KOONTZ BRYANT JOHNSON WILLIAMS

Subsurface Investigation and Geotechnical Analysis Report

Soccer Scoreboards
Dinwiddie Sports Complex
5850 R.B. Pamplin Drive
Sutherland, Virginia

KBJW Project No.: 23-27025-001

Prepared for
Dinwiddie County
Virginia

June 27, 2023

KOONTZ BRYANT JOHNSON WILLIAMS

June 27, 2023

Ms. Hollie R. Casey, CAP, VCA, VCCO, Procurement Officer
Dinwiddie County, Virginia

RE: Geotechnical Investigation and Foundation Design Report
Soccer Scoreboards - Dinwiddie Sports Complex
5850 R. B. Pamplin Drive,
Sutherland, Virginia 23885
KBJW Project No: 23-27025-001

Ms. Casey,

Koontz Bryant Johnson Williams, Inc. (KBJW) is pleased to provide you with the following subsurface investigation and geotechnical analysis report for the proposed soccer scoreboard to be located at the Dinwiddie Sports Complex in Sutherland, Virginia. This report includes our geotechnical field exploration, limited laboratory testing, and a geotechnical engineering evaluation.

Please do not hesitate to contact KBJW if you have any questions regarding this report. KBJW greatly appreciates the opportunity to serve as your geotechnical consultant on this project and we look forward to a continued successful working relationship with Dinwiddie County.

Sincerely,

Koontz Bryant Johnson Williams, Inc.

Siddhartha Kotikalapudi, P.E., PMP
Director of Geotechnical Services

Jeffrey T. Huffman, MS, PE, F. ASCE
Director of Operations
Geotechnical & Environmental

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1.0 INTRODUCTION

1.1 Project Information

The proposed installation of scoreboards is planned at a site that is currently occupied by an existing soccer field. The site is currently mostly cleared and relatively flat.

1.2 Scope-of-Services

Our scope of services for this project was to perform a subsurface investigation and develop geotechnical engineering recommendations for design and construction of the foundations for the proposed scoreboards. Our scope-of-services included:

- Observation of field condition and supervision of drilling operations.
- A review of geologic and subsurface water conditions for the site.
- A subsurface exploration consisting of three (3) Standard Penetration Test (SPT) borings with soil sampling.
- Laboratory testing of select soil samples.
- Preparation of this geotechnical engineering report which summarizes our subsurface exploration, laboratory testing, and geotechnical engineering recommendations.

2.0 SITE DESCRIPTION

The subject site is approximately 2 acres in size and is located on the perimeter of the soccer field at the Dinwiddie Sports Complex at 5850 R.B. Pamplin Drive in Dinwiddie, Virginia. See the Site Location Plan in Appendix A for details.

3.0 SUBSURFACE EXPLORATION

KBJW supervised a subsurface exploration on June 5, 2023, which was performed using a subcontracted, track-mounted Geo-probe drill rig operated by Jetco, Inc. utilizing a 2 ¼ inch hollow stem auger and SPT sampling. These borings were field located by KBJW personnel based on the Proposed Exploration Plan completed by KBJW, dated May 23, 2022.

Three (3) SPT soil borings were advanced in the locations shown on the Subsurface Exploration Plan included in Appendix A. Three (3) borings (B-1 through B-3) were advanced to depths of 20 feet below existing ground surface (bgs) at the locations of the scoreboards.

In situ soil samples were obtained by means of the split-spoon sampling in general accordance with ASTM D1586. The subsurface soils were continuously sampled for the first 10 feet and at intervals of 5 feet thereafter to the scheduled termination depths. The split-spoon sampler was first seated 6 inches to penetrate loose cuttings and then driven an additional 18 inches with a 140-pound hammer free falling 30 inches. The standard penetration resistance, or N-value, designates the number of hammer blows required to drive the sampler the second and third intervals. The N-value, reported in blows-per-foot (bpf), provides an indication of the consistency of the cohesive soils and relative

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density of the cohesionless soils. It also provides an estimation of the approximate shear strength properties of the soils through empirical geotechnical correlations. This exploration program utilized an automatic hammer, which produces approximately 30% more energy than traditional safety hammers. Our analysis considers this increased energy but blow count values on the logs do not show the corrections.

A log of the soils encountered in each boring was prepared during drilling operations by our field staff. The boring logs contain information pertaining to visual-manual soil classification (ASTM D2488), density or consistency, relative moisture contents, groundwater levels, and unique observations (See Appendix B – Boring Logs). The soil samples obtained during split-spoon sampling were immediately sealed in glass containers and transported to KBJW's soil laboratory for additional examination and testing.

Outside water sources were not utilized in the drilling operations. Groundwater elevations are based on measurements at the completion of drilling. Fluctuations in the location of the long-term groundwater may occur seasonally and are dependent upon variations in precipitation, evaporation, and surface run-off.

4.0 LABORATORY TESTING RESULTS

The soil samples obtained during the geotechnical field exploration were transported to KBJW's AASHTO verified, and U.S. Army Corps of Engineers qualified Materials Testing Laboratory for further review and limited laboratory testing. Laboratory testing performed on select samples included natural moisture content (ASTM D2216), percent passing No. 200 sieve (ASTM D6913), and Atterberg Limits (ASTM D4318). See Appendix C for the Laboratory Test Results.

5.0 SUBSURFACE CONDITIONS

5.1 Regional Geology

The site is located within the Piedmont Physiographic Province. The Piedmont is comprised of primarily massive igneous intrusive bedrock intersected by younger igneous intrusives of a higher mafic composition. The Piedmont is also highly faulted in some areas. The undisturbed soils encountered onsite appear to be residual soils derived from the underlying bedrock. The Geologic Map of Virginia indicates that the subject property is underlain by the Mississippian Geologic aged Petersburg Granite Formation.

5.2 Encountered Soil Conditions

The borings reflecting the subsurface conditions at the time of our exploration are included in Appendix B. Soil strata inferences, discussed below and indicated on the boring logs, represent an estimate of the subsurface conditions based on visual-manual classifications of soils (ASTM D2488) and laboratory classification test results (ASTM D2487). Note that the transitions between soil strata are generally less distinct than shown on the boring logs and are interpolated between the boring locations. For specific subsurface soil information, refer to the boring logs in Appendix B.

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5.2.1 Subsurface Soils

The following descriptions generally describe the subsurface conditions encountered at our exploration locations:

At the ground surface Topsoil was encountered to depths of 6 inches.

Soil strata beneath the subsurface materials was broadly classified into two categories as below. For more exact subsurface information at each boring location, refer to the boring logs in Appendix B.

Stratum 1 (0.5 to 6.0 feet): Uncontrolled FILL soils consisting of brown, gray, yellow brown, yellow red and gray brown, soft/loose, damp to moist, organic, silty sand (sm), clayey sand (sc) and sandy lean clay (cl). Stratum 1 was observed within all Borings from the surface to depths of 4 to 6 feet bgs and exhibited N-values ranging from 2 to 11 bpf with an average N-value of 7 bpf.

Stratum 2 (4 to 11 feet): Soils consisting of yellow brown, red and light gray, firm, damp, Sandy Lean Clay (CL) and Sandy Fat Clay (CH). Stratum 2 was observed within Borings B-1 and B-3 from below Stratum 1 to a depth of 14 feet bgs in B-1 and 8 feet in B-3 and exhibited N-values ranging from 5 to 18 blows per foot (bpf) with an average N-value of 11 bpf.

Stratum 3 (7 to 20 feet): Soils consisting of yellow brown, red, brown and light gray, loose, damp to wet, micaceous, Clayey Sand (SC). Stratum 3 was observed within Borings B-2 and B-3 from below Stratum 1 or Stratum 2, in Boring B-2, to boring termination at a depth of 20 feet bgs and exhibited N-values ranging from 5 to 6 blows per foot (bpf) with an average N-value of 5 bpf.

5.3 Subsurface Water

Groundwater was encountered at a depth of 17 feet bgs within Boring B-2. Groundwater elevations are based on measurements at the completion of drilling. 24-hour water levels were not measured. Cave depths were noted and recorded at each boring location as presented in Appendix B Boring logs. The bore holes were backfilled upon completion of drilling for safety reasons.

6.0 DESIGN RECOMMENDATIONS

6.1 General

The following conclusions and recommendations are based on the previously discussed project information, observations at the site, analysis of the laboratory results, interpretation of the field data obtained during the exploration and our experience with similar subsurface conditions, using generally established correlations and methods commonly exercised by members of the geotechnical engineering profession. If project location, loading conditions, or other pertinent information are changed, or differ from our assumptions, we should be advised and allowed to re-evaluate our recommendations. We request the opportunity to review the final foundation design to verify that the intent of our recommendations is met.

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6.2 Structure Characteristics

Based on our experience with similar structures, lightly loaded columns and shallow foundations are anticipated for the scoreboards. Allowable settlements up to 1 inch and differential settlement of ½ inch are assumed acceptable.

6.3 Shallow Foundations

Foundations should be supported on documented, controlled, compacted fill. As discussed above, materials identified as existing fills was encountered in all three (3) borings to depths of 4 to 6 feet below existing grades. Construction documentation for the existing fills was not available at the time of this report. Due to the uncontrolled, undocumented existing fill encountered in all boring locations, shallow spread and column foundations should be founded on native soils or documented, controlled, compacted fill at a depth of 4 to 6 feet bgs.

Provided these recommendations are observed and that any additional required fills within the proposed structural support areas are placed in a controlled manner, the proposed lightly loaded structures can be supported on shallow spread foundation proportioned for a net allowable bearing pressure of 2,000 pounds per square foot (psf). Maximum estimated settlements of less than 1 inch total and ½ inch differential for the proposed structures are expected based on the recommended bearing pressure. These settlement tolerances are within the generally accepted range for the proposed scoreboards. The recommended allowable bearing pressure and anticipated settlements assume the foundation subgrade will be evaluated during construction, and that any soft/loose or unstable areas addressed prior to footing construction as recommended by the project geotechnical engineer or their qualified representative.

Foundations should be designed for minimum widths of 24 inches and 30 inches for continuous wall and individual column footings, respectively. Although these dimensions may not fully utilize the recommended bearing pressure, they should be maintained to reduce the potential for local punching shear type bearing failures.

Foundation excavations should be reviewed by the project geotechnical engineer or their qualified representative prior to concrete placement. Testing should be performed on the exposed foundation subgrade to confirm the design allowable bearing capacity. Foundation concrete should be placed on the day the foundations are excavated to limit the potential for shrink/swell of the subgrade soils due to moisture or temperature changes, and the foundation subgrade soils should be protected from precipitation and frost prior to concrete placement.

7.0 CONSTRUCTION CONSIDERATIONS

7.1 Clearing and Grubbing

Prior to construction operations, all topsoil, roots, unsuitable fill, or other deleterious non-soil material should be stripped within and ten feet beyond the proposed footprint of areas intended for foundations, slabs, parking, and drive lane areas.

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7.2 Demolition of Existing Buildings, Asphalt, and Utilities

Razed utility, foundations, and other underground structure should be backfilled with suitable, controlled, engineered backfill to final grades. Backfill placed under proposed structures or pavement should be placed at 8 inch-controlled lifts and compacted to a minimum of 98 percent of its respective maximum dry density and to within ±2 percentage points of its optimum moisture content as determined by a Standard Proctor test (ASTM D698). We recommend density testing be performed in general accordance with ASTM D6938 at a minimum frequency of one test per lift. Fill placement should be observed and documented by the Project Geotechnical Engineer or their qualified representative, and density testing should be performed to verify the compactive effort.

Existing utilities to be abandoned below parking and driveway areas may remain in place. However, the pipes must be completely filled with flowable fill or Portland cement grout to prevent future collapse. Proof-roll above the abandoned utilities to verify that the previously placed backfill will support pavement loads.

7.3 Site Preparation and Excavation

Any unsuitable fill encountered within five feet or more beyond the proposed footprint of the scoreboard should be over excavated to natural soils and replaced with suitable backfill material meeting the fill material requirement in Section 7.5 of this report. All material is recommended to be inspected and approved by a Geotechnical Engineer or their designated representative prior to any fill placement. Uncontrolled FILL undercuts to depths of 4 to 6 feet bgs are anticipated.

7.4 Groundwater Considerations

Our subsurface exploration encountered groundwater within B-2 at a depth of 17 feet bgs. Groundwater is not anticipated to affect construction of the scoreboard. As noted in the previous section of this report, the groundwater conditions observed reflect the conditions at the time of our exploration only. Fluctuations of the groundwater table should be expected to occur both seasonally and annually due to variations in rainfall, evaporation, transpiration, construction activity, and other site-specific factors.

7.5 Fill Material

Fill material obtained on- or off-site should meet the requirements indicated in table below. When practical, requests to use soils that do not precisely meet requirements may be evaluated by the Geotechnical Engineer.

The maximum particle size of all fill material should be less than three inches in its largest dimension, except in the uppermost lift of fill, where the maximum particle size should be less than two inches in its largest dimension. Maximum sized particles should not be in excess of 20 percent of the volume of the fill material, and such particles shall be well distributed throughout the fill mass. Fill material shall not contain frozen masses of soil and shall not be placed on saturated, frozen, or frost-covered subgrade. Fill material should be placed in such a way as to provide positive drainage from the fill area. Fill materials should be free of organics and debris.

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Onsite existing fill after removal of oversized particles, deleterious materials, or organics may be acceptable for fill after moisture conditioning. The variability of existing fill between boring location may prevent all exiting fill material from being acceptable. If off-site fill is required, the contractor should identify borrow material and submit representative samples for engineering testing and review. Testing should consist of soils classification (ASTM D2487) and a standard Proctor density test (ASTM D698) for each type of borrow soil.

Dinwiddie Sports Complex Fill Material Recommendations		
Fill Material Use	**Recommended USCS Material Classifications**	**Index Property Limits**
Under Structures Foundations and Pavement Sections	GW, GP, GC, GM, SW, SP, SC, SM, CL, ML	<65% pass the No. 200 sieve with LL <50 & PI <20
General Site Grading	GW, GP, GC, GM, SW, SP, SC, SM, CL, ML, CH, & MH	None

Soil fill below structures should be placed in a maximum of an 8-inch-thick loose lift, compacted to a minimum of 95 percent of its respective maximum dry unit weight, and within ±2 percentage points of its optimum moisture content as determined by a Standard Proctor test (ASTM D698). We recommend density testing be performed in general accordance with ASTM D6938 at a minimum frequency of one test per lift. Fill placement should be observed and documented by the Project Geotechnical Engineer or their designated representative, and density testing should be performed to verify the compactive effort.

7.6 Field Observation

We recommend that the pavement and utility construction be observed by our Geotechnical Engineer or our qualified representative to observe that the required minimum soil testing and placement requirements are met. For greater continuity and proper implementation of the recommendations contained herein, we recommend KBJW be retained for construction observation services during this project.

8.0 LIMITATIONS

This report has been prepared for the exclusive use of Dinwiddie County. Our conclusions and recommendations have been rendered in a manner consistent with the level and skill ordinarily exercised by members of the geotechnical engineering profession in the Commonwealth of Virginia at the time of our study. We make no other warranty, expressed or implied.

Our conclusions and recommendations are based on design information furnished to us and our experience. They do not necessarily reflect variations in the subsurface conditions, which have potential to exist intermediate of our borings and in unexplored areas of the site due to inherent variability of the subsurface conditions in this geologic region, as well as past land use. Should such variations become apparent during construction, it will be necessary for

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us to re-evaluate our conclusions and recommendations based upon on-site observations of the conditions.

If changes are made in the location or nature of the structure, then the recommendations presented in this report must not be considered valid unless the changes are reviewed by KBJW, and our recommendations are modified or verified in writing. We request the opportunity to review the foundation plan, grading plan and applicable portions of the project specifications when the design is finalized. This review will allow us to check whether these documents are consistent with the intent of our recommendations. KBJW is not responsible for the conclusions, opinions or recommendations of others based on the data in this report.

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APPENDIX A

SITE LOCATION PLAN

SUBSURFACE EXPLORATION PLAN

LEGEND:

Project Limits

SITE LOCATION PLAN

Soccer Scoreboards - Dinwiddie Sports Complex
5850 R. B. Pamplin Drive
Sutherland, Virginia 23885

PROJECT NO.:	*SCALE:*	*DATE:*
23-27025-001	NTS	6/21/2023

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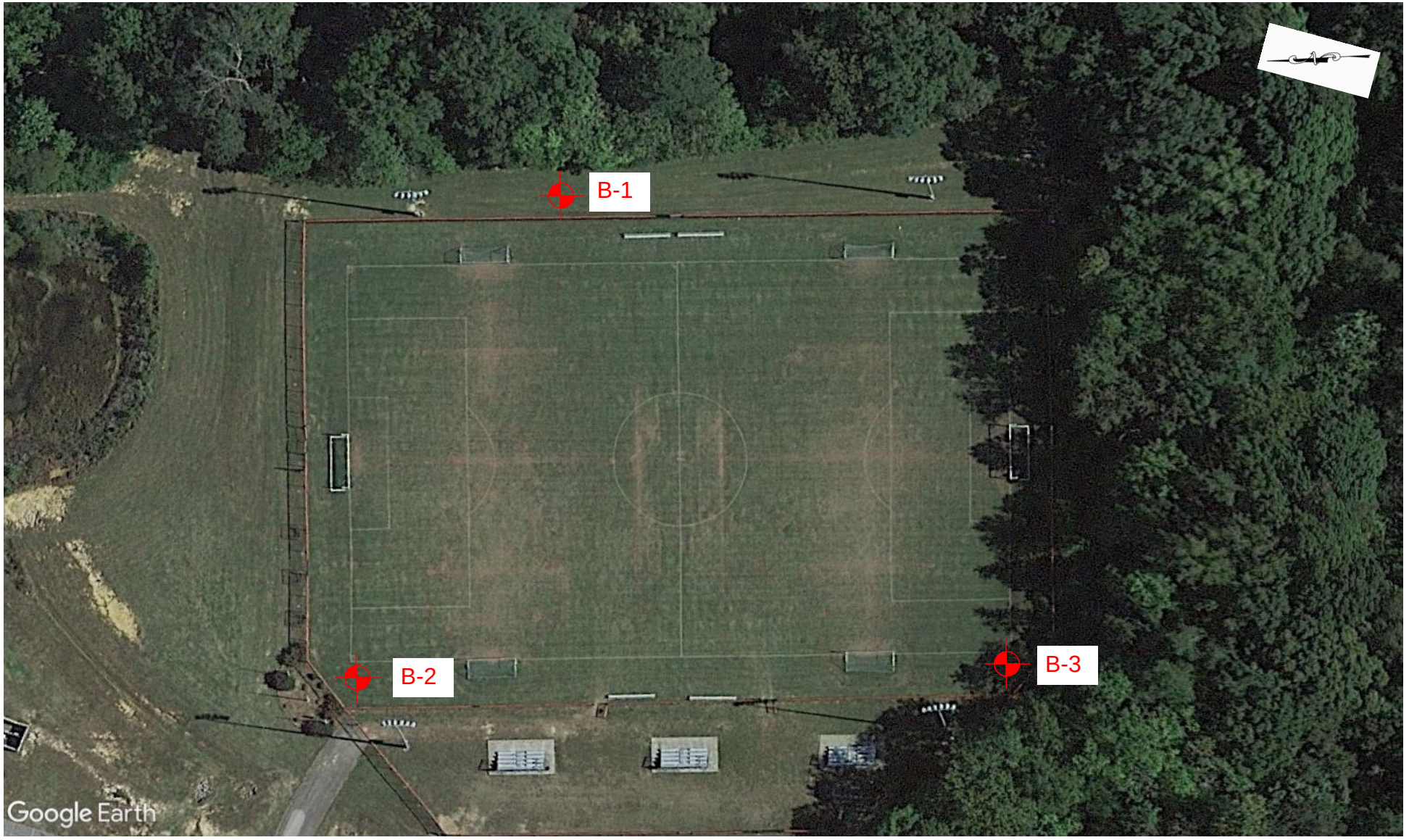

LEGEND:

Boring Locations

SUBSURFACE EXPLORATION PLAN

Soccer Scoreboards - Dinwiddie Sports Complex
5850 R.B. Pamplin Drive,
Sutherland, Virginia 23885

PROPOSAL NO.:	SCALE:	DATE:
23-27025-001	NTS	June 21, 2023

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APPENDIX B

BORING LOGS

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BORING LOG B-1

PROJECT: Dinwiddie Sports Complex - Scoreboards **PROJECT NO.:** 23-27025-001
CLIENT: Dinwiddie County
LOCATION: 5850 R.B. Pamplin Drive, Sutherland, VA
LAT.: 37 11' 23" N **LONG.:** 77 32' 21" W **ELEVATION:** 224' asl
DRILLER: Jetco Inc. **LOGGED BY:** Jeremy Butcher, P.G.
DRILLING METHOD: 2 1/4" HS Auger **DATE:** 6/5/2023
DEPTH TO - WATER> INITIAL: ▽ N/A **AFTER 24 HOURS:** ▼ N/A **CAVING>** ℄ 8'

Depth/ Elevation (feet)	Description	Graphic	Sample No.	Sample Type	Sample Rec. (%)	RQD (%)	Blow Counts	N Value	Water Content (%)	Liquid Limit	Plasticity Index	% < #200
0	Topsoil - 6 inches											
	.5		S-1	SS	75		7 3 3 3	6				
	Uncontrolled FILL - brown and gray brown, loose, organics, silty sand (sm)		S-2	SS	100		7 6 3 4	9				
5			S-3	SS	100		7 4 7 8	11				
	6		S-4	SS	100		6 10 8 9	18	24.5	52	27	63.5
	℄ Natural yellow brown, red and light gray, firm, Sandy FAT CLAY (CH)		S-5	SS	100		8 6 5 5	11				
10												
			S-6	SS	100		7 5 7 8	12				
15												
			S-7	SS	100		6 4 5 8	9				
20	Boring terminated @ 20.0 ft.											
25												
30												
35												

Notes:

This information pertains only to this boring and should not be interpreted as being indicative of the site.

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BORING LOG B-2

PROJECT: Dinwiddie Sports Complex - Scoreboards **PROJECT NO.:** 23-27025-001

CLIENT: Dinwiddie County

LOCATION: 5850 R.B. Pamplin Drive, Sutherland, VA

LAT.: 37 11' 24" N **LONG.:** 77 32' 24" W **ELEVATION:** 226' asl

DRILLER: Jetco Inc. **LOGGED BY:** Jeremy Butcher, P.G.

DRILLING METHOD: 2 1/4" HS Auger **DATE:** 6/5/2023

DEPTH TO - WATER> INITIAL: ▽ 17' **AFTER 24 HOURS:** ▽ N/A **CAVING>** ℄ 7'

Depth/ Elevation (feet)	Description	Graphic	Sample No.	Sample Type	Sample Rec. (%)	RQD (%)	Blow Counts	N Value	Water Content (%)	Liquid Limit	Plasticity Index	% < #200
0	Topsoil - 6 inches											
0.5	Uncontrolled FILL - yellow brown, yellow red and gray brown, loose, damp to moist, organics, sandy lean clay (cl)		S-1	SS	83		7 4 4 4	8				
			S-2	SS	100		2 1 1 1	2				
5			S-3	SS	83		1 1 1 1	2				
6			S-4	SS	100		1 2 2 2	4	23.8	29	NP	41.7
	Red and yellow brown, loose, micacoeus, damp to moist, Clayey SAND (SC)		S-5	SS	100		2 2 3 5	5				
10												
			S-6	SS	100		2 2 4 4	6				
15												
	Red and brown, wet, loose, Clayey SAND (SC)		S-7	SS	100		2 2 4 5	6				
20	Boring terminated @ 20.0 ft.											
25												
30												
35												

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Notes:

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BORING LOG B-3

PROJECT: Dinwiddie Sports Complex - Scoreboards **PROJECT NO.:** 23-27025-001
CLIENT: Dinwiddie County
LOCATION: 5850 R.B. Pamplin Drive, Sutherland, VA
LAT.: 37 11' 21" N **LONG.:** 77 32' 23" W **ELEVATION:** 225' asl
DRILLER: Jetco Inc. **LOGGED BY:** Jeremy Butcher, P.G.
DRILLING METHOD: 2 1/4" HS Auger **DATE:** 6/5/2023
DEPTH TO - WATER> INITIAL: ▽ N/A **AFTER 24 HOURS:** ▼ N/A **CAVING>** ℄ 10'

Depth/ Elevation (feet)	Description	Graphic	Sample No.	Sample Type	Sample Rec. (%)	RQD (%)	Blow Counts	N Value	Water Content (%)	Liquid Limit	Plasticity Index	% < #200
0	Topsoil - 6 inches											
0.5	Uncontrolled FILL - yellow brown, yellow red and gray brown, loose, organics, clayey sand (sc)		S-1	SS	83		5 4 4 5	8				
			S-2	SS	100		12 6 4 4	10				
4	Natural, yellow brown, red and light gray, firm, sandy lean clay (cl)		S-3	SS	92		2 2 3 4	5				
			S-4	SS	92		3 6 7 8	13				
8	Yellow brown, red and light gray, loose, micaceous, Clayey SAND (SC)		S-5	SS	100		3 2 3 3	5	21.4	26	NP	38.4
10												
			S-6	SS	100		3 2 4 5	6				
15												
	yellow brown, moist, loose, Clayey SAND (SC)		S-7	SS	100		2 2 3 3	5				
20	Boring terminated @ 20.0 ft.											
25												
30												
35												

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Notes:

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APPENDIX C

LABORATORY TEST RESULTS

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Table 1: Laboratory Test Results
Dinwiddie Sports Complex,
5850 R.B. Pamplin Drive, Sutherland, Virginia
KBJW Project No.: 23-27025-001

Boring No.	Sample Depth (ft.)		Percent Passing Sieve Number					Liquid Limit	Plasticity Index	USCS Classification	Moisture Content (%)	Max Dry Density (pcf)	Optimum Moisture Content (%)	CBR Value	Swell (%)
	From	To	10	40	60	100	200								
B-1	6	8	-	91.8	-	-	63.5	52	27	CH	24.5	-	-	-	-
B-2	6	8	-	76.9	-	-	41.7	29	NP	SC	23.8	-	-	-	-
B-3	8	10	-	74.1	-	-	38.4	26	NP	SC	21.4	-	-	-	-