

REVISED

## **GEOTECHNICAL BASE LINE REPORT**

Route S-33-52 Replacement Bridge over Rocky Creek  
McCormick County, South Carolina



### **PREPARED FOR**

SCDOT

955 Park Street

Columbia, South Carolina 29201

### **PREPARED BY**

F&ME Consultants, Inc.

Blanding Street

Columbia, South Carolina 29201

SCDOT Project ID: P038304

F&ME Project #: G6100.05.08

**October 23, 2019**

October 23, 2019

Trapp Harris, P.E.  
Design-Build Group Geotechnical Engineer  
South Carolina Department of Transportation  
955 Park Street  
Columbia, South Carolina 29201

Re: Closed and Load-Restricted Bridge Package 2020-1  
REVISED Geotechnical Base Line Report  
Route S-33-52 Bridge over Rocky Creek  
McCormick County, South Carolina  
SCDOT Project ID: P038304  
F&ME Project No.: G6100.050.08

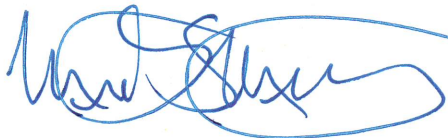
Dear Mr. Harris:

Submitted herein is F&ME Consultants, Inc. (FME) revised Geotechnical Base Line Report (GBLR) for the Route S-33-52 Replacement Bridge over Rocky Creek. Revisions to our previously submitted report include the corrosion series laboratory test results. This report contains findings from our subsurface field exploration, results from the laboratory testing program, and conceptual geotechnical assessment of embankments and bridge foundation systems.

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

Sincerely,

F&ME Consultants, Inc.

A handwritten signature in blue ink, appearing to read 'Michael S. Miller', with a stylized flourish at the end.

Michael S. Miller, P.E.  
Senior Geotechnical Engineer



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## 1.0 INTRODUCTION

FME performed geotechnical soil test borings and laboratory testing for the Route S-33-52 Replacement Bridge over Rocky Creek located in McCormick County, South Carolina. A Site Location Plan is presented as Figure 1 in Section 1 in the Appendix of this report. The South Carolina Department of Transportation (SCDOT) Scope of Services Work Request for the geotechnical subsurface exploration and laboratory testing was issued on March 1, 2019.

The field investigation consisted of performing soil test borings (STB's) with associated Standard Penetration Testing (SPT). Laboratory testing was performed on selected soil samples collected from the test borings. The exploration methods and laboratory procedures were conducted in general accordance with the current American Association of State Highway and Transportation Officials (AASHTO), American Society of Testing and Materials (ASTM) Standards, and the SCDOT Geotechnical Design Manual (GDM). This Geotechnical Base Line Report was prepared in general accordance with the 2019 SCDOT Geotechnical Design Manual (GDM), Version 2.0. along with PCDM-11 Supplemental Design Criteria for Low Volume Bridge Replacement Projects.

## 2.0 FIELD EXPLORATION SUMMARY

On July 16 through July 18, 2019, F&ME performed two (2) soil test borings (STB's). The test boring locations were performed in proximity to the existing bridge end bent locations. The intent of the subsurface investigation was to provide a broad indication of the subsurface conditions at the site.

The STB's were advanced using a CME 45B trailer mounted drill rig with an automatic standard penetration test (SPT) hammer system. Rotary wash drilling techniques were used during drilling to maintain a stable borehole. Standard split-spoon sampling was performed continuously over the first ten (10) feet of the boring depth and at five (5) foot intervals thereafter. Details of each STB are included on the individual Soil Test Boring Logs in Section 4 in the Appendix of this report.

### 2.1 Soil Test Borings (STB's)

The following table is a summary of the STB designations, exploration depths, locations, and ground surface elevations of the test boring locations.

Table 1 – Soil Test Boring Summary Table

SOIL TEST BORINGS (STB)							
Test Hole No.	Surface Condition	Soil Depth (ft.)	Rock Core Depth (ft.)	Total Boring Depth (ft.)	Latitude	Longitude	Elev. (ft.-MSL)
B-1601	Paved Roadway	98.6	0	98.6	33.946842	-82.273375	429.0
B-1602	Paved Roadway	87.5	0	87.5	33.946814	-82.273098	428.6
Totals	-	186.1	0	186.1			

## 2.2 Groundwater

Groundwater depths were recorded at the time of boring (TOB) for soil test borings B-1601 and B-1602, with the recorded measurements noted on the individual Soil Test Boring Logs in Section 4 of the Appendix to this report. Groundwater measurements were also made twenty-four (24) hours following boring completion. The following table is a summary of the groundwater measurements for the soil test borings at time of boring and at twenty-four (24) hours following boring completion.

Table 2 – Groundwater Depth Summary Table

GROUNDWATER DEPTH			
Boring No.	Date of TOB Groundwater Measurement	TOB Groundwater Depth (ft.)	24-hr. Groundwater Depth (ft.)
B-1601	7/18/2019	14.0	15.0
B-1602	7/17/2019	12.8	14.5

## 3.0 LABORATORY TESTING

Following completion of F&ME's field investigation, select split-spoon samples were tested in FME's AASHTO accredited laboratory to determine applicable physical and engineering properties. One (1) split-spoon sample was sent to an off-site AASHTO accredited laboratory for corrosion series testing. All laboratory testing was performed in general accordance with procedures set forth in the most current AASHTO and ASTM standards.

The laboratory testing performed for the split-spoon samples are detailed in the table below. Data sheets containing the results of the laboratory testing program are provided in Section 6 of the Appendix.

Table 3 – Split-Spoon Laboratory Soil Testing Summary Table

LABORATORY SOIL TESTING (SPLIT-SPOON SAMPLES)		
Type of Test	Quantity	Procedure
Grain Size Analysis with Hydrometer	6	AASHTO T88
Grain Size Analyses with Wash 200	2	AASHTO T11
Atterberg Limits	4	AASHTO T89/T90
Natural Moisture Content	6	ASTM D2216
pH	1	AASHTO T289
Resistivity	1	AASHTO T288
Chloride Content	1	AASHTO T291
Sulfate Content	1	AASHTO T290

## 4.0 SUBSURFACE STRATIGRAPHY

The following table summarizes the soil and rock stratigraphy based on conditions as encountered in the soil test borings performed during this geotechnical subsurface investigation.

Table 4 – Stratigraphy Summary Table

SOIL AND ROCK STRATIGRAPHY					
Strata	Elevation of Top Layer (ft-MSL)	Depth to Top of Layer (ft.)	USCS Soil Type	Avg. SPT N Value (bpf)	Comments
Fill	428	0	SM, MH, ML	5	-
Alluvium	421	7	SM, CL, MH, ML	7	-
Residuum	410	18	SM, ML	59	-
PWR	392	36	SM	100+	-

## 5.0 CONCEPTUAL GEOTECHNICAL ASSESSMENT

Relative to the SCDOT's Supplemental Design Criteria for Low Volume Bridge Replacement Projects, the soil subgrade below the new embankment areas are anticipated to be adequate for embankment construction.

We anticipate that pile foundations will be preferred for support of the bridge abutments. The Strength Case axial loadings will likely govern the geotechnical pile design. We anticipate that the soil thickness above partially weathered rock (PWR) is sufficient to resist the assumed lateral loading conditions, and drilled pile will not be likely. We anticipate that the piles will be driven to a practical refusal pile driving condition in PWR conditions. To avoid excessive pile driving stresses, we anticipate that pile driving termination criteria will be based on encountering a pile driving practical refusal condition. Shallow foundation concepts are likely not feasible due to the estimated bearing depth and the presence of groundwater at that depth.

If a multi-span concept is pursued, the selection of the interior bent foundation type will be predicated on the scour depth relative to the bent location(s). For an assumed scour depth and channel geometry, FME anticipates that driven pile concepts will not be feasible based on an insufficient soil thickness above weathered rock to resist the lateral loads. As such, we anticipate that drilled shafts will be utilized at the interior bent(s). The drilled shafts will consist of construction casing and excavation in PWR below the casing tip elevation. We expect the Strength Case axial loadings will govern the drilled shaft design.

# **S-33-52 Replacement Bridge over Rocky Creek**

## **Geotechnical Base Line Report**

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### **APPENDIX**

<b>SECTION 1</b>	<b>SITE LOCATION PLAN</b>
<b>SECTION 2</b>	<b>BORING LOCATION PLAN</b>
<b>SECTION 3</b>	<b>DRILL RIG PHOTOS</b>
<b>SECTION 4</b>	<b>TEST BORING LOGS</b>
<b>SECTION 5</b>	<b>GENERALIZED SUBSURFACE PROFILE</b>
<b>SECTION 6</b>	<b>LABORATORY TEST RESULTS</b>

# S-33-52 Replacement Bridge over Rocky Creek

## Geotechnical Base Line Report

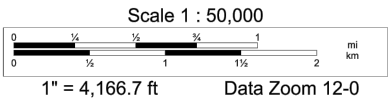
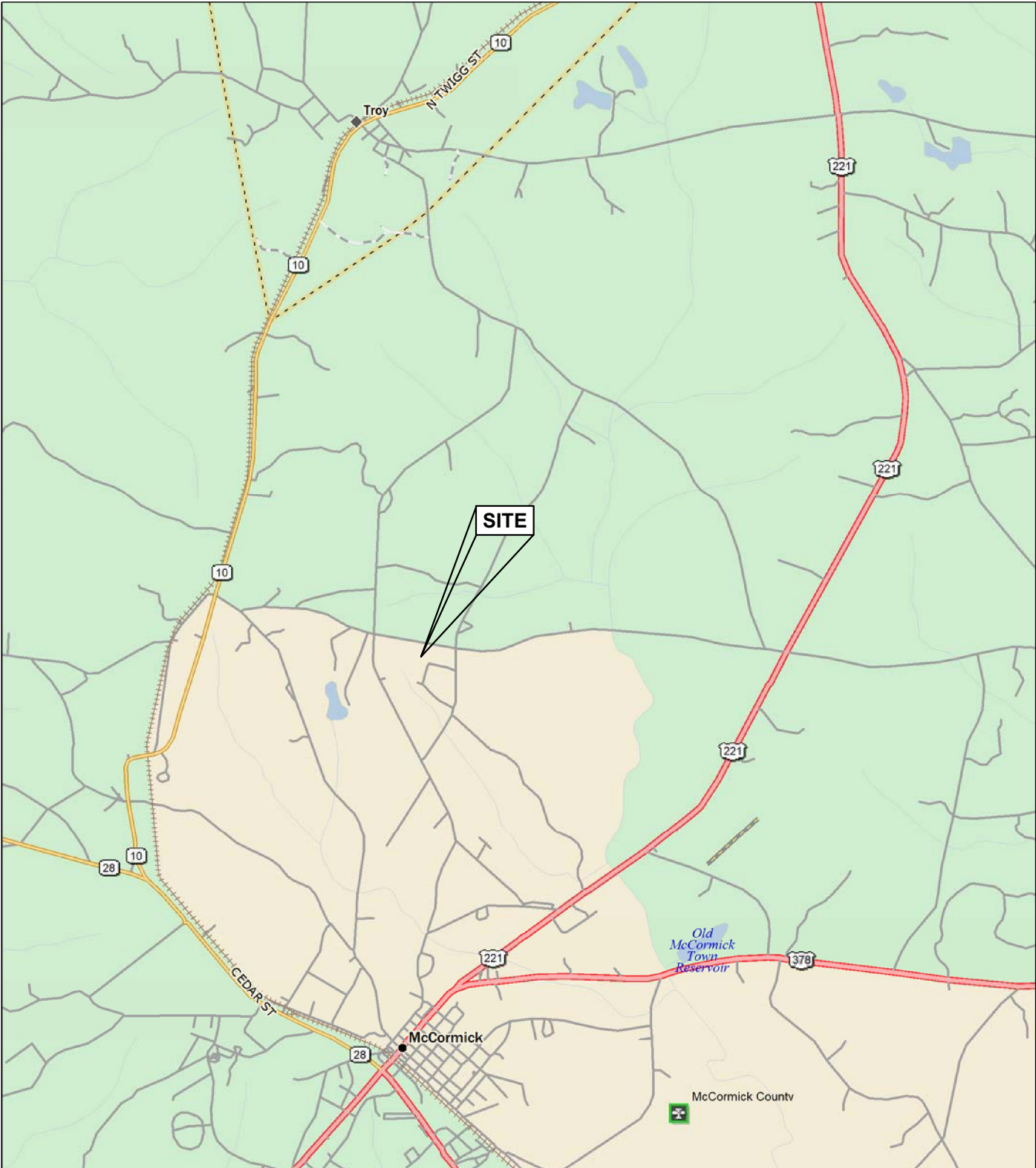
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# APPENDIX

## SECTION 1 SITE LOCATION PLAN



FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROAD / ROUTE NO.	SHEET NO.
3	SC	MCCORMICK	P038304	S-33-52	



F&ME CONSULTANTS, INC.  
COLUMBIA, SC

4			
3			
2			
1			
REV.	BY	DATE	DESCRIPTION OF REVISION
TOPO.		DATE	
DWG.	CTC	DATE 6.3.19	GROUP - -
R/W		DATE	

ROCKY CREEK  
McCORMICK COUNTY, SOUTH CAROLINA

SITE LOCATION PLAN

F&ME JOB NO. G6100.050

SCALE: AS NOTED

FIGURE 1

# **S-33-52 Replacement Bridge over Rocky Creek**

## **Geotechnical Base Line Report**

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# **APPENDIX**

## **SECTION 2 BORING LOCATION PLAN**



FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROAD/ROUTE NO.	SHEET NO.
3	SC	MCCORMICK	P038304	S-33-52	





**LEGEND:**

SOIL TEST BORING LOCATION

4			
3			
2			
1			
REV.	BY	DATE	DESCRIPTION OF REVISION
TOPO.		DATE	
DWG.	CTC	DATE 6.3.19	GROUP -- --
R/W		DATE	



F&ME CONSULTANTS, INC.

COLUMBIA, SC

ROCKY CREEK MCCORMICK COUNTY, SOUTH CAROLINA	
BORING LOCATION PLAN	
F&ME JOB NO. G6100.050	
SCALE: 1"=30'	FIGURE 2



# S-33-52 Replacement Bridge over Rocky Creek

## Geotechnical Base Line Report

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# APPENDIX

## SECTION 3 DRILL RIG PHOTOS

# Drill Rig Setup Photographs

B-1601



# S-33-52 Replacement Bridge over Rocky Creek

## Geotechnical Base Line Report

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# APPENDIX

## SECTION 4 TEST BORING LOGS

## Soil Test Boring Log Descriptors

### Correlation of Penetration Resistance with Relative Density and Consistency














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

### Particle Size Identification
















Gravel	Sieve Size
Fine	#4 to ¾ inch
Coarse	¾ inch to 3 inch

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

Gravel	Sieve Size
Fines Content	< #200

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

### SOIL CLASSIFICATION CHART

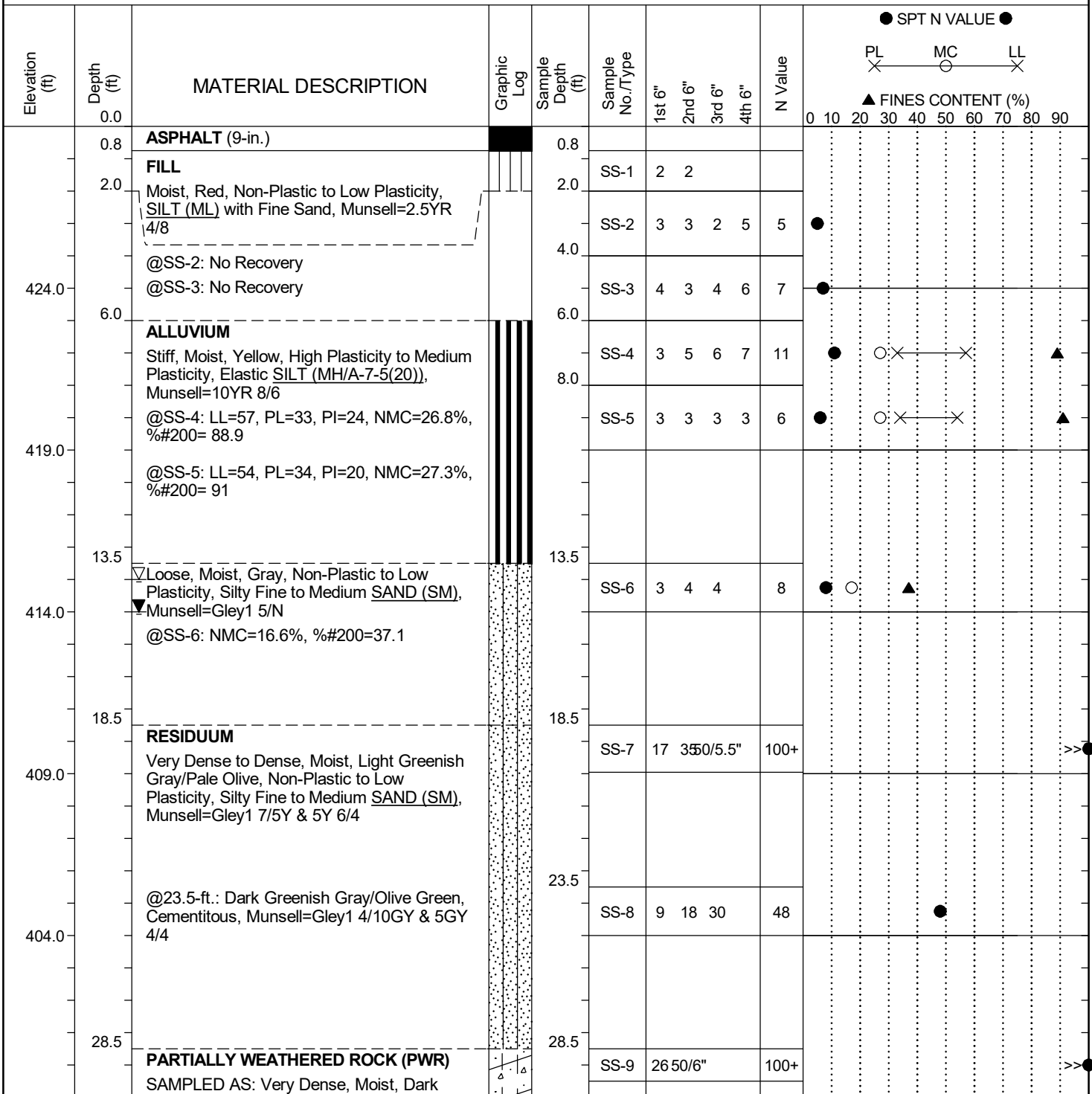
MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL -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

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS





Project ID: P038304				County: McCormick		Boring No.: B-1601		
Site Description:		S-33-52 Replacment Bridge over Rocky Creek					Route: S-33-52	
Eng./Geo.: M. Touchberry		Boring Location: N/A			Offset: N/A		Alignment: Existing	
Elev.: 429.0 ft		Latitude: 33.946842		Longitude: -82.273375		Date Started: 7/17/2019		
Total Depth: 98.6 ft		Soil Depth: 98.6 ft		Core Depth: N/A ft		Date Completed: 7/18/2019		
Bore Hole Diameter (in): 4		Sampler Configuration			Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME 45B		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 92%		
Core Size: N/A		Driller: L. Guempel		Groundwater: TOB 14 ft		24HR 15 ft		



## LEGEND

*Continued Next Page*

SAMPLER TYPE	
SS - Split Spoon	NQ - Rock Core, 1-7/8"
UD - Undisturbed Sample	CU - Cuttings
AWG - Rock Core, 1-1/8"	CT - Continuous Tube

DRILLING METHOD	
HSA - Hollow Stem Auger	RW - Rotary Wash
CFA - Continuous Flight Augers	RC - Rock Core
DC - Driving Casing	



# SCDOT Soil Test Log

<b>Project ID:</b>	P038304	<b>County:</b>	McCormick	<b>Boring No.:</b>	B-1601
<b>Site Description:</b>	S-33-52 Replacment Bridge over Rocky Creek			<b>Route:</b>	S-33-52
<b>Eng./Geo.:</b>	M. Touchberry	<b>Boring Location:</b>	N/A	<b>Offset:</b>	N/A
<b>Elev.:</b>	429.0 ft	<b>Latitude:</b>	33.946842	<b>Longitude:</b>	-82.273375
<b>Date Started:</b>	7/17/2019				
<b>Total Depth:</b>	98.6 ft	<b>Soil Depth:</b>	98.6 ft	<b>Core Depth:</b>	N/A ft
<b>Date Completed:</b>	7/18/2019				
<b>Bore Hole Diameter (in):</b>	4	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)	<b>Drill Machine:</b>	CME 45B	<b>Drill Method:</b>	RW
<b>Hammer Type:</b>	Automatic	<b>Energy Ratio:</b>	92%	<b>Core Size:</b>	N/A
<b>Driller:</b>	L. Guempel	<b>Groundwater:</b>	TOB	14 ft	24HR
				15 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 (%)
		Greenish Gray/Olive Green, Non-Plastic to Low Plasticity, Silty Fine to Medium SAND (SM), Cementitious, Munsell=Gley1 4/10GY & 5GY 4/4													
	394.0	@33.5-ft.: Light Greenish Gray/Greenish Gray, Fine Sands, Munsell=Gley1 7/10Y & Gley1 5/10GY		33.5	SS-10	50/3"				100+					
	389.0	@38.5-ft.: with Trace of Gravel (Fragmented)		38.5	SS-11	50/2"				100+					
	384.0	@43.5-ft.: Light Gray/Dark Gray/Light Greenish Gray, Munsell=5Y 7/1 & 5Y 4/1 & Gley1 7/10Y		43.5	SS-12	50/6"				100+					
	379.0			48.5	SS-13	50/4.5"				100+					
	53.5			53.5	SS-14	9	9	9		18					
	374.0	Medium Dense, Moist, Light Gray/Dark Gray/Light Greenish Gray, Non-Plastic to Low Plasticity, Silty Fine to medium SAND (SM), Munsell=5Y 7/1, 5Y 4/1 & Gley1 7/10Y													
	58.5	@58.5-ft.: Grayish Green/Very Dark Grayish Green/Brownish Yellow/Pale Brown,		58.5	SS-15	28	33	50/5"		100+					

## 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

<b>Project ID:</b>	P038304	<b>County:</b>	McCormick	<b>Boring No.:</b>	B-1601
<b>Site Description:</b>	S-33-52 Replacment Bridge over Rocky Creek			<b>Route:</b>	S-33-52
<b>Eng./Geo.:</b>	M. Touchberry	<b>Boring Location:</b>	N/A	<b>Offset:</b>	N/A
<b>Elev.:</b>	429.0 ft	<b>Latitude:</b>	33.946842	<b>Longitude:</b>	-82.273375
<b>Date Started:</b>	7/17/2019				
<b>Total Depth:</b>	98.6 ft	<b>Soil Depth:</b>	98.6 ft	<b>Core Depth:</b>	N/A ft
<b>Date Completed:</b>	7/18/2019				
<b>Bore Hole Diameter (in):</b>	4	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)	<b>Drill Machine:</b>	CME 45B	<b>Drill Method:</b>	RW
<b>Hammer Type:</b>	Automatic	<b>Energy Ratio:</b>	92%	<b>Core Size:</b>	N/A
<b>Driller:</b>	L. Guempel	<b>Groundwater:</b>	TOB	14 ft	24HR
				15 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 X MC X LL X
											▲ FINES CONTENT (%)
											0 10 20 30 40 50 60 70 80 90
		Munsell=Gley1 4/5G, Gley1 3/10GY, 10YR 6/8 & 2.5Y 8/4									
				63.5	SS-16	50/5.5"				100+	>>●
364.0											
				68.5	SS-17	50/5"				100+	>>●
359.0											
				73.5	SS-18	50/5"				100+	>>●
354.0											
				78.5	SS-19	33 50/2"				100+	>>●
349.0											
		@83.5-ft.: Fine to Coarse Sands		83.5	SS-20	50/2"				100+	>>●
344.0											
		@88.5-ft.: Fine to Medium Sands		88.5	SS-21	50/5.5"				100+	>>●

## LEGEND

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SAMPLER TYPE	
SS - Split Spoon	NQ - Rock Core, 1-7/8"
UD - Undisturbed Sample	CU - Cuttings
AWG - Rock Core, 1-1/8"	CT - Continuous Tube

DRILLING METHOD	
HSA - Hollow Stem Auger	RW - Rotary Wash
CFA - Continuous Flight Augers	RC - Rock Core
DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	P038304	<b>County:</b>	McCormick	<b>Boring No.:</b>	B-1601
<b>Site Description:</b>	S-33-52 Replacment Bridge over Rocky Creek			<b>Route:</b>	S-33-52
<b>Eng./Geo.:</b>	M. Touchberry	<b>Boring Location:</b>	N/A	<b>Offset:</b>	N/A
<b>Elev.:</b>	429.0 ft	<b>Latitude:</b>	33.946842	<b>Longitude:</b>	-82.273375
<b>Date Started:</b>	7/17/2019				
<b>Total Depth:</b>	98.6 ft	<b>Soil Depth:</b>	98.6 ft	<b>Core Depth:</b>	N/A ft
<b>Date Completed:</b>	7/18/2019				
<b>Bore Hole Diameter (in):</b>	4	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)	<b>Drill Machine:</b>	CME 45B	<b>Drill Method:</b>	RW
<b>Hammer Type:</b>	Automatic	<b>Energy Ratio:</b>	92%	<b>Core Size:</b>	N/A
<b>Driller:</b>	L. Guempel	<b>Groundwater:</b>	TOB	14 ft	24HR
				15 ft	

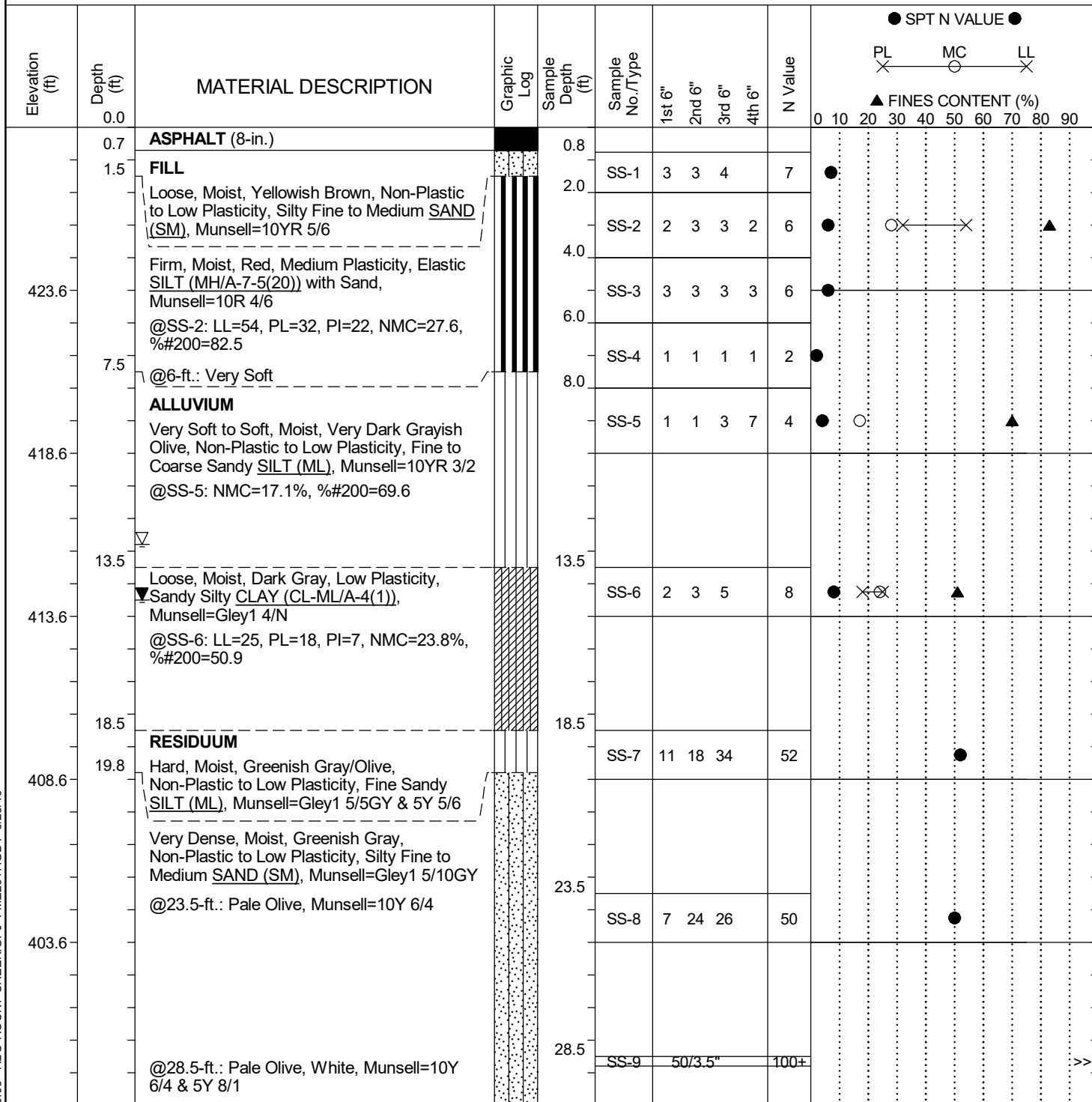
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
334.0	93.5				SS-22	50/5"				100+	>>
329.0	98.6	Boring Terminated at 98.6 Feet		98.5	SS-23	50/1.5"				100+	>>
324.0											
319.0											
314.0											

## 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	

# SCDOT Soil Test Log

<b>Project ID:</b>	P038304	<b>County:</b>	McCormick	<b>Boring No.:</b>	B-1602
<b>Site Description:</b>	S-33-52 Replacment Bridge over Rocky Creek			<b>Route:</b>	S-33-52
<b>Eng./Geo.:</b>	M. Touchberry	<b>Boring Location:</b>	N/A	<b>Offset:</b>	N/A
<b>Elev.:</b>	428.6 ft	<b>Latitude:</b>	33.946814	<b>Longitude:</b>	-82.273098
<b>Date Started:</b>	7/16/2019				
<b>Total Depth:</b>	87.5 ft	<b>Soil Depth:</b>	87.5 ft	<b>Core Depth:</b>	N/A ft
<b>Date Completed:</b>	7/17/2019				
<b>Bore Hole Diameter (in):</b>	4	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)	<b>Drill Machine:</b>	CME 45B	<b>Drill Method:</b>	RW
<b>Hammer Type:</b>	Automatic	<b>Energy Ratio:</b>	92%	<b>Groundwater:</b>	TOB 12.8 ft
<b>24HR:</b>	14.5 ft	<b>Core Size:</b>	N/A	<b>Driller:</b>	L. Guempel



## LEGEND

Continued Next Page

SAMPLER TYPE	
SS - Split Spoon	NQ - Rock Core, 1-7/8"
UD - Undisturbed Sample	CU - Cuttings
AWG - Rock Core, 1-1/8"	CT - Continuous Tube

DRILLING METHOD	
HSA - Hollow Stem Auger	RW - Rotary Wash
CFA - Continuous Flight Augers	RC - Rock Core
DC - Driving Casing	

# SCDOT Soil Test Log

Project ID:		P038304				County:		McCormick		Boring No.:		B-1602				
Site Description:		S-33-52 Replacment Bridge over Rocky Creek									Route:		S-33-52			
Eng./Geo.:		M. Touchberry		Boring Location:		N/A		Offset:		N/A		Alignment:		Existing		
Elev.:		428.6 ft		Latitude:		33.946814		Longitude:		-82.273098		Date Started:		7/16/2019		
Total Depth:		87.5 ft		Soil Depth:		87.5 ft		Core Depth:		N/A ft		Date Completed:		7/17/2019		
Bore Hole Diameter (in):			4		Sampler Configuration			Liner Required:		Y (N)		Liner Used:			Y (N)	
Drill Machine:		CME 45B		Drill Method:		RW		Hammer Type:		Automatic		Energy Ratio:		92%		
Core Size:		N/A		Driller:		L. Guempel		Groundwater:		TOB 12.8 ft		24HR		14.5 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 X      MC ○      LL X ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
393.6	33.5	Very Dense, Moist, Yellow/Greenish Gray, Non-Plastic to Low Plasticity, Silty Fine SAND (SM), Munsell=2.5Y 7/6 & Gley1 5/5GY		33.5	SS-10	28	28	27		55	●
388.6	38.5	Very Stiff, Moist, Yellow/Greenish Gray/Light Greenish Gray, Non-Plastic to Low Plasticity, Fine Sandy SILT (ML), Munsell=2.5Y 7/6, Gley1 5/5GY & Gley1 8/10Y		38.5	SS-11	8	9	17		26	●
383.6	43.5	<b>PARTIALLY WEATHERED ROCK (PWR)</b> SAMPLED AS: Very Dense, Moist, Pale Yellow, Non-Plastic, Silty Fine to Medium SAND (SM), Munsell=5Y 7/4		43.5	SS-12	50/6"				100+	>>●
378.6	48.5			48.5	SS-13	50/4.5"				100+	>>●
373.6	53.5			53.5	SS-14	50/6"				100+	>>●
	58.5			58.5	SS-15	50/4"				100+	>>●

## LEGEND

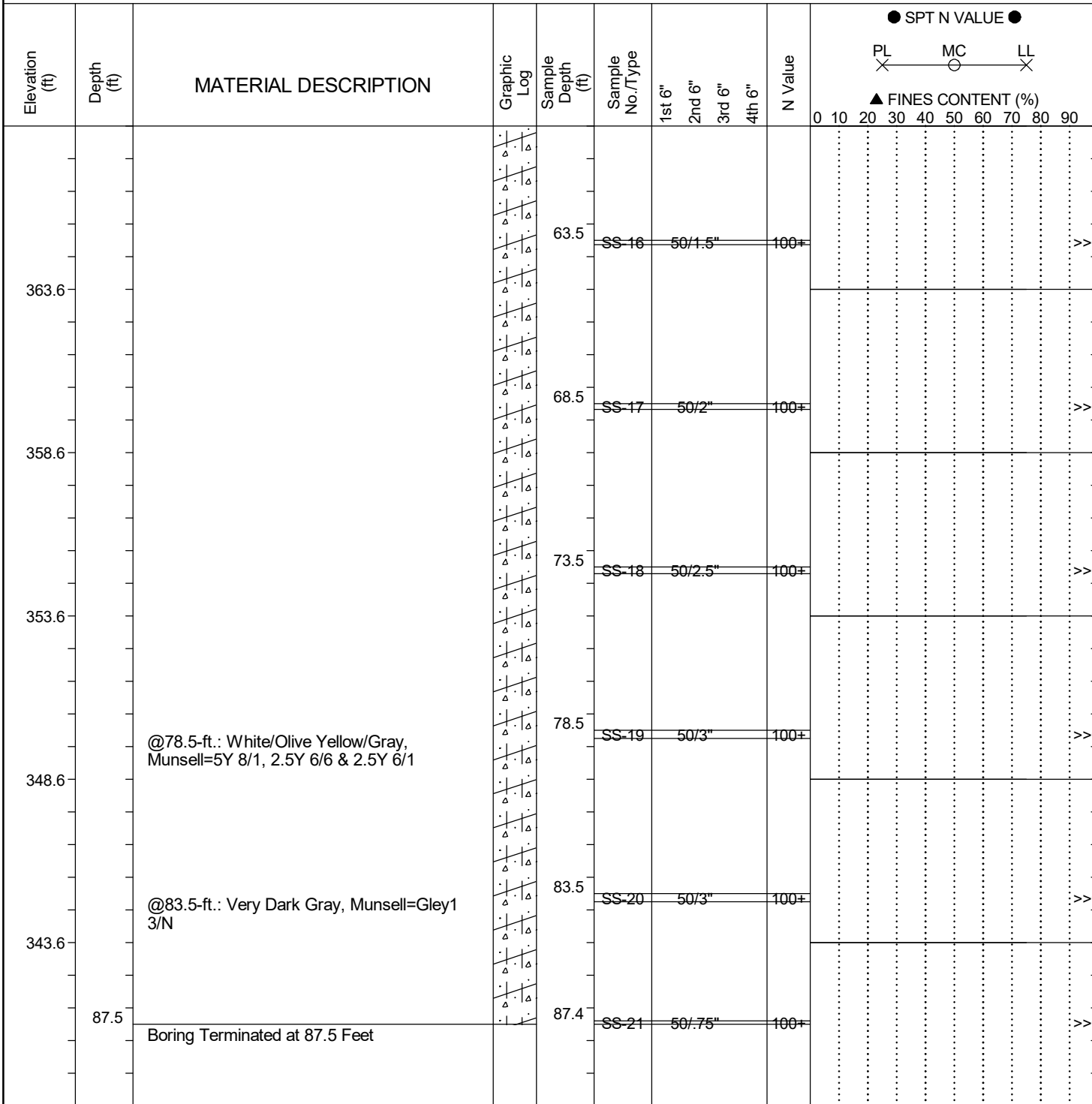
Continued Next Page

SAMPLER TYPE	
SS - Split Spoon	NQ - Rock Core, 1-7/8"
UD - Undisturbed Sample	CU - Cuttings
AWG - Rock Core, 1-1/8"	CT - Continuous Tube

DRILLING METHOD	
HSA - Hollow Stem Auger	RW - Rotary Wash
CFA - Continuous Flight Augers	RC - Rock Core
DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	P038304	<b>County:</b>	McCormick	<b>Boring No.:</b>	B-1602
<b>Site Description:</b>	S-33-52 Replacment Bridge over Rocky Creek			<b>Route:</b>	S-33-52
<b>Eng./Geo.:</b>	M. Touchberry	<b>Boring Location:</b>	N/A	<b>Offset:</b>	N/A
<b>Elev.:</b>	428.6 ft	<b>Latitude:</b>	33.946814	<b>Longitude:</b>	-82.273098
<b>Date Started:</b>	7/16/2019				
<b>Total Depth:</b>	87.5 ft	<b>Soil Depth:</b>	87.5 ft	<b>Core Depth:</b>	N/A ft
<b>Date Completed:</b>	7/17/2019				
<b>Bore Hole Diameter (in):</b>	4	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)	<b>Drill Machine:</b>	CME 45B	<b>Drill Method:</b>	RW
<b>Hammer Type:</b>	Automatic	<b>Energy Ratio:</b>	92%	<b>Core Size:</b>	N/A
<b>Driller:</b>	L. Guempel	<b>Groundwater:</b>	TOB	12.8 ft	24HR
					14.5 ft



## 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	

# **S-33-52 Replacement Bridge over Rocky Creek**

## **Geotechnical Base Line Report**

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# **APPENDIX**


## **SECTION 5 GENERALIZED SUBSURFACE PROFILE**


KEY TO SYMBOLS


PROJECT NAME Closed and Load-Restricted Bridge Package 2020-1  
(S-30-52 Bridge Replacement over Rocky Creek)


PROJECT COUNTY McCormick


LITHOLOGIC SYMBOLS  
(Unified Soil Classification System)


 ASPHALT


 GABC (Graded Aggregate Base Course)


 PWR: Partially Weathered Rock


 BEDROCK: Bedrock


 CH: USCS High Plasticity Clay


 CL: USCS Low Plasticity Clay


 CL-ML: USCS Low Plasticity Silty Clay


 MH: USCS Elastic Silt


 ML: USCS Silt


 SP: USCS Poorly Graded Sand


 SM: USCS Silty Sand

 SC: USCS Clayey Sand

 SP-SM: USCS Poorly Graded Sand w/ Silt

 SC-SM: USCS Silty, Clayey Sand



 SP-SC: USCS Poorly Graded Sand w/ Clay

 No Recovery

SOIL TEST ID'S

B-# SOIL TEST BORING

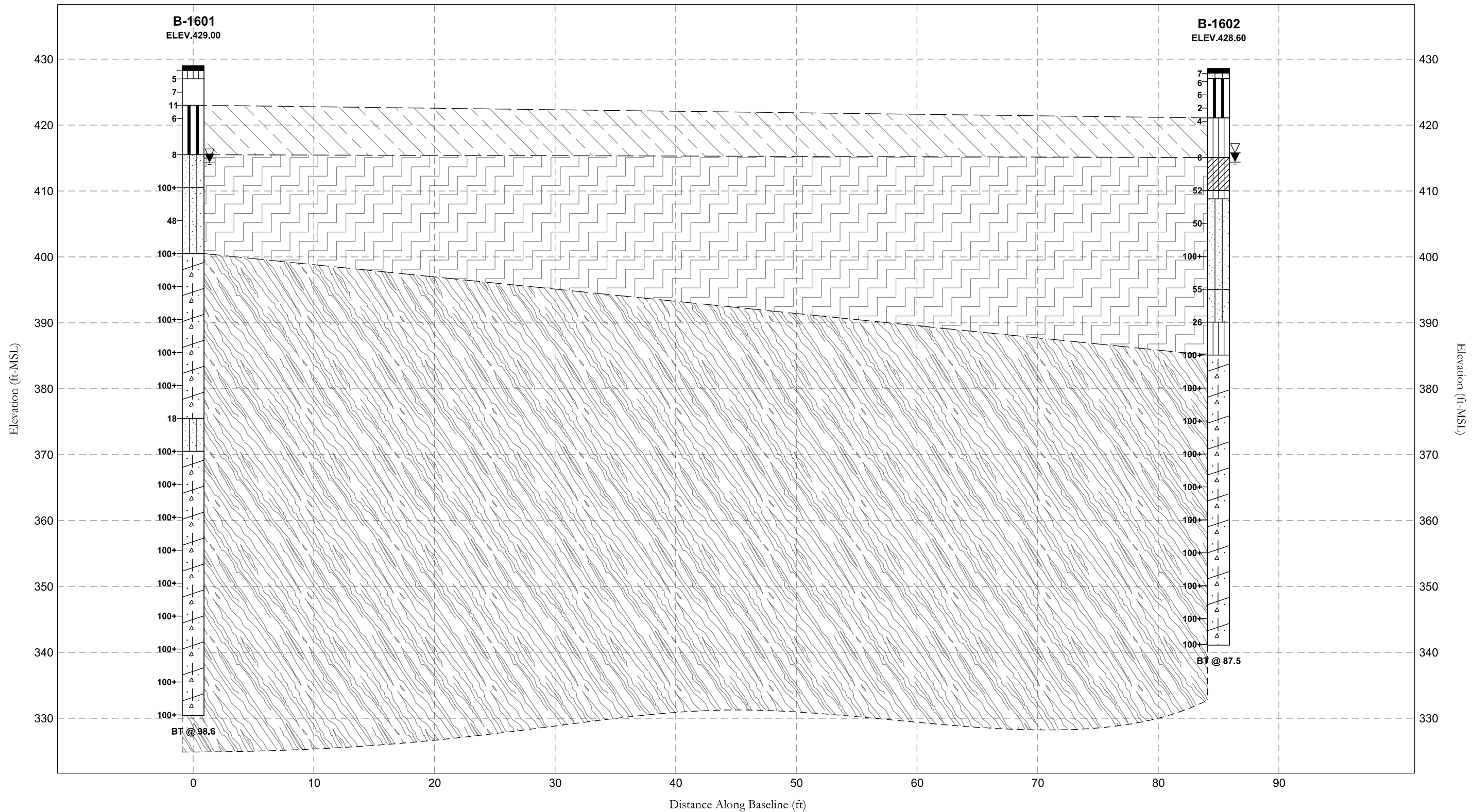
ABBREVIATIONS

- LL - LIQUID LIMIT (%)
  - PL - PLASTIC LIMIT (%)
  - PI - PLASTIC INDEX (%)
  - NMC - MOISTURE CONTENT (%)
  - NP - NON PLASTIC
  - %#200 - PERCENT PASSING NO. 200 SIEVE
-  Water Level at Time Drilling, or as Shown
-  Water Level at End of Drilling, or as Shown

NOTES

1. THE GENERALIZED SUBSURFACE PROFILES ARE PROVIDED ONLY FOR ILLUSTRATIVE PURPOSES. THE INTENT OF THESE DRAWINGS IS TO PROVIDE THE READER WITH VERY GENERAL INFORMATION ON SUBSURFACE CONDITIONS AT THE TIME OF THE INVESTIGATION. VARIATIONS IN THE INDICATED SUBSURFACE CONDITIONS WILL BECOME EVIDENT ONCE ADDITIONAL BORINGS ARE PERFORMED. THE INDICATED STRATIGRAPHY BETWEEN TESTING LOCATIONS WAS GENERATED USING STRAIGHT-LINE LINEAR INTERPOLATION, AND DOES NOT REPRESENT THE TRUE STRATIGRAPHY.





ALLUVIUM



RESIDUUM



PWR

The generalized subsurface profile is provided for illustrative purposes. The intent of this drawing is to provide the reader with very general information on soil stratigraphy at the bridge site. Variations in the indicated subsurface conditions will become evident once additional borings are performed.

4			
3			
2			
1			
REV. NO.	BY	DATE	DESCRIPTION OF REVISION
TOPO.		DATE	
DWG.	JFH	DATE 8.27.19	GROUP - -
R/W		DATE	



S-30-52 BRIDGE REPLACEMENT  
OVER ROCKY CREEK

GENERALIZED SUBSURFACE PROFILE

HRZ SCALE = NTS  
VRT SCALE = NTS

# S-33-52 Replacement Bridge over Rocky Creek

## Geotechnical Base Line Report

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# APPENDIX

## SECTION 6 LABORATORY TEST RESULTS



# SUMMARY OF LABORATORY RESULTS

PAGE 1 OF 1

PROJECT ID P038304

PROJECT NAME S-33-52 Replacment Bridge over Rocky Creek

PROJECT COUNTY McCormick

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-1601	8.0	57	33	24	4.76	89	MH	26.8			
B-1601	10.0	54	34	20	4.76	91	MH	27.3			
B-1601	15.0				4.76	37		16.6			
B-1602	4.0	54	32	22	9.51	82	MH	27.6			
B-1602	10.0				4.76	70		17.1			
B-1602	15.0	25	18	7	4.76	51	CL-ML	23.8			

**F&ME CONSULTANTS**  
**3112 Devine Street**  
**Columbia, South Carolina 29205**

**MOISTURE CONTENT DETERMINATION**  
**(AASHTO T265)**

<b>PROJECT:</b>	<u>S-33-52 Replacment Bridge over Rocky Creek</u>	<b>PROJECT NO.:</b>	<u>P038304</u>
<b>SAMPLE NUMBER:</b>	<u>19-1923</u>	<b>DATE SAMPLE RECEIVED:</b>	<u>7/22/2019</u>
<b>DESCRIPTION OF SOIL:</b>	<u>VARIOUS</u>		
<b>TESTED BY:</b>	<u>AMC</u>	<b>DATE OF TESTING:</b>	<u>8/7/2019</u>
<b>WEIGHED BY:</b>	<u>AMC</u>	<b>DATE OF WEIGHING:</b>	<u>8/8/2019</u>

BORING NO.	B-1601	B-1601	B-1601		
SAMPLE NO.	SS-4	SS-5	SS-6		
SAMPLE DEPTH	6-8'	8-10'	13.5-15'		
WATER CONTENT, W%	26.8	27.3	16.6		

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

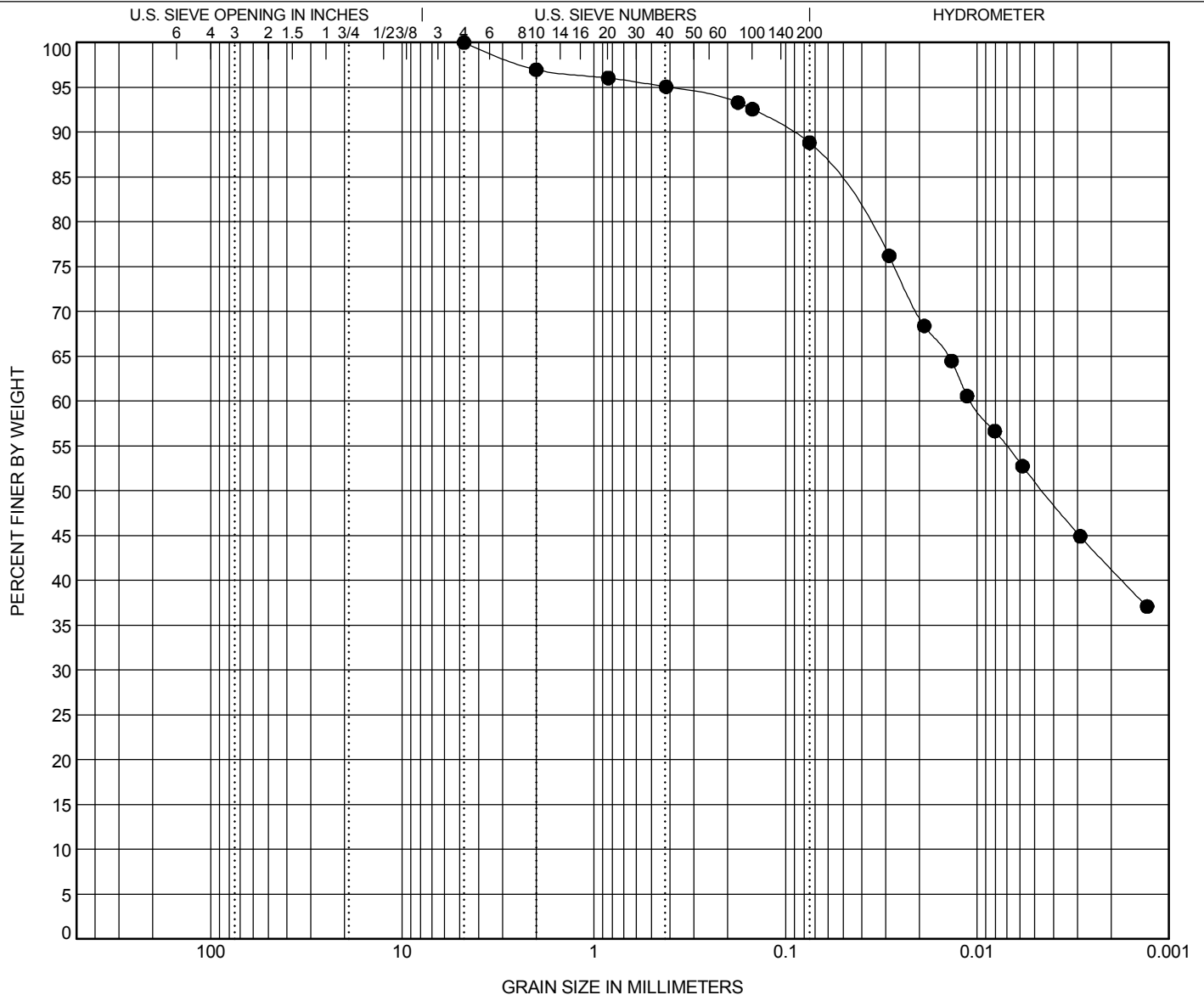


# GRAIN SIZE DISTRIBUTION

PROJECT ID P038304

PROJECT NAME S-33-52 Replacement Bridge over Rocky Creek

PROJECT COUNTY McCormick



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● B-1601	8.0	Elastic SILT (MH/A-7-5(20))					57	33	24		
BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay		
● B-1601	8.0	4.76	0.406	0.005		0.0	11.2	37.8	51.1		

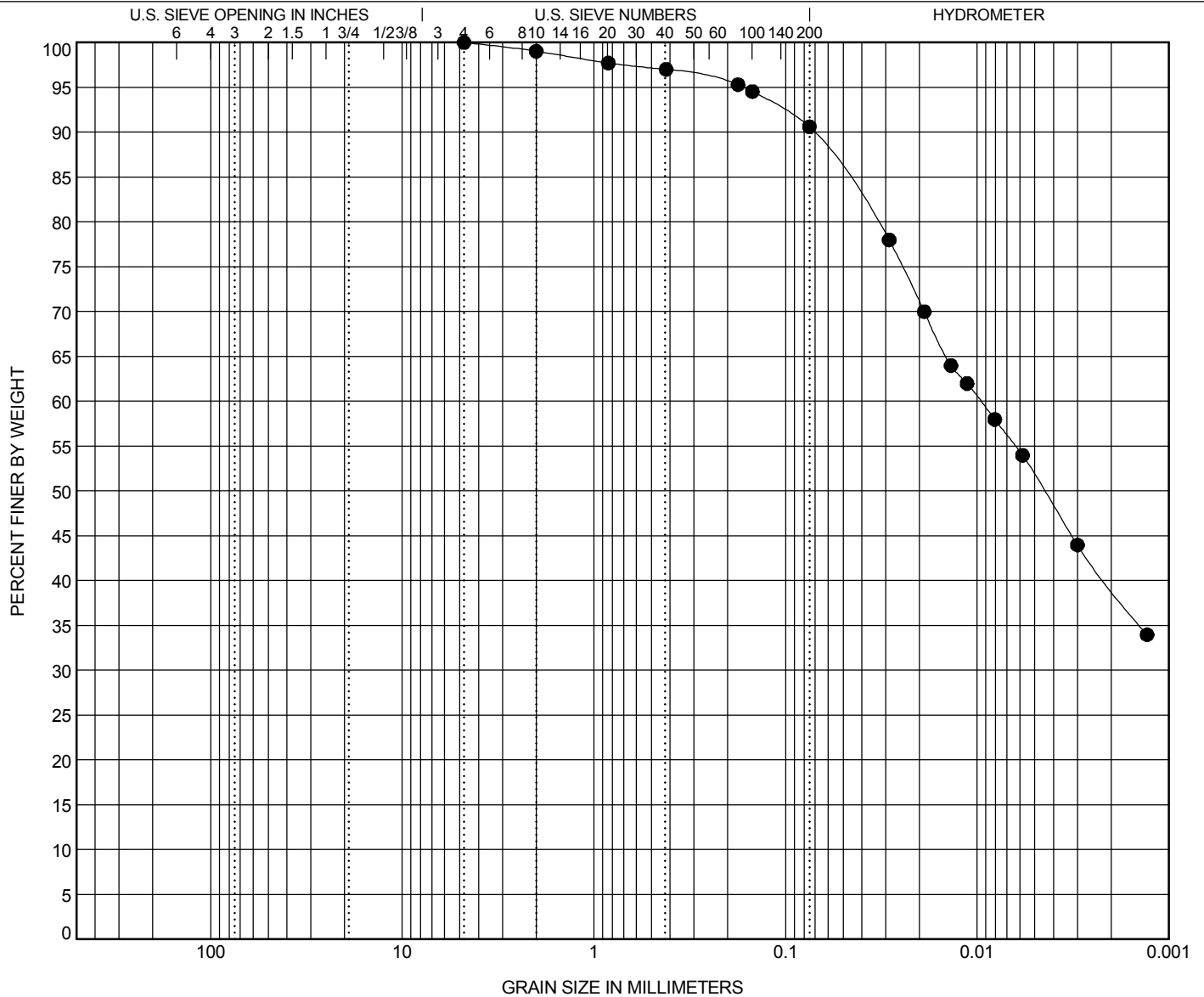


# GRAIN SIZE DISTRIBUTION

PROJECT ID P038304

PROJECT NAME S-33-52 Replacement Bridge over Rocky Creek

PROJECT COUNTY McCormick



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● B-1601	10.0	Elastic SILT (MH/A-7-5(20))					54	34	20		
BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay		
● B-1601	10.0	4.76	0.165	0.004		0.0	9.4	38.9	51.7		

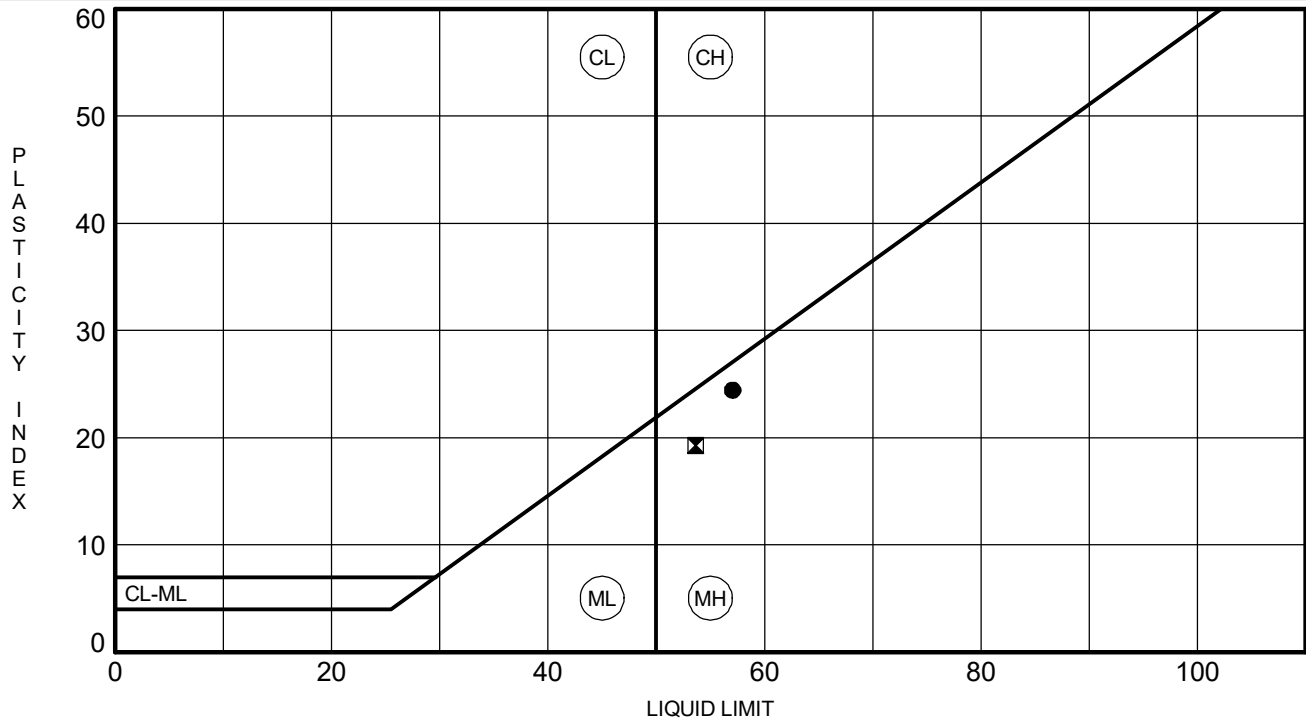


## ATTERBERG LIMITS' RESULTS

**PROJECT ID** P038304

**PROJECT NAME** S-33-52 Replacment Bridge over Rocky Creek

**PROJECT COUNTY** McCormick

[illegible]



**F&ME CONSULTANTS**  
**3112 Devine Street**  
**Columbia, South Carolina 29205**

**MOISTURE CONTENT DETERMINATION**  
**(AASHTO T265)**

<b>PROJECT:</b>	<u>S-33-52 Replacment Bridge over Rocky Creek</u>	<b>PROJECT NO.:</b>	<u>P038304</u>
<b>SAMPLE NUMBER:</b>	<u>19-1924</u>	<b>DATE SAMPLE RECEIVED:</b>	<u>7/22/2019</u>
<b>DESCRIPTION OF SOIL:</b>	<u>VARIOUS</u>		
<b>TESTED BY:</b>	<u>AMC</u>	<b>DATE OF TESTING:</b>	<u>8/7/2019</u>
<b>WEIGHED BY:</b>	<u>AMC</u>	<b>DATE OF WEIGHING:</b>	<u>8/8/2019</u>

BORING NO.	B-1602	B-1602	B-1602		
SAMPLE NO.	SS-2	SS-5	SS-6		
SAMPLE DEPTH	2-4'	8-10'	13.5-15		
WATER CONTENT, W%	27.6	17.1	23.8		

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

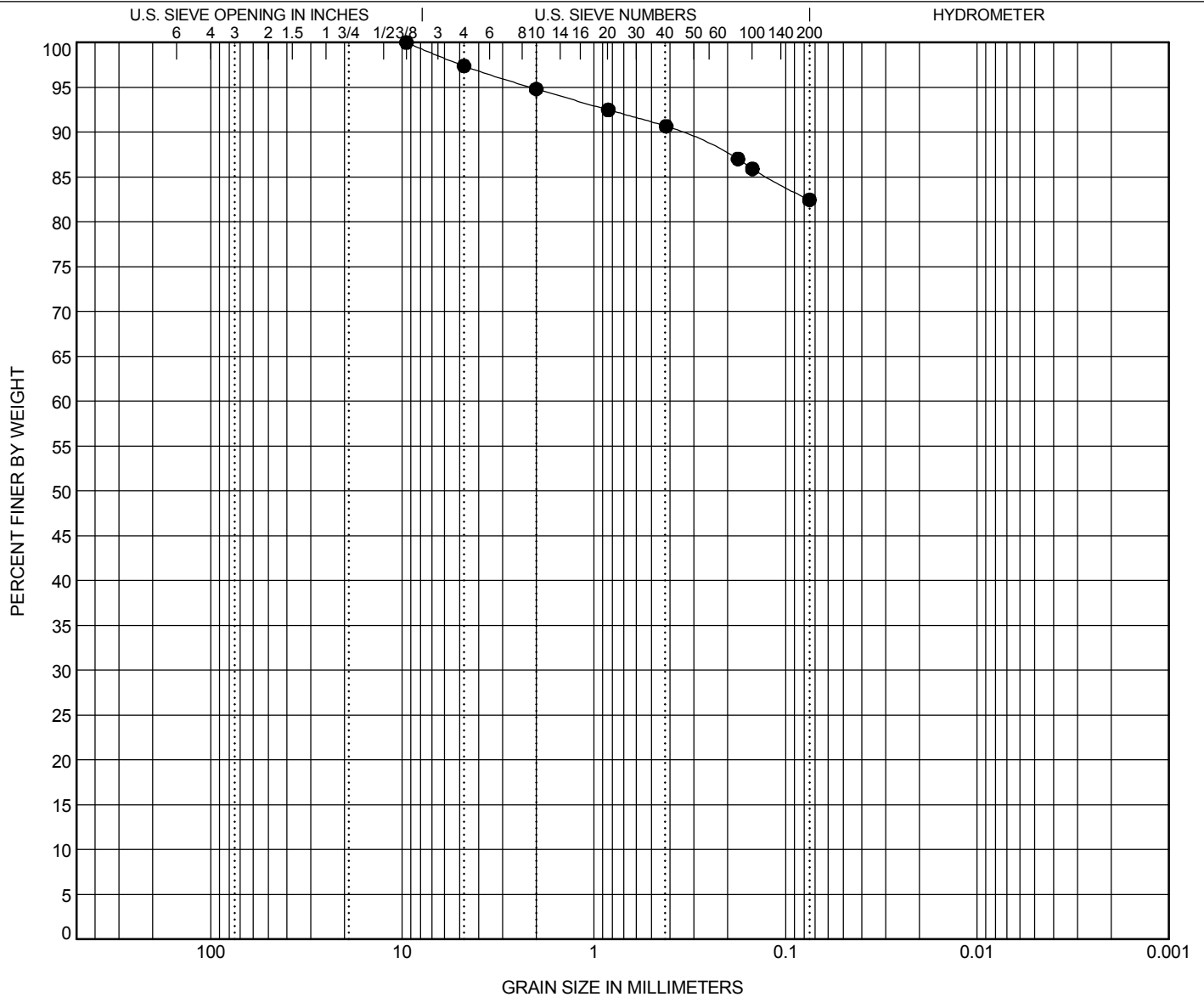


# GRAIN SIZE DISTRIBUTION

PROJECT ID P038304

PROJECT NAME S-33-52 Replacement Bridge over Rocky Creek

PROJECT COUNTY McCormick



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● B-1602	4.0	Elastic SILT (MH/A-7-5(20)) with Sand					54	32	22		
BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt		%Clay	
● B-1602	4.0	9.51	2.123			2.6	14.9	82.5			

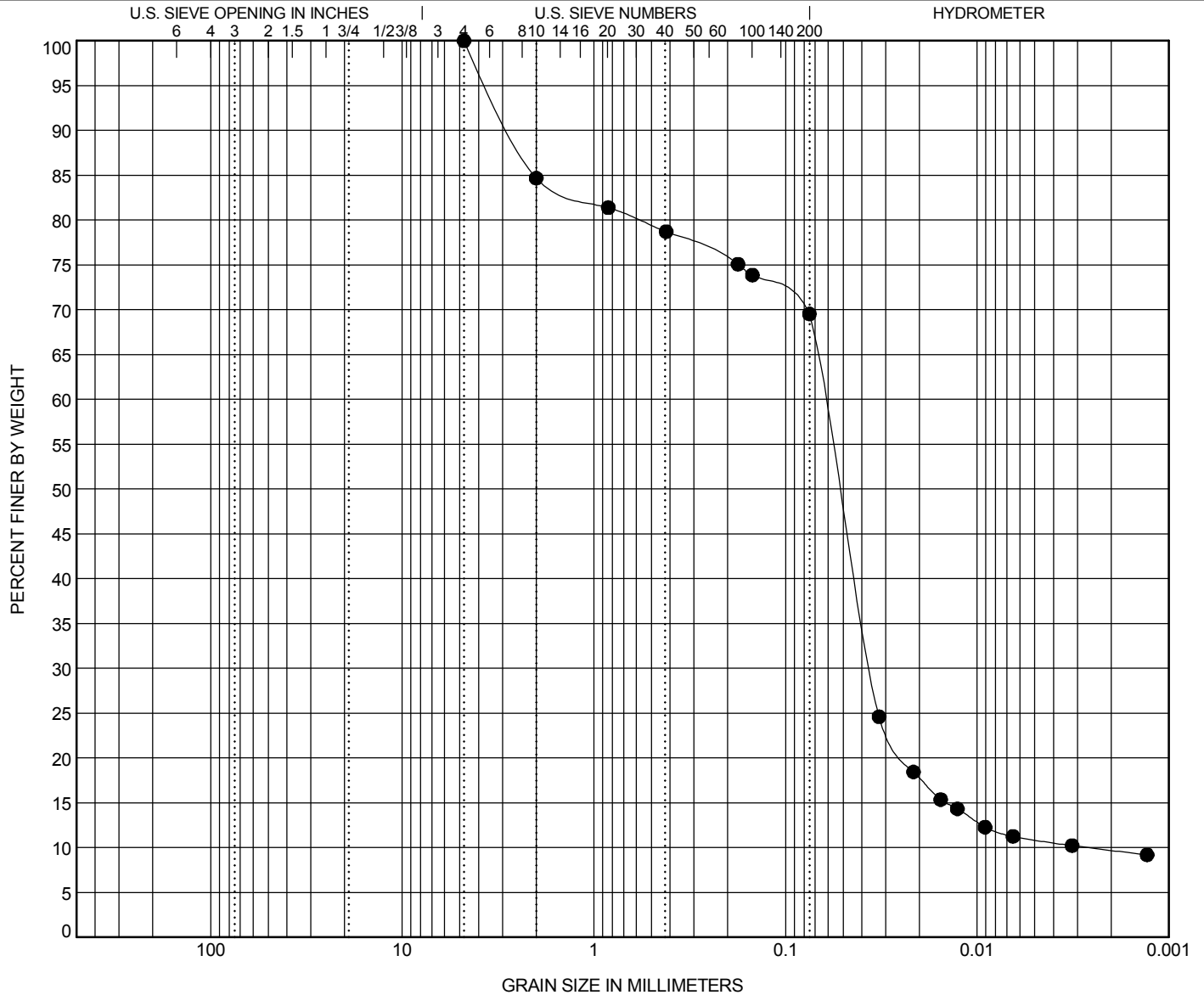


# GRAIN SIZE DISTRIBUTION

PROJECT ID P038304

PROJECT NAME S-33-52 Replacement Bridge over Rocky Creek

PROJECT COUNTY McCormick



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● B-1602	10.0	Sandy SILT (ML)								7.92	24.19
BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay		
● B-1602	10.0	4.76	3.586	0.052	0.003	0.0	30.4	58.7	10.9		

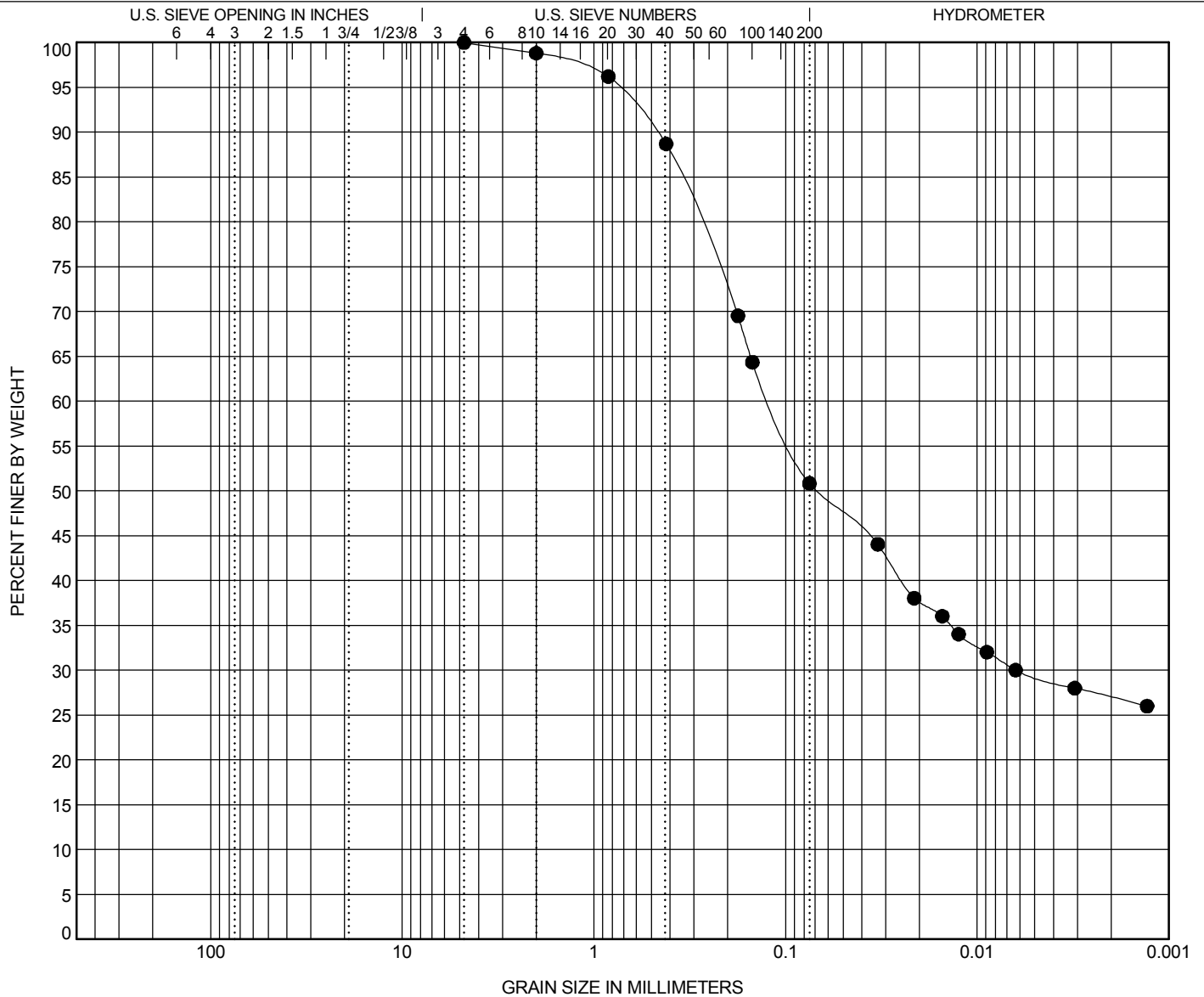


# GRAIN SIZE DISTRIBUTION

PROJECT ID P038304

PROJECT NAME S-33-52 Replacement Bridge over Rocky Creek

PROJECT COUNTY McCormick



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

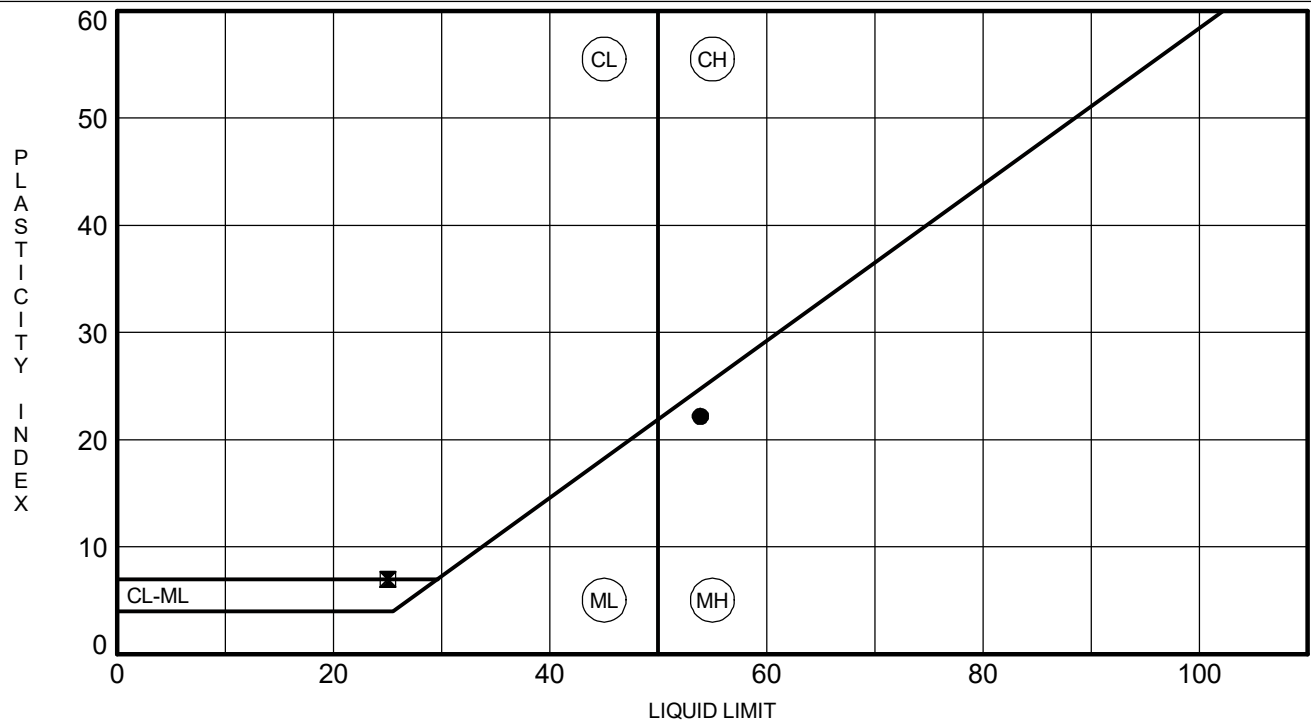
BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● B-1602	15.0	Sandy Silty CLAY (CL-ML/A-4(1))					25	18	7		
BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt		%Clay	
● B-1602	15.0	4.76	0.752	0.068		0.0	49.2	21.5		29.4	



**PROJECT ID** P038304

**PROJECT NAME** S-33-52 Replacment Bridge over Rocky Creek

**PROJECT COUNTY** McCormick

[illegible]

### Corrosivity Testing

Client F&ME Consultants  
 Client Project G6100.050 Load Restricted Bridge Package 2020-1  
 Project No. 42301

Lab Sample ID	Boring	Depth	Sample	Matrix	pH AASHTO T289			Chloride AASHTO T291 (Method B)			Sulfate AASHTO T290 (Method B)			Min. Soil Resistivity AASHTO T288		
					Result	Date Tested	Tested By	Result mg/kg (ppm)	Date Tested	Tested By	Result mg/kg (ppm)	Date Tested	Tested By	Result, Ohm-cm	Date Tested	Tested By
42301013	G6100.050.00001	B-901	0.0' - 10.0'	Soil	5.3	8/27/2019	AMP	75	8/29/2019	AMP	<30	8/28/2019	AMP	16,500	8/27/2019	AMP
42301014	G6100.050.00002	B-802	0.0' - 10.0'	Soil	5.4	8/27/2019	AMP	47	8/29/2019	AMP	<30	8/28/2019	AMP	9,850	8/27/2019	AMP
42301015	G6100.050.00003	B-1001	0.0' - 10.0'	Soil	5.7	8/27/2019	AMP	<10	8/29/2019	AMP	<30	8/28/2019	AMP	16,500	8/27/2019	AMP
42301016	G6100.050.00004	B-602	0.0' - 10.0'	Soil	5.6	8/27/2019	AMP	<10	8/29/2019	AMP	<30	8/28/2019	AMP	15,500	8/27/2019	AMP
42301017	G6100.050.00005	B-501	0.0' - 10.0'	Soil	6.0	8/27/2019	AMP	75	8/29/2019	AMP	<30	8/28/2019	AMP	4,900	8/27/2019	AMP
42301018	G6100.050.00006	B-701	0.0' - 10.0'	Soil	5.2	8/27/2019	AMP	<10	8/29/2019	AMP	<30	8/28/2019	AMP	18,000	8/27/2019	AMP
42301019	G6100.050.00007	B-1202	0.0' - 10.0'	Soil	5.5	8/27/2019	AMP	38	8/29/2019	AMP	88	8/28/2019	AMP	1,700	8/27/2019	AMP
42301020	G6100.050.00008	B-1602	0.0' - 10.0'	Soil	6.1	8/27/2019	AMP	136	8/29/2019	AMP	<30	8/28/2019	AMP	3,500	8/27/2019	AMP
42301021	G6100.050.00009	B-402	0.0' - 10.0'	Soil	5.9	8/27/2019	AMP	<10	8/29/2019	AMP	<30	8/28/2019	AMP	10,500	8/29/2019	AMP
42301022	G6100.050.00010	B-301	0.0' - 10.0'	Soil	7.5	8/27/2019	AMP	40	8/29/2019	AMP	28	8/28/2019	AMP	2,200	8/29/2019	AMP
42301023	G6100.050.00011	B-202	0.0' - 10.0'	Soil	5.9	8/27/2019	AMP	<10	8/29/2019	AMP	36	8/28/2019	AMP	7,200	8/29/2019	AMP
42301024	G6100.050.00012	B-101	0.0' - 10.0'	Soil	6.2	8/27/2019	AMP	<10	8/29/2019	AMP	<30	8/28/2019	AMP	6,000	8/29/2019	AMP
42301025	G6100.050.00013	B-1302	0.0' - 10.0'	Soil	4.9	8/27/2019	AMP	40	8/29/2019	AMP	<30	8/28/2019	AMP	8,500	8/28/2019	AMP
42301026	G6100.050.000014	B-1402	0.0' - 10.0'	Soil	5.2	8/27/2019	AMP	<10	8/29/2019	AMP	<30	8/28/2019	AMP	11,000	8/28/2019	AMP
42301027	G6100.050.00015	B-1501	0.0' - 10.0'	Soil	5.8	8/27/2019	AMP	<10	8/29/2019	AMP	<30	8/28/2019	AMP	11,000	8/28/2019	AMP
42301028	G6100.050.00016	B-1102	0.0' - 10.0'	Soil	5.7	8/27/2019	AMP	78	8/29/2019	AMP	<30	8/28/2019	AMP	5,200	8/28/2019	AMP

Input Validation: AMP

Reviewed By: ALO