



May 5, 2023

Mr. Jason Regan, PE
Senior Design Engineer
Hammer Land Engineering
1707 Atlantic Avenue, Suite B2
Manasquan, New Jersey 08736-1147

**Re: Stormwater Subsurface Investigation Summary Letter Report
Proposed New Asphalt Paved Parking Lot
Block 439, Lots 6,7,8
926-928 US Route 9
Borough of Sayreville, Middlesex County, New Jersey 08879
RPM Project #: 110-115**

Dear Mr. Regan,

RPM Engineering, LLC (RPM) performed a stormwater subsurface investigation at the above referenced site in order to investigate the soil and groundwater conditions for the proposed stormwater management facility to be constructed on site. This was done in accordance with the request by Hammer Land Engineering, the Design Engineer for the project. This letter serves to transmit the results of our investigation.

PROJECT DESCRIPTION

Information provided by Hammer Land Engineering indicates that the proposed development scheme for the site includes the construction of new asphalt paved drive lanes and parking lot. Additionally, a new stormwater management facility is expected to be constructed beneath the parking lot. This underground facility is expected to encompass approximately 1,200 SF in plan area. Proposed basin bottom elevations were not available at the time of the report.

SITE DESCRIPTION

The project site is located at Block 439 and Lots 6-8, locally known as 926-928 US Route 9, in the Borough of Sayreville, Middlesex County, New Jersey (see Attachment A – *Key Map Plan*). The area of the proposed parking lot / stormwater facility consists of grass and asphalt covered areas. The project site is bordered to the north and south by commercial properties. Route 9 and commercial properties were noted to the east and a vacant residential structure scheduled for demolition was noted immediately adjacent to the west.

Topography across the stormwater test boring locations was generally flat, sloping gently downwards from the northwest to the southeast from approximately Elevation (EL) 94.5 feet to EL 93 feet. Vertical elevations are referenced to the North American Vertical Datum of 1988 (NAVD88). Existing



topographical information was provided by Hammer Land Engineering in a Site Plan entitled “Concept Plan” dated February 03, 2023.

USDA SOIL SURVEY

Based on soil mapping data provided by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) for Middlesex County, the site is underlain by Downer-Urban Land Complex, 5 to 10 percent slopes (DouC).

Urban land consists of surfaces covered by pavement, concrete, buildings, and/or other man-made structures. The underlying soils typically consist of disturbed and/or naturally occurring soils.

The Downer-Urban Land Complex soils are derived from loamy fluviomarine deposits and/or gravelly fluviomarine deposits. A typical profile consists of, in descending order, loamy sand, sandy loam, to stratified gravelly sand to sandy clay loam. The depth to a restrictive feature is noted as being more than 80 inches. The depth to the water table is noted as being 48 to 122 inches. These soils are well drained with no frequency of ponding and flooding. This soil generally has a moderately high to high ability to transmit water at 0.6 in/hr to about 6 in/hr and is rated as Hydrologic Soil Group A.

A plan showing the soil mapping areas in the vicinity of the site has been provided as Attachment B – *Soil Map*.

FIELD INVESTIGATION

RPM performed a subsurface investigation at the site on April 4, 2023 in order to investigate the subsurface conditions in the area of the proposed stormwater management facility. A total of 2 stormwater test borings were performed at locations selected by Hammer Land Engineering, referenced as SB-1 and SB-2. The stormwater test borings were conducted with a drilling rig under the direction of an RPM representative. The stormwater test borings extended to a depth of approximately 15 feet below existing ground surface.

A *Stormwater Boring Location Plan* showing the locations of the soil borings is attached to this letter as Attachment C.

Details regarding the subsurface conditions encountered, including soil descriptions, can be found within the *Stormwater Test Boring Logs*, attached to this Letter as Attachment D. General descriptions of the subsurface soils encountered is provided in the “Soil Descriptions” section of this letter.

These borings were backfilled upon completion using the soils excavated during the test boring operation.

SOIL DESCRIPTIONS

General descriptions of the subsurface conditions encountered at the site are as follows:

Topsoil

Topsoil was encountered at the ground surface of each stormwater test boring location and was found to range between approximately 8 inches to 10 inches in thickness. Variations in the topsoil thickness should be expected within the unexplored portions of the site.



Stratum I

Stratum I was encountered below the topsoil in both stormwater test boring locations and extended to depths ranging between approximately 11 feet to 12.5 feet below existing ground surface. Upon visual review, the Stratum I soils consisted of a yellowish brown to brownish yellow to dark gray soil generally ranging in texture from Loam to Sandy Loam to Loamy Sand with varying amounts of Gravel.

Stratum II

Stratum II was encountered below the Stratum I soils in both stormwater test boring locations and extended to depths ranging between approximately 14.7 feet to 15 feet below existing ground surface. Upon visual review, the Stratum II soils consisted of a strong brown to very dark gray Sandy Clay Loam.

Stratum III

Stratum III was encountered below the Stratum II soils in stormwater test boring location SB-2 and extended to the termination depth of approximately 15 feet below existing ground surface. Upon visual review, the Stratum III soils consisted of a dark brown Sandy Loam.

More detailed descriptions of Stratum I, II and III can be found in the *Stormwater Test Boring Log* attached to this letter.

GROUNDWATER

Groundwater was encountered in both stormwater boring locations at depths ranging from approximately 9 feet to 9.7 feet below existing ground surface. These depths correspond to a groundwater elevations (EL) ranging from approximately EL 84 feet to EL 84.3 feet. The groundwater observations were made at the time of the field operation and should be expected to fluctuate with daily, seasonal, and climatological variations.

SEASONAL HIGH GROUNDWATER TABLE

RPM reviewed the soils encountered within the test pits and stormwater boring for indicators of the Seasonal High Groundwater Table elevation. Areas within the soil profile that undergo submersion and subsequent drying often exhibit changes in soil colors due to the reduction of iron and manganese. Such conditions are often characterized by “depleted” soils taking on a `grayish color with sandier soils, or bluish, grayish, or greenish colors in finer grained soils. The longer the saturation period, the more pronounced the reduction process, and the grayer the soil becomes. Iron precipitates are often visible within the soil as bright “high chroma” colors which may indicate the fluctuation of the water table within this particular area of the soil stratum. Blotches of gray and reddish-brown soil colors may also be found occurring at the same depth. These patterns of spots or blotches of different color, or shades of color interspersed with the dominant color, are called redoximorphic features, or soil “mottling”. These features are often indicative of the seasonal high groundwater table elevation.

Based on our field investigation and review work, indicators of the Seasonal High Groundwater (SHGW) Table were observed in the test borings at depths ranging between approximately 8.3 feet and 9 feet below existing ground surface. These depths correspond to seasonal high groundwater elevations ranging between approximately EL 84.7 feet to EL 85 feet.



INFILTRATION TESTING

In order to determine the permeability of the soils underlying the site, 2 percolation tests were performed in general accordance with Subsection A1 of Chapter 12 of the New Jersey Stormwater Best Management Practices Manual. The tests were performed in unsampled augered holes, located approximately 2 feet from the test boring locations. The percolation test depths were determined in the field by a representative of RPM based on soil, groundwater and seasonal high observational data and following conversations with the Design Engineer for the project.

The results of all infiltration testing, as well as seasonal high and groundwater table information, are provided below in Table I.

TABLE I

Test Boring Number (Location)	Surface Elevation (Feet)	Seasonal High Depth/Elevation (Feet)	Groundwater Depth/Elevation (Feet)	Test Depth/Elevation (Feet)	Soil Texture (at test depth)	Test Method	Hydraulic Conductivity (in/hr)
SB-1	94	9 / 85	9.7 / 84.3	6.5 / 87.5	Loamy Sand	Perc Test	16.4
SB-2	93	8.3 / 84.7	9 / 84	5.8 / 87.2	Sandy Loam	Perc Test	14.8

COMMENTARY

Portions of the subsurface soils underlying the site were observed to contain higher portions of silt and clay. Soils containing higher percentages of these fine-grained soils may be encountered elsewhere throughout the unexplored portions of the site. It is not uncommon for fine-grained soils to have very low permeability. If these soils are encountered at or below the proposed basin bottom, consideration should be given to over-excavation of the basin areas and replacing with sandier soils back up to the basin bottom to promote increased permeability if that is the intended use of the stormwater facility.

Although perched water conditions were not encountered in the stormwater test boring locations and test boring at this site, if areas containing higher amounts of clay and silt are encountered, perched water tables may develop in these soils. A perched water table typically exists in localized, discontinuous lenses, typically over top of hydraulically restrictive soils with dry soils beneath. However, the condition prompting perched groundwater will be removed if the clayey soils are over-excavated as discussed above.

LIMITATIONS

This letter has been prepared in accordance with generally accepted practices for projects such as this one. The conclusions contained in this letter are based upon the subsurface data obtained from the test pits performed at the site. Soil conditions may vary from location to location and from point to point on the project site. The validity of the conclusions contained in this letter are necessarily limited by the scope of the field investigation and by the number of locations that were investigated. It is understood that the number of test locations made are consistent with good engineering practice but, given the nature of subsurface conditions, there is a possibility that actual conditions encountered may differ significantly from



those projected in this letter. Should conditions be encountered which differ from those described in this letter, RPM shall be notified immediately so that our conclusions can be reviewed and revised, if necessary.

CLOSING

We trust that this is the information you require. Should you have any questions regarding this information or if we may be of further assistance with this matter, please contact us at 856-776-4588.

Respectfully,

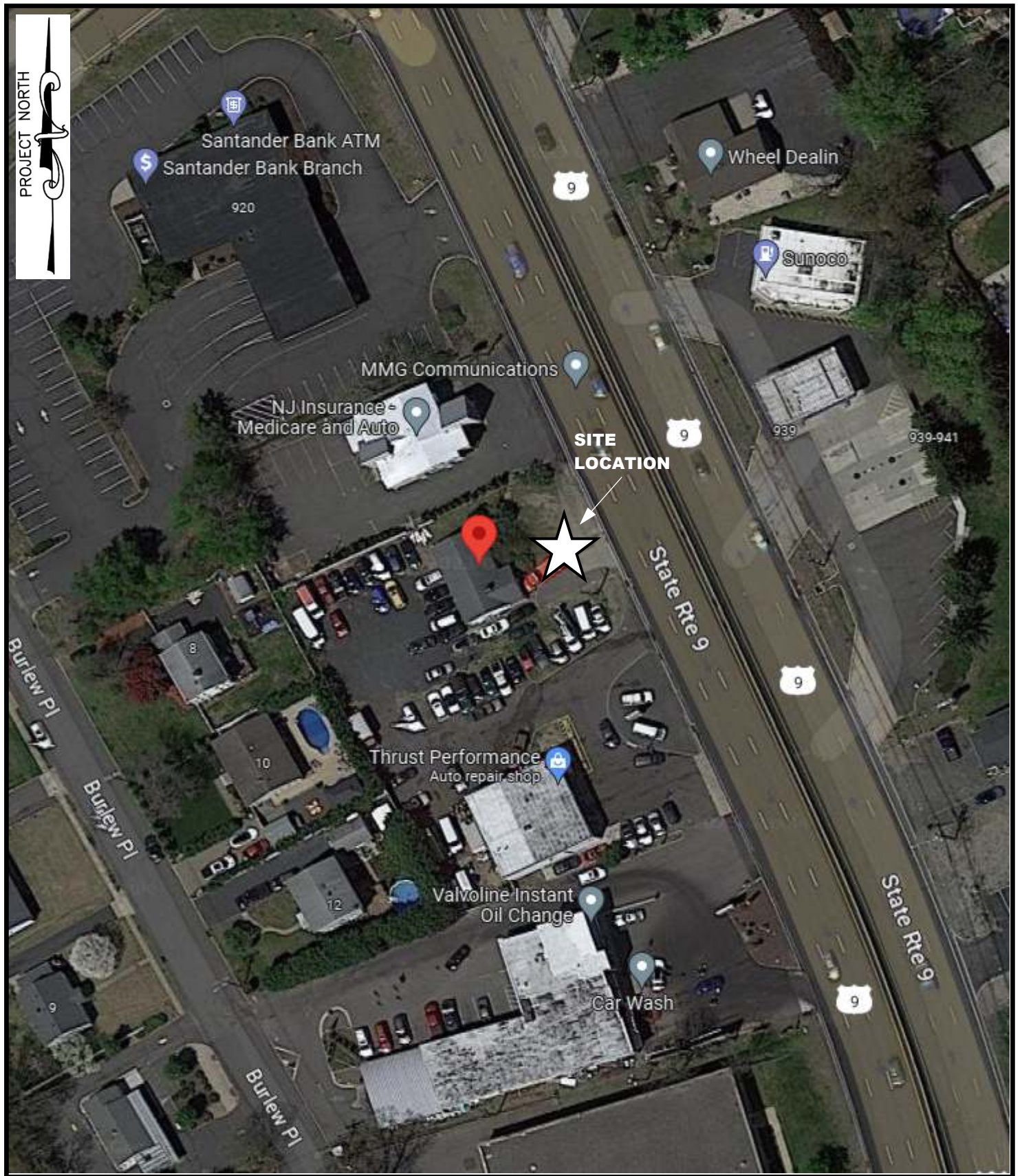
Frank A. DeFeo

Frank DeFeo
Senior Project Manager, Geotechnical Services

Anthony J. Digneo

Anthony J. Digneo, PG, LEED AP
Principal

PROJECT NORTH



PROJECT:

**STORMWATER INVESTIGATION
PROPOSED PARKING LOT
BLOCK 439, LOTS 6,7,8
926-928 US RT 9, BOROUGH OF SAYREVILLE
MIDDLESEX COUNTY, NEW JERSEY 08879
RPM PROJECT NO. 110-115**

DRAWING TITLE: DRAWING SHEET:

**KEY MAP
PLAN**

ATTACHMENT 'A'



PROJECT NORTH



MAP UNIT LEGEND:

UNIT SYMBOL:	UNIT NAME:
DouC	Downer-Urban Land complex, 5 to 10 percent slopes

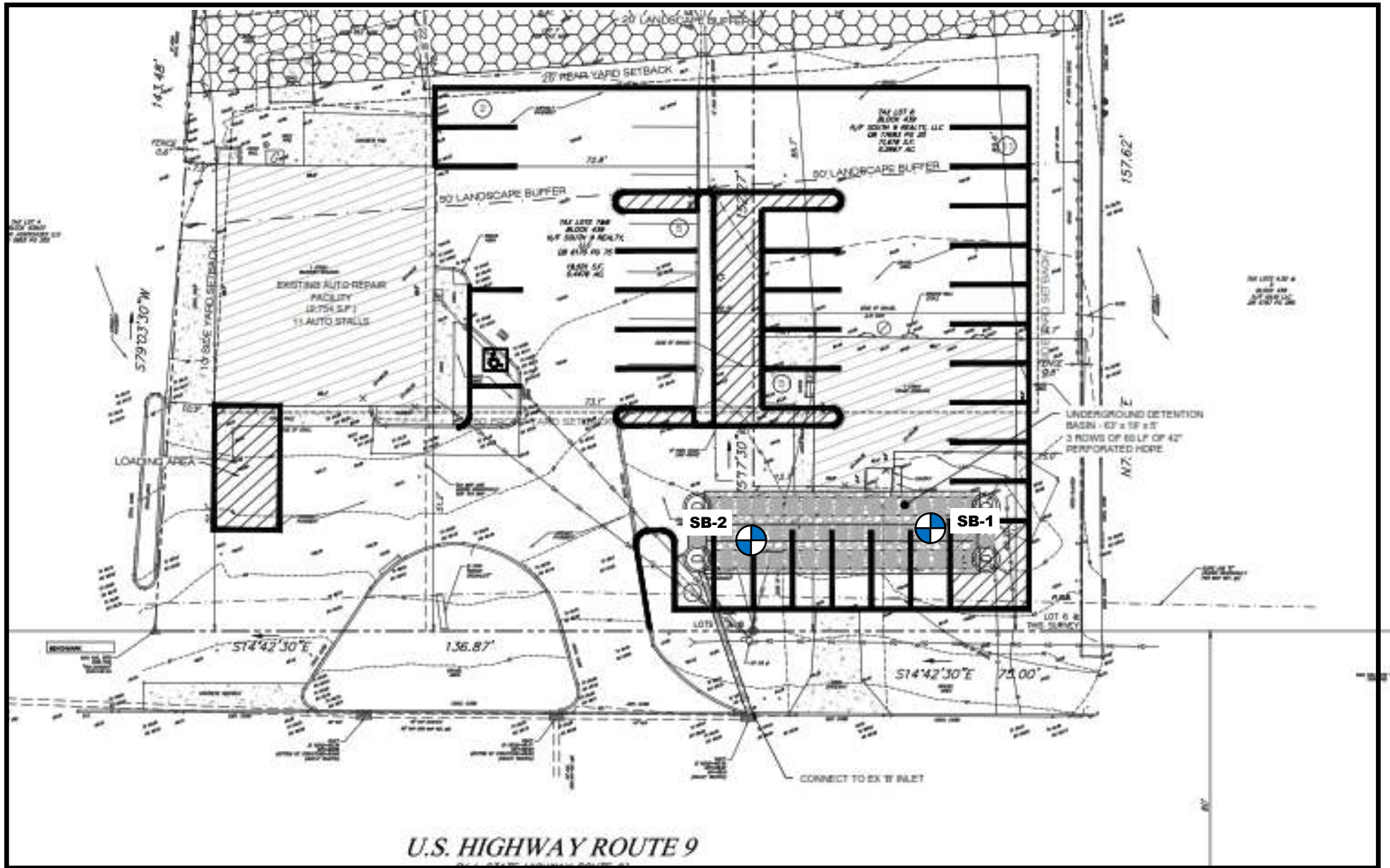
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DRAWING TITLE: DRAWING SHEET:

SOIL MAP

ATTACHMENT 'B'



U.S. HIGHWAY ROUTE 9

PROJECT:

**STORMWATER INVESTIGATION
 PROPOSED PARKING LOT
 BLOCK 439, LOTS 6,7,8
 926-928 US RT 9, BOROUGH OF SAYREVILLE
 MIDDLESEX COUNTY, NEW JERSEY 08879
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DRAWING TITLE: DRAWING SHEET:

**STORMWATER
 BORING
 LOCATION PLAN**

ATTACHMENT 'C'



**APPROXIMATE STORMWATER
 TEST BORING LOCATION**



STORMWATER BORING LOG

Project: Sayerville, NJ Parking Lot Stormwater

Client: Hammer Land Engineering

Date Completed: 4/4/2023

Location: See Boring Plan

Drill Rig: Geoprobe 7822D

Boring Number: SB-1

GS Elevation (ft): 94

GW EL (ft): 84.3

Topo Est: X **Field Survey**

Depth (ft)	Soil Description	Remarks
1	0' - 0.7' Dark yellowish brown (10YR 4/4) Sandy Loam; common fine roots, moist, loose	Topsoil
2	0.7' - 4.5' Yellowish brown (10YR 5/4) to dark yellowish brown (10YR 3/4) to brownish yellow (10YR 6/6) Loamy Sand, moist, loose	
3		
4		
5		
6	4.5' - 5.5' Yellowish brown (10YR 5/6) Loam, very moist, firm	Stratum I
7	5.5' - 7' Yellowish brown (10YR 5/4) Loamy Sand, moist, loose	
8	Percolation Test @ 6.5'	
9	7' - 10' Brownish yellow (10YR 6/6) to strong brown (7.5 YR 4/6) Loamy Sand, 5% Gravel, moist to wet, loose	SHGW @ 9'
10	Very dark gray (10YR3/2) to yellowish red (5YR 4/6) Mottles @ 9'	
11	10' - 12.5' Yellowish brown (10 YR 5/8) Loamy Sand, 15% Gravel, wet, loose, slightly sticky	H₂O @ 9.7'
12		
13		
14		
15		
16	12.5' - 14' Strong brown (10YR 5/6) Sandy Clay Loam, wet, sticky	Stratum II
17	14' - 15' Very dark gray (7.5YR 3/1) Sandy Clay Loam, moist, firm	
18		
19		
20		
21		
22		
23		
24		
25		
END OF BORING @ 15 FEET		



Driller:: East Coast Drilling, Inc.
Drilling Method: Direct Push
RPM Representative: F. DeFeo
Log Completed By: F. DeFeo
Sheet: 1 of 2

STORMWATER BORING LOG

Project: Sayerville, NJ Parking Lot Stormwater

Boring Number: SB-2

Client: Hammer Land Engineering

GS Elevation (ft): 93

Date Completed: 4/4/2023

GW EL (ft): 84

Location: See Boring Plan

Topo Est: X **Field Survey**

Drill Rig: Geoprobe 7822D

Depth (ft)	Soil Description	Remarks
1	0' - 0.8' Dark yellowish brown (10YR 4/4) Sandy Loam; common fine roots, moist, loose	Topsoil
2	0.8' - 5' Brownish yellow (10YR 6/6) to yellowish brown (10YR 5/6) Loamy Sand, 5% Gravel, moist, loose	
3		
4		
5		
5	5' - 6' Strong brown (7.5YR 5/6) Sandy Loam, moist, loose	Stratum I
6	Percolation Test @ 5.8'	
7		14.8 in/hr
8	6' - 11' Strong brown (7.5 YR 4/6) Loamy Sand, 5% Gravel, moist to wet, loose Very dark gray (10YR3/2) to yellowish red (5YR 4/6) Mottles @ 8.3'	SHGW @ 8.3' H₂O @ 9'
9		
10		
11		
12	11' - 12.5' Strong brown (10YR 5/6) Sandy Clay Loam, wet, sticky	Stratum II
13	12.5' - 14.7' Strong brown (10YR 5/6) Sandy Clay Loam, wet, sticky	
14		
15	14.7' - 15' Dark brown (7.5YR 3/4) Sandy Loam, wet, sticky	Stratum III
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
END OF BORING @ 15 FEET		



Driller:: East Coast Drilling, Inc.
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