3.7 GEOLOGY, SOILS AND TOPOGRAPHY

This chapter analyzes the potential impacts of land disturbance as a result of clearing and grading for the construction of the Project and its associated dwelling units, utilities, roads, etc. The erosion and sedimentation control are described and analyzed, including a description of the Project's proposed best management practices.

3.7.1 Existing Conditions

Bedrock in the Project Site 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 Project Site, is formed from similar Devonian sedimentary rocks.

Immediately west of the Project 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 Project 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 Project 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 Project 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.

Moreover, a description of the Project Site geology has been provided in the Project's Water Well Pumping Test Report included in Appendix F. The surficial material (overburden, unconsolidated material above bedrock) underlying the Project Site is mapped as mainly glacial till. Glacial till consists of non-sorted, non-stratified sediments deposited by glacial activity. The sediments contain varying proportions of clay, silt, sand, gravel and boulders. Till is generally not suitable for well development because, as a result of the unsorted character of the material, it does not transmit water in sufficient quantities to support high-yielding wells. There is also a small area of sand and gravel mapped in the valley setting on the northwestern portion of the Project Site along Clove Road. This sand and gravel was encountered during the drilling of onsite wells C-7A and

C-7B. However, the material was not of suitable composition or saturated thickness to attempt the development of a sand and gravel water-supply production well.

The bedrock units mapped underlying the Project Site include the Martinsburg Formation (On), Undifferentiated Lower Devonian and Silurian Rocks (DS), and Undifferentiated Hamilton Group (Dh); to the northeast of the Project Site is mapped the Wappinger Group (OEw); and to the west and northwest some Undifferentiated Gneiss (mu). The bedrock units, geologic contacts, fracture-trace lineations and mapped faults in the bedrock underlying the property are shown in Figure 2 in the Water Well Pumping Test Report. The bedrock units listed above consist of sedimentary rock types, with the exception of the undifferentiated gneiss which is metamorphic. The Martinsburg Formation contains shale, siltstone, sandstone and greywacke; the Undifferentiated Lower Devonian and Silurian Rocks are comprised of shale, sandstone and conglomerates; the Undifferentiated Hamilton Group contains shale, siltstone, sandstone, conglomerate and greywacke and the Wappinger Group is comprised of limestone, dolomite and shale.

Moreover, there are three predominant soil types on that portion of the Project Site proposed for development. They include Mardin (60%), Swartswood (25%) and Erie (15%) soils in various associations, as mapped by the Natural Resource Conservation Service (see full Soils Analysis attached in Appendix D). The following Table 371 presents a full list of soils found on the entire Project tract. The Soils Map in Figure 371 illustrates the locations of these soils on the entire Project tract and Figure 372 superimposes the Project layout with prime soils, although none of these soils are currently in agricultural use as discussed below. All development would take place on 20% of the tract, located along NYS Route 208 and Clove Road.

Table 371

Clovewood Soils Distribution

Soil	Soil Name	%	Acres
MdC	Mardin gravelly silt loam, 8 to 15 percent slopes	39.9%	282
SXC	Swartswood and Mardin soils, sloping, very stony	23.5%	166
MdB	Mardin gravelly silt loam, 3 to 8 percent slopes	9.0%	64
UH	Udorthents, smoothed	6.6%	47
ErB	Erie gravelly silt loam, 3 to 8 percent slopes	5.0%	35
ANF	Arnot-Lordstown complex, very steep	4.7%	33
Ca	Canandaigua silt loam	3.3%	23
Ra	Raynham silt loam	2.2%	16
Ab	Alden silt loam	2.0%	14
MdD	Mardin gravelly silt loam, 15 to 25 percent slopes	1.7%	12
UnB	Unadilla silt loam, 0 to 8 percent slopes	1.0%	7
HoC	Hoosic gravelly sandy loam, 8 to 15 percent slopes	0.4%	3
W	Water	0.4%	3
ANC	Arnot-Lordstown complex, sloping	0.2%	1
HLC	Hollis soils, sloping	0.2%	1
	Totals	**100%**	**708**

The following depths to seasonal high water tables are typical of the predominant soils:
- Mardin soil – approximately 18 to 24 inches;
- Swartswood soil – approximately 18 to 31 inches; and
- Erie gravelly silt loam – approximately 6 to 18 inches.

Based on topographic mapping, approximately 10% of the Project Site features slopes of greater than 15%; none of these steep slopes are located in the area proposed for development.

The MdD Mardin soil (15-25% slope) and the ANF Arnot Lordstown complex ("very steep") together comprise 45 acres (6.4%) of the soils classified as steep. The former would be avoided by the proposed development, and the latter (the bulk of the steep slopes) is located at the south end of the tract along the ridge, well away from all Project development.

Soils with shallow depth to bedrock are limited to roughly 35 acres of land, or a little over 5% of the Project Site, all of it being located along the aforementioned ridge.

None of the soils found on the Project Site are especially susceptible to erosion, although controls would, nonetheless, be put in place to ensure that no erosion occurs and are described below.

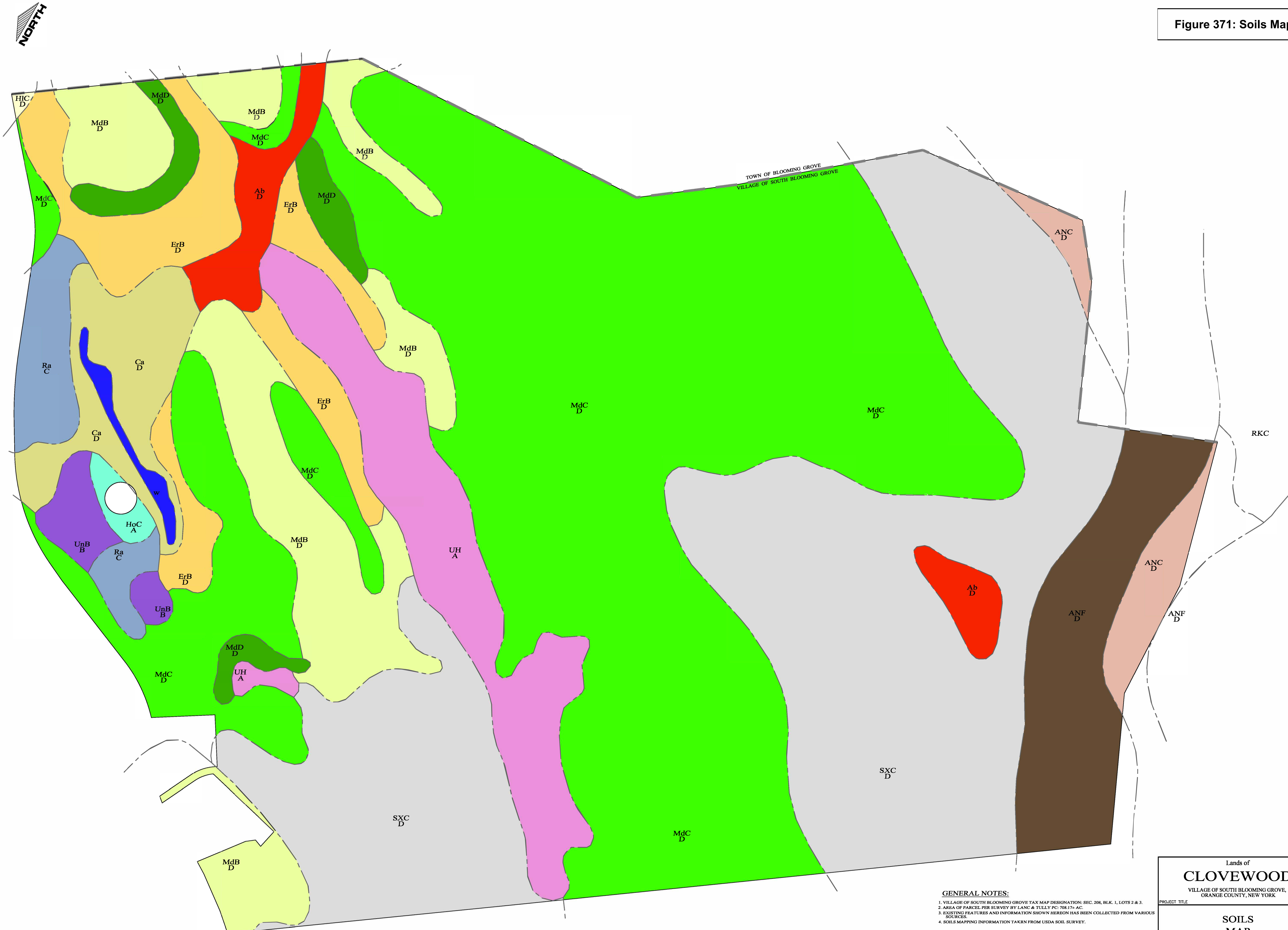
The NYS Unique Geologic Landforms project, a joint venture between NYSDEC and the NYS Museum - Office of the State Geologist, identifies and inventories unique land formations such as cliffs, dunes, waterfalls, erratic rocks, gorges, glacial features, and caves. None of these land formations are located on the Project Site.

Also, the National Natural Landmarks ("NNL") Program recognizes and encourages the conservation of sites that contain some of the best biological and geological resources in the nation. NNLs are designated by the Secretary of the Interior. The Project does not possess, and is not adjacent to, any of these designated resources.

3.7.2 Potential Impacts

The Geotechnical Report in Appendix D details conditions encountered on the Project Site during the investigation and evaluates potential impacts on construction methods, geotechnical design and long-term performance, which are summarized below. 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.

Figure 371: Soils Map



CLOVEWOOD SOIL TYPE LEGEND

COLOR	SYMBOL	SOIL TYPE	AREA
	Ab	ALDEN SILT LOAM	13.9± AC.
	AnC	ARNOT-LORDSTOWN COMPLEX, MODERATELY STEEP	10.5± AC.
	AnF	ARNOT-LORDSTOWN COMPLEX, VERY STEEP	32.6± AC.
	Ca	CANANDAIGUA SILT LOAM	19.8± AC.
	ErB	ERIE GRAVELLY SILT LOAM,	33.1± AC.
	HlC	ERIE GRAVELLY SILT LOAM, 0% - 3% SLOPES.	0.3± AC.
	HoC	HOOSIC GRAVELLY SANDY LOAM, 8% - 15% SLOPES.	2± AC.
	MdB	MARDIN GRAVELLY SILT LOAM, 3% - 8% SLOPES	58.6± AC.
	MdC	MARDIN GRAVELLY SILT LOAM, 8% - 15% SLOPES	277.2± AC.
	MdD	MARDIN GRAVELLY SILT LOAM, 15% - 25% SLOPES	11± AC.
	Ra	RAYNHAM SILT LOAM	9.4± AC.
	SxC	SWARTSWOOD AND MARDIN VERY STONY SOILS	189.6± AC.
	UnB	UNADILLA SILT LOAM, 0% - 8% SLOPES	6.2± AC.
	UH	UDORTHENTS, SMOOTHED	41.8± AC.
	W	WATER	2.2± AC.

LINETYPE LEGEND

EXISTING PROPERTY LINE
USDA SOILTYPE LINE

GRAPHIC SCALE

(IN FEET)
1 inch = 200 ft.

GENERAL NOTES:

1. VILLAGE OF SOUTH BLOOMING GROVE TAX MAP DESIGNATION: SEC. 208, BLK. 1, LOTS 2 & 3.
2. AREA OF PARCEL PER SURVEY BY LANC & TULLY PC: 708.17± AC.
3. EXISTING FEATURES AND INFORMATION SHOWN HEREON HAS BEEN COLLECTED FROM VARIOUS SOURCES.
4. SOILS MAPPING INFORMATION TAKRN FROM USDA SOIL SURVEY.

DATE	REVISIONS
01-03-19	REVISE SOILS
10-13-15	INITIAL PREPARATION

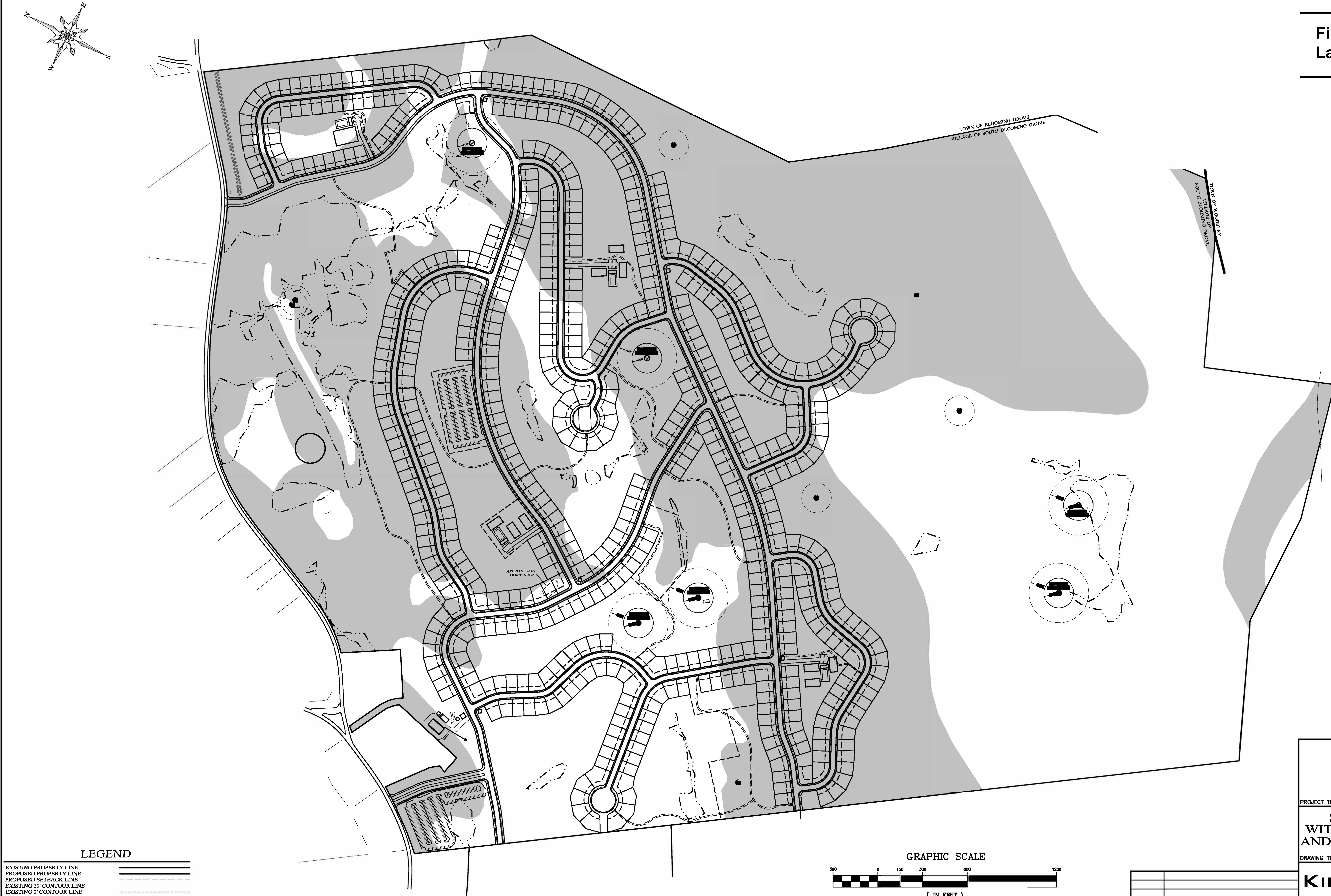
Lands of
CLOVEWOOD
VILLAGE OF SOUTH BLOOMING GROVE,
ORANGE COUNTY, NEW YORK
PROJECT TITLE

SOILS MAP
DRAWING TITLE

KIRK ROTHER, P.E.
CONSULTING ENGINEER, PLLC
5 Saint Stephens Lane, Warwick NY 10990
(845) 988-0620
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.	1 OF 1
CAD #	PROJECT #	SCALE	
14107 USE	14107.0	AS SHOWN	

Figure 372: Subdivision Layout with Prime Soils



LEGEND

EXISTING PROPERTY LINE	
PROPOSED PROPERTY LINE	
PROPOSED SETBACK LINE	
EXISTING 10' CONTOUR LINE	
EXISTING 2' CONTOUR LINE	
EXISTING DEC WETLANDS	
EXISTING FEDERAL WETLANDS	
PROPOSED EDGE OF PAVEMENT	
EXISTING EDGE OF PAVEMENT	
PRIME AGRICULTURAL SOILS AND SOILS OF STATEWIDE SIGNIFICANCE	
CONCEPTUAL STORMWATER MANAGEMENT AREA	
PROPOSED BUS STOP	B

GRAPHIC SCALE

300 0 150 300 600 1200

(IN FEET)
1 inch = 300 ft.

CLOVEWOOD

VILLAGE OF SOUTH BLOOMING GROVE,
ORANGE COUNTY, NEW YORK

PROJECT TITLE

SUBDIVISION LAYOUT
WITH PRIME AGRICULTURAL
AND STATEWIDE SIGNIFICANT
SOILS

DRAWING TITLE

DATE	REVISIONS
03-21-18	INITIAL PREPARATION

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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.	SL 4
CAD #	PROJECT #	SCALE	
14107 BASE	14107.0	AS SHOWN	

Construction on Land with Shallow Depth to Water Table: Because construction would take place on lands having shallow depth to water table (less than three feet), there would likely be some level of impact on land. Construction in areas where the depth to water table is less than three feet could cause flooding of basements, interference with underground utilities, and problems with the proper functioning of septic tank absorption fields. Given that the Project would be served by central sewage and water supply facilities, the last of these would not be an issue, but building construction and underground utilities would be designed to prevent these conditions.

Likewise, stormwater management infrastructure would be designed to ensure seasonal high water tables would not impact its functioning. Shallow depth to the water table would not impact the central water supply system as the Project would incorporate the appropriate protections at the location of water wells to ensure protection of groundwater from any contamination via those seasonal high water tables. Buffers from water supply sources would be included.

The Project's development would not impact or be impacted by shallow depth to bedrock. While Project construction would involve excavation and grading it would be limited to normal construction related activities and the lack of steep slopes in the area being developed ensures cuts and fills would be minimal. Impacts, therefore, would be minimal and not significant.

Approximately 10% of the Project Site is greater than 15% slope as shown in the plans in Appendix A, but such areas are not located near proposed Project development. Such steep slope areas as do exist are avoided in the layout of lots and roads, such that there would be no potential for significant impact and no potential for landslides.

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 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 dusty.

To prepare the Project Site for construction, all topsoil would 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 would either be removed, or reworked and re-compacted to a firm condition. The prepared subgrade surface would be protected from damage by construction traffic, particularly where the soil is wet.

Bedrock: Bedrock appears to be relatively deep throughout the Site, and minimal rock excavation is expected. If bedrock is encountered, mechanical excavation would 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. The Project's construction would not involve blasting as the parts of the Project Site where bedrock is most likely to be encountered are in the eastern rear part of the Project Site (in the Schunnemunk Mountain foothills) where no development is proposed. Nonetheless, generally, the local bedrock areas consisting of siltstone, sandstone, and shale, could be blasted with light to moderate charges without affecting adjacent properties.

Soil Excavation: The native soils would be excavated using conventional heavy equipment, such as tracked excavators and bulldozers. Scraper pans would also be used for excavation; however, these 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 0.75:1 slopes in shallow excavations, and the sandy soils are Type C, requiring 1.5:1 or shallower slopes; soil types must be confirmed during construction.

Soil Placement and Compaction: The glacial till soils that make up the majority of the Project Site would be managed to ensure efficient placement and good long-term performance. The till would be thoroughly broken up, and typically would require some drying prior to compaction. Spreading the till in thin lifts (8 inches un-compacted) with a large bulldozer that thoroughly tracks over the surface of the fill would likely be sufficient to break up the soil clods and expose the soil for drying.

Compaction of the till would be performed with a sheep's-foot roller, to thoroughly knead the soil and minimize voids between the soil clods. Finishing passes would 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.

The lift thickness for all soil types would be reduced as needed to achieve the required percent compaction and when small compactors are used. When hand-operated equipment is required, jumping-jack tampers and vibratory trench rollers would be used to compact the till; when compacting granular fill, these compactor types and/or vibratory plate tampers may be used.

Till placed as fill would be broken up and thoroughly compacted to assure there are no voids between the soil clods that would allow groundwater and/or stormwater to infiltrate, and to preclude softening and/or settlement, especially in deep fills, near slopes, or where loads bear on fill (e.g. under footings.) All fill types would be compacted at a moisture content within approximately 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, such compaction tends to promote instability ("pumping") of the soil, and hours or days could be required between lift placements to allow the excess moisture to dissipate. Compaction at lower moisture contents would not occur, as it would lead to high porosity and increased settlement potential.

Where fill is placed under structures, each lift would 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 would 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. At least six one-way compaction passes would be made over each lift of fill, even if the required compaction percentage is obtained with fewer passes.

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

Reinforcement would be undertaken where appropriate for embankments with slopes steeper than 3:1, especially for embankments more than six feet high that would be important for protection of infrastructure (underground utilities, roads, etc.) or that would be located in areas that would be difficult to access for later maintenance. Reinforcement requirements would be determined on a case-by-case basis.

Typically, a uniaxial geogrid would 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.

Landscaped Areas: Over-compaction of fill in the root zone of landscaped areas would be avoided. Typically, compaction to about 85% of the D1557 maximum dry density would be appropriate in the upper two feet of soil in landscaped zones. The soil would be sufficiently compacted to support light vehicle traffic, but loose enough to allow water and roots to penetrate.

Where landscaping would be installed over cut areas, the subgrade would be thoroughly scarified to a depth of at least twelve inches below the topsoil layer.

Installation of landscaping on embankments and cut slopes would be performed with care. Rapid drainage from embankment slopes and low permeability of the till material below the topsoil can result in loss of vegetation loss due to excessive drying. More importantly, sliding or sloughing of the topsoil layer can occur due to saturation of the topsoil above the underlying till during periods of heavy rain.

The potential for topsoil slides would 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 might also be required to minimize erosion prior to establishing vegetation. Use of open-mesh geosynthetics which could trap or injure wildlife would be avoided.

Road Construction: The Village Code establishes minimum specifications for construction of roads, which would be the minimum standards for this Project. The standard road section would consist 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, would 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 would be proof-rolled with a loaded tri-axle dump truck prior to placing the sub-base, and any areas that exhibit excessive rutting would 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 would 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 site borrow soil.

Roads would be constructed early in the Project, to allow efficient site access and reduce erosion. Preliminary construction consisting of the sub-base (“Item 4”) layer, asphalt base course and asphalt binder course would 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, would 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. To prevent this occurrence, a reinforcing geotextile layer under the sub- base would be installed, and/or the thickness of the Item 4 sub-base course would be increased, 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 would be established in all areas as soon as possible to minimize softening of the subgrade.

Foundation Construction: The native soils are suitable for the use of conventional shallow foundation and slab-ongrade 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 would be thoroughly and systematically compacted, as described previously, to prevent unacceptable settlement.

An allowable bearing capacity of 3000 psf would be 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) would 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 0.5 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 would be used to control water seepage.

Occasional springs may be encountered on the Project Site; these would be directed away from structures, using surface swales or underground drains. Foundation excavations would be backfilled with site-borrow till, compacted in controlled lifts. The relatively low permeability of this soil would 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. would be undertaken to prevent unacceptable transmission of these gases to interior spaces.

A passive radon mitigation system, which would also remove moisture, would 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 at a later time if high radon (or moisture) levels are detected. Vents would also be stubbed up and capped within the walls, for later connection if required, or installed subsequent to construction if needed.

Geosynthetics: Geosynthetic materials would 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 would 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 would be installed substantially free from wrinkles, and fill material would be placed and spread in a manner that does not displace or damage the geosynthetic material. Vehicles would not drive on the exposed geosynthetic.

Subgrade Reinforcement: A woven reinforcing geotextile such as TenCate Mirafi 600X would be used in areas with grades of ten percent or less. On steeper grades, a multi-axial geogrid such as Mirafi BXG-11 or Tensar TX130S would be used. Geogrids can also be used on level or gently sloping areas, and would 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 would be used.

Drainage Separation: A woven drainage geotextile with at least 6% open area would 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) would 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.

Run-off Reduction: An area of highly infiltrative soils has been identified in the southwestern portions of the Project Site and would be used to infiltrate stormwater runoff for that portion of the development that is tributary to the area described. The proposed infiltration area is depicted on the subdivision plan drawings in Appendix A and is just one of several measures that would be implemented to achieve the Run-off Reduction objectives required by the Stormwater SPDES Permit.

Soil Erosion and Sediment Control: The erosion resistance of the on-site soils is discussed briefly in section 3.1.9 of the Geotechnical Report in Appendix D, which also includes copies of the USDA Soil Map and Physical Soil Properties report for the Project 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 Project 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.

An erosion and sedimentation control plan has been prepared and is included in Appendix H and is described below. The Project includes no coastal erosion hazard areas and, therefore, there would be no impacts in this regard.

Temporary erosion control measures would include stabilized construction entrances, silt fence, temporary sediment traps, temporary diversion swales, stone check dams, inlet protection, mulching, land grading, and temporary topsoil stockpiling stabilization and seeding and haying. Areas to be disturbed would have the area of disturbance delineated. Areas in proximity to construction activities but that are to remain undisturbed would be protected with a perimeter construction fence, or snow fence.

Upon completion of clearing and grubbing activities, topsoil would be stripped and temporary topsoil stockpiles created in locations out of the way of construction activities. Temporary topsoil stockpiles would also be placed away from potential watercourses. Stockpiles would be surrounded with silt fencing and immediately stabilized seed and hay per the temporary seeding schedule depicted on the Plans.

Temporary seeding would be placed in all areas that are expected to remain disturbed for a period of 14 days. Dust control by means of spraying water would be undertaken as necessary. The locations of the specific erosion control practices to be implemented, with associated construction details, are depicted on the Project's Erosion Control Plans included in the plan sheets.

Permanent erosion control measures would include downspout splash blocks, rip-rap inlet and outlet protection, grass-lined waterways, permanent seeding and landscaping, land grading, mulching, and slope stabilization. Slope stabilization would be accomplished utilizing rolled erosion control matting in all areas of slopes of two horizontal to one vertical or steeper. Erosion control measures would be routinely inspected daily by a "Trained Contractor" to be employed by the excavation company. The definition of a Trained Contractor and Qualified Inspector can be found in the SPDES Permit text located in Appendix H. Inspection logs identifying Project Site conditions, impacts to adjacent properties or water bodies, defects in erosion control measures, together with photographs of the Project Site, would be prepared by the Inspector. Defects identified would be reported to the project owner in a timely manner which is taken to mean within one business day or less. Corrections would be made immediately.

All weekly inspection logs would be kept at the Project Site in mailbox clearly labeled with the letters "DEC". Any reports and the SWPPP plan would be made available for review by the Regulatory Agency having jurisdiction. Maintenance of erosion control measures would be the responsibility of the Project developer. Included in the erosion control plan is a general sequence of construction.

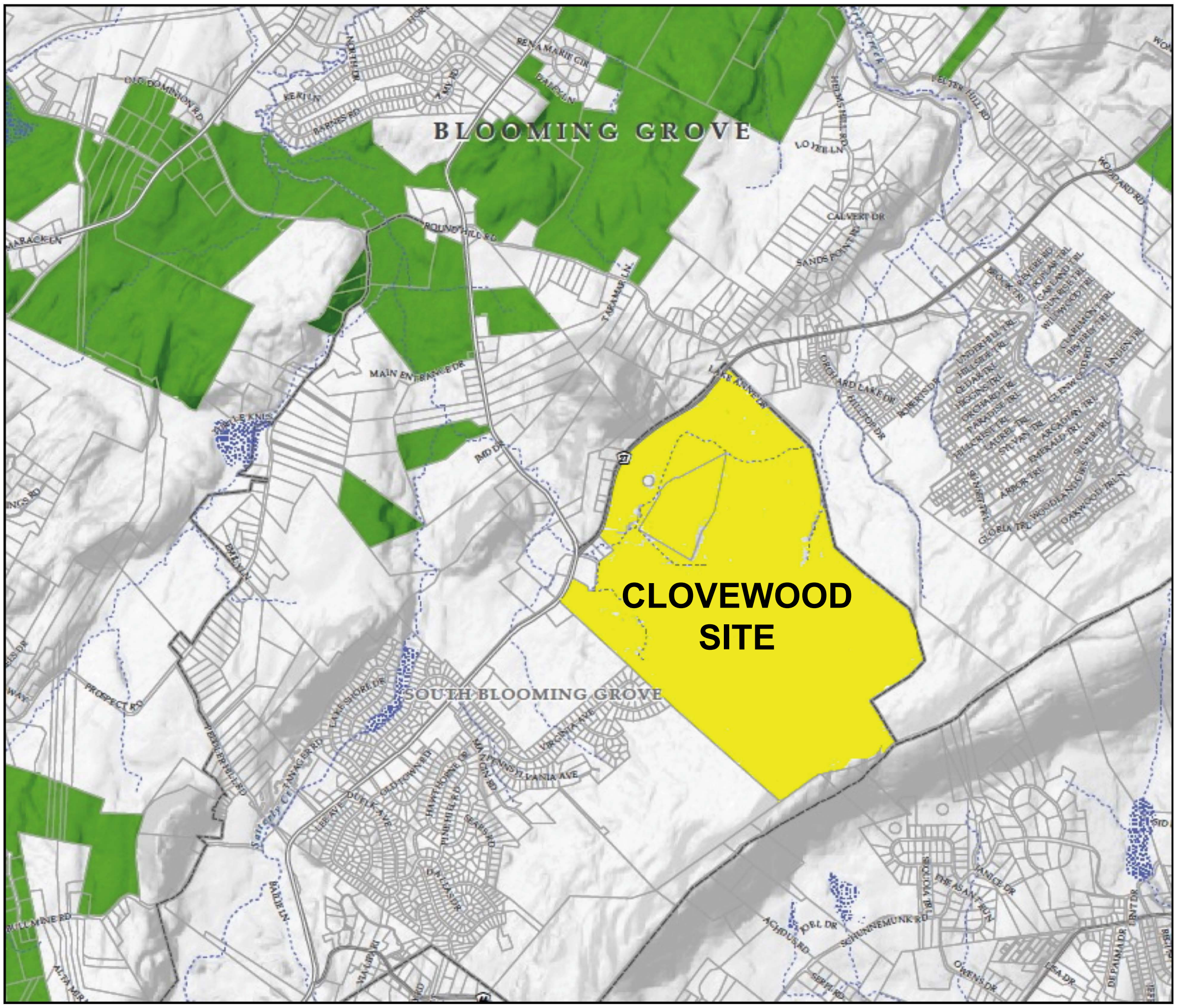
Mining Permit: The Project would not require a mining permit as no material would be removed from the Project Site.

Soils of Agricultural Importance: While many of the soils on the Project Site can be classified as agricultural soils as shown in Figure 372, none of the soils are currently in agricultural use on the Project Site, and none have been so utilized for many years. The Project would disturb no more than approximately 140 acres, leaving the bulk of the prime farmland soils untouched. There are also far more prevalent and better agricultural soils in other parts of Orange County such as the Black Dirt area of Warwick and Wawayanda.

There are no agricultural fields or active agriculture of any sort on or adjacent to the Project Site and the Project Site is not part of an agricultural district as shown in Figure 373. Therefore, there would be no disruption to or prevention of agricultural land management systems.

The Project would not create increased development pressure on farmland. There are many other non-farm uses in the surrounding area, with no large, concentrated blocks of farmland in proximity to the Project Site which could be fragmented or that would be impacted by the introduction of new public services or improvements such as water and sewer lines.

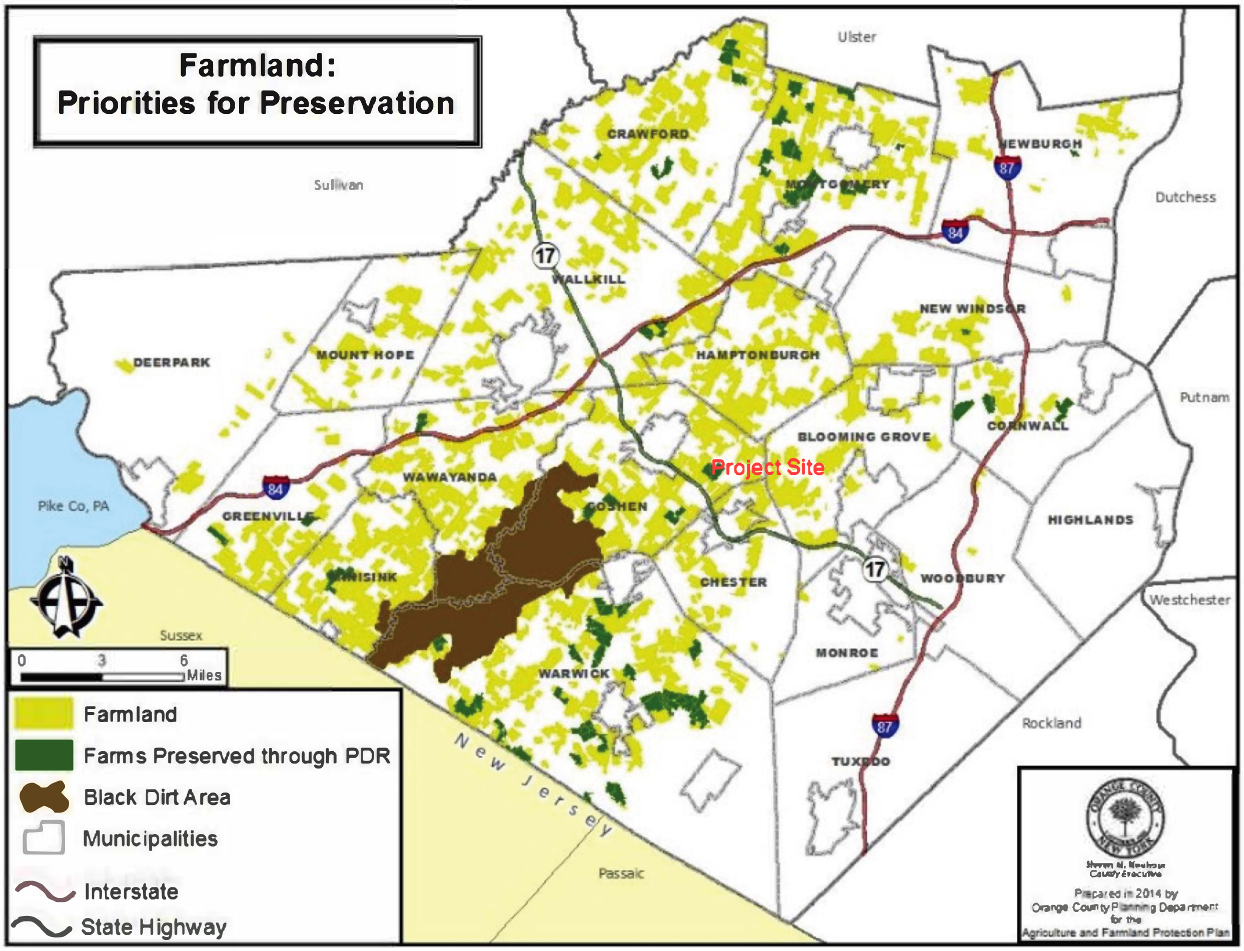
Figure 373: Agricultural Districts Map Excerpt



Source: Excerpted from an Orange County, NY Agricultural Map Prepared By Orange County Tax Map Department Courtesy of Agricultural Maps Received From Orange County Planning Dept. July 30, 2008/Rev. August 2010

The Project Site is not one of the agricultural priority areas identified in the Orange County Agricultural Protection Plan, as the excerpted map from the Plan in Figure 374 indicates. Additionally, the County Agricultural Protection Plan, specifically incorporates part of the County Comprehensive Plan, which provides for the aforementioned designated “growth areas” and designates the Village of South Blooming Grove as one of those growth areas. The Project would be consistent with the Orange County Agricultural Protection Plan, and the Project would not have the potential to generate any significant adverse impacts on agricultural lands.

Figure 374: Priority Agricultural Areas



Source: Orange County Agricultural Protection Plan

3.7.3 Mitigation

The Project would not impact any soils of agricultural significance, and its excavation, building construction and underground utilities would be designed to comply with the recommendations detailed in the Geotechnical Report in Appendix D and with applicable Village Codes. The Project would avoid construction on any steep slopes located on the Project Site. In addition, the Project's temporary and permanent erosion and sedimentation control plan would be followed in accordance with applicable NYS requirements. For these reasons, the Project would not have the potential to generate any significant adverse impacts to geology, soils and topography and therefore no mitigation would be necessary.