Geotechnical Engineering Report

Fluvanna Fire Department
Safety Training Building, Fork Union
Fluvanna County, Virginia

Underhill Project No. 18060

October 25, 2018

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Exhibit B.7

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October 25, 2018

Mr. Benjamin Powell
Fluvanna County Volunteer Fire Department
112 4th Street, NE
Charlottesville, VA 22902

Subject: **Geotechnical Engineering Report, Fluvanna Fire Department Safety Training, Fork Union, Fluvanna County, Virginia (Underhill Engineering Project No. 18060)**

Dear Mr. Powell:

Underhill Engineering, LLC (Underhill) is pleased to present this Geotechnical Engineering Report for the above referenced project. The geotechnical engineering services for this project are provided in accordance with Underhill Engineering's proposal dated August 27, 2018. We proceeded with services based on the Purchase Order 20190008-00 FY 2019, provided by the Fluvanna County Finance Department.

Thank you for the opportunity to provide our services. If you have any questions or require additional information, please do not hesitate to contact the undersigned.

Sincerely,

UNDERHILL ENGINEERING, LLC

Susan E. Ray, EIT, GIT
Staff Geotechnical Engineer

O. Christopher Webster, PE
Principal

COMMONWEALTH OF VIRGINIA
O. CHRISTOPHER WEBSTER
Lic. No. 019910
PROFESSIONAL ENGINEER

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GEOTECHNICAL ENGINEERING REPORT
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1.0 Executive Summary

This report presents the results of the subsurface exploration, soil laboratory testing, and geotechnical engineering analysis for the project site. A summary of our recommendations follows:

- Shallow strip footings are suitable for support of the proposed building when footings bear in competent natural materials (Strata A2, A3, or B residuum) or on select compacted structural fill as recommended herein. A net allowable soil bearing pressure of **2,500 PSF** should be considered for the footing design.
- Laboratory testing indicates that the on-site fine-grained soils exhibit a medium to high potential for moisture-related volume change. Footings may be founded in these materials provided that the bottom of the footings extend at least 4 feet below surrounding grades (the depth of local seasonal moisture change). Specific recommendations to address the shrink-swell soil conditions are included in the body of this report.
- Boring B-2 revealed a layer of loose silty sand (SM) (designated as Stratum A1) to 2 feet below the ground surface. These soils are considered unsuitable for support of the new building slab. Therefore, these soils should be removed and replaced with new compacted structural fill, or scarified, aerated, and recompacted in place.
- Although shallow ground water was not encountered, surface water was observed ponded on portions of the site. Therefore, it will be important for the site grading to provide a positive slope away from the building area and the building's footings should include a draintile (subdrain) to convey water away from the building.

Underhill is providing this Executive Summary solely as an overview of our findings and recommendations. Any party that relies of this report must read the full report since the Executive Summary omits several details, including those that are important to the proper interpretation and application of the report.

2.0 Scope of Services

Underhill's August 27, 2018 proposal authorized by the County's Purchase Order 20190008-00 FY 2019, defines the scope of services for this project. The scope is limited to the Geotechnical Engineering Services as presented therein.

3.0 Site Information

3.1 Site Description

The project is located on the west side of James Madison Highway (U. S. Route 15 / 6) in the unincorporated community of Fork Union in Fluvanna County, Virginia. The site for the proposed project is west of the Fork Union Community Center and southwest of the Fork Union Fire Station. Topographic data were not available for the site as of this writing. However, the site is relatively level and was recently cleared.

3.2 Proposed Construction

Proposed for construction is a new Public Safety Training site, to consist of a structural fire training building. Plan dimensions of the proposed building are about 70 by 52 ft. The two-story structure will include about 2,134 SF. The building will include a 15-ft wide concrete apron on two sides. The foundation for the building is planned as a concrete turn-down slab. Underhill understands that the design has considered a Seismic Site Class of D. Underhill has developed the proposed scope of services as presented herein considering the information provided by the Fluvanna County Volunteer Fire Department.

4.0 Field Services

4.1 Subsurface Exploration Program

Underhill's geotechnical engineering study included a subsurface exploration program consisting of two mechanically-advanced test borings. The subsurface exploration program was performed to evaluate the subsurface conditions and develop generalized stratigraphy at the test hole locations. The evaluation of the soils' characteristics included visual and limited laboratory classification and evaluation of density or stiffness based on the results of the Standard Penetration Test (SPT) N values obtained.

Underhill's drilling subcontractor, Ayers and Ayers, Inc., drilled the test borings on September 28, 2018, under the observation of Underhill's Engineer. The approximate locations of the test borings are presented in Figure 2, following the text of this report. The test boring logs are included in Appendix A. Soil samples retrieved from the subsurface exploration program will be held for 45 days unless the Client requests other disposition.

5.0 Site Geology, Subsurface Conditions, and Soil Laboratory Testing

5.1 Site Geology

Underhill's review of the available geologic data, including the state geologic map of Virginia, indicates the site geology consists of the Proterozoic-age Carysbrook Pluton, which features medium to coarse grained biotite granite that is variably foliated. The site's overburden consists of residuum (commonly silts, sands, and disintegrated rock) overlying the parent material.

5.2 Generalized Subsurface Stratigraphy

Underhill developed the following generalized subsurface stratigraphy based on the results of the subsurface exploration program, the soil laboratory test results, and our review of the local geology:

Topsoil:

- Only limited topsoil was observed on the site. However, stumps remain that will require grubbing. Therefore, we recommend that an average stripping depth of 6 inches be considered to remove the remaining vegetative materials.

Stratum A1 (Loose Silty Sand Residuum):

- Stratum A1 consists of loose SILTY SAND (SM), containing root fragments.
- Boring B-2 revealed Stratum A1 to 2 feet below the ground surface.
- SPT = 5.

Stratum A2 (Fine-grained Residuum):

- Stratum A2 consists of generally stiff to very stiff ELASTIC SILT (MH) and SILT (ML), containing varying amounts of sand.
- The borings revealed A2 from the ground surface and below Stratum A1 to a depth of 4 feet.
- Standard Penetration Test (SPT) N values = 15 to 22.
- Natural Water Content (W) values = 14.5% to 26.8% (from three samples tested).

Stratum A3 (Coarse-grained Residuum):

- Stratum A3 consists of very loose to very dense fine to medium SILTY SAND (SM).
- The borings revealed Stratum A3 below Stratum A2 to depth of 7 to 7.5 feet.
- SPT = 35 to 46.
- W = 14.5% (from one sample tested).

Stratum B (Disintegrated Rock Residuum):

- Stratum B consists of DISINTEGRATED ROCK residuum.
- The borings revealed Stratum B below Strata A2 and A3 to the maximum depth of penetration, 18.9 and 19.9 feet.
- SPT = 63 to 50/2.5."

5.3 Groundwater

Groundwater was not encountered during drilling or at completion of the borings. Borings B-1 and B-2 caved dry at depths of 13 and 12 feet below the ground surface following removal of the augers, respectively. At the time of drilling, water was ponded on the surface throughout much of the site. Fluctuations in the hydrostatic water table should be expected to occur over time, depending on

variations in precipitation, surface runoff, pumping, flooding, evaporation, stream levels, and similar factors.

5.4 Laboratory Testing

Selected specimens were retrieved from the subsurface exploration program for soil laboratory testing. Soil laboratory testing assigned by Underhill consisted of the following:

- Four natural water contents (ASTM D2216),
- Two Atterberg Limits tests (ASTM D4318), and
- Two gradation tests (Percent Passing No. 40 and 200 Sieves after ASTM D422/D1140)

The soil laboratory testing was performed to aid in the classification of the soils encountered in the subsurface exploration program, and to provide index test values for use in the development of design recommendations. Laboratory testing was performed by Underhill's subconsultant laboratory, Schnabel Engineering, and reviewed and interpreted by Underhill.

Natural water content values of specimens tested are presented in the respective logs and summarized above in Section 5.2. A summary of the soil laboratory test results is included in Appendix B.

Soil laboratory index testing indicated the following for specimens retrieved from Stratum A2:

- ASTM Classification: ELASTIC SILT with sand (MH) and sandy SILT (ML)
- AASHTO Classification: A-7-5 (clayey soils) and A-4 (silt soils)
- Liquid Limit values: 42 and 68
- Plasticity Index (PI) values: 15 and 32
- Plasticity of the Whole Sample (PI multiplied by the Percent Passing the No. 40 Sieve): 12 to 27
- The natural water content values of these specimen were near to 10 percent dry of their Plastic Limit values.
- Moisture-related Volume Change Potential (shrink-swell) (NAVFAC DM-7): **Medium to High**

6.0 Geotechnical Recommendations

6.1 Earthwork

6.1.1 Stripping and Grading

The contractor should remove the existing, stumps, vegetation, and the limited topsoil from subgrades to receive compacted structural fill for building and pavement support. Based on the observation of the need for grubbing, a stripping depth of at least 6 inches is recommended for preliminary planning purposes.

Before any fill placement or undercutting below design subgrade level, the Geotechnical Engineer should evaluate the soils for suitability. Evaluation techniques may include probing with a penetrometer, observing proofrolling by a loaded dump truck, drilling hand augers, observing test pits, or a combination of these methods. The contractor should excavate areas deemed unsuitable by the Geotechnical Engineer and replace these areas with additional compacted structural fill.

Boring B-2 revealed a layer of loose silty sand (SM) of Stratum A1 to 2 feet below the ground surface. These soils are considered unsuitable for support of the new building slab. Therefore, these soils should be removed and replaced with new compacted structural fill, or scarified, aerated, and recompacted in place.

Underhill recommends that undercut volumes by measured using cross sectioning survey methods. Other methods of calculating volumes of undercut, such as counting trucks, are less accurate and generally result in additional expense. If truck counts are used, we recommend that the method of payment be in accordance with *Section 109 of the Virginia Department of Transportation (VDOT) Road and Bridge Specifications.*

6.1.2 Compacted Structural Fill

On-site soils may be re-used as compacted structural fill, provided that these materials are at a moisture content in the range suitable for compaction. In situ natural water content values from 14.5% to 26.8% were obtained for the on-site soils. Although these values suggest that the soils are in the general range of moisture to achieve compaction, depending on the weather conditions at the time of earthwork construction, these soils may be too wet for suitable compaction. Therefore, project planning should schedule the earthwork construction for the drier seasons or consider the need for select fill material imported to the site for use as Compacted Structural Fill.

Off-site borrow material used as Compacted Structural Fill should meet the following criteria:

- ASTM Classification: **CL, ML, SC, SM, SP, SW, GC, GM, GP, or GW.**
- Plasticity Index value: **15 or less.**
- Maximum Dry Density (ASTM D698): minimum **100 PCF.**
- Maximum Particle Size: **3 inches.**
- Laboratory CBR value: minimum **6.**

Compacted Structural Fill should be placed in maximum 8-inch thick horizontal, loose lifts and compacted to at least **95 percent** of maximum dry density in accordance with ASTM D698, Standard

Proctor. The contractor should bench compacted structural fill subgrades steeper than 4H:1V to allow placement of horizontal lifts.

Compacted structural fill should extend laterally at least 3 feet beyond the building limits, and slope as needed to meet existing grades. Slopes constructed of Compacted Structural Fill should not be designed and built steeper than 3H:1V.

6.2 Foundations

6.2.1 Footings

Shallow foundations consisting of strip footings or a perimeter turndown foundation are considered suitable for support of the proposed building. Footings should be founded in competent natural materials of Strata A2, A3, or B; or on new Compacted Structural Fill. Underhill considers these materials to be suitable for the Safety Training Building Bearing Pressure of **2,500 PSF**, provided that footings are founded as recommended herein. For conventional strip footings and turndowns minimum footing widths of 16 inches and 12 inches, respectively, should be maintained for shear considerations. This bearing pressure provides a factor of safety of at least 3.0 against general shear failure. Compacted structural fill should meet the requirements outlined in Section 6.1.2 for Compacted Structural Fill.

Note the recommended bearing pressure may be increased by 33 percent for wind and seismic loads only when used in conjunction with load combinations defined in IBC Section 1605.3.2, Alternate Basic Load Combinations for use with allowable stress design or other applicable code exceptions.

Settlements of shallow spread footings founded as described above are not expected to exceed 1 inch. Differential settlements between similarly loaded footings are not expected to exceed ½ inch.

Correlations of the Plasticity Index of the Whole Sample to Volume Change Potential (NAVFAC DM-7) indicates the soils at the anticipated foundation grade to have a **Medium to High Potential for Shrink-Swell.** Recommendations to address these conditions are as follows:

- Footings should bear in the competent Strata A2, A3, or B residuum with the bottom of footing grades set at least 4 feet below final exterior grade (this grade is also considered adequate for frost protection).
- Grades surrounding the building should be sloped away from the foundation to provide positive drainage and reduce the potential for water ponding next to footings.
- Underhill's Geotechnical Engineer should observe the footing subgrades for adequacy prior to placement of concrete by the contractor.
- Footings should include a subdrain (drain tile) consisting of a min. 4-inch diameter corrugated and slotted polyethylene tubing meeting ASTM F-405. The tubing should be surrounded by washed VDOT No. 57 open-graded stone. The crushed stone should be completely wrapped in non-woven drainage geotextile consisting of Mirafi 140N or an equivalent brand. The resulting subdrain (tubing, crushed stone, and geotextile) should have a cross-sectional dimension of at least 12 inches wide by 12 inches deep. The subdrain should be installed immediately next to turndown foundation or on top of strip footings and constructed to provide positive drainage so that water is conveyed away from the foundation and daylighted.

- The building should include gutters and downspouts. The downspouts should connect to non-perforated tubing to convey roof water at least 10 feet beyond the building limits. The downspouts should not connect to the foundation drainage system.

6.2.2 Seismic Site Class and Site Coefficients

We evaluated the Seismic Site Class and Seismic Site Coefficients for this project according to Virginia Uniform Statewide Building Code's (VUSBC) adoption of IBC Section 1613 (2012). Based on our review, the structural design may use the following seismic criteria:

- Seismic Site Class: **D**
- Site Coefficient, Fa: **1.6**
- Site Coefficient, Fv: **2.4**

6.3 Floor Slabs and Concrete Aprons

The proposed floor slabs and concrete aprons should be supported in Strata A2, A3, or B materials, or on Compacted Structural Fill as described in Section 6.1.2. Slabs on grade and aprons supported on these materials should be designed considering a modulus of subgrade reaction value, **k = 100 pci**. The Contractor should re-compact slab subgrades immediately before placing moisture barrier materials to repair any disturbance that may occur due to construction. Since floors will be slab-on-grade, utility excavations should be backfilled with compacted structural fill as defined in Section 6.1.2.

A 4-inch crushed stone or washed gravel capillary moisture barrier should underlie the slab on grade. Moisture barrier material should consist of VDOT No. 57 crushed stone. The Contractor should compact the stone in place with at least two passes of suitable vibratory compaction equipment.

7.0 Construction Considerations

7.1 Site Grading and Earthwork

The on-site soils are very susceptible to moisture changes, will be easily disturbed, and very difficult to compact under wet weather conditions. Drying and reworking of the soils are likely to be difficult and may not be possible during wet winter months. During periods of extended wet weather, project planning should consider that these soils cannot be effectively dried and should consider the need for importing select fill materials. Therefore, it will be important that the earthwork phases of this project be performed during the warmer, drier times of the year to limit the potential for disturbance of on-site soils and reduce the amount of fill imported to the site.

Traffic on stripped or undercut subgrades should be limited to reduce disturbance of underlying soils. The Contractor should provide site drainage to maintain subgrades free of water and to avoid saturation and disturbance of the subgrade soils before placing compacted structural fill or moisture barrier material. This will be important during all phases of the construction work. The Contractor should be responsible for reworking of subgrades and compacted structural fill that were initially considered suitable but were later disturbed by equipment and/or weather.

Although not revealed by Underhill's subsurface exploration, earthwork activities may encounter groundwater during excavation to grade, especially during times of heavy precipitation. Therefore, the Contractor may need to provide temporary dewatering such as trenching and/or pumping from sumps to control the surface and/or groundwater.

7.2 Shallow Foundations

The Contractor should place footing concrete as soon as possible after excavation to limit the potential for moisture changes at the foundation level. Footing concrete should be cast neat against the sides of the excavation. If footings are formed, the sides of the footings should be backfilled with compacted on-site soils to final grade to reduce the potential for water collecting beneath the footings. Final grades should provide positive drainage away from the structure so that water does not accumulate around the foundation.

The Contractor should exercise care during excavation for spread and strip footings so that as little disturbance as possible occurs at the foundation level. The Contractor should carefully clean loose or soft soils from the bottom of the excavation before placing concrete. Underhill's Engineer should observe actual footing subgrades during construction to evaluate whether subgrade soils meet the requirements as recommended in this report.

Footing subgrades needing undercut may be concreted at the elevation of undercut, backfilled with Controlled Low Strength Material (CLSM), locally known as "flowable fill;" or backfilled to the original design subgrade elevation with compacted structural fill as described in Section 6.1.2. Compacted structural fill should extend at least 12 inches laterally beyond the footing in all directions. Concreting should take place the same day as excavation of footings.

7.3 Engineering Services During Construction

The engineering recommendations provided in this report are based on the information obtained from the subsurface exploration and laboratory testing. However, conditions on the site may vary between the discrete locations observed at the time of the subsurface exploration. The nature and extent of variations between borings may not become evident until during construction. To account for this variability, Underhill should provide professional observation and testing of subsurface conditions revealed during construction as an extension of our design phase engineering services. These services will also help in evaluating the Contractor's conformance with the plans and specifications.

8.0 General Specification Recommendations

The Project Construction Documents should include an allowance to account for possible additional costs that may be required to construct the foundations, as recommended in this report. Costs may be incurred for a variety of reasons including variation of soil between borings, greater than anticipated unsuitable soils, need for borrow fill material, wet on-site soils, obstructions, rock excavation, temporary dewatering, etc. Add/deduct unit prices in the construction contract are recommended so adjustments can be made for the actual work performed for the following:

- Scarifying and drying wet and/or loose subgrade soils.
- Undercutting unsuitable soils and replacement with compacted structural fill.

The project documents should indicate the Contractor's responsibility for providing adequate site drainage during construction. Inadequate drainage can lead to disturbance of soils by construction traffic and increased volume of undercut. The project documents should also delegate the Contractor responsible for reworking of subgrades and compacted fill initially considered suitable, but later disturbed by equipment and/or weather.

This report may be made available to prospective bidders for informational purposes. The project specifications are recommended contain the following statement:

> *Underhill Engineering, LLC has prepared this geotechnical engineering report for this project. This report is for informational purposes only and is not part of the contract documents. The opinions expressed represent the Geotechnical Engineer's interpretation of the subsurface conditions, tests, and the results of analyses conducted. Should the data contained in this report not be adequate for the Contractor's purposes, the Contractor may make, before bidding, independent exploration, tests and analyses. This report may be examined by bidders at the office of the Owner, or copies may be obtained from the Owner at nominal charge.*

Additional data and reports prepared by others that could have an impact upon the Contractor's bid should also be made available to prospective bidders for informational purposes.

9.0 Limitations

The analyses and recommendations submitted in this report study are based on the information revealed by the subsurface exploration. This report attempts to provide for normal contingencies, but the possibility remains that unexpected conditions may be encountered during construction.

Underhill has prepared this study to aid in the evaluation of the site. It is intended for use concerning this specific project and should not be used for other purposes. The recommendations provided within are based on information on the site and proposed construction as described in this report. Changes regarding existing conditions or changes in loads, locations, or grades should be brought to Underhill's attention so that recommendations can be modified as needed. Underhill would appreciate an opportunity to review the plans and specifications as they pertain to the recommendations contained in this report, and to submit comments to you based on this review.

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

References

Evans, Nick H. and Rader, E.K. (1993) Geologic Map of Virginia, Virginia Division of Mineral Resources, Charlottesville, Virginia.

Johnson, Stanley S. and Sweet, Palmer C. (1969) Magnetic and Gravity Surveys of Albemarle and Fluvanna Counties, Virginia, Report of Investigations 20, Virginia Division of Mineral Resources, Charlottesville, Virginia.

Figures

FIGURE 1

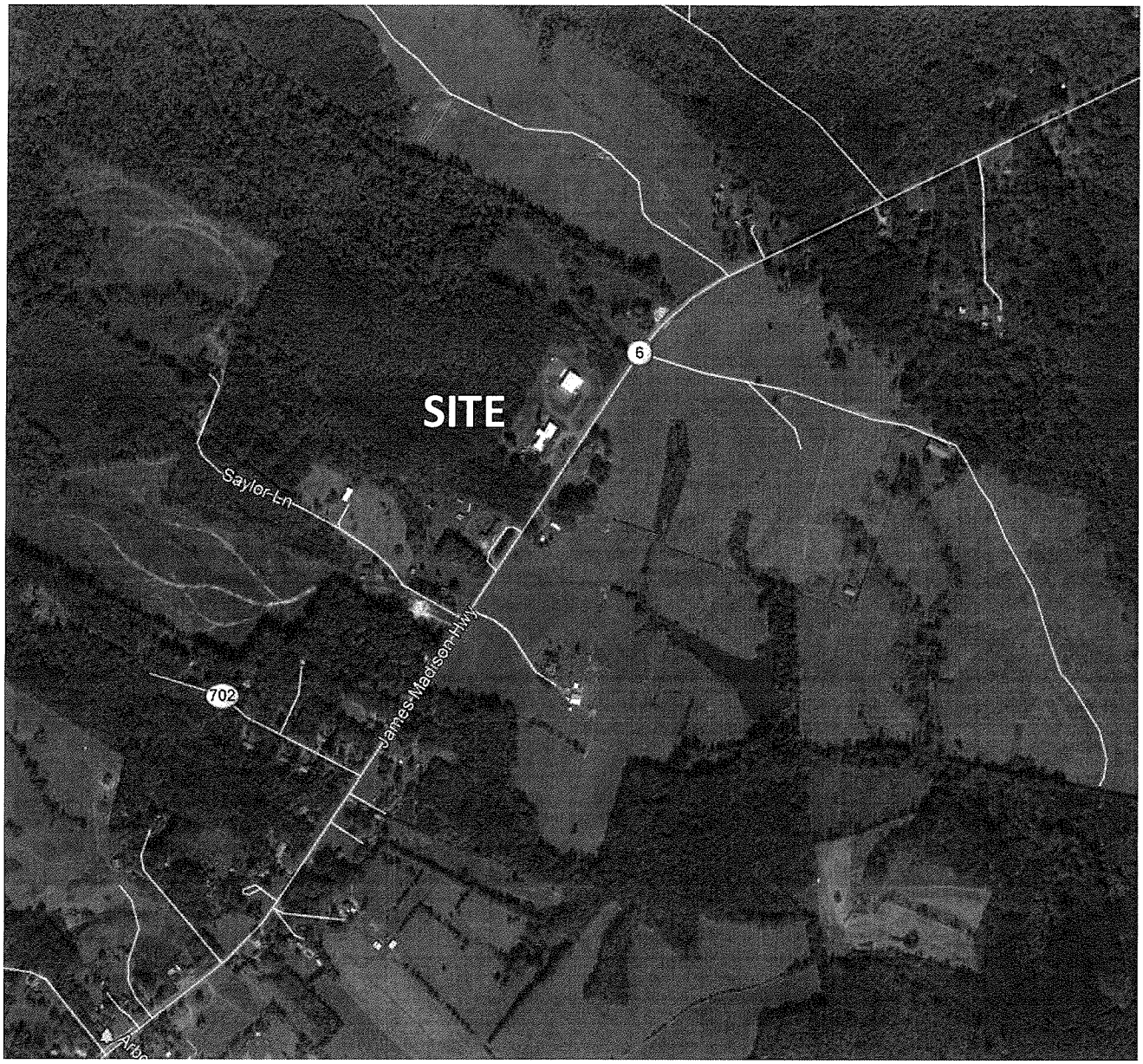

Image from Google Earth

No Scale

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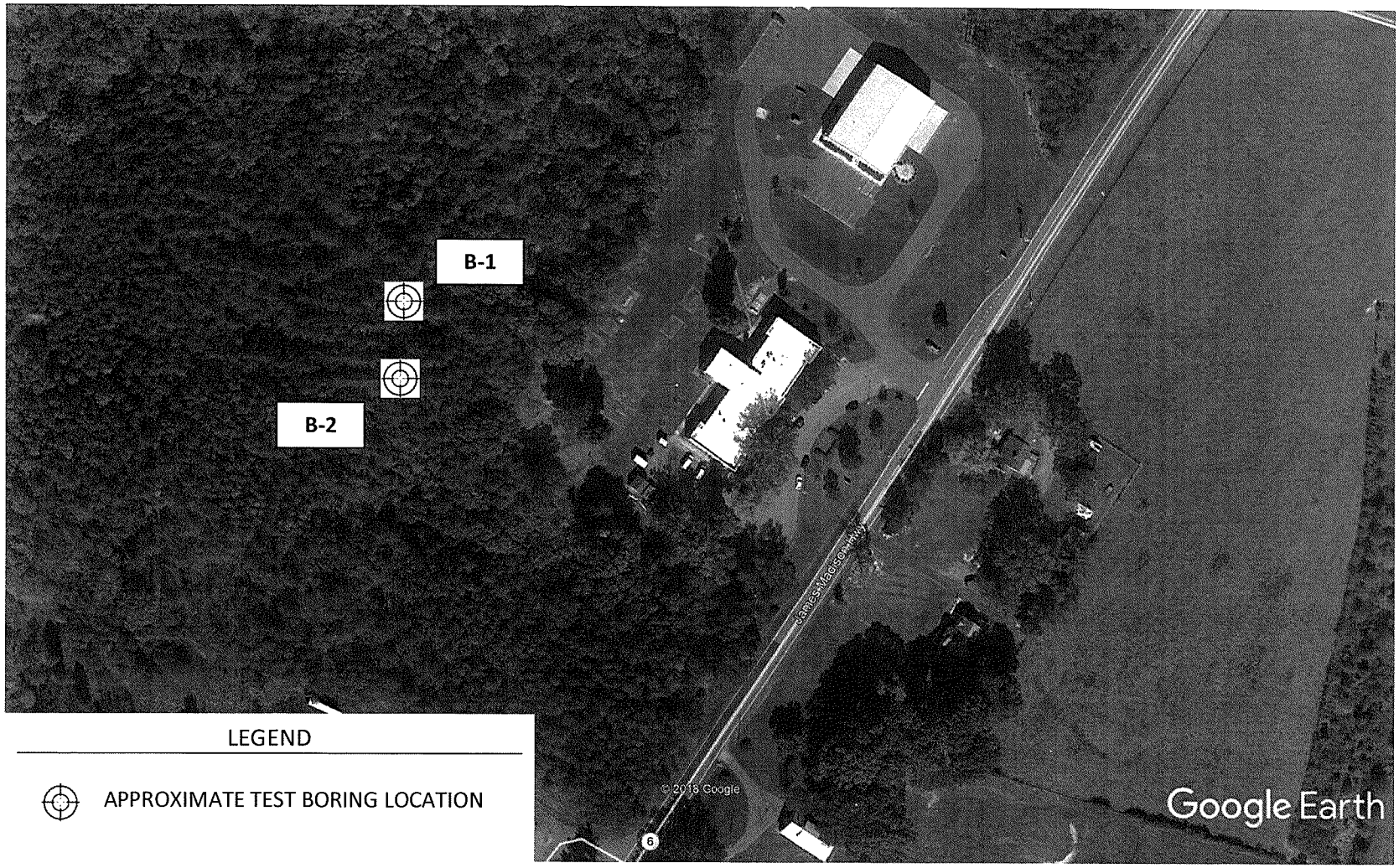
FIGURE 2: LOCATION PLAN

Project 18060
Fluvanna Safety Building
Fluvanna County, Virginia



LEGEND

APPROXIMATE TEST BORING LOCATION

Note: Base drawing obtained from Google Earth

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Subsurface Exploration Data

Test Boring Logs, B-1 and B-2

Note: Test boring locations were located at the building corners staked by Fluvanna County. Elevations at the test boring locations were obtained from Google Earth. The elevations and locations should be considered no more accurate than the means and methods used to obtain them.

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Project: Fluvanna Safety Training
Fluvanna County, Virginia

Boring No. B-1

Project No. 18060

Drilling Contractor: Ayers and Ayers, Inc.

Drill Rig Type: CME-45

Foreman: M. White

Method: 2-1/4" HSA

Logged By: S Ray

Started: 09/28/2018

Finished: 09/28/2018

Location: See Location Plan

GS ELEV: 409'

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	09/28/18	---	Dry	---	---
Completion	09/28/18	1:53 PM	Dry	---	---
Casing Pulled	09/28/18	1:55 PM	Dry	---	13.0'

Depth (feet)	Sample Type	Stratum	Blow Counts (blows/foot)	Soil Group Name: modifier, color, moisture, density/consistency, grain size, other descriptors Rock Description: modifier, color, hardness/degree of concentration, bedding and joint characteristics, solutions, void conditions	USCS	Remarks
0-1.5		A2	4+7+8	Fine to coarse sandy ELASTIC SILT, moist - brown and gray	MH	Water ponded on surface W = 14.5%
2.0-3.5			5+9+13	2.0 Fine to coarse sandy SILT, moist - light brown, white, and orange	ML	W = 19.9%
4.0-5.5		A3	12+12+34	4.0 Fine to coarse SILTY SAND, moist - white and orange	SM	
7.0-8.5		B	25+28+35	7.0 DISINTEGRATED ROCK, moist - white, orange		RESIDUUM
9.0 10.5			21+21+52			
14.0-15.5			50/5"	do, gray and tan		
18.5-20.0			50/5"			
				Test Boring Terminated @ 18.9 ft		

Key:

Boring Log: Sheet 1 of 1

- Standard Penetration Split Spoon Sampler (SPT)
- Bulk/ Bag Sample
- Shelby Tube
- Stabilized Groundwater
- Groundwater at time of drilling

NOTES: 1. Boring elevations obtained from Google Earth
2. Boring backfilled upon completion

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Project: Fluvanna Safety Training
Fluvanna County, Virginia

Boring No. B-2

Project No. 18060

Drilling Contractor: Ayers and Ayers, Inc.

Drill Rig Type: CME-45

Foreman: M. White

Method: 2-1/4" HSA

Logged By: S. Ray

Started: 09/28/2018

Finished: 09/28/2018

Location: See Location Plan

GS ELEV: 411'

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	09/28/18	---	Dry	---	---
Completion	09/28/18	2:34 PM	18.5	---	---
Casing Pulled	09/28/18	2:39 PM	Dry	---	12.0'

Depth (feet)	Sample Type	Stratum	Blow Counts (blows/foot)	Soil Group Name: modifier, color, moisture, density/consistency, grain size, other descriptors Rock Description: modifier, color, hardness/degree of concentration, bedding and joint characteristics, solutions, void conditions	USCS	Remarks
0-1.5		A1	2+3+2	Fine to coarse SILTY SAND, contains root fragments, moist - gray	SM	
2.0-3.5		A2	5+7+11	2.0 ELASTIC SILT with sand, moist - orange and white	MH	W = 26.8%
4.0-5.5		A3	7+16+29	4.0 Fine to medium SILTY SAND, moist - white and orange	SM	W = 14.5%
7.0-8.5			24+44+50/3"			
9.0-10.5		B	50+50/4.0"	7.5 DISINTEGRATED ROCK, dry - white, gray, and orange		Relict structure RESIDUUM Difficult drilling
14.0-15.5			50/2.5"	do, contains mica, tan, gray, and white		Rig chatter
18.5-20.0			20+18+50/5"	do, contains quartz fragments, wet - tan, gray, and white		
				Test Boring Terminated @ 19.9 ft		

Key:

Boring Log: Sheet 1 of 1

- Standard Penetration Split Spoon Sampler (SPT)
- Bulk/ Bag Sample
- Shelby Tube
- Stabilized Groundwater
- Groundwater at time of drilling

NOTES: 1. Boring elevations obtained from Google Earth
2. Boring backfilled upon completion

Soil Laboratory Test Results

Moisture Content Analysis - ASTM D2216 (1 Sheet)

Summary of Soil Laboratory Tests		
Sample Location	B-1	B-2
Sample Type	JAR	JAR
Sample Depth (ft)	2.0-3.5	2.0-3.5
Stratum	A2	A2
Description, Symbol USCS (AASHTO)	Sandy SILT, ML (A-4)	ELASTIC SILT with sand, MH (A-7-5)
Natural Water Content (%)	19.9	26.8
% Passing No. 40 Sieve	79.3	85.4
% Passing No. 200 Sieve	56.7	72.3
Liquid Limit	42	68
Plastic Limit	27	36
Plasticity Index	15	32