ATLANTIC TESTING LABORATORIES

GEOTECHNICAL DESKTOP STUDY

PROPOSED WIND TURBINES
ROARING BROOK WIND POWER PROJECT
TOWN OF MARTINSBURG
LEWIS COUNTY, NEW YORK

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Wind Power Project
Town of Martinsburg
Lewis County, New York

ATL Engineering, P.C.

1.0 DESCRIPTION OF PROPOSED DEVELOPMENT

The proposed Roaring Brook Wind Project is located in the Town of Martinsburg in Lewis County, New York. The planned wind project will consist of approximately 39 Gamesa 2.0 MV G90 wind turbines (78MW) over an approximate 4,000-acre area. The proposed wind turbines will have a 100m tower and 90m rotor.

2.0 PURPOSE AND SCOPE

The scope of work is limited to a review and assessment of readily available existing information. The goals of this report are to:

- Review readily available existing information, such as geologic maps and reports, geophysical reports, topographic maps, corrosivity reports, seismic maps and reports, precipitation maps, US Department of Energy tables, New York State Department of Transportation reports, proposed development maps/turbine layouts, and aerial photographs.
- Summarize ATL Engineering, P.C.'s (ATL's) general knowledge of the soil and groundwater conditions in the area surrounded the proposed development.
- Summarize geologic/geotechnical conditions.
- Identify and qualify geologic/geotechnical risks.
- Address feasible foundation options and related design and construction issues.
- Summarize soil conditions related to electrical design parameters; thermal and electrical resistivity.
- Identify potential roadway issues.
- Recommend whether or not a preliminary field investigation is warranted, and if so, recommend a scope.
- Recommend a geotechnical investigation approach.

3.0 SITE GEOLOGY

The proposed Roaring Brook wind project is located on the Tug Hill Plateau, within the Black River Valley, to the west of the Adirondack Mountains and to the east the Ontario Lowlands. The underlying bedrock consists of the Trenton bedrock group. The bedrock underlying the project area could consist of Utica Shale, limestone, or siltstone. This bedrock is primarily marine sediment of early to mid-Ordovician age (about 400 million years old). The bedrock is relatively flat-lying and undeformed. Within the last 12,000 to 1 million years, the area was covered by glaciers which removed material and rounded the topography, leaving behind glacial till (unsorted clay-rich soil) and outwash (sand and gravel).

The site is generally covered with glacial till that is overlain by lacustrine silty sand. The glacial till varies in texture from boulders to silt, with poorly sorted sand-rich material exhibiting variable permeability. The thickness of the glacial till can range from 3 to 165 feet (1 to 50 meters). Swamp deposits, till moraine, and exposed rock also exist in the project area. The swamp deposits consist of peat-muck, organic silt and sand in poorly drained areas. The thickness of the swamp deposits can range between 3 to 33 feet (1 to 10 meters). Areas to the east and west contain till moraine. Till moraine is variable in size and sorting, with minor amounts of sand and silt that was deposited during the final melting of the glaciers. The thickness of the till moraine ranges from 3 to 33 feet (1 to 10 meters).

Bedrock can be found at depths as shallow as 3 to 10 feet (1 to 3 meters) below the surface. Due to its proximity to the surface, there may be areas of exposed bedrock in the project area.

Due to the rural, forested nature of the proposed site, the NRCS has not conducted a detailed soil survey of the entire project area. The portion of the project area covered by the NRCS soil survey includes turbines 1 through 13, 21, 22, and 23.

According to USDA Web Soil Survey (NRCS, 2006), the portion of the project area covered by the soil survey generally contains the following soil types. Detailed soils reports are included in Appendix C for reference.

USDA Soil Type Symbol	Soil Type Name	USDA texture	Approximate Site Coverage (%)
EdB	Empeyville loam	3 to 8 percent slopes, stony	36.1
PaA	Peat and Muck	Shallow	0.3
PbA	Peat and Muck	Deep	22.3
TaB	Tughill silt loam	0 to 5 percent slopes, very stony	3.8
WdB	Westbury Loam	3 to 8 percent slopes, stony	0.5
WmB	Worth Loam	3 to 8 percent slopes, stony	3.0
WmC	Worth Loam	8 to 15 percent slopes, stony	2.5

The US Department of Energy lists one oil or gas field in the Tug Hill area in Lewis County. (http://www.eia.doe.gov/oil_gas/natural_gas/data_publications/field_code_master _list /fcml.html). Given its rural character, the project area is unlikely to have high-volumes of groundwater withdrawal; therefore there is little risk of subsidence due to these mechanisms.

New York State Department of Transportation, Approved List of Stone Quarries of Fine and Coarse Aggregates lists two aggregate sources in Lewis County.

Company Name and Source Location	Approximate Distance from Roaring Brook (miles)	Rock Type
Barrett Paving Materials Inc. Port Leyden, New York	20	Limestone Granite
V.S. Virkler & Son, Inc. Martinsburg, New York	< 5	Limestone

The seismicity of the project area is considered relatively low. The area has not experienced an earthquake since the mid-1800s.

The water table appears to exist between the ground surface and 2.5 feet below the surface. Below is a table of each soil type and the respective upper and lower limits of the water table.

USDA Soil Type Symbol	Water Table (ft)	
	Upper Limit	Lower Limit
EdB	1.5	2
PaA	0	0
PbA	0	0
TaB	0	0
WdB	0.5	1.5
WmB	2	2.5
WmC	2	2.5

Based on ATL's geotechnical experience in Lewis County and the wetlands indicated on the USGS Quadrangle maps, groundwater may exist at shallow depths.

4.0 GEOLOGICAL/GEOTECHNICAL RISKS

Hazard	Risk	Comment
Flooding/High Groundwater	Possible	Project site is located around a flood plain for Roaring Brook. Several wetlands are identified on the USGS maps. The soil in the area (glacial till) also has low permeability.
Slope Failure	No	The site is generally rolling terrain with elevations ranging from 1900 to 1960, based on the USGS topographic maps, within the project area.
Subsidence – Pumping	No	Project site contains only one oil or gas field and it is located in a rural area with little current risk of high-volume groundwater withdrawal.
Subsidence – Mining	No	While there is mining in Lewis County, there is no known underground mining in the project area.
Subsidence – Caves/Karst	Possible	There is a possibility of caves or karst topography in this area due to the limestone bedrock in the area.
Earthquake/Seismicity	Low	The site is in a relatively low seismicity area.
Swelling/Shrinking Soil	Possible	Depends on the percentage of clay in the soils
Corrosive Soil	Possible	Depends on soil types, see Section 5.2.
Made Ground	No	No known mining and rural nature indicate low risk.
Collapsible Soil	No	Collapsible soils are not known or likely to be present.
Volcanic Action	No	There is no current volcanic activity in this region.
Quick Clay	No	Quick clay conditions are not known or likely to be present.

5.0 OTHER SITE RISKS

5.1 Flooding and Rainfall

Rainfall in the area is approximately 60 to 65 inches annually. Any roadways that will cross streams and gullies will likely require culverts to minimize the amount of water soaking into the road's subgrade and to maintain water flow to prevent flooding and ponding on the proposed access roads. Identification of seeps and the potential for seeps during construction will be important for the long term durability of the roadways.

5.2 Soil Corrosivity

The following table shows the soil types through the Web Soil Survey with corrosivity categories related to uncoated steel and concrete based on soil type.

USDA Soil Type Symbol	Risk of Corrosion	
	Uncoated Steel	Concrete
EdB	Low	High
PaA	High	Moderate
PbA	High	High
TaB	High	High
WdB	Moderate	High
WmB	Low	High
WmC	Low	High

6.0 FOUNDATION CONSIDERATIONS

Feasible foundation types for the project area are in part selected based upon a combination of critical geotechnical and climatological factors, which drive the design selected.

6.1 Geotechnical Factors

The project site geology consists of lacustrine deposits (made up of a variety of materials, including fine particles of silt and clay and larger particles of sand and gravel) and glacial till overlying sedimentary bedrock. Loose or soft lacustrine deposits are generally not suitable for support of typical shallow foundations. The underlying glacial till soils are generally suitable for support of shallow foundations; however, these deposits may become unstable when saturated.

6.2 Climatological Factors

The project site can experience very large storm events. This could cause very high levels of flooding in ditches and small streams that normally experience low or zero flow. While localized flooding occurs along these tributaries, care should be taken in locating foundations so that flooding will not impact turbine foundations and roadways.

6.3 Recommended Foundation Types

Due to the expected competency of the soil deposits and possible shallow bedrock, deep foundations such as caissons, driven piles, or drilled piers are not anticipated at this time. A spread footing founded on suitable glacial till or improved in-situ soils appears feasible and more economical, based on the combination of critical geotechnical and climatological factors identified:

- **Spread Footing**

  The glacial deposits and possible shallow bedrock are typically suitable for support of a spread footing. Some potential limitations, based on the geotechnical information reviewed, include but are not limited to shallow groundwater, depth to competent glacial till, and shallow bedrock. It is anticipated that groundwater encountered during foundation excavations can be controlled with conventional sump and pump methods; however, exposed foundation and road subgrades must be protected from construction traffic and excessive moisture. Rock excavation and/or blasting may be required where shallow rock is encountered.

- **Engineered Subfill Supporting a Spread Footing**

  If weak glacial deposits are encountered less than 15 feet below the surface, or if a sloping bearing surface exists, over excavation may be required. Overexcavated foundation subgrades may be replaced with granular or flowable fill, to provide a stable, uniform bearing surface for support of a spread footing.

- **Stone Columns Supporting a Spread Footing**

  Loose, soft, or unsuitable soil greater than approximately 15 feet below the surface may be improved by installing densified stone columns. The columns are generally 3-feet in diameter, spaced 2 to 3 diameters and can extend to a maximum depth of 30 feet. If unsuitable soil conditions extend greater than 30 feet, stone columns can not typically be constructed. This method is suitable for most soil types, and fits well with the variable soil types anticipated within the project area. The stone backfill material for the columns should consist of well-graded material with particle sizes ranging from 0.4 to 1.4 inches. It will be important to identify supply sources for this material. The size, spacing, and number of stone columns is based upon the unit cell concept. In addition, the equipment used, the area replacement ratio of the stone column to area improved, and the potential lateral support of the surrounding soil are all considerations in designing the stone column layout. The unit cell concept assumes that the individual stone column stabilizes a certain area of soil (the unit cell). In this area, the stone columns replaced a portion of the in-situ soil, while the use of a vibrator for installation of the stone column results in densification of the surrounding soil, with the resulting unit cell being stronger than the original soil. A proprietary version of the stone column is called the Geopier.

7.0 ELECTRICAL DESIGN

7.1 Soil Electrical Resistivity

Based on the National Resource Conservation Service (NRCS), the general soil types relevant to the Roaring Brook Wind Project include the Empeyville loam, Peat and Muck, Tughill silt loam, Westbury loam, and Worth loam.

For most engineering applications in soil, the motion of ions in the interstitial formation of water is the dominant factor affecting the resistivity of the soil. The presence of ions in soil is due to the dissociation of salts into cationic and anionic states. An example would be the dissociation of sodium chloride (NaCl) into sodium ions (cations) and chloride ions (anions).

Because this conduction is electrolytic and is related primarily to ions moving through the fluid, the cation exchange capacity of clay minerals increases conductivity. Although clay minerals are the most important in this regard, all fine-grained minerals possess an exchange capacity to some degree.

The resistivity of the soils or rocks decreases when there is water in the soil or water is encountered at a groundwater table, the salinity of the water or soil is high, the presence of clay or other fine grained particles, high porosity of the soils, fractures in the underlying rock, and finally if weathering has occurred to the underlying rock. In comparison, the resistivity of the soil increases when the soil is compacted.

The predominant factor affecting the electrical resistivity of the subsurface geology in the Roaring Brook Wind Project area appears to be the presence of soils containing silty clay underlain by bodies of limestone and/or shale. These factors lead to lower soil resistivity. There could be smaller local areas of increased resistivity due to glacial till or sandy gravely material. The NRCS soil survey for the site does not provide soil resistivity data.

The British Standard provides guidance for the potential corrosivity of material based upon resistivity measurements (BS-1377 Soil Electrical Resistivity Classification). The following is the Soil Electrical Resistivity Classification Table adapted from http://www.corrocont.com/resistivity.html.

Resistivity Range (Ω-cm)	Resistivity Range (Ω-feet)	Potential Corrosion Activity
Under 1,000	Under 30	Severely Corrosive
1,000 – 5,000	33 - 164	Corrosive
5,000 – 10,000	165 - 328	Moderately Corrosive
Above 10,000	Above 330	Slightly Corrosive

Based on this reference, soils indicated as being present in the USDA/NRCS soil survey appear likely to range from corrosive to moderately corrosive, with less corrosive conditions occurring in well drained sand and gravel soils.

We recommend an electrical resistivity survey be conducted in order to determine specific grounding and cathodic protection design parameters. The survey should be performed in accordance with ASTM G57-95a “Standard Test Method for Field Measurements of Soil Resistivity Using the Wenner Four-Electrode Method” (equivalent to IEEE Std. 81-1983). Testing should be conducted at each construction site or at a representative number of sites for each soil type and topographic setting.

7.2 Soil Thermal Resistivity

To determine soil thermal resistivity, the best method to determine site specific values is to collect soil samples and perform laboratory testing in accordance with ASTM D 5334-05, Standard Test Method for Determination of Thermal Conductivity of Soil.

7.3 Recommended Testing

If PPM completes the next preliminary geotechnical investigation phase, as recommended in Section 9, ATL also recommends the following testing for the electrical design be performed:

- Complete 4 soil electrical resistivity tests
- Collect and test 4 soil samples for thermal resistivity
- Test and sample locations should be selected by the electrical designer

Completing the recommended soil electrical and thermal resistivity testing will cost on the order of $6,000 to $8,000.

8.0 CIVIL DESIGN

The construction of access roads to the turbines was reviewed with respect to the subgrade, availability of construction materials, and the topography of the project site.

The soil types indicated by the USGS/NCRS soil survey data consist of silty sand and peat and muck. The silty sands are potentially moisture sensitive and could become unstable during wet periods of the year. The peat and muck will provide little support for the heavy truck traffic associated with wind turbine construction. Road construction methods consisting of removal of poor subgrade soils and/or the use of stabilizing geotextiles may be necessary.

The availability of granular material for roadway and crane pad construction is good. There are several locations with natural gravel deposits and there are also quarries in the area which supply crushed stone conforming to New York Department of Transportation (NYSDOT) specifications. It is believed that the bedrock could be shallow in some areas and could impact road construction.

Review of aerial photography in the area indicates that clearing and grubbing will be required for construction of the roadways. Based on the aerial photography, the clearing and grubbing may cover a larger area than indicated on the USGS topographic maps.

Based on the rolling topography indicated on the USGS topographic maps, drainage structures such as culverts, may be needed along roadway alignments.

9.0 RECOMMENDED PRELIMINARY GEOTECHNICAL FIELD INVESTIGATION

Based upon the geologic history described in Section 3.0 and our understanding of the project area, it appears the remaining questions regarding the general suitability of this site for the proposed development surround:

- Thickness and conditions of glacial till and overburden
- Depth and condition of bedrock
- Presence of shallow groundwater

It appears that a combination of test pitting at selected sites, a field conditions survey (including electrical resistivity testing), and laboratory soils classification and thermal resistivity testing should provide preliminary information regarding foundation and roadway design and construction.

9.1 Test Pits

Test pits (a maximum of 15 feet deep or to refusal on bedrock) should be performed at approximately 8 locations to provide spatial coverage across the proposed site. The primary purpose of the test pits is to evaluate overburden conditions, depth of rock, and groundwater conditions for the proposed spread footing foundations. In addition, test pits will allow for soil classification and thermal resistivity testing. To avoid potential complications during future investigations and construction, test pits should be performed at least 100 feet from proposed turbine locations.

9.2 Field Conditions Survey

A field conditions survey should be performed to further explore the identified geologic risks and concerns related to foundation and roadway design and construction. Particular attention should be paid to evidence of historic mining and undocumented fill, areas prone to flooding, access roadway conditions, and any other items of geologic interest. This survey should be performed by qualified personnel with a background in engineering geology. In addition, electrical resistivity testing should be performed at approximately 4 locations.

9.3 Laboratory Testing and Other Work

Testing that should be performed on bulk samples gathered during test pitting should include, but not be limited to:

- Grain size, Atterberg limits, moisture content, shear strength (direct shears), and Proctor density testing to determine soil types and engineering properties.
- Thermal resistivity testing for use in design of electrical infrastructure is addressed in Section 7.0.

Additional testing that may be performed include California Bearing Ratio (CBR) testing for use in roadway design, and soil chemical testing for use in concrete design.

9.4 Estimated Cost of Next Investigational Phase

Based upon experience with similar projects, and assuming exploration is limited to that described above (not including testing for electrical design), the cost of implementing this next phase of work is estimated to be on the order of $16,000 to $20,000.

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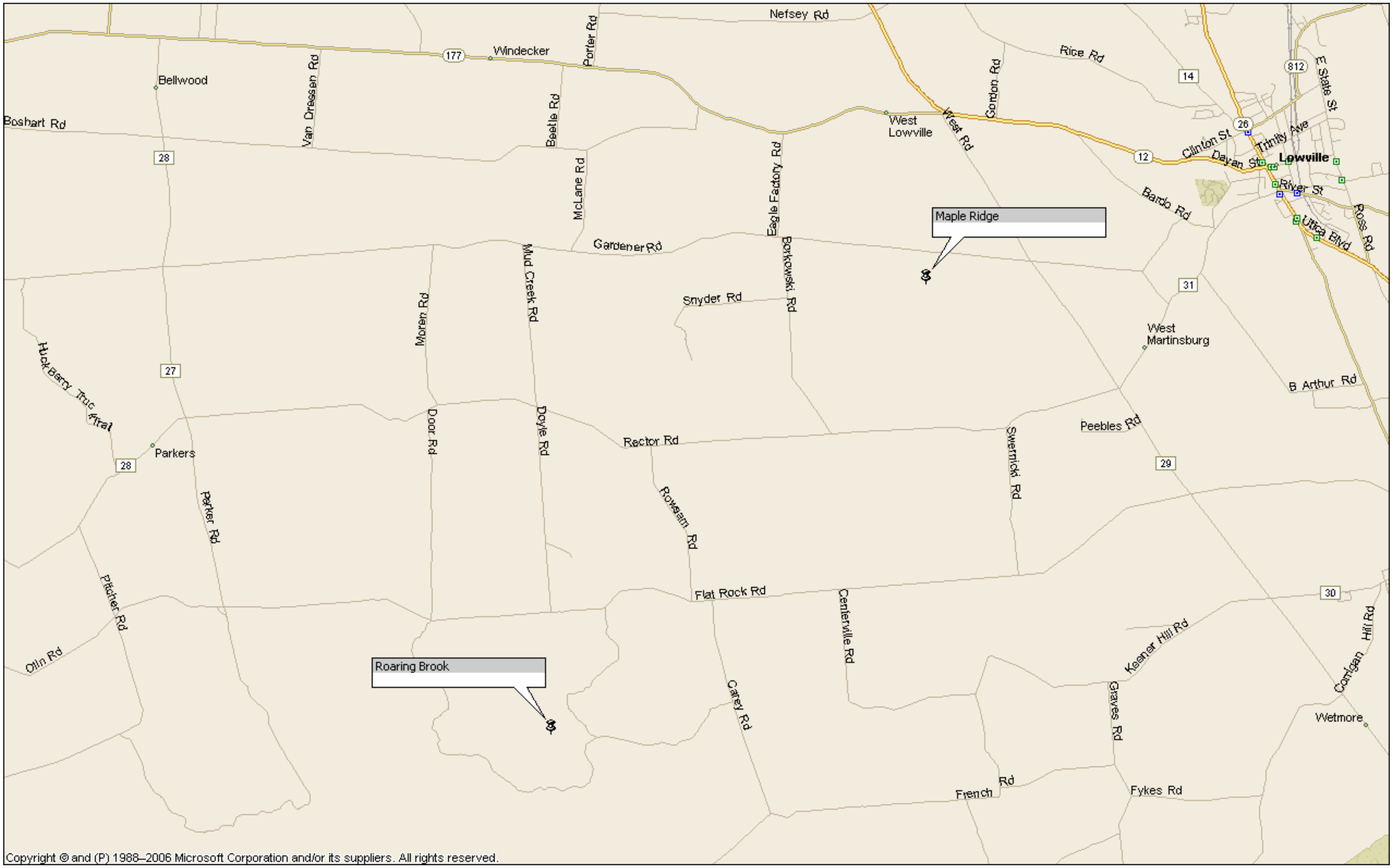
APPENDIX A

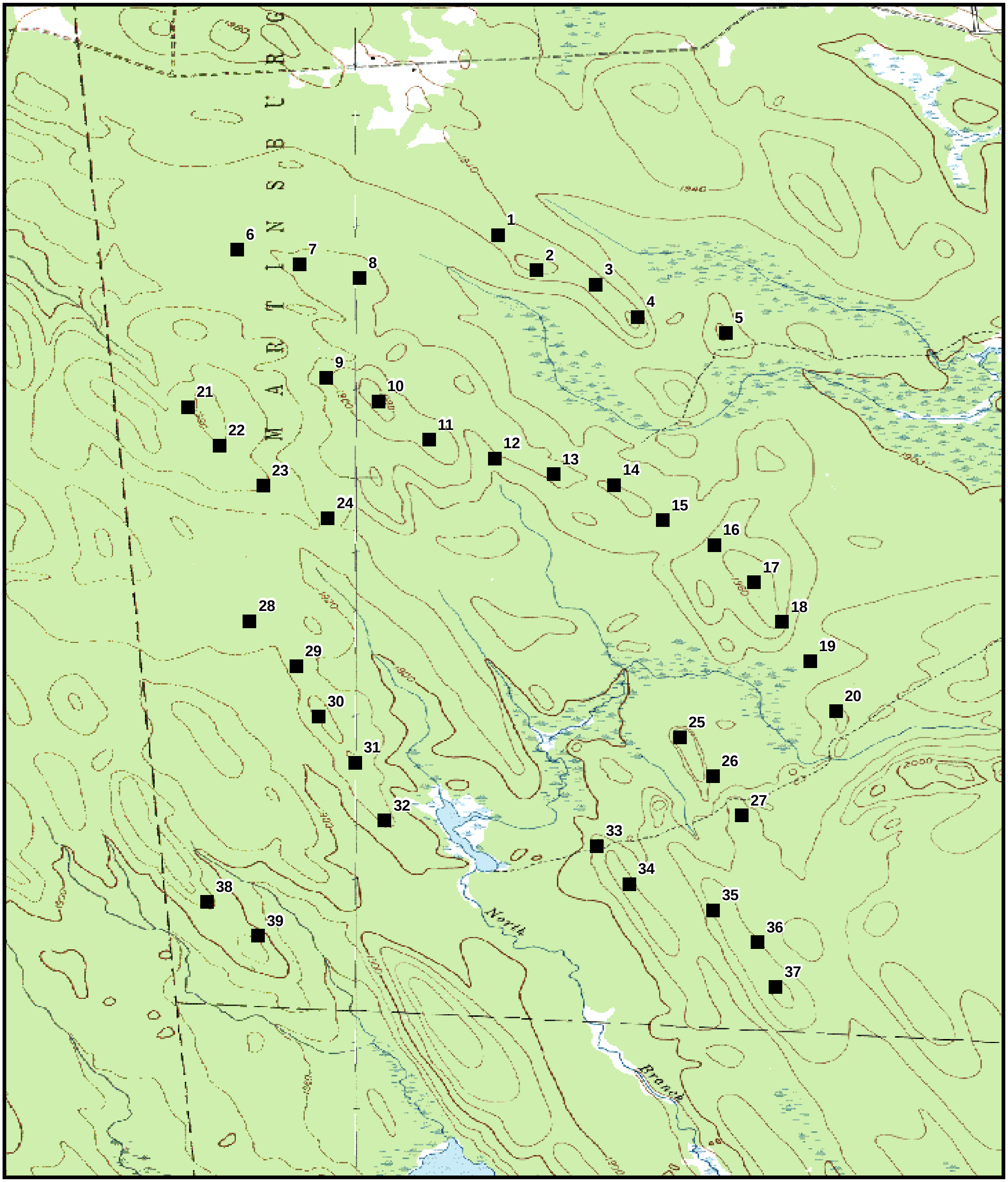
SITE LOCATION PLAN

Roaring Brook Vicinity Map



APPENDIX B

PRELIMINARY TURBINE LAYOUT PLAN



Legend

■ Proppposed Turbine Layout - Gamesa G90

N

0 0.25 0.5 0.75 1

Miles

Turbine Layout

Roaring Brook Wind Project

PPM Energy
A ScottishPower Company

APPENDIX C

USDA/NRCS SOIL SURVEY REPORTS

Map Unit Description

The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The contrasting components are mentioned in the map unit descriptions. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Lucy loamy sand, 0 to 5 percent slopes, is a phase of the Lucy series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Springhill-Nankin complex, 15 to 25 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Mantachie, Kinston, and Iuka soils, 0 to 1 percent slopes, frequently flooded, is an undifferentiated group in this survey area.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits is an example.

Table 2 gives the acreage and proportionate extent of each map unit. Other tables give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Report—Map Unit Description

Lewis County, New York, Middle Part

EdB—Empeyville loam, 3 to 8 percent slopes, stony

Map Unit Setting

Elevation: 800 to 2,000 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 41 to 45 degrees F
Frost-free period: 110 to 150 days

Map Unit Composition

Empeyville and similar soils: 75 percent

Description of Empeyville

Setting

Landform: Drumlinoid ridges, till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Loamy till derived dominantly from acid sandstone

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with stones and boulders: 0.1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Land capability (nonirrigated): 2w

PaA—Peat and Muck, shallow

Map Unit Setting

Elevation: 250 to 1,500 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 41 to 45 degrees F
Frost-free period: 110 to 150 days

Map Unit Composition

Medisaprists and similar soils: 40 percent
Medihemists and similar soils: 35 percent

Description of Medisaprists

Setting

Landform: Swamps, marshes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Organic material

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 20 percent

Interpretive groups

Land capability (nonirrigated): 5w

Description of Medihemists

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope

Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Organic material

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent

Interpretive groups
Land capability (nonirrigated): 8w

PbA—Peat and Muck, deep

Map Unit Setting
Elevation: 250 to 1,600 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 41 to 45 degrees F
Frost-free period: 110 to 150 days

Map Unit Composition
Medisaprists and similar soils: 40 percent
Medihemists and similar soils: 35 percent

Description of Medisaprists

Setting
Landform: Swamps, marshes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Organic material

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent

Interpretive groups
Land capability (nonirrigated): 5w

Description of Medihemists

Setting
Landform: Depressions

Landform position (two-dimensional): Toeslope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Organic material

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent

Interpretive groups

Land capability (nonirrigated): 7w

TaB—Tughill silt loam, 0 to 5 percent slopes, very stony

Map Unit Setting

Elevation: 800 to 2,000 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 41 to 45 degrees F
Frost-free period: 110 to 150 days

Map Unit Composition

Tughill and similar soils: 75 percent

Description of Tughill

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Gravelly loamy till, derived mainly from acid siliceous rocks, and scoured by glacial meltwater

Properties and qualities

Slope: 0 to 5 percent
Surface area covered with stones and boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent

Interpretive groups

Land capability (nonirrigated): 7s

W—Water

Map Unit Composition

Water: 100 percent

WdB—Westbury loam, 3 to 8 percent slopes, stony

Map Unit Setting

Elevation: 800 to 1,800 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 41 to 45 degrees F
Frost-free period: 110 to 150 days

Map Unit Composition

Westbury and similar soils: 75 percent

Description of Westbury

Setting

Landform: Drumlinoid ridges, till plains
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy till derived mainly from acid sandstone and siltstone

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with stones and boulders: 0.1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Land capability (nonirrigated): 3w

WmB—Worth loam, 3 to 8 percent slopes, stony

Map Unit Setting

Elevation: 1,000 to 2,000 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 41 to 45 degrees F
Frost-free period: 110 to 150 days

Map Unit Composition

Worth and similar soils: 75 percent

Description of Worth

Setting

Landform: Drumlinoid ridges, till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from acid sandstone and siltstone

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with stones and boulders: 0.1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 24 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent

Interpretive groups

Land capability (nonirrigated): 2e

WmC—Worth loam, 8 to 15 percent slopes, stony

Map Unit Setting

Elevation: 1,000 to 2,000 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 41 to 45 degrees F
Frost-free period: 110 to 150 days

Map Unit Composition

Worth and similar soils: 75 percent

Description of Worth

Setting

Landform: Drumlinoid ridges, till plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from acid sandstone and siltstone

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with stones and boulders: 0.1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: About 24 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent

Interpretive groups

Land capability (nonirrigated): 3e

Data Source Information

Soil Survey Area: Lewis County, New York, Middle Part
Survey Area Data: Version 6, Sep 24, 2007

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

Physical Soil Properties– Lewis County, New York, Middle Part														
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*					
EdB—Empeyville loam, 3 to 8 percent slopes, stony														
Empeyville	0-2	—	—	1-18	1.10-1.40	4.00-14.00	0.08-0.12	0.0-2.9	4.0-10.0	.20	.28	2	3	86
	2-21	—	—	1-18	1.20-1.50	4.00-14.00	0.08-0.15	0.0-2.9	0.0-1.0	.24	.37			
	21-25	—	—	1-18	1.70-2.00	0.42-1.40	0.00-0.00	0.0-2.9	0.0-1.0	.17	.37			
	25-40	—	—	1-18	1.65-1.95	0.42-1.40	0.00-0.00	0.0-2.9	0.0-1.0	.17	.37			
PaA—Peat and Muck, shallow														
Medisaprists	0-14	—	—	—	0.30-0.40	1.40-42.00	0.35-0.45	—	75.0-99.0				2	134
	14-35	—	—	—	0.15-0.30	1.40-42.00	0.35-0.45	—	75.0-99.0					
	35-60	—	—	7-35	1.45-1.75	1.40-14.00	0.14-0.22	0.0-2.9	0.0-1.0	.37	.37			
Medihemists	0-12	—	—	—	0.10-0.20	14.00-42.00	0.55-0.65	6.0-8.9	90.0-95.0				7	38
	12-25	—	—	—	0.15-0.25	4.00-42.00	0.45-0.60	6.0-8.9	1.0-3.0					
	25-65	—	—	5-10	1.20-1.50	1.40-14.00	0.11-0.19	0.0-2.9	0.0-1.0					
PbA—Peat and Muck, deep														
Medisaprists	0-66	—	—	—	0.13-0.23	1.40-42.00	0.35-0.45	—	70.0-99.0				2	134
Medihemists	0-6	—	—	—	0.30-0.40	42.00-141.00	0.55-0.65	—	55.0-75.0				7	38
	6-60	—	—	—	0.10-0.25	4.00-42.00	0.45-0.55	—	55.0-75.0					

Physical Soil Properties– Lewis County, New York, Middle Part														
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*					
TaB—Tughill silt loam, 0 to 5 percent slopes, very stony														
Tughill	0-3	—	—	5-18	1.10-1.40	4.00-14.00	0.08-0.13	0.0-2.9	4.0-8.0	.20	.32	3	8	0
	3-28	—	—	5-18	1.20-1.50	1.40-4.00	0.06-0.08	0.0-2.9	1.0-3.0	.17	.55			
	28-60	—	—	5-18	1.70-1.95	0.42-1.40	0.05-0.07	0.0-2.9	0.0-1.0	.17	.64			
W—Water														
Water	—	—	—	—	—	—	—	—	—					
WdB—Westbury loam, 3 to 8 percent slopes, stony														
Westbury	0-2	—	—	3-12	0.90-1.20	4.00-14.00	0.12-0.18	0.0-2.9	2.0-8.0	.20	.28	2	5	56
	2-10	—	—	3-12	1.40-1.70	4.00-14.00	0.07-0.15	0.0-2.9	1.0-3.0	.24				
	10-20	—	—	3-12	1.70-2.00	0.42-1.40	0.02-0.06	0.0-2.9	0.0-1.0	.24	.64			
	20-60	—	—	3-12	1.70-2.00	0.42-1.40	0.02-0.16	0.0-2.9	0.0-1.0	.24	.64			
WmB—Worth loam, 3 to 8 percent slopes, stony														
Worth	0-2	—	—	3-18	1.10-1.40	4.00-14.00	0.10-0.13	0.0-2.9	3.0-8.0	.20	.28	3	3	86
	2-25	—	—	3-18	1.20-1.50	4.00-14.00	0.08-0.14	0.0-2.9	0.0-2.0	.24	.43			
	25-55	—	—	3-18	1.70-2.00	0.42-1.40	0.02-0.06	0.0-2.9	0.0-1.0	.24	.55			
	55-60	—	—	3-18	1.65-1.95	0.42-1.40	0.03-0.08	0.0-2.9	0.0-1.0	.24	.55			

Physical Soil Properties– Lewis County, New York, Middle Part															
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*					
WmC—Worth loam, 8 to 15 percent slopes, stony														
Worth	0-2	—	—	3-18	1.10-1.40	4.00-14.00	0.10-0.13	0.0-2.9	3.0-8.0	.20	.28	3	3	86
	2-25	—	—	3-18	1.20-1.50	4.00-14.00	0.08-0.14	0.0-2.9	0.0-2.0	.24	.43			
	25-55	—	—	3-18	1.70-2.00	0.42-1.40	0.02-0.06	0.0-2.9	0.0-1.0	.24	.55			
	55-60	—	—	3-18	1.65-1.95	0.42-1.40	0.03-0.08	0.0-2.9	0.0-1.0	.24	.55			

Data Source Information

Soil Survey Area: Lewis County, New York, Middle Part
Survey Area Data: Version 6, Sep 24, 2007

Engineering Properties

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

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.

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.

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.

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.

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

Engineering Properties– Lewis County, New York, Middle Part												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
EdB—Empeyville loam, 3 to 8 percent slopes, stony												
Empeyville	0-2	Stony loam	SM, GM, ML	A-1, A-2, A-4	0-1	5-10	55-80	50-75	30-75	15-65	20-30	1-6
	2-21	Channery loam, gravelly sandy loam, silt loam	SM, GM, ML	A-1, A-2, A-4	0-1	0-5	60-95	55-90	35-85	15-65	15-30	NP-6
	21-25	Channery loam, gravelly sandy loam, very gravelly sandy loam	GM, ML, SM	A-2, A-4, A-1	0-1	5-10	50-85	45-75	25-70	15-55	15-30	NP-6
	25-40	Very gravelly sandy loam, channery loam, gravelly sandy loam	SM, GM, ML	A-1, A-2, A-4	0-1	5-10	50-85	45-75	25-70	15-55	15-30	NP-6
PaA—Peat and Muck, shallow												
Medisaprists	0-14	Muck	PT	A-8	0	0	100	100	—	—	—	—
	14-35	Muck	PT	A-8	0	0	100	100	—	—	—	—
	35-60	Clay loam, silty clay loam, gravelly sandy loam	CL, CL-ML, SC, SC-SM	A-2, A-4, A-6, A-7	0	0	85-100	60-100	35-95	15-90	20-45	5-20
Medihemists	0-12	Peat	PT	A-8	0	2-15	100	100	—	—	—	—
	12-25	Mucky peat	PT	A-8	0	2-15	100	100	—	—	—	—
	25-65	Silt loam, very fine sandy loam, sandy loam	SM, CL-ML, ML, SC	A-4	0	0	100	100	100	40-90	15-30	NP-10

Engineering Properties– Lewis County, New York, Middle Part												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
PbA—Peat and Muck, deep												
Medisaprists	0-66	Muck	PT	A-8	0	0	100	100	—	—	—	—
Medihemists	0-6	Peat	PT	A-8	0	0	100	100	—	—	—	—
	6-60	Mucky peat	PT	A-8	0	0	100	100	—	—	—	—
TaB—Tughill silt loam, 0 to 5 percent slopes, very stony												
Tughill	0-3	Very stony silt loam	GM, SC, SM, GC	A-2, A-4, A-1	1-5	0-15	55-75	50-80	35-65	20-50	20-30	3-9
	3-28	Very gravelly fine sandy loam, very gravelly loam, very gravelly sandy loam	GC-GM, GM, GC	A-1, A-2	0-1	5-25	50-65	25-50	20-50	10-45	20-30	3-9
	28-60	Very gravelly fine sandy loam, very gravelly loam, very gravelly sandy loam	GC, GC-GM, GM	A-1, A-2	0-1	5-25	50-65	25-50	10-45	10-40	20-30	3-9
WdB—Westbury loam, 3 to 8 percent slopes, stony												
Westbury	0-2	Stony loam	ML, SM	A-2-4, A-4	0-1	0-5	65-95	50-95	40-90	30-70	15-15	NP-4
	2-10	Gravelly loam, silt loam, gravelly sandy loam	ML, SM, GM	A-2, A-4, A-1	0	0-15	65-85	50-80	30-75	15-70	15-15	NP-4
	10-20	Gravelly sandy loam, very gravelly fine sandy loam, gravelly loam	GM, GW-GM, ML, SM	A-2, A-4, A-1	0	0-15	55-85	35-80	20-75	10-65	15-15	NP-4
	20-60	Gravelly sandy loam, very gravelly very fine sandy loam, gravelly loam	GM, GW-GM, ML, SM	A-1, A-2, A-4	0	0-15	55-85	35-80	20-75	10-65	15-15	NP-4

Engineering Properties– Lewis County, New York, Middle Part												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
WmB—Worth loam, 3 to 8 percent slopes, stony												
Worth	0-2	Stony loam	SM, ML	A-1, A-2, A-4	0-1	0-10	80-90	75-85	45-70	20-55	30-40	5-10
	2-25	Gravelly fine sandy loam, channery loam, loam	CL-ML, GM, ML, SM	A-1, A-2, A-4	0	0-5	55-90	50-85	35-80	20-65	20-35	2-10
	25-55	Gravelly fine sandy loam, channery loam, very gravelly fine sandy loam	ML, SC, SM, GM	A-2, A-4, A-1	0	0-5	40-80	35-75	25-70	15-55	15-25	2-10
	55-60	Gravelly sandy loam, channery loam, very gravelly coarse sandy loam	SM, GM, ML, SC	A-2, A-4, A-1	0	0-5	40-80	35-75	20-70	10-55	15-25	2-10
WmC—Worth loam, 8 to 15 percent slopes, stony												
Worth	0-2	Stony loam	ML, SM	A-2, A-4, A-1	0-1	0-10	80-90	75-85	45-70	20-55	30-40	5-10
	2-25	Gravelly fine sandy loam, channery loam, loam	GM, ML, SM, CL-ML	A-2, A-4, A-1	0	0-5	55-90	50-85	35-80	20-65	20-35	2-10
	25-55	Gravelly fine sandy loam, channery loam, very gravelly fine sandy loam	SM, GM, ML, SC	A-1, A-2, A-4	0	0-5	40-80	35-75	25-70	15-55	15-25	2-10
	55-60	Gravelly sandy loam, channery loam, very gravelly coarse sandy loam	SM, GM, ML, SC	A-1, A-2, A-4	0	0-5	40-80	35-75	20-70	10-55	15-25	2-10

Data Source Information

Soil Survey Area: Lewis County, New York, Middle Part
Survey Area Data: Version 6, Sep 24, 2007

Dwellings and Small Commercial Buildings

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. This table shows the degree and kind of soil limitations that affect dwellings and small commercial buildings.

The ratings in the table are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Dwellings are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Information in this table is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this table. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Report—Dwellings and Small Commercial Buildings

[The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The table shows only the top five limitations for any given soil. The soil may have additional limitations]

Dwellings and Small Commercial Buildings– Lewis County, New York, Middle Part							
Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
EdB—Empeyville loam, 3 to 8 percent slopes, stony							
Empeyville	75	Somewhat limited		Very limited		Somewhat limited	
		Depth to saturated zone	0.77	Depth to saturated zone	1.00	Depth to saturated zone	0.77
						Slope	0.50
PaA—Peat and Muck, shallow							
Medisaprists	40	Very limited		Very limited		Very limited	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Subsidence	1.00	Subsidence	1.00	Subsidence	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Organic matter content	1.00			Organic matter content	1.00
Medihemists	35	Very limited		Very limited		Very limited	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00

Dwellings and Small Commercial Buildings– Lewis County, New York, Middle Part							
Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
PbA—Peat and Muck, deep							
Medisaprists	40	Very limited		Very limited		Very limited	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Subsidence	1.00	Subsidence	1.00	Subsidence	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Organic matter content	1.00	Organic matter content	1.00	Organic matter content	1.00
Medihemists	35	Very limited		Very limited		Very limited	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Organic matter content	1.00	Organic matter content	1.00	Organic matter content	1.00
TaB—Tughill silt loam, 0 to 5 percent slopes, very stony							
Tughill	75	Very limited		Very limited		Very limited	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
W—Water							
Water	100	Not rated		Not rated		Not rated	
WdB—Westbury loam, 3 to 8 percent slopes, stony							
Westbury	75	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
						Slope	0.50
WmB—Worth loam, 3 to 8 percent slopes, stony							
Worth	75	Somewhat limited		Very limited		Somewhat limited	
		Depth to saturated zone	0.07	Depth to saturated zone	1.00	Slope	0.50
						Depth to saturated zone	0.07

Dwellings and Small Commercial Buildings– Lewis County, New York, Middle Part							
Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
WmC—Worth loam, 8 to 15 percent slopes, stony							
Worth	75	Somewhat limited		Very limited		Very limited	
		Slope	0.63	Depth to saturated zone	1.00	Slope	1.00
		Depth to saturated zone	0.07	Slope	0.63	Depth to saturated zone	0.07

Data Source Information

Soil Survey Area: Lewis County, New York, Middle Part
Survey Area Data: Version 6, Sep 24, 2007

Roads and Streets, Shallow Excavations, and Lawns and Landscaping

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. This table shows the degree and kind of soil limitations that affect local roads and streets, shallow excavations, and lawns and landscaping.

The ratings in the table are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Information in this table is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this table. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Report—Roads and Streets, Shallow Excavations, and Lawns and Landscaping

[The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The table shows only the top five limitations for any given soil. The soil may have additional limitations]

Roads and Streets, Shallow Excavations, and Lawns and Landscaping– Lewis County, New York, Middle Part							
Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
EdB—Empeyville loam, 3 to 8 percent slopes, stony							
Empeyville	75	Very limited		Very limited		Somewhat limited	
		Frost action	1.00	Depth to saturated zone	1.00	Droughty	0.88
		Depth to saturated zone	0.43	Cutbanks cave	1.00	Depth to saturated zone	0.43
				Dense layer	0.50	Gravel content	0.26
						Large stones content	0.05

Roads and Streets, Shallow Excavations, and Lawns and Landscaping– Lewis County, New York, Middle Part							
Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
PaA—Peat and Muck, shallow							
Medisaprists	40	Very limited		Very limited		Not rated	
		Ponding	1.00	Ponding	1.00		
		Depth to saturated zone	1.00	Depth to saturated zone	1.00		
		Subsidence	1.00	Organic matter content	1.00		
		Frost action	1.00	Cutbanks cave	0.10		
Medihemists	35	Very limited		Very limited		Not rated	
		Ponding	1.00	Ponding	1.00		
		Depth to saturated zone	1.00	Depth to saturated zone	1.00		
		Frost action	1.00	Organic matter content	1.00		
				Cutbanks cave	0.10		
PbA—Peat and Muck, deep							
Medisaprists	40	Very limited		Very limited		Not rated	
		Ponding	1.00	Ponding	1.00		
		Depth to saturated zone	1.00	Depth to saturated zone	1.00		
		Subsidence	1.00	Organic matter content	1.00		
		Frost action	1.00				
Medihemists	35	Very limited		Very limited		Not rated	
		Ponding	1.00	Ponding	1.00		
		Depth to saturated zone	1.00	Depth to saturated zone	1.00		
		Frost action	1.00	Organic matter content	1.00		
TaB—Tughill silt loam, 0 to 5 percent slopes, very stony							
Tughill	75	Very limited		Very limited		Very limited	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Cutbanks cave	1.00	Droughty	0.68
				Dense layer	0.50	Gravel content	0.12
						Large stones content	0.11

Roads and Streets, Shallow Excavations, and Lawns and Landscaping– Lewis County, New York, Middle Part							
Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
W—Water							
Water	100	Not rated		Not rated		Not rated	
WdB—Westbury loam, 3 to 8 percent slopes, stony							
Westbury	75	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Frost action	0.50	Cutbanks cave	1.00	Droughty	0.22
				Dense layer	0.50	Gravel content	0.01
WmB—Worth loam, 3 to 8 percent slopes, stony							
Worth	75	Somewhat limited		Very limited		Somewhat limited	
		Frost action	0.50	Depth to saturated zone	1.00	Droughty	0.19
		Depth to saturated zone	0.03	Cutbanks cave	1.00	Depth to saturated zone	0.03
				Dense layer	0.50	Large stones content	0.01
WmC—Worth loam, 8 to 15 percent slopes, stony							
Worth	75	Somewhat limited		Very limited		Somewhat limited	
		Slope	0.63	Depth to saturated zone	1.00	Slope	0.63
		Frost action	0.50	Cutbanks cave	1.00	Droughty	0.19
		Depth to saturated zone	0.03	Slope	0.63	Depth to saturated zone	0.03
				Dense layer	0.50	Large stones content	0.01

Data Source Information

Soil Survey Area: Lewis County, New York, Middle Part
Survey Area Data: Version 6, Sep 24, 2007

Soil Features

This table gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage, or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, saturated hydraulic conductivity (Ksat), content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Report—Soil Features

Soil Features– Lewis County, New York, Middle Part									
Map symbol and soil name	Restrictive Layer				Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		In	*In*		*In*	*In*			
EdB—Empeyville loam, 3 to 8 percent slopes, stony									
Empeyville		—	—		—	—	High	Low	High
PaA—Peat and Muck, shallow									
Medisaprists		—	—		4-15	25-32	High	High	Moderate
Medihemists		—	—		—	—	High	Moderate	High
PbA—Peat and Muck, deep									
Medisaprists		—	—		—	43-54	High	High	Low
Medihemists		—	—		—	—	High	High	High
TaB—Tughill silt loam, 0 to 5 percent slopes, very stony									
Tughill		—	—		—	—	High	High	High
W—Water									
Water		—	—		—	—			
WdB—Westbury loam, 3 to 8 percent slopes, stony									
Westbury		—	—		—	—	Moderate	Moderate	High

Soil Features– Lewis County, New York, Middle Part									
Map symbol and soil name	**Restrictive Layer**				**Subsidence**		**Potential for frost action**	**Risk of corrosion**	
	Kind	**Depth to top**	**Thickness**	**Hardness**	**Initial**	**Total**		**Uncoated steel**	**Concrete**
		In	*In*		*In*	*In*			
WmB—Worth loam, 3 to 8 percent slopes, stony									
Worth		—	—		—	—	Moderate	Low	High
WmC—Worth loam, 8 to 15 percent slopes, stony									
Worth		—	—		—	—	Moderate	Low	High

Data Source Information

Soil Survey Area: Lewis County, New York, Middle Part
Survey Area Data: Version 6, Sep 24, 2007

Chemical Soil Properties

This table shows estimates of some chemical 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.

Cation-exchange capacity is the total amount of extractable bases that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Effective cation-exchange capacity refers to the sum of extractable bases plus aluminum expressed in terms of milliequivalents per 100 grams of soil. It is determined for soils that have pH of less than 5.5.

Soil reaction is a measure of acidity or alkalinity. It is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced saturated hydraulic conductivity and aeration, and a general degradation of soil structure.

Report—Chemical Soil Properties

Chemical Soil Properties– Lewis County, New York, Middle Part								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
EdB—Empeyville loam, 3 to 8 percent slopes, stony								
Empeyville	0-2	1.1-11	—	4.5-6.5	0	0	0	0
	2-21	0.8-10	—	4.5-6.5	0	0	0	0
	21-25	0.8-10	—	4.5-6.5	0	0	0	0
	25-40	0.8-10	—	5.1-7.3	0	0	0	0
PaA—Peat and Muck, shallow								
Medisaprists	0-14	—	—	5.1-7.8	0	0	0	0
	14-35	—	—	5.1-7.8	0	0	0	0
	35-60	1.8-14	—	6.1-8.4	0-20	0	0	0
Medihemists	0-12	—	26-43	3.6-4.4	0	0	0	0
	12-25	—	0.0-28	3.6-4.4	0	0	0	0
	25-65	1.5-7.7	—	5.1-6.5	0	0	0	0
PbA—Peat and Muck, deep								
Medisaprists	0-66	—	—	4.5-7.3	0	0	0	0
Medihemists	0-6	—	19-36	3.6-4.4	0	0	0	0
	6-60	—	19-36	3.6-4.4	0	0	0	0
TaB—Tughill silt loam, 0 to 5 percent slopes, very stony								
Tughill	0-3	—	1.0-4.5	3.6-5.5	0	0	0	0
	3-28	—	1.1-5.3	3.6-6.0	0	0	0	0
	28-60	2.6-9.7	—	5.6-6.5	0	0	0	0

Chemical Soil Properties– Lewis County, New York, Middle Part								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
W—Water								
Water	—	—	—	—	—	—	—	—
WdB—Westbury loam, 3 to 8 percent slopes, stony								
Westbury	0-2	—	—	3.6-6.0	0	0	0	0
	2-10	—	—	3.6-6.0	0	0	0	0
	10-20	—	—	4.5-6.0	0	0	0	0
	20-60	1.5-11	—	5.1-7.3	0	0	0	0
WmB—Worth loam, 3 to 8 percent slopes, stony								
Worth	0-2	—	—	3.6-5.5	0	0	0	0
	2-25	—	—	4.5-6.0	0	0	0	0
	25-55	2.0-10	—	5.1-6.5	0	0	0	0
	55-60	2.0-10	—	5.1-8.4	0-15	0	0	0
WmC—Worth loam, 8 to 15 percent slopes, stony								
Worth	0-2	—	—	3.6-5.5	0	0	0	0
	2-25	—	—	4.5-6.0	0	0	0	0
	25-55	2.0-10	—	5.1-6.5	0	0	0	0
	55-60	2.0-10	—	5.1-8.4	0-15	0	0	0

Data Source Information

Soil Survey Area: Lewis County, New York, Middle Part
Survey Area Data: Version 6, Sep 24, 2007