SOILS INC.

Soil Scientists • Engineers • Waste Water Professionals
Markham D. Smith, A.O.S.E., L.P.S.S., President
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10805 Main Street, Suite 700, Fairfax, Virginia 22030 (703) 661-3398
F. (540) 364-2060 soils-inc.com

February 6, 2019

Classic Cottages, LLC
433 East Monroe Avenue
Alexandria, Virginia 22301

Attn: Ms. Elainna Wright

Re: Groundwater Table and Bedrock Evaluation Report
4219 Lorcom Lane
Arlington, Virginia
Project No. T1786

Dear Ms. Wright,

As requested, Soils, Inc. conducted a water table and bedrock investigation at your above referenced project. The study was completed on January 25, 2019. The investigation included a review of the site plan provided by Walter L. Phillips and a site visit to advance six (6) hand auger borings. The hand auger borings were advanced to investigate the soil for potential restrictions that could limit the use of the proposed stormwater management facilities. The borings were advanced to a depth of 120 inches with the exception of boring P-4, in which auger refusal was encountered at a depth of 97 inches due to quartz gravel.

A Static Cone Penetrometer (SCP) was used during drilling to evaluate the density of the underlying soils. Based on the results of SCP testing at depths of 9 and 10 feet, no bedrock was encountered in any of the borings.

No Seasonal High Water Table (SHWT) indications were identified in any of the borings. What appeared to be existing fill material was encountered at the existing ground surface in boring P-1, P-2 and P-4 extended to depths of 31 to 75 inches. The USDA soil profile descriptions and the boring location sketch are attached.

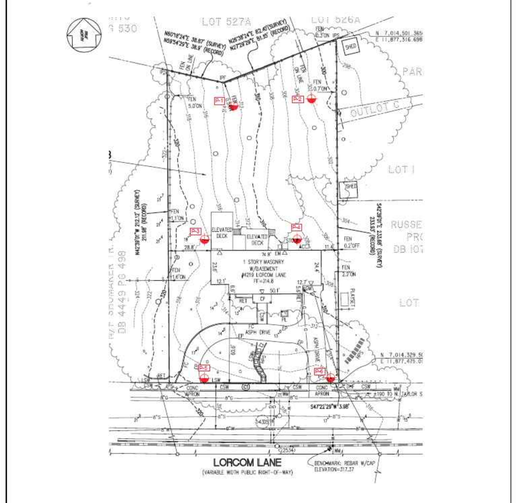
Soils, Inc. thanks you for the opportunity to perform this work. If you have any questions regarding this letter or if any additional fieldwork is required, please do not hesitate to contact us.

Sincerely,

COMMONWEALTH OF VIRGINIA
MARKHAM D. SMITH
License # 3401000243
PROFESSIONAL SOIL SCIENTIST

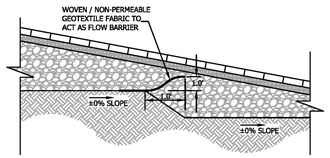
Markham D. Smith, L.P.S.S. # 3401000243
President

Enclosure: Soil Profile Description Report (USDA)
Boring location Sketch



SOILS INC.

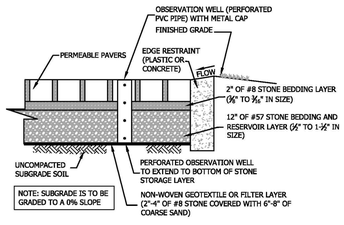
BORING LOCATION PLAN	SHEET: 1
4219 LORCOM LANE	DATE: 02/07/19
ARLINGTON, VIRGINIA	SCALE: NTS
CLIENT: CLASSIC COTTAGES, LLC	SI PROJECT#: T1786



NOTES:
1. LAY WOVEN / NON-PERMEABLE GEOTEXTILE FABRIC TO 12" HEIGHT OF HIGH SIDE STONE SECTION.
2. EXTEND 12" IN BOTH DIRECTIONS TO HOLD IN PLACE.

TYPICAL PERVIOUS PAVER GRAVEL FLOW BARRIER DETAIL
N.T.S.

PERVIOUS PAVER FLOW BARRIER DETAIL (GRAVEL)	REVISION & DATE
ARLINGTON VIRGINIA — ARLINGTON COUNTY, VIRGINIA, DEPARTMENT OF ENVIRONMENTAL SERVICES, OFFICE OF SUSTAINABILITY AND ENVIRONMENTAL MANAGEMENT	DRAWING NO. SWM # 4



TYPICAL RESIDENTIAL PERVIOUS DRIVEWAY CONSTRUCTION DETAIL
N.T.S.

~~NOTE: For installations that abut structures, a 30 mil impermeable liner shall be used. It shall extend along the side of the pavement for the depth of the installation, and extend at least five feet horizontally from the edge of the structure underneath the paver reservoir layer. Consult with a County stormwater inspector to confirm if applicable to the project.~~
IMPERMEABLE LINER IS NOT APPLICABLE TO PROJECT

PERVIOUS DRIVEWAY CONSTRUCTION DETAIL (RESIDENTIAL)	REVISION & DATE
ARLINGTON VIRGINIA — ARLINGTON COUNTY, VIRGINIA, DEPARTMENT OF ENVIRONMENTAL SERVICES, OFFICE OF SUSTAINABILITY AND ENVIRONMENTAL MANAGEMENT	DRAWING NO. SWM # 2

NOTE: PERVIOUS ASPHALT IS NOT AN ACCEPTABLE OPTION IN ARLINGTON COUNTY

Permeable Interlocking Pavers:
Permeable pavement block systems require edge restraints to prevent movement of the pavement blocks. Edge restraints may be standard VDOT curbs, standard VDOT combination curb and gutters, or precast or cast in place reinforced concrete borders a minimum 6 inches wide and 18 inches deep constructed with Class A3 concrete. Edge restraints shall be installed flush with the paver blocks. Permeable pavement block systems used for residential driveways, walkways, and patios can be installed using plastic edge restraints.

Installation of permeable interlocking pavers should only be performed by qualified personnel. A PICP specialist designee should be on site, overseeing each placement crew, during all paver placement and finishing operations.

Pervious Concrete:
Pervious Concrete work shall conform to all requirements of ACI 522.1, "Specification for Pervious Concrete Pavement" published by the American Concrete Institute.

Installation of pervious concrete should only be performed by qualified personnel. A National Ready Mixed Concrete Association (NRMCA) Certified Pervious Concrete Craftsman or Installer should be on site, overseeing each placement crew, during all concrete placement and finishing operations. Each placement crew should have at least two NRMCA certified Pervious Concrete Technicians (per ACI 522.1-13).

PERMEABLE PAVER DESIGN

PERMEABLE PAVER DESIGN SCHEDULE

FACILITY	DESIGN LEVEL	IMPERVIOUS DRAINAGE AREA (SF)	MIN. REQ. TV (CF)	SURFACE AREA PROVIDED (SF)	GRAVEL DEPTH (TREATMENT) (FT)	VOLUME PROVIDED (TREATMENT) (CF)	MAX DRAWDOWN TIME (HRS)	UNDERDRAIN?
A1 DRIVEWAY	1	475	38	475	1.0	190	9.6	NO
A1 PATIO	1	135	11	135	1.0	54	9.6	NO
A1 LEADWALK	1	125	10	125	1.0	50	9.6	NO
B1 DRIVEWAY	1	475	38	475	1.0	190	9.6	NO
B1 PATIO	1	135	11	135	1.0	54	9.6	NO
B1 LEADWALK	1	125	10	125	1.0	50	9.6	NO

NOTES: DESIGN INFITLRATION RATE = 0.50 IN/HR
GRAVEL POROSITY = 0.40
LEVEL 1 Tv = 1 inch depth

GEOSYNTHETICS

N040
TECHNICAL DATA SHEET NONWOVEN GEOTEXTILE

* OR EQUIVALENT

N040 is a polypropylene, needle punched nonwoven geotextile for use in drainage and separation applications. It has been stabilized to resist degradation due to ultraviolet exposure and is resistant to commonly encountered mildew, insects and soil chemicals, and is non-biodegradable.

SPECIFICATIONS:
The N040 polypropylene nonwoven fabric will utilize the following characteristics:

PROPERTY	TEST METHOD	TYPICAL ROLL VALUE
Grab Tensile Strength[1]	ASTM D4632	100 lbs
Grab Tensile Elongation	ASTM D4632	50%
CBR Puncture	ASTM D6241	280 lbs
Trapezoid Tear Strength	ASTM D4533	50 lbs
UV Resistance @ 500 hrs	ASTMD4355	70%
Apparent Opening Size (AOS)	ASTM D4751	70 US Sieve
Permittivity (sec^{-1})	ASTM D4491	2.0 (sec^{-1})
Flow Rate	ASTM D4491	140 gpm/ft^2

Values quoted above are the result of multiple tests conducted at an independent testing facility. N040 meets or exceeds values listed.
[1]Values apply to both machine and cross-machine directions

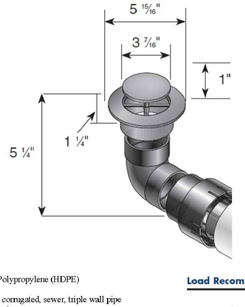
PACKAGING:

Roll Width	12.5 ft.	15 ft.
Roll Length	360 ft.	360 ft.
Roll Area	500 yd^2	600 yd^2

NDS WE PUT WATER IN ITS PLACE — TECHNICAL SPECIFICATIONS

3" and 4" Pop-Up Drainage Emitter with Elbow and Universal Adapter

* OR EQUIVALENT



Part #: 430
Material:
High Density Polypropylene (HDPE)
Colors: Green
Fits: 3" and 4" corrugated, sewer, triple wall pipe and 4" Sch. 40 pipe
Open Surface Area: 10 Sq. Inches
Spring: Stainless Steel Grade 302
Open Pressure: 0.04 PSI
Flow Rate:
1" Head: 43.26 G.P.M
0.5" Head: 30.59 GPM
UV inhibitor
Elbow: ½" drain hole

Load Recommendation Guide

Class A
- Loads of 140 psi.
- Recommended for pedestrians, bicycles and wheel chair traffic.

PERMEABLE PAVEMENT MAINTENANCE

Permeable Pavement Maintenance Schedule

Maintenance Activity	Schedule
• Check observation wells 3 days after a storm event in excess of 1/2 inch in depth. Standing water observed in the well after three days is a clear indication of clogging. • Inspect the surface of the permeable pavement for evidence of sediment deposition, organic debris, staining or ponding that may indicate surface clogging. If any signs of clogging are noted, schedule a vacuum sweeper (no brooms or water spray) to remove deposited material. • Inspect the structural integrity of the pavement surface, looking for signs of surface deterioration, such as slumping, cracking, spalling or broken pavers. Replace or repair affected areas, as necessary. • Check inlets, pretreatment cells and any flow diversion structures for sediment buildup and structural damage. Note if any sediment needs to be removed. • Inspect the condition of the observation well and make sure it is still capped. • Generally inspect any contributing drainage area for any controllable sources of sediment or erosion.	Annually
• Inspected and certified by a professional licensed in the State of Virginia	Once every 5 years

PERMEABLE PAVEMENT MATERIAL SPECS

Material Specifications for Underneath the Permeable Pavements

Material	Specification	Notes
Bedding Layer	PC: None PICP: 2 in. depth of No. 8 stone above 4 inches of No. 57	ASTM D448 size No. 8 stone (e.g. 3/8 to 3/16 inch in size). ASTM D448 size No. 57 stone (e.g. 1 1/2 to 1/2 inch in size) Should be double-washed and clean and free of all fines.
Reservoir Layer	PC: No. 57 stone PICP: No. 2 or 3 stone	PC: ASTM D448 size No. 57 stone (e.g. 1 1/2 to 1/2 inch in size) PICP: No. 2 Stone (e.g. 3 inch to 3/4 inch in size) or No. 3 Stone. Depth is based on the pavement structural and hydraulic requirements. Should be double-washed and clean and free of all fines.
Underdrain	Use 4 to 6 inch diameter perforated PVC (AASHTO M 252) pipe, with 3/8-inch perforations at 6 inches on center; each underdrain installed at a minimum 0.5% slope located 20 feet or less from the next pipe (or equivalent corrugated HDPE may be used for non-vehicular applications). Perforated pipe installed for the full length of the permeable pavement cell, and non-perforated pipe, as needed, is used to connect with the storm drain system. T's and Y's installed as needed, depending on the underdrain configuration. Extend cleanout pipes to the surface with caps.	
Filter Layer	The underlying native soils should be separated from the stone reservoir by a 2 to 4 inch layer of choker stone (e.g. No. 8) covered by a 6 to 8 inch layer of coarse sand (e.g. ASTM C 33, gradation) or use an appropriate filter fabric for the particular application based on AASHTO M288-06. At a minimum the fabric shall have a Flow Rate greater than 125 gpm/sq. ft. (ASTM D4491), and an Apparent Opening Size (AOS) equivalent to a US # 70 or # 80 sieve (ASTM D4751). The geotextile AOS selection is based on the percent passing the No. 200 sieve in "A" Soil subgrade, using FHWA or AASHTO selection criteria.	
Observation Well	Use a perforated 4 to 6 inch vertical PVC pipe (AASHTO M 252) with a cap, installed flush with the surface. Applications in vehicular areas shall have a metal cap. All applications shall have an observation well installed.	

*PC: Permeable Concrete, PICP: Permeable Interlocking Concrete Pavers

Construction Installation. The installation and inspection of the construction of permeable pavement is to follow the Construction Inspection Checklist. The checklist is to be included on the plan (Appendix G).

SECTION 8: CONSTRUCTION

Experience has shown that proper installation is absolutely critical to the effective operation of a permeable pavement system.

8.1 Necessary Erosion & Sediment Controls

- All permeable pavement areas should be fully protected from sediment intrusion by silt fence or construction fencing, particularly if they are intended to infiltrate runoff.
- Permeable pavement areas should remain outside the limit of disturbance during construction to prevent soil compaction by heavy equipment. Permeable pavement areas should be clearly marked on all construction documents and grading plans. To prevent soil compaction, heavy vehicular and foot traffic should be kept out of permeable pavement areas during and immediately after construction.
- During construction, care should be taken to avoid tracking sediments onto any permeable pavement surface to avoid clogging.
- Any area of the site intended ultimately to be a permeable pavement area should generally not be used as the site of a temporary sediment basin. Where locating a sediment basin on an area intended for permeable pavement is unavoidable, the invert of the sediment basin must be a minimum of 2 feet above the final design elevation of the bottom of the aggregate reservoir course. All sediment deposits in the excavated area should be carefully removed prior to installing the sub-base, base and surface materials.

WATER PROOFING NOTES

NOTE: WALTER L. PHILLIPS, INC. IS NOT RESPONSIBLE FOR WATER PROOFING DESIGN REQUIRED AT BUILDING FOUNDATION. CONTRACTOR AND OWNER TO PROVIDE PROPER WATERPROOFING ESPECIALLY NEAR PROPOSED BMP FACILITIES.

NOTE:
ARLINGTON COUNTY DOES NOT REVIEW THE WATERPROOFING DESIGN AND THE OWNER/DEVELOPER AGREES TO HOLD ARLINGTON COUNTY HARMLESS IN THE EVENT OF FAILURE.

COMMONWEALTH OF VIRGINIA
Karl White
KAREN L. S. WHITE
Lic. No.041850
07/17/19
PROFESSIONAL ENGINEER

BMP DETAILS - PERMEABLE PAVEMENT

WALTER L. PHILLIPS INCORPORATED ESTABLISHED 1945
Engineers • Surveyors • Planners
Landscape Architects • Arborists
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ARLINGTON, VIRGINIA
DEPARTMENT OF ENVIRONMENTAL SERVICES
4219/4221 LORCOM LANE
THE PROPERTY OF R.A. PHILLIPS
GRADING PLAN
4219/4221 LORCOM LANE, ARLINGTON, VIRGINIA 22207

SCALE: 1" = 10'	DRAWN CR	CHECKED TPB/KW
SUBMITTED DATE 03/05/2019 05/07/2019 06/24/2019 07/17/2019		APPROVED DATE DIRECTOR OF ENVIRONMENTAL SERVICES
		SHEET: C-0704