GEOTECHNICAL SUBSURFACE EXPLORATION DATA REPORT

Traffic Signal Pole Foundations
River Road at Huguenot Road
City of Richmond and Henrico County, Virginia

Schnabel Reference No. 15613005
January 30, 2015

Prepared For: Elite Contracting Company

Schnabel ENGINEERING

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ENGINEERING

January 30, 2015

Mr. Tommy Shiflett
Elite Contracting Company
23220 Airpark Drive
Petersburg, VA 23803

Subject: **Project 15613005, Geotechnical Subsurface Exploration Data Report, Traffic Signal Pole Foundations, River Road at Huguenot Road, City of Richmond and Henrico County, Virginia**

Dear Mr. Shiflett:

SCHNABEL ENGINEERING CONSULTANTS, INC. (Schnabel) is pleased to submit our subsurface exploration data report for this project. This document includes attached figures and an appendix with relevant data collected for this study. This study was performed in accordance with our proposal dated December 30, 2014.

SUBSURFACE EXPLORATION PROGRAM

We conducted a subsurface exploration and field testing program to identify the subsurface stratigraphy underlying the site. This program included test borings. Exploration methods used are discussed below. The appendix contains the results of our exploration.

Subsurface Exploration Methods

Test Borings

Schnabel's subcontractor, Ayers and Ayers, Inc. of Powhatan, Virginia, drilled three test borings under our observation on January 23, 2015. The Standard Penetration Test (SPT) was conducted at selected depths in the borings. Appendix A includes specific observations, remarks, and logs for the borings; classification criteria; drilling methods; and sampling protocols. Figure 2 included at the end of this report indicates the approximate test boring locations. We will retain soil samples up to 45 days beyond the issuance of this report, unless you request other disposition.

LIMITATIONS

We have endeavored to complete the services identified herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions as this project. No other representation, express or implied, is included or

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intended, and no warranty or guarantee is included or intended in this report, or other instrument of service.

We appreciate the opportunity to be of service for this project. Please call us if you have any questions regarding this report.

Sincerely,

SCHNABEL ENGINEERING CONSULTANTS, INC.

Benedictus K. Azumah, PE
Senior Staff Engineer

Jeremy L. Mydlinski, PE
Senior Associate

COMMONWEALTH OF VIRGINIA
BENEDICTUS K. AZUMAH
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BKA:JLM:ms

Figures
Appendix A: Subsurface Exploration Data

COMMONWEALTH OF VIRGINIA
JEREMY L. MYDLINSKI
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PROFESSIONAL ENGINEER

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FIGURES

Figure 1: Site Vicinity Map
Figure 2: Boring Location Plan

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap

NOT TO SCALE

Schnabel ENGINEERING

TRAFFIC SIGNAL POLE FOUNDATIONS
RIVER ROAD AT HUGUENOT ROAD
RICHMOND / HENRICO COUNTY, VIRGINIA

PROJECT NO. 15613005

SITE VICINITY MAP

FIGURE 1

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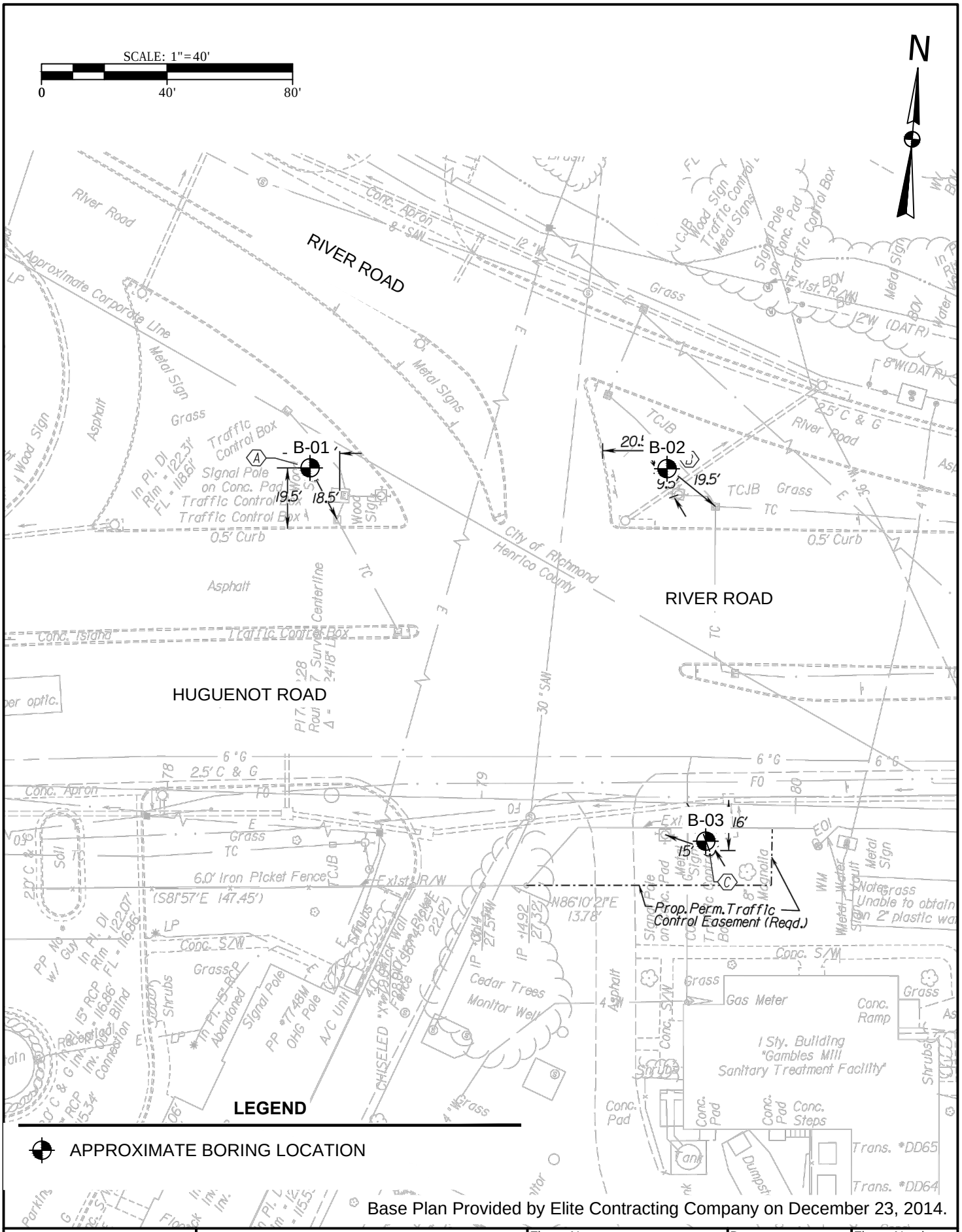
arcgis
1/5/2015 This Map was Created In Schnabel Engineerings Site Vicinity Map Application



Base Plan Provided by Elite Contracting Company on December 23, 2014.

Schnabel ENGINEERING	TRAFFIC SIGNAL POLE FOUNDATIONS RIVER ROAD AT HUGUENOT ROAD RICHMOND / HENRICO COUNTY VIRGINIA	Figure Name: BORING LOCATION PLAN	Done: B. AZUMAH	Figure Number: 2
		Project Number: 15613005	Reviewed: J. MYDLINSKI	Date: JAN 2015

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APPENDIX A

SUBSURFACE EXPLORATION DATA

Subsurface Exploration Procedures
General Notes for Subsurface Exploration Logs
Identification of Soil
Boring Logs, B-01 through B-03

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SUBSURFACE EXPLORATION PROCEDURES

Test Borings – Hollow Stem Augers

The borings are advanced by turning a continuous flight auger with a center opening of 2¼ or 3¼ inches. A plug device blocks off the center opening while augers are advanced. Cuttings are brought to the surface by the auger flights. Sampling is performed through the center opening in the hollow stem auger, by standard methods, after removal of the plug. Usually, no water is introduced into the boring using this procedure.

Standard Penetration Test Results

The numbers in the Sampling Data column of the boring logs represent Standard Penetration Test (SPT) results. Each number represents the blows needed to drive a 2-inch O.D., 1⅜-inch I.D. split-spoon sampler 6 inches, using a 140-pound hammer falling 30 inches. The sampler is typically driven a total of 18 or 24 inches. The first 6 inches are considered a seating interval. The total of the number of blows for the second and third 6-inch intervals is the SPT "N value." The SPT is conducted according to ASTM D1586.

Soil Classification Criteria

The group symbols on the logs represent the Unified Soil Classification System Group Symbols (ASTM D2487) based on visual observation and limited laboratory testing of the samples. Criteria for visual identification of soil samples are included in this appendix. Some variation can be expected between samples visually classified and samples classified in the laboratory.

Residual soils are derived through the in-place physical and chemical weathering of the underlying rock. Disintegrated rock is defined as residual material with SPT N values between 60 blows per foot and refusal. Refusal is defined as an N value of 50 blows for a penetration of one inch or less.

Pocket Penetrometer Results

The values following "PP=" in the sampling data column of the logs represent pocket penetrometer readings. Pocket penetrometer readings provide an estimate of the unconfined compressive strength of fine-grained soils.

Boring Locations and Elevations

Boring locations were staked in the field by personnel from our office by measuring from site features according to the project plans. Approximate boring locations are shown on Figure 2. Ground surface elevations at the boring locations were obtained from the USGS topographic plan and are indicated on the logs. Locations and elevations should be considered no more accurate than the methods used to determine them.

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GENERAL NOTES FOR SUBSURFACE EXPLORATION LOGS

1. Numbers in sampling data column next to Standard Penetration Test (SPT) symbols indicate blows required to drive a 2-inch O.D., 1⅜-inch I.D. sampling spoon 6 inches using a 140 pound hammer falling 30 inches. The Standard Penetration Test (SPT) N value is the number of blows required to drive the sampler 12 inches, after a 6 inch seating interval. The Standard Penetration Test is performed in general accordance with ASTM D1586.
2. Visual classification of soil is in accordance with terminology set forth in “Identification of Soil.” The ASTM D2487 group symbols (e.g., CL) shown in the classification column are based on visual observations.
3. Estimated water levels indicated on the logs are only estimates from available data and may vary with precipitation, porosity of the soil, site topography, and other factors.
4. Refusal at the surface of rock, boulder, or other obstruction is defined as an SPT resistance of 50 blows for 1 inch or less of penetration.
5. The logs and related information depict subsurface conditions only at the specific locations and at the particular time when drilled or excavated. Soil conditions at other locations may differ from conditions occurring at these locations. Also, the passage of time may result in a change in the subsurface soil and water level conditions at the subsurface exploration location.
6. The stratification lines represent the approximate boundary between soil and rock types as obtained from the subsurface exploration. Some variation may also be expected vertically between samples taken. The soil profile, water level observations and penetration resistances presented on these logs have been made with reasonable care and accuracy and must be considered only an approximate representation of subsurface conditions to be encountered at the particular location.
7. Key to symbols and abbreviations:

☒	S-1, SPT	Sample No., Standard Penetration Test
	5+10+1	Number of blows in each 6-inch increment
	REC=18”, 100%	Percentage of soil sample recovered by sampling spoon

LL	Liquid Limit
MC	Moisture Content (percent)
PL	Plastic Limit
PP	Pocket Penetrometer Reading (tsf)
%Passing#200	Percent by weight passing a No. 200 Sieve

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IDENTIFICATION OF SOIL

I. DEFINITION OF SOIL GROUP NAMES (ASTM D2487)

			SYMBOL	GROUP NAME
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels – More than 50% of coarse fraction retained on No. 4 sieve Coarse, ¾" to 3" Fine, No. 4 to ¾"	Clean Gravels Less than 5% fines	GW	WELL GRADED GRAVEL
			GP	POORLY GRADED GRAVEL
		Gravels with fines More than 12% fines	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	Sands – 50% or more of coarse Fraction passes No. 4 sieve Coarse, No. 10 to No. 4 Medium, No. 40 to No. 10 Fine, No. 200 to No. 40	Clean Sands Less than 5% fines	SW	WELL GRADED SAND
			SP	POORLY GRADED SAND
		Sands with fines More than 12% fines	SM	SILTY SAND
			SC	CLAYEY SAND
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays – Liquid Limit less than 50 Low to medium plasticity	Inorganic	CL	LEAN CLAY
			ML	SILT
		Organic	OL	ORGANIC CLAY
				ORGANIC SILT
	Silts and Clays – Liquid Limit 50 or more Medium to high plasticity	Inorganic	CH	FAT CLAY
			MH	ELASTIC SILT
		Organic	OH	ORGANIC CLAY
				ORGANIC SILT
Highly Organic Soils	Primarily organic matter, dark in color and organic odor		PT	PEAT

II. DEFINITION OF SOIL COMPONENT PROPORTIONS (ASTM D2487)

			Examples
Adjective Form	GRAVELLY SANDY	>30% to <50% coarse grained component in a fine-grained soil	GRAVELLY LEAN CLAY
	CLAYEY SILTY	>12% to <50% fine grained component in a coarse-grained soil	SILTY SAND
"With"	WITH GRAVEL WITH SAND	>15% to <30% coarse grained component in a fine-grained soil	FAT CLAY WITH GRAVEL
	WITH GRAVEL WITH SAND	>15% to <50% coarse grained component in a coarse-grained soil	POORLY GRADED GRAVEL WITH SAND
	WITH SILT WITH CLAY	>5% to <12% fine grained component in a coarse-grained soil	POORLY GRADED SAND WITH SILT

III. GLOSSARY OF MISCELLANEOUS TERMS

SYMBOLS ..... Unified Soil Classification Symbols are shown above as group symbols. A dual symbol "-" indicates the soil belongs to two groups. A borderline symbol "/" indicates the soil belongs to two possible groups.

FILL..... Man-made deposit containing soil, rock and often foreign matter.

PROBABLE FILL..... Soils which contain no visually detected foreign matter but which are suspect with regard to origin.

DISINTEGRATED ROCK (DR)..... Residual materials with a standard penetration resistance (SPT) between 60 blows per foot and refusal. Refusal is defined as a SPT of 100 blows for 2" or less penetration.

PARTIALLY WEATHERED ROCK (PWR)..... Residual materials with a standard penetration resistance (SPT) between 100 blows per foot and refusal. Refusal is defined as a SPT of 100 blows for 2" or less penetration.

BOULDERS & COBBLES..... Boulders are considered rounded pieces of rock larger than 12 inches, while cobbles range from 3 to 12 inch size.

LENSES..... 0 to ½ inch seam within a material in a test pit.

LAYERS..... ½ to 12 inch seam within a material in a test pit.

POCKET ..... Discontinuous body within a material in a test pit.

MOISTURE CONDITIONS..... Wet, moist or dry to indicate visual appearance of specimen.

COLOR ..... Overall color, with modifiers such as light to dark or variation in coloration.

Schnabel ENGINEERING	TEST BORING LOG	Project: Traffic Signal Pole Foundations River Road at Huguenot Road Richmond / Henrico County, Virginia	Boring Number: **B-01** Contract Number: 15613005 Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia

Contractor Foreman: M. White

Schnabel Representative: Ben Azumah

Equipment: CME-55 (Truck)

Method: 2-1/4" ID Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)

Dates Started: 1/23/15 **Finished:** 1/23/15

Location: See Location Plan

Ground Surface Elevation: 125.0 (ft) **Total Depth:** 29.3 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/23	8:46 AM	7.0'	---	---
Completion	1/23	9:26 AM	18.0'	---	---
Casing Pulled	1/23	9:47 AM	Dry	---	3.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
0.3	Rootmat and topsoil		124.7					FILL
	FILL, sampled as clayey sand, fine to coarse grained sand; moist, brown and gray, contains crushed stone					S-1, SPT 7+7+9 REC=12", 67% S-2, SPT 6+5+4 REC=12", 50%		
	Change: contains crushed stone, and mica	FILL		A	5	S-3, SPT 3+5+6 REC=14", 78%		
	Change: wet, brownish gray, contains organic matter, and root fragments					S-4, SPT 2+2+1 REC=0", 0%		
9.0	CLAYEY SAND, fine to coarse grained sand; wet, brownish gray	SC	116.0	B2	10	S-5, SPT 1+2+1 REC=14", 78%		ALLUVIUM
13.0	FAT CLAY; wet, brownish gray, contains organic matter, and mica	CH	112.0	B1	15	S-6, SPT 2+2+3 REC=18", 100%	PP = 1.00 tsf	
18.0	CLAYEY SAND, fine to medium grained sand; wet, gray, contains mica	SC	107.0	B2	20	S-7, SPT 1+1+1 REC=15", 83%		
23.0	SILTY SAND, fine to medium grained sand; wet, grayish green and light pinkish brown	SM	102.0	D1	25	S-8, SPT 6+5+16 REC=16", 89%		RESIDUAL GRANITE
27.5	DISINTEGRATED ROCK, sampled as silty sand, fine to coarse grained sand; moist, greenish gray, contains rock fragments	DR	97.5	D2				
29.3			95.8			S-9, SPT 44+56/3" REC=9", 100%		

Bottom of Boring at 29.3 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 15613005 TSP SE AT RIVER RD AND HUGUENOT RD.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 1/30/15

Schnabel ENGINEERING — **TEST BORING LOG**

Project: Traffic Signal Pole Foundations
River Road at Huguenot Road
Richmond / Henrico County, Virginia

Boring Number: **B-02**
Contract Number: 15613005
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: Ben Azumah
Equipment: CME-55 (Truck)
Method: 2-1/4" ID Hollow Stem Auger
Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/23/15 **Finished:** 1/23/15
Location: See Location Plan
Ground Surface Elevation: 125.0 (ft) **Total Depth:** 29.3 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/23	10:06 AM	7.0'	---	---
Completion	1/23	10:46 AM	27.0'	---	---
Casing Pulled	1/23	11:00 AM	Dry	---	8.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
0.3	Rootmat and topsoil		124.7					
	FILL, sampled as silty sand, fine to coarse grained sand; moist, grayish brown, contains root fragments, and crushed stone Change: brown with speckles of gray, contains	FILL		A	5	S-1, SPT 4+5+6 REC=13", 72% S-2, SPT 4+5+6 REC=15", 83% S-3, SPT 4+3+3 REC=15", 83%		FILL
7.0	SILTY SAND, fine to coarse grained sand; wet, brownish gray	SM	118.0			S-4, SPT 5+6+3 REC=12", 67%		ALLUVIUM
9.0	SILTY SAND WITH GRAVEL, fine to coarse grained sand; wet, brownish gray	SM	116.0	B2	10	S-5, SPT 4+7+8 REC=13", 72%		
13.0	SILTY SAND, fine to medium grained sand; wet, dark brownish gray, contains mica	SM	112.0	D1	15	S-6, SPT 3+2+3 REC=15", 83%		RESIDUAL GRANITE
18.0	DISINTEGRATED ROCK, sampled as silty sand, fine to coarse grained sand; moist, light orangish brown with speckles of greenish gray, contains rock fragments, and mica	DR	107.0	D2	20 25	S-7, SPT 21+50/4" REC=10", 100% S-8, SPT 28+50 REC=10", 83%		
29.3			95.7			S-9, SPT 13+50/4" REC=10", 100%		

Bottom of Boring at 29.3 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 15613005 TSP SE AT RIVER RD AND HUGUENOT RD.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 1/30/15

Schnabel ENGINEERING — **TEST BORING LOG**

Project: Traffic Signal Pole Foundations
River Road at Huguenot Road
Richmond / Henrico County, Virginia

Boring Number: **B-03**
Contract Number: 15613005
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: Ben Azumah
Equipment: CME-55 (Truck)
Method: 2-1/4" ID Hollow Stem Auger
Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/23/15 **Finished:** 1/23/15
Location: See Location Plan
Ground Surface Elevation: 125.0 (ft) **Total Depth:** 28.8 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/23	11:11 AM	7.0'	---	---
Completion	1/23	11:47 AM	26.5'	---	---
Casing Pulled	1/23	11:50 AM	14.5'	---	24.5'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
0.3	Rootmat and topsoil		124.7					FILL
	FILL, sampled as silty sand, fine to coarse grained sand; moist, grayish brown	FILL				S-1, SPT 5+4+6 REC=14", 78%		
2.0			123.0			S-2, SPT 8+5+6 REC=15", 83%	PP = 2.00 tsf	
	FILL, sampled as sandy lean clay; moist, grayish brown, contains crushed stone, and brick fragments	FILL		A				
4.0			121.0			S-3, SPT 3+1+1 REC=8", 44%		
	FILL, sampled as silty sand, fine to coarse grained sand; moist, grayish brown	FILL			5			
7.0			118.0			S-4, SPT WOH/18" REC=18", 100%	PP = 0.25 tsf	ALLUVIUM
	LEAN CLAY WITH SAND; wet, light brownish gray	CL		B1				
9.0			116.0			S-5, SPT 2+4+6 REC=16", 89%	PP = 2.25 tsf	TERRACE
	FAT CLAY WITH SAND; moist, light brown and light gray	CH		C1	10			
					15	S-6, SPT 5+6+8 REC=18", 100%	PP = 2.25 tsf	
18.0			107.0					
	SILTY SAND, fine to coarse grained sand; wet, gray, estimated <5% mica	SM		C2	20	S-7, SPT 3+5+4 REC=12", 67%		
23.0			102.0					RESIDUAL GRANITE
	DISINTEGRATED ROCK, sampled as silty sand, fine to coarse grained sand; moist, light orangish brown with speckles of gray, contains mica, and rock fragments	DR		D2	25	S-8, SPT 29+31+50 REC=18", 100%		
28.8			96.3			S-9, SPT 50/3" REC=3", 100%		

Bottom of Boring at 28.8 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.
Boring offset 6 ft to the North due to tree branches

TEST BORING LOG 15613005 TSP SE AT RIVER RD AND HUGUENOT RD.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 1/30/15