PRELIMINARY GEOTECHNICAL EXPLORATION REPORT
HOWARD COUNTY CIRCUIT COURTHOUSE
BENDIX ROAD SITE
ELLICOTT CITY, MD

Submitted To:
Grimm + Parker Architects
11720 Beltsville Drive, Suite 600
Calverton, MD 20705

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September 23, 2016
GAUD 1602

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1. EXECUTIVE SUMMARY

Pennoni Associates Inc. (Pennoni) has completed our preliminary geotechnical exploration for the proposed Howard County Circuit Courthouse building at 9250 Bendix Road in Ellicott City, Maryland. It is our understanding that the project consists of a Public Private Partnership (P3) to construct a new courthouse and associated parking located at one of three locations in Howard County, Maryland. Pennoni previously performed preliminary geotechnical explorations at the existing Howard County Circuit Courthouse site and at an approximately 26 acre site on Martha Bush Drive that were summarized in our previous report dated December 12, 2014. The purpose of our current exploration was to: perform preliminary geotechnical field and laboratory testing; classify the subsurface soils within the proposed building area; and provide our preliminary conclusions and recommendations for foundation design and construction.

We understand that the proposed construction consists of the demolition of the existing Thomas Dorsey Building followed by the construction of a new courthouse and a new office building to replace the existing building. We understand that the existing building does not include any below grade levels. We understand that the proposed structures may be three stories or taller, and have assumed that they may include below grade levels. As this project is in the preliminary stage, proposed site grading, the proposed site layout, and proposed building loads have not yet been determined. For the purposes of this report, we have assumed that the proposed grades will be similar to the existing grades.

The site is bound by wooded areas to the north, a wooded area and Bendix Road to the south, a wooded area and Edgar Road to the west, and grass covered areas and commercial buildings to the east. The existing Thomas Dorsey Building is located at the west side of the site and a large parking area is located on the east side of the site. Topography at the site slopes downward from east to west from approximately elevations 420 feet to 396 feet (NAVD88).

Nine (9) Standard Penetration Test (SPT, ASTM D1586) borings were performed between August 31st and September 1st, 2016 to depths ranging from approximately 25 to 30 feet (elevations 372.0 to 388.5 feet, NAVD88) below the existing ground surface. Subsurface stratigraphy encountered by the test borings consists of a surficial layer of topsoil or hot mix asphalt and graded aggregate base underlain by soft to stiff silt and/or loose to medium dense sand. The silt and sand layers are typically underlain by loose to very dense or soft to very stiff saprolite. In borings “B-4” and “B-9” fill material was encountered below the graded aggregate base. Groundwater was encountered in borings “B-1” through “B-8” at depths ranging from approximately 17 to 27 feet (elevations 377.0 to 391.3 feet, NAVD88). Boring “B-7” was left open following removal of augers and groundwater was observed to have risen from approximately 20 feet below grade to 12 feet below grade after one hour.

Based on our understanding of the project and the data obtained during the field exploration, it is our opinion that the proposed structures can be founded on a traditional shallow foundation system (e.g., strip and/or spread footings); however soil improvement or replacement may be necessary. The net allowable bearing capacity available for foundation design will generally be a function of the bottom of footing elevation. Therefore, we anticipate that if a basement is incorporated, foundations will bear in the medium dense or better saprolite and may be sized using a net allowable bearing capacity on the order of 3,000 to 4,000 psf. Foundation settlement within this stratum is anticipated to be less than one inch. Groundwater control appears necessary if a basement is included. If a basement is not included and the structures are founded “at-grade,” shallow foundations may be an option if the foundations bear in medium dense or better saprolite or if the less dense saprolite or Strata A and F loose sand are improved or replaced. Deep foundations may also be an option, depending on the final grading of the site and the depth to the dense to very dense saprolite stratum.

This report includes a summary of our field and laboratory testing, a discussion of factors affecting the foundation design and construction, and recommendations for additional design phase geotechnical field exploration.

2. INTRODUCTION

2.1. PROJECT DESCRIPTION

It is our understanding that the project consists of a Public Private Partnership (P3) to construct a new courthouse and associated parking located at one of three locations in Howard County, Maryland. We understand that the three sites being considered include:

- An addition to the existing courthouse located at 8360 Court Avenue in Ellicott City;
- A new courthouse located on the north side of Martha Bush Drive across from the District Court in Ellicott City; and,
- A new courthouse located at the existing government offices at 9250 Bendix Road in Ellicott City.

As you are aware, Pennoni previously performed preliminary geotechnical explorations at the existing courthouse site and the site on Martha Bust Drive, which were summarized in our previously submitted preliminary geotechnical report dated December 12, 2014.

Pennoni is also providing landscape architecture, civil design, and surveying services for this project. Based on our involvement, we understand that the proposed construction at the Bendix Road site consists of the demolition of the existing Dorsey Building followed by the construction of a new courthouse and a new office building. As this project is in the preliminary stage, proposed site grading, the proposed site layout, and proposed building loads have not yet been determined. For the purposes of this report, we have assumed that the proposed grades will be similar to the existing grades. We understand that the proposed structures may be three stories or taller, and have assumed that they may include below grade levels.

2.2. INFORMATION REVIEWED

The following information was reviewed and utilized to develop this report:

- A drawing titled "Civil – Office and Depot Buildings: Layout and Utility Plan," prepared by Whitman, Requardt and Associates, dated January 20, 1969.

2.3. EXISTING SITE CONDITIONS

The site is located at 9250 Bendix Road, and currently consists of the approximately 200,000 sf one-story Thomas Dorsey Building on the western portion of the site, and an approximately 400 feet by 670 feet parking lot located on the eastern portion of the site. The site is bound by wooded areas to the north, wooded areas and Bendix Road to the south, a wooded area and Edgar Road to the west, and grass covered areas and commercial buildings to the east. Topography at the site slopes downward from east to west from approximately elevations 420 feet to 396 feet (NAVD88).

2.4. OBJECTIVES

Our objectives were to determine the subsurface conditions at the proposed project site, evaluate these conditions with respect to the proposed construction, and present preliminary recommendations regarding:

- foundation alternatives for the proposed construction
- ground water conditions and their influence on design and construction;
- suitability of on-site material for re-use as fill as part of the site work for the project;
- removal or treatment of objectionable material;
- monitoring and/or protection of adjacent structures and construction during earthwork and foundation construction, if deemed necessary;
- recommendations for additional geotechnical field exploration based on the preliminary design; and
- quality assurance and field-testing and inspection during construction.

3. FIELD AND LABORATORY WORK

3.1. FIELD WORK

Nine (9) Standard Penetration Test (SPT) borings, labeled "B-1" through "B-9" were performed on August 31st through September 1st, 2016. The test borings were performed to depths ranging from approximately 25 to 30 feet below existing ground surface. SPT borings were performed in general accordance with ASTM D1586. Continuous sampling was performed in the top 10 feet in each boring and in 5 foot increments thereafter to termination depths. The test borings in the existing asphalt pavement were backfilled with a mixture of the soil cuttings and bentonite grout and capped with approximately 6 inches of asphalt cold patch. The remaining test borings were backfilled with soil cutting upon completion.

Test borings were performed by Connelly & Associates using a track-mounted auger rig with 2¼ inch hollow stem augers. Our J. Steven Donahue, PE directed the field work and C. Bugher, EIT and Mr. Donahue observed the test drilling. A Test Boring Location Sketch is provided in Appendix A. Logs of the test borings are provided in Appendix B.

3.2. LABORATORY WORK

Following conclusion of the SPT drilling, the soil samples were delivered to our laboratory for visual classification and testing. The geotechnical laboratory program consisted of the following:

- Moisture Content (ASTM D 2216) 4 tests
- Sieve Analysis (w/o hydrometer, ASTM D 422) 4 tests
- Atterberg Limits (ASTM D 4318) 2 tests

Samples for testing were selected by Pennoni Associates' geotechnical engineer. Results of the laboratory testing are provided in Appendix C of this report.

4. SUBSURFACE CHARACTERISTICS

4.1. GEOLOGY

According to the Physiographic Map of Maryland (2008), the site is located within the Hampstead Upland District of the Piedmont Plateau Province. The area is characterized by rolling to hilly uplands interrupted by steep-walled gorges. Differential weathering of adjacent, contrasting lithologies produces distinctive ridges,

hills, barrens, and valleys. Streams may have short segments of narrow, steep-sided valleys. Within the Piedmont Plateau Province, massive rock is commonly encountered at or near the ground surface.

According to the Maryland Geological Survey's Geologic Map of Maryland (1968), the site is located within the Lower Pelitic Schist formation. This formation typically consists of medium to coarse grained biotite-oligoclase-muscovite-quartz schist with garnet, staurolite, and kyanite; fine to medium grained semipelitic schist; and fine grained granular to weakly schistose psammitic granulite; psammitic beds increase upward. This formation has an apparent thickness off 5,500 feet or more.

4.2. SUBSURFACE STRATIGRAPHY

Subsurface stratigraphy encountered by the test borings consists of a surficial layer of topsoil or hot mix asphalt and graded aggregate base underlain by soft to stiff silt and/or loose to medium dense sand. The silt and sand layers are typically underlain by loose to very dense or soft to very stiff saprolite. In borings "B-4" and "B-9" fill material was encountered below the hot mix asphalt and graded aggregate base.

For descriptive purposes the soil layers can be classified as follows:

Stratum	Approximate Thickness (ft.)	Description	USCS Classification
T[1]	0.5	TOPSOIL	---
P[2]	0.9 – 1.4	HOT MIX ASPHALT and GRADED AGGREGATE	---
F[3]	2 – 2.1	FILL: Brown to gray fine to medium sand, trace to and silt, trace to little mica, trace gravel, trace hot mix asphalt (loose to medium dense, dry)	---
A[4]	2 – 4	Multi-colored micaceous SILT, trace to and fine to medium sand, trace coarse sand/fine gravel, trace mica (soft to stiff, moist)	ML
B[5]	2 – 5.7	Brown/tan to gray to orange fine to coarse micaceous SAND, trace to little silt (loose to medium dense, moist)	SM
C[6]	…	SAPROLITE: Multi-colored fine to coarse micaceous sand, trace to and gravel, trace to and silt (loose to very dense, moist to wet) to SAPROLITE: Multi-colored micaceous silt, trace to and fine to medium sand, trace coarse sand (soft to very stiff, moist to damp)	"ML" (after reworking) to "SM" (after reworking)

Notes:
[1] Stratum T was only observed in boring "B-3."
[2] Stratum P was not encountered in boring "B-3."
[3] Stratum F was only observed in borings "B-4," and "B-9."
[4] Stratum A was not encountered in borings "B-1," "B-2," and "B-4."
[5] Stratum B was not encountered in borings "B-1," "B-3," "B-5," "B-6," "B-8," and "B-9."
[6] Stratum C was not fully penetrated.

4.3. GROUNDWATER

Groundwater observations were made in each boring during sampling and shortly after completion of drilling. Groundwater was encountered in borings "B-1" through "B-8" at depths ranging from approximately 17 to 27 feet (elevations 377.0 to 391.3 feet, NAVD88). Boring "B-7" was left open following removal of augers and groundwater was observed to have risen from approximately 20 feet below grade to 12 feet below grade after one hour. Groundwater observations are for the times indicated and may not be indicative of seasonal or daily variations in the groundwater levels. Seasonal variations on the order of several feet should be anticipated.

5. PRELIMINARY ANALYSES AND RECOMMENDATIONS

5.1. GROUNDWATER AND SUBSURFACE STRATIGRAPHY

During the performance of the borings, the level at which apparent groundwater was encountered varied significantly from elevation 377 to 391.3 feet. Additionally, it appears that groundwater levels take time to equilibrate during drilling as observed in boring "B-7." The equilibration of the groundwater combined with the removal of overburden as a result of the drilling process is suspected to have weekend the Stratum C saprolite material resulting in the relatively low blow counts observed in several of the test borings. This effect may have an impact on the allowable bearing capacity this stratum may be capable of achieving. Therefore, the presence of a basement and the construction means and methods utilized to contract the basement will have a significant effect on the resistance of the soil.

5.2. FOUNDATIONS

As this project is in the preliminary conceptual phase, structural and site grading information was not available for our review and analysis. Typically, shallow foundations consisting of isolated spread footings and continuous strip foundations provide a practical and economical solution for support of structures. However, when subsurface conditions cannot provide adequate bearing capacity or result in undesirable settlement estimates, other foundation options are considered. Factors such as proposed grading ("cuts and fills"), structural loads, and the presence of basements also significantly influence the type of foundation. This report discusses the use of shallow and deep foundations for support of the proposed structures.

Based on our understanding of the project and the data obtained during the field exploration, it is our opinion that the proposed structures can be founded on a traditional shallow foundation system (e.g., strip and/or spread footings); however soil improvement or replacement may be necessary. The net allowable bearing capacity available for foundation design will generally be a function of the bottom of footing elevation. Therefore, we anticipate that if a basement is incorporated, foundations will bear in the medium dense or better saprolite and may be sized using a net allowable bearing capacity on the order of 3,000 to 4,000 psf provided that the groundwater elevation has been lowered a minimum of 5 feet below the proposed excavation bottom. Foundation settlement within this stratum is anticipated to be less than one inch. If a basement is not included and the structures are founded "at-grade," shallow foundations may be an option if the foundations bear in medium dense or better saprolite or if the less dense saprolite or Strata A and F loose sand are improved or replaced. Consideration can also be given to subgrade improvement below a shallow foundation system such as utilizing rammed aggregate piers (RAP) to obtain greater allowable bearing capacity without the need for undercut or soil replacement. RAP elements reinforce good to poor soils, including loose sands, silts, mixed soil layers, uncontrolled fill and soils below the ground water table. The process laterally displaces soil during

installation and utilizes vertical impact ramming energy to construct displacement RAPs with increased strength and stiffness and are designed to provide total and differential settlement control and increase bearing support to meet project requirements. Anticipated foundation settlement within these strata will be sensitive to the magnitude of the building loads.

If shallow foundations are not feasible due to the magnitude of the building loads or the varying depth to the medium dense or better Stratum C saprolite, it is our opinion that the proposed structure can be founded on a deep foundation system bearing in the dense to very dense saprolite. Deep foundation alternatives could consist of driven piles or augered cast-in-place piles (ACIP).

5.3. SEISMIC SITE CLASSIFICATION

Based on the sampling performed in the SPT borings, a Site Class D as classified in general accordance with Table 20.3-1 of ASCE 7 and referenced in Section 1613.3 of the 2012 International Building Code, appears suitable. Site Class determination is based on the properties in the upper 100 feet of the ground surface. The borings performed herein were advanced to a maximum depth of 30 feet. Values beyond 30 feet were estimated based on our local experience in this area. Based on Figures 1613.3.1(1) and 1613.3.1(2) of the 2012 International Building Code, parameters S_s and S_1 for the site can be assumed to be 0.124 g and 0.051 g, respectively.

As noted above, it appears that the drilling process has reduced the overburden stress at the boring locations, allowing the groundwater table to rise and the resulting hydrostatic pressure to degrade the underlying subsurface soils, specifically the Stratum C saprolite. We recommend that cone penetrometer test soundings be performed within the footprints of the structures once the site layout and grading have been finalized to further refine the data obtained within the Stratum C saprolite, and in turn refine the seismic site classification.

5.4. GROUNDWATER AND SURFACE WATER MANAGEMENT

The groundwater observations made in the borings suggests that free-standing groundwater may be anticipated in excavations for the proposed structures depending on the footing bottom elevation. We recommend that the groundwater be lowered to a minimum of 5 feet below excavation depths during construction using a well point system to reduce the potential for the groundwater table to degrade the foundation subgrades. The foundation excavations should not be used as a detention basin or sump. During construction, surface runoff should be prevented from entering the excavations by creating soil berms or diversion swales along the perimeter if the excavation is expected to be open for a long period of time. Where ponding does occur, the water should be pumped immediately and grades should then be established to prevent further ponding.

The shallow subsurface material is considered susceptible to damage from moisture and construction traffic. Therefore, precipitation and other water should not be permitted from accumulating on the exposed subgrade and construction traffic should be minimized over exposed subgrade.

5.5. EARTHWORK

Prior to placing any new fill, and before the construction of the proposed foundations, any vegetation, associated topsoil, and construction debris must be removed from within the areas of proposed construction. These materials can remain in proposed landscaped areas provided that future plans do not include building in those areas.

Exposed subgrades should be thoroughly proofrolled using a minimum 10-ton vibratory roller operated in static mode or a fully loaded dump truck in an attempt to identify unstable (soft, yielding, etc.) surface areas. During proofrolling any unstable area found should be stabilized by excavating and replacing those soils with suitable soil (adequately compacted, see below), by lowering the moisture content of the subgrade soils and compacting them, or by other methods (placing a geotextile and stone layer, etc.). To reduce the potential for damage to the subgrade, we recommend that construction traffic over the subgrade be kept to a minimum. Also, concrete for foundations and/or slabs on grade should be placed as soon as possible following the subgrade preparation.

Our experience indicates that the on-site, near surface soils of Strata A, B, C, and F can be reused for the construction, provided all organics and debris larger than 3 inches in its greatest dimension be removed prior to reuse. Strata B, C and F soils were observed to contain a significant amount of fine grained material (silts and clays). These types of soils are sensitive to moisture and may therefore require wetting or drying prior to compaction. Drying “wet” soil is difficult during wet periods and during lower temperatures. Therefore, provisions for importing structural fill should be included in the contract documents. If necessary, granular fill should consist of well-graded material with a maximum particle size less than 3 inches, not more than 20 percent passing the No. 200 sieve and have a plasticity index (PI) not greater than 8 percent.

Fills should be placed in layers not exceeding 10 to 12 in. loose measure. This criterion might be adjusted by the geotechnical engineer in the field depending on the conditions present at the time of construction, on the compaction equipment used, and on the fill materials selected. Fills for support of foundations/floor slabs should be compacted to at least 98 percent of the laboratory determined dry density, ASTM D 698, when small, hand-operated compaction equipment is used, and to at least 95 percent of the laboratory determined maximum dry density, ASTM D 1557, when self-propelled, heavy-duty construction equipment is used. Fills should extend a minimum of 5 feet beyond the exterior edge of a loaded area and have side slopes not steeper than 2 horizontal to 1 vertical.

Specifications should indicate that the percentage of maximum dry density attained in the field is not the only criteria to be used for assessing fill compaction. Observation of the behavior of the fill under the loads of construction equipment should also be used. If the test results indicate that the percentage of compaction is being achieved, but the soil mass is moving under the equipment, placement of additional fill should not be continued until the movement is stabilized. Otherwise, settlement of the fill may occur.

5.6. EXISTING UTILITIES

Several existing utilities were delineated within the existing parking lot and around the perimeter of the existing Thomas Dorsey building. These include (but may not be limited to): telecommunication; water; gas; sewer; and electric. We recommend that all existing utilities be removed from beneath load bearing elements of the proposed construction in order to reduce the potential for damage. We recommend that relocated utilities enter the structure from above the top of the foundations.

6. RECOMMENDATIONS FOR FURTHER GEOTECHNICAL SERVICES

This report is a preliminary geotechnical evaluation for the proposed construction consisting of a new courthouse and a new county office building located at 9250 Bendix Road in Ellicott City, Maryland. The purpose of our services was to provide a preliminary geotechnical engineering exploration of site conditions related to foundation design, site work preparation, and earthwork operations. A design phase study with supplemental geotechnical borings will be required once final grading, proposed layout and anticipated loading have been established. We recommend that cone penetrometer test soundings be performed within the footprints of the structures as part of the design phase study to confirm the depth to the dense to very dense saprolite and further refine the data presented in this report.

When a proposed layout, final site grading, and structural loading information are made available, Pennoni should evaluate the data with respect to the subsurface conditions at the project site in order to refine recommendations presented herein.

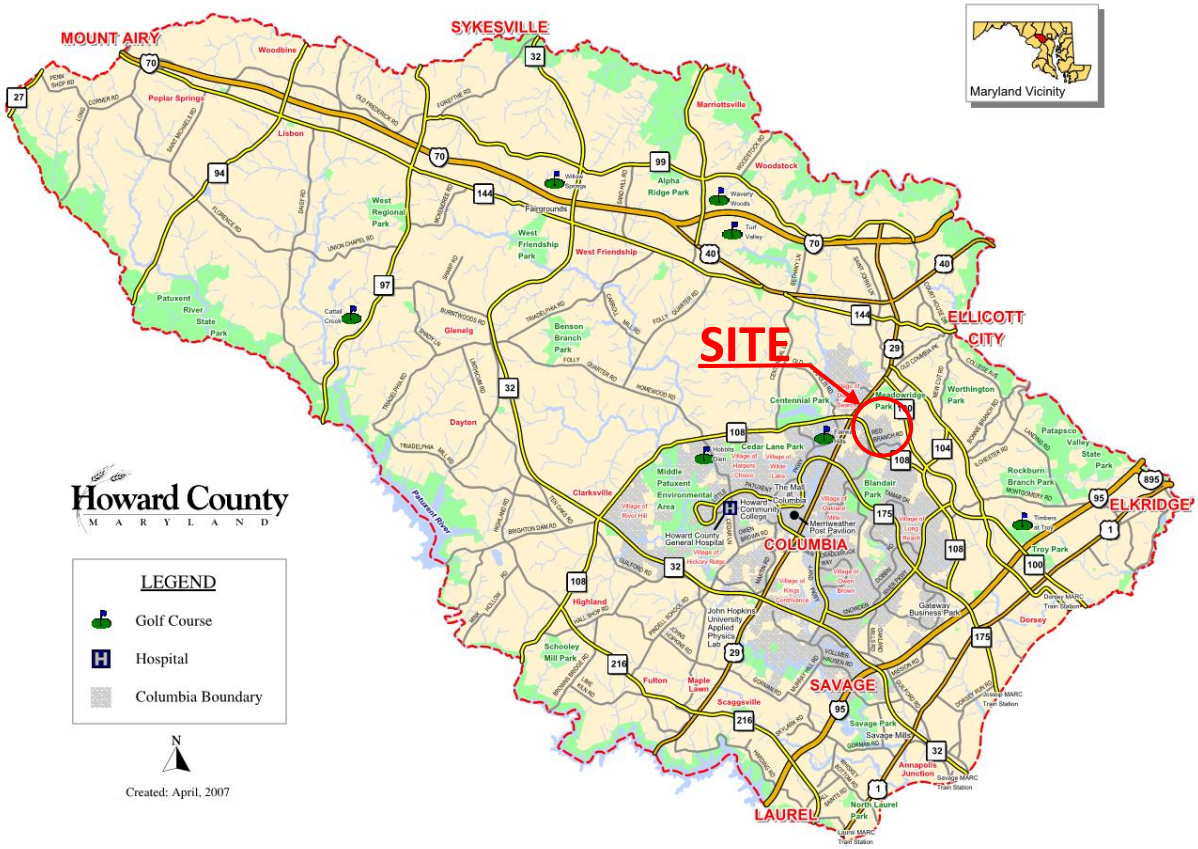
7. LIMITATIONS

This work has been done in accordance with our authorized scope of work and in accordance with generally accepted professional practice in the fields of geotechnical and foundation engineering. This warranty is in lieu of all other warranties either expressed or implied. Our conclusions and recommendations are based on the data revealed by this exploration. We are not responsible for any conclusions or opinions drawn from the data included herein, other than those specifically stated, nor are the recommendations presented in this report intended for direct use as construction specifications. This report is intended for use with regard to the specific project described herein; any changes in loads, structures, or locations should be brought to our attention so that we may determine how they may affect our conclusions. An attempt has been made to provide for normal contingencies but the possibility remains that unexpected conditions may be encountered during construction. If this should occur, or if additional or contradictory data are revealed in the future, we should be notified so that modifications to this report can be made, if necessary. If we do not review relevant construction documents and witness the relevant construction operations, then we cannot be responsible for any problems that may result from misinterpretation or misunderstanding of this report or failure to comply with our recommendations.

APPENDICES

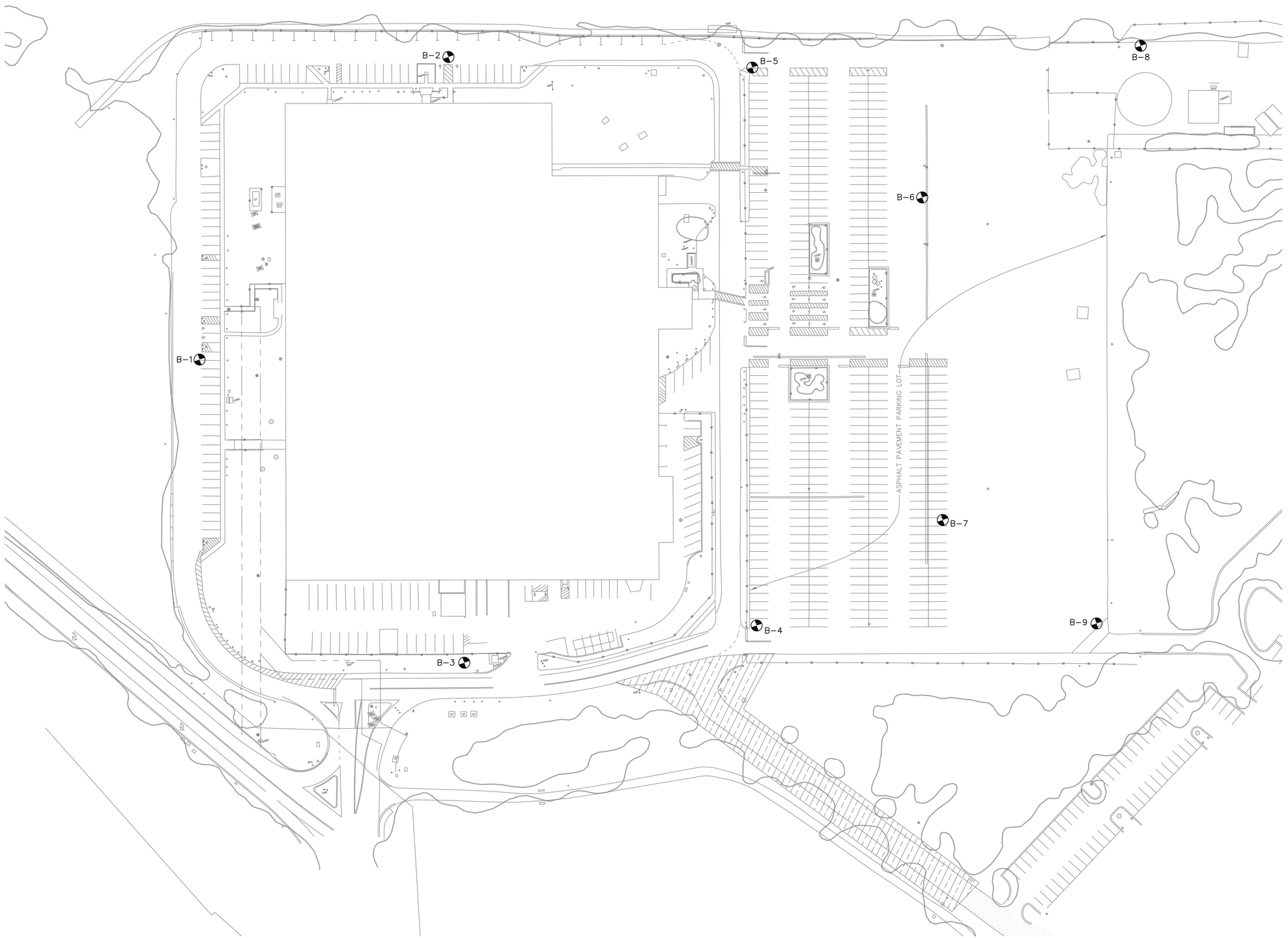
APPENDIX A – Location Sketches

SITE LOCATION SKETCH



Note: This image was adapted from a map titled "General Map" prepared by Howard County, Maryland, dated April 2007.

Pennoni Associates, Inc. 8818 Centre Park Drive, Suite 200 Columbia, MD 21045	ALL DOCUMENTS PREPARED BY PENNONI ASSOCIATES ARE INSTRUMENTS OF SERVICE IN RESPECT OF THE PROJECT. THEY ARE NOT INTENDED OR REPRESENTED TO BE SUITABLE FOR REUSE BY OWNER OR OTHERS ON EXTENSIONS OF THE PROJECT OR ON ANY OTHER PROJECT. ANY REUSE WITHOUT WRITTEN VERIFICATION OR ADAPTATION BY PENNONI ASSOCIATES FOR THE SPECIFIC PURPOSE INTENDED WILL BE AT OWNERS SOLE RISK AND WITHOUT LIABILITY OR LEGAL EXPOSURE TO PENNONI ASSOCIATES; AND OWNER SHALL INDEMNIFY AND HOLD HARMLESS PENNONI ASSOCIATES FROM ALL CLAIMS, DAMAGES, LOSSES, AND EXPENSES ARISING OUT OF OR RESULTING THEREFROM.	DRAWN BY: CLB	SCALE: NTS	DATE: 9/23/2016
		CHECKED BY: JSD	FIGURE No. SL-1	
		Project No: GRIM1401		
HOWARD COUNTY CIRCUIT COURTHOUSE, ELLICOTT CITY, MD				



LEGEND

APPROXIMATE SOIL BORING LOCATION

PROJECT:
HOWARD COUNTY CIRCUIT COURTHOUSE

AREA

9250 BENDIX ROAD
HOWARD COUNTY, MARYLAND

TITLE

SOIL BORING LOCATION PLAN

Pennoni
8818 Centre Park Drive, Suite 200
Columbia, Maryland 21045
(O) 410-997-8900 (F) 410-997-9282

DRAWN BY: H.J.M.	DATE: 08.25.2016
PROJECT No. GRIM1401	SCALE: 1" = 50'
FILE NAME: GRIM1401-V-BORINGS.DWG	DRAWING No. 1 OF 1

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APPENDIX B – Test Boring Logs

TEST BORING LOG

BORING B-1
PAGE 1 OF 1

CLIENT Grimm + Parker Architects
PROJECT NAME Howard County Circuit Courthouse - Bendix Road
PROJECT NUMBER GRIM1401
PROJECT LOCATION 9250 Bendix Road, Ellicott City, MD
DATE STARTED 9/1/16 **COMPLETED** 9/1/16
GROUND ELEVATION 397 ft. +/- NAVD88 *
DRILLING CONTRACTOR Connelly & Associates
WATER ENCOUNTERED:
DRILLING METHOD Hollow Stem Auger
▽ **DURING DRILLING** 20.00 / Elev 377.00 ft.
DRILLER / HELPER J. Boy/J. Leatherman
▼ **AT END OF DRILLING** 20.00 / Elev 377.00 before auger withdrawal
LOGGED BY C. Bugher **CHECKED BY**
AFTER DRILLING --- Dry after auger withdrawal

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in.)	BLOW COUNTS	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0					P	1.0 — 9.5" HMA, 2.5" GRADED AGGREGATE — 396.0	
	S-1	12	9-17-50/5			SAPROLITE: White to gray to orange micaceous sand, little to some gravel, trace to little silt	
5	S-2	9	35-50/5				
	S-3	12	30-50/6				
	S-4	3	50/4			SAPROLITE: White to gray to orange micaceous sand, trace gavel, trace silt	Caved at 7.5'
10	S-5	3	50/3			SAPROLITE: White to gray to orange fine to coarse micaceous sand, trace silt	
					C		
15	S-6	3	50/3			SAPROLITE: Gray to white fine to medium micaceous sand, trace silt	Auger grinding @ 16'
20 ▼	S-7	14	15-21-50/6			SAPROLITE: Gray to white to orange fine to coarse micaceous sand, trace silt, trace gravel	Auger grinding @ 20'
25	S-8	2	50/2			25.0 — SAPROLITE: Gray to white fine to coarse micaceous sand, trace fine gravel, trace silt (damp) — 372.0	
						Boring terminated at 25.0 feet.	

NOTES:
**surveyed by Pennoni on August 31, 2016*

TEST BORING LOG

BORING B-2
PAGE 1 OF 1

CLIENT Grimm + Parker Architects
PROJECT NAME Howard County Circuit Courthouse - Bendix Road
PROJECT NUMBER GRIM1401
PROJECT LOCATION 9250 Bendix Road, Ellicott City, MD
DATE STARTED 9/1/16 **COMPLETED** 9/1/16
GROUND ELEVATION 401.3 ft. +/- NAVD88 *
DRILLING CONTRACTOR Connelly & Associates
WATER ENCOUNTERED:
DRILLING METHOD Hollow Stem Auger
▽ **DURING DRILLING** 22.00 / Elev 379.30 ft.
DRILLER / HELPER J. Boy/J. Leatherman
▼ **AT END OF DRILLING** 22.00 / Elev 379.30 ft. before auger withdrawal
LOGGED BY C. Bugher **CHECKED BY**
AFTER DRILLING --- Dry after auger withdrawal

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in.)	BLOW COUNTS	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0					P	1.0 — 9.5" HMA, 2.5" GRADED AGGREGATE — 400.3	
	S-1	18	4-4-3-5		B	Tan to orange fine to coarse micaceous SAND, little silt — 3.0 — 398.3	
5	S-2	15	2-2-3-3		C	SAPROLITE: Gray to orange micaceous silt, trace fine sand	
	S-3	23	1-2-3-3				
	S-4	24	1-2-4-4			SAPROLITE: White/gray to brown to orange micaceous silt, and fine to medium sand	
C 10	S-5	24	3-3-5-5			SAPROLITE: White to gray to orange micaceous silt, little fine sand	Caved at 9'
15	S-6	18	3-3-4				
20	S-7	11	6-8-10			SAPROLITE: White to gray micaceous silt, and fine to medium sand	
▼ 25	S-8	11	8-8-10			25.0 — 376.3	

Boring terminated at 25.0 feet.

NOTES:
**surveyed by Pennoni on August 31, 2016*

TEST BORING LOG

BORING B-3
PAGE 1 OF 1

CLIENT Grimm + Parker Architects
PROJECT NAME Howard County Circuit Courthouse - Bendix Road
PROJECT NUMBER GRIM1401
PROJECT LOCATION 9250 Bendix Road, Ellicott City, MD
DATE STARTED 9/1/16 **COMPLETED** 9/1/16
GROUND ELEVATION 398.3 ft. +/- NAVD88 *
DRILLING CONTRACTOR Connelly & Associates
WATER ENCOUNTERED:
DRILLING METHOD Hollow Stem Auger
▽ **DURING DRILLING** 17.00 / Elev 381.30 ft.
DRILLER / HELPER J. Boy/J. Leatherman
▼ **AT END OF DRILLING** 22.00 / Elev 376.30 ft. before auger withdrawal
LOGGED BY C. Bugher **CHECKED BY**
AFTER DRILLING --- Dry after auger withdrawal

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in.)	BLOW COUNTS	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0					T	Depth 0.5 — 6" TOPSOIL — Elev. 397.8	
	S-1	14	WH-1-2-2		A	Orange to brown micaceous SILT, little sand	
	S-2	14	3-4-7-8			4.0 — Elev. 394.3	
5						SAPROLITE: White to orange to brown micaceous fine to medium sand, some silt, trace coarse sand	
	S-3	24	4-3-3-3				
	S-4	22	2-3-3-4				Caved at 7'
10	S-5	23	2-2-3-4				
15	S-6	18	9-11-12		C	SAPROLITE: Tan to gray to white micaceous sand, and gravel	
20	S-7	18	4-10-12			SAPROLITE: Gray to white to orange micaceous silt, and fine sand	
25	S-8	18	10-21-35			25.0 — SAPROLITE: White and gray micaceous sand, and gravel — Elev. 373.3	
						Boring terminated at 25.0 feet.	

NOTES:
**surveyed by Pennoni on August 31, 2016*

TEST BORING LOG

BORING B-4
PAGE 1 OF 1

CLIENT Grimm + Parker Architects
PROJECT NAME Howard County Circuit Courthouse - Bendix Road
PROJECT NUMBER GRIM1401
PROJECT LOCATION 9250 Bendix Road, Ellicott City, MD
DATE STARTED 8/31/16 **COMPLETED** 8/31/16
GROUND ELEVATION 413.2 ft. +/- NAVD88 *
DRILLING CONTRACTOR Connelly & Associates
WATER ENCOUNTERED:
DRILLING METHOD Hollow Stem Auger
▽ **DURING DRILLING** 22.00 / Elev 391.20 ft.
DRILLER / HELPER J. Leatherman/J. Ferber
AT END OF DRILLING ---
LOGGED BY S. Donahue **CHECKED BY**
AFTER DRILLING --- Dry after auger withdrawal

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in.)	BLOW COUNTS	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0					P	0.9 — 3.5" HMA, 7.5" GRADED AGGREGATE — 412.3	
	S-1	12	5-5-10-9		F	FILL: Brown fine to medium sand, trace to little silt, trace mica (dry)	
						3.0 — 410.2	
	S-2	9	27-15-17-12		P	3.3 — 4" HMA — 409.9	
5						Brown and gray fine to medium SAND, trace silt (moist)	
	S-3	17	6-7-7-6		B		
	S-4	21	10-4-5-6			9.0 — 404.2	
10	S-5	24	7-16-14-12			SAPROLITE: Multi-colored fine to medium sand, little silt, trace mica	
15	S-6	18	13-12-12			SAPROLITE: Multi-colored fine to medium sand, little coarse sand to fine gravel, little silt, trace mica	
					C		Caved at 17'
20	S-7	18	20-33-50/4			SAPROLITE: Gray medium sand, little fine sand, trace silt, trace coarse sand	
							Wet on spoon
25	S-8		32-25-45				Auger refusal at 22.4 ft
	S-9	1	50/1			25.1 — 388.1	After driving spoon, auger was able to advance to 25'
						Boring terminated at 25.1 feet.	

NOTES:
**surveyed by Pennoni on August 31, 2016*

TEST BORING LOG

BORING B-5
PAGE 1 OF 1

CLIENT Grimm + Parker Architects
PROJECT NAME Howard County Circuit Courthouse - Bendix Road
PROJECT NUMBER GRIM1401
PROJECT LOCATION 9250 Bendix Road, Ellicott City, MD
DATE STARTED 8/31/16 **COMPLETED** 8/31/16
GROUND ELEVATION 403.5 ft. +/- NAVD88 *
DRILLING CONTRACTOR Connelly & Associates
WATER ENCOUNTERED:
DRILLING METHOD Hollow Stem Auger
▽ **DURING DRILLING** 19.00 / Elev 384.50 ft.
DRILLER / HELPER J. Leatherman/J. Ferber
AT END OF DRILLING ---
LOGGED BY S. Donahue **CHECKED BY**
▼ **AFTER DRILLING** 18.50 / Elev 385.00 ft. after auger withdrawal

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in.)	BLOW COUNTS	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0					P	8.4" HMA, 8.4" GRADED AGGREGATE (Depth 1.4 / Elev. 402.1)	
	S-1	24	3-3-4-4		A	Brown to orange micaceous SILT, little fine sand (moist) (Depth 3.4 / Elev. 400.1)	
5	S-2	24	3-5-6-6				
	S-3	24	3-5-5-6			SAPROLITE: Brown to orange to white fine to medium micaceous sand, little to some silt	
	S-4	18	4-2-4-6				
10	S-5	24	2-3-4-4				
15	S-6	18	4-7-9		C	SAPROLITE: Brown to gray to black fine to medium sand, and silt, trace coarse sand	
20	S-7	18	5-4-9			SAPROLITE: Brown to dark gray to white silt, little to some fine to medium sand	Caved at 19'
25	S-8	12	4-9-14			SAPROLITE: White fine to medium sand , little to some silt (damp) (Depth 25.0 / Elev. 378.5)	
						Boring terminated at 25.0 feet.	

NOTES:
**surveyed by Pennoni on August 31, 2016*

TEST BORING LOG

BORING B-6
PAGE 1 OF 1

CLIENT Grimm + Parker Architects
PROJECT NAME Howard County Circuit Courthouse - Bendix Road
PROJECT NUMBER GRIM1401
PROJECT LOCATION 9250 Bendix Road, Ellicott City, MD
DATE STARTED 8/31/16 **COMPLETED** 8/31/16
GROUND ELEVATION 406.2 ft. +/- NAVD88 *
DRILLING CONTRACTOR Connelly & Associates
WATER ENCOUNTERED:
DRILLING METHOD Hollow Stem Auger
▽ **DURING DRILLING** 18.50 / Elev 387.70 ft.
DRILLER / HELPER J. Leatherman/J. Ferber
AT END OF DRILLING ---
LOGGED BY S. Donahue **CHECKED BY**
AFTER DRILLING --- Dry after auger withdrawal

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in.)	BLOW COUNTS	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0					P	1.0 6" HMA, 6" GRADED AGGREGATE 405.2	
	S-1	24	2-2-4-5		A	Yellow to red to brown SILT, little fine sand, trace mica (moist)	
5	S-2	24	3-5-9-29			4.5 401.7	
	S-3	22	12-12-15-15			SAPROLITE: White to gray to light brown fine to coarse sand, trace to little silt, trace fine gravel, trace mica (moist)	
	S-4	24	5-6-9-11				Caved at 7'
10	S-5	24	15-10-11-12				
15	S-6	18	8-14-16		C		
▽ 20	S-7	17	19-45-50/5			SAPROLITE: Gray to brown to orange to white fine to medium sand, little coarse sand, trace to little silt, trace mica (moist)	Wet on spoon
25	S-8	4	50/4			25.0 381.2	

Boring terminated at 25.0 feet.

NOTES:
**surveyed by Pennoni on August 31, 2016*

TEST BORING LOG

BORING B-7
PAGE 1 OF 1

CLIENT Grimm + Parker Architects
PROJECT NAME Howard County Circuit Courthouse - Bendix Road
PROJECT NUMBER GRIM1401
PROJECT LOCATION 9250 Bendix Road, Ellicott City, MD
DATE STARTED 8/31/16 **COMPLETED** 8/31/16
GROUND ELEVATION 409.68 ft. +/- NAVD88 *
DRILLING CONTRACTOR Connelly & Associates
WATER ENCOUNTERED:
DRILLING METHOD Hollow Stem Auger
▽ **DURING DRILLING** 20.00 / Elev 389.68 ft.
DRILLER / HELPER J. Leatherman/J. Ferber
▼ **AT END OF DRILLING** 20.00 / Elev 389.68 ft. after auger withdrawal
LOGGED BY S. Donahue **CHECKED BY**
▼ **1 HRS AFTER DRILLING** 12.00 / Elev 397.68 ft.

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in.)	BLOW COUNTS	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0					P	Depth 1.1 — 8.4" HMA, 4.8" GRADED AGGREGATE — Elev. 408.6	
	S-1	24	2-3-4-4		B	Depth 3.1 — Gray to brown fine to medium micaceous SAND, little coarse sand, little silt (moist) — Elev. 406.6	
5	S-2	24	2-4-4-5		A	Gray SILT, little fine sand Brown to gray SILT, little fine sand, trace mica (moist)	Gray silt, little fine sand in shoe
	S-3	24	3-4-4-5			Depth 7.1 — Elev. 402.6	
	S-4	24	2-6-3-5		C	SAPROLITE: Brown to gray to white fine sand, little silt, trace mica	
10	S-5	24	2-3-5-7				
▼							
15	S-6	7	2-1-3			SAPROLITE: Brown to gray to orange silt, and fine sand, trace medium sand (damp)	
20 ▼	S-7	18	2-2-4			SAPROLITE: Gray to brown to white fine to medium sand, some silt, trace coarse sand/fine gravel (wet)	Wet on spoon
25	S-8	18	3-2-5				
C							Caved at 25.5'
30	S-9	18	2-1-2			Depth 30.0 — SAPROLITE: Gray and white silt, and fine to medium sand, trace coarse sand (damp) — Elev. 379.7	
						Boring terminated at 30.0 feet.	

NOTES:
**surveyed by Pennoni on August 31, 2016*

TEST BORING LOG

BORING B-8
PAGE 1 OF 1

CLIENT Grimm + Parker Architects
PROJECT NAME Howard County Circuit Courthouse - Bendix Road
PROJECT NUMBER GRIM1401
PROJECT LOCATION 9250 Bendix Road, Ellicott City, MD
DATE STARTED 8/31/16 **COMPLETED** 8/31/16
GROUND ELEVATION 417.9 ft. +/- NAVD88 *
DRILLING CONTRACTOR Connelly & Associates
WATER ENCOUNTERED:
DRILLING METHOD Hollow Stem Auger
▽ **DURING DRILLING** 27.00 / Elev 390.90 ft.
DRILLER / HELPER J. Leatherman/J. Ferber
AT END OF DRILLING ---
LOGGED BY S. Donahue **CHECKED BY**
▼ **AFTER DRILLING** 22.00 / Elev 395.90 ft. after auger withdrawal

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in.)	BLOW COUNTS	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0					P	7.2" HMA, 7.2" GRADED AGGREGATE (1.2 / 416.7)	
	S-1	16	2-3-5-5		A	Brown SILT, trace fine to medium sand (moist)	
5	S-2	15	2-3-4-6			Brown SILT, little to some fine to medium sand, trace coarse sand/fine gravel (moist) (5.2 / 412.7)	
	S-3	24	2-3-5-6		C	SAPROLITE: Brown to gray to white fine to medium sand, some silt (moist)	
	S-4	24	2-3-3-3			SAPROLITE: White to brown fine sand, little silt, trace mica	
10	S-5	24	2-4-5-5				
15	S-6	18	4-4-5				
20	S-7	18	3-3-3			SAPROLITE: Brown and white fine to medium sand, and silt, little mica (damp to wet)	
▼ C							Caved at 23'
25	S-8	18	2-4-6				
▽							
30	S-9	18	2-5-5			(30.0 / 387.9)	

Boring terminated at 30.0 feet.

NOTES:
**surveyed by Pennoni on August 31, 2016*

TEST BORING LOG

BORING B-9
PAGE 1 OF 1

CLIENT Grimm + Parker Architects
PROJECT NAME Howard County Circuit Courthouse - Bendix Road
PROJECT NUMBER GRIM1401
PROJECT LOCATION 9250 Bendix Road, Ellicott City, MD
DATE STARTED 8/31/16 **COMPLETED** 8/31/16
GROUND ELEVATION 413.5 ft. +/- NAVD88 *
DRILLING CONTRACTOR Connelly & Associates
WATER ENCOUNTERED:
DRILLING METHOD Hollow Stem Auger
DURING DRILLING --- NE
DRILLER / HELPER J. Leatherman/J. Ferber
AT END OF DRILLING ---
LOGGED BY S. Donahue **CHECKED BY**
AFTER DRILLING --- Dry after auger withdrawal

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in.)	BLOW COUNTS	GRAPHIC LOG	STRATA	DESCRIPTION	Depth	Elev.	REMARKS
0					P	7.2" HMA, 4.8" GRADED AGGREGATE	1.0	412.5	
	S-1	7	2-3-2-5		F	FILL: Brown and gray fine to medium sand, and silt, little mica, trace gravel	3.0	410.5	
5	S-2	14	4-2-3-3		A	Gray SILT, little medium sand, trace mica			
	S-3	24	2-3-4-5			Orange to brown micaceous SILT, and fine to medium SAND, trace coarse sand/fine gravel (moist)			
	S-4	24	2-2-3-4			Orange to brown SILT, little fine to medium sand, trace silt (moist)	9.0	404.5	
10	S-5	24	2-3-4-4		C	SAPROLITE: Orange to brown to gray micaceous silt, some fine sand (moist)			
15	S-6	18	2-3-4			SAPROLITE: Gray to brown to white to orange fine to medium sand, little silt, trace mica (damp)			
20	S-7	18	4-6-9						Caved at 19'
25	S-8	15	8-8-13			SAPROLITE: White and gray fine to medium sand, little coarse sand, trace silt, trace mica	25.0	388.5	
						Boring terminated at 25.0 feet.			

NOTES:
NE = Not Encountered

**surveyed by Pennoni on August 31, 2016*

TEST BORING/TEST PIT/AUGER PROBE LOG KEY SHEET

COLUMN	DESCRIPTION
Depth	Depth in feet below ground surface
Description	Description of sample including color, texture, and classification of subsurface material as applicable. Estimated depths to bottom of strata as interpolated from the boring are also shown.
Stratum	Strata numbers as assigned by the geotechnical engineer
Sample No.	Split barrel sample and sample number (S-x) Undisturbed Tube sample and sample number (U-x) Rock core run and core number (R-x) NR indicates no recovery
Blow Counts	For soils sample (ASTM D 1586): indicates number of blows obtained for each 6 inches penetration of the standard split-barrel sampler. For rock coring (ASTM D 2113): indicates percent recovery (REC) per run and rock quality designation (RQD). Recovery (REC) represents the total length of rock recovered for a given core length. RQD is the sum of rock pieces that are 4 inches or longer in length in one core run divided by the total core run.
Recovery	For soil samples indicates the length of recovery in the sample spoon.
Remarks	Special conditions or test data as noted during drilling

Ground Water: Free water level as shown ( )*; * Free water level as noted may not be indicative of daily, seasonal, or long term fluctuations.

DESCRIPTIVE TERMS

Descriptive Term	Estimated Percentages
Trace	1 to 10
Little	10+ to 20
Some	20+ to 35
And	35+ to 50

GRADATION OF COARSE GRAINED COMPONENTS

Soil Component	Size Range	Maximum Particle Size	Minimum Particle Size
Boulders		-	12”
Cobbles		12”	3”
Gravel	Coarse	3”	¾”
	Fine	¾”	#4 Sieve
Sand	Coarse	#4 Sieve	#10 Sieve
	Medium	#10 Sieve	#40 Sieve
	Fine	#40 Sieve	#200 Sieve
Silt		#200 Sieve	.005 mm
Clay		.005 mm	-

COMPOSITION OF COARSE-GRAINED COMPONENTS

Gradation Designation	Symbol	Defining Proportions
Coarse to Fine	CF	All fractions greater than 10% of the component
Coarse to Medium	CM	Less than 10% Fine
Medium to Fine	MF	Less than 10% Coarse
Coarse	C	Less than 10% Fine and Medium
Medium	M	Less than 10% Coarse and Fine
Fine	F	Less than 10% Coarse and Medium

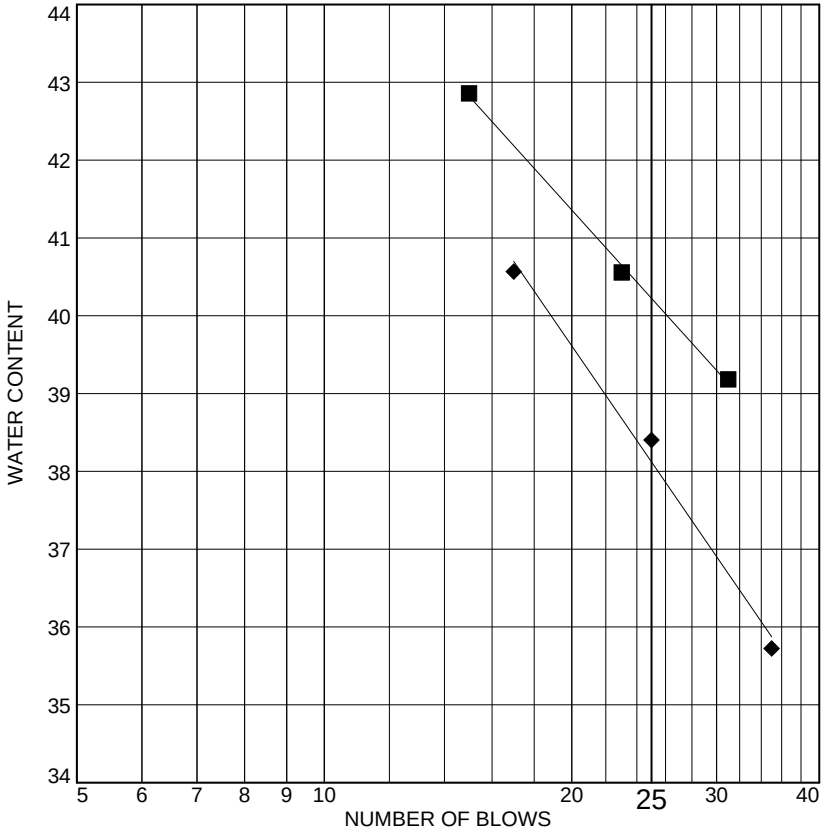
APPENDIX C – Geotechnical Laboratory Test Results

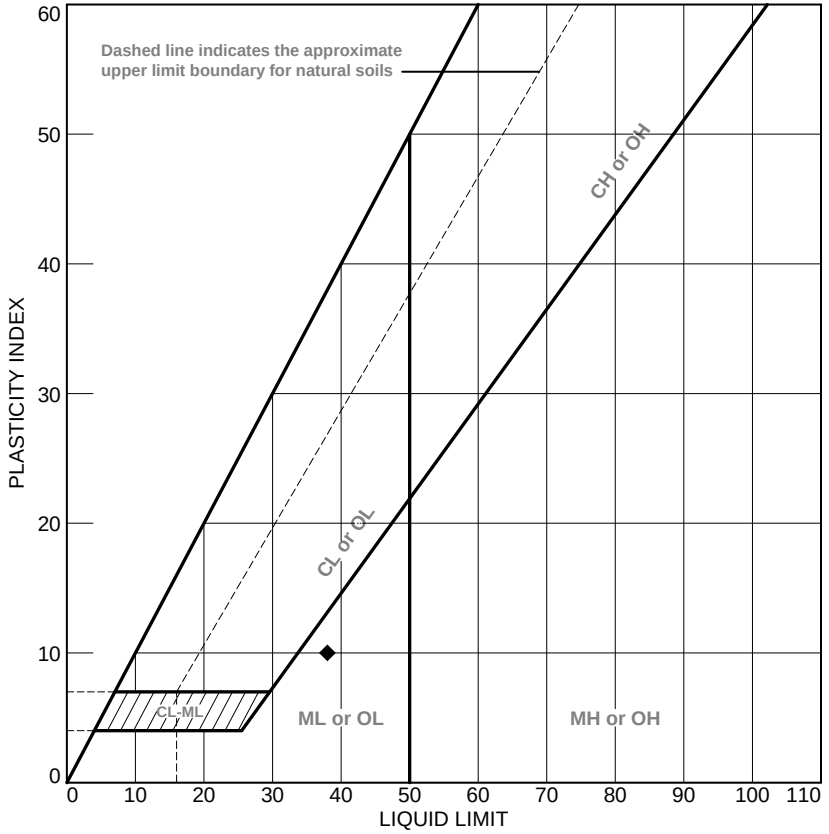
SUMMARY OF LABORATORY DATA

BORING NUMBER	SAMPLE NUMBER	DEPTH (ft)	SOIL GROUP SYMBOL	GRAIN SIZE DISTRIBUTION			PLASTICITY				MOISTURE CONTENT w %	VOLUMETRIC				COMPACTION DATA			PERMEABILITY (E-6 CM/SEC)	FALLING/CONSTANT HEAD	CALIFORNIA BEARING RATIO (CBR) %	SHEAR STRENGTH		
				GRAVEL %	SAND %	SILT/CLAY %	LIQUID LIMIT w_l	PLASTIC LIMIT w_P	PLASTICITY INDEX I_P	LIQUIDITY INDEX I_L		SPECIFIC GRAVITY (G)	DRY UNIT WEIGHT (pcf)	VOID RATIO (e)	DEGREE OF SATURATION %	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT %	STANDARD/MODIFIED				UNCONFINED COMPRESSIVE STRENGTH (tsf)	COHESION (tsf)	AXIAL STRAIN (%)
B-3	S-3	4-6	SM	0	76	24					21.8													
B-5	S-6	13.5-15	SM	0	59	41	38	28	10	0.8	26.3													
B-7	S-7	18.5-20	SM	0	73	27					35.9													
B-9	S-3	4-6	ML	0	48	52	40	NP	NP	-	20.1													

PENNONI ASSOCIATES INC.	DRAWN BY: SJC CHECKED BY: JSD	DATE: 9/12/2016 DATE: 9/21/2016	PROJECT: **Howard County Circuit Courthouse - Bendix Road** LOCATION: **4250 Bendix Rd, Ellicott City, MD**	JOB No.: **GRIM 1401.0015** TABLE No.: **L-1**

LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	B-3	S-3	4-6'		SM	Fine to medium SAND, some silt, trace coarse sand	21.8	NP	NP
■	B-5	S-6	13.5-15'		SM	Fine to medium SAND, and silt, trace coarse sand	26.3	40	NP
▲	B-7	S-7	18.5-20'		SM	Fine to medium SAND, some silt, trace coarse sand	35.9	NP	NP
◆	B-9	S-3	4-6'		ML	SILT, and fine to medium sand, trace coarse sand	20.1	38	10

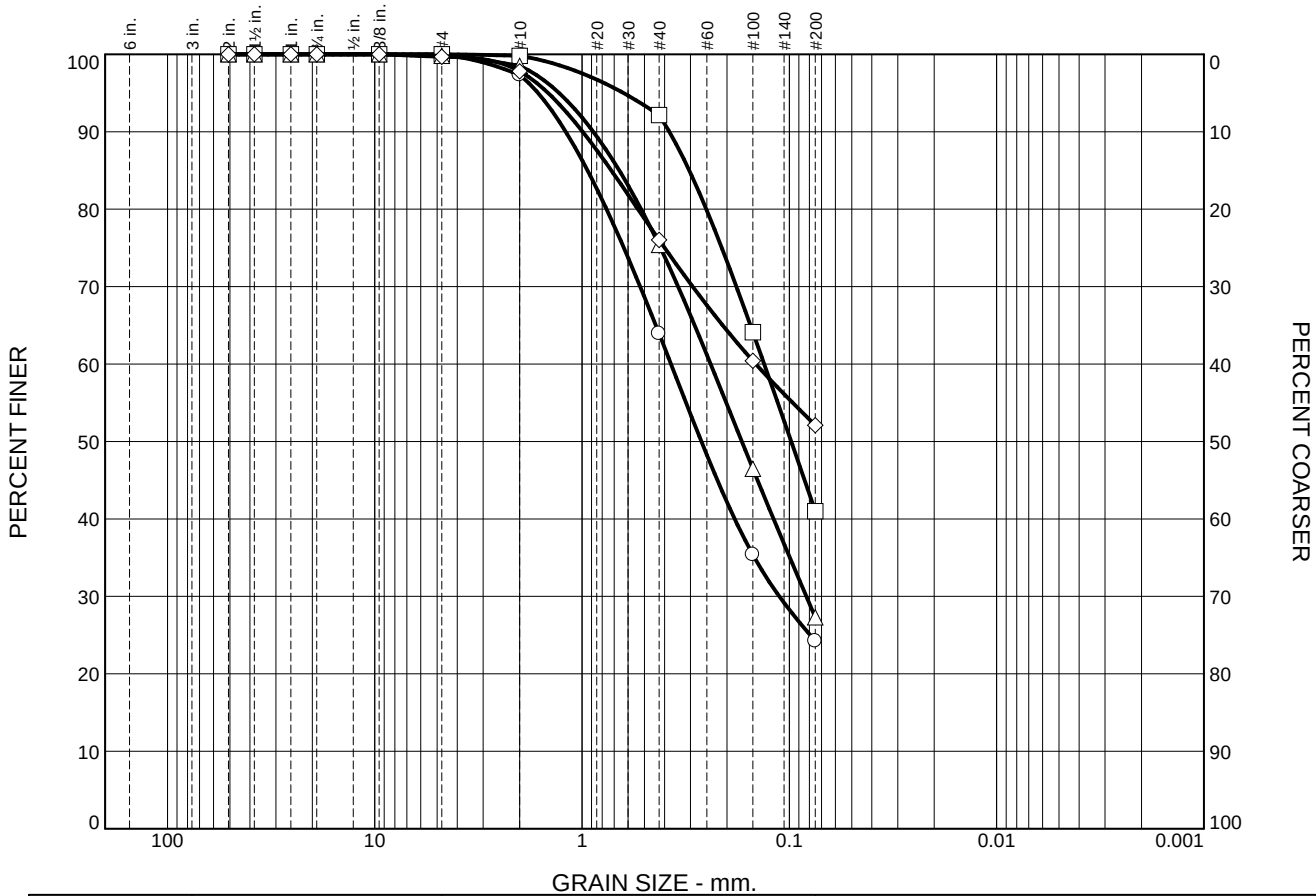
Client Grimm and Parker

Project Howard County Circuit Courthouse - Bendix Road

Project No. GRIM1401.0015 Figure A-1

PENNONI ASSOCIATES INC.

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	2.7	33.4	39.7	24.2	
□	0.0	0.0	0.0	0.2	7.6	51.2	41.0	
△	0.0	0.0	0.2	1.3	23.1	48.1	27.3	
◇	0.0	0.0	0.3	1.9	21.8	23.9	52.1	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	B-3	S-3	4-6'	Fine to medium SAND, some silt, trace coarse sand	SM
□	B-5	S-6	13.5-15'	Fine to medium SAND, and silt, trace coarse sand	SM
△	B-7	S-7	18.5-20'	Fine to medium SAND, some silt, trace coarse sand	SM
◇	B-9	S-3	4-6'	SILT, and fine to medium sand, trace coarse sand	ML

PENNONI ASSOCIATES INC.

Client: Grimm and Parker

Project: Howard County Circuit Courthouse - Bendix Road

Project No.: GRIM1401.0015 **Figure** S-1

APPENDIX D - Important Information About This Geotechnical Engineering Report

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.

Geotechnical 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 civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you 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 the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- 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. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of 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.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* 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 environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of 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. Confer with you GBC-Member geotechnical engineer for more information.

GEOTECHNICAL BUSINESS COUNCIL
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