GEOTECHNICAL REPORT

SUBSURFACE EXPLORATION AND

GEOTECHNICAL EVALUATION

14420 WAYNESFORD DRIVE

UPPER MARLBORO, MARYLAND

SOIL & STRUCTURE CONSULTING, INC.

Prepared for:
Mr. Hank Berben
505 Herndon Woods Court
Herndon, VA 20170

Prepared by:
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October 2011

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October 13, 2011

Mr. Hank Berben
505 Herndon Woods Court
Herndon, VA 20170

Re: Subsurface Exploration and Geotechnical Evaluations
14420 Waynesford Drive
Upper Marlboro, MD

Dear Mr. Berben:

As requested, Soil & Structure Consulting, Inc. has prepared a geotechnical report that presents our subsurface investigation results, conclusions, and recommendations. Our interpretation of the subsurface conditions encountered at the soil boring locations and our recommendations for design and construction are presented in this report. No Marboro Clay was encountered or observed in the subject area during the course of this geotechnical investigation.

We appreciate the opportunity to serve as your geotechnical consultant and look forward to the opportunity to work with you in the future. If you have any questions concerning this report, please call us.

Respectfully submitted,
Soil & Structure Consulting, Inc.

Patrick Barbe
Sr. Soil Scientist

Kenneth G. Fraine, P.E.
President

Section Page

1 INTRODUCTION

This report presents the results of the geotechnical investigation for the construction of a two-story single family home with basement and associated utilities in Upper Marlboro, MD. The footprint of the proposed construction is approximately 100 ft x 200 ft based on the site plan from RDA Engineers dated February 7, 2011. Soil & Structure Consulting, Inc. (SSC) conducted this study on August 31, 2011 at the request of Mr. Hank Berben.

1.1 Scope

The scope of this study includes subsurface exploration, field testing, and engineering analyses for the purpose of foundation design and site work. Our scope of services does not include an environmental assessment for the presence or absence of wetland or hazardous or toxic materials (e.g., asbestos) in the soil, surface water, groundwater, or air, on or below or around this site. Any statements regarding odors, colors, or unusual or suspicious items or conditions are strictly for the information of the client.

1.2 Description of Site

The site fronts on the end of Waynesford Drive and is bound by neighboring properties. The lot is currently wooded. The adjoining lots are developed with two-story single-family homes. All utilities at this site within the area of the investigation were marked by Miss Utility previous to our subsurface investigation.

1.3 Description of Proposed Construction

The proposed residential construction is two stories with basement. The residence is to be supported well water and onsite septic. The purpose of this report is to provide the owner with the bearing capacity of the on-site bearing stratum and recommendations as to the construction of the foundations.

We based our investigation and this report in part on the preliminary plans provided to us by the client. The owner did not specify any unusual or specific loading conditions or special settlement restrictions.

The information presented in this section was used in our geotechnical analyses for preparation of this report. If any of this information is in error, due to design changes or our misunderstanding, we recommend that you consult with SSC for possible revisions to this report.

2 FIELD EXPLORATION AND TESTING

2.1 Scope

To evaluate the subsurface conditions, SSC completed three (3) soil borings in the area of the proposed addition on August 31, 2011. We drilled the soil borings at the approximate locations depicted on the attached Soil Boring Location Plan.

2.2 Drilling, Sampling, and Field Testing Procedures

A geotechnical engineer inspected the soil borings at the three (3) locations and obtained soil samples. Samples were obtained at regular intervals and the in-situ density of the soil was measured at the approximate bottom of footing elevation. Each soil boring for the building foundation was excavated to a depth of fifteen (15) feet. Samples were obtained in general accordance with all applicable ASTM procedures, and field boring logs were kept to record the results.

Our field logs include materials encountered, Standard Penetration Test (SPT) testing values (or N-values), and pertinent field observations made during the drilling operations.

Samples obtained in the soil borings were sealed in glass jars in the field. Group symbols in accordance with the Unified Soil Classification System, ASTM D2487, and visual classification in accordance with the Description and Identification of Soils (Visual-Manual Procedure), ASTM D2488, are provided in Section 3.2.

3 SUBSURFACE CONDITIONS

3.1 General

The soil borings and subsequent soil analyses were the primary investigation techniques used to obtain information about the in-situ conditions and engineering properties of the site soils. The results of the investigation indicate the presence of weathered in place soils. A general description of the soils encountered is provided below.

The stratification of the soils, as shown on the soil boring logs and represents our interpretation of the soil conditions at the actual boring locations based on an inspection by a Geotechnical Engineer or Soil Scientist of the soil boring samples. Variations from the conditions shown on the soil boring logs could occur between borings. In addition, the stratification lines shown on the soil boring logs represent approximate boundaries between the soil types, but these transitions may be gradual, rather than distinct.

Note that it is sometimes difficult to record changes in stratification within narrow limits. In the absence of foreign substances, it is also difficult to distinguish between natural soils and clean soil fill.

3.2 Stratification

The soil borings were advanced to a depth of fifteen (15) ft. Our results indicate that the subgrade material generally consists of two strata: light yellowish brown sandy silt (ML) to a depth of 10 feet and very dark grey silty sand (SM) to a depth of 15 feet where the borings were terminated.

Soil density SPT tests performed at depths of 0 to 15 feet resulted in blow counts of 3 to 21, indicating a relative density of loose to medium dense.

No Marboro Clay was found or observed in the subject area during the course of this investigation. The USDA classification of the top 10 feet of Soil was found to be a USDA Classification of Sandy Silt (ML), which is a Type “B” Soil.

3.3 Groundwater

Groundwater was not encountered during the course of this investigation. However; there is strong evidence to suggest that during extended times of the year that water table is found at depths as shallow as 8 to 10 feet.

The Contractor may encounter water from surface runoff and temporarily perched water at higher levels during excavation. Generally, the Contractor may expect seasonal and yearly fluctuations of the water table with variations in precipitation, surface runoff, evaporation, pumping, and other factors. The Contractor should determine the actual depth to groundwater at the time of construction.

4 ENGINEERING EVALUATIONS AND RECOMMENDATIONS

The medium dense natural silty sands encountered at a depth of ten (10) feet are suitable for the support of the proposed structure using conventional foundations. Recommendations are given below for the support of the proposed structure. General comments and recommendations are also included for preparation of foundation subgrades and related earthwork for the project.

4.1 Wall Foundations

The structure may be supported on continuous wall foundations bearing on firm, natural soils.

For design purposes, we recommend using a maximum net allowable soil bearing pressure of **2,000 psf** for foundations bearing on the in-situ medium dense to very dense sands and silts or on engineered fill. We recommend a minimum footing width of 24 inches. Based on DCP blow counts and the soils encountered during our investigation, we recommend excavating to a depth of 10 ft below existing grades, where adequate soil bearing capacities should exist. Higher foundation subgrade elevations may be achieved by placement of engineered fill.

The contractor should use the estimated highest bottom of footing or excavation subgrade elevation for design and preliminary budgeting purposes only. Adjustments may be necessary due to variations of the natural soil that may occur between the test borings. Additionally, lowering of the footings may be necessary at some locations to satisfy minimum depth requirements with respect to structural considerations.

Prior to the placement of concrete for the footings, an SSC Geotechnical Engineer or his representative should evaluate and test the bases of the footing excavations. The evaluation and tests should ascertain whether foundations are placed on suitable materials in accordance with the recommendations presented in this report.

4.2 Backfill Material for Below-Grade Walls

Generally, backfill materials behind below-grade walls should consist of soils having Unified Soil Classifications of SM or more granular material. Because of the potential for swelling, expansive soils (CL/CH) should not be used as wall backfill except, perhaps, in the upper most one foot in outside areas where a relatively impermeable material will be desirable to minimize infiltration of surface water.

We recommend that any cohesive materials encountered be cut back from behind walls at an angle of 45 degrees as projected upward from the top of the heel of the perimeter wall footing. The excavated soils should be replaced with SM or more granular backfill. *All wall backfill materials should be inspected and approved by the Geotechnical Engineer prior to their use.*

Backfill materials should be placed and compacted in accordance with the *Site Preparation and Earthwork* section of this report. It may be necessary to use smaller walk-behind compaction equipment near the walls to attain the proper degree of compaction while avoiding damaging the wall as a result of heavier loads produced by larger compaction equipment.

4.3 Drainage and Waterproofing of Below-Grade Walls

Drains shall be provided around all concrete or masonry foundations that retain earth and enclosed habitable or usable spaces located below grade. Drainage tiles, gravel or crushed stone drains, perforated pipe or other approved systems or materials should be installed at or below the area to be protected and should discharge by gravity or mechanical means into an approved drainage system.

Gravel or crushed stone drains should extend at least 1 foot beyond the outside edge of the footing and 6 inches above the top of the footing and be covered with approved filter membrane material.

The top of open joints of drain tiles should be protected with strips of building paper and the drainage tiles or perforated pipe shall be placed on a minimum of 2 inches of washed gravel or crushed rock at least one sieve size larger than the tile joint opening or perforation and covered with no less than 6 inches of the same material. Due to the presence of high water table SSC recommends that an interior drainage system is installed under the basement slab.

In other than Group I soils, a sump should be provided to drain the porous layer and footings. The sump should be at least 24 inches in diameter or 20 inches square, extend 24 inches below the bottom of the basement floor, and be capable of positive gravity or mechanical drainage to remove any accumulated water. The drainage system shall discharge into an approved sewer system or to daylight. Due to the potential presence of high water table and the size of the structure SSC recommends at a minimum the installation of a ½ hp sump pump and a ½ hp sump pump with battery backup system.

In areas where a high water table or other severe soil-water conditions are known to exist, exterior foundation walls that retain earth and enclose interior spaces and floors below grade shall be waterproofed from the top of the footing to the finished grade. Walls shall be waterproofed in accordance with one of the following:

1. 2-ply hot mopped felts
2. 55 pound roll roofing
3. 6-mil polyvinyl chloride
4. 6-mil polyethylene
5. 40-mil polymer-modified asphalt
6. 60-mil flexible polymer cement
7. 1/8 inch cement based, fiber-reinforced, waterproof coating

8. 60-mil solvent free liquid applied synthetic rubber

4.4 Slab-on-Grade (Basement)

The basement concrete slab may be supported at subgrade on firm natural material.

A minimum four (4) inch crushed stone layer with gradation similar to VDOT No. 57 stone should be placed beneath floor slabs to permit lateral drainage. An impermeable membrane should be placed between the gravel and slab-on-grade to prevent the infiltration of concrete into the vapor barrier.

The floor slab shall be suitably reinforced and proper joints should be provided at the junctions of the slab and foundation system so that a small amount of independent movement can occur without causing damage.

4.5 Site Preparation and Earthwork

For cut or fill areas, excavations within limits of the proposed foundations should consist of stripping topsoil containing sod and roots. Additional stripping may be required to remove deeper roots or stumps of mature trees or other unsuitable materials.

Following initial topsoil stripping, removal of unsuitable fill, and undercutting, the exposed subgrades should be observed and proofrolled to identify any areas requiring additional undercutting. We recommend using a loaded dump truck for the proofrolling. The Geotechnical Engineer or his field representative should observe the proofrolling.

The Geotechnical Engineer should approve fill materials placed within the limits of the proposed foundation areas. Based on our investigation we do not recommend using the any clayey materials encountered from this site as fill for the structure or pavements.

Any borrow material to be brought on site and used as structural fill and/or backfill should be classified as sandy ML, SM, or more granular with a maximum of 65 percent material passing the No. 200 sieve. The maximum particle size in the borrow material should not exceed four inches in any direction. The fines should also have a Liquid Limit less than 40 and a Plasticity Index less than 15.

The limits of the structural engineered fill should extend outside the foundation a distance equal to at least the depth of compacted fill, as measured below the bottom of the footing, but in no case less than 5 feet.

Materials placed for fill or backfill within the limits of the proposed building addition should be placed in horizontal, loose lifts of not more than 8 inches in thickness and compacted to 95 percent of the Standard Proctor maximum dry density in accordance with ASTM D698. A decreased compaction density of 90 percent in accordance with ASTM D698 may be used in landscaped areas. Moisture contents of the structural fill should be within 2 percent of the optimum moisture as determined in the compaction test.

4.6 General Comments

When the plans and specifications are complete, or if significant changes are made in the character or location of the proposed structures, a consultation should be arranged to review them with respect to the prevailing soil conditions. At that time, it may be necessary to submit supplementary recommendations.

All construction involving problem soil must be performed under the full-time inspection of the Geotechnical Engineer.

Review and approval of plans, specifications and reports by the County, with or without recommendations by the Geotechnical Review Board, shall in no way relieve the developer of the responsibility for the design, construction, and performance of the structures, pavements and slopes on the project and damage to surrounding properties.

5 CONSTRUCTION CONSIDERATIONS

5.1 Groundwater Control

Groundwater was not encountered in the soil borings during the course of the investigation; however; there is strong evidence to suggest that a water table exists during extended periods of the year at depths as shallow as 8 feet. SSC recommends that the excavation of the basement is performed during the summer months of July or August as the water levels should be lower during this period of the year.

Water levels should be maintained at least two feet below final footing and floor slab subgrades. If higher water levels are encountered during construction, the Geotechnical Engineer should be consulted regarding the possible need for permanent drainage provisions. Ditching and/or the use of sumps with pumping should be adequate for temporary control of groundwater during construction.

5.2 Earthwork Operations

For areas of net cutting within limits of the proposed structures, final excavations to the desired subgrade elevations should be accomplished immediately prior to placement of concrete and/or structural fill. Exposure to weather and/or construction traffic could disturb some areas and may require a deeper excavation. Care should therefore be taken to limit construction traffic over the exposed subgrades. Positive drainage should also be maintained in order to minimize ponding of surface water in the excavated areas during construction.

5.3 Field Observations and Testing

Prior to the placement of concrete for footings or floor slabs, a Geotechnical Engineer or his representative should inspect the exposed subgrades to verify that foundations are placed on suitable materials in accordance with the recommendations given in this report. Where reinforcing steel is to be placed for the foundations, observations should also be provided to verify that proper chairs or supports are provided and the reinforcing is properly positioned.

Field observations and testing should also be provided for the earthwork construction for this project. This should include observations of proofrolling and final approval of subgrades prior to placement of compacted fill. Appropriate laboratory tests should be conducted on samples of the compacted fill material, and field density tests should be conducted during the earthwork construction to verify that fill material and compaction requirements are being satisfied.

Technical personnel supervised by an SSC Geotechnical Engineer should provide the field observations and testing recommended in this report. SSC cannot be responsible for the interpretation or implementation, by others, of recommendations provided in this report.

5.4 Excavations and General Safety

It may be necessary to provide lateral support for the slopes of excavations in accordance with applicable OSHA requirements and building codes. Suitable bracing methods, as selected by individual contractors, should be provided as required and in accordance with applicable OSHA and building code requirements. Alternate unbraced excavations should be sloped and protected in accordance with applicable OSHA and building code requirements. Based on the types of materials encountered, we estimate that an excavation slope of about 1.5H:1V should be adequate to prevent slope failure in relatively shallow, temporary excavations. In order to prevent sudden collapse of excavation sidewalls, excavated materials should not be stockpiled immediately adjacent to the open excavations.

6 GENERAL AND LIMITATIONS

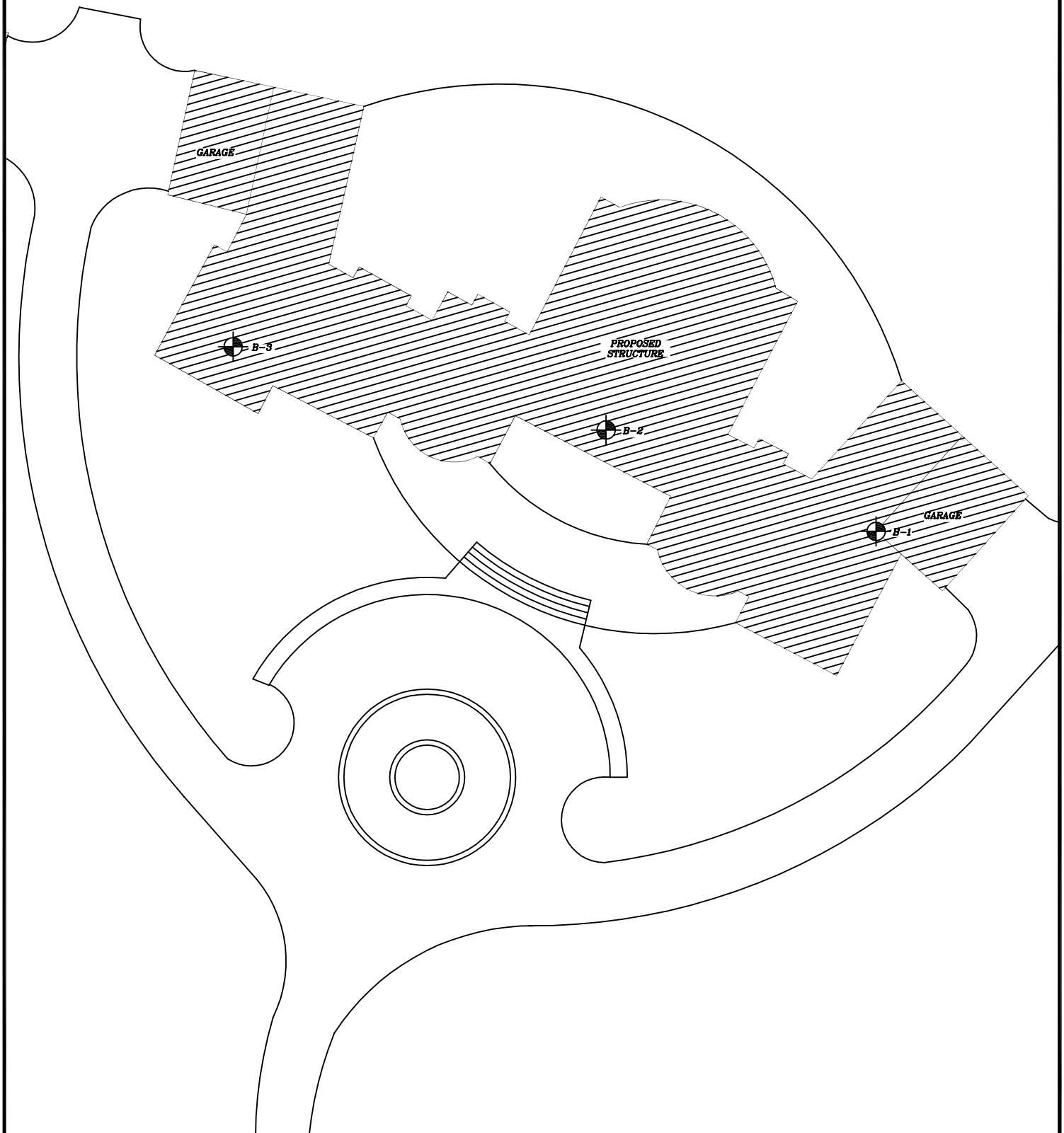
The recommendations contained in this report are based on data obtained from the relatively limited number of test borings performed at the approximate locations given in the Soil Boring Location Plan. This report does not reflect any variations that may occur between these test borings.

This report has been prepared to aid in the evaluation of this site and to assist design professionals in the geotechnical-related design of this project. It is intended for use with regard to the specific project, as described in this report. Any substantial changes in the floor elevation, structural loads, structure location, or the site grading, as described in this report or supporting documents, should be brought to our attention so that we may determine any affect on the recommendations given in this report.

This report should be made available to bidders prior to submitting their proposals and to the successful contractor and subcontractors for their information only, and to supply them with facts relative to the subsurface investigation and laboratory tests. The opinions and conclusions expressed in this report are those of SSC and represent interpretation of the subsurface conditions based on tests and the results of analysis and studies that have been conducted for design.

This report has been prepared in accordance with generally accepted principles of geotechnical engineering practice and no other warranties are included, either expressed or implied, as to the professional services provided under the terms of our agreement.

FIGURES



SHEET NO	DATE	09/15/11	REVISION		SOIL BORING LOCATION PLAN	**SOIL & STRUCTURE CONSULTING, INC.** 1900 CAMPUS COMMONS DRIVE, SUITE 100 RESTON, VA 20191 (703) 391-8911 (703) 995-4680 FAX www.soilandstructure.com
	SCALE	1" = 40'	REV. NO.	DATE		
1 OF 1	DRAWN BY	TOM HOLT	-	-	ADDRESS: 14420 WAYNESFORD DRIVE, UPPER MARLBORO, MD	
	CHECKED BY	KEN FRAINE	-	-		
			-	-		
			-	-		

APPENDIX A

SOIL BORING LOGS

SOIL & STRUCTURE CONSULTING, INC.

LOG OF BORING B-1

1900 Campus Commons Drive
Suite 100
Reston, VA 20191

Site Investigation

14420 Waynesford Road

Date Started	: 08-31-11	Company Rep.	: Pat Barbe
Date Completed	: 08-31-11	Northing Coord.	: N/A
Hole Diameter	: 2 1/4 in.	Easting Coord.	: N/A
Drilling Method	: Hand Auger	Depth to Groundwater	: N/A
Sampling Method	: Continous	Logged By	: Pat Barbe

Well:
Elev.: 112

Depth in Feet	Surf. Elev. 112	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	Natural Moisture	% Finer #200 Sieve
0	112	SM		Silty Sand, Organics, Dark Brown	1	3		
		ML		Sandy Silt, Soft, Moist, Light Yellwoish Brown	2	2		
5	107				3	3		
					4	15		
10	102	SM		Silty Sand, Medium Dense, Moist, Very Dark Grey	5	18		
15	97			Boring Terminated Cave in Depth 10' Water Level Reading at Time of Boring N/A 24 Hour Water Level N/A				
20								

09-13-2011 C:\Program Files (x86)\mtech2010\acegeo\14420 Waynesford Dr - Berben\14420 Waynesford Dr B-1.bor

SOIL & STRUCTURE CONSULTING, INC.

LOG OF BORING B-2

1900 Campus Commons Drive
Suite 100
Reston, VA 20191

Site Investigation

14420 Waynesford Road

Date Started	: 08-31-11	Company Rep.	: Pat Barbe
Date Completed	: 08-31-11	Northing Coord.	: N/A
Hole Diameter	: 2 1/4 in.	Easting Coord.	: N/A
Drilling Method	: Hand Auger	Depth to Groundwater	: N/A
Sampling Method	: Continous	Logged By	: Pat Barbe

Well:
Elev.:

Depth in Feet	Surf. Elev. 114	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	Natural Moisture	% Finer #200 Sieve
0	114	SM		Silty Sand, Organics, Dark Brown				
		ML		Sandy Silt, Soft to Firm, Moist, Light Yellwoish Brown	1	6		
					2	4		
5	109				3	7		
					4	16		
10	104	SM		Silty Sand, Medium Dense, Moist, Very Dark Grey	5	14		
15	99			Boring Terminated Cave in Depth 10' Water Level Reading at Time of Boring N/A 24 Hour Water Level N/A				
20								

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SOIL & STRUCTURE CONSULTING, INC.

LOG OF BORING B-3

1900 Campus Commons Drive
Suite 100
Reston, VA 20191

Site Investigation

14420 Waynesford Road

Date Started	: 08-31-11	Company Rep.	: Pat Barbe
Date Completed	: 08-31-11	Northing Coord.	: N/A
Hole Diameter	: 2 1/4 in.	Easting Coord.	: N/A
Drilling Method	: Hand Auger	Depth to Groundwater	: N/A
Sampling Method	: Continous	Logged By	: Pat Barbe

Well:
Elev.:

Depth in Feet	Surf. Elev. 110	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	Natural Moisture	% Finer #200 Sieve
0	110	SM		Silty Sand, Organics, Dark Brown	1	3		
		ML		Sandy Silt, Soft to Very Stiff, Moist, Light Yellwoish Brown	2	17		
5	105				3	14		
					4	21		
10	100	SM		Silty Sand, Medium Dense, Moist, Very Dark Grey	5	19		
15	95			black, Boring Terminated Cave in Depth 8.5' Water Level Reading at Time of Boring N/A 24 Hour Water Level N/A				
20								

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APPENDIX B

LABORATORY TEST RESULTS

SCE
SOIL CONSULTANTS ENGINEERING • SINCE 1960

CONSULTING ENGINEERS • BUILDING OFFICIALS
CONSTRUCTION PROFESSIONALS • SOIL SCIENTISTS & GEOLOGISTS

DATE: 09-Sep-11
SAMPLE #: 26996
PROJECT NUMBER: P0303
PROJECT NAME: 14420 Waynesford Dr., Upper Marlboro, MD
MATERIAL SOURCE: TB-3, 13.5-15.0'
SOIL DESCRIPTION: Very dark gray clayey SAND
MICA CONTENT: Trace
CLIENT: Soil & Structure **ENGINEER:**

SIEVE ANALYSIS: ASTM C136, C702, D1140, D2217 MODIFIED

Gravel	0.0%
Total Sand	78.5%
Coarse Sand	0.0%
Medium Sand	27.5%
Fine Sand	51.0%
Silt and Clay	21.5%

PERCENTAGE PASSING

3 INCH	100.0%
1.5 INCH	100.0%
1 INCH	100.0%
3/4 INCH	100.0%
3/8 INCH	100.0%
N0. 4	100.0%
NO. 10	100.0%
NO. 40	72.5%
NO. 60	46.0%
NO. 200	21.5%

LIMITS: ASTM D4318

LIQUID (LL):	44
PLASTIC (PL):	17
PLASTIC INDEX (PI):	28

CLASSIFICATION: ASTM D2487, D421, AND AASHTO M145

UNIFIED:	SC
AASHTO:	A-2-7
GROUP INDEX:	1

NATURAL MOISTURE CONTENT:
ASTM D2216, AASHTO T265 27.9%

SCE
Soil Consultants Engineering • Since 1960

Consulting Engineers • Building Officials
Construction Professionals • Soil Scientists & Geologists

DATE: 09-Sep-11
SAMPLE #: 26995
PROJECT NUMBER: P0303
PROJECT NAME: 14420 Waynesford Dr., Upper Marlboro, MD
MATERIAL SOURCE: TB-1, 5.0-6.5'
SOIL DESCRIPTION: Light yellowish brown sandy SILT
MICA CONTENT: Trace
CLIENT: Soil & Structure
ENGINEER:

SIEVE ANALYSIS: ASTM C136, C702, D1140, D2217 MODIFIED

Gravel	0.0%
Total Sand	35.7%
Coarse Sand	0.1%
Medium Sand	0.7%
Fine Sand	35.0%
Silt and Clay	64.3%

PERCENTAGE PASSING

3 INCH	100.0%
1.5 INCH	100.0%
1 INCH	100.0%
3/4 INCH	100.0%
3/8 INCH	100.0%
N0. 4	100.0%
NO. 10	99.9%
NO. 40	99.3%
NO. 60	98.9%
NO. 200	64.3%

LIMITS: ASTM D4318

LIQUID (LL):	38
PLASTIC (PL):	31
PLASTIC INDEX (PI):	7
CLASSIFICATION:	ASTM D2487, D421, AND AASHTO M145
UNIFIED:	ML
AASHTO:	A-4
GROUP INDEX:	4

NATURAL MOISTURE CONTENT:
ASTM D2216, AASHTO T265 52.3%

9303 Center Street • Manassas, VA 20110-5547 • 703.366.3000 • (F) 703.366.3400 • www.SoilConsultants.net