GEOTECHNICAL ENGINEERING SERVICES REPORT

For the proposed

CANOPY & STORMWATER BASIN
400 ORITANI DRIVE
BLAUVELT, NEW YORK

Prepared for

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Prepared by

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PSIE PROJECT NO. 04911893

March 26, 2020

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1.0 PROJECT INFORMATION

1.1 PROJECT AUTHORIZATION

Professional Service Industries Engineering, PLLC (PSIE), an Intertek company, was provided written authorization to proceed with this project by Mr. Aaron Matson with CESO, Inc. (CESO) by issuing a “CESO, Inc. Sub-Consultant Agreement” dated February 7, 2020. The geotechnical services were provided in general accordance with the scope of work set forth in PSIE Proposal No. 0491-300933, dated January 27, 2020; except for a reduction in infiltration drilling/testing due to a reduction in stormwater facilities to a single surface basin.

1.2 PROJECT DESCRIPTION

Project information was initially provided by CESO in the form of email correspondence, which included an aerial photograph marked up with general improvement areas and a preliminary set of existing conditions drawings (6 sheets) prepared by Blew & Associates, PA and dated October 31, 2019. On March 9, 2020, CESO also provided PSIE with three additional sheets: the existing conditions plan overlaid on an aerial photograph (untitled, undated), a “Grading Plan” (Sheet C5.0, dated March 12, 2020), and a detail sheet (no sheet number, also dated March 12, 2020).

PSIE understands that improvements to include a canopy and stormwater basin are planned at the existing facility located at 400 Oritani Drive in Blauvelt, New York. Structural loads were not provided to PSIE; therefore, for the purposes of this report, PSIE is assuming maximum compression loads of 50 kips at each column location.

Based on topographic information on the provided plans, elevations across the proposed canopy range from approximately EL 90 to 95 feet and from about EL 87 to 92 feet across the proposed stormwater basin. Final grading of the canopy area appears to range from about EL 94 to 96½ feet, resulting in fills up 6½ feet being required to reach final elevations. The infiltrative surface elevation of the proposed stormwater basin appears to be on the order of EL 85 feet resulting in cuts ranging from 2 to 7 feet to reach the final infiltrative surface.

Estimated loads, foundation sizes and cut/fill amounts have a direct effect on the recommendations in this report, including the recommended type of foundation, the allowable bearing pressure, and the estimated settlement. Should any of the above information or assumptions made by PSIE be inconsistent with the planned construction, we request that you contact us immediately to allow us to make any necessary modifications to this report.

1.3 PURPOSE AND SCOPE OF WORK

The purpose of our geotechnical services was to assess the subsurface conditions at the site and develop geotechnical-related site preparation, fill placement and foundation recommendations. PSIE’s scope of services included a subsurface exploration (four test borings and two infiltration tests) and laboratory work which formed the basis for the geotechnical recommendations contained in this report.

2.0 SITE AND SUBSURFACE CONDITIONS

2.1 SITE LOCATION AND DESCRIPTION

The project site is located at 400 Oritani Drive in Blauvelt, New York. The general improvement area is bordered by the existing warehouse structure to the south, a sloping grassy area leading to a parking area for the adjacent warehouse to the north, and concrete access drives to the east and west. The approximate site location is shown on a USGS topographic map in the Appendix (Figure 1).

At the time of our exploration, the site was developed with a warehouse structure, concrete pavements and curbs, and various below-grade utilities. The balance of the site generally consisted of low-cut grass. Based on the historical aerials available within Google Earth, the existing facility was constructed between July 2007 and September 2009. Aerial photographs from both Google Earth and https://www.historicaerials.com/viewer indicate an increasing amount of site disturbance between April 1994 and July 2007. Prior aerials (1953, 1964, 1965 and 1974) indicate that the site was likely a farm field prior to disturbance/development.

Based on topographic information on the provided plans, elevations across the proposed improvement areas range from approximately EL 87 to 95½ feet with grades generally sloping downward to the north.

2.2 SUBSURFACE CONDITIONS

2.2.1 USDA & GEOLOGIC MAP REVIEW

Based on the USDA-NRSC Web Soil Survey website (https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx), the site is underlain by the Riverhead fine sandy loam, 3 to 8 percent slopes (ReB) soil unit. The parent material of the Riverhead soil series is indicated as “loamy glaciofluvial deposits overlying stratified sand and gravel” with typical USCS classifications of ML, SM, SP-SM, SP, SW, GM, GP-GM and GP.

Based on the “Surficial Geologic Map of New York – Lower Hudson Sheet” (Cadwell, 1989), the site is underlain by the Till (t) surficial unit, which is generally composed of poorly sorted, variable-sized particles (clay to boulders) that were deposited beneath glacier ice. The thickness of the Till generally ranges from 1 to 50 meters. Additionally, the site is generally bordered to the north/northwest by the Lacustrine Silt and Clay (lsc) surficial unit, which is generally composed of laminated silt and clay that was deposited in proglacial lakes. The thickness of this unit is highly variable but may be up to 100 meters thick.

Furthermore, based on the “Geologic Map of New York – Lower Hudson Sheet” (compiled and edited by Fisher, Isachsen & Rickard, 1970), the site is generally underlain by a sub member of the Brunswick Formation, undivided (generally Trb with the sub member being identified as Trba), which is generally composed of mudstone, sandstone, and arkose.

2.2.2 SUBSURFACE EXPLORATION

On March 16 and 17, 2020, PSIE's drilling subcontractor (Soil Testing, Inc.), drilled two test borings (B-1 and B-2) within the proposed canopy area and four borings within the proposed stormwater basin (two of these borings were used as profile borings, while the remainder were used for cased borehole infiltration testing). The approximate boring locations are shown on the Boring Location Plan in the Appendix (Figure 2). The boring locations were selected and marked in the field by CESO personnel. Elevations on the boring logs were interpolated from the topographic information on the provided plans. The New York One Call System was notified for public utility clearance, prior to drilling the site. Furthermore, PSIE's drilling subcontractor engaged the services of a private utility locator to mark underground utilities in the general area of the proposed borings.

The borings were advanced with hollow-stem augers to auger depths ranging from approximately 10 to 25 feet below the existing ground surface (bgs). At Boring B-1, auger refusal was encountered at the approximate depth of 16½ feet bgs. The refusal material was not further explored but is anticipated to be boulder-sized rock within the soil matrix. Standard Penetration Tests (SPT) and split-spoon sampling was performed in general accordance with ASTM D1586.

The results of the visual classifications of recovered soil, the SPT blow counts and water level observations are presented in the boring logs in the Appendix of this report. The soil samples will be stored in our laboratory for further analysis, if requested. Unless notified otherwise, the samples will be disposed of after 3 months. The results of the drilling are summarized as follows:

Surficial Materials:
Borings B-1 and B-2 within the canopy area encountered concrete pavement approximately 9 inches thick at the ground surface. The borings within the proposed stormwater basin (INF-1A and INF-2A) encountered topsoil on the order of about ½ foot in thickness. However, the actual type and thickness of surficial material should be expected to vary widely across this site and between boring locations.

FILL/Possible FILL:
Underlying the surficial materials at each boring location, FILL/Possible FILL materials were encountered to depths ranging from approximately 2 to 4 feet bgs. These materials were generally classified as red-brown to brown to dark gray-brown Sandy SILT (ML) with varying amounts of gravel, Silty Clayey SAND (SC-SM) or Silty SAND (SM) with varying amounts of gravel. Within the upper 2 feet at Boring B-2, woody matter was present within the cuttings and a cobble-sized rock was encountered during drilling. The SPT N-values within these FILL materials ranged from 6 blows per foot (bpf) to 50 blows to advance the sampler 5 inches. However, due to the nature of man-placed fill, the actual consistency/relative density of the in-situ soils should be expected to vary greatly.

Glaciofluvial Deposits:
Underlying the FILL/Possible FILL at each boring location, apparent glaciofluvial-deposited soils were encountered to each boring's respective termination depth. These soils were generally classified as red-brown to brown to light/dark gray-brown Silty SAND (SM), Poorly Graded

SAND with Silt (SP-SM), Poorly Graded SAND (SP), or Poorly Graded GRAVEL with Silt and Sand (GP-GM). The SPT N-values within these glacial soils ranged from 5 to 31 bpf indicating loose to dense relative soil densities. Loose relative densities (SPT N-values between 5 and 10 bpf) were encountered within Borings B-2 (8 to 11½ feet, 16½ to 25 feet), INF-1A (6 to 8 feet), and INF-2A (6 to 9 feet).

The preceding subsurface descriptions are generalized to highlight the major soil strata encountered during the exploration. The boring logs included in Appendix A should be reviewed for specific information at individual boring locations. The strata shown on the logs represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The strata represent the approximate boundaries between subsurface materials, where the actual transition may be gradual.

2.2.3 FIELD INFILTRATION TEST RESULTS

As previously indicated, on March 16 and 17, 2020, a drill rig was mobilized to drill two boreholes for cased infiltration testing with adjacent offset borings at each infiltration location for soil profiling purposes. At the first infiltration test location (INF-1B with profile boring INF-1A), the borehole was advanced with hollow-stem augers to the approximate requested test depth of 8 feet bgs. The auger was then removed, and casing was placed in the borehole, pushed approximately 2 inches into the bottom of the borehole and the annulus space outside the casing backfilled with soil spoils. A similar method was used at the second infiltration test location (INF-2B with profile boring INF-2A) except the requested test depth was 6 feet bgs. Both borings were then pre-soaked for approximately 24 hours.

On the day of testing (March 17, 2020), an initial water reading was obtained within the cased borehole test casings to determine the amount of water lost during the pre-soak period. Afterwards, the water within the casing was refilled and infiltration testing commenced. Readings were generally obtained at half-hour intervals. After four hours of test results were obtained, the testing was terminated; the casing was then removed and the boreholes backfilled with the remaining borehole spoils. The infiltration test results can be found in the Appendix and are summarized below.

The generalized soil profile consisted of Possible FILL (Sandy Silt/Silty Sand) over Glaciofluvial Deposits (Silty Sand/Silty Gravel). PSIE suggests a factor of safety (for sizing the facility) of 2 to 3 be applied to the raw infiltration test rates summarized in the table below.

Table 1: Field Infiltration Results Summary $^{\text{NOTE 1}}$

Infiltration Test Location	Ground Surface/ Facility Invert Elevations	Test Depth Below Grade (feet)	Approx. Infiltration Rate	"Limiting Layers"
INF-1B	EL 91/85	8	$^{3}/_{8}$ in/hr	Not encountered.
INF-2B	EL 89/85	6	$1^{3}/_{8}$ in/hr	Not encountered within 2 feet of the proposed basin bottom (~EL 85 feet); however, a small area of perched water was encountered within the split-spoon sample at ~EL 82 feet.

Note 1: Please be aware that infiltration tests are performed over a very limited area, at specific depths over very short time periods and may not be representative of how the basin will perform as a whole given that the basin is infiltrating larger quantities of water over longer times and over larger areas at sites where the subsurface conditions can be highly variable laterally, vertically and locally.

2.3 GROUNDWATER CONDITIONS

At the time of our drilling activities (March 2020), groundwater was encountered within Boring B-2 at the approximate depth of 18 feet during drilling activities. Upon completion of the borehole, the groundwater was measured at approximately 20 feet bgs. The borings were backfilled immediately upon completion for safety considerations; thus, long-term groundwater level measurements were not possible.

The observations presented on the test boring logs represent the groundwater conditions at the time of measurement and may not be indicative of other times. Additionally, discontinuous zones of perched water may exist within the overburden materials and the contractor should anticipate surface and subsurface seepage into any subsurface excavations during high moisture periods of the year. Variations in groundwater levels should be expected seasonally, annually and from location to location.

2.4 LABORATORY TESTING

PSIE performed laboratory testing on selected soil samples in general accordance with ASTM standards. The laboratory testing included natural moisture content determination, Atterberg Limits and grain size distribution. The laboratory test results are included in the Appendix and shown on the boring logs opposite of the sample tested and are summarized below.

Table 2: Laboratory Test Results

Boring No.	Sample No.	Sample Depth (ft)	USCS Classification	Passing Sieve (%)	Atterberg Limits (%)			Moisture Content (%)
				No. 200	Liquid Limit	Plastic Limit	Plasticity Index	
B-1	S-3	5 – 7	Poorly Graded SAND with Gravel (SP)	3.0	---	---	---	3
B-2	S-3	4 – 6	Silty SAND (SM)	37.9	NP*	NP	NP	12
B-2	S-5	8 – 10	Poorly Graded GRAVEL with Silt and Sand (GP-GM)**	12.0	---	---	---	8
B-2	S-7	18 – 20	Poorly Graded SAND (SP)	3.9	---	---	---	19
INF-1A	S-5	8 – 10	Silty SAND with Gravel (SM)	35.5	NP	NP	NP	11
INF-2A	S-3	4 – 6	Silty SAND with Gravel (SM)	31.3	NP	NP	NP	9

*NP = Non-plastic fines
**Based on limited laboratory testing and visual-manual classification methods.

3.0 OBSERVATIONS AND RECOMMENDATIONS

3.1 GENERAL

Based on the subsurface conditions encountered and PSIE's understanding of the proposed development, the site is anticipated to be adaptable for conventional shallow foundations for the proposed construction if the recommendations provided in this report are followed. The following geotechnical-related issues may impact site development.

- The site is currently developed with a warehouse structure, concrete pavements and curbs and associated utilities. Debris associated with the demolition of the existing pavements (if planned) should not be reused as structural fill. Care should be taken to avoid underground utilities and existing structural elements during excavation activities.

- Undocumented FILL was encountered within PSIE's test borings to depths ranging from approximately 2 to 4 feet bgs. As previously mentioned, the FILL materials at Boring B-2 contained woody matter and cobble-sized rock, which are considered deleterious materials. Due to the apparent variable nature of the FILL, PSIE recommends that the FILL materials be completely removed below new foundations with grades being re-established to the bottom of foundation elevation using structural fill materials in accordance with Section 3.3 below. Organic- or debris-laden FILL soils should not be reused as structural fill.

- Where loose or disturbed soil area encountered at the bottom of foundation elevation, these soils should be compacted-in-place if possible or removed and replaced/recompacted. Moreover, the underlying glacial soils are anticipated to contain some cobble- or boulder-sized rock within the soil matrix. Where this over-sized rock is encountered at the bottom of foundation elevation, it should be removed a minimum of 12 inches below the proposed foundation base. Furthermore, if large amounts of glacial soils are anticipated for use as structural fill for this project, it may be necessary to remove the over-sized rock with the use of a screener.

3.2 SITE PREPARATION AND EARTHWORK RECOMMENDATIONS

Site preparation procedures should include the removal of existing pavements, debris and any other deleterious material present within the construction area. Under no circumstances should topsoil, demolition debris (including demolished pavements) or organic-laden soils be placed as structural fill.

Following clearing/grubbing operations, lowering of site grades where necessary, and prior to placement of any new fill in the building and pavement areas, the exposed subgrades should be proof-rolled with a fully loaded triaxle dump truck under the observation of a PSIE representative. Those areas observed to rut and deflect excessively should be removed and replaced or otherwise stabilized. The subgrade repair or stabilization approaches should be determined by PSIE at the time of construction, but may include over-excavation, scarification, the placement of a coarse aggregate possibly in conjunction with geotextile/geogrid or cement/lime modification/stabilization.

Any required backfill or new fill should comply with the Structural Fill section below. The placement of a geotextile and/or coarse graded stone may be required to stabilize the undercut subgrade and to facilitate backfilling.

Subgrade areas should be kept properly drained and free of ponded water surfaces. This may be achieved by either sloping the site topography adjacent to the construction to direct the water away from the excavation or trenching and berming to collect the excess run-off. Final excavations to desired subgrades should be accomplished immediately prior to the placement of concrete. The contractor should not place concrete on disturbed subgrades. If the subgrade soils are wet, machine or foot traffic should be reduced or eliminated to lessen disturbance of the subgrade. If the site clearing is performed separate from the proposed fueling facility construction, restoration of the site to provide for positive drainage is recommended.

Materials placed as fill below pavements and other surface improvements should meet the requirements of structural fill as provided below. It is also recommended that PSIE be retained to perform field density testing during fill placement.

3.3 STRUCTURAL FILL MATERIAL AND PLACEMENT

Materials to be used as structural fill or backfill should be tested for compliance with the specifications below for structural fill. If the materials do not meet the specifications, then they may be placed in non-bearing, landscaped areas or removed off-site.

The in-place soils will be sensitive to moisture content variations. This general sensitivity to water will influence construction, since subgrade support capacities will deteriorate when this soil type becomes wet and/or disturbed. It is not unusual for wet or cool season grading operations to be hindered by the continual need to dry back the on-site natural soils during placement. If fill placement must proceed during other than the summer months, the use of imported granular fill with less than 5 percent passing the No. 200 sieve may be necessary.

For any necessary fill, it is recommended that all imported or on-site soils be tested and evaluated by PSIE. In general, fill materials planned for use as structural fill should be free of organic matter and construction debris, and should not be excessively wet or excessively plastic, and should have rock fragments no larger than 3 inches in maximum dimension.

Satisfactory fill material should include clean soil with USCS classifications of (GW, GM, GC, SW, SP, along with some SM or SC). The fill material should have a maximum Liquid Limit of 35 and a Plasticity Index of 15 or less. Unsatisfactory fill material includes fine-grained soils, highly elastic, plastic or organic soils (ML, CL, MH, CH, OH, OL, PT) and these materials should not be used as structural fill.

Structural fill should be placed in accordance with the following recommendations:

1. Structural fill materials should be placed in layers of not more than 8 inches in loose thickness with soils that have rock fragments that are no larger than 3 inches in their maximum dimension.

2. Structural fill materials should have maximum liquid limit of 35 and a maximum plasticity index of 15, tested per ASTM D-4318. Consideration should be given to using granular low plasticity soils for structural fill.

3. Moisture contents should be within ±2 percentage points of optimum moisture content per ASTM D-1557. Adjustments to the natural moisture contents of the soils may be required in order to obtain specified compaction levels. Additionally, soils to be used as fill should have a Maximum Dry Density (MDD) of at least 110 pcf as determined by a Modified Proctor.

4. Each layer of the fill materials in the building areas and in pavement subgrade areas should be compacted to at least 95 percent of the Modified Proctor maximum dry density (ASTM D-1557).

5. A representative of the PSIE Geotechnical Engineer should monitor the fill placement and compaction operations on a full-time basis and should perform a sufficient number of density tests to verify that proper degrees of compaction are achieved.

If on-site material is considered for reuse as structural fill, then PSIE recommends that at the start of construction and during construction (as needed) bulk samples be collected for laboratory testing by PSIE. Based on visual classifications and limited laboratory testing associated with our test boring exploration, the in-place soils and FILL materials generally have suitable plasticity and gradation characteristics for use as structural fill material, if not organic- or debris-laden. However, based on the results of limited laboratory testing, some of the in-place soils may be in excess of their optimum moisture content for compaction and may require drying back. Furthermore, as previously mentioned, if large amounts of natural soils are anticipated for use as structural fill, a screener may be necessary for the removal of cobble- and boulder-sized rock (greater than 3 inches maximum dimension).

3.4 FOUNDATION RECOMMENDATIONS

3.4.1 SHALLOW FOUNDATIONS

After the site has been prepared as described in Section 3.2 above, the proposed structure may be supported on shallow spread footings bearing on compacted structural fill. Spread footings for the proposed canopy can then be designed for a net allowable soil bearing pressure of 3,000 pounds per square foot (psf). For resistance to lateral loads, an allowable coefficient of friction of 0.3 between the base of the foundation elements and underlying compacted materials can be utilized. In addition, an allowable passive resistance equal to an equivalent fluid weighing 250 pounds per cubic foot (pcf) acting against the foundation may be used to resist lateral forces. The top foot of passive resistance at foundations should be neglected unless the ground surface around the footing is covered by concrete or pavement.

Exterior foundations should be designed for a minimum embedment of 48 inches below final exterior grades to provide adequate cover for frost protection.

Utilizing this allowable bearing pressure, we estimate that total and differential settlements will be on the order of 1 inch or less and ½ inch or less spanning 40 feet, respectively, provided that the subgrade soil is firm and fill has been placed and compacted to the required density and exhibits no weaving or other signs of instability.

PSIE recommends that column footings have a minimum width of 24 inches, regardless of the actual bearing pressure. Wall footings (if planned) should be provided with nominal, continuous, longitudinal steel reinforcement for greater bending strength so they can span across small areas of loose or soft soils that may go undetected during construction.

Because of possible variations in subsurface conditions and related bearing capacity, all footing excavations should be observed by PSIE. Foundation bearing surface evaluations should be performed in each foundation excavation prior to placement of reinforcing steel. These evaluations should be performed by a representative of PSIE to confirm that the design allowable soil bearing pressure is available and that our design assumptions about the subgrade are applicable to the conditions encountered during construction. The foundation bearing surface evaluations should be performed using a combination of visual observation and dynamic cone penetrometer testing.

Where unsuitable bearing conditions are encountered as determined by PSIE, these soils should be undercut and replaced with controlled structural fill. Unsuitable foundation bearing conditions may consist of, but are not limited to, soft/loose relative densities, excessively wet conditions, nested debris and organic soil and wood materials or relatively intact hard obstructions. The over-excavation should extend laterally from all foundation edges a minimum of one half the depth of the undercut. The backfill should consist of approved, compacted structural fill as described in Section 3.3 above.

We recommend that the exposed bases of the foundation excavations be compacted prior to placement of reinforcing steel to densify loose natural soils disturbed by the excavation process. Prior to the placement of concrete, where reinforcing steel is placed in the foundations, an inspection must be conducted to observe that specified chairs or supports are provided that the reinforcing steel is properly positioned, as specified.

Exposure to the environment can weaken the soils at the foundation-bearing surface if they are exposed for extended periods of time. If the foundation-bearing surface becomes unstable due to exposure to the environment, remedial work, including the removal of unsuitable soils may need to be performed prior to concrete placement. The foundation bearing surface can be protected with a lean concrete mud mat within the footing excavation; however, it should be located below the design bottom of the foundation concrete.

Once the footing concrete is placed, the foundations should be backfilled with structural fill as soon as it is safe to do so without causing damage to them. The backfill serves to protect the footing, is a component of overturning resistance and prevents accumulation of water around the foundations which can soften and weaken the bearing soils. The ground surface near the completed foundations should be sloped to drain away from the foundations throughout construction to avoid accumulation of moisture in the subgrade soils.

3.5 SEISMIC DESIGN

The project site is located within a municipality that employs the 2015 edition of the International Building Code as adopted by New York State. As part of this code, the design of structures must consider dynamic forces resulting from seismic events. These forces are dependent upon the magnitude of the earthquake event as well as the properties of the soils that underlie the site. As part of the procedure to evaluate seismic forces, the code requires the evaluation of the Seismic Site Class, which categorizes the site based upon the characteristics of the subsurface profile within the upper 100 feet of the ground surface. To define the Site Class for this project, we have interpreted the results of soil test borings drilled within the project site and estimated appropriate subsurface properties below the base of the borings to a depth of 100 feet as permitted by the code.

Based upon our evaluation, the subsurface conditions within the site are consistent with the characteristics of a **Site Class "D"** as defined in ASCE 7 Chapter 20 (per IBC 2015 1613.3.2). The associated probabilistic ground acceleration values and site coefficients for the general site area were obtained from the OSHPD geohazards web page: http://seismicmaps.org/.

The seismic values and coefficient are presented in Table 1 below:

Table 3: Ground Motion Values*

Period (sec)	**Mapped MCE Spectral Response Acceleration** (g)**		**Site Coefficients**		**Adjusted MCE Spectral Response Acceleration (g)**		**Design Spectral Response Acceleration (g)**	
0.2	S_s	0.273	F_a	1.582	S_{Ms}	0.431	S_{Ds}	0.487
1.0	S_1	0.072	F_v	2.400	S_{M1}	0.173	S_{D1}	0.116

**2% Probability of Exceedance in 50 years for 400 Oritani Drive, Blauvelt, NY*
***At B-C interface (i.e. top of bedrock).*
MCE = Maximum Considered Earthquake; g = acceleration due to gravity

4.0 CONSTRUCTION CONSIDERATIONS

4.1 GROUNDWATER CONTROL

As previously indicated at the time of our drilling activities (March 2020), groundwater was encountered within Boring B-2 at the approximate depth of 18 feet during drilling activities. Upon completion of the borehole, the groundwater was measured at approximately 20 feet bgs. However, it is possible that seasonal variations will cause the water levels across the site to vary.

PSIE recommends that the Contractor determine the actual groundwater levels at the site at the time of the construction activities to assess the impact groundwater may have on construction. Water should not be allowed to collect in the foundation excavation, on floor slab areas or on prepared subgrades of the construction area either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of collected rainwater, groundwater or surface runoff. Positive site drainage should be provided to reduce infiltration of surface water around the perimeter of the building and beneath the floor slabs. The grades should be sloped away from the building and surface drainage should be collected and discharged such that water is not permitted to infiltrate the backfill and floor slab areas of the building.

The Geotechnical engineer should be consulted if excessive and uncontrolled amounts of seepage occur. Consultation with the project Storm Civil Engineer may also be necessary.

4.2 EXCAVATION CONSIDERATIONS

In Federal Register, Volume 54, No. 209 (October, 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, Part 1926, Subpart P". This document was established to better enhance the safety of workers entering trenches or excavations.

Federal regulation mandates that all excavations, whether they be utility trenches, basement or footing excavations or others (i.e. underground storage tanks), be constructed in accordance with the OSHA requirements. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could risk injury to workers and be liable for substantial financial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's responsible person, as defined in “29 CFR Part 1926”, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination or excavation depth, including utility trench excavation depth, exceed those specified in local, state and federal safety regulations.

We are providing this information solely as a service to our client. PSIE is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

5.0 REPORT LIMITATIONS

The recommendations and discussions in this submittal are based on the available information obtained by PSIE and design details furnished by CESO, Inc. If there are any revisions of the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, PSIE should be notified immediately to determine if changes in the recommendations are required. If PSIE is not retained to perform these functions, PSIE cannot be responsible for the impact of those conditions on the performance of the project.

PSIE warrants that the findings, recommendations, specifications or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area at the time of this report. No other warranties are implied or expressed.

The scope of our services does not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of our client.

Upon completion of plans and specifications, PSIE should be provided the opportunity to review the final design documents. This review process will allow PSIE to verify whether or not our engineering recommendations have been properly incorporated into the design documents and that the earthwork and foundation recommendations have been properly interpreted and implemented. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of CESO, Inc. for the specific application to the proposed canopy and stormwater basin at 400 Oritani Drive in Blauvelt, New York.

APPENDIX

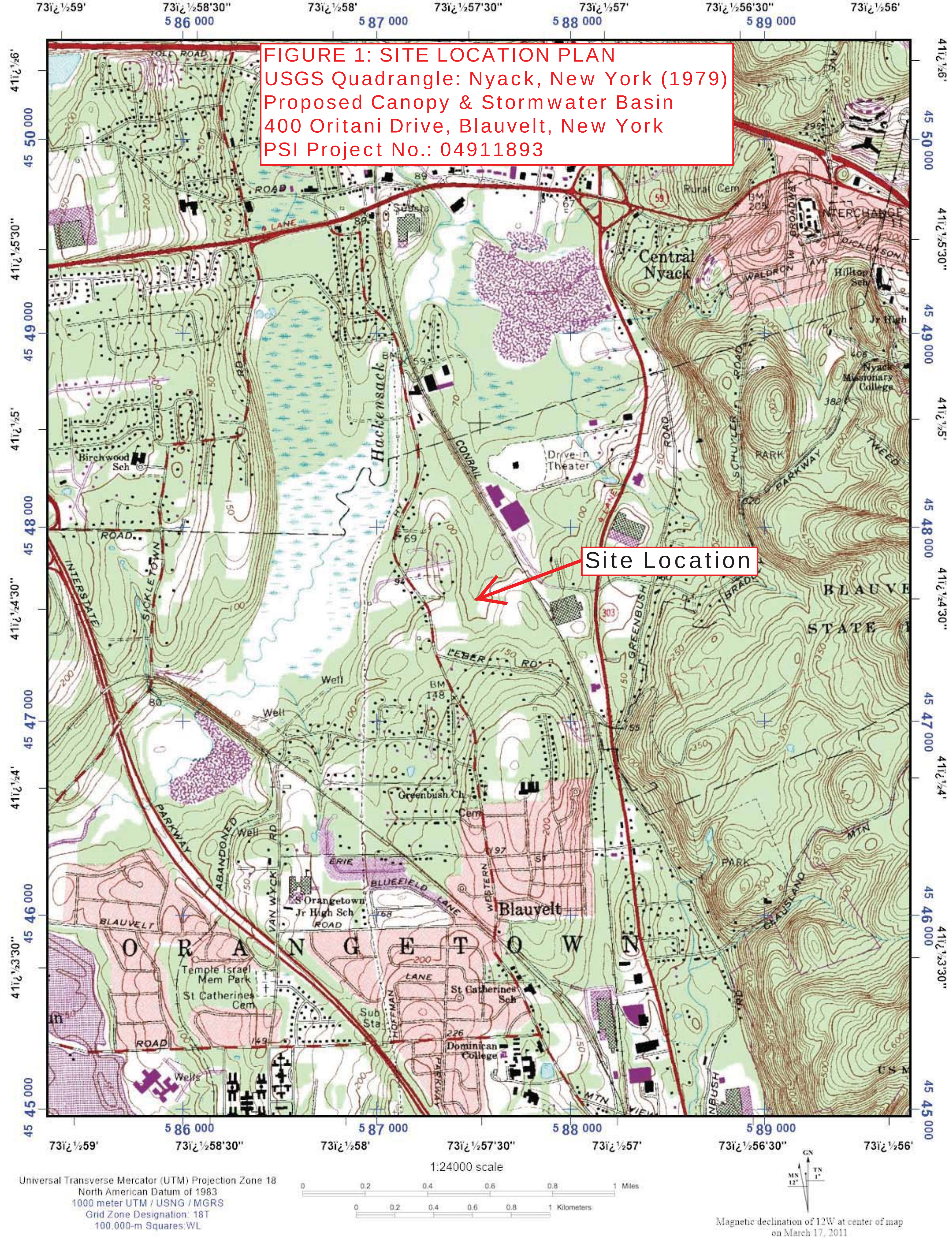


FIGURE 1: SITE LOCATION PLAN
USGS Quadrangle: Nyack, New York (1979)
Proposed Canopy & Stormwater Basin
400 Oritani Drive, Blauvelt, New York
PSI Project No.: 04911893

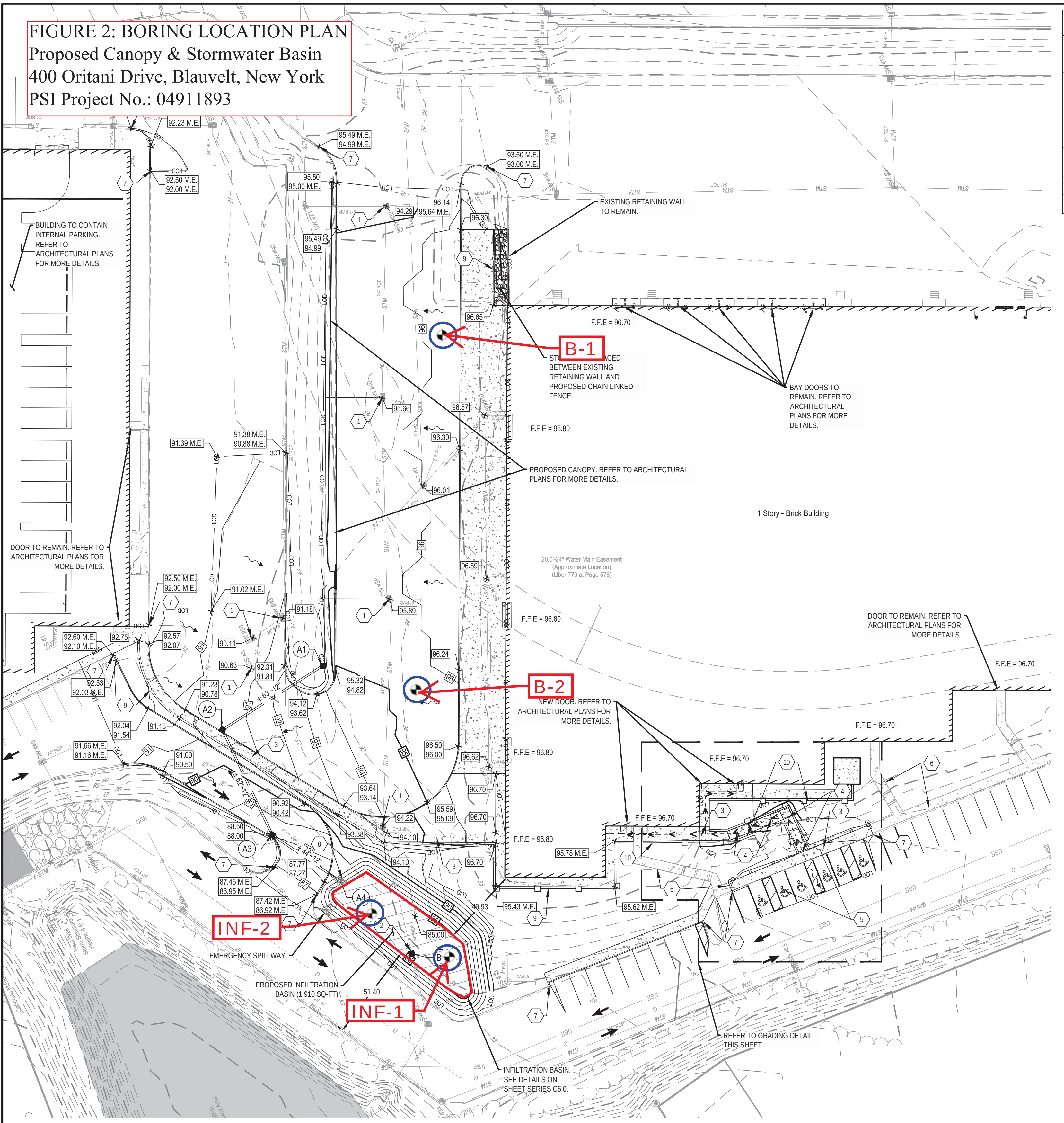
Site Location

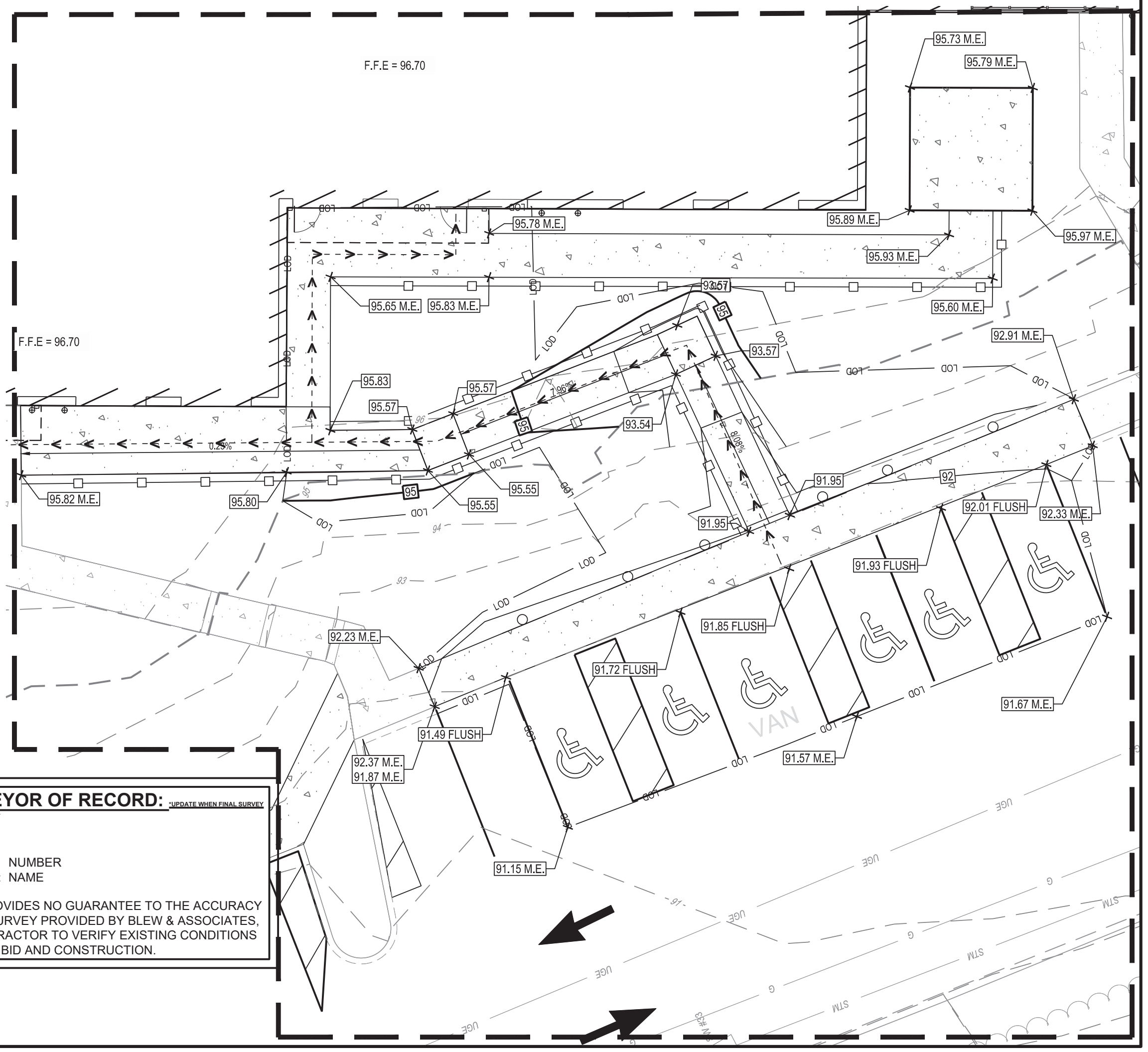
1:24000 scale

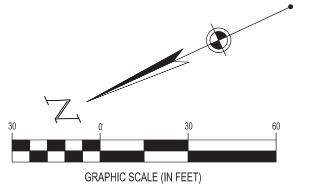
Universal Transverse Mercator (UTM) Projection Zone 18
North American Datum of 1983
1000 meter UTM / USNG / MGRS
Grid Zone Designation: 18T
100,000-m Squares:WL

Magnetic declination of 12W at center of map
on March 17, 2011

FIGURE 2: BORING LOCATION PLAN
Proposed Canopy & Stormwater Basin
400 Oritani Drive, Blauvelt, New York
PSI Project No.: 04911893







REFER TO CONSTRUCTION DETAILS ON SHEET SERIES C7.0

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STORM SEWER STRUCTURE SCHEDULE

NO.	STRUCTURE	RIM	INVERT
A1	2X2 CB	93.44	90.00 (12") N
A2	2X2 CB	90.13	86.43 (12") S 86.23 (12") W
A3	2X2 CB	88.10	85.92 (12") E 85.72 (12") SW
A4	38"X6"X37" HW	87.05	85.50 (12") NE
B1	STANDARD 5X5 INLET WITH BEEHIVE GRATE	87.05	81.71 (24") E 81.71 (24") W
SW #37	4X4 CB	87.26	81.95 (24") E
SW #38	4X4 CB	91.31	81.99 (24") W

⬡ CODED NOTES:

1. EXISTING STRUCTURE'S RIM TO BE BROUGHT TO PROPOSED GRADE.
2. CONTROL STRUCTURE B1.
3. PROPOSED ACCESSIBLE SIDEWALK. REFER TO DETAIL ON SHEET SERIES C7.0.
4. PROPOSED ACCESSIBLE RAMP WITH INTERMEDIATE TURNING PLATFORM AND RAILING. REFER TO DETAIL ON SHEET C7.0.
5. CONTRACTOR TO ENSURE PAVEMENT/SIDEWALK SLOPE DOES NOT EXCEED 2% IN ANY DIRECTION IN ACCESSIBLE PARKING STALLS/AISLES/PATH.
6. EXISTING SIDEWALK TO REMAIN. CONTRACTOR TO REPLACE ANY PORTION DAMAGED DURING CONSTRUCTION ACTIVITIES.
7. APPROXIMATE LOCATION OF TIE IN TO EXISTING CURBING. CONTRACTOR TO REPLACE ANY DAMAGED CURBING DURING CONSTRUCTION ACTIVITIES.
8. RIP-RAP OUTLET.
9. CHAIN LINK FENCE.
10. HAND RAILING.

GENERAL NOTES

1. ALL WORK AND MATERIALS SHALL COMPLY WITH ALL NEW YORK DOT REGULATIONS AND CODES, AND O.S.H.A. STANDARDS. THE CONTRACTOR SHALL OBTAIN FINAL PERMITTING AND APPROVAL/INSPECTIONS AS REQUIRED FROM THE LOCALITY.
2. THE CONTRACTOR SHALL VERIFY ELEVATIONS AT CONNECTION POINTS OR ANY EXISTING UTILITY CROSSING PRIOR TO ORDERING STRUCTURES. REPORT ANY CONFLICTS TO THE ENGINEER.
3. LINES UNDERGROUND SHALL BE INSTALLED, INSPECTED, AND APPROVED PRIOR TO BACKFILLING.
4. THE CONTRACTOR IS RESPONSIBLE FOR THE REPAIRS TO UTILITIES DAMAGED DURING CONSTRUCTION AT NO COST TO THE OWNER.
5. STORM SEWER CATCH BASINS, CURB INLETS, MANHOLES, AND ENDWALLS SHALL CONFORM TO NEW YORK DOT STANDARD CONSTRUCTION DRAWINGS.
6. ALL SPOT ELEVATIONS REFER TO FINISHED PAVEMENT ELEVATION UNLESS OTHERWISE NOTED.
7. PROVIDE 2% MAXIMUM CROSS SLOPE ON SIDEWALKS AND ADA PARKING AREA.
8. CONTRACTOR SHALL APPLY EROSION CONTROL BLANKET AND LOW MAINTENANCE GRASS SEED MIX TO ALL SLOPES 3H:1V OR STEEPER. REFER TO SWPPP DETAILS FOR LOW MAINTENANCE GRASS SEED MIXTURE SPECIFICATIONS.
9. REFER TO GEOTECHNICAL REPORT FOR SUBGRADE PREPARATION.
10. PROVIDE FINGER DRAINS AND CONCRETE COLLARS ON ALL PROPOSED STORM SEWER STRUCTURES IN PAVEMENT PER CONSTRUCTION DETAILS SHEET.

LEGEND

EXISTING

REFER TO TOPOGRAPHIC SURVEY

PROPOSED

Ⓧ	STORM STRUCTURE NUMBER
◉	STORM STANDARD MANHOLE
▣	STORM CATCH BASIN
——XXX——	MAJOR CONTOUR
——XXX——	MINOR CONTOUR
XXX.XX	SPOT ELEVATION
XXX.XX XXX.XX	TOP OF CURB BOTTOM OF CURB
▨	RIP RAP
▨	STORMWATER DETENTION SYSTEM. REFER TO DETAILS ON SHEET SERIES C7.0.
M.E.	MATCH EXISTING PAVEMENT GRADE
—— LOD ——	LIMITS OF DISTURBANCE
—— STM ——	PROPOSED STORM PIPE
—— SAN ——	PROPOSED SANITARY SEWER
- -➤- -➤- -➤- -➤	ACCESSIBLE PATH
—— X ——	CHAIN LINKED FENCE
—□——□—	SIDEWALK RAILING

FLOODPLAIN DESIGNATION:

ACCORDING TO F.I.R.M. NO. 36087C-0179-G, BEARING AN EFFECTIVE DATE OF 03/03/2014, THE SUBJECT PROPERTY IS LOCATED IN A ZONE "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL FLOOD PLAIN).

New York 811 Know what's below. Call before you dig.

FORTY-EIGHT (48) HOURS BEFORE DIGGING IS TO COMMENCE, THE CONTRACTORS SHALL NOTIFY THE FOLLOWING AGENCIES: NEWYORK 811 AND ALL OTHER AGENCIES WHICH MIGHT HAVE UNDERGROUND UTILITIES INVOLVING THIS PROJECT AND ARE NONMEMBERS OF NEWYORK 811 CALL.

BENCHMARK

	ELEVATION	DESCRIPTION
BM 1	93.58 FT	1" PIPE
BM 2	71.22 FT	5/8" REBAR

* VERTICAL DATUM: NAVD88

SURVEY (DATED 10/31/2019) BY:

BLEW & ASSOCIATES, PA
3825 N. SHILOH DRIVE
FAYETTEVILLE, AR 72703
PHONE: (479) 582-1883
CONTACT: PAXTON SINGLETON

CESO PROVIDES NO GUARANTEE TO THE ACCURACY OF THE SURVEY PROVIDED BY BLEW & ASSOCIATES, PA. CONTRACTOR TO VERIFY EXISTING CONDITIONS PRIOR TO BID AND CONSTRUCTION.

SURVEYOR OF RECORD: *UPDATE WHEN FINAL SURVEY

COMPANY
ADDRESS
ADDRESS
PHONE: NUMBER
CONTACT: NAME

CESO PROVIDES NO GUARANTEE TO THE ACCURACY OF THE SURVEY PROVIDED BY BLEW & ASSOCIATES, PA. CONTRACTOR TO VERIFY EXISTING CONDITIONS PRIOR TO BID AND CONSTRUCTION.

NO.	DATE	REVISION DESCRIPTION
0	03/12/20	FOR PERMIT

DELIVERY STATION
200 & 400 ORITANI DRIVE, BLAUVELT, NY 10913

ISSUE:
FOR PERMIT
DATE:
03/12/20

JOB NO.:	757184
SCALE:	1' = 80'
DESIGN:	T. LEUB
DRAWN:	SLB
CHECKED:	J. KOCINSKI

DRAWING TITLE
GRADING PLAN

SHEET NO.
C5.0

757184 - C5.0 GRADING PLAN.DWG - 3/9/2020 1:59 PM

Infiltration Rate Record Chart for INF-1B

Project Identification:	400 Oritani Drive, Blauvelt, NY			**Cased-borehole Details**	
Project Number	04911893			**Casing Type:** Steel	
Test Location:	INF-1B			**Pipe Diameter (in):**	4-1/2"
Liquid Used:	Water	**DATE:**	3/17/2020	**Pipe Thickness (in):**	1/8"
Tested By:	F. Hoffman				
Depth to water table:	Not Enc.			**Test Depth (ft):**	8

Trial #	**Incremental Time (min)**	**Total Elapsed Time (min)**	**Relative Water Level Readings (in)**	**Incremental Infiltration (in)**	**Incremental Infiltration Rate (in/hr)**	**Remarks**
1	30	30	34.38 34.25	0.13	0.25	
2	30	60	34.25 33.88	0.38	0.75	
3	30	90	33.88 33.75	0.13	0.25	
4	30	120	33.75 33.50	0.25	0.50	
5	30	150	33.50 33.38	0.13	0.25	
6	30	180	33.38 33.13	0.25	0.50	
7	30	210	33.13 32.88	0.25	0.50	
8	30	240	32.88 32.75	0.13	0.25	
9						
10						

OFFSET BORING LOG

DEPTH (ft)	SOIL DESCRIPTIONS
0 - 0.4	Topsoil
0.4 - 1.5	Possible FILL: Brown to red-brown, Sandy SILT with Gravel, moist
1.5 - 4	Possible FILL: Red-brown to dark gray-brown, Silty SAND with Gravel, moist
4 - 6	Glaciofluvial Deposits: Medium Dense, Red-brown, Silty SAND with Gravel, moist
6 - 8	Glaciofluvial Deposits: Loose, Red-brown to gray-brown, Silty SAND with Gravel, moist
8 - 10	Glaciofluvial Deposits: Medium Dense, Red-brown to dark gray-brown, Silty SAND, moist
	Test Boring Terminated @ 10 feet

Infiltration Rate Record Chart for INF-2B

Project Identification:	400 Oritani Drive, Blauvelt, NY			**Cased-borehole Details**	
Project Number	04911893			**Casing Type:** Steel	
Test Location:	INF-2B			**Pipe Diameter (in):**	4-1/2"
Liquid Used:	Water	**DATE:**	3/17/2020	**Pipe Thickness (in):**	1/8"
Tested By:	F. Hoffman				
Depth to water table:	Not Enc.			**Test Depth (ft):**	8

Trial #	Incremental Time (min)	Total Elapsed Time (min)	Relative Water Level Readings (in)	Incremental Infiltration (in)	Incremental Infiltration Rate (in/hr)	Remarks
1	30	30	40.88 39.63	1.25	2.50	
2	30	60	39.63 39.25	0.38	0.75	
3	60	120	39.25 37.00	2.25	2.25	
4	30	150	37.00 36.38	0.63	1.25	
5	30	180	36.38 35.63	0.75	1.50	
6	30	210	35.63 35.00	0.63	1.25	
7	30	240	35.00 34.25	0.75	1.50	
8						
9						
10						

OFFSET BORING LOG

DEPTH (ft)	SOIL DESCRIPTIONS
0 - 0.4	Topsoil
0.4 - 2	Possible FILL: Brown to dark gray-brown, Sandy SILT, moist
2 - 4	Possible Glaciofluvial Deposits: Medium Dense, Red-brown, Silty SAND, trace Gravel, moist
4 - 6	Glaciofluvial Deposits: Medium Dense, Red-brown, Silty SAND with Gravel, moist
6 - 8	Glaciofluvial Deposits: Limited split-spoon sample recovery consisted of several gravel-sized rock fragments
8 - 9	Glaciofluvial Deposits: Loose, Red-brown/Dark gray-brown, Silty GRAVEL with Sand, moist to moist/wet
9 - 10	Glaciofluvial Deposits: Medium Dense, Light brown, Silty SAND, moist
	Test Boring Terminated @ 10 feet

BORING B-1

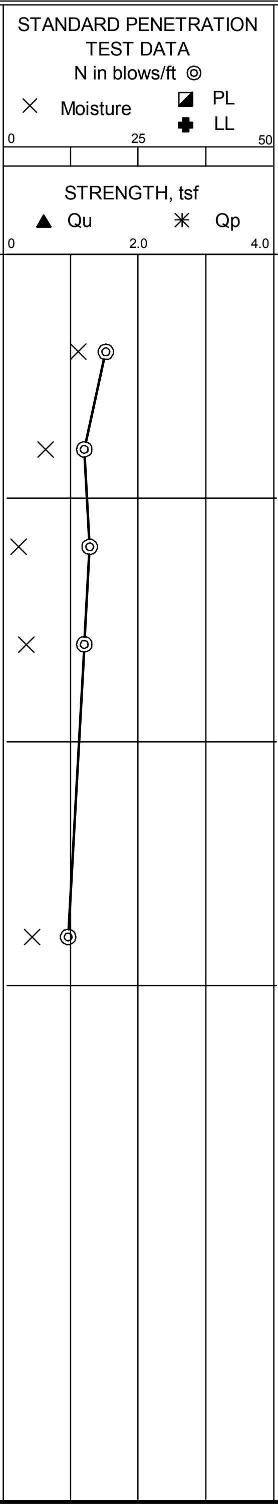
DATE STARTED: 3/16/20
DATE COMPLETED: 3/16/20
COMPLETION DEPTH 16.5 ft
BENCHMARK: N/A
ELEVATION: N/A
LATITUDE: n/a°
LONGITUDE: n/a°
STATION: N/A **OFFSET:** N/A
REMARKS:

DRILL COMPANY: Soil Testing, Inc.
DRILLER: **LOGGED BY:** F. Hoffman
DRILL RIG: CME-550X ATV
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: 2-in SS
HAMMER TYPE: Automatic
EFFICIENCY N/A
REVIEWED BY: P. McMichael

Water		
▽	While Drilling	Not Enc.
▼	Upon Completion	Not Enc.
▽		

BORING LOCATION:
See Boring Location Plan

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0			9" concrete				
		S-1	20	**FILL**- Brown, fine Silty SAND, moist	SM	7-10-9-10 N=19	14	
		S-2	18	**Glaciofluvial Deposits**- Medium Dense, Red-brown to gray-brown, Poorly Graded SAND, dry/moist		8-7-8-9 N=15	8	
	5							
		S-3	12		SP	10-8-8-26 N=16	3	Fines=3.0%
				With Gravel from 5 to 8.5 feet.				
		S-4	10			5-4-11-20 N=15	4	
				Glaciofluvial Deposits- Dense, Red-gray-brown, Poorly Graded SAND with Silt and Gravel, moist	SP-SM			
	10							
		S-5	3	**Glaciofluvial Deposits**- Limited split-spoon sample recovery consisted of moist, brown Poorly Graded SAND with Silt. The soil from the auger cuttings was visually classified as light brown to gray-brown Poorly Graded SAND with Silt and Gravel.	SP-SM	6-6-6-8 N=12	5	
	15							
				Auger refusal @ 16.5 feet				



Professional Service Industries, Inc.
1707 S. Cameron Street, Suite B
Harrisburg, PA 17104
Telephone: (717) 230-8622

PROJECT NO.: 04911893
PROJECT: Canopy & Stormwater Facility
LOCATION: 400 Oritani Drive
Blauvelt, NY

The stratification lines represent approximate boundaries. The transition may be gradual.

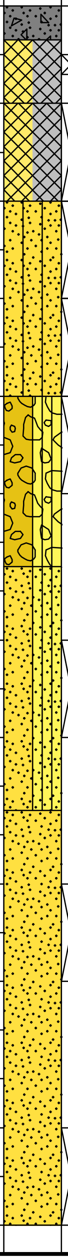
DATE STARTED: 3/17/20
DATE COMPLETED: 3/17/20
COMPLETION DEPTH 25.0 ft
BENCHMARK: N/A
ELEVATION: N/A
LATITUDE: n/a°
LONGITUDE: n/a°
STATION: N/A **OFFSET:** N/A
REMARKS:

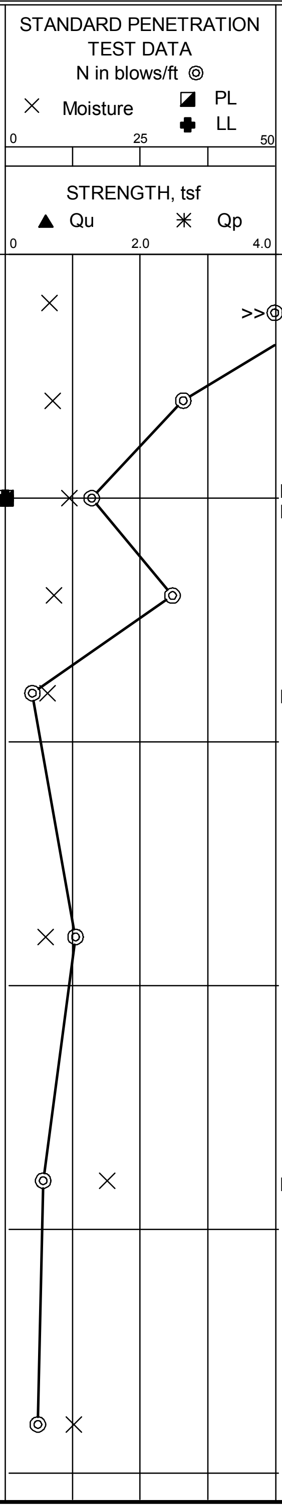
DRILL COMPANY: Soil Testing, Inc.
DRILLER: **LOGGED BY:** F. Hoffman
DRILL RIG: CME-550X ATV
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: 2-in SS
HAMMER TYPE: Automatic
EFFICIENCY N/A
REVIEWED BY: P. McMichael

BORING B-2

Water		
▽	While Drilling	18 feet
▼	Upon Completion	19.8 feet
▽		

BORING LOCATION:
See Boring Location Plan





Elevation (feet)	Depth, (feet)	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0				9" concrete				
		☒	S-1	5	**FILL**- Brown, fine Silty SAND, moist *Based on soil cuttings, this stratum also contains woody matter and cobble-sized rock.	SM	50/5"	8	
		☒	S-2	2	**Possible FILL**- Low split-spoon sample recovery consisted of moist, brown Silty Clayey SAND with trace Gravel	SC-SM	29-18-15-9 N=33	9	
	5	☒	S-3	11	**Glaciofluvial Deposits**- Medium Dense to Dense, Brown, Silty SAND, trace Gravel, moist	SM	7-10-6-8 N=16	12	Non-Plastic Fines=37.9%
		☒	S-4	10	With Gravel, trace clay inclusions from 6 to 8 feet.		14-17-14-7 N=31	9	
		☒	S-5	8	**Glaciofluvial Deposits**- Loose, Brown, Poorly Graded GRAVEL with Silt and Sand, moist	GP-GM	5-2-3-18 N=5	8	Fines=12.0%
	10								
					Glaciofluvial Deposits- Medium Dense, Brown/light gray-brown, Poorly Graded SAND with Silt, dry/moist	SP-SM			
		☒	S-6	13			13-7-6-8 N=13	7	
	15								
					Glaciofluvial Deposits- Loose, Brown/dark gray-brown, Poorly Graded SAND, wet	SP			
		☒	S-7	16			4-3-4-3 N=7	19	Fines=3.9%
	20								
		☒	S-8	20	With Gravel from 23 to 25 feet.		3-3-3-4 N=6	13	
	25				Test boring terminated @ 25 feet				

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PROJECT NO.: 04911893
PROJECT: Canopy & Stormwater Facility
LOCATION: 400 Oritani Drive
Blauvelt, NY

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DATE STARTED: 3/16/20
DATE COMPLETED: 3/16/20
COMPLETION DEPTH 10.0 ft
BENCHMARK: N/A
ELEVATION: N/A
LATITUDE: n/a°
LONGITUDE: n/a°
STATION: N/A **OFFSET:** N/A
REMARKS:

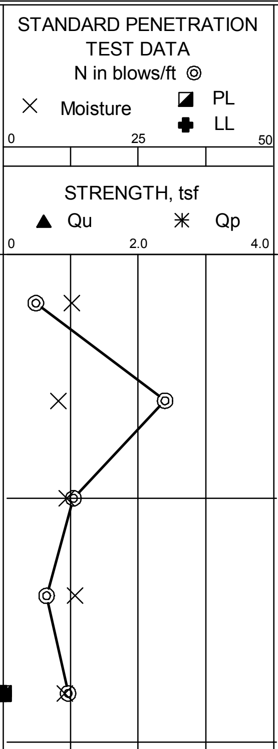
DRILL COMPANY: Soil Testing, Inc.
DRILLER: **LOGGED BY:** F. Hoffman
DRILL RIG: CME-550X ATV
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: 2-in SS
HAMMER TYPE: Automatic
EFFICIENCY N/A
REVIEWED BY: P. McMichael

BORING INF-1A

Water		
▽	While Drilling	Not Enc.
▼	Upon Completion	Not Enc.
▽		

BORING LOCATION:
See Boring Location Plan

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0					5" topsoil				
				S-1	24	**Possible FILL**- Brown to red-brown, Sandy SILT with Gravel, moist	ML	1-3-3-8 N=6	13	
				S-2	24	**Possible FILL**- Red-brown to dark gray-brown, Silty SAND with Gravel, moist	SM	12-15-15-13 N=30	10	
	5			S-3	15	**Glaciofluvial Deposits**- Medium Dense, Red-brown, Silty SAND with Gravel, moist	SM	6-7-6-6 N=13	12	
				S-4	16	**Glaciofluvial Deposits**- Loose, Red-brown to gray-brown, Silty SAND with Gravel, moist	SM	4-4-4-3 N=8	13	
				S-5	16	**Glaciofluvial Deposits**- Medium Dense, Red-brown to dark gray-brown, Silty SAND, moist	SM	3-4-8-22 N=12	11	Non-Plastic Fines=35.5%
	10					Test boring terminated @ 10 feet				



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PROJECT NO.: 04911893
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LOCATION: 400 Oritani Drive
Blauvelt, NY

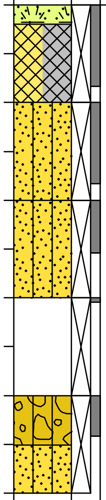
DATE STARTED: 3/16/20
DATE COMPLETED: 3/16/20
COMPLETION DEPTH 10.0 ft
BENCHMARK: N/A
ELEVATION: N/A
LATITUDE: n/a°
LONGITUDE: n/a°
STATION: N/A **OFFSET:** N/A
REMARKS:

DRILL COMPANY: Soil Testing, Inc.
DRILLER: **LOGGED BY:** F. Hoffman
DRILL RIG: CME-550X ATV
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: 2-in SS
HAMMER TYPE: Automatic
EFFICIENCY N/A
REVIEWED BY: P. McMichael

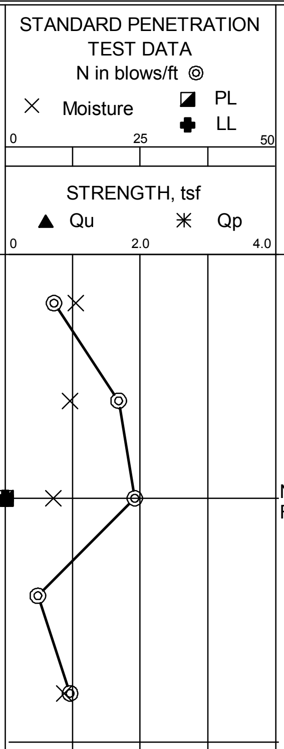
BORING INF-2A

Water		
▽	While Drilling	Not Enc.
▼	Upon Completion	Not Enc.
▽		

BORING LOCATION:
See Boring Location Plan



Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0			5" topsoil				
		S-1	20	**Possible FILL**- Brown to dark gray-brown, Sandy SILT, moist	ML	2-5-4-8 N=9	13	
		S-2	20	**Possible Glaciofluvial Deposits**- Medium Dense, Red-brown, Silty SAND, trace Gravel, moist	SM	10-12-9-12 N=21	12	
	5	S-3	13	**Glaciofluvial Deposits**- Medium Dense, Red-brown, Silty SAND with Gravel, moist	SM	11-15-9-5 N=24	9	Non-Plastic Fines=31.3%
		S-4	1	**Glaciofluvial Deposits**- Limited split-spoon sample recovery consisted of several gravel-sized rock fragments		5-5-1-2 N=6		
		S-5	10	**Glaciofluvial Deposits**- Loose, Red-brown/Dark gray-brown, Silty GRAVEL with Sand, moist to moist/wet	GM	4-4-8-11 N=12	11	
	10			**Glaciofluvial Deposits**- Medium Dense, Light brown, Silty SAND, moist	SM			
				Test boring terminated @ 10 feet				



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PROJECT NO.: 04911893
PROJECT: Canopy & Stormwater Facility
LOCATION: 400 Oritani Drive
Blauvelt, NY

The stratification lines represent approximate boundaries. The transition may be gradual.

GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

DRILLING AND SAMPLING SYMBOLS

SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.
HSA: Hollow Stem Auger - typically 3¼" or 4¼ I.D. openings, except where noted.
M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry
R.C.: Diamond Bit Core Sampler
H.A.: Hand Auger
P.A.: Power Auger - Handheld motorized auger

☒ SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
■ ST: Shelby Tube - 3" O.D., except where noted.
▯ RC: Rock Core
⬇ TC: Texas Cone
✋ BS: Bulk Sample
▚ PM: Pressuremeter
CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings

SOIL PROPERTY SYMBOLS

N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
N_{60}: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
Q_u: Unconfined compressive strength, TSF
Q_p: Pocket penetrometer value, unconfined compressive strength, TSF
w%: Moisture/water content, %
LL: Liquid Limit, %
PL: Plastic Limit, %
PI: Plasticity Index = (LL-PL),%
DD: Dry unit weight, pcf
▼, ▽, ▼: Apparent groundwater level at time noted

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N - Blows/foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50 - 80
Extremely Dense	80+

ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (¾ in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to ¾ in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.005 mm to 0.075 mm
Clay:	<0.005 mm

PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%

GENERAL NOTES

(Continued)

CONSISTENCY OF FINE-GRAINED SOILS

Q_U - TSF	N - Blows/foot	Consistency
0 - 0.25	0 - 2	Very Soft
0.25 - 0.50	2 - 4	Soft
0.50 - 1.00	4 - 8	Firm (Medium Stiff)
1.00 - 2.00	8 - 15	Stiff
2.00 - 4.00	15 - 30	Very Stiff
4.00 - 8.00	30 - 50	Hard
8.00+	50+	Very Hard

MOISTURE CONDITION DESCRIPTION

Description	**Criteria**
Dry:	Absence of moisture, dusty, dry to the touch
Moist:	Damp but no visible water
Wet:	Visible free water, usually soil is below water table

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term	**% Dry Weight**
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

STRUCTURE DESCRIPTION

Description	**Criteria**
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided:	Fracture planes appear polished or glossy, sometimes striated

Description	**Criteria**
Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed:	Inclusion of small pockets of different soils
Layer:	Inclusion greater than 3 inches thick (75 mm)
Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
Parting:	Inclusion less than 1/8-inch (3 mm) thick

SCALE OF RELATIVE ROCK HARDNESS

Q_U - TSF	Consistency
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

ROCK BEDDING THICKNESSES

Description	**Criteria**
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

ROCK VOIDS

Voids	**Void Diameter**
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

Component	**Size Range**
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

ROCK QUALITY DESCRIPTION

Rock Mass Description	**RQD Value**
Excellent	90 -100
Good	75 - 90
Fair	50 - 75
Poor	25 -50
Very Poor	Less than 25

DEGREE OF WEATHERING

Slightly Weathered:	Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.
Weathered:	Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.
Highly Weathered:	Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

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

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Graphic Symbols for Materials and Rock Deposits

▩	CONCRETE Portland Cement Concrete
■	BITUMINOUS CONCRETE
▤	CLAYSTONE
▨	COAL Coal, Anthracite Coal
▧	CONGLOMERATE/BRECCIA Conglomerate, Breccia
▦	IGNEOUS ROCK Anorthsite, Basalt, Metabasalt, Diabase (Gabbro), Gabbro, Granite/Granodionite, Homfels, Pegmatite, Rhyolite/Metarhyolite
▦	LIMESTONE Limestone, Dolomite
▨	METAMORPHIC ROCK Amphibolite, Gneiss, Marble, Phyllite, Quartzite, Schist, Serpentinite, Slate
▦	CHERT
▤	SANDSTONE Sandstone, Orthoquarzite (Sandstone)
▤	SHALE
▤	SILTSTONE
□	NO RECOVERY
▩	VOID

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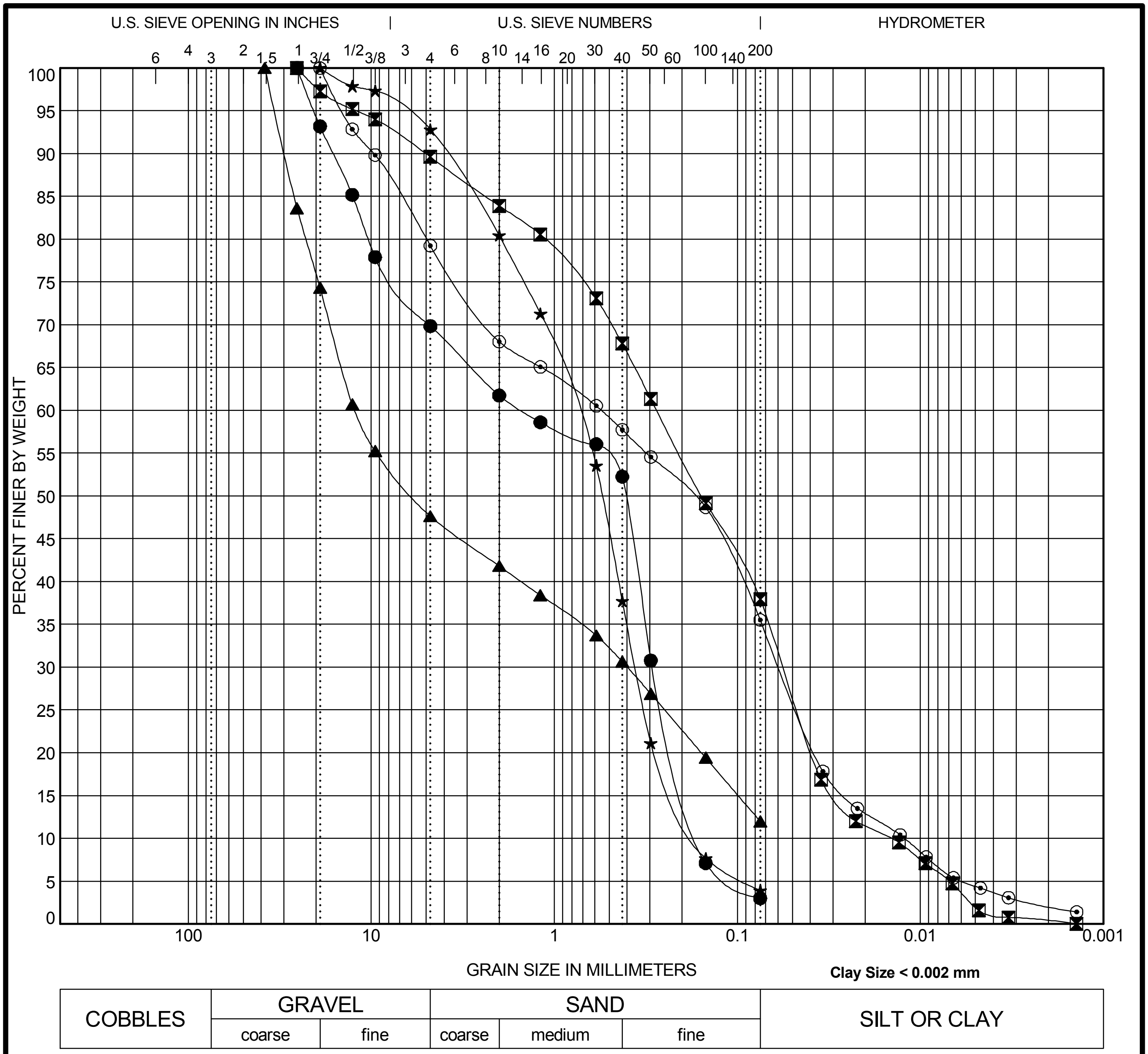

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● **B-1**	**6.0**	**Poorly Graded SAND with Gravel (SP)**				**0.35**	**9.25**
☒ **B-2**	**5.0**	**Silty SAND (SM)**	**NP**	**NP**	**NP**	**0.79**	**18.86**
▲ **B-2**	**9.0**	**Poorly Graded GRAVEL with Silt and Sand (GP-GM)***				**0.21**	**196.06**
★ **B-2**	**19.0**	**Poorly Graded SAND (SP)**				**1.01**	**4.53**
⊙ **INF-1A**	**9.0**	**Silty SAND with Gravel (SM)**	**NP**	**NP**	**NP**	**0.51**	**45.15**

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **B-1**	**6.0**	**25.4**	**1.5**	**0.29**	**0.162**	**30.2**	**66.8**	**3.0**	
☒ **B-2**	**5.0**	**25.4**	**0.275**	**0.056**	**0.015**	**10.4**	**51.7**	**37.6**	**0.3**
▲ **B-2**	**9.0**	**38.1**	**12.246**	**0.399**		**52.4**	**35.7**	**12.0**	
★ **B-2**	**19.0**	**19.05**	**0.761**	**0.36**	**0.168**	**7.2**	**88.9**	**3.9**	
⊙ **INF-1A**	**9.0**	**19.05**	**0.555**	**0.059**	**0.012**	**20.8**	**43.7**	**33.4**	**2.1**

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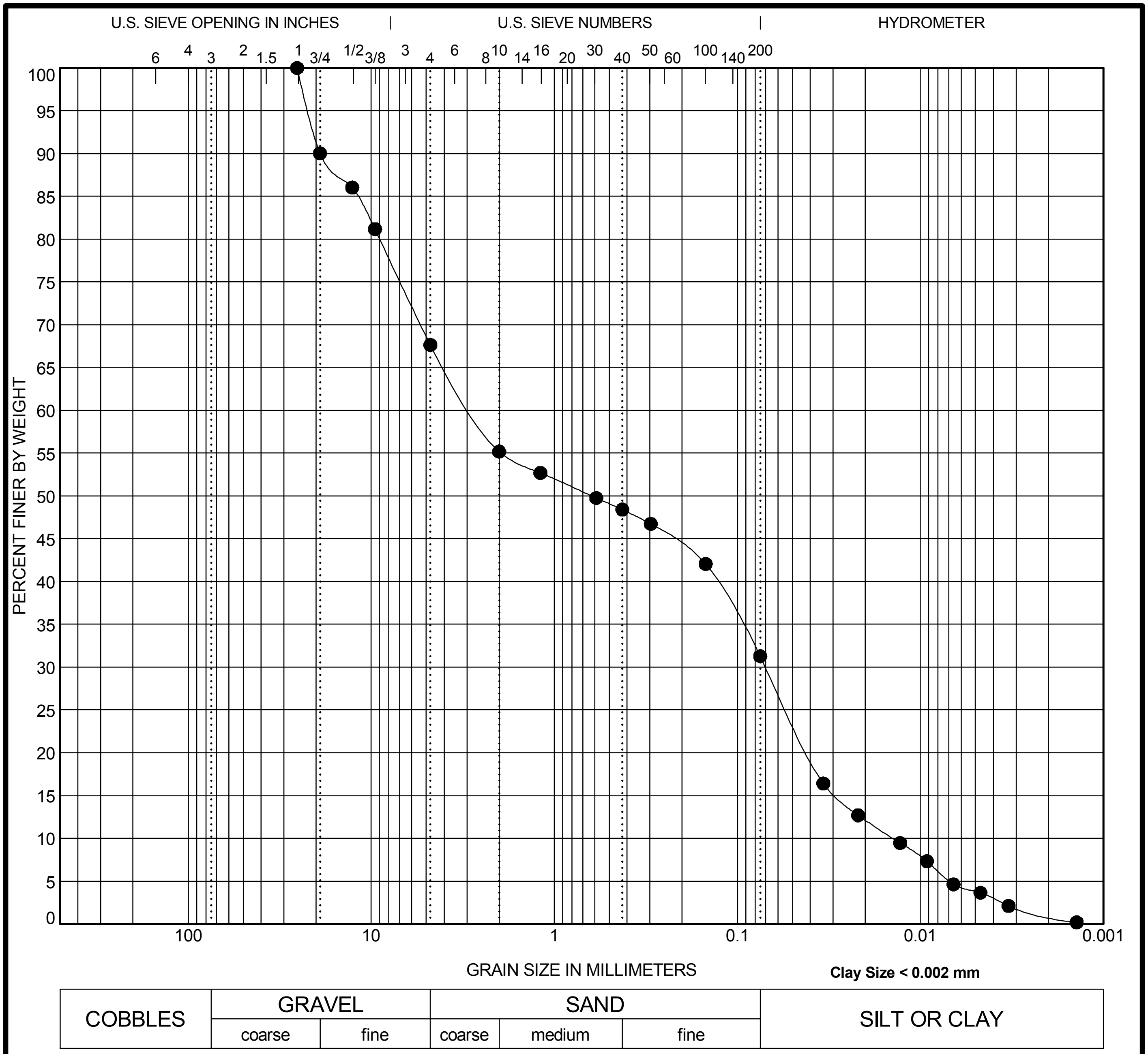
GRAIN SIZE DISTRIBUTION

Project:	Canopy & Stormwater Facility
PSI Job No.:	04911893
Location:	400 Oritani Drive Blauvelt, NY



	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**INF-2A**	**5.0**	**Silty SAND with Gravel (SM)**	**NP**	**NP**	**NP**	**0.12**	**197.86**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**INF-2A**	**5.0**	**25.4**	**2.795**	**0.07**	**0.014**	**32.4**	**36.4**	**30.3**	**1.0**

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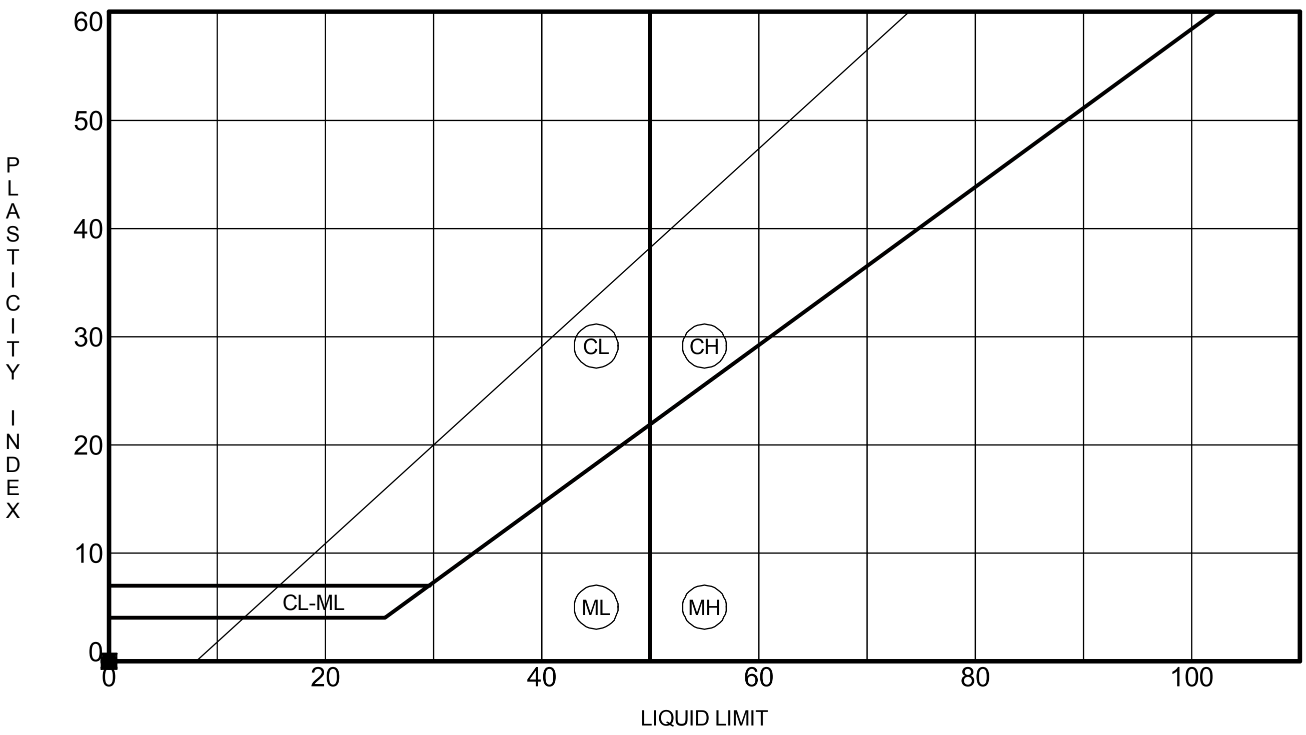

	Boring	Depth (ft)	LL	PL	PI	Fines	Classification (*Visual)
●	**B-2**	**5.0**	**NP**	**NP**	**NP**	**37.9**	**Silty SAND (SM)**
⧗	**INF-1A**	**9.0**	**NP**	**NP**	**NP**	**35.5**	**Silty SAND with Gravel (SM)**
▲	**INF-2A**	**5.0**	**NP**	**NP**	**NP**	**31.3**	**Silty SAND with Gravel (SM)**

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ATTERBERG LIMIT RESULTS

PSI Job No.: 04911893
Project: Canopy & Stormwater Facility
Location: 400 Oritani Drive
Blauvelt, NY

Laboratory Summary Sheet

Sheet 1 of 1

Borehole	Approx. Depth	Liquid Limit	Plastic Limit	Plasticity Index	Qu (tsf)	%<#200 Sieve	Est. Specific Gravity	Water Content (%)	Dry Density (pcf)	Satur- ation (%)	Void Ratio
B-1	2							14			
B-1	4							8			
B-1	6					3.0%		3			
B-1	8							4			
B-1	14							5			
B-2	1							8			
B-2	3							9			
B-2	5	0	0	0		37.9%		12			
B-2	7							9			
B-2	9					12.0%		8			
B-2	14							7			
B-2	19					3.9%		19			
B-2	24							13			
INF-1A	1							13			
INF-1A	3							10			
INF-1A	5							12			
INF-1A	7							13			
INF-1A	9	0	0	0		35.5%		11			
INF-2A	1							13			
INF-2A	3							12			
INF-2A	5	0	0	0		31.3%		9			
INF-2A	9							11			

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Summary of Laboratory Results

PSI Job No.: 04911893
Project: Canopy & Stormwater Facility
Location: 400 Oritani Drive
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