Draft Environmental Impact Statement

Appendix D
Geotechnical Report

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CLIENT:	CPC, LLC P.O. Box 2020 Monroe, NY 10949	PROJECT:	Clovewood South Blooming Grove, NY
		PROJ. No.:	16423
ATTN.:	Mr. Simon Gelb	DATE:	January 9, 2017

GEOTECHNICAL INVESTIGATION REPORT

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1. PROJECT DESCRIPTION

This geotechnical investigation was performed to characterize the typical subsurface conditions in the Project area, as well as to develop general construction methods that will minimize impacts during construction and ensure acceptable performance of the completed work. The investigation was performed in accordance with the 2015 NY State Building Code and Residential Code.

The Project consists of the construction of approximately 600 single-family units with roads, utilities and infrastructure on about 142 acres of a 708-acre tract. No deep fills were noted and no significant excavations were observed, with the exception of some old borrow pits in the southwest part of the Project Site. Several dirt roads and trails provide good access to most of the property. Prior development has been performed on the Project Site, and is concentrated at the north end, close to Clove Road, where there are approximately fifty dwellings and a few agricultural buildings. One additional small abandoned dwelling stands in the south–center part of the Project Site. Part of the Project Site was previously developed as a golf course; however this does not appear to have resulted in any soil disturbance that would affect the Project Site.

The Project Site is situated in Blaggs Clove at the south end of the valley along the west side of Schunnemunk Mountain, and is on the east side of Clove Road. The low part of the Project Site consists of a pond, stream, and meadow along the west part of the property, between Clove Road and the Project area, with elevations of approximately 480 to 550 feet AMSL. The rear (south) end of the Project Site reaches nearly 1400 feet AMSL, on the south end of Schunnemunk Mountain, and the proposed lots would be located at existing elevations of about 530 to 840 feet AMSL.

Drainage for most of the Project area is west toward Clove Road, then south via an unnamed stream past the junction of Clove Road and NY Route 208; at the south end of the Project. Runoff flows west and joins Satterly Creek off-site, which eventually turns north and discharges to the Moodna Creek. A drainage divide wraps around the northeast and east sides of the property, with the area beyond this line draining via a northward route to the Moodna Creek; only a very small part of the project has a potential to discharge to this drainage.

The USDA Soil Survey indicates that the native soils are predominately types that develop over deposits of glacial till, and the soils encountered in the borings did consist mostly of till, with a small amount of sandy to gravelly outwash also present. Mardin gravelly silt loam is the predominant topsoil type, and is present over about 70% of the project area, with other till-derived topsoil types covering most of the remaining area. Mardin soils typically form over deep till deposits composed of silty clay with some sand, little gravel and trace cobbles and boulders. In about eight percent of the project area, toward the south end, the topsoil is 'Swartswood and Mardin soils, sloping, very stony,' indicating Mardin soil with more cobbles and few boulders, with areas of Swartswood soil, which typically has more sand and less clay than Mardin soil. Erie gravelly silt loam is indicated over about six percent of the project area, in the north part of the middle 'valley' area of the Project Site; Erie soils typically form in poorly-drained areas over till composed of sandy clay with little gravel and few cobbles and boulders, with the abundant 'channers' (flat stones.) Approximately one percent of the project area, near the north end of the Project Site, is in an area of Alden silt loam, which forms over pond deposits, typically consisting of a few feet of silt and clay, over till. In the remaining eighth of the Project Site, in the former golf course area, the Soil Survey indicates 'udorthents,' or regraded soil; the native topsoil types in this area were likely Erie and Mardin, which flank this area.

The Soil Survey also indicates the presence of an area of topsoil types that are associated with glacial lake and outwash deposits, however these are outside the project area, with the exception of a short section that will be crossed by the entrance road near Clove Road. The area with these soil types extends approximately from the front pond west to Clove Road and north to the existing barns. Raynham, Canandaigua, and Unadilla soil types are present, indicating underlying glacial lake deposits composed of stratified sand and silt; a small area of Hoosic soil is also present, indicating the presence of sandy to gravelly stratified glacial outwash. These deposits were likely formed in a small, short-lived glacial lake; similar soil types are scarce in the adjacent valley areas.

2. SOIL INVESTIGATION AND TEST RESULTS

A total of sixteen soil borings were drilled at the Project Site on Monday through Thursday, December 5 - 8, 2016. Soil borings were made using a track-mounted drill rig and hollow-stem augers. Soil sampling and testing were performed using the Standard Penetration Test (SPT,) using an Automatic Hammer, in accordance with ASTM D1586 (Standard Method for Penetration Test and Split-Barrel Sampling of Soils.) Additional field tests were performed as noted on the soil boring logs, and laboratory tests were performed on selected samples.

Drilling was performed by General Borings, Inc. of Prospect, CT. The subsurface investigation was supervised by Kevin Patton, P.E. and the borings were witnessed by Wyeth Patton.

In the SPT method, a two-inch diameter 'split spoon' sampling tube is driven into the soil by a 140 lb. hammer falling 30 inches. A sample is collected inside the split spoon, and the strength of the soil is indicated by the number of hammer blows that are required to advance the tube. The split spoon is normally driven 24 inches (if possible) and the blows are counted for each six-inch increment. The total number of blows for the second and third increment (6 to 18 inches) is the "N-value," which is used as a key indicator for many soil properties, including bearing capacity and seismic resistance.

SPT N-values are summarized below, with full details in the boring logs. The Corrected N-values (N') are adjusted to an equivalent overburden stress of one ton per square foot for standard evaluation purposes. In some cases, the evaluation may be performed on only part of the blow count data, such as in cases where there is a dramatic difference in blow counts between the two six-inch sampling increments, often caused by cobbles or boulders in the soil.

As noted in Section 1, the soils encountered in the borings consisted predominately of deep glacial till. Three borings met auger refusal on possible bedrock at depths of 9.5, 13 and 24 feet, and the other thirteen borings stopped in soil at depths of 17 to 27 feet. Two areas of more sandy soil were also encountered, near the old borrow pits in the southwest end of the Project Site (borings B15 and B16,) and in the north-center part of the project area (boring B5.) Few boulders and cobbles were encountered. The deep till soils were typically firm to very firm near the surface, becoming extremely firm below depths of about fifteen feet. Some wet zones were encountered in the borings; these appear to be perched water within the soil profile, above the true groundwater table.

Rock coring was not performed; the borings indicate that deep soils will be typical in most of the project area, and soil properties will govern the geotechnical design. Some areas of bedrock may be encountered, especially high on slopes and in deep utility trenches. Approximately twenty water wells have been drilled on the Project Site, and well records should provide additional information on bedrock depth.

The 1970 Geologic Map of New York indicates that the bedrock consists of Devonian sandstone, siltstone and shale, which is consistent with outcrops observed near the Project Site. The surface of this bedrock is frequently weathered, allowing its outer zone to be efficiently ripped or hammered, however it tends to become very hard and competent within one to three feet of its surface. If significant removal of sound, unweathered bedrock is required, it would be possible to perform the work using hydraulic hoe-rams, however blasting could be a better option, especially for relatively narrow trench cuts, which are difficult to excavate mechanicially.

The Project Site can be roughly divided into five sections, based on topography, existing conditions and subsurface soil profile:

North End – This section includes the area of existing small residences and adjacent agricultural buildings. Borings B1 and B2.

West Hill – The long hill between the pond on the west side of the Project Site and the former golf course area. Borings B4, B5, B6 and B7.

Golf Course Area – The upper valley area between the West Hill and the base of Schunnemunk Mountain. Borings B8 and B9.

Mountain Foothills – The base of Schunnemunk Mountain, east of the Golf Course Area. Borings B3, B10, B11, B12, B13 and B14

Sand Pits – The area at the south end of the West Hill. Borings B15 and B16.

With the exception of the 'Sand Pits' section, the soils in each of the above areas were generally similar, however significant local variations should be expected, such as lenses of clay, veins of sand that allow perched groundwater to discharge freely, boulder pockets, etc. These glacial till soils are predominantly silt, sand and gravel with traces to little clay, typically with 35 to 50 percent passing the #200 sieve. In most areas there are two till strata in the soil profile, an upper brown till and a lower gray till. They are very similar in composition, with the color difference attributed to deposition of the brown till in an oxidizing environment and the gray till in an oxygen-poor reducing environment. The brown till is usually slightly to moderately overconsolidated and the gray till is usually moderately to highly overconsolidated, i.e. pre-compacted or pre-stressed by the weight of the glacier, resulting in increased bearing capacity.

In the 'Sand Pits' area borings B15 and B16 indicated about ten to 25 feet of granular soil (gravelly sand, silty fine sand, etc.) overlying the till. Some old borrow pits and abandoned mining equipment are present in this area; this was a small-scale operation, probably for use on-Project Site or locally, and has been abandoned for many years.

2.1. Soil Boring Blow Count Data

Table 1a: Uncorrected Blow Count Values, N

Depth, feet	B1	B2	B3	B4	B5	B6	B7	B8
ELEV:	592	588	736	575	569	639	636	669
1	8	7	14	6	17	14	5	8
3	10	30	34	15	11	30	12	27
6	17	7	64	35	8	56	54	20
11	21	17	76	71	27	43	14/6″	94
16	50/5″	50/4″		28	23	55	87	38
21	50/5″	36/6″		23		54		
26	46/6″			28		50		
Auger Refusal, ft		24 ft	13 ft					

Table 1b: Uncorrected Blow Count Values, N

Depth, feet	B9	B10	B11	B12	B13	B14	B15	B16
ELEV:	673	688	787	823	741	688	576	588
1	3	28	16	8	20	6	59	36
3	15	8	24	28	43	16	33	28
6	20	7	30	23	32	18	35	35
11	39/6″	28	62	34	68		15	39
16	81	31	33	28	41/6″		14	45
21							8	
26							22	
Auger Refusal, ft						9.5 ft		

Table 2a: Corrected Blow Count Values, N'

Depth, feet	B1	B2	B3	B4	B5	B6	B7	B8
ELEV:	592	588	736	575	569	639	636	669
1	15	13	27	11	33	27	10	15
3	15	46	53	23	17	46	19	42
6	22	9	84	46	11	74	71	26
11	23	19	85	79	30	48	31	100+
16	100+	100+		28	23	54	86	38
21	100+	65		21		48		
26	76			23		41		
Auger Refusal, ft		24 ft	13 ft					

Table 2b: Corrected Blow Count Values, N'

Depth, feet	B9	B10	B11	B12	B13	B14	B15	B16
ELEV:	673	688	787	823	741	688	576	588
1	6	54	31	15	38	11	100+	69
3	23	12	37	43	67	25	51	43
6	26	9	40	30	42	24	46	46
11	87	31	69	38	76		17	43
16	80	31	33	28	81		14	44
21							7	
26							18	
Auger Refusal, ft						9.5 ft		

2.2. Subsurface Profile

Subsurface conditions encountered in the borings are described in the boring logs and are summarized in the drawings attached to this report.

2.3. Laboratory Test Results for Selected Samples

Representative samples of soil were selected for laboratory testing, with results summarized below. The samples were also classified by the visual/manual method, ASTM D2488, and the results are incorporated into the subsurface profile drawings.

The moisture contents of the samples were in the normal range for dense inorganic soils in a moist to saturated condition. The particle size analyses and Atterberg Limits tests represent typical soils within the anticipated depths of excavation. Due to the sampling method, particles that are medium gravel-size or larger are excluded.

Tests on samples B4-S3 and B4-S6 provide a comparison of the upper brown till and the deeper gray till, with nearly identical particle size distribution and plasticity. Samples B9-S2 and B11-S5 represent finer varieties of the brown till, B9-S2 with a high silt content and B11-S5 with a high clay content. Sample B12-S3 was silty gravelly brown till, and sample B16-S2 represents silty sand and gravel from the Sand Pits area near the southwest end of the project.

Test results are summarized on the next page. Please refer to the attached lab reports and to the 'Soil Technical Notes' appendix for additional information.

SUMMARY OF LABORATORY TEST RESULTS

Table 3a: Natural Moisture Content, Percent

Depth, feet	B1	B2	B3	B4	B5	B6	B7	B8
1		14.6				14.2		
3	13.6	10.1	9.9	10.6	11.3	8.5	10.0	9.6
6		12.4	7.8		23.9		9.3	11.3
11	11.7	10.4			9.5	10.1		
16				9.3				9.6
21				9.2		5.9		
27						8.2		

Table 3b: Natural Moisture Content, Percent

Depth, feet	B9	B10	B11	B12	B13	B14	B15	B16
1								
3	12.5	18.1		9.9		14.4	8.3	8.9
6	11.5		7.2		5.0	10.9	4.8	
11			16.2	8.5	8.8			9.4
16								
21							17.1	

Table 4: Particle Size Analysis

Sample		B4-S3	B4-S6	B9-S2	B11-S5	B12-S3	B16-S2
Depth		6 ft	21 ft	3 ft	16 ft	6 ft	3 ft
Sieve Size		Percent Passing by Weight					
Inch	mm						
¾″	19.0	100	79	100	100	69	95
#4	4.75	73	65	88	92	52	69
#10	2.00	64	60	83	85	43	58
#40	0.425	54	52	73	74	33	45
#200	0.075	40	39	60	57	21	36
	0.050	36	36	42	52	18	---
	0.005	18	19	14	30	8	---
	0.002	13	13	9	21	4	---

Table 5: Atterberg Limits

Sample	B4-S3	B4-S6	B9-S2
Depth	6 feet	21 feet	3 feet
Liquid Limit	22	21	19
Plastic Limit	14	13	14
Plasticity Index	8	8	5

3. EVALUATION

The conditions encountered in the investigation were evaluated for their impacts on construction methods, geotechnical design, and long-term performance. Most of the soils that would be affected by the work consist of glacial till composed of silt and sand with some gravel and clay, and the recommendations provided below focus on this type of soil. Relatively minor amounts of sandy granular soils would be affected, and different procedures for working with these soils are provided when appropriate.

3.1. Project Site Development

3.1.1. Subgrade Preparation

The native soils are typically of good quality to provide support for construction of buildings, roads and related infrastructure, either as direct support or as the base for fills supporting these project elements, however the soil is moisture-sensitive and must be properly managed during construction. When the soil is very moist, it tends to be highly susceptible to damage from vehicle traffic, and can develop deep ruts that severely interfere with movement and are difficult to repair. Other factors to consider are that the typical soils are frost-susceptible, are moderately susceptible to erosion by runoff, and, during prolonged dry periods, can be very dusty.

To prepare the Project Site for construction, all topsoil must be removed from areas under buildings and embankments, with the exposed surface thoroughly compacted (after scarification and drying, if needed.) In most areas, a loose, loamy subsoil zone will be present under the topsoil, typically to a depth of 18 to 30 inches below grade; this material must be either removed, or reworked and recompacted to a firm condition. The prepared subgrade surface should be protected from damage by construction traffic, particularly where the soil is wet.

3.1.2. Bedrock

Bedrock appears to be relatively deep throughout the Project Site, and minimal rock excavation is expected. If bedrock is encountered, mechanical excavation will likely be practical to a depth of five feet or less below the rock surface. Mechanical excavation with hydraulic hoe-rams, drilling-and-splitting, etc., could be performed to greater depths, however blasting would likely be a more efficient alternative for some deeper excavations, such as relatively narrow trench cuts for utilities. The local bedrock consists of siltstone, sandstone and shale, and could be blasted with light to moderate charges. Blasting could be performed without affecting adjacent properties, as the parts of the project area where bedrock is most likely to be encountered are in the rear, eastern part of the Project Site, in the Schunnemunk Mountain foothills, well isolated from adjacent Project Sites.

3.1.3. Soil Excavation

The native soils may be excavated using conventional heavy equipment, such as tracked excavators and bulldozers. Scraper pans may also be used for excavation, however they will typically require pushing by a bulldozer when loading, and some interference from boulders should be expected. Firm glacial till is present on most of the Project Site; mini-excavators and small backhoes are generally not suitable to efficiently excavate this material.

The OSHA excavation classification of the majority of the glacial till soils is Type A, suitable for ¾:1 slopes in shallow excavations, and the sandy soils are Type C, requiring 1½:1 or shallower slopes; soil types must be confirmed during construction.

3.1.4. Soil Placement and Compaction

The glacial till soils that make up the majority of the Project Site must be carefully managed to allow efficient placement and good long-term performance. The till must be thoroughly broken up and typically will require some drying prior to compaction. Spreading the till in thin lifts (8 inches uncompacted) with a large bulldozer that thoroughly tracks over the surface of the fill is usually sufficient to break up the soil clods and expose the soil for drying.

Compaction of the till should be performed with a sheep's-foot roller, to thoroughly knead the soil and minimize voids between the soil clods. Finishing passes can be made with a smooth-drum roller when a flat surface is required. Bank-run sand and gravel type soils may be placed in lifts of up to twelve inches in thickness, compacted with a smooth-drum or sheep's-foot roller. Reduce the lift thickness for all soil types as needed to achieve the required percent compaction and when small compactors are used. When hand-operated equipment is required, use jumping-jack tampers and vibratory trench rollers to compact the till; when compacting granular fill, these compactor types and/or vibratory plate tampers may be used.

If till that is placed as fill is not broken up and thoroughly compacted, it will tend to have voids between the soil clods that allow groundwater and/or stormwater to infiltrate, resulting in softening and/or settlement, especially in deep fills, near slopes, or where loads bear on fill (e.g. under footings.) All fill types should be compacted at a moisture content within ±2% of optimum, as determined by the ASTM D1557 Modified Proctor test. Compaction of the till at slightly higher moisture contents may be possible, and can improve binding together of the soil clods and reduce the soil's permeability; however it tends to promote instability ('pumping') of the soil, and hours or days may be required between lift placements to allow the excess moisture to dissipate. Compaction at lower moisture contents is not recommended, as it leads to high porosity and increased settlement potential.

Where fill is placed under structures, each lift shall be compacted to at least 95% of the ASTM D1557 maximum dry density. Where fill is placed under roads, embankments or other areas (exclusive of landscaping fill,) it shall be compacted to at least 90% of the D1557 maximum if the fill consists of glacial till or equivalent material, and to at least 95% if it consists of bank-run sand and gravel type material. Make at least six one-way compaction passes over each lift of fill, even if the required compaction percentage is obtained with fewer passes.

3.1.5. Embankments and Cut Slopes

Embankments constructed with glacial till Project Site-borrow fill, and cut slopes in the till, should have slopes of 3:1 or shallower. Sources of water seepage under, behind or within an embankment must be collected and conveyed out of the embankment to prevent weakening and sloughing of the soil.

Reinforcement should be considered for embankments with slopes steeper than 3:1, especially for embankments more than six feet high that are important for protection of infrastructure (underground utilities, roads, etc.) or that are located in areas that will be difficult to access for later maintenance. Reinforcement requirements should be determined on a case-by-case basis. Typically a uniaxial geogrid will be appropriate to provide tensile reinforcement of the fill. A non-woven needle-punched geotextile may also be appropriate to provide moderate tensile reinforcement in combination with interior drainage of the fill. These materials would be placed in horizontal layers, typically spaced 12 to 24 inches apart, in the outer part of the embankment.

3.1.6. Landscaped Areas

Avoid overcompaction of fill in the root zone of landscaped areas. Typically, compaction to about 85% of the D1557 maximum dry density is appropriate in the upper two feet of soil in landscaped zones. The soil should be sufficiently compacted to support light vehicle traffic, but loose enough to allow water and roots to penetrate. Where landscaping will be installed over cut areas, the subgrade should be thoroughly scarified to a depth of at least twelve inches below the topsoil layer.

Installation of landscaping on embankments and cut slopes must be performed with care. Rapid drainage from embankment slopes and low permeability of the till material below the topsoil may result in loss of vegetation loss due to excessive drying. More importantly, sliding or sloughing of the topsoil layer may occur due to saturation of the topsoil above the underlying till during periods of heavy rain. The potential for topsoil slides can be reduced by using the minimal practical slope angle, by terracing or interrupting the slopes, by using deep-rooted grasses and similar plants, by providing interlocking contact between the topsoil and the embankment fill, and by directing runoff away from slopes.

Temporary stabilization materials may also be required to minimize erosion prior to establishing vegetation; avoid the use of open-mesh geosynthetics, which can trap or injure wildlife. A Landscape Architect should be consulted to assist in the selection of appropriate plant species.

3.1.7. Road Construction

The Village Code provides minimum specifications for construction of roads to be dedicated to the Village, which is being considered for this project. The standard road section consists of 12 inches of sub-base material (‘Item 4’ crushed stone or similar) and six inches of asphalt pavement, consisting of three inches of asphalt base, 1.5 inches of asphalt binder and 1.5 inches of top. This is a very heavy duty pavement section and, when completed, will be more than adequate to provide support of the anticipated traffic loads on the native soils in cut areas or where they are used as fill.

The subgrade, consisting of native soil or fill, must be firm and stable prior to placing the sub-base course. It should be proof-rolled with a loaded tri-axle dump truck prior to placing the sub-base, and any areas that exhibit excessive rutting should be corrected. Where soft or unstable zones are deep or persistent, due to high clay content of the soil and/or shallow groundwater, the subgrade stabilization should include the use of a reinforcing geosynthetic layer, typically installed at least 12 inches below the bottom of the sub-base course, and covered with compacted fill consisting of 'Item 4' or select granular Project Site borrow soil.

Roads should be constructed early in the project, to allow efficient Project Site access and reduce erosion. Preliminary construction consisting of the sub-base (Item 4) layer, asphalt base course and asphalt binder course will be adequate to support all expected construction traffic, with minimal damage requiring repair prior to paving the top course near the end of construction. Preliminary roadways consisting of the Item 4 and asphalt base course, without the binder or top courses, should also perform very well, with a minor increase in the quantity of repairs needed prior to final paving.

Temporary roads consisting of only a 12-inch sub-base (Item 4) layer are likely to be significantly damaged by long-term construction traffic, especially on the main routes and where the subgrade is very moist. This damage could result in the complete loss of the sub-base in some areas, due to mixing with the subgrade soil; installation of a reinforcing geotextile layer under the sub-base, and/or increasing the thickness of the Item 4 sub-base course, may be required to maintain road stability.

Geosynthetic reinforcement and/or increased sub-base (Item 4) thickness may also be required in areas where subgrade conditions are continuously wet, to maintain the stability of the Item 4 during initial paving. Positive roadside drainage should be established in all areas as soon as possible to minimize softening of the subgrade.

3.1.8. Foundation Construction

The native soils are suitable for the use of conventional shallow foundation and slab-on-grade construction, after the topsoil has been removed and the soil has been prepared to a firm, stable condition. The native soils are also suitable for use as controlled fill supporting structures, however the fill must be thoroughly and systematically compacted, as described previously, to prevent unacceptable settlement. An allowable bearing capacity of 3000 psf is suitable for all anticipated conditions; the bearing capacity of most of the undisturbed soil in most areas is significantly greater.

A USCS Soil Class of CL (Lean Clay) should be assumed for design purposes, with a moist unit weight of 135 pcf, producing equivalent lateral loads on the foundation walls of 60 psf (active) and 100 psf (passive) per foot of depth. Foundations designed for these conditions, properly constructed and bearing on undisturbed native soil or on controlled compacted fill as previously discussed, should exhibit total settlement of one inch or less, and differential settlement of ½ inch or less.

Groundwater seepage rates in basement areas are expected to be low. Conventional damp-proofing of basement walls, placement of slabs-on-grade over a vapor barrier and open-graded stone base course, and installation of conventional footing drains are appropriate to control water seepage. Occasional springs may be encountered on the Project Site; these should be directed away from structures, using surface swales or underground drains. Foundation excavations should be backfilled with Project Site-borrow till, compacted in controlled lifts; the relatively low permeability of this soil will help reduce groundwater seepage around the foundation.

Soil gases that could be reasonably expected to impact the dwellings or other structures are water vapor and radon; October 2016 data from NYSDOH indicates high radon levels in about half the homes in this part of Orange County. Thorough foundation damp-proofing, as noted above, placement of dense concrete in walls and slabs (low water-to-cementitious ratio, thoroughly consolidated,) and sealing of all wall-to-slab joints, concrete cracks, pipe penetrations, drainage sumps, etc. are usually effective in controlling transmission of these gases to interior spaces.

A passive radon mitigation system, which will also remove moisture, can be installed during construction, using small-diameter PVC pipe to vent the slab base course to the air, via a roof vent; a low-volume in-line fan can be added later if high radon (or moisture) levels are detected. Vents could also be stubbed up and capped within the walls, for later connection if required, or could be installed subsequent to construction if needed.

3.1.9. Erosion and Sediment Control during Construction

Most of the Project would result in disturbance of glacial till soils with a clayey to silty matrix, with these soils exposed in cuts and used in fills. These soils typically have moderate resistance to erosion of the soil mass (Kw factor) and low erosion resistance of the sand-and-finer sizes (Kf factor.) Erosion of this soil by stormwater can produce runoff with a high suspended sediment concentration that requires excessive time to settle prior to discharge, and which includes colloidal particles that do not settle.

Erosion prevention should be emphasized during construction, with thorough sediment control providing secondary protection. Erosion prevention will reduce the maintenance requirements for the sediment controls and will minimize the potential for sedimentladen stormwater runoff to leave the Project Site. Standard control methods shall be employed during construction, including the following:

- Seed and mulch inactive areas. Direct impact by raindrops during a heavy storm can rapidly erode clay and silt from the surface. Mulch protects the soil until grass is established.
- Provide stabilized routes for vehicle and foot traffic. Perform road construction early in the project. Wood chips from clearing activities can be used to stabilize areas that will ultimately be landscaped. In addition to supporting traffic during wet weather, this will protect against very dusty conditions that can develop during prolonged dry periods.
- Minimize exposure of steep slopes. After compacting these areas, lightly scarify the surface (e.g. track up-and-down with a bulldozer) to reduce runoff velocities. When possible, convey the runoff via a controlled swale with check dams.
- Stormwater sedimentation basins should be provided with forebays to dissipate the energy of incoming runoff, separating it from still areas where sediment can settle out. They should discharge to vegetated swales, meadows or similar areas for final polishing.

3.1.10. Permanent Stormwater Controls

Most of the native soils are not well-suited for the use of infiltration-based stormwater controls. The Soil Survey indicates that the types of glacial till that cover most of the project area have fair to good permeability (perc rate) only to a depth of about 18 to 20 inches, below which the rate is normally very slow. The soils with the best potential for stormwater infiltration are located near the front pond, where the Soil Survey indicates Canandaigua silt loam as the soil type; this is hydraulically down-gradient from the development areas, and thus has good potential for use as a combined infiltration area for the project. Other methods could be used to provide stormwater quality control and some runoff reduction in areas with till subsoil; a subsurface gravel wetland is one option that would work in most areas.

3.1.11. Geosynthetics

Geosynthetic materials are expected be used for reinforcement and drainage applications at the Project Site on an as-needed basis, or where required by Code, such as for footing drains. The following material types are recommended; the products listed are typical examples and are not intended to indicate minimum acceptable strength or performance values.

Geosynthetic materials should be installed over a dense, stable subgrade that is smooth and evenly shaped, to avoid 'tenting' of the material over voids or high points. The geosynthetic shall be installed substantially free from wrinkles, and fill material shall be placed and spread in a manner that does not displace or damage the geosynthetic material. Vehicles shall not drive on the exposed geosynthetic.

Subgrade Reinforcement: Use a woven reinforcing geotextile such as TenCate Mirafi 600X in areas with grades of ten percent or less. On steeper grades, use a multi-axial geogrid such as Mirafi BXG-11 or Tensar TX130S. Geogrids may also be used on level or gently sloping areas, and should be used instead of woven geotextiles in areas where vertical water movement is expected, as woven materials tend to trap the water. Where wicking of subgrade moisture into the fill is to be minimized, such as in low fills for road crossings over wet areas, a woven reinforcing-drainage geotextile such as Mirafi RS280i should be used.

Drainage Separation: A woven drainage geotextile with at least 6% open area should be installed between the native soils and open-graded drainage zones, such as around gravel footing drains. A suitable product is Carthage Mills "Carthage 6%." Non-woven geotextiles are not suitable for use in this application, due to clogging by the clayey fines in the native soil.

Slope Reinforcement: Reinforcement for steep fills (i.e. with slopes steeper than 3:1) should be determined on a case-by-case basis. Typical reinforcement products are uniaxial geogrids such as Mirafi Miragrid 5XT, to provide tensile reinforcement and needle-punched non-woven geotextiles such as Mirafi S1200 to provide internal drainage and pore pressure relief in combination with moderate tensile reinforcement.

3.2. Additional Geotechnical Information

3.2.1. Seismic Design Category

The Seismic Project Site Class and Seismic Design Category for the proposed construction were determined per section 1613 of the New York State Building Code and ASCE 7-10. This data may be applied to residential and non-residential structures.

Table 6

Occupancy Category	I, II, III	
Seismic Project Site Class	C, Very Dense Soil and Soft Rock	
Mapped Spectral Response of Project Site	Short Period S_S 1 sec Period S_1	0.224 g 0.068 g
Maximum Spectral Response	Short Period S_{MS} 1 sec Period S_{M1}	0.269 g 0.115 g
5% Damped Spectral Response (Design Spectral Response Acceleration Parameters)	Short Period S_{DS} 1 sec Period S_{D1}	0.179 g 0.077 g
Seismic Design Category	Short Period 1 sec Period	B B
Governing Seismic Design Category		**B**

3.2.2. Liquefaction Potential

The soils encountered in the investigation have very low susceptibility to liquefaction or cyclic softening. These soils are dense and do not have texture/permeability/density combinations that are associated with loss of shear strength during anticipated seismic events. No special mitigation measures are required.

Determination of liquefaction potential was performed using standard practices, including examination of soil texture and evaluation of blow counts versus depth as described in the New York City Building Code (evaluation criteria are not specified in the State Building Code.)

3.2.3. Expansive Soils

The soils encountered in the investigation have a negligible potential for expansion. This behavior is typically associated with high-plasticity silt and clay soils. Physical testing and qualitative examination indicate that the soil properties do not meet the criteria for potentially expansive soils as defined in section 1803.5.3 of the Building Code and R403.1.8 of the Residential Code. No mitigation measures are required.

4. NOTES AND LIMITATIONS

Please see the attached pages for additional information. Subsurface conditions encountered during construction shall be compared to the soil boring logs and this report; any significant variations from anticipated conditions must be evaluated for their effect on the foundation design. This report summarizes the results of a limited investigation and does not purport to predict every variation in subsurface conditions.

This geotechnical investigation was conducted to evaluate the engineering properties of the soils at the Project Site, to aid in the design of the proposed work. The investigation did not include evaluation of the potential effects of the proposed construction on other properties, nor did it include inspection of, or sampling for, items of environmental concern such as the presence of soil contaminants or of regulated wetlands, and did not include review of local zoning regulations, codes, floodplain boundaries or similar matters, unless specifically referenced in the report. This investigation was conducted solely for the use of the Client and the Client's Project Designers and Agents; this report should not be used by others, nor for any use other than its stated purpose, without contacting the Engineer. Any such use is solely at the user's risk.

LICENSED PROFESSIONAL ENGINEER
KEVIN L. PATTON
1/9/2017
072197
STATE OF NEW YORK

Prepared by Kevin L. Patton, P.E.

Appendix A

Soil Technical Notes

Soil Classifications, Descriptions and Properties

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, N.Y. 12550
845 275-7732 kevin@pattongeotech.com

Soil Technical Notes:

Soil Classifications, Descriptions and Properties

The USCS (Unified Soil Classification System) was used to classify the soils in this report. The USCS is described in ASTM D2487 (laboratory test method) and D2488 (visual-manual method.) The USCS classification gives a ‘Group Symbol’ and ‘Group Name’ based on particle size distribution (gradation,) clay properties (Atterberg Limits) and basic composition (mineral or organic.)

USCS Soil Classes

Soils with less than 5% passing the #200 sieve:

GW, GP, SW, SP – Well-graded gravel, Poorly-graded gravel, Well-graded sand, Poorly-graded sand.

Soils with 12% to 50% passing the #200 sieve:

GC, GM, GC-GM, SC, SM, SC-SM – Clayey gravel, Silty gravel, Silty clayey gravel, Clayey sand, Silty sand, Silty clayey sand.

Soils with 5% to 12% passing the #200 sieve use a dual symbol, such as SW-SC (Clayey well-graded sand.)

Soils with more than 50% passing the #200 sieve:

CL-ML, ML, CL, MH, CH, OL, OH – Silty clay, Silt, Lean clay, Elastic silt, Fat clay, Organic silt, Organic clay.

Highly organic soils:

PT – Peat.

The soil group name is modified with the term ‘with sand’ or ‘with gravel’ if the soil contains more than 15% of these materials; clays and silts with 30% or more plus-#200 material are described as ‘sandy’ or ‘gravelly’ (whichever is predominate.) Examples – GM, Silty gravel with sand; CL, Gravelly lean clay.

Particle size

>12” (300mm)	Boulders
12” to 3” (300-75mm)	Cobbles
3” to #4 (75-4.75mm)	Gravel
#4 to #200 (4.75-0.075mm)	Sand
<#200 (0.075mm)	Silt & Clay

Organic Soils

Highly organic soils such as peat are visually classified. Partly organic soils, with a mix of organic and mineral matter, are classified visually and by Atterberg Limits tests.

Moisture Content

Moisture is visually estimated and samples are usually tested. Soil moisture capacity varies with texture.

Typical examples:
GW, moist at 3%, saturated at 9%
SP, moist at 6%, saturated at 20%.
CL, moist at 12%, saturated at 33%.

Fine- and Coarse-grained Soils

The USCS classification applies to the material smaller than the 3-inch sieve.

‘Fine-Grained Soils’ (silts and clays) have more than 50% passing the #200 sieve and are classified by their Atterberg Limits.

‘Coarse-Grained Soils’ (sands and gravels) have less than 50% passing the #200 sieve. When more than 50% of the plus-200 material is retained on the #4 sieve the general soil type is gravel, and if more than 50% is finer than the #4 sieve, it is sand.

Clean coarse-grained soils are classified as well-graded (Classes GW, SW) or poorly-graded (GP, SP.) Well-graded soils have a wider range of sizes and are typically more stable. Poorly-graded soils are usually more permeable.

Atterberg Limits

Test is performed on the clay, silt and fine sand fraction of the soil:
Liquid Limit (LL) – moisture content (%) at which soil becomes very soft.
Plastic Limit (PL) – moisture content at which soil crumbles.
Plasticity Index (PI) = LL minus PL

Higher PI values generally indicate reduced permeability and increased erosion resistance and cohesion.

LL > 50 indicates soil with a higher potential to shrink and swell due to changing moisture content.

Silts have lower PI values, and behave like very fine sand; most silts also contain some clay. Behavior of clays is partly controlled by electrochemical forces and varies among the several clay minerals.

Color

Soil color sometimes indicates groundwater conditions, with subdued colors below the water table and mottled (mixed) colors in the zone of seasonal water table fluctuation. Color changes tend to be more prominent in fine-grained soils.

Relative Quantities

Estimated percentages in descriptions:
<5% - Trace
5-10% - Traces
10-25% - Little
25-35% - Some
‘And’ - Approx. equal amounts
‘Few’ - <10% (cobbles and boulders)

USDA Soil Classification

USDA classifications are based on the relative amounts of sand, silt and clay in the soil fraction passing the #10 (2mm) sieve. ‘Gravelly’ indicates more than 15% of #10 to 3” size. ‘Channery’ indicates 15 to 35% thin flat pieces up to 6” long.

Appendix B

Boring Locations

Figure B101

GRAPHIC SCALE

300 0 150 300 600 1200

(IN FEET)
1 inch = 300 ft.

LEGEND

B16 SOIL BORING

Lands of
CLOVEWOOD
VILLAGE OF SOUTH BLOOMING GROVE,
ORANGE COUNTY, NEW YORK

PROJECT TITLE

SOIL BORING LOCATIONS
DEC. 5-8, 2016

DRAWING TITLE

KIRK ROTHER, P.E.
CONSULTING ENGINEER, PLLC
5 Saint Stephens Lane, Warwick NY 10990
(845) 988-0620

DATE	REVISIONS
03-20-18	GENERAL REVISIONS
01-09-17	INITIAL PREPARATION

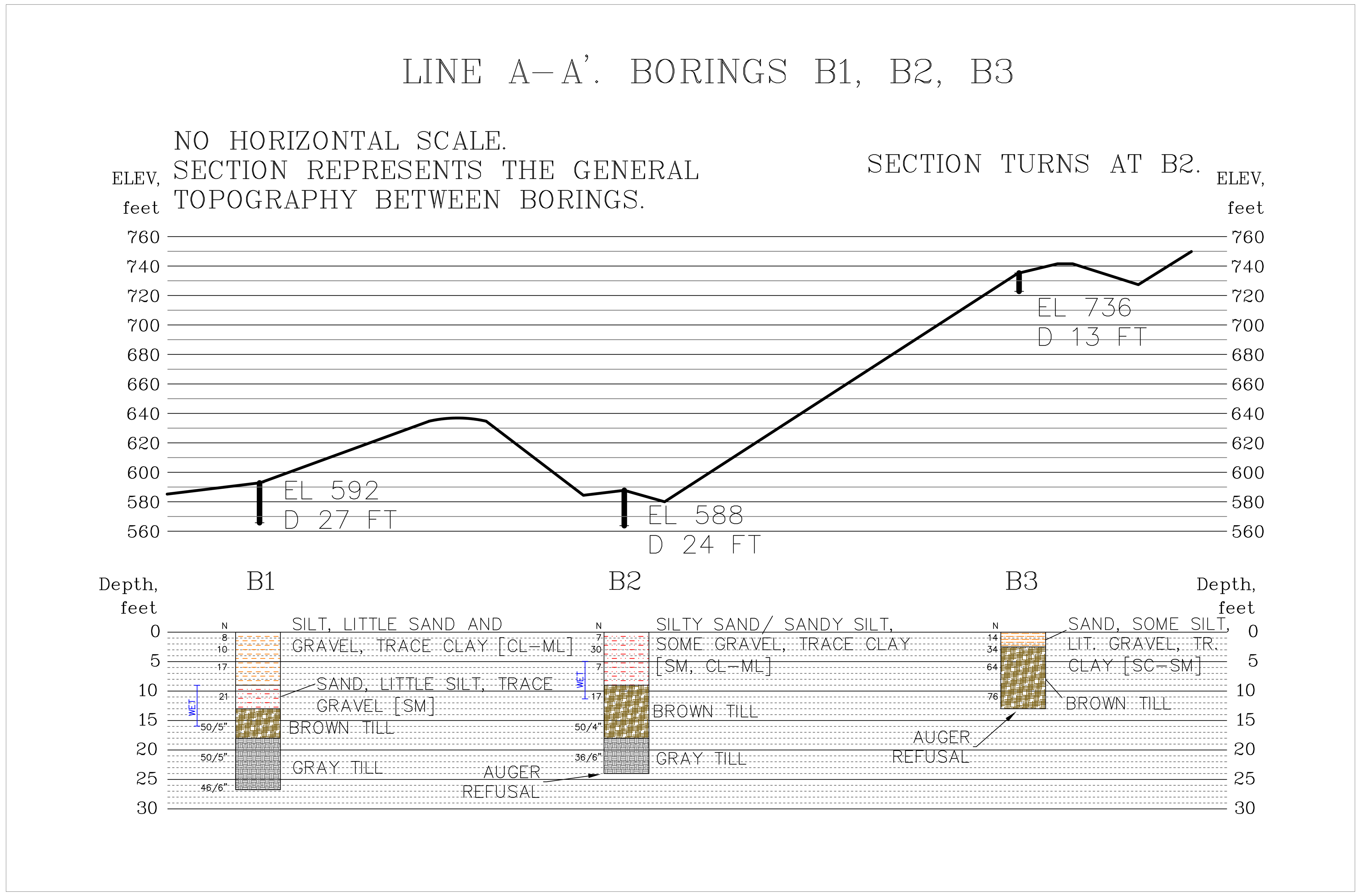
KIRK ROTHER, P.E. N.Y.S. LIC. NO. 079053 DATE

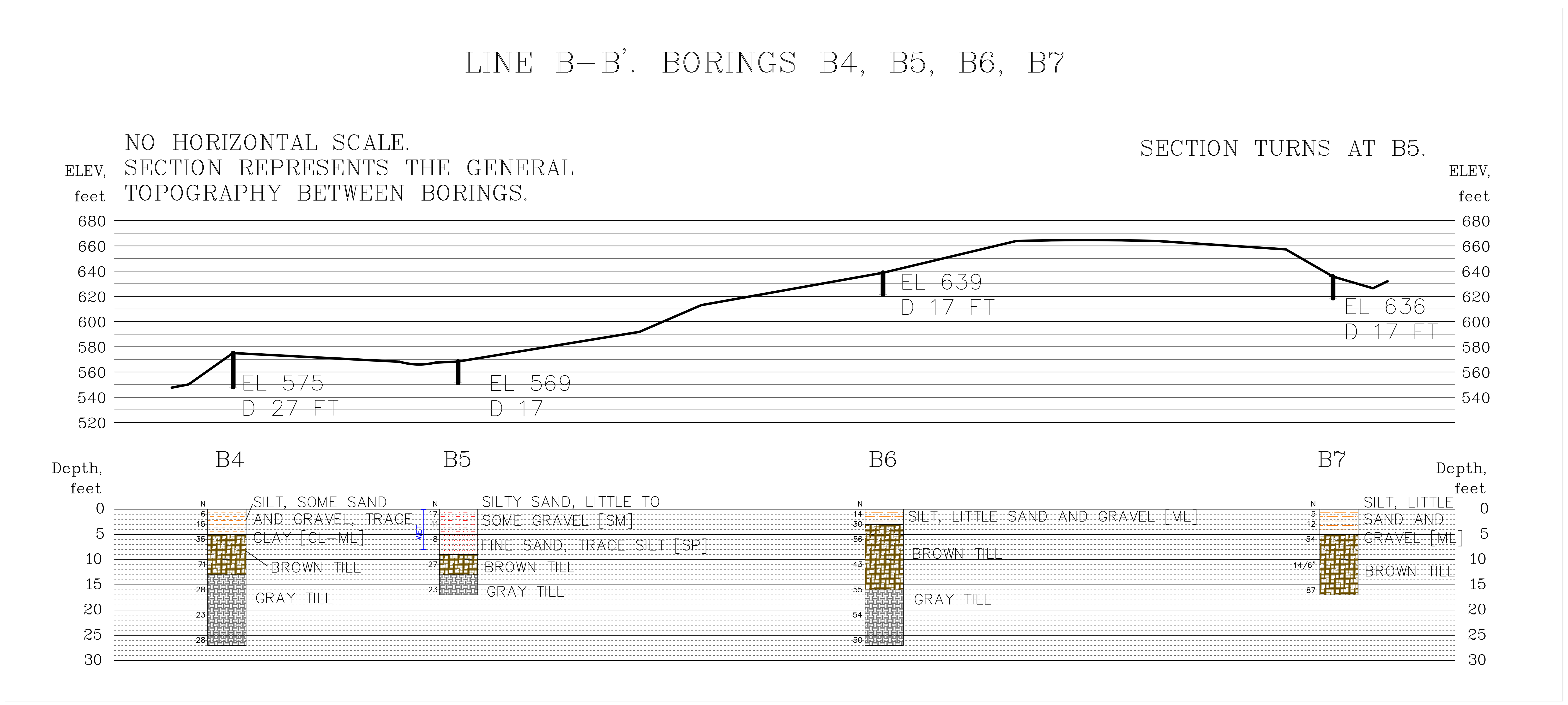
D.O.T. SHEET #	D.E.C. SHEET #	O.C.H.D. SHEET #	SHEET #
N.A.	N.A.	N.A.	B101
CAD #	PROJECT #	SCALE	
14107 BORING	14107.0	AS SHOWN	

Appendix C

Subsurface Profile Drawings

Figure B201, Figure B202 & Figure B203





BROWN TILL: TYPICALLY SILT WITH LITTLE TO SOME SAND AND GRAVEL, TRACES TO LITTLE CLAY, FEW COBBLES AND BOULDERS. SOME VEINS, LENSES OR POCKETS OF SANDY, GRAVELLY OR CLAYEY SOIL MAY BE PRESENT. TYPICAL USCS CLASSIFICATIONS CL, CL–ML, SC, GC, SM, GM. SLIGHTLY TO MODERATELY OVERCONSOLIDATED. LAYERS OF BROWN TILL WERE ALSO PRESENT IN THE SHALLOW SOIL ZONE AT MANY LOCATIONS.

GRAY TILL: COMPOSITION SIMILAR TO BROWN TILL. MODERATELY TO HIGHLY OVERCONSOLIDATED.

SOILS NOTED AS "WET" APPEAR TO BE ZONES OF PERCHED GROUNDWATER, ABOVE A LOW–PERMEABILITY LAYER. DURING EXCAVATION, INTERCEPTION OF BOTH ISOLATED WET POCKETS THAT DRAIN QUICKLY, AS WELL AS SPRINGS OR SEEPS THAT DRAIN OVER AN EXTENDED PERIOD, SHOULD BE EXPECTED.

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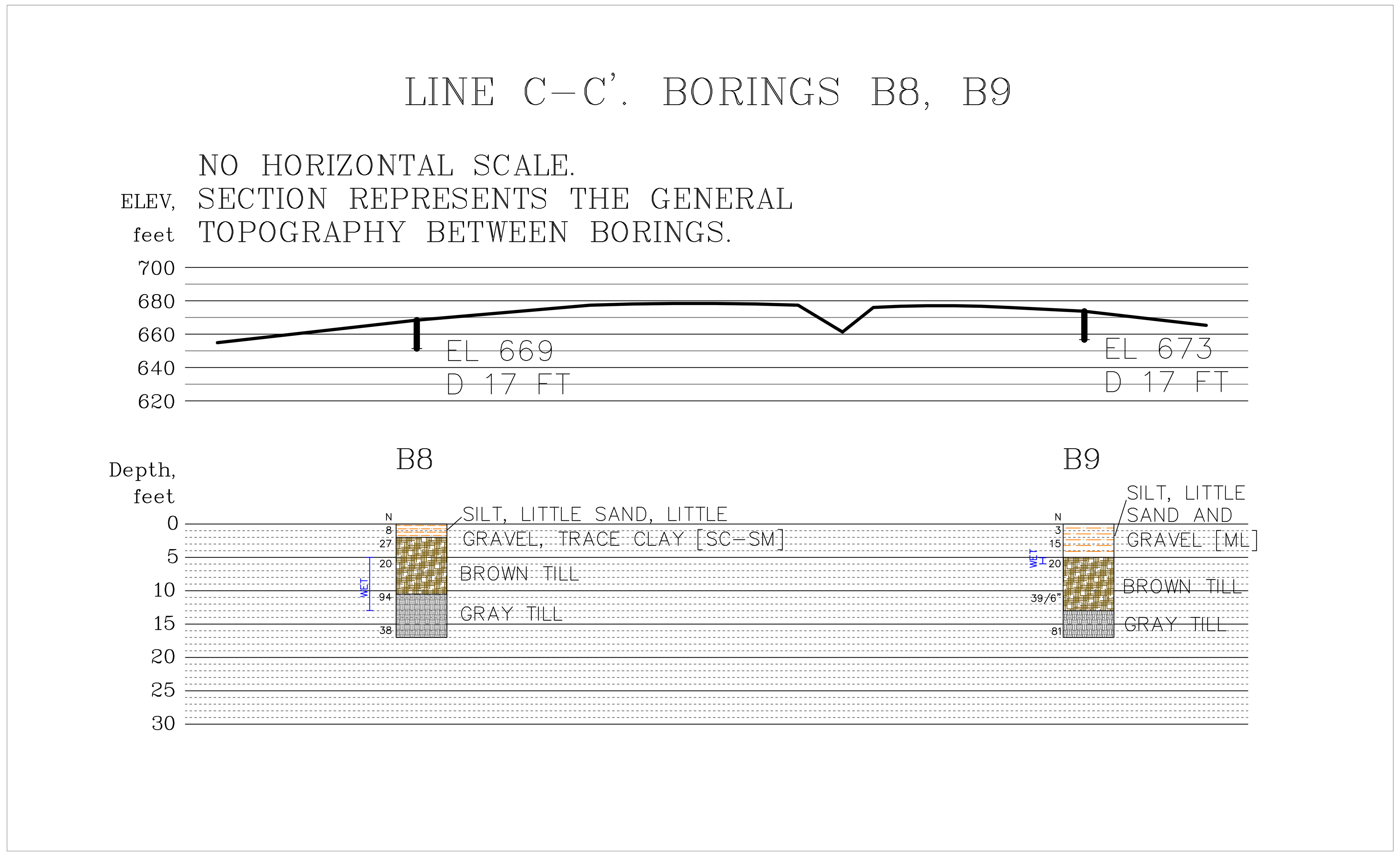
CLOVEWOOD SITE
BLOOMING GROVE, NY
SOIL BORING SECTIONS A and B

REV.	DATE	BY
0	1/9/2017	KLP

SCALE AS NOTED

B201



BROWN TILL: TYPICALLY SILT WITH LITTLE TO SOME SAND AND GRAVEL, TRACES TO LITTLE CLAY, FEW COBBLES AND BOULDERS. SOME VEINS, LENSES OR POCKETS OF SANDY, GRAVELLY OR CLAYEY SOIL MAY BE PRESENT. TYPICAL USCS CLASSIFICATIONS CL, CL–ML, SC, GC, SM, GM. SLIGHTLY TO MODERATELY OVERCONSOLIDATED. LAYERS OF BROWN TILL WERE ALSO PRESENT IN THE SHALLOW SOIL ZONE AT MANY LOCATIONS.

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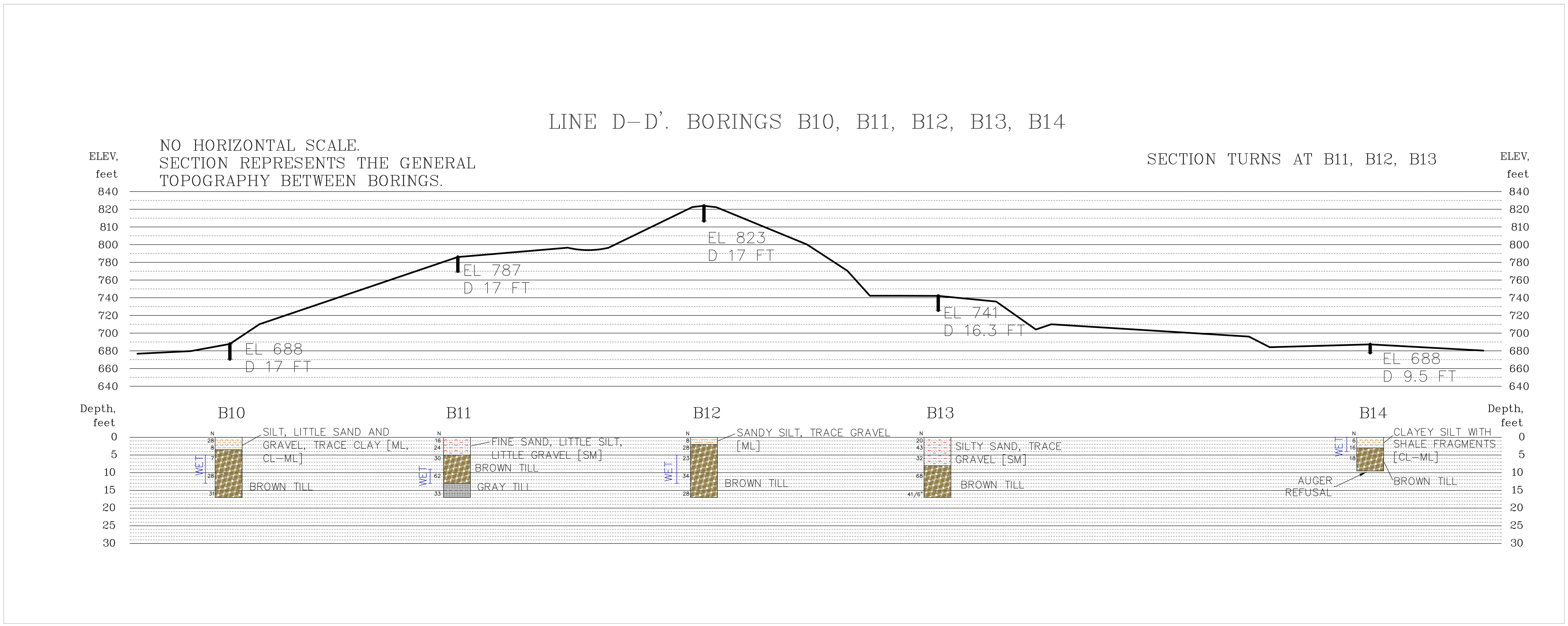

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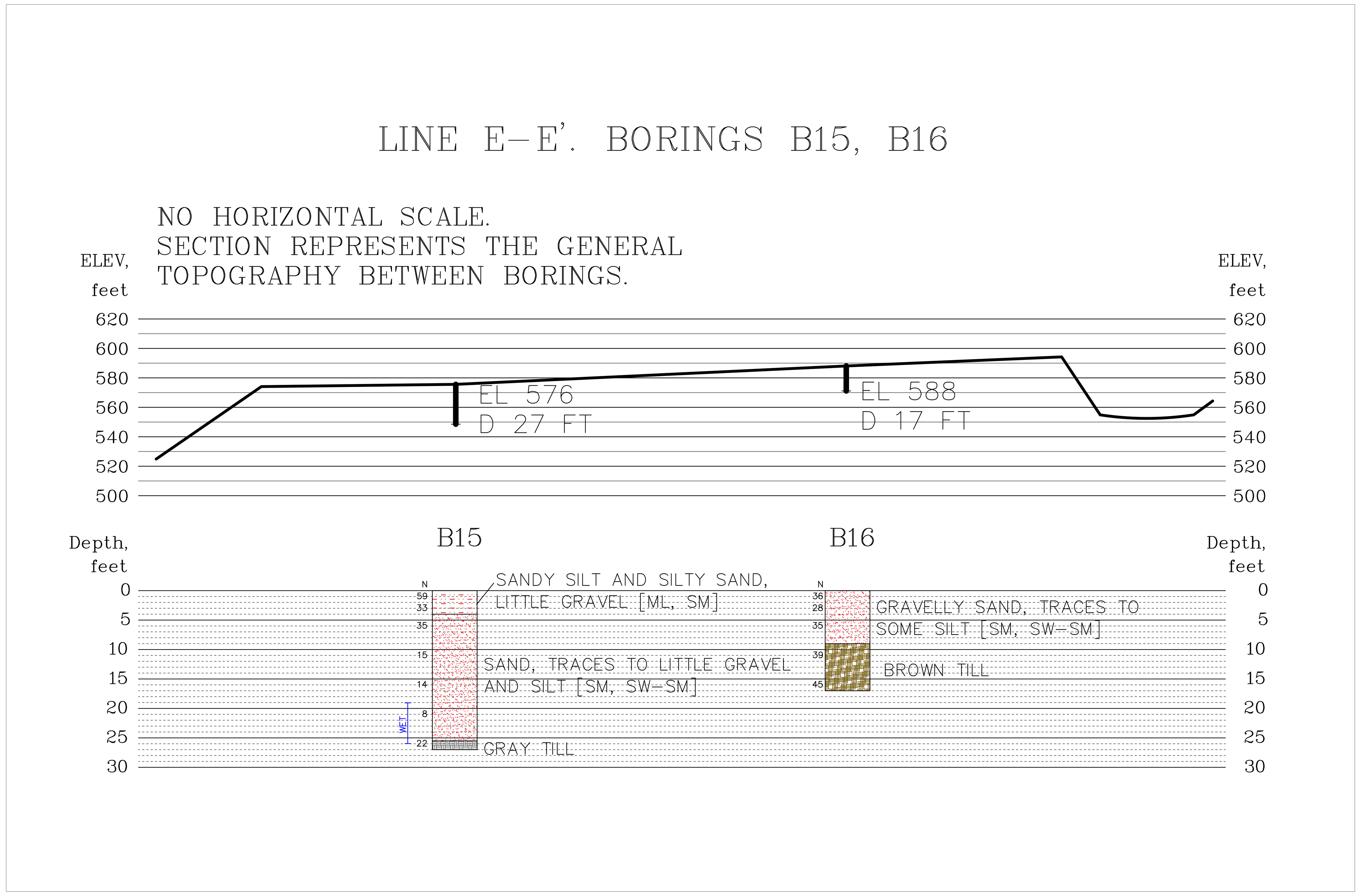
CLOVEWOOD SITE
BLOOMING GROVE, NY
SOIL BORING SECTIONS C and D

REV.	DATE	BY
0	1/9/2017	KLP

SCALE AS NOTED

B202



BROWN TILL: TYPICALLY SILT WITH LITTLE TO SOME SAND AND GRAVEL, TRACES TO LITTLE CLAY, FEW COBBLES AND BOULDERS. SOME VEINS, LENSES OR POCKETS OF SANDY, GRAVELLY OR CLAYEY SOIL MAY BE PRESENT. TYPICAL USCS CLASSIFICATIONS CL, CL–ML, SC, GC, SM, GM. SLIGHTLY TO MODERATELY OVERCONSOLIDATED. LAYERS OF BROWN TILL WERE ALSO PRESENT IN THE SHALLOW SOIL ZONE AT MANY LOCATIONS.

GRAY TILL: COMPOSITION SIMILAR TO BROWN TILL. MODERATELY TO HIGHLY OVERCONSOLIDATED.

SOILS NOTED AS "WET" APPEAR TO BE ZONES OF PERCHED GROUNDWATER, ABOVE A LOW–PERMEABILITY LAYER. DURING EXCAVATION, INTERCEPTION OF BOTH ISOLATED WET POCKETS THAT DRAIN QUICKLY, AS WELL AS SPRINGS OR SEEPS THAT DRAIN OVER AN EXTENDED PERIOD, SHOULD BE EXPECTED.

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CLOVEWOOD SITE
BLOOMING GROVE, NY
SOIL BORING SECTION E

REV.	DATE	BY
0	1/9/2017	KLP

SCALE AS NOTED

B203

Appendix D

Soil Boring Logs
B1-B16

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
PATTONGEOTECH.COM 845 275-7732

CLIENT:	CPC, LLC		
PROJECT:	Clovewood, South Blooming Grove, NY		
DATE:	12/5/2016	Project No.:	16423
WEATHER:	Cloudy, light showers		

SOIL BORING LOG

DRILLING COMPANY:	General Borings	LOCATION:	North End - Existing Houses	**BORING NO.**	**B-1**
DRILLER AND HELPER:	Jim, Nick				
HAMMER TYPE:	Automatic	ELEVATION:	592		
INSPECTOR:	Wyeth Patton	WATER DEPTH:			

DEPTH, FEET	SAMPLE NUMBER	SAMPLE DEPTH	TYPE	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	REC	MOISTURE	DESCRIPTION	NOTES
	1	0-2	SS	4	**5**	**3**	4	10	Moist	Clayey silt loam - Clayey silt, traces sand	
										and gravel. Brown.	
	2	2-4	SS	3	**4**	**6**	7	21	Moist	Silt with little sand and gravel, trace clay.	
										Mottled lt brown - grayish brown. Soft	
5										in upper 12 inches.	
	3	5-7	SS	11	**7**	**10**	18	20	Moist	Till. Silt, little sand and gravel, trace clay.	
										Finely mottled brown-gray-orange.	PEN = 6 ksf
10											
	4	10-12	SS	5	**7**	**14**	10	20	Wet	Sand (Fmc,) little silt, trace gravel	
										Brown.	PEN = 3 ksf
15											
	5	15-17	SS	44	**50/5**			3	Very moist	Till - Silt, little sand and gravel, trace clay.	
										Driven into weathered shale cobble.	
										Brown.	
20											
	6	20-22	SS	38	**50/5**			6	Moist	Till - Silt, some sand and gravel.	
										Gray.	
25											
	7	25-27	SS	40	**46**	**50/3**		14	Moist	Till - Silt, some sand and gravel.	
										Gray.	
30											
35											
40											
45											

COMMENTS:

DRILLING METHOD: Hollow Auger — MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES	SS - SPLIT SPOON	C - CORE	T - UNDISTURBED TUBE	AUG - AUGER CUTTINGS
	PEN - HAND PENETROMETER		TOR - TORVANE	V - VANE SHEAR

KEVIN L. PATTON, P.E. 36 PATTON ROAD NEWBURGH, NY 12550 PATTONGEOTECH.COM 845 275-7732				
	CLIENT:	CPC, LLC		
	PROJECT:	Clovewood, South Blooming Grove, NY		
	DATE:	12/5/2016	Project No.:	16423
	WEATHER:	Cloudy, light showers		

SOIL BORING LOG

DRILLING COMPANY:	General Borings	LOCATION:	North End - East of Houses	BORING NO.	B-2
DRILLER AND HELPER:	Jim, Nick				
HAMMER TYPE:	Automatic	ELEVATION:	588		
INSPECTOR:	Wyeth Patton	WATER DEPTH:			

DEPTH, FEET	SAMPLE NUMBER	SAMPLE DEPTH	TYPE	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	REC	MOISTURE	DESCRIPTION	NOTES
	1	0-2	SS	1	**2**	**5**	17	8	Very moist	Till - Silt, some sand and gravel, trace clay.	
										Light brown	
	2	2-4	SS	21	**18**	**12**	24	16	Moist	Sand, some gravel, little silt.	
										Brown.	
5											
	3	5-7	SS	4	**2**	**5**	9	20	Very moist	Silt, some sand and gravel, trace clay.	PEN = 3 ksf
										Mottled brown-gray-orange	
10											
	4	10-12	SS	6	**6**	**11**	42	12	Very moist	Till - Silt, some sand and gravel trace clay.	PEN = 3 ksf
										Brown.	
15											
	5	15-17	SS	41	**50/4**			12	Moist	Till - Sand, some silt, little gravel.	PEN = 9 ksf
										Grayish brown.	
20											
	6	20-22	SS	29	**36**	**50/5**		16	Moist	Till - Silt and very fine sand, little FMC sand and	PEN = 4 ksf
										gravel. Gray.	
										Refusal 24'	
25											
30											
35											
40											
45											

COMMENTS:

DRILLING METHOD: Hollow Auger — MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES				
	SS - SPLIT SPOON	C - CORE	T - UNDISTURBED TUBE	AUG - AUGER CUTTINGS
	PEN - HAND PENETROMETER		TOR - TORVANE	V - VANE SHEAR

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
PATTONGEOTECH.COM 845 275-7732

CLIENT:	CPC, LLC		
PROJECT:	Clovewood, South Blooming Grove, NY		
DATE:	12/8/2016	Project No.:	16423
WEATHER:	Clear		

SOIL BORING LOG

DRILLING COMPANY:	General Borings	LOCATION:	Mountain Foothills - North	BORING NO.	B-3
DRILLER AND HELPER:	Jim,				
HAMMER TYPE:	Automatic	ELEVATION:	736		
INSPECTOR:	Wyeth Patton	WATER DEPTH:			

DEPTH, FEET	SAMPLE NUMBER	SAMPLE DEPTH	TYPE	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	REC	MOISTURE	DESCRIPTION	NOTES
	1	0-2	SS	4	**6**	**8**	9	24	Moist	Silt, little sand, little gravel, trace clay.	
										Faintly mottled brown-gray.	
	2	2-4	SS	13	**15**	**19**	21	18	Moist	Till - silt, little sand and gravel, trace clay.	PEN = 18 ksf
										Finely mottled olive brown - brown.	
5											
	3	5-7	SS	30	**23**	**41**	46	12	Moist	Till - silt, some sand and gravel, trace clay.	
										Finely mottled olive brown - brown.	
										Boulder 7-8'	
10											
	4	10-12	SS	21	**30**	**46**	49	20	Moist	Till - silt, little sand and gravel, trace clay.	PEN = 20 ksf
										Light brown.	
										Refusal 13'	
15											
20											
25											
30											
35											
40											
45											

COMMENTS:

DRILLING METHOD: Hollow Auger — MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES: SS - SPLIT SPOON; C - CORE; T - UNDISTURBED TUBE; AUG - AUGER CUTTINGS; PEN - HAND PENETROMETER; TOR - TORVANE; V - VANE SHEAR

KEVIN L. PATTON, P.E. 36 PATTON ROAD NEWBURGH, NY 12550 PATTONGEOTECH.COM 845 275-7732				
	CLIENT:	CPC, LLC		
	PROJECT:	Clovewood, South Blooming Grove, NY		
	DATE:	12/5/2016	Project No.:	16423
	WEATHER:	Cloudy, light showers		

SOIL BORING LOG

DRILLING COMPANY:	General Borings	LOCATION:	West Hill - North End	BORING NO.	B-4
DRILLER AND HELPER:	Jim, Nick				
HAMMER TYPE:	Automatic	ELEVATION:	575		
INSPECTOR:	Wyeth Patton	WATER DEPTH:			

DEPTH, FEET	SAMPLE NUMBER	SAMPLE DEPTH	TYPE	SPT TEST, BLOWS/6"				REC	MOISTURE	DESCRIPTION	NOTES
				0-6	6-12	12-18	18-24				
	1	0-2	SS	1	**2**	**4**	6	14	Moist	8" topsoil, over Silt w/ some sand and gravel, trace clay. Faintly mottled brown-light brown.	
	2	2-4	SS	5	**7**	**8**	12	19	Moist	Silt, some sand and gravel, trace clay. Faintly mottled brown-light brown	
5											
	3	5-7	SS	19	**17**	**18**	21	20	Moist	Till - Silt, little to some sand and gravel, trace clay. Mottled brown-light brown-gray.	
10											
	4	10-12	SS	33	**47**	**24**	32	22	Moist	Till - Silt, some gravel and sand, trace clay. Mottled brown-gray-orange	Top 10" gray; then 4" rock; then 8" mostly brown. PEN = 12 ksf
15											
	5	15-17	SS	13	**14**	**14**	17	23	Moist	Till - Silt, little sand and gravel, traces clay. Gray.	PEN = 9 ksf
20											
	6	20-22	SS	18	**12**	**11**	13	20	Moist	Till - Silt, little sand and gravel, traces clay. Gray.	
25											
	7	25-27	SS	16	**15**	**13**	13	12	Moist	Till - Silt, little sand and gravel, traces clay. Gray.	
30											
35											
40											
45											

COMMENTS:

DRILLING METHOD: Hollow Auger — MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES	SS - SPLIT SPOON	C - CORE	T - UNDISTURBED TUBE	AUG - AUGER CUTTINGS
	PEN - HAND PENETROMETER		TOR - TORVANE	V - VANE SHEAR

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
PATTONGEOTECH.COM 845 275-7732

CLIENT:	CPC, LLC		
PROJECT:	Clovewood, South Blooming Grove, NY		
DATE:	12/8/2016	Project No.:	16423
WEATHER:	Clear		

SOIL BORING LOG

DRILLING COMPANY:	General Borings	LOCATION:	West Hill - Northeast end	BORING NO.	B-5
DRILLER AND HELPER:	Jim,				
HAMMER TYPE:	Automatic	ELEVATION:	569		
INSPECTOR:	Wyeth Patton	WATER DEPTH:			

DEPTH, FEET	SAMPLE NUMBER	SAMPLE DEPTH	TYPE	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	REC	MOISTURE	DESCRIPTION	NOTES
	1	0-2	SS	2	**9**	**8**	5	14	Very Moist	Sand, some silt, little gravel.	6" topsoil
										Mottled brown-light brown.	
	2	2-4	SS	3	**7**	**4**	1	8	Wet	Till - Sand, little silt, some gravel.	
										Faintly mottled brown-gray.	
5											
	3	5-7	SS	2	**2**	**6**	6	24	Wet	Fine sand, trace silt.	
										Brown.	
10											
	4	10-12	SS	7	**11**	**16**	15	16	Moist	Till - silt, little sand and gravel, trace clay.	PEN = 16 ksf
										Olive brown.	
15											
	5	15-17	SS	10	**11**	**12**	15	24	Moist	Till - silt, some sand and gravel, trace clay.	PEN = 9 ksf
										Gray.	
20											
25											
30											
35											
40											
45											

COMMENTS:

DRILLING METHOD: Hollow Auger — MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES: SS - SPLIT SPOON, C - CORE, T - UNDISTURBED TUBE, AUG - AUGER CUTTINGS, PEN - HAND PENETROMETER, TOR - TORVANE, V - VANE SHEAR

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
PATTONGEOTECH.COM 845 275-7732

CLIENT:	CPC, LLC		
PROJECT:	Clovewood, South Blooming Grove, NY		
DATE:	12/6/2016	Project No.:	16423
WEATHER:	Clear		

SOIL BORING LOG

DRILLING COMPANY:	General Borings	LOCATION:	West Hill - Middle of East Side	**BORING NO. B-6**
DRILLER AND HELPER:	Jim,			
HAMMER TYPE:	Automatic	ELEVATION:	639	
INSPECTOR:	Wyeth Patton	WATER DEPTH:		

DEPTH, FEET	SAMPLE NUMBER	SAMPLE DEPTH	TYPE	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	REC	MOISTURE	DESCRIPTION	NOTES
	1	0-2	SS	10	**8**	**6**	10	16	Moist	Silt, traces to little sand and gravel.	
										Slightly mottled gray-brown	
	2	2-4	SS	6	**8**	**22**	30	19	Moist	Till - Silt, little sand and gravel. Drive 8" through	PEN = 8 ksf
										weathered rock. Mottled gray-brown-orange	
5											
	3	5-7	SS	14	**24**	**32**	18	14	Moist	Till - Silt, traces to little sand and gravel.	PEN = 8 ksf
										Mottled gray-brown-orange	
10											
	4	10-12	SS	19	**30**	**13**	23	16	Moist	Till - Silt, little clay, little sand and gravel	PEN = 10 ksf
										Brown.	
15											
	5	15-17	SS	26	**31**	**24**	25	1		Gray sandstone fragments	
20											
	6	20-22	SS	22	**21**	**33**	43	24	Moist	Till - Silt, little sand and gravel, trace clay.	
										Gray.	
25											
	7	25-27	SS	21	**16**	**34**	28	24	Moist	Till - Silt, little sand and gravel, trace clay.	
										Gray.	
30											
35											
40											
45											

COMMENTS:

DRILLING METHOD:	Hollow Auger			MEASUREMENTS IN FEET AND INCHES
SAMPLE/TEST TYPES	SS - SPLIT SPOON	C - CORE	T - UNDISTURBED TUBE	AUG - AUGER CUTTINGS
	PEN - HAND PENETROMETER		TOR - TORVANE	V - VANE SHEAR

KEVIN L. PATTON, P.E.	CLIENT:	CPC, LLC		
36 PATTON ROAD	PROJECT:	Clovewood, South Blooming Grove, NY		
NEWBURGH, NY 12550	DATE:	12/6/2016	Project No.:	16423
PATTONGEOTECH.COM 845 275-7732	WEATHER:	Clear		

SOIL BORING LOG

DRILLING COMPANY:	General Borings	LOCATION:	West Hill - Southeast End	BORING NO.	B-7
DRILLER AND HELPER:	Jim,				
HAMMER TYPE:	Automatic	ELEVATION:	636		
INSPECTOR:	Wyeth Patton	WATER DEPTH:			

DEPTH, FEET	SAMPLE NUMBER	SAMPLE DEPTH	TYPE	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	REC	MOISTURE	DESCRIPTION	NOTES
	1	0-2	SS	2	**3**	**2**	2	12	Moist	Loam - Silt, traces to little sand and gravel.	
										Brown.	
	2	2-4	SS	3	**5**	**7**	8	18	Moist	Till - Silt, little sand and gravel.	PEN = 6ksf
										Brown, faintly mottled	
5											
	3	5-7	SS	18	**23**	**21**	21	17	Moist	Till - Silt with some sand, traces gravel.	
										Mottled brown-gray-orange.	
10											
	4	10-12	SS	11	**14**	**50/5**		24	Moist	Till - Clayey silt with little sand, traces gravel.	PEN = 14 ksf
										Brown.	
15											
	5	15-17	SS	26	**38**	**49**	30	0		No recovery	
20											
25											
30											
35											
40											
45											

COMMENTS:

DRILLING METHOD: Hollow Auger — MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES	SS - SPLIT SPOON	C - CORE	T - UNDISTURBED TUBE	AUG - AUGER CUTTINGS
	PEN - HAND PENETROMETER		TOR - TORVANE	V - VANE SHEAR

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
PATTONGEOTECH.COM 845 275-7732

CLIENT:	CPC, LLC		
PROJECT:	Clovewood, South Blooming Grove, NY		
DATE:	12/7/2016	Project No.:	16423
WEATHER:	Cloudy, light snow		

SOIL BORING LOG

DRILLING COMPANY:	General Borings	LOCATION:	Golf Course Area - North End	**BORING NO.** **B-8**
DRILLER AND HELPER:	Jim,			
HAMMER TYPE:	Automatic	ELEVATION:	669	
INSPECTOR:	Wyeth Patton	WATER DEPTH:		

DEPTH, FEET	SAMPLE NUMBER	SAMPLE DEPTH	TYPE	SPT TEST, BLOWS/6"				REC	MOISTURE	DESCRIPTION	NOTES
				0-6	6-12	12-18	18-24				
	1	0-2	SS	2	**6**	**2**	4	12	Very moist	Silt, little sand, trace gravel, trace clay.	
										Brown.	
	2	2-4	SS	15	**14**	**13**	8	9	Moist	Till - silt, little sand and gravel, trace cay.	PEN = 8 ksf
										Brown.	
5											
	3	5-7	SS	4	**6**	**14**	18	5+	Very moist	Till - silt, little sand and gravel, trace cay.	
										Mottled gray-brown-orange.	
10											
	4	10-12	SS	17	**46**	**48**	50/3	16	Very moist	Till - Silty clay, little sand and gravel.	
										Olive gray.	
										Bottom 4 inches dry to moist.	
15											
	5	15-17	SS	14	**16**	**22**	23	20	Very moist	Till - silt, little to some sand, trace clay.	PEN = 10 ksf
										Gray.	
20											
25											
30											
35											
40											
45											

COMMENTS:

DRILLING METHOD:	Hollow Auger			MEASUREMENTS IN FEET AND INCHES
SAMPLE/TEST TYPES	SS - SPLIT SPOON	C - CORE	T - UNDISTURBED TUBE	AUG - AUGER CUTTINGS
	PEN - HAND PENETROMETER		TOR - TORVANE	V - VANE SHEAR

KEVIN L. PATTON, P.E.
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PATTONGEOTECH.COM 845 275-7732

CLIENT:	CPC, LLC		
PROJECT:	Clovewood, South Blooming Grove, NY		
DATE:	12/6/2016	Project No.:	16423
WEATHER:	Clear		

SOIL BORING LOG

DRILLING COMPANY:	General Borings	LOCATION:	Golf Course Area - South End	**BORING NO.** **B-9**
DRILLER AND HELPER:	Jim,			
HAMMER TYPE:	Automatic	ELEVATION:	673	
INSPECTOR:	Wyeth Patton	WATER DEPTH:		

DEPTH, FEET	SAMPLE NUMBER	SAMPLE DEPTH	TYPE	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	REC	MOISTURE	DESCRIPTION	NOTES
	1	0-2	SS	2	**2**	**1**	3	3	Moist	Topsoil - silt loam	
										Brown.	
	2	2-4	SS	5	**8**	**7**	10	12	Moist	Silt and very fine sand, trace gravel.	
										Mottled light brown-orange-gray.	
5											
	3	5-7	SS	7	**8**	**12**	11	14	Moist/V Moist	Till - silt, little sand an gravel, trace clay.	
										Mottled olive brown - brown.	
10											
	4	10-12	SS	20	**39**	**50/3**		7	Moist	Till - silt, some sand and gravel, trace clay.	
										Brown.	
15											
	5	15-17	SS	18	**36**	**45**	50/5	24	Moist	Till - silt, some sand and gravel, trace clay.	
										Gray.	
20											
25											
30											
35											
40											
45											

COMMENTS:

DRILLING METHOD: Hollow Auger — MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES	SS - SPLIT SPOON	C - CORE	T - UNDISTURBED TUBE	AUG - AUGER CUTTINGS
	PEN - HAND PENETROMETER		TOR - TORVANE	V - VANE SHEAR

KEVIN L. PATTON, P.E.	CLIENT:	CPC, LLC		
36 PATTON ROAD	PROJECT:	Clovewood, South Blooming Grove, NY		
NEWBURGH, NY 12550	DATE:	12/8/2016	Project No.:	16423
PATTONGEOTECH.COM 845 275-7732	WEATHER:	Clear		

SOIL BORING LOG

DRILLING COMPANY:	General Borings	LOCATION:	Mountain Foothills - Lower North	**BORING NO.**	**B-10**
DRILLER AND HELPER:	Jim,				
HAMMER TYPE:	Automatic	ELEVATION:	688		
INSPECTOR:	Wyeth Patton	WATER DEPTH:			

DEPTH, FEET	SAMPLE NUMBER	SAMPLE DEPTH	TYPE	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	REC	MOISTURE	DESCRIPTION	NOTES
	1	0-2	SS	3	**13**	**5**	3	10	Moist	Till - Silt, little sand and gravel.	PEN = 6 ksf
										Brownish gray.	
	2	2-4	SS	2	**3**	**5**	8	10	Moist	Till - Silt, little sand and gravel, trace clay.	PEN = 4 ksf
										Finely mottled brown-gray.	
5											
	3	5-7	SS	5	**4**	**3**	11	12	Very Moist	Till - silt and fine sand, little gravel, trace clay.	PEN = 2.5 ksf
										Olive brown.	
										Boulder at 8'	
10											
	4	10-12	SS	8	**12**	**16**	20	14	V Moist/wet	Till - Fmc sand, some silt, little gravel.	PEN = 5 ksf
15											
	5	15-17	SS	11	**12**	**19**	21	4	Wet	Mostly gravel and cobble fragments	
										(sandstone, siltstone) with sandy till.	
										Light brown.	
20											
25											
30											
35											
40											
45											

COMMENTS:

DRILLING METHOD:	Hollow Auger			MEASUREMENTS IN FEET AND INCHES
SAMPLE/TEST TYPES	SS - SPLIT SPOON	C - CORE	T - UNDISTURBED TUBE	AUG - AUGER CUTTINGS
	PEN - HAND PENETROMETER		TOR - TORVANE	V - VANE SHEAR

KEVIN L. PATTON, P.E.	CLIENT:	CPC, LLC		
36 PATTON ROAD	PROJECT:	Clovewood, South Blooming Grove, NY		
NEWBURGH, NY 12550	DATE:	12/7/2016	Project No.:	16423
PATTONGEOTECH.COM 845 275-7732	WEATHER:	Cloudy, light snow		

SOIL BORING LOG

DRILLING COMPANY:	General Borings	LOCATION:	Mountain Footihills - Upper North	BORING NO.	B-11
DRILLER AND HELPER:	Jim,				
HAMMER TYPE:	Automatic	ELEVATION:	787		
INSPECTOR:	Wyeth Patton	WATER DEPTH:			

DEPTH, FEET	SAMPLE NUMBER	SAMPLE DEPTH	TYPE	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	REC	MOISTURE	DESCRIPTION	NOTES
	1	0-2	SS	2	**6**	**10**	13	17	Moist	Fine sand, little silt, little gravel. Shale fragments. Brown.	
	2	2-4	SS	6	**11**	**13**	11	18	Moist	Fine sand, little silt, little gravel. Dense. Brown.	PEN = 7 ksf
5										Boulder at 4 1/2 - 5'	
	3	5-7	SS	15	**14**	**16**	18	24	Moist	Till - Silt, little sand and gravel, trace clay. Olive brown.	PEN = 11 ksf
10											
	4	10-12	SS	28	**27**	**35**	42	8	Very Moist	Till - Silt, little sand and gravel, trace clay. Olive brown. Trace very fine roots.	
15											
	5	15-17	SS	11	**13**	**20**	17	24	Moist	Till - Silt, little sand and gravel, trace clay. Gray.	PEN = 18 ksf
20											
25											
30											
35											
40											
45											

COMMENTS:

DRILLING METHOD: Hollow Auger — MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES			
SS - SPLIT SPOON	C - CORE	T - UNDISTURBED TUBE	AUG - AUGER CUTTINGS
PEN - HAND PENETROMETER		TOR - TORVANE	V - VANE SHEAR

KEVIN L. PATTON, P.E.
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PATTONGEOTECH.COM 845 275-7732

CLIENT:	CPC, LLC		
PROJECT:	Clovewood, South Blooming Grove, NY		
DATE:	12/7/2016	Project No.:	16423
WEATHER:	Cloudy, light snow		

SOIL BORING LOG

DRILLING COMPANY:	General Borings	LOCATION:	Mountain Footihills - Upper Center	BORING NO.	B-12
DRILLER AND HELPER:	Jim,				
HAMMER TYPE:	Automatic	ELEVATION:	823		
INSPECTOR:	Wyeth Patton	WATER DEPTH:			

DEPTH, FEET	SAMPLE NUMBER	SAMPLE DEPTH	TYPE	SPT TEST, BLOWS/6"				REC	MOISTURE	DESCRIPTION	NOTES
				0-6	6-12	12-18	18-24				
	1	0-2	SS	10	**3**	**5**	6	8	Very moist	Silt, little sand, trace gravel.	
										Mottled light brown-brown-orange	
	2	2-4	SS	10	**15**	**13**	15	16	Moist	Till - Silt, little sand and gravel, trace clay.	PEN = 11 ksf
										Brown.	
5											
	3	5-7	SS	9	**9**	**14**	15	4	Very moist	Till - Gravel, some silt, little sand, trace clay.	
										Brown. Friable texture.	
10											
	4	10-12	SS	10	**13**	**21**	21	20	Very moist	Till - Silt, little sand and gravel, trace clay.	
										Finely mottled brown-gray.	
15											
	5	15-17	SS	11	**13**	**15**	16	12	Moist	Till - Silt, little sand and gravel, trace clay.	PEN = 8 ksf
										Finely mottled brown-olive brown.	
20											
25											
30											
35											
40											
45											

COMMENTS:

DRILLING METHOD: Hollow Auger — MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES	SS - SPLIT SPOON	C - CORE	T - UNDISTURBED TUBE	AUG - AUGER CUTTINGS
	PEN - HAND PENETROMETER		TOR - TORVANE	V - VANE SHEAR

KEVIN L. PATTON, P.E.
36 PATTON ROAD
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PATTONGEOTECH.COM 845 275-7732

CLIENT:	CPC, LLC		
PROJECT:	Clovewood, South Blooming Grove, NY		
DATE:	12/8/2016	Project No.:	16423
WEATHER:	Clear		

SOIL BORING LOG

DRILLING COMPANY:	General Borings	LOCATION:	Mountain Footihills - South Center	**BORING NO.** **B-13**
DRILLER AND HELPER:	Jim,			
HAMMER TYPE:	Automatic	ELEVATION:	741	
INSPECTOR:	Wyeth Patton	WATER DEPTH:		

DEPTH, FEET	SAMPLE NUMBER	SAMPLE DEPTH	TYPE	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	REC	MOISTURE	DESCRIPTION	NOTES
	1	0-2	SS	7	**10**	**10**	13	8	Moist	Silt, some sand, traces gravel, trace clay.	
										Orangeish brown	
	2	2-4	SS	15	**19**	**24**	23	14	Dry/moist	Till - silt, little sand, traces gravel.	
										Finely mottled light brown - brown.	
5											
	3	5-7	SS	14	**15**	**17**	29	21	Moist	Sand (Fmc,) little silt, little gravel. Cobble.	
										Brown.	
10											
	4	10-12	SS	13	**28**	**40**	35	19	Moist	Till - silt, little sand and gravel, trace clay,	
										rock fragments. Finely mottled light brown-	
										brown	
15											
	5	15-17	SS	17	**41**	**50/3**		11	Moist	Till - silt, little sand and gravel.	
										Brownish gray.	
20											
25											
30											
35											
40											
45											

COMMENTS:

DRILLING METHOD: Hollow Auger — MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES: SS - SPLIT SPOON; C - CORE; T - UNDISTURBED TUBE; AUG - AUGER CUTTINGS; PEN - HAND PENETROMETER; TOR - TORVANE; V - VANE SHEAR

KEVIN L. PATTON, P.E.
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CLIENT:	CPC, LLC		
PROJECT:	Clovewood, South Blooming Grove, NY		
DATE:	12/7/2016	Project No.:	16423
WEATHER:	Cloudy, light snow		

SOIL BORING LOG

DRILLING COMPANY:	General Borings	LOCATION:	Mountain Footihills - South End	**BORING NO. B-14**
DRILLER AND HELPER:	Jim,			
HAMMER TYPE:	Automatic	ELEVATION:	688	
INSPECTOR:	Wyeth Patton	WATER DEPTH:		

DEPTH, FEET	SAMPLE NUMBER	SAMPLE DEPTH	TYPE	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	REC	MOISTURE	DESCRIPTION	NOTES
	1	0-2	SS	2	**2**	**4**	4	10	Very moist	Topsoil - brown pebbly clayey silt loam over	
										Clayey silt w/ many angular shale fragments*	
	2	2-4	SS	2	**6**	**10**	12	14	Very moist	Till - silt, little sand and gravel, trace clay.	PEN = 3 ksf
										Light brown.	
5											
	3	5-7	SS	6	**8**	**10**	9	12	Moist	Till - silt, little sand and gravel, trace clay.	PEN = 6 ksf
										Mottled brown- light brown- gray.	
10										Refusal at 9.5 feet	
										*Faintly mottled brown-olive brown; friable	
										texture.	
15											
20											
25											
30											
35											
40											
45											

COMMENTS:

DRILLING METHOD: Hollow Auger — MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES	SS - SPLIT SPOON	C - CORE	T - UNDISTURBED TUBE	AUG - AUGER CUTTINGS
	PEN - HAND PENETROMETER		TOR - TORVANE	V - VANE SHEAR

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
PATTONGEOTECH.COM 845 275-7732

CLIENT:	CPC, LLC		
PROJECT:	Clovewood, South Blooming Grove, NY		
DATE:	12/6/2016	Project No.:	16423
WEATHER:	Clear		

SOIL BORING LOG

DRILLING COMPANY:	General Borings	LOCATION:	Sand Pits - West	**BORING NO.** **B-15**
DRILLER AND HELPER:	Jim,			
HAMMER TYPE:	Automatic	ELEVATION:	576	
INSPECTOR:	Wyeth Patton	WATER DEPTH:		

DEPTH, FEET	SAMPLE NUMBER	SAMPLE DEPTH	TYPE	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	REC	MOISTURE	DESCRIPTION	NOTES
	1	0-2	SS	3	**27**	**32**	4	12	Moist	Loam - Silt, little sand, trace gravel.	
										Slightly mottled orangeish brown- brown.	
	2	2-4	SS	6	**13**	**20**	18	8	Moist	Sand, some gravel, little silt.	
										Orangeish brown, slightly mottled.	
5											
	3	5-7	SS	8	**23**	**12**	9	12	Moist	Sand, little gravel, traces silt.	
										Brown.	
10											
	4	10-12	SS	11	**7**	**8**	7	14	Moist	Fine sand with traces gravel, trace silt.	
										Brown.	
15											
	5	15-17	SS	6	**6**	**8**	6	10	---	No Recovery	
20											
	6	20-22	SS	6	**4**	**4**	5	16	Wet	Sand (Fmc) with traces gravel, traces to little	
										silt. Brown.	
25											
	7	25-27	SS	6	**10**	**12**	13	14	V Moist to	1" wet coarse sand, then Till - Fine sand and silt	PEN = 7 ksf (upper)
									moist	with little gravel, grading to silt with little to some	PEN = 12 ksf (lower)
										sand and gravel. Gray	
30											
35											
40											
45											

COMMENTS:

DRILLING METHOD: Hollow Auger — MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES				
	SS - SPLIT SPOON	C - CORE	T - UNDISTURBED TUBE	AUG - AUGER CUTTINGS
	PEN - HAND PENETROMETER		TOR - TORVANE	V - VANE SHEAR

KEVIN L. PATTON, P.E. **36 PATTON ROAD** **NEWBURGH, NY 12550** **PATTONGEOTECH.COM 845 275-7732**	CLIENT:	CPC, LLC	
	PROJECT:	Clovewood, South Blooming Grove, NY	
	DATE:	12/6/2016	Project No.: 16423
	WEATHER:	Clear	

SOIL BORING LOG

DRILLING COMPANY:	General Borings	LOCATION:	Sand Pits - East	BORING NO. **B-16**
DRILLER AND HELPER:	Jim,			
HAMMER TYPE:	Automatic	ELEVATION:	588	
INSPECTOR:	Wyeth Patton	WATER DEPTH:		

DEPTH, FEET	SAMPLE NUMBER	SAMPLE DEPTH	TYPE	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	REC	MOISTURE	DESCRIPTION	NOTES
	1	0-2	SS	9	**22**	**14**	8	17	Moist	3" topsoil over Sand with some silt, little gravel. Brown	
	2	2-4	SS	6	**10**	**18**	18	16	Moist	Sand with some gravel, little silt. Mottled orange-gray-light brown.	
5											
	3	5-7	SS	12	**17**	**18**	18	9	Moist	Sand, little gravel, traces silt. Brown.	
10											
	4	10-12	SS	23	**16**	**23**	21	14	Moist	Till - Silt, little sand and gravel, trace clay. Gravel fragments. Finely mottled light brown-brown-orange.	
15											
	5	15-17	SS	17	**25**	**20**	18	4	Moist	Till - Sand, some silt, little gravel. Shale fragments. Brown.	
20											
25											
30											
35											
40											
45											

COMMENTS:

DRILLING METHOD: Hollow Auger — MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES			
SS - SPLIT SPOON	C - CORE	T - UNDISTURBED TUBE	AUG - AUGER CUTTINGS
PEN - HAND PENETROMETER		TOR - TORVANE	V - VANE SHEAR

Appendix E

Laboratory Test Reports

Moisture Content of Soil

Sieve-and-Hydrometer Analysis Test Report

Gradation Analysis Test Report

Atterberg Limits Test

KEVIN L. PATTON, P.E.
36 PATTON ROAD
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CLIENT:	CPC, LLC		
PROJECT:	Clovewood - South Blooming Grove, NY		
PROJECT No.:	16423	SAMPLE LOT No.:	161208-1
DATE SAMPLED:	12/5-8/16	DATE TESTED:	12/15/2016
SAMPLED BY:	Wyeth Patton	TESTED BY:	Wyeth Patton

MOISTURE CONTENT OF SOIL

TEST METHOD: ASTM D2216

SAMPLE NO.	DEPTH,FT.	% MOISTURE
B1 S2	3	13.6
B1 S4	11	11.7
B2 S1	1	14.6
B2 S2	3	10.1
B2 S3	6	12.4
B2 S4	11	10.4
B3 S2	3	9.9
B3 S3	6	7.8
B4 S2	3	10.6
B4 S5	16	9.3
B4 S7	21	9.2
B5 S2	3	11.3
B5 S3	6	23.9
B5 S4	11	9.5
B6 S1	1	14.2
B6 S2	3	8.5
B6 S4	11	10.1
B6 S6	21	5.9
B6 S7	26	8.2
B7 S2	3	10.0
B7 S3	6	9.3
B8 S2	3	9.6
B8 S3	6	11.3
B8 S5	16	9.6

Moisture content is expressed as a percent of the dry mass of the soil.

Reviewed by: *Kevin Patton*

Form NMC

KEVIN L. PATTON, P.E.
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NEWBURGH, NY 12550
845 275-7732 kevin@pattongeotech.com

CLIENT:	CPC, LLC		
PROJECT:	Clovewood - South Blooming Grove, NY		
PROJECT No.:	16423	SAMPLE LOT No.:	161208-1
DATE SAMPLED:	12/5-8/16	DATE TESTED:	12/15/2016
SAMPLED BY:	Wyeth Patton	TESTED BY:	Wyeth Patton

MOISTURE CONTENT OF SOIL

TEST METHOD: ASTM D2216

SAMPLE NO.	DEPTH,FT.	% MOISTURE
B9 S2	3	12.5
B9 S3	6	11.5
B10 S2	3	18.1
B11 S3	6	7.2
B11 S4	11	16.2
B12 S2	3	9.9
B12 S4	11	8.5
B13 S3	6	5.0
B13 S4	11	8.8
B14 S2	3	14.4
B14 S3	6	10.9
B15 S2	3	8.3
B15 S4	6	4.8
B15 S6	21	17.1
B16 S2	3	8.9
B16 S4	11	9.4

Moisture content is expressed as a percent of the dry mass of the soil.

Reviewed by: *Kevin Patton*

Form NMC

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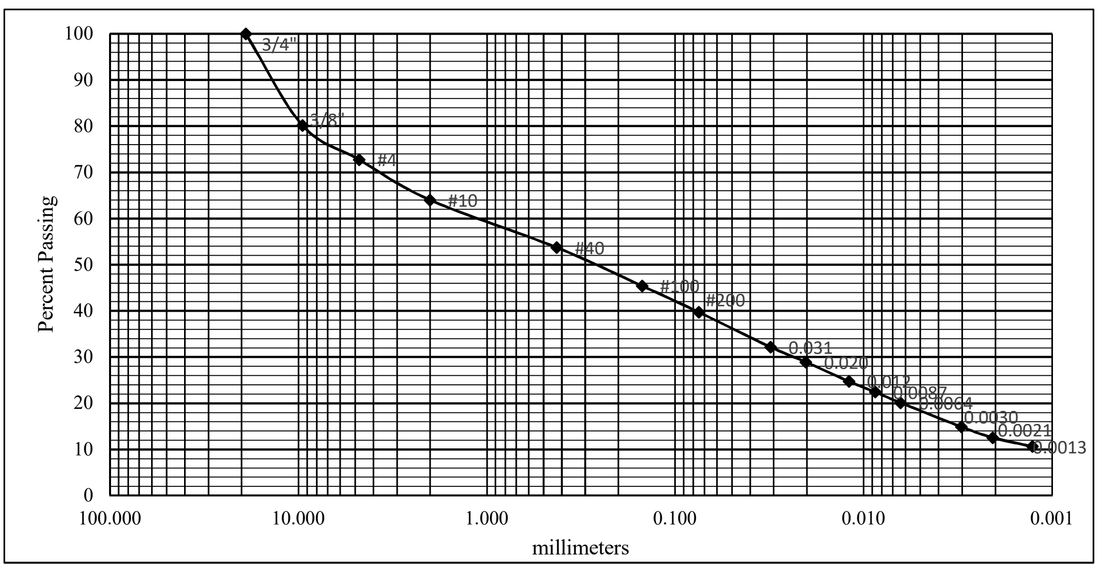
CLIENT:	CPC, LLC		
PROJECT:	Clovewood - South Blooming Grove, NY		
PROJECT No.:	16423	SAMPLE LOT No.:	161208-1
DATE SAMPLED:	12/5-8/16	DATE TESTED:	12/22/2017
SAMPLED BY:	Wyeth Patton	TESTED BY:	Wyeth Patton

SIEVE-AND-HYDROMETER ANALYSIS TEST REPORT

TEST METHOD(s): ASTM D422, AASHTO T88

Sample Location	B4-S3
Depth	6 feet

Sieve Size		Percent Retained	Percent Passing	Specification
inches	mm			
3/4"	19.0	0	100	
3/8"	9.5	20	80	
#4	4.75	7	73	
#10	2.00	9	64	
#40	0.425	10	54	
#100	0.150	9	45	
#200	0.075	5	40	
Hydrometer Analysis	0.050	4	36	
	0.020	7	29	
	0.010	5	24	
	0.005	6	18	
	0.002	5	13	
	<0.002	13		



USDA Particle Size Classification:		**USDA Textural Class:** Loam (gravelly)
Gravel, 2.00mm to 3"	36	
Sand, 2.00 to 0.050mm:	28	**USCS Classification (ASTM D2487/D2488):**
Silt, 0.050 to 0.002mm:	23	SC, Clayey sand with gravel
Clay, <0.002mm	13	
Total	100	Atterberg Limits were determined by: Test

Reviewed by: *Kevin Patton*

Form HYD

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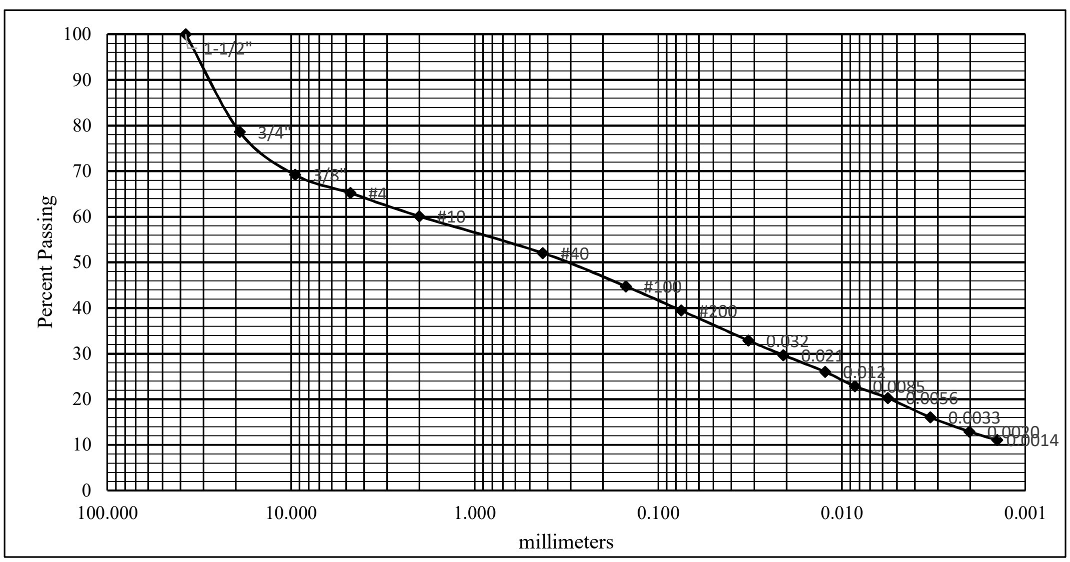
CLIENT:	CPC, LLC		
PROJECT:	Clovewood - South Blooming Grove, NY		
PROJECT No.:	16423	SAMPLE LOT No.:	161208-1
DATE SAMPLED:	12/5-8/16	DATE TESTED:	12/22/2016
SAMPLED BY:	Wyeth Patton	TESTED BY:	Wyeth Patton

SIEVE-AND-HYDROMETER ANALYSIS TEST REPORT

TEST METHOD(s): ASTM D422, AASHTO T88

Sample Location	B4-S6
Depth	21 feet

Sieve Size		Percent Retained	Percent Passing	Specification
inches	mm			
1-1/2"	37.5	0	100	
3/4"	19.0	21	79	
3/8"	9.5	10	69	
#4	4.75	4	65	
#10	2.00	5	60	
#40	0.425	8	52	
#100	0.150	7	45	
#200	0.075	6	39	
Hydrometer Analysis	0.050	3	36	
	0.020	7	29	
	0.010	5	24	
	0.005	5	19	
	0.002	6	13	
	<0.002	13		



USDA Particle Size Classification:		
Gravel, 2.00mm to 3"	40	**USDA Textural Class:** Loam (gravelly)
Sand, 2.00 to 0.050mm:	24	**USCS Classification (ASTM D2487/D2488):**
Silt, 0.050 to 0.002mm:	23	GC, Clayey Gravel with Sand
Clay, <0.002mm	13	
Total	100	Atterberg Limits were determined by: Test

Reviewed by: *Kevin Patton*

Form HYD

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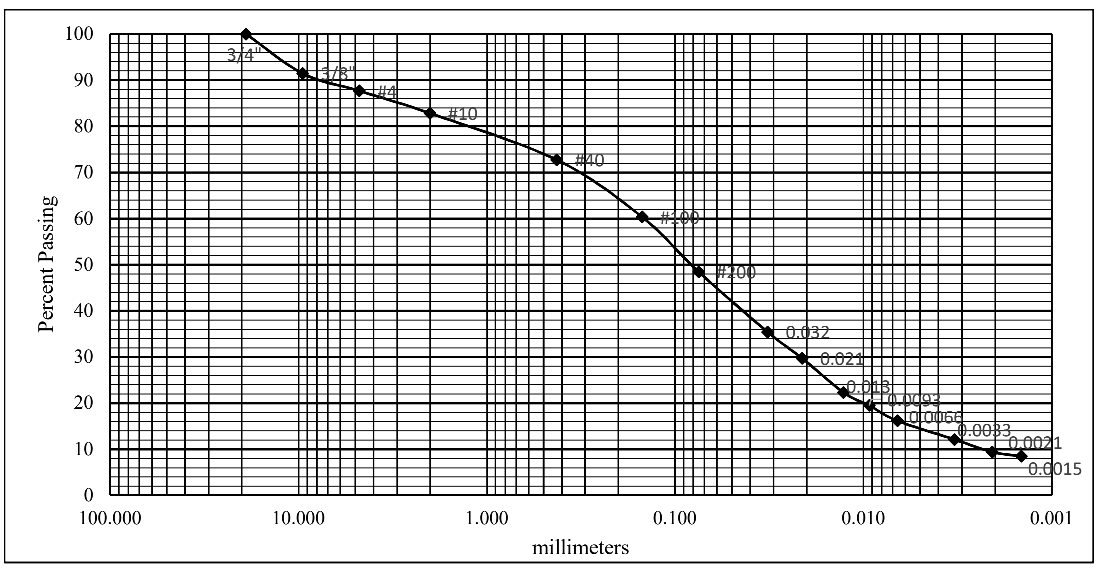
CLIENT:	CPC, LLC		
PROJECT:	Clovewood - South Blooming Grove, NY		
PROJECT No.:	16423	SAMPLE LOT No.:	161208-1
DATE SAMPLED:	12/5-8/16	DATE TESTED:	12/27/2016
SAMPLED BY:	Wyeth Patton	TESTED BY:	Wyeth Patton

SIEVE-AND-HYDROMETER ANALYSIS TEST REPORT

TEST METHOD(s): ASTM D422, AASHTO T88

Sample Location	B9-S2
Depth	3 feet

Sieve Size		Percent Retained	Percent Passing	Specification
inches	mm			
3/4"	19.0	0	100	
3/8"	9.5	9	91	
#4	4.75	3	88	
#10	2.00	5	83	
#40	0.425	10	73	
#100	0.150	13	60	
#200	0.075	12	48	
Hydrometer Analysis	0.050	6	42	
	0.020	13	29	
	0.010	9	20	
	0.005	6	14	
	0.002	5	9	
	<0.002	9		



USDA Particle Size Classification:	
Gravel, 2.00mm to 3"	17
Sand, 2.00 to 0.050mm:	41
Silt, 0.050 to 0.002mm:	33
Clay, <0.002mm	9
Total	100

USDA Textural Class: Silt Loam

USCS Classification (ASTM D2487/D2488):
SC-SM, Silty Clayey Sand

Atterberg Limits were determined by: Test

Reviewed by: *Kevin Patton*

Form HYD

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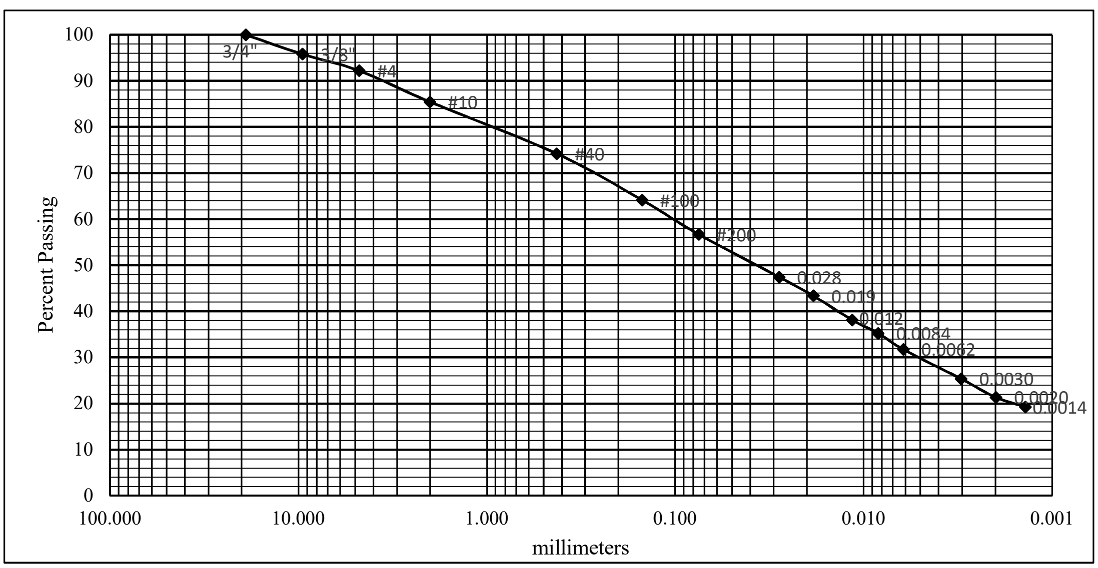
CLIENT:	CPC, LLC		
PROJECT:	Clovewood - South Blooming Grove, NY		
PROJECT No.:	16423	SAMPLE LOT No.:	161208-1
DATE SAMPLED:	12/5-8/16	DATE TESTED:	12/22/2016
SAMPLED BY:	Wyeth Patton	TESTED BY:	Wyeth Patton

SIEVE-AND-HYDROMETER ANALYSIS TEST REPORT

TEST METHOD(s): ASTM D422, AASHTO T88

Sample Location	B11-S5
Depth	16 feet

Sieve Size		Percent Retained	Percent Passing	Specification
inches	mm			
3/4"	19.0	0	100	
3/8"	9.5	4	96	
#4	4.75	4	92	
#10	2.00	7	85	
#40	0.425	11	74	
#100	0.150	10	64	
#200	0.075	7	57	
Hydrometer Analysis	0.050	5	52	
	0.020	8	44	
	0.010	7	37	
	0.005	7	30	
	0.002	9	21	
	<0.002	21		



USDA Particle Size Classification:	
Gravel, 2.00mm to 3"	15
Sand, 2.00 to 0.050mm:	33
Silt, 0.050 to 0.002mm:	31
Clay, <0.002mm	21
Total	100

USDA Textural Class: Loam

USCS Classification (ASTM D2487/D2488):
CL, Sandy Lean Clay

Atterberg Limits were determined by: Estimated (ASTM D2488)

Reviewed by: *Kevin Patton*

Form HYD

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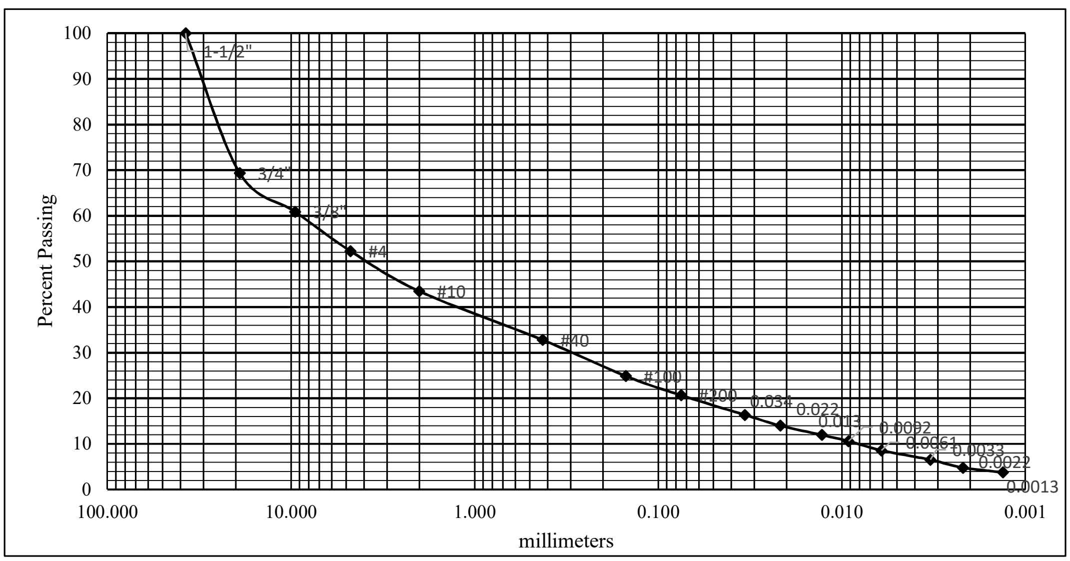
CLIENT:	CPC, LLC		
PROJECT:	Clovewood - South Blooming Grove, NY		
PROJECT No.:	16423	SAMPLE LOT No.:	161208-1
DATE SAMPLED:	12/5-8/16	DATE TESTED:	12/27/2016
SAMPLED BY:	Wyeth Patton	TESTED BY:	Wyeth Patton

SIEVE-AND-HYDROMETER ANALYSIS TEST REPORT

TEST METHOD(s): ASTM D422, AASHTO T88

Sample Location	B12-S3
Depth	6 feet

Sieve Size		Percent Retained	Percent Passing	Specification
inches	mm			
1-1/2"	37.5	0	100	
3/4"	19.0	31	69	
3/8"	9.5	8	61	
#4	4.75	9	52	
#10	2.00	9	43	
#40	0.425	10	33	
#100	0.150	8	25	
#200	0.075	4	21	
Hydrometer Analysis	0.050	3	18	
	0.020	4	14	
	0.010	3	11	
	0.005	3	8	
	0.002	4	4	
	<0.002	4		



USDA Particle Size Classification:	
Gravel, 2.00mm to 3"	57
Sand, 2.00 to 0.050mm:	25
Silt, 0.050 to 0.002mm:	14
Clay, <0.002mm	4
Total	100

USDA Textural Class: Sandy Loam (Gravelly)

USCS Classification (ASTM D2487/D2488):
GM, Silty Gravel with Sand

Atterberg Limits were determined by: Estimated (ASTM D2488)

Reviewed by: *Kevin Patton*

Form HYD

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CLIENT:	CPC, LLC		
PROJECT:	Clovewood - South Blooming Grove, NY		
PROJECT No.:	16423	SAMPLE LOT No.:	161208-1
DATE SAMPLED:	12/5-8/16	DATE TESTED:	12/17/2016
SAMPLED BY:	Wyeth Patton	TESTED BY:	Wyeth Patton

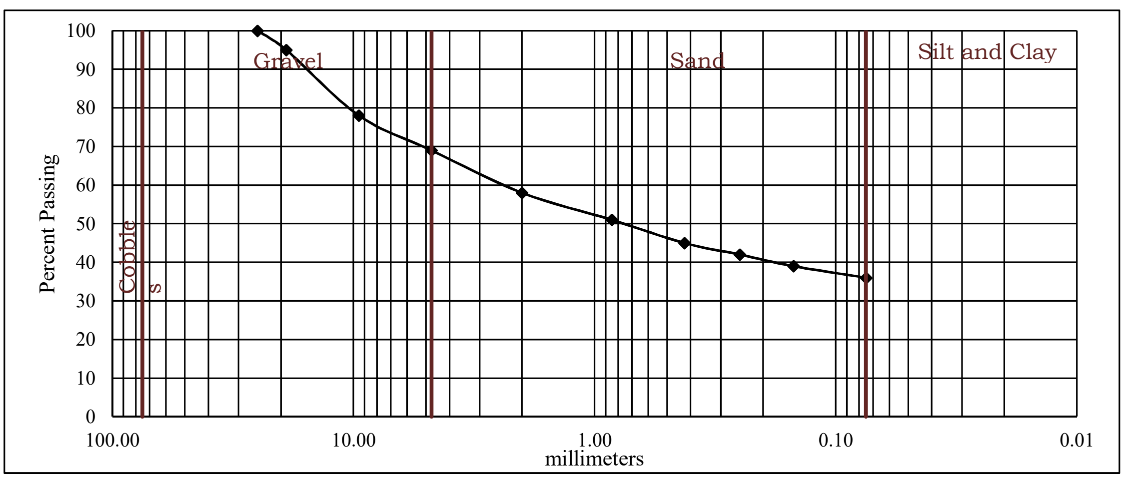
GRADATION ANALYSIS TEST REPORT

TEST METHOD(s): ASTM D422, D1140, AASHTO T311

Sample Location	B16-S2
Depth	3 feet

Sieve Size		Percent Retained	Percent Passing	Specification
inches	mm			
1"	25.0	0	100	
3/4"	19.0	5	95	
3/8"	9.5	17	78	
#4	4.75	9	69	
#10	2.00	11	58	
#20	0.850	7	51	
#40	0.425	6	45	
#60	0.250	3	42	
#100	0.150	3	39	
#200	0.075	3	36	
Pan		36.0	---	
Total		100	---	

Percent passing #200 by wash-sieve method.



Particle type size ranges are per USCS Classification.

D60 (millimeters)	2.3	Uniformity Coefficient (Cu)	Not Determined
D30	<0.075	Coefficient of Curvature (Cc)	Not Determined
D10 (Effective Size)	<0.075	USCS Class*	SM, Silty Sand with Gravel
*For soils with more than 5% passing #200 sieve, Atterberg Limits were determined by:			Estimated (ASTM D2488)

Reviewed by: *Kevin Patton*

Form GRW

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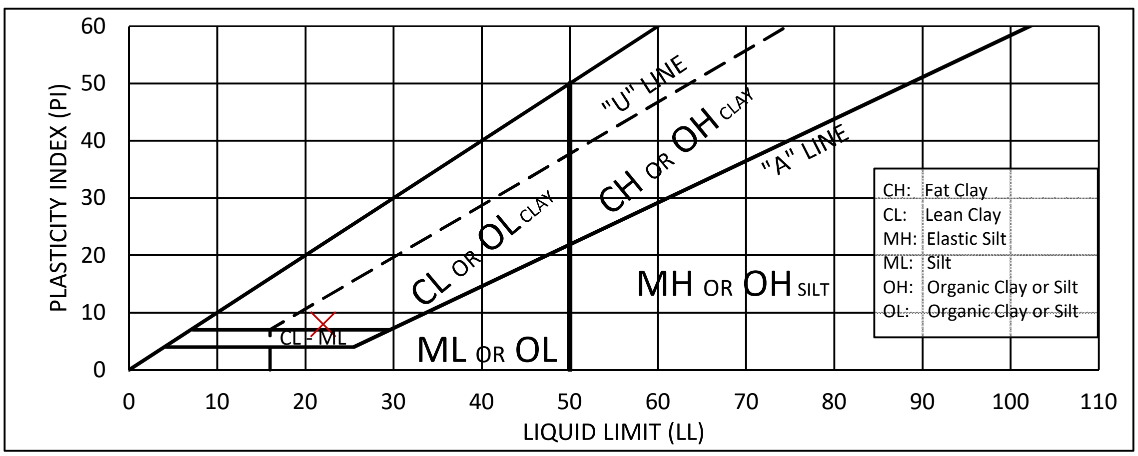
CLIENT:	CPC, LLC		
PROJECT:	Clovewood - South Blooming Grove, NY		
PROJECT No.:	16423	SAMPLE LOT No.:	161208-1
DATE SAMPLED:	12/5-8/16	DATE TESTED:	12/16/2016
SAMPLED BY:	Wyeth Patton	TESTED BY:	Wyeth Patton

ATTERBERG LIMITS TEST

TEST METHODS: ASTM D4318/ AASHTO T89, T90

Sample Location	B4-S3
Depth	6 feet
Percent Passing #40	80
Liquid Limit (LL)	**22**
Plastic Limit (PL)	**14**
Plasticity Index (PI)	**8**
USCS Class of -#40	CL



LL, PL and PI values are percent moisture of the soil by dry mass.

Test is performed on the 'matrix' fraction of the soil, finer than the #40 (0.425mm) sieve.

The Liquid Limit is the moisture content at which the matrix fraction of the soil changes from a stiff to a flowing consistency. The plastic limit is the moisture content at which it changes from cohesive to crumbly. The Plasticity Index is the Liquid Limit minus the Plastic Limit.

Reviewed by: *Kevin Patton*

Form ABL

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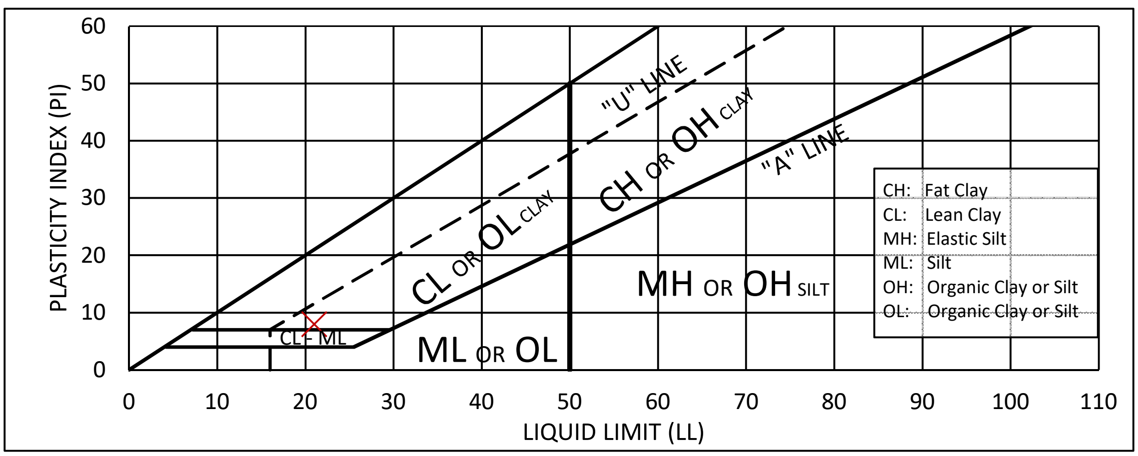
CLIENT:	CPC, LLC		
PROJECT:	Clovewood - South Blooming Grove, NY		
PROJECT No.:	16423	SAMPLE LOT No.:	161208-1
DATE SAMPLED:	12/5-8/16	DATE TESTED:	12/16/2016
SAMPLED BY:	Wyeth Patton	TESTED BY:	Wyeth Patton

ATTERBERG LIMITS TEST

TEST METHODS: ASTM D4318/ AASHTO T89, T90

Sample Location	B4-S6
Depth	21 feet
Percent Passing #40	80
Liquid Limit (LL)	**21**
Plastic Limit (PL)	**13**
Plasticity Index (PI)	**8**
USCS Class of -#40	CL



LL, PL and PI values are percent moisture of the soil by dry mass.

Test is performed on the 'matrix' fraction of the soil, finer than the #40 (0.425mm) sieve.

The Liquid Limit is the moisture content at which the matrix fraction of the soil changes from a stiff to a flowing consistency. The plastic limit is the moisture content at which it changes from cohesive to crumbly. The Plasticity Index is the Liquid Limit minus the Plastic Limit.

Reviewed by: *Kevin Patton*

Form ABL

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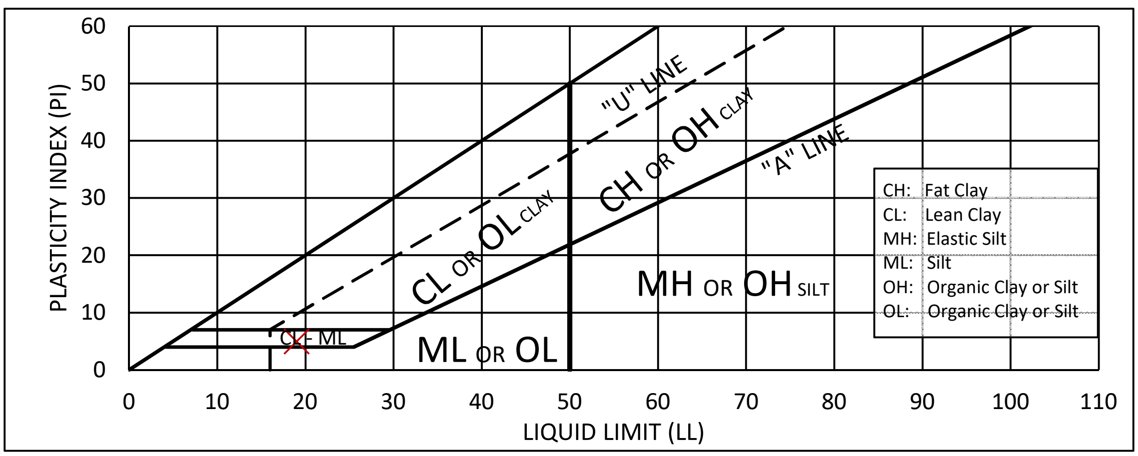
845 275-7732 kevin@pattongeotech.com

CLIENT:	CPC, LLC		
PROJECT:	Clovewood - South Blooming Grove, NY		
PROJECT No.:	16423	SAMPLE LOT No.:	161208-1
DATE SAMPLED:	12/5-8/16	DATE TESTED:	12/30/2016
SAMPLED BY:	Wyeth Patton	TESTED BY:	Wyeth Patton

ATTERBERG LIMITS TEST

TEST METHODS: ASTM D4318/ AASHTO T89, T90

Sample Location	B9-S2
Depth	3 feet
Percent Passing #40	68
Liquid Limit (LL)	**19**
Plastic Limit (PL)	**14**
Plasticity Index (PI)	**5**
USCS Class of -#40	CL-ML



LL, PL and PI values are percent moisture of the soil by dry mass.

Test is performed on the 'matrix' fraction of the soil, finer than the #40 (0.425mm) sieve.

The Liquid Limit is the moisture content at which the matrix fraction of the soil changes from a stiff to a flowing consistency. The plastic limit is the moisture content at which it changes from cohesive to crumbly. The Plasticity Index is the Liquid Limit minus the Plastic Limit.

Reviewed by: *Kevin Patton*

Appendix F

USDA Soil Report Data

Soil Map

Engineering Properties

Map Scale: 1:12,100 if printed on B portrait (11" x 17") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, New York
Survey Area Data: Version 17, Sep 24, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 26, 2011—Apr 16, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Orange County, New York (NY071)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Ab	Alden silt loam	13.8	2.2%
Ca	Canandaigua silt loam	21.4	3.4%
ErB	Erie gravelly silt loam, 3 to 8 percent slopes	33.3	5.3%
HLC	Hollis soils, sloping	24.4	3.9%
HoC	Hoosic gravelly sandy loam, 8 to 15 percent slopes	2.8	0.4%
MdB	Mardin gravelly silt loam, 3 to 8 percent slopes	67.1	10.6%
MdC	Mardin gravelly silt loam, 8 to 15 percent slopes	316.5	50.1%
MdD	Mardin gravelly silt loam, 15 to 25 percent slopes	13.6	2.2%
Ra	Raynham silt loam	15.0	2.4%
ROF	Rock outcrop-Hollis complex, very steep	0.6	0.1%
SXC	Swartswood and Mardin soils, sloping, very stony	73.3	11.6%
UH	Udorthents, smoothed	41.2	6.5%
UnB	Unadilla silt loam, 0 to 8 percent slopes	6.3	1.0%
W	Water	3.1	0.5%
Totals for Area of Interest		**632.4**	**100.0%**

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Percentage of rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Report—Engineering Properties

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Engineering Properties–Orange County, New York														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
Ab—Alden silt loam														
Alden	80	C/D	0-9	Silt loam	ML, OL	A-5, A-7	0- 0- 0	0- 0- 0	85-95-100	75-92-100	60-85-100	35-70-85	40-45-50	5-10-15
			9-36	Silt loam, silty clay loam, very fine sandy loam	CL, CL-ML	A-4, A-6	0- 0- 1	0- 0- 3	85-90-100	75-85-100	60-75-95	35-60-90	20-28-35	5-10-15
			36-60	Gravelly fine sandy loam, loam, silty clay loam	CL, CL-ML, GC, SC	A-2, A-4, A-6	0- 0- 3	0- 2- 5	65-80-95	50-70-92	35-55-90	20-35-85	20-28-35	5-10-15

Engineering Properties–Orange County, New York														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
ANC—Arnot-Lordstown complex, sloping														
Arnot	50	D	0-4	Channery silt loam	GM, ML, SM	A-2, A-4, A-5	0- 0- 2	0- 3- 10	65-75-90	55-65-75	40-55-70	30-45-65	35-40-45	1-5 -9
			4-15	Very channery silt loam, very channery loam	GM	A-1, A-2, A-4	0- 0- 3	1- 8- 25	50-65-70	30-50-50	25-45-50	20-40-45	20-28-35	1-5 -9
			15-19	Unweathered bedrock	—	—	0- 0- 0	0- 0- 0	—	—	—	—	—	—
Lordstown	35	C	0-2	Highly decomposed plant material	PT	A-8	0- 0- 2	0- 2- 10	100-100-100	100-100-100	—	—	—	—
			2-8	Channery silt loam	GM, ML, SM	A-4	0- 0- 2	0- 2- 10	65-85-92	50-75-75	40-65-70	30-55-65	15-23-30	NP-2 -4
			8-21	Channery silt loam, channery loam	GM, ML, SM	A-4	0- 0- 2	0- 2- 10	65-85-92	50-75-75	40-60-70	30-45-65	15-23-30	NP-2 -4
			21-37	Channery loam, channery silt loam, very channery fine sandy loam	GM, ML, SM	A-2, A-4	0- 0- 3	0- 2- 15	65-80-92	50-70-75	40-60-70	30-40-65	15-23-30	NP-2 -4
			37-41	Unweathered bedrock	—	—	0- 0- 0	0- 0- 0	—	—	—	—	—	—

Engineering Properties–Orange County, New York														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
ANF—Arnot-Lordstown complex, very steep														
Arnot	65	D	0-3	Channery silt loam	GM, ML, SM	A-2, A-4, A-5	0- 0- 2	0- 3- 10	65-75-90	55-65-75	40-55-70	30-45-65	35-40-45	1-5 -9
			3-13	Very channery silt loam, very channery loam	GM	A-1, A-2, A-4	0- 0- 3	1- 8- 25	50-65-70	30-50-50	25-45-50	20-40-45	20-28-35	1-5 -9
			13-19	Unweathered bedrock	—	—	0- 0- 0	0- 0- 0	—	—	—	—	—	—
Lordstown	25	C	0-2	Highly decomposed plant material	PT	A-8	0- 0- 2	0- 2- 10	100-100-100	100-100-100	—	—	—	—
			2-7	Channery silt loam	GM, ML, SM	A-4	0- 0- 2	0- 2- 10	65-85-92	50-75-75	40-65-70	30-55-65	15-23-30	NP-2 -4
			7-21	Channery silt loam, channery loam	GM, ML, SM	A-4	0- 0- 2	0- 2- 10	65-85-92	50-75-75	40-60-70	30-45-65	15-23-30	NP-2 -4
			21-34	Channery loam, channery silt loam, very channery fine sandy loam	GM, ML, SM	A-2, A-4	0- 0- 3	0- 2- 15	65-80-92	50-70-75	40-60-70	30-40-65	15-23-30	NP-2 -4
			34-43	Unweathered bedrock	—	—	0- 0- 0	0- 0- 0	—	—	—	—	—	—
Ca—Canandaigua silt loam														
Canandaigua	75	B/D	0-8	Silt loam	CL, ML, OL	A-6, A-7	0- 0- 0	0- 0- 0	95-100-100	92-100-100	80-95-100	65-80-95	35-40-45	10-15-20
			8-35	Silt loam, silty clay loam	CL, CL-ML	A-4, A-6	0- 0- 0	0- 0- 0	95-100-100	92-100-100	80-95-100	65-80-95	20-30-40	5-13-20
			35-60	Stratified very gravelly sand to loamy fine sand, fine sand	SW-SM, SM, SP, SW	A-1, A-2, A-3	0- 0- 0	0- 0- 5	65-100-100	50-100-100	25-70-80	2-25- 35	—	NP

Engineering Properties–Orange County, New York														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
ErA—Erie gravelly silt loam, 0 to 3 percent slopes														
Erie	75	D	0-10	Gravelly silt loam	GM, ML, SM	A-2, A-4	0- 0- 0	0- 2- 5	65-85-90	50-75-75	35-65-70	20-60-65	30-35-40	5-8 -10
			10-18	Channery fine sandy loam, channery silt loam, channery loam	CL, CL-ML, GC, SC	A-1, A-2, A-4	0- 0- 2	0- 2- 10	65-85-90	50-75-75	35-65-70	20-55-65	15-20-25	5-8 -10
			18-56	Channery silt loam, channery silty clay loam, very channery loam	CL, GC, SC	A-2, A-6	0- 2- 5	0- 2- 20	50-80-85	35-70-70	25-65-70	20-55-65	25-30-35	10-13-15
			56-70	Channery silt loam, channery silty clay loam, very channery loam	CL, GC, SC	A-2, A-6, A-4	0- 2- 5	0- 2- 25	50-80-85	35-70-70	25-65-70	20-55-65	25-30-35	10-13-15
ErB—Erie gravelly silt loam, 3 to 8 percent slopes														
Erie	80	D	0-9	Gravelly silt loam	GM, ML, SM	A-2, A-4	0- 0- 0	0- 2- 5	65-85-90	50-75-75	35-65-70	20-60-65	30-35-40	5-8 -10
			9-18	Channery fine sandy loam, channery silt loam, channery loam	CL, CL-ML, GC, SC	A-1, A-2, A-4	0- 0- 2	0- 2- 10	65-85-90	50-75-75	35-65-70	20-55-65	15-20-25	5-8 -10
			18-54	Channery silt loam, channery silty clay loam, very channery loam	CL, GC, SC	A-2, A-6, A-4	0- 2- 5	0- 2- 20	50-80-85	35-70-70	25-65-70	20-55-65	25-30-35	10-13-15
			54-70	Channery silt loam, channery silty clay loam, very channery loam	CL, GC, SC	A-2, A-6	0- 2- 5	0- 2- 25	50-80-85	35-70-70	25-65-70	20-55-65	25-30-35	10-13-15

Engineering Properties–Orange County, New York

Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
HLC—Hollis soils, sloping														
Hollis	80	D	0-3	Highly decomposed plant material	PT	A-8	0- 0- 0	0- 2- 10	100-100 -100	100-100 -100	—	—	—	—
			3-8	Gravelly loam	GM, ML, SM	A-2, A-4	0- 0- 0	0- 2- 10	70-85- 98	65-75- 96	35-70- 90	20-45- 70	15-20 -25	NP-3 -5
			8-18	Sandy loam, fine sandy loam, gravelly loam	GM, ML, SM	A-2, A-4	0- 0- 2	0- 3- 15	70-80- 98	65-70- 96	35-70- 90	20-45- 70	15-20 -25	NP-3 -5
			18-22	Unweathered bedrock	—	—	0- 0- 0	0- 0- 0	—	—	—	—	—	—
HoC—Hoosic gravelly sandy loam, 8 to 15 percent slopes														
Hoosic	80	A	0-5	Gravelly sandy loam	GM, ML, SM	A-1, A-2, A-4, A-5	0- 0- 0	0- 5- 10	50-70- 90	35-60- 75	15-40- 65	10-20- 50	30-38 -45	2-6 -10
			5-25	Gravelly sandy loam, very gravelly sandy loam, gravelly loam	GM, SM, SP-SM, SC-SM	A-1, A-2, A-4	0- 0- 0	0- 7- 10	50-65- 90	35-50- 75	15-30- 65	10-15- 50	20-25 -30	2-5 -8
			25-60	Very gravelly sand, very gravelly loamy sand, extremely gravelly loamy sand	GW, GM, SM, GP	A-1	0- 0- 0	0- 8- 15	40-50- 75	30-35- 50	15-20- 30	0- 2- 15	—	NP

Engineering Properties–Orange County, New York

Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
MdB—Mardin gravelly silt loam, 3 to 8 percent slopes														
Mardin	85	D	0-8	Silt loam, gravelly silt loam, channery silt loam, channery loam	GC-GM, ML, MH	A-4, A-7-5, A-2-4	0- 0- 3	0- 4- 19	43-70-90	41-68-90	33-62-89	28-54-82	27-35-56	6-9 -16
			8-15	Flaggy silt loam, channery loam, silt loam, loam, channery silt loam, gravelly silt loam, gravelly loam	GC-GM, CL	A-4, A-6, A-2-4	0- 0- 3	0- 4- 18	44-71-91	41-69-90	34-61-88	28-54-81	22-27-38	6-9 -15
			15-20	Channery loam, silt loam, loam, channery silt loam, gravelly silt loam, gravelly loam	CL-ML, GM, CL	A-6, A-4, A-2-4	0- 0- 3	0- 4- 18	46-72-91	43-71-91	34-63-88	26-51-77	17-23-32	2-7 -12
			20-72	Very flaggy silt loam, very flaggy loam, very channery loam, very channery silt loam, channery loam, channery silt loam, gravelly loam, gravelly silt loam	GM, CL	A-6, A-1-b	0- 3- 17	3- 6- 40	33-74-82	30-73-81	23-63-80	18-55-73	16-28-35	2-12-17

Engineering Properties–Orange County, New York														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
MdC—Mardin gravelly silt loam, 8 to 15 percent slopes														
Mardin	85	D	0-8	Channery silt loam, silt loam, gravelly silt loam, channery loam	MH, GC-GM, ML	A-2-4, A-7-5, A-4	0- 0- 3	0- 4- 19	43-70-90	41-68-90	33-62-89	28-54-82	27-35-56	6-9 -16
			8-15	Channery silt loam, gravelly loam, loam, gravelly silt loam, channery loam, silt loam, flaggy silt loam	GC-GM, CL	A-6, A-2-4, A-4	0- 0- 3	0- 4- 18	44-71-91	41-69-90	34-61-88	28-54-81	22-27-38	6-9 -15
			15-20	Gravelly silt loam, loam, gravelly loam, channery silt loam, channery loam, silt loam	CL-ML, GM, CL	A-6, A-4, A-2-4	0- 0- 3	0- 4- 18	46-72-91	43-71-91	34-63-88	26-51-77	17-23-32	2-7 -12
			20-72	Very flaggy loam, very channery loam, channery silt loam, gravelly loam, very channery silt loam, channery loam, gravelly silt loam, very flaggy silt loam	GM, CL	A-6, A-1-b	0- 3- 17	3- 6- 40	33-74-82	30-73-81	23-63-80	18-55-73	16-28-35	2-12-17

Engineering Properties–Orange County, New York														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
MdD—Mardin gravelly silt loam, 15 to 25 percent slopes														
Mardin	85	D	0-8	Channery silt loam, silt loam, gravelly silt loam, channery loam	MH, GC-GM, ML	A-2-4, A-7-5, A-4	0- 0- 3	0- 4- 19	43-70-90	41-68-90	33-62-89	28-54-82	27-35-56	6-9 -16
			8-15	Channery silt loam, gravelly loam, loam, gravelly silt loam, channery loam, silt loam, flaggy silt loam	GC-GM, CL	A-6, A-2-4, A-4	0- 0- 3	0- 4- 18	44-71-91	41-69-90	34-61-88	28-54-81	22-27-38	6-9 -15
			15-20	Gravelly silt loam, loam, gravelly loam, channery silt loam, channery loam, silt loam	CL-ML, GM, CL	A-6, A-4, A-2-4	0- 0- 3	0- 4- 18	46-72-91	43-71-91	34-63-88	26-51-77	17-23-32	2-7 -12
			20-72	Very flaggy loam, very channery loam, channery silt loam, gravelly loam, very channery silt loam, channery loam, gravelly silt loam, very flaggy silt loam	CL, GM	A-6, A-1-b	0- 3- 17	3- 6- 40	33-74-82	30-73-81	23-63-80	18-55-73	16-28-35	2-12-17

Engineering Properties–Orange County, New York														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
Ra—Raynham silt loam														
Raynham, poorly drained	50	C/D	0-8	Silt loam	CL-ML, ML	A-4	0- 0- 0	0- 0- 0	100-100-100	95-100-100	80-95-100	45-80-90	15-20-25	NP-3 -5
			8-26	Silt loam, silt, very fine sandy loam	CL-ML, ML	A-4	0- 0- 0	0- 0- 0	100-100-100	95-100-100	80-95-100	45-80-90	15-20-25	NP-3 -5
			26-60	Silt loam, silt, very fine sandy loam	CL-ML, ML	A-4	0- 0- 0	0- 0- 0	100-100-100	95-100-100	80-95-100	45-80-90	15-20-25	NP-3 -5
Raynham, somewhat poorly drained	25	C/D	0-8	Silt loam	CL-ML, ML	A-4	0- 0- 0	0- 0- 0	100-100-100	95-100-100	80-95-100	45-80-90	15-20-25	NP-3 -5
			8-26	Silt loam, silt, very fine sandy loam	CL-ML, ML	A-4	0- 0- 0	0- 0- 0	100-100-100	95-100-100	80-95-100	45-80-90	15-20-25	NP-3 -5
			26-60	Silt loam, silt, very fine sandy loam	CL-ML, ML	A-4	0- 0- 0	0- 0- 0	100-100-100	95-100-100	80-95-100	45-80-90	15-20-25	NP-3 -5

Engineering Properties–Orange County, New York														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
SXC—Swartswood and Mardin soils, sloping, very stony														
Mardin, very stony	40	D	0-4	Gravelly silt loam, channery silt loam, silt loam, channery loam	GM, OL, OH	A-5, A-2-4, A-7-5	0- 0- 3	0- 4- 19	42-69-90	40-67-90	32-61-89	27-53-82	31-46-77	5-9 -16
			4-15	Silt loam, flaggy silt loam, channery silt loam, gravelly loam, loam, gravelly silt loam, channery loam	GC-GM, CL	A-6, A-2-4, A-4	0- 0- 3	0- 4- 18	44-71-91	41-69-90	34-61-88	28-54-81	22-27-38	6-9 -15
			15-20	Channery loam, gravelly silt loam, loam, gravelly loam, channery silt loam, silt loam	CL-ML, GM, CL	A-4, A-2-4, A-6	0- 0- 3	0- 4- 18	46-72-91	43-71-91	34-63-88	26-51-77	17-23-32	2-7 -12

Engineering Properties–Orange County, New York														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
			20-72	Very channery silt loam, very flaggy loam, very channery loam, channery silt loam, gravelly loam, channery loam, gravelly silt loam, very flaggy silt loam	GM, CL	A-6, A-1-b	0- 3- 17	3- 6- 40	33-74-82	30-73-81	23-63-80	18-55-73	16-28-35	2-12-17
Swartswood, very stony	40	C	0-3	Gravelly loam	GM, ML, SM	A-1, A-2, A-4	1- 3- 5	0- 2- 15	65-80-90	50-70-75	30-60-65	15-45-50	—	—
			3-31	Gravelly fine sandy loam, flaggy sandy loam, channery loam	GM, ML, SM	A-1, A-2, A-4	0- 1- 3	0- 2- 20	65-80-90	50-70-75	30-55-65	15-35-50	15-20-25	NP-2 -3
			31-60	Gravelly fine sandy loam, flaggy sandy loam, very channery loam	GM, GW-GM, ML, SM	A-1, A-2, A-4	0- 1- 5	0- 2- 25	50-80-90	35-70-75	15-55-65	10-35-50	15-18-20	NP-2 -3
UH—Udorthents, smoothed														
Udorthents	75	A	0-4	Channery loam	CL, GC, ML, SM	A-2, A-4, A-6	0- 0- 0	0- 5- 10	60-70-80	55-65-75	35-55-75	20-45-70	15-30-45	NP-8 -15
			4-70	Very gravelly sandy loam, channery loam, silty clay loam	CL, GM, ML, SC	A-1, A-2, A-4, A-6	0- 0- 0	0- 5- 10	35-68-100	30-65-100	20-40-100	10-25-95	15-30-45	NP-8 -15

Engineering Properties–Orange County, New York														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
UnB—Unadilla silt loam, 0 to 8 percent slopes														
Unadilla	75	B	0-8	Silt loam	ML, CL-ML	A-4	0- 0- 0	0- 0- 0	100-100-100	95-100-100	75-95-100	45-80-90	15-25-35	NP-5-10
			8-44	Silt loam, very fine sandy loam	CL-ML, ML	A-4	0- 0- 0	0- 0- 0	100-100-100	95-100-100	75-95-100	45-80-90	15-20-25	NP-5-10
			44-60	Stratified very gravelly sand, gravelly sand, fine sandy loam	GM, GP, SM, SP	A-1, A-2, A-3	0- 0- 0	0- 3- 10	45-65-98	30-50-95	15-30-70	1- 3- 30	—	NP

Data Source Information

Soil Survey Area: Orange County, New York
Survey Area Data: Version 16, Sep 24, 2015

CLOVEWOOD

Draft Environmental Impact Statement

Responses to Village Geotechnical Comment

Community Planning Consultants

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36 PATTON ROAD
NEWBURGH, N.Y. 12550
845 275-7732 PATTONGEOTECH.COM

CLIENT:	CPC, LLC P.O. Box 2020 Monroe, NY 10949 Mr. Simon Gelb	PROJECT: PROJ. No.: DATE:	Clovewood South Blooming Grove, NY 16423 November 26, 2018

Re: Village Geotechnical Comments

1. Soil Mitigation Measures in Geotechnical Report
My 'Geotechnical Investigation Report' dated January 9, 2017 describes some procedures to mitigate or minimize erosion and sediment generation during construction. The procedures described are standard construction best-practices. The Village noted that the DEIS should include this information.

2. Soil Erosion Potential
The erosion resistance of the on-site soils was discussed briefly, but not specifically, in section 3.1.9 of my 1/9/17 report. Attached are copies of the USDA Soil Map and Physical Soil Properties report for the site and adjacent areas. Values for erosion potential for each layer of each soil type is given in the report, as follow:

Kw Erosion Factor: Susceptibility of the whole soil to erosion by water
Kf Erosion Factor: Susceptibility of the fine fraction of the soil (minus-#10) to erosion by water
Kw and Kf range can from 0.02 (least susceptible) to 0.69 (most susceptible.)
T: Maximum annual soil erosion by water and wind (tons/acre/year) that will not affect crop production.
Wind Erodibility Group: Can range from 1 (least) to 8 (most erodible.)
Wind Erodibility Index: Expected wind erosion loss (tons/acre/year.)

Erosion factors for the soils at the site range from Kw = 0.02 to 0.64, and Kf = 0.05 to 0.64, i.e. almost the full range of the scale. The vast majority of the soils to be disturbed is glacial till, with Kw values of 0.20 to 0.37 and Kf values of 0.32 to 0.64. The soil as a whole is moderately susceptible to erosion and the fine portion is moderately to highly susceptible.

The soils have good resistance to wind erosion, with the Wind Erodibility Group ranging from 5 to 7, and Wind Erodibility Index values of 38 to 56.

3. Bedrock Geology
Bedrock in the project area is concealed by deep soil cover; it is shown on the Geologic Map of New York (NY State Museum, 1970) as Devonian and Silurian sedimentary rock (sandstone, limestone, shale, etc.) that formed approximately 360 to 440 million years ago. Schunnemunk Mountain, along the southeast side of the site, is formed from similar Devonian sedimentary rocks.

Immediately west of the site, the bedrock is Normanskill shale (Martinsburg Formation,) consisting of interbedded gray siltstone, shale and sandstone. The Normanskill bedrock is Middle Ordovician in age, deposited approximately 460 million years ago as sediment in a geosyncline (an off-shore ocean setting.) Also immediately to the north and west of the site are several isolated hills (klippen) of older granitic gneiss on top of the Normanskill bedrock; these are the erosional remnants of a thick layer of rock that was thrust into place during the Taconic Orogeny, approximately 550 to 440 million years ago. These are marked 'qtcs' on the attached copy from the State map.

The site lies along an ancient, inactive southwest-to-northeast trending fault that separates the older Normanskill bedrock from the Devonian and Silurian sedimentary rocks underlying the site. There are no active faults in the nearby area.

Deposition of the current soils began during retreat of the last Pleistocene glacier, approximately 15,000 to 18,000 years ago. Soils consist primarily of glacial till, an unsorted or crudely-sorted mix of sand, silt, clay and gravel sizes, with cobbles and boulders. Relatively small areas of 'bank run' sand and gravel, clay, and other soil types are also present, deposited by the glacier or by later streams.

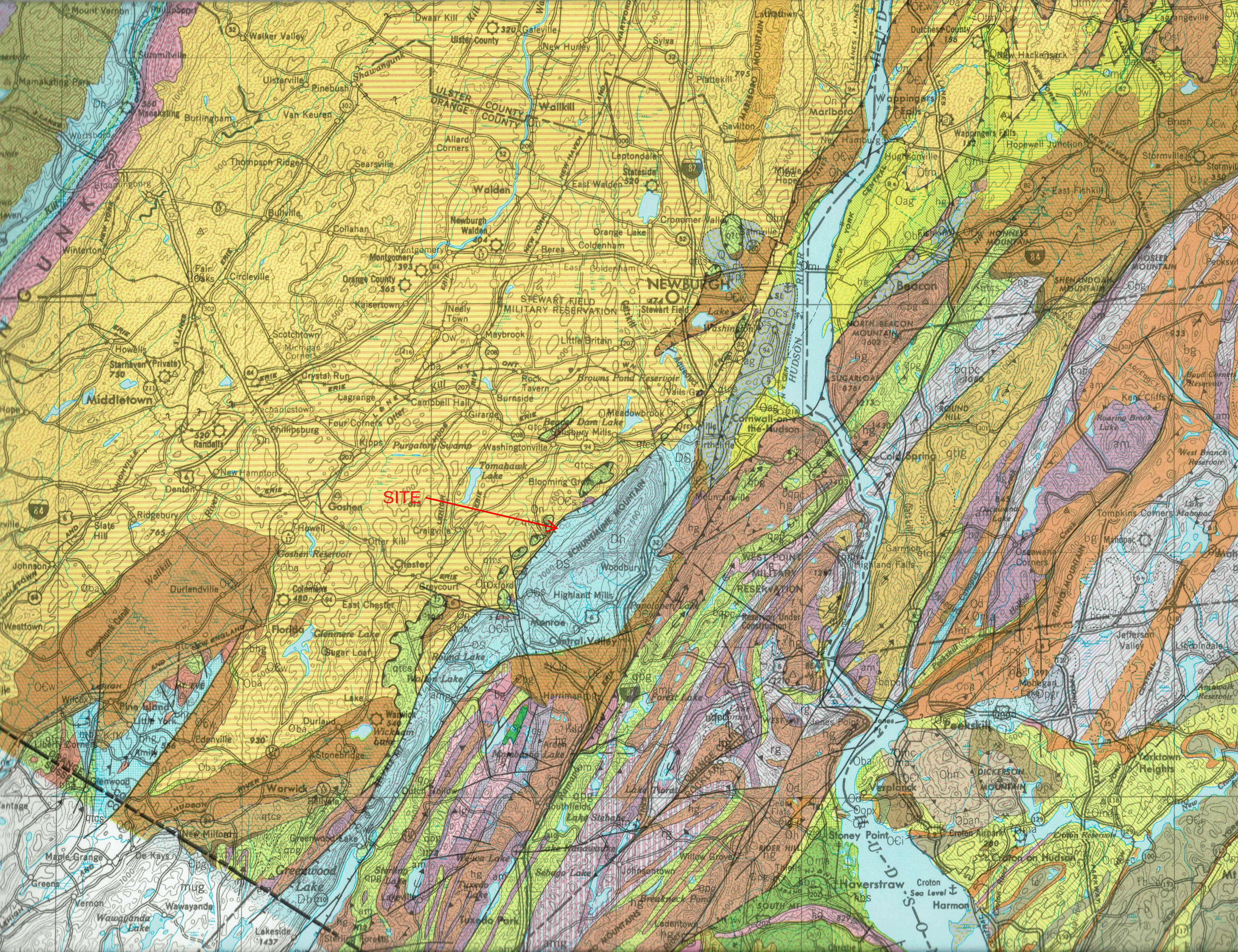
Please contact me if you need any additional information.

Yours truly,

LICENSED PROFESSIONAL ENGINEER KEVIN L. PATTON 072197 STATE OF NEW YORK

November 26, 2018

Kevin L. Patton, P.E.
kevin@pattongeotech.com


SITE
Middletown
Goshen
Chester
Newburgh
Walden
Montgomery
Cornwall-on-the-Hudson
Cold Spring
Beacon
Peekskill
Haverstraw
Croton on Hudson
Stony Point
Warwick
Florida
Monroe
Central Valley
Highland Mills
Woodbury
Washingtonville
Campbell Hall
Craigville
Greycourt
Harriman
Tuxedo Park
Greenwood Lake
West Point Military Reservation
Stewart Field Military Reservation
Hudson River
Schunnemunk Mountain
Wappingers Falls
Marlboro
Yorktown Heights
Jefferson Valley
Mahopac
Garrison
Highland Falls
Verplanck
Wallkill

Soil Map—Orange County, New York
(Clovewood)

Map Scale: 1:12,100 if printed on B portrait (11" x 17") sheet.

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, New York
Survey Area Data: Version 17, Sep 24, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 26, 2011—Apr 16, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Orange County, New York (NY071)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ab	Alden silt loam	13.8	2.2%
Ca	Canandaigua silt loam	21.4	3.4%
ErB	Erie gravelly silt loam, 3 to 8 percent slopes	33.3	5.3%
HLC	Hollis soils, sloping	24.4	3.9%
HoC	Hoosic gravelly sandy loam, 8 to 15 percent slopes	2.8	0.4%
MdB	Mardin gravelly silt loam, 3 to 8 percent slopes	67.1	10.6%
MdC	Mardin gravelly silt loam, 8 to 15 percent slopes	316.5	50.1%
MdD	Mardin gravelly silt loam, 15 to 25 percent slopes	13.6	2.2%
Ra	Raynham silt loam	15.0	2.4%
ROF	Rock outcrop-Hollis complex, very steep	0.6	0.1%
SXC	Swartswood and Mardin soils, sloping, very stony	73.3	11.6%
UH	Udorthents, smoothed	41.2	6.5%
UnB	Unadilla silt loam, 0 to 8 percent slopes	6.3	1.0%
W	Water	3.1	0.5%
Totals for Area of Interest		**632.4**	**100.0%**

Physical Soil Properties

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (Ksat), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (Ksat) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:
United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (http://soils.usda.gov)

Report—Physical Soil Properties

Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Physical Soil Properties–Orange County, New York														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
Ab—Alden silt loam														
Alden	0-9	15-26- 32	50-52- 80	18-22- 27	1.10-1.25 -1.40	4.00-9.00-14.00	0.16-0.19-0. 22	0.0- 1.5- 2.9	4.0- 7.0-10. 0	.28	.28	5	6	48
	9-36	15-26- 82	0-52- 80	18-22- 35	1.20-1.35 -1.50	1.40-2.70-4.00	0.14-0.17-0. 20	0.0- 1.5- 2.9	0.0- 1.0- 3.0	.43	.43			
	36-60	15-67- 82	0-14- 73	18-19- 35	1.50-1.65 -1.80	0.42-2.21-4.00	0.08-0.12-0. 15	0.0- 1.5- 2.9	0.0- 0.5- 1.0	.17	.28			

Physical Soil Properties–Orange County, New York

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
ANC—Arnot-Lordstown complex, sloping														
Arnot	0-4	0-30- 50	50-56- 80	0-14- 27	1.10-1.25-1.40	4.00-9.00-14.00	0.10-0.13-0.15	0.0- 1.5- 2.9	3.0- 4.5- 6.0	.20	.37	1	6	48
	4-15	0-30- 52	28-56- 80	0-14- 27	1.20-1.35-1.50	4.00-9.00-14.00	0.08-0.10-0.12	0.0- 1.5- 2.9	0.0- 1.0- 2.0	.20	.55			
	15-19	—	—	—	—	0.00-0.00-0.01	—	—	—					
Lordstown	0-2	-60-	-30-	-10-	0.10-0.25-0.40	1.40-22.00-42.00	0.35-0.50-0.65	—	80.0-90.0-100.0			2	6	48
	2-8	15-32- 50	50-56- 80	0-12- 17	1.10-1.25-1.40	4.00-9.00-14.00	0.11-0.14-0.17	0.0- 1.5- 2.9	2.0- 4.0- 6.0	.20	.32			
	8-21	15-45- 52	28-43- 80	0-12- 17	1.20-1.35-1.50	4.00-9.00-14.00	0.10-0.13-0.16	0.0- 1.5- 2.9	0.0- 1.0- 2.0	.28	.43			
	21-37	15-45- 85	0-43- 80	0-12- 17	1.20-1.35-1.50	4.00-9.00-14.00	0.05-0.10-0.14	0.0- 1.5- 2.9	0.0- 0.5- 2.0	.32	.55			
	37-41	—	—	—	—	0.00-0.00-0.01	—	—	—					

Physical Soil Properties–Orange County, New York														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/In	Pct	Pct					
ANF—Arnot-Lordstown complex, very steep														
Arnot	0-3	0-30- 50	50-56- 80	0-14- 27	1.10-1.25 -1.40	4.00-9.00-14.00	0.10-0.13-0.15	0.0- 1.5- 2.9	3.0- 4.5- 6.0	.20	.37	1	6	48
	3-13	0-30- 52	28-56- 80	0-14- 27	1.20-1.35 -1.50	4.00-9.00-14.00	0.08-0.10-0.12	0.0- 1.5- 2.9	0.0- 1.0- 2.0	.20	.55			
	13-19	—	—	—	—	0.00-0.00-0.01	—	—	—					
Lordstown	0-2	-60-	-30-	-10-	0.10-0.25 -0.40	1.40-22.00-42.00	0.35-0.50-0.65	—	80.0-90.0 -100.0			2	6	48
	2-7	15-32- 50	50-56- 80	0-12- 17	1.10-1.25 -1.40	4.00-9.00-14.00	0.11-0.14-0.17	0.0- 1.5- 2.9	2.0- 4.0- 6.0	.20	.32			
	7-21	15-45- 52	28-43- 80	0-12- 17	1.20-1.35 -1.50	4.00-9.00-14.00	0.10-0.13-0.16	0.0- 1.5- 2.9	0.0- 1.0- 2.0	.28	.43			
	21-34	15-45- 85	0-43- 80	0-12- 17	1.20-1.35 -1.50	4.00-9.00-14.00	0.05-0.10-0.14	0.0- 1.5- 2.9	0.0- 0.5- 2.0	.32	.55			
	34-43	—	—	—	—	0.00-0.00-0.01	—	—	—					
Ca—Canandaigua silt loam														
Canandaigua	0-8	0-11- 32	50-67- 80	18-22- 27	1.20-1.35 -1.50	1.40-7.70-14.00	0.15-0.19-0.22	0.0- 1.5- 2.9	4.0- 7.0-10.0	.49	.49	5	6	48
	8-35	0- 6- 14	50-62- 80	18-32- 35	1.20-1.35 -1.50	1.40-7.70-14.00	0.15-0.18-0.20	0.0- 1.5- 2.9	0.0- 1.5- 3.0	.49	.49			
	35-60	70-97-100	0- 1- 29	0- 2- 15	1.45-1.55 -1.65	14.00-28.00-42.00	0.02-0.05-0.08	0.0- 1.5- 2.9	0.0- 0.5- 1.0	.15	.15			

Physical Soil Properties–Orange County, New York

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/In	Pct	Pct					
ErA—Erie gravelly silt loam, 0 to 3 percent slopes														
Erie	0-10	15-26- 32	50-52- 80	18-22- 27	1.10-1.25 -1.40	4.00-9.00-14.00	0.10-0.14-0. 17	0.0- 1.5- 2.9	3.0- 5.0- 7.0	.20	.32	3	7	38
	10-18	15-26- 82	0-52- 80	18-22- 27	1.20-1.35 -1.50	4.00-9.00-14.00	0.09-0.13-0. 16	0.0- 1.5- 2.9	0.0- 1.5- 2.0	.32	.43			
	18-56	15-26- 52	28-52- 80	18-22- 35	1.70-1.85 -2.00	0.42-0.91-1.40	0.01-0.02-0. 03	0.0- 1.5- 2.9	0.0- 0.5- 2.0	.28	.49			
	56-70	15-26- 52	28-52- 80	18-22- 35	1.65-1.80 -1.95	0.42-0.91-1.40	0.01-0.02-0. 03	0.0- 1.5- 2.9	0.0- 0.5- 1.0	.28	.49			
ErB—Erie gravelly silt loam, 3 to 8 percent slopes														
Erie	0-9	15-26- 32	50-52- 80	18-22- 27	1.10-1.25 -1.40	4.00-9.00-14.00	0.10-0.14-0. 17	0.0- 1.5- 2.9	3.0- 5.0- 7.0	.20	.32	3	7	38
	9-18	15-26- 82	0-52- 80	18-22- 27	1.20-1.35 -1.50	4.00-9.00-14.00	0.09-0.13-0. 16	0.0- 1.5- 2.9	0.0- 1.5- 2.0	.32	.43			
	18-54	15-26- 52	28-52- 80	18-22- 35	1.70-1.85 -2.00	0.42-0.91-1.40	0.01-0.02-0. 03	0.0- 1.5- 2.9	0.0- 0.5- 2.0	.28	.49			
	54-70	15-26- 52	28-52- 80	18-22- 35	1.65-1.80 -1.95	0.42-0.91-1.40	0.01-0.02-0. 03	0.0- 1.5- 2.9	0.0- 0.5- 1.0	.28	.49			

Physical Soil Properties–Orange County, New York														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
HLC—Hollis soils, sloping														
Hollis	0-3	-60-	-30-	-10-	0.10-0.25-0.40	1.40-22.00-42.00	0.35-0.50-0.65	—	80.0-90.0-100.0			1	6	48
	3-8	24-43- 52	28-40- 50	7-17- 27	1.10-1.25-1.40	4.00-23.00-42.00	0.10-0.14-0.18	0.0- 1.5- 2.9	2.0- 3.5-5.0	.20	.32			
	8-18	24-43- 85	0-40- 50	0-17- 27	1.30-1.43-1.55	4.00-23.00-42.00	0.06-0.12-0.18	0.0- 1.5- 2.9	0.0- 1.0-2.0	.28	.49			
	18-22	—	—	—	—	0.00-0.00-0.01	—	—	—					
HoC—Hoosic gravelly sandy loam, 8 to 15 percent slopes														
Hoosic	0-5	44-67- 85	0-23- 49	0-10- 15	1.10-1.25-1.40	14.00-78.00-141.00	0.05-0.09-0.12	0.0- 1.5- 2.9	2.0- 4.0-6.0	.05	.10	5	5	56
	5-25	24-67- 85	0-23- 50	0-10- 15	1.25-1.40-1.55	14.00-78.00-141.00	0.05-0.08-0.11	0.0- 1.5- 2.9	0.0- 1.0-2.0	.10	.24			
	25-60	70-97-100	0- 2- 29	0- 2- 15	1.45-1.55-1.65	141.00-141.00-141.00	0.01-0.03-0.05	0.0- 1.5- 2.9	0.0- 0.3-0.5	.02	.05			

Physical Soil Properties–Orange County, New York														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
MdB—Mardin gravelly silt loam, 3 to 8 percent slopes														
Mardin	0-8	10-26- 35	40-60- 80	10-14- 25	1.15-1.25 -1.50	1.00-10.00-100. 00	0.14-0.19-0. 23	0.5- 0.9- 2.3	3.0- 5.0-10. 0	.20	.32	4	6	48
	8-15	10-26- 35	43-60- 79	10-14- 22	1.20-1.30 -1.55	1.00-10.00-100. 00	0.13-0.17-0. 21	0.5- 0.9- 1.9	0.5- 1.5- 3.0	.32	.55			
	15-20	15-32- 50	32-56- 80	5-12- 18	1.30-1.40 -1.60	1.00-10.00-100. 00	0.13-0.17-0. 21	0.2- 0.7- 1.4	0.3- 0.5- 2.0	.37	.64			
	20-72	15-28- 50	28-54- 80	5-18- 25	1.65-1.70 -1.90	0.01-0.10-1.00	0.00-0.01-0. 02	0.1- 0.6- 1.1	0.1- 0.3- 1.0	.28	.55			
MdC—Mardin gravelly silt loam, 8 to 15 percent slopes														
Mardin	0-8	10-26- 35	40-60- 80	10-14- 25	1.15-1.25 -1.50	1.00-10.00-100. 00	0.14-0.19-0. 23	0.5- 0.9- 2.3	3.0- 5.0-10. 0	.20	.32	4	6	48
	8-15	10-26- 35	43-60- 79	10-14- 22	1.20-1.30 -1.55	1.00-10.00-100. 00	0.13-0.17-0. 21	0.5- 0.9- 1.9	0.5- 1.5- 3.0	.32	.55			
	15-20	15-32- 50	32-56- 80	5-12- 18	1.30-1.40 -1.60	1.00-10.00-100. 00	0.13-0.17-0. 21	0.2- 0.7- 1.4	0.3- 0.5- 2.0	.37	.64			
	20-72	15-28- 50	28-54- 80	5-18- 25	1.65-1.70 -1.90	0.01-0.10-1.00	0.00-0.01-0. 02	0.1- 0.6- 1.1	0.1- 0.3- 1.0	.28	.55			

Physical Soil Properties–Orange County, New York														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/In	Pct	Pct					
MdD—Mardin gravelly silt loam, 15 to 25 percent slopes														
Mardin	0-8	10-26- 35	40-60- 80	10-14- 25	1.15-1.25 -1.50	1.00-10.00-100. 00	0.14-0.19-0. 23	0.5- 0.9- 2.3	3.0- 5.0-10. 0	.20	.32	4	6	48
	8-15	10-26- 35	43-60- 79	10-14- 22	1.20-1.30 -1.55	1.00-10.00-100. 00	0.13-0.17-0. 21	0.5- 0.9- 1.9	0.5- 1.5- 3.0	.32	.55			
	15-20	15-32- 50	32-56- 80	5-12- 18	1.30-1.40 -1.60	1.00-10.00-100. 00	0.13-0.17-0. 21	0.2- 0.7- 1.4	0.3- 0.5- 2.0	.37	.64			
	20-72	15-28- 50	28-54- 80	5-18- 25	1.65-1.70 -1.90	0.01-0.10-1.00	0.00-0.01-0. 02	0.1- 0.6- 1.1	0.1- 0.3- 1.0	.28	.55			
Ra—Raynham silt loam														
Raynham, poorly drained	0-8	0-21- 50	50-67- 80	0-12- 17	1.20-1.35 -1.50	1.40-7.70-14.00	0.18-0.21-0. 24	0.0- 1.5- 2.9	3.0- 6.5-10. 0	.37	.37	5	5	56
	8-26	0-21- 85	0-67-100	0-12- 17	1.20-1.35 -1.50	1.40-7.70-14.00	0.18-0.20-0. 22	0.0- 1.5- 2.9	0.0- 1.5- 2.0	.55	.55			
	26-60	0-21- 85	0-67-100	0-12- 17	1.20-1.40 -1.60	0.42-0.91-1.40	0.17-0.19-0. 21	0.0- 1.5- 2.9	0.0- 0.5- 1.0	.64	.64			
Raynham, somewhat poorly drained	0-8	0-21- 50	50-67- 80	0-12- 17	1.20-1.35 -1.50	1.40-7.70-14.00	0.18-0.21-0. 24	0.0- 1.5- 2.9	3.0- 6.5-10. 0	.37	.37	5	5	56
	8-26	0-21- 85	0-67-100	0-12- 17	1.20-1.35 -1.50	1.40-7.70-14.00	0.18-0.20-0. 22	0.0- 1.5- 2.9	0.0- 1.5- 2.0	.55	.55			
	26-60	0-21- 85	0-67-100	0-12- 17	1.20-1.40 -1.60	0.42-0.91-1.40	0.17-0.19-0. 21	0.0- 1.5- 2.9	0.0- 0.5- 1.0	.64	.64			

Physical Soil Properties–Orange County, New York														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/In	Pct	Pct					
SXC—Swartswood and Mardin soils, sloping, very stony														
Mardin, very stony	0-4	10-26- 35	40-60- 80	10-14- 25	1.10-1.20 -1.50	1.00-10.00-100. 00	0.12-0.21-0. 25	0.2- 0.6- 2.3	5.0-10.0- 20.0	.20	.32	4	6	48
	4-15	10-26- 35	43-60- 79	10-14- 22	1.20-1.30 -1.55	1.00-10.00-100. 00	0.13-0.17-0. 21	0.5- 0.9- 1.9	0.5- 1.5- 3.0	.32	.55			
	15-20	15-32- 50	32-56- 80	5-12- 18	1.30-1.40 -1.60	1.00-10.00-100. 00	0.13-0.17-0. 21	0.2- 0.7- 1.4	0.3- 0.5- 2.0	.37	.64			
	20-72	15-28- 50	28-54- 80	5-18- 25	1.65-1.70 -1.90	0.01-0.10-1.00	0.00-0.01-0. 02	0.1- 0.6- 1.1	0.1- 0.3- 1.0	.28	.55			
Swartswood, very stony	0-3	32-45- 52	28-43- 50	7-12- 17	1.20-1.30 -1.40	4.00-9.00-14.00	0.08-0.10-0. 12	0.0- 1.5- 2.9	2.0- 3.0- 4.0	.17	.32	4	6	48
	3-31	32-69- 85	0-22- 50	0-10- 17	1.20-1.35 -1.50	4.00-9.00-14.00	0.08-0.10-0. 12	0.0- 1.5- 2.9	0.0- 1.0- 2.0	.20	.32			
	31-60	32-69- 85	0-22- 50	0-10- 17	1.40-1.60 -1.80	0.42-2.21-4.00	0.00-0.00-0. 00	0.0- 1.5- 2.9	0.0- 0.5- 1.0	.20	.37			
UH—Udorthents, smoothed														
Udorthents	0-4	24-43- 52	28-40- 50	7-17- 27	1.20-1.50 -1.80	0.42-70.71-141. 00	0.05-0.09-0. 13	0.0- 1.5- 2.9	0.0- 2.5- 5.0	.15	.24	5	6	48
	4-70	0-67- 85	0-23- 73	0-10- 34	1.30-1.60 -1.90	0.42-21.21-42.0 0	0.04-0.09-0. 13	0.0- 1.5- 2.9	0.0- 0.1- 1.0	.10	.28			

Physical Soil Properties–Orange County, New York														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/In	Pct	Pct					
UnB—Unadilla silt loam, 0 to 8 percent slopes														
Unadilla	0-8	0-21- 50	50-67- 80	0-12- 17	1.20-1.35 -1.50	4.00-9.00-14.00	0.18-0.20-0. 21	0.0- 1.5- 2.9	2.0- 4.5- 7.0	.37	.37	4	5	56
	8-44	0-21- 85	0-67- 80	0-12- 17	1.20-1.35 -1.50	4.00-9.00-14.00	0.17-0.19-0. 20	0.0- 1.5- 2.9	0.0- 1.0- 2.0	.55	.55			
	44-60	44-97-10 0	0- 2- 49	0- 2- 17	1.45-1.55 -1.65	14.00-78.00-14 1.00	0.01-0.06-0. 10	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.02	.05			
W—Water														
Water	—	—	—	—	—	—	—	—	—					

Data Source Information

Soil Survey Area: Orange County, New York
Survey Area Data: Version 16, Sep 24, 2015