

ARKANSAS DEPARTMENT OF TRANSPORTATION



SUBSURFACE INVESTIGATION

STATE JOB NO. 020784

FEDERAL AID PROJECT NO. STPR-STPB-0035(68)

LITTLE BAYOU METO STRS. & APPRS. (S)

STATE HIGHWAY 88 SECTION 9

IN JEFFERSON COUNTY

The information contained herein was obtained by the Department for design and estimating purposes only. It is being furnished with the express understanding that said information does not constitute a part of the Proposal or Contract and represents only the best knowledge of the Department as to the location, character and depth of the materials encountered. The information is only included and made available so that bidders may have access to subsurface information obtained by the Department and is not intended to be a substitute for personal investigation, interpretation and judgment of the bidder. The bidder should be cognizant of the possibility that conditions affecting the cost and/or quantities of work to be performed may differ from those indicated herein.



ARKANSAS DEPARTMENT OF TRANSPORTATION

AR DOT.gov | IDriveArkansas.com | Lorie H. Tudor, P.E., Director

MATERIALS DIVISION

11301 West Baseline Road | P.O. Box 2261 | Little Rock, AR 72203-2261 | Phone: 501.569.2185 | Fax: 501.569.2368

April 5, 2022

**TO:** Mr. Trinity Smith, Engineer of Roadway Design

**SUBJECT:** Job No. 020784  
Little Bayou Meto Strs. & Apprs. (S)  
Route 88 Section 9  
Jefferson County

Based on soil information from projects in the surrounding area, an estimated R-Value of less than 5 is appropriate for the in-situ soils.

Listed below is the additional information requested for use in developing the plans:

Asphalt Concrete Hot Mix **PG 64-22**

<b>Type</b>	<b>Asphalt Cement %</b>	<b>Mineral Aggregate %</b>
Surface Course	5.1	94.9
Binder Course	4.2	95.8
Base Course	4.0	96.0

  
Jonathan A. Annable  
Materials Engineer

JAA:yz:bjj  
Attachment

cc: State Constr. Eng. – Master File Copy  
District 2 Engineer  
System Information and Research Div.  
G. C. File



February 26, 2024

**TO:** Mr. Rick Ellis, Bridge Engineer  
**SUBJECT:** Job No. 020784  
Little Bayou Meto Strs. & Apprs. (S)  
Jefferson County  
Site 1-Route 88, Section 9  
Site 2-Wrape Rd.

### **Introduction**

Submitted herein are the results of the subsurface investigation and geotechnical recommendations for the proposed bridges planned on Highway 88 and Wrape Rd. in Jefferson County.

This project consists of constructing two (2) structures to replace existing bridges over Little Bayou Meto. The Site 1, Highway 88 bridge will be constructed on the same alignment and will be widened. The new bridge will be a three (3) span Integral Prestressed Concrete Girder Unit (53.5'-54'-53.5'). It will have a total length of 162 feet and an out-to-out width of 36.5 feet.

Site 2, Wrape Rd. bridge will be constructed at an offset location west of the existing structure. The new Wrape Rd. bridge will be a three (3) span Continuous Reinforced Concrete Slab Unit. It will have a total length of 120 feet and an out-to-out width of 30.5 feet.

2-Horizontal to 1-Vertical (2H:1V) end slopes and 3H:1V side slopes are planned at each site. Embankment height at both abutments is 11 feet at Site 1. Embankment height varies from 6 feet at the south abutment to 10 feet at the north abutment at Site 2. A Seismic Operational Classification of "Other" is assigned to both replacement bridges.

### **Field Investigation**

A subsurface investigation was requested on June 29, 2023, by Bridge Division to develop recommendations for bridge foundations and to verify the suitability of bridge abutment configuration. The subsurface investigation was performed based on the plans provided to the Geotechnical Section on the above-mentioned date. Four (4) borings were requested, two (2) at each site. A total of four (4) borings were completed.

Site 1, Highway 88, subsurface conditions were investigated by two (2) borings at accessible locations. The originally planned boring locations were inaccessible due to utility conflict and accessibility limitations. Borings were drilled off the existing roadway.

Similarly, Site 2, Wrape Rd. subsurface conditions were investigated by two (2) borings at accessible locations near the existing roadway. The originally planned boring locations were inaccessible due to swamp-like conditions.

The approximate locations of the borings are presented in the Plan of Borings included in Attachment A1 for Highway 88 and Attachment A2 for Wrape Rd., respectively. The borings were advanced with an Acker track-mounted rotary drill rig using a combination of hollow-stem auger and rotary wash drilling methods. The respective boring logs, showing the subsurface conditions



encountered in the borings and the results of field and laboratory tests, are also included in Attachment A1 and A2, immediately following the Plan of Borings. A Legend is attached after the boring logs to interpret/explain the symbols, terms, and conventions used on the logs. Standard Penetration Tests (SPT) were conducted in accordance with ASTM D1586 for field-testing and soil sampling. The correction factor for the hammer is indicated on the boring logs. Liners were not used inside the standard split-barrel samplers.

The number of blows required to drive the standard split-barrel sampler for each 6-inch increment of the total 18-inch drive were measured and recorded on the boring logs. SPT N-values are defined as the total number of blows required to advance the split barrel sampler the final 12 inches of the total 18-inch drive depth. The SPT N-values indicated on the logs are raw (uncorrected) blow counts measured in field.

**Lab Investigation**

All samples were brought to the Materials laboratory for further evaluation and testing. Soil samples were tested to evaluate index properties and to verify soil type and classification. Lab tests were performed on representative soil samples to determine moisture content, Atterberg limits, and/or gradation. Tested soils were classified by licensed professional geologists in accordance with both USCS and AASHTO soil classification systems. The laboratory test and their corresponding ASTM and/or AASHTO test methods are listed below in Table 1.

Table 1: Summary of Laboratory Tests and Methods

Laboratory	ASTM	AASHTO	Denotation on Logs
Moisture Content	D2216	T 265	Solid Circle Symbol (●)
Grain Size Analysis by Sieving	D6913	T 88	Whole Number in the “- No. 200 %” Column (e.g., 12)
Atterberg Limits	D4318	T 89	Plus Symbol (+) on the Right for Liquid Limit
		T 90	Plus Symbol (+) on the Left for Plastic Limit

The particle size through which 50% of particles by weight passing, D<sub>50</sub>, is summarized below in Table 2. Detailed particle size distribution curves used for D<sub>50</sub> determination are included in Attachment B.

Table 2: Summary of D<sub>50</sub> for Scour Analysis

Bridge	Station	Sample Type	Location	D <sub>50</sub> , mm
Highway 88 (Site 1)	100+79, 15' Lt.	Bulk	Creek Bank	<0.075
Wrape Rd. (Site 2)	200+35, 6' Rt.	Bulk	Creek Bank	<0.075



## **Site Conditions**

**Site 1, Highway 88.** – The existing bridge on Hwy. 88 is 19.5 feet wide (18 feet clear roadway) and 125 feet long and consists of five (5) concrete slabs on I-beam spans supported by a timber substructure. The existing bridge is located approximately in the same location as the proposed bridge. Overhead powerlines run parallel to the south of the existing bridge then cross over the bridge on the east side. Site 1 pictures can be viewed in Attachment C1.

**Site 2, Wrape Rd.** – The existing bridge on Wrape Rd. is 21 feet wide (19 feet clear roadway) and 93 feet long and consists of three (3) precast concrete channel beam spans supported by a concrete substructure. The existing bridge is located at approximately 30 feet downstream (east) of the proposed new bridge. Site 2 is surrounded by farm fields with overhead powerlines paralleling the east side of the bridge. Site 2 pictures can be viewed in Attachment C2.

Both bridges span Little Bayou Meto and are located within the Mississippi Alluvial Plain. There are multiple mapped abandoned river channels related to the Arkansas River surrounding both sites and encountering unmapped channels within the project alignments. When encountered, these abandoned channels are typically indicative of poor-quality soils such as low-density silts and clays.

## **Site Geology/Generalized subsurface Conditions**

The project alignment is located on unconsolidated deposits mapped as Quaternary alluvium (stream overbank deposits) (map symbol Qso). Alluvial deposits are composed of deposits of small streams, the overbank deposits of major streams, or older meander belt deposits of major streams. The alluvial deposits include a complex sequence of unconsolidated gravels, sandy gravels, sands, silty sands, silts, clayey silts, and clays. Individual deposits are often lenticular and discontinuous.

Subsurface conditions at both sites consist of poor-quality, low-density clay and silt deposits from 10 to 50 feet below ground level (bgl). These soils are likely back swamp and abandoned channel deposits of the Arkansas River. These low-density soils overlie sand and gravel alluvial deposits of the Mississippi River. At both sites, graveliferous soils were retrieved in samples taken below 75 feet, however it is likely that much of the gravel was “fall-in”. Gravel fall-in likely obscured the accuracy of both sample descriptions and soil density measurements collected below 75 feet, but the degree to which this occurred is unknown. At Site 1, Paleogene aged soil consisting of gray clayey sand was encountered at approximately 106.5 feet bgl. At Site 2, it is unclear if the Paleogene was reached due to gravel fall-in.

To aid in visualizing subsurface conditions and stratigraphy, a Generalized Subsurface Profile is included in Attachment D1 for Site 1 and a profile in Attachment D2 for Site 2, respectively.

## **Seismic Conditions**

**Code-Based Seismic Coefficients.** – Considering the average subsurface conditions as revealed by the borings, a Seismic Site Class E (Soft Soil profile) is calculated for the project sites. Utilizing the **Seismic Site Class E** and the approximate GPS coordinates of the project



sites, the following design peak ground acceleration coefficients ( $A_S$ ), design short-period spectral acceleration coefficients ( $S_{DS}$ ), as well as design long-period spectral acceleration coefficients ( $S_{D1}$ ), are determined. These seismic coefficients are summarized in Table 3a for Site 1 and Table 3b for Site 2. Design Response Spectrum is presented in Attachment E1 for Site 1 and Attachment E2 for Site 2.

Table 3a: Summary of Design Ground Motion Acceleration Response Coefficients

Highway 88 (Site 1)	
Acceleration Coefficient	Value (g)
$A_S$ (Site PGA)	0.284
$S_{DS}$ (0.2 sec)	0.675
$S_{D1}$ (1 sec)	0.315

Table 3b: Summary of Design Ground Motion Acceleration Response Coefficients

Wrape Rd. (Site 2)	
Acceleration Coefficient	Value (g)
$A_S$ (Site PGA)	0.288
$S_{DS}$ (0.2 sec)	0.684
$S_{D1}$ (1 sec)	0.320

For the design long-period spectral acceleration coefficient ( $S_{D1}$ ) of 0.315 for Site 1 and ( $S_{D1}$ ) of 0.320 for Site 2, a Seismic Performance Zone 3 is considered applicable for both sites.

Seismic Coefficients Adopted for Geotechnical Analysis. – A site-specific probabilistic ground-motion analysis has not been performed for this project. However, based on statistical analyses on the available site-specific studies (over 60 sites) performed in Arkansas, the measured site-specific  $A_S$  values range from 27% to 83% of the code-based values, with an average  $A_S$  value equal to 56% of the code-based values. Of the over 60 sites, only two (2) sites have measured  $A_S$  values greater than 67% of the code-based values. These 2 sites (included in the same ARDOT project) are located in the heart of New Madrid Seismic Zone and are far from the 020784 project sites. Consequently, 70% (rounded up from 67%) of code-based  $A_S$  values are utilized in geotechnical analysis for the 020784 bridge sites that have an assigned Seismic Operational Classification of “Other” and estimated 2024 ADT less than or equal to 500 (500 for the Highway 88 site and 150 for the Wrape Rd. site).

Liquefaction Analyses. – Liquefaction potential of the subsurface soils was evaluated based on the results of the borings and utilizing the current Microsoft Excel® spreadsheet developed by the University of Arkansas for ARDOT. An Earthquake Moment Magnitude ( $M_W$ ) of 7.0 and the design peak ground acceleration coefficient ( $A_S$ ) of 0.1988 for Site 1 and 0.2016 for Site 2 were modelled in the analyses. All the borings were analyzed to evaluate liquefaction potential. The borings were advanced deeper than 100 ft. and are located near the bridge ends



of the proposed alignments. The results of liquefaction analyses are presented as a plot of calculated factor of safety against liquefaction versus depth below ground surface at the boring location. Results of liquefaction analyses are included in Attachment E1 for Site 1 and Attachment E2 for Site 2, respectively. The analyses indicate high potential of liquefaction in the top 50 feet for both project sites.

**Design Abutment Configuration**

Slope Stability Analysis. – Stability analyses have been performed to evaluate the design abutment configuration. Slope stability analyses were performed utilizing a commercial computer program Slide2 (Version 2021) developed by RocScience. Spencer analysis method was utilized to analyze the bridge abutments at both project sites. Three (3) general loading conditions were analyzed with respect to slope stability: Short Term/End of Construction Condition, Long Term Condition, and Seismic/Pseudo-Static Condition. A horizontal acceleration coefficient ( $K_h$ ) of 0.099 ( $0.5A_s/g$ ) for Site 1 and ( $K_h$ ) of 0.101 ( $0.5A_s/g$ ) for Site 2 were utilized for analysis of the Seismic/Pseudo-Static Condition. A surcharge of 250 psf is included to model the live load under long term condition.

Results of the Analyses are summarized in Table 4a and 4b for Site 1 and Site 2, respectively. Detailed analyses are shown in Attachment F1 for Site 1 and Attachment F2 for Site 2.

Table 4a: Results of Slope Stability Analyses for Site 1 – Highway 88

Slope	Loading Condition	Calculated Min. F.S.	Recommended Min. F.S.
2H:1V End Slope – Bent 1 (West Abutment)	Short Term	1.30	1.30
	Long Term	1.39	1.40
	Seismic ( $k_h = 0.099$ )	0.78	1.05
2H:1V End Slope – Bent 4 (East Abutment)	Short Term	1.54	1.30
	Long Term	1.49	1.40
	Seismic ( $k_h = 0.099$ )	0.97	1.05

Table 4b. Results of Slope Stability Analyses for Site 2 - Wrape Rd.

Slope	Loading Condition	Calculated Min. F.S.	Recommended Min. F.S.
2H:1V End Slope – Bent 1 (South Abutment)	Short Term	1.79	1.30
	Long Term	1.80	1.40
	Seismic ( $k_h = 0.101$ )	0.96	1.05
2H:1V End Slope – Bent 4 (North Abutment)	Short Term	2.62	1.30
	Long Term	1.54	1.40
	Seismic ( $k_h = 0.101$ )	1.42	1.05

The results of the stability analyses indicate that the plan configuration of 2H:1V end slope is only stable for the north abutment (Bent 4) of Site 2. The plan configuration is not stable for the other abutments (both abutments of Site 1 and the south abutment of Site 2).



Newmark Block Analysis. – Tables 4a and 4b indicates that inadequate factors of safety under seismic condition have been calculated with respect to slope stability for both abutments of Site 1 and the south abutment of Site 2. Newmark Block Analysis has been performed on these abutments to evaluate the potential of permanent deformation. The results of Newmark block analyses are summarized in Table 4c. Detailed analyses are included Attachment F1 for Site 1 and Attachment F2 for Site 2, behind the respective results of slope stability analysis.

Table 4c. Results of Nemark Block Analysis on Design Configuration

Site	Abutment	Bent No.	Calculated Permanent Deformation, in.
1	West Abutment	1	12.2
	East Abutment	4	1.9
2	South Abutment	1	2.1

The calculated permanent deformation of 1.9 inches at Site 1 Bent 4 and 2.1 inches at Site 2 Bent 1 are less than 12 inches and are considered acceptable to the Geotechnical Engineer. The calculated lateral movement of 12.2 inches at Site 1 Bent 1 is considered marginally acceptable.

Settlement Potential. – Site 1 (Highway 88) bridge is planned on the existing bridge alignment. Due to the minimal fill placement, it is anticipated that the abutment settlement at this site is negligible.

Site 2 bridge is planned on a county road (Wrape Rd.). It is recommended an embankment settlement period of 6 months be utilized before piling is commenced.

**Foundation Recommendations**

Axial Capacities – Based on the information provided by the Design Engineer, it is understood that foundation loads of all the bents at both sites will be supported on concrete filled steel shell piles.

Nominal axial capacities (compression and uplift) vs. pile tip penetration/elevation curves for single piles are provided in Attachment G1 for Site 1 and Attachment G2 for Site 2, respectively. For single, isolated foundations, a resistance factor ( $\phi_{stat}$ ) of 0.45 is recommended for calculating factored compression resistance and a resistance factor ( $\phi_{up}$ ) of 0.35 is recommended for determining factored uplift resistance. Based on the nominal axial pile capacity curves, recommended shallowest pile tip elevations are summarized in Table 5a for Site 1 and Tale 5b for Site 2. It is understood that before geotechnical information is available, 20"-diameter piles were considered and tentatively planned at the intermediate bents (Bents 2 and 3) of Site 2 by the Design Engineer. Considering the subsurface conditions, 24"-diameter piles are recommended by the Geotechnical Engineer. Axial pile capacity curves for 20"-diameter piles can be provided upon request if this pile size is preferred by the Design Engineer.





Table 5a: Recommended Shallowest Pile Tip Elevation – Site 1

Bent No.	Required Nominal Axial Resistance, Tons	Plan Pile Diameter, Inch	Recommended Shallowest Pile Tip Elevation, Feet
1	175	16	95
2	325	24	95
3	325	24	65
4	175	16	80

Table 5b: Recommended Shallowest Pile Tip Elevation – Site 2

Bent No.	Required Nominal Axial Resistance, Tons	Recommended Pile Diameter, Inch	Recommended Shallowest Pile Tip Elevation, Feet
1	160	16	100
2	300	24	90
3	300	24	120
4	160	16	125

Following the recommendations provided in the Settlement Potential section of this report, downdrag on piling is expected to be negligible. These capacities are determined for piles driven to the required penetration/elevation. If jetting or other methods are used to assist in advancing the piles, re-evaluation of these pile capacities will be warranted.

The piles are expected to be tipped in the predominantly sandy soils that are likely to be liquefied during driving with considerable resistance loss at the end of initial drive. If the required nominal bearing capacity has not been obtained when top of piles is 6 inches above plan grade, considerations may be given to restriking the piles with a warmed-up hammer after a minimum 24-hour waiting time.

Geotechnical Input Parameters for Lpile – Lateral load analysis will be performed by the structural engineer using commercial computer program Lpile. The geotechnical input parameters are in Attachment H1 for Site 1 and H2 for Site 2.

Pile Installation – Piles should be installed in accordance with Section 805 (2014 Edition). Prior to piling, hammer systems furnished by the Contractor should be evaluated and approved by the Engineer.

Prebore is not anticipated to be required. Water jetting, vibrating, or other means for the purpose of assisting pile penetration are generally not expected. If warranted by specific subsurface conditions, the use of water jetting or vibrating would require review and approval by the Engineer.

Piling should be observed and recorded by the Engineer. Test piles are not required, but the contractor may pursue for information purposes. Nominal axial pile capacity should be determined in accordance with Subsection 805.09(b), “Method B- Wave Equation Analysis (WEAP)”.



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If there are any questions concerning these recommendations, please contact the Materials Division.

A handwritten signature in blue ink that reads "Paul Tinsley". The signature is written in a cursive, flowing style.

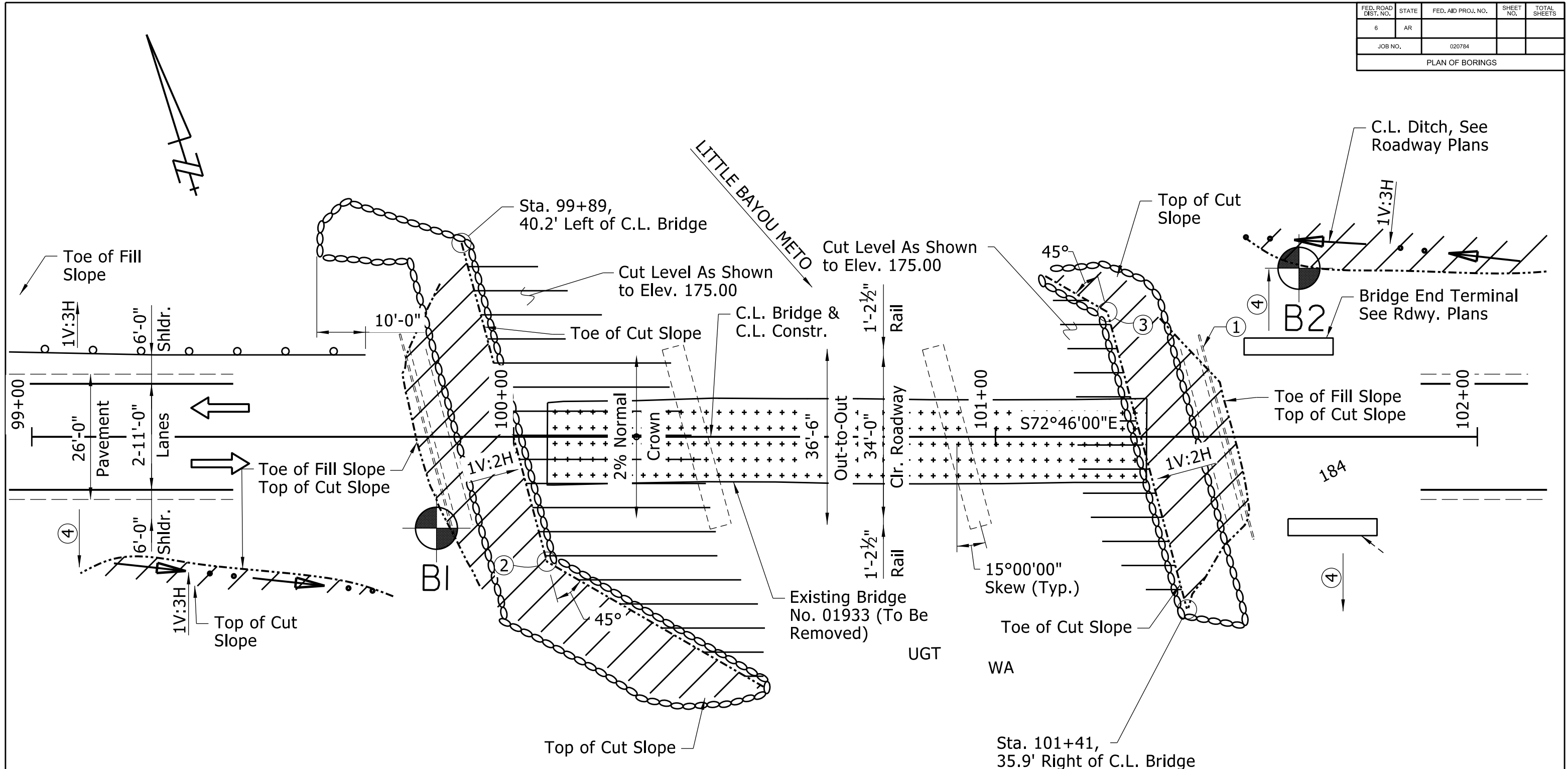
Paul Tinsley  
Materials Engineer

PT:yz:mbb:pc

cc: State Construction Engineer  
District 2 Engineer  
G. C. File

## Attachment A1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
6	AR			
JOB NO.		020784		
PLAN OF BORINGS				



**PLAN**

PLAN OF BORINGS	
LITTLE BAYOU METO STRS. & APPRS. (S) ROUTE 88, SECTION 9 JEFFERSON COUNTY HWY. 88 OVER LITTLE BAYOU METO	
JOB NO. 020784	SHEET 1/1
NTS	

**ARKANSAS DEPARTMENT OF TRANSPORTATION  
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. Site 1-B1  
PAGE 1 OF 4

JOB NO. 020784 Jefferson County  
JOB NAME: Little Bayou Meto Strs. & Apprs. (S)  
Route 88 Section 9 & Wrape Rd.  
STATION: 99+84  
LOCATION: 21' Right of Construction Centerline  
LOGGED BY: Guy King

DATE: December 6, 11, 12, and 13, 2023  
TYPE OF DRILLING:  
Hollow Stem Auger - Rotary Wash  
EQUIPMENT: Acker 1  
HAMMER CORRECTION FACTOR: 1.42

COMPLETION DEPTH: 121.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)		PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% T C R	% R Q D
					PL	LL				
			SURFACE ELEVATION: 184.3							
5			Moist, Medium Stiff, Reddish Brown Lean Clay	CL	28	45	93	2 3-4		
				-						
				CL	30	45	93	1 3-3		
				-						
10			Moist, Brown Lean Clay	CL	35	45	94	1 2-3		
				-						
15			Very Moist, Very Soft, Reddish Brown Silty Clay*	CL	35	45	98			
				CL-ML	35	45	96	0 0-0		
20			Wet, Very Loose, Reddish Brown Silt**	-				0 0-0		
				-						
25			Wet, Very Loose, Dark Brown Silt	-				1 2-0		
				-						
30			Wet, Very Soft, Dark Brown Lean Clay	CL	35	45	99	0 0-0		
				-						
35										

REMARKS: \*Started rotary washing at 13.0 feet below ground level. \*\*A water stratum was encountered at approximately 21.0 feet below ground level. Soil description and density likely impacted by fall-in.

**ARKANSAS DEPARTMENT OF TRANSPORTATION  
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. Site 1-B1  
PAGE 2 OF 4

JOB NO. 020784 Jefferson County  
JOB NAME: Little Bayou Meto Strs. & Apprs. (S)  
Route 88 Section 9 & Wrape Rd.  
STATION: 99+84  
LOCATION: 21' Right of Construction Centerline  
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COMPLETION DEPTH: 121.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)		PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
					PL	LL				
			SURFACE ELEVATION: 184.3							
40		X	Wet, Soft, Brown Lean Clay	CL	15	25	99	1 2-1		
45		X	Moist, Very Soft, Brown Clay	-			0 0-0			
50		X	Wet, Very Soft, Brown Lean Clay with Some Sand	CL	15	25	86	0 0-0		
55		X	Wet, Medium Stiff, Brown Silty Clay with Sand	CL-ML	15	25	81	0 3-4		
60		X	Wet, Loose, Brown Silty Sand				4 5-4			
65		X	Wet, Medium Dense, Brown Sand with Silt				5 9-10			
70		X					6 9-11			

REMARKS: \*Started rotary washing at 13.0 feet below ground level. \*\*A water stratum was encountered at approximately 21.0 feet below ground level. Soil description and density likely impacted by fall-in.

**ARKANSAS DEPARTMENT OF TRANSPORTATION  
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. Site 1-B1  
PAGE 3 OF 4

JOB NO. 020784 Jefferson County  
JOB NAME: Little Bayou Meto Strs. & Apprs. (S)  
Route 88 Section 9 & Wrape Rd.  
STATION: 99+84  
LOCATION: 21' Right of Construction Centerline  
LOGGED BY: Guy King

DATE: December 6, 11, 12, and 13, 2023  
TYPE OF DRILLING:  
Hollow Stem Auger - Rotary Wash  
EQUIPMENT: Acker 1  
HAMMER CORRECTION FACTOR: 1.42

COMPLETION DEPTH: 121.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)										PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% T C R	% R Q D	
					PL	10	20	30	40	50	60	70	LL						
			SURFACE ELEVATION: 184.3																
75		X	Wet, Dense, Light Brown Sand with Some Gravel	-												10	17-15		
80		X	Wet, Medium Dense, Brown Sand with Gravel	-												9	13-10		
85		X	Wet, Dense, Brown Sand with Gravel	-												7	13-21		
90		X	Wet, Very Dense, Brown Sand with Gravel	-												3	26-77		
95		X	Wet, Dense, Brown Sand with Gravel	-												3	15-26		
100		X	Wet, Dense, Brown Sand with Gravel	-												5	13-43		
105		X	Wet, Medium Dense, Brown Well Graded Sand with Silt and Some Gravel	SW-SM												5	7	13-8	

REMARKS: \*Started rotary washing at 13.0 feet below ground level. \*\*A water stratum was encountered at approximately 21.0 feet below ground level. Soil description and density likely impacted by fall-in.

**ARKANSAS DEPARTMENT OF TRANSPORTATION  
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. Site 1-B1  
PAGE 4 OF 4

JOB NO. 020784 Jefferson County  
JOB NAME: Little Bayou Meto Strs. & Apprs. (S)  
Route 88 Section 9 & Wrape Rd.  
STATION: 99+84  
LOCATION: 21' Right of Construction Centerline  
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DATE: December 6, 11, 12, and 13, 2023  
TYPE OF DRILLING:  
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COMPLETION DEPTH: 121.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)		PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% T C R	% R Q D
					PL	LL				
			SURFACE ELEVATION: 184.3							
			Wet, Loose, Light Brown Sand	-				1 2-3		
			Clayey Sand (Paleogene)							
110				CH			92	7 12-15		
			Moist, Very Stiff, Gray Fat Clay	-						
115				ML			58	7 10-15		
			Moist, Medium Dense, Gray Sandy Silt	-						
120				SC-SM		H	41	9 16-26		
			Moist, Dense, Gray Silty Clayey Sand							
			Boring Terminated							
125										
130										
135										
140										

REMARKS: \*Started rotary washing at 13.0 feet below ground level. \*\*A water stratum was encountered at approximately 21.0 feet below ground level. Soil description and density likely impacted by fall-in.



**ARKANSAS DEPARTMENT OF TRANSPORTATION  
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. Site 1-B2  
PAGE 1 OF 5

JOB NO. 020784 Jefferson County  
JOB NAME: Little Bayou Meto Strs. & Apprs. (S)  
Route 88 Section 9 & Wrape Rd.  
STATION: 101+63  
LOCATION: 33' Left of Construction Centerline  
LOGGED BY: Guy King

DATE: November 14 - December 4, 2023  
TYPE OF DRILLING:  
Hollow Stem Auger - Rotary Wash  
EQUIPMENT: Acker 1  
HAMMER CORRECTION FACTOR: 1.42

COMPLETION DEPTH: 151.5

DEPTH FT.	SYMBOL	SAMPLE	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)		PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
					PL	LL				
SURFACE ELEVATION: 182.2										
5			Moist, Very Loose, Brown Silt	ML			95	3 2-1		
			Wet, Brown Silt	ML	H		99			
			Wet, Soft, Brown Silty Clay	CL-ML	H		96	1 1-1		
10				ML	H		96	0 0-0		
15				-						
			Moist, Very Loose, Brown Silt*	ML	H		97	0 0-0		
20				-				0 0-0		
25				CL			99	0 0-0		
30			Moist, Very Soft, Brown Lean Clay	CL			99	0 0-0		
35				-						

REMARKS: \*Started rotary washing at 10.5 feet below ground level. Paleogene encountered at approximately 106.5 feet below ground level.

**ARKANSAS DEPARTMENT OF TRANSPORTATION  
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. Site 1-B2  
PAGE 2 OF 5

JOB NO. 020784 Jefferson County  
JOB NAME: Little Bayou Meto Strs. & Apprs. (S)  
Route 88 Section 9 & Wrape Rd.  
STATION: 101+63  
LOCATION: 33' Left of Construction Centerline  
LOGGED BY: Guy King

DATE: November 14 - December 4, 2023  
TYPE OF DRILLING:  
Hollow Stem Auger - Rotary Wash  
EQUIPMENT: Acker 1  
HAMMER CORRECTION FACTOR: 1.42

COMPLETION DEPTH: 151.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)										PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% T C R	% R Q D
					PL	10	20	30	40	50	60	70	LL					
			SURFACE ELEVATION: 182.2															
				CL-ML											78	0 1-3		
			Moist, Soft, Brown Silty Clay with Sand	-														
40				ML											52	0 1-2		
			Wet, Very Loose, Brown Sandy Silt with Some Organic Matter	-														
45				ML											74	4 3-3		
			Wet, Loose, Brown Silt with Sand	-														
50				ML											57	2 4-5		
			Wet, Loose, Brown Sandy Silt	-														
55				SP											1	6 7-8		
			Wet, Medium Dense, Light Gray Poorly Graded Sand															
60																4 12-20		
			Wet, Dense, Brown Sand	-														
65																9 10-15		
			Wet, Medium Dense, Light Gray Sand															
70																		

REMARKS: \*Started rotary washing at 10.5 feet below ground level. Paleogene encountered at approximately 106.5 feet below ground level.

**ARKANSAS DEPARTMENT OF TRANSPORTATION  
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. Site 1-B2  
PAGE 3 OF 5

JOB NO. 020784 Jefferson County  
JOB NAME: Little Bayou Meto Strs. & Apprs. (S)  
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COMPLETION DEPTH: 151.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)											PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% T C R	% R Q D
					PL	20	30	40	50	60	70	LL							
			SURFACE ELEVATION: 182.2																
75		X	Wet, Medium Dense, Brown Silty Sand with Gravel	SM												29	6 10-12		
80		X	Wet, Medium Dense, Light Gray Sand with Silt	-													8 15-15		
85		X	Wet, Medium Dense, Brown Poorly Graded Sand with Gravel	SP												2	7 12-14		
90		X	Wet, Dense, Brown Sand with Gravel	-													3 12-21		
95		X	Wet, Medium Dense, Brown Sand with Gravel														6 5-7		
100		X	Wet, Dense, Brown Poorly Graded Sand with Silt and Gravel	SP-SM												7	8 18-20		
105		X	Wet, Medium Dense, Brown Poorly Graded Gravel with Sand	GP												2	2 6-14		

REMARKS: \*Started rotary washing at 10.5 feet below ground level. Paleogene encountered at approximately 106.5 feet below ground level.

**ARKANSAS DEPARTMENT OF TRANSPORTATION  
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. Site 1-B2  
PAGE 4 OF 5

JOB NO. 020784 Jefferson County  
JOB NAME: Little Bayou Meto Strs. & Apprs. (S)  
Route 88 Section 9 & Wrape Rd.  
STATION: 101+63  
LOCATION: 33' Left of Construction Centerline  
LOGGED BY: Guy King

DATE: November 14 - December 4, 2023  
TYPE OF DRILLING:  
Hollow Stem Auger - Rotary Wash  
EQUIPMENT: Acker 1  
HAMMER CORRECTION FACTOR: 1.42

COMPLETION DEPTH: 151.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)		PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% T C R	% R Q D
					PL	LL				
			SURFACE ELEVATION: 182.2							
			Wet, Loose, Brown Gravel with Sand					5		
			Dark Brown Silty Sand with Gravel (Gravel Likely Fall in) (Paleogene)	-				4-4		
110								4		
			Moist, Loose, Dark Brown Silty Sand with Gravel (Gravel Likely Fall in)					5-5		
115										
			Moist, Medium Dense, Dark Brown Sandy Silt	ML		●	60	5		
120								8-12		
			Moist, Medium Dense, Dark Brown Sandy Silt	-				2		
125								5-9		
130										
			Moist, Very Stiff, Gray Lean Clay with Sand	CL		●	85	0		
135								8-10		
140										

REMARKS: \*Started rotary washing at 10.5 feet below ground level. Paleogene encountered at approximately 106.5 feet below ground level.

**ARKANSAS DEPARTMENT OF TRANSPORTATION  
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. Site 1-B2  
PAGE 5 OF 5

JOB NO. 020784 Jefferson County  
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DATE: November 14 - December 4, 2023  
TYPE OF DRILLING:  
Hollow Stem Auger - Rotary Wash  
EQUIPMENT: Acker 1  
HAMMER CORRECTION FACTOR: 1.42

COMPLETION DEPTH: 151.5

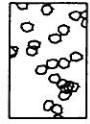
DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)		PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
					PL	LL				
			SURFACE ELEVATION: 182.2							
145			Moist, Very Stiff, Gray Sandy Lean Clay	CL	-----●-----		70	7 11-13		
				-						
150			Moist, Very Dense, Gray Silt with Sand	ML	●		85	17 32-48		
			Boring Terminated							
155										
160										
165										
170										
175										

REMARKS: \*Started rotary washing at 10.5 feet below ground level. Paleogene encountered at approximately 106.5 feet below ground level.

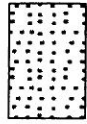
# LEGEND

## SOIL TYPES

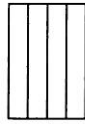
( SHOWN IN SYMBOL COLUMN )  
( PREDOMINANT TYPE SHOWN HEAVY )



GRAVEL



SAND



SILT



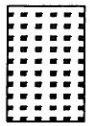
CLAY



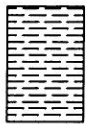
ORGANIC  
MATTER

## ROCK TYPES

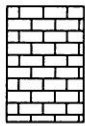
( SHOWN IN SYMBOL COLUMN )



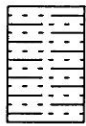
SANDSTONE



SHALE  
or  
SILTSTONE



LIMESTONE  
or  
DOLOMITE



ALTERNATING  
LAYERS of  
SHALE and  
SANDSTONE



OTHER

## SAMPLER TYPES

( SHOWN IN SAMPLE COLUMN )

### SHELBY TUBE



UNDISTURBED  
SAMPLE  
RECOVERY

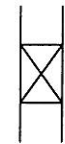


DISTURBED  
SAMPLE  
RECOVERY



NO  
RECOVERY

### SPLIT SPOON

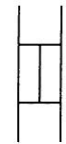


SAMPLE  
RECOVERY



NO  
RECOVERY

### ROCK CORING



% RECOVERY  
INDICATED ON LOGS

## TERMS DESCRIBING CONSISTENCY OR CONDITION

GRANULAR SOIL		CLAY		CLAY-SHALE		SHALE	
*N' Value	Density	*N' Value	Consistency	*N' Value	Consistency	*N' Value	Consistency
0-4	Very Loose	0-1	Very Soft	0-1	Very Soft		
5-10	Loose	2-4	Soft	2-4	Soft	31-60	Soft
11-30	Medium Dense	5-8	Medium Stiff	5-8	Medium Stiff	Over 60	
31-50	Dense	9-15	Stiff	9-15	Stiff	More than 2'	
Over 50	Very Dense	16-30	Very Stiff	16-30	Very Stiff	Penetration	
		31-60	Hard	31-60	Hard	in 60 Blows: Medium Hard	
		Over 60	Very Hard	Over 60	Very Hard	Less than 2'	
						Penetration	
						in 60 Blows: Hard	

1. Ground water elevations indicated on boring logs represent ground water elevations at date or time shown on boring log. Absence of water surface implies that no ground water data is available but does not necessarily mean that ground water will not be encountered at locations or within the vertical reaches of these borings.
2. Borings represent subsurface conditions at their respective locations for their respective depths. Variations in conditions between or adjacent to boring locations may be encountered.
3. Terms used for describing soils according to their texture or grain size distribution are in accordance with the Unified Soil Classification System.

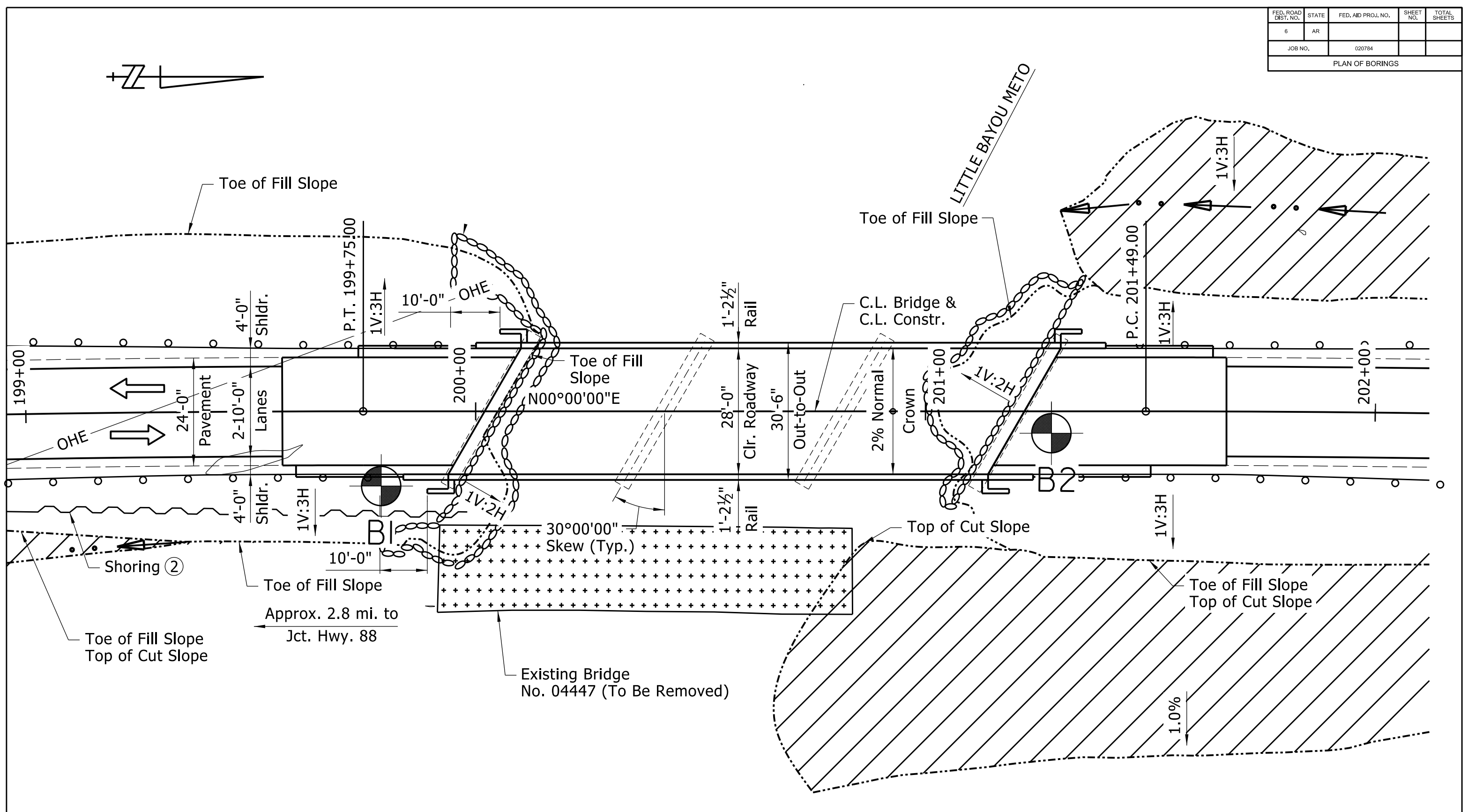
Standard Penetration Test – Driving a 2.0" O.D., 1-3/8" I.D. sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30 inches. It is customary to drive the spoon 6.0 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and performing the test are recorded for each 6 inches of penetration on the drill log. The field "N" Value ( $N_f$ ) can be obtained by

adding the bottom two numbers for example:  $\frac{6}{8-9} \Rightarrow 8+9 = 17 \text{blows/ft}$ . The "N" Value corrected to 60%

efficiency ( $N_{60}$ ) can be obtained by multiplying  $N_f$  by the hammer correction factor published on the boring log.

## Attachment A2

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
6	AR			
JOB NO.		020784		
PLAN OF BORINGS				



PLAN OF BORINGS	
LITTLE BAYOU METO STRS. & APPRS. (S) ROUTE 88, SECTION 9 JEFFERSON COUNTY WRAPE ROAD OVER LITTLE BAYOU METO	
JOB NO. 020784	SHEET 1/1
NTS	



**ARKANSAS DEPARTMENT OF TRANSPORTATION  
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. Site 2-B1  
PAGE 1 OF 4

JOB NO. 020784 Jefferson County  
JOB NAME: Little Bayou Meto Strs. & Apprs. (S)  
Route 88 Section 9 & Wrape Rd.  
STATION: 199+79  
LOCATION: 16' Right of Construction Centerline  
LOGGED BY: Guy King

DATE: January 10, 2024  
TYPE OF DRILLING:  
Hollow Stem Auger - Rotary Wash  
EQUIPMENT: Acker 1  
HAMMER CORRECTION FACTOR: 1.42

COMPLETION DEPTH: 120

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)		PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
					PL	LL				
			SURFACE ELEVATION: 182.0							
5		X	Dry, Stiff, Reddish Brown Lean Clay	CL	25		95	6 6-6		
		X	Dry, Stiff, Brown Lean Clay	CL	20	35	89	4 4-6		
10		X	Wet, Very Loose, Brown Silt	ML	35		97	0 0-0		
		X		ML	35	40	97	0 0-0		
15		X	Moist, Very Soft, Brown Lean Clay with Some Organic Matter (Wood)	CL	45		97	0 0-0		
20		X		CH	45	75	97	0 0-0		
25		X	Moist, Very Soft, Brown Fat Clay					0 0-0		
30		X						0 0-0		
35		X						0 0-0		

REMARKS: \*24 hour water level was approximately 6 feet below ground level(bgl). Soil description and density likely impacted by Gravel fall-in after 73.5 feet(bgl).

**ARKANSAS DEPARTMENT OF TRANSPORTATION  
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. Site 2-B1  
PAGE 2 OF 4

JOB NO. 020784 Jefferson County  
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DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)		PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% T C R	% R Q D
					PL	LL				
			SURFACE ELEVATION: 182.0							
40			Moist, Very Soft, Brown Clay with Trace Organic Matter (Wood)					0 0-0		
			Wet, Loose, Gray Silty Sand	SM			47	1 4-2		
			Moist, Medium Stiff, Gray Clay	-						
45			Moist, Very Soft, Brown Fat Clay	CH			96	0 0-0		
			Moist, Soft, Brown Lean Clay	CL			98	0 0-4		
50			Wet, Dense, Gray Silty Sand	SM			15	10 16-23		
			Wet, Dense, Gray Poorly Graded Sand with Silt	SP-SM			8	12 16-26		
55			Wet, Medium Dense, Light Brown Poorly Graded Sand with Silt and Some Gravel	SP-SM			7	10 14-16		
60										
65										
70										

REMARKS: \*24 hour water level was approximately 6 feet below ground level(bgl). Soil description and density likely impacted by Gravel fall-in after 73.5 feet(bgl).

**ARKANSAS DEPARTMENT OF TRANSPORTATION  
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. Site 2-B1  
PAGE 3 OF 4

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DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)										PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% T C R	% R Q D	
					PL	10	20	30	40	50	60	70	LL						
			SURFACE ELEVATION: 182.0																
75		X	Wet, Medium Dense, Light Brown Sand	-													6 10-13		
		X	Wet, Dense, Light Brown Sand														13 23-27		
			Sand with Gravel																
80		X	Wet, Medium Dense, Light Brown Well Graded Sand with Gravel	SW												4	11 16-12		
85		X															7 11-15		
90		X															6 12-15		
95		X	Wet, Medium Dense, Gray and Brown Sand with Gravel (Lots of Gravel Fall-In)														8 12-13		
100		X															8 7-7		
105		X		-															

REMARKS: \*24 hour water level was approximately 6 feet below ground level(bgl). Soil description and density likely impacted by Gravel fall-in after 73.5 feet(bgl).

**ARKANSAS DEPARTMENT OF TRANSPORTATION  
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. Site 2-B1  
PAGE 4 OF 4

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Hollow Stem Auger - Rotary Wash  
EQUIPMENT: Acker 1  
HAMMER CORRECTION FACTOR: 1.42

COMPLETION DEPTH: 120

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)											PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
					PL	10	20	30	40	50	60	70	LL						
			SURFACE ELEVATION: 182.0																
110		X	Wet, Dense, Gray and Brown Sand with Gravel (Lots of Gravel Fall-In)													15 17-15			
115		X	Wet, Medium Dense, Gray and Brown Sand with Gravel (Lots of Gravel Fall-In)													6 11-23			
120		X	Wet, Medium Dense, Gray and Brown Sand with Gravel (Lots of Gravel Fall-In)													9 10-17			
125			Boring Terminated																
130			Boring Terminated																
135			Boring Terminated																
140			Boring Terminated																

REMARKS: \*24 hour water level was approximately 6 feet below ground level(bgl). Soil description and density likely impacted by Gravel fall-in after 73.5 feet(bgl).

**ARKANSAS DEPARTMENT OF TRANSPORTATION  
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. Site 2-B2  
PAGE 1 OF 3

JOB NO. 020784 Jefferson County  
JOB NAME: Little Bayou Meto Strs. & Apprs. (S)  
Route 88 Section 9 & Wrape Rd.  
STATION: 201+28  
LOCATION: 7' Right of Construction Centerline  
LOGGED BY: Guy King

DATE: January 30, 2024  
TYPE OF DRILLING:  
Hollow Stem Auger - Rotary Wash  
EQUIPMENT: Acker 1  
HAMMER CORRECTION FACTOR: 1.42

COMPLETION DEPTH: 101.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)		PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
					PL	LL				
			SURFACE ELEVATION: 180.6							
5			Moist, Soft, Reddish Brown Lean Clay*	CL	30	35	99	0		
				-				1-2		
			Moist, Very Soft, Reddish Brown Lean Clay	CL	30	35	98	0		
				-				0-0		
10			Moist, Medium Stiff, Reddish Brown Lean Clay	CL	35	45	99	1		
				-				2-3		
			Moist, Medium Stiff, Reddish Brown Fat Clay	CH	35	65	99	1		
				-				2-3		
15			Moist, Soft, Reddish Brown Fat Clay with Organic Matter	CH	35	55	99	0		
				-				0-2		
20			Moist, Very Loose, Brown Elastic Silt	MH	45	55	99	0		
				-				0-2		
25			Moist, Soft, Dark Brown Fat Clay	CH	35	65	99	0		
				-				0-3		
30			Moist, Soft, Dark Brown Fat Clay	CL	35	45	98	0		
				-				3-3		
35										

REMARKS: \*A 24 hour water level reading was 4.2 feet below ground level(bgl). Started rotary washing at 11.5 feet(bgl).

**ARKANSAS DEPARTMENT OF TRANSPORTATION  
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. Site 2-B2  
PAGE 2 OF 3

JOB NO. 020784 Jefferson County  
JOB NAME: Little Bayou Meto Strs. & Apprs. (S)  
Route 88 Section 9 & Wrape Rd.  
STATION: 201+28  
LOCATION: 7' Right of Construction Centerline  
LOGGED BY: Guy King

DATE: January 30, 2024  
TYPE OF DRILLING:  
Hollow Stem Auger - Rotary Wash  
EQUIPMENT: Acker 1  
HAMMER CORRECTION FACTOR: 1.42

COMPLETION DEPTH: 101.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)		PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% T C R	% R Q D
					PL	LL				
			SURFACE ELEVATION: 180.6							
			Moist, Medium Stiff, Gray Lean Clay	CL	30	45	98	0 3-4		
40			Moist, Very Stiff, Brown Clay	-	40			0 5-11		
			Wet, Medium Dense, Gray Sand							
45										
			Wet, Dense, Light Gray Poorly Graded Sand with Silt	SP-SM			8	5 14-20		
50										
			Wet, Dense, Light Gray Sand with Some Gravel	-				9 13-19		
55										
			Wet, Dense, Light Gray Sand with Gravel					14 20-26		
60										
			Wet, Medium Dense, Light Gray Poorly Graded Sand with Gravel	SP			3	8 16-13		
65										
			Wet, Dense, Light Gray Sand					13 22-19		
70										

REMARKS: \*A 24 hour water level reading was 4.2 feet below ground level(bgl). Started rotary washing at 11.5 feet(bgl).

**ARKANSAS DEPARTMENT OF TRANSPORTATION  
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BORING NO. Site 2-B2  
PAGE 3 OF 3

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Hollow Stem Auger - Rotary Wash  
EQUIPMENT: Acker 1  
HAMMER CORRECTION FACTOR: 1.42

COMPLETION DEPTH: 101.5

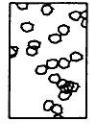
DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)											PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% T C R	% R Q D
					PL	10	20	30	40	50	60	70	LL						
			SURFACE ELEVATION: 180.6																
75		X	Wet, Dense, Light Gray Sand with Gravel	-													11		
		X	Wet, Dense, Light Gray Sand														10		
80		X	Wet, Dense, Light Brown Poorly Graded Sand with Gravel	SP													6		
85		X	Wet, Dense Light Gray Sand														4		
90		X	Wet, Medium Dense, Light Gray Sand with Some Gravel	-													6		
95		X	Wet, Medium Dense, Dark Gray Silty Sand	SM													7		
100		X	Boring Terminated														9		
105																			

REMARKS: \*A 24 hour water level reading was 4.2 feet below ground level(bgl). Started rotary washing at 11.5 feet(bgl).

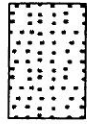
# LEGEND

## SOIL TYPES

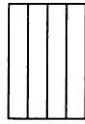
(SHOWN IN SYMBOL COLUMN)  
(PREDOMINANT TYPE SHOWN HEAVY)



GRAVEL



SAND



SILT



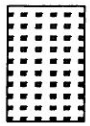
CLAY



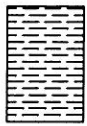
ORGANIC  
MATTER

## ROCK TYPES

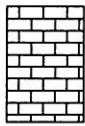
(SHOWN IN SYMBOL COLUMN)



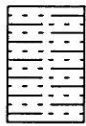
SANDSTONE



SHALE  
or  
SILTSTONE



LIMESTONE  
or  
DOLOMITE



ALTERNATING  
LAYERS of  
SHALE and  
SANDSTONE



OTHER

## SAMPLER TYPES

(SHOWN IN SAMPLE COLUMN)

### SHELBY TUBE



UNDISTURBED  
SAMPLE  
RECOVERY

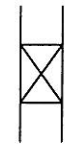


DISTURBED  
SAMPLE  
RECOVERY



NO  
RECOVERY

### SPLIT SPOON

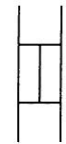


SAMPLE  
RECOVERY



NO  
RECOVERY

### ROCK CORING



% RECOVERY  
INDICATED ON LOGS

## TERMS DESCRIBING CONSISTENCY OR CONDITION

GRANULAR SOIL		CLAY		CLAY-SHALE		SHALE	
*N' Value	Density	*N' Value	Consistency	*N' Value	Consistency	*N' Value	Consistency
0-4	Very Loose	0-1	Very Soft	0-1	Very Soft		
5-10	Loose	2-4	Soft	2-4	Soft	31-60	Soft
11-30	Medium Dense	5-8	Medium Stiff	5-8	Medium Stiff	Over 60	
31-50	Dense	9-15	Stiff	9-15	Stiff	More than 2'	
Over 50	Very Dense	16-30	Very Stiff	16-30	Very Stiff	Penetration	
		31-60	Hard	31-60	Hard	in 60 Blows: Medium Hard	
		Over 60	Very Hard	Over 60	Very Hard	Less than 2'	
						Penetration	
						in 60 Blows: Hard	

1. Ground water elevations indicated on boring logs represent ground water elevations at date or time shown on boring log. Absence of water surface implies that no ground water data is available but does not necessarily mean that ground water will not be encountered at locations or within the vertical reaches of these borings.
2. Borings represent subsurface conditions at their respective locations for their respective depths. Variations in conditions between or adjacent to boring locations may be encountered.
3. Terms used for describing soils according to their texture or grain size distribution are in accordance with the Unified Soil Classification System.

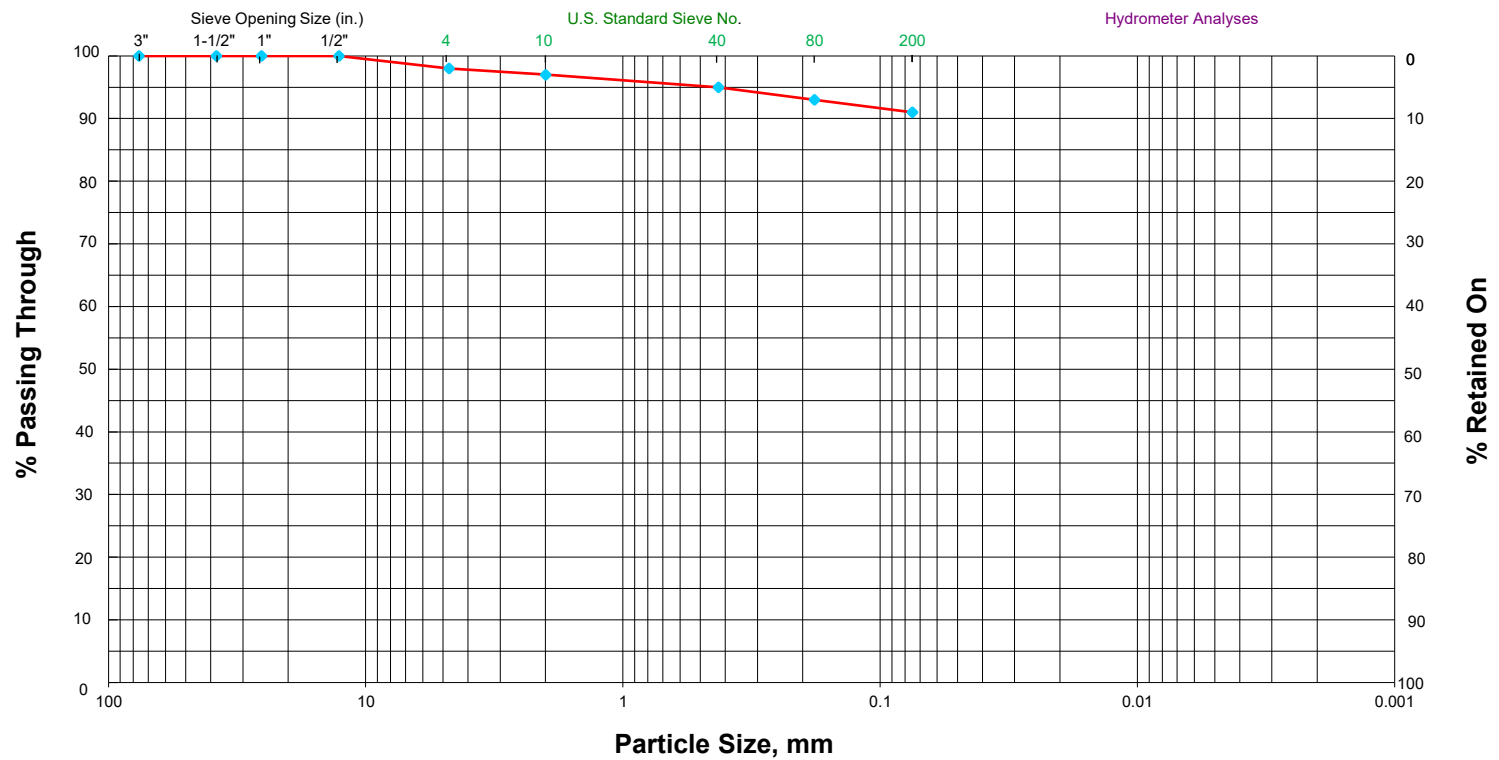
Standard Penetration Test – Driving a 2.0" O.D., 1-3/8" I.D. sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30 inches. It is customary to drive the spoon 6.0 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and performing the test are recorded for each 6 inches of penetration on the drill log. The field "N" Value ( $N_f$ ) can be obtained by

adding the bottom two numbers for example:  $\frac{6}{8-9} \Rightarrow 8+9 = 17 \text{ blows/ft}$ . The "N" Value corrected to 60%

efficiency ( $N_{60}$ ) can be obtained by multiplying  $N_f$  by the hammer correction factor published on the boring log.



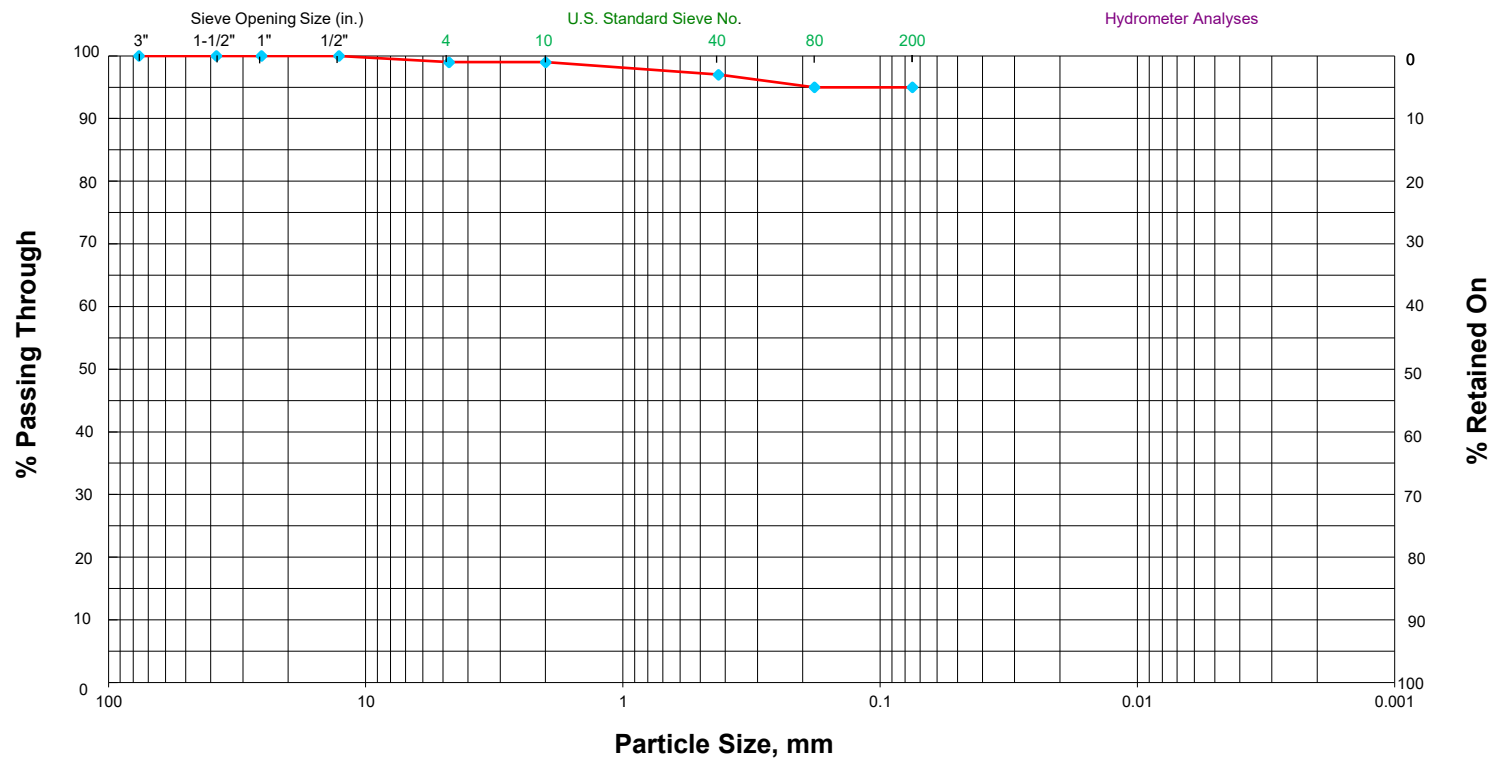
## Attachment B



**Particle Size Distribution Curve**  
**Station 100+79/15' Lt of CL**

Site 1





**Particle Size Distribution Curve**  
**Station 200+35/6' Rt of CL**

Site 2



## Attachment C1

**SITE PICTURES**

**Job No.: 020784 Site 1**

**Job Name: Little Bayou Meto Strs. & Apprs. (S)**



**Looking Downstream at Little Bayou Meto Under Existing Bridge (November 2023)**

**SITE PICTURES**

**Job No.: 020784 Site 1**

**Job Name: Little Bayou Meto Strs. & Apprs. (S)**



**Looking Upstream at Little Bayou Meto Under Existing Bridge (November 2023)**

**SITE PICTURES**

**Job No.: 020784 Site 1**

**Job Name: Little Bayou Meto Strs. & Apprs. (S)**



**Looking East Under Existing Bridge (November 2023)**



**SITE PICTURES**

**Job No.: 020784 Site 1**

**Job Name: Little Bayou Meto Strs. & Apprs. (S)**



**Looking West at Existing Bridge (November 2023)**





**SITE PICTURES**

**Job No.: 020784 Site 1**

**Job Name: Little Bayou Meto Strs. & Apprs. (S)**



**Looking East at Existing Bridge (November 2023)**

## Attachment C2



**SITE PICTURES**

**Job No.: 020784 Site 2**

**Job Name: Little Bayou Meto Strs. & Apprs. (S)**



**Looking East (Downstream) at Little Bayou Meto (November 2023)**



**SITE PICTURES**

**Job No.: 020784 Site 2**

**Job Name: Little Bayou Meto Strs. & Apprs. (S)**



**Looking South (Downstream) at Little Bayou Meto (November 2023)**



**SITE PICTURES**

**Job No.: 020784 Site 2**

**Job Name: Little Bayou Meto Strs. & Apprs. (S)**



**Looking West (Upstream) at Little Bayou Meto (November 2023)**



**SITE PICTURES**

**Job No.: 020784 Site 2**

**Job Name: Little Bayou Meto Strs. & Apprs. (S)**



**Looking North at Existing Bridge (November 2023)**



**SITE PICTURES**

**Job No.: 020784 Site 2**

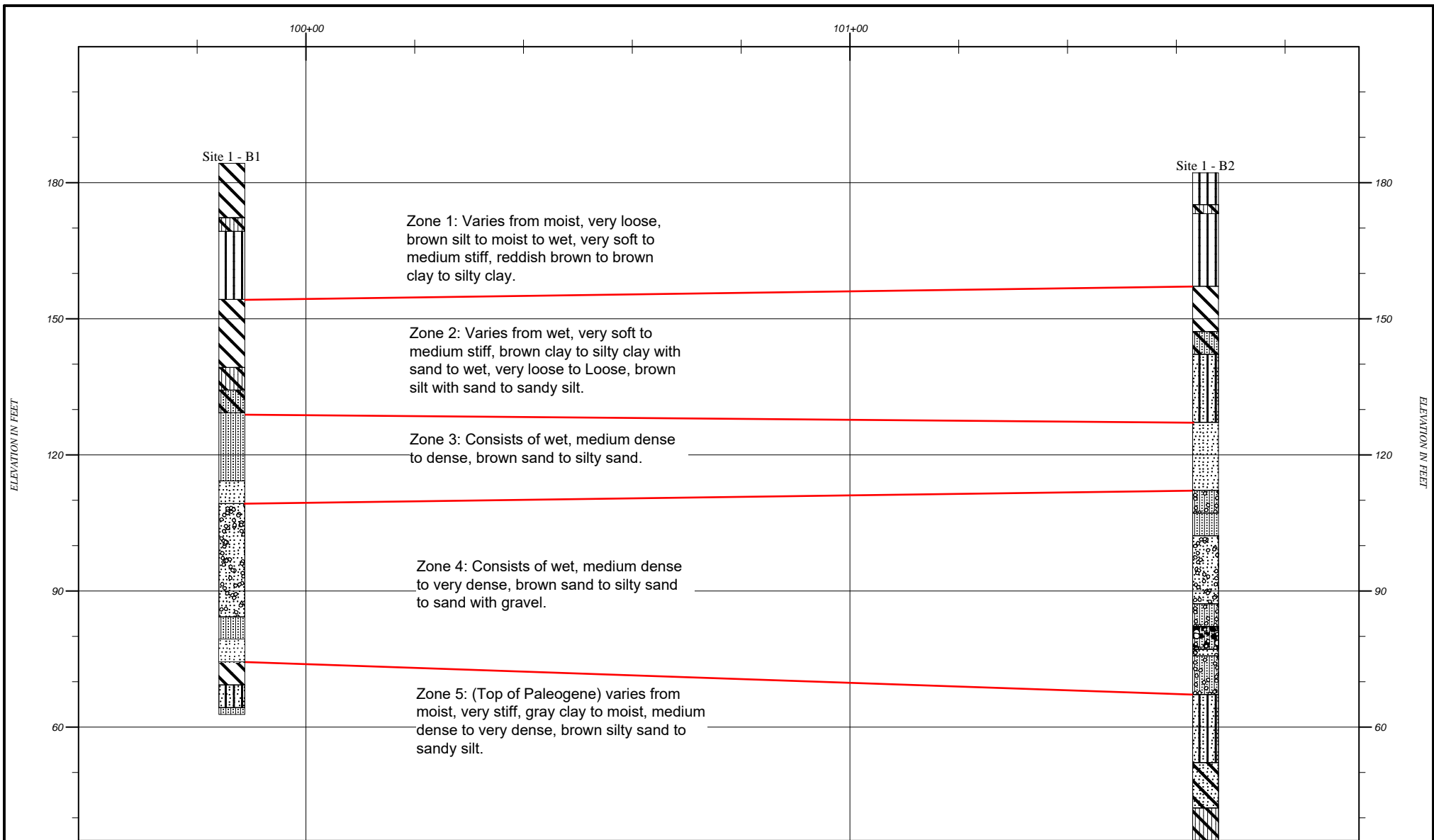
**Job Name: Little Bayou Meto Strs. & Apprs. (S)**



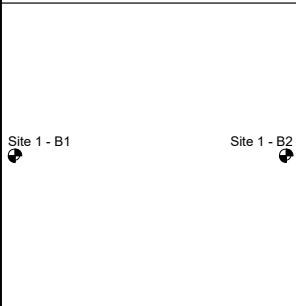
**Looking East Under Existing Bridge (November 2023)**

## Attachment D1





Plan View



Strata symbols

- clay
- silty clay
- silt/cemented silt
- sandy, silty clay

- silty sand
- sand
- sand and gravel
- clayey sand
- sandy silt

- silty sand with gravel
- silty sand gravel, cobbles and boulders
- sandy clay

<b>ARDOT GENERALIZED SUBSURFACE PROFILE</b>		
HORIZONTAL SCALE:	DRAWN BY/APPROVED BY	DATE DRAWN
VERTICAL SCALE:		1/8/2024
Little Bayou Meto Strs. & Apprs. (S)		
PROJECT NO. 020784 Jefferson County		SITE 1

## Attachment D2



## Attachment E1

Title: 020784 Site 1

Latitude: 34.1566972

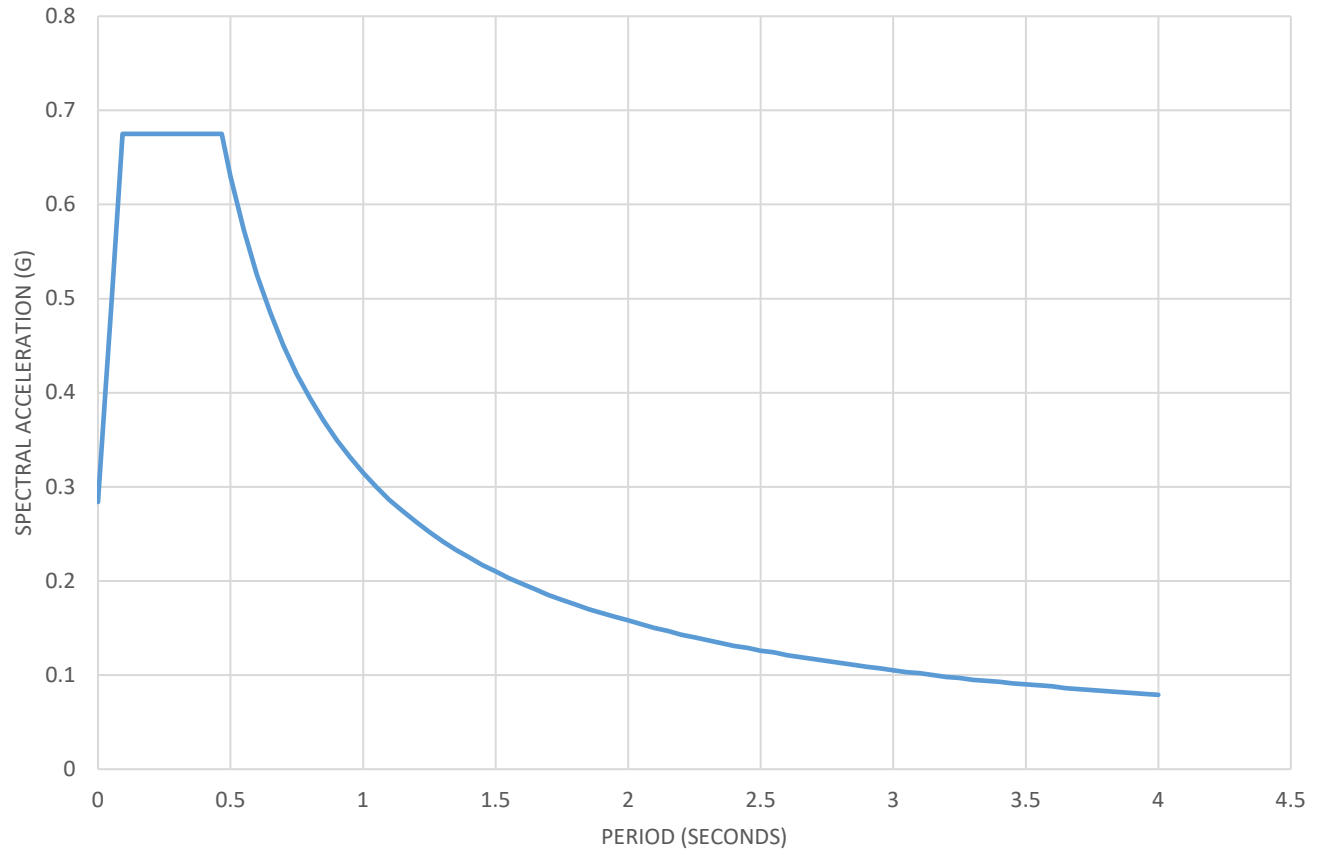
Longitude: -91.566328

Site Class: E

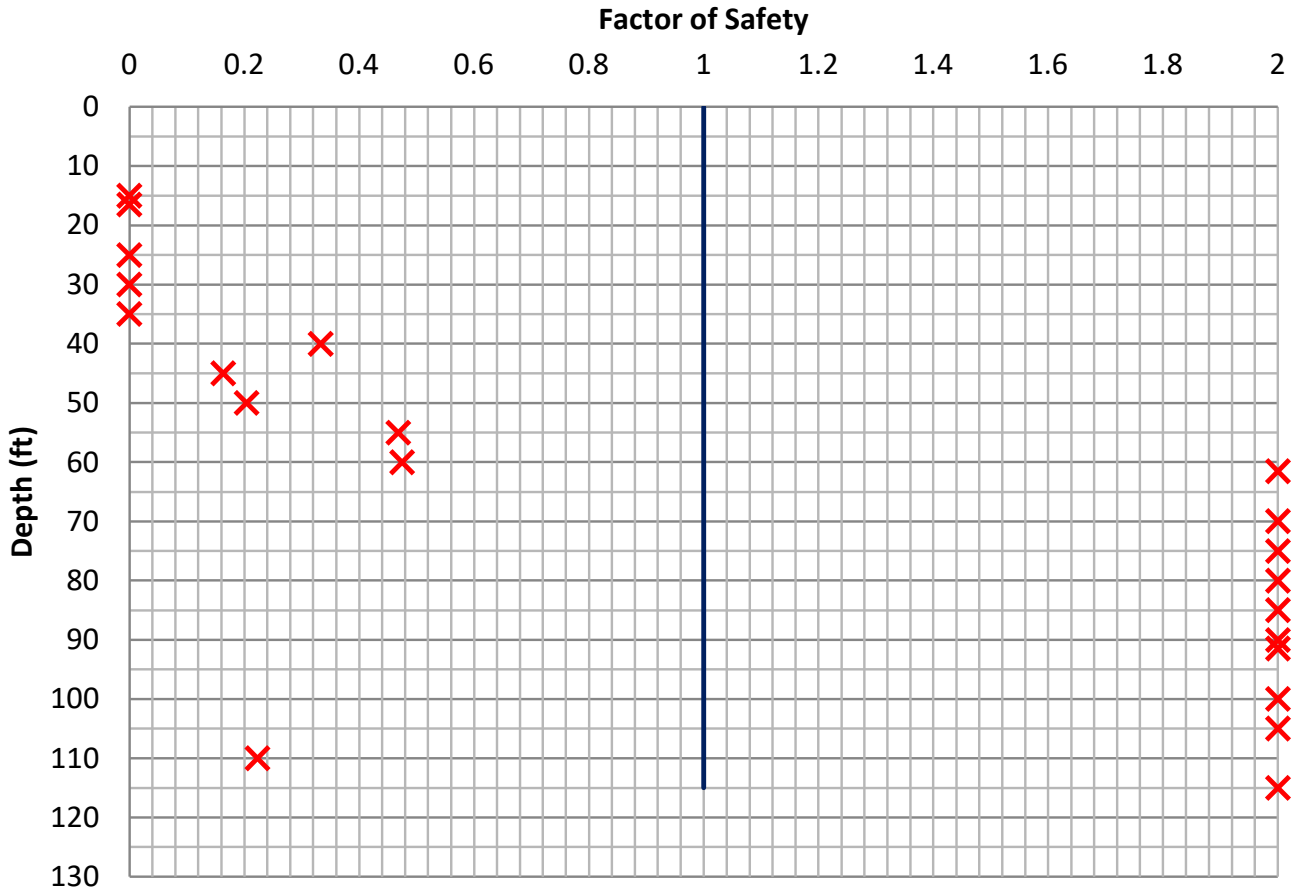
Get USGS Data

PGA:	0.122
$F_{PGA}$ :	2.321
$A_S$ :	0.284
$S_S$ :	0.281
$F_A$ :	2.401
$S_{DS}$ :	0.675
$S_1$ :	0.09
$F_V$ :	3.5
$S_{D1}$ :	0.315
$S_{DC}$ :	C
$T_S$ :	0.467
$T_0$ :	0.093

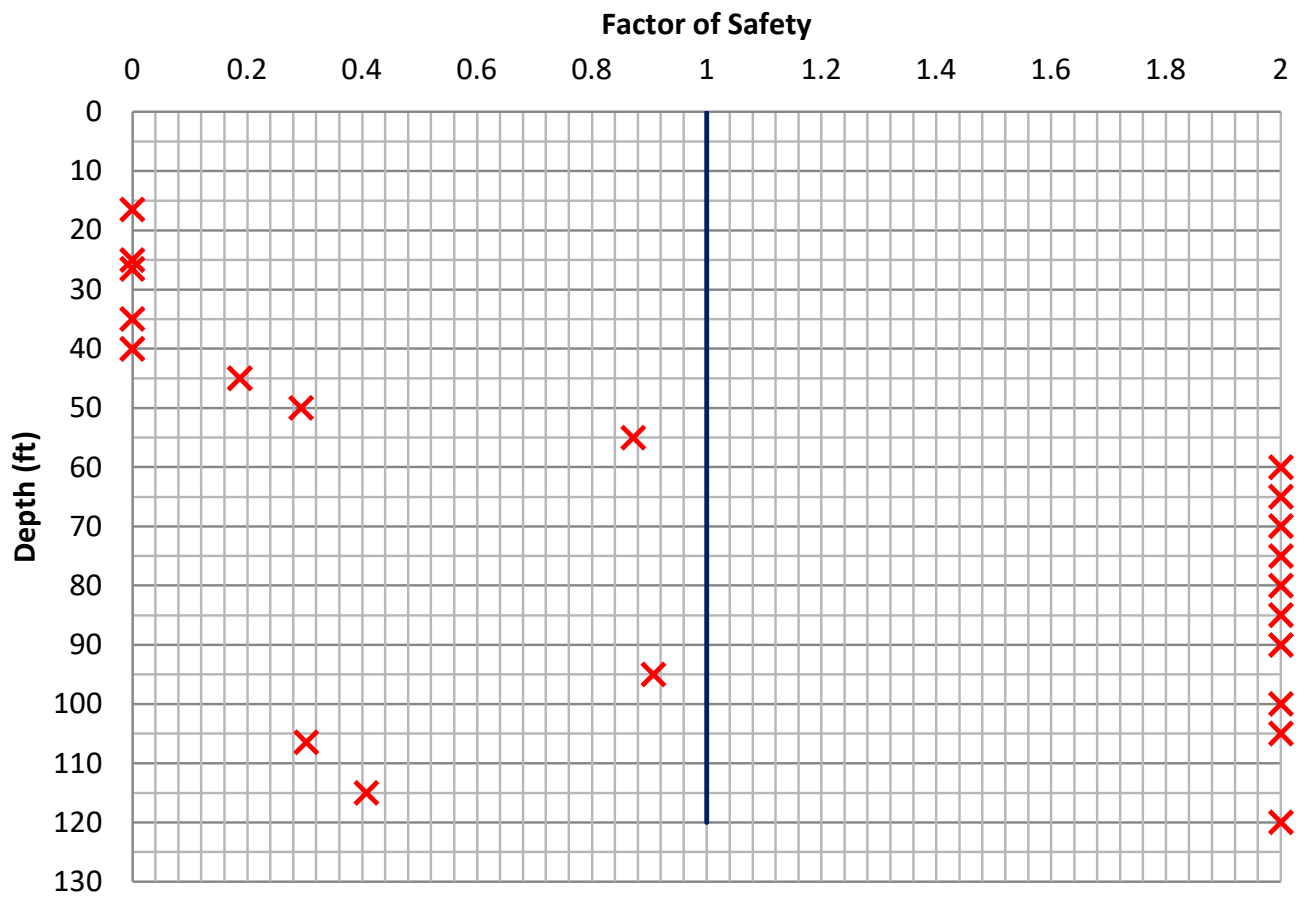
### 020784 SITE 1 DESIGN RESPONSE SPECTRUM



# Factor of Safety Idriss and Boulanger (2012) - Boring 1 (Site 1)



# Factor of Safety Idriss and Boulanger (2012) - Boring 2 (Site 1)



## Attachment E2



Title: 020784 Site 2

Latitude: 34.1978472

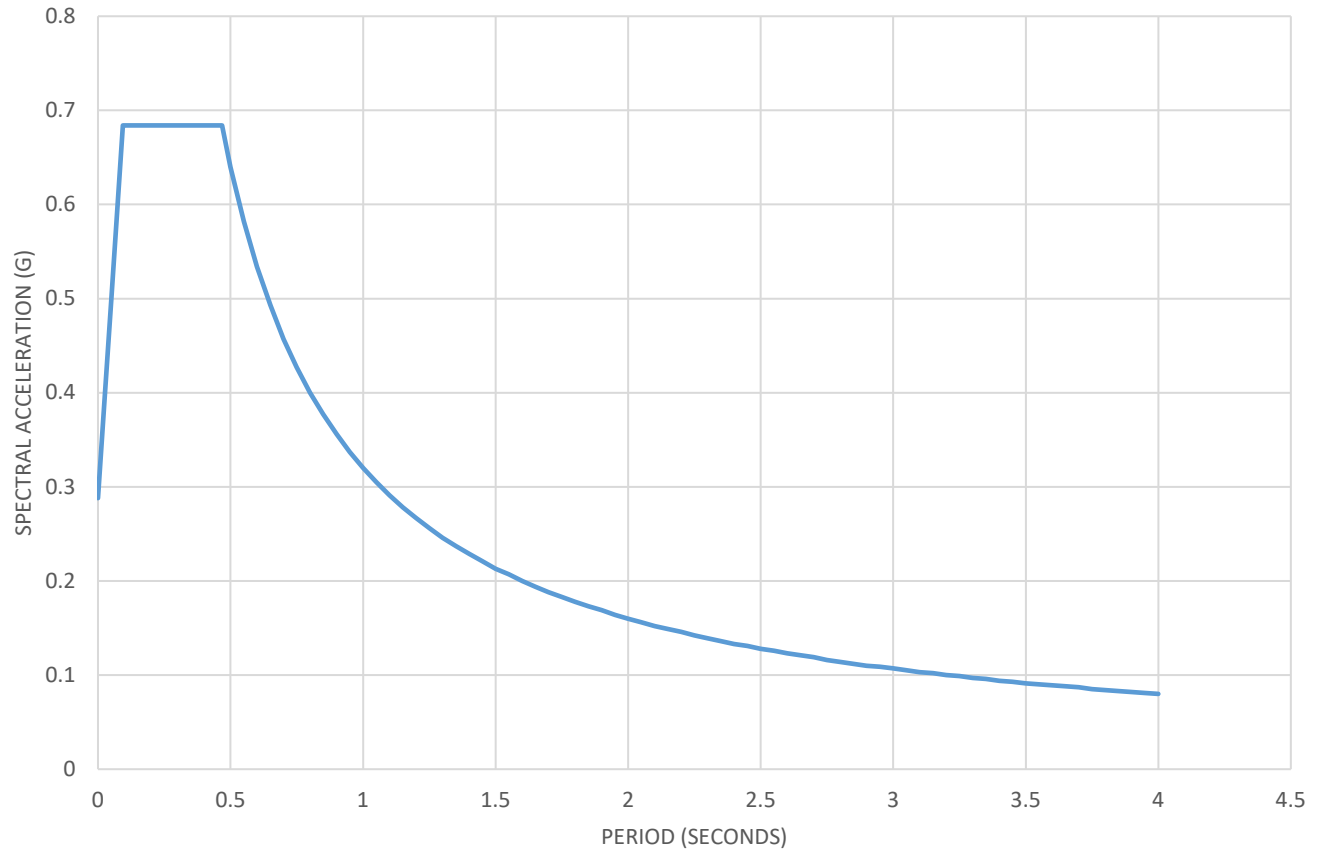
Longitude: -91.582681

Site Class: E

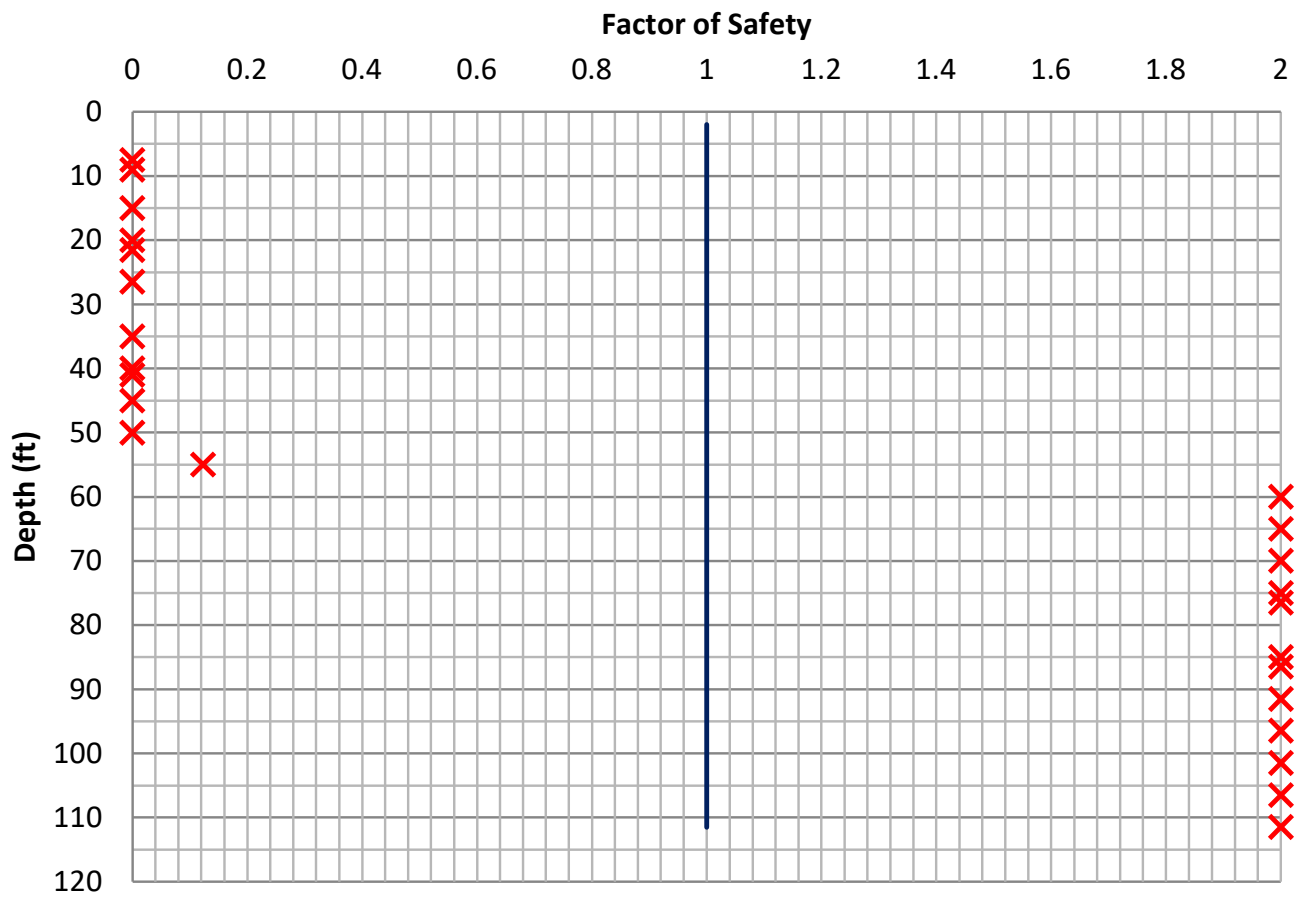
Get USGS Data

PGA:	0.125
$F_{PGA}$ :	2.298
$A_S$ :	0.288
$S_S$ :	0.287
$F_A$ :	2.38
$S_{DS}$ :	0.684
$S_1$ :	0.091
$F_V$ :	3.5
$S_{D1}$ :	0.32
$S_{DC}$ :	C
$T_S$ :	0.468
$T_0$ :	0.094

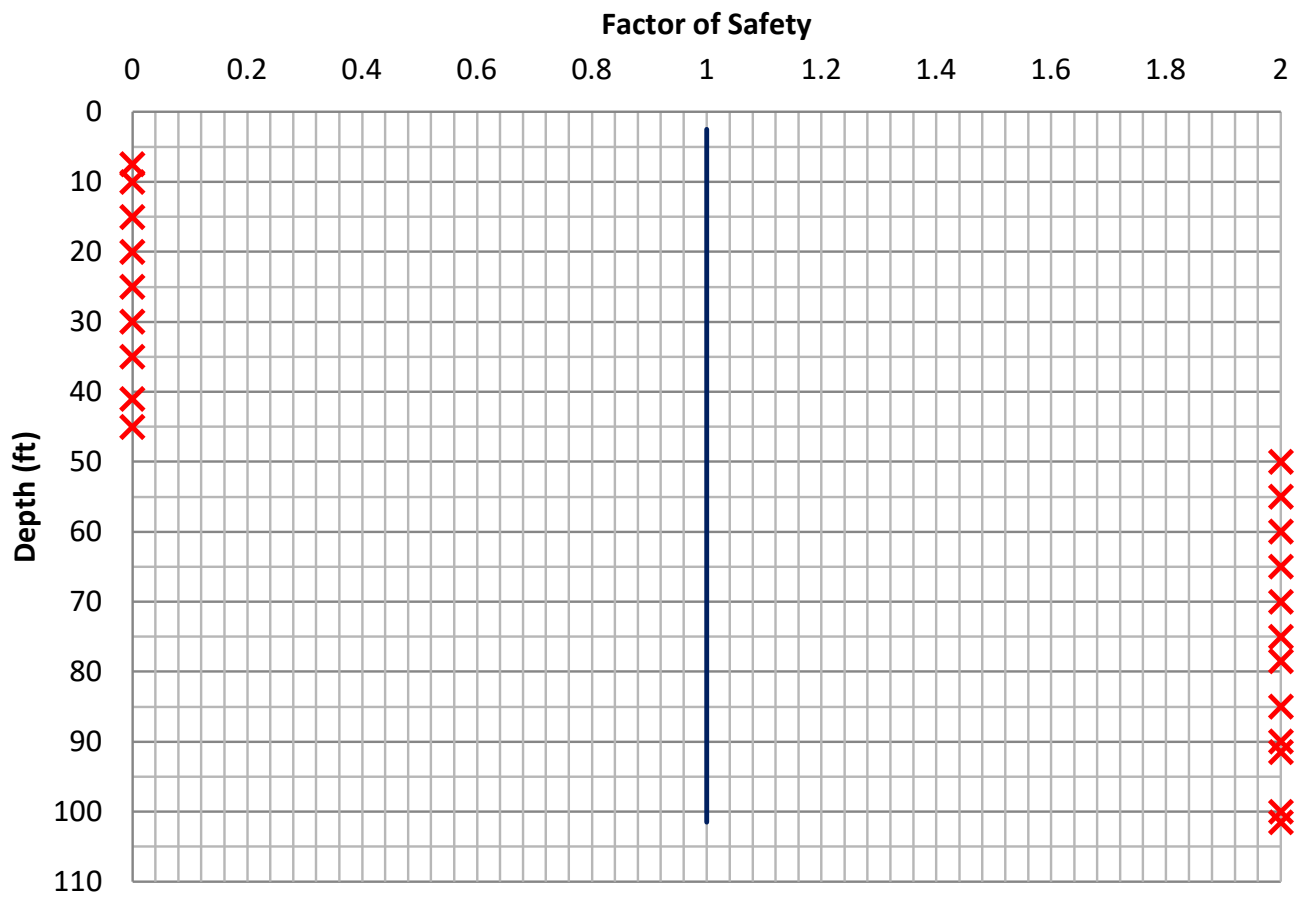
### 020784 SITE 2 DESIGN RESPONSE SPECTRUM









# Factor of Safety Idriss and Boulanger (2012) - Boring 1 (Site 2)

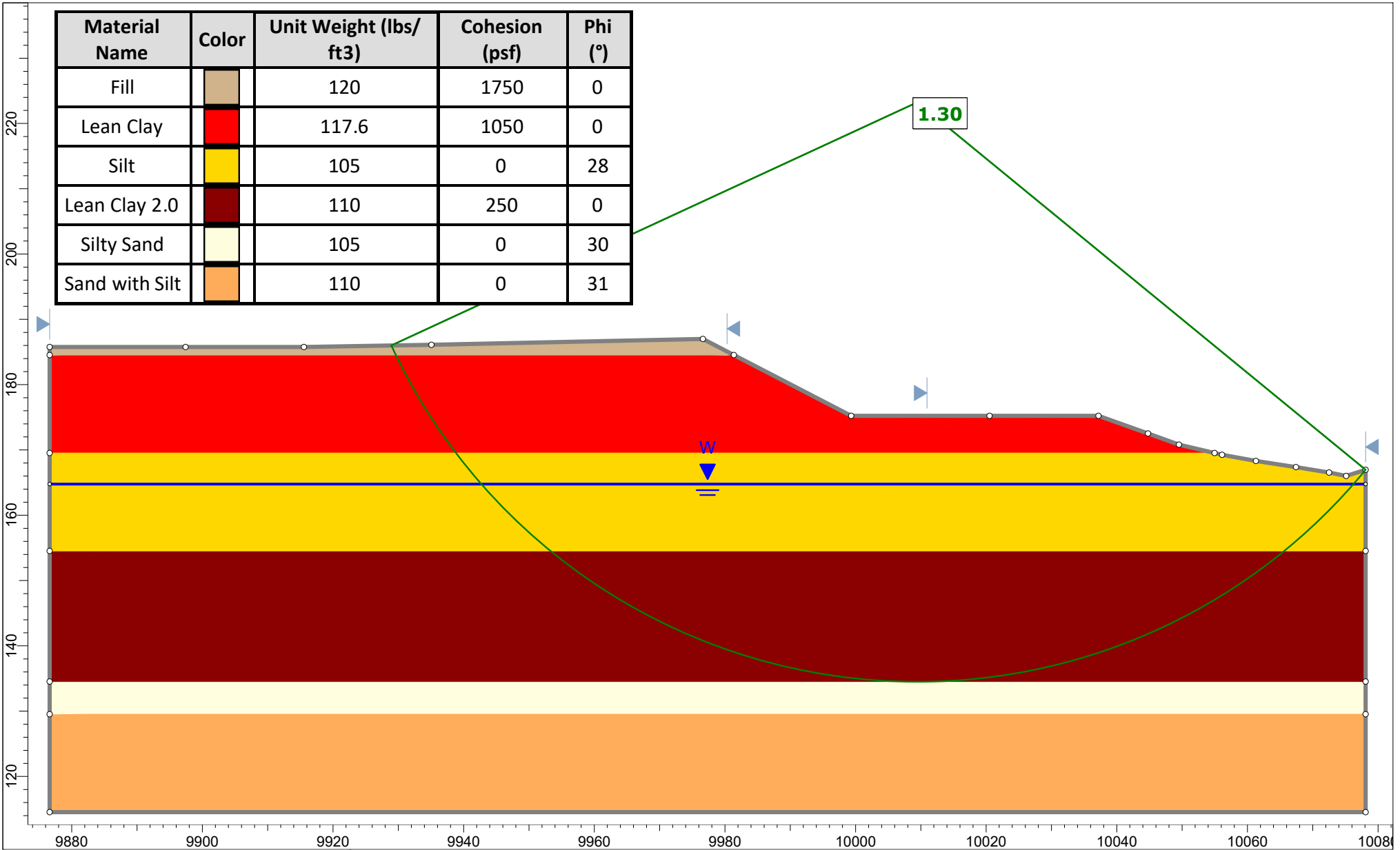



# Factor of Safety Idriss and Boulanger (2012) - Boring 2 (Site 2)

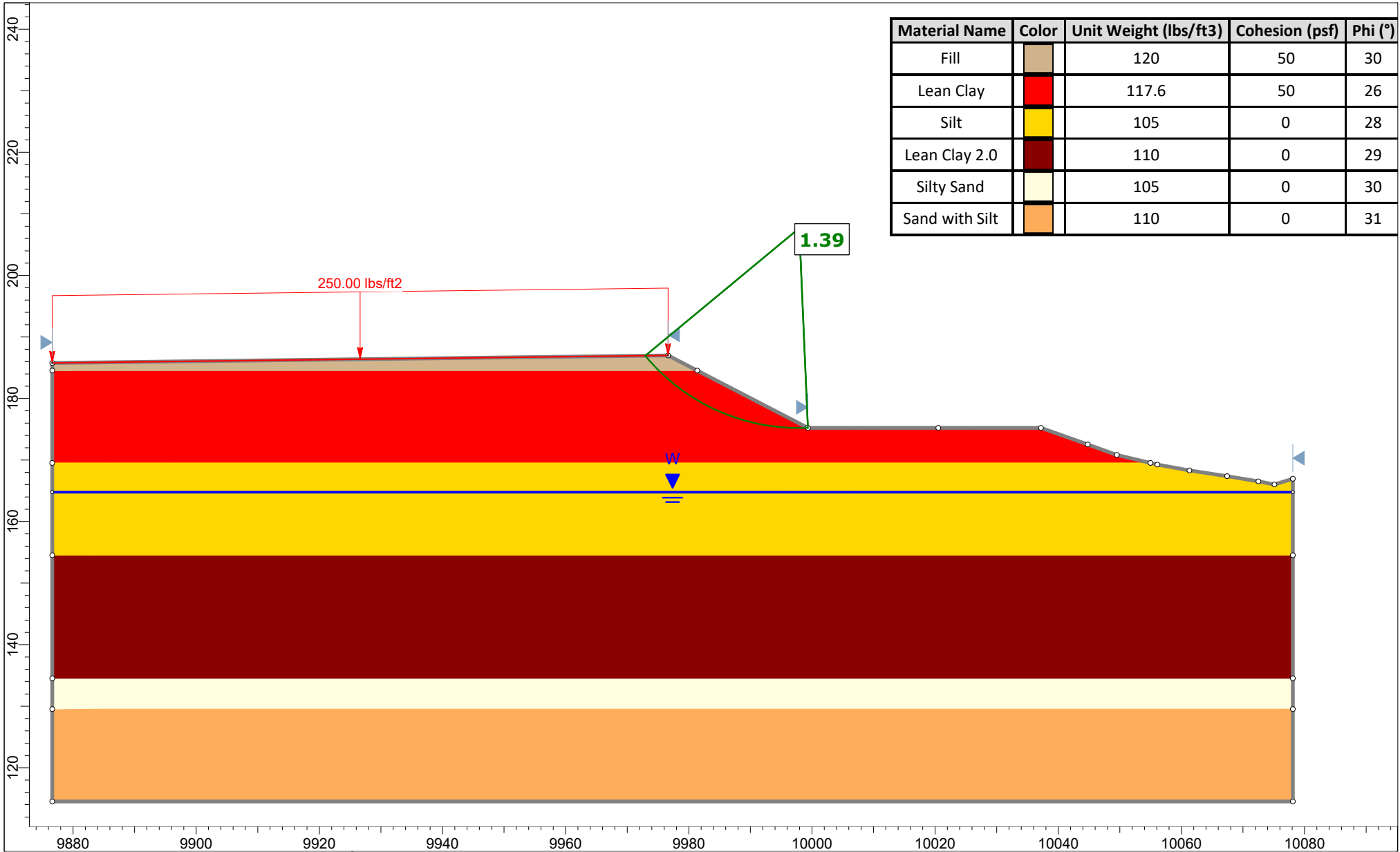


## Attachment F1

Material Name	Color	Unit Weight (lbs/ft <sup>3</sup> )	Cohesion (psf)	Phi (°)
Fill		120	1750	0
Lean Clay		117.6	1050	0
Silt		105	0	28
Lean Clay 2.0		110	250	0
Silty Sand		105	0	30
Sand with Silt		110	0	31

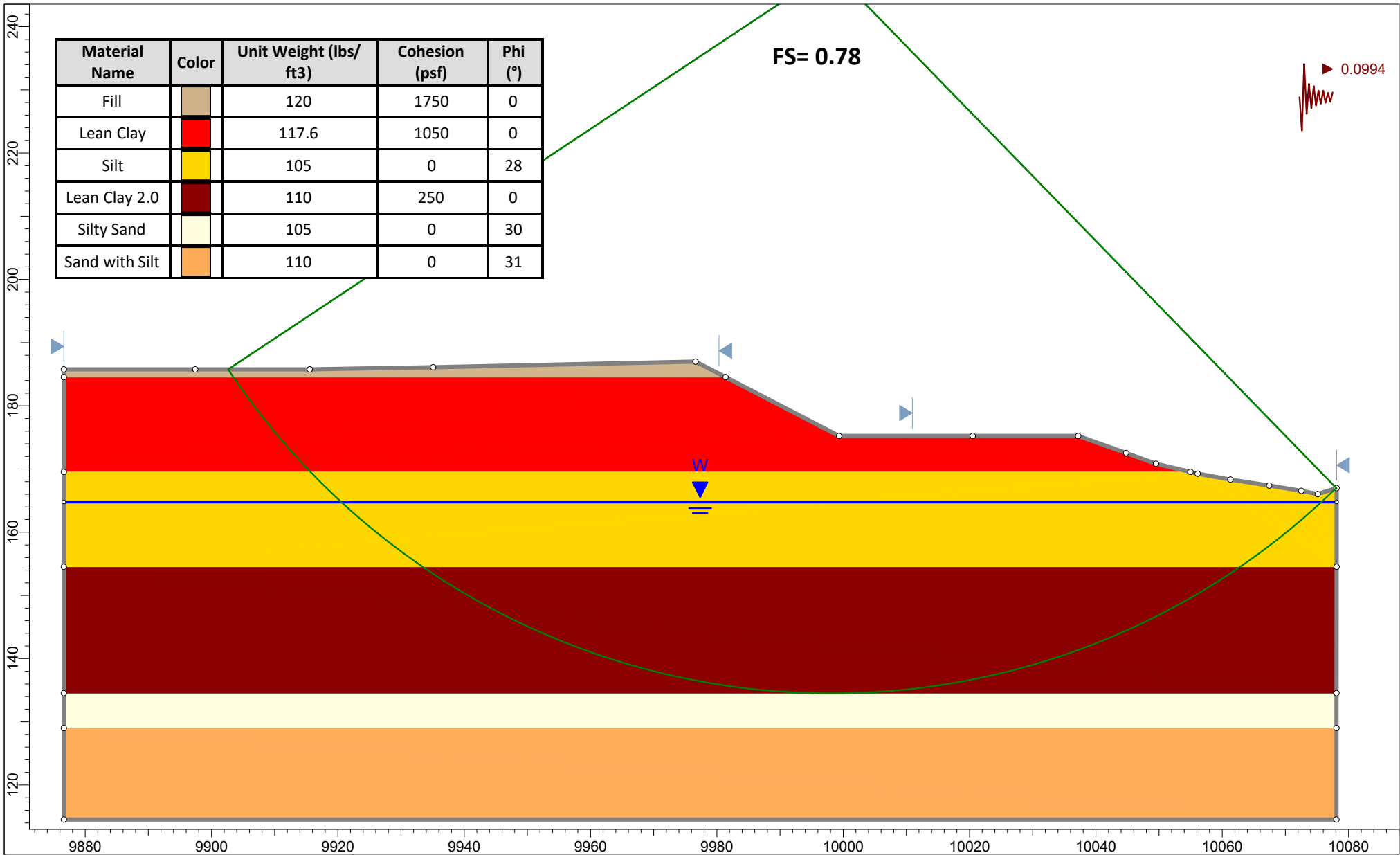


	Project 020784 - Little Bayou Meto STRS. & APPRS. (S)	
	Site Little Bayou Meto (Site 1)	Analysis Type Short Term
	Analyzed By AGW	Configuration West Bridge End, 1V: 2H End slope
	Date 2/26/2024	



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (°)
Fill		120	50	30
Lean Clay		117.6	50	26
Silt		105	0	28
Lean Clay 2.0		110	0	29
Silty Sand		105	0	30
Sand with Silt		110	0	31

	Project		020784 - Little Bayou Meto STRS. & APPRS. (S)	
	Site	Little Bayou Meto (Site 1)	Analysis Type	Long Term
	Analyzed By	AGW	Configuration	West Bridge End, 1V: 2H End slope
	Date	2/26/2024		



Material Name	Color	Unit Weight (lbs/ft <sup>3</sup> )	Cohesion (psf)	Phi (°)
Fill		120	1750	0
Lean Clay		117.6	1050	0
Silt		105	0	28
Lean Clay 2.0		110	250	0
Silty Sand		105	0	30
Sand with Silt		110	0	31

	Project		020784 - Little Bayou Meto STRS. & APPRS. (S)	
	Site	Little Bayou Meto (Site 1)	Analysis Type	Seismic
	Analyzed By	AGW	Configuration	West Bridge End, 1V: 2H End slope
	Date	2/26/2024		

## SIMPLIFIED NEWMARK BLOCK ANALYSIS - NCHRP 611

### Project No.: **020784 Site 1 Bent 1**

## 1. Seismic Coefficients

### 1.1 Design Response Spectrum Coefficients

#### 1.1.1 General (Code-Based) Procedure

$$PGA := 0.122$$

$$F_{PGA} := 2.321$$

$$A_{S\_code} := F_{PGA} \cdot PGA = 0.283$$

$$S_1 := 0.09$$

$$F_V := 3.5$$

$$S_{D1\_code} := F_V \cdot S_1 = 0.315$$

#### 1.1.2 Adopted Values

$$k_{max} := \frac{2}{3} A_{S\_code} = 0.189$$

*Peak ground acceleration coefficient at the ground surface (Eq. 7-1)*

$$S_{D1} := S_{D1\_code} = 0.315$$

## 1.2 Other Seismic Parameters

$$PGV := 55 S_{D1} \cdot \frac{in}{s} = 17.3 \frac{in}{s}$$

*Peak Ground Velocity for  $M = 7.5$  (Eq. 5-11)*

$$\beta := \frac{S_{D1}}{k_{max}} = 1.669$$

*Part of Eq. 7-2 to calculate reduction factor for peak ground acceleration*

## 2. Embankment Effect

$$H := 11.5 \text{ ft}$$

*Embankment or wall height*

$$\alpha := 1 + 0.01 \cdot \frac{H}{ft} \cdot (0.5 \cdot \beta - 1) = 0.981$$

*Reduction factor accounting for fill height for Seismic Site Classes C, D, and E foundations (Eq. 7-2)*

$$k_{av} := \alpha \cdot k_{max} = 0.185$$

*Peak ground acceleration adjusted by fill height (Eq. 7-1)*

$$k_y := 0.046$$

*Yield acceleration of the failure mass, i.e., horizontal acceleration that results in a factor of safety of 1.0 in a pseudo-static limit equilibrium stability analysis*

$$k_{max} := k_{av} = 0.185$$

## 3. Newmark Block Displacement

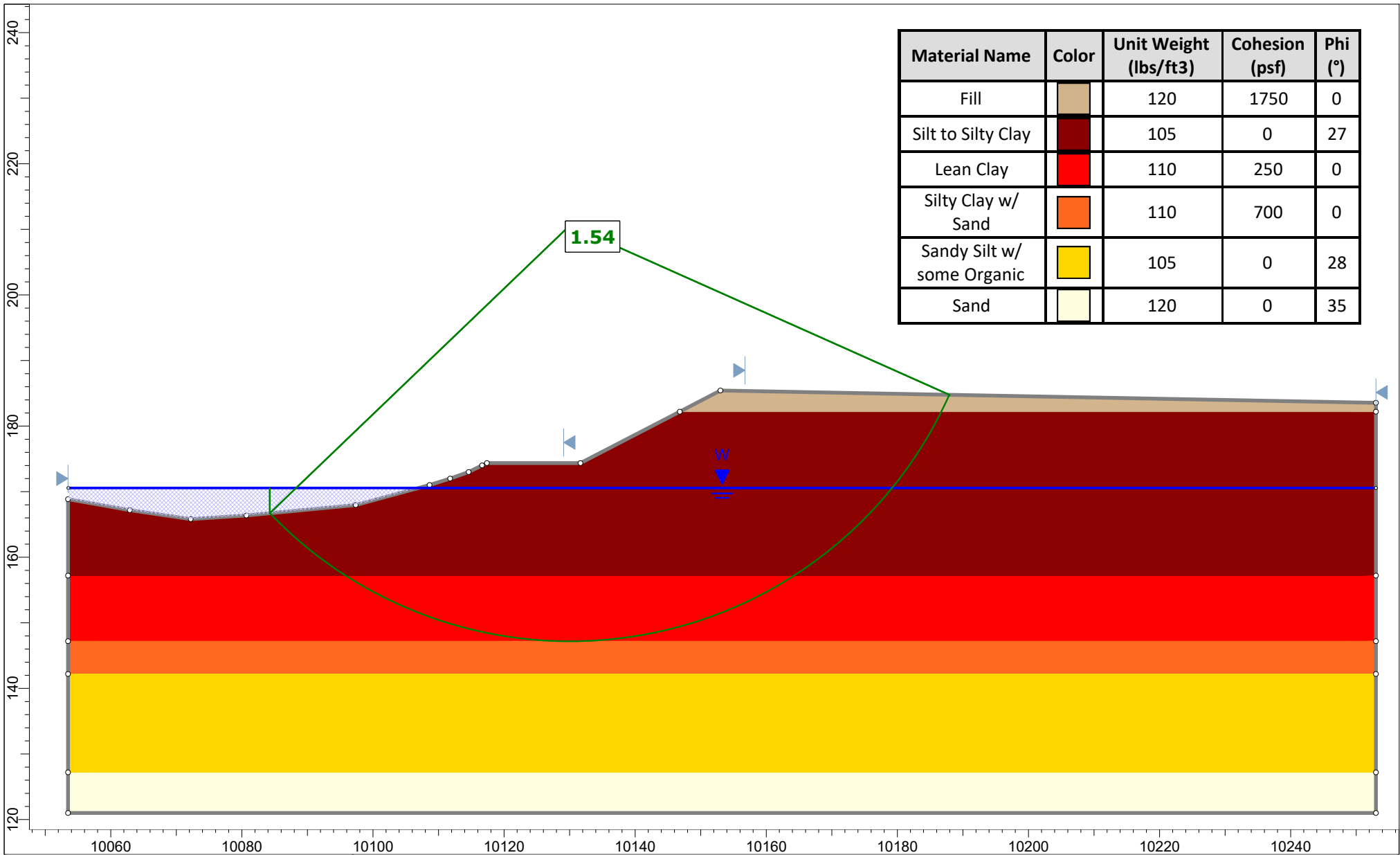
$$A := -1.51 - 0.74 \cdot \log\left(\frac{k_y}{k_{max}}\right) + 3.27 \cdot \log\left(1 - \frac{k_y}{k_{max}}\right)$$

$$B := -0.80 \cdot \log(k_{max}) + 1.59 \cdot \log\left(\frac{PGV}{\frac{in}{s}}\right)$$

$$d := 10^{(A+B)} \cdot in = 12.2 \text{ in}$$

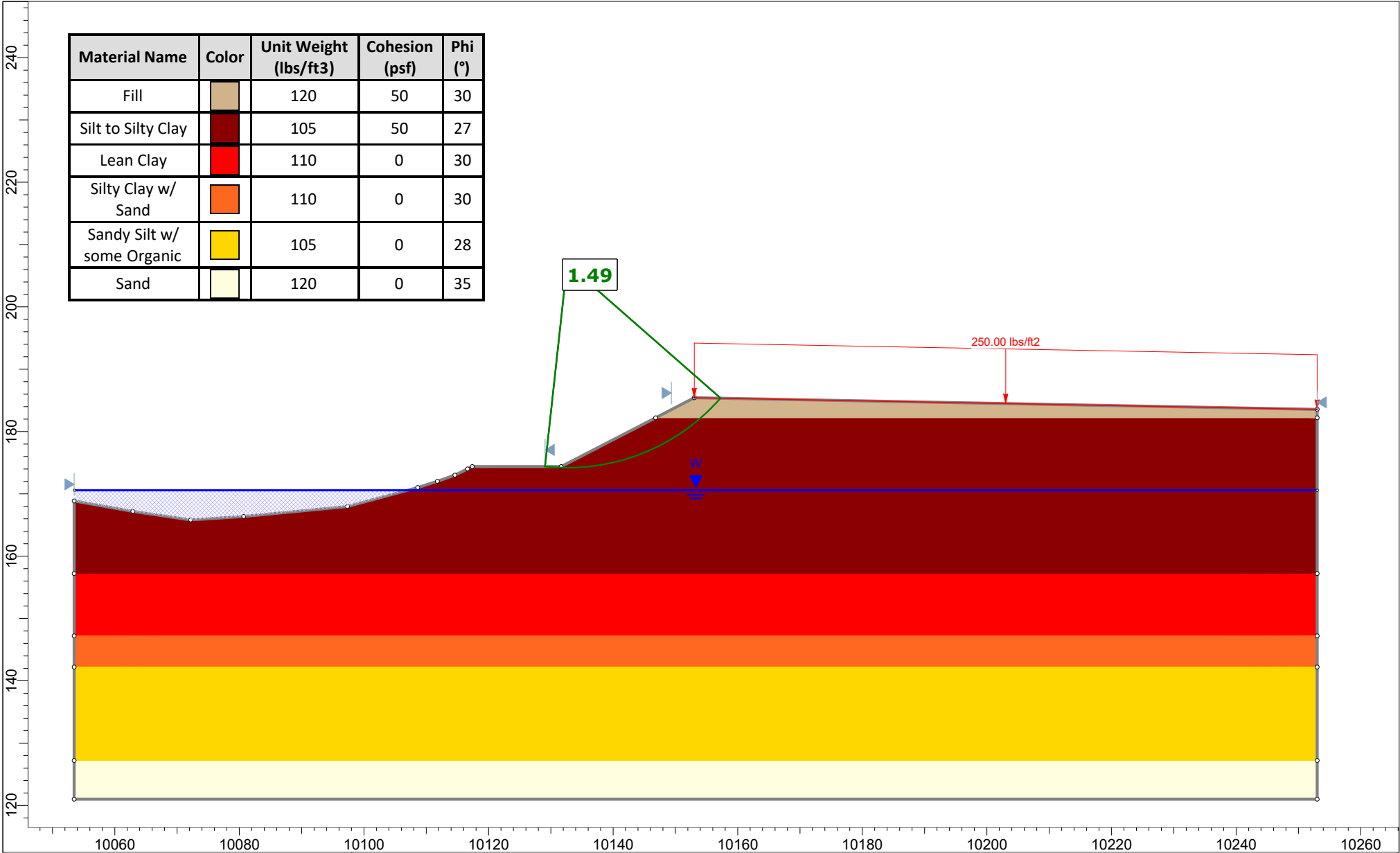
*Estimated permanent displacement (Eq. 5-8)*





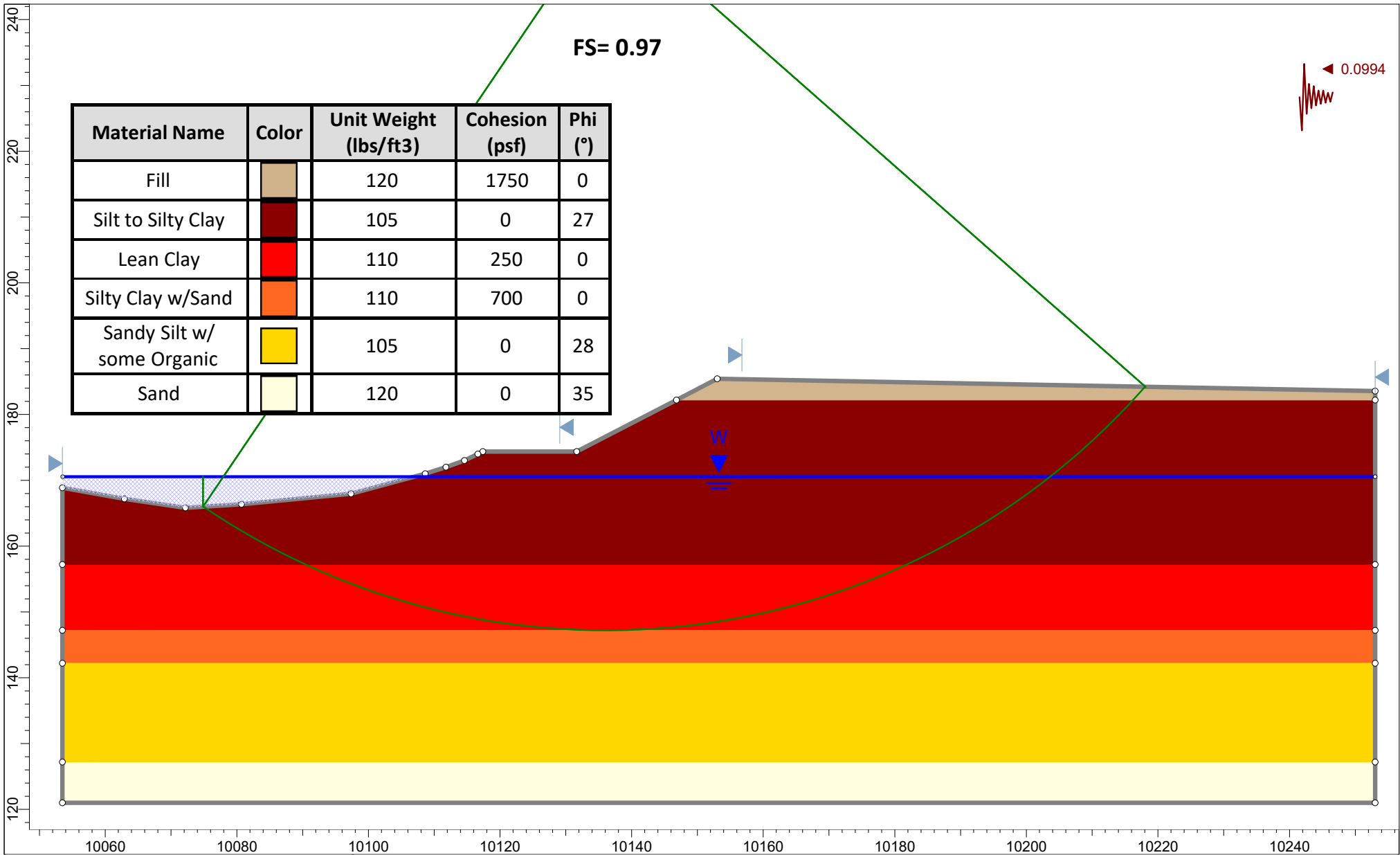
Material Name	Color	Unit Weight (lbs/ft <sup>3</sup> )	Cohesion (psf)	Phi (°)
Fill		120	1750	0
Silt to Silty Clay		105	0	27
Lean Clay		110	250	0
Silty Clay w/ Sand		110	700	0
Sandy Silt w/ some Organic		105	0	28
Sand		120	0	35

	Project		020784 - Little Bayou Meto STRS. & APPRS. (S)	
	Site	Little Bayou Meto (Site 1)	Analysis Type	Short Term
	Analyzed By	AGW	Configuration	East Bridge End, 1V: 2H End slope
	Date	2/21/2024		



Material Name	Color	Unit Weight (lbs/ft <sup>3</sup> )	Cohesion (psf)	Phi (°)
Fill		120	50	30
Silt to Silty Clay		105	50	27
Lean Clay		110	0	30
Silty Clay w/ Sand		110	0	30
Sandy Silt w/ some Organic		105	0	28
Sand		120	0	35

	Project		020784 - Little Bayou Meto STRS. & APPRS. (S)	
	Site	Little Bayou Meto (Site 1)	Analysis Type	Long Term
	Analyzed By	AGW	Configuration	East Bridge End, 1V: 2H End slope
	Date	2/21/2024		



	Project		020784 - Little Bayou Meto STRS. & APPRS. (S)	
	Site	Little Bayou Meto (Site 1)	Analysis Type	Seismic
	Analyzed By	AGW	Configuration	East Bridge End, 1V: 2H End slope
	Date	2/26/2024		

## SIMPLIFIED NEWMARK BLOCK ANALYSIS - NCHRP 611

### Project No.: 020784 (Site 1 Bent 4)

## 1. Seismic Coefficients

### 1.1 Design Response Spectrum Coefficients

#### 1.1.1 General (Code-Based) Procedure

$$PGA := 0.122$$

$$F_{PGA} := 2.321$$

$$A_{S\_code} := F_{PGA} \cdot PGA = 0.283$$

$$S_1 := 0.09$$

$$F_V := 3.5$$

$$S_{D1\_code} := F_V \cdot S_1 = 0.315$$

#### 1.1.2 Adopted Values

$$k_{max} := \frac{2}{3} A_{S\_code} = 0.189$$

*Peak ground acceleration coefficient at the ground surface (Eq. 7-1)*

$$S_{D1} := S_{D1\_code} = 0.315$$

## 1.2 Other Seismic Parameters

$$PGV := 55 S_{D1} \cdot \frac{in}{s} = 17.3 \frac{in}{s}$$

*Peak Ground Velocity for  $M = 7.5$  (Eq. 5-11)*

$$\beta := \frac{S_{D1}}{k_{max}} = 1.669$$

*Part of Eq. 7-2 to calculate reduction factor for peak ground acceleration*

## 2. Embankment Effect

$$H := 11 \text{ ft}$$

*Embankment or wall height*

$$\alpha := 1 + 0.01 \cdot \frac{H}{ft} \cdot (0.5 \cdot \beta - 1) = 0.982$$

*Reduction factor accounting for fill height for Seismic Site Classes C, D, and E foundations (Eq. 7-2)*

$$k_{av} := \alpha \cdot k_{max} = 0.185$$

*Peak ground acceleration adjusted by fill height (Eq. 7-1)*

$$k_y := 0.0925$$

*Yield acceleration of the failure mass, i.e., horizontal acceleration that results in a factor of safety of 1.0 in a pseudo-static limit equilibrium stability analysis*

$$k_{max} := k_{av} = 0.185$$

## 3. Newmark Block Displacement

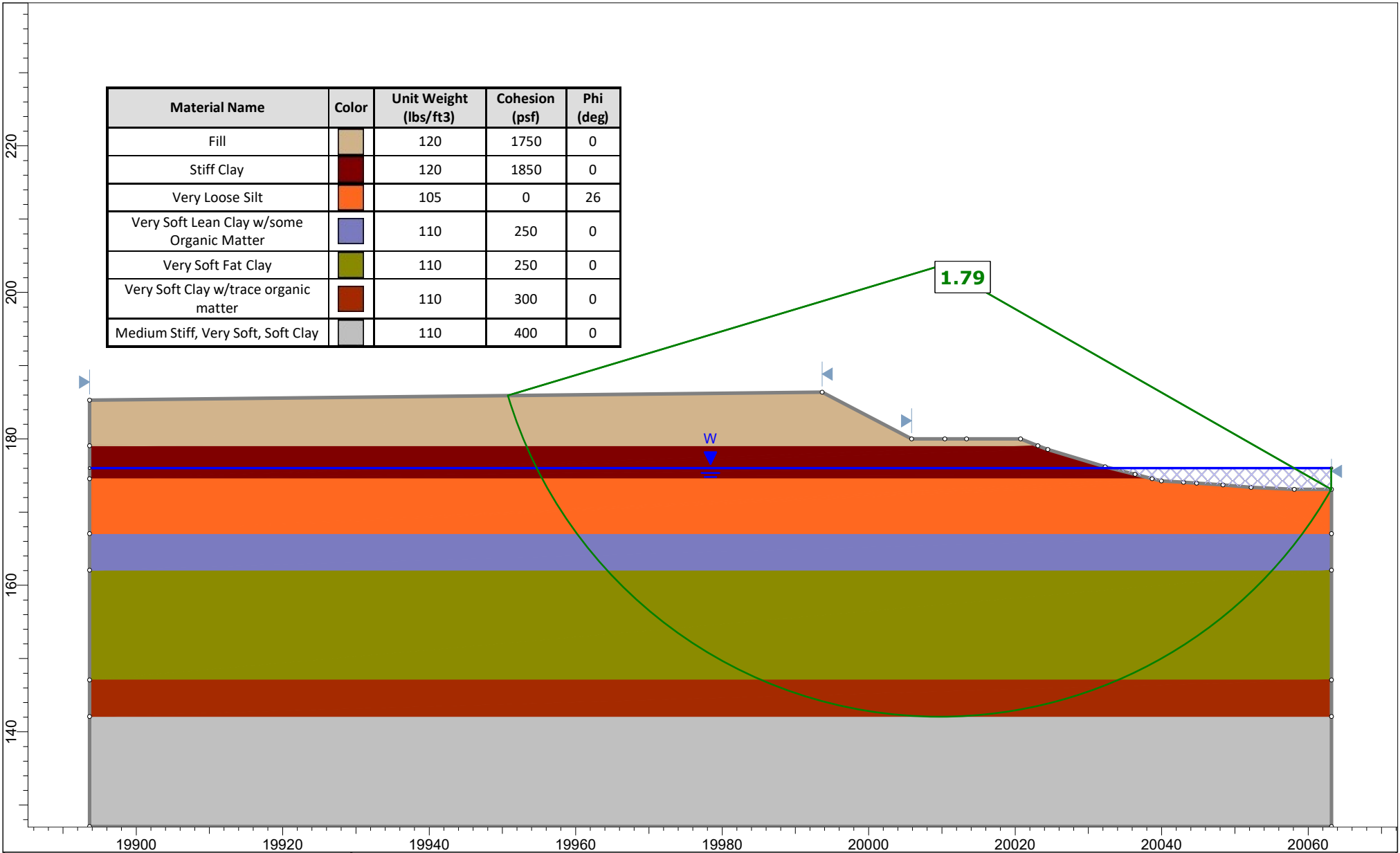
$$A := -1.51 - 0.74 \cdot \log\left(\frac{k_y}{k_{max}}\right) + 3.27 \cdot \log\left(1 - \frac{k_y}{k_{max}}\right)$$


$$B := -0.80 \cdot \log(k_{max}) + 1.59 \cdot \log\left(\frac{PGV}{\frac{in}{s}}\right)$$

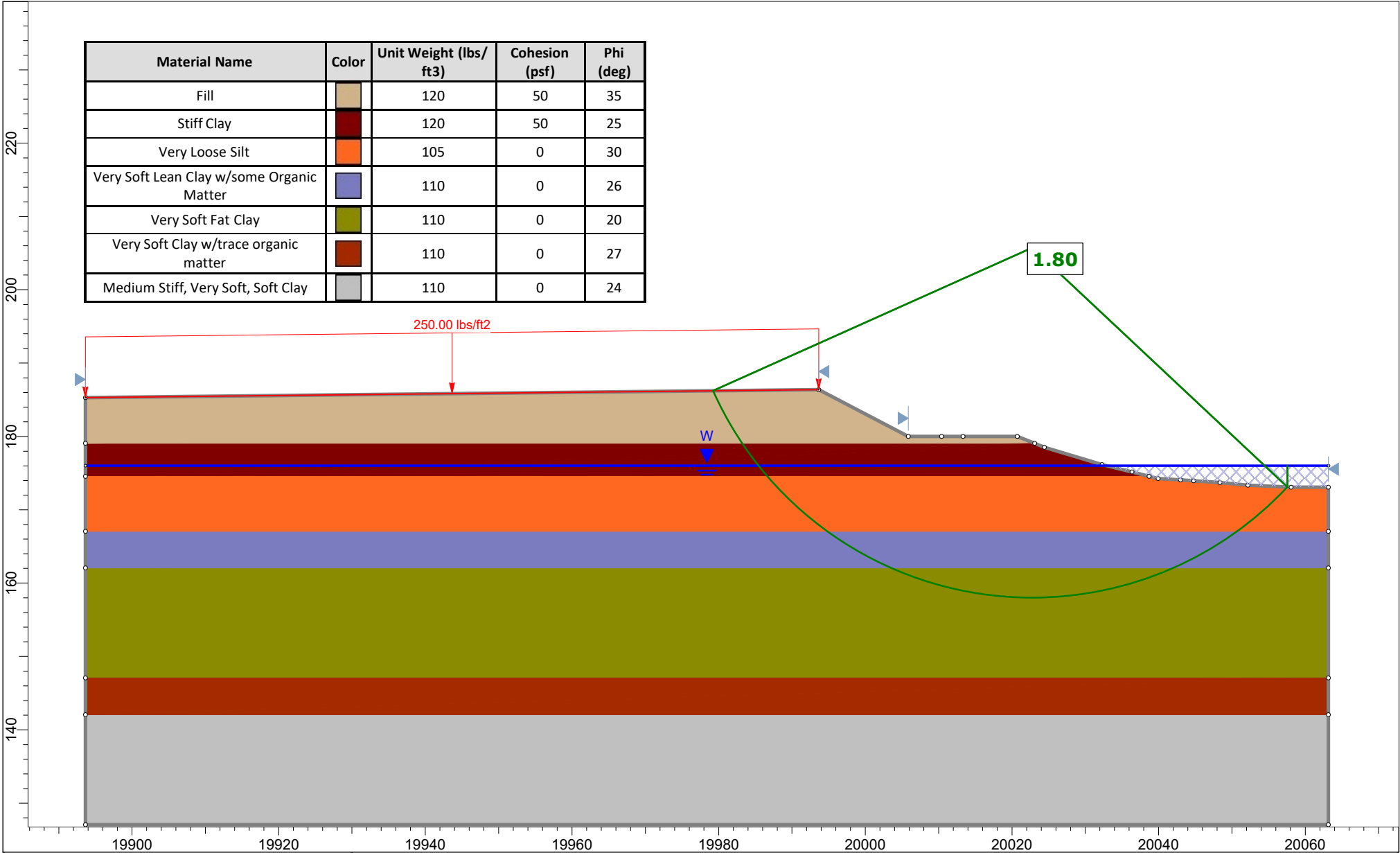
$$d := 10^{(A+B)} \cdot in = 1.9 \text{ in}$$

*Estimated permanent displacement (Eq. 5-8)*

## Attachment F2

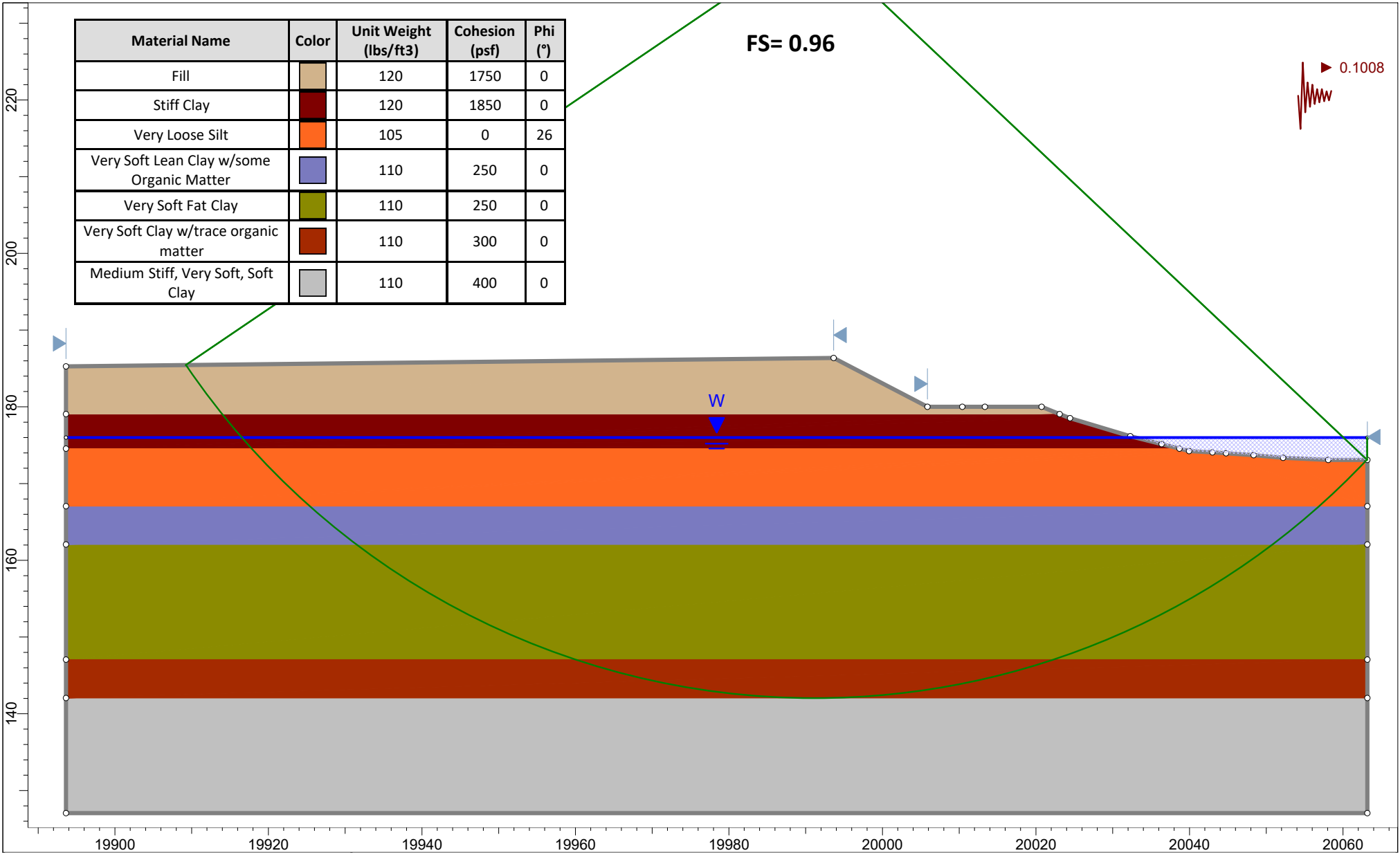



	Project		020784 - Little Bayou Meto Strs. Apprs.	
	Site	Little Bayou Meto (Site 2)	Analysis Type	Short Term
	Analyzed By	AGW	Configuration	South Bridge End, 1V: 2H End Slope
	Date	2/12/2024		



Material Name	Color	Unit Weight (lbs/ft <sup>3</sup> )	Cohesion (psf)	Phi (deg)
Fill		120	50	35
Stiff Clay		120	50	25
Very Loose Silt		105	0	30
Very Soft Lean Clay w/some Organic Matter		110	0	26
Very Soft Fat Clay		110	0	20
Very Soft Clay w/trace organic matter		110	0	27
Medium Stiff, Very Soft, Soft Clay		110	0	24

	Project	020784 - Little Bayou Meto Strs. Apprs.		
	Site	Little Bayou Meto (Site 2)	Analysis Type	Long Term
	Analyzed By	AGW	Configuration	South Bridge End, 1V: 2H End Slope
	Date	2/12/2024		



	Project		020784 - Little Bayou Meto Strs. Apprs.	
	Site	Little Bayou Meto (Site 2)	Analysis Type	Seismic
	Analyzed By	AGW	Configuration	South Bridge End, 1V: 2H End Slope
	Date	2/26/2024		



## SIMPLIFIED NEWMARK BLOCK ANALYSIS - NCHRP 611

### Project No.: 020784 Site 2 Bent 1

## 1. Seismic Coefficients

### 1.1 Design Response Spectrum Coefficients

#### 1.1.1 General (Code-Based) Procedure

$$PGA := 0.125$$

$$F_{PGA} := 2.298$$

$$A_{S\_code} := F_{PGA} \cdot PGA = 0.287$$

$$S_1 := 0.091$$

$$F_V := 3.5$$

$$S_{D1\_code} := F_V \cdot S_1 = 0.319$$

#### 1.1.2 Adopted Values

$$k_{max} := \frac{2}{3} A_{S\_code} = 0.192$$

*Peak ground acceleration coefficient at the ground surface (Eq. 7-1)*

$$S_{D1} := S_{D1\_code} = 0.319$$

## 1.2 Other Seismic Parameters

$$PGV := 55 S_{D1} \cdot \frac{in}{s} = 17.5 \frac{in}{s}$$

*Peak Ground Velocity for  $M = 7.5$  (Eq. 5-11)*

$$\beta := \frac{S_{D1}}{k_{max}} = 1.663$$

*Part of Eq. 7-2 to calculate reduction factor for peak ground acceleration*

## 2. Embankment Effect

$$H := 6 \text{ ft}$$

*Embankment or wall height*

$$\alpha := 1 + 0.01 \cdot \frac{H}{ft} \cdot (0.5 \cdot \beta - 1) = 0.99$$

*Reduction factor accounting for fill height for Seismic Site Classes C, D, and E foundations (Eq. 7-2)*

$$k_{av} := \alpha \cdot k_{max} = 0.19$$

*Peak ground acceleration adjusted by fill height (Eq. 7-1)*

$$k_y := 0.0925$$

*Yield acceleration of the failure mass, i.e., horizontal acceleration that results in a factor of safety of 1.0 in a pseudo-static limit equilibrium stability analysis*

$$k_{max} := k_{av} = 0.19$$

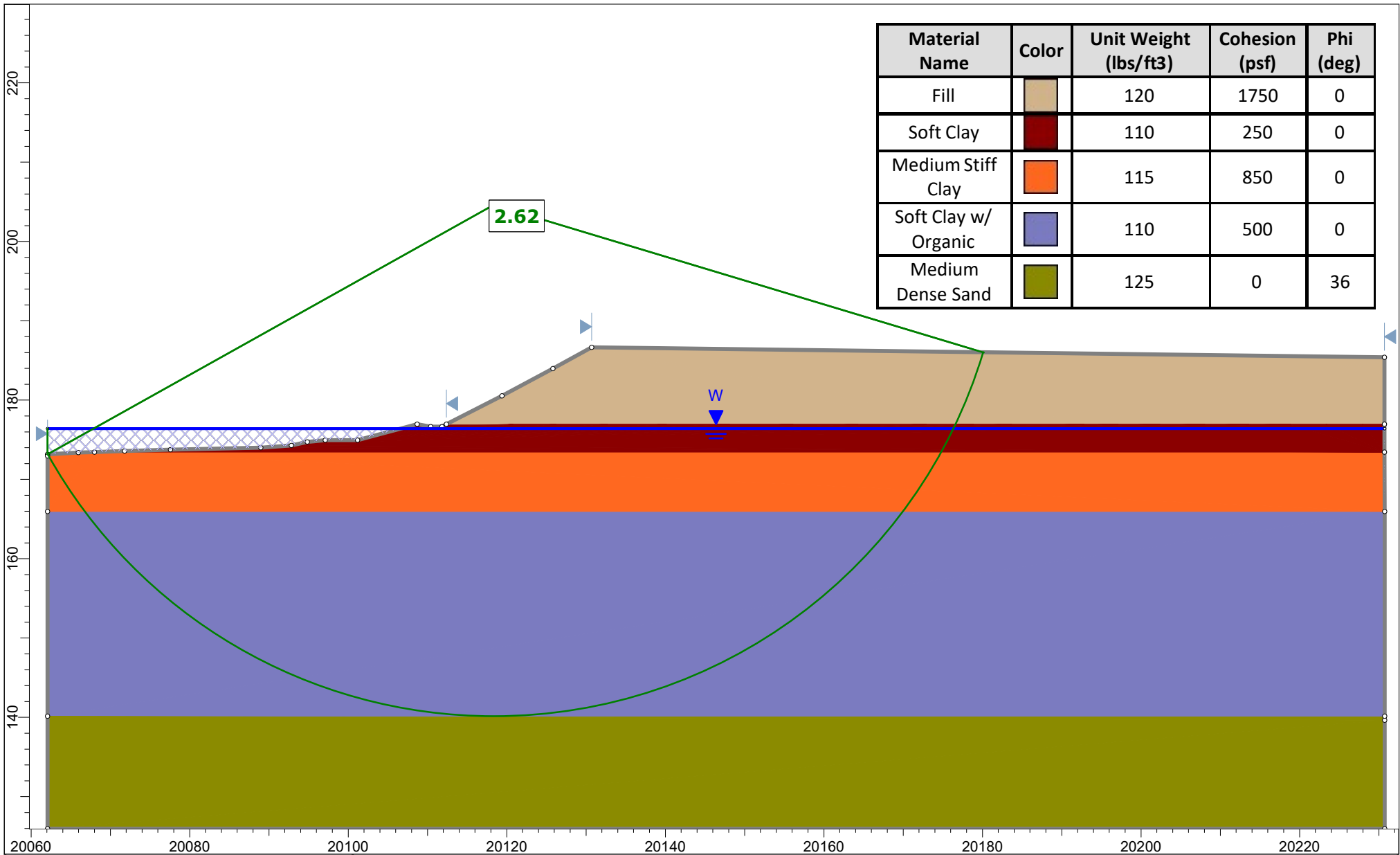
## 3. Newmark Block Displacement

$$A := -1.51 - 0.74 \cdot \log\left(\frac{k_y}{k_{max}}\right) + 3.27 \cdot \log\left(1 - \frac{k_y}{k_{max}}\right)$$

$$B := -0.80 \cdot \log(k_{max}) + 1.59 \cdot \log\left(\frac{PGV}{\frac{in}{s}}\right)$$

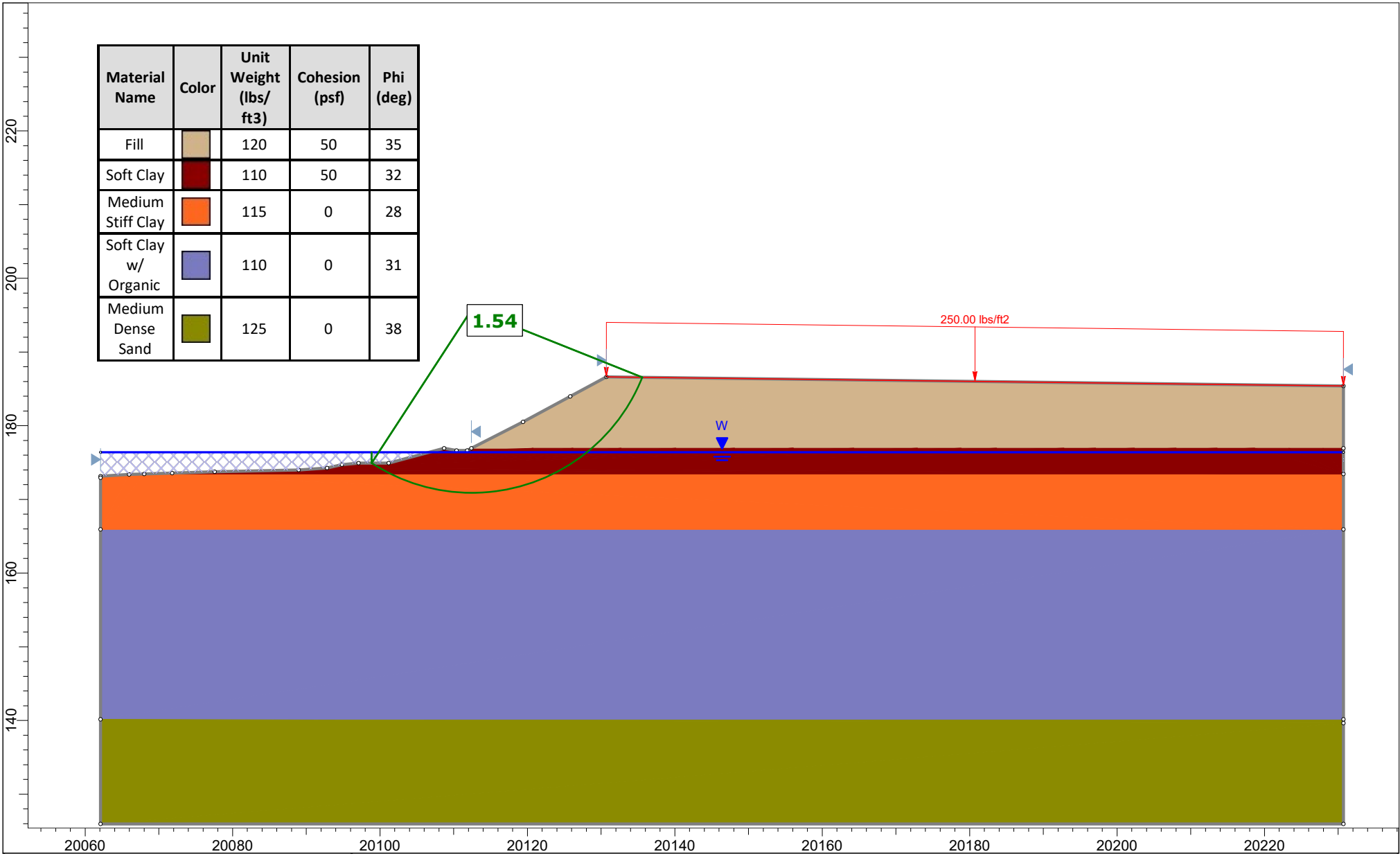
$$d := 10^{(A+B)} \cdot in = 2.1 \text{ in}$$

*Estimated permanent displacement (Eq. 5-8)*



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Fill		120	1750	0
Soft Clay		110	250	0
Medium Stiff Clay		115	850	0
Soft Clay w/ Organic		110	500	0
Medium Dense Sand		125	0	36

	Project	020784 - Little Bayou Beto Strs. & Apprs.		
	Site	Little Bayou Meto (Site 2)	Analysis Type	Short-Term
	Analyzed By	AGW	Configuration	North Bridge End, 1V: 2H End Slope
	Date	2/12/2024		








Material Name	Color	Unit Weight (lbs/ft <sup>3</sup> )	Cohesion (psf)	Phi (deg)
Fill		120	50	35
Soft Clay		110	50	32
Medium Stiff Clay		115	0	28
Soft Clay w/ Organic		110	0	31
Medium Dense Sand		125	0	38

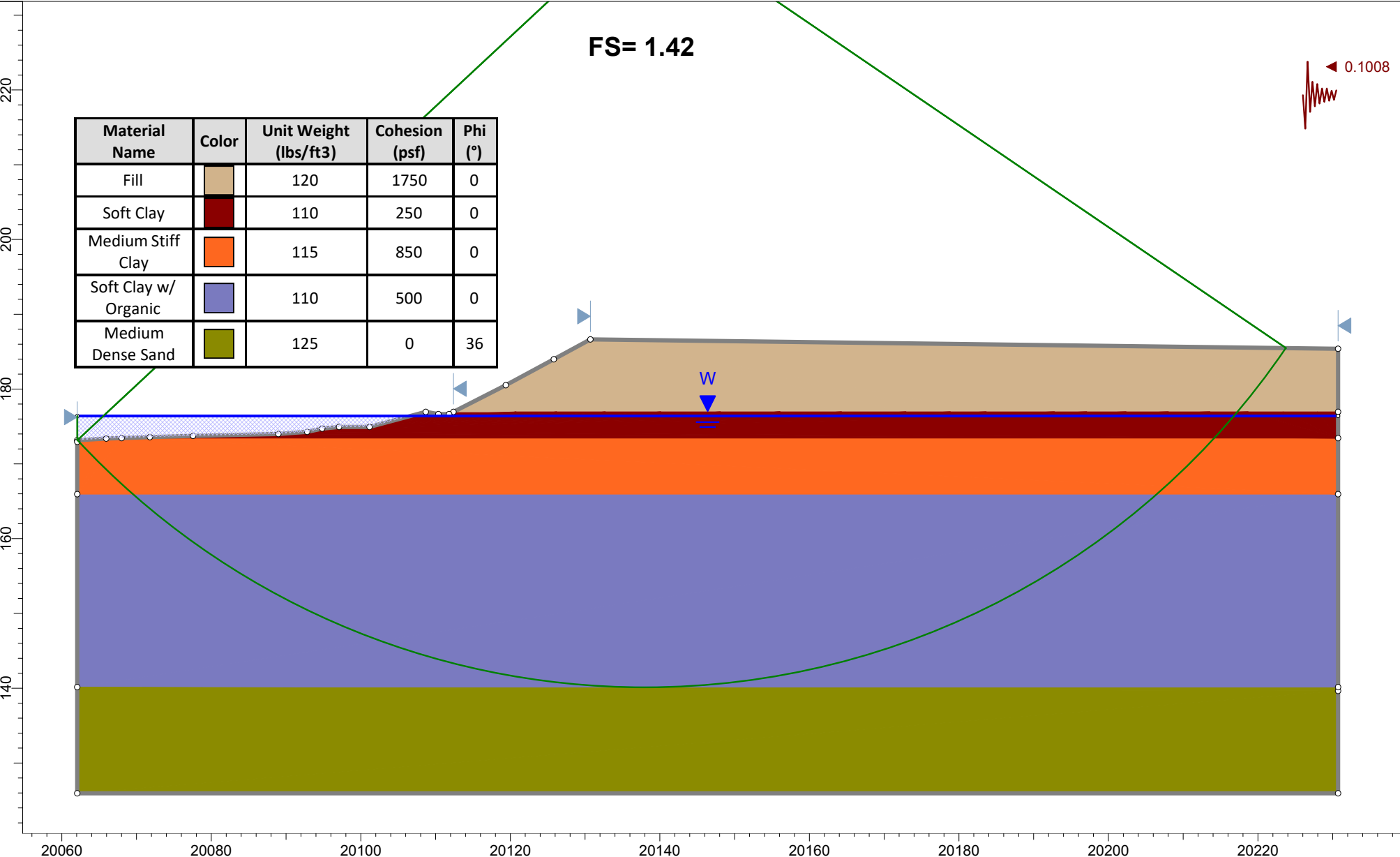
	Project	020784 - Little Bayou Beto Strs. & Apprs.		
	Site	Little Bayou Meto (Site 2)	Analysis Type	Long-Term
	Analyzed By	AGW	Configuration	North Bridge End, 1V: 2H End Slope
	Date	2/12/2024		


**FS= 1.42**

◀ 0.1008

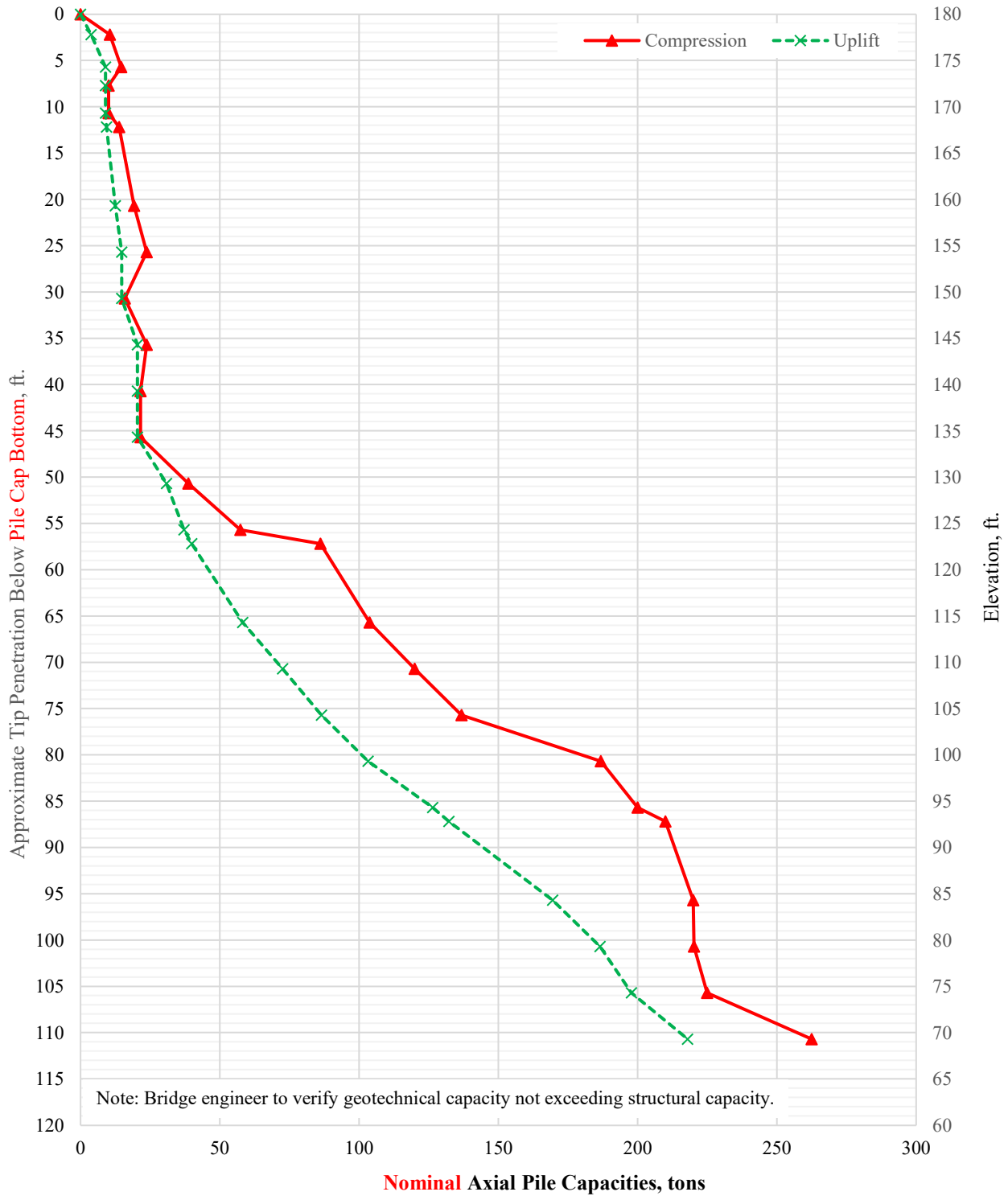


Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (°)
Fill		120	1750	0
Soft Clay		110	250	0
Medium Stiff Clay		115	850	0
Soft Clay w/ Organic		110	500	0
Medium Dense Sand		125	0	36



	Project		020784 - Little Bayou Beto Strs. & Apprs.	
	Site	Little Bayou Meto (Site 2)	Analysis Type	Seismic
	Analyzed By	AGW	Configuration	North Bridge End, 1V: 2H End Slope
	Date	2/26/2024		

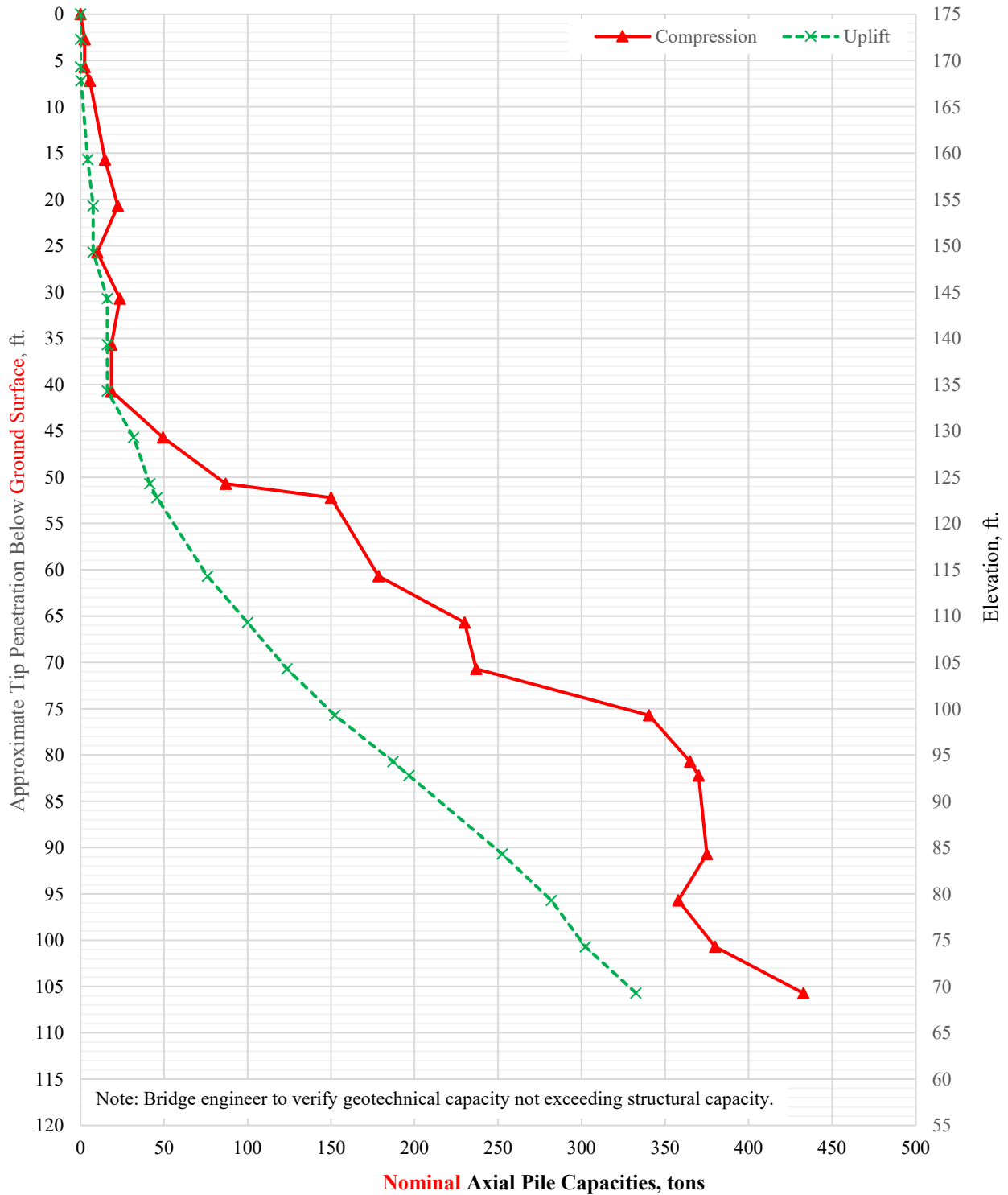
## Attachment G1



**SINGLE 16"-DIAMETER CLOSED-END STEEL SHELL PILE**

Bent 1 - Site 1  
 Project No.: 020784  
 Location: Jefferson County

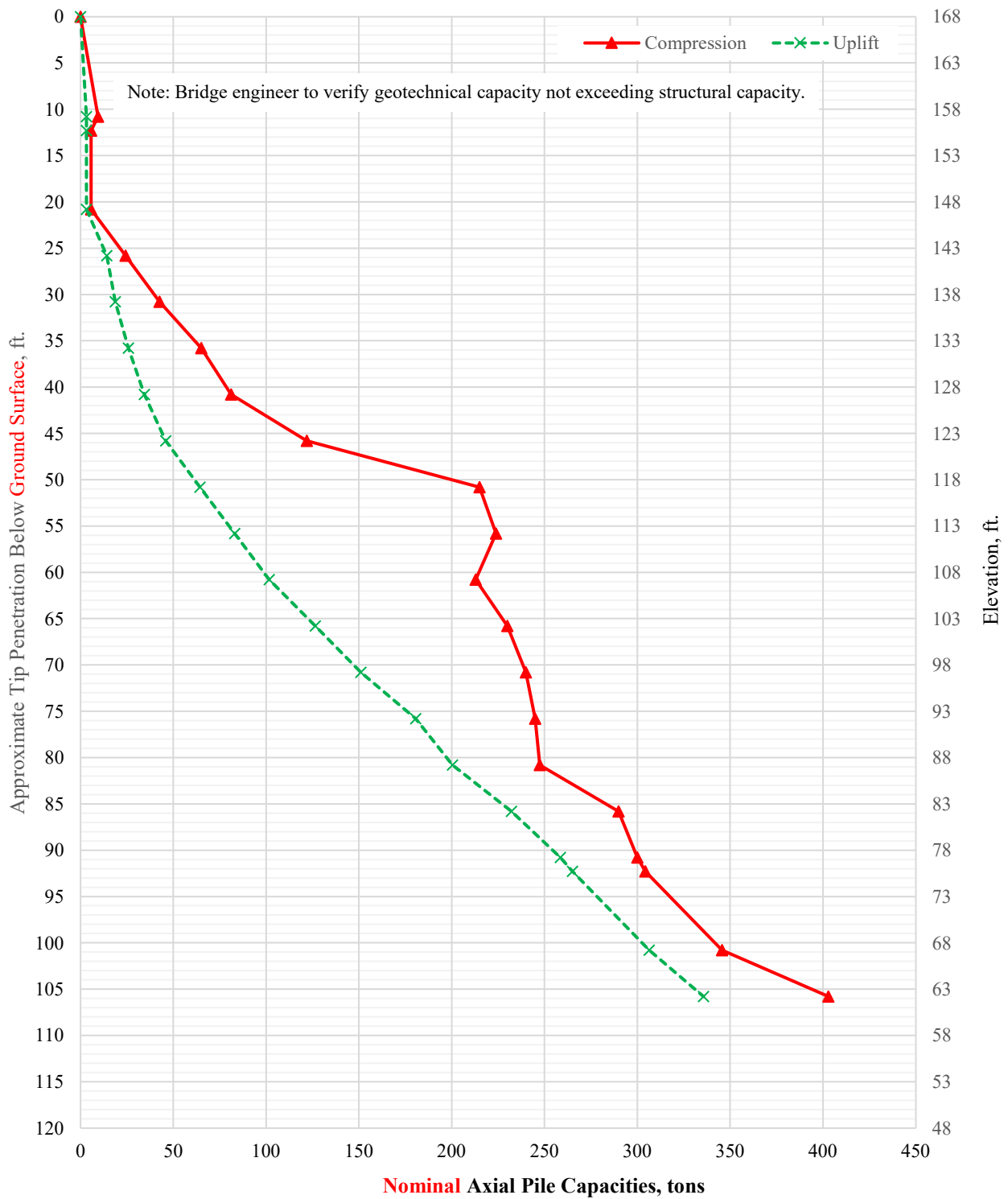




**SINGLE 24"-DIAMETER CLOSED-END STEEL SHELL PILE**

Bent 2 - Site 1  
 Project No.: 020784  
 Location: Jefferson County



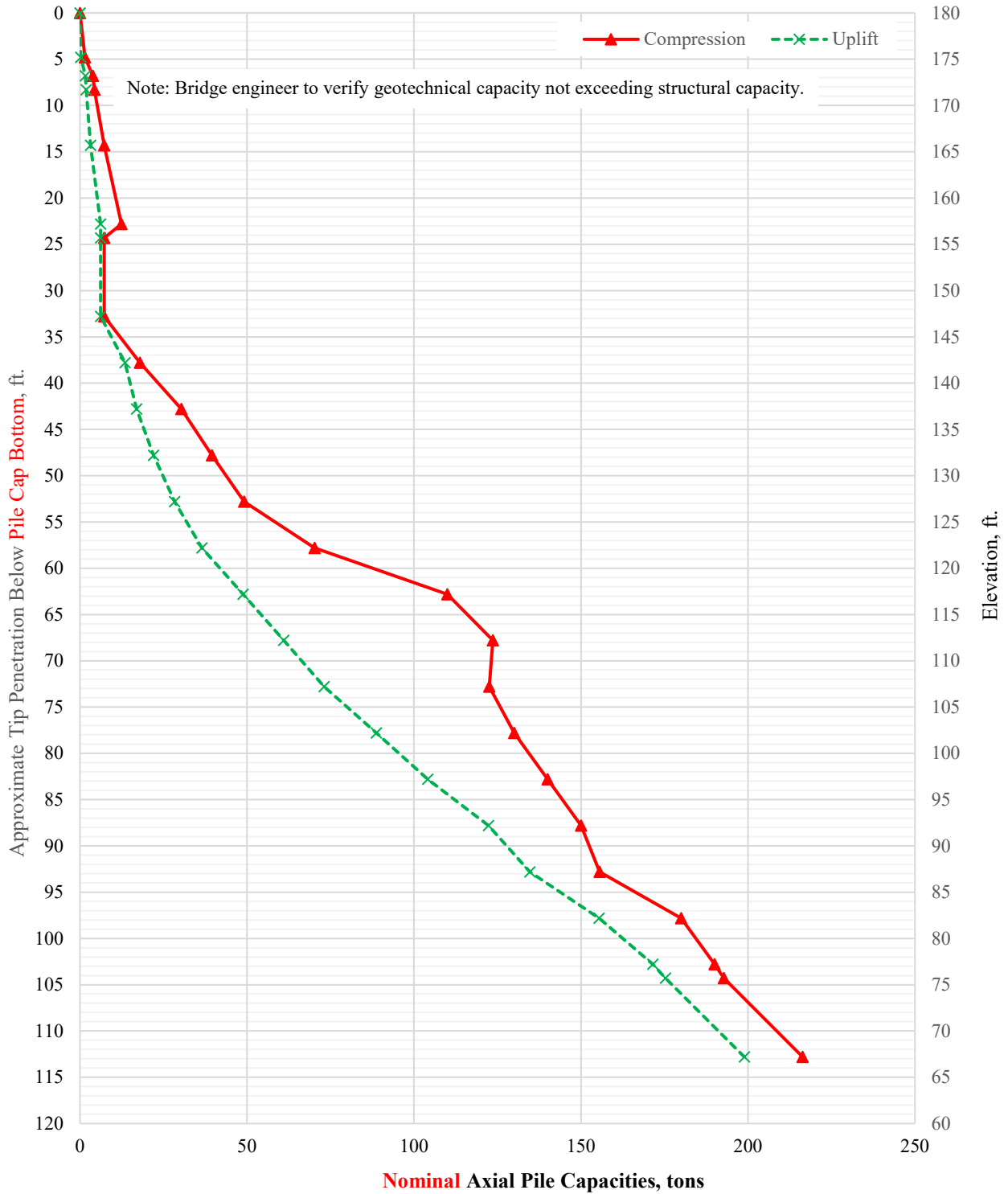


SINGLE 24"-DIAMETER CLOSED-END STEEL SHELL PILE

Bent 3 - Site 1  
 Project No.: 020784  
 Location: Jefferson County







**SINGLE 16"-DIAMETER CLOSED-END STEEL SHELL PILE**

Bent 4 - Site 1  
 Project No.: 020784  
 Location: Jefferson County



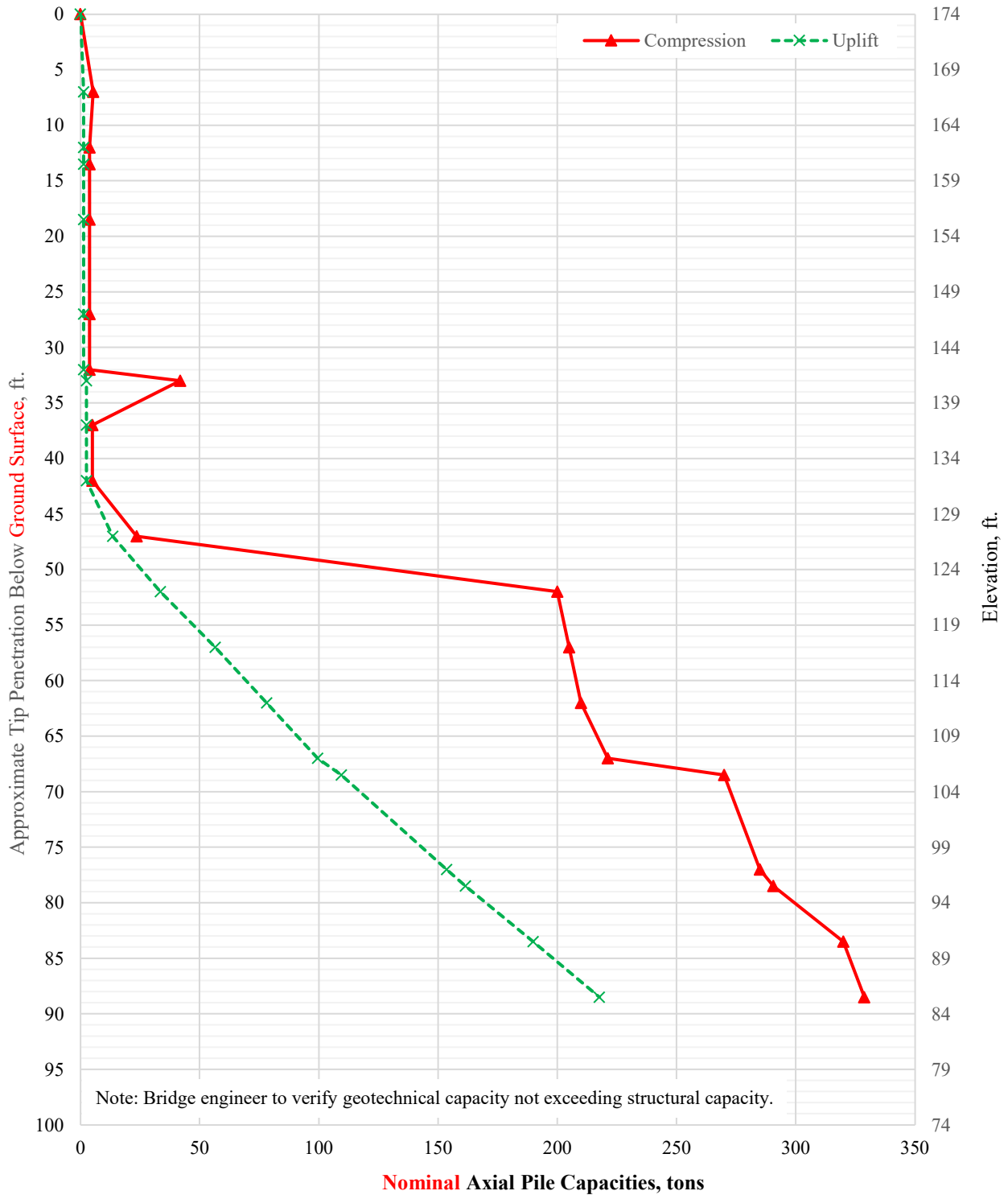
## Attachment G2

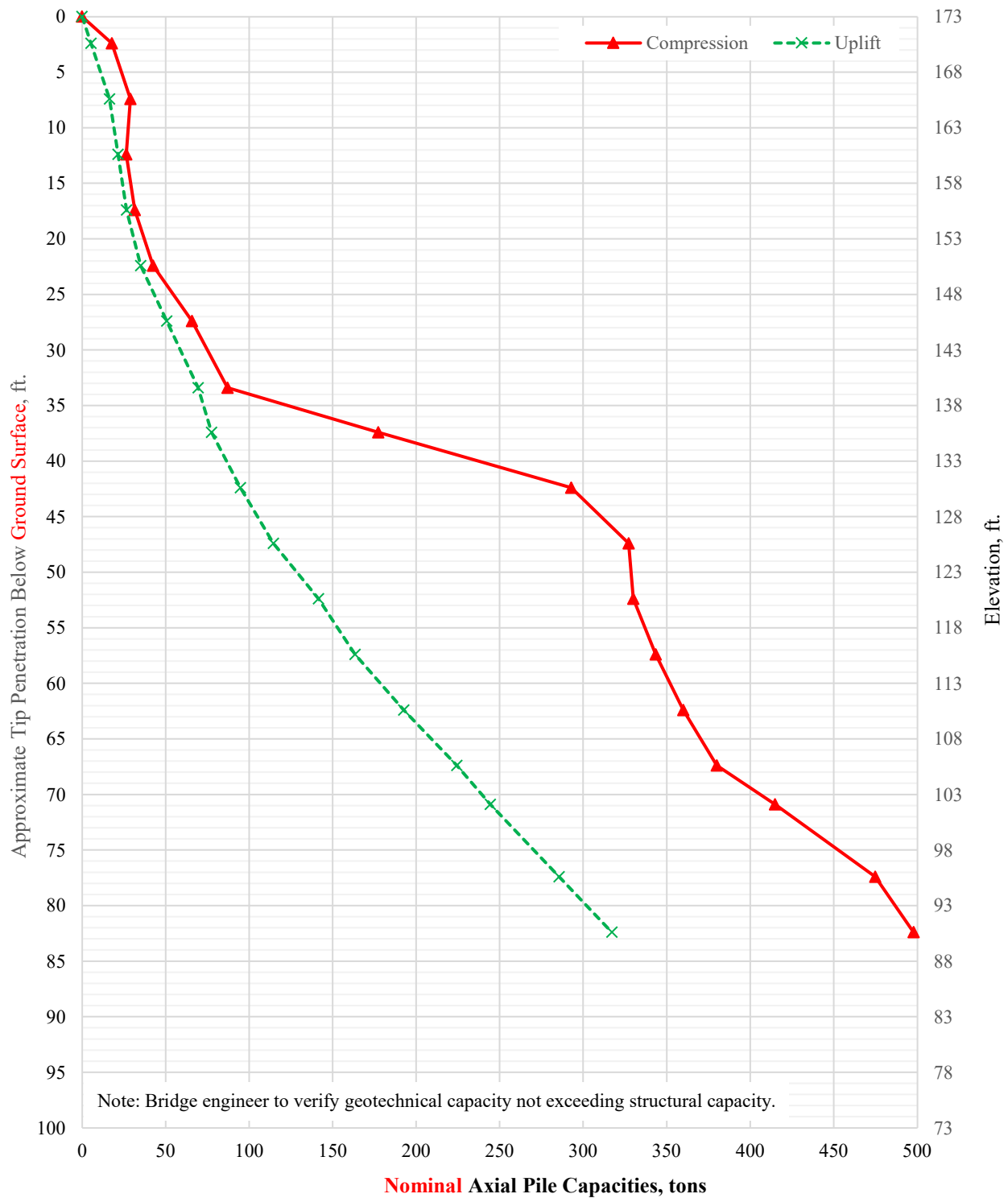


**SINGLE 16"-DIAMETER CLOSED-END STEEL SHELL PILE**

Bent 1 - Site 2  
 Project No.: 020784  
 Location: Jefferson County



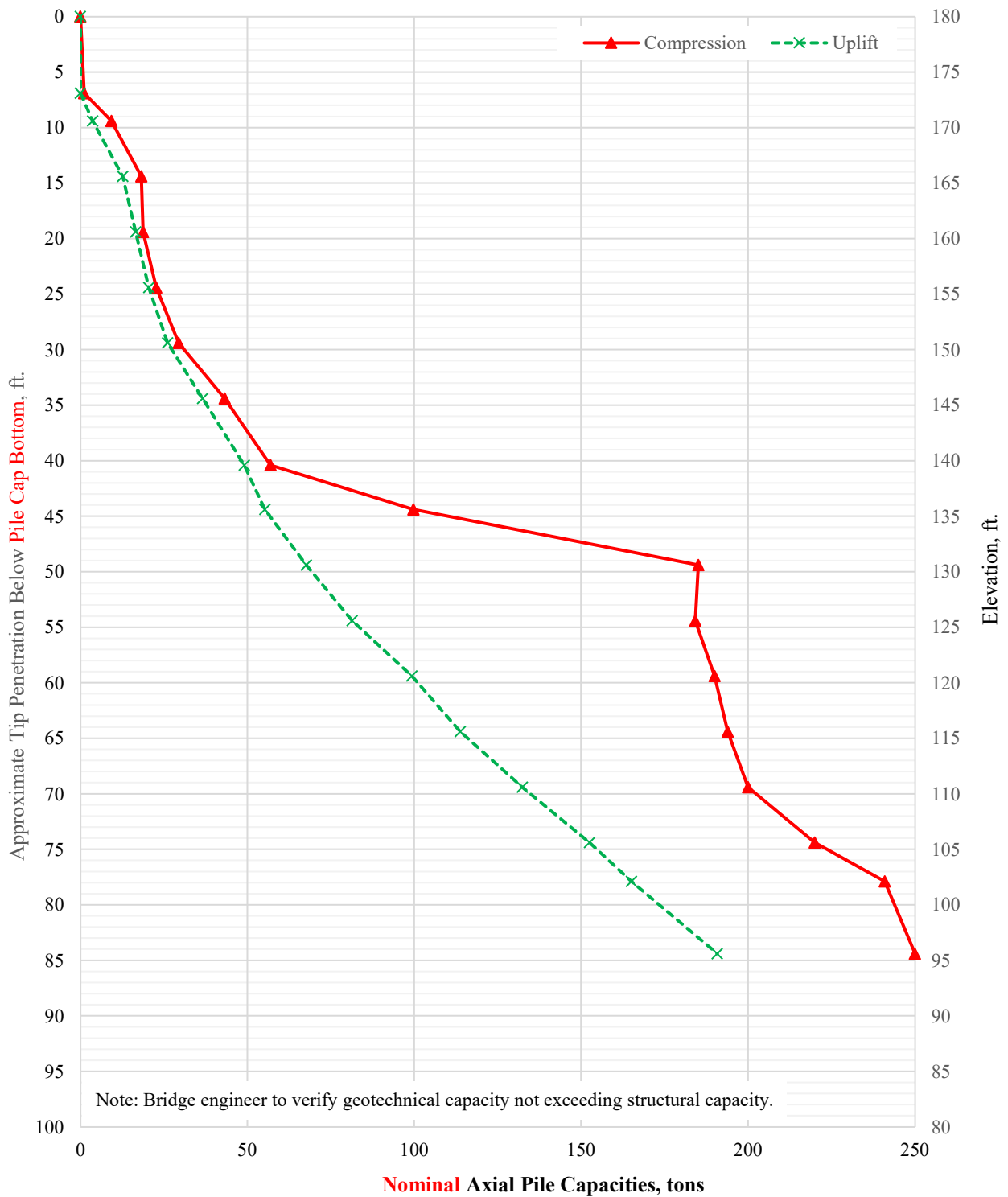




**SINGLE 24"-DIAMETER CLOSED-END STEEL SHELL PILE**

Bent 3 - Site 2  
 Project No.: 020784  
 Location: Jefferson County





**SINGLE 16"-DIAMETER CLOSED-END STEEL SHELL PILE**

Bent 4 - Site 2  
 Project No.: 020784  
 Location: Jefferson County



## Attachment H1



Job No.:	020784
Site No.:	1

Input by:	MBB	2/6/2024
Checked by:	YZ	2/21/2024
Back-checked by:	MLG	2/22/2024

**Bents 1 & 2 - Boring 1**

Elevation, ft		Material	Model	Effective Unit Weight, $\gamma'$ , pcf	Undrained Shear Strength of Soil ( $C_u$ ) (psf)	Strain Factor ( $\epsilon_{50}$ for Soil) / $k_m$ for Rock)	Friction Angle, $\phi$ , °	Soil Modulus, k, pci	Uniaxial Compressive Strength, $q_u$ , psi	Rock Mass Modulus, $E_{rm}$ , 10 <sup>6</sup> psi	RQD, %
Top	Bottom										
Above Ground Surface		Fill	Soft Clay (Matlock)	120	750	0.010	NA	NA	NA	NA	NA
Ground (184)	172	Lean Clay	Stiff Clay W/O Free Water (Reese)	115	1050	0.007	NA	500	NA	NA	NA
172	154	Silt	Sand (Reese)	45	NA	NA	28.0	20	NA	NA	NA
154	134	Lean Clay	Soft Clay (Matlock)	45	250	0.050	NA	NA	NA	NA	NA
134	129	Silty Clay with Sand	Stiff Clay W/ Free Water (Reese)	50	1200	0.007	NA	500	NA	NA	NA
129	109	Silty Sand with some Gravel	Sand (Reese)	65	NA	NA	35.0	78	NA	NA	NA
109	84	Sand with Gravel	Sand (Reese)	85	NA	NA	38.0	119	NA	NA	NA
below 84		Sand	Sand (Reese)	65	NA	NA	33.0	52.0	NA	NA	NA

**Bents 3 & 4 - Boring 2**

Elevation, ft		Material	Model	Effective Unit Weight, $\gamma'$ , pcf	Undrained Shear Strength of Soil ( $C_u$ ) (psf)	Strain Factor ( $\epsilon_{50}$ for Soil) / $k_m$ for Rock)	Friction Angle, $\phi$ , °	Soil Modulus, k, pci	Uniaxial Compressive Strength, $q_u$ , psi	Rock Mass Modulus, $E_{rm}$ , 10 <sup>6</sup> psi	RQD, %
Top	Bottom										
Above Ground Surface		Fill	Soft Clay (Matlock)	120	750	0.010	NA	NA	NA	NA	NA
Ground (182)	173	Silt	Sand (Reese)	100	NA	NA	28.0	20	NA	NA	NA
173	157	Silt	Sand (Reese)	45	NA	NA	27.0	20	NA	NA	NA
157	142	Lean Clay	Soft Clay (Matlock)	45	250	0.050	NA	NA	NA	NA	NA
142	127	Sandy Silt	Sand (Reese)	55	NA	NA	32.0	40	NA	NA	NA
127	102	Sand	Sand (Reese)	70	NA	NA	36.0	92	NA	NA	NA
102	82	Sand with Gravel	Sand (Reese)	70	NA	NA	34.0	66	NA	NA	NA
82	67	Silty Sand with Gravel	Sand (Reese)	60	NA	NA	31.0	26.0	NA	NA	NA



## Attachment H2



Job No.:	020784
Site No.:	2

Input by:	MBB	2/6/2024
Checked by:	YZ	2/20/2024
Back-checked by:	MLG	2/22/2024

**Bents 1 & 2 - Boring 1**

Elevation, ft		Material	Model	Effective Unit Weight, $\gamma'$ , pcf	Undrained Shear Strength of Soil ( $C_u$ ) (psf)	Strain Factor ( $\epsilon_{50}$ for Soil) / $k_{cs}$ for Rock)	Friction Angle, $\phi$ , °	Soil Modulus, k, pci	Uniaxial Compressive Strength, $q_u$ , psi	Rock Mass Modulus, $E_{rms}$ , $10^6$ psi	RQD, %
Top	Bottom										
Above Ground Surface		Fill	Soft Clay (Matlock)	120	750	0.010	NA	NA	NA	NA	NA
Ground (182)	176	Lean Clay	Stiff Clay W / O Free Water	120	2100	0.005	NA	NA	NA	NA	NA
176	174.5	Lean Clay	Stiff Clay W/ Free Water	55	1750	0.007	NA	500	NA	NA	NA
174.5	167	Silt	Sand (Reese)	55	NA	NA	26.0	20	NA	NA	NA
167	142	Clay	Soft Clay (Matlock)	45	250	0.050	NA	NA	NA	NA	NA
142	127	Clay	Soft Clay (Matlock)	45	550	0.010	NA	NA	NA	NA	NA
127	112	Sand with Silt and Gravel	Sand (Reese)	75	NA	NA	39.0	127	NA	NA	NA
Below 112		Sand with Gravel	Sand (Reese)	70	NA	NA	35.0	78.0	NA	NA	NA

**Bents 3 & 4 - Boring 2**

Elevation, ft		Material	Model	Effective Unit Weight, $\gamma'$ , pcf	Undrained Shear Strength of Soil ( $C_u$ ) (psf)	Strain Factor ( $\epsilon_{50}$ for Soil) / $k_{cs}$ for Rock)	Friction Angle, $\phi$ , °	Soil Modulus, k, pci	Uniaxial Compressive Strength, $q_u$ , psi	Rock Mass Modulus, $E_{rms}$ , $10^6$ psi	RQD, %
Top	Bottom										
Above Ground Surface		Fill	Soft Clay (Matlock)	120	750	0.010	NA	NA	NA	NA	NA
Ground (181)	176	Clay	Soft Clay (Matlock)	110	500	0.020	NA	NA	NA	NA	NA
176	140	Clay	Soft Clay (Matlock)	45	650	0.010	NA	NA	NA	NA	NA
Below 140		Sand to Sand with Gravel	Sand (Reese)	75	NA	NA	36.0	92	NA	NA	NA