BULL HILL WIND POWER PROJECT
CLASS L SOIL SURVEY

Township 16 MD, Maine

SOIL NARRATIVE REPORT

October, 2010

PREPARED FOR:

Stantec

(Blue Sky East)

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1.0 Introduction

The proposed project includes 19 wind turbine pad sites, 5.8+/- miles of access roads. *Albert Frick Associates* is pleased to provide the Soil Survey for the proposed Bull Hill Wind Power Project, in Township 16 MD, Maine. This level of soil survey is required by *Maine Department of Environmental Protection* and the *Maine Land Use Regulation Commission* for *linear* projects (e.g. wind projects).

2.0 Purpose

The purpose of our soils investigation was to provide taxonomic classification for the various soils identified along the proposed corridor of the access road alignment and within the proposed turbine pad sites. The purpose of this specific soil survey is to identify and quantify limitations for development, with respect to soil drainage, physical properties and/or depths to bedrock class. Specifically, our investigation was intended to yield a Class L (linear) soils survey for the proposed project.

The focus of a Class L Soil Survey for linear wind power projects is specifically concentrated in areas of proposed access roads, turbine pads, and laydown areas. (A High Intensity Class A Soil Survey was prepared for the Operations and Maintenance Building and Substation site). The *Maine Department of Environmental Protection* and the *Maine Land Use Regulation Commission,* and *David Rocque, State Soil Scientist,* are concerned with retaining hydraulic connections and maintaining the natural perched ground water and surface run-off pattern as much as is feasible. Specifically, transversing road alignments along the side sloping mountainous terrain which is subject to long drainage sheds with high volumes of perched ground water flows and surface water runoff are a primary concern.

Currently, the *state of the art* of access road designs, required by environmental regulators, is to maintain a continued hydraulic interconnection between the upslope and downslope sides of new road beds, by allowing water to pass through in a *sheet* flow capacity and to minimize large channelized flow. A *rock sandwich* (aka *French mattress* per Penn State technical bulletin) is one such technique that can be utilized in road design.

Albert Frick Associates' soil scientists examined the proposed access road corridors, turbine sites and transmission lines, and identified and survey-located areas of soils which are either poorly to somewhat poorly drained, exhibit oxyaquic conditions, intermittent drainages not included in wetland delineation streams, subterranean mountain streams and natural drainage swales that have potential to concentrate surface water runoff during periods of Spring snowmelt or heavy precipitation.

3.0 Methodology

Soils identification, mapping and soil surveys were done in accordance with the standards adopted by the *Maine Association of Professional Soil Scientists* (revised 2004/2009) for *Class L* soil surveys for the proposed access road and proposed turbine sites and *Class A* for the proposed Operations & Maintenance building and substation site. Soils are described using standard soil terminology developed by the *USDA Natural Resources Conservation Service*, which is also where soil interpretation records originate for each soil series described in Maine. Where important distinctions between hydric and non-hydric soils are made in the mapping, the *Maine Association of Professional Soil Scientists Key to Soil Drainage Classes* was also utilized, as well as a separate list of regional indicators for identification of hydric soils *(Field Indicators for Identifying Hydric Soils in New England, version 3, 2004*).

The proposed road alignment, turbine sites, and O & M building site/substation locations were examined in the field on August 14, September 20-22 and October 6, 2010. *James Logan*, Certified Soil Scientist, accompanied by a Field Technician with Global Positioning Systems (GPS) unit [Trimble GeoXT submeter accuracy] performed the field work.

Field work consisted of documenting soil morphology and characteristics with hand dug test pits, borings and probes to bedrock and/or refusal. Soil types were identified and depicted on the proposed project Site Plan 1” = 100’.

The nature of typical proposed wind projects is that they are sited in remote mountainous areas to harvest the potential wind resource. It is usually not feasible to utilize mechanized equipment (i.e. backhoe excavation, drilling rig, etc.) due to inaccessibility and environmental concerns. Consequently, the soil mapping was done utilizing a tile spade shovel, hand soil auger, and tile probe to excavate test pits to a depth of 40 inches or until refusal due to encountering bedrock, large boulders, or basal lodgment till. Test pits were identified on-site with numbered flagging tape. Each test pit was located by submeter GPS by AFA personnel, for addition to the project base map.

Additional confirmatory soil borings/observations by soil auger assisted in placement of soil map unit boundaries onto the soil survey base map. Bedrock outcroppings observed were located by GPS survey to further identify shallow to bedrock soil map units.

Soil map units were designed to report the pertinent soil characteristics along with their soil limitations for the proposed use and management of a Wind Power project site. *Ad hoc* symbols were used in places on the map, to provide more detailed information about bedrock outcropping locations, groundwater seeps, surface water runoff, soil areas comprised of oxyaquic soils, intermittent and perennial streams or watercourses, and other natural features encountered on the property.

A preliminary soils map was developed by obtaining the electronic layer of the *U.S. Natural Resource Conservation Service* medium intensity map, and importing the soil boundary information into the project CAD file. This was utilized for a preliminary soil map and the entire project area was reviewed along the proposed access road corridor, turbine sites, and transmission lines. Soil test pits excavations and descriptions were performed to upgrade, refine, and modify the map within the project borders, to meet the standards for Class L.

The developing soils work, along with the topographic survey and wetland delineation were used by the project Design and Permitting Teams to locate and revise the road alignment and turbine placement, as well as to refine the design with regards to natural hydraulic cross-drainage concerns.

The soils data provide information useful for engineering by anticipating existing and proposed conditions with regards to *depth to bedrock*, that will affect blasting, benching techniques, and source of road building materials and/or cost; *soil drainage characteristics* that will affect road hydraulic cross-drainage, culverting frequency and sizing, storm water design, and erosion and sediment control; *soil textures/slopes* that will affect erosion potential .

4.0 Site Location/Setting

The proposed Bull Hill Wind Power Project is located on Bull Hill, Heifer Hill and Beech Knoll in *Township 16 MD, Maine*. The project area consists of gently sloping to moderately sloping topography, and is currently comprised mainly of forested land, except for portions of the road network which are existing.

5.0 General Site and Subsurface Conditions

The site includes primarily forested sideslopes and mountain top ridges. Soil landforms generally consist of *loam* and *sandy loam* soils derived from glacial till. The tops of the upland glacial till ridge lines are bedrock controlled in localized areas, and consequently exhibit shallow to bedrock soil conditions. The remaining majority of the ridgelines and sideslopes tend to be comprised of deeper soils (ie. +40” in depth), which are *loam* to *sandy loam* textured derived from basal till. These soils commonly exhibit a firm substratum which produces a perched ground water table.

6.0 Soil Map Unit Descriptions

The soil map unit descriptions included in Appendix C provide taxonomic details regarding the soil series encountered, and a summary of the composition of soils within a given map unit (both for the range of soil characteristics and the dominant soils within complex units). Soil map units with multiple names are generally listed in order of their prevalence within the map unit. Slope gradient ranges are also provided, and refer to slope phases indicated in the soil survey map and in the soil legend. The soil narrative report is provided to describe the soil composition and physical characteristics, and the general soil limitations for the proposed use and management. The soils map depicts the spatial location of the soil or soils within the project site.

7.0 Conclusions and Recommendations

Based on our observations of the project site, and our knowledge of the proposed use of the property, the soils within the development area are generally suitable for the proposed use, with the following notable exceptions:

> *Recommend providing road cross drainage of the natural perched and surface water flow in the specified areas of the soil map. Civil engineers should consider rock sandwich (aka French-mattress), frequent cross culverting and road turn-outs to maintain and maximize sheet flow.*

The nearly level to moderately sloping glacial till map units that are moderately well drained or well drained are generally suitable for the proposed use, although some modifications to drainage or slope may be needed to improve conditions. On the somewhat poorly drained soils, where seasonal high groundwater tables may be within 12” of the mineral soil surface for a significant portion of the year, other measures such as the addition of coarse granular fill, or the installation of upslope curtain drain to intercept sheet flow drainage, may be needed to overcome limitations.

Areas identified as somewhat poorly drained, and which occur at or near the base of long, continuously sloping water sheds, are most susceptible to large quantities of sheet flow drainage. Extra provisions for slope stabilization and erosion control should be considered in these areas once project construction begins, especially during spring snowmelt and after prolonged rainfall events.

The poorly or very poorly drained hydric soils have further limitations due to instability, prolonged saturation, and frost heave susceptibility, and may have additional permitting implications if identified as wetland areas.

Those areas of the project where stony or rubbly soil surfaces were observed, and denoted on the project base map with an *ad hoc* symbol, may impede vehicular traffic or require additional time/cost of machinery to clear the soil surface for use as a road base, turbine site and/or laydown area. Areas containing boulder-sized glacial erratics may require blasting to reduce the size for transport.

APPENDICES

Appendix A – Limitations

Appendix B – Soil Survey Maps, appropriate for wind power:

Class L (Linear) 1” = 100’ for proposed access road and turbine sites

Class A 1” = 100’ for proposed Operations and Maintenance Building

Appendix C – Soil Map Unit Descriptions

Appendix D – Soil Profile Descriptions

Appendix E – Glossary of Soil Terminology

Appendix F – Photographs

APPENDIX A

Limitations

This soil narrative report and accompanying soil survey map have been prepared for the exclusive use of Stantec Consulting Services, Inc., for its specific application to the proposed *Bull Hill Wind Power Project.* Albert Frick Associates, Inc. conducted the work in accordance with generally accepted soil science practices outlined in the *Maine Association of Professional Soil Scientists Guidelines*, and the *Maine Board of Certification of Geologists and Soil Scientists Guidelines*. Further, presentation of mapping information meets the requirements of *Guidelines for Maine Certified Soil Scientists for Soil Identification and Mapping (2004)*, and in accordance with standards adopted by the Maine Department of Environmental Protection (MDEP) for project review. No other warranty, expressed or implied, is made.

It should be recognized that map unit design is influenced by the intended use of the soil survey information, and may not be adequate or sufficient to evaluate for uses other than that for which the specific soil survey was developed. Soils which are non-limiting for one use may be considered a limitation for different use than that identified.

The analysis contained herein is based on data obtained during subsurface exploration of the site, and the interpretation of published information by the *USDA Natural Resources Conservation Services*. Due to the glaciation of Maine, and the complexity of the landscape, variations in subsurface conditions may exist between exploration sites which may not become evident until significant project excavation begins. Should significant variations in subsurface conditions become evident after the submission of this report, it may be necessary to re-evaluate the nature of the variation, in light of the recommendations enclosed herein.

Due to the combination of remoteness, current inaccessibility of heavy excavation equipment (e.g. backhoe, excavator, drill auger) and permitting constraints, *Albert Frick Associates'* Soil Scientist utilized hand shovels, tile probes and soil augers. *Refusal* or depth limitation to hand operated equipment may be due to bedrock and/or large stones or boulders.

APPENDIX B

Maine Association of Professional Soil Scientists Standards

Class L (Linear) Soil Survey Map

Purpose - This soil survey standard is designed to provide the minimum soil information necessary to allow for the design and construction of long but narrow projects such as access roads, utility lines or trails with little or no adjacent development. In remote, difficult to access sites such as mountains or roadless areas, soil observations may be made entirely by use of a hand shovel, screw or Dutch auger. For areas which are more accessible, deeper soil observations should be made in order to properly classify the soils.

1. Class L soil survey map units shall be made on the basis of parent material, slope, soil texture, soil depth to dense till or bedrock (which ever is shallowest) and soil wetness (drainage class and/or oxyaquic conditions) at the Class A High Intensity Map Unit size. The preferred method of naming the soil map units is by assigning a soil series name or names for complexes. If soils are classified to the series level in remote areas not readily accessible to equipment and/or without road cuts, it shall be noted in the narrative that soils were classified by shallow observations only.

2. Scale is 1 inch equals 100 feet or larger (e.g. 1”=50’).

3. Ground Control - base line and test pits for which detailed data are recorded are located to sub-meter accuracy under the direction of a qualified professional.

4. Base map with two foot contour lines.

APPENDIX C

Soil Map Unit Descriptions

BRAYTON
(Aeric Haplaquepts)

SETTING

Parent Material:	Compact loamy glacial till.
Landform:	Depressions and toeslopes of glaciated uplands.
Position in Landscape:	Lowest positions on landform.
Slope Gradient Ranges:	**(A)** 0-3% **(B)** 3-8% **(C)** 8-20%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class:	Poorly drained, with a perched water table 0 to 1.0 feet beneath the soil surface from November through May or during periods of excessive precipitation.	
Typical Profile Description:	**Surface layer:**	Very dark grayish brown sandy loam, 0-5"
	Subsurface layer:	Grayish brown sandy loam, 5-15"
	Subsoil layer:	Olive gray fine sandy loam, 15-24"
	Substratum:	Olive sandy loam, 24-65"
Hydrologic Group:	Group C	
Surface Run Off:	Moderate to moderately rapid.	
Permeability:	Moderate in solum, moderately slow or slow in dense substratum.	
Depth to Bedrock:	Deep, greater than 40 inches.	
Hazard to Flooding:	None	
Erosion Factors:	K: .24 - .32	

INCLUSIONS
(Within Mapping Unit)

Similar: Colonel, Monarda, Westbury, Telos, Pillsbury
Dissimilar: Naskeag, Peacham, Waskish, Burnham, Wonsqueak

USE AND MANAGEMENT

Development for wind power projects: The limiting factor for development of wind power projects is wetness, since seasonal high groundwater tables within these map units are generally within 7" of the ground surface for long durations of the year. Groundwater perches on the firm substratum in Brayton, and this can carry significant amounts of runoff from long, upsloping watersheds. Importation of granular fill may be necessary to overcome limitations due to drainage for turbine pad construction, and maintaining cross drainage on new road sections will avoid concentration of stormwater. Brayton flows may have further implications as jurisdictional wetlands, when all three parameters of hydrophytic (wetland) vegetation, wet hydrology, and hydric (wetland) soils are present. The stony phase of these map units may have up to 15% of the soil surface covered with stones or boulders, which may present further limitations for vehicular traffic.

BRAYTON-COLONEL COMPLEX

SETTING

Parent Material: Compact loamy glacial till.

Landform: Depressions and toeslopes of glaciated uplands.

Position in Landscape: Lowest positions on landform.

Slope Gradient Ranges: **(A)** 0-3% **(B)** 3-8% **(C)** 8-20%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class: Poorly drained (Colonel) to somewhat poorly drained (Brayton), with a perched water table 0 to 1.5 feet beneath the soil surface from November through May or during periods of excessive precipitation.

Typical Profile Description: (for Brayton)	**Surface layer:**	Very dark grayish brown sandy loam, 0-5"
	Subsurface layer:	Grayish brown sandy loam, 5-15"
	Subsoil layer:	Olive gray fine sandy loam, 15-24"
	Substratum:	Olive sandy loam, 24-65"
Typical Profile Description: (for Colonel)	**Surface layer:**	Grayish brown fine sandy loam, 0-2"
	Subsurface layer:	Dark reddish brown fine sandy loam, 2-12"
	Subsoil layer:	Light olive brown gravelly fine sandy loam, 12-18"
	Substratum:	Olive gravelly fine sandy loam, 18-65"
	Note:	These soils occur in a non-regular, non-repeating pattern, which could not be separated out in mapping. Predominant pit/mound micro-relief typically consists of somewhat poorly drained Colonel soils on mounds, and hydric Brayton soils within pits or around the base of large stones or boulders. Brayton forms the predominant characteristic of the map unit.

Hydrologic Group: Group C

Surface Run Off: Moderate to moderately rapid.

Permeability: Moderate in solum, moderately slow or slow in dense substratum.

Depth to Bedrock: Deep, greater than 40 inches.

Hazard to Flooding: None

INCLUSIONS
(Within Mapping Unit)

Similar: Colonel, Westbury, Monarda

Dissimilar: Naskeag, Peacham, Wonsqueak

USE AND MANAGEMENT

Development for construction of roads and wind power projects: The limiting factor for construction of roads and wind power projects is wetness due to a perched water table within one foot of the soil surface for a significant portion of the year. Proper sub-grade drainage or other site modification is recommended for road construction. Diversion of upslope drainage away from project areas will assist in the preparation of road basefills and continued stability of constructed road. Brayton (Poorly Drained) may be classified as wetlands, based on the combined consideration of hydric conditions, hydrology, and vegetation. The stony phase of this map unit has up to 15% of the soil surface covered with stones or boulders, which may present further limitations for vehicular traffic.

COLONEL
(Aquic Haplorthods)

SETTING

Parent Material:	Compact loamy glacial till.
Landform:	Glaciated uplands.
Position in Landscape:	Intermediate positions on landform.
Slope Gradient Ranges:	**(A)** 0-3% **(B)** 3-8% **(C)** 8-20%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class:	Somewhat poorly drained, with a perched water table 1.0 to 1.5 feet beneath the soil surface from November through May or during periods of excessive precipitation.	
Typical Profile Description:	**Surface layer:**	Grayish brown fine sandy loam, 0-2"
	Subsurface layer:	Dark reddish brown fine sandy loam, 2-12"
	Subsoil layer:	Light olive brown gravelly fine sandy loam, 12-18"
	Substratum:	Olive gravelly fine sandy loam, 18-65"
Hydrologic Group:	Group C	
Surface Run Off:	Moderate	
Permeability:	Moderate in solum and moderately slow or slow in the compact substratum.	
Depth to Bedrock:	Deep, greater than 40 inches.	
Hazard to Flooding:	None	
Erosion Factor:	K: .17 - .24	

INCLUSIONS
(Within Mapping Unit)

Similar: Dixfield, Skerry, Westbury, Telos
Dissimilar: Pillsbury, Naskeag, Brayton, Monarda

USE AND MANAGEMENT

Development of Wind Power Projects: The limiting factor of this soil for development of wind power projects is wetness, since Colonel soils exhibit a perched water table within 15" of the ground surface throughout much of the year. Proposed activities near the bottom of long sideslopes may be subject to considerable runoff. Maintaining cross drainage beneath proposed roads will help to assure stable road bases, and to avoid concentration of stormwater flows. The stony phase of these mapping units has up to 15% of the soil surface covered with stones or boulders, which may add further limitations for vehicular traffic.

COLONEL-DIXFIELD COMPLEX

SETTING

Parent Material: Compact loamy glacial till.

Landform: Glaciated uplands.

Position in Landscape: Intermediate positions on landform.

Slope Gradient Ranges: **(B)** 3-8% **(C)** 8-20%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class: Somewhat poorly drained to moderately well-drained, with a perched water table 1.0 to 3.0 feet beneath the soil surface from November through May or during periods of excessive precipitation.

Typical Profile Description: (For Colonel soil; see also Dixfield description)

	Surface layer:	Grayish brown fine sandy loam, 0-2"
	Subsurface layer:	Dark reddish brown & brown fine sandy loam, 2-12"
	Subsoil layer:	Light olive brown gravelly fine sandy loam, 12-18"
	Substratum:	Olive gravelly fine sandy loam, 18-65"

NOTE: These two soils are in a non-regular, non-repeating pattern that were not separated out in the mapping at the scale and with the topographic information provided. Colonel generally predominates in this map unit, and occupies microdepressions, while Dixfield is found on the tops of small mounds in the micro-topography,

Hydrologic Group: Group C

Surface Run Off: Moderate

Permeability: Moderate in solum and moderately slow or slow in the compact substratum.

Depth to Bedrock: Deep, greater than 40 inches.

Hazard to Flooding: None

Erosion Factors: K: .17 - .24

INCLUSIONS
(Within Mapping Unit)

Similar: Skerry, Marlow, Monadnock

Dissimilar: Brayton in depressional areas, Westbury, Tunbridge, Lyman, Naskeag

USE AND MANAGEMENT

Development of Wind Power Projects: The limiting factor for development of wind power projects is wetness due to the presence of a groundwater table 1.0 to 3.0 feet below the soil surface. Proper foundation drainage or site modification is recommended. In the lowest portions of Colonel soils, oxyacquic conditions may exist and additional considerations for engineering may be indicated for cross road drainage, and special consideration for heavy equipment traffic during periods of heavy precipitation and/or soil wetness in the transmission line corridor. The stony phase of these mapping units has up to 15% of the soil surface covered with stones or boulders, which may add further limitations for vehicular traffic.

DIXFIELD (Peru)
(Typic Haplorthods)

SETTING

Parent Material:	Compact loamy glacial till.
Landform:	Glaciated uplands, drumlins.
Position in Landscape:	Usually occupies upper portions of landform.
Slope Gradient Ranges:	**(B)** 3-8% **(C)** 8-20% **(D)** 20%+

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class:	Moderately well drained, with a perched water table 1.5 to 2.5 feet beneath the soil surface from November through May and during spring and periods of heavy precipitation.	
Typical Profile	**Surface layer:**	Grayish brown and dark brown fine sandy loam, 0-6”
Description:	**Subsurface layer:**	Strong brown and dark yellowish brown Fine sandy loam, 6-19"
	Subsoil layer:	Light olive brown gravelly fine sandy loam, 19-24"
	Substratum:	Light olive brown gravelly sandy loam, 24-65"
Hydrologic Group:	Group C	
Permeability:	Moderate in the solum, moderately slow or slow in the dense substratum.	
Depth to Bedrock:	Very deep, greater than 60".	
Hazard to Flooding:	None	

INCLUSIONS
(Within Mapping Unit)

Similar: Skerry, Becket

Dissimilar: Lyman (0-20" to bedrock), Tunbridge (20-40" to bedrock), Colonel

USE AND MANAGEMENT

Development of wind power projects: The limiting factor for development of wind power projects is depth to seasonal high water table, which is 1.5 to 2.5 feet beneath the soil surface for a significant portion of the year. Proper road base drainage by importation of coarse granular fill or other site modification to redirect run-off is recommended for construction. The stony phase of these mapping units has up to 15% of the soil surface covered with stones or boulders, which may add further limitations for vehicular traffic.

DIXFIELD (Stony)
(Typic Haplorthods)

SETTING

Parent Material:	Compact loamy glacial till.
Landform:	Glaciated uplands and drumlins.
Position in Landscape:	Upper portions of landform.
Slope Gradient Ranges:	**(B)** 3-8% **(C)** 8-20%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class:	Moderately well drained, with a perched water table 1.5 to 2.5 feet beneath the existing soil surface from November through April and during periods of excessive precipitation.	
Typical Profile Description:	**Surface layer:**	Grayish brown and dark brown fine sandy loam, 0-6"
	Subsurface layer:	Strong brown and dark yellowish brown fine Sandy loam, 6-19"
	Subsoil layer:	Light olive brown gravelly fine sandy loam, 19-24"
	Substratum:	Light olive brown gravelly sandy loam, 24-65"
Hydrologic Group:	Group C	
Permeability:	Moderate in the solum, moderately slow or slow in the compact substratum.	
Depth to Bedrock:	Very deep, greater than 60".	
Hazard to Flooding:	None	
Erosion Factors:	k: .17 - .24	

INCLUSIONS
(Within Mapping Unit)

Similar: Hermon, Skerry, Becket
Dissimilar: Colonel, Tunbridge (20-40" to bedrock)

USE AND MANAGEMENT

Development of wind power projects: The limiting factor for development of wind power projects is depth to seasonal high water table, which is 1.5 to 2.5 feet beneath the soil surface for a significant portion of the year. Proper road base drainage by importation of coarse granular fill or other site modification to redirect run-off is recommended for construction. The stony phase of these mapping units has up to 15% of the soil surface covered with stones or boulders, which may add further limitations for vehicular traffic.

LYMAN-TUNBRIDGE COMPLEX

SETTING

Parent Material: Loamy glacial till.

Landform: Glaciated uplands.

Position in Landscape: Upper positions on landform.

Slope Gradient Ranges: **(B)** 3-8% **(C)** 8-20% **(D)** 20%+

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class: Somewhat excessively to well drained, with no evidence of a water table, or only inches from the bedrock surface during spring and periods of heavy precipitation.

Typical Profile Description:

Surface layer:	Black & reddish brown loam & fine sandy loam, 0-4"
Subsurface layer:	Very dusky red loam, 4-6"
Subsoil layer:	Dark red loam, 6-10"
Substratum layer:	Dark brown to brown loam, 10-20"

Note: These soils occur in a non-regular, non-repeating pattern that could not be separated out in mapping, due to the undulating bedrock surface.

Hydrologic Group: Group C/D

Surface Run Off: Rapid

Permeability: Moderate or moderately rapid.

Depth to Bedrock: Shallow (Lyman, 10-20") to moderately deep (Tunbridge, 20-40").

Hazard to Flooding: None

Erosion Factors: K: .20 - .32

INCLUSIONS
(Within Mapping Unit)

Similar: Dixfield, Skerry (deeper than 40" to bedrock)

Dissimilar: Naskeag (in depressional areas), Colonel, Brayton

USE AND MANAGEMENT

Development of Wind Power Projects: Lyman and Tunbridge soils are generally well-suited for construction of wind power projects, in that they generally exhibit no seasonal water table and the shallow to bedrock soil depths can provide for solid anchoring points into the bedrock surface.

LYMAN-TUNBRIDGE-SKERRY COMPLEX

SETTING

Parent Material: Loamy glacial till underlain by sandy textured denser till.

Landform: Drumlins and glaciated uplands.

Position in Landscape: Usually occupies upper components of landform.

Slope Gradient Ranges: **(C)** 8-20%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class: Moderately well-drained (Skerry) to well-drained (Tunbridge) to somewhat excessively drained (Lyman). Skerry soils have a perched water table 1.5 to 3.5 feet below the soil surface from November through May. In Lyman & Tunbridge soils a water table may exist on the bedrock surface during spring and periods of excessive precipitation. These soils occur in a non-repeating pattern on the landscape that could not be separated out in mapping at the scale provided.

Typical Profile Description: (for Skerry)

Typical Profile	**Surface layer:**	Light gray fine sandy loam, 0-4"
Description:	**Subsurface layer:**	Dark reddish brown fine sandy loam, 4-20"
(for Skerry)	**Subsoil layer:**	Yellowish brown fine sandy loam, 20-25"
	Substratum:	Mixed brown and light olive brown fine sandy
loam and		
		loamy sand, 25-65"

NOTE:: Lyman soils are 10-20" to be bedrock, while Tunbridge soils have bedrock at depths from 20-40".

Hydrologic Group: Tunbridge & Skerry: Group C

Surface Run Off: Moderate

Permeability: Moderate in solum and slow or moderately slow in the compact substratum.

Depth to Bedrock: Deep, greater than 40" - Skerry to moderately deep, 20-40" - Tunbridge

Hazard to Flooding: None

Erosion Factors: Kf: .28-.37 (for Lyman)
Kf: .20-.24 (for Tunbridge)
Kf: .24-.32 (for Skerry)

INCLUSIONS
(Within Mapping Unit)

Similar: Dixfield, Canaan, C slope inclusions in B slope map units
Dissimilar: Westbury, Colonel, Naskeag, Abram, Made Land near old homesite & foundation hole Rock Outcrop

USE AND MANAGEMENT

Development of wind power projects: The limiting factor for building site development is wetness due to the presence of a water table 1.5 to 3.5 feet beneath the soil surface for some period during the year and bedrock in Tunbridge soils that is less than 40" from the soil surface. Proper foundation drainage is recommended for construction. Skerry and Tunbridge soils are suitable for subsurface wastewater disposal as defined by the State of Maine Rules for Subsurface Wastewater Disposal and require a 12-inch separation distance from the bottom of any disposal area to the seasonal high groundwater table. (Tunbridge soils with no water table require a 24" separation distance between the bedrock surface and the bottom of disposal areas.) Skerry soil also requires 3.3 and 1.7 sq.ft/gpd for disposal beds and chamber area, respectively. The bouldery phase of this mapping unit has 3-15% of the soil surface covered with boulders.

MADE LAND (EXISTING GRAVEL ROAD)
(Udorthents)

SETTING

Parent Material: Variable, placed or regraded by man. This map unit consists of nearly level to moderately sloping areas where the original soils have been cut away or covered with variable fill material (ranging from sandy loam to gravel). Most areas have been graded to a smooth surface. Areas are dominantly on uplands but are in almost every landscape position. Areas range in size. Map unit can be linear when exhibiting old road construction. Slopes are smooth or irregular, and range form 0 to 25 percent, but are dominantly 0 to 10 percent. Where the original soil has been cut away, Udorthents, loamy, typically consist of the exposed substrata of underlying soil. In areas that have been filled, they consist of variable soil material.

Landform: Variable. Generally less than 15% maximum grade

Position in Landscape: Variable. Generally in lower elevations and along mountain sideslopes.

Slope Gradient Ranges: **(B)** 3-8% **(C)** 8-20%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class: None assigned

Typical Profile	**Surface layer:**	) Typically this map unit
Description:	**Subsurface layer:**	) consists of areas
Subsoil layer:		) excavated and reworked
Substratum:		) by man, then smoothed.

Note: These map units generally consist of existing gravel roads and associated disturbed area. Ditch turn-outs, fill piles and stump tailings are often present along map unit boundaries.

Hydrologic Group: Variable

Surface Run Off: Variable

Permeability: Variable

Depth to Bedrock: Variable

Hazard to Flooding: None

INCLUSIONS
(Within Mapping Unit)

Similar: Filled Land

Dissimilar: Small 'made' depressions that contain standing water or have other drainage implications. These may be caused by compaction by vehicular traffic, which is not synonymous with seasonal water tables.

USE AND MANAGEMENT

This map unit consists of areas reworked by man, so that the soils are no longer taxonomically classifiable. Limiting factor for development is depth to seasonal high water table, which is somewhat difficult to determine in this map units. Proper subgrade drainage or other site alterations recommended for construction.

In most areas, this soil map unit is used for redevelopment of roads on pre-existing road alignment. The properties of these soils vary greatly with depth, however, they are generally well suited to use as road sites, due to the existing sub-base. These soils differ greatly from place to place, consequently, on-site investigation is needed to assess the suitability of the soils for specific land uses or redevelopment.

SKERRY
(Aquic Haplorthods)

SETTING

Parent Material: Loamy glacial till underlain by sandy textured denser till.

Landform: Drumlins and glaciated uplands.

Position in Landscape: Usually occupies upper components of landform.

Slope Gradient Ranges: **(B)** 3-8% **(C)** 8-20%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class: Moderately well-drained, with a perched water table 1.5 to 3.5 feet below the soil surface from November through May.

Typical Profile Description:

Surface layer:	Light gray fine sandy loam, 0-4"
Subsurface layer:	Dark reddish brown fine sandy loam, 4-20"
Subsoil layer:	Yellowish brown fine sandy loam, 20-25"
Substratum:	Mixed brown and light olive brown fine sandy loam and sand, 25-65"

Hydrologic Group: Group C

Surface Run Off: Moderate

Permeability: Moderate in solum and slow or moderately slow in the compact substratum.

Depth to Bedrock: Deep, greater than 40".

Hazard to Flooding: None

INCLUSIONS
(Within Mapping Unit)

Similar: Dixfield, Hermon

Dissimilar: Tunbridge, Lyman (less than 40" to bedrock), Colonel, Westbury

USE AND MANAGEMENT

Development of Wind Power Projects: Skerry soils are generally suited for development of wind power projects, in that these soils are moderately well drained with basal till substratum. Depths to seasonal high groundwater table can be overcome by redirection of surface water runoff, and/or importation of coarse granular fill.

SKERRY (Stony)
(Aquic Haplorthods)

SETTING

Parent Material: Loamy glacial till underlain by sandy textured denser till.

Landform: Drumlins and glaciated uplands.

Position in Landscape: Usually occupies upper components of landform.

Slope Gradient Ranges: **(B)** 3-8% **(C)** 8-20%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class: Moderately well-drained, with a perched water table 1.5 to 3.5 feet below the soil surface from November through May.

Typical Profile Description:

	Surface layer:	Light gray fine sandy loam, 0-4"
	Subsurface layer:	Dark reddish brown fine sandy loam, 4-20"
	Subsoil layer:	Yellowish brown fine sandy loam, 20-25"
	Substratum:	Mixed brown and light olive brown fine sandy loam and sand, 25-65"

Hydrologic Group: Group C

Surface Run Off: Moderate

Permeability: Moderate in solum and slow or moderately slow in the compact substratum.

Depth to Bedrock: Deep, greater than 40".

Hazard to Flooding: None

INCLUSIONS
(Within Mapping Unit)

Similar: Dixfield

Dissimilar: Westbury, Colonel, Tunbridge (less than 40" to bedrock)

USE AND MANAGEMENT

Development of wind power projects: The limiting factor for development of wind power projects is depth to seasonal high water table, which is 1.5 to 2.5 feet beneath the soil surface for a significant portion of the year. Proper road base drainage by importation of coarse granular fill or other site modification to redirect run-off is recommended for construction. The stony phase of these mapping units has up to 15% of the soil surface covered with stones or boulders, which may add further limitations for vehicular traffic.

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APPENDIX D

Soil Profile Descriptions

Town, City, Plantation	Street, Road Subdivision	Owner's Name
T6 MD	BULL HILL WIND PROJECT	STANTEC (BLUE SKY WIND ENERGY)

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 1 ■ Test Pit ☐ Boring

____ " Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0–~3	GRAVELLY FINE SANDY LOAM	FRIABLE	LIGHT GRAY (ALBIC)	
~3–~8			DARK YELLOWISH BROWN	
~8–~12			YELLOWISH BROWN	
~13–~16			OLIVE BROWN	FEW FAINT
~16–20		SOMEWHAT FIRM	OLIVE	COMMON FAINT
20–40		FIRM		
40	LIMIT OF EXCAVATION			

Soil Classification (Profile / Condition)	Slope	Limiting Factor	
	%	13 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name	Drainage Class	Hydrologic Group
COLONEL		

Observation Hole TP 2 ■ Test Pit ☐ Boring

____ " Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0–~3	GRAVELLY FINE SANDY LOAM	FRIABLE	ALBIC	
~3–~12			DARK YELLOWISH BROWN 10YR4/6	
~12–~16			YELLOWISH BROWN	
~16–20			OLIVE BROWN	FEW FAINT
20–~24		FIRM	OLIVE	COMMON DISTINCT
~24–38		VERY FIRM		
38	LIMIT OF EXCAVATION			

Soil Classification (Profile / Condition)	Slope	Limiting Factor	
	%	16 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name	Drainage Class	Hydrologic Group
DIXFIELD		

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 3 ■ Test Pit ☐ Boring

____ " Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0–~9	GRAVELLY FINE SANDY LOAM	FRIABLE	DARK YELLOWISH BROWN 10YR4/6	
~9–21			YELLOWISH BROWN 10YR5/6	
21–40		FIRM	OLIVE	COMMON FAINT
40	LIMIT OF EXCAVATION			

Soil Classification (Profile / Condition)	Slope	Limiting Factor	
	%	21 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name	Drainage Class	Hydrologic Group
DIXFIELD		

Observation Hole TP 4 ■ Test Pit ☐ Boring

____ " Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0–~6	GRAVELLY FINE SANDY LOAM	FRIABLE	LIGHT GRAY (ALBIC) 10YR6/2	
~6–~17			DARK YELLOWISH BROWN 10YR4/4	
~17–20			MIXED YELLOWISH BROWN	FEW FAINT
20–39		FIRM	OLIVE BROWN	COMMON FAINT
39	LIMIT OF EXCAVATION			

Soil Classification (Profile / Condition)	Slope	Limiting Factor	
	%	17 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name	Drainage Class	Hydrologic Group
DIXFIELD		

FOR WASTEWATER DISPOSAL

FOR SOILS MAPPING

James Logan (for AFA) — Site Evaluator / Soil Scientist Signature

237/213 — SE/CSS #

8/4/10 — Date

ALBERT FRICK ASSOCIATES – 95A COUNTY ROAD GORHAM, MAINE 04038 – (207) 839-5563

Town, City, Plantation	Street, Road Subdivision	Owner's Name
T6 MD	BULL HILL WIND PROJECT	STANTEC (BLUE SKY WIND ENERGY)

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 5 ■ Test Pit ☐ Boring
______ " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (inches)

Depth	Texture	Consistency	Color	Mottling
0–3	GRAVELLY FINE SANDY LOAM	FRIABLE	BROWN	
3–13			DARK YELLOWISH BROWN 10YR4/4	
13–21			MIXED OLIVE BROWN	FEW FAINT
21–36		FIRM	OLIVE BROWN 2.5Y4/3	COMMON DISTINCT
36	LIMIT OF EXCAVATION			

FOR WASTEWATER DISPOSAL

Soil Classification (Profile / Condition)	Slope	Limiting Factor	
	___ %	13 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING

Soil Series Name:	Drainage Class:	Hydrologic Group:
COLONEL		

(IN COMPLEX W/ DIXFIELD)

Observation Hole TP 5A ■ Test Pit ☐ Boring
______ " Depth of Organic Horizon Above Mineral Soil

Depth	Texture	Consistency	Color	Mottling
0–5	GRAVELLY FINE SANDY LOAM	FRIABLE	DARK BROWN 10YR3/3	
5–14			DARK YELLOWISH BROWN 10YR4/6	
14–20			YELLOWISH BROWN	
20–24		SOMEWHAT FIRM	OLIVE BROWN	FEW FAINT
24	REFUSAL			

FOR WASTEWATER DISPOSAL

Soil Classification (Profile / Condition)	Slope	Limiting Factor	
	___ %	24 "	■ Ground Water ☐ Restrictive Layer ■ Bedrock ☐ Pit Depth

FOR SOILS MAPPING

Soil Series Name:	Drainage Class:	Hydrologic Group:
TUNBRIDGE		

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 6 ■ Test Pit ☐ Boring
______ " Depth of Organic Horizon Above Mineral Soil

Depth	Texture	Consistency	Color	Mottling
0–3	GRAVELLY FINE SANDY LOAM	FRIABLE	DARK BROWN 10YR3/3	
3–7			LIGHT GRAY (ALBIC)	
7–15			DARK YELLOWISH BROWN 10YR4/6	
15–36		FIRM	LIGHT OLIVE BROWN 2.5Y5/4	COMMON FAINT / COMMON DISTINCT
37	LIMIT OF EXCAVATION			

FOR WASTEWATER DISPOSAL

Soil Classification (Profile / Condition)	Slope	Limiting Factor	
	___ %	15 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING

Soil Series Name:	Drainage Class:	Hydrologic Group:
DIXFIELD		

Observation Hole TP 7 ■ Test Pit ☐ Boring
______ " Depth of Organic Horizon Above Mineral Soil

Depth	Texture	Consistency	Color	Mottling
0–4	GRAVELLY FINE SANDY LOAM	FRIABLE	DARK BROWN 10YR3/3	
4–15			DARK YELLOWISH BROWN 10YR4/6	
15–19			YELLOWISH BROWN 10YR5/6	
19–37		FIRM	LIGHT OLIVE BROWN	COMMON FAINT
37	LIMIT OF EXCAVATION			

FOR WASTEWATER DISPOSAL

Soil Classification (Profile / Condition)	Slope	Limiting Factor	
	___ %	19 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING

Soil Series Name:	Drainage Class:	Hydrologic Group:
DIXFIELD		

(IN COMPLEX W/ COLONEL IN PIT/MOUND MICRO-RELIEF)

James Logan (for AFA) — Site Evaluator / Soil Scientist Signature

237/213 — SE/CSS #

8/4 & 9/20/10 — Date

ALBERT FRICK ASSOCIATES – 95A COUNTY ROAD GORHAM, MAINE 04038 – (207) 839-5563

Town, City, Plantation	Street, Road Subdivision	Owner's Name
T6 MD	BULL HILL WIND PROJECT	STANTEC (BLUE SKY WIND ENERGY)

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 8 ■ Test Pit ☐ Boring
_____ " Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–5	GRAVELLY FINE SANDY LOAM	FRIABLE	DARK BROWN 10YR3/3	
5–13			DARK YELLOWISH BROWN	
13–15			OLIVE BROWN	FEW FAINT
15–33		FIRM	OLIVE	COMMON DISTINCT
33	LIMIT OF EXCAVATION			

FOR WASTEWATER DISPOSAL: Soil Classification: Profile ____ Condition ____; Slope ____ %; Limiting Factor 13 "; ■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING: Soil Series Name: COLONEL; Drainage Class: ____; Hydrologic Group: ____

Observation Hole TP 9 ■ Test Pit ☐ Boring
_____ " Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–8	MUCKY PEAT	FRIABLE	BLACK 10YR2/1	
8–15	GRAVELLY LOAMY SAND & SANDY LOAM		VARIABLE DARK GRAYISH BROWN 2.5Y4/2	ΔΔΔ FREE WATER
15–27		FIRM	OLIVE GRAY	
27	LIMIT OF EXCAVATION (REFUSAL IN LARGE STONES)			

FOR WASTEWATER DISPOSAL: Soil Classification: Profile ____ Condition ____; Slope ____ %; Limiting Factor 0 "; ■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING: Soil Series Name: PEACHAM (IN COMPLEX W/BRAYTON); Drainage Class: ____; Hydrologic Group: ____

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 10 ■ Test Pit ☐ Boring
_____ " Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–3	GRAVELLY FINE SANDY LOAM	FRIABLE	DARK BROWN	
3–7			LIGHT GRAY (ALBIC)	
7–15			DARK YELLOWISH BROWN 10YR4/6	
15–18			OLIVE BROWN	
18–31		FIRM	OLIVE	COMMON DISTINCT
31	LIMIT OF EXCAVATION			

FOR WASTEWATER DISPOSAL: Soil Classification: Profile ____ Condition ____; Slope ____ %; Limiting Factor 18 "; ■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING: Soil Series Name: DIXFIELD; Drainage Class: ____; Hydrologic Group: ____

Observation Hole TP 11 ■ Test Pit ☐ Boring
_____ " Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–4	GRAVELLY FINE SANDY LOAM	FRIABLE	LIGHT GRAY (ALBIC) 10YR6/2	
4–10			BROWN 7.5YR4/4	
10–17			DARK YELLOWISH BROWN 10YR4/6	
17–20				FEW FAINT
20–35		FIRM	OLIVE BROWN	COMMON FAINT
35	LIMIT OF EXCAVATION			

FOR WASTEWATER DISPOSAL: Soil Classification: Profile ____ Condition ____; Slope ____ %; Limiting Factor 17 "; ■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING: Soil Series Name: DIXFIELD; Drainage Class: ____; Hydrologic Group: ____

James Fry (for AFA) — Site Evaluator / Soil Scientist Signature
237/213 — SE/CSS #
8/5/10 — Date

ALBERT FRICK ASSOCIATES – 95A COUNTY ROAD GORHAM, MAINE 04038 – (207) 839-5563

Town, City, Plantation	Street, Road Subdivision	Owner's Name
T6 MD	BULL HILL WIND PROJECT	STANTEC (BLUE SKY WIND ENERGY)

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 12 ■ Test Pit ☐ Boring

______ " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (inches)

Depth (inches)	Texture	Consistency	Color	Mottling
0–6	PEAT	FRIABLE	BLACK 10YR2/1	
6–15	GRAVELLY ~~LOAMY~~ SAND	FRIABLE	VARIABLE DARK GRAYISH ~~BROWN~~ 2.5Y3/2	COMMON FAINT
15–30	GRAVELLY LOAMY SAND & SANDY LOAM	FIRM	OLIVE 5Y5/3	COMMON DISTINCT
30	LIMIT OF EXCAVATION			

Soil Classification	Slope	Limiting Factor	
Profile ____ Condition ____	____ %	4 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name:	Drainage Class:	Hydrologic Group:
BRAYTON		

Observation Hole TP 13 ■ Test Pit ☐ Boring

______ " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (inches)

Depth (inches)	Texture	Consistency	Color	Mottling
0–4	ORGANIC	FRIABLE	BLACK	
4–6	FINE SANDY LOAM	FRIABLE	VARIABLE DARK GRAYISH BROWN	
6–12	SANDY ~~LOAM~~ & GRAVELLY LOAMY SAND	SOMEWHAT ~~FIRM~~	OLIVE	COMMON DISTINCT
12–27		FIRM		
27	LIMIT OF EXCAVATION			

Soil Classification	Slope	Limiting Factor	
Profile ____ Condition ____	____ %	4 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name:	Drainage Class:	Hydrologic Group:
BRAYTON		

OR
'ASTEWATER
ISPOSAL

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SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 14 ■ Test Pit ☐ Boring

______ " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (inches)

Depth (inches)	Texture	Consistency	Color	Mottling
0–4	GRAVELLY FINE SANDY LOAM	FRIABLE	DARK BROWN 10YR3/3	
4–14	GRAVELLY FINE SANDY LOAM	FRIABLE	DARK YELLOWISH BROWN 10YR4/6	
14–18			LIGHT OLIVE BROWN 2.5Y5/4	FEW FAINT
18–30		FIRM	LIGHT OLIVE BROWN 2.5Y5/4	COMMON DISTINCT
30	LIMIT OF EXCAVATION			

Soil Classification	Slope	Limiting Factor	
Profile ____ Condition ____	____ %	14 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name:	Drainage Class:	Hydrologic Group:
COLONEL		

Observation Hole TP 15 ■ Test Pit ☐ Boring

______ " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (inches)

Depth (inches)	Texture	Consistency	Color	Mottling
0–3	GRAVELLY FINE SANDY LOAM	FRIABLE	LIGHT GRAY (ALBIC)	
3–9	GRAVELLY FINE SANDY LOAM	FRIABLE	DARK YELLOWISH BROWN 10YR4/6	
9–14			OLIVE BROWN	REDOX FEATUTRES
14–35		FIRM	OLIVE	COMMON DISTINCT
35	LIMIT OF EXCAVATION			

Soil Classification	Slope	Limiting Factor	
Profile ____ Condition ____	____ %	9 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name:	Drainage Class:	Hydrologic Group:
COLONEL		

OR
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(WESTBURY INCLUSIONS)

James [signature] (for AFA)

Site Evaluator / Soil Scientist Signature	SE/CSS #	Date
James [signature] (for AFA)	237/213	8/5 & 9/21/10

ALBERT FRICK ASSOCIATES – 95A COUNTY ROAD GORHAM, MAINE 04038 – (207) 839-5563

Town, City, Plantation	Street, Road Subdivision	Owner's Name
T6 MD	BULL HILL WIND PROJECT	STANTEC (BLUE SKY WIND ENERGY)

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 16 ■ Test Pit ☐ Boring
______ " Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0–10	GRAVELLY FINE SANDY LOAM	FRIABLE	DARK BROWN 10YR3/3; DARK YELLOWISH BROWN	
10–15		SOMEWHAT FIRM	OLIVE BROWN	FEW FAINT (REDOX FEATURES)
15–29		FIRM TO VERY FIRM	OLIVE	COMMON DISTINCT
29	LIMIT OF EXCAVATION			

FOR WASTEWATER DISPOSAL — Soil Classification: Profile ___ Condition ___ | Slope ___ % | Limiting Factor 10 " | ■ Ground Water ■ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING — Soil Series Name: COLONEL | Drainage Class: | Hydrologic Group:

Observation Hole TP 17 ■ Test Pit ☐ Boring
______ " Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0–10	ORGANIC (MUCKY PEAT)	FRIABLE	BLACK 10YR2/1	
10–15	GRAVELLY LOAMY SAND		OLIVE GRAY	COMMON FAINT
15–30		FIRM	OLIVE	
30	REFUSAL (IN BOULDERS)			

FOR WASTEWATER DISPOSAL — Soil Classification: Profile ___ Condition ___ | Slope ___ % | Limiting Factor 0 " | ■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING — Soil Series Name: PEACHAM (IN COMPLEX W/ BRAYTON) | Drainage Class: | Hydrologic Group:

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 18 ■ Test Pit ☐ Boring
3+/- " Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0–5	GRAVELLY FINE SANDY LOAM	FRIABLE	LIGHT GRAY (ALBIC)	
5–20			MIXED DARK YELLOWISH BROWN	COMMON FAINT & REDOX CONCENTRATIONS
20–30		FIRM	OLIVE	COMMON DISTINCT
30	LIMIT OF EXCAVATION			

FOR WASTEWATER DISPOSAL — Soil Classification: Profile ___ Condition ___ | Slope ___ % | Limiting Factor 11 " | ■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING — Soil Series Name: COLONEL (IN COMPLEX W/ DIXFIELD) | Drainage Class: | Hydrologic Group:

Observation Hole TP 19 ■ Test Pit ☐ Boring
4+/- " Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0–4	GRAVELLY SANDY LOAM	FRIABLE	VARIABLE DARK BROWN	
4–14			OLIVE BROWN	COMMON FAINT
14+	GRAVELLY LOAMY SAND & SAND	FIRM TO VERY FIRM	OLIVE	COMMON DISTINCT & SATURATED

FOR WASTEWATER DISPOSAL — Soil Classification: Profile ___ Condition ___ | Slope ___ % | Limiting Factor 8 " | ■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING — Soil Series Name: BRAYTON | Drainage Class: | Hydrologic Group:

James Logan (for AFA) — Site Evaluator / Soil Scientist Signature
237/213 — SE/CSS #
8/5 & 9/21/10 — Date

ALBERT FRICK ASSOCIATES – 95A COUNTY ROAD GORHAM, MAINE 04038 – (207) 839-5563

Town, City, Plantation	Street, Road Subdivision	Owner's Name
T6 MD	BULL HILL WIND PROJECT	STANTEC (BLUE SKY WIND ENERGY)

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 20 ■ Test Pit ☐ Boring
____ " Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–5	PEAT	FRIABLE	VARIABLE DARK BROWN 7.5YR3/2	
5–14	GRAVELLY FINE SANDY LOAM	FRIABLE	VARIABLE DARK GRAYISH BROWN 10YR3/2	COMMON DISTINCT
14–29		SOMEWHAT FIRM TO FIRM	OLIVE	
29	LIMIT OF EXCAVATION			

Soil Classification (Profile / Condition)	Slope	Limiting Factor	
	%	2+/- "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name	Drainage Class	Hydrologic Group
BRAYTON		

Observation Hole TP 21 ■ Test Pit ☐ Boring
____ " Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–6	GRAVELLY SANDY LOAM	FRIABLE	LIGHT GRAY (ALBIC)	
6–16	GRAVELLY SANDY LOAM	FRIABLE	DARK YELLOWISH BROWN 10YR4/6	
16–20	GRAVELLY SANDY LOAM	FRIABLE	OLIVE BROWN	FEW FAINT
20–29	GRAVELLY SANDY LOAM & LOAMY SAND	FIRM	OLIVE	COMMON DISTINCT
39	LIMIT OF EXCAVATION			

Soil Classification (Profile / Condition)	Slope	Limiting Factor	
	%	16 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name	Drainage Class	Hydrologic Group
DIXFIELD/SKERRY		

FOR WASTEWATER DISPOSAL
FOR SOILS MAPPING

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 22 ■ Test Pit ☐ Boring
____ " Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–4	GRAVELLY FINE SANDY LOAM	FRIABLE	DARK BROWN	
4–10	GRAVELLY FINE SANDY LOAM	FRIABLE	DARK YELLOWISH BROWN 10YR4/6	
10–15		FRIABLE	DARK YELLOWISH BROWN 10YR4/6	FEW DISTINCT
15–30		FIRM TO VERY FIRM	LIGHT OLIVE BROWN	COMMON DISTINCT
30	LIMIT OF EXCAVATION			

Soil Classification (Profile / Condition)	Slope	Limiting Factor	
	%	10 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name	Drainage Class	Hydrologic Group
COLONEL		

(COMMON WOODY ROOTS TO 15")

Observation Hole TP 23 ■ Test Pit ☐ Boring
____ " Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–3	GRAVELLY FINE SANDY LOAM	FRIABLE	DARK BROWN	
3–6	GRAVELLY FINE SANDY LOAM	FRIABLE	LIGHT GRAY (ALBIC)	
6–12	GRAVELLY FINE SANDY LOAM	FRIABLE	DARK YELLOWISH BROWN	
12–15		FRIABLE	LIGHT OLIVE BROWN	FEW FAINT
15–32		FIRM TO VERY FIRM	OLIVE BROWN 2.5Y5/2	COMMON DISTINCT
32	LIMIT OF EXCAVATION			

Soil Classification (Profile / Condition)	Slope	Limiting Factor	
	%	12 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name	Drainage Class	Hydrologic Group
COLONEL		

(SHALLOW HARDPAN)

FOR WASTEWATER DISPOSAL
FOR SOILS MAPPING

James Logan (for AFA)	237/213	9/21/10
Site Evaluator / Soil Scientist Signature	SE/CSS #	Date

ALBERT FRICK ASSOCIATES - 95A COUNTY ROAD GORHAM, MAINE 04038 - (207) 839-5563

Town, City, Plantation	Street, Road Subdivision	Owner's Name
T16 MD	BULL HILL WIND PROJECT	STANTEC (BLUE SKY WIND ENERGY)

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 24 ■ Test Pit ☐ Boring

______ " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (inches)

Texture	Consistency	Color	Mottling
GRAVELLY FINE SANDY LOAM	FRIABLE	DARK BROWN	
		DARK YELLOWISH BROWN 10YR4/6	
		LIGHT OLIVE BROWN	FEW FAINT
	FIRM		COMMON FAINT
LIMIT OF EXCAVATION			

FOR WASTEWATER DISPOSAL — Soil Classification: Profile ____ Condition ____ | Slope ____ % | Limiting Factor 16 " | ■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING — Soil Series Name: DIXFIELD | Drainage Class: | Hydrologic Group:

Observation Hole TP 25 ■ Test Pit ☐ Boring

______ " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (inches)

Texture	Consistency	Color	Mottling
GRAVELLY SANDY LOAM	FRIABLE	DARK BROWN	
		YELLOWISH BROWN 10YR5/8	
GRAVELLY LOAMY SAND & SAND		YELLOWISH BROWN 10YR5/4	
		LIGHT OLIVE BROWN 2.5Y5/4	
	SOMEWHAT FIRM TO FIRM		FEW FAINT
LIMIT OF EXCAVATION			

FOR WASTEWATER DISPOSAL — Soil Classification: Profile ____ Condition ____ | Slope ____ % | Limiting Factor 37 " | ■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING — Soil Series Name: SKERRY (VARIANT) | Drainage Class: | Hydrologic Group:

W/ HERMON INCLUSIONS

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 26 ■ Test Pit ☐ Boring

______ " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (inches)

Texture	Consistency	Color	Mottling
GRAVELLY SANDY LOAM	FRIABLE	DARK BROWN	
		DARK YELLOWISH BROWN	
GRAVELLY LOAMY SAND		YELLOWISH BROWN	
		LIGHT OLIVE BROWN	
GRAVELLY LOAMY SAND & SAND	SOMEWHAT FIRM TO FIRM	OLIVE BROWN	FEW FAINT
LIMIT OF EXCAVATION			

FOR WASTEWATER DISPOSAL — Soil Classification: Profile ____ Condition ____ | Slope ____ % | Limiting Factor 28 " | ■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING — Soil Series Name: SKERRY (VARIANT) | Drainage Class: | Hydrologic Group:

W/ HERMON INCLUSIONS

Observation Hole ______ ■ Test Pit ☐ Boring

______ " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (inches)

Texture	Consistency	Color	Mottling

FOR WASTEWATER DISPOSAL — Soil Classification: Profile ____ Condition ____ | Slope ____ % | Limiting Factor ____ " | ☐ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING — Soil Series Name: | Drainage Class: | Hydrologic Group:

James Logan (for AFA) — Site Evaluator/Soil Scientist Signature | 237/213 — SE/CSS # | 9/21/10 — Date

ALBERT FRICK ASSOCIATES – 95A COUNTY ROAD GORHAM, MAINE 04038 – (207) 839-5563

Town, City, Plantation	Street, Road Subdivision	Owner's Name
T6 MD	BULL HILL WIND PROJECT (O & M SITE)	STANTEC (BLUE SKY WIND ENERGY)

SOIL TEST PITS EXCAVATED BY BACKHOE

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 100 ■ Test Pit ☐ Boring
" Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–~13	FINE SANDY LOAM	FRIABLE	DARK BROWN 10YR3/3; DARK YELLOWISH BROWN 10YR4/6	NONE EVIDENT
~14	BEDROCK			

Soil Classification		Slope	Limiting Factor	
Profile	Condition	%	14 "	☐ Ground Water ☐ Restrictive Layer ■ Bedrock ☐ Pit Depth

Soil Series Name:	Drainage Class:	Hydrologic Group:
LYMAN		

Observation Hole TP 101 ■ Test Pit ☐ Boring
" Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–~20	GRAVELLY FINE SANDY LOAM	FRIABLE	DARK BROWN; DARK YELLOWISH BROWN; LIGHT OLIVE BROWN	NONE EVIDENT
~21	BEDROCK			

Soil Classification		Slope	Limiting Factor	
Profile	Condition	%	21 "	☐ Ground Water ☐ Restrictive Layer ■ Bedrock ☐ Pit Depth

Soil Series Name:	Drainage Class:	Hydrologic Group:
TUNBRIDGE		

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 102 ■ Test Pit ☐ Boring
" Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–~6	SANDY LOAM	FRIABLE	DARK BROWN	
~6	BEDROCK			

Soil Classification		Slope	Limiting Factor	
Profile	Condition	%	6 "	☐ Ground Water ☐ Restrictive Layer ■ Bedrock ☐ Pit Depth

Soil Series Name:	Drainage Class:	Hydrologic Group:
ABRAM		

Observation Hole TP 103 ■ Test Pit ☐ Boring
" Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–~26–30	STONY FINE SANDY LOAM	FRIABLE	DARK BROWN 10YR3/3; DARK YELLOWISH BROWN 10YR4/6; YELLOWISH BROWN; LIGHT OLIVE BROWN	FEW FAINT
~26–30	BEDROCK			

Soil Classification		Slope	Limiting Factor	
2 (Profile)	AIII/C (Condition)	%	26-30"	☐ Ground Water ☐ Restrictive Layer ■ Bedrock ☐ Pit Depth

Soil Series Name:	Drainage Class:	Hydrologic Group:
TUNBRIDGE		

FOR WASTEWATER DISPOSAL
FOR SOILS MAPPING

James Logan (for AFA)	237/213	9/22/10
Site Evaluator / Soil Scientist Signature	SE/CSS #	Date

ALBERT FRICK ASSOCIATES - 95A COUNTY ROAD GORHAM, MAINE 04038 - (207) 839-5563

Town, City, Plantation	Street, Road Subdivision	Owner's Name
T6 MD	BULL HILL WIND PROJECT (O & M SITE)	STANTEC (BLUE SKY WIND ENERGY)

SOIL TEST PITS EXCAVATED BY BACKHOE

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 104 ■ Test Pit ☐ Boring
____ " Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0–~8	FINE SANDY LOAM	FRIABLE	DARK BROWN 10YR3/3	NONE EVIDENT
~8–24			DARK YELLOWISH BROWN 10YR4/6	
24+	BEDROCK			

FOR WASTEWATER DISPOSAL: Soil Classification 2 Profile, AIII Condition; Slope ___ %; Limiting Factor 24 "; ☐ Ground Water ☐ Restrictive Layer ■ Bedrock ☐ Pit Depth

FOR SOILS MAPPING: Soil Series Name: TUNBRIDGE; Drainage Class: ; Hydrologic Group:

Observation Hole TP 105 ■ Test Pit ☐ Boring
____ " Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0–~6	FINE SANDY LOAM	FRIABLE	DARK BROWN	NONE EVIDENT
~6–15			DARK YELLOWISH BROWN	
15+	BEDROCK			

FOR WASTEWATER DISPOSAL: Soil Classification 2 Profile, AIII Condition; Slope ___ %; Limiting Factor 15 "; ☐ Ground Water ☐ Restrictive Layer ■ Bedrock ☐ Pit Depth

FOR SOILS MAPPING: Soil Series Name: ; Drainage Class: ; Hydrologic Group:

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 106 ■ Test Pit ☐ Boring
____ " Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0–~6	FINE SANDY LOAM	FRIABLE	DARK BROWN 10YR3/3	
~6–17			DARK YELLOWISH BROWN 10YR4/6	
~17–22				FEW FAINT
~22–36/44	GRAVELLY LOAMY SAND & SANDY LOAM	FIRM	OLIVE BROWN	COMMON FAINT
36–44+	BEDROCK			

FOR WASTEWATER DISPOSAL: Soil Classification 3 Profile, AIII/C Condition; Slope ___ %; Limiting Factor 17 "; ■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING: Soil Series Name: TUNBRIDGE/DIXFIELD; Drainage Class: ; Hydrologic Group:

Observation Hole TP 107 ■ Test Pit ☐ Boring
____ " Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0–~7	FINE SANDY LOAM	FRIABLE	DARK BROWN	
~7–15			DARK YELLOWISH BROWN	
~15–19			MIXED DARK YELLOWISH BROWN	FEW FAINT
~19–30	SANDY LOAM & LOAMY SAND	SOMEWHAT FIRM TO FIRM	OLIVE BROWN	COMMON FAINT
30+	BEDROCK			

FOR WASTEWATER DISPOSAL: Soil Classification 3 Profile, AIII/C Condition; Slope ___ %; Limiting Factor 15 "; ■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING: Soil Series Name: TUNBRIDGE (VARIANT) WITH WATER TABLE; Drainage Class: ; Hydrologic Group:

James Logan (for AFA) — Site Evaluator / Soil Scientist Signature

237/213 — SE/CSS #

9/22/10 — Date

ALBERT FRICK ASSOCIATES – 95A COUNTY ROAD GORHAM, MAINE 04038 – (207) 839-5563

Town, City, Plantation	Street, Road Subdivision	Owner's Name
T6 MD	BULL HILL WIND PROJECT (O & M SITE)	STANTEC (BLUE SKY WIND ENERGY)

SOIL TEST PITS EXCAVATED BY BACKHOE

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 108 ■ Test Pit ☐ Boring

3+/- " Depth of Organic Horizon Above Mineral Soil

Depth Below Mineral Soil Surface (inches)	Texture	Consistency	Color	Mottling
0–6	FINE SANDY LOAM	FRIABLE	LIGHT GRAY (ALBIC)	NONE EVIDENT
6+	BEDROCK			

FOR WASTEWATER DISPOSAL

Soil Classification (Profile / Condition)	Slope	Limiting Factor	
	%	6 "	☐ Ground Water ☐ Restrictive Layer ■ Bedrock ☐ Pit Depth

FOR SOILS MAPPING

Soil Series Name:	Drainage Class:	Hydrologic Group:
ABRAM		

Observation Hole TP 109 ■ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

Depth Below Mineral Soil Surface (inches)	Texture	Consistency	Color	Mottling
0–6	FINE SANDY LOAM	FRIABLE	DARK BROWN	
6–22			DARK YELLOWISH BROWN	
22–28/34	GRAVELLY SANDY LOAM	FIRM	OLIVE BROWN	COMMON FAINT
28–34+	BEDROCK			

FOR WASTEWATER DISPOSAL

Soil Classification (Profile / Condition)	Slope	Limiting Factor	
	%	28-34 "	☐ Ground Water ☐ Restrictive Layer ■ Bedrock ☐ Pit Depth

FOR SOILS MAPPING

Soil Series Name:	Drainage Class:	Hydrologic Group:
TUNBRIDGE-DIXFIELD		

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 110 ■ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

Depth Below Mineral Soil Surface (inches)	Texture	Consistency	Color	Mottling
0–6	FINE SANDY LOAM	FRIABLE	DARK BROWN 10YR3/3	
6–16			DARK YELLOWISH BROWN 10YR4/6	
16–24			LIGHT OLIVE BROWN 2.5Y5/4	FEW FAINT
24+	BEDROCK			

FOR WASTEWATER DISPOSAL

Soil Classification (Profile / Condition)	Slope	Limiting Factor	
	%	"	☐ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING

Soil Series Name:	Drainage Class:	Hydrologic Group:
TUNBRIDGE (VARIANT) WITH WATER TABLE		

Observation Hole ■ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

Depth Below Mineral Soil Surface (inches)	Texture	Consistency	Color	Mottling

FOR WASTEWATER DISPOSAL

Soil Classification (Profile / Condition)	Slope	Limiting Factor	
	%	"	☐ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING

Soil Series Name:	Drainage Class:	Hydrologic Group:

James Logan (for AFA)	237/213	9/22/10
Site Evaluator / Soil Scientist Signature	SE/CSS #	Date

ALBERT FRICK ASSOCIATES – 95A COUNTY ROAD GORHAM, MAINE 04038 – (207) 839-5563

APPENDIX E

Glossary Of Soil Terminology

Depth Classes

These refer to the depth of the particle control section used to describe the central concept of each taxonomic unit. These are as follows:

Very shallow	less than 10" to bedrock
Shallow	10" to 20" to bedrock
Moderately deep	20" to 40" to bedrock
Deep	40" to 60" deep
Very deep	greater than 60"

Drainage Class

Drainage class is a reference to the frequency and duration of periods of soil saturation and/or action by seasonal groundwater tables, as evidenced by soil morphologic features identified within each respective soil profile.

Seven classes of soil drainage are recognized:

Excessively drained	water is removed from the soil very rapidly. These are commonly very coarse-textured, rocky or shallow. All are free of soil mottling related to wetness.
Somewhat excessively drained	water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy-textured and very pervious/porous. Some are shallow. Some occur on steep slopes where much of the water they receive is lost as runoff. These too are free of observed mottling due to wetness.
Well drained	Water is removed from the soil readily, but not rapidly. It may be available for plant growth at the deepest rooting depths, and not so wet as to inhibit the growth of plant roots for significant periods during most growing seasons. Well drained soils are often medium textured, or contain restrictive subhorizons generally below 24". They are mainly free of mottling related to wetness.

Moderately well drained	water is removed from the spoils somewhat slowly during wet periods and spring seasons. Moderately well drained soils are saturated in the upper soil profile for short duration during the growing season. Often, they contain a slowly pervious (or restrictive) layer beneath the solum, and may receive additional runoff from upslope areas.
Somewhat poorly drained	water is removed so slowly that the soil is wet for significant periods during the growing season. Somewhat poorly drained soils commonly have an impervious substratum that contributes to a perched water table, additional water through sideslope seeps, long continuous sheet flows below large watershed areas with few or no outlets, or a combination of these together.
Poorly drained	water is removed from these soils so slowly that the soil is saturated during the growing season or remains wet for long durations. Water is present during the growing season which may be prohibitive to plant root growth, due to anaerobic/saturated conditions. These soils are classified as hydric, and may also have implications as wetlands.
Very poorly drained	water is removed from these soils so slowly that free water can be observed at or very near the mineral soil surface for long durations during the growing season. These commonly occur on nearly level slopes or in depressional areas, and can be frequently ponded. Often they include thick organic surface horizons.

Hydrologic Soil Groups

A hydrologic soil group is a class of numerous soil series that all have the same runoff potential under similar climate and vegetative conditions. Soil properties that can influence runoff are those that affect minimum infiltration rates for a bare soil after prolonged wetting and with no frozen ground surface. Most important are depth to seasonal high groundwater table, permeability rates after prolonged wetting, and depth to slowly permeable (restrictive) layer.

Permeability

Permeability is the soil property which enables water to move downward through the soil profile. It is measured as the number of inches per hour of water that can be added to a particular soil as it moves downward through the unsaturated soil. Terminology and ranges are as flows:

Very slow	less than 0.06 in./hr
Slow	0.06 to 0.20 in./hr
Moderately slow	0.20 to 0.60 in./hr
Moderate	0.6 to 2.0 in./hr
Moderately rapid	2.0 to 6.0 in./hr
Rapid	6.0 to 20 in./hr

Soil Erodibility (K Factor)

The measure of soil erodability, or K factor, is the susceptibility of a soil particle to detachment and transport by rainfall. K factors for soil in Maine vary from 0.02 to 0.69. The higher the value, the more susceptible the named soil is to sheet or rill erosion by water.

Soil properties which influence erosion are those that can affect infiltration rates, movement of water through the soil profile and the water storage capacity of a soil. Other soil properties can affect the dispersion and mobility of soil particles by rainfall ad/or runoff. Some of the most important of these properties include soil layer, and the size and stability of the soil structural aggregates in the exposed faces of subsoils. Background levels of soil moisture and the presence of frozen soil horizons also can influence erosion.

Soil Texture

Soil texture refers to the USDA classification for the relative proportions by weight of the several soil particle size classes that are finer than 2 millimeters in diameter, which form the fine earth fraction. (Materials larger than 2 mm. in diameter are considered rock fragments).

Soil texture can influence on plant growth, or the soil mechanics of a particular site when used as construction and/or backfill material for foundations, etc. It influences such physical properties as load bearing strength, permeability, shrink/swell potential (frost action or due to wetness), compressibility and compaction. Rock fragment size and content can also affect applications for use as construction materials.

Soil Texture Modifiers

Named soil texture classes can be further modified by the addition of appropriate adjectives when rock fragment content approaches 15% by volume (i.e. gravelly sandy loam). “Mucky” or “peaty” are modifying terms used when organic matter content reaches 40% (i.e. mucky silt/loam).

Surface Runoff

Surface runoff is water that flows away from the soil over the surface of the site without infiltrating into the ground surface. It may originate from precipitation, or as drainage water from adjacent, upslope areas. The rate and amount of runoff are affected by internal physical characteristics of the soil as well as slope gradient ranges and landform shape (i.e. concave vs. convex slopes). Runoff can be significantly different on a given soil under natural vegetation, cultivation by man, or other kinds of management. Runoff from a particular site can also be affected by other factors such as rainfall amounts, snow pack accumulation or other climatic fluctuations. Surface runoff is usually significantly greater on frozen ground surfaces.

Six categories for runoff rates are provided:

Ponded	little or none of the precipitation and run-on (from surrounding, higher elevations) escapes the site as runoff. Free water stands on or above the existing soil surface for significant periods of time. Ponding normally appears on level to nearly level (i.e. <3%) slopes, in depressions or within concavities in a pit/mound micro-relief topography. Water depth may vary considerably throughout the year, or from year to year. Often this is consistent with very poorly drained soils.
Very slow	surface water flows away slowly, and free water may be present at the soil surface for portions of the year, or may infiltrate slowly into the soil surface when not ponded. These soils may be consistent with very poorly drained, or poorly drained soils that are coarser textured and somewhat porous.
Slow	surface water flows away from the soil quickly enough, either due to slope or the porosity of the soils, so that free water can be observed at the soil surface for moderate periods immediately following spring snowmelt or prolonged storm rainfall events. Most of the water passes through the soil, is used by plants, or evaporates.

Medium — surface water flows away quickly enough due to slope or soil porosity that water is observed at or near the soil surface for short durations, usually during spring snowmelt or immediately following significant storm rainfall events.

Rapid — surface water flows away quickly enough that any period of saturation is brief, and free water does not stand on the soil surface. Only a small portion of the water enters the soil as infiltration, either due to steep slopes and/or fine textures with slow rates of absorption.

Very rapid — surface water flows away so quickly that duration of any event is brief, and water never stands on the soil surface. Only a very small portion of the available moisture enters the soil as infiltration.

ADDITIONAL SOIL TERMS

Flooding (Hazard to flooding)

Flooding is the temporary covering of the soil surface by flowing water from any source, including but not limited to: streams or rivers overflowing their banks, runoff from adjacent or upslope areas, inflow from high tide action, or a combination of sources. Water due to snowmelt is excluded from this definition, as is standing or ponded water that forms a permanent or semi-permanent cover above the soil surface.

Flooding hazard is further expressed by frequency classes, duration, and the time of year that the flooding occurs. The velocity and depth of the floodwater are also important factors.

Oxyaquic — Soil drainage conditions that imply soil saturation for prolonged periods, which are rich in dissolved oxygen and therefore do not exhibit the anaerobic conditions necessary to create hydric soil morphology.

Ponding — Ponding is standing water in a closed depression. The water is removed only by evaporation, transpiration by plants, or percolation through the ground.

Soil complex — A map unit that consist of two or more kinds of soils (i.e. soil series/taxonomic unit) that occur on a non-regular, non-repeating pattern that cannot be separated out at the scale provided. The order of the soils named are generally in order of predominance within the map unit.

Soil map unit	A collection of soils or soil areas that are delineated during soils mapping. It generally is an aggregate of several soil entities with a predominant named soil type. Kinds of soil map units may include complexes, consociations, or associations.

Soil slope gradient range

The slope identified for any given map unit, based on the immediate topography within a specific portion of the mapping site. Designations generally are as follows:

A	0-3%	nearly level to level
B	3-8%	gently sloping
C	8-20%	moderately sloping
D	20%+	steeply sloping

Stoniness	This is a phase of surface characteristic that may be identified in soils mapping, ranging from stony or bouldery (0.01 to 0.1% of soil surface covered with stones) to rubbly or rubble land, in which up to 75% of the soil surface is covered with stones. Extremely stony sites or sites with rubble land may have additional limitations for use of mechanized equipment.
Stony	The areas have enough stones at or near the surface to be a continuing nuisance during operations that mix the surface layer, but they do not make most such operations impractical. Conventional, wheeled vehicles can move with reasonable freedom over the area. Stones may damage both the equipment that mixes the soil and the vehicles that move on the surface. Usually these areas have Class 1 stoniness. If necessary in a highly detailed survey, these areas may be designated as “slightly stony” and “moderately stony”.
Very Stony	The areas have so many stones at or near the surface that operations which mix the surface layer either require heavy equipment or use of implements that can operate between the larger stones. Tillage with conventionally powered farm equipment is impractical. Wheeled tractors and vehicles with high clearance can operate on carefully chosen routes over and around the stones. Usually, these areas have Class 2 stoniness.

Extremely Stony

The areas have so many stones at or near the surface that wheeled power equipment, other than some special types, can operate only along selected routes. Tracked vehicles may be used in most places, although some routes have to be cleared. Usually, these areas have Class 3 stoniness.

Rubbly

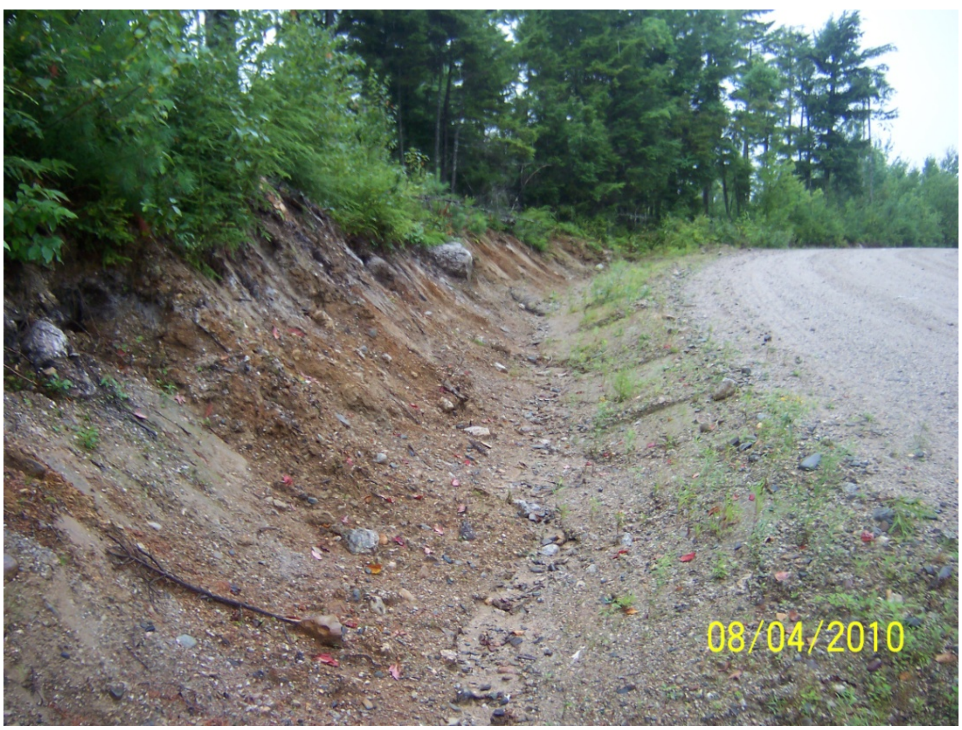
The areas have so many stones at or near the surface that tracked vehicles cannot be used in most places. Usually, these areas have class 4 or 5 stoniness. If necessary in a highly detailed survey, they may be designated as “rubbly” and “very rubbly’.

If the soil has stones, boulders, and smaller fragments, the name includes the kind of rock fragment that are most limiting in the use or management of the soil. This is not necessarily the kind that is most abundant or the kind that is used to modify texture class of horizons in the profile description.

APPENDIX F

Photographs

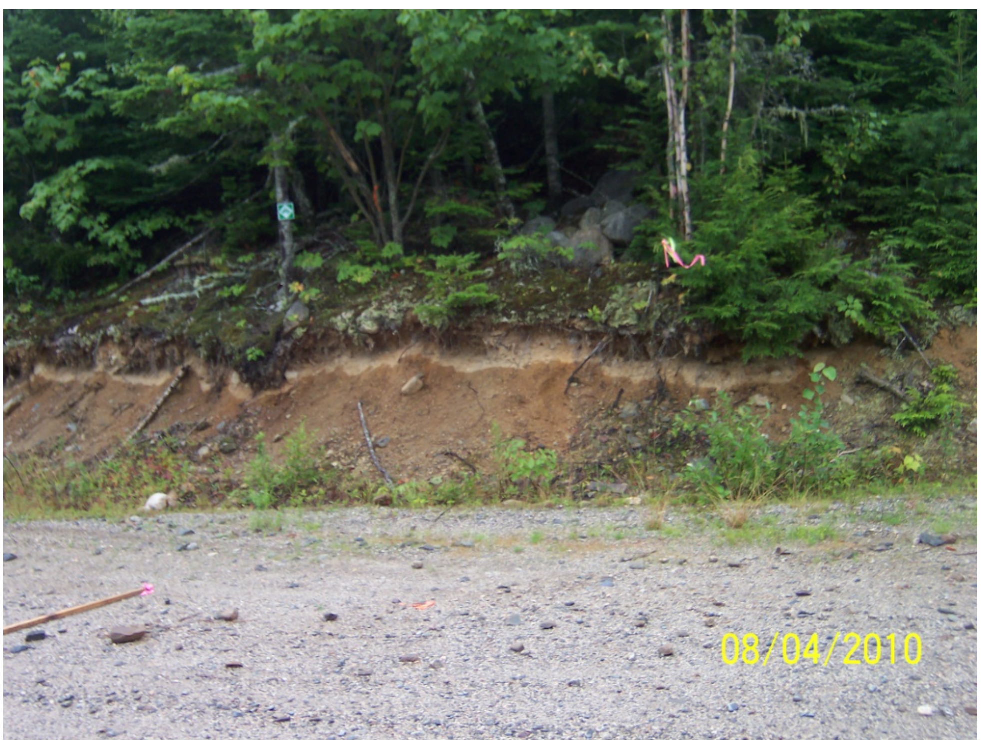
Typical Skerry soils in road cut adjacent to project site



Longer view of moderately well drained soils in existing road cut

BLUE SKY EAST WIND PROJECT
T16 MD, MAINE

Road cut exhibiting moderately well drained conditions



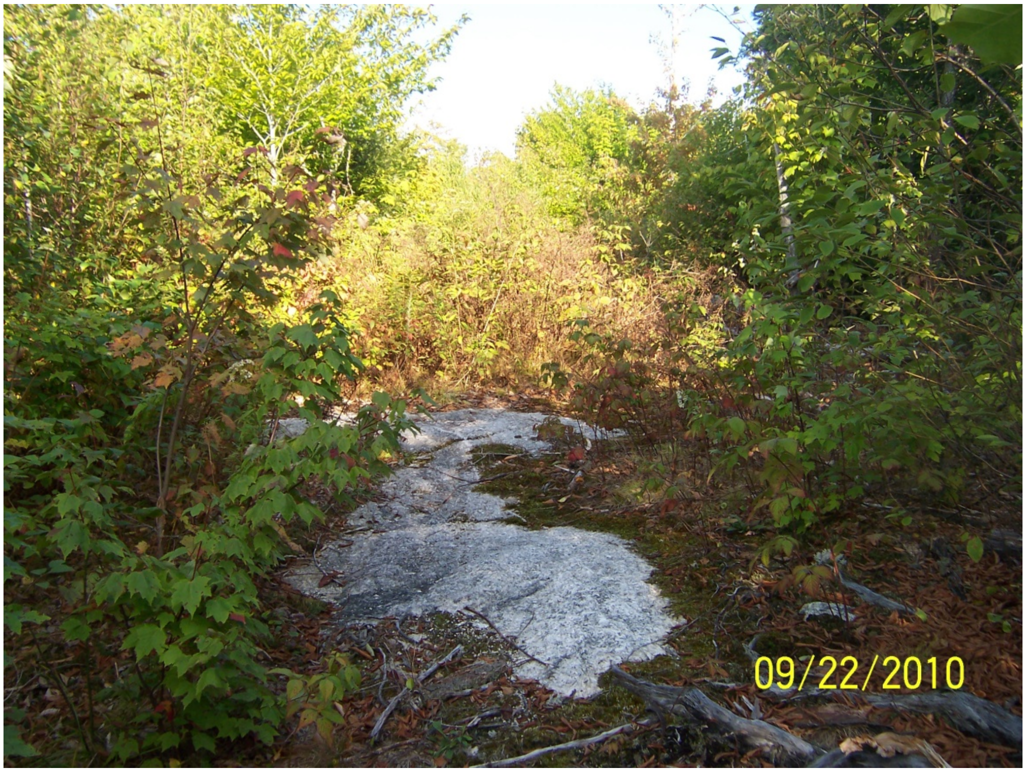
Dixfield soils in road cut on access road to site

BLUE SKY EAST WIND PROJECT
T16 MD, MAINE

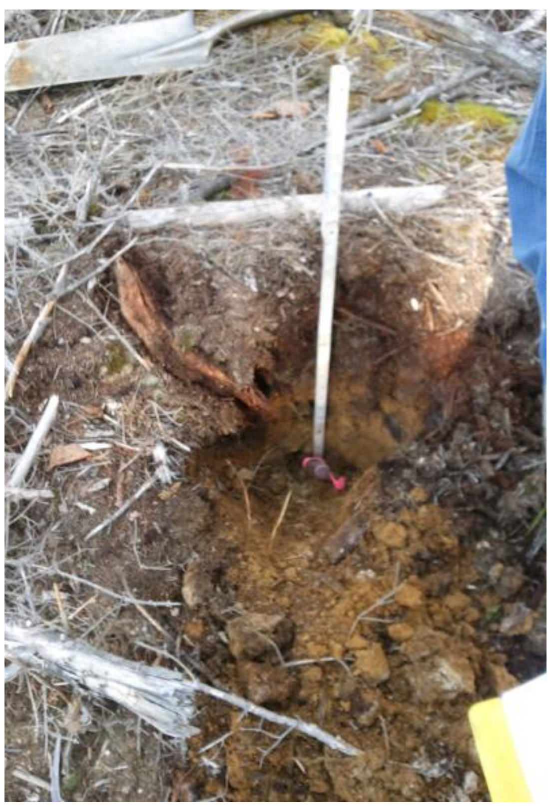
Dixfield soils with seasonal high groundwater table @ 17”

Typical Dixfield map unit exhibiting stony soil surface

BLUE SKY EAST WIND PROJECT
T16 MD, MAINE

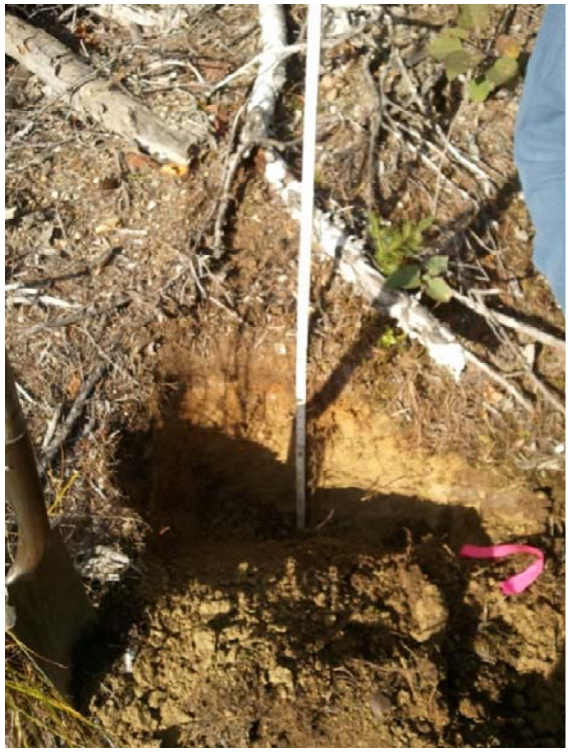


Typical bedrock exposure interspersed with Lyman & Tunbridge soils

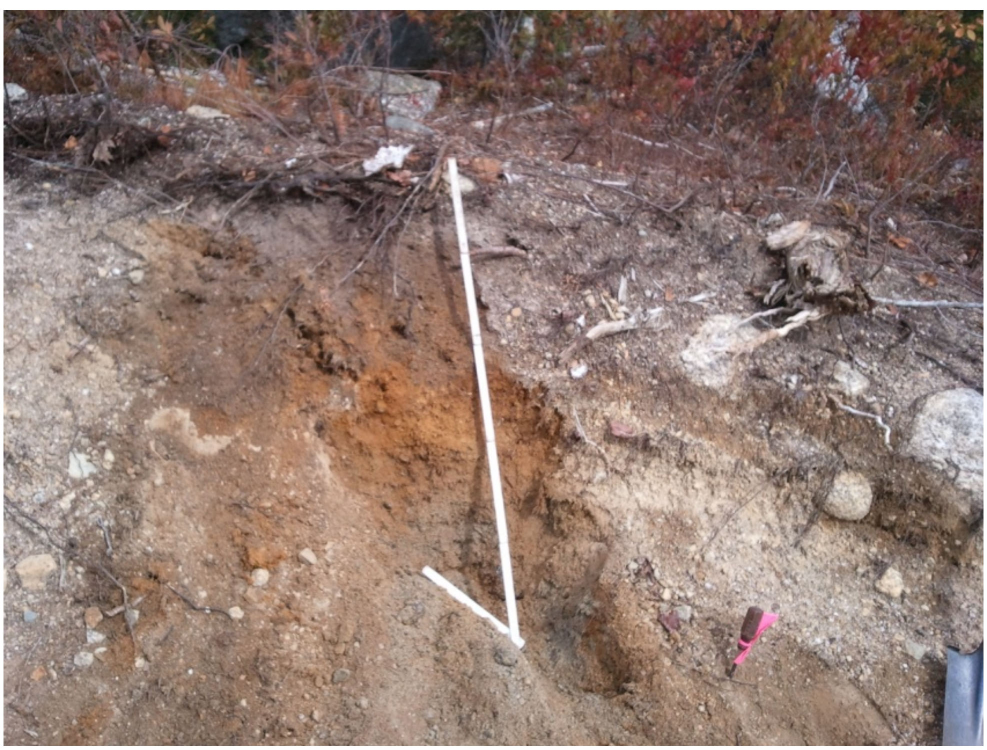


Lyman soils with less than 20” to bedrock surface

BLUE SKY EAST WIND PROJECT
T16 MD, MAINE



Dixfield soils with spodic development in upper portion of profile



Moderately well drained Skerry soils