

Replacement of Bridge 18 (SR-196 Over Russell Creek)

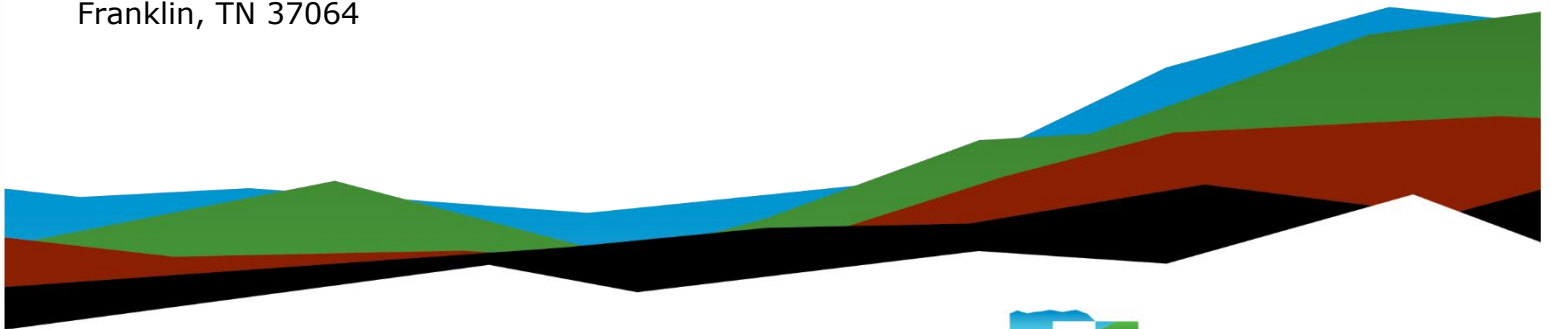
Geotechnical Data Report

Fayette County, Tennessee

September 4, 2026 | Terracon Project No. 1A255160

Prepared for:

American Structurepoint Inc. □
377 Riverside Drive, Suite 420 □
Franklin, TN 37064



Nationwide
Terracon.com

- Facilities
- Environmental
- Geotechnical
- Materials



1922 Old Murfreesboro Pike, Bldg 900, Ste 905
Nashville, TN 37217
P (615) 333-6444
Terracon.com

September 4, 2026

American Structurepoint Inc. □
377 Riverside Drive, Suite 420 □
Franklin, TN 37064

Attn: Mr. Gabe Liptak, P.E.
P: (440) 413-3587
E: gliptak@structurepoint.com

Re: Geotechnical Data Report
Replacement of Bridge 18 (SR-196 Over Russell Creek)
Fayette County, Tennessee
Terracon Project No. 1A255160

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.
Geotechnical Department Manager

James Vinson, P.E.
National Manager



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Introduction

This report presents the results of our subsurface exploration performed for the proposed bridge replacement along SR-196 in Fayette County, Tennessee. The geotechnical Scope of Services included the advancement of test borings, laboratory 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 area are as follows: 35.017095°, -89.617535° See Site Location
Current Ground Cover	The roadways are generally asphaltic concrete underlain by aggregate base.
Existing Topography (Estimated using Google Earth)	The ground surface at the borings ranges from approximately 349 to 353 MSL.

Geologic Formations

Formation ¹	Description
Alluvial Deposits	Alluvial Deposits - sand, silt, clay, and gravel. Flood plain of the Mississippi River, more than 100 feet thick.
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.

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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 locations 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, and California Bearing Ratio. Test results are attached with the boring logs.

Seismic Survey

Terracon performed a limited seismic survey consisting of 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 and associated 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 geotechnical 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.

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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 a Truck-mounted rotary drill rig using continuous flight hollow stem augers and rotary wash boring techniques as necessary depending on soil conditions. Five 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 for the presence of groundwater. The groundwater levels are shown on the attached boring and coring logs.

The sampling depths, penetration distances, and other sampling information were 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. Photographs were taken of the rock core samples and samples selected for testing. 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 and coring 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: Terracon performed a limited seismic survey consisting of two Multi-Channel Analysis of Surface Waves (MASW) arrays at Bridge 18 on TN-196 to obtain shear wave velocity values of the soil within the upper 100 feet. Lines 1 and 2 were located on the north and south approach to the bridge, respectively. Their locations are presented on **Exhibit 1**. The goal of this survey was to refine the seismic site classification in general accordance with procedures outlined in ASCE 7-22 and IBC 2024.

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**.

Our SSC is based on time-averaged shear wave velocity calculations in the upper 100 feet ($V_{s100'}$), in accordance with the prescribed procedure outlined in ASCE 7-22. The average V_{s100} for Bridge 18 was calculated to be 1,041 feet per second (fps), which corresponds to a Seismic Site Classification CD as defined by IBC 2024 and Chapter 20 of ASCE 7-22. Site Class CD has a soil profile of "dense sand or very stiff clay." Individual results of the shear wave velocity calculations are presented in the table below.

Line	Average Shear Wave Velocity (fps)
Line 1	1,028
Line 2	1,053

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
- Atterberg Limits
- Grain Size Analysis

Geotechnical Data Report

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- Corrosion Suite
- Unconfined Compression
- California Bearing Ratio
- Standard Proctor

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.

Geotechnical Data Report

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Site Location and Exploration Plans

Contents:

Site Location Plan
Exploration Plan

Site Location

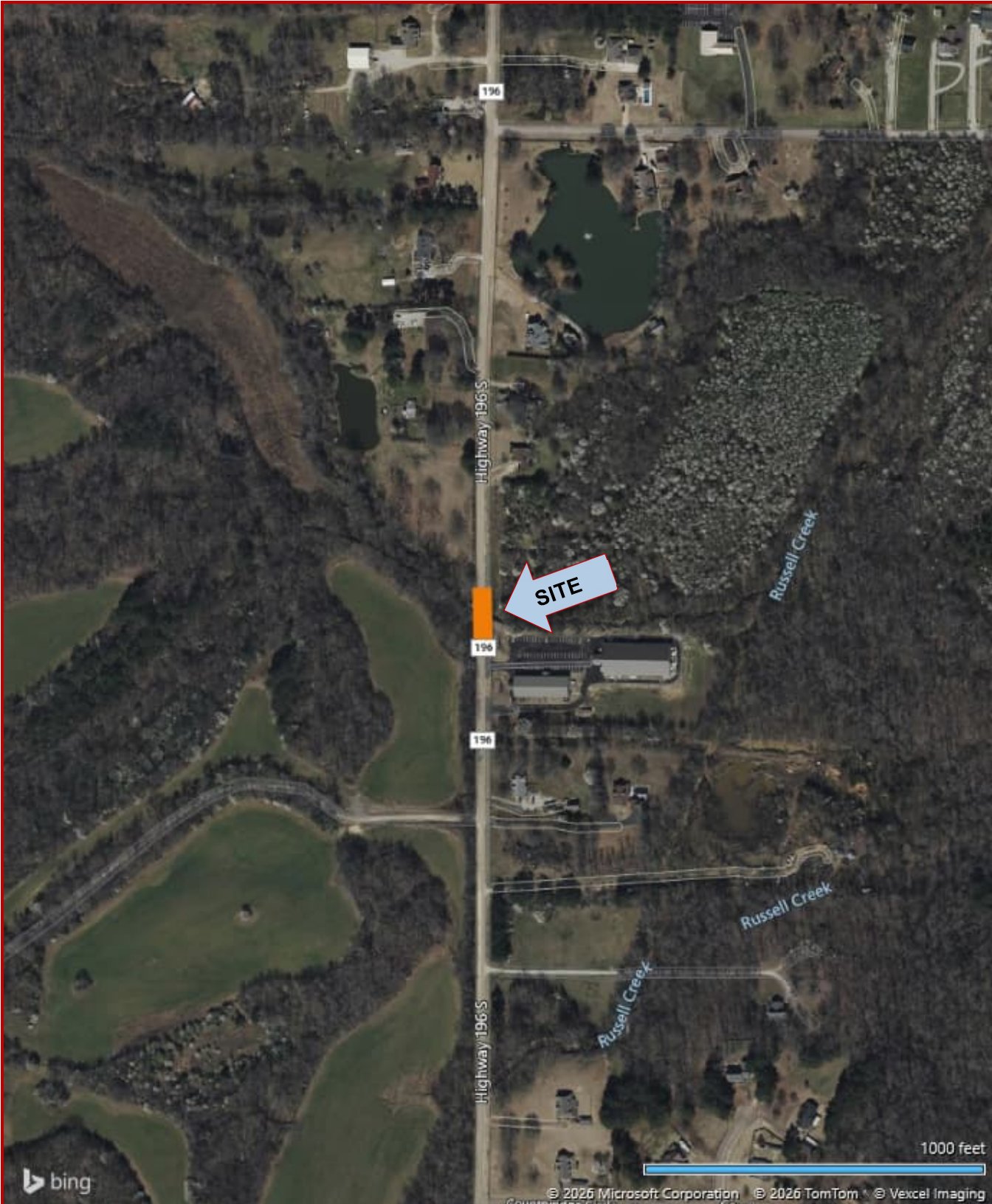


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan



Exploration and Laboratory Results

Contents:

- Boring Logs (B-18-1 and B-18-2)
- Lab Summary
- Atterberg Limits
- California Bearing Ratio
- Standard Proctor
- Grain Size Analysis
- Corrosion Suite
- Geophysical Exploration Results

Boring Log No. B-18-1

Graphic Log	Location: See Exploration Plan		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	HP (tsf)	Strength Test			Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits	
	Latitude: 35.0170° Longitude: -89.6175°							Test Type	Compressive Strength (tsf)	Strain (%)			LL-PL-PI	Percent Fines
   	Approximate Elevation: 350 (Ft.)													
	0.4	5" ASPHALT	349.6			4-5-5 N=10								
	0.8	4" AGGREGATE BASE COURSE	349.25			3-4-6 N=10								
	2.0	FILL - LEAN CLAY (CL) , trace mineral nodules and roots, brown LEAN CLAY (CL) , trace silt and mineral nodules, brown, stiff to medium stiff	348			4-2-3 N=5			21.6					
 	7.0		343											
		SILT (ML) , trace sand and mineral nodules, yellowish brown with gray mottling, medium dense				3-6-6 N=12 7-7-7 N=14			21.8 19.5			NP	89.1	
 	11.5		338.5											
		LEAN CLAY (CL) , trace silt, mineral nodules and gravel, yellowish brown with gray mottling, medium stiff				3-3-5 N=8			22.4					
 	16.5		333.5											
		LEAN CLAY (CL) , with sand, yellowish brown, stiff				4-6-7 N=13			23.2			26-15-11	70.6	
 	21.5		328.5											
		CLAYEY SAND (SC) , yellowish brown, medium dense to dense				8-9-11 N=20 9-16-32 N=48			27.9 21.8					
 	31.5		318.5											
		POORLY GRADED SAND (SP) , brown, very dense to dense				22-34-47 N=81 18-21-25 N=46 15-13-18 N=31			12.2 17.5 19.2					
 	46.5		303.5											
		LEAN CLAY (CL) , with silt and trace sand, reddish brown with gray mottling, stiff				6-6-9 N=15			21.7			29-17-12	84.6	

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 and therefore should be considered approximate and not for building construction use.

Notes

Water Level Observations

Groundwater not encountered prior to beginning mud rotary

Drill Rig

Mobile B-37X

Hammer Type

Automatic

Driller

LW

Logged by

TS

Boring Started

05-21-2026

Boring Completed

05-21-2026

Advancement Method

0 to 10 feet: Continuous Flight Auger
 10 to 100 feet: Mud Rotary

Abandonment Method

Borings backfilled with soil cuttings upon completion.
 Sealed with bituminous cold patch at surface.

Boring Log No. B-18-1

Graphic Log	Location: See Exploration Plan		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	HP (tsf)	Strength Test			Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits	
	Latitude: 35.0170° Longitude: -89.6175°							Test Type	Compressive Strength (tsf)	Strain (%)			LL-PL-PI	Percent Fines
	Depth (Ft.)	Approximate Elevation: 350 (Ft.)												
	51.5	298.5												
	LEAN CLAY (CL) , with silt and trace sand, reddish brown with gray mottling, hard													
	55	293.5				10-14-16 N=30				21.9				
	56.5													
	60	288.5				15-25-32 N=57				24.5				
	61.5													
	65					14-26-32 N=58				25.6				18.4
	66													
	70					7-14-38 N=52				22.7				
	71.5	278.5												
	75					4-7-8 N=15				18.5				
	76													
	80					5-9-12 N=21				18.1			23-14-9	76.3
	81.5	268.5												
	85					17-26-33 N=59				20.1				
	86.5	263.5												
	90					9-12-13 N=25				17.9				
	91.5	258.5												
	95					22-35-40 N=75				19.3				
	96													
	100					25-33-46 N=79				20.3				
	100.0	250												
	Boring Terminated at 100 Feet		100											

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 and therefore should be considered approximate and not for building construction use.

Water Level Observations

Groundwater not encountered prior to beginning mud rotary

Drill Rig

Mobile B-37X

Hammer Type

Automatic

Driller

LW

Logged by

TS

Boring Started

05-21-2026

Boring Completed

05-21-2026

Notes

Advancement Method

0 to 10 feet: Continuous Flight Auger
 10 to 100 feet: Mud Rotary

Abandonment Method

Borings backfilled with soil cuttings upon completion.
 Sealed with bituminous cold patch at surface.

[illegible]

Boring Completed
05-19-2026

Boring Log No. B-18-2

Graphic Log	Location: See Exploration Plan Latitude: 35.0172° Longitude: -89.6175°		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	HP (tsf)	Strength Test			Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits	
								Test Type	Compressive Strength (tsf)	Strain (%)			LL-PL-PI	Percent Fines
	Depth (Ft.)	Approximate Elevation: 349 (Ft.)												
	LEAN CLAY (CL) , with silt, trace sand, light brown, stiff (<i>continued</i>)													
	53.5	295.5												
	SANDY LEAN CLAY (CL) , reddish brown, very stiff		55		X	6-9-12 N=21					20.8			
			60		X	8-10-17 N=27					30.3			
	63.5	285.5			X	13-13-24 N=37					25.5			21.0
	POORLY GRADED SAND WITH CLAY (SP-SC) , reddish brown, dense		65											
	68.5	280.5			X	16-27-31 N=58					22.2			
	POORLY GRADED SAND (SP) , light brown, very dense		70											
			75		X	19-24-40 N=64					19.3			
			80		X	15-17-10 N=27					19.6			
	83.5	265.5			X	4-6-8 N=14					17.4			
	SANDY LEAN CLAY (CL) , with silt, light brown, stiff		85											
	88.5	260.5			X	6-7-11 N=18					21.9		33-19-14	98.4
	LEAN CLAY (CL) , with silt, light brown, very stiff		90											
			95		X	5-7-24 N=31					20.6			
	98.5	250.5			X	10-15-12 N=27					14.2			
	POORLY GRADED SAND (SP) , brown, medium dense		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.

Elevation Reference: Elevations were interpolated from Google Earth and therefore should be considered approximate and not for building construction use.

Water Level Observations

Groundwater not encountered prior to beginning mud rotary

Drill Rig

Mobile B-37X

Hammer Type

Automatic

Driller

LW

Logged by

TS

Boring Started

05-19-2026

Boring Completed

05-19-2026

Notes

Advancement Method

0 to 10 feet: Continuous Flight Auger
 10 to 100 feet: Mud Rotary

Abandonment Method

Borings backfilled with soil cuttings upon completion.
 Sealed with bituminous cold patch at surface.



Summary of Laboratory Results

Boring ID	Depth (Ft.)	Liquid Limit	Plastic Limit	Plasticity Index	% Fines	Water Content (%)
B-18-1	3.5-5					21.6
B-18-1	7-8.5	NP	NP	NP	89.1	21.8
B-18-1	8.5-10					19.5
B-18-1	13.5-15					22.4
B-18-1	18.5-20	26	15	11	70.6	23.2
B-18-1	23.5-25					27.9
B-18-1	28.5-30					21.8
B-18-1	33.5-35					12.2
B-18-1	38.5-40					17.5
B-18-1	43.5-45					19.2
B-18-1	48.5-50	29	17	12	84.6	21.7
B-18-1	53.5-55					21.9
B-18-1	58.5-60					24.5
B-18-1	63.5-65				18.4	25.6
B-18-1	68.5-70					22.7
B-18-1	73.5-75					18.5
B-18-1	78.5-80	23	14	9	76.3	18.1
B-18-1	83.5-85					20.1
B-18-1	88.5-90					17.9



Summary of Laboratory Results

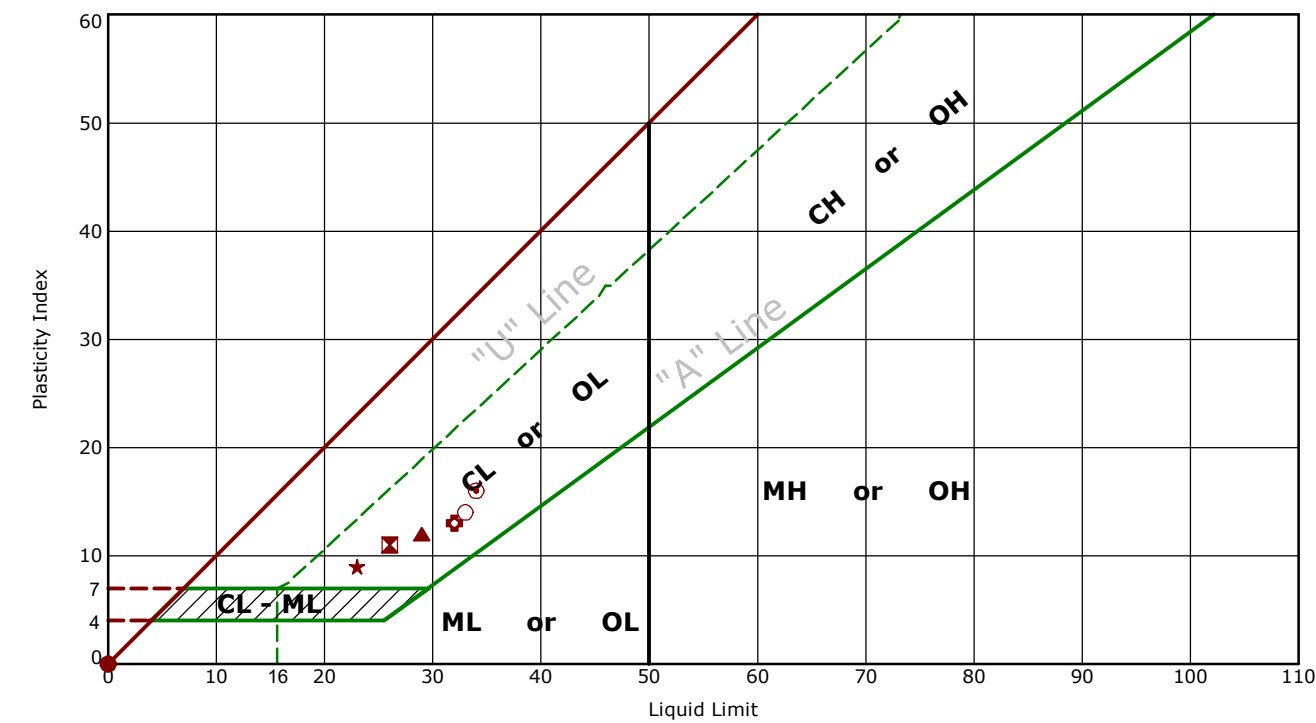
Boring ID	Depth (Ft.)	Liquid Limit	Plastic Limit	Plasticity Index	% Fines	Water Content (%)
B-18-1	93.5-95					19.3
B-18-1	98.5-100					20.3
B-18-2	0.5-2					13.6
B-18-2	3.5-5					23.7
B-18-2	5-6.5					22.6
B-18-2	8.5-10					18.3
B-18-2	13.5-15					18.5
B-18-2	18.5-20	34	18	16	99.2	22.7
B-18-2	23.5-25					28.2
B-18-2	28.5-30					18.3
B-18-2	33.5-35					15.7
B-18-2	38.5-40	32	19	13	90.6	26.3
B-18-2	43.5-45					24.3
B-18-2	48.5-50					18.6
B-18-2	53.5-55					20.8
B-18-2	58.5-60					30.3
B-18-2	63.5-65				21.0	25.5
B-18-2	68.5-70					22.2
B-18-2	73.5-75					19.3



Summary of Laboratory Results

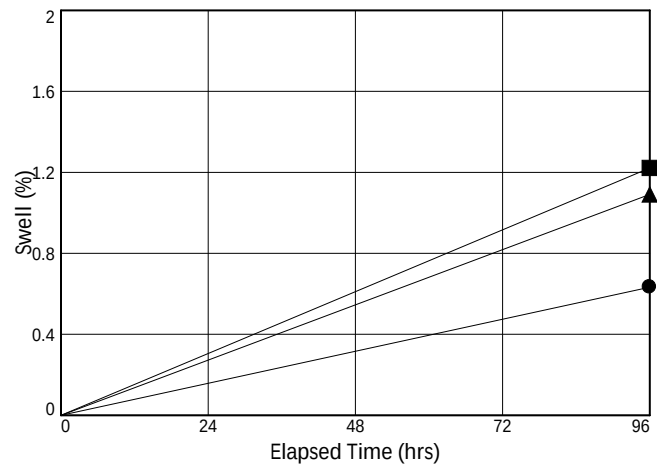
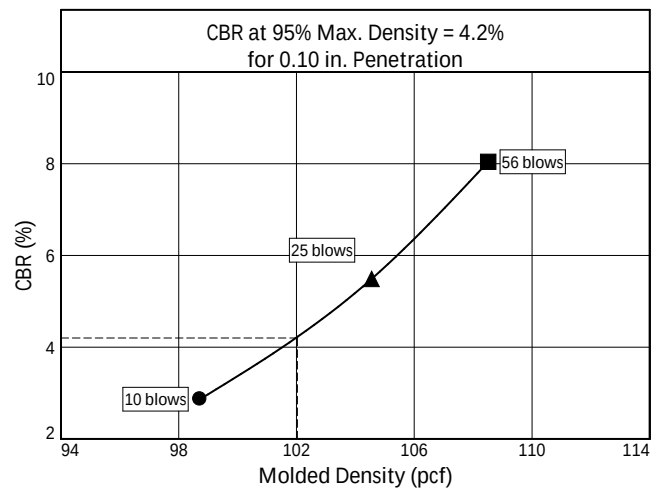
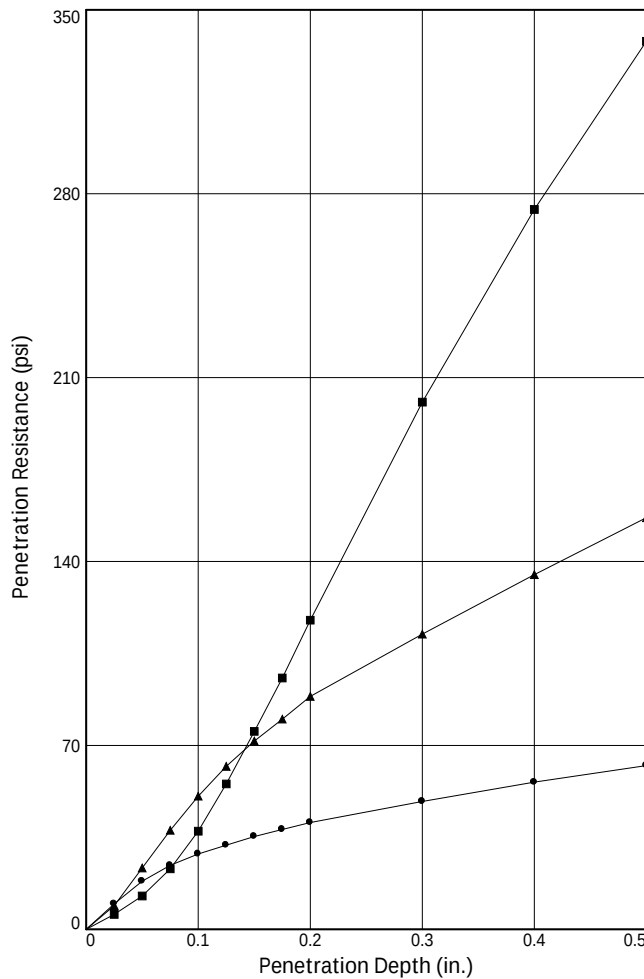
Boring ID	Depth (Ft.)	Liquid Limit	Plastic Limit	Plasticity Index	% Fines	Water Content (%)
B-18-2	78.5-80					19.6
B-18-2	83.5-85					17.4
B-18-2	88.5-90	33	19	14	98.4	21.9
B-18-2	93.5-95					20.6
B-18-2	98.5-100					14.2

Atterberg Limit Results
ASTM D4318



	Boring ID	Depth (Ft)	LL	PL	PI	Fines	USCS	Description
●	B-18-1	7 - 8.5	NP	NP	NP	89.1	ML	SILT
⊠	B-18-1	18.5 - 20	26	15	11	70.6	CL	LEAN CLAY with SAND
▲	B-18-1	48.5 - 50	29	17	12	84.6	CL	LEAN CLAY with SAND
★	B-18-1	78.5 - 80	23	14	9	76.3	CL	LEAN CLAY with SAND
⊙	B-18-2	18.5 - 20	34	18	16	99.2	CL	LEAN CLAY
⊕	B-18-2	38.5 - 40	32	19	13	90.6	CL	LEAN CLAY
○	B-18-2	88.5 - 90	33	19	14	98.4	CL	LEAN CLAY

BEARING RATIO TEST REPORT ASTM D1883



	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ●	98.7	91.9	16.1	98.1	91.3	22.6	2.9	2.7	0.000	10	0.6
2 ▲	104.6	97.4	15.8	103.4	96.3		5.5	6.1	0.009	10	1.1
3 ■	108.5	101	16.2	107.2	99.8	18.3	8.0	11.0	0.056	10	1.2
Material Description							USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Lean Clay							CL	107.4	16.3	26	4

Project No: 1A255160
 Project: AltDeliv_TDOT_West Tennessee Timber Bridge Bundle 2
 Source of Sample: B-18-1 Depth: 0-5'

 Date: 5/12/2026

BEARING RATIO TEST REPORT
Terracon Consultants, Inc.

Test Description:
 Compaction based on D698 efforts.

Figure _____

Client

American Structurepoint Inc
Round Rock, TX

Project

AltDeliv TDOT Timber Bridge Bundle 2
1A255160

Date Received: 7/28/2026

Corrosivity Suite - Results

Sample Location		B-18-1	B-18-2
Sample Depth (ft.)		0.5-3.5'	2.0-3.5'
Acidity (pH)	ASTM G51	7.9	8.3
Water Soluble Sulfate Ion Content (mg/Kg)	AASHTO T290B	209	46
Water Soluble Chloride Ion Content (mg/Kg)	AASHTO T291A	62	125
Oxidation-Reduction Potential (RmV)	ASTM G200	328.5	319.2
Electrical Resistivity ($\Omega \cdot \text{cm}$)	ASTM G57	1600	1300
Total Dissolved Salts (mg/Kg)	AWWA 2520 B	282	412
Water Soluble Sulfide Content (mg/Kg)	AWWA 4500-S,D	Nil	Nil

Verified By: Abby Hagerty
7/29/2026

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.



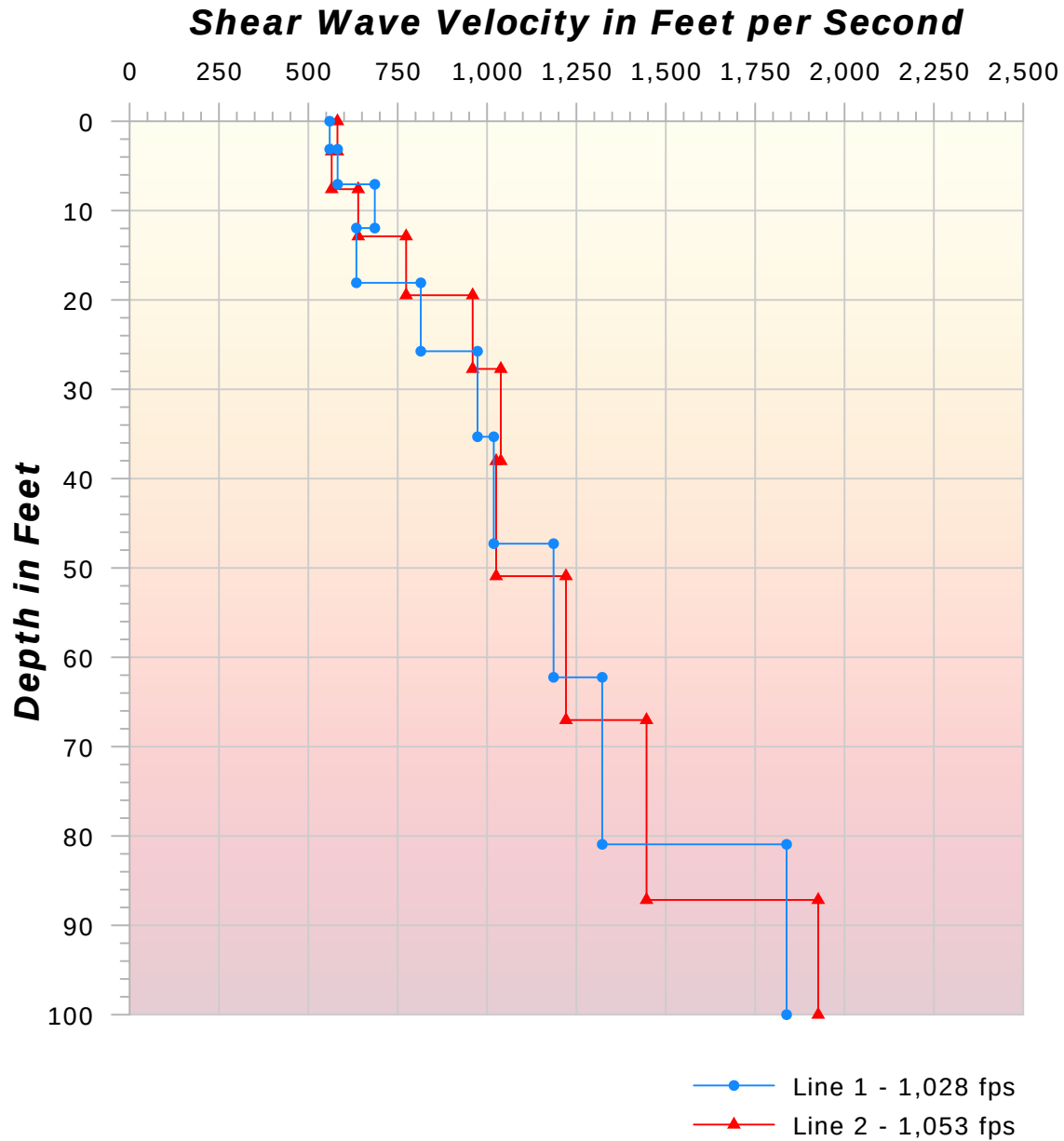
Notes

1) Line and boring locations are approximate. Coordinates were collected via Google Earth approximately every 60 feet.

2) Aerial imagery provided by Google Earth.

	Date: 06/2026 Project No: 1A255160	Geophysical Location Plan	Exhibit
		Replacement of Bridge 18 SR-196 over Russell Creek Fayette County, Tennessee	1

Vs100-ft Model TDOT Bridge 18



Notes:

- 1) Seismic testing was conducted by Terracon on December 16, 2025.
- 2) Shear wave velocity testing and calculations were conducted in general accordance with ASCE 7-22 and IBC 2024.

Drawn By:	AGW	 Date: 05/2026 Project Number: 1A255160	Seismic Site Classification Data	Exhibit
PM:	ECC		Replacement of Bridge 18 SR-196 over Russell Creek Fayette County, Tennessee	2
SME:	NBR			
APR:	JEA			



Supporting Information

Contents:

General Notes

Unified Soil Classification System

General Notes

Sampling			Water Level		Field Tests	
 Grab Sample	 Shelby Tube	 Standard Penetration Test	 Water Initially Encountered		N	Standard Penetration Test Resistance (Blows/Ft.)
			 Water Level After a Specified Period of Time		(HP)	Hand Penetrometer
			 Water Level After a Specified Period of Time		(T)	Torvane
			 Cave In Encountered		(DCP)	Dynamic Cone Penetrometer
			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.		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 (tsf)	Standard Penetration or N-Value (Blows/Ft.)
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	5 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	9 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	16 - 30
		Hard	> 4.00	> 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 $\geq 15\%$ 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 $\geq 15\%$ 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 $\geq 30\%$ plus No. 200 predominantly sand, add "sandy" to group name.

^M If soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.

^N $PI \geq 4$ 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.

