3.0 ENVIRONMENTAL SETTING, IMPACTS, MITIGATION

3.1 Geology, Soils, and Topography

3.1.1 Existing Conditions

Geology

The project site lies within Sullivan County, New York. Sullivan County lies primarily within the Appalachian Plateau province. This province is divided into several regions or sections. The northern one-third of the county consists of the Catskill section and the remainder of the county is the Southern New York section, which lies south of the Catskill Mountains. The area of the county where the subject property is located is within the Southern New York section. This area is defined by a deeply dissected plateau that generally slopes gently towards the southwest. Specifically, the project site is underlain by the Lower Walton Formation within the Sonyea Group and the Upper Walton Formation within the West Falls Group. These bedrock groups are made up of shale, sandstone, and conglomerate. This formation is made up primarily of shale, sandstone, and conglomerate.

Typical of the Sullivan County landscape, areas of exposed bedrock, cobbles and boulders are found throughout the property. A site investigation was conducted to identify and characterize all visually prominent rock formations that exist on the subject property within 200 feet of a public road. Available topographic mapping and aerial photographs were reviewed prior to making the on-site observations. Bedrock outcrops on the property that are visually apparent from St. Joseph's Road were surveyed. This road traverses the property east-west within the northern portion of the property. Appendix F, Bedrock Outcrops, presents a figure locating the outcrops and photographs of the four (4) prominent bedrock outcrops, and other areas of cobbles, and boulders that can be seen along St. Joseph's Road. These larger bedrock outcrops are located on the southern side of the road while smaller sized rock formations occur on both sides. The areas of bedrock observed on the northern side are more limited and seemingly more cobbles or boulders.

As shown on the figure located in Appendix F, four (4) locations within 200 feet of the road were surveyed. Each of these outcrops were observed to be more than 20 feet high and equal to or more than 100 feet long and are surrounded by mature vegetation. The outcrops travel in a north-south pattern and meet St. Joseph's Road with a 45 degree angle.

As stated above the subject property is underlain by shale. Marcellus Shale is a type of shale that has been widely documented to be located within Ohio, West Virginia, Pennsylvania and New York. This shale is known to be located in Sullivan County and is an organically rich (black carbonaceous) low density shale that is a producer of natural gas. This natural resource has become a high commodity since the advent of horizontal drilling technology, and since this technology has become more cost efficient. As shown on Figure 3.1-1, Marcellus Shale in New York State, the Marcellus shale is mapped in the area of the subject property.

Topography

The project site contains varying topography. The southern portion of the site, south of St. Joseph's Road has topography that slopes up and down draining into the wetland that runs northwest to southeast within the property. The northern portion of the site, north of St. Joseph's Road, is characterized by areas of knolls and sloping topography that slopes down from the

center of the property to the west and the east. Local topography in the area of the site is characterized by the varying sloping knolls, much like the northern portion of the property. Local topography is shown on Figure 3.1-2, Local Topography and Figure 3.1-3, Existing Slopes Map shows the onsite topography.

The highest elevation on the property is located along the western boundary south of St. Joseph's Road and is approximately 1,630 feet above sea level. The lowest elevation on the site is located within the central portion of the site, south of St. Joseph's Road, within the wetland and is at approximately 1,373 feet above sea level.

Approximately 1,828 acres of the site contains nearly level to moderately sloping terrain, with slopes less than or equal to 15 percent. Approximately 327 acres contain slope areas greater than 20 percent. Table 3.1-1 below lists the distribution of existing slopes on the property.

Table 3.1-1
Existing Slope Analysis

Slope Category	Approximate Acres
0% to 10%	1,564 acres
10% to 15%	264 acres
15% to 25%	252 acres
> 25%	75 acres
Total Site Acreage	2,080 acres

Source: Brinkash & Associates, 2008

Soils

The soils on the project site were identified using the soil classifications of the *Soil and Water Conservation District Soil Survey of Sullivan County, New York*. The property is underlain primarily by one (1) soil type: Wellsboro and Wurtsboro soils (WIC). However, the site is also underlain by twenty-one (21) less predominant soil types. The soils are grouped together and listed order of prevalence on the site:

- Alden silt loam (Ad), Carlisle muck (Ca), Palms muck (Pa), Neversink loam (Ne), Carlisle, Palms, and Alden soils ponded (Ce), and Neversink and Alden soils, very stony (Nf)
- Arnot-Lordstown complex (AIC and AIE)
- Wurtsboro loam (WuA, WuB, and WuC)
- Lordstown silt loam (LoB) and Lorsdtown-Arnot complex (LrC)
- Swartswood gravelly loam (SrB, SrC, and SrD) and Swarstwood & Lackawanna soils (SwE)
- Scriba loam (ScA and ScB) and Scriba and Morris loams (SeB)
- Arnot-Rock outcrop (ArC and ArE)
- Oquaga very channery silt loam (OeB) and Oquaga-Arnot complex (OgC and OgD)
- Valois gravelly sandy loam (VaB, VaC, and VaE)
- Red Hook sandy loam (Re)
- Fluvaquents-Udifluvents complex (Fu)

The locations of on-site soils by type are shown on Figure 3.1-4, Soils Map. The characteristics of each of the soil series identified on this property are described below generally in the order of their prevalence.

Wellsboro and Wurtsboro soils, strongly sloping, extremely stony (WIC)

This soil unit is very deep, moderately well drained and was formed in glacial till along upland areas and lower parts of hillsides. The soil unit is generally made up of 40 percent Wellsboro soils, 40 percent Wurtsboro soils, and 20 percent other soil types. The water table in both of these soils is perched above the fragipan from late fall to early spring. A fragipan is a dense subsurface horizon low in porosity. It appears cemented, restricts roots and is hydraulically restrictive. The permeability of both soils types is considered moderate above the fragipan and slow in the fragipan. The available water capacity is moderate and the surface runoff is medium to rapid in both soil types. Depth to bedrock can be found more than 60 inches below the ground surface in both soil types. This soil unit is not considered a hydric soil according to the Natural Resources Conservation Service (NRCS).

This soil unit is mapped primarily in the northeast portion, central portion, and southeast portion of the site, as shown on Figure 3.1-4, Soils Map. Due to the distribution of all the soil types on the property there is no one soil type, other than WIC soils, that dominates different areas of the site. The soils described below are located throughout the property in small areas, as shown in the soils figure.

Alden silt loam (Ad), Carlisle muck (Ca), Palms muck (Pa), Neversink loam (Ne), Carlisle, Palms, and Alden soils ponded (Ce), and Neversink and Alden soils, very stony (Nf)

These soil types are considered very deep, nearly level, and very poorly drained. Slopes range from 0 to 3 percent in (Alden). The seasonal high water table is at or near the surface from late fall through late spring. The available water capacity in Alden, Carlisle and Palms soils is high and the surface runoff is considered very low or ponded. The available water capacity in Neversink soils is moderate and the surface runoff is slow or very slow. The permeability is moderate in the surface layer, moderately slow in the subsoil and slow in the substratum. Bedrock can be found more than 60 inches below the ground surface. These soil units are considered hydric soils according to the Natural Resources Conservation Services (NRCS).

Arnot-Lordstown Complex (AIC and AIE)

This map unit consists of nearly level to steep sloping soils. The soil unit is made up of 40 percent Arnot soils, 40 percent Lordstown soil, and 20 percent other soils and rock outcrops. Arnot soils are shallow and somewhat excessively drained to moderately well drained. Lordstown soil is moderately deep and well drained. The slopes within this soil unit range from 0 to 15 percent (AIC) and 15 to 35 percent (AIE). The water table for Arnot soils is perched above the bedrock for brief periods in the spring but is usually found at a depth of more than 6 feet below the ground surface throughout most of the year. The water table for Lordstown soils is usually not perched above the bedrock. The permeability for both soil types is considered moderate. Available water capacity for Arnot soils is low or very low while the surface runoff is rapid. The available water capacity for Lordstown soils is moderate while the surface runoff is medium. Bedrock can be found at a depth of 10 to 20 inches below the ground surface in Arnot soils and 20 to 40 inches below the ground surface in Lordstown soils. Both of the soils

associated with this soil unit are not considered hydric soils according to the Natural Resources Conservation Service (NRCS).

Wurtsboro loam (WuA, WuB, and WuC)

This soil unit is very deep and moderately well drained. The slopes range from 0 to 3 percent (WuA), 3 to 8 percent (WuB) and 8 to 15 percent (WuC). The seasonal high water table is found perched above the fragipan in late fall and early spring. Available water capacity is moderate and the surface runoff slow is rapid depending on the slope category. When the slopes are characterized steeper the surface runoff becomes more rapid. The permeability is moderate to a depth of 26 inches below the ground surface and slow below that depth. Depth to bedrock can be found at more than 60 inches below the ground surface. This soil is not considered a hydric soil according to the NRCS.

Lordstown silt loam (LoB) and Lordstown-Arnot complex (LrC)

These soil units are moderately deep and well drained. The slopes range from 3 to 8 percent (LoB) and 8 to 15 percent (LrC). The seasonal high water table is normally not present above the bedrock in Lordstown soils. The available water capacity is moderate while the surface runoff is medium. The permeability is moderate through the soil. Bedrock can be found at a depth of 20 to 40 inches below the ground surface. These soils are not considered to be hydric according to the NRCS.

Swartswood gravelly loam (SrB, SrC, and SrD) and Swarstwood and Lockawanna soils (SwE)

These soil units are very deep and well drained. The Swartswood and Lockawanna soils are made up of 40 percent Swartswood soils, 40 percent Lockawanna soils, and 20 percent other soils. The slopes range from 3 to 8 percent (SrB), 8 to 15 percent (SrC), 15 to 25 percent (SrD), and 15 to 35 percent (SwE). The seasonal high water table is perched above a fragipan, at a depth of 2.5 to 6 feet below the ground surface, in late fall and winter for SrB, SrC, and SrD soils and in early spring or during wet periods during the rest of the year for SwE soils. Available water capacity is moderate while surface runoff is slow to rapid, depending on the slope category. When the slopes are characterized steeper the surface runoff becomes more rapid. Permeability is moderate above the fragipan, to a depth of 26 inches, and slow or moderately slow in the fragipan or below 26 inches. Bedrock can be found more than 60 inches below the ground surface. These soils are not considered hydric soils according to the NRCS.

Scriba loam (ScA and ScB) and Scriba and Morris loams, gently sloping, extremely stony (SeB)

These soil units consist of very deep, somewhat poorly drained soils. The Scriba and Morris complex consists of approximately 40 percent Scriba soil 40 percent Morris soil, and 20 percent other soils. Slopes range from 0 to 3 percent (ScA), 3 to 8 percent (ScB) and 2 to 8 percent (SeB). The seasonal high water table in both soils is found perched above the dense, firm fragipan at a depth of 0.5 to 1.5 feet below the ground surface from the late fall to early spring. The available water capacity is low or moderate and the surface runoff is slow or medium. The permeability is moderate or slow above the fragipan and slow or very slow in the fragipan. The bedrock can be found more than 60 inches below the ground surface in both soil types. This soil is not considered a hydric soil according to the NRCS.

Arnot-Rock outcrop (ArC and ArE)

This soil unit consists of nearly level to steep soils of exposed shale or sandstone bedrock. Slopes range from 0 to 15 percent (ArC) and 15 to 35 percent (ArE). The seasonal high water table in a Arnot soils is perched above the bedrock for brief periods during wet seasons but is generally found at a depth more than 6 feet below the ground surface. Available water capacity is low or very low while the surface run off is rapid. Permeability is moderate above the bedrock, which can be found at a depth of 10 to 20 inches in Arnot soils. This soil is not considered a hydric soil according to the NRCS.

Oquaga very channery silt loam (OeB) and Oquaga-Arnot complex (OgC and OgD)

These soil units are moderately deep and well drained to excessively well drained. Slopes range from 3 to 8 percent (OeB), 8 to 15 percent (OgC) and 15 to 25 percent (OgD). The Oquaga-Arnot soil complex is made up of 50 percent Oquaga soils, 35 percent Arnot soils, and 15 percent other soils. Arnot soils are shallow and somewhat excessively drained to moderately well drained. Oquaga soil is moderately deep and excessively drained to well drained. The seasonal high water table in Oquaga soils is not usually found above the bedrock while the water table in Arnot soils is perched above the bedrock within this soil in the spring. Both Arnot and Oquaga soils have a moderate permeability. Surface runoff is rapid in Arnot soils and medium in Oquaga soils. The available water capacity is low or very low within the Arnot soils and low or moderate in the Oquaga soils. Bedrock can be found at a depth of 10 to 20 inches below the ground surface in Arnot soils and 20 to 40 inches below the ground surface in Oquaga soils. Soils associated with these soil units are not considered hydric soils according to the Natural Resources Conservation Service (NRCS).

Valois gravelly sandy loam (VaB, VaC, and VaE)

This soil unit is very deep and well drained. The slope ranges from 3 to 8 percent (VaB), 8 to 15 percent (VaC), and 25 to 35 percent (VaE). The seasonal table can be found more than six (6) feet below the ground surface. The available water capacity is moderate and the surface runoff is medium to rapid depending on the slope category of the soil. The permeability is moderate in the surface layer and the upper part of the subsoil and is moderate or moderately rapid below these layers. The depth to bedrock can be found more than 60 inches below the ground surface. This soil is not considered a hydric soil according to the NRCS.

Red Hook sandy loam (Re)

This soil unit is very deep, nearly level, somewhat poorly drained that is formed in glacial outwash. The slopes range from 0 to 3 percent. The seasonal high water table can be found at a depth of 0.5 to 1.5 feet below the ground surface in the winter and early spring. Available water capacity is moderate or low and the surface runoff is slow. Permeability is moderate to moderately slow. Bedrock can be found more than 60 inches below the ground surface. The soil is not considered a hydric soil according to the NRCS.

Fluvaquents-Udifluvents complex, frequently flooded (FU)

This soil unit is also called alluvial land and consists of very deep, excessively drained to very poorly drained soils. The soil unit consists of 45 percent Fluvaquents, 40 percent Udifluvents, and 15 percent other soils. Areas within this soil unit is subject to frequent flooding and stream scour, streambank erosion, and shifting of soil deposits from place to place. The slope can

range from 0 to 5 percent but is normally less than 3 percent. This soil complex is considered to have characteristics of hydric soils according to the NRCS. The depth to bedrock, water table, water capacity, surface runoff and permeability is not provided in the *Soil Survey* of Sullivan County, New York.

Table 3.1-2
Soil Characteristics and Limitations
(Table continues on several pages.)

Soil Series	Hydrologic Group[1] /Hydric Soil	Permeability (in./hr) at depth (in.)	Erosion Factor	Potential Limitations for:		
			K[2]	Roads, Parking Lots	Buildings without basements	Shallow excavations
Wellsboro & Wurtsboro soils (WIC)	C Not hydric	-Wellsboro- 0.6-2.0 0-23" deep) 0.06-0.2 (23-66" deep) --Wurtsboro--- 0.6-2.0 (0-26" deep) 0.06-0.2 (26-60" deep)	-Wellsboro- 0.24 (0-7" deep) 0.28 (7-66" deep) -Wurtsboro- 0.24 (0-2" deep) 0.28 (2-60" deep)	Moderate: wetness, frost action.	Moderate: wetness.	Severe: wetness.
Alden silt loam (Ad)	D Hydric	0.6-2.0 (0-12" deep) 0.2-0.6 (12-33" deep) 0.06-0.6 33-61" deep)	0.37 (0-33" deep) 0.28 (33-61" deep)	Severe: ponding, frost action.	Severe: ponding.	Severe: ponding.
Carlisle muck (Ca)	A/D Hydric	0.2-6.0 (0-66" deep)	----------	Severe: ponding, frost action, subsides.	Severe: ponding, low strength.	Severe: excess humus, ponding.
Palms muck (Pa)	A/D Hydric	0.2-6.0 (0-22" deep) 0.2-2.0 (22-60" deep)	----------	Severe: ponding, frost action, subsides.	Severe: ponding, low strength.	Severe: excess humus, ponding.
Neversink loam (Ne)	D Hydric	0.6-2.0 (0-5" deep) 0.06-0.2 (5-60" deep)	0.28 (0-5" deep) 0.20 (5-60" deep)	Severe: wetness, frost action.	Severe: wetness.	Severe: wetness.
Carlisle, Palms & Alden soils ponded (Ce)	A/D Hydric	Look at specific soil information above.				
Neversink & Alden soils (Nf)	D Hydric	Look at specific soil information above.				
Arnot-Lordstown complex (AIC & AIE)	C/D Not Hydric	------Arnot------ 0.6-2.0 (0-16" deep) ---Lordstown--- 0.6-2.0 (0-25" deep)	-----Arnot----- 0.24 (0-2" deep) 0.17 (2-16" deep) --Lordstown-- 0.20 (0-3" deep) 0.28 (3-25" deep)	------Arnot------ Severe: depth to rock, slope. --Lordstown-- Moderate: depth to rock, frost action. Severe: slope.	------Arnot------ Severe: depth to rock, slope. ---Lordstown--- Moderate: depth to rock. Severe: slope.	Both Soil Types Severe: depth to rock, slope.

Table 3.1-2
Soil Characteristics and Limitations
(Table continues on several pages.)

Soil Series	Hydrologic Group[1] /Hydric Soil	Permeability (in./hr) at depth (in.)	Erosion Factor	Potential Limitations for:		
			K[2]	Roads, Parking Lots	Buildings without basements	Shallow excavations
Wurtsboro loam (WuA, WuB & WuC)	C Not hydric	0.6-2.0 (0-26" deep) 0.06-0.2 (26-60" deep)	0.28 (0-60" deep)	Moderate: wetness, frost action.	Moderate: wetness.	Severe: wetness.
Lordstown silt loam (LoB)	C Not Hydric	0.1-2.0 (0-3 deep) 0.6-2.0 (3-25" deep)	0.20 (0-3" deep) 0.28 (3-25" deep)	Moderate: depth to rock, frost action.	Moderate: depth to rock.	Severe: depth to rock.
Lordstown-Arnot complex (LrC)	C/D Not Hydric	---Lordstown--- 0.6-2.0 (0-25" deep) ------Arnot------ 0.6-2.0 (0-16" deep)	--Lordstown-- 0.20 (0-3" deep) 0.28 (3-25" deep) -----Arnot----- 0.24 (0-2" deep) 0.17 (2-16" deep)	---Lordstown--- Moderate: depth to rock, slope, frost action. ------Arnot------ Severe: depth to rock.	---Lordstown--- Moderate: slope, depth to rock. ------Arnot------ Severe: depth to rock.	---Lordstown--- Severe: depth to rock. ------Arnot------ Severe: depth to rock.
Swartswood gravelly loam (SrB, SrC & SrD)	C Not Hydric	0.6-2.0 (0-26" deep) 0.06-0.6 (26-60" deep)	0.20 (0-60" deep)	---SrB & SrC--- Moderate: wetness, frost action, slope. ------SrD------ Severe: slope.	---SrB & SrC--- Moderate: wetness, slope. ------SrD------ Severe: slope.	---SrB & SrC--- Moderate: wetness, slope. ------SrD------ Severe: slope.
Swartswood & Lackawanna soils (SwE)	C Not Hydric	--Swartswood-- 0.6-2.0 (0-26" deep) 0.06-0.6 (26-60" deep) -Lackawanna- 0.6-2.0 (0-32" deep) 0.06-0.2 (32-60" deep)	-Swartswood- 0.17 (0-3" deep) 0.20 (3-60" deep) -Lackawanna- 0.24 (0-3" deep) 0.20 (3-60" deep)	Severe: slope.	Severe: slope.	Severe: slope, wetness.
Scriba loam (ScA & ScB)	C Not Hydric	0.6-2.0 (0-6" deep) 0.06-0.2 (6-60" deep)	0.28 (0-6" deep) 0.20 (6-60" deep)	Severe: wetness, frost action.	Severe: wetness.	Severe: wetness.
Scriba & Morris loams (SeB)	C Not hydric	------Scriba----- 0.6-2.0 (0-6" deep) 0.06-0.2 (6-60" deep) -----Morris------ 0.6-2.0 (0-20" deep) <0.2 (20-60" deep)	-----Scriba----- 0.20 (0-60" deep) -----Morris----- 0.24 (0-60" deep)	Severe: wetness, frost action.	Severe: wetness.	Severe: wetness
Arnot-Rock outcrop (ArC & ArE)	C/D Not Hydric	0.6-2.0 (0-16" deep)	0.24 (0-2" deep) 0.17 (2-16" deep)	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.

Table 3.1-2
Soil Characteristics and Limitations
(Table continues on several pages.)

Soil Series	Hydrologic Group[1] /Hydric Soil	Permeability (in./hr) at depth (in.)	Erosion Factor	Potential Limitations for:		
			K[2]	Roads, Parking Lots	Buildings without basements	Shallow excavations
Oquaga very channery silt loam (OeB)	C Not Hydric	0.6-2.0 0-34" deep)	0.20 (0-34" deep)	Moderate: depth to rock, frost action.	Moderate: depth to rock.	Severe: depth to rock.
Oquaga-Arnot complex (OgC & OgD)	C/D Not Hydric	----Oquaga---- 0.6-2.0 (0-34" deep) ------Arnot------ 0.6-2.0 (0-16" deep)	----Oquaga---- 0.20 (0-34" deep) -----Arnot----- 0.24 (0-2" deep) 0.17 (2-16" deep)	------OgC------ Moderate: slope, frost action. Severe: depth to rock. ------OgD------ Severe: slope, depth to rock.	------OgC------ Moderate: slope. Severe: depth to rock. ------OgD------ Severe: depth to rock, slope.	------OgC------ Severe: depth to rock. ------OgD------ Severe: depth to rock, slope.
Valois gravelly sandy loam (VaB, VaC & VaE)	B Not hydric	0.6-2.0 (0-25" deep) 0.6-6.0 (25-62" deep)	0.24 (0-62" deep)	Moderate: frost action.	Slight---------	Slight----------
Red Hook sandy loam (Re)	C Not hydric	0.6-2.0 (0-38" deep) 0.2-2.0 (38-60" deep)	0.32 (0-7" deep) 0.24 (7-38" deep) 0.17 (38-60" deep)	Severe: wetness, frost action.	Severe: flooding, wetness.	Severe: wetness.
Fluvaquents - Udifluvents complex (FU)	Details not provided in Sullivan County Soil Survey					

[1] Hydrologic groups are used to estimate runoff from precipitation; they range from high infiltration (A) to low infiltration (D).
[2] Erosion Factor K indicates susceptibility to sheet and rill erosion (expressed in tons/acre/year). K values range from 0.05 to 0.69. (0.05 being least susceptible).
Source: *Soil Survey of Sullivan County, New York*, USDA SCS.

As stated above, the soils observed on the property are rated with moderate to severe limitations for the construction of local roads and parking lots, buildings without basements, and shallow excavations for utilities. As shown on Figure 3.1-4 Soils Map the most prevalent soil type is Wellsboro and Wurtsboro soils (WIC) where development will occur. The Wellsboro & Wurtsboro soils have moderate limitations for buildings and roads due to seasonal wetness and frost action. These restrictions do not impede development on these soils, but they will require a greater degree of engineering and construction costs. There are an abundant amount of soils on this property in which development is proposed. Most soils are proposed to be disturbed except for the hydric soils on the property associated with the wetlands on the property. These soils types that are proposed to remain undisturbed are; Carlisle Muck (Ca), Neversink Loam (Ne), Palms Muck (Pa), Carlisle, Palms, and Alden Soils Ponded (Ce), Neversink and Alden soils, very stony (Nf), and Alden Silt Loam (Ad).

Potential impacts of development in the onsite soils and proposed mitigation measures are described below.

3.1.2 Potential Impacts

Geology Impacts

The specific locations of shallow bedrock and amount of rock removal required for the proposed project have not been identified on the property. The rock outcrops within 200 feet of St. Joseph's Road, shown in Appendix F, will not be disturbed during the construction of the proposed Lost Lake Development. These rock outcrops will be conserved due to their visible location near the public roadway. In spite of design considerations, the evidence of outcrops in many areas of the site indicates that rock removal may be required on the property. The preliminary engineered road profiles show approximately twenty-one areas within the proposed roadways that propose a cut of material greater than 10 feet. It can be assumed that in these areas rock will be encountered and will need to be removed. Rock removal can be completed using methods other than blasting. In areas where rock is weathered, hammering, ripping, or chipping with excavators will be used where possible. Blasting will only be used where other options are not feasible. All rock excavated on the site in connection with the proposed development will remain on the project site to be used as road base.

Blasting, if necessary will be carried out in accordance with the Industrial Code Rule 39 of the New York State, Department of Labor, Industrial Board of Appeals and the applicable section of the New York State Labor Laws. New York State regulations require insurance and licensing for the contractor as well as provide guidelines for the possession, handling, storage, and transportation of all explosives.

As shown in Figure 3.1-1, Marcellus Shale in New York State, Sullivan County and the subject property are located within the area where Marcellus Shale is mapped in New York State. The use of the site as proposed for the development of Lost Lake Resort is not intended to include any drilling of natural gas associated with the Marcellus Shale formation.

Slope Impacts

Impacts to steep slopes are directly related to the potential for soil erosion during construction. The majority of grading for the Lost Lake Development will occur in areas with slopes of less than 25 percent as shown in Figure 3.1-5, Steep Slopes Disturbance Map. Impacts to steep slopes of 25 percent or greater are primarily located south of St. Joseph's Road for the construction of the road network as well as grading for stormwater detention basins and homes. This area represents only two percent of the total area of grading. Approximately 14.99 acres of steep slopes will be impacted by the fully built project. Slope disturbance by acreage and slope category is provided in Table 3.1-3.

Table 3.1-3
Slope Disturbance Analysis

Slope Category	Acres
0% to 25%	586 acres
>25%	15 acres
Total Site Disturbance	601 acres

Source: Tim Miller Associates, Inc. and Brinkash & Associates (2009)

Exposing soils on steep slopes during construction increases the potential for erosion in the short term. This potential impact will be mitigated by adherence to the soil erosion and sedimentation control practices described below. Following construction, soil erosion from the developed site is expected to be minimal since developed areas will be stabilized with permanent stabilization measures including lawn and landscaping, and storm water management features.

Soils Impacts

Grading and recontouring of soils is required for the construction of roads, residential dwellings, recreational facilities, the golf course construction, and the storm water detention basins, as shown in the Grading Plans for the Phase 1 area that accompany this document (Sheets C-2 thru C-6). The total area of grading or site disturbance is estimated to be approximately 601 acres of the site. Therefore, approximately 1478.5 acres of the site will remain undisturbed.

The potential for soil erosion associated with grading work is temporary in nature, as all areas will ultimately be stabilized by impervious cover or landscaping. Any disturbed area that is not developed with impervious surface areas will be graded, seeded and landscaped, including the stormwater management basins. Table 3.1-4, Post Disturbance Coverage, shows the distribution of cover types in the existing condition and post development for the fully built project. These acreages represent all roads, utility and stormwater infrastructure, amenity buildings and 2,557 single family houses for the fully developed site.

Table 3.1-4
Post-Disturbance Coverage - Full Build
(Acres)

Cover	Pre-Dev't	Loss	Created	Post-Dev't
Meadow (upland)	0.50	0.50	175.74	175.74
Woods (upland)	1809.63	600.06	0.00	1209.57 *
Wetland	211.89	0.44	1.01	212.46
Surface Water (additional to wetland)	55.99	0.00	14.01	70.00
Unvegetated, Rock	1.50	0.00	1.50	3.00
Impervious Surfaces (pavement + buildings)	0.00	0.00	193.97	193.97
Lawn/Landscaping	0.00	0.00	214.77	214.77
TOTAL	**2,079.51**	**601.00**	**601.00**	**2,079.51**

Source: Tim Miller Associates, Inc. 2010 and Brinkash Associates 2010.
* Post-development woods refers to the total area of undisturbed upland woods after construction, which is but a part of the total "open space" in the project.

The majority of residential, the road network, and the installation of utilities in shallow excavations will occur within soils mapped as Wellsboro and Wurtsboro soils (WIC). Other soil types are also impacted by the proposed Lost Lake Resort development but not as extensively as these soils due to the frequency of the Wellsboro and Wurtsboro soils on the property. As described previously, on-site soils may have development limitations which will be addressed through appropriate mitigation measures described below. The limitations or restrictions do not impede development on these soils, but may require a greater degree of engineering detail.

A site specific soil erosion and sediment control plan will be prepared for each phase of the project. Erosion control and slope protection will be undertaken in accordance with the Erosion and Sediment Control Guidelines in the New York State Department of Conservation (NYSDEC)

SPDES General Permit for Stormwater Discharges from Construction Activities (Permit No. GP-0-10-001)[1] and the NYSDEC *Stormwater Management Design Manual*. Mitigation measures are presented below. It is anticipated that with the proper design and implementation of these measures, along with consistent and frequent inspections, these measures will minimize potential soil erosion impacts.

Cut and Fill Estimates

A preliminary estimate for earthwork required to construct Phase 1 roadways, stormwater management features and the main entrance structures is approximately 85,700 cubic yards (cy) of earth cut and the same amount of fill, therefore there will be a net balance of earth grading (cut and fill). A preliminary estimate for the total earthwork required to construct the full buildout is approximately 677,500 cy of earth cut and the same amount of fill, therefore there is a net balance of material for the overall project. Crushed rock will be used for roadbed construction or for fill areas where the material is suitable.

There are no areas of steep slope disturbance (25% and greater slopes) for the Phase 1 road network. Given the more gentle topography on the north side of the site, it is excepted that little or no rock excavation will be necessary for Phase 1 construction. The other phases may involve rock excavation. Transition areas back to existing grade at the edges of the roadway section will be graded at 3H:1V or less in most locations. Proximity to properties and steep slopes may warrant slopes of 2H:1V (with slope protection) or 1H:1V in areas of rock cut. Slope protection will be in the form of rolled erosion control protection mats and hydroseeding with tackifier. Excess soil will be stockpiled and skirted with silt fence barrier to prevent sediment transport. Excess rock will be stockpiled for use onsite.

For the overall project road system shown in the preliminary road profiles in Appendix D, there are four locations where 20 feet or greater depth of cut or fill is proposed for road construction (Road J 31.5 ft of cut and 28 ft of fill; Road M 25 ft of fill; and Road A 21 ft of cut for the tunnel). In general, all interior roads will be graded at between 1 percent and eight percent. On the preliminary profiles, there is two locations with maximum gradient of 9.5 to 9.6 percent (Roads K and NN). Overall earthwork for installation of all the roads and stormwater facilities is estimated at 677,500 cubic yards.

Sub-Soils for the Golf Course

On-site soils within the proposed golf course area are currently Wellsboro and Wurstboro soils (WIC) and Wurtsboro loam (Wu). As stated within Section 3.1.1 above, these soils are primarily characterized by moderately well drained, gravelly fine and sandy loam. Typically, a quality golf course is constructed with a manufactured sand-mix for the sub-soils of the fairways. A peat/sand mixture will be used for green and tee areas. It is expected that the existing soil types will provide adequate base for the manufactured surface mix that will be screened and then brought on site.

[1] All references in this DEIS to project conformance to the SPDES General Permit shall mean the most current permit. "An owner or operator of a construction activity that is eligible for coverage under GP-0-10-001 must obtain coverage under the permit prior to the commencement of construction activity." (NYSDEC) The stormwater design conforms to GP-0-10-001, effective January 29, 2010.

3.1.3 Mitigation Measures

Soil Erosion and Sediment Control Plan

Potential erosion and sedimentation will be controlled during the construction period by measures specified and designed in the Preliminary Stormwater Pollution Prevention and Erosion and Sediment Control Report, included in this document as Appendix G. The stormwater management report has been prepared in accordance with New York State regulations applicable to a project-specific stormwater pollution prevention plan ("the SWPPP"). As part of the SWPPP, an erosion and sediment control plan for Phase 1 has been developed in accordance with the Erosion and Sediment Control Guidelines in the NYSDEC SPDES General Permit for Stormwater Discharges for Construction Activities (Permit No. GP-0-10-001), *Best Management Practices Manual for Erosion and Sediment Control (1991)* and *New York State Standards and Specification for Erosion and Sediment Control (2005)*. The Phase 1 Preliminary Erosion and Sediment Control/Stormwater Management Plans accompany this document. These documents (the SWPPP) must be approved by NYSDEC prior to commencement of construction. Implementation of the SWPPP will include monitoring and enforcement as required by NYS law and NYSDEC General Permit requirements.

Per the *New York Standards and Specifications For Erosion and Sediment Control* "The plan must be designed so that suspended, colloidal, and settleable solids are not discharged in amounts that cause substantial visible contrast to natural conditions" The most effective method to prevent colloidal clay dispersion and off-site discharge is though erosion control (controlling runoff and the stabilization of exposed soils). These methods are described below.

The proposed temporary and permanent erosion and sediment control facilities are described in the preliminary SWPPP attached as Appendix G. Temporary erosion control measures will include but are not limited to stabilized construction entrances, temporary sediment traps, silt fences/or haybales, temporary seeding and mulching, sedimentation basins, and diversion berm/swales.

Permanent erosion and sediment control measures are also described in the preliminary SWPPP. In general, the permanent erosion and sediment control facilities to be constructed include but are not limited to: rock aprons, storm sewer piping and swales, dry wells, infiltration trenches, detention ponds, and stoned lined outlet protection, and revegetation on all disturbed area that are not proposed to be impervious surfaces. The SWPPP is a document that is often modified in response as site conditions vary. Erosion and sediment control measures are reviewed weekly for appropriateness and effectiveness. Additional measures, that may not be included in the SWPPP, can be called for in the field to address specific concerns.

The purpose of the Erosion and Sediment Control Plans included in the SWPPP is to minimize the erosion of exposed areas of soils and to prevent the migration of sediment into surface waters during construction. The SWPPP will be implemented in construction areas for the duration of construction on this site to minimize or avoid impact to surface water resources that receive stormwater from the project site following construction.

Construction Sequence for Phase 1 and All Subsequent Phases

During construction of Phase 1 and each subsequent phase of construction of the proposed Lost Lake Resort, a sequencing plan will be used to help with erosion/sedimentation control. The sequencing plans, which are listed on the Phase 1 Preliminary Erosion and Sediment

Control/Stormwater Management Plans, follow these guidelines (refer to drawing Sheets P1-11 and P1-13 for sequencing notes):

- Site disturbance (clearing, grubbing and grading) will be limited to those areas necessary for construction in each stage.
- Each stage will be completed before the next stage is initiated.
- At the completion of each earth disturbance activity, stabilization will immediately occur to the disturbed areas to protect from erosion.
- Responsibilities for ongoing inspection and maintenance of the erosion and sediment control measures for the duration of the construction are specified on the erosion control plans.

The construction sequence for Phase 1 and each subsequent phase is as follows:

1. Installation of the stabilized rock construction entrance along with fabric silt fencing where shown on the erosion control plans. Construct and stabilize the sediment traps and related measures associated with the sediment basins and sediment traps shown on the plans. Procedures for removal of temporary measures or conversion of temporary measures to permanent erosion/sedimentation control measures are specified on the erosion control plans. Topsoil will be stripped from areas of construction, topsoil will not be removed until all erosion and sediment control devices have been properly installed. Topsoil will be stockpiled, seeded and mulched as needed to minimize erosion.
2. Road network will be installed and stabilized. The sequence for roadway construction, including rough grading, utility installation, construction of roadside swales, stormwater management systems, and protection of these activities with erosion/sedimentation control methods and devices, are specified on the erosion control plans.
3. Bulk grading of areas proposed for buildings or other facilities will then occur. If fill is required to come from an off-site source, that source will need to supply an approved erosion and sediment control plan.
4. Provisions are included in the erosion control plans for construction of the dwellings, including typical treatments for grading, erosion/sedimentation controls, stormwater management and sequence of construction on each individual lot (Sheet P1-13).
5. Once all earth moving activities have been completed and all disturbed areas have achieved permanent vegetation (specified as a minimum 80% perennial vegetative cover with a density capable of resisting accelerated erosion and sedimentation), all temporary erosion and sedimentation control devices will be removed and the construction site permanently stabilized.

A site-specific erosion and sediment control plan will be prepared and approved prior to commencement of each subsequent construction phase. Future phases of construction will follow the same sequence as outlined above.

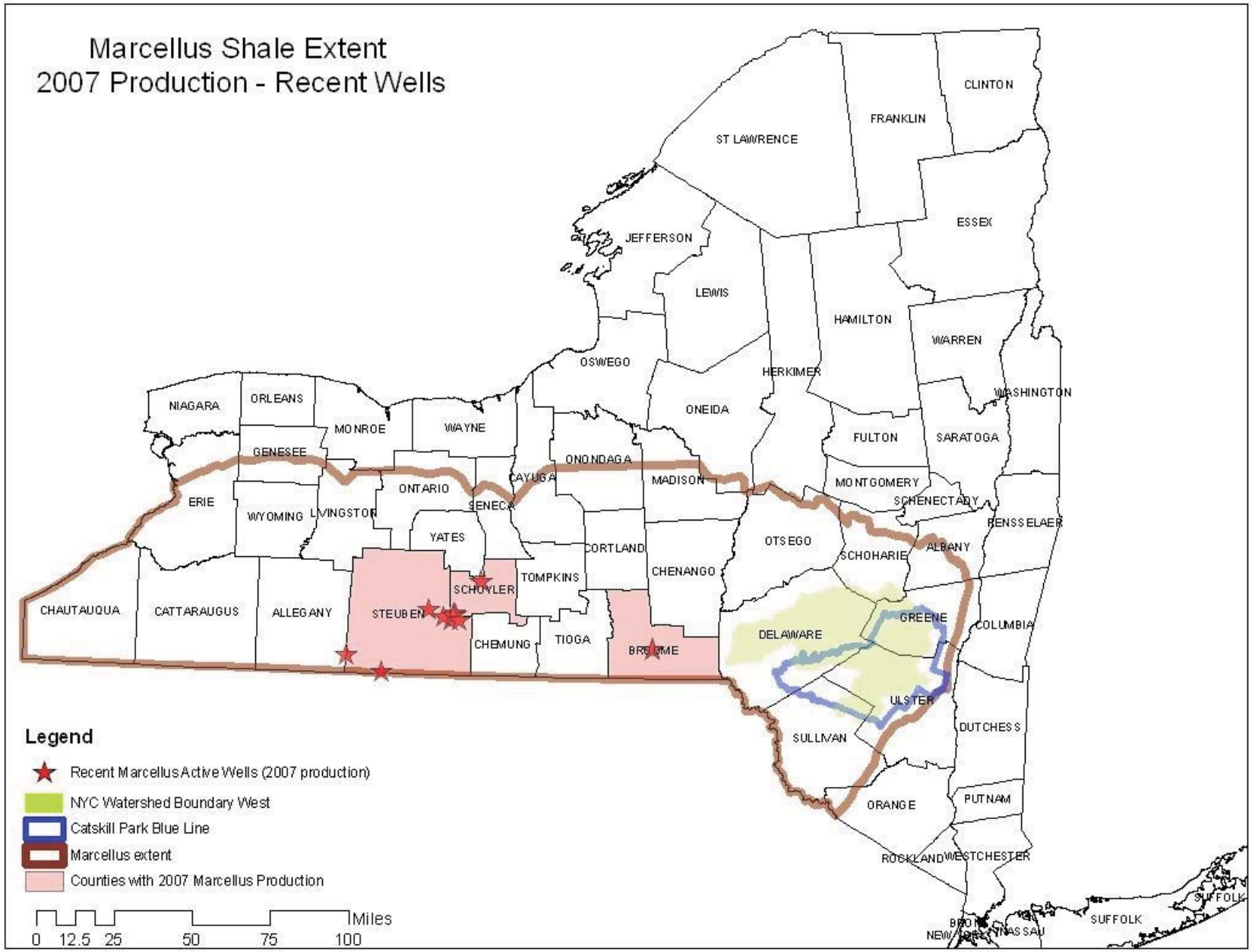

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Figure 3.1-1: Marcellus Shale in New York State
Lost Lake Resort
Town of Forestburgh, Sullivan County, New York
Source: NYSDEC
Scale: Graphic

Tim Miller Associates, Inc.,10 North Street, Cold Spring, New York 10516 (845) 265-4400 Fax (845) 265-4418

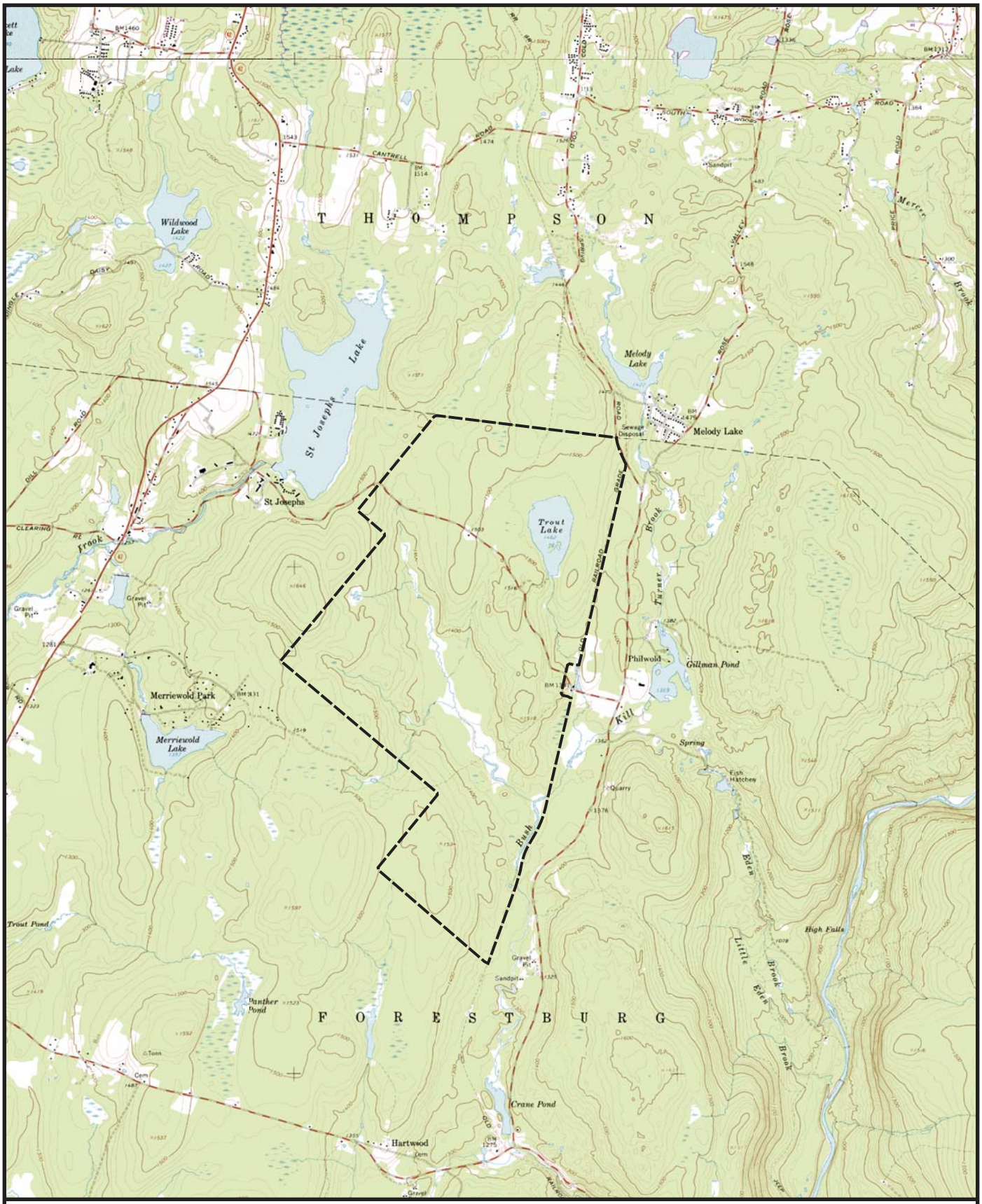

Figure 3.1-2: Local Topography

Lost Lake Resort

Town of Forestburgh, Sullivan County, New York

Base Map: USGS 7.5-minute Topographic Map, Hartwood Quad

Scale: 1" = 4,000'

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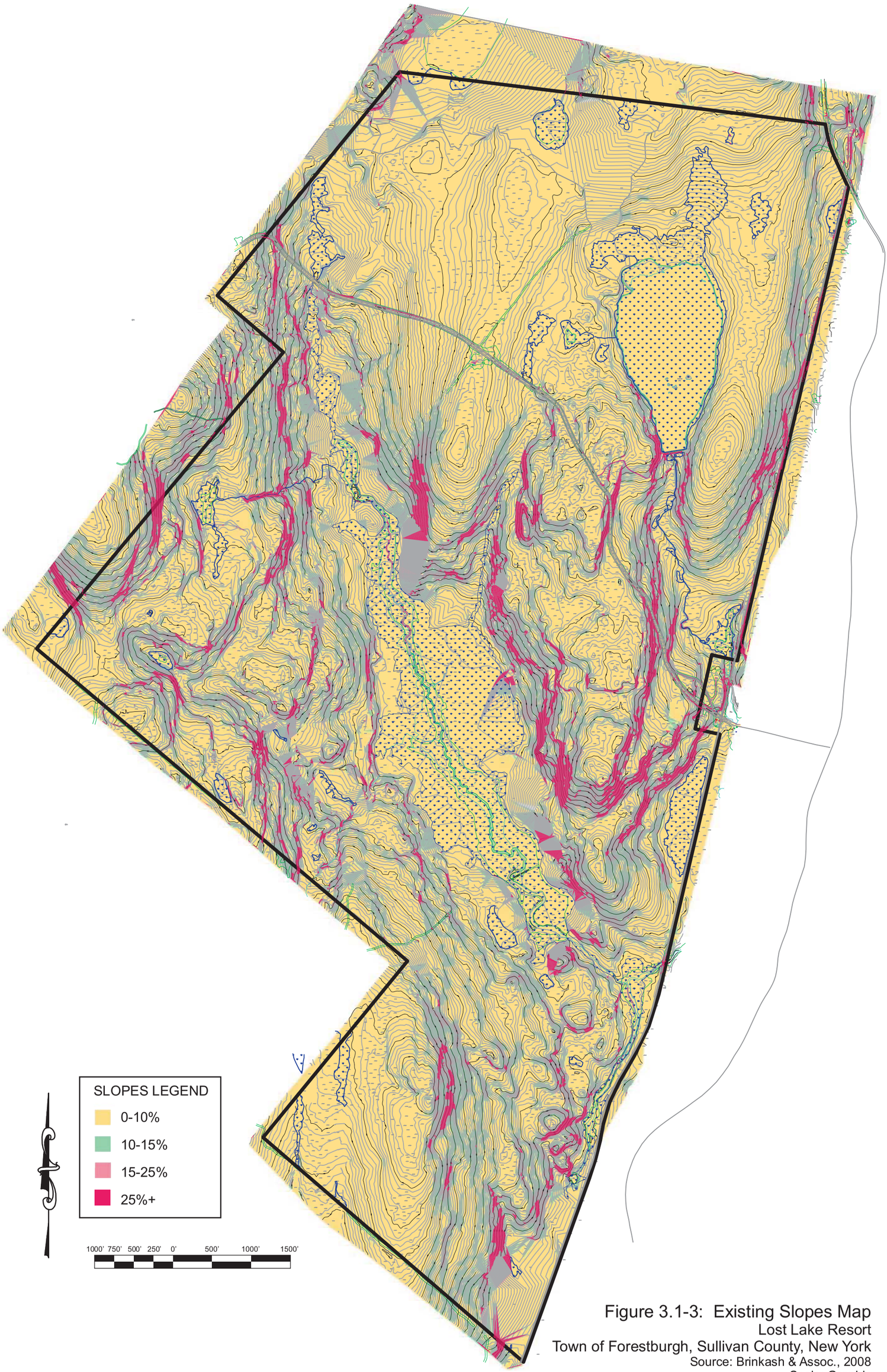

Figure 3.1-3: Existing Slopes Map
Lost Lake Resort
Town of Forestburgh, Sullivan County, New York
Source: Brinkash & Assoc., 2008
Scale: Graphic

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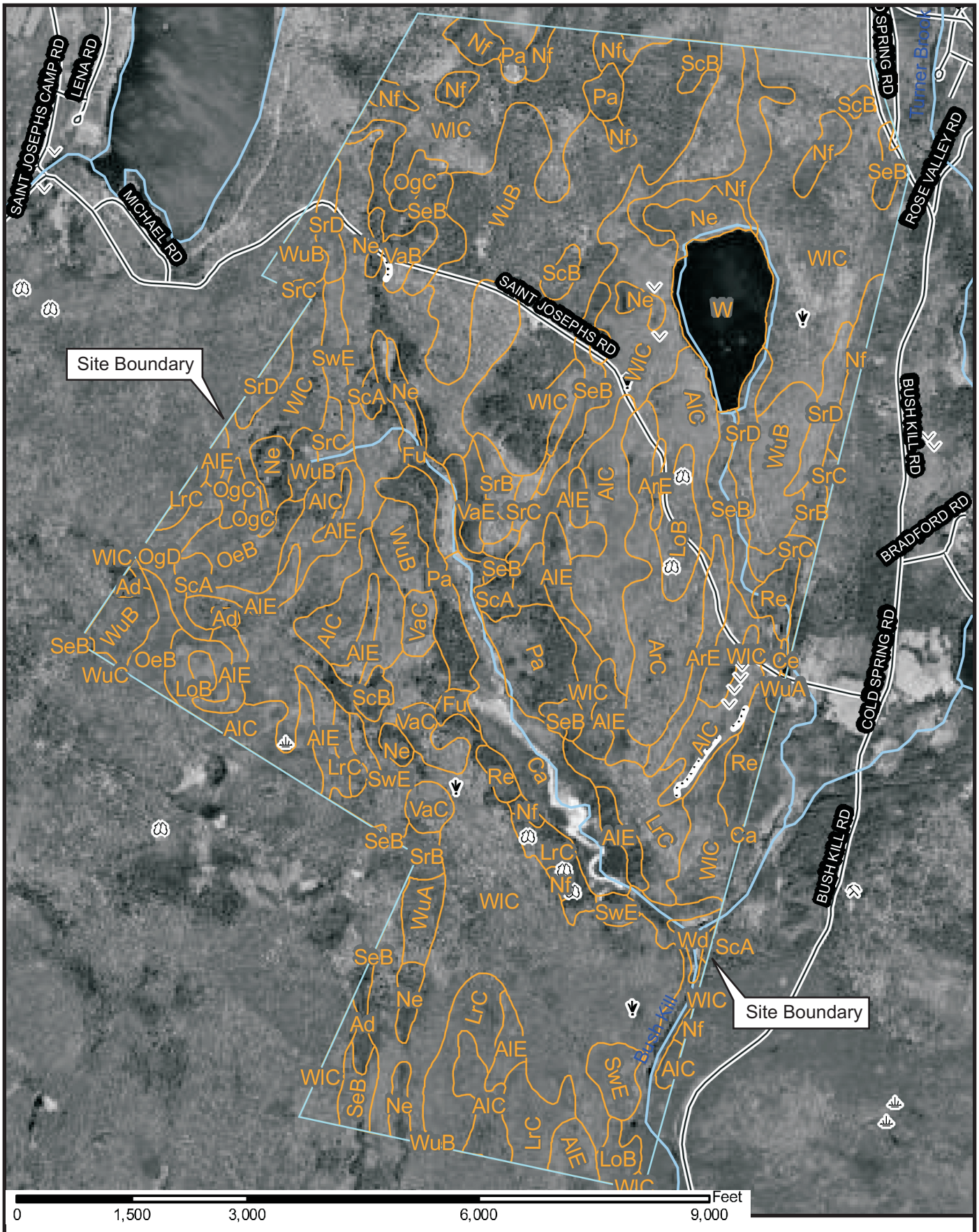

Figure 3.1-4: Soils Map
Lost Lake Resort
Town of Forestburgh, Sullivan County, New York
Source: U.S. Dept. of Agriculture, Natural Resources Conservation Service
Scale: As shown

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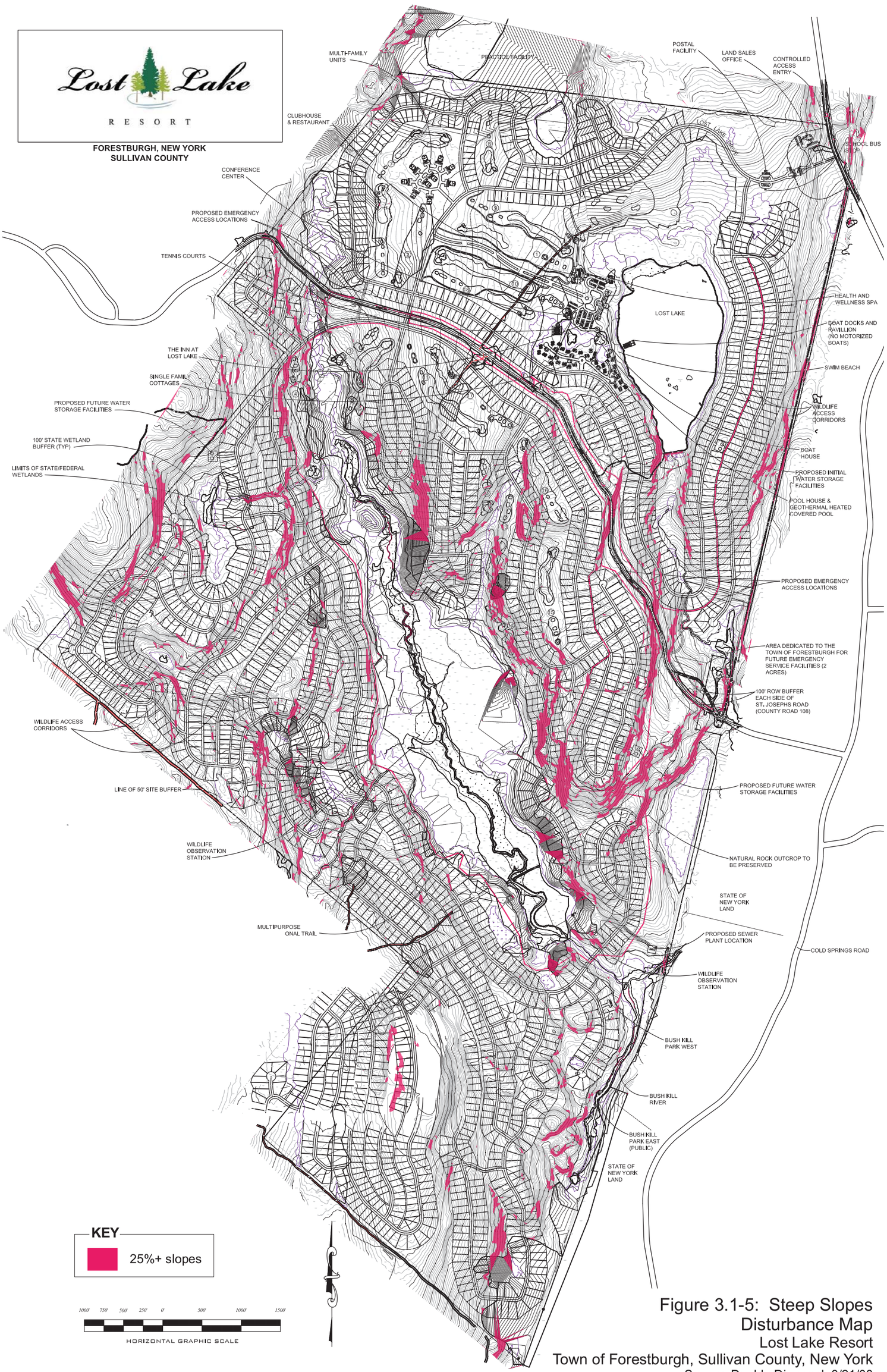

Figure 3.1-5: Steep Slopes Disturbance Map
Lost Lake Resort
Town of Forestburgh, Sullivan County, New York
Source: Double Diamond, 8/21/08
Scale: Graphic

File 07093 09/25/09
JS/07093

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