



GEOTECHNICAL SUBSURFACE DATA REPORT

S-38-191 over Roberts Swamp
Orangeburg County, South Carolina



PREPARED FOR

SCDOT

955 Park Street

Columbia, South Carolina 29201



PREPARED BY

F&ME Consultants, Inc.

211 Business Park Boulevard

Columbia, South Carolina 29203

SCDOT Project ID: P044269

FME Project No.: G7100.009—Task 00030

February 14, 2025

February 14, 2025

Mr. Trapp Harris, P.E.
South Carolina Department of Transportation
955 Park Street
Columbia, South Carolina 29201

Re: Geotechnical Subsurface Data Report
S-38-191 over Roberts Swamp
Orangeburg County, South Carolina
Bridge ID: 387019100100
SCDOT Project ID: P044269
FME Project No.: G7100.009 – Task 00030

Mr. Harris:

Submitted herein is F&ME Consultants, Inc.'s (FME) Geotechnical Subsurface Data Report for the S-38-191 over Roberts Swamp project. This report contains findings from our subsurface field exploration and laboratory testing program.

It has been a pleasure collaborating with you on this project and we appreciate the opportunity to be of service. Please notify us if there are any questions or if we can be of further assistance.

Respectfully Submitted,

F&ME CONSULTANTS, INC.

A handwritten signature in blue ink, reading 'Rebecca M. Coldiron'.

Rebecca M. Coldiron
Geotechnical Professional

A handwritten signature in blue ink, reading 'Alex M. Abernethy'.

Alex M. Abernethy, E.I.T.
Materials Laboratory Manager

A handwritten signature in blue ink, reading 'William J. Gieser'.

William J. Gieser, P.E.
Senior Project Engineer

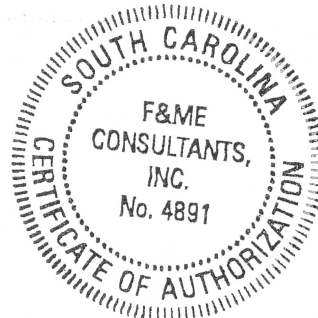
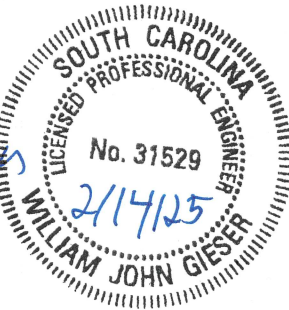


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1. INTRODUCTION

1.1. GENERAL

The project is located along S-38-191 (Middle Willow Road) and is located approximately three (3) miles west of Bolen Town, South Carolina. We understand that this project will involve the demolition/removal of the existing culvert and the replacement with a new bridge structure on the existing roadway alignment. A Site Location Plan is presented in Section 1 of the Appendix of this report.

1.2. SCOPE

FME performed a geotechnical subsurface exploration and laboratory testing for the project. The South Carolina Department of Transportation (SCDOT) Scope of Services was issued on January 6, 2025. The field exploration consisted of Soil Test Borings (STB) with Standard Penetration Testing (SPT) and the collection of a Bulk Soil Sample (BS) via Manual Auger Boring (MAB) methodologies. Laboratory testing was performed on soil samples collected from the Soil Test Borings and the Bulk Soil Sample.

Field exploration methods and laboratory procedures were conducted in general accordance with the current American Association of State Highway and Transportation Officials (AASHTO), American Society of Testing and Materials (ASTM) Standards. This report was prepared in general accordance with the 2022 SCDOT Geotechnical Design Manual (GDM).

2. SUBSURFACE EXPLORATION SUMMARY

From January 3, 2025, through January 23, 2025, FME performed eight (8) Soil Test Borings and collected one (1) Bulk Soil Sample via Manual Auger Boring Methodologies. The soils were visually classified in the field based upon the Unified Soil Classification System (USCS) in general accordance with ASTM D2488. Testing locations and target exploration depths were provided by the SCDOT. A Boring Location Plan (Figure 2) displaying the test locations performed during the subsurface exploration is contained in Section 2 of the Appendix within to this report.

2.1. SOIL TEST BORINGS

Two (2) Soil Test Borings designated as B-1 and B-2 were performed utilizing a CME 550X ATV-mounted drill rig. The measured energy transfer ratio for the CME 550X was 89.8% utilizing an automatic hammer. SPT hammer calibration records are provided within Section 7 of the Appendix of this report. The two (2) Soil Test Borings utilizing rotary wash techniques to maintain a stable borehole, and were sampled continuously through the upper ten (10) feet utilizing SPT testing. Following the continuous sampling, SPT testing was performed on standard five (5) foot intervals thereafter until the target boring depth was achieved. SPT sampling was performed in general accordance with ASTM D1586 to determine the relative densities and consistencies of the subsurface soils, and to collect subsurface soil samples.

FME also conducted six (6) roadway approach Soil Test Borings, designated as P-1 through P-6. Pavement core samples from each Soil Test Boring were bagged and transported to FME's laboratory facility following boring completion. These cores were measured and photographed to document thickness, distress, and existing surface conditions. Copies of the Soil Test Boring Logs are contained within Section 3A in the Appendix of this report. Additionally, pavement core photographic documentation is presented within Section 6 of the Appendix of this report.

The locations, depths, and elevations of the Soil Test Borings performed for the subsurface investigation are provided in the following table.

Table 1 – Field Exploration Summary Table – Soil Test Borings

Test ID	Test Type	Total Boring Depth (ft)	Latitude	Longitude	Elevation (ft-MSL)
B-1	STB	100.0	33.47935173	-81.06169886	218.9
B-2	STB	100.0	33.47928612	-81.06132183	218.8
P-1	STB	6.0	33.47938281	-81.06296319	219.4
P-2	STB	6.0	33.47938581	-81.06247085	219.0
P-3	STB	6.0	33.47932839	-81.06198390	218.6
P-4	STB	6.0	33.47930689	-81.06096275	219.2
P-5	STB	6.0	33.47925176	-81.06047675	221.2
P-6	STB	6.0	33.47926564	-81.05998561	225.8
Total		236.0			

2.2. BULK SOIL SAMPLE

One Bulk Soil Sample (designated as BS-1) was collected on-site. Bulk Soil Sample BS-1 was collected via Manual Auger Boring methodologies (MAB) from the nearby edge of pavement near P-3. Locations where the material was sampled are presented in Section 2 in the Appendix.

The table below summarizes test designation, depth, locations and existing surface elevation for the Bulk Soil Sample.

Table 2 – Field Exploration Summary Table – Bulk Soil Samples

Test ID	Test Type	Test Depth (ft)	Latitude	Longitude	Elevation (ft-MSL)
BS-1	MAB	6.0	-81.06198611	218.1	-81.06198611
TOTAL		6.0			

2.3. GROUND WATER

Groundwater depths were recorded at the time of boring (TOB) and/or twenty-four (24) hours following boring completion. Groundwater depth measurements are noted on the individual Subsurface Exploration Logs in Section 3 of the Appendix.

2.4. TEST LOCATION TABLE

The following table summarizes the state plane coordinates in feet, latitude-longitude in decimal

Table 3 – Test Location Table

Test ID	Test Type	Northing	Easting	Latitude	Longitude	Elevation (ft-MSL)
B-1	STB	598882.213	1981189.556	33.47935173	-81.06169886	218.9
B-2	STB	598858.277	1981304.489	33.47928612	-81.06132183	218.8
BS-1	BS/MAB	598865.233	1981101.968	33.47930491	-81.06198611	218.1
P-1	STB	598893.755	1980804.099	33.47938281	-81.06296319	219.4
P-2	STB	598894.754	1980954.203	33.47938581	-81.06247085	219.0
P-3	STB	598873.776	1981102.648	33.47932839	-81.0619839	218.6
P-4	STB	598865.769	1981413.967	33.47930689	-81.06096275	219.2
P-5	STB	598845.624	1981562.124	33.47925176	-81.06047675	221.2
P-6	STB	598850.586	1981711.865	33.47926564	-81.05998561	225.8

3. LABORATORY TESTING SUMMARY

Following completion of FME's field exploration, draft boring logs were generated and reviewed internally by FME. Based on the data represented in these logs, FME was authorized to designate soil samples for laboratory testing on behalf of the SCDOT. The laboratory testing performed on the soil samples collected from the Soil Test Borings is summarized in the table below. Data sheets containing the results from this testing are provided in Section 4A and 4C within the Appendix of this report.

Table 4 – Laboratory Testing Summary Table – Soil Test Boring (Split-Spoon) Samples

Type of Test	Quantity	Procedure
Moisture Content	10	AASHTO T265 (ASTM D2216)
Atterberg Limits	10	AASHTO T89/T90 (ASTM D4318)
Hydrometer and Grain Size	6	ASTM D6913/AASHTO T11 (ASDM D1140)
Grain-Size Distribution w/ Wash 200	4	AASHTO D6913/AASHTO T11 (ASTM D1140)
pH	2	AASHTO T289 (ASTM G51)
Soil Sulfate Content	2	AASHTO T290 (ASTM C1580)
Soil Chloride Content	2	AASHTO T291
Soil Resistivity	2	AASHTO T288

The laboratory testing performed for the Bulk Soil sample is summarized in the table below. Data sheets containing the results from this testing are provided in Section 5B of the Appendix attached to this report.

Table 5 – Laboratory Testing Summary Table – Bulk Soil Sample

Type of Test	Quantity	Procedure
Moisture Content	1	AASHTO T265 (ASTM D2216)
Atterberg Limits	1	AASHTO T89/T90 (ASTM D4318)
Grain-size Distribution w/ Wash 200	1	ASTM D6913/AASHTO T11 (ASTM D1140)
Standard Proctor	1	AASHTO T99 (ASTM D698)
California Bearing Ratio Test	1	AASHTO T193

S-38-191 over Roberts Swamp

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APPENDIX

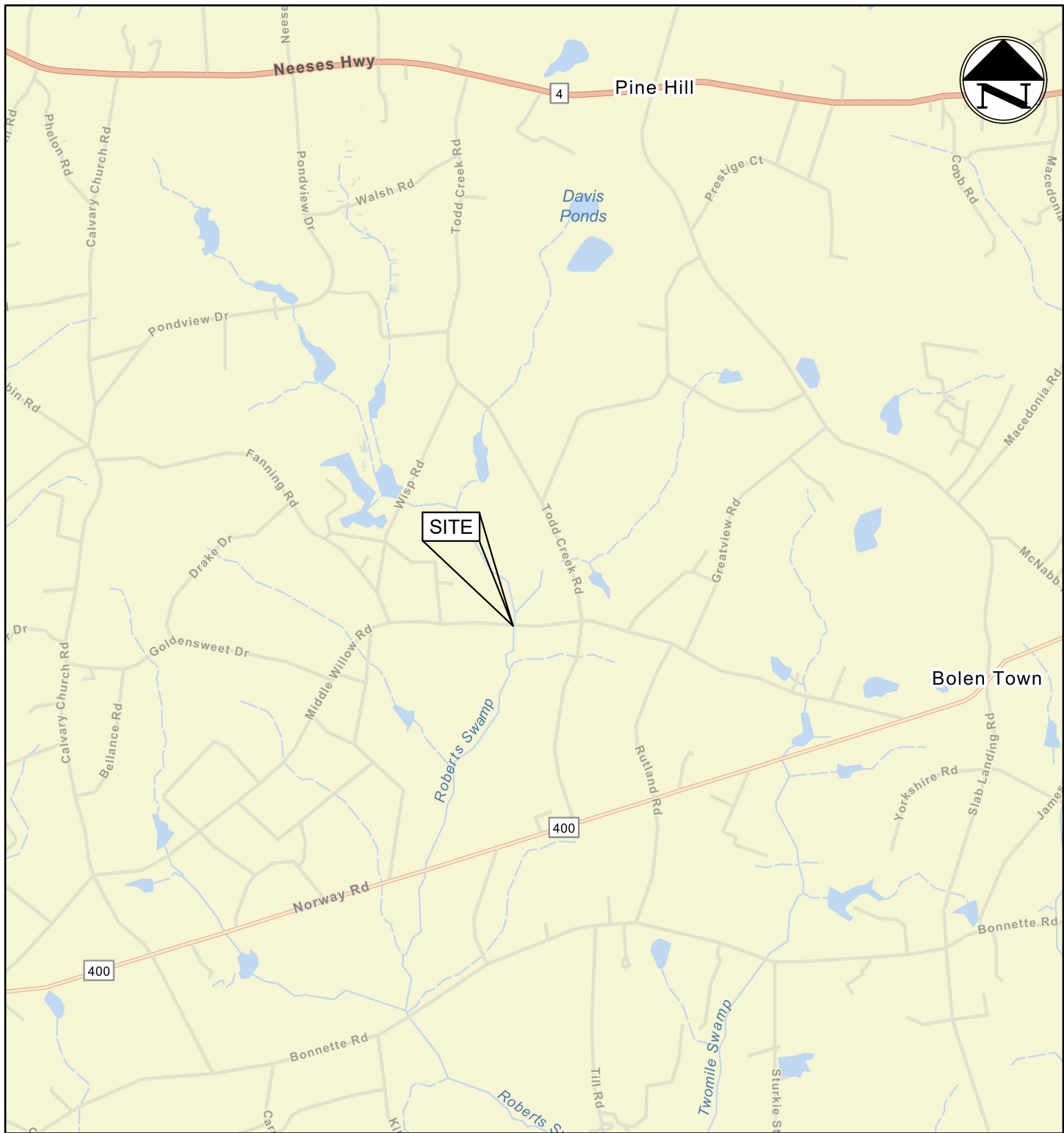
SECTION 1	SITE LOCATION PLAN
SECTION 2	BORING LOCATION PLAN
SECTION 3	SUBSURFACE EXPLORATION LOGS
SECTION 3A	SOIL TEST BORING (STB) LOGS
SECTION 3B	BULK SOIL SAMPLE (BS) LOG
SECTION 4	LABORATORY TEST RESULTS
SECTION 4A	SPLIT SPOON SAMPLES
SECTION 4B	BULK SOIL SAMPLES
SECTION 4C	CORROSION SERIES TESTING
SECTION 5	ON-SITE DRILL RIG PHOTOS
SECTION 6	PAVEMENT CORE PHOTOS
SECTION 7	SPT HAMMER CALIBRATION
SECTION 8	GEOSCOPING FORM

S-38-191 over Roberts Swamp

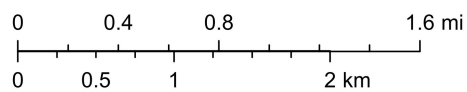
Geotechnical Subsurface Data Report

APPENDIX

SECTION 1 SITE LOCATION PLAN



1:58,000



F&ME CONSULTANTS, INC.
COLUMBIA, SC

4			
3			
2			
1			
REV.	BY	DATE	DESCRIPTION OF REVISION
TOPO.		DATE	
DWG.	CTC	DATE 1.31.25	GROUP -- --
R/W		DATE	

S-38-191 OVER ROBERTS SWAMP
ORANGEBURG COUNTY, SOUTH CAROLINA

SITE LOCATION PLAN

SCDOT PROJECT ID: P044269

FME JOB NO. G7100.009 Task 003

SCALE: AS NOTED

FIGURE 1

S-38-191 over Roberts Swamp

Geotechnical Subsurface Data Report

APPENDIX


SECTION 2 BORING LOCATION PLAN




SUBSURFACE TESTING DATA							
Boring ID	Test Type	Northing	Easting	Latitude	Longitude	Test Elevation (MSL)	Test Depth (ft)
B-1	STB	598882.213	1981189.556	33.47935173	-81.06169886	218.9	100.0
B-2	STB	598858.277	1981304.489	33.47928612	-81.06132183	218.8	100.0
BS-1	BS/MAB	598865.233	1981101.968	33.47930491	-81.06198611	218.1	6.0
P-1	STB	598893.755	1980804.099	33.47938281	-81.06296319	219.4	6.0
P-2	STB	598894.754	1980954.203	33.47938581	-81.06247085	219.0	6.0
P-3	STB	598873.776	1981102.648	33.47932839	-81.06198390	218.6	6.0
P-4	STB	598865.769	1981413.967	33.47930689	-81.06096275	219.2	6.0
P-5	STB	598845.624	1981562.124	33.47925176	-81.06047675	221.2	6.0
P-6	STB	598850.586	1981711.865	33.47926564	-81.05998561	225.8	6.0



LEGEND:

 SOIL TEST BORING LOCATION

 MANUAL AUGER BORING TEST LOCATION

4			
3			
2			
1			
REV.	BY	DATE	DESCRIPTION OF REVISION
TOPO.		DATE	
DWG.	CTC	DATE 1.31.25	GROUP - -
R/W		DATE	

 F&ME CONSULTANTS, INC.
COLUMBIA, SC

S-38-191 OVER ROBERTS SWAMP
ORANGEBURG COUNTY, SOUTH CAROLINA

BORING LOCATION PLAN

SCDOT PROJECT ID: P044269	FME JOB NO. G7100.009 Task 003
SCALE: 1" = 100'	FIGURE 2

S-38-191 over Roberts Swamp

Geotechnical Subsurface Data Report

APPENDIX

SECTION 3 SUBSURFACE EXPLORATION LOGS

Boring Log Descriptors

Correlation of Penetration Resistance with Relative Density and Consistency

Coarse Grained Soils (Sand/Gravel)		Fine Grained Soils (Silt/Clay)	
SPT Blow Count	Relative Density	SPT Blow Count	Consistency
≤4	Very Loose	≤2	Very Soft
5 – 10	Loose	3 – 4	Soft
11 – 30	Medium Dense	5 – 8	Firm
31 – 50	Dense	9 – 15	Stiff
≥51	Very Dense	16 – 30	Very Stiff
		≥31	Hard

Particle Size Identification

Gravel	Sieve Size
Fine	#4 to 3/4-in.
Coarse	3/4-in. to 3-in.

Sand	Sieve Size
Fine	#200 to #40
Medium	#40 to #10
Coarse	#10 to #4

Clay/Silt	Sieve Size
Fines Content	<#200

SYMBOL	PRINT CODE*	TYPICAL DESCRIPTION
	SCCT	CONCRETE
	SCAT	ASPHALT
	SCTS	TOPSOIL/PEAT
	SCSAND	SAND
	SCSTSAND	SILTY SAND/SANDY SILT
	SCCLSAND	CLAYEY SAND/SANDY CLAY
	SCCLAY	CLAY
	SCSILT	SILT
	SCSTCLAY	SILTY CLAY/CLAYEY SILT
	SCSAP	SAPROLITE
	SCLS	LIMESTONE
	SCBR	GRANITE (BEDROCK)
	SCMARL	MARL

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
				SM	SILTY SANDS, SAND-SILT MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS



Rock Description Legend

Discontinuity Type		Discontinuity Width (mm)		Amount of Infilling	
F	Fault	W	Wide (12.5 – 50)	Su	Surface Stain
J	Joint	MW	Moderately Wide (2.5 – 12.5)	Sp	Spotty
Sh	Shear	N	Narrow (1.25 – 2.5)	Pa	Partially Filled
Fo	Foliation	VN	Very Narrow (<1.25)	FI	Filled
V	Vein	T	Tight	No	None
B	Bedding				

Type of Infilling		Surface Shape of Joint		Discontinuity Spacing (ft)	
Cl	Clay	Wa	Wave	EW	Extremely Wide (>65)
Ca	Calcite	Pl	Planar	W	Wide (22 – 65)
Ch	Chloride	St	Stepped	M	Moderate (7.5 – 22)
Fe	Iron Oxide	Ir	Irregular	C	Close (2 – 7.5)
Gy	Gypsum/Talc			VC	Very Close (<2)
H	Healed				
No	None				
Py	Pyrite				
Qz	Quartz				
Sd	Sand				

Roughness of Surface	
Slk	Slickensided (Surface has smooth, glassy finish with visual evidence of striations)
S	Smooth (Surface appears smooth and feels smooth to touch)
SR	Slightly Rough (Asperities on the discontinuity surfaces are distinguishable and can be felt)
R	Rough (some ridges and side-angle steps are evident; asperities are clearly visible, and discontinuity surface feels very abrasive)
VE	Very Rough (Near vertical steps and ridges occur on the discontinuity Surface)



S-38-191 over Roberts Swamp

Geotechnical Subsurface Data Report

APPENDIX

SECTION 3 SUBSURFACE EXPLORATION LOGS

SECTION 3A SOIL TEST BORING (STB) LOGS

SCDOT Soil Test Log

Project ID: P044269				County: Orangeburg		Boring No.: B-1		
Site Description:		S-38-191 over Roberts Swamp					Route: S-38-191	
Eng./Geo.: G. Cantelle		Boring Location: N/A			Offset: N/A		Alignment: Existing	
Elev.: 218.9 ft		Latitude: 33.47935173		Longitude: -81.06169886		Date Started: 1/15/2025		
Total Depth: 100 ft		Soil Depth: 100 ft		Core Depth: N/A ft		Date Completed: 1/16/2025		
Bore Hole Diameter (in): 3.5		Sampler Configuration			Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME 550X		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 89.8%		
Core Size: N/A		Driller: L. Guempel		Groundwater: TOB 11.4 ft		24HR 7 ft		

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	<div> ● SPT N VALUE ● PL X MC X LL X ▲ FINES CONTENT (%) ⊕ RQD (%) ■ REC (%) </div>
	0.0										0 10 20 30 40 50 60 70 80 90
	0.5	ASPHALT ROADWAY (S-38-191) (6.0-in.)		0.5							
		EXISTING FILL									
		Loose, Moist, Yellow/Grayish Brown, Non-Plastic to Low Plasticity, Silty Fine to Coarse SAND (SM/A-2-4), No HCl Reaction, 10YR7/6 & 10YR5/2			SS-1	3	3	3		6	●
	2.0			2.0							
		@SS-2: Brown/Reddish Yellow, with Trace Gravel, 10YR5/3 & 7.5YR6/6		4.0	SS-2	1	2	3	3	5	●
	4.0			4.0							
		Very Loose, Moist, Pale Brown/Light Yellowish Brown, Non-Plastic Fine to Medium Poorly Graded SAND (SP/A-3), No HCl Reaction, 2.5Y8/3 & 2.5Y6/3		6.0	SS-3	1	1	2	1	3	●
	6.0			6.0							
		ALLUVIUM									
		Very Loose, Pale Brown/Light Brownish Gray, Non-Plastic, Silty Fine to Coarse SAND (SM/A-2-4), No HCl Reaction 2.5Y7/3 & 2.5Y6/2		8.0	SS-4	1	1	1	1	2	●
	8.0			8.0							
		@SS-3: LL=NP, PL=NP, PI=NP, NMC=16.6%, %200=17.0			SS-5	WOH/12"	1	WOH		1	●
	13.5			13.5							
		@SS-5: Moist to Wet, Pale Brown, Fine Sand Particles, 2.5Y7/4									
		LL=NP, PL=NP, PI=NP, NMC=22.5%, %200=15.5									
	13.5			13.5							
		Loose, Moist, Light Gray/Gray, Non-Plastic to Low Plasticity, Fine to Coarse Poorly Graded SAND (SP-SM/A-3) with Silt & Trace Organics, No HCl Reaction, 2.5Y7/1 & 2.5Y6/1		18.5	SS-6	2	3	4		7	●
	18.5			18.5							
		COASTAL PLAIN (PLEISTOCENE)									
		Loose to Very Loose, Moist, Reddish Yellow/Pale Yellow, Low Plasticity, Silty Fine to Medium SAND (SM/A-2-4), No HCl Reaction, 7.5YR6/8 & 5Y8/3		23.5	SS-7	1	2	4		6	●
	23.5			23.5							
		@SS-7: LL=31, PL=23, PI=8, NMC=51.3%, %200=23.5									
		@SS-8: Pale Yellow, 5Y8/3			SS-8	1	1	2		3	●
	193.9			193.9							

LEGEND

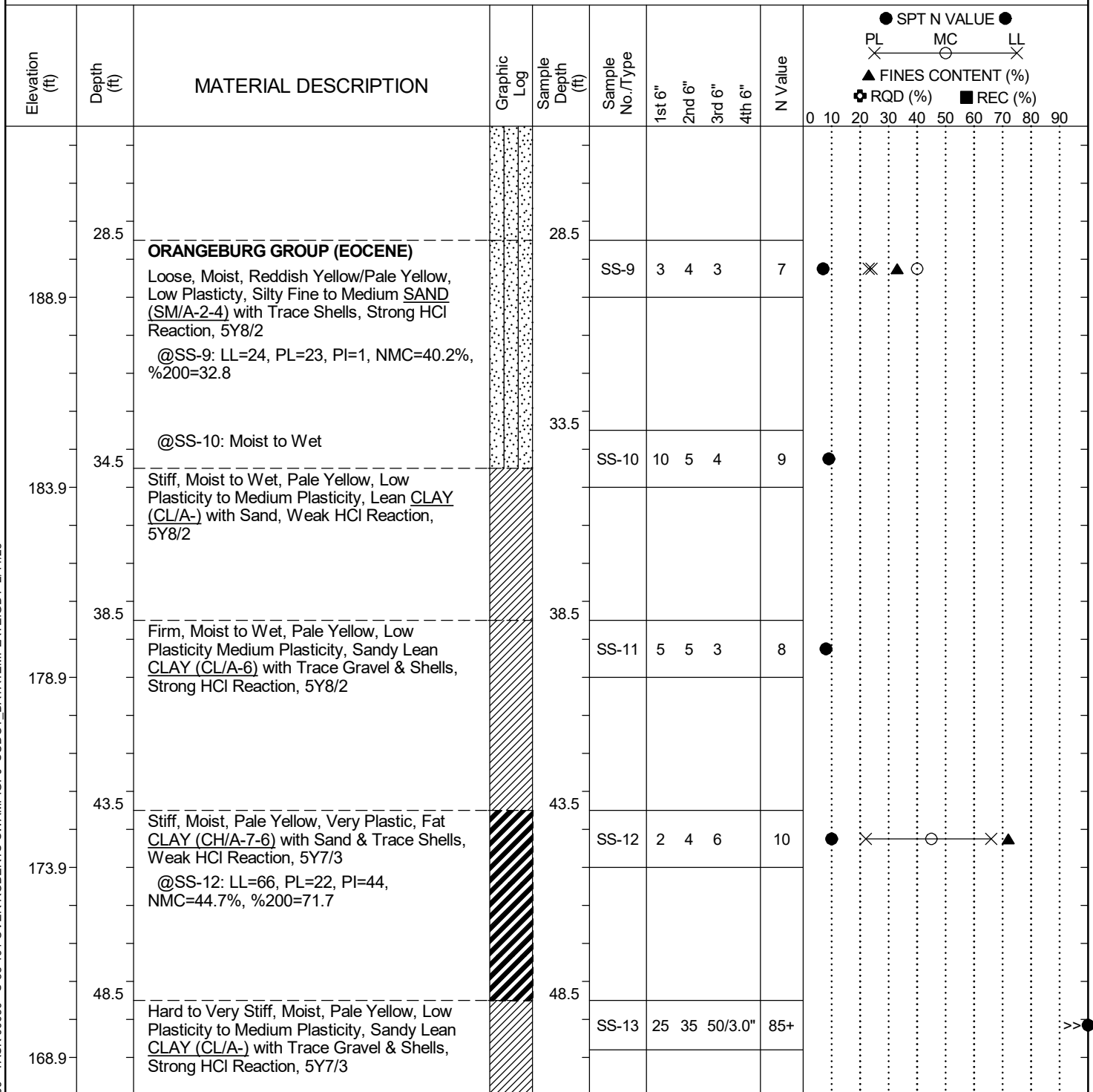
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC.DOT G7100.009 - TASK 00030 - S-38-191 OVER ROBERTS SWAMP.GPJ SCDOT_DATATEMPLATE.GDT 2/14/25

SCDOT Soil Test Log

Project ID: P044269				County: Orangeburg		Boring No.: B-1		
Site Description:		S-38-191 over Roberts Swamp					Route: S-38-191	
Eng./Geo.: G. Cantelle		Boring Location: N/A			Offset: N/A		Alignment: Existing	
Elev.: 218.9 ft		Latitude: 33.47935173		Longitude: -81.06169886		Date Started: 1/15/2025		
Total Depth: 100 ft		Soil Depth: 100 ft		Core Depth: N/A ft		Date Completed: 1/16/2025		
Bore Hole Diameter (in): 3.5		Sampler Configuration			Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME 550X		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 89.8%		
Core Size: N/A		Driller: L. Guempel		Groundwater: TOB 11.4 ft		24HR 7 ft		



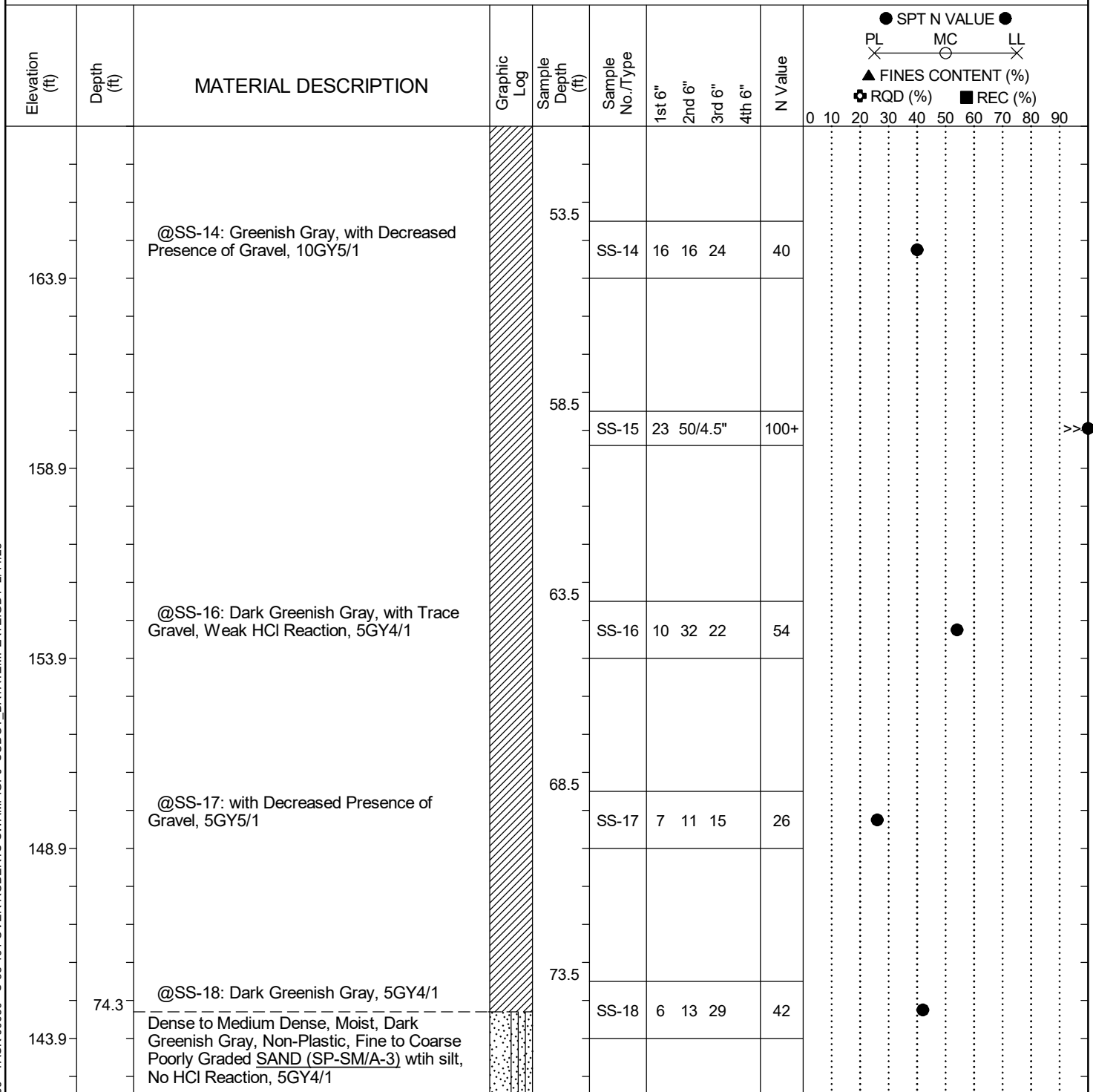
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID: P044269				County: Orangeburg		Boring No.: B-1		
Site Description:		S-38-191 over Roberts Swamp					Route: S-38-191	
Eng./Geo.: G. Cantelle		Boring Location: N/A			Offset: N/A		Alignment: Existing	
Elev.: 218.9 ft		Latitude: 33.47935173		Longitude: -81.06169886		Date Started: 1/15/2025		
Total Depth: 100 ft		Soil Depth: 100 ft		Core Depth: N/A ft		Date Completed: 1/16/2025		
Bore Hole Diameter (in): 3.5		Sampler Configuration			Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME 550X		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 89.8%		
Core Size: N/A		Driller: L. Guempel		Groundwater: TOB 11.4 ft		24HR 7 ft		



LEGEND

Continued Next Page

SAMPLER TYPE			DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash	
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core	
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing		

SCDOT Soil Test Log

Project ID:	P044269	County:	Orangeburg	Boring No.:	B-1
Site Description:	S-38-191 over Roberts Swamp			Route:	S-38-191
Eng./Geo.:	G. Cantelle	Boring Location:	N/A	Offset:	N/A
Elev.:	218.9 ft	Latitude:	33.47935173	Longitude:	-81.06169886
Date Started:	1/15/2025				
Total Depth:	100 ft	Soil Depth:	100 ft	Core Depth:	N/A ft
Date Completed:	1/16/2025				
Bore Hole Diameter (in):	3.5	Sampler Configuration	Liner Required: Y (N)		Liner Used: Y (N)
Drill Machine:	CME 550X	Drill Method:	RW	Hammer Type:	Automatic
Energy Ratio:	89.8%				
Core Size:	N/A	Driller:	L. Guempel	Groundwater:	TOB 11.4 ft
24HR	7 ft				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	<div> ● SPT N VALUE ● PL X MC X LL X ▲ FINES CONTENT (%) + RQD (%) ■ REC (%) </div>
138.9				78.5	SS-19	9	12	17		29	●
133.9				83.5	SS-20	8	10	17		27	●
128.9		@SS-21: Greenish Gray, 10Y5/1		88.5	SS-21	8	12	15		27	●
123.9				93.5	SS-22	7	9	13		22	●
118.9	100.0	@SS-23: Dark Greenish Gray, 10Y4/1		98.5	SS-23	5	7	11		18	●
		Boring Terminated at 100.0-ft. Below Existing Ground Surface. Boring Achieved Target Depth.									

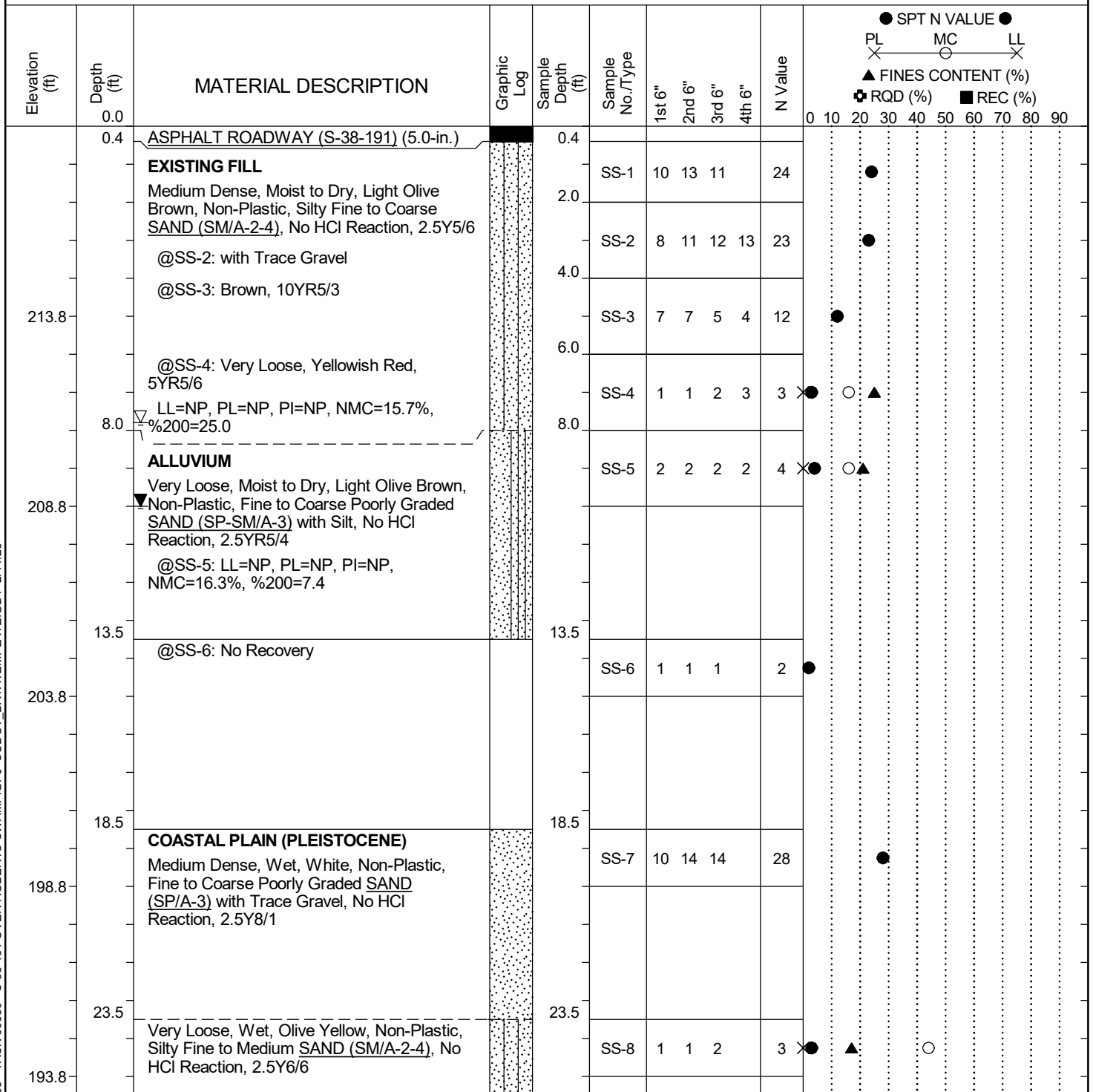
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC.DOT G7100.009 - TASK 00030 - S-38-191 OVER ROBERTS SWAMP.GPJ SCDOT_DATATEMPLATE.GDT 2/14/25

SCDOT Soil Test Log

Project ID:	P044269	County:	Orangeburg	Boring No.:	B-2
Site Description:	S-38-191 over Roberts Swamp			Route:	S-38-191
Eng./Geo.:	G. Cantelle	Boring Location:	N/A	Offset:	N/A
Elev.:	218.8 ft	Latitude:	33.47928612	Longitude:	-81.06132183
Date Started:	1/16/2024				
Total Depth:	100 ft	Soil Depth:	100 ft	Core Depth:	N/A ft
Date Completed:	1/17/2024				
Bore Hole Diameter (in):	3.5	Sampler Configuration	Liner Required: Y (N)		Liner Used: Y (N)
Drill Machine:	CME 550X	Drill Method:	RW	Hammer Type:	Automatic
Energy Ratio:	89.8%				
Core Size:	N/A	Driller:	L. Guempel	Groundwater:	TOB 7.8 ft
24HR	10 ft				



LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

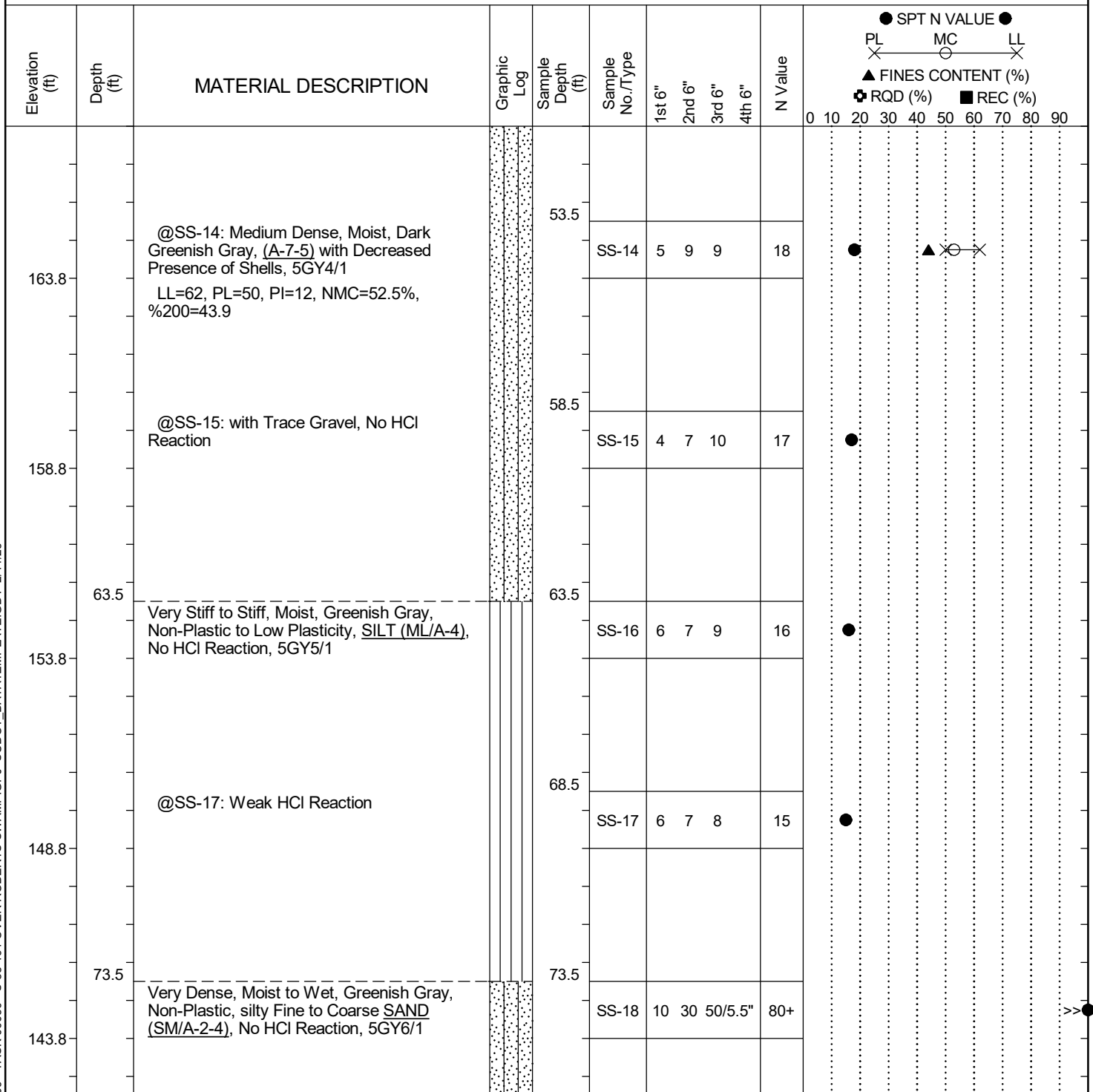
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	SPT N VALUE	PL	MC	LL	FINES CONTENT (%)	RQD (%)	REC (%)
		@SS-8: LL=NP, PL=NP, PI=NP, NMC=43.9%, %200=17.0															
188.8	28.5	ORANGEBURG GROUP (EOCENE) Loose to Medium Dense, Wet, Pale Yellow, Low Plasticity, Silty Fine to Medium SAND <u>(SM/A-2-4)</u> , Strong HCl Reaction, 5Y8/3 @SS-9: LL=30, PL=27, PI=3, NMC=37.2%, %200=26.9		28.5	SS-9	3	3	5		8							
183.8		@SS-10: Moist to Wet, Light Gray, with Trace Shells, 5Y7/2		33.5	SS-10	3	6	13		19							
178.8	38.5	Very Stiff, Moist to Wet, Pale Yellow, Low Plasticity to Medium Plasticity, Sandy SILT <u>(ML/A-4)</u> with Trace Shells, 5Y8/2		38.5	SS-11	3	12	6		18							
173.8	43.5	Very Dense, Moist to Wet, Pale Yellow, Low Plasticity to Medium Plasticity, Silty Fine to Coarse SAND <u>(SM/A-2-4)</u> with Trace Shells, 5Y8/2		43.5	SS-12	50/3.5"				100+							
168.8		@SS-13: Greenish Gray, Weak HCl Reaction, 5GY5/1		48.5	SS-13	50/3.5"				100+							

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SCDOT Soil Test Log

Project ID:	P044269	County:	Orangeburg	Boring No.:	B-2
Site Description:	S-38-191 over Roberts Swamp			Route:	S-38-191
Eng./Geo.:	G. Cantelle	Boring Location:	N/A	Offset:	N/A
Elev.:	218.8 ft	Latitude:	33.47928612	Longitude:	-81.06132183
Date Started:	1/16/2024				
Total Depth:	100 ft	Soil Depth:	100 ft	Core Depth:	N/A ft
Date Completed:	1/17/2024				
Bore Hole Diameter (in):	3.5	Sampler Configuration	Liner Required: Y (N)		Liner Used: Y (N)
Drill Machine:	CME 550X	Drill Method:	RW	Hammer Type:	Automatic
Energy Ratio:	89.8%				
Core Size:	N/A	Driller:	L. Guempel	Groundwater:	TOB 7.8 ft
24HR	10 ft				



LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC.DOT G7100.009 - TASK 00030 - S-38-191 OVER ROBERTS SWAMP.GPJ SCDOT_DATATEMPLATE.GDT 2/14/25

SCDOT Soil Test Log

Project ID:	P044269	County:	Orangeburg	Boring No.:	B-2
Site Description:	S-38-191 over Roberts Swamp			Route:	S-38-191
Eng./Geo.:	G. Cantelle	Boring Location:	N/A	Offset:	N/A
Elev.:	218.8 ft	Latitude:	33.47928612	Longitude:	-81.06132183
Date Started:	1/16/2024				
Total Depth:	100 ft	Soil Depth:	100 ft	Core Depth:	N/A ft
Date Completed:	1/17/2024				
Bore Hole Diameter (in):	3.5	Sampler Configuration	Liner Required: Y (N)		Liner Used: Y (N)
Drill Machine:	CME 550X	Drill Method:	RW	Hammer Type:	Automatic
Energy Ratio:	89.8%				
Core Size:	N/A	Driller:	L. Guempel	Groundwater:	TOB 7.8 ft
24HR	10 ft				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	<div> ● SPT N VALUE ● PL X MC X LL X ▲ FINES CONTENT (%) ⊕ RQD (%) ■ REC (%) </div>
138.8	78.5	Medium Dense to Dense, Moist to Wet, Greenish Gray, Non-Plastic, Fine to Coarse Poorly Graded SAND (SP/A-3), No HCl Reaction, 5GY6/1		78.5	SS-19	6	11	16		27	●
133.8				83.5	SS-20	7	11	18		29	●
128.8		@SS-21: Greenish Gray, Fine to Medium Sand Particles, 5GY5/1		88.5	SS-21	10	14	17		31	●
123.8				93.5	SS-22	8	11	13		24	●
118.8	100.0	Boring Terminated at 100.0-ft. Below Existing Ground Surface. Boring Achieved Target Depth.		98.5	SS-23	6	9	14		23	●

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC.DOT G7100.009 - TASK 00030 - S-38-191 OVER ROBERTS SWAMP.GPJ SCDOT_DATATEMPLATE.GDT 2/14/25

SCDOT Soil Test Log

Project ID:	P044269	County:	Orangeburg	Boring No.:	P-1
Site Description:	S-38-191 over Roberts Swamp			Route:	S-38-191
Eng./Geo.:	G. Cantelle	Boring Location:	N/A	Offset:	N/A
Elev.:	219.4 ft	Latitude:	33.47938281	Longitude:	-81.06296319
Date Started:	1/15/2025				
Total Depth:	6 ft	Soil Depth:	6 ft	Core Depth:	N/A ft
Date Completed:	1/15/2025				
Bore Hole Diameter (in):	3.5	Sampler Configuration	Liner Required: Y (N)		Liner Used: Y (N)
Drill Machine:	CME 550X	Drill Method:	RW	Hammer Type:	Automatic
Energy Ratio:	89.8%				
Core Size:	N/A	Driller:	L. Guempel	Groundwater:	TOB N/A
24HR	Backfilled				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC ○ LL X </div> <div> ▲ FINES CONTENT (%) </div> <div> ⊕ RQD (%) ■ REC (%) </div> </div>
	0.0	ASPHALT ROADWAY (S-38-191) (3.5-in.)									
	0.3	Medium Dense to Loose, Moist to Dry, Light Olive Brown, Non-Plastic to Low Plasticity, Silty Fine to Coarse SAND (SM/A-2-4) with Trace Gravel, 2.5Y5/3		0.3							
					SS-1	3	6	5	9	11	●
		@SS-2: Pale Brown, with Decreased Presence of Gravel, 2.5Y7/4		2.0							
					SS-2	9	8	4	3	12	●
		@SS-3: Strong Brown, with Trace Gravel, 7.5YR5/8		4.0							
					SS-3	2	2	4	5	6	●
214.4	6.0	Boring Terminated at 6.0-ft. Below Existing Roadway Surface. Boring Achieved Target Depth.									

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC.DOT G7100.009 - TASK 00030 - S-38-191 OVER ROBERTS SWAMP.GPJ SCDOT_DATATEMPLATE.GDT 2/12/25

SCDOT Soil Test Log

Project ID:	P044269	County:	Orangeburg	Boring No.:	P-2
Site Description:	S-38-191 over Roberts Swamp			Route:	S-38-191
Eng./Geo.:	G. Cantelle	Boring Location:	N/A	Offset:	N/A
Elev.:	219.0 ft	Latitude:	33.47938581	Longitude:	-81.06247085
Date Started:	1/15/2025				
Total Depth:	6 ft	Soil Depth:	6 ft	Core Depth:	N/A ft
Date Completed:	1/15/2025				
Bore Hole Diameter (in):	3.5	Sampler Configuration	Liner Required: Y (N)		Liner Used: Y (N)
Drill Machine:	CME 550X	Drill Method:	RW	Hammer Type:	Automatic
Energy Ratio:	89.8%				
Core Size:	N/A	Driller:	L. Guempel	Groundwater:	TOB N/A
24HR	Backfilled				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC ○ LL X </div> <div> ▲ FINES CONTENT (%) </div> <div> ⊕ RQD (%) ■ REC (%) </div> </div>
	0.0	ASPHALT ROADWAY (S-38-191) (3.0-in.)									
	0.3	Medium Dense, Moist to Dry, Light Yellowish Brown, Non-Plastic, Silty Fine to Coarse SAND (SM/A-2-4), 10YR6/4		0.3							
					SS-1	4	8	8	8	16	●
		@SS-2: Fine to Medium Sand Particles, 10YR5/4		2.0							
					SS-2	8	10	10	12	20	●
		@SS-3: Brown, Fine to Coarse Sand Particles, 10YR5/3		4.0							
					SS-3	13	10	7	9	17	●
214.0	6.0	Boring Terminated at 6.0-ft. Below Existing Roadway Surface. Boring Achieved Target Depth.									

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC.DOT G7100.009 - TASK 00030 - S-38-191 OVER ROBERTS SWAMP.GPJ SCDOT_DATATEMPLATE.GDT 2/12/25

SCDOT Soil Test Log

Project ID:	P044269	County:	Orangeburg	Boring No.:	P-3
Site Description:	S-38-191 over Roberts Swamp			Route:	S-38-191
Eng./Geo.:	G. Cantelle	Boring Location:	N/A	Offset:	N/A
Elev.:	218.6 ft	Latitude:	33.47932839	Longitude:	-81.0619839
Date Started:	1/15/2025				
Total Depth:	6 ft	Soil Depth:	6 ft	Core Depth:	N/A ft
Date Completed:	1/15/2025				
Bore Hole Diameter (in):	3.5	Sampler Configuration	Liner Required: Y (N)		Liner Used: Y (N)
Drill Machine:	CME 550X	Drill Method:	RW	Hammer Type:	Automatic
Energy Ratio:	89.8%				
Core Size:	N/A	Driller:	L. Guempel	Groundwater:	TOB N/A
24HR	Backfilled				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC ○ LL X </div> <div> ▲ FINES CONTENT (%) </div> <div> ⊕ RQD (%) ■ REC (%) </div> </div>
	0.0	ASPHALT ROADWAY (S-38-191) (4.0-in.)									
	0.3	Medium Dense to Loose, Moist to Dry, Light Olive Brown, Non-Plastic, Silty Fine to Medium SAND (SM/A-2-4), 2.5Y5/4		0.3							
					SS-1	3	8	8	12	16	●
		@SS-2: with Trace Gravel		2.0							
					SS-2	7	11	8	9	19	●
				4.0							
					SS-3	6	5	5	5	10	●
213.6											
	6.0	Boring Terminated at 6.0-ft. Below Existing Roadway Surface. Boring Achieved Target Depth.									

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC.DOT G7100.009 - TASK 00030 - S-38-191 OVER ROBERTS SWAMP.GPJ SCDOT_DATATEMPLATE.GDT 2/12/25

SCDOT Soil Test Log

Project ID:	P044269	County:	Orangeburg	Boring No.:	P-4
Site Description:	S-38-191 over Roberts Swamp			Route:	S-38-191
Eng./Geo.:	G. Cantelle	Boring Location:	N/A	Offset:	N/A
Elev.:	219.2 ft	Latitude:	33.47930689	Longitude:	-81.06096275
Date Started:	1/23/2025				
Total Depth:	6 ft	Soil Depth:	6 ft	Core Depth:	N/A ft
Date Completed:	1/23/2025				
Bore Hole Diameter (in):	3.5	Sampler Configuration	Liner Required: Y (N)		Liner Used: Y (N)
Drill Machine:	CME 550X	Drill Method:	RW	Hammer Type:	Automatic
Energy Ratio:	89.8%				
Core Size:	N/A	Driller:	L. Guempel	Groundwater:	TOB N/A
24HR	Backfilled				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC ○ LL X </div> <div> ▲ FINES CONTENT (%) </div> <div> ⊕ RQD (%) ■ REC (%) </div> </div>
	0.0	ASPHALT ROADWAY (S-38-191) (3.5-in.)									
	0.3	Medium Dense to Loose, Moist to Dry, Brown, Non-Plastic, Fine to Coarse Poorly Graded SAND (SP/A-3), No HCl Reaction, 10YR5/3		0.3							
					SS-1	2	7	7	7	14	●
		@SS-2: Yellowish Brown, 10YR5/6		2.0							
					SS-2	4	5	4	4	9	●
		@SS-3: Very Dark Grayish Brown, 10YR3/2		4.0							
					SS-3	5	6	5	3	11	●
214.2	6.0	Boring Terminated at 6.0-ft. Below Existing Roadway Surface. Boring Achieved Target Depth.									

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC.DOT G7100.009 - TASK 00030 - S-38-191 OVER ROBERTS SWAMP.GPJ SCDOT_DATATEMPLATE.GDT 2/12/25

SCDOT Soil Test Log

Project ID:	P044269	County:	Orangeburg	Boring No.:	P-5
Site Description:	S-38-191 over Roberts Swamp			Route:	S-38-191
Eng./Geo.:	G. Cantelle	Boring Location:	N/A	Offset:	N/A
Elev.:	221.2 ft	Latitude:	33.47925176	Longitude:	-81.06047675
Date Started:	1/23/2025				
Total Depth:	6 ft	Soil Depth:	6 ft	Core Depth:	N/A ft
Date Completed:	1/23/2025				
Bore Hole Diameter (in):	3.5	Sampler Configuration	Liner Required: Y (N)		Liner Used: Y (N)
Drill Machine:	CME 550X	Drill Method:	RW	Hammer Type:	Automatic
Energy Ratio:	89.8%				
Core Size:	N/A	Driller:	L. Guempel	Groundwater:	TOB N/A
24HR	Backfilled				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	● SPT N VALUE ● PL X — MC — LL X ▲ FINES CONTENT (%) + RQD (%) ■ REC (%)
	0.0	ASPHALT ROADWAY (S-38-191) (3.5-in.)									0 10 20 30 40 50 60 70 80 90
	0.3	Medium Dense, Moist to Dry, Brownish Yellow, Non-Plastic to Low Plasticity, Silty Fine to Coarse SAND (SM/A-2-4), No HCl Reaction, 10YR6/6		0.3							
					SS-1	1	7	8	8	15	●
		@SS-2: Grayish Brown, 10YR5/2		2.0							
					SS-2	6	4	7	10	11	●
		@SS-3: Black, 10YR2/1		4.0							
					SS-3	6	9	5	5	14	●
216.2	6.0	Boring Terminated at 6.0-ft. Below Existing Roadway Surface. Boring Achieved Target Depth.									

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC.DOT G7100.009 - TASK 00030 - S-38-191 OVER ROBERTS SWAMP.GPJ SCDOT_DATATEMPLATE.GDT 2/12/25

SCDOT Soil Test Log

Project ID:	P044269	County:	Orangeburg	Boring No.:	P-6
Site Description:	S-38-191 over Roberts Swamp			Route:	S-38-191
Eng./Geo.:	G. Cantelle	Boring Location:	N/A	Offset:	N/A
Elev.:	225.8 ft	Latitude:	33.47926564	Longitude:	-81.05998561
Date Started:	1/23/2025				
Total Depth:	6 ft	Soil Depth:	6 ft	Core Depth:	N/A ft
Date Completed:	1/23/2025				
Bore Hole Diameter (in):	3.5	Sampler Configuration	Liner Required: Y (N)		Liner Used: Y (N)
Drill Machine:	CME 550X	Drill Method:	RW	Hammer Type:	Automatic
Energy Ratio:	89.8%				
Core Size:	N/A	Driller:	L. Guempel	Groundwater:	TOB N/A
24HR	Backfilled				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	<div> ● SPT N VALUE ● PL X MC X LL X ▲ FINES CONTENT (%) + RQD (%) ■ REC (%) </div>
	0.0	ASPHALT ROADWAY (S-38-191) (3.5-in.)									
	0.3	Medium Dense, Moist to Dry, Brown, Non-Plastic, Fine to Coarse Poorly Graded SAND (SP/A-3), No HCl Reaction, 10Y5/3		0.3							
					SS-1	1	9	11	9	20	●
	2.0	Medium Dense, Moist to Dry, Red, Non-Plastic, Silty Fine to Coarse SAND (SM/A-2-4), No HCl Reaction, 2.5YR5/8		2.0							
					SS-2	5	6	6	7	12	●
				4.0							
					SS-3	8	8	11	11	19	●
220.8											
	6.0	Boring Terminated at 6.0-ft. Below Existing Roadway Surface. Boring Achieved Target Depth.									

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC.DOT G7100.009 - TASK 00030 - S-38-191 OVER ROBERTS SWAMP.GPJ SCDOT_DATATEMPLATE.GDT 2/12/25

S-38-191 over Roberts Swamp

Geotechnical Subsurface Data Report

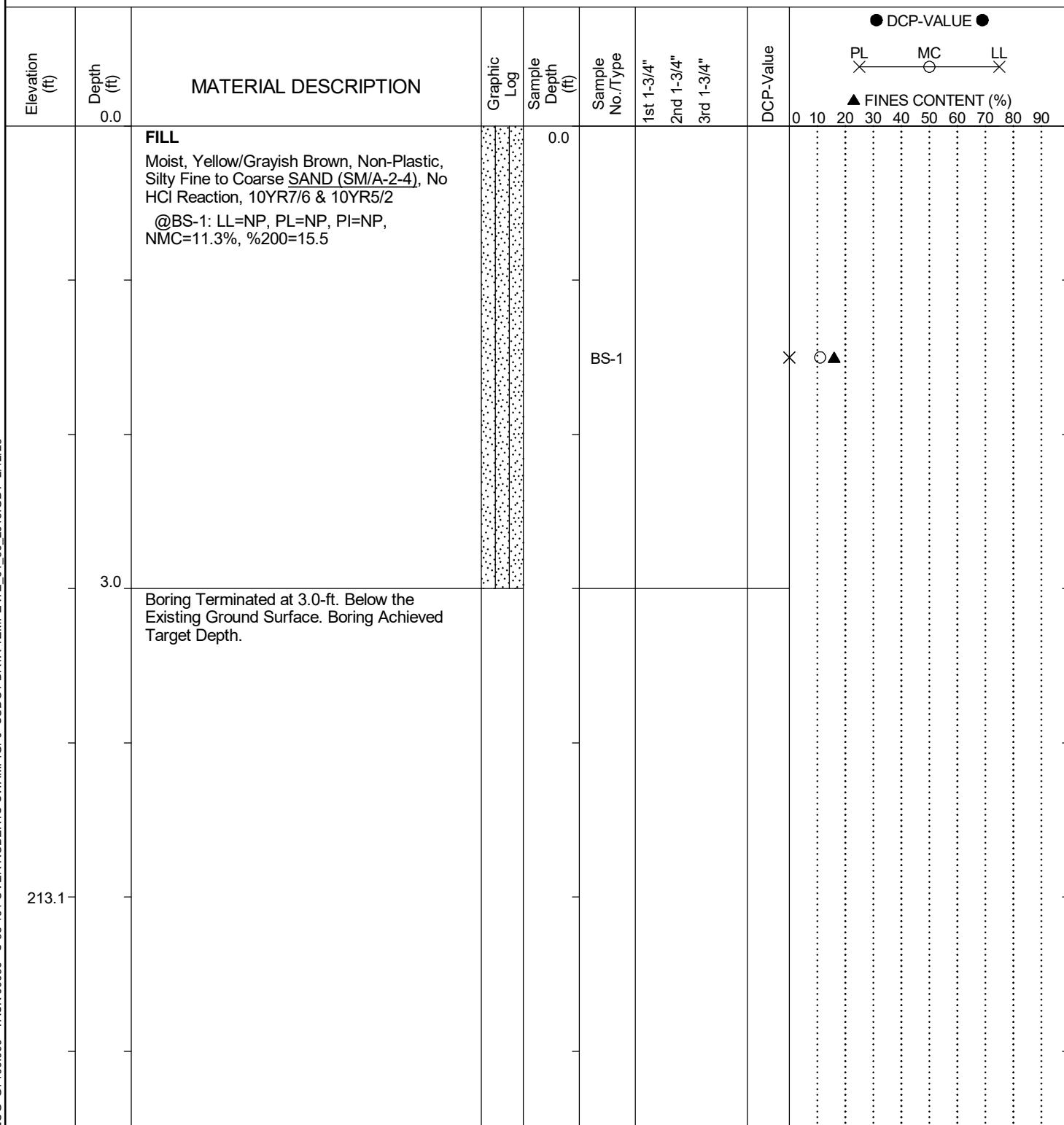
APPENDIX

SECTION 3 SUBSURFACE EXPLORATION LOGS

SECTION 3B BULK SOIL SAMPLE (BS) LOG

SCDOT Manual Auger Log

Project ID:	P044269			County:	Orangeburg		Boring No.:	BS-1		
Site Description:	S-38-191 over Roberts Swamp						Route:	S-38-191		
Driller:	L. Guempel		Boring Location:	N/A		Offset:	N/A		Alignment:	Existing
Elev.:	218.1 ft		Latitude:	33.47930491		Longitude:	-81.06198611		Date Started:	1/3/2025
Total Depth:	3 ft		Groundwater:	TOB		N/A	24 hr Backfilled		Date Completed:	1/3/2025
Dynamic Cone Penetrometer Test Procedure:				ASTM D6951						



LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	DCP Dynamic Cone Penetrometer	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

S-38-191 over Roberts Swamp

Geotechnical Subsurface Data Report

APPENDIX

SECTION 4

LABORATORY TEST RESULTS

S-38-191 over Roberts Swamp

Geotechnical Subsurface Data Report

APPENDIX

SECTION 4 LABORATORY TEST RESULTS

SECTION 4A SPLIT SPOON SAMPLES



SUMMARY OF LABORATORY RESULTS

PAGE 1 OF 1

PROJECT ID P044269

PROJECT NAME S-38-191 over Roberts Swamp

PROJECT COUNTY Orangeburg

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Classification	Water Content (%)	Dry Density (pcf)	Saturation (%)	Void Ratio
B-1	8.0	NP	NP	NP	4.76	17	SM	16.6			
B-1	10.0	NP	NP	NP	4.76	16	SM	22.5			
B-1	20.0	31	23	8	19	23	SM	51.3			
B-1	30.0	24	23	1	4.76	33	SM	40.2			
B-1	45.0	66	22	44	9.51	72	CH	44.7			
B-2	8.0	NP	NP	NP	9.51	25	SM	15.7			
B-2	10.0	NP	NP	NP	9.51	8	SP-SM	16.3			
B-2	25.0	NP	NP	NP	4.76	17	SM	43.9			
B-2	30.0	30	27	3	19	27	SM	37.2			
B-2	55.0	62	50	12	19	44	SM	52.5			



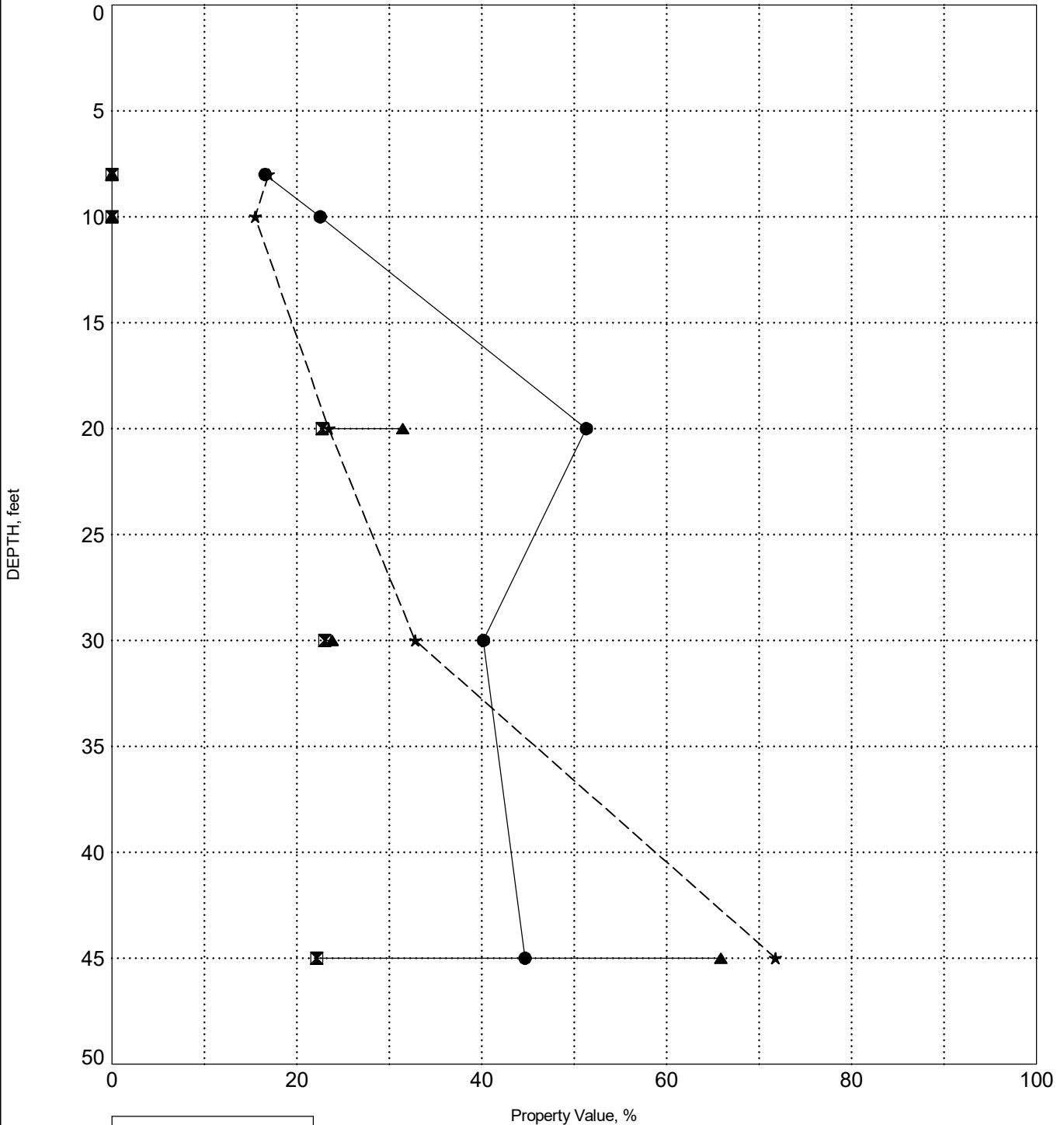
INDEX PROPERTIES VERSUS DEPTH

PROJECT ID P044269

PROJECT NAME S-38-191 over Roberts Swamp

PROJECT COUNTY Orangeburg

BORING B-1



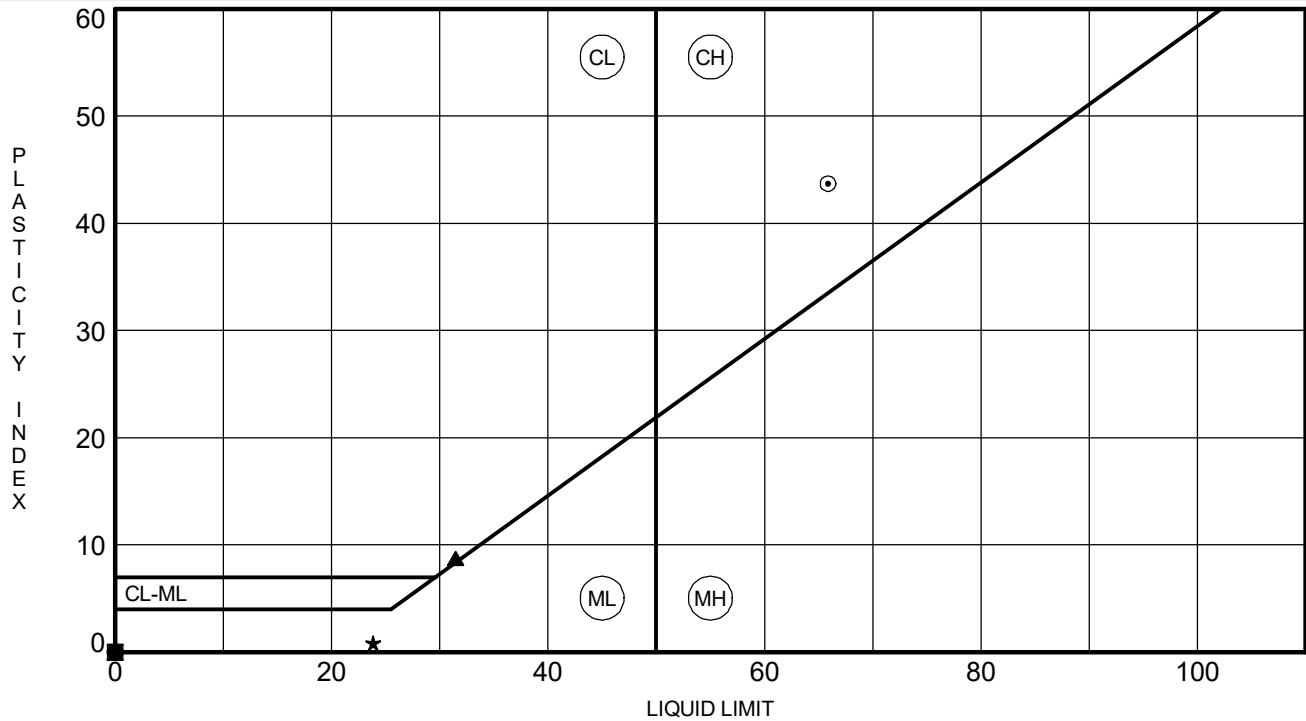
LEGEND	
●	Water Content
⊠	Plastic Limit
▲	Liquid Limit
★	Fines

ATTERBERG LIMITS' RESULTS

PROJECT ID P044269

PROJECT NAME S-38-191 over Roberts Swamp

PROJECT COUNTY Orangeburg

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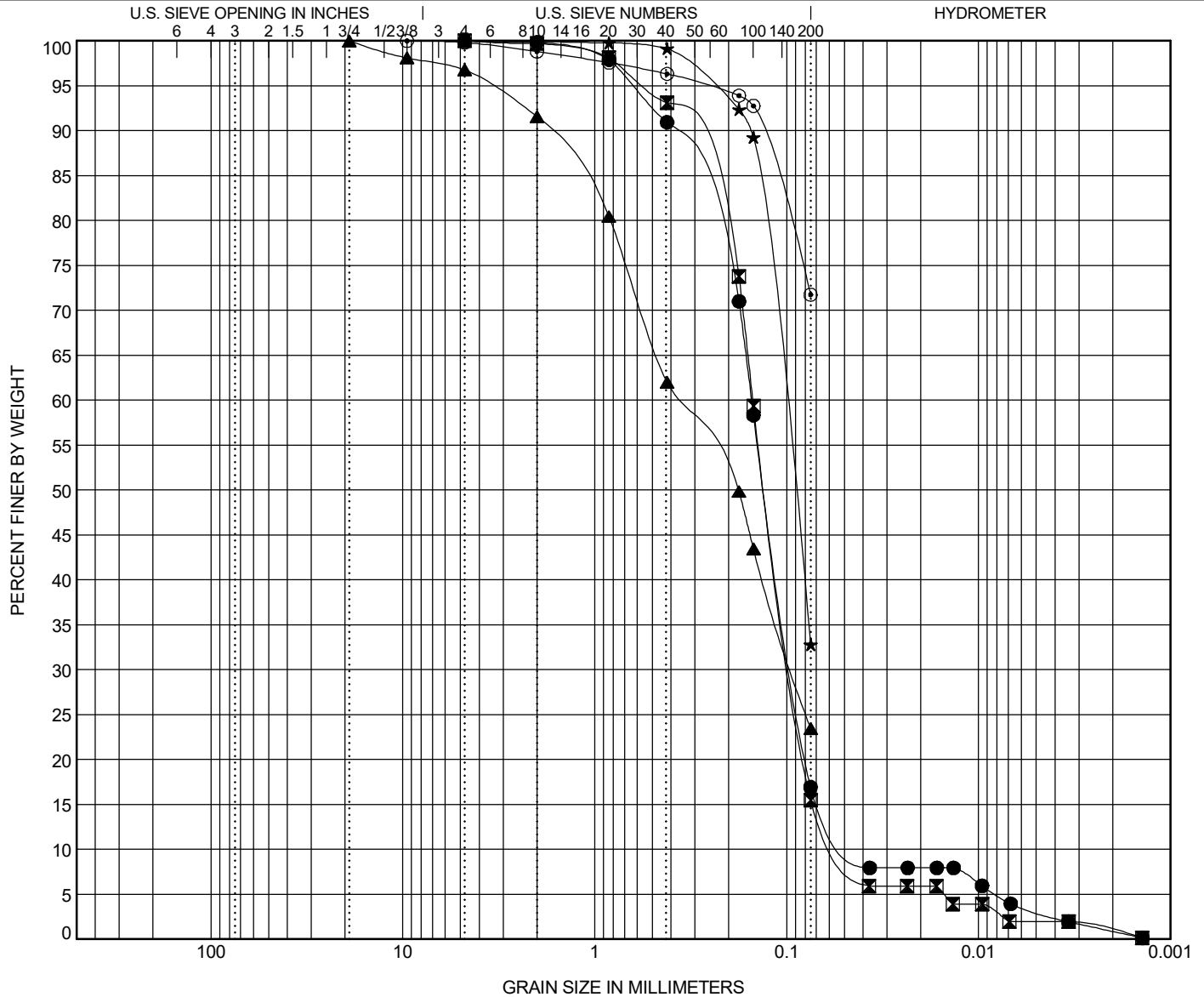


GRAIN SIZE DISTRIBUTION

PROJECT ID P044269

PROJECT NAME S-38-191 over Roberts Swamp

PROJECT COUNTY Orangeburg



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● B-1	8.0	SILTY SAND (SM/A-2-4)					NP	NP	NP	1.31	3.51
▣ B-1	10.0	SILTY SAND (SM/A-2-4)					NP	NP	NP	1.18	3.00
▲ B-1	20.0	SILTY SAND (SM/A-2-4)					31	23	8		
★ B-1	30.0	SILTY SAND (SM/A-2-4)					24	23	1		
◎ B-1	45.0	FAT CLAY with SAND (CH/A-7-6)					66	22	44		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
● B-1	8.0	4.76	0.152	0.093	0.043	0.0	83.1	13.9		3.1	
▣ B-1	10.0	4.76	0.15	0.094	0.05	0.0	84.5	13.6		1.9	
▲ B-1	20.0	19	0.364	0.094		3.2	73.3	23.5			
★ B-1	30.0	4.76	0.104			0.0	67.2	32.8			
◎ B-1	45.0	9.51				0.2	28.1	71.7			

F&ME CONSULTANTS, INC
211 Business Park Blvd.
Columbia, SC 29203

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	S-38-191 over Roberts Swamp	PROJECT NO.:	G7100.009 - Task 00030
SAMPLE NUMBER:	25-0154	DATE REQUESTED:	--
DESCRIPTION OF SOIL:	Various		
TESTED BY:	LG	DATE OF TESTING:	1/21/2025
WEIGHED BY:	AC	DATE OF WEIGHING:	1/22/2025

BORING NO.	B-1	B-1	B-1	B-1	B-1
SAMPLE NO.	SS-4	SS-5	SS-7	SS-9	SS-12
SAMPLE DEPTH (ft.)	6.0 - 8.0	8.0 - 10.0	18.5 - 20.0	28.5 - 30.0	43.5 - 45.0
WATER CONTENT, W%	16.6	22.5	51.3	40.2	44.7

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (ft.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (ft.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (ft.)					
WATER CONTENT, W%					



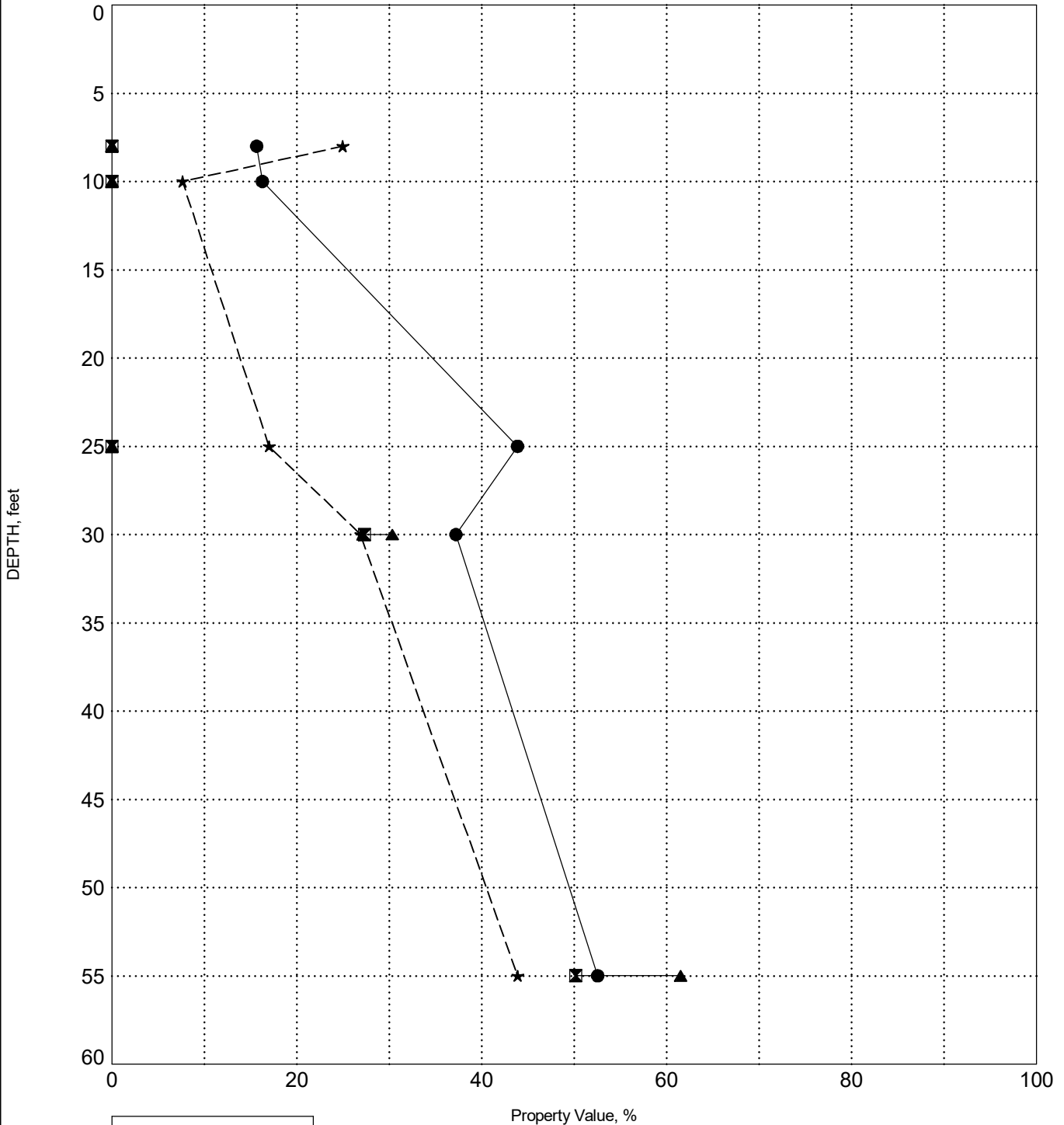
INDEX PROPERTIES VERSUS DEPTH

PROJECT ID P044269

PROJECT NAME S-38-191 over Roberts Swamp

PROJECT COUNTY Orangeburg

BORING B-2



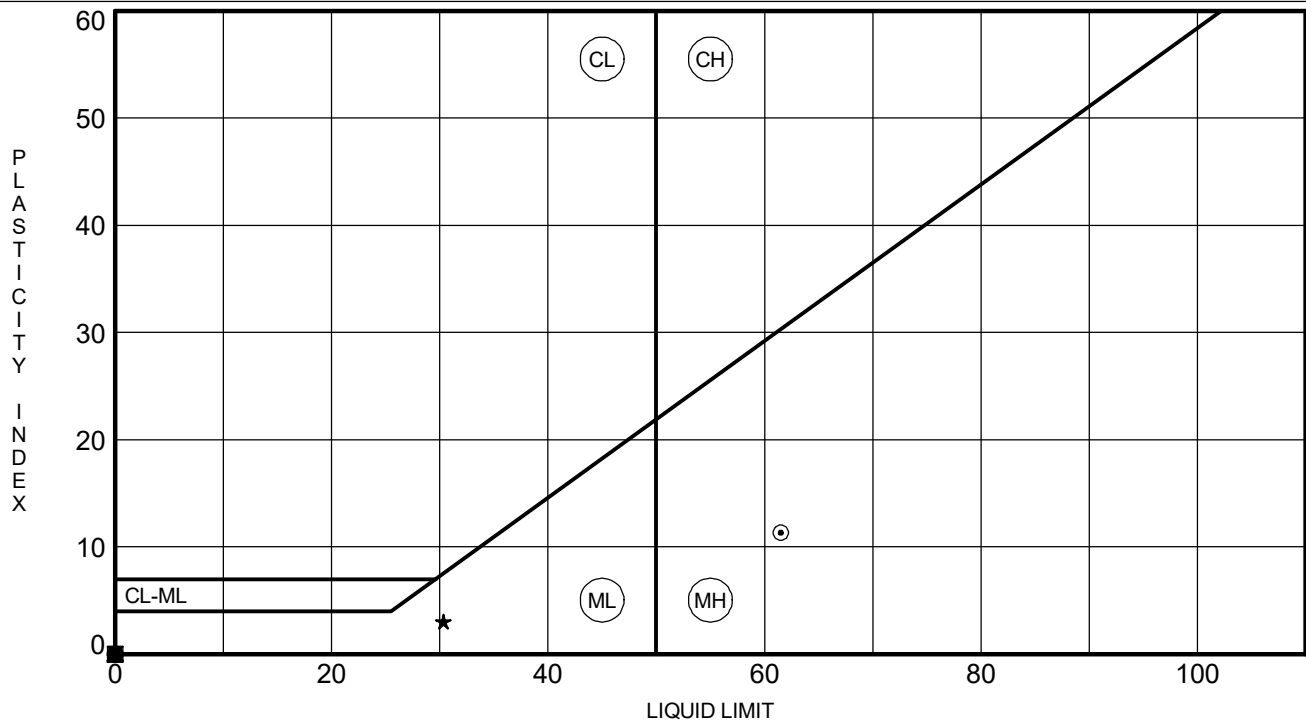
LEGEND	
●	Water Content
⊠	Plastic Limit
▲	Liquid Limit
★	Fines

ATTERBERG LIMITS' RESULTS

PROJECT ID P044269

PROJECT NAME S-38-191 over Roberts Swamp

PROJECT COUNTY Orangeburg

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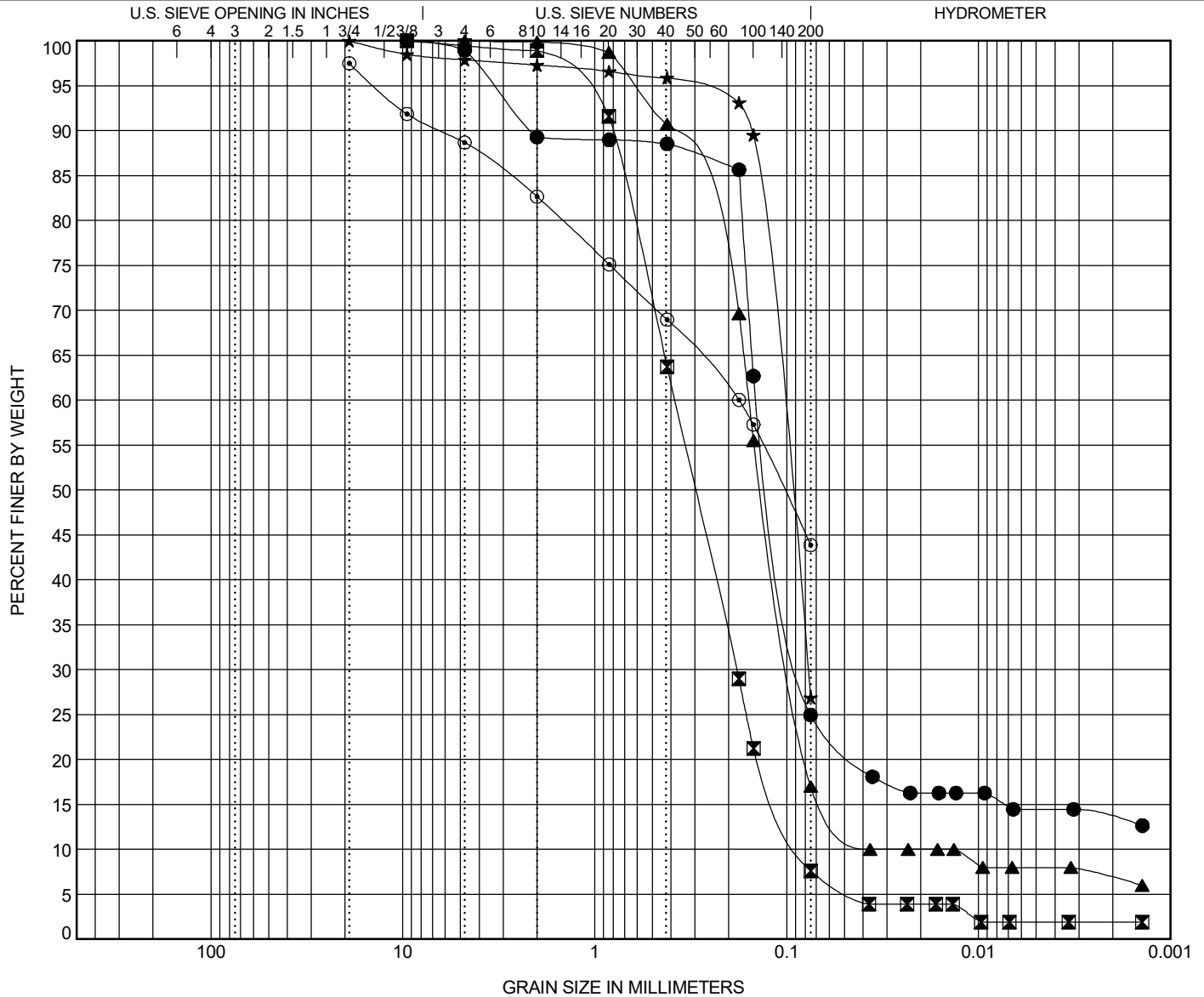


GRAIN SIZE DISTRIBUTION

PROJECT ID P044269

PROJECT NAME S-38-191 over Roberts Swamp

PROJECT COUNTY Orangeburg



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● B-2	8.0	SILTY SAND (SM/A-2-4)					NP	NP	NP		
✕ B-2	10.0	POORLY GRADED SAND with SILT (SP-SM/A-3)					NP	NP	NP	1.02	4.53
▲ B-2	25.0	SILTY SAND (SM/A-2-4)					NP	NP	NP	4.25	11.77
★ B-2	30.0	SILTY SAND (SM/A-2-4)					30	27	3		
⊙ B-2	55.0	SILTY SAND (SM/A-7-5)					62	50	12		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
● B-2	8.0	9.51	0.142	0.082		1.1	73.9	10.5		14.5	
✕ B-2	10.0	9.51	0.383	0.182	0.084	0.5	91.8	5.7		1.9	
▲ B-2	25.0	4.76	0.157	0.095	0.013	0.0	83.0	9.0		8.0	
★ B-2	30.0	19	0.108	0.078		2.1	71.0			26.9	
⊙ B-2	55.0	19	0.176			8.8	44.8			43.9	

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Columbia, SC 29203

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	S-38-191 over Roberts Swamp	PROJECT NO.:	G7100.009 - Task 00030
SAMPLE NUMBER:	25-0155	DATE REQUESTED:	--
DESCRIPTION OF SOIL:	Various		
TESTED BY:	LG	DATE OF TESTING:	1/21/2025
WEIGHED BY:	AC	DATE OF WEIGHING:	1/22/2025

BORING NO.	B-2	B-2	B-2	B-2	B-2
SAMPLE NO.	SS-4	SS-5	SS-8	SS-9	SS-14
SAMPLE DEPTH (ft.)	6.0 - 8.0	8.0 - 10.0	23.5 - 25.0	28.5 - 30.0	53.5 - 55.0
WATER CONTENT, W%	15.7	16.3	43.9	37.2	52.5

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (ft.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (ft.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (ft.)					
WATER CONTENT, W%					

S-38-191 over Roberts Swamp

Geotechnical Subsurface Data Report

APPENDIX

SECTION 4 LABORATORY TEST RESULTS

SECTION 4B BULK SOIL SAMPLES



SUMMARY OF LABORATORY RESULTS

PROJECT ID P044269

PROJECT NAME S-38-191 over Roberts Swamp

PROJECT COUNTY Orangeburg

Boring No.	Sample Depth (ft.)	Liquid Limit	Plastic Limit	Plasticity Index	%<#200 Sieve	Soil Classification	Moisture Content (%)	Max Dry Density (PCF)	Optimum Moisture Content (%)	C (psi)	ϕ (Degrees)	C' (psi)	ϕ' (Degrees)
BS-1	0.0 – 3.0	NP	NP	NP	15.5	SM	11.3	122.5	10.0	--	--	--	--



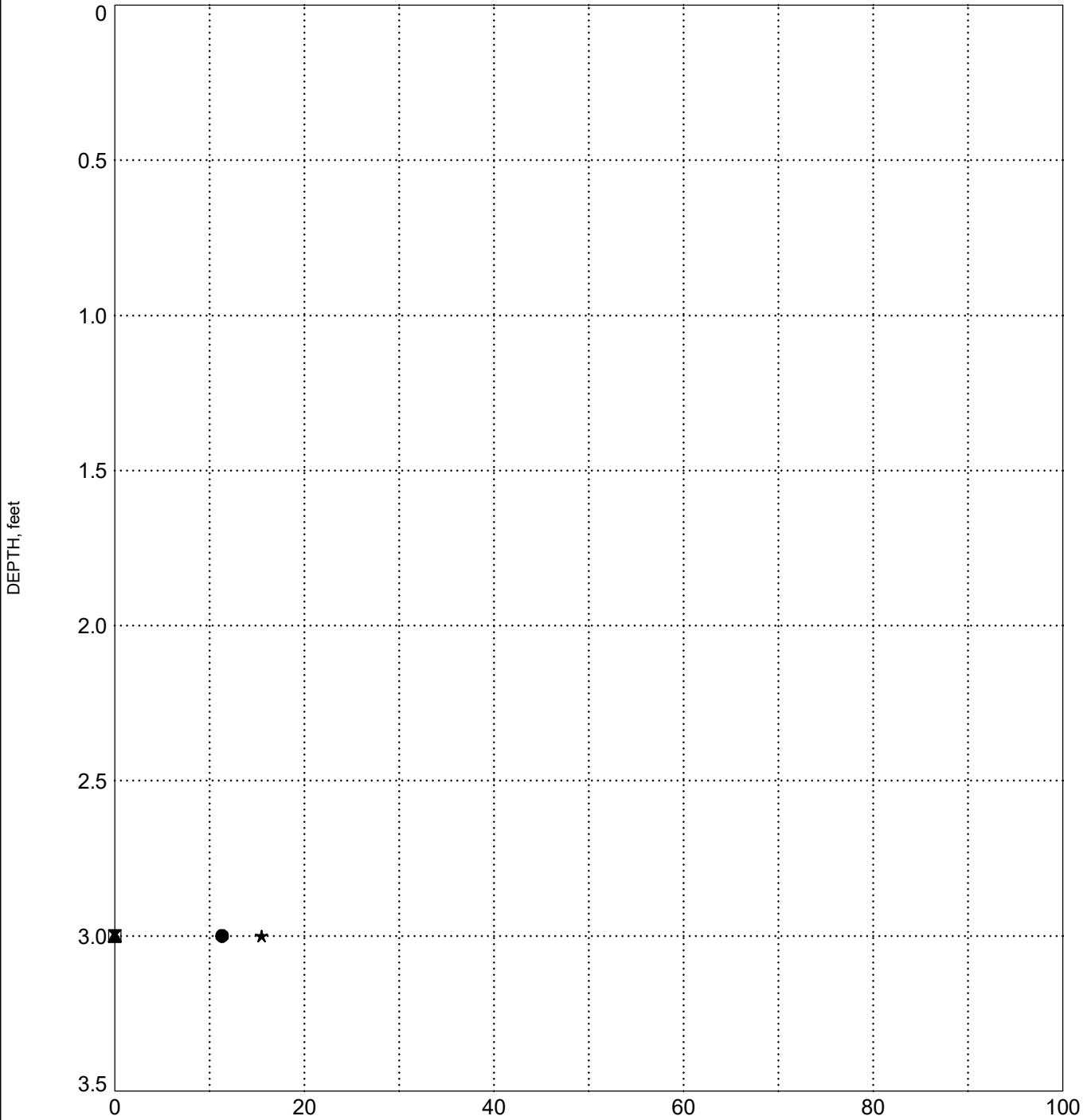
INDEX PROPERTIES VERSUS DEPTH

PROJECT ID P044269

PROJECT NAME S-38-191 over Roberts Swamp

PROJECT COUNTY Orangeburg

BORING BS-1



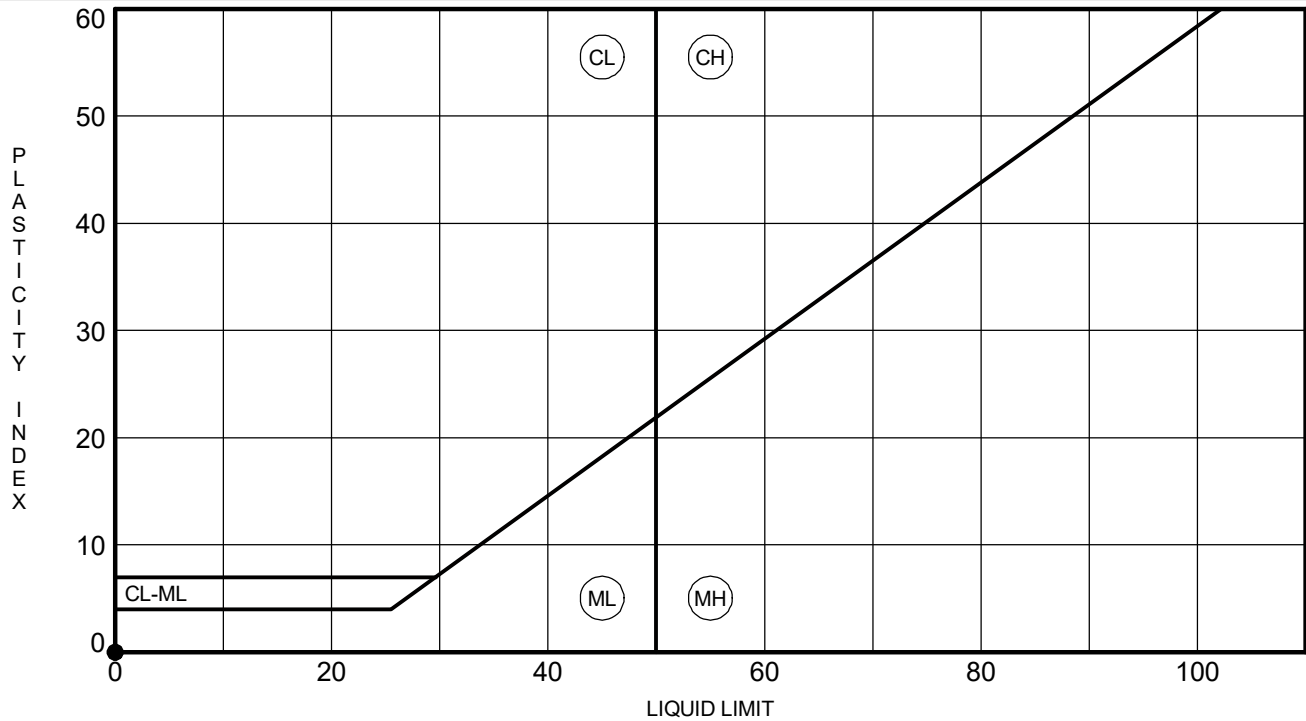
LEGEND	
●	Water Content
☒	Plastic Limit
▲	Liquid Limit
★	Fines

ATTERBERG LIMITS' RESULTS

PROJECT ID P044269

PROJECT NAME S-38-191 over Roberts Swamp

PROJECT COUNTY Orangeburg

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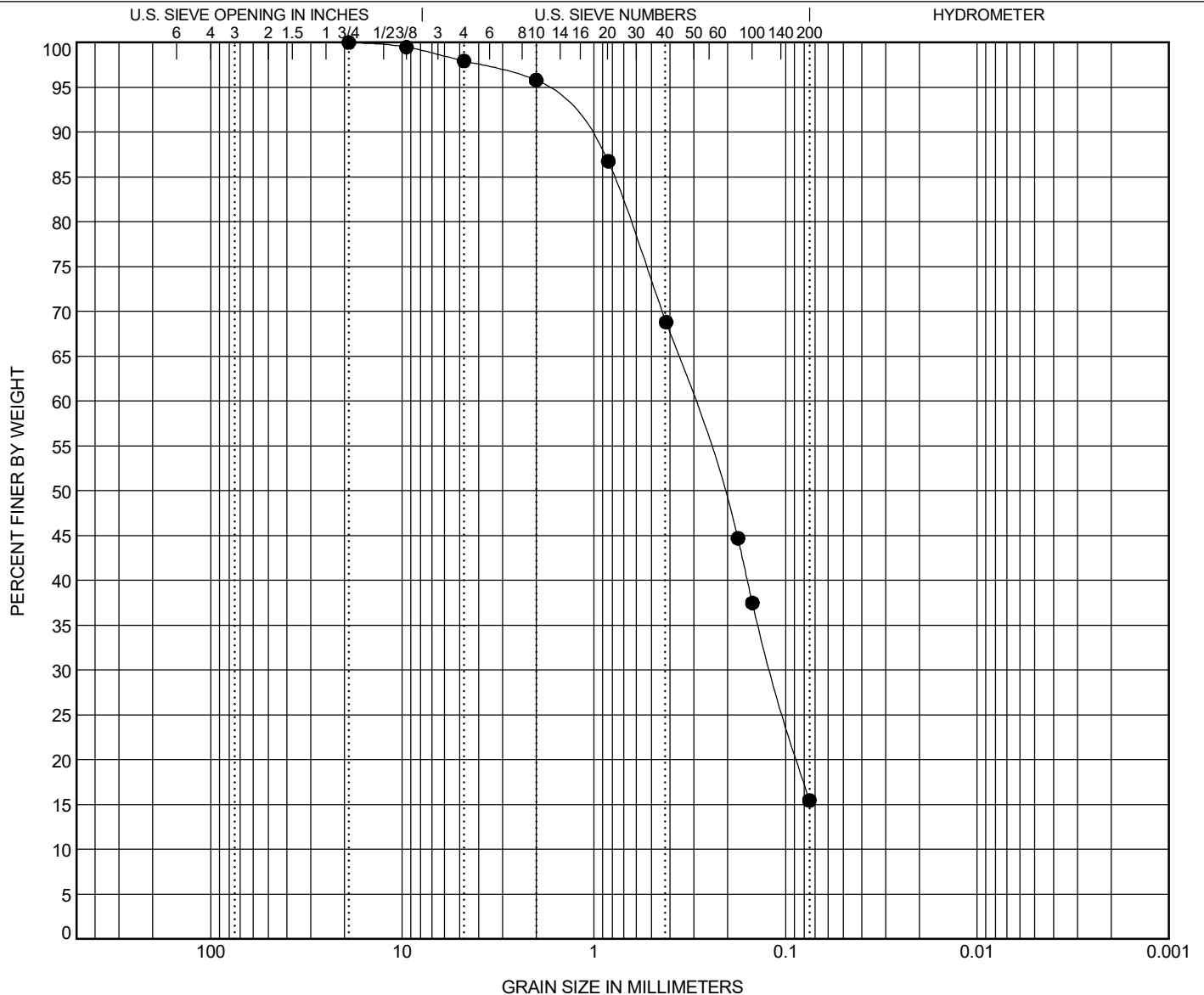


GRAIN SIZE DISTRIBUTION

PROJECT ID P044269

PROJECT NAME S-38-191 over Roberts Swamp

PROJECT COUNTY Orangeburg



F&ME CONSULTANTS, INC
211 Business Park Blvd.
Columbia, SC 29203

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	S-38-191 over Roberts Swamp	PROJECT NO.:	G7100.009 - Task 00030
SAMPLE NUMBER:	25-0002	DATE REQUESTED:	--
DESCRIPTION OF SOIL:	Silty SAND (SM/A-2-4)		
TESTED BY:	CJ	DATE OF TESTING:	1/6/2025
WEIGHED BY:	AAB	DATE OF WEIGHING:	1/7/2025

BORING NO.	BS-1				
SAMPLE NO.	--				
SAMPLE DEPTH (ft.)	0.0 - 3.0				
WATER CONTENT, W%	11.3				

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (ft.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (ft.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (ft.)					
WATER CONTENT, W%					

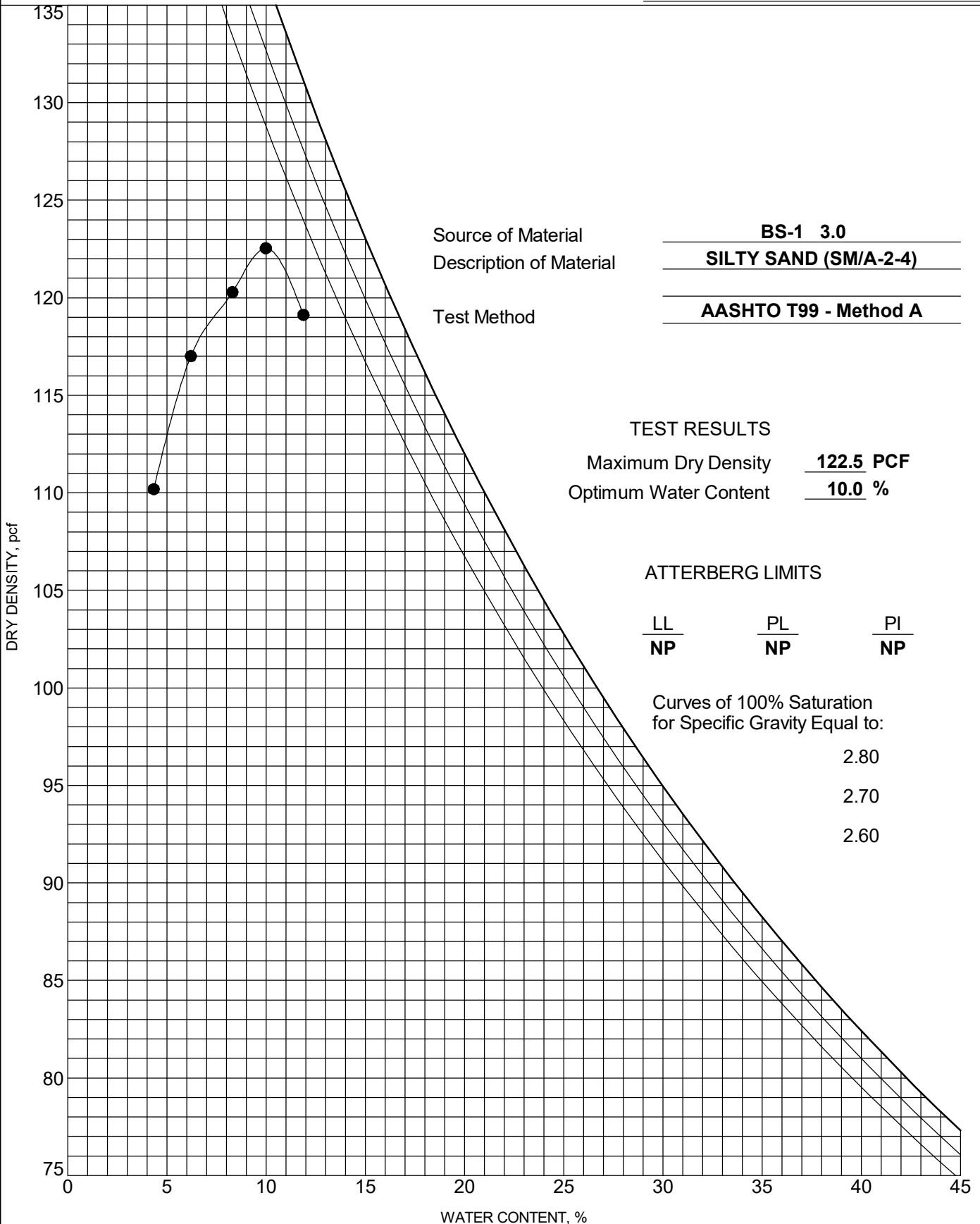


MOISTURE-DENSITY RELATIONSHIP

PROJECT ID P044269

PROJECT NAME S-38-191 over Roberts Swamp

PROJECT COUNTY Orangeburg



CALIFORNIA BEARING RATIO (CBR) AASHTO T193

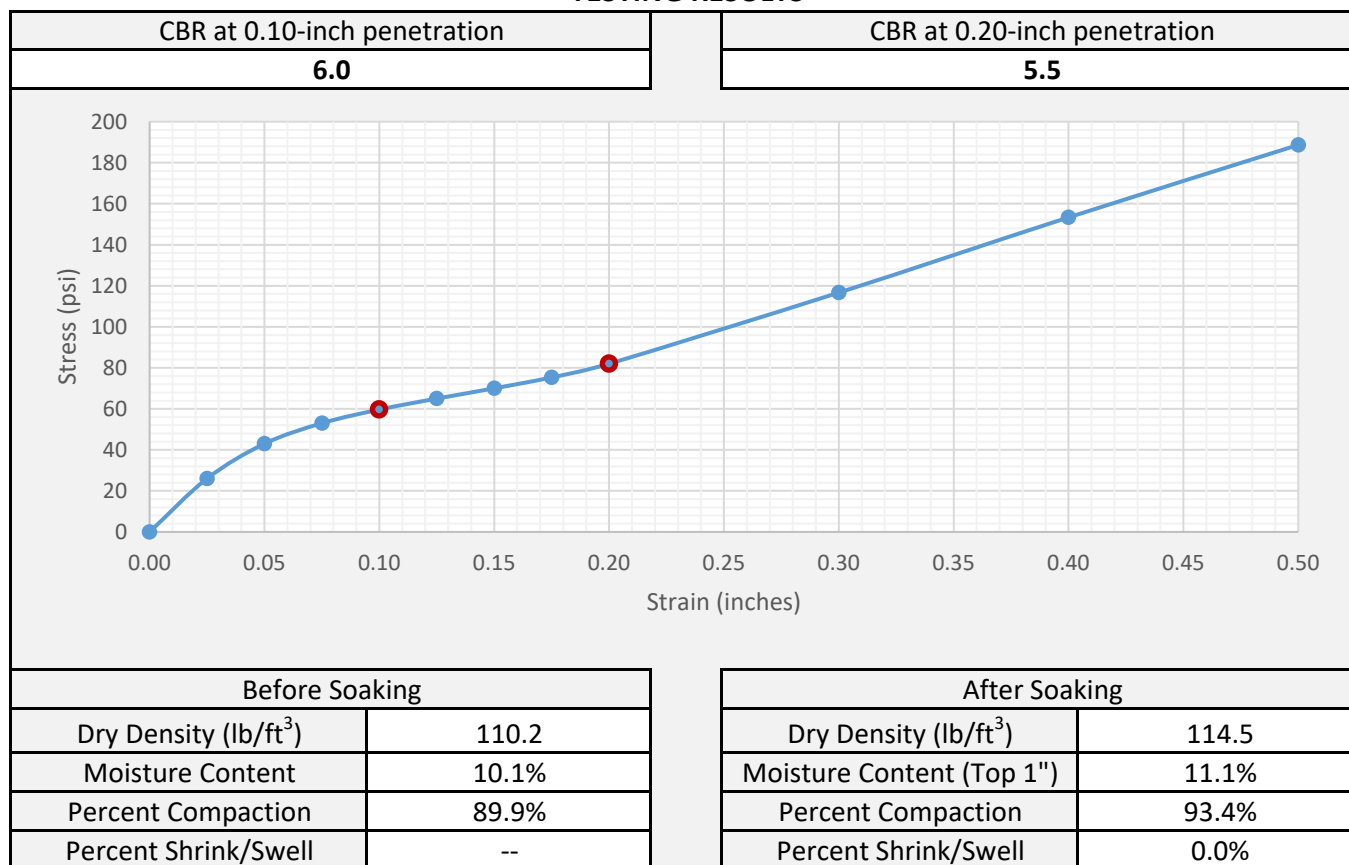
SAMPLE INFORMATION

Project Name	S-38-191 over Roberts Swamp			Project No.	G7100.009 - Task 00030
Sample Location	BS-1			FME Lab ID	25-0002
Soil Description	Silty SAND (SM/A-2-4)			Depth/Elev.	0.0 - 3.0
Date Sampled	--	Sampled By:	F&ME	Date Received	1/3/2025
Date Test Began	1/9/2025	Date Completed	1/13/25	Tested By	DH/LJ

MOLDING CHARACTERISTICS

Method	AASHTO T99 - Method A	% Retained on 3/4" Sieve	0%
Max Dry Density (lb/ft ³)	122.5	Optimum Moisture Content (%)	10.0
Soak Time (hr)	96	Surcharge Weight (lb)	10.0

TESTING RESULTS



ADDITIONAL COMMENTS

Target %Compaction = 90%

	F&ME Consultants, Inc. 211 Business Park Blvd., Columbia, South Carolina 29203		1/15/25
		Reviewed By	Date

CALIFORNIA BEARING RATIO (CBR) AASHTO T193

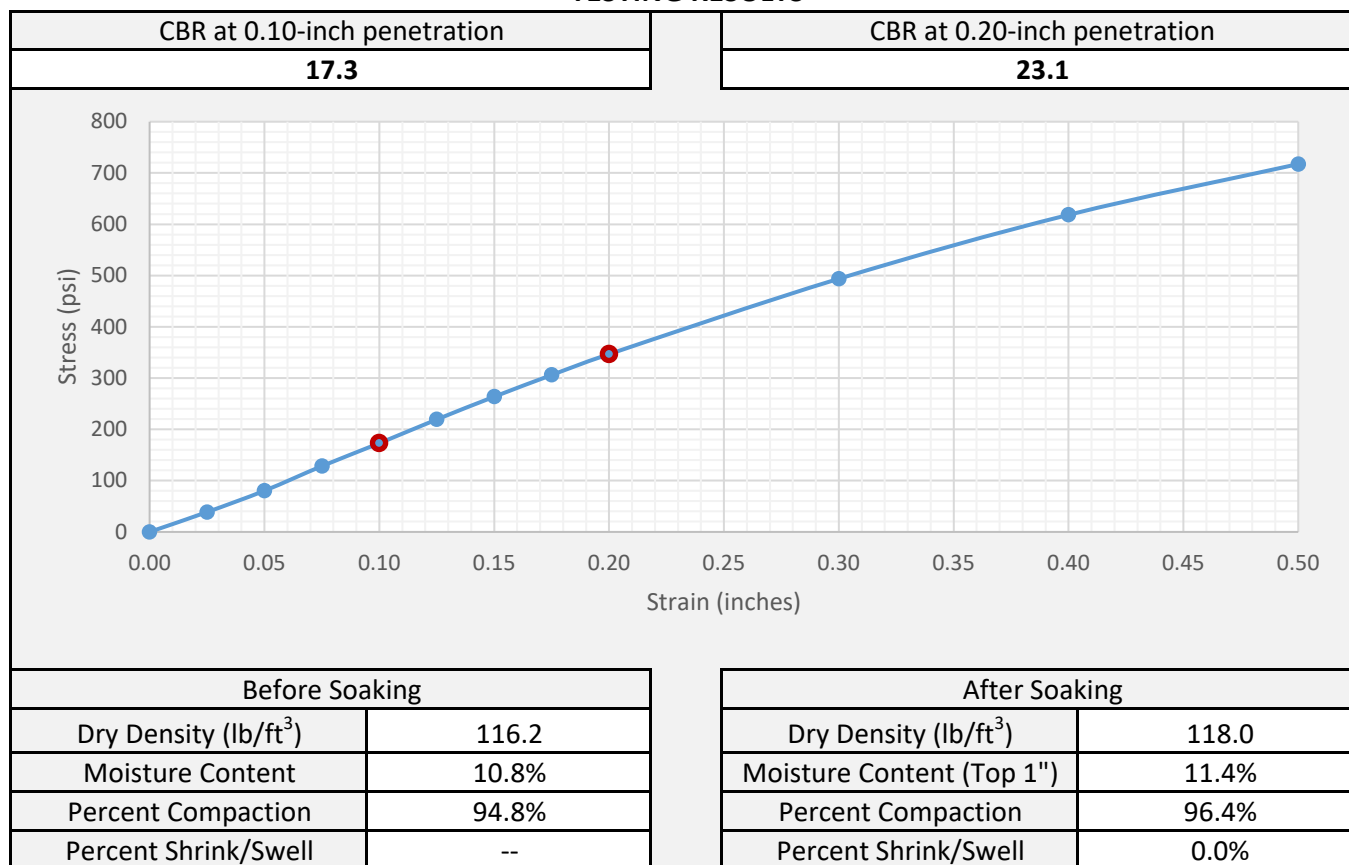
SAMPLE INFORMATION

Project Name	S-38-191 over Roberts Swamp			Project No.	G7100.009 - Task 00030
Sample Location	BS-1			FME Lab ID	25-0002
Soil Description	Silty SAND (SM/A-2-4)			Depth/Elev.	0.0 - 3.0
Date Sampled	--	Sampled By:	F&ME	Date Received	1/3/2025
Date Test Began	1/9/2025	Date Completed	1/13/25	Tested By	DH/LJ

MOLDING CHARACTERISTICS

Method	AASHTO T99 - Method A	% Retained on 3/4" Sieve	0%
Max Dry Density (lb/ft ³)	122.5	Optimum Moisture Content (%)	10.0
Soak Time (hr)	96	Surcharge Weight (lb)	10.0

TESTING RESULTS



ADDITIONAL COMMENTS

Target %Compaction = 95%

	F&ME Consultants, Inc. <small>211 Business Park Blvd., Columbia, South Carolina 29203</small>	 <hr/> Reviewed By	<hr/> 1/15/25 Date
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CALIFORNIA BEARING RATIO (CBR) AASHTO T193

SAMPLE INFORMATION

Project Name	S-38-191 over Roberts Swamp			Project No.	G7100.009 - Task 00030
Sample Location	BS-1			FME Lab ID	25-0002
Soil Description	Silty SAND (SM/A-2-4)			Depth/Elev.	0.0 - 3.0
Date Sampled	--	Sampled By:	F&ME	Date Received	1/3/2025
Date Test Began	1/9/2025	Date Completed	1/13/25	Tested By	DH/LJ

MOLDING CHARACTERISTICS



Method	AASHTO T99 - Method A	% Retained on 3/4" Sieve	0%
Max Dry Density (lb/ft ³)	122.5	Optimum Moisture Content (%)	10.0
Soak Time (hr)	96	Surcharge Weight (lb)	10.0

TESTING RESULTS

Corrected CBR at 0.10-inch penetration		CBR at 0.20-inch penetration																											
34.0		40.0																											
<table border="1"><caption>Stress-Strain Data Points (Estimated)</caption><thead><tr><th>Strain (inches)</th><th>Stress (psi)</th></tr></thead><tbody><tr><td>0.00</td><td>0</td></tr><tr><td>0.02</td><td>40</td></tr><tr><td>0.04</td><td>100</td></tr><tr><td>0.06</td><td>180</td></tr><tr><td>0.10</td><td>280</td></tr><tr><td>0.12</td><td>360</td></tr><tr><td>0.14</td><td>430</td></tr><tr><td>0.16</td><td>500</td></tr><tr><td>0.20</td><td>560</td></tr><tr><td>0.30</td><td>720</td></tr><tr><td>0.40</td><td>680</td></tr><tr><td>0.50</td><td>660</td></tr></tbody></table>				Strain (inches)	Stress (psi)	0.00	0	0.02	40	0.04	100	0.06	180	0.10	280	0.12	360	0.14	430	0.16	500	0.20	560	0.30	720	0.40	680	0.50	660
Strain (inches)	Stress (psi)																												
0.00	0																												
0.02	40																												
0.04	100																												
0.06	180																												
0.10	280																												
0.12	360																												
0.14	430																												
0.16	500																												
0.20	560																												
0.30	720																												
0.40	680																												
0.50	660																												
Before Soaking		After Soaking																											
Dry Density (lb/ft ³)	122.5	Dry Density (lb/ft ³)	123.7																										
Moisture Content	10.8%	Moisture Content (Top 1")	11.3%																										
Percent Compaction	100.0%	Percent Compaction	101.0%																										
Percent Shrink/Swell	--	Percent Shrink/Swell	0.0%																										

ADDITIONAL COMMENTS

Target %Compaction = 100%

	F&ME Consultants, Inc. <small>211 Business Park Blvd., Columbia, South Carolina 29203</small>		1/15/25
			Date

S-38-191 over Roberts Swamp

Geotechnical Subsurface Data Report

APPENDIX

SECTION 4 LABORATORY TEST RESULTS

SECTION 4C CORROSION SERIES TESTING

CORROSION SERIES SUMMARY

PAGE 1 OF 1



PROJECT ID P0344269

PROJECT NAME S-38-191 over Roberts Swamp

PROJECT COUNTY Orangeburg

Borehole	Sample No.	Sample Depth (ft.)	pH of Soil in Distilled Water	Electrical Resistivity (Ω -cm)	Chloride Content (mg/kg (ppm))	Sulfate Content (mg/kg (ppm))
B-1	SS-2/SS-3	2.0 – 6.0	5.4	72,360	5.0	48.3
B-2	SS-2/SS-3	2.0 – 6.0	5.1	41,339	7.3	44.8

**pH DETERMINATION
(AASHTO T289)**

Project Name:	S-38-191 over Roberts Swamp	SCDOT Project Number:	P044269
FME Project Number:	G7100.009 - Task 00030	FME Lab ID:	25-0154
Description of Sample:	Various	Date Received	1/17/2025
Tested By:	LJ	Date Tested:	1/22/2025

Boring ID	B-1
Sample ID.	SS-2/SS-3
Sample Depth (ft.)	2.0 - 6.0
pH Value	5.39
Temperature (°C)	17.8

Date Reviewed: 1/22/2025Reviewed By: A. Abernethy

**SOIL RESISTIVITY
(AASHTO T288)**

Project Name:	S-38-191 over Roberts Swamp	Project ID:	G7100.009 - Task 00030
Location:	--	FME Lab ID No.:	25-0154
Sampled By:	G. Cantele	Date Sampled:	--
Soil Description:	Composite	Date Received:	1/17/2025
Tested By:	J. Marken	Date Tested:	2/11/2025

Boring No.	Sample Depth (ft.)	Minimum Soil Resistivity, Ω -cm
B-1	2.0 - 6.0	72,360

Date Reviewed: 2/11/2025 Reviewed By: J. Hiers

CHLORIDE ION CONTENT IN SOILS

AASHTO T 291 - 94 (2018) (Method B)

Client: F&ME Consultants, Inc.
 Client Reference: Robert's Swamp G7100.009
 Project No.: 2025-054-001
 Lab ID: 2025-054-001-001

Boring No.: B-1
 Depth (ft): 2.0-6.0'
 Sample No.: SS-2/SS-3
 Description: Brown

(- # 10 Sieve material)

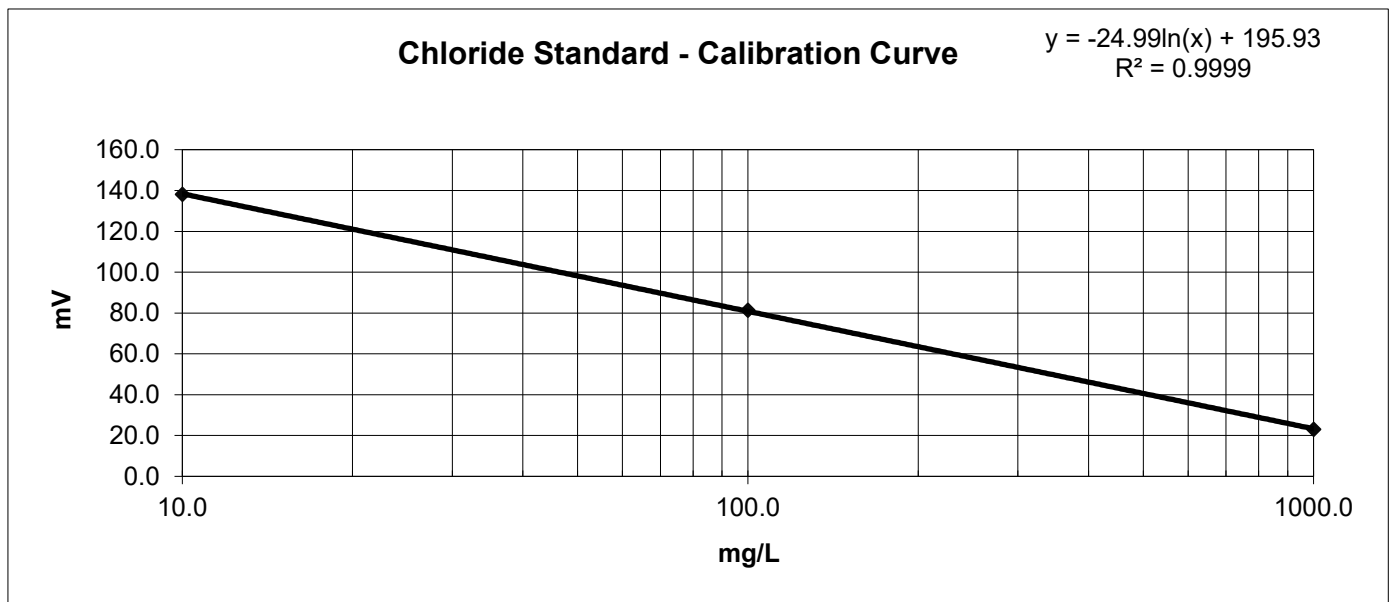
CHLORIDE STANDARD: CALIBRATION CURVE

STANDARD	MILLIVOLTS (mV)
10.0 mg/L	138.1
100.0 mg/L	81.4
1000.0 mg/L	23.0

MEASUREMENT OF CHLORIDES

Sample Weight (g):	100.0	CONCENTRATION	CONCENTRATION
Water added to Sample (ml):	100.0	(mg/L)	(mg/kg)
Size of Sample Aliquot (ml):	25.0		
Sample Reading (mV):	155.9	4.96	4.96

Notes: 1) Samples and standards were buffered by the addition of an equal volume of the 0.2 M KNO₃ solution (1:1 volume).
 2) Samples were dried for a minimum of 12 hours at 110 °/ 5°C.



Notes:

Tested By JAM Date 1/31/25 Checked By EG Date 2/3/25

Water-Soluble Sulfate Ion Content in Soil

AASHTO T 290-95 (2020)

Client: F&ME Consultants, Inc.
 Client Reference: Robert's Swamp G7100.009
 Project No.: 2025-054-001
 Lab ID: 2025-054-001-001

Boring No.: B-1
 Depth (ft): 2.0-6.0'
 Sample No.: SS-2/SS-3
 Soil Description: Brown

Sulfate Standard - Calibration Curve Spectrophotometer Readings

<u>Sulfate Ion Concentrations (mg/L)</u>								
0.0	4.0	10.0	20.0	30.0	40.0	60.0	80.0	100.0
<u>Spectrophotometer Readings (FAU)</u>								
Underrange	Underrange	7	20	42	63	112	163	243

Measurement of Barium Chloride Turbidity

(Sample contains 5.0 mL NaCl solution and 0.3 g BaCl₂·2H₂O)

Sample Weight (g): 100.0
 Water added to Sample (mL): 300.0
 Size of Sample Aliquot (mL): 50.0
 Sample Reading (FAU): 9

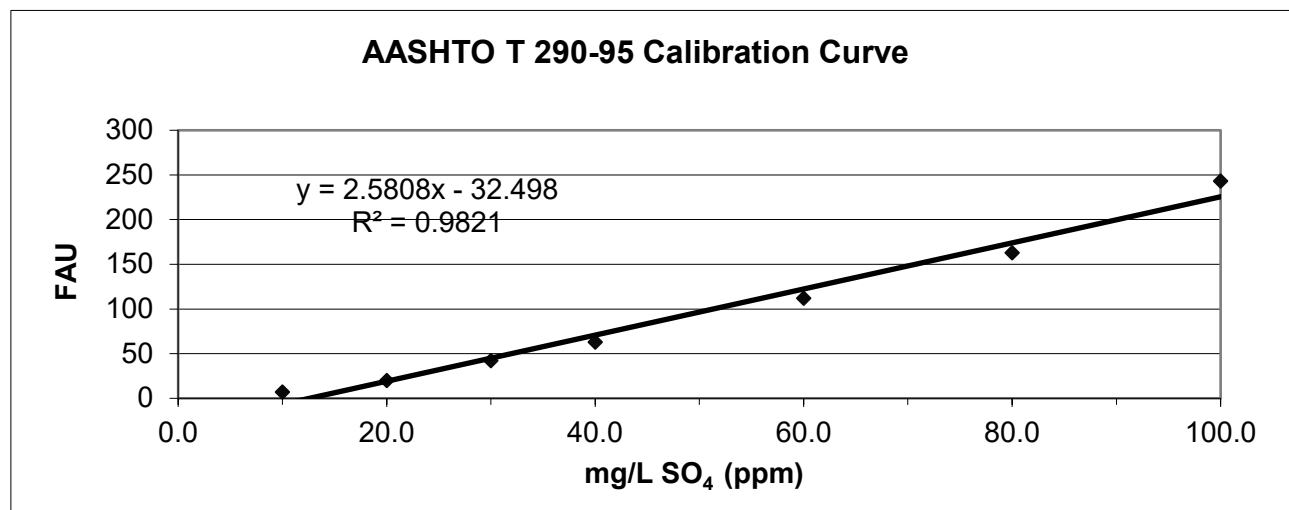
Sample Diluted: No

Sulfate Solution Added (ml): 0

Sample Moisture Content

Tare Number: 411
 Weight of Tare & Wet Sample (g): 241.17
 Weight of Tare & Dry Sample (g): 241.09
 Weight of Tare (g): 98.85
 Weight of Water (g): 0.08
 Weight of Dry Sample (g): 142.24
 Moisture Content (%): 0.06

Sample Sulfate Ion Concentration:	16.08	mg/L SO ₄ (ppm)
Sample Sulfate Ion Content:	48.2	mg/Kg SO ₄ (not corrected for moisture)
Sample Sulfate Ion Content:	48.3	mg/Kg SO ₄ (corrected for moisture)



Tested by: JAM Date: 1/31/25 Checked by: EG Date: 2/3/2025

**pH DETERMINATION
(AASHTO T289)**

Project Name:	S-38-191 over Roberts Swamp	SCDOT Project Number:	P044269
FME Project Number:	G7100.009 - Task 00030	FME Lab ID:	25-0155
Description of Sample:	Various	Date Received	1/17/2025
Tested By:	L. Johnson	Date Tested:	1/22/2025

Boring ID	B-2
Sample ID.	SS-2/SS-3
Sample Depth (ft.)	2.0 - 6.0
pH Value	5.11
Temperature (°C)	17.9

Date Reviewed: 1/22/2025Reviewed By: A. Abernethy

**SOIL RESISTIVITY
(AASHTO T288)**

Project Name:	S-38-191 over Roberts Swamp	Project ID:	G7100.009 - Task 00030
Location:	--	FME Lab ID No.:	25-0155
Sampled By:	G. Cantele	Date Sampled:	--
Soil Description:	Composite	Date Received:	1/17/2025
Tested By:	J. Marken	Date Tested:	1/28/2025

Boring No.	Sample Depth (ft.)	Minimum Soil Resistivity, Ω -cm
B-2	2.0 - 6.0	41,339 Ω -cm

Date Reviewed: 1/28/2025 Reviewed By: J. Hiers

CHLORIDE ION CONTENT IN SOILS

AASHTO T 291 - 94 (2018) (Method B)

Client: F&ME Consultants, Inc.
 Client Reference: Robert's Swamp G7100.009
 Project No.: 2025-054-001
 Lab ID: 2025-054-001-002

Boring No.: B-2
 Depth (ft): 2.0-6.0'
 Sample No.: SS-2/SS-3
 Description: Brown

(- # 10 Sieve material)

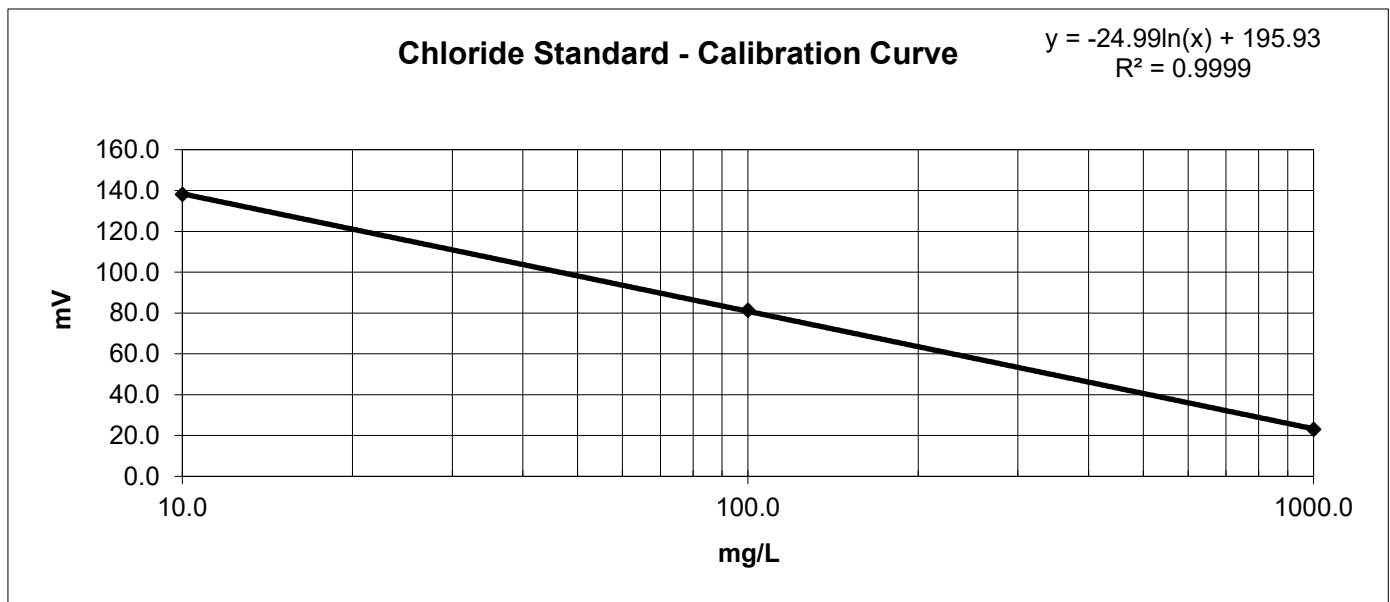
CHLORIDE STANDARD: CALIBRATION CURVE

STANDARD	MILLIVOLTS (mV)
10.0 mg/L	138.1
100.0 mg/L	81.4
1000.0 mg/L	23.0

MEASUREMENT OF CHLORIDES

Sample Weight (g):	100.0	CONCENTRATION	CONCENTRATION
Water added to Sample (ml):	100.0	(mg/L)	(mg/kg)
Size of Sample Aliquot (ml):	25.0		
Sample Reading (mV):	146.1	7.34	7.34

Notes: 1) Samples and standards were buffered by the addition of an equal volume of the 0.2 M KNO₃ solution (1:1 volume).
 2) Samples were dried for a minimum of 12 hours at 110 ± 5°C.



Notes:

Tested By JAM Date 1/31/25 Checked By EG Date 2/3/25

Water-Soluble Sulfate Ion Content in Soil

AASHTO T 290-95 (2020)

Client: F&ME Consultants, Inc.
 Client Reference: Robert's Swamp G7100.009
 Project No.: 2025-054-001
 Lab ID: 2025-054-001-002

Boring No.: B-2
 Depth (ft): 2.0-6.0'
 Sample No.: SS-2/SS-3
 Soil Description: Brown

Sulfate Standard - Calibration Curve Spectrophotometer Readings

<u>Sulfate Ion Concentrations (mg/L)</u>								
0.0	4.0	10.0	20.0	30.0	40.0	60.0	80.0	100.0
<u>Spectrophotometer Readings (FAU)</u>								
Underrange	Underrange	7	20	42	63	112	163	243

Measurement of Barium Chloride Turbidity

(Sample contains 5.0 mL NaCl solution and 0.3 g BaCl₂·2H₂O)

Sample Weight (g): 100.0
 Water added to Sample (mL): 300.0
 Size of Sample Aliquot (mL): 50.0
 Sample Reading (FAU): 6

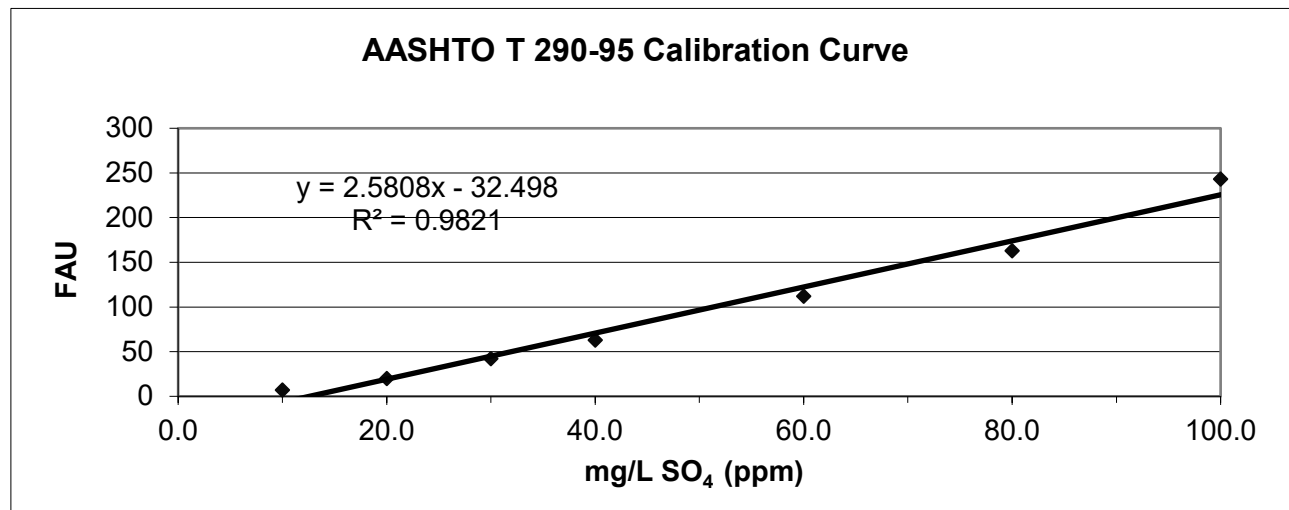
Sample Diluted: No

Sulfate Solution Added (ml): 0

Sample Moisture Content

Tare Number: 483
 Weight of Tare & Wet Sample (g): 229.07
 Weight of Tare & Dry Sample (g): 228.79
 Weight of Tare (g): 97.29
 Weight of Water (g): 0.28
 Weight of Dry Sample (g): 131.50
 Moisture Content (%): 0.21

Sample Sulfate Ion Concentration:	14.92	mg/L SO ₄ (ppm)
Sample Sulfate Ion Content:	44.8	mg/Kg SO ₄ (not corrected for moisture)
Sample Sulfate Ion Content:	44.8	mg/Kg SO ₄ (corrected for moisture)



Tested by: JAM Date: 1/31/25 Checked by: EG Date: 2/3/2025

S-38-191 over Roberts Swamp

Geotechnical Subsurface Data Report

APPENDIX

SECTION 5

ON-SITE DRILL RIG PHOTOS

On-Site Drill Rig Photographs



B-1



B-2



P-1



P-2

On-Site Drill Rig Photographs



P-3



P-4



P-5



P-6

S-38-191 over Roberts Swamp

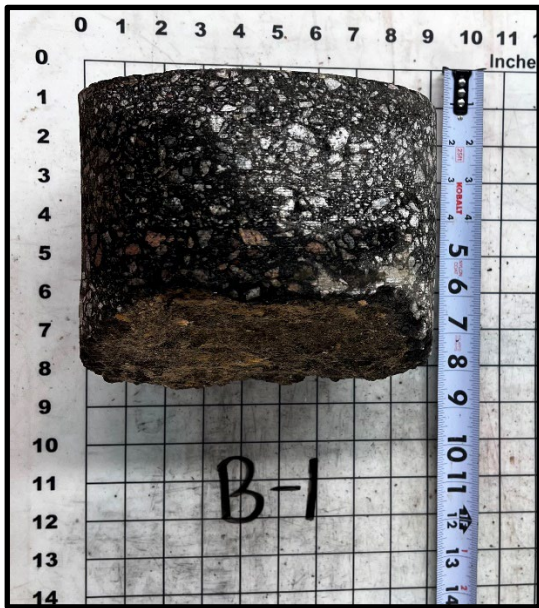
Geotechnical Subsurface Data Report

APPENDIX

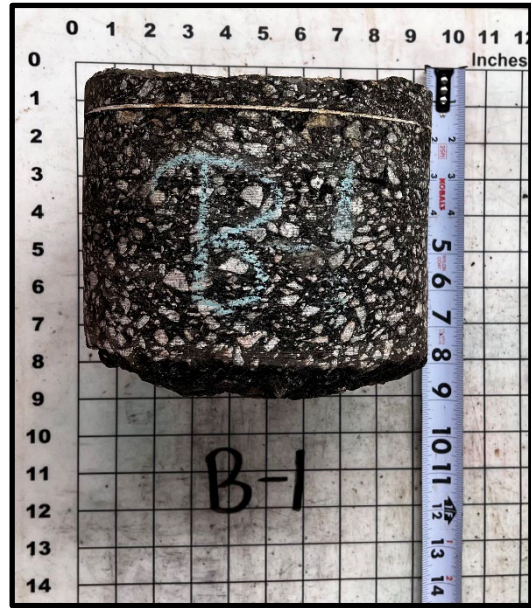
SECTION 6

PAVEMENT CORE PHOTOS

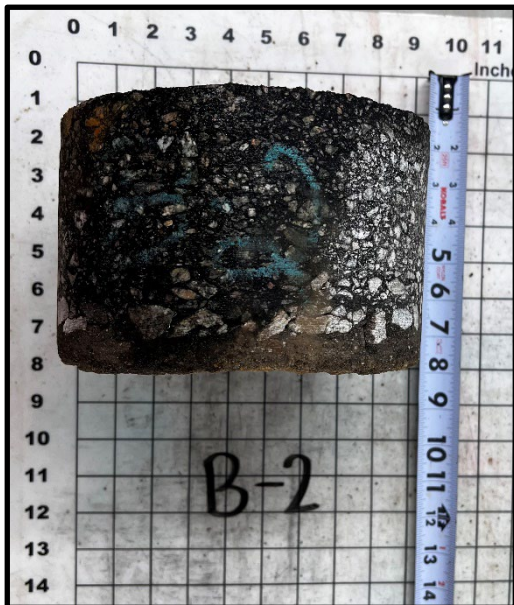
Pavement Core Photos



B-1 (Side 1)



B-1 (Side 2)

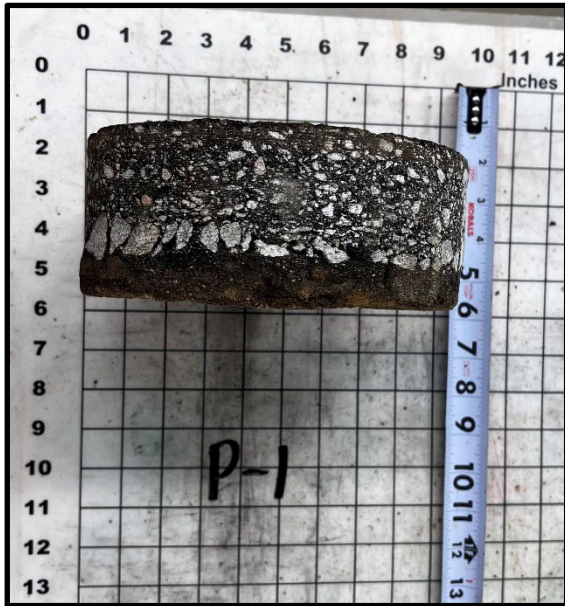


B-2 (Side 1)



B-2 (Side 2)

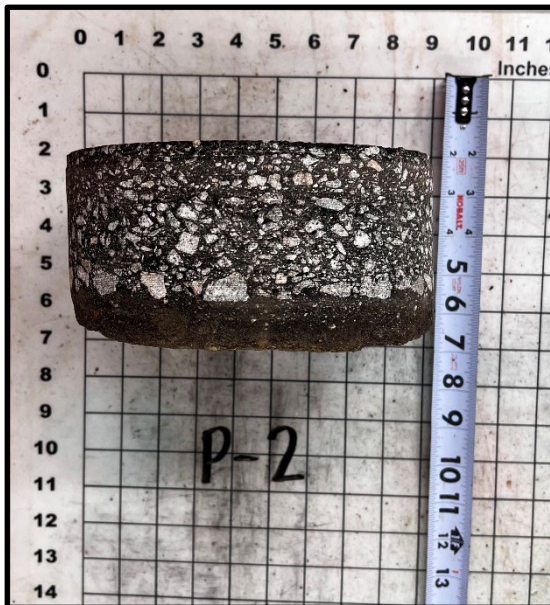
Pavement Core Photos



P-1 (Side 1)



P-1 (Side 2)

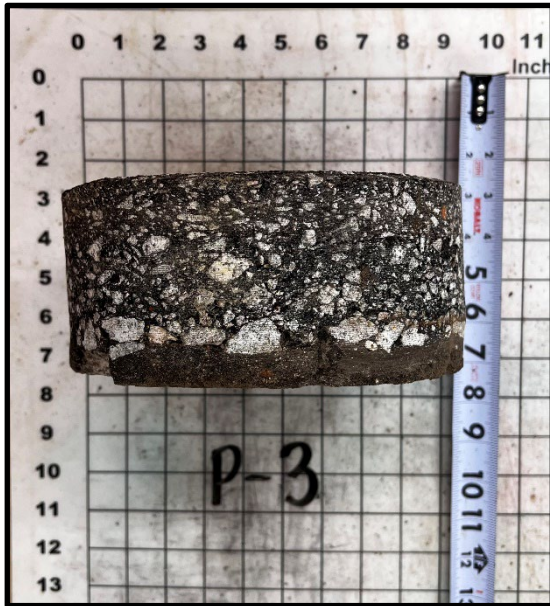


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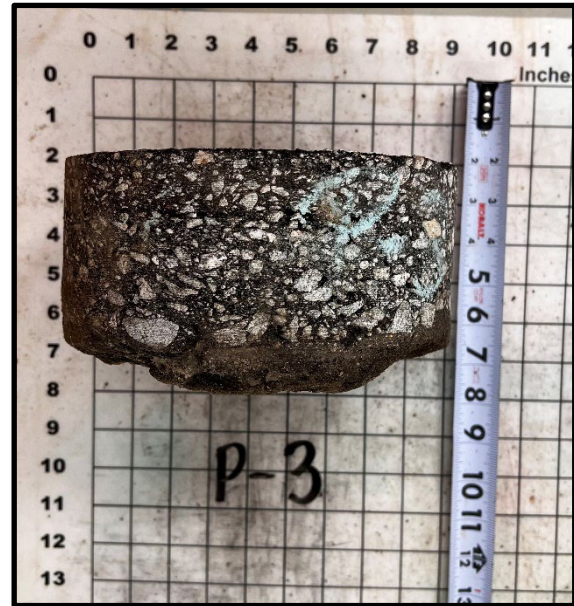


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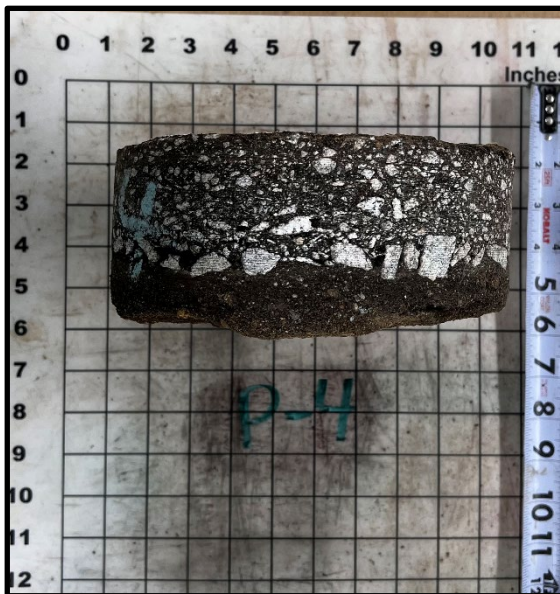
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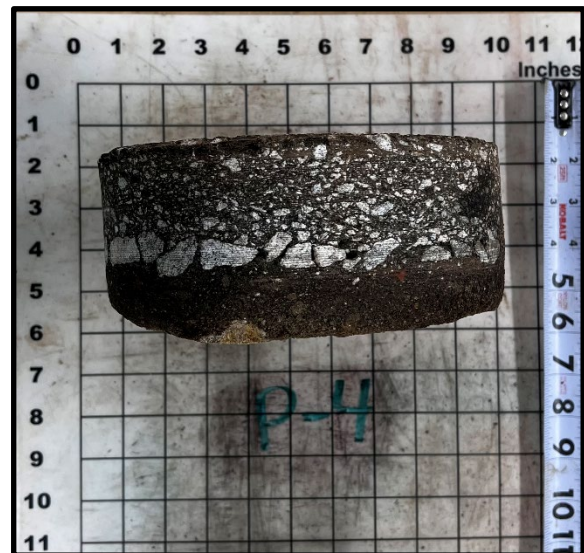
P-3 (Side 1)



P-3 (Side 2)

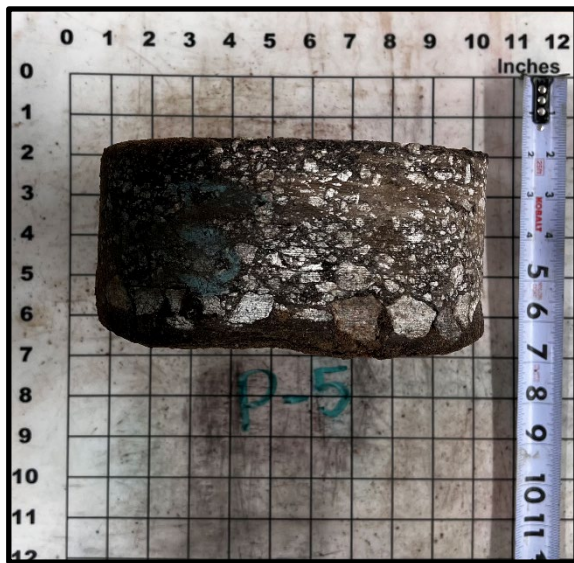


P-4 (Side 1)



P-4 (Side 2)

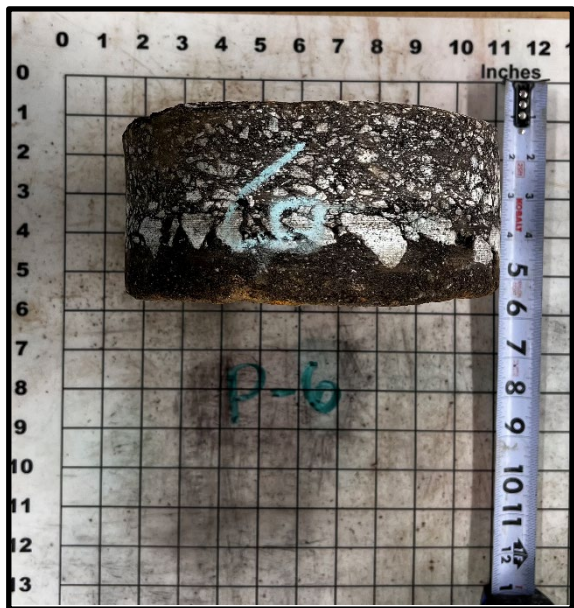
Pavement Core Photos



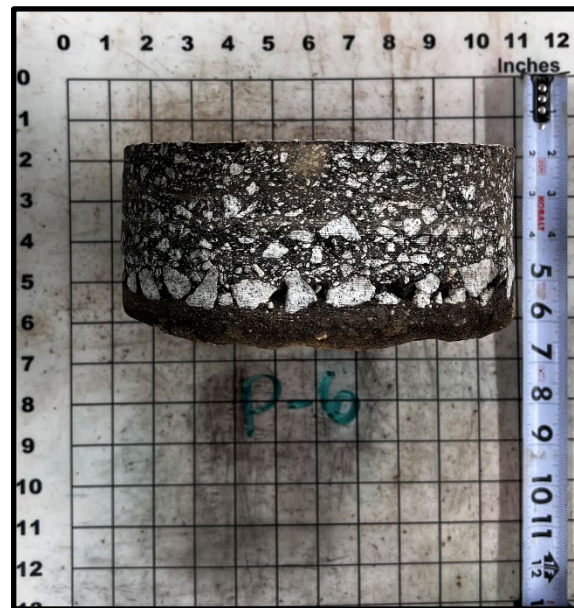
P-5 (Side 1)



P-5 (Side 2)



P-6 (Side 1)



P-6 (Side 2)

S-38-191 over Roberts Swamp

Geotechnical Subsurface Data Report

APPENDIX

SECTION 7

SPT HAMMER CALIBRATION

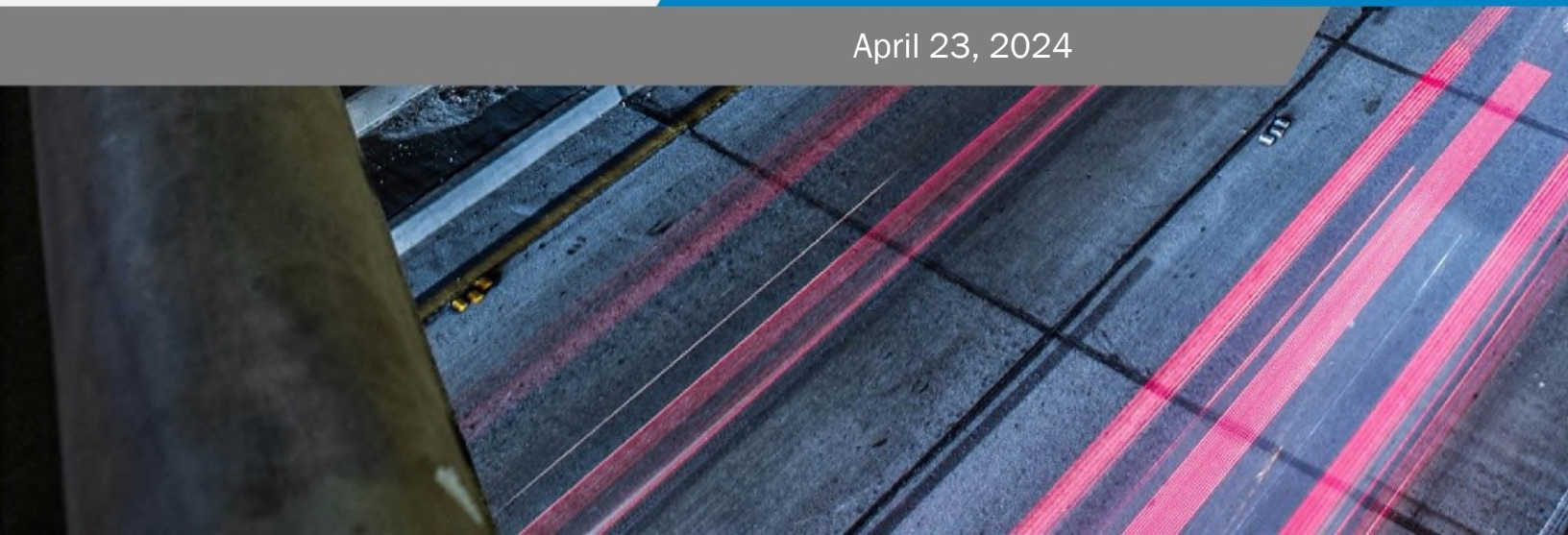


CAROLINAS
GEOTECHNICAL
GROUP

Report of SPT Hammer Energy

Prepared for:
Breccia Construction, LLC
620-B Industrial Way
Chester, South Carolina 29706

April 23, 2024





2400 Crownpoint Executive Drive
Suite 800
Charlotte, NC 28227



(980) 339-8684



contact@carolinasgeotech.com



www.carolinasgeotech.com

April 23, 2024

Mr. Adam J. Shannon
Breccia Construction, LLC
620-B Industrial Way
Chester, South Carolina 29706

SUBJECT: **Report of SPT Hammer Energy**
Breccia Construction, LLC CME 550X ATV Rig (SN 294593)
Chester, South Carolina
CG2 Project No.: 240021095

Dear Mr. Shannon:

Carolinas Geotechnical Group, PLLC (CG2) has completed the Standard Penetration Test (SPT) energy measurements on the automatic hammer mounted on a Breccia Construction, LLC (Breccia) CME 550X ATV-mounted drill rig with a serial number of 294593, see attached Drill Rig Photo Log. This service was performed by Mr. Robert E. Kral, PE on April 12, 2024. SPT energy testing was performed in general accordance with ASTM D4633 and the most recent revision of the North Carolina Department of Transportation (NCDOT), Geotechnical Engineering Unit's requirements. The testing procedures, equipment used during testing, and detailed results are presented in this report.

CG2 recommends Breccia submit this Report of SPT Hammer Energy to the NCDOT Geotechnical Engineering Unit at SPT_Hammer_Energy_Submittal@ncdot.gov for review and approval no later than May 10, 2024.

DYNAMIC TESTING METHODOLOGY

Testing was performed using a model SPT (Serial No. 4553 TB) Pile Driving Analyzer™ (PDA) manufactured by Pile Dynamics, Inc. The PDA was used to record and interpret data from two piezoresistive accelerometers (Serial Nos. K10959 and K10960) bolted to a 2-foot long AWJ drill rod (SN 728AWJ) internally instrumented with two strain transducers. The instrumented AWJ drill rod has a cross-sectional area of 1.13 square inches, an outside diameter of approximately 1.75 inches, and an inside diameter of 1.25 inches at the gauge location. The accelerometers and strain gauges, which are mounted on opposing axis near the middle of the instrumented rod, monitor acceleration and strain for each hammer blow. The analyzer converts the data to velocities and forces and computes the maximum transferred hammer energies with the "EFV" method described in ASTM D4633. Preliminary results are recorded and displayed in real-time for each blow. Calibration sheets for the PDA, accelerometers, and the instrumented rod are included in Appendix III.

Report of SPT Hammer Energy

Chester, South Carolina

CG2 Project No.: 240021095

TESTING AND OBSERVATIONS

CG2 personnel was on site April 12, 2024 to observe and perform high-strain dynamic testing during SPT sampling on the CME 550X ATV-mounted drill rig operated by L. Guempel of Breccia. The measurements were taken during drilling operations at 1817 Lowrys Highway in Chester, South Carolina (Chester County). The approximate coordinates (not professionally surveyed) for the test location are 34.7704428, -81.2454626. No Soil Test Boring Log was maintained. SPT energy measurements were recorded during three intervals at depths of approximately 28½, 33½, and 38½, feet below the existing ground surface. The information presented in the table below summarizes the equipment tested and tooling used during the SPT energy measurements.

Table 1: SPT Field Data

Drill Rig Information	
Manufacturer	CME
Model	550X
Serial Number	294593
Operator	L. Guempel
Carrier	ATV
Hammer Information	
Model / Type	CME / Auto
Serial Number	N/A
Anvil Height (inches)	11.5
Anvil Diameter (inches)	2.5
Drop Height (inches)	30
Ram Weight (pounds)	140
Ram Serial Number	N/A
Drilling and Instrumented Rod Information	
Drill Rod Type	AWJ
OD (inches)	1.75
ID (inches)	1.25
Cross-Sectional Area (in ²)	1.13
Typical Lengths (feet)	5
Instrumented Rod Type	AWJ (SN 728)
OD (inches)	1.75
ID (inches)	1.25
Cross-Sectional Area (in ²)	1.13
Total Instrumented Rod Length (feet)	2.00
Length Below Gages (feet)	0.70
Split-Spoon Length (feet)	2.85

Report of SPT Hammer Energy

Chester, South Carolina

CG2 Project No.: 240021095

DYNAMIC TESTING RESULTS

The total rod length from the instrumentation to the tip of the split-spoon sampler was determined by adding 3.6 feet to the required drill rod length at each sample depth. Based on the test data, the automatic hammer on the CME 550X ATV-mounted drill rig operated at a rate of about 52.3 to 59.6 blows per minute (BPM) during dynamic testing. The measured transferred hammer energy (EFV) ranged from 285.7 to 331.4 foot-pounds, which corresponds to Energy Transfer Ratio (ETR) values of 81.6 to 94.7%, respectively. These data ranges are based on the overall minimum and maximum values for the last 12 inches of each sample interval.

The SPT Energy Measurement Data Summary tables in Appendix I present the test data from every hammer blow at each sampling interval along with representative force and velocity traces for each test interval. The reported blow counts, obtained by the drill rig personnel, a summary of the test data, and average computed BPM, EFV, and ETR values are provided in Table 2. The BPM, EFV, and ETR values presented in Table 2 were computed by averaging data from the last 12 inches of each sample interval. Plots and tables of the following are also included in Appendix I and present the test data with depth for each test interval:

- Penetration vs. BLC
- Penetration vs. CSX
- Average ETR vs. Rod Length
- Penetration vs. FMX
- Penetration vs. VMX
- ETR vs. Rod Length
- Penetration vs. EFV
- Penetration vs. ETR

Table 2: Summary of Dynamic Testing Results

Data Set ID	Sample Depth (ft)	Drill Rod Length (ft)	Instrumentation to Sampler Tip Length (ft)	Blows per 6" Increment / N-value	Soil Sample Description (Piedmont Residual)	Avg. BPM	Avg. EFV (ft-lbs)	Avg. ETR (%)
1	28½ - 30	30	33.6	3-6-9 / 15	SA SILT	59.2	318.5	91.0
2	33½ - 35	35	38.6	2-4-6 / 10	SA SILT	54.9	300.5	85.9
3	38½ - 40	40	43.6	3-5-9 / 14	SA SILT	56.1	319.7	91.3
Overall Average						57.0	314.3	89.8

The average hammer rate, transferred energy, and transfer ratio were calculated for each depth interval. Per ASTM D4633, only the blows from the final foot of each sample interval (i.e., the blows that determine the N-value) were included when computing the average values shown in Table 2. The overall average transferred hammer energy for the automatic hammer on the CME 550X ATV-mounted drill rig (for the depth intervals presented in Table 2) was 314.3 foot-pounds, with an average ETR of 89.8%.

Report of SPT Hammer Energy

Chester, South Carolina

CG2 Project No.: 240021095

LIMITATIONS OF REPORT


This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The information contained in this report were based on the applicable standards of our profession in this geographic area at the time this report was prepared. No other warranty, express or implied, is made.

CLOSING

CG2 is pleased to have the opportunity to provide these services to you. If you have questions concerning the content of this report, or if CG2 can be of further service, please contact CG2 at (980) 339-8684.

Sincerely,
Carolinas Geotechnical Group, PLLC

DocuSigned by:


F926DBFBA80F4FE...
Pressley M. Perry, EIT
Staff Professional

DocuSigned by:


8AD703B2A8484F4...
Robert E. Kral, PE
Geotechnical Design Manager
NC Registration No. 042642



Appendices:

- Appendix I - CME 550X ATV Rig (SN 294593) SPT Energy Measurements Summary Plots and Tables
- Appendix II - SPT Hammer Energy Field Form (Field Log) and Drill Rig Photo Log
- Appendix III - Instrumented Rod and Accelerometer Calibration Sheets
- Appendix IV - Certificate of Proficiency



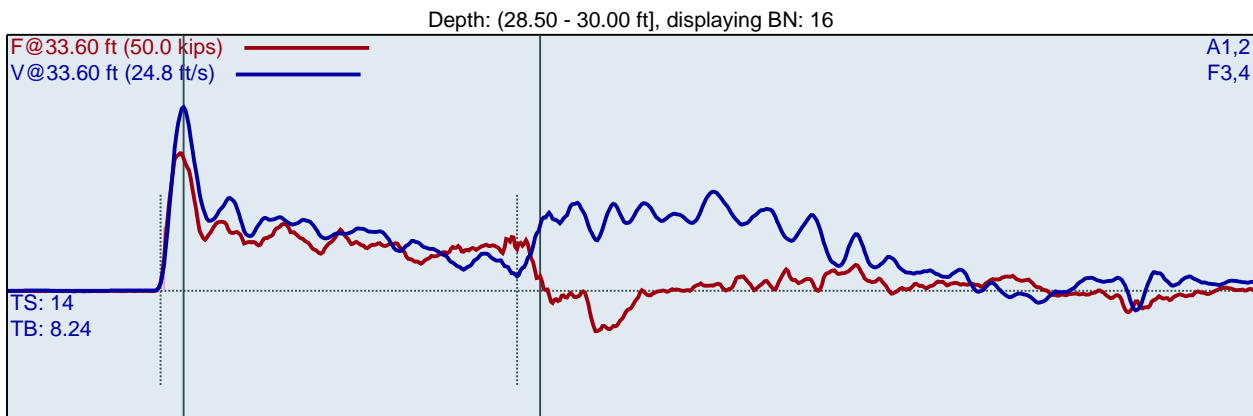
APPENDIX I

CME 550X (SN 294593)
REK
B-1

B-1
Interval start: 4/12/2024

AR: 1.13 in²
LE: 33.60 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft³
EM: 30000 ksi



F3 : [728AWJ1] 224.649 PDICAL (1) FF1
F4 : [728AWJ2] 224.139 PDICAL (1) FF1

A1 (PR): [K10959] 413.827 mv/6.4v/5000g (1) VF1
A2 (PR): [K10960] 419.894 mv/6.4v/5000g (1) VF1

BPM: Blows/Minute

FMX: Maximum Force

VMX: Maximum Velocity

DMX: Maximum Displacement

CSX: Compression Stress Maximum

DFN: Final Displacement

EFV: Maximum Energy

ETR: Energy Transfer Ratio - Rated

LP	BL#	BC	BPM	FMX	VMX	DMX	CSX	DFN	EFV	ETR
ft		/6"	bpm	kips	ft/s	in	ksi	in	ft-lb	%
28.67	1	3	61.3	28.2	17.7	2.0	25.0	2.0	296.2	84.6
28.83	2	3	56.1	28.3	18.4	2.0	25.1	2.0	314.9	90.0
29.00	3	3	56.9	28.5	18.4	2.0	25.2	2.0	317.3	90.7
29.08	4	6	58.7	28.7	18.6	1.2	25.4	1.0	310.7	88.8
29.17	5	6	59.0	28.7	18.5	1.2	25.4	1.0	320.5	91.6
29.25	6	6	58.8	28.8	18.7	1.2	25.5	1.0	328.6	93.9
29.33	7	6	59.1	29.1	18.4	1.1	25.7	1.0	311.1	88.9
29.42	8	6	58.9	29.0	18.3	1.1	25.7	1.0	310.6	88.8
29.50	9	6	59.4	29.1	18.3	1.0	25.8	1.0	318.2	90.9
29.56	10	9	59.2	28.8	18.3	0.9	25.4	0.7	318.6	91.0
29.61	11	9	59.1	28.1	17.9	0.8	24.9	0.7	315.6	90.2
29.67	12	9	59.5	28.1	18.1	0.9	24.9	0.7	318.1	90.9
29.72	13	9	59.0	28.2	18.0	0.8	24.9	0.7	314.6	89.9
29.78	14	9	59.4	27.9	18.0	0.9	24.7	0.7	331.4	94.7
29.83	15	9	59.2	27.7	18.3	0.8	24.5	0.7	325.5	93.0
29.89	16	9	59.6	26.9	17.8	0.8	23.8	0.7	318.9	91.1
29.94	17	9	59.0	27.0	17.9	0.7	23.9	0.7	322.3	92.1
30.00	18	9	59.5	27.2	17.8	0.7	24.1	0.7	312.8	89.4
Average			59.2	28.2	18.2	0.9	25.0	0.8	318.5	91.0
Std Dev			0.3	0.7	0.3	0.2	0.6	0.2	6.2	1.8
Maximum			59.6	29.1	18.7	1.2	25.8	1.0	331.4	94.7
Minimum			58.7	26.9	17.8	0.7	23.8	0.7	310.6	88.8

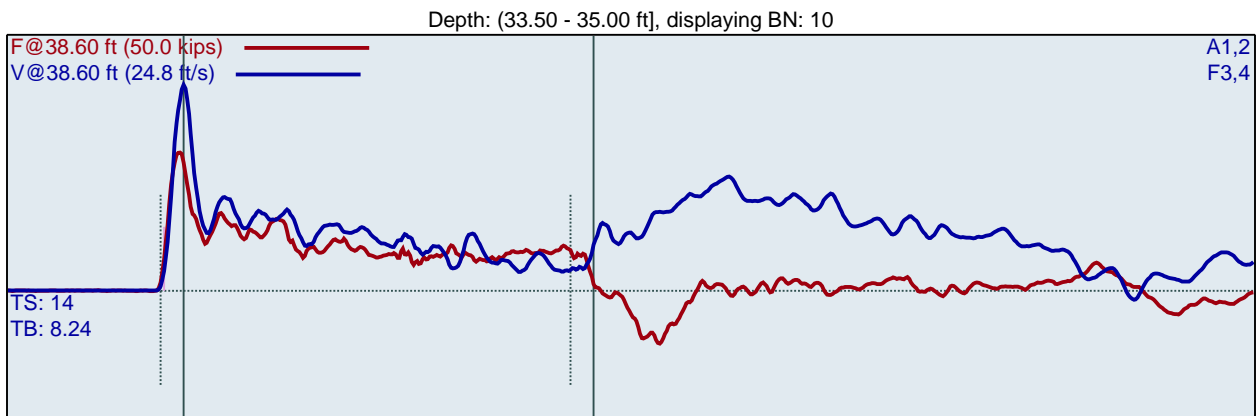
N-value: 15

Sample Interval Time: 17.36 seconds.

CME 550X (SN 294593)
REK
B-1

B-1
Interval start: 4/12/2024

AR: 1.13 in² SP: 0.492 k/ft³
LE: 38.60 ft EM: 30000 ksi
WS: 16807.9 ft/s



F3 : [728AWJ1] 224.649 PDICAL (1) FF1
F4 : [728AWJ2] 224.139 PDICAL (1) FF1

A1 (PR): [K10959] 413.827 mv/6.4v/5000g (1) VF1
A2 (PR): [K10960] 419.894 mv/6.4v/5000g (1) VF1

LP ft	BL#	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR %
33.75	1	2	1.9	26.2	17.4	3.0	23.2	3.0	287.1	82.0
34.00	2	2	48.1	26.7	18.6	3.0	23.6	3.0	321.2	91.8
34.13	3	4	52.3	27.1	18.6	1.5	24.0	1.5	285.7	81.6
34.25	4	4	52.3	26.5	18.4	1.5	23.5	1.5	299.0	85.4
34.38	5	4	54.1	26.9	19.2	1.5	23.8	1.5	298.6	85.3
34.50	6	4	55.3	27.1	19.8	1.5	24.0	1.5	296.8	84.8
34.58	7	6	56.3	26.7	20.0	1.1	23.7	1.0	300.1	85.7
34.67	8	6	55.6	27.2	19.6	1.1	24.1	1.0	299.6	85.6
34.75	9	6	55.8	26.8	19.7	1.1	23.7	1.0	300.6	85.9
34.83	10	6	55.8	27.0	19.9	1.1	23.9	1.0	305.7	87.3
34.92	11	6	56.0	26.3	20.3	1.1	23.2	1.0	311.8	89.1
35.00	12	6	55.8	26.4	20.0	1.0	23.3	1.0	307.0	87.7
Average			54.9	26.8	19.6	1.3	23.7	1.2	300.5	85.9
Std Dev			1.4	0.3	0.6	0.2	0.3	0.2	6.6	1.9
Maximum			56.3	27.2	20.3	1.5	24.1	1.5	311.8	89.1
Minimum			52.3	26.3	18.4	1.0	23.2	1.0	285.7	81.6

N-value: 10

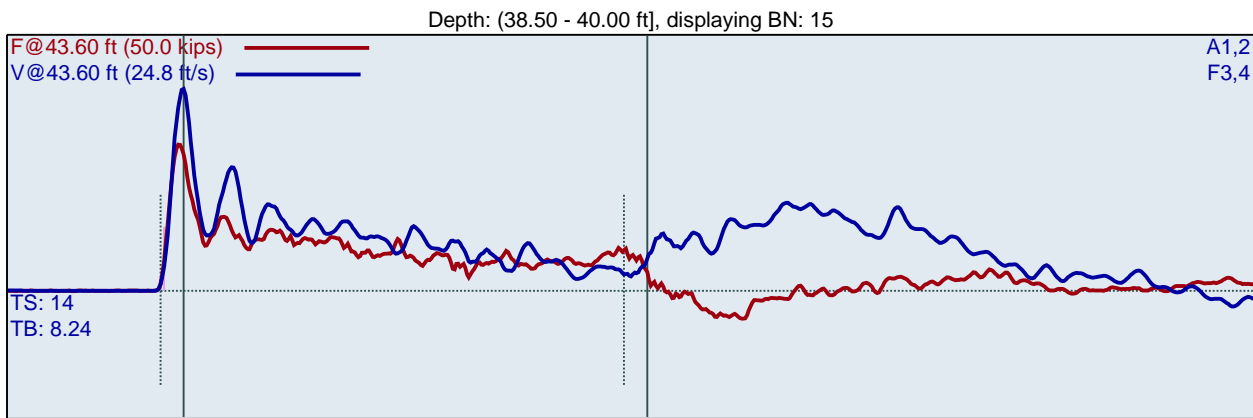
Sample Interval Time: 12.20 seconds.

CME 550X (SN 294593)
REK
B-1

B-1
Interval start: 4/12/2024

AR: 1.13 in²
LE: 43.60 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft³
EM: 30000 ksi



F3 : [728AWJ1] 224.649 PDICAL (1) FF1
F4 : [728AWJ2] 224.139 PDICAL (1) FF1

A1 (PR): [K10959] 413.827 mv/6.4v/5000g (1) VF1
A2 (PR): [K10960] 419.894 mv/6.4v/5000g (1) VF1

LP ft	BL#	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR %
38.67	1	3	1.9	27.7	19.3	2.5	24.5	2.0	320.5	91.6
38.83	2	3	50.9	27.5	19.5	2.1	24.4	2.0	310.0	88.6
39.00	3	3	52.4	27.8	19.9	2.2	24.6	2.0	322.8	92.2
39.10	4	5	54.3	27.1	20.2	1.8	24.0	1.2	317.2	90.6
39.20	5	5	54.4	26.9	20.9	1.6	23.8	1.2	315.5	90.1
39.30	6	5	55.1	26.9	19.4	1.5	23.8	1.2	316.1	90.3
39.40	7	5	56.5	26.7	20.8	1.3	23.7	1.2	324.6	92.7
39.50	8	5	56.3	26.8	20.5	1.3	23.7	1.2	323.6	92.5
39.56	9	9	56.7	26.9	20.2	1.1	23.8	0.7	318.2	90.9
39.61	10	9	55.9	27.1	20.1	1.0	24.0	0.7	325.1	92.9
39.67	11	9	56.5	27.4	20.0	1.0	24.2	0.7	324.0	92.6
39.72	12	9	56.2	27.5	20.0	0.9	24.4	0.7	324.4	92.7
39.78	13	9	56.9	27.6	19.5	0.8	24.5	0.7	315.7	90.2
39.83	14	9	56.5	28.3	19.5	0.9	25.0	0.7	325.3	92.9
39.89	15	9	56.4	28.5	19.6	0.8	25.3	0.7	320.5	91.6
39.94	16	9	56.5	28.2	19.8	0.9	24.9	0.7	319.8	91.4
40.00	17	9	56.5	27.9	19.1	0.8	24.7	0.7	305.9	87.4
Average			56.1	27.4	20.0	1.1	24.3	0.9	319.7	91.3
Std Dev			0.8	0.6	0.5	0.3	0.5	0.3	5.3	1.5
Maximum			56.9	28.5	20.9	1.8	25.3	1.2	325.3	92.9
Minimum			54.3	26.7	19.1	0.8	23.7	0.7	305.9	87.4
N-value: 14										

Sample Interval Time: 17.34 seconds.

Summary of SPT Test Results

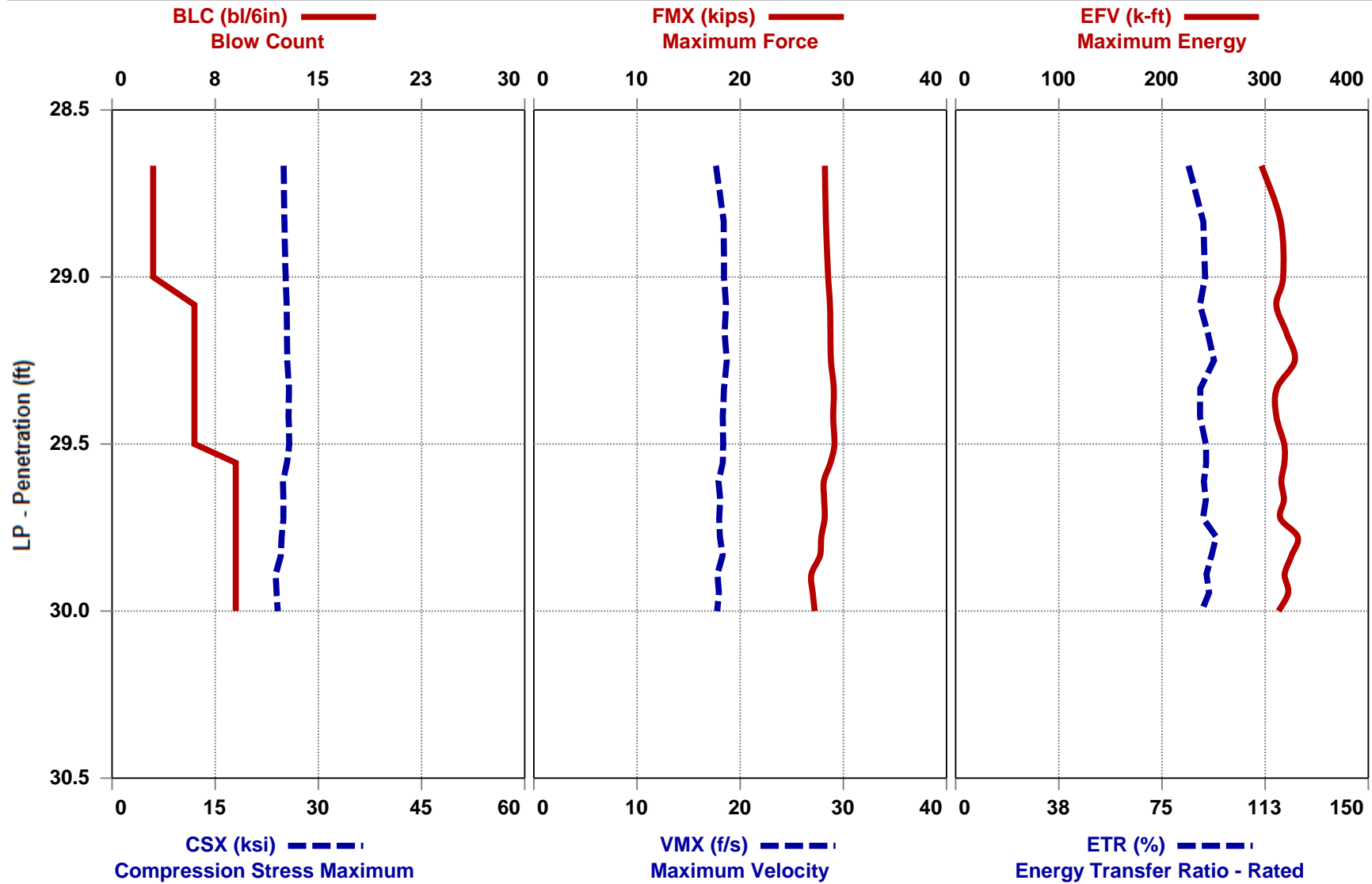
Project: CME 550X (SN 294593), Test Date: 4/12/2024

BPM: Blows/Minute											CSX: Compression Stress Maximum		
FMX: Maximum Force											DFN: Final Displacement		
VMX: Maximum Velocity											EFV: Maximum Energy		
DMX: Maximum Displacement											ETR: Energy Transfer Ratio - Rated		
Instr. Length ft	Start Depth ft	Final Depth ft	Blows Applied /6"	N Value	N60 Value	Average BPM bpm	Average FMX kips	Average VMX ft/s	Average DMX in	Average CSX ksi	Average DFN in	Average EFV ft-lb	Average ETR %
33.60	28.50	30.00	3-6-9	15	22	59.2	28.2	18.2	0.9	25.0	0.8	318.5	91.0
38.60	33.50	35.00	2-4-6	10	14	54.9	26.8	19.6	1.3	23.7	1.2	300.5	85.9
43.60	38.50	40.00	3-5-9	14	20	56.1	27.4	20.0	1.1	24.3	0.9	319.7	91.3
Overall Average Values:						57.0	27.6	19.2	1.1	24.4	0.9	314.3	89.8
Standard Deviation:						2.0	0.8	0.9	0.3	0.7	0.3	10.1	2.9
Overall Maximum Value:						59.6	29.1	20.9	1.8	25.8	1.5	331.4	94.7
Overall Minimum Value:						52.3	26.3	17.8	0.7	23.2	0.7	285.7	81.6



CME 550X (SN 294593) - 28.5 TO 30.0

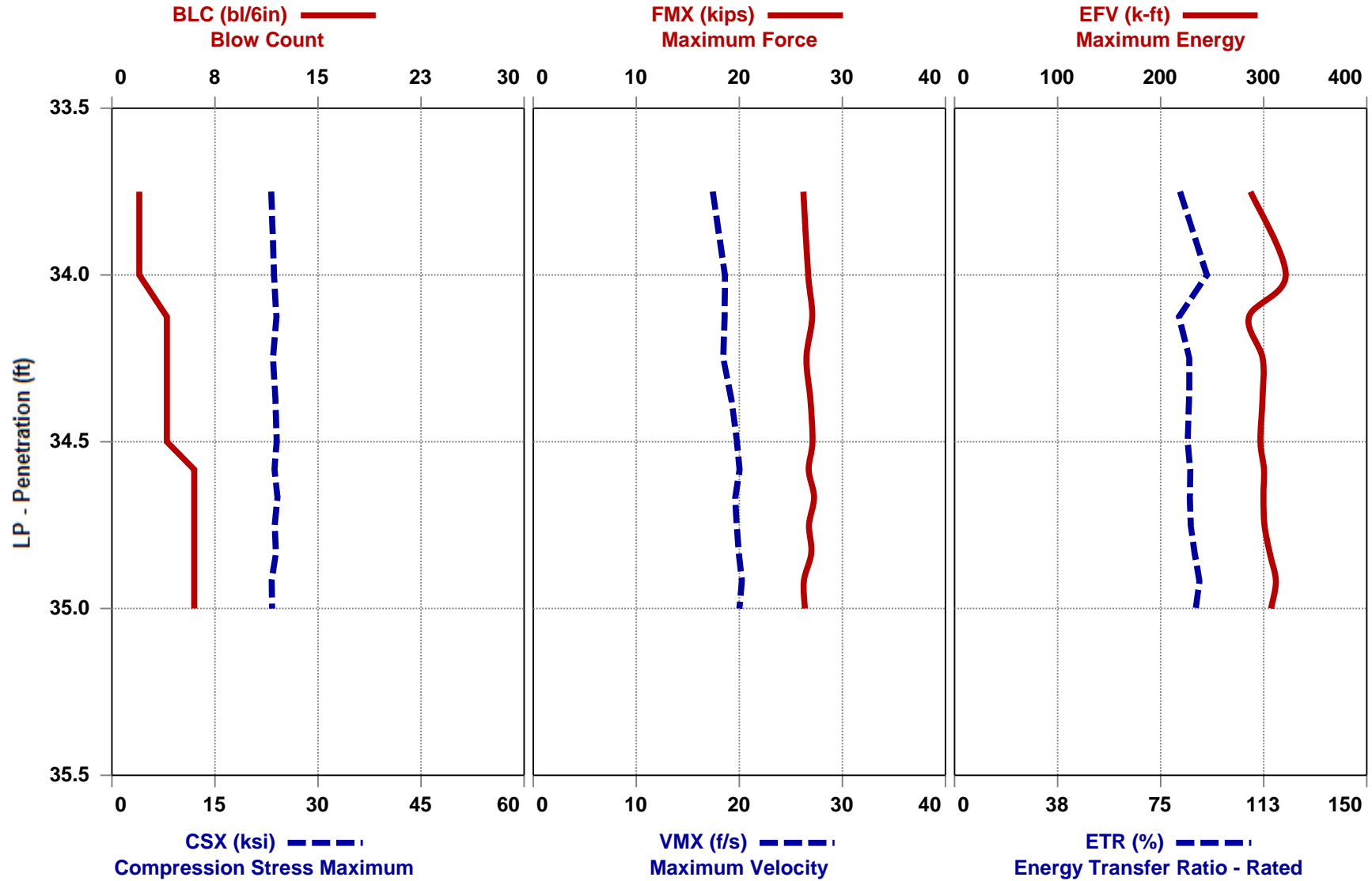
B-1





CME 550X (SN 294593) - 33.5 TO 35.0

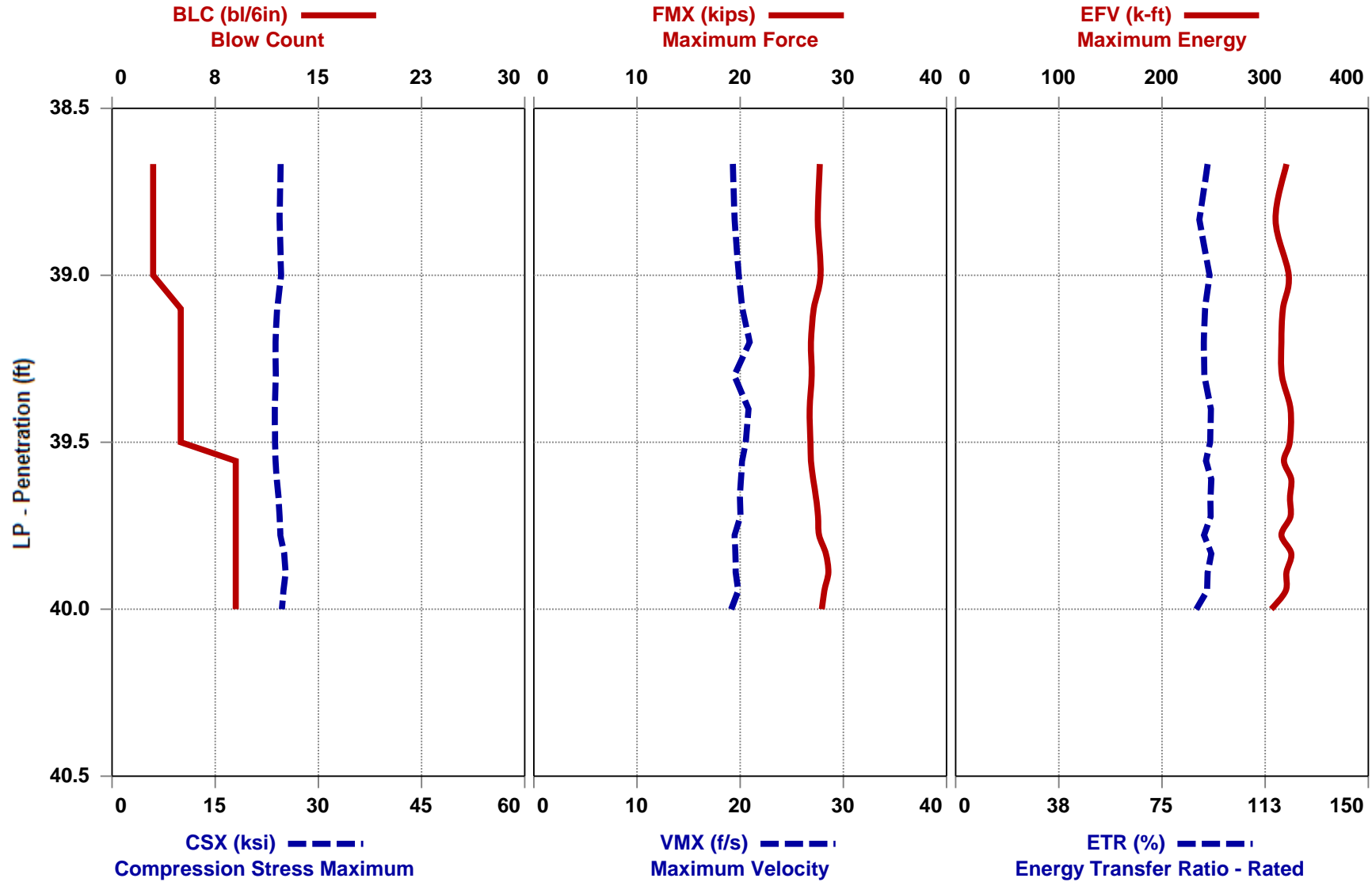
B-1

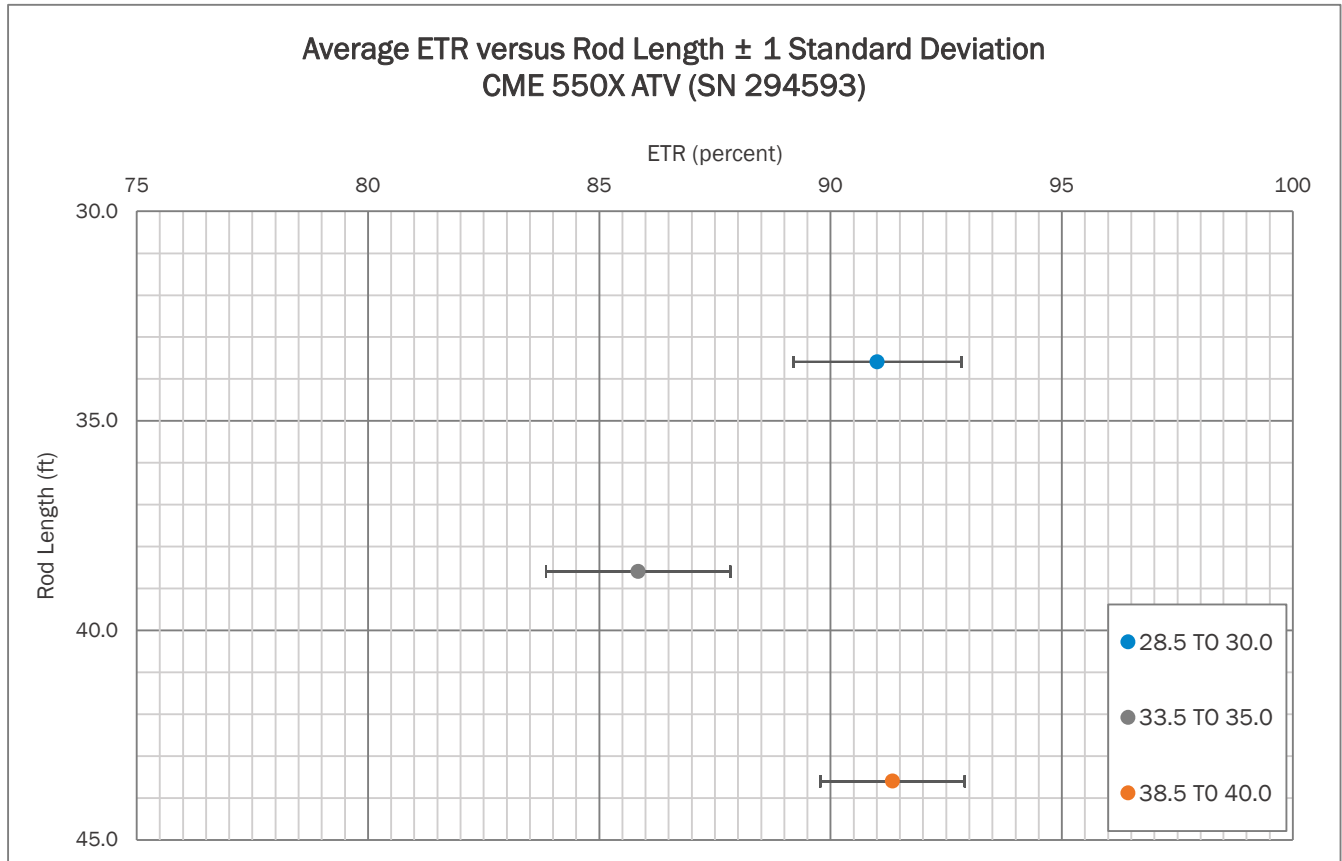
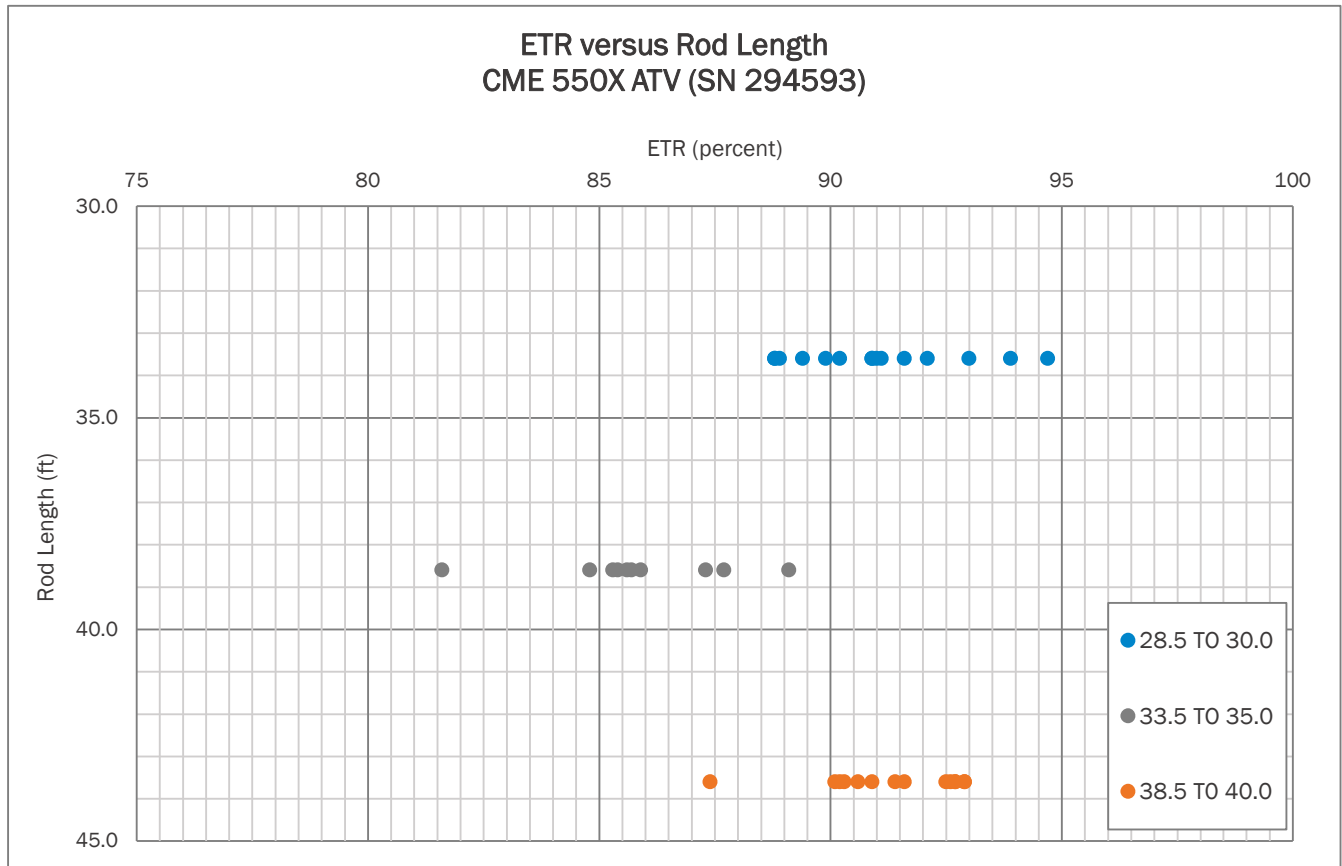




CME 550X (SN 294593) - 38.5 TO 40.0

B-1







APPENDIX II

SPT Hammer Energy Field Form

Project: SPT HAMMER ENERGY
Project No.: 240021095
Boring No.: B-1

Date: 4/12/2024
Weather: 50's CLEAR
Drill Rod Type: AWJ

On-site Personnel

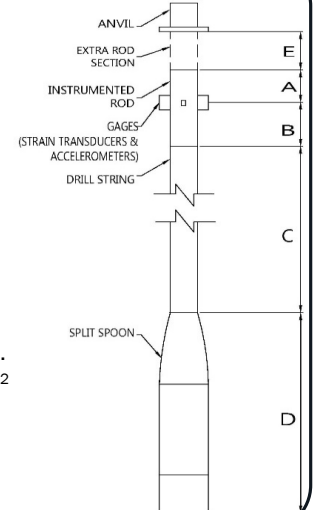
Drilling Company: BRECCIA CONSTRUCTION, LLC
 Rig Operator: L. GUEMPEL
 Engr/Geologist: N/A
 Client Rep.: N/A
 Analyzer Oper.: R. KRAL

Rig/Hammer Info

Drill Rig Make/Model: CME 550X
 Carrier Type: ATV
 Rig Serial No.: 294593
 Hammer Type/Model: CME
 Hammer Serial No.: N/A
 Hammer Drop System: AUTO
 Lubrication Condition: PER MANUFACTURER
 Manufacturer Recommended
 Operation Rate (bpm): 55
 Drop Height (in.): 30
 Hammer Weight (lbs): 140
 Anvil Dimension (in.): 11.5
 Drilling Method: 2.25 HSA

Rod Info

(A + E) Impact Surface to Gages Length: 1.36 ft
(B) Instr. Rod Length below Gages: 0.70 ft
(A) + (B) Instr. Rod Length: 2.00 ft
(D) Spoon Length: 2.85 ft
(E) Rod Length Above Instr. Rod (if applicable): 0.06 ft
 Instr. Rod S/N: 728AWJ
 Instr. Rod Outside Dia.: 1.75 in.
 Instr. Rod Area: 1.13 in²
 PDA Make/Model: SPT
 PDA Serial No.: 4553 TB
 Calib. Pulse Test (y/n): Y



Gage Info

Gage		Serial No.	Calibration No.
Accel.	A3	K10959	413.83
	A4	K10960	419.89
Strain	F3	728AWJ-1	224.65
	F4	728AWJ-2	224.14

Date of Test	Test Depth Increment (ft to ft)	Test Time Start / Stop (military)	Length of Drill String (ft) (C)	(LE) Length below Gages (ft) (B) + (C) + (D)	Avg. Meas. Hammer Rate (BPM)	SPT Blow Counts				Drop Height in Tolerance (y/n)	Soil Class.
						6"	12"	18"	N-Value		
12-Apr	28.5 TO 30.0	0820/0821	30	33.6	59	3	6	9	15	Y	SA SI
12-Apr	33.5 TO 35.0	0825/0825	35	38.6	55	2	4	6	10	Y	SA SI
12-Apr	38.5 TO 40.0	0832/0832	40	43.6	56	3	5	9	14	Y	SA SI

Notes:

TESTING PERFORMED AT 1817 LOWRYS HIGHWAY IN CHESTER, SOUTH CAROLINA (CHESTER COUNTY). THE APPROXIMATE COORDINATES ARE 34.7704428, -81.2454626.

NOTE: (1) Note any unusual hammer operating conditions that affect the hammer performance, or changes in operating conditions (e.g. verticality, weather, or lubrication between trials). (2) Note any changes in rod diameter along drill string and record locations of short rod sections.


 Prepared By (print/signature)

4/12/2024
 Date



Figure No. 1: Rear View of Drill Rig



Figure No. 2: Side View of Drill Rig

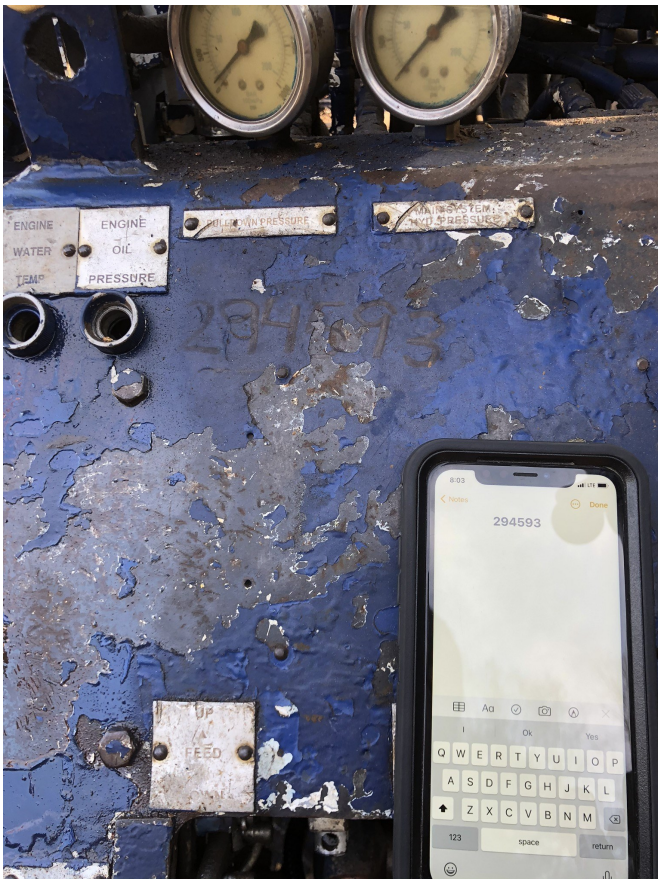


Figure No. 3: Serial Number Plate



Figure No. 4: Automatic Hammer



APPENDIX III

Certificate of Calibration

Pile Dynamics, Inc. certifies that the

Pile Driving Analyzer®, Model SPT

Serial Number: 4553 TB

was calibrated on 18 December 2023
using a PDA Calibration Box whose output was calibrated with test equipment
traceable to NIST.

This certificate is valid for 2 years from above date.



Tested by [Signature]

Pile Dynamics, Inc.
30725 Aurora Road
Cleveland, Ohio 44139 USA



Certificate of Calibration

Pile Dynamics, Inc. certifies that the

Pile Driving Analyzer®, Model SPT

Serial Number: 4549 TB

was calibrated on 14 July 2022

using a PDA Calibration Box whose output was calibrated with test equipment
traceable to NIST.

This certificate is valid for 2 years from above date.



Tested by

MC

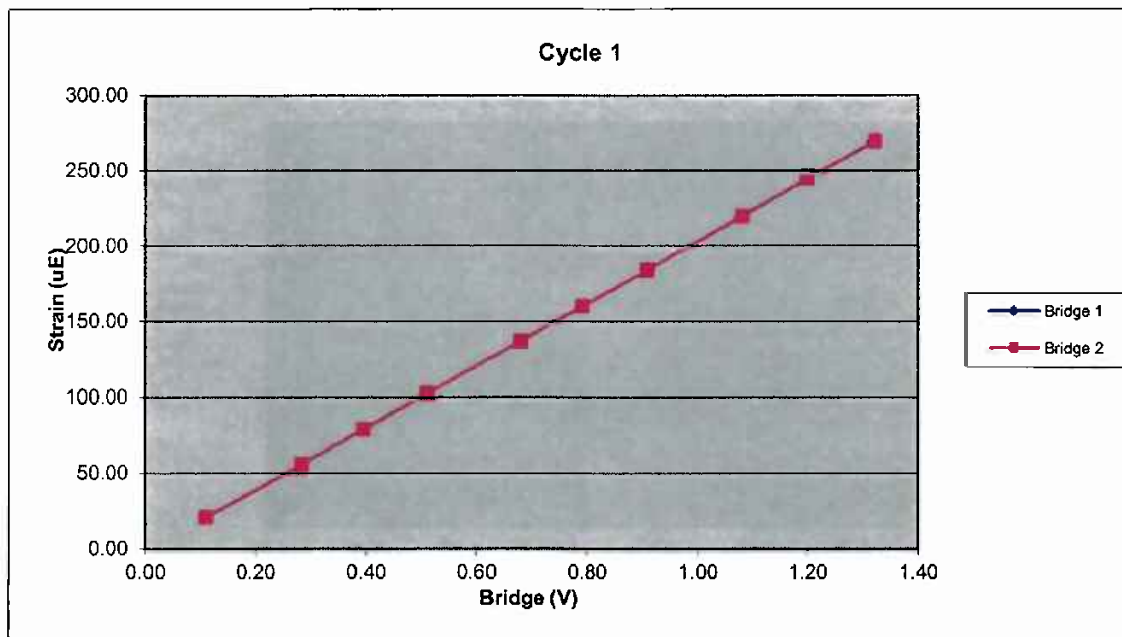


Pile Dynamics, Inc.
30725 Aurora Road
Cleveland, Ohio 44139 USA

528AWJ		Cycle 1		
Sample	Force (lb)	Strain (μE)	Bridge 1 (V)	Bridge 2 (V)
1	0.00	0.00	0.00	0.00
2	803.20	21.15	0.11	0.11
3	2080.73	56.33	0.28	0.28
4	2904.01	79.79	0.39	0.39
5	3765.89	103.49	0.51	0.51
6	5005.11	138.03	0.68	0.68
7	5828.59	161.56	0.79	0.79
8	6692.71	185.68	0.91	0.91
9	7962.93	221.03	1.08	1.08
10	8831.54	245.89	1.20	1.20
11	9736.80	270.68	1.32	1.32

Bridge 1		Bridge 2	
Force Calibration (lb/V)	7358.13	Force Calibration (lb/V)	7351.82
Offset	3.52	Offset	6.26
Correlation	0.999999	Correlation	0.999999
Strain Calibration ($\mu\text{E/V}$)	205.90	Strain Calibration ($\mu\text{E/V}$)	205.73
Offset	-1.56	Offset	-1.48
Correlation	0.999995	Correlation	0.999996

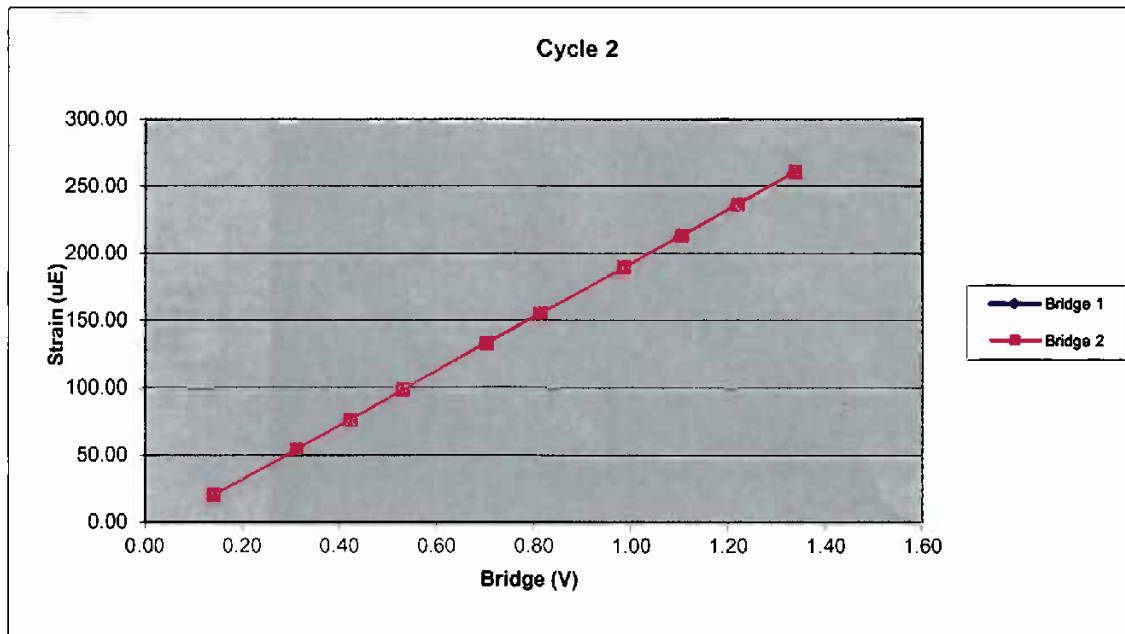
Force Strain Calibration	
EA (Kips)	35735.87
Offset	59.29
Correlation	0.999995



528AWJ		Cycle 2		
Sample	Force (lb)	Strain (μ E)	Bridge 1 (V)	Bridge 2 (V)
1	0.00	0.00	0.00	0.00
2	1038.71	19.60	0.14	0.14
3	2288.25	53.30	0.31	0.31
4	3093.11	75.49	0.42	0.42
5	3893.00	97.84	0.53	0.53
6	5167.50	132.26	0.70	0.70
7	5988.25	154.39	0.81	0.81
8	7248.72	188.87	0.98	0.98
9	8125.71	212.29	1.10	1.10
10	8976.19	235.45	1.22	1.22
11	9854.85	259.50	1.33	1.34

Bridge 1		Bridge 2	
Force Calibration (lb/V)	7381.92	Force Calibration (lb/V)	7365.94
Offset	-0.76	Offset	4.69
Correlation	0.999998	Correlation	0.999999
Strain Calibration (μ E/V)	200.83	Strain Calibration (μ E/V)	200.40
Offset	-8.59	Offset	-8.44
Correlation	0.999997	Correlation	0.999996

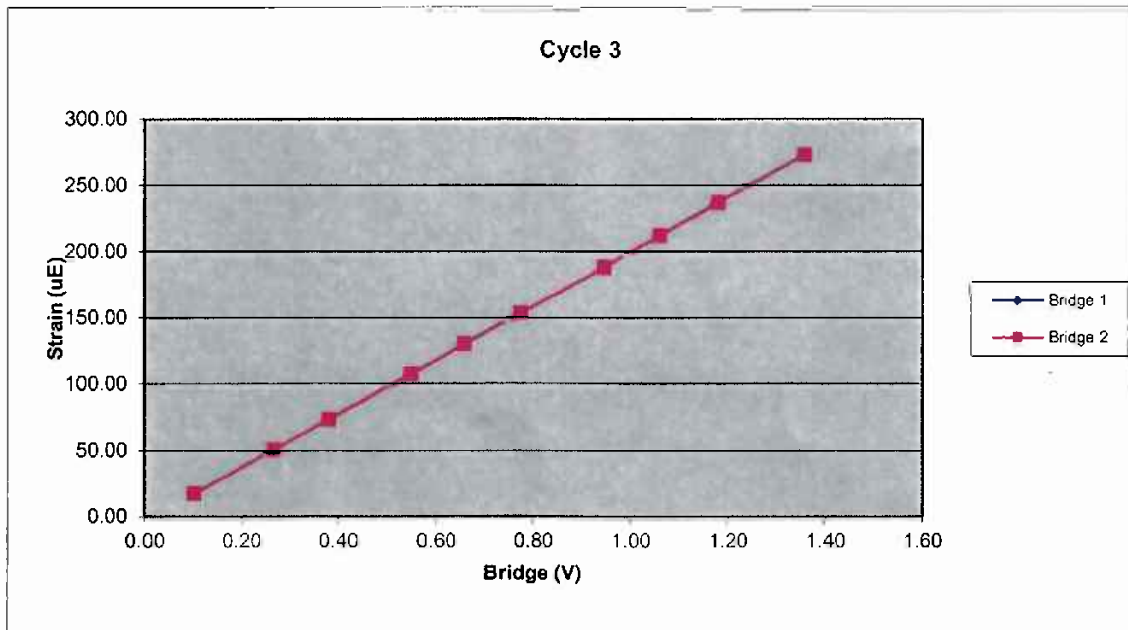
Force Strain Calibration	
EA (Kips)	36756.34
Offset	315.07
Correlation	0.999995



528AWJ		Cycle 3		
Sample	Force (lb)	Strain (μE)	Bridge 1 (V)	Bridge 2 (V)
1	0.00	0.00	0.00	0.00
2	734.68	18.74	0.10	0.10
3	1943.58	51.94	0.26	0.26
4	2781.29	75.07	0.38	0.38
5	4027.81	108.88	0.55	0.55
6	4829.55	131.78	0.66	0.66
7	5689.29	155.36	0.77	0.77
8	6956.49	190.12	0.95	0.95
9	7799.46	214.09	1.06	1.06
10	8693.90	238.78	1.18	1.18
11	10007.88	275.06	1.36	1.36

Bridge 1		Bridge 2	
Force Calibration (lb/V)	7366.71	Force Calibration (lb/V)	7364.49
Offset	-6.17	Offset	-9.40
Correlation	0.999998	Correlation	0.999999
Strain Calibration ($\mu\text{E}/\text{V}$)	203.78	Strain Calibration ($\mu\text{E}/\text{V}$)	203.72
Offset	-2.08	Offset	-2.17
Correlation	0.999989	Correlation	0.999993

Force Strain Calibration	
EA (Kips)	36149.33
Offset	69.26
Correlation	0.999994



Bridge Excitation (V) 5
Shunt Resistor (ohm) 60.4k

Calibration Factors	528AWJ		
Bridge 1 ($\mu\text{E/V}$)	203.51	Bridge 2 ($\mu\text{E/V}$)	203.28
EA Factor (Kips)	36213.85	Area (in^2)	1.21

Calibrated by:



Calibrated Date:

7/18/2022

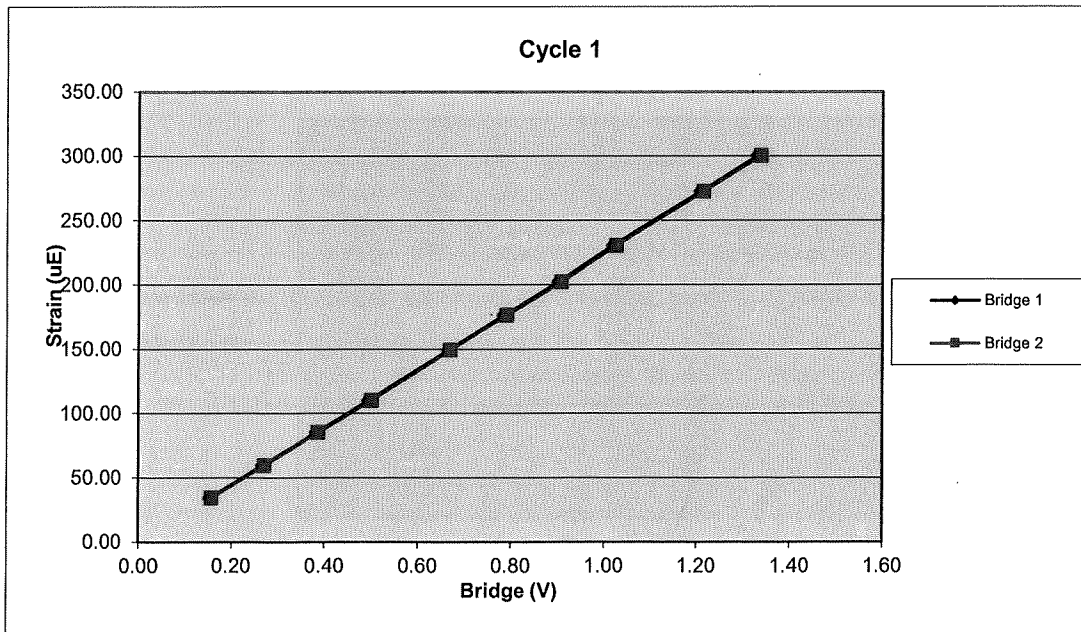
Pile Dynamics Inc
30725 Aurora Rd
Solon, OH 44139

Traceable to N.I.S.T.

728AWJ		Cycle 1		
Sample	Force (lb)	Strain (μ E)	Bridge 1 (V)	Bridge 2 (V)
1	0.00	0.00	0.00	0.00
2	1199.06	34.33	0.16	0.16
3	2052.76	59.72	0.27	0.27
4	2924.20	85.27	0.38	0.39
5	3782.68	110.02	0.50	0.50
6	5074.34	149.22	0.67	0.67
7	5985.06	176.19	0.79	0.79
8	6869.47	202.19	0.90	0.91
9	7768.10	230.48	1.02	1.03
10	9202.28	272.31	1.21	1.22
11	10126.06	300.27	1.33	1.34

Bridge 1		Bridge 2	
Force Calibration (lb/V)	7583.03	Force Calibration (lb/V)	7557.58
Offset	20.67	Offset	0.95
Correlation	1.000000	Correlation	0.999999
Strain Calibration (μ E/V)	226.02	Strain Calibration (μ E/V)	225.27
Offset	-1.27	Offset	-1.86
Correlation	0.999984	Correlation	0.999979

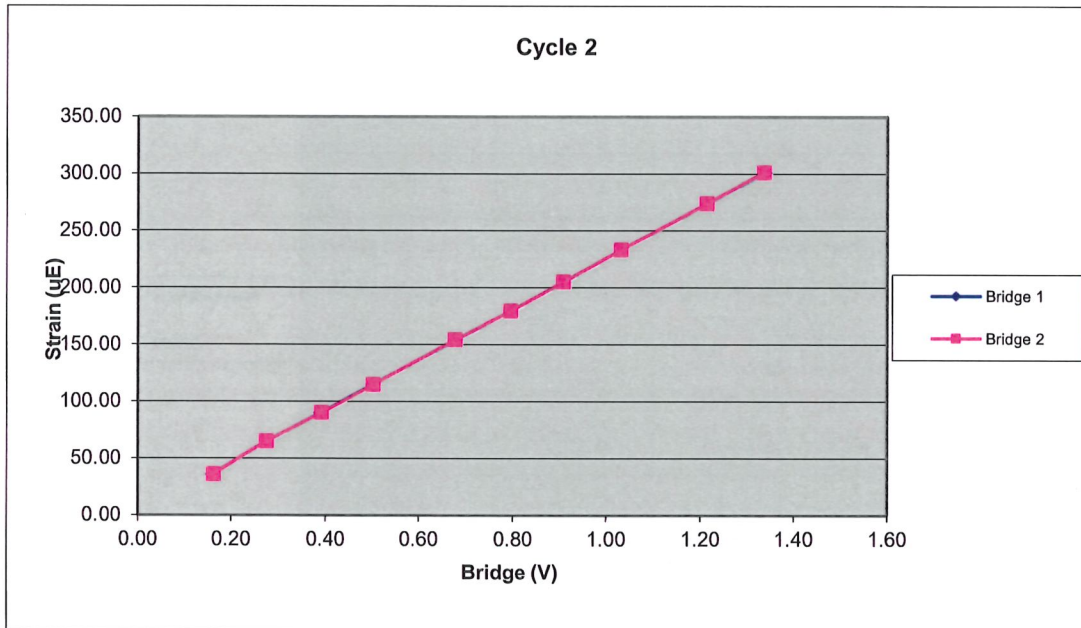
Force Strain Calibration	
EA (Kips)	33548.47
Offset	63.54
Correlation	0.999983



728AWJ		Cycle 2		
Sample	Force (lb)	Strain (μ E)	Bridge 1 (V)	Bridge 2 (V)
1	0.00	0.00	0.00	0.00
2	1236.98	35.69	0.16	0.16
3	2108.61	64.71	0.28	0.28
4	2976.64	89.52	0.39	0.39
5	3811.14	114.45	0.50	0.50
6	5141.89	153.54	0.68	0.68
7	6032.24	178.92	0.80	0.80
8	6903.48	204.54	0.91	0.91
9	7825.42	232.64	1.03	1.03
10	9217.58	273.43	1.22	1.22
11	10151.02	300.79	1.34	1.34

Bridge 1		Bridge 2	
Force Calibration (lb/V)	7561.16	Force Calibration (lb/V)	7576.28
Offset	14.33	Offset	4.68
Correlation	0.999997	Correlation	0.999995
Strain Calibration (μ E/V)	223.39	Strain Calibration (μ E/V)	223.84
Offset	1.55	Offset	1.27
Correlation	0.999945	Correlation	0.999943

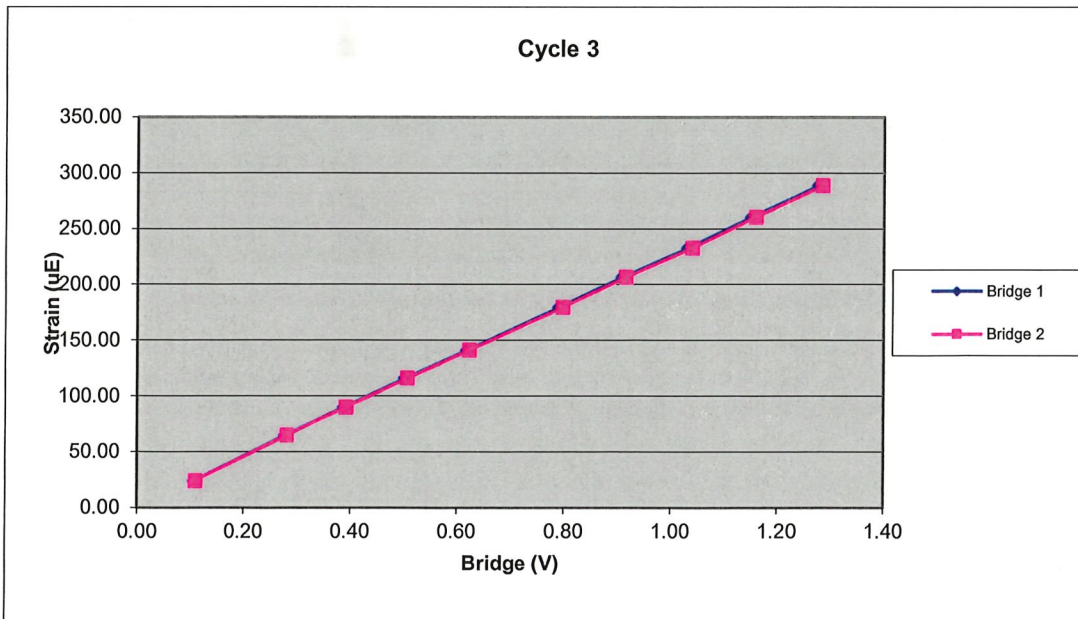
Force Strain Calibration	
EA (Kips)	33843.24
Offset	-37.68
Correlation	0.999950



728AWJ		Cycle 3		
Sample	Force (lb)	Strain (μE)	Bridge 1 (V)	Bridge 2 (V)
1	0.00	0.00	0.00	0.00
2	822.90	24.10	0.11	0.11
3	2132.69	64.89	0.28	0.28
4	2972.74	89.98	0.39	0.39
5	3841.65	115.75	0.50	0.51
6	4741.16	141.06	0.62	0.62
7	6043.35	179.33	0.79	0.80
8	6961.58	206.39	0.91	0.92
9	7901.94	232.60	1.03	1.04
10	8816.85	260.36	1.15	1.16
11	9759.65	288.75	1.28	1.29

Bridge 1		Bridge 2	
Force Calibration (lb/V)	7644.24	Force Calibration (lb/V)	7602.69
Offset	-5.25	Offset	-12.15
Correlation	0.999999	Correlation	0.999997
Strain Calibration ($\mu\text{E}/\text{V}$)	224.53	Strain Calibration ($\mu\text{E}/\text{V}$)	223.31
Offset	1.57	Offset	1.37
Correlation	0.999950	Correlation	0.999942

Force Strain Calibration	
EA (Kips)	34041.33
Offset	-58.11
Correlation	0.999945



Bridge Excitation (V) 5
Shunt Resistor (ohm) 60.4k

Calibration Factors	728AWJ		
Bridge 1 (µE/V)	224.65	Bridge 2 (µE/V)	224.14
EA Factor (Kips)	33811.01	Area (in^2)	1.13

Calibrated by: Sean Bannon
Calibrated Date: 2/6/2024

Pile Dynamics Inc
30725 Aurora Rd
Solon, OH 44139

Traceable to N.I.S.T.

Accelerometer Calibration Certificate

Pile Dynamics, Inc.



Calibrated by Pile Dynamics, Inc.
Calibration performed on 14Jun2022

Serial No: K10959 Temperature: 79.0 °F

Model: PR Humidity: 50%

Calibrated on: Channel 3 on 8G 5161 LE

PDA CALIBRATION FACTOR

413.8 mv/5000g

(82.8 μ v/g)

R²: 0.999956 [Chip programmed]

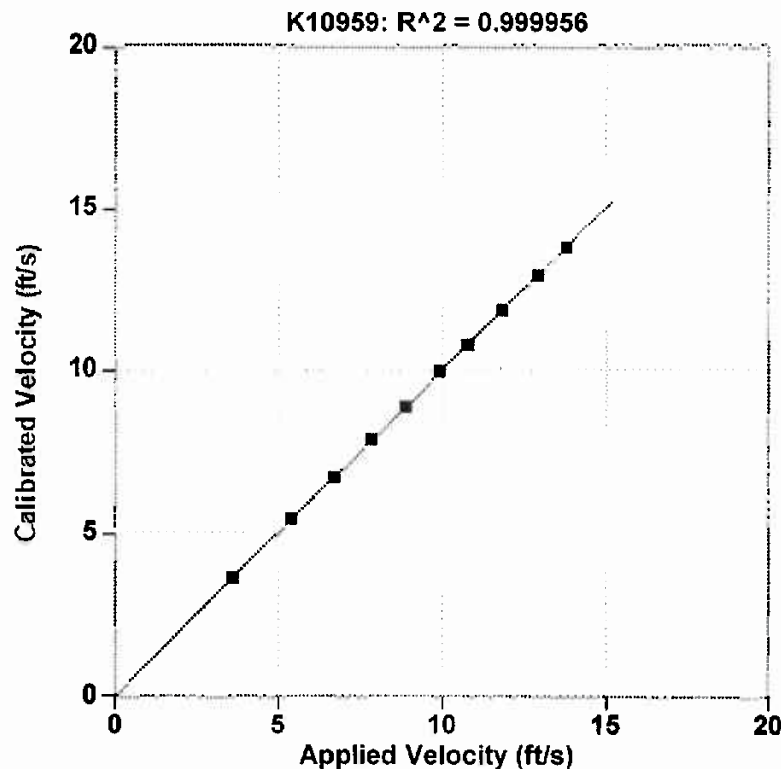
Ref Acc 1: 72517! Cal on: 24Mar2022
1049 g's/volt

Ref Acc 2: 72505! Cal on: 24Mar2022
1035 g's/volt

Operator: William Johnson


Signed

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



Reference Velocity	S/N K10959 Velocity
ft/s	ft/s
3.605	3.589
5.397	5.412
6.705	6.699
7.841	7.862
8.877	8.913
9.904	9.929
10.746	10.721
11.807	11.815
12.910	12.889
13.783	13.762

Maximum Acceleration: 935 g's

Accelerometer Calibration Certificate

Pile Dynamics, Inc.



Calibrated by Pile Dynamics, Inc.
Calibration performed on 14Jun2022

Serial No: K10960 Temperature: 79.0 °F

Model: PR Humidity: 50%

Calibrated on: Channel 3 on 8G 5161 LE

PDA CALIBRATION FACTOR

419.9 mv/5000g

(84.0 μ v/g)

R²: 0.999944 [Chip programmed]

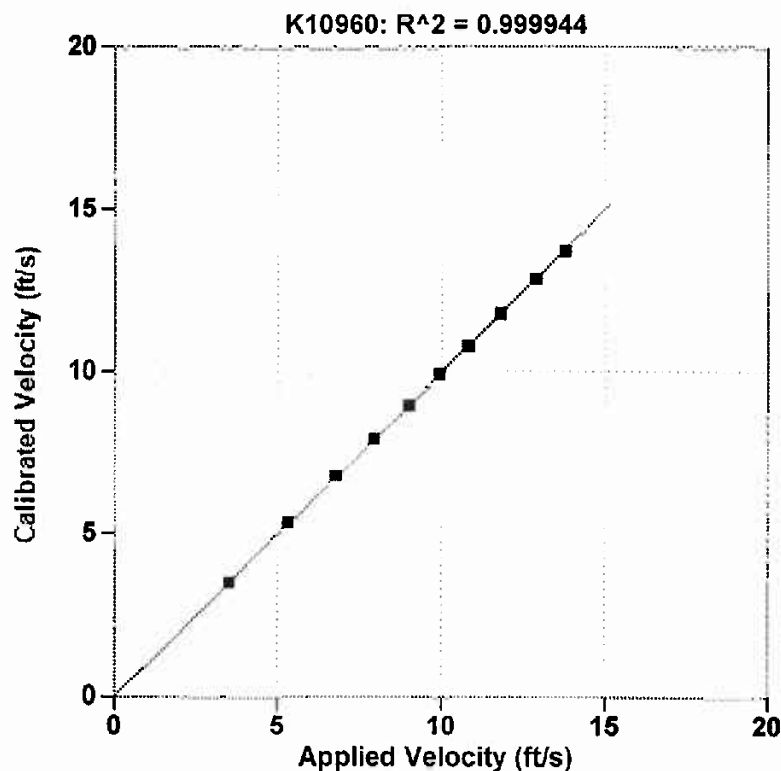
Operator: William Johnson

Ref Acc 1: 72517! Cal on: 24Mar2022
1049 g's/volt

Ref Acc 2: 72505! Cal on: 24Mar2022
1035 g's/volt

Signed

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



Reference Velocity	S/N K10960 Velocity
ft/s	ft/s
3.513	3.540
5.322	5.345
6.769	6.796
7.933	7.937
8.998	9.037
9.912	9.923
10.788	10.775
11.781	11.779
12.877	12.863
13.771	13.732

Maximum Acceleration: 934 g's

Accelerometer Calibration Certificate

Pile Dynamics, Inc.



Calibrated by Pile Dynamics, Inc.
Calibration performed on 14Jun2022

Serial No: K11957 Temperature: 79.0 °F

Model: PR Humidity: 50%

Calibrated on: Channel 3 on 8G 5161 LE

PDA CALIBRATION FACTOR

409.6 mv/5000g

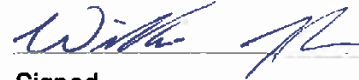
(81.9 μ v/g)

R²: 0.999919 [Chip programmed]

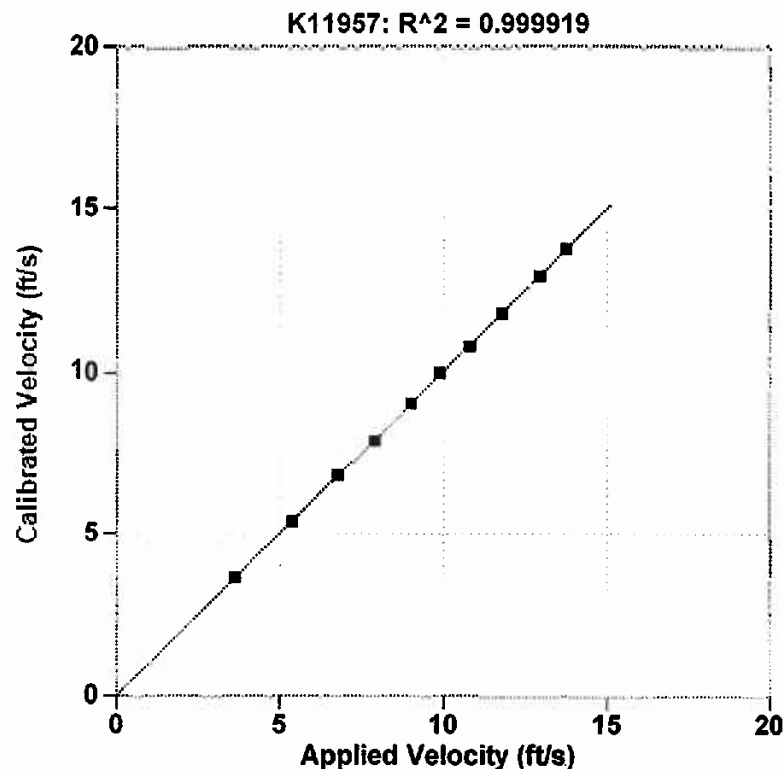
Operator: William Johnson

Ref Acc 1: 72517! Cal on: 24Mar2022
1049 g's/volt

Ref Acc 2: 72505! Cal on: 24Mar2022
1035 g's/volt


Signed

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



Reference Velocity ft/s	S/N K11957 Velocity ft/s
3.643	3.661
5.377	5.363
6.761	6.783
7.895	7.905
8.973	8.989
9.864	9.918
10.780	10.730
11.763	11.749
12.920	12.894
13.735	13.746

Maximum Acceleration: 931 g's



APPENDIX IV



This documents that
Robert E. Kral
Carolinas Geotechnical Group

has on May 20, 2016 achieved the rank of

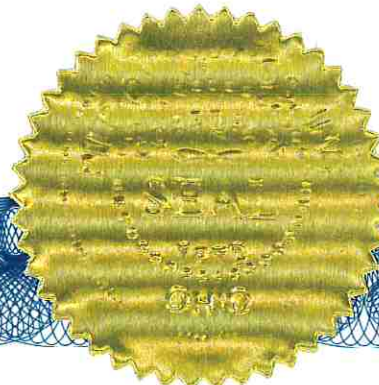
ADVANCED


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. ***It is recommended that individuals at the Advanced level seek Master or Expert levels through additional study within six years of the date of this document.***

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. **This certificate can be verified at www.PDAproficiencytest.com.** 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.


Steven A. Hall, Executive Director
Pile Driving Contractors Association




Garland Likins, Senior Partner
Pile Dynamics, Inc.

No. 2072

S-38-191 over Roberts Swamp

Geotechnical Subsurface Data Report

APPENDIX

SECTION 8 GEOSCOPING FORM

GeoScoping Form

PROJECT INFORMATION	
Project ID: 67100-009 Task 00030	Date of Trip: 1-16-2025
County: Orangeburg County	Location: Countryside E of Norway, SC
Rd/Route: S-38-191	Local Name: Middle Willow Road
Attendees: Benjamin Vogel (+ Grace Contle in background)	

Culvert destroyed + map view not informative enough but maybe like a long car's length? Not too big per visual on site + past pictures

EXISTING BRIDGE INFORMATION	
Bridge Length: <input type="text"/>	Bridge Width: ~27' per road width + grass patches to the sides
Superstructure Type: <input type="text"/>	Substructure Type: <input type="text"/>
Begin Bridge Sta.: <input type="text"/>	End Bridge Sta.: <input type="text"/>
Begin Bridge Embankment Sta. ¹ : <input type="text"/>	End Bridge Embankment Sta. ¹ : <input type="text"/>
Structure Number: 00963 (alt. exterior sign: 387019100100)	Posted Weight Limit: None observed / present
Crossing: Robert's Swamp	Skew: 0-5° road but culvert was parallel w/ creek
Latitude: 33.479343	Longitude: -81.061590
Existing Fill Height: <input type="text"/>	Approximate Existing Slope Angle: <input type="text"/>

but that's visual approximating

¹Begin and End Bridge Embankment 100 feet down station or up station from bridge, respectively

~7' tried to determine from ruins

EXISTING ROADWAY EMBANKMENT INFORMATION	
Begin Project Sta.: <input type="text"/>	Begin Bridge Embankment Sta. ¹ : <input type="text"/>
Accessibility Issues: Manual descent required on both N+S sides; Cleaved-off embankments, dirt mounds, broken trees, utilities, asphalt & sand	
Ground Cover: Both N+S sides: Swamp & woods into sandy beach w/ fallen trees & debris	
Existing Fill Height: <input type="text"/>	Approximate Existing Slope Angle: 90° → 20° → Flat
Local Development (undeveloped, developed residential, developed commercial, developed industrial, etc.): Under. agri. + res.	
Topography (level, flat, rolling, steep, hillside, valley, swamp, gully, etc.): Flat w/ a little rolling	
Traffic Control Necessary (Y/N): No, road already closed due to chasm	
Surface Soil: silty F-C SAND	
Muck (Y/N): Yes, WoR on 8-10'	
Exposed Rock (Y/N): No	In Stream Bed (Y/N): Prior structure possible
In Banks (Y/N): Prior structure possible	
Wetlands On-Site (Y/N): Yes, seems to be in creek/swamp	Wetlands Adjacent (Y/N): Yes, swamp all around
Depth FG to Water: Both N+S sides: 10-11' in current state	Water Depth: Both N+S sides are 1-3' near "embankments"
Depth to Existing Ground: ~7' to N+S banks both in current state	
Scour Condition at EB: Catastrophic	Scour Condition at IB: Catastrophic
End Bridge Embankment Sta. ¹ : <input type="text"/>	End Project Sta.: <input type="text"/>
Accessibility Issues: N-side: needs manual descent due to steep + wooded; S-side: ATV accessible thru sand + trees; both have cleaved-off embankments + dirt mounds on road	
Ground Cover: N-side: Wooded into beachless creek/swamp; S-side: Wooded swamp into sandy beach w/ fallen trees & clearing	
Existing Fill Height: <input type="text"/>	Approximate Existing Slope Angle: -50° → 20°
Local Development (undeveloped, developed residential, developed commercial, developed industrial, etc.): Under. agri. + res.	
Topography (level, flat, rolling, steep, hillside, valley, swamp, gully, etc.): Flat w/ a little rolling	
Traffic Control Necessary (Y/N): No, road already closed due to chasm	
Surface Soil: silty F-C SAND	
Muck (Y/N): No - per geologist on site	
Exposed Rock (Y/N): No	In Stream Bed (Y/N): Prior structure possible
In Banks (Y/N): Prior structure possible	
Wetlands On-Site (Y/N): Yes, seems to be in creek/swamp	Wetlands Adjacent (Y/N): Yes, swamp all around
Depth FG to Water: Both N+S sides: 10-11' in current state	Water Depth: Both N+S sides have steeper dropoff into 3' water
Depth to Existing Ground: Both N+S sides: 7-8' ish to adjacent ground but ~5' to debris pile of sand	
Scour Condition at EB: Catastrophic	Scour Condition at IB: Catastrophic

GeoScoping Form

UTILITIES INFORMATION
Attached: <i>None observed</i>
Above Ground/ Overhead: <i>On S-side of culvert: power lines running adjacent, poles</i>
Underground: <i>On N-side of culvert: large adjacent-running water pipe; S-side: adjacent-running orange-marked comm. cables + possible power cables again</i>

COMMENTS
<p><i>This culvert is totally destroyed. Embankments have been carved out beyond 90° & the main concrete culvert body is at an angle, partially sunken into the water & detached from the road on both ends. Utilities are likewise uprooted & exposed everywhere and one power pole is at an angle.</i></p> <p><i>Basically a watery hole w/ an island.</i></p>

Instructions:


1. Attach boring location plan for bridge and roadway.
2. Attach all photographs taken, photographs to be labeled as to direction looking in and what is being depicted.
3. Fill out GeoScoping Form as completely as possible, using additional sheets as necessary to describe site conditions.
4. If representative of GEC on site during GeoScoping, include GEC representative's name and contact number in Attendees block.




SUBSURFACE TESTING DATA							
Boring ID	Test Type	Northing	Easting	Latitude	Longitude	Test Elevation (MSL)	Test Depth (ft)
B-1	STB	598882.213	1981189.556	33.47935173	-81.06169886	218.9	100.0
B-2	STB	598858.277	1981304.489	33.47928612	-81.06132183	218.8	100.0
BS-1	BS/MAB	598865.233	1981101.968	33.47930491	-81.06198611	218.1	6.0
P-1	STB	598893.755	1980804.099	33.47938281	-81.06296319	219.4	6.0
P-2	STB	598894.754	1980954.203	33.47938581	-81.06247085	219.0	6.0
P-3	STB	598873.776	1981102.648	33.47932839	-81.06198390	218.6	6.0
P-4	STB	598865.769	1981413.967	33.47930689	-81.06096275	219.2	6.0
P-5	STB	598845.624	1981562.124	33.47925176	-81.06047675	221.2	6.0
P-6	STB	598850.586	1981711.865	33.47926564	-81.05998561	225.8	6.0



LEGEND:

 SOIL TEST BORING LOCATION

 MANUAL AUGER BORING TEST LOCATION

4			
3			
2			
1			
REV.	BY	DATE	DESCRIPTION OF REVISION
TOPO.		DATE	
DWG.	CTC	DATE 1.31.25	GROUP - -
R/W		DATE	

 F&ME CONSULTANTS, INC.
COLUMBIA, SC

S-38-191 OVER ROBERTS SWAMP
ORANGEBURG COUNTY, SOUTH CAROLINA

BORING LOCATION PLAN

SCDOT PROJECT ID: P044269	FME JOB NO. G7100.009 Task 003
SCALE: 1" = 100'	FIGURE 2

GeoScoping Form



B-1 Looking East at B-2



Water Pipe on B-1 Bank, Adjacent to North side of Culvert



Pointing Southwest Communications Cables, Adjacent to S Side Culvert



Power Lines Running Adjacent to South Side of Culvert from B-1 Bank



Pointing Northwest from Bank of B-1 (Power Pole)



B-2 Looking Northwest at B-1

GeoScoping Form



Signage



Signage



**Side Profile Pointing Southwest on
Bank of B-2**



**Side profile Pointing Southwest on
Bank B-1**



**Side Profile Pointing Northeast on
Bank of B-1**



**Side Profile Pointing North on Bank
of B-2**

GeoScoping Form



**Pointing Southwest, Water Pipe on
B-1 Bank**