S-42-31 (Cannons Campground Road) over Peters Creek Emergency Bridge Replacement

Spartanburg County, SC
Geotechnical Subsurface Data Report

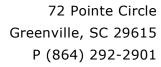
March 10, 2025 | SCDOT Project ID: P041165

Terracon Project No.: 8623P180

Prepared for:

HNTB Corporation 343 E. Six Forks Road, Suite 200 Raleigh, NC 27609







Terracon.com

March 10, 2025

HNTB Corporation 343 E. Forks Road, Suite 200 Raleigh, NC 27609

Attn: Mr. Spencer Franklin, PE, Senior Vice President

P: 919-546-8997

Re: Geotechnical Subsurface Data Report

S-42-31 over Peters Creek Emergency Bridge Replacement

Spartanburg County, South Carolina

SCDOT Project ID.: P041165 Terracon Project No.: 8623P180

Dear Mr. Franklin:

Terracon Consultants Inc. (Terracon) has completed the exploration, testing and limited engineering analysis services (contained in the geotechnical baseline report) for the above referenced project. The services were conducted in general accordance with our Task Order Number 001, dated May 25, 2023.

Introduction

HNTB Corporation (HNTB) has contracted Terracon to perform subsurface exploration, and laboratory testing for the replacement of the S-42-31 Bridge over Peters Creek in Spartanburg County, South Carolina. This GSDR was prepared in general accordance with the 2022 SCDOT Geotechnical Design Manual (GDM).

Project Description

The project site is located at the S-42-31 (Cannons Campground Road) crossing over Peters Creek in Spartanburg County, South Carolina. Site location and exploration plans are presented in Appendix A of this report. Based on the conceptual plans by HNTB dated 2/17/2025, the replacement bridge will be constructed on the same alignment as the current bridge. The current plan indicates the new bridge will be a 170-ft long multi-span bridge constructed with AASHTO Type III Prestressed Concrete Beams.

Geotechnical Subsurface Data Report

S-42-31 over Peters Creek Emergency Bridge Replacement | Spartanburg County, SC March 10, 2025 | Terracon Project No. 8623P180 | SCDOT Project ID: P041165



Geotechnical Testing

The geotechnical exploration for this project was performed between January 13 and February 6, 2025. The results of our fieldwork and our associated laboratory testing are included in Appendices A and B.

Field Exploration

Our field exploration consisted of the following:

- Two (2) Standard Penetration Test (SPT) Borings (S-42-31-1 and S-42-31-2)
- Two (2) offset auger probes near S-42-31-2 for bulk sample collection
- One (1) Downhole Shear Wave Velocity Test (DHT-1) performed in casing installed within Boring S-42-31-2
- Two (2) Cone Penetration Test soundings (S-42-31-1C and S-42-31-2C).

The tests were performed at the approximate locations as approved by SCDOT. A description of our testing methods and graphical logs outlining the soil conditions at each test location are presented in Appendix A. The test locations were established in the field by Terracon and surveyed by Thomas & Hutton, LLC after completion.

Laboratory Testing

The following laboratory tests were performed on the soil samples collected at the site.

- Twenty-seven (27) Natural Moisture Content Tests
- Eight (8) Atterberg Limits Tests
- Nine (9) Grain Size Tests
- Four (4) Grain Size Tests with Hydrometer
- One (1) Remolded, Consolidated-Undrained (CU) Triaxial Compression Test with Pore Pressure Readings
- One (1) Standard Proctor Test
- One (1) Corrosivity Suite (pH, chloride content, sulfate content, and resistivity tests)
- Seven (7) Compressive Strength of Rock Cores

The general scope of the laboratory testing frequency was determined by the SCDOT. The laboratory testing assignment was performed by our engineers. The laboratory procedures and results of the laboratory tests are presented in Appendix B.

Geotechnical Subsurface Data Report

S-42-31 over Peters Creek Emergency Bridge Replacement | Spartanburg County, SC March 10, 2025 | Terracon Project No. 8623P180 | SCDOT Project ID: P041165



Closure

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

Sincerely,

Terracon Consultants, Inc.

Maggie McKenney, EIT Senior Staff Engineer Abdul Q. Fekrat, PhD, PE
Senior Engineer
SC Registration No. 38531

TERRACON

CONSULTANTS.

No. C2220

OF AUTHORITICATION

OF



Appendix A Field Exploration

Exhibit A-1 – Site Location Map

Exhibit A-2 – Aerial Exploration Plan

Exhibit A-3 – Boring Location Diagram

Exhibit A-4 – Field Testing Summary

Exhibit A-5 – GeoScoping Form (2 Pages)

Exhibit A-6 – Field Exploration Description (3 Pages)

Exhibit A-7 - Soil Description Terms

Exhibit A-8 - Soil/Rock Symbols

Exhibit A-9 – Boring Logs (4 Pages)

Exhibit A-10 – Grout Logs (4 Pages)

Exhibit A-11 – Rock Core Photograph Logs (2 Pages)

Exhibit A-12 – Geophysical Testing Results

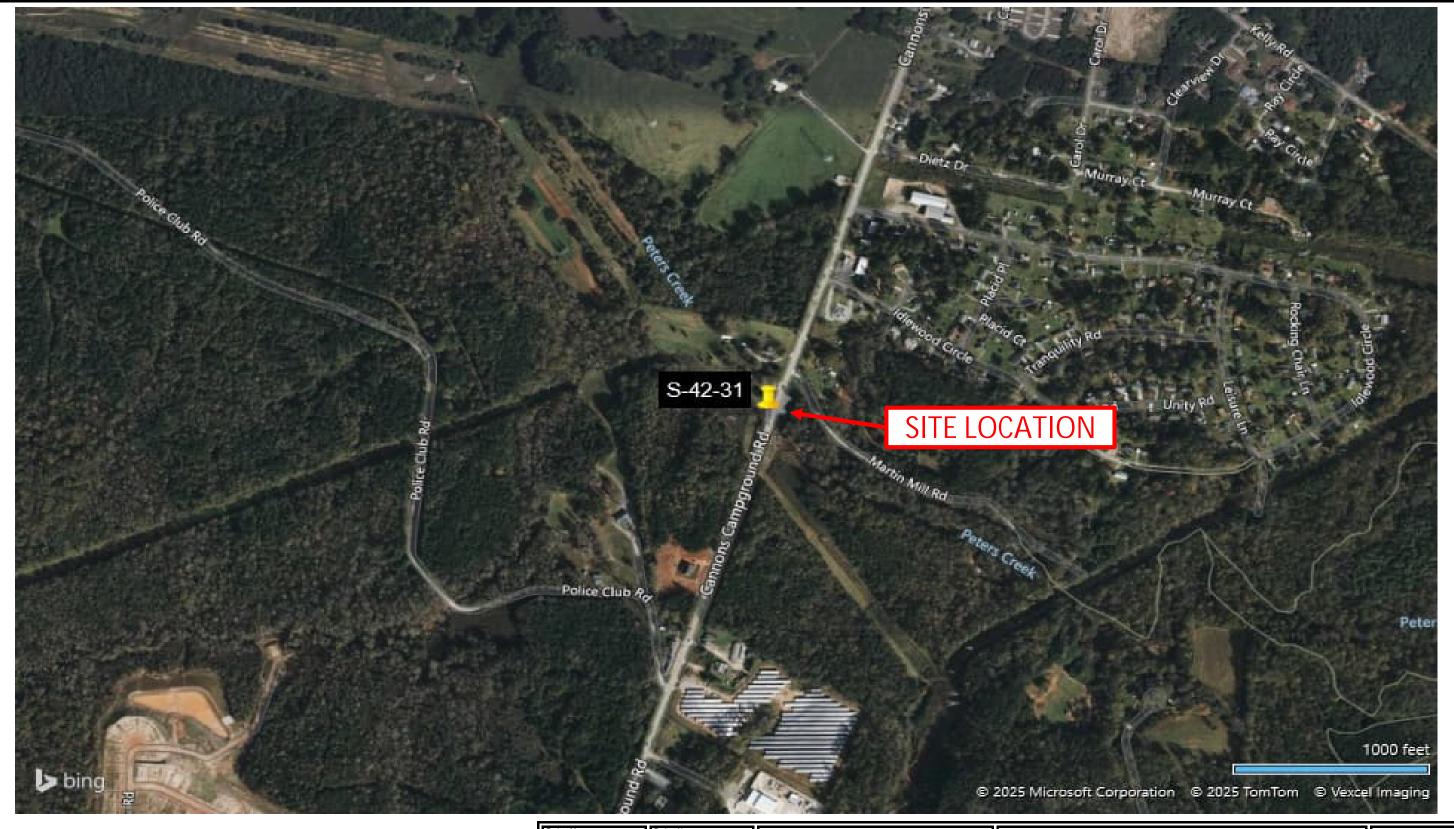
Exhibit A-13 – CPT Sounding Logs (2 Pages)

Exhibit A-14 – Boring Logs Done by F&ME (4 Pages)

Exhibit A-15 – Rock Core Photograph Logs Done by

F&ME (3 Pages)

Note: All exhibits are one page unless noted above





AERIAL PHOTOGRAPHY PROVIDED BY BING DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Mgr:	JA	Project No.	
Drawn by:	MM		8623P180
Checked by:	JA	Scale:	AS SHOWN
Approved by:	JA	Date:	2/27/2025



SITE LOCATION MAP

S-42-31 (Cannons Campground Road) over Peters Creek Emergency Bridge Replacement

Spartanburg County, SC P041165

EXHIBIT

A-1





AERIAL PHOTOGRAPHY PROVIDED BY GOOGLE EARTH DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Mgr:	JA	Project No.	000000400
Drawn by:	MM		8623P180
Checked by:	JA	Scale:	AS SHOWN
Approved by:	JA	Date:	2/27/2025

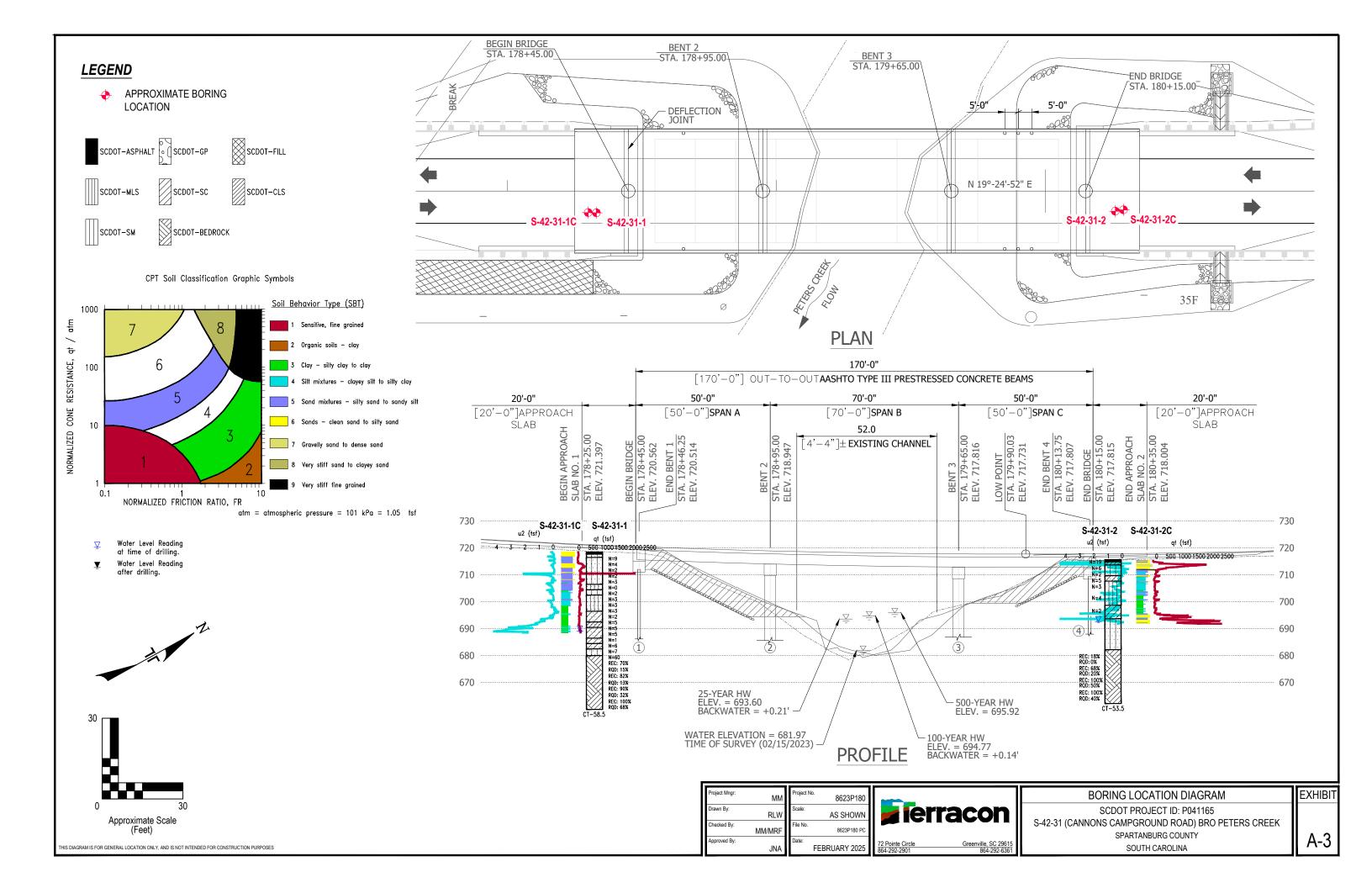


S-42-31 (Cannons Campground Road) over **Peters Creek Emergency Bridge Replacement**

Spartanburg County, SC

EXHIBIT

A-2



Soil Testing Location Table - Exhibit A-4

S-42-31 over Peters Creek Emergency Bridge Replacement | Spartanburg County, SC

Terracon Project No.: 8623P180 | SCDOT Project ID: P041165



Test Number	Туре	Test Hole Local	Northing	Easting	Latitude	Longitude	Station ¹	Offset ¹	Elevation ² (ft)	Depth (ft)
S-42-31-1	STB	Begin Bridge	1152580.06	1737390.87	34.99793	-81.87675	178+33	8.1-R	720.5	58.5
S-42-31-1C	CPT	Begin Bridge	1152576.65	1737389.59	34.99792	-81.87676	178+30	8-R	720.7	30.2
S-42-31-2	STB	End Bridge	1152762.25	1737452.90	34.99843	-81.87655	180+26	7.5-R	716.8	53.5
S-42-31-2C	CPT	End Bridge	1152765.44	1737453.40	34.99844	-81.87655	180+29	7-R	716.9	23.6

^{1.} Stations and offsets were based on the state plane coordinates collected by Thomas & Hutton.

^{2.} Elevations are based on NAVD 88.

^{3.} A composite bulk sample was collected about 5.8 feet and 6.3 feet north of S-42-31-2.

Exhibit A-5 GeoScoping Form

	PROJECT	INFORMATION	
Project ID:	P041165	Date of Trip:	1/14/2025
County:	Spartanburg	Location:	Spartanburg
Rd/ Route:	S-42-31	Local Name:	Cannons
Attendees:	M. McKenney		Campground Rd

	EXISTING BRIDGE INF	FORMATION	
Bridge Length:	150 ft	Bridge Width:	38.5 ft
Superstructure Type:	Concrete framing and decking	Substructure Type:	Timber Piles
Begin Bridge Sta ¹ :	178+45	End Bridge Sta ¹ :	180+15
Begin Bridge Embankment Sta ¹ :	177+45	End Bridge Embankment Sta ¹ :	181+15
Structure Number:	04212	Posted Weight Limit:	20 tons
Crossing:	Peters Creek	Skew:	N/A
Latitude:	34.99820°	Longitude:	-81.87667°
Existing Fill Height:	approx 8 to 16 ft	Approx Existing Slope Angle:	2H:1V
1. Begin & End Bridge Embankment 100	oft down Sta. or up Sta., respectively. Sta. e	stimated from overlay of bridge plan provide	ed by HNTB.

	EXISTING ROADWAY EM	IBANKMENT INFORMATION	
Begin Project Sta:	177+00	Begin Bridge Embankment Sta:	177+45
Accessibility Issues:	None Observed		
Ground Cover:	Asphalt pavement and grasse	ed shoulders	
Existing Fill Height:	16 feet, sloping	Approx Existing Slope Angle:	2H:1V
Local Development:	developed - residential		
Topography:	graded slope to creek		
Traffic Control Necessary:	No, bridge closed for constru	ction	
Surface Soils:	silty sand	Muck:	No
Exposed Rock in Stream Bed:	Yes	Exposed Rock in banks:	Yes
Wetlands on Site:	Yes	Wetland Adjacent:	Yes
Depth FG to Water:	36 feet	Water Depth:	2 feet
Depth to Existing Ground:	approximately 38 feet at cen	ter of bridge	
Scour Condition at EB:	Critical	Scour Condition at IB:	Critical
End Bridge Embankment Sta:	181+15	End Project Sta:	182+00
Accessibility Issues:	None Observed		
Ground Cover:	Asphalt pavement and grasse	ed shoulders	
Existing Fill Height:	8 feet, sloping	Approx Existing Slope Angle:	2H:1V
Local Development:	developed - residential		
Topography:	graded slope to creek		
Traffic Control Necessary:	No, bridge closed for constru	ction	
Surface Soils:	clayey sand	Muck:	No
Exposed Rock in Stream Bed:	Yes	Exposed Rock in banks:	Yes
Wetlands on Site:	Yes	Wetland Adjacent:	Yes
Depth FG to Water:	36 feet	Water Depth:	2 feet
Depth to Existing Ground:	approximately 38 feet at cen	ter of bridge	
Scour Condition at EB:	Critical	Scour Condition at IB:	Critical

GDF 00 Rev. 01/2019

Exhibit A-5 GeoScoping Form

	UTILITIES INFORMATION
Attached:	A telephone conduit was observed to be attached along the west side of the bridge
Above Ground:	Overhead power with attached AT&T cable was observed along the east side of the bridge. A Duke Power easement was observed crossing diagonally over the south end of the bridge. A 16-inch waterline and 8-inch ductile iron sewer line was observed above ground along the east side of the bridge.
Underground:	A 42-inch underground waterline was observed along the west side of the bridge. An underground gas line was observed along the east side of the bridge. Underground sewer was observed crossing over the north end of the bridge.

Comments:

GDF 00 Rev. 01/2019

Exhibit A-6 - Subsurface Exploration Description

S-42-31 over Peters Creek Emergency Bridge Replacement | Spartanburg County, SC Terracon Project No. 8623P180 | SCDOT Project ID: P041165



Field Exploration Description Overview

The testing locations were determined by Terracon and submitted to SCDOT for approval. Terracon located the test locations in the field using handheld GPS and measurements from existing structures shown on the provided drawings. The borings were surveyed by Thomas & Hutton after testing and drilling was complete. The locations, as shown in the Exploration Plans, are shown to the scale indicated.

A field log of each test location was prepared by our engineer. The final boring logs included with this report represent the engineer's description of the encountered conditions modified as necessary based on laboratory test results of the individual samples.

Soil Test Borings (STB)

All boring and sampling operations were conducted in general accordance with the following procedures:

- SCDOT Geotechnical Design Manual 2022
- ASTM D5783, "Standard Guide for Use of Direct Rotary Drilling with Water-Based Drilling Fluid for Geo-environmental Exploration"
- ASTM D6151, "Standard Practice for Using Hollow-Stem Augers for Geotechnical Exploration and Soil Sampling
- ASTM D1586 "Test Method for Penetration Test and Split-Barrel Sampling of Soils"
- ASTM D4220 "Standard Practices for Preserving and Transporting Soil"
- ASTM D2113 "Standard Practice for Rock Core Drilling and Sampling of Rock for Site Exploration"
- ASTM D5079 "Standard Practices for Preserving and Transporting Rock Core Samples"

Each soil test boring was advanced using rotary wash drilling techniques. Soil samples were obtained with a standard 1.4-inch I.D., 2-inch O.D., split-barrel sampler, also known as a standard split-spoon. The sampler is advanced into the soil a total of 18 to 24 inches by striking the drill rod using a 140-pound automatic hammer falling 30 inches. The number of blows required to advance the sampler for each of three to four, 6-inch increments is recorded. The sum of the number of blows for the second and third increments is called the "Standard Penetration Value", or N-value (N_{meas}, blows per foot). The N-value, when properly evaluated, is an index to the soil strength.

Soil classification provides a general guide to the engineering properties of various soil types and enables the engineer to apply his experience to current situations. In our exploration, samples obtained during drilling operations are examined and visually classified by a geotechnical engineer using the procedures outlined in ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System). Laboratory testing was also performed on select split-spoon samples to evaluate index properties for further classification. The soils are described according to color, texture, and relative density or

Exhibit A-6 - Subsurface Exploration Description

S-42-31 over Peters Creek Emergency Bridge Replacement | Spartanburg County, SC Terracon Project No. 8623P180 | SCDOT Project ID: P041165



consistency (based on standard penetration resistance). The designations shown on the logs are described in the 2022 SCDOT Geotechnical Design Manual, Chapter 6.

The borings were advanced either to the planned drilling depth at which they were terminated, or to refusal of the drilling equipment. Select borings were continued below this depth using diamond bit rock coring techniques. NQ2 sized cores were recovered from the borehole. The rock recovery ratios (REC, percentage of the total core run), Rock Quality Designation (RQD, percentage of the total core run of pieces greater than 4 inches) were recorded along with a description of the rock. An explanation of the rock descriptions shown on the logs is provided in the SCDOT GDM Chapter 6. Photos of the recovered rock core specimens are provided in the Rock Core Photograph Log.

Groundwater readings were collected from the soil test borings after 24 hours if site constraints allowed the borings to stay open. If collected, water levels are indicated on the boring logs. The borings were advanced using mud rotary drilling techniques, and time-of-drilling water levels may not be reliable. Due to active construction taking place on the bridge at the time of drilling, borings were immediately backfilled after completion.

At the conclusion of the work, the boreholes holes were backfilled with the drill cuttings and clean sand. The upper 20 feet of the tests in the existing roadways and embankments were grouted with a cement bentonite grout. Test locations performed in existing pavements were capped with cold-patch asphalt.

Cone Penetration Test (CPT) Soundings

Cone Penetration Test soundings were conducted in accordance with ASTM D5778 Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils.

Downhole Shear Wave Velocity Test (DHT)

One downhole seismic test was performed in a cased borehole drilled for this project. After the test boring was completed, the boring was filled with a fluid water/cement/bentonite grout and then a threaded PVC pipe casing (capped at the bottom end) was inserted into the borehole, providing a uniform bond between the soil and pipe exterior.

The downhole seismic test consisted of placing two downhole triaxial geophones at selected depth intervals in the borehole casing. The geophone was connected to a recording device (Seismic Source Daq Link 5 Seismograph) at the surface and clamped to the side of the casing at the selected test depth. The geophones are equipped with a spring-arm that is released at the bottom of the boring. The spring expands and forces the geophone against the casing wall. The interval between each geophone and each test depth was 3 feet for the entire depth of the cased borehole. An instrumented hammer was then used to strike a steel plate with cleats at the bottom (often called a shear wave golf shoe) that penetrated the ground and prevented sliding when struck. The steel plate was oriented to generate horizontal shear waves (SH) at the surface. An additional plate was also struck to better produce compression

Exhibit A-6 - Subsurface Exploration Description

S-42-31 over Peters Creek Emergency Bridge Replacement | Spartanburg County, SC Terracon Project No. 8623P180 | SCDOT Project ID: P041165



waves. The horizontal distance was measured, and the plate was set exactly 10 feet from the borehole. The recorder was set to record the arrival times of the shear waves at the geophone locations. At least 15 blows (5 in each direction on the golf shoe, and 5 on the steel plate) were struck for each test depth to electronically stack and polarize the observed data, and to increase the signal-to-noise ratio. The data was stored on computer disks for processing and computation. The geophone was raised to the next depth interval and the process was repeated.

Shear Wave Velocity Test Results shows the downhole shear wave velocity and compressive wave velocity test results. The data was evaluated using the Fixed Interval method. S-wave arrival times using the Interval method were picked based on the onset of the signal (first break) as observed in the software package TomTime by GeoTom.

SOIL DESCRIPTION TERMS

Relative Density/Consistency Terms

Relative Densit	<u>y¹</u>		Consistency ²		
	-		_	Unconfined	SPT Blow
Descriptive	Relative	SPT Blow	Descriptive	Compression	Count
Term	Density	Count	Term	Strength (q _u) (tsf)	
Very Loose	0 to 15%	4 and less	Very Soft	0.25 and less	2 and less
Loose	16 to 35%	5 to 10	Soft	0.26 to 0.50	3 to 4
Medium Dense	36 to 65%	11 to 30	Firm	0.51 to 1.00	5 to 8
Dense	66 to 85%	31 to 50	Stiff	1.01 to 2.00	9 to 15
Very Dense	86 to 100%	51 and more	Very Stiff	2.01 to 4.00	16 to 30
•			Hard	4.01 and more	31 and more

Moisture Condition

<u>Descriptive Term</u> <u>Criteria</u>

Dry Absence of moisture, dusty, dry to the touch

Moist Damp but no visible water

Wet Visible free water, usually in coarse-grained soils below the water table

Color

Describe the sample color while sample is still moist.

Angularity¹

Descriptive Term Criteria

Angular Particles have sharp edges and relatively plane sides with unpolished surfaces.

Subangular Particles are similar to angular description but have rounded edges.

Subrounded Particles have nearly plane sides but have well-rounded corners and edges.

Rounded Particles have smoothly curved sides and no edges.

HCI Reaction³

<u>Descriptive Term</u> <u>Criteria</u>

None Reactive No visible reaction

Weakly Reactive Some reaction, with bubbles forming slowly

Strongly Reactive Violent reaction, with bubbles forming immediately

Cementation³

Descriptive Term Criteria

Weakly Cemented Crumbles or breaks with handling or little finger pressure Moderately

Cemented Crumbles or breaks with considerable finger pressure

Strongly Cemented Will not crumble or break with finger pressure

Particle-Size Range¹

Gravel Diameter, mm Sieve Size Diameter, mm Sieve Size Sand #4 to 3/4 inch #200 to #40 4.76 to 19.1 Fine 0.074 to 0.42 Fine Coarse 19.1 to 76.2 34 inch to 3 inch #40 to #10 Medium 0.42 to 2.00 4.00 to 4.76 #10 to #4 Coarse

Primary Soil Type^{1, 2}

The primary soil type will be shown in all capital letters.

USCS Soil Designation

Indicate USCS soil designation as defined in ASTM D-2487 and D-2488

AASHTO Soil Designation

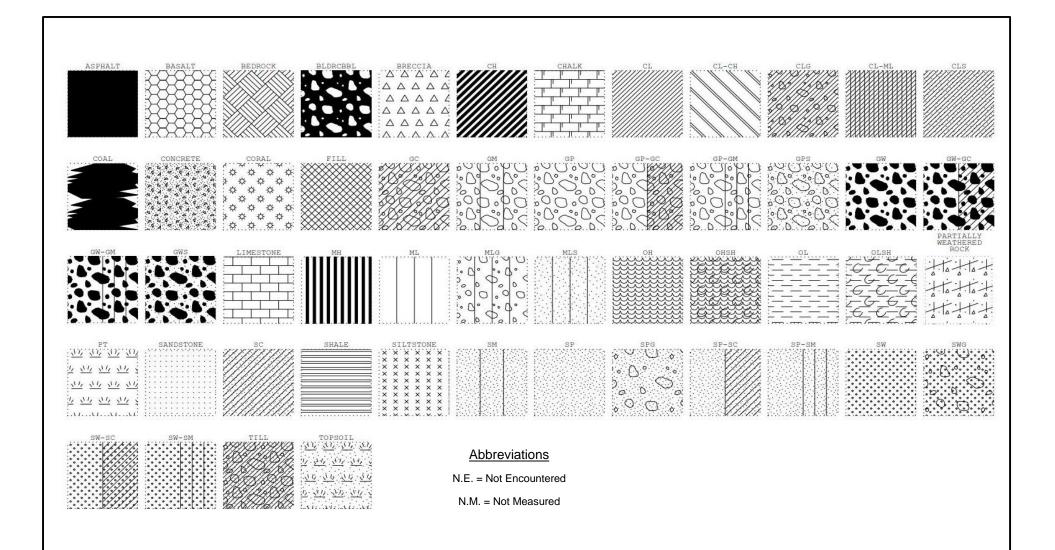
Indicate AASHTO soil designation as defined in AASHTO M-145 and ASTM D-3282

¹Applies to coarse-grained soils (major portion retained on No. 200 sieve)

²Applies to fine-grained soils (major portion passing No. 200 sieve)

³Use as required

Facilities | Environmental | Geotechnical | Materials Exhibit A-7



Project Manag	jer:	Project No.
	MEM	8623P180
Drawn by:	KJZ	Scale: N.T.S.
Checked by:	SG	File Name: Soil – Rock – Log

DJC

Date:

Approved by:

PH. (864) 292-2901



FAX. (864) 292-6361

SOIL AND ROCK SYMBOLS

Exhibit A-8



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_		%#200=50.6 No recovery, 30)_32 feet					SS-16	WOF	1/12"	1 W∩	H 1					:			:
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			PLER TYPE									RILLIN								
	Split Spoo	on ed Sample	NQ - Rock Co		3"			SA - Hollo SA - Cont				nere				otary \ ock C	Wash			
	Rock Cor		CT - Continu)			C - Drivii			jı it ∧u(J OI 3	'	.0	- 170	JUN U	,,,			



Proiect	ID: P	041165				Co	unty:	Sp	artaı	nbur	a		Borii	ng No	.: S-4	42-31-	1
Site De			1 (Cannons C	Camparo	und Roa						<u> </u>			Route		42-31	•
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Core Si			Driller:				Ground		•		_	N.M.			Kalio HR	92.6	70
core Si	ze:	NQ2	Driller:	B. Bur	пеце		Ground	awai	er.	TOI		IN.IVI.		Z 4	пк	N.M.	
Elevation (ft)	Depth (ft)	MATERIA	AL DESCRIP	TION	Graphic Log	Sample Depth	Sample No./Type	1st 6"	2nd 6" 3rd 6"	4th 6"	N Value		PL X ▲ F	FINES (QD (%)	MC ONTE	LL X NT (%) REC (%)	
_	-	Loose, moist, red subangular, none cemented, fine to	reactive, model	rately	h	04.0	- SS-17		3 3		6	0 10	20 3 ∴ ○ ▲	80 40	50 60	70 80	90
685.5	34.0	gravel (SC) (A-2-1 NMC=19.4, %#20	6), 5YR 5/3 and 00=26.8	5YR 5/1,		34.0 36.0	- SS-18	2	3 4	1	7	•	○ ▲				
-		and gray, subang moderately cemer SAND with grave	ular, none react nted, fine to coa l (SC) (A-2-6), 5	ive, rse, Claye 5YR 5/3 ar		38.0	SS-19	26 3	30 30	36		C			•		
680.5	38.5	Very Dense, dry, subangular, none fine to coarse, Si	reddish brown a reactive, weakly ty SAND (SM) (and gray, y cemente A-2-4), wi		38.5	- SS-20 :	50/2"			50/2	-					
_	- - -	rock fragments, 5 NMC=13.0 REFUSAL AT 38. AND BEGIN COF	.5 FEET - SET			40.5	- NQ-1 -					•	>				
675.5 -	_	PARA GNEISS - red, laminated foli subangular, highly rock, 5-60° dip, J to M, SR, 5YR 5/	Gray, white, and ation, coarse gr weathered, me , N to MW, Pa,	ained, edium stro Fe, Pl, VC	ng 💹	43.5	- NQ-2					•					
-	-	NQ-1: RQD=15, 9 RMR=40, qu=5,4 strong rock, 0-40	49 psi	=40-55,		48.5	5-										
670.5	-	NQ-2: RQD=13, 9 RMR=43, qu=11, moderately weath	%REC=82, GSI 576 psi	•			-						:				:
-		0-40° dip, J, N to SR NQ-3: RQD=32, °	MW, No, No, P %REC=90, GSI	l, VČ to C			- NQ-3							0			
665.5	-	RMR=50, qu=3,8 Gray and white, s VC to M, 5YR 5/1	lightly weathere and 5YR 8/1		ip,	53.5	5						:				
-	-	NQ-4: RQD=68, ⁹ RMR=65, qu=5,8		SI=65-75,			NQ-4									O	
-	58.5	CORING TERMIN	NATED AT 58.5	FEET								-					
660.5	-						-						:				:
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	2.0	(33 3					2.0	33-1	4	0	1.1	19]	:		` :			:
-	- - -	none reactive, Sa 2.5YR 5/6 with 7.	ndy lean CLAY .5YR 4/6, LL=34	(CL) (A			4.0	- SS-2	3	3	3 3	3 6	•	0					
711.8					r,			SS-3	2	1	1 2	2 2		0	A	<u>:</u>	<u>: :</u> :		
+	6.0	medium, Silty SA	ND (SM) (A-2-4	l), some	e clay [6.0					+							
	8.0_	Very loose, fine to	o coarse, some	mica ar	nd		8.0		1	3	2 3	5		O.		:			
-		Loose, moist, red	l, subangular, no	one read	ctive,			- SS-5	1	1	2 2	2 3	•	:	0	:			
706.8														:		:			
-		ALLUVIUM - Sof Sandy SILT (ML) NMC=28.8	t, moist, red, no (A-7-6), 2.5YR	ne reac 4/6,	tive,		40 -												
-		LL=42, PL=26, P %#200=52.1	I=16, NMC=20.	3,			13.5	SS-6	2	2	2	4	•	0	×	÷	A		
701.8														:		:			
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		cemented, fine to	medium, Claye	y SÁNE)		18.5					+_		:	, <u>;</u> ,				į
696.8-		LL=37, PL=23, P						55-7	1	1	1	2		<u> </u>		**			
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4	-		vn, fine to coars	e, 5YR	3/3,			55-9_	⊅U/3			50/3	1	\circ :	i				:
Project ID: P041165																			
Site Description: S-42-31 (Cannons Campground Road) BRO Peters Creek Eng./Goo. 2 Screaber Boring Location 180-75 Offset: 7.5 R Alignment: Evising Elev.: 716.8 ft Latitude: 34.99843 Longitude: -81.87655 Date Started: 1713/2025 Drill peter: 1713/2025 Drill meter (Inj.: 4 Sampler Configuration Liner Required: Y & Ulter-Used: Y & Ulter-Used:																			
						LE:	GENF)						:	<u>:</u>	: Con	tinue	d Nex	t Pr
												DRILLI			OD				u
JD - U	Jndisturb	ed Sample	CU - Cuttings	;			CF	A - Conti	nuol	us Flig		ugers							



Project	ID : P	041165							Со	unty:	Spart	anbu	rq		Bor	ing N	o.: §	S-42	2-31-2	 2
Project ID: P041165 Site Description: S-42-31 (Cannons Campground Road) BRO Peters Creek Route: S-42-31 Eng. Geo. S. Greaber Boring Location: 180-76 Offset: 7.58 Alignment: Existing Elev: 716.8 ft Latitude: 34.99843 Longitude: -91.87555 Date Started: 1/13/2025 Total Depth: 53.5 ft Soil Depth: 33.5 ft Core Depth: 20.1 Date Completed: 1/13/2025 Date Started: 1/																				
Project ID: P041165 Site Description: S-42-31 (Cannons Campground Road) BRO Peters Creek Route: S-42-31 (Eng/Geo: S. Greaber Boring Location: 180-26 Offset: 7.5R Alignment: Existing Elev: 176.8 ft Latitude: 34.99843 Longitude: -91.87655 Date Started: 1/13/2025 Date Starte																				
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			7												_					<u>%</u>
Core Si	ze:	NQ2		Drille	er:	B. E	Burnet	te		Groun	dwater	: TO	В	N.M.		2	4HR		N.M.	
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Eleva (ft	Dep (ft	MATE	ERIAI	L DES	CRIP	TION		Grap	Sam	Sam No./T	1st 6" 2nd 6"	3rd 6" 4th 6"	N Va	0 10	○ F	RQD (%) I	RE	C (%)	
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Name: D: ant Firm: By:	<u>Р</u> Т В М	Burnette Mix design: 1 poui	ants, Inc.	Date	1/14/25	Test Hole No.: Station: Offset:	S-42-31-1 178+33 8.1R
			Grout Cur	ve			
0							
4							
8							
12							
16							
20		Y					
24	1	2	3 Grout Volume Pl	aced (ft³)	4	5	6
epth of Te fameter of rea of Tes olume of T olume of C neoretical	est Hole Grouted f Test Hole st Hole Test Hole Casing (If applica Volume of Test	able)	20 20 0.33 0.09 1.74 -	ea. ft. ft. ft² ft³ ft³ ft³			
	ant Firm: By: 0 4 8 12 16 20 24 24 24 24 24 24 24 24 24 25 26 26 26 27 28 28 29 20 20 20 20 20 20 20 20 20 20 20 20 20	ant Firm: By:	Terracon Consulta Burnette Mix design: 1 pour pound bentonite, 6	Terracon Consultants, Inc. Burnette Mix design: 1 pound cement mix, 1 pound bentonite, 6 pounds water Grout Cur Grout Cur Grout Cur The street of Bags On-Site spith of Test Hole armeter of Test Hole solume of Casing (If applicable) teroretical Volume of Test Hole solume of Casing (If applicable) teroretical Volume of Test Hole solume of Sags Used solume of Test Hole solume of Tes	Terracon Consultants, Inc. Burnette	### Terracon Consultants, Inc. Burnette	Terracon Consultants, Inc. Burnette Mix design: 1 pound cement mix, 1 pound bentonite, 6 pounds water Grout Curve Grout Curve Grout Curve 12 12 14 1 2 3 4 5 Grout Volume Placed (ft³) Imber of Bags On-Site spirit of Test Hole ameter of Test Hole and Test Hole solume of Test Hole 1.74 1.74 1.74 1.74 1.74 1.74 1.74 1.75 Interior of Bags Used 1.74 1.74 1.75 Interior of Bags Used 2.5 Interior of Bags Used Interior of Bags



Project I Project I Consulta Grouted Notes:	ID: ant Fir		S-42-31 BRO Peter P041165 Terracon Consulta Burnette Mix design: 1 pour pound bentonite, 6	ants, Inc.	Date	1/13/2025	Test Hole No.: Station: Offset:	S-42-31-2 180+26 7.5R
				Grout Curve				
	0							
	10							
Depth	20							
(ft)	30							
	40							
	50							
	60		1 2	3 Grout Volume Place	ed (ft³)	4	5	6
D D A V V TI N	epth of iamete rea of loume of olume of the oretical contractions.	of Bags On-Site Test Hole Ground Test Hole Test Hole of Test Hole of Casing (If appoint of Test of Bags Used	ted licable)	20 53.5 0.33 0.09 4.6 1.7 2.9 5	ea. ft. ft. ft² ft³ ft³ ft³ ea. ft³			



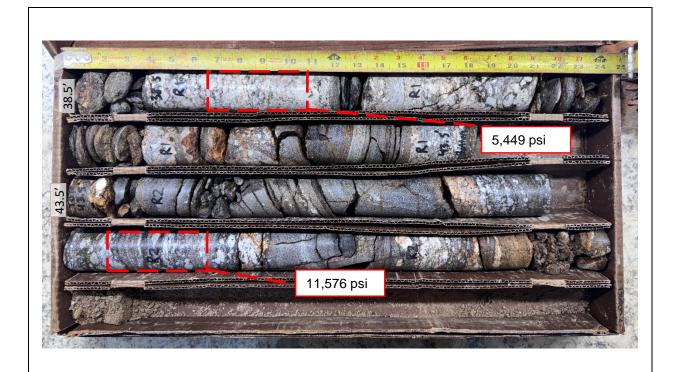
Project I Project I Consulta Grouted Notes:	ID: ant Fir	m:	S-42-31 BRO Pet P041165 Terracon Consulta Burnette Mix design: 1 pou pound bentonite,	ants, Inc.	Date	1/13/2025	Test Hole No.: Station: Offset:	S-42-31-2 Bulk 1 180+32 7R
		N		Grout Co	urve			
	0							
	2							
Depth	4							
(ft)	6							
	8							
	10							
	12		1 2	3 Grout Volume I		4	5	6
D D Al Vi Vi TI	epth of iamete rea of iolume of the oretical contents of the oretical c	of Bags On-Site f Test Hole Groute of Test Hole Test Hole of Test Hole of Casing (If appl cal Volume of Test of Bags Used	icable)	20 5 0.5 0.20 1.0 - 1.0 2	ea. ft. ft. ft² ft³ ft³ ft³ ea.			



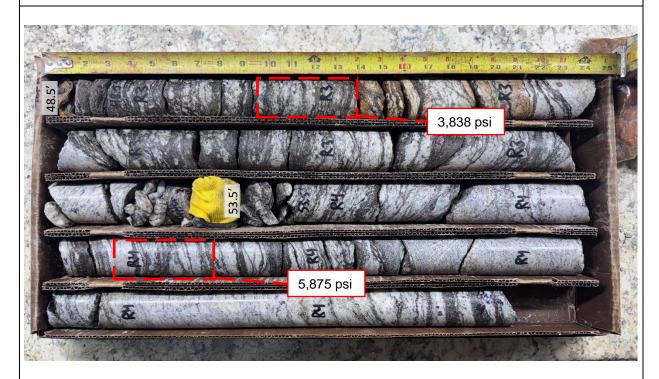
Name: D: ant Fir By:	m:	Burnette Mix design: 1 pou	ants, Inc.	Date	1/1	3/2025	Station:	S-42-31-2 : Bulk 2 180+32 7R	
			Grout Co	urve					
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S-42-31 BRO over Peters Creek | Spartanburg County, SC Terracon Project No. 8623P180 | SCDOT Project ID: P041165





S-42-31-1, NQ-1 and NQ-2 (38.5 to 48.5 feet)



S-42-31-1, NQ-3 and NQ-4 (48.5 to 58.5 feet)



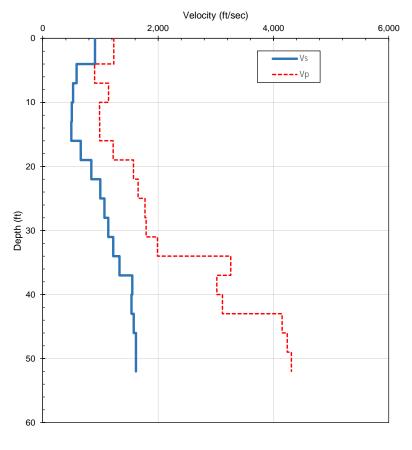


S-42-31-2, NQ-1, NQ-2, and NQ-3 (33.5 to 48.5 feet)



S-42-31-2, NQ-4 (48.5 to 53.5 feet)

Downhole Seismic Velocity Fixed Interval Method



Depth	Vp	Vs	Δi	Δt	Est. In-Situ Unit Wt
(ft)	(ft/sec)	(ft/sec)	(ft)	(sec)	(pcf)
3	1233	904	3	0.00332	
6	900	585	3	0.00513	
9	1140	524	3	0.00573	
12	985	502	3	0.00598	100
15	989	496	3	0.00605	
18	1221	659	3	0.00455	
21	1573	840	3	0.00357	
24	1654	997	3	0.00301	
27	1772	1068	3	0.00281	130
30	1792	1134	3	0.00265	130
33	1989	1221	3	0.00246	
36	3260	1329	3	0.00226	
39	3019	1550	3	0.00194	
42	3117	1536	3	0.00195	405
45	4151	1576	3	0.00190	165
48	4240	1615	3	0.00186	
51	4312	1616	3	0.00186	
Unit Weight o	of Soil estimat of Rock based n of Data O	on average i		ompression tests 0.05700	
Weight	ed Averag	e Shear	-	895 ft/sec	

Project Mgr:	MM	Project No	
Prepared by:	ММ		8623P180
Checked by:	SG	Scale:	NA
Approved by:		Date:	
			3/4/2025
		<u> </u>	3/4/202



GEOPHYSICAL TESTING RESULTS

DOWNHOLE SEISMIC TEST

S-42-31 (Cannons Campground Road) Bridge Replacement over Peters Creek SPARTANBURG COUNTY, SOUTH CAROLINA

P041165

TEST NO. S-42-31-2

EXHIBIT A-12 S-42-31 (Cannons Campground Road) BRO Peters Creek SCDOT Project ID: P041165 | Spartanburg County, SC Terracon Project No. 8623P180

CPT Sounding ID S-42-31-1C

Latitude: 34.99792° Longitude: -81.87676°

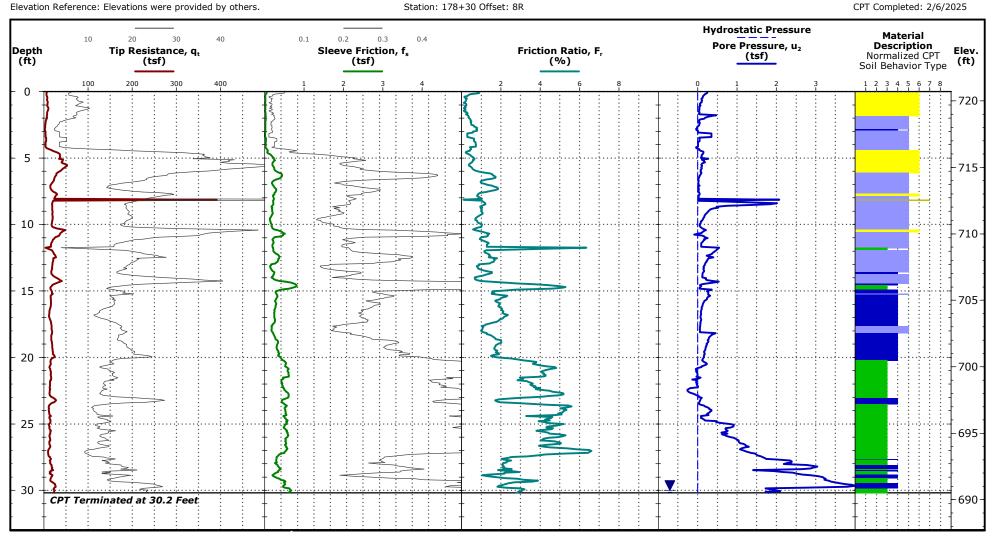
North: 1152576.65 East: 1737389.59



Greenville, SC

CPT Started: 2/6/2025 CPT Completed: 2/6/2025

Elevation: 720.7 (ft) Elevation Reference: Elevations were provided by others.



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.

Notes

Test Location: See Exploration Plan

CPT Equipment

CPT Rig: CR#CPT03 Operator: BJ/LB

CPT sensor calibration reports available upon request

Probe No. 5851 with net area ratio of .86 U₂ pore pressure transducer location

Manufactured by Geoprobe Systems- Calibrated 2/16/2024

Tip and sleeve areas of 10 cm² and 150 cm² Ring friction reducer with O.D. of 2 in

Water Level Observation

√ 30 ft estimated water depth

(used in normalizations and correlations)

2 Organic soils - clay

Clay - silty clay to clay

4 Silt mixtures - clayey silt to silty clay 5 Sand mixtures - silty sand to sandy silt

6 Sands - clean sand to silty sand 7 Gravelly sand to dense sand

Normalized Soil Behavior Type

1 Sensitive, fine grained

8 Very stiff sand to clayey sand

9 Very stiff fine grained

(Robertson 1990)

S-42-31 (Cannons Campground Road) BRO Peters Creek SCDOT Project ID: P041165 | Spartanburg County, SC Terracon Project No. 8623P180

Elevation: 716.9 (ft)

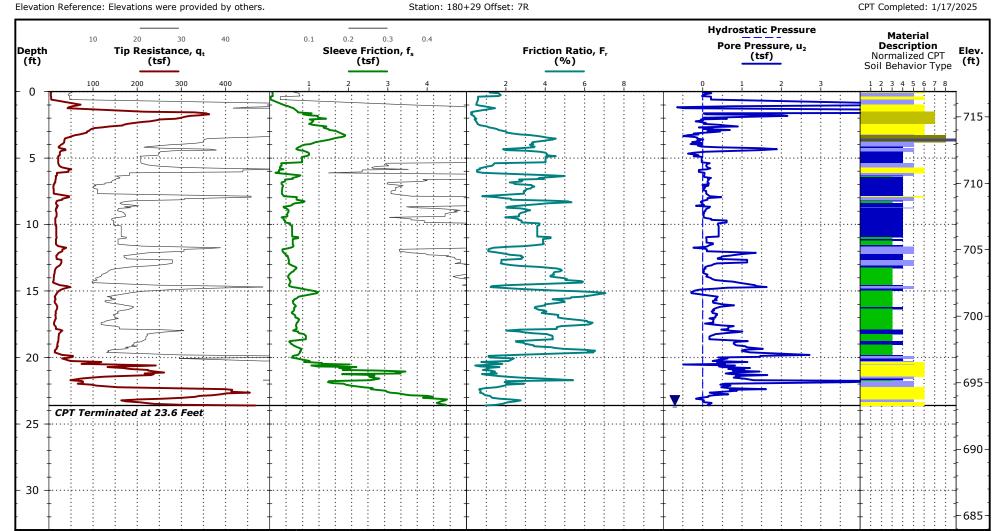
CPT Sounding ID S-42-31-2C



72 Pointe Cir Greenville, SC

CPT Started: 1/17/2025

Latitude: 34.99844° Longitude: -81.87655° North: 1152765.44 East: 1737453.4



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.

Notes

Test Location: See Exploration Plan

CPT Equipment

CPT Rig: CR#CPT03 Operator: AM/LB

CPT sensor calibration reports available upon request

Probe No. 5851 with net area ratio of .86

U₂ pore pressure transducer location Manufactured by Geoprobe Systems- Calibrated 2/16/2024

Tip and sleeve areas of 10 cm² and 150 cm²

Ring friction reducer with O.D. of 2 in

Water Level Observation

23.6 ft estimated water depth

(used in normalizations and correlations)

1 Sensitive, fine grained

(Robertson 1990)

2 Organic soils - clay

Clay - silty clay to clay

Normalized Soil Behavior Type

4 Silt mixtures - clayey silt to silty clay 5 Sand mixtures - silty sand to sandy silt

6 Sands - clean sand to silty sand

7 Gravelly sand to dense sand

8 Very stiff sand to clayey sand

9 Very stiff fine grained

Soil Test Log

Project	ID: E	6950.0	02 - Ta	sk 0	4212	2				Cou	ınty:	S	parta	anbu	ırg		Вс	oring	No.	: В-	1	
Site De	scripti	on:	S-42-	31 c	ver l	Peters	Creek											R	oute:	S-	42-31	
Eng./G	eo.: T	Peter	son		Во	ring Lo	cation	:				Offs	et:				Al	lignr	nent			
Elev.:	717.1	ft	Latitud	de:		34.99	827268	Lo	ngit	ude:	-8	1.87	6668	346	Date	Sta	rted	l:		6/5/	2024	
Total D	epth:	58.5	ft	Soil	Dep	th:	6.7 ft		Cc	re De	pth:	2	5 ft		Date	Cor	nple	eted	:	6/5/	2024	
Bore He		meter		3.0	_		ler Cor	ıfigu	ratio	on	Lin	er R	equi	red	: `	<i>(</i> (Ŋ	Li	ner l	Jsed	: Y	N
Drill Ma	chine:	: CN	IE 45B		Drill	Metho	d: R\	N			Hamm	er T	ype:	Au	toma	ıtic		Enei	gy R	atio	86.4	%
Core Si	ze:	NQ			Drille	er:	D. Har	ris		- 1	Groun	dwa	ter:	TC	В	Not M	_		24H		33,3 (Cav	
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																		⊕ S PL	N TAS	VALI 1C	JE ♥ LL —×	
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(£)	Depth (ft)	ľ	MATER	IAL	DES	CRIPT	ION	1	[연화	Sample Depth (ft)	Sample No./Type		. 9	, d	N Value						NT (%) REC (%)	
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4	1.2-	CONC	RETE BE	RIDO	E DE	CK (9.0	-in)			-	-											
			<u>AP</u> (20.6-				-	_														
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	23.8		m Sandy 4/6, Mica			AY (CL/A	1-/-6),			23.8	L	L										
+		11	4, PL=24			MC=23	3%	12								7		- :		1 1		- :
692.1-		1%200=	52.9%	,	_O, IN	20.	J /0,	18			SS-2	1	2	2 1	4	⊜	×	-	⟨À			
552.1		<u> </u>						_1 12	<u> </u>												<u> </u>	
			CAMP	ED	TVDE				LE	GEND)				ORILL	INIC *	AET,		Cont	ınue	d Next	Page
ss -s	Split Spo	on	SAMPI	١	NQ - F	lock Cor	e, 1 - 7/8"			HS	A - Holle	ow S	em A	uger			RW	- Ro	tary V	/ash		
UD - L	Jndisturl	bed Sam	ple	(CU - C	uttings				CF	4 - Con	tinuo	us Flig	ght A	ugers		RC	- Ro	ck Co	re		
AVVG-1	OUK CO	re, 1-1/8"			J1 - C	ontinuo	as rube			I DC	- Driv	ng C	asıng									

Soil Test Log

Project	ID: E	6950.0	02 - Ta			!				Co	unty:	s	part	anbu	rq		Bor	ing N	No.:	B-1		
Site De							Creek	<		1					3			Rou		-	2-31	
Eng./Ge	eo : T	Peter					ocatio					Offs	et:				Alig	gnme	ent:			
Elev.:	717.1	ft	Latitu	ıde:	Ċ	34.99	98272	68 I	Longit	ude:	-8	1.87	666	346	Date	Star	ted:		6	3/5/2	024	
Total D	•	58.5		_	Dept		6.7				epth:		5 ft	_	Date		•	ed:	(3/5/2	024	
Bore Ho				3.	_		pler C		gurati	on				ired:	_	$\overline{}$	-		er Us		Y	<u>N</u>
Drill Ma			IE 45B	$\overline{}$		Metho		RW_			Hamm										86.4	
Core Si	ze:	NQ			Drille	er:	D. H	arrıs	<u> </u>		Groun	dwa	ter:	10	B 1	Not Me	easure	d a	24HF	<u>≺</u>	33,3 (Cav	e at 59.2
Elevation (ft)	Depth (ft)	1	MATEF	RIAL	DES	CRIP ⁻	TION		Graphic Log	Sample Depth	Sample No./Type	st 6"	2nd 6"	3rd 6" 4th 6"	N Value	0.10	P ≯ △	RQD (MO S CO %)	NTEI	E ⊕	
-			floist, Re Mediur							25.8	SS-3			1 3	2	•) <u>20</u>	30 4	10 St	1 60	70 80	90
-	27.8 28.5	LL=3 %200=	33, PL=1 40.9%	19, P i :	=14, N	MC=2	1.2%,			27.8 28.5	_ 33-4	5(/1.7 5		100*							>>
- 687.1 - -	- - -	Silty C (SC-SI %NM Very D Fine to	oose, M layey Fi M/A-2-6 IC=18.4 Dense, M o Mediur 3) with 0	ne to), 2.5' %, %; —— Moist, n, Po	Mediu YR4/6 200=2 Light (orly Gi	m <u>SAN</u> 2.5% Gray, N raded <u>S</u>	ND Non-Plas	 stic,			- - C-1								¢			
682.1-	33.5	CONC Ultra # @C-	RETE 8 Bit 1: %RE0	C=88,	%RQ	D=50,	3.8 min.	/ft		33.5	; -					-						
-	-	Metam Graine Moder Weath	OCK (Pa norphic, ed, Lami ately We ered, Ul	Black nated eathe ltra #8	/White , Felds red to 3 Bit	e, Fine spar/M Highly	ica/Qua	ırtz,			NQ-1					•						ı
677.1-	-	60°, J/ Pl/lr, V GSI=1	Q-1: Nur Fo, M/N 'C, S/SF 0-20, RI -2: With	I/VN, : R, %F MR=1	Su/Pa REC=8 6, Cla	, CI/Fe, 0, %R	/Qz/Sd, QD=0,			38.5												
-	- - -	Nume Fe/H, I	erous Jo R/SR/S, 5-35, RI	ints E	Dip froi EC=53	3, %RG	QD=8,	ft.		40.5	- NQ-2					٥				•		
- 672.1 - -	-	Weath 45°, J/ %RQE	-3: Mode ered, Ni Fo, Sp, 0=10, GS n/ft. q _u =4	umero Cl/H/I SI=25	ous Jo Py/Sd, -35, R	ints Dip %RE0 MR=18	p from 5 C=87, 3, Class	5° to		43.5) - NQ-3					•	•					
- - 667.1 -	-	Numer %REC RMR=	-4: Mode rous Joii :=97, %I 31, Clas edium S	nts Di RQD= ss I V,	p from 57, G 3.0 mi	5° to 6	60°.Sp.			48.5	5-					-						
									LE	GENI	D								ontir	uec	Next	Page
	Split Spo Jndisturb Rock Cor	ed Sam	ple	1	CU - C	uttings	re, 1-7/8 ous Tube			CF	SA - Holl FA - Con C - Driv	tinuo	us Fli	uger ght Au	RILLII	F	ETHC RW - RC -	Rota	ry Wa Core	ash		

Soil Test Log

Project	ID: E	:6950.002 - Ta	ask 04212)			Co	ounty:	S	parta	nbur	rg	Ti	Boring	g No.:	B-1		
Site De			-31 over F		reek		1			,					oute:		2-31	
Eng./G	eo: T	. Peterson		ring Loc					Offs	set:				Align	ment:	<u>'</u>		
Elev.:					27268	Longi	tude:	-8	1.87	76668	46 I	Date :				6/5/20	024	
Total D	epth:	58.5 ft	Soil Dep		6.7 ft			epth:		5 ft				pleted	l: (6/5/20	024	
Bore He	ole Dia	meter (in):	3.0	Sample	er Conf	gurati	on	Lir	ner F	Requir	ed:	Y	N	Li	iner U	sed:	Υ	N
Drill Ma	achine	: CME 45B	Drill	Method	: RW			Hamn	ner T	уре:	Aut	omati	ic	Ene	rgy Ra	atio:	86.4%	6
Core Si	ize:	NQ	Drille	er:	D. Harri	s		Groun	ndwa	ater:	TOE	3 N	ot Mea	sured	24H	R 3	3.3 (Cave	at 59.2)
Elevation (ft)	Depth (ft)	MATEF	RIAL DES	CRIPTI	ON	aphic -og	Sample Depth	Sample No./Type		ءً وا		N Value		PL ★ A FIN	SPT N '	C NTEN	LL —X T (%)	
E E						ŏ_	l _‰ 🗖	l s S	st	2nd 6" 3rd 6"	. ₹	z	0 10		D (%) 40 5			an l
- - - 662.1-	-	@NQ-5: Num 70°, N/VN, Sp. %RQD=78, G 3.2 min/ft, q.,=	'Fi, S/SR/R SI=35-45, R	%REC= MR=43,	=93, Class III,		53.5	NQ-2		0 6) 4		0 10	20 30	40 5	<u> </u>	70 80	
-	58.5	Boring Termin	ated 58.5-ft	. Below ti	ne			- NQ-5	5								o	-
657.1 - - - -	- - - -	Existing Bridge Achieved Targ	e Deck Surf et Depth,	ace. Bori	ng													-
652.1 - - - -	- - - -																	-
647.1-	- - -																	-
642.1 - -	_						051	-										-
		CAMA	PLER TYPE			LE	GEN	ט				DILLIN	IC ME	THOD				
UD - L		SAMP oon bed Sample re, 1-1/8"	NQ - R CU - C	ock Core, uttings ontinuous			C	SA - Hol FA - Cor C - Driv	ntinuc	us Flig	ger		R'	W - Ro	otary W ock Cor			

Soil Test Log

Project	ID: E		002 - Ta			2				Со	un	ty:	S	oart	anbı	ırg			Во	ring) No).: E	3-2		
Site De				-31 o	ver l	Peters	Cree	ek												R	oute	e: 8	3-42	-31	
Eng./G					Во	ring L							Offs							_	nen	_			
Elev.:	717.4	ft	Latitu	ide:		34.99	98208	842	Longil				.87	669	914	Dat	e S	Start	ted	:		6/6	3/20	24	
Total D	epth:	66.	4 ft	Soil	Dep	th:	10	.1 ft	Co	re De	ept	h:	20) ft		Dat	e C	om	ple	ted	:	6/6	3/20	24	
Bore He	ole Dia	meter	(in):	3.0)	Sam	pler (Confi	gurati	on		Line	r R	equ	ired		Υ	N)	Li	ner	Use	d:	Υ	Ø
Drill Ma	achine:	CN	ЛЕ 45B		Drill	Metho	od:	RW			Ha	amme	r T	ype	: Au	tom	atio	2	E	ne	rgy	Rati	o : 8	6.4%	ó
Core Si	ize:	NQ		1	Drille	er:	D. I	Harris	3		Gr	ounc	lwa	ter:	TC	В	3	5.6	ft		24	HR	3	35.6 f	t
ion	4								ji _	e t		ole /pe					3			PL X—		MC O	LUE	LL ×	
Elevation (ft)	Depth		MATER	RIAL [DES	CRIP	ΓΙΟΝ		Graph	Sample Depth		Sample No./Type	1st 6"	2nd 6"	3rd 6"		3	n 10	۰	RQI	D (%)		(%) C (%) O 80	90
	0.3	ASPH	IALT RO	ADWA	AY (S	-42-31)	(4.0-i	n.)	/ SYSTEM		+		_	· ·	() (一	:	- 20	:		:		0 00	:
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682.4	35.6	▽									+							- 1	-						-
+	36.8	Water	(Peter's	Creel	k) (1.	2-ft.)			<u> </u>	36.8	1					\perp		ĺ	- 1	- 1					
j		ALLU									1	SS-1	8	3	4 4	. 7	,]	•		- 1	:				
]	38.8	ຸ @ss	S-1: No F	Recove	ery				/ हिलाम	38.8	Ŧ		Ĺ	_		+	\dashv	-	:	:	:				
677.4	-	Loose	, Wet, B	rown.	Non-	Plastic.	Poorl	ν		40.8	; ;	SS-2	1	2	3 2	! 5	; *	.	ď	:	i				1
+	-	Grade	ed <u>SANE</u>	(SP-	SM/A	<u>-1-b)</u> w	ith Sil	t and		40.0		SS-3	5	250	/4.5"	52	.+×	: ∆∆	- :						>>
1			I, 7.5YR		-NID	DI-NG	,			42.8	3 T					+	\dashv		-						
]			S-2: LL=N C=17.9%				-,				\bot	SS-4	435	0/4"		10	0+		- :						>>
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			SVIVI	PLER 1	TVDE				LE	GENI	ט					ORILI	IN	C ME	TH		Cor	itinu	ed l	Vext I	Page
	Split Spo			N	IQ - F	lock Co	re, 1 - 7	78"				Hollo			uger			F	W	- Ro	otary	Wasl	h		
UD - L AWG- F	Jndisturt	ed Sam	iple			uttings Continuc	uie Tiil	ha				Conti Drivir				uger	3	F	C	- Ro	ock C	ore			
W G - 1	VOCK COL	⊌, i=1/8			,, <u>-</u> C	onunuc	us IUI	ve		1 00		וואוום	ıg Ci	aomi											

Soil Test Log

Project	ID: E	6950.0	02 - Ta	ask (0421	2			Co	oun	ity:	Spar	tanbı	ırg		Bori	ng No	o.:	B-2		
Site De	_						Creek				•						Rout	$\overline{}$	S-42	2-31	
Eng./Ge	eo.: T	. Peters	son		Вс	ring L	ocation:					Offset:				Alig	nmer	nt:			
Elev.:	717.4	ft	Latitu	ıde:	•	34.99	9820842	Longi	tude:		-81	.87669	914	Date	Start	ted:		6.	/6/20	24	
Total D	epth:	66.4	ft	Soi	I Dep	th:	10.1 ft	С	ore D	ept	h:	20 ft		Date	Com	plete	ed:	6.	/6/20	24	
Bore Ho	ole Dia	meter ((in):	3.	.0	Sam	pler Conf	igurati	on		Line	er Requ	uired	: Y	N		Liner	Us	ed:	Υ	\bigcirc
Orill Ma			IE 45B	3		Metho						er Type					nergy				
Core Si	ze:	NQ			Drill	er:	D. Harri	S		G	round	lwater	: TC)B :	35.6	ft	24	IHR	. ;	35.6	t
Elevation (ft)	Depth (ft)	N	ИАТЕГ	RIAL	DES	CRIP	ΓΙΟΝ	Graphic	Sample Depth	(¥)	Sample No./Type	1st 6" 2nd 6"	3rd 6"	Z	0 10	PI × ▲ F	SPT FINES QD (%	MC CON	ITEN¹ ■ RE	LL X F (%) C (%)	90
	-	@SS	-3: Very	y Den	se			144		7	SS-5	4050/2	"	100+							:>>
1	46.9	LL=N %200=		NP, P	I=NP,	%NMC	=15.0%,		46.9	9]					1	- 1					
667.4 -	- - - -	Very D Non-Pl (SP-SI		51.4	+	NQ-1							۰								
-	-		ense, N			n, Non- ID (SM/				1	NQ-2						۰				
662.4	-	7.5YR		iii Oill	y <u>UAI</u>	10 (OIVI)	/\ 4-4] ,														
657.4	-	Metam to Med Quartz	lium Co	Dark arse ar/Mi	Gray/ Graine ca/Ga	White/F ed, Lam	Pink, Fine inated, oderately		56.4	-	NQ-3					٥				•	
652.4	66.4	80°, J/ CI/H/N %REC RMR=:	Fo, M/N o/Py/Qz =89. %	I/VN, z/Sd, RQD: ss I V,	Pa/Fi, Pl/lr, \ =50, 0 1.6 m	'No, /C, S/S SSI=40- nin/ft. q	50.		01.2	1	NQ-4							•	•		
647.4	- - - -	45°, Sp GSI=3: q _u =3,7:	o/Pa/Fi, 5-45, R 90 psi, l	%RE MR=2 Mediu	C=93 26, Cla um Str	, %RQ[ass IV, 2 ong Ro	2.5 min/ft.	i		-											
642.4	- - - -	@NG 65°, Pa GSI=4 q _u =4,29 Rock G	1-3: Nun a/Fi/No, 0-50, R 90 psi%	merou , %RE MR=3 , Med uck in	is Joir EC=89 31, Cla dium S Oute	its Dip f , %RQI ass IV, 2 Strong F r Core E	rom 0° to D=50, 2.8 min/ft. Rock,														
637.4	- - - -	25°, H/ %RQD	No/Py/0=55, G	Qz/So SI=40	d, %R)-50, F	EC=100	6, Class IV,			1											
632.4	-	Exisitir		je De	ck Su	4-ft. Bel face. B				-											
-	- - -									-											
	_								CEN	ᅺ							<u> i</u>	-	<u> </u>	<u>: :</u>	-
	Split Spo	on oed Sam				Rock Co Cuttings	re, 1-7/8"	LE		SA -		w Stem nuous F	Auger	ORILLIN uaers	F	- WS	D Rotary Rock (sh		

Soil Test Log

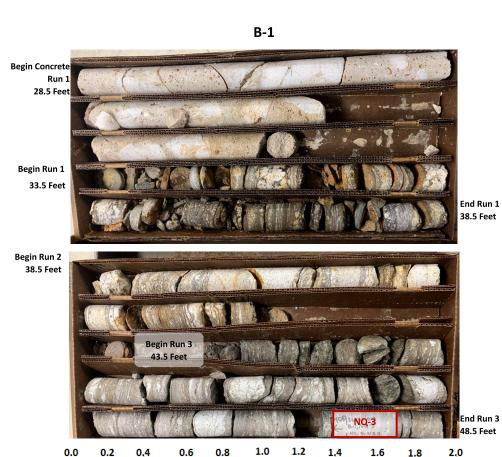
Project	ID: E	6950.002 - T	Task 04	- 4212			Со	unty:	Sı	parta	anbu	rg		Bor	ing N	lo.:	B-3		
Site De					rs Creek										Rou		S-42	2-31	
Eng./G	eo.: T	rey Petersor	1	Boring	Location:				Offs	et:				Alig	gnme	nt:			
Elev.:				34.	.99815213	Longi	tude:	-81	.87	672 ⁻	185	Date	Sta	ted:		6	/6/20	24	
Total D	epth:	62.8 ft	Soil	Depth:	8.2 ft	Co	ore De	epth:	3	1.9 f	t	Date	Cor	nplet	ed:	6	/7/20	24	
Bore H	ole Dia	meter (in):	3.0	Sai	mpler Conf	igurati	on	Line	er R	equ	ired:	Y	(t	D	Line	r Us	ed:	Υ	Ø
Drill Ma	achine:	CME 45	3 [Orill Met	hod: RW	'		Hamme	er T	ype:	Aut	omat	ic	E	nerg	y Rat	tio:	86.4%	6
Core Si	ize:	NQ		Oriller:	Don Ha	rris		Ground	lwa	ter:	TO	B 3	6.7 (0	ave a	t 52) 2	24HF	1 1	Not Me	asured
														Р	⊕ SP	TNV. MC			
u	ا ۔ ا					్లు	ے و	_ e_				<u>o</u>		>	$\overline{\leftarrow}$	$\overline{}$		-X	
Elevation (ft)	Depth (ft)	MATE	RIAL D	DESCRI	PTION	ab P	Sample Depth	Sample No./Type		9		N Value			FINES				
Ele	0.0					5 ⁻	S O	\ _S S	1st 6"	2nd 6"	3rd 6" 4th 6"	ź	0 1		RQD ('			C (%)	qη
	0.6	ASPHALT RO	DADWA	Y (S-42-3	31) (4.0-in.)			1		· ·	4			3 20	30 4	0 30	: 00 /	0 00	:
-	1.3	CONCRETE				33.4		4											-
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712.9-	1 1							1									- 1		
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-		ALLUVIUM				144	1	-					1						-
		Very Loose, I	Moist, R	eddish Br	rown, Low			SS-1	1	1	2 2	3	0	0	××	4			
_]	Plasticity, Silt (SM/A-2-4), 5		o Medium	SAND		24.7	·									i		
692.9-	-	LL=33, PL=		6. %NMC=	=16.0%.			1 _											-
-		%200=35%	,	., /0/11/10	. 5.5 /0,		1	SS-2	2	1	2 2	3	*	Ó	A			i i	-
						<u> 15585</u>	GENI								-	ntin	d	Next	
		SAM	IPLER T	YPE			JEINL				D	RILLI	NG M	ETHC)D			vext	raye
	Split Spo	on	N	Q - Rock (Core, 1-7/8"			SA - Hollo			uger			RW -	Rotar	y Wa	sh		
UD - L AWG- F	onaisturt Rock Coi	ed Sample e, 1-1/8"	C.	U - Cutting T - Contin	gs Iuous Tube		DC	A - Cont Drivii	nuot ng Ca	us rlı asina	ynt Au	igers		KC -	Rock	core			
		-,							. 9 0										

Scil Test Log

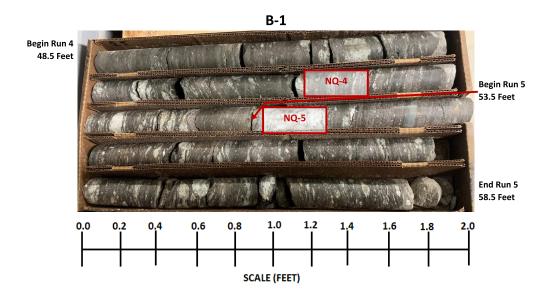
Project	ID: E	6950.002	2 - Task	04212			Co	unty:	S	parta	anbu	rg		Boring	No.:	B-3		
Site De	scripti	on:	S-42-31	over Peters	Creek									Ro	oute:	S-4	2-31	
Eng./G	eo.: T	rey Peter	son	Boring L	ocation:				Offs	et:				Alignn	nent:			
Elev.:	717.9	ft L	atitude:	34.99	9815213	Longi	ude:	-81	.87	672°	185	Date	Starte	ed:	- (6/6/2	024	
Total D	epth:	62.8 ft	Soi	I Depth:	8.2 ft	Co	ore De	pth:	3	1.9 f	t	Date	Comp	pleted:		6/7/2	024	
Bore H	ole Dia	meter (in): 3	.0 Sam	pler Confi	gurati	on	Line	er R	equi	ired:	Y	N	Lir	ner U	sed:	Y	N
Drill Ma	achine:	CME	45B	Drill Metho	od: RW			Hamm	er T	ype:	Aut	tomat	ic	Ener	gy Ra	atio:	86.49	%
Core Si	ize:	NQ		Driller:	Don Ha	rris		Ground	dwa	ter:	то	B 36	6.7 (Ca	ve at 52)	24H	R	Not Me	asured
Elevation (ft)	Depth (ft)	MA	ATERIAL	DESCRIP	ΓΙΟΝ	Graphic	Sample Depth (#)	Sample No./Type	1st 6"	2nd 6"	3rd 6" 4th 6"	N Value	0 10	₽S PL X FINI PRQD 20 30	(%)	C NTEN ■ RI	LL X IT (%) ≣C (%)	90
-	-			Brown, 2.5YR			26.7	_										-
-	_	%200=31	1.9%	PI=NP, %NMC			28.7	SS-3	1	2	2 1	4	•	⊙ × •×				-
-	-	_		Brown, 2.5YR				SS-4	3	1 50	1/2"	51+2	k 🛦	0				-
687.9-		LL=32, %200=30		=6, %NMC=2	1.2%,				Ľ	1 00		1011/	Ĭ T					_
	30.7			se. Reddish E	Prown		30.7	SG-E	ڸ.	50/2"		100+				- 1	1	->4
-	30.9	(SM/A-1- LL=NP, %200=14	<u>b)</u> with Gr PL=NP, F I.7%	se, Reddish B avel, 2.5YR4/ PI=NP, %NMC ————— Light Gray, N	4 =27.3%,		30.9	C-1		<i>10/12</i>								-
- 682.9- -	36.2-	Fine to C 2.5YR7/1 CONCRE Ultra #8 I	oarse <u>SAI</u> E TE Bit	ND (SP/A-3) v	vith Gravel,		36.1	-										-
-	39.3	WOOD (94, MNQD-32	., 2.4 11111111		39.3	C-2										-
	39.3	ALLUVIL	JM			र्जूट	39.3											
677.9 - -	41.2-	Dense, V Fine to C	Vet, Grayis	sh Brown, Nor ndy <u>GRAVEL</u> !5/2	n-Plastic,	000	41.2	SS-6		22 ·		38 55+			•			>>(
_		\						1				1						
- -	42.8	Non-Plas	se, Moist,	Grayish Brov Coarse <u>SAN</u> 5/2	vn, ID (SP/A-3)		42.8											-
672.9 - - -	_ _ _	Metamor Coarse C Feldspan Weather #8 Bit	Frained, La /Mica/Qua ed to Mode	k/White/Pink, aminated, rtz/Garnet, Hi erately Weath	ghly ered, Ultra		47.8	NQ-1					<	>				-
- 667.9-	-	85°, J/Fo Pl/Ir, VC, GSI=25-3 q _u =13,84	, M/N/VN, SR/R, %F 35, RMR=; 0 psi, Stro ely Weathe	us Joints Dip f So/Su/Pa, Cl REC=72, %R0 27, Class IV, 2 ng Rock ered to Slightly	/Fe/Py, QD=15, 2.1 min/ft.			NQ-2									٥	i
-				Joints Dip fro	om 0° to		52.8	1				1						-
				•			1	\vdash				_	<u> </u>		20:-41		Ne:	.: De ::
			SAMPLER	TYPE		LE	GENE)				RILLIN	IG ME		Jontii	пиеа	Next	rage
		on oed Sample	!	NQ - Rock Co CU - Cuttings CT - Continuo			CF	A - Hollo A - Cont : - Drivi	inuo	us Fli	uger ght Au		R۱	W - Rot				

Scil Test Log

Project Site De		6950.002 - T				n C===	lz.		Co	unty:	S	oarta	udni	rg		B			o.: E		24	
		on: 5-42 rey Peterson				s Cree				1.	Off o	~ 4.	- 1				_			5-4 <u>2</u>	-31	
Elev.:				ВО		_ocatio 98152		Longi	udo:		Offs		85	Date	St-	_		mer	_	 3/20	24	_
⊏iev.: Total D		62.8 ft		I Dep		8.2			re De			1.9 ft		Date				ŀ		7/20		_
		meter (in):	3.			pler C						equi				<u>(j)</u>			Use		Y	(N)
Drill Ma						od:			J.,	Hamm					$\overline{}$	_					36.49	$\overline{}$
Core Si		NQ		Drille		Don				Ground			TO		6.7 (lot Me	
																		1-				_
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_								,						N Value			PL X		MC		-X	
Elevation (ft)	Depth (ft)	MATE	DΙΔΙ	DES	CBID	TION		lig 8	Sample Depth	Sample No./Type									CON			
é	ے ق	WATE	INIAL	DLO	CIVII	HON		957	Sar)	Sar No./	1st 6"	2nd 6"	3rd 6-	Ź							C (%)	00
_	_	75°, Su/Sp/Fi	/No. F	e/H/No	n/Pv/C	z. R/SF	R/S.	X//X		+	~	0 0	<u>υ 4</u>	+	0 1	0 2	0 30	1 40	50	60 <i>i</i>	0 80	90
_	_	%REC=100, 9	%RQD)=72, (GSÍ=4	0-50,				-												
		RMR=39, Cla psi, Medium S)											:	- :			÷		
662.9	-	Moderately W	_					NQ-3										٥		- 1		
4	-	NQ-3: Nume	erous .)			4															
		70°, Sp, No/P	y/Qz/S	Sd, %F	REC=9	95,																
1		%RQD=62, G 2.4 min/ft. a =	:SI=30 :6.940	r/Sd, %REC=95, 30-40, RMR=39, Class IV 0 psi, Medium Strong				· 💹	57.8													
+	-	Rock	5,5 .0	po., 14	. 50.011	. 500116	,			1												
_	_	NQ-4: Nume								1												i
				, %RQD=80, GSI=30-40, III, 2.8 min/ft. q,=4,980,												i						- 1
657.9	1	Medium Stror	iss III, na Roc	∠.8 mi ck	ın/π. q	_u =4,980	,			NQ-4								:	:	:	ø	÷
-	-									-												
										_								:		1		- :
	62.8																					
-	-	Boring Termin	nated a	at 62.8	ft. Be	low the	:			-												
4	-	Existing Bridg Achieved Tar			ace. B	soring				4								:		-		
652.9-			3																			-
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	2-12-0		IPLER	TYPE			(O!I							RILLI					101			_
SS - S	Split Spo Jndisturl	on oed Sample	(NQ - R CU - C	ock Co uttinas	ore, 1-7/	0		CF	A - Hollo A - Cont	inuoi	em Ai is Flic	uger aht A	ugers		RC RC	- R	ock (Wasl Core	n		
JD - U	Jndisturl	ped Sample re, 1-1/8"	(CU - C	uttings	ous Tub			CF	A - Cont	inuou	ıs Fliç	ght A	ugers		RC	- R	ock C	Core			

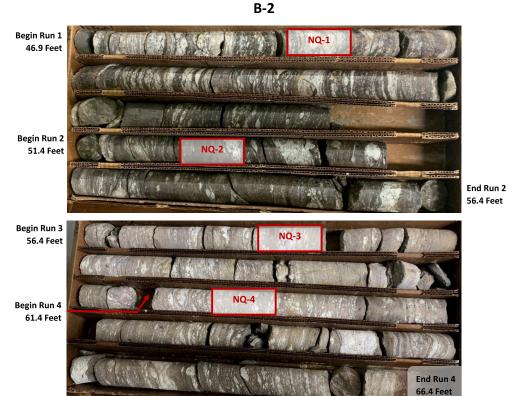


SCALE (FEET)





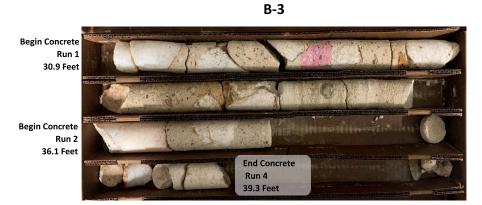
Rock Core Photos by F&ME Exhibit A-15



1.0

SCALE (FEET)

1.2

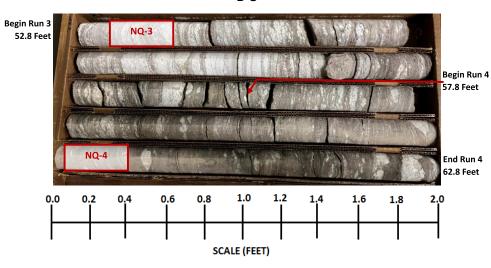














S-42-31 BRO Peters Creek | Spartanburg County, SC Terracon Project No. 8623P180 | SCDOT Project ID: P041165



Appendix B Laboratory Testing

Exhibit B-1 – Laboratory Testing Description Summary of Laboratory Data (2 Pages) Laboratory Data Sheets (25 Pages)

Note: All exhibits are one page unless noted above.

Exhibit B-1 - Laboratory Testing Description

S-42-31 BRO Peters Creek | Spartanburg County, SC Terracon Project No. 8623P180 | SCDOT Project ID: P041165



Laboratory Testing Description

The samples collected during the field exploration were taken to our laboratory for additional testing. The laboratory testing scope was developed by the SCDOT and laboratory assignment was performed by Terracon. The laboratory tests were conducted on selected soil samples from the borings and the bulk sample locations. The test results are presented in this appendix.

The laboratory test results were used to confirm the soil descriptions presented on the boring logs in Appendix A. Laboratory tests were performed in general accordance with the applicable ASTM, AASHTO, SCDOT or other accepted standards.

Selected soil samples obtained from the site were tested for the following engineering properties:

MOIS	sture	Content		

Atterberg Limits

Proctor (Standard effort)

Triaxial Shear CU w/ PP

Grain Size Distribution

Hydrometer

Compressive Strength of Rock Cores

Corrosion Series

AASHTO T265/(ASTM D2216) AASHTO T89/T90(ASTM D4318) AASHTO T99/ (ASTM D698) AASHTO T297/(ASTM D4767)

ASTM D6913 ASTM D7928 ASTM D7012 AASHTO D422

AASHTO T289/ASTM G51 AASHTO T290/ASTM C1580 AASHTO T291



Summary of Laboratory Results

Boring ID	Depth (Ft.)	Soil Classification USCS & AASHTO	Liquid Limit	Plastic Limit	Plasticity Index	% Gravel	% Sand	% Fines	% Silt	% Clay	Water Content (%)	Proctor Dry Density (pcf)/Opt. Moisture (%)
S-42-31-1	2-4	SILTY SAND(SM) / A-2-4 **									10.7	
S-42-31-1	4-6	SILTY SAND(SM) / A-2-4 **									17.0	
S-42-31-1	6-8	SILTY SAND(SM) / A-2-4 **				1.6	66.4	32.0			25.6	
S-42-31-1	8-10	SILTY SAND(SM) / A-2-4 **									23.8	
S-42-31-1	10-12	SILTY SAND(SM) / A-2-4 **									27.7	
S-42-31-1	12-14	SANDY SILT(ML) / A-4 (0)	NP	NP	NP	1.1	45.0	53.9			36.3	
S-42-31-1	14-16	SILTY SAND(SM) / A-2-4 **									28.3	
S-42-31-1	16-18	SANDY SILT(ML) / A-4 (0)	NP	NP	NP	3.5	43.7	52.8			31.8	
S-42-31-1	18-20	SANDY SILT(ML) / A-4 **									31.4	
S-42-31-1	20-22	SANDY SILT(ML) / A-4 **									32.7	
S-42-31-1	22-24	CLAYEY SAND(SC) / A-6 (3)	35	23	12	4.9	46.4	48.7	48.4	0.3	23.9	
S-42-31-1	24-26	CLAYEY SAND(SC) / A-6 **									24.4	
S-42-31-1	26-28	SANDY LEAN CLAY(CL) / A-6 **				5.5	43.2	51.3			22.9	
S-42-31-1	28-30	SANDY LEAN CLAY(CL) / A-4 (3)	33	23	10	7.0	42.4	50.6	32.9	17.7	28.2	
S-42-31-1	32-34	CLAYEY SAND WITH GRAVEL(SC) / A-2-6 **				28.3	44.9	26.8	19.3	7.4	19.4	
S-42-31-1	34-36	CLAYEY SAND WITH GRAVEL(SC) / A-2-6 **				34.0	41.8	24.2			16.8	
S-42-31-1	36-38	SILTY SAND(SM) / A-2-4 **									13.0	
S-42-31-2	0.5-2	SANDY LEAN CLAY(CL) / A-6 (4)	34	20	14	2.2	45.8	52.0			17.8	
S-42-31-2	2-4	SILTY SAND(SM) / A-2-4 **									18.2	

^{**} Where index test was not conclusive, soil was classified per ASTM D2488 - Visual-Manual Procedure



Summary of Laboratory Results

Boring ID	Depth (Ft.)	Soil Classification USCS & AASHTO	Liquid Limit	Plastic Limit	Plasticity Index	% Gravel	% Sand	% Fines	% Silt	% Clay	Water Content (%)	Proctor Dry Density (pcf)/Opt. Moisture (%)
S-42-31-2	4-6	SILTY SAND(SM) / A-2-4 **				14.5	61.0	24.5			15.2	
S-42-31-2	6-8	CLAYEY SAND(SC) / A-2-6 **									18.0	
S-42-31-2	8-10	SANDY SILT(ML) / A-7-6 **									28.8	
S-42-31-2	13.5-15	SANDY SILT(ML) / A-7-6 (6)	42	26	16	1.8	46.1	52.1			20.3	
S-42-31-2	18.5-20	CLAYEY SAND(SC) / A-6 (2)	37	23	14	6.8	52.1	41.1	41.1	0.0	20.4	
S-42-31-2	23.5-24.83	SILTY SAND(SM) / A-2-4 **									17.1	
S-42-31-2	28.5-28.75	SILTY SAND(SM) / A-2-4 **									15.8	
S-42-31-2 Bulk	1-5	CLAYEY SAND(SC) / A-6 (1)	29	18	11	3.6	53.9	42.5			13.7	117.6 / 13.3

^{**} Where index test was not conclusive, soil was classified per ASTM D2488 - Visual-Manual Procedure

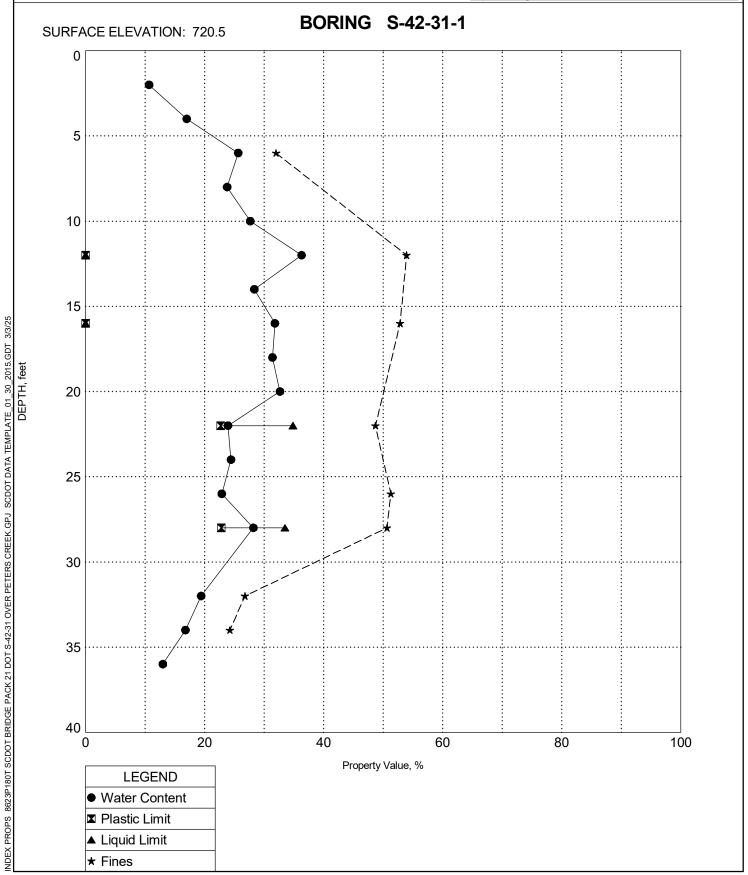


INDEX PROPERTIES VERSUS DEPTH

PROJECT ID P041165

PROJECT NAME S-42-31 (Cannons Campground Road) BRO Peters Creek

PROJECT COUNTY Spartanburg



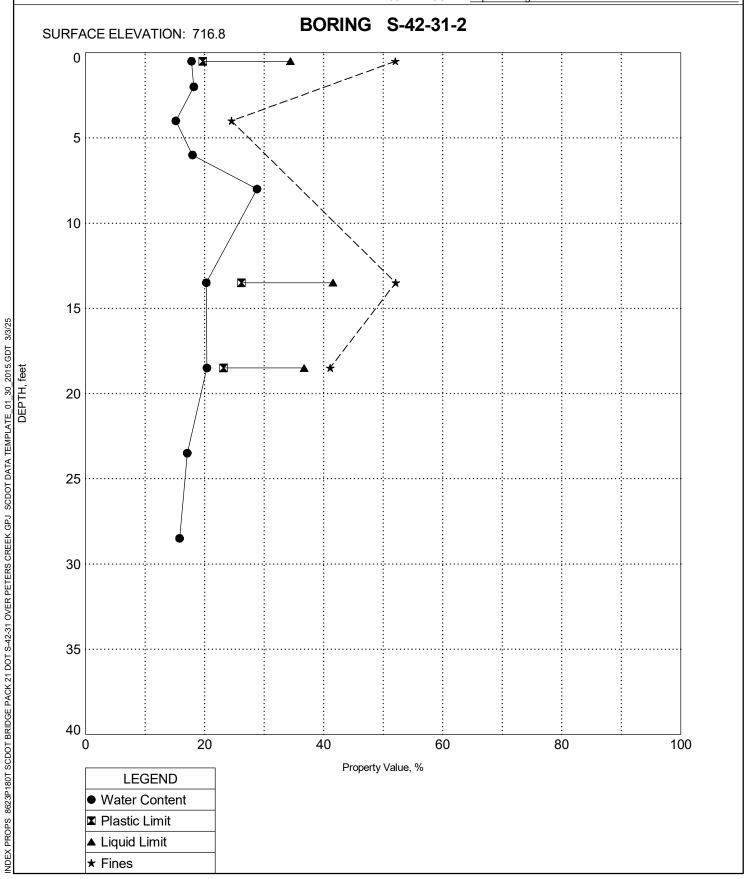


INDEX PROPERTIES VERSUS DEPTH

PROJECT ID P041165

PROJECT NAME S-42-31 (Cannons Campground Road) BRO Peters Creek

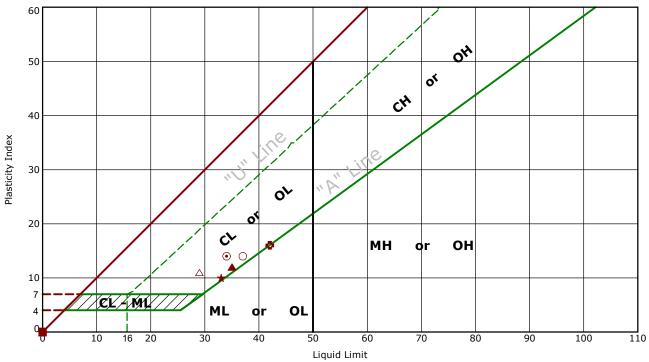
PROJECT COUNTY Spartanburg





Atterberg Limit Results

ASTM D4318

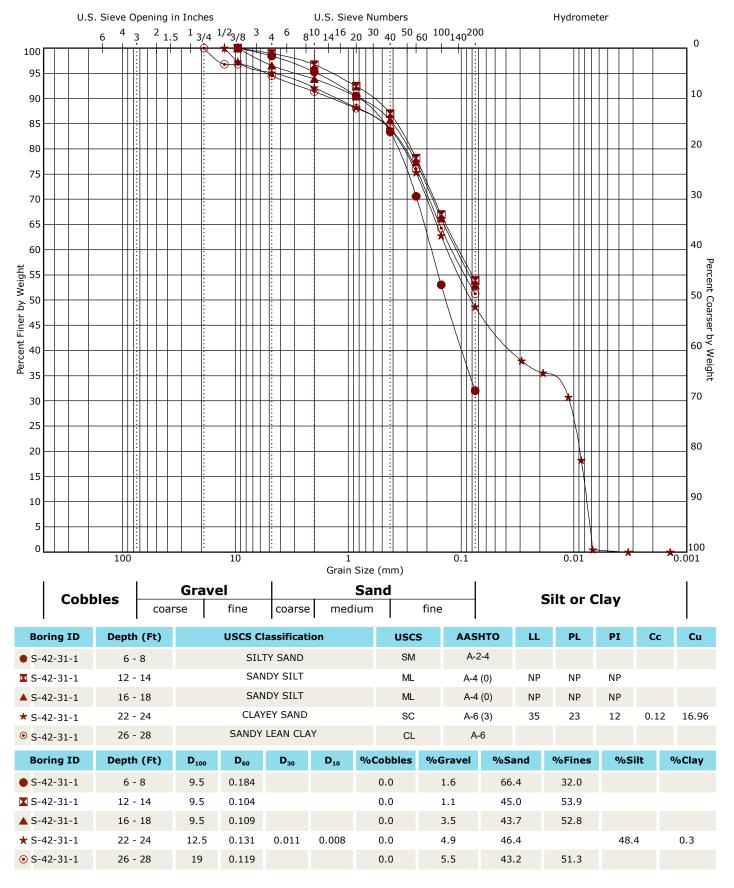


	Boring ID	Depth (Ft)	LL	PL	ΡI	Fines	AASHTO	Description
•	S-42-31-1	12 - 14	NP	NP	NP	53.9	A-4 (0)	SANDY SILT
×	S-42-31-1	16 - 18	NP	NP	NP	52.8	A-4 (0)	SANDY SILT
•	S-42-31-1	22 - 24	35	23	12	48.7	A-6 (3)	CLAYEY SAND
*	S-42-31-1	28 - 30	33	23	10	50.6	A-4 (3)	SANDY LEAN CLAY
•	S-42-31-2	0.5 - 2	34	20	14	52.0	A-6 (4)	SANDY LEAN CLAY
۰	S-42-31-2	13.5 - 15	42	26	16	52.1	A-7-6 (6)	SANDY SILT
0	S-42-31-2	18.5 - 20	37	23	14	41.1	A-6 (2)	CLAYEY SAND
Δ	S-42-31-2 Bulk	1 - 5	29	18	11	42.5	A-6 (1)	CLAYEY SAND



Grain Size Distribution

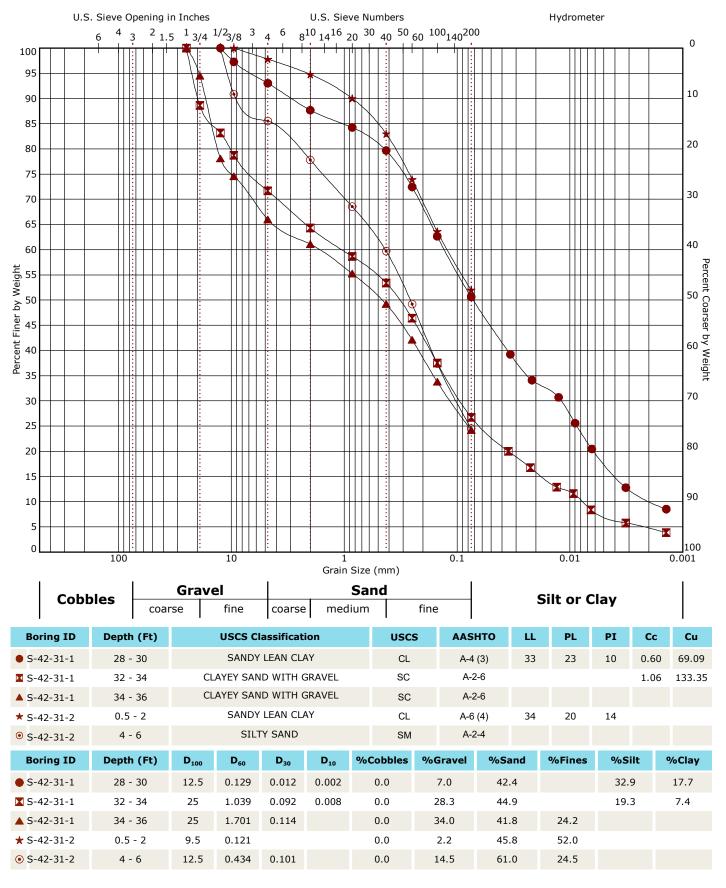
ASTM D422 / ASTM C136





Grain Size Distribution

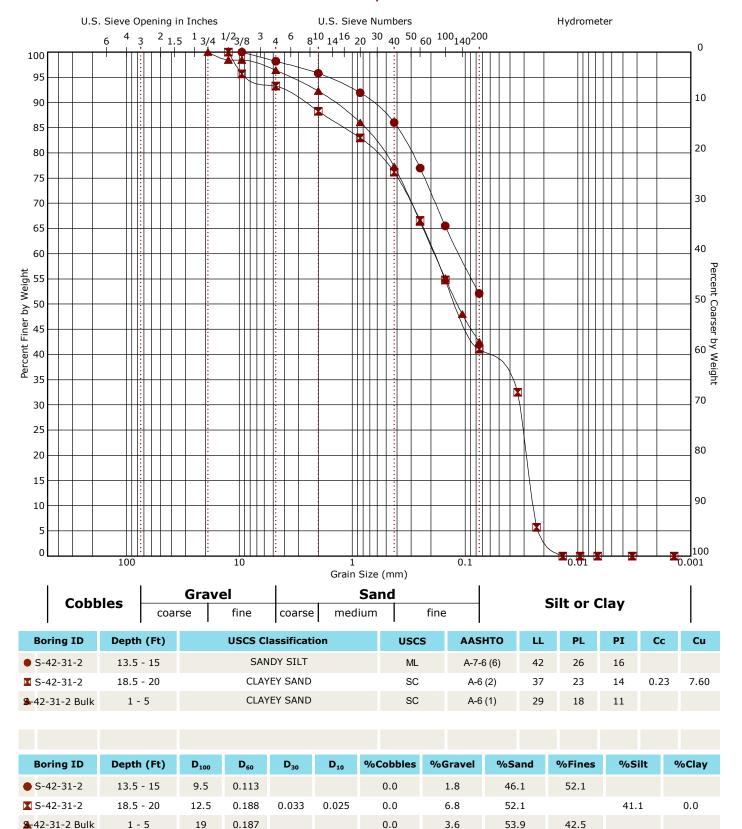
ASTM D422 / ASTM C136



72 Pointe Cir Greenville, SC

Grain Size Distribution

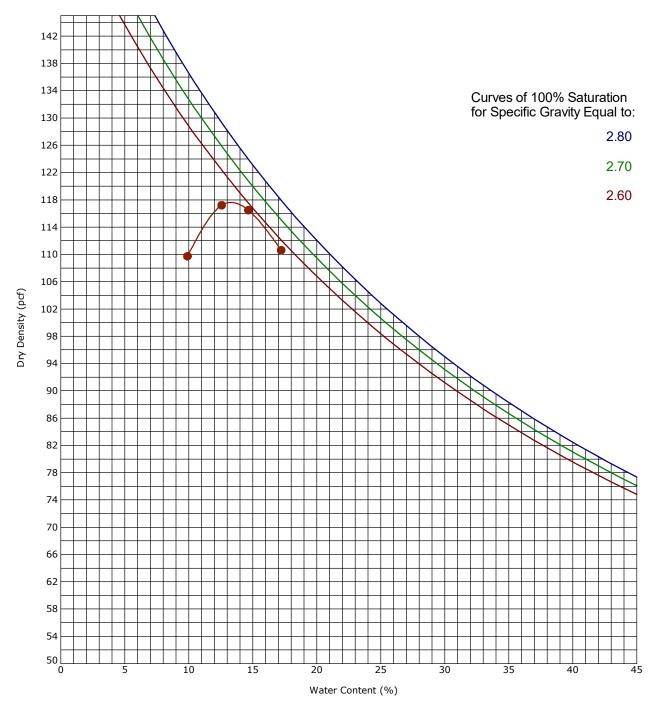
ASTM D422 / ASTM C136



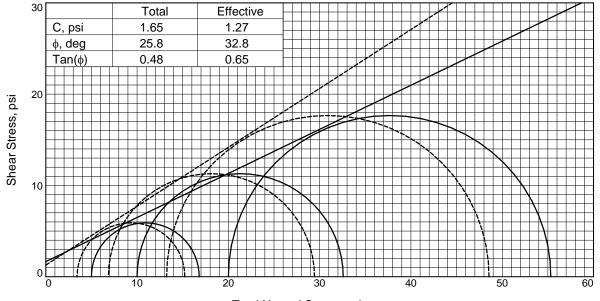


Moisture-Density Relationship

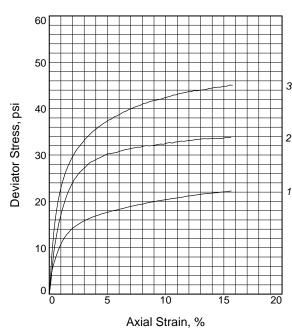
ASTM D698-Method B



Вс	oring ID	Depth ((Ft)	Description of Materials				
S-42	!-31-2 Bulk	1 - 5	i	CLAYEY SAND(SC)				
Fines (%)	Fraction > mm size	LL	PL	PI	Test Method	Maximum Dry Density (pcf)	Optimum Water Content (%)	
43	0.0	29	18	11	ASTM D698-Method B	117.6	13.3	



Total Normal Stress, psi ———— Effective Normal Stress, psi ------



	Saı	mple No.	1	2	3	
		Water Content, %	13.3	13.4	13.2	
	_	Dry Density, pcf	112.0	112.1	112.3	
3	Initial	Saturation, %	71.1	71.9	71.3	
	≟	Void Ratio	0.5044	0.5030	0.5013	
		Diameter, in.	2.80	2.80	2.80	
		Height, in.	5.62	5.62	5.62	
2		Water Content, %	18.2	19.4	18.4	
	+=	Dry Density, pcf	113.0	110.6	112.6	
	es.	Saturation, %	100.0	100.0	100.0	
1	At Test	Void Ratio	0.4910	0.5237	0.4964	
'	1	Diameter, in.	2.80	2.82	2.81	
		Height, in.	5.57	5.58	5.53	
	Str	ain rate, in./min.	0.001	0.001	0.001	
	Ba	ck Pressure, psi	50.0	50.0	50.0	
	Cel	ll Pressure, psi	55.0	60.0	70.0	
	Fai	I. Stress, psi	11.8	22.6	35.3	
	E	Excess Pore Pr., psi	1.6	3.1	6.8	
	Ult. Stress, psi		22.1	33.7	44.9	
	Excess Pore Pr., psi		-2.8	-2.9	2.7	
	$\overline{\sigma}_1$	Failure, psi	15.2	29.4	48.6	
	$\overline{\sigma}_{3}$	Failure, psi	3.4	6.9	13.2	

Type of Test:

CU with Pore Pressures

Sample Type: Remolded

Description: Clayey Sand (SC)

LL= 29 **PL=** 18 **PI=** 11

Specific Gravity= 2.7

Remarks: Specimens were remolded to approximately 95% MDD at optimum water content.

Conton

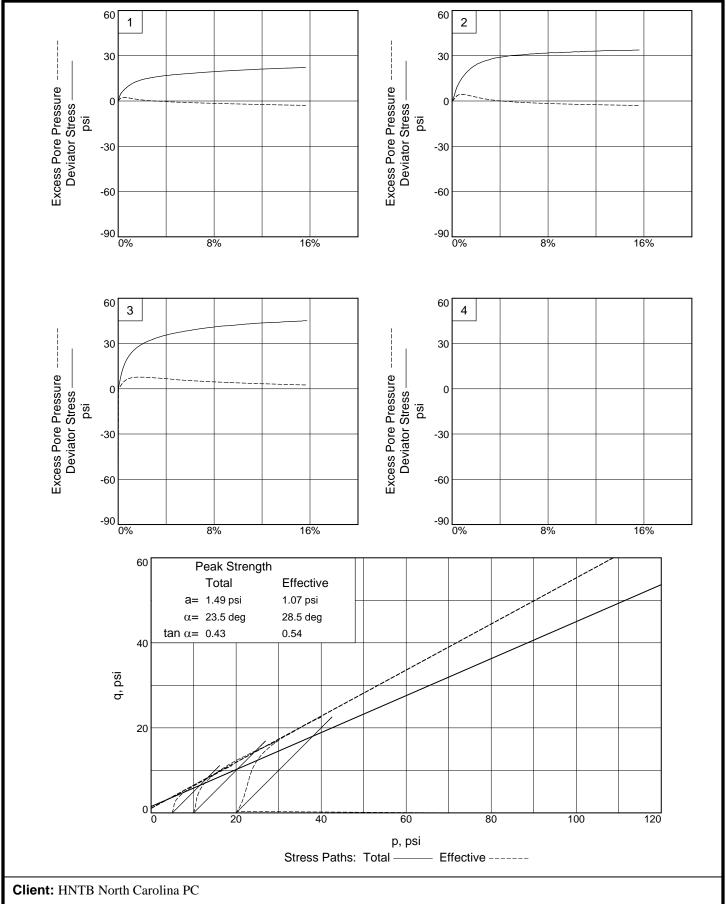
Figure

Client: HNTB North Carolina PC

Project: S-42-31 (Cannons Campground Road) BRO Peters Creek

Source of Sample: S-42-31-2 Depth: 1-3'

> TRIAXIAL SHEAR TEST REPORT Terracon Consultants, Inc. Chattanooga, TN



Project: S-42-31 (Cannons Campground Road) BRO Peters Creek

Source of Sample: S-42-31-2 Depth: 1-3'

Project No.: 8623P180 Figure _____

Terracon Consultants, Inc.

750 Pilot Road, Suite F Las Vegas, Nevada 89119 (702) 597-9393

ierracon

Client

HNTB North Carolina PC

ProjectSCDOT Bridge Package 19 - Peters Creek

Sample Submitted By: Terracon (86) Date Received: 2/7/2025 Lab No.: 25-0052

Results of Corrosion Analysis

Sample Number	
Sample Location	S-42-31-1
Sample Depth (ft.)	2.0-30.0
pH Analysis, AASHTO T289	5.45
Water Soluble Sulfate (SO4), AASHTO T290 (mg/kg)	95
Sulfides, ASTM D4658, (ppm)	Nil
Red-Ox, ASTM G200, (mV)	+733
Chlorides, AASHTO T291, (mg/kg)	130
Saturated Minimum Resistivity, ASTM G-57, (ohm cm)	2814

Analyzed By

Nathan Campo Laboratory Coordinator

M. Cargo

The tests were performed in general accordance with applicable ASTM and AWWA test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. 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 or identical materials.

Rock Coring Summary PAGE 1 OF 1



PROJECT ID P041165

PROJECT NAME S-42-31 (Cannons Campground Road) BRO Peters Creek

PROJECT COUNTY Spartanburg

						<u></u>	a			
Borehole	Core Run Number	Core Run Top Depth	REC (%)	RQD (%)	q _u (psi)	Poisson's Ratio	Secant Modulus (ksi)	Unit Weight (pcf)	RMR	GSI
S-42-31-1	NQ-1	38.5	70	15	5449	0.29	718	162	40	48
S-42-31-1	NQ-2	43.5	82	13	11576	0.22	1449	172	43	53
S-42-31-1	NQ-3	48.5	90	32	3838	0.04	376	165	50	60
S-42-31-1	NQ-4	53.5	100	68	5875	0.03	636	170	65	70
S-42-31-2	NQ-1	33.5	18	0					2	15
S-42-31-2	NQ-2	38.5	68	20	3263	0.10	132	163	22	43
S-42-31-2	NQ-3	43.5	100	50	5710	0.03	616	168	55	65
S-42-31-2	NQ-4	48.5	100	40	3783	0.05	280	165	39	55

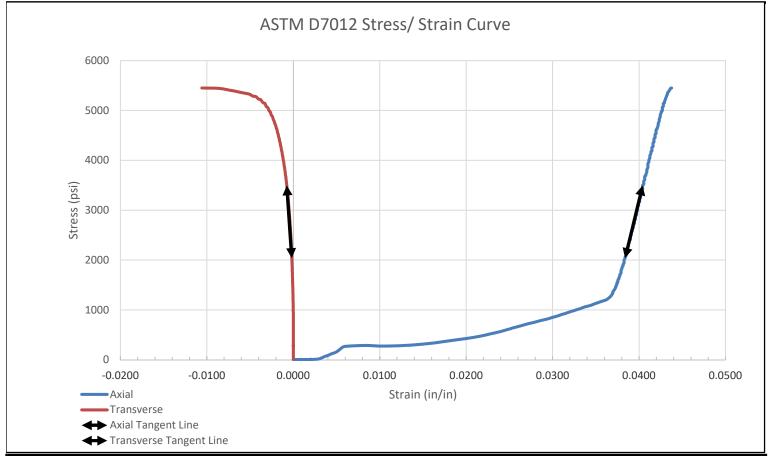


HNTB North Carolina PC 4922 O'Hear Avenue Suite 203 North Charleston, SC 29402

Project

SCDOT Bridge Package 19 Multiple Sites

Project No. 8623P180





SAMPLE LOCATION							
Site:	SCDOT Brid	lge Package 19 - ove	r Peters Creek				
Rock Type:		Granite					
Boring:	S-42-31-1	Depth (feet):	38.8-39.5				
SPECIMEN INFORMATION							
Sample No.:	R1 Mass (g): 530.78						
Length (in.):	4.19	Diameter (in.):	1.95				
L/D Ratio:	2.1	Density (pcf):	161.59				
TEST RESULTS							
Failure Load (lbs):			16266				
Failure Strain (%):			4.38				
Unconfined Compr	essive Strength (osi):	5,449				
Elastic Modulus, E.	, (ksi):		718				
Poisson's Ratio, υ:			0.285				
Time of Failure (min): 00:39							
Rate of Loading (psi/sec): 141.17							
Moisture Content F	ost-break:		0.3%				



HNTB North Carolina PC 4922 O'Hear Avenue Suite 203 North Charleston, SC 29402 **Project**

SCDOT Bridge Package 19

Multiple Sites

Project No. 8623P180

ASTM D4543 Test Results:

<u>Parameter</u> <u>Data</u>

Side Straightness: 0.0079

Perpendicularity Deviation:

Diameter 1a: 0.0017
Diameter 1b: 0.0034
Diameter 2a: 0.0018
Diameter 2b: 0.0028

Max Deviation from Flatness: 0.0014

Parallelism Deviation:

Diameter a: 0.02 Diameter b: 0.04

Equipment: TICCS ID:

Calipers: W-54522 Scale: B-71466

Dial Indicator: B-71466

Compression (spherically seated): C-48999

Samples were prepared and tested in accordance with ASTM D4543 and D7012. Deviations, if any, are noted below: Notes:

Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches. According to ASTM D7012 Section 8.2.1, this specimen, although not meeting all requirements of ASTM D4543 is acceptable for testing. However, the results reported may differ from results obtained from a test specimen that meets the requirements of D4543.

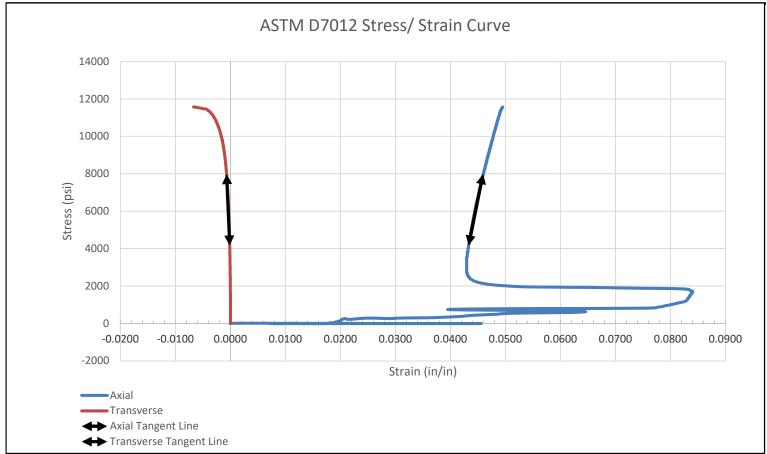


HNTB North Carolina PC 4922 O'Hear Avenue Suite 203 North Charleston, SC 29402

Project

SCDOT Bridge Package 19 Multiple Sites

Project No. 8623P180





SAMPLE LOCATION							
Site:	SCDOT Brid	lge Package 19 - Ov	er Peters Creek				
Rock Type:		Gneiss					
Boring:	S-42-31-1	Depth (feet):	45.3-46.0				
SPECIMEN INFORMATION							
Sample No.:	R2	R2 Mass (g):					
Length (in.):	4.19	Diameter (in.):	1.95				
L/D Ratio:	2.1	Density (pcf):	171.51				
TEST RESULTS							
Failure Load (lbs):			34572				
Failure Strain (%):			8.40				
Unconfined Compr	essive Strength (psi):	11,576				
Elastic Modulus, E	, (ksi):		1449				
Poisson's Ratio, υ:			0.216				
Time of Failure (m	01:55						
Rate of Loading (p	100.315						
Moisture Content F	Moisture Content Post-break: 0.3%						



HNTB North Carolina PC 4922 O'Hear Avenue Suite 203 North Charleston, SC 29402 **Project**

SCDOT Bridge Package 19 Multiple Sites

Project No. 8623P180

ASTM D4543 Test Results:

<u>Parameter</u> <u>Data</u>

Side Straightness: 0.0042

Perpendicularity Deviation:

 Diameter 1a:
 0.0048

 Diameter 1b:
 0.0019

 Diameter 2a:
 0.0025

 Diameter 2b:
 0.0033

Max Deviation from Flatness: 0.0019

Parallelism Deviation:

Diameter a: 0.14 Diameter b: 0.28

Equipment: TICCS ID:

Calipers: W-54522 Scale: B-71466

Dial Indicator: C-70608

Compression (spherically seated): C-48999

Samples were prepared and tested in accordance with ASTM D4543 and D7012. Deviations, if any, are noted below: Notes:

Per ASTM D4543, this specimen has not met the requirements for perpendicularity, by exceeding 0.250°.

Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches.

According to ASTM D7012 Section 8.2.1, this specimen, although not meeting all requirements of ASTM D4543 is acceptable for testing. However, the results reported may differ from results obtained from a test specimen that meets the requirements of D4543.

The inconsistencies on the graph are due to the settling of the chain and movement of the sample during testing. As the testing proceeded, the chain settled into a more stable state. The Elastic Modulus and Poisson's ratio were taken from the stable state. These results may differ from results from a test specimen that does not fluctuate as much.

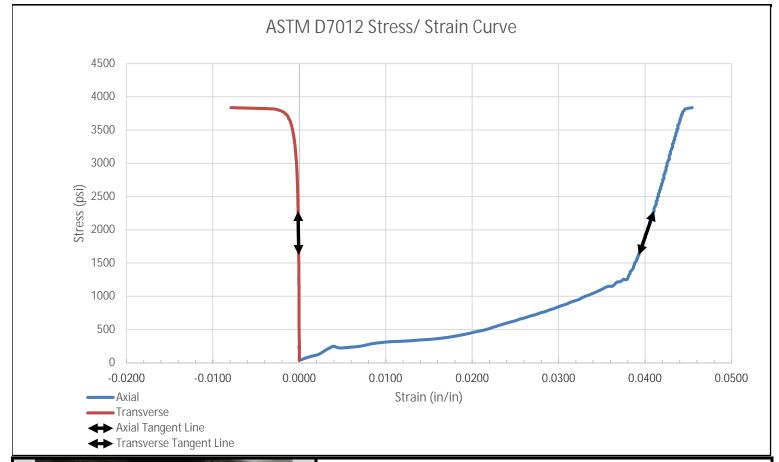


HNTB North Carolina PC 4922 O'Hear Avenue Suite 203 North Charleston, SC 29402

Project

SCDOT Bridge Package 19 Multiple Sites

Project No. 8623P180





SAMPLE LOCATION							
Site:	SCDOT Brid	ge Package 19 - Ove	er Peters Creek				
Rock Type:		Schist					
Boring:	S-42-31-1	Depth (feet):	49.3-50.4				
SPECIMEN INFORMATION							
Sample No.:	R3	Mass (g):	519.42				
Length (in.):	3.98	Diameter (in.):	1.96				
L/D Ratio:	2.03	Density (pcf):	164.78				
TEST RESULTS							
Failure Load (lbs):			11580				
Failure Strain (%):			4.54				
Unconfined Compr	essive Strength (p	osi):	3,838				
Elastic Modulus, E,	(ksi):		376				
Poisson's Ratio, u:	0.041						
Time of Failure (mi	00:34						
Rate of Loading (page 1)	112.884						
Moisture Content P	ost-break:		0.5%				



Client Project

HNTB North Carolina PC 4922 O'Hear Avenue Suite 203 North Charleston, SC 29402 SCDOT Bridge Package 19 Multiple Sites

Project No. 8623P180

ASTM D4543 Test Results:

<u>Parameter</u> <u>Data</u>

Side Straightness: 0.0068

Perpendicularity Deviation:

 Diameter 1a:
 0.0049

 Diameter 1b:
 0.0068

 Diameter 2a:
 0.0099

 Diameter 2b:
 0.0081

Max Deviation from Flatness: 0.0070

Parallelism Deviation:

Diameter a: 0.35 Diameter b: 0.82

Equipment: TICCS ID:

Calipers: W-54522 Scale: B-71466

Dial Indicator: C-70608

Compression (spherically seated): C-48999

Samples were prepared and tested in accordance with ASTM D4543 and D7012. Deviations, if any, are noted below: Notes:

Per ASTM D4543, this specimen has not met the requirements for perpendicularity, by exceeding 0.250°.

Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches.

Per ASTM D4543, this specimen has not met the requirements for parallelism, by exceeding 0.25°.

According to ASTM D7012 Section 8.2.1, this specimen, although not meeting all requirements of ASTM D4543 is acceptable for testing. However, the results reported may differ from results obtained from a test specimen that meets the requirements of D4543.

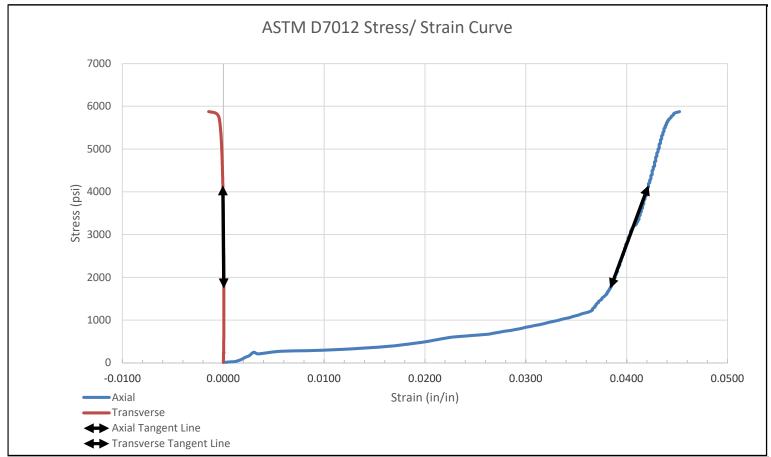


HNTB North Carolina PC 4922 O'Hear Avenue Suite 203 North Charleston, SC 29402

Project

SCDOT Bridge Package 19 Multiple Sites

Project No. 8623P180





SAMPLE LOCATION							
Site:	SCDOT Brid	SCDOT Bridge Package 19 - Over Peters Creek					
Rock Type:		Gneiss					
Boring:	S-42-31-1	Depth (feet):	54.9-55.6				
SPECIMEN INFORMATION							
Sample No.:	R4	Mass (g):	556.32				
Length (in.):	4.23	Diameter (in.):	1.94				
L/D Ratio:	2.2	Density (pcf):	169.50				
TEST RESULTS							
Failure Load (lbs):			17357				
Failure Strain (%):			4.52				
Unconfined Compr	essive Strength (osi):	5,875				
Elastic Modulus, E,	, (ksi):		636				
Poisson's Ratio, υ:			0.025				
Time of Failure (mi		00:54					
Rate of Loading (ps	109.20						
Moisture Content P	ost-break:		0.7%				



HNTB North Carolina PC 4922 O'Hear Avenue Suite 203 North Charleston, SC 29402 **Project**

SCDOT Bridge Package 19 Multiple Sites

Project No. 8623P180

ASTM D4543 Test Results:

<u>Parameter</u> <u>Data</u>

Side Straightness: 0.0087

Perpendicularity Deviation:

 Diameter 1a:
 0.0032

 Diameter 1b:
 0.0069

 Diameter 2a:
 0.0020

 Diameter 2b:
 0.0073

Max Deviation from Flatness: 0.0029

Parallelism Deviation:

Diameter a: 0.05 Diameter b: 0.80

Equipment: TICCS ID:

Calipers: W-54522 Scale: B-71466

Dial Indicator: C-70608

Compression (spherically seated): C-48999

Samples were prepared and tested in accordance with ASTM D4543 and D7012. Deviations, if any, are noted below:

Notes:

Per ASTM D4543, this specimen has not met the requirements for perpendicularity, by exceeding 0.250°.

Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches.

Per ASTM D4543, this specimen has not met the requirements for parallelism, by exceeding 0.25°.

According to ASTM D7012 Section 8.2.1, this specimen, although not meeting all requirements of ASTM D4543 is acceptable for testing. However, the results reported may differ from results obtained from a test specimen that meets the requirements of D4543.

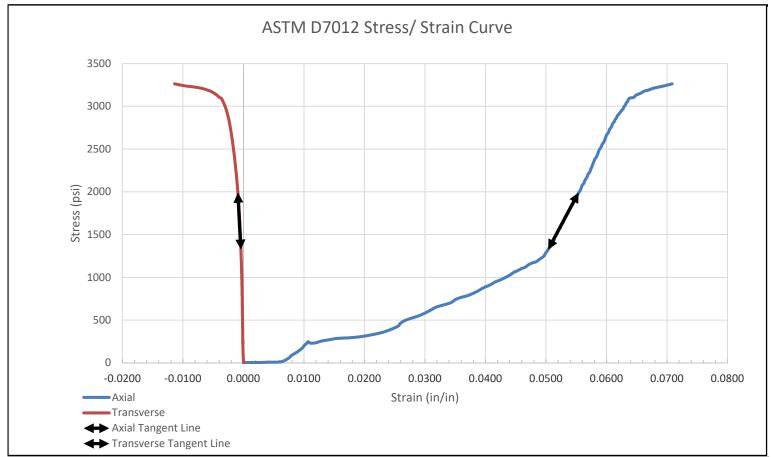


HNTB North Carolina PC 4922 O'Hear Avenue Suite 203 North Charleston, SC 29402

Project

SCDOT Bridge Package 19 Multiple Sites

Project No. 8623P180





	SAMPLE	LOCATION	۱
Site:	SCDOT Brid	lge Package 19 - Ov	er Peters Creek
Rock Type:		Schist	
Boring:	S-42-31-2	Depth (feet):	40.4-41
SP	ECIMEN I	NFORMAT	ION
Sample No.:	R2	Mass (g):	517.09
Length (in.):	4.08	Diameter (in.):	1.94
L/D Ratio:	2.10	Density (pcf):	163.34
	TEST F	RESULTS	
Failure Load (lbs):			9642
Failure Strain (%):			7.08
Unconfined Compr	essive Strength (osi):	3,263
Elastic Modulus, E	, (ksi):		132
Poisson's Ratio, υ:			0.098
Time of Failure (m	in):		00:33
Rate of Loading (p			99.49
Moisture Content F	Post-break:		1.7%



HNTB North Carolina PC 4922 O'Hear Avenue Suite 203 North Charleston, SC 29402 **Project**

SCDOT Bridge Package 19 Multiple Sites

Project No. 8623P180

ASTM D4543 Test Results:

<u>Parameter</u> <u>Data</u>

Side Straightness: 0.0182

Perpendicularity Deviation:

 Diameter 1a:
 0.0085

 Diameter 1b:
 0.0137

 Diameter 2a:
 0.0043

 Diameter 2b:
 0.0155

Max Deviation from Flatness: 0.0064

Parallelism Deviation:

Diameter a: 0.19 Diameter b: 1.70

Equipment: TICCS ID:

Calipers: W-54522 Scale: B-71466

Dial Indicator: C-70608

Compression (spherically seated): C-48999

Samples were prepared and tested in accordance with ASTM D4543 and D7012. Deviations, if any, are noted below:

Notes:

Per ASTM D4543, this specimen has not met the requirements for perpendicularity, by exceeding 0.250°.

Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches.

Per ASTM D4543, this specimen has not met the requirements for parallelism, by exceeding 0.25°.

According to ASTM D7012 Section 8.2.1, this specimen, although not meeting all requirements of ASTM D4543 is acceptable for testing. However, the results reported may differ from results obtained from a test specimen that meets the requirements of D4543.

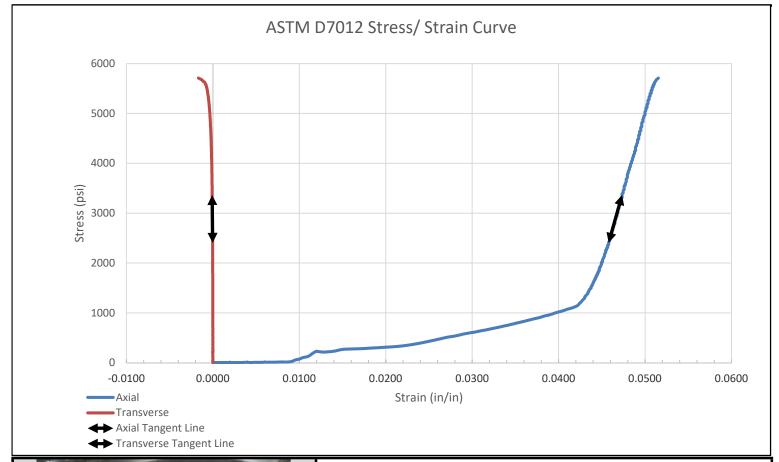


HNTB North Carolina PC 4922 O'Hear Avenue Suite 203 North Charleston, SC 29402

Project

SCDOT Bridge Package 19 Multiple Sites

Project No. 8623P180





	SAMPLE	LOCATION	1							
Site:	Site: SCDOT Bridge Package 19 - Over Peters Creek									
Rock Type:		Gneiss								
Boring:	S-42-31-2	Depth (feet):	46.7-47.5							
SP	ECIMEN I	NFORMAT	ION							
Sample No.:	R3	Mass (g):	551.12							
Length (in.):	4.18	Diameter (in.):	1.95							
L/D Ratio:	2.14	Density (pcf):	168.19							
	TEST F	RESULTS								
Failure Load (lbs):			17043							
Failure Strain (%):			5.15							
Unconfined Compr	essive Strength (p	osi):	5,710							
Elastic Modulus, E.	, (ksi):		616							
Poisson's Ratio, υ:			0.029							
Time of Failure (mi	in):		00:56							
Rate of Loading (page 1			101.59							
Moisture Content F	Post-break:		1.2%							



HNTB North Carolina PC 4922 O'Hear Avenue Suite 203 North Charleston, SC 29402 **Project**

SCDOT Bridge Package 19 Multiple Sites

Project No. 8623P180

ASTM D4543 Test Results:

<u>Parameter</u> <u>Data</u>

Side Straightness: 0.0049

Perpendicularity Deviation:

Diameter 1a: 0.0022
Diameter 1b: 0.0015
Diameter 2a: 0.0008
Diameter 2b: 0.0014

Max Deviation from Flatness: 0.0018

Parallelism Deviation:

Diameter a: 0.08 Diameter b: 0.03

Equipment: TICCS ID:

Calipers: W-54522 Scale: B-71466

Dial Indicator: C-70608

Compression (spherically seated): C-48999

Samples were prepared and tested in accordance with ASTM D4543 and D7012. Deviations, if any, are noted below: Notes:

Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches.

According to ASTM D7012 Section 8.2.1, this specimen, although not meeting all requirements of ASTM D4543 is acceptable for testing. However, the results reported may differ from results obtained from a test specimen that meets the requirements of D4543.

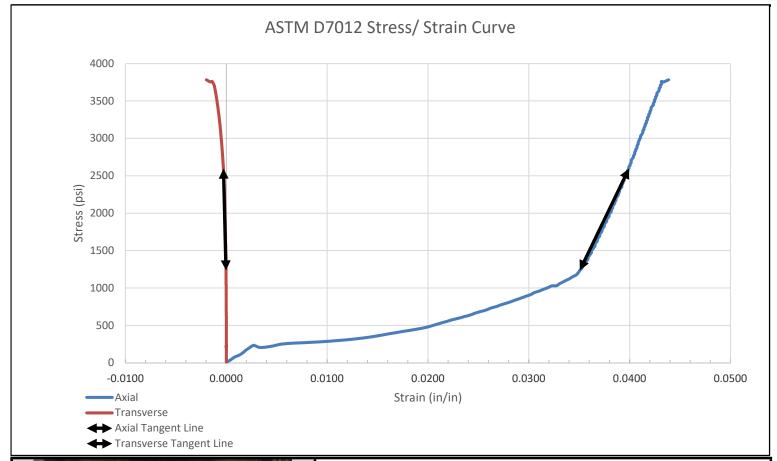


HNTB North Carolina PC 4922 O'Hear Avenue Suite 203 North Charleston, SC 29402

Project

SCDOT Bridge Package 19 Multiple Sites

Project No. 8623P180





	SAMPLE	LOCATION	1
Site:	SCDOT Brid	ge Package 19 - Ove	er Peters Creek
Rock Type:		Schist	
Boring:	S-42-31-2	Depth (feet):	51.4-52
SPI	ECIMEN I	NFORMAT	ION
Sample No.:	R4	Mass (g):	559.94
Length (in.):	4.33	Diameter (in.):	1.95
L/D Ratio:	2.22	Density (pcf):	164.96
	TEST F	RESULTS	
Failure Load (lbs):			11291
Failure Strain (%):			4.38
Unconfined Compr	essive Strength (p	osi):	3,783
Elastic Modulus, E,	, (ksi):		280
Poisson's Ratio, υ:			0.053
Time of Failure (mi	n):		00:35
Rate of Loading (po			109.33
Moisture Content F	ost-break:		1.3%



HNTB North Carolina PC 4922 O'Hear Avenue Suite 203 North Charleston, SC 29402 **Project**

SCDOT Bridge Package 19 Multiple Sites

Project No. 8623P180

ASTM D4543 Test Results:

<u>Parameter</u> <u>Data</u>

Side Straightness: 0.0038

Perpendicularity Deviation:

 Diameter 1a:
 0.0089

 Diameter 1b:
 0.0025

 Diameter 2a:
 0.0088

 Diameter 2b:
 0.0040

Max Deviation from Flatness: 0.0096

Parallelism Deviation:

Diameter a: 0.10 Diameter b: 0.15

Equipment: TICCS ID:

Calipers: W-54522 Scale: B-71466

Scale: B-71466 Dial Indicator: C-70608

Compression (spherically seated): C-48999

Samples were prepared and tested in accordance with ASTM D4543 and D7012. Deviations, if any, are noted below: Notes:

Per ASTM D4543, this specimen has not met the requirements for perpendicularity, by exceeding 0.250°. Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches. According to ASTM D7012 Section 8.2.1, this specimen, although not meeting all requirements of ASTM D4543 is acceptable for testing. However, the results reported may differ from results obtained from a test specimen that meets the requirements of D4543.

Appendix C - Supporting Documents

S-42-31 over Peters Creek Emergency Bridge Replacement | Spartanburg County, SC Terracon Project No. 8623P180 | SCDOT Project ID: P041165



Appendix C Supporting Documents

3-Point Acceleration Design Response Spectrum by SCDOT Rig Calibration Report – DR#1327 (8 Pages)

Note: All exhibits are one page unless noted above.

3-Point Acceleration Design Response Spectrum

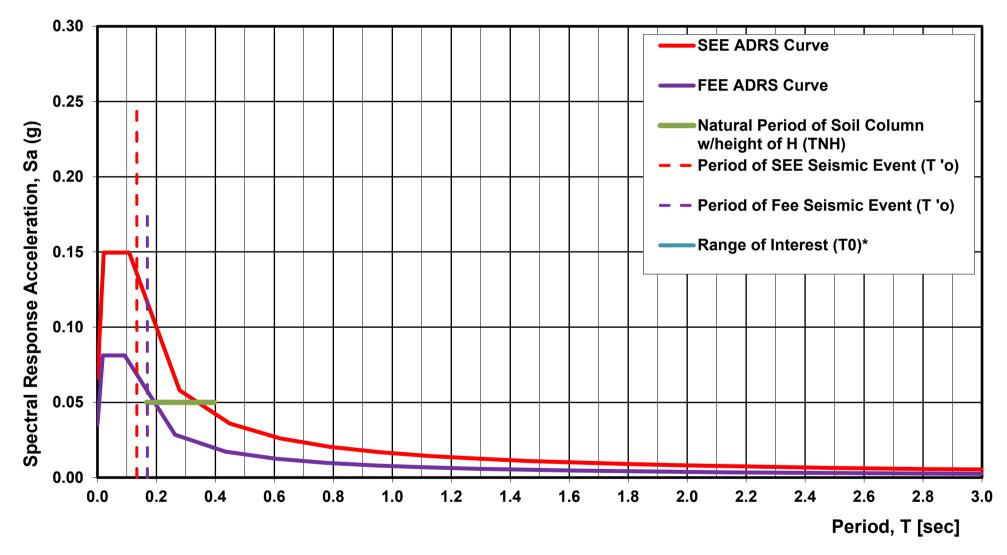
SCDOT v3.2 - 06/01/2023

Project ID:	P041165			Latitude:	34.9982
Route:	S-42-31	County:	42 - Spartanburg	Longitude:	81.8767
Project:		Cannons Car	mpground Road over F	Peters Creek	

Design EQ	PGA	S _{DS}	S _{D1}	M _w	R	PGV	D _{a5-95}	T' _o
	g	g	g	-	km	inches/sec	sec	sec
FEE	0.04	80.0	0.01	7.30	236.43	0.29	54.72	0.17
SEE	0.07	0.15	0.02	6.46	159.77	0.61	34.02	0.13

Fundamental Period of	Range o	f Interest	V*	ш	(4*H)/V* _{s,H}	NH	
Structure, T ₀ *	S	ec	▼ s,H	"	se	ec	
sec	0.5*T ₀	2.0*T ₀	ft/sec	ft	(4*H)/V* _{s,H}	(6*H)/V* _{s,H}	
0.00	0.00	0.00	1117.75	74.00	0.17	0.40	
0.00	0.00	0.00		H = B-C Boundary	1		

SC Seismic ADRS Curve



Designer:	D. Sapkota - Support
Date:	2/5/2025

Damping: 5%	
Geologic Condition:	Geologically Realistic (Q = 100)*
Geologic Condition.	SCP
ADRS Location within Soil Column:	At Ground Surface

*Same Geologic Condition as used in SCENARIO_PC (2006)

_	FEE	Data	_	SEE	Data
Г	Т	Sa	1 г	Т	Sa
	0.00	0.035	1 -	0.00	0.066
	0.00	0.043	1	0.00	0.080
	0.01	0.051	1	0.01	0.094
	0.01	0.058	1	0.01	0.108
	0.01	0.066	1	0.01	0.122
	0.02	0.074	1	0.02	0.136
То	0.02	0.081	То	0.02	0.150
	0.02	0.081		0.03	0.150
	0.03	0.081	1	0.04	0.150
	0.04	0.081	1	0.04	0.150
	0.04	0.081	1	0.05	0.150
	0.05	0.081	1	0.06	0.150
	0.06	0.081	Ι Γ	0.06	0.150
	0.06	0.081	Ι Γ	0.07	0.150
	0.07	0.081	Ι Γ	0.08	0.150
	0.07	0.081		0.09	0.150
	0.08	0.081		0.09	0.150
	0.09	0.081		0.10	0.150
Ts	0.09	0.081	Ts	0.11	0.150
	0.26	0.029		0.28	0.058
	0.43	0.017	1 [0.45	0.036
	0.61	0.012		0.62	0.026
	0.78	0.010		0.79	0.020
	0.95	0.008		0.96	0.017
	1.12	0.007		1.13	0.014
	1.29	0.006		1.30	0.012
	1.46	0.005	J L	1.47	0.011
L	1.63	0.005	l L	1.64	0.010
L	1.80	0.004	l L	1.81	0.009
L	1.97	0.004	l L	1.98	0.008
	2.14	0.004	ı L	2.15	0.008
	2.32	0.003	ı L	2.32	0.007
<u>L</u>	2.49	0.003	l L	2.49	0.006
L	2.66	0.003	ı L	2.66	0.006
	2.83	0.003	ı L	2.83	0.006
	3.00	0.003	J L	3.00	0.005



TH CARO

TERRACON CONSULTANTS, No. 2220

SPT Automatic Hammer Energy Measurement Report

Drill Rig Model: Geoprobe 3126GT Drill Rig Serial Number: 3126S5V224106

Asset Number: DR#1327

September 13, 2024





Terracon Consultants, Inc. Greenville, South Carolina





ierracon



Terracon Consultants Inc. 72 Pointe Circle Greenville, SC 29615

Attn: Nitin Dudani

E: nitin.dudani@terracon.com

SPT Automatic Hammer Energy Measurement Report

Rig No: 1327

Terracon Project Number: 73245115

Dear Mr. Dudani:

This report provides the Energy Transfer Ratio (ETR) for the Standard Penetration Testing (SPT) automatic hammer as summarized below:

Table 1: Hammer Efficiency Summary

Drill Rig Make/Model	Drill Rig Serial Number	Drill Rig Year	Asset Number	Energy Transfer Ratio (ETR)	Hammer Efficiency Correction (C _E)
Geoprobe	3126S5V224106	2024	DR#1327	92.6% ± 1.75%	1.54

*Please Note: according to ASTM standard, a minimum of three recordings should be collected at five-foot intervals no shallow than twenty feet below current ground surface (bgs). The sample intervals were obtained between 30 and 50 feet bgs.

If you have any questions concerning this summary, or if we may be of further service, please contact

Rvan C. Wakeford, P.F.

Susheel Kohwalkar

Susheel R. Kolwalkar, Ph.D., P.E. Regional Services Manager



Micah Hatch, P.E. Geotechnical Department Manager

Attachments:

Exhibit A: SPT Representative Blow

Exhibit B: SPT Analyzer Literature and Equipment Calibrations

Exhibit C: SPT Analyzer Results

Exhibit D: Field Log

Exhibit E: Copy of Certificate of Proficiency

Facilities | Environmental | Geotechnical | Materials |

ierracon





Table 2: SPT Hammer Energy Calibration Testing Summary

Boring Start Rod Depth¹ Length² (ft) (ft)		Roc	d Sect	ions³		asured Blo		S	SPT N _{meas}	Soil	
Богіпд	(ft)	t) (ft)	2 ft	5 ft	10 ft	1 st Inc.	2 nd Inc.	3 rd Inc.	4 th Inc.	(bpf)	Type ⁴
	28.5	33.7	0	6	0	4	5	6	-	11	SP
B-3	38.5	43.7	0	8	0	7	10	10	-	20	SP
B-3	43.5	48.7	0	9	0	4	5	7	-	12	SP
	48.5 pth from ex	53.7	0	10	0	4	4	7		11	SP

- Total rod length from instrumentation to bottom of sampler
 Two-foot section is instrumented and is located at top of drill rods

4. Soil type visually classified by Terracon

Table 3: Energy Measurement and Analysis Summary

	Start	SPT	No.		EMX ³ ((ft-lbs)		ETR ³	(%)
Boring	Depth ¹ (ft)	N _m (bpf)	of Blows ²	Max.	Min.	Ave.	Std. Dev.	Ave.	Std. Dev
	28.5	11	11	340	313	327	8.8	93.4	2.5
B-3	38.5	20	20	334	309	318	5.6	90.9	1.6
	43.5	12	12	330	309	323	5.5	92.4	1.6
	48.5	11	11	334	320	328	4.5	93.7	1.3
		Average:		335	313	334	6.1	92.6	1.75

Averlage: 333 313 334 0.1 72.0 1.72

1.Boring ID and depth from existing ground surface to start of SPT

2.Number of blows used in energy calibration analysis; limited to measurements recorded during the

second and third 6-inch sampling intervals at each depth or during the first increment if refusal were encountered

3.EMX = Maximum Transferred Energy, ETR = Energy Transfer Ratio.

1.0 MEASUREMENT SUMMARY

ITEM	DESCRIPTION
Drill Rig Owner	Terracon Consultant, Inc. – Greenville, SC
Drill Rig Operator	Brett Burnett; Terracon Exploration
Testing Date	9/5/2024
Testing Location	Sumter County, SC
Boring Identification	B-3
Energy Measurement Depths	30 ft, 40 ft, 45 ft, 50 ft
Subsurface Soils	Poorly graded sands (SP) to clayey sands (SC)
Hammer Type/Height	140 pounds (automatic) with 2.5-foot drop height
Boring Method	Mud rotary
Drill Rods	AWJ 1-%* outside diameter 1- ½* inside diameter 1- 1.15 in² cross sectional area 1/4* wall thickness
Calibration Testing Equipment	2-foot AWJ rod instrumented w/ two strain gauges and two accelerometers manufactured by Pile Dynamics Inc. (PDI) SN: 746AWJ Model SPT Analyzer [™] (PDA) SN: 4621 TB
ASTM Methods Used	ASTM D1586, Standard Test Method for Standard Penetration Test and Split-Barrel Sampling of Soils ASTM D4633-16, Standard Method for Energy Measurement for Dynamic Penetrometers
SPT Calibration Personnel	Ryan Wakeford – Intermediate PDA Proficiency, Terracon Consultants, Inc.

2.0 PURPOSE AND SCOPE OF WORK

The North Charleston office of Terracon Consultants, Inc. conducted SPT energy measurements in accordance with ASTM D4633-16 at a site off Panola Road in Sumter County, South Carolina. Energy measurements on the rig were taken during eight samples events.



Terracon

Table 4: Hammer Blow Rate Summary

	Start	SPT	No. of Blows ²	BPM ³				
Boring	Depth ¹ (ft)	N _{meas} (bpf)		Max.	Min.	Ave.	Std. Dev.	
	28.5	11	11	53.8	53.1	53.5	0.2	
B-3	38.5	20	20	53.7	53.0	53.4	0.1	
	43.5	12	12	53.6	53.2	53.4	0.1	
	48.5 11 11	11	53.8	53.1	53.4	0.2		
		Average:		53.7	53.1	53.4	0.2	

Boring ID and depth from existing ground surface to start of SPT.

Exhibit A

SPT Representative Blow

Facilities | Environmental | Geotechnical | Materials iv

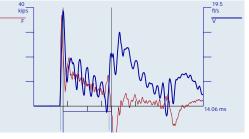
GRL Engineers, Inc. GEOPROBE 3126GT 28.5-30

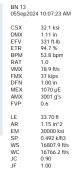
B3 PDA Operator: RW

Pile Driving Analyzer ® (PDA) Version: 2022.35.2

GRL Engineers, Inc. GEOPROBE 3126GT 38.5-40 PDA Operator: RW

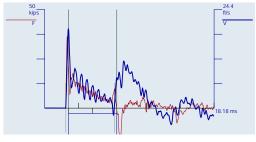
Pile Driving Analyzer ® (PDA) Version: 2022.35.2





F1: [746AWJ1] F2: [746AWJ2] A3 (PR): [K14007] A4 (PR): [K14006]

222.05 PDICAL (1) FF1 222.19 PDICAL (1) FF1 407.233 mv/6.4v/5000g (1) VF1 375.226 mv/6.4v/5000g (1) VF1





F1: [746AWJ1] F2: [746AWJ2] A3 (PR): [K14007] A4 (PR): [K14006]

222.05 PDICAL (1) FF1 222.19 PDICAL (1) FF1 407.233 mv/6.4v/5000g (1) VF1 375.226 mv/6.4v/5000g (1) VF1

Number of blows used in energy calibration analysis. Limited to measurements recorded during the second and third 6-inch sampling intervals at each depth or during the 1st increment if refusal conditions were encountered.

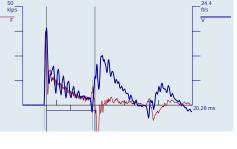
^{3.} BPM = Blows per minute

GRL Engineers, Inc. **GEOPROBE 3126GT** 43.5-45 PDA Operator: RW

Pile Driving Analyzer ® (PDA) Version: 2022.35.2

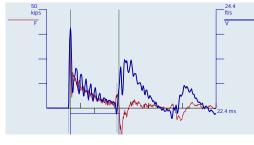
GRL Engineers, Inc. **GEOPROBE 3126GT** 48.5-50 PDA Operator: RW

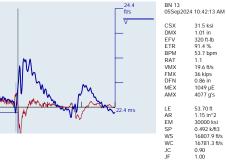
Pile Driving Analyzer ® (PDA) Version: 2022.35.2



	BN 14	
	05Sep2024	10:32:57 AN
-		
	CSX	32.6 ksi
	DMX	0.91 in
	EFV	325 ft-lb
	ETR	92.8 %
	BPM	53.4 bpm
	RAT	1.0
	VMX	19.0 ft/s
	FMX	37 kips
		0.86 in
	MEX	1086 µE
	AMX	3426 g's
	LE	48.70 ft
	AR	1.15 in^2
	EM	30000 ksi
	SP	0.492 k/ft3
		16807.9 ft/s
	WC	16793.1 ft/s
	JC	0.90
	JF	1.00

222.05 PDICAL (1) FF1 222.19 PDICAL (1) FF1 407.233 mv/6.4v/5000g (1) VF1 375.226 mv/6.4v/5000g (1) VF1 F1: [746AWJ1] F2: [746AWJ2] A3 (PR): [K14007] A4 (PR): [K14006]





F1: [746AWJ1] F2: [746AWJ2] A3 (PR): [K14007] A4 (PR): [K14006] 222.05 PDICAL (1) FF1 222.19 PDICAL (1) FF1 407.233 mv/6.4v/5000g (1) VF1 375.226 mv/6.4v/5000g (1) VF1

ierracon

Exhibit B

SPT Analyzer Literature and Equipment Calibrations



SPT Analyzer

Measures the energy transferred into an instrumented SPT rod during a Standard Penetration Test (SPT)

Reliable. Simplified. Rugged.

The SPT Analyzer determines the energy transferred by SPT hammers using force and velocity measurements, for improved reliability of SPT N-values.

What is SPT?

The Standard Penetration Test (SPT) is a widelyemployed soil exploration tool that involves using an SPT hammer to drive a split sampler at the bottom of a drill string to obtain soil samples. The number of blows required to penetrate the last 300mm (1ft) is the "N value" which is related to soil strength.

Why measure the energy transferred by the SPT hammer?

Several different types of SPT hammers are used to conduct Standard Penetration Tests. Their varying efficiencies influence the N value. The measured N value is normalized by multiplying it by the ratio of the measured energy transferred to the rod to 60% of the theoretical potential energy. The normalization compensates for the variability of the efficiencies of different SPT hammer types, and improves the reliability of soil strength estimates used in geotechnical applications.

The SPT Analyzer is furnished with a 0.6m sub assembly (or section) of an SPT rod (AW, NW or other type) instrumented with two strain gage bridges, and calibrated by Pile Dynamics. Once in the field, two accelerometers are bolted to the rod section. The instrumented section is inserted at the top of the drill string between the hammer and the existing sampling rod. The sensors on the rod are connected to the SPT Analyzer.

Smart Sensor technology allows the SPT Analyzer to read the rod instrumentation, obtaining the sensor calibration and rod cross sectional area.



- Calculates energy transferred by SPT hammers using force and velocity hammers using measurements
- Determines N Value to help improve reliability of soil strength estimates
- Offers simplified reporting and analysis option to speed testing results
- Operates in English, SI, or Metric units



EN ISO 22486-3:2005/ASTM Complant

The SPT Analyzer is compliant with EN ISO 22476-3:2005. ASTM D1586 recommends normalizing results from any SPT test using energy measurements. When these tests are performed to determine the liquefaction potential of sands, ASTM D6066 not only recommends but mandates the normalization. ASTM D4633 states that the only acceptable method of determining energy for normalization of N values is by force and velocity measurements.

These quantities are input to the SPT Analyzer automatically. This significantly simplifies the initial test setup.

The strain gages and accelerometers obtain the force and velocity signals necessary for the calculation of transferred energy to the drill string for each hammer blow. The energy is displayed in real time on the SPT Analyzer screen.

Output

SPT Analyzer data is stored and transferred to a computer via USB memory stick. The software furnished with the SPT Analyzer has a Report Creation Option that makes it quick and easy to summarize results and create output graphs of Force, Velocity, Energy and Displacement versus Time, as well as numerical, statistical, and graphical results for each data set. The software is fully customizable.





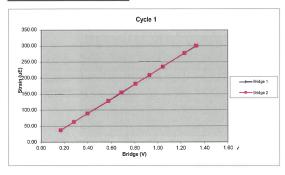
Pile Dynamics, Inc. (PDI) is the world leader in developing, manufacturing and supplying state of the art QA/QC products and systems for the deep foundations industry. The company is headquartered in Cleveland, Ohio, USA, with offices and representatives worldwide. For additional information visit us at www.pile.com or contact info@pile.com.

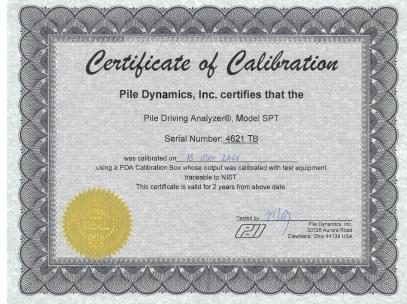
www.pile.com | +1 (216) 831-6131 | info@pile.com

746AWJ		Cycle 1		
Sample	Force (lb)	Strain (µE)	Bridge 1 (V)	Bridge 2 (V)
1	0.00	0.00	0.00	0.00
2	1296.93	37.22	0.17	0.17
3	2135.32	62.74	0.28	0.28
4	3028.79	89.39	0.40	0.40
5	4377.09	128.61	0.58	0.57
6	5243.07	154.57	0.69	0.68
7	6143.17	181.90	0.81	0.81
8	7067.05	208.93	0.93	0.93
9	7958.18	235.42	1.04	1.05
10	9380.66	278.02	1.23	1.23
11	10161 74	200.76	1 24	1 22

Bridge 1		Bridge 2	
Force Calibration (lb/V)	7605.07	Force Calibration (lb/V)	7606.74
Offset	-0.16	Offset	12.66
Correlation	0.999997	Correlation	0.999990
Strain Calibration (µE/V)	225.99	Strain Calibration (µE/V)	226.04
Offset	-1.01	Offset	-0.63
Correlation	0.999989	Correlation	0.999992

Force Strain Calibration	
EA (Kips)	33651.50
Offset	33.98
Correlation	0.999994

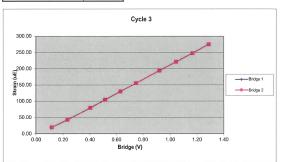




746AWJ		Cycle 3		
Sample	Force (lb)	Strain (µE)	Bridge 1 (V)	Bridge 2 (V)
1	0.00	0.00	0.00	0.00
2	886.16	19.27	0.11	0.12
3	1786.75	42.28	0.23	0.23
4	3083.67	79.12	0.40	0.40
5	3943.80	104.13	0.51	0.51
6	4839.52	129.87	0.63	0.63
7	5750.14	155.24	0.75	0.75
8	7079.92	194.22	0.92	0.92
9	8007.70	221.43	1.04	1.05
10	8943.28	247.95	1.17	1.17
11	9871 55	275 44	1 29	1 29

	Bridge 2	
7659.96	Force Calibration (lb/V)	7667.39
13.76	Offset	-1.59
0.999999	Correlation	0.999998
219.43	Strain Calibration (µE/V)	219.64
-7.95	Offset	-8.39
0.999934	Correlation	0.999939
	13.76 0.999999 219.43 -7.95	7659.96 Force Calibration (lb/V) 13.76 Offset 0.999999 Correlation 219.43 Strain Calibration (μΕ/V) -7.95 Offset

Force Strain Calibration	
EA (Kips)	34904.41
Offset	291.93
Correlation	0.999935



Accelerometer Calibration Certificate Pile Dynamics, Inc.



Calibrated by Pile Dynamics, Inc. Calibration performed on

MAY 1 6 2024

Serial No: Temperature: 24.0 °C Model: PR Humidity:

Calibrated on: Channel 3 on 8G 5161 LF

Ref Acc 1: 78268! Cal on: 11Jan2024

Ref Acc 2: 78270! Cal on: 11Jan2024

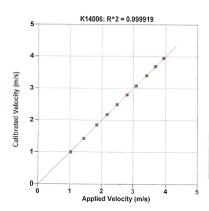
Reference accelerometer calibrations are traceable to the United States National Institute of Standards and Technology (NIST).



375.2 mv/5000g

(75.0 µv/g) R^2: 0.999919 [Chip programmed]

Operator: William Johnson



Reference	S/N K14006
Velocity	Velocity
m/s	m/s
1.015	1.001
1.426	1.425
1.839	1.850
2.171	2.177
2.489	2.491
2.800	2.796
3.087	3.078
3.408	3.397
3.681	3.688
3.938	3.946
Maximum	Acceleration: 848 g's

Version: 2020.30,170 -0.17



Exhibit C SPT Analyzer Results

Accelerometer Calibration Certificate Pile Dynamics, Inc.



Calibrated by Pile Dynamics, Inc. Calibration performed on

Calibrated on: Channel 4 on 8G 5161 LE

MAY 1 6 2024

Serial No: K14007 Temperature: 23.8 °C

Model: PR

Ref Acc 1: 78268! Cal on: 11Jan2024

Ref Acc 2: 78270! Cal on: 11Jan2024

Reference accelerometer calibrations are traceable to the United States National Institute of Standards and Technology (NIST).

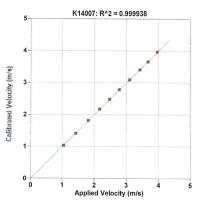


PDA CALIBRATION FACTOR

407.2 mv/5000g

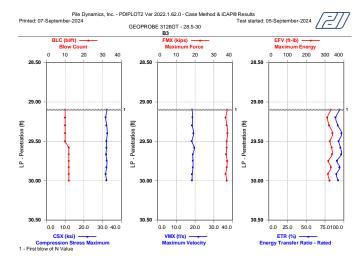
(81.4 µv/g) R^2: 0.999938 [Chip programmed]

Operator: William Johnson



Reference	S/N K14007
Velocity	Velocity
m/s	m/s
1.042	1.032
1.417	1.411
1.812	1.817
2.168	2.173
2.478	2.483
2.777	2.783
3.098	3.090
3.411	3.406
3.666	3.657
3.955	3.967
Maximum	Acceleration: 852 g's

Version: 2020.30.170 -0.28



Facilities | Environmental | Geotechnical | Materials 2

	ynamics, li OT2 2022			Casa	Mathad &	iCAP® R	oculte	Pr	inted 07-S		Page 1 r-2024
GEOF OP: R	PROBE 31:	26GT - 2	8.5-30	Case	ivieti iou o	I ICAF® K	esuits		Date: 05-9	Sentembe	B3
AR:	1.15 in	2								SP: 0.4	
LE:	33.70 ft									EM: 30,0	
	6,807.9 f/s	3									00
	Maximum						BP	M: Blows	s/Minute		
VMX:	Maximum	Velocity					DN	IX: Maxin	num Disp	lacement	
	Maximum						DF	N: Final	Displacer	ment	
EFV:	Maximum	Energy					CS	X: Comp	pression S	Stress Ma:	ximum
ETR:	Energy Tr	ansfer Ra									
BL#	Depth	BLC	FMX	VMX	EMX	EFV	ETR	BPM	DMX	DFN	CSX
	ft	bl/ft	kips	f/s	ft-lb	ft-lb	(%)	bpm	in	in	ksi
5	29.10	10	37	18.4	331.0	331.0	94.6	53.1	1.58	1.20	32.3
6	29.20	10	36	18.7	312.7	312.7	89.3	53.4	1.47	1.20	31.7
7	29.30	10	37	18.5	323.0	323.0	92.3	53.6	1.54	1.20	32.2
8	29.40	10	37	19.2	340.4	340.4	97.3	53.4	1.57	1.20	32.5
9	29.50	10	37	18.4	326.6	326.6	93.3	53.5	1.48	1.20	32.1
10	29.58	12	37	19.6	335.5	335.5	95.9	53.3	1.41	1.00	32.1
11	29.67	12	37	18.8	338.0	338.0	96.6	53.7	1.58	1.00	31.8
12	29.75	12	37	18.9	318.3	318.3	90.9	53.5	1.37	1.00	32.3
13	29.83	12	37	18.9	331.4	331.4	94.7	53.8	1.11	1.00	32.1
14	29.92	12	36	18.5	315.2	315.2	90.1	53.8	1.09	1.00	31.7
15	30.00	12	37	18.4	324.1	324.1	92.6	53.6	1.07	1.00	32.1
		/erage	37	18.8	326.9	326.9	93.4	53.5	1.39	1.09	32.1
		d. Dev.	0	0.4	8.8	8.8	2.5	0.2	0.19	0.10	0.3
		ximum	37	19.6	340.4	340.4	97.3	53.8	1.58	1.20	32.5
	Mi	nimum	36	18.4	312.7	312.7	89.3	53.1	1.07	1.00	31.7
				Total nu	mber of b	olows anal	yzed: 11				

BL# Sensors

5-15 F1: [746AWJ1] 222.1 (1.00); F2: [746AWJ2] 222.2 (1.00); A3: [K14007] 407.2 (1.00); A4: [K14006] 375.2 (1.00)

5 First blow of N Value

Time Summary

Drive 15 seconds 10:07 AM - 10:07 AM BN 1 - 15

	lynamics, li _OT2 2022			0	M-41I 0	iCAP® R		Pr	inted 07-5	Septembe	Page 1 r-2024
GEOF OP: R	PROBE 31:	26GT - 38	3.5-40	Case	Method &	ICAP® R	esuits		1ate: 05-9	Septembe	B3
AR:	1.15 in	2								SP: 0.4	
LE:	43.70 ft									EM: 30.0	
	16,807.9 f/s										00 131
	Maximum						RP	M: Blows		00. 0.	
	Maximum									lacement	
	Maximum						DF	N: Final	Displacer	ment	
	Maximum									Stress Ma	ximum
ETR:	Energy Tr	ansfer Ra	atio - Rate	ed							
BL#	Depth	BLC	FMX	VMX	EMX	EFV	ETR	BPM	DMX	DFN	CSX
	ft	bl/ft	kips	f/s	ft-lb	ft-lb	(%)	bpm	in	in	ksi
7	39.05	20	36	18.7	320.4	320.4	91.5	53.3	0.91	0.60	31.6
8	39.10	20	36	18.5	313.6	313.6	89.6	53.2	0.65	0.60	31.6
9	39.15	20	37	18.9	318.4	318.4	91.0	53.4	0.66	0.60	32.1
10	39.20	20	37	18.9	309.8	309.8	88.5	53.5	0.64	0.60	31.9
11	39.25	20	37	19.1	321.4	321.4	91.8	53.2	0.93	0.60	31.9
12	39.30	20	36	18.5	309.3	309.3	88.4	53.5	0.64	0.60	31.5
13	39.35	20	37	19.5	320.6	320.6	91.6	53.0	0.69	0.60	31.9
14	39.40	20	36	18.4	314.3	314.3	89.8	53.3	0.80	0.60	30.9
15	39.45	20	37	19.5	326.5	326.5	93.3	53.5	0.92	0.60	32.0
16 17	39.50 39.55	20 20	36 37	18.6 19.1	320.6 316.4	320.6 316.4	91.6 90.4	53.5 53.7	1.02 0.68	0.60	31.7 31.8
18	39.55	20	36	19.1	312.4	310.4	90.4 89.2	53.7	0.66	0.60	31.8
19	39.65	20	36	18.8	315.8	315.8	90.2	53.5	0.70	0.60	31.1
20	39.70	20	36	19.2	320.1	320.1	91.5	53.4	0.78	0.60	31.1
21	39.75	20	36	19.5	320.9	320.9	91.7	53.3	0.63	0.60	31.0
22	39.80	20	37	19.2	317.1	317.1	90.6	53.5	0.74	0.60	31.7
23	39.85	20	36	18.8	315.1	315.1	90.0	53.5	0.61	0.60	31.1
24	39.90	20	36	19.7	333.6	333.6	95.3	53.5	0.83	0.60	31.3
25	39.95	20	36	19.6	323.9	323.9	92.6	53.4	0.66	0.60	31.7
26	40.00	20	35	18.9	313.5	313.5	89.6	53.5	0.60	0.60	30.6
Average 36		19.0	318.2	318.2	90.9	53.4	0.74	0.60	31.5		
	Std. Dev. 0		0.4	5.6	5.6	1.6	0.1	0.12	0.00	0.4	
		ximum	37	19.7	333.6	333.6	95.3	53.7	1.02	0.60	32.1
	Mi	nimum	35	_ 18.4	309.3	309.3	88.4	53.0	0.60	0.60	30.6
				Total nu	mber of b	olows ana	lvzed: 20				

BL# Sensors

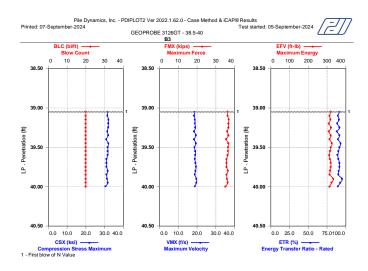
7-26 F1: [746AWJ1] 222.1 (1.00); F2: [746AWJ2] 222.2 (1.00); A3: [K14007] 407.2 (1.00); A4: [K14006] 375.2 (1.00)

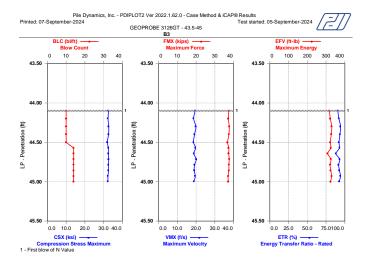
BL# Comments

7 First blow of N Value

Time Summary

Drive 28 seconds 10:24 AM - 10:24 AM BN 1 - 26





Pile Dynamics, Inc. PDIPLOT2 2022.1.62.0 Page 1 Printed 07-September-2024 Case Method & iCAP® Results GEOPROBE 3126GT - 43.5-45
OP: RW
AR: 1.15 in²
LE: 48.70 ft
WS: 16.807.9 f/s
FMX: Maximum Force
VMX: Maximum Velocity
EMX: Maximum Energy
EFV: Maximum Energy
EFV: Maximum Energy
EFP: Energy Transfer Patin - RE Date: 05-September-2024 SP: 0.492 k/ft³ EM: 30,000 ksi JC: 0.00 BPM: Blows/Minute DMX: Maximum Displacement
DFN: Final Displacement
CSX: Compression Stress Maximum EFV: Maximum Energy
ETR: Energy Transfer Ra
BL# Depth BLC
16 bl/ft
5 44.10 10
6 44.20 10
7 44.30 10
8 44.40 10
9 44.50 10
10 44.57 14
11 44.64 14
12 44.71 14
13 44.79 14
14 44.86 14
15 44.93 14
16 45.00 14 atio - Rated FMX kips 37 38 38 37 37 37 37 37 37 37 37 37 37 CSX ksi BPM bpm 53.2 53.3 53.4 53.5 53.4 53.6 53.4 53.4 53.4 53.4 53.5 53.4 DMX DFN VMX EMX ft-lb 317.4 322.7 330.1 327.2 323.0 325.2 309.1 326.0 321.1 324.7 329.6 323.5 EFV ft-lb 317.4 322.7 330.1 327.2 323.0 325.2 309.1 326.0 321.1 324.7 329.6 323.5 ETR (%) 90.7 92.2 94.3 93.5 92.9 88.3 93.2 91.8 92.8 94.2 92.4 1.6 94.3 88.3 f/s 19.5 18.7 19.9 19.2 18.6 19.7 18.8 20.1 19.2 19.0 19.5 18.8 in 1.23 1.22 1.30 1.22 1.21 0.95 0.90 1.06 1.05 0.91 0.99 0.89 32.6 32.4 32.8 32.6 32.0 32.6 32.5 32.6 32.6 32.6 32.3 32.3 Average 0.5 20.1 18.6 0.1 53.6 53.2 0.15 1.30 0.89 0.2 32.8 32.0 Std. Dev. Maximum 5.5 330.1 5.5 330.1 Minimum 309 1 309 1

BL# Sensors

5-16 F1: [746AWJ1] 222.1 (1.00); F2: [746AWJ2] 222.2 (1.00); A3: [K14007] 407.2 (1.00); A4: [K14006] 375.2 (1.00)

5 First blow of N Value

Time Summary

Drive 16 seconds 10:32 AM - 10:33 AM BN 1 - 16

	ynamics, l _OT2 2022			0	M-4ll O	:CADO D	16-	Pr	inted 07-S		Page 1 r-2024
GEOF OP: R	PROBE 31	26GT - 4	8.5-50	Case	wethod &	iCAP® R	esuits	[Date: 05-S	Septembe	B3 r-2024
AR:	1.15 ir	ገ ²									92 k/ft ³
LE:	53.70 ft									EM: 30,0	00 ksi
	16,807.9 f/									JC: 0.	00
	Maximum							M: Blows			
	Maximum								num Disp		
	Maximum								Displacer		
	Maximum						CS	X: Com	pression S	Stress Ma	ximum
	Energy Tr										
BL#	Depth	BLC	FMX	VMX	EMX	EFV	ETR	BPM	DMX	DFN	CSX
_	ft	bl/ft	kips	f/s	ft-lb	ft-lb	(%)	bpm	in	in	ksi
5	49.13	8	36	20.1	321.6	321.6	91.9	53.3	1.81	1.50	31.6
6	49.25	8	37	20.1	323.0	323.0	92.3	53.4	1.81	1.50	32.1
7	49.38	8	36	20.3	332.2	332.2	94.9	53.5	1.50	1.50	31.5
8	49.50	. 8	36	19.6	334.0	334.0	95.4	53.3	1.50	1.50	31.7
9	49.57	14	37	20.3	329.3	329.3	94.1	53.8	0.87	0.86	32.1
10	49.64	14	37 37	20.4	324.8	324.8	92.8 94.2	53.4	1.00	0.86	31.9
11	49.71	14		19.9	329.7	329.7		53.2	0.89	0.86	32.2
12 13	49.79 49.86	14 14	37 36	20.2 19.6	330.1 319.8	330.1 319.8	94.3 91.4	53.7 53.7	0.89 1.01	0.86	32.4 31.5
14	49.86	14	36	20.7	331.0	331.0	91.4	53.7	0.91	0.86	31.9
15	50.00	14	37	20.7	330.2	330.2	94.6	53.1	1.03	0.86	32.1
			37	20.1	327.8	327.8	93.7	53.4	1.20	1.09	31.9
	, , , , , , , , , , , , , , , , , , ,	verage d. Dev.	0	0.3	4.5	4.5	1.3	0.2	0.36	0.31	0.3
		Maximum 37		20.7	334.0	334.0	95.4	53.8	1.81	1.50	32.4
		inimum	36	19.6	319.8	319.8	91.4	53.0	0.87	0.86	31.5
	IVI	minitalii	30			olows ana		55.1	0.07	0.00	31.3
				· otal III		and	.,				

BL# Sensors

5-15 F1: [746AWJ1] 222.1 (1.00); F2: [746AWJ2] 222.2 (1.00); A3: [K14007] 407.2 (1.00); A4: [K14006] 375.2 (1.00)

5 First blow of N Value

Time Summary

Drive 15 seconds 10:42 AM - 10:42 AM BN 1 - 15

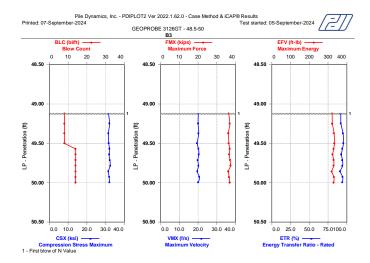
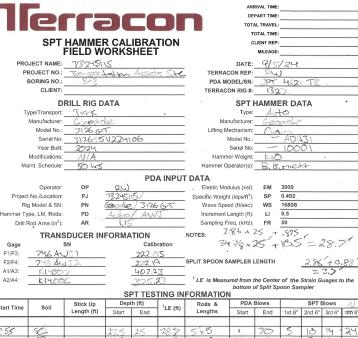




Exhibit D

Field Log



10:05 10:10 10:15 10:25 10:35 0:50 11:10 Individual pairs	Soil	Length (ft)			LE (ft)							
			Start	End	LE (II)	Lengths	Start	End	1st 6"	2nd 6"	3rd 6"	4th 6"
					e .							
9.55	80		23.5	25	28.7	5'x5	1.	30	5	10	14 .	24
16:05	SP		28.5	30	33.7	5 x6	3	18	4	5	6	11
10:10	CL		33.5	35	38.7	5 x7	1	1	8	0	0	0
10:15	SR		38.5	40	43.7	5' x8	3	30	7	10	10	20
0:25	5P.		43.5	45.	48.7	5 x 9		18	4	2	>	13
10:35	5.P		48.5	50	53.7	5'X10	1	17	4	4	>	1.1
0:50	SC		53.5	55	58.7	5'x11	/	6	2	1	2	3
11:10	SC		58.5	60	63.7	5/X12	. /	2		0	0	1
ndividual pair	s of F or V sig	nals versus time s	shall be ver	y similar fo	r good qua	lity data.						
f you see For	ce goes nega	tive before 2L/C a	fter impact,	drill rod joi	nts should	be carefully tighte	ned for goo	d quality d	ata			
Individual pair			shall be ver		r good qua	lity data.	ened for goo		ata	0		>

PICTURE NUMBERS AND INFO:

Take Photo of Each Rigs, Boring Locations at the Site

Terracon SPT Rig Calibration Worksheet.xlsx





This documents that

Susheel R. Kolwalker Terracon Consultants

has on March 11, 2016 achieved the rank of

EXPERT

on the Dynamic Measurement and Analysis Proficiency Test.

The individual identified on this document demonstrated to the degree granted above an understanding of theory, data quality evaluation, interpretation and signal matching for high strain dynamic testing of deep foundations.

The ability of the individual named to provide appropriate knowledge and advice on a specific project is not implied or warranted by the Pile Driving Contractors Association or Pile Dynamics, Inc. The Pile Driving Contractors Association or Pile Dynamics, Inc. assumes no liability for foundation testing and analysis work performed by the bearer of this certificate. This certificate can be verified at www.PDAproficiencytest.com.

Steven A. Hall, Executive Director Pile Driving Contractors Association



No. 2005



Exhibit E

Copy of Certificate of Proficiency

