

MEMO

To: Tim Brochu, PLS/ file
CES, Inc.

From: Johanna Szillery, CSS
CES, Inc.

RE: Verification of USDA Soils Mapping – Silver Maple Wind Energy Project
Clifton, Maine

Date: June 17, 2020



CES, Inc. (CES) completed on-site verification of USDA soils mapping on the proposed Silver Maple Wind Energy Project located in Clifton, Maine. Field work was conducted on May 21, 2020. Field work on the Site consisted of transecting the ridgeline proposed for the wind turbines (the Site) to develop an understating of the landforms present. To verify USDA soil types on the Site, nine test pits were classified; and additional auger borings were used to support test pit observations. Prior to the soils verification, natural resource surveys were completed on the Site in July 2018, and observations associated with these visits have informed the conclusions in this Memo. As part of our natural resources survey work, we also reviewed both upland and wetland areas and the soils associated with them, using hand auger borings and hand dug test pits.

Our observations of the type and extent of soils on Site are consistent with those mapped by the USDA county soil survey, which is attached to this Memo. The ridgeline where the wind turbines are sited is dominated by an association of deep, silt loam tills in the Marlow catena that occur in a consistently repeating pattern with areas of shallow, silt loam tills in the Tunbridge and Lyman series. The deep silt loam tills are the moderately well drained Peru series; however, other members in this catena, such as the somewhat poorly drained Colonel series and the well drained Marlow, are assumed to be present. The shallow to bedrock Tunbridge and Lyman series were observed on the Site, as were indicators of shallow bedrock, such as rock outcrops and steep slopes. We did not observe soils on the Site that are considered dissimilar limiting inclusions from those described in this Memo and shown on the USDA soils mapping. These soils would pose an unknown variable during construction. Attached, please find the test pit logs that describe our soils observations on the Site. Test pit locations are shown on *Sheet C001, Overall Plans, Notes, and Legend*.

As related to soils, limiting conditions were observed associated with shallow to bedrock soils. Standard construction techniques, such as blasting and rock anchors for turbine foundations, may be used to addresses these limitations. Limiting conditions were also observed associated with high seasonal water table/hydric soils on the Site. These deep, poorly drained silt loam soils derived from till are in the Brayton series. Wetlands have been reviewed as part of CES' natural resource survey on the Site and identified as wetland where the areas meet the established regulatory criteria.

SOIL PROFILE / CLASSIFICATION INFORMATION

DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES

Project <i>Silver Maple Wind Energy</i>	Owner Name: <i>Clifton</i>	Project Location (municipality): <i>Clifton</i>
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Exploration Symbol: 1 Test Pit Boring
8 " Organic horizon thickness Ground surface elev. _____

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0				
6	loam	very friable	7.5YR2.5/3	
12		friable	7.5YR3/3	none
18		friable	7.5YR4/4	
24			10YR5/4	
30	Limit of observation = 22"			
36				
42				
48				

soil data by S.E. >>	Soil Profile	Classification Condition	Slope Percent	Limiting Factor > 22" Depth	<input type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
soil data by S.S. >>	Soil series/phase name: <i>Dixmont</i>				Hydrologic <i>C/D</i> <input type="checkbox"/> Hydric <input checked="" type="checkbox"/> Non-hydric Soil Group

Exploration Symbol: 2 Test Pit Boring
2 " Organic horizon thickness Ground surface elev. _____

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0				
6	grav	friable	7.5YR 4/4	none
12	silt loam		10YR 4/6	
24	cobbly silt	firm	2.5Y5/6	10YR4/6
30	Limit = 27"			
36				
42				
48				

soil data by S.E. >>	Soil Profile	Classification Condition	Slope Percent	Limiting Factor 20" Depth	<input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
soil data by S.S. >>	Soil series/phase name: <i>Peru</i>				Hydrologic <i>C/D</i> <input type="checkbox"/> Hydric <input checked="" type="checkbox"/> Non-hydric Soil Group

Exploration Symbol: 3 Test Pit Boring
4 " Organic horizon thickness Ground surface elev. _____

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0				
6	grav loam	friable	7.5YR4/4	none
12				
18	grav silt loam		10YR4/6	
24	cobb silt	firm	2.5Y5/6	10YR4/6
30	Limit = 28"			
36				
42				
48				

soil data by S.E. >>	Soil Profile	Classification Condition	Slope Percent	Limiting Factor 21" Depth	<input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
soil data by S.S. >>	Soil series/phase name: <i>Peru</i>				Hydrologic <i>C/D</i> <input type="checkbox"/> Hydric <input checked="" type="checkbox"/> Non-hydric Soil Group

Exploration Symbol: 4 Test Pit Boring
2 " Organic horizon thickness Ground surface elev. _____

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0				
6	gravelly loam	friable	7.5YR3/3	none
12				
18			10YR4/6	
24	cobbly sandy loam	firm	10YR5/6	10YR 4/4
30	Limit = 25"			
36				
42				
48				

soil data by S.E. >>	Soil Profile	Classification Condition	Slope Percent	Limiting Factor 20" Depth	<input checked="" type="checkbox"/> Groundwater <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock
soil data by S.S. >>	Soil series/phase name: <i>Peru</i>				Hydrologic <i>C/D</i> <input type="checkbox"/> Hydric <input checked="" type="checkbox"/> Non-hydric Soil Group

INVESTIGATOR INFORMATION AND SIGNATURE

Signature: <i>Johanna Szillery</i>	Date: <i>5/21/2020</i>
Name Printed/typed: <i>Johanna Szillery</i>	Cert/Lic/Reg. # <i>CSS 494</i>
Title: <input type="checkbox"/> Licensed Site Evaluator	<input checked="" type="checkbox"/> Certified Soil Scientist
<input type="checkbox"/> Certified Geologist	<input type="checkbox"/> Other:



SOIL PROFILE / CLASSIFICATION INFORMATION

DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES

Project: Silver Maple Wind Energy; Owner Name: Clifton; Project Location (municipality): Clifton

Exploration Symbol: 5; Test Pit; Boring; 3" Organic horizon thickness; Ground surface elev. ... Soil profile: Tunbridge; Soil Group: C

Exploration Symbol: 6; Test Pit; Boring; 0" Organic horizon thickness; Ground surface elev. ... Soil profile: Lyman; Soil Group: D

Exploration Symbol: 7; Test Pit; Boring; 4" Organic horizon thickness; Ground surface elev. ... Soil profile: Peru; Soil Group: CID

Exploration Symbol: 8; Test Pit; Boring; 2" Organic horizon thickness; Ground surface elev. ... Soil profile: Peru; Soil Group: CID

INVESTIGATOR INFORMATION AND SIGNATURE: Signature: Johanna Szillery; Date: 5/21/2020; Name Printed/typed: Johanna Szillery; Title: Certified Soil Scientist



SOIL PROFILE / CLASSIFICATION INFORMATION **DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES**

Project: Silver Maple Wind Energy Owner Name: _____ Project Location (municipality): Clifton

Exploration Symbol: 9 Test Pit Boring
4 " Organic horizon thickness Ground surface elev. _____

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0		<u>v. fr.</u>	<u>10YR 6/2</u>	
6	<u>gray</u>			
12	<u>loam</u>	<u>friable</u>	<u>10YR 4/6</u>	<u>none</u>
24				
30	<u>cobbly loam</u>	<u>firm</u>	<u>2.5Y 5/6</u>	<u>10YR 4/4</u>
36		<u>Limit = 30"</u>		
42				
48				

soil data by S.E. ▶ Soil Classification: _____ Slope: _____ Limiting Factor: 25 " Groundwater Restrictive Layer Bedrock
 Profile: _____ Condition: _____ Percent: _____ Depth: _____

soil data by S.S. ▶ Soil series/phase name: Peru Hydric Non-hydric Hydrologic Soil Group: CID

Exploration Symbol: _____ Test Pit Boring
 _____ " Organic horizon thickness Ground surface elev. _____

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0				
6				
12				
18				
24				
30				
36				
42				
48				

soil data by S.E. ▶ Soil Classification: _____ Slope: _____ Limiting Factor: _____ " Groundwater Restrictive Layer Bedrock
 Profile: _____ Condition: _____ Percent: _____ Depth: _____

soil data by S.S. ▶ Soil series/phase name: _____ Hydric Non-hydric Hydrologic Soil Group: _____

Exploration Symbol: _____ Test Pit Boring
 _____ " Organic horizon thickness Ground surface elev. _____

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0				
6				
12				
18				
24				
30				
36				
42				
48				

soil data by S.E. ▶ Soil Classification: _____ Slope: _____ Limiting Factor: _____ " Groundwater Restrictive Layer Bedrock
 Profile: _____ Condition: _____ Percent: _____ Depth: _____

soil data by S.S. ▶ Soil series/phase name: _____ Hydric Non-hydric Hydrologic Soil Group: _____

Exploration Symbol: _____ Test Pit Boring
 _____ " Organic horizon thickness Ground surface elev. _____

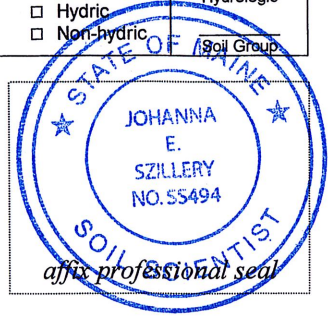
Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0				
6				
12				
18				
24				
30				
36				
42				
48				

soil data by S.E. ▶ Soil Classification: _____ Slope: _____ Limiting Factor: _____ " Groundwater Restrictive Layer Bedrock
 Profile: _____ Condition: _____ Percent: _____ Depth: _____

soil data by S.S. ▶ Soil series/phase name: _____ Hydric Non-hydric Hydrologic Soil Group: _____

INVESTIGATOR INFORMATION AND SIGNATURE

Signature: Johanna Szillery Date: 5/21/2020
 Name Printed/typed: Johanna Szillery Cert/Lic/Reg. #: CSS 494
 Title: Licensed Site Evaluator Certified Soil Scientist Other:



Soil Map—Penobscot County, Maine, Southern Part
(Silver Maple Wind)



Map Scale: 1:13,600 if printed on A portrait (8.5" x 11") sheet.




Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Penobscot County, Maine, Southern Part

Survey Area Data: Version 4, Sep 11, 2018

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

Date(s) aerial images were photographed: Jul 27, 2010—Aug 31, 2010

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AKD	Abram-Knob Lock-Rock outcrop complex, 3 to 30 percent slopes	33.5	3.4%
AKF	Abram-Knob Lock-Rock outcrop complex, 30 to 100 percent slopes	41.6	4.3%
BPA	Brayton-Peacham complex, 0 to 3 percent slopes, extremely stony	32.8	3.4%
BRB	Brayton-Colonel complex, 0 to 8 percent slopes, very stony	42.9	4.4%
BSC	Becket-Skerry complex, 3 to 15 percent slopes, very bouldery	68.5	7.0%
BW	Bucksport and Wonsqueak mucks, 0 to 2 percent slopes, ponded	16.1	1.7%
BYB	Brayton-Colonel-Lyman complex, 0 to 8 percent slopes, rocky	6.1	0.6%
CDB	Colonel-Peru-Brayton complex, 0 to 8 percent slopes, very stony	11.6	1.2%
HMC	Monadnock-Hermon complex, 3 to 15 percent slopes, extremely bouldery	131.1	13.4%
LKE	Lyman-Abram-Knob Lock complex, 30 to 80 percent slopes, very rocky	6.6	0.7%
LTC	Lyman-Tunbridge complex, 3 to 15 percent slopes, rocky	54.8	5.6%
LTD	Lyman-Tunbridge complex, 15 to 30 percent slopes, rocky	73.7	7.5%
MND	Monadnock-Tunbridge association, 15 to 30 percent slopes, very bouldery	124.9	12.8%
PCC	Peru-Colonel-Tunbridge association, 3 to 15 percent slopes, very stony	183.8	18.8%
SKB	Skerry-Becket-Colonel complex, 0 to 8 percent slopes, very bouldery	37.1	3.8%
TPD	Tunbridge-Peru-Lyman association, 15 to 30 percent slopes, very stony	112.0	11.5%
Totals for Area of Interest		977.2	100.0%