

GEOTECHNICAL ENGINEERING REPORT

for

**Arlington County Department of Human Services Group Home
Arlington, Virginia**

Prepared For:

**Arlington County Department of Environmental Services
Facilities Design and Construction**

Prepared By:

**Langan Engineering and Environmental Services, Inc.
1300 Wilson Boulevard, Suite 450
Arlington, Virginia 22209**

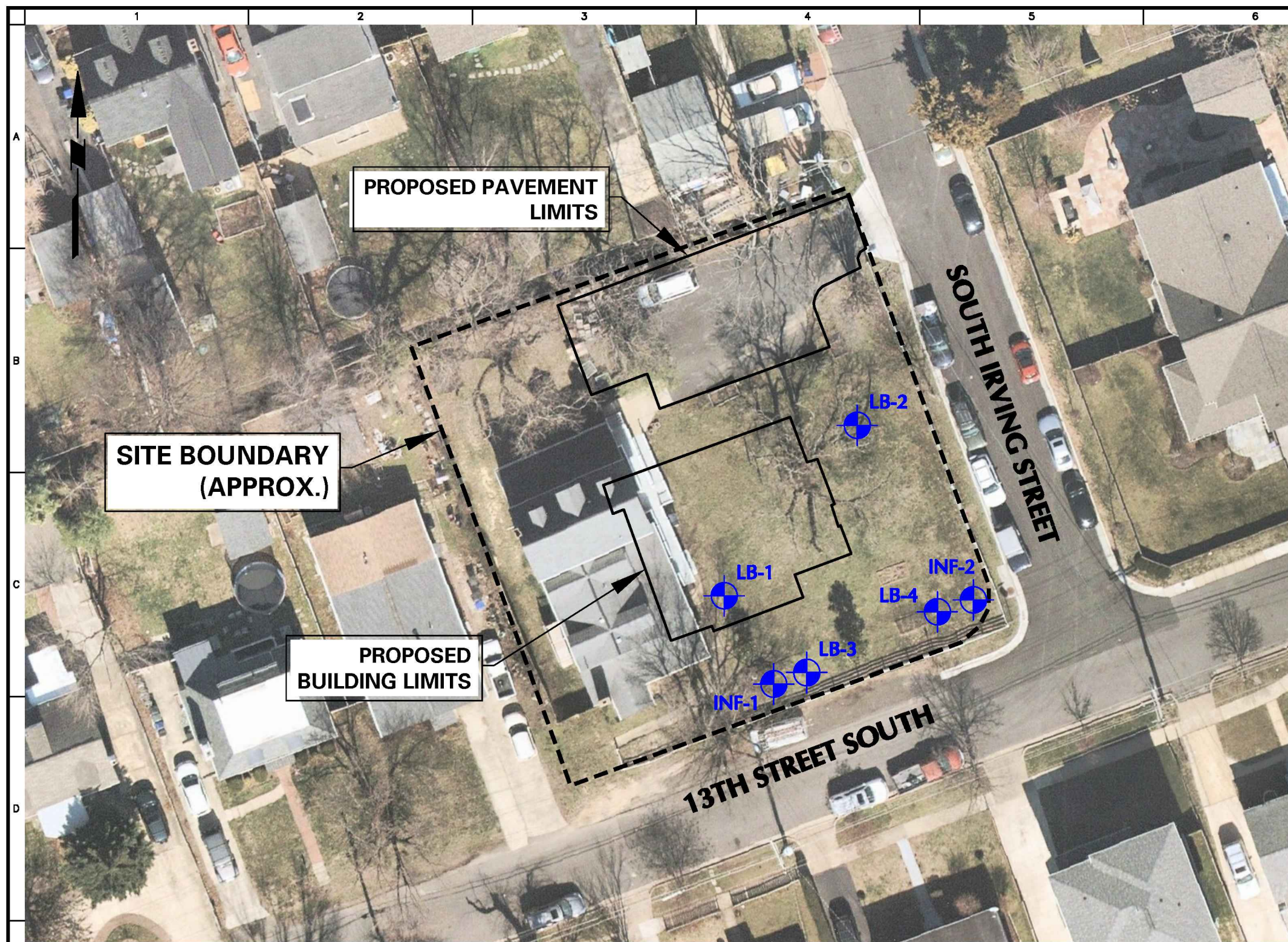
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**16 July 2020
270060006**

LANGAN

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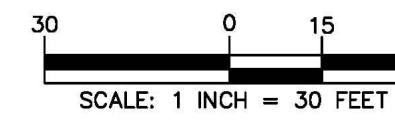


NOTES:

- BACKGROUND AERIAL IS REFERENCED FROM NEARMAP, ACCESSED 25 JUNE 2020.
- BORINGS LB-1 THROUGH LB-4 AND INFILTRATION TESTS INF-1 AND INF-2 WERE DRILLED BY FREE STATE DRILLING INC. ON 1 JULY 2020 UNDER THE DIRECT SUPERVISION OF LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES.
- FOR DETAILED DESCRIPTIONS OF THE SUBSURFACE CONDITIONS, SEE APPENDIX A FOR THE BORING LOGS.
- ALL BORING AND INFILTRATION TEST LOCATIONS ARE APPROXIMATE.

LEGEND

- LB-1** BORING LOCATION
- INF-1** INFILTRATION TEST LOCATION



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Project ARLINGTON COUNTY DHS GROUP HOME	Drawing Title INVESTIGATION PLAN	Project No. 270060006	Drawing No. 2
Date 7/16/20	Drawn By BSS	Checked By KJL	Sheet 2 of 5

Filename: \langan.com\arlington\ARL1500000000\Project Data\CAD\DWG\Design\Final\Geotechnical\Figure 2 - IUP.dwg Date: 7/16/2020 Time: 09:14 User: agrapaty Style Table: Langan.stb Layout: ANSIB-BL

1.0 EXECUTIVE SUMMARY

This report presents the findings of our geotechnical engineering study for the proposed Arlington County Department of Human Services Group Home at 1212 South Irving Street in Arlington, Virginia. This executive summary does not represent a complete summary of our project understanding and recommendations; the report is one cohesive document and should be read in its entirety.

The site is located at the northwest side of the intersection of South Irving Street and 13th Street South and is bound by South Irving Street to the east, 13th Street South to the south, and houses to the north and west. The site has a 2.5-story house at the west portion of the site, a grassy area with a few trees at the east-southeast portions of the site, and an asphalt driveway/parking area at the northeast portion of the site.

We understand that the existing house will be demolished and a new three-story, approximate 3,500 square foot group house will be constructed in its place at the center of the site. A new parking area will be constructed at the northeast portion of the site. Landscaping and hardscaping will be updated throughout the site. A new stormwater management facility is planned at the southeast portion of the site.

We performed a geotechnical investigation on 1 and 2 July 2020 that consisted of drilling four borings and performing two infiltration tests. Subsurface conditions at the site generally consist of surficial topsoil or asphalt overlying successive strata of silt, upper clay, sand, and lower clay and are summarized as follows:

- Topsoil: Topsoil consisted of dark brown silt with varying amounts of clay and sand with trace roots. The topsoil was observed to be 4 to 6 inches thick.
- Stratum A – Silt: The upper 1.5 and 3.7 feet consisted of firm to hard silt with varying amounts of sand and clay with trace amounts of coarse gravel and cobbles.
- Stratum B – Upper Clay: The Upper Clay stratum was observed to be between 4 and 5 feet thick and contained varying amounts of sand and silt.
- Stratum C – Sand: Stratum C consisted of primarily sand with varying amounts gravel, silt, and clay. The sand stratum was observed to be medium dense to very dense and between 23.5 and 27.5 feet thick.
- Stratum D – Lower Clay: The lower clay was observed to be very stiff and contain varying amounts of sand and silt.
- Groundwater: Groundwater was first encountered at approximately 18 and 18.5 feet below grade, or between el 186 and 187. Groundwater after completion of the drilling was recorded at approximately 17.2 feet below grade or at el 188.3.

A summary of pertinent information and our recommendations based on our geotechnical investigation are as follows:

- The subsurface conditions are suitable for supporting structures on shallow foundations using an allowable bearing pressure of 4 ksf for foundations at the basement level and 3 ksf for foundations near existing grade. Shallow foundations should bear on new structural fill or natural soils. We recommend that localized fill, if encountered at the subgrade, be over-excavated and replaced with structural fill or the footing be lowered to bear on natural soil.

- The lowest level floor slab of the proposed building can be designed as conventional slab-on-grade bearing on natural soils or on new structural fill using a modulus of subgrade reaction of 120 pci. The slab should be underlain by a minimum 10 mil vapor barrier and minimum 4 inches of No. 57 stone.
- The new building can be designed using a seismic site class of "D".

- Excavated soil in the upper 4 to 5 feet are expected to have a high percentage of fines and should only be reused as backfill in landscaped areas. Stratum C soil will be encountered during excavation for the basement level and deep utilities and we anticipate a majority of excavated Stratum C soils can be reused as structural fill.
- We anticipate that a majority of the excavations at the site can be completed using temporary construction slopes at a 1H:1V (OSHA Type B Soils) where sufficient space exists.
- Infiltration testing was completed in and yielded infiltration rates ranging from 0.01 to 3.13 inches per hour. The high variation in infiltration rates is likely due to clay seams present in Stratum C near the proposed bottom of basin elevation.
- Excavations for the proposed basement level, foundations, and site utilities are anticipated to be above the groundwater table. However, seasonal perched water may be encountered along the interface of Strata A and B.
- We anticipate that rainwater/surface runoff and perched water can be controlled during construction using conventional submersible pumps in conjunction with gravel filled trenches or sumps. Surface ditches or berms should be used to prevent surface runoff from entering the excavations.

Additional discussion of the investigation, subsurface conditions, and our geotechnical design and construction recommendations are provided in the following sections.

ADVANCE COPY

BOREHOLE INFILTRATION TEST		BOREHOLE INFILTRATION TEST	
1212 South Irving Street Redevelopment Arlington, VA 270060006		1212 South Irving Street Redevelopment Arlington, VA 270060006	
BOREHOLE: INF-1		BOREHOLE: INF-2	
Test Dimensions	Casing Depth: 4 in Casing Length: 11.00 ft Pipe Sock-Up: 1 ft Surface Elevation: 235 ft Test Elevation: 856.0 ft	Test Dimensions	Casing Depth: 4 in Casing Length: 57.2 ft Pipe Sock-Up: 2 ft Surface Elevation: 204 ft Test Elevation: 156.3 ft
Pre-Soak Initial Soak	Date: 7/1/2020 Time: 9:20 AM Water Depth: 9.35 ft Height of Water: 1.65 ft	Pre-Soak Initial Soak	Date: 7/1/2020 Time: 11:01 PM Water Depth Below Casing (ft): 9.85 Height of Water: 2.19 ft
24-hour Results	Date: 7/2/2020 Time: 7:58 AM Water Depth: 30.20 Height of Water: 0.80	24-hour Results	Date: 7/2/2020 Time: 7:59 AM Water Depth: 1.68 ft Height of Water: 2 ft
Test Information	Date: 7/2/2020 Casing Length: 11.00 ft	Test Information	Date: 7/2/2020 Casing Length: 67.5 ft

Start Time	Time Interval (hour)	Depth to Water from Top of Pipe (ft)	Height of Water in Pipe (ft)	Water Drop in Interval (ft)	Infiltration Rate (ft/hr)	Incremental Infiltration Rate (in/hr)
Test #1						
8:00 AM	Start	8.77	2.73	-	-	-
8:15 AM	0.15	8.25	2.25	0.52	0.72	0.64
8:30 AM	0.30	8.04	1.96	0.81	0.36	4.32
8:45 AM	0.45	8.10	1.90	0.06	0.23	2.70
9:00 AM	0.44	8.13	1.87	0.03	0.13	1.24
Test #1 Infiltration Rate: 4.32						
Test #2						
9:00 AM	Start	8.69	2.31	-	-	-
9:15 AM	0.14	8.78	2.22	0.09	0.39	4.63
9:30 AM	0.15	8.85	2.15	0.67	0.28	3.36
9:45 AM	0.16	8.89	2.11	0.04	0.15	1.80
10:00 AM	0.15	8.93	2.07	0.06	0.16	1.92
Test #2 Infiltration Rate: 2.88						
Test #3						
10:00 AM	Start	8.61	2.39	-	-	-
10:15 AM	0.15	8.69	2.31	0.08	0.37	8.64
10:30 AM	0.15	8.75	2.27	0.06	0.16	1.92
10:45 AM	0.15	8.78	2.22	0.05	0.20	2.40
11:00 AM	0.15	8.80	2.20	0.02	0.08	0.96
Test #3 Infiltration Rate: 2.88						
Test #4						
11:00 AM	Start	8.70	2.20	-	-	-
11:15 AM	0.14	8.47	2.53	0.23	0.39	4.63
11:30 AM	0.13	8.53	2.47	0.06	0.28	3.32
11:45 AM	0.15	8.58	2.42	0.05	0.20	2.40
12:00 PM	0.15	8.62	2.38	0.04	0.16	1.92
Test #4 Infiltration Rate: 3.03						

RESULT	
Lowest Infiltration Rate	2.28 in/hr
Average Infiltration Rate	3.13 in/hr

The infiltration tests were performed within Stratum C, which is primarily composed of sand with varying amounts of gravel and clay. However, Stratum C was observed to contain lenses of clay and silt, which likely contributed to the low infiltration test results at INF-2. Based on the results, we recommend that bio-retention basins be designed using an allowable infiltration rate of 0.5 in/hour to account for the possible variability at the bottom of basins.

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Geotechnical Engineering Report Clarifications
Arlington County Department of Human Services Group Home
Arlington, Virginia

12 February 2021
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12 February 2021

Cynthia Wilson, AIA, LEED AP
Arlington County
Department of Environmental Services – Design & Construction

**Re: Geotechnical Engineering Report Clarifications
Arlington County Department of Human Services Group Home
Arlington, Virginia**

Dear Ms. Wilson
We understand that the County and design team requested additional clarification regarding the infiltration tests conducted at the site and associated recommendations. The responses in this letter are based on the results of our geotechnical investigation summarized in our 16 July 2020 Geotechnical Engineering Report and the updated BMP Schematic & Design Details prepared by Walter L. Phillips Incorporated, Sheet C-0704, dated 8 February 2021.

The provided comments/questions and our associated responses are provided as follows:

- Comment:** Provide Geotech certificate that there is an enough separation between water table and the facility invert (Arlington County Permit Review).
Response: Bio-retention basin "A" Detail indicates the bottom of basin elevation to be el 195. Groundwater was measured in borings completed at the site at el 186 to 187. The geotechnical report recommends using a groundwater table of el 190 to account for potential fluctuation. Therefore, we anticipate about 5 feet of separation between the bottom of basin and the design groundwater table.
- Comment:** Describe how the conclusion is drawn for the infiltration rate to be 0.5 inch per hour while the location of the facility has practically no permeability. (Arlington County Permit Review).
Response: Two infiltration tests were completed at the site, INF-1 and INF-2. INF-2 was completed at the southeast portion of the site at a test elevation of 106.3. We agree that the test at INF-2 at the southeast portion of the site resulted in very low infiltration due to clay encountered at the test elevation. INF-2 was targeted at the most impermeable layer or at below the proposed basin elevation, which was determined to be the clay around el 196.

We understand that basin "A" has been redesign with a bottom of basin elevation of 196, which is 5 feet lower than the previous design. Boring B-4 completed in the basin "A" area indicates a transition to sand/gravel material at el 196. Test INF-1 indicates that the sand-gravel of Stratum C is expected to have a much faster infiltration rate, measured to

SOILS REPORT - FOR INFORMATION ONLY

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**ARLINGTON, VIRGINIA
DEPARTMENT OF ENVIRONMENTAL SERVICES
1212 SOUTH IRVING STREET
LOT 41-B AND PARCEL 10, C.B. MUNSON'S 2ND ADDITION TO ARLINGTON
GRADING PLAN
ARLINGTON COUNTY, VIRGINIA**

SCALE: AS NOTED DRAWN DL CHECKED KW
SUBMITTED DATE
REVISION FOR PERMIT: 05/21/2021

APPROVED DATE
DIRECTOR OF ENVIRONMENTAL SERVICES

SHEET: **C-0706**