Geotechnical Engineering Report

Duke Ellington Athletic Field Investigation
Washington, DC
May 27, 2021
GeoCapitol Project No. JE215004

Prepared for:
Studio Laan, PLLC
Washington, DC

Prepared by:
GeoCapitol Engineering, LLC, A Terracon Company
Washington, DC

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May 27, 2021

Studio Laan, PLLC
715 G Street SE, 3rd Floor
Washington, DC 20003

Attn: Mr. Philip Anderson, AIA - Principal
P: (202) 213-4259
E: panderson@studiolaan.net

Re: Geotechnical Engineering Report
Duke Ellington Athletic Field Investigation
1600 38th Street, NW
Washington, DC
GeoCapitol Project No. JE215004

Dear Mr. Anderson:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with GeoCapitol Proposal No. PJE215004 dated January 21, 2021. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
GeoCapitol Engineering, LLC, A Terracon Company

DISTRICT OF COLUMBIA
DANIEL F. GRADISHAR
No. 904645
REGISTERED
PROFESSIONAL ENGINEER

Andrew Arnold
Senior Staff Engineer

Daniel Gradishar, PE
Principal
5/28/2021

REPORT TOPICS

Note: This report was originally delivered in a web-based format. For more interactive features, please view your project online at client.GeoCapitol.com.

ATTACHMENTS

Note: Refer to each individual Attachment for a listing of contents.

REPORT SUMMARY

Topic [1]	Overview Statement [2]
Project Description	DPR has identified the following as requirements for the new Field and Grounds: ■ Replacement and re-grading of natural grass field with irrigation system ■ Renovation of existing field houses, including ADA code improvements ■ Addition of 250 SF storage shed to match exterior of existing field houses ■ New track, with the goal of regulations-size (i.e. 400-meter oval) ■ New dog park of approximately 7,500 SF ■ Erosion controls ■ New field lighting
Geotechnical Characterization	Alluvial silts and sands to about 6 feet Groundwater not encountered
Shallow Foundations	Shallow foundations will be sufficient Allowable bearing pressure = 2,500 psf Expected settlements: < 1-inch total, < 0.5-inch differential Detect and remove zones of fill as noted in **Earthwork.**
General Comments	This section contains important information about the limitations of this geotechnical engineering report.

1. If the reader is reviewing this report as a pdf, the topics above can be used to access the appropriate section of the report by simply clicking on the topic itself.
2. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

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1600 38th Street, NW
Washington, DC
GeoCapitol Project No. JE215004
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INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed redevelopment project to be located at 1600 38th Street, NW in Washington, DC. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Foundation design and construction
- Stormwater management feasibility through in-situ infiltration (laboratory testing only)

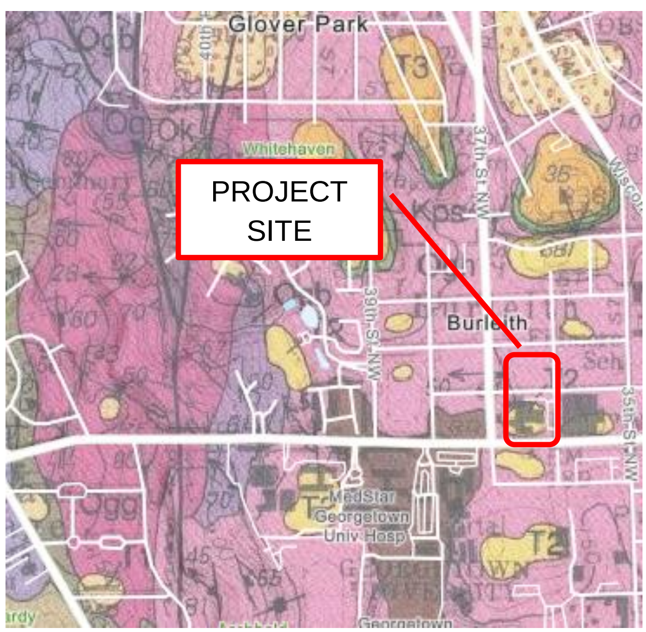
The geotechnical engineering Scope of Services for this project included the advancement of six (6) test borings to depths ranging from approximately 6 feet below existing site grades.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in the **Exploration Results** section.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project is located at 1600 38th Street, NW in Washington, DC 20007. 38° 54' 48.76" N, 77° 4' 29.55" W (approximate) See **Site Location.**
Existing Improvements	Developed property with an existing athletic field surrounded by an asphalt-paved track.

Item	Description
Current Ground Cover	Lightly vegetated property with tree lines bordering the field on all four sides; athletic field covered with landscaped grass and bordered by an asphalt paved track.
Existing Topography (Provided by DC Atlas)	The existing athletic field is relatively flat with an approximate elevation of EL 164 feet; field is bordered by steep slopes upgradient on the north from approximate elevation EL 164 to EL 188 feet as well as the south with a steep slope downgradient from approximate EL 164 to EL 144 feet.
Geology	The site is located within the Coastal Plain Physiographic Province of the District of Columbia. The Coastal Plain consists of a seaward thickening wedge of unconsolidated to semi-consolidated sedimentary deposits from the Cretaceous Geologic Period to the Holocene Geologic Epoch. These deposits represent marginal-marine to marine sediments consisting of interbedded sands and clays. The Coastal Plain is bordered to the east by the Atlantic Ocean and to the west by the Piedmont Physiographic Province. The dividing line between the Coastal Plain and the Piedmont is locally referred to as the "Fall Line". This name comes from the waterfalls that form as a result of the differential erosion that occurs as streams cross the Piedmont/Coastal Plain contact. Specifically, according to local geologic maps, the site is mapped in the Georgetown Formation of the Early Ordovician geologic period. Based on our subsurface investigation, the sediments and strata correspond favorably to the geologic publications. 

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	On Call Small Capital Projects RFP (00052215-4).DOC
Project Description	DGS DPR has identified the following as requirements for the new Field and Grounds: ■ Replacement and re-grading of natural grass field with irrigation system ■ Renovation of existing field houses, including ADA code improvements ■ Addition of additional 250 SF storage shed to match exterior of existing field houses ■ New track, with the goal of regulations-size (i.e. 400-meter oval) ■ New dog park of approximately 7,500 SF ■ Erosion controls ■ New field lighting
Proposed Structure	The project includes a new storage shed.
Finished Floor Elevation (Assumed near existing grade)	EL 164
Maximum Loads	**ASSUMED TYPICAL BUILDING LOADS, TO BE CONFIRMED BY STRUCTURAL ENGINEER** Column Loads: less than 100 kips Continuous Wall Footings: less than 2 klf
Grading/Slopes	Assumed similar grading plan to existing grades
Estimated Start of Construction	2022

GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of site preparation and foundation options. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** section and the GeoModel can be found in the **Figures** section of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	**Topsoil**	SILT (ML), dark brown, moist
2	**Residual**	SANDY SILT (ML), with varying amounts of mica, reddish brown, moist, stiff to hard

Groundwater

Groundwater level observations were made in the field during drilling and upon completion of the test borings. Groundwater was not encountered at any of the excavated borings during our field investigation. The groundwater observations presented herein are considered to be an indication of the groundwater levels at the dates and times indicated. Where more impervious silt soils are encountered, the amount of water seepage into the borings is limited, and it is generally not possible to establish the location of the groundwater table through short term water level observations. Accordingly, the groundwater information presented herein should be used with caution. Also, fluctuations in groundwater levels should be expected with seasons of the year, construction activity, changes to surface grades, precipitation, or other similar factors.

Soil Laboratory Test Results

Selected soil samples obtained from the field investigation were tested for grain size distribution (with hydrometer), Atterberg limits, compaction characteristics using standard (modified) effort, California Bearing Ratio (CBR), shear strength, compressibility, and natural moisture contents. A summary of soil laboratory test results is presented on the following table, and the results of natural moisture content tests are presented on the test boring logs in Appendix A.

Test Boring No.	Depth (ft.)	Sample Type	Description of Soil Specimen	Sieve Results		Atterberg Limits			Natural Moisture Content (%)
				Percent Retained #4 Sieve	Percent Passing #200 Sieve	LL	PL	PI	
B-3	5.5 – 6	Grab	SILTY SAND (SM)	0.0	36.1	35	32	3	24.3
B-5	4 – 4.5	Grab	SILTY SAND (SM)	0.9	38.3	39	34	5	25.6

Notes:
1. Soil tests are in accordance with applicable ASTM standards
2. Soil classification symbols are in accordance with Unified Soil Classification System
3. Visual identification of samples is in accordance with ASTM D-2488
4. Key to abbreviations: LL = liquid limit; PL = plastic limit; PI = plasticity index

The table below shows the results of the USDA classification testing.

Test Boring No.	Sample Depth (ft.)	Percent Sand	Percent Silt	Percent Clay	USDA Soil Texture Classification
B-2	1.5 – 3	71.8	25.1	3.0	Sandy Loam
B-2	4.5 – 6	73.8	23.1	3.0	Loamy Sand
B-6	1.5 – 3	75.8	21.1	3.0	Loamy Sand
B-6	4.5 – 6	73.8	23.1	3.0	Loamy Sand

GEOTECHNICAL OVERVIEW

The near surface, stiff to hard medium plasticity silt could become unstable with typical earthwork and construction traffic, especially after precipitation events. The effective drainage should be completed early in the construction sequence and maintained after construction to avoid potential issues. If possible, the grading should be performed during the warmer and drier times of the year. If grading is performed during the winter months, an increased risk for possible undercutting and replacement of unstable subgrade will persist. Additional site preparation recommendations, including subgrade improvement and fill placement, are provided in the **Earthwork** section.

The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

Earthwork is anticipated to include clearing and grubbing, excavations, and fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria, as necessary, to render the site in the state considered in our geotechnical engineering evaluation for foundations, floor slabs, and pavements.

Site Preparation

Prior to placing fill, existing vegetation and root mat should be removed. Complete stripping of the topsoil should be performed in the proposed building and parking/driveway areas.

The subgrade should be proofrolled with an adequately loaded vehicle such as a fully-loaded tandem-axle dump truck or other method approved by the Geotechnical Engineer. The proofrolling should be performed under the direction of the Geotechnical Engineer. Areas excessively deflecting under the proofroll should be delineated and subsequently addressed by the Geotechnical Engineer. Such areas should either be removed or modified. Excessively wet or dry material should either be removed or moisture conditioned and recompacted.

Fill Material Types

Fill required to achieve design grade should be classified as structural fill and general fill. Structural fill is material used below, or within 10 feet of structures, pavements or constructed slopes. General fill is material used to achieve grade outside of these areas. Earthen materials used for structural and general fill should meet the following material property requirements:

Soil Type [1]	USCS Classification	Acceptable Parameters (for Structural Fill)
Low Plasticity Cohesive	CL, CL-ML ML, SM, SC	Liquid Limit less than 40, Plasticity index less than 15 Maximum dry density greater than 105 pcf
High Plasticity Cohesive [2]	CH, MH	Not recommended for reuse
Granular	GW, GP, GM, GC, SW, SP, SM, SC	Less than 10% Passing No. 200 sieve
On-Site Soils	ML	Liquid Limit less than 40 Plasticity index less than 15 Maximum dry density greater than 105 pcf

1. Structural and general fill should consist of approved materials free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation prior to use on this site.
2. CH or MH soils should not be used within 3 feet of finished grade in building area and 1 foot below finished grade in other structural fill areas.

Fill Compaction Requirements

Structural and general fill should meet the following compaction requirements.

Item	Structural Fill	General Fill
Maximum Lift Thickness	8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used	Same as Structural fill
Minimum Compaction Requirements [1, 2]	98% of max. below foundations 95% of max. above foundations and below floor slabs	92% of max. but only in non-structural areas
Water Content Range [1]	-2% to +2% of optimum	As required to achieve min. compaction requirements

1. Maximum density and optimum water content as determined by the standard Proctor test (ASTM D 698).
2. If the granular material is a coarse sand or gravel, or of a uniform size, or has a low fines content, compaction comparison to relative density may be more appropriate. In this case, granular materials should be compacted to at least 70% relative density (ASTM D 4253 and D 4254).

Utility Trench Backfill

For low permeability subgrades, utility trenches are a common source of water infiltration and migration. Utility trenches penetrating beneath the proposed building should be effectively sealed to restrict water intrusion and flow through the trenches, which could migrate below the building. The trench should provide an effective trench plug that extends at least 5 feet from the face of the building exterior. The plug material should consist of cementitious flowable fill or low permeability clay. The trench plug material should be placed to surround the utility line. If used, the clay trench plug material should be placed and compacted to comply with the water content and compaction recommendations for structural fill stated previously in this report.

Grading and Drainage

All grades must provide effective drainage away from the building during and after construction and should be maintained throughout the life of the structure. Water retained next to the building can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roof should have gutters/drains with downspouts that discharge onto splash blocks at a distance of at least 10 feet from the building.

Exposed ground should be sloped and maintained at a minimum 5% away from the building for at least 10 feet beyond the perimeter of the building. After building construction and landscaping have been completed, final grades should be verified to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted, as necessary, as part of the structure's maintenance program. Where paving or flatwork abuts the structure, a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

Earthwork Construction Considerations

Shallow excavations for the proposed structure are anticipated to be accomplished with conventional construction equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of floor slabs. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

Construction Observation and Testing

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documentation of adequate removal of vegetation and topsoil, proofrolling, and mitigation of areas delineated by the proofroll to require mitigation.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas. One density and water content test should be performed for every 50 linear feet of compacted utility trench backfill.

In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. If unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

SHALLOW FOUNDATIONS

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations.

Design Parameters – Compressive Loads

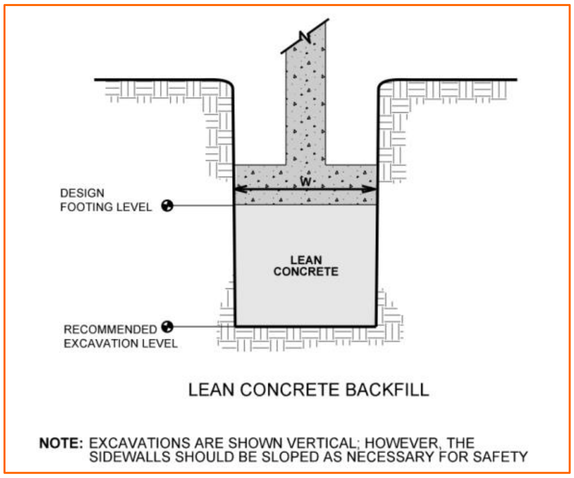
Item	Description
Maximum Net Allowable Bearing pressure [1, 2]	2,500 psf (foundation bearing on undisturbed soils)
Required Bearing Stratum [3]	GeoModel Layer 2 – Alluvial silty sand (SM)
Minimum Foundation Dimensions	Columns: 30 inches Continuous: 18 inches
Minimum Embedment below Finished Grade [4]	Exterior footings in unheated areas: 30 inches Exterior footings in heated areas: 24 inches Interior footings in heated areas: 24 inches
Estimated Total Settlement from Structural Loads [2]	Less than about 1 inch
Estimated Differential Settlement [2, 5]	About 1/2 of total settlement

1. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. An appropriate factor of safety has been applied. Values assume that exterior grades are no steeper than 20% within 10 feet of structure.
2. Values provided are for maximum loads noted in **Project Description**.
3. Unsuitable or soft soils should be over-excavated and replaced per the recommendations presented in the **Earthwork**.
4. Embedment necessary to minimize the effects of frost and/or seasonal water content variations. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.
5. Differential settlements are as measured over a span of 50 feet.

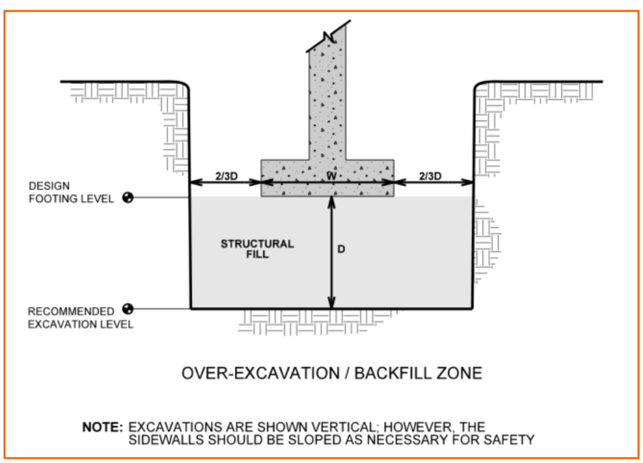
Foundation Construction Considerations

As noted in **Earthwork**, the footing excavations should be evaluated under the direction of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. This is illustrated on the sketch below.



Over-excavation for structural fill placement below footings should be conducted as shown below. The over-excavation should be backfilled up to the footing base elevation, with acceptable structural fill material placed, as recommended in the **Earthwork** section.



INFILTRATION FEASIBILITY RECOMMENDATIONS

Two (2) test borings were sampled and submitted for laboratory testing to obtain the USDA classifications utilizing grain-size sieve analyses including hydrometer testing. Published correlations between USDA classifications and infiltration rates were used to provide estimated hydraulic conductivity values. Since hydraulic conductivity and infiltration values are essentially equal at no head conditions, the hydraulic conductivity values can be used to assist in determining the feasibility of infiltration of the subgrade soils located at areas of proposed infiltration. Utilizing this information and stratums formulated from our subsurface investigation, we have categorized the feasibility of infiltration from low (anticipated infiltration < 0.5 in/hr), medium (anticipated infiltration between 0.5 in/hr to 1 in/hr) and high (anticipated infiltration > 1 in/hr). Results of our infiltration feasibility analysis are presented in the tables below:

Test Boring No.	Depth (ft.)	Infiltration Feasibility
B-2	1.5 – 3	Medium
B-2	4.5 – 6	High
B-6	1.5 – 3	High
B-6	4.5 – 6	High

Based on the infiltration feasibility at each proposed stormwater management location, it is recommended that in-situ infiltration testing be completed in areas where medium to high feasibility of infiltration is estimated based on the USDA soil classifications, to confirm soils are suitable for stormwater management by infiltration at the recommended subgrade elevations. The empirical infiltration values from the USDA laboratory classification may not agree with in-situ infiltration rates in the field due to varying factors. The infiltration feasibility should be used with caution and not relied upon for stormwater management calculations. Only in-situ infiltration values obtained from field testing may be used for stormwater management calculations.

In-Situ Infiltration Test Method

Two methods are used to estimate infiltration capabilities on the subject site: in-situ infiltration testing and published correlations with soil classifications. Details regarding the in-situ infiltration and classification test techniques are presented herein.

The classification test method is performed with grain-size sieve analyses including hydrometer testing on samples obtained from corresponding proposed infiltration depths, to determine the USDA soil texture classifications. Published correlations between USDA classifications and infiltration rates are used to provide estimated hydraulic conductivity values. Since hydraulic conductivity and infiltration values are essentially equal at no head conditions, using the hydraulic conductivity values to estimate the infiltration rates provides an estimate of infiltration for use in design.

For the in-situ test method, test borings are drilled in the area of planned infiltration to depths of at least 4 feet below the planned infiltration invert elevations and allowed to remain open for a period of approximately 24 hours to allow any groundwater levels within the boreholes to stabilize. We have completed the test borings at planned infiltration locations and completed USDA soil classification testing to estimate empirical infiltration rates. Offset infiltration test holes are drilled at the boring locations to planned infiltration invert elevations. The Constant Head Borehole in-situ infiltration testing is utilized to using a Johnson Permeameter. The tests are performed following the standard USBR 7300-89 in accordance with the DOEE Appendix P guidance.

RECOMMENDATIONS FOR ADDITIONAL STUDIES

This geotechnical engineering study may not be considered adequate to use for the final design of the redeveloped property. It may be necessary to conduct a more comprehensive geotechnical engineering analysis and reporting for this project. The field investigation for the final design phase study should consist of additional test borings along the southern edge of the property for a slope stability analysis of the existing slope with an approximate 3:1 slope in addition to in-situ infiltration test borings at any proposed stormwater management facilities.

The comprehensive geotechnical engineering analysis and report should contain a slope stability analysis for the existing slope if modifications to the slope are planned in addition to recommendations regarding the feasibility of stormwater management through in-situ infiltration testing at the proposed stormwater management facility locations and the final design depths.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. GeoCapitol should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by GeoCapitol to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

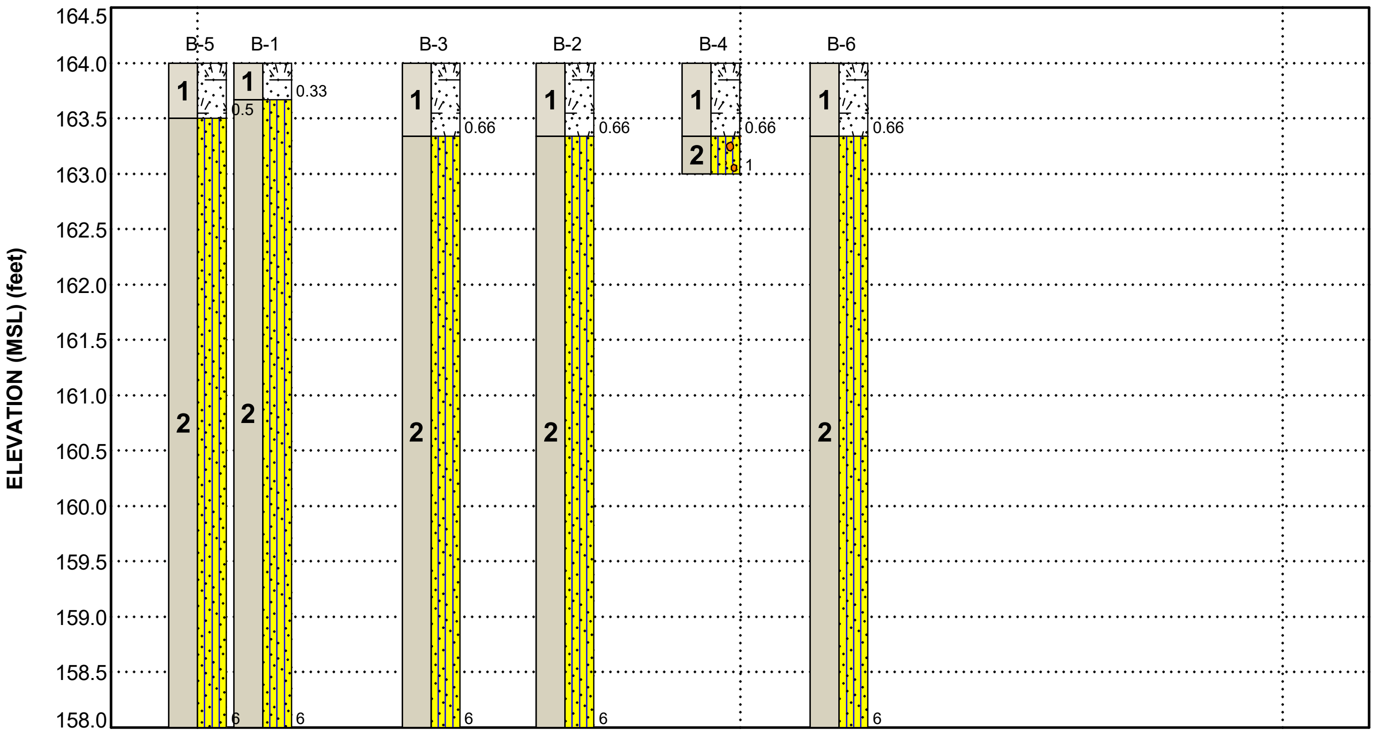
FIGURES

Contents:

GeoModel

GEOMODEL

Duke Ellington Athletic Field Renovations ■ Washington, DC
Terracon Project No. JE215004



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	**Topsoil**	SILT (ML), dark brown, moist
2	**Residual**	SILTY SAND (SM), with varying amounts of mica, reddish brown, moist, medium dense to dense

LEGEND

Topsoil

Silty Sand

Silty Sand with Gravel

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the District of Columbia.

____

Daniel Gradishar, P.E. May 27, 2021

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Borings	Boring Depth (feet)	Planned Location
6	6 or auger refusal	Proposed redevelopment areas

Boring Layout and Elevations: Unless otherwise noted, GeoCapitol personnel provided the boring layout. Coordinates were interpolated in the field using aerial images and approximate elevations were obtained by interpolation from the public data provided on the DC Atlas. If elevations and a more precise boring layout are desired, we recommend borings be surveyed following completion of fieldwork.

Subsurface Exploration Procedures: We advanced the borings with a hand-operated drilling equipment. Hand augers are advanced using manual labor. As such, there are limitations to this type of equipment with regard to auger refusal. Samples were obtained from the excavated spoils at 1.5 foot intervals below the existing groundsurface. Dynamic cone penetrometer (DCP) readings were taken at the bottom of the excavated hole in 1.5 foot intervals. DCP readings were obtained utilizing a 17.6 pound weight dropped 2.33 feet continuously into the ground. The number of blows required to advance the cone tip 1.75 inches three separate intervals are recorded. The DCP reading values are indicated on the boring logs at the test depths. We observed and recorded groundwater levels during drilling and sampling. For safety purposes, all borings were backfilled with auger cuttings after their completion. Pavements were patched with cold-mix asphalt and concrete slab plugged with the existing concrete core.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D422 Standard Test Method for Particle-Size Analysis of Soils
- USDA Textural analysis

The laboratory testing program often included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

SITE LOCATION AND EXPLORATION PLANS

Contents:

Note: All attachments are one page unless noted above.

SITE LOCATION

Duke Ellington Athletic Field Investigation ■ Washington, DC
May 27, 2021 ■ GeoCapitol Project No. JE215004

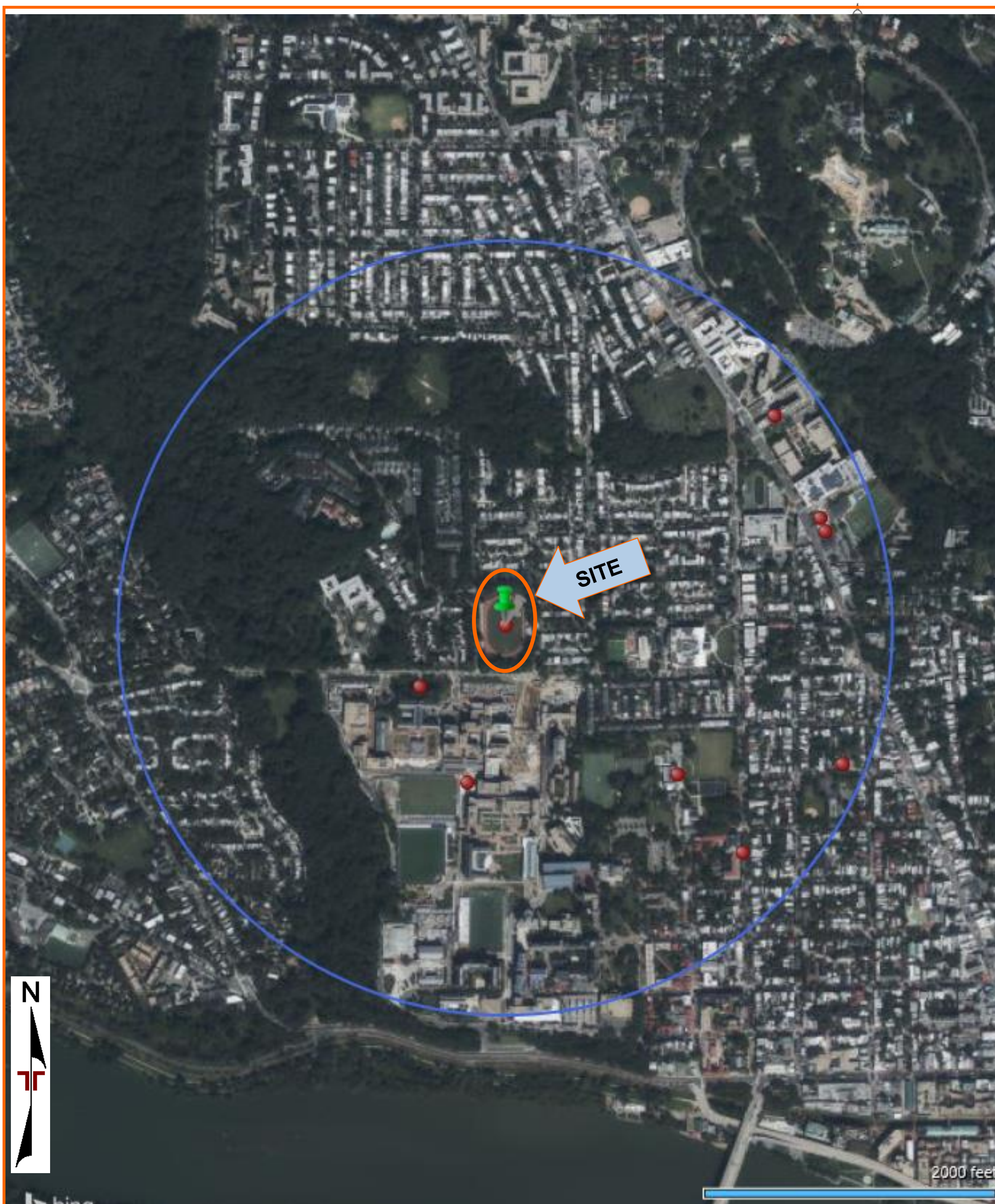


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN

Duke Ellington Athletic Field Investigation ■ Washington, DC
May 27, 2021 ■ GeoCapitol Project No. JE215004

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

GeoCapitol Engineering, LLC
A Terracon COMPANY

EXPLORATION RESULTS

Contents:

Note: All attachments are one page unless noted above.

BORING LOG NO. B-1

PROJECT: Duke Ellington Athletic Field Renovations

CLIENT: Studio Laan PLLC, Washington, DC

SITE: 1600 38th Street NW, Washington, DC

LOCATION See Exploration Plan

Latitude: 38.9139° Longitude: -77.0752°

Approximate Surface Elev.: 164 (Ft.) +/-

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
0.3	**TOPSOIL**	163.5+/-						
	SILTY SAND (SM), reddish brown, moist, medium dense					5-5-6/-6"		
						8-10-8/-6"		
			5			4-6-8/-6"		
6.0		158+/-				7-9-12/-6"		
	Boring Terminated at 6 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: DCP

Advancement Method:
Hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation interpolated from DC Atlas

Notes:

WATER LEVEL OBSERVATIONS

Not encountered during drilling

Terracon
4545 42nd St NW Ste 307
Washington, DC

Boring Started: 04-29-2021	Boring Completed: 04-29-2021
Drill Rig:	Driller: A. Arnold
Project No.: JE215004	

BORING LOG NO. B-2

PROJECT: Duke Ellington Athletic Field Renovations

CLIENT: Studio Laan PLLC Washington, DC

SITE: 1600 38th Street NW Washington, DC

LOCATION See Exploration Plan

Latitude: 38.9137° Longitude: -77.0746°

Approximate Surface Elev.: 164 (Ft.) +/-

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
		TOPSOIL							
	0.7		163.5+/-						
		SILTY SAND (SM), reddish brown, moist, medium dense to dense					15-17-22/-6"		
							10-14-14/-6"		
				5			12-15-15/-6"		
	6.0		158+/-						
		Boring Terminated at 6 Feet					15-17-20/-6"		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: DCP

Advancement Method:
Hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation interpolated from DC Atlas

Notes:

WATER LEVEL OBSERVATIONS

Not encountered during drilling

Terracon
4545 42nd St NW Ste 307
Washington, DC

Boring Started: 04-29-2021	Boring Completed: 04-29-2021
Drill Rig:	Driller: A. Arnold
Project No.: JE215004	

BORING LOG NO. B-3

PROJECT: Duke Ellington Athletic Field Renovations

CLIENT: Studio Laan PLLC Washington, DC

SITE: 1600 38th Street NW Washington, DC

LOCATION See Exploration Plan

Latitude: 38.9134° Longitude: -77.0752°

Approximate Surface Elev.: 164 (Ft.) +/-

DEPTH	Material Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
	TOPSOIL							
0.7		163.5+/-						
	SILTY SAND (SM), reddish brown, moist, medium dense to dense							
						8-9-9/-6"		
						6-7-8/-6"		
			5			8-15-15/-6"		
							24	35-32-3
6.0		158+/-						
	Boring Terminated at 6 Feet					15-30-30/-6"		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: DCP

Advancement Method:
Hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation interpolated from DC Atlas

Notes:

WATER LEVEL OBSERVATIONS

Not encountered during drilling

Terracon
4545 42nd St NW Ste 307
Washington, DC

Boring Started: 04-29-2021	Boring Completed: 04-29-2021
Drill Rig:	Driller: A. Arnold
Project No.: JE215004	

BORING LOG NO. B-4

PROJECT: Duke Ellington Athletic Field Renovations

**CLIENT: Studio Laan PLLC
Washington, DC**

**SITE: 1600 38th Street NW
Washington, DC**

LOCATION See Exploration Plan

Latitude: 38.9132° Longitude: -77.0746°

Approximate Surface Elev.: 164 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
TOPSOIL							
0.7	163.5+/-						
SILTY SAND WITH GRAVEL (SM), reddish brown, moist, hard							
1.0	163+/-						
Auger Refusal at 1 Foot							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: DCP

Advancement Method:
Hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation interpolated from DC Atlas

Notes:

WATER LEVEL OBSERVATIONS

Not encountered during drilling

Terracon
4545 42nd St NW Ste 307
Washington, DC

Boring Started: 04-29-2021	Boring Completed: 04-29-2021
Drill Rig:	Driller: A. Arnold
Project No.: JE215004	

BORING LOG NO. B-5

PROJECT: Duke Ellington Athletic Field Renovations

CLIENT: Studio Laan PLLC, Washington, DC

SITE: 1600 38th Street NW, Washington, DC

LOCATION See Exploration Plan

Latitude: 38.9142° Longitude: -77.0751°

Approximate Surface Elev.: 164 (Ft.) +/-

DEPTH	Material Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
0.5	**TOPSOIL**	163.5+/-						
	SILTY SAND (SM), micaceous, reddish brown, moist, medium stiff				Hand sample		32	
					Drive	6-8-8/-6"		
					Hand sample			
					Drive	8-8-9/-6"		
					Hand sample		26	39-34-5
					Drive	7-5-5/-6"		
			5		Hand sample			
6.0		158+/-			Drive	4-7-9/-6"		
	Boring Terminated at 6 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: DCP

Advancement Method:
Hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation interpolated from DC Atlas

Notes:

WATER LEVEL OBSERVATIONS

Not encountered during drilling

Terracon
4545 42nd St NW Ste 307
Washington, DC

Boring Started: 04-29-2021	Boring Completed: 04-29-2021
Drill Rig:	Driller: D. Nixon
Project No.: JE215004	

BORING LOG NO. B-6

PROJECT: Duke Ellington Athletic Field Renovations

CLIENT: Studio Laan PLLC, Washington, DC

SITE: 1600 38th Street NW, Washington, DC

LOCATION See Exploration Plan

Latitude: 38.913° Longitude: -77.0745°

Approximate Surface Elev.: 164 (Ft.) +/-

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
		TOPSOIL							
	0.7	**SILTY SAND (SM)**, reddish brown, moist, medium dense to dense	163.5+/-						
						Hand		27	
						Split spoon	8-10-14/-6"		
						Hand			
						Split spoon	8-15-15/-6"		
						Hand			
				5		Split spoon	12-18-22/-6"		
						Hand			
	6.0	*Boring Terminated at 6 Feet*	158+/-			Split spoon	10-25-40/-6"		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: DCP

Advancement Method:
Hand auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation interpolated from DC Atlas

Notes:

WATER LEVEL OBSERVATIONS

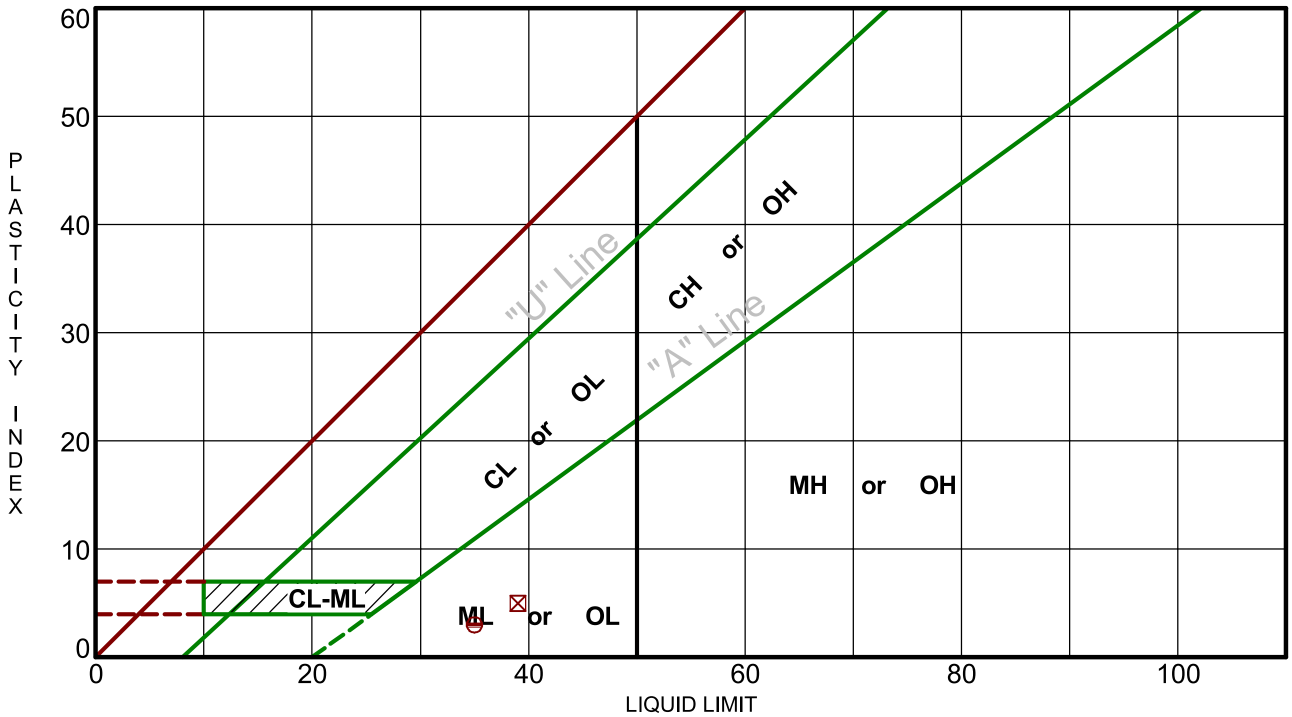
Not encountered during drilling

Terracon
4545 42nd St NW Ste 307
Washington, DC

Boring Started: 04-29-2021	Boring Completed: 04-29-2021
Drill Rig:	Driller: D. Nixon
Project No.: JE215004	

ATTERBERG LIMITS RESULTS

ASTM D4318



	Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
⊖	B-3	5.5 - 6	35	32	3	36.1	SM	SILTY SAND
⊠	B-5	4 - 4.5	39	34	5	38.3	SM	SILTY SAND

PROJECT: Duke Ellington Athletic Field Renovations

SITE: 1600 38th Street NW, Washington, DC

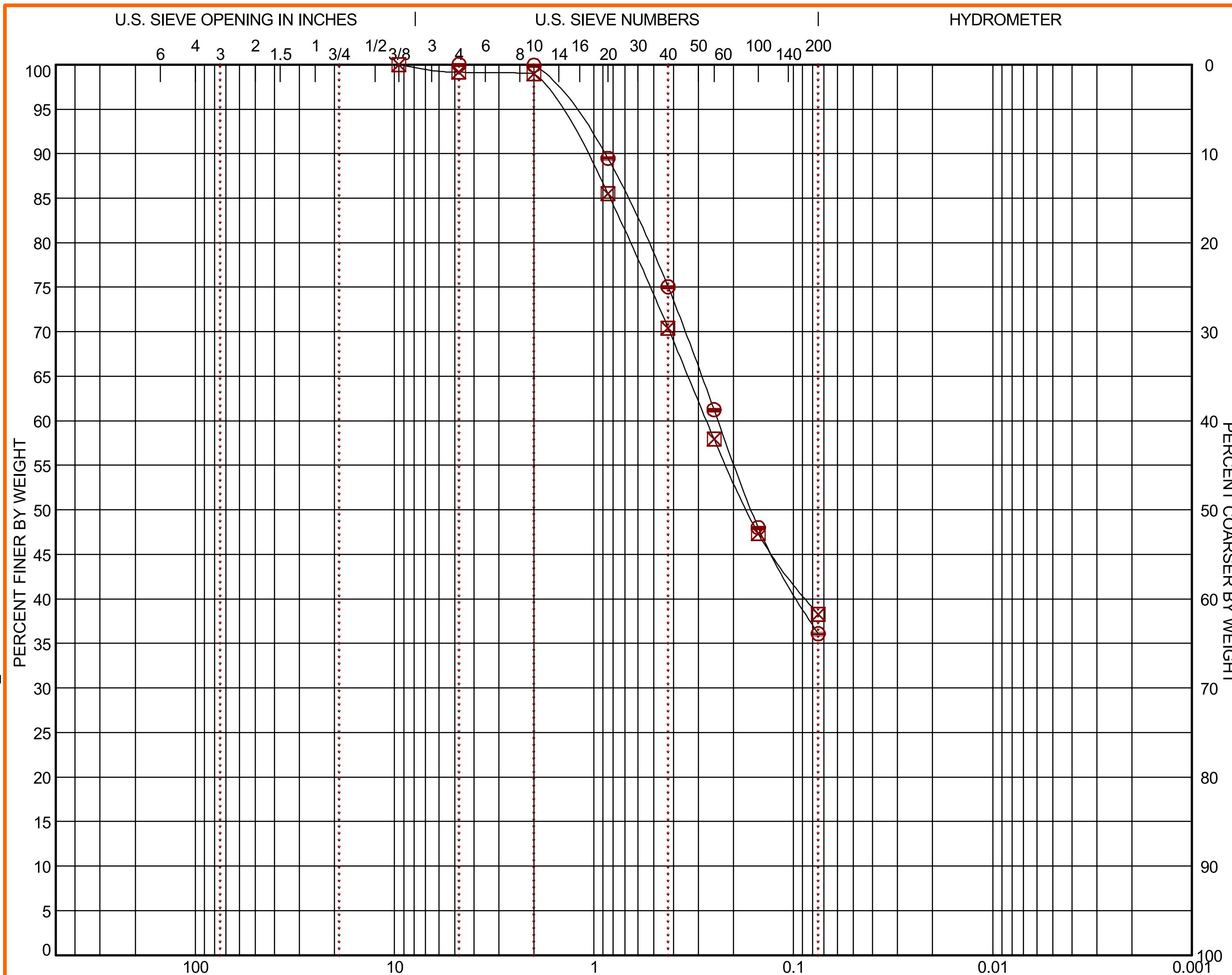
Terracon
4545 42nd St NW Ste 307
Washington, DC

PROJECT NUMBER: JE215004

CLIENT: Studio Laan PLLC, Washington, DC

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
⊖	B-3	5.5 - 6	0.0	0.0	63.9		36.1		SM
⊠	B-5	4 - 4.5	0.0	0.9	60.8		38.3		SM

GRAIN SIZE

	⊖	⊠	
D_{60}	0.238	0.273	
D_{30}			
D_{10}			

COEFFICIENTS

	⊖	⊠	
C_C			
C_U			

⊖		⊠			
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
#4	100.0	3/8"	100.0		
#10	99.93	#4	99.13		
#20	89.48	#10	98.99		
#40	75.05	#20	85.52		
#60	61.24	#40	70.42		
#100	48.01	#60	57.97		
#200	36.09	#100	47.36		
		#200	38.29		

SOIL DESCRIPTION

⊖	SILTY SAND (SM)
⊠	SILTY SAND (SM)

REMARKS

⊖	
⊠	

PROJECT: Duke Ellington Athletic Field Renovations

SITE: 1600 38th Street NW
Washington, DC

Terracon
4545 42nd St NW Ste 307
Washington, DC

PROJECT NUMBER: JE215004

CLIENT: Studio Laan PLLC
Washington, DC

Waypoint ANALYTICAL
7621 Whitepine Road, Richmond, VA 23237
Main 804-743-9401 º Fax 804-271-6446
www.waypointanalytical.com

TEXTURE ANALYSIS

Client :	Grower :	
GeoCapitol Engineering LLC 4545 42nd Street NW Suite 307 Washington , DC 20016	JE215004 Duke Ellington Ath. Field 1600 38th Street NW Washington, DC	Report No : 21-125-0796 Cust No : 06720 Date Printed : 05/07/2021 Page : 1 of 1
	Farm :	Date Received : 05/05/2021

Lab No	Field ID	Sample Identification	Percent Sand	Percent Silt	Percent Clay	Textural Classification
18472		B-2 1.5-3	71.8	25.1	3.0	Sandy Loam
18474		B-2 4.5-6	73.8	23.1	3.0	Loamy Sand
18475		B-6 1.5-3	75.8	21.1	3.0	Loamy Sand
18476		B-6 4.5-6	73.8	23.1	3.0	Loamy Sand

Analysis prepared by: Waypoint Analytical Virginia, Inc.

SUPPORTING INFORMATION

Contents:

Note: All attachments are one page unless noted above.

UNIFIED SOIL CLASSIFICATION SYSTEM

GeoCapitol Engineering, LLC
A Terracon COMPANY

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification: Group Symbol	Soil Classification: Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]	GW	Well-graded gravel [F]
			$Cu < 4$ and/or [$Cc<1$ or $Cc>3.0$] [E]	GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F, G, H]
			Fines classify as CL or CH	GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]	SW	Well-graded sand [I]
			$Cu < 6$ and/or [$Cc<1$ or $Cc>3.0$] [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G, H, I]
			Fines classify as CL or CH	SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	$PI > 7$ and plots on or above "A" line	CL	Lean clay [K, L, M]
			$PI < 4$ or plots below "A" line [J]	ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OL	Organic clay [K, L, M, N]
					Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line	CH	Fat clay [K, L, M]
			PI plots below "A" line	MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OH	Organic clay [K, L, M, P]
					Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

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

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

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

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

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains $\geq$ 15% sand, add "with sand" to group name.

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

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

[I] If soil contains $\geq$ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

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

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

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

[N] $PI \geq 4$ and plots on or above "A" line.

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

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

[Q] PI plots below "A" line.