



NYC DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF ENVIRONMENTAL PLANNING AND ANALYSIS

GREEN INFRASTRUCTURE

PROCEDURE GOVERNING

LIMITED GEOTECHNICAL INVESTIGATION

FOR

RIGHT-OF-WAY GREEN INFRASTRUCTURE PRACTICES

May 2022

Table of Contents

1	General	1
2	Geotechnical Investigation	1
2.1	Pre-Investigation and Planning	1
2.1.1	Boring Plan	1
2.1.2	Historical Borings	1
2.1.3	Pre-Drilling Site Checklist	2
2.2	Geotechnical Investigation Locations	2
2.2.1	Identifying Boring Locations in the Field	2
2.2.2	Field Measurements	3
2.3	Geotechnical Investigation Methodology	3
2.3.1	Drilling Procedure and Equipment.....	3
2.3.1.1	Standard Penetration Test.....	4
2.3.1.2	Soil Sampling.....	4
2.3.2	Permeability Test Procedure and Equipment.....	4
2.3.3	Temperature Measurement	5
2.3.4	Geotechnical Investigation Depths.....	6
2.3.5	Termination and Cancellation of Soil Borings and Permeability Tests.....	7
2.3.5.1	Termination of Permeability Tests after the Saturation Period.....	7
2.3.5.2	Modification of Soil Borings and/or Permeability Test Depths.....	8
2.4	Cleanup.....	8
2.5	Geotechnical Laboratory Testing	9
3	Geotechnical Report.....	9
3.1	Geotechnical Investigation Data	9
3.1.1	Boring Plan Maps and Shapefiles.....	9
3.1.2	Boring Logs.....	9
3.1.3	Permeability Test Logs	10
3.1.4	Laboratory Test Results	11
3.1.5	Geotechnical Report Summary Table	11
3.2	Interim Geotechnical Report Submission	11
3.3	Geotechnical Report Submission	12
3.3.1	Geotechnical Report – Electronic Copy	12
3.3.2	Geospatial Data Requirement	12
3.3.3	Geotechnical Report – Electronic and Physical Copy	13

Appendix:

Relevant Documents Prior to Geotechnical Investigations
Sample for Geotechnical Report Cover Page
Samples and Templates for Geotechnical Report Attachments

Limited Geotechnical Investigation

1 General

Limited Geotechnical Investigation is required prior to the design of these Right-of-way Green Infrastructure (GI) practices to determine soil characteristics, soil permeability rates, and depths to groundwater table and bedrock when encountered.

A Geotechnical Report including the above information, stamped and signed by a NYS Licensed Professional Engineer (P.E.), shall be submitted to BEPA-GI. The following sections provide details of the geotechnical investigation and reporting procedure.

2 Geotechnical Investigation

The Limited Geotechnical Investigation consists primarily of:

- a) Soil borings to determine the soil characteristics (field observation and laboratory testing) as well as the depths to groundwater table and bedrock where encountered.
- b) Falling-head in-situ permeability tests (PTs) to determine soil permeability rates.

In general, Geotechnical Investigations consist of one soil boring and one PT (collectively referred to as B/PT). All Preliminary ROW GI practices considered for design shall have B/PT data, either from geotechnical investigations performed at the location or inferred from existing or proposed B/PTs in the vicinity of the ROW GI practice location.

For ROW Permeable Pavement, B/PTs are required at every street segment near the downstream end. Additional B/PTs may be proposed for longer streets. For areas with permeable pavement planned for both sides of a street, the B/PTs shall be staggered on alternate sides of the street.

The following sections provide more detail on the soil borings and PTs.

2.1 Pre-Investigation and Planning

2.1.1 Boring Plan

Soil boring and PT locations shall be proposed in a Boring Plan and submitted to BEPA-GI for approval. At a minimum, the Boring Plan shall be comprised of the following: Boring Plan Map and Boring Plan Table with all pertinent information, including but not limited to all GI practices with correct GI IDs and GI Types where applicable (see attachments A); all soil boring and PT locations, existing historical data (see attachments B); and a summary of proposed borings and PTs.

2.1.2 Historical Borings

Historical soil borings and PT data in proximity of proposed GI practices may be obtained from DEP or from the Department of Design and Construction (DDC). Boring Log, Laboratory Test

Results and Permeability Tests Logs inferred from different contract areas are to be submitted in this section.

Soil data for Preliminary GI practices may be represented by historical soil boring(s), provided that the available information is sufficient. For example, if the boring log for such a historical boring location shows the soil characteristics up to 20 ft below ground surface (bgs) as well as depths to the groundwater table and bedrock (if encountered), then only PTs will be necessary for that location.

All historical boring data in the vicinity of the GI practice(s) along with distance from GI practice shall be included in the Boring Plan Table. The actual historical boring data in its entirety shall be submitted with the Boring Plan and as a part of the Geotechnical Report.

2.1.3 Pre-Drilling Site Checklist

Prior to any drilling work, the on-site Professional Engineer (P.E.) or representative of the P.E. (Rep.) must complete and sign BEPA-GI's latest Pre-Drilling Site Checklist (Checklist). The Checklist covers all required utility mark-outs, investigation tasks, Health and Safety Plan (HASP), and necessary documentation for each soil boring and/or PT location.

The Checklist must be kept on-site at all times during drilling operations, along with all associated documentation, and available to DEP personnel upon request. If, upon a site inspection, the Checklist is not found on-site, drilling operations shall cease immediately and permission to resume must be requested from and granted by BEPA-GI before any drilling operation resumes.

The P.E. or Rep. shall be on-site to observe subsurface preliminary investigation with ground penetrating radar (GPR), the geotechnical investigation and is responsible for ensuring all geotechnical sub-consultants, drilling contractors, and other field representatives are following BEPA-GI standard procedures and protocol when performing geotechnical work.

The P.E. or Rep. shall document any pre-existing conditions at the site. The P.E. is responsible for any damages and injuries that occurs in the field. In the event of such incidents, BEPA-GI must be notified promptly.

2.2 Geotechnical Investigation Locations

2.2.1 Identifying Boring Locations in the Field

Soil borings and permeability tests shall be conducted in separate boreholes no closer than 5 ft apart. If a boulder or other obstruction is encountered during drilling for any GI practice, another attempt shall be made within 5 ft - 10 ft of the original borehole. Each borehole should be given a name corresponding to the GI ID and the test (B/PT) and an accurate x,y coordinate of each borehole should be recorded.

For all Right-of-way GI practices excluding Permeable Pavement, soil borings and PTs must be performed within the footprint of the GI practice. In the event that drilling cannot be conducted within the footprint area, drilling should be done no more than 10 ft beyond the footprint of the Preliminary GI practice. If the prior two options are not possible, the B/PTs may be relocated.

Please contact BEPA-GI with a recommended action (e.g. provide alternative drilling options, recommend rejection of the GI practice, etc.).

The following list provides general guidance on possible scenarios encountered in field during subsurface preliminary investigations with GPR:

- All siting criteria and utility criteria are met – no changes necessary
- Siting criteria and/or utility criteria require the asset to be shifted – check that geotech is still possible and surrounding assets are still within range to infer geotech. If necessary, additional geotech may be recommended. Asset coordinates should be updated.
- Siting criteria and/or utility criteria are met but there is not enough clearance to safely drill – An offset location should be recommended for drilling and surrounding assets should be checked that they are still within range to infer geotech. If necessary additional geotech may be recommended
- Siting criteria and/or utility criteria are not met and cannot be met by reducing the size or the asset or shifting the asset – site should be rejected, and if possible alternative sites should be recommended for geotech

For permeable pavement, the B/PTs must be conducted within 20 ft of the proposed drilling location according to the approved Boring Map, and if possible, within the permeable pavement footprint.

No drilling is permitted in a location which blocks a driveway.

If drilling cannot be conducted at the planned location and no relocation options are feasible, or an alternate location is far enough away that a proposed inference is no longer feasible the consultant shall submit a recommended action (e.g. provide alternative drilling options, recommend rejection of the GI practice, etc.) pending BEPA-GI approval.

2.2.2 Field Measurements

All GI practices, soil borings, and PT locations represented on the Boring Plan Map shall be accurately laid, and obscuring of crucial elements must be avoided.

The Boring Plan Map shall be updated in a timely manner to reflect any deviations noted between the Boring Plan Map and actual field measurements.

2.3 Geotechnical Investigation Methodology

2.3.1 Drilling Procedure and Equipment

Upon approval by the P.E., geotechnical investigations are to be conducted using the following drilling methods:

- Direct Push Method with a 4-inch inner diameter casing
- Hollow-stem auger (HSA) with a 4-inch inner diameter hollow-stem
- Rotary Tri-cone Roller Bit cased by 4-inch inner diameter casing

Only water from a hydrant or any clean potable water source shall be used as drilling fluid. It is not acceptable to recycle the drilling fluid or to use drilling mud. Proper sediment control must be used at all times to control both coarse and fine particles in runoffs.

The P.E. should approve the drilling method that will minimize disturbance to the soil tested.

The P.E. or Rep. shall be on-site to observe the boring operation and keep a continuous and accurate Boring Log for each location recording all pertinent data. Refer to **Section 3.1.2** for details on the Boring Log.

In the event that no water or sewer records were obtainable for drilling, the P.E. or Rep. may direct drillers to excavate via air vacuum or hand auger up to the depth of the first soil sample or PT (see **Section 2.3.4.** for soil sampling and PT depths). The reason for conducting this procedure must be properly documented and reported to BEPA-GI.

2.3.1.1 Standard Penetration Test

In each soil boring location, a Standard Penetration Test (SPT) shall be conducted continuously in accordance with **ASTM D1586** (i.e. a 24-inch long, 2-inch outside diameter split-barrel- sampler driven by blows from a 140-pound hammer falling freely from a height of 30 inches) to the depth detailed in **Section 2.3.4.**

The number of blows required to drive the 24-inch split-barrel sampler every 6-inch increment will be recorded. The Standard Penetration Resistance (N-value) shall be determined as the sum of the blows required to drive the sampler to the second and third 6-inch increments.

2.3.1.2 Soil Sampling

The P.E. or Rep. shall make visual observations for the soil at all depths at the time of the SPT, and record all pertinent observations as soil descriptions in the Boring Logs.

Soil samples that are representative of the actual recovered soil core shall be collected at specific depth intervals for laboratory analysis. Collected samples shall be stored in labeled jars, to be delivered to an approved AASHTO-certified laboratory for subsequent examination and testing. Within a soil sampling depth if different soil strata are encountered, a sample should be recovered for each stratum, labeled and stored separately. Samples shall be taken and tested as outlined in **Section 2.5.**

2.3.2 Permeability Test Procedure and Equipment

Please see 2.3.1 for allowable drilling equipment.

Prior to conducting the permeability test, the following conditions should be checked:

- If a soil boring was conducted within 20 ft. of a planned PT location, the borehole from the soil boring must be completely backfilled before the PT is commenced.
- Clean water must be used in conducting PTs. PTs conducted using “dirty water” creates faulty results, which shall be rejected, and retest will be required.
- Proper sediment control shall be deployed to protect the catch basin and cleanliness of the street.

- Permeability tests shall not be performed when the ambient temperature is below 0°C.

The permeability test procedure is as follows:

- The 4-inch inner diameter casing shall be driven to the required test depth (refer to soil boring procedure for allowable equipment). The space (annulus) between the casing and borehole must be kept at a minimum.
 - If the casing cannot be driven and a larger hole is first bored to allow for the casing, the annulus must be backfilled and packed with drill cuttings before any water is introduced for testing into the casing.
- Measure the depth to the bottom of the hole to the nearest inch.
- Ensure that the depth to the bottom of the hole is within 1 inch of the depth to the bottom of the casing.
- Place approximately 6 - 8 inches of coarse sand (4.75mm – 2mm) at the bottom of the casing.
- Wash out casing using a continuous flow of clean water at low water pressure (the water shall not disturb the coarse sand layer at the bottom of the casing) until the water exiting the casing runs clear with no discoloration.
- Saturate the soil beneath the bottom of the casing for at least thirty (30) minutes using clean water.
- Fill casing to the top with clean water and record the temperature of the water at the bottom of the casing at the start of the test (see **Section 2.3.3** for details on temperature measurement).
- Record the time at the beginning of the test.
- Record the falling water level in the casing at 1, 2, 3, 4, 5, 10, and 15 minutes after the beginning of the test or until the water level in the casing has stopped falling.
- At the conclusion of the test, fill the casing to the top with clean water and maintain the water at this level for five (5) minutes.
- Repeat the test once for each PT depth using the same procedure.

The P.E. or Rep. must maintain continuous data of PTs and report them accurately in Permeability Test Logs (PT Logs). Refer to **Section 3.1.3** for details on the PT Log.

2.3.3 Temperature Measurement

Temperatures shall be measured in °C using equipment meeting the specifications as shown in Table 1 and calibrated against a National Institute of Standards and Technology (NIST) Standard or with certified calibration traceable to NIST.

Table 1 – Acceptable Temperature Measurement Equipment

Equipment	Specifications
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Liquid-in-glass thermometer (nonmercury)	<ul style="list-style-type: none"> • Temperature range, at least -5 to +45°C • 0.5°C gradations or smaller • Calibrated accuracy within 1 percent of full scale or 0.5°C, whichever is less
Thermistor	<ul style="list-style-type: none"> • Calibrated accuracy within 0.1 to 0.2°C • Digital readout to at least 0.1°C

2.3.4 Geotechnical Investigation Depths

The depth at which all Geotechnical Investigation procedures are to be conducted shall be determined by the depth of the undisturbed soil below the base of the Preliminary GI practice.

Table 2 shows the total soil boring (and SPT) depths, soil sampling (for laboratory testing) depths, and PT depths for various types of GI practices.

Table 2 – Depth of Soil Boring and PT for Various GI Practices

Group	Type of GI Practice	Total Soil Boring Depth	Lab Sample Depths ¹	PT Depths ²
A	ROWB, ROWSGS with tree and/or typical stone reservoir depth, ROWGS, ROWIB	20 ft bgs	5-7 ft bgs 7-9 ft bgs 11-13 ft bgs 18-20 ft bgs	5 ft bgs 10 ft bgs
B	ROWRG, ROWSGS with shallow stone reservoir and no tree	9 ft bgs	3-5 ft bgs 5-7 ft bgs	3 ft bgs 6 ft bgs
C	ROWSB	20 ft bgs	5-7 ft bgs 9-11 ft bgs 11-13 ft bgs 13-15 ft bgs 15-17 ft bgs	5 ft bgs 10 ft bgs 15 ft bgs
D	ROW Permeable Pavement	9 ft bgs	1-3 ft bgs 3-5 ft bgs	3 ft bgs 6 ft bgs

¹Acceptable deviations from the sampling depth, without prior approval by BEPA-GI:

- Two samples may be taken from an interval if there is a significant change in soil layer (e.g. differences in consistency, color or major component). The sampling depths should be labeled and the samples stored separately.
- If a sample cannot be retrieved or the recovery length is extremely low (less than 2 in) and additional soil cannot be obtained, soil from the immediately following interval shall be collected.

² If the bottom of the casing cannot be properly sealed due to soil conditions or obstructions, the casing may be drilled up to an additional foot below ground surface.

2.3.5 Termination and Cancellation of Soil Borings and Permeability Tests

Various conditions at the drilling site may prevent completion of the geotechnical investigation. Soil borings and/or PTs are referred to as “terminated” if the drilling was commenced but could not be completed to the intended depth. “Cancellation” refers to situations where drilling for the soil boring and/or PT did not commence. In general, soil borings and PTs shall not be cancelled without prior approval by BEPA-GI.

The following list provides general guidance on when drilling may be terminated without prior approval by BEPA-GI:

- a) If soil and/or groundwater contamination is suspected during the investigation, drilling shall be terminated immediately. The borehole shall be filled and the proposed location shall be abandoned. Indications of suspected contamination during geotechnical investigations must be reported to BEPA-GI.
- b) If an obstruction (e.g. boulder, abandoned utility, large debris, etc.) is encountered at or less than 15 ft bgs, another drilling location shall be identified according to **Section 2.2.1**. If the obstruction is confirmed at the reattempted location, the soil boring or PT shall be terminated. If the obstruction is encountered at a depth greater than 15 ft bgs, drilling may be terminated without a reattempt.
- c) If an obstruction (e.g. boulder, abandoned utility, large debris, etc.) is encountered at or less than 5 ft bgs, another drilling location shall be identified according to **Section 2.2.1**. If the obstruction is confirmed at the reattempted location, at or less than 5 ft bgs, the soil boring or PT shall be terminated and the remaining test, if not yet performed, shall be canceled. The location shall be rejected.
- d) If bedrock is encountered, drilling shall be terminated and the depth to bedrock and rock classification (based on visual observation) recorded. Where possible, drilling shall proceed through weathered or decomposed bedrock.

If obstructions and/or bedrock are encountered at less than 9 ft bgs at three or more sites within a 100-ft radius, drilling operations shall cease and BEPA-GI must be contacted to obtain approval to proceed with subsequent drillings within the 100-ft radius.

If a water table is encountered, the depth to the water table shall be recorded and the boring shall proceed to the intended depth. The water table shall be identified as either perched water or the groundwater table.

For questions on other scenarios, please contact DEP Project Manager.

2.3.5.1 Termination of Permeability Tests after the Saturation Period

PTs may be terminated after the 30-minute saturation period and reported accordingly for the following conditions:

- If the casing is completely filled during the saturation period and there is no visible drop in water level after 30 minutes, the PT shall be reattempted for the same depth at another location between 5 ft to 10 ft away. If there is no visible drop in water level after 30

minutes at the reattempted location, the PT shall be terminated for that depth only and the permeability coefficient reported as "0.000 in/hr".

- If the casing cannot be filled due to rapid infiltration (RI) during the saturation period and no water is retained in the casing after 30 minutes, the PT shall be reattempted for the same depth at another location between 5 ft to 10 ft away. If rapid infiltration is observed during the saturation period for the reattempt, the PT shall be terminated for that depth only and the permeability coefficient reported as "RI".
- For PT at 10ft, if groundwater is observed between 9 ft - 10 ft and there is no visible drop in water level during the saturation period, the PT need not be reattempted for the 10 ft depth. The PT shall be terminated and the permeability coefficient reported as "0.000 in/hr" for that depth only.

2.3.5.2 Modification of Soil Borings and/or Permeability Test Depths

For Preliminary GI practices in Group A (refer to Table 2), if the groundwater table and/or bedrock is confirmed between 7-9 ft bgs during drilling for either the soil boring or PT, drilling shall be terminated. New offset locations shall be identified according to **Section 2.2.1**, to conduct soil sampling and PTs at the depths specified for Group B practices instead. Soil samples at 3'-5' and 5'-7' must be collected for group B practices.

For example, if bedrock is encountered at 8 ft bgs during drilling for the 10-ft PT at a Preliminary ROWB site, the 10-ft PT shall be cancelled and a new borehole shall be identified to conduct PTs at 3 ft and 6 ft. Additionally, the 20-ft soil boring will also be cancelled (if it had not been conducted yet), and a 9-ft soil boring with the corresponding soil sampling depths shall be conducted instead.

2.4 Cleanup

The P.E. or Rep. on site shall ensure drillers maintain proper housekeeping at all times, and clean up any remaining debris and sediment post drilling operation.

Upon termination or completion of any soil boring or PT, all boreholes are to be backfilled with soil cuttings to the ground surface level and sealed with an asphalt or concrete patch to restore the surface to its original condition. All other holes, depressions, cracks, surface inconsistencies, and other hazards resulting from the work must be properly mitigated. The contractor will return to the site two weeks following the work, one month following the work, and as necessary to make repairs to backfilled holes.

Photographs shall be taken documenting the condition in which the drilling locations are abandoned.

If any damage results due to drilling operations, the PE or Rep. must properly document, inform BEPA-GI and direct the driller to repair.

2.5 Geotechnical Laboratory Testing

Laboratory tests shall be conducted by an AASHTO-certified laboratory to determine the distribution of particle sizes of the soil – particularly the fines (silts and clays) content – in accordance with ASTM D422.

3 Geotechnical Report

3.1 Geotechnical Investigation Data

3.1.1 Boring Plan Maps and Shapefiles

Field-measured locations of all GI practices and geotechnical investigations must be accurately recorded. This location data shall be submitted as a finalized Boring Plan Map and shapefile (**Section 3.3.2** contains additional details on shapefile requirements).

3.1.2 Boring Logs

Boring Logs must be submitted for all soil borings, including those which were terminated. At a minimum, Boring Logs must include the following:

- Identification number (ID No.) and location of the soil boring (nearest building address or cross streets)
- Number of blows per 6-inch intervals of continuous penetration
- Length of sample recovery (inches) for each 2-ft interval
- Thickness of each soil stratum encountered (including pavement, fill or topsoil layers).
- Characteristics of the soil (based on field observations) for all depths, including:
 1. Soil description per Modified Burmister
 2. Soil classification per Unified Soil Classification System (USCS), in parentheses
 3. Color
 4. Soil moisture (dry, moist, or wet)
 5. Soil compaction: Loose, moderately compacted, or very compacted
 6. If present:
 - a. Debris (brick, concrete, wood, glass, etc.)
 - b. Cobbles, boulders, etc.
 - c. Odor (organic, chemical, etc.)
 - d. Notable soil formations which may affect permeability (e.g. "bull's liver", glacial till, etc.)
 - e. Indication of possible contamination (ash, petroleum, slag, etc.)
 - f. Decomposed vegetation
- Notes of subsurface conditions encountered during drilling (e.g. utilities, structures, etc.)
- Additional notes (e.g. interaction with community, etc.)

3.1.3 Permeability Test Logs

Permeability Test Logs (PT Logs) must be submitted for all PTs, including those that were terminated. At a minimum, PT Logs must include PT ID number, ambient temperature, test location, test depth, depth to groundwater table and/or bedrock (if encountered), water temperature at the start of the test, and all water depth readings, results, and calculations.

Average permeability values shall be calculated based on a modification of ASTM D6391 using the following formula. The PT Log template with the formula and associated calculation methods is included in the Appendix. In general, no permeability calculations are necessary at the time of drilling since permeability values (and other variables used to calculate permeability values) are automatically calculated in the PT Log once all the data recorded during the PT (see **Section 2.3.2**) are inputted into the template.

$$K_m = \pi \cdot R_t \cdot \frac{D \cdot \left(\ln \frac{h_1}{h_2}\right)}{11 \cdot (t_2 - t_1)}$$
$$R_t = \frac{2.2902(0.9842^T)}{T^{0.1702}}$$

Where:	K_m	= Mean permeability [in/hr], and $K_m = \sqrt{k_h \cdot k_v}$
	k_h	= Horizontal permeability [in/hr]
	k_v	= Vertical permeability [in/hr]
	D	= Inner diameter of casing [in]
	h	= Height of water above bottom of casing at time t [in]
	t	= Time [hr]
	R_t	= Ratio of viscosity of water at test temperature to the viscosity of water at 20 °C
	T	= temperature [°C]

- Early termination of PTs (see **Section 2.3.5.1**) shall be noted in the “Inspectors Remarks” section of the PT Logs and in Geotech Report Summary Table as general geotech notes. No field data shall be reported as “Depth (in)”, and no permeability values shall be calculated for terminated PTs.
- PT Logs (and Geotechnical Report Summary Tables) must accurately reflect the actual depths the PTs were performed.
- The PT Log template contains default time values of 1, 2, 3, 4, 5, 10, and 15 minutes after the start of the test. If the water level drops below the casing before the 15-minute measurement period, these default values must be modified to the actual time values for which water depth measurements were recorded.
- If the PT cannot be calculated (for example, due to RI), the PT Log shall clearly indicate that PT calculations are not valid.

3.1.4 Laboratory Test Results

Laboratory testing and reporting must include a sieve analysis of soil samples and plotting of gradation curves, as well as soil classification based on the USCS.

The following USCS-classified sieve sizes are to be included with data points for all sampled depths overlaid on the same gradation curve:

4"
3"
1-1/2"
3/4"
3/8"
#4
#10
#20
#40
#60
#100
#200

The sample for Laboratory Test Results showing sieve analyses and gradation curves is included in the Appendix.

3.1.5 Geotechnical Report Summary Table

Pertinent data from the soil borings (including data available from historical boring logs), PTs, laboratory test results, and any other information acquired during the Geotechnical Investigation shall be summarized in all Geotechnical Report Summary Table submittals.

3.2 Interim Geotechnical Report Submission

Interim Geotechnical Reports for subsets of the contract area shall be submitted prior to the completion and subsequent submittal of the Geotechnical Report.

The Interim Geotechnical Reports must include the following attachments:

- Attachment A₁ – Proposed Boring Plan Map
- Attachment B – Historical Boring Logs
- Attachment C₁ – Interim Geotechnical Report Summary Table
- Attachment D – Soil Boring Logs
- Attachment E – Laboratory Test Results
- Attachment F – Permeability Test Logs

Interim Geotechnical Summary Tables shall be submitted as Excel worksheets following the sample provided by BEPA-GI (see the Appendix for sample). Each submission shall also include all previously submitted Interim Geotechnical Summary Table worksheets for the contract area as part of the same workbook.

Although optional, it is highly recommended that updated Boring Plan Maps (and Boring Plan Tables, if applicable) be submitted accordingly with the Interim Geotechnical Report containing the geotechnical data for the affected GI practices. The Final Geotechnical Report submission must include a Boring Map which reflects the most up-to-date location data for all GI practices, soil borings, and PTs.

3.3 Geotechnical Report Submission

3.3.1 Geotechnical Report – Electronic Copy

The Geotechnical Report must include the following as a minimum:

- Project Description
- Site Conditions (Topographic, Geological, Hydrogeological Setting)
- Geotechnical Investigation Results
- Summary and Conclusion
- Attachments (samples and templates in Appendix)
 - Attachment A₂ – Performed Boring Plan Map
 - Attachment B – Historical Boring Logs
 - Attachment C₂ – Geotechnical Report Summary Table
 - Attachment D – Soil Boring Logs
 - Attachment E – Laboratory Test Results
 - Attachment F – Permeability Test Logs

Geotechnical Report shall be submitted electronically in pdf format, along with the Excel versions of Attachment C₂, and the Green Infrastructure Asset, Boring, and Permeability Test Location Shapefiles. Please refer to Geotechnical Investigation Reporting Procedure for additional details.

3.3.2 Geospatial Data Requirement

Geospatial data of all GI practices and geotechnical investigation locations in shapefile format, conforming to the following BEPA-GI GIS requirements:

- Coordinate System: NAD_1983_StatePlane_New_York_Long_Island_FIPS_3104_Feet
- Projection: Lambert_Conformal_Conic
- Coordinates for ROWB, ROWRG, ROWIB, ROWGS, and ROWSGS shall be the upstream curb-side corner of the practice
- Coordinates for ROWSB shall be the center of the ROWSB.
- Coordinates for ROWPP shall be the upstream curb-side corner of the practice and they should be represented as polygons of the proposed footprint of the practices
- Points/Polygons representing all asset, soil boring and PT locations shall have the following attribute fields: 'Contract_No', 'Phase_No', and 'GI_ID', 'B_ID' or 'PT_ID'

Information in the shapefiles should be updated to show assets, boring, and PTs using the most accurate data available. All pertinent data submitted in the Geotechnical Report must be transferred to the Project Tracking Spreadsheet and submitted with the Geotechnical Report.

3.3.3 Geotechnical Report – Electronic and Physical Copy

Refer to 3.3.1 Geotechnical Report for minimum requirements. An updated Geotechnical Report Summary Table shall be submitted according to any final changes and comments from design.

Electronic and printed copy of complete Geotechnical Report, stamped and signed by a Professional Engineer, must be submitted upon DEP request.

Appendix:

Relevant Documents Prior to Geotechnical Investigations:

- Boring Plan Table (Sample) for:
 - ROW GI Practices Excluding Permeable Pavement
 - Permeable Pavement
- Pre-Drilling Site Checklist

Sample for Geotechnical Report Cover Page

Samples and Templates for Geotechnical Report Attachments:

- Attachment A₁ – Proposed Boring Plan Map (Sample)
- Attachment A₂ – Performed Boring Plan Map (Sample)
- Attachment C₁ – Interim Geotechnical Report Summary Table (Sample)
- Attachment C₂ – Geotechnical Report Summary Table (Sample)
- Attachment D – Soil Boring Logs (Templates) for:
 - 20-ft Boring
 - 9-ft Boring
 - 20-ft Boring for ROWSB
 - 9-ft Boring for ROWPP
- Attachment E – Laboratory Test Results (Sample)
- Attachment F – Permeability Test Log (Templates)

DEP Contract ID: [Contract]
 DEP Project: [Project Description]
 Prepared By: [Consultant/Sub Name]

NYC Department of Environmental Protection
 Bureau of Environmental Planning and Analysis - Green Infrastructure
 Borough of X, New York



ROW Permeable Pavement Boring Plan Table

Submission 1

Location	GI ID No. (PP ID)	Laboratory Testing Data/ Historical Boring Soil Description					Permeability Analysis				Groundwater Table Depth (ft)	Bedrock Depth (ft)	General Geotechnical Notes	Consultant Recommendation [date]			
		New Boring ID No.	Nearest Existing/Historical Boring ID No.	Depth (ft)	USCS Symbol	% Passing No. 200	New Permeability Test ID No.	Nearest Historical PT ID No.	Permeability Test Depth (ft)	Avg. Permeability Coef. (in/hr)				Soil Boring (Yes/No)	Permeability Test (Yes/No)	Additional Notes	
Wilson Ave in between Himrod St and Harman St	PP1265.1	B-PP1265.1a					P-PP1265.1a							YES	YES		
	PP1371.1	B-PP1371.1a					P-PP1371.1a							YES	YES		
Greene Ave in between Wilson Ave and Central Ave	PP1270-1.1		B-GS1268-1a	5-7	SM	27.4%		P-GS1268-1a	5	0.00							
				7-9	NR	NR			10	0.01							
				11-13	ML	50.0%											
				18-20	SM	17.5%											
	B-PP1270-1.1a						P-PP1270-1.1a							YES	YES		
Wilson Ave in between Greene Ave and Bleecker St	PP1270.1	B-PP1270.1a						P-PP1270.1a							YES	YES	
			B-SGS1365a	5-7	SM	26.3%		P-SGS1365a	5	0.13							
				7-9	SM	28.3%			10	0.02							
				11-13	SP	30.0%											
		18-20	SM	14.2%													
Bleecker St in between Wilson Ave and Central Ave	PP1271.1	B-PP1271.1a						P-PP1271.1a							NO	YES	
			B-1273c	5-7	SP-SM	18.7%		P-1273c	5	0.90							
				7-9	SP-SM	8.9%			10	0.19							
				11-13	SW-SM	5.0%											
		18-20	SP-SM	8.2%													

See 'Notes' for specific instructions on using template



Limited Geotechnical Investigation Pre-Drilling Site Checklist

GI Contract No: _____ Consultant: _____
 Managing Agency: _____ Site Supervisor: _____
 Project Location: _____ Drilling Contractor: _____

The following investigation activities must be completed prior to commencement of drilling:

- One-Call utility mark-out
- Water and sewer mark-out based on available maps, tap cards, and service connection information
- Subsurface preliminary investigation with Ground Penetrating Radar (GPR) or other subsurface utility detection equipment
- Manual investigation of underground structures
- Manual investigation of overhead utilities
- Mark-out cleared drilling location
- Take photos of sidewalk, making note of any existing cracks or damages. Capture extents of mark-outs
- Ensure that sediment controls are deployed appropriately.
- Ensure that construction materials, equipment, debris, etc. are not blocking driveways

The following utility criteria for the asset footprint (excluding ROWPP) must be completed prior to commencement of drilling:

- One or less gas crossing
- No parallel gas lines
- If any, less than 4 utility crossings
- Minimum of 3'-6" clearance to edge of water or sewer mains
- No valves within footprint of the asset unless asset is a ROWIB Concrete Top and valve is a gas valve

The following documentation must be obtained and kept on-site during all drilling activities:

- Water maps and service line information
- Sewer maps
- Health and Safety Plan (HASP)
- One-Call Ticket stating utilities cleared and/or marked
 Confirmation No. _____ Expiration Date: _____
- Other agency permits (DOT, DPR, and other permits as required)
- Approval from MTA, LIRR, bridges, tunnels, AMTRAK, PATH, etc. (as required)
- Hydrant permit for clean water to conduct Permeability Tests (unless using water truck)
- DEP-reviewed Boring Location Plan

I, _____, (P.E. or Representative) attest that all the above have been completed and that this checklist along with the pertinent documentation mentioned above will be maintained on-site.

Date

Signature of On-site P.E. or Representative

NOTES:

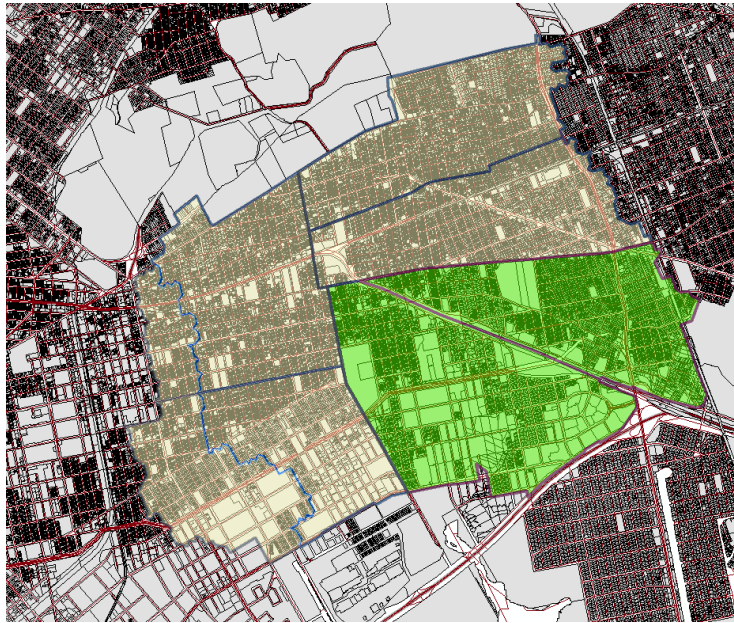
1. This checklist must be kept on-site with all mentioned documentation and produced upon request for DEP Reference and Review.
2. The on-site P.E. or Representative is responsible for observing the geotechnical investigation, confirming the drilling locations, and ensuring that the locations of soil borings and permeability tests do not interfere with DEP infrastructure.
3. Drilling activities shall not interfere with or impact utilities (e.g. water mains, sewers, property service lines, etc.).



City of New York
Department of Environmental Protection
BEDC-Green Infrastructure

Right of Way Green Infrastructure
[CSO], [WATER BODY]
[BOROUGH], NY

CONTRACT [#] PHASE [#] STAGE [#]



Final/Draft Geotechnical Report

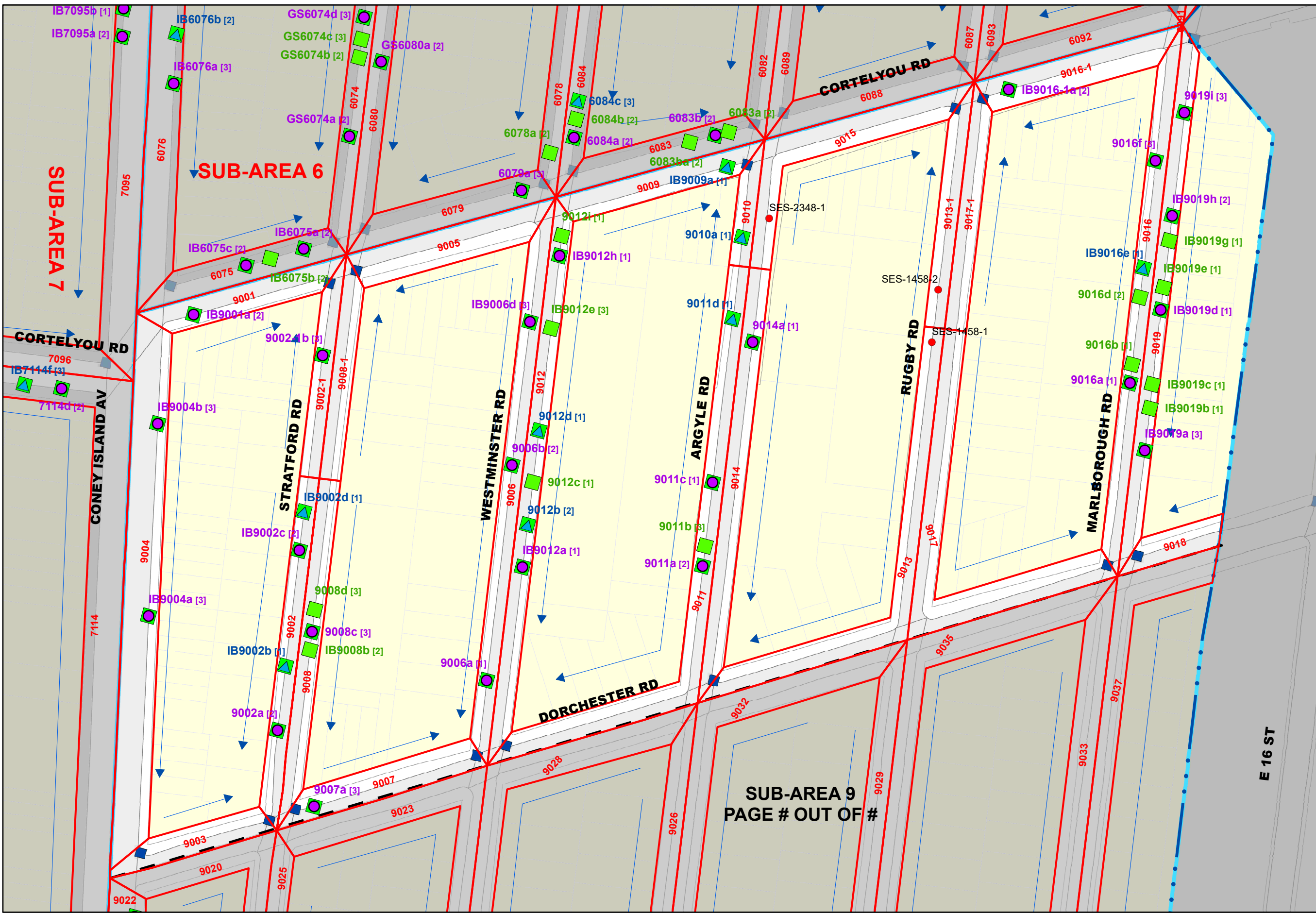
[Lead Agency Name and Address]

[Name]
P.E #

[Consultant Name and Logo]

[Address]

[Date]



LEGEND

- Preliminary
- B&PT
- ▲ PT only
- Reserved
- TDA Boundary
- Catch Basins
- ✕ Non-Existent Catch Basins
- Historical Boring
- Flow_Arrow
- Matchline
- Contract Area Boundary
- Sub-Area Boundary Limit



RIGHT OF WAY GREEN INFRASTRUCTURE
GXXXX-XX PHASE [#], [TRIBUTARY AREA]
[BOROUGH], NY

MANAGING/PARTNER AGENCY:

CONSULTANT ENGINEER:

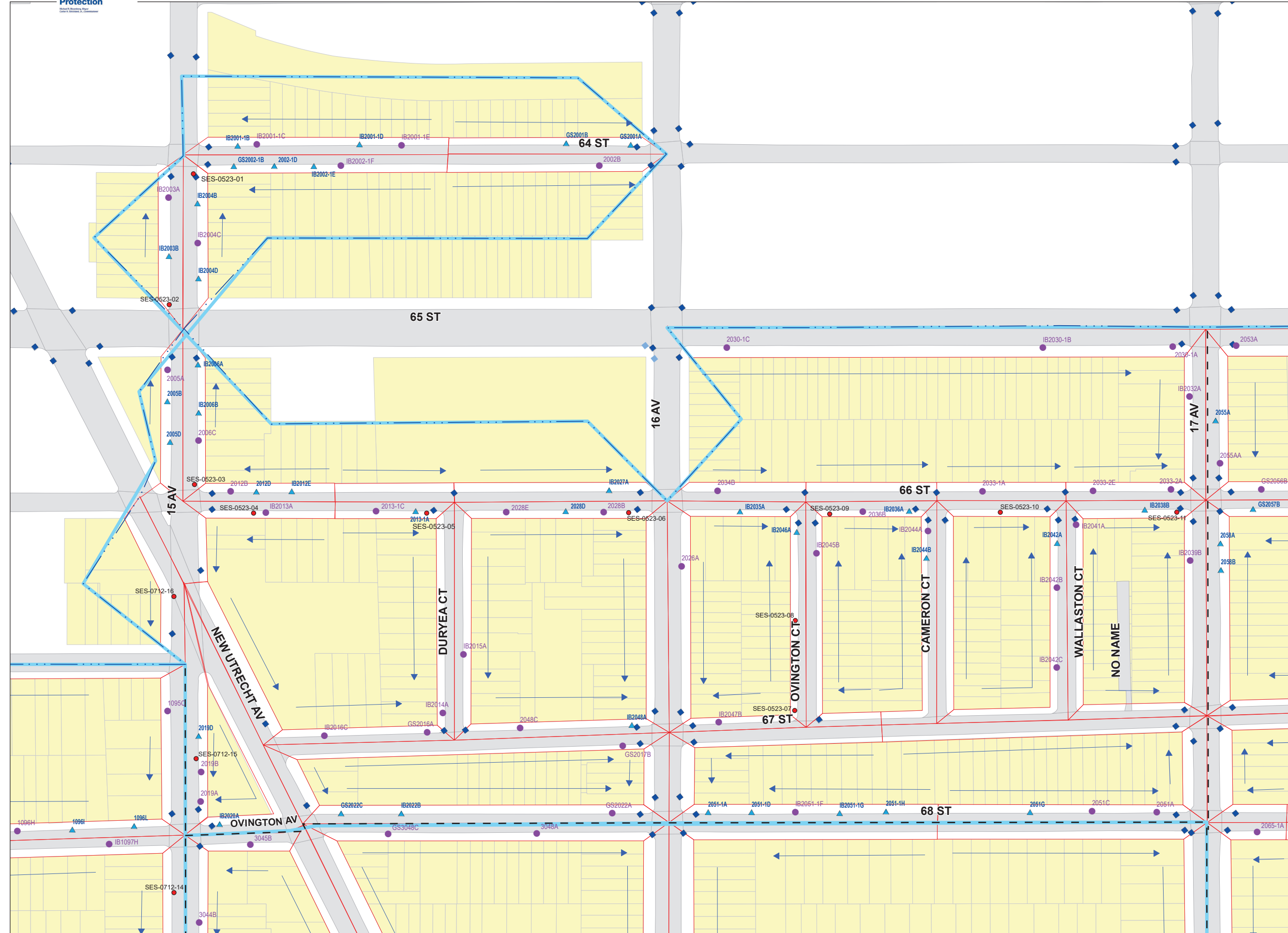
BEPA - GI PROJECT ENGINEER:

CONTRACT NO:
GXXXX-XX

SCALE
0 25 50 100 150 Feet

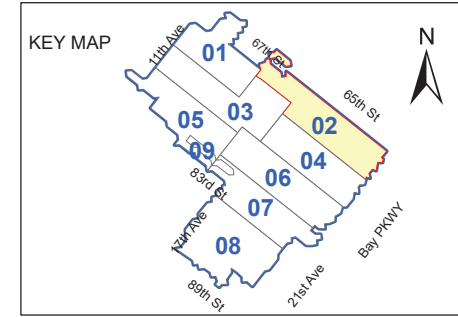
DATE	SHEET
	Page # of #

SUB-AREA 9
PAGE # OUT OF #



LEGEND

- B&PT
- ▲ PT Only
- Boring Only
- Historical Borings
- Flow Arrows
- Catch Basins
- ✕ Non-Existent Catch Basins
- Match Lines
- Contract Area Boundary
- Sub-Area Boundary
- TDA_Final



RIGHT OF WAY GREEN INFRASTRUCTURE GXXXX-XX PHASE #, [TRIBUTARY AREA] [BOROUGH] NY	
MANAGING/PARTNER AGENCY:	
CONSULTANT ENGINEER:	
BEPA - GI PROJECT ENGINEER:	
CONTRACT NO:	
DATE	SHEET
Page 1 of 4	

DEP Contract [Contract]
 DEP Project: [Project Description]
 Prepared By: [Consultant/Sub Name]

NYC Department of Environmental Protection
 Bureau of Environmental Planning and Analysis -- Green Infrastructure
 Borough of X, New York



Interim Geotechnical Report Summary Table for ROW GI Practices (Excluding Permeable Pavement) Submission # 2.01

GI ID No.	Soil Data (Laboratory Results or Historical Boring Soil Description)				Permeability Analysis			Groundwater Table Depth (ft)	Bedrock Depth (ft)	General Geotechnical Notes	Siting Analysis					Consultant Recommendation [Date]		
	Nearest Boring ID No.	Depth (ft)	USCS Symbol	% Passing No 200 Sieve	Nearest Permeability Test ID No.	Permeability Test Depth (ft)	Average Permeability Coef. (in/hr)				ROWGI Length (ft)	ROWGI Width(ft)	Calculated Stormwater Mgmt Capacity (CF)	Available Upstream Distance - Sited* (ft)	Minimum Required Upstream Distance** (ft)	Recommendation for Survey	Stone Column Depth (ft), if applicable	Additional Notes
2017a	0921-31	0-0.5	Concrete		PT-2017a (1)	5	0.00	31.4	NE		13	5	825.54	16	173	Preliminary (For Survey)		
		0.5-24	F-M Brown sand, trace silt, trace gravel (SP)			10	0.26											
		24-51.5	Fine brown sand, trace silt (SP)		PT-2017a (2)	5	6.01											
2022a	B-2022a	5-7	SP-SM	5.5%	PT-2022a	5	0.23	NE	NE		13	5	190.27	18	72	Preliminary (For Survey)	-	Hydraulically Connected to 2022b
		7-9	SP-SM	6.4%		10	0.09											
		11-13	SP	2.7%														
		18-20	SP	4.2%														
2022b	B-2022a	5-7	SP-SM	5.5%	PT-2022a	5	0.23	NE	NE		13	5	190.27	225	72	Preliminary (For Survey)	-	Hydraulically Connected to 2022a
		7-9	SP-SM	6.4%		10	0.09											
		11-13	SP	2.7%														
		18-20	SP	4.2%														
2022c	B-2022c	5-7	SP	4.5%	PT-2022c	5	0.07	NE	NE	Organic clay was encountered at 9'	13	4	116.58	150	44	Rejected	-	
		7-9	SP	1.9%		10	2.32											
		11-13	SP	1.3%														
		18-20	SP	1.7%														
2199b	B-2199b	3-5	SP	3.5%	PT-2199b	3	1.29	8	NE	Shallow GWT was encountered at 8ft and shallow Geotechnical procedure was followed	13	5	311.09	30	109	Preliminary (For Survey)		ROWRG Recommended
		5-7	SP	1.3%		6	2.61											
		7-9	SP	2.9%														
2199c	B-2199b	3-5	SP	3.5%	PT-2199b	3	1.29	8	NE		13	5	311.09	170	109	Preliminary (For Survey)		ROWRG Recommended
		5-7	SP	1.3%		6	2.61											
		7-9	SP	2.9%														
IB2221a	B-IB2221a(1)	5-7	SP	1.5%	PT-IB2221a	5	0.28	NE	NE	Refusal at 9' in boring. Moved to offset location.	13	4	142.83	330	62	Preliminary (For Survey)	-	Clearance to building = 8 ft Vault survey will be conducted HDPE recommended
		7-9	SP	1.7%		10	1.47											
	B-IB2221a(2)	11-13	SP	1.8%														
		18-20	SP	1.9%														
2210a	B-2210a	5-7	SC	28.0%	PT-2210a	5	4.23	NE	NE		10	5	558.22	70	203	Preliminary (For Survey)	13	
		7-9	SP	1.9%		10	0.43											
		11-13	SP	3.3%														
		18-20	SP	2.2%														
2210b	B-2210b	5-7	SC	10.0%	PT-2110b(1)	5	0.00	NE	NE		11	5	110.61	100	40	Preliminary (Interim Rejection)		
		7-9	SP	15.0%		10	2.82											
		PT-2110b(2)	11-13	SP	3.1%	5	0.05											
			18-20	SP	2.5%													

2222a	B-2222a	5-7	SP	3.4%	PT-2222a	5	1.10									Preliminary (For Survey)	-	Clearance to building >10 ft Vault survey not necessary	
		7-9	SP	5.0%		10	0.18	NE	NE		10	5	219.13	120	96				
		11-13	SP	2.3%															
		18-20	SP	1.0%															
2177a	B-2177a	5-7	SP	5.0%	PT-2177a(1)	5	RI									Preliminary (For Survey)			
		7-9	SP	1.2%		10	1.46	NE	NE		20	5	1212.13	25	472				
		11-13	SP	1.1%	PT-2177a(2)	5	5.40												
		18-20	SP	1.2%															
2177b	B-2177a	5-7	SP	5.0%	PT-2177a(1)	5	RI									Reserved			
		7-9	SP	1.2%		10	1.46	NE	NE		20	5	1212.13	65	472				
		11-13	SP	1.1%	PT-2177a(2)	5	5.40												
		18-20	SP	1.2%															
GS2216a	B-GS2216a	5-7	SM	21.8%	PT-GS2216a (1)	5	NP									Preliminary (Interim Rejection)			
		7-9	SP	1.4%		10	3.91	NE	NE	Refusal at 5' PT test both at original and offset location	13	3		40					
		11-13	SP	3.9%	PT-GS2216a (2)	5	NP												
		18-20	SP	3.5%															
GS2216b	B-GS2216a	5-7	SM	21.8%												Preliminary		Recommendation is to make GS2216b Preliminary, infer boring from GS2216a and PT Only	
		7-9	SP	1.4%							13	3		140					
		11-13	SP	3.9%															
		18-20	SP	3.5%															

See 'Notes' for specific instructions on using template

*The distance between the inlet of the GI practice and either the inlet of an upstream GI practice or the top of the tributary area

**Minimum required length of upstream distance, D, determined by the following formula: $D = (12 * [\text{Calculated Stormwater Mgmt Capacity}]) / (1.1 * [\text{TDA width}])$

Proceed	9
Do not proceed/reject	3
Pending	0
Reserved	1
Preliminary	1
	<hr/>
	14

of sites submitted:

14



Interim Geotechnical Report Summary Table for Permeable Pavement Sub Area 2

Location	Soil Data (Laboratory Results or Historical Boring Soil Description)				Permeability Analysis			Groundwater Table Depth (ft)	Bedrock Depth (ft)	General Geotechnical Notes	PP ID No.	Consultant Recommendation [Date]						Approximate Street Slope (%)	DEP Recommendation [Date]															
	Nearby Boring ID No.	Depth (ft)	USCS Symbol	% Passing No 200 Sieve	Nearby Permeability Test ID No.	Permeability Test Depth (ft)	Average Permeability Coef. (in/hr)					Approximate ROWPP Length with Storage			Relevant Boring ID(s) from Nearby Locations	Relevant Permeability Test ID(s) from Nearby	Stone Column Depth (ft), if applicable		Additional Notes	Recommendation for Survey	Reference ID/Point	Approximate ROWPP Length with Storage			Relevant Boring ID(s) from Nearby Locations	Relevant Permeability Test ID(s) from Nearby Locations	Stone Column Depth (ft), if applicable	Additional Notes	PP panel width (ft)					
												Distance Downstream of Reference (ft)	Distance Upstream of Reference (ft)	Distance Downstream of Reference (ft)								Distance Upstream of Reference (ft)	Distance Downstream of Reference (ft)	Distance Upstream of Reference (ft)						Distance Downstream of Reference (ft)	Distance Upstream of Reference (ft)			
17th Avenue between 65th Street and 66th Street	B-IB2032A	5'-7" 7'-9" 11'-13'	SM GP-GM GP	12.44% 8.42% 0.00%	PT-IB2032A	5 10	3.5434 3.8867	NE	NE	B-IB2032A refusal at 16' bgs Sample 4 not taken	PP2032	Rejected															Water Main Conflict							
	B-2055AA	5'-7" 7'-9" 11'-13' 13'-15'	SM GM SM CL-ML	34.16% 24.30% 39.31% 53.34%	PT-2055AA	5 10	1.3559 0.1463	NE	NE	B-2055AA refusal at 15' bgs Sample 4 taken from 13'-15' High fines at 13'-15'	PP2055	Rejected																Sewer Main Conflict						
						PT-2055A	5 10	0.0503 0.1515	NE	NE																				Low permeability at 5'				
	66th Street between Wallaston Court and 17th Avenue	B-2033-2A	5'-7" 7'-9" 11'-13'	SM GP-GM SM	25.20% 10.81% 20.25%	PT-2033-2A	5 10	0.0210 0.0477	NE	NE	Poor permeability at 5' and 10' B-2033-2A refusal at 15' bgs	PP2033-2	Preliminary (Interim Rejection)																Water Main Conflict					
			B-2033-2E	5'-7" 7'-9" 11'-13' 15'-16.5'	GW-GM GP-GM GP-GM GP-GM	8.70% 6.62% 7.78% 10.49%	PT-2033-2E(1) PT-2033-2E(2)	5 10 5 10	NP 0.1678 0.1165	NE	NE																				Poor permeability at 10' B-2033-2E refusal at 16.5' bgs Sample 4 taken from 15'-16.5' PT-2033-2E(1) refusal at 4' bgs			
						PT-2038B	5 10	0.7520 0.0347																										
B-2033-1A		5'-7" 7'-9" 11'-13' 15'-17'	SM SM SM SM	33.22% 18.59% 27.05% 12.27%	PT-2033-1A	5 10	0.1962 0.0592	NE	NE	Poor permeability at 10' B-2033-1A refusal at 17' bgs	PP2033-1	Rejected																	Water Main Conflict					
66th Street between Cameron Court and Wallaston Court											PP2037																							
66th Street between Ovington Ct and Cameron Ct											PP2036																							
	B-2036B	5'-7" 7'-9" 11'-13' 18'-20'	SW-SM SW-SM GP-GM SP-SM	7.27% 7.14% 10.45% 7.43%	PT-2036B	5 10	0.8406 0.2653	NE	NE		PP2036	Preliminary (For Survey)	2036B	120	20	B-2036B	PT-2036A PT-2036B		1.94%	Preliminary (For Survey)	Storage & Infiltration	2036B	100	75						4				
66th Street between 16th Avenue and Ovington Ct	B-2034B	5'-7" 7'-9" 11'-13'	GP-GM SM SM	10.06% 16.48% 14.43%	PT-2034B	5 10	0.5818 NP	NE	NE	B-2034B Refusal at 15.5' due to dense gravelly sand Only three samples are taken PT-2034B refusal at 6.5' bgs, not reattempted	PP2034																							
17th Avenue between 66th Street and 67th Street	B-IB2039B	5'-7" 7'-9" 11'-13' 15'-16'	SP-SM SM SM SM	10.18% 12.41% 14.45% 13.79%	PT-IB2039B	5 10	0.2782 0.0168	NE	NE	B-IB2039B refusal at 16' bgs, sample 4 taken from 15'-16' Low permeability at 10'	PP2039	Rejected																						
Wallaston Ct between 66th Street and 67th Street	B-IB2041A	5'-7" 7'-9" 11'-13' 18'-20'	CL-ML SM GM CL-ML	65.42% 17.78% 17.22% 53.99%	PT-IB2041A(1) PT-IB2041A(2)	5 10 5 10	0.0000 0.0000 0.0000 0.0000	NE	NE	High fines from 5'-7' and 18'-20' Low permeability at 5' and 10'	PP2041	Preliminary (For Survey)	IB2042B	110	190	B-IB2042B	PT-IB2042B PT-IB2042C		-1.65%	Preliminary (For Survey)	Storage Storage & Infiltration	N/A IB2042B	70 50								4			



Interim Geotechnical Report Summary Table for Permeable Pavement

Sub Area 2

Location	Soil Data (Laboratory Results or Historical Boring Soil Description)				Permeability Analysis			Groundwater Table Depth (ft)	Bedrock Depth (ft)	General Geotechnical Notes	PP ID No.	Consultant Recommendation [Date]							Approximate Street Slope (%)	DEP Recommendation [Date]																																
	Nearby Boring ID No.	Depth (ft)	USCS Symbol	% Passing No 200 Sieve	Nearby Permeability Test ID No.	Permeability Test Depth (ft)	Average Permeability Coef. (in/hr)					Approximate ROWPP Length with Storage			Relevant Boring ID(s) from Nearby Locations	Relevant Permeability Test ID(s) from Nearby	Stone Column Depth (ft), if applicable	Additional Notes		Recommendation for Survey	(Storage & Infiltration/Storage Only)	Approximate ROWPP Length with Storage			Relevant Boring ID(s) from Nearby Locations	Relevant Permeability Test ID(s) from Nearby Locations	Stone Column Depth (ft), if applicable	Additional Notes	PP panel width (ft)																							
												Reference ID/Point	Distance Downstream of Reference (ft)	Distance Upstream of Reference (ft)								Reference ID/Point	Distance Downstream of Reference (ft)	Distance Upstream of Reference (ft)																												
Cameron Ct between 66th Street and 67th Street	B-IB2044A	5'-7"	GM	16.49%	PT-IB2044A	5	0.7213	NE	NE	Low permeability at 10'	PP2043	Preliminary (For Survey)	IB2044A	25	250	B-IB2044A	PT-IB2044A PT-IB2044B			-0.91%	Preliminary (For Survey)	Storage & Infiltration	IB2044A	30	150				4																							
		7'-9"	SW-SM	9.97%																																																
		11'-13"	SM	13.93%																																																
		18'-20"	SW-SM	10.91%																																																
					PT-IB2044B	5	0.0922	NE	NE	Low permeability at 5'	PP2044										Preliminary (For Survey)	Storage & Infiltration	IB2044A	30	150				2																							
Ovington Ct between 66th Street and 67th Street	B-IB2045B	5'-7"	SM	15.34%	PT-IB2045B	5	0.7722	NE	NE	18'-20' sample contains small fragments of plastic	PP2045	Preliminary (For Survey)	IB2045B	50	250	B-IB2045B	PT-IB2045B PT-IB2046A			-0.06%	Preliminary (For Survey)	Storage & Infiltration	IB2045B	60	150				4																							
		7'-9"	SM	12.40%																																																
		11'-13"	GP-GM	11.02%																																																
		18'-20"	SW-SM	8.37%																																																
					PT-IB2046A	5	0.6404	NE	NE		PP2046										Rejected								Water Main Conflict																							
67th St between 17th Avenue and 16th Avenue	B-IB2047B	5'-7"	CL	75.60%	PT-IB2047B	5	0.3628	NE	NE	High fines from 5'-7' Low permeability at 10'	PP2047	Rejected									Rejected								Water Main Conflict																							
		7'-9"	SM	31.73%																																																
		11'-13"	GM	17.81%																																																
		18'-20"	SP-SM	10.64%																																																
																						PP2044-1										Rejected									Water Main Conflict											
											PP2040										Rejected									Water Main Conflict																						
											PP2042.2										Rejected									Water Main Conflict																						
											PP2049										Preliminary (Interim Rejection)									Low plasticity silt above 7' in IB2047B																						
											PP2049-1										Rejected									Conflict with siting criteria																						
17th Avenue between 67 Street and 68 Street											PP2050										Rejected									Sewer Main Conflict																						
											PP2062										Rejected									Sewer Main Conflict																						



Interim Geotechnical Report Summary Table for Permeable Pavement

Sub Area 2

Location	Soil Data (Laboratory Results or Historical Boring Soil Description)				Permeability Analysis			Groundwater Table Depth (ft)	Bedrock Depth (ft)	General Geotechnical Notes	PP ID No.	Consultant Recommendation [Date]							DEP Recommendation [Date]										
	Nearby Boring ID No.	Depth (ft)	USCS Symbol	% Passing No 200 Sieve	Nearby Permeability Test ID No.	Permeability Test Depth (ft)	Average Permeability Coef. (in/hr)					Approximate ROWPP Length with Storage			Relevant Boring ID(s) from Nearby Locations	Relevant Permeability Test ID(s) from Nearby	Stone Column Depth (ft), if applicable	Additional Notes	Approximate Street Slope (%)	Recommendation for Survey	(Storage & Infiltration/Storage Only)	Approximate ROWPP Length with Storage			Relevant Boring ID(s) from Nearby Locations	Relevant Permeability Test ID(s) from Nearby Locations	Stone Column Depth (ft), if applicable	Additional Notes	PP panel width (ft)
												Reference ID/Point	Distance Downstream of Reference (ft)	Distance Upstream of Reference (ft)								Reference ID/Point	Distance Downstream of Reference (ft)	Distance Upstream of Reference (ft)					
68th St between 16th and 17th Avenue	B-2051A(1) B-2051A(2)	1'-3' 3'-5'	SW-SM SM	11.84% 18.16%	PT-2051A	5 10	2.710 0.008	NE	NE	Low permeability at 10'	PP2051																		
	B-2051C(1) B-2051C(2)	1'-3' 3'-5'	SM GM	37.10% 16.53%	PT-2051C	5 10	0.509 0.132	NE	NE																			Water Main Conflict	
					PT-2051G	5 10	0.13 1.125	NE	NE																				
					PT-2051-1A	5 10	0.292 0.017	NE	NE	Low permeability at 10'																			
					PT-2051-1D	5 10	0.411 0.309	NE	NE		PP2051-1																	Water Main Conflict	
	B-1B2051-1F	5'-7' 7'-9' 11'-13' 18'-20'	SM SM SM SM	12.95% 14.03% 15.79% 16.14%	PT-1B2051-1F	5 10	0.53 0.912	NE	NE																				
					PT-1B2051-1G	5 10	0.629 0.422	NE	NE																				
					PT-2051-1H	5 10	2.886 0.025	NE	NE	Low permeability at 10'																			
												PP3100																	
												PP3101																	

DEP Contract [Contract]
 DEP Project: [Project Description]
 Prepared By: [Consultant/Sub Name]

NYC Department of Environmental Protection
 Bureau of Environmental Planning and Analysis -- Green Infrastructure
 Borough of X, New York



Geotechnical Report Summary Table for ROW GI Practices (Excluding Permeable Pavement)

Package 2

GI ID No.	Soil Data (Laboratory Results or Historical Boring Soil Description)				Permeability Analysis			Groundwater Table Depth (ft)	Bedrock Depth (ft)	General Geotechnical Notes	Additional Notes
	Nearest Boring ID No.	Depth (ft)	USCS Symbol	% Passing No 200 Sieve	Nearest Permeability Test ID No.	Permeability Test Depth (ft)	Average Permeability Coef. (in/hr)				
2017a	0921-31	0-0.5	Concrete		PT-2017a (1)	5	0.00	31.4	NE		
		0.5-24	F-M Brown sand, trace silt, trace gravel (SP)			10	0.26				
		24-51.5	Fine brown sand, trace silt (SP)		PT-2017a (2)	5	6.01				
2022a	B-2022a	5-7	SP-SM	5.5%	PT-2022a	5	0.23	NE	NE		
		7-9	SP-SM	6.4%		10	0.09				
		11-13	SP	2.7%							
		18-20	SP	4.2%							
2022b	B-2022a	5-7	SP-SM	5.5%	PT-2022a	5	0.23	NE	NE		
		7-9	SP-SM	6.4%		10	0.09				
		11-13	SP	2.7%							
		18-20	SP	4.2%							
2022c	B-2022c	5-7	SP	4.5%	PT-2022c	5	0.07	NE	NE	Organic clay was encountered at 9'	
		7-9	SP	1.9%		10	2.32				
		11-13	SP	1.3%							
		18-20	SP	1.7%							
2199b	B-2199b	3-5	SP	3.5%	PT-2199b	3	1.29	8	NE	Shallow GWT was encountered at 8ft and shallow Geotechnical procedure was followed	
		5-7	SP	1.3%		6	2.61				
		7-9	SP	2.9%							
2199c	B-2199b	3-5	SP	3.5%	PT-2199b	3	1.29	8	NE		
		5-7	SP	1.3%		6	2.61				
		7-9	SP	2.9%							
IB2221a	B-IB2221a(1)	5-7	SP	1.5%	PT-IB2221a	5	0.28	NE	NE	Refusal at 9' in boring. Moved to offset location.	
		7-9	SP	1.7%		10	1.47				
	B-IB2221a(2)	11-13	SP	1.8%							
		18-20	SP	1.9%							
2210a	B-2210a	5-7	SC	28.0%	PT-2210a	5	4.23	NE	NE		
		7-9	SP	1.9%		10	0.43				
		11-13	SP	3.3%							
		18-20	SP	2.2%							
2210b	B-2210b	5-7	SC	10.0%	PT-2110b(1)	5	0.00	NE	NE		
		7-9	SP	15.0%		10	2.82				
		11-13	SP	3.1%	PT-2110b(2)	5	0.05				
		18-20	SP	2.5%							
2222a	Reserved	-	-	-	-	-	-	-	-	-	Due to new construction asset was not drilled
		-	-	-		-	-				
		-	-	-		-	-				
		-	-	-		-	-				
2177a	B-2177a	5-7	SP	5.0%	PT-2177a(1)	5	RI	NE	NE		
		7-9	SP	1.2%		10	1.46				
		11-13	SP	1.1%	PT-2177a(2)	5	5.40				
		18-20	SP	1.2%							

2177b	Rejected	-	-	-	-	-	-	-	-	-	-	Due to utility conflict asset was rejected without geotech investigation
		-	-	-	-	-	-	-	-	-	-	
		-	-	-	-	-	-	-	-	-	-	
		-	-	-	-	-	-	-	-	-	-	
GS2216a	B-GS2216a	5-7	SM	21.8%	PT-GS2216a (1)	5	NP					
		7-9	SP	1.4%		10	3.91	NE	NE			Refusal at 5' PT test both at original and offset location
		11-13	SP	3.9%	PT-GS2216a (2)	5	NP					
		18-20	SP	3.5%								
GS2216b	B-GS2216a	5-7	SM	21.8%	PT-GS2216b	5	0.07					
		7-9	SP	1.4%		10	1.23	NE	NE			
		11-13	SP	3.9%								
		18-20	SP	3.5%								

See 'Notes' for specific instructions on using template

of sites submitted:

14

DEP Contract ID:
 DEP Project:
 Prepared By:

[Contract]
 [Project Description]
 [Consultant/Sub Name]

NYC Department of Environmental Protection
 Bureau of Environmental Planning and Analysis -- Green Infrastructure
 Borough of X, New York

Geotechnical Report Summary Table for Permeable Pavement

Sub Area 2

Location	Soil Data (Laboratory Results or Historical Boring Soil Description)				Permeability Analysis			Groundwater Table Depth (ft)	Bedrock Depth (ft)	General Geotechnical Notes	PP ID No.	
	Nearby Boring ID No.	Depth (ft)	USCS Symbol	% Passing No 200 Sieve	Nearby Permeability Test ID No.	Permeability Test Depth (ft)	Average Permeability Coef. (in/hr)					
64th Street between 15th Avenue and 16th Avenue					PT-GS2001A(1)	5	3.5609	NE	NE	PT-GS2001A(1) Refusal at 5.5' bgs	PP2001	
						10	NP			PT-GS2001A(2) Refusal at 6' bgs		
					PT-GS2001A(2)	10	NP					
					PT-GS2001B(1)	5	0.6331	NE	NE	PT-GS2001B(1) Refusal at 6.5' bgs		
						10	NP			PT-GS2001B(2) Refusal at 6' bgs		
					PT-GS2001B(2)	10	NP					
					PT-IB2001-1B	5	0.0111	NE	NE		PP2001-1	
						10	0.0051					
		B-IB2001-1C	5'-7'	CL-ML	61.6%	PT-IB2001-1C	5	0.0151	NE	NE		B-IB2001-1C refusal at 17' bgs
			7'-9'	GM	21.1%		10	0.0051				Sample 4 taken from 15'-17'
			11'-13'	SM	37.9%							Poor permeability at 5' and 10'
			15'-17'	SM	31.4%							High fines throughout
						PT-IB2001-1D	5	0.0740	NE	NE		
							10	0.1008				
		B-IB2001-1E	5'-7'	CL	92.91%	PT-IB2001-1E	5	0.0273	NE	NE		High fines 5'-9'
			7'-9'	CL	88.73%		10	0.0279				
			11'-13'	SW-SM	8.93%							
			18'-20'	SM	15.50%							
		B-2002B	5'-7'	SP-SM	10.38%	PT-2002B	5	0.5077	NE	NE	B-2002B refusal at 17' bgs	PP2002
			7'-9'	GM	12.51%		10	0.0864			Sample 4 not taken	
			11'-13'	SM	15.82%						Poor permeability at 10'	
					PT-GS2002-1B	5	0.0158	NE	NE	Poor permeability at 5'	PP2002-1	
						10	0.6825					
					PT-2002-1D	5	0.0125	NE	NE	Poor permeability at 5' and 10'		
						10	0.0108					
					PT-IB2002-1E	5	0.0691	NE	NE	Poor permeability at 5' and 10'		
						10	0.0057					
	B-IB2002-1F	5'-7'	ML	76.20%	PT-IB2002-1F	5	0.1347	NE	NE	Poor permeability at 10'	PP2002-1	
		7'-9'	GM	23.66%		10	0.0056			B-IB2002-1F refusal at 17' bgs		
		11'-13'	SM	28.80%						Sample 4 taken from 15'-17'		
		15'-17'	GM	20.65%						High fines 5'-7'		

DEP Contract ID:
 DEP Project:
 Prepared By:

[Contract]
 [Project Description]
 [Consultant/Sub Name]

NYC Department of Environmental Protection
 Bureau of Environmental Planning and Analysis -- Green Infrastructure
 Borough of X, New York

Geotechnical Report Summary Table for Permeable Pavement

Sub Area 2

Location	Soil Data (Laboratory Results or Historical Boring Soil Description)				Permeability Analysis			Groundwater Table Depth (ft)	Bedrock Depth (ft)	General Geotechnical Notes	PP ID No.	
	Nearby Boring ID No.	Depth (ft)	USCS Symbol	% Passing No 200 Sieve	Nearby Permeability Test ID No.	Permeability Test Depth (ft)	Average Permeability Coef. (in/hr)					
15th Avenue between 64th Street and 65th Street	B-IB2003A	5'-7'	SM	21.66%	PT-IB2003A	5	0.0214	NE	NE	Poor permeability at 5' and 10'	PP2003	
		7'-9'	SP-SM	8.40%		10	0.0185					
		11'-13'	SM	13.85%								
		18'-20'	GM	17.30%								
					PT-IB2003B	5	0.2333	NE	NE			
						10	0.9571					
					PT-IB2004B	5	2.3771	NE	NE	Poor permeability at 10'		
						10	0.1128					
		B-IB2004C	5'-7'	SP-SM	7.51%	PT-IB2004C	5	5.9115	NE	NE	B-IB2004C refusal at 15.5' bgs	PP2004
			7'-9'	SW-SM	8.12%		10	0.1068			Sample 4 not taken	
			11'-13'	GW-GM	9.14%						Poor permeability at 10'	
						PT-IB2004D	5	0.2778	NE	NE		
						10	0.0294					
15th Avenue between 65th Street and 66th Street	B-2005A	5'-7'	SM	16.62%	PT-2005A	5	0.7199	NE	NE	B-2005A refusal at 18.5' bgs	PP2005	
		7'-9'	SM	14.10%		10	0.0805					Sample 4 taken from 18'-18.5'
		11'-13'	GP-GM	9.52%								Poor permeability at 10'
		18'-18.5'	SW-SM	10.29%								
					PT-2005B	5	4.9920	NE	NE			
						10	1.1935					
					PT-2005D	5	0.2295	NE	NE			
						10	1.3446					
					PT-IB2006A	5	0.2291	NE	NE		PT-IB2006A refusal at 6', not reattempted due to inspector error	PP2006
						10	NP					
					PT-IB2006B	5	0.1045	NE	NE	Poor permeability at 5'		
						10	0.8634					
	B-2006C	5'-7'	CL-ML	70.70%	PT-2006C	5	0.3965	NE	NE	Sample 2 taken from 9'-11'		
		9'-11'	SM	13.33%		10	12.4876			High fines 5'-7'		
		11'-13'	SW-SM	10.07%								
		18'-20'	SM	12.14%								

DEP Contract ID:
 DEP Project:
 Prepared By:

[Contract]
 [Project Description]
 [Consultant/Sub Name]

NYC Department of Environmental Protection
 Bureau of Environmental Planning and Analysis -- Green Infrastructure
 Borough of X, New York

Geotechnical Report Summary Table for Permeable Pavement

Sub Area 2

Location	Soil Data (Laboratory Results or Historical Boring Soil Description)				Permeability Analysis			Groundwater Table Depth (ft)	Bedrock Depth (ft)	General Geotechnical Notes	PP ID No.	
	Nearby Boring ID No.	Depth (ft)	USCS Symbol	% Passing No 200 Sieve	Nearby Permeability Test ID No.	Permeability Test Depth (ft)	Average Permeability Coef. (in/hr)					
15th Avenue between 66th Street and 67th Street											PP2010	
											PP2011	
66th Street between 15th Avenue and Duryea Court	B-2012B	5'-7'	SM	33.50%	PT-2012B	5	0.0097	NE	NE	Poor permeability at 5'	PP2012	
		7'-9'	SP-SM	5.41%		10	0.9818					
		11'-13'	SW-SM	11.88%								
		18'-20'	SW-SM	11.74%								
					PT-2012D	5	0.8842	NE	NE			
						10	1.7160					
					PT-IB2012E	5	0.2610	NE	NE	Poor permeability at 10'		
						10	0.0574					
												PP2012-1
		B-IB2013A	5'-7'	SW-SM	8.96%	PT-IB2013A	5	0.0125	NE	NE	Poor permeability at 5'	PP2013
			7'-9'	SP-SM	6.13%		10	0.1337				
			11'-13'	SP-SM	7.99%						B-IB2013A refusal at 15' bgs Sample 4 taken from 13'-15'	
		13'-15'	SM	12.56%								
					PT-2013-1A	5	0.1607	NE	NE	Poor permeability at 10'	PP2013-1	
						10	0.0064					
	B-2013-1C	5'-7'	SC-SM	46.94%	PT-2013-1C	5	0.6096	NE	NE	Poor permeability at 10'		
		7'-9'	SP-SM	6.03%		10	0.1022					
		11'-13'	SM	16.88%								
		18'-20'	GP-GM	10.21%								

DEP Contract ID:

[Contract]

DEP Project:

[Project Description]

Prepared By:

[Consultant/Sub Name]

Geotechnical Report Summary Table for Permeable Pavement

Sub Area 2

Location	Soil Data (Laboratory Results or Historical Boring Soil Description)				Permeability Analysis			Groundwater Table Depth (ft)	Bedrock Depth (ft)	General Geotechnical Notes	PP ID No.	
	Nearby Boring ID No.	Depth (ft)	USCS Symbol	% Passing No 200 Sieve	Nearby Permeability Test ID No.	Permeability Test Depth (ft)	Average Permeability Coef. (in/hr)					
66th Street between Duryea Court and 16th Avenue					PT-IB2027A	5	2.1237	NE	NE	Infer boring data from 2028B	PP2027	
						10	0.2830			B-2028B refusal at 18.5' bgs		
										Sample 4 from 18'-18.5'		
		B-2028B	5'-7'	SM	18.64%	PT-2028B	5	0.8702	NE	NE	B-2028B refusal at 18.5' bgs	PP2028
			7'-9'	SM	15.90%		10	0.1360			Sample 4 from 18'-18.5'	
			11'-13'	SM	16.26%							
			18'-18.5'	SM	13.88%							
						PT-2028D	5	0.0128	NE	NE	Poor permeability at 5' and 10'	
							10	0.0271				
	B-2028E	5'-7'	CL-ML	81.26%	PT-2028E	5	0.0161	NE	NE	B-2028E refusal at 19' bgs		
		7'-9'	SC-SM	42.78%		10	1.5549			Sample 4 taken from 18'-19'		
		11'-13'	SC-SM	41.60%						Poor permeability at 5'		
		18'-19'	SM	35.75%						High fines throughout		
Duryea Court between 66th Street and 67th Street	B-IB2014A	5'-7'	SM	22.48%	PT-IB2014A	5	0.0585	NE	NE	Poor permeability at 5'	PP2014	
		7'-9'	SW-SM	9.76%		10	0.2739					
		11'-13'	SM	12.72%								
		18'-20'	SM	14.64%								
		B-IB2015A	5'-7'	SM	14.78%	PT-IB2015A	5	1.8835	NE	NE	B-IB2015A refusal at 16' bgs	PP2015
		7'-9'	SM	12.97%		10	0.3265			Sample 4 taken from 15'-16'		
		11'-13'	SM	16.09%								
		15'-16'	SP-SM	8.61%								
67th St between New Utrecht Avenue and 16th Avenue					PT-IB2048A	5	0.1632	NE	NE	Low permeability at 10'	PP2048	
						10	0.0729					
		B-2048C	5'-7'	SW-SM	9.08%	PT-2048C	5	0.3919	NE	NE	Low permeability at 10'	PP2016
			7'-9'	SM	13.19%		10	0.0476				
			11'-13'	SW-SM	11.10%							
			18'-20'	SW-SM	8.02%							
		B-GS2016A	5'-7'	ML	56.13%	PT-GS2016A	5	0.0058	NE	NE	B-GS2016A refusal at 18' bgs	PP2016
			7'-9'	SM	29.28%		10	0.0224			Sample 4 taken from 17'-18'	
			11'-13'	SM	30.86%						Poor permeability at 5' and 10'	
			17'-18'	SM	20.29%						High fines 5'-7'	
		B-IB2016C	5'-7'	SM	27.39%	PT-IB2016C	5	2.0675	NE	NE	Poor permeability at 10'	
			7'-9'	ML	56.24%		10	0.0131			High fines 7'-9'	
			11'-13'	SM	27.79%							
		18'-20'	SM	24.14%								
	B-GS2017B	5'-7'	CL-ML	82.20%	PT-GS2017B	5	0.2760	NE	NE	B-GS2017B refusal at 18' bgs	PP2017	
		7'-9'	GM	18.44%		10	0.0000			Sample 4 taken from 17'-18'		
		11'-13'	SM	17.45%						Poor permeability at 10'		
		17'-18'	SM	17.08%						High fines 5'-7'		

DEP Contract ID:
 DEP Project:
 Prepared By:

[Contract]
 [Project Description]
 [Consultant/Sub Name]

NYC Department of Environmental Protection
 Bureau of Environmental Planning and Analysis -- Green Infrastructure
 Borough of X, New York

Geotechnical Report Summary Table for Permeable Pavement

Sub Area 2

Location	Soil Data (Laboratory Results or Historical Boring Soil Description)				Permeability Analysis			Groundwater Table Depth (ft)	Bedrock Depth (ft)	General Geotechnical Notes	PP ID No.	
	Nearby Boring ID No.	Depth (ft)	USCS Symbol	% Passing No 200 Sieve	Nearby Permeability Test ID No.	Permeability Test Depth (ft)	Average Permeability Coef. (in/hr)					
15th Avenue between 67th Street and Ovington Avenue	B-1095C	5'-7'	SC-SM	18.4%	PT-1095C	5	2.0586	NE	NE	Poor permeability at 10'	PP1095	
		7'-9'	SM	20.1%		10	0.0453					
		11'-13'	SM	12.2%								
		18'-20'	SP-SM	5.9%								
		B-2019A	5'-7'	SC-SM	14.06%	PT-2019A	5	2.2835	NE	NE	Poor permeability at 10'	PP2019
			7'-9'	SM	15.45%		10	0.1085				
			11'-13'	SM	13.06%							
			18'-20'	SM	24.02%							
		B-2019B	5'-7'	CL-ML	53.21%	PT-2019B	5	1.7836	NE	NE	B-2019B refusal at 17' bgs Sample 4 taken from 15'-17' High fines 5'-7'	PP2019
			7'-9'	SP	2.05%		10	0.2011				
			11'-13'	SM	12.15%							
			15'-17'	SM	18.41%							
					PT-2019D	5	3.0804	NE	NE	Poor permeability at 10'	PP2019	
						10	0.0295					
New Utrecht Avenue between 68th Street and Ovington Avenue											PP2021	
											PP2018	
											PP2020.2	
Ovington Avenue between 15th Avenue and New Utrecht Avenue	B-3045B	3'-5'	SM	16.00%	PT-3045B	3	0.021	NE	NE	Low permeability at 3'	PP3045	
		5'-7'	SW-SM	11.90%		6	0.591					
					PT-IB2020A(1)	5	0.252	NE	NE	Poor permeability at 10'	PP2020.1	
						10	0.000					
					PT-IB2020A(2)	10	0.082					

DEP Contract ID:
 DEP Project:
 Prepared By:

[Contract]
 [Project Description]
 [Consultant/Sub Name]

NYC Department of Environmental Protection
 Bureau of Environmental Planning and Analysis -- Green Infrastructure
 Borough of X, New York

Geotechnical Report Summary Table for Permeable Pavement

Sub Area 2

Location	Soil Data (Laboratory Results or Historical Boring Soil Description)				Permeability Analysis			Groundwater Table Depth (ft)	Bedrock Depth (ft)	General Geotechnical Notes	PP ID No.			
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Ovington avenue between New Utrecht avenue and 16th Avenue	B-3048A	3'-5'	SW-SM	10.20%	PT-3048A	3	6.839	NE	NE	Low permeability at 6'	PP3048			
		5'-7'	SW-SM	7.10%		6	0.063							
	B-GS3048C	3'-5'	SP	4.50%	PT-GS3048C	3	3.432	NE	NE			PP3048		
		5'-7'	SP-SM	7.80%		6	0.679							
	B-GS2022A	5'-7'	SM	18.02%	PT-GS2022A	5	0.671	NE	NE	B-GS2022A refusal at 18' bgs Sample 4 taken from 17'-18'			PP2022	
		7'-9'	SP-SM	8.97%		10	0.398							
		11'-13'	SP-SM	9.65%	PT-IB2022B	5	2.629	NE	NE	Poor permeability at 10'	PP2022			
		17'-18'	SM	19.17%		10	0.081							
					PT-GS2022C	5	0.619	NE	NE			PP2022		
						10	1.216							
	16th Avenue and 67th Street and 68th Street													PP2023
														PP2024
16th Avenue between 66th Street and 67th Street											PP2025			
	B-2026A	5'-7'	SP-SM	9.37%	PT-2026A	5	0.5234	NE	NE		PP2026			
		7'-9'	SM	15.84%		10	0.3650							
		11'-13'	SW-SM	6.60%										
		18'-20'	GW-GM	8.89%										

DEP Contract ID:
 DEP Project:
 Prepared By:

[Contract]
 [Project Description]
 [Consultant/Sub Name]

NYC Department of Environmental Protection
 Bureau of Environmental Planning and Analysis -- Green Infrastructure
 Borough of X, New York

Geotechnical Report Summary Table for Permeable Pavement

Sub Area 2

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	Nearby Boring ID No.	Depth (ft)	USCS Symbol	% Passing No 200 Sieve	Nearby Permeability Test ID No.	Permeability Test Depth (ft)	Average Permeability Coef. (in/hr)					
65th Street between 16th Avenue and 17th Avenue	B-2030-1A	5'-7'	GM	17.15%	PT-2030-1A	5	0.0458	NE	NE	PT-2030-1A refusal at 6.5', not reattempted Poor permeability at 5'	PP2030-1 GKOH15-04	
		7'-9'	GP-GM	11.28%		10	NP					
		11'-13'	SM	26.01%								
		18'-20'	SM	14.02%								
	B-IB2030-1B	5'-7'	GM	38.67%	PT-IB2030-1B	5	0.0176	NE	NE	Poor permeability at 5'		
		7'-9'	GM	14.75%		10	0.1502			B-IB2030-1B no recovery at 9'-11'		
		11'-13'	GM	18.06%						Sample 3 taken from 11'-13'		
		18'-20'	GM	13.20%								
	B-2030-1C	5'-7'	CL-ML	55.68%	PT-2030-1C	5	0.0239	NE	NE	B-2030-1C refusal at 16' bgs		
		7'-9'	SM	30.02%		10	0.3557			Sample 4 taken from 15'-16'		
		11'-13'	GM	14.00%						High fines 5'-7'		
		15'-16'	SM	17.07%						Poor permeability at 5'		
					PT-3105A(1)	5	0.0000	NE	NE	5' PT attempt had no infiltration; offset completed.		
					PT-3105A(1)	10	0.0690					
					PT-3105A(2)	5	2.5384					
					PT-3105A(2)	10	NP					
		B-3105B(1)	5'-7'	SM/SC	30.27%	PT-3105B(1)	5	0.1444	NE	NE	PP3105 GKOH15-03	
			7'-9'	SM/SC	42.93%	PT-3105B(1)	10	0.7363				
			11'-13'	SP-SM/SC	10.04%							
			18'-20'	SW-SM/SC	7.76%							
				PT-3105C(1)	5	0.4405	NE	NE				
				PT-3105C(1)	10	1.0507						
	B-3105E(1)	5'-7'	SM/SC	17.21%	PT-3105E(1)	5	0.0424	NE	NE			
		7'-9'	SW-SM/SC	9.96%	PT-3105E(1)	10	0.6456					
		11'-13'	SM/SC	15.65%								
		18'-20'	SP-SM/SC	10.49%								
	B-3105G(1)	5'-7'	SM/SC	15.27%	PT-3105G(1)	5	0.0000	NE	NE	SB terminated at 15' due to refusal		
		7'-9'	GP-GM/GC	11.11%	PT-3105G(1)	10	0.1092			First 5' PT attempt had no infiltration; offset completed.		
		11'-13'	SM/SC	14.33%	PT-3105G(2)	5	0.0721					
					PT-3105G(2)	10	NP					
	B-3105H(1)	5'-7'	GM/GC	16.40%	PT-3105H(1)	5	0.2488	NE	NE			
		7'-9'	SW-SM/SC	9.84%	PT-3105H(1)	10	0.0264					
		11'-13'	SM/SC	14.61%								
		18'-20'	SM/SC	18.33%								
17th Avenue between 65th Street and 66th Street	B-IB2032A	5'-7'	SM	12.44%	PT-IB2032A	5	3.5434	NE	NE	B-IB2032A refusal at 16' bgs	PP2032	
		7'-9'	GP-GM	8.42%		10	3.8867			Sample 4 not taken		
		11'-13'	GP	0.00%								
		B-2055AA	5'-7'	SM	34.16%	PT-2055AA	5	1.3559	NE	NE	B-2055AA refusal at 15' bgs	PP2055
			7'-9'	GM	24.30%		10	0.1463			Sample 4 taken from 13'-15'	
			11'-13'	SM	39.31%						High fines at 13'-15'	
			13'-15'	CL-ML	53.34%							
					PT-2055A	5	0.0503	NE	NE	Low permeability at 5'		
					10	0.1515						

DEP Contract ID:
 DEP Project:
 Prepared By:

[Contract]
 [Project Description]
 [Consultant/Sub Name]

NYC Department of Environmental Protection
 Bureau of Environmental Planning and Analysis -- Green Infrastructure
 Borough of X, New York

Geotechnical Report Summary Table for Permeable Pavement

Sub Area 2

Location	Soil Data (Laboratory Results or Historical Boring Soil Description)				Permeability Analysis			Groundwater Table Depth (ft)	Bedrock Depth (ft)	General Geotechnical Notes	PP ID No.
	Nearby Boring ID No.	Depth (ft)	USCS Symbol	% Passing No 200 Sieve	Nearby Permeability Test ID No.	Permeability Test Depth (ft)	Average Permeability Coef. (in/hr)				
66th Street between Wallaston Court and 17th Avenue	B-2033-2A	5'-7'	SM	25.20%	PT-2033-2A	5	0.0210	NE	NE	Poor permeability at 5' and 10' B-2033-2A refusal at 15' bgs	PP2033-2
		7'-9'	GP-GM	10.81%		10	0.0477				
		11'-13'	SM	20.25%							
	B-2033-2E	5'-7'	GW-GM	8.70%	PT-2033-2E(1)	5	NP	NE	NE	Poor permeability at 10' B-2033-2E refusal at 16.5' bgs Sample 4 taken from 15'-16.5' PT-2033-2E(1) refusal at 4' bgs	
		7'-9'	GP-GM	6.62%		10	NP				
		11'-13'	GW-GM	7.78%	PT-2033-2E(2)	5	0.1678				
		15'-16.5'	GP-GM	10.49%		10	0.1165				
					PT-2038B	5	0.7520				
					10	0.0347					
66th Street between Cameron Court and Wallaston Court	B-2033-1A	5'-7'	SM	33.22%	PT-2033-1A	5	0.1962	NE	NE	Poor permeability at 10' B-2033-1A refusal at 17' bgs	PP2033-1
		7'-9'	SM	18.59%		10	0.0592				
		11'-13'	SM	27.05%							
		15'-17'	SM	12.27%							
										PP2037	
66 Street between Ovington Ct and Cameron Ct											PP2033
					PT-IB2036A	5	0.6743	NE	NE		PP2036
						10	0.2042				
		B-2036B	5'-7'	SW-SM	7.27%	PT-2036B	5	0.8406	NE	NE	
			7'-9'	SW-SM	7.14%		10	0.2653			
		11'-13'	GP-GM	10.45%							
		18'-20'	SP-SM	7.43%							
66 Street between 16th avenue and Ovington Ct	B-2034B	5'-7'	GP-GM	10.06%	PT-2034B	5	0.5818	NE	NE	B-2034B Refusal at 15.5' due to dense gravelly sand Only three samples are taken PT-2034B refusal at 6.5' bgs, not reattempted	PP2034
		7'-9'	SM	16.48%		10	NP				
		11'-13'	SM	14.43%							
					PT-2035A	5	0.7289	NE	NE		
						10	0.1525				

DEP Contract ID:
 DEP Project:
 Prepared By:

[Contract]
 [Project Description]
 [Consultant/Sub Name]

NYC Department of Environmental Protection
 Bureau of Environmental Planning and Analysis -- Green Infrastructure
 Borough of X, New York

Geotechnical Report Summary Table for Permeable Pavement

Sub Area 2

Location	Soil Data (Laboratory Results or Historical Boring Soil Description)				Permeability Analysis			Groundwater Table Depth (ft)	Bedrock Depth (ft)	General Geotechnical Notes	PP ID No.	
	Nearby Boring ID No.	Depth (ft)	USCS Symbol	% Passing No 200 Sieve	Nearby Permeability Test ID No.	Permeability Test Depth (ft)	Average Permeability Coef. (in/hr)					
17th Avenue between 66th Street and 67th Street	B-IB2039B	5'-7'	SP-SM	10.18%	PT-IB2039B	5	0.2782	NE	NE	B-IB2039B refusal at 16' bgs, sample 4 taken from 15'-16'	PP2039	
		7'-9'	SM	12.41%		10	0.0168					Low permeability at 10'
		11'-13'	SM	14.45%								
		15'-16'	SM	13.79%								
						PT-2058A	5	0.0000	NE	NE	Low permeability at 5' and 10'	PP2058
							10	0.0000				
					PT-2058B	5	0.0000	NE	NE	Low permeability at 5' and 10'	PP2058	
						10	0.0034					
Wallaston Ct between 66th Street and 67th Street	B-IB2041A	5'-7'	CL-ML	65.42%	PT-IB2041A(1)	5	0.0000	NE	NE	High fines from 5'-7' and 18'-20'	PP2041	
		7'-9'	SM	17.78%		10	0.0000					Low permeability at 5' and 10'
		11'-13'	GM	17.22%		5	0.0000					
		18'-20'	CL-ML	53.99%		10	0.0000					
						PT-IB2042A	5	0.7753	NE	NE	Low permeability at 10'	PP2042.1
							10	0.0062				
	B-IB2042B	5'-7'	SM	14.62%	PT-IB2042B	5	2.2018	NE	NE	Low permeability at 10'	PP2042.1	
		7'-9'	SW-SM	8.55%		10	0.0380					
		11'-13'	SW-SM	7.93%								
		18'-20'	SM	12.24%								
B-IB2042C	5'-7'	SW-SM	9.03%	PT-IB2042C	5	2.1572	NE	NE	Low permeability at 10'	PP2042.1		
	7'-9'	SW-SM	10.68%		10	0.0231						
	11'-13'	SP-SM	5.93%									
	18'-20'	SM	13.40%									
Cameron Ct between 66th Street and 67th Street	B-IB2044A	5'-7'	GM	16.49%	PT-IB2044A	5	0.7213	NE	NE	Low permeability at 10'	PP2043	
		7'-9'	SW-SM	9.97%		10	0.0144					
		11'-13'	SM	13.93%								
		18'-20'	SW-SM	10.91%								
						PT-IB2044B	5	0.0922	NE	NE	Low permeability at 5'	PP2044
							10	0.3487				

DEP Contract ID:
 DEP Project:
 Prepared By:

[Contract]
 [Project Description]
 [Consultant/Sub Name]

NYC Department of Environmental Protection
 Bureau of Environmental Planning and Analysis -- Green Infrastructure
 Borough of X, New York

Geotechnical Report Summary Table for Permeable Pavement

Sub Area 2

Location	Soil Data (Laboratory Results or Historical Boring Soil Description)				Permeability Analysis			Groundwater Table Depth (ft)	Bedrock Depth (ft)	General Geotechnical Notes	PP ID No.
	Nearby Boring ID No.	Depth (ft)	USCS Symbol	% Passing No 200 Sieve	Nearby Permeability Test ID No.	Permeability Test Depth (ft)	Average Permeability Coef. (in/hr)				
Ovington Ct between 66th Street and 67th Street	B-IB2045B	5'-7'	SM	15.34%	PT-IB2045B	5	0.7722	NE	NE	18'-20' sample contains small fragments of plastic	PP2045
		7'-9'	SM	12.40%		10	0.9709				
		11'-13'	GP-GM	11.02%							
		18'-20'	SW-SM	8.37%							
						PT-IB2046A	5	0.6404	NE	NE	
						10	0.5609				
67th St between 17th Avenue and 16th Avenue	B-IB2047B	5'-7'	CL	75.60%	PT-IB2047B	5	0.3628	NE	NE	High fines from 5'-7' Low permeability at 10'	PP2047
		7'-9'	SM	31.73%		10	0.0063				
		11'-13'	GM	17.81%							
		18'-20'	SP-SM	10.64%							
17th Avenue between 67 Street and 68 Street											PP2050
											PP2062

DEP Contract ID:
 DEP Project:
 Prepared By:

[Contract]
 [Project Description]
 [Consultant/Sub Name]

NYC Department of Environmental Protection
 Bureau of Environmental Planning and Analysis -- Green Infrastructure
 Borough of X, New York

Geotechnical Report Summary Table for Permeable Pavement

Sub Area 2

Location	Soil Data (Laboratory Results or Historical Boring Soil Description)				Permeability Analysis			Groundwater Table Depth (ft)	Bedrock Depth (ft)	General Geotechnical Notes	PP ID No.	
	Nearby Boring ID No.	Depth (ft)	USCS Symbol	% Passing No 200 Sieve	Nearby Permeability Test ID No.	Permeability Test Depth (ft)	Average Permeability Coef. (in/hr)					
68th St between 16th and 17th Avenue	B-2051A(1)				PT-2051A	5	2.710	NE	NE	Low permeability at 10'	PP2051	
	B-2051A(2)	1'-3'	SW-SM	11.84%		10	0.008					
		3'-5'	SM	18.16%								
	B-2051C(1)				PT-2051C	5	0.509	NE	NE			
	B-2051C(2)	1'-3'	SM	37.10%		10	0.132					
		3'-5'	GM	16.53%								
					PT-2051G	5	0.13	NE	NE			
						10	1.125					
					PT-2051-1A	5	0.292	NE	NE	Low permeability at 10'	PP2051-1	
						10	0.017					
					PT-2051-1D	5	0.411	NE	NE			
						10	0.309					
		B-IB2051-1F	5'-7'	SM	12.95%	PT-IB2051-1F	5	0.53	NE	NE		
			7'-9'	SM	14.03%		10	0.912				
			11'-13'	SM	15.79%							
			18'-20'	SM	16.14%							
					PT-IB2051-1G	5	0.629	NE	NE			
						10	0.422					
				PT-2051-1H	5	2.886	NE	NE	Low permeability at 10'	PP3100		
					10	0.025						
										PP3101		

COMPANY NAME/LOGO			Boring ID No. B- XXXX		
Prepared for: AGENCY NAME / LOGO			PROJECT: <contract area or project description>		
INSPECTOR: <name>			LOCATION / BOROUGH: <borough>		
CONTRACTOR: <name>			DRILLER: <name>		
P.E./REP.: <name>			HELPER: <name>		
Total Boring Depth: <##> ft			Start Date: <date>		
Rig Type: <type>			Weather: <weather>		
Drill Bit Type: <type>			Weight of Hammer for casing: <##> lbs		
Casing Inner Diameter: 4 in			Weight of Hammer for spoon: <##> lbs		
Depth of Casing: <##> ft			Type of Hammer: <type>		
Depth to Groundwater Table (bgs): <##> ft			Drop: 30 in		
Depth to Bedrock (bgs): <##> ft			Split Spoon Diameter: 2 in		


B- XXXX BORING LOG

Depth Below Ground Surface (ft)	Soil Description (Field Observations)	SPT Blows per 6"	N Value	Recovery Length (inches)	Remarks
0					
5	Bulk Sample 1 (S1)				
	Bulk Sample 2 (S2)				
10	Bulk Sample 3 (S3)				
15					
20	Bulk Sample 4 (S4)				

Boring terminated at 20 feet below ground surface unless otherwise instructed.

Latitude: <latitude> Longitude: <longitude>

Inspector's Remarks:

COMPANY NAME/LOGO		Boring ID No. B- XXXX	
Prepared for: AGENCY NAME / LOGO			
PROJECT: <contract area or project description>		LOCATION / BOROUGH: <borough>	
INSPECTOR: <name>	DRILLER: <name>	Start Date: <date>	Weather: <weather>
CONTRACTOR: <name>	HELPER: <name>	Start Time: <time>	
P.E./REP.: <name>			
Total Boring Depth: <##> ft	Drill Bit Type: <type>	Weight of Hammer for casing: <##> lbs	
Rig Type: <type>	Casing Inner Diameter: 4 in	Weight of Hammer for spoon: <##> lbs	
	Depth of Casing: <##> ft	Type of Hammer: <type>	
Depth to Groundwater Table (bgs): <##> ft		Drop: 30 in	
Depth to Bedrock (bgs): <##> ft		Split Spoon Diameter: 2 in	


B- XXXX BORING LOG

Depth Below Ground Surface (ft)	Soil Description (Field Observations)	SPT Blows per 6"	N Value	Recovery Length (inches)	Remarks
0					
3	Bulk Sample 1 (S1)				
6					
9	Bulk Sample 2 (S2)				

Boring terminated at 9 feet below ground surface unless otherwise instructed.

Latitude: <latitude> Longitude: <longitude>

Inspector's Remarks:

COMPANY NAME/LOGO		Boring ID No. B- XXXX	
Prepared for: AGENCY NAME / LOGO		PROJECT: <contract area or project description>	
		LOCATION / BOROUGH : <borough>	
INSPECTOR: <name>	DRILLER: <name>	Start Date: <date>	Weather: <weather>
CONTRACTOR: <name>	HELPER: <name>	Start Time: <time>	
P.E./REP.: <name>			
Total Boring Depth: <##> ft	Drill Bit Type: <type>	Weight of Hammer for casing: <##> lbs	
Rig Type: <type>	Casing Inner Diameter: 4 in	Weight of Hammer for spoon: <##> lbs	
	Depth of Casing: <##> ft	Type of Hammer: <type>	
Depth to Groundwater Table (bgs): <##> ft		Drop: 30 in	
Depth to Bedrock (bgs): <##> ft		Split Spoon Diameter: 2 in	

B- XXXX BORING LOG


Depth Below Ground Surface (ft)	Soil Description (Field Observations)	SPT Blows per 6"	N Value	Recovery Length (inches)	Remarks
---------------------------------	---------------------------------------	------------------	---------	--------------------------	---------

0					
5	Bulk Sample 1 (S1)				
10	Bulk Sample 2 (S2)				
15	Bulk Sample 3 (S3)				
15	Bulk Sample 2 (S4)				
15	Bulk Sample 4 (S5)				
20					

Boring terminated at 20 feet below ground surface unless otherwise instructed.

Latitude: <latitude> Longitude: <longitude>

Inspector's Remarks:

COMPANY NAME/LOGO			Boring ID No. B- XXXX		
Prepared for:		AGENCY NAME / LOGO			
PROJECT: <contract area or project description>			LOCATION / BOROUGH : <borough>		
INSPECTOR: <name>	DRILLER: <name>	Start Date: <date>	Weather: <weather>		
CONTRACTOR: <name>	HELPER: <name>	Start Time: <time>			
P.E./REP.: <name>					
Total Boring Depth: <##> ft	Drill Bit Type: <type>	Weight of Hammer for casing: <##> lbs			
Rig Type: <type>	Casing Inner Diameter: 4 in	Weight of Hammer for spoon: <##> lbs			
	Depth of Casing: <##> ft	Type of Hammer: <type>			
Depth to Groundwater Table (bgs): <##> ft		Drop: 30 in			
Depth to Bedrock (bgs): <##> ft		Split Spoon Diameter: 2 in			

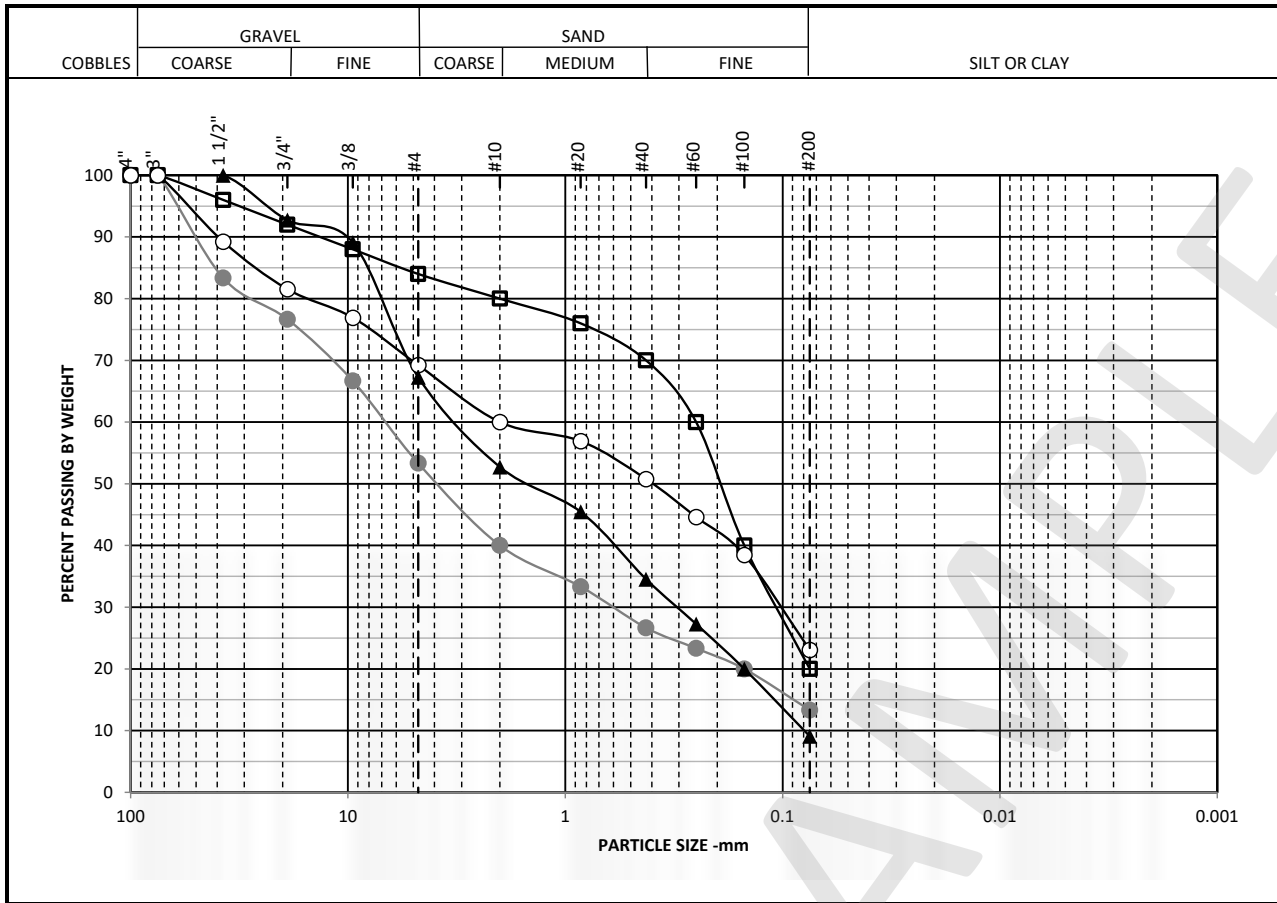
B- XXXX BORING LOG

Depth Below Ground Surface (ft)	Soil Description (Field Observations)	SPT Blows per 6"	N Value	Recovery Length (inches)	Remarks
0					
	Bulk Sample 1 (S1)				
3	Bulk Sample 2 (S2)				
6					
9					

Boring terminated at 9 feet below ground surface unless otherwise instructed.

Latitude: <latitude> Longitude: <longitude>

Inspector's Remarks:




Boring ID No. B-1054					
Symbol	●	□	▲	○	◆
Depth	5-7	7-9	11-13	18-20	-
% Gravel	46.67	16.00	32.73	30.77	-
% Sand	40.00	64.00	58.18	46.15	-
% Fines	13.33	20.00	9.09	23.08	-
% -2μ	-	-	-	-	-
Cc	-	-	0.36	-	-
Cu	-	-	41.54	-	-
D ₁₀₀ (mm)	75.00	75.00	37.50	75.00	-
D ₆₀ (mm)	7.13	0.25	3.38	2.00	-
D ₃₀ (mm)	0.64	0.11	0.32	0.11	-
D ₁₀ (mm)	-	-	0.08	-	-
USCS	SP-SM	SM	SP	SM-ML	-
w (%)	-	-	-	-	-
Particle Size (Sieve #)	Percent Finer				
	●	□	▲	○	◆
4"	100.0	100.0	100.0	100.0	-
3"	100.0	100.0	100.0	100.0	-
1 1/2"	83.3	96.0	100.0	89.2	-
3/4"	76.7	92.0	92.7	81.5	-
3/8"	66.7	88.0	89.1	76.9	-
4	53.3	84.0	67.3	69.2	-
10	40.0	80.0	52.7	60.0	-
20	33.3	76.0	45.5	56.9	-
40	26.7	70.0	34.5	50.8	-
60	23.3	60.0	27.3	44.6	-
100	20.0	40.0	20.0	38.5	-
200	13.3	20.0	9.1	23.1	-

Depth (ft bgs)	Symbol	DESCRIPTION AND REMARKS
5-7	●	sandy silt Color/Odor/Impurities: brown
7-9	□	silt and sand Color/Odor/Impurities: dark brown - brown
11-13	▲	poorly graded sand, little silt Color/Odor/Impurities: light brown
18-20	○	silt and clay, some sand Color/Odor/Impurities: brown/gray
-	◆	-

PARTICLE SIZE DISTRIBUTION

Consultant Name

Prepared for: Agency Name / Logo 

Contract Area / Project Description

Borough

Laboratory Name

Comments:

COMPANY NAME/LOGO	PT ID No. PT- <ID> Sheet <#> of 2
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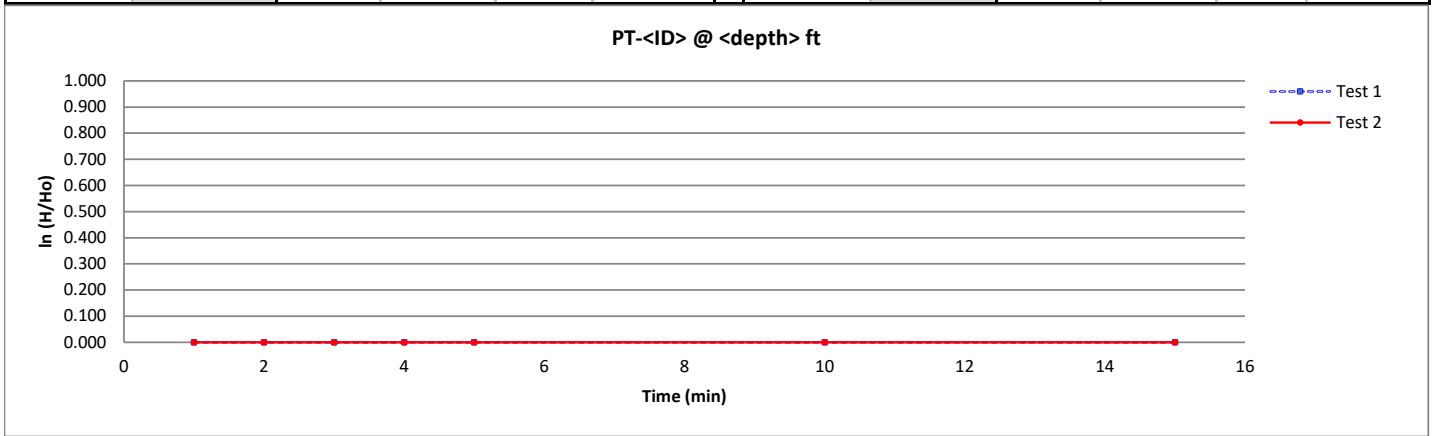
Prepared for:	AGENCY NAME / LOGO 	PROJECT: <contract area or project description> LOCATION / BOROUGH : <borough>
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INSPECTOR: <name>	DRILLER: <name>	Start Date: <date>	Weather: <weather and ambient temperature>
CONTRACTOR: <name>	HELPER: <name>	Start Time: <time>	
P.E./REP.: <name>			

Depth of PT: <depth> ft	Drill Bit Type: <type>	Weight of Hammer for casing: 140 lbs
Rig Type: <type>	Casing Internal Diameter: 4 in	Type of Hammer: <type>
	Casing Length: <length> in	

	General Formula:	Formula for 4" internal diameter casing (in/hr):
ASTM D-6391 – 11 PERMEABILITY COEFFICIENT (Km) FORMULA:	$K_m = \pi R_t \times \frac{D \left\{ \ln \left(\frac{h_1}{h_2} \right) \right\}}{11 \times (t_2 - t_1)}$	$K_m = 1.142 R_t \times \frac{\left\{ \ln \left(\frac{h_1}{h_2} \right) \right\}}{(t_2 - t_1)}$
where:	$R_t = 2.2902(0.9842^T) / T^{0.1702}$	

PT-<ID> @ <depth> ft											
TEST 1						TEST 2					
Water temperature (°C), T: <temp>						Water temperature (°C), T: <temp>					
Rt= -						Rt= -					
FIELD DATA		CALCULATED DATA				FIELD DATA		CALCULATED DATA			
Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t ₁ -t ₂)	*Kv (in/hr)	Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t ₁ -t ₂)	*Kv (in/hr)
1		-	-	0.017	-	1		-	-	0.017	-
2		-	-	0.017	-	2		-	-	0.017	-
3		-	-	0.017	-	3		-	-	0.017	-
4		-	-	0.017	-	4		-	-	0.017	-
5		-	-	0.017	-	5		-	-	0.017	-
10		-	-	0.083	-	10		-	-	0.083	-
15		-	-	0.083	-	15		-	-	0.083	-



TEST 1 FINAL RESULTS	TEST 2 FINAL RESULTS
Time Weighted Average Permeability Coefficient K_m = 0.0000 in/hr	Time Weighted Average Permeability Coefficient K_m = 0.0000 in/hr

AVERAGE PT-<ID> @ <depth> ft Time Weighted Average Permeability Coefficient K_m = 0.0000 in/hr	Coordinates: Longitude: <longitude> Latitude: <latitude>
--	--

Inspectors Remarks:

DEFINITION OF VARIABLES

*K_m= Mean permeability
 T = Temperature of permeant (water), in °C
 Ln = Natural Logarithmic
 t₁ = Time at the start of the test in the same units selected for Km
 R_t = Ratio of viscosity of water at test temperature to the viscosity of water at 20°C

t₂= Time at the end of the test in the units selected for Km
 h₁= Height of the water above the bottom of the casing at the start of the test in the same units selected for Km
 h₂= Height of the water above the bottom of the casing at the end of the test in the same units selected for Km

COMPANY NAME/LOGO	PT ID No. PT- <ID> Sheet <#> of 2
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Prepared for:	AGENCY NAME / LOGO 	PROJECT: <contract area or project description> LOCATION / BOROUGH : <borough>
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INSPECTOR: <name>	DRILLER: <name>	Start Date: <date>	Weather: <weather and ambient temperature>
CONTRACTOR: <name>	HELPER: <name>	Start Time: <time>	
P.E./REP.: <name>			

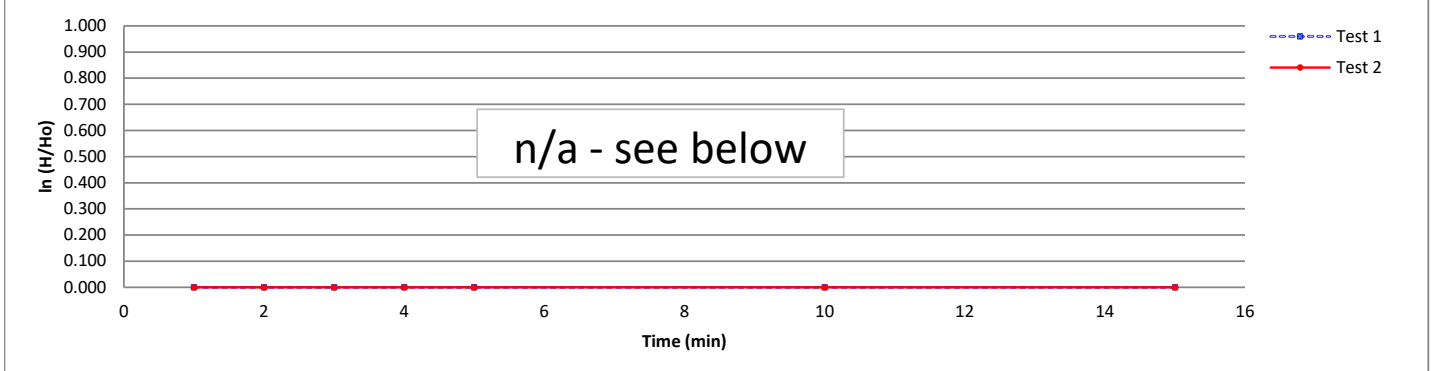
Depth of PT: <depth> ft	Drill Bit Type: <type>	Weight of Hammer for casing: 140 lbs
Rig Type: <type>	Casing Internal Diameter: 4 in	Type of Hammer: <type>
	Casing Length: <length> in	

ASTM D-6391 – 11 PERMEABILITY COEFFICIENT (Km) FORMULA:	General Formula: $K_m = \pi R_t \times \frac{\left[D \left\{ \ln \left(\frac{h_1}{h_2} \right) \right\} \right]}{11 \times (t_2 - t_1)}$	Formula for 4" internal diameter casing (in/hr): $K_m = 1.142 R_t \times \frac{\left[\ln \left(\frac{h_1}{h_2} \right) \right]}{(t_2 - t_1)}$
where:	$R_t = 2.2902(0.9842^T) / T^{0.1702}$	

PT-<ID> @ <depth> ft

TEST 1						TEST 2							
Water temperature (°C), T:					Rt=	-	Water temperature (°C), T:					Rt=	-
FIELD DATA		CALCULATED DATA				FIELD DATA		CALCULATED DATA					
Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t ₁ -t ₂)	*Kv (in/hr)	Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t ₁ -t ₂)	*Kv (in/hr)		
1		-	-	0.017	-	1		-	-	0.017	-		
2		-	-	0.017	-	2		-	-	0.017	-		
3		-	-	0.017	-	3		-	-	0.017	-		
4		-	-	0.017	-	4		-	-	0.017	-		
5		-	-	0.017	-	5		-	-	0.017	-		
10		-	-	0.083	-	10		-	-	0.083	-		
15		-	-	0.083	-	15		-	-	0.083	-		

PT-<ID> @ <depth> ft



TEST 1 FINAL RESULTS	TEST 2 FINAL RESULTS
Time Weighted Average Permeability Coefficient K_m = in/hr	Time Weighted Average Permeability Coefficient K_m = in/hr

AVERAGE PT-<ID> @ <depth> ft Time Weighted Average Permeability Coefficient K_m = in/hr	Coordinates: Longitude: <longitude> Latitude: <latitude>
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Inspectors Remarks:

<Insert reason for PT termination here>

DEFINITION OF VARIABLES

*K_m= Mean permeability
 T = Temperature of permeant (water), in °C
 Ln = Natural Logarithmic
 t₁ = Time at the start of the test in the same units selected for Km
 R_t = Ratio of viscosity of water at test temperature to the viscosity of water at 20°C

t₂= Time at the end of the test in the units selected for Km
 h₁= Height of the water above the bottom of the casing at the start of the test in the same units selected for Km
 h₂= Height of the water above the bottom of the casing at the end of the test in the same units selected for Km