

**Report of Subsurface Exploration, Permeability Testing &
Geotechnical Engineering Assessment**

Truck Service Center
Elk Township, Gloucester County, New Jersey



Mr. Nate Russo
Russo Corporation
403 Helms Avenue
Swedesboro, New Jersey 08085

Joseph M. Tierney, PE
NJ PE No. 45862
May 16, 2024



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May 16, 2024

Mr. Nate Russo
Russo Corporation
403 Helms Avenue
Swedesboro, New Jersey 08085

Re: Report of Subsurface Exploration, Permeability Testing &
Geotechnical Engineering Assessment
Truck Service Center
Elk Township, Gloucester County, New Jersey
FPA No. 21743.001R1

Dear Mr. Russo:

INTRODUCTION

This report presents the results of our Subsurface Exploration, Permeability Testing and Geotechnical Engineering Assessment performed in connection with the proposed improvements to the property located at 705 Buck Road in Elk Township, Gloucester County, New Jersey. The property is designated as Block 15, Lot 15 on the Elk Township Tax Map and occupies approximately 2.56 acres. The property is currently wooded. The regional location of the project site is presented on Drawing No. 1, "Regional Location Plan."

It is our understanding that the site will be developed into a tractor trailer service center. The increase in imperious coverage from the proposed improvements will necessitate stormwater management to be incorporated into the site design. Based upon our review of the Preliminary/Final Site Plans prepared by MidAtlantic Engineering Partners, it is our understanding that the proposed stormwater management structures may include two stormwater infiltration basins. The property is relatively flat with site grades varying from approximate elevation +129 feet within the southwest portion of the site along Buck Road and gradually slope up to approximately elevation +133 feet in the north along Elk Road. As provided by Mid MidAtlantic Engineering Partners, the proposed bottom of the stormwater infiltration basins are situated at elevations +128 feet and +128.5 feet, which is approximately 0 to 4.5 feet below the existing site grades.

The purpose for our involvement on the project at this time was to perform a subsurface exploration and permeability testing of the soils specifically at the planned stormwater management systems to facilitate the design and construction of the subject structures at the project site. Our scope of work included the technical observation of 4 test pits, laboratory permeability testing of select samples recovered from the test pits and the preparation of this report.



SUBSURFACE EXPLORATION

French and Parrello Associates (FPA) provided technical oversight of 4 test pits performed on April 4, 2024 at the locations identified on the above referenced plan provided by MidAtlantic Engineering Partners. The field work was performed by an excavator provided by the Client while under the full-time technical observation by a representative of FPA. The test pit locations were located by a representative of FPA utilizing handheld GPS equipment as well as based on correlation with existing site features presented on the site plan. The approximate test pit locations are presented on Drawing No. 2, "Test Pit Location Plan."

The test pits, designated as TP-1 through TP-4, were excavated to determine soil and groundwater conditions as well as soil permeability rates for stormwater infiltration design. The test pits were advanced to depths ranging from approximately 8 feet to 12 feet below the existing ground surface. The exposed soil profiles were classified in accordance with the Burmister Soil Classification System. Indications of seasonal high groundwater (e.g., soil mottling) were also evaluated within the test pits and noted on the logs where observed. The depth to groundwater was measured upon the completion of the test pits. Soil classifications, soil mottling observations and recorded groundwater depths are presented on the test pit logs in Appendix A.

PERMEABILITY TESTING

Selected soil samples were returned to our in-house soils laboratory and subjected to laboratory permeability testing. Specifically, 4 Rigid Wall Permeability Tests were performed in accordance with ASTM D-2434. The tests were performed below the bottom of the proposed stormwater management systems in soils representative of the subgrade conditions below the bottom of the basin. A summary of permeability testing is summarized below and is included in Appendix B.

SITE CONDITIONS

Regional Geology

Based on our review of the published geologic literature, the native soils at the project site are comprised of stratified alluvial soils referred to on the Geologic Map of New Jersey as the Bridgeton formation underlain by stratified marine deposits. The alluvial soils typically consist of sand, silty and clayey sand and sandy silt. Some gravel is always intermixed within the major soil fraction and this gravel, together with coarser sand, becomes increasingly abundant with depth. The material is poorly sorted with "fines" distributed throughout the profile. The alluvial soils are underlain by marine deposits referred to on the Geologic Map of New Jersey as the Cohansey Sand formation. The marine soils typically consist of uniform narrowly-graded sand with silty sand layers commonly interbedded. Bedrock is encountered at depths greater than 100 feet throughout Gloucester County.

Subsurface Conditions

The soils encountered within the test pits were consistent with those reported in published geologic literature and typically consisted of a surficial layer of alluvial clayey sand underlain by predominately granular marine deposits to their terminating depths. The surficial clayey sand layer was generally encountered from the existing ground surface to depths ranging from approximately 2 feet to 7 feet and was comprised of coarse to fine sand intermixed with moderate to significant amounts of silt and clay as well as minor to moderate amounts of coarse to fine gravel.



Granular marine deposits of the Cohansey sand formation were encountered below the surficial clayey sand layer to their terminating depths and consisted of coarse to fine sand intermixed with minor to moderate amounts of silt and coarse to fine gravel. Based upon the observed excavation effort during the advancement of the test pits, the relative density of granular marine soils was medium-dense.

Groundwater was encountered within the test pits at depths ranging from approximately 2.5 feet to 7 feet below the existing grade at the time the explorations were performed, corresponding to approximate elevations +125 feet to +126 feet. In accordance with the guidelines presented in the New Jersey Stormwater Best Management Practices (BMP) manual, during the months of January through April, inclusive, water levels may be measured directly within soil profile pits when soil mottling is not observed at a higher elevation. Therefore, the encountered groundwater level should be taken as the seasonal high water at elevations +125 feet to +126 feet.

Seasonal and storm-related fluctuations in the groundwater level, as well as the potential presence of perched groundwater in the surficial clayey sand layer should be anticipated. For a more detailed description of the subsurface soil and groundwater conditions encountered, please refer to the test pit logs presented in Appendix A.

DISCUSSION & RECOMMENDATIONS

FPA performed four laboratory Rigid Wall Permeability Tests to determine permeability rates of the soils specifically at the planned stormwater management systems. The test pits performed at the proposed stormwater structure locations encountered surficial clayey sands underlain by coarse to fine sands with minor to moderate amounts of silt and coarse to fine gravel. The surficial clayey sands encountered from the existing grade to depths ranging from approximately 2 feet to 7 feet are intermixed with moderate to significant amounts of silt and clay and are not suitable for stormwater infiltration. The tested infiltration rate of the underlying granular soils ranged from approximately 1.44 inches per hour to 15.41 inches per hour as summarized below and is suitable for stormwater infiltration.

Test Pit	Test Depth (Elevation)	Soil Classification	Soil Permeability
TP-1	80-132" (+121 to +125.3 feet)	Ligh Tan m ⁺ f SAND, little Silt.	1.44 in/hr
TP-2	84-144" (+121 to +126 feet)	Tan c ⁺ mf SAND, little mf Gravel, little Silt.	12.05 in/hr
TP-3	24-96" (+120 to +126 feet)	Orange-Brown cmf SAND, some cmf Gravel, little ⁺ Silt.	15.41 in/hr
TP-4	30-84" (+123 to +127.5 feet)	Brown c ⁺ mf SAND, some ⁺ cmf Gravel, little ⁺ Clayey Silt.	5.41 in/hr

The guidelines presented in the New Jersey Stormwater Best Management Practices manual indicate that a minimum design permeability rate of 0.5 inches per hour is required for infiltration basins. Design rates consider a factor of safety of 2 applied to laboratory permeability testing results. Additionally, the bottom of subsurface stormwater basins shall be situated a minimum of 2 feet above the estimated seasonal high water level which should be taken as elevations +125 feet to +126 feet since the indications of the seasonal high water elevation were not observed above the encountered groundwater level.



Based upon the encountered granular soils as well as laboratory permeability test results, it is our opinion stormwater infiltration is feasible for the proposed stormwater management structures at the project site within the predominantly granular marine soils encountered at or below depths ranging from approximately 2 feet to 7 feet from the existing grade. The surficial sandy clay must be completely removed from below the proposed bottom of the stormwater management system. We anticipate this layer will be removed during excavations for the southern stormwater basin in the vicinity of test pit TP-4. We anticipate over-excavation on the order of 2 to 3 feet may be required to reach the suitable soil stratum for infiltration in the vicinity of test pits TP-1 through TP-3. In-situ single ring infiltrometer testing may be performed at the proposed bottom of the northern basin elevation at the time of construction to limit the required depth of over-excavation.

We recommend a representative of FPA be on-site during excavations to delineate the depth of removal and replacement below the proposed stormwater structures as well as to perform in-situ permeability testing at the time of basin construction. It is our opinion that the on-site free-draining granular soils encountered below the surface clayey sand layer encountered at depths ranging from 2 to 7 feet may be used to backfill the over-excavations to the proposed bottom of the stormwater structures. Alternatively, imported granular fill conforming to ASTM C-33 sand may be utilized.

CLOSING & LIMITATIONS

The recommendations contained herein are contingent upon subsurface conditions remaining consistent with those encountered during our subsurface exploration. They are also contingent upon the basis that all stormwater management structure related aspects of construction, including stripping, excavation and removal of unsuitable soil, be observed by a representative of FPA. This is to observe compliance with the design concepts and specifications and to allow design changes in the event that subsurface conditions differ from those anticipated prior to construction.

The scope of our services did not include any environmental assessment or investigation for the presence or absence of wetlands, chemically hazardous, or biologically toxic materials in the soil, surface water, groundwater or air, on or below or around the site. Services performed by FPA 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.

Should you have any questions or if we can be of service to you in the future, please feel free to contact us.

Sincerely,

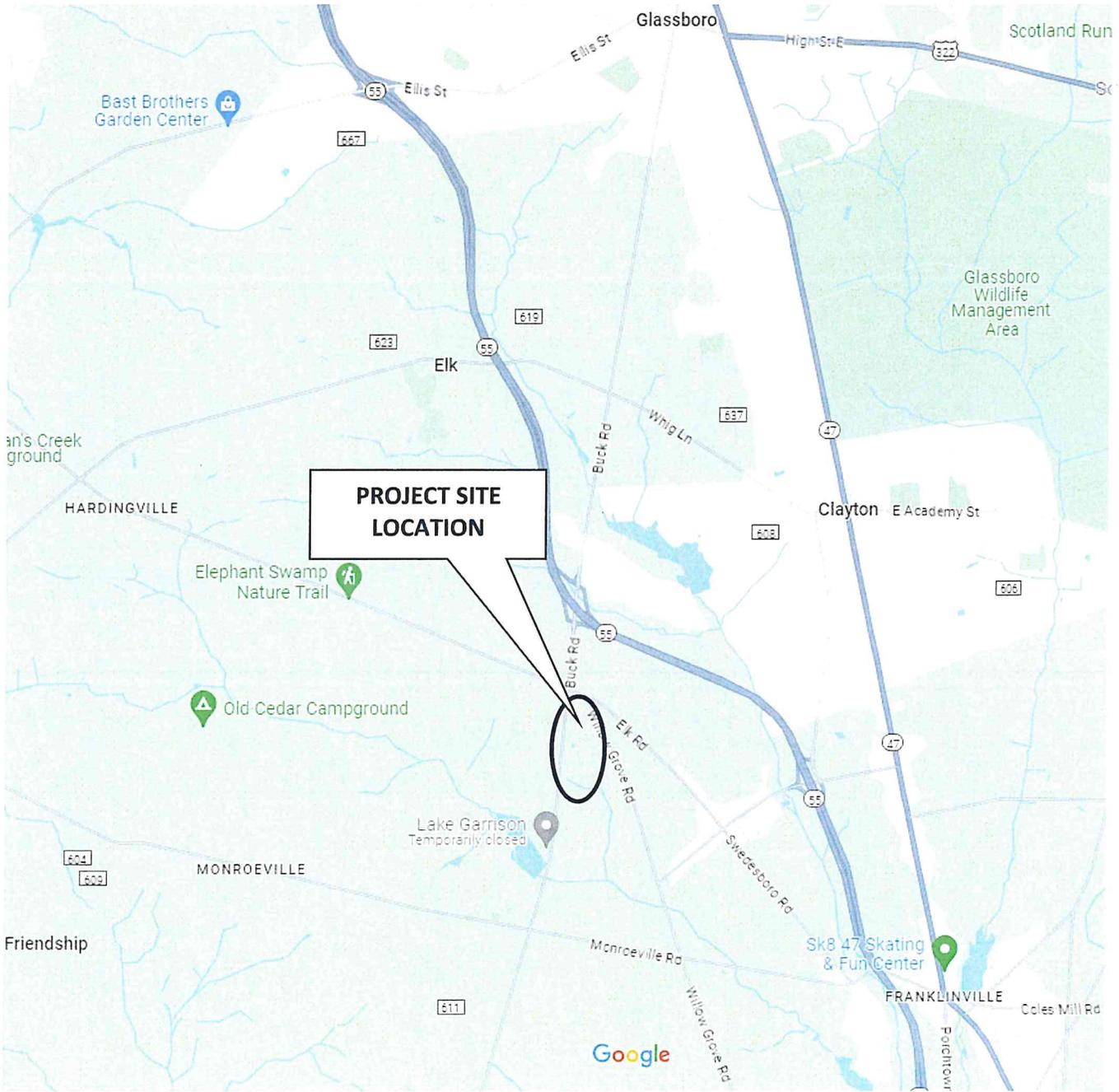
FRENCH & PARRELLO ASSOCIATES

A handwritten signature in blue ink that reads "David M. Rohmeyer".

David M. Rohmeyer, PE
Project Manager

A handwritten signature in blue ink that reads "Joseph M. Tierney".

Joseph M. Tierney, PE
Project Consultant, Manager of Geotechnical Services



REGIONAL LOCATION PLAN

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**TRUCK SERVICE CENTER
ELK TOWNSHIP, GLOUCESTER COUNTY, NEW JERSEY**

SCALE: NTS	DATE: MAY 2024	JOB NO.: 21743.001	DRAWING NO.: 1
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Appendix A

Test Pit Logs

BURMISTER SOIL CLASSIFICATION SYSTEM

A. Cohesionless Soils: Particle Size Definitions

Soil	Fraction	U.S. Standard Sieve	Actual Sizes
Gravel	coarse	3 in. to 1 in.	76 mm to 25 mm
	medium	1 in. to 3/8 in.	25 mm to 9.5 mm
	fine	3/8 in. to No. 10	9.5 mm to 2.0 mm
Sand	coarse	No. 10 to No. 30	2.0 mm to 0.6 mm
	medium	No. 30 to No. 60	0.6 mm to 0.25 mm
	fine	No. 60 to No. 200	0.25 mm to 0.075 mm
Silt		< No. 200	< 0.075 mm

B. Terms Describing Gradation of Cohesionless Soils

Written Description	Symbol/Designation	Defining Proportions
coarse, medium to fine	cmf	all fractions > 10%
coarse to medium	cm	< 10% fine
medium to fine	mf	< 10% coarse
coarse	c	< 10% medium and fine
medium	m	< 10% coarse and fine
fine	f	< 10% coarse and medium

Note: Use (+) for upper limit and (-) for lower limit.

C. Cohesive Soils: Terms Describing Plasticity

Soil	Plasticity Index	Workability	Plasticity Description
Clayey SILT	1 to 5	1/4 in. thread	Slightly Plastic
SILT & CLAY	5 to 10	1/8 in. thread	Low Plasticity
CLAY & SILT	10 to 20	1/16 in. thread	Medium Plasticity
Silty CLAY	20 to 40	1/32 in. thread	High Plasticity
CLAY	>40	1/64 in. thread	Very High Plasticity

D. Terms Describing Overall Composition of Soil

Written Proportion	Proportion Symbol	Proportion Percent by Weight
and	a	35 to 50
some	s	20 to 35
little	l	10 to 20
trace	t	1 to 10

Note: Use (+) for upper limit and (-) for lower limit.



TEST PIT LOG

TRUCK SERVICE CENTER
ELK TOWNSHIP, GLOUCESTER COUNTY, NJ (FPA JOB NO. 21743.001)

TEST PIT NO.: TP-1
DATE: 4/4/2024

GROUND ELEV.: +132'±
DEPTH OF WATER: 6.5'±
GROUNDWATER ELEV.: 125.5'±
DEPTH TO EST. SEASONAL HIGH WATER: 6.5'±

DEPTH	DESCRIPTION
0 – 17"	Brown mf SAND , some Silt.
17 – 80"	Orange-Brown cmf SAND , little* cmf Gravel, little Clayey Silt. (<i>Sample 1</i>) <hr style="border-top: 1px dashed black;"/> <i>Prop. Basin Bot: 128.5'</i>
80 – 132"	Light Tan m+f SAND , little Silt. (<i>Sample 2, k=1.44 in./hr</i>)

END OF TEST PIT AT @ 11' (*Sidewall Collapse*)

NOTES:

SOILS ENGINEER: J. Tierney, PE

CONTRACTOR: Russo Corp.

TEST PIT OBSERVER: M. Milgrom

EXCAVATOR: Caterpillar 430E

The information shown hereon indicates the subsurface conditions encountered at the specified test pit location on the date(s) of excavation. Subsurface conditions are likely to vary across the project site. Interpretation of the subsurface data shall be at the discretion of the user.



TEST PIT LOG

TRUCK SERVICE CENTER
ELK TOWNSHIP, GLOUCESTER COUNTY, NJ (FPA JOB NO. 21743.001)

TEST PIT NO.: TP-2
DATE: 4/4/2024

GROUND ELEV.: +133'±
DEPTH OF WATER: 7'±
GROUNDWATER ELEV.: 126'±
DEPTH TO EST. SEASONAL HIGH WATER: 7'±

DEPTH	DESCRIPTION
0 – 19"	Brown mf+ SAND, and Clayey Silt.
19 – 84"	Orange-Brown cmf SAND, some+ cmf Gravel, little Clayey Silt. (Sample 1) <hr/> <i>Prop. Basin Bot: 128.5'</i>
84 – 144"	Tan c+mf SAND, little mf Gravel, little Silt. (Sample 2, $k=12.05$ in./hr)

END OF TEST PIT AT @ 12' (Sidewall Collapse)

NOTES:

SOILS ENGINEER: J. Tierney, PE

CONTRACTOR: Russo Corp.

TEST PIT OBSERVER: M. Milgrom

EXCAVATOR: Caterpillar 430E

The information shown hereon indicates the subsurface conditions encountered at the specified test pit location on the date(s) of excavation. Subsurface conditions are likely to vary across the project site. Interpretation of the subsurface data shall be at the discretion of the user.



TEST PIT LOG

TRUCK SERVICE CENTER
ELK TOWNSHIP, GLOUCESTER COUNTY, NJ (FPA JOB NO. 21743.001)

TEST PIT NO.: TP-3
DATE: 4/4/2024

GROUND ELEV.: +128'±
DEPTH OF WATER: 2.5'±
GROUNDWATER ELEV.: 125.5'±
DEPTH TO EST. SEASONAL HIGH WATER: 2.5'±

DEPTH	DESCRIPTION
0 – 24"	Dark Brown mf SAND, and Clayey Silt. <i>Prop. Basin Bot: 128'</i>
24 – 96"	Orange-Brown cmf SAND, some cmf Gravel, little+ Silt. (<i>Sample 1, k=15.41 in./hr</i>)

END OF TEST PIT AT @ 8' (*Sidewall Collapse*)

NOTES:

SOILS ENGINEER: J. Tierney, PE

CONTRACTOR: Russo Corp.

TEST PIT OBSERVER: M. Milgrom

EXCAVATOR: Caterpillar 430E

The information shown hereon indicates the subsurface conditions encountered at the specified test pit location on the date(s) of excavation. Subsurface conditions are likely to vary across the project site. Interpretation of the subsurface data shall be at the discretion of the user.



TEST PIT LOG

TRUCK SERVICE CENTER
ELK TOWNSHIP, GLOUCESTER COUNTY, NJ (FPA JOB NO. 21743.001)

TEST PIT NO.: TP-4
DATE: 4/4/2024

GROUND ELEV.: +130'±
DEPTH OF WATER: 5'±
GROUNDWATER ELEV.: +125'±
DEPTH TO EST. SEASONAL HIGH WATER: 5'±

DEPTH	DESCRIPTION
0 – 30"	Brown mf SAND, some Clayey Silt. <i>Prop. Basin Bot: 128'</i>
30 – 84"	Brown c*mf SAND, some* cmf Gravel, little* Clayey Silt. (Sample 1, k=5.41 in./hr)
84 – 120"	Tan c*mf SAND, some cmf Gravel, little Silt. (Sample 2)

END OF TEST PIT AT @ 10' (Sidewall Collapse)

NOTES:

SOILS ENGINEER: J. Tierney, PE

CONTRACTOR: Russo Corp.

TEST PIT OBSERVER: M. Milgrom

EXCAVATOR: Caterpillar 430E

The information shown hereon indicates the subsurface conditions encountered at the specified test pit location on the date(s) of excavation. Subsurface conditions are likely to vary across the project site. Interpretation of the subsurface data shall be at the discretion of the user.



Appendix B

Laboratory Testing

