ECS Southeast, LLP

Geotechnical Subsurface Data Report

Emergency Bridge Package 2020-1

SCDOT Project ID: P039600

Anderson County, South Carolina

ECS Project Number 14:9922

March 24, 2020

GEOTECHNICAL SUBSURFACE DATA REPORT

Emergency Bridge Package 2020-1
SCDOT Project ID: P039600
Anderson County, South Carolina

Prepared For:

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Prepared By:
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ECS Project No:
14:9922

Report Date:
March 24, 2020

ECS SOUTHEAST, LLP
Geotechnical • Construction Materials • Environmental • Facilities

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NC Registered Engineering Firm F-1078
NC Registered Geologists Firm C-553
SC Registered Engineering Firm 3239

March 24, 2020

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

ECS Project No. 14:9922

Reference: Geotechnical Subsurface Data Report
Emergency Bridge Package 2020-1
SCDOT Project ID: P039600
Anderson County, South Carolina

Dear Mr. Harris:

ECS Southeast, LLP (ECS) has completed the subsurface exploration and laboratory testing for the above referenced project. Our services were performed in general accordance with the scope provided in the SCDOT NTP dated February 28, 2019. This report presents our understanding of the geotechnical aspects of the project, along with the results of the field exploration and laboratory testing conducted.

It has been our pleasure to be of service to the South Carolina Department of Transportation (SCDOT) during this phase of this project. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

ECS Southeast, LLP

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 33477 3/24/20 KELLY DE MONTBRUN

SOUTH CAROLINA ECS SOUTHEAST, LLP No. COA3239 CERTIFICATE OF AUTHORIZATION

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TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

ECS is pleased to present this Geotechnical Subsurface Data Report for the S-4-174 (Timms Mill Road) Bridge over Six & Twenty Creek, part of the Emergency Bridge Package 2020-1 project. The purpose of this report is to provide geotechnical information and laboratory testing results.

2.0 PROJECT LOCATION

2.1 PROJECT LOCATION

The project site is located along S-4-174 (Timms Mill Road) approximately 3.5 miles northwest of the intersection of I-85 and N Hwy 81. The project site is approximately 7.9 miles northeast of the town of Pendleton in Anderson County, South Carolina, as shown on the Site Location Diagram in Appendix A.

2.2 PROJECT DESCRIPTION

The S-4-174 (Timms Mill Road) Bridge over Six & Twenty Creek currently a 2 lane bridge in Anderson County, South Carolina. This bridge is currently closed to traffic. We understand plans are to demolish the existing bridge and replace with a new bridge.

3.0 SUBSURFACE EXPLORATION

3.1 SOIL TEST BORINGS

ECS completed a total of four (4) soil test borings (B-1, B-2, B-3, and B-4) at the subject bridge consisting of four (4) bridge end bent borings. The soil test borings were performed utilizing a CME 75 drill rig on March 3 through March 6, 2020. Photographic documentation of the drill rig setup at each boring location is included in Appendix B. The borings were located in the field by an ECS representative at the approximate locations provided by the SCDOT. After completion, the test locations were obtained by a licensed surveyor. A Boring Location Diagram is included in Appendix A.

The soil test borings were drilled by a CME 75 drill rig using the rotary wash drilling method with a 6 inch bit. Standard Penetration Tests (SPTs) were generally conducted continuously within the top 10 feet and at 5- foot intervals thereafter until refusal was encountered. The SPT is used to provide an index for estimating soil strength and density. In conjunction with the penetration testing, split barrel soil samples were recovered for soil classification and laboratory testing at various intervals. The N-values presented in the boring logs are uncorrected, field N-values. Blow counts recorded at these intervals were produced from a standard penetration test hammer with an energy efficiency of 72.8%. The hammer calibration records are included in Appendix D.

An ECS Geotechnical Professional was on site and visually classified each sample during drilling. Samples from each split spoon were sealed in plastic bags and returned to the ECS office for laboratory testing. The boring logs are included in Appendix B. A summary of the borings is presented in Table 3.1.1.

Table 3.1.1 Summary of Subsurface Exploration Boring Locations

Boring ID	Boring Type	Northing (Int. ft.)	Easting (Int. ft.)	Ground Surface Elevation (ft.)	24-HR Water Depth (ft)	24- HR Water Elevation (ft)
B-1	SPT	1030956.89	1506478.62	723.4	6.5	716.9
B-2	SPT	1030968.77	1506480.85	723.1	7.1	716.0
B-3	SPT	1030962.41	1506392.28	722.3	8.4	713.9
B-4	SPT	1030975.57	1506390.18	721.8	9.7	712.1

3.2 ROCK CORING

Rock coring was performed within the soil test borings at the auger and spoon refusal depths. Borings B-1 through B-4 were terminated in rock at depths ranging between approximately 29 feet and 46 feet below the existing ground surface.

A summary of the rock coring runs recovered from the borings is included in Table 3.2.1. Rock coring was performed using a diamond-studded bit fastened to the end of a hollow double tube core barrel. A HQ core barrel was used to obtain rock cores 2½ inches in diameter. This device was rotated at high speed by the drill rig and the cuttings were brought to the surface by circulating water. Core samples of the materials penetrated were protected and retained in the swivel-mounted inner tube of the core barrel. Upon completion of each drill run, the core barrel was brought to the surface, removed and placed in core boxes, and returned to our laboratory for testing. An ECS Project Geologist was on site and visually classified each sample during coring. The rock coring results are presented on the boring logs and a Photo Log is included in Appendix B.

Table 3.2.1 Summary of Rock Core Runs

Boring ID	Run ID	Run Depth (ft)	Recovery (%)	Rock Quality Designation (%)	q_u (psi)
B-1	HQ-1	14.0 – 19.0	100	100	7,359.9
	HQ-2	19.0 – 24.0	100	100	13,604.5
	HQ-3	24.0 – 29.0	100	100	7,947.5
B-2	HQ-1	14.0 – 19.0	100	80	11,317.1
	HQ-2	19.0 – 24.0	100	100	7,592.1
	HQ-3	24.0 – 29.0	100	100	9,625.5
B-3	HQ-1	31.0 – 34.0	100	77	9,813.8
	HQ-2	34.0 – 39.0	100	96	16,224.0
	HQ-3	39.0 – 44.0	100	80	16,485.4
	HQ-4	44.0 – 46.0	100	75	12,731.4
B-4	HQ-1	24.0 – 29.0	70	50	-
	HQ-2	29.0 – 34.0	82	34	-
	HQ-3	34.0 – 39.0	88	64	9,038.1
	HQ-4	39.0 – 44.0	100	100	17,311.1

3.3 GROUNDWATER

Groundwater was measured between approximately 6.5 and 9.7 feet below the existing ground surface at around the 24-hr time interval within Borings B-1, B-2, B-3, and B-4. After a 24 hour measurement was obtained, the borings were backfilled and capped with bentonite. Groundwater elevations should be expected to vary depending on seasonal fluctuations in precipitation, surface water absorption characteristics, and other factors not readily apparent at the time of our exploration, and may be higher or lower than inferred from the recent test boring data.

3.4 LABORATORY TESTING

The laboratory testing frequency was determined by the SCDOT and laboratory testing was performed in accordance with the respective ASTM and AASHTO standards. Individual laboratory test results and a Laboratory Testing Summary are presented in Appendix C. Table 3.3.1 provides a quantitative overview of the testing performed:

Table 3.4.1 Laboratory Test Quantities

Test Type	Quantity
Atterberg Limits	4
Sieve Analysis	4
Moisture Content	12
Hydrometer	8
Corrosion Testing	1
Unconfined Compressive Strength (Rock)	12

4.0 CLOSING

Due to the prevailing geology, changes in the subsurface conditions can occur over relatively short distances that have not been disclosed by the results of the borings evaluated. Consequently, there may be undisclosed subsurface conditions that require special treatment or additional preparation once these conditions are revealed during construction. The assessment of site environmental conditions for the presence of pollutants in the soil, rock, and groundwater of the site was beyond the scope of services for this project.

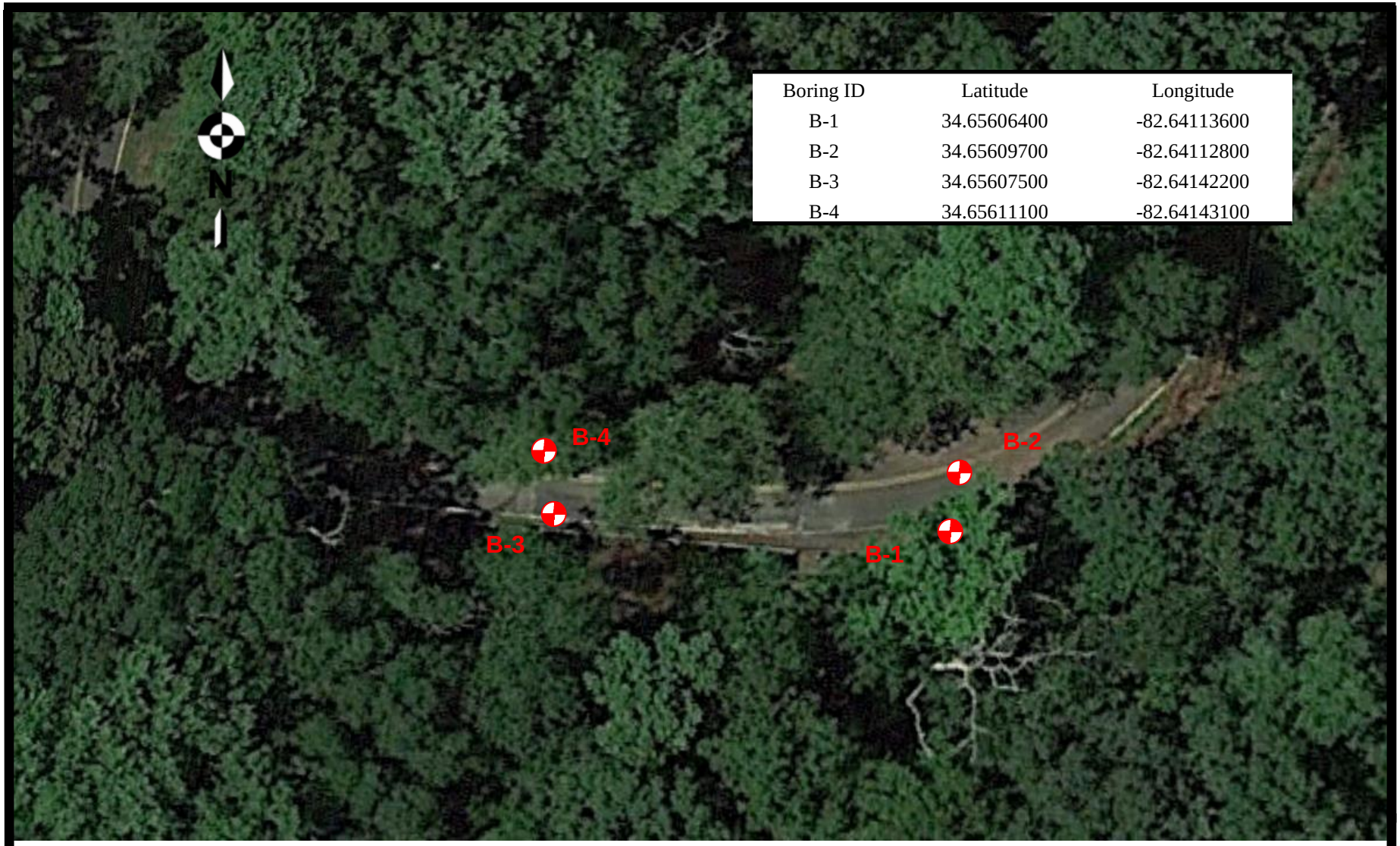
APPENDIX A – Drawings & Reports

Site Location Diagram
Boring Location Diagram

Site Location Diagram
SCDOT EMERGENCY BRIDGE PACKAGE 2020-1

TIMMS MILL ROAD, ANDERSON COUNTY, SOUTH CAROLINA
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

ENGINEER	MFP
SCALE	1 " = 1000 '
PROJECT NO.	14:9922
SHEET	1 OF 1
DATE	3/12/2020



Boring ID	Latitude	Longitude
B-1	34.65606400	-82.64113600
B-2	34.65609700	-82.64112800
B-3	34.65607500	-82.64142200
B-4	34.65611100	-82.64143100

Source: Google Earth (2020)
Scale: Not to Scale

LEGEND

Boring Location

B-# Boring Number

Boring Location Plan
Emergency Bridge Package 2020-1
S-174 (Timms Mill Rd) Bridge over Six & Twenty Cr
Anderson County, South Carolina
ECS Project No.: 14:9922

APPENDIX B – Field Operations

Reference Notes for Boring Logs
Boring Logs (Borings B-1, B-2, B-3, B-2, B-4)
Rock Core Photo Log (Borings B-1, B-2, B-3, B-4)
Photo Log

ECS REFERENCE NOTES FOR SCDOT BORING LOGS - SOIL DESCRIPTIONS

The descriptions noted on the boring logs generally conform to the SCDOT GDM format.

DESCRIPTION FORMAT

GEOLOGIC ORIGIN* - Relative density/consistency, moisture condition, color, angularity, hcl reaction, cementation, secondary component (adj.), particle-size range, PRIMARY COMPONENT (noun), USCS, AASHTO, contains, other

*Such as FILL, ALLUVIUM, RESIDUUM , PARTIALLY WEATHERED ROCK, etc. In Coastal Plain areas, name of formation may be used. Geologic origin is cited only for first sample of geologic type.

RELATIVE DENSITY/CONSISTENCY

SANDS AND GRAVELS

SPT	Density description
0 - 4	Very loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
> 50	Very Dense

SILTS AND CLAYS

SPT	Consistency Description
0 - 2	Very Soft
3 - 4	Soft
5 - 8	Firm
9 - 15	Stiff
16 - 30	Very Stiff
>30	Hard

MOISTURE CONDITION

Dry	Dusty, dry to touch
Moist	Moisture can be felt but not visible
Wet	Water is visible

COLOR

Basic colors (when moist) using the Munsell color chart
Mottled, indicates splotches of various colors
Variegated, indicates thin layers of various colors

ANGULARITY

Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular	Particles are similar to angular description but have rounded edges
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges
Rounded	Particles have smoothly curved sides and no edges

HCL REACTION

None Reactive	No visible reaction
Weakly Reactive	Some reaction, with bubbles forming slowly
Strongly Reactive	Violent reaction, with bubbles forming immediately

CEMENTATION

Weakly Cemented	Crumbles or breaks with handing or little finger pressure
Moderately Cemented	Crumbles or breaks with considerable finger pressure
Strongly Cemented	Will no crumble or break with finger pressure

PARTICLE-SIZE RANGE

SIZE:		12”	3”	¾”	#4	#10	#40	#200	
DESCRIPTION:	BOULDER	COBBLE	GRAVEL		SAND				SILT to CLAY
RANGE:			Coarse	Fine	Coarse	Medium	Fine		
EXAMPLE:	basketball	softball	golf ball	marble	pea	sugar	beach sand		flour

USCS SOIL DESIGNATION

USCS classification per ASTM D 2487 and D 2488

AASHTO SOIL DESIGNATION

AASHTO classification per AASHTO M 145 and ASTM D 3282

CONTAINS

Contains is used to describe non-ASTM components such as roots, construction debris, asphalt concrete, etc. “contains slight” is used for occasional particles, “contains” is used for about 10% to 30% particles, “contains significant” is used for > 30% particles

ECS REFERENCE NOTES FOR SCDOT BORING LOGS - ROCK DESCRIPTIONS

The descriptions noted on the boring logs generally conform to the SCDOT GDM format.

DESCRIPTION FORMAT

Rock origin, TYPE, color, texture, grain size and shape, weathering / alteration, strength, hardness, strike and dip, discontinuity type, discontinuity width, amount of infilling, type of infilling, surface shape of joint, discontinuity spacing, roughness of surface, other

Descriptions are typically provided for each run. When portions of an individual run are notably different, the run may be subdivided into sub-runs with appropriate descriptions provided.

ROCK ORIGIN AND TYPE

Sedimentary:	Breccia, sandstone, siltstone, mudstone, shale, coal, conglomerate, limestone, chert, dolomite, etc.
Metamorphic:	Schist, phyllite, gneiss, marble, metaquartzite, slate, amphibolite, hornfels, serpentine, metatuff, etc.
Igneous:	Granite, syenite, diorite, gabbro, periodite, diabase, basalt, pegmatite, etc.

COLOR

Basic colors (when moist) using the Munsell color chart
Mottled, indicates splotches of various colors
Variegated, indicates thin layers of various colors

TEXTURE

Very Thickly Bedded	> 1.0 m
Thickly Bedded	0.5 to 1.0 m
Thinly Bedded	50 to 500 mm
Very Thinly Bedded	10 to 50 mm
Laminated	2.5 to 10 mm
Thinly Laminated	< 2.5 mm

GRAIN SIZE AND SHAPE

Size

Very coarse grained	> 4.75	Grain sizes greater than popcorn kernels
Coarse grained	2.00 – 4.75	Individual grains easy to distinguish by eye
Medium grained	0.425 – 2.00	Individual grains distinguished by eye
Fine grained	0.075 – 0.425	Individual grains distinguished with difficulty
Very fine grained	<0.075	Individual grains cannot be distinguished by unaided eye

Shape

Angular	Shows little wear; edges and corners are sharp
Subangular	Shows definite effects of wear; edges and corners are slightly rounded off
Subrounded	Shows considerable wear; edges and corners are rounded to smooth curves
Rounded	Shows extreme wear; edges and corners are smoother to broad curves
Well-rounded	Completely worn; edges and corners are not present

WEATHERING / ALTERATION

Residual Soil	Original minerals of rock have been entirely decomposed to secondary minerals, and original rock fabric is not apparent; material can be easily broken by hand
Completely Weather / Altered	Original minerals of rock have been almost entirely decomposed to secondary minerals, although the original fabric may be intact; material can be granulated by hand
Highly Weathered / Altered	More than half of the rock is decomposed; rock is weakened so that a minimum 1-7/8 inch diameter sample can be easily broken readily by hand across rock fabric
Moderately Weathered / Altered	Rock is discolored and noticeably weakened, but less than half is decomposed; a minimum 1-7/8 inch diameter sample cannot be broken readily by hand across rock fabric

Slightly Weathered / Altered	Rock is slightly discolored, but not noticeably lower in strength than fresh rock
Fresh	Rock shows no discoloration, loss of strength, or other effect of weathering / alteration

STRENGTH

Extremely Weak Rock	Can be indented by thumbnail
Very Weak Rock	Can be peeled by pocket knife
Weak Rock	Can be peeled with difficulty by pocket knife
Medium Strong Rock	Can be indented 3/16 inch with sharp end of pick
Strong Rock	Requires one hammer blow to fracture
Very Strong Rock	Requires many hammer blows to fracture
Extremely Strong Rock	Can only be chipped with hammer blows

HARDNESS

Very Soft	Can be deformed by hand
Soft	Can be scratched with a fingernail
Moderately Hard	Can be scratched easily by a knife
Hard	Can be scratched with difficulty by a knife
Very Gard	Can not be scratched with a knife

STRIKE AND DIP

Dip of fracture surface measured relative to horizontal with bearing and direction.

DISCONTINUITY TYPE

F - Fault
J - Joint
Sh - Shear
Fo - Foliation
V - Vein
B - Bedding

DISCONTINUITY WIDTH (MM)

W - Wide (12.5 – 50)
MW - Moderately Wide (2.5 – 12.5)
N - Narrow (1.25 – 2.5)
VN - Very Narrow (<1.25)
T - Tight (0)

AMOUNT OF INFILLING

Su - Surface Stain
Sp - Spotty
Pa - Partially Filled
Fi - Filled
No - None

TYPE OF INFILLING

Cl - Clay
Ca - Calcite
Ch - Chloride
Fe - Iron Oxide
Gy - Gypsum/Tale
H - Healed
No - None
Py - Pyrite
Qz - Quartz
Sd - Sand

SURFACE SHAPE OF JOINT

Wa - Wavy
Pl - Planar
St - Stepped
Ir - Irregular

DISCONTINUITY SPACING (FT)

Ew - Extremely Wide (>65)
W - Wide (22 – 65)
M - Moderate (7.5 – 22)
C - Close (2 – 7.5)
VC - Very Close (<2)

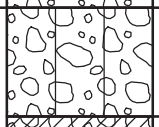
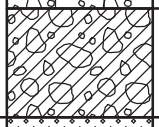
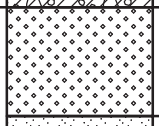
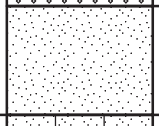
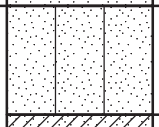
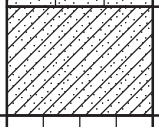
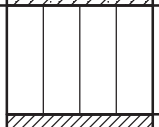
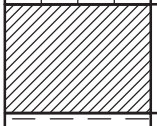
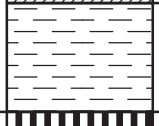
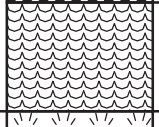
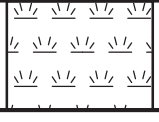
ROUGHNESS OF SURFACE

Slk - Slickensided (surface has smooth, glassy finish with visual evidence of striations)
S - Smooth (surface appears smooth and feels so to the 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)
VR - Very Rough (near-vertical steps and ridges occur on the discontinuity surface)

REC and RQD

Rock Recovery, expressed as REC, is the percentage of the total length or rock recovered divided by the length of the core run. The Rock Quality Designation, expressed as RQD is the percentage of the total length of the rock pieces 4 inches in length or greater divided the length of the rock core run. Mechanical breaks are neglected in determining the RQD.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	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

SCDOT Soil Test Log

Project ID:	P039600			**County:**	Anderson	**Boring No.:**	B-1
Site Description:	Emergency Bridge Package 2020-1					**Route:**	S-4-174
Eng./Geo.:	J. Garrick	**Boring Location:**		**Offset:**		**Alignment:**	
Elev.:	723.4 ft	**Latitude:**	34.656064	**Longitude:**	-82.641136	**Date Started:**	3/3/2020
Total Depth:	29 ft	**Soil Depth:**	14 ft	**Core Depth:**	29 ft	**Date Completed:**	3/3/2020
Bore Hole Diameter (in):	8	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 75	**Drill Method:**	Wash Rotary	**Hammer Type:**	Automatic	**Energy Ratio:**	73%
Core Size:	HQ	**Driller:**	Betts	**Groundwater:**	**TOB** N/A	**24HR**	6.5 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	SPT N VALUE / PL MC LL / FINES CONTENT (%) / RQD (%) / REC (%) (0 10 20 30 40 50 60 70 80 90)
	0.0	Asphalt									
	0.8	Asphalt = 5", Stone = 5"									
		FILL		1.0							
		Firm to Stiff, Moist, Reddish Brown to Orangish Brown, Elastic SILT (MH), (A-7-5(6))			SS-1	6	5	4	5	9	
		LL=55, PL=40, PI=15, NMC=25.1, %200=50		3.0	SS-2	8	4	3	4	7	
718.4				5.0	SS-3	4	3	2	3	5	
	7.0	▼		7.0							
		RESIDUAL			SS-4	8	9	8	10	17	
		Very Stiff, Moist, Reddish Brown, Fine to Medium Sandy SILT (ML), (A-7-6(7))		9.0							
		LL=44, PL=27, PI=17, NMC=21.4, %200=53			SS-5	4	7	10	9	17	
713.4											
	12.0	Very Dense, Moist, Gray, Silty Fine to Medium SAND (SM), (A-2-4)		13.5	SS-6	50/1				100	>>
	14.0			14.0							
		GNEISS, Black and White, Thinly Bedded, Fresh, Strong Rock									
708.4		%REC=100, RQD=100, GSI=65, RMR=77, 1.4 min/ft, qu=7359.9psi			HQ-1						REC=100%, RQD=100%
				19.0							
703.4					HQ-2						REC=100%, RQD=100%
		%REC=100, RQD=100, GSI=65, RMR=77, 2.2 min/ft, qu=13604.5psi		24.0							
698.4					HQ-3						REC=100%, RQD=100%
		%REC=100, RQD=100, GSI=65, RMR=77, 2.5 min/ft, qu=7947.5psi									
	29.0	Boring Terminated @ 29.0'									

SC_DOT S-4-174_ANDERSON COUNTY.GPJ SCDOT_DATATEMPLATE.GDT 3/24/20

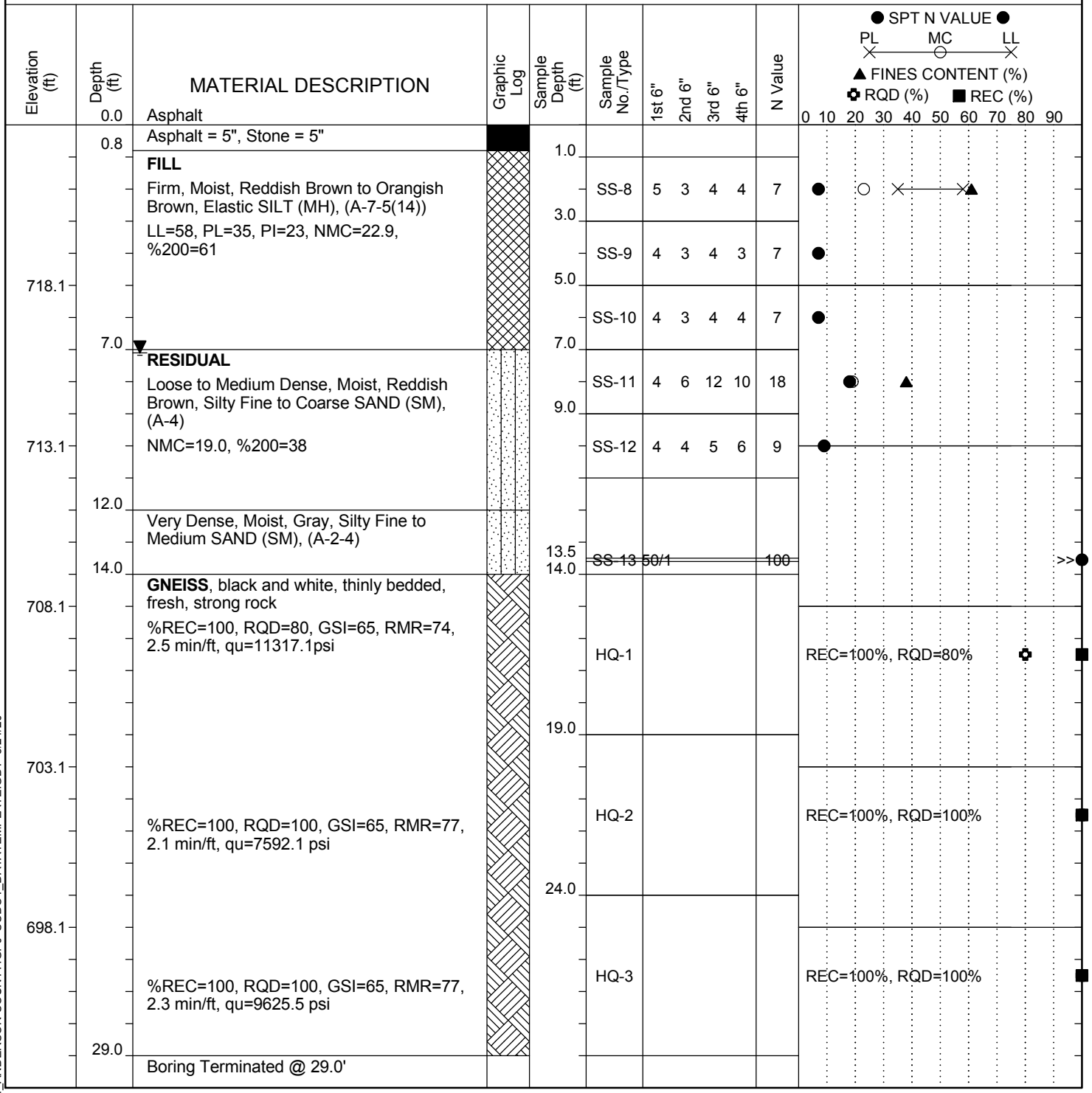
LEGEND

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	

SCDOT Soil Test Log

Project ID:	P039600			**County:**	Anderson	**Boring No.:**	B-2
Site Description:	Emergency Bridge Package 2020-1					**Route:**	S-4-174
Eng./Geo.:	J. Garrick	**Boring Location:**		**Offset:**		**Alignment:**	
Elev.:	723.1 ft	**Latitude:**	34.656097	**Longitude:**	-82.641128	**Date Started:**	3/4/2020
Total Depth:	29 ft	**Soil Depth:**	14 ft	**Core Depth:**	29 ft	**Date Completed:**	3/4/2020
Bore Hole Diameter (in):	8	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 75	**Drill Method:**	Wash Rotary	**Hammer Type:**	Automatic	**Energy Ratio:**	73%
Core Size:	HQ	**Driller:**	Betts	**Groundwater:**	**TOB** N/A	**24HR**	7.1 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
	0.0	Asphalt								
	0.8	Asphalt = 5", Stone = 5"								
		FILL		1.0						
		Firm, Moist, Reddish Brown to Orangish Brown, Elastic SILT (MH), (A-7-5(14))			SS-8	5	3	4	4	7
		LL=58, PL=35, PI=23, NMC=22.9, %200=61		3.0	SS-9	4	3	4	3	7
718.1				5.0	SS-10	4	3	4	4	7
	7.0	**RESIDUAL**		7.0	SS-11	4	6	12	10	18
		Loose to Medium Dense, Moist, Reddish Brown, Silty Fine to Coarse SAND (SM), (A-4)		9.0	SS-12	4	4	5	6	9
713.1		NMC=19.0, %200=38								
	12.0	Very Dense, Moist, Gray, Silty Fine to Medium SAND (SM), (A-2-4)		13.5	~~SS-13~~	~~50/1~~				~~100~~
	14.0			14.0						
708.1		**GNEISS**, black and white, thinly bedded, fresh, strong rock			HQ-1					
		%REC=100, RQD=80, GSI=65, RMR=74, 2.5 min/ft, qu=11317.1psi		19.0						
703.1		%REC=100, RQD=100, GSI=65, RMR=77, 2.1 min/ft, qu=7592.1 psi			HQ-2					
				24.0						
698.1		%REC=100, RQD=100, GSI=65, RMR=77, 2.3 min/ft, qu=9625.5 psi			HQ-3					
	29.0	Boring Terminated @ 29.0'								



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 S-4-174_ANDERSON COUNTY.GPJ SCDOT_DATATEMPLATE.GDT 3/24/20

SCDOT Soil Test Log

Project ID:	P039600			**County:**	Anderson	**Boring No.:**	B-3
Site Description:	Emergency Bridge Package 2020-1					**Route:**	S-4-174
Eng./Geo.:	J. Garrick	**Boring Location:**		**Offset:**		**Alignment:**	
Elev.:	722.3 ft	**Latitude:**	34.656075	**Longitude:**	-82.641422	**Date Started:**	3/5/2020
Total Depth:	46 ft	**Soil Depth:**	31 ft	**Core Depth:**	46 ft	**Date Completed:**	3/5/2020
Bore Hole Diameter (in):	6	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 75	**Drill Method:**	Wash Rotary	**Hammer Type:**	Automatic	**Energy Ratio:**	73%
Core Size:	HQ	**Driller:**	Betts	**Groundwater:**	**TOB** N/A	**24HR**	8.4 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
	0.0	Grass Shoulder								
		FILL		0.0						
		Loose to Medium Dense, Moist, Reddish Brown to Orangish Brown, Silty Fine to Coarse SAND (SM), (A-2-4)			SS-15	9	9	7	7	16
		NMC=14.6, %200=27		2.0						
					SS-16	4	4	4	5	8
		NMC=22.6, %200=49		4.0						
717.3					SS-17	3	2	3	2	5
				6.0						
					SS-18	3	2	3	5	5
		NMC=22.5, %200=38		8.0						
					SS-19	3	5	2	3	7
712.3										
	12.0	**RESIDUAL**								
		Dense to Very Dense, Moist, Grayish Brown, Fine to Coarse SAND with Silt (SP), (A-1-b)		13.5						
					SS-20	12	13	15		28
707.3		NMC=8.1, %200=15								
				18.5						
					SS-21	8	15	24		39
702.3										
				23.5						
		NMC=16.0, %200=19			SS-22	27	12	28		40
697.3										
				28.5						
					SS-23	32	50/3			100

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)
0 10 20 30 40 50 60 70 80 90

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:	P039600			**County:**	Anderson	**Boring No.:**	B-3
Site Description:	Emergency Bridge Package 2020-1					**Route:**	S-4-174
Eng./Geo.:	J. Garrick	**Boring Location:**		**Offset:**		**Alignment:**	
Elev.:	722.3 ft	**Latitude:**	34.656075	**Longitude:**	-82.641422	**Date Started:**	3/5/2020
Total Depth:	46 ft	**Soil Depth:**	31 ft	**Core Depth:**	46 ft	**Date Completed:**	3/5/2020
Bore Hole Diameter (in):	6	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 75	**Drill Method:**	Wash Rotary	**Hammer Type:**	Automatic	**Energy Ratio:**	73%
Core Size:	HQ	**Driller:**	Betts	**Groundwater:**	**TOB** N/A	**24HR**	8.4 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	SPT N VALUE / PL MC LL / FINES CONTENT (%) / RQD (%) / REC (%)
	31.0			31.0				
		GNEISS, black and white, thinly bedded, fresh, strong rock			HQ-1			REC=100%, RQD=77%
		%REC=100, RQD=77, GSI=65, RMR=74, 1.9 min/ft, qu=9813.8 psi		34.0				
687.3					HQ-2			REC=100%, RQD=96%
		%REC=100, RQD=96, GSI=75, RMR=82, 2.6 min/ft, qu=16224.0 psi		39.0				
682.3					HQ-3			REC=100%, RQD=80%
		%REC=100, RQD=80, GSI=75, RMR=79, 2.3 min/ft, qu=16485.4 psi		44.0				
677.3					HQ-4			REC=100%, RQD=75%
	46.0	%REC=100, RQD=75, GSI=65, RMR=74, 2.6 min/ft, qu=12731.4 psi						
		Boring Terminated @ 46.0'						
672.3								
667.3								

LEGEND

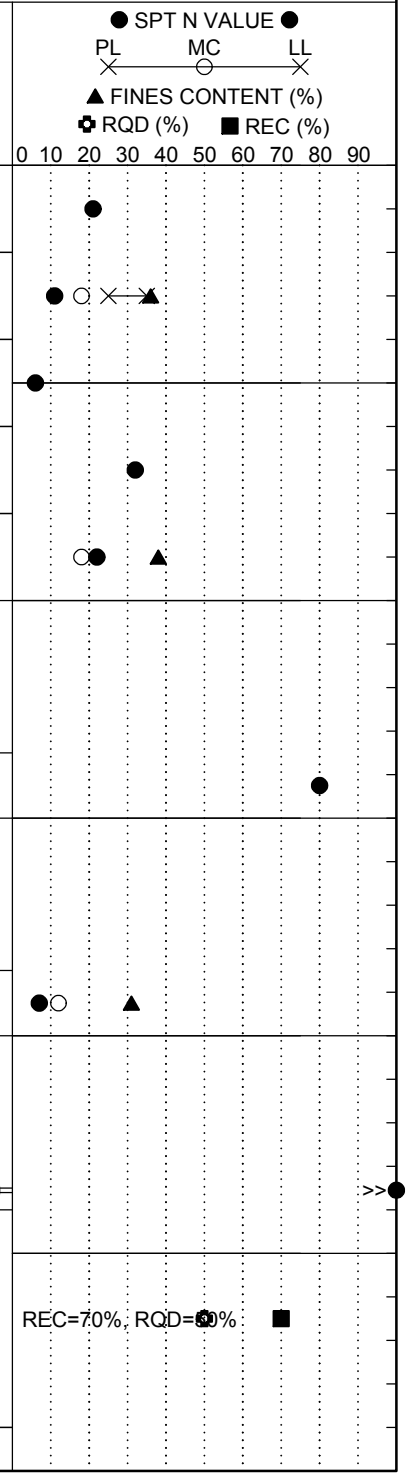
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC_DOT S-4-174_ANDERSON COUNTY.GPJ SCDOT_DATATEMPLATE.GDT 3/24/20

SCDOT Soil Test Log

Project ID:	P039600			**County:**	Anderson	**Boring No.:**	B-4
Site Description:	Emergency Bridge Package 2020-1					**Route:**	S-4-174
Eng./Geo.:	J. Garrick	**Boring Location:**		**Offset:**		**Alignment:**	
Elev.:	721.8 ft	**Latitude:**	34.656111	**Longitude:**	-82.641431	**Date Started:**	3/6/2020
Total Depth:	44 ft	**Soil Depth:**	24 ft	**Core Depth:**	44 ft	**Date Completed:**	3/6/2020
Bore Hole Diameter (in):	6	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 75	**Drill Method:**	Wash Rotary	**Hammer Type:**	Automatic	**Energy Ratio:**	73%
Core Size:	HQ	**Driller:**	Betts	**Groundwater:**	**TOB** N/A	**24HR**	9.7 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
	0.0	Grass Shoulder								
		FILL Medium Dense, Moist, Reddish Brown to Orangish Brown, Silty Fine to Coarse SAND with trace gravel (SM), (A-4(0)) LL=35, PL=25, PI=10, NMC=17.8, %200=36		0.0	SS-25	8	11	10	10	21
				2.0	SS-26	5	6	5	4	11
				4.0	SS-27	4	3	3	3	6
716.8	6.0	**RESIDUAL** Medium Dense to Very Dense, Moist, Grayish Brown, Silty Fine to Medium SAND (SM), (A-2-4) NMC=17.5, %200=38		6.0	SS-28	6	11	21	23	32
				8.0	SS-29	8	14	8	12	22
711.8										
				13.5	SS-30	16	42	38		80
706.8										
	17.0	Loose, Wet, Orangish Brown, Silty Fine to Coarse SAND (SM), (A-2-4) NMC=12.4, %200=31		18.5	SS-31	2	3	4		7
701.8										
	22.0	Very Dense, Moist, Grayish Brown, Silty Fine to Coarse SAND (SM), (A-2-4)		23.5	SS-32	50/1				100
	24.0	**GNEISS**, Black and White, Thinly Bedded, Moderately Weathered, Medium Strong Rock %REC=70, RQD=50, GSI=45, RMR=26, 2.0 min/ft		24.0	HQ-1					REC=70%, RQD=50%
696.8				29.0						



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 S-4-174_ANDERSON COUNTY.GPJ SCDOT_DATATEMPLATE.GDT 3/24/20

SCDOT Soil Test Log

Project ID:	P039600			**County:**	Anderson	**Boring No.:**	B-4
Site Description:	Emergency Bridge Package 2020-1					**Route:**	S-4-174
Eng./Geo.:	J. Garrick	**Boring Location:**		**Offset:**		**Alignment:**	
Elev.:	721.8 ft	**Latitude:**	34.656111	**Longitude:**	-82.641431	**Date Started:**	3/6/2020
Total Depth:	44 ft	**Soil Depth:**	24 ft	**Core Depth:**	44 ft	**Date Completed:**	3/6/2020
Bore Hole Diameter (in):	6	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 75	**Drill Method:**	Wash Rotary	**Hammer Type:**	Automatic	**Energy Ratio:**	73%
Core Size:	HQ	**Driller:**	Betts	**Groundwater:**	**TOB** N/A	**24HR**	9.7 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	SPT N VALUE / PL MC LL / FINES CONTENT (%) / RQD (%) / REC (%)
		%REC=82, RQD=34, GSI=55, RMR=44, 1.4 min/ft			HQ-2			REC=82%, RQD=34%
686.8	34.0	**GNEISS**, Black and White, Thinly Bedded, Moderately to Slightly Weathered, Strong Rock %REC=88, RQD=64, GSI=55, RMR=52, 2.1 min/ft, qu=9038.1 psi		34.0	HQ-3			REC=88%, RQD=64%
681.8	39.0	**GNEISS**, Black and White, Thinly Bedded, Fresh, Strong Rock %REC=100, RQD=100, GSI=65, RMR=82, 3.1 min/ft, qu=17311.1 psi		39.0	HQ-4			REC=100%, RQD=100%
676.8	44.0	Boring Terminated @ 44.0'						
671.8								
666.8								

SC_DOT S-4-174_ANDERSON COUNTY.GPJ SCDOT_DATATEMPLATE.GDT 3/24/20

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	

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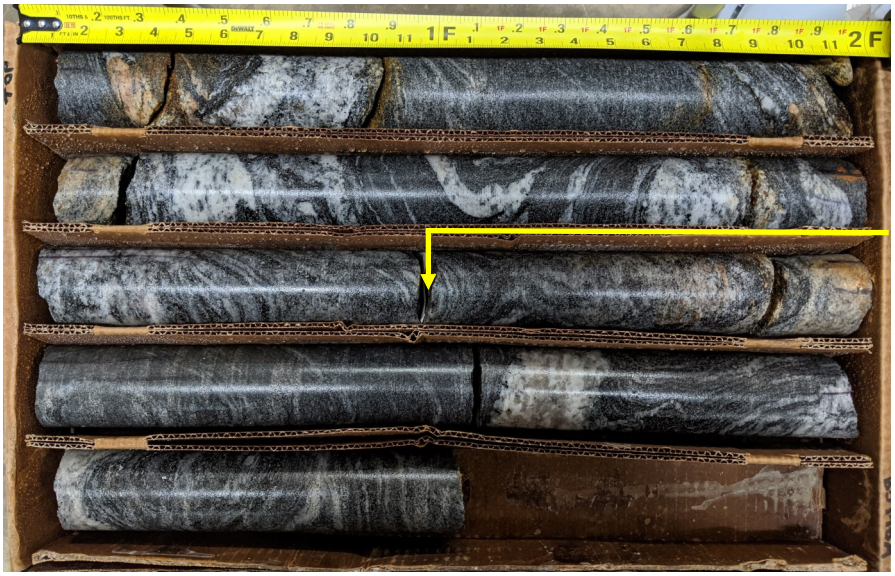
Greenville, SC 29607
Phone: 864-987-1610

ROCK CORE PHOTO LOG

Boring B-1

Project Name: 2020-1 SCDOT Emergency Bridge Package Bridge Replacement over Six and Twenty Creek on Timms Mill Road	Project Number: 14:9922
Project Location: Anderson County, South Carolina	Date: 3/9/2020

Begin HQ-1
14.0 ft



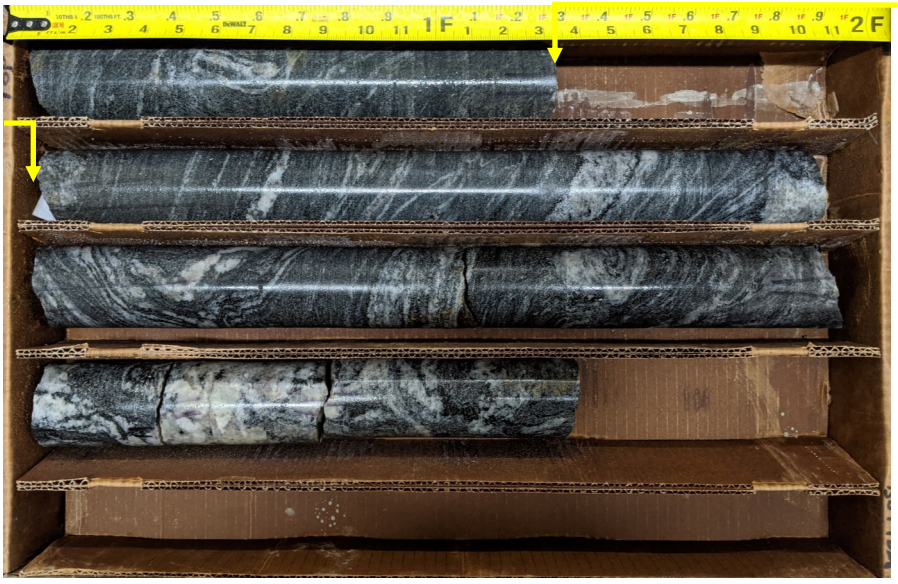
Begin HQ-2
19.0 ft

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

End HQ-2
24.0 ft

Begin HQ-3
24.0 ft



End HQ-3
29.0 ft

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

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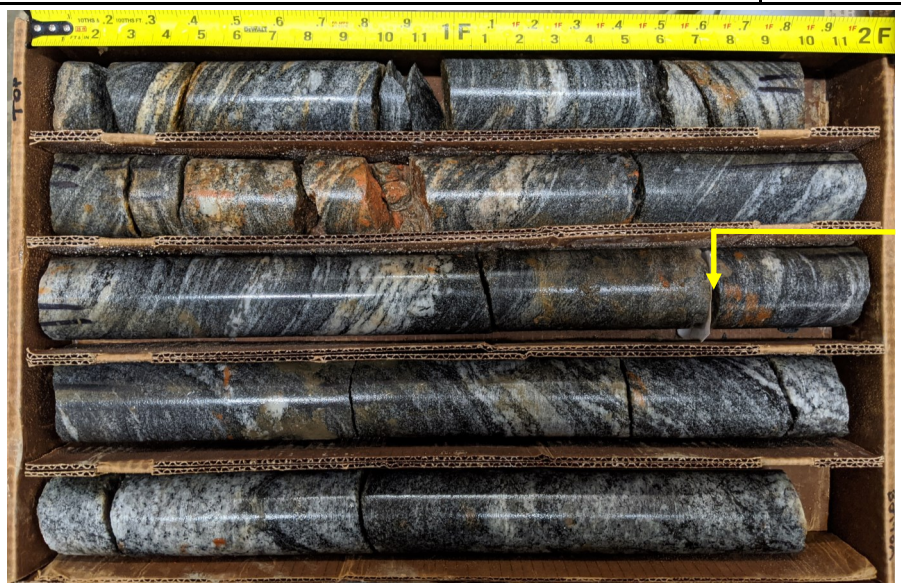
ROCK CORE PHOTO LOG

Boring B-2

Project Name: 2020-1 SCDOT Emergency Bridge Package Bridge Replacement over Six and Twenty Creek on Timms Mill Road	Project Number: 14:9922
Project Location: Anderson County, South Carolina	Date: 3/9/2020

Begin HQ-1
14.0 ft

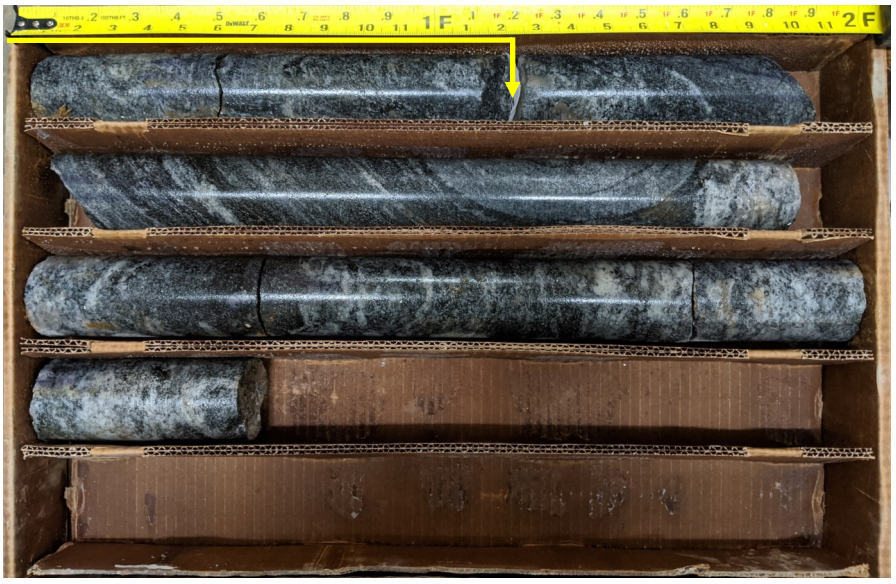


Begin HQ-2
19.0ft

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

Begin HQ-3
24.0 ft



End HQ-3
29.0 ft

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

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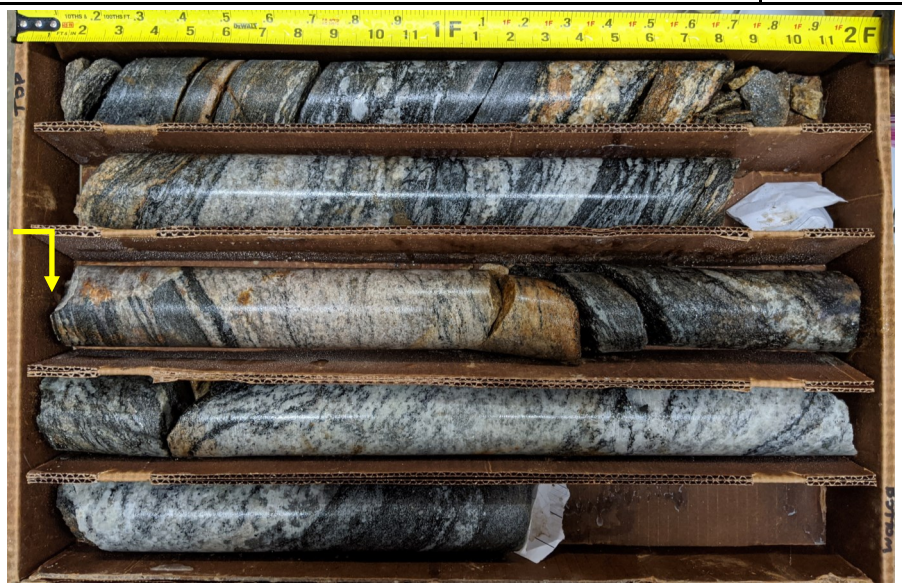
ROCK CORE PHOTO LOG

Boring B-3

Project Name: 2020-1 SCDOT Emergency Bridge Package Bridge Replacement over Six and Twenty Creek on Timms Mill Road	Project Number: 14:9922
Project Location: Anderson County, South Carolina	Date: 3/9/2020

Begin HQ-1
31. 0 ft

Begin HQ-2
34.0 ft



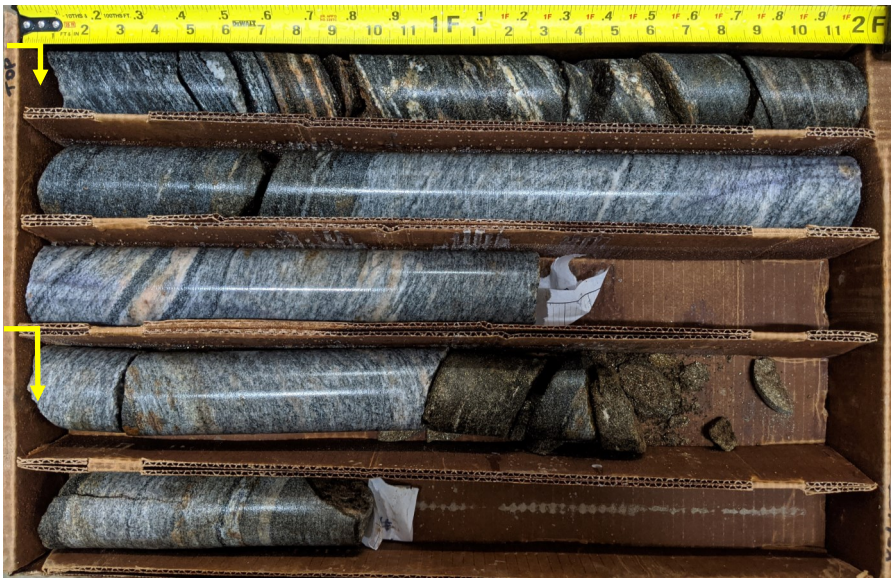
End HQ-2
39.0 ft

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

Begin HQ-3
39.0 ft

Begin HQ-4
44.0 ft



End HQ-4
46.0 ft

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

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Greenville, SC 29607
Phone: 864-987-1610

ROCK CORE PHOTO LOG

Boring B-4

Project Name: 2020-1 SCDOT Emergency Bridge Package Bridge Replacement over Six and Twenty Creek on Timms Mill Road	Project Number: 14:9922
Project Location: Anderson County, South Carolina	Date: 3/9/2020

Begin HQ-1
24.0 ft

Begin HQ-2
29.0 ft

End HQ-1
29.0 ft

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

Begin HQ-3
34.0 ft

Begin HQ-4
39.0 ft

End HQ-4
44.0 ft

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

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1200 Woodruff Road, H-12
Greenville, SC 29607
Phone: 864-987-1610

PHOTO LOG

Project Name: Emergency Bridge Package 2020-1 S-174 Bridge on Timms Mill Road over Six & Twenty Creek	Project Number: 14:9922
Project Location: Anderson County, South Carolina	Date: 03/20/2020

Photo 1: Drill Rig at Boring B-1

Photo 2: Drill Rig at Boring B-2

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Greenville, SC 29607
Phone: 864-987-1610

PHOTO LOG

Project Name: Emergency Bridge Package 2020-1 S-174 Bridge on Timms Mill Road over Six & Twenty Creek	Project Number: 14:9922
Project Location: Anderson County, South Carolina	Date: 03/20/2020

Photo 3: Drill Rig at Boring B-3

Photo 4: Drill Rig at Boring B-7

APPENDIX C – Laboratory Testing

Summary of Laboratory Results
Atterberg Limits Results
Laboratory Data Sheets (15 sheets)
Rock Core Summary
Uniaxial Compressive Strength Reports (12 sheets)

SUMMARY OF LABORATORY RESULTS

PROJECT ID N/A **PROJECT NAME** Emergency Bridge Package 2020-1

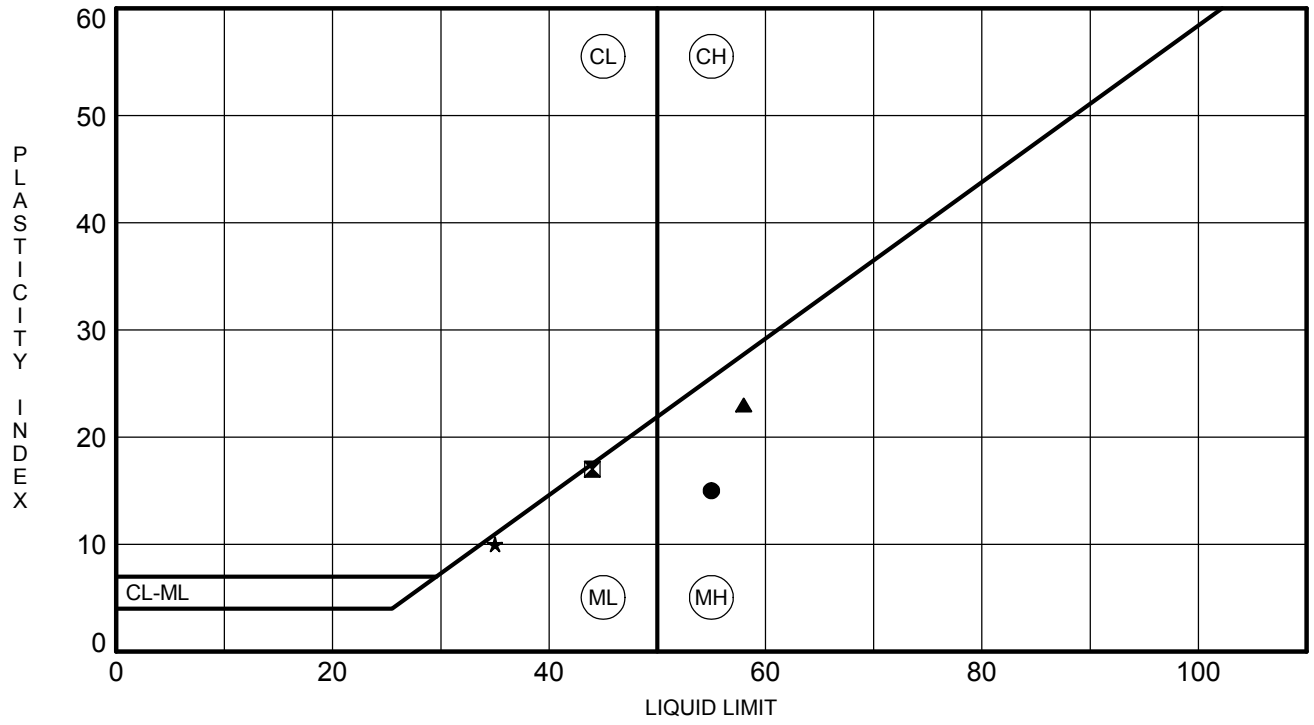
PROJECT COUNTY Anderson

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
B-1	5.0	55	40	15	4.76	50	MH	25.1			
B-1	9.0	44	27	17	4.76	53	ML	21.4			
B-2	0.8	58	35	23	4.76	61	MH	22.9			
B-2	7.0				4.76	38	SM	19.0			
B-3	0.0				2	27	SM	14.6			
B-3	4.0				4.76	49	SM	22.6			
B-3	8.0				4.76	38	SM	22.5			
B-3	13.5				2	15	SP	8.1			
B-3	23.5				2	19	SP	16.0			
B-4	2.0	35	25	10	4.76	36	SM	17.8			
B-4	8.0				2	38	SM	17.5			
B-4	18.5				4.76	31	SM	12.4			

ATTERBERG LIMITS' RESULTS

PROJECT ID N/A **PROJECT NAME** Emergency Bridge Package 2020-1

PROJECT COUNTY Anderson



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-1**	**5.0**	**55**	**40**	**15**		**Orangish Brown Elastic SILT**
⊠	**B-1**	**9.0**	**44**	**27**	**17**		**Reddish Brown Fine to Medium Sandy SITL**
▲	**B-2**	**0.8**	**58**	**35**	**23**		**Orangish Brown Elastic SILT**
★	**B-4**	**2.0**	**35**	**25**	**10**		**Reddish Brown Fine to Coarse Sandy SILT**

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SOIL
TESTS, LLC

1874 Forge Street Tucker, GA 30084
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Fax: 770-923-8973
Web: www.test-llc.com

AASHTO ACCREDITED

Tested By	EB
Date	03/16/20
Checked By	LB

Client Pr. #	14:9922	Lab. PR. #	2020B-03-1
Pr. Name	Emergency Bridge Package 2020-1	S. Type	Bulk (Composite)
Sample ID	33464/SS-15 & SS-18	Depth/Elev.	0-8'
Location	B-3	Add. Info	-

ASTM G 57/G187/AASHTO T 288

Standard Test Method for Determining Minimum Laboratory Soil Resistivity

Determination of Resistivity at as-received moisture content

As-received Moisture Content	
Mass of Wet Sample & Tare, g	
Mass of Dry Sample & Tare, g	
Mass of Tare, g	
Moisture Content, %	NA

Remarks

TEST DATA

Mass of Soil Box, g	-	Meter Dial Reading, ohms	-
Mass of Soil Box + Soil, g	-	Reading of Meter Range Multiplier	-
Mass of Soil, g	-	Measured Resistance, ohms	NA
Calibrated Volume of Soil Box, ft^3	0.0027	Calibrated Soil Box Multiplier, cm	1.0
Wet Density of as-placed Soil, pcf	-		
Dry Density of as-placed Soil, pcf	-	**Reported Soil Resistivity, ohms-cm**	**NA**

Determination of Minimum Soil Resistivity

TEST DATA

	Trials at Various Moisture Content								
TRIAL #	1	2	3	4	5	6	7	8	9
Meter Dial Reading, ohms	12.4	11.6	10.4	9.12	9.12				
Reading of Meter Range Multiplier	K	K	K	K	K				
Measured Resistance, ohms	12400	11600	10400	9120	9120				
Calibrated Soil Box Multiplier, cm	1.0	1.0	1.0	1.0	1.0				
Measured Resistivity, ohms-cm	12400	11600	10400	9120	9120				

Reported Soil Minimum Resistivity, ohms-cm **9120**

Note: Material passed # 10 sieve used for testing

Oven ID #	496/610
Balance ID #	563/700
Soil Box ID #	612/613/707
Resistivity Meter ID #	706

Description

NA

USCS (D2487; D2488)	NA
AASHTO (M145)	NA

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ENGINEERING
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Tested By	EB
Date	03/16/20
Checked By	

Client Pr. #	14:9922	Lab. PR. #	2020B-03-1
Pr. Name	Emergency Bridge Package 2020-1	S. Type	Bulk (Composite)
Sample ID	33464/SS-15 & SS-18	Depth/Elev.	0-8'
Location	B-3	Add. Info	-

ASTM G51

Standard Test Method for Determining pH of Soil for Use in Corrosion Testing

SAMPLE PREPARATION

Roots, Stones, Gravel and other deleterious material was removed prior to testing

Measurements performed ar room temperature condition: 18.9 °C

TEST DATA

T.E.S.T. Sample ID	Client Sample ID	pH meter Reading #1	pH meter Reading #2	pH meter Reading #3	**Reported pH value**
33464	See Above	6.09	6.10	6.08	**6.1**

REMARKS

NIST TRACEABLE BUFFER SOLUTIONS (4.0; 7.0; 10.0 pH) were used for CALIBRATION of pH METER prior to testing.

pH Meter ID 375/732/733

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Tested By	KP
Date	03/18/20
Checked By	[signature]

Client Pr. #	14:9922 & 08:14113	Lab. PR. #	2020B-03-1
Pr. Name	Emergency Bridge Package 2020-1	S. Type	Bag
Sample ID	Various (see below)	Depth/Elev.	Various (see below)
Location	-	Add. Info	-

Analytical Testing Results for
Water Soluble Chloride Ion Content in Soil (Method AASHTO T291)

T.E.S.T. Sample ID	Client Sample ID	Sample Depth/Elevation, ft	Result, mg/kg-dry	Remarks
33464	B-3 (SS-15, SS-18)	0-8	**36.3**	
33521	B-6 (SS-34, SS-38)	0-10	**12.8**	

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AASHTO ACCREDITED

Tested By	KP
Date	03/20/20
Checked By	

Client Pr. #	14:9922	Lab. PR. #	2020B-03-1
Pr. Name	Emergency Bridge Package 2020-1	S. Type	Bag
Sample ID	Various (see below)	Depth/Elev.	Various (see below)
Location	-	Add. Info	-

Analytical Testing Results for

Water Soluble Sulfate Ion Content in Soil (Method AASHTO T290)

T.E.S.T. Sample ID	Client Sample ID	Sample Depth/Elevation, ft	Result, mg/kg-dry	Remarks
33464	SS-15 & SS-18	0-8	**10**	
33521	SS-34 & SS-38	0-10	**<5**	

INDEX PROPERTIES VERSUS DEPTH

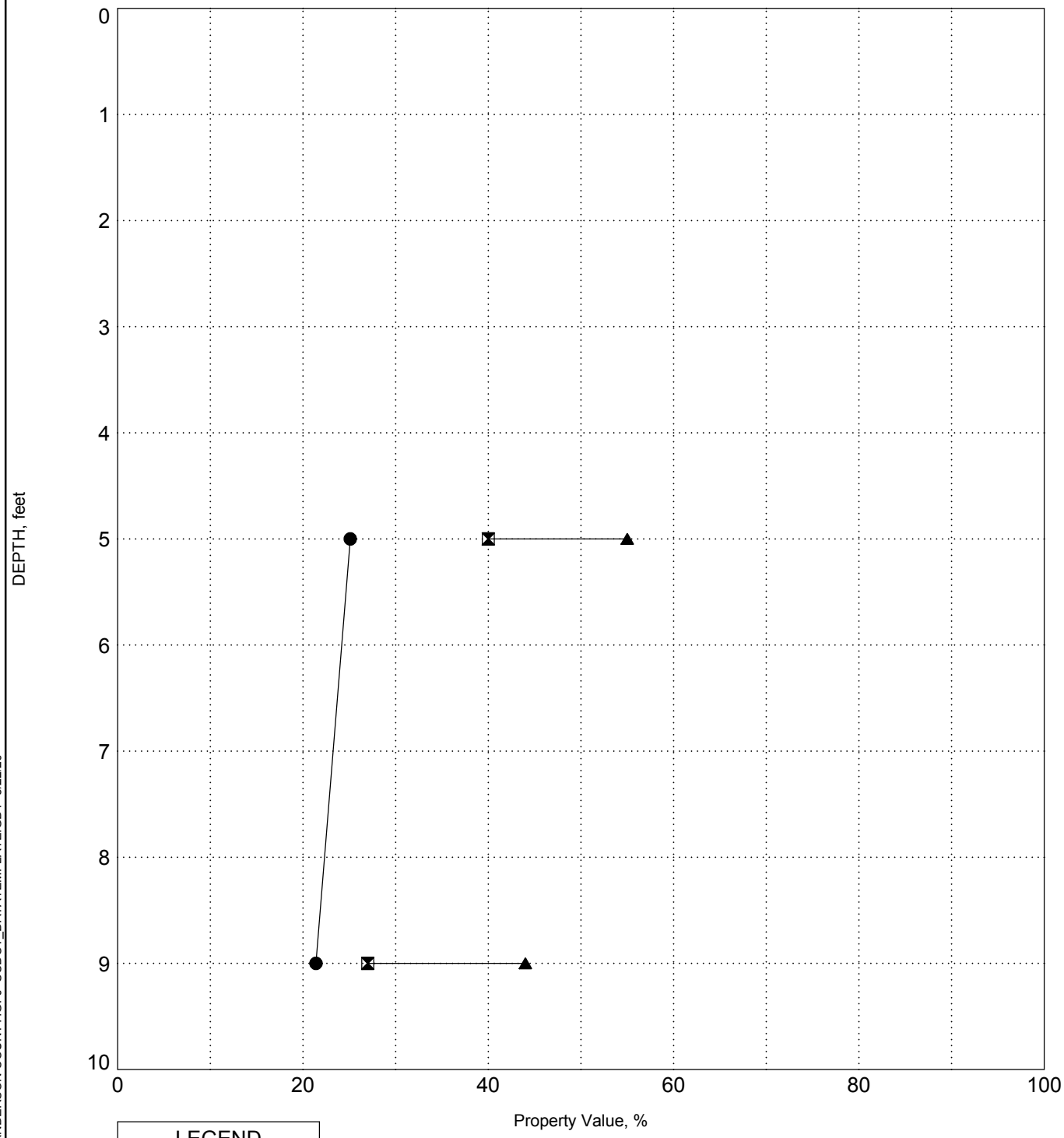
PROJECT ID N/A

PROJECT NAME Emergency Bridge Package 2020-1

PROJECT COUNTY Anderson

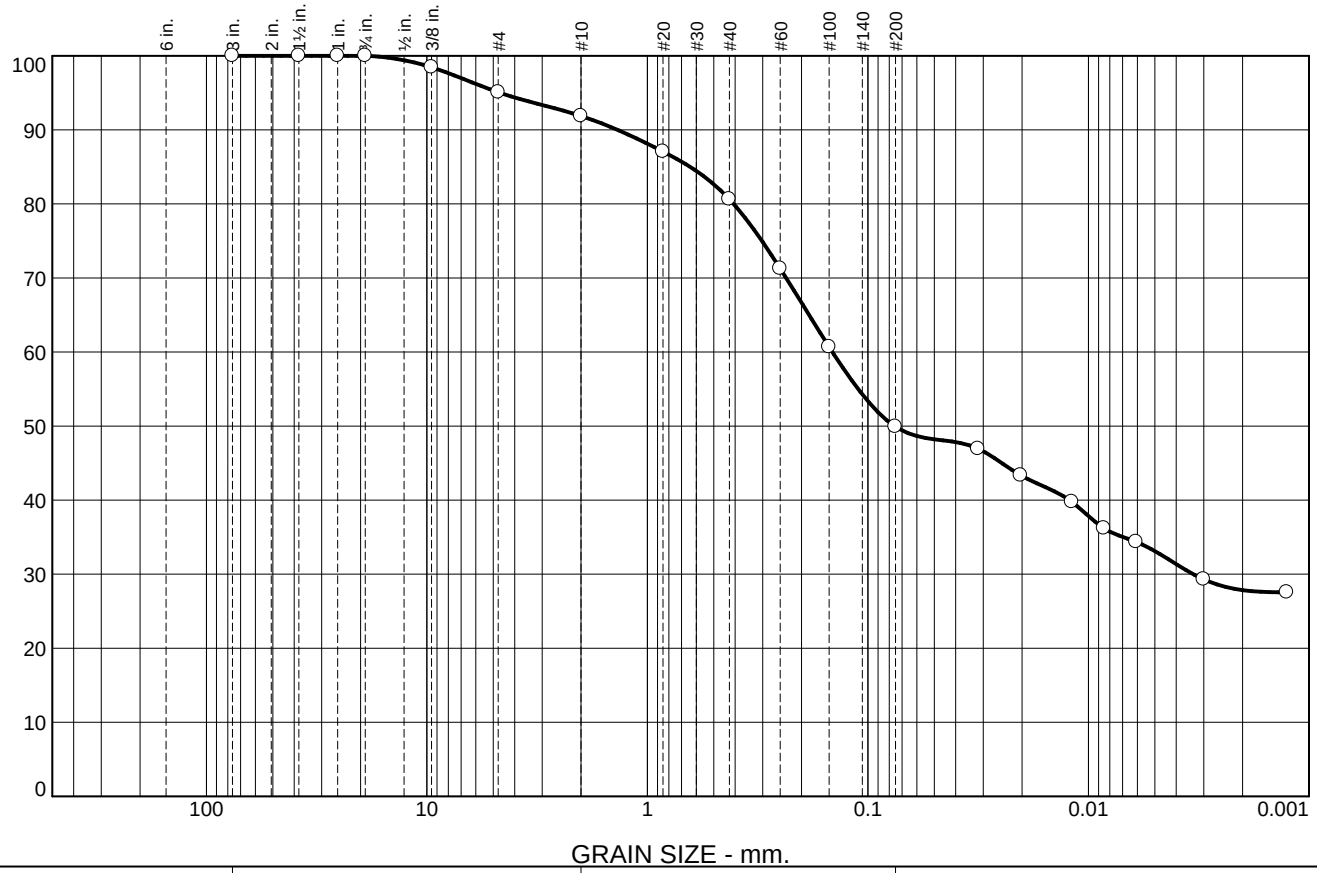
BORING B-1

SURFACE ELEVATION: 723.4



INDEX PROPS S-4-174_ANDERSON COUNTY.GPJ SCDOT_DATATEMPLATE.GDT 3/22/20

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0	8	11	31	22	28

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
1.5	100		
1	100		
.75	100		
.375	98		
#4	95		
#10	92		
#20	87		
#40	81		
#60	71		
#100	61		
#200	50		
0.0316 mm.	47		
0.0203 mm.	43		
0.0119 mm.	40		
0.0085 mm.	36		
0.0061 mm.	34		
0.0030 mm.	29		
0.0013 mm.	28		

* (no specification provided)

Soil Description

Light orange/brown Sandy Silt (A-7-5(6))

Atterberg Limits

PL= 40 LL= 55 PI= 15

Coefficients

D_{90}= 1.3672 D_{85}= 0.6402 D_{60}= 0.1449
D_{50}= 0.0757 D_{30}= 0.0033 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-7-5(6)

Remarks

Natural Moisture: 25.1%
F.M.=1.05

Sample Number: B-1 **Depth:** SS-3

Date: 3.20.2020

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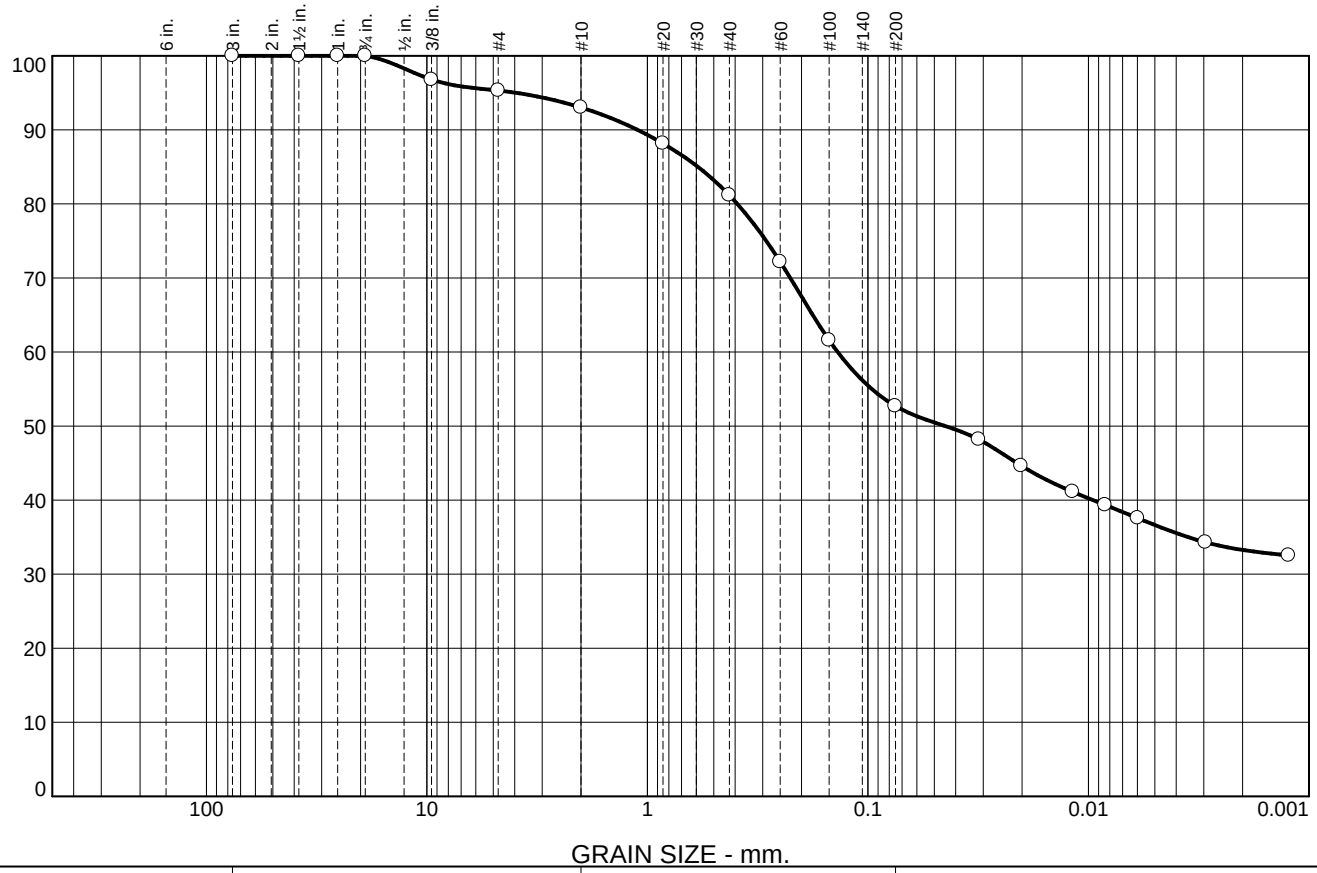
Client: SCDOT
Project: Emergency Bridge Package 2020-1 - York County

Project No: 14:9922 **Figure**

Tested By: CER

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0	7	12	28	20	33

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
1.5	100		
1	100		
.75	100		
.375	97		
#4	95		
#10	93		
#20	88		
#40	81		
#60	72		
#100	62		
#200	53		
0.0314 mm.	48		
0.0202 mm.	45		
0.0118 mm.	41		
0.0084 mm.	39		
0.0060 mm.	38		
0.0029 mm.	34		
0.0012 mm.	33		

* (no specification provided)

Soil Description

Orange/brwon Silty Clay (A-7-6(7))

Atterberg Limits

PL= 27 LL= 44 PI= 17

Coefficients

D_{90}= 1.1105 D_{85}= 0.5899 D_{60}= 0.1372
D_{50}= 0.0446 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-7-6(7)

Remarks

Natural Moisture: 21.4%
F.M.=1.01

Sample Number: B-1 **Depth:** SS-5

Date: 3.20.2020

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Project: Emergency Bridge Package 2020-1 - York County

Project No: 14:9922 **Figure**

Tested By: CER

INDEX PROPERTIES VERSUS DEPTH

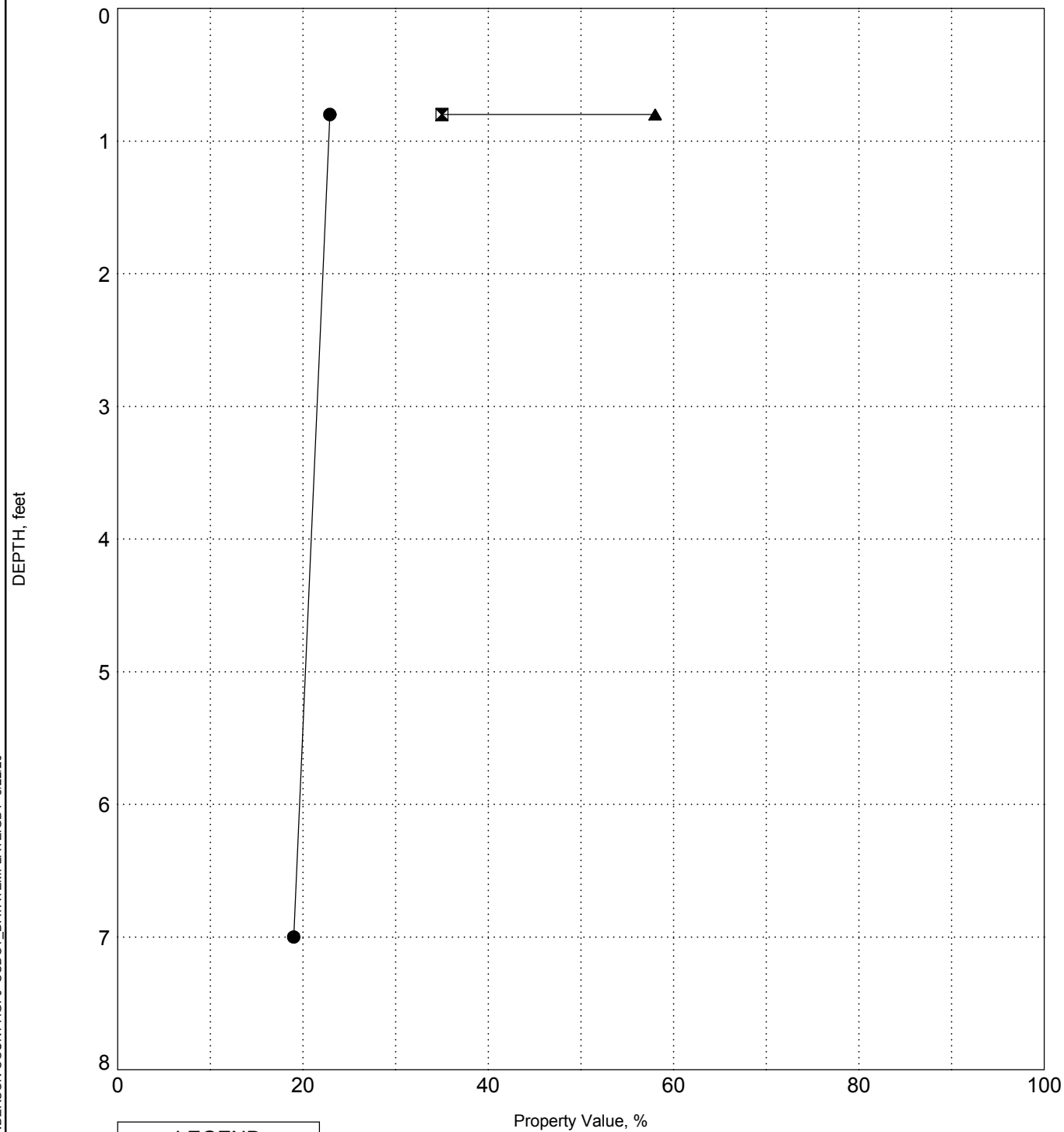
PROJECT ID N/A

PROJECT NAME Emergency Bridge Package 2020-1

PROJECT COUNTY Anderson

BORING B-2

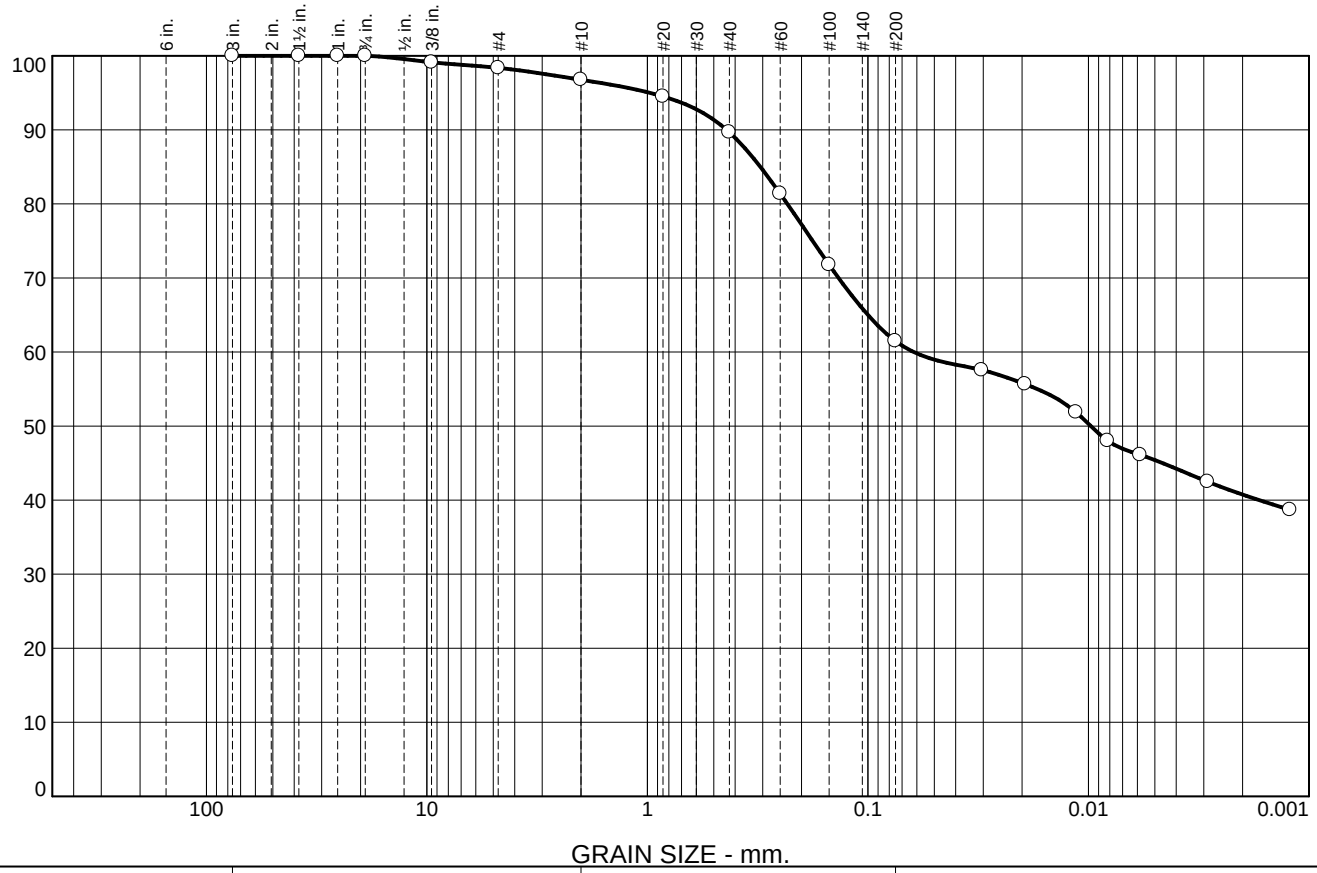
SURFACE ELEVATION: 723.1



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

INDEX PROPS S-4-174_ANDERSON COUNTY.GPJ SCDOT_DATATEMPLATE.GDT 3/22/20

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0	3	7	29	20	41

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
1.5	100		
1	100		
.75	100		
.375	99		
#4	98		
#10	97		
#20	95		
#40	90		
#60	81		
#100	72		
#200	61		
0.0304 mm.	58		
0.0194 mm.	56		
0.0114 mm.	52		
0.0082 mm.	48		
0.0058 mm.	46		
0.0029 mm.	42		
0.0012 mm.	39		

* (no specification provided)

Soil Description

Orange Silty Clay (A-7-5(14))

Atterberg Limits

PL= 35 LL= 58 PI= 23

Coefficients

D_{90}= 0.4374 D_{85}= 0.3075 D_{60}= 0.0620
D_{50}= 0.0098 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(14)

Remarks

Natural Moisture: 22.9%
F.M.=0.61

Sample Number: B-2 **Depth:** SS-1

Date: 3.20.2020

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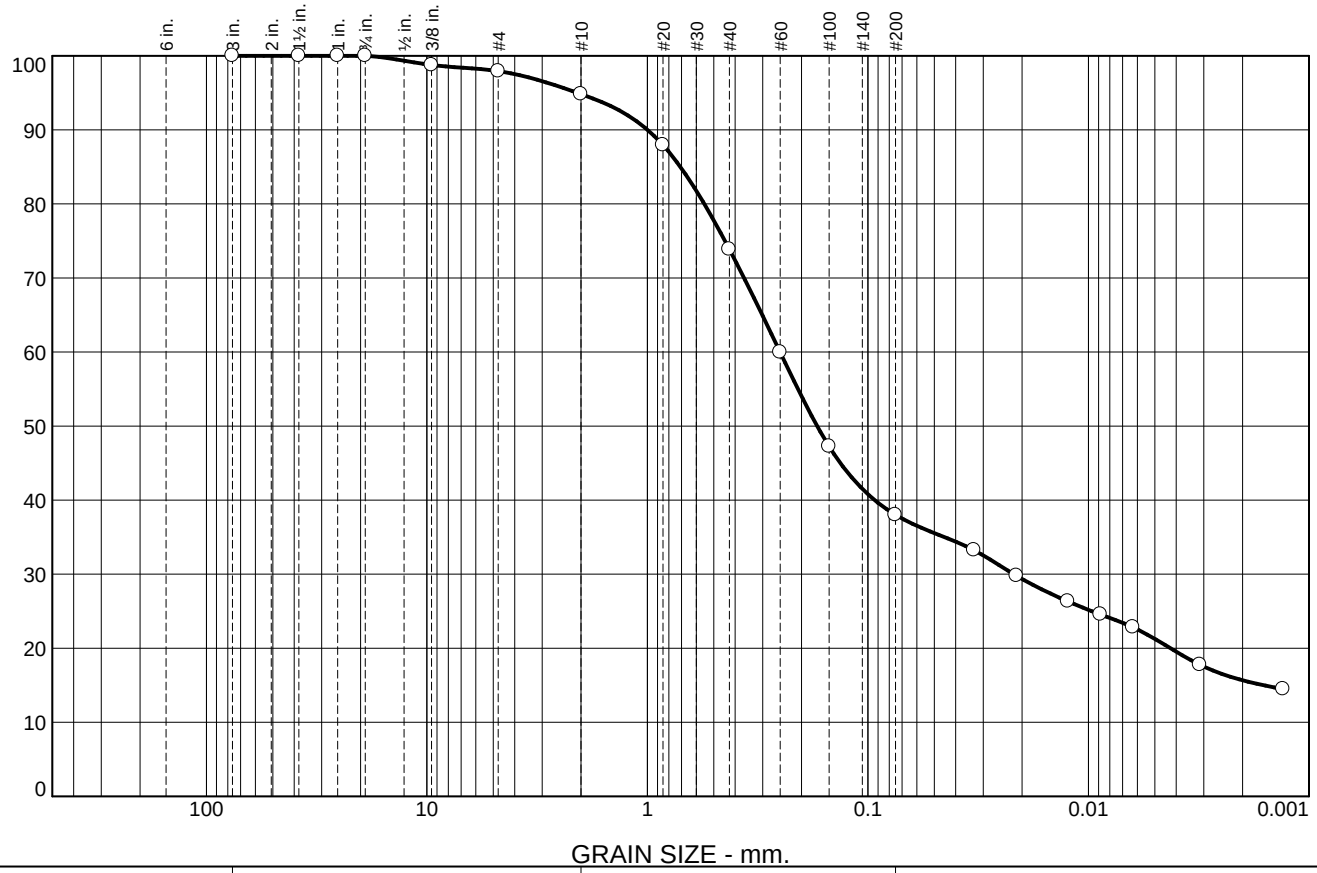
Client: SCDOT

Project: Emergency Bridge Package 2020-1 - York County

Project No: 14:9922 **Figure**

Tested By: CER

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0	5	21	36	22	16

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
1.5	100		
1	100		
.75	100		
.375	99		
#4	98		
#10	95		
#20	88		
#40	74		
#60	60		
#100	47		
#200	38		
0.0330 mm.	33		
0.0212 mm.	30		
0.0124 mm.	26		
0.0088 mm.	25		
0.0063 mm.	23		
0.0031 mm.	18		
0.0013 mm.	14		

* (no specification provided)

Soil Description

Gray/brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.9989 D_{85}= 0.7087 D_{60}= 0.2504
D_{50}= 0.1700 D_{30}= 0.0218 D_{15}= 0.0016
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Natural Moisture: 19.0%
F.M.=1.22

Sample Number: B-2 **Depth:** SS-4

Date: 3.20.2020

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Client: SCDOT
Project: Emergency Bridge Package 2020-1 - York County

Project No: 14:9922 **Figure**

Tested By: CER

INDEX PROPERTIES VERSUS DEPTH

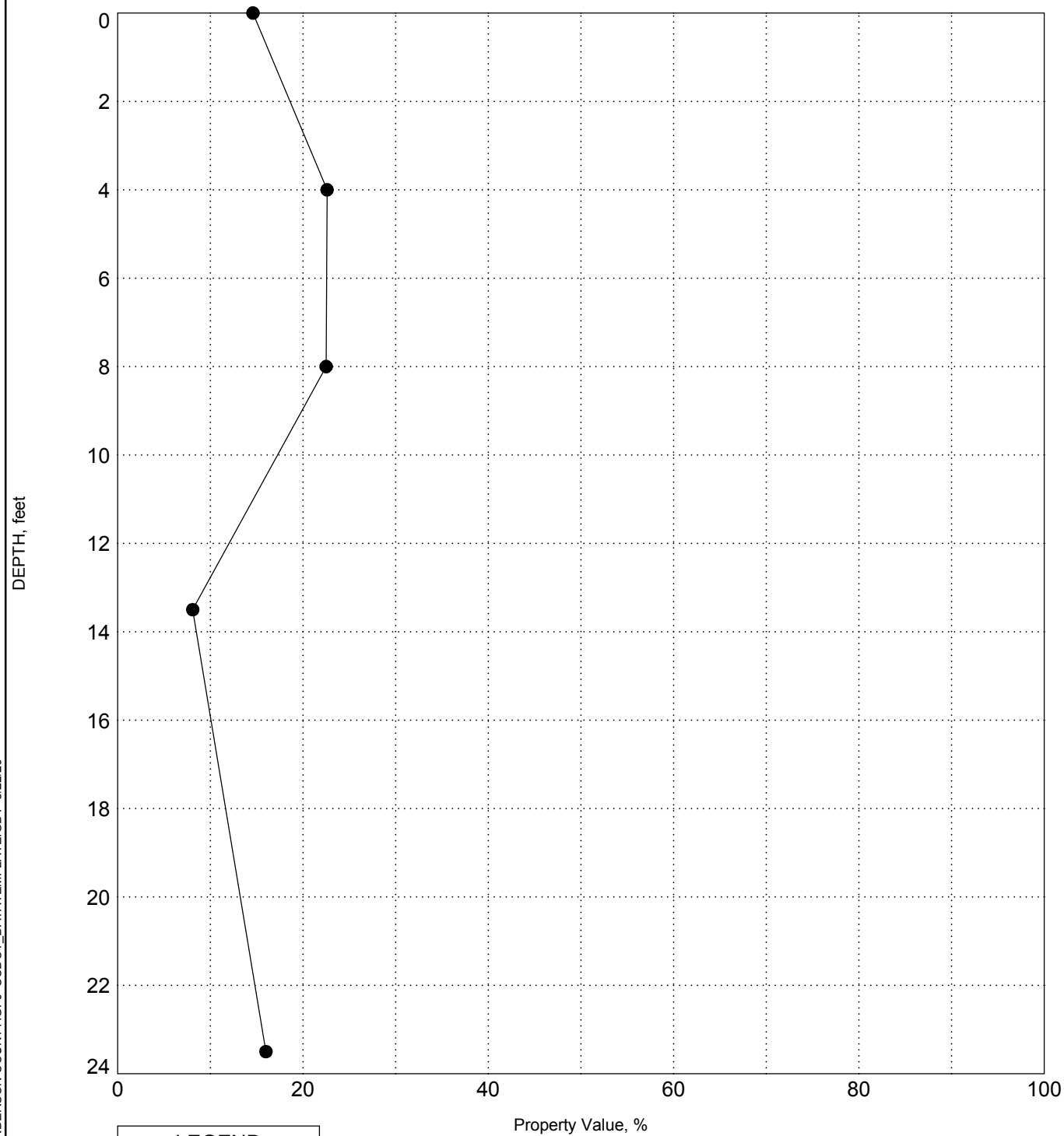
PROJECT ID N/A

PROJECT NAME Emergency Bridge Package 2020-1

PROJECT COUNTY Anderson

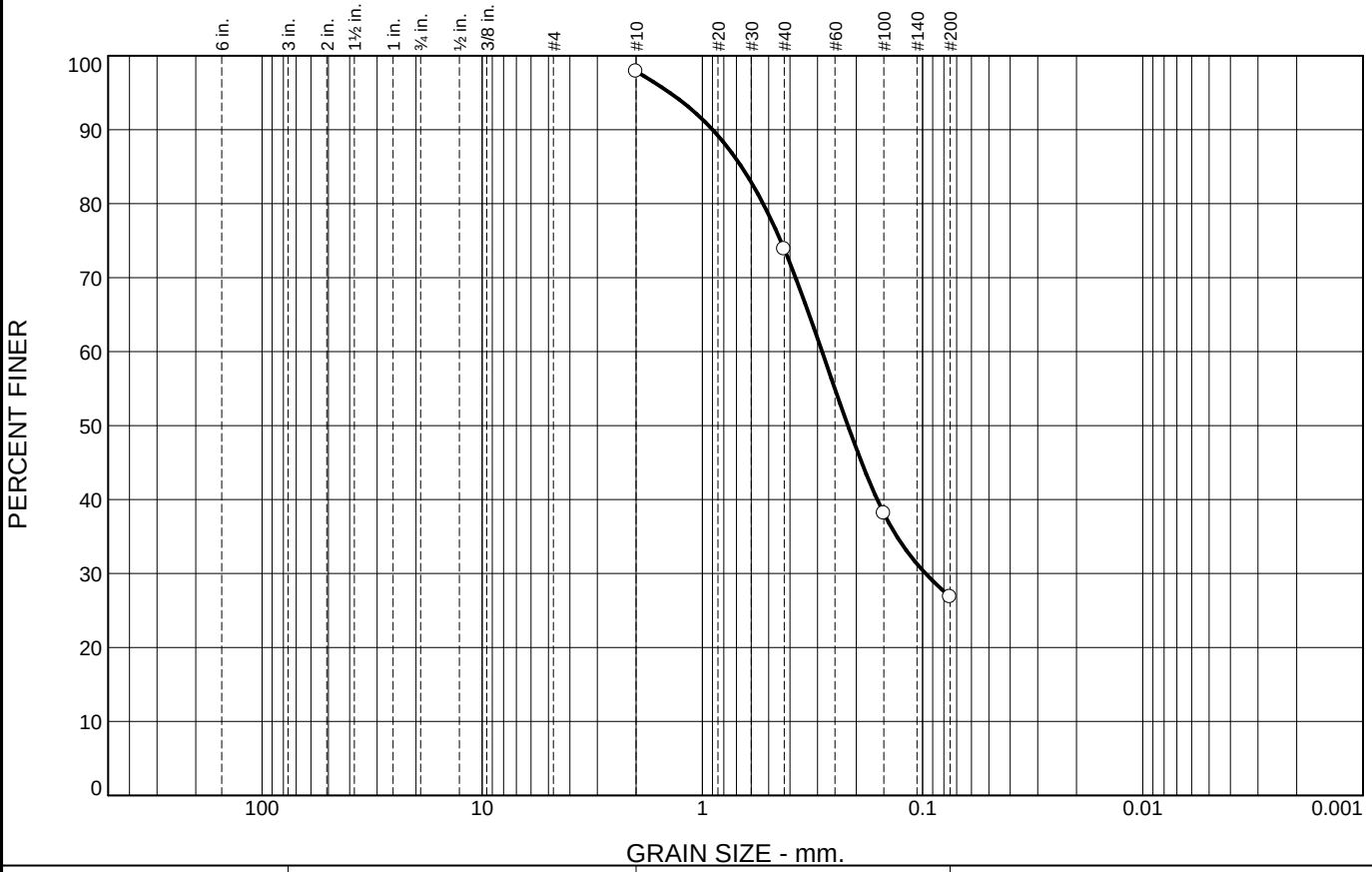
BORING B-3

SURFACE ELEVATION: 722.3



INDEX PROPS S-4-174_ANDERSON COUNTY.GPJ SCDOT_DATATEMPLATE.GDT 3/22/20

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
		24	47	27	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	98		
#40	74		
#100	38		
#200	27		

* (no specification provided)

Soil Description

Light red/brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.8986 D_{85}= 0.6647 D_{60}= 0.2860
D_{50}= 0.2184 D_{30}= 0.0970 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Natural Moisture: 14.6%
F.M.=1.24

Sample Number: B-3 **Depth:** SS-15

Date: 3.20.2020

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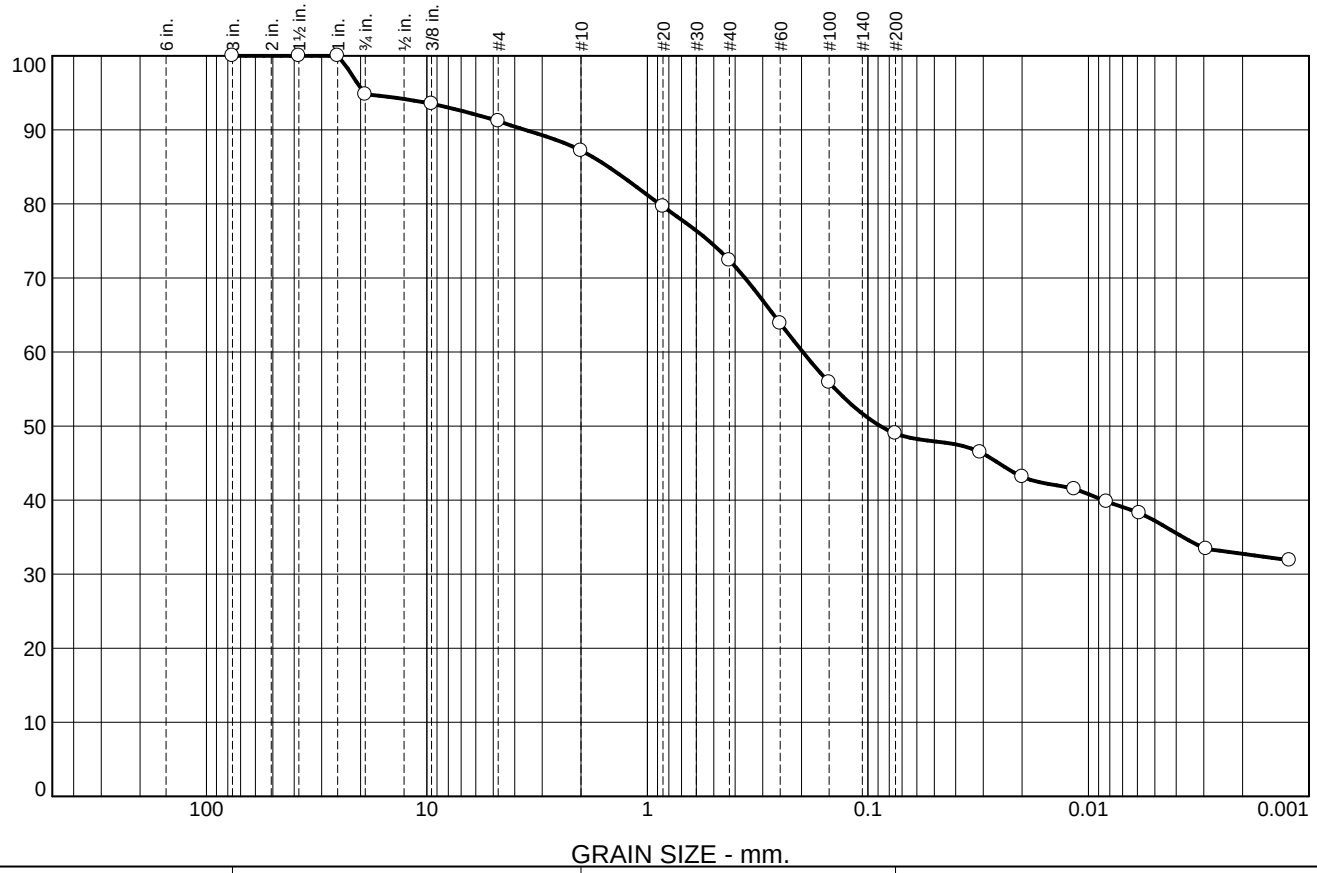
Client: SCDOT

Project: Emergency Bridge Package 2020-1 - York County

Project No: 14:9922 **Figure**

Tested By: CER

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0	13	15	23	16	33

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
1.5	100		
1	100		
.75	95		
.375	94		
#4	91		
#10	87		
#20	80		
#40	72		
#60	64		
#100	56		
#200	49		
0.0310 mm.	46		
0.0199 mm.	43		
0.0116 mm.	41		
0.0083 mm.	40		
0.0059 mm.	38		
0.0029 mm.	33		
0.0012 mm.	32		

* (no specification provided)

Soil Description

Dark red/brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 3.5882 D_{85}= 1.5027 D_{60}= 0.1975
D_{50}= 0.0879 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

NAtrual Moisture: 22.6%
F.M.=1.50

Sample Number: B-3 **Depth:** SS-17

Date: 3.20.2020

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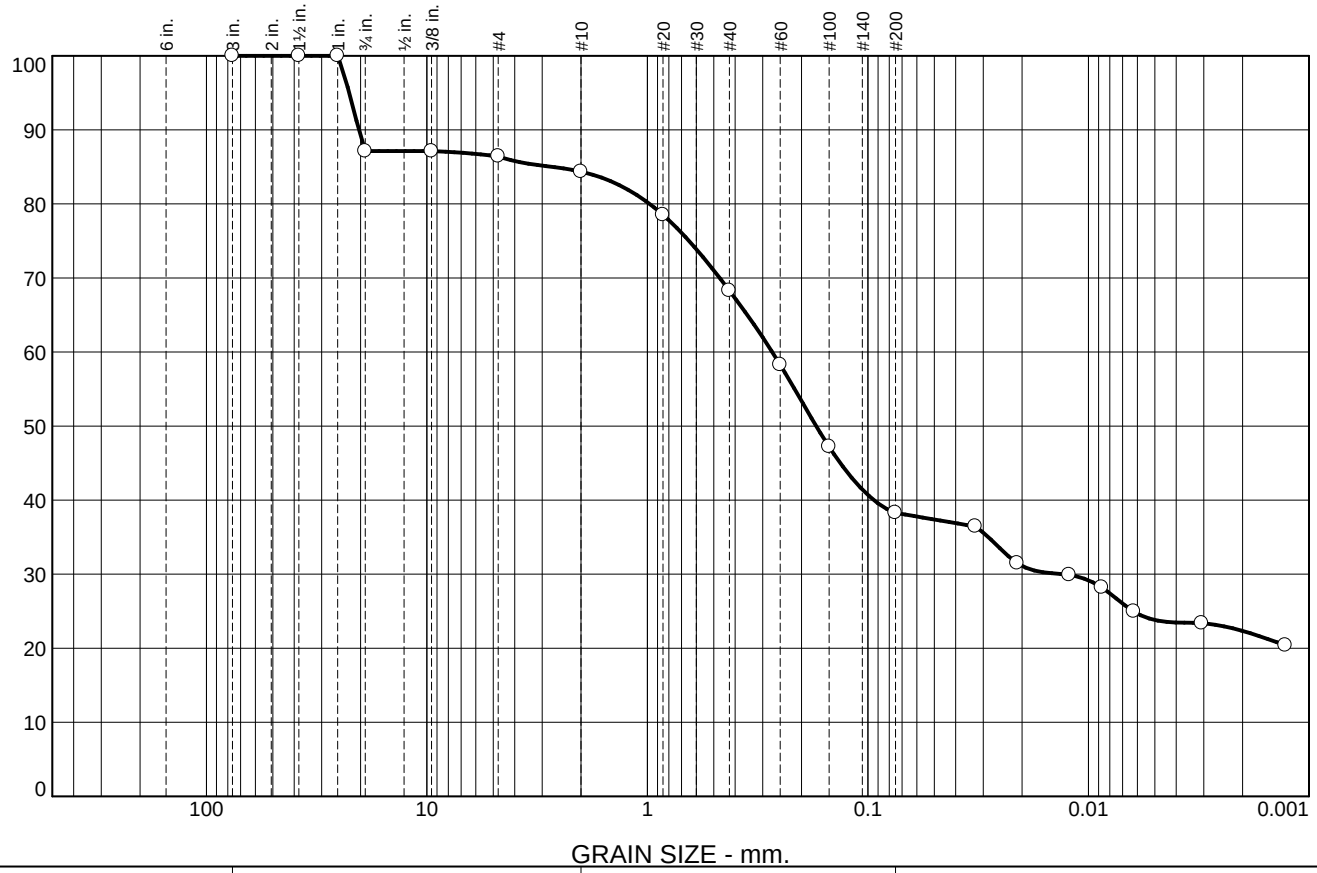
Client: SCDOT

Project: Emergency Bridge Package 2020-1 - York County

Project No: 14:9922 **Figure**

Tested By: CER

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0	16	16	30	16	22

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
1.5	100		
1	100		
.75	87		
.375	87		
#4	86		
#10	84		
#20	79		
#40	68		
#60	58		
#100	47		
#200	38		
0.0326 mm.	36		
0.0210 mm.	31		
0.0122 mm.	30		
0.0087 mm.	28		
0.0062 mm.	25		
0.0031 mm.	23		
0.0013 mm.	20		

* (no specification provided)

Soil Description

Light brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 20.3520 D_{85}= 2.7045 D_{60}= 0.2716
D_{50}= 0.1716 D_{30}= 0.0131 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Natural Moisture: 22.5%
F.M.=1.90

Sample Number: B-3 **Depth:** SS-19

Date: 3.20.2020

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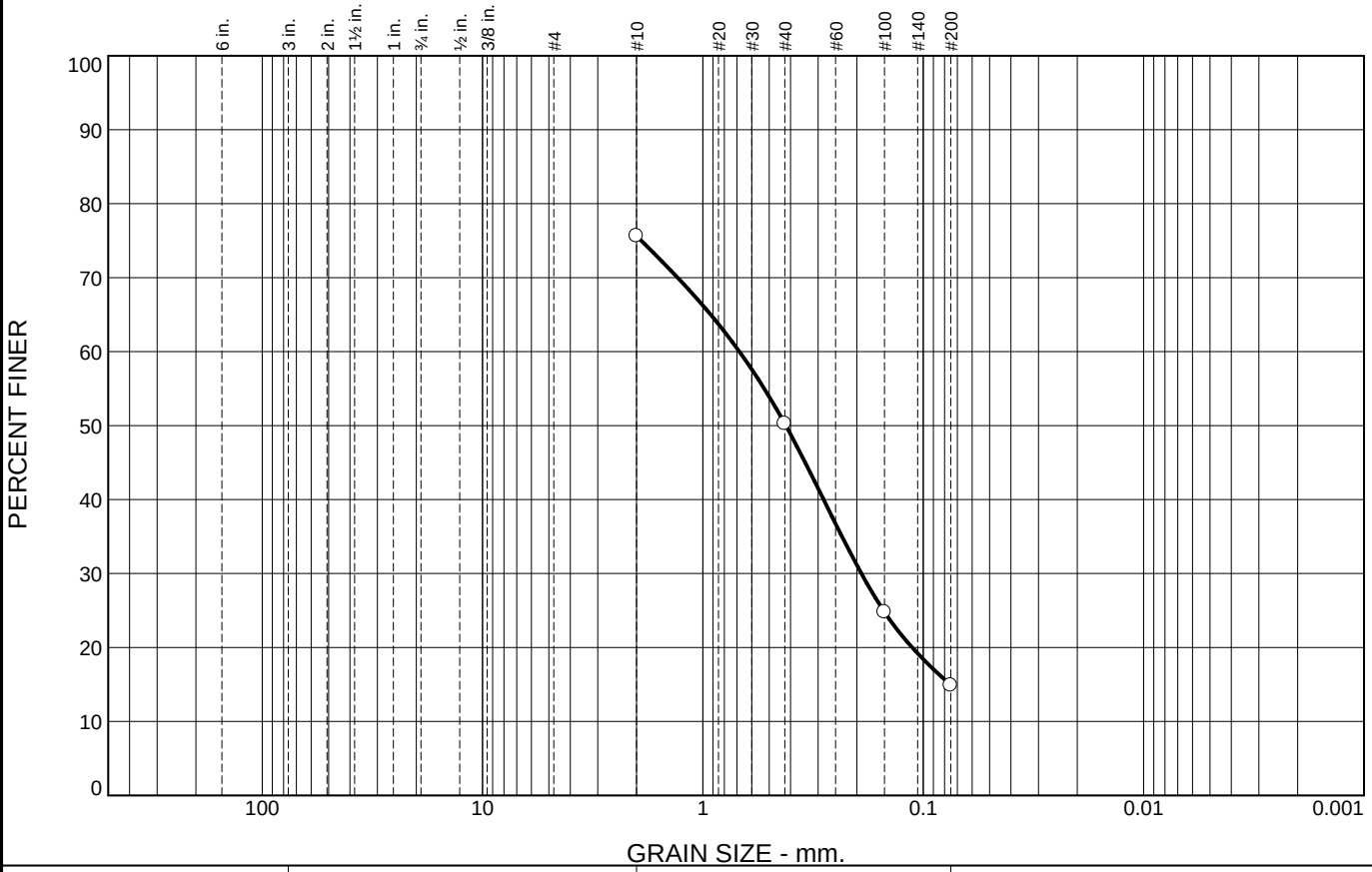
Client: SCDOT

Project: Emergency Bridge Package 2020-1 - York County

Project No: 14:9922 **Figure**

Tested By: CER

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
		26	35	15	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	76		
#40	50		
#100	25		
#200	15		

* (no specification provided)

Soil Description

Gray/light brown with mica and rock fragments

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}= 0.6828
D_{50}= 0.4203 D_{30}= 0.1909 D_{15}= 0.0757
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Natrual Moisture: 8.1%
F.M.=2.07

Sample Number: B-3 **Depth:** SS-20

Date: 3.20.2020

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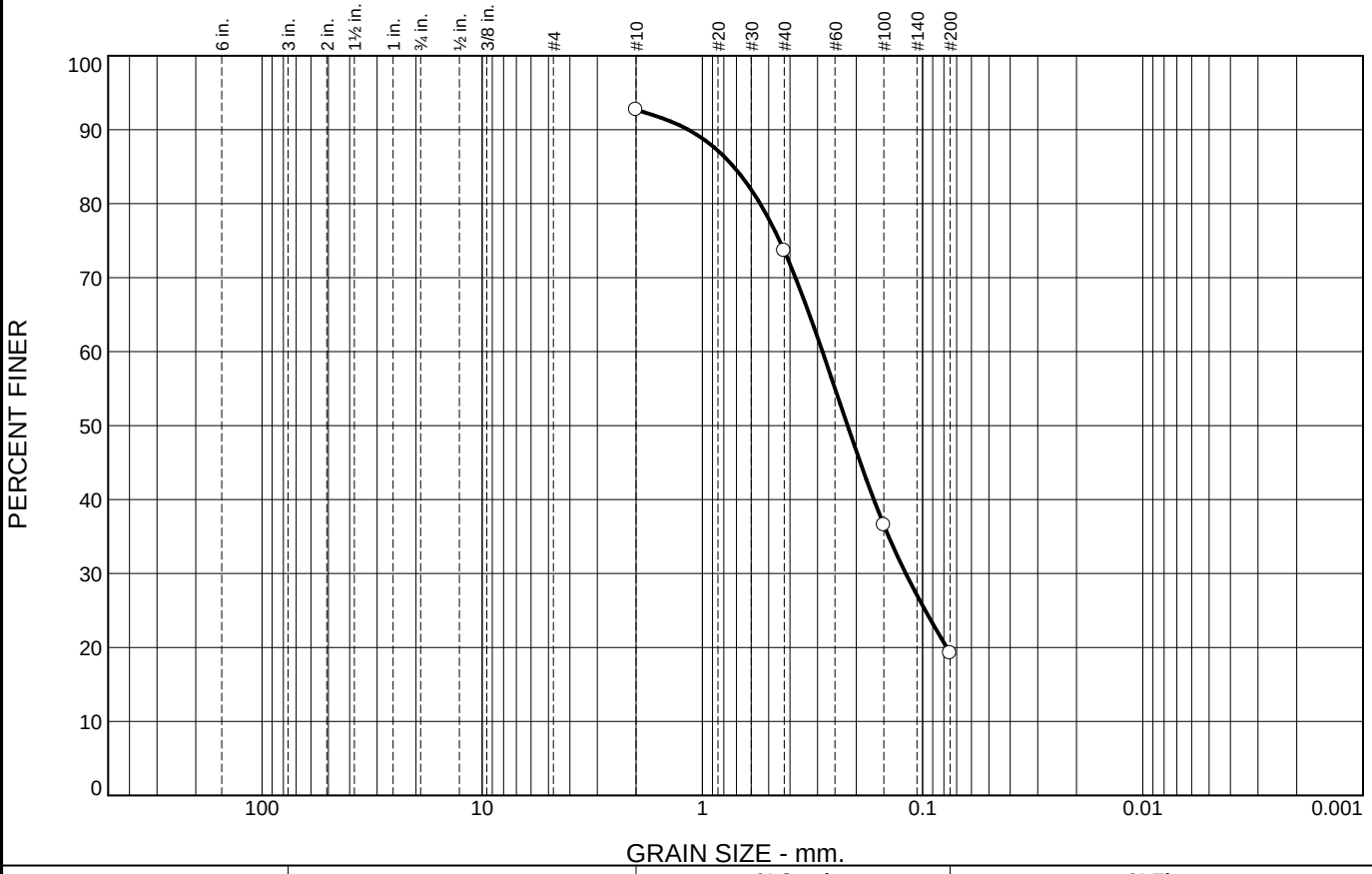
Client: SCDOT
Project: Emergency Bridge Package 2020-1 - York County

Project No: 14:9922 **Figure**

Tested By: CER

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
		19	55	19	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	93		
#40	74		
#100	37		
#200	19		

* (no specification provided)

Soil Description

Gray with mica and organics

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.1585 D_{85}= 0.7208 D_{60}= 0.2850
D_{50}= 0.2192 D_{30}= 0.1193 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Natrual Moisture: 16.0%
F.M.=1.29

Sample Number: B-3 **Depth:** SS-22

Date: 3.20.2020

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Client: SCDOT
Project: Emergency Bridge Package 2020-1 - York County

Project No: 14:9922 **Figure**

Tested By: CER

INDEX PROPERTIES VERSUS DEPTH

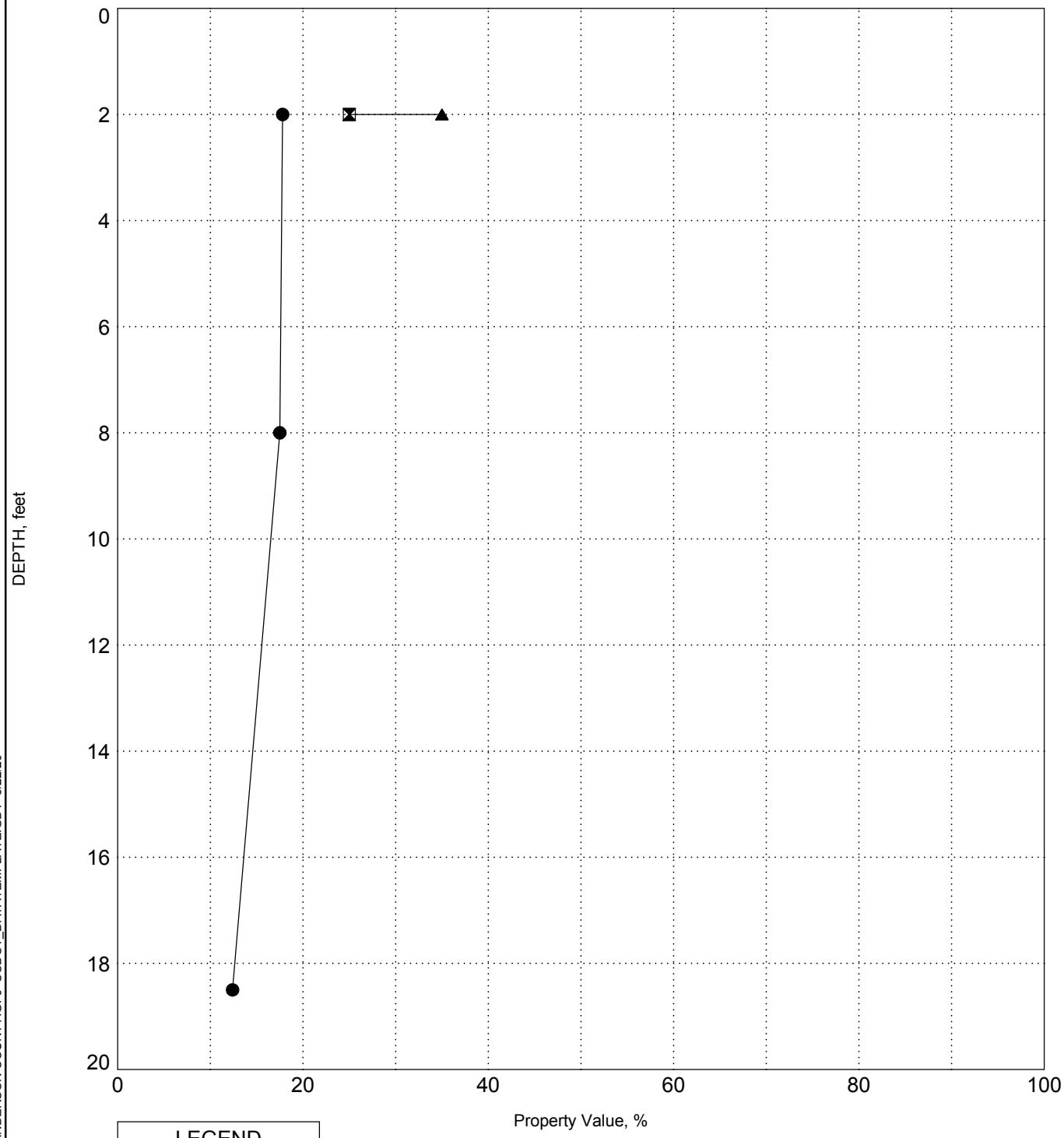
PROJECT ID N/A

PROJECT NAME Emergency Bridge Package 2020-1

PROJECT COUNTY Anderson

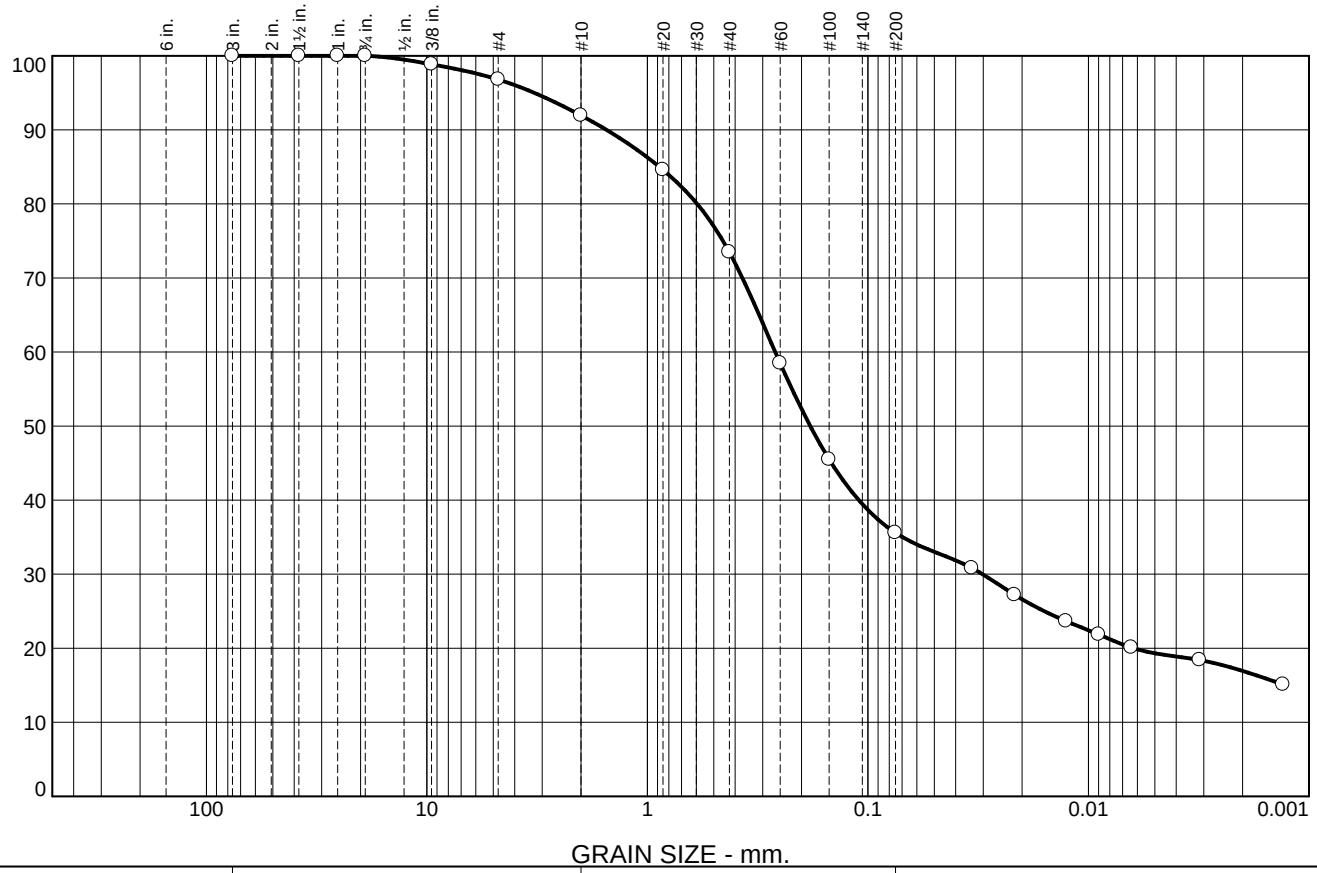
BORING B-4

SURFACE ELEVATION: 721.8



INDEX PROPS S-4-174_ANDERSON COUNTY.GPJ SCDOT_DATATEMPLATE.GDT 3/22/20

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0	8	19	37	19	17

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
1.5	100		
1	100		
.75	100		
.375	99		
#4	97		
#10	92		
#20	85		
#40	73		
#60	58		
#100	46		
#200	36		
0.0337 mm.	31		
0.0216 mm.	27		
0.0126 mm.	24		
0.0090 mm.	22		
0.0064 mm.	20		
0.0031 mm.	18		
0.0013 mm.	15		

* (no specification provided)

Soil Description

Dark brown Sandy Silt (A-4(0)) with mica

Atterberg Limits

PL= 25 LL= 35 PI= 10

Coefficients

D_{90}= 1.5332 D_{85}= 0.8828 D_{60}= 0.2633
D_{50}= 0.1826 D_{30}= 0.0302 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Natural Moisture: 17.8%
F.M.=1.34

Sample Number: B-4 **Depth:** SS-26

Date: 3.20.2020

ECS SOUTHEAST, LLP
1812 Center Park Drive, Suite D
Charlotte, NC 28217
Phone: (704) 525-5152
Fax: (704) 357-0023

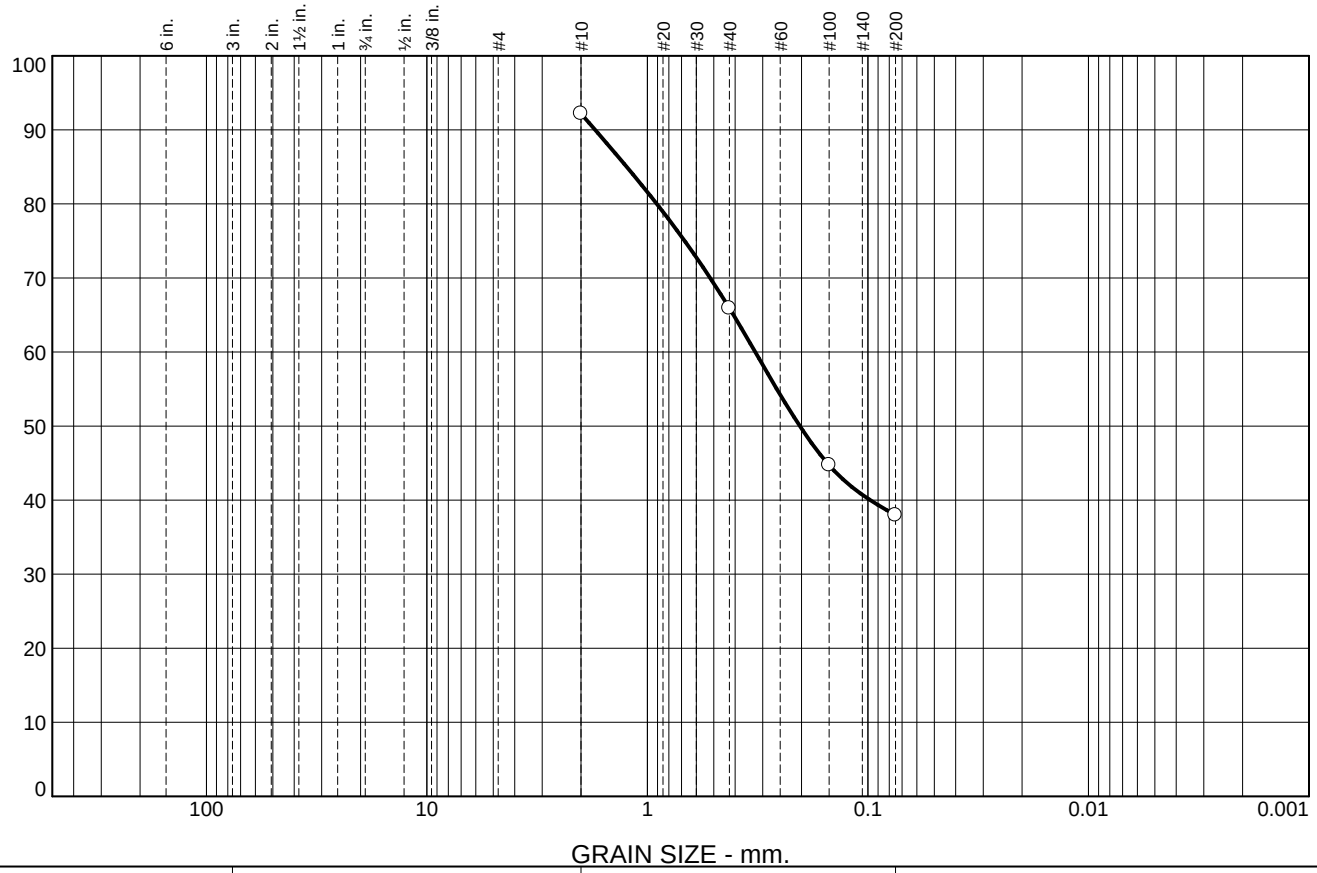
Client: SCDOT

Project: Emergency Bridge Package 2020-1 - York County

Project No: 14:9922 **Figure**

Tested By: CER

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
		26	28	38	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	92		
#40	66		
#100	45		
#200	38		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.7272 D_{85}= 1.2413 D_{60}= 0.3244
D_{50}= 0.2036 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Natural Moisture: 17.5%
F.M.=1.40

Sample Number: B-4 **Depth:** SS-29

Date: 3.20.2020

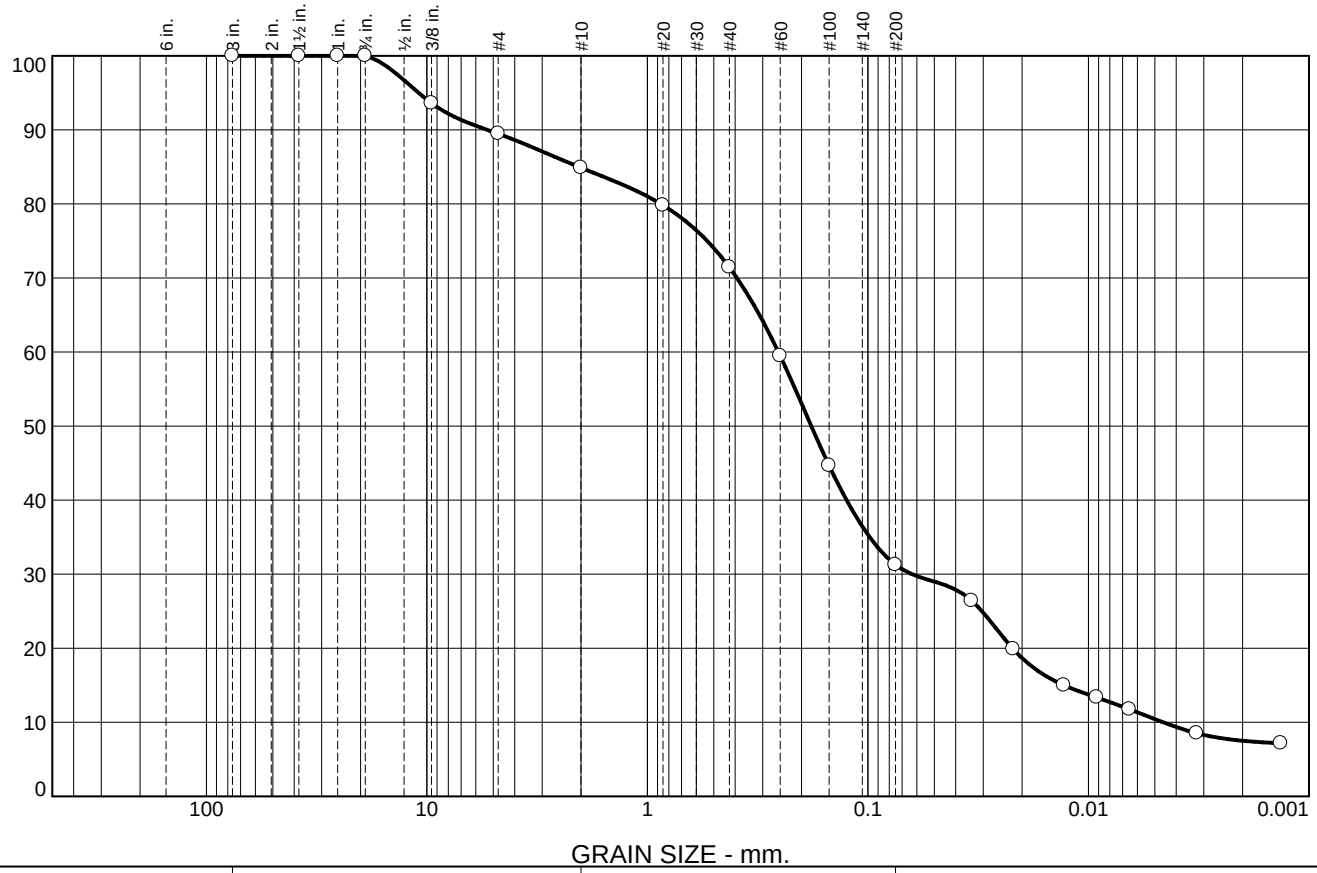
ECS SOUTHEAST, LLP
1812 Center Park Drive, Suite D
Charlotte, NC 28217
Phone: (704) 525-5152
Fax: (704) 357-0023

Client: SCDOT
Project: Emergency Bridge Package 2020-1 - York County

Project No: 14:9922 **Figure**

Tested By: CER

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0	15	14	40	24	7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
1.5	100		
1	100		
.75	100		
.375	94		
#4	89		
#10	85		
#20	80		
#40	71		
#60	59		
#100	45		
#200	31		
0.0338 mm.	26		
0.0219 mm.	20		
0.0129 mm.	15		
0.0092 mm.	13		
0.0065 mm.	12		
0.0032 mm.	8.5		
0.0013 mm.	7.2		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 5.3223 D_{85}= 2.0478 D_{60}= 0.2548
D_{50}= 0.1807 D_{30}= 0.0631 D_{15}= 0.0129
D_{10}= 0.0046 C_u= 55.59 C_c= 3.41

Classification

USCS= AASHTO=

Remarks

Natural Moisture: 12.4%
F.M.=1.64

Sample Number: B-4 **Depth:** SS-31

Date: 3.20.2020

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Charlotte, NC 28217
Phone: (704) 525-5152
Fax: (704) 357-0023

Client: SCDOT
Project: Emergency Bridge Package 2020-1 - York County

Project No: 14:9922 **Figure**

Tested By: CER

Rock Coring Summary

PROJECT ID N/A

PROJECT NAME Emergency Bridge Package 2020-1

PROJECT COUNTY Anderson

Borehole	Core Run Number	Core Run Top Depth	REC (%)	RQD (%)	q_u (psi)	Poisson's Ratio	Secant Modulus (ksi)	Unit Weight (pcf)	RMR	GSI
B-1	HQ-1	14.0	100	100	7360	0.18	2474	154	77	65
B-1	HQ-2	19.0	100	100	13605	0.17	4470	168	77	65
B-1	HQ-3	24.0	100	100	7948	0.29	3195	171	77	65
B-2	HQ-1	14.0	100	80	11317	0.14	4102	170	74	65
B-2	HQ-2	19.0	100	100	7592	0.24	4268	170	77	65
B-2	HQ-3	24.0	100	100	9626	0.21	5635	173	77	65
B-3	HQ-1	31.0	100	77	9814	0.15	3698	170	74	65
B-3	HQ-2	34.0	100	96	16224	0.11	5151	166	82	75
B-3	HQ-3	39.0	100	80	16485	0.20	4850	165	79	75
B-3	HQ-4	44.0	100	75	12731	0.27	2788	164	74	65
B-4	HQ-1	24.0	70	50					26	45
B-4	HQ-2	29.0	82	34					44	55
B-4	HQ-3	34.0	88	64	9038		4192	165	52	55
B-4	HQ-4	39.0	100	100	17311	0.21	3958	165	82	65

Department of Mining Engineering
Rock Mechanics Lab
University of Kentucky

Form: 101.03

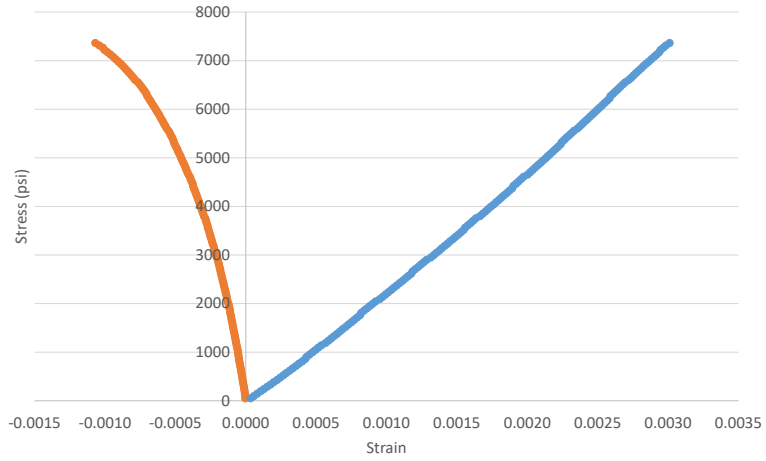
University of Kentucky
504 Rose Street, 230 MMRB
Lexington, KY 40506

Uniaxial Compressive Strength of Intact Rock Core Specimens

References:
ASTM D7012-14 Method D

Project No.:	14:9922	Borehole:	B1
Project:	S-174 Bridge over Six and Twenty Creek	Sample No.:	HQ-1
Location:	Anderson County, SC	Depth:	16.9-17.5 ft
Client:			
Date Received:	03/12/2020		
Date Tested:	03/19/2020	Lab ID No:	B1-HQ1

Testing Results			Sample Measurements		
Max Load	36,159	lbs	Diameter	2.501	in
	160.8	kN		6.35	cm
UCS	7360	psi	Height	5.756	in
	50.7	MPa		14.62	cm
Elastic Modulus	2474	ksi	Area	4.913	in^2
	17.06	GPa		31.69	cm^2
Loading Rate	14000	lbs/min	Volume	28.277	in^3
	1.04	kN/s		463.38	cm^3
Lithology	Gneiss, black and white, thinly bedded, fresh, strong rock		Mass	2.515	lbs
				1140.78	g
Failure Mode	Diagonal shear plane(s)		Bulk Density	153.69	lbs/ft^3
				2461.86	kg/m^3
Poisson's Ratio	0.177				

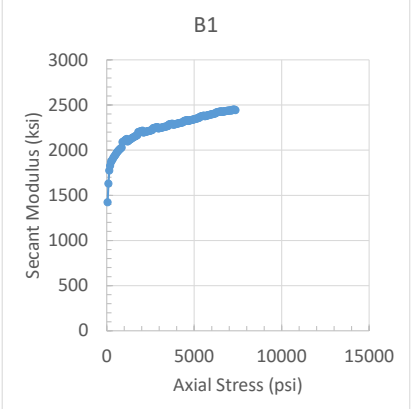


Before Test

After Test

Comments

1. Sample was received trimmed and was cut to size and repolished
2. One vertical and one lateral strain gages were attached
3. Elastic Modulus and Poisson's ratio was calculated at about 50% failure load



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Rock Mechanics Lab
University of Kentucky

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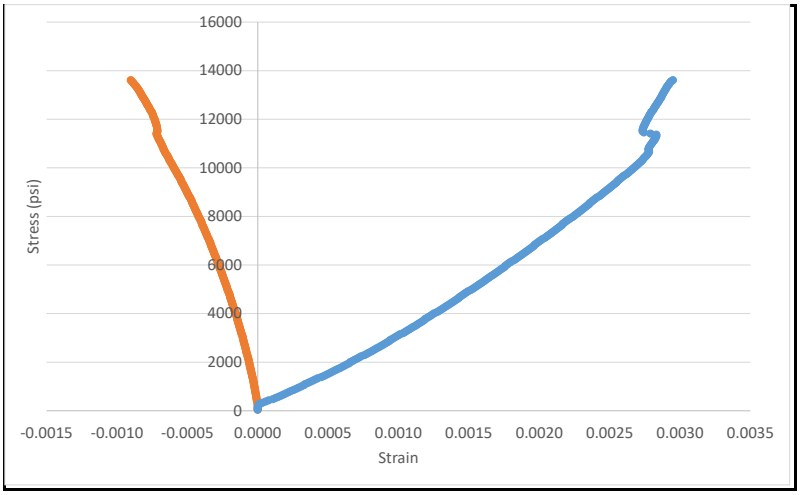
University of Kentucky
504 Rose Street, 230 MMRB
Lexington, KY 40506

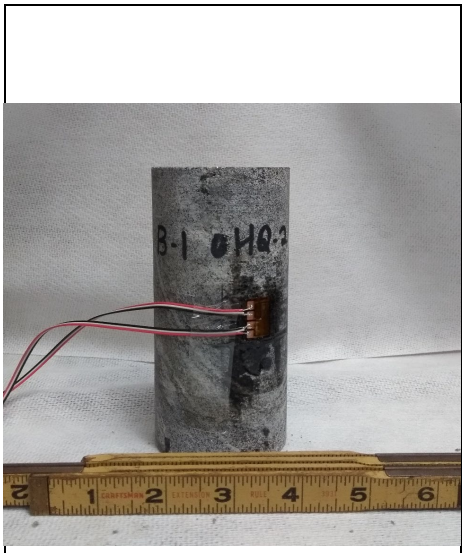
Uniaxial Compressive Strength of Intact Rock Core Specimens

References:
ASTM D7012-14 Method D

Project No.:	14:9922	Borehole:	B1
Project:	S-174 Bridge over Six and Twenty Creek	Sample No.:	HQ-2
Location:	Anderson County, SC	Depth:	20.1-20.7 ft
Client:			
Date Received:	03/12/2020		
Date Tested:	03/19/2020	Lab ID No:	B1-HQ2

Testing Results			Sample Measurements		
Max Load	66,485	lbs	Diameter	2.494	in
	295.7	kN		6.34	cm
UCS	13606	psi	Height	5.296	in
	93.8	MPa		13.45	cm
Elastic Modulus	4470	ksi	Area	4.887	in^2
	30.82	GPa		31.53	cm^2
Loading Rate	14000	lbs/min	Volume	25.881	in^3
	1.04	kN/s		424.11	cm^3
Lithology	Gneiss, black and white, thinly bedded, fresh, strong rock		Mass	2.522	lbs
				1143.96	g
Failure Mode	Diagonal shear plane(s)		Bulk Density	168.39	lbs/ft^3
				2697.34	kg/m^3
Poisson's Ratio	0.170				





Before Test

After Test

Comments

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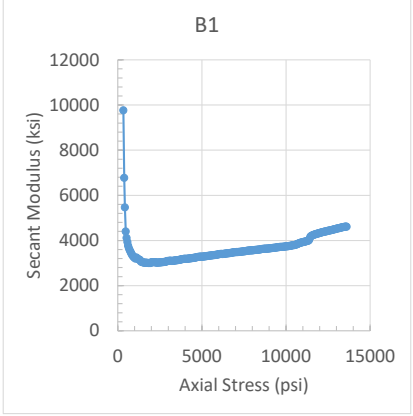

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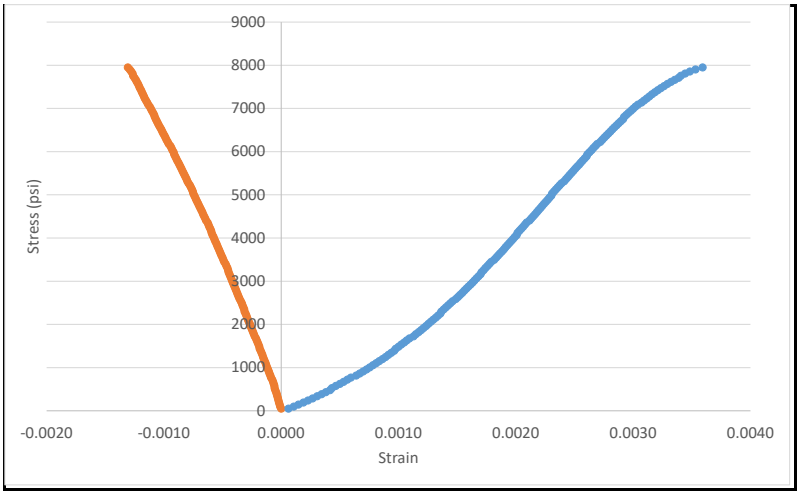
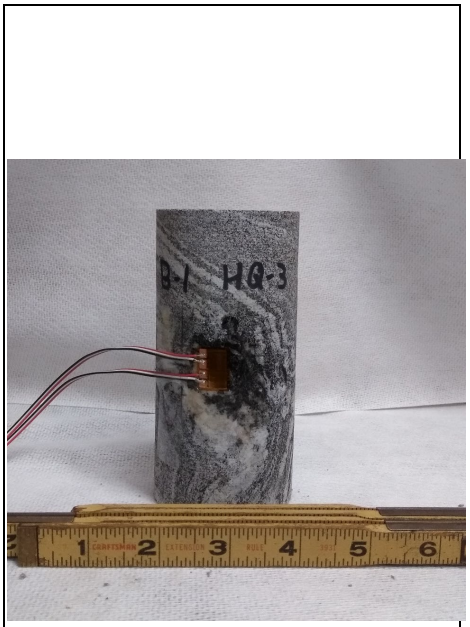
Uniaxial Compressive Strength of Intact Rock Core Specimens

References:
ASTM D7012-14 Method D

Project No.:	14:9922	Borehole:	B1
Project:	S-174 Bridge over Six and Twenty Creek	Sample No.:	HQ-3
Location:	Anderson County, SC	Depth:	26.2-26.8 ft
Client:			
Date Received:	03/12/2020		
Date Tested:	03/19/2020	Lab ID No:	B1-HQ3

Testing Results			Sample Measurements		
Max Load	38,720	lbs	Diameter	2.491	in
	172.2	kN		6.33	cm
UCS	7947	psi	Height	5.247	in
	54.8	MPa		13.33	cm
Elastic Modulus	3195	ksi	Area	4.872	in^2
	22.03	GPa		31.43	cm^2
Loading Rate	14000	lbs/min	Volume	25.566	in^3
	1.04	kN/s		418.95	cm^3
Lithology	Gneiss, black and white, thinly bedded, fresh, strong rock		Mass	2.531	lbs
				1148.04	g
Failure Mode	Diagonal shear plane(s)		Bulk Density	171.07	lbs/ft^3
				2740.29	kg/m^3
Poisson's Ratio	0.292				





Before Test

After Test

Comments

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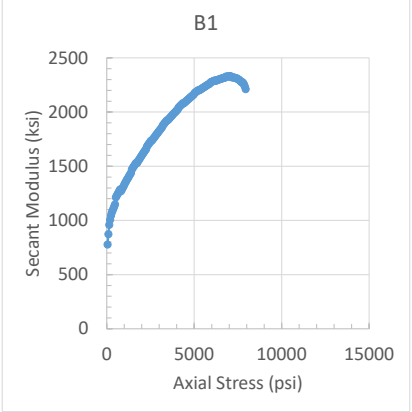
2. One vertical and one lateral strain gages were attached
3. Elastic Modulus and Poisson's ratio was calculated at about 50% failure load



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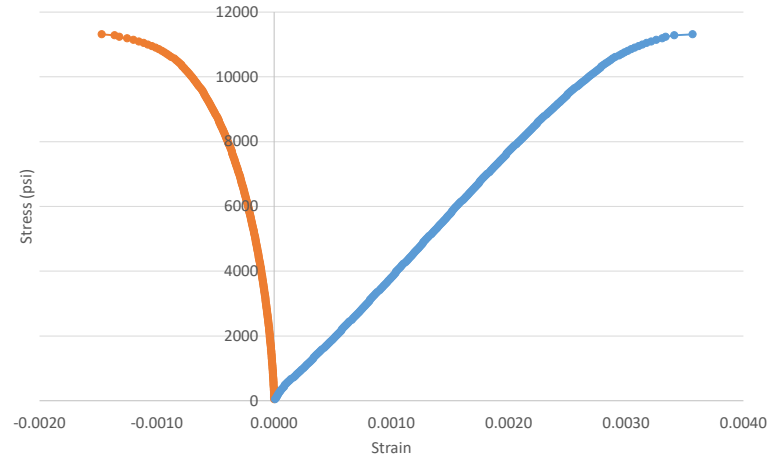
504 Rose Street, 230 MMRB
Lexington, KY 40506

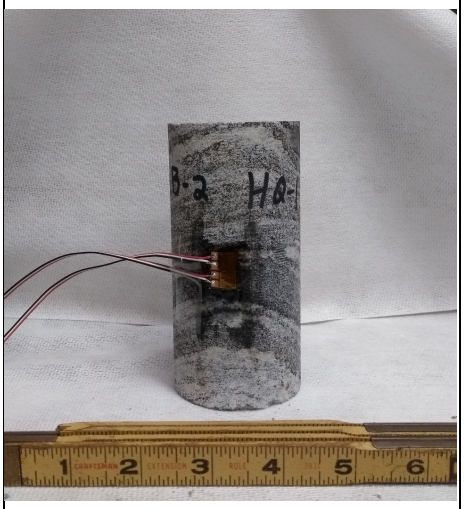
Uniaxial Compressive Strength of Intact Rock Core Specimens

References:
ASTM D7012-14 Method D

Project No.:	14:9922	Borehole:	B2
Project:	S-174 Bridge over Six and Twenty Creek	Sample No.:	HQ-1
Location:	Anderson County, SC	Depth:	17.6-18.2 ft
Client:			
Date Received:	03/12/2020		
Date Tested:	03/19/2020	Lab ID No:	B2-HQ1

Testing Results			Sample Measurements		
Max Load	54,990	lbs	Diameter	2.487	in
	244.6	kN		6.32	cm
UCS	11317	psi	Height	5.268	in
	78.0	MPa		13.38	cm
Elastic Modulus	4102	ksi	Area	4.859	in^2
	28.28	GPa		31.35	cm^2
Loading Rate	14000	lbs/min	Volume	25.596	in^3
	1.04	kN/s		419.45	cm^3
Lithology	Gneiss, black and white, thinly bedded, fresh, strong rock		Mass	2.517	lbs
				1141.69	g
Failure Mode	Vertical splitting		Bulk Density	169.92	lbs/ft^3
				2721.89	kg/m^3
Poisson's Ratio	0.138				





Before Test

After Test

Comments

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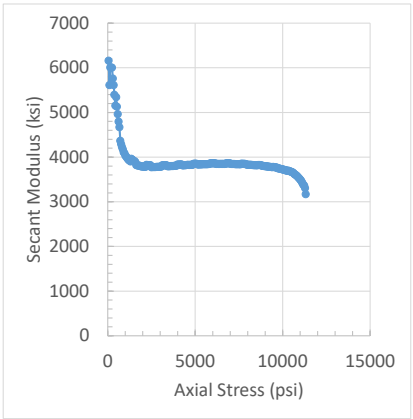
2. One vertical and one lateral strain gages were attached
3. Elastic Modulus and Poisson's ratio was calculated at about 50% failure load



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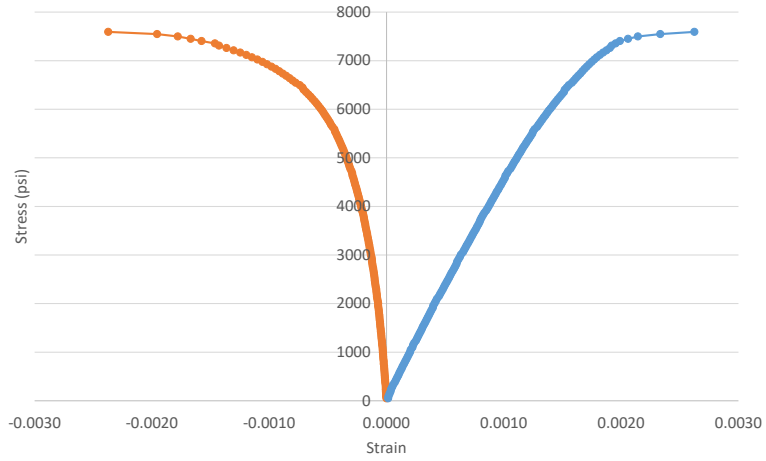
Lexington, KY 40506

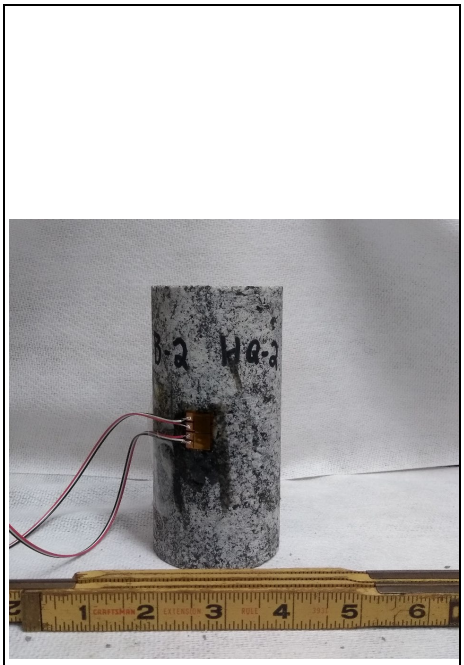
Uniaxial Compressive Strength of Intact Rock Core Specimens

References:
ASTM D7012-14 Method D

Project No.:	14:9922	Borehole:	B2
Project:	S-174 Bridge over Six and Twenty Creek	Sample No.:	HQ-2
Location:	Anderson County, SC	Depth:	21.7-22.3 ft
Client:			
Date Received:	03/12/2020		
Date Tested:	03/19/2020	Lab ID No:	B2-HQ2

Testing Results			Sample Measurements		
Max Load	37,072	lbs	Diameter	2.493	in
	164.9	kN		6.33	cm
UCS	7593	psi	Height	5.245	in
	52.3	MPa		13.32	cm
Elastic Modulus	4268	ksi	Area	4.883	in^2
	29.42	GPa		31.50	cm^2
Loading Rate	14000	lbs/min	Volume	25.611	in^3
	1.04	kN/s		419.69	cm^3
Lithology	Gneiss, black and white, thinly bedded, fresh, strong rock		Mass	2.526	lbs
				1145.77	g
Failure Mode	Diagonal shear plane(s)		Bulk Density	170.43	lbs/ft^3
				2730.07	kg/m^3
Poisson's Ratio	0.243				



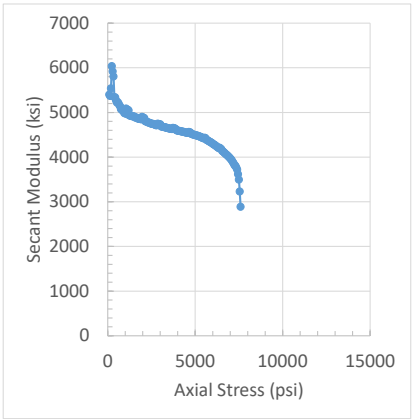


Before Test

After Test

Comments

1. Sample was received trimmed and was cut to size and repolished
2. One vertical and one lateral strain gages were attached
3. Elastic Modulus and Poisson's ratio was calculated at about 50% failure load



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Rock Mechanics Lab
University of Kentucky

Form: 101.03

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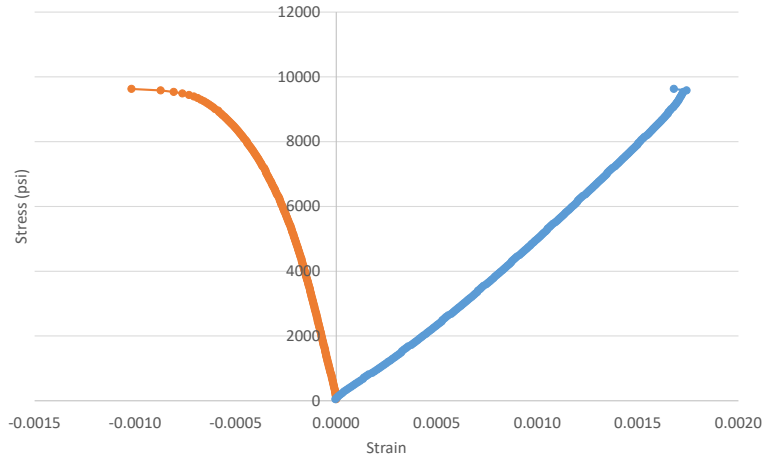
Lexington, KY 40506

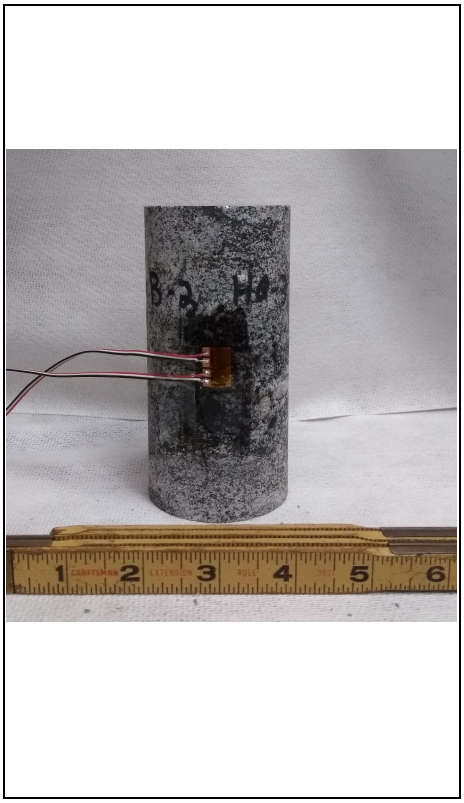
Uniaxial Compressive Strength of Intact Rock Core Specimens

References:
ASTM D7012-14 Method D

Project No.:	14:9922	Borehole:	B2
Project:	S-174 Bridge over Six and Twenty Creek	Sample No.:	HQ-3
Location:	Anderson County, SC	Depth:	27.2-27.8 ft
Client:			
Date Received:	03/12/2020		
Date Tested:	03/19/2020	Lab ID No:	B2-HQ3

Testing Results			Sample Measurements		
Max Load	46,876	lbs	Diameter	2.490	in
	208.5	kN		6.32	cm
UCS	9626	psi	Height	5.250	in
	66.4	MPa		13.33	cm
Elastic Modulus	5635	ksi	Area	4.870	in^2
	38.85	GPa		31.42	cm^2
Loading Rate	14000	lbs/min	Volume	25.563	in^3
	1.04	kN/s		418.91	cm^3
Lithology	Gneiss, black and white, thinly bedded, fresh, strong rock		Mass	2.554	lbs
				1158.47	g
Failure Mode	Diagonal shear plane(s)		Bulk Density	172.64	lbs/ft^3
				2765.44	kg/m^3
Poisson's Ratio	0.205				



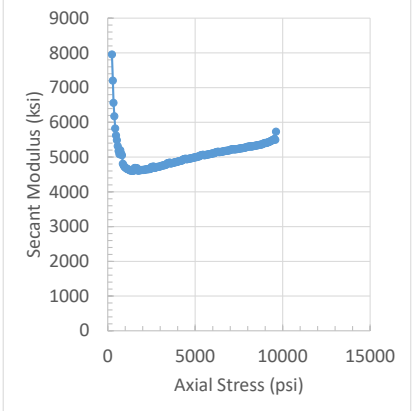


Before Test

After Test

Comments

1. Sample was received trimmed and was cut to size and repolished
2. One vertical and one lateral strain gages were attached
3. Elastic Modulus and Poisson's ratio was calculated at about 50% failure load



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Form: 101.03

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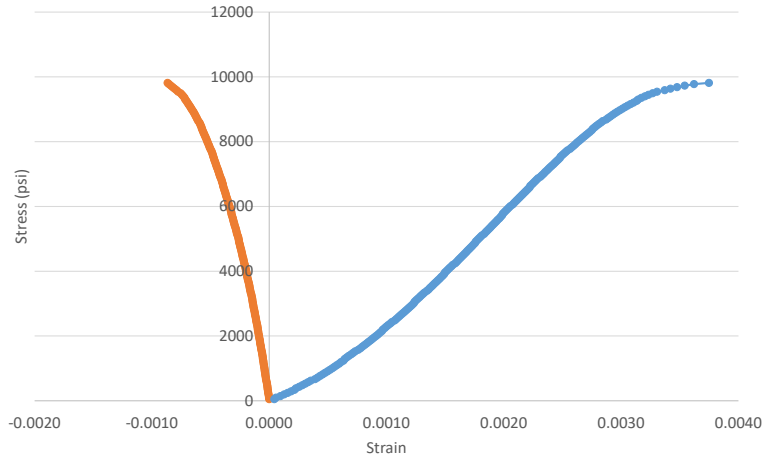
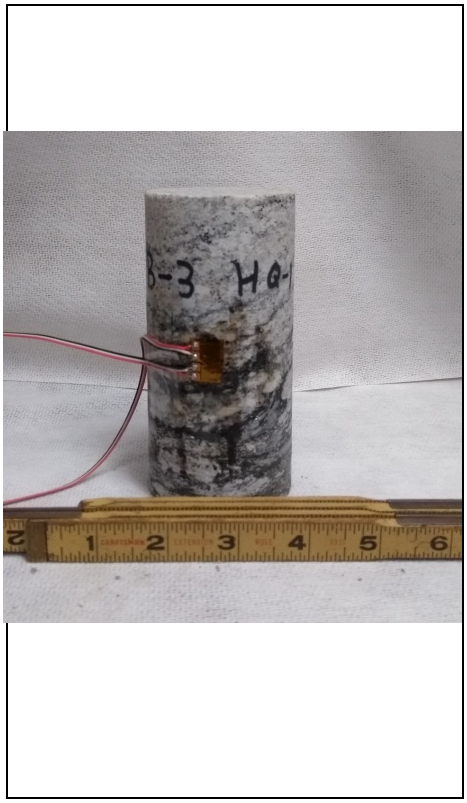
Uniaxial Compressive Strength of Intact Rock Core Specimens

References:
ASTM D7012-14 Method D

Project No.:	14:9922	Borehole:	B3
Project:	S-174 Bridge over Six and Twenty Creek	Sample No.:	HQ-1
Location:	Anderson County, SC	Depth:	33.1-33.7 ft
Client:			
Date Received:	03/12/2020		
Date Tested:	03/19/2020	Lab ID No:	B3-HQ1

Testing Results			Sample Measurements		
Max Load	48,009	lbs	Diameter	2.496	in
	213.6	kN		6.34	cm
UCS	9814	psi	Height	5.262	in
	67.7	MPa		13.37	cm
Elastic Modulus	3698	ksi	Area	4.892	in^2
	25.50	GPa		31.56	cm^2
Loading Rate	14000	lbs/min	Volume	25.740	in^3
	1.04	kN/s		421.81	cm^3
Lithology	Gneiss, black and white, thinly bedded, fresh, strong rock		Mass	2.539	lbs
				1151.67	g
Failure Mode	Diagonal shear plane(s)		Bulk Density	170.45	lbs/ft^3
				2730.32	kg/m^3
Poisson's Ratio	0.147				





Before Test

After Test

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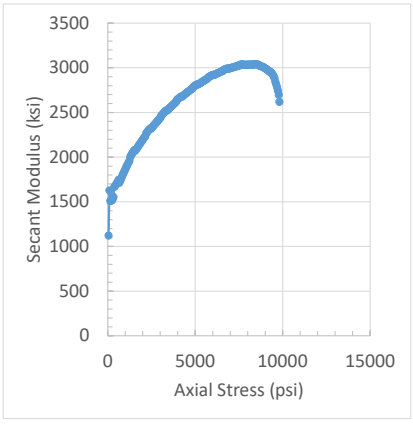

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Form: 101.03

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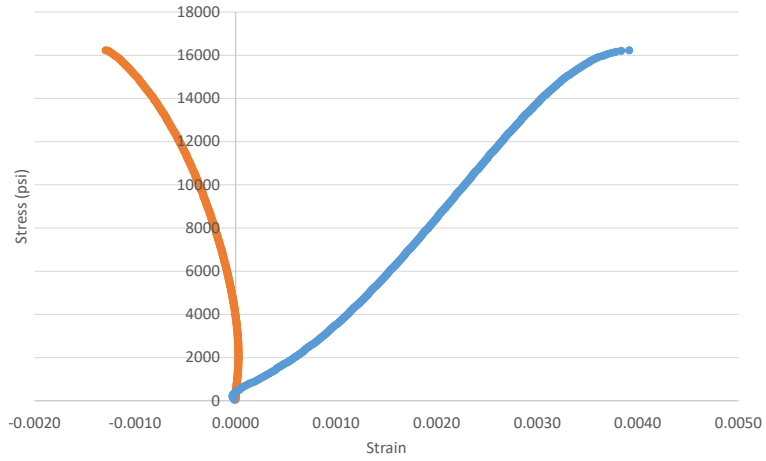
Lexington, KY 40506

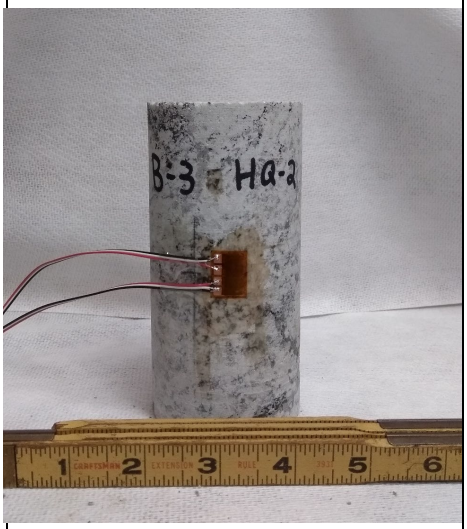
Uniaxial Compressive Strength of Intact Rock Core Specimens

References:
ASTM D7012-14 Method D

Project No.:	14:9922	Borehole:	B3
Project:	S-174 Bridge over Six and Twenty Creek	Sample No.:	HQ-2
Location:	Anderson County, SC	Depth:	36.7-37.5 ft
Client:			
Date Received:	03/12/2020		
Date Tested:	03/19/2020	Lab ID No:	B3-HQ2

Testing Results			Sample Measurements		
Max Load	78,962	lbs	Diameter	2.489	in
	351.2	kN		6.32	cm
UCS	16224	psi	Height	5.273	in
	111.9	MPa		13.39	cm
Elastic Modulus	5151	ksi	Area	4.867	in^2
	35.51	GPa		31.40	cm^2
Loading Rate	14000	lbs/min	Volume	25.665	in^3
	1.04	kN/s		420.57	cm^3
Lithology	Gneiss, black and white, thinly bedded, fresh, strong rock		Mass	2.462	lbs
				1116.74	g
Failure Mode	Diagonal shear plane(s)		Bulk Density	165.76	lbs/ft^3
				2655.28	kg/m^3
Poisson's Ratio	0.113				



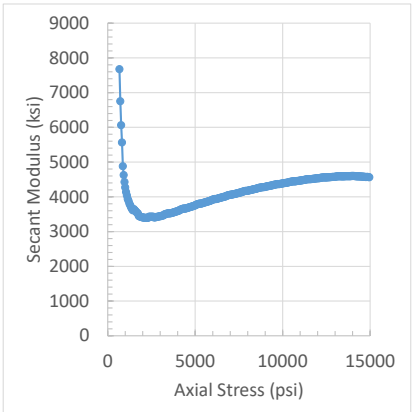


Before Test

After Test

Comments

1. Sample was received trimmed and was cut to size and repolished
2. One vertical and one lateral strain gages were attached
3. Elastic Modulus and Poisson's ratio was calculated at about 50% failure load
4. The strains registered at the beginning of the loading cycle were abnormal.



Department of Mining Engineering
Rock Mechanics Lab
University of Kentucky

Form: 101.03

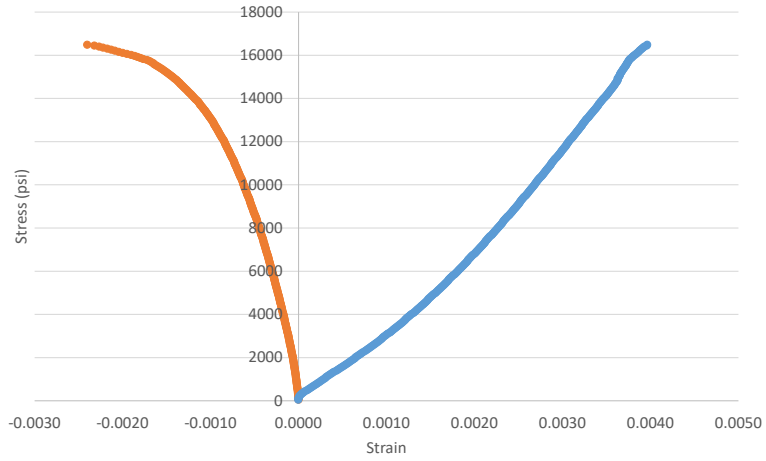
University of Kentucky
504 Rose Street, 230 MMRB
Lexington, KY 40506

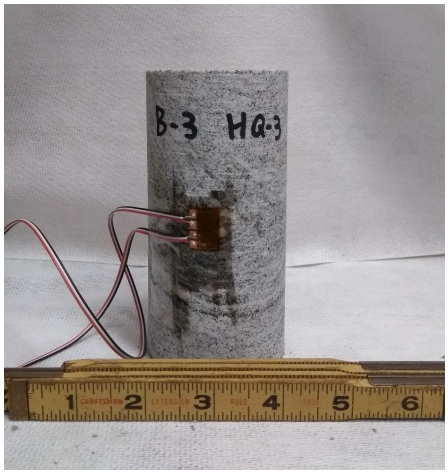
Uniaxial Compressive Strength of Intact Rock Core Specimens

References:
ASTM D7012-14 Method D

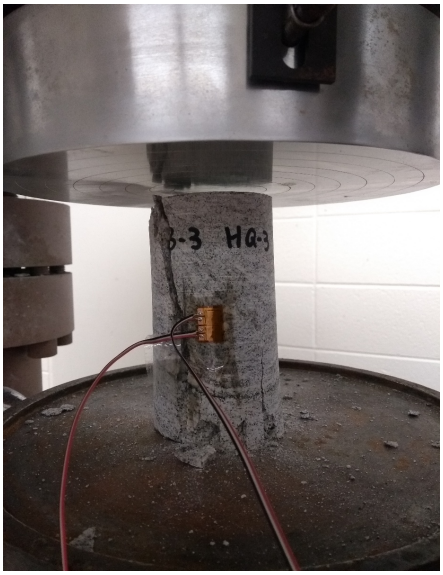
Project No.:	14:9922	Borehole:	B3
Project:	S-174 Bridge over Six and Twenty Creek	Sample No.:	HQ-3
Location:	Anderson County, SC		
Client:		Depth:	41-41.6 ft
Date Received:	03/12/2020		
Date Tested:	03/19/2020	Lab ID No:	B3-HQ3

Testing Results			Sample Measurements		
Max Load	80,218	lbs	Diameter	2.489	in
	356.8	kN		6.32	cm
UCS	16487	psi	Height	5.256	in
	113.7	MPa		13.35	cm
Elastic Modulus	4850	ksi	Area	4.866	in^2
	33.44	GPa		31.39	cm^2
Loading Rate	14000	lbs/min	Volume	25.572	in^3
	1.04	kN/s		419.05	cm^3
Lithology	Gneiss, black and white, thinly bedded, fresh, strong rock		Mass	2.444	lbs
				1108.58	g
Failure Mode	Diagonal shear plane(s)		Bulk Density	165.15	lbs/ft^3
				2645.44	kg/m^3
Poisson's Ratio	0.203				





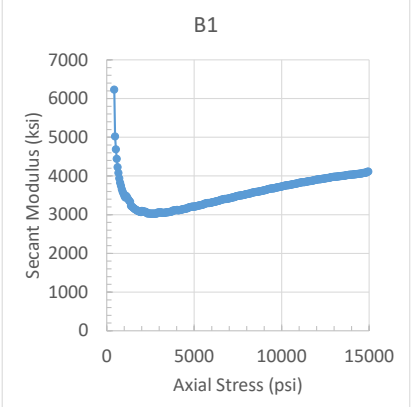
Before Test



After Test

Comments

1. Sample was received trimmed and was cut to size and repolished
2. One vertical and one lateral strain gages were attached
3. Elastic Modulus and Poisson's ratio was calculated at about 50% failure load



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Rock Mechanics Lab
University of Kentucky

Form: 101.03

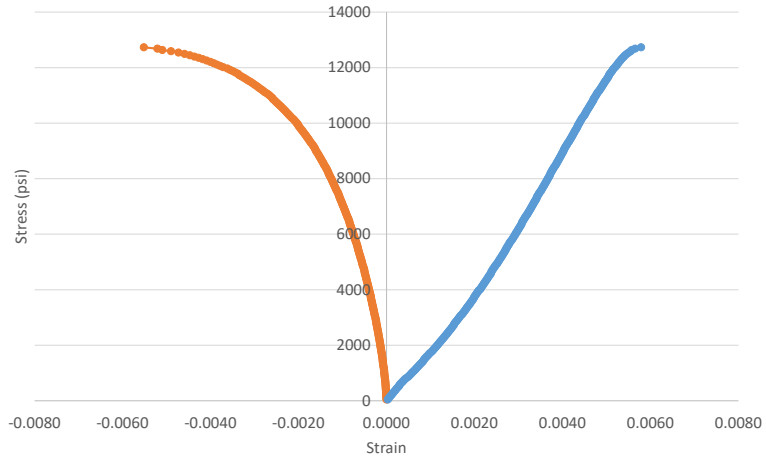
University of Kentucky
504 Rose Street, 230 MMRB
Lexington, KY 40506

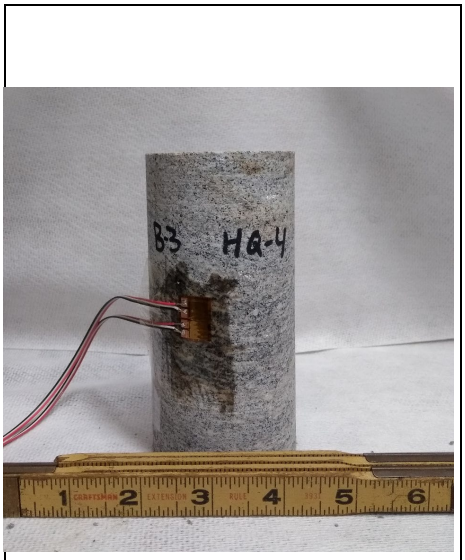
Uniaxial Compressive Strength of Intact Rock Core Specimens

References:
ASTM D7012-14 Method D

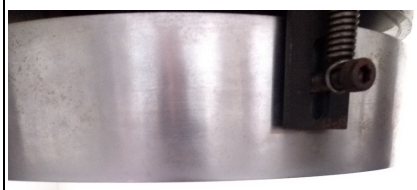
Project No.:	14:9922	Borehole:	B3
Project:	S-174 Bridge over Six and Twenty Creek	Sample No.:	HQ-4
Location:	Anderson County, SC	Depth:	44.2-45 ft
Client:			
Date Received:	03/12/2020		
Date Tested:	03/19/2020	Lab ID No:	B3-HQ4

Testing Results			Sample Measurements		
Max Load	62,040	lbs	Diameter	2.491	in
	276.0	kN		6.33	cm
UCS	12730	psi	Height	5.277	in
	87.8	MPa		13.40	cm
Elastic Modulus	2788	ksi	Area	4.873	in^2
	19.22	GPa		31.44	cm^2
Loading Rate	14000	lbs/min	Volume	25.717	in^3
	1.04	kN/s		421.43	cm^3
Lithology	Gneiss, black and white, thinly bedded, fresh, strong rock		Mass	2.438	lbs
				1105.86	g
Failure Mode	Diagonal shear plane(s)		Bulk Density	163.81	lbs/ft^3
				2624.06	kg/m^3
Poisson's Ratio	0.274				





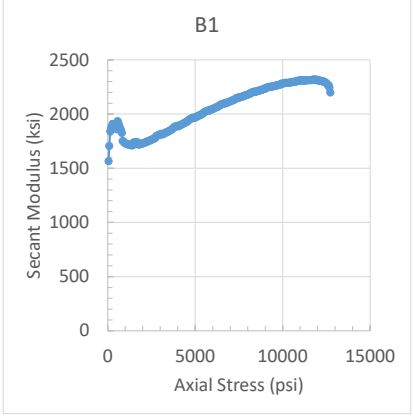
Before Test



After Test

Comments

1. Sample was received trimmed and was cut to size and repolished
2. One vertical and one lateral strain gages were attached
3. Elastic Modulus and Poisson's ratio was calculated at about 50% failure load



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Rock Mechanics Lab
University of Kentucky

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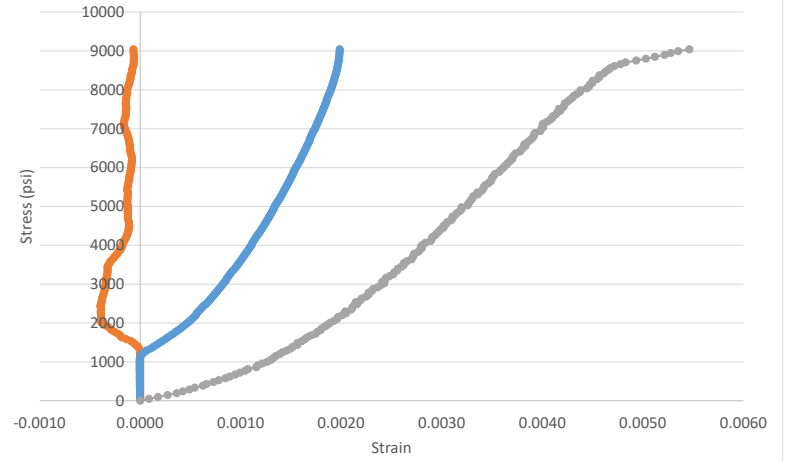
504 Rose Street, 230 MMRB
Lexington, KY 40506

Uniaxial Compressive Strength of Intact Rock Core Specimens

References:
ASTM D7012-14 Method D

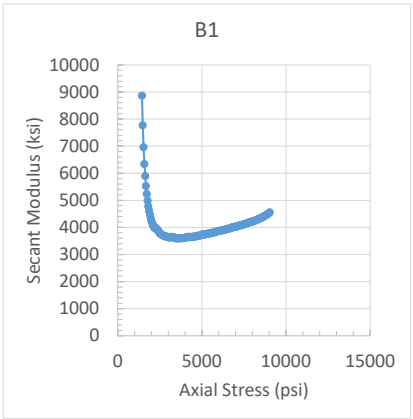
Project No.:	14:9922	Borehole:	B4
Project:	S-174 Bridge over Six and Twenty Creek	Sample No.:	HQ-3
Location:	Anderson County, SC	Depth:	37-37.6 ft
Client:			
Date Received:	03/12/2020		
Date Tested:	03/19/2020	Lab ID No:	B4HQ3

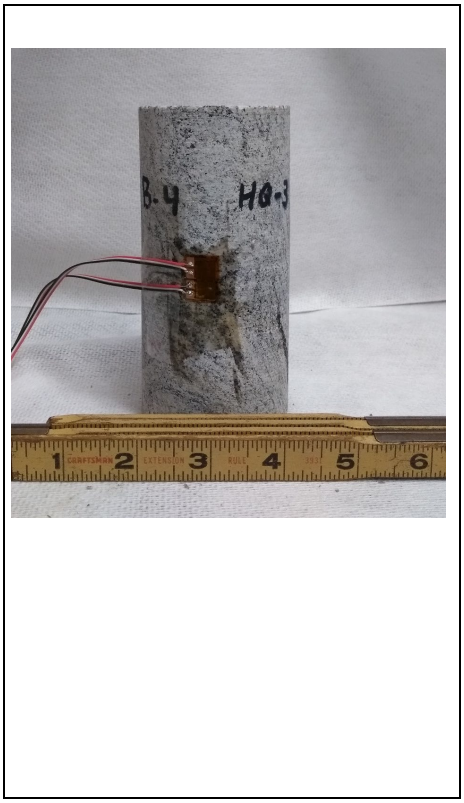
Testing Results			Sample Measurements		
Max Load	44,097	lbs	Diameter	2.492	in
	196.2	kN		6.33	cm
UCS	9039	psi	Height	5.282	in
	62.3	MPa		13.42	cm
Elastic Modulus	4192	ksi	Area	4.879	in^2
	28.90	GPa		31.48	cm^2
Loading Rate	14000	lbs/min	Volume	25.769	in^3
	1.04	kN/s		422.28	cm^3
Lithology	Gneiss, black and white, thinly bedded, moderately weathered, medium strong rock		Mass	2.457	lbs
				1114.48	g
Failure Mode	Shear along foliation / discontinuity		Bulk Density	164.76	lbs/ft^3
				2639.18	kg/m^3
Poisson's Ratio					



Comments

1. Sample was received trimmed and was cut to size and repolished
2. One vertical and one lateral strain gages were attached
3. The lateral strain gage behaves erratically through out the test. The axial SG records zero strain until about 1500 psi.
4. The stress - strain curve based on platten movement is also included in the graph.
5. The elastic modulus is calculated as the slope at 50% load, however Poisson's ratio is not calculated





Before Test

After Test

Department of Mining Engineering
Rock Mechanics Lab
University of Kentucky

Form: 101.03

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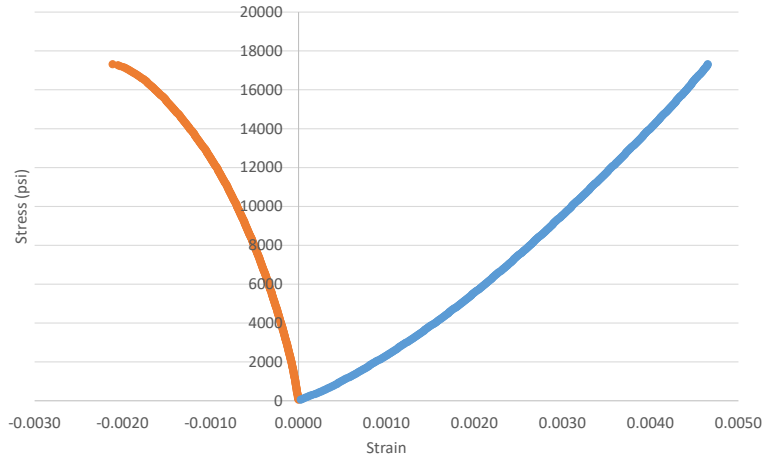
504 Rose Street, 230 MMRB
Lexington, KY 40506

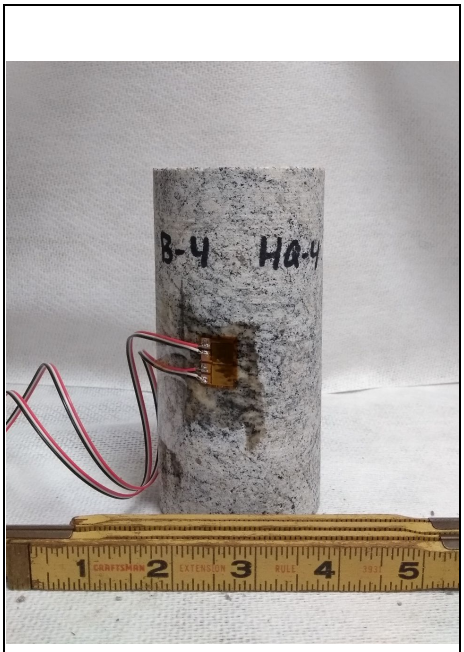
Uniaxial Compressive Strength of Intact Rock Core Specimens

References:
ASTM D7012-14 Method D

Project No.:	14:9922	Borehole:	B4
Project:	S-174 Bridge over Six and Twenty Creek	Sample No.:	HQ-4
Location:	Anderson County, SC	Depth:	42.8-43.4 ft
Client:			
Date Received:	03/12/2020		
Date Tested:	03/19/2020	Lab ID No:	B4-HQ4

Testing Results			Sample Measurements		
Max Load	84,253	lbs	Diameter	2.489	in
	374.8	kN		6.32	cm
UCS	17311	psi	Height	5.256	in
	119.4	MPa		13.35	cm
Elastic Modulus	3958	ksi	Area	4.867	in^2
	27.29	GPa		31.40	cm^2
Loading Rate	14000	lbs/min	Volume	25.581	in^3
	1.04	kN/s		419.19	cm^3
Lithology	Gneiss, black and white, thinly bedded, fresh, strong rock		Mass	2.441	lbs
				1107.22	g
Failure Mode	Diagonal shear plane(s)		Bulk Density	164.89	lbs/ft^3
				2641.32	kg/m^3
Poisson's Ratio	0.205				



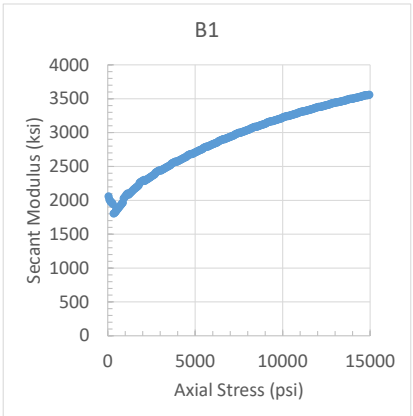


Before Test

After Test

Comments

1. Sample was received trimmed and was cut to size and repolished
2. One vertical and one lateral strain gages were attached
3. Elastic Modulus and Poisson's ratio was calculated at about 50% failure load



APPENDIX D – Supplemental Report Documents

Hammer Calibration

UNIVERSAL
ENGINEERING SCIENCES
Consultants In: Geotechnical Engineering • Environmental Engineering • Construction Materials Testing • Threshold Inspection • Private Provider Inspection • Geophysical Studies

Offices In:
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• Fort Myers, FL
• Fort Pierce, FL
• Gainesville, FL
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• Norcross, GA
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• Orlando, FL
• Palm Coast, FL
• Panama City, FL
• Pensacola, FL
• Rockledge, FL
• Sarasota, FL
• St. Augustine, FL
• Tampa, FL
• West Palm Beach, FL

Betts Environmental
361 Airport Square
Adel, Georgia 31620

April 18, 2019

Subject**:** **Dynamic Testing Report**
SPT Hammer Energy Measurement- CME-75 (S/N 164447)
156 N Johnson Street
Newborn, Georgia 30056
UES Project 0950.1900024.0000

UES has completed the high strain dynamic (i.e. PDA) testing for the Soil Test Boring drill rig designated CME-75 in use at the above referenced project. Dynamic monitoring was conducted during performance of a soil test boring in order to determine energy transferred by the Standard Penetration Test hammer to the drill rods during split spoon sampling. The dynamic testing was conducted using the Pile Driving Analyzer™ (PDA) Model 8G, which records, digitizes, and processes the force and acceleration signals. The dynamic testing was carried out in accordance with ASTM D4945 *Standard Test Method for High Strain Dynamic Testing of Piles and* ASTM D4633 *Standard Test Method for Energy Measurement for Dynamic Penetrometers.*

PROJECT DESCRIPTION

Overview

The SPT hammer calibration testing was performed on site at the property located at 156 N Johnson Street in Newborn, Georgia. The SPT hammer calibration testing was performed at five (5) depths during sampling of an SPT Test Boring on April 12, 2019. The SPT hammer calibration testing was performed the following sampling depths; 33.5 to 35.0 feet (Sample 1), 38.5 to 40.0 feet (Sample 2), 43.5 to 45.0 feet (Sample 3), 48.5 to 50.0 feet (Sample 4), and 53.5 to 55.0 feet (Sample 5).

SPT Testing Overview

Numerous technical publications exist regarding the Standard Penetration Test (SPT). Of these publications, ASTM D1586 *Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils* is considered to be the industry standard. This standard was last approved in January, 1999. In addition, U.S. Army Corp of Engineers Engineering Technical Letter (ETL) 1110-1-138 (dated March, 1988) is also a commonly used standard reference.

The Standard Penetration Test (SPT) consists of a drive weight assembly (i.e. hammer and anvil), split spoon sampler, and drill rods. The drive weight system consists of a 140 lb hammer raised by a number of mechanical means. The split spoon sampler is placed at the end of the drill rods in a borehole. The 140 lb hammer is raised 30 inches and then dropped to impact the drill rods. This procedure is repeated until the sampler has penetrated 18 inches into the underlying soil. The number of blows required to advance the split spoon sampler 12 inches is recorded as the "N" value for the test. Typically, the test is performed every 2 ½ ft for the upper 10 ft of a boring and then at 5 ft intervals thereafter. The standard dimensions of the split spoon sampler are shown in Figure 1, while a typical SPT setup is presented in Figure 2.

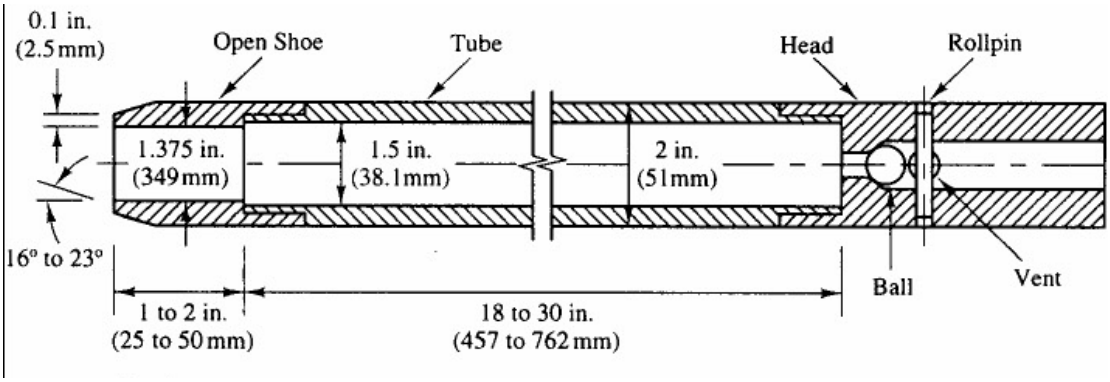


Figure 1. Split Spoon Sampler (after Rogers, 2004, adapted from ASTM D1586).

There are three (3) types of SPT hammers currently used in drilling practice today: the donut hammer, the automatic hammer, and the safety hammer. In addition, there are three (3) main types of hammer lifting mechanisms: cathead-rope system, spooling wench, or chain driven systems. Drill rods vary from AW (1 ¾ in O.D.) to NW (2 5/8 in O.D.), with drill rod lengths varying between 2 ft to 10 ft increments. Methods for advancing boreholes for the SPT test include mud rotary drilling, hollow stem augers, and water drilling with steel casing.

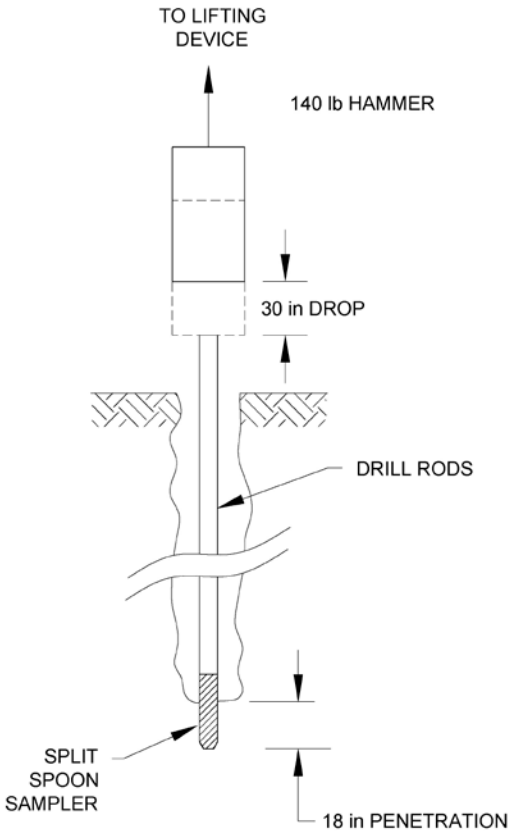


Figure 2. Typical SPT Setup.

SPT Energy Measurements

A number of factors can influence the SPT test and the subsequent N value. These include but are not limited to the following:

- Hammer
- Hammer Lifting System
- Operator Field Procedures
- Drill Rod Diameter and Length
- Borehole Drilling Method and Size
- Spilt Spoon Sampler

A graphical representation of various SPT system variables is provided in Figure 3.

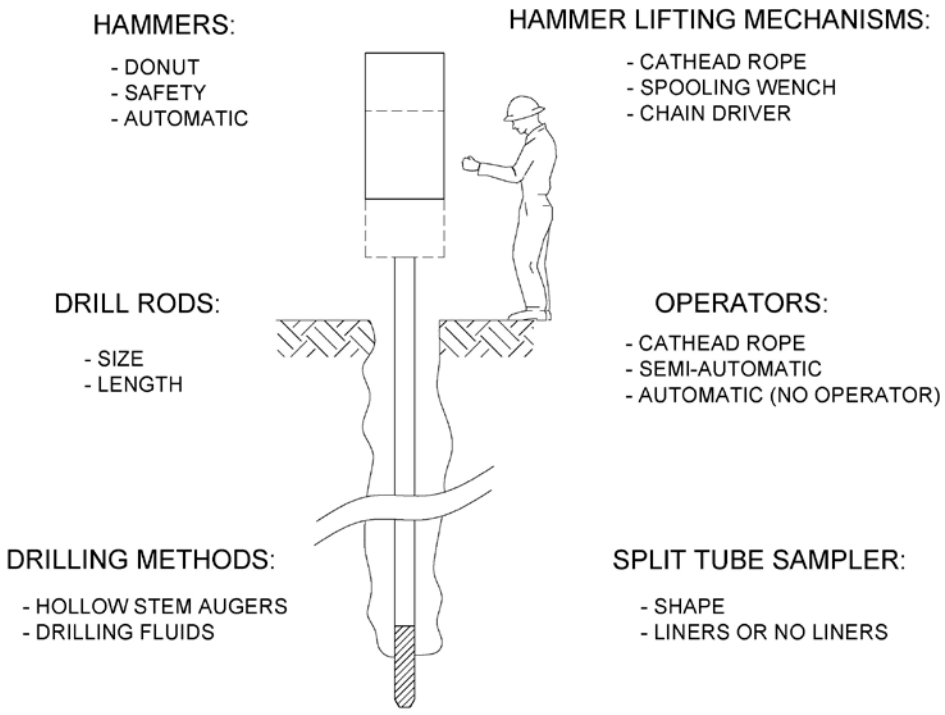


Figure 3. SPT Testing System Variables (after Lamb, 1997).

In order to account for these system variables, standardized SPT corrections have been developed. The corrected blow count is referred to as the N_{60} value. The N_{60} value is derived from the assumed efficiency of the original SPT (Mohr) hammer (Rogers, 2004). The following equation defines N_{60} values:

$$N_{60} = C_{60}C_bC_sC_rN$$

Where:
N_{60} = SPT N Value corrected for field procedures and apparatus
C_{60} = Hammer Efficiency Correction
C_b = Borehole Diameter Correction
C_s = Sample Barrel Correction
C_r = Rod Length Correction
N = Raw SPT value
In addition, the N value is influenced by the overburden pressure. Laio and Whitman (1986) proposed the following overburden correction for N_{60}, termed $(N_1)_{60}$:

$$(N_1)_{60} = N_{60}\frac{\sqrt{2000\,psf}}{\sigma'_v}$$

Where:
σ'_v = Effective vertical overburden stress

The hammer efficiency correction (C_{60}) is based on the Energy Transfer Efficiency (ER_i) and the 60% of the theoretical transferred hammer energy of 350 ft-lbs (i.e. 140 lbs multiplied by a 30 inch drop). The following equations show the derivation of C_{60}:

$$ER_i = \frac{E_i}{E_{th}}$$

Where:
ER_i = Energy Transfer Efficiency
E_i = Measured Transferred Energy
E_{th} = Theoretical Transferred Energy (i.e. 350 ft-lb)

and

$$C_{60} = \frac{ER_i}{60\%}$$

For liquefaction analysis using SPT N values, transferred energy measurements are required to determine $(N_1)_{60}$. The methods for determining the normalized penetration resistance for liquefaction potential are presented in ASTM D6066 *Standard Practice for Determining the Normalized Penetration Resistance of Sands for Evaluation of Liquefaction Potential.*

Transferred (i.e. delivered) energy measurements of SPT testing (i.e. the energy delivered by the hammer to the drill rods) are commonly taken in engineering practice through the use of several types of instruments. The most common of these is the Pile Driving Analyzer (PDA), developed and marketed by Pile Dynamics Inc. of Cleveland, Ohio. The PDA is a computer fitted with a data acquisition and a signal conditioning system and is typically used to conduct high strain dynamic load testing of driven piles, which is analogous to the SPT test. Strain gages and accelerometers which are connected to the PDA are attached to the pile or drill rods (for SPT testing). During pile driving or SPT testing, the strain and acceleration signals are recorded and processed for each hammer blow. The strain signal is converted to a force record and the acceleration signal is converted to a velocity record. The PDA saves selected hammer blows containing this information to disk and determines the compressive stresses, displacement, and

energy at the point of measurement (pile top). The maximum transferred energy (EMX) is derived from the dynamic measurements using the following equation:

$$EMX = \int_{b}^{a} F(t)V(t)dt$$

Where:
a = Time Energy Transfer Begins
b = Time Energy Transfer End
F = Force
V = Velocity
t = Time

Refer to Abou-matar and Goble (1997) for additional details of SPT energy measurements using the PDA. Literature regarding the PDA is provided in the Appendix.

SPT Rig/Hammer System

The tested drill rig is designated CME-75 and is manufactured by Central Mine Equipment, Inc. The drill rig was parked on existing grade in a grassy area for this project. We understand that the drill rig was built on October 29, 1984 and is identified with Serial Number 164447. The CME-75 drill rig is fitted with an automatically operated hammer system. The drill rig and SPT hammer were operated by Mr. Chris Golden.

The method of drilling for the rig during testing was hollow stem auger (HSA), with Standard Penetration Testing being performed with AWJ drill rods. AWJ drill rod sections have nominal outside diameter of 1-5/8 inches and wall thickness of 3/16 inches. The instrumented sub-assembly (i.e. where gauges were attached) consisted of a two feet long section of AWJ rod that was threaded into the top drill rod at each testing interval.

Dynamic Load Test Instrumentation

The dynamic pile testing instrumentation consisted of a 2-feet long AWJ instrumented drill rod which is fitted with two strain gauges by Pile Dynamic Inc., in addition two (2) accelerometer transducers are attached a distance of approximately 1 foot below the top (i.e. in the center) of a two feet long instrumented AWJ drill rod. One strain gauge and one accelerometer are on opposite faces of the sub-assembly to minimize the effects of uneven hammer impact and rod bending.

A Model 8G Pile Driving Analyzer™ (PDA), manufactured by Pile Dynamics Inc., was used to collect the instrumentation data. The PDA is a computer fitted with a data acquisition and a

signal conditioning system. During driving, the strain and acceleration signals are recorded and processed for each hammer blow. The strain signal is converted to a force record and the acceleration signal is converted to a velocity record. The sampling frequency used during the SPT Energy Measurement Testing was 20,000 hertz (20 kHz). The PDA saves selected hammer blows containing this information to disk and determines the energy at the point of measurement.

DYNAMIC TESTING RESULTS

Hammer Performance

The transferred energy monitored during the sampling is summarized in Table 1. Note that the values are those recorded during the second and third 6-inch sampling interval at each depth. Hammer Efficiency is based on measured transferred energy divided by the energy generated with a 140 pound hammer dropping 30 inches (0.35 kip-ft).

Table 1. CME-75 Rig SPT Energy Measurement Summary

SPT 1 Sample Depth (feet)	SPT Blow Count (Per 6 inch)	Hammer Efficiency (%)			
		Min	Max	**Average**	Standard Deviation
33.5 to 35.0	3-4-4	73.70	75.96	75.02	0.71
38.5 to 40.0	5-12-14	70.58	74.11	72.25	0.92
43.5 to 45.0	5-12-21	70.22	74.76	71.98	1.13
48.5 to 50.0	8-12-25	71.29	74.62	72.84	0.80
53.5 to 55.0	20-22-29	70.49	74.32	72.31	0.78
OVERALL[1]:		71.26	74.75	**72.88**	0.87

The following figure shows the SPT rig tested.

Figure 1: SPT drill rig.

CONCLUSIONS AND RECOMMENDATIONS

It is our opinion that the SPT hammer on the drill rig designated CME-75 is operating within a normal range for a semi-automatic SPT hammer.

UES appreciates the opportunity to provide this report. This report is for the sole use of this project and should not be relied upon otherwise. Should the project change significantly, we can review and modify our recommendations as needed. If you have questions concerning the contents herein, please contact us.

Sincerely,

UNIVERSAL ENGINEERING SCIENCES, INC.
Universal Florida Certificate of Authorization No. 549

Joshua C. Adams
Deep Foundation Engineer
HSDPT Certified – Master Level

Adam G. Kirk, P.E. 74552
Senior Engineer
Florida P.E. Number 74552
Date: 4/18/18

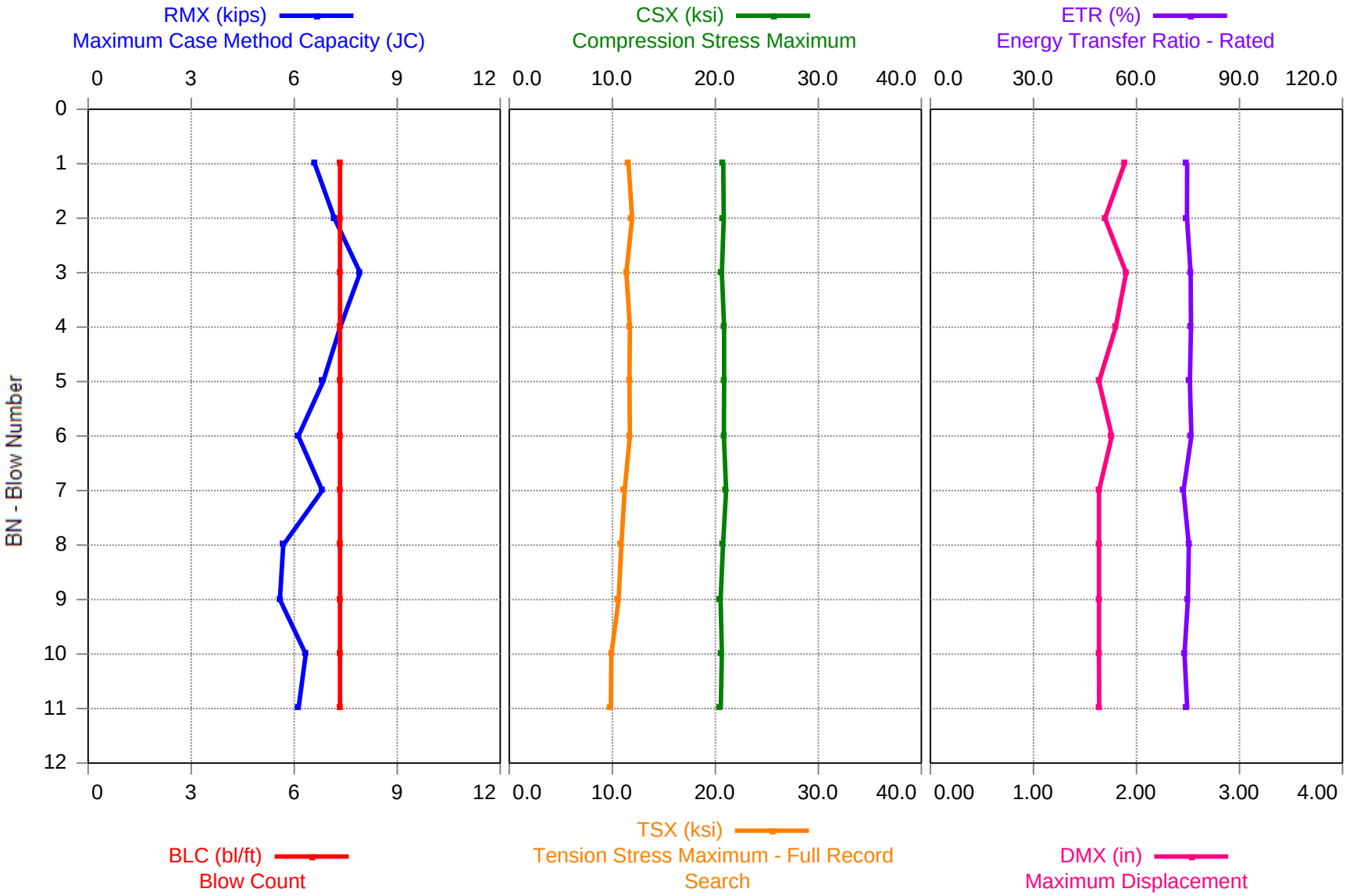
ADAM G. KIRK LICENSE STATE OF FLORIDA PROFESSIONAL ENGINEER

Attachments: PDA Data Output (PDIPLOT Graphs and Tables)

Universal Engineering Sciences, Inc. - PDIPLOT2 Ver 2017.2.58.3 - Case Method & iCAP® Results

Printed: 18-April-2019 Test started: 12-April-2019

Georgia SPT - SPT 2 Sample1



Georgia SPT - SPT 2 Sample1 Rod of area 1.18 square inches on CME 75
OP: NVT Date: 12-April-2019

AR: 1.18 in² SP: 0.492 k/ft³
LE: 44.00 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.60

RMX: Maximum Case Method Capacity (JC) CSB: Compression Stress at Bottom of Pile
CSX: Compression Stress Maximum DMX: Maximum Displacement
TSX: Tension Stress Maximum - Full Record Search SFR: Skin Friction (Crude Damping Correction)
STK: Hammer Stroke ETR: Energy Transfer Ratio - Rated
CSI: Compression Stress Maximum - Individual Sensor

BL#	Depth ft	BLC bl/ft	RMX kips	CSX ksi	TSX ksi	STK ft	CSI ksi	CSB ksi	DMX in	SFR kips	ETR (%)
1	33.64	7	6.6	20.8	11.6	0.00	20.8	15.0	1.88	3	74.72
2	33.77	7	7.2	20.8	11.9	0.00	21.0	14.5	1.69	4	74.72
3	33.91	7	7.9	20.6	11.4	0.00	21.1	15.1	1.90	4	75.75
4	34.05	7	7.3	20.8	11.7	0.00	21.1	14.6	1.80	4	75.86
5	34.18	7	6.8	20.9	11.7	0.00	21.1	14.6	1.64	3	75.54
6	34.32	7	6.1	20.8	11.7	0.00	21.1	15.0	1.76	2	75.96
7	34.45	7	6.8	21.0	11.2	0.00	21.3	15.3	1.64	3	73.70
8	34.59	7	5.7	20.7	10.9	0.00	21.0	14.7	1.64	2	75.25
9	34.73	7	5.6	20.5	10.6	0.00	20.8	14.6	1.64	2	74.95
10	34.86	7	6.3	20.6	9.9	0.00	20.9	14.4	1.64	3	73.99
11	35.00	7	6.1	20.5	9.9	0.00	20.8	14.6	1.64	3	74.78
	Average		6.6	20.7	11.1	**	21.0	14.8	1.71	3	75.02
	Std. Dev.		0.7	0.2	0.7	**	0.1	0.3	0.10	1	0.71
	Maximum		7.9	21.0	11.9	**	21.3	15.3	1.90	4	75.96
	Minimum		5.6	20.5	9.9	**	20.8	14.4	1.64	2	73.70

Total number of blows analyzed: 11

BL# Sensors

1-11 F1: [357AWJ1] 212.0 (1.02); F4: [357AWJ2] 211.2 (1.02); A2: [55385] 915.0 (0.98); A3: [50148] 1065.0 (0.98)

BL# Comments

11 End of Set 1. n=10

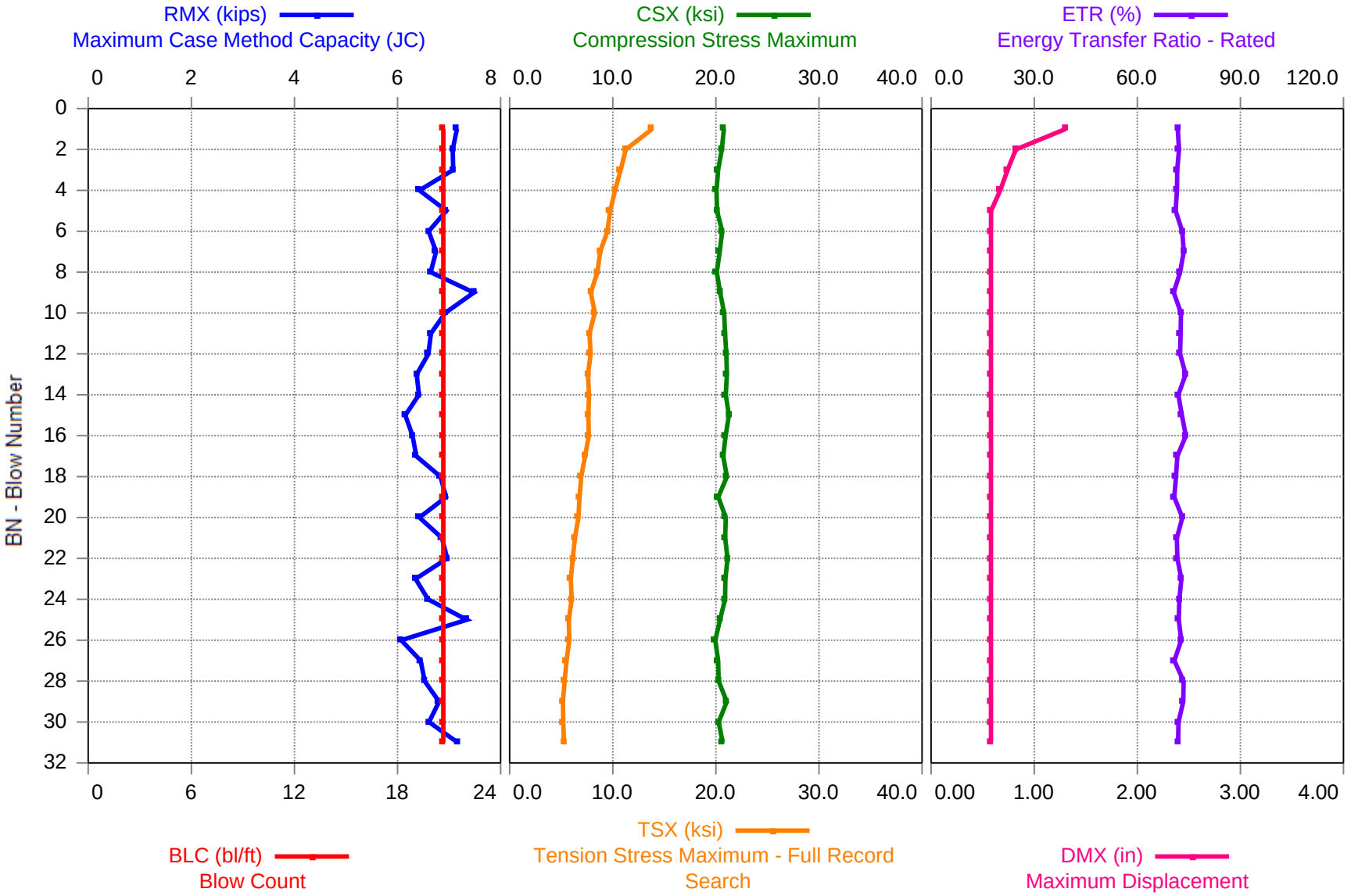
Time Summary

Drive 13 seconds 1:46 PM - 1:46 PM BN 1 - 11

Universal Engineering Sciences, Inc. - PDIPLOT2 Ver 2017.2.58.3 - Case Method & iCAP® Results

Printed: 18-April-2019 Test started: 12-April-2019

Georgia SPT - SPT 2 Sample 2



Georgia SPT - SPT 2 Sample 2 Rod of area 1.18 square inches on CME 75
OP: NVT Date: 12-April-2019

AR: 1.18 in² SP: 0.492 k/ft³
LE: 50.00 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.60

RMX: Maximum Case Method Capacity (JC)
CSX: Compression Stress Maximum
TSX: Tension Stress Maximum - Full Record Search
STK: Hammer Stroke
CSI: Compression Stress Maximum - Individual Sensor
CSB: Compression Stress at Bottom of Pile
DMX: Maximum Displacement
SFR: Skin Friction (Crude Damping Correction)
ETR: Energy Transfer Ratio - Rated

BL#	Depth ft	BLC bl/ft	RMX kips	CSX ksi	TSX ksi	STK ft	CSI ksi	CSB ksi	DMX in	SFR kips	ETR (%)
1	38.55	21	7.2	20.8	13.8	0.00	20.9	15.4	1.31	3	71.76
2	38.60	21	7.1	20.6	11.3	0.00	20.6	14.9	0.82	3	72.14
3	38.65	21	7.1	20.2	10.8	0.00	20.5	14.7	0.74	3	71.63
4	38.69	21	6.4	20.1	10.2	0.00	20.3	14.2	0.67	3	71.53
5	38.74	21	6.9	20.1	9.8	0.00	20.3	14.5	0.58	3	71.16
6	38.79	21	6.6	20.6	9.5	0.00	20.9	14.4	0.58	3	73.06
7	38.84	21	6.7	20.4	8.8	0.00	20.4	14.7	0.58	3	73.52
8	38.89	21	6.6	20.1	8.5	0.00	20.1	13.9	0.58	3	72.45
9	38.94	21	7.5	20.4	7.9	0.00	20.4	14.3	0.58	3	70.58
10	38.98	21	6.9	20.8	8.3	0.00	21.0	14.9	0.58	3	72.72
11	39.03	21	6.6	20.9	7.7	0.00	21.0	14.7	0.58	3	72.58
12	39.08	21	6.6	21.0	7.9	0.00	21.2	14.8	0.58	3	72.44
13	39.13	21	6.4	21.1	7.6	0.00	21.1	14.7	0.58	3	74.07
14	39.18	21	6.4	21.0	7.7	0.00	21.2	14.4	0.58	3	71.92
15	39.23	21	6.1	21.3	7.6	0.00	21.3	14.8	0.58	3	72.94
16	39.27	21	6.3	20.9	7.7	0.00	21.2	15.0	0.58	2	74.11
17	39.32	21	6.4	20.7	7.3	0.00	20.8	14.4	0.58	3	71.63
18	39.37	21	6.8	21.1	6.9	0.00	21.1	15.2	0.58	3	71.24
19	39.42	21	6.9	20.2	6.8	0.00	20.4	14.9	0.58	3	70.74
20	39.47	21	6.4	21.0	6.7	0.00	21.0	15.1	0.58	3	73.12
21	39.52	21	6.9	20.9	6.3	0.00	21.0	15.2	0.58	3	71.50
22	39.56	21	7.0	21.1	6.1	0.00	21.3	15.1	0.58	3	71.65
23	39.61	21	6.3	20.9	5.9	0.00	21.0	15.0	0.58	3	72.81
24	39.66	21	6.6	20.9	6.0	0.00	21.0	15.0	0.58	3	72.22
25	39.71	21	7.3	20.4	5.7	0.00	20.7	14.9	0.58	3	72.04
26	39.76	21	6.1	19.9	5.8	0.00	20.0	14.2	0.58	2	72.76
27	39.81	21	6.4	20.2	5.5	0.00	20.5	14.8	0.58	3	70.77
28	39.85	21	6.5	20.3	5.3	0.00	20.5	14.7	0.58	3	73.48
29	39.90	21	6.8	21.1	5.2	0.00	21.3	15.2	0.58	3	73.35
30	39.95	21	6.6	20.3	5.2	0.00	20.6	14.3	0.58	3	71.99
31	40.00	21	7.2	20.7	5.3	0.00	20.9	15.1	0.58	3	71.85
		Average	6.7	20.6	7.6	**	20.8	14.8	0.62	3	72.25
		Std. Dev.	0.3	0.4	2.0	**	0.4	0.4	0.14	0	0.92
		Maximum	7.5	21.3	13.8	**	21.3	15.4	1.31	3	74.11
		Minimum	6.1	19.9	5.2	**	20.0	13.9	0.58	2	70.58

Total number of blows analyzed: 31

BL# Sensors

1-31 F1: [357AWJ1] 212.0 (1.12); F4: [357AWJ2] 211.2 (1.12); A2: [55385] 915.0 (0.88); A3: [50148] 1065.0 (0.88)

Georgia SPT - SPT 2 Sample 2 Rod of area 1.18 square inches on CME 75
OP: NVT Date: 12-April-2019

BL# Comments

31 end of set 2. N=28

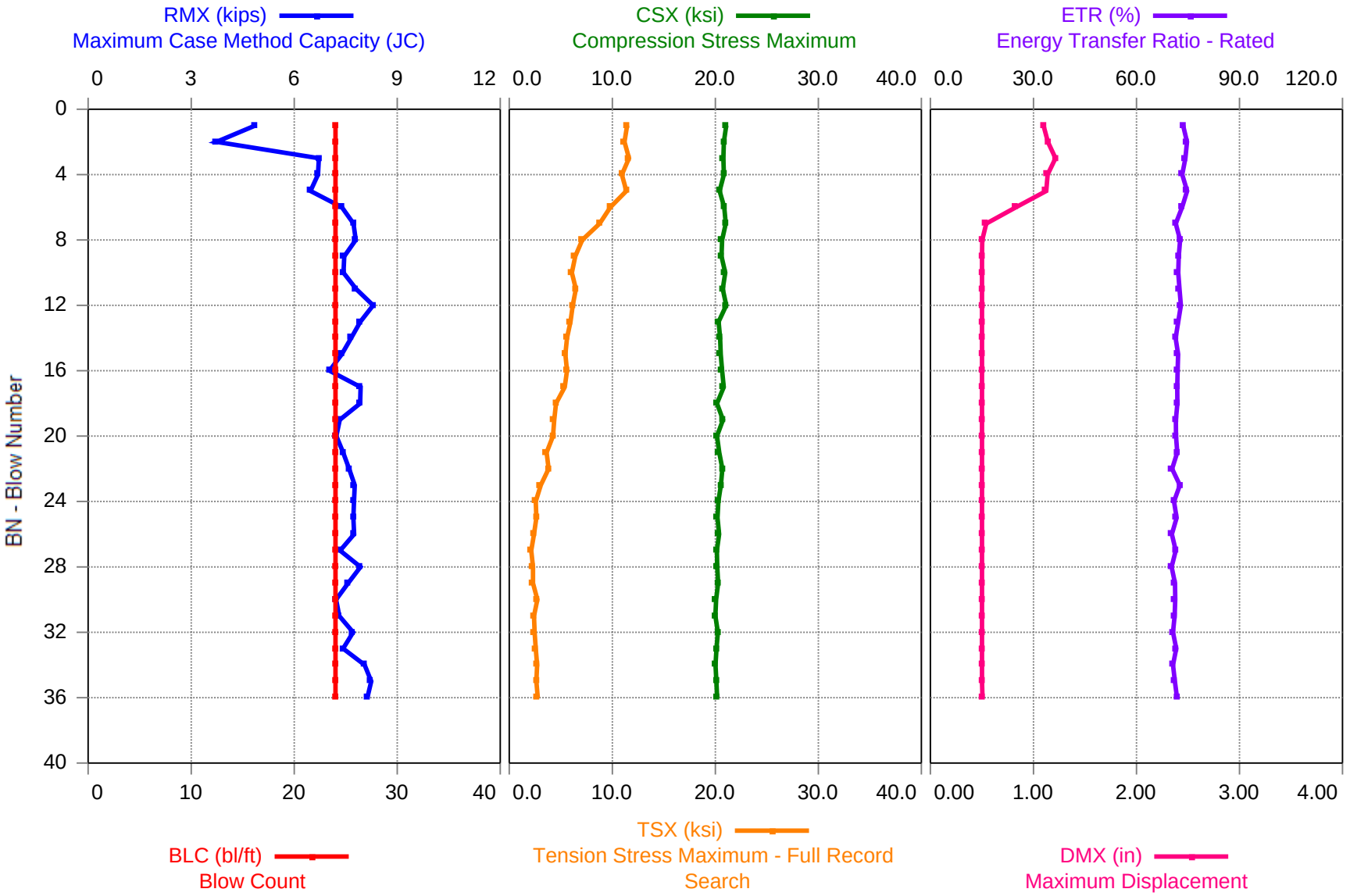
Time Summary

Drive 41 seconds 1:56 PM - 1:56 PM BN 1 - 31

Universal Engineering Sciences, Inc. - PDIPLOT2 Ver 2017.2.58.3 - Case Method & iCAP® Results

Printed: 18-April-2019 Test started: 12-April-2019

Georgia SPT - SPT 2 Sample 3



Georgia SPT - SPT 2 Sample 3 Rod of area 1.18 square inches on CME 75
OP: NVT Date: 12-April-2019

AR: 1.18 in² SP: 0.492 k/ft³
LE: 55.00 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.60

RMX: Maximum Case Method Capacity (JC) CSB: Compression Stress at Bottom of Pile
CSX: Compression Stress Maximum DMX: Maximum Displacement
TSX: Tension Stress Maximum - Full Record Search SFR: Skin Friction (Crude Damping Correction)
STK: Hammer Stroke ETR: Energy Transfer Ratio - Rated
CSI: Compression Stress Maximum - Individual Sensor

BL#	Depth	BLC	RMX	CSX	TSX	STK	CSI	CSB	DMX	SFR	ETR
	ft	bl/ft	kips	ksi	ksi	ft	ksi	ksi	in	kips	(%)
1	43.54	24	4.9	21.1	11.4	0.00	21.6	13.3	1.10	3	73.56
2	43.58	24	3.7	20.8	11.2	0.00	21.3	12.7	1.14	2	74.69
3	43.63	24	6.7	20.8	11.6	0.00	21.2	14.4	1.21	3	74.22
4	43.67	24	6.7	20.8	10.9	0.00	21.4	13.9	1.14	4	73.33
5	43.71	24	6.5	20.4	11.4	0.00	20.9	13.8	1.12	3	74.76
6	43.75	24	7.4	20.9	9.8	0.00	21.5	14.5	0.83	4	73.27
7	43.79	24	7.7	21.0	8.8	0.00	21.6	14.4	0.54	4	71.45
8	43.83	24	7.8	20.7	7.1	0.00	21.3	14.5	0.50	4	72.71
9	43.88	24	7.5	20.6	6.4	0.00	21.2	14.7	0.50	3	72.31
10	43.92	24	7.4	21.0	6.1	0.00	21.6	14.8	0.50	3	72.14
11	43.96	24	7.8	20.7	6.5	0.00	21.4	14.8	0.50	4	72.51
12	44.00	24	8.3	21.1	6.2	0.00	21.9	15.1	0.50	4	72.92
13	44.04	24	7.9	20.3	5.9	0.00	20.8	14.8	0.50	4	72.14
14	44.08	24	7.7	20.5	5.6	0.00	21.2	14.6	0.50	4	71.40
15	44.13	24	7.4	20.5	5.4	0.00	21.3	14.9	0.50	3	72.12
16	44.17	24	7.0	20.7	5.6	0.00	21.4	14.6	0.50	3	71.96
17	44.21	24	7.9	20.8	5.4	0.00	21.5	15.1	0.50	4	71.86
18	44.25	24	7.9	20.2	4.5	0.00	20.7	14.4	0.50	4	71.91
19	44.29	24	7.3	20.7	4.4	0.00	21.5	14.2	0.50	4	71.45
20	44.33	24	7.2	20.2	4.2	0.00	20.7	14.2	0.50	3	71.52
21	44.38	24	7.4	20.4	3.6	0.00	21.1	14.4	0.50	4	71.86
22	44.42	24	7.6	20.7	3.8	0.00	21.3	14.4	0.50	4	70.36
23	44.46	24	7.8	20.5	3.0	0.00	21.4	14.7	0.50	4	72.62
24	44.50	24	7.7	20.3	2.6	0.00	20.9	14.1	0.50	4	70.92
25	44.54	24	7.7	20.2	2.6	0.00	20.8	13.9	0.50	4	71.70
26	44.58	24	7.7	20.4	2.4	0.00	21.1	14.3	0.50	4	70.31
27	44.63	24	7.3	20.1	2.1	0.00	20.8	14.0	0.50	4	71.44
28	44.67	24	7.9	20.2	2.3	0.00	20.7	14.0	0.50	4	70.22
29	44.71	24	7.6	20.3	2.3	0.00	20.9	14.2	0.50	4	71.23
30	44.75	24	7.2	20.1	2.7	0.00	20.7	14.1	0.50	4	71.27
31	44.79	24	7.3	20.0	2.4	0.00	20.6	13.8	0.50	4	71.10
32	44.83	24	7.7	20.2	2.5	0.00	20.8	14.3	0.50	4	70.64
33	44.88	24	7.4	20.1	2.6	0.00	20.7	13.8	0.50	4	71.58
34	44.92	24	8.0	20.0	2.7	0.00	20.5	14.0	0.50	4	70.62
35	44.96	24	8.2	20.1	2.6	0.00	20.7	14.2	0.50	4	71.18
36	45.00	24	8.1	20.2	2.8	0.00	20.6	14.3	0.51	4	71.80
		Average	7.4	20.5	5.3	**	21.1	14.3	0.60	4	71.98
		Std. Dev.	0.9	0.3	3.1	**	0.4	0.5	0.23	0	1.13
		Maximum	8.3	21.1	11.6	**	21.9	15.1	1.21	4	74.76
		Minimum	3.7	20.0	2.1	**	20.5	12.7	0.50	2	70.22

Total number of blows analyzed: 36

Georgia SPT - SPT 2 Sample 3 Rod of area 1.18 square inches on CME 75
OP: NVT Date: 12-April-2019

BL#	Sensors
1-36	F1: [357AWJ1] 212.0 (1.12); F4: [357AWJ2] 211.2 (1.12); A2: [55385] 915.0 (0.88); A3: [50148] 1065.0 (0.88)

BL#	Comments
36	End of Set 3. n=33

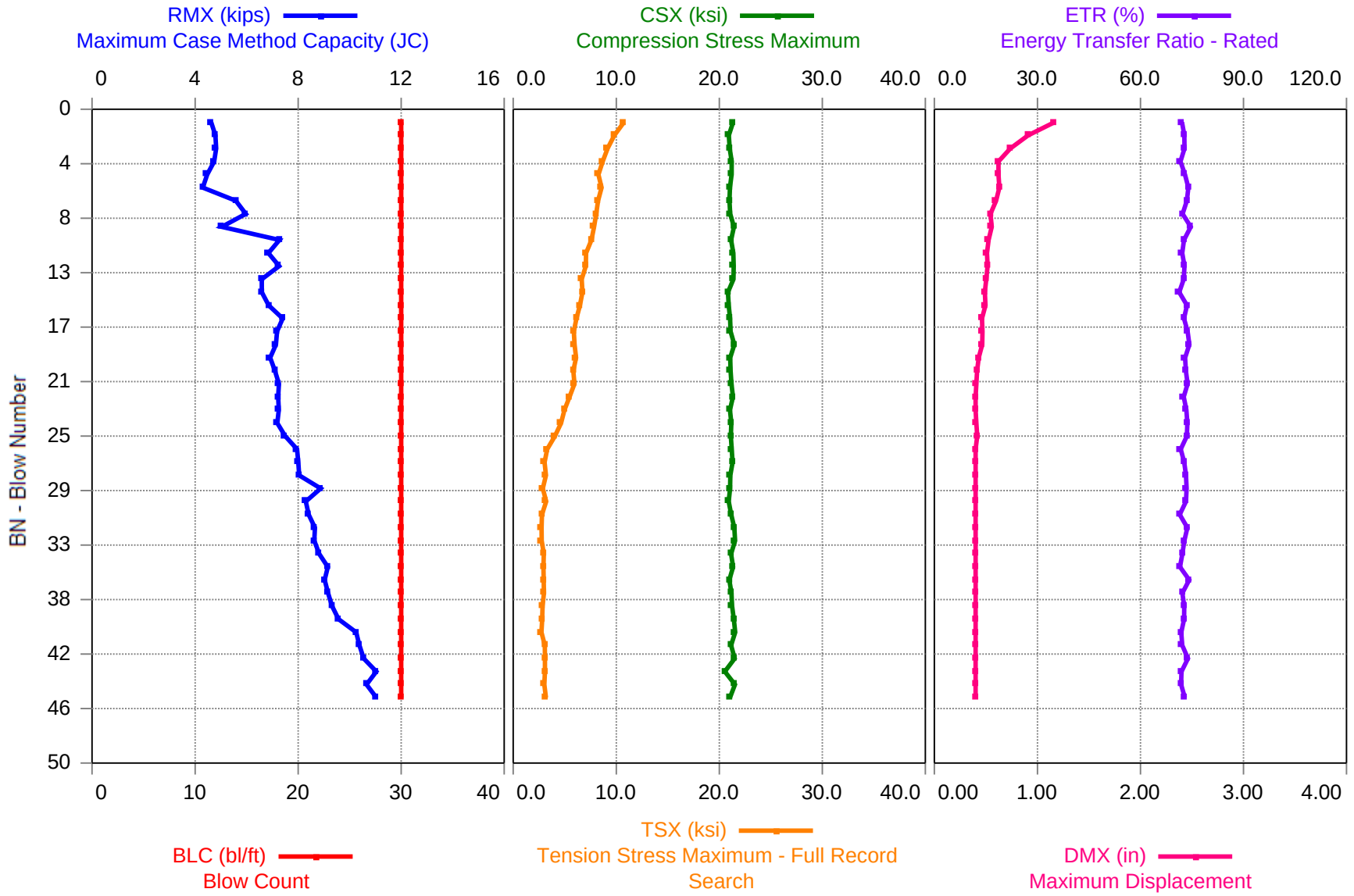
Time Summary

Drive 49 seconds 2:14 PM - 2:14 PM BN 1 - 36

Universal Engineering Sciences, Inc. - PDIPLOT2 Ver 2017.2.58.3 - Case Method & iCAP® Results

Printed: 18-April-2019 Test started: 12-April-2019

Georgia SPT - SPT 2 Sample 4



Georgia SPT - SPT 2 Sample 4 Rod of area 1.18 square inches on CME 75
OP: NVT Date: 12-April-2019

AR: 1.18 in² SP: 0.492 k/ft³
LE: 55.00 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.60

RMX: Maximum Case Method Capacity (JC) CSB: Compression Stress at Bottom of Pile
CSX: Compression Stress Maximum DMX: Maximum Displacement
TSX: Tension Stress Maximum - Full Record Search SFR: Skin Friction (Crude Damping Correction)
STK: Hammer Stroke ETR: Energy Transfer Ratio - Rated
CSI: Compression Stress Maximum - Individual Sensor

BL#	Depth ft	BLC bl/ft	RMX kips	CSX ksi	TSX ksi	STK ft	CSI ksi	CSB ksi	DMX in	SFR kips	ETR (%)
1	48.53	30	4.6	21.3	10.7	0.00	21.5	15.0	1.17	1	72.09
2	48.57	30	4.8	20.9	9.8	0.00	21.1	13.1	0.91	2	72.78
3	48.60	30	4.8	21.0	9.2	0.00	21.0	13.8	0.74	2	72.83
4	48.63	30	4.7	21.2	8.7	0.00	21.2	14.1	0.62	2	71.63
5	48.67	30	4.5	21.2	8.3	0.00	21.2	14.6	0.62	1	72.96
6	48.70	30	4.3	21.0	8.6	0.00	21.1	14.3	0.63	2	73.93
7	48.73	30	5.6	21.0	8.2	0.00	21.0	15.0	0.60	2	73.49
8	48.77	30	6.0	21.1	8.0	0.00	21.1	15.2	0.54	2	72.26
9	48.80	30	5.0	21.4	7.8	0.00	21.5	14.4	0.56	2	74.62
10	48.83	30	7.3	21.1	7.6	0.00	21.2	15.6	0.53	3	72.65
11	48.87	30	6.8	21.4	7.1	0.00	21.4	15.6	0.51	3	72.17
12	48.90	30	7.3	21.4	7.0	0.00	21.5	15.8	0.52	3	72.82
13	48.93	30	6.6	21.4	6.6	0.00	21.5	15.5	0.50	2	72.61
14	48.97	30	6.6	20.8	6.7	0.00	20.9	15.4	0.49	2	71.29
15	49.00	30	6.9	20.9	6.5	0.00	21.0	15.8	0.50	2	73.55
16	49.03	30	7.4	21.0	6.1	0.00	21.1	15.7	0.46	3	72.67
17	49.07	30	7.2	21.1	5.9	0.00	21.2	15.9	0.47	3	73.71
18	49.10	30	7.1	21.5	6.0	0.00	21.7	15.8	0.46	3	74.24
19	49.13	30	6.9	21.1	6.1	0.00	21.1	15.3	0.43	2	73.00
20	49.17	30	7.1	21.1	5.8	0.00	21.1	15.9	0.41	2	73.21
21	49.20	30	7.3	21.2	5.9	0.00	21.3	16.0	0.41	2	73.71
22	49.23	30	7.2	21.3	5.5	0.00	21.5	15.9	0.40	2	72.58
23	49.27	30	7.2	21.0	5.0	0.00	21.1	15.9	0.40	2	73.35
24	49.30	30	7.2	21.2	4.6	0.00	21.2	16.1	0.41	2	73.66
25	49.33	30	7.5	21.1	4.0	0.00	21.1	15.8	0.42	3	73.49
26	49.37	30	8.0	21.2	3.3	0.00	21.4	14.8	0.40	3	71.73
27	49.40	30	8.0	21.3	3.0	0.00	21.4	15.8	0.40	3	72.73
28	49.43	30	8.0	21.1	3.2	0.00	21.1	15.8	0.40	3	73.24
29	49.47	30	8.9	21.0	2.9	0.00	21.1	16.0	0.40	3	73.44
30	49.50	30	8.3	20.9	3.2	0.00	21.0	15.8	0.40	3	73.26
31	49.53	30	8.4	21.2	2.8	0.00	21.2	15.5	0.40	3	71.45
32	49.57	30	8.7	21.5	2.8	0.00	21.7	15.7	0.40	3	73.66
33	49.60	30	8.6	21.5	2.8	0.00	21.8	16.2	0.40	3	72.79
34	49.63	30	8.8	21.1	3.0	0.00	21.3	15.8	0.40	3	72.19
35	49.67	30	9.2	21.3	2.9	0.00	21.6	15.2	0.40	4	71.50
36	49.70	30	9.0	21.0	3.0	0.00	21.2	15.9	0.40	3	74.18
37	49.73	30	9.2	21.2	3.0	0.00	21.2	15.7	0.40	3	72.21
38	49.77	30	9.3	21.2	2.9	0.00	21.4	15.9	0.40	4	72.74
39	49.80	30	9.6	21.4	2.8	0.00	21.6	15.9	0.40	4	72.69
40	49.83	30	10.3	21.5	2.7	0.00	21.8	15.9	0.40	4	71.86
41	49.87	30	10.4	21.1	3.1	0.00	21.3	16.2	0.40	4	72.14
42	49.90	30	10.5	21.5	3.1	0.00	21.7	15.8	0.40	4	73.82
43	49.93	30	11.0	20.5	3.1	0.00	20.6	15.9	0.40	4	71.92
44	49.97	30	10.7	21.5	3.0	0.00	21.6	16.4	0.40	4	71.82
45	50.00	30	11.0	21.0	3.2	0.00	21.1	15.8	0.40	4	72.92

Georgia SPT - SPT 2 Sample 4 Rod of area 1.18 square inches on CME 75
OP: NVT Date: 12-April-2019

BL#	Depth ft	BLC bl/ft	RMX kips	CSX ksi	TSX ksi	STK ft	CSI ksi	CSB ksi	DMX in	SFR kips	ETR (%)
		Average	7.6	21.2	5.2	**	21.3	15.5	0.48	3	72.84
		Std. Dev.	1.8	0.2	2.3	**	0.3	0.7	0.15	1	0.80
		Maximum	11.0	21.5	10.7	**	21.8	16.4	1.17	4	74.62
		Minimum	4.3	20.5	2.7	**	20.6	13.1	0.40	1	71.29

Total number of blows analyzed: 45

BL# Sensors

1-45 F1: [357AWJ1] 212.0 (1.12); F4: [357AWJ2] 211.2 (1.12); A2: [55385] 915.0 (0.88); A3: [50148] 1065.0 (0.88)

BL# Comments

45 end of set 4. n=39

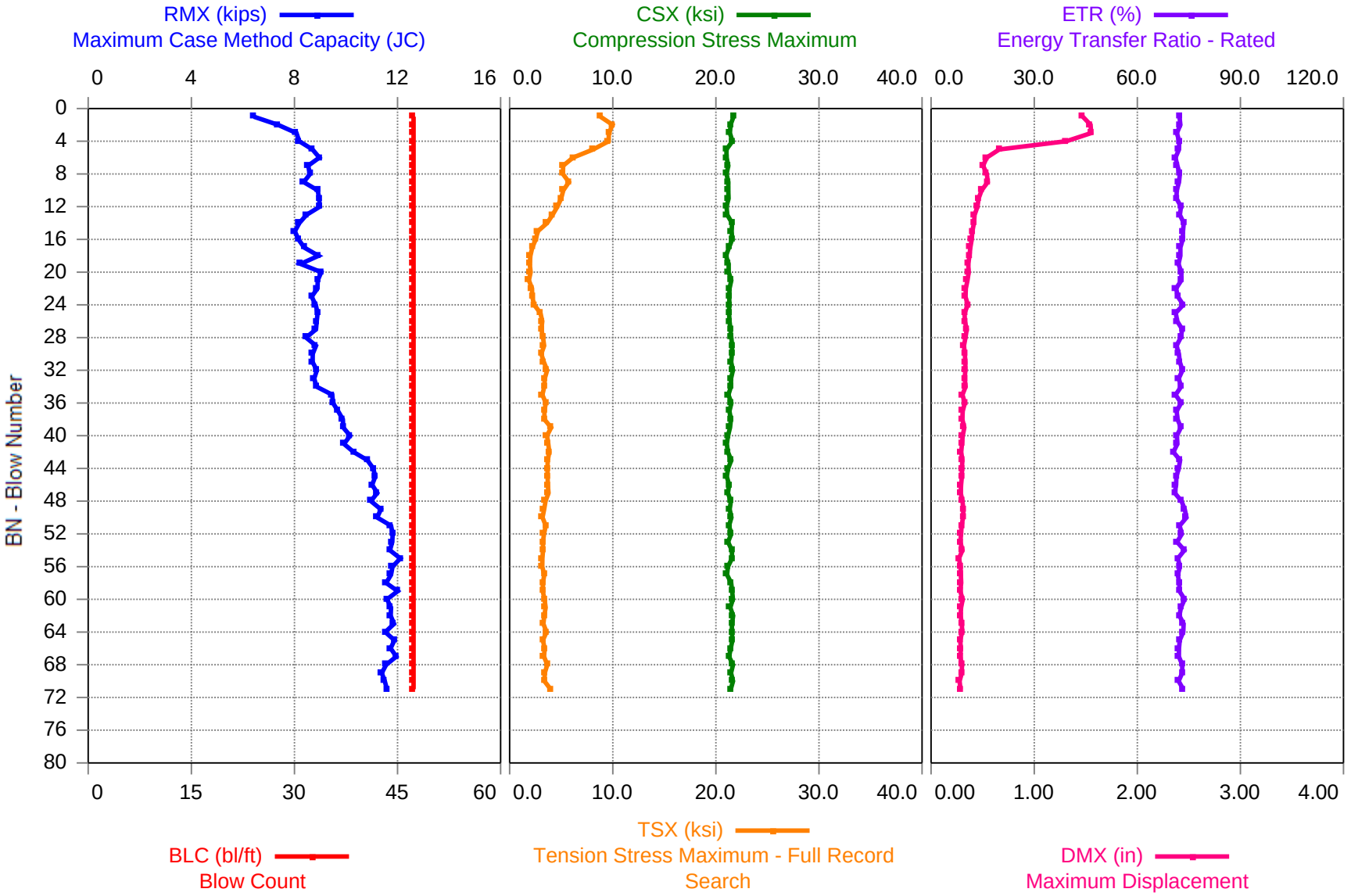
Time Summary

Drive 1 minute 2 seconds 2:27 PM - 2:28 PM BN 1 - 45

Universal Engineering Sciences, Inc. - PDIPLOT2 Ver 2017.2.58.3 - Case Method & iCAP® Results

Printed: 18-April-2019 Test started: 12-April-2019

Georgia SPT - SPT 2 Sample 5



Georgia SPT - SPT 2 Sample 5 Rod of area 1.18 square inches on CME 75
OP: NVT Date: 12-April-2019

AR: 1.18 in² SP: 0.492 k/ft³
LE: 60.00 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.60

RMX: Maximum Case Method Capacity (JC)
CSX: Compression Stress Maximum
TSX: Tension Stress Maximum - Full Record Search
STK: Hammer Stroke
CSI: Compression Stress Maximum - Individual Sensor
CSB: Compression Stress at Bottom of Pile
DMX: Maximum Displacement
SFR: Skin Friction (Crude Damping Correction)
ETR: Energy Transfer Ratio - Rated

BL#	Depth ft	BLC bl/ft	RMX kips	CSX ksi	TSX ksi	STK ft	CSI ksi	CSB ksi	DMX in	SFR kips	ETR (%)
1	53.52	47	6.4	21.7	8.8	0.00	21.8	17.7	1.47	1	72.27
2	53.54	47	7.4	21.4	10.0	0.00	21.5	15.4	1.55	3	72.51
3	53.56	47	8.1	21.4	9.6	0.00	21.4	15.5	1.55	4	71.52
4	53.58	47	8.2	21.6	9.6	0.00	21.6	16.4	1.31	3	72.20
5	53.61	47	8.7	21.0	8.1	0.00	21.2	15.8	0.66	4	72.13
6	53.63	47	9.0	21.0	6.1	0.00	21.2	16.1	0.54	3	71.12
7	53.65	47	8.5	21.2	5.2	0.00	21.3	16.4	0.50	3	71.64
8	53.67	47	8.6	21.0	5.2	0.00	21.2	16.6	0.54	3	72.37
9	53.69	47	8.4	21.2	5.7	0.00	21.4	16.1	0.55	3	72.11
10	53.71	47	8.9	21.2	5.2	0.00	21.3	16.7	0.49	3	71.46
11	53.73	47	9.0	21.2	5.0	0.00	21.5	16.8	0.46	3	71.39
12	53.75	47	9.0	21.0	4.6	0.00	21.2	16.7	0.45	3	72.71
13	53.77	47	8.5	21.1	4.2	0.00	21.2	16.0	0.42	3	72.38
14	53.80	47	8.2	21.6	3.6	0.00	21.6	16.8	0.42	3	73.49
15	53.82	47	8.0	21.5	2.7	0.00	21.6	16.6	0.40	3	73.30
16	53.84	47	8.2	21.6	2.5	0.00	21.6	16.6	0.39	3	73.22
17	53.86	47	8.4	21.3	2.2	0.00	21.3	16.0	0.38	3	72.54
18	53.88	47	8.9	21.0	2.0	0.00	21.1	16.8	0.37	3	72.52
19	53.90	47	8.2	21.2	2.0	0.00	21.3	16.6	0.36	3	71.99
20	53.92	47	9.0	21.2	2.0	0.00	21.5	16.7	0.36	3	72.82
21	53.94	47	8.9	21.5	1.9	0.00	21.7	16.7	0.35	3	72.80
22	53.96	47	8.9	21.3	2.2	0.00	21.6	16.5	0.34	3	71.30
23	53.99	47	8.7	21.3	2.2	0.00	21.4	16.5	0.33	3	71.79
24	54.01	47	8.8	21.3	2.4	0.00	21.4	16.4	0.36	3	73.37
25	54.03	47	8.9	21.3	3.0	0.00	21.4	16.8	0.32	3	71.17
26	54.05	47	8.9	21.3	3.2	0.00	21.5	16.6	0.33	3	71.61
27	54.07	47	8.8	21.4	3.1	0.00	21.4	17.5	0.35	2	73.06
28	54.09	47	8.5	21.5	3.2	0.00	21.5	16.7	0.33	3	72.63
29	54.11	47	8.8	21.6	3.3	0.00	21.7	16.8	0.32	3	71.40
30	54.13	47	8.7	21.6	3.1	0.00	21.8	16.6	0.33	3	72.10
31	54.15	47	8.7	21.5	3.3	0.00	21.7	16.9	0.33	3	72.38
32	54.18	47	8.9	21.7	3.6	0.00	21.8	17.1	0.33	3	73.15
33	54.20	47	8.8	21.5	3.4	0.00	21.6	17.1	0.33	3	72.04
34	54.22	47	8.9	21.5	3.3	0.00	21.6	16.8	0.33	3	72.75
35	54.24	47	9.5	21.2	3.2	0.00	21.5	16.8	0.30	3	71.13
36	54.26	47	9.5	21.5	3.5	0.00	21.6	17.0	0.33	3	72.73
37	54.28	47	9.7	21.3	3.4	0.00	21.5	16.8	0.31	3	71.44
38	54.30	47	9.9	21.5	3.4	0.00	21.7	16.4	0.30	4	71.71
39	54.32	47	9.9	21.4	4.0	0.00	21.4	17.0	0.32	3	72.68
40	54.35	47	10.2	21.2	3.6	0.00	21.3	16.6	0.31	4	71.51
41	54.37	47	9.9	21.1	3.7	0.00	21.2	16.6	0.30	4	71.63
42	54.39	47	10.3	21.2	3.8	0.00	21.3	16.5	0.29	4	70.49
43	54.41	47	10.8	21.5	3.7	0.00	21.7	16.6	0.30	4	72.44
44	54.43	47	11.1	21.2	3.7	0.00	21.2	16.5	0.30	4	72.04
45	54.45	47	11.1	21.1	3.7	0.00	21.2	16.6	0.30	4	71.36

Georgia SPT - SPT 2 Sample 5 Rod of area 1.18 square inches on CME 75
OP: NVT Date: 12-April-2019

BL#	Depth ft	BLC bl/ft	RMX kips	CSX ksi	TSX ksi	STK ft	CSI ksi	CSB ksi	DMX in	SFR kips	ETR (%)
46	54.47	47	11.0	21.3	3.7	0.00	21.5	16.5	0.29	4	71.27
47	54.49	47	11.2	21.2	3.8	0.00	21.3	16.3	0.29	4	70.87
48	54.51	47	11.0	21.5	3.5	0.00	21.6	16.6	0.30	4	72.83
49	54.54	47	11.4	21.3	3.3	0.00	21.4	16.7	0.31	4	73.80
50	54.56	47	11.2	21.5	3.2	0.00	21.7	16.9	0.31	4	74.32
51	54.58	47	11.7	21.3	3.5	0.00	21.3	16.3	0.30	4	72.31
52	54.60	47	11.8	21.5	3.3	0.00	21.7	16.5	0.29	5	72.94
53	54.62	47	11.8	21.2	3.2	0.00	21.3	16.7	0.28	4	71.57
54	54.64	47	11.7	21.6	3.2	0.00	21.6	16.3	0.30	5	73.68
55	54.66	47	12.1	21.6	3.2	0.00	21.6	16.2	0.27	5	71.81
56	54.68	47	11.8	21.2	3.2	0.00	21.3	16.5	0.29	5	72.43
57	54.70	47	11.7	21.1	3.4	0.00	21.2	16.6	0.29	4	71.75
58	54.73	47	11.6	21.5	3.2	0.00	21.7	16.3	0.29	5	72.23
59	54.75	47	12.0	21.6	3.2	0.00	21.7	16.1	0.28	5	72.28
60	54.77	47	11.6	21.6	3.4	0.00	21.7	16.4	0.31	5	73.76
61	54.79	47	11.7	21.4	3.5	0.00	21.5	15.7	0.29	5	72.69
62	54.81	47	11.7	21.7	3.4	0.00	21.7	16.8	0.29	4	72.24
63	54.83	47	11.9	21.5	3.3	0.00	21.6	15.9	0.30	5	73.48
64	54.85	47	11.5	21.6	3.6	0.00	21.6	15.8	0.30	5	73.37
65	54.87	47	11.9	21.6	3.2	0.00	21.7	16.5	0.28	5	72.35
66	54.89	47	11.7	21.4	3.4	0.00	21.5	16.4	0.29	5	72.12
67	54.92	47	12.0	21.3	3.3	0.00	21.3	16.5	0.28	5	72.10
68	54.94	47	11.6	21.7	3.6	0.00	21.8	16.7	0.30	5	73.06
69	54.96	47	11.4	21.5	3.4	0.00	21.5	16.6	0.30	5	73.07
70	54.98	47	11.5	21.7	3.4	0.00	21.8	16.4	0.28	5	72.03
71	55.00	47	11.6	21.4	4.0	0.00	21.5	16.1	0.28	5	73.35
		Average	9.9	21.4	3.9	**	21.5	16.5	0.41	4	72.31
		Std. Dev.	1.5	0.2	1.7	**	0.2	0.4	0.27	1	0.78
		Maximum	12.1	21.7	10.0	**	21.8	17.7	1.55	5	74.32
		Minimum	6.4	21.0	1.9	**	21.1	15.4	0.27	1	70.49

Total number of blows analyzed: 71

BL# Sensors

1-71 F1: [357AWJ1] 212.0 (1.12); F4: [357AWJ2] 211.2 (1.12); A2: [55385] 915.0 (0.88); A3: [50148] 1065.0 (0.88)

BL# Comments

71 end of set 5. n=51

Time Summary

Drive 1 minute 41 seconds 2:42 PM - 2:43 PM BN 1 - 71