FROEHLING & ROBERTSON

Engineering Stability Since 1881

Ramboll Americas Engineering Solutions, Inc.
4435 Waterfront Drive
Suite 205
Glen Allen, Virginia 23060

June 14, 2024

NOT A CONTRACT DOCUMENT, for

INFORMATION ONLY.

ACSA, 2/6/2025

Attention: Mr. Don Simmons

Reference: Briarwood Water Main Replacement Project
Albemarle County, Virginia
F&R Project No. 71C0069

Dear Mr. Simmons:

The purpose of this report is to present the results of the subsurface exploration and laboratory testing program undertaken by Froehling & Robertson, Inc. (F&R) in connection with the above referenced project. Our services were performed in general accordance with our Proposal No. 2171-0019G Revision 3, dated May 7, 2024, as authorized by you. The attached report presents our understanding of the project, reviews our exploration procedures, describes existing site and general subsurface conditions, and presents the results of our exploration and testing.

PROJECT INFORMATION

Our understanding of the proposed construction is based on project information provided by you, which included the electronically provided "Briarwood Water Main Replacement, Revised Soil Boring and Test Pit Location Plans", 15 Sheets, dated 2/23/24, prepared by Ramboll, that included the general water line alignment and the boring locations. Based on the provided information, we understand that the Albemarle County Service Authority (ACSA) is designing the replacement of the water main that runs along Briarwood Drive, Austin Drive, Dickerson Road, Finch Court, Whitney Court, and Heather Court.

METHOD OF EXPLORATION

Subsurface Exploration

The exploration program was performed on May 29 through 31, 2024, and consisted of sixteen soil test borings designated B-01 through B-16. The soil test borings were drilled to the boring termination depths of 6 feet to 6.5 feet below the existing grades. The locations of the borings are shown on the attached Boring Location Plan (Drawing No. 2). The test boring locations were marked in the field by F&R by measuring at right angles off of existing site features. Given that some minor shifting of pre-staked locations may have occurred during drilling, we recommend that the test boring locations shown on the attached Boring Location Plan and elevations shown on the boring logs be considered approximate.

The test borings were performed in accordance with generally accepted practice using a truck-mounted CME 55 rotary drill rig equipped with an automatic hammer. The majority of the borings were located in existing pavement and prior to drilling, the asphalt was cored with a 4 inch diameter core barrel. Our drill crew conducted standard penetration testing and representative split-spoon soil sampling at pre-selected depth intervals in general accordance with ASTM D 1586. A further explanation of standard test boring methods is attached.

Laboratory Testing

Representative soil samples were subjected to Water Content (ASTM D 2216), Atterberg Limits (ASTM C4318), #200 Sieve Wash (ASTM D1140) testing to substantiate the visual classifications and assist with the estimation of the soils' pertinent engineering properties. The results of the laboratory testing is provided in the following table.

Boring No.	Sample Depth (Feet)	Natural Water Content (%)	Liquid Limit/ Plasticity Index	% Passing No. 200 Sieve	USCS Class.
B-01	2.5-4.5	14.8	--	--	--
B-02	2.5-4.5	45.2	61/13	75.0	MH
B-03	4.5-6.5	15.7	--	--	--
B-04	4.5-6.5	44.0	--	--	--
B-05	4.5-6.5	8.2	--	--	--
B-06	2.5-4.5	16.5	--	--	--
B-07	0.5-2.5	22.9	--	--	--
B-08	4.5-6.5	22.0	--	--	--
B-09	0.5-2.5	34.5	--	--	--
B-10	2.5-4.5	27.0	--	--	--
B-11	2.5-4.5	36.5	--	--	--

Boring No.	Sample Depth (Feet)	Natural Water Content (%)	Liquid Limit/ Plasticity Index	% Passing No. 200 Sieve	USCS Class.
B-12	4.5-6.5	34.0	67/27	82.1	MH
B-13	4-6	12.0	--	--	--
B-14	4-6	13.4	--	--	--
B-15	2-4	29.6	NP/NP	99.8	ML
B-16	4.5-6.5	24.4	--	--	--

SUBSURFACE CONDITIONS

Area Geology

The project site is located in the upland area of the Piedmont Plateau, at the western edge of the Piedmont Physiographic Province, an area underlain by ancient metamorphic rocks. Information obtained from the Geology and Mineral Resources of Alebmarle County, Virginia (1962) indicates that the project site is underlain by igneous rocks injected into the Lovingston Gneiss of the Precambrian Age. The Lovingston Gneiss is a coarse grained quartz monzonite, which is variable in composition. The igneous rocks injected into the Lovingston Gneiss in this area generally consists of a white granite gneiss. The virgin soils encountered in this area are the residual product of in-place chemical and mechanical weathering of the parent bedrock formation that underlies the site. These materials consist of SILT and CLAY soils near the surface where soil weathering is more advanced, underlain by silty SAND and clayey SAND.

Soil Conditions

Detailed descriptions of the sampled subsurface strata are presented on the attached boring logs. Strata breaks designated on the boring logs represent an approximate boundary between soil types; transition from one soil type to another may be gradual or occur abruptly between sampling intervals. Although the test borings are representative of the subsurface conditions at the boring locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times. Below the existing ground surface, the test borings generally encountered surficial materials, fill soils, residual soils, and soft weathered rock. These strata are discussed in the following paragraphs.

<u>Surficial Materials</u>

Asphaltic pavement was encountered at the ground surface in each of the borings except borings B-13, B-14, and B-15. The asphalt was found to vary in thickness from 2.5 inches to 6 inches and the aggregate base below the asphalt was found to vary in thickness from 6.5 inches to 12 inches. The asphalt thickness values on our boring logs are based on measurements of the core collected at each boring location. The aggregate base thickness values are based on measurement in the augered hole, and therefore should be considered approximate. The asphalt and aggregate base thickness at each boring location are shown in the following table.

Boring No.	Asphalt Thickness (inches)	Aggregate Base Thickness (inches)
B-01	4.5	10
B-02	4.5	10
B-03	5	12
B-04	2.5	10
B-05	5.5	11.5
B-06	2.5	6.5
B-07	6	10
B-08	5	10
B-09	3	7
B-10	2.5	7
B-11	2.5	10
B-12	3.5	10
B-16	3	8

Surficial organic soils were encountered in borings B-13, B-14, and B-15, to a depth of approximately 8 to 10 inches below the existing ground surface. Surficial organic soil is typically a dark-colored soil material containing roots, fibrous matter, and/or other organic components, and is generally unsuitable for engineering purposes. F&R has not performed any laboratory testing to determine the organic content or other horticultural properties of the observed surficial organic soil materials. Therefore, the term surficial organic soil is not intended to indicate a suitability for landscaping and/or other purposes. The surficial organic soil depths provided in this report are based on driller observations and should be considered approximate. We note that the transition from surficial organic soil to underlying materials may be gradual, and therefore the observation and measurement of surficial organic soil depths is subjective. Actual surficial organic soil depths should be expected to vary.

Fill Soils

Fill may be any material that has been transported and deposited by man. Soils considered fill material were encountered in borings B-04, B-06, B-08, B-10, B-11, B-14, B-15, and B-16, below the surficial materials and extended to depths of 2 to 6.5 feet below existing grades. Fill materials were described as fat CLAY (CH), lean CLAY (CL), elastic SILT (MH), SILT (ML), or silty SAND (SM) with varying amounts of sand, gravel, mica, and organics. The sampled fill materials were brown, red brown, dark red-brown, orange-brown, white, or gray in color, with moisture contents visually characterized as moist. The Standard Penetration Test values (N-Values) in the fill materials ranged from 6 blows per foot (bpf) to 61 bpf. .

Residual Soils

Residual soils, formed by in-place weathering of the parent rock, were encountered below the surficial materials or fill soils in each of the borings except B-04 and B-06, and extended to the boring termination depths of 6 feet or 6.5 feet below the existing ground surface. The sampled residual soils were described as elastic SILT (MH), SILT (ML), or silty SAND (SM) with varying amounts of sand, gravel, mica, and organics. The residual soils were light brown, dark brown, brown, red-brown, orange-brown, tan, and white in color with water contents visually characterized as moist. The N-values in the residual soils ranged from 5 bpf to 42 bpf.

Soft Weathered Rock

Soft weathered rock (SWR) is a transitional material between soil and rock which contains the relic structure of the rock with very hard consistencies or very dense densities. SWR materials were encountered below the residual soils in boring B-06 at a depth of 2 feet below existing grades and extended to the boring termination depth of 6.5 feet below existing grades. When sampled, the SWR was described as silty SAND (SM) with varying amounts of gravel and mica. The SWR was brown, tan, or white in color, with moisture contents visually characterized as moist. N-values of 50/4 to 50/2 were recorded in the SWR.

Subsurface Water

Subsurface water for the purposes of this report is defined as water encountered below the existing ground surface. Subsurface water was not encountered during drilling or upon removal of the augers at the boring locations. Fluctuations in subsurface water levels and soil moisture can be anticipated with changes in precipitation, run-off, and season.

LIMITATIONS

This report has been prepared for the exclusive use of Ramboll Americas Engineering Solutions, Inc. and/or their agents, for specific application to the Briarwood Water Main Replacement project located in Albemarle County, Virginia, in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made. These conclusions and recommendations do not reflect variations in subsurface conditions, which could exist in unexplored areas of the site.

There are important limitations to this and all geotechnical studies. Some of these limitations are discussed in the information prepared by GBA, which is attached at the end of this report. We ask that you please review this GBA information.

Regardless of the thoroughness of a subsurface exploration, there is the possibility that conditions will differ from those at the boring locations, that conditions are not as anticipated by the designers, or that the construction process has altered the soil conditions. Therefore, experienced geotechnical engineers should evaluate earthwork and foundation construction to verify that the conditions anticipated in design actually exist. Otherwise, we assume no responsibility for construction compliance with the design concepts, specifications, or recommendations.

In the event changes are made in the proposed construction plans, the recommendations presented in this report shall not be considered valid unless reviewed by our firm and conclusions of this report modified or verified in writing. If this report is copied or transmitted to a third party, it must be copied or transmitted in its entirety, including text and attachments. Interpretations based on only a part of this report may not be valid. This report contains 7 pages of text and the listed attachments.

ACKNOWLEDGMENT

Froehling & Robertson, Inc. appreciates the opportunity to be a member of your team for this project and is prepared to assist with the recommended engineering evaluations and testing services during construction. Please call if you have questions or if we can be of additional service.

Sincerely,

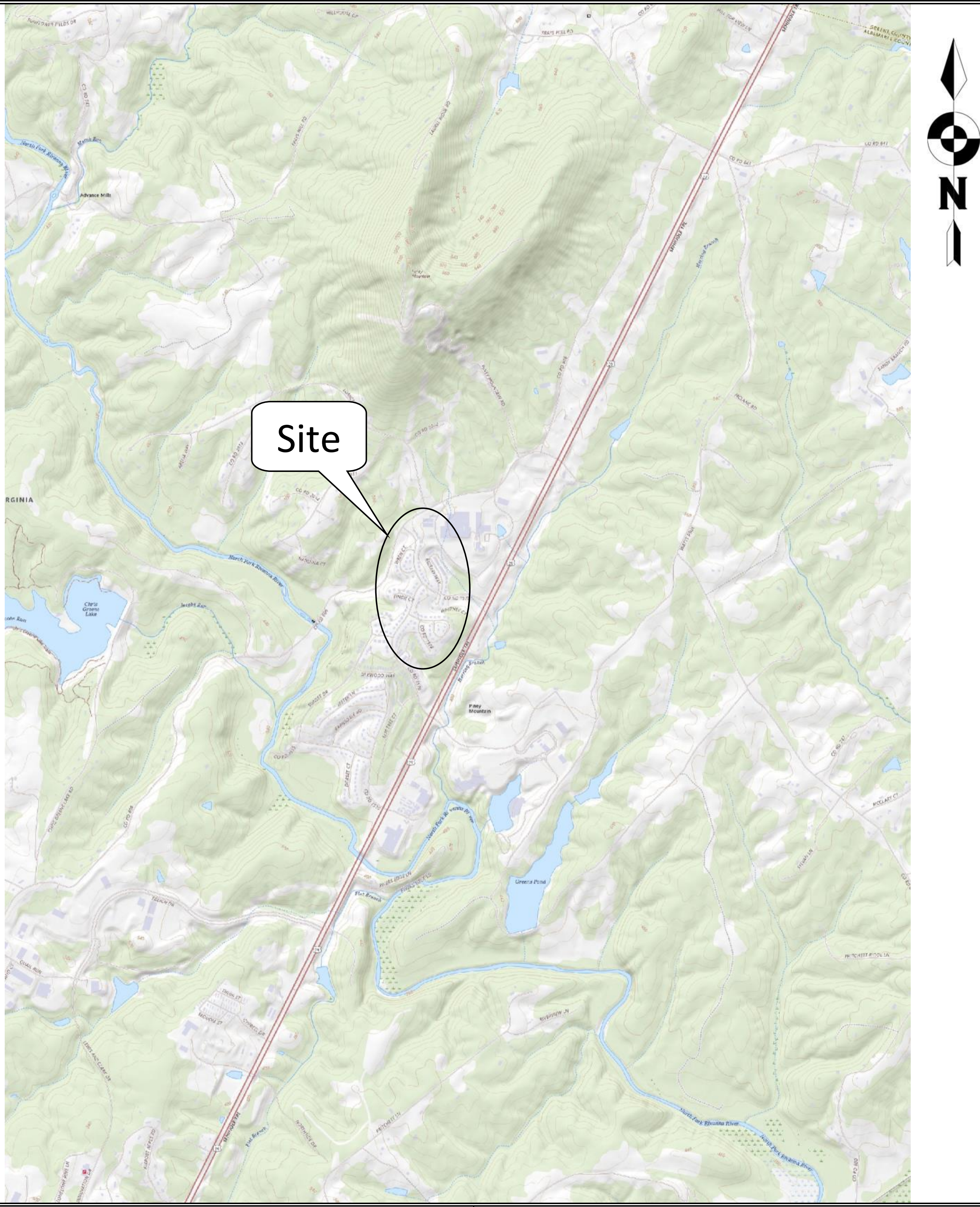
FROEHLING & ROBERTSON, INC.

Evan Bond
Staff Engineer

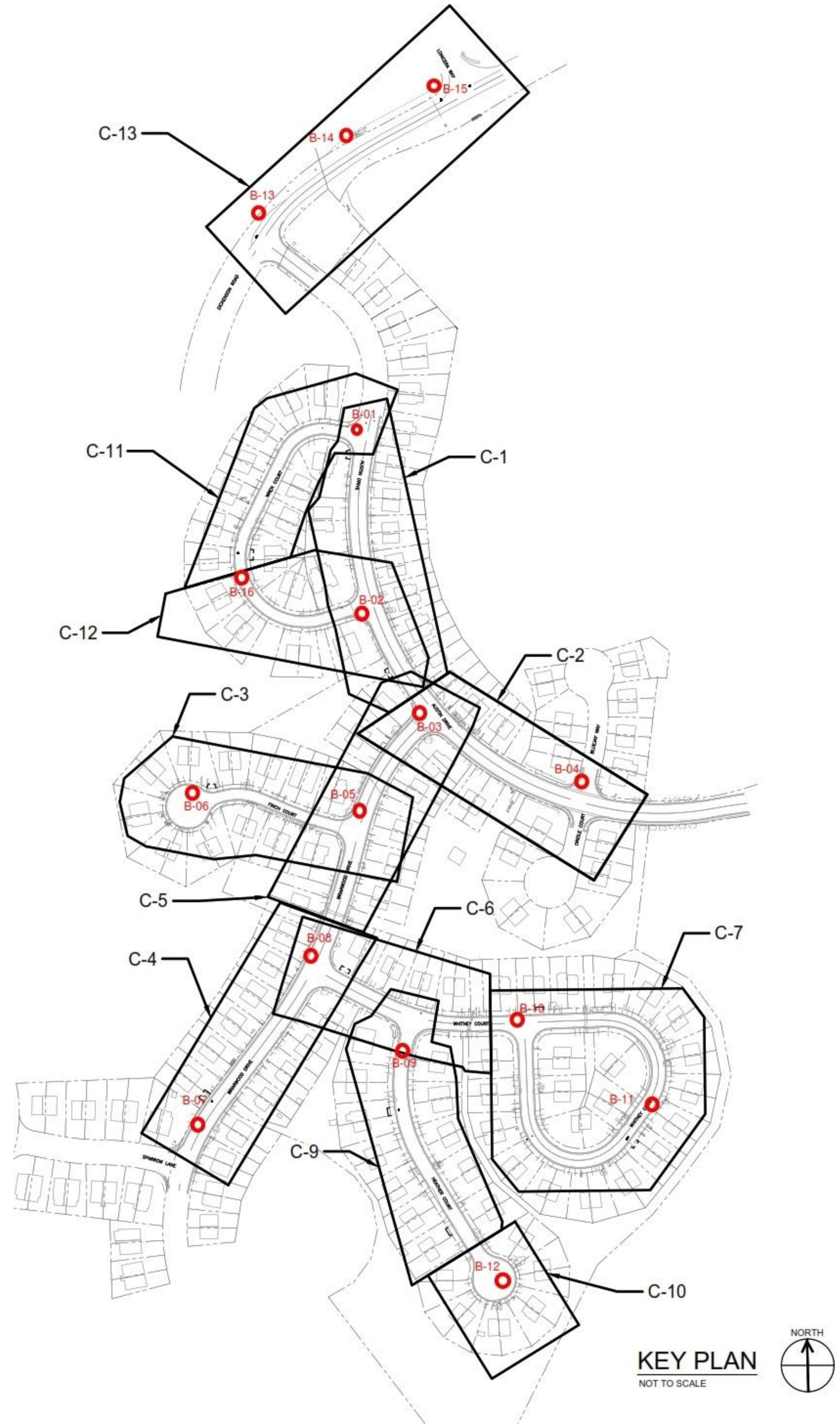
Matthew E. DuBois, P.E.
Senior Engineer

Attachments: Site Vicinity Map (Drawing No. 1)
Boring Location Plan (Drawing No. 2)
Standard Test Boring Method
Key to Boring Log Soil Classification
Classification of Soils for Engineering Purposes
Soil Classification Chart
Boring Logs
GBA Important Information about Your Geotechnical Report

J:\Projects 71C\71C0069 (Briarwood Water Main Replacement)\Reports\71C0069 Briarwood Water Main Replacement - Report.docx



FROEHLING & ROBERTSON, INC.	Site Location Plan
Engineering Stability Since 1881	Client: Ramboll Americas Engineering Solutions, Inc.
6185 Rockfish Gap Turnpike	Project: Briarwood Water Main Replacement Project
Crozet, Virginia 22932-3330	F&R Project No. 71C0069
T 434.823.5154 I F 434.823.4764	Date: June 2024 · Scale: No Scale · Drawing No.: 1



FROEHLING & ROBERTSON, INC

Engineering Stability Since 1881

6185 Rockfish Gap Turnpike, Crozet, VA 22932

T 434.823.5154 | F 434.823.4764

Boring Location Plan

Client: Ramboll Americas Engineering Solutions, Inc.

Project: Briarwood Water Main Replacement

F&R Project No.: 71C0069

Date: June 2024

Scale: None

Drawing No.

2

STANDARD TEST BORING METHODS

The test borings were performed in accordance with generally accepted practice using CME-55 rotary drill rig equipped with an automatic hammer. Hollow-stem augers were advanced to pre-selected depths, the center plug was removed, and disturbed soil samples were recovered with a standard split-spoon sampler (1.375 in. ID, 2.0 in. OD) in general accordance with ASTM D 1586, the Standard Penetration Test. In this test, a weight of 140 pounds is freely dropped from a height of 30 inches to drive the sampler into the soil. The number of blows required to drive the sampler three consecutive 6-inch increments is recorded, and the blows of the last two increments are added to obtain the Standard Penetration Resistance (N-value). In some instances, the sampler is driven a fourth increment to provide additional information regarding the subsurface soils.

The test borings were advanced through the soil overburden by soil drilling procedures to auger refusal. Subsurface water level readings were taken in the boring immediately upon completion of the drilling process. Upon completion of drilling, the borehole was backfilled with auger cuttings (soil) and patched with cold patch asphalt. Periodic observation of the borehole should be performed to monitor subsidence at the ground surface, as the borehole backfill could settle over time.

Representative portions of the split-spoon soil samples obtained throughout the exploration program were placed in glass jars and transported to our laboratory. In the laboratory, the soil samples were evaluated by a member of our professional staff in general accordance with techniques outlined in the visual-manual identification procedure (ASTM D 2488) and the Unified Soil Classification System. The soil descriptions and classifications discussed in this report and shown on the attached boring logs are based on visual observation and should be considered approximate.

Split-spoon soil samples recovered on this project will be stored at F & R's office for a period of sixty days. After sixty days, the samples will be discarded unless prior notification is provided to us.

KEY TO BORING LOG SOIL CLASSIFICATION

Particle Size and Proportion

Verbal descriptions are assigned to each soil sample or stratum based on estimates of the particle size of each component of the soil and the percentage of each component of the soil.

Particle Size Descriptive Terms		Proportion Descriptive Terms		
Soil Component	Particle Size	Component	Term	Percentage
Boulder	> 12 inch	Major	Uppercase Letters	>50%
Cobble	3 – 12 inch		(e.g., SAND, CLAY)	
Gravel-Coarse	¾ - 3 inch			
-Fine	#4 – ¾ inch	Secondary	Adjective	20%-50%
Sand-Coarse	#10 - #4		(e.g. sandy, clayey)	
-Medium	#40 - #10			
-Fine	#200 - #40	Minor	Some	15%-25%
Silt (non-cohesive)	< #200		Little	5%-15%
Clay (cohesive)	< #200		Trace	0%-5%

Notes:
1. Particle size is designated by U.S. Standard Sieve Sizes
2. Because of the small size of the split spoon sampler relative to the size of gravel, the true percentage of gravel may not be accurately estimated.

Density or Consistency

The standard penetration resistance values (N-values are used to describe the density of coarse-grained soils (GRAVEL, SAND) or the consistency of fine-grained soils (SILT, CLAY). Sandy silts of very low plasticity may be assigned a density instead of a consistency.

DENSITY		CONSISTENCY	
Term	N-Value	Term	N-Value
Very Loose	0 – 4	Very Soft	0 – 1
Loose	5 – 10	Soft	2 – 4
Medium-Dense	11 – 30	Medium Stiff	5 – 8
Dense	31 – 50	Stiff	9 – 15
Very Dense	> 50	Very Stiff	16 – 30
		Hard	>30

Notes:
1. The N-value is the number of blows of a 140 lb. hammer freely falling 30 inches required to drive a standard split-spoon sampler (2.0 in. O.D., 1-3/8 in. I.D.) 12 inches into the soil after properly seating the sampler 6 inches.
2. When encountered, gravel may increase the N-value of the standard penetration test and may not accurately represent the in-situ density or consistency of the soil sampled.

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

ASTM Designation: D 2487

(Based on Unified Soil Classification System)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification	
				Group Symbol	Group Name [B]
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve	Gravels More than 50% coarse fraction retaining on No. 4 sieve	Clean Gravels Less than 5% fines [c]	$Cu \ge 4$ and $1 \le Cc \le 3$ [E]	GW	Well graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]	GP	Poorly graded gravel [F]
		Gravels with Fines More than 12 % fines [c]	Fines classify as ML or MH	GM	Silty gravel [F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel [F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines [D]	$Cu \ge 6$ and $1 \le Cc \le 3$ [E]	SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]	SP	Poorly graded sand [I]
		Sands with Fines More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G,H,I]
			Fines classify as CL or CH	SC	Clayey sand [G,H,I]
FINE-GRAINED SOILS 50% or more passes the No. 200 sieve	Silts and Clays Liquid Limit less than 50	Inorganic	PI > 7 and plots on or above "A" line [J]	CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K,L,M]
		Organic	<u>Liquid limit - ovendried</u> <0.75 Liquid limit - not dried	OL	Organic clay [K,L,M,N]
					Organic silt [K,L,M,O]
	Silts and Clays Liquid Limit 50 or more	Inorganic	PI plots on or above "A" line	CH	Fat clay [K,L,M]
			PI plots below "A" line	MH	Elastic silt [K,L,M]
		Organic	<u>Liquid limit - ovendried</u> <0.75 Liquid limit - not dried	OH	Organic clay [K,L,M,P]
					Organic silt [K,L,M,Q]
HIGHLY ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-in (75 mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

[D] Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $Cc = (D_{30})^2/(D_{10}*D_{60})$

[F] If soil contains ≥ 15% sand, add "with sand" to the group name

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM

[H] If fines are organic, add "with organic fines" to the group name

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name

[J] If Atterberg limits plot in hatched area, soils is a CL-ML, silty clay

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant

[L] If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name

[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name

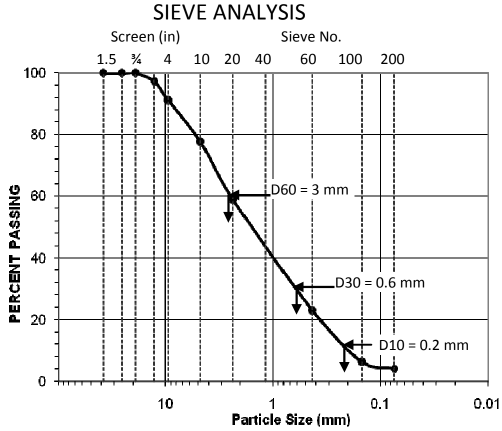
[N] PI ≥ 4 and plots on or above "A" line

[O] PI < 4 or plots below "A" line

[P] PI plots on or above "A" line

[Q] PI plots below "A" line

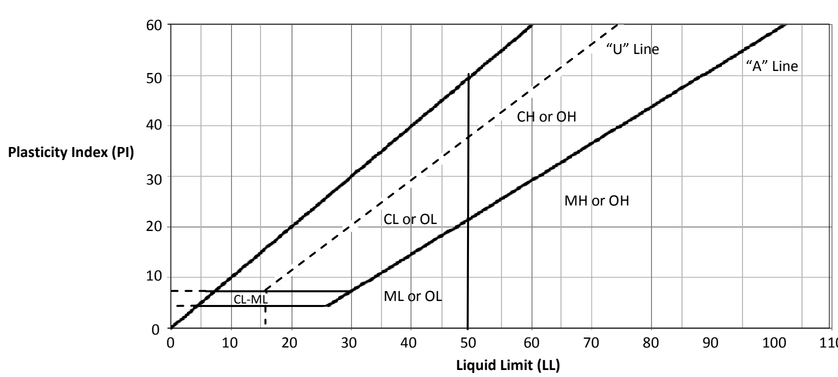
SIEVE ANALYSIS



$Cu = D_{60}/D_{10} = (3/0.2) = 15$

$Cc = (D_{30})^2/(D_{10}*D_{60}) = (0.6^2)/(0.2*3) = 0.6$

For classification of fine-grained soils and fine-grained fraction of coarse-grained soils:



Equation of "A" line: Horizontal at PI = 4 to LL = 22.5, then PI = 0.73*(LL-20)

Equation of "U" line: Vertical at LL = 16 to PI = 7, then PI = 0.9*(LL-8)

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
EXISTING FILL				FILL	EXISTING FILL MATERIALS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

BORING LOG

Boring: B-01 (1 of 1)

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Project No: 71C0069
Client: Ramboll Americas Engineering Solutions, Inc
Project: Briarwood Water Main Replacement
City/State: Albemarle County, Virginia
Elevation: 506 ±
Total Depth: 6.5'
Boring Location: See Boring Location Plan
Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 5/30/24
Driller: A. Wilhelm

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
		4-1/2 Inches Asphalt				
505.6	0.4	10 Inches Aggregate Base Course	4-4-4 -5	0.5	8	
504.8	1.2	Orange-brown, Moist, Loose, Silty SAND (SM), Little Gravel, Micaceous **RESIDUUM**				
503.5	2.5	Brown and Tan, Moist, Loose, Silty SAND (SM), Trace Gravel, Micaceous **RESIDUUM**	3-5-5 -5	2.5	10	
			3-4-6 -7	4.5	10	
499.5	6.5	Boring Terminated at 6.5 Feet		6.5		

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

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BORING LOG

Boring: B-02 (1 of 1)

Project No: 71C0069
Client: Ramboll Americas Engineering Solutions, Inc
Project: Briarwood Water Main Replacement
City/State: Albemarle County, Virginia

Elevation: 510 ±
Total Depth: 6.5'
Boring Location: See Boring Location Plan

Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 5/31/24
Driller: A. Wilhelm

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
		4-1/2 Inches Asphalt				
509.6	0.4	10 Inches Aggregate Base Course	4-3-3 -5	0.5	6	
508.8	1.2	Red-brown, Moist, Medium Stiff to Stiff, Sandy Elastic SILT (MH), Micaceous **RESIDUUM**				
			4-4-5 -7	2.5	9	
			3-4-6 -7	4.5	10	
503.5	6.5	Boring Terminated at 6.5 Feet		6.5		

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

BORING LOG

Boring: B-03 (1 of 1)

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Project No: 71C0069
Client: Ramboll Americas Engineering Solutions, Inc
Project: Briarwood Water Main Replacement
City/State: Albemarle County, Virginia

Elevation: 504 ±
Total Depth: 6.5'
Boring Location: See Boring Location Plan

Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 5/30/24
Driller: A. Wilhelm

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
		5 Inches Asphalt				
503.6	0.4	12-Inches Aggregate Base Course	13-13-7-6	0.5	20	
502.6	1.4	Tan, Moist, Medium Dense, Silty SAND (SM), Micaceous **RESIDUUM**				
501.5	2.5	Tan and White, Moist, Loose to Medium Dense, Silty SAND (SM), Micaceous **RESIDUUM**	3-4-5-6	2.5	9	
			4-7-7-9	4.5	14	
497.5	6.5	Boring Terminated at 6.5 Feet		6.5		

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

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Engineering Stability Since 1881

BORING LOG

Boring: B-04 (1 of 1)

Project No: 71C0069
Client: Ramboll Americas Engineering Solutions, Inc
Project: Briarwood Water Main Replacement
City/State: Albemarle County, Virginia

Elevation: 475 ±
Total Depth: 6.5'
Boring Location: See Boring Location Plan

Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 5/30/24
Driller: A. Wilhelm

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
474.8	0.2	2-1/2 Inches Asphalt				
		10 Inches Aggregate Base Course	4-4-4-4	0.5	8	
474.0	1.0	Orange-brown, Moist, Medium Stiff, Sandy SILT (ML), Contains Organics, Micaceous **FILL**				
472.5	2.5	Orange-brown, Moist, Medium Stiff, Elastic SILT (MH), Some Sand, Micaceous **FILL**	2-3-5-5	2.5	8	
			3-3-4-5	4.5	7	
468.5	6.5	Boring Terminated at 6.5 Feet		6.5		

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

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Engineering Stability Since 1881

BORING LOG

Boring: B-05 (1 of 1)

Project No: 71C0069
Client: Ramboll Americas Engineering Solutions, Inc
Project: Briarwood Water Main Replacement
City/State: Albemarle County, Virginia

Elevation: 506 ±
Total Depth: 6.5'
Boring Location: See Boring Location Plan

Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 5/30/24
Driller: A. Wilhelm

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
		5-1/2 Inches Asphalt				
505.5	0.5	11-1/2 Inches Aggregate Base Course	9-11-20 -22	0.5	31	
504.6	1.4	Tan and White, Moist, Dense, Silty SAND (SM), Some Gravel, Micaceous **RESIDUUM**				
			7-7-8 -9	2.5	15	
503.0	3.0	Red-brown and Tan, Moist, Medium Dense, Silty SAND (SM), Some Gravel, Micaceous **RESIDUUM**				
501.5	4.5	Dark-brown and Red-brown, Moist, Dense, Silty SAND (SM), Micaceous **RESIDUUM**	16-17-25 -27	4.5	42	
499.5	6.5	Boring Terminated at 6.5 Feet		6.5		

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

BORING LOG 71C0069.GPJ F&R.GDT 6/14/24

FROEHLING & ROBERTSON
Engineering Stability Since 1881

BORING LOG

Boring: B-06 (1 of 1)

Project No: 71C0069
Client: Ramboll Americas Engineering Solutions, Inc
Project: Briarwood Water Main Replacement
City/State: Albemarle County, Virginia

Elevation: 495 ±
Total Depth: 6.5'
Boring Location: See Boring Location Plan

Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 5/30/24
Driller: A. Wilhelm

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
494.8	0.2	2-1/2 Inches Asphalt				
494.2	0.8	6-1/2 Inches Aggregate Base Course	4-19-42 -50/4	0.5	61	
493.0	2.0	Red-brown, Moist, Very Stiff, Sandy Elastic SILT (MH), Some Gravel, Contains Organics, Micaceous **FILL**				
490.5	4.5	Soft Weathered Rock becomes Tan and White, Moist, Very Dense, Silty SAND (SM), Micaceous **SOFT WEATHERED ROCK**	35-50/3	2.3 2.5 3.3	100+	
488.5	6.5	Soft Weathered Rock becomes Brown, Moist, Very Dense, Silty SAND (SM), Micaceous **SOFT WEATHERED ROCK**	50/2	4.5 4.7	100+	
		Boring Terminated at 6.5 Feet				

BORING_LOG 71C0069.GPJ F&R.GDT 6/14/24

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

FROEHLING & ROBERTSON
Engineering Stability Since 1881

BORING LOG

Project No: 71C0069
Client: Ramboll Americas Engineering Solutions, Inc
Project: Briarwood Water Main Replacement
City/State: Albemarle County, Virginia
Elevation: 512 ±
Total Depth: 6.5'
Boring Location: See Boring Location Plan
Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 5/29/24
Driller: A. Wilhelm

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
		6 Inches Asphalt				
511.5	0.5	10 Inches Aggregate Base Course	12-13-5-4	0.5	18	
510.7	1.3	Brown, Moist, Very Stiff to Stiff, Sandy Elastic SILT (ML), Micaceous **RESIDUUM**	3-4-6-6	2.5	10	
508.5	3.5	Light Brown, Moist, Stiff, Sandy SILT (ML), Micaceous **RESIDUUM**	4-5-6-7	4.5	11	
505.5	6.5	Boring Terminated at 6.5 Feet		6.5		

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

FROEHLING & ROBERTSON
Engineering Stability Since 1881

BORING LOG

Boring: B-08 (1 of 1)

Project No: 71C0069
Client: Ramboll Americas Engineering Solutions, Inc
Project: Briarwood Water Main Replacement
City/State: Albemarle County, Virginia

Elevation: 505 ±
Total Depth: 6.5'
Boring Location: See Boring Location Plan

Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 5/29/24
Driller: A. Wilhelm

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
		5 Inches Asphalt				
504.6	0.4	10 Inches Aggregate Base Course	11-10-4-5	0.5	14	
503.7	1.3	Dark Red-brown and Gray, Moist, Stiff, Sandy Lean CLAY (CL), Some Gravel, Micaceous **FILL**				
502.5	2.5	Red-brown, Moist, Medium Stiff, Sandy Fat CLAY (CH), Trace Gravel, Contains Organics, Micaceous **FILL**	2-2-6-7	2.5	8	
			4-6-7-9	4.5	13	
500.3	4.8	Red-brown, Moist, Stiff, Sandy SILT (ML), Miaceous **RESIDUUM**				
498.5	6.5	Boring Terminated at 6.5 Feet		6.5		

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

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Engineering Stability Since 1881

BORING LOG

Boring: B-09 (1 of 1)

Project No: 71C0069
Client: Ramboll Americas Engineering Solutions, Inc
Project: Briarwood Water Main Replacement
City/State: Albemarle County, Virginia

Elevation: 500 ±
Total Depth: 6.5'
Boring Location: See Boring Location Plan

Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 5/29/24
Driller: A. Wilhelm

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
		3 Inches Asphalt				
499.7	0.3	7 Inches Aggregate Base Course	4-5-4 -5	0.5	9	
499.2	0.8	Red-brown and Tan, Moist, Stiff to Medium Stiff, Sandy Elastic SILT (MH), Trace Gravel, Micaceous **RESIDUUM**				
			3-3-3 -6	2.5	6	
495.5	4.5	Orange-brown and White, Moist, Loose, Silty SAND (SM), Micaceous **RESIDUUM**	3-3-3 -4	4.5	6	
493.5	6.5	Boring Terminated at 6.5 Feet		6.5		

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

BORING_LOG 71C0069.GPJ F&R.GDT 6/14/24

BORING LOG

Boring: B-10 (1 of 1)

FROEHLING & ROBERTSON
Engineering Stability Since 1881

Project No: 71C0069
Client: Ramboll Americas Engineering Solutions, Inc
Project: Briarwood Water Main Replacement
City/State: Albemarle County, Virginia

Elevation: 497 ±
Total Depth: 6.5'
Boring Location: See Boring Location Plan

Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 5/29/24
Driller: A. Wilhelm

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
496.8	0.2	2-1/2 Inches Asphalt				
		7 Inches Aggregate Base Course	8-6-5 -8	0.5	11	
496.2	0.8	Orange-brown and White, Moist, Stiff, Sandy SILT (ML), Trace Gravel, Micaceous **FILL**				
494.5	2.5	Red-brown, Moist, Stiff, Sandy Elastic SILT (MH), Micaceous **FILL**	4-5-6 -6	2.5	11	
492.5	4.5	Orange-brown, Moist, Medium Stiff, Sandy SILT (ML), Trace Gravel, Contains Root Fragments, Micaceous **RESIDUUM**	3-2-4 -6	4.5	6	
490.5	6.5	Boring Terminated at 6.5 Feet		6.5		

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

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Engineering Stability Since 1881

BORING LOG

Boring: B-11 (1 of 1)

Project No: 71C0069
Client: Ramboll Americas Engineering Solutions, Inc
Project: Briarwood Water Main Replacement
City/State: Albemarle County, Virginia

Elevation: 499 ±
Total Depth: 6.5'
Boring Location: See Boring Location Plan

Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 5/29/24
Driller: A. Wilhelm

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
498.8	0.2	2-1/2 Inches Asphalt				
		10 Inches Aggregate Base Course	5-6-6 -5	0.5	12	
498.0	1.0	Brown and Red-brown, Moist, Stiff, Sandy SILT (ML), Trace Gravel, Micaceous **FILL**				
496.5	2.5	Red-brown, Moist, Stiff, Fat CLAY (CH), Some Sand, Contains Organics and Root Fragments, Micaceous **FILL**	3-4-5 -6	2.5	9	
494.5	4.5	Red-brown, Moist, Stiff, Sandy SILT (ML), Micaceous **RESIDUUM**	4-5-6 -6	4.5	11	
492.5	6.5	Boring Terminated at 6.5 Feet		6.5		

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

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Engineering Stability Since 1881

BORING LOG

Project No: 71C0069
Client: Ramboll Americas Engineering Solutions, Inc
Project: Briarwood Water Main Replacement
City/State: Albemarle County, Virginia

Elevation: 486 ±
Total Depth: 6.5'
Boring Location: See Boring Location Plan

Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 5/29/24
Driller: A. Wilhelm

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
		3-1/2 Inches Asphalt				
485.7	0.3	10 Inches Aggregate Base Course	9-3-3-5	0.5	6	
484.9	1.1	Red-brown, Moist, Medium Stiff to Stiff, Elastic SILT (MH), Some Sand, Micaceous **RESIDUUM**	5-6-9-11	2.5	15	
481.5	4.5	Red-brown, Moist, Very Stiff, Elastic SILT (MH), Some Sand, Micaceous **RESIDUUM**	5-8-11-11	4.5	19	
479.5	6.5	Boring Terminated at 6.5 Feet		6.5		

BORING_LOG 71C0069.GPJ F&R.GDT 6/14/24

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

BORING LOG

Boring: B-13 (1 of 1)

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Project No: 71C0069
Client: Ramboll Americas Engineering Solutions, Inc
Project: Briarwood Water Main Replacement
City/State: Albemarle County, Virginia

Elevation: 488 ±
Total Depth: 6.0'
Boring Location: See Boring Location Plan

Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 5/31/24
Driller: A. Wilhelm

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
		Surficial Organics	6-7-8 -7	0.0	15	
487.3	0.7	Tan-brown, Moist, Stiff, Sandy SILT (ML), Trace Gravel, Micaceous **RESIDUUM**				
486.0	2.0	Tan-brown, Moist, Loose, Silty SAND (SM), Micaceous **RESIDUUM**	8-5-5 -6	2.0	10	
			2-3-3 -6	4.0	6	
482.0	6.0	Boring Terminated at 6 Feet		6.0		

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

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Engineering Stability Since 1881

BORING LOG

Boring: B-14 (1 of 1)

Project No: 71C0069
Client: Ramboll Americas Engineering Solutions, Inc
Project: Briarwood Water Main Replacement
City/State: Albemarle County, Virginia

Elevation: 498 ±
Total Depth: 6.0'
Boring Location: See Boring Location Plan

Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 5/31/24
Driller: A. Wilhelm

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
		Surficical Organics	2-3-4 -3	0.0	7	
497.2	0.8	Brown, Moist, Loose, Silty SAND (SM), Some Gravel, Micaceous **FILL**				
496.0	2.0	Brown, Moist, Medium Stiff, Sandy SILT (ML), Trace Gravel **RESIDUUM**	2-3-2 -3	2.0	5	
494.0	4.0	Orange-brown, Moist, Loose, Silty SAND (SM), Little Gravel, Micaceous **RESIDUUM**	3-3-3 -3	4.0	6	
492.0	6.0	Boring Terminated at 6 Feet		6.0		

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

FROEHLING & ROBERTSON
Engineering Stability Since 1881

BORING LOG

Boring: B-15 (1 of 1)

Project No: 71C0069
Client: Ramboll Americas Engineering Solutions, Inc
Project: Briarwood Water Main Replacement
City/State: Albemarle County, Virginia

Elevation: 506 ±
Total Depth: 6.0'
Boring Location: See Boring Location Plan

Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 5/31/24
Driller: A. Wilhelm

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
		Surficial Organics	2-3-3-3	0.0	6	
505.3	0.7	Brown, Moist, Medium Stiff, Elastic SILT (MH), Trace Gravel, Contains Organics and Root Fragments, Micaceous **FILL**				
504.0	2.0	Brown and Orange-brown, Moist, Medium Stiff, SILT (ML), Trace Sand, Micaceous **RESIDUUM**	2-3-4-7	2.0	7	
502.0	4.0	Dark Brown and Orange-brown, Moist, Medium Dense, Silty SAND (SM), Little Gravel, Micaceous **RESIDUUM**	4-7-6-8	4.0	13	
500.0	6.0	Boring Terminated at 6 Feet		6.0		

BORING LOG 71C0069.GPJ F&R.GDT 6/14/24

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

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Engineering Stability Since 1881

BORING LOG

Boring: B-16 (1 of 1)

Project No: 71C0069
Client: Ramboll Americas Engineering Solutions, Inc
Project: Briarwood Water Main Replacement
City/State: Albemarle County, Virginia

Elevation: 500 ±
Total Depth: 6.5'
Boring Location: See Boring Location Plan

Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 5/30/24
Driller: A. Wilhelm

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
		3 Inches Asphalt				
499.7	0.3	8 Inches Aggregate Base Course	4-4-5-7	0.5	9	
499.1	0.9	Brown and Red-brown, Moist, Loose, Silty SAND (SM), Some Gravel **FILL**				
497.5	2.5	Red-brown, Moist, Stiff, Sandy Elastic SILT (MH), Some Gravel, Micaceous **FILL**	4-5-5-6	2.5	10	
495.5	4.5	Orange-brown, Moist, Stiff, Sandy SILT (ML), Micaceous **RESIDUUM**	3-4-5-7	4.5	9	
493.5	6.5	Boring Terminated at 6.5 Feet		6.5		

BORING LOG 71C0069.GPJ F&R.GDT 6/14/24

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

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