Colliers
Engineering
& Design

Preliminary Report of Infiltration Evaluation

May 24, 2021

Proposed Warehouse Addition
1100 Randolph Road
Block 517.04, Lot 1.01
Franklin Township, Somerset County, New Jersey

Prepared for:

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Project No. 20001469A

Maser Consulting is now Colliers Engineering & Design

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1.0 Introduction

This report presents the results of the infiltration evaluation for the proposed warehouse addition, located in the Township of Franklin, Somerset County, New Jersey (Block 517.04, Lot 1.01), with respect to proposed stormwater management areas and preliminary infiltration rates for use in conceptual design. Colliers Engineering & Design understands that the proposed development consists of an approximately 100,000 square-foot (SF) warehouse building. Development plans also include various appurtenant site improvements.

Infiltration rate recommendations provided in this preliminary infiltration report are based on a review of published data, accepted engineering practice, field observations, and laboratory test results. Colliers Engineering & Design 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 and Project Description

The subject project site is located at 1100 Randolph Road in the Township of Franklin, Somerset County, New Jersey, and is referred to as Block 517.04, Lot 1.01 on the local Tax Maps. The property is located on the east side of Randolph Road, at the northeast intersection with School House Road. The overall property consists of approximately 20.97 acres of land and currently is developed with a 192,245 sf, 3-story commercial building containing office, manufacturing, and warehouse space. The property is also developed with car parking, trailer parking, loading areas, two existing access driveways, one each from Randolph Road and School House Road, and appears to also contain three existing detention basins. The site is bordered to the west by Randolph Road and to the north, south, and west by various commercial developments.

The proposed development includes the construction of an approximately 100,000 sf, one-story, warehouse addition, with minimal office space and minimal site improvements. Expansion to one of the existing basins or construction of a new stormwater basin is anticipated. It is our understanding that the proposed finished floor elevation (FFE) of the warehouse addition is approximately 83.9 feet, matching the FFE of the existing warehouse. Building loading information was not available during the preparation of this report, but we assume that maximum column and wall loads will be typical to those of similar sized structures.

Additional site improvements include asphalt paved drive lanes, concrete loading dock apron, and the use of stone and stone and pipe storage beds underlying pavements around the warehouse addition. A Preliminary Infiltration Evaluation and corresponding subsurface exploration program were performed to address this development, with data and recommendations provided within a separate report. No below grade walls or retaining walls are anticipated to be constructed.

3.0 Scope of Services

To evaluate the subsurface conditions within the influence of the proposed stormwater management areas, and to subsequently provide preliminary considerations 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 explore subsurface soil and groundwater conditions within the proposed stormwater management areas through the excavation of a total of seven test pits;

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 table (GWT), and estimated seasonal high-water level (ESHWL), where encountered;

e. Performed laboratory Tube Permeameter testing (N.J.A.C. 7:9A-6.2) on select soil samples to evaluate preliminary infiltration rates for the subgrade soils; and

f. Prepared this *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 April 10, 2021, through the excavation of seven test pits, labeled TP-101 through TP-109. Test pits TP-106, TP-107, and TP-110 were proposed to be excavated within an existing trailer parking lot but were eliminated due to the presence of parked trailers and to eliminate the restoration of the bituminous pavement. Test pits for the exploration were excavated at the locations shown on the Exploration Location Plan (Figure 2). Test pits were excavated to depths ranging from approximately 4.5 to 10 feet below the existing ground surface (bgs).

Representatives from Colliers Engineering & Design's Geotechnical Department observed the seven (7) 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 Colliers Engineering & Design Mays Landing laboratory facility for further evaluation and analysis. Details pertaining to the subsurface conditions encountered are represented on the Test Pit Logs in Appendix A, Test Pit Photographs in Appendix B, and Laboratory Test Results in Appendix C.

The depth of groundwater is measured from the ground surface to the point of observed seepage or consistent soil moisture. Groundwater was not encountered in either the test borings or test pits that were advanced as part of this evaluation within the extents of the test explorations. Perched water was observed in test pit TP-101 at a depth of approximately 35 inches bgs.

The subsurface strata were also evaluated with respect to mottling and soil staining (i.e. redox) to determine if seasonal high groundwater levels extended into the 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.

Please refer to Table 1 for a summary of depths to the groundwater table and to the estimated seasonal high-water level (ESHWL). The ESHWL reported in the test pits generally correlate to the observed static groundwater table (GWT). 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 No. 1 – Depth to Ground Water Table & Estimated Seasonal High-Water Level Summary

Test Pit ID	Ground Surface Elev. (ft)	Termination Depth of Test Exploration (ft)	Depth to GWT (in)	Depth to ESHWL (in)	GWT Elev. (ft)	ESHWL Elev. (ft)
TP-101	80.1	7.8	NE	ND	N/A	N/A
TP-102	81.5	7.6	NE	ND	N/A	N/A
TP-103	80.3	9.1	NE	ND	N/A	N/A
TP-104	78.1	6.4	NE	ND	N/A	N/A
TP-105	80.7	9.2	NE	ND	N/A	N/A
TP-108	80.9	6.8	NE	ND	N/A	N/A
TP-109	80.9	4.3	NE	ND	N/A	N/A

NE – Not Encountered; ND – Not Detected: N/A – Not Applicable

5.0 Subsurface Conditions

5.1 Regional Geology

The site is located within the Piedmont Physiographic Province. According to the *Surficial Geology of the Bound Brook Quadrangle, Somerset and Middlesex Counties New Jersey* (Stanford 1992), the surficial soils are composed of weathered bedrock material, particularly weathered shale and mudstone (Map Unit – *Qsw*) which is characterized as diamict material consisting of some to many angular chips of red shale in reddish-brown, red, and reddish-yellow silty clay to clayey silt, generally 3 to 10 feet thick. Based on the *Bedrock Geology of the Bound Brook Quadrangle, Somerset and Middlesex Counties New Jersey* (Volkert and Monteverde, 2011), the bedrock is part of the Passaic Formation, Lower Jurassic and Upper Triassic (Map Unit – JT_Rp) which is an interbedded sequence of reddish-brown, and less commonly, maroon or purple, fine to coarse-grained sandstone, siltstone, shaly siltstone, silty mudstone, and mudstone.

According to the Natural Resources Conservation Service (NRCS) Web Soil Survey, the soils at the project site are classified as *Reaville silt loam, 2 to 6 percent slopes (RehB),* and *Rowland silt loam, 0 to 2 percent slopes, frequently flooded (RorAt)* each with a Hydrologic Soil Group Designation of C. These soils have a typical soil profile of silt loam underlain by shallow weathered to competent bedrock.

5.2 Subsurface Description

The surface cover in each test pit, a topsoil, consisted of a yellowish red to reddish brown silt loam to loam with occasional fine roots. The topsoil layer was found to be 3 to 11 inches thick. Underlying the surficial layer were layers of reddish brown to gray sandy clay loam to clay. Gravel and cobbles were encountered in this layer up to a 50%. This layer extended to depths ranging from 13 to 85 inches below ground surface. Each test pit terminated in a weathered shale bedrock material that was yellowish brown in color. Test pits were terminated at depths ranging from 52 to 110 inches below ground surface.

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 Colliers Engineering & Design's Geotechnical Laboratory in Mays Landing, New Jersey. The testing consisted of fourteen (14) 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 Chapter 12, "Soil Testing Criteria," of the *New Jersey Stormwater Best Management Practices Manual* (November 2020) requirements.

The soil samples were selected based on field observations made by design personnel, the proposed infiltration depths, and comparison to 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. Tube Permeameter test results are presented in Appendix C.

Table No. 2 – Infiltration Test Summary, Tube Permeameter Testing (N.J.A.C. 7:9A-6.2)

Test Pit ID	Ground Surface Elev. (ft)	Testing Depth Below Existing Grade (in)	Approx. Testing Elev. (ft)	Measured Infiltration Rate (in/hr)	Soil Permeability Class Rating
TP-101	80.1	67		5.93* / 0.0	K3 / K0
TP-102	81.5	58		0.14 / 0.23	K0 / K1
TP-103	80.3	82		0.0 / 17.22*	K0 / K4
TP-104	78.1	52		20.29* / 12.84*	K4 / K5
TP-105	80.7	77		1.15* / 0.75*	K2 / K2
TP-108	80.9	49		0.01 / 0.04	K0 / K0
TP-109	80.9	9		5.15* / 6.08*	K3 / K4

7.0 Discussion

It is our understanding that the proposed stormwater management plan for the site consist of the use of porous pavements and underdrain systems. According to the Natural Resources Conservation Service (NRCS) Web Soil Survey, the soils at the project site are classified as *Reaville silt loam, 2 to 6 percent slopes (RehB),* and *Rowland silt loam, 0 to 2 percent slopes, frequently flooded (RorAt)* each with a Hydrologic Soil Group Designation of C. These soils have a typical soil profile of silt loam underlain by shallow weathered to competent bedrock.

The depth of groundwater is typically measured from the ground surface to the point of observed seepage or consistent soil moisture. At the time of our exploration, groundwater was not encountered within the test pits excavated. 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. We note that the test pit excavations conducted as part of this preliminary evaluation were performed in the later parts of the "wet" season (which is between January 1 and April 30, per NJDEP BMP).

The results of our laboratory-testing program yielded highly variable infiltration values which did not correlate well with the soil composition encountered within the test pit excavations. We believe that this is the result of a combination of factors including the presence of rock (shale) fragments within the soil matrix which lead to the potential for large voids in the tube sample. Based on our visual characterization, the near surface soils are consistent with the typical soil profiles as indicated in the NRCS Web Soil Survey.

The soils with lower permeability values will act as limiting zones and may be addressed by excavation and removal, with replacement with granular soils exhibiting higher permeability rates (sands with a Soil Permeability Class Rating of K3 or better), depending on final site grades and proposed infiltration levels.

Given the presence of shallow bedrock within the limits of the project site, we recommend that a Basin Flooding Test be conducted in accordance with the requirements of N.J.A.C. 7:9A-6.7 and Chapter 12 of the NJDEP BMP Manual. We recommend a factor of safety of 2 to be applied to the slowest infiltration rate of the replicate tube pairs for the design of the stormwater management basins. Once the final site design and grading are prepared, and following the final stormwater exploration and testing program, as needed, construction recommendations should be provided to outline proper equipment, sequence, subgrade preparation, testing, and any subgrade amendments. We are available to perform the final stormwater exploration and testing program, and provide construction recommendations, if requested.

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 when final site regrading is prepared, Colliers Engineering & Design should be notified immediately to determine what impact the changed conditions or the grading may have upon the presented recommendations.

9.0 Limitations

Services performed by Colliers Engineering & Design 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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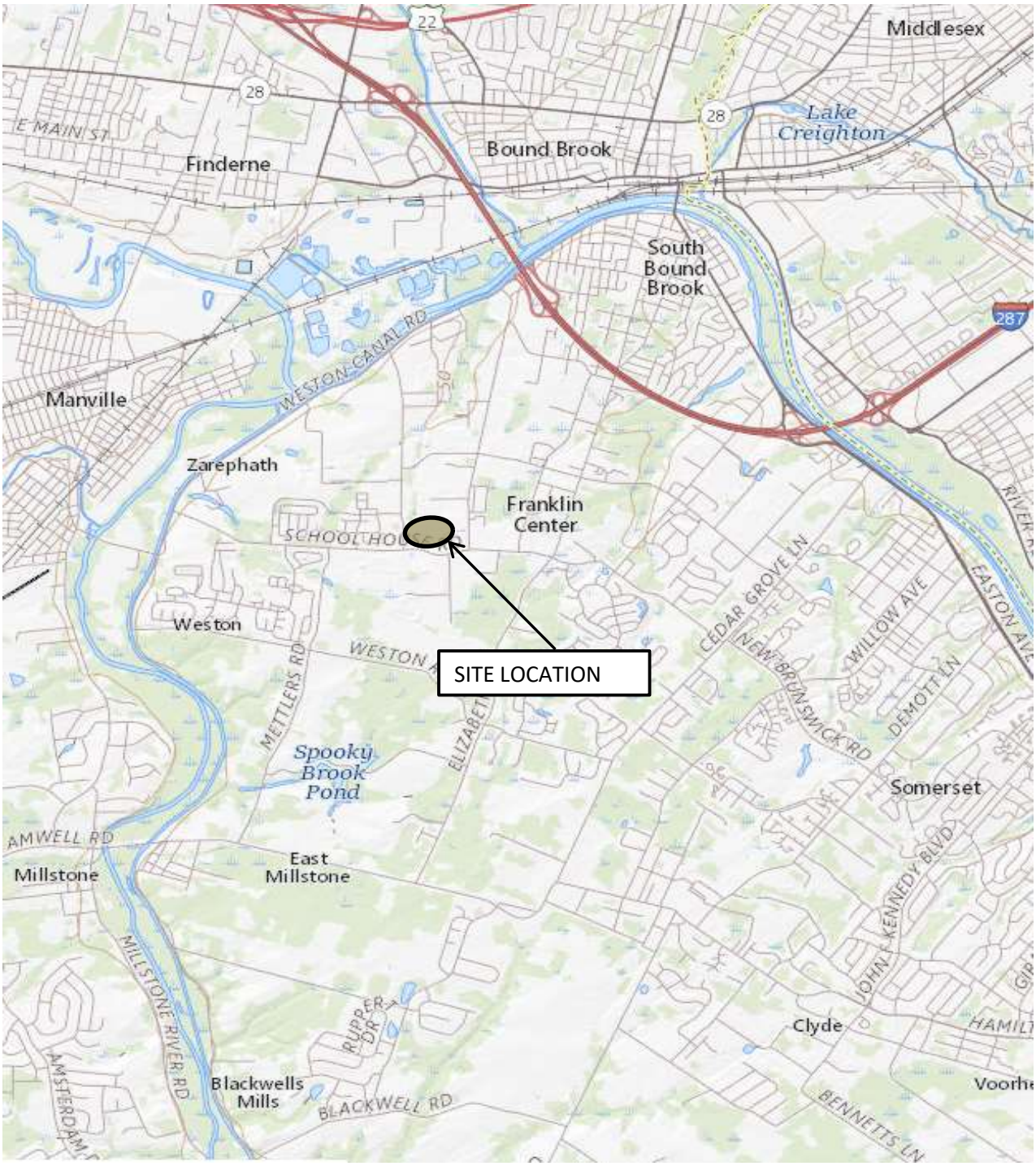

NOTES:

1.) *SITE MAP OBTAINED FROM USGS TOPOGRAPHIC MAP, BERNARDSVILLE, NEW JERSEY QUADRANGLE, DATED 2019.

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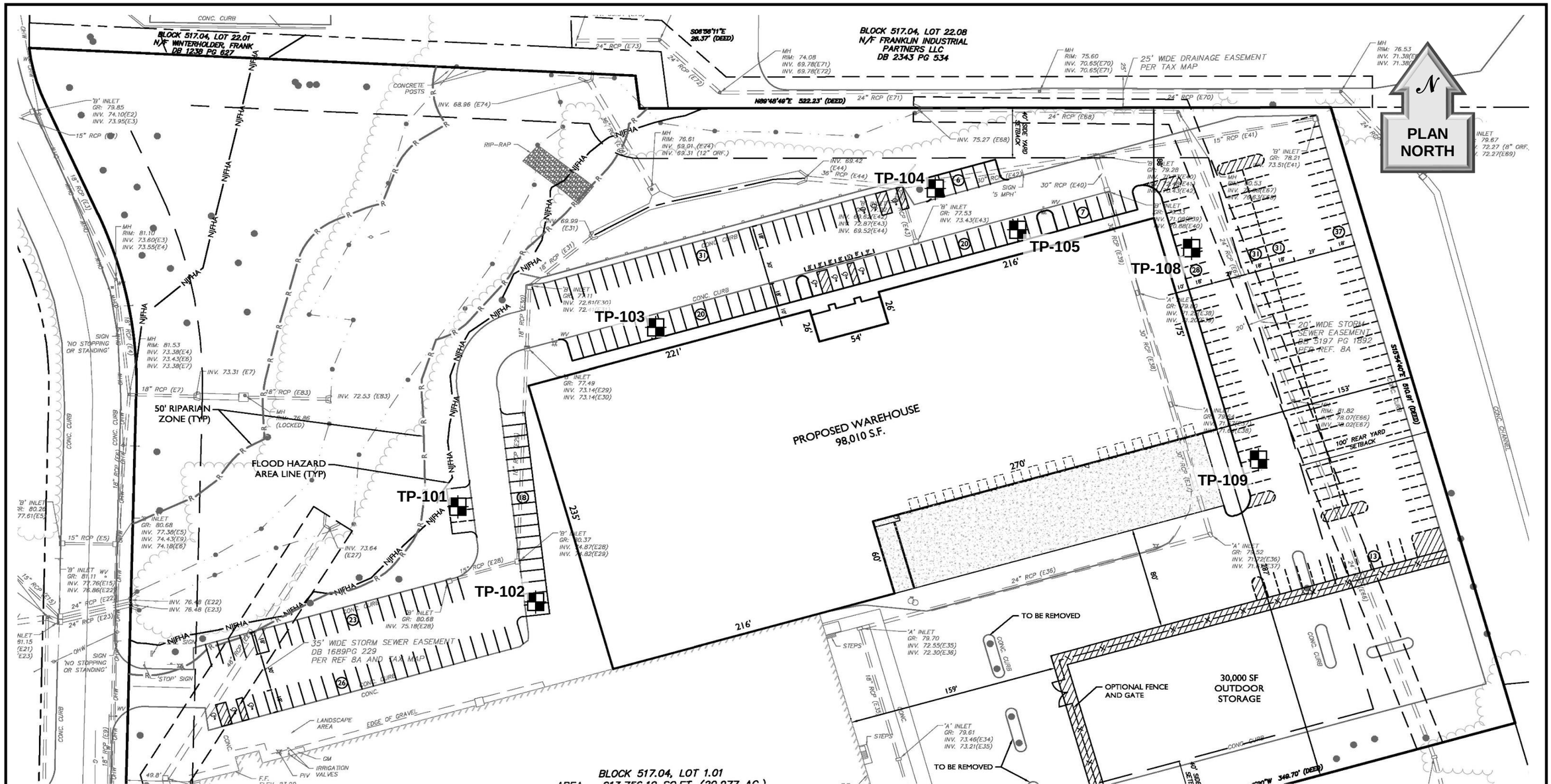
Title: SITE LOCATION MAP

Project: **PROPOSED ONE-STORY WAREHOUSE**
1100 RANDOLPH ROAD
TOWNSHIP OF WEST FRANKLIN
SOMERSET COUNTY, NEW JERSEY

Drawn	MN	Checked By:	MC	Project	20001469A
Scale	N.T.S.	Date	5/21/21	Figure No.:	1



LEGEND:

TP-1 INDICATES THE NUMBERS AND APPROXIMATE LOCATIONS OF TEST PITS PERFORMED.

NOTES:

1.) THIS FIGURE IS BASED ON MASER CONSULTING'S CONCEPT PLAN FOR ROSENWACH GROUP, BLOCK 517.04, LOT 1.01, DATED OCTOBER 29, 2020.

2.) EXPLORATION LOCATIONS ARE APPROXIMATE BASED UPON EXISTING SITE FEATURES AND BASE MAP INFORMATION AVAILABLE AT THE TIME OF OUR FIELD EXPLORATIONS.

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TITLE: EXPLORATION LOCATION PLAN

PROJECT:

PROPOSED ONE-STORY WAREHOUSE
1100 RANDOLPH ROAD
TOWNSHIP OF FRANKLIN
SOMERSET COUNTY, NEW JERSEY

DRAWN BY:	CHECKED BY:	PROJECT NO.:
MC	MC	20001469A
SCALE: N.T.S.	DATE: 5/21/21	FIGURE NO.: 2

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Appendix A

Test Pit Logs

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Burmister Soil Classification System

I - Soil and Fraction/Plasticity Definitions

Material	Symbol	Fraction	Sieve Size	Definition
Boulders	Bldr	-----	9" +	Material retained on 9" sieve.
Cobbles	Cbl	-----	3" to 9"	Material passing 9" sieve and retained on the 3" sieve.
Gravel	G	Coarse (c) Medium (m) Fine (f)	1" to 3" 3/8" to 1" No. to 3/8"	Material passing the 3" sieve and retained on the No. 10 sieve.
Sand	S	Coarse (c) Medium (m) Fine (f)	No. 30 to No. 10 No. 60 to No. 30 No. 200 to No. 60	Material passing No. 10 sieve and retained on the No. 200 sieve.
Material	**Symbol**	**Plasticity**	**Plasticity Index**	**Definition**
Silt	$	Non-Plastic	Passing No. 200 (0.075 mm) PI<1	Material passing the No. 200 sieve that is non-plastic in character and exhibits little or no strength when air-dried.
Clayey Silt	cy$	Slight (SL)	1 to 5	Clay – Soil. Material passing the No. 200 sieve which can be made to exhibit plasticity and clay qualities within a certain range of moisture content, and which exhibits considerable strength when air-dried.
Silt & Clay	$ & C	Low (L)	5 to 10	
Clay & Silt	C & $	Medium (M)	10 to 20	
Silty Clay	$C	High (H)	20 to 40	
Clay	C	Very High (VH)	40 Plus	
Organic Silt	(O$)	-----	-----	Material passing the No. 200 sieve which exhibits plastic properties within a certain range of moisture content and exhibits fine granular and organic characteristics.

II - Proportion Definitions

Component	Written	Proportions	Symbol	Percentage Range by Weight*
Principal	CAPITALS	---	---	50 or more
Minor	Lower Case	And	a.	35 to 50
		Some	s.	20 to 35
		Little	l.	10 to 20
		Trace	t.	0 to 10

* Minus sign (-) lower limit, plus sign (+) upper limit, no sign middle range.

III – Terminology for Stratified Soils

Terminology	Definition
Parting	0 to 1/16" thickness
Seam	1/16" to ½" thickness
Layer	½" to 12" thickness
Occasional	One or less per foot of thickness
Frequent	More than one per foot of thickness
Alternating	Stratification descriptor (non-varved)

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331 Newman Springs Road, Suite 203, Red Bank, NJ 07701

PROJECT: 1100 Randolph Road
Franklin Township, Somserset County, NJ

LOCATION: See Plan.

PROJECT NO. 20001469A

TEST PIT: TP-101

GROUND ELEVATION (ft): 80.1
ELEV. FROM: Survey

GROUNDWATER ELEV. (ft):

GROUNDWATER:	DEPTH (ft)	DATE
First Encountered	N.E.	4/10/21
At Completion (0 hrs.)	N.E.	4/10/21

CONTRACTOR: Kevin Viersma
EQUIPMENT: CAT 311

FIELD OBSERVER: S. Chasmar
CHECKED BY: M. Carnivale

DATE STARTED 4/10/21
DATE FINISHED 4/10/21

DEPTH (ft.)	WATER SYMBOL	DESCRIPTION
0		(5YR 4/6) Yellowish Red Silt Loam. Subangular-Blocky, Friable. Occasional f Roots. (Topsoil). [CLAY & SILT, some(-) c(-)mf Sand].
11" / 79.20		(5YR 5/4) Reddish Brown Sandy Clay Loam. Subangular-Blocky, Firm. 40% Gravel, 10% Cobbles. (Moist). [cmf GRAVEL, little Clay & Silt, little(-) cmf Sand].
2		
4		
57" / 75.35		(10YR 5/1) Gray Clay Loam. Massive, Very Firm. (Moist). [CLAY & SILT, some(-) cmf Sand].
70"		(10YR 5/4) Yellowish Brown Shale. (Possible Bedrock).
6		
94" / 72.30		END OF TEST PIT AT 94 INCHES
8		
10		
12		

NOTES:

PERCHED WATER CONDITIONS ENCOUNTERED AT: 35 inches
Est. Seasonal High Groundwater - Not Detected

TEST PIT: TP-101

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331 Newman Springs Road, Suite 203, Red Bank, NJ 07701

PROJECT: 1100 Randolph Road
Franklin Township, Somserset County, NJ

LOCATION: See Plan.

PROJECT NO. 20001469A

TEST PIT: TP-102

GROUND ELEVATION (ft): 81.5
ELEV. FROM: Survey

GROUNDWATER ELEV. (ft):

GROUNDWATER:	DEPTH (ft)	DATE
First Encountered	N.E.	4/10/21
At Completion (0 hrs.)	N.E.	4/10/21

CONTRACTOR: Kevin Viersma
EQUIPMENT: CAT 311

FIELD OBSERVER: S. Chasmar
CHECKED BY: M. Carnivale

DATE STARTED 4/10/21
DATE FINISHED 4/10/21

DEPTH (ft.)	WATER SYMBOL	DESCRIPTION
0		6" 81.00 (5YR 4/8) Yellowish Red Loam. Subangular-Blocky, Friable. Frequent f Roots. (Topsoil). [SILT & CLAY, and(-) cmf Sand].
		(5YR 5/4) Reddish Brown Sandy Clay Loam. Subangular-Blocky, Firm. 45% Gravel, 15% Cobbles. (Moist). [cmf GRAVEL, little(+) Clay & Silt, little cmf Sand].
2		
4		55" 76.90 (10YR 5/1) Gray Clay. Massive, Very Firm. (Moist). [Silty CLAY, little c(-)mf Sand].
		70" (10YR 5/4) Yellowish Brown Shale. (Possible Bedrock).
6		91"
8		73.90 END OF TEST PIT AT 91 INCHES
10		
12		

NOTES:

Perched Water Conditions - Not Encountered
Est. Seasonal High Groundwater - Not Detected

TEST PIT: TP-102

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331 Newman Springs Road, Suite 203, Red Bank, NJ 07701

PROJECT: 1100 Randolph Road
Franklin Township, Somserset County, NJ

LOCATION: See Plan.

PROJECT NO. 20001469A

TEST PIT: TP-103

GROUND ELEVATION (ft): 80.3
ELEV. FROM: Survey

GROUNDWATER ELEV. (ft):

GROUNDWATER:	DEPTH (ft)	DATE
First Encountered	N.E.	4/10/21
At Completion (0 hrs.)	N.E.	4/10/21

CONTRACTOR: Kevin Viersma
EQUIPMENT: CAT 311

FIELD OBSERVER: S. Chasmar
CHECKED BY: M. Carnivale

DATE STARTED 4/10/21
DATE FINISHED 4/10/21

DEPTH (ft.)	WATER SYMBOL	DESCRIPTION
0		7" 79.72 (5YR 4/3) Reddish Brown Loam. Subangular-Blocky, Friable. Frequent f Roots. (Topsoil). [SILT & CLAY, and cmf Sand].
2		(5YR 5/4) Reddish Brown Sandy Clay Loam. Subangular-Blocky, Firm. 50% Gravel, 15% Cobbles. (Moist). [cmf GRAVEL, little(-) Clay & Silt, little cmf Sand].
4		
6		71" 74.40 (10YR 5/1) Gray Clay. Massive, Very Firm. (Moist). [Silty CLAY, little(-) mf Sand].
8		85" (10YR 5/4) Yellowish Brown Shale. (Possible Bedrock).
10		109" 71.20 END OF TEST PIT AT 109 INCHES
12		

NOTES:

Perched Water Conditions - Not Encountered
Est. Seasonal High Groundwater - Not Detected

TEST PIT: TP-103

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331 Newman Springs Road, Suite 203, Red Bank, NJ 07701

PROJECT: 1100 Randolph Road
Franklin Township, Somserset County, NJ

LOCATION: See Plan.

PROJECT NO. 20001469A

TEST PIT: TP-104

GROUND ELEVATION (ft): 78.1
ELEV. FROM: Survey

GROUNDWATER ELEV. (ft):

GROUNDWATER:	DEPTH (ft)	DATE
First Encountered	N.E.	4/10/21
At Completion (0 hrs.)	N.E.	4/10/21

CONTRACTOR: Kevin Viersma
EQUIPMENT: CAT 311

FIELD OBSERVER: S. Chasmar
CHECKED BY: M. Carnivale

DATE STARTED 4/10/21
DATE FINISHED 4/10/21

DEPTH (ft.)	WATER SYMBOL	DESCRIPTION
0		
7" / 77.50		(5YR 4/3) Reddish Brown Silt Loam. Subangular-Blocky, Friable. Frequent f Roots. (Topsoil). [SILT & CLAY, some cmf Sand].
		(5YR 5/4) Reddish Brown Sandy Clay Loam. Subangular-Blocky, Friable. 10% Gravel, 15% Cobbles. (Moist). [CLAY & SILT, some cmf Sand, little(-) cmf Gravel].
2		
46" / 74.27		
4		
53"		(10YR 5/1) Gray Silty Clay. Massive, Very Firm. Occasional f Roots. (Moist). [CLAY & SILT, little(+) mf Sand].
		(10YR 5/4) Yellowish Brown Shale. (Possible Bedrock).
6		
77" / 71.69		END OF TEST PIT AT 77 INCHES
8		
10		
12		

NOTES:

Perched Water Conditions - Not Encountered
Est. Seasonal High Groundwater - Not Detected

TEST PIT: TP-104

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331 Newman Springs Road, Suite 203, Red Bank, NJ 07701

PROJECT: 1100 Randolph Road
Franklin Township, Somserset County, NJ

LOCATION: See Plan.

PROJECT NO. 20001469A

TEST PIT: TP-105

GROUND ELEVATION (ft): 80.7
ELEV. FROM: Survey

GROUNDWATER ELEV. (ft):

GROUNDWATER:	DEPTH (ft)	DATE
First Encountered	N.E.	4/10/21
At Completion (0 hrs.)	N.E.	4/10/21

CONTRACTOR: Kevin Viersma
EQUIPMENT: CAT 311

FIELD OBSERVER: S. Chasmar
CHECKED BY: M. Carnivale

DATE STARTED 4/10/21
DATE FINISHED 4/10/21

DEPTH (ft.)	WATER SYMBOL	DESCRIPTION
0		7" (80.10) (5YR 4/3) Reddish Brown Loam. Subangular-Blocky, Friable. Frequent f Roots. (Topsoil). [SILT & CLAY, and(-) cmf Sand].
2		(5YR 5/4) Reddish Brown Sandy Clay Loam. Platy, Firm. 50% Gravel, 20% Cobbles. (Moist). [cmf GRAVEL, little Clay & Silt, cmf Sand].
4		67"
6		75.12 (10YR 5/1) Gray Sandy Clay Loam. Massive, Very Firm. (Moist). [CLAY & SILT, some(+) cmf Sand]. 81"
8		(10YR 5/4) Yellowish Brown Shale. (Possible Bedrock). 110"
10		71.54 END OF TEST PIT AT 110 INCHES
12		

NOTES:

Perched Water Conditions - Not Encountered
Est. Seasonal High Groundwater - Not Detected

TEST PIT: TP-105

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331 Newman Springs Road, Suite 203, Red Bank, NJ 07701

PROJECT: 1100 Randolph Road
Franklin Township, Somserset County, NJ

LOCATION: See Plan.

PROJECT NO. 20001469A

TEST PIT: TP-108

GROUND ELEVATION (ft): 80.9
ELEV. FROM: Survey

GROUNDWATER ELEV. (ft):

GROUNDWATER:	DEPTH (ft)	DATE
First Encountered	N.E.	4/10/21
At Completion (0 hrs.)	N.E.	4/10/21

CONTRACTOR: Kevin Viersma
EQUIPMENT: CAT 311

FIELD OBSERVER: S. Chasmar
CHECKED BY: M. Carnivale

DATE STARTED 4/10/21
DATE FINISHED 4/10/21

DEPTH (ft.)	WATER SYMBOL	DESCRIPTION
0		4" 80.57 (5YR 4/3) Reddish Brown Silt Loam. Subangular-Blocky, Friable. 5% Gravel. (Topsoil) . [SILT & CLAY, some cmf Sand, trace f Gravel].
2		(5YR 5/4) Reddish Brown Sandy Clay Loam. 35% Gravel, 5% Cobbles. Sheet Metal at 33". (Moist). [SILT & CLAY, little(-) cmf Sand, some(+) cmf Gravel].
		37" 77.80 (10YR 5/1) Gray Clay. Massive, Very Firm. (Moist). [Silty CLAY, little(-) c(-)mf Sand].
4		52" (10YR 5/4) Yellowish Brown Shale.
6		82"
		74.10 END OF TEST PIT AT 82 INCHES
8		
10		
12		

NOTES:

Perched Water Conditions - Not Encountered
Est. Seasonal High Groundwater - Not Detected

TEST PIT: TP-108

Colliers Engineering & Design

331 Newman Springs Road, Suite 203, Red Bank, NJ 07701

PROJECT: 1100 Randolph Road
Franklin Township, Somserset County, NJ

LOCATION: See Plan.

PROJECT NO. 20001469A

TEST PIT: TP-109

GROUND ELEVATION (ft): 80.9
ELEV. FROM: Survey

GROUNDWATER ELEV. (ft):

GROUNDWATER:	DEPTH (ft)	DATE
First Encountered	N.E.	4/10/21
At Completion (0 hrs.)	N.E.	4/10/21

CONTRACTOR: Kevin Viersma
EQUIPMENT: CAT 311

FIELD OBSERVER: S. Chasmar
CHECKED BY: M. Carnivale

DATE STARTED 4/10/21
DATE FINISHED 4/10/21

DEPTH (ft.)	WATER SYMBOL	DESCRIPTION
0		3" (80.65) (5YR 4/3) Reddish Brown Silt Loam. Subangular-Blocky, Friable. Frequent mf Roots. (Topsoil). [SILT & CLAY, some(+) cmf Sand].
		13" (10YR 6/3) Pale Brown Sandy Clay Loam. Subangular-Blocky, Friable. 40% Gravel, 5% Cobbles. (Moist). [cmf GRAVEL, some Clay & Silt, some cmf Sand].
2		(10YR 5/4) Yellowish Brown Shale. (Possible Bedrock).
4		52" (76.60) END OF TEST PIT AT 52 INCHES
6		
8		
10		
12		

NOTES:

Perched Water Conditions - Not Encountered
Est. Seasonal High Groundwater - Not Detected

TEST PIT: TP-109

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Appendix B

Test Pit Photographs

Photograph 1 – Test Pit TP-101

Photograph 2 – Test Pit TP-102

Photograph 3 – Test Pit TP-103

Photograph 4 – Test Pit TP-104

Photograph 5 – Test Pit TP-105

Photograph 6 – Test Pit TP-108

Photograph 7 – Test Pit TP-109

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Appendix C

Tube Permeameter Test Results

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TUBE PERMEAMETER TEST

(N.J.A.C. 7:9A - Standards for Individual Subsurface Sewage Disposal Systems; Subchapter 6, Section 6.2, page 39, Modified)

Client: Rosenwach Group **Project #:** 20001469A

Project: 1100 Randolph Road **Date:** May 19, 2021

Boring/Sample # or Descrip./Location: TP-101 / S-1A **Depth:** 67"

Visual Description of Soil (USDA): Light gray brown red SILTY CLAY with trace gravel

Technician: K. Perry

Proctor Data:

Max Dry Density (pcf)	% of Max Dry Density	Opt. Moisture (%)
-	-	-

Initial Specimen Data:

Sample Type:
Undisturbed ☑
Re-Compacted ☐

Water Content (%)	Length, L (in)	Diameter (in)	Wet Density (pcf)	Dry Density (pcf)
29.5	5.17	2.875	124.9	96.4

Radius of Burette, r: 0.3141 in **Radius of Soil Specimen, R:** 1.4375 in

TEST DATA

1	2	3	4	5		6	7	8	9
Trial No.	Burette Readings		Head, h (cm)	Time, t		Temp, T (^oC)	Permeability at T^oC, k_T	Temp Correc.	Permeability at 20^oC, k_{20}
	h_1 (cm)	h_2 (cm)		Sec	Min				
1	90.0	80.0	10.0	18.5	0.309	16.7	5.65	1.087	6.14
2	90.0	80.0	10.0	18.4	0.307	16.7	5.68	1.087	6.18
3	90.0	80.0	10.0	19.0	0.317	16.7	5.51	1.087	5.99
4	80.0	70.0	10.0	20.2	0.336	16.7	5.89	1.087	6.40
5	80.0	70.0	10.0	21.4	0.356	16.7	5.56	1.087	6.04
6	80.0	70.0	10.0	21.4	0.356	16.7	5.56	1.087	6.04
7	70.0	60.0	10.0	24.9	0.415	16.7	5.50	1.087	5.98
8	70.0	60.0	10.0	25.0	0.416	16.7	5.49	1.087	5.97
9	70.0	60.0	10.0	25.5	0.425	16.7	5.37	1.087	5.84
10	60.0	50.0	10.0	30.4	0.507	16.7	5.33	1.087	5.79
11	60.0	50.0	10.0	30.3	0.505	16.7	5.35	1.087	5.82
12	60.0	50.0	10.0	30.5	0.508	16.7	5.32	1.087	5.78
13	50.0	40.0	10.0	37.9	0.632	16.7	5.23	1.087	5.69
14	50.0	40.0	10.0	37.9	0.632	16.7	5.23	1.087	5.68
15	50.0	40.0	10.0	38.9	0.648	16.7	5.10	1.087	5.55

Perm, k_T (7) = 60 * L/t * r^2/R^2* ln(h1/h2) = 60* L/(5) * r^2/R^2 * ln((2)/(3))

Head, h (4) = (2) - (3); **Perm, k_{20}** (9) = (7)*(8)

AVERAGE k_{20} (in/hr): **5.93**

SOIL PERMEABILITY CLASS: **K3**

Soil Permeability Classes

> 20 inches per hour (in/hr)	K5
6 - 20 in/hr	K4
2 - 6 in/hr	K3
0.6 - 2 in/hr	K2
0.2 - 0.6 in/hr	K1
< 0.2 in/hr	K0

Remarks

- Sample able to slide up and down within the tube during preparation & was split horizontally about midway in the tube.
- Localized voids along sample wall but did not extend full length of sample.

Plate No.: TP-1

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TUBE PERMEAMETER TEST

(N.J.A.C. 7:9A - Standards for Individual Subsurface Sewage Disposal Systems; Subchapter 6, Section 6.2, page 39, Modified)

Client: Rosenwach Group **Project #:** 20001469A

Project: 1100 Randolph Road **Date:** May 19, 2021

Boring/Sample # or Descrip./Location: TP-101 / S-1B **Depth:** 67"

Visual Description of Soil (USDA): Light gray brown red SILTY CLAY with trace gravel

Technician: K. Perry

Proctor Data:

Max Dry Density (pcf)	% of Max Dry Density	Opt. Moisture (%)
-	-	-

Initial Specimen Data:

Sample Type:
Undisturbed ☑
Re-Compacted ☐

Water Content (%)	Length, L (in)	Diameter (in)	Wet Density (pcf)	Dry Density (pcf)
29.1	5.13	2.875	123.1	95.3

Radius of Burette, r: 0.3141 in **Radius of Soil Specimen, R:** 1.4375 in

TEST DATA

1	2	3	4	5		6	7	8	9
Trial No.	Burette Readings		Head, h (cm)	Time, t		Temp, T (^oC)	Permeability at T^oC, k_T	Temp Correc.	Permeability at 20^oC, k_{20}
	h_1 (cm)	h_2 (cm)		Sec	Min				
1	90.0	90.0	0.0	600.0	10.000	17.0	0.00	1.079	0.00
2	80.0	80.0	0.0	600.0	10.000	17.0	0.00	1.079	0.00
3	70.0	70.0	0.0	600.0	10.000	17.1	0.00	1.076	0.00
4	60.0	60.0	0.0	600.0	10.000	17.1	0.00	1.076	0.00
5	50.0	50.0	0.0	600.0	10.000	17.1	0.00	1.076	0.00

Perm, k_T (7) = 60 * L/t * r^2/R^2* ln(h1/h2) = 60* L/(5) * r^2/R^2 * ln((2)/(3))

Head, h (4) = (2) - (3); **Perm, k_{20}** (9) = (7)*(8)

AVERAGE k_{20} (in/hr):	**0.00**
SOIL PERMEABILITY CLASS:	**K0**

Soil Permeability Classes

> 20 inches per hour (in/hr)	K5
6 - 20 in/hr	K4
2 - 6 in/hr	K3
0.6 - 2 in/hr	K2
0.2 - 0.6 in/hr	K1
< 0.2 in/hr	K0

Remarks

- Sample was very loose inside of the tube. Sample able to slide up and down within the tube during preparation.

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TUBE PERMEAMETER TEST

(N.J.A.C. 7:9A - Standards for Individual Subsurface Sewage Disposal Systems; Subchapter 6, Section 6.2, page 39, Modified)

Client: Rosenwach Group **Project #:** 20001469A

Project: 1100 Randolph Road **Date:** May 19, 2021

Boring/Sample # or Descrip./Location: TP-102 / S-1A **Depth:** 58"

Visual Description of Soil (USDA): Brown light gray CLAY

Technician: K. Perry

Proctor Data:

Max Dry Density (pcf)	% of Max Dry Density	Opt. Moisture (%)
-	-	-

Initial Specimen Data:

Sample Type:
Undisturbed ☑
Re-Compacted ☐

Water Content (%)	Length, L (in)	Diameter (in)	Wet Density (pcf)	Dry Density (pcf)
23.9	5.14	2.875	120.4	97.2

Radius of Burette, r: 0.3141 in **Radius of Soil Specimen, R:** 1.4375 in

TEST DATA

1	2	3	4	5		6	7	8	9
Trial No.	Burette Readings		Head, h (cm)	Time, t		Temp, T (^oC)	Permeability at T^oC, k_T	Temp Correc.	Permeability at 20^oC, k_{20}
	h_1 (cm)	h_2 (cm)		Sec	Min				
1	90.0	80.0	10.0	424.7	7.078	17.5	0.25	1.065	0.26
2	90.0	80.0	10.0	458.1	7.635	17.8	0.23	1.057	0.24
3	90.0	80.0	10.0	455.6	7.594	18.6	0.23	1.036	0.24
4	80.0	71.5	8.5	600.0	10.000	18.2	0.17	1.046	0.17
5	70.0	67.5	2.5	600.0	10.000	18.2	0.05	1.046	0.06
6	60.0	59.5	0.5	600.0	10.000	18.0	0.01	1.051	0.01
7	50.0	50.0	0.0	600.0	10.000	18.1	0.00	1.049	0.00

Perm, k_T (7) = 60 * L/t * r^2/R^2* ln(h1/h2) = 60* L/(5) * r^2/R^2 * ln((2)/(3))

Head, h (4) = (2) - (3); **Perm, k_{20}** (9) = (7)*(8)

AVERAGE k_{20} (in/hr): **0.14**

SOIL PERMEABILITY CLASS: **K0**

Soil Permeability Classes

> 20 inches per hour (in/hr)	K5
6 - 20 in/hr	K4
2 - 6 in/hr	K3
0.6 - 2 in/hr	K2
0.2 - 0.6 in/hr	K1
< 0.2 in/hr	K0

Remarks

- Localized voids along sample wall but did not extend full length of sample.

Plate No.: TP-3

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TUBE PERMEAMETER TEST

(N.J.A.C. 7:9A - Standards for Individual Subsurface Sewage Disposal Systems; Subchapter 6, Section 6.2, page 39, Modified)

Client: Rosenwach Group **Project #:** 20001469A

Project: 1100 Randolph Road **Date:** May 19, 2021

Boring/Sample # or Descrip./Location: TP-102 / S-1B **Depth:** 58"

Visual Description of Soil (USDA): Brown light gray CLAY

Technician: K. Perry

Proctor Data:

Max Dry Density (pcf)	% of Max Dry Density	Opt. Moisture (%)
-	-	-

Initial Specimen Data:

Sample Type:
Undisturbed ☑
Re-Compacted ☐

Water Content (%)	Length, L (in)	Diameter (in)	Wet Density (pcf)	Dry Density (pcf)
26.4	5.22	2.875	124.5	98.5

Radius of Burette, r: 0.3141 in **Radius of Soil Specimen, R:** 1.4375 in

TEST DATA

1	2	3	4	5		6	7	8	9
Trial No.	Burette Readings		Head, h (cm)	Time, t		Temp, T (^oC)	Permeability at T^oC, k_T	Temp Correc.	Permeability at 20^oC, k_{20}
	h_1 (cm)	h_2 (cm)		Sec	Min				
1	90.0	80.0	10.0	508.6	8.476	18.0	0.21	1.051	0.22
2	90.0	80.0	10.0	514.5	8.575	18.0	0.21	1.051	0.22
3	90.0	80.0	10.0	480.2	8.003	17.6	0.22	1.062	0.23
4	80.0	70.0	10.0	541.1	9.019	17.6	0.22	1.062	0.23
5	80.0	70.0	10.0	536.1	8.935	17.4	0.22	1.068	0.24
6	80.0	70.0	10.0	541.2	9.020	17.4	0.22	1.068	0.24
7	70.0	60.5	9.5	600.0	10.000	17.4	0.22	1.068	0.23
8	60.0	52.1	7.9	600.0	10.000	17.3	0.21	1.070	0.23
9	50.0	44.1	5.9	600.0	10.000	17.3	0.19	1.070	0.20

Perm, k_T (7) = 60 * L/t * r^2/R^2* ln(h1/h2) = 60* L/(5) * r^2/R^2 * ln((2)/(3))

Head, h (4) = (2) - (3); **Perm, k_{20}** (9) = (7)*(8)

AVERAGE k_{20} (in/hr):	**0.23**
SOIL PERMEABILITY CLASS:	**K1**

Soil Permeability Classes

> 20 inches per hour (in/hr)	K5
6 - 20 in/hr	K4
2 - 6 in/hr	K3
0.6 - 2 in/hr	K2
0.2 - 0.6 in/hr	K1
< 0.2 in/hr	K0

Remarks

Plate No.: TP-4

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TUBE PERMEAMETER TEST

(N.J.A.C. 7:9A - Standards for Individual Subsurface Sewage Disposal Systems; Subchapter 6, Section 6.2, page 39, Modified)

Client: Rosenwach Group **Project #:** 20001469A

Project: 1100 Randolph Road **Date:** May 19, 2021

Boring/Sample # or Descrip./Location: TP-103 / S-1A **Depth:** 82"

Visual Description of Soil (USDA): Brown light gray CLAY

Technician: K. Perry **Proctor Data:**

Max Dry Density (pcf)	% of Max Dry Density	Opt. Moisture (%)
-	-	-

Initial Specimen Data:

Sample Type:
Undisturbed ☑
Re-Compacted ☐

Water Content (%)	Length, L (in)	Diameter (in)	Wet Density (pcf)	Dry Density (pcf)
23.2	5.17	2.875	117.9	95.7

Radius of Burette, r: 0.3141 in **Radius of Soil Specimen, R:** 1.4375 in

TEST DATA

1	2	3	4	5		6	7	8	9
Trial No.	Burette Readings		Head, h (cm)	Time, t		Temp, T (^oC)	Permeability at T^oC, k_T	Temp Correc.	Permeability at 20^oC, k_{20}
	h_1 (cm)	h_2 (cm)		Sec	Min				
1	90.0	90.0	0.0	600.0	10.000	17.7	0.00	1.059	0.00
2	80.0	80.0	0.0	600.0	10.000	17.7	0.00	1.059	0.00
3	70.0	70.0	0.0	600.0	10.000	17.7	0.00	1.059	0.00
4	60.0	60.0	0.0	600.0	10.000	17.7	0.00	1.059	0.00
5	50.0	50.0	0.0	600.0	10.000	17.7	0.00	1.059	0.00

Perm, k_T (7) = 60 * L/t * r^2/R^2* ln(h1/h2) = 60* L/(5) * r^2/R^2 * ln((2)/(3))

Head, h (4) = (2) - (3); **Perm, k_{20}** (9) = (7)*(8)

AVERAGE k_{20} (in/hr): 0.00

SOIL PERMEABILITY CLASS: K0

Soil Permeability Classes

> 20 inches per hour (in/hr)	K5
6 - 20 in/hr	K4
2 - 6 in/hr	K3
0.6 - 2 in/hr	K2
0.2 - 0.6 in/hr	K1
< 0.2 in/hr	K0

Remarks

- Organic odor

Plate No.: TP-5

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TUBE PERMEAMETER TEST

(N.J.A.C. 7:9A - Standards for Individual Subsurface Sewage Disposal Systems; Subchapter 6, Section 6.2, page 39, Modified)

Client: Rosenwach Group **Project #:** 20001469A

Project: 1100 Randolph Road **Date:** May 19, 2021

Boring/Sample # or Descrip./Location: TP-103 / S-1B **Depth:** 82"

Visual Description of Soil (USDA): Brown CLAY trace organics

Technician: K. Perry

Proctor Data:

Max Dry Density (pcf)	% of Max Dry Density	Opt. Moisture (%)
-	-	-

Initial Specimen Data:

Sample Type:
Undisturbed ☑
Re-Compacted ☐

Water Content (%)	Length, L (in)	Diameter (in)	Wet Density (pcf)	Dry Density (pcf)
23.2	5.03	2.875	118.1	95.8

Radius of Burette, r: 0.3141 in **Radius of Soil Specimen, R:** 1.4375 in

TEST DATA

1	2	3	4	5		6	7	8	9
Trial No.	Burette Readings		Head, h (cm)	Time, t		Temp, T (^oC)	Permeability at T^oC, k_T	Temp Correc.	Permeability at 20^oC, k_{20}
	h_1 (cm)	h_2 (cm)		Sec	Min				
1	90.0	80.0	10.0	6.8	0.113	17.0	14.96	1.079	16.14
2	90.0	80.0	10.0	7.6	0.127	17.0	13.34	1.079	14.38
3	90.0	80.0	10.0	7.4	0.124	17.0	13.73	1.079	14.81
4	80.0	70.0	10.0	7.6	0.127	17.0	15.18	1.079	16.37
5	80.0	70.0	10.0	7.4	0.123	17.0	15.63	1.079	16.86
6	80.0	70.0	10.0	7.4	0.123	17.0	15.63	1.079	16.86
7	70.0	60.0	10.0	8.2	0.137	17.0	16.20	1.079	17.47
8	70.0	60.0	10.0	8.2	0.136	17.0	16.28	1.079	17.56
9	70.0	60.0	10.0	8.3	0.138	17.0	16.08	1.079	17.35
10	60.0	50.0	10.0	9.2	0.153	17.0	17.14	1.079	18.49
11	60.0	50.0	10.0	9.4	0.157	17.0	16.74	1.079	18.05
12	60.0	50.0	10.0	9.2	0.153	17.0	17.19	1.079	18.55
13	50.0	40.0	10.0	11.3	0.188	17.0	17.09	1.079	18.43
14	50.0	40.0	10.0	11.2	0.187	17.0	17.18	1.079	18.53
15	50.0	40.0	10.0	11.2	0.187	17.0	17.15	1.079	18.50

Perm, k_T (7) = 60 * L/t * r^2/R^2* ln(h1/h2) = 60* L/(5) * r^2/R^2 * ln((2)/(3))

Head, h (4) = (2) - (3); **Perm, k_{20}** (9) = (7)*(8)

AVERAGE k_{20} (in/hr): **17.22**

SOIL PERMEABILITY CLASS: **K4**

Soil Permeability Classes

> 20 inches per hour (in/hr)	K5
6 - 20 in/hr	K4
2 - 6 in/hr	K3
0.6 - 2 in/hr	K2
0.2 - 0.6 in/hr	K1
< 0.2 in/hr	K0

Remarks

- Localized voids along sample wall but did not extend full length of sample.
- Sample able to slide up and down within the tube during preparation & was split horizontally about midway in the tube.
- Organic odor

Plate No.: TP-6

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TUBE PERMEAMETER TEST

(N.J.A.C. 7:9A - Standards for Individual Subsurface Sewage Disposal Systems; Subchapter 6, Section 6.2, page 39, Modified)

Client: Rosenwach Group **Project #:** 20001469A

Project: 1100 Randolph Road **Date:** May 19, 2021

Boring/Sample # or Descrip./Location: TP-104 / S-1A **Depth:** 52"

Visual Description of Soil (USDA): Brown SILTY CLAY with trace organics

Technician: K. Perry

Proctor Data:

Max Dry Density (pcf)	% of Max Dry Density	Opt. Moisture (%)
-	-	-

Initial Specimen Data:

Sample Type:
Undisturbed ☑
Re-Compacted ☐

Water Content (%)	Length, L (in)	Diameter (in)	Wet Density (pcf)	Dry Density (pcf)
19.2	5.31	2.875	125.9	105.6

Radius of Burette, r: 0.3141 in **Radius of Soil Specimen, R:** 1.4375 in

TEST DATA

1	2	3	4	5		6	7	8	9
Trial No.	Burette Readings		Head, h (cm)	Time, t		Temp, T (^oC)	Permeability at T^oC, k_T	Temp Correc.	Permeability at 20^oC, k_{20}
	h_1 (cm)	h_2 (cm)		Sec	Min				
1	90.0	80.0	10.0	6.1	0.102	17.5	17.64	1.065	18.78
2	90.0	80.0	10.0	6.0	0.101	17.5	17.81	1.065	18.97
3	90.0	80.0	10.0	6.3	0.105	17.5	17.10	1.065	18.21
4	80.0	70.0	10.0	6.5	0.109	17.5	18.65	1.065	19.86
5	80.0	70.0	10.0	6.0	0.100	17.5	20.40	1.065	21.72
6	80.0	70.0	10.0	6.7	0.111	17.5	18.31	1.065	19.50
7	70.0	60.0	10.0	7.4	0.123	17.5	19.08	1.065	20.31
8	70.0	60.0	10.0	7.4	0.124	17.5	18.92	1.065	20.15
9	70.0	60.0	10.0	7.6	0.126	17.5	18.60	1.065	19.80
10	60.0	50.0	10.0	8.5	0.142	17.5	19.49	1.065	20.76
11	60.0	50.0	10.0	8.6	0.143	17.5	19.36	1.065	20.61
12	60.0	50.0	10.0	8.5	0.142	17.5	19.56	1.065	20.83
13	50.0	40.0	10.0	10.1	0.168	17.5	20.23	1.065	21.54
14	50.0	40.0	10.0	10.1	0.169	17.5	20.13	1.065	21.43
15	50.0	40.0	10.0	9.9	0.166	17.5	20.49	1.065	21.82

Perm, k_T (7) = 60 * L/t * r^2/R^2* ln(h1/h2) = 60* L/(5) * r^2/R^2 * ln((2)/(3))

Head, h (4) = (2) - (3); **Perm, k_{20}** (9) = (7)*(8)

AVERAGE k_{20} (in/hr):	**20.29**
SOIL PERMEABILITY CLASS:	**K5**

Soil Permeability Classes

> 20 inches per hour (in/hr)	K5
6 - 20 in/hr	K4
2 - 6 in/hr	K3
0.6 - 2 in/hr	K2
0.2 - 0.6 in/hr	K1
< 0.2 in/hr	K0

Remarks

- Sample able to slide up and down within the tube during preparation & was split horizontally about midway in the tube.
- large roots in top and bottom of sample.

Plate No.: TP-7

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TUBE PERMEAMETER TEST

(N.J.A.C. 7:9A - Standards for Individual Subsurface Sewage Disposal Systems; Subchapter 6, Section 6.2, page 39, Modified)

Client: Rosenwach Group **Project #:** 20001469A

Project: 1100 Randolph Road **Date:** May 19, 2021

Boring/Sample # or Descrip./Location: TP-104 / S-1B **Depth:** 52"

Visual Description of Soil (USDA): Brown SILTY CLAY

Technician: K. Perry

Proctor Data:

Max Dry Density (pcf)	% of Max Dry Density	Opt. Moisture (%)
-	-	-

Initial Specimen Data:

Sample Type: Undisturbed ☑ Re-Compacted ☐

Water Content (%)	Length, L (in)	Diameter (in)	Wet Density (pcf)	Dry Density (pcf)
14.9	4.90	2.875	132.8	115.6

Radius of Burette, r: 0.3141 in **Radius of Soil Specimen, R:** 1.4375 in

TEST DATA

1	2	3	4	5		6	7	8	9
Trial No.	Burette Readings		Head, h (cm)	Time, t		Temp, T (^oC)	Permeability at T^oC, k_T	Temp Correc.	Permeability at 20^oC, k_{20}
	h_1 (cm)	h_2 (cm)		Sec	Min				
1	90.0	80.0	10.0	8.9	0.148	17.0	11.16	1.079	12.04
2	90.0	80.0	10.0	9.3	0.155	17.0	10.65	1.079	11.49
3	90.0	80.0	10.0	9.4	0.156	17.0	10.57	1.079	11.40
4	80.0	70.0	10.0	9.8	0.164	17.0	11.45	1.079	12.35
5	80.0	70.0	10.0	9.8	0.163	17.0	11.47	1.079	12.37
6	80.0	70.0	10.0	9.8	0.163	17.0	11.53	1.079	12.43
7	70.0	60.0	10.0	11.5	0.191	17.0	11.31	1.079	12.20
8	70.0	60.0	10.0	11.3	0.189	17.0	11.47	1.079	12.37
9	70.0	60.0	10.0	10.9	0.182	17.0	11.86	1.079	12.79
10	60.0	50.0	10.0	12.0	0.200	17.0	12.82	1.079	13.83
11	60.0	50.0	10.0	11.9	0.198	17.0	12.90	1.079	13.91
12	60.0	50.0	10.0	11.9	0.199	17.0	12.87	1.079	13.89
13	50.0	40.0	10.0	14.9	0.248	17.0	12.65	1.079	13.64
14	50.0	40.0	10.0	14.9	0.248	17.0	12.61	1.079	13.60
15	50.0	40.0	10.0	14.2	0.237	17.0	13.24	1.079	14.28

Perm, k_T (7) = 60 * L/t * r^2/R^2* ln(h1/h2) = 60* L/(5) * r^2/R^2 * ln((2)/(3))

Head, h (4) = (2) - (3); **Perm, k_{20}** (9) = (7)*(8)

AVERAGE k_{20} (in/hr): **12.84**

SOIL PERMEABILITY CLASS: **K4**

Soil Permeability Classes

> 20 inches per hour (in/hr)	K5
6 - 20 in/hr	K4
2 - 6 in/hr	K3
0.6 - 2 in/hr	K2
0.2 - 0.6 in/hr	K1
< 0.2 in/hr	K0

Remarks

- Sample able to slide up and down within the tube during preparation & was split horizontally about midway in the tube.

Plate No.: TP-8

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TUBE PERMEAMETER TEST

(N.J.A.C. 7:9A - Standards for Individual Subsurface Sewage Disposal Systems; Subchapter 6, Section 6.2, page 39, Modified)

Client: Rosenwach Group **Project #:** 20001469A

Project: 1100 Randolph Road **Date:** May 19, 2021

Boring/Sample # or Descrip./Location: TP-105 / S-1A **Depth:** 77"

Visual Description of Soil (USDA): Red brown SILTY CLAY LOAM

Technician: K. Perry

Proctor Data:

Max Dry Density (pcf)	% of Max Dry Density	Opt. Moisture (%)
-	-	-

Initial Specimen Data:

Sample Type:
Undisturbed ☑
Re-Compacted ☐

Water Content (%)	Length, L (in)	Diameter (in)	Wet Density (pcf)	Dry Density (pcf)
15.7	4.81	2.875	107.9	93.2

Radius of Burette, r: 0.3141 in **Radius of Soil Specimen, R:** 1.4375 in

TEST DATA

1	2	3	4	5		6	7	8	9
Trial No.	Burette Readings		Head, h (cm)	Time, t		Temp, T (^oC)	Permeability at T^oC, k_T	Temp Correc.	Permeability at 20^oC, k_{20}
	h_1 (cm)	h_2 (cm)		Sec	Min				
1	90.0	80.0	10.0	86.3	1.438	17.1	1.13	1.076	1.21
2	90.0	80.0	10.0	85.8	1.430	17.1	1.13	1.076	1.22
3	90.0	80.0	10.0	86.2	1.437	17.1	1.13	1.076	1.22
4	80.0	70.0	10.0	96.8	1.613	17.1	1.14	1.076	1.23
5	80.0	70.0	10.0	97.0	1.617	17.1	1.14	1.076	1.22
6	80.0	70.0	10.0	97.1	1.618	17.1	1.14	1.076	1.22
7	70.0	60.0	10.0	124.9	2.082	17.0	1.02	1.079	1.10
8	70.0	60.0	10.0	125.1	2.085	17.0	1.02	1.079	1.10
9	70.0	60.0	10.0	124.7	2.079	17.0	1.02	1.079	1.10
10	60.0	50.0	10.0	144.2	2.404	17.0	1.05	1.079	1.13
11	60.0	50.0	10.0	142.3	2.371	17.0	1.06	1.079	1.14
12	60.0	50.0	10.0	150.4	2.507	17.0	1.00	1.079	1.08
13	50.0	40.0	10.0	175.2	2.919	17.0	1.05	1.079	1.14
14	50.0	40.0	10.0	181.6	3.026	17.0	1.02	1.079	1.10
15	50.0	40.0	10.0	186.7	3.112	17.0	0.99	1.079	1.07

Perm, k_T (7) = 60 * L/t * r^2/R^2* ln(h1/h2) = 60* L/(5) * r^2/R^2 * ln((2)/(3))

Head, h (4) = (2) - (3); **Perm, k_{20}** (9) = (7)*(8)

AVERAGE k_{20} (in/hr):	**1.15**
SOIL PERMEABILITY CLASS:	**K2**

Soil Permeability Classes

> 20 inches per hour (in/hr)	K5
6 - 20 in/hr	K4
2 - 6 in/hr	K3
0.6 - 2 in/hr	K2
0.2 - 0.6 in/hr	K1
< 0.2 in/hr	K0

Remarks

- Sample able to slide up and down within the tube during preparation & was split horizontally about midway in the tube.
- Sample was very loose inside of the tube.

Plate No.: TP-9

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TUBE PERMEAMETER TEST

(N.J.A.C. 7:9A - Standards for Individual Subsurface Sewage Disposal Systems; Subchapter 6, Section 6.2, page 39, Modified)

Client: Rosenwach Group **Project #:** 20001469A

Project: 1100 Randolph Road **Date:** May 19, 2021

Boring/Sample # or Descrip./Location: TP-105 / S-1B **Depth:** 77"

Visual Description of Soil (USDA): Brown light gray SILTY CLAY LOAM

Technician: K. Perry

Proctor Data:

Max Dry Density (pcf)	% of Max Dry Density	Opt. Moisture (%)
-	-	-

Initial Specimen Data:

Sample Type:
Undisturbed ☑
Re-Compacted ☐

Water Content (%)	Length, L (in)	Diameter (in)	Wet Density (pcf)	Dry Density (pcf)
17.0	5.36	2.875	112.4	96.1

Radius of Burette, r: 0.3141 in **Radius of Soil Specimen, R:** 1.4375 in

TEST DATA

1	2	3	4	5		6	7	8	9
Trial No.	Burette Readings		Head, h (cm)	Time, t		Temp, T (^oC)	Permeability at T^oC, k_T	Temp Correc.	Permeability at 20^oC, k_{20}
	h_1 (cm)	h_2 (cm)		Sec	Min				
1	90.0	80.0	10.0	129.9	2.165	17.4	0.84	1.068	0.89
2	90.0	80.0	10.0	128.5	2.141	17.4	0.84	1.068	0.90
3	90.0	80.0	10.0	129.9	2.164	17.4	0.84	1.068	0.89
4	80.0	70.0	10.0	170.8	2.846	17.4	0.72	1.068	0.77
5	80.0	70.0	10.0	167.5	2.791	17.4	0.73	1.068	0.78
6	80.0	70.0	10.0	171.1	2.852	17.4	0.72	1.068	0.77
7	70.0	60.0	10.0	187.8	3.130	17.3	0.76	1.070	0.81
8	70.0	60.0	10.0	189.1	3.152	17.3	0.75	1.070	0.80
9	70.0	60.0	10.0	187.6	3.127	17.3	0.76	1.070	0.81
10	60.0	50.0	10.0	289.3	4.822	17.3	0.58	1.070	0.62
11	60.0	50.0	10.0	285.4	4.756	17.3	0.59	1.070	0.63
12	60.0	50.0	10.0	280.3	4.672	17.3	0.60	1.070	0.64
13	50.0	40.0	10.0	345.4	5.756	17.3	0.60	1.070	0.64
14	50.0	40.0	10.0	340.8	5.681	17.3	0.60	1.070	0.65
15	50.0	40.0	10.0	350.0	5.834	17.3	0.59	1.070	0.63

Perm, k_T (7) = 60 * L/t * r^2/R^2* ln(h1/h2) = 60* L/(5) * r^2/R^2 * ln((2)/(3))

Head, h (4) = (2) - (3); **Perm, k_{20}** (9) = (7)*(8)

AVERAGE k_{20} (in/hr): 0.75

SOIL PERMEABILITY CLASS: K2

Soil Permeability Classes

> 20 inches per hour (in/hr)	K5
6 - 20 in/hr	K4
2 - 6 in/hr	K3
0.6 - 2 in/hr	K2
0.2 - 0.6 in/hr	K1
< 0.2 in/hr	K0

Remarks

- Sample was very loose inside of the tube. Sample able to slide up and down within the tube during preparation.
- Localized voids along sample wall but did not extend full length of sample.

Plate No.: TP-10

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TUBE PERMEAMETER TEST

(N.J.A.C. 7:9A - Standards for Individual Subsurface Sewage Disposal Systems; Subchapter 6, Section 6.2, page 39, Modified)

Client: Rosenwach Group **Project #:** 20001469A

Project: 1100 Randolph Road **Date:** May 19, 2021

Boring/Sample # or Descrip./Location: TP-108 / S-1A **Depth:** 49"

Visual Description of Soil (USDA): Red brown SILTY CLAY

Technician: K. Perry

Proctor Data:

Max Dry Density (pcf)	% of Max Dry Density	Opt. Moisture (%)
-	-	-

Initial Specimen Data:

Sample Type:
Undisturbed ☑
Re-Compacted ☐

Water Content (%)	Length, L (in)	Diameter (in)	Wet Density (pcf)	Dry Density (pcf)
16.3	5.24	2.875	126.9	109.1

Radius of Burette, r: 0.3141 in **Radius of Soil Specimen, R:** 1.4375 in

TEST DATA

1	2	3	4	5		6	7	8	9
Trial No.	Burette Readings		Head, h (cm)	Time, t		Temp, T (^oC)	Permeability at T^oC, k_T	Temp Correc.	Permeability at 20^oC, k_{20}
	h_1 (cm)	h_2 (cm)		Sec	Min				
1	90.0	87.3	2.7	600.0	10.000	18.0	0.05	1.051	0.05
2	80.0	80.0	0.0	600.0	10.000	18.0	0.00	1.051	0.00
3	70.0	70.0	0.0	600.0	10.000	18.0	0.00	1.051	0.00
4	60.0	60.0	0.0	600.0	10.000	18.1	0.00	1.049	0.00
5	50.0	50.0	0.0	600.0	10.000	18.1	0.00	1.049	0.00

Perm, k_T (7) = 60 * L/t * r^2/R^2* ln(h1/h2) = 60* L/(5) * r^2/R^2 * ln((2)/(3))

Head, h (4) = (2) - (3); **Perm, k_{20}** (9) = (7)*(8)

AVERAGE k_{20} (in/hr): **0.01**

SOIL PERMEABILITY CLASS: **K0**

Soil Permeability Classes

> 20 inches per hour (in/hr)	K5
6 - 20 in/hr	K4
2 - 6 in/hr	K3
0.6 - 2 in/hr	K2
0.2 - 0.6 in/hr	K1
< 0.2 in/hr	K0

Remarks

- Localized voids along sample wall but did not extend full length of sample.

Plate No.: TP-11

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TUBE PERMEAMETER TEST

(N.J.A.C. 7:9A - Standards for Individual Subsurface Sewage Disposal Systems; Subchapter 6, Section 6.2, page 39, Modified)

Client: Rosenwach Group **Project #:** 20001469A

Project: 1100 Randolph Road **Date:** May 19, 2021

Boring/Sample # or Descrip./Location: TP-108 / S-1B **Depth:** 49"

Visual Description of Soil (USDA): Red brown SILTY CLAY

Technician: K. Perry **Proctor Data:**

Max Dry Density (pcf)	% of Max Dry Density	Opt. Moisture (%)
-	-	-

Initial Specimen Data:

Sample Type:
Undisturbed ☑
Re-Compacted ☐

Water Content (%)	Length, L (in)	Diameter (in)	Wet Density (pcf)	Dry Density (pcf)
18.2	5.38	2.875	129.3	109.4

Radius of Burette, r: 0.3141 in **Radius of Soil Specimen, R:** 1.4375 in

TEST DATA

1	2	3	4	5		6	7	8	9
Trial No.	Burette Readings		Head, h (cm)	Time, t		Temp, T (^oC)	Permeability at T^oC, k_T	Temp Correc.	Permeability at 20^oC, k_{20}
	h_1 (cm)	h_2 (cm)		Sec	Min				
1	90.0	86.3	3.7	600.0	10.000	17.7	0.06	1.059	0.07
2	80.0	77.5	2.5	600.0	10.000	17.8	0.05	1.057	0.05
3	70.0	68.5	1.5	600.0	10.000	17.7	0.03	1.059	0.04
4	60.0	59.0	1.0	600.0	10.000	17.7	0.03	1.059	0.03
5	50.0	50.0	0.0	600.0	10.000	17.7	0.00	1.059	0.00

Perm, k_T (7) = 60 * L/t * r^2/R^2* ln(h1/h2) = 60* L/(5) * r^2/R^2 * ln((2)/(3))

Head, h (4) = (2) - (3); **Perm, k_{20}** (9) = (7)*(8)

AVERAGE k_{20} (in/hr): 0.04

SOIL PERMEABILITY CLASS: K0

Soil Permeability Classes

> 20 inches per hour (in/hr)	K5
6 - 20 in/hr	K4
2 - 6 in/hr	K3
0.6 - 2 in/hr	K2
0.2 - 0.6 in/hr	K1
< 0.2 in/hr	K0

Remarks

- Sample was very loose inside of the tube. Sample able to slide up and down within the tube during preparation.

Plate No.: TP-12

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TUBE PERMEAMETER TEST

(N.J.A.C. 7:9A - Standards for Individual Subsurface Sewage Disposal Systems; Subchapter 6, Section 6.2, page 39, Modified)

Client: Rosenwach Group **Project #:** 20001469A

Project: 1100 Randolph Road **Date:** May 19, 2021

Boring/Sample # or Descrip./Location: TP-109 / S-1A **Depth:** 9"

Visual Description of Soil (USDA): Red brown SILTY CLAY with gravel and trace organics

Technician: K. Perry

Proctor Data:

Max Dry Density (pcf)	% of Max Dry Density	Opt. Moisture (%)
-	-	-

Initial Specimen Data:

Sample Type:
Undisturbed ☑
Re-Compacted ☐

Water Content (%)	Length, L (in)	Diameter (in)	Wet Density (pcf)	Dry Density (pcf)
16.1	5.29	2.875	117.3	101.0

Radius of Burette, r: 0.3141 in **Radius of Soil Specimen, R:** 1.4375 in

TEST DATA

1	2	3	4	5		6	7	8	9
Trial No.	Burette Readings		Head, h (cm)	Time, t		Temp, T (^oC)	Permeability at T^oC, k_T	Temp Correc.	Permeability at 20^oC, k_{20}
	h_1 (cm)	h_2 (cm)		Sec	Min				
1	90.0	80.0	10.0	19.2	0.320	17.7	5.57	1.059	5.90
2	90.0	80.0	10.0	20.3	0.338	17.7	5.28	1.059	5.59
3	90.0	80.0	10.0	20.0	0.333	17.7	5.36	1.059	5.68
4	80.0	70.0	10.0	23.2	0.386	17.8	5.24	1.057	5.54
5	80.0	70.0	10.0	22.8	0.379	17.8	5.33	1.057	5.64
6	80.0	70.0	10.0	23.2	0.387	17.8	5.23	1.057	5.52
7	70.0	60.0	10.0	28.2	0.469	17.8	4.97	1.057	5.26
8	70.0	60.0	10.0	30.7	0.512	17.8	4.56	1.057	4.82
9	70.0	60.0	10.0	31.1	0.519	17.8	4.50	1.057	4.76
10	60.0	50.0	10.0	35.6	0.593	17.8	4.65	1.057	4.92
11	60.0	50.0	10.0	36.6	0.609	17.8	4.53	1.057	4.79
12	60.0	50.0	10.0	39.8	0.663	17.8	4.16	1.057	4.40
13	50.0	40.0	10.0	44.5	0.742	17.7	4.56	1.059	4.83
14	50.0	40.0	10.0	45.8	0.763	17.7	4.43	1.059	4.70
15	50.0	40.0	10.0	43.2	0.720	17.7	4.69	1.059	4.97

Perm, k_T (7) = 60 * L/t * r^2/R^2* ln(h1/h2) = 60* L/(5) * r^2/R^2 * ln((2)/(3))

Head, h (4) = (2) - (3); **Perm, k_{20}** (9) = (7)*(8)

AVERAGE k_{20} (in/hr): 5.15

SOIL PERMEABILITY CLASS: K3

Soil Permeability Classes

> 20 inches per hour (in/hr)	K5
6 - 20 in/hr	K4
2 - 6 in/hr	K3
0.6 - 2 in/hr	K2
0.2 - 0.6 in/hr	K1
< 0.2 in/hr	K0

Remarks

- Sample able to slide up and down within the tube during preparation & was split horizontally about midway in the tube.
- Localized voids along sample wall but did not extend full length of sample.
- Multiple large rocks at bottom of the sample

Plate No.: TP-13

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TUBE PERMEAMETER TEST

(N.J.A.C. 7:9A - Standards for Individual Subsurface Sewage Disposal Systems; Subchapter 6, Section 6.2, page 39, Modified)

Client: Rosenwach Group **Project #:** 20001469A

Project: 1100 Randolph Road **Date:** May 19, 2021

Boring/Sample # or Descrip./Location: TP-109 / S-1A **Depth:** 9"

Visual Description of Soil (USDA): Red SILTY CLAY with gravel and trace organics

Technician: K. Perry

Proctor Data:

Max Dry Density (pcf)	% of Max Dry Density	Opt. Moisture (%)
-	-	-

Initial Specimen Data:

Sample Type:
Undisturbed ☑
Re-Compacted ☐

Water Content (%)	Length, L (in)	Diameter (in)	Wet Density (pcf)	Dry Density (pcf)
16.1	4.97	2.875	117.4	101.1

Radius of Burette, r: 0.3141 in **Radius of Soil Specimen, R:** 1.4375 in

TEST DATA

1	2	3	4	5		6	7	8	9
Trial No.	Burette Readings		Head, h (cm)	Time, t		Temp, T (^oC)	Permeability at T^oC, k_T	Temp Correc.	Permeability at 20^oC, k_{20}
	h_1 (cm)	h_2 (cm)		Sec	Min				
1	90.0	80.0	10.0	13.2	0.219	18.1	7.65	1.049	8.02
2	90.0	80.0	10.0	13.7	0.228	18.1	7.35	1.049	7.71
3	90.0	80.0	10.0	14.3	0.239	18.1	7.03	1.049	7.37
4	80.0	70.0	10.0	17.2	0.287	18.1	6.63	1.049	6.95
5	80.0	70.0	10.0	16.5	0.276	18.1	6.90	1.049	7.24
6	80.0	70.0	10.0	18.3	0.306	18.1	6.22	1.049	6.52
7	70.0	60.0	10.0	24.0	0.399	18.1	5.50	1.049	5.76
8	70.0	60.0	10.0	24.1	0.401	18.1	5.47	1.049	5.74
9	70.0	60.0	10.0	25.5	0.425	18.1	5.17	1.049	5.42
10	60.0	50.0	10.0	30.7	0.512	18.1	5.07	1.049	5.32
11	60.0	50.0	10.0	30.8	0.514	18.1	5.05	1.049	5.30
12	60.0	50.0	10.0	31.3	0.521	18.1	4.98	1.049	5.23
13	50.0	40.0	10.0	42.1	0.701	18.1	4.53	1.049	4.75
14	50.0	40.0	10.0	40.5	0.676	18.1	4.70	1.049	4.93
15	50.0	40.0	10.0	41.0	0.683	18.1	4.66	1.049	4.88

Perm, k_T (7) = 60 * L/t * r^2/R^2* ln(h1/h2) = 60* L/(5) * r^2/R^2 * ln((2)/(3))

Head, h (4) = (2) - (3); **Perm, k_{20}** (9) = (7)*(8)

AVERAGE k_{20} (in/hr):	**6.08**
SOIL PERMEABILITY CLASS:	**K4**

Soil Permeability Classes

> 20 inches per hour (in/hr)	K5
6 - 20 in/hr	K4
2 - 6 in/hr	K3
0.6 - 2 in/hr	K2
0.2 - 0.6 in/hr	K1
< 0.2 in/hr	K0

Remarks

- Sample was very loose inside of the tube. Sample able to slide up and down within the tube during preparation.

Plate No.: TP-14

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