Replacement of Bridge 31 (SR-180 Over Otter Creek Overflow)

Geotechnical Data Report

Haywood County, Tennessee

August 15, 2025 | Terracon Project No. 1A255072

Prepared for:

American Structurepoint Inc.
600 Superior Ave East, Suite 2401
Cleveland, Ohio 44114

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August 15, 2025

American Structurepoint Inc.
600 Superior Ave East, Suite 2401
Cleveland, Ohio 44114

Attn: Mr. Gabe Liptak, P.E.
P: (216) 302-3694
E: gliptak@structurepoint.com

Re: Geotechnical Data Report
Replacement of Bridge 31 (SR-180 Over Otter Creek Overflow)
Haywood County, Tennessee
Terracon Project No. 1A255072

Dear Mr. Liptak:

We have completed the scope of work for the above referenced project. This Data Report presents the findings of the subsurface exploration, including field and laboratory test results.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon

Eric Conway, P.E.	James Vinson, P.E.
Geotechnical Department Manager	National Manager

Table of Contents

Attachments

Introduction

This report presents the results of our subsurface exploration performed for the proposed bridge replacement along SR-180 in Haywood County, Tennessee. The geotechnical Scope of Services included the advancement of test borings, laboratory testing, geophysical testing and preparation of this data report. The exploratory locations were determined by Terracon field staff. Encountered soil and groundwater depths are provided herein.

Site Information

The following description of site conditions is derived from our site visit in association with field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Site Information	The approximate coordinates for the bridge crossing are as follows: ▪ **Bridge No. 31**: 35.733430° N 89.414207° W See **Site Location**
Current Ground Cover	Away from the existing bridge, SR-180 pavement consists of asphalt overlaying fill.
Existing Topography (Estimated using Google Earth)	The ground surface elevation at the borings is approximately 325 feet.

Geologic Formations

Formation [1]	Description
Loess Deposits	Clayey and sandy silt, gray to brown, massive. Maximum thickness about 100 feet along bluffs of Mississippi River; thins eastward.

1. Geologic Map of Tennessee, published by the State of Tennessee Department of Conservation, Division of Geology (1966).

Geotechnical Borings and Laboratory Testing

Terracon drilled two borings near the proposed bridge replacement. Each boring encountered asphalt over fill over alluvial deposits.

Subsurface conditions observed at each location are indicated on the individual logs. The individual logs can be found in the **Exploration Results**. Drawings depicting site location and boring locations relative to existing site features are attached.

Laboratory testing was performed to confirm visual descriptions and further characterize the encountered soils. Testing included the following: natural moisture, grain-size distribution, Atterberg limits, compaction, California Bearing Ratio, unconsolidated-undrained triaxial and corrosion series. Test results are attached with the boring logs.

Seismic Survey

Terracon performed a limited seismic survey consisting of twenty-two Multi-Channel Analysis of Surface Waves (MASW) arrays at the subject bridge site to obtain shear wave velocities of the soil within the upper 100 feet. Results of the seismic survey as well as location map for the arrays are attached.

General Comments

This geotechnical data report does not include any analysis or recommendations. The data presented in this report are based upon the borings and geophysical data at the indicated locations. This report does not reflect variations that may occur across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until, during, or after construction.

No warranties, either expressed or implied, are intended or made. The scope of geotechnical services does not include either specifically or by implication any environmental assessment of the site or identification or prevention of pollutants, hazardous materials, or conditions.

Attachments

Exploration and Testing Procedures

Field Exploration

Number of Exploration Points	Approximate Exploration Depth (feet)	Location
2	100	Bridge Abutments
2 MASW Arrays	100	Bridge Abutments

Boring Layout and Elevations: Terracon personnel provided the boring layout using handheld GPS equipment (estimated horizontal accuracy of about ±10 feet) and referencing existing site features. Approximate ground surface elevations were estimated using Google Earth™.

Subsurface Exploration Procedures: We advanced the borings with an truck-mounted rotary drill rig using continuous flight solid stem augers and rotary wash boring techniques as necessary depending on soil conditions. Three samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge was pushed hydraulically into the soil to obtain a relatively undisturbed sample. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths.

We also observed the boreholes while drilling with augers for the presence of groundwater. The measured groundwater levels are shown on the attached boring logs.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials observed during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Multi-Channel Analysis of Surface Waves: Our method of investigation utilized a standard fixed-array set of MASW geophones. Each array consisted of 24 4.5Hz geophones, spaced 10 feet apart along a sensor cable. For the passive surveys, ambient noise (such as nearby traffic or construction) on the site was recorded by a seismograph. For the active surveys, three sledgehammer strikes were performed every 10 feet against a polyethylene plate from 20 feet before the start of the array through geophone 12.

The data was returned to our office and processed using dispersion analysis software (SurfSeis, engineered by the Kansas Geological Survey) that extracts the fundamental-mode dispersion curve(s). The active and passive surveys performed at each line were combined to produce a broader-band overtone image to better identify the dispersion trends. The resulting curves were inverted and modeled to yield a 1D shear-wave velocity profile along the array to 100 feet below ground surface. The velocity models from the MASW surveys are presented on **Exhibit 2**.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests. The laboratory testing program included the following types of tests:

- Moisture Content
- Unconfined Compression
- Atterberg Limits
- Triaxial Compression
- Grain Size Analysis
- Corrosion Suite
- Standard Proctor
- California Bearing Ratio

Based on the results of our field and laboratory programs, we described and classified the soil samples in accordance with the Unified Soil Classification System.

Site Location and Exploration Plans

Contents:

Site Location

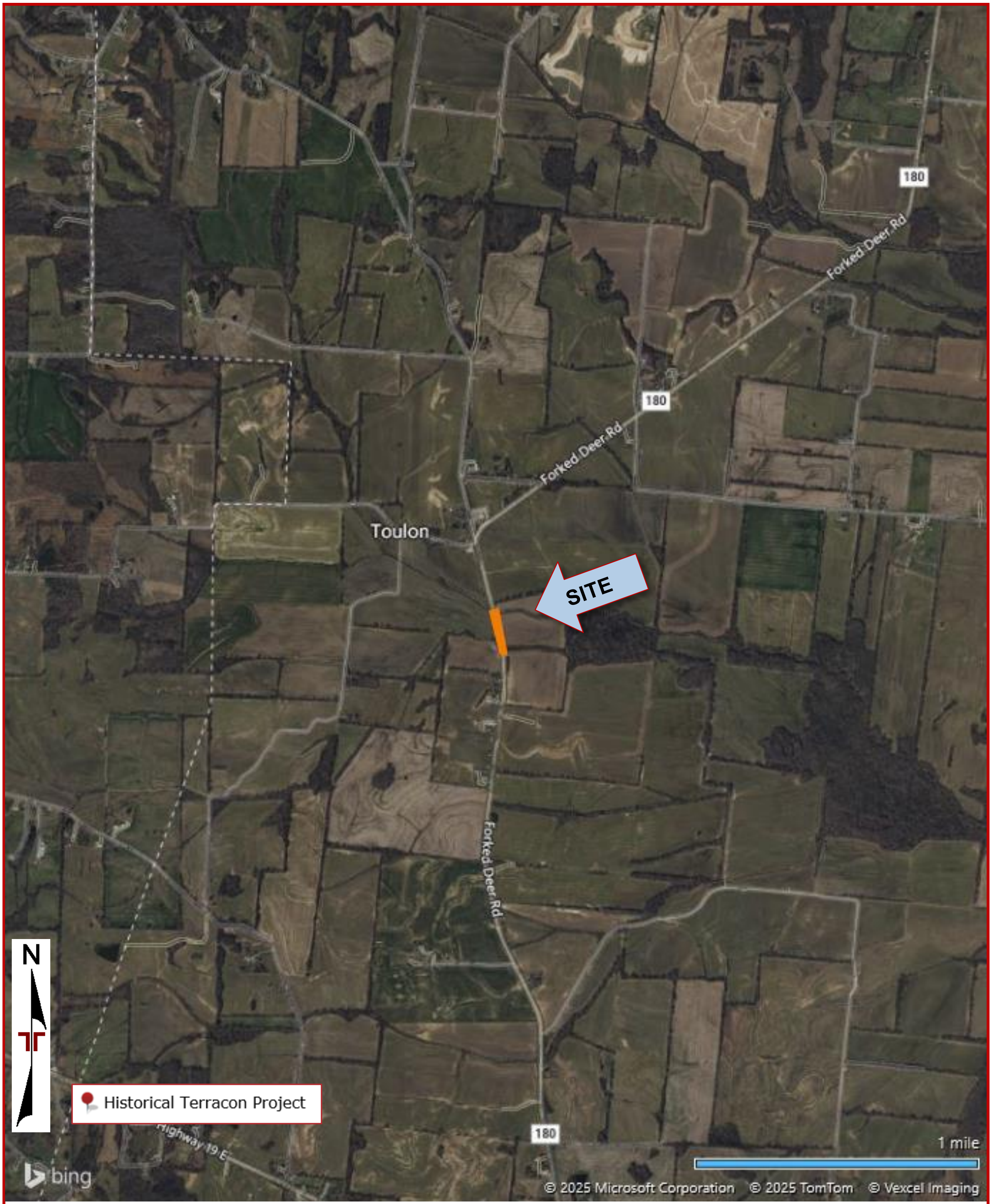

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan

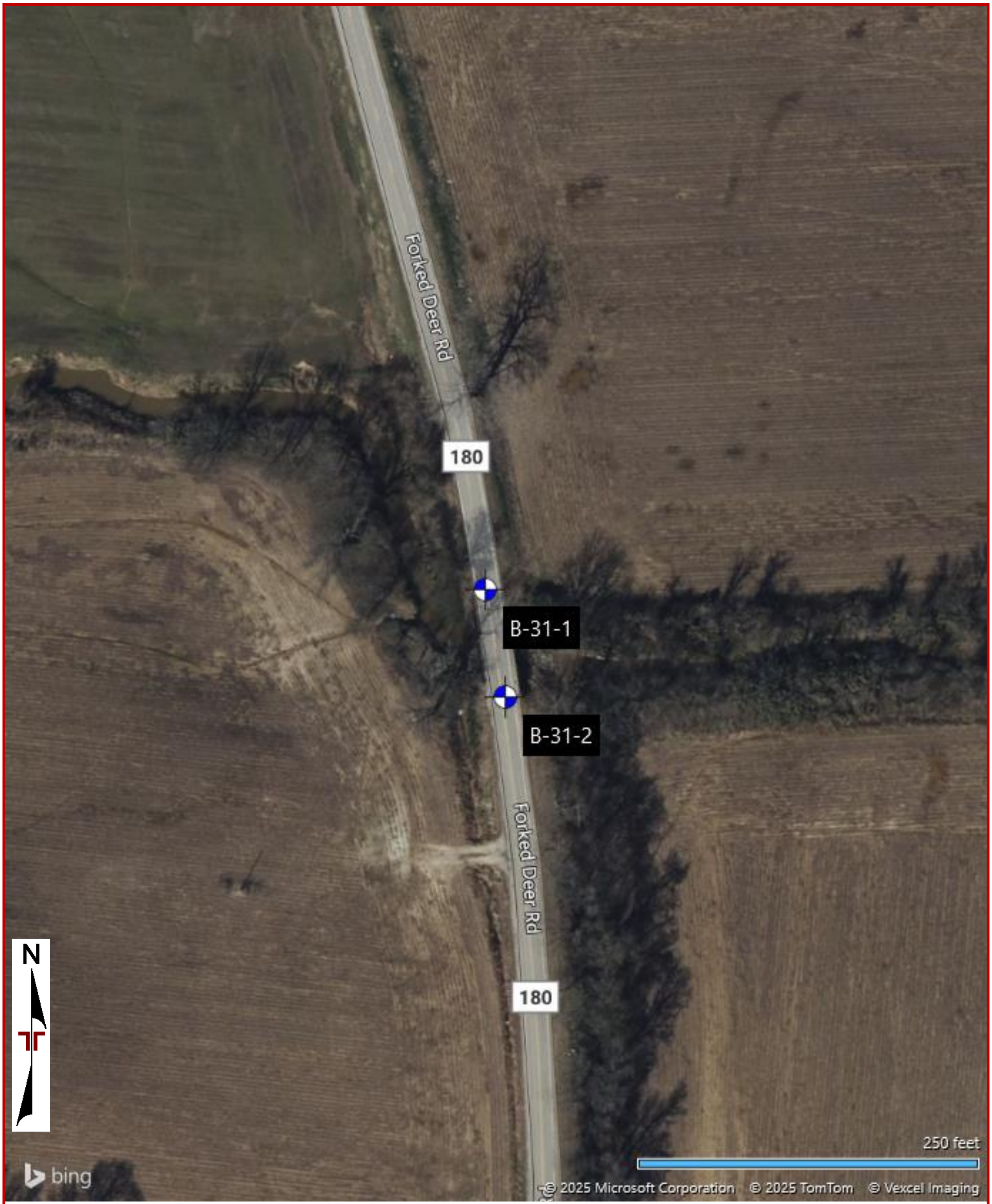

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration and Laboratory Results

Contents:

Boring Log No. B-31-1

Location: See Exploration Plan

Latitude: 35.7335° Longitude: -89.4142°

Depth (Ft.)	Description	Approximate Elevation: 325 (Ft.)
0.3	**ASPHALT**	324.75
4.5	**FILL - LEAN CLAY (CL)**, trace gravel, gray, moist	320.5
7.0	**LEAN CLAY (CL)**, gray with brown, moist, medium stiff	318
14.5	**SILTY CLAY (CL-ML)**, brown to gray, wet, soft to very soft	310.5
17.0	**LEAN CLAY (CL)**, trace wood, brown to gray, wet, soft	308
23.5	**LEAN CLAY WITH SAND (CL)**, brown to gray, wet, medium stiff to stiff	301.5
26.3	**LEAN CLAY (CL)**, trace fine sand, grayish brown with brown, wet, stiff	298.7
31.8	**SILT (ML)**, trace fine sand, grayish brown with brown, wet, medium stiff	293.2
	SANDY LEAN CLAY (CL), fine grained, gray, wet, very stiff	

Field Test Results	Test Type	Compressive Strength (psf)	Strain (%)	Confining Pressure (psi)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
14-19-10 N=29								
5-3-2 N=5					23.1 23.9		42-25-17 NP	94.8
1-3-1 N=4					27.8		27-21-6	
WOH-1-1 N=2					28.7			
WOH-WOH-WOH					26.4		23-16-7	
2-1-2 N=3					36.1			
2-3-4 N=7					24.8			
	UU	3269	14.8	16	21.0	109	25-17-8	75.5
3-3-3 N=6								
4-5-5 N=10								
4-3-4 N=7					18.1		NP	23.4
12-14-15 N=29					21.9			66.9

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Elevations were interpolated from Google Earth

Water Level Observations
▽ While drilling

Drill Rig
CME 75

Hammer Type
Automatic

Driller
Terracon

Notes

Advancement Method
Continuous Flight Auger/Mud Rotary

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
P Van Winkle

Boring Started
05-21-2025

Boring Completed
05-29-2025

Boring Log No. B-31-1

Location: See Exploration Plan

Latitude: 35.7335° Longitude: -89.4142°

Approximate Elevation: 325 (Ft.)

Depth (Ft.)	Description	Elevation (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (psf)	Strength Test: Strain (%)	Strength Test: Confining Pressure (psi)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
36.8	**SANDY LEAN CLAY (CL)**, fine grained, gray, wet, very stiff *(continued)*	288.2												
41.8	**SILTY SAND (SM)**, gray with light yellowish brown, moist, medium dense	283.2	40		☒	8-9-10 N=19					21.5		NP	13.3
46.8	**LEAN CLAY (CL)**, trace gravel, very pale brown with brownish yellow, wet, stiff	278.2	45		☒	9-8-7 N=15					21.3			91.4
51.8	**POORLY GRADED SAND WITH CLAY (SP-SC)**, fine grained, very pale brown with brownish yellow, wet, dense	273.2	50		☒	14-15-23 N=38					22.8			10.0
56.8	**CLAYEY SAND (SC)**, fine grained, very pale brown with brownish yellow, wet, dense	268.2	55		☒	11-12-18 N=30					22.9			14.1
	POORLY GRADED SAND WITH CLAY (SP-SC), trace gravel, fine grained, brownish yellow with dark yellowish brown, wet, medium dense to dense		60		☒	20-22-17 N=39					20.5			5.7
66.8		258.2	65		☒	10-12-11 N=23					19.7			8.4
	LEAN CLAY (CL), gray, moist, very soft		70		☒	WOH-WOH-1 N=1					32.7		33-16-17	86.6

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
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Elevation Reference: Elevations were interpolated from Google Earth

Water Level Observations
▽ While drilling

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CME 75

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Driller
Terracon

Notes

Advancement Method
Continuous Flight Auger/Mud Rotary

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
P Van Winkle

Boring Started
05-21-2025

Boring Completed
05-29-2025

Boring Log No. B-31-1

Graphic Log	Location: See Exploration Plan Latitude: 35.7335° Longitude: -89.4142° Depth (Ft.) Approximate Elevation: 325 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test				Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits	Percent Fines
						Test Type	Compressive Strength (psf)	Strain (%)	Confining Pressure (psi)			LL-PL-PI	
	LEAN CLAY (CL), gray, moist, very soft *(continued)* 71.8 253.2												
	LEAN CLAY WITH SAND (CL), gray, moist, very soft	75		☒	WOH-WOH-2 N=2					32.0			
	76.8 248.2 **SANDY SILT (ML)**, gray with reddish yellow, moist, very soft	80		☒	WOH-WOH-1 N=1					29.9		NP	
	81.8 243.2 **POORLY GRADED SAND WITH CLAY (SP-SC)**, fine grained, brownish yellow, wet, medium dense to dense	85		☒	9-18-17 N=35					24.4			10.2
		90		☒	10-15-23 N=38								
		95		☒	8-10-9 N=19					30.2			9.2
	100.0 225	100		☒	15-24-26 N=50					28.5			11.7
	Boring Terminated at 100 Feet												

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
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Elevation Reference: Elevations were interpolated from Google Earth

Water Level Observations
▽ While drilling

Drill Rig
CME 75

Hammer Type
Automatic

Driller
Terracon

Notes

Advancement Method
Continuous Flight Auger/Mud Rotary

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
P Van Winkle

Boring Started
05-21-2025

Boring Completed
05-29-2025

Boring Log No. B-31-2

Location: See Exploration Plan

Latitude: 35.7333° Longitude: -89.4142°

Graphic Log	Depth (Ft.)		Approximate Elevation: 325 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test			Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits	Percent Fines
								Test Type	Compressive Strength (psf)	Strain (%)			LL-PL-PI	
■	0.3	**ASPHALT**	324.75											
▦	4.5	**FILL - SILTY SAND WITH GRAVEL (SM)**, grayish brown	320.5											
						☒	12-10-13 N=23							
▥	12.0	**SILT (ML)**, grayish brown, moist, soft to medium stiff	313											
				5		☒	6-3-2 N=5				20.5			
						☒	2-1-3 N=4				27.0		NP	
				10		☒	2-2-1 N=3				24.5			
▨	17.5	**LEAN CLAY (CL)**, grayish brown, very moist, soft to medium stiff	307.5											
						☒	WOH-WOH-4 N=4				28.9		36-22-14	
				15		☒	2-3-3 N=6							
▨	19.5	**SILTY CLAY (CL-ML)**, grayish brown, very moist, hard	305.5			■		UC	9485	10.8	1083.3	11	25-18-7	83.6
▨	26.8	**LEAN CLAY (CL)**, grayish brown, very moist, medium stiff	298.2											
				20	▽	☒	2-3-4 N=7							
						☒	2-3-4 N=7				24.5		25-15-10	
				25										
🟨		**CLAYEY SAND (SC)**, trace gravel, fine to coarse grained sand, brownish yellow, wet, loose to medium dense												
						☒	4-7-7 N=14							44.3
				30										
						☒	11-14-12 N=26				19.8			21.9
				35										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
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Water Level Observations
▽ While drilling

Drill Rig
CME 75

Hammer Type
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Driller
Terracon

Notes

Advancement Method
Continuous Flight Auger/Mud Rotary

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
P Van Winkle

Boring Started
05-30-2025

Boring Completed
05-30-2025

Boring Log No. B-31-2

Location: See Exploration Plan

Latitude: 35.7333° Longitude: -89.4142°

Depth (Ft.) Approximate Elevation: 325 (Ft.)

Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test			Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits	Percent Fines
					Test Type	Compressive Strength (psf)	Strain (%)			LL-PL-PI	
CLAYEY SAND (SC), trace gravel, fine to coarse grained sand, brownish yellow, wet, loose to medium dense *(continued)*	40		☒	5-7-2 N=9				23.9			19.5
41.8 — 283.2											
POORLY GRADED SAND WITH CLAY (SP-SC), fine grained sand, light brownish yellow to brownish yellow, wet, medium dense to dense	45		☒	5-6-11 N=17				23.3			11.4
	50		☒	8-7-11 N=18				25.8			14.3
	55		☒	8-12-14 N=26				24.2			7.4
	60		☒	13-24-27 N=51				23.3			7.7
	65		☒	8-12-11 N=23				25.1			6.8
66.8 — 258.2											
LEAN CLAY WITH SAND (CL), light brownish gray with brownish yellow, moist, very soft	70		☒	WOH-WOH-WOH				27.0		28-14-14	77.1

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05-30-2025

Boring Log No. B-31-2

Location: See Exploration Plan

Latitude: 35.7333° Longitude: -89.4142°

Graphic Log	Depth (Ft.) Approximate Elevation: 325 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (psf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
▨	**LEAN CLAY WITH SAND (CL)**, light brownish gray with brownish yellow, moist, very soft *(continued)* 71.8 253.2											
▨	**LEAN CLAY (CL)**, dark gray, moist, medium stiff	75		☒	WOH-WOH-6 N=6				26.4			87.5
	76.8 248.2											
▥	**SANDY SILT (ML)**, trace sand, dark gray, moist, medium stiff to stiff	80		☒	2-4-6 N=10							
		85		☒	2-3-4 N=7				35.4		NP	65.6
		90		☒	4-4-5 N=9							
	91.8 233.2											
▨	**SANDY LEAN CLAY (CL)**, light brownish gray with gray, moist, hard	95		☒	WOH-3-28 N=31				28.0			64.5
	96.8 228.2											
▨	**CLAYEY SAND (SC)**, fine grained, very pale brown, moist, dense			☒	15-18-20 N=38				27.7			12.2
	100.0 225	100										
	Boring Terminated at 100 Feet											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.
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Water Level Observations
▽ While drilling

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P Van Winkle

Boring Started
05-30-2025

Boring Completed
05-30-2025

Summary of Laboratory Results

Boring ID	Depth (Ft.)	Liquid Limit	Plastic Limit	Plasticity Index	% Fines	Water Content (%)
B-31-1	4-7	42	25	17	94.8	23.1
B-31-1	5-6.5	NP	NP	NP		23.9
B-31-1	7.5-9	27	21	6		27.8
B-31-1	10-11.5					28.7
B-31-1	12.5-14	23	16	7		26.4
B-31-1	15-16.5					36.1
B-31-1	17-18.5					24.8
B-31-1	20-22	25	17	8	75.5	21.0
B-31-1	28.5-30	NP	NP	NP	23.4	18.1
B-31-1	33.5-35				66.9	21.9
B-31-1	38.5-40	NP	NP	NP	13.3	21.5
B-31-1	43.5-45				91.4	21.3
B-31-1	48.5-50				10.0	22.8
B-31-1	53.5-55				14.1	22.9
B-31-1	58.5-60				5.7	20.5
B-31-1	63.5-65				8.4	19.7
B-31-1	68.5-70	33	16	17	86.6	32.7
B-31-1	73.5-75					32.0
B-31-1	78.5-80	NP	NP	NP		29.9

Summary of Laboratory Results

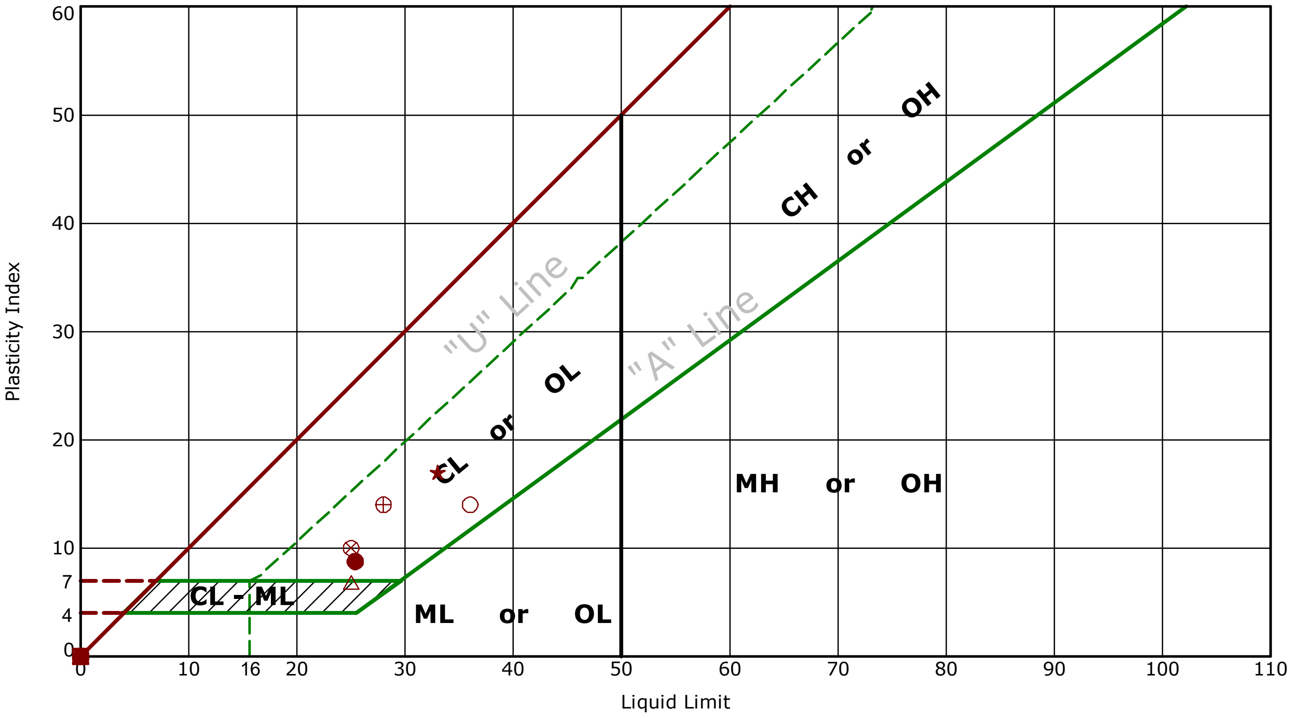
Boring ID	Depth (Ft.)	Liquid Limit	Plastic Limit	Plasticity Index	% Fines	Water Content (%)
B-31-1	83.5-85				10.2	24.4
B-31-1	93.5-95				9.2	30.2
B-31-1	98.5-100				11.7	28.5
B-31-2	5-6.5					20.5
B-31-2	7.5-9	NP	NP	NP		27.0
B-31-2	10-11.5					24.5
B-31-2	12.5-14	36	22	14		28.9
B-31-2	17.5-19.5	25	18	7	83.6	1083.3
B-31-2	23.5-25	25	15	10		24.5
B-31-2	28.5-30				44.3	
B-31-2	33.5-35				21.9	19.8
B-31-2	38.5-40				19.5	23.9
B-31-2	43.5-45				11.4	23.3
B-31-2	48.5-50				14.3	25.8
B-31-2	53.5-55				7.4	24.2
B-31-2	58.5-60				7.7	23.3
B-31-2	63.5-65				6.8	25.1
B-31-2	68.5-70	28	14	14	77.1	27.0
B-31-2	73.5-75				87.5	26.4

Summary of Laboratory Results

Boring ID	Depth (Ft.)	Liquid Limit	Plastic Limit	Plasticity Index	% Fines	Water Content (%)
B-31-2	83.5-85	NP	NP	NP	65.6	35.4
B-31-2	93.5-95				64.5	28.0
B-31-2	98.5-100				12.2	27.7

Atterberg Limit Results

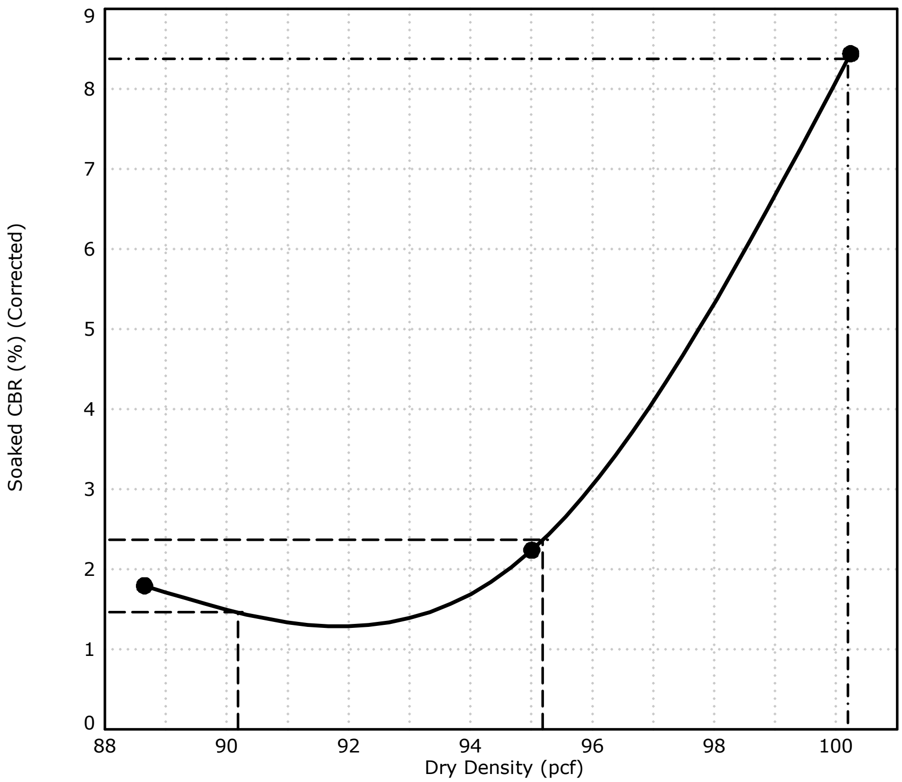
ASTM D4318



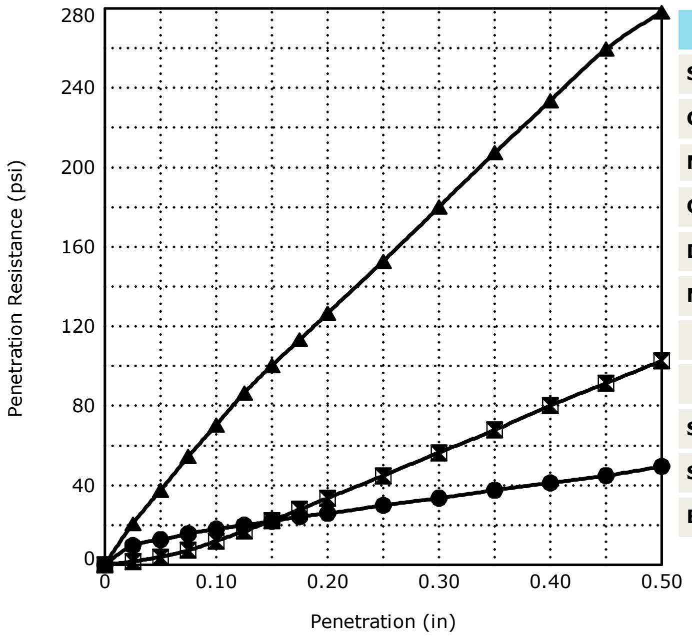
	Boring ID	Depth (Ft)	LL	PL	PI	Fines	USCS	Description
●	B-31-1	20 - 22	25	17	8	75.5	CL	LEAN CLAY with SAND
⊠	B-31-1	28.5 - 30	NP	NP	NP	23.4	SM	SILTY SAND
▲	B-31-1	38.5 - 40	NP	NP	NP	13.3	SM	SILTY SAND
★	B-31-1	68.5 - 70	33	16	17	86.6	CL	LEAN CLAY
⊙	B-31-1	78.5 - 80	NP	NP	NP			
✚	B-31-2	7.5 - 9	NP	NP	NP			
○	B-31-2	12.5 - 14	36	22	14			
△	B-31-2	17.5 - 19.5	25	18	7	83.6	CL-ML	SILTY CLAY with SAND
⊗	B-31-2	23.5 - 25	25	15	10			
⊕	B-31-2	68.5 - 70	28	14	14	77.1	CL	LEAN CLAY with SAND
☐	B-31-2	83.5 - 85	NP	NP	NP	65.6	ML	SANDY SILT

California Bearing Ratio

ASTM D1883-07^2



Source of Material	B-31-1 4.0-7.0		
Description of Material	LEAN CLAY(CL)		
Percent Fines	94.8		
Atterberg Limits	LL 42	PL 25	PI 17
Remarks:			



Sample No.	**1**	**2**	**3**
Sample Condition	Soaked		
Compaction Method	ASTM 698A		
Maximum Dry Density (pcf)	100.2	100.2	100.2
Optimum Moisture Content (%)	18	18	18
Dry Density before Soaking, (pcf)	88.65	95.01	100.24
Moisture Content, (%)			
After Compaction	18.4	18.8	18.2
Top 1" After Soaking	30.9	30.4	28.4
Surcharge, (lbs)	10.00	10.00	10.00
Swell, (%)	1.06	1.15	1.24
Bearing Ratio, (%)	1.7	2.2	8.4

Dry Density @ 90% 90.2 pcf

Dry Density @ 95% 95.2 pcf

Dry Density @ 100% 100.2 pcf

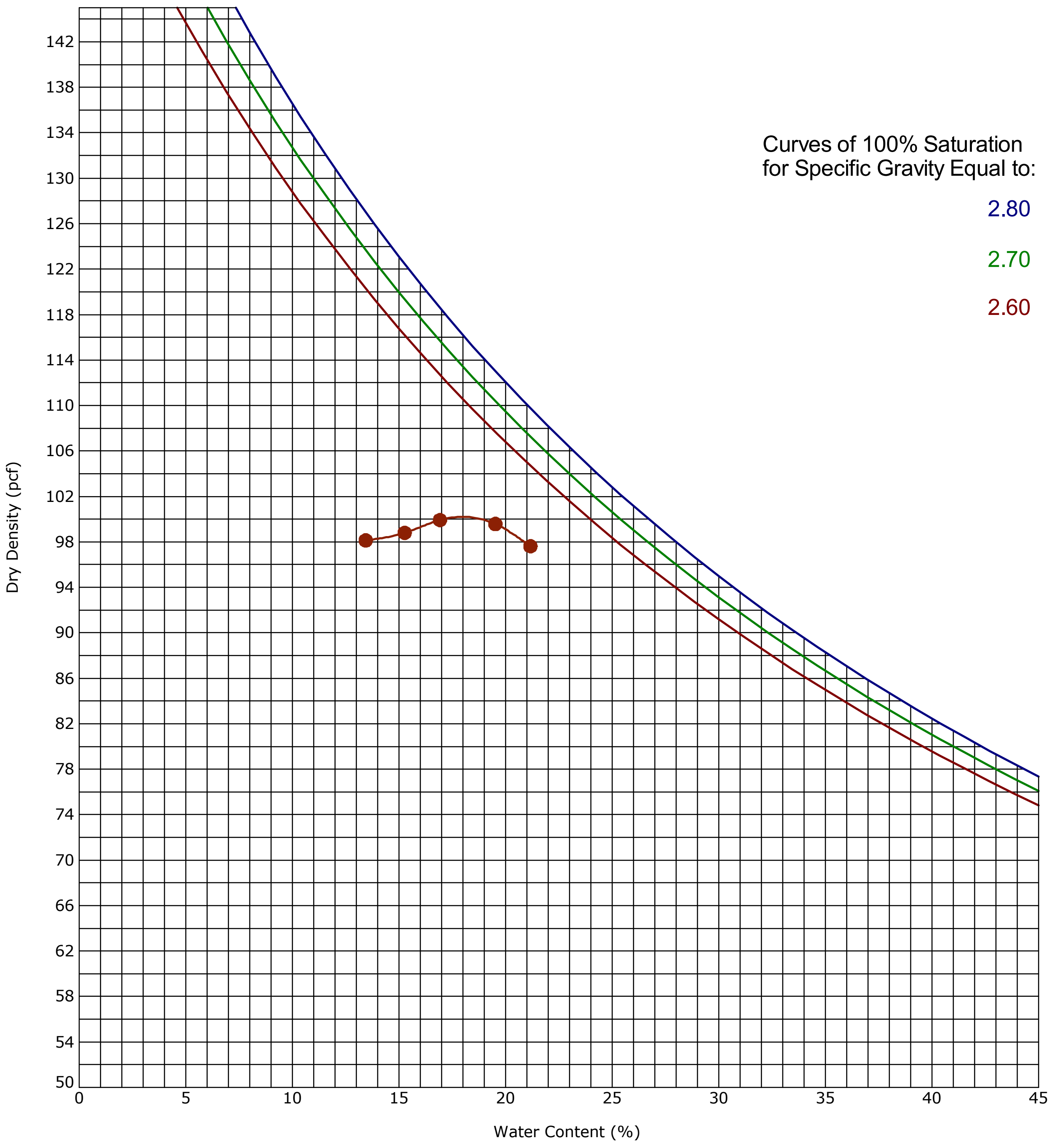
CBR @ 90% Density 1.5

CBR @ 95% Density 2.4

CBR @ 100% Density 8.4

Moisture-Density Relationship

ASTM D698-Method A

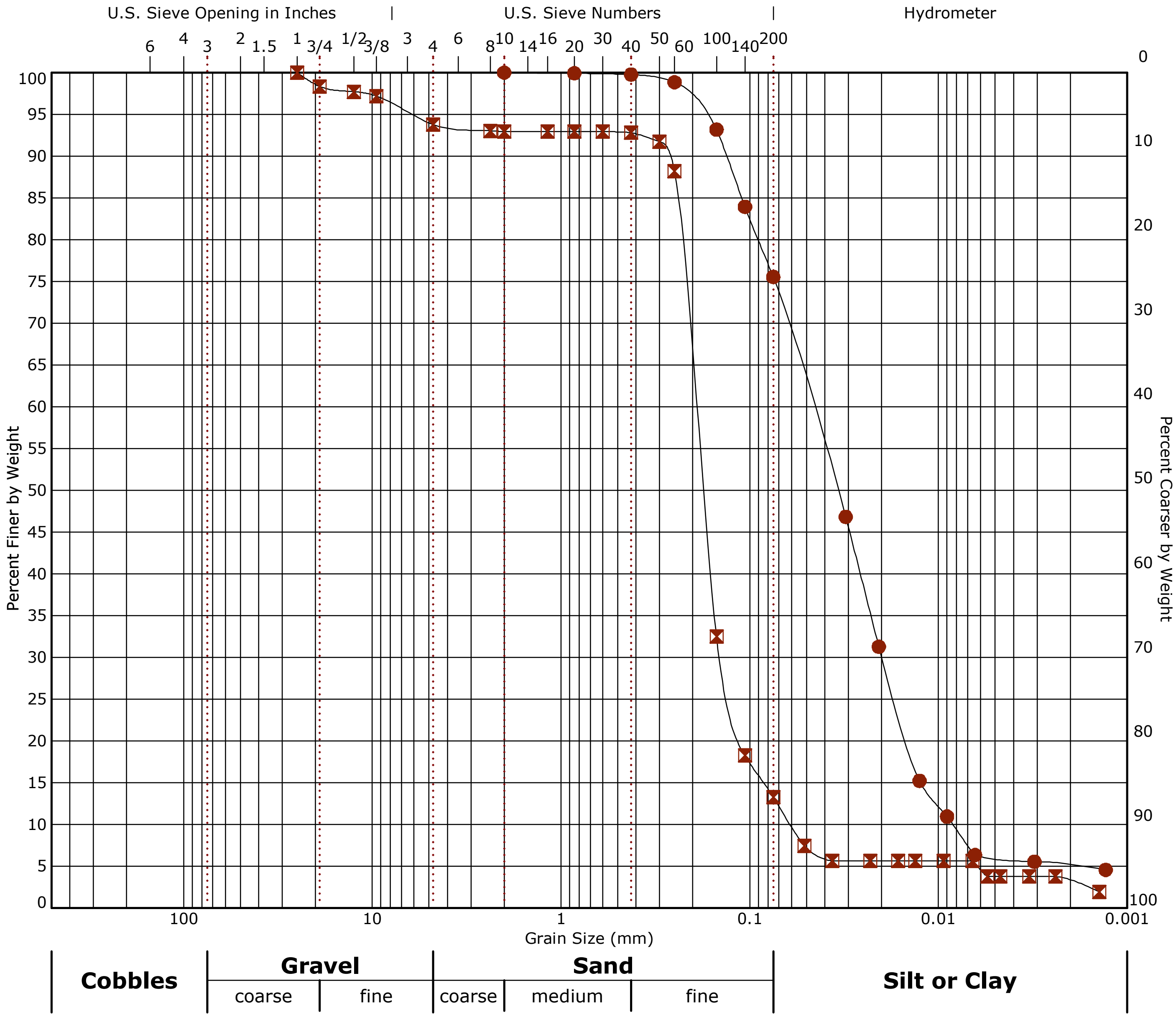


Boring ID	Depth (Ft)	Description of Materials
B-31-1	4 - 7	LEAN CLAY(CL)

Fines (%)	Fraction > mm size	LL	PL	PI	Test Method	Maximum Dry Density (pcf)	Optimum Water Content (%)
95	0.0	42	25	17	ASTM D698-Method A	100.2	18.0

Grain Size Distribution

ASTM D422 / ASTM C136 / AASHTO T27



	Boring ID	Depth	% Cobbles	% Gravel	% Sand	% Fines	% Silt	% Clay	USCS
●	**B-31-1**	20 - 22	0.0	0.0	24.5		69.5	6.1	CL
☒	**B-31-1**	38.5 - 40	0.0	6.2	80.5		9.5	3.8	SM

	Description
●	LEAN CLAY with SAND
☒	SILTY SAND

	Remarks
●	
☒	

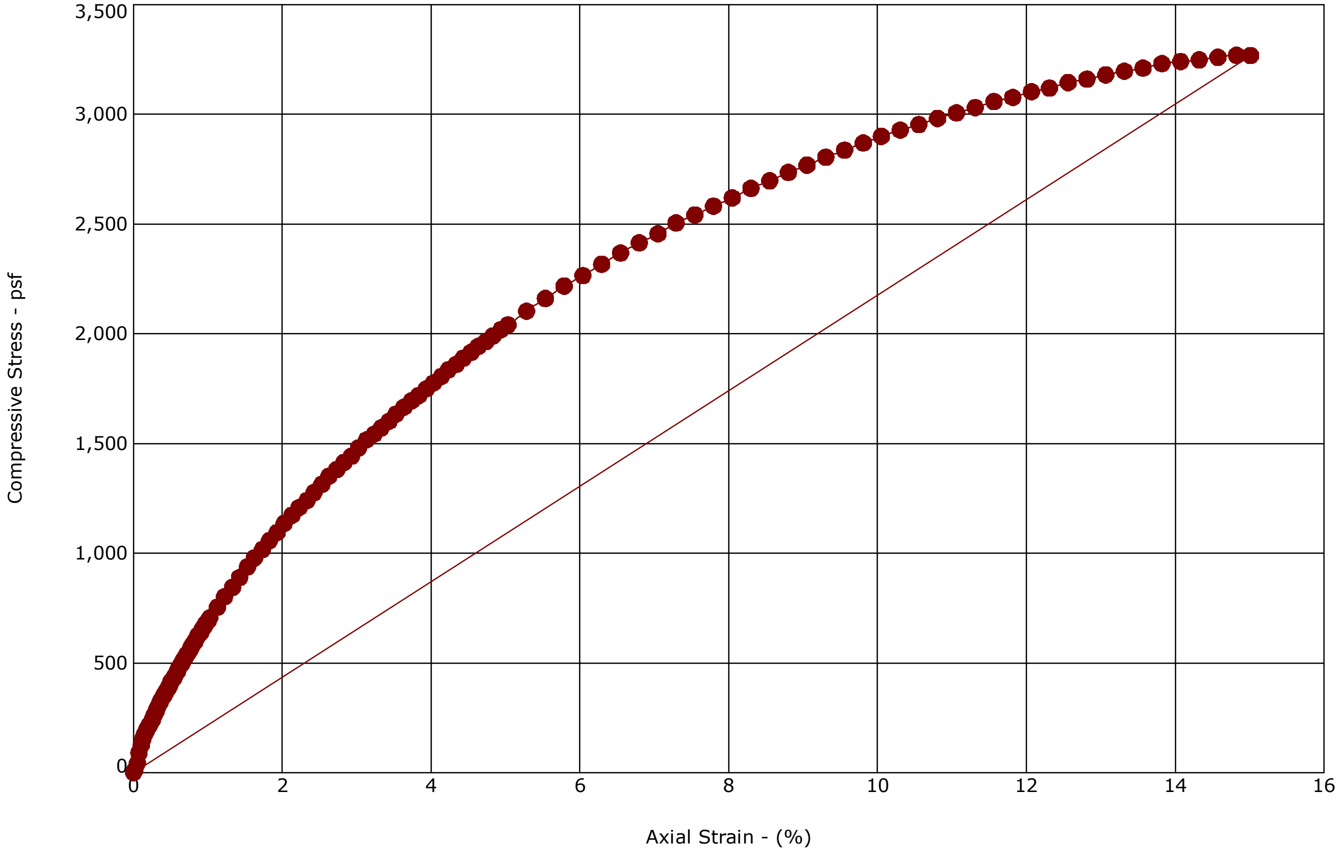
●		☒			
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
#10	100.0	1"	100.0		
#20	99.92	3/4"	98.35		
#40	99.77	1/2"	97.72		
#60	98.85	3/8"	97.2		
#100	93.18	#4	93.76		
#140	83.94	#8	93.04		
#200	75.54	#10	92.94		
		#16	92.94		
		#20	92.94		
		#30	92.94		
		#40	92.81		
		#50	91.73		
		#60	88.23		
		#100	32.53		
		#140	18.24		
		#200	13.29		

Grain Size			
	●	☒	
D_{60}	0.047	0.193	
D_{10}	0.008	0.06	

Coefficients			
	●	☒	
C_C	1.02	1.71	
C_U	5.54	3.19	

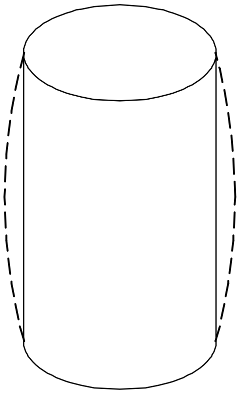
Unconsolidated-Undrained Test

ASTM D2850



Boring ID	Depth (Ft)	Sample type	LL	PL	PI	Fines (%)	Description
B-31-1	20 - 22	Shelby Tube	25	17	8	75.5	LEAN CLAY with SAND(CL)

Specimen Failure Mode



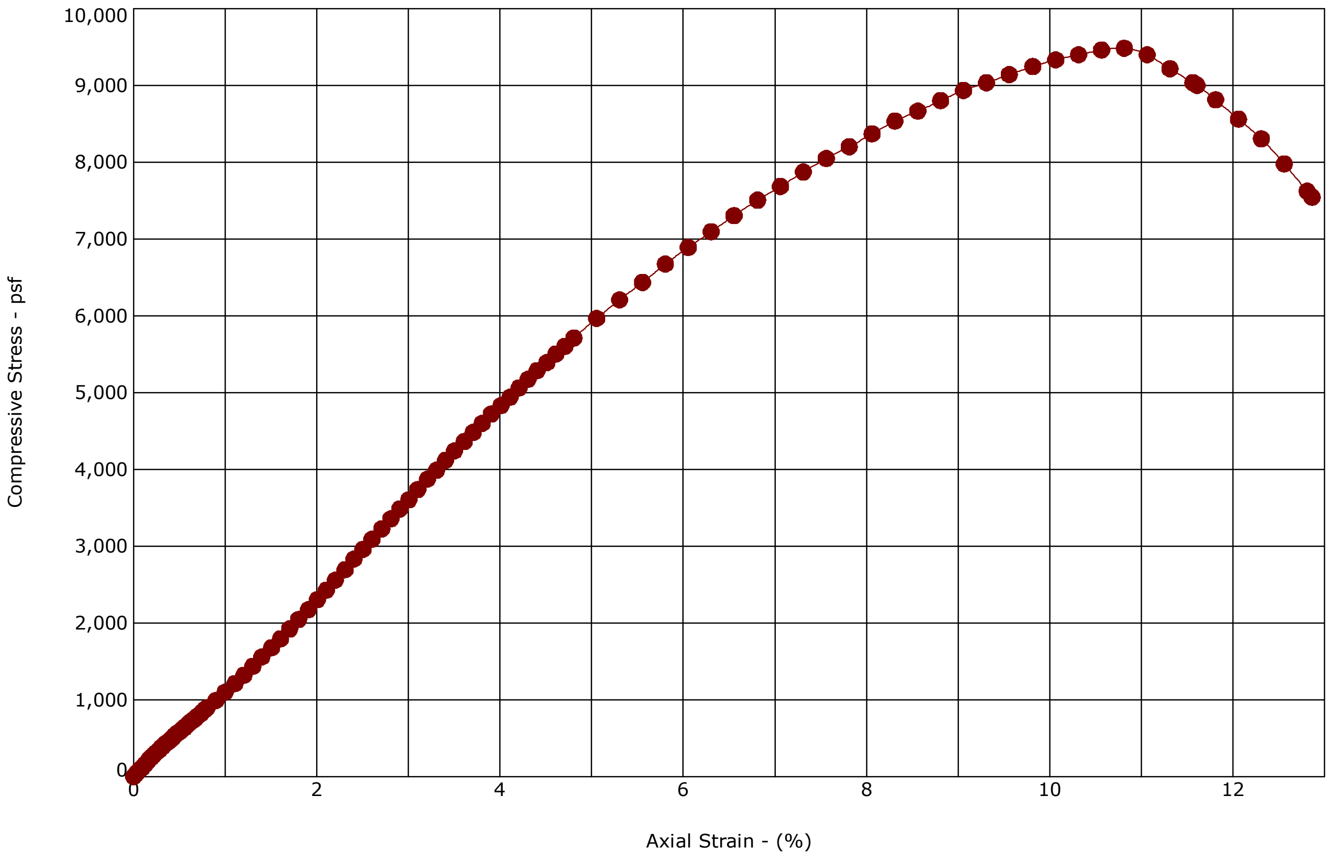
Failure Mode: Bulge (dashed)

Specimen Test Data

Moisture Content (%):	21.0
Dry Density (pcf)	109.0
Diameter (in):	2.83
Height (in):	5.64
Height / Diameter Ratio:	2.00
Calculated Saturation (%)	103.78
Calculated Void Ratio:	0.55
Assumed Specific Gravity:	2.7
Failure Strain (%):	14.82
Compressive Strength (psf):	3269
Undrained Shear Strength (psf):	1635
Strain Rate (in/min):	0.0564
Confining Pressure (psi):	16.0
Remarks:	

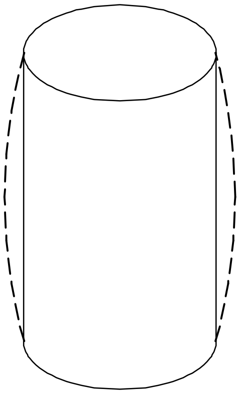
Unconsolidated-Undrained Test

ASTM D2850



Boring ID	Depth (Ft)	Sample type	LL	PL	PI	Fines (%)	Description
B-31-2	17.5 - 19.5	Shelby Tube	25	18	7	83.6	SILTY CLAY with SAND(CL-ML)

Specimen Failure Mode



Failure Mode: Bulge (dashed)

Specimen Test Data

Moisture Content (%):	1083.3
Dry Density (pcf)	11.0
Diameter (in):	2.72
Height (in):	5.64
Height / Diameter Ratio:	2.07
Calculated Saturation (%)	204.40
Calculated Void Ratio:	14.31
Assumed Specific Gravity:	2.7
Failure Strain (%):	10.81
Compressive Strength (psf):	9485
Undrained Shear Strength (psf):	4742
Strain Rate (in/min):	0.0564
Confining Pressure (psi):	
Remarks:	

Client

American Structurepoint Inc
Cleveland, OH

Project Number

1A255072

Corrosivity Suite - *Results*

Sample Location		B-31-2			
Sample Depth (ft.)		10.0-11.5'			
Acidity (pH)	**AASHTO T289**	5.4			
Water Soluble Sulfate Ion Content (mg/Kg)	**ASTM C1580**	301			
Water Soluble Sulfide Content (mg/Kg)	**AWWA 4500-S,D**	Nil			
Water Soluble Chloride Ion Content (mg/Kg)	**ASTM D512**	<20			
Oxidation-Reduction Potential (RmV)	**ASTM G200**	73.4			
Total Dissolved Salts (mg/Kg)	**AWWA 2520 B**	424			
Electrical Resistivity (Ω·cm)	**ASTM G57**	3200			

Verified By: *Myles Warner*

8/12/2025

These tests were performed in general accordance with the applicable AASHTO, ASTM, and AWWA test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced without the full written consent of Terracon Consultants Inc.. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar materials.

Notes

1) The MASW arrays performed by Terracon on May 14, 2025 are shown above in **RED**. Label locations indicate the start, or "0-foot," mark of the arrays. Several geophone locations were collected using a sub-meter accurate GPS receiver.

2) Geotechnical boring locations were collected using a handheld GPS and are shown above in **BLUE**.

3) Aerial imagery provided by Bing.

PROJECT MANAGER: ECC
DRAWN BY: AGW
CHECKED BY: NBR
APPROVED BY: DAB

PROJECT NUMBER: 1A255072
DRAWING SCALE: AS SHOWN
FILE NAME: Loc-31.srf
DATE DRAWN: 8/7/2025

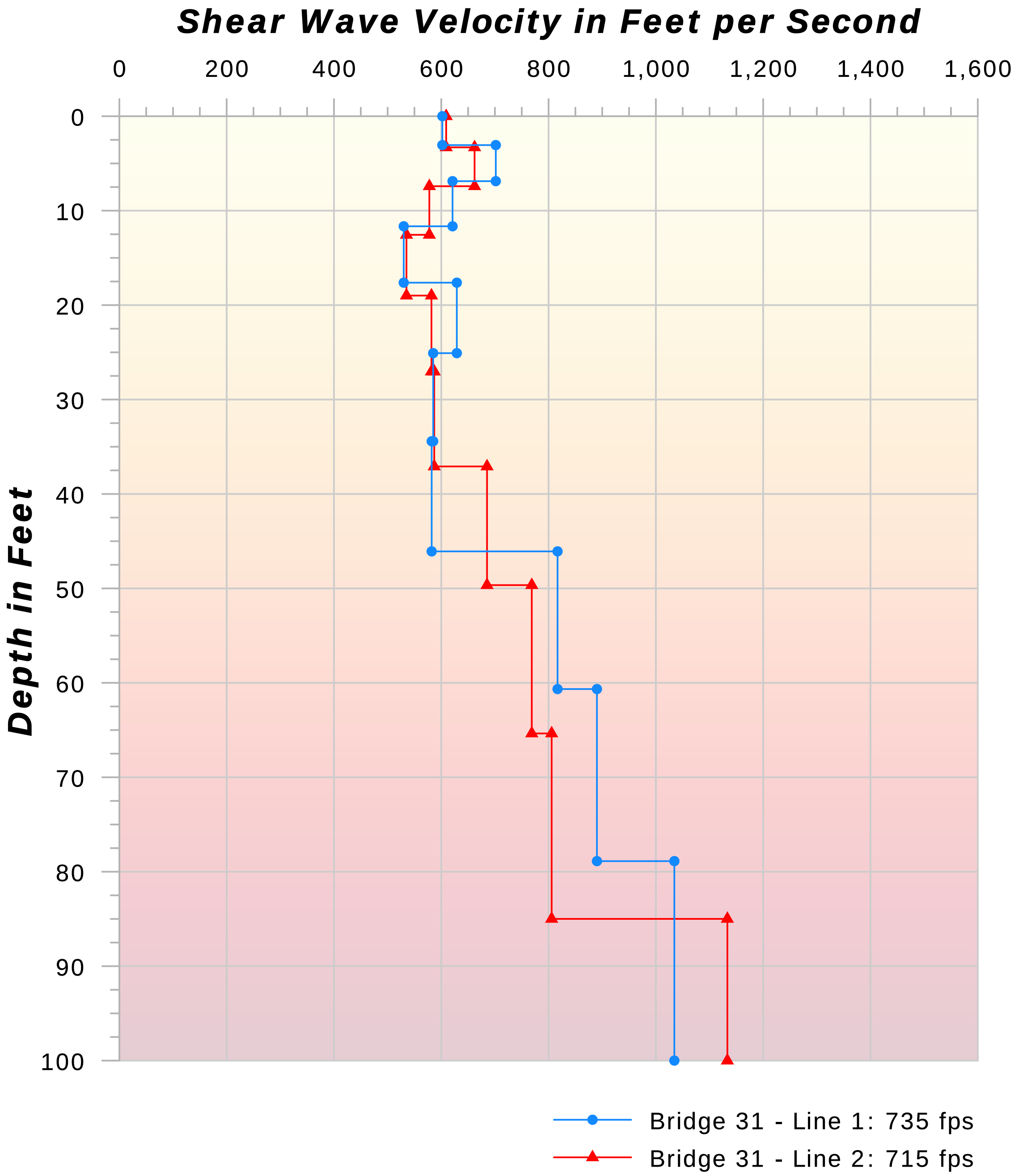
Terracon
1922 Old Murfreesboro Pike, Suite 905
Nashville, TN 37217

Geophysical Exploration Plan

Replacement of Bridge 31
(SR-180 Over Otter Creek Overflow)
Haywood County, Tennessee

EXHIBIT
1

Vs100' Model
TDOT Bridge 31



Notes:

1) Seismic testing was conducted by Terracon on May 14, 2025.

2) Shear wave velocity testing and calculations were conducted in general accordance with ASCE 7-16 and IBC 2018.

PROJECT MANAGER: ECC	PROJECT NUMBER: 1A255072
DRAWN BY: AGW	PROJECT TASK: 1
CHECKED BY: NBR	FILE NAME: Vs100.gpj
APPROVED BY: DAB	DATE: 8/7/2025

Terracon

1922 Old Murfreesboro Pike #905
Nashville, TN 37217

Site Classification Data

Replacement of Bridge 31
(SR-180 Over Otter Creek Overflow)
Haywood County, Tennessee

EXHIBIT

2

Supporting Information

Contents:

General Notes

Sampling

✋ Grab Sample

■ Shelby Tube

☒ Standard Penetration Test

Water Level

▽	Water Initially Encountered
▽	Water Level After a Specified Period of Time
▼	Water Level After a Specified Period of Time
▨	Cave In Encountered

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

Field Tests

N	Standard Penetration Test Resistance (Blows/Ft.)
(HP)	Hand Penetrometer
(T)	Torvane
(DCP)	Dynamic Cone Penetrometer
UC	Unconfined Compressive Strength
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

Descriptive Soil Classification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

Strength Terms

Relative Density of Coarse-Grained Soils (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		**Consistency of Fine-Grained Soils** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Relative Density	**Standard Penetration or N-Value (Blows/Ft.)**	**Consistency**	**Unconfined Compressive Strength Qu (psf)**	**Standard Penetration or N-Value (Blows/Ft.)**
Very Loose	0 - 3	Very Soft	less than 500	0 - 1
Loose	4 - 9	Soft	500 to 1,000	2 - 4
Medium Dense	10 - 29	Medium Stiff	1,000 to 2,000	5 - 8
Dense	30 - 50	Stiff	2,000 to 4,000	9 - 15
Very Dense	> 50	Very Stiff	4,000 to 8,000	16 - 30
		Hard	> 8,000	> 30

Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

Unified Soil Classification System

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification	
				Group Symbol	**Group Name** [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu≥4 and 1≤Cc≤3 [E]	GW	Well-graded gravel [F]
			Cu<4 and/or [Cc<1 or Cc>3.0] [E]	GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F, G, H]
			Fines classify as CL or CH	GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu≥6 and 1≤Cc≤3 [E]	SW	Well-graded sand [I]
			Cu<6 and/or [Cc<1 or Cc>3.0] [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G, H, I]
			Fines classify as CL or CH	SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots above "A" line [J]	CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OL	Organic clay [K, L, M, N]
					Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line	CH	Fat clay [K, L, M]
			PI plots below "A" line	MH	Elastic silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OH	Organic clay [K, L, M, P]
					Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

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

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.