## **GEOTECHNICAL DATA REPORT**

US 264 HDD Crossings Greenville, North Carolina S&ME Project No. 1358-14-033

Prepared For:

RK&K 2100 East Cary Street, Suite 209 Richmond, Virginia 23223

Prepared By:



3718 Old Battleground Road Greensboro, North Carolina 27410 NC PE Firm License No. F-0176

July 28, 2014



July 28, 2014

RK&K 2100 East Cary Street, Suite 209 Richmond, Virginia 23223

Attention: Mr. Martin Rodgers, P.E.

Reference: GEOTECHNICAL DATA REPORT

US 264 HDD Crossings Greenville, North Carolina S&ME Project No. 1358-14-033

Dear Mr. Rodgers:

S&ME, Inc. (S&ME) has completed field exploration and laboratory testing for the above referenced project. The purpose was to explore and characterize subsurface conditions for use in design and construction of four sections of a directionally drilled pipeline along US 264 between Old River Road and MacGregor Downs Road in Greenville, North Carolina. Our work was performed in general accordance with S&ME Proposal No. 1581-13-P233 dated November 21, 2013 and the terms and conditions of the General Services Agreement between RK&K and S&ME dated June 4, 2010. The project scope was amended during a telephone call on June 27, 2014 between Wayne Noonoo with RK&K and Matt Moler with S&ME to include a total of eight soil test borings to depths of 40 or 50 feet below existing grade.

S&ME appreciates the opportunity to provide geotechnical exploration and testing services for this project. If you have any questions or need additional information in regard to this report, please call us at (336) 288-7180.

Respectfully,

S&ME, Inc.

Matt Moler, P.E.

Senior Engineer/Project Manager

Scott Hancock, P.E.

Technical Principal/Vice President

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## **APPENDICES**

- A Legend to Soil Classification and Symbols Boring Logs (B-1 through B-8)
- B Summary of Laboratory Test Data Laboratory Test Results (34 pages)

### 1.0 PROJECT INFORMATION

Project information was obtained from e-mail correspondence between Martin Rodgers with RK&K and Scott Hancock with S&ME dated November 19, 2013. In the e-mail correspondence, Mr. Rodgers provided a project schedule and requested five boring to depths of 60 feet below existing grade. The project scope was amended during a telephone call on June 27, 2014 between Wayne Noonoo with RK&K and Matt Moler with S&ME to include a total of eight soil test borings to depths of 40 or 50 feet below existing grade.

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The proposed construction consists of four sections of horizontal directionally drilled (HDD) pipeline along US 264 between Old River Road and MacGregor Downs Road in Greenville, North Carolina, as shown on Figure 1 (Site Vicinity Plan) in the Appendix. S&ME was requested to perform two borings at each HDD crossing for use in the HDD design by RK&K.

### 2.0 GEOLOGY

The site is located within the Coastal Plain Physiographic Province of North Carolina. The Coastal Plain Province is typically characterized by marine, alluvial, and eolian sediments that were deposited during periods of fluctuating sea levels and moving shorelines. The soils in this province are typical of those laid down in a shallow sloping near-shore marine environment. Alluvial sands, silts, and clays are typically present near rivers and creeks.

According to the 1985 Geologic Map of North Carolina, the site is underlain by the Black Creek Formation of the Cretaceous Period. The Black Creek Formation is described as clay, gray to black, lignitic, and contains thin beds and laminae of finegrained micaceous sand and thick lenses of cross-bedded sand. Glauconitic, fossiliferous clayey sand lenses are located in the upper part of the formation. Borings performed for this exploration did not extend deep enough to encounter the Black Creek Formation.

Based on our experience with HDD and the area geology, we have the following comments relative to HDD natural geologic hazards associated with the subject site:

HDD GEOLOGIC HAZARD	COMMENTS
Cohesionless sand, gravel, cobbles, or boulders with little to no fines.	Zone of clean sands (5% or less passing the No. 200 sieve) encountered sporadically.
Horizontal zones of gravel, cobbles, or boulders in soil matrix.	Inconsistent with site geology.
Near vertical zones of gravel, cobbles, or boulders in soil matrix.	Inconsistent with site geology.
Voids or preferential seepage paths potentially resulting in loss of drilling fluid return.	Inconsistent with site geology.
Very loose sand or very soft silt/clay.	Encountered in several borings at various depths.

Peat, organic soil.	Inconsistent with site geology.
Material with sufficient potential swell upon exposure to water to reduce borehole diameter.	Inconsistent with site geology.
Continuous strata of hard material requiring rock drilling techniques to penetrate.	Inconsistent with site geology.
Artesian groundwater conditions.	Inconsistent with site geology.

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### 3.0 EXPLORATION PROCEDURES

#### 3.1 Field

Eight soil test borings (labeled B-1 through B-8) were conducted at the locations indicated on Figures 2, 4, 6, and 8 (Boring Location Plans). The borings were located roughly parallel to, and offset from, the planned pipeline alignment. Borings B-1 through B-6 were located along US 264, boring B-7 was located within the Greenville Utility right-of-way near the Greenville West 230 Substation, and boring B-8 was located off of MacGregor Downs Road.

The borings were located by S&ME using GPS equipment within the areas requested by RK&K. S&ME provided as-drilled boring coordinates to RK&K, and RK&K provided interpolated ground surface elevations. Subsurface conditions encountered at the boring locations are presented on the Boring Logs in Appendix A. Boring coordinates and ground surface elevations are provided on the Boring Logs and should be considered approximate.

The borings were conducted using a CME 550 drill rig mounted on a rubber-tired all-terrain vehicle. Mud rotary (wash boring) drilling procedures were used to advance the borings to termination depths of 40 or 50 feet. Standard Penetration Tests (SPT) were performed in the borings at 2.5-foot intervals in the top 10 feet, then at 5-foot intervals thereafter, in general accordance with ASTM D 1586 to provide an index for estimating strength parameters and relative consistency of subsurface soils.

### 3.2 Laboratory

Samples were returned to our laboratory where a geotechnical staff professional visually examined each soil sample to assess the distribution of grain sizes, plasticity, organic content, moisture condition, color, presence of lenses and seams, and apparent geological origin. The results of the classifications are presented on the individual Boring Logs included in Appendix A. The contact lines represent approximate boundaries between the soil types. The actual boundaries between the soil types in the field may vary in both the horizontal and vertical directions.

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Classification tests were performed on selected soil samples obtained during the field exploration. Laboratory testing included:

- Atterberg Limits (ASTM D 4318)
- Grain Size Distribution (#200 wash) (ASTM D 422)
- Moisture Content (ASTM D 2216)

Results of the laboratory testing are presented in Appendix B. A Summary of Laboratory Test Data table is also included in Appendix B.

#### 4.0 HDD SUBSURFACE CONDITIONS

Subsurface conditions at the four HDD crossings were characterized based on subsurface conditions encountered and geologic setting. Soils with similar HDD drilling characteristics were grouped into strata (as shown in the table below) based on visual soil classification, laboratory classification tests, consistencies inferred from standard penetration resistance values, and geologic origin. Material properties were estimated from correlations to material types, laboratory tests, and field tests. The Strata contacts shown on the Generalized Subsurface Profiles in the Appendix may vary between borings and should be considered approximate. Material properties are provided in tables based on correlations with subsurface conditions encountered. More detailed information is presented in the Appendix.

STRATA	DESCRIPTION	PERCE	NT OF MA	USCS	SPT	
OIRAIA	DEGGKII TION	GRAVEL	SAND	SILT/CLAY	0000	(blows/ft)
ı	COASTAL PLAIN SOILS: Very loose to medium dense SANDS and soft to stiff SILTS	< 1%	35% to 95%	5% to 65%	SP-SM, SP, SC, SM, SC- SM, ML, MH	WOH to 24
II	COASTAL PLAIN SOILS: Medium dense to dense SANDS	< 1%	80% to 95%	5% to 20%	SP-SM, SM	25 to 40
III	COASTAL PLAIN SOILS: High Plasticity CLAY with intermittent silty sand layers, sporadic shells	< 1%	20% to 50%	50% to 80%	CH, SM	2 to 15

#### Notes:

- 1. USCS Unified Soil Classification System, visual classification.
- SPT Standard Penetration Test "N" value. Tests performed with an autohammer. WOH – Weight of Hammer.
- 3. The range of Percentage of Materials was estimated based on lab data.
- 4. The information presented above is a generalization of predominant subsurface conditions encountered. The material descriptions, percentages of materials, USCS, and SPT values presented are estimated based on visual classification, laboratory testing, field testing, and experience.

Groundwater was encountered in the borings at depths of 2.5 to 16.5 feet below the existing ground surface. These depths correspond to approximate elevations of 11.5 to 77.3 feet. The groundwater level typically fluctuates during the year due to seasonal and climatic changes.

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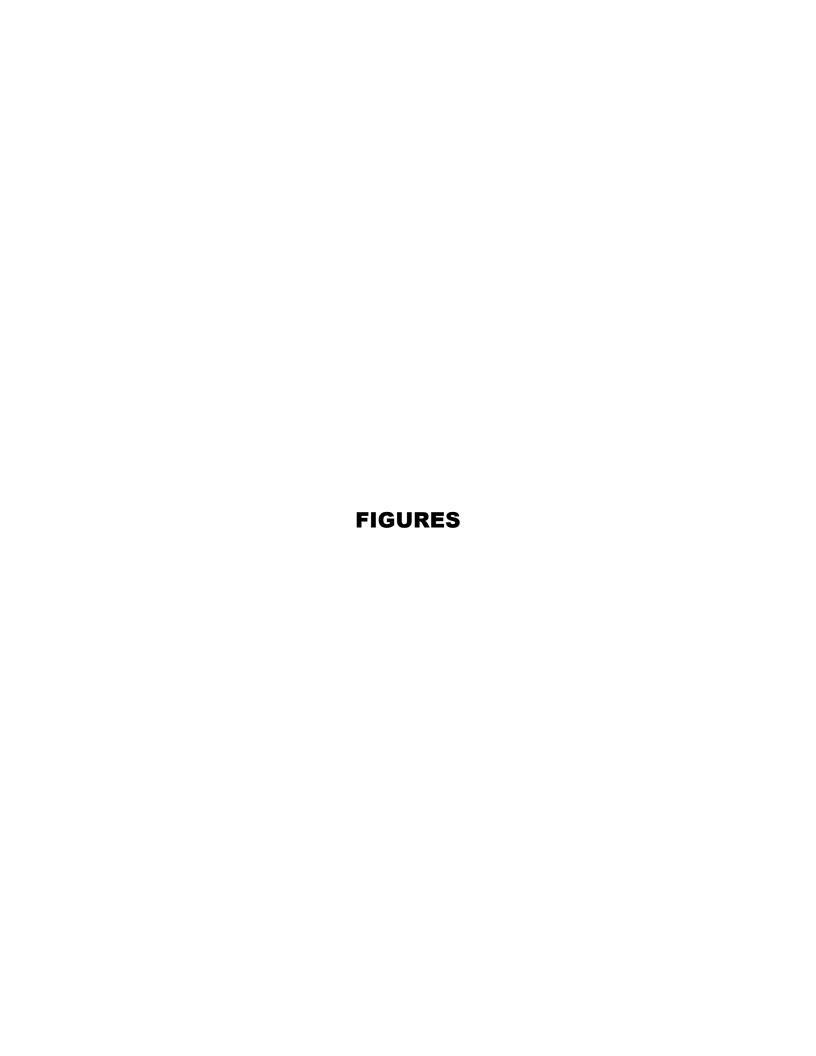
Based on the data obtained during our field and laboratory exploration, we recommend the following parameters for use in design of the HDD program.

Strata	Friction Angle	Cohesion	Unit Wei	ght (pcf)	Shear Modulus
	(degrees)	(psf)	Total	Submerged	(ksf)
I	28	0	120	58	200
i.i.	32	0	120	58	600
III	10	500	110	48	200

### 5.0 QUALIFICATIONS

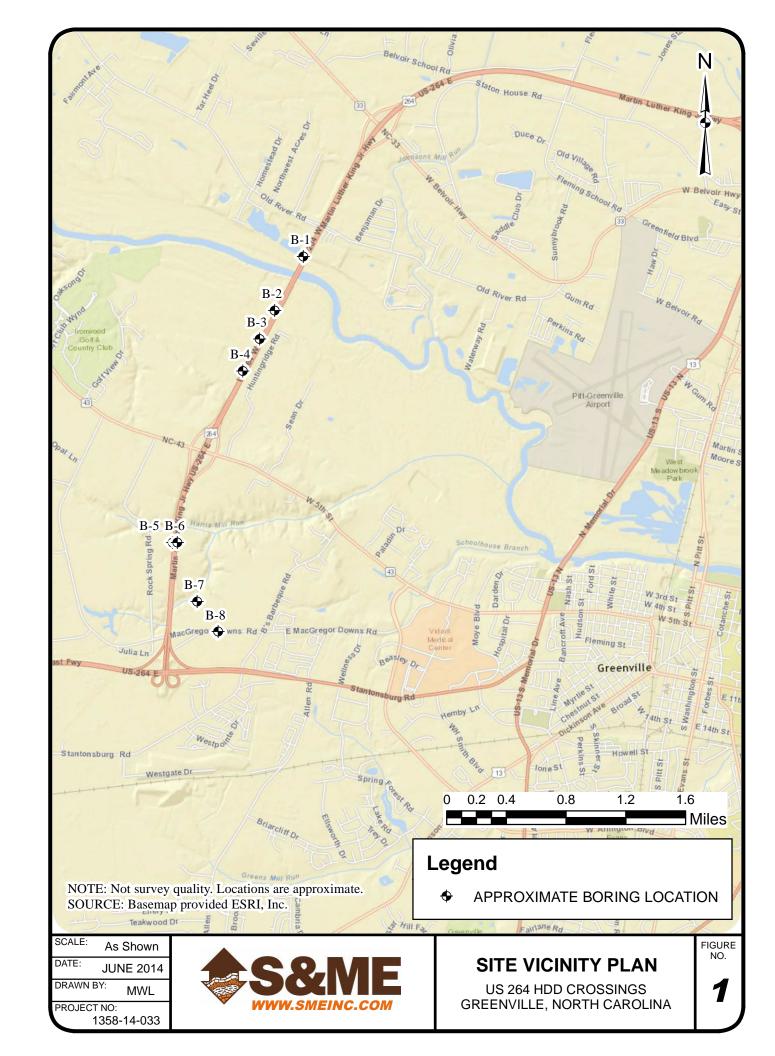
This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions contained in this report were based on the applicable standards of the engineering profession at the time this report was prepared. No other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

The nature and extent of variations between borings may not become evident until construction. If variations appear evident, then it will be necessary to reevaluate the applicability of the information obtained with this exploration and laboratory testing program. Environmental services were beyond the scope of this report.

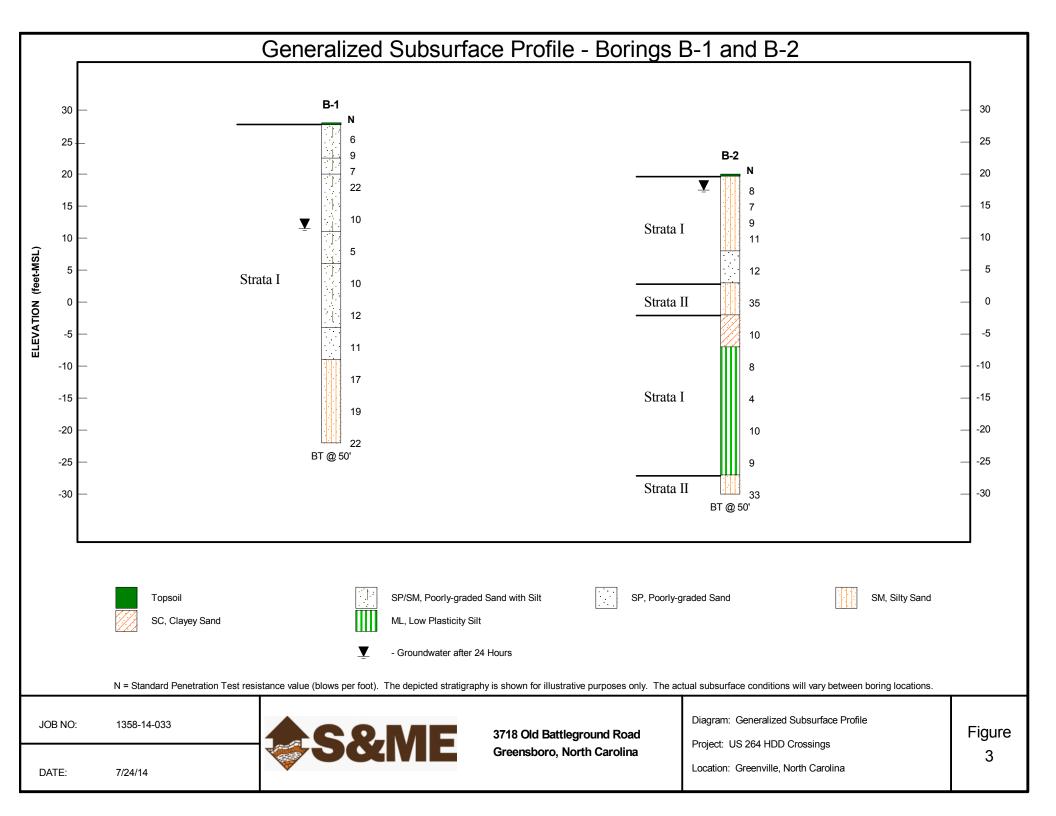


# **FIGURES**

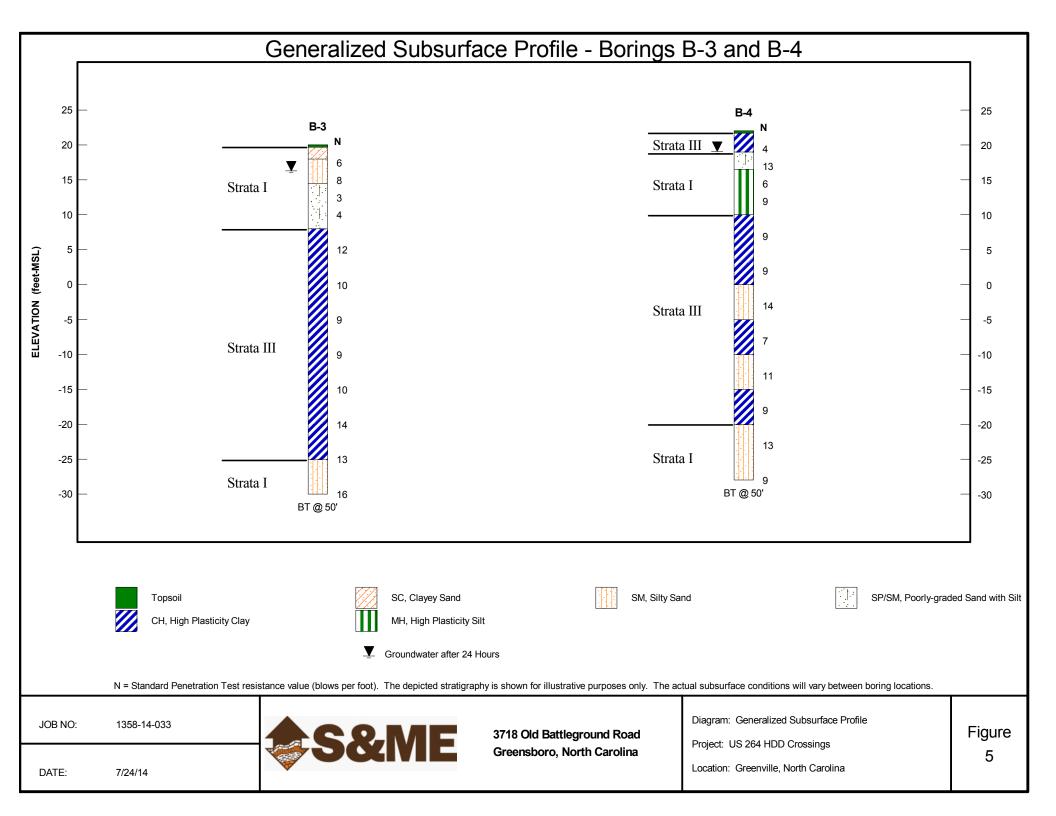
Site Vicinity Plan – Figure 1 Boring Location Plans – Figures 2, 4, 6, and 8 Generalized Subsurface Profiles – Figures 3, 5, 7, and 9







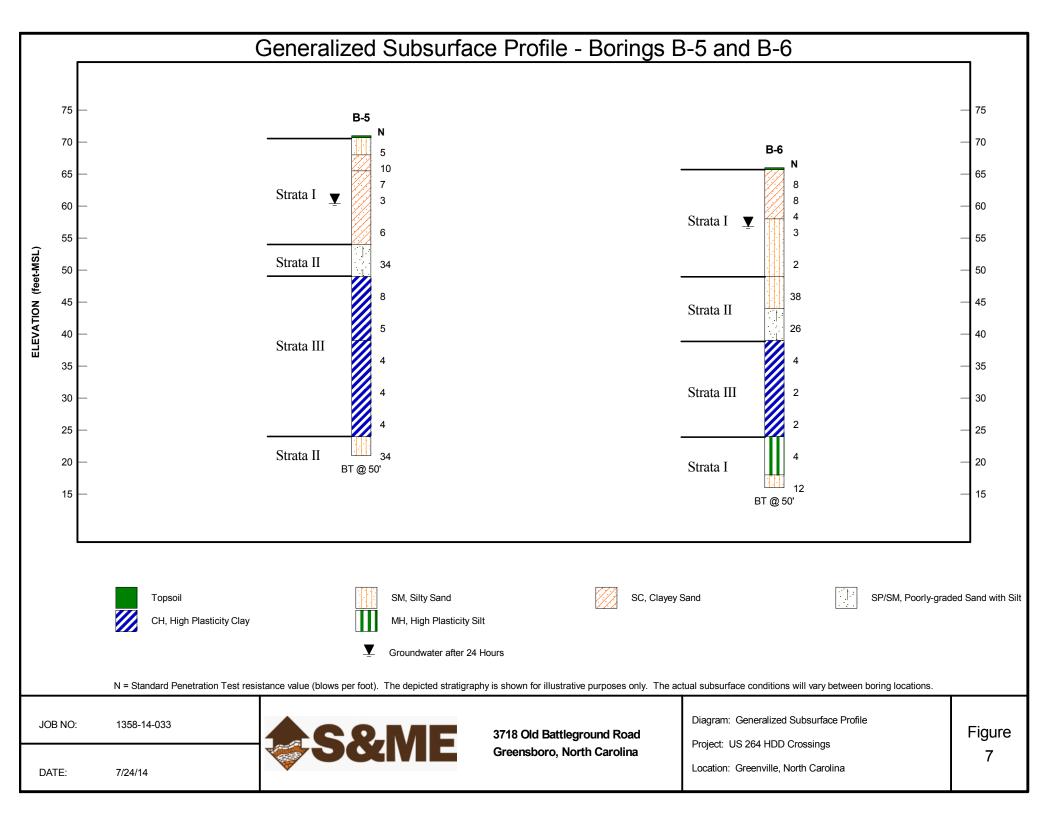


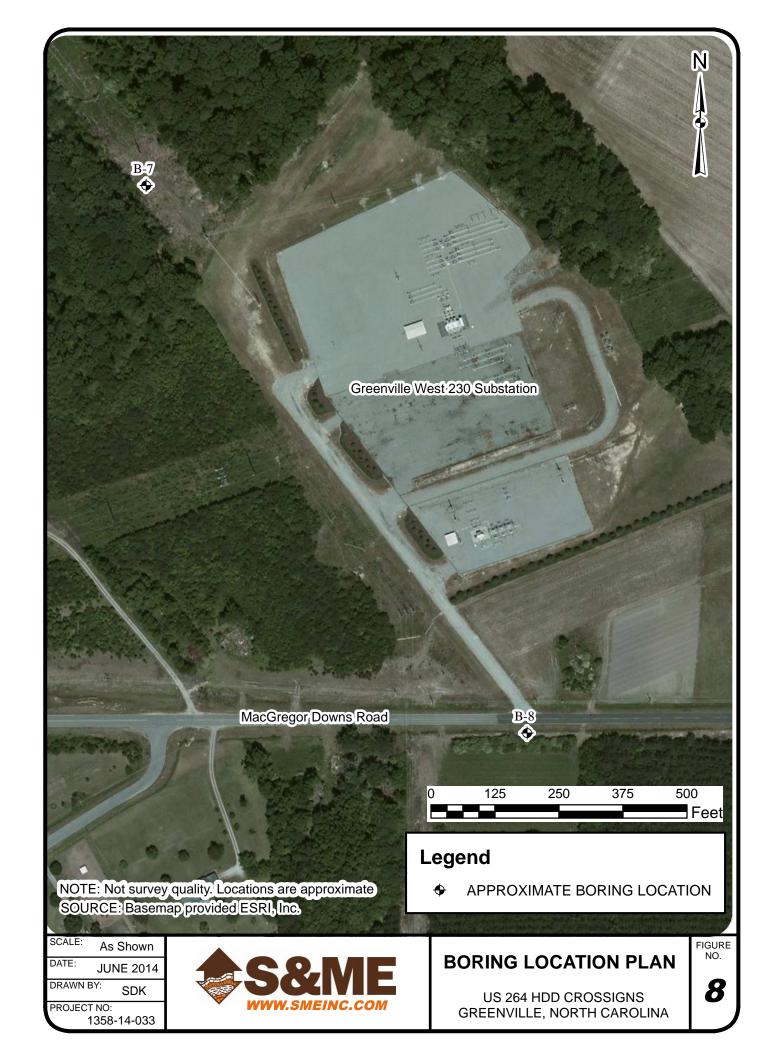


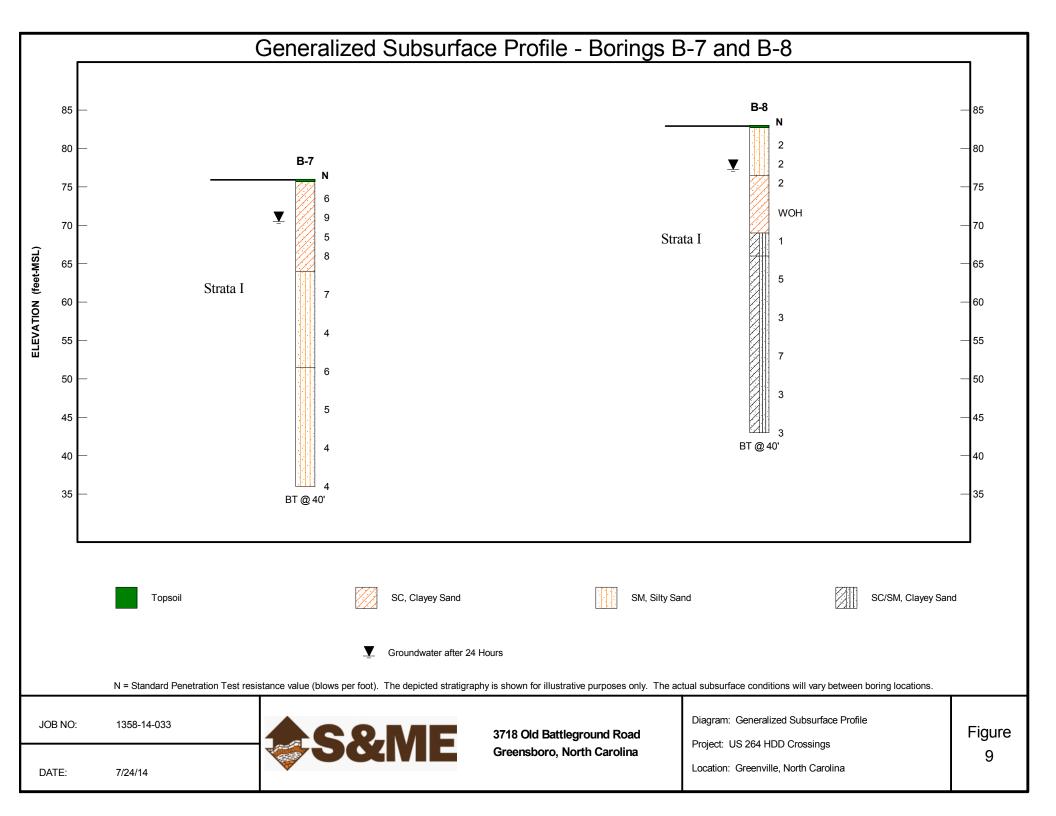


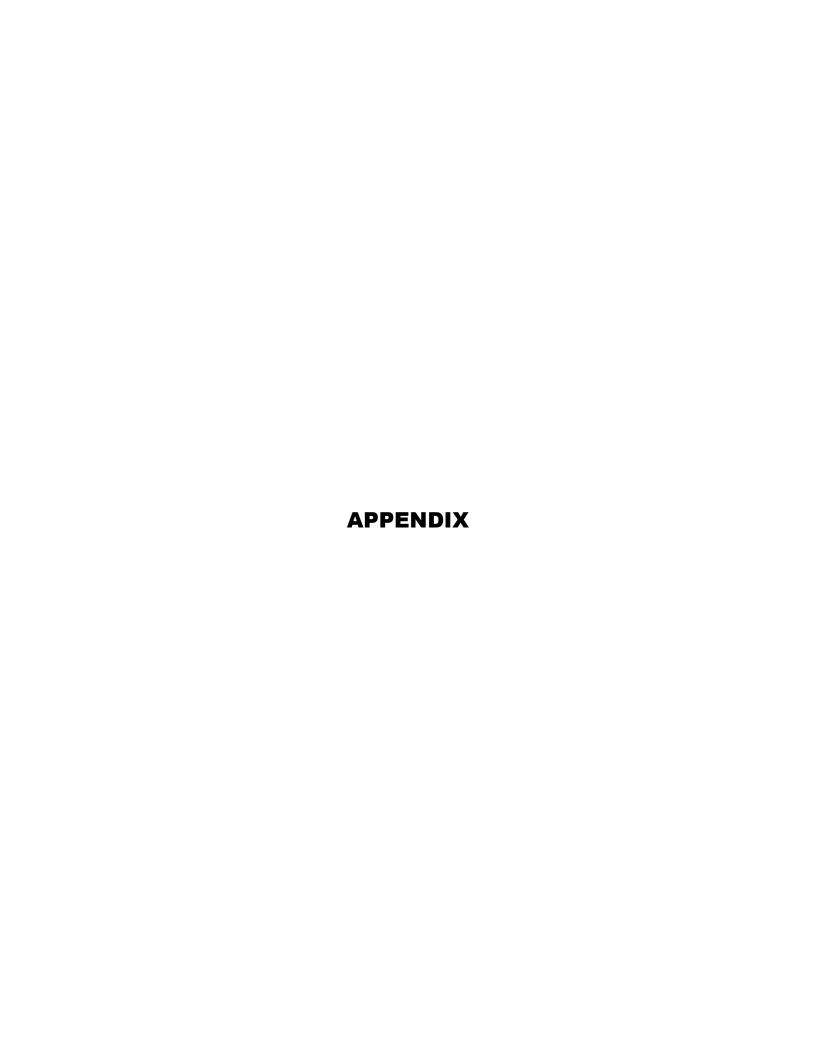
PROJECT NO: 1358-14-033

US 264 HDD CROSSIGNS GREENVILLE, NORTH CAROLINA









# **APPENDIX A**

Legend to Soil Classification and Symbols Boring Logs (B-1 through B-8)

# LEGEND TO SOIL CLASSIFICATION AND SYMBOLS

### **SOIL TYPES**

(Shown in Graphic Log)



Fill



Asphalt



Concrete



**Topsoil** 



Gravel



SP, Poorly Graded Sand



Silt



CH, High Plasticity Clay



MH, High Plasticity Silt



SM, Silty Sand



SC, Clayey Sand



SP/SM, Poorly-Graded Sand with Silt



SP/SC, Poorly-Graded Sand with Clay



ML, Low Plasticity Silt



CL, Low Plasticity Clay



Partially Weathered Rock



Cored Rock

## WATER LEVELS

(Shown in Water Level Column)

= Water Level At Termination of Boring = Water Level Taken After 24 Hours

= Loss of Drilling Water

HC = Hole Cave

## **CONSISTENCY OF COHESIVE SOILS**

	STD. PENETRATION
	RESISTANCE
CONSISTENCY	BLOWS/FOOT
Very Soft	0 to 2
Soft	3 to 4
Firm	5 to 8
Stiff	9 to 15
Very Stiff	16 to 30
Hard	31 to 50
Very Hard	Over 50

## RELATIVE DENSITY OF COHESIONLESS SOILS

RELATIVE DENSITY	STD. PENETRATION RESISTANCE <u>BLOWS/FOOT</u>
Very Loose	0 to 4
Loose	5 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	Over 50

## **SAMPLER TYPES**

(Shown in Samples Column)

Shelby Tube



Split Spoon



**Rock Core** 

No Recovery

## **TERMS**

**Penetration** Resistance

Standard - The Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in. I.D. Split Spoon Sampler 1 Foot. As Specified in ASTM D-1586.

**REC** - Total Length of Rock Recovered in the Core Barrel Divided by the Total Length of the Core Run Times 100%.

**RQD** - Total Length of Sound Rock Segments Recovered that are Longer Than or Equal to 4" (mechanical breaks excluded) Divided by the Total Length of the Core Run Times 100%.



PROJECT:	PROJECT: US 264 HDD Crossings Greenville, North Carolina S&ME Project No. 1358-14-033						BORING LOG B-1								
DATE DRILLI	DATE DRILLED: 7/8/14 ELEVATION: 28.0 ft						NO.	TES: T	emporary P	VC standpip grouted to t centonite gro	e installed	to			
DRILL RIG: (		BORING DEPTH: 50.0							ith cement-k	pentonite gro	out.				
DRILLER: <b>J.</b>	White	WATER LEVEL: 16.5 ft	WATER LEVEL: 16.5 ft @ 24 hrs												
HAMMER TY	PE: Autohammer	LOGGED BY: F. Wrigh													
SAMPLING N	METHOD: Split Spoon							NORTHING: <b>694465</b> EASTING: <b>2469110</b>							
DRILLING MI	ETHOD: Wash Boring														
DEPTH (feet) GRAPHIC LOG	MATERIAL DES	CRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.		44	Sta 6in / ROD State Stat		D PENETRATION (blows/ft) /REMARKS	N TEST DATA	N VALU			
- (1) (1) - (1) (1) - (1) (2)	TOPSOIL - 3 Inches  COASTAL PLAIN: SAND (SP-Source to be seen to b			-	SS-1	X	3	3 3		•		- 6			
5—	with silt	not, poorly graded,		23.0-	SS-2	X	3	4 5				9			
13(4) - 3(4)	SAND (SP-SM) loose, tan, fine to medium, mo with silt	oist, poorly graded,		-	SS-3	X	5	3 4				7			
10-	SAND (SP-SM) medium dense, gray tan, fine poorly graded, with silt	to medium, moist,		18.0-	SS-4	X	5	9 13			<b>?</b>	22			
15—			<u></u>	13.0-	SS-5	X	4	5 5				10			
20-	SAND (SP-SM) loose, tan, fine to medium, we with silt	t, poorly gaded,		8.0-	SS-6	X	2	2 3		•		5			
25	SAND (SP-SM) medium dense, gray tan, fine poorly graded, with silt	to medium, wet,		3.0-	SS-7	X	5	5 5				10			
30-				-2.0-	SS-8	X	5	7 5		•		12			
(1) (1) 	SAND (SP) medium dense, orange browr wet, poorly graded	, fine to medium,		-	SS-9	X	4	4 7				11			

S&ME BORING LOG 1358-14-033 US 264 HDD CROSSING OF TAR RIVER.GPJ S&ME.GDT 7/24/14

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- 2. BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
- 3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJECT:	US 264 HDD Cro Greenville, North S&ME Project No. 135	Carolina			BORING LOG B-1												
DATE DRILLE	ED: <b>7/8/14</b>	ELEVATION: 28.0 ft	8.0 ft NOTES: Temporary PVC 50.0 ft. Boring tremie gr surface with cement-ber								C standpi routed to	pe installed the ground	to				
DRILL RIG: (	CME 550	BORING DEPTH: 50.0 f	t				SI	ırfac	e wit	th cement-be	ntonite g	rout.					
DRILLER: J.	White	WATER LEVEL: 16.5 ft															
HAMMER TY	PE: Autohammer	LOGGED BY: F. Wright	:														
SAMPLING N	METHOD: Split Spoon						N	ORTI	HING	6: 694465	EASTI	NG: <b>246911</b>	0				
DRILLING METHOD: Wash Boring																	
(feet) GRAPHIC LOG	9 MATERIAL DESCRIPTION				MATERIAL DESCRIPTION  ELEVATION			ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	1st 6in / RUN # / DIS	OW COUNT PRE DATA STANDA STANDA STANDA STANDA STANDA STANDA STANDA		STANDARD F	RD PENETRATION TEST DATA (blows/ft) /REMARKS 10 20 30 6080		N VALU
40-	SILTY SAND (SM) medium dense, gray, fine to co	parse, wet		-12.0—	SS-10	X	6	7	10				17				
45				-17.0— - - - -	SS-11 SS-12	X	9	9	10		,		19				
50	Boring terminated at 50 ft			-22.0-													

S&ME BORING LOG 1358-14-033 US 264 HDD CROSSING OF TAR RIVER.GPJ S&ME.GDT 7/24/14

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PROJECT: US 264 HDD Crossings Greenville, North Carolina S&ME Project No. 1358-14-033							BOF					B-2			
DATE I	ORILLE	ED: <b>7/2/14</b>	ELEVATION: 20.0 ft					N 50	OTES	S: <b>Te</b> . <b>Bo</b>	emporary PVC	standpip	e inst	alled to	ס
DRILL	RIG: C	CME 550	BORING DEPTH: 50.0 f	t	NOTES: Temporary PVC standpipe install 50.0 ft. Boring tremie grouted to the grour surface with cement-bentonite grout.										
DRILLE	ER: <b>J.</b>	White	WATER LEVEL: 2.5 ft	R LEVEL: 2.5 ft @ 24 hrs											
HAMM	ER TYI	PE: Autohammer	LOGGED BY: F. Wright												
SAMPL	ING M	ETHOD: Split Spoon						N	ORT	HING	: <b>692568</b>	EASTI	NG: <b>24</b>	68099	
DRILLI	NG ME	ETHOD: Wash Boring													
DEPTH (feet)	GRAPHIC LOG	MATERIAL DES	CRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	1st 6in / RUN # /	2nd 6in / REC 300 M	3rd 6in / RQD YA	STANDARD PE	(blows/ft) REMARKS		DATA 60.80	N VALUE
-		TOPSOIL - 4 Inches			-	SS-1	X	4	4	4		•			8
-		COASTAL PLAIN: SILTY SAND loose, tan, fine to coarse, mois		₹	-	-	V	3	3	4					-
5-					15.0-	SS-2		3	3	7					7
-					-	SS-3	X	3	4	5		1			9
10 <del>-</del>					10.0-	SS-4	X	5	5	6		•			11
- - 15 —		SAND (SP) loose, tan gray, medium to coagraded	arse, wet, poorly		5.0—	SS-5	X	4	3	9		•			12
- - 20 —		SILTY SAND (SM) dense, gray tan, fine to mediur	n, wet		0.0-	SS-6	X	13	14	21			\ /		35
- - 25 —		CLAYEY SAND (SC) medium dense, gray, fine, wet,	with silt and mica		-5.0-	SS-7	X	4	4	6			/ : : : : : : : : : : : : : : : : : : :		10
30 —		SANDY SILT (ML) firm to stiff, gray, wet, with mice	3		- - -10.0—	SS-8	X	3	3	5		•			8
- - -					- - -	SS-9	X	4	3	1		/			4

S&ME BORING LOG 1358-14-033 US 264 HDD CROSSING OF TAR RIVER.GPJ S&ME.GDT 7/24/14

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- 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJECT: US 264 HDD Crossings Greenville, North Carolina S&ME Project No. 1358-14-033							BOR					3-2	
DATE DRIL	ATE DRILLED: 7/2/14 ELEVATION: 20.0 ft							NO <b>50</b> .	TES 0 ft.	: Te Bor	emporary PVC s	standpipe installed to uted to the ground onite grout.	•
ORILL RIG	: CI	ME 550	BORING DEPTH: 50.0	ft				sur	face	wit	h cement-bent	onite grout.	
ORILLER:	J. W	Vhite	WATER LEVEL: 2.5 ft (										
HAMMER	TYPI	E: Autohammer	LOGGED BY: F. Wrigh										
SAMPLING	G ME	THOD: Split Spoon						NO	RTH	IING	: 692568	EASTING: <b>2468099</b>	
DRILLING	ΜĘΊ	THOD: Wash Boring		WATER LEVEL									
(feet) GRAPHIC						SAMPLE NO.		1st 6in / RUN # COR / RON # MOTE		3rd 6in / RQD TIN		NETRATION TEST DATA (blows/ft) REMARKS 10 20 30 60.80	N VALUE
- - - 40 - - - 45		SANDY SILT (ML) firm to stiff, gray, wet, with m	ica (continued)		-20.0       25.0	SS-10 SS-11		4	4	6			10
50		SILTY SAND (SM) dense, gray, fine, with clay  Boring terminated at 50 ft		-	-30.0-	SS-12		11	14	19			33

S&ME BORING LOG 1358-14-033 US 264 HDD CROSSING OF TAR RIVER.GPJ S&ME.GDT 7/24/14

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PROJE	ECT:	US 264 HDD Cro Greenville, North ( S&ME Project No. 135	Carolina				BOR	ING	LC	)G	B-3				
DATE I	DRILLE	ED: <b>7/2/14</b>	ELEVATION: 20.0 ft					NO 50	TES:	Temporary PV	/C standpi	pe install	ed to	,	
		CME 550	BORING DEPTH: 50.0 f	t				NOTES: Temporary PVC standpipe installed to 50.0 ft. Boring tremie grouted to the ground surface with cement-bentonite grout.							
DRILLE			WATER LEVEL: 3.7 ft @		hrs			Ī							
		PE: Autohammer	LOGGED BY: F. Wright												
SAMPL	ING M	ETHOD: Split Spoon						NO	RTH	ING: <b>691562</b>	EASTING: <b>2467566</b>				
DRILLI	NG ME	THOD: Wash Boring													
DEPTH (feet)	GRAPHIC LOG	MATERIAL DES	CRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	**	Zud 6in / REC 32 / NOO /	NT CAD STANDARD	PENETRATI (blows/ft) /REMARKS	3	ATA 6080	N VALUE	
-		TOPSOIL - 4 Inches			-	SS-1	X	2	2	4			: : : : : :	6	
-		COASTAL PLAIN: CLAYEY SA very loose, orange tan, fine, m	ND (SC) oist, with silt	₹	-	30-1								J	
5-		SILTY SAND (SM) loose, orange tan, fine to medi	um, moist to wet		15.0-	SS-2	Ă	4	4	4				8	
-		SAND (SP-SM) very loose, gray black, fine to r graded, with silt	nedium, wet, poorly		-	SS-3	X	1	1	2				3	
10 —					10.0-	SS-4	X	2	1	3				4	
- - 15 — -		SANDY CLAY (CH) stiff to firm, gray black, wet, fat	, with shells		5.0—	SS-5	X	4	5	7				12	
20 —					- 0.0- -	SS-6	X	3	5	5	•			10	
- 25 — -					-5.0-	SS-7	X	3	4	5	•			9	
30-					-10.0—	SS-8	X	3	4	5	•			9	
-					-	SS-9	X	3	5	5				10	

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- 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJECT:	Greenville, North Carolina S&ME Project No. 1358-14-033							G L			B-3			
DATE DRILLE	D: <b>7/2/14</b>	ELEVATION: 20.0 ft					N 50	OTES	S: <b>Te</b>	emporary PVC ring tremie gr th cement-ber	standpi	pe insta the gro	lled to	)
DRILL RIG: C	ME 550	BORING DEPTH: 50.0 f	t				SI	urfac	e wit	h cement-ber	ntonite g	out.		
DRILLER: J. V	White	WATER LEVEL: 3.7 ft @	24	hrs										
HAMMER TYP	PE: Autohammer	LOGGED BY: F. Wright												
SAMPLING ME	ETHOD: Split Spoon						N	ORTI	HING	: 691562	EASTI	NG: <b>246</b>	7566	
DRILLING ME	THOD: Wash Boring													
DEPTH (feet) GRAPHIC LOG	MATERIAL DES	CRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	1st 6in / RUN # / OT	2nd 6in / REC 30 M	3rd 6in / RQD YA	STANDARD P	(blows/ft) / REMARKS		OATA 60.80	N VALUE
40-	SANDY CLAY (CH) stiff to firm, gray black, wet, fat (continued)	, with shells		-20.0— -20.0—	SS-10	X	3	9	5					14
45	SILTY SAND (SM) medium dense, gray black, fin	e, wet, with clay		-25.0— -25.0— - - - -30.0—	SS-11 SS-12		4	5	8					13
30	Boring terminated at 50 ft			-30.0										

S&ME BORING LOG 1358-14-033 US 264 HDD CROSSING OF TAR RIVER.GPJ S&ME.GDT 7/24/14

- 1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
- BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
- 3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJECT:	CT: US 264 HDD Crossings Greenville, North Carolina S&ME Project No. 1358-14-033  DRILLED: 7/3/14  ELEVATION: 22.0 ft								og		B-4			
DATE DRILL	ED: <b>7/3/14</b>	ELEVATION: 22.0 ft					NO 50	OTES	S: <b>Te</b> . <b>Bo</b> i	emporary PVC ring tremie gr h cement-ben	standpi	pe insta	alled to	D
DRILL RIG:	CME 550	BORING DEPTH: 50.0 f	t				si	ırfac	e wit	h cement-ben	tonite g	rout.		
DRILLER: <b>J.</b>	. White	WATER LEVEL: 2.9 ft @		hrs										
	PE: Autohammer	LOGGED BY: F. Wright												
	METHOD: Split Spoon						N	ORTI	HING	: 690431	EAST	NG: <b>24</b> 0	66974	
	ETHOD: Wash Boring													
DEPTH (feet) GRAPHIC LOG	MATERIAL DES	CRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	<u> </u>	/CO	2nd 6in / REC TAN OO OO	3rd 6in / RQD YAN	STANDARD PI	ENETRATI (blows/ft) (REMARKS		DATA .6080	N VALUE
	TOPSOIL - 3 Inches  COASTAL PLAIN: SANDY CLA stiff, gray tan, moist	<u> </u>	Ī	-	- SS-1	X	3	2	2	•				4
5-	SAND (SP-SM) medium dense, gray tan, fine poorly graded, with silt	to medium, wet,		17.0-	SS-2	X	7	6	7					13
-	SILT (MH) firm to stiff, gray black, wet, elveins	astic, with fine sand		-	SS-3	X	2	2	4	•				6
10 —				12.0-	SS-4	X	3	4	5					9
15-	CLAY (CH) stiff, gray, wet, with sand and	shells; with mica		7.0-	SS-5	X	3	4	5		•			9
20-				2.0-	SS-6	X	3	4	5		•			9
25—	SILTY SAND (SM) loose, gray olive, fine, wet, wit	h clay		-3.0-	SS-7	X	3	9	5					14
30-	SANDY CLAY (CH) firm, gray, wet, fat			- - -8.0	SS-8	X	3	3	4		•			7
- 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	SILTY SAND (SM) medium dense, gray olive, fine	e, wet, with clay		-	SS-9	X	4	4	7					11

S&ME BORING LOG 1358-14-033 US 264 HDD CROSSING OF TAR RIVER.GPJ S&ME.GDT 7/24/14

1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.

- 2. BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
- 3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



Greenville, N	Greenville, North Carolina S&ME Project No. 1358-14-033						LOG		B-4		
DATE DRILLED: 7/3/14	ELEVATION: 22.0 ft					NOT <b>50.0</b>	ES: To	emporary PV	C standpipe in routed to the ntonite grout.	nstalled to	)
DRILL RIG: CME 550	BORING DEPTH: 50.0	ft				surfa	ice wi	th cement-be	ntonite grout		
DRILLER: J. White	WATER LEVEL: 2.9 ft	@ 24	hrs								
HAMMER TYPE: Autohammer	LOGGED BY: F. Wrig	ht									
SAMPLING METHOD: Split Spoon						NOR	THING	9: <b>690431</b>	EASTING:	2466974	
DRILLING METHOD: Wash Boring											
(feet) (feet) GRAPHIC LOG	DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	1st 6in / RUN # / SON CASH		STANDARD F	PENETRATION TI (blows/ft) /REMARKS		N VALUE
SILTY SAND (SM) medium dense, gray oliv (continued)  SANDY CLAY (CH) stiff, gray black, wet, fat,			-18.0—	SS-10		4 4	5		•		9
SILTY SAND (SM) medium dense to loose, wet, with clay	gray, fine to medium,		-23.0— -23.0— - - - -28.0—	SS-11 SS-12		3 5	8				13
Boring terminated at 50	ft		-20.0								

S&ME BORING LOG 1358-14-033 US 264 HDD CROSSING OF TAR RIVER.GPJ S&ME.GDT 7/24/14

- 1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
- BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
- 3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJI	ECT:	US 264 HDD Crossings Greenville, North Carolina S&ME Project No. 1358-14-033  DRILLED: 7/3/14  ELEVATION: 71.0 ft					BOR		LOG		B-5			
DATE	DRILLE	ED: <b>7/3/14</b>	ELEVATION: 71.0 ft					NO <b>50</b> .0	TES: 1	Temporary PVC oring tremie greith cement-ben	standpip	oe insta the ara	alled to	)
DRILL	RIG: (	CME 550	BORING DEPTH: 50.0	ft				sur	face w	ith cement-ben	tonite gr	out.		
DRILL	ER: <b>J.</b>	White	WATER LEVEL: 10.6 ft	@ 2	4 hrs									
HAMN	IER TY	PE: Autohammer	LOGGED BY: F. Wrigh	t										
SAMP	LING N	METHOD: Split Spoon						NO	RTHIN	G: <b>684340</b>	EASTI	NG: <b>24</b> 0	64484	
DRILL	ING ME	THOD: Wash Boring												
DEPTH (feet)	GRAPHIC LOG	MATERIAL DES	CRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	ÆΙ	/ COR	Zud ein / REC 3rd ein / ROD ASde	0171140711011	(blows/ft) REMARKS		DATA 6080	N VALUE
	- - - -	TOPSOIL - 4 Inches  COASTAL PLAIN: SILTY SANI	) (SM)		-	SS-1	X	2	2 3	•				5
5-		loose, gray tan red, fine  CLAYEY SAND (SC)  medium dense, orange tan, fine			66.0-	SS-2	X	3	4 6					10
		moist, with silt  CLAYEY SAND (SC) loose, orange tan, fine, moist			-	SS-3	X	2	3 4					7
10 –		, , , , , , , , , , , , , , , , , , ,		Ā	61.0-	SS-4	X	2	1 2					3
15 –					- - - 56.0-	SS-5	X	6	3 3					6
20-	- 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	SAND (SP-SM) dense, gray tan, medium to fir graded, with silt	ne, wet, poorly		51.0—	SS-6	X	13	16 18			<b>\</b>		34
25 –		CLAY (CH) firm, gray olive, wet, fat			- - 46.0	SS-7	X	6	4 4		•			8
30 -					41.0-	SS-8	X	2	1 4		<b>/</b>			5
		SANDY CLAY (CH) soft, gray, wet, with fine sandy	y seams		-	SS-9	X	1	2 2					4

S&ME BORING LOG 1358-14-033 US 264 HDD CROSSING OF TAR RIVER.GPJ S&ME.GDT 7/24/14

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- 2. BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
- 3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJECT:	US 264 HDD Crossings Greenville, North Carolina S&ME Project No. 1358-14-033  RILLED: 7/3/14  ELEVATION: 71.0 ft							G L			B-5			
DATE DRILLE	D: <b>7/3/14</b>	ELEVATION: 71.0 ft					NO 50	OTES	S: <b>Te</b> . <b>Bo</b>	emporary PVC ring tremie gro th cement-ben	stand	oipe inst	alled to	)
DRILL RIG: C		BORING DEPTH: 50.0 f	t				si	ırfac	e wit	th cement-ben	tonite	grout.	Juna	
DRILLER: J. V	White	WATER LEVEL: 10.6 ft	@ 2	4 hrs										
HAMMER TYP	PE: Autohammer	LOGGED BY: F. Wright	t											
SAMPLING M	ETHOD: Split Spoon						N	ORTI	HING	6: <b>684340</b>	EAS <sup>-</sup>	TING: <b>2</b> 4	64484	
DRILLING ME	THOD: Wash Boring													
DEPTH (feet) GRAPHIC LOG	MATERIAL DES	SCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE		2nd 6in / REC 300	3rd 6in / RQD YAD	STANDARD PE	ENETRA (blows/f REMARI 10	t)	F DATA 	N VALUE
40-	SANDY CLAY (CH) soft, gray, wet, with fine sandy	v seams (continued)		31.0-	SS-10 SS-11		1	1	3					4
50	SILTY SAND (SM) dense, medium to fine, wet, w Boring terminated at 50 ft	vith shells		21.0-	SS-12	X	16	16	18					34

S&ME BORING LOG 1358-14-033 US 264 HDD CROSSING OF TAR RIVER.GPJ S&ME.GDT 7/24/14

- 1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
- BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
- 3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJE	CT:	Greenville, North Carolina S&ME Project No. 1358-14-033  PRILLED: 7/8/14  ELEVATION: 66.0 ft						RINC				B-6			
DATE	DRILLE	ED: <b>7/8/14</b>	ELEVATION: 66.0 ft					NC 50	OTES O ft	S: Te	emporary PV0 ring tremie gi th cement-bei	standpi	pe inst	alled to	5
		CME 550	BORING DEPTH: 50.0	ft				su	rfac	e wit	th cement-bei	ntonite g	rout.	Juna	
DRILL	ER: <b>J.</b>	White	WATER LEVEL: 9.2 ft (	@ 24	hrs			1							
		PE: Autohammer	LOGGED BY: F. Wrigh												
SAMPI	ING M	METHOD: Split Spoon						NC	DRTH	HING	6: 684371	EAST	ING: <b>24</b>	64654	
DRILL	NG ME	ETHOD: Wash Boring													
DEPTH (feet)	GRAPHIC LOG	MATERIAL DES	SCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	1st 6in / RUN # /OOPI	2nd 6in / REC 32 NOO N	3rd 6in / RQD 보건	STANDARD F	ENETRATI (blows/ft) /REMARKS		F DATA 60.80	N VALUE
-		TOPSOIL - 4 Inches  COASTAL PLAIN: CLAYEY S	AND (SC)		-	SS-1	X	4	4	4		•			- 8
5-		loose to very loose, orange ta with silt			61.0-	SS-2	X	3	4	4					8
-					-	SS-3	X	2	2	2	•				4
10 <del>-</del>		SILTY SAND (SM) very loose, gray tan, fine, moi	st to wet, with clay	Ā	56.0-	SS-4	X	2	2	1	<b>—</b>				3
- - 15 —					51.0-	SS-5	X	1	1	1					2
20 -		SILTY SAND (SM) dense, gray, medium to fine,	wet		46.0-	SS-6	X	13	15	23					38
- 25 —		SAND (SP-SM) medium dense, gray, mediun graded, with silt	n to fine, wet, poorly		41.0-	SS-7	X	8	10	16					26
30-		SANDY CLAY (CH) soft to very soft, gray olive, we	et, fat		36.0-	SS-8	X	2	1	3	•	/			4
-					-	SS-9	X	1	1	1					2

S&ME BORING LOG 1358-14-033 US 264 HDD CROSSING OF TAR RIVER.GPJ S&ME.GDT 7/24/14

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- 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJECT:	Greenville, North Carolina S&ME Project No. 1358-14-033								og		B-6			
DATE DRILLE	D: <b>7/8/14</b>	ELEVATION: 66.0 ft					NO 50	OTES 0.0 ft	S: <b>Te</b> . <b>Bo</b>	emporary PVC ring tremie gr th cement-ben	standpipe outed to t	e installe	d to	
DRILL RIG: C	ME 550	BORING DEPTH: 50.0 f	t				SI	urfac	e wit	th cement-ben	tonite gro	ut.		
DRILLER: J. V	White	WATER LEVEL: 9.2 ft @	<u>)</u> 24	hrs										
HAMMER TYP	PE: Autohammer	LOGGED BY: F. Wright	:								_			
SAMPLING M	ETHOD: Split Spoon						N	ORT	HING	6: 684371	EASTIN	IG: <b>24646</b>	54	
DRILLING ME	THOD: Wash Boring													
DEPTH (feet) GRAPHIC LOG	MATERIAL DES	CRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	1st 6in / RUN # / OC	2nd 6in / REC 30 M	3rd 6in / RQD YLA	STANDARD PI	(blows/ft) REMARKS		N VALUE	
40-	SANDY CLAY (CH) soft to very soft, gray olive, we	t, fat (continued)		- - - 26.0-	SS-10	X	1	1	1				2	
45	SILT (MH) soft, gray black, wet, elastic, w	rith sand		21.0-	SS-11	X	1	1	3				4	
50	SILTY SAND (SM) medium dense, gray black, m with clay  Boring terminated at 50 ft	edium to fine, wet,		16.0—	SS-12	X	3	3	9				12	

S&ME BORING LOG 1358-14-033 US 264 HDD CROSSING OF TAR RIVER.GPJ S&ME.GDT 7/24/14

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- BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
- 3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJE	ECT:	Greenville, North Carolina S&ME Project No. 1358-14-033  PRILLED: 7/8/14  ELEVATION: 76.0 ft							G L			3-7		
DATE	ORILLE	ED: <b>7/8/14</b>	ELEVATION: 76.0 ft					N( 40	OTES	S: Te	emporary PVC ring tremie gro th cement-bent	standpip	e installed	to
DRILL	RIG: (	CME 550	BORING DEPTH: 40.0 f	t				sı	ırfac	e wit	h cement-bent	onite gro	out.	
DRILLI	ER: <b>J.</b>	White	WATER LEVEL: 5.5 ft (	24	hrs									
		PE: Autohammer	LOGGED BY: F. Wright											
SAMPI	ING N	METHOD: Split Spoon						N	ORTI	HING	: 682282	EASTIN	IG: <b>246535</b>	3
DRILLI	NG ME	ETHOD: Wash Boring												
DEPTH (feet)	GRAPHIC LOG	MATERIAL DES	CRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE		2nd 6in / REC 30 M	3rd 6in / RQD YLV		(blows/ft) REMARKS	N TEST DAT <i>A</i>	N VALU
- - -		TOPSOIL - 3 Inches  COASTAL PLAIN: CLAYEY SA			- - -	SS-1	X	2	3	3	•	\		6
5-		loose, orange tan, fine, moist t	o wet	≖	71.0-	SS-2	X	4	4	5				9
-					-	SS-3	X	2	2	3	•			5
10 <del>-</del>					66.0—	SS-4	X	3	3	5				8
- - 15 — -		SILTY SAND (SM) loose, orange tan, fine, wet			61.0-	SS-5	X	3	4	3		<b>)</b>		7
20 —					56.0- -	SS-6	X	2	2	2				4
25 -		SILTY SAND (SM) loose, gray, fine to medium, w	et		51.0—	SS-7	X	2	2	4				6
30-					- - 46.0 -	SS-8	X	2	3	2	•			5
-					-	SS-9	X	1	2	2				4

S&ME BORING LOG 1358-14-033 US 264 HDD CROSSING OF TAR RIVER.GPJ S&ME.GDT 7/25/14

- 1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
- 2. BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
- 3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJECT:	Greenville, North Carolina S&ME Project No. 1358-14-033						NG L			B-7		
DATE DRILLE	ED: <b>7/8/14</b>	ELEVATION: 76.0 ft					NOTE 40.0 f	S: <b>T</b> 6	emporary PV	C standpi	pe installed to the ground rout.	)
DRILL RIG: (	CME 550	BORING DEPTH: 40.0 f	t				surfac	e wi	th cement-be	entonite g	rout.	
DRILLER: <b>J.</b>	White	WATER LEVEL: 5.5 ft @	24	hrs								
HAMMER TY	PE: Autohammer	LOGGED BY: F. Wright										
SAMPLING M	METHOD: Split Spoon						NORT	HING	6: 682282	EAST	ING: <b>2465353</b>	
DRILLING ME	ETHOD: Wash Boring											
DEPTH (feet) GRAPHIC LOG	MATERIAL DES	CRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE IYPE 1st 6in / RUN # // PI	2nd 6in / REC 3300	3rd 6in / RQD ALVI	STANDARD	PENETRATI (blows/ft) /REMARKS		N VALUE
40	SILTY SAND (SM) loose, gray, fine to medium, w	et (continued)		- - - - 36.0-	SS-10			2				4
	Boring terminated at 40 ft											

S&ME BORING LOG 1358-14-033 US 264 HDD CROSSING OF TAR RIVER.GPJ S&ME.GDT 7/25/14

- 1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
- BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
- 3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJE	CT:	Greenville, North Carolina S&ME Project No. 1358-14-033  PRILLED: 7/8/14  ELEVATION: 83.0 ft								og		B-8			
DATE D	RILLE	ED: <b>7/8/14</b>	ELEVATION: 83.0 ft					N(	OTE:	S: Te	emporary PVC ring tremie gro th cement-ben	standpip	e inst	alled t	:0
DRILL F	RIG: C	CME 550	BORING DEPTH: 40.0	ft				si	ırfac	e wit	th cement-ben	tonite gr	out.		
DRILLE	R: <b>J.</b>	White	WATER LEVEL: 5.7 ft (	@ 24	hrs										
HAMME	ER TYI	PE: Autohammer	LOGGED BY: F. Wrigh	t											
SAMPL	ING M	IETHOD: Split Spoon						N	ORT	HING	6: 681213	EASTI	NG: <b>24</b>	66098	
DRILLI	NG ME	THOD: Wash Boring						DI O							
DEPTH (feet)	GRAPHIC LOG	MATERIAL DES	CRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	1st 6in / RUN # / DO	2nd 6in / REC 330 M	3rd 6in / RQD YE	STANDARD PE	(blows/ft) REMARKS	ON TEST	DATA 6080	N VALUE
-		TOPSOIL - 3 Inches			-		V	3	1	1	_				
-		COASTAL PLAIN: SILTY SANI very loose, gray, fine, moist to			-	SS-1			•	'	•				2
5—				▼	78.0	SS-2	X	1	1	1	•				2
- -		CLAYEY SAND (SC) very loose, white tan, fine			-	SS-3	X	1	1	1	<b>,</b>				2
10-					73.0-	SS-4	X	VOH	WOH	WOH					WOH
15		SILTY SAND (SC-SM) very loose, gray, fine, wet, with	n clay	_	- - 68.0-	SS-5	X	VOH	WOH	1					1
20		SILTY SAND (SC-SM) loose to very loose, gray, fine,	wet, with clay		63.0-	SS-6	X	2	2	3					5
					-	SS-7	X	2	1	2					3
25 — - - -					58.0— - - -	-									
30 -					53.0-	SS-8		2	3	4		<b>&gt;</b>			7
-					-	SS-9	X	2	1	2					3

S&ME BORING LOG 1358-14-033 US 264 HDD CROSSING OF TAR RIVER.GPJ S&ME.GDT 7/25/14

1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.

- 2. BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
- 3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJECT:	US 264 HDD Cro Greenville, North S&ME Project No. 135	Carolina			В	OR	ING I			B-8		
DATE DRILLE	ED: <b>7/8/14</b>	ELEVATION: 83.0 ft					NOTE 40.0	ES: To	emporary PVO	C standprouted to	ipe installed to the ground grout.	,
DRILL RIG: (	CME 550	BORING DEPTH: 40.0 f	t				surfa	ce wi	th cement-be	ntonite	grout.	
DRILLER: J.	White	WATER LEVEL: 5.7 ft @	24	hrs								
HAMMER TY	PE: Autohammer	LOGGED BY: F. Wright										
SAMPLING M	METHOD: Split Spoon						NOR	THING	6: <b>681213</b>	EAST	ING: <b>2466098</b>	
DRILLING ME	ETHOD: Wash Boring											
(feet) GRAPHIC LOG	MATERIAL DES	CRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	2nd 6in / REC BOOT			PENETRAT (blows/ff / REMARK	,	N VALUE
40	SILTY SAND (SC-SM) loose to very loose, gray, fine, (continued)	wet, with clay		- - - 43.0—	SS-10	X -	1 1	2				3
	Boring terminated at 40 ft											

#### NOTES:

S&ME BORING LOG 1358-14-033 US 264 HDD CROSSING OF TAR RIVER.GPJ S&ME.GDT 7/25/14

- 1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
- BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
- 3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



Page 2 of 2

### **APPENDIX B**

Summary of Laboratory Test Data Laboratory Test Results (34 pages)



#### SUMMARY OF LABORATORY TEST DATA

#### US 264 HDD Crossings Greenville, North Carolina S&ME Project No. 1358-14-033

	SAMPLE I	OCATION		Sample Type	USCS Classification	Atte	rberg L	imits	Natural Moisture Content	D	iameter (1	nillimeter	s)	% Silt and Clay		% Sand		% Gravel
Boring	Sample #	Depth	Strata			LL	PL	PI	%	$\mathbf{D}_{100}$	${\bf D}_{60}$	$D_{30}$	$\mathbf{D}_{10}$		Fine	Medium	Coarse	
B-1	5	13.5' - 15'	I	SS	SP-SM				20.7	2.3	0.53	0.31	0.17	5.0	39.3	52.8	2.8	0.1
B-1	9	33.5' - 35'	I	SS	SP				22.8	1.0	0.51	0.33	0.17	3.8	38.9	56.8	0.5	0.0
	5	13.5' - 15'	I	SS	SP				21.1	10.1	1.70	0.63	0.40	2.2	9.7	54.3	18.9	14.9
B-2	9	33.5' - 35'	I	SS	ML	32	30	2	32.9	0.2				64.9	34.9	0.2	0.0	0.0
	11	43.5' - 45'	I	SS	ML	28	23	5	26.9									
	4	8.5' - 10'	I	SS	SP-SM				23.5	2.7	0.41	0.20	0.11	5.4	53.9	38.6	2.1	0.0
B-3	5	13.5' - 15'	III	SS	СН	56	25	31	35.3									
	10	38.5' - 40'	III	SS	СН	57	23	34	30.2	2.0				75.9	23.2	0.9	0.0	0.0
	2	3.5' - 5'	I	SS	SP-SM				17.4	4.8	0.68	0.32	0.14	5.2	35.8	53.1	5.7	0.2
B-4	3	6.0' - 7.5'	I	SS	MH	84	38	46	48.8									
	8	28.5' - 30'	III	SS	СН	61	22	39	29.3	4.6				71.3	26.5	1.5	0.7	0.0
	10	38.5' - 40'	III	SS	СН	55	24	31	32.0									
	4	8.5' - 10'	I	SS	SC				40.2	2.0	0.10			46.2	52.9	0.8	0.1	0.0
B-5	6	18.5' - 20'	II	SS	SP-SM				16.8	2.0	0.59	0.34	0.11	7.7	31.9	60.0	0.4	0.0
	7	23.5' - 25'	III	SS	СН	53	27	26	35.9									
	9	33.5' - 35'	III	SS	СН	55	26	29	44.3	0.4	0.08			51.4	48.2	0.4	0.0	0.0
	5	13.5' - 15'	I	SS	SM				29.3	2.0	0.53	0.27		14.1	35.3	50.1	0.5	0.0
	7	23.5' - 25'	II	SS	SP-SM				18.4	2.0	0.64	0.40	0.16	6.0	27.4	66.0	0.6	0.0
B-6	8	28.5' - 30'	III	SS	СН	79	35	44	77.1									
	10	38.5' - 40'	III	SS	СН	70	29	41	67.6	-								
	11	43.5' - 45'	I	SS	MH	64	39	25	59.5	4.8	0.09			52.0	41.1	5.5	1.4	0.0
	4	8.5' - 10'	I	SS	SC				17.9	2.0	0.13			31.1	65.6	3.3	0.0	0.0
B-7	6	18.5' - 20'	I	SS	SM				36.5	0.2	0.11	0.08		22.4	77.1	0.5	0.0	0.0
	8	28.5' - 30'	I	SS	SM				33.4	0.4	0.11	0.08		18.4	81.1	0.5	0.0	0.0
	4	8.5' - 10'	I	SS	SC				32.9	0.8	0.11			35.1	63.6	1.3	0.0	0.0
B-8	7	23.5' - 25'	I	SS	SC-SM				37.5	0.4	0.11	0.08		30.6	69.3	0.1	0.0	0.0
	9	33.5' - 35'	I	SS	SC-SM				32.1	0.4	0.12	0.09		16.1	83.7	0.2	0.0	0.0

Form No: TR-D2216-T265-2

Revision No. 0

### **Laboratory Determination of Water Content**



Revision Date:	02/22/08	A CITI A	D 2216		CHTO T 265		0 11 4	
	COME	ASTM A			SHTO T 265	Namth Canali	Quality A	ssurance
D	· ·	<u> </u>	3201 Spr	ing Forest Ro	aa, Kaleign,	North Carolin		/2014
Project #: Project Name:	1358-14		-0			Report Date:	07/17	
Client Name:	RK&K	HDD Crossing	<u>ss</u>			Test Date(s):	07/14 - 07	//13/2014
Client Addres		st Cary Street.	Suite 209	9, Richmond, \	VA 23223	<del></del>		
Sample by:	S&ME,		Built 20	, ruemiona,		ample Date(s):	Vai	ries
Sampling Met		Site Borehole	<del>,</del>			Drill Rig:	N/	
Method:	A (1%)	В	(0.1%)	✓ Bal	ance ID.	<b>1024</b> Cali	bration Date:	11/14/13
Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft. or m.		grams	grams	grams	grams	%
B-1	S-5	13.5' - 15.0'	137	111.73	389.82	342.08	47.74	20.7%
B-1	S-9	33.5' - 35.0'	121	111.62	409.24	354.04	55.20	22.8%
B-2	S-5	13.5' - 15.0'	130	109.97	442.72	384.74	57.98	21.1%
B-2	S-9	33.5' - 35.0'	116	118.07	249.68	217.13	32.55	32.9%
B-2	S-11	43.5' - 45.0'	119	116.09	200.27	182.43	17.84	26.9%
B-3	S-4	8.5' - 10.0'	135	99.68	323.00	280.50	42.50	23.5%
B-3	S-5	38.5' - 40.0'	108	91.53	200.82	172.30	28.52	35.3%
B-3	S-10	38.5' - 40.0'	139	106.89	198.43	177.19	21.24	30.2%
B-4	S-2	3.5' - 5.0'	147	115.73	406.19	363.04	43.15	17.4%
B-4	S-3	6.0' - 7.5'	102	117.27	205.74	176.71	29.03	48.8%
B-4	S-8	28.5' - 30.0'	144	133.62	208.64	191.64	17.00	29.3%
B-4	S-10	38.5' - 40.0'	106	115.69	225.58	198.95	26.63	32.0%
B-5	S-4	8.5' - 10.0'	146	93.91	262.91	214.43	48.48	40.2%
B-5	S-6	18.5' - 20.0'	107	123.04	375.35	339.09	36.26	16.8%
B-5	S-7	23.5 - 25.0'	129	113.25	203.60	179.73	23.87	35.9%
B-5	S-9	33.5' - 35.0'	105	108.77	200.33	172.22	28.11	44.3%
Notes / Deviation	ns / References							
AASHTO T 26 ASTM D 2216:						ock by Mass		
·	l Krajan, ET	_	Sign	ature	Cert	N/A ification Type / No.	_	Date
	l Krajan, ET ical Responsibility			ature		pratory Manage Position		
	Th	is report shall not b	e reproduce	d, except in full, wit	thout the written a	pproval of S&ME, I	nc.	

Form No: TR-D2216-T265-2

Revision No. 0

Revision Date: 02/22/08

# **Laboratory Determination of Water Content**



Revision Date.	02/22/08	ASTM I	D 2216	$\checkmark$ AA	SHTO T 265		Quality A	ssurance
	S&ME,	Inc. Raleigh,	3201 Spr	ring Forest Ro	ad, Raleigh,	North Carolin	na 27616	
Project #:	1358-14	4-033				Report Date:	07/17	/2014
Project Name:	US 264	HDD Crossing	S			Test Date(s):	07/14 - 07	7/15/2014
Client Name:	RK&K							
Client Address	s: 2100 Ea	st Cary Street,	Suite 209	9, Richmond, \	VA 23223			
Sample by:	S&ME,	Inc.			Sa	ample Date(s):	Vai	ries
Sampling Met	hod:	Site Borehole				Drill Rig:	N/	
Method:	A (1%)	□ B	(0.1%)	✓ Bal	ance ID.	<b>1024</b> Cali	bration Date:	11/14/13
Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft. or m.		grams	grams	grams	grams	%
B-6	S-5	13.5' - 15.0'	110	106.51	325.79	276.15	49.64	29.3%
B-6	S-7	23.5' - 25.0'	132	126.16	495.14	437.82	57.32	18.4%
B-6	S-8	28.5' - 30.0'	101	125.01	224.79	181.35	43.44	77.1%
B-6	S-10	38.5' - 40.0'	136	113.04	229.84	182.72	47.12	67.6%
B-6	S-11	43.5' - 45.0'	112	97.72	220.39	174.61	45.78	59.5%
B-7	S-4	8.5' - 10.0'	127	107.64	369.24	329.60	39.64	17.9%
B-7	S-6	18.5' - 20.0'	117	118.31	380.83	310.61	70.22	36.5%
B-7	S-8	28.5' - 30.0'	5X1	73.20	363.66	290.98	72.68	33.4%
B-8	S-4	8.5' - 10.0'	203	69.22	260.32	213.03	47.29	32.9%
B-8	S-7	23.5' - 25.0'	2X	74.19	322.63	254.88	67.75	37.5%
B-8	S-9	33.5' - 35.0'	53	120.06	453.23	372.30	80.93	32.1%
Notes / Deviation	s / References							
	<b></b>							
		Determination o				11.36		
ASTM D 2216:	Laboratory D	etermination of	water (M	oisture) Content	of Soil and Ro	ock by Mass		
Mal	Krajan, ET					N/A		
· · · · · · · · · · · · · · · · · · ·	hnician Name		Sign	ature	Cert	ification Type / No.	_	Date
						. 36		
	Krajan, ET cal Responsibility	<del>_</del>	Sion	ature	Labo	oratory Manage  Position	<u>r</u>	 Date
2001111					hout the written a	approval of S&ME, In	nc.	

Revision No. 0

Revision Date: 05/10/12



Revision Date: 05/10/12	Sieve Anary		
	ASTM I	0 6913	Quality Assurance
S&ME, Inc	c. Raleigh, 3201 Spring Fores	t Road, Raleigh, North C	arolina 27616
Project #: 1358-14-03	33	Report I	Date: 07/17/2014
Project Name: US 264 HD	D Crossings	Test Dat	e(s): 07/14 - 07/16/2014
Client Name: RK&K			
Client Address: 2100 East C	Cary Street, Suite 209, Richmo	nd, VA 23223	
Boring No.: B-1	Sample #:	S-5 Sam	ple Date: 07/08/2014
Location: Site-Borehole	Offset:	N/A D	Pepth (ft): 13.5' - 15.0'
Sample Description: Gr	ray Tan Poorly Graded SAND	with Silt (SP-SM)	
3" 1.5" 1	."3/4" 3/8" #4 #10	#20 #40 #60 #100	#200
100%	3/4 3/8 #4 #10	#20 #40 #00 #100	#200
000/	<del></del>		
90%			
80%			
70%			
Percent Passing (%) 60% 50%			
60%		<del>-                                     </del>	
50%			
er er			
40%			
30%			
20%			
10%			
00/			
100.00	10.00 Millimeters	1.00	0.10 0.01
	- Trimmeters		
	00 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
	4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
	0.00 mm and > 0.425 mm (#40) 3/8" Coa	Colloids	< 0.001 mm
Maximum Particle Size Gravel		rse Sand 2.8% um Sand 52.8%	Fine Sand 39.3%
			Silt & Clay 5.0% Plastic Index ND
Liquid Limit		tic Limit ND	
Specific Gravity  Coarse Sand	ND	Cond 52 00/	
		um Sand 52.8%	Fine Sand 39.3%
Description of Sand Hard & Durable		Rounded Weather	Angular ⊠ ered & Friable □
		<b>w</b> eathe	ered & Friable
Notes / Deviations / References:	ND=Not Determined.		
Mal Krajan, ET		Laboratory Ma	nnager
Technical Responsibility	Signature	Position	Date
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Revision Date: 05/10/12

### **Sieve Analysis of Soils**



ASTM D 6913 Quality Assurance S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616 Project #: 1358-14-033 Report Date: 07/17/2014 **US 264 HDD Crossings** Test Date(s): 07/14 - 07/16/2014 Project Name: Client Name: RK&K Client Address: 2100 East Cary Street, Suite 209, Richmond, VA 23223 S-9 07/08/2014 Boring No.: Sample #: Sample Date: N/A 33.5' - 35.0' Location: Site-Borehole Offset: Depth (ft): Sample Description: Orange Brown Poorly Graded SAND (SP) 1.5" 1"3/4" 3/8" #4 #10 #20 #40 #60 #100 #200 100% 90% 80% Percent Passing (%) 70% 60% 50% 40% 30% 20% 10% 0% 100.00 10.00 1.00 0.10 0.01 Millimeters Cobbles < 300 mm (12") and > 75 mm (3")Fine Sand < 0.425 mm and > 0.075 mm (#200)Gravel < 75 mm and > 4.75 mm (#4)Silt < 0.075 and > 0.005 mmCoarse Sand < 4.75 mm and >2.00 mm (#10) Clay < 0.005 mm < 2.00 mm and > 0.425 mm (#40)< 0.001 mm Medium Sand Colloids Maximum Particle Size #4 Coarse Sand 0.5% Fine Sand 38.9% Gravel 0.0% Medium Sand 56.8% Silt & Clay 3.8% Liquid Limit ND Plastic Limit ND Plastic Index ND Moisture Content Specific Gravity ND 22.8% Coarse Sand 0.5% Medium Sand Fine Sand 38.9% 56.8% Description of Sand & Gravel Particles: Rounded Angular X Hard & Durable |X|Soft Weathered & Friable Notes / Deviations / References: ND=Not Determined. Mal Krajan, ET Laboratory Manager Technical Responsibility Position Date Signature This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

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Revision Date: 05/10/12

# **Sieve Analysis of Soils**



Revision Date: 0.				1	ASTM D	6913					Qualit	y Assu	rance
	S&N	IE, Inc. Rale	igh, 320	1 Spring	Forest	Road, R	aleigh	, Nor	th Car	olina 2	27616		
Project #:	1358	8-14-033						Rej	ort Da	ite:	07/	17/20	14
Project Name:	US 2	264 HDD Cro	ssings					Tes	t Date(	(s):	07/14 -	07/16	5/2014
Client Name:	RK8	kΚ											
Client Address:	: 2100	East Cary S	reet, Sui	te 209, R	Richmon	d, VA 23	223						
Boring No.: B	3-2		,	Sample #	<b>‡:</b>	S-5			Sampl	le Date:	: (	)7/02/	2014
ocation: S	ite-Bore	hole		Offset	t:	N/A			Dej	pth (ft):	: 1	3.5' -	15.0'
ample Descrip	ption:	Tan Gra	y Poorly	Graded S	SAND (	SP)							
100% (	3"	1.5" 1"3/4"	3/8"	#4	#10	#20	#40	#60	#100	#200			
10070													
90%													_
80%													_
(%) <b>7</b> 00/													
) Sing 70%													
88 60%													-
Percent Passing (%) 60% 60% 60% 60% 60% 60% 60% 60% 60% 60%					,								
erc						$-\lambda$							
40%													
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0%									_	<del></del>			
100	0.00		10.00	Millim	neters	1.00			0	).10			0.01
Cobbles		< 300 mm	(12") and >	> 75 mm (3	5")	F	ine San	d		< 0.425 1	mm and >	> 0.075	mm (#20
Gravel			and $> 4.75$				Silt			< (	0.075 and		5 mm
Coarse San			n and >2.00				Clay					)5 mm	
Medium Sar		< 2.00 mm		25 mm (#4)			Colloids			,		01 mm	0.70/
Maximum F						se Sand	18.9				Fine Sa		9.7%
т		avel 14.99	0		Mediu		54.3				ilt & Cl	•	2.2%
	iquid Li ific Gra				Piasti	c Limit	NI	J	<b>1</b>		stic Ind e Conte		ND 21.1%
	Coarse S		/		Mediu	n Cond	54.3	0/.	ľ		Fine Sa		9.7%
				alagi	Mediui				X				9.1%
	ription o rd & Du	of Sand & Gra	ivei Parti X	cies: Sof	ft 🗖	Round	ieu			An ed & Fr	gular iable	$\boxtimes$	
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Mal 1	Krajan,	<u>ET</u>					Labo	orato	y Man	ager			
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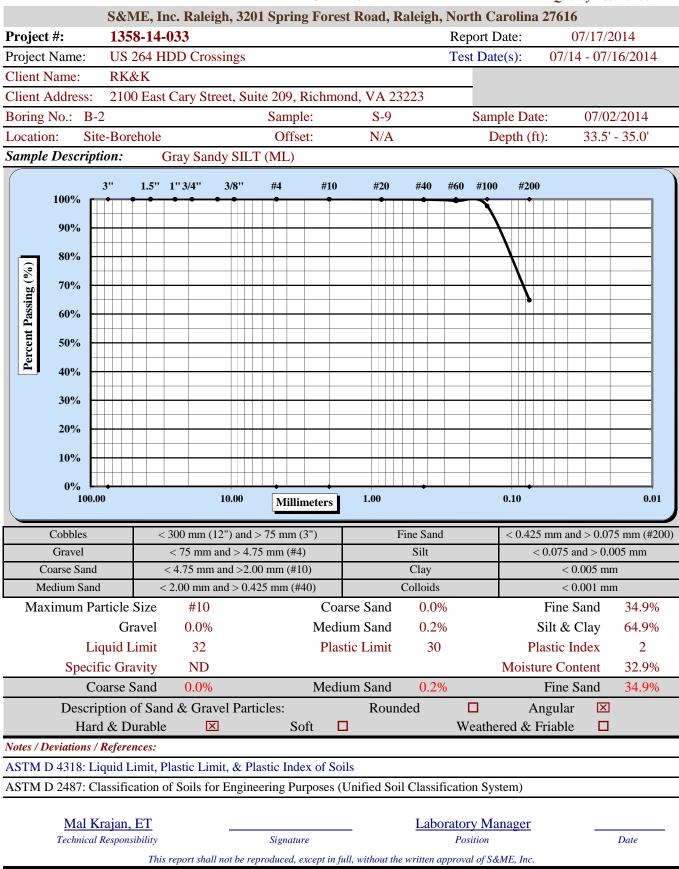
Revision Date: 05/10/12

#### Sieve Analysis of Soils



ASTM D 6913

Quality Assurance



#### Liquid Limit, Plastic Limit, and Plastic Index



Revision Date: 11/20/07 Test Methods. ASTM D 4318 X AASHTO T 89 AASHTO T 90 Quality Assurance S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616 Project #: 1358-14-033 Report Date: 07/17/2014 07/14 - 07/16/2014 Project Name: **US 264 HDD Crossings** Test Date(s) Client Name: RK&K 2100 East Cary Street, Suite 209, Richmond, VA 23223 Client Address: Boring #: B-2 Sample #: S-9 Sample Date: 07/02/2014 Offset: N/A Location: Site-Borehole Depth (ft): 33.5' - 35.0' Sample Description: Gray Sandy SILT (ML) Type and Specification S&ME ID # Cal Date: Type and Specification S&ME ID # Cal Date: Balance (0.01 g) 11/14/2013 Grooving tool 5/20/2014 1024 S-1 LL Apparatus 1084 8/17/2013 Oven 1454 10/1/2013 Liquid Limit Pan # Plastic Limit 9 Tare #: 12 1 7 12 Tare Weight 13.02 12.92 13.09 15.34 11.15 Α В Wet Soil Weight + A 26.06 25.50 25.00 26.29 24.27  $\mathbf{C}$ Dry Soil Weight + A 22.57 22.35 22.22 23.78 21.20 D Water Weight (B-C) 3.49 3.15 2.78 2.51 3.07 E Dry Soil Weight (C-A) 9.55 9.43 9.13 8.44 10.05 F % Moisture (D/E)\*100 36.5% 33.4% 30.4% 29.7% 30.5% N # OF DROPS 16 23 30 Moisture Contents determined by ASTM D 2216 LL  $LL = \mathbf{F} * FACTOR$ Ave. 30.1% Average One Point Liquid Limit 38.0 Factor Factor N 37.0 20 0.974 26 1.005 21 0.979 27 1.009 36.0 % Moisture Content 22 0.985 28 1.014 35.0 0.99 23 29 1.018 34.0 24 0.995 1.022 25 1.000 33.0 NP. Non-Plastic 32.0 Liquid Limit **32** 31.0 Plastic Limit **30** 30.0 Plastic Index 2 29.0 ML Group Symbol 100 15 20 25 30 35 40 # of Drops Multipoint Method  $\overline{\phantom{a}}$ One-point Method **Dry Preparation** Estimate the % Retained on the #40 Sieve: Wet Preparation Air Dried Notes / Deviations / References: ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System) ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Mal Krajan, ET Laboratory Manager Technical Responsibility Signature Date This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

#### Liquid Limit, Plastic Limit, and Plastic Index



Revision Date: 11/20/07 Test Methods: ASTM D 4318 X AASHTO T 89 AASHTO T 90 Quality Assurance S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616 Project #: 1358-14-033 Report Date: 7/19/14 7/14 - 7/17/14 Project Name: **US 264 HDD Crossings** Test Date(s) Client Name: RK&K 2100 East Cary Street, Suite 209, Richmond, VA 23223 Client Address: Sample Date: 07/02/2014 Boring #: B-2 Sample #: S-11 Location: Site Borehole Offset: N/A Depth (ft): 43.5 - 45 ft. Sample Description: Gray Sandy SILT (ML) Type and Specification S&ME ID # Cal Date: Type and Specification S&ME ID # Cal Date: Balance (0.01 g) 11/4/2013 Grooving tool 5/20/2014 1024 S-1 LL Apparatus 13288 8/10/2013 Oven 1454 10/1/2013 Pan # Liquid Limit Plastic Limit 158 23 Tare #: 53 812 6 Tare Weight 20.72 20.84 20.87 15.23 16.70 Α В Wet Soil Weight + A 36.05 36.30 39.80 28.19 26.20  $\mathbf{C}$ Dry Soil Weight + A 32.32 32.75 35.84 26.08 24.17 D Water Weight (B-C) 3.73 3.55 3.96 2.03 2.11 E 8.94 Dry Soil Weight (C-A) 11.91 14.97 9.38 11.60 F % Moisture (D/E)\*100 32.2% 29.8% 26.5% 22.5% 22.7% N # OF DROPS 17 21 30 Moisture Contents determined by ASTM D 2216 LL  $LL = \mathbf{F} * FACTOR$ Ave. 22.6% Average One Point Liquid Limit 34.0 Ν Factor Factor Ν 33.0 20 0.974 26 1.005 21 0.979 27 1.009 32.0 % Moisture Content 22 0.985 28 1.014 31.0 0.99 1.018 23 29 30.0 24 0.995 1.022 25 1.000 29.0 NP. Non-Plastic 28.0 Liquid Limit 28 27.0 Plastic Limit 23 26.0 Plastic Index 5 25.0 ML Group Symbol 100 15 20 25 30 35 40 # of Drops Multipoint Method  $\sqrt{\phantom{a}}$ One-point Method Estimate the % Retained on the #40 Sieve: Wet Preparation **Dry Preparation** Air Dried Notes / Deviations / References: ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Mal Krajan, ET Laboratory Manager Technical Responsibility Signature Date This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

Revision No. 0

Revision Date: 05/10/12



Kevisi	on Date. 03/	10/12	,						ASTM I	D 6913						Q	uality	Assı	ırance	
			1		Ralei	gh, 32	<b>01</b> S <sub>]</sub>	pring	g Fores	st Road,	, Ra	aleigh				a 276				
Proj€		135	58-14	-033										ort Da			07/	17/20	)14	
	ct Name:		264 I	HDD (	Cros	sings							Tes	t Date(	(s):	07	/14 -	07/1	6/2014	1
Clien	t Name:	RK	&K																	
Clien	t Address:	210	00 Eas	t Car	y Str	eet, Si				ond, VA	232	223								
	ig No.: B-							nple :		S-4	1			Sampl	le Da	ate:			/2014	
Locat			rehole					Offse		N/A				Dej	pth (	ft):	8	3.5' -	10.0'	
Samp	ole Descript	ion:		Gray	Blac	ck Poo	rly C	rade	d SAN	D with S	Silt	(SP-S	M)							
		3"	1.5"	1'' 3/4	4''	3/8''	#	4	#10	#20	)	#40	#60	#100	#2	00				
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	90%																			
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	Cobbles					2") and					Fi	ine Sano	<u>l</u>		< 0.4				5 mm (#2	200)
	Gravel Coarse Sand					and > 4 and $>2$						Silt Clay				< 0.07	$\frac{5 \text{ and}}{< 0.00}$			
	Medium Sand	1				$\frac{\text{and}}{\text{ond}} > 0.$					(	Colloids					< 0.00			
	laximum Pa				#4			(	,	rse Sand		2.19					e Sar		53.99	%
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	Specif	•			ND				1140			- 1.2		N		ture C			23.59	
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Notes /	Deviations /					Not De	termi			_										
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			Thi	s report	t shall	not be r	eprodu	iced, e.	xcept in fi	ull, without	the	written d	approv	al of S&N	1E, In	c.				



Liquid Limit, Plastic Limit, and Plastic Index Revision Date: 11/20/07 Test Methods: ASTM D 4318 X AASHTO T 89 AASHTO T 90 Quality Assurance S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616 Project #: 1358-14-033 Report Date: 7/19/14 7/14 - 7/17/14 Project Name: **US 264 HDD Crossings** Test Date(s) Client Name: RK&K 2100 East Cary Street, Suite 209, Richmond, VA 23223 Client Address: Sample Date: 07/02/2014 Boring #: B-3 Sample #: S-5 Location: Site Borehole Offset: N/A Depth (ft): 13.5 - 15 ft. Sample Description: Gray Black Sandy Fat CLAY (CH) Type and Specification S&ME ID # Cal Date: Type and Specification S&ME ID # Cal Date: Balance (0.01 g) 11/4/2013 Grooving tool 5/20/2014 1024 S-1 LL Apparatus 13288 8/10/2013 Oven 1454 10/1/2013 Pan # Liquid Limit Plastic Limit 802 803 Tare #: 55 11 8 Tare Weight 16.75 16.71 15.23 12.99 12.48 Α В Wet Soil Weight + A 30.65 29.17 29.10 23.42 21.98  $\mathbf{C}$ Dry Soil Weight + A 25.78 24.67 23.99 21.18 20.18 D Water Weight (B-C) 4.87 4.50 2.24 1.80 5.11 E 8.70 7.19 Dry Soil Weight (C-A) 9.03 7.96 8.76 F % Moisture (D/E)\*100 53.9% 56.5% 58.3% 25.7% 25.0% N # OF DROPS 34 23 18 Moisture Contents determined by ASTM D 2216 LL  $LL = \mathbf{F} * FACTOR$ Ave. 25.4% Average One Point Liquid Limit 60.0 Ν Factor Factor 59.0 20 0.974 26 1.005 21 0.979 27 1.009 58.0 % Moisture Content 22 0.985 28 1.014 57.0 0.99 1.018 23 29 56.0 24 0.995 1.022 25 1.000 55.0 NP. Non-Plastic 54.0 Liquid Limit **56** 53.0 Plastic Limit 25 52.0 Plastic Index 31 51.0 CH Group Symbol 100 15 20 25 30 35 40 # of Drops Multipoint Method **V** One-point Method Estimate the % Retained on the #40 Sieve: Wet Preparation **Dry Preparation** Air Dried Notes / Deviations / References: ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Mal Krajan, ET Laboratory Manager Technical Responsibility Signature Date This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

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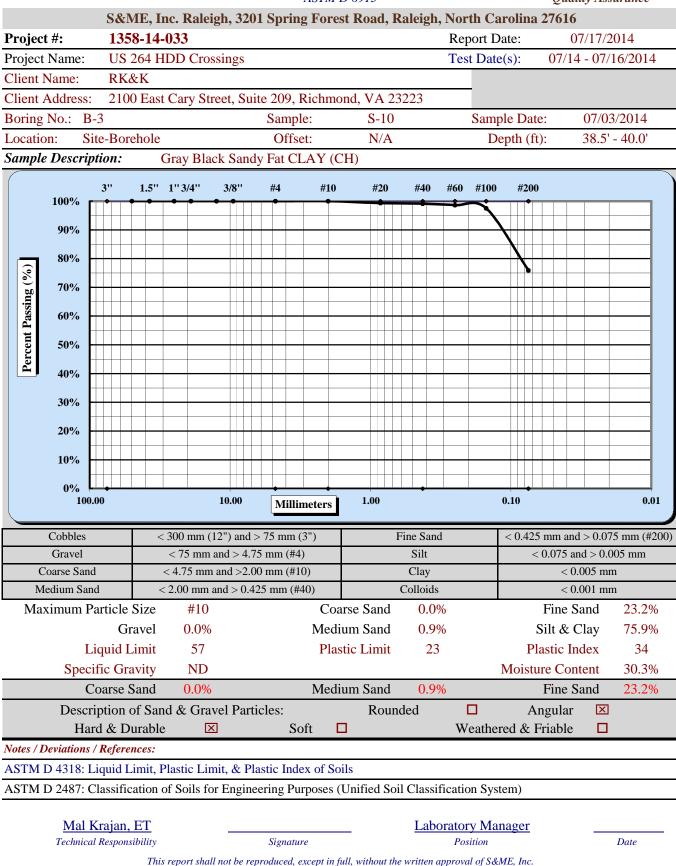
Revision Date: 05/10/12

#### Sieve Analysis of Soils



ASTM D 6913

Quality Assurance



#### Liquid Limit, Plastic Limit, and Plastic Index



Revision Date: 11/20/07 Test Methods. ASTM D 4318 X AASHTO T 89 AASHTO T 90 Quality Assurance S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616 Project #: 1358-14-033 Report Date: 07/17/2014 07/14 - 07/16/2014 Project Name: **US 264 HDD Crossings** Test Date(s) Client Name: RK&K 2100 East Cary Street, Suite 209, Richmond, VA 23223 Client Address: Boring #: B-3 Sample #: S-10 Sample Date: 07/03/2014 Location: Site-Borehole Offset: N/A Depth (ft): 38.5' - 40.0' Sample Description: Gray Black Sandy Fat CLAY (CH) Type and Specification S&ME ID # Cal Date: Type and Specification S&ME ID # Cal Date: Balance (0.01 g) 11/4/2013 Grooving tool 5/20/2014 1024 S-1 LL Apparatus 13288 8/10/2013 Oven 1454 10/1/2013 Liquid Limit Pan # Plastic Limit 9 806 10 Tare #: 809 807 Tare Weight 15.30 16.58 11.01 16.70 16.73 Α В Wet Soil Weight + A 26.94 29.32 21.42 25.17 27.25  $\mathbf{C}$ Dry Soil Weight + A 22.87 24.69 17.53 23.63 25.25 D Water Weight (B-C) 4.63 3.89 1.54 2.00 4.07 E 8.52 Dry Soil Weight (C-A) 7.57 8.11 6.52 6.93 F % Moisture (D/E)\*100 53.8% 57.1% 59.7% 22.2% 23.5% N # OF DROPS 35 25 18 Moisture Contents determined by ASTM D 2216 LL  $LL = \mathbf{F} * FACTOR$ Ave. 22.9% Average One Point Liquid Limit 61.0 Factor Factor N 20 0.974 26 1.005 60.0 21 0.979 27 1.009 59.0 **Moisture Content** 22 0.985 28 1.014 0.99 23 29 1.018 58.0 24 0.995 1.022 57.0 25 1.000 NP. Non-Plastic 56.0 Liquid Limit 57 % 55.0 Plastic Limit 23 54.0 Plastic Index 34 53.0 CH Group Symbol 100 15 20 25 30 35 40 # of Drops Multipoint Method  $\overline{}$ One-point Method **Dry Preparation** Estimate the % Retained on the #40 Sieve: Wet Preparation Air Dried Notes / Deviations / References: ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System) ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Mal Krajan, ET Laboratory Manager Technical Responsibility Signature Date This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

Revision No. 0

Revision Date: 05/10/12



Revision Date: 05/	/10/12			Sieve	Analys	15 01 50	1115			A.				
					ASTM D	6913					Quali	ty Assi	ırance	
	S&ME	, Inc. Rale	eigh, 320	1 Sprin	ng Forest	Road, R	aleigh	, Nor	th Ca	rolina 2	27616			
Project #:	1358-1	4-033						Rep	ort Da	ate:	07	/17/20	014	
Project Name:	US 264	· HDD Cro	ssings					Tes	t Date	(s):	07/14	- 07/1	6/2014	-
Client Name:	RK&K													
Client Address:	2100 E	ast Cary S	treet, Sui	te 209,	Richmon	d, VA 23	3223							
Boring No.: B-4	4			Sample	#:	S-2			Samp	le Date	:	07/03	/2014	
Location: Site	e-Boreho	le		Offs	et:	N/A			De	pth (ft)	:	3.5' -	5.0'	
Sample Descript	ion:	Gray Ta	n Poorly	Graded	l SAND v	vith Silt (	SP-SM	<b>(</b> )						
	3" 1.5	5" 1"3/4"	3/8''	#4	#10	#20	#40	#60	#100	#200				
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Cobbles		< 300 mm				I	Fine Sand	d			mm and		`	200)
Gravel Coarse Sand			$\frac{1}{1} \text{ and } > 4.7$ $\frac{1}{1} \text{ and } > 2.0$				Silt			< !	0.075 and	0.00 mm $0.00$		
Medium Sand			$\frac{11 \text{ and } > 2.0}{1 \text{ and } > 0.42}$				Clay Colloids					003 mm		
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Notes / Deviations /			=Not Dete											
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Mal K	<u>rajan, ET</u>	-					Labo	orator	y Man	<u>ager</u>				
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#### Liquid Limit, Plastic Limit, and Plastic Index



Revision Date: 11/20/07 Test Methods: ASTM D 4318 X AASHTO T 89 AASHTO T 90 Quality Assurance S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616 Project #: 1358-14-033 Report Date: 7/19/14 7/14 - 7/17/14 Project Name: **US 264 HDD Crossings** Test Date(s) Client Name: RK&K 2100 East Cary Street, Suite 209, Richmond, VA 23223 Client Address: Boring #: B-4 Sample #: S-3 Sample Date: 07/03/2014 Location: Site Borehole Offset: N/A Depth (ft): 6 - 7.5 ft. Sample Description: Gray Black Elastic SILT (MH) Type and Specification S&ME ID # Cal Date: Type and Specification S&ME ID # Cal Date: Balance (0.01 g) 11/4/2013 Grooving tool 5/20/2014 1024 S-1 LL Apparatus 13288 8/10/2013 Oven 1454 10/1/2013 Pan # Liquid Limit Plastic Limit 98 Tare #: 13 12 51 Tare Weight 20.91 21.00 20.88 20.86 20.86 Α В Wet Soil Weight + A 32.43 32.90 33.09 28.63 29.82  $\mathbf{C}$ Dry Soil Weight + A 27.06 27.25 27.67 26.46 27.40 D Water Weight (B-C) 5.37 5.65 5.42 2.42 2.17 E Dry Soil Weight (C-A) 6.15 6.39 6.67 5.60 6.52 F % Moisture (D/E)\*100 87.3% 88.4% 37.1% 81.3% 38.8% N # OF DROPS 20 17 30 Moisture Contents determined by ASTM D 2216 LL  $LL = \mathbf{F} * FACTOR$ Ave. 38.0% Average One Point Liquid Limit 90.0 Factor Factor N N 89.0 20 0.974 26 1.005 88.0 21 0.979 27 1.009 % Moisture Content 22 0.985 28 1.014 87.0 0.99 1.018 23 29 86.0 24 0.995 1.022 85.0 25 1.000 84.0 NP. Non-Plastic 83.0 Liquid Limit 84 82.0 Plastic Limit 38 81.0 Plastic Index 46 80.0 **MH** Group Symbol 100 15 20 25 30 35 40 # of Drops Multipoint Method  $\overline{}$ One-point Method Estimate the % Retained on the #40 Sieve: Wet Preparation **Dry Preparation** Air Dried Notes / Deviations / References: ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Mal Krajan, ET Laboratory Manager Technical Responsibility Signature Date This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

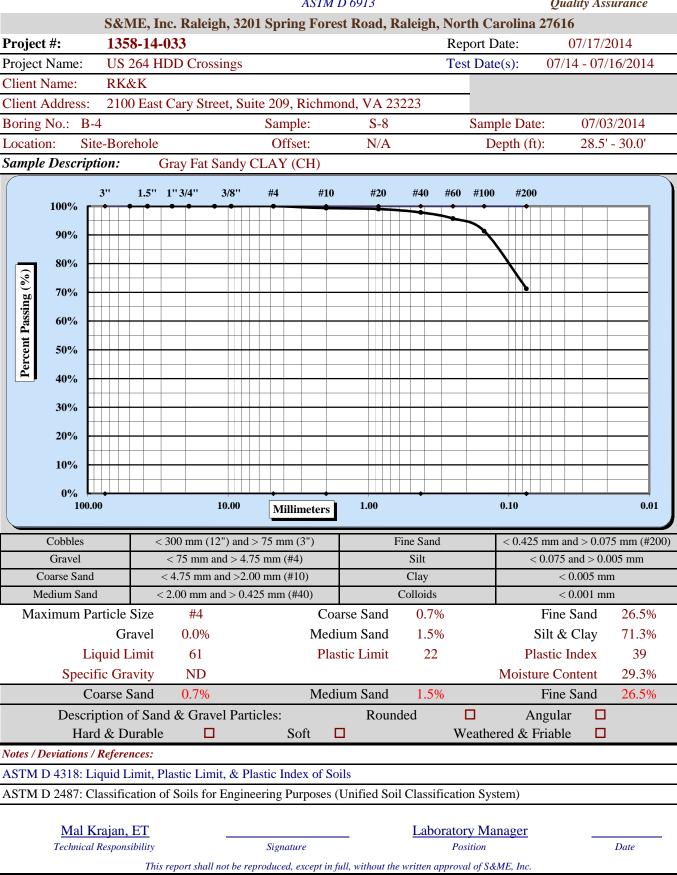
Revision No. 0

Revision Date: 05/10/12

#### Sieve Analysis of Soils



ASTM D 6913 Quality Assurance



#### Liquid Limit, Plastic Limit, and Plastic Index



Revision Date: 11/20/07 Test Methods. ASTM D 4318 X AASHTO T 89 AASHTO T 90 Quality Assurance S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616 Project #: 1358-14-033 Report Date: 07/17/2014 07/14 - 07/16/2014 Project Name: **US 264 HDD Crossings** Test Date(s) Client Name: RK&K 2100 East Cary Street, Suite 209, Richmond, VA 23223 Client Address: Boring #: B-4 Sample #: S-8 Sample Date: 07/03/2014 Location: Site-Borehole Offset: N/A Depth (ft): 28.5' - 30.0' Sample Description: Gray Fat Sandy CLAY (CH) Type and Specification S&ME ID # Cal Date: Type and Specification S&ME ID # Cal Date: Balance (0.01 g) 11/4/2013 Grooving tool 5/20/2014 1024 S-1 LL Apparatus 13288 8/10/2013 Oven 1454 10/1/2013 Pan # Liquid Limit Plastic Limit 19 Tare #: 10 3 22 14 Tare Weight 13.00 13.06 13.04 12.96 13.06 Α В Wet Soil Weight + A 25.41 26.60 24.81 22.25 20.94  $\mathbf{C}$ Dry Soil Weight + A 20.86 21.56 20.24 20.54 19.52 D Water Weight (B-C) 4.55 5.04 4.57 1.71 1.42 7.20 E Dry Soil Weight (C-A) 7.86 8.50 7.48 6.56 F % Moisture (D/E)\*100 57.9% 59.3% 63.5% 22.9% 21.6% N # OF DROPS 35 27 20 Moisture Contents determined by ASTM D 2216 LL  $LL = \mathbf{F} * FACTOR$ Ave. 22.3% Average One Point Liquid Limit 65.0 Factor Factor N 64.0 20 0.974 26 1.005 21 0.979 27 1.009 63.0 % Moisture Content 22 0.985 28 1.014 62.0 0.99 23 29 1.018 61.0 24 0.995 1.022 25 1.000 60.0 NP. Non-Plastic 59.0 Liquid Limit 61 58.0 Plastic Limit 22 57.0 Plastic Index 39 56.0 CH Group Symbol 100 15 20 25 30 35 40 # of Drops Multipoint Method  $\overline{}$ One-point Method **Dry Preparation** Estimate the % Retained on the #40 Sieve: Wet Preparation Air Dried Notes / Deviations / References: ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System) ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Mal Krajan, ET Laboratory Manager Technical Responsibility Signature Position Date This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

#### Liquid Limit, Plastic Limit, and Plastic Index



Revision Date: 11/20/07 Test Methods: ASTM D 4318 X AASHTO T 89 AASHTO T 90 Quality Assurance S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616 Project #: 1358-14-033 Report Date: 7/19/14 7/14 - 7/17/14 Project Name: **US 264 HDD Crossings** Test Date(s) Client Name: RK&K 2100 East Cary Street, Suite 209, Richmond, VA 23223 Client Address: Sample Date: 07/03/2014 Sample #: S-10 Boring #: B-4 Location: Site Borehole Offset: N/A Depth (ft): 38.5 - 40 ft. Sample Description: Gray Black Fat Sandy CLAY (CH) Type and Specification S&ME ID # Cal Date: Type and Specification S&ME ID # Cal Date: Balance (0.01 g) 11/4/2013 Grooving tool 5/20/2014 1024 S-1 LL Apparatus 13288 8/10/2013 Oven 1454 10/1/2013 Pan # Liquid Limit Plastic Limit 2 107 Tare #: 15 16 58 Tare Weight 21.04 20.71 21.01 20.58 21.02 Α В Wet Soil Weight + A 35.03 34.81 34.94 32.58 31.97  $\mathbf{C}$ Dry Soil Weight + A 30.18 29.82 29.88 30.31 29.77 D Water Weight (B-C) 4.85 4.99 2.27 2.20 5.06 E 8.87 Dry Soil Weight (C-A) 9.14 9.11 9.29 9.19 F % Moisture (D/E)\*100 53.1% 54.8% 24.4% 23.9% 57.0% N # OF DROPS 33 24 18 Moisture Contents determined by ASTM D 2216 LL  $LL = \mathbf{F} * FACTOR$ Ave. 24.2% Average One Point Liquid Limit 59.0 Factor Factor N 20 0.974 26 1.005 58.0 21 0.979 27 1.009 % Moisture Content 57.0 22 0.985 28 1.014 0.99 1.018 23 29 56.0 24 0.995 1.022 25 1.000 55.0 NP. Non-Plastic 54.0 Liquid Limit **55** Plastic Limit 24 53.0 Plastic Index 31 52.0 CH Group Symbol 100 15 20 25 30 35 40 # of Drops Multipoint Method **V** One-point Method Estimate the % Retained on the #40 Sieve: Wet Preparation **Dry Preparation** Air Dried Notes / Deviations / References: ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Mal Krajan, ET Laboratory Manager Technical Responsibility Signature Date This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

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Revision Date: 05/10/12

#### **Sieve Analysis of Soils**



ASTM D 6913 Quality Assurance S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616 Project #: 1358-14-033 Report Date: 07/17/2014 US 264 HDD Crossingd Test Date(s): 07/14 - 07/16/2014 Project Name: Client Name: RK&K Client Address: 2100 East Cary Street, Suite 209, Richmond, VA 23223 S-4 07/03/2014 Boring No.: Sample #: Sample Date: N/A Location: Site-Borehole Offset: Depth (ft): 8.5' - 10.0' Sample Description: Orange Tan Clayey SAND (SC) 1.5" 1"3/4" 3/8'' #4 #10 #20 #40 #60 #100 #200 100% 90% 80% Percent Passing (%) 70% 60% 50% 40% 30% 20% 10% 0% 100.00 10.00 1.00 0.10 0.01 Millimeters Cobbles < 300 mm (12") and > 75 mm (3")Fine Sand < 0.425 mm and > 0.075 mm (#200)Gravel < 75 mm and > 4.75 mm (#4)Silt < 0.075 and > 0.005 mmCoarse Sand < 4.75 mm and >2.00 mm (#10) Clay < 0.005 mm < 2.00 mm and > 0.425 mm (#40)< 0.001 mm Medium Sand Colloids Maximum Particle Size #4 Coarse Sand 0.1% Fine Sand 52.9% Gravel 0.0% Medium Sand 0.8% Silt & Clay 46.2% Liquid Limit ND Plastic Limit ND Plastic Index ND Specific Gravity Moisture Content ND 40.2% Coarse Sand Medium Sand Fine Sand 52.9% 0.1% 0.8% Description of Sand & Gravel Particles: Rounded Angular X Hard & Durable |X|Soft Weathered & Friable Notes / Deviations / References: ND=Not Determined. Mal Krajan, ET Laboratory Manager Technical Responsibility Position Date Signature This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

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Revision Date: 05/10/12

### **Sieve Analysis of Soils**



ASTM D 6913 Quality Assurance S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616 Project #: 1358-14-033 Report Date: 07/17/2014 **US 264 HDD Crossings** Test Date(s): 07/14 - 07/16/2014 Project Name: Client Name: RK&K Client Address: 2100 East Cary Street, Suite 209, Richmond, VA 23223 S-6 07/03/2014 Boring No.: Sample #: Sample Date: N/A 18.5' - 20.0' Location: Site-Borehole Offset: Depth (ft): Sample Description: Gray Tan Poorly Graded SAND with Silt (SP-SM) 1.5" 1"3/4" 3/8'' #4 #10 #20 #40 #60 #100 #200 100% 90% 80% Percent Passing (%) 70% 60% 50% 40% 30% 20% 10% 0% 100.00 10.00 1.00 0.10 0.01 Millimeters Cobbles < 300 mm (12") and > 75 mm (3")Fine Sand < 0.425 mm and > 0.075 mm (#200)Gravel < 75 mm and > 4.75 mm (#4)Silt < 0.075 and > 0.005 mmCoarse Sand < 4.75 mm and >2.00 mm (#10) Clay < 0.005 mm < 2.00 mm and > 0.425 mm (#40)< 0.001 mm Medium Sand Colloids Maximum Particle Size #4 Coarse Sand 0.4% Fine Sand 31.9% Gravel 0.0% Medium Sand 60.0% Silt & Clay 7.7% Liquid Limit ND Plastic Limit ND Plastic Index ND Specific Gravity Moisture Content ND 16.8% Coarse Sand 0.4% Medium Sand 60.0% Fine Sand 31.9% Description of Sand & Gravel Particles: Rounded Angular X Hard & Durable |X|Soft Weathered & Friable Notes / Deviations / References: ND=Not Determined. Mal Krajan, ET Laboratory Manager Technical Responsibility Position Date Signature This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

#### Liquid Limit, Plastic Limit, and Plastic Index



Revision Date: 11/20/07 Test Methods: ASTM D 4318 X AASHTO T 89 AASHTO T 90 Quality Assurance S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616 Project #: 1358-14-033 Report Date: 7/19/14 7/14 - 7/17/14 Project Name: **US 264 HDD Crossings** Test Date(s) Client Name: RK&K 2100 East Cary Street, Suite 209, Richmond, VA 23223 Client Address: Boring #: B-5 Sample #: S-7 Sample Date: 07/03/2014 Location: Site Borehole Offset: N/A Depth (ft): 23.5 - 25 ft. Sample Description: Gray Olive Fat CLAY (CH) Cal Date: Type and Specification S&ME ID # Type and Specification S&ME ID # Cal Date: Balance (0.01 g) 11/4/2013 Grooving tool 5/20/2014 1024 S-1 LL Apparatus 13288 8/10/2013 Oven 1454 10/1/2013 Pan # Liquid Limit Plastic Limit Tare #: 13 21 25 5 Tare Weight 13.09 12.94 12.94 12.50 11.10 Α В Wet Soil Weight + A 27.94 26.82 24.54 20.77 20.36  $\mathbf{C}$ Dry Soil Weight + A 22.49 21.97 20.65 18.99 18.41 D Water Weight (B-C) 5.45 4.85 3.89 1.78 1.95 7.71 E 7.31 Dry Soil Weight (C-A) 9.40 9.03 6.49 F % Moisture (D/E)\*100 58.0% 53.7% 50.5% 27.4% 26.7% N # OF DROPS 15 23 30 Moisture Contents determined by ASTM D 2216 LL  $LL = \mathbf{F} * FACTOR$ Ave. 27.1% Average One Point Liquid Limit 59.0 Ν Factor Factor 58.0 20 0.974 26 1.005 21 0.979 27 1.009 57.0 % Moisture Content 22 0.985 28 1.014 56.0 0.99 1.018 23 29 55.0 24 0.995 1.022 30 25 1.000 54.0 NP. Non-Plastic 53.0 Liquid Limit **53** 52.0 Plastic Limit 27 51.0 Plastic Index **26** 50.0 CH Group Symbol 100 15 20 25 30 35 40 # of Drops Multipoint Method **V** One-point Method **Dry Preparation** Estimate the % Retained on the #40 Sieve: Wet Preparation Air Dried Notes / Deviations / References: ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Mal Krajan, ET Laboratory Manager Technical Responsibility Signature Date This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

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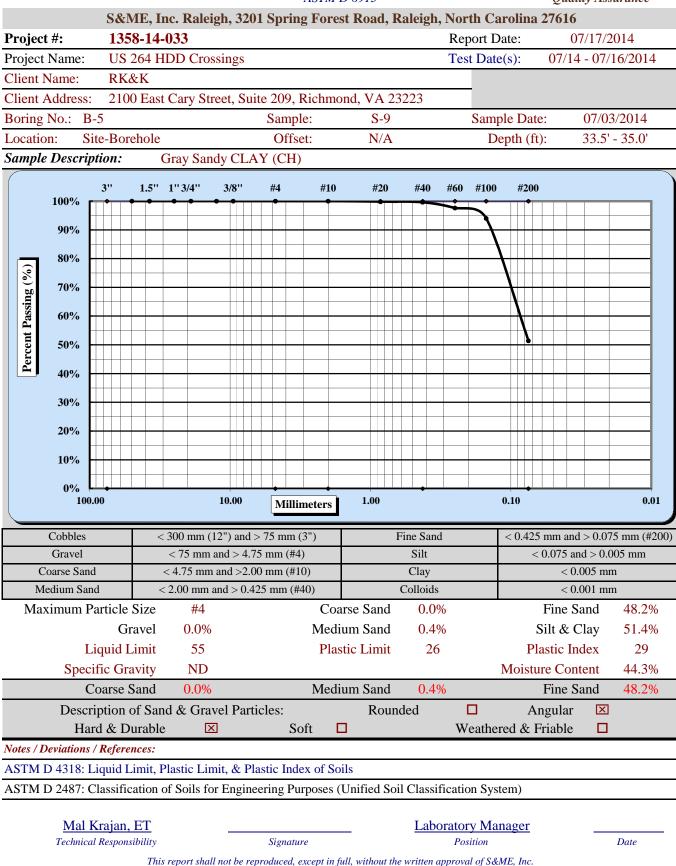
Revision Date: 05/10/12

#### Sieve Analysis of Soils



ASTM D 6913

Quality Assurance



### Liquid Limit, Plastic Limit, and Plastic Index



Revision Date: 11/20/07 Test Methods. ASTM D 4318 X AASHTO T 89 AASHTO T 90 Quality Assurance S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616 Project #: 1358-14-033 Report Date: 07/17/2014 07/14 - 07/16/2014 Project Name: **US 264 HDD Crossings** Test Date(s) Client Name: RK&K 2100 East Cary Street, Suite 209, Richmond, VA 23223 Client Address: Boring #: B-5 Sample #: S-9 Sample Date: 07/03/2014 Location: Site-Borehole Offset: N/A Depth (ft): 33.5' - 35.0' Sample Description: Gray Sandy CLAY (CH) Type and Specification S&ME ID # Cal Date: Type and Specification S&ME ID # Cal Date: Balance (0.01 g) 11/4/2013 Grooving tool 5/20/2014 1024 S-1 LL Apparatus 13288 8/10/2013 Oven 1454 10/1/2013 Liquid Limit Pan # Plastic Limit 4 Tare #: 2 26 6 15 Tare Weight 10.97 12.97 12.90 12.41 12.97 Α В Wet Soil Weight + A 23.49 25.82 24.74 20.87 23.95  $\mathbf{C}$ Dry Soil Weight + A 18.74 21.18 20.60 19.24 21.58 D Water Weight (B-C) 4.75 4.64 4.14 2.37 1.63 7.70 E Dry Soil Weight (C-A) 7.77 8.21 6.27 9.17 F % Moisture (D/E)\*100 56.5% 53.8% 25.8% 61.1% 26.0% N # OF DROPS 15 22 28 Moisture Contents determined by ASTM D 2216 LL LL = F \* FACTORAve. 25.9% Average One Point Liquid Limit 63.0 Factor Factor N 62.0 20 0.974 26 1.005 61.0 21 0.979 27 1.009 % Moisture Content 22 0.985 28 1.014 60.0 0.99 23 29 1.018 59.0 24 0.995 1.022 58.0 25 1.000 57.0 NP. Non-Plastic 56.0 Liquid Limit **55** 55.0 Plastic Limit 26 54.0 Plastic Index 29 53.0 CH Group Symbol 100 15 20 25 30 35 40 # of Drops Multipoint Method  $\overline{}$ One-point Method **Dry Preparation** Estimate the % Retained on the #40 Sieve: Wet Preparation Air Dried Notes / Deviations / References: ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System) ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Mal Krajan, ET Laboratory Manager Technical Responsibility Signature Date This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

Revision No. 0

Revision Date: 05/10/12



						ASTM I	D 6913					Quality	y Assi	ırance	
		-		eigh, 32	01 Sprin	ng Fores	st Road,	Raleigh,							
Project #:	1358									port Da			17/20		
Project Name:			DD Cro	ossings					Tes	t Date(	(s):	07/14 -	07/1	6/2014	4
Client Name:	RK&														
Client Address:		East	Cary S	treet, Su			ond, VA 2	3223							
Boring No.: B-6					Sample		S-5				e Date:			/2014	
	e-Boreh				Offs	et:	N/A			Dep	oth (ft):	1	3.5' -	15.0'	
Sample Descript	ion:	(	Gray Sil	lty SAN	D (SM)										
	3''	1.5''	1" 3/4"	3/8''	#4	#10	#20	#40	#60	#100	#200				
100%		T	•					$\top$	1	•					
90%															
-							$\overline{}$								
80%															
70%							<del></del>						-		
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leg   50%  -								+							
40%															
-								<b>    '</b>	ackslash						
30%									1						
20%									_						
100/											<b>—</b>				
10%															
0%				10.00			1.00				10			0	
100.00	U			10.00	Milli	imeters	1.00				.10			0.0	
Cobbles		<			> 75 mm			Fine Sand	l		< 0.425 m			`	200)
Gravel					75 mm (#4	•		Silt			< 0.	075 and			
Coarse Sand Medium Sand					00 mm (#1 425 mm (#			Clay Colloids					)5 mm )1 mm		
Maximum Par	rticle Si		#4		+23 mm (π	,	rse Sand	0.59	6		F	ine Sa		35.39	<u>/</u> /
WidAinidin 1 di	Grav		0.09				um Sand	50.1				t & Cla		14.19	
Lic	uid Lir		ND				tic Limit	NE				tic Inde	•	ND	
•	ic Grav		ND			1 143	tie Ziiiit	112		N	Aoisture			29.39	
	arse Sa		0.59			Medi	um Sand	50.1	%	-		ine Sai		35.39	
				avel Par	ticles:		Roui	nded			Ang		X		
_	l & Dur			X		oft [	3		W	eathere	ed & Fri				
Notes / Deviations / I	Referenc	es:	ND	=Not Det	termined.										
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<u>Mal Kı</u> Technical I	-				Signatu	ıre	_	Labo		ry Man sition	<u>ager</u>			Date	_
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Revision No. 0

Revision Date: 05/10/12

### Sieve Analysis of Soils



ASTM D 6913 Quality Assurance S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616 Project #: 1358-14-033 Report Date: 07/17/2014 **US 264 HDD Crossings** Test Date(s): 07/14 - 07/16/2014 Project Name: Client Name: RK&K Client Address: 2100 East Cary Street, Suite 209, Richmond, VA 23223 S-7 07/08/2014 Boring No.: B-6 Sample #: Sample Date: N/A 23.5' - 25.0' Location: Site-Borehole Offset: Depth (ft): Sample Description: Gray Poorly Graded SAND with Silt (SP-SM) 1.5" 1"3/4" 3/8'' #4 #10 #20 #40 #60 #100 #200 100% 90% 80% Percent Passing (%) 70% 60% 50% 40% 30% 20% 10% 0% 100.00 10.00 1.00 0.10 0.01 Millimeters Cobbles < 300 mm (12") and > 75 mm (3")Fine Sand < 0.425 mm and > 0.075 mm (#200)Gravel < 75 mm and > 4.75 mm (#4)Silt < 0.075 and > 0.005 mmCoarse Sand < 4.75 mm and >2.00 mm (#10) Clay < 0.005 mm < 2.00 mm and > 0.425 mm (#40)< 0.001 mm Medium Sand Colloids Maximum Particle Size #4 Coarse Sand Fine Sand 27.4% 0.6% Gravel 0.0% Medium Sand 66.0% Silt & Clay 6.0% Liquid Limit ND Plastic Limit ND Plastic Index ND Specific Gravity Moisture Content ND 18.4% Coarse Sand Medium Sand Fine Sand 27.4% 0.6% 66.0% Description of Sand & Gravel Particles: Rounded Angular X Hard & Durable |X|Soft Weathered & Friable Notes / Deviations / References: ND=Not Determined. Mal Krajan, ET Laboratory Manager Technical Responsibility Position Date Signature This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

#### Liquid Limit, Plastic Limit, and Plastic Index



Revision Date: 11/20/07 Test Methods: ASTM D 4318 X AASHTO T 89 AASHTO T 90 Quality Assurance S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616 Project #: 1358-14-033 Report Date: 7/19/14 7/14 - 7/17/14 Project Name: **US 264 HDD Crossings** Test Date(s) Client Name: RK&K 2100 East Cary Street, Suite 209, Richmond, VA 23223 Client Address: Sample Date: 07/08/2014 Boring #: B-6 Sample #: S-8 Location: Site Borehole Offset: N/A Depth (ft): 18.5 - 20 ft. Sample Description: Gray Olive Sandy Fat CLAY (CH) Type and Specification S&ME ID # Cal Date: Type and Specification S&ME ID # Cal Date: Balance (0.01 g) 11/4/2013 Grooving tool 5/20/2014 1024 S-1 LL Apparatus 13288 8/10/2013 Oven 1454 10/1/2013 Pan # Liquid Limit Plastic Limit 23 Tare #: 17 7 29 27 Tare Weight 12.88 13.06 12.92 13.01 13.07 Α В Wet Soil Weight + A 23.41 25.76 22.90 20.32 22.88  $\mathbf{C}$ Dry Soil Weight + A 18.65 20.10 18.56 18,44 20.32 D Water Weight (B-C) 4.76 5.66 4.34 1.88 2.56 E 7.04 7.31 Dry Soil Weight (C-A) 5.77 5.64 5.37 F % Moisture (D/E)\*100 82.5% 80.4% 77.0% 35.0% 35.0% N # OF DROPS 15 22 30 Moisture Contents determined by ASTM D 2216 LL  $LL = \mathbf{F} * FACTOR$ Ave. 35.0% Average One Point Liquid Limit 85.0 Factor Factor N 84.0 20 0.974 26 1.005 83.0 21 0.979 27 1.009 % Moisture Content 22 0.985 28 1.014 82.0 0.99 1.018 23 29 81.0 24 0.995 1.022 30 80.0 25 1.000 79.0 NP. Non-Plastic 78.0 Liquid Limit **79** 77.0 Plastic Limit 35 76.0 Plastic Index 44 75.0 CH Group Symbol 100 15 20 25 30 35 40 # of Drops Multipoint Method  $\overline{}$ One-point Method Estimate the % Retained on the #40 Sieve: Wet Preparation **Dry Preparation** Air Dried Notes / Deviations / References: ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Mal Krajan, ET Laboratory Manager Technical Responsibility Signature Date This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

#### Liquid Limit, Plastic Limit, and Plastic Index



Revision Date: 11/20/07 Test Methods: ASTM D 4318 X AASHTO T 89 AASHTO T 90 Quality Assurance S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616 Project #: 1358-14-033 Report Date: 7/19/14 7/14 - 7/17/14 Project Name: **US 264 HDD Crossings** Test Date(s) Client Name: RK&K 2100 East Cary Street, Suite 209, Richmond, VA 23223 Client Address: Sample Date: 07/08/2014 Sample #: S-10 Boring #: B-6 Location: Site Borehole Offset: N/A Depth (ft): 38.5 - 40 ft. Sample Description: Gray Olive Sandy Fat CLAY (CH) Cal Date: Type and Specification S&ME ID # Type and Specification S&ME ID # Cal Date: Balance (0.01 g) 11/4/2013 Grooving tool 5/20/2014 1024 S-1 LL Apparatus 13288 8/10/2013 Oven 1454 10/1/2013 Pan # Liquid Limit Plastic Limit 810 Tare #: 3 5 24 4 Tare Weight 15.30 10.99 13.04 16.63 13.06 Α В Wet Soil Weight + A 31.01 27.83 23.50 21.84 21.66  $\mathbf{C}$ Dry Soil Weight + A 24.97 22.66 18.44 19.87 19.73 D Water Weight (B-C) 5.17 5.06 1.97 1.93 6.04 E 7.45 Dry Soil Weight (C-A) 8.34 7.36 6.81 6.69 F % Moisture (D/E)\*100 72.4% 70.2% 67.9% 28.9% 28.8% N # OF DROPS 17 25 35 Moisture Contents determined by ASTM D 2216 LL  $LL = \mathbf{F} * FACTOR$ Ave. 28.9% Average One Point Liquid Limit 74.0 Factor Factor N 20 0.974 26 73.0 1.005 21 0.979 27 1.009 72.0 % Moisture Content 22 0.985 28 1.014 0.99 1.018 71.0 23 29 24 0.995 30 1.022 70.0 25 1.000 NP. Non-Plastic 69.0 Liquid Limit **70** 68.0 Plastic Limit 29 67.0 Plastic Index 41 66.0 CH Group Symbol 100 15 20 25 30 35 40 # of Drops Multipoint Method  $\overline{}$ One-point Method Estimate the % Retained on the #40 Sieve: Wet Preparation **Dry Preparation** Air Dried Notes / Deviations / References: ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Mal Krajan, ET **Laboratory Manager** Technical Responsibility Signature Date This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

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Revision Date: 05/10/12



								ASI	MD0	913							Quali	ty Assi	urance	
	S&N	ME, I	nc. Ra	aleigh,	, 32	01	Spri	ing F	orest l	Road,	Ral	leigh	, Nor	th Car	olin	a 27	7616			
Project #:	135	8-14-	-033											ort Da				7/19/20		
Project Name:	US 2	264 H	IDD (	Crossin	ıgs								Tes	t Date(	(s):	(	07/14	- 07/1	6/2014	1
Client Name:	RK													_						
Client Address:		0 East	t Cary	Street	, S	uite			nmond	, VA 2		23								
Boring No.: B-6							Sam	•		S-11				Sampl				07/08		
	-Bore							fset:		N/A				Dej	pth (	ft):		43.5' -	45.0'	
Sample Descripti	on:	(	Gray l	Black 1	Ela	stic	SIL	T wit	h Sand	l (MH)	)									
	3''	1.5"	1" 3/4	" 3/	/8''		#4	ŧ	<b>#10</b>	#20		#40	#60	#100	#20	00				
100%				_					•	<b>—</b>										
90%													•							
80%														1						
<u>80</u> 70%																				
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951 30%																				
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100.00				10	.00		Mil	limete	rs	1.00				0	0.10				0.0	01
Cobbles		<		m (12")								e Sano	d						5 mm (#/	200)
Gravel Coarse Sand				mm and				•				Silt Clay				< 0.0		d > 0.00		
Medium Sand				nm and								olloids						001 mm		
Maximum Pai	ticle			‡4					Coarse	Sand		1.49				F	ine S		41.19	<u>~</u>
		avel		0%						Sand		5.59					t & C		52.0%	
Lig	uid L			54						Limit		39			F		tic In	•	25	
Specifi			N	ND										N	Mois	ture	Cont	ent	59.5%	%
	arse S		1.	4%				M	ledium	Sand		5.59	%			F	ine Sa	and	41.19	%
Descrip	tion o	of Sar	nd & 0	Gravel	Pa	rtic	les:			Rou	nde	d			I	Ang	ular			
Hard	& D	urable	e				,	Soft					W	eathere	ed &	Fri	able			
Notes / Deviations / I	Refere	nces:																		
ASTM D 4318: Lic	quid L	imit, I	Plastic	Limit,	& I	Plas	tic In	dex of	f Soils											
ASTM D 2487: Cla	assific	ation	of Soil	s for E	ngi	nee	ring I	urpos	es (Un	ified So	oil (	Classi	ficatio	on Syste	em)					
			_	_					_					_				_		
Mal Kı	-			-			C;	tune				Labo		y Man	<u>ager</u>				Data.	_
Technical I	xespons	-	s report	shall no	t ha	ronr	Signa oducec		t in full	without t	he w	ritten e		sition al of S&M	IF Inc				Date	
		11113	, report	simil not	Je	cpre	uncth	., смер	juu,	out t	W	cn t	PPION	of DOM	ب، بالل	•				

#### Liquid Limit, Plastic Limit, and Plastic Index



Revision Date: 11/20/07 Test Methods. ASTM D 4318 X AASHTO T 89 AASHTO T 90 Quality Assurance S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616 Project #: 1358-14-033 Report Date: 07/19/2014 07/14 - 07/16/2014 Project Name: **US 264 HDD Crossings** Test Date(s) Client Name: RK&K 2100 East Cary Street, Suite 209, Richmond, VA 23223 Client Address: Boring #: B-6 Sample #: S-11 Sample Date: 07/08/2014 Location: Site-Borehole Offset: N/A Depth (ft): 43.5' - 45.0' Sample Description: Gray Black Elastic SILT with Sand (MH) Type and Specification S&ME ID # Cal Date: Type and Specification S&ME ID # Cal Date: Balance (0.01 g) 11/14/2013 Grooving tool 5/20/2014 1024 S-1 LL Apparatus 1084 8/17/2013 Oven 1454 10/1/2013 Liquid Limit Pan # Plastic Limit 803 Tare #: 18 16 20 28 Tare Weight 12.97 16.70 13.01 12.98 12.95 Α В Wet Soil Weight + A 25.36 29.08 24.90 22.27 21.06  $\mathbf{C}$ Dry Soil Weight + A 20.38 24.20 20.35 19.62 18.84 D Water Weight (B-C) 4.98 4.88 4.55 2.65 2.22 E 7.34 5.86 Dry Soil Weight (C-A) 7.41 7.50 6.67 F % Moisture (D/E)\*100 67.2% 65.1% 62.0% 37.9% 39.7% N # OF DROPS 17 23 30 Moisture Contents determined by ASTM D 2216 LL  $LL = \mathbf{F} * FACTOR$ Ave. 38.8% Average One Point Liquid Limit 69.0 Factor Factor N Ν 68.0 20 0.974 26 1.005 21 0.979 27 1.009 67.0 % Moisture Content 22 0.985 28 1.014 66.0 0.99 23 29 1.018 65.0 24 0.995 1.022 30 25 1.000 64.0 NP. Non-Plastic 63.0 Liquid Limit 64 62.0 Plastic Limit **39** 61.0 Plastic Index 25 60.0 **MH** Group Symbol 100 15 20 25 30 35 40 # of Drops Multipoint Method  $\overline{}$ One-point Method Estimate the % Retained on the #40 Sieve: **Dry Preparation** Wet Preparation Air Dried Notes / Deviations / References: ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System) ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Mal Krajan, ET Laboratory Manager Technical Responsibility Signature Date This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

Revision No. 0

Revision Date: 05/10/12



								AST	TMD	6913					Quali	ty Ass	urance	,
			-		`	gh, 320	)1 Sp	ring F	orest	Road, l	Raleig							
Projec				1-033									port D			7/17/2		
	t Name:			HDD	Cross	sings						Tes	st Date	e(s):	07/14	- 07/1	16/201	4
Client			&K										_					
	Address		00 Eas	st Car	y Str	eet, Su			nmon	d, VA 2	3223							
	No.: E							ole #:		S-4				le Date			3/2014	
Location		ite-Bo	rehole					ffset:		N/A			De	epth (ft)	:	8.5' -	10.0'	
Sample	e Descri	ption:		Oran	ige Ta	an Clay	yey S	AND (	SC)									
	100%	3"	1.5'	1"3	/4''	3/8''	#4	#	<b>#10</b>	#20	#40	#60	#100	#200				. )
	90%																	-
												-\	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \					-
(e)	80%																	
90 9)	70%												+					-
Ssin	60%																	
t Pa	00 76																	-
Percent Passing (%)	50%												'	ackslash				
Per	40%																	
	200/													-1				
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	20%																	
	10%																	
																		-
	0% 100	0.00				10.00	M	lillimete	rs	1.00	•			0.10			0.	.01
	Cobbles			< 200	mm (1	2") and	\ 75 m	nm (2")			Fine Sa	nd		< 0.425	mm and	> 0.07	5 mm (+	+200)
	Gravel					$\frac{2}{\text{and}} > 4.7$					Silt	na			0.075 an			1200)
	Coarse San	ıd				and >2.0		, ,			Clay					005 mn		
N	Iedium Sa	nd		< 2.00	mm a	nd > 0.4	25 mn	n (#40)			Colloid	ls			< 0.0	001 mn	1	
Ma	ximum I	Particle	Size		#4			(	Coars	e Sand	0.0	)%			Fine Sa	and	65.6	%
		G	ravel	(	0.0%			M	ediur	n Sand	3.3	3%		S	ilt & C	lay	31.19	%
	I	iquid I	Limit		ND			I	Plastic	c Limit	N	D		Pla	stic Ind	dex	ND	)
	Spec	ific Gr	avity		ND								]	Moistui	re Cont	ent	17.9	%
	(	Coarse	Sand	(	0.0%			M	ediur	n Sand	3.3	3%			Fine Sa	and	65.6	%
		ription					icles:		_	Rour	nded				igular	X		
N. ( /3		rd & D			X			Soft				W	eather	ed & F	riable			
Notes / I	Deviations	/ Kefere	ences:		ו=טאו	Not Det	ermine	ea.										
	Mal	Krajan	<u>, ET</u>								Lal	orato	ry Mar	nager				
		al Respon					Sign	nature					sition	=		_	Date	
			Th	is repor	t shall	not be re	produce	ed, except	in full,	, without th	ne writter	approv	al of S&	ME, Inc.				

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Revision Date: 05/10/12



						ASTM I	0 6913					Qualit	y Assi	urance	
	S&N	IE, I	nc. Rale	igh, 320	1 Sprin	ng Fores	t Road, R	aleigh,	Nor	th Car	rolina 2	27616			
Project #:	1358	8-14-	-033						Rep	ort Da	ite:	07/	/17/20	014	
Project Name:	US 2	264 H	IDD Cro	ssings					Tes	t Date(	(s):	07/14 -	- 07/1	6/2014	
Client Name:	RK8	έK								_					
Client Address:	2100	) East	t Cary St	reet, Sui	te 209,	Richmo	nd, VA 23	3223							
Boring No.: B-	7				Sample		S-6			Sampl	le Date	: (	07/08	/2014	
	te-Bore				Offs		N/A			Dej	pth (ft)	: 1	18.5' -	- 20.0'	
Sample Descript	tion:	(	Orange 7	Γan Silty	SAND	(SM)									
	3"	1.5"	1"3/4"	3/8''	#4	#10	#20	#40	#60	#100	#200				
100%	• •	•	•	•	<b>-</b> • −	<del>   </del>			1	•	111			$\neg$	
90%															
-										\				-	
80%										1				$\neg$	
70%										1					
Sing										-				-	
Ba 60%															
50% -															
Percent Passing (%)  80%  80%  90%  90%											ackslash			-	
40%															
30%											+ $+$ $+$ $+$ $+$ $+$ $+$ $+$ $+$ $+$ $+$ $+$ $+$			-	
20%											1				
20%															
10%														-	
0%															
100.0	00			10.00	Milli	imeters	1.00	Ť		0	0.10			0.0	1
					-										<u> </u>
Cobbles		<		(12") and			I	Fine Sand				mm and			00)
Gravel Coarse Sand				and $> 4.7$ n and $> 2.0$		*		Silt Clay			< 1	0.075  and	0.00 0.00 0.00		
Medium Sand				and $> 0.4$ ?				Colloids					03 mm		
Maximum Pa			#4			,	rse Sand	0.0%				Fine Sa		77.1%	,
		avel	0.0%	)			ım Sand	0.5%				ilt & Cl		22.4%	
Lie	quid L		ND				tic Limit	ND				stic Ind	•	ND	
	fic Gra		ND			1145	.ic ziiiit	112		N		re Conte		36.5%	1
	oarse S	<u> </u>	0.0%			Medi	ım Sand	0.5%	)	1,		Fine Sa		77.1%	
				vel Parti	icles:		Roun					gular	X		
	d & Du			X		oft 🗀		aca			ed & Fi	_			
Notes / Deviations /				- Not Dete											
	<i>y</i>		•												
· · · · · · · · · · · · · · · · · · ·	rajan,						_	Labo		y Man	<u>ager</u>				_
Technical	Responsi				Signati					ition				Date	
		This	report sha	ll not be rep	produced,	except in fu	ll, without the	e written aj	prove	il of S&M	IE, Inc.				

Revision No. 0

Revision Date: 05/10/12



		ASTM D 6913												Quality Assurance							
		S&I	<b>ME</b> , 1	Inc. 1	Ralei	gh, 32	01 S	prin	g Fore	est Road	, R	Raleigh,	Nor	th Ca	rolin	a 27	616				
Projec		1358-14-033												ort D	ate:		07	/17/2	014		
	t Name:	US	264 I	HDD	Cros	sings							Tes	t Date	(s):	0	7/14	- 07/1	16/2014	4	
	Name:	RK												_							
	Address:		0 Eas	t Cai	ry Str	eet, Sı				ond, VA		3223									
	No.: B-							nple		S-				*					3/2014		
Locati		e-Bor			~	~	Offset: N/A							De	epth (	ft):		28.5'	- 30.0'		
Sampl	e Descript	ion:		Gray	Silty	SAN	D (S	SM)													
	4000/	3"	1.5" 1"			3/8"	#	<b>‡4</b>	#10	#2	0	#40	#60	#100	#200				)		
	100%												1								
	90%													$\overline{}$							
	80%													1							
@	0070													-							
ng (	70%													<del>\</del>							
assi	60%														acksquare						
Percent Passing (%)	<b>7</b> 00/														+						
l ce	50%														$\mathbf{I}$						
	40%														+						
	30%																				
															+1						
	20%																				
	10%																				
	0%																				
	100.0	0				10.00		Millimeters 1.00							0.10		0.0				
	Cobbles		•			2") and					Fine Sand			< 0.4		m and > 0.075 mm (#200)					
(	Gravel Coarse Sand					$\frac{\text{and} > 4}{\text{and} > 2}$		` `	<u> </u>			Silt Clay				< 0.0		5 and > 0.005 mm			
	Iedium Sand					1 $1$ $1$ $1$ $1$ $1$ $1$ $1$ $1$ $1$						Colloids						01 mn			
Ma	ximum Pa	rticle	Size		#4				Coa	arse San	d	0.0%	)			Fi	ne Sa	ınd	81.19	%	
		Gı	ravel	(	0.0%				Med	ium San	d	0.5%	)			Silt	& C	lay	18.49	%	
	Lio	quid I	imit		ND				Plas	stic Lim	it	ND			]	Plasti	ic Ind	lex	ND		
	Specif	avity		ND									]	Mois	ture	Conte	ent	33.49	%		
	Co	arse S	Sand	(	0.0%				Med	ium San	d	0.5%	)			Fi	ne Sa	ınd	81.19	%	
	Descrip	otion	of Sa	nd &	Grav	el Par	ticle	es:		Ro	uno	ded				Angu		X			
Hard & Durable									oft [				W	Weathered & Friable							
Notes / I	Deviations /	Refere	nces:		ND=1	Not De	term	ined.													
Mal Krajan, ET												Labo	rato	ry Mar	າລດຊະ						
	Technical .						S	ignatu	re			Laud		sition	iagel	=			Date	_	
		This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.																			

Revision No. 0

Revision Date: 05/10/12



ASTM D 6913												Quality Assurance									
S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, No													*	rth Carolina 27616							
Project			58-14-033												port D					/2014	
Project				64 HDD Crossings Test													(	07/14	1 - 07	//16/20	14
Client N			&K												_						
Client A			00 Ea	st Car	y Str	eet, Si				nond			223								
Boring				Sample #: S-4											Samp					08/201	
Location: Site-Borehole									et:		N/	A			De	epth	(ft):		8.5	' - 10.0	'
Sample	Descri	ption:		Whit	te Tai	n Clay	ey S	ANI	O (SC	()											
	100%	3''	1.5	" 1"3	/4''	3/8''	#	#4 #10			#2	0	#40	#60	#100	0 #200					_ )
	90%																				
	80%														+						
%) M	70%																				_
Ssing															<u> </u>	ackslash					
Pas	60%																				╡ ┃
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Per	40%															$\perp \setminus$					<b>□ I</b>
	30%																•				╛┃
	30 / 0																				-
	20%																				┨
	10%																				
	0%																				
		0.00				10.00		Millimeters 1.00							0.10						0.01
	Cobbles			< 300	mm (1	2") and	1 \ 75	mm /	(3")			F	ine Sa	nd	< 0.425 mm and > 0.07.						(#200)
	Gravel					and $> 4$						1	Silt	IG		₹ 0.5		1 > 0.005 mm			
C	oarse San	ıd				and >2							Clay					< 0	.005 n	nm	
Me	edium Sa	nd		< 2.00	) mm a	nd > 0.	.425 n	nm (#	40)			(	Colloid	s				< 0	.001 n	nm	
Max	kimum I	Particle	Size	;	#10				C	oarse	San	d	0.0	)%			F	ine S	Sand	63.	6%
		G	ravel	l (	0.0%				Me	dium	san	d	1.3	3%			Sil	t & (	Clay	35.	1%
	I	Liquid 1	Limit	-	ND				Pl	astic	Lim	it	N	D			Plas	tic In	ıdex	N	D
		ific Gr	ND											Mois				32.	9%		
Coarse Sand 0.0%									Me	dium			1.3		Fine San					63.	6%
		ription					rticle		C.		Ro	unc	led				_	ular	Z		
Notes / D		rd & D			ND-N	Not De	termi		oft					W	eather	red &	z Fri	able		1	
INDIES / D	evialions	/ Kejeri	ences:		ו-עווי	יטנ של	ACT III	incu.													
Mal Krajan, ET								Laborato								ory Manager					
	Technic	al Respon	ısibility	V			S	Signature Pos								osition					
			Th	is repor	t shall	not be r	eprodi	uced, e	except i	n full,	withou	t the	written	approv	al of S&	ME, In	ıc.				

Revision No. 0

Revision Date: 05/10/12



Nei	vision Date. 03/	10/12							AS7	TM D 6	5913						Qua	ılity Ass	urance	
			ME, 1 8-14			gh, 32	201	Spri	ng Fo	orest l	Road,	Ra	aleigh,				27616			
	oject #:										ort Da		(	07/17/2	014					
	oject Name:			HDD	Cros	sings								Tes	t Date	(s):	07/1	4 - 07/1	16/2014	1
Cli	ient Name:	RK	&K												_					
	ient Address:		0 Eas	st Car	ry Str	eet, S				nmond	, VA 2	232	223							
	ring No.: B-8						S	ample			S-7				Samp			07/08/2014		
Location: Site-Borehole								Off			N/A	L			Depth (ft):				- 25.0'	
Sa	mple Descript	Gray	Silt	y Clay	ey	SAN	D (SC	C-SM)												
		3''	3" 1.5"		/4''	3/8''		#4	#	<b>#10</b>	#20		#40	#60	#100	#20	0			
	100%	Ĭ	<b>—</b>	T•	•			<b>-</b>		1		П	$\top$	<b>\</b>		<u> </u>				
	90%																			
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	<u>0</u> 70%														-					
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	30%																		$\neg \neg$	
	20%																			
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	10%																			
	0%					10.00										0.01				
	100.00				10.00		Millimeters 1.00								0.10			0.0		
	Cobbles					12") and						Fi	ne Sand			< 0.42	1d > 0.07	> 0.075 mm (#200)		
	Gravel					and $> 4$							Silt			05 mm				
	Coarse Sand Medium Sand					and $>2$ and $>0$						C	Clay				0.005 mn 0.001 mn			
	Maximum Par	rticla	Siza		#10	ana > 0	.423	) шш (-		Coarse	Sand		0.0%	<u> </u>			Fine		69.39	6
	Waxiiiuiii 1 a		ravel		0.0%						Sand Sand		0.0%				Silt &		30.69	
	Lic	uid I			).070 ND						Limit		ND				lastic I	•	ND	U
		ND				1	Tastic	Lillit		ND		1		ure Co		37.59	6			
Specific Gravity ND  Coarse Sand 0.0%									M	edium	Sand		0.1%	<u></u>	1	vioist	Fine S		69.39	
		zel Par	rtic	lec.	171	Caran	Rou					Δ	ngular		07.57	U				
Description of Sand & Gravel Par Hard & Durable							ıııc		Soft		Rou	IIU	cu				Friable			
Notes / Deviations / References: ND=Not							eter							**	cutifor	ca cc	Tiuoic			
		.,, 0																		
															_					
Mal Krajan, ET  Technical Responsibility								C:	4				<u>Labo</u>		y Mar	<u>ager</u>			Dat:	
	1 ecnnical 1	xespon		s repoi	rt shall	not be	repr	Signat oduced,		in full.	without	Position Date  pproval of S&ME, Inc.								

Revision No. 0

Revision Date: 05/10/12



	<i>xevisio</i>	n Daie. 03/	/10/12	•						AST	M D 6	913						Qua	lity Ass	urance			
							igh, 3	201	Spri	ng Fo	rest I	Road, l	Rale	•				27616					
	Projec		13:	58-1	4-033	3										ort Da	)7/17/2	014					
		t Name:			HDD	Cros	ssings								Test Date(s): 07/14				4 - 07/1	- 07/16/2014			
(	Client	Name:	RK	&K																			
		Address:		00 Ea	ast Ca	ry Sti	reet, S				mond	, VA 2	3223	3									
Boring No.: B-8							Sample #: S-9								Sampl			07/08/2014					
Location: Site-Borehole									Off			N/A			Depth (ft):				- 35.0				
Sample Description: Gr						y Silt	y Cla	yey	SAN	D (SC	C-SM)												
ĺ			3"	1.5	3'' 1''3	3/4''	3/8''		#4	#	10	#20	#	40 i	#60	#100	#200	0					
		100%			$\top$	•			ightharpoonup							•							
		90%													$\rightarrow$					_			
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		100.0				10.00		Millimeters 1.00							0	).10			0.01	<b>'</b>			
		Cobbles			< 300	mm (	12") an	d>	75 mm	n (3")			Fine	Sand			< 0.42	d > 0.07	l > 0.075 mm (#200)				
		Gravel					and > 4		•				Si				<		.005 mm				
		Coarse Sand					and >2						Cl						0.005 mn				
		Medium Sand		Ci-			and > (	).42:	5 mm (		1	Cand	Coll						0.001 mn				
	Ma	ximum Pa				#10						Sand		0.0%				Fine S		83.7%			
		т:		rave		0.0%						Sand		0.2%				Silt & (	•	16.1%	)		
Liquid Limit						ND				Р	lastic	Limit		ND				lastic Iı		ND			
Specific Gravity ND										M	. 1	C 1	-	0.20/		N	VIO1St	ure Cor		32.1%			
Coarse Sand 0.0%								,.	1	IVI	eatum	Sand		0.2%	_	,		Fine S		83.7%	)		
Description of Sand & Gravel Pa								ırtıc		7 - 6		Rour	nded					ngular	$\boxtimes$				
Hard & Durable   Notes / Deviations / References: ND=Not										Soft					we	athere	ea & I	Friable					
	Notes / 1	Deviations /	Kefer	ences.	:	ND=	Not D	eter	minea														
Mal Krajan, ET												<u>I</u>	abor	atory	Man Man	ager				_			
		Technical	Respoi	ısibilit	ty				Signat	ture					Posi	Date							
This report shall not									oduced,	except	in full, v	without th	he writ	tten ap	provai	of S&M	IE, Inc.						