Replacement of Bridge 16 (SR 193 over Alexandar Creek)

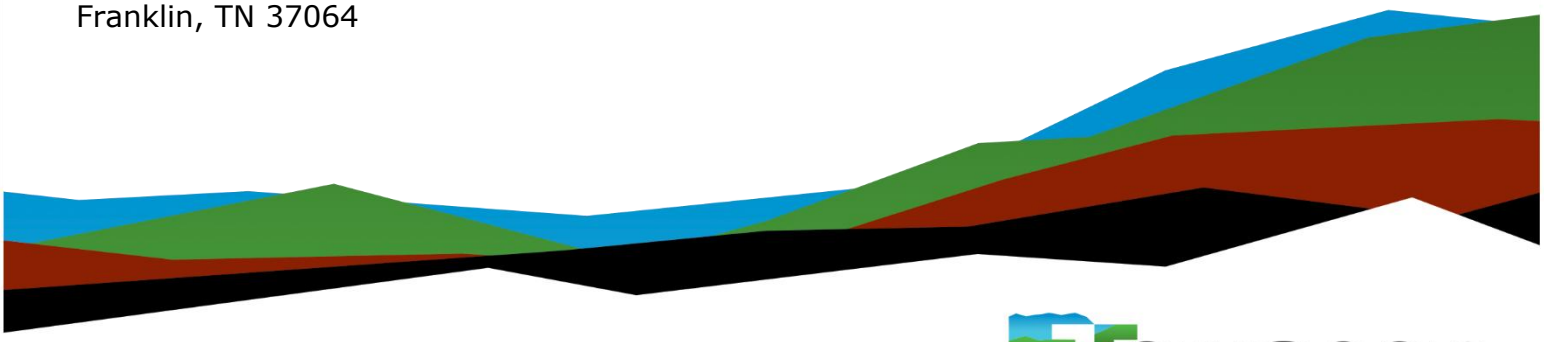
Geotechnical Data Report

Fayette County, Tennessee

August 7, 2026 | Terracon Project No. 1A255160

Prepared for:

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



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August 7, 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 16 (SR 193 over Alexandar Creek)
Fayette County, Tennessee
Terracon Project No. 1A255160

Dear Mr. Liptak:

We have completed the scope of work for the above-referenced project. This draft 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

Babak Vafaei, Ph.D., P.E.*
Senior Engineer
*Licensed in IN, KY, TN, & TX

Kenneth Zur, P.E.*
Program Manager/ Geotechnical Services
*Licensed in IN, GA, KY, NC, SC, TN, & WV

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Introduction

This report presents the results of our subsurface exploration and Geotechnical Data services performed for the proposed bridge replacement located approximately 4 miles west of Macon, TN in Fayette County, Tennessee along SR 193 over Alexandar Creek. The geotechnical Scope of Services included the advancement of test borings, laboratory testing, geophysical testing and preparation of this data report. The exploration locations were determined by Terracon field staff.

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. 16**: 35.146331, -89.555073 See **Site Location**
Current Ground Cover	Away from the existing bridge, pavement is asphalt underlain by aggregate basecourse and fill materials.
Existing Topography (Estimated using Google Earth Pro)	The ground surface at the borings El. is 353 ft MSL.

Geologic Formations

Formation [1]	Description
Alluvial Deposits	The geology is characterized by thick, unconsolidated Quaternary-aged alluvial deposits, including sand, silt, clay, and gravel.

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 boring near the proposed bridge replacement. Each boring encountered asphalt over fill and native (alluvial) soil 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 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
- California Bearing Ratio (CBR)
- Unconfined Compression
- Standard Proctor
- Corrosion testing series

Test results are attached with the boring logs.

Seismic Site Survey

Terracon performed a limited seismic survey consisting of two Multi-Channel Analysis of Surface Waves (MASW) arrays at the bridge site to obtain shear wave velocity values of the soil within the upper 100 feet. Lines 1 and 2 were located on the east and west bridge approaches to the bridge, respectively. Their location 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 geotechnical borings, laboratory testing results, 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	70 to 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 solid 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 test depths.

We also observed the boreholes while drilling for the presence of groundwater. The 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 boring field 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
- Grain Size Analysis
- California Bearing Ratio
- Standard Proctor
- Corrosion testing

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 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

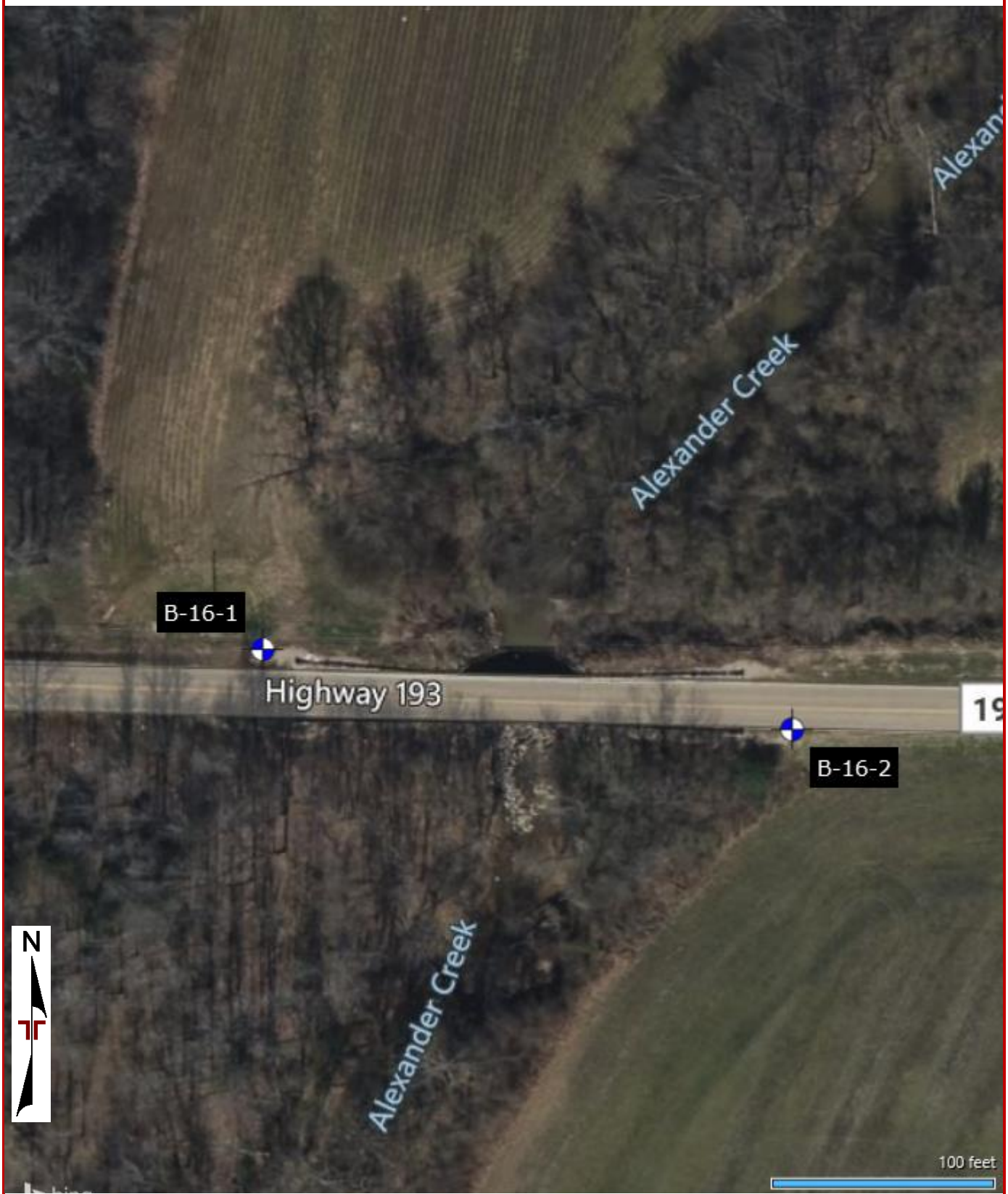


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES MAP PROVIDED BY MICROSOFT BING MAPS

Exploration and Laboratory Results

Contents:

Boring Logs (B-16-1 and B-16-2)
Atterberg Limits
California Bearing Ratio
Grain Size Distribution
Unconfined Compression Test
Standard Proctor
Corrosion Testing
Geophysical Exploration Results

Boring Log No. B-16-1

Location: See Exploration Plan

Latitude: 35.1464° Longitude: -89.5555°

Depth (Ft.) Approximate Elevation: 353 (Ft.)

Depth (Ft.)	Elevation	Description	Sample Type	Field Test Results	HP (tsf)	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI
0.3	352.67	**4" ASPHALT**									
1.5	351.5	**14" AGGREGATE BASE COURSE**									
3.0	350	**FILL - LEAN CLAY (CL)**, brown		10-10-10 N=20	1.5				17.8		
		LEAN CLAY (CL), gray and brown, medium stiff to very soft		3-3-3 N=6	0.75				21.6		
				2-2-2 N=4	0.5				27.4		30-22-8
				1-1-1 N=2	0.5				30.4		
9.5	343.5				0.25	UC	0.21	15	27.5	98	29-20-9
		LEAN CLAY (CL), with silt, gray and brown, stiff		4-6-8 N=14	3				19.5		
13.5	339.5										
		LEAN CLAY (CL), gray and brown, stiff to medium stiff		4-5-5 N=10	1.75				22.5		
				3-4-4 N=8	0.75				27.5		35-22-13
23.5	329.5										
		SILTY SAND (SM), fine grained, brown, medium dense		5-12-15 N=27							
28.5	324.5										
		SILTY SAND (SM), medium grained, reddish brown, dense		12-13-19 N=32							NP
33.5	319.5										
		CLAYEY SAND (SC), fine grained, white and reddish brown, medium dense		5-7-8 N=15							
				4-5-6 N=11							27-12-15
43.5	309.5										
		CLAYEY SAND (SC), medium grained, reddish brown, dense		5-15-30 N=45							
48.5	304.5										
		POORLY GRADED SAND WITH CLAY (SP-SC), medium to coarse grained, reddish brown, medium dense to dense		15-50/5"							

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 provided by others.

Water Level Observations
Groundwater not encountered prior to beginning mud rotary

Drill Rig
CME 75

Hammer Type
Automatic

Driller
Terracon Springfield

Logged by
PJH

Boring Started
01-20-2026

Boring Completed
01-20-2026

Notes

Advancement Method
0 to 11 feet: Continuous Flight Auger

11 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-16-1

Location: See Exploration Plan

Latitude: 35.1464° Longitude: -89.5555°

Depth (Ft.) Approximate Elevation: 353 (Ft.)

Depth (Ft.)	Graphic Log	Water Level Observations	Sample Type	Field Test Results	HP (tsf)	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI
55				20-38-50/5"							
58.5	**POORLY GRADED SAND WITH CLAY (SP-SC)**, medium to coarse grained, reddish brown, medium dense to dense *(continued)*										
294.5											
60	**POORLY GRADED SAND WITH CLAY (SP-SC)**, brown to reddish brown, medium dense to dense			10-9-11 N=20							
65				6-5-9 N=14							
70				10-13-13 N=26							
75				12-20-22 N=42							
78.5											
274.5	**SANDY LEAN CLAY (CL)**, fine grained, white and light red, hard										
80				7-10-29 N=39							
85				5-24-24 N=48							
90				10-28-32 N=60							
95				25-12-27 N=39							
97.0											
256	**SANDY LEAN CLAY (CL)**, white and light red, very stiff, 3" clay seam										
100.0											
253				5-10-15 N=25							
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 provided by others.

Water Level Observations
Groundwater not encountered prior to beginning mud rotary

Drill Rig
CME 75

Hammer Type
Automatic

Driller
Terracon Springfield

Logged by
PJH

Boring Started
01-20-2026

Boring Completed
01-20-2026

Notes

Advancement Method
0 to 11 feet: Continuous Flight Auger

11 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-16-2

Location: See Exploration Plan

Latitude: 35.1463° Longitude: -89.5547°

Depth (Ft.) Approximate Elevation: 353 (Ft.)

Depth (Ft.)	Elevation	Description	Sample Type	Field Test Results
0.5	352.5	**6" ASPHALT**		
1.5	351.5	**12" AGGREGATE BASE COURSE**		
3.0	350	**FILL - CLAYEY GRAVEL (GC)**, brown		4-6-4 N=10
		LEAN CLAY (CL), with silt, brown and gray, soft		3-3-3 N=6
				WOH-1-2 N=3
				2-1-3 N=4
				WOH-1-1 N=2
13.5	339.5	**POORLY GRADED SAND WITH CLAY (SP-SC)**, medium grained, gray, loose		1-2-2 N=4
18.5	334.5	**LEAN CLAY (CL)**, brown, stiff		3-4-5 N=9
23.5	329.5	**POORLY GRADED SAND (SP)**, medium grained, brown, medium dense		6-8-9 N=17
				3-5-9 N=14
33.5	319.5	**POORLY GRADED SAND (SP)**, brown, very dense		7-17-41 N=58
		dense		16-19-21 N=40
43.5	309.5	**POORLY GRADED SAND (SP)**, reddish brown, very dense		37-50/4"
48.5	304.5	**POORLY GRADED SAND (SP)**, brown, dense		10-17-23 N=40

Strength Test			HP (tsf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits	Percent Fines
Test Type	Compressive Strength (tsf)	Strain (%)				LL-PL-PI	

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 provided by others.

Water Level Observations
Groundwater not encountered prior to beginning mud rotary

Drill Rig
CME 75

Hammer Type
Automatic

Driller
Terracon Springfield

Logged by
PJH

Boring Started
01-22-2026

Boring Completed
01-22-2026

Notes
Terminated at 70 ft due to equipment failure.

Advancement Method
0 to 11 feet: Continuous Flight Auger

11 to 70 feet: Mud Rotary

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

Boring Log No. B-16-2

Location: See Exploration Plan

Latitude: 35.1463° Longitude: -89.5547°

Depth (Ft.) Approximate Elevation: 353 (Ft.)

Graphic Log	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	HP (tsf)	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
POORLY GRADED SAND (SP), brown, dense *(continued)*												
very dense	55			13-27-33 N=60								
dense	60			15-25-25 N=50								
very dense	65			21-31-50 N=81								
68.5 284.5												
70.0 **POORLY GRADED SAND (SP)**, fine grained, gray to white, very dense 283	70			41-42-39 N=81								
Boring Terminated at 70 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 provided by others.

Water Level Observations
Groundwater not encountered prior to beginning mud rotary

Drill Rig
CME 75

Hammer Type
Automatic

Driller
Terracon Springfield

Logged by
PJH

Boring Started
01-22-2026

Boring Completed
01-22-2026

Notes
Terminated at 70 ft due to equipment failure.

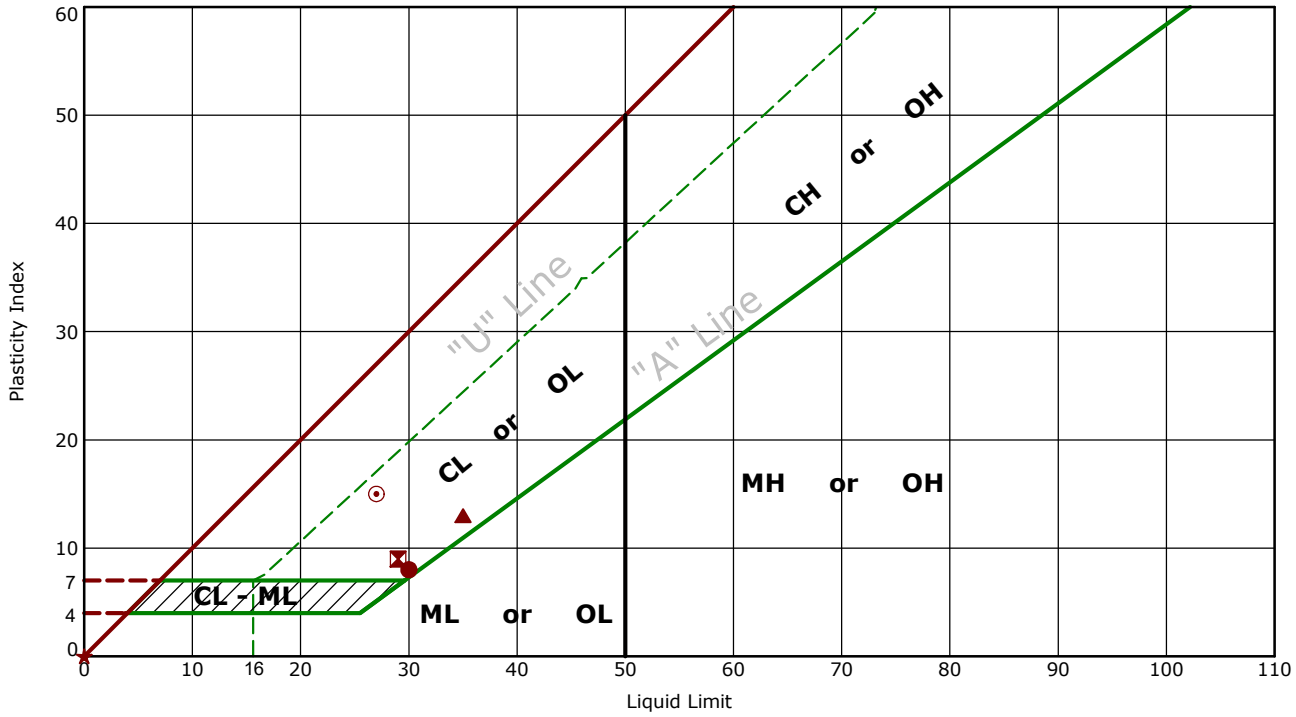
Advancement Method
0 to 11 feet: Continuous Flight Auger

11 to 70 feet: Mud Rotary

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

Atterberg Limit Results

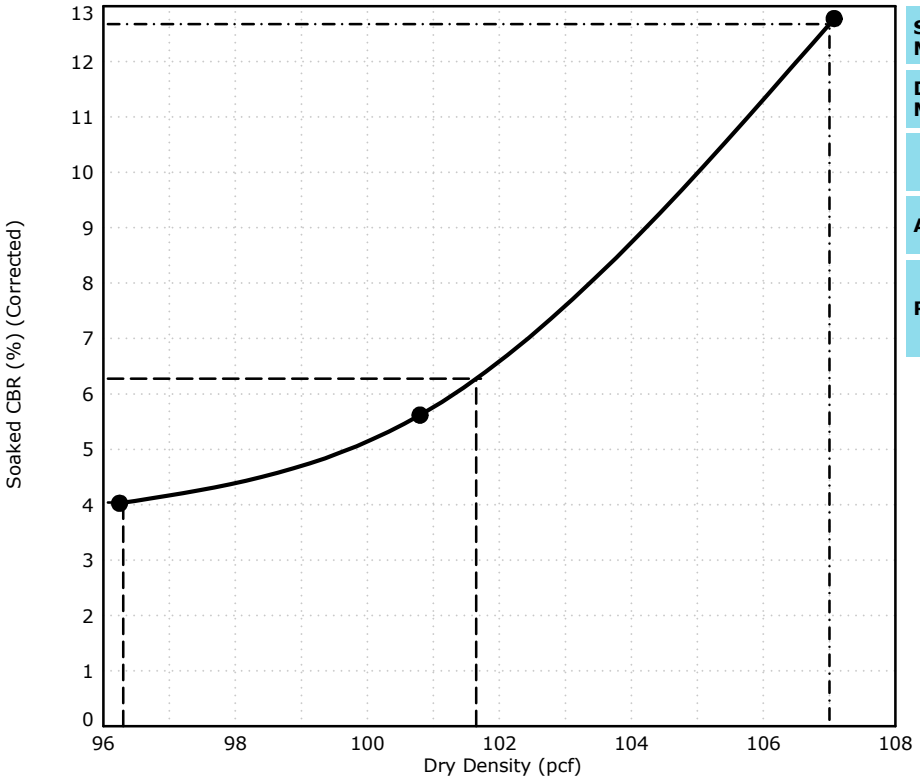
ASTM D4318



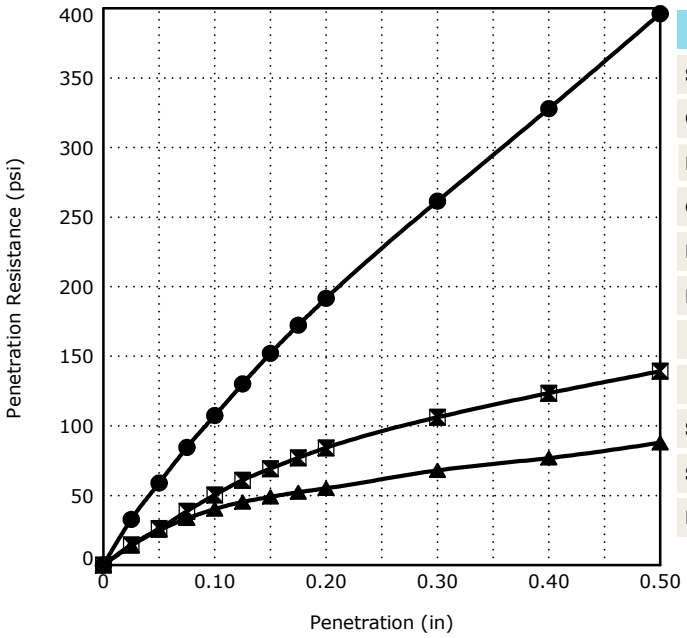
	Boring ID	Depth (Ft)	LL	PL	PI	Fines	USCS	Description
●	B-16-1	4.5 - 6	30	22	8			
⊠	B-16-1	7.5 - 9.5	29	20	9	97.1	CL	LEAN CLAY
▲	B-16-1	18.5 - 20	35	22	13	99.0	CL	LEAN CLAY
★	B-16-1	28.5 - 30	NP	NP	NP	13.7	SM	SILTY SAND
⊙	B-16-1	38.5 - 40	27	12	15	35.0	SC	CLAYEY SAND

California Bearing Ratio

ASTM D1883-07[2]



Source of Material	B-16-1 1.5
Description of Material	
Percent Fines	
Atterberg Limits	LL PL PI
Remarks:	



Sample No.	1	2	3
Sample Condition	Soaked		
Compaction Method	AASHTO T99B		
Maximum Dry Density (pcf)	107	107	107
Optimum Moisture Content (%)	16.7	16.7	16.7
Dry Density before Soaking, (pcf)	107.07	100.80	96.25
Moisture Content, (%)			
After Compaction	15.5	15.1	14.4
Top 1" After Soaking	22.3	23	24
Surcharge, (lbs)	10.00	10.00	10.00
Swell, (%)	0.39	2.36	2.31
Bearing Ratio, (%)	10.7	5.0	4.0

Dry Density @ 90% 96.3 pcf

Dry Density @ 95% 101.7 pcf

Dry Density @ 100% 107.0 pcf

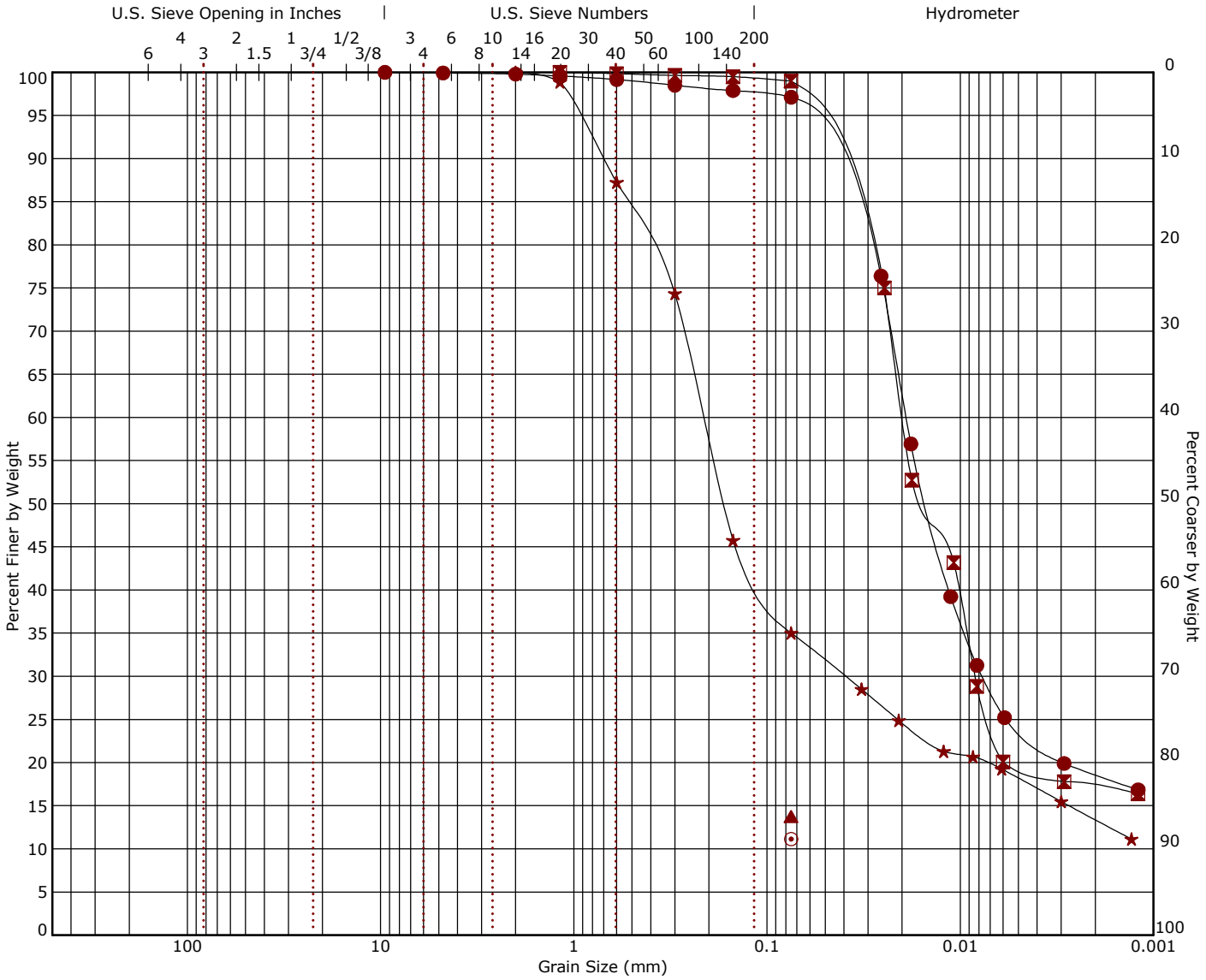
CBR @ 90% Density 4.0

CBR @ 95% Density 6.3

CBR @ 100% Density 12.7

Grain Size Distribution

ASTM D422 / ASTM C136



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

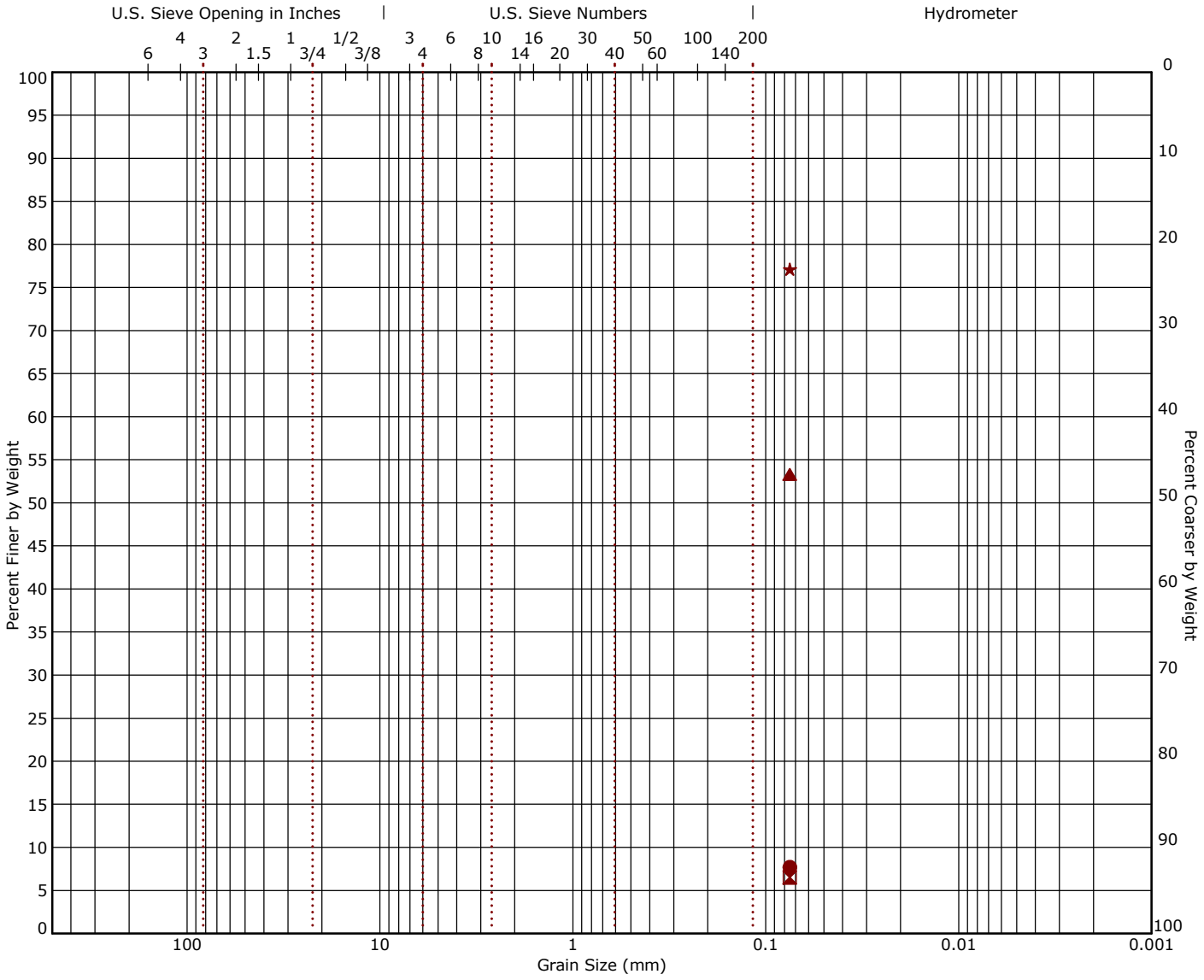
Boring ID		Depth (Ft)	Description	USCS	LL	PL	PI	Cc	Cu
●	B-16-1	7.5 - 9.5	LEAN CLAY	CL	29	20	9		
⊠	B-16-1	18.5 - 20	LEAN CLAY	CL	35	22	13		
▲	B-16-1	28.5 - 30	SILTY SAND	SM	NP	NP	NP		
★	B-16-1	38.5 - 40	CLAYEY SAND	SC	27	12	15		
⊙	B-16-1	48.5 - 49.4							

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
●	B-16-1	7.5 - 9.5	9.5	0.019	0.008		0.0	0.1	2.8	97.1	73.1	24.0
⊠	B-16-1	18.5 - 20	1.18	0.02	0.008		0.0	0.0	1.0	99.0	79.5	19.5
▲	B-16-1	28.5 - 30	0.075							13.7		
★	B-16-1	38.5 - 40	2	0.212	0.039		0.0	0.0	65.0	35.0	16.8	18.2
⊙	B-16-1	48.5 - 49.4	0.075							11.1		

AltDeliv_TDOT_W. TN Timber Bridge Bundle 2
SR 193 Over Alexandar Creek | Fayette County, TN
Terracon Project No. 1A255160

Grain Size Distribution

ASTM D422 / ASTM C136



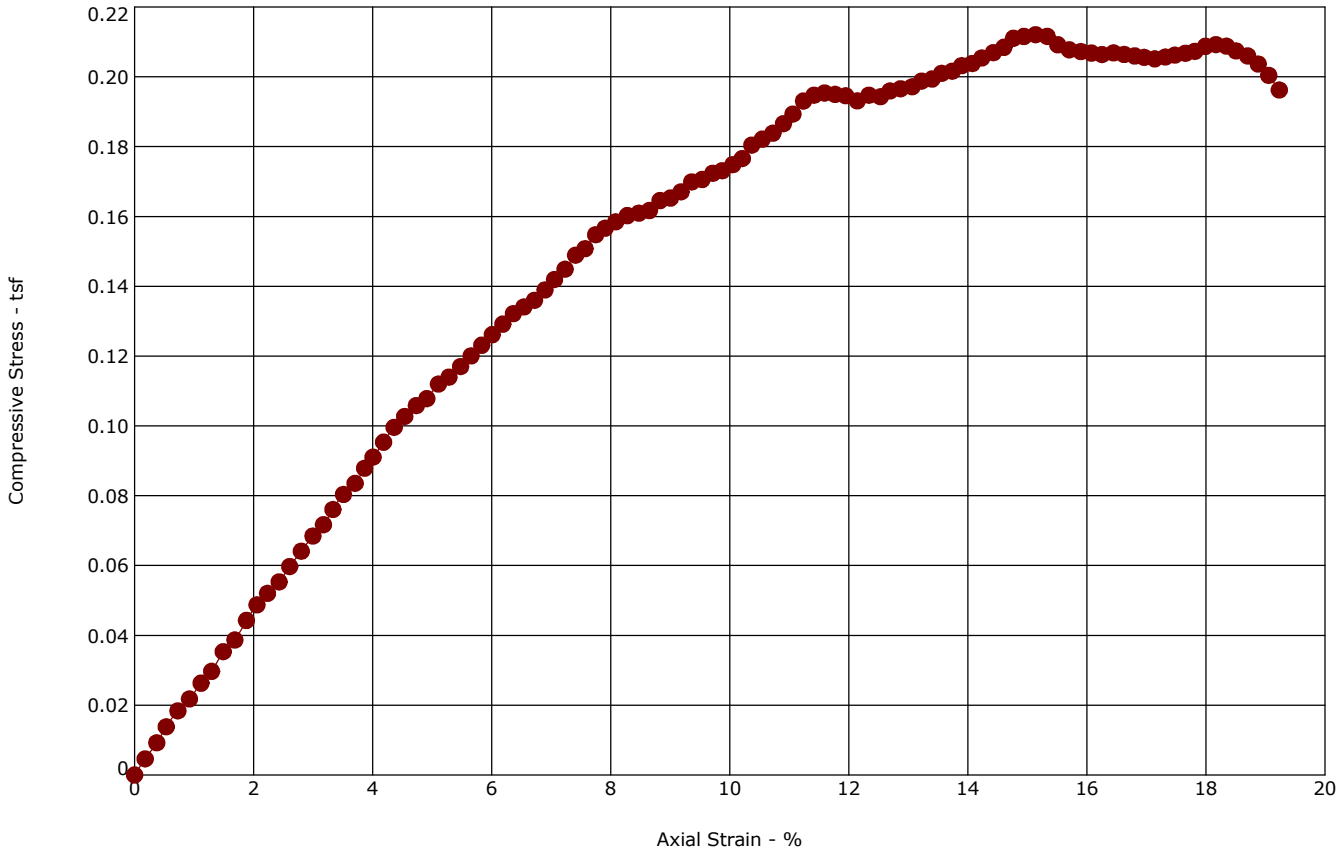
Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Boring ID	Depth (Ft)	Description	USCS	LL	PL	PI	Cc	Cu
B-16-1	58.5 - 60							
B-16-1	73.5 - 75							
B-16-1	83.5 - 85							
B-16-1	93.5 - 95							

Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
B-16-1	58.5 - 60	0.075							7.7		
B-16-1	73.5 - 75	0.075							6.5		
B-16-1	83.5 - 85	0.075							53.3		
B-16-1	93.5 - 95	0.075							77.1		

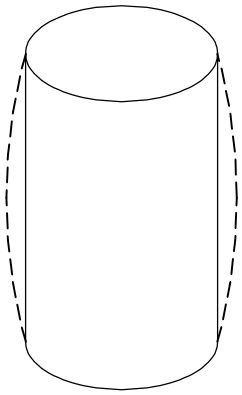
Unconfined Compression Test

ASTM D2166



Boring ID	Depth (Ft)	Sample type	LL	PL	PI	Fines (%)	Description
B-16-1	7.5 - 9.5	Shelby Tube	29	20	9	97.1	LEAN CLAY(CL)

Specimen Failure Mode



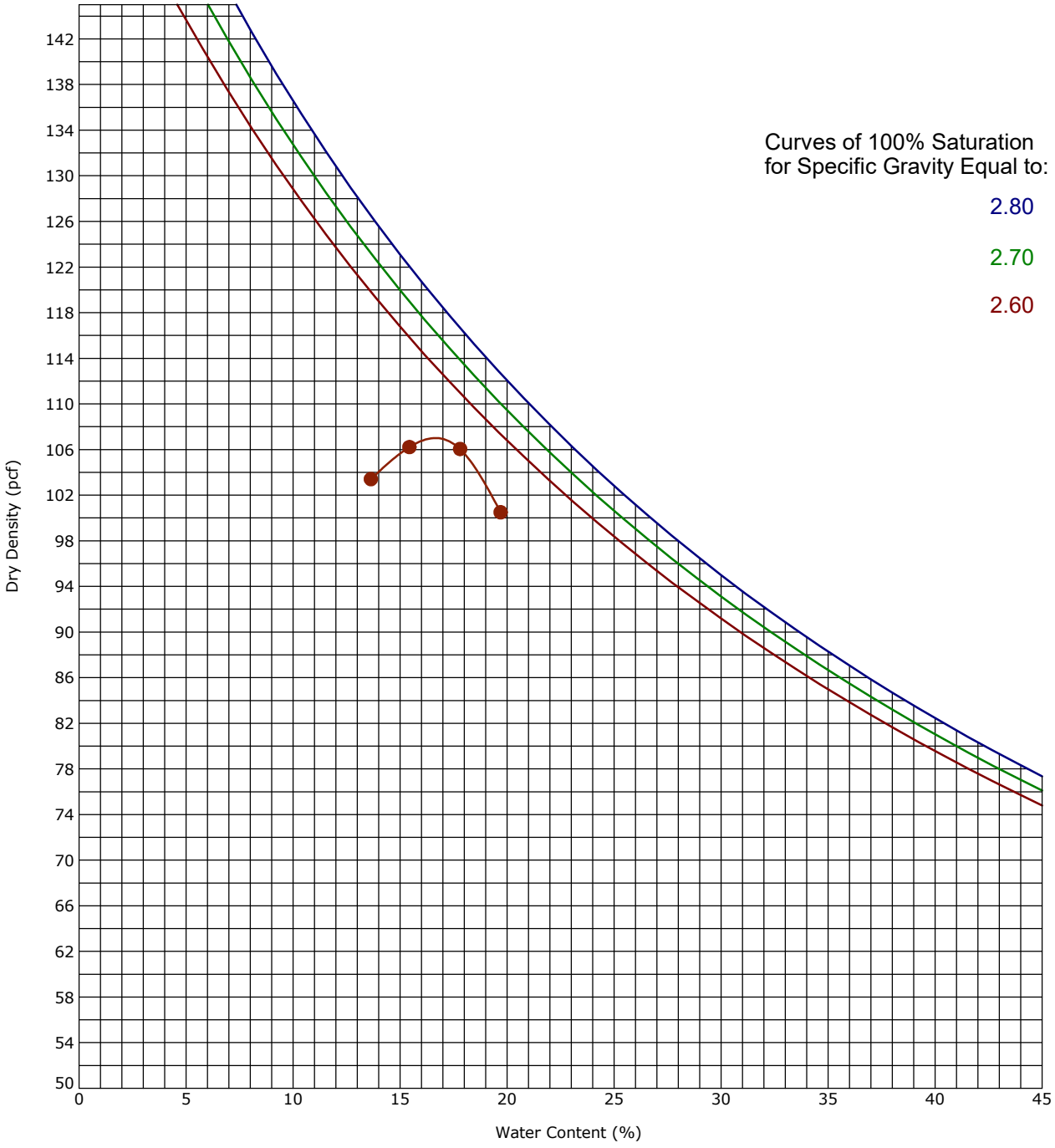
Failure Mode: Bulge (dashed)

Specimen Test Data

Moisture Content (%):	27.5
Dry Density (pcf):	98
Diameter (in.):	2.81
Height (in.):	5.64
Height / Diameter Ratio:	2.00
Calculated Saturation (%):	102.34
Calculated Void Ratio:	0.73
Assumed Specific Gravity:	2.7
Failure Strain (%):	15.00
Unconfined Compressive Strength (tsf):	0.21
Undrained Shear Strength (tsf):	0.11
Strain Rate (in/min):	
Remarks:	

Moisture-Density Relationship

AASHTO T99-Method B



Boring ID	Depth (Ft)	Description of Materials
B-16-1	1.5 - 3	

Fines (%)	Fraction > mm size	LL	PL	PI	Test Method	Maximum Dry Density (pcf)	Optimum Water Content (%)
	0.0				AASHTO T99-Method B	107.0	16.7

Client

American Structurepoint Inc
Round Rock, TX

Project

AltDeliv_TDOT_West Tennessee Timber Bridge Bundle 2
1A255160

Date Received: 3/12/2026*

Corrosivity Suite - *Results*

Sample Location		16.1	16.2
Sample Depth (ft.)		-	-
Acidity (pH)	**AASHTO T289**	6.6	6.5
Water Soluble Sulfate Ion Content (mg/Kg)	**AASHTO T290B**	428	116
Water Soluble Chloride Ion Content (mg/Kg)	**AASHTO T291A**	62	Nil
Oxidation-Reduction Potential (RmV)	**ASTM G200**	353.8	383.4
Electrical Resistivity (Ω·cm)	**ASTM G57**	6700	9300
Total Dissolved Salts (mg/Kg)	**AWWA 2520 B**	341	111
Water Soluble Sulfide Content (mg/Kg)	**AWWA 4500-S,D**	Nil	Nil

Verified By: *Myles Warner*
4/10/2026

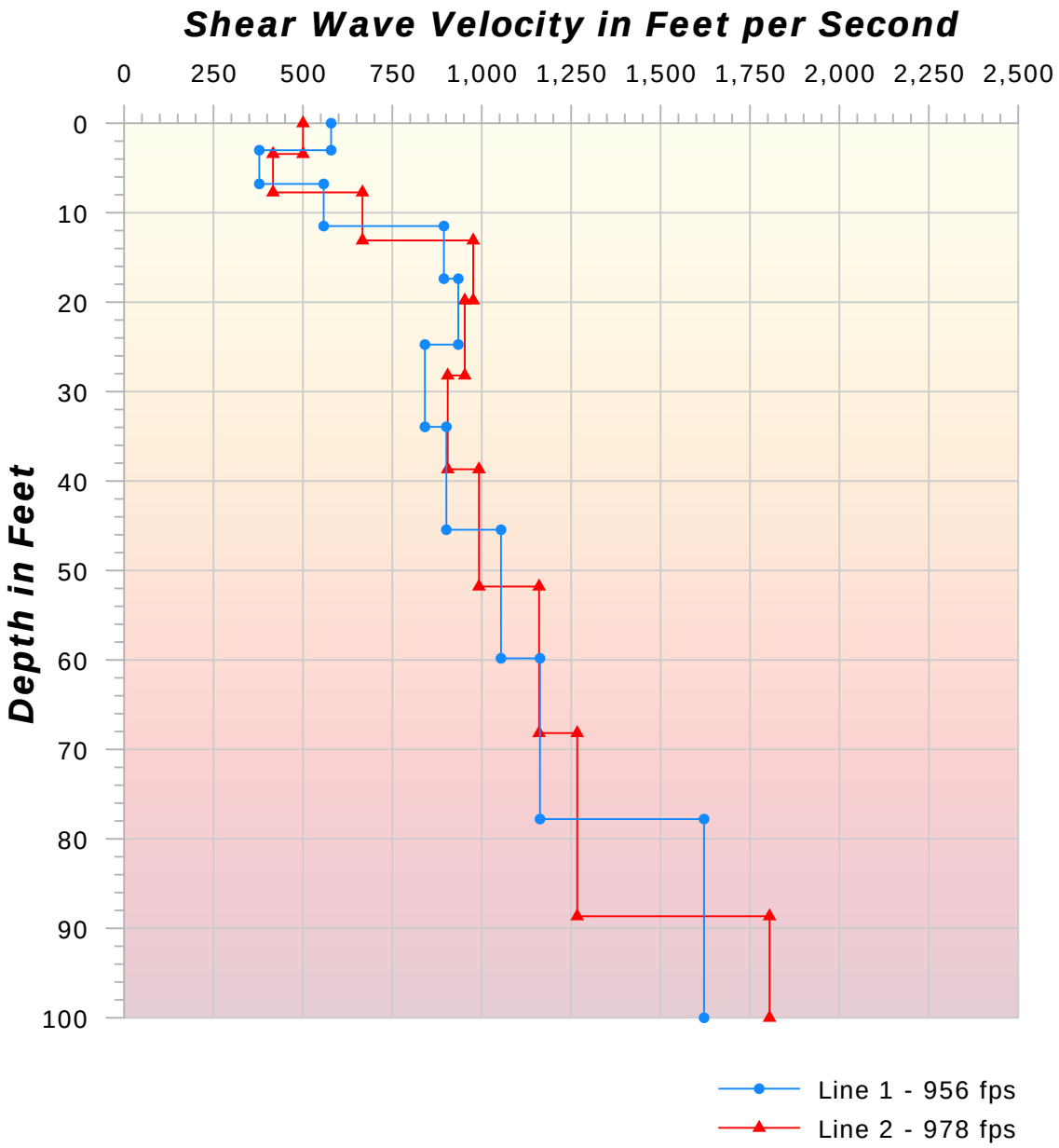
These tests were performed in general accordance with the applicable AASHTO, ASTM, and AWWA test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced without the full written consent of Terracon Consultants Inc.. Test results transmitted herein are 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.

N	Terracon Date: 05/2026 | Project No: 1A255160	Geophysical Location Plan Replacement of Bridge 16 SR-193 over Alexander Creek Fayette County, Tennessee	Exhibit 1

Vs100-ft Model
TDOT Bridge 16



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	Terracon Date: 05/2026 Project Number: 1A255160	Seismic Site Classification Data	Exhibit
PM:	ECC		Replacement of Bridge 16 SR-193 over Alexander 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 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.	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

Relative Density	Standard Penetration or N-Value (Blows/Ft.)
Very Loose	0 - 3
Loose	4 - 9
Medium Dense	10 - 29
Dense	30 - 50
Very Dense	> 50

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

Consistency	Unconfined Compressive Strength Qu (psf)	Standard Penetration or N-Value (Blows/Ft.)
Very Soft	less than 500	0 - 1
Soft	500 to 1,000	2 - 4
Medium Stiff	1,000 to 2,000	5 - 8
Stiff	2,000 to 4,000	9 - 15
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. 4 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.

