



16 OLD FORGE ROAD
SUITE A
ROCKY HILL, CT 06067
860.726.7889
whitestoneassoc.com

November 16, 2020

via email

BL COMPANIES, INC.
100 Constitution Plaza
10th Floor
Hartford, Connecticut 06103

Attention: Matthew Bruton, P.E.
Project Manager

**Regarding: LIMITED GEOTECHNICAL INVESTIGATION
PROPOSED PARKING LOT EXPANSION
FEDEX GROUND DISTRIBUTION HUB
49 FEDEX DRIVE
MIDDLETOWN, MIDDLESEX COUNTY, CONNECTICUT
WHITESTONE PROJECT NO.: GM2017486.000**

Dear Mr. Bruton:

Whitestone Associates, Inc. (Whitestone) has completed a limited geotechnical investigation at the above-referenced site. The results of the investigation and recommendations presented below are based on the soil conditions disclosed from a limited number of soil borings performed during Whitestone's field investigation. The purpose of the investigation was to assess subsurface conditions within two proposed parking lot expansion areas accessible to an all terrain vehicle mounted drill rig. Recommendations for pavement sections and anticipated earthwork requirements are included herein.

1.0 PROJECT DESCRIPTION

1.1 Site Location & Existing Conditions

The subject property located at 49 FedEx Drive in Middletown, Middlesex County, Connecticut, currently is developed with a distribution hub for FedEx Ground. The upper proposed parking expansion is on higher ground close to the FedEx offices. The lower proposed parking expansion is within a low-lying area immediately east of Sawmill Brook and west of an existing FedEx parking area.

1.2 Site Geology

Based on a review of the *Surficial Materials Map of Connecticut (1992)*, the natural site soils in the area generally consist of glacial till. An alluvial deposit underlain by a glaciolacustrine deposit is shown within lower lying areas close to Sawmill Brook. The *Bedrock Geologic Map of Connecticut (1985)* indicates that the subject property is underlain by Lower Jurassic-aged Portland Arkose, consisting of reddish-brown sandstone and siltstone.

Other Office Locations:

WARREN, NJ
908.668.7777

CHALFONT, PA
215.712.2700

SOUTHBOROUGH, MA
508.485.0755

WALL, NJ
732.592.2101

EVERGREEN, CO
303.670.6905

1.3 Proposed Construction

Based on an undated *Site Plan*, prepared by FedEx Ground Facilities & Material Handling Systems of Moon Township, Pennsylvania, the proposed development will include two areas of parking lot expansion. The upper area will be an expansion at the southern end of the existing parking to accommodate 68 automobile parking spaces. Access will be from Middle Street. The lower area will be an expansion immediately west of the existing automobile parking lot to accommodate tractor trailer parking with 254 53-foot-equivalent parking spaces. Access will be from Industrial Park Road. The locations are shown on attached Figure 1 - *Boring Location Plan*.

2.0 FIELD INVESTIGATION

2.1 Field work

Field exploration at the project site consisted of advancing eight soil explorations (identified as P-1, P-2, and B-3 through B-8) within accessible portions of the site. The explorations subsequently were backfilled to the surface with excavated soils from the investigation. The locations of the soil borings are shown on the accompanying *Boring Location Plan* included as Figure 1. *Records of Subsurface Exploration* are provided in Appendix A.

The subsurface tests were conducted in the presence of a Whitestone engineer, who performed field tests, recorded visual classifications, and collected samples of the various strata encountered. The tests were located in the field using normal taping procedures and estimated right angles. These locations are presumed to be accurate within a few feet.

Soil borings and Standard Penetration Tests (SPTs) were conducted in general accordance with ASTM International (ASTM) designation D1586. The SPT resistance value (N) can be used as an indicator of the consistency of fine-grained soils and the relative density of coarse-grained soils. The N-value for various soil types can be correlated with the engineering behavior of earthworks and foundations.

Groundwater level observations, where encountered, were recorded during and immediately after the completion of field operations prior to backfilling the tests. Seasonal variations, temperature effects, man-made effects, and recent rainfall conditions may influence the levels of the groundwater, and the observed levels will depend on the permeability of the soils. Groundwater elevations derived from sources other than seasonally observed groundwater monitor wells may not be representative of true groundwater levels.

2.2 Laboratory Program

In addition to the field investigation, a laboratory program was conducted to determine additional, pertinent engineering characteristics of representative samples of on-site soils. The laboratory program was performed in general accordance with applicable ASTM standard test methods and included physical/textural testing of representative samples.

The results of the laboratory program are presented in this section in a general manner and qualitatively interpreted. The results are incorporated into the findings and recommendations discussed throughout this report. Quantitative test results are provided in Appendix B.

Physical and Textural Analysis: Two representative samples were subjected to a laboratory testing program that included moisture content determinations (ASTM D2216) and washed gradation analyses (ASTM D422) in order to perform supplementary engineering soil classifications in general accordance with ASTM D2487. The soil stratum tested was classified by the Unified Soil Classification System (USCS), provided in Appendix C. The results of the laboratory testing are summarized in the following table.

PHYSICAL/TEXTURAL ANALYSES SUMMARY					
Boring	Sample	Depth (fbgs)	Moisture Content (%)	Passing No. 200 Sieve (%)	USCS Classification
B-4	S-2	2.0 - 4.0	15.4	9.0	GW-GM
B-6	S-2	2.0 - 4.0	17.8	15.0	GM

3.0 SUBSURFACE CONDITIONS

The subsurface soil conditions encountered within the subsurface tests conducted by Whitestone consisted of the following generalized strata in order of increasing depth. *Records of Subsurface Exploration* are provided in Appendix A.

Upper Area

The proposed expansion area is a berm.

Surface Cover Materials: Borings P-1 and P-2 encountered six inches of topsoil at the ground surface.

Existing Fill: Beneath the surface cover materials, the borings encountered existing fill, consisting of brown, silty sand with gravel, cobbles, boulders. Borings P-1 and P-2 extended to depths of three fbgs and four fbgs, respectively, before the power auger encountered refusal on cobbles.

Groundwater: Groundwater was not encountered in the soil borings during the exploration. Groundwater levels should be expected to fluctuate seasonally and following periods of precipitation.

Lower Area

Surface Cover Materials: Borings B-4, B-6, B-7, and B-8 encountered six inches of forest mat at the ground surface. In borings B-4 and B-7, the forest mat was underlain by 18 inches of silty subsoil. Borings B-3 and B-5 encountered two inches and six inches of topsoil, respectively, at the ground surface

Alluvial Deposit: Beneath the surface cover materials, borings B-4, B-5, B-6, and B-8 encountered an alluvial deposit, consisting of reddish-brown, very loose to medium dense (occasionally dense), well-graded gravel with silt and sand (USCS: GW-GM) to silty gravel with sand (USCS: GM). The SPT N-values within the alluvial deposit were variable, ranging from three blows per foot (bpf) to 37 bpf. The alluvial deposit extended to depths of six fbgs to eight fbgs.

Glaciolacustrine Deposit: Beneath the alluvial deposit, borings B-5 and B-8 encountered a glaciolacustrine deposit, consisting of reddish-brown, medium stiff to stiff, clayey silt (USCS: ML). The SPT N-values within the alluvial deposit ranged from 6 bpf to 10 bpf. Borings B-5 and B-8 terminated in this stratum at a depth of 10 fbgs.

Glacial Till: Beneath the surface cover materials or alluvial deposit, borings B-3, B-4, B-6, and B-7 encountered glacial till, consisting of reddish-brown, medium dense to very dense, silty sand with gravel (USCS: SM) to sandy silt with gravel (USCS: ML), cobbles, boulders. The SPT N-values within the glacial till were variable, ranging from 12 bpf to 90 bpf. Borings B-3, B-4, B-6, and B-7 terminated in this stratum at a depth of 10 fbgs.

Groundwater: Groundwater was encountered in the soil borings during the exploration at depths ranging from 2.6 fbgs to six fbgs. Perched water was encountered at the ground surface in boring B-3. Groundwater levels should be expected to fluctuate seasonally and following periods of precipitation.

4.0 CONCLUSIONS & RECOMMENDATIONS

The following recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions encountered within the limited exploration performed. If there are any significant changes to the project characteristics or if significantly different subsurface conditions are encountered during construction, Whitestone should be consulted, so that the recommendations of this report can be reviewed.

Within the upper area of the site, under the existing fill berm, several electrical utilities were marked by the private utility locators. Whitestone was alerted to the possible presence of a duct bank by the contractor for the original FedEx facility. A hand-operated power auger was therefore used for the explorations in this area. The precise location and elevation of the duct bank should be established prior to pavement design to reduce the likelihood of construction conflicts. Care should be taken during excavation in this area.

4.1 Site Preparation & Earthwork

Surface Preparation: Prior to placing fill to raise or restore grades to the desired subgrade elevations, the existing exposed soils should be compacted to a firm and unyielding surface with several passes in two perpendicular directions of a minimum 10-ton vibratory compactor. The surface should then be proofrolled with a loaded tandem axle truck in the presence of the geotechnical engineer to help identify soft or loose pockets that may require removal and replacement, or further evaluation. Proofrolling should be performed after a suitable period of dry and non-freezing weather to reduce the likelihood of degrading an otherwise stable subgrade. Should construction be started during the winter months, Whitestone should be contacted for alternate surface preparation procedures. Fill and backfill should be placed and compacted in accordance with Section 4.2.

Weather Performance Criteria: Every effort should be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of excavations and prepared subgrades to rainfall. Accordingly, excavation and fill placement procedures should be performed during favorable weather conditions. Overexcavation of saturated soils and replacement with controlled structural fill per Section 4.2 of this report may be required prior to resuming work on disturbed subgrade soils.

Subgrade Protection and Inspection: Every effort should be made to reduce disturbance of the on-site soils by construction traffic and surface runoff. The contractor should be responsible for protection of subgrades and minimization of exposure of the site soils to precipitation by covering stockpiles and subgrades with plastic and preventing ponding of water by sealing subgrades before precipitation events and grading the site to allow proper drainage of surface water. The services of the geotechnical engineer should be retained to observe soils conditions during construction and review the suitability of prepared foundation subgrades for support of design loads.

Subgrade Stabilization: Within portions of the site, subgrade soils exposed to inclement weather and heavy construction traffic may degrade and require overexcavation and replacement to provide a suitable subgrade for pavements. A geogrid, such as Tensar TriAx TX130S (or engineer approved equivalent), may be used to reduce the depth of overexcavation and stabilize pavement subgrades. Geogrids typically are economical when proposed undercut depths exceed approximately 16 inches. The geogrid should be placed directly on the exposed subgrade and backfill should consist of a well-graded gravel and sand blend. The services of the geotechnical engineer should be retained to provide specific recommendations for stabilizing subgrades, if required.

Groundwater Control: Groundwater was encountered during the exploration at depths close to ground surface. Perched water was encountered at the ground surface. Perched water may also be encountered above impermeable layers during construction. Construction phase dewatering, if required, may consist of removing surface water runoff, infiltrating water, or trapped water at this site. Whitestone anticipates that such construction phase dewatering would typically include installing temporary sump pits and pumps within trenches and excavations. Whitestone recommends that construction occur during periods of relatively dry weather. Every effort should be made to maintain drainage of surface water runoff away from construction areas by grading and limiting exposure to precipitation.

4.2 Structural Fill & Backfill

Imported Fill Material: Any imported material placed as structural fill or backfill to restore design grades should consist of clean, relatively well graded sand or gravel with a maximum particle size of three inches and up to 15 percent of material finer than a #200 sieve. The material should be free of clay lumps, organics, and deleterious material. Any imported structural fill material should be approved by a qualified geotechnical engineer prior to delivery to the site.

Soil Reuse: Whitestone anticipates that the more granular portions of the natural glacial till, alluvial deposit, and existing fill will be suitable for selective reuse as structural backfill materials provided that particles larger than three inches in diameter are crushed or discarded, moisture contents are controlled within three percent of the optimum moisture content, and any deleterious and objectionable debris encountered are removed. Portions of the site soils have a relatively high fines content and will require drying and/or mixing with more granular material before reuse. Cobbles and boulders were encountered in the borings. Cobbles and boulders should be crushed to a maximum particle diameter of three inches before reuse as fill or discarded. Larger particles, placed more than three feet from subsurface construction, may be individually seated. Reuse of the natural on-site soils and existing fill materials will be contingent on careful inspection by the owner's geotechnical engineer during construction. The site contractor should be required to cover stockpiled soils, seal subgrades each day, and provide proper surface drainage during forecasted wet weather. Immediate reuse of on-site soil should not be expected.

Compaction and Placement Requirements: Fill and backfill should be placed in maximum eight-inch loose lifts and compacted to 95 percent of the maximum dry density within three percent of the optimum moisture content, as determined by ASTM D1557 (Modified Proctor).

4.3 Pavements

Whitestone anticipates that approved glacial till, alluvial deposit, or existing fill, and/or compacted structural fill are expected to be suitable for support of the proposed pavements, provided these materials are properly evaluated, compacted, and proofrolled in accordance with Sections 4.1 and 4.2 of this report during favorable weather conditions.

A California Bearing Ratio value of 8.0 has been assigned to the properly prepared subgrade soils for pavement design purposes. This value was correlated with pertinent soil support values and assumed traffic loads to prepare flexible and rigid pavement designs per the AASHTO *Guide for the Design of Pavement Structures*.

Design traffic loads were assumed based on typical volumes for similar facilities and correlated with 18-kip equivalent single axle loads (ESAL) for a 20-year life. Estimated maximum pavement loads of 15,000 ESALs and 50,000 ESALs were used for the standard-duty and heavy-duty pavement areas, respectively. These values assume the pavements primarily will accommodate both automobile and limited heavier truck traffic, with the heavier truck traffic designated to the main drive/access lanes.

Pavement Sections: Pavement components should meet material specifications from CTDOT *Standard Specifications* specified below. The recommended flexible pavement sections are tabulated below:

FLEXIBLE PAVEMENT SECTION			
Layer	Material	Standard-Duty Thickness (inches)	Heavy-Duty Thickness (inches)
Asphalt Wearing Course	CTDOT HMA S0.375 (Superpave); PG 64S-22	1.5	1.5
Asphalt Binder Course	CTDOT HMA S0.5 (Superpave); PG 64S-22	1.5	2.5
Granular Base	CTDOT M.05.01 Processed Aggregate Base	6.0	6.0
Granular Subbase	CTDOT M.02.02 Subbase; M.02.06 Gradation A	6.0	6.0

A rigid concrete pavement should be used to provide suitable support at areas of high traffic or severe turns, such as at ingress/egress locations. The recommended rigid pavement is tabulated below:

RIGID PAVEMENT SECTION		
Layer	Material	Thickness (inches)
Surface	4,000 psi Air-Entrained Concrete	6.0 ¹
Granular Base	CTDOT M.05.01 Processed Aggregate Base	6.0
Granular Subbase	CTDOT M.02.02 Subbase; M.02.06 Gradation A	6.0

¹ The outer edges of concrete pavements are susceptible to damage as trucks move from rigid pavement to adjacent flexible pavement. Therefore, the thickness at the outer two feet of the rigid concrete pavement should be 12 inches.

Pavement Drainage Systems: In low-lying areas near Sawmill Brook and where the groundwater was encountered at two fbg's to three fbg's, Whitestone recommends installing radial interceptor drains extending from stormwater inlet structures to improve drainage within proposed pavement areas. Radial interceptor drains typically consist of top perforated polyvinyl chloride (PVC) piping within a 12-inch by

12-inch, clean 0.75-inch crushed stone layer surrounded by a fines separation fabric. For the fine-grained soils present on the subject site, a woven fabric, such as long term clog-resistant Mirafi Filterweave 700X, or approved equivalent, is recommended. Radial interceptor drains should be designed to pitch towards and discharge into the stormwater drainage system. The pipes should have a minimum slope of 0.5 percent.

Additional Design Considerations: The pavement section thickness designs presented in this report are based on the design parameters detailed herein and are contingent on proper construction, inspection, and maintenance. Additional pavement thickness may be required by local code. The designs are contingent on achieving the minimum soil support value in the field. To accomplish this requirement, subgrade soil and supporting fill or backfill should be placed, compacted, and evaluated in accordance with Sections 4.1 and 4.2 of this report. Proper drainage should be provided for the pavement structure, including appropriate grading and surface water control. Depending on the surrounding topography, edge (interceptor) drains may be required on the higher side(s) of the pavement.

The performance of the pavement also will depend on the quality of materials and workmanship. Whitestone recommends that CTDOT standards for materials, workmanship, and maintenance be applied to this site. Project specifications should require that the installed asphaltic concrete material composition be within tolerance for the specified materials and that the percentage of air voids of the installed pavement be within specified ranges for the respective materials. Rigid concrete pavements should be suitably air-entrained, jointed, and reinforced in general accordance with ACI 330R-08 *Guide for the Design and Construction of Concrete Parking Lots*.

4.5 Excavations

The site soils encountered during this investigation within the depth of expected excavation typically are, at a minimum, consistent with Type C Soil Conditions as defined by 29 CFR Part 1926 (OSHA), which require a maximum unbraced excavation angle of 1.5:1 (horizontal:vertical). Actual conditions encountered during construction should be evaluated by a competent person (as defined by OSHA), so that safe excavation methods and/or shoring and bracing requirements are implemented.

5.0 SUPPLEMENTAL POST INVESTIGATION SERVICES

Construction Inspection and Monitoring: The owner's geotechnical engineer with specific knowledge of the site subsurface conditions and design intent should perform inspection, testing, and consultation during construction as described in previous sections of this report. Monitoring and testing should also be performed to check that any encountered underground structures are properly backfilled, the existing surface cover materials are properly removed, and suitable materials, used for controlled fill, are properly placed and compacted over suitable subgrade soils. The proofrolling of all subgrades prior to pavement support should be witnessed and documented by the owner's geotechnical engineer.

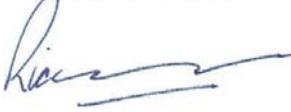
6.0 CLOSING

Whitestone's Geotechnical Division appreciates the opportunity to be of continuing service to BL Companies, Inc.

Please contact us with any questions regarding this report.

Sincerely,

WHITESTONE ASSOCIATES, INC.



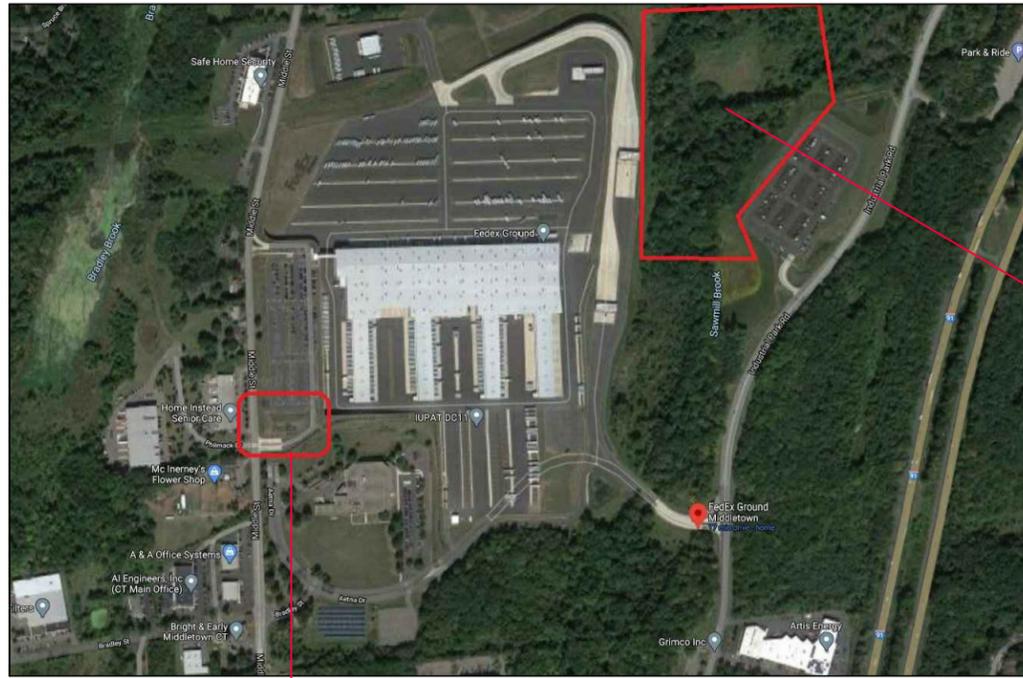
Richard W.M. McLaren, P.E.
Senior Consultant



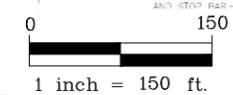
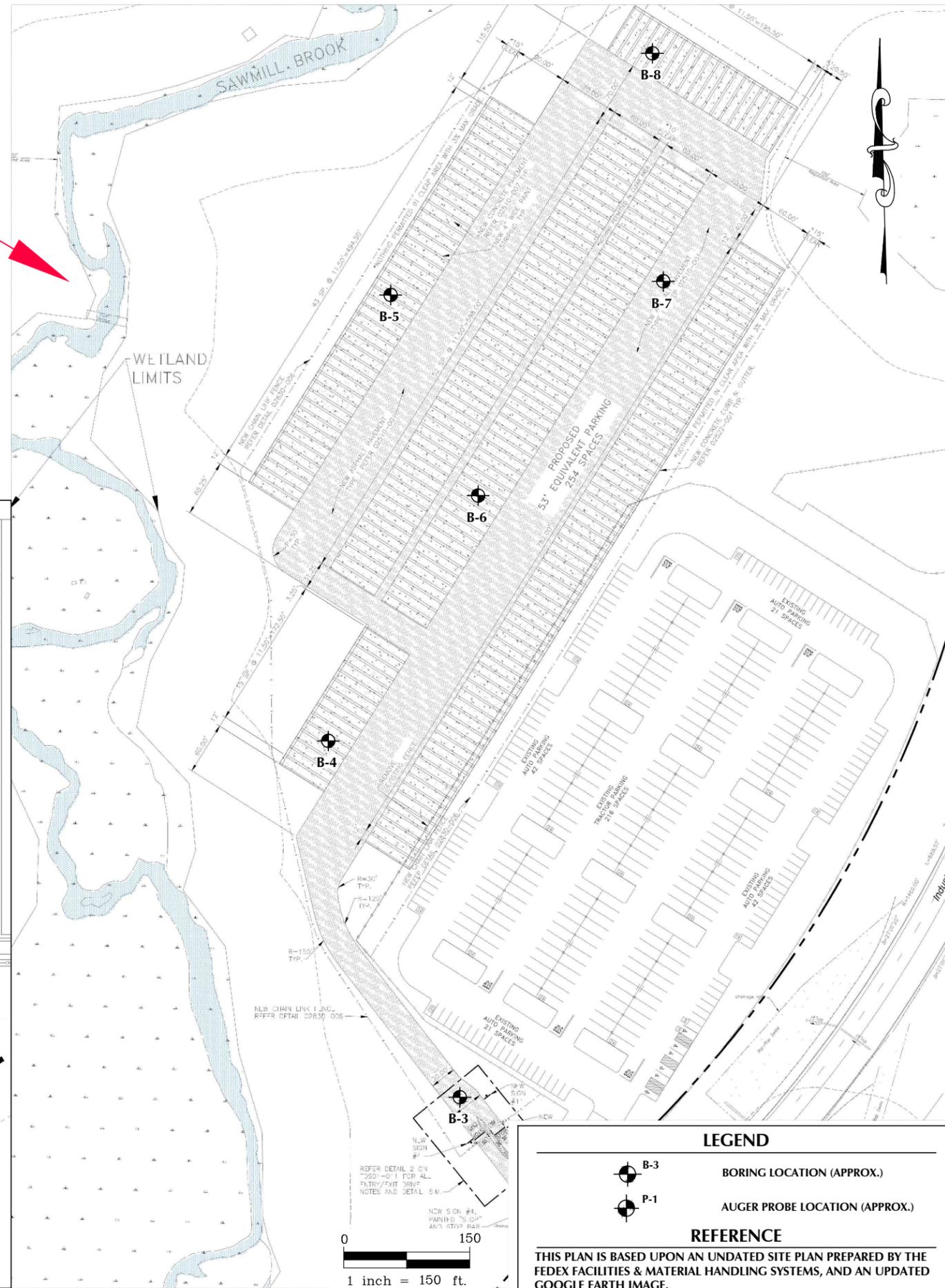
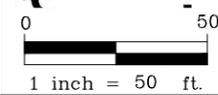
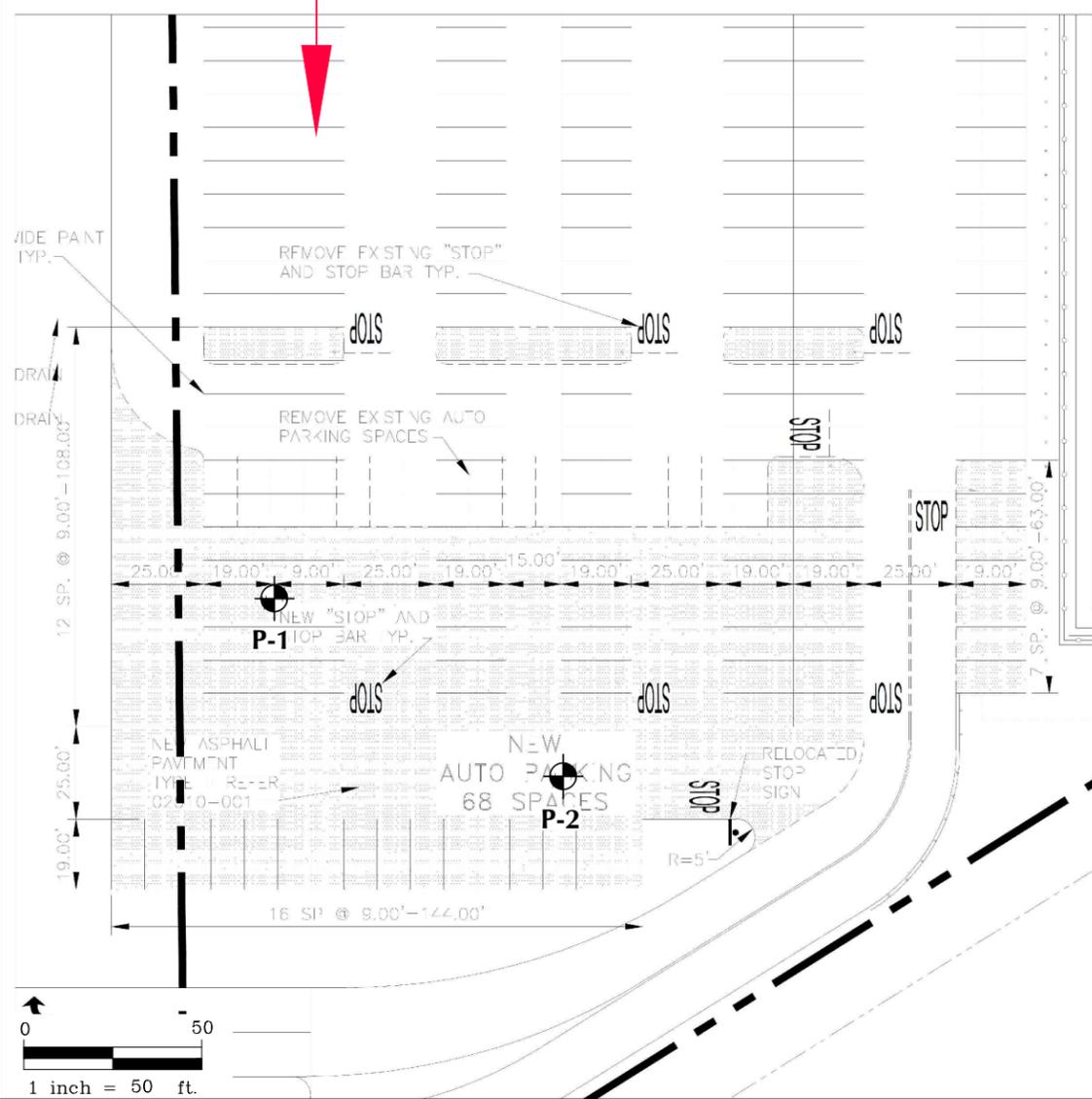
Ryan R. Roy, P.E.
Principal, New England Region

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Enclosures
Copy: Laurence W. Keller, P.E., Whitestone Associates, Inc.

FIGURE 1
Boring Location Plan



NOT TO SCALE



LEGEND

- B-3 BORING LOCATION (APPROX.)
- P-1 AUGER PROBE LOCATION (APPROX.)

REFERENCE

THIS PLAN IS BASED UPON AN UNDATED SITE PLAN PREPARED BY THE FEDEX FACILITIES & MATERIAL HANDLING SYSTEMS, AND AN UPDATED GOOGLE EARTH IMAGE.

WHITESTONE ASSOCIATES, INC.
Environmental & Geotechnical Engineers & Consultants
 16 OLD FORGE ROAD, SUITE A, ROCKY HILL, CT 06067
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DRAWING TITLE: BORING LOCATION PLAN	
CLIENT: BL COMPANIES	
PROJECT: PROPOSED FEDEX PARKING EXPANSION 49 FEDEX DRIVE MIDDLETOWN, MIDDLESEX COUNTY, CONNECTICUT	
PROJECT #: GM2017486.000	
DESIGNED BY: MR	PROJ. MGR.: RR
DATE: 11/5/20	FIGURE: 1
SCALE: As shown	

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APPENDIX A
Records of Subsurface Exploration

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Parking Lot Expansion		WAI Project No.: GM2017486.000	
Location: 49 FedEx Drive, Middletown, Middlesex County, Connecticut		Client: BL Companies	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>11/5/2020</u>	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: <u>3.0</u> feet bgs	Date Completed: <u>11/5/2020</u>	During: <u> </u> <u> </u> ▼	At Completion: <u> </u> <u> </u> ▼
Proposed Location: <u>Parking</u>	Logged By: <u>RK</u>	At Completion: <u> </u> <u> </u> ▼	At Completion: <u> </u> <u> </u> ▼
Drill / Test Method: <u>Auger Probe</u>	Contractor: <u>SD</u>	24 Hours: <u> </u> <u> </u> ▼	24 Hours: <u> </u> <u> </u> ▼
	Equipment: <u>Power Auger</u>		

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						0.0	TS	6" Topsoil	
0 - 2	S-1	Grab					EXISTING FILL	Reddish-Brown, Silty Sand with Gravel, Cobbles (FILL)	
2 - 3	S-2	Grab						As Above (FILL)	
						5.0			
						10.0			
						15.0			
						20.0			
						25.0			
								Boring Log P-1 Terminated at Depth of 3 feet below ground surface.	

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Parking Lot Expansion		WAI Project No.: GM2017486.000	
Location: 49 FedEx Drive, Middletown, Middlesex County, Connecticut		Client: BL Companies	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>11/5/2020</u>	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: <u>4.0</u> feet bgs	Date Completed: <u>11/5/2020</u>	During: <u> </u> <u> </u> ▼	At Completion: <u> </u> <u> </u> ▼
Proposed Location: <u>Parking</u>	Logged By: <u>RK</u>	At Completion: <u> </u> <u> </u> ▼	At Completion: <u> </u> <u> </u> ▼
Drill / Test Method: <u>Auger Probe</u>	Contractor: <u>SD</u>	24 Hours: <u> </u> <u> </u> ▼	24 Hours: <u> </u> <u> </u> ▼
	Equipment: <u>Power Auger</u>		

SAMPLE INFORMATION					DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)				
					0.0			
						TS	6" Topsoil	
0 - 2	S-1	Grab				EXISTING FILL	Reddish-Brown, Silty Sand with Gravel, Cobbles (FILL)	
2 - 4	S-2	Grab					As Above (FILL)	
					5.0			
					10.0			
					15.0			
					20.0			
					25.0			
							Boring Log P-2 Terminated at Depth of 4 feet below ground surface.	

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Parking Lot Expansion		WAI Project No.: GM2017486.000	
Location: 49 FedEx Drive, Middletown, Middlesex County, Connecticut		Client: BL Companies	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>10/30/2020</u>	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: <u>10.0</u> feet bgs	Date Completed: <u>10/30/2020</u>	During: <u> </u> <u> </u> ▼	At Completion: <u> </u> <u> </u> ▼
Proposed Location: <u>Access Road</u>	Logged By: <u>RK</u>	At Completion: <u> </u> <u> </u> ▼	At Completion: <u> </u> <u> </u> ▼
Drill / Test Method: <u>HSA / SPT</u>	Contractor: <u>SD</u>	24 Hours: <u> </u> <u> </u> ▼	24 Hours: <u> </u> <u> </u> ▼
	Equipment: <u>Mobile B-53</u>		

SAMPLE INFORMATION						DEPTH	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)			
						0.0			
0 - 2	S-1		5 - 5 - 7 - 10	18	12		TS 	2" Topsoil	Perched water at surface.
2 - 4	S-2		14 - 16 - 18 - 22	18	34			Reddish-Brown, Medium Dense, Sandy Silt with Gravel (ML)	
4 - 6	S-3		23 - 30 - 41 - 43	12	71	5.0	GLACIAL TILL	As Above, Dense (ML)	
6 - 8	S-4		49 - 42 - 41 - 42	18	83			As Above, Very Dense (ML)	
8 - 10	S-5		42 - 44 - 46 - 46	16	90			As Above (ML)	
						10.0			Boring Log B-3 Terminated at Depth of 10 feet below ground surface.
						15.0			
						20.0			
						25.0			

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Parking Lot Expansion		WAI Project No.: GM2017486.000	
Location: 49 FedEx Drive, Middletown, Middlesex County, Connecticut		Client: BL Companies	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>10/30/2020</u>	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: <u>10.0</u> feet bgs	Date Completed: <u>10/30/2020</u>	During: <u>2.5</u> --	At Completion: -- --
Proposed Location: <u>Parking</u>	Logged By: <u>RK</u>	At Completion: -- --	At Completion: -- --
Drill / Test Method: <u>HSA / SPT</u>	Contractor: <u>SD</u>	24 Hours: -- --	24 Hours: -- --
	Equipment: <u>Mobile B-53</u>		

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						0.0	TS	6" Forest Mat	
0 - 2	S-1	W O H	- 2 - 2 - 2	12	4		SUBSOIL	18" Silty Subsoil	
2 - 4	S-2	X	4 - 8 - 9 - 10	12	17		ALLUVIAL DEPOSIT	Reddish-Brown, Medium Dense, Well-Graded Gravel with Silt and Sand (GW-GM)	
4 - 6	S-3	X	9 - 11 - 10 - 14	6	21	5.0		As Above (GW-GM)	
						6.0			
6 - 8	S-4	X	14 - 17 - 18 - 6	6	35		GLACIAL TILL	Reddish-Brown, Dense, Silty Sand with Gravel (SM)	
8 - 10	S-5	X	4 - 7 - 9 - 4	8	16	10.0		As Above, Medium Dense (SM)	
								Boring Log B-4 Terminated at Depth of 10 feet below ground surface.	
						15.0			
						20.0			
						25.0			

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Parking Lot Expansion		WAI Project No.: GM2017486.000	
Location: 49 FedEx Drive, Middletown, Middlesex County, Connecticut		Client: BL Companies	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>10/30/2020</u>	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: <u>10.0</u> feet bgs	Date Completed: <u>10/30/2020</u>	During: <u>3.0</u> -- ▾	At Completion: -- -- ▾
Proposed Location: <u>Parking</u>	Logged By: <u>RK</u>	At Completion: -- -- ▾	At Completion: -- -- ▾
Drill / Test Method: <u>HSA / SPT</u>	Contractor: <u>SD</u>	24 Hours: -- -- ▾	24 Hours: -- -- ▾
	Equipment: <u>Mobile B-53</u>		

SAMPLE INFORMATION						DEPTH	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)			
						0.0			
0 - 2	S-1		2 - 3 - 5 - 6	8	8		TS	6" Topsoil	
2 - 4	S-2		4 - 9 - 7 - 9	8	16		ALLUVIAL DEPOSIT	Reddish-Brown, Loose, Well-Graded Gravel with Silt and Sand (GW-GM)	
4 - 6	S-3		2 - 4 - 4 - 5	6	8	5.0		As Above, Medium Dense (GW-GM)	
						6.0		As Above, Loose (GW-GM)	
6 - 8	S-4		4 - 4 - 4 - 4	6	8		GLACIO- LACUSTRINE DEPOSIT	Reddish-Brown, Medium Stiff to Stiff, Clayey Silt (ML)	
8 - 10	S-5		4 - 3 - 3 - 3	18	6	10.0		As Above, Medium Stiff (ML)	
								Boring Log B-5 Terminated at Depth of 10 feet below ground surface.	
						15.0			
						20.0			
						25.0			

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Parking Lot Expansion		WAI Project No.: GM2017486.000	
Location: 49 FedEx Drive, Middletown, Middlesex County, Connecticut		Client: BL Companies	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>10/30/2020</u>	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: <u>10.0</u> feet bgs	Date Completed: <u>10/30/2020</u>	During: <u>3.0</u> -- ▾	At Completion: -- -- ▾
Proposed Location: <u>Parking</u>	Logged By: <u>RK</u>	At Completion: -- -- ▾	At Completion: -- -- ▾
Drill / Test Method: <u>HSA / SPT</u>	Contractor: <u>SD</u>	24 Hours: -- -- ▾	24 Hours: -- -- ▾
	Equipment: <u>Mobile B-53</u>		

SAMPLE INFORMATION						DEPTH	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)			
						0.0			
0 - 2	S-1		1 - 2 - 2 - 2	12	4		TS	6" Forest Mat	
2 - 4	S-2		6 - 7 - 5 - 6	14	12		ALLUVIAL DEPOSIT	Reddish-Brown, Very Loose to Loose, Silty Gravel with Sand (GM)	
4 - 6	S-3		2 - 2 - 3 - 2	4	5	5.0		As Above, Medium Dense (GM)	
6 - 8	S-4		2 - 3 - 2 - 3	1	5	8.0		As Above, Loose (GM)	
8 - 10	S-5		9 - 18 - 21 - 20	4	39	10.0	GLACIAL TILL	Reddish-Brown, Dense, Silty Sand with Gravel (SM)	
						15.0			
						20.0			
						25.0			
Boring Log B-6 Terminated at Depth of 10 feet below ground surface.									

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RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Parking Lot Expansion		WAI Project No.: GM2017486.000	
Location: 49 FedEx Drive, Middletown, Middlesex County, Connecticut		Client: BL Companies	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>10/30/2020</u>	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: <u>10.0</u> feet bgs	Date Completed: <u>10/30/2020</u>	During: <u>6.0</u> -- ▾	At Completion: -- -- ▾
Proposed Location: <u>Parking</u>	Logged By: <u>RK</u>	24 Hours: -- -- ▾	At Completion: -- -- ▾
Drill / Test Method: <u>HSA / SPT</u>	Contractor: <u>SD</u>		24 Hours: -- -- ▾
	Equipment: <u>Mobile B-53</u>		

SAMPLE INFORMATION						DEPTH	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)			
						0.0			
0 - 2	S-1	X	2 - 2 - 3 - 2	14	5		TS	6" Forest Mat	
							SUBSOIL	18" Silty Subsoil	
2 - 4	S-2	X	11 - 12 - 18 - 18	8	30		GLACIAL TILL	Reddish-Brown, Medium Dense to Dense, Silty Sand with Gravel (SM)	
4 - 6	S-3	X	36 - 17 - 15 - 12	12	32	5.0		As Above, Dense (SM)	
6 - 8	S-4	X	11 - 12 - 11 - 10	14	23			As Above, Medium Dense (SM)	
8 - 10	S-5	X	12 - 10 - 10 - 10	16	20			As Above (SM)	
						10.0			
								Boring Log B-7 Terminated at Depth of 10 feet below ground surface.	
						15.0			
						20.0			
						25.0			

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Parking Lot Expansion		WAI Project No.: GM2017486.000	
Location: 49 FedEx Drive, Middletown, Middlesex County, Connecticut		Client: BL Companies	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>10/30/2020</u>	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: <u>10.0</u> feet bgs	Date Completed: <u>10/30/2020</u>	During: <u>6.0</u> -- ▾	At Completion: -- -- ▾
Proposed Location: <u>Parking</u>	Logged By: <u>RK</u>	At Completion: -- -- ▾	At Completion: -- -- ▾
Drill / Test Method: <u>HSA / SPT</u>	Contractor: <u>SD</u>	24 Hours: -- -- ▾	24 Hours: -- -- ▾
	Equipment: <u>Mobile B-53</u>		

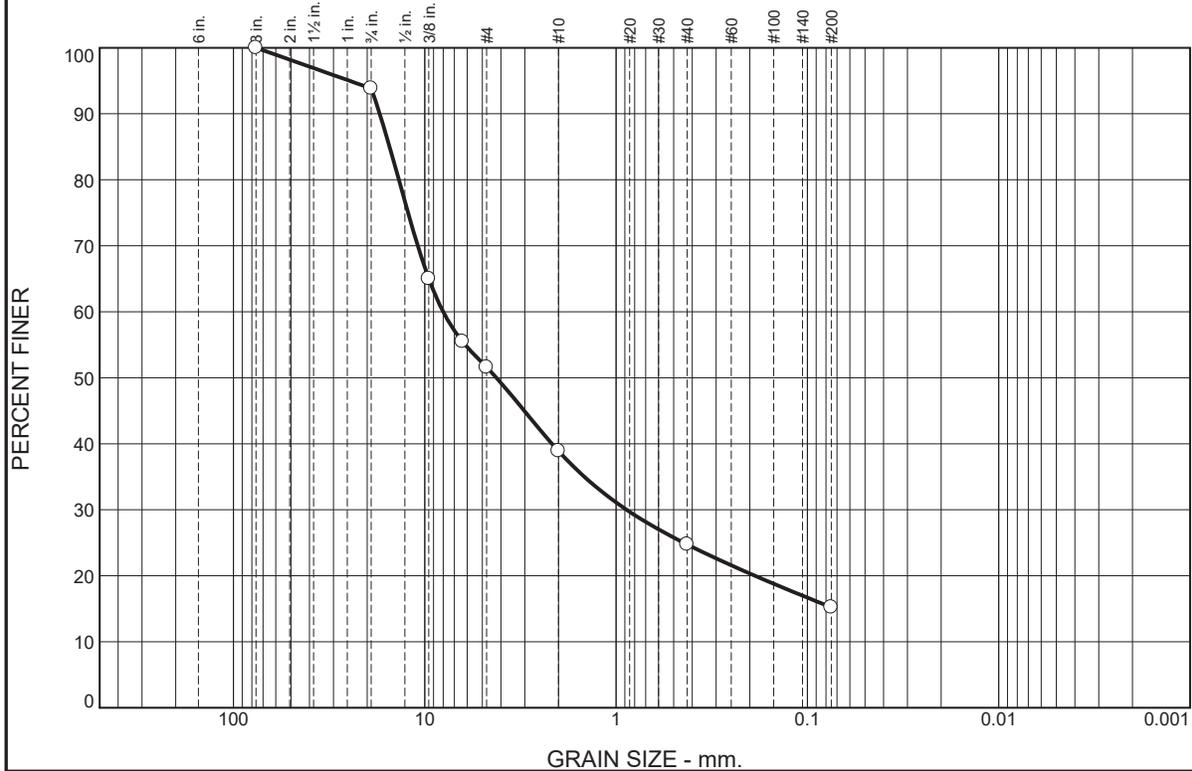
SAMPLE INFORMATION						DEPTH	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)			
						0.0			
0 - 2	S-1		2 - 1 - 2 - 2	18	3		TS	6" Forest Mat	
2 - 4	S-2		13 - 18 - 19 - 19	12	37		ALLUVIAL DEPOSIT	Reddish-Brown, Very Loose, Well-Graded Gravel with Silt and Sand (GW-GM)	
4 - 6	S-3		5 - 6 - 6 - 6	6	12	5.0		As Above, Dense (GW-GM)	
						6.0		As Above, Medium Dense (GW-GM)	
6 - 8	S-4		4 - 5 - 5 - 7	10	10		GLACIO- LACUSTRINE DEPOSIT	Reddish-Brown, Stiff, Clayey Silt (ML)	
8 - 10	S-5		4 - 4 - 3 - 3	7	7	10.0		As Above, Medium Stiff (ML)	
								Boring Log B-8 Terminated at Depth of 10 feet below ground surface.	
						15.0			
						20.0			
						25.0			

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

APPENDIX B

Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	6	42	13	14	10	15	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100	100	
3/4"	94		
3/8"	65		
1/4"	55		
#4	52		
#10	39		
#40	25		
#200	15	0.0 - 15	X

Material Description

Silty Gravel with Sand

Atterberg Limits
 PL= NP LL= NP PI= NV

Coefficients
 D₉₀= 17.1809 D₈₅= 15.2572 D₆₀= 8.0106
 D₅₀= 4.2222 D₃₀= 0.8809 D₁₅=
 D₁₀= C_u= C_c=

Classification
 USCS= GM AASHTO= A-1-a

Remarks
 Moisture Content = 17.8%

* Whitestone Structural Fill

Location: Boring B-6
Sample Number: S-2

Depth: 2'-4'

Date: 11/11/2020



Client: BL Companies

Project: Proposed FedEx Parking Expansion
 49 Fedex Drive, Middletown, Middlesex County, CT

Project No: GM2017486.000

Figure S-2

Tested By: JM

Checked By: RWM

APPENDIX C
Supplemental Information
(USCS, Terms and Symbols)



UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	
	MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION <u>RETAINED</u> ON NO. 4 SIEVE	CLEAN SAND (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMITS <u>LESS</u> THAN 50	SM	SILTY SANDS, SAND-SILT MIXTURES	
		LIQUID LIMITS <u>GREATER</u> THAN 50	SC	CLAYEY SANDS, SAND-CLAY MIXTURES	
MORE THAN 50% OF MATERIAL IS <u>SMALLER</u> THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMITS <u>LESS</u> THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
HIGHLY ORGANIC SOILS	SILTS AND CLAYS	LIQUID LIMITS <u>GREATER</u> THAN 50	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
		LIQUID LIMITS <u>GREATER</u> THAN 50	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
		LIQUID LIMITS <u>GREATER</u> THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS	
		LIQUID LIMITS <u>GREATER</u> THAN 50	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
HIGHLY ORGANIC SOILS	SILTS AND CLAYS	LIQUID LIMITS <u>GREATER</u> THAN 50	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	
		LIQUID LIMITS <u>GREATER</u> THAN 50	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS FOR SAMPLES WITH 5% TO 12% FINES

GRADATION*

% FINER BY WEIGHT

TRACE..... 1% TO 10%
LITTLE..... 10% TO 20%
SOME..... 20% TO 35%
AND..... 35% TO 50%

COMPACTNESS*
Sand and/or Gravel

RELATIVE DENSITY

LOOSE..... 0% TO 40%
MEDIUM DENSE.... 40% TO 70%
DENSE..... 70% TO 90%
VERY DENSE..... 90% TO 100%

CONSISTENCY*
Clay and/or Silt

RANGE OF SHEARING STRENGTH IN POUNDS PER SQUARE FOOT

VERY SOFT..... LESS THAN 250
SOFT..... 250 TO 500
MEDIUM..... 500 TO 1000
STIFF..... 1000 TO 2000
VERY STIFF..... 2000 TO 4000
HARD..... GREATER THAN 4000

* VALUES ARE FROM LABORATORY OR FIELD TEST DATA, WHERE APPLICABLE. WHEN NO TESTING WAS PERFORMED, VALUES ARE ESTIMATED.

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Other Office Locations:

WARREN, NJ
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CHALFONT, PA
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SOUTHBOROUGH, MA
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WALL, NJ
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EVERGREEN, CO
303.670.6905

GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

- N: Standard Penetration Value: Blows per ft. of a 140 lb. hammer falling 30" on a 2" O.D. split-spoon.
 Qu: Unconfined compressive strength, TSF.
 Qp: Penetrometer value, unconfined compressive strength, TSF.
 Mc: Moisture content, %.
 LL: Liquid limit, %.
 PI: Plasticity index, %.
 δd: Natural dry density, PCF.
 ▽: Apparent groundwater level at time noted after completion of boring.

DRILLING AND SAMPLING SYMBOLS

- NE: Not Encountered (Groundwater was not encountered).
 SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
 ST: Shelby Tube - 3" O.D., except where noted.
 AU: Auger Sample.
 OB: Diamond Bit.
 CB: Carbide Bit
 WS: Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

<u>Term (Non-Cohesive Soils)</u>	<u>Standard Penetration Resistance</u>
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

<u>Term (Cohesive Soils)</u>	<u>Qu (TSF)</u>
Very Soft	0 - 0.25
Soft	0.25 - 0.50
Firm (Medium)	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	4.00+

PARTICLE SIZE

Boulders	8 in.+	Coarse Sand	5mm-0.6mm	Silt	0.074mm-0.005mm
Cobbles	8 in.-3 in.	Medium Sand	0.6mm-0.2mm	Clay	-0.005mm
Gravel	3 in.-5mm	Fine Sand	0.2mm-0.074mm		

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