PRELIMINARY GEOTECHNICAL ENGINEERING SERVICES REPORT

For

PARCEL 26B
US Rt. 29, Stringfellow Road and
Autumn Willow Drive
Fairfax, VA

Prepared for

Fairfax County
Department of Housing and Community Development
3700 Pender Drive, Suite 300
Fairfax, VA - 22030

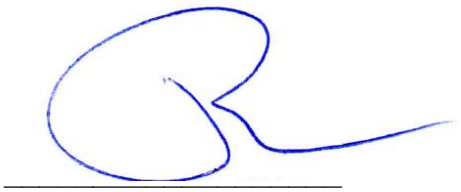
Prepared by

Professional Service Industries, Inc.
2930 Eskridge Rd
Fairfax, VA
Telephone (703) 698-9300
Fax (703) 560-7931

PSI PROJECT NO.: 0512887-1

June 28, 2019

Pavan Karanam
Staff Engineer



Richard Weber
Principal Consultant

Naveen Thakur
Geotechnical Department Manager

2930 Eskridge Road
Fairfax, VA 22031
phone: 703-698-9300
fax: (703) 698-4414
intertek.com/building
psiusa.com

June 28, 2019

Fairfax County
Department of Housing and Community Development
3700 Pender Drive, Suite 300
Fairfax, VA - 22030

Attention: Tony Esse, P.E.
Associate Director, Design, Development and Construction
Email: tony.esse@fairfaxcounty.gov

Subject: Preliminary Geotechnical Engineering Services Report
Parcel 26B
US Rt.29, Stringfellow Road and Autumn Willow Drive
Fairfax, VA
PSI Report Number: 0512887-1

Dear Mr. Esse:

Thank you for choosing Professional Service Industries, Inc. (PSI), an Intertek Company as your consultant for the above referenced project.

Per your authorization, PSI has completed a preliminary geotechnical engineering report for the above referenced project. The findings are discussed in the accompanying report.

Should there be any questions, please do not hesitate to contact our office at (703) 698-9300. PSI would be pleased to continue providing geotechnical services throughout the implementation of the project, and we look forward to working with you and your organization on this and future projects.

Respectfully submitted,

PROFESSIONAL SERVICE INDUSTRIES, INC

K.N. Pavan Kumar

Pavan Karanam
Staff Engineer

Naseen

Naveen Thakur
Geotechnical Department Manager

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1 EXECUTIVE SUMMARY

PSI has completed the preliminary geotechnical assessment for Parcel 26B located at the intersection of US Route 29, Stringfellow Road and Autumn Willow Drive in Fairfax, Virginia.

PSI understand that the Fairfax County Department of Housing and Community Development plans to develop the10.88-acre tract of land (Parcel 26B) located at the intersection of US Route 29, Stringfellow Road and Autumn Willow Drive in Fairfax, Virginia. The proposed development consists of five residential apartment buildings, a club house, new paved parking areas, drive aisles and roadways.

Based on the google earth and partial grading information provided to us by Fairfax County Department of Housing and Community Development, the existing grade within the proposed construction slopes from EL. 360 to EL. 390 feet from west to northeast .

A total of seven soil test borings (B-1 through B-7) were drilled for this project with depths ranging from 14.3 to 35 feet below the existing grade. Explorations were taken for foundation and stormwater management considerations.

Subsurface conditions at the site consist of sandy lean CLAY (CL), silty SAND (SM), sandy SILT (ML), sandy ELASTIC SILT (MH), FAT CLAY with sand (CH), lean CLAY with sand (CL) and sandy SILT with gravel (ML) to the depths explored.

Based on the review of the subsurface conditions and an assumed structural loading, shallow foundations can be used to support the buildings.

Groundwater was encountered in borings B-3, B-6 and B-7 at 18, 26 and 24 feet below the existing ground level, respectively. As such, depending upon the final site grading plans, groundwater may or may not be a concern during the excavation and construction of the shallow foundations and other facilities. If groundwater seepage resulting from surface run off is present, sump pumps can be used for temporary dewatering.

Preliminary recommendations relative to earthwork and foundations are summarized in the report. The owner/designer should not rely solely upon the executive summary and must read and understand the entire contents of this report. Further, once the final site grading plans are available, additional test borings within the footprint of the proposed facilities are recommended, and the preliminary geotechnical recommendations provided herein will be revised accordingly.

2 PROJECT INFORMATION

2.1 PROPOSAL AND PROJECT AUTHORIZATION

This report presents the findings and preliminary recommendations of the subsurface exploration and geotechnical assessment performed by Intertek-PSI for Parcel 26B located at the intersection of US Rt. 29, Stringfellow Road and Autumn Willow Drive in Fairfax, Virginia.

The contract was executed by Mr. Tony Esse, P.E. of Fairfax County Department of Housing and Community Development through an email on April 4, 2019. PSI's scope of work is described under the "Geotechnical Exploration Services" section.

2.2 PROJECT DESCRIPTION

PSI was provided with a request for proposal (RFP) via email on February 7, 2019 from Mr. Tony Esse, P.E. of Fairfax County Department of Housing and Community Development.

Based on the provided information, PSI understands that the Fairfax County Department of Housing and Development is interested in identifying any potential site issues which may impact the cost and development of the approximately 10.88-acre tract of land (Parcel 26B) located at the intersection of US Rt. 29, Stringfellow Road and Autumn Willow Drive in Fairfax, Virginia. The RFP included a drawing titled "Proposed Boring Location Plan.pdf" showing the boring locations on the preliminary rough site plan of Parcel 26B with proposed apartment buildings and club house. Five proposed residential apartment buildings will be 2-story, slab-on-grade, wood frame building and similar construction will be used for a single-story club house building.

Due to preliminary state of the proposed site development, structural loads, site grading plans and finish floor information of the proposed structures were not provided..

2.3 PURPOSE AND SCOPE OF WORK

The scope of services for this study included a site reconnaissance of the project area and the preliminary assessment of subsurface conditions through field explorations and laboratory testing. Included in this report are the preliminary assessment of the site, subsurface conditions relative to the proposed development, and engineering studies that were used in preparing this report. Information from the subsurface exploration was used to develop the following:

- Geologic review of the project site.
- Subsurface conditions encountered including pertinent soil properties, groundwater levels and drainage characteristics.

- Soil data review and analysis as it relates to the proposed site construction and development.

- Feasibility of type of foundations based on the subsurface conditions.

- Comments relating to observed geotechnical conditions such as soft material or groundwater which could impact development.

- Determination of the Seismic Site Class per IBC 2015 based on the SPT N-values obtained during field exploration.

The scope of our services did not include an environmental assessment for determining the presence or absence of wetlands, hazardous or toxic materials in the soil, bedrock, groundwater, or air, on or below or around this site. Any statement in this report or on the boring logs regarding odors, colors, unusual or unexpected items or conditions are strictly for the information of our client.

PSI did not provide, nor was it requested to provide, any service to investigate or detect the presence of moisture, mold or other biological contaminants in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence of the amplification of the same. Client acknowledges that mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. Client further acknowledges that site conditions are outside of PSI's control, and that mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, PSI cannot, and shall not, be held responsible for the occurrence or recurrence of mold amplification.

2.4 SUBSURFACE EXPLORATION PROGRAM

The subsurface exploration consisted of seven soil test borings drilled to depths ranging from 14.3 feet to 35 feet below the existing ground level. The approximate location of each boring is shown on the attached Boring Location Plan, in **Appendix B**.

Our drilling subcontractor used a CME 55C drill rig fitted with hollow stem auger equipped and automatic hammer to advance the boreholes, conduct Standard Penetration Test (SPT) and retrieve soil samples. SPTs were performed at selected depths within the borings as detailed in ASTM D1586. The penetration resistance, in conjunction with soil classifications, provides an indication of engineering characteristics and strength of the underlying soil.

Based on the client provided site plan, the test borings were approximately located in the field with respect to the known site features. The boring elevations shown on the individual boring logs provided in **Appendix C** were estimated using information from google earth. The elevations are approximate.

Soil samples recovered during the drilling operations were transported to PSI's laboratory in Fairfax, Virginia for visual classification and further evaluation/testing. Groundwater when encountered was noted on the logs. Descriptions of the soils encountered during our subsurface exploration are also provided in the Boring Logs. Groundwater conditions, penetration resistances, and other pertinent drilling and subsurface information are included in the Boring Logs in **Appendix C**.

The location of each boring is shown on the attached Boring Location Plan, in **Appendix B**. the findings of the PSI borings are presented on the Test Boring Logs and soil profile included in **Appendix C**.

2.5 LABORATORY TESTING

Limited soil laboratory testing was conducted as part of our services. The tests and results are reported in Section 3.5.

3 SITE AND SUBSURFACE CONDITIONS

3.1 SITE LOCATION AND DESCRIPTION

The proposed project site is located at the intersection of Route 29, Stringfellow Road and Autumn Willow Drive in Fairfax, Virginia. Based on google earth and site reconnaissance, the proposed construction/development area is currently a wooded area with dense matured trees and thick bushes. Based on the google earth and partial grading information provided to us, the existing grade within the proposed construction limits slopes from EL. 360 to EL. 390 feet along west to northeast direction. The approximate location of the site is shown on the Site Vicinity Map in **Appendix B.**

3.2 AREA GEOLOGY

Based on the Geological Map of Virginia (1993), the site is geologically located in the Mather Gorge Formation. This formation consists of Schist with greenish gray to gray, reddish-brown weathering, fine to coarse grained materials, lustrous, rich in quartz and lesser amount of mica gneiss. This formation also contains interbedded metagraywacke, calc-silicate rock, abundant mafic and ultramafic rock debris.

3.3 SUBSURFACE SOIL CONDITIONS

Results from the borings are presented on the Boring Logs which are included in **Appendix C**. Based on the drilling and laboratory test performed on samples from the seven soil test borings, the encountered soils and their stratification are summarized as follows.

Surficial Cover:

At the ground surface, all the test borings encountered approximately 2 to 3-inches of topsoil / forest mat.

Native Subsurface Soils:

Beneath the surficial cover, native cohesive soils and native granular soils described as sandy lean CLAY (CL), silty SAND (SM), sandy SILT (ML),sandy ELASTIC SILT (MH), lean CLAY with sand (CL), FAT CLAY with sand (CH) and sandy SILT with gravel (ML) were encountered up to depths varying from 8.5 feet to 35 feet, below the existing grade. These soils had moisture contents ranging from 4% to 32% and SPT N values ranging from 4 blows per foot (bpf) to over 50 bpf. The soils were predominately stiff below 2 feet from the existing ground surface.

Highly Weathered Rock:

Beneath the native soils, Highly Weathered Rock described as very dense silty SAND (SM) and very hard sandy SILT (ML) was encountered to the boring termination depths. Auger refusal was also encountered in all of the test borings.

Atterberg limits and sieve analysis tests were performed of the native soils from depths ranging from 1 feet to 9 feet. Based on the lab testing, the soils were classified as sandy lean CLAY (CL), silty SAND (SM), sandy ELASTIC SILT (MH) and FAT CLAY with sand (CH). The results of those tests are summarized on the boring logs and in section 2.5 of this report.

The above subsurface description highlights the major soil strata encountered. The boring logs included in the **Appendix C** should be reviewed for specific information as to individual test boring locations. The stratification lines shown on the test boring logs represent the conditions only at the actual test boring locations. Any stratification lines represent the approximate boundaries ranging from subsurface materials and the actual transition may be gradual.

3.4 GROUNDWATER CONDITIONS

During drilling, groundwater was encountered in borings B-3, B-6 and B-7 at 18 feet, 26 feet and 24 feet below the existing ground level, respectively. Refer to attached test boring logs in **Appendix C** indicating the approximate depths of groundwater at each test boring location. For safety reasons, the boreholes were backfilled upon completion.

The groundwater observations presented in this report and the attached boring logs reflect those observed at the time of our field activities. Since the subsurface soil materials below the surface of this site consisted of slowly draining clays, gravels, sands and silts, the short-term water levels measured during drilling are considered representative of site conditions only at the time that the reading was made. No 24-hour on longer measurements were made. Groundwater can be higher than stated on the logs.

3.5 LABORATORY TESTING

Our geotechnical engineering staff visually classified the recovered soil samples in the laboratory in general accordance with the Unified Soil Classification System (USCS) (ASTM D2488). Natural moisture content determinations (ASTM D2216), Atterberg limits tests (ASTM D4318) and grain size analyses (ASTM D6913) were conducted on selected samples.

The soil samples obtained during this exploration will be retained in our laboratory for two months, unless otherwise advised. Thereafter, the samples will be disposed. A summary of laboratory test results is presented in the following table. The detailed laboratory test results are provided **Appendix D** and are shown on the individual boring logs.

Table 1: Laboratory Summary Sheet

Borehole ID	Approximate Depth (ft.)	Atterberg Limits			%<#200 Sieve	Water Content (%)
		Liquid Limit	Plastic Limit	Plasticity Index		
B-01	1	45	23	22	60.2	23
	3					14
	6					15
	19					16
B-02	1					25
	3					23
	6					20
	9	Non-Plastic			35.1	17
	19					25
B-03	1					27
	3	59	31	28	67.4	29
	6					25
	14					28
B-04	1					22
	3	69	31	38	76.3	32
	6					13
B-05	1					13
	3	53	33	20	51.1	22
	6					5
	14.3					11
B-06	1					22
	3					13
	6	35	29	6	26.4	7
	14					4
B-07	1					27
	3					24
	9					28
	24					16

4 GEOTECHNICAL EVALUATION AND PRELIMINARY RECOMMENDATIONS

This report is preliminary and no site grading plans, specific building loads or the finish floor elevation for the proposed buildings are available. The data developed during this study indicates that the subsurface soil and groundwater conditions are generally suitable for constructing the proposed buildings, slab-on-grade, pavements, earthwork and related infrastructure. Buildings can be supported on shallow spread footings.

Based on the review of subsurface soils, the site in general will support shallow foundations and other facilities at the site. However, there are some geotechnical issues that might be encountered at the site and are described below. In addition, the geotechnical recommendations to remediate these issues are also provided below.

- Based on the "Fairfax County Soil Map Guide", the central, northern and northeastern portions of the project site will consist of soil group type 64B. The soil group 64B are of Jackland and Haymarket soil formation and these soils are Class III soils, which are subjected to high shrinkage and swelling behavior. This is also evident based on the subsurface information from our test borings B-3, B-4 and B-5, where high plasticity and expansive Elastic Silt (MH) soils were encountered. The approximate limits of these expansive soils are provided in the "Soil Classification Map – Figure 3" in Appendix B.

- In addition to above, within the central and eastern portions of the project site, soil group 39B will also be encountered. The soil group 39B are of Glenelg Silt Loam formation and these soils are of Class I type. However, these soils may potentially contain Asbestos as indicated on the attached Soil Classification Map – Figure 3 (Appendix B)

4.1 SEISMIC CONSIDERATIONS

The project site is located within a municipality that employs the International Building Code (IBC), 2015 edition. As part of this code, the design of structures must consider dynamic forces resulting from seismic events. These forces are dependent upon the magnitude of the earthquake event as well as the properties of the soils that underlie the site.

Part of the IBC code procedure to evaluate seismic forces requires the evaluation of the Seismic Site Class, which categorizes the site based upon the characteristics of the subsurface profile within the upper 100 feet of the ground surface.

To define the Seismic Site Class for this project, and in accordance with your requested level of assessment, we have interpreted the results of our soil test borings drilled within the project site per Section 1613.5 of the code. Material properties were estimated below the depth of the borings based upon data available in published geologic reports as well as our experience with subsurface conditions in the general site area.

Based upon our assessment, it is our opinion that the subsurface conditions within the areas of the site planned for building construction are consistent with the characteristics of **Site Class C** as defined in Table 1613.5.2 of the building code.

The associated IBC probabilistic ground motion values for latitude 38.842541° and longitude -77.402904º obtained from https://siesmicmaps.org/ on the ATC Hazards by Location Tool application (https://earthquake.usgs.gov/hazards/designmaps/designmaps-gone.php) are as follows:

Table 2: Seismic Design Parameters*

Period (seconds)	Mapped MCE Spectral Response Acceleration** (g)		Site Coefficients		Adjusted MCE Spectral Response Acceleration (g)		Design Spectral Response Acceleration (g)	
0.2	S_s	0.123	F_a	1.2	SM_S	0.147	SD_S	0.098
1.0	S_1	0.052	F_v	1.7	SM_1	0.089	SD_1	0.059

* 2% Probability of exceedance in 50 years.
** At B-C interface (i.e. top of bedrock).
MCE= Maximum Considered Earthquake

The Site Coefficients, F_a and F_v presented in the above table were also obtained from the USGS calculator but can be interpolated from IBC Tables 1613.5.3(1) and 1613.5.3(2) as a function of the site classification and mapped spectral response acceleration at the short (S_s) and 1 second (S_1) periods.

For Seismic Design Category designations of C, D, E or F, which are contingent on the structure "Occupancy Category", the Code also requires an assessment of liquefaction, slope stability and surface rupture due to faulting or lateral spreading. Detailed evaluations of these factors were beyond the scope of this study. However, the following table presents a qualitative assessment of these issues considering the site class, the subsurface soil properties, the groundwater elevation and probabilistic ground motions.

Table 3: Seismic Hazards

Hazard	Relative Risk	Comments
Liquefaction	Low	The materials with low SPT N-values have high fines contents and the seismicity is low.
Slope Stability	Low	The site is relatively level and does not incorporate significant cut or fill slopes.
Surface Rupture	Low	The site is not underlain by a mapped Holocene-aged fault.

4.2 SITE PREPARATION AND EARTHWORK

Since this report is preliminary, the following Site Preparation and Earthwork recommendations provided herein should be considered as general and are intended to attain the planned grades within the footprint areas of the proposed buildings and parking

areas.

- Site preparation procedures should include removing topsoil, vegetation, root mat and other deleterious material within the construction area or depressions left from removing tree's root balls and shrubs along the lot periphery which should be backfilled with compacted structural fill. Topsoil may be stockpiled for later use in landscape areas or may be removed from the site. Under no circumstances should topsoil or other organic-laden soil be placed as structural fill. All underground utilities within the planned development area should also be removed.

- The Geotechnical Engineer of Record (GER) or his/her qualified representative should observe the site for proper stripping, excavation and preparation.

- A proofroll on existing soil after stripping and prior to filling, observed by the Geotechnical Engineer of Record, is required within all development areas of the site before placing fill or constructing foundations. A fully loaded tandem axle dump truck weighing at least 40,000 pounds is acceptable. If existing subgrade soils are found to pump, rut, excessively deflect or to otherwise be unsuitable they should be undercut and replaced with compacted structural fill. The depth of the undercut should be determined by the Geotechnical Engineer of Record.

- The backfill should consist of suitable backfill materials as materials described in this section. A density of 98% of the Standard Proctor maximum density (ASTM D698) for the upper one foot of the proposed design subgrade of parking and footing area is recommended. Below the upper one foot of the design subgrade of the parking and/or footing area, a compaction of 95% of maximum Standard Proctor density is acceptable. Material must be placed and compacted at plus/minus 2 percent of the optimum moisture content.

- If soils are wet of optimum, lowering the moisture content by scarifying and aeration (discing and exposure to sun and wind) will be required. However, this method may not be feasible if construction occurs during wet seasonal conditions or if the soils are close to the water table. If the soils get wet, they will “pump” under the operation of heavy equipment, resulting in deep rutting and perhaps rendering the operation of grading and paving equipment difficult or impossible.

- Material satisfactory for structural fill may include clean soil or bankrun sand and gravel (SW, SP, SM, GW, and GM). CL, ML, GC, and SC material can be used in structural fills subject to the following limitations:

Maximum Dry Density (per ASTM D698)	$\geq$ 105 pcf
Liquid Limit	$\leq$ 40
Plasticity Index	$\leq$ 20

- Organic soils and high plasticity clays and silts (CH, MH, OL, OH, PT) must not be used as engineered fill. The fill materials should be free from topsoil and debris, have less than 3 percent organics and should not contain rock fragments having a major dimension greater than 3 inches. The use of the excavated fill soils for controlled structural fill will be subject to acceptance by the Geotechnical Engineer of Record.

- Place fill in loose, horizontal lifts no greater than 8 inches thick compacted uniformly with the proper equipment. Within small excavations such as footing excavations, we recommend using gasoline-powered tampers or diesel sled tampers to achieve the specified compaction. We recommend using loose lift thicknesses of no more than 5 inches within small or confined area fills.

- Fill placement on sloping ground should be benched into the existing slope and bear on natural materials.

- All earthwork should be performed under the observation of and to the satisfaction of the Geotechnical Engineer of Record or his authorized representative. The subgrade may require scarification and recompaction or other remedial measures to provide a firm and unyielding subgrade prior to final slab construction.

- Subgrade areas should be kept drained and free of ponded water surfaces. This may be achieved by either sloping the site topography adjacent to the construction to direct the water away from the excavation or by trenching and berming to collect the excess run-off. Final excavations to the required subgrades should be accomplished immediately prior to the placement of concrete. The contractor should not place concrete on disturbed subgrades. If the subgrade soils are wet, machine or foot traffic should be reduced or eliminated to lessen disturbance of the subgrade. If the site clearing is performed separate from the proposed building construction, restoration of the site to provide for positive drainage is recommended.

- The Geotechnical Engineer of Record or his authorized representative should monitor the fill placement and compaction operations on a full-time basis and should perform a sufficient number of density tests to verify that proper degrees of compaction are achieved.

4.3 FOUNDATION DISCUSSION

Provided the issues indicated in the “Geotechnical Evaluation & Recommendations” section are considered, the proposed structures can be supported on shallow foundations bearing on underlying native soils and/or new compacted structural fill. Shallow foundations can be proportioned utilizing a net allowable soil bearing pressure not exceeding 2,000 pounds per square foot (psf). Utilizing this allowable soil bearing pressure, the total settlement and differential settlements of the proposed structures are expected to be within an inch and half-inch, respectively.

Footings should be at least 18 inches and 24 inches wide for wall and isolated column footings, respectively.

Wall footings should be provided with nominal, continuous, longitudinal steel reinforcement for greater bending strength so they can span across small areas of loose or soft soils that may go undetected during construction.

Due to expected variations in subsurface conditions and soils and its effect on bearing capacity, all footing excavations should be observed by the Geotechnical Engineer of Record or his qualified representative prior to placing foundations. To verify the bearing capacity of the footings, Dynamic Cone Penetrometer (DCP) testing could be conducted at each column footing and at several places along each side of the building at the bottom of the wall footing excavations. The foundation subgrades should be observed and accepted by the Geotechnical Engineer of Record or his authorized representative.

If soft or loose soil pockets are observed or detected during the footing assessment, these materials should be removed and replaced with suitable compacted structural fill. Water and possibly some loose soil may collect in the footing excavations as a result of surface precipitation and near ground surface seepage. Therefore:

- Water, loose soil and soil softened by water should be removed from the bottom of the footing excavations before placing concrete. Use a flat blade shovel to preserve the integrity of the foundation material.

- Footing excavations should not be left open for long periods. If the concrete cannot be placed due to inclement weather conditions or any other unforeseen circumstances, the bottom of the footing excavations and trenches should be protected by undercutting 3 inches and placing a 3-inch thick lean-mix concrete (1,000 psi) working mat immediately upon approval and before reinforcing steel is placed.

- We recommend that foundations be cast the same day the excavations are made. If this is not possible, then the contractor must protect the foundation subgrade from becoming disturbed.

Once the footing concrete is placed, the foundation footings should be backfilled with structural fill as soon as it is safe to do so without causing damage. The backfill serves to protect the footing, is a component of overturning resistance and prevents accumulation of water around the foundations which can soften and weaken the bearing soils. The ground surface near the completed foundations should be sloped to drain away from the foundations throughout construction to avoid accumulation of moisture in the subgrade soils.

Backfill around and above the footing should also satisfy the controlled fill requirements described in Section 4.2, Site Preparation and Earthwork.

5 REPORT LIMITATIONS

The preliminary recommendations and discussions in this submittal are based on the available information obtained by PSI and design details furnished by **Fairfax County Department of Housing and Community Development** and their consultants. If there are any revisions of the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the recommendations are required. If PSI is not retained to perform these functions, PSI cannot be responsible for the impact of those conditions on the performance of the project.

PSI warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area at the time of this report. No other warranties are implied or expressed.

The scope of our services does not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of our client.

Upon completion of plans and specifications, PSI should be provided the opportunity to review the final design documents. This review process will allow PSI to verify whether or not our engineering recommendations have been properly incorporated into the design documents and that the earthwork and foundation recommendations have been properly interpreted and implemented. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of **Fairfax County Department of Housing and Community Development** and its consultants for the specific application to the proposed development of **Parcel 26B** located at the **intersection of Route 29, Stringfellow Road and Autumn Willow Drive** in **Fairfax, Virginia.**

APPENDIX A: IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL REPORT

Important Information about Your

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 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 your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the 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.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of 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,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- 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 study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the 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 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 construction recommendations included in your report. *Those 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 recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower 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. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing 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 Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors 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 contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors 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 contractors do not 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.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental 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 geoenvironmental 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, a number of 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 ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE
THE BEST PEOPLE ON EARTH

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

liGER06085.0MRP

APPENDIX B – VICINITY MAP AND BORING LOCATION PLAN

FIGURE 1

		REVISIONS
intertek psi		
Site Vicinity Map **PARCEL 26B at US Rt.29, Stringfellow Road and Autumn Willow Drive**		
Fairfax, VA		05-24-2019
P.K.	Not Drawn To Scale	0512887-1

FIGURE 2A

LEGEND:

B-1 - PROPOSED BORING

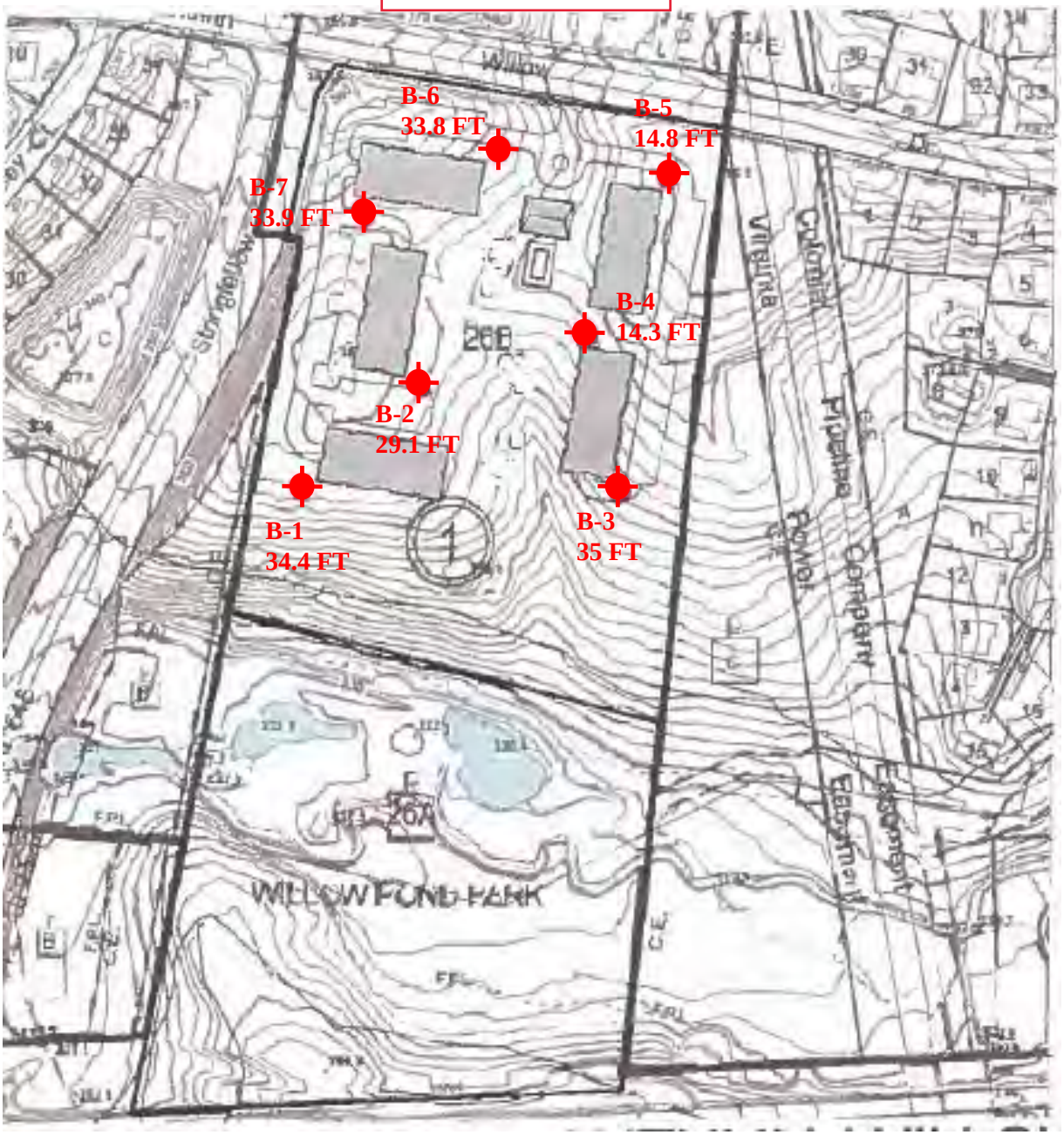
34.4 FT - BORING DEPTH

NOTES:

1. ALL BORINGS WILL BE ADVANCED WITH HOLLOW-STEM AUGERS.
2. SPT SAMPLING WILL BE PERFORMED IN ALL BORINGS.
3. BORING DEPTHS ARE AS SHOWN
4. BORING SPOILS WILL USED TO BACKFILL THE BORE HOLES.

intertek psi		REVISIONS
Boring Location Plan **Parcel 26B at US Rt. 29 , Stringfellow Road and Autumn Willow Drive**		
Fairfax, VA		05-24-2019
P.K.	Not Drawn To Scale	0512887-1

FIGURE 2B



LEGEND:

B-1 - PROPOSED BORING

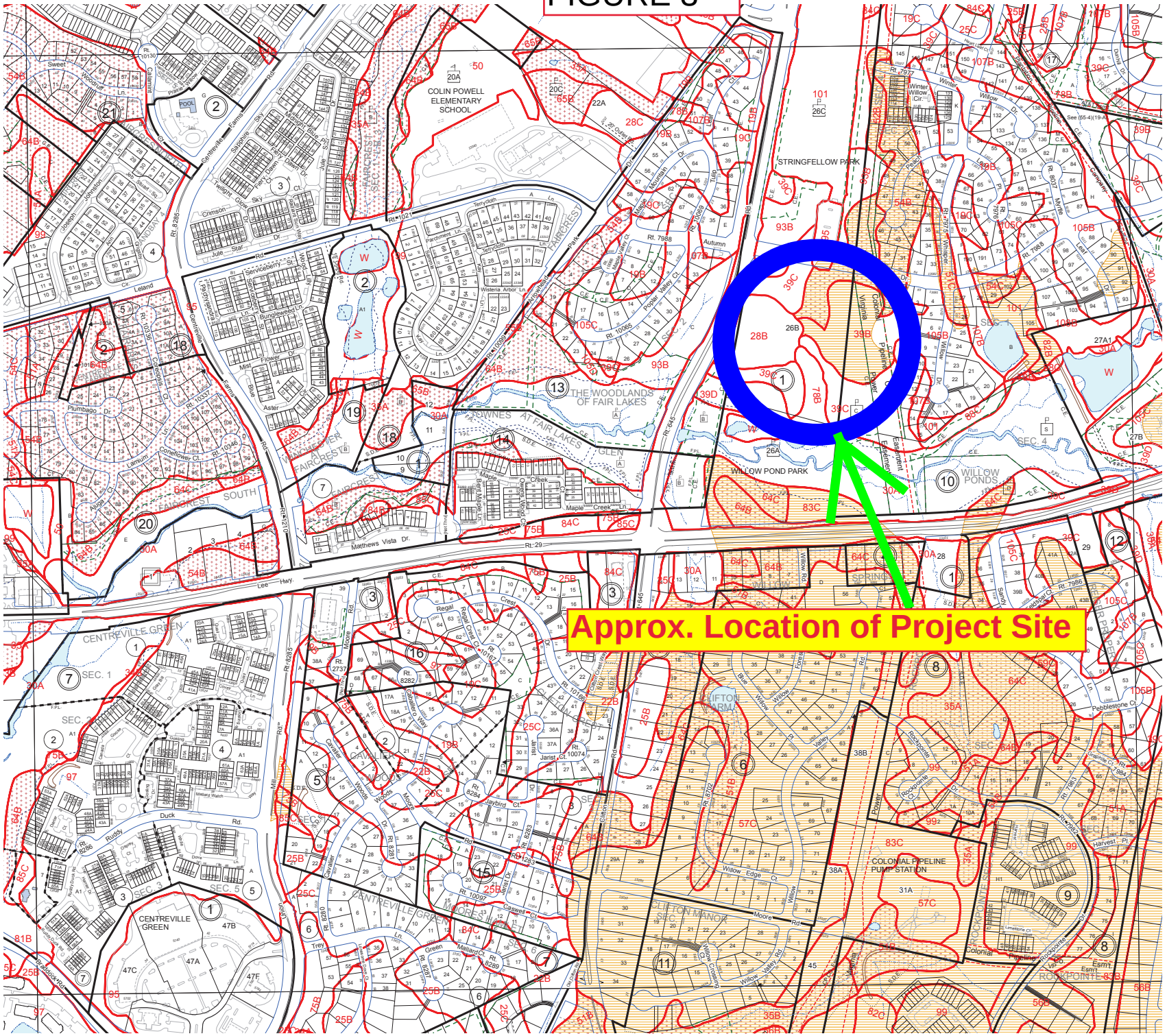
34.4 FT - BORING DEPTH

NOTES:

1. ALL BORINGS WILL BE ADVANCED WITH HOLLOW-STEM AUGERS.
2. SPT SAMPLING WILL BE PERFORMED IN ALL BORINGS.
3. BORING DEPTHS ARE AS SHOWN
4. BORING SPOILS WILL USED TO BACKFILL THE BORE HOLES.

intertek psi		REVISIONS
Boring Location Plan **Parcel 26B at US Rt. 29 , Stringfellow Road and Autumn Willow Drive**		
Fairfax, VA		05-24-2019
P.K.	Not Drawn To Scale	0512887-1

FIGURE 3



COUNTY OF FAIRFAX 1742 VIRGINIA

A Fairfax County, Virginia Publication

N

100 50 0 100 200 300 400 Feet

Map file is 50" X 75" based on USGS 1:24,000 scale 7 1/2-minute Quad. Virginia Coordinate System values are of 1983 North Zone in U.S. feet based on NAD 83/93 High Precision GPS Network adjustment.

National Geodetic Vertical Datum 1929

GENERAL NOTES

Soil Lines

Soil survey maps are for general planning purposes. Soil lines are not definitive. Soils gradually phase into one another. Characteristics of neighboring soil types will be found within a soil's borders.

Marumsco Soils

Marumsco soils are variable but may contain bands of shrinking-swelling "marine clay." Foundation distress and slope failure are possible if precautions are not taken during design and construction.

Previously Mapped Marine Clay

Areas mapped as marine clay in previous soil surveys.See precautions for Marumsco Soils.

Non-Marine Clay High Shrink-Swell Soils

Soils containing other shrinking-swelling clays that can lead to foundation distress if precautions are not taken during design and construction

Potential Asbestos Containing Soils

Soils mapped over bedrock that may contain natural asbestos. Safety precautions must be taken during construction. Asbestos identification in map grid 49-3 may be incomplete: asbestos bedrock may be present in parcels bordering areas of mapped asbestos soil. For asbestos soils in Fairfax City, please contact the City of Fairfax. Orange soils, which overlie a majority of this geology, also contain shrinking-swelling clays which can cause foundation distress.

Landfill **Quarry**

ADMINISTRATIVE INDEX

54-2	55-1	55-2
54-4	55-3	55-4
65-2	66-1	66-2

SHEET INDEX

SOILS MAP
55-3

Revised to : 03 - 01 - 2018

Prepared by:

DEPARTMENT OF INFORMATION TECHNOLOGY
GIS and Mapping Services Branch
12000 Government Center Parkway, Suite 117
Fairfax, Virginia 22035-0010
(703) 324-2712 FAX (703) 324-3937
Email: gis.help@fairfaxcounty.gov

For questions or comments about the content of this map please contact the Northern Virginia Soil and Water Conservation District
12055 Government Center Parkway, Suite 905
(703) 324-1460
FAX (703) 324-1421

Print Code: 20180603

APPENDIX C: BORING LOGS

BORING B-1

DATE STARTED:	5/15/19	**DRILL COMPANY:**	DGMTS
DATE COMPLETED:	5/15/19	**DRILLER:**	Louis J
COMPLETION DEPTH	34.4 ft	**LOGGED BY:**	Miller T
BENCHMARK:	N/A	**DRILL RIG:**	CME 55 ATV
ELEVATION:	373 ft	**DRILLING METHOD:**	Hollow Stem Auger
LATITUDE:	38.842541°	**SAMPLING METHOD:**	Standard
LONGITUDE:	-77.402904°	**HAMMER TYPE:**	Automatic
STATION:	N/A	**EFFICIENCY**	N/A
OFFSET:	N/A	**REVIEWED BY:**	Vimal Jha

REMARKS:

Water

While Drilling	DRY
Upon Completion	DRY
Cave-In	25 feet

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification		Moisture, %	Additional Remarks
	0	1	18	Approximately 3-inches of TOPSOIL Medium stiff, moist, red brown, **sandy lean CLAY (USCS : CL)**, trace gravel	CL	3-3-4 N=7	23	LL = 45 PL = 23 Fines=60.2%
370		2	18	Medium dense, moist, red brown, **silty SAND (USCS : SM)**, mica	SM	7-8-5 N=13	14	
	5	3	18	Stiff to hard, moist, dark red brown and gray brown, **sandy SILT (USCS : ML)**, mica		3-4-6 N=10	15	
365		4	18			5-5-7 N=12		
	10							
360		5	18			17-14-15 N=29		
	15							
355		6	18		ML	9-10-10 N=20	16	
	20							
350		7	18			14-16-15 N=31		
	25							
345		8	8			13-12-39 N=51		>>
	30							
340		9	11	Very dense, moist, gray, **silty SAND (USCS : SM)**, trace gravel, mica Auger refusal End of Boring approximately at 34.4 feet	SM	20-50/5"		>>

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
Moisture ✕ PL ◪ LL ✚
0 25 50
STRENGTH, tsf
Qu ▲ Qp ✳
0 2.0 4.0

Professional Service Industries, Inc.
2930 Eskridge Rd
Fairfax, VA 22031
Telephone: (703) 698-9300

PROJECT NO.: 0512887-1
PROJECT: Parcel 26B
LOCATION: Rt.29, Stringfellow Rd and Autumn Willow Drive
Fairfax, VA

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-2

DATE STARTED:	5/14/19	**DRILL COMPANY:**	DGMTS
DATE COMPLETED:	5/14/19	**DRILLER:**	Louis J
COMPLETION DEPTH	29.1 ft	**LOGGED BY:**	Miller T
BENCHMARK:	N/A	**DRILL RIG:**	CME 55 ATV
ELEVATION:	377 ft	**DRILLING METHOD:**	Hollow Stem Auger
LATITUDE:	38.842878°	**SAMPLING METHOD:**	Standard
LONGITUDE:	-77.402322°	**HAMMER TYPE:**	Automatic
STATION:	N/A	**EFFICIENCY**	N/A
OFFSET:	N/A	**REVIEWED BY:**	Vimal Jha

REMARKS:

Water

While Drilling	DRY
Upon Completion	DRY
Cave-In	24 feet

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification		Moisture, %	Additional Remarks
	0	1	18	Approximately 2-inches of TOPSOIL Soft to stiff, moist, brown, **sandy SILT (USCS : ML)**, mica	ML	2-2-2 N=4	25	
375		2	18			4-4-4 N=8	23	
	5	3	18			3-4-5 N=9	20	
370		4	18	Medium dense, moist, brown, **silty SAND (USCS : SM)**, mica	SM	7-6-9 N=15	17	Non-Plastic Fines=35.1%
	10	5	18			5-8-9 N=17		
365								
	15							
360		6	18	Very stiff, moist, brown, **sandy SILT (USCS : ML)**, mica	ML	10-11-10 N=21	25	
	20							
355		7	18			8-8-20 N=28		
	25							
350		8	7	Very dense, moist, gray brown, **silty SAND (USCS : SM)** Auger Refusal End of Boring approximately at 29.1 feet	SM	48-50/1"		>>

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

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Fairfax, VA 22031
Telephone: (703) 698-9300

PROJECT NO.: 0512887-1
PROJECT: Parcel 26B
LOCATION: Rt.29, Stringfellow Rd and Autumn Willow Drive
Fairfax, VA

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-3

DATE STARTED:	5/15/19	**DRILL COMPANY:**	DGMTS
DATE COMPLETED:	5/15/19	**DRILLER:**	Louis J
COMPLETION DEPTH	35.0 ft	**LOGGED BY:**	Miller T
BENCHMARK:	N/A	**DRILL RIG:**	CME 55 ATV
ELEVATION:	370 ft	**DRILLING METHOD:**	Hollow Stem Auger
LATITUDE:	38.842602°	**SAMPLING METHOD:**	Standard
LONGITUDE:	-77.401394°	**HAMMER TYPE:**	Automatic
STATION:	N/A	**EFFICIENCY**	N/A
OFFSET:	N/A	**REVIEWED BY:**	Vimal Jha

REMARKS:

Water

While Drilling	DRY
Upon Completion	18 feet
Cave-In	22 feet

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification		Moisture, %	Additional Remarks
	0	1	18	Approximately 2-inches of TOPSOIL Medium stiff, moist, black and brown, **sandy lean CLAY (USCS : CL)**, roots	CL	2-2-3 N=5	27	
		2	18	Very stiff, moist, brown and gray brown, **sandy ELASTIC SILT (USCS : MH)**, trace gravel, mica	MH	5-8-10 N=18	29	LL = 59 PL = 31 Fines=67.4%
365	5	3	18	Stiff to very stiff, moist, brown and gray brown, **sandy SILT (USCS : ML)**		6-7-8 N=15	25	
		4	18			6-7-9 N=16		
360	10							
		5	18			8-7-9 N=16	28	
355	15				ML			
		6	18			5-7-9 N=16		
350	20							
		7	18			6-12-16 N=28		
345	25							
		8	8	Hard, moist, gray, **silty SAND (USCS : SM)**, mica	SM	10-17-29 N=46		
340	30							
		9	18			15-24-30 N=54		>>
335	35			Auger Refusal End of Boring approximately at 35 feet				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
Moisture, PL, LL
0 25 50
STRENGTH, tsf
Qu, Qp
0 2.0 4.0

intertek psi
Professional Service Industries, Inc.
2930 Eskridge Rd
Fairfax, VA 22031
Telephone: (703) 698-9300

PROJECT NO.: 0512887-1
PROJECT: Parcel 26B
LOCATION: Rt.29, Stringfellow Rd and Autumn Willow Drive
Fairfax, VA

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-4

DATE STARTED:	5/15/19	**DRILL COMPANY:**	DGMTS
DATE COMPLETED:	5/15/19	**DRILLER:**	Louis J
COMPLETION DEPTH	14.3 ft	**LOGGED BY:**	Miller T
BENCHMARK:	N/A	**DRILL RIG:**	CME 55 ATV
ELEVATION:	377 ft	**DRILLING METHOD:**	Hollow Stem Auger
LATITUDE:	38.843119°	**SAMPLING METHOD:**	Standard
LONGITUDE:	-77.401571°	**HAMMER TYPE:**	Automatic
STATION:	N/A	**EFFICIENCY**	N/A
OFFSET:	N/A	**REVIEWED BY:**	Vimal Jha

REMARKS:

Water

While Drilling	DRY
Upon Completion	DRY
Cave-In	11 feet

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification		Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ Moisture PL LL (0 25 50) STRENGTH, tsf Qu Qp (0 2.0 4.0)	Additional Remarks
	0					Approximately 2-inches of TOPSOIL					
375				1	18	Soft, moist, gray, **lean CLAY with sand (USCS : CL)**	CL	WOH-1-3 N=4	22		
				2	18	Very stiff, moist, brown, **FAT CLAY with sand (USCS : CH)**	CH	10-9-13 N=22	32		LL = 69 PL = 31 Fines=76.3%
	5			3	18	Very stiff to hard, moist, gray brown, **sandy SILT (USCS : ML)**, mica		9-17-14 N=31	13		
370				4	18		ML	11-10-9 N=19			
	10										
365				5	8	Very hard, moist, gray brown, **sandy SILT (USCS : ML)**, quartz rock fragments	ML	26-50/3"			
						Auger Refusal					
						End of Boring approximately at 14.3 feet					

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PROJECT NO.: 0512887-1
PROJECT: Parcel 26B
LOCATION: Rt.29, Stringfellow Rd and Autumn Willow Drive
Fairfax, VA

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-5

DATE STARTED:	5/15/19	**DRILL COMPANY:**	DGMTS
DATE COMPLETED:	5/15/19	**DRILLER:**	Louis J
COMPLETION DEPTH	14.8 ft	**LOGGED BY:**	Miller T
BENCHMARK:	N/A	**DRILL RIG:**	CME 55 ATV
ELEVATION:	390 ft	**DRILLING METHOD:**	Hollow Stem Auger
LATITUDE:	38.843618°	**SAMPLING METHOD:**	Standard
LONGITUDE:	-77.401093°	**HAMMER TYPE:**	Automatic
STATION:	N/A	**EFFICIENCY**	N/A
OFFSET:	N/A	**REVIEWED BY:**	Vimal Jha

REMARKS:

Water

While Drilling	DRY
Upon Completion	DRY
Cave-In	10 feet

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification		Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ Moisture PL LL (0 25 50) STRENGTH, tsf Qu Qp (0 2.0 4.0)	Additional Remarks
	0			1	18	Approximately 3-inches of TOPSOIL Medium stiff to hard, moist, red brown, **sandy ELASTIC SILT (USCS : CL)**, trace gravel, mica		WOH-3-4 N=7	13		
				2	18		MH	11-24-30 N=51	22		LL = 53 PL = 33 Fines=51.1%
385	5			3	18	Dense to very dense, moist, red brown, **silty SAND with gravel (USCS : SM)**, mica		16-26-14 N=40	5		
				4	18		SM	12-23-39 N=62			
380	10			5	16			27-32-50/4"	11		
						Auger Refusal End of Boring approximately at 14.8 feet					

Professional Service Industries, Inc.
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Telephone: (703) 698-9300

PROJECT NO.: 0512887-1
PROJECT: Parcel 26B
LOCATION: Rt.29, Stringfellow Rd and Autumn Willow Drive
Fairfax, VA

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-6

DATE STARTED:	5/14/19	**DRILL COMPANY:**	DGMTS
DATE COMPLETED:	5/14/19	**DRILLER:** Louis J	**LOGGED BY:** Miller T
COMPLETION DEPTH	33.8 ft	**DRILL RIG:**	CME 55 ATV
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	375 ft	**SAMPLING METHOD:**	Standard
LATITUDE:	38.84376°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-77.40186°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	Vimal Jha

REMARKS:

Water

While Drilling	26	feet
Upon Completion	11	feet
Cave-In	24	feet

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification		Moisture, %	Additional Remarks
	0	1	18	Approximately 3-inches of TOPSOIL Stiff, moist, brown, **sandy lean CLAY (USCS : CL)**	CL	2-3-6 N=9	22	
		2	8	Very stiff, moist, brown, **sandy SILT (USCS : ML)**, mica	ML	7-9-17 N=26	13	
370	5	3	18	Medium dense to very dense, moist, gray, **silty SAND with gravel (USCS : SM)**, mica		15-23-28 N=51	7	LL = 35 PL = 29 Fines=26.4%
		4	8			24-50/2"		
365	10							
		5	8			30-50/3"	4	
360	15				SM			
		6	18			11-17-11 N=28		
355	20							
		7	8			30-50/2"		
350	25							
		8	8	Very dense, moist, gray, **silty SAND (USCS : SM)**, rock fragments, mica	SM	30-50/4"		
345	30							
		9	3	Very hard, moist, gray, **sandy SILT (USCS : ML)**, rock fragments Auger Refusal End of Boring approximately at 33.8 feet	ML	50/3"		

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

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Telephone: (703) 698-9300

PROJECT NO.: 0512887-1
PROJECT: Parcel 26B
LOCATION: Rt.29, Stringfellow Rd and Autumn Willow Drive
Fairfax, VA

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-7

DATE STARTED:	5/14/19	**DRILL COMPANY:**	DGMTS
DATE COMPLETED:	5/14/19	**DRILLER:**	Louis J
COMPLETION DEPTH	33.8 ft	**LOGGED BY:**	Miller T
BENCHMARK:	N/A	**DRILL RIG:**	CME 55 ATV
ELEVATION:	375 ft	**DRILLING METHOD:**	Hollow Stem Auger
LATITUDE:	38.843537°	**SAMPLING METHOD:**	Standard
LONGITUDE:	-77.402471°	**HAMMER TYPE:**	Automatic
STATION:	N/A	**EFFICIENCY**	N/A
OFFSET:	N/A	**REVIEWED BY:**	Vimal Jha

REMARKS:

Water

While Drilling	24	feet
Upon Completion	14	feet
Cave-In	27	feet

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification		Moisture, %
	0	1	18	Approximately 3-inches of TOPSOIL Medium stiff to stiff, moist, brown, **sandy SILT (USCS : ML)**, mica		2-2-3 N=5	27
		2	18			4-4-5 N=9	24
370	5	3	18		ML	5-5-7 N=12	
365	10	4	18	Loose to very dense, moist, brown and gray, **silty SAND (USCS : SM)**, mica		2-2-3 N=5	28
		5	18			5-6-7 N=13	
360	15						
		6	18			5-4-6 N=10	
355	20				SM		
		7	18			10-11-20 N=31	16
350	25						
		8	2			50/2"	
345	30						
		9	4	Very hard, moist, gray, **sandy SILT (USCS : ML)**, mica Auger Refusal End of Boring approximately at 33.8 feet	ML	50/4"	

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

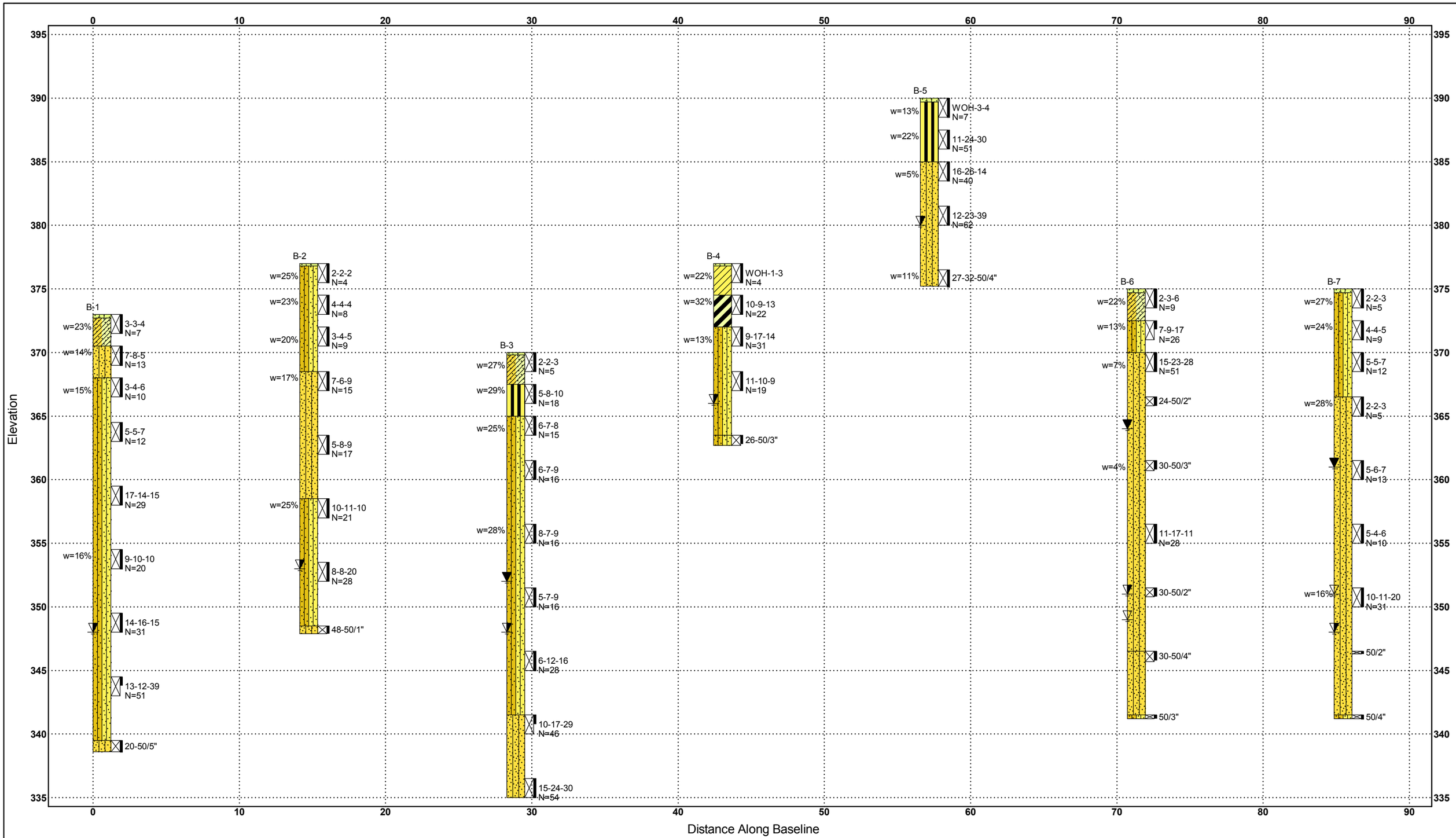
Additional Remarks

intertek psi

Professional Service Industries, Inc.
2930 Eskridge Rd
Fairfax, VA 22031
Telephone: (703) 698-9300

PROJECT NO.: 0512887-1
PROJECT: Parcel 26B
LOCATION: Rt.29, Stringfellow Rd and Autumn Willow Drive
Fairfax, VA

The stratification lines represent approximate boundaries. The transition may be gradual.



intertek psi
Professional Service Industries, Inc.
2930 Eskridge Rd
Fairfax, VA 22031

Profile

Parcel 26B
PSI Project Number: 0512887-1

Rt.29, Stringfellow Rd and Autumn Wil
Fairfax, VA

GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

DRILLING AND SAMPLING SYMBOLS

SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.
HSA: Hollow Stem Auger - typically 3¼" or 4¼ I.D. openings, except where noted.
M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry
R.C.: Diamond Bit Core Sampler
H.A.: Hand Auger
P.A.: Power Auger - Handheld motorized auger

SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
RC: Rock Core
TC: Texas Cone
BS: Bulk Sample
PM: Pressuremeter
CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings

SOIL PROPERTY SYMBOLS

N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
N_{60}: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
Q_u: Unconfined compressive strength, TSF
Q_p: Pocket penetrometer value, unconfined compressive strength, TSF
w%: Moisture/water content, %
LL: Liquid Limit, %
PL: Plastic Limit, %
PI: Plasticity Index = (LL-PL),%
DD: Dry unit weight, pcf
▼,▽,▼ Apparent groundwater level at time noted

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N - Blows/foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50 - 80
Extremely Dense	80+

ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (¾ in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to ¾ in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.005 mm to 0.075 mm
Clay:	<0.005 mm

PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%

GENERAL NOTES

(Continued)

CONSISTENCY OF FINE-GRAINED SOILS

Q_U - TSF	N - Blows/foot	Consistency
0 - 0.25	0 - 2	Very Soft
0.25 - 0.50	2 - 4	Soft
0.50 - 1.00	4 - 8	Firm (Medium Stiff)
1.00 - 2.00	8 - 15	Stiff
2.00 - 4.00	15 - 30	Very Stiff
4.00 - 8.00	30 - 50	Hard
8.00+	50+	Very Hard

MOISTURE CONDITION DESCRIPTION

Description	Criteria
Dry:	Absence of moisture, dusty, dry to the touch
Moist:	Damp but no visible water
Wet:	Visible free water, usually soil is below water table

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term	% Dry Weight
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

STRUCTURE DESCRIPTION

Description	Criteria
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided:	Fracture planes appear polished or glossy, sometimes striated
Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed:	Inclusion of small pockets of different soils
Layer:	Inclusion greater than 3 inches thick (75 mm)
Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
Parting:	Inclusion less than 1/8-inch (3 mm) thick

SCALE OF RELATIVE ROCK HARDNESS

Q_U - TSF	Consistency
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

ROCK BEDDING THICKNESSES

Description	Criteria
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

ROCK VOIDS

Voids	Void Diameter
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

Component	Size Range
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

ROCK QUALITY DESCRIPTION

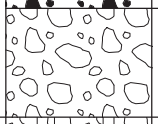
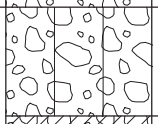
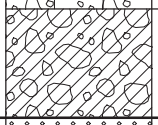
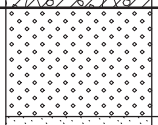
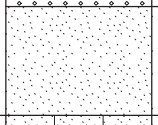
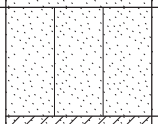
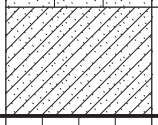
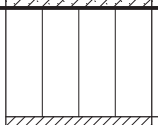
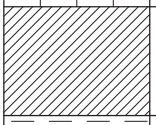
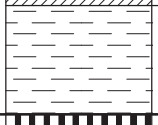
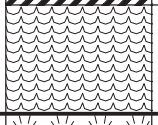
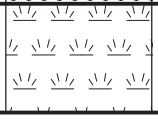
Rock Mass Description	RQD Value
Excellent	90 -100
Good	75 - 90
Fair	50 - 75
Poor	25 -50
Very Poor	Less than 25

DEGREE OF WEATHERING

Slightly Weathered:	Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.
Weathered:	Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.
Highly Weathered:	Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

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

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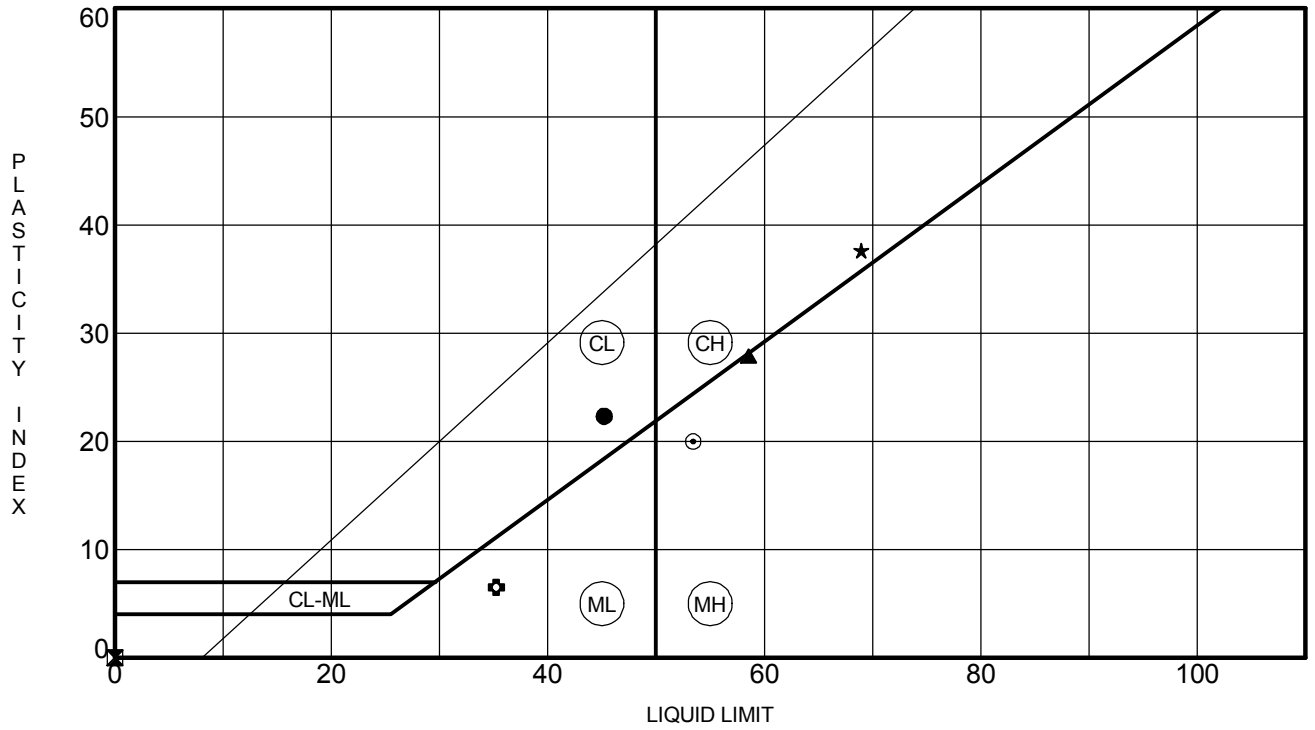
APPENDIX D: LABORATORY TESTING RESULTS

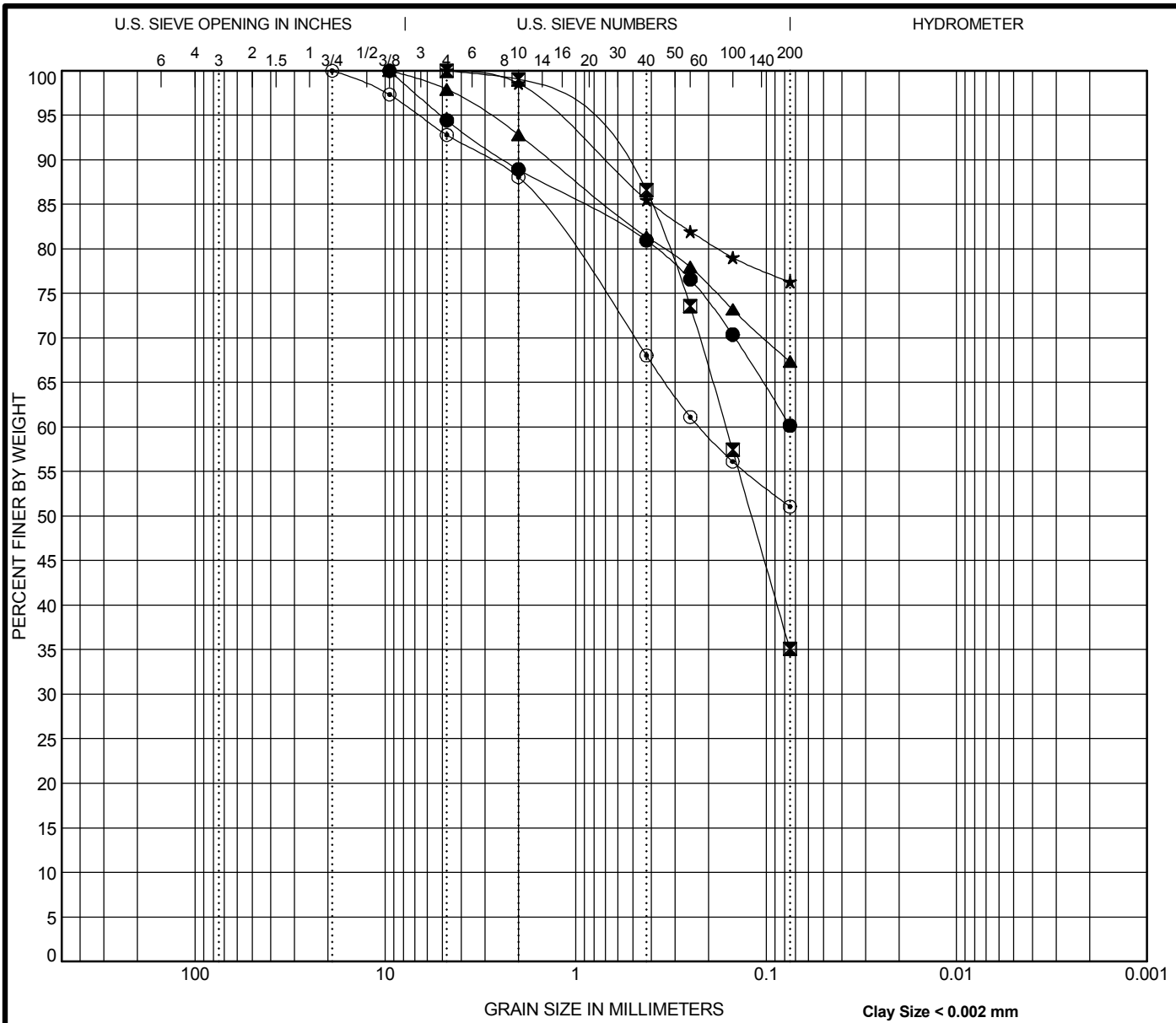


	Boring	Depth (ft)	LL	PL	PI	Fines	Classification (*Visual)
●	**B-1**	**1.0**	**45**	**23**	**22**	**60.2**	sandy lean CLAY (CL)
⊠	**B-2**	**9.0**	**NP**	**NP**	**NP**	**35.1**	silty SAND (SM)
▲	**B-3**	**3.0**	**59**	**31**	**28**	**67.4**	sandy ELASTIC SILT (MH)
★	**B-4**	**3.0**	**69**	**31**	**38**	**76.3**	FAT CLAY with sand (CH)
⊙	**B-5**	**3.0**	**53**	**33**	**20**	**51.1**	sandy ELASTIC SILT (MH)
✿	**B-6**	**6.0**	**35**	**29**	**6**	**26.4**	silty SAND (SM)

intertek psi
Professional Service Industries, Inc.
2930 Eskridge Rd
Fairfax, VA 22031
Telephone: (703) 698-9300
Fax: (703) 560-7931

ATTERBERG LIMIT RESULTS

PSI Job No.: 0512887-1
Project: Parcel 26B
Location: US Rt.29, Stringfellow Road and Autumn Willow Drive
Fairfax, VA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	B-1	1.0	sandy lean CLAY (CL)	45	23	22		
⊠	B-2	9.0	silty SAND (SM)	NP	NP	NP		
▲	B-3	3.0	sandy ELASTIC SILT (MH)	59	31	28		
★	B-4	3.0	FAT CLAY with sand (CH)	69	31	38		
⊙	B-5	3.0	sandy ELASTIC SILT (MH)	53	33	20		

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-1	1.0	9.5				5.6	34.3	60.2	
⊠	B-2	9.0	4.75	0.163			0.0	64.9	35.1	
▲	B-3	3.0	9.5				2.1	30.6	67.4	
★	B-4	3.0	4.75				0.0	23.7	76.3	
⊙	B-5	3.0	19	0.223			7.2	41.7	51.1	

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2930 Eskridge Rd
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Telephone: (703) 698-9300
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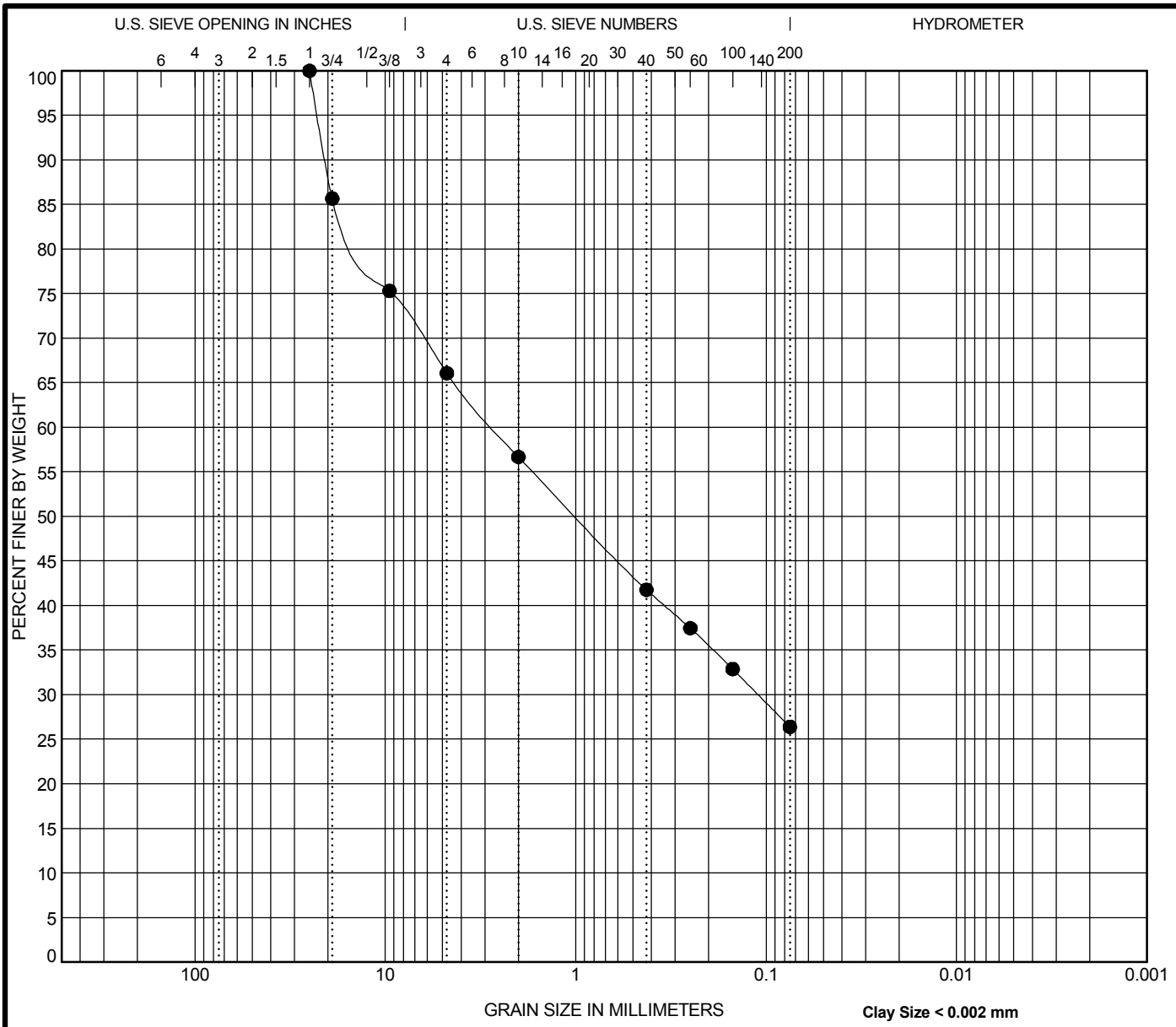
GRAIN SIZE DISTRIBUTION

Project: Parcel 26B
PSI Job No.: 0512887-1
Location: US Rt.29, Stringfellow Road and Autumn Willow Drive
Fairfax, VA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-6**	**6.0**	**silty SAND (SM)**	**35**	**29**	**6**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-6**	**6.0**	**25**	**2.717**	**0.11**		**33.9**	**39.7**	**26.4**	

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