GOVERNMENT OF THE DISTRICT OF COLUMBIA
DEPARTMENT OF GENERAL SERVICES

Addendum No. 4
To
CONSTRUCTION MANAGEMENT AT-RISK SERVICES
BENNING PARK COMMUNITY CENTER
Solicitation No: DCAM-19-CS-RFP-0007

Issued: October 30, 2019

This Addendum No. 4 is issued and hereby published on the DGS website on October 30, 2019. Except as modified hereby, the Request for Proposal ("RFP") remains unmodified.

Item #1 Attachments

The Subsurface Exploration and Geotechnical Engineering Letter Report is attached hereto as **Exhibit 1.**

Item #2 The Due Date for Proposals is hereby extended to November 15, 2019 at 2:00 pm.

By: Franklin Austin
Franklin Austin
Contracting Officer

Date: 10/30/2019

- End of Addendum No. 4 –

Exhibit 1

ECS Capitol Services, PLLC

Subsurface Exploration and Geotechnical Engineering Letter Report

Benning Park Community Center

5100 Southern Avenue, SE
Washington, DC

ECS Project Number 37:1691-A

October 18, 2019

October 18, 2019

Mr. Drew Deering, AIA, LEED AP
Senior Associate Architect
Moody Nolan
209 South Lasalle Street
Suite 820
Chicago, IL 60604

ECS Project No. 37:1691-A

Reference: Subsurface Exploration and Geotechnical Engineering Letter Report
Benning Park Community Center
5100 Southern Avenue, SE
Washington, DC

Dear Mr. Deering:

As requested, ECS Capitol Services, PLLC (ECS) has prepared the following Geotechnical Letter Report for the proposed elevator and rain garden at the Benning Park Community Center in Southeast, Washington, DC. In preparing this letter report, we have discussed the overall project with you and the civil engineer (AMT), and reviewed the available project documents provided by your office.

The information contained within this letter report is intended for use by your office during the design and construction stages of the project described herein. This report contains the results of our subsurface exploration, infiltration testing, laboratory testing, engineering analyses, and recommendations for the design and construction of the planned elevator and rain garden.

PROJECT DESCRIPTION

Existing Conditions

The project site is located at the physical address of 5100 Southern Avenue in Southeast, Washington, DC. The site is bound to the north by the Benning Park Apartment Complex, to the east and southeast by Southern Avenue SE, to the southwest by a large grass playing field, and to the west by a recreational playground. The site is currently occupied by the Benning Park Community Center, a two-story structure with one story above-grade and one story partially below-grade. Based on our review of the existing conditions plan within the Permit Set of Drawings dated 9/28/2018, we understand the site slopes from an approximate topographical high of EL. +195 feet in the northern portion of the site to an approximate topographical low of EL. +166 feet in the southwest portion. The lowest level finished floor elevation of the existing structure is EL. +171 feet. Please see the attached Site Location Diagram in Appendix A for further details (included below for reference).

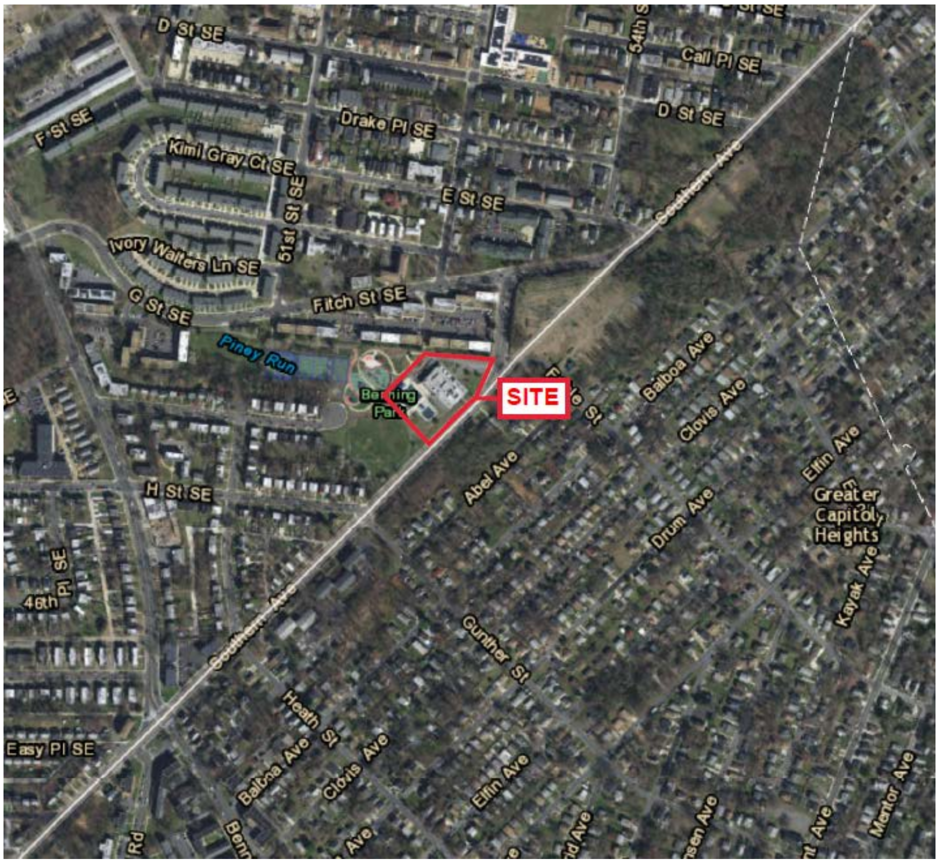

Figure 1. Site Location

<u>Proposed Construction</u>

Based on our discussions with your office and our review of the available project documents, we understand the project will include the construction of a new elevator within the existing building as part of the overall modernization and ADA accessibility upgrades. Per our review of the Permit Set of Drawings dated 9/28/2018, we understand the bottom of the elevator pit foundation will be approximately 5 feet below the finished floor elevation of the existing building (EL +166.0 feet) and has already been designed assuming a 2,000 psf bearing capacity. Please see the attached boring location diagram for an approximate location of the proposed elevator with regard to the existing structure.

Additionally, we understand the project will include the design and construction of two bioretention facilities along the north side of the site. Based on the Infiltration Testing Exhibit Drawing provided by your office on 5/8/2019 and our conversations with the project civil engineer, we understand the facilities bottom will have invert elevations of EL. +177 feet (±6 feet below existing site grades).

FIELD EXPLORATION

The purposes of this geotechnical exploration were to observe the subsurface conditions and provide engineering recommendations to guide the design and construction of the new elevator shallow foundations and infiltration facilities. We accomplished these purposes by performing the following services:

Soil Borings

The subsurface conditions were explored by drilling one (1) soil test boring near the footprint of the proposed new elevator (referenced as B-1) to approximately 25 feet below existing grades and two (2) infiltration soil test borings at the locations of the proposed stormwater management facilities (referenced as IT-1 and IT-2) to approximately 10 feet below existing grades. Please note, due to the existing structure, the soil boring was advanced outside the building and not at the location of the proposed elevator.

Boring locations were identified in the field by ECS personnel by referencing existing features prior to mobilization of our drilling equipment. The approximate as-drilled boring locations are shown in the Boring Location Diagram in Appendix A. Ground surface elevations noted on our boring logs were interpolated from the existing conditions drawing within the Permit Set of Drawings dated 9/28/2018.

Standard Penetration Tests (SPTs) were conducted in the borings at regular intervals in general accordance with ASTM D 1586. Small representative samples were obtained during these tests and were used to classify the soils encountered. The standard penetration resistances obtained provide a general indication of soil shear strength and compressibility.

Infiltration Testing

The infiltration test locations and depths were provided by your office and confirmed with the civil engineer prior to the exploration and testing. The infiltration tests were performed within an auger probe boring (no samples taken) advanced to depths of ±8 feet below existing site grades (a minimum of ±2 feet below proposed facility bottom elevations) at an offset location from the soil boring. ECS used the Johnson Permeameter™ to perform a constant head infiltration test, which is in general accordance with the publication entitled "DOEE (District Department of Energy and the Environment) Stormwater Guidebook, Appendix O."

Each hole is prepared in general accordance with the information contained in the Johnson Permeameter™ Instruction Manual revised February 2, 2019. A schematic of the equipment used is included in Appendix D of this report for reference. The test is then performed in general accordance with the same manual and the test results are recorded during testing of each location. The final design rate chosen is ultimately the discretion of the design engineer; however, it is typically the average of the last three to four readings taken during the test or the last reading, as appropriate, based on the test results. The results of the infiltration test are included in Appendix B of this letter report for reference.

Regional/Site Geology

The proposed site is located in the Coastal Plain Physiographic Province of Washington, DC. The near surface soils in the Washington, DC area typically consist of man-placed fill soils or natural soils which have been disturbed by previous construction.

Beneath these near surface fill or disturbed soils, Pliocene and Pleistocene river terrace deposits are generally encountered. These deposits vary in their percentages of sand, silt, clay and gravel, both laterally and vertically, and contain localized areas of organics. Beneath the Coastal river terrace deposits, the area is typically underlain by lower and upper Cretaceous, or Potomac Formation soils. Although not encountered during this exploration, the Potomac formation is often the bearing stratum for highly loaded deep foundations or higher capacity spread foundations in the project vicinity. These materials generally consist of over consolidated sand and clay materials, and appeared to be encountered beneath the softer river terrace deposits discussed above during the current subsurface exploration. An overview of the general site geology is illustrated in Figure 2 below.

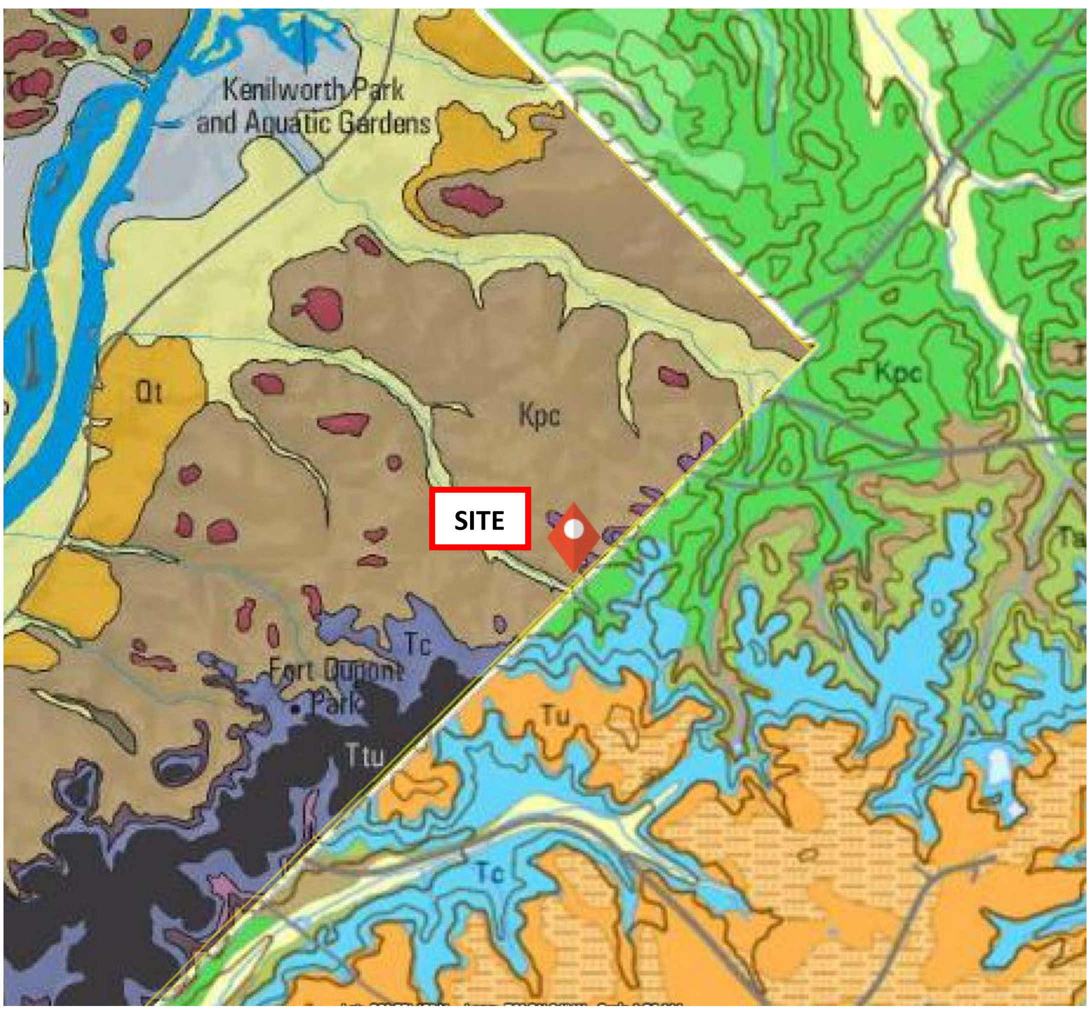

Figure 2. General Site Geology

Geologic map for Figure 2 obtained from the U.S. Geologic Service website, https://ngmdb.usgs.gov/maps/mapview/

Subsurface Conditions

The subsurface conditions encountered were generally consistent with published geological mapping. The following sections provide generalized characterizations of the soils encountered during our subsurface exploration. For subsurface information at a specific location, refer to the Boring Logs in Appendix B.

Table 2. Subsurface Stratigraphy

Approximate Depth Range (ft)	Elevation (ft)	Stratum	Material Description	Ranges of SPT$^{(1)}$ N-values (bpf)
0-0.67 ft (Surface cover)	EL. +183.0 to +170.7	n/a	**Surficial Materials** - Approximately 4 inches of asphalt (B-1) - Approximately 6 to 8 inches of topsoil (IT-1, IT-2)	N/A
0.3-11.75 ft	EL. +182.5 to +159.25	I	**Existing Fills** - Generally CLAYEY SANDS (SC), SILTY SANDS (SM), and LEAN CLAYS (CL) - Varying amounts of sand, gravel and organics - Soft cohesive materials and loose to medium dense granular materials	3 to 25
4.5-25 ft	EL. +178.5 to +146.0	II	**Alluvial Soils** - Generally LEAN CLAYS (CL), CLAYEY SANDS (SC), FAT CLAY (CH), and SANDY SILTS (ML) - Varying amounts of sand - Firm to very stiff cohesive materials and medium dense granular materials	8 to 28

Notes: (1) Standard Penetration Test, blows per foot (bpf)

Groundwater Observations

Water levels were measured in the boring during drilling and also prior to grouting. Groundwater was encountered during drilling within boring B-1 at approximately 9.0 feet below ground surface (EL. +162.0 feet), and prior to grouting the water level was observed to be 12.0 feet below the ground surface (EL +159.0 feet). Water was not encountered in either of the infiltration test borings (IT-1 and IT-2). Variations in the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, construction activities, and other factors.

DESIGN RECOMMENDATIONS

Based on our review of the subsurface conditions encountered during our geotechnical exploration and our experience in the project area, the site appears suitable for the proposed development. The recommendations presented in this report should be incorporated in the design and construction of the project to reduce possible soil and/or foundation related problems during construction.

Please note, the soil boring for the elevator (boring B-1) was advanced at a location offset from the proposed elevator due to an inability to access the interior of the building. Although we have recommended shallow foundations which we anticipate will require undercutting of existing fill encountered and replacement with lean concrete, other foundation alternatives are feasible. Intermediate foundation systems (such as helical piles and/or micropiles) may be feasible and ECS can provide additional recommendations upon your request. Please reference the attached boring location diagram for the location of the proposed elevator versus the location of our geotechnical soil boring.

Shallow Foundations

Based on our understanding of the proposed development and the results of our subsurface exploration, we recommend the proposed elevator be supported by conventional shallow foundations. In general, the shallow foundation system can be designed assuming Stratum II – Alluvial Soil materials will be encountered at the bottom of the elevator pit and the design parameters summarized in Table 3 below should be utilized.

Based on review of the provided drawings, the bottom of elevator pit foundation is approximately EL +166.0 feet (5 feet below existing grades). Based on the soil boring performed at an offset location from the proposed elevator, the subgrade soils at the bottom of the planned foundations may be Stratum I – Existing Fills. These existing fills were encountered to approximately EL +159.25 feet (11.75 feet below existing grades). The Stratum I soils **are not suitable** for foundation construction. If existing fills are encountered at/below the bottom of footings, those materials will need to be removed in their entirety under the foundation elements and replaced with lean concrete. Based on the soil conditions encountered in boring B-1, approximately $\pm$7.0 feet of existing fill will need to be removed and replaced in order to reach the natural Stratum II – Alluvial Soils for acceptable bearing materials.

Table 3. Shallow Foundation Design

Design Parameter	Design Value
Net Allowable Bearing Pressure	2,000 psf*
Acceptable Bearing Soil Material	Stratum II with an N-Value of at least 5 bpf
Minimum Width	24 inches
Minimum Footing Embedment Depth (below bottom of pit)	24 inches
Estimated Total Settlement	Less than 0.5 inches

*On natural soils or lean concrete bearing on natural soils

Please note, the existing fills were encountered within B-1 at an approximate offset of 35 feet from the proposed elevator location outside the footprint of the existing structure. It is possible the existing building and slab may be founded on natural materials, but this will need to be confirmed by a geotechnical engineer during construction and excavation to the subgrade elevations.

Footing Subgrade Observations: It will be important to have the geotechnical engineer of record observe the foundation subgrade prior to placing foundation concrete, to confirm the bearing soils are what was anticipated. If existing fill or unsuitable soils are observed at the footing bearing elevations, the unsuitable soils should be undercut and removed. Any undercut should be backfilled with lean concrete ($f'_c \geq 1{,}000$ psi at 28 days) up to the original design bottom of footing elevation; the original footing shall be constructed on top of the hardened lean concrete.

Site Dewatering: Groundwater encountered at the site will likely be at or near the bottom of the elevator pit (approximately 9-12 feet below existing grades); however, pockets of perched water may be encountered at shallower depths (perched on top of less permeable soil layers). Dewatering activities will need to be performed onsite to maintain groundwater levels at least 3 feet below the foundation subgrade elevations.

Based upon our subsurface exploration at this site, and the proposed elevator pit foundation of approximately EL +166.0 feet, we believe construction dewatering at this site may be able to be managed by the use of conventional submersible pumps directly in the excavation; however, the our past experience indicates that the underlying alluvial sands (SM/SC) can transmit high volumes of groundwater into below-grade excavations. A deep sump pit system may be needed and the contractor should be prepared to establish sump pits and pumping operation with special emphasis around the perimeter of the excavation, and especially where a granular material is encountered. If temporary sump pits are used, we recommend they be established at an elevation 3 to 5 feet below the bottom of the excavation subgrade or bottom of footing. A perforated 55 gallon drum or other temporary structure could be used to house the pump. We recommend continuous dewatering of the excavations using electric pumps be used during construction.

Elevator Pit Walls: We have assumed the elevator pit walls will be designed for a "drained" basement condition and should be designed to withstand lateral earth pressures and surcharge loads from the soil, adjacent building foundations, or streets. To accomplish a drained condition, the walls will need to incorporate appropriate drainage materials (often a geo-composite drainage panel), horizontal foundation drains, and/or weep holes and be connected to the existing foundation drain, a sump pit, or incorporated into the existing buildings underslab drainage system. We recommend walls that are restrained from movement at the top be designed for a linearly increasing lateral earth pressure of 60 pounds per square foot (psf) per vertical foot of wall. The figure below depicts the suggested lateral earth pressure condition for a "drained basement" with restrained wall tops.

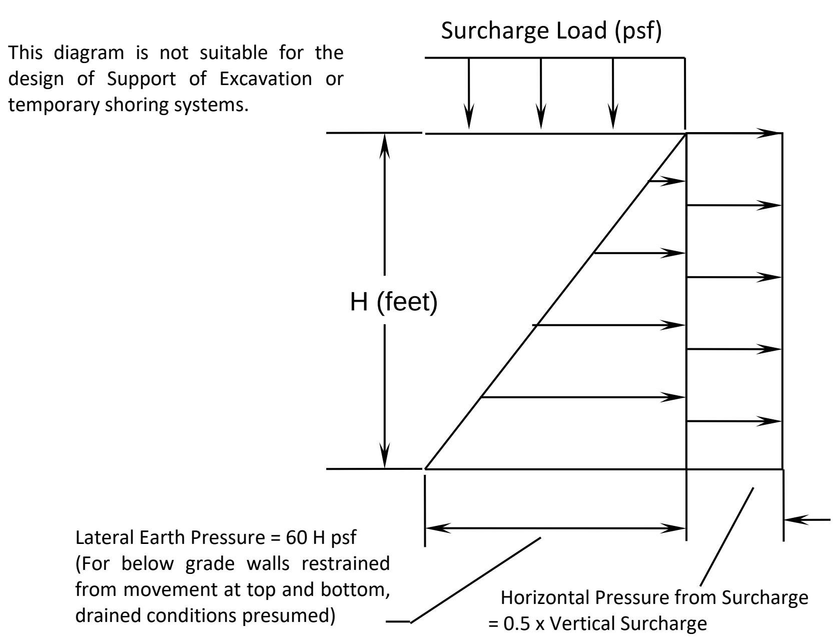

Figure 3. Lateral Earth Pressures Diagram – Drained Elevator Pit Wall

Any surcharge loads imposed within a 45 degree slope of the base of the wall should be considered in the below grade wall design. The influence of these surcharge loads on the below grade walls should be based on an at-rest pressure coefficient, k_0, of 0.5 in the case of restrained walls.

All below-grade walls and the elevator slab should be drained so that hydrostatic pressures do not build up behind the walls or slab. Wall drains can consist of a 12-inch wide zone of free draining gravel, such as AASHTO No. 57 Stone, employed directly behind the wall and separated from the soils beyond with a non-woven filter fabric. Alternatively, the wall drain can consist of a suitable geocomposite drainage board material. The wall drain and gravel layer below the slab should be hydraulically connected to the foundation drain, a sump pit, or incorporated into the existing buildings underslab drainage system.

Alternatively, the elevator pit walls could be designed as fully waterproofed to withstand hydrostatic pressures. Should this alternative be considered, ECS can provide additional recommendations upon your request. This would eliminate the need for drainage and the associated sump pits/pumps.

Underpinning: The proposed elevator foundations may be within a 1H:1V zone of influence of existing buildings footings. Therefore, depending on the site specific constraints of the project, including the amount of undercut required to reach natural soil during foundation excavation, traditional underpinning methods such as pits, support walls, or micropiles may be necessary. In general, footings of any existing adjacent structures (within a 1H:1V zone) may need to be protected against undermining during excavation of this site, depending on the existing building's foundation type and lowest building level; however, this should be studied by the project structural engineer. Special protection is generally not required if the footings of the existing buildings are outside a 3H:1V slope up from the bottom of the new footings

<u>Stormwater Management Facilities</u>

Per our correspondence with you and the project civil engineer (AMT), we understand two stormwater management (SWM) facilities are proposed to be installed. At this time, limited information and details regarding the proposed rain garden have been provided; however, we anticipate the soil conditions will generally be suitable for the SWM facilities. This suitability should be further analyzed by the project civil engineer.

We recommend initial subgrade preparation over proposed SWM facility locations is performed in a way so that these areas are isolated from construction traffic and stock piling in order to maintain the natural condition of the subgrade soils. We recommend isolating these areas by setting up a barrier around the facility footprint using flagging/tape, orange fence, or silt fence. During facility construction, subgrade preparation for all SWM facilities should consist of stripping all vegetation, rootmat, topsoil, and any other soft or unsuitable material from the facility footprint. Further, should infiltration be necessary, as the facility excavation proceeds, care must be employed to assure that the facility soil subgrade are not densifies or smeared during final excavation. As final subgrade elevations are reached, we recommend the subgrade be roughed open with a multiple-toothed bucket, and a layer of medium to coarse grained, open graded sand should be worked into/sprinkled into the roughed-up subgrade so as to promote infiltration (should it be necessary, rather than impede it by smearing a skin across the subgrade interface). We also recommend a minimum 6-inch layer of open graded clean wash stone be placed across the entire facility footprint to help establish working subgrades and to reduce the loading impact on the subgrade soils. The individual infiltration tests are included in Appendix B and the results are summarized on the following page. Refer to Appendix C for detailed soils laboratory data.

Table 4. Field Infiltration Rates

Infiltration Test Location	Depth of Infiltration Test (ft)	Elevation of Infiltration Test (ft)	Soil Classification (USGS)	Measured Field K_{sat} (in/hr)[(1)]
IT-1	8.0	+175.0	CH	0.22
IT-2	8.0	+175.0	CH	0.13

Notes: (1) The project civil engineer should review the enclosed data to determine an appropriate factor of safety to apply to the measured infiltration rates.

Approximate test elevations are based on the existing conditions plan within the Permit Set of Drawings dated 9/28/2018 provided to us by your office. The infiltration tests were performed at the depths and locations provided to us by AMT in the Infiltration Testing Exhibit document and our conversation with the civil engineer on 9/18/2019. The data collected during the performance of this subsurface exploration and infiltration testing program should be reviewed by AMT for incorporation into the design of the proposed rain garden stormwater management facilities.

It is important to note that the saturated hydraulic conductivity (K_{sat}) rate (traditionally presented in units of inches/hour for SWM applications) is different than the traditional standpipe test infiltration rate (also presented in units of inches/hour for SWM applications). The standpipe test measures soil conductivity with a falling head in which the height of a column of water in the test hole drops during the testing period. The referenced Johnson Permeameter™ measures the saturated hydraulic conductivity (K_{sat}) property of the soil in which the height of a column of water in the test hole is maintained at the same level throughout the testing period. While both test methods present infiltration values in units of inches/hour, the constant head K_{sat} values can be an order of magnitude slower than the falling head standpipe values which have traditionally been utilized for SWM design practice in the project vicinity. The civil engineer should take this into account when using the values included herein and apply a conversion factor should it be necessary.

CLOSING

This report has been prepared in order to aid in the evaluation of this project. The scope is limited to the specific project and location described herein, and the project description represents our understanding of the significant aspects relevant to soil and foundation characteristics. In the event that changes in the design or location of the buildings are planned, we should be informed so the changes can be reviewed and the conclusions of this report modified or approved in writing by the soil and foundation engineer. At a minimum, we recommend we be authorized to review the project plans and specifications to confirm that our report recommendations have been interpreted in accordance with our intent. Without this review, we will not be responsible for misinterpretation of our data, our analysis, and/or our recommendations, nor how these are incorporated into this final design.

It is recommended all construction operations dealing with earthwork and foundations be observed by ECS to provide information on which to base a decision as to whether the design requirements are fulfilled during construction.

Should you have any questions with respect to the information contained in this report, or if we can be of further service, please do not hesitate to contact any of the undersigned.

Respectfully,

ECS CAPITOL SERVICES, PLLC

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Enclosures: Appendix A – Drawings and Reports
Appendix B – Field Operations
Appendix C – Laboratory Testing
Appendix D – Supplemental Report Documents

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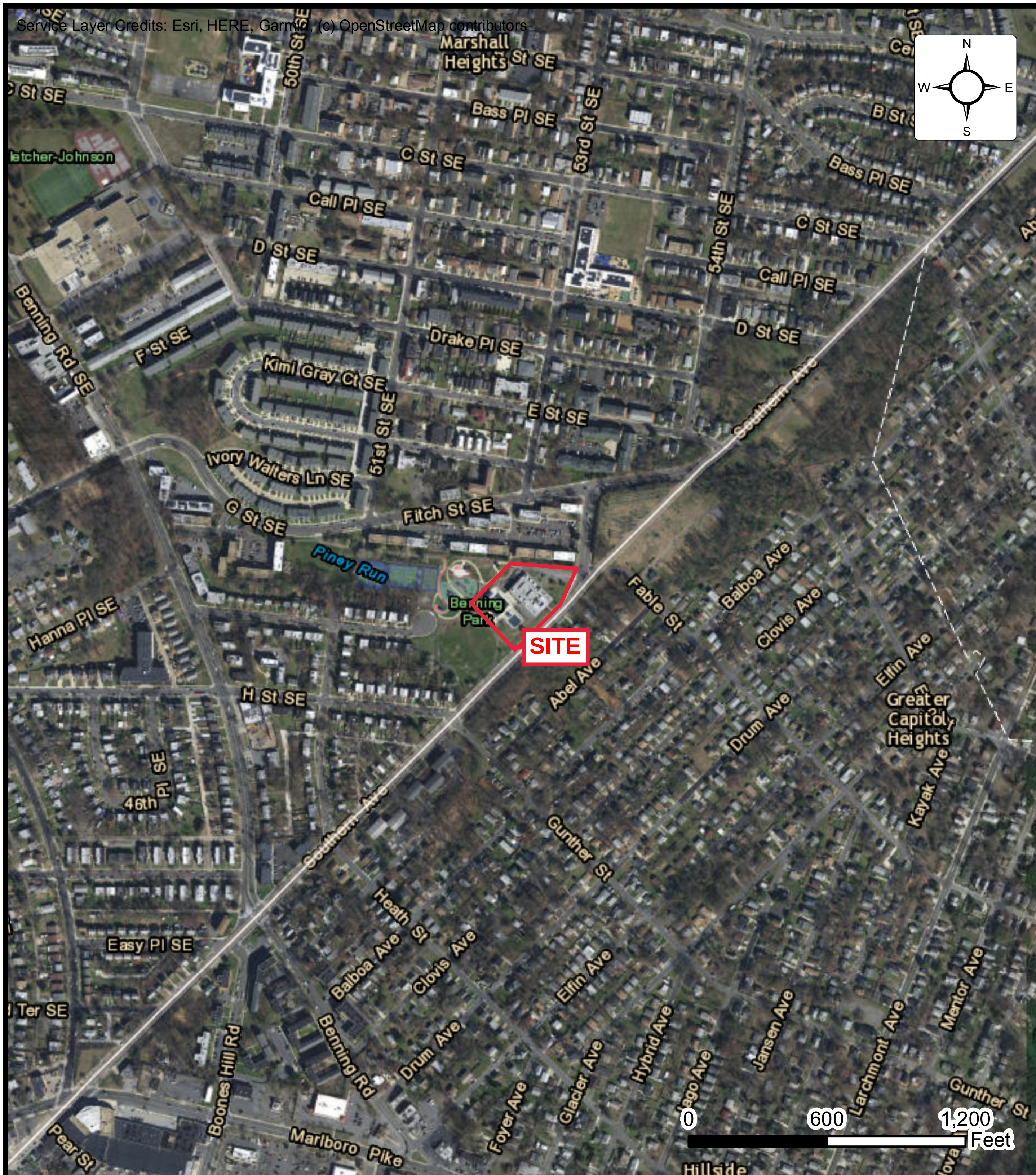
APPENDIX A – Drawings & Reports

Site Location Diagram
Boring Location Diagram



Site Location Diagram
BENNING PARK COMMUNITY CENTER

5100 SOUTHERN AVE SE, WASHINGTON, DC

MOODY NOLAN

ENGINEER	ROD
SCALE	1 " = 600 '
PROJECT NO.	37:1691-A
SHEET	1 OF 2
DATE	9/30/2019

Boring Location Diagram

MOODY NOLAN

BENNING PARK COMMUNITY CENTER

5100 SOUTHERN AVE SE, WASHINGTON, DC

ENGINEER	ROD
SCALE	1 " = 30 '
PROJECT NO.	37:1691-A
SHEET	2 OF 2
DATE	10/10/2019

APPENDIX B – Field Operations

Reference Notes for Boring Logs
Boring Logs B-1, IT-1, and IT-2
Infiltration Test Results IT-1 and IT-2

REFERENCE NOTES FOR BORING LOGS

MATERIAL [1,2]

	ASPHALT
	CONCRETE
	GRAVEL
	TOPSOIL
	VOID
	BRICK
	AGGREGATE BASE COURSE
FILL [3]	**MAN-PLACED SOILS**
GW	**WELL-GRADED GRAVEL** gravel-sand mixtures, little or no fines
GP	**POORLY-GRADED GRAVEL** gravel-sand mixtures, little or no fines
GM	**SILTY GRAVEL** gravel-sand-silt mixtures
GC	**CLAYEY GRAVEL** gravel-sand-clay mixtures
SW	**WELL-GRADED SAND** gravelly sand, little or no fines
SP	**POORLY-GRADED SAND** gravelly sand, little or no fines
SM	**SILTY SAND** sand-silt mixtures
SC	**CLAYEY SAND** sand-clay mixtures
ML	**SILT** non-plastic to medium plasticity
MH	**ELASTIC SILT** high plasticity
CL	**LEAN CLAY** low to medium plasticity
CH	**FAT CLAY** high plasticity
OL	**ORGANIC SILT or CLAY** non-plastic to low plasticity
OH	**ORGANIC SILT or CLAY** high plasticity
PT	**PEAT** highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS

SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION

DESIGNATION		PARTICLE SIZES
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay (“Fines”)		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS

UNCONFINED COMPRESSIVE STRENGTH, Q_P [4]	SPT [5] (BPF)	CONSISTENCY [7] (COHESIVE)
<0.25	<3	Very Soft
0.25 - <0.50	3 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

RELATIVE AMOUNT [7]	COARSE GRAINED (%) [8]	FINE GRAINED (%) [8]
Trace	≤5	≤5
Dual Symbol (ex: SW-SM)	10	10
With	15 - 20	15 - 25
Adjective (ex: “Silty”)	≥25	≥30

GRAVELS, SANDS & NON-COHESIVE SILTS

SPT [5]	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

WATER LEVELS [6]

WL	Water Level (WS)(WD) (WS) While Sampling (WD) While Drilling
SHW	Seasonal High WT
ACR	After Casing Removal
SWT	Stabilized Water Table
DCI	Dry Cave-In
WCI	Wet Cave-In

[1] *Classifications and symbols per ASTM D 2488-09 (Visual-Manual Procedure) unless noted otherwise.*

[2] *To be consistent with general practice, “POORLY GRADED” has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.*

[3] *Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-**FILL**)].*

[4] *Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).*

[5] *Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). “N-value” is another term for “blow count” and is expressed in blows per foot (bpf).*

[6] *The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.*

[7] *Minor deviation from ASTM D 2488-09 Note 16.*

[8] *Percentages are estimated to the nearest 5% per ASTM D 2488-09.*

CLIENT	Job #:	BORING #	SHEET
Moody Nolan	37:1691-A	B-1	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Benning Park Community Center	Moody Nolan - SK&A

SITE LOCATION: 5100 Southern Ave SE, Washington, DC

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT²

ROCK QUALITY DESIGNATION & RECOVERY: RQD% – – –   REC% ———

PLASTIC LIMIT% ✕ — WATER CONTENT% ● — LIQUID LIMIT% △

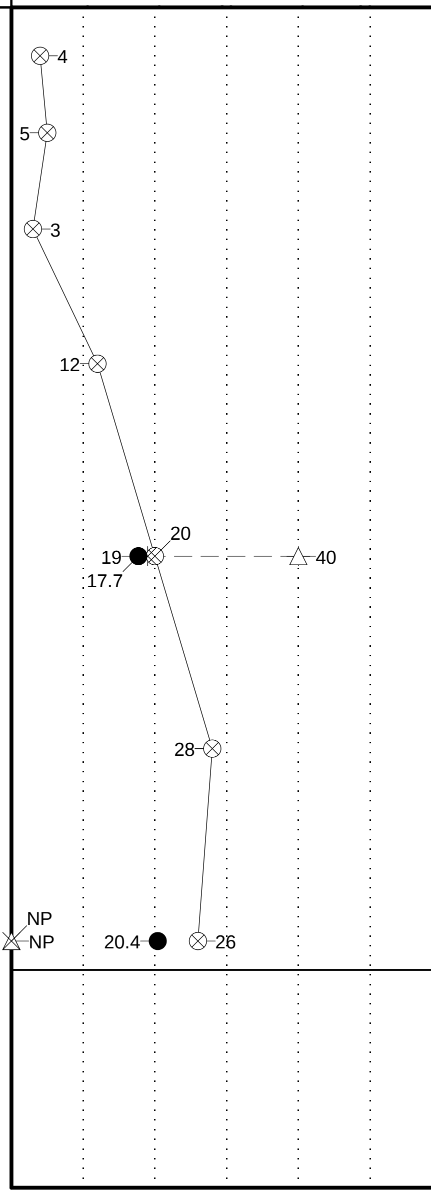
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION (100%)

SURFACE ELEVATION 171

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)	BLOWS/6"
0					Asphalt Thickness [4.00"]		
	S-1	SS	18	12	(CL FILL) SANDY LEAN CLAY, brown, moist, soft	170	2 2 2
	S-2	SS	18	12	(SM FILL) SILTY SAND WITH GRAVEL, brown, moist, loose		2 2 3
5	S-3	SS	18	12	(CL FILL) SANDY LEAN CLAY, brown, moist, soft	165	4 1 2
	S-4	SS	18	1	(SC FILL) CLAYEY SAND, black, wet, medium dense		8 7 5
10						160	
	S-5	SS	18	16	(CL) SANDY LEAN CLAY, tan and brownish gray, moist, very stiff		10 10 10
15						155	
	S-6	SS	18	18	(SC) CLAYEY SAND, tan, moist, medium dense		22 15 13
20						150	
	S-7	SS	18	18	(ML) SANDY SILT, purplish gray, moist, very stiff		9 13 13
25					END OF BORING @ 25'	145	
30							



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 9 WS ☐ WD ☒	BORING STARTED 09/20/19	CAVE IN DEPTH N/A
WL(SHW) WL(ACR) 12	BORING COMPLETED 09/20/19	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Brandon	DRILLING METHOD 3.25 HSA

CLIENT	Job #:	BORING #	SHEET
Moody Nolan	37:1691-A	IT-1	1 OF 1

ECS

PROJECT NAME	ARCHITECT-ENGINEER
Benning Park Community Center	Moody Nolan - SK&A

SITE LOCATION

5100 Southern Ave SE, Washington, DC

NORTHING	EASTING	STATION

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION (100%)

SURFACE ELEVATION 183

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	18	18	Topsoil Thickness [6.00"] (SC FILL) CLAYEY SAND, trace organics, brown, moist, medium dense			6 8 11
	S-2	SS	18	18			180	5 6 6
5	S-3	SS	18	18	(CH) SANDY FAT CLAY, mottled gray and red, moist, stiff to very stiff			6 7 9
							175	
	S-4	SS	18	18				5 5 7
10					END OF BORING @ 10'		170	
15							165	
20							160	
25							155	
30								

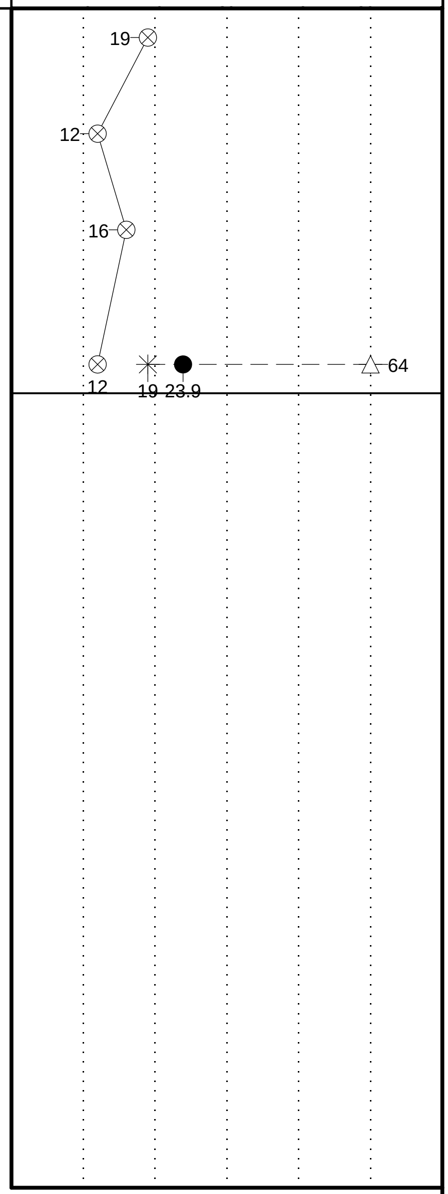
CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY

RQD% — — — REC% ———

PLASTIC LIMIT% — WATER CONTENT% — LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS ☐ WD ☒	BORING STARTED 09/19/19	CAVE IN DEPTH N/A
WL(SHW) WL(ACR)	BORING COMPLETED 09/19/19	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Brandon	DRILLING METHOD 3.25 HSA

CLIENT	Job #:	BORING #	SHEET
Moody Nolan	37:1691-A	IT-2	1 OF 1

PROJECT NAME: Benning Park Community Center

ARCHITECT-ENGINEER: Moody Nolan - SK&A

SITE LOCATION: 5100 Southern Ave SE, Washington, DC

NORTHING: | EASTING: | STATION:

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% — WATER CONTENT% — LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 183

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	SPT N (BLOWS/FT)
0	S-1	SS	18	18	Topsoil Thickness [8.00"] (SC FILL) CLAYEY SAND, trace gravel, trace organics, brown, moist, loose to medium dense			3 4 5	9
	S-2	SS	18	0			180	8 10 15	25
5	S-3	SS	18	13	(CL) SANDY LEAN CLAY, tan, moist, firm			5 4 4	8
	S-4	SS	18	18	(CH) FAT CLAY, orangish brown, moist, stiff		175	4 6 8	14 (Water content 26.3; PL 27; LL 69)
10					END OF BORING @ 10'				
15							170		
20							165		
25							160		
30							155		

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS ☐ WD ☒	BORING STARTED 09/19/19	CAVE IN DEPTH N/A
WL(SHW) WL(ACR)	BORING COMPLETED 09/19/19	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Brandon	DRILLING METHOD 3.25 HSA

Constant-Head Borehole Permeameter Test

Solution: R. E. Glover (Deep WT or Impermeable Layer)

File Name.....:

Project Name.............:	Benning Park Community Center	**Boring No...........:**	IT-1
Project No..................:	37:1691-A	**Investigators......:**	ROD
Project Location.........:	5100 Southern Ave SE, Washington, DC	**Date...................:**	9/19/2019
Boring Depth.............:	8 ft **(Specify units)**	**WCU Base Ht. h:**	40.6 **cm*****
Boring Diameter.......:	15.20 **cm**	**WCU Susp. Ht. S:**	10.0 **cm**
Boring Radius r.........:	7.60 **cm**	**Const. Wtr. Ht. H:**	50.6 **cm**
Soil Temperature T...:	20 **°C**	**H/r**..................:**	6.7
Dyn. Visc. @ T..........:	0.001003 **kg/m·s**	**Dyn. Visc. @ T_B.:**	0.001003 **kg/m·s**

Solution and Terminology (R. E. Glover solution)*

$K_{sat} = Q[\sinh^{-1}(H/r) - (r^2/H^2+1)^{.5} + r/H]/(2\pi H^2)$ [Basic Glover solution]

$K_{satB} = QV[\sinh^{-1}(H/r) - (r^2/H^2+1)^{.5} + r/H]/(2\pi H^2)$ [Temp.-corrected]

K_{satB}: Saturated Hydraulic Conduct. @ base Tmp. T_B °C: 20

Q: Rate of flow of water from the borehole

H: Constant height of water in the borehole

r: Radius of the cylindrical borehole

V: Dynamic viscosity of water @ T °C/Dyn. Visc. of water @ T_B °C

Reservoir Volume (ml)	Time (12 hr) (h:mm:ss A/P)	Volume Out (ml)	Elapsed Time Total (min)	Elapsed Time Interval (min)	Flow Rate (ml/min)	K_{satB} Equivalent Values (µm/sec)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
1,000	1:14:00 PM									
630	1:16:00 PM	370	2.00	2.00	185.0	3.3	3.32E-04	28.7	0.47	0.94
3,100	1:17:00 PM									
2,490	1:22:00 PM	610	7.00	5.00	122.0	2.2	2.19E-04	18.9	0.31	0.62
2,050	1:27:00 PM									
1,560	1:32:00 PM	490	12.00	5.00	98.0	1.8	1.76E-04	15.2	0.25	0.50
1,020	1:37:00 PM									
580	1:42:00 PM	440	17.00	5.00	88.0	1.6	1.58E-04	13.7	0.22	0.45
3,100	1:43:00 PM									
2,670	1:48:00 PM	430	22.00	5.00	86.0	1.5	1.54E-04	13.3	0.22	0.44
2,290	1:54:00 PM									
1,880	1:59:00 PM	410	27.00	5.00	82.0	1.5	1.47E-04	12.7	0.21	0.42
1,560	2:11:00 PM									
1,150	2:16:00 PM	410	32.00	5.00	82.0	1.5	1.47E-04	12.7	0.21	0.42

Natural Moisture........:	23.9 %	**Consistence......:**	Stiff	**Enter K_{satB} Value........................:**	1.5 / 1.53E-04 / 13.2 / 0.22 / 0.43
USDA Txt./USCS Class:	CH	**WT Depth..........:**	Not Encountered	**Data Logger No....:**	
Struct./% Pass. #200..:	67.0 %	**Init. Sat. Time...:**	N/A		

Note: K_B is determined by visually analyzing the Flow Rate vs Elapsed Time Graph and averaging the the results for the final three to five stabilized values.

*Glover, R. E. l953. Flow from a test-hole located above groundwater level. pp. 69-71. in: Theory and Problems of Water Percolation. (C. N. Zanger. ed.). USBR. The Cond. for this solution exists when the Dist. from the bottom of the BH to the WT or an imperm. layer is ≥2X the depth of the water in the BH. **H/r ≥5 to ≤10. ***JP-M1: h = 15cm, WCU-3 (3" Dia.): h = 10cm, WCU-2 (2" Dia.) h = 17cm.

Constant-Head Borehole Permeameter Test	Solution: R. E. Glover (Deep WT or Impermeable Layer)	File Name.....:

Project Name............:	Benning Park Community Center	**Boring No...........:**	IT-2
Project No.................:	37:1691-A	**Investigators......:**	ROD
Project Location.........:	5100 Southern Ave SE, Washington, DC	**Date...................:**	9/20/2019
Boring Depth............:	8 ft **(Specify units)**	**WCU Base Ht. h:**	40.6 **cm*****
Boring Diameter.......:	15.20 **cm**	**WCU Susp. Ht. S:**	10.0 **cm**
Boring Radius r.........:	7.60 **cm**	**Const. Wtr. Ht. H:**	50.6 **cm**
Soil Temperature T...:	20 **°C**	**H/r**.................:**	6.7
Dyn. Visc. @ T..........:	0.001003 **kg/m·s**	**Dyn. Visc. @ T_B.:**	0.001003 **kg/m·s**

Solution and Terminology (R. E. Glover solution)*

$K_{sat} = Q[\sinh^{-1}(H/r) - (r^2/H^2+1)^{.5} + r/H]/(2\pi H^2)$ [Basic Glover solution]

$K_{satB} = QV[\sinh^{-1}(H/r) - (r^2/H^2+1)^{.5} + r/H]/(2\pi H^2)$ [Temp.-corrected]

K_{satB}: Saturated Hydraulic Conduct. @ base Tmp. T_B °C: 20

Q: Rate of flow of water from the borehole

H: Constant height of water in the borehole

r: Radius of the cylindrical borehole

V: Dynamic viscosity of water @ T °C/Dyn. Visc. of water @ T_B °C

Reservoir Volume (ml)	Time (12 hr) (h:mm:ss A/P)	Volume Out (ml)	Elapsed Time		Flow Rate (ml/min)	K_{satB} Equivalent Values				
			Total (min)	Interval (min)		(µm/sec)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
3,000	9:46:00 AM									
2,180	9:51:00 AM	820	5.00	5.00	164.0	2.9	2.95E-04	25.4	0.42	0.83
1,870	9:56:00 AM									
1,480	10:01:00 AM	390	10.00	5.00	78.0	1.4	1.40E-04	12.1	0.20	0.40
1,200	10:06:00 AM									
930	10:11:00 AM	270	15.00	5.00	54.0	1.0	9.70E-05	8.4	0.14	0.27
670	10:16:00 AM									
410	10:21:00 AM	260	20.00	5.00	52.0	0.9	9.34E-05	8.1	0.13	0.26
2,910	10:22:00 AM									
2,660	10:27:00 AM	250	25.00	5.00	50.0	0.9	8.98E-05	7.8	0.13	0.25
2,420	10:32:00 AM									
2,180	10:37:00 AM	240	30.00	5.00	48.0	0.9	8.62E-05	7.4	0.12	0.24

Natural Moisture........:	26.3 %	**Consistence......:**	Stiff	**Enter K_{satB} Value.........................:**	**0.9**	**8.98E-05**	**7.8**	**0.13**	**0.25**
USDA Txt./USCS Class:	CH	**WT Depth..........:**	Not Encountered	**Data Logger No....:**					
Struct./% Pass. #200..:	97.8	**Init. Sat. Time...:**	N/A						

Note: K_B is determined by visually analyzing the Flow Rate vs Elapsed Time Graph and averaging the the results for the final three to five stabilized values.

*Glover, R. E. l953. Flow from a test-hole located above groundwater level. pp. 69-71. in: Theory and Problems of Water Percolation. (C. N. Zanger. ed.). USBR. The Cond. for this solution exists when the Dist. from the bottom of the BH to the WT or an imperm. layer is ≥2X the depth of the water in the BH. **H/r ≥5 to ≤10. ***JP-M1: h = 15cm, WCU-3 (3" Dia.): h = 10cm, WCU-2 (2" Dia.) h = 17cm.

APPENDIX C – Laboratory Testing

Laboratory Test Results Summary
Plasticity Chart
Grain Size Analysis

Laboratory Testing Summary

Sample Source	Sample Number	Start Depth (feet)	End Depth (feet)	Sample Distance (feet)	MC[1] (%)	Soil Type[2]	Atterberg Limits[3] LL	PL	PI	Percent Passing No. 200 Sieve[4]	Moisture - Density (Corr.)[5] Maximum Density (pcf)	Optimum Moisture (%)	CBR Value[6]	Other
B-1														
	S-5	13.5	15.0	1.5	17.7	CL	40	19	21	84.3				
	S-7	23.5	25.0	1.5	20.4	ML	NP	NP	NP	61.1				
IT-1														
	S-4	8.5	10.0	1.5	23.9	CH	64	19	45	67.0				
IT-2														
	S-4	8.5	10.0	1.5	26.3	CH	69	27	42	97.8				

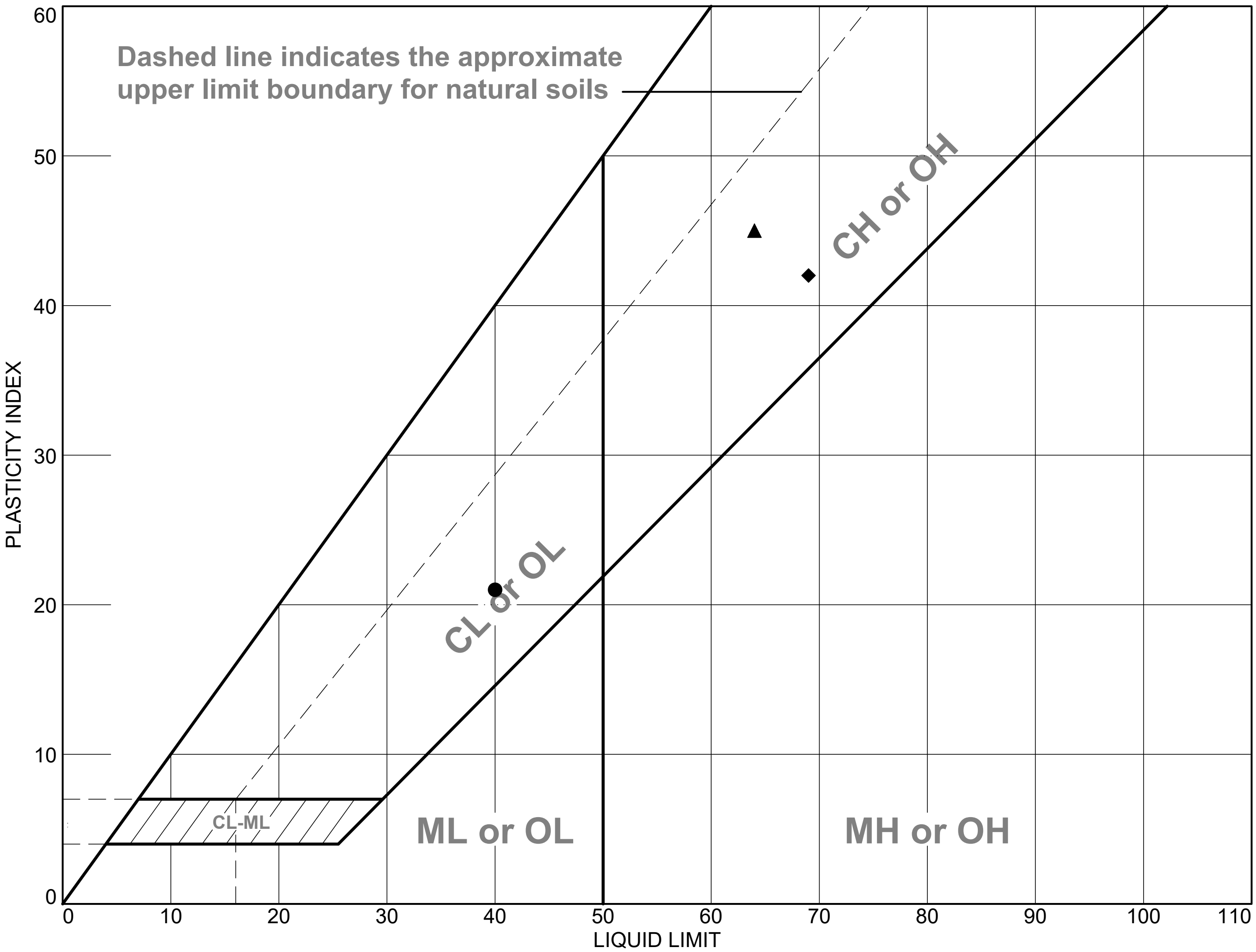
Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 1140, 5. See test reports for test method, 6. See test reports for test method

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content (ASTM D 2974)

Project No. 37:1691-A
Project Name: Benning Park Community Center
PM: Rory O. Dierman
PE: Daniel J. Spielvogel
Printed On: Tuesday, October 1, 2019

ECS CAPITOL SERVICES, PLLC
1310 L Street, NW, Suite 425
Washington, DC 20005
Phone: (202) 400-2188
Fax: (202)-478-1831

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	SANDY LEAN CLAY, tan and brownish gray, moist, very stiff	40	19	21	98.0	84.3	CL
■	SANDY SILT, purplish gray, moist, medium dense	NP	NP	NP	99.5	61.1	ML
▲	SANDY FAT CLAY, mottled gray and red, moist, stiff to very stiff	64	19	45	70.8	67.0	CH
◆	FAT CLAY, orangish brown, moist, stiff	69	27	42	99.8	97.8	CH

Project No. 1691-A **Client:** Moody Nolan

Project: Benning Park Community Center

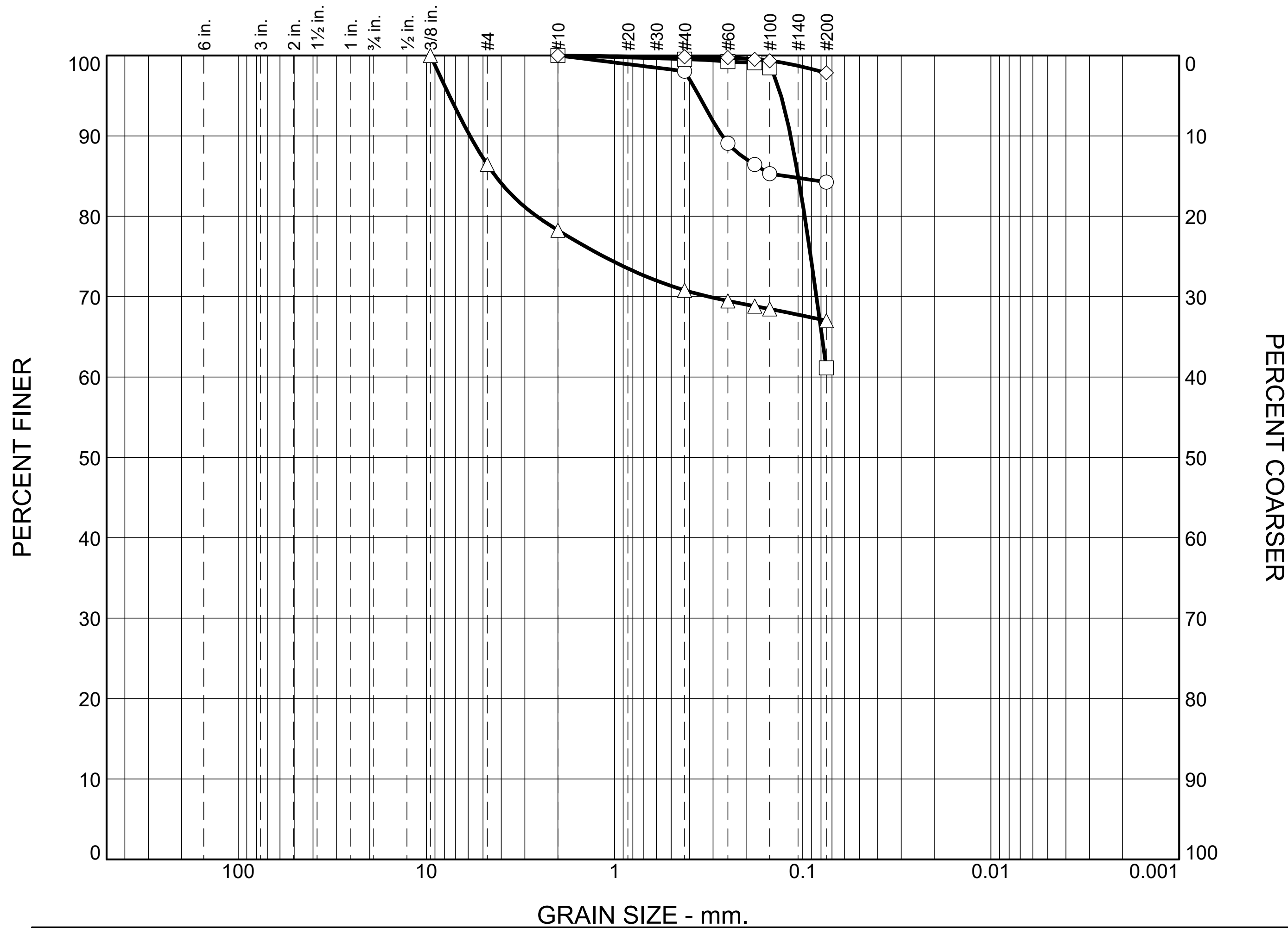
● **Source of Sample:** B-1 **Depth:** 13.50-15.00 **Sample Number:** S-5
■ **Source of Sample:** B-1 **Depth:** 23.50-25.00 **Sample Number:** S-7
▲ **Source of Sample:** IT-1 **Depth:** 8.50-10.00 **Sample Number:** S-4
◆ **Source of Sample:** IT-2 **Depth:** 8.50-10.00 **Sample Number:** S-4

Remarks:

ECS CAPITOL SERVICES, PLLC
1310 L Street, NW, Suite 425
Washington, DC 20005
Phone: (202) 400-2188
Fax: (202)-478-1831

Tested By: HTN1 **Checked By:** ROD

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	2.0	13.7	84.3	
□	0.0	0.0	0.0	0.0	0.5	38.4	61.1	
△	0.0	0.0	13.6	8.1	7.5	3.8	67.0	
◇	0.0	0.0	0.0	0.0	0.2	2.0	97.8	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	B-1	S-5	13.50-15.00	SANDY LEAN CLAY, tan and brownish gray, moist, very stiff	CL
□	B-1	S-7	23.50-25.00	SANDY SILT, purplish gray, moist, medium dense	ML
△	IT-1	S-4	8.50-10.00	SANDY FAT CLAY, mottled gray and red, moist, stiff to very	CH
				stiff	
◇	IT-2	S-4	8.50-10.00	FAT CLAY, orangish brown, moist, stiff	CH

ECS CAPITOL SERVICES, PLLC
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Client: Moody Nolan
Project: Benning Park Community Center

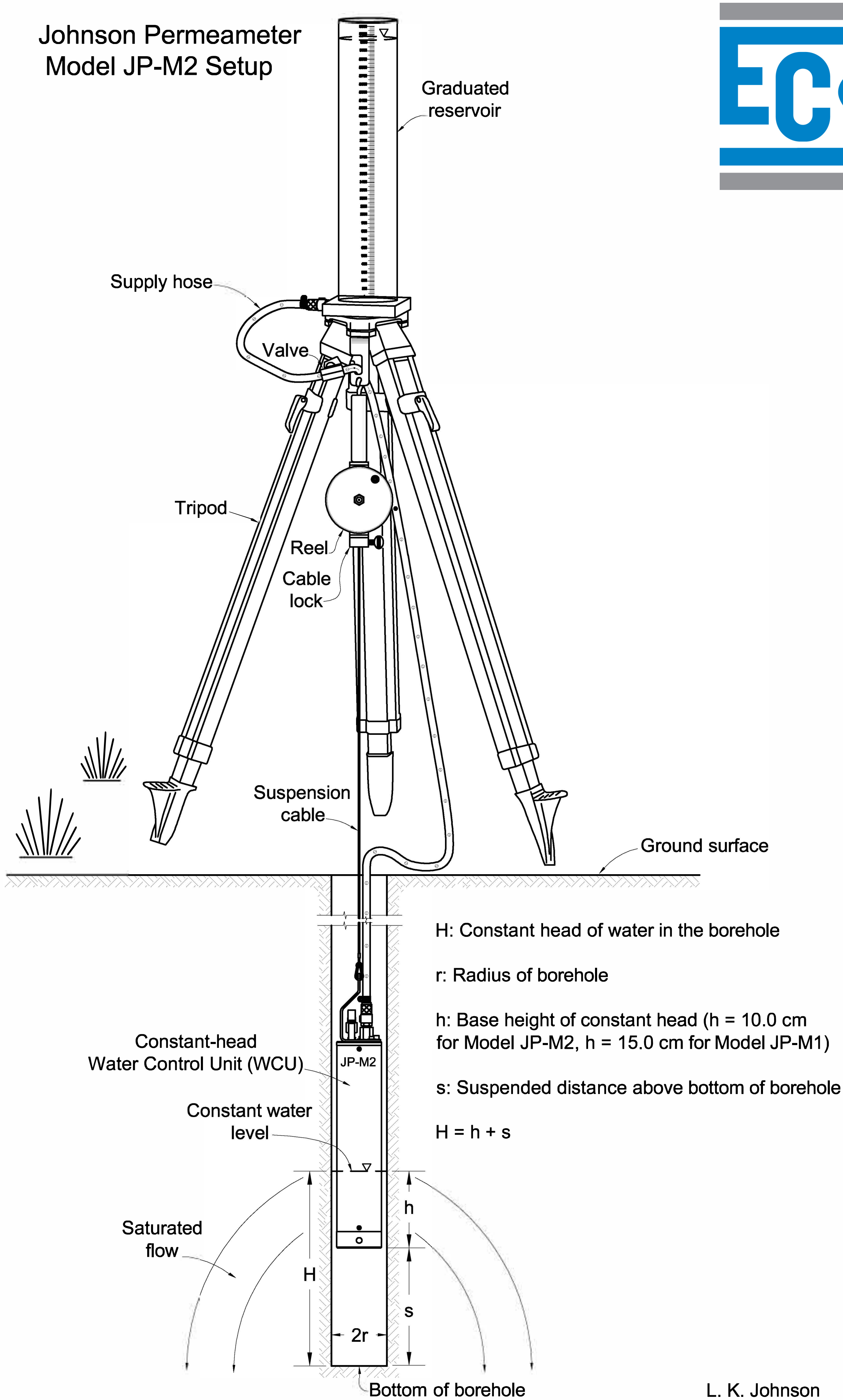
Project No.: 1691-A

Figure 2 of 2

Tested By: ● HTN1 ■ HNT1 ▲ HTN1 ◆ HTN1 **Checked By:** ROD

APPENDIX D – Supplemental Report Documents

Johnson Permeameter^{TM} Equipment Schematic


Johnson Permeameter
Model JP-M2 Setup
Graduated reservoir
Supply hose
Valve
Tripod
Reel
Cable lock
Suspension cable
Ground surface
H: Constant head of water in the borehole
r: Radius of borehole
h: Base height of constant head (h = 10.0 cm for Model JP-M2, h = 15.0 cm for Model JP-M1)
s: Suspended distance above bottom of borehole
H = h + s
Constant-head Water Control Unit (WCU)
JP-M2
Constant water level
Saturated flow
h
H
s
2r
Bottom of borehole

L. K. Johnson