.0000   -0.06596   2633568.    -16207.   -0.00142      1924.   9.95E+10
   3.8052      1385.       0.00
   52.0000   -0.09247   2257626.    -16108.  -8.32E-04      1761.   9.95E+10
   4.4217      1148.       0.00
   54.0000    -0.1059   1878352.    -15998.  -3.34E-04      1597.   9.95E+10
   4.7967      1087.       0.00
   56.0000    -0.1085   1496949.    -15880.   7.32E-05      1431.   9.95E+10
   5.0069      1108.       0.00
   58.0000    -0.1024   1114532.    -15759.   3.88E-04      1265.   9.95E+10
   5.0799      1191.       0.00
   60.0000   -0.08986    732139.    -15638.   6.11E-04      1099.   9.95E+10
   5.0247      1342.       0.00
   62.0000   -0.07309    350733.    -15519.   7.41E-04   933.4778   9.95E+10
   4.8407      1590.       0.00
   64.0000   -0.05428    -28798.    -15407.   7.80E-04   793.7492   9.95E+10
   4.5201      1999.       0.00
   66.0000   -0.03564   -405651.    -15304.   7.28E-04   957.3136   9.95E+10
   4.0472      2725.       0.00
   68.0000   -0.01935   -779115.    -10968.   5.85E-04      1119.   9.95E+10
   357.2964    443098.       0.00
   70.0000   -0.00757   -944749.      1304.   3.77E-04      1191.   9.95E+10
   665.4027   2109301.       0.00
   72.0000   -0.00126   -724650.     12542.   1.76E-04      1096.   9.95E+10
   271.0903   5176846.       0.00
   74.0000   8.64E-04   -346516.     13098.   4.66E-05   931.6474   9.95E+10
   -224.7879   6244609.       0.00
   76.0000   9.79E-04    -96957.      7529.  -6.88E-06   823.3320   9.95E+10
   -239.3238   5864910.       0.00
   78.0000   5.34E-04     15004.      2723.  -1.68E-05   787.7621   9.95E+10
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Half scour) 24in"


```
 -161.1246   7246080.       0.00
 80.0000   1.75E-04     34118.   139.2003  -1.08E-05   796.0580   9.95E+10
 -54.2067   7441920.       0.00
 82.0000   1.34E-05     21919.  -562.4665  -4.08E-06   790.7637   9.95E+10
 -4.2655   7637760.       0.00
 84.0000  -2.12E-05      7207.  -447.9008  -5.71E-07   784.3782   9.95E+10
 13.8127   1.57E+07       0.00
 86.0000  -1.40E-05   432.5977  -169.6362   3.50E-07   781.4378   9.95E+10
 9.3760   1.61E+07       0.00
 88.0000  -4.36E-06  -942.7182   -21.2424   2.88E-07   781.6592   9.95E+10
 2.9901   1.65E+07       0.00
 90.0000  -1.68E-07  -593.2686    16.0517   1.03E-07   781.5075   9.95E+10
 0.1177   1.68E+07       0.00
 92.0000   5.94E-07  -174.4658    12.3497   1.07E-08   781.3257   9.95E+10
 -0.4262   1.72E+07       0.00
 94.0000   3.45E-07    -0.7158     4.1924  -1.04E-08   781.2503   9.95E+10
 -0.2535   1.76E+07       0.00
 96.0000   9.28E-08    26.9924     0.3139  -7.26E-09   781.2617   9.95E+10
 -0.06965   1.80E+07       0.00
 98.0000  -3.47E-09    14.5099    -0.4899  -2.26E-09   781.2563   9.95E+10
 0.00267   1.84E+07       0.00
100.0000  -1.58E-08     3.5248    -0.3098  -8.70E-11   781.2515   9.95E+10
0.01235   1.88E+07       0.00
102.0000  -7.65E-09    -0.3575   -0.08820   2.95E-10   781.2502   9.95E+10
0.00612   1.92E+07       0.00
104.0000  -1.61E-09    -0.7149   9.73E-04   1.66E-10   781.2503   9.95E+10
0.00131   1.96E+07       0.00
106.0000   2.96E-10    -0.3144    0.01377   4.15E-11   781.2501   9.95E+10
-2.46E-04   2.00E+07       0.00
108.0000   3.82E-10   -0.05502    0.00692  -3.07E-12   781.2500   9.95E+10
-3.24E-04   2.04E+07       0.00
110.0000   1.49E-10    0.01799    0.00150  -7.54E-12   781.2500   9.95E+10
-1.28E-04   2.08E+07       0.00
112.0000   1.97E-11    0.01694  -2.55E-04  -3.33E-12   781.2500   9.95E+10
-1.74E-05   2.12E+07       0.00
114.0000  -1.11E-11    0.00584  -3.43E-04       0.00   781.2500   9.95E+10
9.99E-06   2.15E+07       0.00
116.0000  -8.16E-12   4.80E-04  -1.34E-04       0.00   781.2500   9.95E+10
7.46E-06   2.19E+07       0.00
118.0000  -2.42E-12  -5.83E-04  -1.72E-05       0.00   781.2500   9.95E+10
2.25E-06   2.23E+07       0.00
120.0000       0.00  -3.49E-04   1.04E-05       0.00   781.2500   9.95E+10
4.57E-08   2.27E+07       0.00
122.0000       0.00  -8.74E-05   7.39E-06       0.00   781.2500   9.95E+10
-2.92E-07   2.31E+07       0.00
124.0000       0.00   5.89E-06   2.12E-06       0.00   781.2500   9.95E+10
-1.47E-07   2.35E+07       0.00
126.0000       0.00   1.46E-05   2.99E-10       0.00   781.2500   9.95E+10
-3.00E-08   2.39E+07       0.00
128.0000       0.00   5.97E-06  -2.88E-07       0.00   781.2500   9.95E+10
6.02E-09   2.86E+07       0.00
130.0000       0.00   7.96E-07  -1.32E-07       0.00   781.2500   9.95E+10
6.95E-09   2.90E+07       0.00
132.0000       0.00  -3.77E-07  -2.18E-08       0.00   781.2500   9.95E+10
2.25E-09   2.95E+07       0.00
134.0000       0.00  -2.54E-07   6.58E-09       0.00   781.2500   9.95E+10
1.18E-10   3.00E+07       0.00
136.0000       0.00  -6.19E-08   5.37E-09       0.00   781.2500   9.95E+10
-2.19E-10   3.04E+07       0.00
138.0000       0.00   3.89E-09   1.47E-09       0.00   781.2500   9.95E+10
-1.06E-10   3.09E+07       0.00
140.0000       0.00   8.76E-09  -1.65E-11       0.00   781.2500   9.95E+10
-1.82E-11   3.13E+07       0.00
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (Half scour) 24in"


```
  142.0000       0.00   3.14E-09  -1.77E-10       0.00   781.2500   9.95E+10
  4.81E-12   3.18E+07       0.00
  144.0000       0.00   2.78E-10  -7.04E-11       0.00   781.2500   9.95E+10
  4.06E-12   3.23E+07       0.00
  146.0000       0.00  -2.42E-10  -8.43E-12       0.00   781.2500   9.95E+10
  1.10E-12   3.27E+07       0.00
  148.0000       0.00  -1.28E-10   4.54E-12       0.00   781.2500   9.95E+10
  0.00   3.32E+07       0.00
  150.0000       0.00  -2.39E-11   2.76E-12       0.00   781.2500   9.95E+10
  0.00   3.36E+07       0.00
  152.0000       0.00   4.61E-12       0.00       0.00   781.2500   9.95E+10
  0.00   3.41E+07       0.00
  154.0000       0.00   4.41E-12       0.00       0.00   781.2500   9.95E+10
  0.00   3.46E+07       0.00
  156.0000       0.00   1.21E-12       0.00       0.00   781.2500   9.95E+10
  0.00   3.50E+07       0.00
  158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.55E+07       0.00
  160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.59E+07       0.00
  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.64E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.69E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.26E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

File name is incorrect below, run designation is "E.Overbank Post Seismic (Half scour) 24in"

East Overbank Static 24in.lp9o 10/3/2017

Output Summary for Load Case No. 7:

```
Pile-head deflection             =     6.06825643 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -23589423. inch-lbs
Maximum shear force              =        163187. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             22
Number of zero deflection points =             20
```

--
Summary of Pile-head Responses for Conventional Analyses

--

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case	Load Type	Pile-head Load 1	Load Type 2	Pile-head Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	y, in	0.5000	S, rad	0.00	450000.	0.5160	0.00	52526.	-5535658.
2	y, in	1.0000	S, rad	0.00	450000.	1.0274	0.00	84858.	-9453268.
3	y, in	2.0000	S, rad	0.00	450000.	2.0460	0.00	133095.	-1.59E+07
4	y, in	3.0000	S, rad	0.00	450000.	3.0547	0.00	149775.	-1.89E+07
5	y, in	4.0000	S, rad	0.00	450000.	4.0596	0.00	154872.	-2.06E+07
6	y, in	5.0000	S, rad	0.00	450000.	5.0642	0.00	159360.	-2.22E+07
7	y, in	6.0000	S, rad	0.00	450000.	6.0683	0.00	163187.	-2.36E+07

Maximum pile-head deflection = 6.0682564324 inches
Maximum pile-head rotation = 0.0000000000 radians = 0.000000 deg.

The analysis ended normally.

File name is incorrect below, run designation is "E.Overbank Post Seismic (No scour) 24in"

==========
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LPile for Windows, Version 2016-09.009

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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--
Files Used for Analysis

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Path to file locations:
\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis
\L-Pile\East Overbank\Post Seismic (No Scour)\

Name of input data file:
East Overbank Static 24in.lp9d

Name of output report file:
East Overbank Static 24in.lp9o

Name of plot output file:
East Overbank Static 24in.lp9p

Name of runtime message file:
East Overbank Static 24in.lp9r

--
Date and Time of Analysis

--

Date: October 3, 2017 Time: 11:56:12

--

File name is incorrect below, run designation is "E.Overbank Post Seismic (No scour) 24in"

Problem Title

Project Name: Harbor River Bridge
Job Number: 18461-007-01
Client: SCDOT
Engineer: HPC
Description: East Overbank - Post Seismic

Program Options and Settings

Computational Options:
 - Use unfactored loads in computations (conventional analysis)
Engineering Units Used for Data Input and Computations:
 - US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed	=	500
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	100

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Computation of pile-head foundation stiffness matrix not selected
 - Push-over analysis of pile not selected
 - Buckling analysis of pile not selected

Output Options:
 - Output files use decimal points to denote decimal symbols.
 - Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1
 - No p-y curves to be computed and reported for user-specified depths
 - Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined	=	1
Total length of pile	=	200.000 ft
Depth of ground surface below top of pile	=	0.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

File name is incorrect below, run designation is "E.Overbank Post Seismic (No scour) 24in"

East Overbank Static 24in.lp9o 10/3/2017

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	24.0000
2	200.000	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile

Cross-sectional shape	=	rectangular
Length of section	=	200.000000 ft
Width of top of section	=	24.000000 in
Width of bottom of section	=	24.000000 in
Top Section Depth	=	24.000000 in
Bottom Section Depth	=	24.000000 in
Top Area	=	576.000000 sq. in
Bottom Area	=	576.000000 sq. in
Moment of Inertia at Top	=	27648. in^4
Moment of Inertia at Bottom	=	27648. in^4
Elastic Modulus	=	3600000. psi

Ground Slope and Pile Batter Angles

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 7 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	0.0000 ft
Distance from top of pile to bottom of layer	=	3.000000 ft
Effective unit weight at top of layer	=	100.000000 pcf
Effective unit weight at bottom of layer	=	100.000000 pcf
Friction angle at top of layer	=	29.000000 deg.
Friction angle at bottom of layer	=	29.000000 deg.

```
   Subgrade k at top of layer                          =    20.000000 pci
   Subgrade k at bottom of layer                       =    20.000000 pci


Layer 2 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer           =     3.000000 ft
   Distance from top of pile to bottom of layer        =    18.000000 ft
   Effective unit weight at top of layer               =    57.600000 pcf
   Effective unit weight at bottom of layer            =    57.600000 pcf
   Friction angle at top of layer                      =    38.000000 deg.
   Friction angle at bottom of layer                   =    38.000000 deg.
   Subgrade k at top of layer                          =   150.000000 pci
   Subgrade k at bottom of layer                       =   150.000000 pci


Layer 3 is soft clay, p-y criteria by Matlock, 1970

   Distance from top of pile to top of layer           =    18.000000 ft
   Distance from top of pile to bottom of layer        =    38.000000 ft
   Effective unit weight at top of layer               =    37.600000 pcf
   Effective unit weight at bottom of layer            =    37.600000 pcf
   Undrained cohesion at top of layer                  =   116.000000 psf
   Undrained cohesion at bottom of layer               =   192.000000 psf
   Epsilon-50 at top of layer                          =     0.020000
   Epsilon-50 at bottom of layer                       =     0.020000


Layer 4 is soft clay, p-y criteria by Matlock, 1970

   Distance from top of pile to top of layer           =    38.000000 ft
   Distance from top of pile to bottom of layer        =    48.000000 ft
   Effective unit weight at top of layer               =    32.600000 pcf
   Effective unit weight at bottom of layer            =    32.600000 pcf
   Undrained cohesion at top of layer                  =   421.000000 psf
   Undrained cohesion at bottom of layer               =   493.000000 psf
   Epsilon-50 at top of layer                          =     0.020000
   Epsilon-50 at bottom of layer                       =     0.020000


Layer 5 is soft clay, p-y criteria by Matlock, 1970

   Distance from top of pile to top of layer           =    48.000000 ft
   Distance from top of pile to bottom of layer        =    68.000000 ft
   Effective unit weight at top of layer               =    37.600000 pcf
   Effective unit weight at bottom of layer            =    37.600000 pcf
   Undrained cohesion at top of layer                  =   179.000000 psf
   Undrained cohesion at bottom of layer               =   239.000000 psf
   Epsilon-50 at top of layer                          =     0.020000
   Epsilon-50 at bottom of layer                       =     0.020000


Layer 6 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer           =    68.000000 ft
   Distance from top of pile to bottom of layer        =    83.000000 ft
   Effective unit weight at top of layer               =    57.600000 pcf
   Effective unit weight at bottom of layer            =    57.600000 pcf
   Undrained cohesion at top of layer                  =        3400. psf
   Undrained cohesion at bottom of layer               =        3400. psf
   Epsilon-50 at top of layer                          =     0.005000
   Epsilon-50 at bottom of layer                       =     0.005000
   Subgrade k at top of layer                          =   400.000000 pci
```

```
   Subgrade k at bottom of layer                        =   400.000000 pci


Layer 7 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer            =    83.000000 ft
   Distance from top of pile to bottom of layer         =   210.000000 ft
   Effective unit weight at top of layer                =    57.600000 pcf
   Effective unit weight at bottom of layer             =    57.600000 pcf
   Undrained cohesion at top of layer                   =        6000. psf
   Undrained cohesion at bottom of layer                =        6000. psf
   Epsilon-50 at top of layer                           =     0.005000
   Epsilon-50 at bottom of layer                        =     0.005000
   Subgrade k at top of layer                           =   800.000000 pci
   Subgrade k at bottom of layer                        =   800.000000 pci


 (Depth of the lowest soil layer extends 10.000 ft below the pile tip)



--------------------------------------------------------------------------------
--
                        Summary of Input Soil Properties
--------------------------------------------------------------------------------
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Layer         Soil Type          Layer      Effective    Undrained    Angle of
E50
Layer           Name             Depth       Unit Wt.    Cohesion     Friction
or           kpy
 Num.     (p-y Curve Type)        ft           pcf          psf          deg.
 krm          pci
-----   -------------------   ----------   ----------   ----------
----------   ----------   ----------
  1            Sand                 0.00     100.0000       --
  29.0000       --          20.0000
          (Reese, et al.)         3.0000     100.0000       --
          29.0000       --          20.0000
  2            Sand               3.0000      57.6000       --
  38.0000       --         150.0000
          (Reese, et al.)        18.0000      57.6000       --
          38.0000       --         150.0000
  3            Soft              18.0000      37.6000     116.0000       --
  0.02000       --
               Clay              38.0000      37.6000     192.0000       --
               0.02000       --
  4            Soft              38.0000      32.6000     421.0000       --
  0.02000       --
               Clay              48.0000      32.6000     493.0000       --
               0.02000       --
  5            Soft              48.0000      37.6000     179.0000       --
  0.02000       --
               Clay              68.0000      37.6000     239.0000       --
               0.02000       --
  6         Stiff Clay           68.0000      57.6000        3400.       --
  0.00500     400.0000
          with Free Water        83.0000      57.6000        3400.       --
          0.00500     400.0000
  7         Stiff Clay           83.0000      57.6000        6000.       --
  0.00500     800.0000
          with Free Water       210.0000      57.6000        6000.       --
          0.00500     800.0000
```

--
p-y Modification Factors for Group Action

--

Distribution of p-y modifiers with depth defined using 10 points

Point No.	Depth X ft	p-mult	y-mult
1	0.000	0.8500	1.0000
2	18.000	0.8500	1.0000
3	18.000	0.0850	1.0000
4	38.000	0.0850	1.0000
5	38.000	0.8500	1.0000
6	48.000	0.8500	1.0000
7	48.000	0.0850	1.0000
8	68.000	0.0850	1.0000
9	68.000	0.8500	1.0000
10	210.000	0.8500	1.0000

--
Static Loading Type

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Static loading criteria were used when computing p-y curves for all analyses.

--
Pile-head Loading and Pile-head Fixity Conditions

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Number of loads specified = 7

```
Load    Load         Condition                Condition            Axial Thrust
Compute Top y
 No.    Type             1                        2                 Force, lbs
 vs. Pile Length
-----   ----   --------------------   ------------------------
----------------   ---------------
   1     5     y =     0.500000 in    S =       0.0000 in/in
   450000.          N.A.
   2     5     y =     1.000000 in    S =       0.0000 in/in
   450000.          N.A.
   3     5     y =     2.000000 in    S =       0.0000 in/in
   450000.          N.A.
   4     5     y =     3.000000 in    S =       0.0000 in/in
   450000.          N.A.
   5     5     y =     4.000000 in    S =       0.0000 in/in
   450000.          N.A.
   6     5     y =     5.000000 in    S =       0.0000 in/in
   450000.          N.A.
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (No scour) 24in"

East Overbank Static 24in.lp9o 10/3/2017

7 5 y = 6.000000 in S = 0.0000 in/in
450000. N.A.

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

---

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

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Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.00	0.00	N.A.	No	0.00	7915.
2	3.0000	3.0000	Yes	No	7915.	539056.
3	18.0000	18.0000	No	No	546971.	55577.
4	38.0000	38.0000	Yes	No	602548.	82097.
5	48.0000	48.0000	Yes	No	684645.	77325.
6	68.0000	179.4395	No	No	761970.	98354.
7	83.0000	194.4395	Yes	No	860324.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

File name is incorrect below, run designation is "E.Overbank Post Seismic (No scour) 24in"

East Overbank Static 24in.lp9o 10/3/2017

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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 450000.0 lbs

Depth X feet	Deflect. y inches	Bending Distrib. Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Lat. Load lb/inch				
0.00	0.5234	-8100232.	102383.	0.00	4297.	9.95E+10
0.00	0.00	0.00				
2.0000	0.5000	-5693445.	97434.	-0.00166	3252.	9.95E+10
-200.7695	9637.	0.00				
4.0000	0.4436	-3387474.	87285.	-0.00276	2252.	9.95E+10
-644.9504	34893.	0.00				
6.0000	0.3676	-1444174.	70948.	-0.00334	1408.	9.95E+10
-716.5198	46777.	0.00				
8.0000	0.2833	90172.	53852.	-0.00350	820.3870	9.95E+10
-708.0912	59992.	0.00				
10.0000	0.1995	1216422.	36226.	-0.00335	1309.	9.95E+10
-760.7606	91542.	0.00				
12.0000	0.1227	1901307.	17879.	-0.00297	1606.	9.95E+10
-768.1909	150300.	0.00				
14.0000	0.05688	2138762.	1132.	-0.00248	1710.	9.95E+10
-627.4045	264718.	0.00				
16.0000	0.00348	2009263.	-7418.	-0.00198	1653.	9.95E+10
-85.0975	587520.	0.00				
18.0000	-0.03830	1825515.	-8411.	-0.00152	1574.	9.95E+10
2.3458	1470.	0.00				
20.0000	-0.06952	1638364.	-8347.	-0.00110	1492.	9.95E+10
3.0489	1053.	0.00				
22.0000	-0.09125	1448703.	-8268.	-7.31E-04	1410.	9.95E+10
3.5435	932.0122	0.00				
24.0000	-0.1046	1257310.	-8178.	-4.05E-04	1327.	9.95E+10
3.9234	900.2191	0.00				
26.0000	-0.1107	1064903.	-8080.	-1.25E-04	1243.	9.95E+10
4.2168	914.4532	0.00				
28.0000	-0.1106	872152.	-7976.	1.09E-04	1160.	9.95E+10
4.4345	962.4503	0.00				
30.0000	-0.1054	679683.	-7868.	2.96E-04	1076.	9.95E+10
4.5802	1042.	0.00				
32.0000	-0.09637	488083.	-7757.	4.37E-04	993.0917	9.95E+10
4.6540	1159.	0.00				
34.0000	-0.08448	297893.	-7646.	5.32E-04	910.5437	9.95E+10
4.6542	1322.	0.00				
36.0000	-0.07086	109607.	-7535.	5.81E-04	828.8226	9.95E+10
4.5780	1551.	0.00				
38.0000	-0.05661	-76327.	-6633.	5.85E-04	814.3780	9.95E+10
70.6072	29936.	0.00				
40.0000	-0.04280	-221392.	-4689.	5.49E-04	877.3404	9.95E+10
91.3761	51244.	0.00				
42.0000	-0.03027	-313249.	-2583.	4.84E-04	917.2086	9.95E+10
84.1082	66697.	0.00				
44.0000	-0.01955	-355843.	-673.3380	4.04E-04	935.6957	9.95E+10
75.0392	92130.	0.00				
46.0000	-0.01089	-354288.	991.2160	3.18E-04	935.0207	9.95E+10

```
 63.6736    140330.       0.00
 48.0000   -0.00428   -315134.      1795.   2.37E-04   918.0269   9.95E+10
 3.2774     18369.       0.00
 50.0000   5.02E-04   -273272.      1823.   1.66E-04   899.8576   9.95E+10
 -0.8734     41743.       0.00
 52.0000    0.00370   -231201.      1792.   1.06E-04   881.5978   9.95E+10
 -1.7708     11471.       0.00
 54.0000    0.00557   -189549.      1745.   5.48E-05   863.5194   9.95E+10
 -2.0934      9021.       0.00
 56.0000    0.00634   -148608.      1693.   1.41E-05   845.7500   9.95E+10
 -2.2524      8530.       0.00
 58.0000    0.00625   -108578.      1638.  -1.69E-05   828.3758   9.95E+10
 -2.3079      8869.       0.00
 60.0000    0.00552    -69594.      1583.  -3.84E-05   811.4559   9.95E+10
 -2.2792      9901.       0.00
 62.0000    0.00440    -31742.      1530.  -5.06E-05   795.0271   9.95E+10
 -2.1719     11843.       0.00
 64.0000    0.00309      4941.      1480.  -5.39E-05   783.3946   9.95E+10
 -1.9837     15386.       0.00
 66.0000    0.00182     40469.      1436.  -4.84E-05   798.8148   9.95E+10
 -1.7047     22530.       0.00
 68.0000   7.72E-04     74910.   552.8120  -3.45E-05   813.7630   9.95E+10
 -71.8868   2235404.       0.00
 70.0000   1.61E-04     67749.  -862.0004  -1.73E-05   810.6549   9.95E+10
 -46.0143   6854400.       0.00
 72.0000  -5.75E-05     33907.     -1211.  -5.02E-06   795.9667   9.95E+10
 16.8925   7050240.       0.00
 74.0000  -7.99E-05      9707.  -719.2654   2.37E-07   785.4632   9.95E+10
 24.1238   7246080.       0.00
 76.0000  -4.61E-05  -622.6828  -258.1619   1.33E-06   781.5203   9.95E+10
 14.3015   7441920.       0.00
 78.0000  -1.59E-05     -2713.   -25.6476   9.30E-07   782.4277   9.95E+10
 5.0747   7637760.       0.00
 80.0000  -1.47E-06     -1874.    41.0155   3.77E-07   782.0633   9.95E+10
 0.4806   7833600.       0.00
 82.0000   2.16E-06  -752.7206    38.1210   6.05E-08   781.5767   9.95E+10
 -0.7218   8029440.       0.00
 84.0000   1.43E-06   -45.3574    17.6893  -3.57E-08   781.2697   9.95E+10
 -0.9809   1.65E+07       0.00
 86.0000   4.42E-07    97.1362     2.1949  -2.95E-08   781.2922   9.95E+10
 -0.3103   1.68E+07       0.00
 88.0000   1.55E-08    60.6330    -1.6626  -1.05E-08   781.2763   9.95E+10
 -0.01114   1.72E+07       0.00
 90.0000  -6.03E-08    17.5566    -1.2649  -1.04E-09   781.2576   9.95E+10
 0.04428   1.76E+07       0.00
 92.0000  -3.45E-08   -0.05923    -0.4227   1.07E-09   781.2500   9.95E+10
 0.02590   1.80E+07       0.00
 94.0000  -9.05E-09    -2.7560   -0.02859   7.28E-10   781.2512   9.95E+10
 0.00694   1.84E+07       0.00
 96.0000   4.53E-10    -1.4473    0.05045   2.21E-10   781.2506   9.95E+10
 -3.55E-04   1.88E+07       0.00
 98.0000   1.58E-09    -0.3393    0.03102   6.08E-12   781.2501   9.95E+10
 -0.00126   1.92E+07       0.00
100.0000   7.45E-10    0.04139    0.00855  -2.98E-11   781.2500   9.95E+10
-6.08E-04   1.96E+07       0.00
102.0000   1.49E-10    0.07171  -2.35E-04  -1.62E-11   781.2500   9.95E+10
-1.24E-04   2.00E+07       0.00
104.0000  -3.24E-11    0.03045   -0.00139  -3.88E-12   781.2500   9.95E+10
2.75E-05   2.04E+07       0.00
106.0000  -3.75E-11    0.00494  -6.74E-04       0.00   781.2500   9.95E+10
3.24E-05   2.08E+07       0.00
108.0000  -1.40E-11   -0.00192  -1.37E-04       0.00   781.2500   9.95E+10
1.23E-05   2.12E+07       0.00
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (No scour) 24in"


```
110.0000  -1.64E-12   -0.00166   2.88E-05       0.00   781.2500   9.95E+10
1.47E-06   2.15E+07       0.00
112.0000   1.15E-12  -5.44E-04   3.38E-05       0.00   781.2500   9.95E+10
-1.05E-06   2.19E+07       0.00
114.0000       0.00  -3.37E-05   1.26E-05       0.00   781.2500   9.95E+10
-7.25E-07   2.23E+07       0.00
116.0000       0.00   5.91E-05   1.38E-06       0.00   781.2500   9.95E+10
-2.06E-07   2.27E+07       0.00
118.0000       0.00   3.30E-05  -1.07E-06       0.00   781.2500   9.95E+10
1.58E-09   2.72E+07       0.00
120.0000       0.00   7.69E-06  -7.05E-07       0.00   781.2500   9.95E+10
2.92E-08   2.35E+07       0.00
122.0000       0.00  -8.13E-07  -1.90E-07       0.00   781.2500   9.95E+10
1.36E-08   2.39E+07       0.00
124.0000       0.00  -1.46E-06   6.07E-09       0.00   781.2500   9.95E+10
2.74E-09   2.86E+07       0.00
126.0000       0.00  -5.28E-07   2.94E-08       0.00   781.2500   9.95E+10
-7.90E-10   2.90E+07       0.00
128.0000       0.00  -4.98E-08   1.19E-08       0.00   781.2500   9.95E+10
-6.72E-10   2.95E+07       0.00
130.0000       0.00   4.17E-08   1.52E-09       0.00   781.2500   9.95E+10
-1.91E-10   3.00E+07       0.00
132.0000       0.00   2.33E-08  -7.71E-10       0.00   781.2500   9.95E+10
0.00   3.04E+07       0.00
134.0000       0.00   4.83E-09  -5.01E-10       0.00   781.2500   9.95E+10
2.26E-11   3.09E+07       0.00
136.0000       0.00  -7.09E-10  -1.18E-10       0.00   781.2500   9.95E+10
9.38E-12   3.13E+07       0.00
138.0000       0.00  -8.44E-10   9.37E-12       0.00   781.2500   9.95E+10
1.24E-12   3.18E+07       0.00
140.0000       0.00  -2.62E-10   1.74E-11       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
142.0000       0.00  -1.05E-11   5.98E-12       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
144.0000       0.00   2.51E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
146.0000       0.00   1.11E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
148.0000       0.00   1.62E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.73E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.78E+07       0.00
166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.82E+07       0.00
168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.87E+07       0.00
170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.92E+07       0.00
172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
```

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  0.00   3.96E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.52E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.56E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.30E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.52343817 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -8100232. inch-lbs
Maximum shear force              =        102383. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             19
Number of zero deflection points =             21
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 2
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                              =     1.000000 inches
Rotation of pile head                                  =    0.000E+00 radians
Axial load on pile head                                =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (No scour) 24in"

East Overbank Static 24in.lp9o 10/3/2017

lb/inch	lb/inch	lb/inch				
0.00	1.0417	-1.44E+07	167154.	0.00	7032.	9.95E+10
0.00	0.00	0.00				
2.0000	1.0000	-1.04E+07	160793.	-0.00300	5317.	9.95E+10
-256.1207	6147.	0.00				
4.0000	0.8979	-6618356.	147200.	-0.00505	3654.	9.95E+10
-876.6267	23432.	0.00				
6.0000	0.7574	-3274825.	124659.	-0.00625	2203.	9.95E+10
-1002.	31744.	0.00				
8.0000	0.5980	-499806.	99486.	-0.00670	998.1795	9.95E+10
-1096.	43983.	0.00				
10.0000	0.4357	1645245.	71640.	-0.00656	1495.	9.95E+10
-1225.	67447.	0.00				
12.0000	0.2830	3080679.	41622.	-0.00599	2118.	9.95E+10
-1277.	108307.	0.00				
14.0000	0.1480	3772553.	12831.	-0.00517	2419.	9.95E+10
-1122.	181951.	0.00				
16.0000	0.03493	3808176.	-7707.	-0.00425	2434.	9.95E+10
-589.2262	404906.	0.00				
18.0000	-0.05614	3494487.	-14746.	-0.00337	2298.	9.95E+10
2.6647	1139.	0.00				
20.0000	-0.1270	3173233.	-14669.	-0.00257	2159.	9.95E+10
3.7270	704.3911	0.00				
22.0000	-0.1795	2845863.	-14571.	-0.00184	2016.	9.95E+10
4.4397	593.7131	0.00				
24.0000	-0.2155	2513638.	-14458.	-0.00120	1872.	9.95E+10
4.9921	556.0138	0.00				
26.0000	-0.2369	2177743.	-14333.	-6.32E-04	1726.	9.95E+10
5.4348	550.4819	0.00				
28.0000	-0.2458	1839307.	-14198.	-1.48E-04	1580.	9.95E+10
5.7873	565.0552	0.00				
30.0000	-0.2440	1499415.	-14056.	2.55E-04	1432.	9.95E+10
6.0582	595.8237	0.00				
32.0000	-0.2336	1159108.	-13908.	5.76E-04	1284.	9.95E+10
6.2512	642.3322	0.00				
34.0000	-0.2164	819383.	-13757.	8.14E-04	1137.	9.95E+10
6.3679	706.2264	0.00				
36.0000	-0.1945	481192.	-13604.	9.71E-04	990.1006	9.95E+10
6.4095	790.9097	0.00				
38.0000	-0.1698	145440.	-12305.	0.00105	844.3748	9.95E+10
101.8223	14392.	0.00				
40.0000	-0.1443	-132042.	-9439.	0.00105	838.5598	9.95E+10
136.9972	22790.	0.00				
42.0000	-0.1195	-330269.	-6200.	9.92E-04	924.5959	9.95E+10
132.9155	26695.	0.00				
44.0000	-0.09664	-451077.	-3071.	8.98E-04	977.0298	9.95E+10
127.7995	31738.	0.00				
46.0000	-0.07639	-497097.	-75.8691	7.84E-04	997.0039	9.95E+10
121.8326	38276.	0.00				
48.0000	-0.05902	-471647.	1480.	6.67E-04	985.9581	9.95E+10
7.8485	3192.	0.00				
50.0000	-0.04438	-440449.	1622.	5.57E-04	972.4170	9.95E+10
3.9296	2125.	0.00				
52.0000	-0.03228	-405840.	1713.	4.55E-04	957.3957	9.95E+10
3.6489	2713.	0.00				
54.0000	-0.02254	-368072.	1796.	3.62E-04	941.0034	9.95E+10
3.3388	3555.	0.00				
56.0000	-0.01492	-327423.	1872.	2.78E-04	923.3605	9.95E+10
2.9988	4822.	0.00				
58.0000	-0.00920	-284193.	1940.	2.04E-04	904.5978	9.95E+10
2.6282	6853.	0.00				

```
   60.0000   -0.00513   -238710.      1998.   1.41E-04   884.8568   9.95E+10
   2.2251     10411.       0.00
   62.0000   -0.00244   -191323.      2046.   8.92E-05   864.2897   9.95E+10
   1.7846     17585.       0.00
   64.0000  -8.49E-04   -142411.      2083.   4.89E-05   843.0602   9.95E+10
   1.2906     36487.       0.00
   66.0000  -8.64E-05    -92384.      2106.   2.06E-05   821.3471   9.95E+10
   0.6212    172597.       0.00
   68.0000   1.42E-04    -41758.      1745.   4.46E-06   799.3742   9.95E+10
   -30.7589   5215514.       0.00
   70.0000   1.28E-04     -8741.   937.4414  -1.63E-06   785.0439   9.95E+10
   -36.5008   6854400.       0.00
   72.0000   6.35E-05      3274.   275.6557  -2.29E-06   782.6710   9.95E+10
   -18.6480   7050240.       0.00
   74.0000   1.81E-05      4540.   -13.7111  -1.34E-06   783.2203   9.95E+10
   -5.4659   7246080.       0.00
   76.0000  -1.00E-06      2645.   -75.5742  -4.77E-07   782.3980   9.95E+10
   0.3107   7441920.       0.00
   78.0000  -4.80E-06   922.3447   -53.5115  -4.71E-08   781.6503   9.95E+10
   1.5279   7637760.       0.00
   80.0000  -3.26E-06    77.4135   -22.3971   7.34E-08   781.2836   9.95E+10
   1.0650   7833600.       0.00
   82.0000  -1.28E-06  -154.3032    -4.4933   6.42E-08   781.3170   9.95E+10
   0.4270   8029440.       0.00
   84.0000  -1.83E-07  -139.6529     2.1358   2.87E-08   781.3106   9.95E+10
   0.1254   1.65E+07       0.00
   86.0000   1.02E-07   -52.4033     2.7795   5.57E-09   781.2727   9.95E+10
   -0.07177   1.68E+07       0.00
   88.0000   8.42E-08    -6.3571     1.1923  -1.52E-09   781.2528   9.95E+10
   -0.06050   1.72E+07       0.00
   90.0000   2.94E-08     4.8604     0.2070  -1.70E-09   781.2521   9.95E+10
   -0.02161   1.76E+07       0.00
   92.0000   2.74E-09     3.6152   -0.07710  -6.76E-10   781.2516   9.95E+10
   -0.00206   1.80E+07       0.00
   94.0000  -3.02E-09     1.1743   -0.07399  -9.87E-11   781.2505   9.95E+10
   0.00232   1.84E+07       0.00
   96.0000  -1.99E-09    0.06569   -0.02744   5.08E-11   781.2500   9.95E+10
   0.00156   1.88E+07       0.00
   98.0000  -5.83E-10    -0.1439   -0.00311   4.14E-11   781.2501   9.95E+10
   4.66E-04   1.92E+07       0.00
  100.0000  -6.07E-12   -0.08451    0.00254   1.39E-11   781.2500   9.95E+10
  4.95E-06   1.96E+07       0.00
  102.0000   8.19E-11   -0.02206    0.00179   1.01E-12   781.2500   9.95E+10
  -6.82E-05   2.00E+07       0.00
  104.0000   4.22E-11    0.00119   5.38E-04  -1.51E-12   781.2500   9.95E+10
  -3.58E-05   2.04E+07       0.00
  106.0000   9.41E-12    0.00381   1.09E-05       0.00   781.2500   9.95E+10
  -8.14E-06   2.08E+07       0.00
  108.0000  -1.30E-12    0.00174  -7.29E-05       0.00   781.2500   9.95E+10
  1.15E-06   2.12E+07       0.00
  110.0000  -1.96E-12   3.18E-04  -3.81E-05       0.00   781.2500   9.95E+10
  1.76E-06   2.15E+07       0.00
  112.0000       0.00  -8.90E-05  -8.44E-06       0.00   781.2500   9.95E+10
  7.08E-07   2.19E+07       0.00
  114.0000       0.00  -8.80E-05   1.23E-06       0.00   781.2500   9.95E+10
  9.81E-08   2.23E+07       0.00
  116.0000       0.00  -3.02E-05   1.78E-06       0.00   781.2500   9.95E+10
  -5.21E-08   2.27E+07       0.00
  118.0000       0.00  -2.44E-06   6.91E-07       0.00   781.2500   9.95E+10
  -3.89E-08   2.31E+07       0.00
  120.0000       0.00   2.96E-06   8.65E-08       0.00   781.2500   9.95E+10
  -1.15E-08   2.35E+07       0.00
  122.0000       0.00   1.74E-06  -5.37E-08       0.00   781.2500   9.95E+10
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```
-2.02E-10   2.81E+07       0.00
124.0000       0.00   3.90E-07  -3.71E-08       0.00   781.2500   9.95E+10
1.59E-09   2.86E+07       0.00
126.0000       0.00  -4.29E-08  -9.46E-09       0.00   781.2500   9.95E+10
7.12E-10   2.90E+07       0.00
128.0000       0.00  -6.50E-08   4.35E-10       0.00   781.2500   9.95E+10
1.12E-10   2.95E+07       0.00
130.0000       0.00  -2.23E-08   1.32E-09       0.00   781.2500   9.95E+10
-3.83E-11   3.00E+07       0.00
132.0000       0.00  -1.70E-09   5.04E-10       0.00   781.2500   9.95E+10
-2.96E-11   3.04E+07       0.00
134.0000       0.00   1.90E-09   5.57E-11       0.00   781.2500   9.95E+10
-7.84E-12   3.09E+07       0.00
136.0000       0.00   9.79E-10  -3.58E-11       0.00   781.2500   9.95E+10
0.00   3.13E+07       0.00
138.0000       0.00   1.83E-10  -2.12E-11       0.00   781.2500   9.95E+10
1.00E-12   3.18E+07       0.00
140.0000       0.00  -3.70E-11  -4.55E-12       0.00   781.2500   9.95E+10
0.00   3.23E+07       0.00
142.0000       0.00  -3.55E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.27E+07       0.00
144.0000       0.00  -1.01E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.32E+07       0.00
146.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
148.0000       0.00   1.08E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
150.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
152.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.73E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.78E+07       0.00
166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.82E+07       0.00
168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.87E+07       0.00
170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.92E+07       0.00
172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.96E+07       0.00
174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.01E+07       0.00
176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.06E+07       0.00
178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.10E+07       0.00
180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.15E+07       0.00
182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.19E+07       0.00
184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.24E+07       0.00
```

```
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.52E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.56E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.30E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     1.04166995 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -14401134. inch-lbs
Maximum shear force              =        167154. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             20
Number of zero deflection points =             21
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 3
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     2.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     2.0717  -2.48E+07    256719.       0.00     11540.   9.95E+10
      0.00       0.00       0.00
     2.0000     2.0000  -1.87E+07    250241.   -0.00524      8888.   9.95E+10
    -256.1207      3073.       0.00
     4.0000     1.8202  -1.27E+07    236635.   -0.00902      6278.   9.95E+10
    -877.7192     11573.       0.00
     6.0000     1.5671  -7123885.    212831.   -0.01140      3873.   9.95E+10
    -1106.     16938.       0.00
     8.0000     1.2728  -2202006.    182064.   -0.01253      1737.   9.95E+10
    -1458.     27492.       0.00
```

```
10.0000     0.9657   1885824.    140039.   -0.01257      1600.   9.95E+10
-2044.     50803.       0.00
12.0000     0.6695   4791313.     88848.   -0.01176      2861.   9.95E+10
-2222.     79642.       0.00
14.0000     0.4011   6404579.     37499.   -0.01041      3561.   9.95E+10
-2057.    123100.       0.00
16.0000     0.1697   6816152.     -5679.   -0.00882      3740.   9.95E+10
-1541.    217871.       0.00
18.0000   -0.02219   6322448.    -24146.   -0.00723      3525.   9.95E+10
1.9555      2115.       0.00
20.0000    -0.1775   5813407.    -24073.   -0.00577      3304.   9.95E+10
4.1673   563.4087       0.00
22.0000    -0.2992   5291627.    -23959.   -0.00443      3078.   9.95E+10
5.2644   422.2642       0.00
24.0000    -0.3903   4759098.    -23823.   -0.00322      2847.   9.95E+10
6.0851   374.2035       0.00
26.0000    -0.4538   4217682.    -23669.   -0.00214      2612.   9.95E+10
6.7492   356.9408       0.00
28.0000    -0.4929   3669169.    -23501.   -0.00119      2374.   9.95E+10
7.2980   355.3331       0.00
30.0000    -0.5108   3115305.    -23320.  -3.70E-04      2133.   9.95E+10
7.7496   364.1141       0.00
32.0000    -0.5107   2557791.    -23130.   3.14E-04      1891.   9.95E+10
8.1134   381.3099       0.00
34.0000    -0.4957   1998291.    -22932.   8.64E-04      1649.   9.95E+10
8.3943   406.4062       0.00
36.0000    -0.4692   1438421.    -22728.    0.00128      1406.   9.95E+10
8.5962   439.6955       0.00
38.0000    -0.4344    879757.    -20953.    0.00156      1163.   9.95E+10
139.2540      7694.       0.00
40.0000    -0.3944    399012.    -16984.    0.00171   954.4323   9.95E+10
191.5615     11655.       0.00
42.0000    -0.3522     27568.    -12398.    0.00176   793.2151   9.95E+10
190.5659     12985.       0.00
44.0000    -0.3098   -234183.     -7850.    0.00174   882.8918   9.95E+10
188.4368     14597.       0.00
46.0000    -0.2688   -386784.     -3365.    0.00166   949.1249   9.95E+10
185.2949     16545.       0.00
48.0000    -0.2300   -431647.  -993.6210    0.00156   968.5970   9.95E+10
12.3498      1289.       0.00
50.0000    -0.1937   -468274.  -768.3669    0.00146   984.4938   9.95E+10
6.4213   795.7106       0.00
52.0000    -0.1601   -499982.  -616.6503    0.00134   998.2559   9.95E+10
6.2217   932.7588       0.00
54.0000    -0.1294   -526804.  -470.2589    0.00122      1010.   9.95E+10
5.9776      1109.       0.00
56.0000    -0.1017   -548811.  -330.3052    0.00109      1019.   9.95E+10
5.6853      1341.       0.00
58.0000   -0.07726   -566115.  -197.9988   9.52E-04      1027.   9.95E+10
5.3403      1659.       0.00
60.0000   -0.05606   -578868.   -74.6758   8.13E-04      1032.   9.95E+10
4.9366      2113.       0.00
62.0000   -0.03822   -587270.    38.1539   6.73E-04      1036.   9.95E+10
4.4659      2805.       0.00
64.0000   -0.02377   -591571.   138.7293   5.31E-04      1038.   9.95E+10
3.9154      3954.       0.00
66.0000   -0.01274   -592075.   224.8910   3.88E-04      1038.   9.95E+10
3.2647      6150.       0.00
68.0000   -0.00514   -589158.      2491.   2.46E-04      1037.   9.95E+10
185.5706    866544.       0.00
70.0000  -9.49E-04   -477817.      7545.   1.17E-04   988.6359   9.95E+10
235.6375   5958341.       0.00
72.0000   4.76E-04   -229505.      8694.   3.17E-05   880.8615   9.95E+10
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 -139.8821   7050240.       0.00
 74.0000   5.73E-04    -61167.      4939.  -3.33E-06   807.7983   9.95E+10
 -173.1037   7246080.       0.00
 76.0000   3.17E-04      7622.      1684.  -9.78E-06   784.5581   9.95E+10
 -98.1496   7441920.       0.00
 78.0000   1.04E-04     19857.   109.3171  -6.47E-06   789.8686   9.95E+10
 -33.0414   7637760.       0.00
 80.0000   6.04E-06     13009.  -310.8174  -2.51E-06   786.8962   9.95E+10
 -1.9698   7833600.       0.00
 82.0000  -1.65E-05      4992.  -268.3232  -3.36E-07   783.4167   9.95E+10
 5.5110   8029440.       0.00
 84.0000  -1.01E-05   136.6215  -119.1932   2.82E-07   781.3093   9.95E+10
 6.9165   1.65E+07       0.00
 86.0000  -2.92E-06  -735.2984   -11.6222   2.10E-07   781.5691   9.95E+10
 2.0478   1.68E+07       0.00
 88.0000  -7.54E-10  -425.7834    12.9577   7.02E-08   781.4348   9.95E+10
 5.42E-04   1.72E+07       0.00
 90.0000   4.53E-07  -114.8477     8.9761   5.04E-09   781.2998   9.95E+10
 -0.3323   1.76E+07       0.00
 92.0000   2.41E-07     4.9618     2.8154  -8.21E-09   781.2522   9.95E+10
 -0.1811   1.80E+07       0.00
 94.0000   5.85E-08    20.4685     0.1038  -5.14E-09   781.2589   9.95E+10
 -0.04491   1.84E+07       0.00
 96.0000  -5.63E-09    10.0547    -0.3822  -1.46E-09   781.2544   9.95E+10
 0.00441   1.88E+07       0.00
 98.0000  -1.16E-08     2.1565    -0.2176   1.02E-11   781.2509   9.95E+10
 0.00930   1.92E+07       0.00
100.0000  -5.14E-09    -0.3916   -0.05570   2.23E-10   781.2502   9.95E+10
0.00420   1.96E+07       0.00
102.0000  -9.23E-10    -0.5218    0.00387   1.13E-10   781.2502   9.95E+10
7.68E-04   2.00E+07       0.00
104.0000   2.76E-10    -0.2083    0.01027   2.49E-11   781.2501   9.95E+10
-2.34E-04   2.04E+07       0.00
106.0000   2.70E-10   -0.02920    0.00466  -3.78E-12   781.2500   9.95E+10
-2.34E-04   2.08E+07       0.00
108.0000   9.49E-11    0.01540   8.52E-04  -5.44E-12   781.2500   9.95E+10
-8.36E-05   2.12E+07       0.00
110.0000   8.81E-12    0.01181  -2.46E-04  -2.16E-12   781.2500   9.95E+10
-7.91E-06   2.15E+07       0.00
112.0000  -8.87E-12    0.00364  -2.44E-04       0.00   781.2500   9.95E+10
8.11E-06   2.19E+07       0.00
114.0000  -5.50E-12   1.22E-04  -8.50E-05       0.00   781.2500   9.95E+10
5.12E-06   2.23E+07       0.00
116.0000  -1.43E-12  -4.45E-04  -7.29E-06       0.00   781.2500   9.95E+10
1.36E-06   2.27E+07       0.00
118.0000       0.00  -2.31E-04   8.27E-06       0.00   781.2500   9.95E+10
-5.91E-08   2.31E+07       0.00
120.0000       0.00  -4.92E-05   4.97E-06       0.00   781.2500   9.95E+10
-2.16E-07   2.35E+07       0.00
122.0000       0.00   7.88E-06   1.24E-06       0.00   781.2500   9.95E+10
-9.49E-08   2.39E+07       0.00
124.0000       0.00   1.03E-05  -8.89E-08       0.00   781.2500   9.95E+10
-1.57E-08   2.43E+07       0.00
126.0000       0.00   3.66E-06  -2.08E-07       0.00   781.2500   9.95E+10
5.75E-09   2.90E+07       0.00
128.0000       0.00   3.22E-07  -8.23E-08       0.00   781.2500   9.95E+10
4.71E-09   2.95E+07       0.00
130.0000       0.00  -2.98E-07  -1.01E-08       0.00   781.2500   9.95E+10
1.31E-09   3.00E+07       0.00
132.0000       0.00  -1.63E-07   5.54E-09       0.00   781.2500   9.95E+10
-1.02E-11   3.04E+07       0.00
134.0000       0.00  -3.29E-08   3.50E-09       0.00   781.2500   9.95E+10
-1.60E-10   3.09E+07       0.00
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (No scour) 24in"


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  136.0000       0.00   5.28E-09   8.07E-10       0.00   781.2500   9.95E+10
  -6.51E-11   3.13E+07       0.00
  138.0000       0.00   5.93E-09  -7.29E-11       0.00   781.2500   9.95E+10
  -8.25E-12   3.18E+07       0.00
  140.0000       0.00   1.81E-09  -1.22E-10       0.00   781.2500   9.95E+10
  4.13E-12   3.23E+07       0.00
  142.0000       0.00   5.97E-11  -4.13E-11       0.00   781.2500   9.95E+10
  2.62E-12   3.27E+07       0.00
  144.0000       0.00  -1.78E-10  -2.84E-12       0.00   781.2500   9.95E+10
  0.00   3.32E+07       0.00
  146.0000       0.00  -7.73E-11   3.49E-12       0.00   781.2500   9.95E+10
  0.00   3.36E+07       0.00
  148.0000       0.00  -1.09E-11   1.70E-12       0.00   781.2500   9.95E+10
  0.00   3.41E+07       0.00
  150.0000       0.00   4.17E-12       0.00       0.00   781.2500   9.95E+10
  0.00   3.46E+07       0.00
  152.0000       0.00   2.80E-12       0.00       0.00   781.2500   9.95E+10
  0.00   3.50E+07       0.00
  154.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.55E+07       0.00
  156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.59E+07       0.00
  158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.64E+07       0.00
  160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.69E+07       0.00
  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.52E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
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  0.00   4.56E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.30E+07       0.00

* The above values of total stress are combined axial and bending stresses.


Output Summary for Load Case No. 3:

Pile-head deflection             =     2.07172741 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -24788992. inch-lbs
Maximum shear force              =        256719. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             19
Number of zero deflection points =             20



-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 4
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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     3.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     3.0950  -3.28E+07    316371.       0.00     15028.   9.95E+10
      0.00       0.00       0.00
    2.0000     3.0000  -2.53E+07    309815.   -0.00700     11750.   9.95E+10
    -256.1207      2049.       0.00
    4.0000     2.7588  -1.78E+07    296209.   -0.01220      8508.   9.95E+10
    -877.7192      7636.       0.00
    6.0000     2.4145  -1.08E+07    272405.   -0.01564      5465.   9.95E+10
    -1106.     10993.       0.00
    8.0000     2.0078  -4388836.    241638.   -0.01748      2686.   9.95E+10
    -1458.     17427.       0.00
   10.0000     1.5757   1185030.    199613.   -0.01786      1296.   9.95E+10
   -2044.     31135.       0.00
   12.0000     1.1505   5578382.    141796.   -0.01705      3202.   9.95E+10
   -2774.     57867.       0.00
   14.0000     0.7575   8359439.     70469.   -0.01537      4409.   9.95E+10
   -3170.    100434.       0.00
   16.0000     0.4129   9292812.   679.7638   -0.01324      4815.   9.95E+10
   -2646.    153780.       0.00
   18.0000     0.1221   8677993.    -31112.   -0.01107      4548.   9.95E+10
   -3.4525   678.5162       0.00
   20.0000    -0.1185   8038586.    -31109.   -0.00906      4270.   9.95E+10
   3.6418   737.7774       0.00
   22.0000    -0.3125   7380343.    -31001.   -0.00720      3985.   9.95E+10
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5.3414   410.1760       0.00
24.0000    -0.4639   6705957.    -30860.   -0.00550      3692.   9.95E+10
6.4459   333.4876       0.00
26.0000    -0.5764   6017820.    -30695.   -0.00396      3393.   9.95E+10
7.3094   304.3259       0.00
28.0000    -0.6542   5318223.    -30511.   -0.00260      3090.   9.95E+10
8.0199   294.2368       0.00
30.0000    -0.7011   4609395.    -30311.   -0.00140      2782.   9.95E+10
8.6124   294.8160       0.00
32.0000    -0.7214   3893524.    -30099.  -3.75E-04      2471.   9.95E+10
9.1035   302.8708       0.00
34.0000    -0.7191   3172757.    -29876.   4.77E-04      2158.   9.95E+10
9.5025   317.1378       0.00
36.0000    -0.6985   2449202.    -29644.    0.00115      1844.   9.95E+10
9.8153   337.2489       0.00
38.0000    -0.6637   1724922.    -27601.    0.00166      1530.   9.95E+10
160.3900      5800.       0.00
40.0000    -0.6189   1088535.    -23005.    0.00200      1254.   9.95E+10
222.5993      8632.       0.00
42.0000    -0.5679    577530.    -17653.    0.00220      1032.   9.95E+10
223.4533      9444.       0.00
44.0000    -0.5134    193730.    -12295.    0.00229   865.3343   9.95E+10
222.9918     10424.       0.00
46.0000    -0.4579    -62131.     -6964.    0.00231   808.2164   9.95E+10
221.3011     11599.       0.00
48.0000    -0.4027   -190360.     -4130.    0.00228   863.8716   9.95E+10
14.8854   887.1090       0.00
50.0000    -0.3486   -309520.     -3857.    0.00222   915.5904   9.95E+10
7.8112   537.7246       0.00
52.0000    -0.2963   -423375.     -3672.    0.00213   965.0064   9.95E+10
7.6394   618.6829       0.00
54.0000    -0.2465   -531727.     -3491.    0.00201      1012.   9.95E+10
7.4103   721.4596       0.00
56.0000    -0.1997   -634425.     -3317.    0.00187      1057.   9.95E+10
7.1190   855.3438       0.00
58.0000    -0.1567   -731372.     -3150.    0.00171      1099.   9.95E+10
6.7591      1035.       0.00
60.0000    -0.1178   -822520.     -2993.    0.00152      1138.   9.95E+10
6.3229      1288.       0.00
62.0000   -0.08371   -907884.     -2848.    0.00131      1175.   9.95E+10
5.7998      1663.       0.00
64.0000   -0.05487   -987543.     -2716.    0.00108      1210.   9.95E+10
5.1748      2264.       0.00
66.0000   -0.03174  -1061650.     -2601.   8.36E-04      1242.   9.95E+10
4.4257      3347.       0.00
68.0000   -0.01476  -1130443.      1225.   5.71E-04      1272.   9.95E+10
314.4281    511389.       0.00
70.0000   -0.00431  -1015182.     11027.   3.13E-04      1222.   9.95E+10
502.3677   2794193.       0.00
72.0000   2.52E-04   -607913.     16168.   1.17E-04      1045.   9.95E+10
-73.9175   7050240.       0.00
74.0000    0.00130   -241637.     11972.   1.46E-05   886.1273   9.95E+10
-275.7581   5090154.       0.00
76.0000   9.50E-04    -33569.      5834.  -1.86E-05   795.8199   9.95E+10
-235.7678   5953725.       0.00
78.0000   4.06E-04     38784.      1453.  -1.80E-05   798.0834   9.95E+10
-129.3141   7637760.       0.00
80.0000   8.67E-05     36552.  -438.7122  -8.91E-06   797.1144   9.95E+10
-28.3080   7833600.       0.00
82.0000  -2.14E-05     17919.  -692.6540  -2.34E-06   789.0271   9.95E+10
7.1461   8029440.       0.00
84.0000  -2.58E-05      3355.  -395.0816   2.21E-07   782.7061   9.95E+10
17.6516   1.65E+07       0.00
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 86.0000  -1.07E-05     -1050.   -92.9084   4.99E-07   781.7058   9.95E+10
 7.5295   1.68E+07       0.00
 88.0000  -1.78E-06     -1115.    12.8198   2.38E-07   781.7341   9.95E+10
 1.2811   1.72E+07       0.00
 90.0000   7.06E-07  -439.9519    21.9723   5.07E-08   781.4410   9.95E+10
 -0.5184   1.76E+07       0.00
 92.0000   6.50E-07   -61.9012     9.8956  -9.79E-09   781.2769   9.95E+10
 -0.4880   1.80E+07       0.00
 94.0000   2.36E-07    35.2495     1.8697  -1.30E-08   781.2653   9.95E+10
 -0.1809   1.84E+07       0.00
 96.0000   2.56E-08    28.1272    -0.5415  -5.37E-09   781.2622   9.95E+10
 -0.02007   1.88E+07       0.00
 98.0000  -2.18E-08     9.3741    -0.5731  -8.45E-10   781.2541   9.95E+10
 0.01743   1.92E+07       0.00
100.0000  -1.50E-08     0.6379    -0.2173   3.62E-10   781.2503   9.95E+10
0.01221   1.96E+07       0.00
102.0000  -4.44E-09    -1.0654   -0.02641   3.10E-10   781.2505   9.95E+10
0.00370   2.00E+07       0.00
104.0000  -8.16E-11    -0.6367    0.01878   1.05E-10   781.2503   9.95E+10
6.92E-05   2.04E+07       0.00
106.0000   5.94E-10    -0.1664    0.01344   8.08E-12   781.2501   9.95E+10
-5.14E-04   2.08E+07       0.00
108.0000   3.06E-10    0.00846    0.00404  -1.10E-11   781.2500   9.95E+10
-2.70E-04   2.12E+07       0.00
110.0000   6.73E-11    0.02795   8.25E-05  -6.58E-12   781.2500   9.95E+10
-6.04E-05   2.15E+07       0.00
112.0000  -9.65E-12    0.01256  -5.37E-04  -1.69E-12   781.2500   9.95E+10
8.82E-06   2.19E+07       0.00
114.0000  -1.39E-11    0.00222  -2.76E-04       0.00   781.2500   9.95E+10
1.30E-05   2.23E+07       0.00
116.0000  -5.37E-12  -6.68E-04  -5.91E-05       0.00   781.2500   9.95E+10
5.08E-06   2.27E+07       0.00
118.0000       0.00  -6.25E-04   9.66E-06       0.00   781.2500   9.95E+10
6.50E-07   2.31E+07       0.00
120.0000       0.00  -2.07E-04   1.28E-05       0.00   781.2500   9.95E+10
-3.91E-07   2.35E+07       0.00
122.0000       0.00  -1.34E-05   4.75E-06       0.00   781.2500   9.95E+10
-2.76E-07   2.39E+07       0.00
124.0000       0.00   2.14E-05   5.22E-07       0.00   781.2500   9.95E+10
-7.71E-08   2.43E+07       0.00
126.0000       0.00   1.18E-05  -3.96E-07       0.00   781.2500   9.95E+10
6.26E-10   2.90E+07       0.00
128.0000       0.00   2.44E-06  -2.53E-07       0.00   781.2500   9.95E+10
1.13E-08   2.95E+07       0.00
130.0000       0.00  -3.67E-07  -5.99E-08       0.00   781.2500   9.95E+10
4.74E-09   3.00E+07       0.00
132.0000       0.00  -4.41E-07   4.77E-09       0.00   781.2500   9.95E+10
6.47E-10   3.04E+07       0.00
134.0000       0.00  -1.40E-07   9.05E-09       0.00   781.2500   9.95E+10
-2.91E-10   3.09E+07       0.00
136.0000       0.00  -6.87E-09   3.20E-09       0.00   781.2500   9.95E+10
-1.97E-10   3.13E+07       0.00
138.0000       0.00   1.33E-08   2.70E-10       0.00   781.2500   9.95E+10
-4.73E-11   3.18E+07       0.00
140.0000       0.00   6.17E-09  -2.56E-10       0.00   781.2500   9.95E+10
3.37E-12   3.23E+07       0.00
142.0000       0.00   9.90E-10  -1.35E-10       0.00   781.2500   9.95E+10
6.77E-12   3.27E+07       0.00
144.0000       0.00  -2.94E-10  -2.53E-11       0.00   781.2500   9.95E+10
2.34E-12   3.32E+07       0.00
146.0000       0.00  -2.26E-10   4.95E-12       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
148.0000       0.00  -5.69E-11   4.77E-12       0.00   781.2500   9.95E+10
```

```
  0.00   3.41E+07       0.00
  150.0000       0.00   2.42E-12   1.33E-12       0.00   781.2500   9.95E+10
  0.00   3.46E+07       0.00
  152.0000       0.00   7.10E-12       0.00       0.00   781.2500   9.95E+10
  0.00   3.50E+07       0.00
  154.0000       0.00   2.48E-12       0.00       0.00   781.2500   9.95E+10
  0.00   3.55E+07       0.00
  156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.59E+07       0.00
  158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.64E+07       0.00
  160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.69E+07       0.00
  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.52E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.56E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.30E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 4:

```
Pile-head deflection             =     3.09497860 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -32824606. inch-lbs
Maximum shear force              =        316371. lbs
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (No scour) 24in"

East Overbank Static 24in.lp9o 10/3/2017

Depth of maximum bending moment = 0.000000 feet below pile head
Depth of maximum shear force = 0.000000 feet below pile head
Number of iterations = 19
Number of zero deflection points = 20

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 5

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 4.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 450000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	4.1128	-3.90E+07	357987.	0.00	17697.	9.95E+10	0.00	0.00	0.00
2.0000	4.0000	-3.04E+07	351376.	-0.00837	13983.	9.95E+10	-256.1207	1537.	0.00
4.0000	3.7112	-2.19E+07	337770.	-0.01468	10298.	9.95E+10	-877.7192	5676.	0.00
6.0000	3.2955	-1.39E+07	313966.	-0.01899	6809.	9.95E+10	-1106.	8054.	0.00
8.0000	2.7995	-6447027.	283199.	-0.02145	3579.	9.95E+10	-1458.	12499.	0.00
10.0000	2.2661	169877.	241174.	-0.02220	854.9814	9.95E+10	-2044.	21649.	0.00
12.0000	1.7337	5608911.	183357.	-0.02151	3216.	9.95E+10	-2774.	38400.	0.00
14.0000	1.2338	9435569.	106693.	-0.01969	4877.	9.95E+10	-3615.	70317.	0.00
16.0000	0.7885	1.12E+07	13791.	-0.01721	5623.	9.95E+10	-4127.	125622.	0.00
18.0000	0.4077	1.05E+07	-35795.	-0.01460	5325.	9.95E+10	-5.1600	303.7603	0.00
20.0000	0.08752	9752793.	-35896.	-0.01216	5014.	9.95E+10	-3.2920	902.7730	0.00
22.0000	-0.1762	9009019.	-35883.	-0.00990	4691.	9.95E+10	4.4128	600.9883	0.00
24.0000	-0.3878	8244327.	-35757.	-0.00782	4360.	9.95E+10	6.0724	375.7809	0.00
26.0000	-0.5517	7461662.	-35598.	-0.00593	4020.	9.95E+10	7.2034	313.3513	0.00
28.0000	-0.6724	6663715.	-35414.	-0.00423	3673.	9.95E+10	8.0939	288.8846	0.00
30.0000	-0.7546	5853077.	-35211.	-0.00272	3322.	9.95E+10	8.8260	280.7201	0.00
32.0000	-0.8028	5032280.	-34992.	-0.00140	2965.	9.95E+10	9.4341	282.0185	0.00
34.0000	-0.8220	4203812.	-34759.	-2.91E-04	2606.	9.95E+10	9.9356	290.0903	0.00

```
36.0000    -0.8168   3370120.    -34516.   6.22E-04      2244.   9.95E+10
10.3409   303.8366       0.00
38.0000    -0.7922   2533607.    -32350.    0.00133      1881.   9.95E+10
170.1329      5155.       0.00
40.0000    -0.7528   1788494.    -27457.    0.00185      1558.   9.95E+10
237.6143      7575.       0.00
42.0000    -0.7031   1175588.    -21727.    0.00221      1291.   9.95E+10
239.9488      8190.       0.00
44.0000    -0.6466    697832.    -15958.    0.00244      1084.   9.95E+10
240.8127      8938.       0.00
46.0000    -0.5861    356967.    -10184.    0.00257   936.1834   9.95E+10
240.2807      9839.       0.00
48.0000    -0.5235    153573.     -7106.    0.00263   847.9050   9.95E+10
16.2456   744.7777       0.00
50.0000    -0.4600    -40863.     -6808.    0.00264   798.9855   9.95E+10
8.5675   446.9809       0.00
52.0000    -0.3968   -230257.     -6604.    0.00261   881.1881   9.95E+10
8.4198   509.3019       0.00
54.0000    -0.3349   -414202.     -6405.    0.00253   961.0254   9.95E+10
8.2068   588.2079       0.00
56.0000    -0.2753   -592342.     -6211.    0.00241      1038.   9.95E+10
7.9227   690.5960       0.00
58.0000    -0.2192   -764375.     -6026.    0.00224      1113.   9.95E+10
7.5604   827.6203       0.00
60.0000    -0.1676   -930063.     -5850.    0.00204      1185.   9.95E+10
7.1110      1018.       0.00
62.0000    -0.1213  -1089233.     -5685.    0.00180      1254.   9.95E+10
6.5628      1299.       0.00
64.0000   -0.08131  -1241787.     -5536.    0.00152      1320.   9.95E+10
5.8996      1741.       0.00
66.0000   -0.04851  -1387708.     -5404.    0.00120      1384.   9.95E+10
5.0979      2522.       0.00
68.0000   -0.02375  -1527079.  -556.4794   8.48E-04      1444.   9.95E+10
398.8586    403130.       0.00
70.0000   -0.00782  -1432731.     12344.   4.91E-04      1403.   9.95E+10
676.1883   2075844.       0.00
72.0000  -1.81E-04   -945167.     21097.   2.04E-04      1191.   9.95E+10
53.2197   7050240.       0.00
74.0000    0.00199   -424488.     17646.   3.91E-05   965.4894   9.95E+10
-340.7900   4118848.       0.00
76.0000    0.00170    -98998.      9777.  -2.40E-05   824.2177   9.95E+10
-314.9629   4456704.       0.00
78.0000   8.34E-04     45332.      3348.  -3.05E-05   800.9252   9.95E+10
-220.8092   6357273.       0.00
80.0000   2.33E-04     62357.  -216.1143  -1.75E-05   808.3145   9.95E+10
-76.1863   7833600.       0.00
82.0000  -5.91E-06     35336.     -1107.  -5.71E-06   796.5867   9.95E+10
1.9780   8029440.       0.00
84.0000  -4.07E-05      9362.  -747.7111  -3.23E-07   785.3136   9.95E+10
27.9306   1.65E+07       0.00
86.0000  -2.14E-05  -547.3013  -232.3001   7.40E-07   781.4875   9.95E+10
15.0203   1.68E+07       0.00
88.0000  -5.23E-06     -1804.    -7.0210   4.57E-07   782.0330   9.95E+10
3.7529   1.72E+07       0.00
90.0000   5.12E-07  -894.1728    33.5057   1.31E-07   781.6381   9.95E+10
-0.3757   1.76E+07       0.00
92.0000   1.07E-06  -198.4971    19.3131  -4.58E-10   781.3362   9.95E+10
-0.8070   1.80E+07       0.00
94.0000   4.90E-07    32.8680     5.1227  -2.04E-08   781.2643   9.95E+10
-0.3755   1.84E+07       0.00
96.0000   9.45E-08    47.8329    -0.2718  -1.07E-08   781.2708   9.95E+10
-0.07399   1.88E+07       0.00
98.0000  -2.39E-08    20.0523    -0.9306  -2.51E-09   781.2587   9.95E+10
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (No scour) 24in"


```
 0.01909   1.92E+07       0.00
100.0000  -2.62E-08     3.2174    -0.4453   2.92E-10   781.2514   9.95E+10
0.02135   1.96E+07       0.00
102.0000  -9.84E-09    -1.3265   -0.09074   5.20E-10   781.2506   9.95E+10
0.00819   2.00E+07       0.00
104.0000  -1.19E-09    -1.1492    0.01967   2.22E-10   781.2505   9.95E+10
0.00101   2.04E+07       0.00
106.0000   8.11E-10    -0.3872    0.02337   3.67E-11   781.2502   9.95E+10
-7.01E-04   2.08E+07       0.00
108.0000   5.71E-10   -0.02821    0.00892  -1.34E-11   781.2500   9.95E+10
-5.03E-04   2.12E+07       0.00
110.0000   1.67E-10    0.04126    0.00109  -1.18E-11   781.2500   9.95E+10
-1.50E-04   2.15E+07       0.00
112.0000   2.25E-12    0.02430  -7.35E-04  -3.93E-12   781.2500   9.95E+10
-2.06E-06   2.19E+07       0.00
114.0000  -2.19E-11    0.00608  -5.15E-04       0.00   781.2500   9.95E+10
2.04E-05   2.23E+07       0.00
116.0000  -1.08E-11  -4.25E-04  -1.48E-04       0.00   781.2500   9.95E+10
1.02E-05   2.27E+07       0.00
118.0000  -2.19E-12   -0.00104  -1.59E-07       0.00   781.2500   9.95E+10
2.11E-06   2.31E+07       0.00
120.0000       0.00  -4.37E-04   2.03E-05       0.00   781.2500   9.95E+10
-4.04E-07   2.35E+07       0.00
122.0000       0.00  -6.64E-05   9.68E-06       0.00   781.2500   9.95E+10
-4.81E-07   2.39E+07       0.00
124.0000       0.00   2.73E-05   1.83E-06       0.00   781.2500   9.95E+10
-1.73E-07   2.43E+07       0.00
126.0000       0.00   2.15E-05  -4.38E-07       0.00   781.2500   9.95E+10
-1.62E-08   2.47E+07       0.00
128.0000       0.00   6.37E-06  -4.50E-07       0.00   781.2500   9.95E+10
1.52E-08   2.51E+07       0.00
130.0000       0.00  -4.99E-08  -1.49E-07       0.00   781.2500   9.95E+10
9.90E-09   3.00E+07       0.00
132.0000       0.00  -7.71E-07  -5.44E-09       0.00   781.2500   9.95E+10
2.04E-09   3.04E+07       0.00
134.0000       0.00  -3.15E-07   1.52E-08       0.00   781.2500   9.95E+10
-3.18E-10   3.09E+07       0.00
136.0000       0.00  -4.05E-08   6.96E-09       0.00   781.2500   9.95E+10
-3.72E-10   3.13E+07       0.00
138.0000       0.00   1.95E-08   1.10E-09       0.00   781.2500   9.95E+10
-1.16E-10   3.18E+07       0.00
140.0000       0.00   1.25E-08  -3.48E-10       0.00   781.2500   9.95E+10
-4.63E-12   3.23E+07       0.00
142.0000       0.00   2.85E-09  -2.66E-10       0.00   781.2500   9.95E+10
1.14E-11   3.27E+07       0.00
144.0000       0.00  -2.60E-10  -6.80E-11       0.00   781.2500   9.95E+10
5.12E-12   3.32E+07       0.00
146.0000       0.00  -4.19E-10   2.62E-12       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
148.0000       0.00  -1.37E-10   8.58E-12       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
150.0000       0.00  -7.71E-12   3.09E-12       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
152.0000       0.00   1.18E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
154.0000       0.00   5.37E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
```

```
  162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.73E+07       0.00
  164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.78E+07       0.00
  166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.82E+07       0.00
  168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.87E+07       0.00
  170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.92E+07       0.00
  172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   3.96E+07       0.00
  174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.01E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.52E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.56E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.30E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 5:

```
Pile-head deflection             =     4.11277326 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -38974438. inch-lbs
Maximum shear force              =        357987. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             19
Number of zero deflection points =             20
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 6
-------------------------------------------------------------------------------
--
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (No scour) 24in"

East Overbank Static 24in.lp9o 10/3/2017

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 5.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 450000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				
0.00	5.1196	-4.13E+07	369925.	0.00	18719.	9.95E+10
0.00	0.00	0.00				
2.0000	5.0000	-3.25E+07	363298.	-0.00890	14880.	9.95E+10
-256.1207	1229.	0.00				
4.0000	4.6924	-2.37E+07	349692.	-0.01567	11067.	9.95E+10
-877.7194	4489.	0.00				
6.0000	4.2477	-1.54E+07	325888.	-0.02038	7448.	9.95E+10
-1106.	6249.	0.00				
8.0000	3.7141	-7616132.	295122.	-0.02315	4087.	9.95E+10
-1458.	9421.	0.00				
10.0000	3.1364	-693152.	253096.	-0.02415	1082.	9.95E+10
-2044.	15642.	0.00				
12.0000	2.5548	5054202.	195280.	-0.02363	2975.	9.95E+10
-2774.	26059.	0.00				
14.0000	2.0023	9190623.	118615.	-0.02191	4770.	9.95E+10
-3615.	43328.	0.00				
16.0000	1.5031	1.12E+07	20433.	-0.01945	5651.	9.95E+10
-4567.	72921.	0.00				
18.0000	1.0688	1.06E+07	-34456.	-0.01682	5378.	9.95E+10
-7.1150	159.7724	0.00				
20.0000	0.6957	9930393.	-34620.	-0.01435	5091.	9.95E+10
-6.5704	226.6472	0.00				
22.0000	0.3802	9239625.	-34767.	-0.01203	4792.	9.95E+10
-5.7020	359.9403	0.00				
24.0000	0.1181	8521510.	-34884.	-0.00989	4480.	9.95E+10
-4.0857	830.1660	0.00				
26.0000	-0.09465	7778851.	-34885.	-0.00793	4157.	9.95E+10
4.0023	1015.	0.00				
28.0000	-0.2624	7018240.	-34766.	-0.00614	3827.	9.95E+10
5.9145	540.9611	0.00				
30.0000	-0.3895	6242758.	-34611.	-0.00454	3491.	9.95E+10
7.0801	436.2153	0.00				
32.0000	-0.4805	5455098.	-34430.	-0.00313	3149.	9.95E+10
7.9505	397.0730	0.00				
34.0000	-0.5400	4657811.	-34231.	-0.00192	2803.	9.95E+10
8.6369	383.8733	0.00				
36.0000	-0.5725	3853369.	-34017.	-8.89E-04	2454.	9.95E+10
9.1853	385.0818	0.00				
38.0000	-0.5827	3044184.	-32064.	-5.74E-05	2103.	9.95E+10
153.5737	6326.	0.00				
40.0000	-0.5752	2315529.	-27615.	5.89E-04	1786.	9.95E+10
217.2285	9063.	0.00				
42.0000	-0.5544	1705967.	-22348.	0.00107	1522.	9.95E+10
221.6705	9596.	0.00				
44.0000	-0.5237	1219646.	-16994.	0.00143	1311.	9.95E+10
224.4634	10287.	0.00				
46.0000	-0.4859	859439.	-11592.	0.00168	1154.	9.95E+10
225.7246	11149.	0.00				
48.0000	-0.4432	627011.	-8699.	0.00186	1053.	9.95E+10

File name is incorrect below, run designation is "E.Overbank Post Seismic (No scour) 24in"


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 15.3680   832.2242       0.00
 50.0000    -0.3968    401802.     -8416.    0.00198   955.6434   9.95E+10
 8.1556   493.2491       0.00
 52.0000    -0.3481    180245.     -8222.    0.00205   859.4813   9.95E+10
 8.0606   555.6847       0.00
 54.0000    -0.2984    -37139.     -8030.    0.00207   797.3693   9.95E+10
 7.8974   635.1723       0.00
 56.0000    -0.2489   -249877.     -7844.    0.00203   889.7036   9.95E+10
 7.6603   738.6817       0.00
 58.0000    -0.2008   -457552.     -7664.    0.00195   979.8404   9.95E+10
 7.3422   877.4957       0.00
 60.0000    -0.1554   -659807.     -7492.    0.00181      1068.   9.95E+10
 6.9342      1071.       0.00
 62.0000    -0.1138   -856349.     -7332.    0.00163      1153.   9.95E+10
 6.4244      1355.       0.00
 64.0000   -0.07713  -1046961.     -7185.    0.00140      1236.   9.95E+10
 5.7968      1804.       0.00
 66.0000   -0.04654  -1231507.     -7056.    0.00113      1316.   9.95E+10
 5.0279      2593.       0.00
 68.0000   -0.02308  -1409950.     -2277.   8.08E-04      1393.   9.95E+10
 393.2127    408902.       0.00
 70.0000   -0.00777  -1358231.     10533.   4.74E-04      1371.   9.95E+10
 674.2875   2081583.       0.00
 72.0000  -3.30E-04   -914585.     19787.   2.00E-04      1178.   9.95E+10
 96.8421   7050240.       0.00
 74.0000    0.00182   -412776.     17032.   3.99E-05   960.4064   9.95E+10
 -326.4518   4299527.       0.00
 76.0000    0.00159    -97929.      9460.  -2.17E-05   823.7539   9.95E+10
 -304.4985   4609460.       0.00
 78.0000   7.82E-04     41782.      3240.  -2.84E-05   799.3847   9.95E+10
 -213.8350   6563731.       0.00
 80.0000   2.20E-04     58216.  -187.9902  -1.64E-05   806.5173   9.95E+10
 -71.8490   7833600.       0.00
 82.0000  -4.73E-06     33113.     -1031.  -5.38E-06   795.6219   9.95E+10
 1.5824   8029440.       0.00
 84.0000  -3.80E-05      8835.  -699.9676  -3.19E-07   785.0846   9.95E+10
 26.0194   1.65E+07       0.00
 86.0000  -2.01E-05  -478.7648  -218.7841   6.88E-07   781.4578   9.95E+10
 14.0792   1.68E+07       0.00
 88.0000  -4.94E-06     -1682.    -7.3024   4.28E-07   781.9799   9.95E+10
 3.5443   1.72E+07       0.00
 90.0000   4.60E-07  -838.5127    31.1779   1.24E-07   781.6139   9.95E+10
 -0.3376   1.76E+07       0.00
 92.0000   1.00E-06  -187.7197    18.0936  -7.38E-12   781.3315   9.95E+10
 -0.7527   1.80E+07       0.00
 94.0000   4.59E-07    29.9799     4.8325  -1.90E-08   781.2630   9.95E+10
 -0.3523   1.84E+07       0.00
 96.0000   8.95E-08    44.6527    -0.2369  -1.00E-08   781.2694   9.95E+10
 -0.07011   1.88E+07       0.00
 98.0000  -2.19E-08    18.8258    -0.8676  -2.37E-09   781.2582   9.95E+10
 0.01755   1.92E+07       0.00
100.0000  -2.44E-08     3.0588    -0.4176   2.65E-10   781.2513   9.95E+10
0.01995   1.96E+07       0.00
102.0000  -9.25E-09    -1.2257   -0.08589   4.86E-10   781.2505   9.95E+10
0.00770   2.00E+07       0.00
104.0000  -1.14E-09    -1.0745    0.01804   2.08E-10   781.2505   9.95E+10
9.66E-04   2.04E+07       0.00
106.0000   7.52E-10    -0.3642    0.02183   3.48E-11   781.2502   9.95E+10
-6.50E-04   2.08E+07       0.00
108.0000   5.34E-10   -0.02744    0.00838  -1.24E-11   781.2500   9.95E+10
-4.71E-04   2.12E+07       0.00
110.0000   1.57E-10    0.03836    0.00104  -1.11E-11   781.2500   9.95E+10
-1.41E-04   2.15E+07       0.00
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112.0000   2.58E-12    0.02276  -6.81E-04  -3.70E-12   781.2500   9.95E+10
-2.36E-06   2.19E+07       0.00
114.0000  -2.04E-11    0.00574  -4.82E-04       0.00   781.2500   9.95E+10
1.90E-05   2.23E+07       0.00
116.0000  -1.01E-11  -3.78E-04  -1.40E-04       0.00   781.2500   9.95E+10
9.59E-06   2.27E+07       0.00
118.0000  -2.07E-12  -9.70E-04  -5.79E-07       0.00   781.2500   9.95E+10
1.99E-06   2.31E+07       0.00
120.0000       0.00  -4.10E-04   1.89E-05       0.00   781.2500   9.95E+10
-3.70E-07   2.35E+07       0.00
122.0000       0.00  -6.31E-05   9.07E-06       0.00   781.2500   9.95E+10
-4.50E-07   2.39E+07       0.00
124.0000       0.00   2.53E-05   1.73E-06       0.00   781.2500   9.95E+10
-1.62E-07   2.43E+07       0.00
126.0000       0.00   2.01E-05  -4.03E-07       0.00   781.2500   9.95E+10
-1.56E-08   2.47E+07       0.00
128.0000       0.00   6.00E-06  -4.20E-07       0.00   781.2500   9.95E+10
1.41E-08   2.51E+07       0.00
130.0000       0.00  -2.96E-08  -1.40E-07       0.00   781.2500   9.95E+10
9.27E-09   3.00E+07       0.00
132.0000       0.00  -7.19E-07  -5.46E-09       0.00   781.2500   9.95E+10
1.93E-09   3.04E+07       0.00
134.0000       0.00  -2.95E-07   1.42E-08       0.00   781.2500   9.95E+10
-2.91E-10   3.09E+07       0.00
136.0000       0.00  -3.86E-08   6.52E-09       0.00   781.2500   9.95E+10
-3.47E-10   3.13E+07       0.00
138.0000       0.00   1.81E-08   1.05E-09       0.00   781.2500   9.95E+10
-1.09E-10   3.18E+07       0.00
140.0000       0.00   1.17E-08  -3.21E-10       0.00   781.2500   9.95E+10
-4.62E-12   3.23E+07       0.00
142.0000       0.00   2.69E-09  -2.49E-10       0.00   781.2500   9.95E+10
1.06E-11   3.27E+07       0.00
144.0000       0.00  -2.35E-10  -6.40E-11       0.00   781.2500   9.95E+10
4.80E-12   3.32E+07       0.00
146.0000       0.00  -3.91E-10   2.27E-12       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
148.0000       0.00  -1.28E-10   8.00E-12       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
150.0000       0.00  -7.52E-12   2.90E-12       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
152.0000       0.00   1.10E-11       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
154.0000       0.00   5.03E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.73E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.78E+07       0.00
166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.82E+07       0.00
168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.87E+07       0.00
170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.92E+07       0.00
172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.96E+07       0.00
174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
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  0.00   4.01E+07       0.00
  176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.06E+07       0.00
  178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.10E+07       0.00
  180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.15E+07       0.00
  182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.19E+07       0.00
  184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.24E+07       0.00
  186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.29E+07       0.00
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.52E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.56E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.30E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 6:

```
Pile-head deflection             =     5.11958786 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -41329564. inch-lbs
Maximum shear force              =        369925. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             24
Number of zero deflection points =             20
```

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-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 7
-------------------------------------------------------------------------------
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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                              =     6.000000 inches
Rotation of pile head                                  =    0.000E+00 radians
Axial load on pile head                                =     450000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
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File name is incorrect below, run designation is "E.Overbank Post Seismic (No scour) 24in"

East Overbank Static 24in.lp9o 10/3/2017

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      0.00     6.1233  -4.26E+07    373438.       0.00     19277.   9.95E+10
      0.00       0.00       0.00
    2.0000     6.0000  -3.37E+07    366807.   -0.00920     15400.   9.95E+10
   -256.1207      1024.       0.00
    4.0000     5.6818  -2.48E+07    353200.   -0.01625     11548.   9.95E+10
   -877.7193      3708.       0.00
    6.0000     5.2200  -1.64E+07    329397.   -0.02121      7889.   9.95E+10
   -1106.      5085.       0.00
    8.0000     4.6635  -8538394.    298630.   -0.02422      4487.   9.95E+10
   -1458.      7503.       0.00
   10.0000     4.0575  -1518493.    256604.   -0.02543      1440.   9.95E+10
   -2044.     12091.       0.00
   12.0000     3.4428   4327932.    198788.   -0.02509      2660.   9.95E+10
   -2774.     19337.       0.00
   14.0000     2.8531   8565314.    122123.   -0.02354      4499.   9.95E+10
   -3615.     30408.       0.00
   16.0000     2.3130   1.07E+07     23941.   -0.02122      5425.   9.95E+10
   -4567.     47388.       0.00
   18.0000     1.8347   1.02E+07    -30964.   -0.01870      5197.   9.95E+10
   -8.5193   111.4400       0.00
   20.0000     1.4154   9615877.    -31166.   -0.01631      4955.   9.95E+10
   -8.3253   141.1672       0.00
   22.0000     1.0517   9029158.    -31362.   -0.01407      4700.   9.95E+10
   -8.0042   182.6594       0.00
   24.0000     0.7402   8414314.    -31549.   -0.01196      4433.   9.95E+10
   -7.5324   244.2163       0.00
   26.0000     0.4775   7773219.    -31721.   -0.01001      4155.   9.95E+10
   -6.8647   345.0395       0.00
   28.0000     0.2597   7107928.    -31874.   -0.00822      3866.   9.95E+10
   -5.8945   544.7025       0.00
   30.0000    0.08308   6420731.    -31996.   -0.00659      3568.   9.95E+10
   -4.2305      1222.       0.00
   32.0000   -0.05640   5714376.    -32000.   -0.00512      3261.   9.95E+10
   3.8922      1656.       0.00
   34.0000    -0.1628   4995383.    -31884.   -0.00383      2949.   9.95E+10
   5.7913   853.7263       0.00
   36.0000    -0.2403   4266716.    -31732.   -0.00271      2633.   9.95E+10
   6.8774   686.8651       0.00
   38.0000    -0.2931   3530900.    -30184.   -0.00177      2314.   9.95E+10
   122.1395     10001.       0.00
   40.0000    -0.3255   2856240.    -26562.   -0.00100      2021.   9.95E+10
   179.6726     13248.       0.00
   42.0000    -0.3413   2277634.    -22143.  -3.86E-04      1770.   9.95E+10
   188.5798     13259.       0.00
   44.0000    -0.3440   1801719.    -17538.   1.06E-04      1563.   9.95E+10
   195.1225     13613.       0.00
   46.0000    -0.3362   1433503.    -12801.   4.96E-04      1403.   9.95E+10
   199.6512     14250.       0.00
   48.0000    -0.3202   1176552.    -10240.   8.11E-04      1292.   9.95E+10
   13.7897      1034.       0.00
   50.0000    -0.2973    924480.     -9985.    0.00106      1183.   9.95E+10
   7.4073   597.9240       0.00
   52.0000    -0.2691    674268.     -9808.    0.00126      1074.   9.95E+10
   7.3976   659.7447       0.00
   54.0000    -0.2370    426560.     -9631.    0.00139   966.3890   9.95E+10
   7.3135   740.6376       0.00
   56.0000    -0.2024    181954.     -9458.    0.00146   860.2233   9.95E+10
   7.1502   847.8307       0.00
   58.0000    -0.1668    -59007.     -9289.    0.00148   806.8605   9.95E+10
   6.9013   993.1960       0.00
   60.0000    -0.1315   -295839.     -9127.    0.00144   909.6523   9.95E+10
   6.5583      1197.       0.00
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File name is incorrect below, run designation is "E.Overbank Post Seismic (No scour) 24in"


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 62.0000   -0.09788   -528123.     -8975.    0.00134      1010.   9.95E+10
 6.1100      1498.       0.00
 64.0000   -0.06735   -755513.     -8836.    0.00118      1109.   9.95E+10
 5.5407      1974.       0.00
 66.0000   -0.04120   -977743.     -8711.   9.72E-04      1206.   9.95E+10
 4.8275      2812.       0.00
 68.0000   -0.02070  -1194647.     -4185.   7.10E-04      1300.   9.95E+10
 372.3822    431774.       0.00
 70.0000   -0.00711  -1193948.      8024.   4.22E-04      1299.   9.95E+10
 644.9999   2176087.       0.00
 72.0000  -4.38E-04   -818619.     17308.   1.79E-04      1137.   9.95E+10
 128.6784   7050240.       0.00
 74.0000    0.00150   -367040.     15298.   3.65E-05   940.5555   9.95E+10
 -296.2040   4738545.       0.00
 76.0000    0.00131    -85118.      8416.  -1.80E-05   818.1938   9.95E+10
 -277.2528   5062359.       0.00
 78.0000   6.36E-04     37327.      2775.  -2.38E-05   797.4510   9.95E+10
 -192.8601   7277407.       0.00
 80.0000   1.74E-04     48588.  -219.6225  -1.34E-05   802.3386   9.95E+10
 -56.6799   7833600.       0.00
 82.0000  -7.54E-06     27075.  -869.4927  -4.29E-06   793.0012   9.95E+10
 2.5241   8029440.       0.00
 84.0000  -3.21E-05      6945.  -575.5216  -1.84E-07   784.2643   9.95E+10
 21.9735   1.65E+07       0.00
 86.0000  -1.64E-05  -546.1930  -173.9058   5.87E-07   781.4871   9.95E+10
 11.4945   1.68E+07       0.00
 88.0000  -3.86E-06     -1415.    -2.6905   3.51E-07   781.8642   9.95E+10
 2.7735   1.72E+07       0.00
 90.0000   4.65E-07  -682.9163    26.4904   9.80E-08   781.5464   9.95E+10
 -0.3417   1.76E+07       0.00
 92.0000   8.41E-07  -145.7290    14.8148  -1.92E-09   781.3133   9.95E+10
 -0.6313   1.80E+07       0.00
 94.0000   3.73E-07    28.2346     3.8056  -1.61E-08   781.2623   9.95E+10
 -0.2862   1.84E+07       0.00
 96.0000   6.87E-08    37.2859    -0.2745  -8.19E-09   781.2662   9.95E+10
 -0.05383   1.88E+07       0.00
 98.0000  -1.99E-08    15.2340    -0.7297  -1.86E-09   781.2566   9.95E+10
 0.01590   1.92E+07       0.00
100.0000  -2.03E-08     2.3021    -0.3398   2.59E-10   781.2510   9.95E+10
0.01659   1.96E+07       0.00
102.0000  -7.45E-09    -1.0809   -0.06631   4.06E-10   781.2505   9.95E+10
0.00620   2.00E+07       0.00
104.0000  -8.26E-10    -0.8894    0.01652   1.69E-10   781.2504   9.95E+10
7.01E-04   2.04E+07       0.00
106.0000   6.51E-10    -0.2918    0.01817   2.64E-11   781.2501   9.95E+10
-5.63E-04   2.08E+07       0.00
108.0000   4.40E-10   -0.01788    0.00676  -1.10E-11   781.2500   9.95E+10
-3.88E-04   2.12E+07       0.00
110.0000   1.25E-10    0.03277   7.57E-04  -9.17E-12   781.2500   9.95E+10
-1.12E-04   2.15E+07       0.00
112.0000       0.00    0.01866  -5.90E-04  -2.97E-12   781.2500   9.95E+10
4.32E-08   2.19E+07       0.00
114.0000  -1.72E-11    0.00452  -3.97E-04       0.00   781.2500   9.95E+10
1.60E-05   2.23E+07       0.00
116.0000  -8.26E-12  -4.00E-04  -1.11E-04       0.00   781.2500   9.95E+10
7.82E-06   2.27E+07       0.00
118.0000  -1.61E-12  -8.13E-04   1.48E-06       0.00   781.2500   9.95E+10
1.55E-06   2.31E+07       0.00
120.0000       0.00  -3.33E-04   1.60E-05       0.00   781.2500   9.95E+10
-3.40E-07   2.35E+07       0.00
122.0000       0.00  -4.76E-05   7.39E-06       0.00   781.2500   9.95E+10
-3.74E-07   2.39E+07       0.00
124.0000       0.00   2.22E-05   1.33E-06       0.00   781.2500   9.95E+10
```

```
-1.31E-07   2.43E+07       0.00
126.0000       0.00   1.66E-05  -3.63E-07       0.00   781.2500   9.95E+10
-1.09E-08   2.47E+07       0.00
128.0000       0.00   4.78E-06  -3.49E-07       0.00   781.2500   9.95E+10
1.21E-08   2.51E+07       0.00
130.0000       0.00  -1.02E-07  -1.12E-07       0.00   781.2500   9.95E+10
7.61E-09   3.00E+07       0.00
132.0000       0.00  -6.06E-07  -2.81E-09       0.00   781.2500   9.95E+10
1.51E-09   3.04E+07       0.00
134.0000       0.00  -2.40E-07   1.20E-08       0.00   781.2500   9.95E+10
-2.70E-10   3.09E+07       0.00
136.0000       0.00  -2.88E-08   5.32E-09       0.00   781.2500   9.95E+10
-2.89E-10   3.13E+07       0.00
138.0000       0.00   1.57E-08   7.99E-10       0.00   781.2500   9.95E+10
-8.77E-11   3.18E+07       0.00
140.0000       0.00   9.65E-09  -2.84E-10       0.00   781.2500   9.95E+10
-2.52E-12   3.23E+07       0.00
142.0000       0.00   2.12E-09  -2.06E-10       0.00   781.2500   9.95E+10
9.01E-12   3.27E+07       0.00
144.0000       0.00  -2.31E-10  -5.09E-11       0.00   781.2500   9.95E+10
3.91E-12   3.32E+07       0.00
146.0000       0.00  -3.27E-10   2.70E-12       0.00   781.2500   9.95E+10
0.00   3.36E+07       0.00
148.0000       0.00  -1.03E-10   6.71E-12       0.00   781.2500   9.95E+10
0.00   3.41E+07       0.00
150.0000       0.00  -4.79E-12   2.35E-12       0.00   781.2500   9.95E+10
0.00   3.46E+07       0.00
152.0000       0.00   9.32E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.50E+07       0.00
154.0000       0.00   4.11E-12       0.00       0.00   781.2500   9.95E+10
0.00   3.55E+07       0.00
156.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.59E+07       0.00
158.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.64E+07       0.00
160.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.69E+07       0.00
162.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.73E+07       0.00
164.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.78E+07       0.00
166.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.82E+07       0.00
168.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.87E+07       0.00
170.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.92E+07       0.00
172.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   3.96E+07       0.00
174.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.01E+07       0.00
176.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.06E+07       0.00
178.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.10E+07       0.00
180.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.15E+07       0.00
182.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.19E+07       0.00
184.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.24E+07       0.00
186.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
0.00   4.29E+07       0.00
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (No scour) 24in"


```
  188.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.33E+07       0.00
  190.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.38E+07       0.00
  192.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.42E+07       0.00
  194.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.47E+07       0.00
  196.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.52E+07       0.00
  198.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   4.56E+07       0.00
  200.0000       0.00       0.00       0.00       0.00   781.2500   9.95E+10
  0.00   2.30E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 7:

```
Pile-head deflection             =     6.12330169 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -42613064. inch-lbs
Maximum shear force              =        373438. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             23
Number of zero deflection points =             20
```

--
Summary of Pile-head Responses for Conventional Analyses

--

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

```
Load Load                Load                  Axial    Pile-head  Pile-head
Max Shear Max Moment
Case Type   Pile-head    Type     Pile-head   Loading  Deflection  Rotation
in Pile    in Pile
 No.  1      Load 1       2        Load 2       lbs      inches     radians
 lbs      in-lbs
---- ----- ---------- ---------- ---------- ---------- ---------- ----------
---------- ----------
  1  y, in     0.5000   S, rad         0.00    450000.     0.5234       0.00
  102383.  -8100232.
  2  y, in     1.0000   S, rad         0.00    450000.     1.0417       0.00
  167154.  -1.44E+07
  3  y, in     2.0000   S, rad         0.00    450000.     2.0717       0.00
  256719.  -2.48E+07
  4  y, in     3.0000   S, rad         0.00    450000.     3.0950       0.00
```

File name is incorrect below, run designation is "E.Overbank Post Seismic (No scour) 24in"

```
East Overbank Static 24in.lp9o                                          10/3/2017

  316371.  -3.28E+07
  5  y, in     4.0000   S, rad         0.00    450000.     4.1128       0.00
  357987.  -3.90E+07
  6  y, in     5.0000   S, rad         0.00    450000.     5.1196       0.00
  369925.  -4.13E+07
  7  y, in     6.0000   S, rad         0.00    450000.     6.1233       0.00
  373438.  -4.26E+07


Maximum pile-head deflection = 6.1233016898 inches
Maximum pile-head rotation   = 0.0000000000 radians = 0.000000 deg.

The analysis ended normally.
```

==========
==

LPile Plus for Windows, Version 2013-07.007

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

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--
Files Used for Analysis

--

Path to file locations: Z:\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis\L-Pile\East Abutment\Longitudinal\Post Seismic (No Scour)\
Name of input data file: East Abutment.lp7d
Name of output report file: East Abutment.lp7o
Name of plot output file: East Abutment.lp7p
Name of runtime messeage file: East Abutment.lp7r

--
Date and Time of Analysis

--

Date: October 3, 2017 Time: 13:53:23

--
Problem Title

--

Project Name: SR 21 Harbor River Bridge
Job Number:
Client:
Engineer:
Description:

```
--------------------------------------------------------------------------------
--
                           Program Options and Settings
--------------------------------------------------------------------------------
--

Engineering Units of Input Data and Computations:
 - Engineering units are US Customary Units (pounds, feet, inches)

Analysis Control Options:
- Maximum number of iterations allowed                  =          750
- Deflection tolerance for convergence                  =   1.0000E-05 in
- Maximum allowable deflection                          =     100.0000 in
- Number of pile increments                             =          100

Loading Type and Number of Cycles of Loading:
 - Static loading specified

Computational Options:
 - Use unfactored loads in computations (conventional analysis)
 - Compute pile response under loading and nonlinear bending properties of
 pile
   (only if nonlinear pile properties are input)
 - Analysis uses p-y modification factors for p-y curves
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Computation of pile-head foundation stiffness matrix not selected
 - Push-over analysis of pile not selected
 - Buckling analysis of pile not selected

Output Options:
 - No p-y curves to be computed and reported for user-specified depths
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1


--------------------------------------------------------------------------------
--
                     Pile Structural Properties and Geometry
--------------------------------------------------------------------------------
--

Total number of pile sections                           =          1

Total length of pile                                    =     200.00 ft

Depth of ground surface below top of pile               =       0.00 ft

Pile diameter values used for p-y curve computations are defined using 2
points.

p-y curves are computed using pile diameter values interpolated with depth
over
the length of the pile.

Point         Depth              Pile
                X              Diameter
                ft                in
-----       ---------        -----------
  1           0.00000         14.2000000
  2         200.000000        14.2000000
```

Input Structural Properties:

Pile Section No. 1:

Section Type	=	Elastic with Specified Moment Capacity
Cross-sectional Shape	=	Weak H-Pile
Section Length	=	200.00000 ft
Flange Width	=	14.90000 in
Section Depth	=	14.20000 in
Flange Thickness	=	0.80500 in
Web Thickness	=	0.80500 in
Section Area	=	34.12395 Sq. in
Moment of Inertia	=	444.36380 in^4
Elastic Modulus	=	29000000. lbs/in^2
Plastic Moment Capacity	=	2975000. in-lb
Top Elastic Bending Stiffness	=	1.2887E+10 lbs-in^2
Bot Elastic Bending Stiffness	=	1.2887E+10 lbs-in^2

--
Ground Slope and Pile Batter Angles

--

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

--
Soil and Rock Layering Information

--

The soil profile is modelled using 7 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	0.0000 ft
Distance from top of pile to bottom of layer	=	3.00000 ft
Effective unit weight at top of layer	=	100.00000 pcf
Effective unit weight at bottom of layer	=	100.00000 pcf
Friction angle at top of layer	=	30.00000 deg.
Friction angle at bottom of layer	=	30.00000 deg.
Subgrade k at top of layer	=	25.00000 pci
Subgrade k at bottom of layer	=	25.00000 pci

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	3.00000 ft
Distance from top of pile to bottom of layer	=	18.00000 ft
Effective unit weight at top of layer	=	57.60000 pcf
Effective unit weight at bottom of layer	=	57.60000 pcf
Friction angle at top of layer	=	41.00000 deg.

Friction angle at bottom of layer	=	41.00000	deg.
Subgrade k at top of layer	=	150.00000	pci
Subgrade k at bottom of layer	=	150.00000	pci

Layer 3 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	18.00000	ft
Distance from top of pile to bottom of layer	=	33.00000	ft
Effective unit weight at top of layer	=	37.60000	pcf
Effective unit weight at bottom of layer	=	37.60000	pcf
Undrained cohesion at top of layer	=	93.00000	psf
Undrained cohesion at bottom of layer	=	138.00000	psf
Epsilon-50 at top of layer	=	0.02000	
Epsilon-50 at bottom of layer	=	0.02000	

Layer 4 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	33.00000	ft
Distance from top of pile to bottom of layer	=	53.00000	ft
Effective unit weight at top of layer	=	32.60000	pcf
Effective unit weight at bottom of layer	=	32.60000	pcf
Undrained cohesion at top of layer	=	380.00000	psf
Undrained cohesion at bottom of layer	=	524.00000	psf
Epsilon-50 at top of layer	=	0.02000	
Epsilon-50 at bottom of layer	=	0.02000	

Layer 5 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	53.00000	ft
Distance from top of pile to bottom of layer	=	69.00000	ft
Effective unit weight at top of layer	=	37.60000	pcf
Effective unit weight at bottom of layer	=	37.60000	pcf
Undrained cohesion at top of layer	=	214.00000	psf
Undrained cohesion at bottom of layer	=	268.00000	psf
Epsilon-50 at top of layer	=	0.02000	
Epsilon-50 at bottom of layer	=	0.02000	

Layer 6 is stiff clay with water-induced erosion

Distance from top of pile to top of layer	=	69.00000	ft
Distance from top of pile to bottom of layer	=	80.00000	ft
Effective unit weight at top of layer	=	57.60000	pcf
Effective unit weight at bottom of layer	=	57.60000	pcf
Undrained cohesion at top of layer	=	3400.00000	psf
Undrained cohesion at bottom of layer	=	3400.00000	psf
Epsilon-50 at top of layer	=	0.00500	
Epsilon-50 at bottom of layer	=	0.00500	
Subgrade k at top of layer	=	400.00000	pci
Subgrade k at bottom of layer	=	400.00000	pci

Layer 7 is stiff clay with water-induced erosion

Distance from top of pile to top of layer	=	80.00000	ft
Distance from top of pile to bottom of layer	=	200.00000	ft
Effective unit weight at top of layer	=	57.60000	pcf
Effective unit weight at bottom of layer	=	57.60000	pcf
Undrained cohesion at top of layer	=	6000.00000	psf
Undrained cohesion at bottom of layer	=	6000.00000	psf

```
   Epsilon-50 at top of layer                          =      0.00500
   Epsilon-50 at bottom of layer                       =      0.00500
   Subgrade k at top of layer                          =    800.00000 pci
   Subgrade k at bottom of layer                       =    800.00000 pci


   (Depth of lowest soil layer extends    0.00 ft below pile tip)



-------------------------------------------------------------------------------
--
                            Summary of Soil Properties
-------------------------------------------------------------------------------
--

                       Layer                       Layer      Effective
                       Undrained    Angle of       Strain
Layer                Soil Type                    Depth       Unit Wt.
Cohesion     Friction      Factor        kpy
 Num.         (p-y Curve Criteria)                ft           pcf          psf
 deg.     Epsilon 50      pci
-----   ----------------------------------   ----------   ----------
----------   ----------   ----------   ----------
  1     Sand (Reese, et al.)                       0.00      100.000       --
  30.000       --           25.000
                                                  3.000      100.000       --
                                                  30.000       --
                                                  25.000
  2     Sand (Reese, et al.)                       3.000       57.600       --
  41.000       --          150.000
                                                 18.000       57.600       --
                                                 41.000       --
                                                 150.000
  3     Soft Clay                                18.000       37.600
  93.000       --          0.02000       --
                                                 33.000       37.600
                                                 138.000       --
                                                 0.02000       --
  4     Soft Clay                                33.000       32.600
  380.000       --          0.02000       --
                                                 53.000       32.600
                                                 524.000       --
                                                 0.02000       --
  5     Soft Clay                                53.000       37.600
  214.000       --          0.02000       --
                                                 69.000       37.600
                                                 268.000       --
                                                 0.02000       --
  6     Stiff Clay with Free Water               69.000       57.600
  3400.000       --          0.00500      400.000
                                                 80.000       57.600
                                                 3400.000       --
                                                 0.00500      400.000
  7     Stiff Clay with Free Water               80.000       57.600
  6000.000       --          0.00500      800.000
                                                200.000       57.600
                                                6000.000       --
                                                0.00500      800.000


-------------------------------------------------------------------------------
```

--

p-y Modification Factors for Group Action

--

Distribution of p-y modifiers with depth defined using 12 points

Point No.	Depth X ft	p-mult	y-mult
1	0.000	1.0000	1.0000
2	3.000	1.0000	1.0000
3	3.000	1.0000	1.0000
4	18.000	1.0000	1.0000
5	18.000	0.1000	1.0000
6	33.000	0.1000	1.0000
7	33.000	1.0000	1.0000
8	53.000	1.0000	1.0000
9	53.000	0.1000	1.0000
10	69.000	0.1000	1.0000
11	69.000	1.0000	1.0000
12	210.000	1.0000	1.0000

--

Loading Type

--

Static loading criteria were used when computing p-y curves for all analyses.

--

Pile-head Loading and Pile-head Fixity Conditions

--

Number of loads specified = 3

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	5	y = 0.50000 in	S = 0.0000 in/in	255000.	No
2	5	y = 1.00000 in	S = 0.0000 in/in	255000.	No
3	5	y = 2.00000 in	S = 0.0000 in/in	255000.	No

V = perpendicular shear force applied to pile head
M = bending moment applied to pile head
y = lateral deflection relative to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applie to pile head
Axial thrust is assumed to be acting axially for all pile batter angles.

--
Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness
---
--

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic-plastic section properties

---
--
Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 255000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.5000	-2288505.	44473.	0.000	44038.	1.289E+10	0.000	0.000	0.000
2.000	0.4489	-1259071.	40226.	-0.003304	27590.	1.289E+10	-176.9665	9462.2987	0.000
4.000	0.3414	-317218.	32572.	-0.004771	12541.	1.289E+10	-460.8364	32393.	0.000
6.000	0.2198	362808.	20839.	-0.004729	13270.	1.289E+10	-516.9771	56441.	0.000
8.000	0.1144	740920.	7757.3905	-0.003701	19311.	1.289E+10	-573.1307	120191.	0.000
10.000	0.0422	780465.	-4851.3166	-0.002284	19943.	1.289E+10	-477.5949	271773.	0.000
12.000	0.004793	536018.	-11728.	-0.001058	16037.	1.289E+10	-95.4754	478079.	0.000
14.000	-0.008631	230469.	-10438.	-0.000345	11155.	1.289E+10	203.0035	564479.	0.000
16.000	-0.0118	39222.	-4176.6423	-9.359E-05	8099.4455	1.289E+10	318.7615	650879.	0.000
18.000	-0.0131	31135.	-338.4100	-2.807E-05	7970.2341	1.289E+10	1.0912	1995.6078	0.000
20.000	-0.0131	23322.	-311.3836	2.264E-05	7845.3951	1.289E+10	1.1610	2126.8455	0.000
22.000	-0.0120	15912.	-283.0860	5.918E-05	7726.9938	1.289E+10	1.1971	2387.0051	0.000

```
24.000    -0.0103  9009.6220  -254.3199  8.238E-05  7616.7122  1.289E+10
1.2000  2806.9588      0.000
26.000  -0.008082  2696.0271  -225.8997  9.328E-05  7515.8343  1.289E+10
1.1683  3469.3127      0.000
28.000  -0.005783 -2975.3552  -198.6957  9.302E-05  7520.2973  1.289E+10
1.0987  4559.7123      0.000
30.000  -0.003617 -7979.9716  -173.6834  8.282E-05  7600.2606  1.289E+10
0.9857  6540.2164      0.000
32.000  -0.001808    -12326.  -152.0292  6.391E-05  7669.6994  1.289E+10
0.8189     10873.      0.000
34.000  -0.000549    -16060.    47.3968  3.748E-05  7729.3572  1.289E+10
15.8000    690550.      0.000
36.000 -8.517E-06    -10510.   284.2291  1.274E-05  7640.6789  1.289E+10
3.9361  11090757.      0.000
38.000  6.234E-05 -2572.5948   231.3533  5.566E-07  7513.8621  1.289E+10
-8.3424   3211942.      0.000
40.000  1.820E-05   588.5356    60.6095 -1.291E-06  7482.1610  1.289E+10
-5.8863   7762737.      0.000
42.000  3.682E-07   352.4643   -10.9078 -4.147E-07  7478.3890  1.289E+10
-0.0735   4791462.      0.000
44.000 -1.708E-06    70.0372    -7.5659 -2.128E-08  7473.8765  1.289E+10
0.3520   4946582.      0.000
46.000 -6.533E-07   -10.4381    -1.6754  3.422E-08  7472.9242  1.289E+10
0.1389   5101701.      0.000
48.000 -6.539E-08   -10.7999     0.1631  1.444E-08  7472.9300  1.289E+10
0.0143   5256820.      0.000
50.000  3.981E-08    -2.7882     0.2272  1.787E-09  7472.8020  1.289E+10
-0.008978   5411940.      0.000
52.000  2.039E-08     0.0841     0.0627 -7.309E-10  7472.7587  1.289E+10
-0.004730   5567059.      0.000
54.000  4.728E-09     0.2312   0.000427 -4.373E-10  7472.7611  1.289E+10
-0.000461   2341601.      0.000
56.000 -6.012E-10     0.1100  -0.004382 -1.196E-10  7472.7592  1.289E+10
6.048E-05   2414313.      0.000
58.000 -1.015E-09     0.0223  -0.002395  3.563E-12  7472.7578  1.289E+10
0.000105   2487025.      0.000
60.000 -4.301E-10  -0.005025  -0.000583  1.967E-11  7472.7575  1.289E+10
4.588E-05   2559738.      0.000
62.000 -7.036E-11  -0.005888  6.045E-05  9.508E-12  7472.7575  1.289E+10
7.717E-06   2632450.      0.000
64.000  2.624E-11  -0.002239   0.000118  1.940E-12  7472.7574  1.289E+10
-2.958E-06   2705162.      0.000
66.000  2.275E-11  -0.000269  5.049E-05      0.000  7472.7574  1.289E+10
-2.633E-06   2777874.      0.000
68.000  7.247E-12   0.000189  8.566E-06      0.000  7472.7574  1.289E+10
-8.607E-07   2850586.      0.000
70.000      0.000   0.000148 -3.683E-06      0.000  7472.7574  1.289E+10
-1.600E-07  20278893.      0.000
72.000      0.000  1.398E-05 -3.164E-06      0.000  7472.7574  1.289E+10
2.032E-07  20509293.      0.000
74.000      0.000 -3.466E-06 -3.106E-07      0.000  7472.7574  1.289E+10
3.453E-08  20739693.      0.000
76.000      0.000 -9.876E-07  7.217E-08      0.000  7472.7574  1.289E+10
-2.628E-09  20970093.      0.000
78.000      0.000 -1.200E-08  2.130E-08      0.000  7472.7574  1.289E+10
-1.612E-09  21200493.      0.000
80.000      0.000  3.530E-08  3.200E-10      0.000  7472.7574  1.289E+10
-1.360E-10  30947248.      0.000
82.000      0.000  3.834E-09 -7.469E-10      0.000  7472.7574  1.289E+10
4.714E-11  31408048.      0.000
84.000      0.000 -5.227E-10 -8.275E-11      0.000  7472.7574  1.289E+10
8.205E-12  31868848.      0.000
86.000      0.000 -1.475E-10  1.090E-11      0.000  7472.7574  1.289E+10
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  0.000  32329648.      0.000
  88.000      0.000 -1.185E-12  3.145E-12      0.000  7472.7574  1.289E+10
  0.000  32790448.      0.000
  90.000      0.000  3.513E-12      0.000      0.000  7472.7574  1.289E+10
  0.000  33251248.      0.000
  92.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
  0.000  33712048.      0.000
  94.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
  0.000  34172848.      0.000
  96.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
  0.000  34633648.      0.000
  98.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
  0.000  35094448.      0.000
 100.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  35555248.      0.000
 102.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  36016048.      0.000
 104.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  36476848.      0.000
 106.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  36937648.      0.000
 108.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  37398448.      0.000
 110.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  37859248.      0.000
 112.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  38320048.      0.000
 114.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  38780848.      0.000
 116.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  39241648.      0.000
 118.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  39702448.      0.000
 120.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  40163248.      0.000
 122.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  40624048.      0.000
 124.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  41084848.      0.000
 126.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  41545648.      0.000
 128.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  42006448.      0.000
 130.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  42467248.      0.000
 132.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  42928048.      0.000
 134.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  43388848.      0.000
 136.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  43849648.      0.000
 138.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  44310448.      0.000
 140.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  44771248.      0.000
 142.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  45232048.      0.000
 144.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  45692848.      0.000
 146.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  46153648.      0.000
 148.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  46614448.      0.000
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```
   150.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  47075248.      0.000
   152.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  47536048.      0.000
   154.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  47996848.      0.000
   156.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  48457648.      0.000
   158.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  48918448.      0.000
   160.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  49379248.      0.000
   162.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  49840048.      0.000
   164.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  50300848.      0.000
   166.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  50761648.      0.000
   168.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  51222448.      0.000
   170.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  51683248.      0.000
   172.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  52144048.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  52604848.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  53065648.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  53526448.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  53987248.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  54448048.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  54908848.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  55369648.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  55830448.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  56291248.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  56752048.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  57212848.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  57673648.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  58134448.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  29297624.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.
```

Output Summary for Load Case No. 1:

```
Pile-head deflection             =      0.5000000 inches
Computed slope at pile head      =     -0.0009586 radians
Maximum bending moment           =      -2288505. inch-lbs
Maximum shear force              =         44473. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             10
Number of zero deflection points =             34
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)

```
Displacement of pile head                                =     1.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     255000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	1.0000	-2975130.	59965.	0.000	55009.	5.821E+09	0.000	0.000	0.000
2.000	0.8528	-1553837.	55349.	-0.007580	32300.	1.289E+10	-192.3296	5412.5880	0.000
4.000	0.6362	-225616.	46151.	-0.009237	11078.	1.289E+10	-574.1393	21660.	0.000
6.000	0.4094	774473.	30089.	-0.008726	19847.	1.289E+10	-764.3859	44806.	0.000
8.000	0.2173	1325448.	10759.	-0.006770	28651.	1.289E+10	-846.4343	93472.	0.000
10.000	0.0845	1373769.	-8140.3235	-0.004257	29423.	1.289E+10	-728.5020	206997.	0.000
12.000	0.0130	986815.	-19991.	-0.002059	23240.	1.289E+10	-259.0392	478079.	0.000
14.000	-0.0143	439407.	-19050.	-0.000731	14494.	1.289E+10	337.4781	564479.	0.000
16.000	-0.0221	81378.	-7820.4035	-0.000246	8773.0124	1.289E+10	598.2843	650879.	0.000
18.000	-0.0261	67034.	-624.5189	-0.000107	8543.8131	1.289E+10	1.3728	1260.6126	0.000
20.000	-0.0272	52715.	-590.2718	4.155E-06	8315.0399	1.289E+10	1.4812	1306.2418	0.000
22.000	-0.0259	38650.	-553.9468	8.923E-05	8090.2978	1.289E+10	1.5459	1430.5383	0.000
24.000	-0.0229	25034.	-516.5734	0.000149	7872.7447	1.289E+10	1.5685	1641.6815	0.000
26.000	-0.0188	12036.	-479.1806	0.000183	7665.0681	1.289E+10	1.5476	1974.9577	0.000

```
28.000    -0.0141  -207.4938  -442.8560   0.000194  7476.0727  1.289E+10
1.4795  2510.5114      0.000
30.000  -0.009491    -11596.  -408.8008   0.000183  7658.0447  1.289E+10
1.3584  3435.2018      0.000
32.000  -0.005356    -22071.  -378.4026   0.000152  7825.4029  1.289E+10
1.1748  5264.1350      0.000
34.000  -0.002208    -31617.   -63.4169   0.000102  7977.9300  1.289E+10
25.0740    272585.      0.000
36.000  -0.000473    -26360.   424.1307  4.775E-05  7893.9359  1.289E+10
15.5549    789837.      0.000
38.000  8.413E-05    -11843.   501.9687  1.217E-05  7661.9852  1.289E+10
-9.0684   2586920.      0.000
40.000   0.000112 -2414.5473   269.5477 -1.106E-06  7511.3368  1.289E+10
-10.3000   2215937.      0.000
42.000  3.105E-05  1108.7298    62.6620 -2.322E-06  7490.4726  1.289E+10
-6.9405   5363910.      0.000
44.000  1.107E-07   621.6473   -20.8976 -7.104E-07  7482.6900  1.289E+10
-0.0228   4946582.      0.000
46.000 -3.047E-06   114.3386   -13.4001 -2.508E-08  7474.5843  1.289E+10
0.6476   5101701.      0.000
48.000 -1.093E-06   -21.2512    -2.7557  6.160E-08  7473.0970  1.289E+10
0.2394   5256820.      0.000
50.000 -8.955E-08   -18.6884     0.3598  2.441E-08  7473.0560  1.289E+10
0.0202   5411940.      0.000
52.000  7.869E-08    -4.2816     0.3830  3.023E-09  7472.8258  1.289E+10
-0.0183   5567059.      0.000
54.000  5.554E-08    -0.3391     0.0990 -1.280E-09  7472.7628  1.289E+10
-0.005419   2341601.      0.000
56.000  1.723E-08     0.4861     0.0132 -1.143E-09  7472.7652  1.289E+10
-0.001734   2414313.      0.000
58.000  6.535E-10     0.3072  -0.008441 -4.047E-10  7472.7623  1.289E+10
-6.772E-05   2487025.      0.000
60.000 -2.193E-09     0.0859  -0.006447 -3.862E-11  7472.7588  1.289E+10
0.000234   2559738.      0.000
62.000 -1.200E-09  -0.001732  -0.002060  3.974E-11  7472.7574  1.289E+10
0.000132   2632450.      0.000
64.000 -2.854E-10    -0.0135 -9.396E-05  2.557E-11  7472.7576  1.289E+10
3.217E-05   2705162.      0.000
66.000  2.676E-11  -0.006555   0.000255  6.904E-12  7472.7575  1.289E+10
-3.097E-06   2777874.      0.000
68.000  4.594E-11  -0.001333   0.000152      0.000  7472.7574  1.289E+10
-5.457E-06   2850586.      0.000
70.000  5.525E-12   0.000760  3.079E-05      0.000  7472.7574  1.289E+10
-4.669E-06  20278893.      0.000
72.000      0.000   0.000157 -1.600E-05      0.000  7472.7574  1.289E+10
7.693E-07  20509293.      0.000
74.000      0.000 -5.877E-06 -3.393E-06      0.000  7472.7574  1.289E+10
2.809E-07  20739693.      0.000
76.000      0.000 -6.491E-06  1.099E-07      0.000  7472.7574  1.289E+10
1.101E-08  20970093.      0.000
78.000      0.000 -6.892E-07  1.386E-07      0.000  7472.7574  1.289E+10
-8.617E-09  21200493.      0.000
80.000      0.000  1.572E-07  1.500E-08      0.000  7472.7574  1.289E+10
-1.681E-09  30947248.      0.000
82.000      0.000  3.351E-08 -3.298E-09      0.000  7472.7574  1.289E+10
1.560E-10  31408048.      0.000
84.000      0.000 -7.083E-10 -7.165E-10      0.000  7472.7574  1.289E+10
5.904E-11  31868848.      0.000
86.000      0.000 -9.133E-10  1.353E-11      0.000  7472.7574  1.289E+10
1.802E-12  32329648.      0.000
88.000      0.000 -7.025E-11  1.936E-11      0.000  7472.7574  1.289E+10
-1.316E-12  32790448.      0.000
90.000      0.000  1.577E-11  1.525E-12      0.000  7472.7574  1.289E+10
```

```
 0.000  33251248.      0.000
 92.000      0.000  3.187E-12      0.000      0.000  7472.7574  1.289E+10
 0.000  33712048.      0.000
 94.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  34172848.      0.000
 96.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  34633648.      0.000
 98.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  35094448.      0.000
100.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  35555248.      0.000
102.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  36016048.      0.000
104.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  36476848.      0.000
106.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  36937648.      0.000
108.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  37398448.      0.000
110.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  37859248.      0.000
112.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  38320048.      0.000
114.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  38780848.      0.000
116.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  39241648.      0.000
118.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  39702448.      0.000
120.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  40163248.      0.000
122.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  40624048.      0.000
124.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  41084848.      0.000
126.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  41545648.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  42006448.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  42467248.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  42928048.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  43388848.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  43849648.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  44310448.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  44771248.      0.000
142.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  45232048.      0.000
144.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  45692848.      0.000
146.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  46153648.      0.000
148.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  46614448.      0.000
150.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  47075248.      0.000
152.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  47536048.      0.000
```

```
   154.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  47996848.      0.000
   156.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  48457648.      0.000
   158.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  48918448.      0.000
   160.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  49379248.      0.000
   162.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  49840048.      0.000
   164.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  50300848.      0.000
   166.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  50761648.      0.000
   168.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  51222448.      0.000
   170.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  51683248.      0.000
   172.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  52144048.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  52604848.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  53065648.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  53526448.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  53987248.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  54448048.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  54908848.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  55369648.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  55830448.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  56291248.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  56752048.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  57212848.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  57673648.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  58134448.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  29297624.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 2:
```

```
Pile-head deflection             =      1.0000000 inches
Computed slope at pile head      =     -0.0046860 radians
Maximum bending moment           =      -2975130. inch-lbs
Maximum shear force              =         59965. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             18
Number of zero deflection points =             33
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 3
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     2.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     255000.0 lbs

   Depth    Deflect.    Bending    Shear       Slope      Total    Bending
   Soil Res.  Soil Spr.   Distrib.
     X         y        Moment     Force         S       Stress   Stiffness
     p         Es*h    Lat. Load
   feet      inches     in-lbs      lbs       radians     psi*      lb-in^2
   lb/in      lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     2.0000  -2975035.     70328.      0.000     55008.  2.219E+09
      0.000      0.000      0.000
     2.000     1.6138  -1244064.     65712.    -0.0172     27350.  1.289E+10
     -192.3306  2860.2791      0.000
     4.000     1.1720    390303.     56515.    -0.0180     13709.  1.289E+10
     -574.1440     11757.      0.000
     6.000     0.7476   1689515.     38528.    -0.0161     34468.  1.289E+10
     -924.7307     29684.      0.000
     8.000     0.3988   2436826.     12278.    -0.0123     46408.  1.289E+10
     -1262.7957     75994.      0.000
    10.000     0.1589   2428991.    -15713.  -0.007735     46283.  1.289E+10
    -1069.7510    161582.      0.000
    12.000     0.0275   1777294.    -34818.  -0.003818     35870.  1.289E+10
    -522.3490    455139.      0.000
    14.000    -0.0244    804467.    -34210.  -0.001414     20326.  1.289E+10
    572.9971    564479.      0.000
    16.000    -0.0403    152517.    -14215.  -0.000522  9909.6528  1.289E+10
    1093.2190    650879.      0.000
    18.000    -0.0494    128522. -1076.4158  -0.000261  9526.2712  1.289E+10
    1.6978   824.1511      0.000
    20.000    -0.0528    104041. -1033.8699 -4.422E-05  9135.1092  1.289E+10
    1.8477   839.4052      0.000
    22.000    -0.0516     79438.  -988.3712   0.000127  8742.0045  1.289E+10
    1.9439   904.7548      0.000
    24.000    -0.0467     55049.  -941.1781   0.000252  8352.3231  1.289E+10
    1.9889  1021.0281      0.000
    26.000    -0.0395     31178.  -893.5348   0.000332  7970.9205  1.289E+10
    1.9814  1204.6641      0.000
    28.000    -0.0308  8093.5553  -846.7451   0.000369  7602.0754  1.289E+10
    1.9177  1494.0394      0.000
    30.000    -0.0218    -13979.  -802.2337   0.000363  7696.1091  1.289E+10
    1.7916  1974.5670      0.000
```

```
32.000    -0.0134    -34860.  -761.6141   0.000318  8029.7449  1.289E+10
1.5934  2860.2809      0.000
34.000  -0.006522    -54426.  -310.8475   0.000235  8342.3676  1.289E+10
35.9705    132357.      0.000
36.000  -0.002108    -52652.   427.8490   0.000135  8314.0325  1.289E+10
25.5876    291362.      0.000
38.000 -4.637E-05    -35540.   821.7300  5.279E-05  8040.6194  1.289E+10
7.2359   3745189.      0.000
40.000   0.000426    -13856.   714.9500  6.795E-06  7694.1403  1.289E+10
-16.1342    908164.      0.000
42.000   0.000280 -1306.0437   347.6669 -7.323E-06  7493.6252  1.289E+10
-14.4727   1241362.      0.000
44.000  7.487E-05  2922.0730    58.4900 -5.818E-06  7519.4460  1.289E+10
-9.6253   3085621.      0.000
46.000  5.319E-07  1572.6925   -58.3708 -1.633E-06  7497.8857  1.289E+10
-0.1131   5101701.      0.000
48.000 -3.506E-06   140.2595   -33.2618 -3.765E-08  7474.9985  1.289E+10
2.2055  15096079.      0.000
50.000 -1.275E-06   -23.4116    -3.3451  7.116E-08  7473.1315  1.289E+10
0.2876   5411940.      0.000
52.000 -9.065E-08   -21.1766     0.3580  2.964E-08  7473.0958  1.289E+10
0.0210   5567059.      0.000
54.000  1.474E-07    -6.5887     0.4378  3.784E-09  7472.8627  1.289E+10
-0.0144   2341601.      0.000
56.000  9.098E-08    -0.2102     0.1554 -2.547E-09  7472.7608  1.289E+10
-0.009152   2414313.      0.000
58.000  2.514E-08     0.8993     0.0143 -1.906E-09  7472.7718  1.289E+10
-0.002605   2487025.      0.000
60.000 -4.945E-10     0.4978    -0.0164 -6.047E-10  7472.7654  1.289E+10
5.275E-05   2559738.      0.000
62.000 -3.882E-09     0.1210    -0.0106 -2.851E-11  7472.7593  1.289E+10
0.000426   2632450.      0.000
64.000 -1.863E-09    -0.0119  -0.002996  7.304E-11  7472.7576  1.289E+10
0.000210   2705162.      0.000
66.000 -3.767E-10    -0.0237  4.707E-05  3.983E-11  7472.7578  1.289E+10
4.360E-05   2777874.      0.000
68.000  4.897E-11    -0.0102   0.000500  8.281E-12  7472.7576  1.289E+10
-5.817E-06   2850586.      0.000
70.000  2.081E-11   0.000190   0.000220      0.000  7472.7574  1.289E+10
-1.759E-05  20278893.      0.000
72.000  1.136E-12   0.000401 -3.042E-06      0.000  7472.7574  1.289E+10
-9.710E-07  20509293.      0.000
74.000      0.000  4.927E-05 -8.531E-06      0.000  7472.7574  1.289E+10
5.135E-07  20739693.      0.000
76.000      0.000 -7.712E-06 -1.083E-06      0.000  7472.7574  1.289E+10
1.072E-07  20970093.      0.000
78.000      0.000 -2.850E-06  1.601E-07      0.000  7472.7574  1.289E+10
-3.657E-09  21200493.      0.000
80.000      0.000 -6.201E-08  6.076E-08      0.000  7472.7574  1.289E+10
-4.617E-09  30947248.      0.000
82.000      0.000  6.748E-08  1.444E-09      0.000  7472.7574  1.289E+10
-3.263E-10  31408048.      0.000
84.000      0.000  8.235E-09 -1.426E-09      0.000  7472.7574  1.289E+10
8.716E-11  31868848.      0.000
86.000      0.000 -8.982E-10 -1.773E-10      0.000  7472.7574  1.289E+10
1.689E-11  32329648.      0.000
88.000      0.000 -2.913E-10  1.866E-11      0.000  7472.7574  1.289E+10
0.000  32790448.      0.000
90.000      0.000 -5.622E-12  6.204E-12      0.000  7472.7574  1.289E+10
0.000  33251248.      0.000
92.000      0.000  6.545E-12      0.000      0.000  7472.7574  1.289E+10
0.000  33712048.      0.000
94.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
```

```
 0.000  34172848.      0.000
 96.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  34633648.      0.000
 98.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
 0.000  35094448.      0.000
100.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  35555248.      0.000
102.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  36016048.      0.000
104.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  36476848.      0.000
106.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  36937648.      0.000
108.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  37398448.      0.000
110.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  37859248.      0.000
112.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  38320048.      0.000
114.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  38780848.      0.000
116.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  39241648.      0.000
118.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  39702448.      0.000
120.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  40163248.      0.000
122.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  40624048.      0.000
124.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  41084848.      0.000
126.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  41545648.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  42006448.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  42467248.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  42928048.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  43388848.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  43849648.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  44310448.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  44771248.      0.000
142.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  45232048.      0.000
144.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  45692848.      0.000
146.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  46153648.      0.000
148.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  46614448.      0.000
150.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  47075248.      0.000
152.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  47536048.      0.000
154.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  47996848.      0.000
156.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
0.000  48457648.      0.000
```

```
   158.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  48918448.      0.000
   160.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  49379248.      0.000
   162.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  49840048.      0.000
   164.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  50300848.      0.000
   166.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  50761648.      0.000
   168.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  51222448.      0.000
   170.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  51683248.      0.000
   172.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  52144048.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  52604848.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  53065648.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  53526448.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  53987248.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  54448048.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  54908848.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  55369648.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  55830448.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  56291248.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  56752048.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  57212848.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  57673648.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  58134448.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  1.289E+10
   0.000  29297624.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 3:

Pile-head deflection             =      2.0000000 inches
Computed slope at pile head      =     -0.0149330 radians
Maximum bending moment           =      -2975035. inch-lbs
Maximum shear force              =         70328. lbs
```

```
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             16
Number of zero deflection points =             33
```

```
-----------------------------------------------------------------------------
--
                           Summary of Pile Response(s)
-----------------------------------------------------------------------------
--
```

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs
Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians
Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/
radian
Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs
Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians

```
               Pile-head      Pile-head
               Maximum        Maximum
Load  Load    Condition 1    Condition 2        Axial        Pile-head
Moment          Shear        Pile-head
Case  Type    V(lbs) or     in-lb, rad.,       Loading      Deflection
in Pile        in Pile       Rotation
 No.   No.    y(inches)     or in-lb/rad.        lbs          inches
 in-lbs           lbs          radians
----  ----  --------------  --------------  -------------  -------------
-------------  -------------  -------------
  1     5   y =     0.5000  S =      0.000        255000.     0.50000000
  -2288505.         44473.    -0.00095861
  2     5   y =     1.0000  S =      0.000        255000.     1.00000000
  -2975130.         59965.    -0.00468596
  3     5   y =     2.0000  S =      0.000        255000.     2.00000000
  -2975035.         70328.    -0.01493297
```

The analysis ended normally.

==========
==

LPile Plus for Windows, Version 2013-07.007

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

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--
Files Used for Analysis

--

Path to file locations: Z:\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis\L-Pile\East Abutment\Transverse\Post Seismic (No Scour)\
Name of input data file: East Abutment.lp7d
Name of output report file: East Abutment.lp7o
Name of plot output file: East Abutment.lp7p
Name of runtime messeage file: East Abutment.lp7r

--
Date and Time of Analysis

--

Date: October 3, 2017 Time: 13:58:15

--
Problem Title

--

Project Name: SR 21 Harbor River Bridge
Job Number:
Client:
Engineer:
Description:

```
--------------------------------------------------------------------------------
--
                           Program Options and Settings
--------------------------------------------------------------------------------
--

Engineering Units of Input Data and Computations:
 - Engineering units are US Customary Units (pounds, feet, inches)

Analysis Control Options:
- Maximum number of iterations allowed                  =          750
- Deflection tolerance for convergence                  =   1.0000E-05 in
- Maximum allowable deflection                          =     100.0000 in
- Number of pile increments                             =          100

Loading Type and Number of Cycles of Loading:
 - Static loading specified

Computational Options:
 - Use unfactored loads in computations (conventional analysis)
 - Compute pile response under loading and nonlinear bending properties of
 pile
   (only if nonlinear pile properties are input)
 - Analysis uses p-y modification factors for p-y curves
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Computation of pile-head foundation stiffness matrix not selected
 - Push-over analysis of pile not selected
 - Buckling analysis of pile not selected

Output Options:
 - No p-y curves to be computed and reported for user-specified depths
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1


--------------------------------------------------------------------------------
--
                     Pile Structural Properties and Geometry
--------------------------------------------------------------------------------
--

Total number of pile sections                           =          1

Total length of pile                                    =     200.00 ft

Depth of ground surface below top of pile               =       0.00 ft

Pile diameter values used for p-y curve computations are defined using 2
points.

p-y curves are computed using pile diameter values interpolated with depth
over
the length of the pile.

Point         Depth              Pile
                X              Diameter
                ft                in
-----       ---------        -----------
  1           0.00000         14.9000000
  2         200.000000        14.9000000
```

Input Structural Properties:

Pile Section No. 1:

Section Type	=	Elastic with Specified Moment Capacity
Cross-sectional Shape	=	Strong H-Pile
Section Length	=	200.00000 ft
Flange Width	=	14.90000 in
Section Depth	=	14.20000 in
Flange Thickness	=	0.80500 in
Web Thickness	=	0.80500 in
Section Area	=	34.12395 Sq. in
Moment of Inertia	=	1211.23082 in^4
Elastic Modulus	=	29000000. lbs/in^2
Plastic Moment Capacity	=	8600000. in-lb
Top Elastic Bending Stiffness	=	3.5126E+10 lbs-in^2
Bot Elastic Bending Stiffness	=	3.5126E+10 lbs-in^2

--
Ground Slope and Pile Batter Angles

--

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

--
Soil and Rock Layering Information

--

The soil profile is modelled using 7 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	0.0000 ft
Distance from top of pile to bottom of layer	=	3.00000 ft
Effective unit weight at top of layer	=	100.00000 pcf
Effective unit weight at bottom of layer	=	100.00000 pcf
Friction angle at top of layer	=	30.00000 deg.
Friction angle at bottom of layer	=	30.00000 deg.
Subgrade k at top of layer	=	25.00000 pci
Subgrade k at bottom of layer	=	25.00000 pci

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	3.00000 ft
Distance from top of pile to bottom of layer	=	18.00000 ft
Effective unit weight at top of layer	=	57.60000 pcf
Effective unit weight at bottom of layer	=	57.60000 pcf
Friction angle at top of layer	=	41.00000 deg.

Friction angle at bottom of layer	=	41.00000	deg.
Subgrade k at top of layer	=	150.00000	pci
Subgrade k at bottom of layer	=	150.00000	pci

Layer 3 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	18.00000	ft
Distance from top of pile to bottom of layer	=	33.00000	ft
Effective unit weight at top of layer	=	37.60000	pcf
Effective unit weight at bottom of layer	=	37.60000	pcf
Undrained cohesion at top of layer	=	93.00000	psf
Undrained cohesion at bottom of layer	=	138.00000	psf
Epsilon-50 at top of layer	=	0.02000	
Epsilon-50 at bottom of layer	=	0.02000	

Layer 4 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	33.00000	ft
Distance from top of pile to bottom of layer	=	53.00000	ft
Effective unit weight at top of layer	=	32.60000	pcf
Effective unit weight at bottom of layer	=	32.60000	pcf
Undrained cohesion at top of layer	=	380.00000	psf
Undrained cohesion at bottom of layer	=	524.00000	psf
Epsilon-50 at top of layer	=	0.02000	
Epsilon-50 at bottom of layer	=	0.02000	

Layer 5 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	53.00000	ft
Distance from top of pile to bottom of layer	=	69.00000	ft
Effective unit weight at top of layer	=	37.60000	pcf
Effective unit weight at bottom of layer	=	37.60000	pcf
Undrained cohesion at top of layer	=	214.00000	psf
Undrained cohesion at bottom of layer	=	268.00000	psf
Epsilon-50 at top of layer	=	0.02000	
Epsilon-50 at bottom of layer	=	0.02000	

Layer 6 is stiff clay with water-induced erosion

Distance from top of pile to top of layer	=	69.00000	ft
Distance from top of pile to bottom of layer	=	80.00000	ft
Effective unit weight at top of layer	=	57.60000	pcf
Effective unit weight at bottom of layer	=	57.60000	pcf
Undrained cohesion at top of layer	=	3400.00000	psf
Undrained cohesion at bottom of layer	=	3400.00000	psf
Epsilon-50 at top of layer	=	0.00500	
Epsilon-50 at bottom of layer	=	0.00500	
Subgrade k at top of layer	=	400.00000	pci
Subgrade k at bottom of layer	=	400.00000	pci

Layer 7 is stiff clay with water-induced erosion

Distance from top of pile to top of layer	=	80.00000	ft
Distance from top of pile to bottom of layer	=	200.00000	ft
Effective unit weight at top of layer	=	57.60000	pcf
Effective unit weight at bottom of layer	=	57.60000	pcf
Undrained cohesion at top of layer	=	6000.00000	psf
Undrained cohesion at bottom of layer	=	6000.00000	psf

```
   Epsilon-50 at top of layer                          =      0.00500
   Epsilon-50 at bottom of layer                       =      0.00500
   Subgrade k at top of layer                          =    800.00000 pci
   Subgrade k at bottom of layer                       =    800.00000 pci


   (Depth of lowest soil layer extends    0.00 ft below pile tip)



-------------------------------------------------------------------------------
--
                            Summary of Soil Properties
-------------------------------------------------------------------------------
--

                       Layer                       Layer      Effective
                       Undrained    Angle of       Strain
Layer                Soil Type                    Depth       Unit Wt.
Cohesion     Friction      Factor        kpy
 Num.         (p-y Curve Criteria)                ft           pcf          psf
 deg.     Epsilon 50      pci
-----   ----------------------------------   ----------   ----------
----------   ----------   ----------   ----------
  1     Sand (Reese, et al.)                       0.00      100.000       --
  30.000       --           25.000
                                                  3.000      100.000       --
                                                  30.000       --
                                                  25.000
  2     Sand (Reese, et al.)                       3.000       57.600       --
  41.000       --          150.000
                                                 18.000       57.600       --
                                                 41.000       --
                                                 150.000
  3     Soft Clay                                18.000       37.600
  93.000       --          0.02000       --
                                                 33.000       37.600
                                                 138.000       --
                                                 0.02000       --
  4     Soft Clay                                33.000       32.600
  380.000       --          0.02000       --
                                                 53.000       32.600
                                                 524.000       --
                                                 0.02000       --
  5     Soft Clay                                53.000       37.600
  214.000       --          0.02000       --
                                                 69.000       37.600
                                                 268.000       --
                                                 0.02000       --
  6     Stiff Clay with Free Water               69.000       57.600
  3400.000       --          0.00500      400.000
                                                 80.000       57.600
                                                 3400.000       --
                                                 0.00500      400.000
  7     Stiff Clay with Free Water               80.000       57.600
  6000.000       --          0.00500      800.000
                                                200.000       57.600
                                                6000.000       --
                                                0.00500      800.000


-------------------------------------------------------------------------------
```

--

p-y Modification Factors for Group Action

--

Distribution of p-y modifiers with depth defined using 12 points

Point No.	Depth X ft	p-mult	y-mult
1	0.000	0.8500	1.0000
2	3.000	0.8500	1.0000
3	3.000	0.8500	1.0000
4	18.000	0.8500	1.0000
5	18.000	0.0850	1.0000
6	33.000	0.0850	1.0000
7	33.000	0.8500	1.0000
8	53.000	0.8500	1.0000
9	53.000	0.0850	1.0000
10	69.000	0.0850	1.0000
11	69.000	0.8500	1.0000
12	210.000	0.8500	1.0000

--

Loading Type

--

Static loading criteria were used when computing p-y curves for all analyses.

--

Pile-head Loading and Pile-head Fixity Conditions

--

Number of loads specified = 7

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	5	y = 0.50000 in	S = 0.0000 in/in	255000.	No
2	5	y = 1.00000 in	S = 0.0000 in/in	255000.	No
3	5	y = 2.00000 in	S = 0.0000 in/in	255000.	No
4	5	y = 3.00000 in	S = 0.0000 in/in	255000.	No
5	5	y = 4.00000 in	S = 0.0000 in/in	255000.	No
6	5	y = 5.00000 in	S = 0.0000 in/in	255000.	No
7	5	y = 6.00000 in	S = 0.0000 in/in	255000.	No

V = perpendicular shear force applied to pile head
M = bending moment applied to pile head
y = lateral deflection relative to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applie to pile head
Axial thrust is assumed to be acting axially for all pile batter angles.

--
Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness
---
--

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic-plastic section properties

---
--
Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 255000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.5000	-4059027.	62434.	0.000	32439.	3.513E+10	0.000	0.000	0.000
2.000	0.4667	-2597449.	58657.	-0.002274	23449.	3.513E+10	-157.3347	8090.5834	0.000
4.000	0.3908	-1215634.	51601.	-0.003577	14950.	3.513E+10	-430.6961	26447.	0.000
6.000	0.2950	-76817.	40213.	-0.004018	7945.2402	3.513E+10	-518.2804	42160.	0.000
8.000	0.1980	763792.	26005.	-0.003784	12171.	3.513E+10	-665.7110	80705.	0.000
10.000	0.1134	1217757.	9325.9352	-0.003107	14963.	3.513E+10	-724.2519	153246.	0.000
12.000	0.0489	1249462.	-6737.1350	-0.002264	15158.	3.513E+10	-614.3373	301813.	0.000
14.000	0.004767	922083.	-15253.	-0.001522	13144.	3.513E+10	-95.3447	480060.	0.000

```
16.000    -0.0242    535930. -9700.6874  -0.001024     10769.  3.513E+10
558.0640    553500.      0.000
18.000    -0.0444    468981. -2986.6696  -0.000680     10357.  3.513E+10
1.4375   777.4733      0.000
20.000    -0.0569    400899. -2949.4748  -0.000383  9938.5930  3.513E+10
1.6621   701.5467      0.000
22.000    -0.0628    332098. -2907.6669  -0.000133  9515.4126  3.513E+10
1.8219   696.5885      0.000
24.000    -0.0632    262957. -2862.6343  7.042E-05  9090.1455  3.513E+10
1.9308   732.7807      0.000
26.000    -0.0594    193829. -2815.5478   0.000226  8664.9557  3.513E+10
1.9931   805.3992      0.000
28.000    -0.0524    125039. -2767.5201   0.000335  8241.8418  3.513E+10
2.0092   920.8412      0.000
30.000    -0.0433     56883. -2719.6761   0.000398  7822.6303  3.513E+10
1.9778  1096.4359      0.000
32.000    -0.0333    -10372. -2673.1883   0.000413  7536.5520  3.513E+10
1.8962  1367.2931      0.000
34.000    -0.0234    -76491. -2069.6925   0.000384  7943.2348  3.513E+10
48.3951     49538.      0.000
36.000    -0.0149   -114414.  -971.4476   0.000319  8176.4941  3.513E+10
43.1253     69637.      0.000
38.000  -0.008156   -127019.   -14.9483   0.000236  8254.0244  3.513E+10
36.5830    107654.      0.000
40.000  -0.003531   -118021.   767.9220   0.000152  8198.6802  3.513E+10
28.6562    194754.      0.000
42.000  -0.000842    -92024.  1333.0418  8.060E-05  8038.7760  3.513E+10
18.4371    525267.      0.000
44.000   0.000338    -55022.  1388.5011  3.037E-05  7811.1852  3.513E+10
-13.8155    982396.      0.000
46.000   0.000615    -25748.  1012.5403  2.773E-06  7631.1254  3.513E+10
-17.5146    683307.      0.000
48.000   0.000471 -6454.0510   604.1240 -8.228E-06  7512.4548  3.513E+10
-16.5201    842483.      0.000
50.000   0.000220  3350.9894   247.3857 -9.288E-06  7493.3686  3.513E+10
-13.2081   1439463.      0.000
52.000  2.477E-05  5534.1516     9.9813 -6.253E-06  7506.7967  3.513E+10
-6.5756   6370394.      0.000
54.000 -7.992E-05  3906.6253   -64.0403 -3.028E-06  7496.7861  3.513E+10
0.4071    122262.      0.000
56.000  -0.000121  2497.2738   -53.3753 -8.398E-07  7488.1176  3.513E+10
0.4816     95882.      0.000
58.000  -0.000120  1354.8920   -41.6462  4.762E-07  7481.0910  3.513E+10
0.4958     98968.      0.000
60.000 -9.770E-05   492.4258   -29.9806  1.107E-06  7475.7862  3.513E+10
0.4763    117016.      0.000
62.000 -6.708E-05   -97.7304   -19.0758  1.242E-06  7473.3585  3.513E+10
0.4324    154696.      0.000
64.000 -3.807E-05  -438.4147    -9.4683  1.059E-06  7475.4540  3.513E+10
0.3682    232103.      0.000
66.000 -1.625E-05  -565.1708    -1.6282  7.161E-07  7476.2336  3.513E+10
0.2851    420987.      0.000
68.000 -3.702E-06  -525.3312     7.0704  3.435E-07  7475.9886  3.513E+10
0.4398   2850586.      0.000
70.000  2.354E-07  -229.9976    10.3825  8.550E-08  7474.1721  3.513E+10
-0.1637  16697570.      0.000
72.000  4.016E-07   -28.0195     5.0256 -2.647E-09  7472.9297  3.513E+10
-0.2827  16893410.      0.000
74.000  1.083E-07    11.2628     0.7082 -8.371E-09  7472.8267  3.513E+10
-0.0771  17089250.      0.000
76.000 -2.564E-10     6.0750    -0.2151 -2.448E-09  7472.7948  3.513E+10
0.000185  17285090.      0.000
78.000 -9.204E-09     0.9682    -0.1324 -4.208E-11  7472.7634  3.513E+10
```

```
 0.006704  17480930.      0.000
 80.000 -2.276E-09    -0.2810    -0.0229  1.927E-10  7472.7591  3.513E+10
 0.002421  25529126.      0.000
 82.000  4.372E-11    -0.1345   0.005565  5.073E-11  7472.7582  3.513E+10
 -4.722E-05  25920806.      0.000
 84.000  1.587E-10    -0.0145   0.002910      0.000  7472.7575  3.513E+10
 -0.000174  26312486.      0.000
 86.000  3.556E-11   0.005245   0.000348 -3.340E-12  7472.7574  3.513E+10
 -3.956E-05  26704166.      0.000
 88.000 -1.597E-12   0.002203  -0.000105      0.000  7472.7574  3.513E+10
 1.803E-06  27095846.      0.000
 90.000 -2.620E-12   0.000191 -4.786E-05      0.000  7472.7574  3.513E+10
 3.000E-06  27487526.      0.000
 92.000      0.000 -9.433E-05 -4.668E-06      0.000  7472.7574  3.513E+10
 5.988E-07  27879206.      0.000
 94.000      0.000 -3.405E-05  1.925E-06      0.000  7472.7574  3.513E+10
 -4.939E-08  28270886.      0.000
 96.000      0.000 -2.073E-06  7.446E-07      0.000  7472.7574  3.513E+10
 -4.898E-08  28662566.      0.000
 98.000      0.000  1.699E-06  5.248E-08      0.000  7472.7574  3.513E+10
 -8.693E-09  34181466.      0.000
100.000      0.000  4.567E-07 -3.540E-08      0.000  7472.7574  3.513E+10
1.369E-09  34642266.      0.000
102.000      0.000  1.301E-09 -1.001E-08      0.000  7472.7574  3.513E+10
7.470E-10  35103066.      0.000
104.000      0.000 -2.385E-08 -1.238E-10      0.000  7472.7574  3.513E+10
7.661E-11  35563866.      0.000
106.000      0.000 -4.777E-09  5.035E-10      0.000  7472.7574  3.513E+10
-2.434E-11  36024666.      0.000
108.000      0.000  3.001E-10  1.057E-10      0.000  7472.7574  3.513E+10
-8.807E-12  36485466.      0.000
110.000      0.000  3.030E-10 -5.390E-12      0.000  7472.7574  3.513E+10
0.000  36946266.      0.000
112.000      0.000  4.296E-11 -6.462E-12      0.000  7472.7574  3.513E+10
0.000  37407066.      0.000
114.000      0.000 -7.060E-12      0.000      0.000  7472.7574  3.513E+10
0.000  37867866.      0.000
116.000      0.000 -3.472E-12      0.000      0.000  7472.7574  3.513E+10
0.000  38328666.      0.000
118.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  38789466.      0.000
120.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  39250266.      0.000
122.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  39711066.      0.000
124.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  40171866.      0.000
126.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  40632666.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  41093466.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  41554266.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42015066.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42475866.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42936666.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  43397466.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  43858266.      0.000
```

```
   142.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  44319066.      0.000
   144.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  44779866.      0.000
   146.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  45240666.      0.000
   148.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  45701466.      0.000
   150.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  46162266.      0.000
   152.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  46623066.      0.000
   154.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  47083866.      0.000
   156.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  47544666.      0.000
   158.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  48005466.      0.000
   160.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  48466266.      0.000
   162.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  48927066.      0.000
   164.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  49387866.      0.000
   166.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  49848666.      0.000
   168.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  50309466.      0.000
   170.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  50770266.      0.000
   172.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  51231066.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  51691866.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  52152666.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  52613466.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53074266.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53535066.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53995866.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  54456666.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  54917466.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  55378266.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  55839066.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  56299866.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  56760666.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  57221466.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  28841133.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
```

Values of total stress due to combined axial and bending stresses are computed only
for elastic sections only and do not equal the actual stresses in concrete and steel.
Stresses in concrete and steel may be interpolated from the output for nonlinear
bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =      0.5000000 inches
Computed slope at pile head      =     -0.0004993 radians
Maximum bending moment           =      -4059027. inch-lbs
Maximum shear force              =         62434. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             16
Number of zero deflection points =             28
```

--

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)

```
Displacement of pile head                                =     1.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     255000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	1.0000	-7251922.	101541.	0.000	52078.	3.513E+10	0.000	0.000	0.000
2.000	0.9405	-4849212.	97422.	-0.004134	37299.	3.513E+10	-171.6195	4379.2570	0.000
4.000	0.8016	-2525078.	89192.	-0.006653	23004.	3.513E+10	-514.1923	15396.	0.000
6.000	0.6212	-486559.	73443.	-0.007682	10465.	3.513E+10	-798.2640	30842.	0.000
8.000	0.4328	1094194.	50553.	-0.007475	14203.	3.513E+10	-1109.1826	61505.	0.000
10.000	0.2624	2031482.	22766.	-0.006407	19968.	3.513E+10	-1206.4352	110348.	0.000
12.000	0.1253	2265369.	-4781.3645	-0.004939	21407.	3.513E+10	-1089.1565	208642.	0.000
14.000	0.0253	1862429.	-23930.	-0.003529	18928.	3.513E+10	-506.5700	480060.	0.000
16.000	-0.0441	1159917.	-17976.	-0.002496	14607.	3.513E+10	1002.7327	545779.	0.000
18.000	-0.0945	1030128.	-5921.1446	-0.001748	13809.	3.513E+10	1.8494	469.7180	0.000

```
20.000    -0.1280    897097. -5872.8128  -0.001090     12991.  3.513E+10
2.1783   408.4302      0.000
22.000    -0.1468    761570. -5817.6542  -0.000523     12157.  3.513E+10
2.4183   395.3705      0.000
24.000    -0.1531    624251. -5757.5243 -4.954E-05     11312.  3.513E+10
2.5926   406.4056      0.000
26.000    -0.1492    485815. -5693.9040   0.000330     10461.  3.513E+10
2.7091   435.8659      0.000
28.000    -0.1373    346908. -5628.1512   0.000614  9606.5101  3.513E+10
2.7703   484.3249      0.000
30.000    -0.1197    208146. -5561.6000   0.000804  8753.0179  3.513E+10
2.7757   556.5615      0.000
32.000    -0.0987     70113. -5495.6052   0.000899  7904.0061  3.513E+10
2.7239   662.3874      0.000
34.000    -0.0765    -66645. -4601.5408   0.000900  7882.6736  3.513E+10
71.7815     22506.      0.000
36.000    -0.0555   -161778. -2937.5666   0.000822  8467.8139  3.513E+10
66.8831     28927.      0.000
38.000    -0.0371   -217709. -1408.0456   0.000692  8811.8372  3.513E+10
60.5770     39198.      0.000
40.000    -0.0223   -237838.   -46.7097   0.000537  8935.6462  3.513E+10
52.8676     57006.      0.000
42.000    -0.0113   -226521.  1111.1923   0.000378  8866.0363  3.513E+10
43.6242     92439.      0.000
44.000  -0.004109   -189129.  2020.2163   0.000236  8636.0468  3.513E+10
32.1278    187653.      0.000
46.000  6.765E-06   -132441.  2363.3406   0.000126  8287.3691  3.513E+10
-3.5341  12537568.      0.000
48.000   0.001951    -77234.  2001.3539  5.461E-05  7947.8059  3.513E+10
-26.6314    327647.      0.000
50.000   0.002628    -37044.  1318.2488  1.557E-05  7700.6072  3.513E+10
-30.2940    276635.      0.000
52.000   0.002698    -14149.   577.3493 -1.916E-06  7559.7826  3.513E+10
-31.4476    279718.      0.000
54.000   0.002536 -9307.8982   184.4245 -9.930E-06  7530.0081  3.513E+10
-1.2961     12265.      0.000
56.000   0.002222 -5174.7574   153.5233 -1.488E-05  7504.5861  3.513E+10
-1.2790     13817.      0.000
58.000   0.001822 -1756.6804   123.3717 -1.725E-05  7483.5623  3.513E+10
-1.2336     16249.      0.000
60.000   0.001394   958.1707    94.6293 -1.752E-05  7478.6509  3.513E+10
-1.1616     20001.      0.000
62.000   0.000981  2999.9511    67.9341 -1.617E-05  7491.2094  3.513E+10
-1.0630     26001.      0.000
64.000   0.000618  4416.8811    43.9379 -1.363E-05  7499.9246  3.513E+10
-0.9367     36384.      0.000
66.000   0.000327  5275.8301    23.3591 -1.032E-05  7505.2078  3.513E+10
-0.7783     57140.      0.000
68.000   0.000122  5664.4451     7.1084 -6.583E-06  7507.5981  3.513E+10
-0.5760    112902.      0.000
70.000  1.088E-05  5697.6148   -90.6179 -2.702E-06  7507.8021  3.513E+10
-7.5679  16697570.      0.000
72.000 -7.250E-06  1347.8546  -120.1925 -2.949E-07  7481.0477  3.513E+10
5.1033  16893410.      0.000
74.000 -3.276E-06   -68.0139   -30.9644  1.424E-07  7473.1757  3.513E+10
2.3323  17089250.      0.000
76.000 -4.161E-07  -140.1774     0.6200  7.125E-08  7473.6196  3.513E+10
0.2997  17285090.      0.000
78.000  1.446E-07   -39.1271     2.9527  9.996E-09  7472.9981  3.513E+10
-0.1053  17480930.      0.000
80.000  6.367E-08     1.4290     0.8762 -2.883E-09  7472.7662  3.513E+10
-0.0677  25529126.      0.000
82.000  6.199E-09     2.9666    -0.0169 -1.381E-09  7472.7757  3.513E+10
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 -0.006695  25920806.      0.000
 84.000 -2.628E-09     0.6354    -0.0627 -1.507E-10  7472.7613  3.513E+10
 0.002881  26312486.      0.000
 86.000 -1.034E-09    -0.0390    -0.0143  5.307E-11  7472.7576  3.513E+10
 0.001151  26704166.      0.000
 88.000 -8.022E-11    -0.0505   0.000619  2.251E-11  7472.7577  3.513E+10
 9.057E-05  27095846.      0.000
 90.000  4.617E-11  -0.009557   0.001071  2.001E-12  7472.7575  3.513E+10
 -5.288E-05  27487526.      0.000
 92.000  1.585E-11   0.000934   0.000216      0.000  7472.7574  3.513E+10
 -1.841E-05  27879206.      0.000
 94.000      0.000   0.000817 -1.680E-05      0.000  7472.7574  3.513E+10
 -9.822E-07  28270886.      0.000
 96.000      0.000   0.000132 -1.745E-05      0.000  7472.7574  3.513E+10
 9.280E-07  28662566.      0.000
 98.000      0.000 -1.988E-05 -3.003E-06      0.000  7472.7574  3.513E+10
 2.757E-07  29054246.      0.000
100.000      0.000 -1.259E-05  3.815E-07      0.000  7472.7574  3.513E+10
6.313E-09  34642266.      0.000
102.000      0.000 -1.623E-06  2.713E-07      0.000  7472.7574  3.513E+10
-1.550E-08  29837606.      0.000
104.000      0.000  4.246E-07  3.726E-08      0.000  7472.7574  3.513E+10
-3.996E-09  35563866.      0.000
106.000      0.000  1.687E-07 -8.631E-09      0.000  7472.7574  3.513E+10
1.718E-10  36024666.      0.000
108.000      0.000  1.102E-08 -3.649E-09      0.000  7472.7574  3.513E+10
2.433E-10  36485466.      0.000
110.000      0.000 -6.510E-09 -2.663E-10      0.000  7472.7574  3.513E+10
3.854E-11  36946266.      0.000
112.000      0.000 -1.809E-09  1.354E-10      0.000  7472.7574  3.513E+10
-5.062E-12  37407066.      0.000
114.000      0.000 -1.706E-11  3.949E-11      0.000  7472.7574  3.513E+10
-2.931E-12  37867866.      0.000
116.000      0.000  8.692E-11      0.000      0.000  7472.7574  3.513E+10
0.000  38328666.      0.000
118.000      0.000  1.709E-11 -1.834E-12      0.000  7472.7574  3.513E+10
0.000  38789466.      0.000
120.000      0.000 -1.082E-12      0.000      0.000  7472.7574  3.513E+10
0.000  39250266.      0.000
122.000      0.000 -1.027E-12      0.000      0.000  7472.7574  3.513E+10
0.000  39711066.      0.000
124.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  40171866.      0.000
126.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  40632666.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  41093466.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  41554266.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42015066.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42475866.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42936666.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  43397466.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  43858266.      0.000
142.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  44319066.      0.000
144.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  44779866.      0.000
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   146.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  45240666.      0.000
   148.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  45701466.      0.000
   150.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  46162266.      0.000
   152.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  46623066.      0.000
   154.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  47083866.      0.000
   156.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  47544666.      0.000
   158.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  48005466.      0.000
   160.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  48466266.      0.000
   162.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  48927066.      0.000
   164.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  49387866.      0.000
   166.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  49848666.      0.000
   168.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  50309466.      0.000
   170.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  50770266.      0.000
   172.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  51231066.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  51691866.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  52152666.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  52613466.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53074266.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53535066.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53995866.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  54456666.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  54917466.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  55378266.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  55839066.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  56299866.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  56760666.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  57221466.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  28841133.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
```

Stresses in concrete and steel may be interpolated from the output for nonlinear
bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 2:

```
Pile-head deflection             =      1.0000000 inches
Computed slope at pile head      =     -0.0008208 radians
Maximum bending moment           =      -7251922. inch-lbs
Maximum shear force              =        101541. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             17
Number of zero deflection points =             26
```

--

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 3

--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)

```
Displacement of pile head                                =     2.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     255000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	2.0000	-8600209.	124802.	0.000	60371.	1.184E+10	0.000	0.000	0.000
2.000	1.7908	-5601029.	120683.	-0.0106	41923.	3.513E+10	-171.6190	2300.0637	0.000
4.000	1.4897	-2677282.	112453.	-0.0135	23940.	3.513E+10	-514.1894	8284.0893	0.000
6.000	1.1447	-38512.	96704.	-0.0144	7709.6346	3.513E+10	-798.2574	16737.	0.000
8.000	0.7991	2140623.	70988.	-0.0137	20639.	3.513E+10	-1344.7562	40391.	0.000
10.000	0.4885	3536227.	32625.	-0.0117	29223.	3.513E+10	-1852.1542	90990.	0.000
12.000	0.2360	3850203.	-8808.4265	-0.009207	31154.	3.513E+10	-1600.6333	162777.	0.000
14.000	0.0466	3226114.	-37641.	-0.006789	27316.	3.513E+10	-802.0544	413058.	0.000
16.000	-0.0899	2126552.	-28711.	-0.004961	20553.	3.513E+10	1546.1974	412815.	0.000
18.000	-0.1915	1908708.	-10129.	-0.003582	19213.	3.513E+10	2.3404	293.2900	0.000
20.000	-0.2618	1684230.	-10067.	-0.002355	17832.	3.513E+10	2.7651	253.4515	0.000
22.000	-0.3045	1454302.	-9997.0509	-0.001283	16418.	3.513E+10	3.0842	243.0551	0.000

```
24.000    -0.3234   1220069. -9920.1244  -0.000369     14977.  3.513E+10
3.3264   246.8562      0.000
26.000    -0.3222    982651. -9838.1840   0.000384     13517.  3.513E+10
3.5020   260.8186      0.000
28.000    -0.3050    743141. -9752.7845   0.000973     12044.  3.513E+10
3.6146   284.4461      0.000
30.000    -0.2755    502605. -9665.4318   0.001399     10564.  3.513E+10
3.6648   319.2172      0.000
32.000    -0.2378    262078. -9577.6342   0.001660  9084.7409  3.513E+10
3.6517   368.4869      0.000
34.000    -0.1958     22559. -8355.7854   0.001757  7611.5149  3.513E+10
98.1690     12030.      0.000
36.000    -0.1535   -160509. -6051.2546   0.001710  8460.0086  3.513E+10
93.8752     14679.      0.000
38.000    -0.1138   -288833. -3868.7385   0.001557  9249.3041  3.513E+10
88.0012     18565.      0.000
40.000    -0.0788   -365262. -1846.1498   0.001333  9719.3966  3.513E+10
80.5479     24542.      0.000
42.000    -0.0498   -393767.   -22.4268   0.001074  9894.7262  3.513E+10
71.4290     34446.      0.000
44.000    -0.0272   -379483.  1558.4109   0.000810  9806.8664  3.513E+10
60.3075     53169.      0.000
46.000    -0.0109   -328874.  2832.2296   0.000568  9495.5866  3.513E+10
45.8441    100939.      0.000
48.000  2.883E-05   -250485.  3303.9577   0.000370  9013.4298  3.513E+10
-6.5334   5439040.      0.000
50.000   0.006850   -174811.  2725.6823   0.000225  8547.9775  3.513E+10
-41.6562    145940.      0.000
52.000     0.0108   -122400.  1627.2476   0.000123  8225.6104  3.513E+10
-49.8800    110789.      0.000
54.000     0.0128    -98208.  1002.0808  4.761E-05  8076.8123  3.513E+10
-2.2172  4172.4897      0.000
56.000     0.0131    -74883.   947.8018 -1.152E-05  7933.3436  3.513E+10
-2.3060  4227.8030      0.000
58.000     0.0122    -52573.   892.2851 -5.507E-05  7796.1188  3.513E+10
-2.3204  4564.5562      0.000
60.000     0.0104    -31379.   837.2263 -8.375E-05  7665.7625  3.513E+10
-2.2679  5209.7149      0.000
62.000   0.008180    -11361.   784.2160 -9.835E-05  7542.6338  3.513E+10
-2.1497  6306.7449      0.000
64.000   0.005727  7467.1155   734.8824 -9.968E-05  7518.6859  3.513E+10
-1.9615  8220.0157      0.000
66.000   0.003396     25134.   691.0386 -8.854E-05  7627.3496  3.513E+10
-1.6922     11959.      0.000
68.000   0.001477     41721.   654.9446 -6.570E-05  7729.3717  3.513E+10
-1.3157     21378.      0.000
70.000   0.000242     57375.  -486.3091 -3.185E-05  7825.6596  3.513E+10
-93.7888   9289831.      0.000
72.000 -5.157E-05     18768. -1176.1467 -5.833E-06  7588.1929  3.513E+10
36.3024  16893410.      0.000
74.000 -3.769E-05   991.6677  -418.4593  9.172E-07  7478.8569  3.513E+10
26.8383  17089250.      0.000
76.000 -7.547E-06 -1329.6241   -31.1707  8.018E-07  7480.9356  3.513E+10
5.4358  17285090.      0.000
78.000  7.929E-07  -514.3394    27.1282  1.718E-07  7475.9210  3.513E+10
-0.5776  17480930.      0.000
80.000  6.991E-07   -29.5742    11.2739 -1.401E-08  7472.9393  3.513E+10
-0.7436  25529126.      0.000
82.000  1.203E-07    26.9797     0.7913 -1.490E-08  7472.9233  3.513E+10
-0.1299  25920806.      0.000
84.000 -1.610E-08     8.5895    -0.5559 -2.748E-09  7472.8102  3.513E+10
0.0177  26312486.      0.000
86.000 -1.163E-08     0.3298    -0.1888  2.987E-10  7472.7594  3.513E+10
```

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 0.0129  26704166.      0.000
 88.000 -1.760E-09    -0.4755  -0.009612  2.489E-10  7472.7603  3.513E+10
 0.001987  27095846.      0.000
 90.000  3.162E-10    -0.1346   0.009881  4.049E-11  7472.7582  3.513E+10
 -0.000362  27487526.      0.000
 92.000  1.840E-10  -0.001745   0.002971 -6.102E-12  7472.7574  3.513E+10
 -0.000214  27879206.      0.000
 94.000  2.327E-11   0.008024  7.639E-05 -3.957E-12  7472.7575  3.513E+10
 -2.741E-05  28270886.      0.000
 96.000 -5.892E-12   0.001970  -0.000168      0.000  7472.7574  3.513E+10
 7.037E-06  28662566.      0.000
 98.000 -2.754E-12 -3.982E-05 -4.369E-05      0.000  7472.7574  3.513E+10
 3.334E-06  29054246.      0.000
100.000      0.000  -0.000129  2.893E-07      0.000  7472.7574  3.513E+10
3.308E-07  29445926.      0.000
102.000      0.000 -2.666E-05  2.720E-06      0.000  7472.7574  3.513E+10
-1.282E-07  29837606.      0.000
104.000      0.000  1.708E-06  5.964E-07      0.000  7472.7574  3.513E+10
-4.875E-08  30229286.      0.000
106.000      0.000  1.990E-06 -2.953E-08      0.000  7472.7574  3.513E+10
-3.407E-09  36024666.      0.000
108.000      0.000  3.008E-07 -4.238E-08      0.000  7472.7574  3.513E+10
2.336E-09  36485466.      0.000
110.000      0.000 -4.369E-08 -6.752E-09      0.000  7472.7574  3.513E+10
6.325E-10  36946266.      0.000
112.000      0.000 -2.366E-08  8.644E-10      0.000  7472.7574  3.513E+10
2.133E-12  37407066.      0.000
114.000      0.000 -2.307E-09  5.085E-10      0.000  7472.7574  3.513E+10
-3.180E-11  37867866.      0.000
116.000      0.000  7.435E-10  5.322E-11      0.000  7472.7574  3.513E+10
-6.142E-12  38328666.      0.000
118.000      0.000  2.529E-10 -1.529E-11      0.000  7472.7574  3.513E+10
0.000  38789466.      0.000
120.000      0.000  1.051E-11 -5.482E-12      0.000  7472.7574  3.513E+10
0.000  39250266.      0.000
122.000      0.000 -1.032E-11      0.000      0.000  7472.7574  3.513E+10
0.000  39711066.      0.000
124.000      0.000 -2.385E-12      0.000      0.000  7472.7574  3.513E+10
0.000  40171866.      0.000
126.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  40632666.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  41093466.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  41554266.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42015066.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42475866.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42936666.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  43397466.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  43858266.      0.000
142.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  44319066.      0.000
144.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  44779866.      0.000
146.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  45240666.      0.000
148.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  45701466.      0.000
```

```
   150.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  46162266.      0.000
   152.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  46623066.      0.000
   154.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  47083866.      0.000
   156.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  47544666.      0.000
   158.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  48005466.      0.000
   160.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  48466266.      0.000
   162.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  48927066.      0.000
   164.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  49387866.      0.000
   166.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  49848666.      0.000
   168.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  50309466.      0.000
   170.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  50770266.      0.000
   172.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  51231066.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  51691866.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  52152666.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  52613466.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53074266.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53535066.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53995866.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  54456666.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  54917466.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  55378266.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  55839066.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  56299866.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  56760666.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  57221466.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  28841133.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.
```

Output Summary for Load Case No. 3:

```
Pile-head deflection             =      2.0000000 inches
Computed slope at pile head      =     -0.0068049 radians
Maximum bending moment           =      -8600209. inch-lbs
Maximum shear force              =        124802. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             21
Number of zero deflection points =             26
```

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Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 4

--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 3.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 255000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	3.0000	-8600023.	133514.	0.000	60370.	6.503E+09	0.000	0.000	0.000
2.000	2.6191	-5347992.	129395.	-0.0177	40367.	3.513E+10	-171.6195	1572.6211	0.000
4.000	2.1505	-2172451.	121165.	-0.0203	20835.	3.513E+10	-514.1918	5738.4231	0.000
6.000	1.6463	716000.	105416.	-0.0208	11877.	3.513E+10	-798.2627	11637.	0.000
8.000	1.1538	3141658.	79699.	-0.0194	26796.	3.513E+10	-1344.7683	27971.	0.000
10.000	0.7129	4779592.	38930.	-0.0167	36871.	3.513E+10	-2052.6597	69105.	0.000
12.000	0.3503	5215208.	-10460.	-0.0133	39550.	3.513E+10	-2063.2008	141352.	0.000
14.000	0.0733	4440613.	-47890.	-0.0100	34786.	3.513E+10	-1055.9200	345961.	0.000
16.000	-0.1310	3039239.	-37234.	-0.007472	26166.	3.513E+10	1943.9071	356172.	0.000
18.000	-0.2854	2744847.	-13875.	-0.005496	24356.	3.513E+10	2.6732	224.8073	0.000
20.000	-0.3948	2440517.	-13805.	-0.003724	22484.	3.513E+10	3.1707	192.7604	0.000
22.000	-0.4641	2127808.	-13724.	-0.002163	20560.	3.513E+10	3.5493	183.5284	0.000
24.000	-0.4986	1808246.	-13635.	-0.000819	18595.	3.513E+10	3.8428	184.9662	0.000
26.000	-0.5034	1483336.	-13540.	0.000306	16596.	3.513E+10	4.0636	193.7170	0.000

```
28.000    -0.4839   1154564.    -13441.   0.001207     14574.  3.513E+10
4.2161   209.0858      0.000
30.000    -0.4455    823393.    -13339.   0.001883     12537.  3.513E+10
4.3015   231.7220      0.000
32.000    -0.3936    491256.    -13235.   0.002332     10494.  3.513E+10
4.3194   263.3896      0.000
34.000    -0.3336    159553.    -11777.   0.002554  8454.1324  3.513E+10
117.2417  8434.9439      0.000
36.000    -0.2710   -105286. -9008.2070   0.002573  8120.3452  3.513E+10
113.4625     10049.      0.000
38.000    -0.2101   -304330. -6350.9703   0.002433  9344.6201  3.513E+10
107.9738     12334.      0.000
40.000    -0.1542   -439909. -3846.0413   0.002178     10179.  3.513E+10
100.7702     15683.      0.000
42.000    -0.1055   -515604. -1535.4897   0.001852     10644.  3.513E+10
91.7757     20871.      0.000
44.000    -0.0653   -536281.   534.7666   0.001493     10771.  3.513E+10
80.7456     29670.      0.000
46.000    -0.0339   -508206.  2306.7976   0.001136     10599.  3.513E+10
66.9236     47397.      0.000
48.000    -0.0108   -439457.  3675.2428   0.000812     10176.  3.513E+10
47.1135    104752.      0.000
50.000   0.005093   -341734.  3788.2992   0.000545  9574.6838  3.513E+10
-37.6921    177631.      0.000
52.000     0.0154   -264292.  2662.9741   0.000338  9098.3581  3.513E+10
-56.0850     87543.      0.000
54.000     0.0213   -218050.  1958.3811   0.000173  8813.9352  3.513E+10
-2.6311  2961.1624      0.000
56.000     0.0237   -172412.  1893.0866  4.000E-05  8533.2256  3.513E+10
-2.8101  2845.8364      0.000
58.000     0.0232   -127672.  1824.8510 -6.252E-05  8258.0374  3.513E+10
-2.8762  2969.6473      0.000
60.000     0.0207    -84054.  1756.1605  -0.000135  7989.7554  3.513E+10
-2.8480  3302.4179      0.000
62.000     0.0168    -41726.  1689.2169  -0.000178  7729.4016  3.513E+10
-2.7306  3907.4331      0.000
64.000     0.0122  -795.2529  1626.1973  -0.000192  7477.6488  3.513E+10
-2.5210  4974.8176      0.000
66.000   0.007539     38686.  1569.4576  -0.000179  7710.7077  3.513E+10
-2.2073  7026.7162      0.000
68.000   0.003551     76735.  1521.8224  -0.000140  7944.7343  3.513E+10
-1.7623     11912.      0.000
70.000   0.000820    113447.  -570.1521 -7.500E-05  8170.5438  3.513E+10
-172.5689   5048129.      0.000
72.000 -4.944E-05     50285. -2223.4014 -1.907E-05  7782.0509  3.513E+10
34.7982  16893410.      0.000
74.000 -9.472E-05  6957.1239 -1102.2369  4.902E-07  7515.5491  3.513E+10
58.6322  14856836.      0.000
76.000 -2.591E-05 -2628.0298  -174.7256  1.969E-06  7488.9218  3.513E+10
18.6604  17285090.      0.000
78.000 -1.987E-07 -1453.8064    50.9362  5.746E-07  7481.6994  3.513E+10
0.1448  17480930.      0.000
80.000  1.672E-06  -190.1242    31.3281  1.300E-08  7473.9268  3.513E+10
-1.7788  25529126.      0.000
82.000  4.255E-07    49.7855     4.4687 -3.494E-08  7473.0636  3.513E+10
-0.4595  25920806.      0.000
84.000 -4.875E-09    24.7993    -0.9815 -9.459E-09  7472.9099  3.513E+10
0.005345  26312486.      0.000
86.000 -2.856E-08     2.7881    -0.5360 -3.440E-11  7472.7746  3.513E+10
0.0318  26704166.      0.000
88.000 -6.527E-09    -0.9302    -0.0663  6.003E-10  7472.7631  3.513E+10
0.007369  27095846.      0.000
90.000  2.530E-10    -0.4004     0.0187  1.457E-10  7472.7599  3.513E+10
```

```
 -0.000290  27487526.      0.000
 92.000  4.666E-10    -0.0358   0.008689 -3.336E-12  7472.7576  3.513E+10
 -0.000542  27879206.      0.000
 94.000  9.291E-11     0.0167   0.000871 -9.870E-12  7472.7575  3.513E+10
 -0.000109  28270886.      0.000
 96.000 -7.132E-12   0.006093  -0.000340 -2.087E-12  7472.7574  3.513E+10
 8.517E-06  28662566.      0.000
 98.000 -7.254E-12   0.000376  -0.000133      0.000  7472.7574  3.513E+10
 8.782E-06  29054246.      0.000
100.000 -1.213E-12  -0.000285 -9.600E-06      0.000  7472.7574  3.513E+10
1.488E-06  29445926.      0.000
102.000      0.000 -8.686E-05  5.888E-06      0.000  7472.7574  3.513E+10
-1.976E-07  29837606.      0.000
104.000      0.000 -2.444E-06  1.905E-06      0.000  7472.7574  3.513E+10
-1.343E-07  30229286.      0.000
106.000      0.000  4.598E-06  7.371E-08      0.000  7472.7574  3.513E+10
-1.823E-08  30620966.      0.000
108.000      0.000  1.122E-06 -9.626E-08      0.000  7472.7574  3.513E+10
4.065E-09  36485466.      0.000
110.000      0.000 -1.827E-08 -2.462E-08      0.000  7472.7574  3.513E+10
1.906E-09  36946266.      0.000
112.000      0.000 -6.046E-08  1.669E-10      0.000  7472.7574  3.513E+10
1.594E-10  37407066.      0.000
114.000      0.000 -1.059E-08  1.281E-09      0.000  7472.7574  3.513E+10
-6.652E-11  37867866.      0.000
116.000      0.000  1.014E-09  2.352E-10      0.000  7472.7574  3.513E+10
-2.066E-11  38328666.      0.000
118.000      0.000  7.122E-10 -1.948E-11      0.000  7472.7574  3.513E+10
0.000  38789466.      0.000
120.000      0.000  8.241E-11 -1.524E-11      0.000  7472.7574  3.513E+10
0.000  39250266.      0.000
122.000      0.000 -1.936E-11 -1.870E-12      0.000  7472.7574  3.513E+10
0.000  39711066.      0.000
124.000      0.000 -7.484E-12      0.000      0.000  7472.7574  3.513E+10
0.000  40171866.      0.000
126.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  40632666.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  41093466.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  41554266.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42015066.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42475866.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42936666.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  43397466.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  43858266.      0.000
142.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  44319066.      0.000
144.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  44779866.      0.000
146.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  45240666.      0.000
148.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  45701466.      0.000
150.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  46162266.      0.000
152.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  46623066.      0.000
```

```
   154.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  47083866.      0.000
   156.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  47544666.      0.000
   158.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  48005466.      0.000
   160.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  48466266.      0.000
   162.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  48927066.      0.000
   164.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  49387866.      0.000
   166.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  49848666.      0.000
   168.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  50309466.      0.000
   170.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  50770266.      0.000
   172.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  51231066.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  51691866.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  52152666.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  52613466.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53074266.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53535066.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53995866.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  54456666.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  54917466.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  55378266.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  55839066.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  56299866.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  56760666.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  57221466.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  28841133.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 4:
```

```
Pile-head deflection             =      3.0000000 inches
Computed slope at pile head      =     -0.0140434 radians
Maximum bending moment           =      -8600023. inch-lbs
Maximum shear force              =        133514. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             20
Number of zero deflection points =             26
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 5
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     4.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     255000.0 lbs

   Depth    Deflect.    Bending    Shear       Slope      Total    Bending
   Soil Res.  Soil Spr.   Distrib.
     X         y        Moment     Force         S       Stress   Stiffness
     p         Es*h    Lat. Load
   feet      inches     in-lbs      lbs       radians     psi*      lb-in^2
   lb/in      lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     4.0000  -8600014.    140883.      0.000     60369.  4.525E+09
      0.000      0.000      0.000
     2.000     3.4526  -5128674.    136764.    -0.0246     39018.  3.513E+10
     -171.6195  1192.9602      0.000
     4.000     2.8212  -1734742.    128534.    -0.0269     18143.  3.513E+10
     -514.1919  4374.2585      0.000
     6.000     2.1613   1370270.    112785.    -0.0270     15901.  3.513E+10
     -798.2630  8864.3167      0.000
     8.000     1.5239   4009752.     87068.    -0.0252     32136.  3.513E+10
     -1344.7691     21180.      0.000
    10.000     0.9522   5857880.     46299.    -0.0218     43503.  3.513E+10
    -2052.6617     51738.      0.000
    12.000     0.4765   6499181. -9214.5972    -0.0176     47448.  3.513E+10
    -2573.4968    129606.      0.000
    14.000     0.1075   5630970.    -56096.    -0.0135     42108.  3.513E+10
    -1333.3089    297659.      0.000
    16.000    -0.1692   3971227.    -44840.    -0.0102     31899.  3.513E+10
    2271.2971    322161.      0.000
    18.000    -0.3808   3603146.    -17550.  -0.007585     29635.  3.513E+10
    2.9429   185.4836      0.000
    20.000    -0.5333   3221693.    -17472.  -0.005254     27289.  3.513E+10
    3.5050   157.7387      0.000
    22.000    -0.6330   2828787.    -17383.  -0.003187     24872.  3.513E+10
    3.9360   149.2393      0.000
    24.000    -0.6862   2426319.    -17284.  -0.001391     22396.  3.513E+10
    4.2745   149.4910      0.000
    26.000    -0.6997   2016168.    -17179.   0.000126     19874.  3.513E+10
    4.5349   155.5387      0.000
    28.000    -0.6802   1600198.    -17068.   0.001362     17315.  3.513E+10
    4.7226   166.6355      0.000
    30.000    -0.6344   1180257.    -16953.   0.002312     14732.  3.513E+10
    4.8392   183.0783      0.000
```

```
32.000    -0.5692    758168.    -16836.   0.002974     12136.  3.513E+10
4.8846   205.9489      0.000
34.000    -0.4916    335722.    -15176.   0.003348  9537.7072  3.513E+10
133.4173  6513.1236      0.000
36.000    -0.4085    -11279.    -12014.   0.003459  7542.1316  3.513E+10
130.0963  7642.8348      0.000
38.000    -0.3256   -283298. -8953.8090   0.003358  9215.2548  3.513E+10
124.9464  9209.3651      0.000
40.000    -0.2473   -482162. -6039.0417   0.003096     10438.  3.513E+10
117.9509     11445.      0.000
42.000    -0.1770   -611071. -3315.3063   0.002723     11231.  3.513E+10
109.0271     14784.      0.000
44.000    -0.1166   -674625.  -831.5706   0.002284     11622.  3.513E+10
97.9509     20153.      0.000
46.000    -0.0674   -678939.  1353.3624   0.001821     11649.  3.513E+10
84.1268     29968.      0.000
48.000    -0.0292   -631956.  3150.2631   0.001373     11360.  3.513E+10
65.6149     53876.      0.000
50.000  -0.001449   -544537.  4234.2559   0.000971     10822.  3.513E+10
24.7178    409454.      0.000
52.000     0.0174   -440603.  3829.0182   0.000635     10183.  3.513E+10
-58.4877     80663.      0.000
54.000     0.0290   -368516.  3092.1603   0.000359  9739.4111  3.513E+10
-2.9172  2411.8662      0.000
56.000     0.0346   -296567.  3018.8838   0.000131  9296.8751  3.513E+10
-3.1892  2211.4843      0.000
58.000     0.0353   -225216.  2940.9193 -4.695E-05  8858.0104  3.513E+10
-3.3078  2246.9967      0.000
60.000     0.0324   -154829.  2861.5516  -0.000177  8425.0723  3.513E+10
-3.3062  2452.2598      0.000
62.000     0.0268    -85698.  2783.5396  -0.000259  7999.8652  3.513E+10
-3.1948  2856.2889      0.000
64.000     0.0199    -18049.  2709.5300  -0.000294  7583.7728  3.513E+10
-2.9726  3580.2356      0.000
66.000     0.0127     47963.  2642.3244  -0.000284  7767.7671  3.513E+10
-2.6278  4960.8145      0.000
68.000   0.006286    112261.  2585.2019  -0.000229  8163.2485  3.513E+10
-2.1324  8141.3044      0.000
70.000   0.001700    174861.  -421.7995  -0.000131  8548.2880  3.513E+10
-248.4511   3507939.      0.000
72.000 -1.906E-05     93622. -3242.2537 -3.964E-05  8048.6070  3.513E+10
13.4132  16893410.      0.000
74.000  -0.000203     19718. -2051.7818 -9.146E-07  7594.0391  3.513E+10
85.7928  10159166.      0.000
76.000 -6.295E-05 -4851.9426  -478.1795  4.164E-06  7502.6006  3.513E+10
45.3408  17285090.      0.000
78.000 -2.796E-06 -3285.4518    90.3491  1.384E-06  7492.9655  3.513E+10
2.0366  17480930.      0.000
80.000  3.487E-06  -532.1308    70.2808  8.000E-08  7476.0304  3.513E+10
-3.7090  25529126.      0.000
82.000  1.044E-06    87.0453    12.2457 -7.206E-08  7473.2928  3.513E+10
-1.1273  25920806.      0.000
84.000  2.806E-08    56.5446    -1.6509 -2.300E-08  7473.1052  3.513E+10
-0.0308  26312486.      0.000
86.000 -6.039E-08     8.0859    -1.2138 -9.230E-10  7472.8071  3.513E+10
0.0672  26704166.      0.000
88.000 -1.624E-08    -1.7042    -0.1874  1.257E-09  7472.7679  3.513E+10
0.0183  27095846.      0.000
90.000 -4.438E-11    -0.9240     0.0333  3.593E-10  7472.7631  3.513E+10
5.082E-05  27487526.      0.000
92.000  1.003E-09    -0.1107     0.0199  5.842E-12  7472.7581  3.513E+10
-0.001165  27879206.      0.000
94.000  2.360E-10     0.0320   0.002597 -2.104E-11  7472.7576  3.513E+10
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 -0.000278  28270886.      0.000
 96.000 -6.958E-12     0.0143  -0.000640 -5.249E-12  7472.7575  3.513E+10
 8.310E-06  28662566.      0.000
 98.000 -1.588E-11   0.001319  -0.000309      0.000  7472.7574  3.513E+10
 1.923E-05  29054246.      0.000
100.000 -3.175E-12  -0.000567 -3.172E-05      0.000  7472.7574  3.513E+10
3.895E-06  29445926.      0.000
102.000      0.000  -0.000207  1.157E-05      0.000  7472.7574  3.513E+10
-2.880E-07  29837606.      0.000
104.000      0.000 -1.254E-05  4.516E-06      0.000  7472.7574  3.513E+10
-3.000E-07  30229286.      0.000
106.000      0.000  9.484E-06  3.177E-07      0.000  7472.7574  3.513E+10
-4.984E-08  30620966.      0.000
108.000      0.000  2.766E-06 -1.968E-07      0.000  7472.7574  3.513E+10
6.966E-09  36485466.      0.000
110.000      0.000  5.008E-08 -6.034E-08      0.000  7472.7574  3.513E+10
4.402E-09  36946266.      0.000
112.000      0.000 -1.308E-07 -1.599E-09      0.000  7472.7574  3.513E+10
4.926E-10  37407066.      0.000
114.000      0.000 -2.742E-08  2.755E-09      0.000  7472.7574  3.513E+10
-1.298E-10  37867866.      0.000
116.000      0.000  1.344E-09  6.042E-10      0.000  7472.7574  3.513E+10
-4.947E-11  38328666.      0.000
118.000      0.000  1.604E-09 -2.335E-11      0.000  7472.7574  3.513E+10
-2.823E-12  38789466.      0.000
120.000      0.000  2.316E-10 -3.417E-11      0.000  7472.7574  3.513E+10
1.922E-12  39250266.      0.000
122.000      0.000 -3.517E-11 -5.185E-12      0.000  7472.7574  3.513E+10
0.000  39711066.      0.000
124.000      0.000 -1.753E-11      0.000      0.000  7472.7574  3.513E+10
0.000  40171866.      0.000
126.000      0.000 -1.493E-12      0.000      0.000  7472.7574  3.513E+10
0.000  40632666.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  41093466.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  41554266.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42015066.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42475866.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42936666.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  43397466.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  43858266.      0.000
142.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  44319066.      0.000
144.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  44779866.      0.000
146.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  45240666.      0.000
148.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  45701466.      0.000
150.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  46162266.      0.000
152.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  46623066.      0.000
154.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  47083866.      0.000
156.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  47544666.      0.000
```

```
   158.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  48005466.      0.000
   160.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  48466266.      0.000
   162.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  48927066.      0.000
   164.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  49387866.      0.000
   166.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  49848666.      0.000
   168.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  50309466.      0.000
   170.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  50770266.      0.000
   172.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  51231066.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  51691866.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  52152666.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  52613466.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53074266.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53535066.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53995866.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  54456666.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  54917466.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  55378266.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  55839066.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  56299866.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  56760666.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  57221466.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  28841133.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 5:

Pile-head deflection             =      4.0000000 inches
Computed slope at pile head      =     -0.0210544 radians
Maximum bending moment           =      -8600014. inch-lbs
Maximum shear force              =        140883. lbs
```

```
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             39
Number of zero deflection points =             26


-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 6
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     5.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     255000.0 lbs

   Depth    Deflect.    Bending    Shear       Slope      Total    Bending
   Soil Res.  Soil Spr.   Distrib.
     X         y        Moment     Force         S       Stress   Stiffness
     p         Es*h    Lat. Load
   feet      inches     in-lbs      lbs       radians     psi*      lb-in^2
   lb/in      lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     5.0000  -8600000.    147352.      0.000     60369.  3.493E+09
      0.000      0.000      0.000
     2.000     4.2909  -4932146.    143233.    -0.0312     37809.  3.513E+10
     -171.6195   959.9164      0.000
     4.000     3.5008  -1342522.    135003.    -0.0334     15730.  3.513E+10
     -514.1922  3525.0378      0.000
     6.000     2.6888   1956542.    119254.    -0.0332     19507.  3.513E+10
     -798.2637  7125.1973      0.000
     8.000     1.9089   4787624.     93538.    -0.0309     36920.  3.513E+10
     -1344.7709     16908.      0.000
    10.000     1.2074   6824099.     52768.    -0.0269     49446.  3.513E+10
    -2052.6657     40801.      0.000
    12.000     0.6179   7649702. -6732.8675    -0.0220     54524.  3.513E+10
    -2905.7675    112865.      0.000
    14.000     0.1538   6769597.    -61494.    -0.0170     49111.  3.513E+10
    -1657.6473    258675.      0.000
    16.000    -0.1993   4906378.    -51279.    -0.0130     37651.  3.513E+10
    2508.8962    302145.      0.000
    18.000    -0.4719   4467768.    -21134.  -0.009833     34953.  3.513E+10
    3.1611   160.7639      0.000
    20.000    -0.6713   4012296.    -21051.  -0.006936     32151.  3.513E+10
    3.7845   135.3051      0.000
    22.000    -0.8049   3542227.    -20954.  -0.004355     29260.  3.513E+10
    4.2641   127.1533      0.000
    24.000    -0.8803   3059802.    -20847.  -0.002100     26293.  3.513E+10
    4.6445   126.6212      0.000
    26.000    -0.9056   2567257.    -20732.  -0.000177     23263.  3.513E+10
    4.9421   130.9674      0.000
    28.000    -0.8889   2066824.    -20611.   0.001406     20185.  3.513E+10
    5.1632   139.4122      0.000
    30.000    -0.8382   1560722.    -20485.   0.002645     17072.  3.513E+10
    5.3101   152.0492      0.000
    32.000    -0.7619   1051152.    -20357.   0.003537     13938.  3.513E+10
    5.3832   169.5717      0.000
    34.000    -0.6684    540288.    -18519.   0.004081     10796.  3.513E+10
    147.8027  5307.2410      0.000
```

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36.000    -0.5660    112299.    -15005.   0.004304  8163.4825  3.513E+10
145.0356  6149.8106      0.000
38.000    -0.4618   -232619.    -11580.   0.004263  8903.5440  3.513E+10
140.3838  7295.8880      0.000
40.000    -0.3614   -495704. -8288.9420   0.004014     10522.  3.513E+10
133.8470  8888.6486      0.000
42.000    -0.2691   -679619. -5178.2218   0.003612     11653.  3.513E+10
125.3797     11181.      0.000
44.000    -0.1880   -788474. -2295.4536   0.003111     12322.  3.513E+10
114.8510     14662.      0.000
46.000    -0.1198   -827878.   305.9726   0.002559     12565.  3.513E+10
101.9345     20420.      0.000
48.000    -0.0652   -805106.  2558.1774   0.002001     12425.  3.513E+10
85.7492     31572.      0.000
50.000    -0.0238   -729576.  4344.0371   0.001477     11960.  3.513E+10
63.0724     63697.      0.000
52.000   0.005690   -614665.  4617.8684   0.001017     11253.  3.513E+10
-40.2531    169783.      0.000
54.000     0.0251   -520370.  4101.5068   0.000630     10673.  3.513E+10
-2.7770  2658.9801      0.000
56.000     0.0359   -425498.  4029.4484   0.000306     10090.  3.513E+10
-3.2279  2157.4759      0.000
58.000     0.0398   -330706.  3949.4290  4.805E-05  9506.8549  3.513E+10
-3.4404  2076.0878      0.000
60.000     0.0382   -236513.  3866.2141  -0.000146  8927.4965  3.513E+10
-3.4942  2194.5149      0.000
62.000     0.0328   -143344.  3783.3133  -0.000276  8354.4343  3.513E+10
-3.4142  2500.0020      0.000
64.000     0.0250    -51542.  3703.8800  -0.000342  7789.7814  3.513E+10
-3.2052  3078.3364      0.000
66.000     0.0164     38629.  3631.1244  -0.000346  7710.3564  3.513E+10
-2.8577  4193.1685      0.000
68.000   0.008357    126993.  3568.6983  -0.000290  8253.8613  3.513E+10
-2.3444  6732.5045      0.000
70.000   0.002441    213475.   -31.5647  -0.000174  8785.7940  3.513E+10
-297.6775   2927113.      0.000
72.000  2.464E-05    127603. -3811.8074 -5.708E-05  8257.6117  3.513E+10
-17.3427  16893410.      0.000
74.000  -0.000299     31207. -2769.7220 -2.823E-06  7664.7050  3.513E+10
104.1832   8363056.      0.000
76.000  -0.000111 -5309.4518  -758.2895  6.025E-06  7505.4146  3.513E+10
63.4362  13733377.      0.000
78.000 -9.803E-06 -5264.5456    88.6237  2.412E-06  7505.1384  3.513E+10
7.1399  17480930.      0.000
80.000  4.925E-06 -1085.0393   111.4428  2.429E-07  7479.4312  3.513E+10
-5.2383  25529126.      0.000
82.000  1.859E-06    81.7354    24.4908 -9.981E-08  7473.2601  3.513E+10
-2.0077  25920806.      0.000
84.000  1.336E-07    91.7415    -1.3589 -4.055E-08  7473.3217  3.513E+10
-0.1465  26312486.      0.000
86.000 -8.734E-08    17.0047    -1.9502 -3.396E-09  7472.8620  3.513E+10
0.0972  26704166.      0.000
88.000 -2.942E-08    -1.8280    -0.3856  1.789E-09  7472.7686  3.513E+10
0.0332  27095846.      0.000
90.000 -1.468E-09    -1.5238     0.0331  6.439E-10  7472.7668  3.513E+10
0.001682  27487526.      0.000
92.000  1.491E-09    -0.2447     0.0326  3.970E-11  7472.7589  3.513E+10
-0.001732  27879206.      0.000
94.000  4.374E-10     0.0381   0.005590 -3.085E-11  7472.7576  3.513E+10
-0.000515  28270886.      0.000
96.000  9.620E-12     0.0240  -0.000731 -9.619E-12  7472.7576  3.513E+10
-1.149E-05  28662566.      0.000
98.000 -2.429E-11   0.003179  -0.000516      0.000  7472.7574  3.513E+10
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 2.941E-05  29054246.      0.000
100.000 -6.071E-12  -0.000736 -7.355E-05      0.000  7472.7574  3.513E+10
7.449E-06  29445926.      0.000
102.000      0.000  -0.000357  1.461E-05      0.000  7472.7574  3.513E+10
-1.019E-07  29837606.      0.000
104.000      0.000 -3.602E-05  7.718E-06      0.000  7472.7574  3.513E+10
-4.728E-07  30229286.      0.000
106.000      0.000  1.314E-05  8.517E-07      0.000  7472.7574  3.513E+10
-9.945E-08  30620966.      0.000
108.000      0.000  4.957E-06 -2.681E-07      0.000  7472.7574  3.513E+10
6.129E-09  36485466.      0.000
110.000      0.000  2.874E-07 -1.073E-07      0.000  7472.7574  3.513E+10
7.269E-09  36946266.      0.000
112.000      0.000 -1.964E-07 -7.043E-09      0.000  7472.7574  3.513E+10
1.090E-09  37407066.      0.000
114.000      0.000 -5.184E-08  4.097E-09      0.000  7472.7574  3.513E+10
-1.614E-10  37867866.      0.000
116.000      0.000  5.645E-12  1.133E-09      0.000  7472.7574  3.513E+10
-8.558E-11  38328666.      0.000
118.000      0.000  2.559E-09  9.466E-12      0.000  7472.7574  3.513E+10
-8.036E-12  38789466.      0.000
120.000      0.000  4.741E-10 -5.412E-11      0.000  7472.7574  3.513E+10
2.737E-12  39250266.      0.000
122.000      0.000 -3.689E-11 -1.048E-11      0.000  7472.7574  3.513E+10
0.000  39711066.      0.000
124.000      0.000 -2.948E-11      0.000      0.000  7472.7574  3.513E+10
0.000  40171866.      0.000
126.000      0.000 -3.570E-12      0.000      0.000  7472.7574  3.513E+10
0.000  40632666.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  41093466.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  41554266.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42015066.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42475866.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42936666.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  43397466.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  43858266.      0.000
142.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  44319066.      0.000
144.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  44779866.      0.000
146.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  45240666.      0.000
148.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  45701466.      0.000
150.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  46162266.      0.000
152.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  46623066.      0.000
154.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  47083866.      0.000
156.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  47544666.      0.000
158.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  48005466.      0.000
160.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  48466266.      0.000
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   162.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  48927066.      0.000
   164.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  49387866.      0.000
   166.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  49848666.      0.000
   168.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  50309466.      0.000
   170.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  50770266.      0.000
   172.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  51231066.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  51691866.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  52152666.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  52613466.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53074266.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53535066.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53995866.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  54456666.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  54917466.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  55378266.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  55839066.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  56299866.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  56760666.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  57221466.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  28841133.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 6:

Pile-head deflection             =      5.0000000 inches
Computed slope at pile head      =     -0.0278624 radians
Maximum bending moment           =      -8600000. inch-lbs
Maximum shear force              =        147352. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             25
Number of zero deflection points =             26
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 7
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     6.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     255000.0 lbs

   Depth    Deflect.    Bending    Shear       Slope      Total    Bending
   Soil Res.  Soil Spr.   Distrib.
     X         y        Moment     Force         S       Stress   Stiffness
     p         Es*h    Lat. Load
   feet      inches     in-lbs      lbs       radians     psi*      lb-in^2
   lb/in      lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     6.0000  -8600001.    152313.      0.000     60369.  2.872E+09
      0.000      0.000      0.000
     2.000     5.1377  -4774019.    148194.    -0.0376     36837.  3.513E+10
     -171.6195   801.6975      0.000
     4.000     4.1971  -1026927.    139965.    -0.0395     13789.  3.513E+10
     -514.1922  2940.2836      0.000
     6.000     3.2396   2428284.    124215.    -0.0391     22409.  3.513E+10
     -798.2636  5913.7198      0.000
     8.000     2.3220   5413541.     98499.    -0.0364     40770.  3.513E+10
     -1344.7707     13899.      0.000
    10.000     1.4932   7601574.     57730.    -0.0319     54228.  3.513E+10
    -2052.6652     32993.      0.000
    12.000     0.7890   8575485. -1771.6605    -0.0264     60219.  3.513E+10
    -2905.7660     88391.      0.000
    14.000     0.2254   7839815.    -61737.    -0.0208     55694.  3.513E+10
    -2091.3265    222680.      0.000
    16.000    -0.2096   5866760.    -55787.    -0.0161     43558.  3.513E+10
    2587.1709    296219.      0.000
    18.000    -0.5484   5359382.    -24701.    -0.0123     40437.  3.513E+10
    3.3235   145.4409      0.000
    20.000    -0.7994   4831508.    -24613.  -0.008805     37190.  3.513E+10
    4.0113   120.4367      0.000
    22.000    -0.9710   4285742.    -24510.  -0.005690     33833.  3.513E+10
    4.5395   112.1960      0.000
    24.000    -1.0725   3724669.    -24396.  -0.002953     30382.  3.513E+10
    4.9605   111.0067      0.000
    26.000    -1.1128   3150878.    -24273.  -0.000604     26853.  3.513E+10
    5.2933   114.1620      0.000
    28.000    -1.1015   2566961.    -24143.   0.001349     23262.  3.513E+10
    5.5458   120.8380      0.000
    30.000    -1.0481   1975505.    -24008.   0.002901     19624.  3.513E+10
    5.7208   131.0034      0.000
    32.000    -0.9622   1379083.    -23869.   0.004047     15955.  3.513E+10
    5.8188   145.1314      0.000
    34.000    -0.8538    780245.    -21875.   0.004785     12272.  3.513E+10
    160.3716  4507.9460      0.000
    36.000    -0.7326    270520.    -18054.   0.005144  9136.6605  3.513E+10
    158.0586  5178.1397      0.000
    38.000    -0.6069   -149296.    -14312.   0.005185  8391.0404  3.513E+10
    153.7719  6080.7563      0.000
```

```
 40.000    -0.4837   -479914.    -10697.   0.004970     10425.  3.513E+10
 147.5051  7318.7660      0.000
 42.000    -0.3684   -723563. -7255.9902   0.004559     11923.  3.513E+10
 139.2084  9069.9246      0.000
 44.000    -0.2649   -884001. -4040.4277   0.004010     12910.  3.513E+10
 128.7552     11666.      0.000
 46.000    -0.1759   -966581. -1105.1029   0.003377     13418.  3.513E+10
 115.8553     15808.      0.000
 48.000    -0.1028   -978386.  1482.7538   0.002713     13491.  3.513E+10
 99.7995     23307.      0.000
 50.000    -0.0457   -928615.  3621.3278   0.002061     13184.  3.513E+10
 78.4150     41202.      0.000
 52.000  -0.003815   -829795.  4985.9102   0.001461     12577.  3.513E+10
 35.3002    222077.      0.000
 54.000     0.0244   -707171.  5376.4692   0.000936     11822.  3.513E+10
 -2.7536  2704.0803      0.000
 56.000     0.0411   -583177.  5302.9094   0.000495     11060.  3.513E+10
 -3.3764  1971.7691      0.000
 58.000     0.0482   -458688.  5218.3785   0.000139     10294.  3.513E+10
 -3.6678  1826.6100      0.000
 60.000     0.0478   -334395.  5129.1976  -0.000132  9529.5421  3.513E+10
 -3.7639  1891.2235      0.000
 62.000     0.0419   -210871.  5039.5811  -0.000318  8769.7752  3.513E+10
 -3.7041  2124.0032      0.000
 64.000     0.0325    -88599.  4953.1538  -0.000421  8017.7080  3.513E+10
 -3.4982  2584.3579      0.000
 66.000     0.0217     32029.  4873.5148  -0.000440  7669.7594  3.513E+10
 -3.1384  3476.6957      0.000
 68.000     0.0114    150715.  4804.6816  -0.000378  8399.7693  3.513E+10
 -2.5977  5483.7783      0.000
 70.000   0.003544    267274.   468.8868  -0.000235  9116.6997  3.513E+10
 -358.7185   2429019.      0.000
 72.000   0.000103    176094. -4568.0661 -8.325E-05  8555.8725  3.513E+10
 -61.0275  14272766.      0.000
 74.000  -0.000451     49026. -3764.1054 -6.338E-06  7774.3053  3.513E+10
 128.0243   6805984.      0.000
 76.000  -0.000202 -4505.2077 -1201.2728  8.872E-06  7500.4679  3.513E+10
 85.5451  10184769.      0.000
 78.000 -2.559E-05 -8743.6342    48.9538  4.346E-06  7526.5375  3.513E+10
 18.6404  17480930.      0.000
 80.000  7.020E-06 -2208.6215   183.0365  6.043E-07  7486.3421  3.513E+10
 -7.4668  25529126.      0.000
 82.000  3.414E-06    34.7237    49.1934 -1.384E-07  7472.9710  3.513E+10
 -3.6867  25920806.      0.000
 84.000  3.769E-07   154.3559  -0.006302 -7.379E-08  7473.7068  3.513E+10
 -0.4132  26312486.      0.000
 86.000 -1.286E-07    35.3245    -3.2484 -8.994E-09  7472.9747  3.513E+10
 0.1431  26704166.      0.000
 88.000 -5.478E-08    -1.4566    -0.7896  2.577E-09  7472.7664  3.513E+10
 0.0618  27095846.      0.000
 90.000 -4.883E-09    -2.6066     0.0197  1.189E-09  7472.7734  3.513E+10
 0.005593  27487526.      0.000
 92.000  2.272E-09    -0.5242     0.0552  1.190E-10  7472.7606  3.513E+10
 -0.002639  27879206.      0.000
 94.000  8.300E-10     0.0405     0.0118 -4.623E-11  7472.7577  3.513E+10
 -0.000978  28270886.      0.000
 96.000  5.231E-11     0.0419  -0.000699 -1.809E-11  7472.7577  3.513E+10
 -6.248E-05  28662566.      0.000
 98.000 -3.832E-11   0.007144  -0.000892 -1.336E-12  7472.7574  3.513E+10
 4.639E-05  29054246.      0.000
100.000 -1.180E-11  -0.000920  -0.000162      0.000  7472.7574  3.513E+10
1.448E-05  29445926.      0.000
102.000      0.000  -0.000637  1.740E-05      0.000  7472.7574  3.513E+10
```

```
4.598E-07  29837606.      0.000
104.000      0.000 -8.769E-05  1.366E-05      0.000  7472.7574  3.513E+10
-7.711E-07  30229286.      0.000
106.000      0.000  1.821E-05  2.014E-06      0.000  7472.7574  3.513E+10
-1.995E-07  30620966.      0.000
108.000      0.000  9.150E-06 -3.628E-07      0.000  7472.7574  3.513E+10
1.372E-09  36485466.      0.000
110.000      0.000  8.399E-07 -1.969E-07      0.000  7472.7574  3.513E+10
1.245E-08  36946266.      0.000
112.000      0.000 -3.032E-07 -1.954E-08      0.000  7472.7574  3.513E+10
2.335E-09  37407066.      0.000
114.000      0.000 -9.994E-08  6.247E-09      0.000  7472.7574  3.513E+10
-1.866E-10  37867866.      0.000
116.000      0.000 -3.750E-09  2.170E-09      0.000  7472.7574  3.513E+10
-1.532E-10  38328666.      0.000
118.000      0.000  4.231E-09  9.776E-11      0.000  7472.7574  3.513E+10
-1.949E-11  38789466.      0.000
120.000      0.000  9.676E-10 -8.878E-11      0.000  7472.7574  3.513E+10
3.946E-12  39250266.      0.000
122.000      0.000 -2.720E-11 -2.122E-11      0.000  7472.7574  3.513E+10
1.685E-12  39711066.      0.000
124.000      0.000 -5.141E-11      0.000      0.000  7472.7574  3.513E+10
0.000  40171866.      0.000
126.000      0.000 -7.992E-12  1.092E-12      0.000  7472.7574  3.513E+10
0.000  40632666.      0.000
128.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  41093466.      0.000
130.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  41554266.      0.000
132.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42015066.      0.000
134.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42475866.      0.000
136.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  42936666.      0.000
138.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  43397466.      0.000
140.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  43858266.      0.000
142.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  44319066.      0.000
144.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  44779866.      0.000
146.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  45240666.      0.000
148.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  45701466.      0.000
150.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  46162266.      0.000
152.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  46623066.      0.000
154.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  47083866.      0.000
156.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  47544666.      0.000
158.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  48005466.      0.000
160.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  48466266.      0.000
162.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  48927066.      0.000
164.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
0.000  49387866.      0.000
```

```
   166.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  49848666.      0.000
   168.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  50309466.      0.000
   170.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  50770266.      0.000
   172.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  51231066.      0.000
   174.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  51691866.      0.000
   176.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  52152666.      0.000
   178.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  52613466.      0.000
   180.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53074266.      0.000
   182.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53535066.      0.000
   184.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  53995866.      0.000
   186.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  54456666.      0.000
   188.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  54917466.      0.000
   190.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  55378266.      0.000
   192.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  55839066.      0.000
   194.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  56299866.      0.000
   196.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  56760666.      0.000
   198.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  57221466.      0.000
   200.000      0.000      0.000      0.000      0.000  7472.7574  3.513E+10
   0.000  28841133.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are
  computed only
  for elastic sections only and do not equal the actual stresses in concrete
  and steel.
  Stresses in concrete and steel may be interpolated from the output for
  nonlinear
  bending properties relative to the magnitude of bending moment developed in
  the pile.


Output Summary for Load Case No. 7:

Pile-head deflection             =      6.0000000 inches
Computed slope at pile head      =     -0.0342989 radians
Maximum bending moment           =      -8600001. inch-lbs
Maximum shear force              =        152313. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             23
Number of zero deflection points =             26
```

```
--------------------------------------------------------------------------------
--
                            Summary of Pile Response(s)
--------------------------------------------------------------------------------
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Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs
Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians
Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/
radian
Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs
Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians


               Pile-head      Pile-head
               Maximum        Maximum
Load  Load    Condition 1    Condition 2        Axial        Pile-head
Moment          Shear        Pile-head
Case  Type    V(lbs) or     in-lb, rad.,       Loading      Deflection
in Pile        in Pile       Rotation
 No.   No.    y(inches)     or in-lb/rad.        lbs          inches
 in-lbs           lbs          radians
----  ----  --------------  --------------  -------------  -------------
-------------  -------------  -------------
  1     5   y =     0.5000  S =      0.000        255000.     0.50000000
  -4059027.         62434.    -0.00049932
  2     5   y =     1.0000  S =      0.000        255000.     1.00000000
  -7251922.        101541.    -0.00082084
  3     5   y =     2.0000  S =      0.000        255000.     2.00000000
  -8600209.        124802.    -0.00680495
  4     5   y =     3.0000  S =      0.000        255000.     3.00000000
  -8600023.        133514.    -0.01404339
  5     5   y =     4.0000  S =      0.000        255000.     4.00000000
  -8600014.        140883.    -0.02105436
  6     5   y =     5.0000  S =      0.000        255000.     5.00000000
  -8600000.        147352.    -0.02786245
  7     5   y =     6.0000  S =      0.000        255000.     6.00000000
  -8600001.        152313.    -0.03429889

The analysis ended normally.
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(Full scour) 96in"

==========
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LPile for Windows, Version 2016-09.009

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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--
Files Used for Analysis

--

Path to file locations:
\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis
\L-Pile\Point of Fixity Calculations (200 ft Embedment)\Channel\Longitudinal
\Post Seismic (Full Scour)\

Name of input data file:
Channel Static 24in.lp9d

Name of output report file:
Channel Static 24in.lp9o

Name of plot output file:
Channel Static 24in.lp9p

Name of runtime message file:
Channel Static 24in.lp9r

--
Date and Time of Analysis

--

Date: October 4, 2017 Time: 15:46:04

File name is incorrect below, run designation is "Channel Post Seismic Long. (Full scour) 96in"


```
--
                                   Problem Title
-------------------------------------------------------------------------------
--

Project Name: Harbor River Bridge
Job Number: 18461-007-01
Client: SCDOT
Engineer: HPC
Description: Channel - Static



-------------------------------------------------------------------------------
--
                           Program Options and Settings
-------------------------------------------------------------------------------
--

Computational Options:
 - Use unfactored loads in computations (conventional analysis)
Engineering Units Used for Data Input and Computations:
 - US Customary System Units (pounds, feet, inches)

Analysis Control Options:
 - Maximum number of iterations allowed                =          500
 - Deflection tolerance for convergence                =   1.0000E-05 in
 - Maximum allowable deflection                        =     100.0000 in
 - Number of pile increments                           =          100

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Computation of pile-head foundation stiffness matrix not selected
 - Push-over analysis of pile not selected
 - Buckling analysis of pile not selected

Output Options:
 - Output files use decimal points to denote decimal symbols.
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1
 - No p-y curves to be computed and reported for user-specified depths
 - Print using wide report formats



-------------------------------------------------------------------------------
--
                     Pile Structural Properties and Geometry
-------------------------------------------------------------------------------
--

Number of pile sections defined                        =            1
Total length of pile                                   =      200.000 ft
Depth of ground surface below top of pile              =      65.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.
```

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	96.0000
2	200.000	96.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile

Cross-sectional Shape	=	Circular Pile
Length of section	=	200.000000 ft
Width of top of section	=	96.000000 in
Width of bottom of section	=	96.000000 in
Top Area	=	7238. sq. in
Bottom Area	=	7238. sq. in
Moment of Inertia at Top	=	4169220. in^4
Moment of Inertia at Bottom	=	4169220. in^4
Elastic Modulus	=	3600000. psi

Ground Slope and Pile Batter Angles

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is stiff clay with water-induced erosion

Distance from top of pile to top of layer	=	65.000000 ft
Distance from top of pile to bottom of layer	=	100.000000 ft
Effective unit weight at top of layer	=	57.600000 pcf
Effective unit weight at bottom of layer	=	57.600000 pcf
Undrained cohesion at top of layer	=	3400. psf
Undrained cohesion at bottom of layer	=	3400. psf
Epsilon-50 at top of layer	=	0.005000

```
   Epsilon-50 at bottom of layer                        =     0.005000
   Subgrade k at top of layer                           =   400.000000 pci
   Subgrade k at bottom of layer                        =   400.000000 pci


Layer 2 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer            =   100.000000 ft
   Distance from top of pile to bottom of layer         =   210.000000 ft
   Effective unit weight at top of layer                =    57.600000 pcf
   Effective unit weight at bottom of layer             =    57.600000 pcf
   Undrained cohesion at top of layer                   =        6000. psf
   Undrained cohesion at bottom of layer                =        6000. psf
   Epsilon-50 at top of layer                           =     0.005000
   Epsilon-50 at bottom of layer                        =     0.005000
   Subgrade k at top of layer                           =   800.000000 pci
   Subgrade k at bottom of layer                        =   800.000000 pci


 (Depth of the lowest soil layer extends 10.000 ft below the pile tip)



--------------------------------------------------------------------------------
--
                        Summary of Input Soil Properties
--------------------------------------------------------------------------------
--

Layer         Soil Type          Layer      Effective    Undrained       E50
Layer           Name             Depth       Unit Wt.    Cohesion        or
kpy
 Num.     (p-y Curve Type)        ft           pcf          psf          krm
 pci
-----   -------------------   ----------   ----------   ----------
----------   ----------
  1         Stiff Clay           65.0000      57.6000        3400.
  0.00500     400.0000
          with Free Water       100.0000      57.6000        3400.
          0.00500     400.0000
  2         Stiff Clay          100.0000      57.6000        6000.
  0.00500     800.0000
          with Free Water       210.0000      57.6000        6000.
          0.00500     800.0000


--------------------------------------------------------------------------------
--
                    p-y Modification Factors for Group Action
--------------------------------------------------------------------------------
--

Distribution of p-y modifiers with depth defined using 2 points

Point      Depth X         p-mult         y-mult
 No.          ft
-----     ----------     ----------     ----------
  1           65.000         0.8000         1.0000
  2          210.000         0.8000         1.0000
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(Full scour) 96in"

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 7

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	5	y = 0.500000 in	S = 0.0000 in/in	2500000.	N.A.
2	5	y = 1.000000 in	S = 0.0000 in/in	2500000.	N.A.
3	5	y = 2.000000 in	S = 0.0000 in/in	2500000.	N.A.
4	5	y = 3.000000 in	S = 0.0000 in/in	2500000.	N.A.
5	5	y = 4.000000 in	S = 0.0000 in/in	2500000.	N.A.
6	5	y = 5.000000 in	S = 0.0000 in/in	2500000.	N.A.
7	5	y = 6.000000 in	S = 0.0000 in/in	2500000.	N.A.

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

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--
Layering Correction Equivalent Depths of Soil & Rock Layers

--

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	65.0000	0.00	N.A.	No	0.00	625226.
2	100.0000	35.0000	Yes	No	625226.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

--
Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 2500000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				
0.00	0.5008	-4.24E+07	81838.	0.00	832.9994	1.50E+13
0.00	0.00	0.00				
2.0000	0.5000	-4.04E+07	81834.	-6.62E-05	810.3644	1.50E+13
0.00	0.00	0.00				
4.0000	0.4976	-3.84E+07	81834.	-1.29E-04	787.6848	1.50E+13
0.00	0.00	0.00				
6.0000	0.4938	-3.64E+07	81834.	-1.89E-04	764.9627	1.50E+13
0.00	0.00	0.00				
8.0000	0.4886	-3.45E+07	81834.	-2.46E-04	742.2005	1.50E+13
0.00	0.00	0.00				
10.0000	0.4820	-3.25E+07	81834.	-2.99E-04	719.4001	1.50E+13
0.00	0.00	0.00				
12.0000	0.4742	-3.05E+07	81834.	-3.50E-04	696.5639	1.50E+13
0.00	0.00	0.00				
14.0000	0.4652	-2.85E+07	81834.	-3.97E-04	673.6939	1.50E+13
0.00	0.00	0.00				

File name is incorrect below, run designation is "Channel Post Seismic Long. (Full scour) 96in"


```
16.0000     0.4552  -2.65E+07     81834.  -4.41E-04   650.7925   1.50E+13
0.00       0.00       0.00
18.0000     0.4441  -2.45E+07     81834.  -4.82E-04   627.8618   1.50E+13
0.00       0.00       0.00
20.0000     0.4320  -2.25E+07     81834.  -5.19E-04   604.9040   1.50E+13
0.00       0.00       0.00
22.0000     0.4191  -2.05E+07     81834.  -5.54E-04   581.9212   1.50E+13
0.00       0.00       0.00
24.0000     0.4055  -1.85E+07     81834.  -5.85E-04   558.9158   1.50E+13
0.00       0.00       0.00
26.0000     0.3911  -1.65E+07     81834.  -6.13E-04   535.8899   1.50E+13
0.00       0.00       0.00
28.0000     0.3760  -1.45E+07     81834.  -6.38E-04   512.8457   1.50E+13
0.00       0.00       0.00
30.0000     0.3604  -1.25E+07     81834.  -6.60E-04   489.7855   1.50E+13
0.00       0.00       0.00
32.0000     0.3444  -1.05E+07     81834.  -6.78E-04   466.7114   1.50E+13
0.00       0.00       0.00
34.0000     0.3279  -8532770.     81834.  -6.93E-04   443.6256   1.50E+13
0.00       0.00       0.00
36.0000     0.3111  -6526752.     81834.  -7.05E-04   420.5305   1.50E+13
0.00       0.00       0.00
38.0000     0.2941  -4520109.     81834.  -7.14E-04   397.4281   1.50E+13
0.00       0.00       0.00
40.0000     0.2768  -2513031.     81834.  -7.20E-04   374.3207   1.50E+13
0.00       0.00       0.00
42.0000     0.2595   -505713.     81834.  -7.22E-04   351.2106   1.50E+13
0.00       0.00       0.00
44.0000     0.2422   1501654.     81834.  -7.21E-04   362.6768   1.50E+13
0.00       0.00       0.00
46.0000     0.2249   3508877.     81834.  -7.17E-04   385.7858   1.50E+13
0.00       0.00       0.00
48.0000     0.2077   5515763.     81834.  -7.10E-04   408.8910   1.50E+13
0.00       0.00       0.00
50.0000     0.1908   7522120.     81834.  -7.00E-04   431.9901   1.50E+13
0.00       0.00       0.00
52.0000     0.1741   9527756.     81834.  -6.86E-04   455.0809   1.50E+13
0.00       0.00       0.00
54.0000     0.1579   1.15E+07     81834.  -6.69E-04   478.1611   1.50E+13
0.00       0.00       0.00
56.0000     0.1420   1.35E+07     81834.  -6.49E-04   501.2286   1.50E+13
0.00       0.00       0.00
58.0000     0.1267   1.55E+07     81834.  -6.26E-04   524.2812   1.50E+13
0.00       0.00       0.00
60.0000     0.1120   1.75E+07     81834.  -5.99E-04   547.3165   1.50E+13
0.00       0.00       0.00
62.0000    0.09793   1.95E+07     81834.  -5.70E-04   570.3326   1.50E+13
0.00       0.00       0.00
64.0000    0.08463   2.15E+07     81834.  -5.37E-04   593.3270   1.50E+13
0.00       0.00       0.00
66.0000    0.07215   2.35E+07     78509.  -5.01E-04   616.2977   1.50E+13
-277.0738     92160.       0.00
68.0000    0.06058   2.54E+07     66809.  -4.62E-04   637.4049   1.50E+13
-697.9137    276480.       0.00
70.0000    0.04998   2.68E+07     46918.  -4.20E-04   653.8560   1.50E+13
-959.6991    460800.       0.00
72.0000    0.04041   2.77E+07     22365.  -3.77E-04   663.9132   1.50E+13
-1086.    645120.       0.00
74.0000    0.03191   2.79E+07     -3902.  -3.32E-04   666.7360   1.50E+13
-1103.    829440.       0.00
76.0000    0.02447   2.75E+07    -29537.  -2.88E-04   662.2156   1.50E+13
-1034.   1013760.       0.00
78.0000    0.01809   2.65E+07    -52774.  -2.45E-04   650.8111   1.50E+13
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 -902.9051   1198080.       0.00
 80.0000    0.01272   2.50E+07    -72404.  -2.03E-04   633.3896   1.50E+13
 -732.8955   1382400.       0.00
 82.0000    0.00832   2.31E+07    -87717.  -1.65E-04   611.0803   1.50E+13
 -543.1769   1566720.       0.00
 84.0000    0.00480   2.08E+07    -98440.  -1.30E-04   585.1435   1.50E+13
 -350.4421   1751040.       0.00
 86.0000    0.00208   1.84E+07   -104663.  -9.86E-05   556.8598   1.50E+13
 -168.1244   1935360.       0.00
 88.0000   7.14E-05   1.58E+07   -106756.  -7.13E-05   527.4408   1.50E+13
 -6.3103   2119680.       0.00
 90.0000   -0.00134   1.33E+07   -105294.  -4.80E-05   497.9626   1.50E+13
 128.1732   2304000.       0.00
 92.0000   -0.00223   1.08E+07   -100977.  -2.88E-05   469.3197   1.50E+13
 231.5322   2488320.       0.00
 94.0000   -0.00272   8408963.    -94567.  -1.35E-05   442.2002   1.50E+13
 302.6812   2672640.       0.00
 96.0000   -0.00288   6226942.    -86820.  -1.78E-06   417.0788   1.50E+13
 342.8634   2856960.       0.00
 98.0000   -0.00280   4241812.    -78443.   6.59E-06   394.2241   1.50E+13
 355.2548   3041280.       0.00
100.0000   -0.00256   2460903.    -65909.   1.19E-05   373.7206   1.50E+13
689.1771   6451200.       0.00
102.0000   -0.00223   1076724.    -50036.   1.48E-05   357.7846   1.50E+13
633.6490   6819840.       0.00
104.0000   -0.00185     57423.    -35766.   1.57E-05   346.0494   1.50E+13
555.4840   7188480.       0.00
106.0000   -0.00148   -641925.    -23519.   1.52E-05   352.7788   1.50E+13
465.0952   7557120.       0.00
108.0000   -0.00112  -1073316.    -13483.   1.38E-05   357.7454   1.50E+13
371.2442   7925760.       0.00
110.0000  -8.12E-04  -1290768.     -5659.   1.20E-05   360.2489   1.50E+13
280.7877   8294400.       0.00
112.0000  -5.50E-04  -1346362.    94.5215   9.85E-06   360.8889   1.50E+13
198.6360   8663040.       0.00
114.0000  -3.40E-04  -1287412.      4013.   7.74E-06   360.2102   1.50E+13
127.8745   9031680.       0.00
116.0000  -1.79E-04  -1154684.      6387.   5.79E-06   358.6821   1.50E+13
69.9980   9400320.       0.00
118.0000  -6.19E-05   -981525.      7530.   4.08E-06   356.6886   1.50E+13
25.2099   9768960.       0.00
120.0000   1.72E-05   -793752.      7745.   2.66E-06   354.5268   1.50E+13
-7.2549   1.01E+07       0.00
122.0000   6.58E-05   -610081.      7312.   1.54E-06   352.4122   1.50E+13
-28.8151   1.05E+07       0.00
124.0000   9.11E-05   -442949.      6471.   6.97E-07   350.4880   1.50E+13
-41.2611   1.09E+07       0.00
126.0000   9.93E-05   -299542.      5418.   1.04E-07   348.8369   1.50E+13
-46.5187   1.12E+07       0.00
128.0000   9.60E-05   -182900.      4302.  -2.82E-07   347.4940   1.50E+13
-46.4674   1.16E+07       0.00
130.0000   8.58E-05    -93006.      3231.  -5.03E-07   346.4591   1.50E+13
-42.8121   1.20E+07       0.00
132.0000   7.19E-05    -27762.      2273.  -5.99E-07   345.7080   1.50E+13
-37.0045   1.23E+07       0.00
134.0000   5.70E-05     16169.      1466.  -6.08E-07   345.5745   1.50E+13
-30.2070   1.27E+07       0.00
136.0000   4.27E-05     42700.   824.4757  -5.61E-07   345.8799   1.50E+13
-23.2897   1.31E+07       0.00
138.0000   3.01E-05     55811.   342.7740  -4.83E-07   346.0309   1.50E+13
-16.8521   1.35E+07       0.00
140.0000   1.95E-05     59211.     5.4348  -3.91E-07   346.0700   1.50E+13
-11.2595   1.38E+07       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Long. (Full scour) 96in"

142.0000	1.13E-05	56119.	-209.9320	-2.98E-07	346.0344	1.50E+13	-6.6877	1.42E+07	0.00
144.0000	5.22E-06	49170.	-328.2196	-2.14E-07	345.9544	1.50E+13	-3.1696	1.46E+07	0.00
146.0000	1.03E-06	40390.	-373.9138	-1.43E-07	345.8533	1.50E+13	-0.6383	1.49E+07	0.00
148.0000	-1.62E-06	31239.	-369.1666	-8.54E-08	345.7480	1.50E+13	1.0339	1.53E+07	0.00
150.0000	-3.07E-06	22680.	-332.7021	-4.22E-08	345.6495	1.50E+13	2.0048	1.57E+07	0.00
152.0000	-3.65E-06	15274.	-279.3802	-1.19E-08	345.5642	1.50E+13	2.4387	1.60E+07	0.00
154.0000	-3.64E-06	9272.	-220.2399	7.72E-09	345.4951	1.50E+13	2.4897	1.64E+07	0.00
156.0000	-3.28E-06	4702.	-162.8626	1.89E-08	345.4425	1.50E+13	2.2918	1.68E+07	0.00
158.0000	-2.74E-06	1452.	-111.9157	2.38E-08	345.4050	1.50E+13	1.9538	1.71E+07	0.00
160.0000	-2.14E-06	-672.8105	-69.7679	2.44E-08	345.3961	1.50E+13	1.5585	1.75E+07	0.00
162.0000	-1.56E-06	-1900.	-37.0975	2.24E-08	345.4102	1.50E+13	1.1640	1.79E+07	0.00
164.0000	-1.06E-06	-2456.	-13.4411	1.89E-08	345.4166	1.50E+13	0.8073	1.82E+07	0.00
166.0000	-6.55E-07	-2547.	2.3480	1.49E-08	345.4177	1.50E+13	0.5084	1.86E+07	0.00
168.0000	-3.47E-07	-2345.	11.7407	1.10E-08	345.4153	1.50E+13	0.2743	1.90E+07	0.00
170.0000	-1.28E-07	-1985.	16.2723	7.52E-09	345.4112	1.50E+13	0.1033	1.94E+07	0.00
172.0000	1.44E-08	-1565.	17.3706	4.69E-09	345.4064	1.50E+13	-0.01180	1.97E+07	0.00
174.0000	9.68E-08	-1152.	16.2569	2.51E-09	345.4016	1.50E+13	-0.08101	2.01E+07	0.00
176.0000	1.35E-07	-785.0639	13.9039	9.65E-10	345.3974	1.50E+13	-0.1151	2.05E+07	0.00
178.0000	1.43E-07	-484.5323	11.0330	-5.05E-11	345.3939	1.50E+13	-0.1242	2.08E+07	0.00
180.0000	1.33E-07	-255.4726	8.1381	-6.42E-10	345.3913	1.50E+13	-0.1171	2.12E+07	0.00
182.0000	1.12E-07	-93.8263	5.5228	-9.21E-10	345.3894	1.50E+13	-0.1009	2.16E+07	0.00
184.0000	8.83E-08	9.7317	3.3436	-9.89E-10	345.3884	1.50E+13	-0.08073	2.19E+07	0.00
186.0000	6.48E-08	66.7868	1.6523	-9.27E-10	345.3891	1.50E+13	-0.06021	2.23E+07	0.00
188.0000	4.38E-08	89.1524	0.4330	-8.03E-10	345.3894	1.50E+13	-0.04139	2.27E+07	0.00
190.0000	2.63E-08	87.6670	-0.3663	-6.61E-10	345.3893	1.50E+13	-0.02521	2.30E+07	0.00
192.0000	1.21E-08	71.6508	-0.8101	-5.34E-10	345.3892	1.50E+13	-0.01177	2.34E+07	0.00
194.0000	6.30E-10	48.8459	-0.9589	-4.38E-10	345.3889	1.50E+13	-6.24E-04	2.38E+07	0.00
196.0000	-8.94E-09	25.6770	-0.8585	-3.78E-10	345.3886	1.50E+13	0.00899	2.41E+07	0.00
198.0000	-1.75E-08	7.6851	-0.5358	-3.51E-10	345.3884	1.50E+13	0.01790	2.45E+07	0.00
200.0000	-2.58E-08	0.00	0.00	-3.45E-10	345.3883	1.50E+13	0.02676	1.24E+07	0.00

* The above values of total stress are combined axial and bending stresses.

File name is incorrect below, run designation is "Channel Post Seismic Long.(Full scour) 96in"

Channel Static 24in.lp9o 10/4/2017

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.50081269 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -42353286. inch-lbs
Maximum shear force              =       -106756. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    88.00000000 feet below pile head
Number of iterations             =              6
Number of zero deflection points =              5
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)

```
Displacement of pile head                                =     1.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	1.0016	-8.34E+07	160064.	0.00	1306.	1.50E+13	0.00	0.00	0.00
2.0000	1.0000	-7.96E+07	160056.	-1.30E-04	1262.	1.50E+13	0.00	0.00	0.00
4.0000	0.9953	-7.57E+07	160056.	-2.55E-04	1217.	1.50E+13	0.00	0.00	0.00
6.0000	0.9878	-7.19E+07	160056.	-3.73E-04	1173.	1.50E+13	0.00	0.00	0.00
8.0000	0.9775	-6.80E+07	160056.	-4.84E-04	1128.	1.50E+13	0.00	0.00	0.00
10.0000	0.9645	-6.41E+07	160056.	-5.90E-04	1084.	1.50E+13	0.00	0.00	0.00
12.0000	0.9491	-6.02E+07	160056.	-6.89E-04	1039.	1.50E+13	0.00	0.00	0.00
14.0000	0.9314	-5.64E+07	160056.	-7.83E-04	994.2959	1.50E+13	0.00	0.00	0.00
16.0000	0.9116	-5.25E+07	160056.	-8.70E-04	949.4990	1.50E+13	0.00	0.00	0.00
18.0000	0.8897	-4.86E+07	160056.	-9.50E-04	904.6441	1.50E+13	0.00	0.00	0.00
20.0000	0.8660	-4.47E+07	160056.	-0.00103	859.7356	1.50E+13	0.00	0.00	0.00
22.0000	0.8405	-4.08E+07	160056.	-0.00109	814.7777	1.50E+13	0.00	0.00	0.00
24.0000	0.8135	-3.69E+07	160056.	-0.00116	769.7748	1.50E+13	0.00	0.00	0.00
26.0000	0.7850	-3.29E+07	160056.	-0.00121	724.7312	1.50E+13	0.00	0.00	0.00
28.0000	0.7553	-2.90E+07	160056.	-0.00126	679.6512	1.50E+13			

File name is incorrect below, run designation is "Channel Post Seismic Long.(Full scour) 96in"


```
0.00        0.00        0.00
30.0000      0.7245  -2.51E+07    160056.   -0.00130   634.5391   1.50E+13
0.00        0.00        0.00
32.0000      0.6927  -2.12E+07    160056.   -0.00134   589.3993   1.50E+13
0.00        0.00        0.00
34.0000      0.6602  -1.73E+07    160056.   -0.00137   544.2361   1.50E+13
0.00        0.00        0.00
36.0000      0.6269  -1.33E+07    160056.   -0.00140   499.0538   1.50E+13
0.00        0.00        0.00
38.0000      0.5931  -9421427.    160056.   -0.00141   453.8567   1.50E+13
0.00        0.00        0.00
40.0000      0.5590  -5494763.    160056.   -0.00143   408.6492   1.50E+13
0.00        0.00        0.00
42.0000      0.5247  -1567573.    160056.   -0.00143   363.4357   1.50E+13
0.00        0.00        0.00
44.0000      0.4903   2359769.    160056.   -0.00143   372.5562   1.50E+13
0.00        0.00        0.00
46.0000      0.4559   6286883.    160056.   -0.00142   417.7689   1.50E+13
0.00        0.00        0.00
48.0000      0.4219   1.02E+07    160056.   -0.00141   462.9746   1.50E+13
0.00        0.00        0.00
50.0000      0.3882   1.41E+07    160056.   -0.00139   508.1690   1.50E+13
0.00        0.00        0.00
52.0000      0.3551   1.81E+07    160056.   -0.00137   553.3478   1.50E+13
0.00        0.00        0.00
54.0000      0.3226   2.20E+07    160056.   -0.00133   598.5067   1.50E+13
0.00        0.00        0.00
56.0000      0.2910   2.59E+07    160056.   -0.00130   643.6413   1.50E+13
0.00        0.00        0.00
58.0000      0.2604   2.98E+07    160056.   -0.00125   688.7472   1.50E+13
0.00        0.00        0.00
60.0000      0.2310   3.37E+07    160056.   -0.00120   733.8202   1.50E+13
0.00        0.00        0.00
62.0000      0.2028   3.77E+07    160056.   -0.00114   778.8560   1.50E+13
0.00        0.00        0.00
64.0000      0.1761   4.16E+07    160056.   -0.00108   823.8501   1.50E+13
0.00        0.00        0.00
66.0000      0.1510   4.55E+07    153099.   -0.00101   868.7984   1.50E+13
-579.7026     92160.       0.00
68.0000      0.1276   4.90E+07    128686.  -9.35E-04   909.8522   1.50E+13
-1455.    273649.       0.00
70.0000      0.1061   5.18E+07     91519.  -8.54E-04   941.2048   1.50E+13
-1643.    371588.       0.00
72.0000     0.08658   5.35E+07     50577.  -7.70E-04   961.6079   1.50E+13
-1769.    490474.       0.00
74.0000     0.06912   5.43E+07      7314.  -6.84E-04   970.2187   1.50E+13
-1836.    637503.       0.00
76.0000     0.05374   5.40E+07    -36845.  -5.97E-04   966.5945   1.50E+13
-1844.    823407.       0.00
78.0000     0.04044   5.26E+07    -80506.  -5.12E-04   950.6830   1.50E+13
-1795.   1065032.       0.00
80.0000     0.02915   5.02E+07   -122193.  -4.30E-04   922.8127   1.50E+13
-1679.   1382400.       0.00
82.0000     0.01979   4.68E+07   -157848.  -3.53E-04   883.7511   1.50E+13
-1292.   1566720.       0.00
84.0000     0.01223   4.26E+07   -184056.  -2.81E-04   836.0697   1.50E+13
-891.9540   1751040.       0.00
86.0000     0.00629   3.80E+07   -200850.  -2.17E-04   782.4263   1.50E+13
-507.5349   1935360.       0.00
88.0000     0.00182   3.30E+07   -208868.  -1.60E-04   725.3753   1.50E+13
-160.6732   2119680.       0.00
90.0000    -0.00139   2.80E+07   -209197.  -1.11E-04   667.2223   1.50E+13
133.3228   2304000.       0.00
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File name is incorrect below, run designation is "Channel Post Seismic Log.(Full scour) 96in"


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 92.0000   -0.00352   2.30E+07   -203212.  -7.06E-05   609.9226   1.50E+13
 365.3678   2488320.       0.00
 94.0000   -0.00478   1.82E+07   -192444.  -3.77E-05   555.0204   1.50E+13
 532.0146   2672640.       0.00
 96.0000   -0.00533   1.37E+07   -178443.  -1.21E-05   503.6261   1.50E+13
 634.7322   2856960.       0.00
 98.0000   -0.00536   9644579.   -162676.   6.58E-06   456.4258   1.50E+13
 679.1297   3041280.       0.00
100.0000   -0.00502   5935077.   -138346.   1.90E-05   413.7185   1.50E+13
1348.   6451200.       0.00
102.0000   -0.00445   3001684.   -107006.   2.62E-05   379.9465   1.50E+13
1263.   6819840.       0.00
104.0000   -0.00376    795655.    -78333.   2.92E-05   354.5487   1.50E+13
1126.   7188480.       0.00
106.0000   -0.00304   -761797.    -53320.   2.92E-05   354.1589   1.50E+13
958.2991   7557120.       0.00
108.0000   -0.00236  -1767195.    -32483.   2.72E-05   365.7339   1.50E+13
778.1100   7925760.       0.00
110.0000   -0.00174  -2324232.    -15942.   2.39E-05   372.1471   1.50E+13
600.2487   8294400.       0.00
112.0000   -0.00121  -2535303.     -3513.   2.01E-05   374.5771   1.50E+13
435.5567   8663040.       0.00
114.0000  -7.74E-04  -2495251.      5208.   1.60E-05   374.1160   1.50E+13
291.1924   9031680.       0.00
116.0000  -4.37E-04  -2287232.     10755.   1.22E-05   371.7211   1.50E+13
171.0370   9400320.       0.00
118.0000  -1.87E-04  -1980476.     13723.   8.81E-06   368.1894   1.50E+13
76.2538   9768960.       0.00
120.0000  -1.40E-05  -1629608.     14709.   5.92E-06   364.1499   1.50E+13
5.9150   1.01E+07       0.00
122.0000   9.68E-05  -1275177.     14271.   3.60E-06   360.0694   1.50E+13
-42.3718   1.05E+07       0.00
124.0000   1.59E-04   -945029.     12900.   1.82E-06   356.2684   1.50E+13
-71.8880   1.09E+07       0.00
126.0000   1.84E-04   -656198.     11002.   5.42E-07   352.9431   1.50E+13
-86.3142   1.12E+07       0.00
128.0000   1.85E-04   -417022.      8894.  -3.16E-07   350.1895   1.50E+13
-89.3422   1.16E+07       0.00
130.0000   1.69E-04   -229266.      6809.  -8.33E-07   348.0279   1.50E+13
-84.3937   1.20E+07       0.00
132.0000   1.45E-04    -90099.      4903.  -1.09E-06   346.4256   1.50E+13
-74.4388   1.23E+07       0.00
134.0000   1.17E-04      6199.      3267.  -1.16E-06   345.4597   1.50E+13
-61.9023   1.27E+07       0.00
136.0000   8.92E-05     66842.      1940.  -1.10E-06   346.1579   1.50E+13
-48.6399   1.31E+07       0.00
138.0000   6.42E-05     99461.   924.9224  -9.64E-07   346.5334   1.50E+13
-35.9674   1.35E+07       0.00
140.0000   4.29E-05    111354.   196.6267  -7.96E-07   346.6703   1.50E+13
-24.7239   1.38E+07       0.00
142.0000   2.60E-05    108995.  -284.3256  -6.19E-07   346.6432   1.50E+13
-15.3554   1.42E+07       0.00
144.0000   1.32E-05     97780.  -564.6358  -4.54E-07   346.5141   1.50E+13
-8.0038   1.46E+07       0.00
146.0000   4.17E-06     81947.  -691.8092  -3.10E-07   346.3318   1.50E+13
-2.5940   1.49E+07       0.00
148.0000  -1.71E-06     64611.  -709.8783  -1.93E-07   346.1322   1.50E+13
1.0883   1.53E+07       0.00
150.0000  -5.10E-06     47896.  -656.8301  -1.03E-07   345.9397   1.50E+13
3.3324   1.57E+07       0.00
152.0000  -6.66E-06     33095.  -563.4065  -3.85E-08   345.7694   1.50E+13
4.4529   1.60E+07       0.00
154.0000  -6.95E-06     20857.  -452.9352   4.61E-09   345.6285   1.50E+13
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(Full scour) 96in"


```
  4.7531   1.64E+07       0.00
  156.0000  -6.44E-06     11354.  -341.8645   3.04E-08   345.5190   1.50E+13
  4.5028   1.68E+07       0.00
  158.0000  -5.50E-06      4443.  -240.7234   4.30E-08   345.4395   1.50E+13
  3.9256   1.71E+07       0.00
  160.0000  -4.38E-06  -206.0765  -155.2766   4.64E-08   345.3907   1.50E+13
  3.1949   1.75E+07       0.00
  162.0000  -3.27E-06     -3015.   -87.7073   4.38E-08   345.4230   1.50E+13
  2.4358   1.79E+07       0.00
  164.0000  -2.28E-06     -4421.   -37.7096   3.79E-08   345.4392   1.50E+13
  1.7306   1.82E+07       0.00
  166.0000  -1.45E-06     -4830.    -3.4237   3.05E-08   345.4439   1.50E+13
  1.1265   1.86E+07       0.00
  168.0000  -8.14E-07     -4589.    17.8193   2.29E-08   345.4412   1.50E+13
  0.6437   1.90E+07       0.00
  170.0000  -3.51E-07     -3977.    28.9440   1.61E-08   345.4341   1.50E+13
  0.2833   1.94E+07       0.00
  172.0000  -4.16E-08     -3202.    32.7541   1.03E-08   345.4252   1.50E+13
  0.03417   1.97E+07       0.00
  174.0000   1.45E-07     -2406.    31.7045   5.86E-09   345.4160   1.50E+13
  -0.1216   2.01E+07       0.00
  176.0000   2.40E-07     -1681.    27.7911   2.60E-09   345.4077   1.50E+13
  -0.2045   2.05E+07       0.00
  178.0000   2.70E-07     -1073.    22.5267   3.94E-10   345.4007   1.50E+13
  -0.2342   2.08E+07       0.00
  180.0000   2.59E-07  -599.5485    16.9733  -9.43E-10   345.3952   1.50E+13
  -0.2286   2.12E+07       0.00
  182.0000   2.25E-07  -257.9252    11.8085  -1.63E-09   345.3913   1.50E+13
  -0.2019   2.16E+07       0.00
  184.0000   1.81E-07   -32.5451     7.4055  -1.86E-09   345.3887   1.50E+13
  -0.1651   2.19E+07       0.00
  186.0000   1.35E-07    97.7620     3.9156  -1.81E-09   345.3895   1.50E+13
  -0.1258   2.23E+07       0.00
  188.0000   9.38E-08   155.6227     1.3433  -1.61E-09   345.3901   1.50E+13
  -0.08861   2.27E+07       0.00
  190.0000   5.82E-08   162.4308    -0.3910  -1.35E-09   345.3902   1.50E+13
  -0.05591   2.30E+07       0.00
  192.0000   2.89E-08   137.0172    -1.4004  -1.11E-09   345.3899   1.50E+13
  -0.02821   2.34E+07       0.00
  194.0000   4.85E-09    95.3429    -1.7967  -9.26E-10   345.3894   1.50E+13
  -0.00481   2.38E+07       0.00
  196.0000  -1.56E-08    50.8890    -1.6666  -8.10E-10   345.3889   1.50E+13
  0.01565   2.41E+07       0.00
  198.0000  -3.40E-08    15.4421    -1.0621  -7.57E-10   345.3885   1.50E+13
  0.03473   2.45E+07       0.00
  200.0000  -5.19E-08       0.00       0.00  -7.44E-10   345.3883   1.50E+13
  0.05377   1.24E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     1.00160084 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -83428077. inch-lbs
Maximum shear force              =       -209197. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    90.00000000 feet below pile head
Number of iterations             =              7
Number of zero deflection points =              5
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(Full scour) 96in"

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Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 3

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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 2.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 2500000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				
0.00	2.0031	-1.60E+08	300396.	0.00	2185.	1.50E+13
0.00	0.00	0.00				
2.0000	2.0000	-1.53E+08	300381.	-2.50E-04	2102.	1.50E+13
0.00	0.00	0.00				
4.0000	1.9911	-1.45E+08	300381.	-4.88E-04	2019.	1.50E+13
0.00	0.00	0.00				
6.0000	1.9766	-1.38E+08	300381.	-7.15E-04	1935.	1.50E+13
0.00	0.00	0.00				
8.0000	1.9568	-1.31E+08	300381.	-9.30E-04	1852.	1.50E+13
0.00	0.00	0.00				
10.0000	1.9320	-1.24E+08	300381.	-0.00113	1768.	1.50E+13
0.00	0.00	0.00				
12.0000	1.9024	-1.16E+08	300381.	-0.00132	1684.	1.50E+13
0.00	0.00	0.00				
14.0000	1.8684	-1.09E+08	300381.	-0.00150	1600.	1.50E+13
0.00	0.00	0.00				
16.0000	1.8302	-1.02E+08	300381.	-0.00167	1516.	1.50E+13
0.00	0.00	0.00				
18.0000	1.7881	-9.44E+07	300381.	-0.00183	1432.	1.50E+13
0.00	0.00	0.00				
20.0000	1.7423	-8.71E+07	300381.	-0.00198	1348.	1.50E+13
0.00	0.00	0.00				
22.0000	1.6932	-7.97E+07	300381.	-0.00211	1263.	1.50E+13
0.00	0.00	0.00				
24.0000	1.6411	-7.24E+07	300381.	-0.00223	1179.	1.50E+13
0.00	0.00	0.00				
26.0000	1.5862	-6.50E+07	300381.	-0.00234	1094.	1.50E+13
0.00	0.00	0.00				
28.0000	1.5288	-5.77E+07	300381.	-0.00244	1009.	1.50E+13
0.00	0.00	0.00				
30.0000	1.4692	-5.03E+07	300381.	-0.00252	924.7540	1.50E+13
0.00	0.00	0.00				
32.0000	1.4076	-4.30E+07	300381.	-0.00260	839.9838	1.50E+13
0.00	0.00	0.00				
34.0000	1.3444	-3.56E+07	300381.	-0.00266	755.1662	1.50E+13
0.00	0.00	0.00				
36.0000	1.2799	-2.82E+07	300381.	-0.00271	670.3093	1.50E+13
0.00	0.00	0.00				
38.0000	1.2142	-2.08E+07	300381.	-0.00275	585.4212	1.50E+13
0.00	0.00	0.00				
40.0000	1.1478	-1.35E+07	300381.	-0.00278	500.5101	1.50E+13
0.00	0.00	0.00				

File name is incorrect below, run designation is "Channel Post Seismic Long.(Full scour) 96in"


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 42.0000     1.0808  -6097115.    300381.   -0.00280   415.5841   1.50E+13
 0.00       0.00       0.00
 44.0000     1.0136   1280038.    300381.   -0.00280   360.1253   1.50E+13
 0.00       0.00       0.00
 46.0000     0.9464   8657067.    300381.   -0.00279   445.0567   1.50E+13
 0.00       0.00       0.00
 48.0000     0.8796   1.60E+07    300381.   -0.00277   529.9784   1.50E+13
 0.00       0.00       0.00
 50.0000     0.8134   2.34E+07    300381.   -0.00274   614.8825   1.50E+13
 0.00       0.00       0.00
 52.0000     0.7481   3.08E+07    300381.   -0.00270   699.7607   1.50E+13
 0.00       0.00       0.00
 54.0000     0.6840   3.81E+07    300381.   -0.00264   784.6049   1.50E+13
 0.00       0.00       0.00
 56.0000     0.6213   4.55E+07    300381.   -0.00257   869.4070   1.50E+13
 0.00       0.00       0.00
 58.0000     0.5604   5.29E+07    300381.   -0.00250   954.1588   1.50E+13
 0.00       0.00       0.00
 60.0000     0.5015   6.02E+07    300381.   -0.00241      1039.   1.50E+13
 0.00       0.00       0.00
 62.0000     0.4450   6.76E+07    300381.   -0.00230      1123.   1.50E+13
 0.00       0.00       0.00
 64.0000     0.3910   7.49E+07    300381.   -0.00219      1208.   1.50E+13
 0.00       0.00       0.00
 66.0000     0.3399   8.23E+07    284719.   -0.00206      1293.   1.50E+13
 -1305.     92160.       0.00
 68.0000     0.2919   8.88E+07    245543.   -0.00193      1368.   1.50E+13
 -1960.    161091.       0.00
 70.0000     0.2474   9.43E+07    193040.   -0.00178      1431.   1.50E+13
 -2416.    234348.       0.00
 72.0000     0.2065   9.83E+07    131261.   -0.00163      1477.   1.50E+13
 -2732.    317594.       0.00
 74.0000     0.1693   1.01E+08     63987.   -0.00147      1506.   1.50E+13
 -2874.    407288.       0.00
 76.0000     0.1361   1.02E+08     -5704.   -0.00131      1515.   1.50E+13
 -2934.    517503.       0.00
 78.0000     0.1067   1.01E+08    -75887.   -0.00114      1504.   1.50E+13
 -2915.    655729.       0.00
 80.0000    0.08117   9.81E+07   -144691.  -9.85E-04      1474.   1.50E+13
 -2819.    833510.       0.00
 82.0000    0.05941   9.38E+07   -210296.  -8.31E-04      1426.   1.50E+13
 -2648.   1069767.       0.00
 84.0000    0.04126   8.81E+07   -270922.  -6.86E-04      1359.   1.50E+13
 -2404.   1398356.       0.00
 86.0000    0.02649   8.09E+07   -324779.  -5.51E-04      1277.   1.50E+13
 -2084.   1888390.       0.00
 88.0000    0.01482   7.25E+07   -365495.  -4.28E-04      1181.   1.50E+13
 -1309.   2119680.       0.00
 90.0000    0.00594   6.34E+07   -388041.  -3.19E-04      1076.   1.50E+13
 -569.9154   2304000.       0.00
 92.0000  -5.13E-04   5.40E+07   -394242.  -2.26E-04   966.6094   1.50E+13
 53.1766   2488320.       0.00
 94.0000   -0.00489   4.45E+07   -387067.  -1.47E-04   857.9786   1.50E+13
 544.7358   2672640.       0.00
 96.0000   -0.00756   3.54E+07   -369728.  -8.30E-05   752.9109   1.50E+13
 900.1572   2856960.       0.00
 98.0000   -0.00887   2.68E+07   -345433.  -3.32E-05   653.7734   1.50E+13
 1124.   3041280.       0.00
100.0000   -0.00916   1.88E+07   -309090.   3.22E-06   562.0632   1.50E+13
1904.   4990462.       0.00
102.0000   -0.00872   1.19E+07   -257777.   2.78E-05   482.9593   1.50E+13
2372.   6529102.       0.00
104.0000   -0.00782   6443468.   -202355.   4.25E-05   419.5716   1.50E+13
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2247.   6893389.       0.00
106.0000   -0.00668   2231122.   -150486.   4.95E-05   371.0751   1.50E+13
2076.   7460750.       0.00
108.0000   -0.00545   -785781.   -103988.   5.06E-05   354.4350   1.50E+13
1799.   7925760.       0.00
110.0000   -0.00425  -2766384.    -64784.   4.78E-05   377.2376   1.50E+13
1468.   8294400.       0.00
112.0000   -0.00315  -3901138.    -33505.   4.24E-05   390.3019   1.50E+13
1139.   8663040.       0.00
114.0000   -0.00221  -4379729.     -9862.   3.58E-05   395.8119   1.50E+13
831.7576   9031680.       0.00
116.0000   -0.00143  -4378808.      6861.   2.88E-05   395.8013   1.50E+13
561.8301   9400320.       0.00
118.0000  -8.27E-04  -4053852.     17641.   2.21E-05   392.0601   1.50E+13
336.4695   9768960.       0.00
120.0000  -3.74E-04  -3534701.     23576.   1.60E-05   386.0832   1.50E+13
158.1515   1.01E+07       0.00
122.0000  -5.78E-05  -2924116.     25778.   1.09E-05   379.0535   1.50E+13
25.3235   1.05E+07       0.00
124.0000   1.46E-04  -2298664.     25285.   6.68E-06   371.8527   1.50E+13
-66.3815   1.09E+07       0.00
126.0000   2.63E-04  -1711227.     23012.   3.47E-06   365.0896   1.50E+13
-123.0373   1.12E+07       0.00
128.0000   3.13E-04  -1194495.     19718.   1.15E-06   359.1405   1.50E+13
-151.4864   1.16E+07       0.00
130.0000   3.18E-04   -764905.     15997.  -4.19E-07   354.1946   1.50E+13
-158.6021   1.20E+07       0.00
132.0000   2.93E-04   -426596.     12285.  -1.37E-06   350.2997   1.50E+13
-150.7552   1.23E+07       0.00
134.0000   2.52E-04   -175082.      8874.  -1.85E-06   347.4040   1.50E+13
-133.4729   1.27E+07       0.00
136.0000   2.04E-04  -430.8166      5937.  -1.99E-06   345.3933   1.50E+13
-111.2642   1.31E+07       0.00
138.0000   1.56E-04    110132.      3551.  -1.91E-06   346.6563   1.50E+13
-87.5771   1.35E+07       0.00
140.0000   1.13E-04    170240.      1722.  -1.68E-06   347.3483   1.50E+13
-64.8547   1.38E+07       0.00
142.0000   7.55E-05    192975.   407.5687  -1.39E-06   347.6100   1.50E+13
-44.6560   1.42E+07       0.00
144.0000   4.58E-05    189970.  -462.0398  -1.08E-06   347.5754   1.50E+13
-27.8114   1.46E+07       0.00
146.0000   2.35E-05    170928.  -970.8600  -7.96E-07   347.3562   1.50E+13
-14.5903   1.49E+07       0.00
148.0000   7.63E-06    143464.     -1204.  -5.45E-07   347.0400   1.50E+13
-4.8630   1.53E+07       0.00
150.0000  -2.69E-06    113187.     -1242.  -3.39E-07   346.6914   1.50E+13
1.7565   1.57E+07       0.00
152.0000  -8.67E-06     83909.     -1151.  -1.82E-07   346.3544   1.50E+13
5.7906   1.60E+07       0.00
154.0000  -1.14E-05     57960.  -987.8369  -6.85E-08   346.0556   1.50E+13
7.8073   1.64E+07       0.00
156.0000  -1.20E-05     36502.  -793.8995   7.04E-09   345.8086   1.50E+13
8.3541   1.68E+07       0.00
158.0000  -1.11E-05     19852.  -598.6482   5.21E-08   345.6169   1.50E+13
7.9168   1.71E+07       0.00
160.0000  -9.45E-06      7760.  -420.8839   7.42E-08   345.4777   1.50E+13
6.8969   1.75E+07       0.00
162.0000  -7.52E-06  -359.5872  -270.8607   8.01E-08   345.3925   1.50E+13
5.6050   1.79E+07       0.00
164.0000  -5.61E-06     -5251.  -152.4274   7.56E-08   345.4488   1.50E+13
4.2644   1.82E+07       0.00
166.0000  -3.89E-06     -7685.   -64.9996   6.53E-08   345.4768   1.50E+13
3.0212   1.86E+07       0.00
```

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  168.0000  -2.48E-06     -8379.    -5.2397   5.24E-08   345.4848   1.50E+13
  1.9587   1.90E+07       0.00
  170.0000  -1.38E-06     -7943.    31.6084   3.94E-08   345.4798   1.50E+13
  1.1119   1.94E+07       0.00
  172.0000  -5.86E-07     -6866.    50.7348   2.75E-08   345.4674   1.50E+13
  0.4819   1.97E+07       0.00
  174.0000  -5.75E-08     -5511.    57.0956   1.76E-08   345.4518   1.50E+13
  0.04814   2.01E+07       0.00
  176.0000   2.60E-07     -4128.    55.0141   9.93E-09   345.4359   1.50E+13
  -0.2216   2.05E+07       0.00
  178.0000   4.19E-07     -2872.    47.9916   4.33E-09   345.4214   1.50E+13
  -0.3636   2.08E+07       0.00
  180.0000   4.68E-07     -1825.    38.6698   5.77E-10   345.4093   1.50E+13
  -0.4132   2.12E+07       0.00
  182.0000   4.47E-07     -1015.    28.8953  -1.69E-09   345.4000   1.50E+13
  -0.4014   2.16E+07       0.00
  184.0000   3.87E-07  -437.3927    19.8400  -2.86E-09   345.3934   1.50E+13
  -0.3533   2.19E+07       0.00
  186.0000   3.10E-07   -62.7761    12.1486  -3.26E-09   345.3891   1.50E+13
  -0.2877   2.23E+07       0.00
  188.0000   2.30E-07   146.1312     6.0861  -3.19E-09   345.3900   1.50E+13
  -0.2175   2.27E+07       0.00
  190.0000   1.57E-07   229.7383     1.6727  -2.89E-09   345.3910   1.50E+13
  -0.1503   2.30E+07       0.00
  192.0000   9.16E-08   226.7688    -1.2028  -2.52E-09   345.3909   1.50E+13
  -0.08936   2.34E+07       0.00
  194.0000   3.54E-08   172.3063    -2.6961  -2.20E-09   345.3903   1.50E+13
  -0.03508   2.38E+07       0.00
  196.0000  -1.42E-08    97.6215    -2.9457  -1.99E-09   345.3895   1.50E+13
  0.01428   2.41E+07       0.00
  198.0000  -6.00E-08    31.1501    -2.0385  -1.89E-09   345.3887   1.50E+13
  0.06133   2.45E+07       0.00
  200.0000  -1.05E-07       0.00       0.00  -1.86E-09   345.3883   1.50E+13
  0.1085   1.24E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 3:

```
Pile-head deflection             =     2.00306618 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -159794996. inch-lbs
Maximum shear force              =       -394242. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    92.00000000 feet below pile head
Number of iterations             =              9
Number of zero deflection points =              5
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 4

```
Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     3.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(Full scour) 96in"

Channel Static 24in.lp9o 10/4/2017

Depth X feet	Deflect. y inches	Bending Distrib. Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Lat. Load lb/inch				
0.00	3.0044	-2.30E+08	424473.	0.00	2997.	1.50E+13
0.00	0.00	0.00				
2.0000	3.0000	-2.20E+08	424453.	-3.60E-04	2879.	1.50E+13
0.00	0.00	0.00				
4.0000	2.9871	-2.10E+08	424453.	-7.04E-04	2762.	1.50E+13
0.00	0.00	0.00				
6.0000	2.9662	-2.00E+08	424453.	-0.00103	2644.	1.50E+13
0.00	0.00	0.00				
8.0000	2.9376	-1.89E+08	424453.	-0.00134	2526.	1.50E+13
0.00	0.00	0.00				
10.0000	2.9018	-1.79E+08	424453.	-0.00164	2407.	1.50E+13
0.00	0.00	0.00				
12.0000	2.8591	-1.69E+08	424453.	-0.00192	2289.	1.50E+13
0.00	0.00	0.00				
14.0000	2.8099	-1.59E+08	424453.	-0.00218	2170.	1.50E+13
0.00	0.00	0.00				
16.0000	2.7546	-1.48E+08	424453.	-0.00242	2051.	1.50E+13
0.00	0.00	0.00				
18.0000	2.6936	-1.38E+08	424453.	-0.00265	1932.	1.50E+13
0.00	0.00	0.00				
20.0000	2.6273	-1.27E+08	424453.	-0.00286	1813.	1.50E+13
0.00	0.00	0.00				
22.0000	2.5562	-1.17E+08	424453.	-0.00306	1694.	1.50E+13
0.00	0.00	0.00				
24.0000	2.4805	-1.07E+08	424453.	-0.00324	1574.	1.50E+13
0.00	0.00	0.00				
26.0000	2.4008	-9.64E+07	424453.	-0.00340	1455.	1.50E+13
0.00	0.00	0.00				
28.0000	2.3173	-8.60E+07	424453.	-0.00355	1335.	1.50E+13
0.00	0.00	0.00				
30.0000	2.2306	-7.56E+07	424453.	-0.00367	1215.	1.50E+13
0.00	0.00	0.00				
32.0000	2.1410	-6.52E+07	424453.	-0.00379	1095.	1.50E+13
0.00	0.00	0.00				
34.0000	2.0488	-5.47E+07	424453.	-0.00388	975.5612	1.50E+13
0.00	0.00	0.00				
36.0000	1.9546	-4.43E+07	424453.	-0.00396	855.5677	1.50E+13
0.00	0.00	0.00				
38.0000	1.8586	-3.39E+07	424453.	-0.00402	735.5253	1.50E+13
0.00	0.00	0.00				
40.0000	1.7614	-2.35E+07	424453.	-0.00407	615.4454	1.50E+13
0.00	0.00	0.00				
42.0000	1.6632	-1.30E+07	424453.	-0.00410	495.3396	1.50E+13
0.00	0.00	0.00				
44.0000	1.5646	-2591097.	424453.	-0.00411	375.2195	1.50E+13
0.00	0.00	0.00				
46.0000	1.4658	7842638.	424453.	-0.00411	435.6802	1.50E+13
0.00	0.00	0.00				
48.0000	1.3674	1.83E+07	424453.	-0.00409	555.7945	1.50E+13
0.00	0.00	0.00				
50.0000	1.2697	2.87E+07	424453.	-0.00405	675.8887	1.50E+13
0.00	0.00	0.00				
52.0000	1.1730	3.91E+07	424453.	-0.00400	795.9512	1.50E+13
0.00	0.00	0.00				
54.0000	1.0779	4.96E+07	424453.	-0.00392	915.9704	1.50E+13

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 0.00        0.00        0.00
 56.0000      0.9846   6.00E+07    424453.   -0.00384      1036.   1.50E+13
 0.00        0.00        0.00
 58.0000      0.8937   7.04E+07    424453.   -0.00373      1156.   1.50E+13
 0.00        0.00        0.00
 60.0000      0.8055   8.08E+07    424453.   -0.00361      1276.   1.50E+13
 0.00        0.00        0.00
 62.0000      0.7203   9.12E+07    424453.   -0.00347      1395.   1.50E+13
 0.00        0.00        0.00
 64.0000      0.6387   1.02E+08    424453.   -0.00332      1515.   1.50E+13
 0.00        0.00        0.00
 66.0000      0.5610   1.12E+08    409304.   -0.00315      1635.   1.50E+13
 -1262.      54011.       0.00
 68.0000      0.4875   1.22E+08    369078.   -0.00296      1746.   1.50E+13
 -2090.     102873.       0.00
 70.0000      0.4188   1.30E+08    310843.   -0.00276      1843.   1.50E+13
 -2763.     158363.       0.00
 72.0000      0.3550   1.37E+08    238146.   -0.00255      1921.   1.50E+13
 -3295.     222768.       0.00
 74.0000      0.2965   1.42E+08    154356.   -0.00233      1978.   1.50E+13
 -3688.     298537.       0.00
 76.0000      0.2434   1.45E+08     63021.   -0.00210      2010.   1.50E+13
 -3924.     386939.       0.00
 78.0000      0.1958   1.45E+08    -31452.   -0.00186      2015.   1.50E+13
 -3949.     483975.       0.00
 80.0000      0.1539   1.43E+08   -125411.   -0.00163      1995.   1.50E+13
 -3881.     605376.       0.00
 82.0000      0.1174   1.39E+08   -216650.   -0.00141      1948.   1.50E+13
 -3722.     761038.       0.00
 84.0000     0.08626   1.33E+08   -303027.   -0.00119      1877.   1.50E+13
 -3476.     967095.       0.00
 86.0000     0.06023   1.25E+08   -382447.  -9.85E-04      1783.   1.50E+13
 -3143.    1252195.       0.00
 88.0000     0.03900   1.15E+08   -452803.  -7.93E-04      1667.   1.50E+13
 -2720.    1674106.       0.00
 90.0000     0.02217   1.03E+08   -510988.  -6.19E-04      1533.   1.50E+13
 -2128.    2304000.       0.00
 92.0000     0.00930   9.03E+07   -548106.  -4.64E-04      1386.   1.50E+13
 -964.6428   2488320.       0.00
 94.0000  -9.61E-05   7.69E+07   -559553.  -3.30E-04      1231.   1.50E+13
 10.7069   2672640.       0.00
 96.0000   -0.00654   6.35E+07   -550077.  -2.18E-04      1077.   1.50E+13
 778.9586   2856960.       0.00
 98.0000   -0.01055   5.06E+07   -524682.  -1.27E-04   927.5033   1.50E+13
 1337.    3041280.       0.00
100.0000   -0.01262   3.84E+07   -481807.  -5.55E-05   787.0218   1.50E+13
2236.    4250769.       0.00
102.0000   -0.01322   2.74E+07   -419932.  -2.94E-06   661.3232   1.50E+13
2921.    5302600.       0.00
104.0000   -0.01276   1.82E+07   -350445.   3.36E-05   554.9627   1.50E+13
2870.    5396540.       0.00
106.0000   -0.01161   1.06E+07   -283163.   5.66E-05   467.6135   1.50E+13
2737.    5658591.       0.00
108.0000   -0.01005   4604770.   -219765.   6.88E-05   398.4028   1.50E+13
2546.    6082643.       0.00
110.0000   -0.00831     59374.   -161426.   7.25E-05   346.0719   1.50E+13
2315.    6689003.       0.00
112.0000   -0.00657  -3152371.   -108939.   7.00E-05   381.6814   1.50E+13
2059.    7523737.       0.00
114.0000   -0.00495  -5178116.    -62798.   6.34E-05   405.0037   1.50E+13
1787.    8668796.       0.00
116.0000   -0.00352  -6174284.    -24791.   5.43E-05   416.4725   1.50E+13
1381.    9400320.       0.00
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118.0000   -0.00234  -6374620.      3208.   4.43E-05   418.7790   1.50E+13
952.6416   9768960.       0.00
120.0000   -0.00140  -6025623.     21739.   3.43E-05   414.7610   1.50E+13
591.6064   1.01E+07       0.00
122.0000  -6.92E-04  -5335283.     32473.   2.53E-05   406.8131   1.50E+13
302.9282   1.05E+07       0.00
124.0000  -1.88E-04  -4469944.     37131.   1.74E-05   396.8505   1.50E+13
85.2583   1.09E+07       0.00
126.0000   1.44E-04  -3555067.     37344.   1.10E-05   386.3176   1.50E+13
-67.5261   1.12E+07       0.00
128.0000   3.40E-04  -2678745.     34560.   6.02E-06   376.2286   1.50E+13
-164.5080   1.16E+07       0.00
130.0000   4.33E-04  -1896922.     29991.   2.36E-06   367.2275   1.50E+13
-216.1887   1.20E+07       0.00
132.0000   4.53E-04  -1239441.     24598.  -1.46E-07   359.6579   1.50E+13
-233.2698   1.23E+07       0.00
134.0000   4.26E-04   -716205.     19089.  -1.71E-06   353.6340   1.50E+13
-225.7677   1.27E+07       0.00
136.0000   3.71E-04   -322943.     13951.  -2.54E-06   349.1064   1.50E+13
-202.4398   1.31E+07       0.00
138.0000   3.04E-04    -46255.      9476.  -2.84E-06   345.9209   1.50E+13
-170.4807   1.35E+07       0.00
140.0000   2.35E-04    132241.      5805.  -2.77E-06   346.9108   1.50E+13
-135.4355   1.38E+07       0.00
142.0000   1.71E-04    232713.      2964.  -2.48E-06   348.0675   1.50E+13
-101.2732   1.42E+07       0.00
144.0000   1.16E-04    274829.   902.3182  -2.07E-06   348.5524   1.50E+13
-70.5671   1.46E+07       0.00
146.0000   7.19E-05    276272.  -481.2974  -1.63E-06   348.5690   1.50E+13
-44.7342   1.49E+07       0.00
148.0000   3.81E-05    251922.     -1310.  -1.21E-06   348.2887   1.50E+13
-24.2956   1.53E+07       0.00
150.0000   1.40E-05    213554.     -1711.  -8.35E-07   347.8470   1.50E+13
-9.1301   1.57E+07       0.00
152.0000  -1.95E-06    169906.     -1805.  -5.28E-07   347.3444   1.50E+13
1.3008   1.60E+07       0.00
154.0000  -1.14E-05    126991.     -1696.  -2.91E-07   346.8504   1.50E+13
7.7644   1.64E+07       0.00
156.0000  -1.59E-05     88536.     -1469.  -1.18E-07   346.4076   1.50E+13
11.1112   1.68E+07       0.00
158.0000  -1.70E-05     56473.     -1190.  -2.41E-09   346.0385   1.50E+13
12.1706   1.71E+07       0.00
160.0000  -1.60E-05     31414.  -903.7905   6.79E-08   345.7500   1.50E+13
11.6838   1.75E+07       0.00
162.0000  -1.38E-05     13083.  -640.3744   1.03E-07   345.5390   1.50E+13
10.2675   1.79E+07       0.00
164.0000  -1.10E-05   663.7979  -416.3536   1.14E-07   345.3960   1.50E+13
8.4009   1.82E+07       0.00
166.0000  -8.29E-06     -6916.  -238.3765   1.09E-07   345.4680   1.50E+13
6.4305   1.86E+07       0.00
168.0000  -5.80E-06    -10791.  -106.1853   9.53E-08   345.5126   1.50E+13
4.5854   1.90E+07       0.00
170.0000  -3.72E-06    -12024.   -15.1894   7.70E-08   345.5268   1.50E+13
2.9976   1.94E+07       0.00
172.0000  -2.10E-06    -11530.    41.4835   5.82E-08   345.5211   1.50E+13
1.7251   1.97E+07       0.00
174.0000  -9.24E-07    -10040.    71.4656   4.10E-08   345.5039   1.50E+13
0.7734   2.01E+07       0.00
176.0000  -1.34E-07     -8104.    82.1137   2.64E-08   345.4816   1.50E+13
0.1140   2.05E+07       0.00
178.0000   3.45E-07     -6102.    79.8837   1.51E-08   345.4586   1.50E+13
-0.2998   2.08E+07       0.00
180.0000   5.90E-07     -4272.    70.0283   6.79E-09   345.4375   1.50E+13
```

```
  -0.5215   2.12E+07       0.00
  182.0000   6.71E-07     -2741.    56.5303   1.19E-09   345.4199   1.50E+13
  -0.6034   2.16E+07       0.00
  184.0000   6.47E-07     -1558.    42.1907  -2.25E-09   345.4063   1.50E+13
  -0.5916   2.19E+07       0.00
  186.0000   5.63E-07  -715.9776    28.8094  -4.07E-09   345.3966   1.50E+13
  -0.5235   2.23E+07       0.00
  188.0000   4.52E-07  -175.0442    17.4046  -4.78E-09   345.3903   1.50E+13
  -0.4269   2.27E+07       0.00
  190.0000   3.34E-07   120.0171     8.4371  -4.83E-09   345.3897   1.50E+13
  -0.3204   2.30E+07       0.00
  192.0000   2.20E-07   230.5182     2.0152  -4.55E-09   345.3910   1.50E+13
  -0.2148   2.34E+07       0.00
  194.0000   1.15E-07   217.2919    -1.9349  -4.19E-09   345.3908   1.50E+13
  -0.1144   2.38E+07       0.00
  196.0000   1.91E-08   138.1439    -3.5386  -3.90E-09   345.3899   1.50E+13
  -0.01923   2.41E+07       0.00
  198.0000  -7.20E-08    47.9067    -2.8874  -3.76E-09   345.3889   1.50E+13
  0.07350   2.45E+07       0.00
  200.0000  -1.61E-07       0.00       0.00  -3.72E-09   345.3883   1.50E+13
  0.1671   1.24E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 4:

```
Pile-head deflection             =     3.00441909 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -230301894. inch-lbs
Maximum shear force              =       -559553. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    94.00000000 feet below pile head
Number of iterations             =             11
Number of zero deflection points =              5
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 5
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     4.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     4.0057  -2.96E+08    536657.       0.00      3758.   1.50E+13
      0.00       0.00       0.00
    2.0000     4.0000  -2.83E+08    536631.  -4.64E-04      3609.   1.50E+13
    0.00       0.00       0.00
    4.0000     3.9834  -2.71E+08    536631.  -9.07E-04      3460.   1.50E+13
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(Full scour) 96in"


```
 0.00       0.00       0.00
 6.0000     3.9565  -2.58E+08    536631.   -0.00133      3311.   1.50E+13
 0.00       0.00       0.00
 8.0000     3.9196  -2.45E+08    536631.   -0.00173      3162.   1.50E+13
 0.00       0.00       0.00
10.0000     3.8734  -2.32E+08    536631.   -0.00211      3012.   1.50E+13
0.00       0.00       0.00
12.0000     3.8183  -2.19E+08    536631.   -0.00247      2863.   1.50E+13
0.00       0.00       0.00
14.0000     3.7548  -2.06E+08    536631.   -0.00281      2713.   1.50E+13
0.00       0.00       0.00
16.0000     3.6834  -1.93E+08    536631.   -0.00313      2562.   1.50E+13
0.00       0.00       0.00
18.0000     3.6046  -1.79E+08    536631.   -0.00343      2412.   1.50E+13
0.00       0.00       0.00
20.0000     3.5189  -1.66E+08    536631.   -0.00370      2261.   1.50E+13
0.00       0.00       0.00
22.0000     3.4269  -1.53E+08    536631.   -0.00396      2110.   1.50E+13
0.00       0.00       0.00
24.0000     3.3289  -1.40E+08    536631.   -0.00419      1959.   1.50E+13
0.00       0.00       0.00
26.0000     3.2256  -1.27E+08    536631.   -0.00441      1808.   1.50E+13
0.00       0.00       0.00
28.0000     3.1174  -1.14E+08    536631.   -0.00460      1656.   1.50E+13
0.00       0.00       0.00
30.0000     3.0049  -1.01E+08    536631.   -0.00477      1505.   1.50E+13
0.00       0.00       0.00
32.0000     2.8884  -8.75E+07    536631.   -0.00492      1353.   1.50E+13
0.00       0.00       0.00
34.0000     2.7686  -7.43E+07    536631.   -0.00505      1201.   1.50E+13
0.00       0.00       0.00
36.0000     2.6460  -6.12E+07    536631.   -0.00516      1050.   1.50E+13
0.00       0.00       0.00
38.0000     2.5210  -4.80E+07    536631.   -0.00525   897.6787   1.50E+13
0.00       0.00       0.00
40.0000     2.3942  -3.48E+07    536631.   -0.00531   745.7513   1.50E+13
0.00       0.00       0.00
42.0000     2.2660  -2.16E+07    536631.   -0.00536   593.7855   1.50E+13
0.00       0.00       0.00
44.0000     2.1370  -8373843.    536631.   -0.00538   441.7959   1.50E+13
0.00       0.00       0.00
46.0000     2.0077   4828588.    536631.   -0.00538   400.9796   1.50E+13
0.00       0.00       0.00
48.0000     1.8786   1.80E+07    536631.   -0.00537   552.9731   1.50E+13
0.00       0.00       0.00
50.0000     1.7502   3.12E+07    536631.   -0.00533   704.9467   1.50E+13
0.00       0.00       0.00
52.0000     1.6229   4.44E+07    536631.   -0.00527   856.8858   1.50E+13
0.00       0.00       0.00
54.0000     1.4974   5.76E+07    536631.   -0.00518      1009.   1.50E+13
0.00       0.00       0.00
56.0000     1.3741   7.08E+07    536631.   -0.00508      1161.   1.50E+13
0.00       0.00       0.00
58.0000     1.2535   8.40E+07    536631.   -0.00496      1312.   1.50E+13
0.00       0.00       0.00
60.0000     1.1361   9.72E+07    536631.   -0.00481      1464.   1.50E+13
0.00       0.00       0.00
62.0000     1.0224   1.10E+08    536631.   -0.00465      1616.   1.50E+13
0.00       0.00       0.00
64.0000     0.9130   1.23E+08    536631.   -0.00446      1767.   1.50E+13
0.00       0.00       0.00
66.0000     0.8084   1.37E+08    525189.   -0.00425      1918.   1.50E+13
-953.5419     28311.       0.00
```

```
 68.0000     0.7089   1.49E+08    489868.   -0.00402      2063.   1.50E+13
 -1990.     67366.       0.00
 70.0000     0.6152   1.61E+08    431466.   -0.00378      2195.   1.50E+13
 -2877.    112231.       0.00
 72.0000     0.5277   1.70E+08    353739.   -0.00351      2307.   1.50E+13
 -3600.    163759.       0.00
 74.0000     0.4467   1.78E+08    260503.   -0.00323      2395.   1.50E+13
 -4169.    224029.       0.00
 76.0000     0.3725   1.83E+08    155430.   -0.00294      2455.   1.50E+13
 -4587.    295537.       0.00
 78.0000     0.3053   1.86E+08     42200.   -0.00265      2485.   1.50E+13
 -4849.    381154.       0.00
 80.0000     0.2453   1.86E+08    -74796.   -0.00235      2482.   1.50E+13
 -4901.    479419.       0.00
 82.0000     0.1924   1.83E+08   -190793.   -0.00206      2447.   1.50E+13
 -4766.    594389.       0.00
 84.0000     0.1465   1.77E+08   -302348.   -0.00177      2380.   1.50E+13
 -4530.    741942.       0.00
 86.0000     0.1074   1.68E+08   -407080.   -0.00149      2282.   1.50E+13
 -4197.    937542.       0.00
 88.0000    0.07480   1.57E+08   -502655.   -0.00123      2157.   1.50E+13
 -3767.   1208831.       0.00
 90.0000    0.04818   1.44E+08   -585782.  -9.93E-04      2006.   1.50E+13
 -3160.   1573930.       0.00
 92.0000    0.02711   1.29E+08   -652145.  -7.75E-04      1834.   1.50E+13
 -2370.   2098393.       0.00
 94.0000    0.01100   1.13E+08   -695284.  -5.81E-04      1647.   1.50E+13
 -1225.   2672640.       0.00
 96.0000  -7.78E-04   9.60E+07   -708868.  -4.14E-04      1451.   1.50E+13
 92.5839   2856960.       0.00
 98.0000   -0.00887   7.91E+07   -694273.  -2.74E-04      1256.   1.50E+13
 1124.   3041280.       0.00
100.0000   -0.01392   6.27E+07   -652613.  -1.61E-04      1068.   1.50E+13
2348.   4047290.       0.00
102.0000   -0.01657   4.78E+07   -585197.  -7.22E-05   895.1340   1.50E+13
3270.   4735980.       0.00
104.0000   -0.01739   3.46E+07   -505760.  -6.29E-06   744.3042   1.50E+13
3350.   4623554.       0.00
106.0000   -0.01687   2.35E+07   -425967.   4.02E-05   615.6491   1.50E+13
3300.   4693438.       0.00
108.0000   -0.01546   1.42E+07   -348468.   7.03E-05   508.8505   1.50E+13
3158.   4903503.       0.00
110.0000   -0.01350   6739622.   -275149.   8.70E-05   422.9812   1.50E+13
2951.   5247353.       0.00
112.0000   -0.01128    980529.   -207354.   9.32E-05   356.6771   1.50E+13
2698.   5740120.       0.00
114.0000   -0.00903  -3224548.   -146017.   9.14E-05   382.5124   1.50E+13
2413.   6417523.       0.00
116.0000   -0.00689  -6039250.    -91748.   8.40E-05   414.9179   1.50E+13
2109.   7343256.       0.00
118.0000   -0.00499  -7638547.    -44900.   7.31E-05   433.3305   1.50E+13
1795.   8628307.       0.00
120.0000   -0.00339  -8203213.     -6200.   6.04E-05   439.8315   1.50E+13
1430.   1.01E+07       0.00
122.0000   -0.00209  -7943378.     21957.   4.75E-05   436.8400   1.50E+13
916.3081   1.05E+07       0.00
124.0000   -0.00111  -7154987.     38964.   3.54E-05   427.7633   1.50E+13
500.9819   1.09E+07       0.00
126.0000  -3.93E-04  -6077344.     47184.   2.48E-05   415.3565   1.50E+13
183.9549   1.12E+07       0.00
128.0000   8.71E-05  -4893160.     48885.   1.61E-05   401.7230   1.50E+13
-42.1298   1.16E+07       0.00
130.0000   3.79E-04  -3732773.     46109.   9.18E-06   388.3635   1.50E+13
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(Full scour) 96in"


```
-189.2111   1.20E+07       0.00
132.0000   5.28E-04  -2681013.     40580.   4.05E-06   376.2547   1.50E+13
-271.5501   1.23E+07       0.00
134.0000   5.74E-04  -1785410.     33674.   4.82E-07   365.9437   1.50E+13
-303.9350   1.27E+07       0.00
136.0000   5.51E-04  -1064701.     26423.  -1.80E-06   357.6462   1.50E+13
-300.3661   1.31E+07       0.00
138.0000   4.87E-04   -516901.     19540.  -3.06E-06   351.3394   1.50E+13
-273.1922   1.35E+07       0.00
140.0000   4.04E-04   -126411.     13470.  -3.58E-06   346.8437   1.50E+13
-232.6398   1.38E+07       0.00
142.0000   3.16E-04    130091.      8439.  -3.57E-06   346.8861   1.50E+13
-186.6566   1.42E+07       0.00
144.0000   2.32E-04    279067.      4507.  -3.25E-06   348.6012   1.50E+13
-140.9913   1.46E+07       0.00
146.0000   1.60E-04    346805.      1622.  -2.75E-06   349.3811   1.50E+13
-99.4307   1.49E+07       0.00
148.0000   1.01E-04    357237.  -340.9870  -2.18E-06   349.5012   1.50E+13
-64.1252   1.53E+07       0.00
150.0000   5.51E-05    330699.     -1542.  -1.63E-06   349.1957   1.50E+13
-35.9495   1.57E+07       0.00
152.0000   2.22E-05    283423.     -2152.  -1.14E-06   348.6514   1.50E+13
-14.8548   1.60E+07       0.00
154.0000   2.72E-07    227563.     -2332.  -7.33E-07   348.0082   1.50E+13
-0.1859   1.64E+07       0.00
156.0000  -1.30E-05    171574.     -2226.  -4.14E-07   347.3636   1.50E+13
9.0544   1.68E+07       0.00
158.0000  -1.96E-05    120784.     -1949.  -1.80E-07   346.7789   1.50E+13
13.9981   1.71E+07       0.00
160.0000  -2.16E-05     78045.     -1592.  -2.13E-08   346.2869   1.50E+13
15.7640   1.75E+07       0.00
162.0000  -2.06E-05     44378.     -1218.   7.66E-08   345.8993   1.50E+13
15.3604   1.79E+07       0.00
164.0000  -1.79E-05     19555.  -870.4315   1.28E-07   345.6135   1.50E+13
13.6315   1.82E+07       0.00
166.0000  -1.45E-05      2582.  -571.9979   1.45E-07   345.4181   1.50E+13
11.2379   1.86E+07       0.00
168.0000  -1.09E-05     -7918.  -333.2201   1.41E-07   345.4795   1.50E+13
8.6602   1.90E+07       0.00
170.0000  -7.71E-06    -13429.  -154.6718   1.24E-07   345.5429   1.50E+13
6.2188   1.94E+07       0.00
172.0000  -4.99E-06    -15357.   -30.8285   1.01E-07   345.5651   1.50E+13
4.1015   1.97E+07       0.00
174.0000  -2.86E-06    -14921.    47.1163   7.69E-08   345.5601   1.50E+13
2.3939   2.01E+07       0.00
176.0000  -1.30E-06    -13105.    89.1519   5.45E-08   345.5392   1.50E+13
1.1090   2.05E+07       0.00
178.0000  -2.45E-07    -10648.   105.0130   3.55E-08   345.5109   1.50E+13
0.2127   2.08E+07       0.00
180.0000   4.02E-07     -8068.   103.3042   2.05E-08   345.4812   1.50E+13
-0.3551   2.12E+07       0.00
182.0000   7.40E-07     -5692.    91.0673   9.51E-09   345.4539   1.50E+13
-0.6646   2.16E+07       0.00
184.0000   8.59E-07     -3698.    73.6736   2.01E-09   345.4309   1.50E+13
-0.7849   2.19E+07       0.00
186.0000   8.36E-07     -2156.    54.9332  -2.67E-09   345.4132   1.50E+13
-0.7769   2.23E+07       0.00
188.0000   7.30E-07     -1061.    37.3312  -5.25E-09   345.4005   1.50E+13
-0.6900   2.27E+07       0.00
190.0000   5.84E-07  -363.5218    22.3218  -6.39E-09   345.3925   1.50E+13
-0.5608   2.30E+07       0.00
192.0000   4.24E-07    11.0934    10.6303  -6.67E-09   345.3885   1.50E+13
-0.4135   2.34E+07       0.00
```

```
  194.0000   2.64E-07   147.5342     2.5280  -6.54E-09   345.3900   1.50E+13
  -0.2617   2.38E+07       0.00
  196.0000   1.10E-07   133.2227    -1.9406  -6.32E-09   345.3899   1.50E+13
  -0.1107   2.41E+07       0.00
  198.0000  -3.90E-08    55.1418    -2.7909  -6.16E-09   345.3890   1.50E+13
  0.03983   2.45E+07       0.00
  200.0000  -1.86E-07       0.00       0.00  -6.12E-09   345.3883   1.50E+13
  0.1927   1.24E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 5:

```
Pile-head deflection             =     4.00568714 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -296386803. inch-lbs
Maximum shear force              =       -708868. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    96.00000000 feet below pile head
Number of iterations             =             13
Number of zero deflection points =              5
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 6

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)

```
Displacement of pile head                                =     5.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs
```

```
   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     5.0069  -3.59E+08    640615.       0.00      4482.   1.50E+13
      0.00       0.00       0.00
    2.0000     5.0000  -3.44E+08    640585.  -5.62E-04      4305.   1.50E+13
    0.00       0.00       0.00
    4.0000     4.9799  -3.28E+08    640585.   -0.00110      4127.   1.50E+13
    0.00       0.00       0.00
    6.0000     4.9472  -3.13E+08    640585.   -0.00161      3949.   1.50E+13
    0.00       0.00       0.00
    8.0000     4.9025  -2.98E+08    640585.   -0.00210      3771.   1.50E+13
    0.00       0.00       0.00
   10.0000     4.8464  -2.82E+08    640585.   -0.00256      3592.   1.50E+13
   0.00       0.00       0.00
   12.0000     4.7794  -2.66E+08    640585.   -0.00300      3413.   1.50E+13
   0.00       0.00       0.00
   14.0000     4.7022  -2.51E+08    640585.   -0.00342      3234.   1.50E+13
   0.00       0.00       0.00
   16.0000     4.6154  -2.35E+08    640585.   -0.00381      3055.   1.50E+13
   0.00       0.00       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(Full scour) 96in"


```
18.0000     4.5196  -2.20E+08    640585.   -0.00417      2875.   1.50E+13
0.00       0.00       0.00
20.0000     4.4153  -2.04E+08    640585.   -0.00451      2695.   1.50E+13
0.00       0.00       0.00
22.0000     4.3032  -1.88E+08    640585.   -0.00482      2515.   1.50E+13
0.00       0.00       0.00
24.0000     4.1839  -1.73E+08    640585.   -0.00511      2334.   1.50E+13
0.00       0.00       0.00
26.0000     4.0579  -1.57E+08    640585.   -0.00537      2154.   1.50E+13
0.00       0.00       0.00
28.0000     3.9259  -1.41E+08    640585.   -0.00561      1973.   1.50E+13
0.00       0.00       0.00
30.0000     3.7885  -1.26E+08    640585.   -0.00583      1792.   1.50E+13
0.00       0.00       0.00
32.0000     3.6463  -1.10E+08    640585.   -0.00601      1611.   1.50E+13
0.00       0.00       0.00
34.0000     3.4998  -9.42E+07    640585.   -0.00618      1430.   1.50E+13
0.00       0.00       0.00
36.0000     3.3497  -7.84E+07    640585.   -0.00632      1248.   1.50E+13
0.00       0.00       0.00
38.0000     3.1966  -6.27E+07    640585.   -0.00643      1067.   1.50E+13
0.00       0.00       0.00
40.0000     3.0412  -4.69E+07    640585.   -0.00652   885.4043   1.50E+13
0.00       0.00       0.00
42.0000     2.8839  -3.11E+07    640585.   -0.00658   703.8769   1.50E+13
0.00       0.00       0.00
44.0000     2.7254  -1.54E+07    640585.   -0.00662   522.3151   1.50E+13
0.00       0.00       0.00
46.0000     2.5663    404068.    640585.   -0.00663   350.0403   1.50E+13
0.00       0.00       0.00
48.0000     2.4073   1.62E+07    640585.   -0.00661   531.6187   1.50E+13
0.00       0.00       0.00
50.0000     2.2488   3.19E+07    640585.   -0.00658   713.1791   1.50E+13
0.00       0.00       0.00
52.0000     2.0916   4.77E+07    640585.   -0.00651   894.7043   1.50E+13
0.00       0.00       0.00
54.0000     1.9362   6.35E+07    640585.   -0.00642      1076.   1.50E+13
0.00       0.00       0.00
56.0000     1.7833   7.92E+07    640585.   -0.00631      1258.   1.50E+13
0.00       0.00       0.00
58.0000     1.6334   9.50E+07    640585.   -0.00617      1439.   1.50E+13
0.00       0.00       0.00
60.0000     1.4871   1.11E+08    640585.   -0.00601      1620.   1.50E+13
0.00       0.00       0.00
62.0000     1.3451   1.26E+08    640585.   -0.00582      1801.   1.50E+13
0.00       0.00       0.00
64.0000     1.2080   1.42E+08    640585.   -0.00560      1982.   1.50E+13
0.00       0.00       0.00
66.0000     1.0763   1.58E+08    630942.   -0.00536      2163.   1.50E+13
-803.5697     17919.       0.00
68.0000     0.9506   1.73E+08    600913.   -0.00510      2338.   1.50E+13
-1699.     42889.       0.00
70.0000     0.8316   1.87E+08    546931.   -0.00481      2502.   1.50E+13
-2800.     80795.       0.00
72.0000     0.7198   2.00E+08    468757.   -0.00450      2647.   1.50E+13
-3715.    123855.       0.00
74.0000     0.6157   2.10E+08    370686.   -0.00417      2767.   1.50E+13
-4458.    173763.       0.00
76.0000     0.5196   2.18E+08    256774.   -0.00383      2858.   1.50E+13
-5035.    232547.       0.00
78.0000     0.4319   2.23E+08    130965.   -0.00348      2914.   1.50E+13
-5449.    302762.       0.00
80.0000     0.3528   2.25E+08     -2800.   -0.00312      2935.   1.50E+13
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 -5698.    387596.       0.00
 82.0000     0.2823   2.23E+08   -140355.   -0.00276      2917.   1.50E+13
 -5765.    490059.       0.00
 84.0000     0.2204   2.19E+08   -276206.   -0.00241      2861.   1.50E+13
 -5556.    604988.       0.00
 86.0000     0.1669   2.10E+08   -405648.   -0.00206      2768.   1.50E+13
 -5231.    752295.       0.00
 88.0000     0.1214   1.99E+08   -526016.   -0.00173      2640.   1.50E+13
 -4800.    948785.       0.00
 90.0000    0.08360   1.85E+08   -633563.   -0.00143      2480.   1.50E+13
 -4162.   1194888.       0.00
 92.0000    0.05291   1.69E+08   -723246.   -0.00114      2292.   1.50E+13
 -3311.   1502065.       0.00
 94.0000    0.02870   1.51E+08   -792245.  -8.88E-04      2082.   1.50E+13
 -2439.   2039542.       0.00
 96.0000    0.01027   1.31E+08   -836187.  -6.63E-04      1855.   1.50E+13
 -1223.   2856960.       0.00
 98.0000   -0.00312   1.11E+08   -846127.  -4.69E-04      1620.   1.50E+13
 394.7485   3041280.       0.00
100.0000   -0.01226   9.06E+07   -814957.  -3.08E-04      1388.   1.50E+13
2203.   4313771.       0.00
102.0000   -0.01792   7.17E+07   -747719.  -1.79E-04      1170.   1.50E+13
3400.   4554313.       0.00
104.0000   -0.02083   5.47E+07   -662916.  -7.77E-05   975.1901   1.50E+13
3667.   4223860.       0.00
106.0000   -0.02165   3.99E+07   -574067.  -2.08E-06   804.2000   1.50E+13
3738.   4143647.       0.00
108.0000   -0.02093   2.71E+07   -485112.   5.15E-05   657.9513   1.50E+13
3675.   4213807.       0.00
110.0000   -0.01918   1.66E+07   -398795.   8.64E-05   536.0454   1.50E+13
3518.   4402584.       0.00
112.0000   -0.01678   7996288.   -317089.   1.06E-04   437.4491   1.50E+13
3291.   4705873.       0.00
114.0000   -0.01409   1327219.   -241418.   1.14E-04   360.6685   1.50E+13
3015.   5136991.       0.00
116.0000   -0.01134  -3605419.   -172785.   1.12E-04   386.8973   1.50E+13
2705.   5726296.       0.00
118.0000   -0.00872  -6979865.   -111858.   1.03E-04   425.7471   1.50E+13
2373.   6527370.       0.00
120.0000   -0.00638  -8986983.    -59037.   9.05E-05   448.8550   1.50E+13
2029.   7632672.       0.00
122.0000   -0.00438  -9824490.    -14510.   7.54E-05   458.4971   1.50E+13
1681.   9210607.       0.00
124.0000   -0.00276  -9692534.     20672.   5.98E-05   456.9779   1.50E+13
1250.   1.09E+07       0.00
126.0000   -0.00151  -8839408.     44165.   4.50E-05   447.1559   1.50E+13
707.2865   1.12E+07       0.00
128.0000  -5.99E-04  -7578036.     56131.   3.19E-05   432.6338   1.50E+13
289.8912   1.16E+07       0.00
130.0000   2.06E-05  -6148960.     59486.   2.09E-05   416.1810   1.50E+13
-10.3011   1.20E+07       0.00
132.0000   4.04E-04  -4725228.     56865.   1.22E-05   399.7896   1.50E+13
-208.1097   1.23E+07       0.00
134.0000   6.07E-04  -3420913.     50508.   5.70E-06   384.7731   1.50E+13
-321.6144   1.27E+07       0.00
136.0000   6.78E-04  -2301520.     42212.   1.13E-06   371.8856   1.50E+13
-369.7532   1.31E+07       0.00
138.0000   6.61E-04  -1394884.     33328.  -1.83E-06   361.4476   1.50E+13
-370.5607   1.35E+07       0.00
140.0000   5.90E-04   -701557.     24801.  -3.51E-06   353.4653   1.50E+13
-340.0080   1.38E+07       0.00
142.0000   4.93E-04   -204008.     17225.  -4.23E-06   347.7371   1.50E+13
-291.3630   1.42E+07       0.00
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  144.0000   3.87E-04    125736.     10909.  -4.29E-06   346.8359   1.50E+13
  -234.9700   1.46E+07       0.00
  146.0000   2.87E-04    320126.      5949.  -3.94E-06   349.0739   1.50E+13
  -178.3402   1.49E+07       0.00
  148.0000   1.98E-04    411760.      2291.  -3.35E-06   350.1289   1.50E+13
  -126.4512   1.53E+07       0.00
  150.0000   1.26E-04    430519.  -211.8960  -2.68E-06   350.3449   1.50E+13
  -82.1648   1.57E+07       0.00
  152.0000   6.99E-05    401910.     -1758.  -2.01E-06   350.0155   1.50E+13
  -46.6901   1.60E+07       0.00
  154.0000   2.93E-05    346369.     -2559.  -1.41E-06   349.3761   1.50E+13
  -20.0382   1.64E+07       0.00
  156.0000   2.05E-06    279253.     -2817.  -9.13E-07   348.6034   1.50E+13
  -1.4299   1.68E+07       0.00
  158.0000  -1.45E-05    211286.     -2709.  -5.21E-07   347.8209   1.50E+13
  10.3617   1.71E+07       0.00
  160.0000  -2.30E-05    149268.     -2384.  -2.33E-07   347.1068   1.50E+13
  16.7460   1.75E+07       0.00
  162.0000  -2.57E-05     96881.     -1954.  -3.57E-08   346.5037   1.50E+13
  19.1223   1.79E+07       0.00
  164.0000  -2.47E-05     55498.     -1499.   8.61E-08   346.0273   1.50E+13
  18.7552   1.82E+07       0.00
  166.0000  -2.15E-05     24914.     -1074.   1.50E-07   345.6752   1.50E+13
  16.7052   1.86E+07       0.00
  168.0000  -1.74E-05      3949.  -707.4685   1.73E-07   345.4338   1.50E+13
  13.8028   1.90E+07       0.00
  170.0000  -1.32E-05     -9065.  -414.0035   1.69E-07   345.4927   1.50E+13
  10.6526   1.94E+07       0.00
  172.0000  -9.32E-06    -15943.  -194.2753   1.49E-07   345.5719   1.50E+13
  7.6581   1.97E+07       0.00
  174.0000  -6.04E-06    -18409.   -41.7040   1.22E-07   345.6003   1.50E+13
  5.0562   2.01E+07       0.00
  176.0000  -3.47E-06    -17960.    54.4404   9.28E-08   345.5951   1.50E+13
  2.9558   2.05E+07       0.00
  178.0000  -1.58E-06    -15807.   106.4053   6.58E-08   345.5703   1.50E+13
  1.3746   2.08E+07       0.00
  180.0000  -3.07E-07    -12860.   126.1548   4.29E-08   345.5364   1.50E+13
  0.2712   2.12E+07       0.00
  182.0000   4.76E-07     -9756.   124.2744   2.48E-08   345.5007   1.50E+13
  -0.4279   2.16E+07       0.00
  184.0000   8.85E-07     -6898.   109.4325   1.15E-08   345.4677   1.50E+13
  -0.8089   2.19E+07       0.00
  186.0000   1.03E-06     -4505.    88.2477   2.41E-09   345.4402   1.50E+13
  -0.9565   2.23E+07       0.00
  188.0000   1.00E-06     -2662.    65.4281  -3.33E-09   345.4190   1.50E+13
  -0.9452   2.27E+07       0.00
  190.0000   8.70E-07     -1364.    44.0677  -6.54E-09   345.4040   1.50E+13
  -0.8349   2.30E+07       0.00
  192.0000   6.86E-07  -546.3561    26.0152  -8.07E-09   345.3946   1.50E+13
  -0.6695   2.34E+07       0.00
  194.0000   4.82E-07  -114.2998    12.2482  -8.60E-09   345.3896   1.50E+13
  -0.4777   2.38E+07       0.00
  196.0000   2.74E-07    42.5890     3.2119  -8.66E-09   345.3888   1.50E+13
  -0.2753   2.41E+07       0.00
  198.0000   6.67E-08    40.9082    -0.9087  -8.59E-09   345.3888   1.50E+13
  -0.06810   2.45E+07       0.00
  200.0000  -1.39E-07       0.00       0.00  -8.56E-09   345.3883   1.50E+13
  0.1438   1.24E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 6:

File name is incorrect below, run designation is "Channel Post Seismic Long.(Full scour) 96in"

Channel Static 24in.lp9o 10/4/2017

```
Pile-head deflection             =     5.00689434 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -359300017. inch-lbs
Maximum shear force              =       -846127. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    98.00000000 feet below pile head
Number of iterations             =             14
Number of zero deflection points =              5
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 7

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)

```
Displacement of pile head                                =     6.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	6.0080	-4.19E+08	737300.	0.00	5173.	1.50E+13	0.00	0.00	0.00
2.0000	6.0000	-4.02E+08	737265.	-6.56E-04	4969.	1.50E+13	0.00	0.00	0.00
4.0000	5.9765	-3.84E+08	737265.	-0.00128	4765.	1.50E+13	0.00	0.00	0.00
6.0000	5.9383	-3.66E+08	737265.	-0.00188	4560.	1.50E+13	0.00	0.00	0.00
8.0000	5.8861	-3.48E+08	737265.	-0.00246	4355.	1.50E+13	0.00	0.00	0.00
10.0000	5.8205	-3.30E+08	737265.	-0.00300	4149.	1.50E+13	0.00	0.00	0.00
12.0000	5.7422	-3.13E+08	737265.	-0.00351	3943.	1.50E+13	0.00	0.00	0.00
14.0000	5.6519	-2.95E+08	737265.	-0.00400	3737.	1.50E+13	0.00	0.00	0.00
16.0000	5.5503	-2.77E+08	737265.	-0.00445	3531.	1.50E+13	0.00	0.00	0.00
18.0000	5.4381	-2.59E+08	737265.	-0.00488	3324.	1.50E+13	0.00	0.00	0.00
20.0000	5.3160	-2.41E+08	737265.	-0.00528	3116.	1.50E+13	0.00	0.00	0.00
22.0000	5.1846	-2.23E+08	737265.	-0.00565	2909.	1.50E+13	0.00	0.00	0.00
24.0000	5.0447	-2.05E+08	737265.	-0.00599	2701.	1.50E+13	0.00	0.00	0.00
26.0000	4.8970	-1.87E+08	737265.	-0.00631	2493.	1.50E+13	0.00	0.00	0.00
28.0000	4.7420	-1.68E+08	737265.	-0.00659	2285.	1.50E+13	0.00	0.00	0.00
30.0000	4.5806	-1.50E+08	737265.	-0.00684	2077.	1.50E+13			

File name is incorrect below, run designation is "Channel Post Seismic Long.(Full scour) 96in"


```
0.00        0.00        0.00
32.0000      4.4135  -1.32E+08    737265.   -0.00707      1868.   1.50E+13
0.00        0.00        0.00
34.0000      4.2412  -1.14E+08    737265.   -0.00727      1659.   1.50E+13
0.00        0.00        0.00
36.0000      4.0646  -9.60E+07    737265.   -0.00744      1451.   1.50E+13
0.00        0.00        0.00
38.0000      3.8843  -7.79E+07    737265.   -0.00757      1242.   1.50E+13
0.00        0.00        0.00
40.0000      3.7010  -5.97E+07    737265.   -0.00768      1033.   1.50E+13
0.00        0.00        0.00
42.0000      3.5154  -4.15E+07    737265.   -0.00777   823.6830   1.50E+13
0.00        0.00        0.00
44.0000      3.3283  -2.34E+07    737265.   -0.00782   614.5815   1.50E+13
0.00        0.00        0.00
46.0000      3.1402  -5217248.    737265.   -0.00784   405.4542   1.50E+13
0.00        0.00        0.00
48.0000      2.9519   1.29E+07    737265.   -0.00783   494.4555   1.50E+13
0.00        0.00        0.00
50.0000      2.7642   3.11E+07    737265.   -0.00780   703.5743   1.50E+13
0.00        0.00        0.00
52.0000      2.5776   4.93E+07    737265.   -0.00773   912.6587   1.50E+13
0.00        0.00        0.00
54.0000      2.3929   6.74E+07    737265.   -0.00764      1122.   1.50E+13
0.00        0.00        0.00
56.0000      2.2108   8.56E+07    737265.   -0.00752      1331.   1.50E+13
0.00        0.00        0.00
58.0000      2.0320   1.04E+08    737265.   -0.00737      1540.   1.50E+13
0.00        0.00        0.00
60.0000      1.8571   1.22E+08    737265.   -0.00719      1748.   1.50E+13
0.00        0.00        0.00
62.0000      1.6870   1.40E+08    737265.   -0.00698      1957.   1.50E+13
0.00        0.00        0.00
64.0000      1.5222   1.58E+08    737265.   -0.00674      2165.   1.50E+13
0.00        0.00        0.00
66.0000      1.3634   1.76E+08    729551.   -0.00647      2374.   1.50E+13
-642.8313      11315.       0.00
68.0000      1.2115   1.94E+08    703863.   -0.00618      2577.   1.50E+13
-1498.      29672.       0.00
70.0000      1.0670   2.11E+08    655243.   -0.00585      2771.   1.50E+13
-2554.      57446.       0.00
72.0000      0.9305   2.26E+08    580639.   -0.00550      2948.   1.50E+13
-3663.      94480.       0.00
74.0000      0.8028   2.39E+08    481685.   -0.00513      3100.   1.50E+13
-4583.     137017.       0.00
76.0000      0.6842   2.50E+08    362817.   -0.00474      3221.   1.50E+13
-5323.     186712.       0.00
78.0000      0.5752   2.57E+08    228303.   -0.00434      3307.   1.50E+13
-5887.     245635.       0.00
80.0000      0.4761   2.61E+08     82335.   -0.00392      3353.   1.50E+13
-6277.     316464.       0.00
82.0000      0.3869   2.62E+08    -70897.   -0.00350      3358.   1.50E+13
-6492.     402660.       0.00
84.0000      0.3079   2.58E+08   -227037.   -0.00309      3319.   1.50E+13
-6520.     508207.       0.00
86.0000      0.2387   2.51E+08   -380351.   -0.00268      3236.   1.50E+13
-6257.     628957.       0.00
88.0000      0.1792   2.40E+08   -525410.   -0.00229      3112.   1.50E+13
-5832.     780915.       0.00
90.0000      0.1289   2.26E+08   -657419.   -0.00191      2949.   1.50E+13
-5169.     962173.       0.00
92.0000     0.08732   2.09E+08   -770497.   -0.00157      2752.   1.50E+13
-4254.    1169163.       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(Full scour) 96in"


```
 94.0000    0.05373   1.89E+08   -861590.   -0.00125      2526.   1.50E+13
 -3337.   1490475.       0.00
 96.0000    0.02741   1.68E+08   -930236.  -9.63E-04      2277.   1.50E+13
 -2383.   2086914.       0.00
 98.0000    0.00753   1.45E+08   -970283.  -7.13E-04      2013.   1.50E+13
 -953.7375   3041280.       0.00
100.0000   -0.00680   1.21E+08   -962041.  -5.00E-04      1742.   1.50E+13
1641.   5790218.       0.00
102.0000   -0.01647   9.87E+07   -903235.  -3.24E-04      1482.   1.50E+13
3260.   4750141.       0.00
104.0000   -0.02235   7.80E+07   -818542.  -1.83E-04      1243.   1.50E+13
3798.   4077590.       0.00
106.0000   -0.02524   5.94E+07   -724535.  -7.29E-05      1030.   1.50E+13
4036.   3837139.       0.00
108.0000   -0.02585   4.32E+07   -627091.   9.19E-06   842.9519   1.50E+13
4084.   3791718.       0.00
110.0000   -0.02480   2.93E+07   -530071.   6.72E-05   683.1924   1.50E+13
4001.   3871144.       0.00
112.0000   -0.02263   1.78E+07   -436211.   1.05E-04   549.9304   1.50E+13
3821.   4053007.       0.00
114.0000   -0.01977   8390550.   -347497.   1.26E-04   441.9883   1.50E+13
3572.   4336055.       0.00
116.0000   -0.01659   1071321.   -265374.   1.33E-04   357.7224   1.50E+13
3272.   4733382.       0.00
118.0000   -0.01337  -4363406.   -190866.   1.31E-04   395.6240   1.50E+13
2937.   5272805.       0.00
120.0000   -0.01032  -8105912.   -124659.   1.21E-04   438.7112   1.50E+13
2580.   6002623.       0.00
122.0000   -0.00757  -1.04E+07    -67170.   1.06E-04   464.6801   1.50E+13
2211.   7005535.       0.00
124.0000   -0.00523  -1.13E+07    -18599.   8.86E-05   475.9774   1.50E+13
1837.   8431045.       0.00
126.0000   -0.00332  -1.13E+07     21007.   7.05E-05   475.0809   1.50E+13
1464.   1.06E+07       0.00
128.0000   -0.00184  -1.03E+07     49270.   5.33E-05   464.4660   1.50E+13
891.6087   1.16E+07       0.00
130.0000  -7.63E-04  -8906385.     64538.   3.79E-05   447.9270   1.50E+13
380.7719   1.20E+07       0.00
132.0000  -2.45E-05  -7249653.     69259.   2.50E-05   428.8532   1.50E+13
12.6316   1.23E+07       0.00
134.0000   4.35E-04  -5584949.     66642.   1.47E-05   409.6875   1.50E+13
-230.7544   1.27E+07       0.00
136.0000   6.81E-04  -4052624.     59416.   7.00E-06   392.0460   1.50E+13
-371.4014   1.31E+07       0.00
138.0000   7.71E-04  -2733838.     49770.   1.57E-06   376.8629   1.50E+13
-432.4015   1.35E+07       0.00
140.0000   7.56E-04  -1663852.     39352.  -1.95E-06   364.5442   1.50E+13
-435.7397   1.38E+07       0.00
142.0000   6.78E-04   -844693.     29313.  -3.95E-06   355.1132   1.50E+13
-400.8642   1.42E+07       0.00
144.0000   5.67E-04   -256351.     20376.  -4.83E-06   348.3397   1.50E+13
-343.9057   1.46E+07       0.00
146.0000   4.46E-04    133927.     12920.  -4.93E-06   346.9302   1.50E+13
-277.4161   1.49E+07       0.00
148.0000   3.30E-04    364399.      7065.  -4.53E-06   349.5836   1.50E+13
-210.4894   1.53E+07       0.00
150.0000   2.28E-04    473595.      2750.  -3.86E-06   350.8408   1.50E+13
-149.1361   1.57E+07       0.00
152.0000   1.45E-04    496843.  -201.6475  -3.09E-06   351.1085   1.50E+13
-96.8007   1.60E+07       0.00
154.0000   8.04E-05    464286.     -2022.  -2.32E-06   350.7336   1.50E+13
-54.9305   1.64E+07       0.00
156.0000   3.37E-05    400045.     -2964.  -1.63E-06   349.9940   1.50E+13
```

```
  -23.5309   1.68E+07       0.00
  158.0000   2.33E-06    322211.     -3266.  -1.05E-06   349.0979   1.50E+13
  -1.6620   1.71E+07       0.00
  160.0000  -1.67E-05    243390.     -3140.  -5.96E-07   348.1905   1.50E+13
  12.1479   1.75E+07       0.00
  162.0000  -2.63E-05    171542.     -2760.  -2.64E-07   347.3633   1.50E+13
  19.5826   1.79E+07       0.00
  164.0000  -2.93E-05    110957.     -2257.  -3.85E-08   346.6658   1.50E+13
  22.3080   1.82E+07       0.00
  166.0000  -2.81E-05     63211.     -1727.   1.01E-07   346.1161   1.50E+13
  21.8242   1.86E+07       0.00
  168.0000  -2.45E-05     28030.     -1233.   1.74E-07   345.7110   1.50E+13
  19.3845   1.90E+07       0.00
  170.0000  -1.98E-05      4011.  -808.6931   1.99E-07   345.4345   1.50E+13
  15.9659   1.94E+07       0.00
  172.0000  -1.49E-05    -10812.  -469.7885   1.94E-07   345.5128   1.50E+13
  12.2762   1.97E+07       0.00
  174.0000  -1.05E-05    -18562.  -217.0606   1.70E-07   345.6020   1.50E+13
  8.7845   2.01E+07       0.00
  176.0000  -6.76E-06    -21251.   -42.4845   1.39E-07   345.6330   1.50E+13
  5.7635   2.05E+07       0.00
  178.0000  -3.84E-06    -20618.    66.7053   1.05E-07   345.6257   1.50E+13
  3.3356   2.08E+07       0.00
  180.0000  -1.72E-06    -18062.   124.9364   7.41E-08   345.5963   1.50E+13
  1.5170   2.12E+07       0.00
  182.0000  -2.85E-07    -14630.   146.2094   4.80E-08   345.5568   1.50E+13
  0.2558   2.16E+07       0.00
  184.0000   5.87E-07    -11049.   142.8438   2.75E-08   345.5155   1.50E+13
  -0.5363   2.19E+07       0.00
  186.0000   1.03E-06     -7777.   124.8762   1.24E-08   345.4779   1.50E+13
  -0.9610   2.23E+07       0.00
  188.0000   1.18E-06     -5057.    99.9319   2.16E-09   345.4466   1.50E+13
  -1.1176   2.27E+07       0.00
  190.0000   1.14E-06     -2980.    73.4100  -4.26E-09   345.4226   1.50E+13
  -1.0925   2.30E+07       0.00
  192.0000   9.79E-07     -1533.    48.8462  -7.87E-09   345.4060   1.50E+13
  -0.9545   2.34E+07       0.00
  194.0000   7.60E-07  -634.7025    28.3541  -9.60E-09   345.3956   1.50E+13
  -0.7532   2.38E+07       0.00
  196.0000   5.18E-07  -170.5247    13.0662  -1.02E-08   345.3903   1.50E+13
  -0.5208   2.41E+07       0.00
  198.0000   2.68E-07    -6.2964     3.5266  -1.04E-08   345.3884   1.50E+13
  -0.2742   2.45E+07       0.00
  200.0000   1.90E-08       0.00       0.00  -1.04E-08   345.3883   1.50E+13
  -0.01970   1.24E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 7:

```
Pile-head deflection             =     6.00804672 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -419357055. inch-lbs
Maximum shear force              =       -970283. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    98.00000000 feet below pile head
Number of iterations             =             15
Number of zero deflection points =              5
```

--

File name is incorrect below, run designation is "Channel Post Seismic Long.(Full scour) 96in"

Channel Static 24in.lp9o 10/4/2017

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type 1	Load 1 lbs	Load Type 2	Pile-head Load 2 in-lbs	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile	Max Moment in Pile
1	y, in	0.5000	S, rad	0.00	2500000.	0.5008	0.00	-106756.	-4.24E+07
2	y, in	1.0000	S, rad	0.00	2500000.	1.0016	0.00	-209197.	-8.34E+07
3	y, in	2.0000	S, rad	0.00	2500000.	2.0031	0.00	-394242.	-1.60E+08
4	y, in	3.0000	S, rad	0.00	2500000.	3.0044	0.00	-559553.	-2.30E+08
5	y, in	4.0000	S, rad	0.00	2500000.	4.0057	0.00	-708868.	-2.96E+08
6	y, in	5.0000	S, rad	0.00	2500000.	5.0069	0.00	-846127.	-3.59E+08
7	y, in	6.0000	S, rad	0.00	2500000.	6.0080	0.00	-970283.	-4.19E+08

Maximum pile-head deflection = 6.0080467241 inches
Maximum pile-head rotation = 0.0000000000 radians = 0.000000 deg.

The analysis ended normally.

File name is incorrect below, run designation is "Channel Post Seismic Long.(Half scour) 96in"

==========
==

LPile for Windows, Version 2016-09.009

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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--
Files Used for Analysis

--

Path to file locations:
\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis
\L-Pile\Point of Fixity Calculations (200 ft Embedment)\Channel\Longitudinal
\Post Seismic (Half Scour)\

Name of input data file:
Channel Static 24in.lp9d

Name of output report file:
Channel Static 24in.lp9o

Name of plot output file:
Channel Static 24in.lp9p

Name of runtime message file:
Channel Static 24in.lp9r

--
Date and Time of Analysis

--

Date: October 4, 2017 Time: 15:45:44

File name is incorrect below, run designation is "Channel Post Seismic Long.(Half scour) 96in"


```
--
                                   Problem Title
-------------------------------------------------------------------------------
--

Project Name: Harbor River Bridge
Job Number: 18461-007-01
Client: SCDOT
Engineer: HPC
Description: Channel - Static



-------------------------------------------------------------------------------
--
                           Program Options and Settings
-------------------------------------------------------------------------------
--

Computational Options:
 - Use unfactored loads in computations (conventional analysis)
Engineering Units Used for Data Input and Computations:
 - US Customary System Units (pounds, feet, inches)

Analysis Control Options:
 - Maximum number of iterations allowed                =          500
 - Deflection tolerance for convergence                =   1.0000E-05 in
 - Maximum allowable deflection                        =     100.0000 in
 - Number of pile increments                           =          100

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Computation of pile-head foundation stiffness matrix not selected
 - Push-over analysis of pile not selected
 - Buckling analysis of pile not selected

Output Options:
 - Output files use decimal points to denote decimal symbols.
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1
 - No p-y curves to be computed and reported for user-specified depths
 - Print using wide report formats



-------------------------------------------------------------------------------
--
                     Pile Structural Properties and Geometry
-------------------------------------------------------------------------------
--

Number of pile sections defined                        =            1
Total length of pile                                   =      200.000 ft
Depth of ground surface below top of pile              =      55.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(Half scour) 96in"

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	96.0000
2	200.000	96.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile

Cross-sectional Shape	=	Circular Pile
Length of section	=	200.000000 ft
Width of top of section	=	96.000000 in
Width of bottom of section	=	96.000000 in
Top Area	=	7238. sq. in
Bottom Area	=	7238. sq. in
Moment of Inertia at Top	=	4169220. in^4
Moment of Inertia at Bottom	=	4169220. in^4
Elastic Modulus	=	3600000. psi

Ground Slope and Pile Batter Angles

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	55.000000 ft
Distance from top of pile to bottom of layer	=	60.000000 ft
Effective unit weight at top of layer	=	37.600000 pcf
Effective unit weight at bottom of layer	=	37.600000 pcf
Undrained cohesion at top of layer	=	0.0000 psf
Undrained cohesion at bottom of layer	=	15.000000 psf
Epsilon-50 at top of layer	=	0.020000

```
   Epsilon-50 at bottom of layer                        =     0.020000


Layer 2 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer            =    60.000000 ft
   Distance from top of pile to bottom of layer         =   100.000000 ft
   Effective unit weight at top of layer                =    57.600000 pcf
   Effective unit weight at bottom of layer             =    57.600000 pcf
   Undrained cohesion at top of layer                   =        3400. psf
   Undrained cohesion at bottom of layer                =        3400. psf
   Epsilon-50 at top of layer                           =     0.005000
   Epsilon-50 at bottom of layer                        =     0.005000
   Subgrade k at top of layer                           =   400.000000 pci
   Subgrade k at bottom of layer                        =   400.000000 pci


Layer 3 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer            =   100.000000 ft
   Distance from top of pile to bottom of layer         =   210.000000 ft
   Effective unit weight at top of layer                =    57.600000 pcf
   Effective unit weight at bottom of layer             =    57.600000 pcf
   Undrained cohesion at top of layer                   =        6000. psf
   Undrained cohesion at bottom of layer                =        6000. psf
   Epsilon-50 at top of layer                           =     0.005000
   Epsilon-50 at bottom of layer                        =     0.005000
   Subgrade k at top of layer                           =   800.000000 pci
   Subgrade k at bottom of layer                        =   800.000000 pci


 (Depth of the lowest soil layer extends 10.000 ft below the pile tip)



--------------------------------------------------------------------------------
--
                        Summary of Input Soil Properties
--------------------------------------------------------------------------------
--

Layer         Soil Type          Layer      Effective    Undrained       E50
Layer           Name             Depth       Unit Wt.    Cohesion        or
kpy
 Num.     (p-y Curve Type)        ft           pcf          psf          krm
 pci
-----   -------------------   ----------   ----------   ----------
----------   ----------
  1            Soft              55.0000      37.6000         0.00
  0.02000       --
               Clay              60.0000      37.6000      15.0000
               0.02000       --
  2         Stiff Clay           60.0000      57.6000        3400.
  0.00500     400.0000
          with Free Water       100.0000      57.6000        3400.
          0.00500     400.0000
  3         Stiff Clay          100.0000      57.6000        6000.
  0.00500     800.0000
          with Free Water       210.0000      57.6000        6000.
          0.00500     800.0000


--------------------------------------------------------------------------------
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(Half scour) 96in"


```
--
                    p-y Modification Factors for Group Action
-----------------------------------------------------------------------------
--

Distribution of p-y modifiers with depth defined using 4 points

Point      Depth X         p-mult         y-mult
 No.          ft
-----     ----------     ----------     ----------
  1          55.000         0.0800         1.0000
  2          60.000         0.0800         1.0000
  3          60.000         0.8000         1.0000
  4         210.000         0.8000         1.0000



-----------------------------------------------------------------------------
--
                                Static Loading Type
-----------------------------------------------------------------------------
--

Static loading criteria were used when computing p-y curves for all analyses.



-----------------------------------------------------------------------------
--
                Pile-head Loading and Pile-head Fixity Conditions
-----------------------------------------------------------------------------
--

Number of loads specified = 7

Load    Load         Condition               Condition            Axial Thrust
Compute Top y
 No.    Type            1                       2                  Force, lbs
 vs. Pile Length
-----   ----   --------------------   -----------------------
----------------   ---------------
   1     5     y =     0.500000 in    S =       0.0000 in/in
   2500000.          N.A.
   2     5     y =     1.000000 in    S =       0.0000 in/in
   2500000.          N.A.
   3     5     y =     2.000000 in    S =       0.0000 in/in
   2500000.          N.A.
   4     5     y =     3.000000 in    S =       0.0000 in/in
   2500000.          N.A.
   5     5     y =     4.000000 in    S =       0.0000 in/in
   2500000.          N.A.
   6     5     y =     5.000000 in    S =       0.0000 in/in
   2500000.          N.A.
   7     5     y =     6.000000 in    S =       0.0000 in/in
   2500000.          N.A.

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with
```

specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

---

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

---

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	55.0000	0.00	N.A.	No	0.00	3461.
2	60.0000	16.3437	No	No	3461.	1016444.
3	100.0000	56.3437	Yes	No	1019905.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 2500000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p	Soil Spr. Es*h	Distrib. Lat. Load				

File name is incorrect below, run designation is "Channel Post Seismic Long.(Half scour) 96in"

Channel Static 24in.lp9o 10/4/2017

lb/inch	lb/inch	lb/inch				
0.00	0.5010	-5.20E+07	111687.	0.00	944.0294	1.50E+13
0.00	0.00	0.00				
2.0000	0.5000	-4.93E+07	111682.	-8.10E-05	913.1418	1.50E+13
0.00	0.00	0.00				
4.0000	0.4971	-4.66E+07	111682.	-1.58E-04	882.1998	1.50E+13
0.00	0.00	0.00				
6.0000	0.4924	-4.39E+07	111682.	-2.30E-04	851.2063	1.50E+13
0.00	0.00	0.00				
8.0000	0.4861	-4.12E+07	111682.	-2.98E-04	820.1643	1.50E+13
0.00	0.00	0.00				
10.0000	0.4781	-3.85E+07	111682.	-3.62E-04	789.0767	1.50E+13
0.00	0.00	0.00				
12.0000	0.4687	-3.58E+07	111682.	-4.21E-04	757.9466	1.50E+13
0.00	0.00	0.00				
14.0000	0.4579	-3.31E+07	111682.	-4.77E-04	726.7769	1.50E+13
0.00	0.00	0.00				
16.0000	0.4458	-3.04E+07	111682.	-5.27E-04	695.5705	1.50E+13
0.00	0.00	0.00				
18.0000	0.4326	-2.77E+07	111682.	-5.74E-04	664.3306	1.50E+13
0.00	0.00	0.00				
20.0000	0.4183	-2.50E+07	111682.	-6.16E-04	633.0601	1.50E+13
0.00	0.00	0.00				
22.0000	0.4030	-2.23E+07	111682.	-6.54E-04	601.7620	1.50E+13
0.00	0.00	0.00				
24.0000	0.3869	-1.95E+07	111682.	-6.87E-04	570.4393	1.50E+13
0.00	0.00	0.00				
26.0000	0.3700	-1.68E+07	111682.	-7.16E-04	539.0950	1.50E+13
0.00	0.00	0.00				
28.0000	0.3525	-1.41E+07	111682.	-7.41E-04	507.7321	1.50E+13
0.00	0.00	0.00				
30.0000	0.3345	-1.14E+07	111682.	-7.61E-04	476.3536	1.50E+13
0.00	0.00	0.00				
32.0000	0.3160	-8648895.	111682.	-7.77E-04	444.9626	1.50E+13
0.00	0.00	0.00				
34.0000	0.2971	-5921479.	111682.	-7.89E-04	413.5620	1.50E+13
0.00	0.00	0.00				
36.0000	0.2781	-3193496.	111682.	-7.96E-04	382.1549	1.50E+13
0.00	0.00	0.00				
38.0000	0.2589	-465206.	111682.	-7.99E-04	350.7442	1.50E+13
0.00	0.00	0.00				
40.0000	0.2397	2263129.	111682.	-7.98E-04	371.4436	1.50E+13
0.00	0.00	0.00				
42.0000	0.2206	4991246.	111682.	-7.92E-04	402.8523	1.50E+13
0.00	0.00	0.00				
44.0000	0.2017	7718885.	111682.	-7.82E-04	434.2554	1.50E+13
0.00	0.00	0.00				
46.0000	0.1831	1.04E+07	111682.	-7.67E-04	465.6501	1.50E+13
0.00	0.00	0.00				
48.0000	0.1649	1.32E+07	111682.	-7.48E-04	497.0331	1.50E+13
0.00	0.00	0.00				
50.0000	0.1472	1.59E+07	111682.	-7.25E-04	528.4017	1.50E+13
0.00	0.00	0.00				
52.0000	0.1301	1.86E+07	111682.	-6.98E-04	559.7527	1.50E+13
0.00	0.00	0.00				
54.0000	0.1137	2.13E+07	111682.	-6.66E-04	591.0831	1.50E+13
0.00	0.00	0.00				
56.0000	0.09811	2.41E+07	111679.	-6.29E-04	622.3899	1.50E+13
-0.1969	48.1550	0.00				
58.0000	0.08347	2.68E+07	111670.	-5.89E-04	653.6689	1.50E+13
-0.5596	160.9009	0.00				

File name is incorrect below, run designation is "Channel Post Seismic Long.(Half scour) 96in"


```
 60.0000    0.06986   2.95E+07    101260.  -5.44E-04   684.9146   1.50E+13
 -866.9859    297863.       0.00
 62.0000    0.05737   3.17E+07     72350.  -4.95E-04   710.3783   1.50E+13
 -1542.    645120.       0.00
 64.0000    0.04611   3.30E+07     34722.  -4.43E-04   725.5800   1.50E+13
 -1593.    829440.       0.00
 66.0000    0.03611   3.34E+07     -2701.  -3.90E-04   730.1786   1.50E+13
 -1525.   1013760.       0.00
 68.0000    0.02739   3.29E+07    -37410.  -3.37E-04   724.6263   1.50E+13
 -1367.   1198080.       0.00
 70.0000    0.01994   3.17E+07    -67598.  -2.85E-04   709.9706   1.50E+13
 -1148.   1382400.       0.00
 72.0000    0.01370   2.97E+07    -92109.  -2.36E-04   687.6645   1.50E+13
 -894.2905   1566720.       0.00
 74.0000    0.00860   2.73E+07   -110373.  -1.91E-04   659.3952   1.50E+13
 -627.6533   1751040.       0.00
 76.0000    0.00455   2.45E+07   -122310.  -1.49E-04   626.9335   1.50E+13
 -367.1375   1935360.       0.00
 78.0000    0.00144   2.14E+07   -128243.  -1.13E-04   592.0101   1.50E+13
 -127.3019   2119680.       0.00
 80.0000  -8.48E-04   1.83E+07   -128794.  -8.07E-05   556.2189   1.50E+13
 81.4062   2304000.       0.00
 82.0000   -0.00243   1.52E+07   -124788.  -5.39E-05   520.9472   1.50E+13
 252.4158   2488320.       0.00
 84.0000   -0.00344   1.23E+07   -117168.  -3.19E-05   487.3326   1.50E+13
 382.6278   2672640.       0.00
 86.0000   -0.00396   9628596.   -106914.  -1.43E-05   456.2418   1.50E+13
 471.8976   2856960.       0.00
 88.0000   -0.00412   7198975.    -94981.  -8.58E-07   428.2697   1.50E+13
 522.4567   3041280.       0.00
 90.0000   -0.00401   5069598.    -82252.   8.95E-06   403.7543   1.50E+13
 538.3230   3225600.       0.00
 92.0000   -0.00369   3249809.    -69495.   1.56E-05   382.8032   1.50E+13
 524.7417   3409920.       0.00
 94.0000   -0.00326   1731959.    -57346.   1.96E-05   365.3283   1.50E+13
 487.6890   3594240.       0.00
 96.0000   -0.00275    494852.    -46292.   2.14E-05   351.0855   1.50E+13
 433.4625   3778560.       0.00
 98.0000   -0.00223   -492628.    -36670.   2.14E-05   351.0599   1.50E+13
 368.3699   3962880.       0.00
100.0000   -0.00173  -1267879.    -25085.   2.00E-05   359.9854   1.50E+13
597.0440   8294400.       0.00
102.0000   -0.00127  -1699112.    -12407.   1.76E-05   364.9501   1.50E+13
459.4480   8663040.       0.00
104.0000  -8.83E-04  -1865540.     -2905.   1.47E-05   366.8662   1.50E+13
332.4217   9031680.       0.00
106.0000  -5.65E-04  -1840313.      3742.   1.18E-05   366.5758   1.50E+13
221.4714   9400320.       0.00
108.0000  -3.18E-04  -1687343.      7954.   8.95E-06   364.8146   1.50E+13
129.5021   9768960.       0.00
110.0000  -1.36E-04  -1459617.     10195.   6.44E-06   362.1928   1.50E+13
57.2884   1.01E+07       0.00
112.0000  -9.11E-06  -1198754.     10930.   4.31E-06   359.1895   1.50E+13
3.9885   1.05E+07       0.00
114.0000   7.14E-05   -935478.     10590.   2.61E-06   356.1584   1.50E+13
-32.3526   1.09E+07       0.00
116.0000   1.16E-04   -690747.      9550.   1.31E-06   353.3409   1.50E+13
-54.3484   1.12E+07       0.00
118.0000   1.34E-04   -477255.      8119.   3.73E-07   350.8829   1.50E+13
-64.8888   1.16E+07       0.00
120.0000   1.34E-04   -301093.      6538.  -2.50E-07   348.8548   1.50E+13
-66.8423   1.20E+07       0.00
122.0000   1.22E-04   -163403.      4982.  -6.21E-07   347.2696   1.50E+13
```

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```
-62.8435   1.23E+07       0.00
124.0000   1.04E-04    -61896.      3566.  -8.01E-07   346.1009   1.50E+13
-55.1602   1.27E+07       0.00
126.0000   8.37E-05      7846.      2356.  -8.44E-07   345.4787   1.50E+13
-45.6274   1.31E+07       0.00
128.0000   6.36E-05     51305.      1381.  -7.97E-07   345.9790   1.50E+13
-35.6364   1.35E+07       0.00
130.0000   4.54E-05     74233.   639.4903  -6.97E-07   346.2430   1.50E+13
-26.1616   1.38E+07       0.00
132.0000   3.01E-05     82084.   111.7837  -5.72E-07   346.3334   1.50E+13
-17.8140   1.42E+07       0.00
134.0000   1.80E-05     79667.  -232.8772  -4.42E-07   346.3055   1.50E+13
-10.9078   1.46E+07       0.00
136.0000   8.89E-06     70959.  -430.1342  -3.22E-07   346.2053   1.50E+13
-5.5303   1.49E+07       0.00
138.0000   2.53E-06     59059.  -515.8127  -2.18E-07   346.0683   1.50E+13
-1.6096   1.53E+07       0.00
140.0000  -1.57E-06     46226.  -522.8009  -1.34E-07   345.9205   1.50E+13
1.0272   1.57E+07       0.00
142.0000  -3.90E-06     33981.  -479.2201  -6.97E-08   345.7795   1.50E+13
2.6045   1.60E+07       0.00
144.0000  -4.92E-06     23232.  -407.6222  -2.39E-08   345.6558   1.50E+13
3.3619   1.64E+07       0.00
146.0000  -5.05E-06     14418.  -324.9476   6.15E-09   345.5543   1.50E+13
3.5276   1.68E+07       0.00
148.0000  -4.62E-06      7634.  -242.9920   2.38E-08   345.4762   1.50E+13
3.3020   1.71E+07       0.00
150.0000  -3.91E-06      2751.  -169.1713   3.21E-08   345.4200   1.50E+13
2.8497   1.75E+07       0.00
152.0000  -3.08E-06  -490.2968  -107.4153   3.39E-08   345.3940   1.50E+13
2.2967   1.79E+07       0.00
154.0000  -2.28E-06     -2409.   -59.0638   3.16E-08   345.4161   1.50E+13
1.7326   1.82E+07       0.00
156.0000  -1.57E-06     -3329.   -23.6844   2.70E-08   345.4267   1.50E+13
1.2156   1.86E+07       0.00
158.0000  -9.83E-07     -3549.     0.2372   2.15E-08   345.4292   1.50E+13
0.7778   1.90E+07       0.00
160.0000  -5.36E-07     -3320.    14.7543   1.60E-08   345.4266   1.50E+13
0.4319   1.94E+07       0.00
162.0000  -2.15E-07     -2843.    22.0610   1.11E-08   345.4211   1.50E+13
0.1770   1.97E+07       0.00
164.0000  -4.18E-09     -2263.    24.2266   6.99E-09   345.4144   1.50E+13
0.00350   2.01E+07       0.00
166.0000   1.20E-07     -1681.    23.0394   3.84E-09   345.4077   1.50E+13
-0.1024   2.05E+07       0.00
168.0000   1.80E-07     -1157.    19.9356   1.57E-09   345.4017   1.50E+13
-0.1562   2.08E+07       0.00
170.0000   1.95E-07  -723.8859    15.9899   6.41E-11   345.3967   1.50E+13
-0.1726   2.12E+07       0.00
172.0000   1.83E-07  -389.8074    11.9446  -8.26E-10   345.3928   1.50E+13
-0.1645   2.16E+07       0.00
174.0000   1.56E-07  -150.4463     8.2623  -1.26E-09   345.3901   1.50E+13
-0.1424   2.19E+07       0.00
176.0000   1.23E-07     6.9317     5.1859  -1.37E-09   345.3884   1.50E+13
-0.1140   2.23E+07       0.00
178.0000   8.99E-08    98.6429     2.7992  -1.29E-09   345.3895   1.50E+13
-0.08489   2.27E+07       0.00
180.0000   6.08E-08   141.4502     1.0799  -1.10E-09   345.3900   1.50E+13
-0.05839   2.30E+07       0.00
182.0000   3.72E-08   150.6089   -0.05651  -8.63E-10   345.3901   1.50E+13
-0.03631   2.34E+07       0.00
184.0000   1.94E-08   138.8414    -0.7228  -6.32E-10   345.3899   1.50E+13
-0.01922   2.38E+07       0.00
```

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  186.0000   6.90E-09   115.9916    -1.0367  -4.28E-10   345.3897   1.50E+13
  -0.00694   2.41E+07       0.00
  188.0000  -1.15E-09    89.1321    -1.1059  -2.64E-10   345.3894   1.50E+13
  0.00117   2.45E+07       0.00
  190.0000  -5.77E-09    62.9381    -1.0201  -1.42E-10   345.3891   1.50E+13
  0.00598   2.49E+07       0.00
  192.0000  -7.98E-09    40.1844    -0.8475  -5.99E-11   345.3888   1.50E+13
  0.00840   2.53E+07       0.00
  194.0000  -8.65E-09    22.2634    -0.6360  -1.00E-11   345.3886   1.50E+13
  0.00923   2.56E+07       0.00
  196.0000  -8.46E-09     9.6579    -0.4153   1.55E-11   345.3884   1.50E+13
  0.00916   2.60E+07       0.00
  198.0000  -7.90E-09     2.3291    -0.2011   2.51E-11   345.3884   1.50E+13
  0.00868   2.64E+07       0.00
  200.0000  -7.26E-09       0.00       0.00   2.70E-11   345.3883   1.50E+13
  0.00808   1.34E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.50099774 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -51997215. inch-lbs
Maximum shear force              =       -128794. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    80.00000000 feet below pile head
Number of iterations             =              6
Number of zero deflection points =              5
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 1.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 2500000.0 lbs

```
   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     1.0020  -1.03E+08    220902.       0.00      1534.   1.50E+13
      0.00       0.00       0.00
    2.0000     1.0000  -9.79E+07    220892.  -1.61E-04      1473.   1.50E+13
    0.00       0.00       0.00
    4.0000     0.9943  -9.26E+07    220892.  -3.13E-04      1412.   1.50E+13
    0.00       0.00       0.00
    6.0000     0.9850  -8.73E+07    220892.  -4.57E-04      1351.   1.50E+13
    0.00       0.00       0.00
    8.0000     0.9723  -8.20E+07    220892.  -5.92E-04      1289.   1.50E+13
    0.00       0.00       0.00
```

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```
10.0000     0.9565  -7.66E+07    220892.  -7.19E-04      1228.   1.50E+13
0.00       0.00       0.00
12.0000     0.9378  -7.13E+07    220892.  -8.37E-04      1166.   1.50E+13
0.00       0.00       0.00
14.0000     0.9163  -6.59E+07    220892.  -9.47E-04      1104.   1.50E+13
0.00       0.00       0.00
16.0000     0.8923  -6.06E+07    220892.   -0.00105      1043.   1.50E+13
0.00       0.00       0.00
18.0000     0.8660  -5.52E+07    220892.   -0.00114   980.8693   1.50E+13
0.00       0.00       0.00
20.0000     0.8376  -4.98E+07    220892.   -0.00122   919.0161   1.50E+13
0.00       0.00       0.00
22.0000     0.8072  -4.44E+07    220892.   -0.00130   857.1078   1.50E+13
0.00       0.00       0.00
24.0000     0.7752  -3.91E+07    220892.   -0.00137   795.1504   1.50E+13
0.00       0.00       0.00
26.0000     0.7416  -3.37E+07    220892.   -0.00143   733.1499   1.50E+13
0.00       0.00       0.00
28.0000     0.7068  -2.83E+07    220892.   -0.00147   671.1122   1.50E+13
0.00       0.00       0.00
30.0000     0.6708  -2.29E+07    220892.   -0.00152   609.0432   1.50E+13
0.00       0.00       0.00
32.0000     0.6340  -1.75E+07    220892.   -0.00155   546.9490   1.50E+13
0.00       0.00       0.00
34.0000     0.5965  -1.21E+07    220892.   -0.00157   484.8354   1.50E+13
0.00       0.00       0.00
36.0000     0.5586  -6715923.    220892.   -0.00159   422.7084   1.50E+13
0.00       0.00       0.00
38.0000     0.5204  -1319006.    220892.   -0.00159   360.5740   1.50E+13
0.00       0.00       0.00
40.0000     0.4821   4078037.    220892.   -0.00159   392.3385   1.50E+13
0.00       0.00       0.00
42.0000     0.4440   9474688.    220892.   -0.00158   454.4699   1.50E+13
0.00       0.00       0.00
44.0000     0.4063   1.49E+07    220892.   -0.00156   516.5908   1.50E+13
0.00       0.00       0.00
46.0000     0.3691   2.03E+07    220892.   -0.00153   578.6952   1.50E+13
0.00       0.00       0.00
48.0000     0.3327   2.57E+07    220892.   -0.00150   640.7773   1.50E+13
0.00       0.00       0.00
50.0000     0.2973   3.10E+07    220892.   -0.00145   702.8310   1.50E+13
0.00       0.00       0.00
52.0000     0.2631   3.64E+07    220892.   -0.00140   764.8505   1.50E+13
0.00       0.00       0.00
54.0000     0.2303   4.18E+07    220892.   -0.00133   826.8297   1.50E+13
0.00       0.00       0.00
56.0000     0.1991   4.72E+07    220889.   -0.00126   888.7627   1.50E+13
-0.2492    30.0471       0.00
58.0000     0.1697   5.26E+07    220877.   -0.00118   950.6419   1.50E+13
-0.7089   100.2751       0.00
60.0000     0.1423   5.79E+07    206021.   -0.00109      1012.   1.50E+13
-1237.    208712.       0.00
62.0000     0.1171   6.26E+07    156426.  -9.98E-04      1066.   1.50E+13
-2896.    593351.       0.00
64.0000    0.09437   6.56E+07     82543.  -8.96E-04      1100.   1.50E+13
-3261.    829440.       0.00
66.0000    0.07412   6.67E+07      5835.  -7.90E-04      1113.   1.50E+13
-3131.   1013760.       0.00
68.0000    0.05644   6.59E+07    -65549.  -6.84E-04      1105.   1.50E+13
-2818.   1198080.       0.00
70.0000    0.04129   6.36E+07   -127901.  -5.80E-04      1078.   1.50E+13
-2378.   1382400.       0.00
72.0000    0.02858   5.99E+07   -178830.  -4.82E-04      1035.   1.50E+13
```

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 -1866.   1566720.       0.00
 74.0000    0.01817   5.51E+07   -217125.  -3.90E-04   979.4200   1.50E+13
 -1326.   1751040.       0.00
 76.0000    0.00987   4.95E+07   -242580.  -3.06E-04   915.2699   1.50E+13
 -795.7469   1935360.       0.00
 78.0000    0.00347   4.35E+07   -255804.  -2.32E-04   845.7882   1.50E+13
 -306.2838   2119680.       0.00
 80.0000   -0.00126   3.72E+07   -258023.  -1.67E-04   774.2274   1.50E+13
 121.3555   2304000.       0.00
 82.0000   -0.00457   3.11E+07   -250886.  -1.13E-04   703.4302   1.50E+13
 473.4716   2488320.       0.00
 84.0000   -0.00668   2.52E+07   -236283.  -6.77E-05   635.7385   1.50E+13
 743.4096   2672640.       0.00
 86.0000   -0.00782   1.98E+07   -216196.  -3.17E-05   572.9488   1.50E+13
 930.5319   2856960.       0.00
 88.0000   -0.00820   1.48E+07   -192561.  -4.08E-06   516.3080   1.50E+13
 1039.   3041280.       0.00
 90.0000   -0.00801   1.05E+07   -167169.   1.62E-05   466.5413   1.50E+13
 1077.   3225600.       0.00
 92.0000   -0.00742   6819811.   -141592.   3.01E-05   423.9044   1.50E+13
 1054.   3409920.       0.00
 94.0000   -0.00657   3723154.   -117133.   3.85E-05   388.2528   1.50E+13
 983.7990   3594240.       0.00
 96.0000   -0.00557   1192807.    -94797.   4.24E-05   359.1210   1.50E+13
 877.5225   3778560.       0.00
 98.0000   -0.00453   -832202.    -75286.   4.27E-05   354.9694   1.50E+13
 748.3970   3962880.       0.00
100.0000   -0.00352  -2426053.    -52132.   4.01E-05   373.3193   1.50E+13
1181.   8046127.       0.00
102.0000   -0.00261  -3339331.    -26666.   3.55E-05   383.8339   1.50E+13
940.9928   8663040.       0.00
104.0000   -0.00182  -3710277.     -7160.   2.99E-05   388.1045   1.50E+13
684.4724   9031680.       0.00
106.0000   -0.00117  -3686611.      6568.   2.40E-05   387.8321   1.50E+13
459.5132   9400320.       0.00
108.0000  -6.69E-04  -3397912.     15349.   1.83E-05   384.5083   1.50E+13
272.3066   9768960.       0.00
110.0000  -2.95E-04  -2952038.     20113.   1.32E-05   379.3750   1.50E+13
124.6921   1.01E+07       0.00
112.0000  -3.47E-05  -2434058.     21792.   8.91E-06   373.4115   1.50E+13
15.1880   1.05E+07       0.00
114.0000   1.32E-04  -1907096.     21254.   5.44E-06   367.3446   1.50E+13
-59.9926   1.09E+07       0.00
116.0000   2.26E-04  -1414507.     19262.   2.78E-06   361.6735   1.50E+13
-106.0193   1.12E+07       0.00
118.0000   2.66E-04   -982849.     16446.   8.65E-07   356.7038   1.50E+13
-128.6662   1.16E+07       0.00
120.0000   2.68E-04   -625209.     13297.  -4.21E-07   352.5863   1.50E+13
-133.7013   1.20E+07       0.00
122.0000   2.46E-04   -344521.     10176.  -1.20E-06   349.3548   1.50E+13
-126.4489   1.23E+07       0.00
124.0000   2.10E-04   -136635.      7320.  -1.58E-06   346.9614   1.50E+13
-111.5116   1.27E+07       0.00
126.0000   1.70E-04      7034.      4870.  -1.68E-06   345.4693   1.50E+13
-92.6303   1.31E+07       0.00
128.0000   1.30E-04     97348.      2887.  -1.60E-06   346.5091   1.50E+13
-72.6545   1.35E+07       0.00
130.0000   9.30E-05    145803.      1372.  -1.41E-06   347.0670   1.50E+13
-53.5931   1.38E+07       0.00
132.0000   6.21E-05    163374.   288.3018  -1.16E-06   347.2692   1.50E+13
-36.7178   1.42E+07       0.00
134.0000   3.74E-05    159780.  -424.6573  -9.01E-07   347.2279   1.50E+13
-22.6955   1.46E+07       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(Half scour) 96in"


```
136.0000   1.89E-05    143099.  -837.7568  -6.59E-07   347.0358   1.50E+13
-11.7295   1.49E+07       0.00
138.0000   5.80E-06    119647.     -1023.  -4.49E-07   346.7658   1.50E+13
-3.6941   1.53E+07       0.00
140.0000  -2.67E-06     94056.     -1046.  -2.78E-07   346.4712   1.50E+13
1.7451   1.57E+07       0.00
142.0000  -7.53E-06     69461.  -964.8941  -1.47E-07   346.1880   1.50E+13
5.0327   1.60E+07       0.00
144.0000  -9.73E-06     47759.  -824.7330  -5.32E-08   345.9382   1.50E+13
6.6474   1.64E+07       0.00
146.0000  -1.01E-05     29881.  -660.3798   8.87E-09   345.7323   1.50E+13
7.0487   1.68E+07       0.00
148.0000  -9.30E-06     16060.  -496.0925   4.56E-08   345.5732   1.50E+13
6.6419   1.71E+07       0.00
150.0000  -7.90E-06      6063.  -347.2523   6.33E-08   345.4581   1.50E+13
5.7614   1.75E+07       0.00
152.0000  -6.26E-06  -616.1456  -222.1420   6.76E-08   345.3954   1.50E+13
4.6644   1.79E+07       0.00
154.0000  -4.65E-06     -4608.  -123.7458   6.35E-08   345.4414   1.50E+13
3.5352   1.82E+07       0.00
156.0000  -3.21E-06     -6564.   -51.3987   5.45E-08   345.4639   1.50E+13
2.4937   1.86E+07       0.00
158.0000  -2.03E-06     -7082.    -2.1867   4.36E-08   345.4699   1.50E+13
1.6073   1.90E+07       0.00
160.0000  -1.12E-06     -6674.    27.9462   3.26E-08   345.4652   1.50E+13
0.9038   1.94E+07       0.00
162.0000  -4.66E-07     -5744.    43.3836   2.27E-08   345.4545   1.50E+13
0.3827   1.97E+07       0.00
164.0000  -3.11E-08     -4594.    48.2882   1.44E-08   345.4412   1.50E+13
0.02603   2.01E+07       0.00
166.0000   2.27E-07     -3428.    46.2763   8.02E-09   345.4278   1.50E+13
-0.1937   2.05E+07       0.00
168.0000   3.54E-07     -2374.    40.2663   3.38E-09   345.4157   1.50E+13
-0.3072   2.08E+07       0.00
170.0000   3.90E-07     -1496.    32.4518   2.89E-10   345.4056   1.50E+13
-0.3441   2.12E+07       0.00
172.0000   3.68E-07  -816.1123    24.3575  -1.56E-09   345.3977   1.50E+13
-0.3305   2.16E+07       0.00
174.0000   3.15E-07  -326.5757    16.9407  -2.47E-09   345.3921   1.50E+13
-0.2876   2.19E+07       0.00
176.0000   2.49E-07    -2.6617    10.7123  -2.74E-09   345.3884   1.50E+13
-0.2314   2.23E+07       0.00
178.0000   1.83E-07   187.9441     5.8570  -2.59E-09   345.3905   1.50E+13
-0.1732   2.27E+07       0.00
180.0000   1.25E-07   278.7860     2.3413  -2.22E-09   345.3915   1.50E+13
-0.1198   2.30E+07       0.00
182.0000   7.70E-08   300.5923    0.00265  -1.75E-09   345.3918   1.50E+13
-0.07508   2.34E+07       0.00
184.0000   4.07E-08   279.1232    -1.3821  -1.29E-09   345.3915   1.50E+13
-0.04031   2.38E+07       0.00
186.0000   1.51E-08   234.4060    -2.0484  -8.78E-10   345.3910   1.50E+13
-0.01521   2.41E+07       0.00
188.0000  -1.46E-09   180.9049    -2.2131  -5.46E-10   345.3904   1.50E+13
0.00149   2.45E+07       0.00
190.0000  -1.11E-08   128.2450    -2.0571  -2.99E-10   345.3898   1.50E+13
0.01150   2.49E+07       0.00
192.0000  -1.58E-08    82.1983    -1.7195  -1.31E-10   345.3893   1.50E+13
0.01663   2.53E+07       0.00
194.0000  -1.74E-08    45.7243    -1.2974  -2.84E-11   345.3889   1.50E+13
0.01854   2.56E+07       0.00
196.0000  -1.72E-08    19.9251    -0.8518   2.41E-11   345.3886   1.50E+13
0.01860   2.60E+07       0.00
198.0000  -1.62E-08     4.8350    -0.4150   4.39E-11   345.3884   1.50E+13
```

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```
  0.01780   2.64E+07       0.00
  200.0000  -1.51E-08       0.00       0.00   4.77E-11   345.3883   1.50E+13
  0.01678   1.34E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     1.00198118 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -103249571. inch-lbs
Maximum shear force              =       -258023. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    80.00000000 feet below pile head
Number of iterations             =              6
Number of zero deflection points =              5
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 3

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)

```
Displacement of pile head                                =     2.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				
0.00	2.0038	-2.00E+08	421485.	0.00	2649.	1.50E+13
0.00	0.00	0.00				
2.0000	2.0000	-1.90E+08	421464.	-3.12E-04	2532.	1.50E+13
0.00	0.00	0.00				
4.0000	1.9889	-1.80E+08	421464.	-6.07E-04	2415.	1.50E+13
0.00	0.00	0.00				
6.0000	1.9708	-1.70E+08	421464.	-8.87E-04	2298.	1.50E+13
0.00	0.00	0.00				
8.0000	1.9463	-1.59E+08	421464.	-0.00115	2181.	1.50E+13
0.00	0.00	0.00				
10.0000	1.9156	-1.49E+08	421464.	-0.00140	2064.	1.50E+13
0.00	0.00	0.00				
12.0000	1.8793	-1.39E+08	421464.	-0.00163	1946.	1.50E+13
0.00	0.00	0.00				
14.0000	1.8375	-1.29E+08	421464.	-0.00184	1829.	1.50E+13
0.00	0.00	0.00				
16.0000	1.7909	-1.19E+08	421464.	-0.00204	1711.	1.50E+13
0.00	0.00	0.00				
18.0000	1.7397	-1.08E+08	421464.	-0.00222	1593.	1.50E+13
0.00	0.00	0.00				
20.0000	1.6843	-9.81E+07	421464.	-0.00239	1475.	1.50E+13
0.00	0.00	0.00				
22.0000	1.6251	-8.79E+07	421464.	-0.00253	1357.	1.50E+13

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```
0.00        0.00        0.00
24.0000      1.5626  -7.76E+07    421464.   -0.00267      1239.   1.50E+13
0.00        0.00        0.00
26.0000      1.4971  -6.73E+07    421464.   -0.00278      1120.   1.50E+13
0.00        0.00        0.00
28.0000      1.4290  -5.70E+07    421464.   -0.00288      1002.   1.50E+13
0.00        0.00        0.00
30.0000      1.3588  -4.67E+07    421464.   -0.00296   883.3350   1.50E+13
0.00        0.00        0.00
32.0000      1.2867  -3.64E+07    421464.   -0.00303   764.8059   1.50E+13
0.00        0.00        0.00
34.0000      1.2133  -2.61E+07    421464.   -0.00308   646.2366   1.50E+13
0.00        0.00        0.00
36.0000      1.1388  -1.58E+07    421464.   -0.00312   527.6385   1.50E+13
0.00        0.00        0.00
38.0000      1.0638  -5527213.    421464.   -0.00313   409.0228   1.50E+13
0.00        0.00        0.00
40.0000      0.9885   4776124.    421464.   -0.00313   400.3756   1.50E+13
0.00        0.00        0.00
42.0000      0.9134   1.51E+07    421464.   -0.00312   518.9920   1.50E+13
0.00        0.00        0.00
44.0000      0.8389   2.54E+07    421464.   -0.00308   637.5919   1.50E+13
0.00        0.00        0.00
46.0000      0.7653   3.57E+07    421464.   -0.00304   756.1636   1.50E+13
0.00        0.00        0.00
48.0000      0.6932   4.60E+07    421464.   -0.00297   874.6960   1.50E+13
0.00        0.00        0.00
50.0000      0.6227   5.63E+07    421464.   -0.00289   993.1776   1.50E+13
0.00        0.00        0.00
52.0000      0.5545   6.66E+07    421464.   -0.00279      1112.   1.50E+13
0.00        0.00        0.00
54.0000      0.4888   7.68E+07    421464.   -0.00268      1230.   1.50E+13
0.00        0.00        0.00
56.0000      0.4261   8.71E+07    421461.   -0.00254      1348.   1.50E+13
-0.3212    18.0919        0.00
58.0000      0.3667   9.74E+07    421446.   -0.00240      1466.   1.50E+13
-0.9165    59.9901        0.00
60.0000      0.3110   1.08E+08    399483.   -0.00223      1584.   1.50E+13
-1829.    141172.        0.00
62.0000      0.2595   1.17E+08    325814.   -0.00205      1690.   1.50E+13
-4310.    398658.        0.00
64.0000      0.2124   1.24E+08    206645.   -0.00186      1767.   1.50E+13
-5621.    635126.        0.00
66.0000      0.1701   1.27E+08     74031.   -0.00166      1807.   1.50E+13
-5430.    766205.        0.00
68.0000      0.1326   1.27E+08    -52917.   -0.00146      1811.   1.50E+13
-5149.    931562.        0.00
70.0000      0.1001   1.25E+08   -169354.   -0.00126      1780.   1.50E+13
-4554.   1092040.        0.00
72.0000    0.07232   1.19E+08   -270460.   -0.00106      1719.   1.50E+13
-3871.   1284767.        0.00
74.0000    0.04912   1.12E+08   -355199.  -8.77E-04      1632.   1.50E+13
-3190.   1558937.        0.00
76.0000    0.03021   1.02E+08   -422713.  -7.06E-04      1524.   1.50E+13
-2436.   1935360.        0.00
78.0000    0.01522   9.15E+07   -468074.  -5.51E-04      1399.   1.50E+13
-1344.   2119680.        0.00
80.0000    0.00375   7.99E+07   -488528.  -4.14E-04      1266.   1.50E+13
-360.0481   2304000.        0.00
82.0000   -0.00465   6.81E+07   -487059.  -2.96E-04      1130.   1.50E+13
482.4279   2488320.        0.00
84.0000   -0.01044   5.66E+07   -467316.  -1.96E-04   996.9239   1.50E+13
1163.   2672640.        0.00
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 86.0000   -0.01406   4.57E+07   -433278.  -1.14E-04   871.7593   1.50E+13
 1674.   2856960.       0.00
 88.0000   -0.01592   3.58E+07   -391398.  -4.90E-05   757.6427   1.50E+13
 1816.   2737938.       0.00
 90.0000   -0.01641   2.69E+07   -347472.   1.18E-06   655.5321   1.50E+13
 1844.   2696892.       0.00
 92.0000   -0.01587   1.91E+07   -303586.   3.80E-05   565.6204   1.50E+13
 1813.   2742858.       0.00
 94.0000   -0.01459   1.24E+07   -260965.   6.32E-05   487.7117   1.50E+13
 1739.   2860634.       0.00
 96.0000   -0.01283   6595186.   -220534.   7.83E-05   421.3183   1.50E+13
 1631.   3049871.       0.00
 98.0000   -0.01083   1766974.   -182994.   8.50E-05   365.7314   1.50E+13
 1498.   3320580.       0.00
100.0000   -0.00875  -2198708.   -142683.   8.47E-05   370.7019   1.50E+13
1861.   5105480.       0.00
102.0000   -0.00676  -5091976.    -95281.   7.89E-05   404.0120   1.50E+13
2089.   7415323.       0.00
104.0000   -0.00497  -6781681.    -48737.   6.94E-05   423.4654   1.50E+13
1790.   8652502.       0.00
106.0000   -0.00343  -7439673.    -11133.   5.80E-05   431.0409   1.50E+13
1344.   9400320.       0.00
108.0000   -0.00218  -7323014.     15645.   4.62E-05   429.6978   1.50E+13
887.8739   9768960.       0.00
110.0000   -0.00121  -6694236.     32449.   3.50E-05   422.4587   1.50E+13
512.4372   1.01E+07       0.00
112.0000  -5.02E-04  -5769652.     41235.   2.50E-05   411.8140   1.50E+13
219.7205   1.05E+07       0.00
114.0000  -1.21E-05  -4717955.     43938.   1.66E-05   399.7059   1.50E+13
5.4839   1.09E+07       0.00
116.0000   2.97E-04  -3662648.     42336.   9.94E-06   387.5562   1.50E+13
-138.9776   1.12E+07       0.00
118.0000   4.65E-04  -2687039.     37969.   4.86E-06   376.3241   1.50E+13
-224.9158   1.16E+07       0.00
120.0000   5.30E-04  -1840725.     32095.   1.24E-06   366.5805   1.50E+13
-264.5441   1.20E+07       0.00
122.0000   5.24E-04  -1146611.     25683.  -1.15E-06   358.5892   1.50E+13
-269.8228   1.23E+07       0.00
124.0000   4.75E-04   -607806.     19426.  -2.55E-06   352.3860   1.50E+13
-251.6127   1.27E+07       0.00
126.0000   4.02E-04   -213871.     13776.  -3.21E-06   347.8506   1.50E+13
-219.1611   1.31E+07       0.00
128.0000   3.21E-04     53848.      8988.  -3.34E-06   346.0083   1.50E+13
-179.8688   1.35E+07       0.00
130.0000   2.42E-04    217957.      5158.  -3.12E-06   347.8977   1.50E+13
-139.2756   1.38E+07       0.00
132.0000   1.71E-04    301823.      2273.  -2.70E-06   348.8632   1.50E+13
-101.2009   1.42E+07       0.00
134.0000   1.12E-04    327368.   242.4213  -2.20E-06   349.1573   1.50E+13
-67.9831   1.46E+07       0.00
136.0000   6.55E-05    313723.     -1063.  -1.69E-06   349.0002   1.50E+13
-40.7655   1.49E+07       0.00
138.0000   3.11E-05    276568.     -1789.  -1.22E-06   348.5724   1.50E+13
-19.7934   1.53E+07       0.00
140.0000   7.19E-06    227984.     -2083.  -8.12E-07   348.0131   1.50E+13
-4.6907   1.57E+07       0.00
142.0000  -7.93E-06    176677.     -2076.  -4.89E-07   347.4224   1.50E+13
5.2993   1.60E+07       0.00
144.0000  -1.63E-05    128406.     -1879.  -2.45E-07   346.8667   1.50E+13
11.1192   1.64E+07       0.00
146.0000  -1.97E-05     86527.     -1580.  -7.28E-08   346.3845   1.50E+13
13.7513   1.68E+07       0.00
148.0000  -1.98E-05     52560.     -1246.   3.84E-08   345.9935   1.50E+13
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  14.1164   1.71E+07       0.00
  150.0000  -1.78E-05     26719.  -920.3415   1.02E-07   345.6960   1.50E+13
  13.0126   1.75E+07       0.00
  152.0000  -1.49E-05      8371.  -631.1626   1.30E-07   345.4847   1.50E+13
  11.0856   1.79E+07       0.00
  154.0000  -1.16E-05     -3592.  -392.2513   1.34E-07   345.4297   1.50E+13
  8.8236   1.82E+07       0.00
  156.0000  -8.47E-06    -10473.  -207.5524   1.22E-07   345.5089   1.50E+13
  6.5679   1.86E+07       0.00
  158.0000  -5.73E-06    -13569.   -74.3321   1.03E-07   345.5446   1.50E+13
  4.5338   1.90E+07       0.00
  160.0000  -3.52E-06    -14053.    14.0986   8.11E-08   345.5501   1.50E+13
  2.8355   1.94E+07       0.00
  162.0000  -1.84E-06    -12902.    66.2716   5.95E-08   345.5369   1.50E+13
  1.5123   1.97E+07       0.00
  164.0000  -6.60E-07    -10879.    91.0447   4.05E-08   345.5136   1.50E+13
  0.5521   2.01E+07       0.00
  166.0000   1.04E-07     -8537.    96.6095   2.50E-08   345.4866   1.50E+13
  -0.08840   2.05E+07       0.00
  168.0000   5.39E-07     -6245.    89.9321   1.32E-08   345.4602   1.50E+13
  -0.4680   2.08E+07       0.00
  170.0000   7.35E-07     -4222.    76.5225   4.79E-09   345.4369   1.50E+13
  -0.6494   2.12E+07       0.00
  172.0000   7.69E-07     -2572.    60.4346  -6.41E-10   345.4179   1.50E+13
  -0.6912   2.16E+07       0.00
  174.0000   7.05E-07     -1321.    44.4133  -3.75E-09   345.4035   1.50E+13
  -0.6439   2.19E+07       0.00
  176.0000   5.89E-07  -440.0293    30.1178  -5.16E-09   345.3934   1.50E+13
  -0.5474   2.23E+07       0.00
  178.0000   4.57E-07   125.4732    18.3713  -5.41E-09   345.3898   1.50E+13
  -0.4315   2.27E+07       0.00
  180.0000   3.29E-07   442.4406     9.4009  -4.96E-09   345.3934   1.50E+13
  -0.3161   2.30E+07       0.00
  182.0000   2.19E-07   577.3104     3.0483  -4.14E-09   345.3950   1.50E+13
  -0.2133   2.34E+07       0.00
  184.0000   1.30E-07   589.2549    -1.0609  -3.21E-09   345.3951   1.50E+13
  -0.1291   2.38E+07       0.00
  186.0000   6.46E-08   526.7711    -3.3898  -2.32E-09   345.3944   1.50E+13
  -0.06496   2.41E+07       0.00
  188.0000   1.90E-08   426.8221    -4.4024  -1.56E-09   345.3932   1.50E+13
  -0.01942   2.45E+07       0.00
  190.0000  -1.02E-08   315.6447    -4.5091  -9.63E-10   345.3920   1.50E+13
  0.01053   2.49E+07       0.00
  192.0000  -2.72E-08   210.5007    -4.0392  -5.42E-10   345.3908   1.50E+13
  0.02863   2.53E+07       0.00
  194.0000  -3.62E-08   121.8261    -3.2322  -2.77E-10   345.3897   1.50E+13
  0.03863   2.56E+07       0.00
  196.0000  -4.05E-08    55.3899    -2.2425  -1.35E-10   345.3890   1.50E+13
  0.04384   2.60E+07       0.00
  198.0000  -4.27E-08    14.2017    -1.1542  -7.93E-11   345.3885   1.50E+13
  0.04685   2.64E+07       0.00
  200.0000  -4.43E-08       0.00       0.00  -6.80E-11   345.3883   1.50E+13
  0.04933   1.34E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 3:

```
Pile-head deflection             =     2.00383890 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -200065183. inch-lbs
Maximum shear force              =       -488528. lbs
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(Half scour) 96in"

Channel Static 24in.lp9o 10/4/2017

Depth of maximum bending moment = 0.000000 feet below pile head
Depth of maximum shear force = 80.00000000 feet below pile head
Number of iterations = 9
Number of zero deflection points = 5

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 4

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 3.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 2500000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				
0.00	3.0056	-2.91E+08	602877.	0.00	3690.	1.50E+13
0.00	0.00	0.00				
2.0000	3.0000	-2.76E+08	602848.	-4.53E-04	3524.	1.50E+13
0.00	0.00	0.00				
4.0000	2.9838	-2.62E+08	602848.	-8.83E-04	3357.	1.50E+13
0.00	0.00	0.00				
6.0000	2.9576	-2.47E+08	602848.	-0.00129	3189.	1.50E+13
0.00	0.00	0.00				
8.0000	2.9219	-2.32E+08	602848.	-0.00167	3022.	1.50E+13
0.00	0.00	0.00				
10.0000	2.8773	-2.18E+08	602848.	-0.00203	2854.	1.50E+13
0.00	0.00	0.00				
12.0000	2.8244	-2.03E+08	602848.	-0.00237	2686.	1.50E+13
0.00	0.00	0.00				
14.0000	2.7636	-1.89E+08	602848.	-0.00268	2517.	1.50E+13
0.00	0.00	0.00				
16.0000	2.6956	-1.74E+08	602848.	-0.00297	2349.	1.50E+13
0.00	0.00	0.00				
18.0000	2.6209	-1.59E+08	602848.	-0.00324	2180.	1.50E+13
0.00	0.00	0.00				
20.0000	2.5401	-1.45E+08	602848.	-0.00348	2011.	1.50E+13
0.00	0.00	0.00				
22.0000	2.4538	-1.30E+08	602848.	-0.00370	1842.	1.50E+13
0.00	0.00	0.00				
24.0000	2.3624	-1.15E+08	602848.	-0.00390	1673.	1.50E+13
0.00	0.00	0.00				
26.0000	2.2666	-1.01E+08	602848.	-0.00407	1504.	1.50E+13
0.00	0.00	0.00				
28.0000	2.1670	-8.59E+07	602848.	-0.00422	1334.	1.50E+13
0.00	0.00	0.00				
30.0000	2.0641	-7.12E+07	602848.	-0.00435	1165.	1.50E+13
0.00	0.00	0.00				
32.0000	1.9584	-5.64E+07	602848.	-0.00445	994.9762	1.50E+13
0.00	0.00	0.00				
34.0000	1.8506	-4.17E+07	602848.	-0.00453	825.2995	1.50E+13
0.00	0.00	0.00				

File name is incorrect below, run designation is "Channel Post Seismic Long.(Half scour) 96in"


```
36.0000     1.7412  -2.69E+07    602848.   -0.00458   655.5768   1.50E+13
0.00       0.00       0.00
38.0000     1.6307  -1.22E+07    602848.   -0.00461   485.8244   1.50E+13
0.00       0.00       0.00
40.0000     1.5198   2547561.    602848.   -0.00462   374.7183   1.50E+13
0.00       0.00       0.00
42.0000     1.4090   1.73E+07    602848.   -0.00460   544.4814   1.50E+13
0.00       0.00       0.00
44.0000     1.2988   3.20E+07    602848.   -0.00456   714.2254   1.50E+13
0.00       0.00       0.00
46.0000     1.1899   4.68E+07    602848.   -0.00450   883.9341   1.50E+13
0.00       0.00       0.00
48.0000     1.0828   6.15E+07    602848.   -0.00441      1054.   1.50E+13
0.00       0.00       0.00
50.0000     0.9780   7.62E+07    602848.   -0.00430      1223.   1.50E+13
0.00       0.00       0.00
52.0000     0.8761   9.10E+07    602848.   -0.00417      1393.   1.50E+13
0.00       0.00       0.00
54.0000     0.7778   1.06E+08    602848.   -0.00401      1562.   1.50E+13
0.00       0.00       0.00
56.0000     0.6835   1.20E+08    602844.   -0.00383      1731.   1.50E+13
-0.3760    13.2022       0.00
58.0000     0.5938   1.35E+08    602826.   -0.00363      1901.   1.50E+13
-1.0763    43.5004       0.00
60.0000     0.5093   1.50E+08    574721.   -0.00340      2070.   1.50E+13
-2341.    110315.       0.00
62.0000     0.4306   1.63E+08    483583.   -0.00315      2223.   1.50E+13
-5254.    292868.       0.00
64.0000     0.3581   1.73E+08    335031.   -0.00288      2341.   1.50E+13
-7125.    477605.       0.00
66.0000     0.2922   1.79E+08    164196.   -0.00260      2412.   1.50E+13
-7111.    584016.       0.00
68.0000     0.2333   1.82E+08     -3065.   -0.00231      2435.   1.50E+13
-6828.    702489.       0.00
70.0000     0.1813   1.80E+08   -158547.   -0.00202      2413.   1.50E+13
-6129.    811453.       0.00
72.0000     0.1362   1.74E+08   -295844.   -0.00174      2351.   1.50E+13
-5312.    936205.       0.00
74.0000    0.09778   1.66E+08   -413610.   -0.00147      2252.   1.50E+13
-4501.   1104889.       0.00
76.0000    0.06573   1.54E+08   -511913.   -0.00121      2124.   1.50E+13
-3691.   1347633.       0.00
78.0000    0.03960   1.41E+08   -590579.  -9.76E-04      1971.   1.50E+13
-2865.   1736111.       0.00
80.0000    0.01890   1.26E+08   -646731.  -7.62E-04      1799.   1.50E+13
-1814.   2304000.       0.00
82.0000    0.00304   1.10E+08   -672290.  -5.73E-04      1615.   1.50E+13
-315.4979   2488320.       0.00
84.0000   -0.00858   9.41E+07   -664606.  -4.09E-04      1428.   1.50E+13
955.8230   2672640.       0.00
86.0000   -0.01660   7.84E+07   -630881.  -2.71E-04      1248.   1.50E+13
1855.   2681382.       0.00
88.0000   -0.02161   6.38E+07   -583236.  -1.58E-04      1080.   1.50E+13
2116.   2350271.       0.00
90.0000   -0.02417   5.04E+07   -530992.  -6.63E-05   926.0046   1.50E+13
2238.   2222395.       0.00
92.0000   -0.02479   3.83E+07   -476943.   4.69E-06   786.7233   1.50E+13
2266.   2194298.       0.00
94.0000   -0.02394   2.75E+07   -423020.   5.74E-05   662.4290   1.50E+13
2227.   2232832.       0.00
96.0000   -0.02204   1.80E+07   -370651.   9.38E-05   552.8744   1.50E+13
2137.   2327346.       0.00
98.0000   -0.01944   9735279.   -320925.   1.16E-04   457.4701   1.50E+13
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(Half scour) 96in"


```
 2007.   2477913.       0.00
100.0000   -0.01647   2603667.   -266198.   1.26E-04   375.3642   1.50E+13
2554.   3721436.       0.00
102.0000   -0.01340  -3057306.   -200269.   1.25E-04   380.5869   1.50E+13
2940.   5266996.       0.00
104.0000   -0.01045  -7024299.   -133828.   1.17E-04   426.2587   1.50E+13
2596.   5965129.       0.00
106.0000   -0.00776  -9495155.    -75815.   1.04E-04   454.7055   1.50E+13
2238.   6919659.       0.00
108.0000   -0.00544  -1.07E+07    -26466.   8.81E-05   468.2997   1.50E+13
1874.   8262919.       0.00
110.0000   -0.00353  -1.08E+07     13943.   7.09E-05   469.4529   1.50E+13
1493.   1.01E+07       0.00
112.0000   -0.00204  -1.00E+07     42574.   5.43E-05   460.6924   1.50E+13
892.7627   1.05E+07       0.00
114.0000  -9.28E-04  -8739056.     58334.   3.93E-05   446.0006   1.50E+13
420.5979   1.09E+07       0.00
116.0000  -1.52E-04  -7219839.     64238.   2.66E-05   428.5099   1.50E+13
71.4144   1.12E+07       0.00
118.0000   3.46E-04  -5658794.     63085.   1.63E-05   410.5377   1.50E+13
-167.5428   1.16E+07       0.00
120.0000   6.28E-04  -4193712.     57313.   8.38E-06   393.6703   1.50E+13
-313.4120   1.20E+07       0.00
122.0000   7.48E-04  -2908752.     48931.   2.70E-06   378.8766   1.50E+13
-385.1172   1.23E+07       0.00
124.0000   7.57E-04  -1845341.     39493.  -1.10E-06   366.6336   1.50E+13
-401.3739   1.27E+07       0.00
126.0000   6.96E-04  -1012944.     30125.  -3.39E-06   357.0503   1.50E+13
-379.2910   1.31E+07       0.00
128.0000   5.95E-04   -398922.     21572.  -4.52E-06   349.9811   1.50E+13
-333.5148   1.35E+07       0.00
130.0000   4.79E-04     23034.     14260.  -4.82E-06   345.6535   1.50E+13
-275.8266   1.38E+07       0.00
132.0000   3.64E-04    286112.      8368.  -4.57E-06   348.6823   1.50E+13
-215.0972   1.42E+07       0.00
134.0000   2.60E-04    425266.      3897.  -4.00E-06   350.2844   1.50E+13
-157.4927   1.46E+07       0.00
136.0000   1.72E-04    473664.   725.3280  -3.28E-06   350.8416   1.50E+13
-106.8412   1.49E+07       0.00
138.0000   1.02E-04    460476.     -1338.  -2.53E-06   350.6898   1.50E+13
-65.0785   1.53E+07       0.00
140.0000   5.01E-05    409758.     -2511.  -1.84E-06   350.1059   1.50E+13
-32.7119   1.57E+07       0.00
142.0000   1.39E-05    340159.     -3015.  -1.24E-06   349.3046   1.50E+13
-9.2553   1.60E+07       0.00
144.0000  -9.35E-06    265197.     -3049.  -7.55E-07   348.4415   1.50E+13
6.3925   1.64E+07       0.00
146.0000  -2.24E-05    193890.     -2785.  -3.88E-07   347.6206   1.50E+13
15.6403   1.68E+07       0.00
148.0000  -2.80E-05    131575.     -2357.  -1.28E-07   346.9031   1.50E+13
19.9738   1.71E+07       0.00
150.0000  -2.85E-05     80751.     -1868.   4.22E-08   346.3180   1.50E+13
20.7949   1.75E+07       0.00
152.0000  -2.59E-05     41898.     -1387.   1.40E-07   345.8707   1.50E+13
19.3238   1.79E+07       0.00
154.0000  -2.18E-05     14171.  -956.2355   1.85E-07   345.5515   1.50E+13
16.5516   1.82E+07       0.00
156.0000  -1.71E-05     -4024.  -598.8640   1.93E-07   345.4347   1.50E+13
13.2294   1.86E+07       0.00
158.0000  -1.25E-05    -14598.  -321.4972   1.78E-07   345.5564   1.50E+13
9.8845   1.90E+07       0.00
160.0000  -8.50E-06    -19477.  -120.6668   1.51E-07   345.6126   1.50E+13
6.8513   1.94E+07       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(Half scour) 96in"


```
  162.0000  -5.24E-06    -20408.    13.2639   1.19E-07   345.6233   1.50E+13
  4.3095   1.97E+07       0.00
  164.0000  -2.78E-06    -18855.    92.8600   8.78E-08   345.6054   1.50E+13
  2.3235   2.01E+07       0.00
  166.0000  -1.03E-06    -15961.   131.2823   6.00E-08   345.5721   1.50E+13
  0.8784   2.05E+07       0.00
  168.0000   1.02E-07    -12560.   140.7583   3.72E-08   345.5329   1.50E+13
  -0.08872   2.08E+07       0.00
  170.0000   7.53E-07     -9209.   131.7148   1.97E-08   345.4944   1.50E+13
  -0.6649   2.12E+07       0.00
  172.0000   1.05E-06     -6240.   112.4141   7.39E-09   345.4602   1.50E+13
  -0.9435   2.16E+07       0.00
  174.0000   1.11E-06     -3814.    88.9440  -6.46E-10   345.4322   1.50E+13
  -1.0123   2.19E+07       0.00
  176.0000   1.02E-06     -1971.    65.4326  -5.27E-09   345.4110   1.50E+13
  -0.9469   2.23E+07       0.00
  178.0000   8.55E-07  -672.9617    44.3810  -7.39E-09   345.3961   1.50E+13
  -0.8074   2.27E+07       0.00
  180.0000   6.65E-07   160.1393    27.0375  -7.80E-09   345.3902   1.50E+13
  -0.6379   2.30E+07       0.00
  182.0000   4.81E-07   625.7756    13.7584  -7.17E-09   345.3955   1.50E+13
  -0.4687   2.34E+07       0.00
  184.0000   3.21E-07   821.4032     4.3241  -6.01E-09   345.3978   1.50E+13
  -0.3175   2.38E+07       0.00
  186.0000   1.92E-07   834.0557    -1.8045  -4.69E-09   345.3979   1.50E+13
  -0.1932   2.41E+07       0.00
  188.0000   9.56E-08   735.3482    -5.2942  -3.43E-09   345.3968   1.50E+13
  -0.09761   2.45E+07       0.00
  190.0000   2.73E-08   580.3476    -6.8053  -2.38E-09   345.3950   1.50E+13
  -0.02832   2.49E+07       0.00
  192.0000  -1.87E-08   408.9804    -6.9095  -1.59E-09   345.3930   1.50E+13
  0.01964   2.53E+07       0.00
  194.0000  -4.89E-08   248.8846    -6.0468  -1.06E-09   345.3912   1.50E+13
  0.05225   2.56E+07       0.00
  196.0000  -6.97E-08   118.8598    -4.5145  -7.69E-10   345.3897   1.50E+13
  0.07545   2.60E+07       0.00
  198.0000  -8.58E-08    32.2809    -2.4779  -6.48E-10   345.3887   1.50E+13
  0.09427   2.64E+07       0.00
  200.0000  -1.01E-07       0.00       0.00  -6.22E-10   345.3883   1.50E+13
  0.1122   1.34E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 4:

```
Pile-head deflection             =     3.00557483 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -290533906. inch-lbs
Maximum shear force              =       -672290. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    82.00000000 feet below pile head
Number of iterations             =             11
Number of zero deflection points =              5
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 5

File name is incorrect below, run designation is "Channel Post Seismic Long.(Half scour) 96in"

Channel Static 24in.lp9o 10/4/2017

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 4.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 2500000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment lb/inch	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load in-lb lb/inch				
0.00	4.0072	-3.77E+08	771422.	0.00	4682.	1.50E+13
0.00	0.00	0.00				
2.0000	4.0000	-3.58E+08	771385.	-5.87E-04	4469.	1.50E+13
0.00	0.00	0.00				
4.0000	3.9790	-3.40E+08	771385.	-0.00115	4255.	1.50E+13
0.00	0.00	0.00				
6.0000	3.9450	-3.21E+08	771385.	-0.00167	4041.	1.50E+13
0.00	0.00	0.00				
8.0000	3.8987	-3.02E+08	771385.	-0.00217	3826.	1.50E+13
0.00	0.00	0.00				
10.0000	3.8408	-2.84E+08	771385.	-0.00264	3611.	1.50E+13
0.00	0.00	0.00				
12.0000	3.7720	-2.65E+08	771385.	-0.00308	3396.	1.50E+13
0.00	0.00	0.00				
14.0000	3.6930	-2.46E+08	771385.	-0.00349	3181.	1.50E+13
0.00	0.00	0.00				
16.0000	3.6046	-2.28E+08	771385.	-0.00387	2965.	1.50E+13
0.00	0.00	0.00				
18.0000	3.5074	-2.09E+08	771385.	-0.00422	2749.	1.50E+13
0.00	0.00	0.00				
20.0000	3.4022	-1.90E+08	771385.	-0.00453	2533.	1.50E+13
0.00	0.00	0.00				
22.0000	3.2897	-1.71E+08	771385.	-0.00482	2317.	1.50E+13
0.00	0.00	0.00				
24.0000	3.1707	-1.52E+08	771385.	-0.00508	2100.	1.50E+13
0.00	0.00	0.00				
26.0000	3.0458	-1.34E+08	771385.	-0.00531	1883.	1.50E+13
0.00	0.00	0.00				
28.0000	2.9158	-1.15E+08	771385.	-0.00551	1667.	1.50E+13
0.00	0.00	0.00				
30.0000	2.7814	-9.59E+07	771385.	-0.00568	1450.	1.50E+13
0.00	0.00	0.00				
32.0000	2.6433	-7.70E+07	771385.	-0.00582	1232.	1.50E+13
0.00	0.00	0.00				
34.0000	2.5022	-5.82E+07	771385.	-0.00592	1015.	1.50E+13
0.00	0.00	0.00				
36.0000	2.3589	-3.93E+07	771385.	-0.00600	797.9211	1.50E+13
0.00	0.00	0.00				
38.0000	2.2141	-2.04E+07	771385.	-0.00605	580.6116	1.50E+13
0.00	0.00	0.00				
40.0000	2.0686	-1554005.	771385.	-0.00607	363.2795	1.50E+13
0.00	0.00	0.00				
42.0000	1.9229	1.73E+07	771385.	-0.00605	544.8310	1.50E+13
0.00	0.00	0.00				
44.0000	1.7779	3.62E+07	771385.	-0.00601	762.1457	1.50E+13
0.00	0.00	0.00				
46.0000	1.6343	5.51E+07	771385.	-0.00594	979.4204	1.50E+13
0.00	0.00	0.00				
48.0000	1.4929	7.39E+07	771385.	-0.00584	1197.	1.50E+13

File name is incorrect below, run designation is "Channel Post Seismic Long.(Half scour) 96in"


```
  0.00        0.00        0.00
  50.0000      1.3542   9.28E+07    771385.   -0.00570      1414.   1.50E+13
  0.00        0.00        0.00
  52.0000      1.2192   1.12E+08    771385.   -0.00554      1631.   1.50E+13
  0.00        0.00        0.00
  54.0000      1.0884   1.30E+08    771385.   -0.00535      1848.   1.50E+13
  0.00        0.00        0.00
  56.0000      0.9626   1.49E+08    771380.   -0.00512      2064.   1.50E+13
  -0.4214     10.5076       0.00
  58.0000      0.8425   1.68E+08    771360.   -0.00487      2281.   1.50E+13
  -1.2094     34.4505       0.00
  60.0000      0.7289   1.87E+08    737898.   -0.00458      2497.   1.50E+13
  -2787.      91772.       0.00
  62.0000      0.6225   2.04E+08    634317.   -0.00427      2695.   1.50E+13
  -5844.     225324.       0.00
  64.0000      0.5239   2.18E+08    467269.   -0.00393      2854.   1.50E+13
  -8076.     369970.       0.00
  66.0000      0.4337   2.27E+08    271507.   -0.00358      2959.   1.50E+13
  -8237.     455854.       0.00
  68.0000      0.3522   2.31E+08     73969.   -0.00321      3009.   1.50E+13
  -8224.     560499.       0.00
  70.0000      0.2795   2.31E+08   -116050.   -0.00284      3004.   1.50E+13
  -7611.     653482.       0.00
  72.0000      0.2157   2.26E+08   -287613.   -0.00248      2949.   1.50E+13
  -6686.     743838.       0.00
  74.0000      0.1606   2.17E+08   -437081.   -0.00212      2849.   1.50E+13
  -5769.     862035.       0.00
  76.0000      0.1139   2.05E+08   -564607.   -0.00178      2710.   1.50E+13
  -4858.    1023844.       0.00
  78.0000     0.07499   1.91E+08   -670206.   -0.00147      2539.   1.50E+13
  -3942.    1261626.       0.00
  80.0000     0.04343   1.73E+08   -753512.   -0.00118      2342.   1.50E+13
  -3000.    1657902.       0.00
  82.0000     0.01852   1.55E+08   -812552.  -9.14E-04      2124.   1.50E+13
  -1920.    2488320.       0.00
  84.0000   -4.62E-04   1.35E+08   -834975.  -6.83E-04      1894.   1.50E+13
  51.4313    2672640.       0.00
  86.0000    -0.01428   1.15E+08   -813959.  -4.84E-04      1664.   1.50E+13
  1700.    2856960.       0.00
  88.0000    -0.02370   9.55E+07   -766965.  -3.16E-04      1445.   1.50E+13
  2216.    2243901.       0.00
  90.0000    -0.02946   7.77E+07   -710721.  -1.78E-04      1240.   1.50E+13
  2471.    2012711.       0.00
  92.0000    -0.03224   6.14E+07   -650055.  -6.66E-05      1052.   1.50E+13
  2585.    1924132.       0.00
  94.0000    -0.03266   4.65E+07   -587824.   1.98E-05   881.2647   1.50E+13
  2601.    1911750.       0.00
  96.0000    -0.03129   3.32E+07   -526051.   8.35E-05   727.4288   1.50E+13
  2546.    1953071.       0.00
  98.0000    -0.02865   2.13E+07   -466257.   1.27E-04   590.4421   1.50E+13
  2437.    2041096.       0.00
 100.0000    -0.02519   1.08E+07   -399119.   1.53E-04   469.5896   1.50E+13
 3158.    3008910.       0.00
 102.0000    -0.02132   2109053.   -316707.   1.63E-04   369.6697   1.50E+13
 3709.    4175366.       0.00
 104.0000    -0.01737  -4433550.   -232023.   1.61E-04   396.4315   1.50E+13
 3348.    4626115.       0.00
 106.0000    -0.01359  -9047388.   -156318.   1.50E-04   449.5504   1.50E+13
 2961.    5230561.       0.00
 108.0000    -0.01015  -1.20E+07    -90074.   1.34E-04   483.0240   1.50E+13
 2559.    6051180.       0.00
 110.0000    -0.00717  -1.34E+07    -33541.   1.13E-04   499.5120   1.50E+13
 2152.    7197657.       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(Half scour) 96in"


```
112.0000   -0.00471  -1.36E+07     13204.   9.17E-05   501.7163   1.50E+13
1744.   8881395.       0.00
114.0000   -0.00277  -1.28E+07     49195.   7.07E-05   492.3419   1.50E+13
1255.   1.09E+07       0.00
116.0000   -0.00132  -1.12E+07     71676.   5.15E-05   474.6278   1.50E+13
617.9894   1.12E+07       0.00
118.0000  -2.98E-04  -9329915.     80825.   3.51E-05   452.8031   1.50E+13
144.3557   1.16E+07       0.00
120.0000   3.64E-04  -7350208.     80374.   2.17E-05   430.0109   1.50E+13
-181.8983   1.20E+07       0.00
122.0000   7.45E-04  -5474569.     73591.   1.15E-05   408.4167   1.50E+13
-383.3668   1.23E+07       0.00
124.0000   9.16E-04  -3819224.     63168.   4.05E-06   389.3588   1.50E+13
-485.1959   1.27E+07       0.00
126.0000   9.40E-04  -2442986.     51198.  -9.53E-07   373.5143   1.50E+13
-512.3438   1.31E+07       0.00
128.0000   8.70E-04  -1361623.     39198.  -4.00E-06   361.0646   1.50E+13
-487.6671   1.35E+07       0.00
130.0000   7.48E-04   -561026.     28177.  -5.53E-06   351.8474   1.50E+13
-430.7489   1.38E+07       0.00
132.0000   6.04E-04     -8486.     18719.  -5.99E-06   345.4860   1.50E+13
-357.3505   1.42E+07       0.00
134.0000   4.60E-04    338220.     11079.  -5.72E-06   349.2822   1.50E+13
-279.3448   1.46E+07       0.00
136.0000   3.30E-04    523992.      5267.  -5.03E-06   351.4210   1.50E+13
-204.9939   1.49E+07       0.00
138.0000   2.19E-04    591636.      1134.  -4.14E-06   352.1998   1.50E+13
-139.4404   1.53E+07       0.00
140.0000   1.31E-04    578907.     -1563.  -3.21E-06   352.0533   1.50E+13
-85.3055   1.57E+07       0.00
142.0000   6.48E-05    516985.     -3107.  -2.33E-06   351.3404   1.50E+13
-43.3091   1.60E+07       0.00
144.0000   1.88E-05    430069.     -3781.  -1.57E-06   350.3397   1.50E+13
-12.8506   1.64E+07       0.00
146.0000  -1.07E-05    335708.     -3845.  -9.61E-07   349.2533   1.50E+13
7.4868   1.68E+07       0.00
148.0000  -2.73E-05    245628.     -3521.  -4.97E-07   348.2162   1.50E+13
19.5292   1.71E+07       0.00
150.0000  -3.45E-05    166774.     -2984.  -1.67E-07   347.3084   1.50E+13
25.2049   1.75E+07       0.00
152.0000  -3.53E-05    102421.     -2365.   4.84E-08   346.5675   1.50E+13
26.3340   1.79E+07       0.00
154.0000  -3.22E-05     53227.     -1755.   1.73E-07   346.0011   1.50E+13
24.4994   1.82E+07       0.00
156.0000  -2.71E-05     18139.     -1210.   2.30E-07   345.5972   1.50E+13
20.9842   1.86E+07       0.00
158.0000  -2.12E-05     -4863.  -756.7081   2.41E-07   345.4443   1.50E+13
16.7595   1.90E+07       0.00
160.0000  -1.55E-05    -18211.  -405.5316   2.22E-07   345.5980   1.50E+13
12.5052   1.94E+07       0.00
162.0000  -1.05E-05    -24355.  -151.6619   1.88E-07   345.6687   1.50E+13
8.6506   1.97E+07       0.00
164.0000  -6.48E-06    -25514.    17.2525   1.48E-07   345.6821   1.50E+13
5.4256   2.01E+07       0.00
166.0000  -3.41E-06    -23545.   117.2894   1.09E-07   345.6594   1.50E+13
2.9109   2.05E+07       0.00
168.0000  -1.25E-06    -19897.   165.2529   7.42E-08   345.6174   1.50E+13
1.0861   2.08E+07       0.00
170.0000   1.48E-07    -15622.   176.7178   4.58E-08   345.5682   1.50E+13
-0.1307   2.12E+07       0.00
172.0000   9.48E-07    -11420.   164.9275   2.42E-08   345.5198   1.50E+13
-0.8518   2.16E+07       0.00
174.0000   1.31E-06     -7708.   140.3418   8.91E-09   345.4771   1.50E+13
```

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  -1.1970   2.19E+07       0.00
  176.0000   1.38E-06     -4685.   110.6375  -9.98E-10   345.4423   1.50E+13
  -1.2784   2.23E+07       0.00
  178.0000   1.26E-06     -2397.    80.9934  -6.66E-09   345.4159   1.50E+13
  -1.1920   2.27E+07       0.00
  180.0000   1.06E-06  -796.1335    54.5249  -9.21E-09   345.3975   1.50E+13
  -1.0137   2.30E+07       0.00
  182.0000   8.20E-07   221.0981    32.7673  -9.67E-09   345.3909   1.50E+13
  -0.7994   2.34E+07       0.00
  184.0000   5.92E-07   777.8578    16.1403  -8.87E-09   345.3973   1.50E+13
  -0.5862   2.38E+07       0.00
  186.0000   3.94E-07   996.8972     4.3538  -7.46E-09   345.3998   1.50E+13
  -0.3960   2.41E+07       0.00
  188.0000   2.34E-07   987.7337    -3.2646  -5.87E-09   345.3997   1.50E+13
  -0.2388   2.45E+07       0.00
  190.0000   1.12E-07   840.9030    -7.5233  -4.41E-09   345.3980   1.50E+13
  -0.1161   2.49E+07       0.00
  192.0000   2.23E-08   627.1438    -9.1977  -3.23E-09   345.3956   1.50E+13
  -0.02348   2.53E+07       0.00
  194.0000  -4.32E-08   399.8010    -8.9255  -2.41E-09   345.3929   1.50E+13
  0.04616   2.56E+07       0.00
  196.0000  -9.35E-08   199.0073    -7.1573  -1.93E-09   345.3906   1.50E+13
  0.1012   2.60E+07       0.00
  198.0000  -1.36E-07    56.4830    -4.1503  -1.73E-09   345.3890   1.50E+13
  0.1494   2.64E+07       0.00
  200.0000  -1.76E-07       0.00       0.00  -1.68E-09   345.3883   1.50E+13
  0.1965   1.34E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 5:

```
Pile-head deflection             =     4.00722755 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -376665485. inch-lbs
Maximum shear force              =       -834975. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    84.00000000 feet below pile head
Number of iterations             =             12
Number of zero deflection points =              5
```

--

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 6

--

```
Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                              =     5.000000 inches
Rotation of pile head                                  =    0.000E+00 radians
Axial load on pile head                                =    2500000.0 lbs
```

Depth	Deflect.	Bending	Shear	Slope	Total	Bending
Soil Res.	Soil Spr.	Distrib.				
X	y	Moment	Force	S	Stress	Stiffness
p	Es*h	Lat. Load				
feet	inches	in-lbs	lbs	radians	psi*	in-lb^2
lb/inch	lb/inch	lb/inch				

File name is incorrect below, run designation is "Channel Post Seismic Long.(Half scour) 96in"

Channel Static 24in.lp9o 10/4/2017

```
---------- ---------- ----------
      0.00     5.0088  -4.59E+08    928346.       0.00      5628.   1.50E+13
      0.00       0.00       0.00
    2.0000     5.0000  -4.37E+08    928302.  -7.16E-04      5371.   1.50E+13
    0.00       0.00       0.00
    4.0000     4.9744  -4.14E+08    928302.   -0.00140      5114.   1.50E+13
    0.00       0.00       0.00
    6.0000     4.9330  -3.92E+08    928302.   -0.00204      4856.   1.50E+13
    0.00       0.00       0.00
    8.0000     4.8765  -3.69E+08    928302.   -0.00265      4598.   1.50E+13
    0.00       0.00       0.00
   10.0000     4.8058  -3.47E+08    928302.   -0.00322      4339.   1.50E+13
   0.00       0.00       0.00
   12.0000     4.7219  -3.24E+08    928302.   -0.00376      4080.   1.50E+13
   0.00       0.00       0.00
   14.0000     4.6255  -3.02E+08    928302.   -0.00426      3821.   1.50E+13
   0.00       0.00       0.00
   16.0000     4.5174  -2.79E+08    928302.   -0.00472      3562.   1.50E+13
   0.00       0.00       0.00
   18.0000     4.3987  -2.57E+08    928302.   -0.00515      3302.   1.50E+13
   0.00       0.00       0.00
   20.0000     4.2701  -2.34E+08    928302.   -0.00554      3041.   1.50E+13
   0.00       0.00       0.00
   22.0000     4.1326  -2.12E+08    928302.   -0.00590      2781.   1.50E+13
   0.00       0.00       0.00
   24.0000     3.9869  -1.89E+08    928302.   -0.00622      2520.   1.50E+13
   0.00       0.00       0.00
   26.0000     3.8339  -1.66E+08    928302.   -0.00651      2259.   1.50E+13
   0.00       0.00       0.00
   28.0000     3.6746  -1.44E+08    928302.   -0.00675      1998.   1.50E+13
   0.00       0.00       0.00
   30.0000     3.5098  -1.21E+08    928302.   -0.00696      1737.   1.50E+13
   0.00       0.00       0.00
   32.0000     3.3403  -9.82E+07    928302.   -0.00714      1476.   1.50E+13
   0.00       0.00       0.00
   34.0000     3.1671  -7.55E+07    928302.   -0.00728      1214.   1.50E+13
   0.00       0.00       0.00
   36.0000     2.9910  -5.27E+07    928302.   -0.00738   952.5877   1.50E+13
   0.00       0.00       0.00
   38.0000     2.8128  -3.00E+07    928302.   -0.00745   690.9603   1.50E+13
   0.00       0.00       0.00
   40.0000     2.6335  -7288445.    928302.   -0.00748   429.2998   1.50E+13
   0.00       0.00       0.00
   42.0000     2.4539   1.54E+07    928302.   -0.00747   523.1454   1.50E+13
   0.00       0.00       0.00
   44.0000     2.2749   3.82E+07    928302.   -0.00743   784.7970   1.50E+13
   0.00       0.00       0.00
   46.0000     2.0974   6.09E+07    928302.   -0.00735      1046.   1.50E+13
   0.00       0.00       0.00
   48.0000     1.9222   8.36E+07    928302.   -0.00723      1308.   1.50E+13
   0.00       0.00       0.00
   50.0000     1.7502   1.06E+08    928302.   -0.00708      1569.   1.50E+13
   0.00       0.00       0.00
   52.0000     1.5823   1.29E+08    928302.   -0.00689      1831.   1.50E+13
   0.00       0.00       0.00
   54.0000     1.4194   1.52E+08    928302.   -0.00667      2092.   1.50E+13
   0.00       0.00       0.00
   56.0000     1.2622   1.74E+08    928296.   -0.00641      2353.   1.50E+13
   -0.4613     8.7708       0.00
   58.0000     1.1118   1.97E+08    928275.   -0.00611      2614.   1.50E+13
   -1.3265    28.6354       0.00
   60.0000     0.9689   2.20E+08    891103.   -0.00578      2874.   1.50E+13
   -3096.     76695.       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(Half scour) 96in"


```
 62.0000     0.8345   2.40E+08    779407.   -0.00541      3114.   1.50E+13
 -6212.    178653.       0.00
 64.0000     0.7093   2.58E+08    600063.   -0.00501      3313.   1.50E+13
 -8734.    295531.       0.00
 66.0000     0.5939   2.70E+08    386589.   -0.00459      3453.   1.50E+13
 -9056.    365942.       0.00
 68.0000     0.4890   2.77E+08    167540.   -0.00415      3533.   1.50E+13
 -9198.    451483.       0.00
 70.0000     0.3946   2.78E+08    -47552.   -0.00371      3551.   1.50E+13
 -8726.    530718.       0.00
 72.0000     0.3110   2.75E+08   -248036.   -0.00327      3511.   1.50E+13
 -7981.    615983.       0.00
 74.0000     0.2378   2.67E+08   -428054.   -0.00283      3418.   1.50E+13
 -7021.    708417.       0.00
 76.0000     0.1750   2.55E+08   -584562.   -0.00242      3279.   1.50E+13
 -6022.    825925.       0.00
 78.0000     0.1219   2.39E+08   -717135.   -0.00202      3099.   1.50E+13
 -5026.    989561.       0.00
 80.0000    0.07799   2.21E+08   -825691.   -0.00165      2885.   1.50E+13
 -4020.   1237153.       0.00
 82.0000    0.04255   2.00E+08   -909568.   -0.00132      2645.   1.50E+13
 -2970.   1674965.       0.00
 84.0000    0.01477   1.77E+08   -964943.   -0.00102      2384.   1.50E+13
 -1645.   2672640.       0.00
 86.0000   -0.00621   1.54E+08   -975819.  -7.51E-04      2113.   1.50E+13
 738.8296   2856960.       0.00
 88.0000   -0.02129   1.30E+08   -941747.  -5.24E-04      1846.   1.50E+13
 2100.   2367377.       0.00
 90.0000   -0.03138   1.08E+08   -885943.  -3.34E-04      1593.   1.50E+13
 2550.   1950244.       0.00
 92.0000   -0.03731   8.79E+07   -821980.  -1.77E-04      1357.   1.50E+13
 2780.   1788678.       0.00
 94.0000   -0.03986   6.90E+07   -754130.  -5.13E-05      1139.   1.50E+13
 2874.   1730446.       0.00
 96.0000   -0.03977   5.17E+07   -685197.   4.52E-05   940.3774   1.50E+13
 2871.   1732467.       0.00
 98.0000   -0.03769   3.61E+07   -617216.   1.15E-04   760.5082   1.50E+13
 2795.   1779543.       0.00
100.0000   -0.03423   2.20E+07   -539501.   1.62E-04   599.1315   1.50E+13
3682.   2581284.       0.00
102.0000   -0.02992   1.01E+07   -442590.   1.88E-04   462.1447   1.50E+13
4394.   3524354.       0.00
104.0000   -0.02523    772984.   -341438.   1.96E-04   354.2877   1.50E+13
4035.   3838274.       0.00
106.0000   -0.02051  -6271278.   -249367.   1.92E-04   417.5892   1.50E+13
3638.   4257535.       0.00
108.0000   -0.01602  -1.12E+07   -167131.   1.78E-04   474.5598   1.50E+13
3215.   4816566.       0.00
110.0000   -0.01197  -1.43E+07    -95197.   1.57E-04   510.1952   1.50E+13
2779.   5572756.       0.00
112.0000   -0.00846  -1.58E+07    -33802.   1.33E-04   527.3853   1.50E+13
2337.   6626466.       0.00
114.0000   -0.00557  -1.60E+07     16989.   1.08E-04   529.0593   1.50E+13
1895.   8170561.       0.00
116.0000   -0.00328  -1.50E+07     57200.   8.32E-05   518.1459   1.50E+13
1455.   1.06E+07       0.00
118.0000   -0.00157  -1.32E+07     83803.   6.06E-05   497.5643   1.50E+13
761.4398   1.16E+07       0.00
120.0000  -3.72E-04  -1.10E+07     95168.   4.13E-05   471.9186   1.50E+13
185.6815   1.20E+07       0.00
122.0000   4.08E-04  -8654699.     94877.   2.56E-05   445.0294   1.50E+13
-209.9711   1.23E+07       0.00
124.0000   8.56E-04  -6439252.     86914.   1.35E-05   419.5231   1.50E+13
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-453.5797   1.27E+07       0.00
126.0000    0.00106  -4484449.     74557.   4.78E-06   397.0175   1.50E+13
-576.2000   1.31E+07       0.00
128.0000    0.00109  -2861107.     60340.  -1.09E-06   378.3281   1.50E+13
-608.5031   1.35E+07       0.00
130.0000    0.00100  -1587988.     46097.  -4.65E-06   363.6708   1.50E+13
-578.4425   1.38E+07       0.00
132.0000   8.62E-04   -647900.     33037.  -6.44E-06   352.8476   1.50E+13
-509.8512   1.42E+07       0.00
134.0000   6.95E-04     -1424.     21857.  -6.96E-06   345.4047   1.50E+13
-421.8099   1.46E+07       0.00
136.0000   5.28E-04    402090.     12852.  -6.64E-06   350.0176   1.50E+13
-328.6062   1.49E+07       0.00
138.0000   3.77E-04    616288.      6028.  -5.82E-06   352.4836   1.50E+13
-240.1088   1.53E+07       0.00
140.0000   2.49E-04    692124.      1198.  -4.78E-06   353.3567   1.50E+13
-162.3948   1.57E+07       0.00
142.0000   1.47E-04    674355.     -1933.  -3.68E-06   353.1521   1.50E+13
-98.4986   1.60E+07       0.00
144.0000   7.19E-05    599785.     -3705.  -2.67E-06   352.2936   1.50E+13
-49.1780   1.64E+07       0.00
146.0000   1.95E-05    496832.     -4459.  -1.79E-06   351.1083   1.50E+13
-13.6255   1.68E+07       0.00
148.0000  -1.39E-05    385982.     -4503.  -1.08E-06   349.8321   1.50E+13
9.9201   1.71E+07       0.00
150.0000  -3.25E-05    280810.     -4100.  -5.49E-07   348.6213   1.50E+13
23.6840   1.75E+07       0.00
152.0000  -4.03E-05    189252.     -3456.  -1.74E-07   347.5672   1.50E+13
29.9904   1.79E+07       0.00
154.0000  -4.08E-05    114951.     -2724.   6.97E-08   346.7118   1.50E+13
31.0142   1.82E+07       0.00
156.0000  -3.69E-05     58503.     -2008.   2.08E-07   346.0619   1.50E+13
28.6326   1.86E+07       0.00
158.0000  -3.08E-05     18541.     -1372.   2.70E-07   345.6018   1.50E+13
24.3558   1.90E+07       0.00
160.0000  -2.40E-05     -7393.  -848.0700   2.79E-07   345.4734   1.50E+13
19.3172   1.94E+07       0.00
162.0000  -1.74E-05    -22199.  -444.6434   2.55E-07   345.6439   1.50E+13
14.3017   1.97E+07       0.00
164.0000  -1.17E-05    -28766.  -155.4452   2.14E-07   345.7195   1.50E+13
9.7981   2.01E+07       0.00
166.0000  -7.11E-06    -29686.    34.8596   1.68E-07   345.7301   1.50E+13
6.0606   2.05E+07       0.00
168.0000  -3.65E-06    -27113.   145.6336   1.22E-07   345.7005   1.50E+13
3.1706   2.08E+07       0.00
170.0000  -1.24E-06    -22711.   196.8008   8.25E-08   345.6498   1.50E+13
1.0934   2.12E+07       0.00
172.0000   3.06E-07    -17677.   206.6224   5.02E-08   345.5918   1.50E+13
-0.2749   2.16E+07       0.00
174.0000   1.17E-06    -12799.   190.4761   2.58E-08   345.5357   1.50E+13
-1.0706   2.19E+07       0.00
176.0000   1.55E-06     -8537.   160.3905   8.77E-09   345.4866   1.50E+13
-1.4365   2.23E+07       0.00
178.0000   1.59E-06     -5101.   125.0998  -2.13E-09   345.4471   1.50E+13
-1.5044   2.27E+07       0.00
180.0000   1.44E-06     -2532.    90.4174  -8.23E-09   345.4175   1.50E+13
-1.3858   2.30E+07       0.00
182.0000   1.20E-06  -760.1919    59.7736  -1.09E-08   345.3971   1.50E+13
-1.1679   2.34E+07       0.00
184.0000   9.22E-07   338.7205    34.7980  -1.12E-08   345.3922   1.50E+13
-0.9134   2.38E+07       0.00
186.0000   6.60E-07   911.4560    15.8728  -1.02E-08   345.3988   1.50E+13
-0.6637   2.41E+07       0.00
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  188.0000   4.32E-07      1102.     2.6105  -8.59E-09   345.4010   1.50E+13
  -0.4415   2.45E+07       0.00
  190.0000   2.47E-07      1038.    -5.7631  -6.88E-09   345.4003   1.50E+13
  -0.2563   2.49E+07       0.00
  192.0000   1.02E-07   826.0343   -10.1250  -5.39E-09   345.3978   1.50E+13
  -0.1072   2.53E+07       0.00
  194.0000  -1.17E-08   552.4380   -11.2623  -4.29E-09   345.3947   1.50E+13
  0.01245   2.56E+07       0.00
  196.0000  -1.04E-07   285.9586    -9.7612  -3.62E-09   345.3916   1.50E+13
  0.1126   2.60E+07       0.00
  198.0000  -1.85E-07    84.3369    -5.9658  -3.32E-09   345.3893   1.50E+13
  0.2036   2.64E+07       0.00
  200.0000  -2.64E-07       0.00       0.00  -3.26E-09   345.3883   1.50E+13
  0.2935   1.34E+07       0.00

* The above values of total stress are combined axial and bending stresses.


Output Summary for Load Case No. 6:

Pile-head deflection             =     5.00880379 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -458811570. inch-lbs
Maximum shear force              =       -975819. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    86.00000000 feet below pile head
Number of iterations             =             13
Number of zero deflection points =              5



-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 7
-------------------------------------------------------------------------------
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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     6.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     6.0103  -5.37E+08   1074708.       0.00      6531.   1.50E+13
      0.00       0.00       0.00
    2.0000     6.0000  -5.11E+08   1074656.  -8.38E-04      6233.   1.50E+13
    0.00       0.00       0.00
    4.0000     5.9701  -4.86E+08   1074656.   -0.00164      5936.   1.50E+13
    0.00       0.00       0.00
    6.0000     5.9215  -4.60E+08   1074656.   -0.00239      5637.   1.50E+13
    0.00       0.00       0.00
    8.0000     5.8553  -4.34E+08   1074656.   -0.00311      5339.   1.50E+13
    0.00       0.00       0.00
   10.0000     5.7724  -4.08E+08   1074656.   -0.00378      5039.   1.50E+13
   0.00       0.00       0.00
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12.0000	5.6739	-3.82E+08	1074656.	-0.00441	4739.	1.50E+13
0.00	0.00	0.00				
14.0000	5.5608	-3.56E+08	1074656.	-0.00500	4439.	1.50E+13
0.00	0.00	0.00				
16.0000	5.4340	-3.29E+08	1074656.	-0.00555	4139.	1.50E+13
0.00	0.00	0.00				
18.0000	5.2946	-3.03E+08	1074656.	-0.00605	3838.	1.50E+13
0.00	0.00	0.00				
20.0000	5.1435	-2.77E+08	1074656.	-0.00652	3536.	1.50E+13
0.00	0.00	0.00				
22.0000	4.9818	-2.51E+08	1074656.	-0.00694	3235.	1.50E+13
0.00	0.00	0.00				
24.0000	4.8104	-2.25E+08	1074656.	-0.00732	2933.	1.50E+13
0.00	0.00	0.00				
26.0000	4.6304	-1.99E+08	1074656.	-0.00766	2631.	1.50E+13
0.00	0.00	0.00				
28.0000	4.4429	-1.72E+08	1074656.	-0.00795	2328.	1.50E+13
0.00	0.00	0.00				
30.0000	4.2487	-1.46E+08	1074656.	-0.00821	2026.	1.50E+13
0.00	0.00	0.00				
32.0000	4.0489	-1.20E+08	1074656.	-0.00842	1723.	1.50E+13
0.00	0.00	0.00				
34.0000	3.8445	-9.34E+07	1074656.	-0.00859	1420.	1.50E+13
0.00	0.00	0.00				
36.0000	3.6365	-6.71E+07	1074656.	-0.00872	1118.	1.50E+13
0.00	0.00	0.00				
38.0000	3.4259	-4.07E+07	1074656.	-0.00881	814.5022	1.50E+13
0.00	0.00	0.00				
40.0000	3.2138	-1.44E+07	1074656.	-0.00885	511.4581	1.50E+13
0.00	0.00	0.00				
42.0000	3.0011	1.19E+07	1074656.	-0.00885	482.3787	1.50E+13
0.00	0.00	0.00				
44.0000	2.7889	3.82E+07	1074656.	-0.00881	785.4257	1.50E+13
0.00	0.00	0.00				
46.0000	2.5782	6.45E+07	1074656.	-0.00873	1088.	1.50E+13
0.00	0.00	0.00				
48.0000	2.3699	9.09E+07	1074656.	-0.00861	1391.	1.50E+13
0.00	0.00	0.00				
50.0000	2.1651	1.17E+08	1074656.	-0.00844	1694.	1.50E+13
0.00	0.00	0.00				
52.0000	1.9649	1.43E+08	1074656.	-0.00823	1997.	1.50E+13
0.00	0.00	0.00				
54.0000	1.7701	1.70E+08	1074656.	-0.00798	2299.	1.50E+13
0.00	0.00	0.00				
56.0000	1.5818	1.96E+08	1074650.	-0.00769	2602.	1.50E+13
-0.4973	7.5456	0.00				
58.0000	1.4011	2.22E+08	1074627.	-0.00735	2904.	1.50E+13
-1.4328	24.5441	0.00				
60.0000	1.2288	2.48E+08	1034549.	-0.00698	3206.	1.50E+13
-3338.	65200.	0.00				
62.0000	1.0662	2.73E+08	917819.	-0.00656	3485.	1.50E+13
-6389.	143823.	0.00				
64.0000	0.9139	2.93E+08	731395.	-0.00611	3722.	1.50E+13
-9146.	240176.	0.00				
66.0000	0.7730	3.09E+08	505985.	-0.00563	3898.	1.50E+13
-9638.	299242.	0.00				
68.0000	0.6439	3.18E+08	271050.	-0.00513	4009.	1.50E+13
-9940.	370509.	0.00				
70.0000	0.5270	3.22E+08	36796.	-0.00461	4055.	1.50E+13
-9581.	436362.	0.00				
72.0000	0.4224	3.21E+08	-185372.	-0.00410	4036.	1.50E+13
-8933.	507522.	0.00				
74.0000	0.3302	3.14E+08	-390637.	-0.00359	3958.	1.50E+13

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 -8172.    594022.       0.00
 76.0000     0.2500   3.02E+08   -575077.   -0.00310      3825.   1.50E+13
 -7198.    690989.       0.00
 78.0000     0.1814   2.87E+08   -735022.   -0.00263      3644.   1.50E+13
 -6131.    811188.       0.00
 80.0000     0.1238   2.67E+08   -869376.   -0.00219      3423.   1.50E+13
 -5065.    981931.       0.00
 82.0000    0.07646   2.45E+08   -977922.   -0.00178      3167.   1.50E+13
 -3981.   1249490.       0.00
 84.0000    0.03852   2.21E+08  -1059594.   -0.00140      2885.   1.50E+13
 -2825.   1760345.       0.00
 86.0000    0.00905   1.94E+08  -1106429.   -0.00107      2583.   1.50E+13
 -1077.   2856960.       0.00
 88.0000   -0.01296   1.68E+08  -1099695.  -7.83E-04      2275.   1.50E+13
 1639.   3034489.       0.00
 90.0000   -0.02854   1.42E+08  -1050851.  -5.36E-04      1977.   1.50E+13
 2432.   2044999.       0.00
 92.0000   -0.03868   1.17E+08   -987697.  -3.29E-04      1695.   1.50E+13
 2831.   1756610.       0.00
 94.0000   -0.04432   9.43E+07   -917358.  -1.60E-04      1431.   1.50E+13
 3031.   1640996.       0.00
 96.0000   -0.04635   7.32E+07   -843804.  -2.58E-05      1188.   1.50E+13
 3099.   1604793.       0.00
 98.0000   -0.04556   5.38E+07   -769746.   7.58E-05   965.1937   1.50E+13
 3073.   1618587.       0.00
100.0000   -0.04271   3.62E+07   -683529.   1.48E-04   762.6102   1.50E+13
4112.   2310975.       0.00
102.0000   -0.03846   2.10E+07   -574398.   1.94E-04   587.2568   1.50E+13
4982.   3108654.       0.00
104.0000   -0.03341   8645051.   -458891.   2.17E-04   444.9183   1.50E+13
4644.   3335278.       0.00
106.0000   -0.02803  -1044450.   -352130.   2.23E-04   357.4130   1.50E+13
4253.   3641352.       0.00
108.0000   -0.02269  -8284003.   -255172.   2.16E-04   440.7616   1.50E+13
3827.   4047268.       0.00
110.0000   -0.01767  -1.33E+07   -168733.   1.99E-04   498.7249   1.50E+13
3377.   4586642.       0.00
112.0000   -0.01316  -1.64E+07    -93249.   1.75E-04   534.2815   1.50E+13
2914.   5315260.       0.00
114.0000   -0.00927  -1.78E+07    -28928.   1.48E-04   550.4976   1.50E+13
2446.   6330793.       0.00
116.0000   -0.00608  -1.78E+07     24189.   1.19E-04   550.4713   1.50E+13
1980.   7821780.       0.00
118.0000   -0.00356  -1.67E+07     66137.   9.15E-05   537.2950   1.50E+13
1516.   1.02E+07       0.00
120.0000   -0.00168  -1.46E+07     94419.   6.64E-05   514.0488   1.50E+13
841.0835   1.20E+07       0.00
122.0000  -3.72E-04  -1.21E+07    106807.   4.50E-05   485.2089   1.50E+13
191.2440   1.23E+07       0.00
124.0000   4.75E-04  -9528319.    106078.   2.77E-05   455.0873   1.50E+13
-251.9580   1.27E+07       0.00
126.0000   9.57E-04  -7056211.     96793.   1.44E-05   426.6261   1.50E+13
-521.7949   1.31E+07       0.00
128.0000    0.00117  -4883979.     82676.   4.87E-06   401.6173   1.50E+13
-654.6052   1.35E+07       0.00
130.0000    0.00119  -3088332.     66590.  -1.50E-06   380.9441   1.50E+13
-685.9278   1.38E+07       0.00
132.0000    0.00110  -1687482.     50584.  -5.32E-06   364.8162   1.50E+13
-647.8768   1.42E+07       0.00
134.0000   9.36E-04   -659648.     35998.  -7.20E-06   352.9828   1.50E+13
-567.6080   1.46E+07       0.00
136.0000   7.50E-04     41307.     23587.  -7.69E-06   345.8639   1.50E+13
-466.6750   1.49E+07       0.00
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File name is incorrect below, run designation is "Channel Post Seismic Long.(Half scour) 96in"


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138.0000   5.66E-04    473454.     13654.  -7.28E-06   350.8392   1.50E+13
-361.0585   1.53E+07       0.00
140.0000   4.01E-04    697585.      6182.  -6.34E-06   353.4196   1.50E+13
-261.6578   1.57E+07       0.00
142.0000   2.62E-04    770935.   941.0871  -5.17E-06   354.2641   1.50E+13
-175.0572   1.60E+07       0.00
144.0000   1.53E-04    743378.     -2413.  -3.96E-06   353.9468   1.50E+13
-104.4143   1.64E+07       0.00
146.0000   7.20E-05    655606.     -4270.  -2.84E-06   352.9363   1.50E+13
-50.3534   1.68E+07       0.00
148.0000   1.65E-05    538769.     -5015.  -1.88E-06   351.5911   1.50E+13
-11.7833   1.71E+07       0.00
150.0000  -1.84E-05    415092.     -4996.  -1.12E-06   350.1673   1.50E+13
13.4082   1.75E+07       0.00
152.0000  -3.73E-05    299099.     -4501.  -5.50E-07   348.8318   1.50E+13
27.8039   1.79E+07       0.00
154.0000  -4.48E-05    199092.     -3759.  -1.52E-07   347.6805   1.50E+13
34.0545   1.82E+07       0.00
156.0000  -4.46E-05    118681.     -2935.   1.02E-07   346.7547   1.50E+13
34.6078   1.86E+07       0.00
158.0000  -3.99E-05     58194.     -2141.   2.44E-07   346.0583   1.50E+13
31.5530   1.90E+07       0.00
160.0000  -3.29E-05     15875.     -1444.   3.03E-07   345.5711   1.50E+13
26.5521   1.94E+07       0.00
162.0000  -2.54E-05    -11152.  -875.2718   3.07E-07   345.5167   1.50E+13
20.8366   1.97E+07       0.00
164.0000  -1.82E-05    -26175.  -442.2695   2.77E-07   345.6897   1.50E+13
15.2469   2.01E+07       0.00
166.0000  -1.21E-05    -32414.  -135.7783   2.30E-07   345.7615   1.50E+13
10.2940   2.05E+07       0.00
168.0000  -7.18E-06    -32720.    62.5362   1.78E-07   345.7650   1.50E+13
6.2322   2.08E+07       0.00
170.0000  -3.54E-06    -29433.   174.8696   1.28E-07   345.7272   1.50E+13
3.1290   2.12E+07       0.00
172.0000  -1.03E-06    -24342.   223.5645   8.51E-08   345.6686   1.50E+13
0.9289   2.16E+07       0.00
174.0000   5.41E-07    -18713.   228.7791   5.07E-08   345.6038   1.50E+13
-0.4944   2.19E+07       0.00
176.0000   1.40E-06    -13366.   207.2609   2.50E-08   345.5422   1.50E+13
-1.2988   2.23E+07       0.00
178.0000   1.74E-06     -8767.   171.9364   7.31E-09   345.4893   1.50E+13
-1.6449   2.27E+07       0.00
180.0000   1.75E-06     -5114.   132.0535  -3.79E-09   345.4472   1.50E+13
-1.6786   2.30E+07       0.00
182.0000   1.56E-06     -2428.    93.6561  -9.82E-09   345.4163   1.50E+13
-1.5211   2.34E+07       0.00
184.0000   1.28E-06  -617.6690    60.2162  -1.23E-08   345.3954   1.50E+13
-1.2655   2.38E+07       0.00
186.0000   9.71E-07   463.8140    33.3013  -1.24E-08   345.3937   1.50E+13
-0.9774   2.41E+07       0.00
188.0000   6.83E-07   982.2798    13.1964  -1.12E-08   345.3996   1.50E+13
-0.6980   2.45E+07       0.00
190.0000   4.33E-07      1099.    -0.5669  -9.56E-09   345.4010   1.50E+13
-0.4489   2.49E+07       0.00
192.0000   2.25E-07   956.2153    -8.7913  -7.91E-09   345.3993   1.50E+13
-0.2365   2.53E+07       0.00
194.0000   5.32E-08   677.5543   -12.3101  -6.61E-09   345.3961   1.50E+13
-0.05678   2.56E+07       0.00
196.0000  -9.24E-08   366.1240   -11.7913  -5.77E-09   345.3925   1.50E+13
0.1000   2.60E+07       0.00
198.0000  -2.24E-07   112.2650    -7.6411  -5.39E-09   345.3896   1.50E+13
0.2458   2.64E+07       0.00
200.0000  -3.51E-07       0.00       0.00  -5.30E-09   345.3883   1.50E+13
```

```
  0.3909   1.34E+07       0.00

* The above values of total stress are combined axial and bending stresses.


Output Summary for Load Case No. 7:

Pile-head deflection             =     6.01030890 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -537250871. inch-lbs
Maximum shear force              =      -1106429. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    86.00000000 feet below pile head
Number of iterations             =             15
Number of zero deflection points =              5


-------------------------------------------------------------------------------
--
            Summary of Pile-head Responses for Conventional Analyses
-------------------------------------------------------------------------------
--

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/
rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-
lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S,
radians


Load Load                Load                  Axial    Pile-head  Pile-head
Max Shear Max Moment
Case Type   Pile-head    Type     Pile-head   Loading  Deflection  Rotation
in Pile    in Pile
 No.  1      Load 1       2        Load 2       lbs      inches     radians
 lbs      in-lbs
---- ----- ---------- ---------- ---------- ---------- ---------- ----------
---------- ----------
  1  y, in     0.5000   S, rad         0.00   2500000.     0.5010       0.00
  -128794.  -5.20E+07
  2  y, in     1.0000   S, rad         0.00   2500000.     1.0020       0.00
  -258023.  -1.03E+08
  3  y, in     2.0000   S, rad         0.00   2500000.     2.0038       0.00
  -488528.  -2.00E+08
  4  y, in     3.0000   S, rad         0.00   2500000.     3.0056       0.00
  -672290.  -2.91E+08
  5  y, in     4.0000   S, rad         0.00   2500000.     4.0072       0.00
  -834975.  -3.77E+08
  6  y, in     5.0000   S, rad         0.00   2500000.     5.0088       0.00
  -975819.  -4.59E+08
  7  y, in     6.0000   S, rad         0.00   2500000.     6.0103       0.00
  -1106429.  -5.37E+08


Maximum pile-head deflection = 6.0103088990 inches
Maximum pile-head rotation   = 0.0000000000 radians = 0.000000 deg.

The analysis ended normally.
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(No scour) 96in"

==========
==

LPile for Windows, Version 2016-09.009

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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--
Files Used for Analysis

--

Path to file locations:
\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis
\L-Pile\Point of Fixity Calculations (200 ft Embedment)\Channel\Longitudinal
\Post Seismic (No Scour)\

Name of input data file:
Channel Static 24in.lp9d

Name of output report file:
Channel Static 24in.lp9o

Name of plot output file:
Channel Static 24in.lp9p

Name of runtime message file:
Channel Static 24in.lp9r

--
Date and Time of Analysis

--

Date: October 4, 2017 Time: 15:45:20

```
--
                                   Problem Title
-------------------------------------------------------------------------------
--

Project Name: Harbor River Bridge
Job Number: 18461-007-01
Client: SCDOT
Engineer: HPC
Description: Channel - Static



-------------------------------------------------------------------------------
--
                           Program Options and Settings
-------------------------------------------------------------------------------
--

Computational Options:
 - Use unfactored loads in computations (conventional analysis)
Engineering Units Used for Data Input and Computations:
 - US Customary System Units (pounds, feet, inches)

Analysis Control Options:
 - Maximum number of iterations allowed                =          500
 - Deflection tolerance for convergence                =   1.0000E-05 in
 - Maximum allowable deflection                        =     100.0000 in
 - Number of pile increments                           =          100

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Computation of pile-head foundation stiffness matrix not selected
 - Push-over analysis of pile not selected
 - Buckling analysis of pile not selected

Output Options:
 - Output files use decimal points to denote decimal symbols.
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1
 - No p-y curves to be computed and reported for user-specified depths
 - Print using wide report formats



-------------------------------------------------------------------------------
--
                     Pile Structural Properties and Geometry
-------------------------------------------------------------------------------
--

Number of pile sections defined                        =            1
Total length of pile                                   =      200.000 ft
Depth of ground surface below top of pile              =      45.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.
```

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	96.0000
2	200.000	96.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile

Cross-sectional Shape	=	Circular Pile
Length of section	=	200.000000 ft
Width of top of section	=	96.000000 in
Width of bottom of section	=	96.000000 in
Top Area	=	7238. sq. in
Bottom Area	=	7238. sq. in
Moment of Inertia at Top	=	4169220. in^4
Moment of Inertia at Bottom	=	4169220. in^4
Elastic Modulus	=	3600000. psi

Ground Slope and Pile Batter Angles

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	45.000000 ft
Distance from top of pile to bottom of layer	=	60.000000 ft
Effective unit weight at top of layer	=	37.600000 pcf
Effective unit weight at bottom of layer	=	37.600000 pcf
Undrained cohesion at top of layer	=	0.0000 psf
Undrained cohesion at bottom of layer	=	45.000000 psf
Epsilon-50 at top of layer	=	0.020000

```
   Epsilon-50 at bottom of layer                        =     0.020000


Layer 2 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer            =    60.000000 ft
   Distance from top of pile to bottom of layer         =   100.000000 ft
   Effective unit weight at top of layer                =    57.600000 pcf
   Effective unit weight at bottom of layer             =    57.600000 pcf
   Undrained cohesion at top of layer                   =        3400. psf
   Undrained cohesion at bottom of layer                =        3400. psf
   Epsilon-50 at top of layer                           =     0.005000
   Epsilon-50 at bottom of layer                        =     0.005000
   Subgrade k at top of layer                           =   400.000000 pci
   Subgrade k at bottom of layer                        =   400.000000 pci


Layer 3 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer            =   100.000000 ft
   Distance from top of pile to bottom of layer         =   210.000000 ft
   Effective unit weight at top of layer                =    57.600000 pcf
   Effective unit weight at bottom of layer             =    57.600000 pcf
   Undrained cohesion at top of layer                   =        6000. psf
   Undrained cohesion at bottom of layer                =        6000. psf
   Epsilon-50 at top of layer                           =     0.005000
   Epsilon-50 at bottom of layer                        =     0.005000
   Subgrade k at top of layer                           =   800.000000 pci
   Subgrade k at bottom of layer                        =   800.000000 pci


 (Depth of the lowest soil layer extends 10.000 ft below the pile tip)



--------------------------------------------------------------------------------
--
                        Summary of Input Soil Properties
--------------------------------------------------------------------------------
--

Layer         Soil Type          Layer      Effective    Undrained       E50
Layer           Name             Depth       Unit Wt.    Cohesion        or
kpy
 Num.     (p-y Curve Type)        ft           pcf          psf          krm
 pci
-----   -------------------   ----------   ----------   ----------
----------   ----------
  1            Soft              45.0000      37.6000         0.00
  0.02000       --
               Clay              60.0000      37.6000      45.0000
               0.02000       --
  2         Stiff Clay           60.0000      57.6000        3400.
  0.00500     400.0000
          with Free Water       100.0000      57.6000        3400.
          0.00500     400.0000
  3         Stiff Clay          100.0000      57.6000        6000.
  0.00500     800.0000
          with Free Water       210.0000      57.6000        6000.
          0.00500     800.0000


--------------------------------------------------------------------------------
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(No scour) 96in"

--

p-y Modification Factors for Group Action

--

Distribution of p-y modifiers with depth defined using 4 points

Point No.	Depth X ft	p-mult	y-mult
1	45.000	0.0800	1.0000
2	60.000	0.0800	1.0000
3	60.000	0.8000	1.0000
4	210.000	0.8000	1.0000

--

Static Loading Type

--

Static loading criteria were used when computing p-y curves for all analyses.

--

Pile-head Loading and Pile-head Fixity Conditions

--

Number of loads specified = 7

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	5	y = 0.500000 in	S = 0.0000 in/in	2500000.	N.A.
2	5	y = 1.000000 in	S = 0.0000 in/in	2500000.	N.A.
3	5	y = 2.000000 in	S = 0.0000 in/in	2500000.	N.A.
4	5	y = 3.000000 in	S = 0.0000 in/in	2500000.	N.A.
5	5	y = 4.000000 in	S = 0.0000 in/in	2500000.	N.A.
6	5	y = 5.000000 in	S = 0.0000 in/in	2500000.	N.A.
7	5	y = 6.000000 in	S = 0.0000 in/in	2500000.	N.A.

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with

specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

--
Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness
---
--

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

---
--
Layering Correction Equivalent Depths of Soil & Rock Layers

--

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	45.0000	0.00	N.A.	No	0.00	27077.
2	60.0000	40.6795	No	No	27077.	1049005.
3	100.0000	80.6795	Yes	No	1076082.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

--
Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 2500000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p	Soil Spr. Es*h	Distrib. Lat. Load				

File name is incorrect below, run designation is "Channel Post Seismic Long.(No scour) 96in"

Channel Static 24in.lp9o 10/4/2017

```
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     0.5011  -5.58E+07    123725.       0.00   987.2834   1.50E+13
      0.00       0.00       0.00
    2.0000     0.5000  -5.28E+07    123719.  -8.68E-05   953.0679   1.50E+13
    0.00       0.00       0.00
    4.0000     0.4969  -4.98E+07    123719.  -1.69E-04   918.7940   1.50E+13
    0.00       0.00       0.00
    6.0000     0.4919  -4.68E+07    123719.  -2.46E-04   884.4651   1.50E+13
    0.00       0.00       0.00
    8.0000     0.4851  -4.38E+07    123719.  -3.19E-04   850.0845   1.50E+13
    0.00       0.00       0.00
   10.0000     0.4766  -4.08E+07    123719.  -3.86E-04   815.6555   1.50E+13
   0.00       0.00       0.00
   12.0000     0.4666  -3.79E+07    123719.  -4.49E-04   781.1814   1.50E+13
   0.00       0.00       0.00
   14.0000     0.4550  -3.49E+07    123719.  -5.07E-04   746.6654   1.50E+13
   0.00       0.00       0.00
   16.0000     0.4422  -3.19E+07    123719.  -5.61E-04   712.1110   1.50E+13
   0.00       0.00       0.00
   18.0000     0.4281  -2.88E+07    123719.  -6.09E-04   677.5214   1.50E+13
   0.00       0.00       0.00
   20.0000     0.4130  -2.58E+07    123719.  -6.53E-04   642.8999   1.50E+13
   0.00       0.00       0.00
   22.0000     0.3968  -2.28E+07    123719.  -6.92E-04   608.2498   1.50E+13
   0.00       0.00       0.00
   24.0000     0.3798  -1.98E+07    123719.  -7.26E-04   573.5746   1.50E+13
   0.00       0.00       0.00
   26.0000     0.3620  -1.68E+07    123719.  -7.55E-04   538.8774   1.50E+13
   0.00       0.00       0.00
   28.0000     0.3435  -1.38E+07    123719.  -7.80E-04   504.1617   1.50E+13
   0.00       0.00       0.00
   30.0000     0.3245  -1.08E+07    123719.  -7.99E-04   469.4308   1.50E+13
   0.00       0.00       0.00
   32.0000     0.3051  -7756452.    123719.  -8.14E-04   434.6879   1.50E+13
   0.00       0.00       0.00
   34.0000     0.2855  -4737988.    123719.  -8.24E-04   399.9365   1.50E+13
   0.00       0.00       0.00
   36.0000     0.2656  -1719069.    123719.  -8.29E-04   365.1799   1.50E+13
   0.00       0.00       0.00
   38.0000     0.2457   1300015.    123719.  -8.30E-04   360.3553   1.50E+13
   0.00       0.00       0.00
   40.0000     0.2258   4318974.    123719.  -8.25E-04   395.1124   1.50E+13
   0.00       0.00       0.00
   42.0000     0.2060   7337519.    123719.  -8.16E-04   429.8648   1.50E+13
   0.00       0.00       0.00
   44.0000     0.1866   1.04E+07    123719.  -8.02E-04   464.6090   1.50E+13
   0.00       0.00       0.00
   46.0000     0.1676   1.34E+07    123716.  -7.83E-04   499.3418   1.50E+13
   -0.2353    33.7027       0.00
   48.0000     0.1490   1.64E+07    123705.  -7.59E-04   534.0583   1.50E+13
   -0.6789   109.3225       0.00
   50.0000     0.1311   1.94E+07    123684.  -7.30E-04   568.7521   1.50E+13
   -1.0843   198.4262       0.00
   52.0000     0.1140   2.24E+07    123653.  -6.97E-04   603.4174   1.50E+13
   -1.4487   305.0099       0.00
   54.0000    0.09770   2.54E+07    123615.  -6.59E-04   638.0483   1.50E+13
   -1.7692   434.6271       0.00
   56.0000    0.08238   2.84E+07    123569.  -6.16E-04   672.6393   1.50E+13
   -2.0429   595.1735       0.00
   58.0000    0.06815   3.14E+07    123517.  -5.68E-04   707.1855   1.50E+13
   -2.2665   798.1549       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(No scour) 96in"


```
 60.0000    0.05513   3.44E+07    110494.  -5.15E-04   741.6818   1.50E+13
 -1083.    471459.       0.00
 62.0000    0.04343   3.68E+07     63476.  -4.58E-04   768.9583   1.50E+13
 -2835.   1566720.       0.00
 64.0000    0.03314   3.75E+07   438.0859  -3.99E-04   777.3931   1.50E+13
 -2418.   1751040.       0.00
 66.0000    0.02429   3.69E+07    -52087.  -3.39E-04   769.7512   1.50E+13
 -1959.   1935360.       0.00
 68.0000    0.01686   3.51E+07    -93464.  -2.82E-04   749.0774   1.50E+13
 -1489.   2119680.       0.00
 70.0000    0.01077   3.24E+07   -123742.  -2.28E-04   718.4902   1.50E+13
 -1034.   2304000.       0.00
 72.0000    0.00593   2.92E+07   -143525.  -1.79E-04   681.0098   1.50E+13
 -614.5127   2488320.       0.00
 74.0000    0.00220   2.55E+07   -153840.  -1.35E-04   639.4220   1.50E+13
 -245.1247   2672640.       0.00
 76.0000  -5.45E-04   2.18E+07   -156004.  -9.70E-05   596.1806   1.50E+13
 64.8193   2856960.       0.00
 78.0000   -0.00245   1.81E+07   -151494.  -6.51E-05   553.3449   1.50E+13
 311.0028   3041280.       0.00
 80.0000   -0.00367   1.45E+07   -141842.  -3.91E-05   512.5517   1.50E+13
 493.3552   3225600.       0.00
 82.0000   -0.00433   1.13E+07   -128539.  -1.85E-05   475.0141   1.50E+13
 615.2253   3409920.       0.00
 84.0000   -0.00456   8351949.   -112966.  -2.79E-06   441.5439   1.50E+13
 682.5135   3594240.       0.00
 86.0000   -0.00446   5837095.    -96342.   8.55E-06   412.5905   1.50E+13
 702.8299   3778560.       0.00
 88.0000   -0.00415   3726512.    -79691.   1.62E-05   388.2915   1.50E+13
 684.7256   3962880.       0.00
 90.0000   -0.00369   2009973.    -63830.   2.08E-05   368.5290   1.50E+13
 637.0358   4147200.       0.00
 92.0000   -0.00315    660174.    -49365.   2.29E-05   352.9889   1.50E+13
 568.3544   4331520.       0.00
 94.0000   -0.00259   -362317.    -36705.   2.32E-05   349.5597   1.50E+13
 486.6513   4515840.       0.00
 96.0000   -0.00204  -1104461.    -26077.   2.20E-05   358.1039   1.50E+13
 399.0272   4700160.       0.00
 98.0000   -0.00153  -1616660.    -17550.   1.98E-05   364.0009   1.50E+13
 311.5990   4884480.       0.00
100.0000   -0.00109  -1949223.     -8303.   1.70E-05   367.8296   1.50E+13
458.9892   1.01E+07       0.00
102.0000  -7.17E-04  -2017221.   971.7390   1.38E-05   368.6125   1.50E+13
313.8741   1.05E+07       0.00
104.0000  -4.25E-04  -1904234.      7048.   1.07E-05   367.3117   1.50E+13
192.4820   1.09E+07       0.00
106.0000  -2.06E-04  -1680195.     10514.   7.79E-06   364.7323   1.50E+13
96.3487   1.12E+07       0.00
108.0000  -5.10E-05  -1400498.     11966.   5.32E-06   361.5122   1.50E+13
24.6818   1.16E+07       0.00
110.0000   4.99E-05  -1106449.     11964.   3.32E-06   358.1268   1.50E+13
-24.9059   1.20E+07       0.00
112.0000   1.08E-04   -826641.     10996.   1.77E-06   354.9054   1.50E+13
-55.7443   1.23E+07       0.00
114.0000   1.35E-04   -578861.      9468.   6.50E-07   352.0527   1.50E+13
-71.5671   1.27E+07       0.00
116.0000   1.40E-04   -372249.      7696.  -1.10E-07   349.6740   1.50E+13
-76.0975   1.31E+07       0.00
118.0000   1.30E-04   -209433.      5910.  -5.75E-07   347.7995   1.50E+13
-72.7572   1.35E+07       0.00
120.0000   1.12E-04    -88505.      4263.  -8.13E-07   346.4073   1.50E+13
-64.4869   1.38E+07       0.00
122.0000   9.07E-05     -4714.      2845.  -8.88E-07   345.4426   1.50E+13
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-53.6607   1.42E+07       0.00
124.0000   6.93E-05     48170.      1696.  -8.53E-07   345.9429   1.50E+13
-42.0729   1.46E+07       0.00
126.0000   4.98E-05     76815.   819.7702  -7.53E-07   346.2727   1.50E+13
-30.9779   1.49E+07       0.00
128.0000   3.32E-05     87609.   194.0988  -6.22E-07   346.3970   1.50E+13
-21.1614   1.53E+07       0.00
130.0000   2.00E-05     86206.  -216.1955  -4.83E-07   346.3808   1.50E+13
-13.0298   1.57E+07       0.00
132.0000   1.00E-05     77290.  -452.9768  -3.52E-07   346.2782   1.50E+13
-6.7020   1.60E+07       0.00
134.0000   3.07E-06     64506.  -558.5591  -2.39E-07   346.1310   1.50E+13
-2.0965   1.64E+07       0.00
136.0000  -1.42E-06     50508.  -571.8047  -1.47E-07   345.9698   1.50E+13
0.9927   1.68E+07       0.00
138.0000  -3.97E-06     37076.  -525.8661  -7.66E-08   345.8152   1.50E+13
2.8355   1.71E+07       0.00
140.0000  -5.10E-06     25275.  -447.2197  -2.67E-08   345.6793   1.50E+13
3.7184   1.75E+07       0.00
142.0000  -5.25E-06     15613.  -355.6387   5.96E-09   345.5681   1.50E+13
3.9133   1.79E+07       0.00
144.0000  -4.81E-06      8204.  -264.7880   2.50E-08   345.4828   1.50E+13
3.6575   1.82E+07       0.00
146.0000  -4.05E-06      2900.  -183.1704   3.39E-08   345.4217   1.50E+13
3.1439   1.86E+07       0.00
148.0000  -3.18E-06  -592.4835  -115.2152   3.57E-08   345.3952   1.50E+13
2.5190   1.90E+07       0.00
150.0000  -2.34E-06     -2634.   -62.3585   3.31E-08   345.4187   1.50E+13
1.8857   1.94E+07       0.00
152.0000  -1.59E-06     -3590.   -24.0154   2.82E-08   345.4297   1.50E+13
1.3095   1.97E+07       0.00
154.0000  -9.86E-07     -3790.     1.6084   2.23E-08   345.4320   1.50E+13
0.8258   2.01E+07       0.00
156.0000  -5.25E-07     -3515.    16.8865   1.64E-08   345.4288   1.50E+13
0.4474   2.05E+07       0.00
158.0000  -1.98E-07     -2982.    24.3176   1.12E-08   345.4227   1.50E+13
0.1719   2.08E+07       0.00
160.0000   1.43E-08     -2349.    26.2288   6.97E-09   345.4154   1.50E+13
-0.01261   2.12E+07       0.00
162.0000   1.36E-07     -1724.    24.6063   3.71E-09   345.4082   1.50E+13
-0.1226   2.16E+07       0.00
164.0000   1.92E-07     -1169.    21.0244   1.40E-09   345.4018   1.50E+13
-0.1759   2.19E+07       0.00
166.0000   2.04E-07  -714.6806    16.6429  -1.06E-10   345.3966   1.50E+13
-0.1892   2.23E+07       0.00
168.0000   1.87E-07  -369.7075    12.2481  -9.73E-10   345.3926   1.50E+13
-0.1770   2.27E+07       0.00
170.0000   1.57E-07  -126.6527     8.3162  -1.37E-09   345.3898   1.50E+13
-0.1507   2.30E+07       0.00
172.0000   1.22E-07    29.6364     5.0848  -1.45E-09   345.3887   1.50E+13
-0.1186   2.34E+07       0.00
174.0000   8.75E-08   117.5900     2.6213  -1.33E-09   345.3897   1.50E+13
-0.08665   2.38E+07       0.00
176.0000   5.78E-08   155.6205     0.8836  -1.11E-09   345.3901   1.50E+13
-0.05816   2.41E+07       0.00
178.0000   3.41E-08   160.1348    -0.2327  -8.59E-10   345.3902   1.50E+13
-0.03486   2.45E+07       0.00
180.0000   1.66E-08   144.5535    -0.8575  -6.15E-10   345.3900   1.50E+13
-0.01720   2.49E+07       0.00
182.0000   4.61E-09   119.0487    -1.1221  -4.04E-10   345.3897   1.50E+13
-0.00485   2.53E+07       0.00
184.0000  -2.81E-09    90.7413    -1.1442  -2.37E-10   345.3894   1.50E+13
0.00300   2.56E+07       0.00
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  186.0000  -6.75E-09    64.1555    -1.0204  -1.13E-10   345.3891   1.50E+13
  0.00731   2.60E+07       0.00
  188.0000  -8.23E-09    41.7747    -0.8243  -2.81E-11   345.3888   1.50E+13
  0.00903   2.64E+07       0.00
  190.0000  -8.10E-09    24.5939    -0.6076   2.50E-11   345.3886   1.50E+13
  0.00902   2.67E+07       0.00
  192.0000  -7.03E-09    12.6054    -0.4042   5.47E-11   345.3885   1.50E+13
  0.00793   2.71E+07       0.00
  194.0000  -5.47E-09     5.1853    -0.2339   6.90E-11   345.3884   1.50E+13
  0.00626   2.75E+07       0.00
  196.0000  -3.72E-09     1.3709    -0.1070   7.42E-11   345.3883   1.50E+13
  0.00431   2.78E+07       0.00
  198.0000  -1.91E-09    0.03918   -0.02837   7.53E-11   345.3883   1.50E+13
  0.00224   2.82E+07       0.00
  200.0000  -1.01E-10       0.00       0.00   7.54E-11   345.3883   1.50E+13
  1.20E-04   1.43E+07       0.00

* The above values of total stress are combined axial and bending stresses.


Output Summary for Load Case No. 1:

Pile-head deflection             =     0.50106983 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -55754208. inch-lbs
Maximum shear force              =       -156004. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    76.00000000 feet below pile head
Number of iterations             =              6
Number of zero deflection points =              6



-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 2
-------------------------------------------------------------------------------
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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     1.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     1.0021  -1.08E+08    236465.       0.00      1590.   1.50E+13
      0.00       0.00       0.00
    2.0000     1.0000  -1.02E+08    236453.  -1.68E-04      1525.   1.50E+13
    0.00       0.00       0.00
    4.0000     0.9940  -9.68E+07    236453.  -3.28E-04      1459.   1.50E+13
    0.00       0.00       0.00
    6.0000     0.9843  -9.11E+07    236453.  -4.78E-04      1394.   1.50E+13
    0.00       0.00       0.00
    8.0000     0.9711  -8.54E+07    236453.  -6.19E-04      1328.   1.50E+13
    0.00       0.00       0.00
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File name is incorrect below, run designation is "Channel Post Seismic Long.(No scour) 96in"


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10.0000     0.9546  -7.96E+07    236453.  -7.51E-04      1262.   1.50E+13
0.00       0.00       0.00
12.0000     0.9350  -7.39E+07    236453.  -8.74E-04      1196.   1.50E+13
0.00       0.00       0.00
14.0000     0.9126  -6.82E+07    236453.  -9.87E-04      1130.   1.50E+13
0.00       0.00       0.00
16.0000     0.8876  -6.24E+07    236453.   -0.00109      1064.   1.50E+13
0.00       0.00       0.00
18.0000     0.8602  -5.67E+07    236453.   -0.00119   998.1934   1.50E+13
0.00       0.00       0.00
20.0000     0.8307  -5.10E+07    236453.   -0.00127   932.0077   1.50E+13
0.00       0.00       0.00
22.0000     0.7991  -4.52E+07    236453.   -0.00135   865.7656   1.50E+13
0.00       0.00       0.00
24.0000     0.7659  -3.94E+07    236453.   -0.00142   799.4737   1.50E+13
0.00       0.00       0.00
26.0000     0.7311  -3.37E+07    236453.   -0.00148   733.1381   1.50E+13
0.00       0.00       0.00
28.0000     0.6950  -2.79E+07    236453.   -0.00153   666.7654   1.50E+13
0.00       0.00       0.00
30.0000     0.6579  -2.21E+07    236453.   -0.00157   600.3618   1.50E+13
0.00       0.00       0.00
32.0000     0.6199  -1.64E+07    236453.   -0.00160   533.9338   1.50E+13
0.00       0.00       0.00
34.0000     0.5813  -1.06E+07    236453.   -0.00162   467.4877   1.50E+13
0.00       0.00       0.00
36.0000     0.5423  -4832950.    236453.   -0.00163   401.0298   1.50E+13
0.00       0.00       0.00
38.0000     0.5031   939959.     236453.   -0.00163   356.2100   1.50E+13
0.00       0.00       0.00
40.0000     0.4639   6712777.    236453.   -0.00163   422.6722   1.50E+13
0.00       0.00       0.00
42.0000     0.4250   1.25E+07    236453.   -0.00161   489.1269   1.50E+13
0.00       0.00       0.00
44.0000     0.3865   1.83E+07    236453.   -0.00159   555.5678   1.50E+13
0.00       0.00       0.00
46.0000     0.3488   2.40E+07    236450.   -0.00155   621.9886   1.50E+13
-0.3005    20.6739       0.00
48.0000     0.3120   2.98E+07    236436.   -0.00151   688.3808   1.50E+13
-0.8685    66.8098       0.00
50.0000     0.2763   3.56E+07    236409.   -0.00146   754.7344   1.50E+13
-1.3901   120.7382       0.00
52.0000     0.2420   4.13E+07    236370.   -0.00140   821.0395   1.50E+13
-1.8620   184.6536       0.00
54.0000     0.2093   4.71E+07    236320.   -0.00133   887.2866   1.50E+13
-2.2808   261.5553       0.00
56.0000     0.1784   5.28E+07    236261.   -0.00125   953.4665   1.50E+13
-2.6430   355.6264       0.00
58.0000     0.1495   5.86E+07    236194.   -0.00116      1020.   1.50E+13
-2.9449   472.8281       0.00
60.0000     0.1228   6.43E+07    216759.   -0.00106      1086.   1.50E+13
-1617.    315856.       0.00
62.0000    0.09867   6.91E+07    143096.  -9.52E-04      1141.   1.50E+13
-4522.   1099936.       0.00
64.0000    0.07714   7.13E+07     40852.  -8.40E-04      1166.   1.50E+13
-3998.   1243954.       0.00
66.0000    0.05836   7.12E+07    -48862.  -7.26E-04      1165.   1.50E+13
-3478.   1430254.       0.00
68.0000    0.04230   6.90E+07   -126125.  -6.14E-04      1140.   1.50E+13
-2961.   1679934.       0.00
70.0000    0.02889   6.52E+07   -191022.  -5.07E-04      1096.   1.50E+13
-2447.   2032724.       0.00
72.0000    0.01799   5.99E+07   -242767.  -4.07E-04      1035.   1.50E+13
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 -1865.   2488320.       0.00
 74.0000    0.00938   5.36E+07   -277679.  -3.16E-04   962.1066   1.50E+13
 -1044.   2672640.       0.00
 76.0000    0.00283   4.66E+07   -294252.  -2.36E-04   882.1063   1.50E+13
 -336.6241   2856960.       0.00
 78.0000   -0.00193   3.95E+07   -295350.  -1.67E-04   799.8221   1.50E+13
 245.1657   3041280.       0.00
 80.0000   -0.00518   3.25E+07   -284050.  -1.09E-04   719.1202   1.50E+13
 696.5216   3225600.       0.00
 82.0000   -0.00718   2.59E+07   -263442.  -6.27E-05   643.0013   1.50E+13
 1021.   3409920.       0.00
 84.0000   -0.00819   1.98E+07   -236467.  -2.62E-05   573.6231   1.50E+13
 1227.   3594240.       0.00
 86.0000   -0.00844   1.45E+07   -205868.   1.21E-06   512.3610   1.50E+13
 1323.   3759621.       0.00
 88.0000   -0.00814   9942357.   -174415.   2.08E-05   459.8541   1.50E+13
 1298.   3830052.       0.00
 90.0000   -0.00745   6128605.   -143928.   3.36E-05   415.9466   1.50E+13
 1242.   4003353.       0.00
 92.0000   -0.00652   3029787.   -115070.   4.09E-05   380.2701   1.50E+13
 1163.   4277604.       0.00
 94.0000   -0.00548    600338.    -88740.   4.38E-05   352.3000   1.50E+13
 1032.   4515840.       0.00
 96.0000   -0.00442  -1234976.    -65976.   4.33E-05   359.6065   1.50E+13
 865.4171   4700160.       0.00
 98.0000   -0.00340  -2571692.    -47280.   4.03E-05   374.9961   1.50E+13
 692.5603   4884480.       0.00
100.0000   -0.00249  -3509246.    -27064.   3.54E-05   385.7901   1.50E+13
992.0976   9579651.       0.00
102.0000   -0.00170  -3875014.     -6214.   2.95E-05   390.0012   1.50E+13
745.4121   1.05E+07       0.00
104.0000   -0.00107  -3811054.      8542.   2.34E-05   389.2648   1.50E+13
484.2816   1.09E+07       0.00
106.0000  -5.81E-04  -3467782.     17620.   1.76E-05   385.3127   1.50E+13
272.1916   1.12E+07       0.00
108.0000  -2.26E-04  -2967395.     22200.   1.24E-05   379.5518   1.50E+13
109.5076   1.16E+07       0.00
110.0000   1.45E-05  -2403647.     23428.   8.11E-06   373.0614   1.50E+13
-7.2242   1.20E+07       0.00
112.0000   1.63E-04  -1843829.     22335.   4.72E-06   366.6162   1.50E+13
-83.8885   1.23E+07       0.00
114.0000   2.41E-04  -1332155.     19796.   2.18E-06   360.7254   1.50E+13
-127.6196   1.27E+07       0.00
116.0000   2.68E-04   -893861.     16515.   3.97E-07   355.6793   1.50E+13
-145.8641   1.31E+07       0.00
118.0000   2.60E-04   -539499.     13016.  -7.49E-07   351.5996   1.50E+13
-145.6963   1.35E+07       0.00
120.0000   2.32E-04   -269007.      9667.  -1.40E-06   348.4854   1.50E+13
-133.3686   1.38E+07       0.00
122.0000   1.93E-04    -75309.      6698.  -1.67E-06   346.2554   1.50E+13
-114.0656   1.42E+07       0.00
124.0000   1.51E-04     52694.      4227.  -1.69E-06   345.9950   1.50E+13
-91.8217   1.46E+07       0.00
126.0000   1.12E-04    127803.      2291.  -1.54E-06   346.8597   1.50E+13
-69.5594   1.49E+07       0.00
128.0000   7.72E-05    162834.   865.4844  -1.31E-06   347.2630   1.50E+13
-49.2093   1.53E+07       0.00
130.0000   4.88E-05    169504.  -107.5288  -1.05E-06   347.3398   1.50E+13
-31.8751   1.57E+07       0.00
132.0000   2.70E-05    157798.  -706.2189  -7.85E-07   347.2050   1.50E+13
-18.0157   1.60E+07       0.00
134.0000   1.12E-05    135699.     -1014.  -5.50E-07   346.9506   1.50E+13
-7.6239   1.64E+07       0.00
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File name is incorrect below, run designation is "Channel Post Seismic Long.(No scour) 96in"


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136.0000   5.52E-07    109197.     -1110.  -3.54E-07   346.6455   1.50E+13
-0.3859   1.68E+07       0.00
138.0000  -5.86E-06     82462.     -1064.  -2.01E-07   346.3377   1.50E+13
4.1847   1.71E+07       0.00
140.0000  -9.11E-06     58129.  -934.4863  -8.88E-08   346.0576   1.50E+13
6.6434   1.75E+07       0.00
142.0000  -1.01E-05     37617.  -764.2858  -1.22E-08   345.8214   1.50E+13
7.5400   1.79E+07       0.00
144.0000  -9.69E-06     21444.  -585.3646   3.50E-08   345.6352   1.50E+13
7.3701   1.82E+07       0.00
146.0000  -8.44E-06      9515.  -418.3373   5.97E-08   345.4979   1.50E+13
6.5488   1.86E+07       0.00
148.0000  -6.83E-06      1357.  -274.9493   6.84E-08   345.4040   1.50E+13
5.4002   1.90E+07       0.00
150.0000  -5.16E-06     -3691.  -160.2275   6.66E-08   345.4308   1.50E+13
4.1599   1.94E+07       0.00
152.0000  -3.63E-06     -6342.   -74.4899   5.85E-08   345.4613   1.50E+13
2.9848   1.97E+07       0.00
154.0000  -2.35E-06     -7273.   -15.0726   4.76E-08   345.4721   1.50E+13
1.9666   2.01E+07       0.00
156.0000  -1.35E-06     -7071.    22.2889   3.62E-08   345.4697   1.50E+13
1.1469   2.05E+07       0.00
158.0000  -6.13E-07     -6208.    42.4330   2.56E-08   345.4598   1.50E+13
0.5318   2.08E+07       0.00
160.0000  -1.18E-07     -5037.    50.0702   1.66E-08   345.4463   1.50E+13
0.1046   2.12E+07       0.00
162.0000   1.83E-07     -3806.    49.3576   9.50E-09   345.4322   1.50E+13
-0.1640   2.16E+07       0.00
164.0000   3.37E-07     -2669.    43.6884   4.32E-09   345.4191   1.50E+13
-0.3084   2.19E+07       0.00
166.0000   3.90E-07     -1710.    35.6389   8.20E-10   345.4080   1.50E+13
-0.3624   2.23E+07       0.00
168.0000   3.77E-07  -958.7435    27.0188  -1.31E-09   345.3994   1.50E+13
-0.3560   2.27E+07       0.00
170.0000   3.27E-07  -412.6873    18.9811  -2.41E-09   345.3931   1.50E+13
-0.3138   2.30E+07       0.00
172.0000   2.61E-07   -47.3625    12.1583  -2.78E-09   345.3889   1.50E+13
-0.2547   2.34E+07       0.00
174.0000   1.94E-07   171.2441     6.8000  -2.68E-09   345.3903   1.50E+13
-0.1918   2.38E+07       0.00
176.0000   1.33E-07   279.3606     2.8977  -2.32E-09   345.3915   1.50E+13
-0.1334   2.41E+07       0.00
178.0000   8.23E-08   310.6130     0.2880  -1.85E-09   345.3919   1.50E+13
-0.08408   2.45E+07       0.00
180.0000   4.40E-08   293.4064    -1.2678  -1.36E-09   345.3917   1.50E+13
-0.04557   2.49E+07       0.00
182.0000   1.69E-08   249.9216    -2.0275  -9.29E-10   345.3912   1.50E+13
-0.01774   2.53E+07       0.00
184.0000  -6.50E-10   196.1965    -2.2320  -5.73E-10   345.3906   1.50E+13
6.94E-04   2.56E+07       0.00
186.0000  -1.06E-08   142.8520    -2.0856  -3.02E-10   345.3900   1.50E+13
0.01151   2.60E+07       0.00
188.0000  -1.51E-08    96.1225    -1.7482  -1.10E-10   345.3894   1.50E+13
0.01661   2.64E+07       0.00
190.0000  -1.59E-08    58.9503    -1.3361   1.35E-11   345.3890   1.50E+13
0.01774   2.67E+07       0.00
192.0000  -1.45E-08    31.9902    -0.9271   8.62E-11   345.3887   1.50E+13
0.01634   2.71E+07       0.00
194.0000  -1.18E-08    14.4393    -0.5691   1.23E-10   345.3885   1.50E+13
0.01349   2.75E+07       0.00
196.0000  -8.55E-09     4.6586    -0.2882   1.39E-10   345.3884   1.50E+13
0.00992   2.78E+07       0.00
198.0000  -5.14E-09     0.5908   -0.09670   1.43E-10   345.3883   1.50E+13
```

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  0.00604   2.82E+07       0.00
  200.0000  -1.70E-09       0.00       0.00   1.43E-10   345.3883   1.50E+13
  0.00202   1.43E+07       0.00

* The above values of total stress are combined axial and bending stresses.


Output Summary for Load Case No. 2:

Pile-head deflection             =     1.00207483 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -108130363. inch-lbs
Maximum shear force              =       -295350. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    78.00000000 feet below pile head
Number of iterations             =              8
Number of zero deflection points =              6



--------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 3
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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     2.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     2.0040  -2.06E+08    440567.       0.00      2718.   1.50E+13
      0.00       0.00       0.00
    2.0000     2.0000  -1.95E+08    440546.  -3.21E-04      2596.   1.50E+13
    0.00       0.00       0.00
    4.0000     1.9885  -1.85E+08    440546.  -6.25E-04      2474.   1.50E+13
    0.00       0.00       0.00
    6.0000     1.9700  -1.74E+08    440546.  -9.12E-04      2351.   1.50E+13
    0.00       0.00       0.00
    8.0000     1.9448  -1.64E+08    440546.   -0.00118      2229.   1.50E+13
    0.00       0.00       0.00
   10.0000     1.9132  -1.53E+08    440546.   -0.00144      2106.   1.50E+13
   0.00       0.00       0.00
   12.0000     1.8759  -1.42E+08    440546.   -0.00167      1984.   1.50E+13
   0.00       0.00       0.00
   14.0000     1.8330  -1.32E+08    440546.   -0.00189      1861.   1.50E+13
   0.00       0.00       0.00
   16.0000     1.7851  -1.21E+08    440546.   -0.00209      1737.   1.50E+13
   0.00       0.00       0.00
   18.0000     1.7326  -1.10E+08    440546.   -0.00228      1614.   1.50E+13
   0.00       0.00       0.00
   20.0000     1.6758  -9.95E+07    440546.   -0.00244      1491.   1.50E+13
   0.00       0.00       0.00
   22.0000     1.6152  -8.88E+07    440546.   -0.00260      1367.   1.50E+13
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(No scour) 96in"


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0.00        0.00        0.00
24.0000      1.5512  -7.80E+07    440546.   -0.00273      1244.   1.50E+13
0.00        0.00        0.00
26.0000      1.4843  -6.73E+07    440546.   -0.00284      1120.   1.50E+13
0.00        0.00        0.00
28.0000      1.4147  -5.65E+07    440546.   -0.00294   996.4239   1.50E+13
0.00        0.00        0.00
30.0000      1.3430  -4.58E+07    440546.   -0.00303   872.6317   1.50E+13
0.00        0.00        0.00
32.0000      1.2695  -3.50E+07    440546.   -0.00309   748.7889   1.50E+13
0.00        0.00        0.00
34.0000      1.1946  -2.43E+07    440546.   -0.00314   624.9073   1.50E+13
0.00        0.00        0.00
36.0000      1.1189  -1.35E+07    440546.   -0.00317   500.9990   1.50E+13
0.00        0.00        0.00
38.0000      1.0426  -2752326.    440546.   -0.00318   377.0757   1.50E+13
0.00        0.00        0.00
40.0000      0.9662   8011760.    440546.   -0.00318   437.6273   1.50E+13
0.00        0.00        0.00
42.0000      0.8901   1.88E+07    440546.   -0.00316   561.5447   1.50E+13
0.00        0.00        0.00
44.0000      0.8147   2.95E+07    440546.   -0.00312   685.4415   1.50E+13
0.00        0.00        0.00
46.0000      0.7405   4.03E+07    440541.   -0.00306   809.3056   1.50E+13
-0.3862    12.5157        0.00
48.0000      0.6678   5.10E+07    440523.   -0.00299   933.1226   1.50E+13
-1.1192    40.2244        0.00
50.0000      0.5971   6.18E+07    440488.   -0.00290      1057.   1.50E+13
-1.7971    72.2358        0.00
52.0000      0.5287   7.25E+07    440437.   -0.00279      1181.   1.50E+13
-2.4160   109.6690        0.00
54.0000      0.4631   8.33E+07    440373.   -0.00267      1304.   1.50E+13
-2.9721   154.0164        0.00
56.0000      0.4008   9.40E+07    440296.   -0.00252      1428.   1.50E+13
-3.4616   207.3006        0.00
58.0000      0.3420   1.05E+08    440208.   -0.00237      1551.   1.50E+13
-3.8804   272.3109        0.00
60.0000      0.2872   1.15E+08    410496.   -0.00219      1674.   1.50E+13
-2472.    206548.        0.00
62.0000      0.2369   1.25E+08    296749.   -0.00200      1781.   1.50E+13
-7007.    709796.        0.00
64.0000      0.1914   1.30E+08    137096.   -0.00179      1841.   1.50E+13
-6298.    789739.        0.00
66.0000      0.1508   1.31E+08     -5565.   -0.00158      1859.   1.50E+13
-5591.    889593.        0.00
68.0000      0.1153   1.30E+08   -131317.   -0.00138      1840.   1.50E+13
-4889.   1017367.        0.00
70.0000    0.08480   1.25E+08   -240285.   -0.00117      1788.   1.50E+13
-4192.   1186434.        0.00
72.0000    0.05908   1.18E+08   -332579.  -9.77E-04      1709.   1.50E+13
-3499.   1421366.        0.00
74.0000    0.03791   1.09E+08   -408207.  -7.95E-04      1606.   1.50E+13
-2803.   1774375.        0.00
76.0000    0.02095   9.89E+07   -466846.  -6.28E-04      1484.   1.50E+13
-2084.   2387295.        0.00
78.0000    0.00777   8.72E+07   -503671.  -4.79E-04      1349.   1.50E+13
-985.1833   3041280.        0.00
80.0000   -0.00205   7.48E+07   -512183.  -3.50E-04      1207.   1.50E+13
275.8517   3225600.        0.00
82.0000   -0.00901   6.26E+07   -493513.  -2.40E-04      1066.   1.50E+13
1280.   3409920.        0.00
84.0000   -0.01356   5.11E+07   -458039.  -1.49E-04   934.2637   1.50E+13
1676.   2966495.        0.00
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 86.0000   -0.01615   4.06E+07   -415971.  -7.54E-05   813.3353   1.50E+13
 1829.   2718285.       0.00
 88.0000   -0.01718   3.12E+07   -371375.  -1.80E-05   704.4936   1.50E+13
 1887.   2635537.       0.00
 90.0000   -0.01702   2.28E+07   -326201.   2.52E-05   608.1301   1.50E+13
 1878.   2648416.       0.00
 92.0000   -0.01597   1.55E+07   -281837.   5.58E-05   524.1934   1.50E+13
 1819.   2733470.       0.00
 94.0000   -0.01434   9286567.   -239324.   7.57E-05   452.3041   1.50E+13
 1723.   2885456.       0.00
 96.0000   -0.01234   4034171.   -199453.   8.63E-05   391.8335   1.50E+13
 1599.   3109938.       0.00
 98.0000   -0.01019   -297553.   -162827.   8.93E-05   348.8140   1.50E+13
 1453.   3422255.       0.00
100.0000   -0.00805  -3792250.   -123962.   8.61E-05   389.0483   1.50E+13
1786.   5321904.       0.00
102.0000   -0.00606  -6258076.    -78806.   7.80E-05   417.4372   1.50E+13
1977.   7831666.       0.00
104.0000   -0.00431  -7584301.    -35071.   6.70E-05   432.7060   1.50E+13
1667.   9289207.       0.00
106.0000   -0.00285  -7949521.   933.6194   5.45E-05   436.9107   1.50E+13
1333.   1.12E+07       0.00
108.0000   -0.00169  -7546032.     26742.   4.21E-05   432.2654   1.50E+13
817.4620   1.16E+07       0.00
110.0000  -8.23E-04  -6670961.     41480.   3.08E-05   422.1907   1.50E+13
410.7235   1.20E+07       0.00
112.0000  -2.12E-04  -5558673.     47718.   2.10E-05   409.3850   1.50E+13
109.0894   1.23E+07       0.00
114.0000   1.85E-04  -4383016.     47848.   1.31E-05   395.8497   1.50E+13
-98.2635   1.27E+07       0.00
116.0000   4.15E-04  -3263538.     43955.   6.94E-06   382.9613   1.50E+13
-226.1069   1.31E+07       0.00
118.0000   5.19E-04  -2273985.     37753.   2.51E-06   371.5686   1.50E+13
-290.7760   1.35E+07       0.00
120.0000   5.35E-04  -1451701.     30563.  -4.64E-07   362.1017   1.50E+13
-308.3735   1.38E+07       0.00
122.0000   4.96E-04   -806900.     23340.  -2.27E-06   354.6781   1.50E+13
-293.5394   1.42E+07       0.00
124.0000   4.26E-04   -331101.     16713.  -3.18E-06   349.2003   1.50E+13
-258.7197   1.46E+07       0.00
126.0000   3.44E-04     -4292.     11042.  -3.45E-06   345.4378   1.50E+13
-213.8465   1.49E+07       0.00
128.0000   2.61E-04    199341.      6480.  -3.29E-06   347.6833   1.50E+13
-166.3290   1.53E+07       0.00
130.0000   1.86E-04    307149.      3029.  -2.89E-06   348.9245   1.50E+13
-121.2608   1.57E+07       0.00
132.0000   1.22E-04    345082.   592.8274  -2.37E-06   349.3612   1.50E+13
-81.7590   1.60E+07       0.00
134.0000   7.22E-05    335889.  -980.6224  -1.82E-06   349.2554   1.50E+13
-49.3618   1.64E+07       0.00
136.0000   3.50E-05    298231.     -1866.  -1.31E-06   348.8218   1.50E+13
-24.4327   1.68E+07       0.00
138.0000   9.15E-06    246471.     -2238.  -8.78E-07   348.2259   1.50E+13
-6.5336   1.71E+07       0.00
140.0000  -7.21E-06    190924.     -2253.  -5.29E-07   347.5864   1.50E+13
5.2573   1.75E+07       0.00
142.0000  -1.62E-05    138387.     -2045.  -2.65E-07   346.9816   1.50E+13
12.0923   1.79E+07       0.00
144.0000  -1.99E-05     92802.     -1718.  -8.06E-08   346.4568   1.50E+13
15.1667   1.82E+07       0.00
146.0000  -2.01E-05     55944.     -1349.   3.83E-08   346.0324   1.50E+13
15.5927   1.86E+07       0.00
148.0000  -1.81E-05     28062.  -989.6350   1.05E-07   345.7114   1.50E+13
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  14.3252   1.90E+07       0.00
  150.0000  -1.50E-05      8429.  -672.1977   1.35E-07   345.4854   1.50E+13
  12.1279   1.94E+07       0.00
  152.0000  -1.16E-05     -4219.  -411.8154   1.38E-07   345.4369   1.50E+13
  9.5706   1.97E+07       0.00
  154.0000  -8.42E-06    -11355.  -212.4339   1.26E-07   345.5191   1.50E+13
  7.0445   2.01E+07       0.00
  156.0000  -5.62E-06    -14431.   -70.4112   1.05E-07   345.5545   1.50E+13
  4.7907   2.05E+07       0.00
  158.0000  -3.38E-06    -14747.    22.2561   8.16E-08   345.5581   1.50E+13
  2.9316   2.08E+07       0.00
  160.0000  -1.70E-06    -13373.    75.4766   5.91E-08   345.5423   1.50E+13
  1.5035   2.12E+07       0.00
  162.0000  -5.40E-07    -11131.    99.3377   3.95E-08   345.5165   1.50E+13
  0.4850   2.16E+07       0.00
  164.0000   1.96E-07     -8609.   103.0117   2.38E-08   345.4874   1.50E+13
  -0.1788   2.19E+07       0.00
  166.0000   6.01E-07     -6189.    94.1678   1.19E-08   345.4596   1.50E+13
  -0.5582   2.23E+07       0.00
  168.0000   7.68E-07     -4091.    78.7626   3.71E-09   345.4354   1.50E+13
  -0.7256   2.27E+07       0.00
  170.0000   7.79E-07     -2409.    61.0858  -1.49E-09   345.4161   1.50E+13
  -0.7475   2.30E+07       0.00
  172.0000   6.97E-07     -1158.    43.9626  -4.34E-09   345.4017   1.50E+13
  -0.6795   2.34E+07       0.00
  174.0000   5.70E-07  -298.4896    29.0298  -5.51E-09   345.3918   1.50E+13
  -0.5649   2.38E+07       0.00
  176.0000   4.32E-07   235.8711    17.0310  -5.56E-09   345.3910   1.50E+13
  -0.4350   2.41E+07       0.00
  178.0000   3.04E-07   519.6632     8.0908  -4.95E-09   345.3943   1.50E+13
  -0.3100   2.45E+07       0.00
  180.0000   1.95E-07   624.8258     1.9487  -4.04E-09   345.3955   1.50E+13
  -0.2018   2.49E+07       0.00
  182.0000   1.10E-07   613.6851    -1.8587  -3.05E-09   345.3954   1.50E+13
  -0.1155   2.53E+07       0.00
  184.0000   4.84E-08   535.9729    -3.8644  -2.13E-09   345.3945   1.50E+13
  -0.05167   2.56E+07       0.00
  186.0000   7.62E-09   428.4481    -4.5835  -1.36E-09   345.3933   1.50E+13
  -0.00825   2.60E+07       0.00
  188.0000  -1.67E-08   316.1287    -4.4622  -7.61E-10   345.3920   1.50E+13
  0.01836   2.64E+07       0.00
  190.0000  -2.89E-08   214.3535    -3.8554  -3.37E-10   345.3908   1.50E+13
  0.03221   2.67E+07       0.00
  192.0000  -3.29E-08   131.1090    -3.0232  -6.10E-11   345.3898   1.50E+13
  0.03714   2.71E+07       0.00
  194.0000  -3.18E-08    69.2467    -2.1401   9.92E-11   345.3891   1.50E+13
  0.03644   2.75E+07       0.00
  196.0000  -2.81E-08    28.3700    -1.3112   1.77E-10   345.3887   1.50E+13
  0.03263   2.78E+07       0.00
  198.0000  -2.33E-08     6.2867    -0.5905   2.05E-10   345.3884   1.50E+13
  0.02743   2.82E+07       0.00
  200.0000  -1.83E-08       0.00       0.00   2.10E-10   345.3883   1.50E+13
  0.02179   1.43E+07       0.00

* The above values of total stress are combined axial and bending stresses.


Output Summary for Load Case No. 3:

Pile-head deflection             =     2.00395363 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -206044648. inch-lbs
Maximum shear force              =       -512183. lbs
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(No scour) 96in"

Channel Static 24in.lp9o 10/4/2017

Depth of maximum bending moment = 0.000000 feet below pile head
Depth of maximum shear force = 80.00000000 feet below pile head
Number of iterations = 11
Number of zero deflection points = 5

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 4

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 3.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 2500000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				
0.00	3.0057	-2.99E+08	630076.	0.00	3790.	1.50E+13
0.00	0.00	0.00				
2.0000	3.0000	-2.84E+08	630045.	-4.66E-04	3615.	1.50E+13
0.00	0.00	0.00				
4.0000	2.9834	-2.69E+08	630045.	-9.08E-04	3441.	1.50E+13
0.00	0.00	0.00				
6.0000	2.9564	-2.54E+08	630045.	-0.00133	3266.	1.50E+13
0.00	0.00	0.00				
8.0000	2.9197	-2.38E+08	630045.	-0.00172	3091.	1.50E+13
0.00	0.00	0.00				
10.0000	2.8739	-2.23E+08	630045.	-0.00209	2915.	1.50E+13
0.00	0.00	0.00				
12.0000	2.8195	-2.08E+08	630045.	-0.00243	2740.	1.50E+13
0.00	0.00	0.00				
14.0000	2.7571	-1.93E+08	630045.	-0.00275	2564.	1.50E+13
0.00	0.00	0.00				
16.0000	2.6873	-1.77E+08	630045.	-0.00305	2388.	1.50E+13
0.00	0.00	0.00				
18.0000	2.6107	-1.62E+08	630045.	-0.00332	2211.	1.50E+13
0.00	0.00	0.00				
20.0000	2.5279	-1.47E+08	630045.	-0.00357	2035.	1.50E+13
0.00	0.00	0.00				
22.0000	2.4394	-1.31E+08	630045.	-0.00379	1858.	1.50E+13
0.00	0.00	0.00				
24.0000	2.3459	-1.16E+08	630045.	-0.00399	1682.	1.50E+13
0.00	0.00	0.00				
26.0000	2.2480	-1.01E+08	630045.	-0.00416	1505.	1.50E+13
0.00	0.00	0.00				
28.0000	2.1462	-8.53E+07	630045.	-0.00431	1328.	1.50E+13
0.00	0.00	0.00				
30.0000	2.0411	-6.99E+07	630045.	-0.00443	1150.	1.50E+13
0.00	0.00	0.00				
32.0000	1.9333	-5.45E+07	630045.	-0.00453	973.3046	1.50E+13
0.00	0.00	0.00				
34.0000	1.8235	-3.91E+07	630045.	-0.00461	796.0544	1.50E+13
0.00	0.00	0.00				

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36.0000     1.7121  -2.37E+07    630045.   -0.00466   618.7610   1.50E+13
0.00       0.00       0.00
38.0000     1.5998  -8343043.    630045.   -0.00468   441.4413   1.50E+13
0.00       0.00       0.00
40.0000     1.4873   7059523.    630045.   -0.00469   426.6642   1.50E+13
0.00       0.00       0.00
42.0000     1.3749   2.25E+07    630045.   -0.00466   603.9853   1.50E+13
0.00       0.00       0.00
44.0000     1.2635   3.79E+07    630045.   -0.00461   781.2816   1.50E+13
0.00       0.00       0.00
46.0000     1.1535   5.33E+07    630040.   -0.00454   958.5361   1.50E+13
-0.4476     9.3138       0.00
48.0000     1.0455   6.86E+07    630019.   -0.00444      1136.   1.50E+13
-1.2996    29.8333       0.00
50.0000     0.9402   8.40E+07    629978.   -0.00432      1313.   1.50E+13
-2.0907    53.3697       0.00
52.0000     0.8381   9.94E+07    629919.   -0.00417      1490.   1.50E+13
-2.8170    80.6692       0.00
54.0000     0.7398   1.15E+08    629844.   -0.00400      1667.   1.50E+13
-3.4743   112.7120       0.00
56.0000     0.6459   1.30E+08    629753.   -0.00381      1843.   1.50E+13
-4.0585   150.8041       0.00
58.0000     0.5570   1.45E+08    629650.   -0.00359      2020.   1.50E+13
-4.5655   196.7126       0.00
60.0000     0.4737   1.61E+08    591500.   -0.00334      2196.   1.50E+13
-3175.    160838.       0.00
62.0000     0.3966   1.74E+08    448510.   -0.00307      2351.   1.50E+13
-8741.    529014.       0.00
64.0000     0.3261   1.83E+08    246018.   -0.00279      2448.   1.50E+13
-8133.    598546.       0.00
66.0000     0.2627   1.86E+08     59885.   -0.00249      2491.   1.50E+13
-7378.    674102.       0.00
68.0000     0.2064   1.86E+08   -107128.   -0.00220      2485.   1.50E+13
-6540.    760491.       0.00
70.0000     0.1572   1.82E+08   -254104.   -0.00190      2435.   1.50E+13
-5708.    871300.       0.00
72.0000     0.1150   1.74E+08   -381193.   -0.00162      2347.   1.50E+13
-4883.   1018620.       0.00
74.0000    0.07952   1.63E+08   -488500.   -0.00135      2227.   1.50E+13
-4060.   1225161.       0.00
76.0000    0.05028   1.51E+08   -575950.   -0.00110      2079.   1.50E+13
-3228.   1540850.       0.00
78.0000    0.02681   1.36E+08   -642972.  -8.69E-04      1910.   1.50E+13
-2357.   2110130.       0.00
80.0000    0.00856   1.20E+08   -685062.  -6.65E-04      1725.   1.50E+13
-1150.   3225600.       0.00
82.0000   -0.00510   1.03E+08   -690177.  -4.86E-04      1532.   1.50E+13
723.9231   3409920.       0.00
84.0000   -0.01479   8.68E+07   -660483.  -3.35E-04      1344.   1.50E+13
1751.   2840328.       0.00
86.0000   -0.02116   7.14E+07   -614349.  -2.08E-04      1168.   1.50E+13
2094.   2374898.       0.00
88.0000   -0.02479   5.73E+07   -562028.  -1.05E-04      1005.   1.50E+13
2266.   2194329.       0.00
90.0000   -0.02621   4.45E+07   -506866.  -2.39E-05   857.3000   1.50E+13
2331.   2133756.       0.00
92.0000   -0.02594   3.30E+07   -451081.   3.80E-05   724.9672   1.50E+13
2318.   2145201.       0.00
94.0000   -0.02439   2.28E+07   -396285.   8.26E-05   607.9708   1.50E+13
2248.   2212062.       0.00
96.0000   -0.02197   1.39E+07   -343703.   1.12E-04   505.8575   1.50E+13
2134.   2330667.       0.00
98.0000   -0.01902   6296396.   -294278.   1.28E-04   417.8784   1.50E+13
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 1985.   2505157.       0.00
100.0000   -0.01582   -202552.   -240421.   1.33E-04   347.7203   1.50E+13
2503.   3796677.       0.00
102.0000   -0.01263  -5259795.   -176124.   1.29E-04   405.9441   1.50E+13
2855.   5423979.       0.00
104.0000   -0.00965  -8671935.   -111921.   1.17E-04   445.2278   1.50E+13
2495.   6206898.       0.00
106.0000   -0.00699  -1.06E+07    -56488.   1.02E-04   467.9563   1.50E+13
2124.   7289780.       0.00
108.0000   -0.00475  -1.14E+07     -9989.   8.44E-05   476.5852   1.50E+13
1751.   8846379.       0.00
110.0000   -0.00294  -1.11E+07     27550.   6.64E-05   473.5929   1.50E+13
1378.   1.12E+07       0.00
112.0000   -0.00156  -1.01E+07     53724.   4.94E-05   461.4520   1.50E+13
803.4693   1.23E+07       0.00
114.0000  -5.68E-04  -8562847.     66979.   3.45E-05   443.9719   1.50E+13
301.0772   1.27E+07       0.00
116.0000   9.65E-05  -6870303.     69960.   2.22E-05   424.4857   1.50E+13
-52.6439   1.31E+07       0.00
118.0000   4.98E-04  -5207422.     65981.   1.25E-05   405.3411   1.50E+13
-278.9674   1.35E+07       0.00
120.0000   6.99E-04  -3704727.     57803.   5.42E-06   388.0406   1.50E+13
-402.5015   1.38E+07       0.00
122.0000   7.58E-04  -2433517.     47596.   5.14E-07   373.4053   1.50E+13
-448.1403   1.42E+07       0.00
124.0000   7.23E-04  -1420203.     36951.  -2.57E-06   361.7391   1.50E+13
-438.9309   1.46E+07       0.00
126.0000   6.35E-04   -659577.     26946.  -4.23E-06   352.9820   1.50E+13
-394.7610   1.49E+07       0.00
128.0000   5.20E-04   -126270.     18229.  -4.86E-06   346.8421   1.50E+13
-331.7261   1.53E+07       0.00
130.0000   4.01E-04    215976.     11104.  -4.79E-06   347.8748   1.50E+13
-262.0202   1.57E+07       0.00
132.0000   2.91E-04    407276.      5629.  -4.29E-06   350.0773   1.50E+13
-194.1959   1.60E+07       0.00
134.0000   1.96E-04    486681.      1695.  -3.57E-06   350.9915   1.50E+13
-133.6531   1.64E+07       0.00
136.0000   1.19E-04    489055.  -907.9423  -2.79E-06   351.0188   1.50E+13
-83.2416   1.68E+07       0.00
138.0000   6.14E-05    443435.     -2433.  -2.05E-06   350.4936   1.50E+13
-43.8873   1.71E+07       0.00
140.0000   2.08E-05    372494.     -3142.  -1.40E-06   349.6768   1.50E+13
-15.1776   1.75E+07       0.00
142.0000  -5.55E-06    292774.     -3275.  -8.64E-07   348.7590   1.50E+13
4.1315   1.79E+07       0.00
144.0000  -2.07E-05    215406.     -3037.  -4.57E-07   347.8683   1.50E+13
15.7074   1.82E+07       0.00
146.0000  -2.75E-05    147065.     -2592.  -1.68E-07   347.0815   1.50E+13
21.3353   1.86E+07       0.00
148.0000  -2.87E-05     90999.     -2064.   2.26E-08   346.4360   1.50E+13
22.7091   1.90E+07       0.00
150.0000  -2.64E-05     48004.     -1536.   1.34E-07   345.9410   1.50E+13
21.3037   1.94E+07       0.00
152.0000  -2.23E-05     17276.     -1060.   1.86E-07   345.5872   1.50E+13
18.3141   1.97E+07       0.00
154.0000  -1.75E-05     -2905.  -664.6550   1.97E-07   345.4218   1.50E+13
14.6426   2.01E+07       0.00
156.0000  -1.28E-05    -14651.  -357.9182   1.83E-07   345.5570   1.50E+13
10.9188   2.05E+07       0.00
158.0000  -8.69E-06    -20107.  -136.4238   1.56E-07   345.6198   1.50E+13
7.5391   2.08E+07       0.00
160.0000  -5.34E-06    -21218.    10.6158   1.23E-07   345.6326   1.50E+13
4.7142   2.12E+07       0.00
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  162.0000  -2.80E-06    -19612.    97.4050   9.00E-08   345.6141   1.50E+13
  2.5182   2.16E+07       0.00
  164.0000  -1.02E-06    -16553.   138.8085   6.10E-08   345.5789   1.50E+13
  0.9321   2.19E+07       0.00
  166.0000   1.27E-07    -12956.   148.5730   3.74E-08   345.5375   1.50E+13
  -0.1184   2.23E+07       0.00
  168.0000   7.77E-07     -9426.   138.3389   1.96E-08   345.4969   1.50E+13
  -0.7345   2.27E+07       0.00
  170.0000   1.07E-06     -6319.   117.2472   6.96E-09   345.4611   1.50E+13
  -1.0232   2.30E+07       0.00
  172.0000   1.11E-06     -3799.    91.9575  -1.13E-09   345.4321   1.50E+13
  -1.0843   2.34E+07       0.00
  174.0000   1.01E-06     -1904.    66.9182  -5.69E-09   345.4103   1.50E+13
  -1.0023   2.38E+07       0.00
  176.0000   8.39E-07  -586.6387    44.7651  -7.68E-09   345.3951   1.50E+13
  -0.8438   2.41E+07       0.00
  178.0000   6.43E-07   245.2080    26.7571  -7.95E-09   345.3912   1.50E+13
  -0.6569   2.45E+07       0.00
  180.0000   4.57E-07   698.6570    13.1890  -7.20E-09   345.3964   1.50E+13
  -0.4738   2.49E+07       0.00
  182.0000   2.98E-07   879.1414     3.7458  -5.94E-09   345.3985   1.50E+13
  -0.3132   2.53E+07       0.00
  184.0000   1.72E-07   879.1656    -2.2158  -4.53E-09   345.3985   1.50E+13
  -0.1836   2.56E+07       0.00
  186.0000   8.02E-08   773.3247    -5.4614  -3.21E-09   345.3972   1.50E+13
  -0.08682   2.60E+07       0.00
  188.0000   1.80E-08   617.4023    -6.7404  -2.10E-09   345.3954   1.50E+13
  -0.01976   2.64E+07       0.00
  190.0000  -2.05E-08   450.0383    -6.7036  -1.24E-09   345.3935   1.50E+13
  0.02282   2.67E+07       0.00
  192.0000  -4.17E-08   295.7764    -5.8647  -6.48E-10   345.3917   1.50E+13
  0.04709   2.71E+07       0.00
  194.0000  -5.16E-08   168.6088    -4.5915  -2.76E-10   345.3903   1.50E+13
  0.05902   2.75E+07       0.00
  196.0000  -5.50E-08    75.4189    -3.1183  -8.11E-11   345.3892   1.50E+13
  0.06375   2.78E+07       0.00
  198.0000  -5.55E-08    18.9393    -1.5712  -5.69E-12   345.3885   1.50E+13
  0.06518   2.82E+07       0.00
  200.0000  -5.52E-08       0.00       0.00   9.45E-12   345.3883   1.50E+13
  0.06576   1.43E+07       0.00

* The above values of total stress are combined axial and bending stresses.


Output Summary for Load Case No. 4:

Pile-head deflection             =     3.00574032 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -299158432. inch-lbs
Maximum shear force              =       -690177. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    82.00000000 feet below pile head
Number of iterations             =             12
Number of zero deflection points =              5


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                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 5
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File name is incorrect below, run designation is "Channel Post Seismic Long.(No scour) 96in"

Channel Static 24in.lp9o 10/4/2017

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 4.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 2500000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment lb-in	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				
0.00	4.0074	-3.88E+08	806194.	0.00	4810.	1.50E+13
0.00	0.00	0.00				
2.0000	4.0000	-3.68E+08	806155.	-6.05E-04	4587.	1.50E+13
0.00	0.00	0.00				
4.0000	3.9784	-3.49E+08	806155.	-0.00118	4364.	1.50E+13
0.00	0.00	0.00				
6.0000	3.9434	-3.30E+08	806155.	-0.00172	4140.	1.50E+13
0.00	0.00	0.00				
8.0000	3.8958	-3.10E+08	806155.	-0.00223	3916.	1.50E+13
0.00	0.00	0.00				
10.0000	3.8363	-2.91E+08	806155.	-0.00271	3691.	1.50E+13
0.00	0.00	0.00				
12.0000	3.7656	-2.71E+08	806155.	-0.00316	3467.	1.50E+13
0.00	0.00	0.00				
14.0000	3.6845	-2.52E+08	806155.	-0.00358	3242.	1.50E+13
0.00	0.00	0.00				
16.0000	3.5938	-2.32E+08	806155.	-0.00397	3016.	1.50E+13
0.00	0.00	0.00				
18.0000	3.4942	-2.12E+08	806155.	-0.00432	2791.	1.50E+13
0.00	0.00	0.00				
20.0000	3.3864	-1.93E+08	806155.	-0.00465	2565.	1.50E+13
0.00	0.00	0.00				
22.0000	3.2712	-1.73E+08	806155.	-0.00494	2339.	1.50E+13
0.00	0.00	0.00				
24.0000	3.1493	-1.53E+08	806155.	-0.00520	2112.	1.50E+13
0.00	0.00	0.00				
26.0000	3.0216	-1.34E+08	806155.	-0.00543	1886.	1.50E+13
0.00	0.00	0.00				
28.0000	2.8888	-1.14E+08	806155.	-0.00563	1659.	1.50E+13
0.00	0.00	0.00				
30.0000	2.7515	-9.44E+07	806155.	-0.00579	1433.	1.50E+13
0.00	0.00	0.00				
32.0000	2.6107	-7.47E+07	806155.	-0.00593	1206.	1.50E+13
0.00	0.00	0.00				
34.0000	2.4669	-5.50E+07	806155.	-0.00603	979.0320	1.50E+13
0.00	0.00	0.00				
36.0000	2.3211	-3.53E+07	806155.	-0.00611	752.0850	1.50E+13
0.00	0.00	0.00				
38.0000	2.1739	-1.56E+07	806155.	-0.00615	525.0990	1.50E+13
0.00	0.00	0.00				
40.0000	2.0261	4107770.	806155.	-0.00615	392.6809	1.50E+13
0.00	0.00	0.00				
42.0000	1.8785	2.38E+07	806155.	-0.00613	619.6796	1.50E+13
0.00	0.00	0.00				
44.0000	1.7317	4.35E+07	806155.	-0.00608	846.6519	1.50E+13
0.00	0.00	0.00				
46.0000	1.5867	6.32E+07	806149.	-0.00599	1074.	1.50E+13
-0.4978	7.5302	0.00				
48.0000	1.4440	8.30E+07	806126.	-0.00588	1300.	1.50E+13

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 -1.4473    24.0547       0.00
 50.0000     1.3046   1.03E+08    806080.   -0.00573      1527.   1.50E+13
 -2.3319    42.8994       0.00
 52.0000     1.1691   1.22E+08    806015.   -0.00555      1754.   1.50E+13
 -3.1475    64.6147       0.00
 54.0000     1.0383   1.42E+08    805930.   -0.00534      1980.   1.50E+13
 -3.8899    89.9149       0.00
 56.0000     0.9129   1.62E+08    805829.   -0.00509      2207.   1.50E+13
 -4.5547   119.7393       0.00
 58.0000     0.7938   1.81E+08    805713.   -0.00482      2433.   1.50E+13
 -5.1376   155.3397       0.00
 60.0000     0.6816   2.01E+08    759956.   -0.00451      2658.   1.50E+13
 -3808.    134088.       0.00
 62.0000     0.5771   2.18E+08    596261.   -0.00418      2859.   1.50E+13
 -9833.    408960.       0.00
 64.0000     0.4810   2.30E+08    366439.   -0.00382      2994.   1.50E+13
 -9318.    464988.       0.00
 66.0000     0.3937   2.36E+08    149990.   -0.00345      3067.   1.50E+13
 -8719.    531536.       0.00
 68.0000     0.3155   2.38E+08    -50966.   -0.00307      3081.   1.50E+13
 -8027.    610697.       0.00
 70.0000     0.2464   2.34E+08   -233039.   -0.00269      3043.   1.50E+13
 -7145.    696049.       0.00
 72.0000     0.1863   2.27E+08   -393341.   -0.00232      2956.   1.50E+13
 -6213.    800506.       0.00
 74.0000     0.1349   2.16E+08   -531340.   -0.00197      2829.   1.50E+13
 -5287.    940757.       0.00
 76.0000    0.09175   2.02E+08   -647111.   -0.00164      2665.   1.50E+13
 -4361.   1140608.       0.00
 78.0000    0.05637   1.85E+08   -740454.   -0.00133      2473.   1.50E+13
 -3418.   1455291.       0.00
 80.0000    0.02807   1.66E+08   -810414.   -0.00105      2258.   1.50E+13
 -2412.   2062321.       0.00
 82.0000    0.00615   1.46E+08   -849848.  -7.97E-04      2027.   1.50E+13
 -873.9953   3409920.       0.00
 84.0000   -0.01016   1.25E+08   -842927.  -5.80E-04      1790.   1.50E+13
 1451.   3425848.       0.00
 86.0000   -0.02167   1.06E+08   -800094.  -3.95E-04      1562.   1.50E+13
 2119.   2346877.       0.00
 88.0000   -0.02911   8.71E+07   -745200.  -2.41E-04      1348.   1.50E+13
 2456.   2024665.       0.00
 90.0000   -0.03322   6.99E+07   -684248.  -1.15E-04      1150.   1.50E+13
 2623.   1895466.       0.00
 92.0000   -0.03464   5.42E+07   -620619.  -1.59E-05   969.9406   1.50E+13
 2679.   1856163.       0.00
 94.0000   -0.03398   4.01E+07   -556630.   5.96E-05   807.3210   1.50E+13
 2653.   1874102.       0.00
 96.0000   -0.03178   2.75E+07   -493995.   1.14E-04   662.2530   1.50E+13
 2566.   1937871.       0.00
 98.0000   -0.02852   1.64E+07   -434029.   1.49E-04   534.1716   1.50E+13
 2431.   2045472.       0.00
100.0000   -0.02464   6671239.   -367374.   1.67E-04   422.1939   1.50E+13
3123.   3042311.       0.00
102.0000   -0.02050  -1256541.   -286250.   1.72E-04   359.8548   1.50E+13
3637.   4258033.       0.00
104.0000   -0.01641  -7089340.   -203563.   1.65E-04   427.0075   1.50E+13
3254.   4759574.       0.00
106.0000   -0.01259  -1.10E+07   -130323.   1.50E-04   472.5759   1.50E+13
2850.   5434160.       0.00
108.0000   -0.00919  -1.34E+07    -66906.   1.31E-04   499.2344   1.50E+13
2435.   6359638.       0.00
110.0000   -0.00631  -1.43E+07    -13482.   1.09E-04   509.7305   1.50E+13
2017.   7677372.       0.00
```

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112.0000   -0.00397  -1.40E+07     29926.   8.61E-05   506.8351   1.50E+13
1600.   9676173.       0.00
114.0000   -0.00217  -1.28E+07     62938.   6.46E-05   493.3118   1.50E+13
1151.   1.27E+07       0.00
116.0000  -8.67E-04  -1.10E+07     82417.   4.56E-05   472.1436   1.50E+13
472.5603   1.31E+07       0.00
118.0000   1.56E-05  -8897913.     87982.   2.96E-05   447.8295   1.50E+13
-8.7664   1.35E+07       0.00
120.0000   5.56E-04  -6790215.     84031.   1.71E-05   423.5637   1.50E+13
-320.5095   1.38E+07       0.00
122.0000   8.37E-04  -4866478.     74248.   7.78E-06   401.4158   1.50E+13
-494.7668   1.42E+07       0.00
124.0000   9.30E-04  -3227260.     61539.   1.31E-06   382.5436   1.50E+13
-564.3224   1.46E+07       0.00
126.0000   9.00E-04  -1912783.     48050.  -2.80E-06   367.4101   1.50E+13
-559.7040   1.49E+07       0.00
128.0000   7.96E-04   -920511.     35246.  -5.06E-06   355.9861   1.50E+13
-507.3601   1.53E+07       0.00
130.0000   6.57E-04   -220390.     24012.  -5.97E-06   347.9257   1.50E+13
-428.7669   1.57E+07       0.00
132.0000   5.09E-04    232782.     14784.  -5.96E-06   348.0683   1.50E+13
-340.2486   1.60E+07       0.00
134.0000   3.71E-04    489948.      7661.  -5.39E-06   351.0291   1.50E+13
-253.3028   1.64E+07       0.00
136.0000   2.51E-04    601165.      2519.  -4.51E-06   352.3095   1.50E+13
-175.2385   1.68E+07       0.00
138.0000   1.54E-04    611387.  -903.8128  -3.54E-06   352.4272   1.50E+13
-109.9705   1.71E+07       0.00
140.0000   8.07E-05    558207.     -2930.  -2.61E-06   351.8149   1.50E+13
-58.8482   1.75E+07       0.00
142.0000   2.88E-05    471077.     -3893.  -1.79E-06   350.8118   1.50E+13
-21.4323   1.79E+07       0.00
144.0000  -5.04E-06    371557.     -4104.  -1.11E-06   349.6660   1.50E+13
3.8323   1.82E+07       0.00
146.0000  -2.46E-05    274209.     -3829.  -5.95E-07   348.5453   1.50E+13
19.0750   1.86E+07       0.00
148.0000  -3.36E-05    187821.     -3281.  -2.26E-07   347.5507   1.50E+13
26.5942   1.90E+07       0.00
150.0000  -3.54E-05    116734.     -2619.   1.75E-08   346.7323   1.50E+13
28.5782   1.94E+07       0.00
152.0000  -3.28E-05     62097.     -1953.   1.60E-07   346.1032   1.50E+13
26.9367   1.97E+07       0.00
154.0000  -2.77E-05     22969.     -1351.   2.28E-07   345.6528   1.50E+13
23.2186   2.01E+07       0.00
156.0000  -2.18E-05     -2787.  -849.4230   2.45E-07   345.4204   1.50E+13
18.5942   2.05E+07       0.00
158.0000  -1.60E-05    -17833.  -459.7256   2.28E-07   345.5936   1.50E+13
13.8806   2.08E+07       0.00
160.0000  -1.09E-05    -24881.  -178.0464   1.94E-07   345.6748   1.50E+13
9.5927   2.12E+07       0.00
162.0000  -6.68E-06    -26402.     9.1268   1.53E-07   345.6923   1.50E+13
6.0051   2.16E+07       0.00
164.0000  -3.52E-06    -24462.   119.7695   1.12E-07   345.6700   1.50E+13
3.2151   2.19E+07       0.00
166.0000  -1.29E-06    -20667.   172.7548   7.62E-08   345.6263   1.50E+13
1.2003   2.23E+07       0.00
168.0000   1.42E-07    -16178.   185.5542   4.68E-08   345.5746   1.50E+13
-0.1337   2.27E+07       0.00
170.0000   9.54E-07    -11766.   172.9614   2.44E-08   345.5238   1.50E+13
-0.9157   2.30E+07       0.00
172.0000   1.31E-06     -7879.   146.5860   8.73E-09   345.4790   1.50E+13
-1.2823   2.34E+07       0.00
174.0000   1.37E-06     -4731.   114.8752  -1.35E-09   345.4428   1.50E+13
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  -1.3603   2.38E+07       0.00
  176.0000   1.25E-06     -2365.    83.4610  -7.02E-09   345.4156   1.50E+13
  -1.2575   2.41E+07       0.00
  178.0000   1.04E-06  -723.6212    55.6716  -9.49E-09   345.3967   1.50E+13
  -1.0583   2.45E+07       0.00
  180.0000   7.94E-07   308.3240    33.0892  -9.82E-09   345.3919   1.50E+13
  -0.8236   2.49E+07       0.00
  182.0000   5.65E-07   865.8373    16.0778  -8.88E-09   345.3983   1.50E+13
  -0.5940   2.53E+07       0.00
  184.0000   3.68E-07      1081.     4.2362  -7.33E-09   345.4008   1.50E+13
  -0.3928   2.56E+07       0.00
  186.0000   2.13E-07      1070.    -3.2432  -5.61E-09   345.4007   1.50E+13
  -0.2305   2.60E+07       0.00
  188.0000   9.88E-08   926.1208    -7.3111  -4.01E-09   345.3990   1.50E+13
  -0.1085   2.64E+07       0.00
  190.0000   2.03E-08   719.6014    -8.8844  -2.70E-09   345.3966   1.50E+13
  -0.02260   2.67E+07       0.00
  192.0000  -3.06E-08   499.9954    -8.7411  -1.72E-09   345.3941   1.50E+13
  0.03454   2.71E+07       0.00
  194.0000  -6.23E-08   300.2360    -7.4712  -1.08E-09   345.3918   1.50E+13
  0.07128   2.75E+07       0.00
  196.0000  -8.25E-08   141.5076    -5.4681  -7.28E-10   345.3900   1.50E+13
  0.09564   2.78E+07       0.00
  198.0000  -9.72E-08    37.8552    -2.9495  -5.84E-10   345.3888   1.50E+13
  0.1142   2.82E+07       0.00
  200.0000  -1.11E-07       0.00       0.00  -5.54E-10   345.3883   1.50E+13
  0.1316   1.43E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 5:

```
Pile-head deflection             =     4.00744120 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -387800062. inch-lbs
Maximum shear force              =       -849848. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    82.00000000 feet below pile head
Number of iterations             =             13
Number of zero deflection points =              5
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 6
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     5.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(No scour) 96in"

Channel Static 24in.lp9o 10/4/2017

```
---------- ---------- ----------
      0.00     5.0091  -4.72E+08    970285.       0.00      5784.   1.50E+13
      0.00       0.00       0.00
    2.0000     5.0000  -4.49E+08    970239.  -7.37E-04      5515.   1.50E+13
    0.00       0.00       0.00
    4.0000     4.9737  -4.26E+08    970239.   -0.00144      5247.   1.50E+13
    0.00       0.00       0.00
    6.0000     4.9311  -4.02E+08    970239.   -0.00210      4977.   1.50E+13
    0.00       0.00       0.00
    8.0000     4.8730  -3.79E+08    970239.   -0.00272      4707.   1.50E+13
    0.00       0.00       0.00
   10.0000     4.8004  -3.55E+08    970239.   -0.00331      4437.   1.50E+13
   0.00       0.00       0.00
   12.0000     4.7141  -3.32E+08    970239.   -0.00386      4167.   1.50E+13
   0.00       0.00       0.00
   14.0000     4.6151  -3.08E+08    970239.   -0.00437      3896.   1.50E+13
   0.00       0.00       0.00
   16.0000     4.5043  -2.85E+08    970239.   -0.00485      3625.   1.50E+13
   0.00       0.00       0.00
   18.0000     4.3825  -2.61E+08    970239.   -0.00528      3353.   1.50E+13
   0.00       0.00       0.00
   20.0000     4.2508  -2.38E+08    970239.   -0.00568      3081.   1.50E+13
   0.00       0.00       0.00
   22.0000     4.1099  -2.14E+08    970239.   -0.00604      2809.   1.50E+13
   0.00       0.00       0.00
   24.0000     3.9608  -1.90E+08    970239.   -0.00637      2537.   1.50E+13
   0.00       0.00       0.00
   26.0000     3.8043  -1.67E+08    970239.   -0.00665      2264.   1.50E+13
   0.00       0.00       0.00
   28.0000     3.6415  -1.43E+08    970239.   -0.00690      1991.   1.50E+13
   0.00       0.00       0.00
   30.0000     3.4732  -1.19E+08    970239.   -0.00711      1718.   1.50E+13
   0.00       0.00       0.00
   32.0000     3.3004  -9.55E+07    970239.   -0.00728      1445.   1.50E+13
   0.00       0.00       0.00
   34.0000     3.1238  -7.18E+07    970239.   -0.00741      1172.   1.50E+13
   0.00       0.00       0.00
   36.0000     2.9445  -4.81E+07    970239.   -0.00751   898.7631   1.50E+13
   0.00       0.00       0.00
   38.0000     2.7634  -2.43E+07    970239.   -0.00757   625.4622   1.50E+13
   0.00       0.00       0.00
   40.0000     2.5813   -585955.    970239.   -0.00759   352.1344   1.50E+13
   0.00       0.00       0.00
   42.0000     2.3992   2.32E+07    970239.   -0.00757   611.9707   1.50E+13
   0.00       0.00       0.00
   44.0000     2.2180   4.69E+07    970239.   -0.00751   885.2736   1.50E+13
   0.00       0.00       0.00
   46.0000     2.0386   7.06E+07    970232.   -0.00742      1159.   1.50E+13
   -0.5412     6.3715       0.00
   48.0000     1.8619   9.44E+07    970207.   -0.00729      1432.   1.50E+13
   -1.5753    20.3056       0.00
   50.0000     1.6888   1.18E+08    970157.   -0.00712      1705.   1.50E+13
   -2.5415    36.1172       0.00
   52.0000     1.5203   1.42E+08    970086.   -0.00691      1978.   1.50E+13
   -3.4355    54.2354       0.00
   54.0000     1.3572   1.65E+08    969993.   -0.00666      2250.   1.50E+13
   -4.2531    75.2118       0.00
   56.0000     1.2004   1.89E+08    969882.   -0.00638      2523.   1.50E+13
   -4.9899    99.7635       0.00
   58.0000     1.0509   2.13E+08    969755.   -0.00606      2795.   1.50E+13
   -5.6414   128.8342       0.00
   60.0000     0.9096   2.36E+08    918157.   -0.00570      3067.   1.50E+13
   -4294.    113305.       0.00
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 62.0000     0.7773   2.58E+08    739862.   -0.00530      3310.   1.50E+13
 -10564.    326157.       0.00
 64.0000     0.6550   2.73E+08    491117.   -0.00488      3483.   1.50E+13
 -10165.    372484.       0.00
 66.0000     0.5430   2.82E+08    253149.   -0.00444      3589.   1.50E+13
 -9666.    427184.       0.00
 68.0000     0.4419   2.85E+08     28339.   -0.00398      3629.   1.50E+13
 -9068.    492478.       0.00
 70.0000     0.3518   2.84E+08   -180939.   -0.00353      3610.   1.50E+13
 -8371.    571140.       0.00
 72.0000     0.2725   2.77E+08   -371573.   -0.00308      3534.   1.50E+13
 -7515.    661839.       0.00
 74.0000     0.2039   2.66E+08   -539745.   -0.00265      3409.   1.50E+13
 -6500.    765204.       0.00
 76.0000     0.1454   2.51E+08   -683617.   -0.00223      3240.   1.50E+13
 -5490.    905999.       0.00
 78.0000    0.09663   2.34E+08   -803194.   -0.00185      3034.   1.50E+13
 -4475.   1111428.       0.00
 80.0000    0.05681   2.13E+08   -898070.   -0.00149      2798.   1.50E+13
 -3431.   1449600.       0.00
 82.0000    0.02516   1.91E+08   -966648.   -0.00117      2540.   1.50E+13
 -2284.   2178351.       0.00
 84.0000   8.26E-04   1.67E+08   -995536.  -8.81E-04      2266.   1.50E+13
 -123.6841   3594240.       0.00
 86.0000   -0.01711   1.43E+08   -974430.  -6.33E-04      1991.   1.50E+13
 1883.   2641049.       0.00
 88.0000   -0.02956   1.20E+08   -922145.  -4.23E-04      1728.   1.50E+13
 2475.   2009453.       0.00
 90.0000   -0.03739   9.87E+07   -859048.  -2.48E-04      1482.   1.50E+13
 2784.   1786499.       0.00
 92.0000   -0.04145   7.89E+07   -790480.  -1.06E-04      1254.   1.50E+13
 2930.   1696964.       0.00
 94.0000   -0.04247   6.08E+07   -719717.   5.97E-06      1045.   1.50E+13
 2966.   1676410.       0.00
 96.0000   -0.04116   4.44E+07   -649076.   9.00E-05   856.0353   1.50E+13
 2920.   1702873.       0.00
 98.0000   -0.03815   2.96E+07   -580295.   1.49E-04   686.2850   1.50E+13
 2811.   1768816.       0.00
100.0000   -0.03400   1.65E+07   -502528.   1.86E-04   535.1461   1.50E+13
3669.   2589989.       0.00
102.0000   -0.02922   5466196.   -406393.   2.04E-04   408.3203   1.50E+13
4342.   3566596.       0.00
104.0000   -0.02423  -3049160.   -306838.   2.05E-04   380.4931   1.50E+13
3954.   3916695.       0.00
106.0000   -0.01936  -9286701.   -216981.   1.96E-04   452.3056   1.50E+13
3534.   4382086.       0.00
108.0000   -0.01484  -1.35E+07   -137439.   1.77E-04   500.6717   1.50E+13
3094.   5004753.       0.00
110.0000   -0.01084  -1.59E+07    -68570.   1.54E-04   528.5026   1.50E+13
2645.   5855606.       0.00
112.0000   -0.00745  -1.68E+07    -10522.   1.28E-04   538.7777   1.50E+13
2193.   7062718.       0.00
114.0000   -0.00471  -1.64E+07     36703.   1.01E-04   534.4936   1.50E+13
1743.   8886060.       0.00
116.0000   -0.00259  -1.50E+07     73137.   7.60E-05   518.6347   1.50E+13
1293.   1.20E+07       0.00
118.0000   -0.00106  -1.29E+07     95769.   5.37E-05   494.1814   1.50E+13
592.4555   1.35E+07       0.00
120.0000  -1.64E-05  -1.05E+07    102992.   3.50E-05   465.7851   1.50E+13
9.4626   1.38E+07       0.00
122.0000   6.23E-04  -7984587.     98687.   2.02E-05   437.3144   1.50E+13
-368.1629   1.42E+07       0.00
124.0000   9.55E-04  -5722958.     87315.   9.28E-06   411.2764   1.50E+13
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-579.5070   1.46E+07       0.00
126.0000    0.00107  -3794575.     72388.   1.67E-06   389.0751   1.50E+13
-664.4424   1.49E+07       0.00
128.0000    0.00104  -2248548.     56494.  -3.16E-06   371.2757   1.50E+13
-660.0220   1.53E+07       0.00
130.0000   9.16E-04  -1082477.     41395.  -5.82E-06   357.8508   1.50E+13
-598.2670   1.57E+07       0.00
132.0000   7.56E-04   -260905.     28154.  -6.90E-06   348.3921   1.50E+13
-505.1009   1.60E+07       0.00
134.0000   5.85E-04    269755.     17291.  -6.89E-06   348.4940   1.50E+13
-400.1603   1.64E+07       0.00
136.0000   4.25E-04    569896.      8923.  -6.22E-06   351.9495   1.50E+13
-297.2164   1.68E+07       0.00
138.0000   2.87E-04    698786.      2896.  -5.20E-06   353.4334   1.50E+13
-204.9731   1.71E+07       0.00
140.0000   1.76E-04    709544.     -1100.  -4.08E-06   353.5573   1.50E+13
-128.0469   1.75E+07       0.00
142.0000   9.13E-05    646480.     -3452.  -2.99E-06   352.8312   1.50E+13
-67.9814   1.79E+07       0.00
144.0000   3.18E-05    544196.     -4558.  -2.04E-06   351.6536   1.50E+13
-24.1910   1.82E+07       0.00
146.0000  -6.74E-06    427926.     -4786.  -1.26E-06   350.3150   1.50E+13
5.2258   1.86E+07       0.00
148.0000  -2.89E-05    314625.     -4449.  -6.71E-07   349.0106   1.50E+13
22.8363   1.90E+07       0.00
150.0000  -3.89E-05    214447.     -3798.  -2.48E-07   347.8572   1.50E+13
31.3901   1.94E+07       0.00
152.0000  -4.08E-05    132330.     -3020.   2.96E-08   346.9118   1.50E+13
33.4900   1.97E+07       0.00
154.0000  -3.75E-05     69490.     -2241.   1.91E-07   346.1884   1.50E+13
31.3948   2.01E+07       0.00
156.0000  -3.16E-05     24726.     -1541.   2.66E-07   345.6730   1.50E+13
26.9264   2.05E+07       0.00
158.0000  -2.47E-05     -4529.  -960.8479   2.82E-07   345.4405   1.50E+13
21.4528   2.08E+07       0.00
160.0000  -1.80E-05    -21428.  -512.3544   2.62E-07   345.6350   1.50E+13
15.9217   2.12E+07       0.00
162.0000  -1.22E-05    -29154.  -190.2070   2.21E-07   345.7240   1.50E+13
10.9239   2.16E+07       0.00
164.0000  -7.41E-06    -30585.    22.1007   1.74E-07   345.7405   1.50E+13
6.7684   2.19E+07       0.00
166.0000  -3.83E-06    -28114.   146.0118   1.27E-07   345.7120   1.50E+13
3.5576   2.23E+07       0.00
168.0000  -1.33E-06    -23591.   203.7751   8.52E-08   345.6599   1.50E+13
1.2560   2.27E+07       0.00
170.0000   2.64E-07    -18343.   215.8103   5.17E-08   345.5995   1.50E+13
-0.2531   2.30E+07       0.00
172.0000   1.15E-06    -13239.   199.2778   2.65E-08   345.5407   1.50E+13
-1.1246   2.34E+07       0.00
174.0000   1.53E-06     -8781.   167.5415   8.87E-09   345.4894   1.50E+13
-1.5201   2.38E+07       0.00
176.0000   1.58E-06     -5198.   130.2412  -2.31E-09   345.4482   1.50E+13
-1.5883   2.41E+07       0.00
178.0000   1.42E-06     -2529.    93.7332  -8.49E-09   345.4174   1.50E+13
-1.4541   2.45E+07       0.00
180.0000   1.17E-06  -697.4357    61.7107  -1.11E-08   345.3964   1.50E+13
-1.2145   2.49E+07       0.00
182.0000   8.92E-07   434.5495    35.8693  -1.13E-08   345.3933   1.50E+13
-0.9390   2.53E+07       0.00
184.0000   6.30E-07      1026.    16.5291  -1.01E-08   345.4001   1.50E+13
-0.6727   2.56E+07       0.00
186.0000   4.07E-07      1229.     3.1644  -8.30E-09   345.4025   1.50E+13
-0.4410   2.60E+07       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(No scour) 96in"


```
  188.0000   2.32E-07      1179.    -5.1789  -6.38E-09   345.4019   1.50E+13
  -0.2543   2.64E+07       0.00
  190.0000   1.01E-07   981.3359    -9.5800  -4.65E-09   345.3996   1.50E+13
  -0.1125   2.67E+07       0.00
  192.0000   8.17E-09   719.2492   -11.0407  -3.29E-09   345.3966   1.50E+13
  -0.00923   2.71E+07       0.00
  194.0000  -5.71E-08   451.7795   -10.3677  -2.36E-09   345.3935   1.50E+13
  0.06531   2.75E+07       0.00
  196.0000  -1.05E-07   221.8840    -8.1231  -1.82E-09   345.3909   1.50E+13
  0.1217   2.78E+07       0.00
  198.0000  -1.44E-07    62.0893    -4.6266  -1.59E-09   345.3890   1.50E+13
  0.1696   2.82E+07       0.00
  200.0000  -1.81E-07       0.00       0.00  -1.54E-09   345.3883   1.50E+13
  0.2159   1.43E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 6:

```
Pile-head deflection             =     5.00906395 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -472369930. inch-lbs
Maximum shear force              =       -995536. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    84.00000000 feet below pile head
Number of iterations             =             14
Number of zero deflection points =              5
```

```
-----------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 7
-----------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     6.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     6.0106  -5.53E+08   1123251.       0.00      6713.   1.50E+13
      0.00       0.00       0.00
    2.0000     6.0000  -5.26E+08   1123197.  -8.63E-04      6402.   1.50E+13
    0.00       0.00       0.00
    4.0000     5.9692  -4.99E+08   1123197.   -0.00168      6091.   1.50E+13
    0.00       0.00       0.00
    6.0000     5.9192  -4.72E+08   1123197.   -0.00246      5779.   1.50E+13
    0.00       0.00       0.00
    8.0000     5.8512  -4.45E+08   1123197.   -0.00319      5467.   1.50E+13
    0.00       0.00       0.00
   10.0000     5.7660  -4.18E+08   1123197.   -0.00388      5154.   1.50E+13
   0.00       0.00       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(No scour) 96in"


```
12.0000     5.6649  -3.90E+08   1123197.   -0.00453      4841.   1.50E+13
0.00       0.00       0.00
14.0000     5.5487  -3.63E+08   1123197.   -0.00513      4527.   1.50E+13
0.00       0.00       0.00
16.0000     5.4186  -3.36E+08   1123197.   -0.00569      4213.   1.50E+13
0.00       0.00       0.00
18.0000     5.2756  -3.09E+08   1123197.   -0.00620      3899.   1.50E+13
0.00       0.00       0.00
20.0000     5.1208  -2.81E+08   1123197.   -0.00668      3584.   1.50E+13
0.00       0.00       0.00
22.0000     4.9551  -2.54E+08   1123197.   -0.00710      3269.   1.50E+13
0.00       0.00       0.00
24.0000     4.7798  -2.27E+08   1123197.   -0.00749      2953.   1.50E+13
0.00       0.00       0.00
26.0000     4.5957  -1.99E+08   1123197.   -0.00783      2638.   1.50E+13
0.00       0.00       0.00
28.0000     4.4040  -1.72E+08   1123197.   -0.00813      2322.   1.50E+13
0.00       0.00       0.00
30.0000     4.2057  -1.44E+08   1123197.   -0.00838      2006.   1.50E+13
0.00       0.00       0.00
32.0000     4.0019  -1.17E+08   1123197.   -0.00859      1690.   1.50E+13
0.00       0.00       0.00
34.0000     3.7935  -8.93E+07   1123197.   -0.00875      1373.   1.50E+13
0.00       0.00       0.00
36.0000     3.5818  -6.18E+07   1123197.   -0.00887      1057.   1.50E+13
0.00       0.00       0.00
38.0000     3.3677  -3.43E+07   1123197.   -0.00895   740.3857   1.50E+13
0.00       0.00       0.00
40.0000     3.1523  -6813674.   1123197.   -0.00898   423.8338   1.50E+13
0.00       0.00       0.00
42.0000     2.9366   2.07E+07   1123197.   -0.00897   583.5023   1.50E+13
0.00       0.00       0.00
44.0000     2.7217   4.82E+07   1123197.   -0.00892   900.0390   1.50E+13
0.00       0.00       0.00
46.0000     2.5086   7.57E+07   1123190.   -0.00882      1217.   1.50E+13
-0.5800     5.5485       0.00
48.0000     2.2985   1.03E+08   1123163.   -0.00867      1533.   1.50E+13
-1.6899    17.6452       0.00
50.0000     2.0923   1.31E+08   1123110.   -0.00849      1849.   1.50E+13
-2.7296    31.3103       0.00
52.0000     1.8911   1.58E+08   1123033.   -0.00826      2165.   1.50E+13
-3.6948    46.8905       0.00
54.0000     1.6960   1.86E+08   1122933.   -0.00798      2481.   1.50E+13
-4.5811    64.8271       0.00
56.0000     1.5080   2.13E+08   1122814.   -0.00766      2797.   1.50E+13
-5.3841    85.6882       0.00
58.0000     1.3282   2.40E+08   1122676.   -0.00730      3112.   1.50E+13
-6.0994   110.2133       0.00
60.0000     1.1576   2.68E+08   1066630.   -0.00689      3427.   1.50E+13
-4664.     96704.       0.00
62.0000     0.9973   2.92E+08    878765.   -0.00645      3711.   1.50E+13
-10991.    264506.       0.00
64.0000     0.8482   3.11E+08    618019.   -0.00596      3922.   1.50E+13
-10738.    303831.       0.00
66.0000     0.7110   3.23E+08    364794.   -0.00546      4061.   1.50E+13
-10364.    349855.       0.00
68.0000     0.5862   3.29E+08    121910.   -0.00494      4131.   1.50E+13
-9876.    404328.       0.00
70.0000     0.4740   3.29E+08   -107912.   -0.00441      4135.   1.50E+13
-9276.    469637.       0.00
72.0000     0.3745   3.24E+08   -322009.   -0.00389      4078.   1.50E+13
-8566.    548939.       0.00
74.0000     0.2874   3.14E+08   -517402.   -0.00338      3963.   1.50E+13
```

```
 -7717.    644470.       0.00
 76.0000     0.2123   3.00E+08   -689611.   -0.00289      3796.   1.50E+13
 -6634.    749755.       0.00
 78.0000     0.1488   2.81E+08   -835851.   -0.00242      3586.   1.50E+13
 -5553.    895647.       0.00
 80.0000    0.09606   2.60E+08   -956030.   -0.00199      3338.   1.50E+13
 -4462.   1114738.       0.00
 82.0000    0.05329   2.36E+08  -1049452.   -0.00159      3060.   1.50E+13
 -3323.   1496637.       0.00
 84.0000    0.01958   2.10E+08  -1113506.   -0.00124      2760.   1.50E+13
 -2014.   2469639.       0.00
 86.0000   -0.00609   1.82E+08  -1126166.  -9.24E-04      2446.   1.50E+13
 959.4010   3778560.       0.00
 88.0000   -0.02476   1.56E+08  -1087474.  -6.53E-04      2139.   1.50E+13
 2265.   2195378.       0.00
 90.0000   -0.03745   1.30E+08  -1026868.  -4.24E-04      1846.   1.50E+13
 2786.   1785197.       0.00
 92.0000   -0.04513   1.07E+08   -956744.  -2.35E-04      1572.   1.50E+13
 3058.   1626141.       0.00
 94.0000   -0.04873   8.45E+07   -881915.  -8.23E-05      1318.   1.50E+13
 3178.   1564989.       0.00
 96.0000   -0.04909   6.42E+07   -805512.   3.65E-05      1085.   1.50E+13
 3189.   1559322.       0.00
 98.0000   -0.04698   4.58E+07   -729802.   1.25E-04   872.6736   1.50E+13
 3120.   1593948.       0.00
100.0000   -0.04311   2.92E+07   -642783.   1.84E-04   681.2552   1.50E+13
4132.   2300097.       0.00
102.0000   -0.03812   1.49E+07   -533685.   2.20E-04   517.2031   1.50E+13
4960.   3122422.       0.00
104.0000   -0.03256   3529754.   -419156.   2.34E-04   386.0262   1.50E+13
4584.   3378437.       0.00
106.0000   -0.02687  -5224006.   -314178.   2.33E-04   405.5320   1.50E+13
4164.   3719237.       0.00
108.0000   -0.02138  -1.16E+07   -219642.   2.20E-04   478.6942   1.50E+13
3714.   4169886.       0.00
110.0000   -0.01633  -1.58E+07   -136124.   1.98E-04   527.2142   1.50E+13
3246.   4771362.       0.00
112.0000   -0.01188  -1.81E+07    -63945.   1.71E-04   554.1924   1.50E+13
2769.   5592777.       0.00
114.0000   -0.00814  -1.89E+07     -3222.   1.41E-04   562.7875   1.50E+13
2291.   6759300.       0.00
116.0000   -0.00511  -1.83E+07     46066.   1.11E-04   556.1680   1.50E+13
1816.   8526647.       0.00
118.0000   -0.00279  -1.67E+07     83967.   8.33E-05   537.4840   1.50E+13
1342.   1.15E+07       0.00
120.0000   -0.00111  -1.43E+07    107758.   5.86E-05   509.8811   1.50E+13
640.3628   1.38E+07       0.00
122.0000   2.00E-05  -1.15E+07    115300.   3.79E-05   478.0158   1.50E+13
-11.8321   1.42E+07       0.00
124.0000   7.10E-04  -8757791.    109991.   2.17E-05   446.2163   1.50E+13
-430.5685   1.46E+07       0.00
126.0000    0.00106  -6242891.     96887.   9.74E-06   417.2624   1.50E+13
-661.4143   1.49E+07       0.00
128.0000    0.00118  -4108367.     79946.   1.46E-06   392.6877   1.50E+13
-750.4037   1.53E+07       0.00
130.0000    0.00113  -2405682.     62061.  -3.74E-06   373.0848   1.50E+13
-739.9711   1.57E+07       0.00
132.0000   9.98E-04  -1128988.     45183.  -6.57E-06   358.3863   1.50E+13
-666.5111   1.60E+07       0.00
134.0000   8.18E-04   -236097.     30474.  -7.66E-06   348.1065   1.50E+13
-559.2585   1.64E+07       0.00
136.0000   6.30E-04    334683.     18481.  -7.58E-06   349.2415   1.50E+13
-440.1646   1.68E+07       0.00
```

```
138.0000   4.54E-04    651897.      9305.  -6.79E-06   352.8936   1.50E+13
-324.4571   1.71E+07       0.00
140.0000   3.04E-04    782161.      2753.  -5.65E-06   354.3933   1.50E+13
-221.6097   1.75E+07       0.00
142.0000   1.83E-04    784703.     -1545.  -4.39E-06   354.4226   1.50E+13
-136.4992   1.79E+07       0.00
144.0000   9.28E-05    708546.     -4030.  -3.20E-06   353.5458   1.50E+13
-70.5830   1.82E+07       0.00
146.0000   2.96E-05    591666.     -5152.  -2.16E-06   352.2001   1.50E+13
-22.9817   1.86E+07       0.00
148.0000  -1.09E-05    461491.     -5325.  -1.32E-06   350.7014   1.50E+13
8.5998   1.90E+07       0.00
150.0000  -3.37E-05    336225.     -4896.  -6.81E-07   349.2593   1.50E+13
27.1439   1.94E+07       0.00
152.0000  -4.35E-05    226562.     -4141.  -2.31E-07   347.9967   1.50E+13
35.7847   1.97E+07       0.00
154.0000  -4.47E-05    137489.     -3262.   6.03E-08   346.9712   1.50E+13
37.4508   2.01E+07       0.00
156.0000  -4.07E-05     69975.     -2397.   2.26E-07   346.1939   1.50E+13
34.6554   2.05E+07       0.00
158.0000  -3.39E-05     22415.     -1628.   3.00E-07   345.6464   1.50E+13
29.4041   2.08E+07       0.00
160.0000  -2.63E-05     -8210.  -997.0249   3.11E-07   345.4828   1.50E+13
23.1850   2.12E+07       0.00
162.0000  -1.89E-05    -25479.  -514.6281   2.84E-07   345.6817   1.50E+13
17.0147   2.16E+07       0.00
164.0000  -1.26E-05    -32946.  -172.2934   2.38E-07   345.7676   1.50E+13
11.5132   2.19E+07       0.00
166.0000  -7.52E-06    -33778.    49.7690   1.84E-07   345.7772   1.50E+13
6.9920   2.23E+07       0.00
168.0000  -3.75E-06    -30579.   176.1457   1.33E-07   345.7404   1.50E+13
3.5394   2.27E+07       0.00
170.0000  -1.14E-06    -25339.   231.7874   8.82E-08   345.6801   1.50E+13
1.0974   2.30E+07       0.00
172.0000   4.88E-07    -19464.   239.2421   5.24E-08   345.6124   1.50E+13
-0.4762   2.34E+07       0.00
174.0000   1.37E-06    -13862.   217.2105   2.58E-08   345.5479   1.50E+13
-1.3598   2.38E+07       0.00
176.0000   1.72E-06     -9041.   180.0680   7.45E-09   345.4924   1.50E+13
-1.7354   2.41E+07       0.00
178.0000   1.73E-06     -5219.   138.0337  -3.95E-09   345.4484   1.50E+13
-1.7674   2.45E+07       0.00
180.0000   1.54E-06     -2415.    97.7206  -1.01E-08   345.4161   1.50E+13
-1.5920   2.49E+07       0.00
182.0000   1.25E-06  -527.4194    62.8607  -1.24E-08   345.3944   1.50E+13
-1.3130   2.53E+07       0.00
184.0000   9.40E-07   603.8587    35.0612  -1.23E-08   345.3953   1.50E+13
-1.0036   2.56E+07       0.00
186.0000   6.56E-07      1157.    14.4997  -1.09E-08   345.4017   1.50E+13
-0.7098   2.60E+07       0.00
188.0000   4.15E-07      1301.     0.5083  -8.97E-09   345.4033   1.50E+13
-0.4561   2.64E+07       0.00
190.0000   2.25E-07      1182.    -7.9720  -6.98E-09   345.4019   1.50E+13
-0.2506   2.67E+07       0.00
192.0000   8.01E-08   919.3375   -12.0645  -5.30E-09   345.3989   1.50E+13
-0.09045   2.71E+07       0.00
194.0000  -2.95E-08   604.0141   -12.7448  -4.08E-09   345.3953   1.50E+13
0.03376   2.75E+07       0.00
196.0000  -1.16E-07   308.0769   -10.7263  -3.36E-09   345.3919   1.50E+13
0.1345   2.78E+07       0.00
198.0000  -1.91E-07    89.5556    -6.4259  -3.04E-09   345.3894   1.50E+13
0.2239   2.82E+07       0.00
200.0000  -2.62E-07       0.00       0.00  -2.97E-09   345.3883   1.50E+13
```

File name is incorrect below, run designation is "Channel Post Seismic Long.(No scour) 96in"


```
  0.3116   1.43E+07       0.00

* The above values of total stress are combined axial and bending stresses.


Output Summary for Load Case No. 7:

Pile-head deflection             =     6.01061290 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -553094186. inch-lbs
Maximum shear force              =      -1126166. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    86.00000000 feet below pile head
Number of iterations             =             15
Number of zero deflection points =              5


-------------------------------------------------------------------------------
--
            Summary of Pile-head Responses for Conventional Analyses
-------------------------------------------------------------------------------
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Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/
rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-
lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S,
radians


Load Load                Load                  Axial    Pile-head  Pile-head
Max Shear Max Moment
Case Type   Pile-head    Type     Pile-head   Loading  Deflection  Rotation
in Pile    in Pile
 No.  1      Load 1       2        Load 2       lbs      inches     radians
 lbs      in-lbs
---- ----- ---------- ---------- ---------- ---------- ---------- ----------
---------- ----------
  1  y, in     0.5000   S, rad         0.00   2500000.     0.5011       0.00
  -156004.  -5.58E+07
  2  y, in     1.0000   S, rad         0.00   2500000.     1.0021       0.00
  -295350.  -1.08E+08
  3  y, in     2.0000   S, rad         0.00   2500000.     2.0040       0.00
  -512183.  -2.06E+08
  4  y, in     3.0000   S, rad         0.00   2500000.     3.0057       0.00
  -690177.  -2.99E+08
  5  y, in     4.0000   S, rad         0.00   2500000.     4.0074       0.00
  -849848.  -3.88E+08
  6  y, in     5.0000   S, rad         0.00   2500000.     5.0091       0.00
  -995536.  -4.72E+08
  7  y, in     6.0000   S, rad         0.00   2500000.     6.0106       0.00
  -1126166.  -5.53E+08


Maximum pile-head deflection = 6.0106129043 inches
Maximum pile-head rotation   = 0.0000000000 radians = 0.000000 deg.

The analysis ended normally.
```

File name is incorrect below, run designation is "Channel Static Long.(Half scour) 96in"

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LPile for Windows, Version 2016-09.009

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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--
Files Used for Analysis

--

Path to file locations:
\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis
\L-Pile\Point of Fixity Calculations (200 ft Embedment)\Channel\Longitudinal
\Static (Half Scour)\

Name of input data file:
Channel Static 24in.lp9d

Name of output report file:
Channel Static 24in.lp9o

Name of plot output file:
Channel Static 24in.lp9p

Name of runtime message file:
Channel Static 24in.lp9r

--
Date and Time of Analysis

--

Date: October 4, 2017 Time: 15:44:49

File name is incorrect below, run designation is "Channel Static Long.(Half scour) 96in"


```
--
                                   Problem Title
------------------------------------------------------------------------------
--

Project Name: Harbor River Bridge
Job Number: 18461-007-01
Client: SCDOT
Engineer: HPC
Description: Channel - Static



------------------------------------------------------------------------------
--
                           Program Options and Settings
------------------------------------------------------------------------------
--

Computational Options:
 - Use unfactored loads in computations (conventional analysis)
Engineering Units Used for Data Input and Computations:
 - US Customary System Units (pounds, feet, inches)

Analysis Control Options:
 - Maximum number of iterations allowed                =          500
 - Deflection tolerance for convergence                =   1.0000E-05 in
 - Maximum allowable deflection                        =     100.0000 in
 - Number of pile increments                           =          100

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Computation of pile-head foundation stiffness matrix not selected
 - Push-over analysis of pile not selected
 - Buckling analysis of pile not selected

Output Options:
 - Output files use decimal points to denote decimal symbols.
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1
 - No p-y curves to be computed and reported for user-specified depths
 - Print using wide report formats



------------------------------------------------------------------------------
--
                     Pile Structural Properties and Geometry
------------------------------------------------------------------------------
--

Number of pile sections defined                        =            1
Total length of pile                                   =      200.000 ft
Depth of ground surface below top of pile              =      55.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.
```

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	96.0000
2	200.000	96.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile

Cross-sectional Shape	=	Circular Pile
Length of section	=	200.000000 ft
Width of top of section	=	96.000000 in
Width of bottom of section	=	96.000000 in
Top Area	=	7238. sq. in
Bottom Area	=	7238. sq. in
Moment of Inertia at Top	=	4169220. in^4
Moment of Inertia at Bottom	=	4169220. in^4
Elastic Modulus	=	3600000. psi

--
Ground Slope and Pile Batter Angles

--

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

--
Soil and Rock Layering Information

--

The soil profile is modelled using 3 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	55.000000 ft
Distance from top of pile to bottom of layer	=	60.000000 ft
Effective unit weight at top of layer	=	37.600000 pcf
Effective unit weight at bottom of layer	=	37.600000 pcf
Friction angle at top of layer	=	30.000000 deg.
Friction angle at bottom of layer	=	30.000000 deg.
Subgrade k at top of layer	=	20.000000 pci

```
   Subgrade k at bottom of layer                        =    20.000000 pci


Layer 2 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer            =    60.000000 ft
   Distance from top of pile to bottom of layer         =   100.000000 ft
   Effective unit weight at top of layer                =    57.600000 pcf
   Effective unit weight at bottom of layer             =    57.600000 pcf
   Undrained cohesion at top of layer                   =        4000. psf
   Undrained cohesion at bottom of layer                =        4000. psf
   Epsilon-50 at top of layer                           =     0.005000
   Epsilon-50 at bottom of layer                        =     0.005000
   Subgrade k at top of layer                           =  1000.000000 pci
   Subgrade k at bottom of layer                        =  1000.000000 pci


Layer 3 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer            =   100.000000 ft
   Distance from top of pile to bottom of layer         =   210.000000 ft
   Effective unit weight at top of layer                =    57.600000 pcf
   Effective unit weight at bottom of layer             =    57.600000 pcf
   Undrained cohesion at top of layer                   =        6000. psf
   Undrained cohesion at bottom of layer                =        6000. psf
   Epsilon-50 at top of layer                           =     0.005000
   Epsilon-50 at bottom of layer                        =     0.005000
   Subgrade k at top of layer                           =        2000. pci
   Subgrade k at bottom of layer                        =        2000. pci


 (Depth of the lowest soil layer extends 10.000 ft below the pile tip)



--------------------------------------------------------------------------------
--
                        Summary of Input Soil Properties
--------------------------------------------------------------------------------
--

Layer         Soil Type          Layer      Effective    Undrained    Angle of
E50
Layer           Name             Depth       Unit Wt.    Cohesion     Friction
or           kpy
 Num.     (p-y Curve Type)        ft           pcf          psf          deg.
 krm          pci
-----   -------------------   ----------   ----------   ----------
----------   ----------   ----------
  1            Sand              55.0000      37.6000       --
  30.0000       --          20.0000
          (Reese, et al.)        60.0000      37.6000       --
          30.0000       --          20.0000
  2         Stiff Clay           60.0000      57.6000        4000.       --
  0.00500    1000.0000
          with Free Water       100.0000      57.6000        4000.       --
          0.00500    1000.0000
  3         Stiff Clay          100.0000      57.6000        6000.       --
  0.00500        2000.
          with Free Water       210.0000      57.6000        6000.       --
          0.00500        2000.
```

File name is incorrect below, run designation is "Channel Static Long.(Half scour) 96in"

---

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 2 points

Point No.	Depth X ft	p-mult	y-mult
1	55.000	0.8000	1.0000
2	210.000	0.8000	1.0000

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 2

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	2	V = 200000. lbs	S = 0.0000 in/in	2500000.	No
2	2	V = 250000. lbs	S = 0.0000 in/in	2500000.	No

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

---

File name is incorrect below, run designation is "Channel Static Long.(Half scour) 96in"

Channel Static 24in.lp9o 10/4/2017

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

---
Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	55.0000	0.00	N.A.	No	0.00	32644.
2	60.0000	50.0812	No	No	32644.	1235610.
3	100.0000	90.0812	Yes	No	1268253.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head = 200000.0 lbs
Rotation of pile head = 0.000E+00 radians
Axial load at pile head = 2500000.0 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				
0.00	0.7740	-8.88E+07	200000.	0.00	1367.	1.50E+13
0.00	0.00	0.00				
2.0000	0.7723	-8.40E+07	200000.	-1.38E-04	1312.	1.50E+13
0.00	0.00	0.00				
4.0000	0.7674	-7.91E+07	200000.	-2.68E-04	1257.	1.50E+13

File name is incorrect below, run designation is "Channel Static Long.(Half scour) 96in"


```
 0.00       0.00       0.00
 6.0000     0.7594  -7.43E+07    200000.  -3.91E-04      1201.   1.50E+13
 0.00       0.00       0.00
 8.0000     0.7486  -6.95E+07    200000.  -5.06E-04      1145.   1.50E+13
 0.00       0.00       0.00
10.0000     0.7351  -6.47E+07    200000.  -6.13E-04      1090.   1.50E+13
0.00       0.00       0.00
12.0000     0.7191  -5.98E+07    200000.  -7.13E-04      1034.   1.50E+13
0.00       0.00       0.00
14.0000     0.7009  -5.50E+07    200000.  -8.05E-04   978.3381   1.50E+13
0.00       0.00       0.00
16.0000     0.6805  -5.01E+07    200000.  -8.89E-04   922.4897   1.50E+13
0.00       0.00       0.00
18.0000     0.6582  -4.53E+07    200000.  -9.65E-04   866.5859   1.50E+13
0.00       0.00       0.00
20.0000     0.6342  -4.04E+07    200000.   -0.00103   810.6322   1.50E+13
0.00       0.00       0.00
22.0000     0.6086  -3.55E+07    200000.   -0.00109   754.6338   1.50E+13
0.00       0.00       0.00
24.0000     0.5817  -3.07E+07    200000.   -0.00115   698.5961   1.50E+13
0.00       0.00       0.00
26.0000     0.5535  -2.58E+07    200000.   -0.00119   642.5245   1.50E+13
0.00       0.00       0.00
28.0000     0.5244  -2.09E+07    200000.   -0.00123   586.4245   1.50E+13
0.00       0.00       0.00
30.0000     0.4945  -1.61E+07    200000.   -0.00126   530.3013   1.50E+13
0.00       0.00       0.00
32.0000     0.4640  -1.12E+07    200000.   -0.00128   474.1604   1.50E+13
0.00       0.00       0.00
34.0000     0.4330  -6307575.    200000.   -0.00130   418.0071   1.50E+13
0.00       0.00       0.00
36.0000     0.4018  -1429565.    200000.   -0.00130   361.8468   1.50E+13
0.00       0.00       0.00
38.0000     0.3706   3448581.    200000.   -0.00130   385.0917   1.50E+13
0.00       0.00       0.00
40.0000     0.3394   8326397.    200000.   -0.00129   441.2497   1.50E+13
0.00       0.00       0.00
42.0000     0.3086   1.32E+07    200000.   -0.00127   497.3985   1.50E+13
0.00       0.00       0.00
44.0000     0.2783   1.81E+07    200000.   -0.00125   553.5327   1.50E+13
0.00       0.00       0.00
46.0000     0.2487   2.30E+07    200000.   -0.00122   609.6470   1.50E+13
0.00       0.00       0.00
48.0000     0.2200   2.78E+07    200000.   -0.00117   665.7359   1.50E+13
0.00       0.00       0.00
50.0000     0.1923   3.27E+07    200000.   -0.00113   721.7941   1.50E+13
0.00       0.00       0.00
52.0000     0.1659   3.76E+07    200000.   -0.00107   777.8162   1.50E+13
0.00       0.00       0.00
54.0000     0.1410   4.24E+07    200000.   -0.00101   833.7967   1.50E+13
0.00       0.00       0.00
56.0000     0.1176   4.73E+07    199729.  -9.34E-04   889.7305   1.50E+13
-22.5853      4608.       0.00
58.0000    0.09611   5.21E+07    198794.  -8.55E-04   945.4622   1.50E+13
-55.3610     13824.       0.00
60.0000    0.07659   5.69E+07    154011.  -7.68E-04      1001.   1.50E+13
-3677.   1152000.       0.00
62.0000    0.05926   5.96E+07     62105.  -6.75E-04      1032.   1.50E+13
-3982.   1612800.       0.00
64.0000    0.04421   6.00E+07    -28416.  -5.79E-04      1036.   1.50E+13
-3561.   1933024.       0.00
66.0000    0.03147   5.83E+07   -107201.  -4.84E-04      1017.   1.50E+13
-3004.   2291246.       0.00
```

File name is incorrect below, run designation is "Channel Static Long.(Half scour) 96in"


```
   68.0000    0.02096   5.49E+07   -172677.  -3.94E-04   977.4496   1.50E+13
   -2452.   2807307.       0.00
   70.0000    0.01256   5.01E+07   -223811.  -3.10E-04   921.8485   1.50E+13
   -1809.   3456000.       0.00
   72.0000    0.00608   4.42E+07   -257436.  -2.35E-04   854.1952   1.50E+13
   -993.0468   3916800.       0.00
   74.0000    0.00130   3.77E+07   -272204.  -1.69E-04   779.9078   1.50E+13
   -237.6067   4377600.       0.00
   76.0000   -0.00203   3.11E+07   -270142.  -1.14E-04   704.0031   1.50E+13
   409.4718   4838400.       0.00
   78.0000   -0.00417   2.48E+07   -254181.  -6.93E-05   630.7793   1.50E+13
   920.6271   5299200.       0.00
   80.0000   -0.00536   1.90E+07   -228257.  -3.43E-05   563.6332   1.50E+13
   1240.   5554416.       0.00
   82.0000   -0.00582   1.38E+07   -197879.  -8.09E-06   504.6872   1.50E+13
   1292.   5330480.       0.00
   84.0000   -0.00574   9459276.   -166971.   1.05E-05   454.2925   1.50E+13
   1284.   5363587.       0.00
   86.0000   -0.00531   5820651.   -136751.   2.28E-05   412.4012   1.50E+13
   1234.   5578781.       0.00
   88.0000   -0.00465   2892484.   -108073.   2.97E-05   378.6893   1.50E+13
   1155.   5960280.       0.00
   90.0000   -0.00388    629586.    -81539.   3.25E-05   352.6367   1.50E+13
   1056.   6523790.       0.00
   92.0000   -0.00309  -1025272.    -57568.   3.22E-05   357.1922   1.50E+13
   941.8553   7313182.       0.00
   94.0000   -0.00234  -2137523.    -36436.   2.97E-05   369.9975   1.50E+13
   819.0729   8410327.       0.00
   96.0000   -0.00167  -2777782.    -18740.   2.58E-05   377.3688   1.50E+13
   655.6476   9446400.       0.00
   98.0000   -0.00110  -3040122.     -5419.   2.11E-05   380.3891   1.50E+13
   454.4141   9907200.       0.00
  100.0000  -6.53E-04  -3040428.      6527.   1.62E-05   380.3926   1.50E+13
  541.1281   1.99E+07       0.00
  102.0000  -3.21E-04  -2728752.     16496.   1.16E-05   376.8043   1.50E+13
  289.5843   2.17E+07       0.00
  104.0000  -9.40E-05  -2250014.     21032.   7.65E-06   371.2926   1.50E+13
  88.4470   2.26E+07       0.00
  106.0000   4.65E-05  -1720115.     21547.   4.48E-06   365.1919   1.50E+13
  -45.5639   2.35E+07       0.00
  108.0000   1.21E-04  -1216295.     19522.   2.13E-06   359.3915   1.50E+13
  -123.1949   2.44E+07       0.00
  110.0000   1.49E-04   -783319.     16156.   5.34E-07   354.4066   1.50E+13
  -157.2590   2.53E+07       0.00
  112.0000   1.47E-04   -440849.     12343.  -4.44E-07   350.4638   1.50E+13
  -160.5635   2.63E+07       0.00
  114.0000   1.28E-04   -190822.      8681.  -9.49E-07   347.5853   1.50E+13
  -144.5336   2.72E+07       0.00
  116.0000   1.01E-04    -24027.      5526.  -1.12E-06   345.6650   1.50E+13
  -118.4582   2.81E+07       0.00
  118.0000   7.38E-05     74538.      3033.  -1.08E-06   346.2465   1.50E+13
  -89.2364   2.90E+07       0.00
  120.0000   4.93E-05    121695.      1225.  -9.24E-07   346.7894   1.50E+13
  -61.4825   3.00E+07       0.00
  122.0000   2.94E-05    133428.    32.5224  -7.20E-07   346.9245   1.50E+13
  -37.8541   3.09E+07       0.00
  124.0000   1.47E-05    123343.  -655.5550  -5.15E-07   346.8084   1.50E+13
  -19.4857   3.18E+07       0.00
  126.0000   4.72E-06    102023.  -966.6598  -3.34E-07   346.5629   1.50E+13
  -6.4397   3.27E+07       0.00
  128.0000  -1.35E-06     76983.     -1021.  -1.91E-07   346.2746   1.50E+13
  1.8855   3.36E+07       0.00
  130.0000  -4.46E-06     53023.  -921.6131  -8.74E-08   345.9988   1.50E+13
```

```
6.4226   3.46E+07       0.00
132.0000  -5.54E-06     32756.  -746.2562  -1.88E-08   345.7655   1.50E+13
8.1905   3.55E+07       0.00
134.0000  -5.36E-06     17205.  -550.3534   2.11E-08   345.5864   1.50E+13
8.1347   3.64E+07       0.00
136.0000  -4.53E-06      6337.  -368.2754   4.00E-08   345.4613   1.50E+13
7.0385   3.73E+07       0.00
138.0000  -3.45E-06  -477.2740  -217.9296   4.46E-08   345.3938   1.50E+13
5.4904   3.82E+07       0.00
140.0000  -2.38E-06     -4129.  -105.3753   4.10E-08   345.4359   1.50E+13
3.8892   3.92E+07       0.00
142.0000  -1.48E-06     -5540.   -29.0522   3.32E-08   345.4521   1.50E+13
2.4711   4.01E+07       0.00
144.0000  -7.88E-07     -5528.    16.7638   2.44E-08   345.4520   1.50E+13
1.3469   4.10E+07       0.00
146.0000  -3.09E-07     -4738.    39.4102   1.62E-08   345.4429   1.50E+13
0.5403   4.19E+07       0.00
148.0000  -1.21E-08     -3638.    46.1526   9.47E-09   345.4302   1.50E+13
0.02158   4.29E+07       0.00
150.0000   1.45E-07     -2524.    43.2279   4.55E-09   345.4174   1.50E+13
-0.2653   4.38E+07       0.00
152.0000   2.06E-07     -1563.    35.4377   1.28E-09   345.4063   1.50E+13
-0.3839   4.47E+07       0.00
154.0000   2.07E-07  -823.4194    26.1143  -6.30E-10   345.3978   1.50E+13
-0.3931   4.56E+07       0.00
156.0000   1.76E-07  -309.8043    17.3050  -1.54E-09   345.3919   1.50E+13
-0.3410   4.65E+07       0.00
158.0000   1.33E-07     7.4047    10.0553  -1.78E-09   345.3884   1.50E+13
-0.2631   4.75E+07       0.00
160.0000   9.05E-08   173.0611     4.7083  -1.63E-09   345.3903   1.50E+13
-0.1825   4.84E+07       0.00
162.0000   5.46E-08   233.5974     1.1721  -1.31E-09   345.3910   1.50E+13
-0.1122   4.93E+07       0.00
164.0000   2.77E-08   229.4786    -0.8699  -9.39E-10   345.3910   1.50E+13
-0.05795   5.02E+07       0.00
166.0000   9.57E-09   191.9570    -1.8100  -6.02E-10   345.3905   1.50E+13
-0.02040   5.11E+07       0.00
168.0000  -1.18E-09   142.6688    -2.0240  -3.34E-10   345.3900   1.50E+13
0.00257   5.21E+07       0.00
170.0000  -6.46E-09    94.8470    -1.8219  -1.44E-10   345.3894   1.50E+13
0.01427   5.30E+07       0.00
172.0000  -8.10E-09    55.2366    -1.4322  -2.42E-11   345.3890   1.50E+13
0.01820   5.39E+07       0.00
174.0000  -7.62E-09    26.1060    -1.0047   4.09E-11   345.3886   1.50E+13
0.01742   5.48E+07       0.00
176.0000  -6.14E-09     7.0051    -0.6245   6.74E-11   345.3884   1.50E+13
0.01427   5.58E+07       0.00
178.0000  -4.39E-09    -3.8789    -0.3289   6.99E-11   345.3884   1.50E+13
0.01037   5.67E+07       0.00
180.0000  -2.79E-09    -8.7910    -0.1242   5.97E-11   345.3884   1.50E+13
0.00669   5.76E+07       0.00
182.0000  -1.52E-09    -9.8484   6.44E-04   4.48E-11   345.3884   1.50E+13
0.00371   5.85E+07       0.00
184.0000  -6.36E-10    -8.7655    0.06413   2.99E-11   345.3884   1.50E+13
0.00158   5.94E+07       0.00
186.0000  -8.60E-11    -6.7739    0.08563   1.75E-11   345.3884   1.50E+13
2.16E-04   6.04E+07       0.00
188.0000   2.04E-10    -4.6572    0.08196   8.38E-12   345.3884   1.50E+13
-5.22E-04   6.13E+07       0.00
190.0000   3.16E-10    -2.8406    0.06587   2.38E-12   345.3884   1.50E+13
-8.19E-04   6.22E+07       0.00
192.0000   3.19E-10    -1.4958    0.04597  -1.08E-12   345.3883   1.50E+13
-8.39E-04   6.31E+07       0.00
```

```
  194.0000   2.64E-10    -0.6339    0.02745  -2.79E-12   345.3883   1.50E+13
  -7.05E-04   6.41E+07       0.00
  196.0000   1.85E-10    -0.1780    0.01298  -3.44E-12   345.3883   1.50E+13
  -5.01E-04   6.50E+07       0.00
  198.0000   9.92E-11   -0.01056    0.00370  -3.59E-12   345.3883   1.50E+13
  -2.72E-04   6.59E+07       0.00
  200.0000   1.29E-11       0.00       0.00  -3.60E-12   345.3883   1.50E+13
  -3.59E-05   3.34E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.77398308 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -88759999. inch-lbs
Maximum shear force              =       -272204. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    74.00000000 feet below pile head
Number of iterations             =              7
Number of zero deflection points =              7
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 2
-------------------------------------------------------------------------------
--
```

Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

```
Shear force at pile head                                =     250000.0 lbs
Rotation of pile head                                   =    0.000E+00 radians
Axial load at pile head                                 =    2500000.0 lbs
```

(Zero slope for this load indicates fixed-head conditions)

```
   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     0.9794  -1.11E+08    250000.       0.00      1628.   1.50E+13
      0.00       0.00       0.00
    2.0000     0.9773  -1.05E+08    250000.  -1.73E-04      1558.   1.50E+13
    0.00       0.00       0.00
    4.0000     0.9711  -9.94E+07    250000.  -3.37E-04      1489.   1.50E+13
    0.00       0.00       0.00
    6.0000     0.9611  -9.33E+07    250000.  -4.91E-04      1420.   1.50E+13
    0.00       0.00       0.00
    8.0000     0.9475  -8.73E+07    250000.  -6.35E-04      1350.   1.50E+13
    0.00       0.00       0.00
   10.0000     0.9306  -8.13E+07    250000.  -7.70E-04      1281.   1.50E+13
   0.00       0.00       0.00
   12.0000     0.9106  -7.52E+07    250000.  -8.95E-04      1211.   1.50E+13
   0.00       0.00       0.00
   14.0000     0.8877  -6.91E+07    250000.   -0.00101      1141.   1.50E+13
```

```
0.00        0.00        0.00
16.0000      0.8621  -6.31E+07    250000.   -0.00112      1072.   1.50E+13
0.00        0.00        0.00
18.0000      0.8341  -5.70E+07    250000.   -0.00121      1002.   1.50E+13
0.00        0.00        0.00
20.0000      0.8039  -5.09E+07    250000.   -0.00130   931.8032   1.50E+13
0.00        0.00        0.00
22.0000      0.7717  -4.49E+07    250000.   -0.00138   861.8002   1.50E+13
0.00        0.00        0.00
24.0000      0.7379  -3.88E+07    250000.   -0.00144   791.7478   1.50E+13
0.00        0.00        0.00
26.0000      0.7025  -3.27E+07    250000.   -0.00150   721.6525   1.50E+13
0.00        0.00        0.00
28.0000      0.6659  -2.66E+07    250000.   -0.00155   651.5211   1.50E+13
0.00        0.00        0.00
30.0000      0.6283  -2.05E+07    250000.   -0.00158   581.3604   1.50E+13
0.00        0.00        0.00
32.0000      0.5898  -1.44E+07    250000.   -0.00161   511.1770   1.50E+13
0.00        0.00        0.00
34.0000      0.5509  -8302771.    250000.   -0.00163   440.9777   1.50E+13
0.00        0.00        0.00
36.0000      0.5116  -2204551.    250000.   -0.00164   370.7692   1.50E+13
0.00        0.00        0.00
38.0000      0.4722   3893881.    250000.   -0.00164   390.2184   1.50E+13
0.00        0.00        0.00
40.0000      0.4330   9991939.    250000.   -0.00163   460.4250   1.50E+13
0.00        0.00        0.00
42.0000      0.3942   1.61E+07    250000.   -0.00161   530.6205   1.50E+13
0.00        0.00        0.00
44.0000      0.3559   2.22E+07    250000.   -0.00157   600.7983   1.50E+13
0.00        0.00        0.00
46.0000      0.3186   2.83E+07    250000.   -0.00153   670.9516   1.50E+13
0.00        0.00        0.00
48.0000      0.2823   3.44E+07    250000.   -0.00148   741.0737   1.50E+13
0.00        0.00        0.00
50.0000      0.2473   4.05E+07    250000.   -0.00142   811.1578   1.50E+13
0.00        0.00        0.00
52.0000      0.2139   4.65E+07    250000.   -0.00136   881.1972   1.50E+13
0.00        0.00        0.00
54.0000      0.1823   5.26E+07    250000.   -0.00128   951.1852   1.50E+13
0.00        0.00        0.00
56.0000      0.1527   5.87E+07    249648.   -0.00119      1021.   1.50E+13
-29.3100       4608.        0.00
58.0000      0.1253   6.47E+07    248430.   -0.00109      1091.   1.50E+13
-72.1726      13824.        0.00
60.0000      0.1004   7.07E+07    189718.  -9.80E-04      1160.   1.50E+13
-4821.    1152000.        0.00
62.0000     0.07827   7.40E+07     75014.  -8.64E-04      1197.   1.50E+13
-4738.    1452832.        0.00
64.0000     0.05895   7.45E+07    -31188.  -7.45E-04      1203.   1.50E+13
-4112.    1674032.        0.00
66.0000     0.04249   7.26E+07   -122426.  -6.28E-04      1181.   1.50E+13
-3491.    1971802.        0.00
68.0000     0.02882   6.87E+07   -198817.  -5.15E-04      1136.   1.50E+13
-2875.    2394434.        0.00
70.0000     0.01777   6.31E+07   -260411.  -4.10E-04      1072.   1.50E+13
-2258.    3048776.        0.00
72.0000     0.00915   5.62E+07   -305431.  -3.14E-04   992.4243   1.50E+13
-1494.    3916800.        0.00
74.0000     0.00269   4.85E+07   -329243.  -2.31E-04   903.2634   1.50E+13
-490.4853   4377600.        0.00
76.0000    -0.00192   4.04E+07   -330494.  -1.60E-04   810.7964   1.50E+13
386.1627    4838400.        0.00
```

```
 78.0000   -0.00497   3.26E+07   -312695.  -1.01E-04   720.8456   1.50E+13
 1097.   5299200.       0.00
 80.0000   -0.00677   2.54E+07   -282808.  -5.47E-05   638.1340   1.50E+13
 1394.   4939908.       0.00
 82.0000   -0.00760   1.90E+07   -248372.  -1.92E-05   564.6355   1.50E+13
 1476.   4663685.       0.00
 84.0000   -0.00769   1.35E+07   -212835.   6.84E-06   500.9047   1.50E+13
 1485.   4634820.       0.00
 86.0000   -0.00727   8826618.   -177685.   2.47E-05   447.0087   1.50E+13
 1444.   4767943.       0.00
 88.0000   -0.00651   4976098.   -143966.   3.57E-05   402.6779   1.50E+13
 1366.   5039525.       0.00
 90.0000   -0.00555   1911965.   -112428.   4.12E-05   367.4007   1.50E+13
 1262.   5454965.       0.00
 92.0000   -0.00453   -425396.    -83609.   4.24E-05   350.2859   1.50E+13
 1139.   6041999.       0.00
 94.0000   -0.00352  -2106370.    -57883.   4.04E-05   369.6389   1.50E+13
 1004.   6855272.       0.00
 96.0000   -0.00259  -3208640.    -35493.   3.62E-05   382.3292   1.50E+13
 861.4837   7992466.       0.00
 98.0000   -0.00178  -3814388.    -16578.   3.05E-05   389.3032   1.50E+13
 714.7813   9633453.       0.00
100.0000   -0.00112  -4008055.   506.3857   2.43E-05   391.5328   1.50E+13
708.9287   1.52E+07       0.00
102.0000  -6.15E-04  -3792995.     15674.   1.80E-05   389.0569   1.50E+13
555.0210   2.17E+07       0.00
104.0000  -2.55E-04  -3257880.     25209.   1.24E-05   382.8961   1.50E+13
239.5938   2.26E+07       0.00
106.0000  -1.93E-05  -2584445.     28311.   7.74E-06   375.1429   1.50E+13
18.9148   2.35E+07       0.00
108.0000   1.17E-04  -1899868.     27111.   4.15E-06   367.2614   1.50E+13
-118.9118   2.44E+07       0.00
110.0000   1.80E-04  -1283601.     23402.   1.61E-06   360.1664   1.50E+13
-190.2032   2.53E+07       0.00
112.0000   1.94E-04   -776769.     18570.  -3.76E-08   354.3312   1.50E+13
-212.4428   2.63E+07       0.00
114.0000   1.78E-04   -392229.     13597.  -9.72E-07   349.9040   1.50E+13
-201.9894   2.72E+07       0.00
116.0000   1.47E-04   -123997.      9101.  -1.38E-06   346.8159   1.50E+13
-172.6925   2.81E+07       0.00
118.0000   1.12E-04     44776.      5405.  -1.45E-06   345.9038   1.50E+13
-135.2696   2.90E+07       0.00
120.0000   7.79E-05    135629.      2615.  -1.30E-06   346.9498   1.50E+13
-97.2556   3.00E+07       0.00
122.0000   4.92E-05    170450.   687.8770  -1.06E-06   347.3507   1.50E+13
-63.3337   3.09E+07       0.00
124.0000   2.71E-05    168774.  -502.6126  -7.88E-07   347.3314   1.50E+13
-35.8738   3.18E+07       0.00
126.0000   1.14E-05    146419.     -1120.  -5.36E-07   347.0740   1.50E+13
-15.5418   3.27E+07       0.00
128.0000   1.34E-06    115098.     -1329.  -3.27E-07   346.7134   1.50E+13
-1.8814   3.36E+07       0.00
130.0000  -4.30E-06     82682.     -1277.  -1.69E-07   346.3402   1.50E+13
6.1910   3.46E+07       0.00
132.0000  -6.77E-06     53824.     -1083.  -5.98E-08   346.0080   1.50E+13
10.0057   3.55E+07       0.00
134.0000  -7.17E-06     30724.  -832.0090   7.77E-09   345.7421   1.50E+13
10.8769   3.64E+07       0.00
136.0000  -6.39E-06     13886.  -582.1425   4.34E-08   345.5482   1.50E+13
9.9453   3.73E+07       0.00
138.0000  -5.09E-06      2776.  -365.5396   5.68E-08   345.4203   1.50E+13
8.1049   3.82E+07       0.00
140.0000  -3.67E-06     -3666.  -196.3989   5.60E-08   345.4305   1.50E+13
```

File name is incorrect below, run designation is "Channel Static Long.(Half scour) 96in"


```
5.9901   3.92E+07       0.00
142.0000  -2.40E-06     -6658.   -76.4973   4.78E-08   345.4650   1.50E+13
4.0017   4.01E+07       0.00
144.0000  -1.38E-06     -7344.    -0.2545   3.66E-08   345.4729   1.50E+13
2.3519   4.10E+07       0.00
146.0000  -6.39E-07     -6675.    41.3639   2.54E-08   345.4652   1.50E+13
1.1163   4.19E+07       0.00
148.0000  -1.58E-07     -5362.    58.1363   1.58E-08   345.4501   1.50E+13
0.2814   4.29E+07       0.00
150.0000   1.18E-07     -3886.    58.9317   8.37E-09   345.4331   1.50E+13
-0.2151   4.38E+07       0.00
152.0000   2.44E-07     -2534.    50.8890   3.24E-09   345.4175   1.50E+13
-0.4551   4.47E+07       0.00
154.0000   2.74E-07     -1444.    39.1886   6.15E-11   345.4050   1.50E+13
-0.5199   4.56E+07       0.00
156.0000   2.47E-07  -652.7778    27.1943  -1.61E-09   345.3958   1.50E+13
-0.4796   4.65E+07       0.00
158.0000   1.96E-07  -138.1093    16.7870  -2.25E-09   345.3899   1.50E+13
-0.3877   4.75E+07       0.00
160.0000   1.39E-07   153.2661     8.7609  -2.23E-09   345.3901   1.50E+13
-0.2812   4.84E+07       0.00
162.0000   8.88E-08   282.6806     3.1986  -1.89E-09   345.3916   1.50E+13
-0.1824   4.93E+07       0.00
164.0000   4.89E-08   307.0247    -0.2185  -1.41E-09   345.3919   1.50E+13
-0.1024   5.02E+07       0.00
166.0000   2.09E-08   272.3642    -1.9806  -9.52E-10   345.3915   1.50E+13
-0.04446   5.11E+07       0.00
168.0000   3.25E-09   212.0696    -2.5987  -5.64E-10   345.3908   1.50E+13
-0.00705   5.21E+07       0.00
170.0000  -6.22E-09   147.6927    -2.5185  -2.77E-10   345.3900   1.50E+13
0.01374   5.30E+07       0.00
172.0000  -1.00E-08    91.2144    -2.0834  -8.56E-11   345.3894   1.50E+13
0.02252   5.39E+07       0.00
174.0000  -1.03E-08    47.6999    -1.5299   2.55E-11   345.3889   1.50E+13
0.02360   5.48E+07       0.00
176.0000  -8.80E-09    17.7745    -1.0013   7.78E-11   345.3885   1.50E+13
0.02045   5.58E+07       0.00
178.0000  -6.59E-09    -0.3737    -0.5691   9.17E-11   345.3883   1.50E+13
0.01557   5.67E+07       0.00
180.0000  -4.40E-09    -9.5534    -0.2556   8.38E-11   345.3884   1.50E+13
0.01056   5.76E+07       0.00
182.0000  -2.57E-09   -12.6520   -0.05371   6.61E-11   345.3885   1.50E+13
0.00627   5.85E+07       0.00
184.0000  -1.23E-09   -12.1396    0.05798   4.62E-11   345.3885   1.50E+13
0.00304   5.94E+07       0.00
186.0000  -3.51E-10    -9.8747     0.1050   2.86E-11   345.3884   1.50E+13
8.82E-04   6.04E+07       0.00
188.0000   1.47E-10    -7.1006     0.1111   1.51E-11   345.3884   1.50E+13
-3.75E-04   6.13E+07       0.00
190.0000   3.72E-10    -4.5422    0.09505   5.76E-12   345.3884   1.50E+13
-9.65E-04   6.22E+07       0.00
192.0000   4.23E-10    -2.5391    0.07011       0.00   345.3884   1.50E+13
-0.00111   6.31E+07       0.00
194.0000   3.77E-10    -1.1771    0.04468  -2.88E-12   345.3883   1.50E+13
-0.00101   6.41E+07       0.00
196.0000   2.85E-10    -0.3942    0.02334  -4.13E-12   345.3883   1.50E+13
-7.72E-04   6.50E+07       0.00
198.0000   1.78E-10   -0.05601    0.00820  -4.49E-12   345.3883   1.50E+13
-4.90E-04   6.59E+07       0.00
200.0000   6.95E-11       0.00       0.00  -4.54E-12   345.3883   1.50E+13
-1.94E-04   3.34E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

File name is incorrect below, run designation is "Channel Static Long.(Half scour) 96in"

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     0.97943655 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -111374169. inch-lbs
Maximum shear force              =       -330494. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    76.00000000 feet below pile head
Number of iterations             =              9
Number of zero deflection points =              7
```

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type 1	Load 1 lbs	Load Type 2	Load 2 in-lbs	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile	Max Moment in Pile
1	V, lb	200000.	S, rad	0.00	2500000.	0.7740	0.00	-272204.	-8.88E+07
2	V, lb	250000.	S, rad	0.00	2500000.	0.9794	0.00	-330494.	-1.11E+08

Maximum pile-head deflection = 0.9794365541 inches
Maximum pile-head rotation = -0.0000000000 radians = -0.000000 deg.

The analysis ended normally.

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"

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LPile for Windows, Version 2016-09.009

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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Files Used for Analysis

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Path to file locations:
\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis
\L-Pile\Channel\Transverse\Post Seismic (Full Scour)\

Name of input data file:
Channel Static 24in.lp9d

Name of output report file:
Channel Static 24in.lp9o

Name of plot output file:
Channel Static 24in.lp9p

Name of runtime message file:
Channel Static 24in.lp9r

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Date and Time of Analysis

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Date: October 4, 2017 Time: 12:09:46

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Problem Title

Project Name: Harbor River Bridge
Job Number: 18461-007-01
Client: SCDOT
Engineer: HPC
Description: Channel - Static

Program Options and Settings

Computational Options:
- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:
- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed	=	500
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	100

Loading Type and Number of Cycles of Loading:
- Static loading specified

- Analysis uses p-y modification factors for p-y curves
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined	=	1
Total length of pile	=	200.000 ft
Depth of ground surface below top of pile	=	65.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	96.0000
2	200.000	96.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile

Cross-sectional Shape	=	Circular Pile
Length of section	=	200.000000 ft
Width of top of section	=	96.000000 in
Width of bottom of section	=	96.000000 in
Top Area	=	7238. sq. in
Bottom Area	=	7238. sq. in
Moment of Inertia at Top	=	4169220. in^4
Moment of Inertia at Bottom	=	4169220. in^4
Elastic Modulus	=	3600000. psi

Ground Slope and Pile Batter Angles

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is stiff clay with water-induced erosion

Distance from top of pile to top of layer	=	65.000000 ft
Distance from top of pile to bottom of layer	=	100.000000 ft
Effective unit weight at top of layer	=	57.600000 pcf
Effective unit weight at bottom of layer	=	57.600000 pcf
Undrained cohesion at top of layer	=	3400. psf
Undrained cohesion at bottom of layer	=	3400. psf
Epsilon-50 at top of layer	=	0.005000
Epsilon-50 at bottom of layer	=	0.005000

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"


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   Subgrade k at top of layer                          =   400.000000 pci
   Subgrade k at bottom of layer                       =   400.000000 pci


Layer 2 is stiff clay with water-induced erosion

   Distance from top of pile to top of layer           =   100.000000 ft
   Distance from top of pile to bottom of layer        =   210.000000 ft
   Effective unit weight at top of layer               =    57.600000 pcf
   Effective unit weight at bottom of layer            =    57.600000 pcf
   Undrained cohesion at top of layer                  =        6000. psf
   Undrained cohesion at bottom of layer               =        6000. psf
   Epsilon-50 at top of layer                          =     0.005000
   Epsilon-50 at bottom of layer                       =     0.005000
   Subgrade k at top of layer                          =   800.000000 pci
   Subgrade k at bottom of layer                       =   800.000000 pci


 (Depth of the lowest soil layer extends 10.000 ft below the pile tip)



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                        Summary of Input Soil Properties
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Layer         Soil Type          Layer      Effective    Undrained       E50
Layer           Name             Depth       Unit Wt.    Cohesion        or
kpy
 Num.     (p-y Curve Type)        ft           pcf          psf          krm
 pci
-----   -------------------   ----------   ----------   ----------
----------   ----------
  1         Stiff Clay           65.0000      57.6000        3400.
  0.00500     400.0000
          with Free Water       100.0000      57.6000        3400.
          0.00500     400.0000
  2         Stiff Clay          100.0000      57.6000        6000.
  0.00500     800.0000
          with Free Water       210.0000      57.6000        6000.
          0.00500     800.0000


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                    p-y Modification Factors for Group Action
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Distribution of p-y modifiers with depth defined using 2 points

Point      Depth X         p-mult         y-mult
 No.          ft
-----     ----------     ----------     ----------
  1           65.000         0.4500         1.0000
  2          210.000         0.4500         1.0000



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Static Loading Type

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Static loading criteria were used when computing p-y curves for all analyses.

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Pile-head Loading and Pile-head Fixity Conditions

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Number of loads specified = 7

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	5	y = 0.500000 in	S = 0.0000 in/in	2500000.	N.A.
2	5	y = 1.000000 in	S = 0.0000 in/in	2500000.	N.A.
3	5	y = 2.000000 in	S = 0.0000 in/in	2500000.	N.A.
4	5	y = 3.000000 in	S = 0.0000 in/in	2500000.	N.A.
5	5	y = 4.000000 in	S = 0.0000 in/in	2500000.	N.A.
6	5	y = 5.000000 in	S = 0.0000 in/in	2500000.	N.A.
7	5	y = 6.000000 in	S = 0.0000 in/in	2500000.	N.A.

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

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Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

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Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	65.0000	0.00	N.A.	No	0.00	625226.
2	100.0000	35.0000	Yes	No	625226.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 2500000.0 lbs

Depth X feet	Deflect. y inches	Bending Distrib. Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Lat. Load lb/inch				
0.00	0.5008	-3.98E+07	74646.	0.00	803.4470	1.50E+13
0.00	0.00	0.00				
2.0000	0.5000	-3.80E+07	74643.	-6.22E-05	782.8004	1.50E+13
0.00	0.00	0.00				
4.0000	0.4978	-3.62E+07	74643.	-1.22E-04	762.1119	1.50E+13
0.00	0.00	0.00				
6.0000	0.4942	-3.44E+07	74643.	-1.78E-04	741.3834	1.50E+13
0.00	0.00	0.00				
8.0000	0.4892	-3.26E+07	74643.	-2.31E-04	720.6169	1.50E+13
0.00	0.00	0.00				
10.0000	0.4831	-3.08E+07	74643.	-2.82E-04	699.8144	1.50E+13
0.00	0.00	0.00				
12.0000	0.4757	-2.90E+07	74643.	-3.30E-04	678.9779	1.50E+13
0.00	0.00	0.00				
14.0000	0.4672	-2.72E+07	74643.	-3.75E-04	658.1094	1.50E+13
0.00	0.00	0.00				
16.0000	0.4577	-2.53E+07	74643.	-4.17E-04	637.2109	1.50E+13

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"


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0.00        0.00        0.00
18.0000      0.4472  -2.35E+07     74643.  -4.56E-04   616.2844   1.50E+13
0.00        0.00        0.00
20.0000      0.4358  -2.17E+07     74643.  -4.92E-04   595.3319   1.50E+13
0.00        0.00        0.00
22.0000      0.4236  -1.99E+07     74643.  -5.25E-04   574.3554   1.50E+13
0.00        0.00        0.00
24.0000      0.4106  -1.81E+07     74643.  -5.56E-04   553.3570   1.50E+13
0.00        0.00        0.00
26.0000      0.3969  -1.62E+07     74643.  -5.83E-04   532.3386   1.50E+13
0.00        0.00        0.00
28.0000      0.3826  -1.44E+07     74643.  -6.08E-04   511.3022   1.50E+13
0.00        0.00        0.00
30.0000      0.3678  -1.26E+07     74643.  -6.29E-04   490.2500   1.50E+13
0.00        0.00        0.00
32.0000      0.3524  -1.08E+07     74643.  -6.48E-04   469.1838   1.50E+13
0.00        0.00        0.00
34.0000      0.3367  -8921911.     74643.  -6.64E-04   448.1058   1.50E+13
0.00        0.00        0.00
36.0000      0.3206  -7090244.     74643.  -6.76E-04   427.0179   1.50E+13
0.00        0.00        0.00
38.0000      0.3042  -5257897.     74643.  -6.86E-04   405.9222   1.50E+13
0.00        0.00        0.00
40.0000      0.2876  -3425045.     74643.  -6.93E-04   384.8207   1.50E+13
0.00        0.00        0.00
42.0000      0.2709  -1591864.     74643.  -6.97E-04   363.7154   1.50E+13
0.00        0.00        0.00
44.0000      0.2542    241469.     74643.  -6.98E-04   348.1683   1.50E+13
0.00        0.00        0.00
46.0000      0.2374   2074779.     74643.  -6.96E-04   369.2751   1.50E+13
0.00        0.00        0.00
48.0000      0.2207   3907889.     74643.  -6.92E-04   390.3796   1.50E+13
0.00        0.00        0.00
50.0000      0.2042   5740625.     74643.  -6.84E-04   411.4798   1.50E+13
0.00        0.00        0.00
52.0000      0.1879   7572810.     74643.  -6.73E-04   432.5737   1.50E+13
0.00        0.00        0.00
54.0000      0.1719   9404269.     74643.  -6.60E-04   453.6592   1.50E+13
0.00        0.00        0.00
56.0000      0.1562   1.12E+07     74643.  -6.43E-04   474.7343   1.50E+13
0.00        0.00        0.00
58.0000      0.1410   1.31E+07     74643.  -6.24E-04   495.7969   1.50E+13
0.00        0.00        0.00
60.0000      0.1263   1.49E+07     74643.  -6.01E-04   516.8452   1.50E+13
0.00        0.00        0.00
62.0000      0.1122   1.67E+07     74643.  -5.76E-04   537.8770   1.50E+13
0.00        0.00        0.00
64.0000    0.09864   1.85E+07     74643.  -5.48E-04   558.8903   1.50E+13
0.00        0.00        0.00
66.0000    0.08585   2.04E+07     72418.  -5.17E-04   579.8832   1.50E+13
-185.4351     51840.       0.00
68.0000    0.07384   2.21E+07     64451.  -4.83E-04   599.6238   1.50E+13
-478.4594    155520.       0.00
70.0000    0.06267   2.35E+07     50587.  -4.46E-04   616.1672   1.50E+13
-676.8414    259200.       0.00
72.0000    0.05241   2.46E+07     33173.  -4.08E-04   628.1962   1.50E+13
-774.3116    354597.       0.00
74.0000    0.04309   2.52E+07     14097.  -3.68E-04   635.0632   1.50E+13
-815.3712    454175.       0.00
76.0000    0.03473   2.53E+07     -5590.  -3.28E-04   636.4953   1.50E+13
-825.2274    570240.       0.00
78.0000    0.02735   2.49E+07    -24708.  -2.88E-04   632.4270   1.50E+13
-767.9094    673920.       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"


```
 80.0000    0.02092   2.41E+07    -42056.  -2.49E-04   623.2388   1.50E+13
 -677.7887    777600.       0.00
 82.0000    0.01542   2.29E+07    -56983.  -2.11E-04   609.5293   1.50E+13
 -566.1407    881280.       0.00
 84.0000    0.01080   2.14E+07    -69094.  -1.75E-04   592.0401   1.50E+13
 -443.0931    984960.       0.00
 86.0000    0.00700   1.96E+07    -78220.  -1.43E-04   571.5888   1.50E+13
 -317.4125   1088640.       0.00
 88.0000    0.00395   1.77E+07    -84385.  -1.13E-04   549.0110   1.50E+13
 -196.3674   1192320.       0.00
 90.0000    0.00159   1.56E+07    -87770.  -8.61E-05   525.1114   1.50E+13
 -85.6657   1296000.       0.00
 92.0000  -1.81E-04   1.35E+07    -88671.  -6.29E-05   500.6265   1.50E+13
 10.5422   1399680.       0.00
 94.0000   -0.00143   1.14E+07    -87470.  -4.30E-05   476.1965   1.50E+13
 89.6047   1503360.       0.00
 96.0000   -0.00224   9290410.    -84591.  -2.65E-05   452.3483   1.50E+13
 150.2682   1607040.       0.00
 98.0000   -0.00270   7304644.    -80477.  -1.32E-05   429.4863   1.50E+13
 192.5482   1710720.       0.00
100.0000   -0.00288   5429085.    -72945.  -3.03E-06   407.8931   1.50E+13
435.1705   3628800.       0.00
102.0000   -0.00285   3803663.    -62263.   4.35E-06   389.1797   1.50E+13
454.9976   3836160.       0.00
104.0000   -0.00267   2439955.    -51406.   9.35E-06   373.4794   1.50E+13
449.6865   4043520.       0.00
106.0000   -0.00240   1335033.    -40914.   1.24E-05   360.7585   1.50E+13
424.7233   4250880.       0.00
108.0000   -0.00208    474623.    -31190.   1.38E-05   350.8526   1.50E+13
385.5575   4458240.       0.00
110.0000   -0.00173   -163752.    -22516.   1.41E-05   347.2736   1.50E+13
337.2803   4665600.       0.00
112.0000   -0.00140   -607837.    -15056.   1.34E-05   352.3863   1.50E+13
284.3937   4872960.       0.00
114.0000   -0.00109   -888053.     -8875.   1.22E-05   355.6124   1.50E+13
230.6682   5080320.       0.00
116.0000  -8.13E-04  -1035319.     -3958.   1.07E-05   357.3079   1.50E+13
179.0775   5287680.       0.00
118.0000  -5.76E-04  -1079337.  -227.7929   9.02E-06   357.8147   1.50E+13
131.7992   5495040.       0.00
120.0000  -3.80E-04  -1047336.      2437.   7.32E-06   357.4462   1.50E+13
90.2642   5702400.       0.00
122.0000  -2.24E-04   -963241.      4183.   5.71E-06   356.4781   1.50E+13
55.2441   5909760.       0.00
124.0000  -1.06E-04   -847234.      5169.   4.26E-06   355.1425   1.50E+13
26.9578   6117120.       0.00
126.0000  -1.97E-05   -715617.      5555.   3.01E-06   353.6272   1.50E+13
5.1905   6324480.       0.00
128.0000   3.89E-05   -580943.      5490.   1.98E-06   352.0767   1.50E+13
-10.5898   6531840.       0.00
130.0000   7.52E-05   -452312.      5110.   1.15E-06   350.5958   1.50E+13
-21.1226   6739200.       0.00
132.0000   9.42E-05   -335804.      4529.   5.21E-07   349.2544   1.50E+13
-27.2587   6946560.       0.00
134.0000   1.00E-04   -234965.      3844.   6.50E-08   348.0935   1.50E+13
-29.8809   7153920.       0.00
136.0000   9.73E-05   -151315.      3127.  -2.44E-07   347.1304   1.50E+13
-29.8423   7361280.       0.00
138.0000   8.85E-05    -84840.      2434.  -4.33E-07   346.3651   1.50E+13
-27.9214   7568640.       0.00
140.0000   7.65E-05    -34440.      1801.  -5.28E-07   345.7848   1.50E+13
-24.7944   7776000.       0.00
142.0000   6.32E-05      1683.      1251.  -5.54E-07   345.4077   1.50E+13
```

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```
-21.0200   7983360.       0.00
144.0000   4.99E-05     25697.   794.7810  -5.32E-07   345.6842   1.50E+13
-17.0374   8190720.       0.00
146.0000   3.76E-05     39896.   432.2875  -4.80E-07   345.8477   1.50E+13
-13.1704   8398080.       0.00
148.0000   2.69E-05     46505.   158.5590  -4.11E-07   345.9237   1.50E+13
-9.6403   8605440.       0.00
150.0000   1.79E-05     47556.   -36.0795  -3.36E-07   345.9358   1.50E+13
-6.5796   8812800.       0.00
152.0000   1.08E-05     44813.  -163.6341  -2.62E-07   345.9043   1.50E+13
-4.0499   9020160.       0.00
154.0000   5.35E-06     39733.  -236.9297  -1.94E-07   345.8458   1.50E+13
-2.0580   9227520.       0.00
156.0000   1.45E-06     33464.  -268.4888  -1.36E-07   345.7736   1.50E+13
-0.5719   9434880.       0.00
158.0000  -1.16E-06     26862.  -269.7632  -8.74E-08   345.6976   1.50E+13
0.4657   9642240.       0.00
160.0000  -2.74E-06     20526.  -250.6708  -4.95E-08   345.6246   1.50E+13
1.1253   9849600.       0.00
162.0000  -3.54E-06     14836.  -219.3791  -2.13E-08   345.5591   1.50E+13
1.4823   1.01E+07       0.00
164.0000  -3.76E-06      9998.  -182.2781  -1.42E-09   345.5034   1.50E+13
1.6095   1.03E+07       0.00
166.0000  -3.61E-06      6087.  -144.0868   1.14E-08   345.4584   1.50E+13
1.5731   1.05E+07       0.00
168.0000  -3.21E-06      3081.  -108.0473   1.88E-08   345.4238   1.50E+13
1.4302   1.07E+07       0.00
170.0000  -2.70E-06   898.0957   -76.1642   2.20E-08   345.3987   1.50E+13
1.2268   1.09E+07       0.00
172.0000  -2.16E-06  -577.8948   -49.4591   2.22E-08   345.3950   1.50E+13
0.9987   1.11E+07       0.00
174.0000  -1.64E-06     -1479.   -28.2162   2.06E-08   345.4054   1.50E+13
0.7716   1.13E+07       0.00
176.0000  -1.17E-06     -1935.   -12.2048   1.78E-08   345.4106   1.50E+13
0.5627   1.15E+07       0.00
178.0000  -7.83E-07     -2067.    -0.8681   1.46E-08   345.4121   1.50E+13
0.3820   1.17E+07       0.00
180.0000  -4.71E-07     -1978.     6.5242   1.14E-08   345.4111   1.50E+13
0.2340   1.19E+07       0.00
182.0000  -2.35E-07     -1755.    10.7596   8.42E-09   345.4085   1.50E+13
0.1190   1.21E+07       0.00
184.0000  -6.70E-08     -1463.    12.6006   5.84E-09   345.4052   1.50E+13
0.03446   1.23E+07       0.00
186.0000   4.52E-08     -1151.    12.7308   3.75E-09   345.4016   1.50E+13
-0.02360   1.25E+07       0.00
188.0000   1.13E-07  -852.0840    11.7260   2.15E-09   345.3981   1.50E+13
-0.06014   1.28E+07       0.00
190.0000   1.49E-07  -588.0692    10.0420   1.00E-09   345.3951   1.50E+13
-0.08019   1.30E+07       0.00
192.0000   1.61E-07  -370.1884     8.0180   2.36E-10   345.3926   1.50E+13
-0.08847   1.32E+07       0.00
194.0000   1.60E-07  -203.2333     5.8876  -2.23E-10   345.3907   1.50E+13
-0.08906   1.34E+07       0.00
196.0000   1.51E-07   -87.5572     3.7964  -4.55E-10   345.3893   1.50E+13
-0.08521   1.36E+07       0.00
198.0000   1.38E-07   -20.9518     1.8228  -5.42E-10   345.3886   1.50E+13
-0.07926   1.38E+07       0.00
200.0000   1.25E-07       0.00       0.00  -5.59E-10   345.3883   1.50E+13
-0.07263   6998400.       0.00
```

* The above values of total stress are combined axial and bending stresses.

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"

Channel Static 24in.lp9o 10/4/2017

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.50076343 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -39786402. inch-lbs
Maximum shear force              =        -88671. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    92.00000000 feet below pile head
Number of iterations             =              6
Number of zero deflection points =              4
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)

```
Displacement of pile head                                =     1.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				
0.00	1.0015	-7.70E+07	142338.	0.00	1232.	1.50E+13
0.00	0.00	0.00				
2.0000	1.0000	-7.36E+07	142332.	-1.20E-04	1193.	1.50E+13
0.00	0.00	0.00				
4.0000	0.9957	-7.02E+07	142332.	-2.35E-04	1153.	1.50E+13
0.00	0.00	0.00				
6.0000	0.9887	-6.68E+07	142332.	-3.45E-04	1114.	1.50E+13
0.00	0.00	0.00				
8.0000	0.9791	-6.33E+07	142332.	-4.49E-04	1074.	1.50E+13
0.00	0.00	0.00				
10.0000	0.9672	-5.99E+07	142332.	-5.47E-04	1035.	1.50E+13
0.00	0.00	0.00				
12.0000	0.9529	-5.64E+07	142332.	-6.40E-04	994.8779	1.50E+13
0.00	0.00	0.00				
14.0000	0.9364	-5.30E+07	142332.	-7.28E-04	955.0767	1.50E+13
0.00	0.00	0.00				
16.0000	0.9179	-4.95E+07	142332.	-8.10E-04	915.2170	1.50E+13
0.00	0.00	0.00				
18.0000	0.8976	-4.60E+07	142332.	-8.86E-04	875.3027	1.50E+13
0.00	0.00	0.00				
20.0000	0.8754	-4.26E+07	142332.	-9.57E-04	835.3375	1.50E+13
0.00	0.00	0.00				
22.0000	0.8516	-3.91E+07	142332.	-0.00102	795.3252	1.50E+13
0.00	0.00	0.00				
24.0000	0.8263	-3.56E+07	142332.	-0.00108	755.2699	1.50E+13
0.00	0.00	0.00				
26.0000	0.7997	-3.21E+07	142332.	-0.00114	715.1752	1.50E+13
0.00	0.00	0.00				
28.0000	0.7718	-2.86E+07	142332.	-0.00118	675.0450	1.50E+13
0.00	0.00	0.00				

```
30.0000     0.7428  -2.51E+07    142332.   -0.00123   634.8832   1.50E+13
0.00       0.00       0.00
32.0000     0.7129  -2.17E+07    142332.   -0.00126   594.6936   1.50E+13
0.00       0.00       0.00
34.0000     0.6821  -1.82E+07    142332.   -0.00130   554.4801   1.50E+13
0.00       0.00       0.00
36.0000     0.6506  -1.47E+07    142332.   -0.00132   514.2466   1.50E+13
0.00       0.00       0.00
38.0000     0.6186  -1.12E+07    142332.   -0.00134   473.9968   1.50E+13
0.00       0.00       0.00
40.0000     0.5861  -7673655.    142332.   -0.00136   433.7347   1.50E+13
0.00       0.00       0.00
42.0000     0.5534  -4175803.    142332.   -0.00137   393.4641   1.50E+13
0.00       0.00       0.00
44.0000     0.5205   -677551.    142332.   -0.00137   353.1889   1.50E+13
0.00       0.00       0.00
46.0000     0.4875   2820767.    142332.   -0.00137   377.8637   1.50E+13
0.00       0.00       0.00
48.0000     0.4547   6318814.    142332.   -0.00136   418.1365   1.50E+13
0.00       0.00       0.00
50.0000     0.4221   9816254.    142332.   -0.00135   458.4023   1.50E+13
0.00       0.00       0.00
52.0000     0.3899   1.33E+07    142332.   -0.00133   498.6573   1.50E+13
0.00       0.00       0.00
54.0000     0.3582   1.68E+07    142332.   -0.00131   538.8976   1.50E+13
0.00       0.00       0.00
56.0000     0.3271   2.03E+07    142332.   -0.00128   579.1193   1.50E+13
0.00       0.00       0.00
58.0000     0.2968   2.38E+07    142332.   -0.00124   619.3186   1.50E+13
0.00       0.00       0.00
60.0000     0.2675   2.73E+07    142332.   -0.00120   659.4917   1.50E+13
0.00       0.00       0.00
62.0000     0.2391   3.08E+07    142332.   -0.00116   699.6345   1.50E+13
0.00       0.00       0.00
64.0000     0.2120   3.43E+07    142332.   -0.00110   739.7434   1.50E+13
0.00       0.00       0.00
66.0000     0.1862   3.77E+07    137506.   -0.00105   779.8145   1.50E+13
-402.1350     51840.       0.00
68.0000     0.1618   4.10E+07    121627.  -9.83E-04   817.1771   1.50E+13
-921.1438    136638.       0.00
70.0000     0.1390   4.37E+07     97882.  -9.15E-04   848.3860   1.50E+13
-1058.    182612.       0.00
72.0000     0.1179   4.58E+07     71257.  -8.44E-04   872.5335   1.50E+13
-1161.    236459.       0.00
74.0000    0.09849   4.72E+07     42529.  -7.69E-04   888.9299   1.50E+13
-1233.    300409.       0.00
76.0000    0.08093   4.79E+07     12462.  -6.93E-04   897.0989   1.50E+13
-1273.    377446.       0.00
78.0000    0.06521   4.79E+07    -18193.  -6.17E-04   896.7748   1.50E+13
-1282.    471787.       0.00
80.0000    0.05132   4.71E+07    -48705.  -5.41E-04   887.8973   1.50E+13
-1261.    589601.       0.00
82.0000    0.03925   4.56E+07    -78365.  -4.67E-04   870.6063   1.50E+13
-1211.    740340.       0.00
84.0000    0.02893   4.34E+07   -106481.  -3.95E-04   845.2357   1.50E+13
-1132.    939421.       0.00
86.0000    0.02027   4.06E+07   -131101.  -3.28E-04   812.3088   1.50E+13
-919.3701   1088640.       0.00
88.0000    0.01317   3.72E+07   -149983.  -2.66E-04   773.2403   1.50E+13
-654.1317   1192320.       0.00
90.0000    0.00749   3.34E+07   -162687.  -2.10E-04   729.7929   1.50E+13
-404.5505   1296000.       0.00
92.0000    0.00310   2.94E+07   -169709.  -1.60E-04   683.6259   1.50E+13
```

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 -180.6637   1399680.       0.00
 94.0000  -1.69E-04   2.53E+07   -171751.  -1.16E-04   636.2284   1.50E+13
 10.5623   1503360.       0.00
 96.0000   -0.00247   2.11E+07   -169643.  -7.88E-05   588.8730   1.50E+13
 165.0945   1607040.       0.00
 98.0000   -0.00395   1.71E+07   -164282.  -4.82E-05   542.5891   1.50E+13
 281.6205   1710720.       0.00
100.0000   -0.00478   1.33E+07   -152232.  -2.39E-05   498.1538   1.50E+13
722.5704   3628800.       0.00
102.0000   -0.00510   9824350.   -133783.  -5.43E-06   458.4955   1.50E+13
814.8142   3836160.       0.00
104.0000   -0.00504   6848073.   -113817.   7.90E-06   424.2298   1.50E+13
849.0455   4043520.       0.00
106.0000   -0.00472   4360190.    -93600.   1.69E-05   395.5870   1.50E+13
835.7224   4250880.       0.00
108.0000   -0.00423   2353265.    -74142.   2.22E-05   372.4813   1.50E+13
785.7685   4458240.       0.00
110.0000   -0.00365    798716.    -56195.   2.48E-05   354.5839   1.50E+13
709.8193   4665600.       0.00
112.0000   -0.00304   -347053.    -40265.   2.51E-05   349.3839   1.50E+13
617.6468   4872960.       0.00
114.0000   -0.00245  -1137025.    -26640.   2.39E-05   358.4788   1.50E+13
517.7643   5080320.       0.00
116.0000   -0.00189  -1628655.    -15421.   2.17E-05   364.1389   1.50E+13
417.1962   5287680.       0.00
118.0000   -0.00140  -1879824.     -6558.   1.89E-05   367.0306   1.50E+13
321.3934   5495040.       0.00
120.0000  -9.86E-04  -1945690.   110.2946   1.59E-05   367.7889   1.50E+13
234.2661   5702400.       0.00
122.0000  -6.43E-04  -1876432.      4821.   1.28E-05   366.9916   1.50E+13
158.3066   5909760.       0.00
124.0000  -3.72E-04  -1715809.      7858.   9.92E-06   365.1423   1.50E+13
94.7730   6117120.       0.00
126.0000  -1.67E-04  -1500432.      9522.   7.35E-06   362.6627   1.50E+13
43.9074   6324480.       0.00
128.0000  -1.90E-05  -1259621.     10111.   5.14E-06   359.8903   1.50E+13
5.1670   6531840.       0.00
130.0000   8.03E-05  -1015713.      9903.   3.33E-06   357.0822   1.50E+13
-22.5507   6739200.       0.00
132.0000   1.41E-04   -784697.      9144.   1.89E-06   354.4225   1.50E+13
-40.7020   6946560.       0.00
134.0000   1.71E-04   -577049.      8044.   7.97E-07   352.0319   1.50E+13
-50.9191   7153920.       0.00
136.0000   1.79E-04   -398676.      6775.   1.69E-08   349.9783   1.50E+13
-54.8658   7361280.       0.00
138.0000   1.72E-04   -251867.      5467.  -5.03E-07   348.2881   1.50E+13
-54.1267   7568640.       0.00
140.0000   1.55E-04   -136211.      4216.  -8.13E-07   346.9565   1.50E+13
-50.1308   7776000.       0.00
142.0000   1.33E-04    -49417.      3085.  -9.62E-07   345.9573   1.50E+13
-44.1038   7983360.       0.00
144.0000   1.09E-04     11978.      2111.  -9.92E-07   345.5262   1.50E+13
-37.0471   8190720.       0.00
146.0000   8.50E-05     52032.      1310.  -9.41E-07   345.9874   1.50E+13
-29.7359   8398080.       0.00
148.0000   6.34E-05     74954.   680.0172  -8.39E-07   346.2513   1.50E+13
-22.7333   8605440.       0.00
150.0000   4.47E-05     84774.   210.2473  -7.11E-07   346.3643   1.50E+13
-16.4142   8812800.       0.00
152.0000   2.93E-05     85131.  -118.6569  -5.76E-07   346.3684   1.50E+13
-10.9945   9020160.       0.00
154.0000   1.71E-05     79147.  -329.3602  -4.44E-07   346.2995   1.50E+13
-6.5641   9227520.       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"


```
  156.0000   7.93E-06     69375.  -445.5357  -3.26E-07   346.1870   1.50E+13
  -3.1172   9434880.       0.00
  158.0000   1.45E-06     57801.  -489.9260  -2.24E-07   346.0538   1.50E+13
  -0.5820   9642240.       0.00
  160.0000  -2.81E-06     45885.  -483.0508  -1.41E-07   345.9166   1.50E+13
  1.1549   9849600.       0.00
  162.0000  -5.32E-06     34631.  -442.4613  -7.66E-08   345.7870   1.50E+13
  2.2276   1.01E+07       0.00
  164.0000  -6.49E-06     24656.  -382.4302  -2.92E-08   345.6722   1.50E+13
  2.7750   1.03E+07       0.00
  166.0000  -6.72E-06     16278.  -313.9706   3.58E-09   345.5757   1.50E+13
  2.9299   1.05E+07       0.00
  168.0000  -6.32E-06      9585.  -245.0822   2.43E-08   345.4987   1.50E+13
  2.8108   1.07E+07       0.00
  170.0000  -5.55E-06      4511.  -181.1385   3.55E-08   345.4403   1.50E+13
  2.5179   1.09E+07       0.00
  172.0000  -4.61E-06   886.4549  -125.3432   3.98E-08   345.3985   1.50E+13
  2.1317   1.11E+07       0.00
  174.0000  -3.64E-06     -1510.   -79.2026   3.93E-08   345.4057   1.50E+13
  1.7133   1.13E+07       0.00
  176.0000  -2.72E-06     -2920.   -42.9718   3.58E-08   345.4219   1.50E+13
  1.3059   1.15E+07       0.00
  178.0000  -1.92E-06     -3577.   -16.0525   3.06E-08   345.4295   1.50E+13
  0.9374   1.17E+07       0.00
  180.0000  -1.25E-06     -3694.     2.6738   2.48E-08   345.4309   1.50E+13
  0.6232   1.19E+07       0.00
  182.0000  -7.30E-07     -3452.    14.5808   1.91E-08   345.4281   1.50E+13
  0.3691   1.21E+07       0.00
  184.0000  -3.39E-07     -2997.    21.0989   1.39E-08   345.4228   1.50E+13
  0.1741   1.23E+07       0.00
  186.0000  -6.20E-08     -2441.    23.5767   9.57E-09   345.4164   1.50E+13
  0.03240   1.25E+07       0.00
  188.0000   1.21E-07     -1866.    23.1941   6.13E-09   345.4098   1.50E+13
  -0.06428   1.28E+07       0.00
  190.0000   2.32E-07     -1328.    20.9174   3.58E-09   345.4036   1.50E+13
  -0.1255   1.30E+07       0.00
  192.0000   2.93E-07  -862.4563    17.4850   1.83E-09   345.3983   1.50E+13
  -0.1606   1.32E+07       0.00
  194.0000   3.20E-07  -489.1334    13.4182   7.46E-10   345.3940   1.50E+13
  -0.1783   1.34E+07       0.00
  196.0000   3.28E-07  -218.4723     9.0477   1.80E-10   345.3908   1.50E+13
  -0.1859   1.36E+07       0.00
  198.0000   3.29E-07   -54.8642     4.5514  -3.88E-11   345.3890   1.50E+13
  -0.1888   1.38E+07       0.00
  200.0000   3.27E-07       0.00       0.00  -8.26E-11   345.3883   1.50E+13
  -0.1905   6998400.       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     1.00147809 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -77031117. inch-lbs
Maximum shear force              =       -171751. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    94.00000000 feet below pile head
Number of iterations             =              8
Number of zero deflection points =              4
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"

Channel Static 24in.lp9o 10/4/2017

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 3

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 2.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 2500000.0 lbs

Depth X feet	Deflect. y inches	Bending Distrib. Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Lat. Load lb/inch
0.00	2.0028	-1.46E+08	262438.	0.00	2024.	1.50E+13	0.00	0.00	0.00
2.0000	2.0000	-1.40E+08	262425.	-2.28E-04	1951.	1.50E+13	0.00	0.00	0.00
4.0000	1.9918	-1.33E+08	262425.	-4.46E-04	1879.	1.50E+13	0.00	0.00	0.00
6.0000	1.9786	-1.27E+08	262425.	-6.54E-04	1806.	1.50E+13	0.00	0.00	0.00
8.0000	1.9605	-1.21E+08	262425.	-8.52E-04	1733.	1.50E+13	0.00	0.00	0.00
10.0000	1.9377	-1.14E+08	262425.	-0.00104	1660.	1.50E+13	0.00	0.00	0.00
12.0000	1.9106	-1.08E+08	262425.	-0.00122	1586.	1.50E+13	0.00	0.00	0.00
14.0000	1.8793	-1.01E+08	262425.	-0.00138	1513.	1.50E+13	0.00	0.00	0.00
16.0000	1.8441	-9.50E+07	262425.	-0.00154	1439.	1.50E+13	0.00	0.00	0.00
18.0000	1.8053	-8.86E+07	262425.	-0.00169	1366.	1.50E+13	0.00	0.00	0.00
20.0000	1.7631	-8.22E+07	262425.	-0.00182	1292.	1.50E+13	0.00	0.00	0.00
22.0000	1.7177	-7.58E+07	262425.	-0.00195	1218.	1.50E+13	0.00	0.00	0.00
24.0000	1.6695	-6.94E+07	262425.	-0.00207	1144.	1.50E+13	0.00	0.00	0.00
26.0000	1.6185	-6.30E+07	262425.	-0.00217	1070.	1.50E+13	0.00	0.00	0.00
28.0000	1.5652	-5.65E+07	262425.	-0.00227	996.3046	1.50E+13	0.00	0.00	0.00
30.0000	1.5096	-5.01E+07	262425.	-0.00235	922.1955	1.50E+13	0.00	0.00	0.00
32.0000	1.4522	-4.37E+07	262425.	-0.00243	848.0311	1.50E+13	0.00	0.00	0.00
34.0000	1.3931	-3.72E+07	262425.	-0.00249	773.8185	1.50E+13	0.00	0.00	0.00
36.0000	1.3325	-3.08E+07	262425.	-0.00255	699.5647	1.50E+13	0.00	0.00	0.00
38.0000	1.2708	-2.43E+07	262425.	-0.00259	625.2770	1.50E+13	0.00	0.00	0.00
40.0000	1.2081	-1.79E+07	262425.	-0.00263	550.9624	1.50E+13	0.00	0.00	0.00
42.0000	1.1448	-1.14E+07	262425.	-0.00265	476.6281	1.50E+13			

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"


```
 0.00       0.00       0.00
 44.0000     1.0810  -4941646.    262425.   -0.00266   402.2812   1.50E+13
 0.00       0.00       0.00
 46.0000     1.0170   1516507.    262425.   -0.00266   362.8478   1.50E+13
 0.00       0.00       0.00
 48.0000     0.9531   7974514.    262425.   -0.00266   437.1985   1.50E+13
 0.00       0.00       0.00
 50.0000     0.8895   1.44E+07    262425.   -0.00264   511.5403   1.50E+13
 0.00       0.00       0.00
 52.0000     0.8264   2.09E+07    262425.   -0.00261   585.8663   1.50E+13
 0.00       0.00       0.00
 54.0000     0.7641   2.73E+07    262425.   -0.00257   660.1691   1.50E+13
 0.00       0.00       0.00
 56.0000     0.7029   3.38E+07    262425.   -0.00252   734.4418   1.50E+13
 0.00       0.00       0.00
 58.0000     0.6430   4.02E+07    262425.   -0.00246   808.6771   1.50E+13
 0.00       0.00       0.00
 60.0000     0.5846   4.67E+07    262425.   -0.00239   882.8680   1.50E+13
 0.00       0.00       0.00
 62.0000     0.5281   5.31E+07    262425.   -0.00231   957.0073   1.50E+13
 0.00       0.00       0.00
 64.0000     0.4735   5.96E+07    262425.   -0.00222      1031.   1.50E+13
 0.00       0.00       0.00
 66.0000     0.4213   6.60E+07    253224.   -0.00212      1105.   1.50E+13
 -766.7388     43681.       0.00
 68.0000     0.3716   7.20E+07    230209.   -0.00201      1174.   1.50E+13
 -1151.     74360.       0.00
 70.0000     0.3246   7.73E+07    198758.   -0.00189      1235.   1.50E+13
 -1470.    108668.       0.00
 72.0000     0.2806   8.17E+07    160410.   -0.00177      1286.   1.50E+13
 -1726.    147623.       0.00
 74.0000     0.2397   8.52E+07    116694.   -0.00163      1326.   1.50E+13
 -1917.    191910.       0.00
 76.0000     0.2022   8.75E+07     69550.   -0.00150      1353.   1.50E+13
 -2012.    238809.       0.00
 78.0000     0.1679   8.87E+07     20727.   -0.00136      1367.   1.50E+13
 -2057.    293981.       0.00
 80.0000     0.1371   8.87E+07    -28686.   -0.00121      1366.   1.50E+13
 -2061.    360725.       0.00
 82.0000     0.1097   8.75E+07    -77703.   -0.00107      1353.   1.50E+13
 -2024.    442848.       0.00
 84.0000    0.08563   8.51E+07   -125366.  -9.35E-04      1325.   1.50E+13
 -1948.    545987.       0.00
 86.0000    0.06483   8.16E+07   -170749.  -8.01E-04      1285.   1.50E+13
 -1834.    678924.       0.00
 88.0000    0.04716   7.70E+07   -212950.  -6.75E-04      1232.   1.50E+13
 -1683.    856303.       0.00
 90.0000    0.03245   7.14E+07   -250647.  -5.56E-04      1168.   1.50E+13
 -1459.   1078817.       0.00
 92.0000    0.02048   6.50E+07   -282059.  -4.47E-04      1094.   1.50E+13
 -1159.   1357979.       0.00
 94.0000    0.01101   5.79E+07   -304239.  -3.48E-04      1013.   1.50E+13
 -689.4417   1503360.       0.00
 96.0000    0.00376   5.05E+07   -315529.  -2.62E-04   926.3843   1.50E+13
 -251.4524   1607040.       0.00
 98.0000   -0.00156   4.28E+07   -317213.  -1.87E-04   838.5193   1.50E+13
 111.1422   1710720.       0.00
100.0000   -0.00523   3.53E+07   -306390.  -1.25E-04   751.3441   1.50E+13
790.7701   3628800.       0.00
102.0000   -0.00755   2.81E+07   -282424.  -7.41E-05   669.3739   1.50E+13
1206.   3836160.       0.00
104.0000   -0.00879   2.17E+07   -251876.  -3.42E-05   595.3727   1.50E+13
1339.   3658774.       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"


```
106.0000   -0.00919   1.61E+07   -219368.  -4.01E-06   530.2290   1.50E+13
1370.   3577408.       0.00
108.0000   -0.00898   1.12E+07   -186684.   1.78E-05   474.1510   1.50E+13
1354.   3619384.       0.00
110.0000   -0.00834   7092061.   -154781.   3.24E-05   427.0388   1.50E+13
1305.   3755974.       0.00
112.0000   -0.00742   3750765.   -124352.   4.10E-05   388.5707   1.50E+13
1231.   3980310.       0.00
114.0000   -0.00637   1118240.    -95897.   4.49E-05   358.2626   1.50E+13
1140.   4298109.       0.00
116.0000   -0.00527   -857691.    -69773.   4.52E-05   355.2629   1.50E+13
1037.   4725764.       0.00
118.0000   -0.00420  -2236264.    -46218.   4.27E-05   371.1343   1.50E+13
925.9317   5292322.       0.00
120.0000   -0.00322  -3081287.    -25933.   3.84E-05   380.8630   1.50E+13
764.5151   5702400.       0.00
122.0000   -0.00235  -3485652.     -9801.   3.32E-05   385.5185   1.50E+13
579.7919   5909760.       0.00
124.0000   -0.00163  -3555724.      2127.   2.75E-05   386.3252   1.50E+13
414.2492   6117120.       0.00
126.0000   -0.00103  -3386846.     10363.   2.20E-05   384.3809   1.50E+13
272.0631   6324480.       0.00
128.0000  -5.70E-04  -3060935.     15488.   1.68E-05   380.6287   1.50E+13
155.0065   6531840.       0.00
130.0000  -2.24E-04  -2645447.     18103.   1.23E-05   375.8452   1.50E+13
62.9363   6739200.       0.00
132.0000   1.98E-05  -2193454.     18790.   8.41E-06   370.6414   1.50E+13
-5.7177   6946560.       0.00
134.0000   1.79E-04  -1744544.     18079.   5.26E-06   365.4732   1.50E+13
-53.4945   7153920.       0.00
136.0000   2.72E-04  -1326279.     16435.   2.80E-06   360.6577   1.50E+13
-83.4964   7361280.       0.00
138.0000   3.14E-04   -955981.     14245.   9.80E-07   356.3945   1.50E+13
-99.0501   7568640.       0.00
140.0000   3.19E-04   -642644.     11815.  -2.98E-07   352.7871   1.50E+13
-103.4404   7776000.       0.00
142.0000   3.00E-04   -388827.      9377.  -1.12E-06   349.8649   1.50E+13
-99.7165   7983360.       0.00
144.0000   2.65E-04   -192409.      7094.  -1.59E-06   347.6035   1.50E+13
-90.5633   8190720.       0.00
146.0000   2.24E-04    -48137.      5068.  -1.78E-06   345.9425   1.50E+13
-78.2318   8398080.       0.00
148.0000   1.80E-04     51077.      3355.  -1.78E-06   345.9764   1.50E+13
-64.5156   8605440.       0.00
150.0000   1.38E-04    113126.      1972.  -1.65E-06   346.6907   1.50E+13
-50.7652   8812800.       0.00
152.0000   1.01E-04    145923.   907.5479  -1.44E-06   347.0683   1.50E+13
-37.9261   9020160.       0.00
154.0000   6.92E-05    156861.   133.2946  -1.20E-06   347.1943   1.50E+13
-26.5950   9227520.       0.00
156.0000   4.35E-05    152465.  -390.8274  -9.50E-07   347.1437   1.50E+13
-17.0819   9434880.       0.00
158.0000   2.36E-05    138215.  -709.5102  -7.17E-07   346.9796   1.50E+13
-9.4750   9642240.       0.00
160.0000   9.02E-06    118495.  -867.6319  -5.12E-07   346.7526   1.50E+13
-3.7018   9849600.       0.00
162.0000  -9.97E-07     96631.  -907.0415  -3.40E-07   346.5008   1.50E+13
0.4176   1.01E+07       0.00
164.0000  -7.30E-06     74998.  -864.5402  -2.03E-07   346.2518   1.50E+13
3.1241   1.03E+07       0.00
166.0000  -1.07E-05     55157.  -770.8444  -9.88E-08   346.0234   1.50E+13
4.6838   1.05E+07       0.00
168.0000  -1.20E-05     38009.  -650.3066  -2.43E-08   345.8259   1.50E+13
```

```
  5.3610   1.07E+07       0.00
  170.0000  -1.19E-05     23945.  -521.1852   2.52E-08   345.6640   1.50E+13
  5.3991   1.09E+07       0.00
  172.0000  -1.08E-05     12989.  -396.2750   5.47E-08   345.5379   1.50E+13
  5.0100   1.11E+07       0.00
  174.0000  -9.28E-06      4917.  -283.7407   6.90E-08   345.4449   1.50E+13
  4.3678   1.13E+07       0.00
  176.0000  -7.52E-06  -638.7814  -188.0295   7.25E-08   345.3957   1.50E+13
  3.6081   1.15E+07       0.00
  178.0000  -5.80E-06     -4117.  -110.7710   6.87E-08   345.4357   1.50E+13
  2.8301   1.17E+07       0.00
  180.0000  -4.23E-06     -5964.   -51.6011   6.06E-08   345.4570   1.50E+13
  2.1007   1.19E+07       0.00
  182.0000  -2.89E-06     -6601.    -8.8731   5.06E-08   345.4643   1.50E+13
  1.4599   1.21E+07       0.00
  184.0000  -1.80E-06     -6396.    19.7606   4.02E-08   345.4620   1.50E+13
  0.9262   1.23E+07       0.00
  186.0000  -9.60E-07     -5657.    36.8992   3.05E-08   345.4535   1.50E+13
  0.5020   1.25E+07       0.00
  188.0000  -3.36E-07     -4629.    45.0668   2.23E-08   345.4416   1.50E+13
  0.1786   1.28E+07       0.00
  190.0000   1.10E-07     -3497.    46.4949   1.58E-08   345.4286   1.50E+13
  -0.05962   1.30E+07       0.00
  192.0000   4.23E-07     -2399.    42.9958   1.11E-08   345.4159   1.50E+13
  -0.2320   1.32E+07       0.00
  194.0000   6.43E-07     -1434.    35.9113   8.03E-09   345.4048   1.50E+13
  -0.3584   1.34E+07       0.00
  196.0000   8.08E-07  -675.8756    26.1201   6.35E-09   345.3961   1.50E+13
  -0.4575   1.36E+07       0.00
  198.0000   9.48E-07  -181.1075    14.0949   5.66E-09   345.3904   1.50E+13
  -0.5446   1.38E+07       0.00
  200.0000   1.08E-06       0.00       0.00   5.52E-09   345.3883   1.50E+13
  -0.6300   6998400.       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 3:

```
Pile-head deflection             =     2.00279777 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -145806748. inch-lbs
Maximum shear force              =       -317213. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    98.00000000 feet below pile head
Number of iterations             =             11
Number of zero deflection points =              4
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 4

```
Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     3.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"

Channel Static 24in.lp9o 10/4/2017

Soil Res. X p feet lb/inch	Soil Spr. y Es*h inches lb/inch	Distrib. Moment Lat. Load in-lbs lb/inch	Force lbs	S radians	Stress psi*	Stiffness in-lb^2
0.00	3.0040	-2.08E+08	366411.	0.00	2746.	1.50E+13
0.00	0.00	0.00				
2.0000	3.0000	-2.00E+08	366393.	-3.26E-04	2644.	1.50E+13
0.00	0.00	0.00				
4.0000	2.9883	-1.91E+08	366393.	-6.39E-04	2543.	1.50E+13
0.00	0.00	0.00				
6.0000	2.9693	-1.82E+08	366393.	-9.37E-04	2441.	1.50E+13
0.00	0.00	0.00				
8.0000	2.9434	-1.73E+08	366393.	-0.00122	2339.	1.50E+13
0.00	0.00	0.00				
10.0000	2.9108	-1.64E+08	366393.	-0.00149	2237.	1.50E+13
0.00	0.00	0.00				
12.0000	2.8718	-1.55E+08	366393.	-0.00175	2135.	1.50E+13
0.00	0.00	0.00				
14.0000	2.8269	-1.46E+08	366393.	-0.00199	2032.	1.50E+13
0.00	0.00	0.00				
16.0000	2.7764	-1.38E+08	366393.	-0.00221	1929.	1.50E+13
0.00	0.00	0.00				
18.0000	2.7206	-1.29E+08	366393.	-0.00243	1826.	1.50E+13
0.00	0.00	0.00				
20.0000	2.6599	-1.20E+08	366393.	-0.00263	1723.	1.50E+13
0.00	0.00	0.00				
22.0000	2.5946	-1.11E+08	366393.	-0.00281	1620.	1.50E+13
0.00	0.00	0.00				
24.0000	2.5250	-1.02E+08	366393.	-0.00298	1517.	1.50E+13
0.00	0.00	0.00				
26.0000	2.4515	-9.28E+07	366393.	-0.00314	1414.	1.50E+13
0.00	0.00	0.00				
28.0000	2.3745	-8.38E+07	366393.	-0.00328	1310.	1.50E+13
0.00	0.00	0.00				
30.0000	2.2942	-7.48E+07	366393.	-0.00340	1207.	1.50E+13
0.00	0.00	0.00				
32.0000	2.2111	-6.58E+07	366393.	-0.00352	1103.	1.50E+13
0.00	0.00	0.00				
34.0000	2.1255	-5.68E+07	366393.	-0.00361	999.4257	1.50E+13
0.00	0.00	0.00				
36.0000	2.0376	-4.78E+07	366393.	-0.00370	895.6593	1.50E+13
0.00	0.00	0.00				
38.0000	1.9480	-3.88E+07	366393.	-0.00377	791.8402	1.50E+13
0.00	0.00	0.00				
40.0000	1.8568	-2.98E+07	366393.	-0.00382	687.9782	1.50E+13
0.00	0.00	0.00				
42.0000	1.7645	-2.07E+07	366393.	-0.00386	584.0833	1.50E+13
0.00	0.00	0.00				
44.0000	1.6714	-1.17E+07	366393.	-0.00389	480.1656	1.50E+13
0.00	0.00	0.00				
46.0000	1.5779	-2679297.	366393.	-0.00390	376.2349	1.50E+13
0.00	0.00	0.00				
48.0000	1.4842	6348249.	366393.	-0.00390	418.4754	1.50E+13
0.00	0.00	0.00				
50.0000	1.3908	1.54E+07	366393.	-0.00388	522.4020	1.50E+13
0.00	0.00	0.00				
52.0000	1.2980	2.44E+07	366393.	-0.00385	626.3116	1.50E+13
0.00	0.00	0.00				
54.0000	1.2062	3.34E+07	366393.	-0.00380	730.1943	1.50E+13
0.00	0.00	0.00				

```
  56.0000     1.1156   4.24E+07    366393.   -0.00374   834.0401   1.50E+13
  0.00       0.00       0.00
  58.0000     1.0266   5.15E+07    366393.   -0.00367   937.8390   1.50E+13
  0.00       0.00       0.00
  60.0000     0.9396   6.05E+07    366393.   -0.00358      1042.   1.50E+13
  0.00       0.00       0.00
  62.0000     0.8550   6.95E+07    366393.   -0.00347      1145.   1.50E+13
  0.00       0.00       0.00
  64.0000     0.7730   7.85E+07    366393.   -0.00335      1249.   1.50E+13
  0.00       0.00       0.00
  66.0000     0.6940   8.75E+07    358972.   -0.00322      1352.   1.50E+13
  -618.4282     21388.       0.00
  68.0000     0.6183   9.61E+07    337685.   -0.00307      1452.   1.50E+13
  -1155.     44848.       0.00
  70.0000     0.5464   1.04E+08    304505.   -0.00291      1543.   1.50E+13
  -1610.     70699.       0.00
  72.0000     0.4784   1.11E+08    261313.   -0.00274      1624.   1.50E+13
  -1990.     99814.       0.00
  74.0000     0.4147   1.17E+08    209834.   -0.00256      1691.   1.50E+13
  -2300.    133101.       0.00
  76.0000     0.3555   1.21E+08    151730.   -0.00237      1743.   1.50E+13
  -2542.    171577.       0.00
  78.0000     0.3010   1.24E+08     88671.   -0.00217      1779.   1.50E+13
  -2713.    216325.       0.00
  80.0000     0.2512   1.26E+08     22638.   -0.00197      1795.   1.50E+13
  -2790.    266480.       0.00
  82.0000     0.2063   1.26E+08    -44146.   -0.00177      1794.   1.50E+13
  -2776.    322908.       0.00
  84.0000     0.1662   1.24E+08   -110022.   -0.00157      1774.   1.50E+13
  -2714.    391892.       0.00
  86.0000     0.1309   1.21E+08   -173855.   -0.00138      1735.   1.50E+13
  -2606.    477865.       0.00
  88.0000     0.1001   1.16E+08   -234547.   -0.00119      1679.   1.50E+13
  -2452.    587633.       0.00
  90.0000    0.07388   1.10E+08   -290385.   -0.00101      1607.   1.50E+13
  -2201.    714971.       0.00
  92.0000    0.05183   1.02E+08   -338919.  -8.38E-04      1520.   1.50E+13
  -1843.    853678.       0.00
  94.0000    0.03368   9.34E+07   -378874.  -6.81E-04      1421.   1.50E+13
  -1486.   1058916.       0.00
  96.0000    0.01913   8.39E+07   -410148.  -5.39E-04      1312.   1.50E+13
  -1120.   1405258.       0.00
  98.0000    0.00779   7.38E+07   -430253.  -4.13E-04      1195.   1.50E+13
  -555.4333   1710720.       0.00
 100.0000  -7.10E-04   6.33E+07   -435629.  -3.04E-04      1075.   1.50E+13
 107.3961   3628800.       0.00
 102.0000   -0.00678   5.29E+07   -421332.  -2.11E-04   954.8101   1.50E+13
 1084.   3836160.       0.00
 104.0000   -0.01082   4.31E+07   -390486.  -1.34E-04   842.1023   1.50E+13
 1486.   3296386.       0.00
 106.0000   -0.01321   3.42E+07   -352944.  -7.20E-05   739.2040   1.50E+13
 1642.   2984052.       0.00
 108.0000   -0.01428   2.62E+07   -312750.  -2.37E-05   647.1574   1.50E+13
 1707.   2869894.       0.00
 110.0000   -0.01434   1.92E+07   -271724.   1.26E-05   566.4045   1.50E+13
 1711.   2863306.       0.00
 112.0000   -0.01367   1.32E+07   -231137.   3.85E-05   496.9795   1.50E+13
 1671.   2932705.       0.00
 114.0000   -0.01250   8098020.   -191917.   5.55E-05   438.6204   1.50E+13
 1597.   3067597.       0.00
 116.0000   -0.01101   3948366.   -154754.   6.51E-05   390.8457   1.50E+13
 1499.   3268159.       0.00
 118.0000   -0.00937    661994.   -120161.   6.88E-05   353.0098   1.50E+13
```

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1383.   3542308.       0.00
120.0000   -0.00771  -1827620.    -88505.   6.79E-05   366.4296   1.50E+13
1255.   3905911.       0.00
122.0000   -0.00612  -3594410.    -60041.   6.35E-05   386.7706   1.50E+13
1117.   4385420.       0.00
124.0000   -0.00466  -4717221.    -34927.   5.69E-05   399.6974   1.50E+13
975.4027   5023958.       0.00
126.0000   -0.00338  -5277747.    -13246.   4.89E-05   406.1507   1.50E+13
831.3551   5894478.       0.00
128.0000   -0.00231  -5358907.      4284.   4.04E-05   407.0851   1.50E+13
629.4622   6531840.       0.00
130.0000   -0.00145  -5076982.     16711.   3.20E-05   403.8393   1.50E+13
406.1439   6739200.       0.00
132.0000  -7.75E-04  -4560631.     24276.   2.43E-05   397.8946   1.50E+13
224.2468   6946560.       0.00
134.0000  -2.78E-04  -3914676.     27961.   1.76E-05   390.4578   1.50E+13
82.9144   7153920.       0.00
136.0000   6.82E-05  -3220587.     28705.   1.19E-05   382.4668   1.50E+13
-20.9203   7361280.       0.00
138.0000   2.91E-04  -2538239.     27353.   7.25E-06   374.6109   1.50E+13
-91.7633   7568640.       0.00
140.0000   4.16E-04  -1908503.     24633.   3.70E-06   367.3608   1.50E+13
-134.8955   7776000.       0.00
142.0000   4.68E-04  -1356284.     21145.   1.09E-06   361.0032   1.50E+13
-155.8309   7983360.       0.00
144.0000   4.69E-04   -893694.     17356.  -7.11E-07   355.6774   1.50E+13
-159.9035   8190720.       0.00
146.0000   4.34E-04   -523122.     13613.  -1.84E-06   351.4110   1.50E+13
-151.9762   8398080.       0.00
148.0000   3.80E-04   -240038.     10154.  -2.45E-06   348.1519   1.50E+13
-136.2593   8605440.       0.00
150.0000   3.17E-04    -35417.      7125.  -2.67E-06   345.7961   1.50E+13
-116.2215   8812800.       0.00
152.0000   2.52E-04    102265.      4595.  -2.62E-06   346.5657   1.50E+13
-94.5754   9020160.       0.00
154.0000   1.91E-04    185461.      2580.  -2.39E-06   347.5235   1.50E+13
-73.3173   9227520.       0.00
156.0000   1.37E-04    226408.      1055.  -2.06E-06   347.9950   1.50E+13
-53.8040   9434880.       0.00
158.0000   9.17E-05    236343.   -32.9721  -1.69E-06   348.1093   1.50E+13
-36.8513   9642240.       0.00
160.0000   5.57E-05    225029.  -749.2794  -1.32E-06   347.9791   1.50E+13
-22.8410   9849600.       0.00
162.0000   2.82E-05    200536.     -1165.  -9.83E-07   347.6971   1.50E+13
-11.8261   1.01E+07       0.00
164.0000   8.48E-06    169213.     -1351.  -6.87E-07   347.3365   1.50E+13
-3.6286   1.03E+07       0.00
166.0000  -4.76E-06    135783.     -1369.  -4.43E-07   346.9516   1.50E+13
2.0767   1.05E+07       0.00
168.0000  -1.28E-05    103537.     -1276.  -2.52E-07   346.5803   1.50E+13
5.6921   1.07E+07       0.00
170.0000  -1.69E-05     74559.     -1116.  -1.10E-07   346.2467   1.50E+13
7.6441   1.09E+07       0.00
172.0000  -1.81E-05     49977.  -924.2502  -9.97E-09   345.9637   1.50E+13
8.3436   1.11E+07       0.00
174.0000  -1.73E-05     30196.  -726.1996   5.41E-08   345.7360   1.50E+13
8.1606   1.13E+07       0.00
176.0000  -1.55E-05     15113.  -539.3566   9.04E-08   345.5623   1.50E+13
7.4096   1.15E+07       0.00
178.0000  -1.30E-05      4296.  -374.3255   1.06E-07   345.4378   1.50E+13
6.3430   1.17E+07       0.00
180.0000  -1.04E-05     -2868.  -236.3859   1.07E-07   345.4213   1.50E+13
5.1520   1.19E+07       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"


```
  182.0000  -7.86E-06     -7063.  -126.9071   9.91E-08   345.4697   1.50E+13
  3.9713   1.21E+07       0.00
  184.0000  -5.61E-06     -8971.   -44.6144   8.63E-08   345.4916   1.50E+13
  2.8865   1.23E+07       0.00
  186.0000  -3.72E-06     -9215.    13.3376   7.17E-08   345.4944   1.50E+13
  1.9429   1.25E+07       0.00
  188.0000  -2.17E-06     -8339.    50.5050   5.77E-08   345.4843   1.50E+13
  1.1544   1.28E+07       0.00
  190.0000  -9.48E-07     -6798.    70.5027   4.56E-08   345.4666   1.50E+13
  0.5121   1.30E+07       0.00
  192.0000   1.51E-08     -4961.    76.5480   3.62E-08   345.4454   1.50E+13
  -0.00829   1.32E+07       0.00
  194.0000   7.88E-07     -3128.    71.1779   2.97E-08   345.4243   1.50E+13
  -0.4392   1.34E+07       0.00
  196.0000   1.44E-06     -1548.    56.1207   2.60E-08   345.4062   1.50E+13
  -0.8156   1.36E+07       0.00
  198.0000   2.03E-06  -437.1929    32.3052   2.44E-08   345.3934   1.50E+13
  -1.1691   1.38E+07       0.00
  200.0000   2.61E-06       0.00       0.00   2.40E-08   345.3883   1.50E+13
  -1.5230   6998400.       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 4:

```
Pile-head deflection             =     3.00400063 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -208493617. inch-lbs
Maximum shear force              =       -435629. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =   100.00000000 feet below pile head
Number of iterations             =             12
Number of zero deflection points =              4
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 5
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     4.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     4.0051  -2.67E+08    460168.       0.00      3421.   1.50E+13
      0.00       0.00       0.00
    2.0000     4.0000  -2.56E+08    460146.  -4.18E-04      3294.   1.50E+13
    0.00       0.00       0.00
    4.0000     3.9850  -2.45E+08    460146.  -8.19E-04      3166.   1.50E+13
    0.00       0.00       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"


```
 6.0000     3.9607  -2.34E+08    460146.   -0.00120      3039.   1.50E+13
 0.00       0.00       0.00
 8.0000     3.9274  -2.23E+08    460146.   -0.00157      2910.   1.50E+13
 0.00       0.00       0.00
10.0000     3.8855  -2.12E+08    460146.   -0.00191      2782.   1.50E+13
0.00       0.00       0.00
12.0000     3.8355  -2.00E+08    460146.   -0.00224      2654.   1.50E+13
0.00       0.00       0.00
14.0000     3.7778  -1.89E+08    460146.   -0.00256      2525.   1.50E+13
0.00       0.00       0.00
16.0000     3.7128  -1.78E+08    460146.   -0.00285      2396.   1.50E+13
0.00       0.00       0.00
18.0000     3.6410  -1.67E+08    460146.   -0.00313      2267.   1.50E+13
0.00       0.00       0.00
20.0000     3.5628  -1.56E+08    460146.   -0.00338      2137.   1.50E+13
0.00       0.00       0.00
22.0000     3.4786  -1.44E+08    460146.   -0.00362      2008.   1.50E+13
0.00       0.00       0.00
24.0000     3.3889  -1.33E+08    460146.   -0.00384      1878.   1.50E+13
0.00       0.00       0.00
26.0000     3.2941  -1.22E+08    460146.   -0.00405      1748.   1.50E+13
0.00       0.00       0.00
28.0000     3.1946  -1.11E+08    460146.   -0.00423      1618.   1.50E+13
0.00       0.00       0.00
30.0000     3.0908  -9.92E+07    460146.   -0.00440      1488.   1.50E+13
0.00       0.00       0.00
32.0000     2.9833  -8.79E+07    460146.   -0.00455      1358.   1.50E+13
0.00       0.00       0.00
34.0000     2.8723  -7.66E+07    460146.   -0.00468      1227.   1.50E+13
0.00       0.00       0.00
36.0000     2.7585  -6.53E+07    460146.   -0.00480      1097.   1.50E+13
0.00       0.00       0.00
38.0000     2.6421  -5.39E+07    460146.   -0.00489   966.3386   1.50E+13
0.00       0.00       0.00
40.0000     2.5237  -4.26E+07    460146.   -0.00497   835.7865   1.50E+13
0.00       0.00       0.00
42.0000     2.4036  -3.13E+07    460146.   -0.00503   705.1874   1.50E+13
0.00       0.00       0.00
44.0000     2.2823  -1.99E+07    460146.   -0.00507   574.5537   1.50E+13
0.00       0.00       0.00
46.0000     2.1603  -8556430.    460146.   -0.00509   443.8980   1.50E+13
0.00       0.00       0.00
48.0000     2.0379   2792978.    460146.   -0.00510   377.5437   1.50E+13
0.00       0.00       0.00
50.0000     1.9156   1.41E+07    460146.   -0.00508   508.2058   1.50E+13
0.00       0.00       0.00
52.0000     1.7939   2.55E+07    460146.   -0.00505   638.8522   1.50E+13
0.00       0.00       0.00
54.0000     1.6732   3.68E+07    460146.   -0.00500   769.4704   1.50E+13
0.00       0.00       0.00
56.0000     1.5539   4.82E+07    460146.   -0.00493   900.0480   1.50E+13
0.00       0.00       0.00
58.0000     1.4364   5.95E+07    460146.   -0.00485      1031.   1.50E+13
0.00       0.00       0.00
60.0000     1.3212   7.08E+07    460146.   -0.00474      1161.   1.50E+13
0.00       0.00       0.00
62.0000     1.2087   8.22E+07    460146.   -0.00462      1291.   1.50E+13
0.00       0.00       0.00
64.0000     1.0994   9.35E+07    460146.   -0.00448      1422.   1.50E+13
0.00       0.00       0.00
66.0000     0.9937   1.05E+08    454409.   -0.00432      1552.   1.50E+13
-478.0169     11545.       0.00
68.0000     0.8920   1.16E+08    436636.   -0.00415      1679.   1.50E+13
```

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```
  -1003.     26990.       0.00
  70.0000     0.7947   1.26E+08    405534.   -0.00395      1799.   1.50E+13
  -1589.     47980.       0.00
  72.0000     0.7023   1.36E+08    361416.   -0.00374      1908.   1.50E+13
  -2088.     71350.       0.00
  74.0000     0.6151   1.44E+08    306277.   -0.00352      2004.   1.50E+13
  -2507.     97826.       0.00
  76.0000     0.5334   1.51E+08    241994.   -0.00328      2082.   1.50E+13
  -2850.    128229.       0.00
  78.0000     0.4575   1.56E+08    170386.   -0.00304      2142.   1.50E+13
  -3118.    163546.       0.00
  80.0000     0.3876   1.59E+08     93253.   -0.00279      2181.   1.50E+13
  -3310.    204970.       0.00
  82.0000     0.3238   1.61E+08     12430.   -0.00253      2197.   1.50E+13
  -3425.    253858.       0.00
  84.0000     0.2662   1.60E+08    -69885.   -0.00227      2191.   1.50E+13
  -3435.    309659.       0.00
  86.0000     0.2147   1.58E+08   -151152.   -0.00202      2162.   1.50E+13
  -3338.    373037.       0.00
  88.0000     0.1693   1.53E+08   -229466.   -0.00177      2110.   1.50E+13
  -3188.    451914.       0.00
  90.0000     0.1298   1.47E+08   -302737.   -0.00153      2038.   1.50E+13
  -2917.    539389.       0.00
  92.0000    0.09593   1.39E+08   -367843.   -0.00130      1945.   1.50E+13
  -2508.    627449.       0.00
  94.0000    0.06739   1.29E+08   -423163.   -0.00109      1836.   1.50E+13
  -2102.    748649.       0.00
  96.0000    0.04381   1.19E+08   -468726.  -8.87E-04      1713.   1.50E+13
  -1695.    928511.       0.00
  98.0000    0.02479   1.07E+08   -504364.  -7.07E-04      1578.   1.50E+13
  -1275.   1234352.       0.00
 100.0000    0.00988   9.47E+07   -533017.  -5.46E-04      1435.   1.50E+13
 -1113.   2702887.       0.00
 102.0000   -0.00140   8.16E+07   -543694.  -4.05E-04      1285.   1.50E+13
 223.0747   3836160.       0.00
 104.0000   -0.00954   6.86E+07   -524269.  -2.85E-04      1135.   1.50E+13
 1396.   3510500.       0.00
 106.0000   -0.01505   5.64E+07   -486483.  -1.85E-04   995.1937   1.50E+13
 1753.   2794881.       0.00
 108.0000   -0.01840   4.53E+07   -442185.  -1.03E-04   866.6827   1.50E+13
 1938.   2527996.       0.00
 110.0000   -0.02001   3.52E+07   -394669.  -3.89E-05   750.9755   1.50E+13
 2021.   2424226.       0.00
 112.0000   -0.02027   2.63E+07   -346002.   1.03E-05   648.6337   1.50E+13
 2034.   2408790.       0.00
 114.0000   -0.01952   1.86E+07   -297637.   4.63E-05   559.7532   1.50E+13
 1996.   2454849.       0.00
 116.0000   -0.01805   1.20E+07   -250648.   7.08E-05   484.0894   1.50E+13
 1920.   2552735.       0.00
 118.0000   -0.01612   6579872.   -205844.   8.57E-05   421.1420   1.50E+13
 1814.   2701276.       0.00
 120.0000   -0.01393   2156605.   -163835.   9.27E-05   370.2172   1.50E+13
 1687.   2905152.       0.00
 122.0000   -0.01167  -1295304.   -125071.   9.34E-05   360.3011   1.50E+13
 1544.   3174665.       0.00
 124.0000   -0.00945  -3858005.    -89877.   8.92E-05   389.8053   1.50E+13
 1389.   3527159.       0.00
 126.0000   -0.00739  -5620104.    -58470.   8.17E-05   410.0923   1.50E+13
 1228.   3990483.       0.00
 128.0000   -0.00553  -6674346.    -30979.   7.18E-05   422.2297   1.50E+13
 1063.   4610178.       0.00
 130.0000   -0.00394  -7115708.     -7464.   6.08E-05   427.3111   1.50E+13
 896.6271   5465174.       0.00
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File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"


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132.0000   -0.00261  -7039930.     12063.   4.95E-05   426.4386   1.50E+13
730.6468   6706667.       0.00
134.0000   -0.00156  -6542623.     26418.   3.86E-05   420.7132   1.50E+13
465.5896   7153920.       0.00
136.0000  -7.60E-04  -5776510.     34804.   2.88E-05   411.8930   1.50E+13
233.2195   7361280.       0.00
138.0000  -1.80E-04  -4875507.     38285.   2.03E-05   401.5198   1.50E+13
56.9075   7568640.       0.00
140.0000   2.12E-04  -3941259.     38142.   1.32E-05   390.7638   1.50E+13
-68.8034   7776000.       0.00
142.0000   4.54E-04  -3046262.     35505.   7.63E-06   380.4598   1.50E+13
-150.9898   7983360.       0.00
144.0000   5.79E-04  -2237944.     31323.   3.40E-06   371.1537   1.50E+13
-197.4529   8190720.       0.00
146.0000   6.17E-04  -1543144.     26362.   3.82E-07   363.1545   1.50E+13
-216.0174   8398080.       0.00
148.0000   5.97E-04   -972622.     21201.  -1.63E-06   356.5861   1.50E+13
-214.0177   8605440.       0.00
150.0000   5.39E-04   -525280.     16258.  -2.83E-06   351.4359   1.50E+13
-197.9586   8812800.       0.00
152.0000   4.61E-04   -191913.     11802.  -3.40E-06   347.5978   1.50E+13
-173.3247   9020160.       0.00
154.0000   3.76E-04     41638.      7988.  -3.52E-06   345.8677   1.50E+13
-144.5124   9227520.       0.00
156.0000   2.92E-04    191946.      4876.  -3.33E-06   347.5982   1.50E+13
-114.8543   9434880.       0.00
158.0000   2.16E-04    276079.      2457.  -2.96E-06   348.5668   1.50E+13
-86.7092   9642240.       0.00
160.0000   1.50E-04    310241.   677.4637  -2.49E-06   348.9601   1.50E+13
-61.5931   9849600.       0.00
162.0000   9.62E-05    308896.  -545.6160  -2.00E-06   348.9446   1.50E+13
-40.3302   1.01E+07       0.00
164.0000   5.43E-05    284291.     -1308.  -1.52E-06   348.6614   1.50E+13
-23.2067   1.03E+07       0.00
166.0000   2.32E-05    246292.     -1708.  -1.10E-06   348.2239   1.50E+13
-10.1182   1.05E+07       0.00
168.0000   1.57E-06    202441.     -1838.  -7.39E-07   347.7190   1.50E+13
-0.6984   1.07E+07       0.00
170.0000  -1.23E-05    158169.     -1779.  -4.51E-07   347.2093   1.50E+13
5.5710   1.09E+07       0.00
172.0000  -2.01E-05    117090.     -1601.  -2.31E-07   346.7364   1.50E+13
9.2740   1.11E+07       0.00
174.0000  -2.34E-05     81341.     -1358.  -7.20E-08   346.3248   1.50E+13
10.9956   1.13E+07       0.00
176.0000  -2.35E-05     51919.     -1091.   3.46E-08   345.9861   1.50E+13
11.2771   1.15E+07       0.00
178.0000  -2.17E-05     28987.  -828.2473   9.93E-08   345.7221   1.50E+13
10.5888   1.17E+07       0.00
180.0000  -1.88E-05     12151.  -589.3858   1.32E-07   345.5282   1.50E+13
9.3163   1.19E+07       0.00
182.0000  -1.53E-05   680.1440  -384.5010   1.42E-07   345.3962   1.50E+13
7.7574   1.21E+07       0.00
184.0000  -1.19E-05      -6322.  -217.8975   1.38E-07   345.4611   1.50E+13
6.1262   1.23E+07       0.00
186.0000  -8.73E-06      -9795.   -89.6320   1.25E-07   345.5011   1.50E+13
4.5626   1.25E+07       0.00
188.0000  -5.92E-06     -10640.     2.8419   1.09E-07   345.5108   1.50E+13
3.1436   1.28E+07       0.00
190.0000  -3.51E-06      -9672.    63.3227   9.24E-08   345.4997   1.50E+13
1.8965   1.30E+07       0.00
192.0000  -1.48E-06      -7611.    95.8182   7.86E-08   345.4760   1.50E+13
0.8115   1.32E+07       0.00
194.0000   2.62E-07      -5082.   103.8056   6.85E-08   345.4468   1.50E+13
```

```
  -0.1459   1.34E+07       0.00
  196.0000   1.81E-06     -2637.    89.7802   6.23E-08   345.4187   1.50E+13
  -1.0229   1.36E+07       0.00
  198.0000   3.25E-06  -780.3041    55.0826   5.96E-08   345.3973   1.50E+13
  -1.8685   1.38E+07       0.00
  200.0000   4.67E-06       0.00       0.00   5.89E-08   345.3883   1.50E+13
  -2.7217   6998400.       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 5:

```
Pile-head deflection             =     4.00512650 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -267168909. inch-lbs
Maximum shear force              =       -543694. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =   102.00000000 feet below pile head
Number of iterations             =             14
Number of zero deflection points =              4
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 6

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)

```
Displacement of pile head                                =     5.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs
```

```
   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     5.0062  -3.23E+08    546028.       0.00      4060.   1.50E+13
      0.00       0.00       0.00
    2.0000     5.0000  -3.10E+08    546002.  -5.05E-04      3909.   1.50E+13
    0.00       0.00       0.00
    4.0000     4.9819  -2.96E+08    546002.  -9.90E-04      3758.   1.50E+13
    0.00       0.00       0.00
    6.0000     4.9525  -2.83E+08    546002.   -0.00145      3606.   1.50E+13
    0.00       0.00       0.00
    8.0000     4.9122  -2.70E+08    546002.   -0.00190      3454.   1.50E+13
    0.00       0.00       0.00
   10.0000     4.8615  -2.57E+08    546002.   -0.00232      3302.   1.50E+13
   0.00       0.00       0.00
   12.0000     4.8010  -2.44E+08    546002.   -0.00272      3149.   1.50E+13
   0.00       0.00       0.00
   14.0000     4.7311  -2.30E+08    546002.   -0.00310      2996.   1.50E+13
   0.00       0.00       0.00
   16.0000     4.6524  -2.17E+08    546002.   -0.00345      2843.   1.50E+13
   0.00       0.00       0.00
   18.0000     4.5654  -2.04E+08    546002.   -0.00379      2690.   1.50E+13
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"


```
0.00        0.00        0.00
20.0000      4.4705  -1.90E+08    546002.   -0.00410      2536.   1.50E+13
0.00        0.00        0.00
22.0000      4.3684  -1.77E+08    546002.   -0.00440      2382.   1.50E+13
0.00        0.00        0.00
24.0000      4.2594  -1.64E+08    546002.   -0.00467      2228.   1.50E+13
0.00        0.00        0.00
26.0000      4.1442  -1.50E+08    546002.   -0.00492      2074.   1.50E+13
0.00        0.00        0.00
28.0000      4.0232  -1.37E+08    546002.   -0.00515      1920.   1.50E+13
0.00        0.00        0.00
30.0000      3.8970  -1.23E+08    546002.   -0.00536      1765.   1.50E+13
0.00        0.00        0.00
32.0000      3.7660  -1.10E+08    546002.   -0.00554      1611.   1.50E+13
0.00        0.00        0.00
34.0000      3.6309  -9.64E+07    546002.   -0.00571      1456.   1.50E+13
0.00        0.00        0.00
36.0000      3.4920  -8.30E+07    546002.   -0.00585      1301.   1.50E+13
0.00        0.00        0.00
38.0000      3.3499  -6.95E+07    546002.   -0.00597      1146.   1.50E+13
0.00        0.00        0.00
40.0000      3.2052  -5.61E+07    546002.   -0.00608   990.9009   1.50E+13
0.00        0.00        0.00
42.0000      3.0583  -4.26E+07    546002.   -0.00615   835.8071   1.50E+13
0.00        0.00        0.00
44.0000      2.9098  -2.91E+07    546002.   -0.00621   680.6662   1.50E+13
0.00        0.00        0.00
46.0000      2.7602  -1.56E+07    546002.   -0.00625   525.4932   1.50E+13
0.00        0.00        0.00
48.0000      2.6099  -2164045.    546002.   -0.00626   370.3029   1.50E+13
0.00        0.00        0.00
50.0000      2.4596   1.13E+07    546002.   -0.00625   475.6665   1.50E+13
0.00        0.00        0.00
52.0000      2.3097   2.48E+07    546002.   -0.00623   630.8467   1.50E+13
0.00        0.00        0.00
54.0000      2.1608   3.83E+07    546002.   -0.00617   785.9995   1.50E+13
0.00        0.00        0.00
56.0000      2.0133   5.17E+07    546002.   -0.00610   941.1100   1.50E+13
0.00        0.00        0.00
58.0000      1.8679   6.52E+07    546002.   -0.00601      1096.   1.50E+13
0.00        0.00        0.00
60.0000      1.7249   7.87E+07    546002.   -0.00589      1251.   1.50E+13
0.00        0.00        0.00
62.0000      1.5849   9.21E+07    546002.   -0.00576      1406.   1.50E+13
0.00        0.00        0.00
64.0000      1.4485   1.06E+08    546002.   -0.00560      1561.   1.50E+13
0.00        0.00        0.00
66.0000      1.3162   1.19E+08    541484.   -0.00542      1716.   1.50E+13
-376.4831      6865.       0.00
68.0000      1.1884   1.32E+08    526742.   -0.00522      1868.   1.50E+13
-852.0767     17209.       0.00
70.0000      1.0656   1.45E+08    499266.   -0.00500      2014.   1.50E+13
-1438.      32376.       0.00
72.0000      0.9485   1.57E+08    457364.   -0.00476      2150.   1.50E+13
-2054.      51982.       0.00
74.0000      0.8373   1.67E+08    401735.   -0.00450      2273.   1.50E+13
-2581.      73992.       0.00
76.0000      0.7326   1.77E+08    334470.   -0.00422      2379.   1.50E+13
-3024.      99067.       0.00
78.0000      0.6346   1.84E+08    257567.   -0.00393      2464.   1.50E+13
-3385.     127993.       0.00
80.0000      0.5438   1.89E+08    172978.   -0.00364      2526.   1.50E+13
-3664.     161739.       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"


```
 82.0000     0.4601   1.93E+08     82638.   -0.00333      2564.   1.50E+13
 -3864.    201524.       0.00
 84.0000     0.3839   1.94E+08    -11501.   -0.00302      2577.   1.50E+13
 -3981.    248864.       0.00
 86.0000     0.3152   1.93E+08   -107403.   -0.00271      2562.   1.50E+13
 -4011.    305433.       0.00
 88.0000     0.2538   1.89E+08   -202371.   -0.00241      2521.   1.50E+13
 -3903.    369159.       0.00
 90.0000     0.1996   1.83E+08   -292625.   -0.00211      2454.   1.50E+13
 -3618.    434967.       0.00
 92.0000     0.1525   1.75E+08   -373987.   -0.00182      2362.   1.50E+13
 -3162.    497635.       0.00
 94.0000     0.1121   1.65E+08   -444472.   -0.00155      2250.   1.50E+13
 -2711.    580385.       0.00
 96.0000    0.07808   1.54E+08   -504163.   -0.00130      2119.   1.50E+13
 -2263.    695488.       0.00
 98.0000    0.04995   1.41E+08   -553034.   -0.00106      1973.   1.50E+13
 -1810.    869543.       0.00
100.0000    0.02725   1.28E+08   -596927.  -8.44E-04      1815.   1.50E+13
-1848.   1627549.       0.00
102.0000    0.00944   1.13E+08   -635767.  -6.52E-04      1644.   1.50E+13
-1389.   3530241.       0.00
104.0000   -0.00404   9.72E+07   -644269.  -4.84E-04      1464.   1.50E+13
680.2360   4043520.       0.00
106.0000   -0.01379   8.19E+07   -615975.  -3.41E-04      1289.   1.50E+13
1678.   2920370.       0.00
108.0000   -0.02039   6.76E+07   -571358.  -2.21E-04      1124.   1.50E+13
2040.   2401377.       0.00
110.0000   -0.02440   5.45E+07   -520089.  -1.23E-04   973.2260   1.50E+13
2232.   2195296.       0.00
112.0000   -0.02632   4.27E+07   -465487.  -4.57E-05   836.9760   1.50E+13
2318.   2113877.       0.00
114.0000   -0.02660   3.22E+07   -409707.   1.42E-05   716.0510   1.50E+13
2330.   2102819.       0.00
116.0000   -0.02564   2.30E+07   -354288.   5.83E-05   610.5435   1.50E+13
2288.   2141742.       0.00
118.0000   -0.02380   1.52E+07   -300382.   8.89E-05   520.1831   1.50E+13
2204.   2223075.       0.00
120.0000   -0.02137   8602060.   -248863.   1.08E-04   444.4234   1.50E+13
2089.   2345770.       0.00
122.0000   -0.01862   3224087.   -200398.   1.17E-04   382.5071   1.50E+13
1950.   2513304.       0.00
124.0000   -0.01574  -1031149.   -155489.   1.19E-04   357.2599   1.50E+13
1793.   2733440.       0.00
126.0000   -0.01290  -4253679.   -114500.   1.15E-04   394.3607   1.50E+13
1623.   3019192.       0.00
128.0000   -0.01023  -6540923.    -77683.   1.06E-04   420.6936   1.50E+13
1445.   3391182.       0.00
130.0000   -0.00780  -7995209.    -45197.   9.46E-05   437.4367   1.50E+13
1262.   3882425.       0.00
132.0000   -0.00569  -8721709.    -17122.   8.13E-05   445.8009   1.50E+13
1077.   4548323.       0.00
134.0000   -0.00390  -8826792.      6519.   6.72E-05   447.0107   1.50E+13
892.6391   5489769.       0.00
136.0000   -0.00246  -8416867.     25733.   5.34E-05   442.2913   1.50E+13
708.5085   6916534.       0.00
138.0000   -0.00134  -7598034.     39297.   4.06E-05   432.8641   1.50E+13
421.8164   7568640.       0.00
140.0000  -5.08E-04  -6535505.     46334.   2.93E-05   420.6312   1.50E+13
164.6702   7776000.       0.00
142.0000   7.03E-05  -5377500.     48030.   1.98E-05   407.2992   1.50E+13
-23.3774   7983360.       0.00
144.0000   4.42E-04  -4232444.     45938.   1.21E-05   394.1162   1.50E+13
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"


```
-150.9921   8190720.       0.00
146.0000   6.52E-04  -3173953.     41387.   6.20E-06   381.9299   1.50E+13
-228.2013   8398080.       0.00
148.0000   7.40E-04  -2246602.     35464.   1.87E-06   371.2533   1.50E+13
-265.3600   8605440.       0.00
150.0000   7.42E-04  -1471883.     29012.  -1.11E-06   362.3340   1.50E+13
-272.3793   8812800.       0.00
152.0000   6.87E-04   -853913.     22645.  -2.97E-06   355.2194   1.50E+13
-258.1983   9020160.       0.00
154.0000   5.99E-04   -384583.     16781.  -3.96E-06   349.8160   1.50E+13
-230.4713   9227520.       0.00
156.0000   4.97E-04    -47968.     11670.  -4.30E-06   345.9406   1.50E+13
-195.4293   9434880.       0.00
158.0000   3.93E-04    176085.      7430.  -4.20E-06   347.4156   1.50E+13
-157.8797   9642240.       0.00
160.0000   2.96E-04    309182.      4080.  -3.81E-06   348.9479   1.50E+13
-121.3037   9849600.       0.00
162.0000   2.10E-04    372378.      1568.  -3.27E-06   349.6755   1.50E+13
-88.0167   1.01E+07       0.00
164.0000   1.39E-04    384842.  -200.4887  -2.66E-06   349.8190   1.50E+13
-59.3635   1.03E+07       0.00
166.0000   8.23E-05    363074.     -1344.  -2.06E-06   349.5684   1.50E+13
-35.9233   1.05E+07       0.00
168.0000   3.98E-05    320580.     -1987.  -1.52E-06   349.0792   1.50E+13
-17.7071   1.07E+07       0.00
170.0000   9.56E-06    267856.     -2252.  -1.05E-06   348.4721   1.50E+13
-4.3363   1.09E+07       0.00
172.0000  -1.04E-05    212609.     -2246.  -6.61E-07   347.8361   1.50E+13
4.8053   1.11E+07       0.00
174.0000  -2.22E-05    160109.     -2063.  -3.64E-07   347.2317   1.50E+13
10.4498   1.13E+07       0.00
176.0000  -2.78E-05    113613.     -1778.  -1.45E-07   346.6964   1.50E+13
13.3517   1.15E+07       0.00
178.0000  -2.91E-05     74797.     -1447.   5.97E-09   346.2495   1.50E+13
14.2229   1.17E+07       0.00
180.0000  -2.76E-05     44165.     -1112.   1.01E-07   345.8968   1.50E+13
13.6904   1.19E+07       0.00
182.0000  -2.43E-05     21416.  -800.2797   1.54E-07   345.6349   1.50E+13
12.2740   1.21E+07       0.00
184.0000  -2.02E-05      5733.  -528.4510   1.75E-07   345.4543   1.50E+13
10.3784   1.23E+07       0.00
186.0000  -1.59E-05     -3971.  -304.3443   1.77E-07   345.4341   1.50E+13
8.2971   1.25E+07       0.00
188.0000  -1.17E-05     -8896.  -130.1121   1.66E-07   345.4908   1.50E+13
6.2222   1.28E+07       0.00
190.0000  -7.89E-06    -10236.    -4.3284   1.51E-07   345.5062   1.50E+13
4.2597   1.30E+07       0.00
192.0000  -4.46E-06     -9122.    76.1496   1.36E-07   345.4934   1.50E+13
2.4468   1.32E+07       0.00
194.0000  -1.38E-06     -6598.   114.7461   1.23E-07   345.4643   1.50E+13
0.7696   1.34E+07       0.00
196.0000   1.44E-06     -3629.   114.1721   1.15E-07   345.4301   1.50E+13
-0.8174   1.36E+07       0.00
198.0000   4.13E-06     -1131.    75.8831   1.11E-07   345.4014   1.50E+13
-2.3733   1.38E+07       0.00
200.0000   6.77E-06       0.00       0.00   1.10E-07   345.3883   1.50E+13
-3.9503   6998400.       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 6:

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"

Channel Static 24in.lp9o 10/4/2017

```
Pile-head deflection             =     5.00619112 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -322651943. inch-lbs
Maximum shear force              =       -644269. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =   104.00000000 feet below pile head
Number of iterations             =             14
Number of zero deflection points =              4
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 7

```
Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     6.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	6.0072	-3.75E+08	625055.	0.00	4666.	1.50E+13	0.00	0.00	0.00
2.0000	6.0000	-3.60E+08	625025.	-5.88E-04	4494.	1.50E+13	0.00	0.00	0.00
4.0000	5.9790	-3.45E+08	625025.	-0.00115	4320.	1.50E+13	0.00	0.00	0.00
6.0000	5.9447	-3.30E+08	625025.	-0.00169	4147.	1.50E+13	0.00	0.00	0.00
8.0000	5.8977	-3.15E+08	625025.	-0.00221	3972.	1.50E+13	0.00	0.00	0.00
10.0000	5.8387	-3.00E+08	625025.	-0.00270	3798.	1.50E+13	0.00	0.00	0.00
12.0000	5.7682	-2.85E+08	625025.	-0.00317	3623.	1.50E+13	0.00	0.00	0.00
14.0000	5.6867	-2.70E+08	625025.	-0.00361	3448.	1.50E+13	0.00	0.00	0.00
16.0000	5.5949	-2.54E+08	625025.	-0.00403	3273.	1.50E+13	0.00	0.00	0.00
18.0000	5.4933	-2.39E+08	625025.	-0.00442	3097.	1.50E+13	0.00	0.00	0.00
20.0000	5.3825	-2.24E+08	625025.	-0.00479	2921.	1.50E+13	0.00	0.00	0.00
22.0000	5.2632	-2.08E+08	625025.	-0.00514	2745.	1.50E+13	0.00	0.00	0.00
24.0000	5.1359	-1.93E+08	625025.	-0.00546	2569.	1.50E+13	0.00	0.00	0.00
26.0000	5.0011	-1.78E+08	625025.	-0.00576	2392.	1.50E+13	0.00	0.00	0.00
28.0000	4.8596	-1.62E+08	625025.	-0.00603	2216.	1.50E+13	0.00	0.00	0.00
30.0000	4.7117	-1.47E+08	625025.	-0.00628	2039.	1.50E+13	0.00	0.00	0.00

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"


```
32.0000     4.5583  -1.32E+08    625025.   -0.00650      1862.   1.50E+13
0.00       0.00       0.00
34.0000     4.3998  -1.16E+08    625025.   -0.00670      1684.   1.50E+13
0.00       0.00       0.00
36.0000     4.2368  -1.01E+08    625025.   -0.00687      1507.   1.50E+13
0.00       0.00       0.00
38.0000     4.0700  -8.55E+07    625025.   -0.00702      1329.   1.50E+13
0.00       0.00       0.00
40.0000     3.8999  -7.00E+07    625025.   -0.00714      1152.   1.50E+13
0.00       0.00       0.00
42.0000     3.7271  -5.46E+07    625025.   -0.00724   974.0752   1.50E+13
0.00       0.00       0.00
44.0000     3.5522  -3.92E+07    625025.   -0.00732   796.3400   1.50E+13
0.00       0.00       0.00
46.0000     3.3758  -2.37E+07    625025.   -0.00737   618.5615   1.50E+13
0.00       0.00       0.00
48.0000     3.1985  -8283590.    625025.   -0.00739   440.7568   1.50E+13
0.00       0.00       0.00
50.0000     3.0208   7161098.    625025.   -0.00740   427.8337   1.50E+13
0.00       0.00       0.00
52.0000     2.8435   2.26E+07    625025.   -0.00737   605.6396   1.50E+13
0.00       0.00       0.00
54.0000     2.6670   3.80E+07    625025.   -0.00732   783.4205   1.50E+13
0.00       0.00       0.00
56.0000     2.4919   5.35E+07    625025.   -0.00725   961.1595   1.50E+13
0.00       0.00       0.00
58.0000     2.3190   6.89E+07    625025.   -0.00715      1139.   1.50E+13
0.00       0.00       0.00
60.0000     2.1486   8.43E+07    625025.   -0.00703      1316.   1.50E+13
0.00       0.00       0.00
62.0000     1.9815   9.98E+07    625025.   -0.00688      1494.   1.50E+13
0.00       0.00       0.00
64.0000     1.8183   1.15E+08    625025.   -0.00671      1671.   1.50E+13
0.00       0.00       0.00
66.0000     1.6594   1.31E+08    621805.   -0.00651      1849.   1.50E+13
-268.3995      3882.       0.00
68.0000     1.5056   1.46E+08    609932.   -0.00629      2024.   1.50E+13
-720.9521     11492.       0.00
70.0000     1.3574   1.61E+08    586003.   -0.00605      2194.   1.50E+13
-1273.     22511.       0.00
72.0000     1.2153   1.75E+08    547859.   -0.00578      2356.   1.50E+13
-1906.     37632.       0.00
74.0000     1.0799   1.88E+08    494502.   -0.00549      2505.   1.50E+13
-2541.     56468.       0.00
76.0000     0.9517   1.99E+08    427007.   -0.00518      2637.   1.50E+13
-3084.     77765.       0.00
78.0000     0.8312   2.09E+08    347544.   -0.00486      2748.   1.50E+13
-3538.    102162.       0.00
80.0000     0.7187   2.16E+08    258215.   -0.00452      2836.   1.50E+13
-3906.    130441.       0.00
82.0000     0.6144   2.22E+08    161087.   -0.00417      2897.   1.50E+13
-4188.    163586.       0.00
84.0000     0.5187   2.25E+08     58219.   -0.00381      2931.   1.50E+13
-4384.    202856.       0.00
86.0000     0.4316   2.25E+08    -48316.   -0.00345      2935.   1.50E+13
-4494.    249868.       0.00
88.0000     0.3531   2.23E+08   -156380.   -0.00309      2909.   1.50E+13
-4512.    306624.       0.00
90.0000     0.2832   2.18E+08   -262231.   -0.00274      2852.   1.50E+13
-4309.    365176.       0.00
92.0000     0.2216   2.10E+08   -359688.   -0.00240      2768.   1.50E+13
-3812.    412794.       0.00
94.0000     0.1681   2.01E+08   -445279.   -0.00207      2657.   1.50E+13
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"


```
 -3320.    473936.       0.00
 96.0000     0.1224   1.89E+08   -519113.   -0.00176      2524.   1.50E+13
 -2832.    555591.       0.00
 98.0000    0.08382   1.76E+08   -581235.   -0.00146      2373.   1.50E+13
 -2344.    671244.       0.00
100.0000    0.05205   1.62E+08   -640014.   -0.00119      2205.   1.50E+13
-2554.   1177515.       0.00
102.0000    0.02648   1.46E+08   -698566.  -9.49E-04      2021.   1.50E+13
-2325.   2107607.       0.00
104.0000    0.00649   1.28E+08   -739598.  -7.30E-04      1820.   1.50E+13
-1094.   4043520.       0.00
106.0000   -0.00858   1.10E+08   -736844.  -5.40E-04      1613.   1.50E+13
1323.   3701965.       0.00
108.0000   -0.01943   9.28E+07   -697066.  -3.78E-04      1414.   1.50E+13
1991.   2460405.       0.00
110.0000   -0.02671   7.67E+07   -645144.  -2.42E-04      1228.   1.50E+13
2335.   2098279.       0.00
112.0000   -0.03105   6.19E+07   -586905.  -1.31E-04      1058.   1.50E+13
2518.   1946065.       0.00
114.0000   -0.03302   4.85E+07   -525530.  -4.32E-05   903.9860   1.50E+13
2597.   1887196.       0.00
116.0000   -0.03313   3.67E+07   -463162.   2.49E-05   767.3891   1.50E+13
2601.   1884183.       0.00
118.0000   -0.03183   2.63E+07   -401363.   7.52E-05   647.9985   1.50E+13
2549.   1922304.       0.00
120.0000   -0.02952   1.74E+07   -341313.   1.10E-04   545.4836   1.50E+13
2455.   1996092.       0.00
122.0000   -0.02654   9888102.   -283919.   1.32E-04   459.2295   1.50E+13
2328.   2105047.       0.00
124.0000   -0.02318   3736097.   -229875.   1.43E-04   388.4018   1.50E+13
2176.   2252249.       0.00
126.0000   -0.01969  -1163032.   -179708.   1.45E-04   358.7783   1.50E+13
2005.   2444244.       0.00
128.0000   -0.01623  -4907254.   -133804.   1.40E-04   401.8853   1.50E+13
1820.   2691825.       0.00
130.0000   -0.01296  -7602422.    -92434.   1.30E-04   432.9146   1.50E+13
1627.   3011887.       0.00
132.0000   -0.00999  -9359706.    -55772.   1.16E-04   453.1461   1.50E+13
1428.   3431106.       0.00
134.0000   -0.00737  -1.03E+07    -23908.   1.01E-04   463.8961   1.50E+13
1227.   3993426.       0.00
136.0000   -0.00515  -1.05E+07      3128.   8.41E-05   466.4973   1.50E+13
1026.   4776716.       0.00
138.0000   -0.00334  -1.02E+07     25345.   6.76E-05   462.2837   1.50E+13
825.5411   5935948.       0.00
140.0000   -0.00191  -9310909.     42681.   5.20E-05   452.5843   1.50E+13
619.1028   7776000.       0.00
142.0000  -8.41E-04  -8110939.     53468.   3.81E-05   438.7691   1.50E+13
279.7986   7983360.       0.00
144.0000  -8.27E-05  -6749027.     57164.   2.62E-05   423.0895   1.50E+13
28.2406   8190720.       0.00
146.0000   4.17E-04  -5370201.     55754.   1.65E-05   407.2152   1.50E+13
-145.7918   8398080.       0.00
148.0000   7.10E-04  -4074835.     50949.   8.96E-06   392.3017   1.50E+13
-254.5583   8605440.       0.00
150.0000   8.47E-04  -2925704.     44163.   3.37E-06   379.0718   1.50E+13
-310.9711   8812800.       0.00
152.0000   8.72E-04  -1955412.     36501.  -5.36E-07   367.9009   1.50E+13
-327.5513   9020160.       0.00
154.0000   8.21E-04  -1173602.     28782.  -3.04E-06   358.8999   1.50E+13
-315.7054   9227520.       0.00
156.0000   7.26E-04   -573525.     21570.  -4.43E-06   351.9913   1.50E+13
-285.2830   9434880.       0.00
```

```
  158.0000   6.08E-04   -137716.     15214.  -5.00E-06   346.9739   1.50E+13
  -244.3689   9642240.       0.00
  160.0000   4.86E-04    157349.      9891.  -4.99E-06   347.1999   1.50E+13
  -199.2563   9849600.       0.00
  162.0000   3.69E-04    337627.      5645.  -4.59E-06   349.2754   1.50E+13
  -154.5534   1.01E+07       0.00
  164.0000   2.65E-04    428851.      2430.  -3.98E-06   350.3257   1.50E+13
  -113.3754   1.03E+07       0.00
  166.0000   1.78E-04    454729.   138.1308  -3.27E-06   350.6236   1.50E+13
  -77.5859   1.05E+07       0.00
  168.0000   1.08E-04    435874.     -1370.  -2.56E-06   350.4065   1.50E+13
  -48.0531   1.07E+07       0.00
  170.0000   5.49E-05    389298.     -2245.  -1.90E-06   349.8703   1.50E+13
  -24.9013   1.09E+07       0.00
  172.0000   1.67E-05    328342.     -2637.  -1.33E-06   349.1685   1.50E+13
  -7.7378   1.11E+07       0.00
  174.0000  -8.82E-06    262898.     -2680.  -8.55E-07   348.4151   1.50E+13
  4.1517   1.13E+07       0.00
  176.0000  -2.43E-05    199820.     -2490.  -4.85E-07   347.6888   1.50E+13
  11.6449   1.15E+07       0.00
  178.0000  -3.21E-05    143430.     -2162.  -2.10E-07   347.0396   1.50E+13
  15.6619   1.17E+07       0.00
  180.0000  -3.44E-05     96047.     -1770.  -1.88E-08   346.4941   1.50E+13
  17.0792   1.19E+07       0.00
  182.0000  -3.30E-05     58493.     -1365.   1.05E-07   346.0618   1.50E+13
  16.6731   1.21E+07       0.00
  184.0000  -2.94E-05     30537.  -983.3883   1.76E-07   345.7399   1.50E+13
  15.0889   1.23E+07       0.00
  186.0000  -2.45E-05     11270.  -648.3686   2.09E-07   345.5181   1.50E+13
  12.8294   1.25E+07       0.00
  188.0000  -1.93E-05  -609.5371  -371.3328   2.18E-07   345.3953   1.50E+13
  10.2569   1.28E+07       0.00
  190.0000  -1.41E-05     -6581.  -156.9705   2.12E-07   345.4641   1.50E+13
  7.6066   1.30E+07       0.00
  192.0000  -9.12E-06     -8170.    -5.6358   2.00E-07   345.4824   1.50E+13
  5.0046   1.32E+07       0.00
  194.0000  -4.47E-06     -6875.    84.3192   1.88E-07   345.4675   1.50E+13
  2.4916   1.34E+07       0.00
  196.0000  -8.40E-08     -4145.   114.7892   1.79E-07   345.4361   1.50E+13
  0.04755   1.36E+07       0.00
  198.0000   4.14E-06     -1387.    86.7886   1.75E-07   345.4043   1.50E+13
  -2.3809   1.38E+07       0.00
  200.0000   8.32E-06       0.00       0.00   1.74E-07   345.3883   1.50E+13
  -4.8514   6998400.       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 7:

```
Pile-head deflection             =     6.00720173 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -375320064. inch-lbs
Maximum shear force              =       -739598. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =   104.00000000 feet below pile head
Number of iterations             =             15
Number of zero deflection points =              4
```

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Summary of Pile-head Responses for Conventional Analyses

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Full scour) 96in"

Channel Static 24in.lp9o 10/4/2017

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Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type	Load 1	Load Type 2	Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	y, in	0.5000	S, rad	0.00	2500000.	0.5008	0.00	-88671.	-3.98E+07
2	y, in	1.0000	S, rad	0.00	2500000.	1.0015	0.00	-171751.	-7.70E+07
3	y, in	2.0000	S, rad	0.00	2500000.	2.0028	0.00	-317213.	-1.46E+08
4	y, in	3.0000	S, rad	0.00	2500000.	3.0040	0.00	-435629.	-2.08E+08
5	y, in	4.0000	S, rad	0.00	2500000.	4.0051	0.00	-543694.	-2.67E+08
6	y, in	5.0000	S, rad	0.00	2500000.	5.0062	0.00	-644269.	-3.23E+08
7	y, in	6.0000	S, rad	0.00	2500000.	6.0072	0.00	-739598.	-3.75E+08

Maximum pile-head deflection = 6.0072017317 inches
Maximum pile-head rotation = 0.0000000000 radians = 0.000000 deg.

The analysis ended normally.

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Half scour) 96in"

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LPile for Windows, Version 2016-09.009

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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--
Files Used for Analysis

--

Path to file locations:
\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis
\L-Pile\Channel\Transverse\Post Seismic (Half Scour)\

Name of input data file:
Channel Static 24in.lp9d

Name of output report file:
Channel Static 24in.lp9o

Name of plot output file:
Channel Static 24in.lp9p

Name of runtime message file:
Channel Static 24in.lp9r

--
Date and Time of Analysis

--

Date: October 4, 2017 Time: 12:09:27

--

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Half scour) 96in"

Problem Title

Project Name: Harbor River Bridge
Job Number: 18461-007-01
Client: SCDOT
Engineer: HPC
Description: Channel - Static

Program Options and Settings

Computational Options:
- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:
- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed	=	500
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	100

Loading Type and Number of Cycles of Loading:
- Static loading specified

- Analysis uses p-y modification factors for p-y curves
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined	=	1
Total length of pile	=	200.000 ft
Depth of ground surface below top of pile	=	55.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Half scour) 96in"

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	96.0000
2	200.000	96.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile

Cross-sectional Shape	=	Circular Pile
Length of section	=	200.000000 ft
Width of top of section	=	96.000000 in
Width of bottom of section	=	96.000000 in
Top Area	=	7238. sq. in
Bottom Area	=	7238. sq. in
Moment of Inertia at Top	=	4169220. in^4
Moment of Inertia at Bottom	=	4169220. in^4
Elastic Modulus	=	3600000. psi

Ground Slope and Pile Batter Angles

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	55.000000 ft
Distance from top of pile to bottom of layer	=	60.000000 ft
Effective unit weight at top of layer	=	37.600000 pcf
Effective unit weight at bottom of layer	=	37.600000 pcf
Undrained cohesion at top of layer	=	0.0000 psf
Undrained cohesion at bottom of layer	=	15.000000 psf
Epsilon-50 at top of layer	=	0.020000
Epsilon-50 at bottom of layer	=	0.020000

Layer 2 is stiff clay with water-induced erosion

Distance from top of pile to top of layer	=	60.000000	ft
Distance from top of pile to bottom of layer	=	100.000000	ft
Effective unit weight at top of layer	=	57.600000	pcf
Effective unit weight at bottom of layer	=	57.600000	pcf
Undrained cohesion at top of layer	=	3400.	psf
Undrained cohesion at bottom of layer	=	3400.	psf
Epsilon-50 at top of layer	=	0.005000	
Epsilon-50 at bottom of layer	=	0.005000	
Subgrade k at top of layer	=	400.000000	pci
Subgrade k at bottom of layer	=	400.000000	pci

Layer 3 is stiff clay with water-induced erosion

Distance from top of pile to top of layer	=	100.000000	ft
Distance from top of pile to bottom of layer	=	210.000000	ft
Effective unit weight at top of layer	=	57.600000	pcf
Effective unit weight at bottom of layer	=	57.600000	pcf
Undrained cohesion at top of layer	=	6000.	psf
Undrained cohesion at bottom of layer	=	6000.	psf
Epsilon-50 at top of layer	=	0.005000	
Epsilon-50 at bottom of layer	=	0.005000	
Subgrade k at top of layer	=	800.000000	pci
Subgrade k at bottom of layer	=	800.000000	pci

(Depth of the lowest soil layer extends 10.000 ft below the pile tip)

Summary of Input Soil Properties

Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	E50 or krm	kpy pci
1	Soft Clay	55.0000	37.6000	0.00	0.02000	--
		60.0000	37.6000	15.0000	0.02000	--
2	Stiff Clay with Free Water	60.0000	57.6000	3400.	0.00500	400.0000
		100.0000	57.6000	3400.	0.00500	400.0000
3	Stiff Clay with Free Water	100.0000	57.6000	6000.	0.00500	800.0000
		210.0000	57.6000	6000.	0.00500	800.0000

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Half scour) 96in"

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 4 points

Point No.	Depth X ft	p-mult	y-mult
1	55.000	0.0450	1.0000
2	60.000	0.0450	1.0000
3	60.000	0.4500	1.0000
4	210.000	0.4500	1.0000

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 7

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	5	y = 0.500000 in	S = 0.0000 in/in	2500000.	N.A.
2	5	y = 1.000000 in	S = 0.0000 in/in	2500000.	N.A.
3	5	y = 2.000000 in	S = 0.0000 in/in	2500000.	N.A.
4	5	y = 3.000000 in	S = 0.0000 in/in	2500000.	N.A.
5	5	y = 4.000000 in	S = 0.0000 in/in	2500000.	N.A.
6	5	y = 5.000000 in	S = 0.0000 in/in	2500000.	N.A.
7	5	y = 6.000000 in	S = 0.0000 in/in	2500000.	N.A.

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Half scour) 96in"

Channel Static 24in.lp9o 10/4/2017

Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness
---

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

---
Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	55.0000	0.00	N.A.	No	0.00	3461.
2	60.0000	16.3437	No	No	3461.	1016444.
3	100.0000	56.3437	Yes	No	1019905.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 2500000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Half scour) 96in"


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      0.00     0.5009  -4.86E+07    101161.       0.00   904.9978   1.50E+13
      0.00       0.00       0.00
    2.0000     0.5000  -4.62E+07    101156.  -7.58E-05   877.0205   1.50E+13
    0.00       0.00       0.00
    4.0000     0.4973  -4.37E+07    101156.  -1.48E-04   848.9922   1.50E+13
    0.00       0.00       0.00
    6.0000     0.4929  -4.13E+07    101156.  -2.16E-04   820.9156   1.50E+13
    0.00       0.00       0.00
    8.0000     0.4869  -3.89E+07    101156.  -2.80E-04   792.7933   1.50E+13
    0.00       0.00       0.00
   10.0000     0.4795  -3.64E+07    101156.  -3.40E-04   764.6282   1.50E+13
   0.00       0.00       0.00
   12.0000     0.4706  -3.40E+07    101156.  -3.96E-04   736.4228   1.50E+13
   0.00       0.00       0.00
   14.0000     0.4605  -3.15E+07    101156.  -4.49E-04   708.1799   1.50E+13
   0.00       0.00       0.00
   16.0000     0.4491  -2.91E+07    101156.  -4.97E-04   679.9022   1.50E+13
   0.00       0.00       0.00
   18.0000     0.4366  -2.66E+07    101156.  -5.41E-04   651.5924   1.50E+13
   0.00       0.00       0.00
   20.0000     0.4231  -2.41E+07    101156.  -5.82E-04   623.2532   1.50E+13
   0.00       0.00       0.00
   22.0000     0.4087  -2.17E+07    101156.  -6.19E-04   594.8874   1.50E+13
   0.00       0.00       0.00
   24.0000     0.3934  -1.92E+07    101156.  -6.51E-04   566.4976   1.50E+13
   0.00       0.00       0.00
   26.0000     0.3774  -1.67E+07    101156.  -6.80E-04   538.0866   1.50E+13
   0.00       0.00       0.00
   28.0000     0.3608  -1.43E+07    101156.  -7.05E-04   509.6571   1.50E+13
   0.00       0.00       0.00
   30.0000     0.3436  -1.18E+07    101156.  -7.26E-04   481.2119   1.50E+13
   0.00       0.00       0.00
   32.0000     0.3259  -9325618.    101156.  -7.43E-04   452.7537   1.50E+13
   0.00       0.00       0.00
   34.0000     0.3079  -6852874.    101156.  -7.56E-04   424.2851   1.50E+13
   0.00       0.00       0.00
   36.0000     0.2897  -4379472.    101156.  -7.65E-04   395.8090   1.50E+13
   0.00       0.00       0.00
   38.0000     0.2712  -1905651.    101156.  -7.70E-04   367.3280   1.50E+13
   0.00       0.00       0.00
   40.0000     0.2527    568354.    101156.  -7.71E-04   351.9318   1.50E+13
   0.00       0.00       0.00
   42.0000     0.2342   3042304.    101156.  -7.68E-04   380.4142   1.50E+13
   0.00       0.00       0.00
   44.0000     0.2159   5515962.    101156.  -7.61E-04   408.8933   1.50E+13
   0.00       0.00       0.00
   46.0000     0.1977   7989091.    101156.  -7.50E-04   437.3663   1.50E+13
   0.00       0.00       0.00
   48.0000     0.1799   1.05E+07    101156.  -7.35E-04   465.8305   1.50E+13
   0.00       0.00       0.00
   50.0000     0.1624   1.29E+07    101156.  -7.17E-04   494.2831   1.50E+13
   0.00       0.00       0.00
   52.0000     0.1455   1.54E+07    101156.  -6.94E-04   522.7214   1.50E+13
   0.00       0.00       0.00
   54.0000     0.1291   1.79E+07    101156.  -6.67E-04   551.1427   1.50E+13
   0.00       0.00       0.00
   56.0000     0.1134   2.03E+07    101154.  -6.37E-04   579.5443   1.50E+13
   -0.1162    24.5889       0.00
   58.0000    0.09855   2.28E+07    101149.  -6.02E-04   607.9226   1.50E+13
   -0.3327    81.0234       0.00
   60.0000    0.08453   2.53E+07     94708.  -5.64E-04   636.2736   1.50E+13
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 -536.4565    152314.       0.00
 62.0000    0.07148   2.74E+07     75301.  -5.22E-04   661.0391   1.50E+13
 -1081.    362880.       0.00
 64.0000    0.05948   2.89E+07     48455.  -4.77E-04   678.6072   1.50E+13
 -1156.    466560.       0.00
 66.0000    0.04860   2.98E+07     20722.  -4.30E-04   688.4749   1.50E+13
 -1155.    570240.       0.00
 68.0000    0.03886   3.00E+07     -6227.  -3.82E-04   690.6524   1.50E+13
 -1091.    673920.       0.00
 70.0000    0.03026   2.95E+07    -31087.  -3.34E-04   685.5613   1.50E+13
 -980.5834    777600.       0.00
 72.0000    0.02281   2.85E+07    -52904.  -2.88E-04   673.9349   1.50E+13
 -837.4949    881280.       0.00
 74.0000    0.01645   2.70E+07    -71053.  -2.43E-04   656.7231   1.50E+13
 -674.9203    984960.       0.00
 76.0000    0.01112   2.52E+07    -85206.  -2.02E-04   635.0058   1.50E+13
 -504.4503   1088640.       0.00
 78.0000    0.00676   2.30E+07    -95290.  -1.63E-04   609.9155   1.50E+13
 -335.9383   1192320.       0.00
 80.0000    0.00328   2.06E+07   -101450.  -1.28E-04   582.5720   1.50E+13
 -177.3795   1296000.       0.00
 82.0000   5.98E-04   1.81E+07   -103997.  -9.75E-05   554.0294   1.50E+13
 -34.8858   1399680.       0.00
 84.0000   -0.00139   1.56E+07   -103369.  -7.05E-05   525.2355   1.50E+13
 87.2560   1503360.       0.00
 86.0000   -0.00278   1.32E+07   -100084.  -4.75E-05   497.0030   1.50E+13
 186.4596   1607040.       0.00
 88.0000   -0.00367   1.08E+07    -94707.  -2.83E-05   469.9924   1.50E+13
 261.6635   1710720.       0.00
 90.0000   -0.00414   8626533.    -87809.  -1.27E-05   444.7051   1.50E+13
 313.1246   1814400.       0.00
 92.0000   -0.00428   6609641.    -79945.  -5.44E-07   421.4848   1.50E+13
 342.1967   1918080.       0.00
 94.0000   -0.00417   4789220.    -71626.   8.57E-06   400.5264   1.50E+13
 351.1094   2021760.       0.00
 96.0000   -0.00387   3170578.    -63299.   1.49E-05   381.8910   1.50E+13
 342.7623   2125440.       0.00
 98.0000   -0.00345   1749064.    -55340.   1.89E-05   365.5252   1.50E+13
 320.5431   2229120.       0.00
100.0000   -0.00296    512014.    -44577.   2.07E-05   351.2831   1.50E+13
576.3544   4665600.       0.00
102.0000   -0.00246   -393104.    -31670.   2.08E-05   349.9141   1.50E+13
499.2286   4872960.       0.00
104.0000   -0.00197  -1010629.    -20680.   1.96E-05   357.0237   1.50E+13
416.5523   5080320.       0.00
106.0000   -0.00152  -1388124.    -11675.   1.77E-05   361.3697   1.50E+13
333.9377   5287680.       0.00
108.0000   -0.00112  -1573136.     -4599.   1.54E-05   363.4998   1.50E+13
255.7069   5495040.       0.00
110.0000  -7.78E-04  -1610711.   688.7842   1.28E-05   363.9324   1.50E+13
184.9279   5702400.       0.00
112.0000  -5.02E-04  -1541613.      4390.   1.03E-05   363.1368   1.50E+13
123.5205   5909760.       0.00
114.0000  -2.84E-04  -1401219.      6741.   7.94E-06   361.5205   1.50E+13
72.4110   6117120.       0.00
116.0000  -1.20E-04  -1218981.      7991.   5.85E-06   359.4224   1.50E+13
31.7132   6324480.       0.00
118.0000  -3.37E-06  -1018360.      8382.   4.06E-06   357.1127   1.50E+13
0.9173   6531840.       0.00
120.0000   7.45E-05   -817113.      8142.   2.59E-06   354.7957   1.50E+13
-20.9259   6739200.       0.00
122.0000   1.21E-04   -627841.      7471.   1.44E-06   352.6166   1.50E+13
-35.0388   6946560.       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Half scour) 96in"


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  124.0000   1.43E-04   -458691.      6537.   5.68E-07   350.6692   1.50E+13
  -42.7738   7153920.       0.00
  126.0000   1.48E-04   -314135.      5478.  -4.96E-08   349.0049   1.50E+13
  -45.4975   7361280.       0.00
  128.0000   1.41E-04   -195755.      4398.  -4.57E-07   347.6420   1.50E+13
  -44.5029   7568640.       0.00
  130.0000   1.26E-04   -102990.      3372.  -6.96E-07   346.5740   1.50E+13
  -40.9496   7776000.       0.00
  132.0000   1.08E-04    -33802.      2451.  -8.05E-07   345.7775   1.50E+13
  -35.8270   7983360.       0.00
  134.0000   8.77E-05     14753.      1662.  -8.21E-07   345.5582   1.50E+13
  -29.9389   8190720.       0.00
  136.0000   6.83E-05     46062.      1016.  -7.72E-07   345.9186   1.50E+13
  -23.9037   8398080.       0.00
  138.0000   5.07E-05     63597.   510.8131  -6.84E-07   346.1205   1.50E+13
  -18.1668   8605440.       0.00
  140.0000   3.55E-05     70663.   136.5578  -5.77E-07   346.2019   1.50E+13
  -13.0212   8812800.       0.00
  142.0000   2.30E-05     70221.  -123.2802  -4.64E-07   346.1968   1.50E+13
  -8.6320   9020160.       0.00
  144.0000   1.32E-05     64801.  -287.6211  -3.56E-07   346.1344   1.50E+13
  -5.0631   9227520.       0.00
  146.0000   5.86E-06     56458.  -376.0071  -2.60E-07   346.0383   1.50E+13
  -2.3024   9434880.       0.00
  148.0000   7.12E-07     46784.  -407.0676  -1.77E-07   345.9269   1.50E+13
  -0.2859   9642240.       0.00
  150.0000  -2.64E-06     36940.  -397.5072  -1.10E-07   345.8136   1.50E+13
  1.0826   9849600.       0.00
  152.0000  -4.57E-06     27717.  -361.5348  -5.83E-08   345.7074   1.50E+13
  1.9151   1.01E+07       0.00
  154.0000  -5.44E-06     19593.  -310.6427  -2.05E-08   345.6139   1.50E+13
  2.3260   1.03E+07       0.00
  156.0000  -5.56E-06     12808.  -253.6461   5.39E-09   345.5358   1.50E+13
  2.4238   1.05E+07       0.00
  158.0000  -5.18E-06      7418.  -196.9022   2.16E-08   345.4737   1.50E+13
  2.3049   1.07E+07       0.00
  160.0000  -4.52E-06      3354.  -144.6388   3.02E-08   345.4269   1.50E+13
  2.0504   1.09E+07       0.00
  162.0000  -3.73E-06   471.5354   -99.3339   3.32E-08   345.3938   1.50E+13
  1.7250   1.11E+07       0.00
  164.0000  -2.93E-06     -1418.   -62.1042   3.25E-08   345.4047   1.50E+13
  1.3775   1.13E+07       0.00
  166.0000  -2.17E-06     -2513.   -33.0695   2.93E-08   345.4173   1.50E+13
  1.0421   1.15E+07       0.00
  168.0000  -1.52E-06     -3009.   -11.6749   2.49E-08   345.4230   1.50E+13
  0.7408   1.17E+07       0.00
  170.0000  -9.77E-07     -3077.     3.0408   2.00E-08   345.4238   1.50E+13
  0.4855   1.19E+07       0.00
  172.0000  -5.55E-07     -2865.    12.2344   1.53E-08   345.4213   1.50E+13
  0.2806   1.21E+07       0.00
  174.0000  -2.43E-07     -2491.    17.1005   1.10E-08   345.4170   1.50E+13
  0.1249   1.23E+07       0.00
  176.0000  -2.64E-08     -2045.    18.7650   7.39E-09   345.4119   1.50E+13
  0.01380   1.25E+07       0.00
  178.0000   1.12E-07     -1592.    18.2184   4.48E-09   345.4067   1.50E+13
  -0.05935   1.28E+07       0.00
  180.0000   1.89E-07     -1172.    16.2834   2.27E-09   345.4018   1.50E+13
  -0.1019   1.30E+07       0.00
  182.0000   2.21E-07  -810.1706    13.6074   6.88E-10   345.3977   1.50E+13
  -0.1211   1.32E+07       0.00
  184.0000   2.22E-07  -518.4753    10.6715  -3.75E-10   345.3943   1.50E+13
  -0.1235   1.34E+07       0.00
  186.0000   2.03E-07  -297.8939     7.8120  -1.03E-09   345.3918   1.50E+13
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  -0.1147   1.36E+07       0.00
  188.0000   1.72E-07  -143.3766     5.2465  -1.38E-09   345.3900   1.50E+13
  -0.09904   1.38E+07       0.00
  190.0000   1.37E-07   -45.8949     3.1027  -1.53E-09   345.3889   1.50E+13
  -0.07961   1.40E+07       0.00
  192.0000   9.89E-08     5.7356     1.4452  -1.56E-09   345.3884   1.50E+13
  -0.05851   1.42E+07       0.00
  194.0000   6.15E-08    23.6612     0.3002  -1.54E-09   345.3886   1.50E+13
  -0.03690   1.44E+07       0.00
  196.0000   2.49E-08    20.3301    -0.3249  -1.50E-09   345.3886   1.50E+13
  -0.01519   1.46E+07       0.00
  198.0000  -1.08E-08     8.2462    -0.4272  -1.48E-09   345.3884   1.50E+13
  0.00666   1.48E+07       0.00
  200.0000  -4.62E-08       0.00       0.00  -1.48E-09   345.3883   1.50E+13
  0.02894   7516800.       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.50093268 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -48606977. inch-lbs
Maximum shear force              =       -103997. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    82.00000000 feet below pile head
Number of iterations             =              6
Number of zero deflection points =              5
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 2
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     1.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
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      0.00     1.0018  -9.63E+07    199528.       0.00      1455.   1.50E+13
      0.00       0.00       0.00
    2.0000     1.0000  -9.16E+07    199519.  -1.50E-04      1399.   1.50E+13
    0.00       0.00       0.00
    4.0000     0.9946  -8.68E+07    199519.  -2.93E-04      1344.   1.50E+13
    0.00       0.00       0.00
    6.0000     0.9859  -8.19E+07    199519.  -4.28E-04      1289.   1.50E+13
    0.00       0.00       0.00
    8.0000     0.9741  -7.71E+07    199519.  -5.55E-04      1233.   1.50E+13
    0.00       0.00       0.00
   10.0000     0.9593  -7.23E+07    199519.  -6.74E-04      1178.   1.50E+13
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Half scour) 96in"


```
0.00        0.00        0.00
12.0000      0.9417  -6.75E+07    199519.  -7.86E-04      1122.   1.50E+13
0.00        0.00        0.00
14.0000      0.9216  -6.26E+07    199519.  -8.90E-04      1066.   1.50E+13
0.00        0.00        0.00
16.0000      0.8990  -5.78E+07    199519.  -9.86E-04      1011.   1.50E+13
0.00        0.00        0.00
18.0000      0.8742  -5.29E+07    199519.   -0.00107   954.8100   1.50E+13
0.00        0.00        0.00
20.0000      0.8474  -4.81E+07    199519.   -0.00116   898.9091   1.50E+13
0.00        0.00        0.00
22.0000      0.8188  -4.32E+07    199519.   -0.00123   842.9551   1.50E+13
0.00        0.00        0.00
24.0000      0.7885  -3.84E+07    199519.   -0.00129   786.9534   1.50E+13
0.00        0.00        0.00
26.0000      0.7567  -3.35E+07    199519.   -0.00135   730.9092   1.50E+13
0.00        0.00        0.00
28.0000      0.7236  -2.86E+07    199519.   -0.00140   674.8281   1.50E+13
0.00        0.00        0.00
30.0000      0.6894  -2.37E+07    199519.   -0.00144   618.7154   1.50E+13
0.00        0.00        0.00
32.0000      0.6543  -1.89E+07    199519.   -0.00148   562.5765   1.50E+13
0.00        0.00        0.00
34.0000      0.6185  -1.40E+07    199519.   -0.00150   506.4167   1.50E+13
0.00        0.00        0.00
36.0000      0.5822  -9107417.    199519.   -0.00152   450.2415   1.50E+13
0.00        0.00        0.00
38.0000      0.5455  -4227233.    199519.   -0.00153   394.0562   1.50E+13
0.00        0.00        0.00
40.0000      0.5086    653355.    199519.   -0.00154   352.9104   1.50E+13
0.00        0.00        0.00
42.0000      0.4718   5533881.    199519.   -0.00153   409.0996   1.50E+13
0.00        0.00        0.00
44.0000      0.4352   1.04E+07    199519.   -0.00152   465.2827   1.50E+13
0.00        0.00        0.00
46.0000      0.3990   1.53E+07    199519.   -0.00150   521.4543   1.50E+13
0.00        0.00        0.00
48.0000      0.3633   2.02E+07    199519.   -0.00147   577.6090   1.50E+13
0.00        0.00        0.00
50.0000      0.3285   2.50E+07    199519.   -0.00143   633.7415   1.50E+13
0.00        0.00        0.00
52.0000      0.2946   2.99E+07    199519.   -0.00139   689.8463   1.50E+13
0.00        0.00        0.00
54.0000      0.2618   3.48E+07    199519.   -0.00134   745.9180   1.50E+13
0.00        0.00        0.00
56.0000      0.2304   3.97E+07    199517.   -0.00128   801.9513   1.50E+13
-0.1472    15.3305       0.00
58.0000      0.2005   4.45E+07    199510.   -0.00121   857.9398   1.50E+13
-0.4216    50.4547       0.00
60.0000      0.1724   4.94E+07    190313.   -0.00113   913.8763   1.50E+13
-766.0491    106665.       0.00
62.0000      0.1461   5.38E+07    159292.   -0.00105   964.6783   1.50E+13
-1819.    298858.       0.00
64.0000      0.1219   5.72E+07    109038.  -9.64E-04      1003.   1.50E+13
-2369.    466560.       0.00
66.0000    0.09983   5.91E+07     52531.  -8.71E-04      1026.   1.50E+13
-2340.    562583.       0.00
68.0000    0.08007   5.98E+07     -2528.  -7.76E-04      1034.   1.50E+13
-2248.    673920.       0.00
70.0000    0.06260   5.91E+07    -53818.  -6.80E-04      1026.   1.50E+13
-2026.    776732.       0.00
72.0000    0.04740   5.73E+07    -99017.  -5.87E-04      1005.   1.50E+13
-1741.    881280.       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Half scour) 96in"


```
  74.0000    0.03440   5.44E+07   -136848.  -4.98E-04   972.0332   1.50E+13
  -1412.    984960.       0.00
  76.0000    0.02349   5.08E+07   -166579.  -4.14E-04   929.8531   1.50E+13
  -1066.   1088640.       0.00
  78.0000    0.01453   4.65E+07   -188030.  -3.36E-04   880.5501   1.50E+13
  -721.9079   1192320.       0.00
  80.0000    0.00735   4.18E+07   -201457.  -2.66E-04   826.4085   1.50E+13
  -397.0576   1296000.       0.00
  82.0000    0.00178   3.68E+07   -207466.  -2.03E-04   769.5876   1.50E+13
  -103.6976   1399680.       0.00
  84.0000   -0.00238   3.18E+07   -206920.  -1.48E-04   712.0384   1.50E+13
  149.2562   1503360.       0.00
  86.0000   -0.00532   2.69E+07   -200853.  -1.01E-04   655.4438   1.50E+13
  356.3233   1607040.       0.00
  88.0000   -0.00723   2.22E+07   -190395.  -6.16E-05   601.1824   1.50E+13
  515.1114   1710720.       0.00
  90.0000   -0.00828   1.78E+07   -176703.  -2.96E-05   550.3124   1.50E+13
  625.8999   1814400.       0.00
  92.0000   -0.00865   1.37E+07   -160898.  -4.41E-06   503.5733   1.50E+13
  691.1903   1918080.       0.00
  94.0000   -0.00849   1.01E+07   -144021.   1.46E-05   461.4027   1.50E+13
  715.2543   2021760.       0.00
  96.0000   -0.00795   6824995.   -126993.   2.81E-05   423.9641   1.50E+13
  703.7069   2125440.       0.00
  98.0000   -0.00714   3977807.   -110591.   3.68E-05   391.1846   1.50E+13
  663.1275   2229120.       0.00
 100.0000   -0.00618   1512199.    -92074.   4.12E-05   362.7982   1.50E+13
 879.9951   3417196.       0.00
 102.0000   -0.00516   -446677.    -69192.   4.20E-05   350.5309   1.50E+13
 1027.   4772790.       0.00
 104.0000   -0.00416  -1814071.    -46295.   4.02E-05   366.2736   1.50E+13
 881.2795   5080320.       0.00
 106.0000   -0.00323  -2673673.    -27173.   3.66E-05   376.1702   1.50E+13
 712.2608   5287680.       0.00
 108.0000   -0.00241  -3122757.    -12018.   3.20E-05   381.3405   1.50E+13
 550.6572   5495040.       0.00
 110.0000   -0.00170  -3254363.  -571.1404   2.69E-05   382.8556   1.50E+13
 403.2231   5702400.       0.00
 112.0000   -0.00111  -3153399.      7559.   2.18E-05   381.6932   1.50E+13
 274.3085   5909760.       0.00
 114.0000  -6.52E-04  -2894132.     12845.   1.69E-05   378.7083   1.50E+13
 166.1630   6117120.       0.00
 116.0000  -3.01E-04  -2538877.     15790.   1.26E-05   374.6183   1.50E+13
 79.3013   6324480.       0.00
 118.0000  -4.74E-05  -2137701.     16897.   8.86E-06   369.9996   1.50E+13
 12.8918   6531840.       0.00
 120.0000   1.24E-04  -1728894.     16633.   5.76E-06   365.2930   1.50E+13
 -34.8632   6739200.       0.00
 122.0000   2.29E-04  -1340002.     15418.   3.31E-06   360.8157   1.50E+13
 -66.3781   6946560.       0.00
 124.0000   2.83E-04   -989216.     13609.   1.45E-06   356.7771   1.50E+13
 -84.3818   7153920.       0.00
 126.0000   2.99E-04   -686939.     11496.   1.09E-07   353.2970   1.50E+13
 -91.6704   7361280.       0.00
 128.0000   2.88E-04   -437398.      9305.  -7.90E-07   350.4241   1.50E+13
 -90.9182   7568640.       0.00
 130.0000   2.61E-04   -240183.      7200.  -1.33E-06   348.1535   1.50E+13
 -84.5448   7776000.       0.00
 132.0000   2.24E-04    -91644.      5290.  -1.60E-06   346.4434   1.50E+13
 -74.6325   7983360.       0.00
 134.0000   1.84E-04     13916.      3639.  -1.66E-06   345.5485   1.50E+13
 -62.8879   8190720.       0.00
 136.0000   1.45E-04     83251.      2277.  -1.58E-06   346.3468   1.50E+13
```

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```
-50.6373   8398080.       0.00
138.0000   1.08E-04    123411.      1203.  -1.42E-06   346.8092   1.50E+13
-38.8488   8605440.       0.00
140.0000   7.67E-05    141182.   399.1253  -1.20E-06   347.0138   1.50E+13
-28.1709   8812800.       0.00
142.0000   5.05E-05    142714.  -166.7189  -9.78E-07   347.0314   1.50E+13
-18.9828   9020160.       0.00
144.0000   2.98E-05    133297.  -531.8830  -7.57E-07   346.9230   1.50E+13
-11.4475   9227520.       0.00
146.0000   1.42E-05    117274.  -736.0335  -5.57E-07   346.7385   1.50E+13
-5.5650   9434880.       0.00
148.0000   3.04E-06     98034.  -817.4622  -3.85E-07   346.5170   1.50E+13
-1.2207   9642240.       0.00
150.0000  -4.32E-06     78082.  -810.8511  -2.44E-07   346.2873   1.50E+13
1.7716   9849600.       0.00
152.0000  -8.68E-06     59143.  -745.9659  -1.34E-07   346.0692   1.50E+13
3.6355   1.01E+07       0.00
154.0000  -1.08E-05     42292.  -647.0938  -5.32E-08   345.8752   1.50E+13
4.6039   1.03E+07       0.00
156.0000  -1.12E-05     28089.  -533.0440   3.04E-09   345.7117   1.50E+13
4.9003   1.05E+07       0.00
158.0000  -1.06E-05     16705.  -417.5403   3.88E-08   345.5807   1.50E+13
4.7250   1.07E+07       0.00
160.0000  -9.37E-06      8042.  -309.8582   5.86E-08   345.4809   1.50E+13
4.2485   1.09E+07       0.00
162.0000  -7.80E-06      1825.  -215.5859   6.65E-08   345.4093   1.50E+13
3.6076   1.11E+07       0.00
164.0000  -6.17E-06     -2314.  -137.4148   6.61E-08   345.4150   1.50E+13
2.9067   1.13E+07       0.00
166.0000  -4.63E-06     -4779.   -75.8918   6.05E-08   345.4433   1.50E+13
2.2202   1.15E+07       0.00
168.0000  -3.27E-06     -5964.   -30.0898   5.19E-08   345.4570   1.50E+13
1.5966   1.17E+07       0.00
170.0000  -2.14E-06     -6229.     1.8280   4.21E-08   345.4600   1.50E+13
1.0632   1.19E+07       0.00
172.0000  -1.25E-06     -5881.    22.1597   3.24E-08   345.4560   1.50E+13
0.6311   1.21E+07       0.00
174.0000  -5.83E-07     -5169.    33.3285   2.36E-08   345.4478   1.50E+13
0.2996   1.23E+07       0.00
176.0000  -1.15E-07     -4284.    37.6480   1.60E-08   345.4377   1.50E+13
0.06034   1.25E+07       0.00
178.0000   1.88E-07     -3364.    37.1763   9.93E-09   345.4271   1.50E+13
-0.09965   1.28E+07       0.00
180.0000   3.61E-07     -2501.    33.6384   5.25E-09   345.4171   1.50E+13
-0.1952   1.30E+07       0.00
182.0000   4.39E-07     -1750.    28.4041   1.85E-09   345.4085   1.50E+13
-0.2410   1.32E+07       0.00
184.0000   4.50E-07     -1138.    22.5024  -4.63E-10   345.4014   1.50E+13
-0.2508   1.34E+07       0.00
186.0000   4.17E-07  -670.0639    16.6605  -1.91E-09   345.3960   1.50E+13
-0.2360   1.36E+07       0.00
188.0000   3.58E-07  -338.0417    11.3570  -2.71E-09   345.3922   1.50E+13
-0.2059   1.38E+07       0.00
190.0000   2.87E-07  -124.6015     6.8790  -3.08E-09   345.3898   1.50E+13
-0.1672   1.40E+07       0.00
192.0000   2.10E-07    -7.4819     3.3781  -3.19E-09   345.3884   1.50E+13
-0.1245   1.42E+07       0.00
194.0000   1.34E-07    37.9303     0.9212  -3.17E-09   345.3888   1.50E+13
-0.08025   1.44E+07       0.00
196.0000   5.84E-08    37.1157    -0.4686  -3.11E-09   345.3888   1.50E+13
-0.03557   1.46E+07       0.00
198.0000  -1.54E-08    15.8117    -0.7809  -3.06E-09   345.3885   1.50E+13
0.00954   1.48E+07       0.00
```

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  200.0000  -8.87E-08       0.00       0.00  -3.05E-09   345.3883   1.50E+13
  0.05554   7516800.       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     1.00184876 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -96348704. inch-lbs
Maximum shear force              =       -207466. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    82.00000000 feet below pile head
Number of iterations             =              6
Number of zero deflection points =              5
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 3

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)

```
Displacement of pile head                                =     2.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				
0.00	2.0035	-1.83E+08	368685.	0.00	2447.	1.50E+13
0.00	0.00	0.00				
2.0000	2.0000	-1.74E+08	368668.	-2.85E-04	2345.	1.50E+13
0.00	0.00	0.00				
4.0000	1.9898	-1.65E+08	368668.	-5.55E-04	2243.	1.50E+13
0.00	0.00	0.00				
6.0000	1.9733	-1.56E+08	368668.	-8.12E-04	2141.	1.50E+13
0.00	0.00	0.00				
8.0000	1.9509	-1.47E+08	368668.	-0.00105	2038.	1.50E+13
0.00	0.00	0.00				
10.0000	1.9227	-1.38E+08	368668.	-0.00128	1935.	1.50E+13
0.00	0.00	0.00				
12.0000	1.8893	-1.29E+08	368668.	-0.00150	1833.	1.50E+13
0.00	0.00	0.00				
14.0000	1.8509	-1.20E+08	368668.	-0.00170	1730.	1.50E+13
0.00	0.00	0.00				
16.0000	1.8080	-1.11E+08	368668.	-0.00188	1626.	1.50E+13
0.00	0.00	0.00				
18.0000	1.7607	-1.02E+08	368668.	-0.00205	1523.	1.50E+13
0.00	0.00	0.00				
20.0000	1.7095	-9.33E+07	368668.	-0.00221	1420.	1.50E+13
0.00	0.00	0.00				
22.0000	1.6547	-8.43E+07	368668.	-0.00235	1316.	1.50E+13
0.00	0.00	0.00				

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```
   24.0000     1.5967  -7.54E+07    368668.   -0.00248      1213.   1.50E+13
   0.00       0.00       0.00
   26.0000     1.5358  -6.64E+07    368668.   -0.00259      1109.   1.50E+13
   0.00       0.00       0.00
   28.0000     1.4724  -5.73E+07    368668.   -0.00269      1006.   1.50E+13
   0.00       0.00       0.00
   30.0000     1.4067  -4.83E+07    368668.   -0.00277   901.8731   1.50E+13
   0.00       0.00       0.00
   32.0000     1.3392  -3.93E+07    368668.   -0.00284   798.0635   1.50E+13
   0.00       0.00       0.00
   34.0000     1.2702  -3.03E+07    368668.   -0.00290   694.2104   1.50E+13
   0.00       0.00       0.00
   36.0000     1.2001  -2.13E+07    368668.   -0.00294   590.3239   1.50E+13
   0.00       0.00       0.00
   38.0000     1.1291  -1.22E+07    368668.   -0.00297   486.4139   1.50E+13
   0.00       0.00       0.00
   40.0000     1.0576  -3222631.    368668.   -0.00298   382.4903   1.50E+13
   0.00       0.00       0.00
   42.0000     0.9860   5804348.    368668.   -0.00298   412.2135   1.50E+13
   0.00       0.00       0.00
   44.0000     0.9147   1.48E+07    368668.   -0.00296   516.1342   1.50E+13
   0.00       0.00       0.00
   46.0000     0.8439   2.39E+07    368668.   -0.00293   620.0385   1.50E+13
   0.00       0.00       0.00
   48.0000     0.7740   3.29E+07    368668.   -0.00289   723.9165   1.50E+13
   0.00       0.00       0.00
   50.0000     0.7054   4.19E+07    368668.   -0.00283   827.7581   1.50E+13
   0.00       0.00       0.00
   52.0000     0.6384   5.09E+07    368668.   -0.00275   931.5535   1.50E+13
   0.00       0.00       0.00
   54.0000     0.5733   5.99E+07    368668.   -0.00266      1035.   1.50E+13
   0.00       0.00       0.00
   56.0000     0.5106   6.89E+07    368665.   -0.00256      1139.   1.50E+13
   -0.1919     9.0202       0.00
   58.0000     0.4505   7.79E+07    368656.   -0.00244      1243.   1.50E+13
   -0.5522    29.4170       0.00
   60.0000     0.3934   8.69E+07    354763.   -0.00231      1346.   1.50E+13
   -1157.     70608.       0.00
   62.0000     0.3396   9.52E+07    308227.   -0.00216      1442.   1.50E+13
   -2721.    192286.       0.00
   64.0000     0.2895   1.02E+08    231330.   -0.00201      1519.   1.50E+13
   -3687.    305741.       0.00
   66.0000     0.2432   1.07E+08    143248.   -0.00184      1572.   1.50E+13
   -3653.    360406.       0.00
   68.0000     0.2011   1.09E+08     56621.   -0.00167      1601.   1.50E+13
   -3566.    425563.       0.00
   70.0000     0.1632   1.09E+08    -25426.   -0.00149      1606.   1.50E+13
   -3271.    481091.       0.00
   72.0000     0.1294   1.08E+08    -99640.   -0.00132      1589.   1.50E+13
   -2913.    540155.       0.00
   74.0000    0.09986   1.05E+08   -165309.   -0.00115      1553.   1.50E+13
   -2559.    614999.       0.00
   76.0000    0.07430   1.00E+08   -222502.  -9.85E-04      1499.   1.50E+13
   -2207.    713005.       0.00
   78.0000    0.05258   9.43E+07   -271271.  -8.29E-04      1431.   1.50E+13
   -1857.    847575.       0.00
   80.0000    0.03448   8.73E+07   -311598.  -6.84E-04      1351.   1.50E+13
   -1504.   1046670.       0.00
   82.0000    0.01973   7.94E+07   -343294.  -5.51E-04      1260.   1.50E+13
   -1138.   1383655.       0.00
   84.0000    0.00803   7.09E+07   -362984.  -4.31E-04      1162.   1.50E+13
   -503.2063   1503360.       0.00
   86.0000  -9.45E-04   6.21E+07   -368263.  -3.24E-04      1060.   1.50E+13
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 63.2838   1607040.       0.00
 88.0000   -0.00754   5.33E+07   -361052.  -2.32E-04   958.5654   1.50E+13
 537.5745   1710720.       0.00
 90.0000   -0.01209   4.48E+07   -343917.  -1.54E-04   860.7163   1.50E+13
 890.3513   1766798.       0.00
 92.0000   -0.01493   3.68E+07   -321362.  -8.87E-05   768.7220   1.50E+13
 989.2579   1590299.       0.00
 94.0000   -0.01635   2.93E+07   -297066.  -3.59E-05   683.2473   1.50E+13
 1035.   1519526.       0.00
 96.0000   -0.01665   2.25E+07   -272105.   5.60E-06   604.6063   1.50E+13
 1045.   1505904.       0.00
 98.0000   -0.01608   1.63E+07   -247245.   3.66E-05   532.8688   1.50E+13
 1027.   1532202.       0.00
100.0000   -0.01489   1.06E+07   -218532.   5.81E-05   467.9229   1.50E+13
1366.   2201142.       0.00
102.0000   -0.01329   5787820.   -182372.   7.13E-05   412.0232   1.50E+13
1647.   2974261.       0.00
104.0000   -0.01147   1880789.   -144239.   7.74E-05   367.0417   1.50E+13
1530.   3201760.       0.00
106.0000   -0.00958  -1144938.   -109095.   7.80E-05   358.5699   1.50E+13
1398.   3504097.       0.00
108.0000   -0.00773  -3365124.    -77243.   7.44E-05   384.1308   1.50E+13
1256.   3901116.       0.00
110.0000   -0.00601  -4861524.    -48883.   6.78E-05   401.3588   1.50E+13
1107.   4424883.       0.00
112.0000   -0.00447  -5719630.    -24129.   5.94E-05   411.2381   1.50E+13
955.4735   5128195.       0.00
114.0000   -0.00316  -6026834.     -3030.   5.00E-05   414.7749   1.50E+13
802.7879   6103549.       0.00
116.0000   -0.00207  -5871054.     13159.   4.05E-05   412.9814   1.50E+13
546.2797   6324480.       0.00
118.0000   -0.00121  -5400054.     23681.   3.14E-05   407.5588   1.50E+13
330.5814   6531840.       0.00
120.0000  -5.64E-04  -4738120.     29547.   2.33E-05   399.9380   1.50E+13
158.2423   6739200.       0.00
122.0000  -9.43E-05  -3984585.     31774.   1.64E-05   391.2626   1.50E+13
27.2815   6946560.       0.00
124.0000   2.22E-04  -3214953.     31306.   1.06E-05   382.4019   1.50E+13
-66.2079   7153920.       0.00
126.0000   4.15E-04  -2483148.     28984.   6.06E-06   373.9767   1.50E+13
-127.3214   7361280.       0.00
128.0000   5.13E-04  -1824443.     25516.   2.61E-06   366.3930   1.50E+13
-161.7178   7568640.       0.00
130.0000   5.40E-04  -1258711.     21474.   1.47E-07   359.8798   1.50E+13
-175.1173   7776000.       0.00
132.0000   5.20E-04   -793727.     17297.  -1.49E-06   354.5265   1.50E+13
-172.9270   7983360.       0.00
134.0000   4.69E-04   -428272.     13302.  -2.47E-06   350.3190   1.50E+13
-159.9848   8190720.       0.00
136.0000   4.01E-04   -154928.      9697.  -2.94E-06   347.1720   1.50E+13
-140.4087   8398080.       0.00
138.0000   3.28E-04     37556.      6602.  -3.03E-06   345.8207   1.50E+13
-117.5341   8605440.       0.00
140.0000   2.56E-04    162337.      4065.  -2.87E-06   347.2573   1.50E+13
-93.9192   8812800.       0.00
142.0000   1.90E-04    233005.      2081.  -2.56E-06   348.0709   1.50E+13
-71.4012   9020160.       0.00
144.0000   1.33E-04    262523.   609.7941  -2.16E-06   348.4107   1.50E+13
-51.1843   9227520.       0.00
146.0000   8.63E-05    262534.  -411.7636  -1.74E-06   348.4109   1.50E+13
-33.9455   9434880.       0.00
148.0000   4.96E-05    242967.     -1058.  -1.33E-06   348.1856   1.50E+13
-19.9463   9642240.       0.00
```

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  150.0000   2.23E-05    211888.     -1407.  -9.71E-07   347.8278   1.50E+13
  -9.1394   9849600.       0.00
  152.0000   3.02E-06    175524.     -1532.  -6.62E-07   347.4091   1.50E+13
  -1.2670   1.01E+07       0.00
  154.0000  -9.49E-06    138413.     -1499.  -4.11E-07   346.9819   1.50E+13
  4.0572   1.03E+07       0.00
  156.0000  -1.67E-05    103627.     -1363.  -2.17E-07   346.5814   1.50E+13
  7.2800   1.05E+07       0.00
  158.0000  -1.99E-05     73023.     -1169.  -7.58E-08   346.2290   1.50E+13
  8.8575   1.07E+07       0.00
  160.0000  -2.03E-05     47515.  -952.2640   2.05E-08   345.9354   1.50E+13
  9.2196   1.09E+07       0.00
  162.0000  -1.89E-05     27312.  -736.6753   8.04E-08   345.7028   1.50E+13
  8.7461   1.11E+07       0.00
  164.0000  -1.65E-05     12145.  -538.6652   1.12E-07   345.5282   1.50E+13
  7.7547   1.13E+07       0.00
  166.0000  -1.36E-05      1443.  -367.6380   1.23E-07   345.4049   1.50E+13
  6.4975   1.15E+07       0.00
  168.0000  -1.06E-05     -5517.  -227.7135   1.20E-07   345.4518   1.50E+13
  5.1628   1.17E+07       0.00
  170.0000  -7.81E-06     -9502.  -119.1759   1.07E-07   345.4977   1.50E+13
  3.8820   1.19E+07       0.00
  172.0000  -5.42E-06    -11250.   -39.7407   9.09E-08   345.5179   1.50E+13
  2.7376   1.21E+07       0.00
  174.0000  -3.45E-06    -11420.    14.3973   7.28E-08   345.5198   1.50E+13
  1.7739   1.23E+07       0.00
  176.0000  -1.92E-06    -10568.    47.7458   5.52E-08   345.5100   1.50E+13
  1.0052   1.25E+07       0.00
  178.0000  -8.01E-07     -9135.    64.9155   3.94E-08   345.4935   1.50E+13
  0.4256   1.28E+07       0.00
  180.0000  -2.96E-08     -7457.    70.2147   2.62E-08   345.4742   1.50E+13
  0.01598   1.30E+07       0.00
  182.0000   4.56E-07     -5768.    67.4064   1.56E-08   345.4547   1.50E+13
  -0.2500   1.32E+07       0.00
  184.0000   7.20E-07     -4223.    59.5943   7.62E-09   345.4369   1.50E+13
  -0.4010   1.34E+07       0.00
  186.0000   8.21E-07     -2908.    49.2040   1.92E-09   345.4218   1.50E+13
  -0.4649   1.36E+07       0.00
  188.0000   8.12E-07     -1861.    38.0297  -1.90E-09   345.4098   1.50E+13
  -0.4663   1.38E+07       0.00
  190.0000   7.30E-07     -1083.    27.3217  -4.25E-09   345.4008   1.50E+13
  -0.4260   1.40E+07       0.00
  192.0000   6.08E-07  -549.4249    17.8941  -5.55E-09   345.3947   1.50E+13
  -0.3596   1.42E+07       0.00
  194.0000   4.64E-07  -223.1856    10.2361  -6.17E-09   345.3909   1.50E+13
  -0.2785   1.44E+07       0.00
  196.0000   3.11E-07   -57.3530     4.6175  -6.40E-09   345.3890   1.50E+13
  -0.1897   1.46E+07       0.00
  198.0000   1.57E-07    -0.7778     1.1787  -6.44E-09   345.3883   1.50E+13
  -0.09687   1.48E+07       0.00
  200.0000   2.17E-09       0.00       0.00  -6.44E-09   345.3883   1.50E+13
  -0.00136   7516800.       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 3:

```
Pile-head deflection             =     2.00350277 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -182547835. inch-lbs
Maximum shear force              =        368685. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
```

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Channel Static 24in.lp9o 10/4/2017

Depth of maximum shear force = 0.000000 feet below pile head
Number of iterations = 10
Number of zero deflection points = 5

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 4

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 3.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 2500000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				
0.00	3.0050	-2.63E+08	520769.	0.00	3371.	1.50E+13
0.00	0.00	0.00				
2.0000	3.0000	-2.50E+08	520744.	-4.10E-04	3227.	1.50E+13
0.00	0.00	0.00				
4.0000	2.9854	-2.38E+08	520744.	-8.00E-04	3082.	1.50E+13
0.00	0.00	0.00				
6.0000	2.9616	-2.25E+08	520744.	-0.00117	2938.	1.50E+13
0.00	0.00	0.00				
8.0000	2.9292	-2.13E+08	520744.	-0.00152	2793.	1.50E+13
0.00	0.00	0.00				
10.0000	2.8886	-2.00E+08	520744.	-0.00185	2648.	1.50E+13
0.00	0.00	0.00				
12.0000	2.8404	-1.87E+08	520744.	-0.00216	2503.	1.50E+13
0.00	0.00	0.00				
14.0000	2.7849	-1.75E+08	520744.	-0.00245	2357.	1.50E+13
0.00	0.00	0.00				
16.0000	2.7228	-1.62E+08	520744.	-0.00272	2212.	1.50E+13
0.00	0.00	0.00				
18.0000	2.6544	-1.49E+08	520744.	-0.00297	2066.	1.50E+13
0.00	0.00	0.00				
20.0000	2.5803	-1.37E+08	520744.	-0.00320	1920.	1.50E+13
0.00	0.00	0.00				
22.0000	2.5010	-1.24E+08	520744.	-0.00341	1774.	1.50E+13
0.00	0.00	0.00				
24.0000	2.4169	-1.11E+08	520744.	-0.00359	1627.	1.50E+13
0.00	0.00	0.00				
26.0000	2.3285	-9.86E+07	520744.	-0.00376	1481.	1.50E+13
0.00	0.00	0.00				
28.0000	2.2363	-8.59E+07	520744.	-0.00391	1334.	1.50E+13
0.00	0.00	0.00				
30.0000	2.1408	-7.32E+07	520744.	-0.00404	1188.	1.50E+13
0.00	0.00	0.00				
32.0000	2.0426	-6.04E+07	520744.	-0.00414	1041.	1.50E+13
0.00	0.00	0.00				
34.0000	1.9420	-4.77E+07	520744.	-0.00423	894.1348	1.50E+13
0.00	0.00	0.00				
36.0000	1.8396	-3.49E+07	520744.	-0.00430	747.2999	1.50E+13

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0.00        0.00        0.00
38.0000      1.7358  -2.22E+07    520744.   -0.00434   600.4265   1.50E+13
0.00        0.00        0.00
40.0000      1.6312  -9392923.    520744.   -0.00437   453.5285   1.50E+13
0.00        0.00        0.00
42.0000      1.5262   3367349.    520744.   -0.00437   384.1564   1.50E+13
0.00        0.00        0.00
44.0000      1.4214   1.61E+07    520744.   -0.00436   531.0610   1.50E+13
0.00        0.00        0.00
46.0000      1.3172   2.89E+07    520744.   -0.00432   677.9478   1.50E+13
0.00        0.00        0.00
48.0000      1.2141   4.16E+07    520744.   -0.00426   824.8026   1.50E+13
0.00        0.00        0.00
50.0000      1.1126   5.44E+07    520744.   -0.00419   971.6115   1.50E+13
0.00        0.00        0.00
52.0000      1.0131   6.71E+07    520744.   -0.00409      1118.   1.50E+13
0.00        0.00        0.00
54.0000      0.9163   7.99E+07    520744.   -0.00397      1265.   1.50E+13
0.00        0.00        0.00
56.0000      0.8225   9.26E+07    520741.   -0.00383      1412.   1.50E+13
-0.2250      6.5639       0.00
58.0000      0.7323   1.05E+08    520731.   -0.00368      1558.   1.50E+13
-0.6492     21.2777       0.00
60.0000      0.6461   1.18E+08    502925.   -0.00350      1704.   1.50E+13
-1483.      55093.       0.00
62.0000      0.5644   1.30E+08    446669.   -0.00330      1841.   1.50E+13
-3205.     136272.       0.00
64.0000      0.4878   1.40E+08    354851.   -0.00308      1956.   1.50E+13
-4447.     218794.       0.00
66.0000      0.4165   1.47E+08    246640.   -0.00285      2041.   1.50E+13
-4571.     263413.       0.00
68.0000      0.3508   1.52E+08    136355.   -0.00261      2096.   1.50E+13
-4620.     316037.       0.00
70.0000      0.2910   1.54E+08     28528.   -0.00237      2120.   1.50E+13
-4366.     360088.       0.00
72.0000      0.2371   1.54E+08    -71179.   -0.00212      2115.   1.50E+13
-3943.     399110.       0.00
74.0000      0.1891   1.51E+08   -160748.   -0.00188      2084.   1.50E+13
-3521.     446902.       0.00
76.0000      0.1469   1.46E+08   -240244.   -0.00164      2029.   1.50E+13
-3104.     507055.       0.00
78.0000      0.1103   1.40E+08   -309758.   -0.00141      1953.   1.50E+13
-2689.     585151.       0.00
80.0000     0.07907   1.32E+08   -369353.   -0.00120      1860.   1.50E+13
-2277.     691128.       0.00
82.0000     0.05288   1.22E+08   -419023.  -9.93E-04      1751.   1.50E+13
-1862.     845092.       0.00
84.0000     0.03138   1.12E+08   -458583.  -8.07E-04      1629.   1.50E+13
-1435.    1097045.       0.00
86.0000     0.01416   1.00E+08   -487178.  -6.37E-04      1499.   1.50E+13
-948.3493   1607040.       0.00
88.0000    7.86E-04   8.82E+07   -499231.  -4.87E-04      1361.   1.50E+13
-56.0483   1710720.       0.00
90.0000    -0.00920   7.63E+07   -491553.  -3.55E-04      1223.   1.50E+13
695.8560   1814400.       0.00
92.0000    -0.01627   6.47E+07   -470810.  -2.43E-04      1090.   1.50E+13
1033.    1523519.       0.00
94.0000    -0.02085   5.37E+07   -444387.  -1.48E-04   963.4593   1.50E+13
1169.    1345763.       0.00
96.0000    -0.02337   4.34E+07   -415501.  -7.04E-05   844.6199   1.50E+13
1238.    1271093.       0.00
98.0000    -0.02423   3.37E+07   -385521.  -8.77E-06   733.9417   1.50E+13
1260.    1248392.       0.00
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100.0000   -0.02379   2.49E+07   -349678.   3.81E-05   631.5846   1.50E+13
1727.   1741503.       0.00
102.0000   -0.02240   1.70E+07   -303294.   7.15E-05   540.6498   1.50E+13
2139.   2291186.       0.00
104.0000   -0.02036   1.03E+07   -253162.   9.33E-05   463.8791   1.50E+13
2039.   2403335.       0.00
106.0000   -0.01792   4797182.   -205739.   1.05E-04   400.6180   1.50E+13
1913.   2561512.       0.00
108.0000   -0.01530    403848.   -161571.   1.10E-04   350.0378   1.50E+13
1768.   2772213.       0.00
110.0000   -0.01267  -2971376.   -121062.   1.07E-04   379.5976   1.50E+13
1608.   3047109.       0.00
112.0000   -0.01014  -5420020.    -84494.   1.01E-04   407.7887   1.50E+13
1439.   3404969.       0.00
114.0000   -0.00783  -7039205.    -52053.   9.08E-05   426.4303   1.50E+13
1264.   3875725.       0.00
116.0000   -0.00578  -7929463.    -23840.   7.88E-05   436.6798   1.50E+13
1087.   4508863.       0.00
118.0000   -0.00404  -8192973.   106.5284   6.60E-05   439.7136   1.50E+13
908.7386   5392217.       0.00
120.0000   -0.00262  -7932264.     19786.   5.31E-05   436.7120   1.50E+13
731.2414   6701017.       0.00
122.0000   -0.00150  -7249598.     33763.   4.09E-05   428.8526   1.50E+13
433.4924   6946560.       0.00
124.0000  -6.55E-04  -6316546.     41307.   3.01E-05   418.1104   1.50E+13
195.1311   7153920.       0.00
126.0000  -5.40E-05  -5270492.     43847.   2.08E-05   406.0672   1.50E+13
16.5526   7361280.       0.00
128.0000   3.44E-04  -4214398.     42742.   1.32E-05   393.9085   1.50E+13
-108.6197   7568640.       0.00
130.0000   5.81E-04  -3220465.     39179.   7.29E-06   382.4654   1.50E+13
-188.2745   7776000.       0.00
132.0000   6.94E-04  -2334669.     34149.   2.84E-06   372.2672   1.50E+13
-230.9079   7983360.       0.00
134.0000   7.18E-04  -1581651.     28439.  -2.86E-07   363.5978   1.50E+13
-244.9177   8190720.       0.00
136.0000   6.80E-04   -969555.     22643.  -2.33E-06   356.5508   1.50E+13
-238.0937   8398080.       0.00
138.0000   6.06E-04   -494508.     17178.  -3.50E-06   351.0816   1.50E+13
-217.2852   8605440.       0.00
140.0000   5.13E-04   -144569.     12312.  -4.01E-06   347.0527   1.50E+13
-188.2220   8812800.       0.00
142.0000   4.14E-04     96967.      8188.  -4.05E-06   346.5047   1.50E+13
-155.4596   9020160.       0.00
144.0000   3.18E-04    248950.      4854.  -3.77E-06   348.2545   1.50E+13
-122.4180   9227520.       0.00
146.0000   2.33E-04    330396.      2287.  -3.31E-06   349.1922   1.50E+13
-91.4865   9434880.       0.00
148.0000   1.60E-04    359114.   418.9520  -2.75E-06   349.5228   1.50E+13
-64.1686   9642240.       0.00
150.0000   1.00E-04    350836.  -846.0127  -2.19E-06   349.4275   1.50E+13
-41.2451   9849600.       0.00
152.0000   5.47E-05    318767.     -1616.  -1.65E-06   349.0583   1.50E+13
-22.9403   1.01E+07       0.00
154.0000   2.12E-05    273455.     -2000.  -1.18E-06   348.5366   1.50E+13
-9.0767   1.03E+07       0.00
156.0000  -1.80E-06    222888.     -2100.  -7.81E-07   347.9544   1.50E+13
0.7873   1.05E+07       0.00
158.0000  -1.63E-05    172753.     -2004.  -4.65E-07   347.3772   1.50E+13
7.2433   1.07E+07       0.00
160.0000  -2.41E-05    126773.     -1785.  -2.25E-07   346.8479   1.50E+13
10.9421   1.09E+07       0.00
162.0000  -2.71E-05     87084.     -1504.  -5.45E-08   346.3909   1.50E+13
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  12.5276   1.11E+07       0.00
  164.0000  -2.67E-05     54603.     -1202.   5.88E-08   346.0170   1.50E+13
  12.5910   1.13E+07       0.00
  166.0000  -2.43E-05     29368.  -911.4528   1.26E-07   345.7264   1.50E+13
  11.6432   1.15E+07       0.00
  168.0000  -2.07E-05     10838.  -650.5006   1.58E-07   345.5131   1.50E+13
  10.1028   1.17E+07       0.00
  170.0000  -1.67E-05     -1875.  -429.7413   1.65E-07   345.4099   1.50E+13
  8.2938   1.19E+07       0.00
  172.0000  -1.28E-05     -9810.  -252.7911   1.56E-07   345.5013   1.50E+13
  6.4520   1.21E+07       0.00
  174.0000  -9.21E-06    -14027.  -118.5359   1.37E-07   345.5498   1.50E+13
  4.7359   1.23E+07       0.00
  176.0000  -6.20E-06    -15516.   -22.8282   1.13E-07   345.5670   1.50E+13
  3.2397   1.25E+07       0.00
  178.0000  -3.78E-06    -15137.    40.1437   8.87E-08   345.5626   1.50E+13
  2.0079   1.28E+07       0.00
  180.0000  -1.94E-06    -13599.    76.8137   6.57E-08   345.5449   1.50E+13
  1.0479   1.30E+07       0.00
  182.0000  -6.24E-07    -11457.    93.4994   4.57E-08   345.5202   1.50E+13
  0.3425   1.32E+07       0.00
  184.0000   2.52E-07     -9117.    95.9230   2.92E-08   345.4933   1.50E+13
  -0.1406   1.34E+07       0.00
  186.0000   7.79E-07     -6857.    88.9462   1.65E-08   345.4673   1.50E+13
  -0.4408   1.36E+07       0.00
  188.0000   1.04E-06     -4849.    76.4682   7.11E-09   345.4442   1.50E+13
  -0.5990   1.38E+07       0.00
  190.0000   1.12E-06     -3187.    61.4419   6.80E-10   345.4250   1.50E+13
  -0.6532   1.40E+07       0.00
  192.0000   1.08E-06     -1900.    45.9676  -3.39E-09   345.4102   1.50E+13
  -0.6363   1.42E+07       0.00
  194.0000   9.57E-07  -980.1120    31.4327  -5.69E-09   345.3996   1.50E+13
  -0.5749   1.44E+07       0.00
  196.0000   8.02E-07  -390.9135    18.6713  -6.79E-09   345.3928   1.50E+13
  -0.4885   1.46E+07       0.00
  198.0000   6.32E-07   -83.0775     8.1261  -7.17E-09   345.3893   1.50E+13
  -0.3902   1.48E+07       0.00
  200.0000   4.58E-07       0.00       0.00  -7.23E-09   345.3883   1.50E+13
  -0.2870   7516800.       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 4:

```
Pile-head deflection             =     3.00504237 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -262784599. inch-lbs
Maximum shear force              =        520769. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             12
Number of zero deflection points =              4
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 5

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Half scour) 96in"

Channel Static 24in.lp9o 10/4/2017

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 4.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 2500000.0 lbs

Depth X feet	Deflect. y inches	Bending Distrib. Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Lat. Load lb/inch				
0.00	4.0065	-3.38E+08	658519.	0.00	4236.	1.50E+13
0.00	0.00	0.00				
2.0000	4.0000	-3.22E+08	658487.	-5.28E-04	4053.	1.50E+13
0.00	0.00	0.00				
4.0000	3.9812	-3.06E+08	658487.	-0.00103	3871.	1.50E+13
0.00	0.00	0.00				
6.0000	3.9506	-2.90E+08	658487.	-0.00151	3688.	1.50E+13
0.00	0.00	0.00				
8.0000	3.9088	-2.74E+08	658487.	-0.00196	3505.	1.50E+13
0.00	0.00	0.00				
10.0000	3.8566	-2.59E+08	658487.	-0.00238	3322.	1.50E+13
0.00	0.00	0.00				
12.0000	3.7944	-2.43E+08	658487.	-0.00279	3138.	1.50E+13
0.00	0.00	0.00				
14.0000	3.7229	-2.27E+08	658487.	-0.00316	2954.	1.50E+13
0.00	0.00	0.00				
16.0000	3.6427	-2.11E+08	658487.	-0.00351	2770.	1.50E+13
0.00	0.00	0.00				
18.0000	3.5544	-1.95E+08	658487.	-0.00383	2585.	1.50E+13
0.00	0.00	0.00				
20.0000	3.4587	-1.78E+08	658487.	-0.00413	2400.	1.50E+13
0.00	0.00	0.00				
22.0000	3.3561	-1.62E+08	658487.	-0.00440	2215.	1.50E+13
0.00	0.00	0.00				
24.0000	3.2472	-1.46E+08	658487.	-0.00465	2030.	1.50E+13
0.00	0.00	0.00				
26.0000	3.1328	-1.30E+08	658487.	-0.00487	1845.	1.50E+13
0.00	0.00	0.00				
28.0000	3.0134	-1.14E+08	658487.	-0.00507	1660.	1.50E+13
0.00	0.00	0.00				
30.0000	2.8895	-9.81E+07	658487.	-0.00524	1474.	1.50E+13
0.00	0.00	0.00				
32.0000	2.7620	-8.19E+07	658487.	-0.00538	1289.	1.50E+13
0.00	0.00	0.00				
34.0000	2.6312	-6.58E+07	658487.	-0.00550	1103.	1.50E+13
0.00	0.00	0.00				
36.0000	2.4980	-4.97E+07	658487.	-0.00559	917.1484	1.50E+13
0.00	0.00	0.00				
38.0000	2.3628	-3.35E+07	658487.	-0.00566	731.3111	1.50E+13
0.00	0.00	0.00				
40.0000	2.2264	-1.74E+07	658487.	-0.00570	545.4368	1.50E+13
0.00	0.00	0.00				
42.0000	2.0893	-1229476.	658487.	-0.00571	359.5432	1.50E+13
0.00	0.00	0.00				
44.0000	1.9521	1.49E+07	658487.	-0.00570	517.1283	1.50E+13
0.00	0.00	0.00				
46.0000	1.8155	3.11E+07	658487.	-0.00567	703.0068	1.50E+13
0.00	0.00	0.00				
48.0000	1.6801	4.72E+07	658487.	-0.00560	888.8509	1.50E+13
0.00	0.00	0.00				

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Half scour) 96in"


```
 50.0000     1.5465   6.33E+07    658487.   -0.00552      1075.   1.50E+13
 0.00       0.00       0.00
 52.0000     1.4154   7.95E+07    658487.   -0.00540      1260.   1.50E+13
 0.00       0.00       0.00
 54.0000     1.2873   9.56E+07    658487.   -0.00526      1446.   1.50E+13
 0.00       0.00       0.00
 56.0000     1.1628   1.12E+08    658484.   -0.00510      1632.   1.50E+13
 -0.2525     5.2108       0.00
 58.0000     1.0427   1.28E+08    658473.   -0.00490      1817.   1.50E+13
 -0.7304    16.8115       0.00
 60.0000     0.9274   1.44E+08    637876.   -0.00469      2002.   1.50E+13
 -1716.     44397.       0.00
 62.0000     0.8177   1.59E+08    575500.   -0.00444      2176.   1.50E+13
 -3482.    102205.       0.00
 64.0000     0.7141   1.72E+08    474672.   -0.00418      2326.   1.50E+13
 -4920.    165354.       0.00
 66.0000     0.6171   1.82E+08    353882.   -0.00390      2444.   1.50E+13
 -5146.    200129.       0.00
 68.0000     0.5271   1.90E+08    228618.   -0.00360      2527.   1.50E+13
 -5293.    241009.       0.00
 70.0000     0.4443   1.94E+08    103782.   -0.00329      2575.   1.50E+13
 -5110.    276014.       0.00
 72.0000     0.3690   1.95E+08    -15048.   -0.00298      2589.   1.50E+13
 -4792.    311692.       0.00
 74.0000     0.3012   1.93E+08   -125728.   -0.00267      2571.   1.50E+13
 -4431.    353072.       0.00
 76.0000     0.2408   1.89E+08   -226577.   -0.00237      2523.   1.50E+13
 -3973.    396056.       0.00
 78.0000     0.1876   1.83E+08   -316345.   -0.00207      2449.   1.50E+13
 -3507.    448668.       0.00
 80.0000     0.1415   1.74E+08   -394982.   -0.00178      2351.   1.50E+13
 -3046.    516681.       0.00
 82.0000     0.1020   1.64E+08   -462568.   -0.00151      2233.   1.50E+13
 -2586.    608445.       0.00
 84.0000    0.06886   1.52E+08   -519103.   -0.00126      2098.   1.50E+13
 -2125.    740610.       0.00
 86.0000    0.04154   1.39E+08   -564406.   -0.00103      1948.   1.50E+13
 -1650.    953563.       0.00
 88.0000    0.01956   1.25E+08   -597803.  -8.16E-04      1787.   1.50E+13
 -1133.   1389608.       0.00
 90.0000    0.00239   1.11E+08   -613565.  -6.27E-04      1619.   1.50E+13
 -180.8393   1814400.       0.00
 92.0000   -0.01053   9.59E+07   -605765.  -4.62E-04      1449.   1.50E+13
 830.8714   1893272.       0.00
 94.0000   -0.01978   8.16E+07   -582130.  -3.20E-04      1285.   1.50E+13
 1139.   1381751.       0.00
 96.0000   -0.02589   6.80E+07   -552832.  -2.00E-04      1128.   1.50E+13
 1303.   1207682.       0.00
 98.0000   -0.02940   5.51E+07   -520540.  -1.02E-04   979.6501   1.50E+13
 1388.   1133416.       0.00
100.0000   -0.03079   4.30E+07   -480314.  -2.36E-05   840.4625   1.50E+13
1964.   1530997.       0.00
102.0000   -0.03053   3.20E+07   -426788.   3.64E-05   714.2510   1.50E+13
2497.   1962766.       0.00
104.0000   -0.02904   2.25E+07   -367612.   8.00E-05   604.5598   1.50E+13
2435.   2012472.       0.00
106.0000   -0.02668   1.44E+07   -310383.   1.10E-04   510.9905   1.50E+13
2334.   2099333.       0.00
108.0000   -0.02378   7599765.   -255933.   1.27E-04   432.8840   1.50E+13
2203.   2223877.       0.00
110.0000   -0.02058   2083977.   -204892.   1.35E-04   369.3810   1.50E+13
2050.   2390347.       0.00
112.0000   -0.01731  -2251230.   -157736.   1.35E-04   371.3066   1.50E+13
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Half scour) 96in"


```
1880.   2606840.       0.00
114.0000   -0.01412  -5503504.   -114808.   1.29E-04   408.7499   1.50E+13
1698.   2886440.       0.00
116.0000   -0.01114  -7777416.    -76342.   1.18E-04   434.9293   1.50E+13
1508.   3249668.       0.00
118.0000   -0.00846  -9182048.    -42480.   1.04E-04   451.1007   1.50E+13
1314.   3729375.       0.00
120.0000   -0.00613  -9828990.    -13292.   8.92E-05   458.5490   1.50E+13
1118.   4380998.       0.00
122.0000   -0.00418  -9830753.     11210.   7.34E-05   458.5692   1.50E+13
923.3659   5306601.       0.00
124.0000   -0.00260  -9299713.     31037.   5.81E-05   452.4554   1.50E+13
728.8841   6722372.       0.00
126.0000   -0.00139  -8347944.     44883.   4.40E-05   441.4978   1.50E+13
424.8962   7361280.       0.00
128.0000  -4.89E-04  -7150634.     51831.   3.16E-05   427.7132   1.50E+13
154.1184   7568640.       0.00
130.0000   1.33E-04  -5863866.     53161.   2.12E-05   412.8987   1.50E+13
-43.2415   7776000.       0.00
132.0000   5.31E-04  -4601442.     50524.   1.29E-05   398.3645   1.50E+13
-176.4971   7983360.       0.00
134.0000   7.51E-04  -3440239.     45330.   6.44E-06   384.9956   1.50E+13
-256.3494   8190720.       0.00
136.0000   8.40E-04  -2426364.     38728.   1.75E-06   373.3229   1.50E+13
-293.8148   8398080.       0.00
138.0000   8.35E-04  -1581492.     31609.  -1.46E-06   363.5960   1.50E+13
-299.4224   8605440.       0.00
140.0000   7.70E-04   -908937.     24624.  -3.45E-06   355.8529   1.50E+13
-282.6646   8812800.       0.00
142.0000   6.70E-04   -399109.     18212.  -4.49E-06   349.9832   1.50E+13
-251.6686   9020160.       0.00
144.0000   5.54E-04    -34203.     12636.  -4.84E-06   345.7821   1.50E+13
-213.0529   9227520.       0.00
146.0000   4.37E-04    207987.      8016.  -4.70E-06   347.7829   1.50E+13
-171.9256   9434880.       0.00
148.0000   3.29E-04    351128.      4369.  -4.25E-06   349.4308   1.50E+13
-131.9868   9642240.       0.00
150.0000   2.33E-04    418211.      1637.  -3.64E-06   350.2032   1.50E+13
-95.6979   9849600.       0.00
152.0000   1.54E-04    430131.  -285.4042  -2.96E-06   350.3404   1.50E+13
-64.4869   1.01E+07       0.00
154.0000   9.11E-05    404866.     -1527.  -2.29E-06   350.0495   1.50E+13
-38.9654   1.03E+07       0.00
156.0000   4.39E-05    357118.     -2224.  -1.68E-06   349.4998   1.50E+13
-19.1383   1.05E+07       0.00
158.0000   1.03E-05    298313.     -2509.  -1.16E-06   348.8228   1.50E+13
-4.5929   1.07E+07       0.00
160.0000  -1.18E-05    236833.     -2500.  -7.31E-07   348.1150   1.50E+13
5.3391   1.09E+07       0.00
162.0000  -2.48E-05    178405.     -2298.  -3.99E-07   347.4423   1.50E+13
11.4517   1.11E+07       0.00
164.0000  -3.09E-05    126557.     -1986.  -1.55E-07   346.8454   1.50E+13
14.5651   1.13E+07       0.00
166.0000  -3.22E-05     83086.     -1626.   1.22E-08   346.3449   1.50E+13
15.4560   1.15E+07       0.00
168.0000  -3.03E-05     48510.     -1263.   1.17E-07   345.9468   1.50E+13
14.8128   1.17E+07       0.00
170.0000  -2.66E-05     22461.  -926.4288   1.74E-07   345.6469   1.50E+13
13.2121   1.19E+07       0.00
172.0000  -2.20E-05      4020.  -634.5514   1.95E-07   345.4346   1.50E+13
11.1110   1.21E+07       0.00
174.0000  -1.72E-05     -8021.  -395.0094   1.92E-07   345.4807   1.50E+13
8.8508   1.23E+07       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Half scour) 96in"


```
  176.0000  -1.28E-05    -14963.  -208.7682   1.74E-07   345.5606   1.50E+13
  6.6693   1.25E+07       0.00
  178.0000  -8.87E-06    -18063.   -72.1482   1.47E-07   345.5963   1.50E+13
  4.7158   1.28E+07       0.00
  180.0000  -5.68E-06    -18444.    21.2743   1.18E-07   345.6007   1.50E+13
  3.0695   1.30E+07       0.00
  182.0000  -3.20E-06    -17056.    79.1840   8.98E-08   345.5847   1.50E+13
  1.7564   1.32E+07       0.00
  184.0000  -1.37E-06    -14654.   109.4417   6.45E-08   345.5570   1.50E+13
  0.7651   1.34E+07       0.00
  186.0000  -1.07E-07    -11810.   119.3497   4.33E-08   345.5243   1.50E+13
  0.06055   1.36E+07       0.00
  188.0000   7.06E-07     -8930.   115.2103   2.67E-08   345.4911   1.50E+13
  -0.4055   1.38E+07       0.00
  190.0000   1.18E-06     -6283.   102.1160   1.46E-08   345.4607   1.50E+13
  -0.6857   1.40E+07       0.00
  192.0000   1.40E-06     -4031.    83.9117   6.31E-09   345.4347   1.50E+13
  -0.8313   1.42E+07       0.00
  194.0000   1.48E-06     -2256.    63.2797   1.29E-09   345.4143   1.50E+13
  -0.8880   1.44E+07       0.00
  196.0000   1.47E-06  -993.3654    41.9047  -1.31E-09   345.3998   1.50E+13
  -0.8932   1.46E+07       0.00
  198.0000   1.42E-06  -244.7799    20.6894  -2.30E-09   345.3911   1.50E+13
  -0.8747   1.48E+07       0.00
  200.0000   1.36E-06       0.00       0.00  -2.50E-09   345.3883   1.50E+13
  -0.8494   7516800.       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 5:

```
Pile-head deflection             =     4.00648371 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -337900252. inch-lbs
Maximum shear force              =        658519. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             14
Number of zero deflection points =              4
```

--

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 6

--

```
Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     5.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				

File name is incorrect below, run designation is "Channel Post Seismic Trans.(Half scour) 96in"


```
     0.00     5.0078  -4.08E+08    783791.       0.00      5048.   1.50E+13
     0.00       0.00       0.00
   2.0000     5.0000  -3.90E+08    783754.  -6.38E-04      4831.   1.50E+13
   0.00       0.00       0.00
   4.0000     4.9772  -3.71E+08    783754.   -0.00125      4614.   1.50E+13
   0.00       0.00       0.00
   6.0000     4.9402  -3.52E+08    783754.   -0.00182      4396.   1.50E+13
   0.00       0.00       0.00
   8.0000     4.8897  -3.33E+08    783754.   -0.00237      4178.   1.50E+13
   0.00       0.00       0.00
  10.0000     4.8264  -3.14E+08    783754.   -0.00289      3960.   1.50E+13
  0.00       0.00       0.00
  12.0000     4.7510  -2.95E+08    783754.   -0.00338      3741.   1.50E+13
  0.00       0.00       0.00
  14.0000     4.6643  -2.76E+08    783754.   -0.00383      3522.   1.50E+13
  0.00       0.00       0.00
  16.0000     4.5671  -2.57E+08    783754.   -0.00426      3303.   1.50E+13
  0.00       0.00       0.00
  18.0000     4.4600  -2.38E+08    783754.   -0.00465      3083.   1.50E+13
  0.00       0.00       0.00
  20.0000     4.3437  -2.19E+08    783754.   -0.00502      2863.   1.50E+13
  0.00       0.00       0.00
  22.0000     4.2191  -2.00E+08    783754.   -0.00535      2643.   1.50E+13
  0.00       0.00       0.00
  24.0000     4.0868  -1.80E+08    783754.   -0.00566      2423.   1.50E+13
  0.00       0.00       0.00
  26.0000     3.9476  -1.61E+08    783754.   -0.00593      2202.   1.50E+13
  0.00       0.00       0.00
  28.0000     3.8022  -1.42E+08    783754.   -0.00617      1982.   1.50E+13
  0.00       0.00       0.00
  30.0000     3.6513  -1.23E+08    783754.   -0.00638      1761.   1.50E+13
  0.00       0.00       0.00
  32.0000     3.4957  -1.04E+08    783754.   -0.00657      1540.   1.50E+13
  0.00       0.00       0.00
  34.0000     3.3362  -8.45E+07    783754.   -0.00672      1318.   1.50E+13
  0.00       0.00       0.00
  36.0000     3.1734  -6.53E+07    783754.   -0.00684      1097.   1.50E+13
  0.00       0.00       0.00
  38.0000     3.0080  -4.61E+07    783754.   -0.00692   875.8829   1.50E+13
  0.00       0.00       0.00
  40.0000     2.8410  -2.69E+07    783754.   -0.00698   654.5144   1.50E+13
  0.00       0.00       0.00
  42.0000     2.6729  -7619937.    783754.   -0.00701   433.1162   1.50E+13
  0.00       0.00       0.00
  44.0000     2.5044   1.16E+07    783754.   -0.00701   479.0670   1.50E+13
  0.00       0.00       0.00
  46.0000     2.3365   3.08E+07    783754.   -0.00697   700.4608   1.50E+13
  0.00       0.00       0.00
  48.0000     2.1697   5.01E+07    783754.   -0.00691   921.8205   1.50E+13
  0.00       0.00       0.00
  50.0000     2.0049   6.93E+07    783754.   -0.00681      1143.   1.50E+13
  0.00       0.00       0.00
  52.0000     1.8427   8.85E+07    783754.   -0.00669      1364.   1.50E+13
  0.00       0.00       0.00
  54.0000     1.6839   1.08E+08    783754.   -0.00653      1585.   1.50E+13
  0.00       0.00       0.00
  56.0000     1.5292   1.27E+08    783751.   -0.00634      1806.   1.50E+13
  -0.2766     4.3412       0.00
  58.0000     1.3794   1.46E+08    783738.   -0.00612      2027.   1.50E+13
  -0.8018    13.9501       0.00
  60.0000     1.2352   1.65E+08    761160.   -0.00588      2248.   1.50E+13
  -1881.     36541.       0.00
  62.0000     1.0974   1.83E+08    695398.   -0.00560      2456.   1.50E+13
```

```
 -3599.     78721.       0.00
 64.0000     0.9666   1.99E+08    590023.   -0.00529      2640.   1.50E+13
 -5182.    128661.       0.00
 66.0000     0.8434   2.12E+08    461715.   -0.00496      2789.   1.50E+13
 -5511.    156807.       0.00
 68.0000     0.7284   2.22E+08    326514.   -0.00461      2902.   1.50E+13
 -5756.    189658.       0.00
 70.0000     0.6219   2.29E+08    189720.   -0.00425      2976.   1.50E+13
 -5643.    217776.       0.00
 72.0000     0.5242   2.32E+08     57428.   -0.00389      3013.   1.50E+13
 -5381.    246365.       0.00
 74.0000     0.4354   2.32E+08    -68054.   -0.00352      3013.   1.50E+13
 -5076.    279806.       0.00
 76.0000     0.3554   2.29E+08   -185688.   -0.00315      2980.   1.50E+13
 -4727.    319183.       0.00
 78.0000     0.2843   2.23E+08   -294221.   -0.00279      2915.   1.50E+13
 -4317.    364487.       0.00
 80.0000     0.2217   2.15E+08   -391782.   -0.00244      2821.   1.50E+13
 -3813.    412743.       0.00
 82.0000     0.1674   2.05E+08   -477285.   -0.00210      2702.   1.50E+13
 -3313.    475042.       0.00
 84.0000     0.1209   1.92E+08   -550821.   -0.00178      2560.   1.50E+13
 -2815.    558959.       0.00
 86.0000    0.08179   1.78E+08   -612395.   -0.00149      2400.   1.50E+13
 -2316.    679550.       0.00
 88.0000    0.04954   1.63E+08   -661813.   -0.00121      2224.   1.50E+13
 -1802.    873148.       0.00
 90.0000    0.02356   1.47E+08   -698356.  -9.65E-04      2036.   1.50E+13
 -1243.   1266265.       0.00
 92.0000    0.00321   1.30E+08   -716349.  -7.44E-04      1840.   1.50E+13
 -256.4699   1918080.       0.00
 94.0000   -0.01216   1.13E+08   -708713.  -5.50E-04      1641.   1.50E+13
 892.7501   1762158.       0.00
 96.0000   -0.02321   9.58E+07   -683199.  -3.84E-04      1449.   1.50E+13
 1233.   1275580.       0.00
 98.0000   -0.03058   7.98E+07   -651406.  -2.43E-04      1264.   1.50E+13
 1416.   1111273.       0.00
100.0000   -0.03489   6.46E+07   -609327.  -1.28E-04      1089.   1.50E+13
2091.   1438196.       0.00
102.0000   -0.03672   5.06E+07   -551383.  -3.58E-05   927.5932   1.50E+13
2738.   1789662.       0.00
104.0000   -0.03661   3.81E+07   -485719.   3.51E-05   784.3156   1.50E+13
2734.   1792365.       0.00
106.0000   -0.03503   2.73E+07   -420818.   8.74E-05   659.1258   1.50E+13
2675.   1832178.       0.00
108.0000   -0.03241   1.79E+07   -357852.   1.23E-04   551.6420   1.50E+13
2573.   1904768.       0.00
110.0000   -0.02911   1.01E+07   -297726.   1.46E-04   461.1986   1.50E+13
2438.   2010055.       0.00
112.0000   -0.02542   3606574.   -241136.   1.57E-04   386.9106   1.50E+13
2278.   2151137.       0.00
114.0000   -0.02158  -1534221.   -188610.   1.58E-04   363.0517   1.50E+13
2099.   2334263.       0.00
116.0000   -0.01781  -5465695.   -140534.   1.53E-04   408.3146   1.50E+13
1907.   2569594.       0.00
118.0000   -0.01425  -8298213.    -97183.   1.42E-04   440.9252   1.50E+13
1706.   2872928.       0.00
120.0000   -0.01100  -1.01E+07    -58728.   1.27E-04   462.2157   1.50E+13
1499.   3269085.       0.00
122.0000   -0.00815  -1.11E+07    -25261.   1.10E-04   473.5549   1.50E+13
1290.   3798732.       0.00
124.0000   -0.00572  -1.14E+07      3189.   9.21E-05   476.3275   1.50E+13
1081.   4533442.       0.00
```

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```
126.0000   -0.00373  -1.10E+07     26633.   7.42E-05   471.9198   1.50E+13
872.7930   5614210.       0.00
128.0000   -0.00216  -1.01E+07     45079.   5.73E-05   461.7121   1.50E+13
664.3427   7375606.       0.00
130.0000  -9.80E-04  -8833471.     56862.   4.22E-05   447.0876   1.50E+13
317.5765   7776000.       0.00
132.0000  -1.38E-04  -7379437.     61222.   2.92E-05   430.3474   1.50E+13
45.7696   7983360.       0.00
134.0000   4.22E-04  -5898331.     60044.   1.86E-05   413.2955   1.50E+13
-143.9477   8190720.       0.00
136.0000   7.55E-04  -4499573.     55147.   1.03E-05   397.1917   1.50E+13
-264.1242   8398080.       0.00
138.0000   9.15E-04  -3252519.     48040.   4.08E-06   382.8344   1.50E+13
-328.1400   8605440.       0.00
140.0000   9.51E-04  -2194161.     39913.  -2.74E-07   370.6496   1.50E+13
-349.0927   8812800.       0.00
142.0000   9.02E-04  -1336670.     31656.  -3.10E-06   360.7773   1.50E+13
-339.0119   9020160.       0.00
144.0000   8.02E-04   -674322.     23887.  -4.70E-06   353.1518   1.50E+13
-308.3675   9227520.       0.00
146.0000   6.76E-04   -189529.     16997.  -5.40E-06   347.5704   1.50E+13
-265.8223   9434880.       0.00
148.0000   5.43E-04    142168.     11189.  -5.43E-06   347.0251   1.50E+13
-218.1802   9642240.       0.00
150.0000   4.15E-04    348180.      6525.  -5.04E-06   349.3969   1.50E+13
-170.4769   9849600.       0.00
152.0000   3.01E-04    455964.      2965.  -4.40E-06   350.6378   1.50E+13
-126.1665   1.01E+07       0.00
154.0000   2.04E-04    491033.   402.7222  -3.64E-06   351.0416   1.50E+13
-87.3647   1.03E+07       0.00
156.0000   1.26E-04    475732.     -1307.  -2.87E-06   350.8654   1.50E+13
-55.1120   1.05E+07       0.00
158.0000   6.66E-05    428641.     -2324.  -2.15E-06   350.3233   1.50E+13
-29.6357   1.07E+07       0.00
160.0000   2.33E-05    364439.     -2807.  -1.51E-06   349.5841   1.50E+13
-10.5893   1.09E+07       0.00
162.0000  -5.93E-06    294102.     -2901.  -9.85E-07   348.7743   1.50E+13
2.7398   1.11E+07       0.00
164.0000  -2.39E-05    225315.     -2733.  -5.69E-07   347.9824   1.50E+13
11.2601   1.13E+07       0.00
166.0000  -3.33E-05    162993.     -2406.  -2.59E-07   347.2649   1.50E+13
15.9449   1.15E+07       0.00
168.0000  -3.63E-05    109839.     -2002.  -4.07E-08   346.6529   1.50E+13
17.7375   1.17E+07       0.00
170.0000  -3.52E-05     66891.     -1579.   1.01E-07   346.1584   1.50E+13
17.4893   1.19E+07       0.00
172.0000  -3.15E-05     34011.     -1179.   1.81E-07   345.7799   1.50E+13
15.9241   1.21E+07       0.00
174.0000  -2.65E-05     10300.  -823.9598   2.17E-07   345.5069   1.50E+13
13.6240   1.23E+07       0.00
176.0000  -2.11E-05     -5565.  -528.1025   2.21E-07   345.4524   1.50E+13
11.0308   1.25E+07       0.00
178.0000  -1.59E-05    -15076.  -294.2397   2.04E-07   345.5619   1.50E+13
8.4578   1.28E+07       0.00
180.0000  -1.13E-05    -19713.  -119.4553   1.76E-07   345.6153   1.50E+13
6.1076   1.30E+07       0.00
182.0000  -7.46E-06    -20831.     2.9499   1.44E-07   345.6282   1.50E+13
4.0928   1.32E+07       0.00
184.0000  -4.41E-06    -19589.    81.5489   1.11E-07   345.6139   1.50E+13
2.4571   1.34E+07       0.00
186.0000  -2.11E-06    -16930.   125.3618   8.23E-08   345.5832   1.50E+13
1.1940   1.36E+07       0.00
188.0000  -4.60E-07    -13581.   142.8638   5.79E-08   345.5447   1.50E+13
```

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```
  0.2645   1.38E+07       0.00
  190.0000   6.68E-07    -10079.   141.3633   3.90E-08   345.5044   1.50E+13
  -0.3895   1.40E+07       0.00
  192.0000   1.41E-06     -6801.   126.6790   2.55E-08   345.4666   1.50E+13
  -0.8341   1.42E+07       0.00
  194.0000   1.89E-06     -4002.   103.0509   1.68E-08   345.4344   1.50E+13
  -1.1349   1.44E+07       0.00
  196.0000   2.22E-06     -1856.    73.2288   1.21E-08   345.4097   1.50E+13
  -1.3503   1.46E+07       0.00
  198.0000   2.47E-06  -488.2075    38.6958   1.03E-08   345.3940   1.50E+13
  -1.5274   1.48E+07       0.00
  200.0000   2.71E-06       0.00       0.00   9.87E-09   345.3883   1.50E+13
  -1.6972   7516800.       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 6:

```
Pile-head deflection             =     5.00783781 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -408469349. inch-lbs
Maximum shear force              =        783791. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             15
Number of zero deflection points =              4
```

```
-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 7
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     6.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     6.0091  -4.75E+08    897233.       0.00      5810.   1.50E+13
      0.00       0.00       0.00
    2.0000     6.0000  -4.53E+08    897190.  -7.42E-04      5562.   1.50E+13
    0.00       0.00       0.00
    4.0000     5.9735  -4.31E+08    897190.   -0.00145      5313.   1.50E+13
    0.00       0.00       0.00
    6.0000     5.9304  -4.10E+08    897190.   -0.00212      5064.   1.50E+13
    0.00       0.00       0.00
    8.0000     5.8717  -3.88E+08    897190.   -0.00276      4814.   1.50E+13
    0.00       0.00       0.00
   10.0000     5.7980  -3.66E+08    897190.   -0.00336      4564.   1.50E+13
   0.00       0.00       0.00
   12.0000     5.7102  -3.45E+08    897190.   -0.00393      4314.   1.50E+13
```

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```
0.00        0.00        0.00
14.0000      5.6093  -3.23E+08    897190.   -0.00447      4063.   1.50E+13
0.00        0.00        0.00
16.0000      5.4959  -3.01E+08    897190.   -0.00496      3812.   1.50E+13
0.00        0.00        0.00
18.0000      5.3710  -2.79E+08    897190.   -0.00543      3560.   1.50E+13
0.00        0.00        0.00
20.0000      5.2354  -2.57E+08    897190.   -0.00586      3309.   1.50E+13
0.00        0.00        0.00
22.0000      5.0898  -2.35E+08    897190.   -0.00625      3057.   1.50E+13
0.00        0.00        0.00
24.0000      4.9353  -2.14E+08    897190.   -0.00661      2804.   1.50E+13
0.00        0.00        0.00
26.0000      4.7725  -1.92E+08    897190.   -0.00693      2552.   1.50E+13
0.00        0.00        0.00
28.0000      4.6024  -1.70E+08    897190.   -0.00722      2299.   1.50E+13
0.00        0.00        0.00
30.0000      4.4258  -1.48E+08    897190.   -0.00748      2046.   1.50E+13
0.00        0.00        0.00
32.0000      4.2435  -1.26E+08    897190.   -0.00770      1793.   1.50E+13
0.00        0.00        0.00
34.0000      4.0564  -1.04E+08    897190.   -0.00788      1539.   1.50E+13
0.00        0.00        0.00
36.0000      3.8654  -8.17E+07    897190.   -0.00803      1286.   1.50E+13
0.00        0.00        0.00
38.0000      3.6711  -5.97E+07    897190.   -0.00814      1033.   1.50E+13
0.00        0.00        0.00
40.0000      3.4746  -3.77E+07    897190.   -0.00822   778.9432   1.50E+13
0.00        0.00        0.00
42.0000      3.2767  -1.56E+07    897190.   -0.00826   525.3423   1.50E+13
0.00        0.00        0.00
44.0000      3.0781   6398377.    897190.   -0.00827   419.0525   1.50E+13
0.00        0.00        0.00
46.0000      2.8798   2.84E+07    897190.   -0.00824   672.6636   1.50E+13
0.00        0.00        0.00
48.0000      2.6826   5.05E+07    897190.   -0.00818   926.2432   1.50E+13
0.00        0.00        0.00
50.0000      2.4873   7.25E+07    897190.   -0.00808      1180.   1.50E+13
0.00        0.00        0.00
52.0000      2.2948   9.45E+07    897190.   -0.00795      1433.   1.50E+13
0.00        0.00        0.00
54.0000      2.1059   1.16E+08    897190.   -0.00778      1687.   1.50E+13
0.00        0.00        0.00
56.0000      1.9215   1.38E+08    897187.   -0.00757      1940.   1.50E+13
-0.2985      3.7281       0.00
58.0000      1.7424   1.60E+08    897173.   -0.00733      2193.   1.50E+13
-0.8667     11.9382       0.00
60.0000      1.5695   1.82E+08    873112.   -0.00706      2446.   1.50E+13
-2004.      30647.       0.00
62.0000      1.4036   2.03E+08    806155.   -0.00675      2685.   1.50E+13
-3576.      61139.       0.00
64.0000      1.2454   2.22E+08    700160.   -0.00641      2901.   1.50E+13
-5257.     101315.       0.00
66.0000      1.0958   2.38E+08    568764.   -0.00604      3081.   1.50E+13
-5692.     124667.       0.00
68.0000      0.9553   2.50E+08    427981.   -0.00565      3223.   1.50E+13
-6040.     151736.       0.00
70.0000      0.8244   2.59E+08    283390.   -0.00525      3325.   1.50E+13
-6009.     174947.       0.00
72.0000      0.7034   2.64E+08    141487.   -0.00483      3387.   1.50E+13
-5816.     198427.       0.00
74.0000      0.5926   2.66E+08      4839.   -0.00441      3410.   1.50E+13
-5572.     225645.       0.00
```

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```
 76.0000     0.4920   2.65E+08   -125363.   -0.00398      3396.   1.50E+13
 -5279.    257507.       0.00
 78.0000     0.4015   2.61E+08   -247967.   -0.00356      3346.   1.50E+13
 -4938.    295169.       0.00
 80.0000     0.3211   2.53E+08   -361791.   -0.00315      3264.   1.50E+13
 -4547.    339881.       0.00
 82.0000     0.2504   2.44E+08   -464975.   -0.00275      3151.   1.50E+13
 -4052.    388395.       0.00
 84.0000     0.1890   2.31E+08   -555838.   -0.00237      3011.   1.50E+13
 -3520.    447029.       0.00
 86.0000     0.1365   2.17E+08   -633982.   -0.00201      2847.   1.50E+13
 -2992.    525994.       0.00
 88.0000    0.09236   2.01E+08   -699415.   -0.00168      2663.   1.50E+13
 -2461.    639466.       0.00
 90.0000    0.05594   1.84E+08   -751929.   -0.00137      2463.   1.50E+13
 -1915.    821688.       0.00
 92.0000    0.02658   1.65E+08   -790753.   -0.00109      2249.   1.50E+13
 -1320.   1192171.       0.00
 94.0000    0.00356   1.46E+08   -810192.  -8.42E-04      2027.   1.50E+13
 -299.7609   2021760.       0.00
 96.0000   -0.01385   1.27E+08   -802354.  -6.24E-04      1803.   1.50E+13
 952.9553   1650896.       0.00
 98.0000   -0.02641   1.08E+08   -775129.  -4.37E-04      1585.   1.50E+13
 1316.   1195811.       0.00
100.0000   -0.03483   8.94E+07   -734272.  -2.79E-04      1375.   1.50E+13
2089.   1439362.       0.00
102.0000   -0.03982   7.24E+07   -674987.  -1.50E-04      1179.   1.50E+13
2851.   1718486.       0.00
104.0000   -0.04204   5.70E+07   -605614.  -4.66E-05      1002.   1.50E+13
2930.   1672663.       0.00
106.0000   -0.04206   4.34E+07   -535294.   3.37E-05   844.5767   1.50E+13
2930.   1672215.       0.00
108.0000   -0.04042   3.14E+07   -465657.   9.34E-05   706.3383   1.50E+13
2873.   1705831.       0.00
110.0000   -0.03757   2.10E+07   -397949.   1.35E-04   587.1153   1.50E+13
2770.   1769224.       0.00
112.0000   -0.03392   1.22E+07   -333130.   1.62E-04   486.2365   1.50E+13
2632.   1861980.       0.00
114.0000   -0.02980   4986416.   -271948.   1.76E-04   402.7967   1.50E+13
2467.   1986506.       0.00
116.0000   -0.02549   -840671.   -214969.   1.79E-04   355.0669   1.50E+13
2281.   2147919.       0.00
118.0000   -0.02121  -5353580.   -162618.   1.74E-04   407.0238   1.50E+13
2081.   2354595.       0.00
120.0000   -0.01714  -8667226.   -115196.   1.63E-04   445.1736   1.50E+13
1871.   2619477.       0.00
122.0000   -0.01340  -1.09E+07    -72899.   1.47E-04   470.9083   1.50E+13
1654.   2962635.       0.00
124.0000   -0.01008  -1.22E+07    -35838.   1.29E-04   485.6623   1.50E+13
1434.   3416271.       0.00
126.0000   -0.00722  -1.26E+07     -4053.   1.09E-04   490.8908   1.50E+13
1214.   4035325.       0.00
128.0000   -0.00485  -1.24E+07     22464.   8.88E-05   488.0525   1.50E+13
995.3833   4922952.       0.00
130.0000   -0.00296  -1.16E+07     43735.   6.97E-05   478.5997   1.50E+13
777.2103   6304831.       0.00
132.0000   -0.00151  -1.03E+07     59083.   5.22E-05   463.9800   1.50E+13
501.7830   7983360.       0.00
134.0000  -4.54E-04  -8740865.     66962.   3.70E-05   446.0214   1.50E+13
154.8544   8190720.       0.00
136.0000   2.66E-04  -7090969.     67706.   2.43E-05   427.0263   1.50E+13
-92.9217   8398080.       0.00
138.0000   7.13E-04  -5493917.     63524.   1.42E-05   408.6395   1.50E+13
```

```
-255.5536   8605440.       0.00
140.0000   9.49E-04  -4043536.     56275.   6.61E-06   391.9413   1.50E+13
-348.4931   8812800.       0.00
142.0000    0.00103  -2793499.     47447.   1.15E-06   377.5497   1.50E+13
-387.1950   9020160.       0.00
144.0000    0.00100  -1766218.     38168.  -2.50E-06   365.7227   1.50E+13
-386.0811   9227520.       0.00
146.0000   9.10E-04   -961151.     29240.  -4.68E-06   356.4540   1.50E+13
-357.8710   9434880.       0.00
148.0000   7.80E-04   -362125.     21187.  -5.74E-06   349.5575   1.50E+13
-313.2204   9642240.       0.00
150.0000   6.35E-04     56521.     14301.  -5.98E-06   346.0391   1.50E+13
-260.6076   9849600.       0.00
152.0000   4.93E-04    325051.      8697.  -5.68E-06   349.1306   1.50E+13
-206.4049   1.01E+07       0.00
154.0000   3.63E-04    474661.      4359.  -5.04E-06   350.8531   1.50E+13
-155.0758   1.03E+07       0.00
156.0000   2.51E-04    534901.      1185.  -4.23E-06   351.5466   1.50E+13
-109.4488   1.05E+07       0.00
158.0000   1.60E-04    532048.  -980.6816  -3.38E-06   351.5138   1.50E+13
-71.0247   1.07E+07       0.00
160.0000   8.88E-05    488234.     -2316.  -2.56E-06   351.0093   1.50E+13
-40.2858   1.09E+07       0.00
162.0000   3.67E-05    421168.     -3004.  -1.83E-06   350.2372   1.50E+13
-16.9843   1.11E+07       0.00
164.0000   8.36E-07    344279.     -3212.  -1.22E-06   349.3520   1.50E+13
-0.3938   1.13E+07       0.00
166.0000  -2.19E-05    267130.     -3091.  -7.32E-07   348.4638   1.50E+13
10.4816   1.15E+07       0.00
168.0000  -3.43E-05    195992.     -2764.  -3.62E-07   347.6448   1.50E+13
16.7449   1.17E+07       0.00
170.0000  -3.92E-05    134481.     -2330.  -9.76E-08   346.9366   1.50E+13
19.4865   1.19E+07       0.00
172.0000  -3.90E-05     84181.     -1859.   7.73E-08   346.3575   1.50E+13
19.7046   1.21E+07       0.00
174.0000  -3.55E-05     45223.     -1404.   1.81E-07   345.9090   1.50E+13
18.2578   1.23E+07       0.00
176.0000  -3.03E-05     16777.  -994.5759   2.30E-07   345.5815   1.50E+13
15.8439   1.25E+07       0.00
178.0000  -2.45E-05     -2544.  -648.4752   2.42E-07   345.4176   1.50E+13
12.9979   1.28E+07       0.00
180.0000  -1.87E-05    -14378.  -371.2586   2.28E-07   345.5539   1.50E+13
10.1035   1.30E+07       0.00
182.0000  -1.35E-05    -20392.  -161.0662   2.00E-07   345.6231   1.50E+13
7.4125   1.32E+07       0.00
184.0000  -9.09E-06    -22134.   -11.3026   1.66E-07   345.6432   1.50E+13
5.0678   1.34E+07       0.00
186.0000  -5.53E-06    -20954.    87.0400   1.32E-07   345.6296   1.50E+13
3.1274   1.36E+07       0.00
188.0000  -2.76E-06    -17972.   143.6184   1.01E-07   345.5952   1.50E+13
1.5874   1.38E+07       0.00
190.0000  -6.89E-07    -14073.   167.4912   7.52E-08   345.5503   1.50E+13
0.4019   1.40E+07       0.00
192.0000   8.44E-07     -9941.   166.3174   5.60E-08   345.5028   1.50E+13
-0.4998   1.42E+07       0.00
194.0000   2.00E-06     -6096.   145.9336   4.31E-08   345.4585   1.50E+13
-1.1989   1.44E+07       0.00
196.0000   2.91E-06     -2941.   110.2419   3.59E-08   345.4222   1.50E+13
-1.7754   1.46E+07       0.00
198.0000   3.72E-06  -808.8495    61.3598   3.29E-08   345.3976   1.50E+13
-2.2981   1.48E+07       0.00
200.0000   4.49E-06       0.00       0.00   3.23E-08   345.3883   1.50E+13
-2.8152   7516800.       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 7:

```
Pile-head deflection             =     6.00910761 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -474645567. inch-lbs
Maximum shear force              =        897233. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             16
Number of zero deflection points =              4
```

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type 1	Load 1	Load Type 2	Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	y, in	0.5000	S, rad	0.00	2500000.	0.5009	0.00	-103997.	-4.86E+07
2	y, in	1.0000	S, rad	0.00	2500000.	1.0018	0.00	-207466.	-9.63E+07
3	y, in	2.0000	S, rad	0.00	2500000.	2.0035	0.00	368685.	-1.83E+08
4	y, in	3.0000	S, rad	0.00	2500000.	3.0050	0.00	520769.	-2.63E+08
5	y, in	4.0000	S, rad	0.00	2500000.	4.0065	0.00	658519.	-3.38E+08
6	y, in	5.0000	S, rad	0.00	2500000.	5.0078	0.00	783791.	-4.08E+08
7	y, in	6.0000	S, rad	0.00	2500000.	6.0091	0.00	897233.	-4.75E+08

Maximum pile-head deflection = 6.0091076133 inches
Maximum pile-head rotation = 0.0000000000 radians = 0.000000 deg.

The analysis ended normally.

File name is incorrect below, run designation is "Channel Post Seismic Trans.(No scour) 96in"

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LPile for Windows, Version 2016-09.009

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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Files Used for Analysis

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Path to file locations:
\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis
\L-Pile\Channel\Transverse\Post Seismic (No Scour)\

Name of input data file:
Channel Static 24in.lp9d

Name of output report file:
Channel Static 24in.lp9o

Name of plot output file:
Channel Static 24in.lp9p

Name of runtime message file:
Channel Static 24in.lp9r

--
Date and Time of Analysis

--

Date: October 4, 2017 Time: 12:08:43

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Problem Title

Project Name: Harbor River Bridge
Job Number: 18461-007-01
Client: SCDOT
Engineer: HPC
Description: Channel - Static

Program Options and Settings

Computational Options:
- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:
- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed	=	500
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	100

Loading Type and Number of Cycles of Loading:
- Static loading specified

- Analysis uses p-y modification factors for p-y curves
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined	=	1
Total length of pile	=	200.000 ft
Depth of ground surface below top of pile	=	45.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	96.0000
2	200.000	96.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile

Cross-sectional Shape	=	Circular Pile
Length of section	=	200.000000 ft
Width of top of section	=	96.000000 in
Width of bottom of section	=	96.000000 in
Top Area	=	7238. sq. in
Bottom Area	=	7238. sq. in
Moment of Inertia at Top	=	4169220. in^4
Moment of Inertia at Bottom	=	4169220. in^4
Elastic Modulus	=	3600000. psi

--
Ground Slope and Pile Batter Angles

--

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

--
Soil and Rock Layering Information

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The soil profile is modelled using 3 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	45.000000 ft
Distance from top of pile to bottom of layer	=	60.000000 ft
Effective unit weight at top of layer	=	37.600000 pcf
Effective unit weight at bottom of layer	=	37.600000 pcf
Undrained cohesion at top of layer	=	0.0000 psf
Undrained cohesion at bottom of layer	=	45.000000 psf
Epsilon-50 at top of layer	=	0.020000
Epsilon-50 at bottom of layer	=	0.020000

Layer 2 is stiff clay with water-induced erosion

Distance from top of pile to top of layer	=	60.000000	ft
Distance from top of pile to bottom of layer	=	100.000000	ft
Effective unit weight at top of layer	=	57.600000	pcf
Effective unit weight at bottom of layer	=	57.600000	pcf
Undrained cohesion at top of layer	=	3400.	psf
Undrained cohesion at bottom of layer	=	3400.	psf
Epsilon-50 at top of layer	=	0.005000	
Epsilon-50 at bottom of layer	=	0.005000	
Subgrade k at top of layer	=	400.000000	pci
Subgrade k at bottom of layer	=	400.000000	pci

Layer 3 is stiff clay with water-induced erosion

Distance from top of pile to top of layer	=	100.000000	ft
Distance from top of pile to bottom of layer	=	210.000000	ft
Effective unit weight at top of layer	=	57.600000	pcf
Effective unit weight at bottom of layer	=	57.600000	pcf
Undrained cohesion at top of layer	=	6000.	psf
Undrained cohesion at bottom of layer	=	6000.	psf
Epsilon-50 at top of layer	=	0.005000	
Epsilon-50 at bottom of layer	=	0.005000	
Subgrade k at top of layer	=	800.000000	pci
Subgrade k at bottom of layer	=	800.000000	pci

(Depth of the lowest soil layer extends 10.000 ft below the pile tip)

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Summary of Input Soil Properties

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Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	E50 or krm	kpy pci
1	Soft Clay	45.0000	37.6000	0.00	0.02000	--
		60.0000	37.6000	45.0000	0.02000	--
2	Stiff Clay with Free Water	60.0000	57.6000	3400.	0.00500	400.0000
		100.0000	57.6000	3400.	0.00500	400.0000
3	Stiff Clay with Free Water	100.0000	57.6000	6000.	0.00500	800.0000
		210.0000	57.6000	6000.	0.00500	800.0000

--

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 4 points

Point No.	Depth X ft	p-mult	y-mult
1	45.000	0.0450	1.0000
2	60.000	0.0450	1.0000
3	60.000	0.4500	1.0000
4	210.000	0.4500	1.0000

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 7

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	5	y = 0.500000 in	S = 0.0000 in/in	2500000.	N.A.
2	5	y = 1.000000 in	S = 0.0000 in/in	2500000.	N.A.
3	5	y = 2.000000 in	S = 0.0000 in/in	2500000.	N.A.
4	5	y = 3.000000 in	S = 0.0000 in/in	2500000.	N.A.
5	5	y = 4.000000 in	S = 0.0000 in/in	2500000.	N.A.
6	5	y = 5.000000 in	S = 0.0000 in/in	2500000.	N.A.
7	5	y = 6.000000 in	S = 0.0000 in/in	2500000.	N.A.

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).

File name is incorrect below, run designation is "Channel Post Seismic Trans.(No scour) 96in"

Channel Static 24in.lp9o 10/4/2017

Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

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Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	45.0000	0.00	N.A.	No	0.00	27077.
2	60.0000	40.6795	No	No	27077.	1049005.
3	100.0000	80.6795	Yes	No	1076082.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 2500000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				

File name is incorrect below, run designation is "Channel Post Seismic Trans.(No scour) 96in"


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---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     0.5010  -5.22E+07    112171.       0.00   945.8653   1.50E+13
      0.00       0.00       0.00
    2.0000     0.5000  -4.95E+07    112166.  -8.12E-05   914.8440   1.50E+13
    0.00       0.00       0.00
    4.0000     0.4971  -4.68E+07    112166.  -1.58E-04   883.7680   1.50E+13
    0.00       0.00       0.00
    6.0000     0.4924  -4.41E+07    112166.  -2.31E-04   852.6404   1.50E+13
    0.00       0.00       0.00
    8.0000     0.4860  -4.14E+07    112166.  -2.99E-04   821.4640   1.50E+13
    0.00       0.00       0.00
   10.0000     0.4781  -3.86E+07    112166.  -3.63E-04   790.2421   1.50E+13
   0.00       0.00       0.00
   12.0000     0.4686  -3.59E+07    112166.  -4.23E-04   758.9774   1.50E+13
   0.00       0.00       0.00
   14.0000     0.4578  -3.32E+07    112166.  -4.78E-04   727.6730   1.50E+13
   0.00       0.00       0.00
   16.0000     0.4457  -3.05E+07    112166.  -5.29E-04   696.3320   1.50E+13
   0.00       0.00       0.00
   18.0000     0.4324  -2.78E+07    112166.  -5.75E-04   664.9573   1.50E+13
   0.00       0.00       0.00
   20.0000     0.4180  -2.50E+07    112166.  -6.18E-04   633.5520   1.50E+13
   0.00       0.00       0.00
   22.0000     0.4027  -2.23E+07    112166.  -6.55E-04   602.1190   1.50E+13
   0.00       0.00       0.00
   24.0000     0.3866  -1.96E+07    112166.  -6.89E-04   570.6613   1.50E+13
   0.00       0.00       0.00
   26.0000     0.3697  -1.68E+07    112166.  -7.18E-04   539.1821   1.50E+13
   0.00       0.00       0.00
   28.0000     0.3521  -1.41E+07    112166.  -7.43E-04   507.6843   1.50E+13
   0.00       0.00       0.00
   30.0000     0.3340  -1.14E+07    112166.  -7.63E-04   476.1709   1.50E+13
   0.00       0.00       0.00
   32.0000     0.3155  -8621302.    112166.  -7.79E-04   444.6449   1.50E+13
   0.00       0.00       0.00
   34.0000     0.2966  -5882169.    112166.  -7.91E-04   413.1094   1.50E+13
   0.00       0.00       0.00
   36.0000     0.2775  -3142473.    112166.  -7.98E-04   381.5674   1.50E+13
   0.00       0.00       0.00
   38.0000     0.2583   -402475.    112166.  -8.01E-04   350.0220   1.50E+13
   0.00       0.00       0.00
   40.0000     0.2391   2337562.    112166.  -7.99E-04   372.3006   1.50E+13
   0.00       0.00       0.00
   42.0000     0.2200   5077375.    112166.  -7.93E-04   403.8439   1.50E+13
   0.00       0.00       0.00
   44.0000     0.2010   7816700.    112166.  -7.83E-04   435.3816   1.50E+13
   0.00       0.00       0.00
   46.0000     0.1824   1.06E+07    112164.  -7.68E-04   466.9106   1.50E+13
   -0.1362    17.9171       0.00
   48.0000     0.1641   1.33E+07    112158.  -7.49E-04   498.4271   1.50E+13
   -0.3944    57.6620       0.00
   50.0000     0.1464   1.60E+07    112145.  -7.26E-04   529.9263   1.50E+13
   -0.6327   103.7108       0.00
   52.0000     0.1293   1.88E+07    112127.  -6.98E-04   561.4036   1.50E+13
   -0.8499   157.7361       0.00
   54.0000     0.1129   2.15E+07    112105.  -6.66E-04   592.8546   1.50E+13
   -1.0444   221.9814       0.00
   56.0000    0.09736   2.42E+07    112078.  -6.29E-04   624.2749   1.50E+13
   -1.2150   299.5085       0.00
   58.0000    0.08272   2.69E+07    112047.  -5.88E-04   655.6603   1.50E+13
   -1.3600   394.5726       0.00
   60.0000    0.06912   2.97E+07    103845.  -5.43E-04   687.0070   1.50E+13
```

```
 -682.1178    236848.       0.00
 62.0000    0.05666   3.20E+07     72531.  -4.94E-04   713.7975   1.50E+13
 -1927.    816459.       0.00
 64.0000    0.04542   3.32E+07     28692.  -4.42E-04   727.7710   1.50E+13
 -1726.    911857.       0.00
 66.0000    0.03546   3.34E+07    -10316.  -3.88E-04   730.2633   1.50E+13
 -1525.   1031996.       0.00
 68.0000    0.02679   3.28E+07    -44518.  -3.35E-04   722.6065   1.50E+13
 -1325.   1187447.       0.00
 70.0000    0.01937   3.13E+07    -72971.  -2.84E-04   706.1250   1.50E+13
 -1046.   1296000.       0.00
 72.0000    0.01315   2.93E+07    -94722.  -2.36E-04   682.6739   1.50E+13
 -766.8527   1399680.       0.00
 74.0000    0.00806   2.68E+07   -109980.  -1.91E-04   654.1051   1.50E+13
 -504.6425   1503360.       0.00
 76.0000    0.00399   2.40E+07   -119244.  -1.50E-04   622.1602   1.50E+13
 -267.3359   1607040.       0.00
 78.0000   8.51E-04   2.11E+07   -123180.  -1.14E-04   588.4158   1.50E+13
 -60.6794   1710720.       0.00
 80.0000   -0.00148   1.81E+07   -122566.  -8.26E-05   554.2458   1.50E+13
 111.8741   1814400.       0.00
 82.0000   -0.00311   1.52E+07   -118236.  -5.59E-05   520.7976   1.50E+13
 248.9286   1918080.       0.00
 84.0000   -0.00416   1.25E+07   -111039.  -3.38E-05   488.9833   1.50E+13
 350.8537   2021760.       0.00
 86.0000   -0.00474   9910032.   -101795.  -1.59E-05   459.4820   1.50E+13
 419.4635   2125440.       0.00
 88.0000   -0.00493   7588241.    -91269.  -1.90E-06   432.7513   1.50E+13
 457.6880   2229120.       0.00
 90.0000   -0.00483   5529350.    -80146.   8.59E-06   409.0474   1.50E+13
 469.2594   2332800.       0.00
 92.0000   -0.00452   3740221.    -69013.   1.60E-05   388.4493   1.50E+13
 458.4248   2436480.       0.00
 94.0000   -0.00406   2214787.    -58356.   2.08E-05   370.8870   1.50E+13
 429.7013   2540160.       0.00
 96.0000   -0.00352    936648.    -48547.   2.33E-05   356.1719   1.50E+13
 387.6774   2643840.       0.00
 98.0000   -0.00294   -118279.    -39853.   2.39E-05   346.7501   1.50E+13
 336.8668   2747520.       0.00
100.0000   -0.00237   -979159.    -29271.   2.31E-05   356.6613   1.50E+13
544.9848   5517708.       0.00
102.0000   -0.00184  -1526034.    -17306.   2.11E-05   362.9575   1.50E+13
452.0871   5909760.       0.00
104.0000   -0.00136  -1812361.     -7721.   1.84E-05   366.2539   1.50E+13
346.6375   6117120.       0.00
106.0000  -9.54E-04  -1898850.  -545.8874   1.54E-05   367.2497   1.50E+13
251.2917   6324480.       0.00
108.0000  -6.20E-04  -1840413.      4495.   1.24E-05   366.5769   1.50E+13
168.7558   6531840.       0.00
110.0000  -3.57E-04  -1684596.      7723.   9.61E-06   364.7830   1.50E+13
100.2889   6739200.       0.00
112.0000  -1.59E-04  -1470852.      9479.   7.08E-06   362.3222   1.50E+13
45.9909   6946560.       0.00
114.0000  -1.71E-05  -1230475.     10092.   4.93E-06   359.5547   1.50E+13
5.0925   7153920.       0.00
116.0000   7.75E-05   -987047.      9867.   3.15E-06   356.7521   1.50E+13
-23.7726   7361280.       0.00
118.0000   1.34E-04   -757217.      9074.   1.76E-06   354.1061   1.50E+13
-42.3267   7568640.       0.00
120.0000   1.62E-04   -551695.      7937.   7.11E-07   351.7400   1.50E+13
-52.4455   7776000.       0.00
122.0000   1.68E-04   -376329.      6636.  -3.09E-08   349.7210   1.50E+13
-55.9994   7983360.       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(No scour) 96in"


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124.0000   1.60E-04   -233182.      5307.  -5.18E-07   348.0729   1.50E+13
-54.7365   8190720.       0.00
126.0000   1.43E-04   -121541.      4047.  -8.02E-07   346.7876   1.50E+13
-50.2046   8398080.       0.00
128.0000   1.22E-04    -38806.      2921.  -9.30E-07   345.8351   1.50E+13
-43.7081   8605440.       0.00
130.0000   9.88E-05     18757.      1961.  -9.46E-07   345.6043   1.50E+13
-36.2920   8812800.       0.00
132.0000   7.65E-05     55414.      1180.  -8.87E-07   346.0263   1.50E+13
-28.7478   9020160.       0.00
134.0000   5.63E-05     75507.   575.4706  -7.82E-07   346.2576   1.50E+13
-21.6351   9227520.       0.00
136.0000   3.90E-05     83130.   132.1033  -6.55E-07   346.3454   1.50E+13
-15.3122   9434880.       0.00
138.0000   2.48E-05     81926.  -171.3031  -5.23E-07   346.3315   1.50E+13
-9.9717   9642240.       0.00
140.0000   1.38E-05     74971.  -359.0912  -3.98E-07   346.2515   1.50E+13
-5.6773   9849600.       0.00
142.0000   5.72E-06     64738.  -456.0041  -2.86E-07   346.1337   1.50E+13
-2.3987   1.01E+07       0.00
144.0000   9.95E-08     53117.  -485.3000  -1.92E-07   345.9999   1.50E+13
-0.04257   1.03E+07       0.00
146.0000  -3.49E-06     41466.  -467.5542  -1.16E-07   345.8657   1.50E+13
1.5214   1.05E+07       0.00
148.0000  -5.48E-06     30688.  -420.0265  -5.86E-08   345.7416   1.50E+13
2.4393   1.07E+07       0.00
150.0000  -6.30E-06     21312.  -356.4669  -1.70E-08   345.6337   1.50E+13
2.8574   1.09E+07       0.00
152.0000  -6.30E-06     13580.  -287.2394   1.09E-08   345.5447   1.50E+13
2.9116   1.11E+07       0.00
154.0000  -5.78E-06      7523.  -219.6560   2.77E-08   345.4749   1.50E+13
2.7204   1.13E+07       0.00
156.0000  -4.97E-06      3033.  -158.4311   3.62E-08   345.4232   1.50E+13
2.3817   1.15E+07       0.00
158.0000  -4.04E-06   -85.8233  -106.1839   3.85E-08   345.3893   1.50E+13
1.9722   1.17E+07       0.00
160.0000  -3.12E-06     -2069.   -63.9370   3.68E-08   345.4121   1.50E+13
1.5484   1.19E+07       0.00
162.0000  -2.27E-06     -3159.   -31.5728   3.26E-08   345.4247   1.50E+13
1.1487   1.21E+07       0.00
164.0000  -1.55E-06     -3588.    -8.2284   2.72E-08   345.4296   1.50E+13
0.7967   1.23E+07       0.00
166.0000  -9.65E-07     -3557.     7.3829   2.15E-08   345.4293   1.50E+13
0.5042   1.25E+07       0.00
168.0000  -5.16E-07     -3236.    16.7240   1.61E-08   345.4256   1.50E+13
0.2742   1.28E+07       0.00
170.0000  -1.92E-07     -2757.    21.2559   1.13E-08   345.4201   1.50E+13
0.1035   1.30E+07       0.00
172.0000   2.70E-08     -2217.    22.3195   7.34E-09   345.4139   1.50E+13
-0.01483   1.32E+07       0.00
174.0000   1.61E-07     -1686.    21.0679   4.22E-09   345.4077   1.50E+13
-0.08948   1.34E+07       0.00
176.0000   2.29E-07     -1206.    18.4363   1.90E-09   345.4022   1.50E+13
-0.1298   1.36E+07       0.00
178.0000   2.52E-07  -801.4622    15.1415   2.98E-10   345.3976   1.50E+13
-0.1447   1.38E+07       0.00
180.0000   2.44E-07  -479.7329    11.6990  -7.26E-10   345.3939   1.50E+13
-0.1421   1.40E+07       0.00
182.0000   2.17E-07  -239.8207     8.4520  -1.30E-09   345.3911   1.50E+13
-0.1285   1.42E+07       0.00
184.0000   1.81E-07   -73.8805     5.6046  -1.55E-09   345.3892   1.50E+13
-0.1088   1.44E+07       0.00
186.0000   1.43E-07    29.3887     3.2570  -1.59E-09   345.3887   1.50E+13
```

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  -0.08682   1.46E+07       0.00
  188.0000   1.05E-07    82.6451     1.4368  -1.50E-09   345.3893   1.50E+13
  -0.06486   1.48E+07       0.00
  190.0000   7.06E-08    98.5356     0.1278  -1.35E-09   345.3895   1.50E+13
  -0.04423   1.50E+07       0.00
  192.0000   4.00E-08    88.9399    -0.7079  -1.20E-09   345.3894   1.50E+13
  -0.02541   1.52E+07       0.00
  194.0000   1.28E-08    64.6992    -1.1120  -1.08E-09   345.3891   1.50E+13
  -0.00826   1.54E+07       0.00
  196.0000  -1.19E-08    35.6952    -1.1182  -1.00E-09   345.3887   1.50E+13
  0.00774   1.57E+07       0.00
  198.0000  -3.52E-08    11.1476    -0.7461  -9.63E-10   345.3885   1.50E+13
  0.02327   1.59E+07       0.00
  200.0000  -5.81E-08       0.00       0.00  -9.54E-10   345.3883   1.50E+13
  0.03891   8035200.       0.00

* The above values of total stress are combined axial and bending stresses.


Output Summary for Load Case No. 1:

Pile-head deflection             =     0.50100080 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -52156685. inch-lbs
Maximum shear force              =       -123180. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    78.00000000 feet below pile head
Number of iterations             =              7
Number of zero deflection points =              5



-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 2
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     1.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     1.0019  -9.94E+07    209160.       0.00      1490.   1.50E+13
      0.00       0.00       0.00
    2.0000     1.0000  -9.44E+07    209150.  -1.55E-04      1432.   1.50E+13
    0.00       0.00       0.00
    4.0000     0.9945  -8.94E+07    209150.  -3.02E-04      1374.   1.50E+13
    0.00       0.00       0.00
    6.0000     0.9855  -8.43E+07    209150.  -4.41E-04      1316.   1.50E+13
    0.00       0.00       0.00
    8.0000     0.9733  -7.93E+07    209150.  -5.72E-04      1258.   1.50E+13
    0.00       0.00       0.00
   10.0000     0.9581  -7.42E+07    209150.  -6.94E-04      1200.   1.50E+13
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0.00        0.00        0.00
12.0000      0.9400  -6.92E+07    209150.  -8.09E-04      1142.   1.50E+13
0.00        0.00        0.00
14.0000      0.9192  -6.41E+07    209150.  -9.16E-04      1083.   1.50E+13
0.00        0.00        0.00
16.0000      0.8960  -5.90E+07    209150.   -0.00101      1025.   1.50E+13
0.00        0.00        0.00
18.0000      0.8706  -5.39E+07    209150.   -0.00110   966.2498   1.50E+13
0.00        0.00        0.00
20.0000      0.8430  -4.88E+07    209150.   -0.00119   907.6669   1.50E+13
0.00        0.00        0.00
22.0000      0.8136  -4.37E+07    209150.   -0.00126   849.0299   1.50E+13
0.00        0.00        0.00
24.0000      0.7825  -3.86E+07    209150.   -0.00133   790.3447   1.50E+13
0.00        0.00        0.00
26.0000      0.7500  -3.35E+07    209150.   -0.00138   731.6168   1.50E+13
0.00        0.00        0.00
28.0000      0.7161  -2.84E+07    209150.   -0.00143   672.8518   1.50E+13
0.00        0.00        0.00
30.0000      0.6812  -2.33E+07    209150.   -0.00147   614.0554   1.50E+13
0.00        0.00        0.00
32.0000      0.6453  -1.82E+07    209150.   -0.00151   555.2332   1.50E+13
0.00        0.00        0.00
34.0000      0.6088  -1.31E+07    209150.   -0.00153   496.3909   1.50E+13
0.00        0.00        0.00
36.0000      0.5717  -8003670.    209150.   -0.00155   437.5341   1.50E+13
0.00        0.00        0.00
38.0000      0.5344  -2890675.    209150.   -0.00156   378.6685   1.50E+13
0.00        0.00        0.00
40.0000      0.4969   2222598.    209150.   -0.00156   370.9770   1.50E+13
0.00        0.00        0.00
42.0000      0.4595   7335658.    209150.   -0.00155   429.8434   1.50E+13
0.00        0.00        0.00
44.0000      0.4224   1.24E+07    209150.   -0.00154   488.7016   1.50E+13
0.00        0.00        0.00
46.0000      0.3858   1.76E+07    209148.   -0.00151   547.5461   1.50E+13
-0.1748    10.8734        0.00
48.0000      0.3498   2.27E+07    209140.   -0.00148   606.3701   1.50E+13
-0.5075    34.8184        0.00
50.0000      0.3148   2.78E+07    209124.   -0.00144   665.1657   1.50E+13
-0.8166    62.2662        0.00
52.0000      0.2807   3.29E+07    209101.   -0.00139   723.9251   1.50E+13
-1.1005    94.0790        0.00
54.0000      0.2480   3.80E+07    209071.   -0.00133   782.6410   1.50E+13
-1.3576   131.3875        0.00
56.0000      0.2167   4.31E+07    209036.   -0.00127   841.3059   1.50E+13
-1.5863   175.6961        0.00
58.0000      0.1871   4.82E+07    208996.   -0.00120   899.9127   1.50E+13
-1.7851   229.0358        0.00
60.0000      0.1593   5.33E+07    196549.   -0.00112   958.4544   1.50E+13
-1035.    156036.        0.00
62.0000      0.1335   5.77E+07    148619.   -0.00103      1010.   1.50E+13
-2959.    531878.        0.00
64.0000      0.1100   6.05E+07     80888.  -9.32E-04      1042.   1.50E+13
-2685.    586033.        0.00
66.0000     0.08877   6.17E+07     19712.  -8.34E-04      1056.   1.50E+13
-2413.    652311.        0.00
68.0000     0.06992   6.16E+07    -34935.  -7.36E-04      1054.   1.50E+13
-2141.    734974.        0.00
70.0000     0.05344   6.01E+07    -83095.  -6.39E-04      1038.   1.50E+13
-1872.    840708.        0.00
72.0000     0.03927   5.76E+07   -124817.  -5.44E-04      1009.   1.50E+13
-1605.    980769.        0.00
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 74.0000    0.02731   5.42E+07   -160134.  -4.55E-04   969.5457   1.50E+13
 -1338.   1176124.       0.00
 76.0000    0.01743   5.00E+07   -189024.  -3.72E-04   921.1459   1.50E+13
 -1069.   1472276.       0.00
 78.0000    0.00947   4.52E+07   -209955.  -2.96E-04   865.6003   1.50E+13
 -674.9544   1710720.       0.00
 80.0000    0.00324   4.00E+07   -220996.  -2.27E-04   805.5288   1.50E+13
 -245.1321   1814400.       0.00
 82.0000   -0.00145   3.46E+07   -222546.  -1.68E-04   743.7877   1.50E+13
 115.9063   1918080.       0.00
 84.0000   -0.00482   2.93E+07   -216288.  -1.17E-04   682.7769   1.50E+13
 405.6197   2021760.       0.00
 86.0000   -0.00706   2.42E+07   -203923.  -7.40E-05   624.4237   1.50E+13
 624.8076   2125440.       0.00
 88.0000   -0.00837   1.95E+07   -187540.  -3.90E-05   570.1870   1.50E+13
 740.4591   2124395.       0.00
 90.0000   -0.00893   1.52E+07   -169475.  -1.12E-05   520.8391   1.50E+13
 764.8979   2056659.       0.00
 92.0000   -0.00890   1.14E+07   -151130.   1.01E-05   476.5468   1.50E+13
 763.8781   2059487.       0.00
 94.0000   -0.00844   7983980.   -133038.   2.56E-05   437.3074   1.50E+13
 743.8303   2115049.       0.00
 96.0000   -0.00767   5003383.   -115601.   3.60E-05   402.9920   1.50E+13
 709.2010   2218363.       0.00
 98.0000   -0.00671   2430805.    -99130.   4.19E-05   373.3741   1.50E+13
 663.3682   2371660.       0.00
100.0000   -0.00566    240095.    -81066.   4.41E-05   348.1525   1.50E+13
842.0227   3570465.       0.00
102.0000   -0.00460  -1465634.    -59336.   4.31E-05   362.2621   1.50E+13
968.8190   5057265.       0.00
104.0000   -0.00359  -2613182.    -37434.   3.98E-05   375.4738   1.50E+13
856.2951   5721866.       0.00
106.0000   -0.00269  -3267254.    -18665.   3.51E-05   383.0040   1.50E+13
707.8042   6324480.       0.00
108.0000   -0.00191  -3513317.     -3948.   2.97E-05   385.8370   1.50E+13
518.6365   6531840.       0.00
110.0000   -0.00126  -3460308.      6522.   2.41E-05   385.2267   1.50E+13
353.8447   6739200.       0.00
112.0000  -7.47E-04  -3203153.     13364.   1.88E-05   382.2661   1.50E+13
216.3346   6946560.       0.00
114.0000  -3.58E-04  -2821082.     17240.   1.40E-05   377.8673   1.50E+13
106.6067   7153920.       0.00
116.0000  -7.61E-05  -2377334.     18799.   9.83E-06   372.7584   1.50E+13
23.3499   7361280.       0.00
118.0000   1.14E-04  -1919909.     18647.   6.39E-06   367.4921   1.50E+13
-36.0000   7568640.       0.00
120.0000   2.31E-04  -1483036.     17318.   3.67E-06   362.4624   1.50E+13
-74.7660   7776000.       0.00
122.0000   2.90E-04  -1089085.     15261.   1.62E-06   357.9269   1.50E+13
-96.6151   7983360.       0.00
124.0000   3.08E-04   -750681.     12839.   1.45E-07   354.0309   1.50E+13
-105.2317   8190720.       0.00
126.0000   2.97E-04   -472818.     10328.  -8.33E-07   350.8319   1.50E+13
-104.0769   8398080.       0.00
128.0000   2.68E-04   -254858.      7924.  -1.41E-06   348.3225   1.50E+13
-96.2274   8605440.       0.00
130.0000   2.30E-04    -92300.      5758.  -1.69E-06   346.4510   1.50E+13
-84.2844   8812800.       0.00
132.0000   1.87E-04     21719.      3902.  -1.75E-06   345.6384   1.50E+13
-70.3389   9020160.       0.00
134.0000   1.46E-04     95220.      2386.  -1.66E-06   346.4846   1.50E+13
-55.9816   9227520.       0.00
136.0000   1.08E-04    136467.      1207.  -1.47E-06   346.9595   1.50E+13
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(No scour) 96in"


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-42.3428   9434880.       0.00
138.0000   7.51E-05    153312.   336.6070  -1.24E-06   347.1534   1.50E+13
-30.1533   9642240.       0.00
140.0000   4.83E-05    152773.  -263.0029  -9.93E-07   347.1472   1.50E+13
-19.8142   9849600.       0.00
142.0000   2.74E-05    140807.  -638.4025  -7.59E-07   347.0094   1.50E+13
-11.4691   1.01E+07       0.00
144.0000   1.19E-05    122221.  -836.9180  -5.48E-07   346.7955   1.50E+13
-5.0738   1.03E+07       0.00
146.0000   1.05E-06    100700.  -903.2888  -3.70E-07   346.5477   1.50E+13
-0.4571   1.05E+07       0.00
148.0000  -5.90E-06     78907.  -877.2495  -2.27E-07   346.2968   1.50E+13
2.6270   1.07E+07       0.00
150.0000  -9.83E-06     58620.  -792.2336  -1.17E-07   346.0632   1.50E+13
4.4576   1.09E+07       0.00
152.0000  -1.15E-05     40894.  -674.9475  -3.70E-08   345.8591   1.50E+13
5.3162   1.11E+07       0.00
154.0000  -1.16E-05     26227.  -545.5767   1.66E-08   345.6903   1.50E+13
5.4647   1.13E+07       0.00
156.0000  -1.07E-05     14704.  -418.4119   4.93E-08   345.5576   1.50E+13
5.1324   1.15E+07       0.00
158.0000  -9.24E-06      6137.  -302.7156   6.60E-08   345.4590   1.50E+13
4.5090   1.17E+07       0.00
160.0000  -7.53E-06   166.0592  -203.6887   7.10E-08   345.3902   1.50E+13
3.7433   1.19E+07       0.00
162.0000  -5.83E-06     -3649.  -123.4309   6.83E-08   345.4303   1.50E+13
2.9449   1.21E+07       0.00
164.0000  -4.26E-06     -5767.   -61.8242   6.07E-08   345.4547   1.50E+13
2.1890   1.23E+07       0.00
166.0000  -2.91E-06     -6624.   -17.2960   5.08E-08   345.4646   1.50E+13
1.5217   1.25E+07       0.00
168.0000  -1.82E-06     -6603.    12.5582   4.03E-08   345.4644   1.50E+13
0.9662   1.28E+07       0.00
170.0000  -9.79E-07     -6026.    30.4951   3.02E-08   345.4577   1.50E+13
0.5286   1.30E+07       0.00
172.0000  -3.71E-07     -5143.    39.2788   2.12E-08   345.4475   1.50E+13
0.2034   1.32E+07       0.00
174.0000   4.01E-08     -4143.    41.4512   1.38E-08   345.4360   1.50E+13
-0.02235   1.34E+07       0.00
176.0000   2.92E-07     -3155.    39.2007   7.97E-09   345.4247   1.50E+13
-0.1652   1.36E+07       0.00
178.0000   4.23E-07     -2262.    34.3042   3.64E-09   345.4144   1.50E+13
-0.2428   1.38E+07       0.00
180.0000   4.67E-07     -1509.    28.1248   6.24E-10   345.4057   1.50E+13
-0.2721   1.40E+07       0.00
182.0000   4.53E-07  -912.1440    21.6450  -1.31E-09   345.3988   1.50E+13
-0.2679   1.42E+07       0.00
184.0000   4.04E-07  -469.6871    15.5222  -2.42E-09   345.3937   1.50E+13
-0.2424   1.44E+07       0.00
186.0000   3.37E-07  -166.7904    10.1532  -2.93E-09   345.3903   1.50E+13
-0.2050   1.46E+07       0.00
188.0000   2.63E-07    18.0171     5.7414  -3.04E-09   345.3885   1.50E+13
-0.1626   1.48E+07       0.00
190.0000   1.91E-07   109.1618     2.3581  -2.94E-09   345.3896   1.50E+13
-0.1193   1.50E+07       0.00
192.0000   1.22E-07   131.5607   -0.00341  -2.75E-09   345.3898   1.50E+13
-0.07746   1.52E+07       0.00
194.0000   5.85E-08   109.3283    -1.3849  -2.56E-09   345.3896   1.50E+13
-0.03766   1.54E+07       0.00
196.0000  -7.74E-10    65.3939    -1.8307  -2.42E-09   345.3891   1.50E+13
5.05E-04   1.57E+07       0.00
198.0000  -5.75E-08    21.7441    -1.3682  -2.35E-09   345.3886   1.50E+13
0.03803   1.59E+07       0.00
```

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  200.0000  -1.13E-07       0.00       0.00  -2.33E-09   345.3883   1.50E+13
  0.07599   8035200.       0.00

* The above values of total stress are combined axial and bending stresses.


Output Summary for Load Case No. 2:

Pile-head deflection             =     1.00190793 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =     -99432027. inch-lbs
Maximum shear force              =       -222546. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    82.00000000 feet below pile head
Number of iterations             =              9
Number of zero deflection points =              5



-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 3
-------------------------------------------------------------------------------
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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     2.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     2.0036  -1.88E+08    384923.       0.00      2508.   1.50E+13
      0.00       0.00       0.00
    2.0000     2.0000  -1.79E+08    384904.  -2.93E-04      2401.   1.50E+13
    0.00       0.00       0.00
    4.0000     1.9895  -1.69E+08    384904.  -5.71E-04      2295.   1.50E+13
    0.00       0.00       0.00
    6.0000     1.9726  -1.60E+08    384904.  -8.34E-04      2188.   1.50E+13
    0.00       0.00       0.00
    8.0000     1.9495  -1.51E+08    384904.   -0.00108      2081.   1.50E+13
    0.00       0.00       0.00
   10.0000     1.9206  -1.41E+08    384904.   -0.00132      1974.   1.50E+13
   0.00       0.00       0.00
   12.0000     1.8863  -1.32E+08    384904.   -0.00154      1866.   1.50E+13
   0.00       0.00       0.00
   14.0000     1.8469  -1.23E+08    384904.   -0.00174      1759.   1.50E+13
   0.00       0.00       0.00
   16.0000     1.8028  -1.13E+08    384904.   -0.00193      1651.   1.50E+13
   0.00       0.00       0.00
   18.0000     1.7544  -1.04E+08    384904.   -0.00210      1543.   1.50E+13
   0.00       0.00       0.00
   20.0000     1.7020  -9.47E+07    384904.   -0.00226      1436.   1.50E+13
   0.00       0.00       0.00
   22.0000     1.6459  -8.53E+07    384904.   -0.00240      1328.   1.50E+13
   0.00       0.00       0.00
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(No scour) 96in"


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24.0000     1.5866  -7.59E+07    384904.   -0.00253      1219.   1.50E+13
0.00       0.00       0.00
26.0000     1.5243  -6.65E+07    384904.   -0.00265      1111.   1.50E+13
0.00       0.00       0.00
28.0000     1.4595  -5.71E+07    384904.   -0.00275      1003.   1.50E+13
0.00       0.00       0.00
30.0000     1.3925  -4.77E+07    384904.   -0.00283   894.8521   1.50E+13
0.00       0.00       0.00
32.0000     1.3237  -3.83E+07    384904.   -0.00290   786.5177   1.50E+13
0.00       0.00       0.00
34.0000     1.2534  -2.89E+07    384904.   -0.00295   678.1410   1.50E+13
0.00       0.00       0.00
36.0000     1.1819  -1.95E+07    384904.   -0.00299   569.7323   1.50E+13
0.00       0.00       0.00
38.0000     1.1098  -1.01E+07    384904.   -0.00301   461.3022   1.50E+13
0.00       0.00       0.00
40.0000     1.0372   -649058.    384904.   -0.00302   352.8609   1.50E+13
0.00       0.00       0.00
42.0000     0.9647   8770078.    384904.   -0.00302   446.3578   1.50E+13
0.00       0.00       0.00
44.0000     0.8924   1.82E+07    384904.   -0.00300   554.7901   1.50E+13
0.00       0.00       0.00
46.0000     0.8209   2.76E+07    384902.   -0.00296   663.2023   1.50E+13
-0.2248     6.5725       0.00
48.0000     0.7504   3.70E+07    384891.   -0.00291   771.5825   1.50E+13
-0.6545    20.9335       0.00
50.0000     0.6814   4.64E+07    384871.   -0.00284   879.9175   1.50E+13
-1.0563    37.2084       0.00
52.0000     0.6141   5.58E+07    384841.   -0.00276   988.1942   1.50E+13
-1.4285    55.8301       0.00
54.0000     0.5489   6.52E+07    384803.   -0.00266      1096.   1.50E+13
-1.7693    77.3528       0.00
56.0000     0.4863   7.46E+07    384756.   -0.00255      1205.   1.50E+13
-2.0769   102.4944       0.00
58.0000     0.4266   8.40E+07    384703.   -0.00242      1313.   1.50E+13
-2.3495   132.1953       0.00
60.0000     0.3700   9.34E+07    365737.   -0.00228      1420.   1.50E+13
-1578.    102367.       0.00
62.0000     0.3171   1.02E+08    292506.   -0.00213      1518.   1.50E+13
-4524.    342480.       0.00
64.0000     0.2680   1.08E+08    187910.   -0.00196      1585.   1.50E+13
-4192.    375393.       0.00
66.0000     0.2231   1.11E+08     91712.   -0.00178      1624.   1.50E+13
-3825.    411453.       0.00
68.0000     0.1824   1.12E+08      4314.   -0.00160      1638.   1.50E+13
-3459.    454996.       0.00
70.0000     0.1461   1.11E+08    -74328.   -0.00143      1629.   1.50E+13
-3095.    508455.       0.00
72.0000     0.1140   1.09E+08   -144279.   -0.00125      1599.   1.50E+13
-2734.    575530.       0.00
74.0000    0.08613   1.05E+08   -205608.   -0.00108      1551.   1.50E+13
-2376.    662181.       0.00
76.0000    0.06226   9.92E+07   -258373.  -9.15E-04      1487.   1.50E+13
-2021.    778835.       0.00
78.0000    0.04220   9.24E+07   -302582.  -7.62E-04      1409.   1.50E+13
-1663.    946042.       0.00
80.0000    0.02568   8.47E+07   -338117.  -6.20E-04      1321.   1.50E+13
-1298.   1212690.       0.00
82.0000    0.01242   7.63E+07   -364520.  -4.92E-04      1223.   1.50E+13
-902.4528   1744110.       0.00
84.0000    0.00208   6.73E+07   -377451.  -3.77E-04      1120.   1.50E+13
-175.1845   2021760.       0.00
86.0000   -0.00568   5.82E+07   -373520.  -2.77E-04      1015.   1.50E+13
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 502.7536   2125440.       0.00
 88.0000   -0.01120   4.94E+07   -357205.  -1.91E-04   913.9948   1.50E+13
 856.8581   1836082.       0.00
 90.0000   -0.01483   4.11E+07   -335091.  -1.18E-04   818.2408   1.50E+13
 985.9450   1595791.       0.00
 92.0000   -0.01688   3.33E+07   -310636.  -5.89E-05   728.9796   1.50E+13
 1052.   1495687.       0.00
 94.0000   -0.01765   2.62E+07   -285103.  -1.13E-05   646.6577   1.50E+13
 1076.   1462579.       0.00
 96.0000   -0.01742   1.96E+07   -259369.   2.53E-05   571.4410   1.50E+13
 1069.   1472254.       0.00
 98.0000   -0.01644   1.37E+07   -234087.   5.20E-05   503.2898   1.50E+13
 1038.   1515711.       0.00
100.0000   -0.01493   8392216.   -205221.   6.97E-05   442.0075   1.50E+13
1367.   2198742.       0.00
102.0000   -0.01309   3856165.   -169191.   7.95E-05   389.7841   1.50E+13
1635.   2996948.       0.00
104.0000   -0.01111    261502.   -131496.   8.28E-05   348.3990   1.50E+13
1506.   3253130.       0.00
106.0000   -0.00912  -2465594.    -97046.   8.10E-05   373.7746   1.50E+13
1365.   3590668.       0.00
108.0000   -0.00722  -4406424.    -66096.   7.55E-05   396.1192   1.50E+13
1215.   4034481.       0.00
110.0000   -0.00550  -5647273.    -38809.   6.75E-05   410.4051   1.50E+13
1059.   4625058.       0.00
112.0000   -0.00399  -6277355.    -15270.   5.79E-05   417.6592   1.50E+13
902.1910   5431007.       0.00
114.0000   -0.00272  -6387174.      4494.   4.78E-05   418.9235   1.50E+13
744.7936   6578624.       0.00
116.0000   -0.00169  -6067378.     19661.   3.78E-05   415.2417   1.50E+13
519.1399   7361280.       0.00
118.0000  -9.01E-04  -5447976.     29300.   2.86E-05   408.1106   1.50E+13
284.0796   7568640.       0.00
120.0000  -3.18E-04  -4664421.     33946.   2.05E-05   399.0895   1.50E+13
103.0780   7776000.       0.00
122.0000   8.55E-05  -3821045.     34841.   1.38E-05   389.3798   1.50E+13
-28.4483   7983360.       0.00
124.0000   3.43E-04  -2993690.     33097.   8.32E-06   379.8545   1.50E+13
-116.9051   8190720.       0.00
126.0000   4.85E-04  -2233384.     29659.   4.14E-06   371.1012   1.50E+13
-169.6020   8398080.       0.00
128.0000   5.41E-04  -1570555.     25295.   1.10E-06   363.4700   1.50E+13
-194.0231   8605440.       0.00
130.0000   5.37E-04  -1019332.     20600.  -9.75E-07   357.1238   1.50E+13
-197.2872   8812800.       0.00
132.0000   4.94E-04   -581649.     16003.  -2.26E-06   352.0848   1.50E+13
-185.7827   9020160.       0.00
134.0000   4.29E-04   -250921.     11794.  -2.92E-06   348.2772   1.50E+13
-164.9537   9227520.       0.00
136.0000   3.54E-04    -15183.      8144.  -3.13E-06   345.5631   1.50E+13
-139.2109   9434880.       0.00
138.0000   2.79E-04    140372.      5130.  -3.03E-06   347.0044   1.50E+13
-111.9396   9642240.       0.00
140.0000   2.09E-04    231436.      2760.  -2.74E-06   348.0528   1.50E+13
-85.5746   9849600.       0.00
142.0000   1.47E-04    273186.   992.5966  -2.33E-06   348.5335   1.50E+13
-61.7199   1.01E+07       0.00
144.0000   9.65E-05    279360.  -243.5335  -1.89E-06   348.6046   1.50E+13
-41.2910   1.03E+07       0.00
146.0000   5.65E-05    261724.     -1035.  -1.46E-06   348.4015   1.50E+13
-24.6629   1.05E+07       0.00
148.0000   2.65E-05    229856.     -1473.  -1.07E-06   348.0347   1.50E+13
-11.8125   1.07E+07       0.00
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  150.0000   5.39E-06    191163.     -1644.  -7.29E-07   347.5892   1.50E+13
  -2.4453   1.09E+07       0.00
  152.0000  -8.43E-06    151042.     -1626.  -4.55E-07   347.1273   1.50E+13
  3.8964   1.11E+07       0.00
  154.0000  -1.65E-05    113152.     -1487.  -2.44E-07   346.6910   1.50E+13
  7.7475   1.13E+07       0.00
  156.0000  -2.01E-05     79713.     -1278.  -8.97E-08   346.3061   1.50E+13
  9.6550   1.15E+07       0.00
  158.0000  -2.08E-05     51828.     -1040.   1.55E-08   345.9850   1.50E+13
  10.1328   1.17E+07       0.00
  160.0000  -1.94E-05     29774.  -803.1611   8.07E-08   345.7311   1.50E+13
  9.6332   1.19E+07       0.00
  162.0000  -1.69E-05     13266.  -585.1733   1.15E-07   345.5411   1.50E+13
  8.5325   1.21E+07       0.00
  164.0000  -1.39E-05      1672.  -397.2643   1.27E-07   345.4076   1.50E+13
  7.1266   1.23E+07       0.00
  166.0000  -1.08E-05     -5818.  -244.1235   1.24E-07   345.4553   1.50E+13
  5.6351   1.25E+07       0.00
  168.0000  -7.92E-06    -10061.  -125.9949   1.11E-07   345.5042   1.50E+13
  4.2089   1.28E+07       0.00
  170.0000  -5.45E-06    -11879.   -40.1852   9.36E-08   345.5251   1.50E+13
  2.9419   1.30E+07       0.00
  172.0000  -3.43E-06    -12001.    17.7031   7.45E-08   345.5265   1.50E+13
  1.8822   1.32E+07       0.00
  174.0000  -1.87E-06    -11038.    52.8199   5.60E-08   345.5154   1.50E+13
  1.0442   1.34E+07       0.00
  176.0000  -7.41E-07     -9472.    70.3805   3.96E-08   345.4974   1.50E+13
  0.4191   1.36E+07       0.00
  178.0000   2.90E-08     -7664.    75.2101   2.59E-08   345.4766   1.50E+13
  -0.01668   1.38E+07       0.00
  180.0000   5.05E-07     -5865.    71.4789   1.51E-08   345.4559   1.50E+13
  -0.2943   1.40E+07       0.00
  182.0000   7.55E-07     -4235.    62.5857   7.05E-09   345.4371   1.50E+13
  -0.4468   1.42E+07       0.00
  184.0000   8.43E-07     -2862.    51.1496   1.38E-09   345.4213   1.50E+13
  -0.5062   1.44E+07       0.00
  186.0000   8.21E-07     -1780.    39.0745  -2.34E-09   345.4088   1.50E+13
  -0.5001   1.46E+07       0.00
  188.0000   7.31E-07  -986.1191    27.6559  -4.55E-09   345.3997   1.50E+13
  -0.4515   1.48E+07       0.00
  190.0000   6.03E-07  -452.0744    17.7080  -5.70E-09   345.3935   1.50E+13
  -0.3775   1.50E+07       0.00
  192.0000   4.57E-07  -135.4505     9.6927  -6.17E-09   345.3899   1.50E+13
  -0.2904   1.52E+07       0.00
  194.0000   3.07E-07    13.9147     3.8390  -6.26E-09   345.3885   1.50E+13
  -0.1974   1.54E+07       0.00
  196.0000   1.57E-07    49.5742     0.2444  -6.21E-09   345.3889   1.50E+13
  -0.1022   1.57E+07       0.00
  198.0000   8.41E-09    26.3901    -1.0482  -6.15E-09   345.3886   1.50E+13
  -0.00556   1.59E+07       0.00
  200.0000  -1.39E-07       0.00       0.00  -6.13E-09   345.3883   1.50E+13
  0.09291   8035200.       0.00

* The above values of total stress are combined axial and bending stresses.


Output Summary for Load Case No. 3:

Pile-head deflection             =     2.00360392 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -187819137. inch-lbs
Maximum shear force              =        384923. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(No scour) 96in"

Channel Static 24in.lp9o 10/4/2017

Depth of maximum shear force = 0.000000 feet below pile head
Number of iterations = 12
Number of zero deflection points = 5

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Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 4

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Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 3.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 2500000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch				
0.00	3.0052	-2.70E+08	543483.	0.00	3457.	1.50E+13
0.00	0.00	0.00				
2.0000	3.0000	-2.57E+08	543457.	-4.22E-04	3307.	1.50E+13
0.00	0.00	0.00				
4.0000	2.9849	-2.44E+08	543457.	-8.23E-04	3156.	1.50E+13
0.00	0.00	0.00				
6.0000	2.9605	-2.31E+08	543457.	-0.00120	3005.	1.50E+13
0.00	0.00	0.00				
8.0000	2.9272	-2.18E+08	543457.	-0.00156	2854.	1.50E+13
0.00	0.00	0.00				
10.0000	2.8856	-2.05E+08	543457.	-0.00190	2703.	1.50E+13
0.00	0.00	0.00				
12.0000	2.8361	-1.92E+08	543457.	-0.00222	2551.	1.50E+13
0.00	0.00	0.00				
14.0000	2.7792	-1.78E+08	543457.	-0.00251	2399.	1.50E+13
0.00	0.00	0.00				
16.0000	2.7155	-1.65E+08	543457.	-0.00279	2247.	1.50E+13
0.00	0.00	0.00				
18.0000	2.6454	-1.52E+08	543457.	-0.00304	2095.	1.50E+13
0.00	0.00	0.00				
20.0000	2.5696	-1.39E+08	543457.	-0.00327	1943.	1.50E+13
0.00	0.00	0.00				
22.0000	2.4883	-1.26E+08	543457.	-0.00348	1790.	1.50E+13
0.00	0.00	0.00				
24.0000	2.4023	-1.12E+08	543457.	-0.00367	1638.	1.50E+13
0.00	0.00	0.00				
26.0000	2.3120	-9.90E+07	543457.	-0.00384	1485.	1.50E+13
0.00	0.00	0.00				
28.0000	2.2179	-8.57E+07	543457.	-0.00399	1332.	1.50E+13
0.00	0.00	0.00				
30.0000	2.1204	-7.24E+07	543457.	-0.00412	1179.	1.50E+13
0.00	0.00	0.00				
32.0000	2.0203	-5.91E+07	543457.	-0.00422	1026.	1.50E+13
0.00	0.00	0.00				
34.0000	1.9178	-4.58E+07	543457.	-0.00431	872.8775	1.50E+13
0.00	0.00	0.00				
36.0000	1.8136	-3.25E+07	543457.	-0.00437	719.7148	1.50E+13

File name is incorrect below, run designation is "Channel Post Seismic Trans.(No scour) 96in"


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0.00        0.00        0.00
38.0000      1.7081  -1.92E+07    543457.   -0.00441   566.5163   1.50E+13
0.00        0.00        0.00
40.0000      1.6019  -5898422.    543457.   -0.00443   413.2965   1.50E+13
0.00        0.00        0.00
42.0000      1.4954   7410622.    543457.   -0.00443   430.7064   1.50E+13
0.00        0.00        0.00
44.0000      1.3893   2.07E+07    543457.   -0.00441   583.9245   1.50E+13
0.00        0.00        0.00
46.0000      1.2839   3.40E+07    543453.   -0.00436   737.1197   1.50E+13
-0.2610      4.8778       0.00
48.0000      1.1799   4.73E+07    543441.   -0.00430   890.2756   1.50E+13
-0.7611     15.4815       0.00
50.0000      1.0777   6.06E+07    543417.   -0.00421      1043.   1.50E+13
-1.2308     27.4096       0.00
52.0000      0.9778   7.39E+07    543382.   -0.00410      1196.   1.50E+13
-1.6681     40.9448       0.00
54.0000      0.8807   8.72E+07    543338.   -0.00397      1349.   1.50E+13
-2.0712     56.4438       0.00
56.0000      0.7870   1.00E+08    543283.   -0.00382      1502.   1.50E+13
-2.4383     74.3609       0.00
58.0000      0.6971   1.14E+08    543221.   -0.00365      1655.   1.50E+13
-2.7675     95.2805       0.00
60.0000      0.6116   1.27E+08    518840.   -0.00346      1807.   1.50E+13
-2029.      79622.       0.00
62.0000      0.5310   1.39E+08    429675.   -0.00325      1946.   1.50E+13
-5401.     244149.       0.00
64.0000      0.4557   1.48E+08    303032.   -0.00302      2049.   1.50E+13
-5152.     271365.       0.00
66.0000      0.3861   1.54E+08    182757.   -0.00278      2118.   1.50E+13
-4871.     302797.       0.00
68.0000      0.3224   1.57E+08     69659.   -0.00253      2154.   1.50E+13
-4554.     339068.       0.00
70.0000      0.2647   1.58E+08    -34980.   -0.00228      2160.   1.50E+13
-4166.     377746.       0.00
72.0000      0.2130   1.56E+08   -129821.   -0.00203      2138.   1.50E+13
-3738.     421034.       0.00
74.0000      0.1674   1.52E+08   -214428.   -0.00178      2091.   1.50E+13
-3313.     474988.       0.00
76.0000      0.1276   1.46E+08   -288890.   -0.00154      2022.   1.50E+13
-2892.     544117.       0.00
78.0000     0.09332   1.38E+08   -353280.   -0.00132      1934.   1.50E+13
-2474.     636165.       0.00
80.0000     0.06437   1.29E+08   -407618.   -0.00110      1829.   1.50E+13
-2054.     765979.       0.00
82.0000     0.04037   1.19E+08   -451795.  -9.06E-04      1710.   1.50E+13
-1627.     967309.       0.00
84.0000     0.02091   1.07E+08   -485369.  -7.25E-04      1580.   1.50E+13
-1171.    1344118.       0.00
86.0000     0.00556   9.53E+07   -505334.  -5.63E-04      1443.   1.50E+13
-492.8167   2125440.       0.00
88.0000    -0.00612   8.31E+07   -504426.  -4.20E-04      1302.   1.50E+13
568.4892    2229120.       0.00
90.0000    -0.01462   7.11E+07   -485857.  -2.97E-04      1164.   1.50E+13
978.9400    1607159.       0.00
92.0000    -0.02039   5.98E+07   -460236.  -1.93E-04      1034.   1.50E+13
1156.    1360983.       0.00
94.0000    -0.02386   4.91E+07   -431355.  -1.06E-04   910.3071   1.50E+13
1251.    1258022.       0.00
96.0000    -0.02545   3.91E+07   -400844.  -3.51E-05   795.3121   1.50E+13
1292.    1218073.       0.00
98.0000    -0.02554   2.98E+07   -369814.   2.00E-05   688.8403   1.50E+13
1294.    1215896.       0.00
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File name is incorrect below, run designation is "Channel Post Seismic Trans.(No scour) 96in"


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100.0000   -0.02449   2.13E+07   -333266.   6.09E-05   590.9172   1.50E+13
1752.   1716570.       0.00
102.0000   -0.02262   1.38E+07   -286459.   8.91E-05   504.5863   1.50E+13
2149.   2280243.       0.00
104.0000   -0.02022   7565615.   -236292.   1.06E-04   432.4908   1.50E+13
2032.   2411938.       0.00
106.0000   -0.01752   2472974.   -189215.   1.14E-04   373.8595   1.50E+13
1891.   2590647.       0.00
108.0000   -0.01473  -1530423.   -145704.   1.15E-04   363.0080   1.50E+13
1734.   2825102.       0.00
110.0000   -0.01201  -4534612.   -106103.   1.10E-04   397.5951   1.50E+13
1566.   3129754.       0.00
112.0000   -0.00945  -6636559.    -70646.   1.01E-04   421.7947   1.50E+13
1389.   3527527.       0.00
114.0000   -0.00715  -7937759.    -39478.   8.95E-05   436.7753   1.50E+13
1208.   4055418.       0.00
116.0000   -0.00515  -8542243.    -12669.   7.63E-05   443.7347   1.50E+13
1026.   4776353.       0.00
118.0000   -0.00349  -8555008.      9766.   6.27E-05   443.8817   1.50E+13
843.7207   5807373.       0.00
120.0000   -0.00215  -8080970.     27836.   4.94E-05   438.4241   1.50E+13
662.0889   7400276.       0.00
122.0000   -0.00112  -7224793.     40243.   3.71E-05   428.5670   1.50E+13
371.8129   7983360.       0.00
124.0000  -3.66E-04  -6153759.     46202.   2.64E-05   416.2362   1.50E+13
124.7563   8190720.       0.00
126.0000   1.50E-04  -5010275.     47067.   1.75E-05   403.0713   1.50E+13
-52.6614   8398080.       0.00
128.0000   4.74E-04  -3896643.     44394.   1.04E-05   390.2502   1.50E+13
-170.0538   8605440.       0.00
130.0000   6.49E-04  -2880588.     39496.   4.96E-06   378.5524   1.50E+13
-238.1301   8812800.       0.00
132.0000   7.12E-04  -2001420.     33427.   1.05E-06   368.4306   1.50E+13
-267.6692   9020160.       0.00
134.0000   6.99E-04  -1276237.     26989.  -1.57E-06   360.0816   1.50E+13
-268.7778   9227520.       0.00
136.0000   6.37E-04   -705748.     20759.  -3.15E-06   353.5136   1.50E+13
-250.4058   9434880.       0.00
138.0000   5.48E-04   -279425.     15113.  -3.94E-06   348.6053   1.50E+13
-220.0793   9642240.       0.00
140.0000   4.48E-04     20160.     10267.  -4.15E-06   345.6204   1.50E+13
-183.8109   9849600.       0.00
142.0000   3.49E-04    213867.      6307.  -3.96E-06   347.8506   1.50E+13
-146.1404   1.01E+07       0.00
144.0000   2.58E-04    323377.      3230.  -3.53E-06   349.1114   1.50E+13
-110.2670   1.03E+07       0.00
146.0000   1.79E-04    369342.   968.1868  -2.98E-06   349.6405   1.50E+13
-78.2372   1.05E+07       0.00
148.0000   1.15E-04    370207.  -584.5502  -2.38E-06   349.6505   1.50E+13
-51.1576   1.07E+07       0.00
150.0000   6.48E-05    341570.     -1551.  -1.82E-06   349.3208   1.50E+13
-29.4105   1.09E+07       0.00
152.0000   2.78E-05    295959.     -2059.  -1.31E-06   348.7957   1.50E+13
-12.8563   1.11E+07       0.00
154.0000   2.15E-06    242915.     -2225.  -8.75E-07   348.1850   1.50E+13
-1.0105   1.13E+07       0.00
156.0000  -1.42E-05    189266.     -2155.  -5.30E-07   347.5673   1.50E+13
6.8086   1.15E+07       0.00
158.0000  -2.33E-05    139520.     -1937.  -2.67E-07   346.9946   1.50E+13
11.3645   1.17E+07       0.00
160.0000  -2.70E-05     96306.     -1640.  -7.83E-08   346.4971   1.50E+13
13.4173   1.19E+07       0.00
162.0000  -2.70E-05     60812.     -1315.   4.73E-08   346.0885   1.50E+13
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  13.6664   1.21E+07       0.00
  164.0000  -2.47E-05     33184.  -998.3362   1.22E-07   345.7704   1.50E+13
  12.7164   1.23E+07       0.00
  166.0000  -2.12E-05     12877.  -713.0087   1.59E-07   345.5366   1.50E+13
  11.0609   1.25E+07       0.00
  168.0000  -1.71E-05     -1059.  -471.3060   1.69E-07   345.4005   1.50E+13
  9.0810   1.28E+07       0.00
  170.0000  -1.31E-05     -9765.  -277.7014   1.60E-07   345.5008   1.50E+13
  7.0527   1.30E+07       0.00
  172.0000  -9.41E-06    -14408.  -131.1436   1.41E-07   345.5542   1.50E+13
  5.1604   1.32E+07       0.00
  174.0000  -6.30E-06    -16077.   -27.0610   1.16E-07   345.5734   1.50E+13
  3.5131   1.34E+07       0.00
  176.0000  -3.82E-06    -15721.    41.0331   9.10E-08   345.5693   1.50E+13
  2.1614   1.36E+07       0.00
  178.0000  -1.94E-06    -14119.    80.3301   6.71E-08   345.5509   1.50E+13
  1.1134   1.38E+07       0.00
  180.0000  -5.98E-07    -11873.    97.8760   4.63E-08   345.5250   1.50E+13
  0.3488   1.40E+07       0.00
  182.0000   2.86E-07     -9426.   100.0311   2.93E-08   345.4969   1.50E+13
  -0.1692   1.42E+07       0.00
  184.0000   8.08E-07     -7075.    92.1769   1.61E-08   345.4698   1.50E+13
  -0.4853   1.44E+07       0.00
  186.0000   1.06E-06     -5004.    78.6132   6.45E-09   345.4459   1.50E+13
  -0.6450   1.46E+07       0.00
  188.0000   1.12E-06     -3303.    62.5879  -1.94E-10   345.4264   1.50E+13
  -0.6904   1.48E+07       0.00
  190.0000   1.05E-06     -1999.    46.4130  -4.43E-09   345.4113   1.50E+13
  -0.6575   1.50E+07       0.00
  192.0000   9.05E-07     -1074.    31.6279  -6.89E-09   345.4007   1.50E+13
  -0.5746   1.52E+07       0.00
  194.0000   7.19E-07  -480.3465    19.1799  -8.13E-09   345.3939   1.50E+13
  -0.4627   1.54E+07       0.00
  196.0000   5.14E-07  -152.7800     9.6003  -8.64E-09   345.3901   1.50E+13
  -0.3356   1.57E+07       0.00
  198.0000   3.04E-07   -18.4930     3.1610  -8.78E-09   345.3885   1.50E+13
  -0.2010   1.59E+07       0.00
  200.0000   9.32E-08       0.00       0.00  -8.79E-09   345.3883   1.50E+13
  -0.06238   8035200.       0.00
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* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 4:

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Pile-head deflection             =     3.00518593 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -270265817. inch-lbs
Maximum shear force              =        543483. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             13
Number of zero deflection points =              5
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Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 5

File name is incorrect below, run designation is "Channel Post Seismic Trans.(No scour) 96in"

Channel Static 24in.lp9o 10/4/2017

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 4.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 2500000.0 lbs

Depth X feet	Deflect. y inches	Bending Distrib. Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Lat. Load lb/inch				
0.00	4.0067	-3.47E+08	687198.	0.00	4346.	1.50E+13
0.00	0.00	0.00				
2.0000	4.0000	-3.31E+08	687165.	-5.42E-04	4156.	1.50E+13
0.00	0.00	0.00				
4.0000	3.9806	-3.14E+08	687165.	-0.00106	3965.	1.50E+13
0.00	0.00	0.00				
6.0000	3.9492	-2.98E+08	687165.	-0.00155	3775.	1.50E+13
0.00	0.00	0.00				
8.0000	3.9063	-2.81E+08	687165.	-0.00201	3584.	1.50E+13
0.00	0.00	0.00				
10.0000	3.8527	-2.65E+08	687165.	-0.00245	3392.	1.50E+13
0.00	0.00	0.00				
12.0000	3.7889	-2.48E+08	687165.	-0.00286	3200.	1.50E+13
0.00	0.00	0.00				
14.0000	3.7155	-2.31E+08	687165.	-0.00324	3008.	1.50E+13
0.00	0.00	0.00				
16.0000	3.6333	-2.15E+08	687165.	-0.00360	2816.	1.50E+13
0.00	0.00	0.00				
18.0000	3.5429	-1.98E+08	687165.	-0.00393	2624.	1.50E+13
0.00	0.00	0.00				
20.0000	3.4448	-1.81E+08	687165.	-0.00423	2431.	1.50E+13
0.00	0.00	0.00				
22.0000	3.3398	-1.64E+08	687165.	-0.00451	2238.	1.50E+13
0.00	0.00	0.00				
24.0000	3.2285	-1.48E+08	687165.	-0.00476	2045.	1.50E+13
0.00	0.00	0.00				
26.0000	3.1116	-1.31E+08	687165.	-0.00498	1852.	1.50E+13
0.00	0.00	0.00				
28.0000	2.9896	-1.14E+08	687165.	-0.00517	1658.	1.50E+13
0.00	0.00	0.00				
30.0000	2.8632	-9.72E+07	687165.	-0.00534	1465.	1.50E+13
0.00	0.00	0.00				
32.0000	2.7331	-8.04E+07	687165.	-0.00548	1271.	1.50E+13
0.00	0.00	0.00				
34.0000	2.5999	-6.36E+07	687165.	-0.00560	1078.	1.50E+13
0.00	0.00	0.00				
36.0000	2.4643	-4.68E+07	687165.	-0.00569	883.8122	1.50E+13
0.00	0.00	0.00				
38.0000	2.3269	-2.99E+07	687165.	-0.00575	689.9859	1.50E+13
0.00	0.00	0.00				
40.0000	2.1883	-1.31E+07	687165.	-0.00578	496.1265	1.50E+13
0.00	0.00	0.00				
42.0000	2.0493	3746703.	687165.	-0.00579	388.5239	1.50E+13
0.00	0.00	0.00				
44.0000	1.9103	2.06E+07	687165.	-0.00577	582.3936	1.50E+13
0.00	0.00	0.00				
46.0000	1.7722	3.74E+07	687162.	-0.00573	776.2405	1.50E+13
-0.2905	3.9347	0.00				
48.0000	1.6355	5.43E+07	687148.	-0.00565	970.0442	1.50E+13
-0.8486	12.4530	0.00				

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 50.0000     1.5009   7.11E+07    687121.   -0.00555      1164.   1.50E+13
 -1.3744    21.9782       0.00
 52.0000     1.3690   8.79E+07    687082.   -0.00543      1357.   1.50E+13
 -1.8661    32.7152       0.00
 54.0000     1.2405   1.05E+08    687032.   -0.00527      1551.   1.50E+13
 -2.3217    44.9195       0.00
 56.0000     1.1160   1.22E+08    686971.   -0.00509      1744.   1.50E+13
 -2.7394    58.9124       0.00
 58.0000     0.9962   1.38E+08    686901.   -0.00488      1938.   1.50E+13
 -3.1172    75.1011       0.00
 60.0000     0.8816   1.55E+08    658210.   -0.00465      2131.   1.50E+13
 -2388.     65002.       0.00
 62.0000     0.7731   1.70E+08    558331.   -0.00439      2308.   1.50E+13
 -5935.    184271.       0.00
 64.0000     0.6710   1.82E+08    418085.   -0.00411      2445.   1.50E+13
 -5752.    205718.       0.00
 66.0000     0.5760   1.91E+08    282724.   -0.00381      2545.   1.50E+13
 -5528.    230353.       0.00
 68.0000     0.4883   1.96E+08    153188.   -0.00350      2607.   1.50E+13
 -5266.    258850.       0.00
 70.0000     0.4081   1.99E+08     30399.   -0.00318      2634.   1.50E+13
 -4966.    292039.       0.00
 72.0000     0.3356   1.98E+08    -84704.   -0.00286      2628.   1.50E+13
 -4626.    330824.       0.00
 74.0000     0.2707   1.95E+08   -190765.   -0.00255      2591.   1.50E+13
 -4213.    373550.       0.00
 76.0000     0.2132   1.89E+08   -286184.   -0.00224      2526.   1.50E+13
 -3739.    420872.       0.00
 78.0000     0.1630   1.82E+08   -370288.   -0.00195      2436.   1.50E+13
 -3270.    481293.       0.00
 80.0000     0.1198   1.72E+08   -443161.   -0.00166      2324.   1.50E+13
 -2803.    561387.       0.00
 82.0000    0.08323   1.61E+08   -504832.   -0.00140      2193.   1.50E+13
 -2336.    673629.       0.00
 84.0000    0.05278   1.48E+08   -555190.   -0.00115      2047.   1.50E+13
 -1860.    845896.       0.00
 86.0000    0.02801   1.34E+08   -593778.  -9.25E-04      1888.   1.50E+13
 -1355.   1161251.       0.00
 88.0000    0.00838   1.19E+08   -618936.  -7.23E-04      1720.   1.50E+13
 -741.2886   2123556.       0.00
 90.0000   -0.00667   1.04E+08   -620051.  -5.44E-04      1547.   1.50E+13
 648.3872   2332800.       0.00
 92.0000   -0.01771   8.97E+07   -599339.  -3.88E-04      1378.   1.50E+13
 1078.   1460074.       0.00
 94.0000   -0.02531   7.57E+07   -570950.  -2.56E-04      1217.   1.50E+13
 1288.   1221428.       0.00
 96.0000   -0.03001   6.23E+07   -538660.  -1.46E-04      1063.   1.50E+13
 1403.   1121821.       0.00
 98.0000   -0.03231   4.98E+07   -504363.  -5.61E-05   919.0902   1.50E+13
 1455.   1081116.       0.00
100.0000   -0.03270   3.81E+07   -462609.   1.42E-05   784.5664   1.50E+13
2024.   1485548.       0.00
102.0000   -0.03163   2.76E+07   -407827.   6.68E-05   663.4228   1.50E+13
2541.   1928374.       0.00
104.0000   -0.02949   1.86E+07   -347887.   1.04E-04   559.1000   1.50E+13
2454.   1996922.       0.00
106.0000   -0.02665   1.09E+07   -290451.   1.27E-04   471.0296   1.50E+13
2332.   2100873.       0.00
108.0000   -0.02338   4605819.   -236242.   1.40E-04   398.4149   1.50E+13
2185.   2242774.       0.00
110.0000   -0.01994   -443350.   -185811.   1.43E-04   350.4926   1.50E+13
2018.   2428646.       0.00
112.0000   -0.01651  -4330296.   -139565.   1.39E-04   395.2428   1.50E+13
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(No scour) 96in"


```
1836.   2668626.       0.00
114.0000   -0.01326  -7159159.    -97789.   1.30E-04   427.8113   1.50E+13
1645.   2978641.       0.00
116.0000   -0.01027  -9039753.    -60670.   1.17E-04   449.4625   1.50E+13
1448.   3383747.       0.00
118.0000   -0.00763  -1.01E+07    -28310.   1.02E-04   461.5004   1.50E+13
1248.   3924868.       0.00
120.0000   -0.00538  -1.04E+07  -746.4839   8.54E-05   465.2479   1.50E+13
1048.   4673500.       0.00
122.0000   -0.00353  -1.01E+07     22028.   6.90E-05   462.0309   1.50E+13
849.4073   5768720.       0.00
124.0000   -0.00207  -9361779.     40026.   5.34E-05   453.1700   1.50E+13
650.4332   7533226.       0.00
126.0000  -9.70E-04  -8216580.     51904.   3.94E-05   439.9854   1.50E+13
339.3654   8398080.       0.00
128.0000  -1.83E-04  -6875119.     56763.   2.73E-05   424.5412   1.50E+13
65.5418   8605440.       0.00
130.0000   3.40E-04  -5495246.     56049.   1.74E-05   408.6548   1.50E+13
-124.9989   8812800.       0.00
132.0000   6.53E-04  -4186845.     51605.   9.67E-06   393.5912   1.50E+13
-245.3203   9020160.       0.00
134.0000   8.04E-04  -3019347.     44950.   3.90E-06   380.1499   1.50E+13
-309.2617   9227520.       0.00
136.0000   8.40E-04  -2029694.     37276.  -1.33E-07   368.7561   1.50E+13
-330.2718   9434880.       0.00
138.0000   7.98E-04  -1230082.     29465.  -2.74E-06   359.5502   1.50E+13
-320.6058   9642240.       0.00
140.0000   7.09E-04   -615022.     22128.  -4.21E-06   352.4690   1.50E+13
-290.8385   9849600.       0.00
142.0000   5.96E-04   -167425.     15642.  -4.84E-06   347.3159   1.50E+13
-249.6371   1.01E+07       0.00
144.0000   4.76E-04    136396.     10202.  -4.86E-06   346.9587   1.50E+13
-203.7363   1.03E+07       0.00
146.0000   3.62E-04    322852.      5860.  -4.50E-06   349.1053   1.50E+13
-158.0569   1.05E+07       0.00
148.0000   2.61E-04    418237.      2573.  -3.90E-06   350.2035   1.50E+13
-115.9183   1.07E+07       0.00
150.0000   1.75E-04    446812.   230.0909  -3.21E-06   350.5325   1.50E+13
-79.3023   1.09E+07       0.00
152.0000   1.06E-04    429667.     -1311.  -2.51E-06   350.3351   1.50E+13
-49.1317   1.11E+07       0.00
154.0000   5.42E-05    384180.     -2207.  -1.86E-06   349.8114   1.50E+13
-25.5411   1.13E+07       0.00
156.0000   1.69E-05    323945.     -2611.  -1.30E-06   349.1179   1.50E+13
-8.1209   1.15E+07       0.00
158.0000  -7.94E-06    259001.     -2662.  -8.29E-07   348.3702   1.50E+13
3.8751   1.17E+07       0.00
160.0000  -2.29E-05    196264.     -2479.  -4.65E-07   347.6479   1.50E+13
11.3631   1.19E+07       0.00
162.0000  -3.03E-05    140054.     -2159.  -1.96E-07   347.0008   1.50E+13
15.3021   1.21E+07       0.00
164.0000  -3.23E-05     92644.     -1776.  -1.04E-08   346.4549   1.50E+13
16.6060   1.23E+07       0.00
166.0000  -3.08E-05     54791.     -1384.   1.07E-07   346.0191   1.50E+13
16.0865   1.25E+07       0.00
168.0000  -2.71E-05     26198.     -1018.   1.72E-07   345.6899   1.50E+13
14.4233   1.28E+07       0.00
170.0000  -2.25E-05      5910.  -698.9844   1.98E-07   345.4564   1.50E+13
12.1545   1.30E+07       0.00
172.0000  -1.76E-05     -7377.  -436.9577   1.97E-07   345.4733   1.50E+13
9.6811   1.32E+07       0.00
174.0000  -1.31E-05    -15088.  -233.4071   1.79E-07   345.5620   1.50E+13
7.2815   1.34E+07       0.00
```

```
  176.0000  -9.07E-06    -18602.   -84.4652   1.52E-07   345.6025   1.50E+13
  5.1304   1.36E+07       0.00
  178.0000  -5.78E-06    -19160.    16.9430   1.22E-07   345.6089   1.50E+13
  3.3203   1.38E+07       0.00
  180.0000  -3.23E-06    -17804.    79.3744   9.21E-08   345.5933   1.50E+13
  1.8823   1.40E+07       0.00
  182.0000  -1.36E-06    -15361.   111.6168   6.56E-08   345.5652   1.50E+13
  0.8046   1.42E+07       0.00
  184.0000  -8.08E-08    -12454.   121.8541   4.33E-08   345.5317   1.50E+13
  0.04854   1.44E+07       0.00
  186.0000   7.20E-07     -9517.   117.1750   2.58E-08   345.4979   1.50E+13
  -0.4385   1.46E+07       0.00
  188.0000   1.16E-06     -6833.   103.3496   1.27E-08   345.4670   1.50E+13
  -0.7137   1.48E+07       0.00
  190.0000   1.33E-06     -4558.    84.7999   3.57E-09   345.4408   1.50E+13
  -0.8321   1.50E+07       0.00
  192.0000   1.33E-06     -2763.    64.7039  -2.28E-09   345.4201   1.50E+13
  -0.8425   1.52E+07       0.00
  194.0000   1.22E-06     -1452.    45.1780  -5.65E-09   345.4050   1.50E+13
  -0.7846   1.54E+07       0.00
  196.0000   1.06E-06  -593.3921    27.4999  -7.29E-09   345.3952   1.50E+13
  -0.6885   1.57E+07       0.00
  198.0000   8.69E-07  -131.2286    12.3427  -7.86E-09   345.3898   1.50E+13
  -0.5746   1.59E+07       0.00
  200.0000   6.78E-07       0.00       0.00  -7.97E-09   345.3883   1.50E+13
  -0.4540   8035200.       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 5:

```
Pile-head deflection             =     4.00666749 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -347478063. inch-lbs
Maximum shear force              =        687198. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             15
Number of zero deflection points =              4
```

```
--------------------------------------------------------------------------------
--
                 Computed Values of Pile Loading and Deflection
                   for Lateral Loading for Load Case Number 6
--------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                              =     5.000000 inches
Rotation of pile head                                  =    0.000E+00 radians
Axial load on pile head                                =    2500000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(No scour) 96in"


```
     0.00      5.0081  -4.20E+08    817588.       0.00      5180.   1.50E+13
     0.00        0.00       0.00
   2.0000      5.0000  -4.00E+08    817549.  -6.56E-04      4953.   1.50E+13
   0.00        0.00       0.00
   4.0000      4.9766  -3.81E+08    817549.   -0.00128      4727.   1.50E+13
   0.00        0.00       0.00
   6.0000      4.9386  -3.61E+08    817549.   -0.00187      4500.   1.50E+13
   0.00        0.00       0.00
   8.0000      4.8867  -3.41E+08    817549.   -0.00243      4272.   1.50E+13
   0.00        0.00       0.00
  10.0000      4.8217  -3.21E+08    817549.   -0.00296      4045.   1.50E+13
  0.00        0.00       0.00
  12.0000      4.7444  -3.01E+08    817549.   -0.00346      3817.   1.50E+13
  0.00        0.00       0.00
  14.0000      4.6556  -2.82E+08    817549.   -0.00393      3588.   1.50E+13
  0.00        0.00       0.00
  16.0000      4.5559  -2.62E+08    817549.   -0.00436      3359.   1.50E+13
  0.00        0.00       0.00
  18.0000      4.4462  -2.42E+08    817549.   -0.00476      3130.   1.50E+13
  0.00        0.00       0.00
  20.0000      4.3272  -2.22E+08    817549.   -0.00514      2901.   1.50E+13
  0.00        0.00       0.00
  22.0000      4.1997  -2.02E+08    817549.   -0.00547      2671.   1.50E+13
  0.00        0.00       0.00
  24.0000      4.0644  -1.82E+08    817549.   -0.00578      2442.   1.50E+13
  0.00        0.00       0.00
  26.0000      3.9221  -1.62E+08    817549.   -0.00606      2212.   1.50E+13
  0.00        0.00       0.00
  28.0000      3.7737  -1.42E+08    817549.   -0.00630      1981.   1.50E+13
  0.00        0.00       0.00
  30.0000      3.6197  -1.22E+08    817549.   -0.00651      1751.   1.50E+13
  0.00        0.00       0.00
  32.0000      3.4611  -1.02E+08    817549.   -0.00669      1521.   1.50E+13
  0.00        0.00       0.00
  34.0000      3.2986  -8.21E+07    817549.   -0.00684      1290.   1.50E+13
  0.00        0.00       0.00
  36.0000      3.1329  -6.20E+07    817549.   -0.00695      1059.   1.50E+13
  0.00        0.00       0.00
  38.0000      2.9648  -4.20E+07    817549.   -0.00704   828.6438   1.50E+13
  0.00        0.00       0.00
  40.0000      2.7952  -2.19E+07    817549.   -0.00709   597.8626   1.50E+13
  0.00        0.00       0.00
  42.0000      2.6246  -1882133.    817549.   -0.00711   367.0572   1.50E+13
  0.00        0.00       0.00
  44.0000      2.4541   1.82E+07    817549.   -0.00709   554.5269   1.50E+13
  0.00        0.00       0.00
  46.0000      2.2842   3.82E+07    817545.   -0.00705   785.3143   1.50E+13
  -0.3162      3.3223       0.00
  48.0000      2.1157   5.83E+07    817530.   -0.00697      1016.   1.50E+13
  -0.9247     10.4890       0.00
  50.0000      1.9495   7.83E+07    817501.   -0.00686      1247.   1.50E+13
  -1.4997     18.4615       0.00
  52.0000      1.7864   9.83E+07    817459.   -0.00672      1477.   1.50E+13
  -2.0392     27.3972       0.00
  54.0000      1.6269   1.18E+08    817404.   -0.00655      1708.   1.50E+13
  -2.5414     37.4899       0.00
  56.0000      1.4721   1.38E+08    817337.   -0.00634      1938.   1.50E+13
  -3.0043     48.9809       0.00
  58.0000      1.3225   1.58E+08    817260.   -0.00611      2168.   1.50E+13
  -3.4260     62.1724       0.00
  60.0000      1.1790   1.78E+08    785550.   -0.00584      2398.   1.50E+13
  -2639.      53721.       0.00
  62.0000      1.0424   1.97E+08    679351.   -0.00554      2610.   1.50E+13
```

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 -6211.    142999.       0.00
 64.0000     0.9133   2.12E+08    531477.   -0.00521      2781.   1.50E+13
 -6112.    160615.       0.00
 66.0000     0.7923   2.23E+08    386558.   -0.00486      2911.   1.50E+13
 -5965.    180674.       0.00
 68.0000     0.6799   2.31E+08    245745.   -0.00450      3002.   1.50E+13
 -5770.    203673.       0.00
 70.0000     0.5763   2.35E+08    110155.   -0.00413      3053.   1.50E+13
 -5529.    230256.       0.00
 72.0000     0.4818   2.36E+08    -19129.   -0.00375      3068.   1.50E+13
 -5244.    261249.       0.00
 74.0000     0.3963   2.35E+08   -141053.   -0.00337      3048.   1.50E+13
 -4916.    297693.       0.00
 76.0000     0.3199   2.30E+08   -254527.   -0.00300      2995.   1.50E+13
 -4540.    340665.       0.00
 78.0000     0.2522   2.23E+08   -357812.   -0.00264      2911.   1.50E+13
 -4067.    386950.       0.00
 80.0000     0.1932   2.13E+08   -449320.   -0.00229      2801.   1.50E+13
 -3559.    442178.       0.00
 82.0000     0.1423   2.02E+08   -528680.   -0.00196      2666.   1.50E+13
 -3054.    515224.       0.00
 84.0000    0.09913   1.88E+08   -595926.   -0.00165      2511.   1.50E+13
 -2549.    617268.       0.00
 86.0000    0.06320   1.73E+08   -650948.   -0.00136      2339.   1.50E+13
 -2036.    773099.       0.00
 88.0000    0.03391   1.57E+08   -693271.   -0.00109      2153.   1.50E+13
 -1491.   1055440.       0.00
 90.0000    0.01065   1.40E+08   -721196.  -8.57E-04      1958.   1.50E+13
 -835.9113   1883580.       0.00
 92.0000   -0.00723   1.23E+08   -722966.  -6.47E-04      1756.   1.50E+13
 688.4152   2284031.       0.00
 94.0000   -0.02042   1.05E+08   -700823.  -4.65E-04      1559.   1.50E+13
 1157.   1359914.       0.00
 96.0000   -0.02955   8.89E+07   -670239.  -3.10E-04      1369.   1.50E+13
 1392.   1130358.       0.00
 98.0000   -0.03528   7.33E+07   -635287.  -1.80E-04      1189.   1.50E+13
 1521.   1034624.       0.00
100.0000   -0.03819   5.85E+07   -590791.  -7.46E-05      1019.   1.50E+13
2187.   1374628.       0.00
102.0000   -0.03886   4.49E+07   -530745.   8.11E-06   862.6375   1.50E+13
2817.   1739719.       0.00
104.0000   -0.03780   3.30E+07   -463610.   7.04E-05   725.2955   1.50E+13
2778.   1763878.       0.00
106.0000   -0.03548   2.27E+07   -397979.   1.15E-04   606.3393   1.50E+13
2691.   1820721.       0.00
108.0000   -0.03228   1.39E+07   -334876.   1.44E-04   505.2051   1.50E+13
2567.   1908642.       0.00
110.0000   -0.02856   6574541.   -275092.   1.60E-04   421.0807   1.50E+13
2415.   2029335.       0.00
112.0000   -0.02458    657791.   -219235.   1.66E-04   352.9614   1.50E+13
2240.   2187401.       0.00
114.0000   -0.02058  -3968702.   -167758.   1.64E-04   391.0798   1.50E+13
2050.   2390743.       0.00
116.0000   -0.01672  -7414243.   -120989.   1.55E-04   430.7481   1.50E+13
1848.   2651738.       0.00
118.0000   -0.01316  -9794700.    -79146.   1.41E-04   458.1542   1.50E+13
1639.   2989580.       0.00
120.0000   -0.00997  -1.12E+07    -42359.   1.24E-04   474.6802   1.50E+13
1427.   3434878.       0.00
122.0000   -0.00721  -1.18E+07    -10683.   1.06E-04   481.7338   1.50E+13
1213.   4039219.       0.00
124.0000   -0.00490  -1.18E+07     15880.   8.66E-05   480.7297   1.50E+13
1000.   4897517.       0.00
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126.0000   -0.00305  -1.11E+07     37353.   6.84E-05   473.0780   1.50E+13
788.9540   6210468.       0.00
128.0000   -0.00162  -9970843.     53723.   5.15E-05   460.1821   1.50E+13
575.1806   8518278.       0.00
130.0000  -5.75E-04  -8518461.     63158.   3.68E-05   443.4609   1.50E+13
211.0985   8812800.       0.00
132.0000   1.44E-04  -6943668.     65042.   2.44E-05   425.3304   1.50E+13
-54.0729   9020160.       0.00
134.0000   5.96E-04  -5399356.     61643.   1.45E-05   407.5508   1.50E+13
-229.2107   9227520.       0.00
136.0000   8.41E-04  -3986551.     54924.   7.02E-06   391.2853   1.50E+13
-330.7063   9434880.       0.00
138.0000   9.33E-04  -2763851.     46456.   1.63E-06   377.2084   1.50E+13
-374.9716   9642240.       0.00
140.0000   9.19E-04  -1756868.     37429.  -1.99E-06   365.6151   1.50E+13
-377.2983   9849600.       0.00
142.0000   8.38E-04   -967041.     28687.  -4.16E-06   356.5218   1.50E+13
-351.1308   1.01E+07       0.00
144.0000   7.19E-04   -379373.     20782.  -5.24E-06   349.7560   1.50E+13
-307.6848   1.03E+07       0.00
146.0000   5.86E-04     31105.     14019.  -5.52E-06   345.7464   1.50E+13
-255.8385   1.05E+07       0.00
148.0000   4.54E-04    294217.      8523.  -5.26E-06   348.7756   1.50E+13
-202.2238   1.07E+07       0.00
150.0000   3.34E-04    440820.      4278.  -4.67E-06   350.4635   1.50E+13
-151.4519   1.09E+07       0.00
152.0000   2.30E-04    500145.      1184.  -3.92E-06   351.1465   1.50E+13
-106.4160   1.11E+07       0.00
154.0000   1.46E-04    498126.  -916.4446  -3.12E-06   351.1232   1.50E+13
-68.6266   1.13E+07       0.00
156.0000   8.04E-05    456530.     -2202.  -2.36E-06   350.6443   1.50E+13
-38.5441   1.15E+07       0.00
158.0000   3.25E-05    392689.     -2856.  -1.68E-06   349.9093   1.50E+13
-15.8848   1.17E+07       0.00
160.0000  -2.30E-07    319661.     -3045.  -1.11E-06   349.0686   1.50E+13
0.1144   1.19E+07       0.00
162.0000  -2.07E-05    246668.     -2918.  -6.57E-07   348.2282   1.50E+13
10.4794   1.21E+07       0.00
164.0000  -3.18E-05    179687.     -2596.  -3.16E-07   347.4571   1.50E+13
16.3323   1.23E+07       0.00
166.0000  -3.59E-05    122097.     -2175.  -7.49E-08   346.7940   1.50E+13
18.7713   1.25E+07       0.00
168.0000  -3.54E-05     75307.     -1724.   8.29E-08   346.2553   1.50E+13
18.7922   1.28E+07       0.00
170.0000  -3.19E-05     39334.     -1292.   1.75E-07   345.8412   1.50E+13
17.2430   1.30E+07       0.00
172.0000  -2.70E-05     13289.  -907.0041   2.17E-07   345.5413   1.50E+13
14.8063   1.32E+07       0.00
174.0000  -2.15E-05     -4228.  -585.3294   2.24E-07   345.4370   1.50E+13
11.9999   1.34E+07       0.00
176.0000  -1.62E-05    -14833.  -331.0362   2.09E-07   345.5591   1.50E+13
9.1912   1.36E+07       0.00
178.0000  -1.15E-05    -20143.  -141.3260   1.81E-07   345.6202   1.50E+13
6.6180   1.38E+07       0.00
180.0000  -7.57E-06    -21639.    -8.9407   1.47E-07   345.6375   1.50E+13
4.4141   1.40E+07       0.00
182.0000  -4.45E-06    -20590.    75.6289   1.14E-07   345.6254   1.50E+13
2.6334   1.42E+07       0.00
184.0000  -2.12E-06    -18022.   122.5083   8.26E-08   345.5958   1.50E+13
1.2732   1.44E+07       0.00
186.0000  -4.83E-07    -14719.   141.3170   5.65E-08   345.5578   1.50E+13
0.2941   1.46E+07       0.00
188.0000   5.90E-07    -11246.   140.4752   3.57E-08   345.5178   1.50E+13
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(No scour) 96in"


```
  -0.3643   1.48E+07       0.00
  190.0000   1.23E-06     -7981.   126.8525   2.03E-08   345.4802   1.50E+13
  -0.7709   1.50E+07       0.00
  192.0000   1.57E-06     -5159.   105.6715   9.82E-09   345.4477   1.50E+13
  -0.9942   1.52E+07       0.00
  194.0000   1.70E-06     -2910.    80.5931   3.37E-09   345.4218   1.50E+13
  -1.0957   1.54E+07       0.00
  196.0000   1.73E-06     -1291.    53.9230   1.38E-11   345.4032   1.50E+13
  -1.1268   1.57E+07       0.00
  198.0000   1.70E-06  -321.4002    26.8946  -1.28E-09   345.3920   1.50E+13
  -1.1256   1.59E+07       0.00
  200.0000   1.67E-06       0.00       0.00  -1.53E-09   345.3883   1.50E+13
  -1.1157   8035200.       0.00

* The above values of total stress are combined axial and bending stresses.


Output Summary for Load Case No. 6:

Pile-head deflection             =     5.00805686 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -419885408. inch-lbs
Maximum shear force              =        817588. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             16
Number of zero deflection points =              4



-------------------------------------------------------------------------------
--
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 7
-------------------------------------------------------------------------------
--

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     6.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =    2500000.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     6.0094  -4.88E+08    935539.       0.00      5961.   1.50E+13
      0.00       0.00       0.00
    2.0000     6.0000  -4.65E+08    935494.  -7.62E-04      5702.   1.50E+13
    0.00       0.00       0.00
    4.0000     5.9728  -4.43E+08    935494.   -0.00149      5443.   1.50E+13
    0.00       0.00       0.00
    6.0000     5.9286  -4.20E+08    935494.   -0.00218      5183.   1.50E+13
    0.00       0.00       0.00
    8.0000     5.8683  -3.98E+08    935494.   -0.00283      4923.   1.50E+13
    0.00       0.00       0.00
   10.0000     5.7927  -3.75E+08    935494.   -0.00345      4662.   1.50E+13
   0.00       0.00       0.00
   12.0000     5.7027  -3.52E+08    935494.   -0.00403      4401.   1.50E+13
```

```
0.00        0.00        0.00
14.0000      5.5992  -3.30E+08    935494.   -0.00458      4139.   1.50E+13
0.00        0.00        0.00
16.0000      5.4831  -3.07E+08    935494.   -0.00508      3878.   1.50E+13
0.00        0.00        0.00
18.0000      5.3552  -2.84E+08    935494.   -0.00556      3615.   1.50E+13
0.00        0.00        0.00
20.0000      5.2163  -2.61E+08    935494.   -0.00599      3353.   1.50E+13
0.00        0.00        0.00
22.0000      5.0675  -2.38E+08    935494.   -0.00639      3090.   1.50E+13
0.00        0.00        0.00
24.0000      4.9095  -2.16E+08    935494.   -0.00676      2827.   1.50E+13
0.00        0.00        0.00
26.0000      4.7433  -1.93E+08    935494.   -0.00708      2564.   1.50E+13
0.00        0.00        0.00
28.0000      4.5696  -1.70E+08    935494.   -0.00737      2300.   1.50E+13
0.00        0.00        0.00
30.0000      4.3894  -1.47E+08    935494.   -0.00762      2037.   1.50E+13
0.00        0.00        0.00
32.0000      4.2036  -1.24E+08    935494.   -0.00784      1773.   1.50E+13
0.00        0.00        0.00
34.0000      4.0131  -1.01E+08    935494.   -0.00802      1509.   1.50E+13
0.00        0.00        0.00
36.0000      3.8186  -7.81E+07    935494.   -0.00816      1245.   1.50E+13
0.00        0.00        0.00
38.0000      3.6212  -5.52E+07    935494.   -0.00827   980.5817   1.50E+13
0.00        0.00        0.00
40.0000      3.4216  -3.22E+07    935494.   -0.00834   716.3510   1.50E+13
0.00        0.00        0.00
42.0000      3.2208  -9267510.    935494.   -0.00837   452.0847   1.50E+13
0.00        0.00        0.00
44.0000      3.0197   1.37E+07    935494.   -0.00837   502.9685   1.50E+13
0.00        0.00        0.00
46.0000      2.8190   3.66E+07    935490.   -0.00833   767.2299   1.50E+13
-0.3392      2.8875       0.00
48.0000      2.6198   5.96E+07    935474.   -0.00825      1031.   1.50E+13
-0.9929      9.0962       0.00
50.0000      2.4229   8.25E+07    935443.   -0.00814      1296.   1.50E+13
-1.6123     15.9711       0.00
52.0000      2.2291   1.05E+08    935397.   -0.00799      1560.   1.50E+13
-2.1954     23.6372       0.00
54.0000      2.0394   1.28E+08    935338.   -0.00780      1824.   1.50E+13
-2.7402     32.2473       0.00
56.0000      1.8546   1.51E+08    935266.   -0.00758      2087.   1.50E+13
-3.2448     41.9898       0.00
58.0000      1.6756   1.74E+08    935182.   -0.00732      2351.   1.50E+13
-3.7072     53.0981       0.00
60.0000      1.5033   1.97E+08    901133.   -0.00702      2614.   1.50E+13
-2834.      45240.       0.00
62.0000      1.3386   2.18E+08    792039.   -0.00669      2859.   1.50E+13
-6257.     112191.       0.00
64.0000      1.1822   2.36E+08    641820.   -0.00633      3061.   1.50E+13
-6261.     127099.       0.00
66.0000      1.0349   2.50E+08    492211.   -0.00594      3222.   1.50E+13
-6207.     143930.       0.00
68.0000      0.8972   2.60E+08    344584.   -0.00553      3341.   1.50E+13
-6096.     163057.       0.00
70.0000      0.7695   2.67E+08    200276.   -0.00511      3420.   1.50E+13
-5930.     184954.       0.00
72.0000      0.6520   2.70E+08     60580.   -0.00468      3459.   1.50E+13
-5711.     210237.       0.00
74.0000      0.5449   2.71E+08    -73265.   -0.00425      3460.   1.50E+13
-5442.     239709.       0.00
```

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```
 76.0000     0.4482   2.67E+08   -200066.   -0.00382      3424.   1.50E+13
 -5124.    274422.       0.00
 78.0000     0.3617   2.61E+08   -318652.   -0.00339      3355.   1.50E+13
 -4758.    315677.       0.00
 80.0000     0.2853   2.53E+08   -427645.   -0.00298      3253.   1.50E+13
 -4325.    363848.       0.00
 82.0000     0.2186   2.41E+08   -524971.   -0.00259      3122.   1.50E+13
 -3786.    415705.       0.00
 84.0000     0.1611   2.28E+08   -609396.   -0.00221      2967.   1.50E+13
 -3250.    484231.       0.00
 86.0000     0.1123   2.12E+08   -680962.   -0.00186      2789.   1.50E+13
 -2714.    579850.       0.00
 88.0000    0.07174   1.95E+08   -739556.   -0.00154      2593.   1.50E+13
 -2169.    725613.       0.00
 90.0000    0.03863   1.77E+08   -784682.   -0.00124      2382.   1.50E+13
 -1592.    988822.       0.00
 92.0000    0.01232   1.58E+08   -814569.  -9.70E-04      2161.   1.50E+13
 -898.8633   1751521.       0.00
 94.0000   -0.00795   1.38E+08   -816696.  -7.34E-04      1933.   1.50E+13
 721.5859   2179214.       0.00
 96.0000   -0.02292   1.19E+08   -793329.  -5.29E-04      1711.   1.50E+13
 1226.   1283585.       0.00
 98.0000   -0.03334   9.99E+07   -760881.  -3.54E-04      1496.   1.50E+13
 1478.   1064294.       0.00
100.0000   -0.03992   8.21E+07   -716305.  -2.09E-04      1291.   1.50E+13
2236.   1344449.       0.00
102.0000   -0.04336   6.56E+07   -653766.  -9.07E-05      1100.   1.50E+13
2975.   1646952.       0.00
104.0000   -0.04427   5.07E+07   -581984.   2.29E-06   929.4173   1.50E+13
3007.   1629788.       0.00
106.0000   -0.04325   3.76E+07   -510247.   7.29E-05   778.5483   1.50E+13
2971.   1649055.       0.00
108.0000   -0.04077   2.62E+07   -439966.   1.24E-04   647.3430   1.50E+13
2885.   1698314.       0.00
110.0000   -0.03730   1.65E+07   -372228.   1.58E-04   535.2425   1.50E+13
2759.   1775754.       0.00
112.0000   -0.03318   8341470.   -307879.   1.78E-04   441.4232   1.50E+13
2603.   1882552.       0.00
114.0000   -0.02875   1690934.   -247569.   1.86E-04   364.8560   1.50E+13
2423.   2022435.       0.00
116.0000   -0.02426  -3564169.   -191789.   1.85E-04   386.4224   1.50E+13
2225.   2201927.       0.00
118.0000   -0.01990  -7537099.   -140899.   1.76E-04   432.1625   1.50E+13
2016.   2431233.       0.00
120.0000   -0.01583  -1.03E+07    -95142.   1.61E-04   464.5286   1.50E+13
1798.   2726023.       0.00
122.0000   -0.01215  -1.21E+07    -54669.   1.43E-04   484.9629   1.50E+13
1575.   3110858.       0.00
124.0000   -0.00894  -1.30E+07    -19551.   1.23E-04   494.9381   1.50E+13
1351.   3626081.       0.00
126.0000   -0.00623  -1.31E+07     10204.   1.02E-04   495.9375   1.50E+13
1128.   4343122.       0.00
128.0000   -0.00403  -1.25E+07     34624.   8.20E-05   489.4406   1.50E+13
906.7263   5404080.       0.00
130.0000   -0.00230  -1.14E+07     53726.   6.28E-05   476.9170   1.50E+13
685.1459   7151649.       0.00
132.0000   -0.00101  -9940894.     66503.   4.58E-05   459.8373   1.50E+13
379.6351   9020160.       0.00
134.0000  -1.02E-04  -8237746.     71532.   3.12E-05   440.2290   1.50E+13
39.3828   9227520.       0.00
136.0000   4.89E-04  -6511122.     69697.   1.94E-05   420.3505   1.50E+13
-192.2746   9434880.       0.00
138.0000   8.31E-04  -4894624.     63385.   1.03E-05   401.7399   1.50E+13
```

File name is incorrect below, run designation is "Channel Post Seismic Trans.(No scour) 96in"


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-333.7644   9642240.       0.00
140.0000   9.85E-04  -3469904.     54531.   3.63E-06   385.3371   1.50E+13
-404.0691   9849600.       0.00
142.0000    0.00101  -2277596.     44627.  -9.60E-07   371.6102   1.50E+13
-421.2312   1.01E+07       0.00
144.0000   9.38E-04  -1327698.     34756.  -3.84E-06   360.6740   1.50E+13
-401.3685   1.03E+07       0.00
146.0000   8.21E-04   -608861.     25642.  -5.39E-06   352.3981   1.50E+13
-358.1207   1.05E+07       0.00
148.0000   6.80E-04    -96243.     17715.  -5.95E-06   346.4964   1.50E+13
-302.4421   1.07E+07       0.00
150.0000   5.35E-04    242177.     11174.  -5.84E-06   348.1765   1.50E+13
-242.6505   1.09E+07       0.00
152.0000   3.99E-04    440807.      6046.  -5.29E-06   350.4633   1.50E+13
-184.6534   1.11E+07       0.00
154.0000   2.81E-04    533035.      2243.  -4.51E-06   351.5251   1.50E+13
-132.2811   1.13E+07       0.00
156.0000   1.83E-04    549018.  -396.3037  -3.65E-06   351.7091   1.50E+13
-87.6693   1.15E+07       0.00
158.0000   1.06E-04    514450.     -2068.  -2.80E-06   351.3112   1.50E+13
-51.6477   1.17E+07       0.00
160.0000   4.85E-05    450085.     -2977.  -2.03E-06   350.5701   1.50E+13
-24.1032   1.19E+07       0.00
162.0000   8.51E-06    371792.     -3318.  -1.37E-06   349.6688   1.50E+13
-4.2991   1.21E+07       0.00
164.0000  -1.72E-05    290988.     -3263.  -8.40E-07   348.7385   1.50E+13
8.8614   1.23E+07       0.00
166.0000  -3.18E-05    215259.     -2957.  -4.35E-07   347.8666   1.50E+13
16.6295   1.25E+07       0.00
168.0000  -3.81E-05    149089.     -2515.  -1.44E-07   347.1048   1.50E+13
20.2599   1.28E+07       0.00
170.0000  -3.87E-05     94574.     -2021.   5.09E-08   346.4772   1.50E+13
20.9099   1.30E+07       0.00
172.0000  -3.57E-05     52094.     -1535.   1.68E-07   345.9881   1.50E+13
19.5788   1.32E+07       0.00
174.0000  -3.07E-05     20887.     -1095.   2.26E-07   345.6288   1.50E+13
17.0812   1.34E+07       0.00
176.0000  -2.48E-05  -484.1393  -721.3228   2.43E-07   345.3939   1.50E+13
14.0430   1.36E+07       0.00
178.0000  -1.90E-05    -13766.  -421.8309   2.31E-07   345.5468   1.50E+13
10.9146   1.38E+07       0.00
180.0000  -1.37E-05    -20760.  -194.9298   2.04E-07   345.6273   1.50E+13
7.9938   1.40E+07       0.00
182.0000  -9.21E-06    -23147.   -33.5673   1.69E-07   345.6548   1.50E+13
5.4531   1.42E+07       0.00
184.0000  -5.61E-06    -22391.    72.2870   1.32E-07   345.6461   1.50E+13
3.3681   1.44E+07       0.00
186.0000  -2.86E-06    -19693.   133.6358   9.86E-08   345.6151   1.50E+13
1.7443   1.46E+07       0.00
188.0000  -8.74E-07    -15989.   161.0460   7.01E-08   345.5724   1.50E+13
0.5399   1.48E+07       0.00
190.0000   5.02E-07    -11971.   163.7502   4.78E-08   345.5262   1.50E+13
-0.3145   1.50E+07       0.00
192.0000   1.42E-06     -8134.   149.1640   3.17E-08   345.4820   1.50E+13
-0.9010   1.52E+07       0.00
194.0000   2.02E-06     -4815.   122.7240   2.13E-08   345.4438   1.50E+13
-1.3023   1.54E+07       0.00
196.0000   2.44E-06     -2246.    87.9726   1.57E-08   345.4142   1.50E+13
-1.5936   1.57E+07       0.00
198.0000   2.78E-06  -594.5658    46.8276   1.34E-08   345.3952   1.50E+13
-1.8351   1.59E+07       0.00
200.0000   3.09E-06       0.00       0.00   1.29E-08   345.3883   1.50E+13
-2.0672   8035200.       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 7:

```
Pile-head deflection             =     6.00935864 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -487727764. inch-lbs
Maximum shear force              =        935539. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             17
Number of zero deflection points =              4
```

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type 1	Pile-head Load 1 lbs	Load Type 2	Pile-head Load 2 in-lbs	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile	Max Moment in Pile
1	y, in	0.5000	S, rad	0.00	2500000.	0.5010	0.00	-123180.	-5.22E+07
2	y, in	1.0000	S, rad	0.00	2500000.	1.0019	0.00	-222546.	-9.94E+07
3	y, in	2.0000	S, rad	0.00	2500000.	2.0036	0.00	384923.	-1.88E+08
4	y, in	3.0000	S, rad	0.00	2500000.	3.0052	0.00	543483.	-2.70E+08
5	y, in	4.0000	S, rad	0.00	2500000.	4.0067	0.00	687198.	-3.47E+08
6	y, in	5.0000	S, rad	0.00	2500000.	5.0081	0.00	817588.	-4.20E+08
7	y, in	6.0000	S, rad	0.00	2500000.	6.0094	0.00	935539.	-4.88E+08

Maximum pile-head deflection = 6.0093586377 inches
Maximum pile-head rotation = 0.0000000000 radians = 0.000000 deg.

The analysis ended normally.

File name is incorrect below, run designation is "Channel Static Trans.(Half scour) 96in"

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LPile for Windows, Version 2016-09.009

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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Files Used for Analysis

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Path to file locations:
\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis
\L-Pile\Channel\Transverse\Static (Half Scour)\

Name of input data file:
Channel Static 24in.lp9d

Name of output report file:
Channel Static 24in.lp9o

Name of plot output file:
Channel Static 24in.lp9p

Name of runtime message file:
Channel Static 24in.lp9r

--
Date and Time of Analysis

--

Date: October 4, 2017 Time: 12:08:11

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Problem Title

Project Name: Harbor River Bridge
Job Number: 18461-007-01
Client: SCDOT
Engineer: HPC
Description: Channel - Static

Program Options and Settings

Computational Options:
- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:
- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed	=	500
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	100

Loading Type and Number of Cycles of Loading:
- Static loading specified

- Analysis uses p-y modification factors for p-y curves
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined	=	1
Total length of pile	=	200.000 ft
Depth of ground surface below top of pile	=	55.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	96.0000
2	200.000	96.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile

Cross-sectional Shape	=	Circular Pile
Length of section	=	200.000000 ft
Width of top of section	=	96.000000 in
Width of bottom of section	=	96.000000 in
Top Area	=	7238. sq. in
Bottom Area	=	7238. sq. in
Moment of Inertia at Top	=	4169220. in^4
Moment of Inertia at Bottom	=	4169220. in^4
Elastic Modulus	=	3600000. psi

--
Ground Slope and Pile Batter Angles

--

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

--
Soil and Rock Layering Information

--

The soil profile is modelled using 3 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	55.000000 ft
Distance from top of pile to bottom of layer	=	60.000000 ft
Effective unit weight at top of layer	=	37.600000 pcf
Effective unit weight at bottom of layer	=	37.600000 pcf
Friction angle at top of layer	=	30.000000 deg.
Friction angle at bottom of layer	=	30.000000 deg.
Subgrade k at top of layer	=	20.000000 pci
Subgrade k at bottom of layer	=	20.000000 pci

Layer 2 is stiff clay with water-induced erosion

Distance from top of pile to top of layer	=	60.000000	ft
Distance from top of pile to bottom of layer	=	100.000000	ft
Effective unit weight at top of layer	=	57.600000	pcf
Effective unit weight at bottom of layer	=	57.600000	pcf
Undrained cohesion at top of layer	=	4000.	psf
Undrained cohesion at bottom of layer	=	4000.	psf
Epsilon-50 at top of layer	=	0.005000	
Epsilon-50 at bottom of layer	=	0.005000	
Subgrade k at top of layer	=	1000.000000	pci
Subgrade k at bottom of layer	=	1000.000000	pci

Layer 3 is stiff clay with water-induced erosion

Distance from top of pile to top of layer	=	100.000000	ft
Distance from top of pile to bottom of layer	=	210.000000	ft
Effective unit weight at top of layer	=	57.600000	pcf
Effective unit weight at bottom of layer	=	57.600000	pcf
Undrained cohesion at top of layer	=	6000.	psf
Undrained cohesion at bottom of layer	=	6000.	psf
Epsilon-50 at top of layer	=	0.005000	
Epsilon-50 at bottom of layer	=	0.005000	
Subgrade k at top of layer	=	2000.	pci
Subgrade k at bottom of layer	=	2000.	pci

(Depth of the lowest soil layer extends 10.000 ft below the pile tip)

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Summary of Input Soil Properties

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Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Sand (Reese, et al.)	55.0000 60.0000	37.6000 37.6000	-- --		30.0000 30.0000	-- 20.0000
2	Stiff Clay with Free Water	60.0000 100.0000	57.6000 57.6000	4000. 4000.	-- --	0.00500 0.00500	1000.0000 1000.0000
3	Stiff Clay with Free Water	100.0000 210.0000	57.6000 57.6000	6000. 6000.	-- --	0.00500 0.00500	2000. 2000.

--
p-y Modification Factors for Group Action

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Distribution of p-y modifiers with depth defined using 2 points

Point No.	Depth X ft	p-mult	y-mult
1	55.000	0.4500	1.0000
2	210.000	0.4500	1.0000

--
Static Loading Type

--

Static loading criteria were used when computing p-y curves for all analyses.

--
Pile-head Loading and Pile-head Fixity Conditions

--

Number of loads specified = 2

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	2	V = 400000. lbs	S = 0.0000 in/in	2500000.	No
2	2	V = 500000. lbs	S = 0.0000 in/in	2500000.	No

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

--
Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness
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Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

---
Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	55.0000	0.00	N.A.	No	0.00	32644.
2	60.0000	50.0812	No	No	32644.	1235610.
3	100.0000	90.0812	Yes	No	1268253.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head = 400000.0 lbs
Rotation of pile head = 0.000E+00 radians
Axial load at pile head = 2500000.0 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth X feet	Deflect. y inches	Bending Moment lb/inch	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2
Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load in-lb/inch				
0.00	1.8970	-1.89E+08	400000.	0.00	2525.	1.50E+13
0.00	0.00	0.00				
2.0000	1.8934	-1.80E+08	400000.	-2.95E-04	2414.	1.50E+13
0.00	0.00	0.00				
4.0000	1.8829	-1.70E+08	400000.	-5.75E-04	2303.	1.50E+13
0.00	0.00	0.00				

File name is incorrect below, run designation is "Channel Static Trans.(Half scour) 96in"


```
 6.0000     1.8658  -1.60E+08    400000.  -8.39E-04      2192.   1.50E+13
 0.00       0.00       0.00
 8.0000     1.8426  -1.51E+08    400000.   -0.00109      2081.   1.50E+13
 0.00       0.00       0.00
10.0000     1.8136  -1.41E+08    400000.   -0.00132      1970.   1.50E+13
0.00       0.00       0.00
12.0000     1.7792  -1.31E+08    400000.   -0.00154      1858.   1.50E+13
0.00       0.00       0.00
14.0000     1.7398  -1.22E+08    400000.   -0.00174      1746.   1.50E+13
0.00       0.00       0.00
16.0000     1.6956  -1.12E+08    400000.   -0.00193      1635.   1.50E+13
0.00       0.00       0.00
18.0000     1.6472  -1.02E+08    400000.   -0.00210      1523.   1.50E+13
0.00       0.00       0.00
20.0000     1.5949  -9.25E+07    400000.   -0.00225      1411.   1.50E+13
0.00       0.00       0.00
22.0000     1.5390  -8.28E+07    400000.   -0.00240      1299.   1.50E+13
0.00       0.00       0.00
24.0000     1.4799  -7.30E+07    400000.   -0.00252      1186.   1.50E+13
0.00       0.00       0.00
26.0000     1.4181  -6.33E+07    400000.   -0.00263      1074.   1.50E+13
0.00       0.00       0.00
28.0000     1.3538  -5.35E+07    400000.   -0.00272   961.6018   1.50E+13
0.00       0.00       0.00
30.0000     1.2874  -4.38E+07    400000.   -0.00280   849.1677   1.50E+13
0.00       0.00       0.00
32.0000     1.2194  -3.40E+07    400000.   -0.00286   736.6852   1.50E+13
0.00       0.00       0.00
34.0000     1.1500  -2.42E+07    400000.   -0.00291   624.1652   1.50E+13
0.00       0.00       0.00
36.0000     1.0798  -1.44E+07    400000.   -0.00294   511.6185   1.50E+13
0.00       0.00       0.00
38.0000     1.0089  -4661489.    400000.   -0.00295   399.0558   1.50E+13
0.00       0.00       0.00
40.0000     0.9379   5116013.    400000.   -0.00295   404.2887   1.50E+13
0.00       0.00       0.00
42.0000     0.8671   1.49E+07    400000.   -0.00294   516.8509   1.50E+13
0.00       0.00       0.00
44.0000     0.7969   2.47E+07    400000.   -0.00291   629.3966   1.50E+13
0.00       0.00       0.00
46.0000     0.7276   3.44E+07    400000.   -0.00286   741.9151   1.50E+13
0.00       0.00       0.00
48.0000     0.6596   4.42E+07    400000.   -0.00280   854.3956   1.50E+13
0.00       0.00       0.00
50.0000     0.5934   5.40E+07    400000.   -0.00272   966.8272   1.50E+13
0.00       0.00       0.00
52.0000     0.5292   6.37E+07    400000.   -0.00262      1079.   1.50E+13
0.00       0.00       0.00
54.0000     0.4674   7.35E+07    400000.   -0.00251      1192.   1.50E+13
0.00       0.00       0.00
56.0000     0.4085   8.32E+07    399471.   -0.00239      1304.   1.50E+13
-44.1183      2592.       0.00
58.0000     0.3528   9.30E+07    397570.   -0.00225      1416.   1.50E+13
-114.2966      7776.       0.00
60.0000     0.3006   1.03E+08    333696.   -0.00209      1527.   1.50E+13
-5208.    415847.       0.00
62.0000     0.2524   1.09E+08    213767.   -0.00192      1603.   1.50E+13
-4786.    455114.       0.00
64.0000     0.2083   1.13E+08    104161.   -0.00174      1647.   1.50E+13
-4348.    500914.       0.00
66.0000     0.1686   1.14E+08      5041.   -0.00156      1663.   1.50E+13
-3912.    556766.       0.00
68.0000     0.1333   1.14E+08    -83643.   -0.00138      1652.   1.50E+13
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 -3478.    626167.       0.00
 70.0000     0.1024   1.11E+08   -161959.   -0.00120      1619.   1.50E+13
 -3048.    714590.       0.00
 72.0000    0.07566   1.06E+08   -229979.   -0.00103      1564.   1.50E+13
 -2620.    831204.       0.00
 74.0000    0.05302   9.97E+07   -287745.  -8.64E-04      1493.   1.50E+13
 -2193.    992986.       0.00
 76.0000    0.03419   9.22E+07   -335207.  -7.10E-04      1407.   1.50E+13
 -1762.   1236416.       0.00
 78.0000    0.01891   8.37E+07   -372068.  -5.70E-04      1309.   1.50E+13
 -1310.   1662571.       0.00
 80.0000    0.00684   7.44E+07   -397245.  -4.44E-04      1202.   1.50E+13
 -787.9577   2764662.       0.00
 82.0000   -0.00238   6.46E+07   -402541.  -3.32E-04      1090.   1.50E+13
 346.5909   3499200.       0.00
 84.0000   -0.00911   5.51E+07   -387469.  -2.37E-04   979.7822   1.50E+13
 909.3794   2394768.       0.00
 86.0000   -0.01374   4.61E+07   -363160.  -1.56E-04   875.8686   1.50E+13
 1116.   1950735.       0.00
 88.0000   -0.01659   3.77E+07   -335039.  -8.88E-05   779.3076   1.50E+13
 1227.   1775062.       0.00
 90.0000   -0.01800   3.00E+07   -304981.  -3.46E-05   690.8414   1.50E+13
 1278.   1704260.       0.00
 92.0000   -0.01825   2.31E+07   -274202.   7.78E-06   610.8165   1.50E+13
 1287.   1692287.       0.00
 94.0000   -0.01762   1.68E+07   -243583.   3.97E-05   539.3008   1.50E+13
 1265.   1722231.       0.00
 96.0000   -0.01635   1.14E+07   -213792.   6.22E-05   476.1527   1.50E+13
 1218.   1788160.       0.00
 98.0000   -0.01464   6573534.   -185346.   7.66E-05   421.0691   1.50E+13
 1152.   1889815.       0.00
100.0000   -0.01267   2452235.   -155430.   8.38E-05   373.6208   1.50E+13
1340.   2538703.       0.00
102.0000   -0.01061   -897182.   -121678.   8.50E-05   355.7175   1.50E+13
1472.   3328663.       0.00
104.0000   -0.00859  -3398525.    -88118.   8.16E-05   384.5154   1.50E+13
1324.   3699919.       0.00
106.0000   -0.00670  -5136640.    -58190.   7.48E-05   404.5262   1.50E+13
1170.   4190203.       0.00
108.0000   -0.00500  -6200622.    -32028.   6.57E-05   416.7758   1.50E+13
1011.   4848636.       0.00
110.0000   -0.00355  -6681845.     -9689.   5.54E-05   422.3160   1.50E+13
850.8008   5759944.       0.00
112.0000   -0.00234  -6672366.      8822.   4.47E-05   422.2069   1.50E+13
691.7818   7084054.       0.00
114.0000   -0.00140  -6263780.     23535.   3.44E-05   417.5029   1.50E+13
534.3643   9171104.       0.00
116.0000  -6.93E-04  -5546799.     34463.   2.49E-05   409.2483   1.50E+13
376.3112   1.30E+07       0.00
118.0000  -2.01E-04  -4612531.     40624.   1.68E-05   398.4921   1.50E+13
137.0503   1.63E+07       0.00
120.0000   1.14E-04  -3598879.     41311.   1.02E-05   386.8220   1.50E+13
-79.7527   1.68E+07       0.00
122.0000   2.91E-04  -2630820.     37832.   5.27E-06   375.6768   1.50E+13
-210.2271   1.74E+07       0.00
124.0000   3.66E-04  -1783599.     32031.   1.74E-06   365.9228   1.50E+13
-273.1078   1.79E+07       0.00
126.0000   3.74E-04  -1093517.     25438.  -5.61E-07   357.9779   1.50E+13
-276.3378   1.77E+07       0.00
128.0000   3.40E-04   -562501.     18962.  -1.89E-06   351.8644   1.50E+13
-263.3036   1.86E+07       0.00
130.0000   2.84E-04   -183094.     13047.  -2.48E-06   347.4963   1.50E+13
-229.6406   1.94E+07       0.00
```

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132.0000   2.20E-04     64058.      8092.  -2.58E-06   346.1258   1.50E+13
-183.3178   2.00E+07       0.00
134.0000   1.60E-04    205613.      4255.  -2.36E-06   347.7555   1.50E+13
-136.3680   2.05E+07       0.00
136.0000   1.07E-04    268600.      1495.  -1.98E-06   348.4807   1.50E+13
-93.7027   2.10E+07       0.00
138.0000   6.47E-05    277589.  -325.8982  -1.55E-06   348.5842   1.50E+13
-58.0000   2.15E+07       0.00
140.0000   3.29E-05    253142.     -1385.  -1.12E-06   348.3027   1.50E+13
-30.2446   2.20E+07       0.00
142.0000   1.09E-05    211251.     -1871.  -7.50E-07   347.8205   1.50E+13
-10.2452   2.26E+07       0.00
144.0000  -3.03E-06    163438.     -1959.  -4.50E-07   347.2700   1.50E+13
2.9140   2.31E+07       0.00
146.0000  -1.07E-05    117288.     -1798.  -2.26E-07   346.7387   1.50E+13
10.5108   2.36E+07       0.00
148.0000  -1.39E-05     77181.     -1504.  -7.00E-08   346.2769   1.50E+13
13.9178   2.41E+07       0.00
150.0000  -1.41E-05     45083.     -1164.   2.77E-08   345.9074   1.50E+13
14.4225   2.46E+07       0.00
152.0000  -1.25E-05     21289.  -833.8096   8.08E-08   345.6334   1.50E+13
13.1233   2.51E+07       0.00
154.0000  -1.02E-05      5051.  -545.7165   1.02E-07   345.4465   1.50E+13
10.8845   2.57E+07       0.00
156.0000  -7.64E-06     -4918.  -315.1086   1.02E-07   345.4450   1.50E+13
8.3328   2.62E+07       0.00
158.0000  -5.29E-06    -10087.  -144.5374   8.99E-08   345.5045   1.50E+13
5.8814   2.67E+07       0.00
160.0000  -3.32E-06    -11867.   -28.7525   7.24E-08   345.5250   1.50E+13
3.7673   2.72E+07       0.00
162.0000  -1.81E-06    -11476.    41.5910   5.37E-08   345.5204   1.50E+13
2.0946   2.77E+07       0.00
164.0000  -7.43E-07     -9877.    77.2282   3.67E-08   345.5020   1.50E+13
0.8751   2.83E+07       0.00
166.0000  -5.33E-08     -7773.    88.4959   2.25E-08   345.4778   1.50E+13
0.06384   2.88E+07       0.00
168.0000   3.39E-07     -5632.    84.3033   1.18E-08   345.4532   1.50E+13
-0.4132   2.93E+07       0.00
170.0000   5.14E-07     -3728.    71.6792   4.34E-09   345.4312   1.50E+13
-0.6388   2.98E+07       0.00
172.0000   5.47E-07     -2192.    55.7197  -3.91E-10   345.4136   1.50E+13
-0.6912   3.03E+07       0.00
174.0000   4.96E-07     -1053.    39.7831  -2.99E-09   345.4005   1.50E+13
-0.6369   3.08E+07       0.00
176.0000   4.04E-07  -281.6432    25.8101  -4.05E-09   345.3916   1.50E+13
-0.5275   3.14E+07       0.00
178.0000   3.01E-07   186.1264    14.6813  -4.13E-09   345.3905   1.50E+13
-0.3999   3.19E+07       0.00
180.0000   2.05E-07   423.5529     6.5539  -3.64E-09   345.3932   1.50E+13
-0.2774   3.24E+07       0.00
182.0000   1.26E-07   501.1496     1.1475  -2.90E-09   345.3941   1.50E+13
-0.1731   3.29E+07       0.00
184.0000   6.62E-08   478.9804    -2.0364  -2.12E-09   345.3938   1.50E+13
-0.09220   3.34E+07       0.00
186.0000   2.45E-08   403.6575    -3.5591  -1.41E-09   345.3930   1.50E+13
-0.03469   3.40E+07       0.00
188.0000  -1.65E-09   308.3128    -3.9471  -8.44E-10   345.3919   1.50E+13
0.00236   3.45E+07       0.00
190.0000  -1.60E-08   214.2999    -3.6391  -4.26E-10   345.3908   1.50E+13
0.02330   3.50E+07       0.00
192.0000  -2.21E-08   133.6867    -2.9673  -1.48E-10   345.3899   1.50E+13
0.03269   3.55E+07       0.00
194.0000  -2.31E-08    71.8877    -2.1594   1.66E-11   345.3892   1.50E+13
```

```
  0.03463   3.60E+07       0.00
  196.0000  -2.13E-08    30.0314    -1.3547   9.81E-11   345.3887   1.50E+13
  0.03242   3.65E+07       0.00
  198.0000  -1.84E-08     6.8489    -0.6253   1.28E-10   345.3884   1.50E+13
  0.02836   3.71E+07       0.00
  200.0000  -1.52E-08       0.00       0.00   1.33E-10   345.3883   1.50E+13
  0.02375   1.88E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     1.89703942 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -189281747. inch-lbs
Maximum shear force              =       -402541. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =    82.00000000 feet below pile head
Number of iterations             =             14
Number of zero deflection points =              5
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

```
Shear force at pile head                                =     500000.0 lbs
Rotation of pile head                                   =    0.000E+00 radians
Axial load at pile head                                 =    2500000.0 lbs
```

(Zero slope for this load indicates fixed-head conditions)

```
   Depth    Deflect.    Bending     Shear      Slope      Total     Bending
   Soil Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness
     p        Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
   lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     2.4565  -2.39E+08    500000.       0.00      3100.   1.50E+13
      0.00       0.00       0.00
    2.0000     2.4519  -2.27E+08    500000.  -3.73E-04      2962.   1.50E+13
    0.00       0.00       0.00
    4.0000     2.4386  -2.15E+08    500000.  -7.27E-04      2823.   1.50E+13
    0.00       0.00       0.00
    6.0000     2.4170  -2.03E+08    500000.   -0.00106      2684.   1.50E+13
    0.00       0.00       0.00
    8.0000     2.3877  -1.91E+08    500000.   -0.00138      2545.   1.50E+13
    0.00       0.00       0.00
   10.0000     2.3510  -1.79E+08    500000.   -0.00167      2406.   1.50E+13
   0.00       0.00       0.00
   12.0000     2.3074  -1.67E+08    500000.   -0.00195      2267.   1.50E+13
   0.00       0.00       0.00
   14.0000     2.2574  -1.55E+08    500000.   -0.00221      2127.   1.50E+13
   0.00       0.00       0.00
```

File name is incorrect below, run designation is "Channel Static Trans.(Half scour) 96in"


```
16.0000     2.2015  -1.43E+08    500000.   -0.00244      1987.   1.50E+13
0.00       0.00       0.00
18.0000     2.1401  -1.30E+08    500000.   -0.00266      1847.   1.50E+13
0.00       0.00       0.00
20.0000     2.0737  -1.18E+08    500000.   -0.00286      1707.   1.50E+13
0.00       0.00       0.00
22.0000     2.0028  -1.06E+08    500000.   -0.00304      1567.   1.50E+13
0.00       0.00       0.00
24.0000     1.9278  -9.39E+07    500000.   -0.00320      1427.   1.50E+13
0.00       0.00       0.00
26.0000     1.8492  -8.17E+07    500000.   -0.00334      1286.   1.50E+13
0.00       0.00       0.00
28.0000     1.7674  -6.95E+07    500000.   -0.00346      1146.   1.50E+13
0.00       0.00       0.00
30.0000     1.6830  -5.73E+07    500000.   -0.00356      1005.   1.50E+13
0.00       0.00       0.00
32.0000     1.5964  -4.51E+07    500000.   -0.00364   864.6485   1.50E+13
0.00       0.00       0.00
34.0000     1.5081  -3.29E+07    500000.   -0.00371   723.9504   1.50E+13
0.00       0.00       0.00
36.0000     1.4185  -2.07E+07    500000.   -0.00375   583.2160   1.50E+13
0.00       0.00       0.00
38.0000     1.3281  -8431415.    500000.   -0.00377   442.4587   1.50E+13
0.00       0.00       0.00
40.0000     1.2373   3795391.    500000.   -0.00378   389.0845   1.50E+13
0.00       0.00       0.00
42.0000     1.1468   1.60E+07    500000.   -0.00376   529.8468   1.50E+13
0.00       0.00       0.00
44.0000     1.0568   2.82E+07    500000.   -0.00373   670.5914   1.50E+13
0.00       0.00       0.00
46.0000     0.9679   4.05E+07    500000.   -0.00367   811.3049   1.50E+13
0.00       0.00       0.00
48.0000     0.8806   5.27E+07    500000.   -0.00360   951.9736   1.50E+13
0.00       0.00       0.00
50.0000     0.7953   6.49E+07    500000.   -0.00350      1093.   1.50E+13
0.00       0.00       0.00
52.0000     0.7125   7.71E+07    500000.   -0.00339      1233.   1.50E+13
0.00       0.00       0.00
54.0000     0.6326   8.93E+07    500000.   -0.00326      1374.   1.50E+13
0.00       0.00       0.00
56.0000     0.5562   1.01E+08    499386.   -0.00310      1514.   1.50E+13
-51.1578      2207.       0.00
58.0000     0.4837   1.14E+08    496892.   -0.00293      1654.   1.50E+13
-156.7112      7776.       0.00
60.0000     0.4155   1.26E+08    424470.   -0.00274      1793.   1.50E+13
-5878.    339545.       0.00
62.0000     0.3522   1.34E+08    287423.   -0.00253      1892.   1.50E+13
-5542.    377697.       0.00
64.0000     0.2940   1.40E+08    159004.   -0.00231      1955.   1.50E+13
-5159.    421214.       0.00
66.0000     0.2411   1.42E+08     40955.   -0.00209      1983.   1.50E+13
-4678.    465580.       0.00
68.0000     0.1938   1.42E+08    -65505.   -0.00186      1980.   1.50E+13
-4194.    519371.       0.00
70.0000     0.1519   1.39E+08   -160378.   -0.00164      1950.   1.50E+13
-3712.    586681.       0.00
72.0000     0.1153   1.35E+08   -243745.   -0.00142      1894.   1.50E+13
-3235.    673315.       0.00
74.0000    0.08390   1.28E+08   -315675.   -0.00121      1817.   1.50E+13
-2759.    789338.       0.00
76.0000    0.05740   1.20E+08   -376175.   -0.00101      1721.   1.50E+13
-2282.    954312.       0.00
78.0000    0.03549   1.10E+08   -425098.  -8.25E-04      1610.   1.50E+13
```

```
 -1795.   1213726.       0.00
 80.0000    0.01779   9.92E+07   -461880.  -6.58E-04      1487.   1.50E+13
 -1271.   1714286.       0.00
 82.0000    0.00390   8.78E+07   -483948.  -5.09E-04      1356.   1.50E+13
 -568.4138   3499200.       0.00
 84.0000   -0.00662   7.60E+07   -481467.  -3.78E-04      1221.   1.50E+13
 775.1641   2809303.       0.00
 86.0000   -0.01423   6.47E+07   -458531.  -2.65E-04      1091.   1.50E+13
 1136.   1916868.       0.00
 88.0000   -0.01934   5.41E+07   -428998.  -1.70E-04   967.7298   1.50E+13
 1325.   1643799.       0.00
 90.0000   -0.02239   4.41E+07   -395994.  -9.16E-05   853.6740   1.50E+13
 1425.   1527953.       0.00
 92.0000   -0.02374   3.51E+07   -361276.  -2.82E-05   749.0218   1.50E+13
 1468.   1483862.       0.00
 94.0000   -0.02374   2.68E+07   -326048.   2.12E-05   654.0642   1.50E+13
 1468.   1483709.       0.00
 96.0000   -0.02272   1.94E+07   -291202.   5.82E-05   568.8116   1.50E+13
 1436.   1516775.       0.00
 98.0000   -0.02095   1.28E+07   -257424.   8.39E-05   493.0597   1.50E+13
 1379.   1579499.       0.00
100.0000   -0.01869   7039855.   -221341.   9.98E-05   426.4378   1.50E+13
1628.   2090380.       0.00
102.0000   -0.01616   2190201.   -180007.   1.07E-04   370.6040   1.50E+13
1816.   2697759.       0.00
104.0000   -0.01354  -1613362.   -138253.   1.08E-04   363.9629   1.50E+13
1663.   2946704.       0.00
106.0000   -0.01099  -4458859.   -100319.   1.03E-04   396.7229   1.50E+13
1498.   3271090.       0.00
108.0000   -0.00861  -6441011.    -66431.   9.41E-05   419.5433   1.50E+13
1326.   3696014.       0.00
110.0000   -0.00647  -7658832.    -36722.   8.28E-05   433.5640   1.50E+13
1150.   4262023.       0.00
112.0000   -0.00463  -8213627.    -11252.   7.01E-05   439.9514   1.50E+13
972.7096   5038038.       0.00
114.0000   -0.00311  -8207353.      9980.   5.70E-05   439.8791   1.50E+13
796.6312   6151632.       0.00
116.0000   -0.00190  -7741432.     27008.   4.43E-05   434.5150   1.50E+13
622.4068   7873689.       0.00
118.0000  -9.83E-04  -6916262.     39855.   3.25E-05   425.0149   1.50E+13
448.1298   1.09E+07       0.00
120.0000  -3.35E-04  -5832306.     48056.   2.23E-05   412.5353   1.50E+13
235.2854   1.68E+07       0.00
122.0000   8.93E-05  -4612266.     50104.   1.40E-05   398.4891   1.50E+13
-64.6221   1.74E+07       0.00
124.0000   3.37E-04  -3429005.     46317.   7.57E-06   384.8663   1.50E+13
-250.9645   1.79E+07       0.00
126.0000   4.53E-04  -2389972.     39657.   2.92E-06   372.9039   1.50E+13
-304.0063   1.61E+07       0.00
128.0000   4.77E-04  -1525816.     32265.  -2.13E-07   362.9550   1.50E+13
-312.0150   1.57E+07       0.00
130.0000   4.42E-04   -841235.     24914.  -2.11E-06   355.0734   1.50E+13
-300.5503   1.63E+07       0.00
132.0000   3.76E-04   -329690.     17984.  -3.04E-06   349.1840   1.50E+13
-276.9758   1.77E+07       0.00
134.0000   2.96E-04     22349.     11708.  -3.29E-06   345.6456   1.50E+13
-246.0023   1.99E+07       0.00
136.0000   2.18E-04    232688.      6468.  -3.08E-06   348.0673   1.50E+13
-190.6296   2.10E+07       0.00
138.0000   1.48E-04    333202.      2585.  -2.63E-06   349.2245   1.50E+13
-132.9940   2.15E+07       0.00
140.0000   9.16E-05    357080.   -20.1201  -2.08E-06   349.4994   1.50E+13
-84.0926   2.20E+07       0.00
```

```
142.0000   4.85E-05    332486.     -1577.  -1.53E-06   349.2162   1.50E+13
-45.6149   2.26E+07       0.00
144.0000   1.82E-05    281586.     -2334.  -1.04E-06   348.6302   1.50E+13
-17.5416   2.31E+07       0.00
146.0000  -1.24E-06    220555.     -2530.  -6.36E-07   347.9276   1.50E+13
1.2200   2.36E+07       0.00
148.0000  -1.23E-05    160206.     -2368.  -3.31E-07   347.2328   1.50E+13
12.3223   2.41E+07       0.00
150.0000  -1.71E-05    106938.     -2009.  -1.18E-07   346.6195   1.50E+13
17.5930   2.46E+07       0.00
152.0000  -1.79E-05     63795.     -1572.   1.87E-08   346.1228   1.50E+13
18.7752   2.51E+07       0.00
154.0000  -1.62E-05     31459.     -1139.   9.49E-08   345.7505   1.50E+13
17.3732   2.57E+07       0.00
156.0000  -1.34E-05      9128.  -755.1920   1.27E-07   345.4934   1.50E+13
14.5820   2.62E+07       0.00
158.0000  -1.01E-05     -4805.  -444.8863   1.31E-07   345.4437   1.50E+13
11.2768   2.67E+07       0.00
160.0000  -7.09E-06    -12242.  -213.0728   1.17E-07   345.5293   1.50E+13
8.0410   2.72E+07       0.00
162.0000  -4.51E-06    -15047.   -53.9812   9.53E-08   345.5616   1.50E+13
5.2166   2.77E+07       0.00
164.0000  -2.51E-06    -14845.    44.1455   7.14E-08   345.5592   1.50E+13
2.9606   2.83E+07       0.00
166.0000  -1.09E-06    -12936.    95.2881   4.92E-08   345.5373   1.50E+13
1.3012   2.88E+07       0.00
168.0000  -1.52E-07    -10277.   113.1347   3.07E-08   345.5067   1.50E+13
0.1860   2.93E+07       0.00
170.0000   3.86E-07     -7510.   109.6092   1.64E-08   345.4748   1.50E+13
-0.4798   2.98E+07       0.00
172.0000   6.37E-07     -5018.    94.1966   6.43E-09   345.4461   1.50E+13
-0.8046   3.03E+07       0.00
174.0000   6.95E-07     -2989.    73.8274   2.36E-11   345.4227   1.50E+13
-0.8928   3.08E+07       0.00
176.0000   6.38E-07     -1474.    53.1103  -3.54E-09   345.4053   1.50E+13
-0.8336   3.14E+07       0.00
178.0000   5.25E-07  -439.1789    34.7452  -5.07E-09   345.3934   1.50E+13
-0.6968   3.19E+07       0.00
180.0000   3.94E-07   194.3507    19.9951  -5.27E-09   345.3906   1.50E+13
-0.5324   3.24E+07       0.00
182.0000   2.72E-07   521.2200     9.1365  -4.70E-09   345.3943   1.50E+13
-0.3725   3.29E+07       0.00
184.0000   1.69E-07   633.4676     1.8434  -3.77E-09   345.3956   1.50E+13
-0.2352   3.34E+07       0.00
186.0000   9.04E-08   610.1550    -2.5146  -2.78E-09   345.3954   1.50E+13
-0.1279   3.40E+07       0.00
188.0000   3.54E-08   513.1025    -4.6597  -1.88E-09   345.3942   1.50E+13
-0.05084   3.45E+07       0.00
190.0000   6.69E-11   386.7159    -5.2710  -1.16E-09   345.3928   1.50E+13
-9.75E-05   3.50E+07       0.00
192.0000  -2.04E-08   260.2360    -4.9096  -6.46E-10   345.3913   1.50E+13
0.03021   3.55E+07       0.00
194.0000  -3.09E-08   151.1348    -3.9899  -3.17E-10   345.3901   1.50E+13
0.04642   3.60E+07       0.00
196.0000  -3.56E-08    68.7567    -2.7820  -1.41E-10   345.3891   1.50E+13
0.05425   3.65E+07       0.00
198.0000  -3.77E-08    17.6176    -1.4326  -7.18E-11   345.3885   1.50E+13
0.05820   3.71E+07       0.00
200.0000  -3.91E-08       0.00       0.00  -5.78E-11   345.3883   1.50E+13
0.06118   1.88E+07       0.00
```

* The above values of total stress are combined axial and bending stresses.

File name is incorrect below, run designation is "Channel Static Trans.(Half scour) 96in"

Channel Static 24in.lp9o 10/4/2017

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     2.45649902 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =    -239252502. inch-lbs
Maximum shear force              =        500000. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =     4.00000000 feet below pile head
Number of iterations             =             15
Number of zero deflection points =              5
```

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type 1	Pile-head Load 1	Load Type 2	Pile-head Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	V, lb	400000.	S, rad	0.00	2500000.	1.8970	0.00	-402541.	-1.89E+08
2	V, lb	500000.	S, rad	0.00	2500000.	2.4565	0.00	500000.	-2.39E+08

Maximum pile-head deflection = 2.4564990162 inches
Maximum pile-head rotation = 0.0000000000 radians = 0.000000 deg.

The analysis ended normally.

APPENDIX G
Global Stability Analyses

3. Post Seismic

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File Information

File Version: 8.16
Created By: Yoon Seok Choi
Last Edited By: Ivy A. Harmon
Revision Number: 156
Date: 10/6/2017
Time: 8:20:26 AM
Tool Version: 8.16.1.13452
File Name: W_Abut Profile.gsz
Directory: Z:\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis\Slope-W\Bridge Report\

Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

3. Post Seismic

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: No
- Use Staged Rapid Drawdown: No

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °
- Optimize Critical Slip Surface Location: No
- Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

Compacted Fill

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 38 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (1)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silts/Clays

Model: S=f(overburden)
Unit Weight: 95 pcf
Tau/Sigma Ratio: 0.36
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Cooper Group Limestone

Model: Undrained (Phi=0)
Unit Weight: 120 pcf
Cohesion: 6,000 psf
Pore Water Pressure
Piezometric Line: 1

Sands (1) - Improved

Model: Mohr-Coulomb

Unit Weight: 100 pcf
Cohesion': 348 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silts/Clays - Improved

Model: Mohr-Coulomb
Unit Weight: 95 pcf
Cohesion': 348 psf
Phi': 19.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (1) - Residual

Model: S=f(overburden)
Unit Weight: 100 pcf
Tau/Sigma Ratio: 0.08
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Sands (2) - Residual

Model: S=f(overburden)
Unit Weight: 100 pcf
Tau/Sigma Ratio: 0.08
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Hawthorn Marl - Seismic

Model: Undrained (Phi=0)
Unit Weight: 120 pcf
Cohesion: 3,400 psf
Pore Water Pressure
Piezometric Line: 1

Sands (1) - Residual Improved

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 348 psf
Phi': 4.6 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (2) - Residual Improved

Model: Mohr-Coulomb

Unit Weight: 100 pcf
Cohesion': 348 psf
Phi': 4.6 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Abutment

Model: High Strength
Unit Weight: 150 pcf
Pore Water Pressure
Piezometric Line: 1

Rip-Rap

Model: High Strength
Unit Weight: 140 pcf
Pore Water Pressure
Piezometric Line: 1

Sands (1) - Improved (2)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 200 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (1) - Residual Improved (2)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 200 psf
Phi': 4.6 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (2) - Residual Improved (2)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 200 psf
Phi': 4.6 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silts/Clays - Improved (2)

Model: Mohr-Coulomb
Unit Weight: 95 pcf
Cohesion': 200 psf

Phi': 19.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (6,850, 14.92473) ft
Left-Zone Right Coordinate: (7,040, 23) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (7,059.1088, 3) ft
Right-Zone Right Coordinate: (7,150, 3) ft
Right-Zone Increment: 10
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (6,850, 14.92473) ft
Right Coordinate: (7,150, 3) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	6,850	0
Coordinate 2	7,150	0

Seismic Coefficients

Horz Seismic Coef.: 0.29

Reinforcements

Reinforcement 1

Type: Geosynthetic
Outside Point: (6,850, 3) ft
Inside Point: (7,040, 3) ft
Length: 190 ft
Direction: 180 °
F of S Dependent: No
Pullout Resistance: 1,406 psf

Resistance Reduction Factor: 1
Force Distribution: Distributed
Anchorage: No
Tensile Capacity: 33,980 lbs
Reduction Factor: 1
Force Orientation: 0
Factored Pullout Resistance: 1,406 lbs/ft
Max. Pullout Force: 33,980 lbs
Factored Tensile Capacity: 33,980 lbs

Reinforcement 2

Type: Geosynthetic
Outside Point: (6,981, 5) ft
Inside Point: (7,040, 5) ft
Length: 59 ft
Direction: 180 °
F of S Dependent: No
Pullout Resistance: 1,406 psf
Resistance Reduction Factor: 1
Force Distribution: Distributed
Anchorage: No
Tensile Capacity: 33,980 lbs
Reduction Factor: 1
Force Orientation: 0
Factored Pullout Resistance: 1,406 lbs/ft
Max. Pullout Force: 33,980 lbs
Factored Tensile Capacity: 33,980 lbs

Points

	X (ft)	Y (ft)
Point 1	6,912	3
Point 2	6,912	-3
Point 3	6,912	-33
Point 4	6,912	-50
Point 5	6,912	-72
Point 6	7,040	3
Point 7	7,056	-5
Point 8	7,056	-35
Point 9	7,056	-50
Point 10	7,040	-74
Point 11	6,890	3
Point 12	7,190	3
Point 13	7,190	-5
Point 14	7,190	-35
Point 15	7,190	-50
Point 16	7,190	-74

Point 17	7,040	21
Point 18	6,890	16
Point 19	7,056	0
Point 20	6,981	3
Point 21	7,040	24
Point 22	6,890	20
Point 23	7,040	25
Point 24	7,041	25
Point 25	7,041	3
Point 26	7,056	3
Point 27	6,704	3
Point 28	6,704	-5
Point 29	6,704	-40
Point 30	6,704	-48
Point 31	6,704	-72
Point 32	6,704	11
Point 33	6,704	16
Point 34	6,981	0
Point 35	6,981	-3.95833
Point 36	6,981	-33.95833
Point 37	6,981	-50
Point 38	6,900	3
Point 39	6,900	0
Point 40	6,900	-3.11538
Point 41	6,900	-33.40385
Point 42	6,900	-49.88462
Point 43	7,041	11
Point 44	6,850	-100
Point 45	6,850	19.13978
Point 46	6,850	-72
Point 47	6,850	-49.40385
Point 48	6,850	-35.08654
Point 49	6,850	-3.59615
Point 50	6,850	0
Point 51	6,850	3
Point 52	6,850	14.92473
Point 53	7,150	-100
Point 54	7,150	3
Point 55	7,150	-74
Point 56	7,150	-50
Point 57	7,150	-35
Point 58	7,150	-5
Point 59	7,150	0

Regions

	Material	Points	Area (ft²)
Region 1	Silts/Clays	8,7,58,57	2,820
Region 2	Sands (1) - Residual	7,58,59,19	470
Region 3	Abutment	23,21,17,6,25,43,24	22
Region 4	Sands (1)	19,26,54,59	282
Region 5	Sands (1) - Improved	26,25,6,20,34,19	225
Region 6	Silts/Clays - Improved	8,7,35,36	2,250
Region 7	Sands (2) - Residual Improved	8,9,37,36	1,164.1
Region 8	Sands (1) - Improved (2)	1,38,39,34,20	243
Region 9	Sands (1) - Residual Improved	7,19,34,35	335.94
Region 10	Silts/Clays - Improved (2)	2,40,41,3,36,35	2,431.7
Region 11	Sands (2) - Residual Improved (2)	4,42,41,3,36,37	1,340.8
Region 12	Sands (1)	11,51,50,39,38	150
Region 13	Sands (1) - Residual Improved (2)	2,35,34,39,40	276.75
Region 14	Rip-Rap	43,25,26	60
Region 15	Hawthorn Marl - Seismic	5,10,55,56,9,37,4,42,47,46	6,966.5
Region 16	Sands (2) - Residual	41,42,47,48	769.95
Region 17	Silts/Clays	41,40,49,48	1,544.5
Region 18	Sands (1) - Residual	40,39,50,49	167.79
Region 19	Compacted Fill	11,38,1,20,6,17,18,52,51	2,823.5
Region 20		22,21,17,18,52,45	689.3
Region 21	Cooper Group Limestone	10,5,46,44,53,55	8,052
Region 22	Sands (2) - Residual	8,9,56,57	1,410

1. Static - Preload

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File Information

File Version: 8.16
Created By: Yoon Seok Choi
Last Edited By: Ivy A. Harmon
Revision Number: 156
Date: 10/6/2017
Time: 8:20:26 AM
Tool Version: 8.16.1.13452
File Name: W_Abut Profile.gsz
Directory: Z:\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis\Slope-W\Bridge Report\

Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

1. Static - Preload

Description: Static Case
Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: No
- Use Staged Rapid Drawdown: No

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °

Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

Compacted Fill

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 38 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (1)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silts/Clays

Model: S=f(overburden)
Unit Weight: 95 pcf
Tau/Sigma Ratio: 0.36
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Sands (2)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

Hawthorn Marl

Model: Undrained (Phi=0)
Unit Weight: 120 pcf
Cohesion: 4,000 psf
Pore Water Pressure
Piezometric Line: 1

Cooper Group Limestone

Model: Undrained (Phi=0)
Unit Weight: 120 pcf
Cohesion: 6,000 psf
Pore Water Pressure
Piezometric Line: 1

Sands (1) - Improved

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 348 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silts/Clays - Improved

Model: Mohr-Coulomb
Unit Weight: 95 pcf
Cohesion': 348 psf
Phi': 19.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (2) - Improved

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 348 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Abutment

Model: High Strength
Unit Weight: 150 pcf
Pore Water Pressure
Piezometric Line: 1

Rip-Rap

Model: High Strength
Unit Weight: 140 pcf
Pore Water Pressure
Piezometric Line: 1

Sands (1) - Improved (2)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 200 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (2) - Improved (2)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 200 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silts/Clays - Improved (2)

Model: Mohr-Coulomb
Unit Weight: 95 pcf
Cohesion': 200 psf
Phi': 19.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (6,856.9056, 19.28829) ft
Left-Zone Right Coordinate: (7,041, 25) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (7,056.2608, 3) ft
Right-Zone Right Coordinate: (7,150, 3) ft
Right-Zone Increment: 10
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (6,850, 19.13978) ft
Right Coordinate: (7,150, 3) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	6,850	0
Coordinate 2	7,150	0

Reinforcements

Reinforcement 1

Type: Geosynthetic
Outside Point: (6,850, 3) ft
Inside Point: (7,040, 3) ft
Length: 190 ft
Direction: 180 °
F of S Dependent: No
Pullout Resistance: 1,641 psf
Resistance Reduction Factor: 1
Force Distribution: Distributed
Anchorage: No
Tensile Capacity: 33,980 lbs
Reduction Factor: 1
Force Orientation: 0
Factored Pullout Resistance: 1,641 lbs/ft
Max. Pullout Force: 33,980 lbs
Factored Tensile Capacity: 33,980 lbs

Reinforcement 2

Type: Geosynthetic
Outside Point: (6,981, 5) ft
Inside Point: (7,040, 5) ft
Length: 59 ft
Direction: 180 °
F of S Dependent: No
Pullout Resistance: 1,641 psf
Resistance Reduction Factor: 1
Force Distribution: Distributed
Anchorage: No
Tensile Capacity: 33,980 lbs
Reduction Factor: 1
Force Orientation: 0
Factored Pullout Resistance: 1,641 lbs/ft
Max. Pullout Force: 33,980 lbs
Factored Tensile Capacity: 33,980 lbs

Points

	X (ft)	Y (ft)
Point 1	6,912	3
Point 2	6,912	-3
Point 3	6,912	-33
Point 4	6,912	-50
Point 5	6,912	-72
Point 6	7,040	3
Point 7	7,056	-5
Point 8	7,056	-35
Point 9	7,056	-50
Point 10	7,040	-74
Point 11	6,890	3
Point 12	7,190	3
Point 13	7,190	-5
Point 14	7,190	-35
Point 15	7,190	-50
Point 16	7,190	-74
Point 17	7,040	21
Point 18	6,890	16
Point 19	7,056	0
Point 20	6,981	3
Point 21	7,040	24
Point 22	6,890	20
Point 23	7,040	25
Point 24	7,041	25
Point 25	7,041	3
Point 26	7,056	3
Point 27	6,704	3
Point 28	6,704	-5
Point 29	6,704	-40
Point 30	6,704	-48
Point 31	6,704	-72
Point 32	6,704	11
Point 33	6,704	16
Point 34	6,981	0
Point 35	6,981	-3.95833
Point 36	6,981	-33.95833
Point 37	6,981	-50
Point 38	6,900	3
Point 39	6,900	0
Point 40	6,900	-3.11538
Point 41	6,900	-33.40385

Point 42	6,900	-49.88462
Point 43	7,041	11
Point 44	6,850	-100
Point 45	6,850	19.13978
Point 46	6,850	-72
Point 47	6,850	-49.40385
Point 48	6,850	-35.08654
Point 49	6,850	-3.59615
Point 50	6,850	0
Point 51	6,850	3
Point 52	6,850	14.92473
Point 53	7,150	-100
Point 54	7,150	3
Point 55	7,150	-74
Point 56	7,150	-50
Point 57	7,150	-35
Point 58	7,150	-5
Point 59	7,150	0

Regions

	Material	Points	Area (ft²)
Region 1	Silts/Clays	8,7,58,57	2,820
Region 2	Sands (1)	7,58,59,19	470
Region 3	Abutment	23,21,17,6,25,43,24	22
Region 4	Sands (1)	19,26,54,59	282
Region 5	Sands (1) - Improved	26,25,6,20,34,19	225
Region 6	Silts/Clays - Improved	8,7,35,36	2,250
Region 7	Sands (2) - Improved	8,9,37,36	1,164.1

Region 8	Sands (1) - Improved (2)	1,38,39,34,20	243
Region 9	Sands (1) - Improved	7,19,34,35	335.94
Region 10	Silts/Clays - Improved (2)	2,40,41,3,36,35	2,431.7
Region 11	Sands (2) - Improved (2)	4,42,41,3,36,37	1,340.8
Region 12	Sands (1)	11,51,50,39,38	150
Region 13	Sands (1) - Improved (2)	2,35,34,39,40	276.75
Region 14	Rip-Rap	43,25,26	60
Region 15	Hawthorn Marl	5,10,55,56,9,37,4,42,47,46	6,966.5
Region 16	Sands (2)	41,42,47,48	769.95
Region 17	Silts/Clays	41,40,49,48	1,544.5
Region 18	Sands (1)	40,39,50,49	167.79
Region 19	Compacted Fill	11,38,1,20,6,17,18,52,51	2,823.5
Region 20	Compacted Fill	22,21,17,18,52,45	689.3
Region 21	Cooper Group Limestone	10,5,46,44,53,55	8,052
Region 22	Sands (2)	8,9,56,57	1,410

2. Static - Traffic

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File Information

File Version: 8.16
Created By: Yoon Seok Choi
Last Edited By: Ivy A. Harmon
Revision Number: 156
Date: 10/6/2017
Time: 8:20:26 AM
Tool Version: 8.16.1.13452
File Name: W_Abut Profile.gsz
Directory: Z:\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis\Slope-W\Bridge Report\

Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

2. Static - Traffic

Description: Static Case
Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: No
- Use Staged Rapid Drawdown: No

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °
- Optimize Critical Slip Surface Location: No

Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

Compacted Fill

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 38 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (1)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silts/Clays

Model: S=f(overburden)
Unit Weight: 95 pcf
Tau/Sigma Ratio: 0.36
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Sands (2)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Hawthorn Marl

Model: Undrained (Phi=0)
Unit Weight: 120 pcf
Cohesion: 4,000 psf
Pore Water Pressure
Piezometric Line: 1

Cooper Group Limestone

Model: Undrained (Phi=0)
Unit Weight: 120 pcf
Cohesion: 6,000 psf
Pore Water Pressure
Piezometric Line: 1

Sands (1) - Improved

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 348 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silts/Clays - Improved

Model: Mohr-Coulomb
Unit Weight: 95 pcf
Cohesion': 348 psf
Phi': 19.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (2) - Improved

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 348 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Abutment

Model: High Strength
Unit Weight: 150 pcf
Pore Water Pressure
Piezometric Line: 1

Rip-Rap

Model: High Strength

Unit Weight: 140 pcf
Pore Water Pressure
Piezometric Line: 1

Sands (1) - Improved (2)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 200 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (2) - Improved (2)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 200 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silts/Clays - Improved (2)

Model: Mohr-Coulomb
Unit Weight: 95 pcf
Cohesion': 200 psf
Phi': 19.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (6,850, 14.92473) ft
Left-Zone Right Coordinate: (7,037, 20.9) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (7,056.2608, 3) ft
Right-Zone Right Coordinate: (7,150, 3) ft
Right-Zone Increment: 10
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (6,850, 14.92473) ft
Right Coordinate: (7,150, 3) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	6,850	0
Coordinate 2	7,150	0

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 400 pcf
Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	6,850	16
	7,040	22

Reinforcements

Reinforcement 1

Type: Geosynthetic
Outside Point: (6,850, 3) ft
Inside Point: (7,040, 3) ft
Length: 190 ft
Direction: 180 °
F of S Dependent: No
Pullout Resistance: 1,406 psf
Resistance Reduction Factor: 1
Force Distribution: Distributed
Anchorage: No
Tensile Capacity: 33,980 lbs
Reduction Factor: 1
Force Orientation: 0
Factored Pullout Resistance: 1,406 lbs/ft
Max. Pullout Force: 33,980 lbs
Factored Tensile Capacity: 33,980 lbs

Reinforcement 2

Type: Geosynthetic
Outside Point: (6,981, 5) ft

Inside Point: (7,040, 5) ft
Length: 59 ft
Direction: 180 °
F of S Dependent: No
Pullout Resistance: 1,406 psf
Resistance Reduction Factor: 1
Force Distribution: Distributed
Anchorage: No
Tensile Capacity: 33,980 lbs
Reduction Factor: 1
Force Orientation: 0
Factored Pullout Resistance: 1,406 lbs/ft
Max. Pullout Force: 33,980 lbs
Factored Tensile Capacity: 33,980 lbs

Points

	X (ft)	Y (ft)
Point 1	6,912	3
Point 2	6,912	-3
Point 3	6,912	-33
Point 4	6,912	-50
Point 5	6,912	-72
Point 6	7,040	3
Point 7	7,056	-5
Point 8	7,056	-35
Point 9	7,056	-50
Point 10	7,040	-74
Point 11	6,890	3
Point 12	7,190	3
Point 13	7,190	-5
Point 14	7,190	-35
Point 15	7,190	-50
Point 16	7,190	-74
Point 17	7,040	21
Point 18	6,890	16
Point 19	7,056	0
Point 20	6,981	3
Point 21	7,040	24
Point 22	6,890	20
Point 23	7,040	25
Point 24	7,041	25
Point 25	7,041	3
Point 26	7,056	3
Point 27	6,704	3
Point 28	6,704	-5

Point 29	6,704	-40
Point 30	6,704	-48
Point 31	6,704	-72
Point 32	6,704	11
Point 33	6,704	16
Point 34	6,981	0
Point 35	6,981	-3.95833
Point 36	6,981	-33.95833
Point 37	6,981	-50
Point 38	6,900	3
Point 39	6,900	0
Point 40	6,900	-3.11538
Point 41	6,900	-33.40385
Point 42	6,900	-49.88462
Point 43	7,041	11
Point 44	6,850	-100
Point 45	6,850	19.13978
Point 46	6,850	-72
Point 47	6,850	-49.40385
Point 48	6,850	-35.08654
Point 49	6,850	-3.59615
Point 50	6,850	0
Point 51	6,850	3
Point 52	6,850	14.92473
Point 53	7,150	-100
Point 54	7,150	3
Point 55	7,150	-74
Point 56	7,150	-50
Point 57	7,150	-35
Point 58	7,150	-5
Point 59	7,150	0

Regions

	Material	Points	Area (ft²)
Region 1	Silts/Clays	8,7,58,57	2,820
Region 2	Sands (1)	7,58,59,19	470
Region 3	Abutment	23,21,17,6,25,43,24	22
Region 4	Sands (1)	19,26,54,59	282
Region 5	Sands (1) - Improved	26,25,6,20,34,19	225
Region 6	Silts/Clays - Improved	8,7,35,36	2,250
Region 7	Sands (2) - Improved	8,9,37,36	1,164.1
Region 8	Sands (1) - Improved (2)	1,38,39,34,20	243
Region 9	Sands (1) - Improved	7,19,34,35	335.94

Region 10	Silts/Clays - Improved (2)	2,40,41,3,36,35	2,431.7
Region 11	Sands (2) - Improved (2)	4,42,41,3,36,37	1,340.8
Region 12	Sands (1)	11,51,50,39,38	150
Region 13	Sands (1) - Improved (2)	2,35,34,39,40	276.75
Region 14	Rip-Rap	43,25,26	60
Region 15	Hawthorn Marl	5,10,55,56,9,37,4,42,47,46	6,966.5
Region 16	Sands (2)	41,42,47,48	769.95
Region 17	Silts/Clays	41,40,49,48	1,544.5
Region 18	Sands (1)	40,39,50,49	167.79
Region 19	Compacted Fill	11,38,1,20,6,17,18,52,51	2,823.5
Region 20		22,21,17,18,52,45	689.3
Region 21	Cooper Group Limestone	10,5,46,44,53,55	8,052
Region 22	Sands (2)	8,9,56,57	1,410

2. Post Seismic (FEE)

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File Information

File Version: 8.16
Created By: Yoon Seok Choi
Last Edited By: Ivy A. Harmon
Revision Number: 154
Date: 10/5/2017
Time: 8:54:01 PM
Tool Version: 8.16.1.13452
File Name: W_Channel Profile.gsz
Directory: Z:\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis\Slope-W\Bridge Report\

Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

2. Post Seismic (FEE)

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: No
- Use Staged Rapid Drawdown: No

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °
- Optimize Critical Slip Surface Location: No
- Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

Silts/Clays

Model: S=f(overburden)
Unit Weight: 95 pcf
Tau/Sigma Ratio: 0.36
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Cooper Group Limestone

Model: Undrained (Phi=0)
Unit Weight: 120 pcf
Cohesion: 6,000 psf
Pore Water Pressure
Piezometric Line: 1

Sands (1) - Residual

Model: S=f(overburden)
Unit Weight: 100 pcf
Tau/Sigma Ratio: 0.08
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Sands (2) - Residual

Model: S=f(overburden)
Unit Weight: 100 pcf
Tau/Sigma Ratio: 0.08
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Hawthorn Marl - Seismic

Model: Undrained (Phi=0)
Unit Weight: 120 pcf
Cohesion: 3,400 psf

Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (8,100.9301, -2.57674) ft
Left-Zone Right Coordinate: (8,202, -5.52308) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (8,286.5338, -27.16811) ft
Right-Zone Right Coordinate: (8,400, -36) ft
Right-Zone Increment: 10
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (8,100, -2.57143) ft
Right Coordinate: (8,400, -36) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	8,100	0
Coordinate 2	8,400	0

Seismic Coefficients

Horz Seismic Coef.: 0.07

Reinforcements

Reinforcement 1

Type: Geosynthetic
Outside Point: (-150, 3) ft
Inside Point: (0, 3) ft
Length: 150 ft
Direction: 180 °
F of S Dependent: No
Pullout Resistance: 1,406 psf
Resistance Reduction Factor: 1
Force Distribution: Distributed

Anchorage: No
Tensile Capacity: 33,980 lbs
Reduction Factor: 1
Force Orientation: 0
Factored Pullout Resistance: 1,406 lbs/ft
Max. Pullout Force: 33,980 lbs
Factored Tensile Capacity: 33,980 lbs

Reinforcement 2

Type: Geosynthetic
Outside Point: (-75, 5) ft
Inside Point: (0, 5) ft
Length: 75 ft
Direction: 180 °
F of S Dependent: No
Pullout Resistance: 1,406 psf
Resistance Reduction Factor: 1
Force Distribution: Distributed
Anchorage: No
Tensile Capacity: 33,980 lbs
Reduction Factor: 1
Force Orientation: 0
Factored Pullout Resistance: 1,406 lbs/ft
Max. Pullout Force: 33,980 lbs
Factored Tensile Capacity: 33,980 lbs

Points

	X (ft)	Y (ft)
Point 1	7,824	-2
Point 2	8,000	-2
Point 3	8,175	-3
Point 4	8,200	-5
Point 5	8,265	-22
Point 6	8,290	-28
Point 7	8,325	-33
Point 8	8,400	-36
Point 9	8,430	-37
Point 10	8,495	-37
Point 11	8,600	-39
Point 12	8,650	-45
Point 13	8,788	-33
Point 14	8,840	-40
Point 15	8,890	-37
Point 16	9,000	-34
Point 17	7,824	0
Point 18	7,824	-15

Point 19	7,824	-45
Point 20	7,824	-55
Point 21	7,824	-75
Point 22	8,788	-35
Point 23	8,788	-50
Point 24	8,788	-90
Point 25	8,400	-45
Point 26	8,100	-100
Point 27	8,100	-79.29461
Point 28	8,100	-53.56846
Point 29	8,100	-45
Point 30	8,100	-19.38095
Point 31	8,100	-2.57143
Point 32	8,400	-100
Point 33	8,400	-83.96266
Point 34	8,400	-52.01245

Regions

	Material	Points	Area (ft^2)
Region 1	Sands (2) - Residual	25,34,28,29	2,337.1
Region 2	Silts/Clays	5,6,7,25,29,30	5,468.6
Region 3	Sands (1) - Residual	3,4,5,30,31	2,227.5
Region 4	Cooper Group Limestone	27,26,32,33	5,511.4
Region 5	Hawthorn Marl - Seismic	28,27,33,34	8,651.5
Region 6	Sands (1) - Residual	7,25,8	337.5

3. Post Seismic (SEE)

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File Information

File Version: 8.16
Created By: Yoon Seok Choi
Last Edited By: Ivy A. Harmon
Revision Number: 154
Date: 10/5/2017
Time: 8:54:01 PM
Tool Version: 8.16.1.13452
File Name: W_Channel Profile.gsz
Directory: Z:\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis\Slope-W\Bridge Report\

Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

3. Post Seismic (SEE)

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: No
- Use Staged Rapid Drawdown: No

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °
- Optimize Critical Slip Surface Location: No
- Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

Silts/Clays

Model: S=f(overburden)
Unit Weight: 95 pcf
Tau/Sigma Ratio: 0.36
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Cooper Group Limestone

Model: Undrained (Phi=0)
Unit Weight: 120 pcf
Cohesion: 6,000 psf
Pore Water Pressure
Piezometric Line: 1

Sands (1) - Residual

Model: S=f(overburden)
Unit Weight: 100 pcf
Tau/Sigma Ratio: 0.08
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Sands (2) - Residual

Model: S=f(overburden)
Unit Weight: 100 pcf
Tau/Sigma Ratio: 0.08
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Hawthorn Marl - Seismic

Model: Undrained (Phi=0)
Unit Weight: 120 pcf
Cohesion: 3,400 psf

Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (8,109, -2.62286) ft
Left-Zone Right Coordinate: (8,202, -5.52308) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (8,286.5338, -27.16811) ft
Right-Zone Right Coordinate: (8,395, -35.8) ft
Right-Zone Increment: 10
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (8,100, -2.57143) ft
Right Coordinate: (8,400, -36) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	8,100	0
Coordinate 2	8,500	0

Seismic Coefficients

Horz Seismic Coef.: 0.13

Reinforcements

Reinforcement 1

Type: Geosynthetic
Outside Point: (-150, 3) ft
Inside Point: (0, 3) ft
Length: 150 ft
Direction: 180 °
F of S Dependent: No
Pullout Resistance: 1,406 psf
Resistance Reduction Factor: 1
Force Distribution: Distributed

Anchorage: No
Tensile Capacity: 33,980 lbs
Reduction Factor: 1
Force Orientation: 0
Factored Pullout Resistance: 1,406 lbs/ft
Max. Pullout Force: 33,980 lbs
Factored Tensile Capacity: 33,980 lbs

Reinforcement 2

Type: Geosynthetic
Outside Point: (-75, 5) ft
Inside Point: (0, 5) ft
Length: 75 ft
Direction: 180 °
F of S Dependent: No
Pullout Resistance: 1,406 psf
Resistance Reduction Factor: 1
Force Distribution: Distributed
Anchorage: No
Tensile Capacity: 33,980 lbs
Reduction Factor: 1
Force Orientation: 0
Factored Pullout Resistance: 1,406 lbs/ft
Max. Pullout Force: 33,980 lbs
Factored Tensile Capacity: 33,980 lbs

Points

	X (ft)	Y (ft)
Point 1	7,824	-2
Point 2	8,000	-2
Point 3	8,175	-3
Point 4	8,200	-5
Point 5	8,265	-22
Point 6	8,290	-28
Point 7	8,325	-33
Point 8	8,400	-36
Point 9	8,430	-37
Point 10	8,495	-37
Point 11	8,600	-39
Point 12	8,650	-45
Point 13	8,788	-33
Point 14	8,840	-40
Point 15	8,890	-37
Point 16	9,000	-34
Point 17	7,824	0
Point 18	7,824	-15

Point 19	7,824	-45
Point 20	7,824	-55
Point 21	7,824	-75
Point 22	8,788	-35
Point 23	8,788	-50
Point 24	8,788	-90
Point 25	8,400	-45
Point 26	8,100	-100
Point 27	8,100	-79.29461
Point 28	8,100	-53.56846
Point 29	8,100	-45
Point 30	8,100	-19.38095
Point 31	8,100	-2.57143
Point 32	8,400	-100
Point 33	8,400	-83.96266
Point 34	8,400	-52.01245

Regions

	Material	Points	Area (ft^2)
Region 1	Sands (2) - Residual	25,34,28,29	2,337.1
Region 2	Silts/Clays	5,6,7,25,29,30	5,468.6
Region 3	Sands (1) - Residual	3,4,5,30,31	2,227.5
Region 4	Cooper Group Limestone	27,26,32,33	5,511.4
Region 5	Hawthorn Marl - Seismic	28,27,33,34	8,651.5
Region 6	Sands (1) - Residual	7,25,8	337.5

1. Static

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File Information

File Version: 8.16
Created By: Yoon Seok Choi
Last Edited By: Ivy A. Harmon
Revision Number: 154
Date: 10/5/2017
Time: 8:54:01 PM
Tool Version: 8.16.1.13452
File Name: W_Channel Profile.gsz
Directory: Z:\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis\Slope-W\Bridge Report\

Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

1. Static

Description: Static Case
Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: No
- Use Staged Rapid Drawdown: No

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °
- Optimize Critical Slip Surface Location: No

Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

Sands (1)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silts/Clays

Model: S=f(overburden)
Unit Weight: 95 pcf
Tau/Sigma Ratio: 0.36
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Sands (2)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Hawthorn Marl

Model: Undrained (Phi=0)
Unit Weight: 120 pcf
Cohesion: 4,000 psf
Pore Water Pressure
Piezometric Line: 1

Cooper Group Limestone

Model: Undrained (Phi=0)
Unit Weight: 120 pcf
Cohesion: 6,000 psf
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (8,100, -2.57143) ft
Left-Zone Right Coordinate: (8,203, -5.78462) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (8,318, -32) ft
Right-Zone Right Coordinate: (8,400, -36) ft
Right-Zone Increment: 10
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (8,100, -2.57143) ft
Right Coordinate: (8,400, -36) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	8,100	0
Coordinate 2	8,400	0

Points

	X (ft)	Y (ft)
Point 1	7,824	-2
Point 2	8,000	-2
Point 3	8,175	-3
Point 4	8,200	-5
Point 5	8,265	-22
Point 6	8,290	-28
Point 7	8,325	-33
Point 8	8,400	-36
Point 9	8,430	-37
Point 10	8,495	-37

Point 11	8,600	-39
Point 12	8,650	-45
Point 13	8,788	-33
Point 14	8,840	-40
Point 15	8,890	-37
Point 16	9,000	-34
Point 17	7,824	0
Point 18	7,824	-15
Point 19	7,824	-45
Point 20	7,824	-55
Point 21	7,824	-75
Point 22	8,788	-35
Point 23	8,788	-50
Point 24	8,788	-90
Point 25	8,400	-45
Point 26	8,100	-100
Point 27	8,100	-79.29461
Point 28	8,100	-53.56846
Point 29	8,100	-45
Point 30	8,100	-19.38095
Point 31	8,100	-2.57143
Point 32	8,400	-100
Point 33	8,400	-83.96266
Point 34	8,400	-52.01245

Regions

	Material	Points	Area (ft^2)
Region 1	Sands (2)	25,34,28,29	2,337.1
Region 2	Silts/Clays	5,6,7,25,29,30	5,468.6
Region 3	Sands (1)	3,4,5,30,31	2,227.5
Region 4	Cooper Group Limestone	27,26,32,33	5,511.4
Region 5	Hawthorn Marl	28,27,33,34	8,651.5
Region 6	Sands (1)	7,25,8	337.5

2. Post Seismic (FEE)

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File Information

File Version: 8.16
Created By: Colton W. McInelly
Last Edited By: Ivy A. Harmon
Revision Number: 156
Date: 10/5/2017
Time: 8:23:50 PM
Tool Version: 8.16.1.13452
File Name: E_Channel Profile.gsz
Directory: Z:\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis\Slope-W\Bridge Report\

Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

2. Post Seismic (FEE)

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: No
- Use Staged Rapid Drawdown: No

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °
- Optimize Critical Slip Surface Location: No
- Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 5 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

Sands (2)

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 41 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silts/Clays

Model: S=f(overburden)
Unit Weight: 95 pcf
Tau/Sigma Ratio: 0.23
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Cooper Group Limestone

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 6,000 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (3) - Residual

Model: S=f(overburden)
Unit Weight: 100 pcf
Tau/Sigma Ratio: 0.09
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Sands (4) - Residual

Model: S=f(overburden)
Unit Weight: 100 pcf
Tau/Sigma Ratio: 0.09
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Hawthorn Marl - Seismic

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 3,400 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (9,110.3927, -33.44804) ft
Left-Zone Right Coordinate: (9,263, -29.81818) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (9,367.5144, -15.07093) ft
Right-Zone Right Coordinate: (9,499, -4.74815) ft
Right-Zone Increment: 10
Radius Increments: 10

Slip Surface Limits

Left Coordinate: (9,100, -33.5) ft
Right Coordinate: (9,500, -4.74074) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	9,100	0
Coordinate 2	9,500	0

Seismic Coefficients

Horz Seismic Coef.: 0.06

Points

	X (ft)	Y (ft)
Point 1	8,788	-33
Point 2	8,840	-40
Point 3	8,890	-37
Point 4	9,000	-34
Point 5	9,200	-33
Point 6	9,235	-33
Point 7	9,279	-28
Point 8	9,400	-10
Point 9	9,465	-5
Point 10	9,600	-4
Point 11	9,718	0
Point 12	9,800	4
Point 13	8,788	-35
Point 14	8,788	-50
Point 15	8,788	-90
Point 16	9,800	3
Point 17	9,800	0
Point 18	9,800	-15
Point 19	9,800	-35
Point 20	9,800	-45
Point 21	9,800	-65
Point 22	9,800	-80
Point 23	9,368	-15
Point 24	9,100	-100
Point 25	9,100	-86.917
Point 26	9,100	-54.62451
Point 27	9,100	-41.35417
Point 28	9,100	-33.5
Point 29	9,100	-34.125
Point 30	9,500	-100
Point 31	9,500	-82.96443
Point 32	9,500	-60.55336
Point 33	9,500	-43.4375
Point 34	9,500	-34.625
Point 35	9,500	-15
Point 36	9,500	-4.74074

Regions

	Material	Points	Area (ft²)

Region 1	Cooper Group Limestone	25,24,30,31	6,023.7
Region 2	Hawthorn Marl - Seismic	26,25,31,32	10,941
Region 3	Sands (4) - Residual	26,27,33,32	6,077.2
Region 4	Silts/Clays	29,27,33,34	3,208.3
Region 5	Sands (3) - Residual	23,7,6,5,28,29,34,35	4,034.5
Region 6	Sands (2)	23,8,9,36,35	922.04

3. Post Seismic (SEE)

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File Information

File Version: 8.16
Created By: Colton W. McInelly
Last Edited By: Ivy A. Harmon
Revision Number: 156
Date: 10/5/2017
Time: 8:23:50 PM
Tool Version: 8.16.1.13452
File Name: E_Channel Profile.gsz
Directory: Z:\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis\Slope-W\Bridge Report\

Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

3. Post Seismic (SEE)

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: No
- Use Staged Rapid Drawdown: No

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °
- Optimize Critical Slip Surface Location: No
- Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 5 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

Sands (2)

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 41 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silts/Clays

Model: S=f(overburden)
Unit Weight: 95 pcf
Tau/Sigma Ratio: 0.23
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Cooper Group Limestone

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 6,000 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (3) - Residual

Model: S=f(overburden)
Unit Weight: 100 pcf
Tau/Sigma Ratio: 0.09
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Sands (4) - Residual

Model: S=f(overburden)
Unit Weight: 100 pcf
Tau/Sigma Ratio: 0.09
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Hawthorn Marl - Seismic

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 3,400 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (9,110.3927, -33.44804) ft
Left-Zone Right Coordinate: (9,263, -29.81818) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (9,367.5144, -15.07093) ft
Right-Zone Right Coordinate: (9,499, -4.74815) ft
Right-Zone Increment: 10
Radius Increments: 10

Slip Surface Limits

Left Coordinate: (9,100, -33.5) ft
Right Coordinate: (9,500, -4.74074) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	9,100	0
Coordinate 2	9,500	0

Seismic Coefficients

Horz Seismic Coef.: 0.15

Points

	X (ft)	Y (ft)
Point 1	8,788	-33
Point 2	8,840	-40
Point 3	8,890	-37
Point 4	9,000	-34
Point 5	9,200	-33
Point 6	9,235	-33
Point 7	9,279	-28
Point 8	9,400	-10
Point 9	9,465	-5
Point 10	9,600	-4
Point 11	9,718	0
Point 12	9,800	4
Point 13	8,788	-35
Point 14	8,788	-50
Point 15	8,788	-90
Point 16	9,800	3
Point 17	9,800	0
Point 18	9,800	-15
Point 19	9,800	-35
Point 20	9,800	-45
Point 21	9,800	-65
Point 22	9,800	-80
Point 23	9,368	-15
Point 24	9,100	-100
Point 25	9,100	-86.917
Point 26	9,100	-54.62451
Point 27	9,100	-41.35417
Point 28	9,100	-33.5
Point 29	9,100	-34.125
Point 30	9,500	-100
Point 31	9,500	-82.96443
Point 32	9,500	-60.55336
Point 33	9,500	-43.4375
Point 34	9,500	-34.625
Point 35	9,500	-15
Point 36	9,500	-4.74074

Regions

	Material	Points	Area (ft²)

Region 1	Cooper Group Limestone	25,24,30,31	6,023.7
Region 2	Hawthorn Marl - Seismic	26,25,31,32	10,941
Region 3	Sands (4) - Residual	26,27,33,32	6,077.2
Region 4	Silts/Clays	29,27,33,34	3,208.3
Region 5	Sands (3) - Residual	23,7,6,5,28,29,34,35	4,034.5
Region 6	Sands (2)	23,8,9,36,35	922.04

1. Static

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File Information

File Version: 8.16
Created By: Colton W. McInelly
Last Edited By: Ivy A. Harmon
Revision Number: 156
Date: 10/5/2017
Time: 8:23:50 PM
Tool Version: 8.16.1.13452
File Name: E_Channel Profile.gsz
Directory: Z:\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis\Slope-W\Bridge Report\

Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

1. Static

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: No
- Use Staged Rapid Drawdown: No

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °
- Optimize Critical Slip Surface Location: No

Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 5 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

Sands (2)

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 41 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (3)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silts/Clays

Model: S=f(overburden)
Unit Weight: 95 pcf
Tau/Sigma Ratio: 0.23
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Sands (4)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Hawthorn Marl

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 4,000 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Cooper Group Limestone

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 6,000 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (9,100.8424, -33.49579) ft
Left-Zone Right Coordinate: (9,255, -30.72727) ft
Left-Zone Increment: 8
Right Projection: Range
Right-Zone Left Coordinate: (9,374.4, -14) ft
Right-Zone Right Coordinate: (9,500, -4.74074) ft
Right-Zone Increment: 10
Radius Increments: 10

Slip Surface Limits

Left Coordinate: (9,100, -33.5) ft
Right Coordinate: (9,500, -4.74074) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	9,100	0
Coordinate 2	9,500	0

Points

	X (ft)	Y (ft)
Point 1	8,788	-33
Point 2	8,840	-40
Point 3	8,890	-37
Point 4	9,000	-34
Point 5	9,200	-33
Point 6	9,235	-33
Point 7	9,279	-28
Point 8	9,400	-10
Point 9	9,465	-5
Point 10	9,600	-4
Point 11	9,718	0
Point 12	9,800	4
Point 13	8,788	-35
Point 14	8,788	-50
Point 15	8,788	-90
Point 16	9,800	3
Point 17	9,800	0
Point 18	9,800	-15
Point 19	9,800	-35
Point 20	9,800	-45
Point 21	9,800	-65
Point 22	9,800	-80
Point 23	9,368	-15
	9,100	-100

Point 24		
Point 25	9,100	-86.917
Point 26	9,100	-54.62451
Point 27	9,100	-41.35417
Point 28	9,100	-33.5
Point 29	9,100	-34.125
Point 30	9,500	-100
Point 31	9,500	-82.96443
Point 32	9,500	-60.55336
Point 33	9,500	-43.4375
Point 34	9,500	-34.625
Point 35	9,500	-15
Point 36	9,500	-4.74074

Regions

	Material	Points	Area (ft²)
Region 1	Cooper Group Limestone	25,24,30,31	6,023.7
Region 2	Hawthorn Marl	26,25,31,32	10,941
Region 3	Sands (4)	26,27,33,32	6,077.2
Region 4	Silts/Clays	29,27,33,34	3,208.3
Region 5	Sands (3)	23,7,6,5,28,29,34,35	4,034.5
Region 6	Sands (2)	23,8,9,36,35	922.04

3. Post Seismic

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File Information

File Version: 8.16
Created By: Colton W. McInelly
Last Edited By: Ivy A. Harmon
Revision Number: 154
Date: 10/6/2017
Time: 11:47:02 AM
Tool Version: 8.16.1.13452
File Name: E_Abut Profile.gsz
Directory: Z:\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis\Slope-W\Bridge Report\

Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

3. Post Seismic

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: No
- Use Staged Rapid Drawdown: No

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °
- Optimize Critical Slip Surface Location: No

Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 5 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

Compacted Fill

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 38 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (1)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (2)

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 41 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silts/Clays

Model: S=f(overburden)
Unit Weight: 95 pcf
Tau/Sigma Ratio: 0.23
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Cooper Group Limestone

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 6,000 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (3) - Residual

Model: S=f(overburden)
Unit Weight: 100 pcf
Tau/Sigma Ratio: 0.09
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Sands (4) - Residual

Model: S=f(overburden)
Unit Weight: 100 pcf
Tau/Sigma Ratio: 0.09
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Hawthorn Marl - Seismic

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 3,400 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (1) - Improved

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 348 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (2) - Improved

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 348 psf
Phi': 41 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

Silts/Clays - Improved

Model: Mohr-Coulomb
Unit Weight: 95 pcf
Cohesion': 348 psf
Phi': 13 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (3) - Residual Improved

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 348 psf
Phi': 5.1 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (4) - Residual Improved

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 348 psf
Phi': 5.1 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Abutment

Model: High Strength
Unit Weight: 150 pcf
Pore Water Pressure
Piezometric Line: 1

Rip-Rap

Model: High Strength
Unit Weight: 140 pcf
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (10,250, 1.67) ft
Left-Zone Right Coordinate: (10,363.636, 2.773) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (10,380, 22.931) ft
Right-Zone Right Coordinate: (10,500, 16.682) ft

Right-Zone Increment: 10
Radius Increments: 10

Slip Surface Limits

Left Coordinate: (10,250, 1.67) ft
Right Coordinate: (10,500, 16.682) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	10,250	0
Coordinate 2	10,500	0

Seismic Coefficients

Horz Seismic Coef.: 0.29

Reinforcements

Reinforcement 1

Type: Geosynthetic
Outside Point: (10,500, 3) ft
Inside Point: (10,380, 3) ft
Length: 120 ft
Direction: 0 °
F of S Dependent: No
Pullout Resistance: 1,328 psf
Resistance Reduction Factor: 1
Force Distribution: Distributed
Anchorage: No
Tensile Capacity: 33,980 lbs
Reduction Factor: 1
Force Orientation: 0
Factored Pullout Resistance: 1,328 lbs/ft
Max. Pullout Force: 33,980 lbs
Factored Tensile Capacity: 33,980 lbs

Points

	X (ft)	Y (ft)
Point 1	10,387	3

Point 2	10,387	0
Point 3	10,387	-15
Point 4	10,387	-30
Point 5	10,387	-50
Point 6	10,387	-66
Point 7	10,387	-77
Point 8	10,380	20
Point 9	10,380	3
Point 10	10,380	11
Point 11	10,364	2.777
Point 12	10,380	23
Point 13	10,439	3
Point 14	10,439	-65.752
Point 15	10,439	-0.495
Point 16	10,439	-15
Point 17	10,439	-33.714
Point 18	10,439	-51.238
Point 19	10,363	-66.311
Point 20	10,363.957	-0.224
Point 21	10,363.741	-15.151
Point 22	10,363.521	-30.304
Point 23	10,363.242	-49.616
Point 24	10,380	24
Point 25	10,379	24

Point 26	10,379	2.986
Point 27	10,379	10.486
Point 28	10,250	-100
Point 29	10,250	1.67
Point 30	10,250	-77
Point 31	10,250	-67.774
Point 32	10,250	-47.783
Point 33	10,250	-31.774
Point 34	10,250	-15.887
Point 35	10,250	-1.33
Point 36	10,500	-100
Point 37	10,500	20.235
Point 38	10,500	-77
Point 39	10,500	-65.462
Point 40	10,500	-52.69
Point 41	10,500	-38.071
Point 42	10,500	-15
Point 43	10,500	-1.076
Point 44	10,500	3
Point 45	10,500	16.682

Regions

	Material	Points	Area (ft²)
Region 1	Compacted Fill	9,10,8,45,44,13,1	1,840.9
Region 2	Rip-Rap	11,26,27	56.25
Region 3		12,8,45,37	393.18

Region 4	Sands (1) - Improved	9,1,13,15,2,20,11,26	238.72
Region 5	Sands (2) - Improved	2,15,16,3,21,20	1,113.5
Region 6	Sands (3) - Residual Improved	3,16,17,4,22,21	1,228.9
Region 7	Silts/Clays - Improved	4,17,18,5,23,22	1,439.9
Region 8	Sands (4) - Residual Improved	5,18,14,6,19,23	1,183.7
Region 9	Abutment	12,24,25,27,26,9,10,8	21.007
Region 10	Hawthorn Marl - Seismic	19,6,14,39,38,7,30,31	2,658.9
Region 11	Sands (4) - Residual	23,19,31,32	2,075
Region 12	Silts/Clays	22,23,32,33	2,002.4
Region 13	Sands (3) - Residual	21,22,33,34	1,763.4
Region 14	Sands (2)	20,21,34,35	1,678.3
Region 15	Sands (1)	11,20,35,29	341.97
Region 16	Cooper Group Limestone	7,30,28,36,38	5,750
Region 17	Sands (4) - Residual	14,18,40,39	832.22
Region 18	Silts/Clays	18,17,41,40	980.36
Region 19	Sands (3) - Residual	17,16,42,41	1,274.4
Region 20	Sands (2)	16,15,43,42	867.08
Region 21	Sands (1)	15,13,44,43	230.92

1. Static - Preload

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File Information

File Version: 8.16
Created By: Colton W. McInelly
Last Edited By: Ivy A. Harmon
Revision Number: 154
Date: 10/6/2017
Time: 11:47:02 AM
Tool Version: 8.16.1.13452
File Name: E_Abut Profile.gsz
Directory: Z:\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis\Slope-W\Bridge Report\

Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

1. Static - Preload

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: No
- Use Staged Rapid Drawdown: No

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °
- Optimize Critical Slip Surface Location: No

Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 5 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

Compacted Fill

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 38 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (1)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (2)

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 41 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (3)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

Silts/Clays

Model: S=f(overburden)
Unit Weight: 95 pcf
Tau/Sigma Ratio: 0.23
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Sands (4)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Hawthorn Marl

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 4,000 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Cooper Group Limestone

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 6,000 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (1) - Improved

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 348 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (2) - Improved

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 348 psf

Phi': 41 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (3) - Improved

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 348 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (4) - Improved

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 348 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silts/Clays - Improved

Model: Mohr-Coulomb
Unit Weight: 95 pcf
Cohesion': 348 psf
Phi': 13 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Abutment

Model: High Strength
Unit Weight: 150 pcf
Pore Water Pressure
Piezometric Line: 1

Rip-Rap

Model: High Strength
Unit Weight: 140 pcf
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (10,262, 1.787) ft
Left-Zone Right Coordinate: (10,364, 2.777) ft
Left-Zone Increment: 10

Right Projection: Range
Right-Zone Left Coordinate: (10,382.427, 22.944) ft
Right-Zone Right Coordinate: (10,485, 20.581) ft
Right-Zone Increment: 8
Radius Increments: 10

Slip Surface Limits

Left Coordinate: (10,250, 1.67) ft
Right Coordinate: (10,500, 20.235) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	10,250	0
Coordinate 2	10,500	0

Reinforcements

Reinforcement 1

Type: Geosynthetic
Outside Point: (10,500, 3) ft
Inside Point: (10,380, 3) ft
Length: 120 ft
Direction: 0 °
F of S Dependent: No
Pullout Resistance: 1,563 psf
Resistance Reduction Factor: 1
Force Distribution: Distributed
Anchorage: No
Tensile Capacity: 33,980 lbs
Reduction Factor: 1
Force Orientation: 0
Factored Pullout Resistance: 1,563 lbs/ft
Max. Pullout Force: 33,980 lbs
Factored Tensile Capacity: 33,980 lbs

Points

	X (ft)	Y (ft)
Point 1	10,387	3
Point 2	10,387	0

Point 3	10,387	-15
Point 4	10,387	-30
Point 5	10,387	-50
Point 6	10,387	-66
Point 7	10,387	-77
Point 8	10,380	20
Point 9	10,380	3
Point 10	10,380	11
Point 11	10,364	2.777
Point 12	10,380	23
Point 13	10,439	3
Point 14	10,439	-65.752
Point 15	10,439	-0.495
Point 16	10,439	-15
Point 17	10,439	-33.714
Point 18	10,439	-51.238
Point 19	10,363	-66.311
Point 20	10,363.957	-0.224
Point 21	10,363.741	-15.151
Point 22	10,363.521	-30.304
Point 23	10,363.242	-49.616
Point 24	10,380	24
Point 25	10,379	24
Point 26	10,379	2.986

Point 27	10,379	10.486
Point 28	10,250	-100
Point 29	10,250	1.67
Point 30	10,250	-77
Point 31	10,250	-67.774
Point 32	10,250	-47.783
Point 33	10,250	-31.774
Point 34	10,250	-15.887
Point 35	10,250	-1.33
Point 36	10,500	-100
Point 37	10,500	20.235
Point 38	10,500	-77
Point 39	10,500	-65.462
Point 40	10,500	-52.69
Point 41	10,500	-38.071
Point 42	10,500	-15
Point 43	10,500	-1.076
Point 44	10,500	3
Point 45	10,500	16.682

Regions

	Material	Points	Area (ft²)
Region 1	Compacted Fill	9,10,8,45,44,13,1	1,840.9
Region 2	Rip-Rap	11,26,27	56.25
Region 3	Compacted Fill	12,8,45,37	393.18
Region 4	Sands (1) - Improved	9,1,13,15,2,20,11,26	238.72
Region 5	Sands (2) - Improved	2,15,16,3,21,20	1,113.5

Region 6	Sands (3) - Improved	3,16,17,4,22,21	1,228.9
Region 7	Silts/Clays - Improved	4,17,18,5,23,22	1,439.9
Region 8	Sands (4) - Improved	5,18,14,6,19,23	1,183.7
Region 9	Abutment	12,24,25,27,26,9,10,8	21.007
Region 10	Hawthorn Marl	19,6,14,39,38,7,30,31	2,658.9
Region 11	Sands (4)	23,19,31,32	2,075
Region 12	Silts/Clays	22,23,32,33	2,002.4
Region 13	Sands (3)	21,22,33,34	1,763.4
Region 14	Sands (2)	20,21,34,35	1,678.3
Region 15	Sands (1)	11,20,35,29	341.97
Region 16	Cooper Group Limestone	7,30,28,36,38	5,750
Region 17	Sands (4)	14,18,40,39	832.22
Region 18	Silts/Clays	18,17,41,40	980.36
Region 19	Sands (3)	17,16,42,41	1,274.4
Region 20	Sands (2)	16,15,43,42	867.08
Region 21	Sands (1)	15,13,44,43	230.92

2. Static - Trafic

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File Information

File Version: 8.16
Created By: Colton W. McInelly
Last Edited By: Ivy A. Harmon
Revision Number: 154
Date: 10/6/2017
Time: 11:47:02 AM
Tool Version: 8.16.1.13452
File Name: E_Abut Profile.gsz
Directory: Z:\18461-007-01 (US 21 Harbor River Bridge Design Phase)\3 - Technical Analysis\Slope-W\Bridge Report\

Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

2. Static - Trafic

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: No
- Use Staged Rapid Drawdown: No

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °
- Optimize Critical Slip Surface Location: No

Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 5 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

Compacted Fill

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 38 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (1)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (2)

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 41 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (3)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

Silts/Clays

Model: S=f(overburden)
Unit Weight: 95 pcf
Tau/Sigma Ratio: 0.23
Minimum Strength: 0 psf
Pore Water Pressure
Piezometric Line: 1

Sands (4)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Hawthorn Marl

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 4,000 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Cooper Group Limestone

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 6,000 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (1) - Improved

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 348 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (2) - Improved

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 348 psf

Phi': 41 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (3) - Improved

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 348 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Sands (4) - Improved

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 348 psf
Phi': 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Silts/Clays - Improved

Model: Mohr-Coulomb
Unit Weight: 95 pcf
Cohesion': 348 psf
Phi': 13 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Abutment

Model: High Strength
Unit Weight: 150 pcf
Pore Water Pressure
Piezometric Line: 1

Rip-Rap

Model: High Strength
Unit Weight: 140 pcf
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (10,252, 1.689) ft
Left-Zone Right Coordinate: (10,364, 2.777) ft
Left-Zone Increment: 10

Right Projection: Range
Right-Zone Left Coordinate: (10,380, 20) ft
Right-Zone Right Coordinate: (10,500, 16.682) ft
Right-Zone Increment: 10
Radius Increments: 10

Slip Surface Limits

Left Coordinate: (10,250, 1.67) ft
Right Coordinate: (10,500, 16.682) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	10,250	0
Coordinate 2	10,500	0

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 400 pcf
Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	10,380	21
	10,500	18

Reinforcements

Reinforcement 1

Type: Geosynthetic
Outside Point: (10,500, 3) ft
Inside Point: (10,380, 3) ft
Length: 120 ft
Direction: 0 °
F of S Dependent: No
Pullout Resistance: 1,328 psf
Resistance Reduction Factor: 1
Force Distribution: Distributed

Anchorage: No
Tensile Capacity: 33,980 lbs
Reduction Factor: 1
Force Orientation: 0
Factored Pullout Resistance: 1,328 lbs/ft
Max. Pullout Force: 33,980 lbs
Factored Tensile Capacity: 33,980 lbs

Points

	X (ft)	Y (ft)
Point 1	10,387	3
Point 2	10,387	0
Point 3	10,387	-15
Point 4	10,387	-30
Point 5	10,387	-50
Point 6	10,387	-66
Point 7	10,387	-77
Point 8	10,380	20
Point 9	10,380	3
Point 10	10,380	11
Point 11	10,364	2.777
Point 12	10,380	23
Point 13	10,439	3
Point 14	10,439	-65.752
Point 15	10,439	-0.495
Point 16	10,439	-15
Point 17	10,439	-33.714
Point 18	10,439	-51.238
Point 19	10,363	-66.311
Point 20	10,363.957	-0.224
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Point 22	10,363.521	-30.304
Point 23	10,363.242	-49.616
Point 24	10,380	24
Point 25	10,379	24
Point 26	10,379	2.986
Point 27	10,379	10.486
Point 28	10,250	-100
Point 29	10,250	1.67
Point 30	10,250	-77
Point 31	10,250	-67.774
Point 32	10,250	-47.783
Point 33	10,250	-31.774
Point 34	10,250	-15.887

Point 35	10,250	-1.33
Point 36	10,500	-100
Point 37	10,500	20.235
Point 38	10,500	-77
Point 39	10,500	-65.462
Point 40	10,500	-52.69
Point 41	10,500	-38.071
Point 42	10,500	-15
Point 43	10,500	-1.076
Point 44	10,500	3
Point 45	10,500	16.682

Regions

	Material	Points	Area (ft²)
Region 1	Compacted Fill	9,10,8,45,44,13,1	1,840.9
Region 2	Rip-Rap	11,26,27	56.25
Region 3		12,8,45,37	393.18
Region 4	Sands (1) - Improved	9,1,13,15,2,20,11,26	238.72
Region 5	Sands (2) - Improved	2,15,16,3,21,20	1,113.5
Region 6	Sands (3) - Improved	3,16,17,4,22,21	1,228.9
Region 7	Silts/Clays - Improved	4,17,18,5,23,22	1,439.9
Region 8	Sands (4) - Improved	5,18,14,6,19,23	1,183.7
Region 9	Abutment	12,24,25,27,26,9,10,8	21.007
Region 10	Hawthorn Marl	19,6,14,39,38,7,30,31	2,658.9
Region 11	Sands (4)	23,19,31,32	2,075
Region 12	Silts/Clays	22,23,32,33	2,002.4
Region 13	Sands (3)	21,22,33,34	1,763.4
Region 14	Sands (2)	20,21,34,35	1,678.3
Region 15	Sands (1)	11,20,35,29	341.97
Region 16	Cooper Group Limestone	7,30,28,36,38	5,750
Region 17	Sands (4)	14,18,40,39	832.22
Region 18	Silts/Clays	18,17,41,40	980.36
Region 19	Sands (3)	17,16,42,41	1,274.4
Region 20	Sands (2)	16,15,43,42	867.08

Region 21	Sands (1)	15,13,44,43	230.92

APPENDIX H
Seismic Passive Pressure Analyses

Seismic Backwall Abutment Passive Soil Pressures

7/19/2017

Project Name: US-21 over Harbor River
Abutment Location: West Abutment
Backfill Type: Structural Backfill
Backwall Dimensions:

h_{wall} =	12.5	ft	*Wall height*
b_{wall} =	50.0	ft	*Wall width based on width of pile cap*
Design Earthquake:	SEE		
S_{D1} =	0.740	g	
k_{max} = PGA =	0.260	g	

Wave Scattering:

$\beta = S_{D1}$ / PGA =	1.500		*Ground motion index* $0.5 \le \beta \le 1.5$
α_w =	0.969		*Wave scattering scaling factor* $\alpha_w = 1 + 0.01\, h_{wall}[(0.5\beta)-1] \le 1.0$
k_h =	0.252	g	*Average seismic horizontal coefficient due to wave scattering (ignore if wall height less than 20 feet)*

Ult. Force/Disp. per Foot of Wall Width:

y_{max} / h_{wall} =	0.05		*(y_{max} / h_{wall}): Granular Soils 0.05, Cohesive Soils 0.10 (per SCDOT GDM)*
p_{wall} =	5.8	ksf	
f_{ult} =	72.1	k/ft	$f_{ult} = p_{wall} * h_{wall}$
y_{max} =	7.50	in	

$p_{wall} = 0.5\, K_{PE}\, \gamma_{Backfill}\, h_{wall}$

K_{PE} =	7.1	(NCHRP Report 611)
$\gamma_{Backfill}$ =	130.0	pcf
p_{wall} =	5.8	psf

Avg Wall Stiffness per Foot of Wall Width:

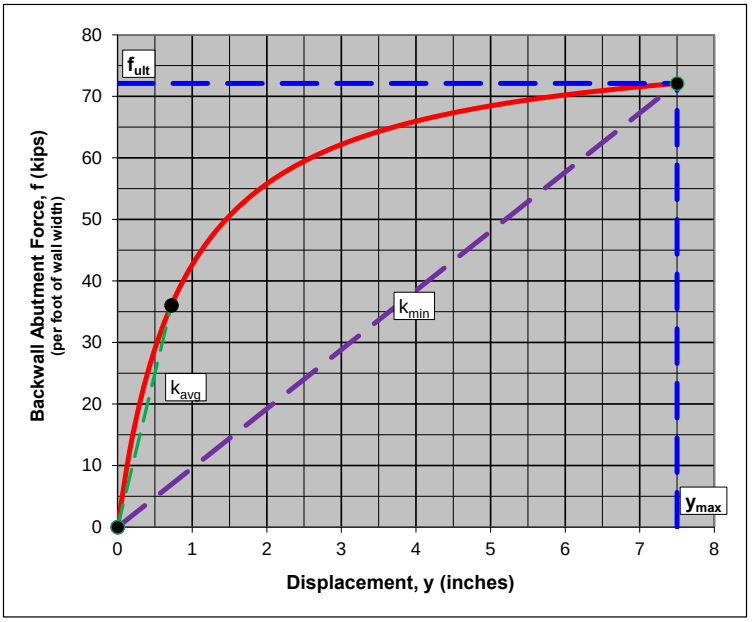
$k = k_{avg}$ =	50	k/in/ft	*k: Granular Soils 50, Cohesive Soils 25 (per SCDOT GDM)*
f_{avg} =	36.05	k/ft	
y_{avg} =	0.72	inches	
A =	0.0111	in/k/ft	$A = y_{max}/2ky_{max} - f_{ult}$
B =	0.0124	1/(k/ft)	$B = 2(ky_{max} - f_{ult})/f_{ult}(2ky_{max} - f_{ult})$

Total Wall Force/Stiffness per Foot of Wall Width:

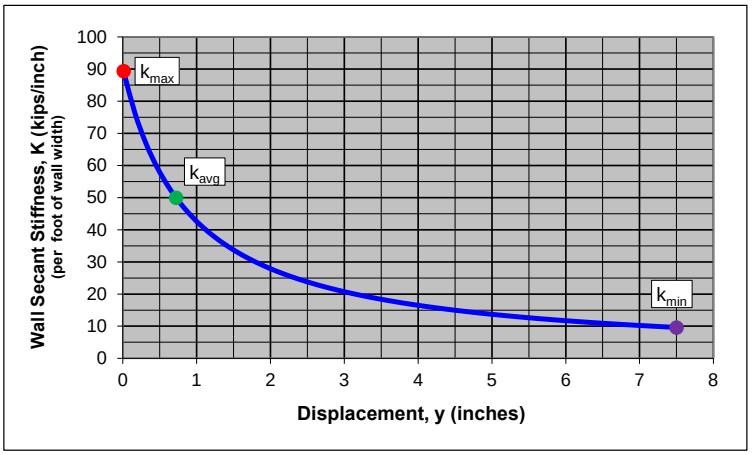
$f_{max} = f_{ult}$ =	72.1	kip
k_{max} =	89.4	kip/inch
k_{avg} =	50.0	kip/inch
k_{min} =	9.6	kip/inch

Per Foot of Wall Width		
y	f	k
inches	k/ft	kip/inch
0.00	0.0	0.0
0.01	0.9	89.4
0.16	12.5	76.4
0.32	21.1	66.7
0.47	27.8	59.2
0.62	33.1	53.3
0.78	37.5	48.4
0.93	41.1	44.3
1.08	44.2	40.9
1.23	46.8	37.9
1.39	49.1	35.4
1.54	51.1	33.2
1.69	52.8	31.2
1.85	54.4	29.5
2.00	55.8	27.9
2.15	57.0	26.5
2.31	58.2	25.2
2.46	59.2	24.1
2.61	60.1	23.0
2.77	61.0	22.1
2.92	61.8	21.2
3.07	62.5	20.4
3.22	63.2	19.6
3.38	63.8	18.9
3.53	64.4	18.2
3.68	65.0	17.6
3.84	65.5	17.1
3.99	65.9	16.5
4.14	66.4	16.0
4.30	66.8	15.6
4.45	67.2	15.1
4.60	67.6	14.7
4.75	67.9	14.3
4.91	68.3	13.9
5.06	68.6	13.6
5.21	68.9	13.2
5.37	69.2	12.9
5.52	69.5	12.6
5.67	69.7	12.3
5.83	70.0	12.0
5.98	70.2	11.7
6.13	70.4	11.5
6.29	70.7	11.2
6.44	70.9	11.0
6.59	71.1	10.8
6.74	71.3	10.6
6.90	71.4	10.4
7.05	71.6	10.2
7.20	71.8	10.0
7.36	72.0	9.8
7.50	72.1	9.6

$f(y_i) = y_i/A + By_i$



k = f / y



Seismic Backwall Abutment Passive Soil Pressures

7/19/2017

Project Name: US-21 over Harbor River
Abutment Location: East Abutment
Backfill Type: Structural Backfill
Backwall Dimensions:

h_{wall} =	12.5	ft	*Wall height*
b_{wall} =	50.0	ft	*Wall width based on width of pile cap*
Design Earthquake:	SEE		
S_{D1} =	0.580	g	
k_{max} = PGA =	0.290	g	

Wave Scattering:

$\beta = S_{D1}$ / PGA =	1.500		*Ground motion index* $0.5 \le \beta \le 1.5$
α_w =	0.969		*Wave scattering scaling factor* $\alpha_w = 1 + 0.01\, h_{wall}\,[(0.5\beta)-1] \le 1.0$
k_h =	0.281	g	*Average seismic horizontal coefficient due to wave scattering (ignore if wall height less than 20 feet)*

Ult. Force/Disp. per Foot of Wall Width:

y_{max} / h_{wall} =	0.05		*(y_{max} / h_{wall}): Granular Soils 0.05, Cohesive Soils 0.10 (per SCDOT GDM)*
p_{wall} =	5.7	ksf	
f_{ult} =	71.1	k/ft	$f_{ult} = p_{wall} * h_{wall}$
y_{max} =	7.50	in	

$p_{wall} = 0.5\, K_{PE}\, \gamma_{Backfill}\, h_{wall}$

K_{PE} =	7.0	(NCHRP Report 611)
$\gamma_{Backfill}$ =	130.0	pcf
p_{wall} =	5.7	psf

Avg Wall Stiffness per Foot of Wall Width:

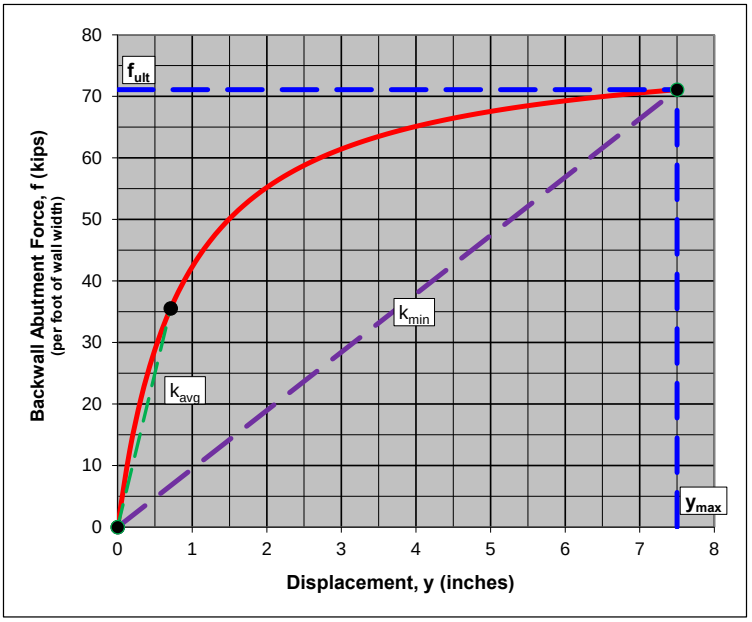
$k = k_{avg}$ =	50	k/in/ft	*k: Granular Soils 50, Cohesive Soils 25 (per SCDOT GDM)*
f_{avg} =	35.55	k/ft	
y_{avg} =	0.71	inches	
A =	0.0110	in/k/ft	$A = y_{max}/2ky_{max} - f_{ult}$
B =	0.0126	1/(k/ft)	$B = 2(ky_{max} - f_{ult})/f_{ult}(2ky_{max} - f_{ult})$

Total Wall Force/Stiffness per Foot of Wall Width:

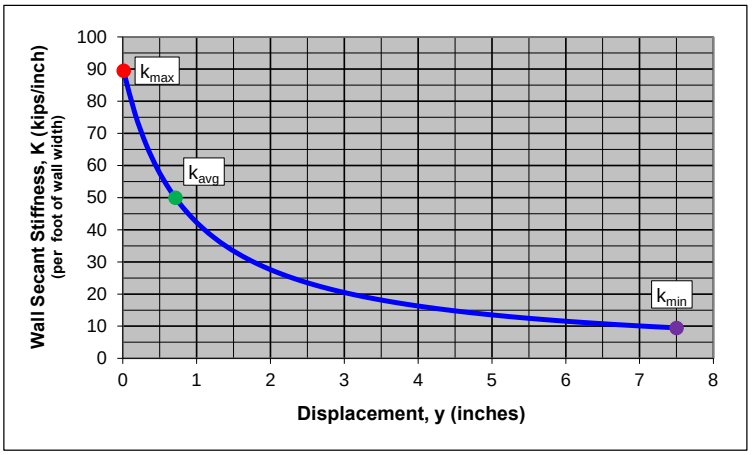
$f_{max} = f_{ult}$ =	71.1	kip
k_{max} =	89.5	kip/inch
k_{avg} =	50.0	kip/inch
k_{min} =	9.5	kip/inch

Per Foot of Wall Width		
y	f	k
inches	k/ft	kip/inch
0.00	0.0	0.0
0.01	0.9	89.5
0.16	12.4	76.3
0.32	21.0	66.5
0.47	27.7	59.0
0.62	33.0	53.0
0.78	37.3	48.1
0.93	40.8	44.0
1.08	43.8	40.5
1.23	46.4	37.6
1.39	48.7	35.1
1.54	50.6	32.8
1.69	52.3	30.9
1.85	53.8	29.2
2.00	55.2	27.6
2.15	56.4	26.2
2.31	57.5	24.9
2.46	58.5	23.8
2.61	59.4	22.8
2.77	60.3	21.8
2.92	61.1	20.9
3.07	61.8	20.1
3.22	62.4	19.4
3.38	63.0	18.7
3.53	63.6	18.0
3.68	64.1	17.4
3.84	64.6	16.8
3.99	65.1	16.3
4.14	65.5	15.8
4.30	65.9	15.4
4.45	66.3	14.9
4.60	66.7	14.5
4.75	67.0	14.1
4.91	67.4	13.7
5.06	67.7	13.4
5.21	68.0	13.0
5.37	68.3	12.7
5.52	68.5	12.4
5.67	68.8	12.1
5.83	69.0	11.8
5.98	69.2	11.6
6.13	69.5	11.3
6.29	69.7	11.1
6.44	69.9	10.9
6.59	70.1	10.6
6.74	70.3	10.4
6.90	70.4	10.2
7.05	70.6	10.0
7.20	70.8	9.8
7.36	70.9	9.6
7.50	71.1	9.5

$f(y_i) = y_i/A + By_i$



k = f / y



APPENDIX I
Report Limitations and Guidelines for Use

APPENDIX I
REPORT LIMITATIONS AND GUIDELINES FOR USE

Geotechnical Services Are Performed For Specific Purposes, Persons And Projects

This report is for the use by UIG-ICE Design Build Team and the SCDOT for design and construction of the US 21 over Harbor River Bridge Replacement project in Beaufort County, South Carolina. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

GeoEngineers structures our services to meet the specific needs of our clients. For example, a geotechnical or geologic study conducted for a civil engineer or architect may not fulfill the needs of a construction contractor or even another civil engineer or architect that are involved in the same project. Because each geotechnical or geologic study is unique, each geotechnical engineering or geologic report is unique, prepared solely for the specific client and project site. This report should not be applied for any purpose or project except the one originally contemplated.

A Geotechnical Engineering Or Geologic Report Is Based On A Unique Set Of Project-Specific Factors

This data report has been prepared for UIG-ICE Design Build Team and the SCDOT for design and construction of the US 21 over Harbor River Bridge Replacement project in Beaufort County, South Carolina. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, do not rely on this report if it was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

For example, changes that can affect the applicability of this report include those that affect:

- the function of the proposed structure;
- elevation, configuration, location, orientation or weight of the proposed structure;
- composition of the design team; or
- project ownership.

If important changes are made after the date of this report, GeoEngineers should be given the opportunity to review our interpretations and recommendations and provide written modifications or confirmation, as appropriate.

Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, or by natural events such as floods, earthquakes, and slope

instability or groundwater fluctuations. Always contact GeoEngineers before applying a report to determine if it remains applicable.

Most Geotechnical And Geologic Findings Are Professional Opinions

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied our professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ, sometimes significantly, from those indicated in this report. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

Geotechnical Engineering Report Recommendations Are Not Final

Do not over-rely on the preliminary construction recommendations included in this report. These recommendations are not final, because they were developed principally from GeoEngineers' professional judgment and opinion. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers cannot assume responsibility or liability for this report's recommendations if we do not perform construction observation.

Sufficient monitoring, testing and consultation by GeoEngineers should be provided during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether or not earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions.

A Geotechnical Engineering Report Or Geologic Report Could Be Subject To Misinterpretation

Misinterpretation of this report by other design team members can result in costly problems. You could lower that risk by having GeoEngineers confer with appropriate members of the design team after submitting the report. Also retain GeoEngineers to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering or geologic report. Reduce that risk by having GeoEngineers participate in pre-bid and preconstruction conferences, and by providing construction observation.

Do Not Redraw The Exploration Logs

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, but recognize that separating logs from the report can elevate risk.

Give Contractors A Complete Report And Guidance

Some owners and design professionals believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering or geologic report, but preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes

of bid development and that the report's accuracy is limited; encourage them to confer with GeoEngineers and/or to conduct additional study to obtain the specific types of information they need or prefer. A pre-bid conference can also be valuable. Be sure contractors have sufficient time to perform additional study. Only then might an owner be in a position to give contractors the best information available, while requiring them to at least share the financial responsibilities stemming from unanticipated conditions. Further, a contingency for unanticipated conditions should be included in your project budget and schedule.

Contractors Are Responsible For Site Safety On Their Own Construction Projects

Our geotechnical recommendations are not intended to direct the contractor's procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and to adjacent properties.

Read These Provisions Closely

Some clients, design professionals and contractors may not recognize that the geoscience practices (geotechnical engineering or geology) are far less exact than other engineering and natural science disciplines. This lack of understanding can create unrealistic expectations that could lead to disappointments, claims and disputes. GeoEngineers includes these explanatory "limitations" provisions in our reports to help reduce such risks. Please confer with GeoEngineers if you are unclear how these "Report Limitations and Guidelines for Use" apply to your project or site.

Geotechnical, Geologic And Environmental Reports Should Not Be Interchanged

The equipment, techniques and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study and vice versa. For that reason, a geotechnical engineering or geologic report does not usually relate any environmental findings, conclusions or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding a specific project.

Have we delivered World Class Client Service?

Please let us know by visiting **www.geoengineers.com/feedback**.

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