



Preliminary Report of Infiltration Evaluation

Hightstown Redevelopment

Block 8, Lot 12
Bank Street and North Academy Street
Borough of Hightstown, Mercer County, New Jersey

March 23, 2020

Prepared For

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A handwritten signature in black ink that reads 'Michael Carnivale III'.

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MC Project No. 16001094B





TABLE OF CONTENTS

1.0 INTRODUCTION..... 1

2.0 SITE DESCRIPTION..... 1

3.0 SCOPE OF SERVICES..... 1

4.0 SUBSURFACE EXPLORATION 2

5.0 SUBSURFACE CONDITIONS 3

 5.1 Regional Geology 3

 5.2 Subsurface Description 4

6.0 SOIL INFILTRATION EVALUATION 4

7.0 DISCUSSION 5

8.0 CLOSING 5

9.0 LIMITATIONS 6

FIGURES

Site Location Plan Figure No. 1

Exploration Location Plan Figure No. 2

APPENDICES

APPENDIX A Test Pit Logs

APPENDIX B Tube Permeameter Test Results

APPENDIX C Photographs



1.0 INTRODUCTION

This report presents the results of the infiltration evaluation for the proposed residential redevelopment project located at the intersection of Bank Street and North Academy Street in the Borough of Hightstown, Mercer County, New Jersey (Block 8, Lot 12), with respect to proposed stormwater management areas and preliminary infiltration rates for use in conceptual design.

Infiltration rate recommendations provided in this preliminary infiltration report are based on review of published data, accepted engineering practice, and field observations. Maser Consulting has evaluated the subsurface conditions at the site and provides an evaluation of potential infiltration rates for soils encountered at depth within the area of the proposed stormwater management systems and design seasonal high-water levels.

2.0 SITE DESCRIPTION

The subject project site is located at 158 North Academy Street in the Borough of Hightstown, Mercer County, New Jersey as shown on the attached Site Location Plan (Figure No. 1) and is referred to as Block 8, Lot 12 on the Borough of Hightstown Tax Maps.

The subject property is bounded by Bank Street to the south, North Academy Street to the west, Hightstown Emergency Squad building to the east, and the Rocky Brook to the north. The property is approximately 1.864 acres and developed with an abandoned 2-1/2 story wood frame residential structure, driveway, and landscaping.

3.0 SCOPE OF SERVICES

To evaluate the subsurface conditions within the influence of the proposed stormwater management areas, and to subsequently provide consultation regarding anticipated subsurface infiltration rates and design estimated seasonal high-water levels (ESHWL), we performed the following scope of services:



- a) Engaged the services of an excavation contractor to excavate test pits for exploration of subsurface soil and groundwater conditions within the proposed stormwater management areas;
- b) Provided full-time technical observation of the excavation work;
- c) Obtained representative soil samples encountered within the zone of influence of the proposed construction;
- d) Evaluated the field data and prepared test pit logs showing the types of soils observed, depths to groundwater, and depths to estimated seasonal high groundwater;
- e) Performed a combination of laboratory testing on select soil samples and field percolation testing to evaluate groundwater infiltration rates for the subgrade soils; and
- f) Provided a *Preliminary Report of Infiltration Evaluation* that reviews potential soil infiltration rates for design and groundwater considerations for the proposed basin requirements.

4.0 SUBSURFACE EXPLORATION

The subsurface conditions were evaluated on February 12, 2020 through the excavation of three test pits, labeled TP-1 through TP-3. Test pits for the exploration were excavated at the locations shown on the Exploration Location Plan, Figure No. 2. Test pits were excavated to depths ranging from approximately 12 to 13 feet below the existing ground surface.

Representatives from Maser Consulting's Geotechnical Department observed the test pit excavations. Soils encountered were classified in the field in accordance with N.J.A.C. 7:9A, Subchapter 5.3, Terminology Required for Soil Logs. Representative soil samples of strata encountered were collected and returned to Maser Consulting's Red Bank laboratory facilities for further evaluation and analyses. Details pertaining to the subsurface conditions encountered are presented on the Test Pit Logs in Appendix A. Photographs of the test pits are provided in Appendix C.



**HIGHTSTOWN REDEVELOPMENT
MC PROJECT NO. 16001094B**

The depth to groundwater is typically measured from the ground surface to the point of observed seepage or consistent soil moisture. In the case of these three test pits, consistent soil moisture was not encountered, and seepage was not continuous; therefore, an accurate groundwater table reading was not believed to be found. The subsurface strata were evaluated with respect to mottling and soil staining to determine if seasonal high groundwater levels extended into test pit depths. Staining and mottling within a soil stratum can indicate seasonal high-water level fluctuations, but can also be found along wormholes, as a result of prior farming practices, and/or as an indication of geologic depositional factors. These conditions are evaluated in the field on a case by case basis. Several perched conditions were encountered at depths ranging from 36 to 72 inches in test pits TP-1 and TP-2 but were not encountered in test pit TP-3.

Please refer to Table 1 for a summary of depths to the groundwater table and to the estimated seasonal high-water level (ESHWL). Soil moisture and groundwater conditions should be expected to fluctuate with season, precipitation amounts, and other on-site and off-site factors including site utilization.

TABLE 1 DEPTH TO GWT AND ESHWL SUMMARY			
Test Pit ID	Ground Surface Elev. (ft)	Depth to Groundwater Table, GWT (in)	Depth to Estimated Seasonal High-Water Level, ESHWL (in)
TP-1	± 101.5	Not Encountered	36 to 72 (Perched)
TP-2	± 101.5	Not Encountered	44 to 58 (Perched)
TP-3	± 99.0	Not Encountered	Not Encountered

5.0 SUBSURFACE CONDITIONS

5.1 Regional Geology

According to the Surficial Geology of the Hightstown Quadrangle, Middlesex and Mercer Counties, New Jersey (Stanford 2002), the project site is underlain by the Pensauken Formation (*Tp*) which is described as sand, minor silt and clay; yellowish to reddish yellow; and pebble gravel and minor cobble gravel, particularly at the base of the deposit. Sand is



chiefly quartz with some weathered feldspar and minor glauconite and mica. Gravel is chiefly quartz and quartzite with some chert and ironstone, and minor amounts of deeply weathered sandstone, mudstone, diabase, and gneiss. Locally iron-cemented. Locally beds of dark-gray to reddish yellow clay as much as 6 feet thick.

According to the Natural Resources Conservation Service (NRCS) Web Soil Survey, the soils at the project site are classified as *Fort Mott loamy sand, 5 to 10 percent slopes (FodC)* and *Sassafras sandy loam, 2 to 5 percent slopes, Northern Coastal Plain (SacB)*.

5.2 Subsurface Description

Test pits TP-1 through TP-3 disclosed a topsoil layer consisting of very dark gray, black, and brown sandy loam and loam, with up to 5% gravel, ranging in thickness from 5 to 12 inches. Underlying the topsoil are layers of brown, brownish yellow, light yellowish brown, light brownish gray and yellowish red sandy loam, sandy clay loam, silty clay loam, clay loam, silty clay, with gravel contents ranging from 5% to 35%, which extended to the termination depths of the test pits. In test pit TP-1, a reddish yellow loamy sand with 35% gravel content was encountered between 72 and 96 inches bgs. This layer was not encountered in the other two test pits excavated as part of this preliminary exploration.

Test pit logs presented in Appendix A provide soil classification per N.J.A.C. 7:9A, Subchapter 5.3, Terminology Required for Soil Logs.

6.0 SOIL INFILTRATION EVALUATION

Selected soil samples were tested by the Maser Consulting Geotechnical Laboratory in Red Bank, New Jersey. The testing consisted of six Tube Permeameter Tests performed to estimate the infiltration rate of groundwater through the soils at depth. Tube Permeameter testing was performed in accordance with N.J.A.C. 7:9A-6.2 and *New Jersey Stormwater Best Management Practices Manual, Appendix E (BMP-E)* requirements. The soil samples were selected based on review of test pit logs by design personnel, the proposed infiltration depths, and comparison to



**HIGHTSTOWN REDEVELOPMENT
MC PROJECT NO. 16001094B**

other strata encountered at each test pit location. The tube samples were collected from the soils directly by inserting the sample tube into the ground and retrieving the tube by excavating the soils surrounding it. Infiltration test results are summarized in Table 2 below. Tube Permeameter test results are presented in Appendix B.

TABLE 2 INFILTRATION TEST SUMMARY				
Test Pit ID	Ground Surface Elev. (ft)	Depth below Existing Grade (in)	Infiltration Test Performed	Infiltration Rate (in/hr)
TP-1	± 101.5	36	Tube Permeameter	16.4 / 14.8
TP-2	± 101.5	29	Tube Permeameter	0.15 / 0.05
		44	Tube Permeameter	0.0 / 0.0
		58	Tube Permeameter	0.0 / 0.0
TP-3	± 99.0	22	Tube Permeameter	0.21 / 0.0
		50	Tube Permeameter	0.0 / 0.0

7.0 DISCUSSION

The laboratory-measured permeability values consistent with a Soil Permeability Class Rating of K0 are representative of the zone of fine-grained silty and clayey soils encountered in each of the test pits excavated as part of this preliminary infiltration evaluation. Although the Natural Resources Conservation Service (NRCS) classifies the soils at the project site as *Fort Mott loamy sand, 5 to 10 percent slopes (FodC)* and *Sassafras sandy loam, 2 to 5 percent slopes, Northern Coastal Plain (SacB)*, which are considered to have typical profiles consisting of sandy loams and loamy sands and Hydrologic Soil Group (HSG) classifications of A and B, the results of the test pits and tube permeameter testing indicate that the soils encountered will act as limiting zones. Consideration may be given to performing a supplemental exploration for HSG reclassification.

8.0 CLOSING

Successful construction of the project will require competent field observation of the construction operations. Earthwork, including clearing and grubbing, subgrade identification, grading, and fill



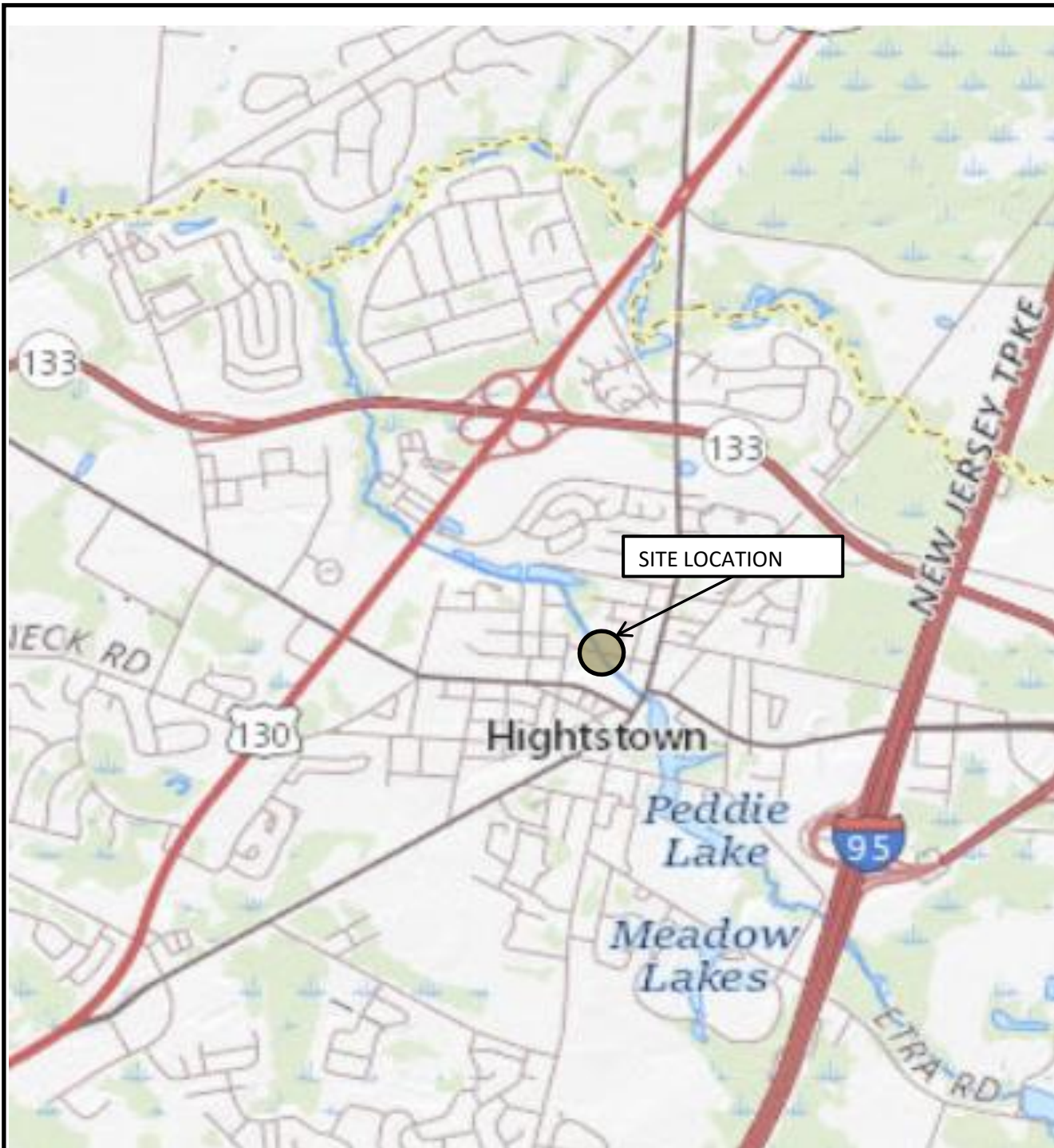
placement should be observed by a competent individual familiar with the recommendations contained in this report. We are available to perform construction observation services, if requested.

The recommendations contained in this report are contingent upon the actual field conditions being consistent with those encountered during our field exploration. Should any variation in the anticipated conditions be encountered, or should site regrading be proposed, Maser Consulting should be notified immediately to determine what impact the changed conditions may have upon the presented recommendations.

9.0 LIMITATIONS

Services performed by Maser Consulting during this project have been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, expressed or implied, and no warranty or guarantee is included or intended in the services provided. This is not an Environmental Assessment.

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NOTES:

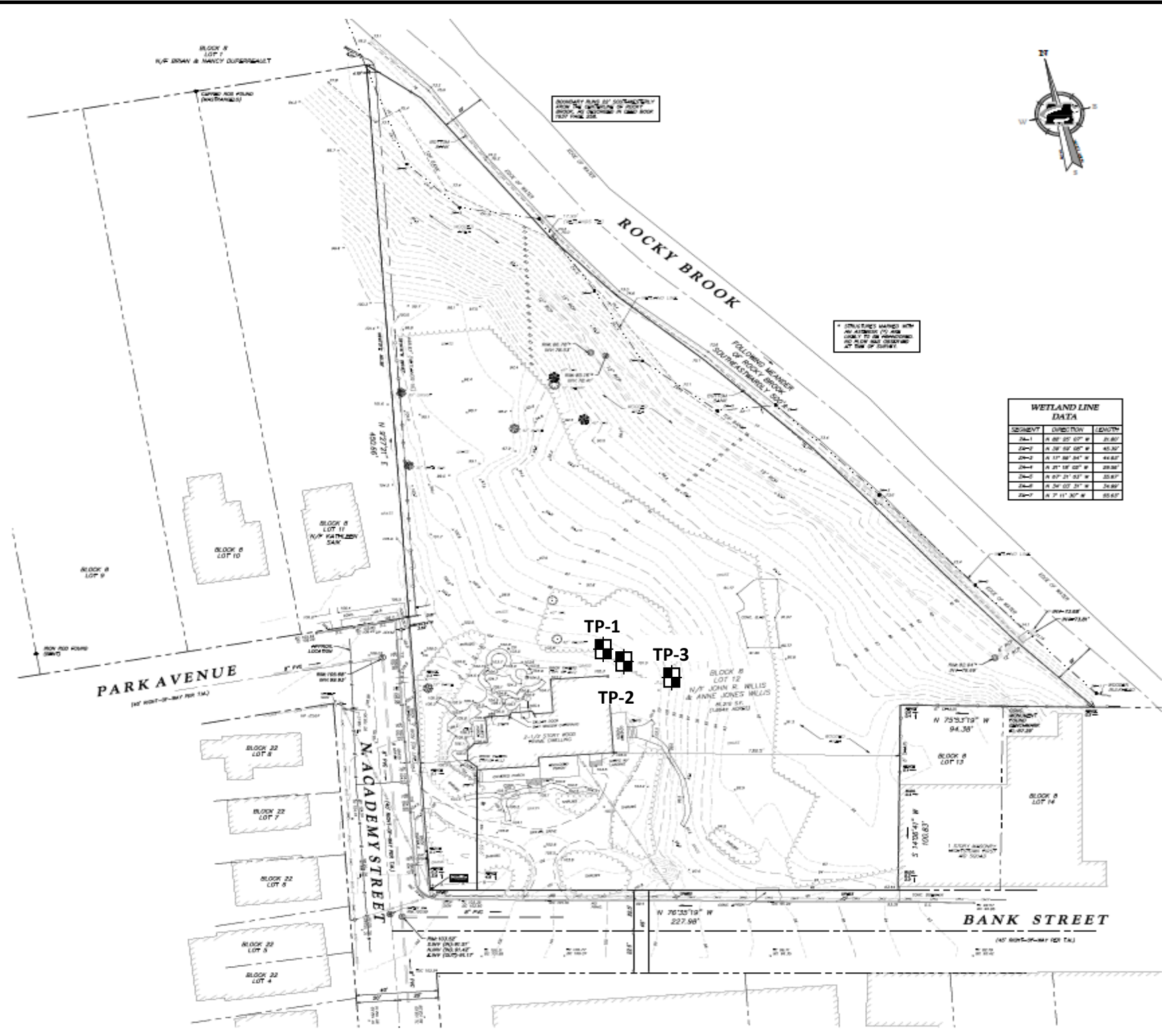
1.) *SITE MAP OBTAINED FROM USGS TOPOGRAPHIC MAP, HIGHTSTOWN, NEW JERSEY QUADRANGLE, DATED 2016.



Consulting, Municipal & Environmental Engineers
Planners ■ Surveyors ■ Landscape Architects

New Jersey New York Pennsylvania Virginia
Customer Loyalty through Client Satisfaction

Title:				SITE LOCATION MAP			
Project:				HIGHTSTOWN REDEVELOPMENT BOROUGH OF HIGHTSTOWN, MERCER COUNTY, NEW JERSEY			
Drawn By:	SMC	Checked By:	MC	Project No.:	16001094B		
Scale:	N.T.S.	Date:	3/23/2020	Figure No.:	1		



LEGEND:

INDICATES THE NUMBERS AND APPROXIMATE LOCATIONS OF TEST PITS PERFORMED.
TP-0

NOTES:

- 1.) THIS DRAWING IS PART OF A DRAWING TITLED "CONCEPT PLAN", DRAWN BY MASER CONSULTING, JOB NUMBER 16001094B, DATED FEBRUARY 9, 2020.
- 2.) EXPLORATION LOCATIONS ARE APPROXIMATE BASED UPON EXISTING SITE FEATURES AND BASE MAP INFORMATION AVAILABLE AT THE TIME OF OUR FIELD



New Jersey New York Pennsylvania Virginia
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TITLE: EXPLORATION LOCATION PLAN

PROJECT:
HIGHTSTOWN REDEVELOPMENT
 BOROUGH OF HIGHTSTOWN,
 MERCER COUNTY, NEW JERSEY

DRAWN BY:	SMC	CHECKED BY:	MC	PROJECT NO.:	16001094B
SCALE:	N.T.S.	DATE:	3/23/2020	FIGURE NO.:	2



APPENDIX A

TEST PIT LOGS



Consulting, Municipal & Environmental Engineers
Planners ■ Surveyors ■ Landscape Architects

RED BANK OFFICE
331 Newman Springs Road
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Red Bank, N.J. 07701
Phone (732) 383-1950
Fax (732) 383-1990
E-mail - geotech@maserconsulting.com

TEST PIT No. TP-1

DATE EXCAVATED: 2/12/2020
SURFACE ELEVATION: ±101.5

Project: Hightstown Redevelopment
Location: Hightstown, Mercer County, NJ
Job Number: 16001094B

EXCAVATED BY: Hertiage Excavating
EQUIPMENT USED: DEERE 310G Backhoe
INSPECTED BY: Austin Young

DEPTH (ft)	DEPTH (in)	DESCRIPTION	REMARKS
0	0	(7.5YR 3/1) Very Dark Gray Sandy Loam. Granular, Very Friable. (Topsoil, Moist).	7"
	3		
	6		
	9		
	12	(7.5YR 5/4) Brown Sandy Loam. 5% Gravel. Subangular Blocky, Friable. (Pensauken Formation, Moist).	14"
	24		
	36	(10YR 6/6) Brownish Yellow Sandy Clay Loam. 5% Gravel. Subangular Blocky, Friable. (Pensauken Formation, Moist).	36"
	48		
	60	(10YR 6/8) Brownish Yellow Sandy Clay Loam. 10% Gravel. Subangular Blocky, Friable.	
5	60	(7.5YR 5/6) Strong Brown Frequent, Fine, Faint Redox. (Pensauken Formation, Perched Water).	72"
	72		
	84	(7.5YR 7/8) Reddish Yellow Loamy Sandy. 35% Gravel. Single Grain, Loose. (Pensauken Formation, Moist).	96"
	96		
	108	(5YR 5/8) Yellowish Red Clay. 10% Gravel. Massive, Very Firm. (Merchantville Formation, Moist).	113"
	120		
10	120	(7.5YR 4/3) Brown Silty Clay. Massive, Friable. (Merchantville Formation, Moist).	
	132		
	144		
	156	END OF TEST PIT AT 144 INCHES	
	168		
15	180		
	192		
	204		
	216		
	228		
20	240		

GROUNDWATER: DEPTH (ft.) DATE	ESTIMATED DEPTH TO SEASONAL HIGH GROUNDWATER: <u>36 Inches (Perched)</u>
First Encountered ▽ <u>N.E.</u> <u>2/12/20</u>	
At Completion (0 hrs.) ▼ <u>N.E.</u> <u>2/12/20</u>	
After Completion (>24 hrs.) ▼ _____	

TEST PIT No. TP-1



Consulting, Municipal & Environmental Engineers
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TEST PIT No. TP-2

DATE EXCAVATED: 2/12/2020
SURFACE ELEVATION: ±101.5

Project: Hightstown Redevelopment
Location: Hightstown, Mercer County, NJ
Job Number: 16001094B

EXCAVATED BY: Hertiage Excavating
EQUIPMENT USED: DEERE 310G Backhoe
INSPECTED BY: Austin Young

DEPTH (ft)	DEPTH (in)	DESCRIPTION	REMARKS
0	3	(7.5YR 4/3) Brown Loam. 5% Gravel, Granular, Very Friable. (Topsoil, Moist).	
	6		
	9		
	12	(10YR 6/4) Light Yellowish Brown Sandy Loam. 10% Gravel. Subangular Blocky, Very Friable. (Pensauken Formation, Moist).	12"
	24		
	36	(7.5YR 5/8) Strong Brown Sandy Clay Loam. 25% Gravel. Subangular Blocky, Friable. (Pensauken Formation, Moist).	29"
	48	(2.5Y 6/2) Light Brownish Gray Clay Loam. Subangular Blocky, Very Firm.	44"
5	60	(7.5YR 5/6) Strong Brown Many, Course, Distinct Redox. (Pensauken Formation, Perched Water).	58"
	72		
	84	(5YR 5/8) Yellowish Red Clay. 5% Gravel. Massive, Firm. (Merchantville Formation, Moist).	70"
	96		
	108		
10	120	(7.5YR 4/3) Brown Silty Clay Loam. Massive, Friable. (Merchantville Formation, Moist).	
	132		
	144		
	156		
	168	END OF TEST PIT AT 156 INCHES	
15	180		
	192		
	204		
	216		
	228		
20	240		

GROUNDWATER:	DEPTH (ft.)	DATE
First Encountered	<u>▽</u> N.E.	<u>2/12/20</u>
At Completion (0 hrs.)	<u>▼</u> N.E.	<u>2/12/20</u>
After Completion (>24 hrs.)	<u>▼</u>	

ESTIMATED DEPTH TO SEASONAL HIGH GROUNDWATER: 44 Inches (Perched)

TEST PIT No. TP-2



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TEST PIT No. TP-3

DATE EXCAVATED: 2/12/2020
SURFACE ELEVATION: ±99.0

Project: Hightstown Redevelopment
Location: Hightstown, Mercer County, NJ
Job Number: 16001094B

EXCAVATED BY: Hertiage Excavating
EQUIPMENT USED: DEERE 310G Backhoe
INSPECTED BY: Austin Young

DEPTH (ft)	DEPTH (in)	DESCRIPTION	REMARKS
0	3	(10YR 2/1) Black Sandy Loam. Granular, Very Friable. (Topsoil, Moist).	
	6		
	9		
	12	(10YR 5/6) Yellowish Brown Sandy Loam. 10% Gravel. Subangular Blocky, Very Friable. (Pensauken Formation, Moist).	
	24		
	36		
	48	(7.5YR 5/8) Yellowish Brown Silty Clay Loam. 25% Gravel. Subangular Blocky, Friable. (Pensauken Formation, Moist).	
5	60		
	72		
	84	(7.5YR 4/4) Brown Silty Clay Loam. 10% Gravel. Massive, Friable. (Merchantville Formation, Moist).	
	96		
	108		
10	120		
	132		
	144		
	156	END OF TEST PIT AT 156 INCHES	
	168		
15	180		
	192		
	204		
	216		
	228		
20	240		

GROUNDWATER:	DEPTH (ft.)	DATE
First Encountered	<u>∇</u> <u>N.E.</u>	<u>2/12/20</u>
At Completion (0 hrs.)	<u>▼</u> <u>N.E.</u>	<u>2/12/20</u>
After Completion (>24 hrs.)	<u>▼</u> _____	_____

ESTIMATED DEPTH TO SEASONAL HIGH GROUNDWATER: Not Encountered

TEST PIT No. TP-3



APPENDIX B

TUBE PERMEAMETER TEST RESULTS

TUBE PERMEAMETER TEST DATA

Project Name: Hightstown Redevelopment Project Number: 16001094B
 Block: 0 Municipality: Hightstown
 Lot: 0 County: Mercer
 Test Number: 1 Date Collected: 2/12/2020
 Material Tested: TP-1 Replicate: A
 Depth of Sample: 36" Sample Type: Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
 Length = 3.000 in

2. **Measurements** Tube Weight = 358.40 g
 Total Weight = 659.99 g
 tube #: L1 Soil Weight = 301.59 g

Volume = Length * 2.54 cm/inch * π * Radius²
 Volume = 86.83

Bulk Density = Soil Weight / Volume
 Bulk Density = 3.47

Height of Water Level above Rim of Test Basin (inches)

At beginning of interval: 4.500 H₁
 At end of interval: 3.750 H₂

3. **Test Data**

	<u>Time Begin,</u> T ₁	<u>Time End,</u> T ₂	<u>Test Length</u> (min)	<u>Δ Height</u> (in)
a.	0:00:00	0:02:00	2.0	0.750
b.	0:00:00	0:02:00	2.0	0.750
c.	0:00:00	0:02:00	2.0	0.750
d.	0:00:00	0:02:00	2.0	0.750
		av =	2.0	0.750

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r²/R² * L (in)/T (min) * ln (H₁/H₂)

K = 16.41 in/hr = Soil Permeability Class K4

5. Any Defects in Sample: NO

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water pollution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer

Michael Carnivale, III, P.E.

License #45357

TUBE PERMEAMETER TEST DATA

Project Name: Hightstown Redevelopment Project Number: 16001094B
 Block: 0 Municipality: Hightstown
 Lot: 0 County: Mercer
 Test Number: 1 Date Collected: 2/12/2020
 Material Tested: TP-1 Replicate: B
 Depth of Sample: 36" Sample Type: Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
 Length = 3.000 in

2. **Measurements** Tube Weight = 363.96 g
 Total Weight = 671.99 g
 tube #: L2 Soil Weight = 308.03 g

Volume = Length * 2.54 cm/inch * π * Radius²
 Volume = 86.83

Bulk Density = Soil Weight / Volume
 Bulk Density = 3.55

Height of Water Level above Rim of Test Basin (inches)

At beginning of interval: 4.125 H₁
 At end of interval: 3.500 H₂

3. **Test Data**

	<u>Time Begin,</u> T ₁	<u>Time End,</u> T ₂	<u>Test Length</u> (min)	<u>Δ Height</u> (in)
a.	0:00:00	0:02:00	2.0	0.625
b.	0:00:00	0:02:00	2.0	0.625
c.	0:00:00	0:02:00	2.0	0.625
d.	0:00:00	0:02:00	2.0	0.625
		av =	2.0	0.625

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r²/R² * L (in)/T (min) * ln (H₁/H₂)
 K = 14.79 in/hr = Soil Permeability Class K4

5. Any Defects in Sample: NO

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water pollution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer

 Michael Carnivale, III, P.E.

License #45357

TUBE PERMEAMETER TEST DATA

Project Name: Hightstown Redevelopment Project Number: 16001094B
 Block: 0 Municipality: Hightstown
 Lot: 0 County: Mercer
 Test Number: 1 Date Collected: 2/12/2020
 Material Tested: TP-2 Replicate: A
 Depth of Sample: 29" Sample Type: Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
Length = 3.000 in
2. **Measurements** Tube Weight = 354.13 g
Total Weight = 657.87 g
tube #: L3 Soil Weight = 303.74 g
 Volume = Length * 2.54 cm/inch * π * Radius²
 Volume = 86.83
 Bulk Density = Soil Weight / Volume
 Bulk Density = 3.50

Height of Water Level above Rim of Test Basin (inches)

At beginning of interval: 3.875 H₁
 At end of interval: 3.500 H₂

3. **Test Data**

	<u>Time Begin,</u> T ₁	<u>Time End,</u> T ₂	<u>Test Length</u> (min)	<u>Δ Height</u> (in)
a.	0:00:00	2:00	120.0	0.375
b.	0:00:00	2:00	120.0	0.375
c.	0:00:00	2:00	120.0	0.375
d.	0:00:00	2:00	120.0	0.375
		av =	120.0	0.375

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r²/R² * L (in)/T (min) * ln (H₁/H₂)
 K = 0.15 in/hr = Soil Permeability Class K0

5. Any Defects in Sample: NO

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water pollution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer

 Michael Carnivale, III, P.E.

License #45357

TUBE PERMEAMETER TEST DATA

Project Name: Hightstown Redevelopment Project Number: 16001094B
 Block: 0 Municipality: Hightstown
 Lot: 0 County: Mercer
 Test Number: 1 Date Collected: 2/12/2020
 Material Tested: TP-2 Replicate: B
 Depth of Sample: 29" Sample Type: Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
 Length = 3.000 in

2. **Measurements** Tube Weight = 357.03 g
 Total Weight = 684.82 g
 tube #: L4 Soil Weight = 327.79 g

Volume = Length * 2.54 cm/inch * π * Radius²
 Volume = 86.83

Bulk Density = Soil Weight / Volume
 Bulk Density = 3.78

Height of Water Level above Rim of Test Basin (inches)

At beginning of interval: 3.875 H₁
 At end of interval: 3.750 H₂

3. **Test Data**

	<u>Time Begin,</u> T ₁	<u>Time End,</u> T ₂	<u>Test Length</u> (min)	<u>Δ Height</u> (in)
a.	0:00:00	2:00	120.0	0.125
b.	0:00:00	2:00	120.0	0.125
c.	0:00:00	2:00	120.0	0.125
d.	0:00:00	2:00	120.0	0.125
		av =	120.0	0.125

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r²/R² * L (in)/T (min) * ln (H₁/H₂)
 K = 0.05 in/hr = Soil Permeability Class K0

5. Any Defects in Sample: NO

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water pollution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer

 Michael Carnivale, III, P.E.

License #45357

TUBE PERMEAMETER TEST DATA

Project Name: Hightstown Redevelopment Project Number: 16001094B
 Block: 0 Municipality: Hightstown
 Lot: 0 County: Mercer
 Test Number: 1 Date Collected: 2/12/2020
 Material Tested: TP-2 Replicate: A
 Depth of Sample: 44" Sample Type: Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
 Length = 3.000 in

2. **Measurements** Tube Weight = 362.03 g
 Total Weight = 700.85 g
 tube #: L5 Soil Weight = 338.82 g

Volume = Length * 2.54 cm/inch * π * Radius²
 Volume = 86.83

Bulk Density = Soil Weight / Volume
 Bulk Density = 3.90

Height of Water Level above Rim of Test Basin (inches)

At beginning of interval: 3.750 H₁
 At end of interval: 3.750 H₂

3. **Test Data**

	<u>Time Begin,</u> T ₁	<u>Time End,</u> T ₂	<u>Test Length</u> (min)	<u>Δ Height</u> (in)
a.	0:00:00	2:00	120.0	0.000
b.	0:00:00	2:00	120.0	0.000
c.	0:00:00	2:00	120.0	0.000
d.	0:00:00	2:00	120.0	0.000
		av =	120.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r²/R² * L (in)/T (min) * ln (H₁/H₂)
 K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: NO

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water pollution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer

 Michael Carnivale, III, P.E.

License #45357

TUBE PERMEAMETER TEST DATA

Project Name: Hightstown Redevelopment Project Number: 16001094B
 Block: 0 Municipality: Hightstown
 Lot: 0 County: Mercer
 Test Number: 1 Date Collected: 2/12/2020
 Material Tested: TP-2 Replicate: B
 Depth of Sample: 44" Sample Type: Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
Length = 3.000 in

2. **Measurements** Tube Weight = 371.80 g
Total Weight = 715.48 g
tube #: L6 Soil Weight = 343.68 g
 Volume = Length * 2.54 cm/inch * π * Radius²
 Volume = 86.83
 Bulk Density = Soil Weight / Volume
 Bulk Density = 3.96

Height of Water Level above Rim of Test Basin (inches)

At beginning of interval: 3.750 H₁
 At end of interval: 3.750 H₂

3. **Test Data**

	<u>Time Begin,</u> T ₁	<u>Time End,</u> T ₂	<u>Test Length</u> (min)	<u>Δ Height</u> (in)
a.	0:00:00	2:00	120.0	0.000
b.	0:00:00	2:00	120.0	0.000
c.	0:00:00	2:00	120.0	0.000
d.	0:00:00	2:00	120.0	0.000
		av =	120.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r²/R² * L (in)/T (min) * ln (H₁/H₂)
 K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: NO

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water pollution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer

Michael Carnivale, III, P.E.

License #45357

TUBE PERMEAMETER TEST DATA

Project Name: Hightstown Redevelopment Project Number: 16001094B
 Block: 0 Municipality: Hightstown
 Lot: 0 County: Mercer
 Test Number: 1 Date Collected: 2/12/2020
 Material Tested: TP-2 Replicate: B
 Depth of Sample: 58" Sample Type: Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
 Length = 3.000 in

2. **Measurements** Tube Weight = 356.72 g
 Total Weight = 653.73 g
 tube #: 79 Soil Weight = 297.01 g

Volume = Length * 2.54 cm/inch * π * Radius²
 Volume = 86.83

Bulk Density = Soil Weight / Volume
 Bulk Density = 3.42

Height of Water Level above Rim of Test Basin (inches)

At beginning of interval: 3.875 H₁
 At end of interval: 3.875 H₂

3. **Test Data**

	<u>Time Begin,</u> T ₁	<u>Time End,</u> T ₂	<u>Test Length</u> (min)	<u>Δ Height</u> (in)
a.	0:00:00	2:00	120.0	0.000
b.	0:00:00	2:00	120.0	0.000
c.	0:00:00	2:00	120.0	0.000
d.	0:00:00	2:00	120.0	0.000
		av =	120.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r²/R² * L (in)/T (min) * ln (H₁/H₂)
 K = 0.00 in/hr = Soil Permeability Class K0

5. Any Defects in Sample: NO

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water pollution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer

 Michael Carnivale, III, P.E.

License #45357

TUBE PERMEAMETER TEST DATA

Project Name: Hightstown Redevelopment Project Number: 16001094B
 Block: 0 Municipality: Hightstown
 Lot: 0 County: Mercer
 Test Number: 1 Date Collected: 2/12/2020
 Material Tested: TP-3 Replicate: A
 Depth of Sample: 22" Sample Type: Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
 Length = 3.000 in

2. **Measurements** Tube Weight = 360.00 g
 Total Weight = 644.09 g
 tube #: L7 Soil Weight = 284.09 g

Volume = Length * 2.54 cm/inch * π * Radius²
 Volume = 86.83

Bulk Density = Soil Weight / Volume
 Bulk Density = 3.27

Height of Water Level above Rim of Test Basin (inches)

At beginning of interval: 3.875 H₁
 At end of interval: 3.375 H₂

3. **Test Data**

	<u>Time Begin,</u> T ₁	<u>Time End,</u> T ₂	<u>Test Length</u> (min)	<u>Δ Height</u> (in)
a.	0:00:00	2:00	120.0	0.500
b.	0:00:00	2:00	120.0	0.500
c.	0:00:00	2:00	120.0	0.500
d.	0:00:00	2:00	120.0	0.500
		av =	120.0	0.500

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r²/R² * L (in)/T (min) * ln (H₁/H₂)

K = 0.21 in/hr = Soil Permeability Class K1

5. Any Defects in Sample: NO

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water pollution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer

Michael Carnivale, III, P.E.

License #45357

TUBE PERMEAMETER TEST DATA

Project Name: Hightstown Redevelopment Project Number: 16001094B
 Block: 0 Municipality: Hightstown
 Lot: 0 County: Mercer
 Test Number: 1 Date Collected: 2/12/2020
 Material Tested: TP-3 Replicate: B
 Depth of Sample: 22" Sample Type: Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
Length = 3.000 in

2. **Measurements** Tube Weight = 402.92 g
Total Weight = 757.45 g
tube #: L8 Soil Weight = 354.53 g

 Volume = Length * 2.54 cm/inch * π * Radius²
 Volume = 86.83

 Bulk Density = Soil Weight / Volume
 Bulk Density = 4.08

Height of Water Level above Rim of Test Basin (inches)

At beginning of interval: 4.625 H₁
 At end of interval: 4.625 H₂

3. **Test Data**

	<u>Time Begin,</u> T ₁	<u>Time End,</u> T ₂	<u>Test Length</u> (min)	<u>Δ Height</u> (in)
a.	0:00:00	2:00	120.0	0.000
b.	0:00:00	2:00	120.0	0.000
c.	0:00:00	2:00	120.0	0.000
d.	0:00:00	2:00	120.0	0.000
		av =	120.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r²/R² * L (in)/T (min) * ln (H₁/H₂)
 K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: NO

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water pollution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer

 Michael Carnivale, III, P.E.

License #45357

TUBE PERMEAMETER TEST DATA

Project Name: Hightstown Redevelopment Project Number: 16001094B
 Block: 0 Municipality: Hightstown
 Lot: 0 County: Mercer
 Test Number: 1 Date Collected: 2/12/2020
 Material Tested: TP-3 Replicate: A
 Depth of Sample: 50" Sample Type: Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
 Length = 3.000 in

2. **Measurements** Tube Weight = 371.53 g
 Total Weight = 662.97 g
 tube #: F3 Soil Weight = 291.44 g

Volume = Length * 2.54 cm/inch * π * Radius²
 Volume = 86.83

Bulk Density = Soil Weight / Volume
 Bulk Density = 3.36

Height of Water Level above Rim of Test Basin (inches)

At beginning of interval: 3.875 H₁
 At end of interval: 3.875 H₂

3. **Test Data**

	<u>Time Begin,</u> T ₁	<u>Time End,</u> T ₂	<u>Test Length</u> (min)	<u>Δ Height</u> (in)
a.	0:00:00	2:00	120.0	0.000
b.	0:00:00	2:00	120.0	0.000
c.	0:00:00	2:00	120.0	0.000
d.	0:00:00	2:00	120.0	0.000
		av =	120.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r²/R² * L (in)/T (min) * ln (H₁/H₂)

K = 0.00 in/hr = Soil Permeability Class K0

5. Any Defects in Sample: NO

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water pollution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer

Michael Carnivale, III, P.E.

License #45357

TUBE PERMEAMETER TEST DATA

Project Name: Hightstown Redevelopment Project Number: 16001094B
 Block: 0 Municipality: Hightstown
 Lot: 0 County: Mercer
 Test Number: 1 Date Collected: 2/12/2020
 Material Tested: TP-3 Replicate: B
 Depth of Sample: 50" Sample Type: Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
Length = 3.000 in
2. **Measurements** Tube Weight = 369.12 g
Total Weight = 617.21 g
tube #: F4 Soil Weight = 248.09 g
 Volume = Length * 2.54 cm/inch * π * Radius²
 Volume = 86.83
 Bulk Density = Soil Weight / Volume
 Bulk Density = 2.86

Height of Water Level above Rim of Test Basin (inches)

At beginning of interval: 3.750 H₁
 At end of interval: 3.750 H₂

3. **Test Data**

	<u>Time Begin,</u> T ₁	<u>Time End,</u> T ₂	<u>Test Length</u> (min)	<u>Δ Height</u> (in)
a.	0:00:00	2:00	120.0	0.000
b.	0:00:00	2:00	120.0	0.000
c.	0:00:00	2:00	120.0	0.000
d.	0:00:00	2:00	120.0	0.000
		av =	120.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r²/R² * L (in)/T (min) * ln (H₁/H₂)
 K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: NO

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water pollution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer

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License #45357



APPENDIX C

TEST PIT PHOTOGRAPHS



**HIGHTSTOWN REDEVELOPMENT
MC PROJECT NO. 16001094B**



Photograph 1 – Test Pit TP-1



**HIGHTSTOWN REDEVELOPMENT
MC PROJECT NO. 16001094B**



Photograph 2 – Test Pit TP-2



**HIGHTSTOWN REDEVELOPMENT
MC PROJECT NO. 16001094B**



Photograph 3 – Test Pit TP-3