Supplemental Visual Resource Evaluation Report

Wind Colebrook North

Winsted-Norfolk Road and Rock Hall Road Colebrook, Connecticut

Prepared for

Prepared by

***VHB*/Vanasse Hangen Brustlin, Inc.**
54 Tuttle Place
Middletown, Connecticut 06457

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Visual Resource Evaluation

BNE Energy Inc. ("BNE") seeks to construct a wind generation project ("Wind Colebrook North" or the "Project") on property at the intersection of Winsted-Norfolk Road (Route 44) and Rock Hall Road (referred to herein as the "Property" or "Site") in the Town of Colebrook, Connecticut. This Supplemental Visual Resource Evaluation was conducted to evaluate the potential visibility of the Project within a five-mile radius of the proposed Property ("Study Area"), and incorporates recent Project modifications including relocation of the western-most turbine and associated clearing limits. In addition to Colebrook, the Study Area also includes land located within the neighboring municipalities of Norfolk, Goshen, and Winchester. Figure 1 (*Property Location Map*) depicts the location of the Property, the proposed locations of the Project turbines, and the limits of the Study Area.

Project Introduction

BNE proposes to install three General Electric ("GE") 1.6 megawatt ("MW") wind turbines at the Property, two in the eastern portion of the Property and one in the western portion of the Property. The hub heights of the GE turbines would be 100 meters (328 feet). The blade diameter of the GE turbines would be 82.5 meters (270.6 feet). Aviation lighting in the form of an upward-facing, low intensity red strobe would be required by the Federal Aviation Administration for illumination at night on the hub of each of the turbines. In addition to the three turbines, the Project would include associated ground equipment consisting of an electrical collector yard and associated utility infrastructure so that the turbines can be interconnected to the electrical grid. The turbines would be located at ground elevations of approximately 1252 feet Above Mean Sea Level ("AMSL") for the western turbine, 1360 feet ASML for the northeastern turbine, and 1322 feet ASML for the southeastern turbine.

Site Description and Setting

Identified in the Town of Colebrook land records as Map 7, Lot 4, the Property consists of approximately 125 acres, most of which is undeveloped, forested land. The western edge of the Property is cleared and used as golf driving range. The Property is primarily surrounded by undeveloped woodlands, with residential properties adjoining its southwest boundary. Winsted-Norfolk Road abuts a portion of the Property to the west and Rock Hall Road adjoins the northwest Property boundary. Land use within the vicinity of the Property is comprised of sparse residential development.

The topography within the Study Area is generally characterized by gently rolling to steep hills with ground elevations that range from approximately 519 feet AMSL to approximately 1720 feet AMSL. The tree cover within the Study Area consists mainly of mixed deciduous hardwood species, with some stands of intermixed conifers that occupy approximately 44,487 acres of the 53,332-acre study area (83%). The average tree canopy height throughout the Study Area was conservatively estimated to be approximately 65 feet.

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METHODOLOGY

To evaluate the visibility associated with the proposed Project, VHB used a predictive computer model that provides an assessment of potential visibility throughout the entire Study Area. A description of the procedures used in the analysis is provided below.

VHB uses ArcGIS® Spatial Analyst, a computer modeling tool developed by Environmental Systems Research Institute, Inc., to calculate the areas from which at least the tops of the turbines (hub height) and the blades, respectively, are estimated to be visible. Project- and Study Area-specific data were incorporated into the computer model, including turbine and blade heights, turbine locations and ground elevations, underlying and surrounding topography, anticipated Project clearing limits, and existing vegetation. Information used in the model included Connecticut LiDAR[1]-based digital elevation data and model and a digital forest (or tree canopy) layer developed for the Study Area. The LiDAR-based Digital Elevation Model (DEM) represents ten-foot spatial resolution elevation information for the state of Connecticut that was derived through the spatial interpolation of airborne LiDAR-based data collected in the year 2000 and has a horizontal resolution of ten (10) feet. The data was edited in 2007 and made available by the University of Connecticut through its Center for Land Use Education and Research (CLEAR). To create the forest layer, mature trees and woodland areas depicted on aerial photographs (ranging in dates from 2004 to 2008) were manually digitized (hand traced) in ArcGIS®, creating a geographic data layer for inclusion in the computer model. The black and white, digital aerial photographs, obtained from the Connecticut Department of Transportation, were flown in the spring of 2004 and selected for use in this analysis because of their image quality and depiction of pre-leaf emergence (i.e., "leaf-off") conditions. These photographs are half-foot pixel resolution. The more recent aerial photographs (2006 and 2008) were overlaid and evaluated to identify any new development resulting in the removal of trees.

Once the specific data layers were entered, the ArcGIS® Spatial Analyst Viewshed tool was applied to achieve an estimate of locations where the Project could be visible. First, only topography was used as a possible visual constraint; the tree canopy was omitted to evaluate potential visibility with no intervening vegetative screening. The initial omission of this data layer resulted in an excessively conservative prediction, but it provided an opportunity to identify areas within potential direct lines of sight of the Project.

The average tree canopy height within the Study Area, in this case 65 feet, was determined based on information collected in the field using a combination of a hand-held laser range finder, clinometer and comparative observations. The 65-foot forest data layer was merged with the DEM to establish intervening vegetation, with a height of 65 feet added to the base elevation, and the viewshed model recalculated within the Study Area.

As a final step, the forested areas were extracted from the areas of potential visibility, using a conservative assumption that a person standing within the forest will not be able to view the

1 LiDAR is an acronym for Light Detection and Ranging. It is a technology that utilized lasers to determine the distance to an object or surface. LiDAR is similar to radar, but incorporates laser pulses rather than sound waves. It measures the time delay between transmission and reflection of the laser pulse.

Project beyond a distance of approximately 500 feet. Depending on the density of the intervening tree canopy and understory of the surrounding woodlands, it is assumed that some locations within this distance could provide visibility of at least portions of the Project at any time of the year. In "leaf-on" conditions, this distance may be overly conservative for most locations. However, for purposes of this analysis, it was reasoned that forested land beyond 500 feet of the Project would consist of light-impenetrable trees of a uniform height.

Visibility varies seasonally, primarily with increased views occurring through the leafless trees and understory. During "leaf-off" conditions, mast or pole timber and branching provide the majority of screening. Because each site has distinctive forest characteristics, modeling for seasonal variations of visibility becomes problematic. In our experience, even when incorporating conservative constraints into the model, the results over predict seasonal visibility. Because each Study Area includes mature vegetation with unique and variable tree spacing, dimensions and branching patterns, creating a realistic, Study Area-specific "leaf-off" tree density data layer is not possible. Eliminating the tree canopy altogether, as performed in our initial analysis described above, exaggerates areas of visibility because it assumes unobstructed sight lines from numerous areas. For example, some locations at similar ground elevation as that of the Project and separated from the project site by 500 or more feet of intervening forest or woodland vegetation, could likely be obstructed by the combined mass of variable tree trunk and limb patterns. To provide an estimate of seasonal visibility through the trees, the forest data layer was manipulated to eliminate a 500-foot wide perimeter of vegetation. Using this approach, potential seasonal visibility could occur from some (but not all) locations within this presumed leafless corridor.

Also included on the viewshed mapping is a data layer, obtained from the State of Connecticut Department of Environmental Protection ("CTDEP"), which depicts various land and water resources such as parks and forests, recreational facilities, dedicated open space, schools and other categories. Lastly, based on a review of published information, it was determined that portions of two State-designated scenic roadways are present within the Study Area, including Route 183 to the northeast in Colebrook and Route 272 to the west in Norfolk. A portion of Winchester Road in Norfolk is designated as a local scenic road. No additional locally-designated scenic roads are located in the Study Area.

This analysis assumes the installation of three turbines at heights of 100 meters (463± feet) with blade lengths of 41.25 meters (135± feet). Three viewshed maps were created for purposes of analyzing the potential visibility of the Project and are included as attachments to this report, including:

- Figure 2 (*Year-Round Visibility*) depicts the potential year-round (leaf-on) visibility of the Project, including separate estimates of both the turbine hub heights (100 meters/328 feet) and combined turbine and blade apex heights of 141.25 meters (463± feet), based on a 82.5-meter blade rotor diameter (41.25 meters/135± feet in length), within the Study Area;
- Figure 3 (*Hub Height Visibility*) depicts the potential year-round (leaf-on) and seasonal (leaf-off) visibility of the turbine hub heights within the Study Area; and,
- Figure 4 (*Visibility Within One Mile*) depicts the potential year-round visibility of the turbine hub and hub plus blade apex heights, and the seasonal visibility of the hub height, within one (1) mile of the Property.

Photographic Simulations

Photographic simulations were generated at select locations where the Project could be visible. The photographic simulations portray a scaled rendering of the Project from representative locations within the Study Area. Using field data, site plan information and 3-dimension (3D) modeling software, a spatially referenced model of the site area was generated. At each location, information was collected including the geographic coordinates (latitude and longitude) of the camera's position, angle of camera view, height of camera, weather and time of day, and logged using a combination of Trimble and Mobile GIS (ArcPad) field equipment utilizing global positioning system [GPS] technology.

The photographs used in the simulations are depicted on Figures 1 and 3 and were obtained from the following areas:

- View 1: U.S Route 44 Adjacent to Proposed Project Area (Colebrook)
- View 2: U.S Route 44 (Colebrook)
- View 3: Adjacent to #42 Stillman Hill Road (Colebrook)
- View 4: Old Colebrook Road (Colebrook)
- View 5: Lookout Tower at Haystack Mountain (Norfolk)
- View 6: Lookout Tower at Soldiers' Memorial Park (Winsted)

Photographs were taken with a Nikon D-80 digital camera body and Nikon 18 to 135 mm zoom lens[2]. For views 2, 4 and 6, the lens was set to 50mm. The photographs taken to produce the simulations provided in views 1, 3 and 5 were created using a 24mm focal length in order to provide a greater depth of field for presentation in this report. Note that when using a digital single lens reflex (DSLR) camera, the image is captured on a digital sensor, as opposed to 35 mm film when using a traditional single lens reflex camera. The digital sensors in DSLR cameras are physically smaller than that of 35mm film, resulting in what is virtually a 'cropped' image. 35mm film captures a wider field of view. In order to compensate for that loss, VHB selectively uses focal lengths less than 50 mm resulting in wider fields of view.

Preparation of the photographic simulations began with the creation of a spatially-referenced 3D computer model of the proposed project area which includes the proposed turbines,

2 Focal lengths ranging from 17mm to 50mm can approximate views similar to that achieved from the unaided human eye. Two key factors to consider when determining what specific focal length to use to best represent "real world" conditions is field of view and relation of sizes between objects in the frame. A 17mm focal length has a wider field of view, which is more representative of the overall extent (including peripheral vision) that the human eye typically sees. At this focal length, relation of sizes between objects is skewed and not entirely accurate to what the human eye experiences. A 50mm focal length has a narrower field of view than that of the human eye; however, the relation of sizes between objects is more representative to that of what the human eye perceives. When producing photographic simulations, VHB has chosen to use a 50mm focal length whenever possible. For presentation purposes, such as in this report, the photographs are produced and viewed in an approximate 6.5"by 9.5" format. VHB has determined that when viewing a proposed facility at this format size, it is important to provide the largest representational image while maintaining an accurate relation of sizes between objects within the frame of the photograph. However, in some instances (such as when close to a proposed structure), a 50mm focal length does not allow sufficient image space to capture a proposed structure and its surroundings. In those instances, a focal length of 24mm is used to provide the viewer with an accurate representation of a proposed structure within its surrounding environment.

surrounding land formations, and any structures that assist in linking the project photography with the 3D computer model such as existing telephone/electric distribution poles, communication towers and/or existing buildings/homes in cases where their global position can be verified. As one example, in view 5, an existing telecommunications facility (the Winchester "monopine") is visible and was used to further ensure accuracy of the simulation. The information recorded by the photographer was used to set up a virtual camera within the 3D computer model replicating the exact position of the camera when in the field. Photo simulations were then created using a combination of renderings generated in the 3D model and photo rendering software programs. As a final step, the accuracy and scale of the simulation is tested against photographs of existing wind turbines with recorded camera position, focal lengths, photographic locations, and site locations.

Please note that the photographs/simulations where the Project is either not visible or partially obstructed by intervening topography and/or trees include additional information, presented in green outline. Specifically, a green outline of the proposed turbines and a green line representing the intervening topography (that would otherwise break the viewer's line of sight were it to be visible from that spot) are provided to depict the approximate turbine positions (to scale) from each of the photograph locations.

CONCLUSIONS

The results of this analysis indicate that a total of 159± acres within the Study Area would have some visibility of the turbine hubs above the tree canopy year-round (that is, during "leaf-on" conditions). This represents less than one-half of one percent of the 53,332-acre Study Area. At its apex, the blade(s) may be visible above the tree canopy from approximately 292 acres (less than one percent of the Study Area). The majority of potential year-round views of the turbine hub would occur on and in close proximity to the Property. Select locations along and adjacent to Route 44, Rock Hall Road, Greenwood Turnpike, Pinney Street, and Stillman Road (Route 182) would have brief views, as would outlying areas at higher elevations with open clearings. Generally, views would be limited by the steep topography associated with the significant ridgelines within the Study Area. We estimate approximately 86 residential properties located within the Study Area could have at least partial views of the Project's turbine(s) hub(s) year-round (during "leaf-on" conditions). This total includes approximately 26 residential properties within one mile of the Property. An additional 4± residential properties within one mile could have views of the blade(s) at its apex above the trees.

We estimate that approximately 1,365 acres (representing approximately 2.6% of the Study Area) have the potential to offer some views of the turbine hubs through the trees during "leaf-off" conditions. Nearly 86% of the potential seasonal visibility (1,176 acres) occurs on and within approximately one mile of the Property. Approximately 71 residential properties within one mile of the Project site could have at least partial views of the turbine(s) hub(s) through the intervening trees during "leaf-off" conditions.

It should be noted that the conservative methodology used to predict seasonal visibility represents an over-prediction of the total acreage that would likely encounter views once the Project is constructed. The results are based on the assumptions discussed previously and should be interpreted as representing gross areas where a potential exists for visibility

through the trees during leaf-off conditions. That is, it may be possible to view the Project from within portions of the shaded areas indicating seasonal visibility, but not necessarily from all locations within those shaded areas.

Views of the Project appear to be substantially limited to the west beyond a distance of approximately one mile, due to the presence of elevated north-to-south ridgelines. Similar conditions exist to the east. Two state-scenic roads exist within the Study Area including portions of Route 183 in Colebrook and Route 272 in Norfolk. No views are anticipated from Route 272, which is located approximately three miles to the west. Brief views may be achieved from a short section of Route 183 approximately 2.5 miles to the east-northeast. Winchester Road in Norfolk is designated as a local scenic road; brief views may be achieved from an open height of land along this road approximately three miles southwest of the Project. Similarly, Winchester Road in Winchester (Winsted) is also designated as a local scenic road; no views are anticipated from this roadway. Haystack Mountain State Park, located approximately four miles to the northwest includes several hiking trails and an observation tower. No views are anticipated from the trail system on Haystack Mountain; however, views of the turbines would be achieved from the observation tower lookout (see View 5). Dennis Hill State Park, located approximately 3.5 miles southwest of the Property Trail, has a system of hiking trails; no views of the Project are anticipated from this area.

The table below presents an inventory of residential properties within one mile of the Property that have the potential for views of the Project.

Height	Approx. Residential Properties[3] With Potential Year-Round Views Within 1-Mile By Street		Approx. Residential Properties With Potential Leaf-Off Views Within 1-Mile By Street*	
100-Meter Hub Height	Flagg Hill Road	2	Beckley Road	2
	Greenwoods Road East	2	Colebrook Road	1
	Greenwoods Turnpike	2	Flagg Hill Road	5
	Phelps Road	1	Greenwoods Road East	2
	Pinney Street	8	Greenwoods Turnpike	6
	Rock Hall Road	4	Millbrook Road	1
	Stillman Hill Road	4	Pinney Street	25
	Winsted-Norfolk Road	3	Rock Hall Road	14
			Stillman Road	8
			Tim O'Connor Road	1
			Winsted-Norfolk Road	6
	TOTAL:	**26**	**TOTAL:**	**71***
100-Meter Hub Height Plus 50-Meter Blade Height	Colebrook Road	1		
	Flagg Hill Road	1		
	Pinney Street	2		
	TOTAL:	**4***		

* Denotes residential properties in addition to those with potential year-round views of 100-meter hub height.

[3] It is important to note that some of those properties identified as "residential" may be: occupied by either commercial or recreational structures; agricultural land; and/or, forested tracts with some clearing(s).

The table below summarizes the amount of residential properties within the remainder of the Study Area that could have at least partial views of the Project.

Height	Approx. Residential Properties With Potential Year-Round Views Two, Three, Four and Five Miles From Proposed Project Area	
100-Meter Hub Height	0 to 1 Mile	26
	1 to 2 Miles	36
	2 to 3 Miles	10
	3 to 4 Miles	13
	4 to 5 Miles	1
	TOTAL:	**86**

The Project requires aviation lighting that would be mounted to the top of the turbine hubs at heights of 100 meters. An upward facing red strobe would be activated during nighttime hours only. It stands to reason that those areas where the turbine hub(s) can be seen would also offer views of the strobe at night.

Attachments

Study Area Map, Photographic Simulations, and Viewshed Maps

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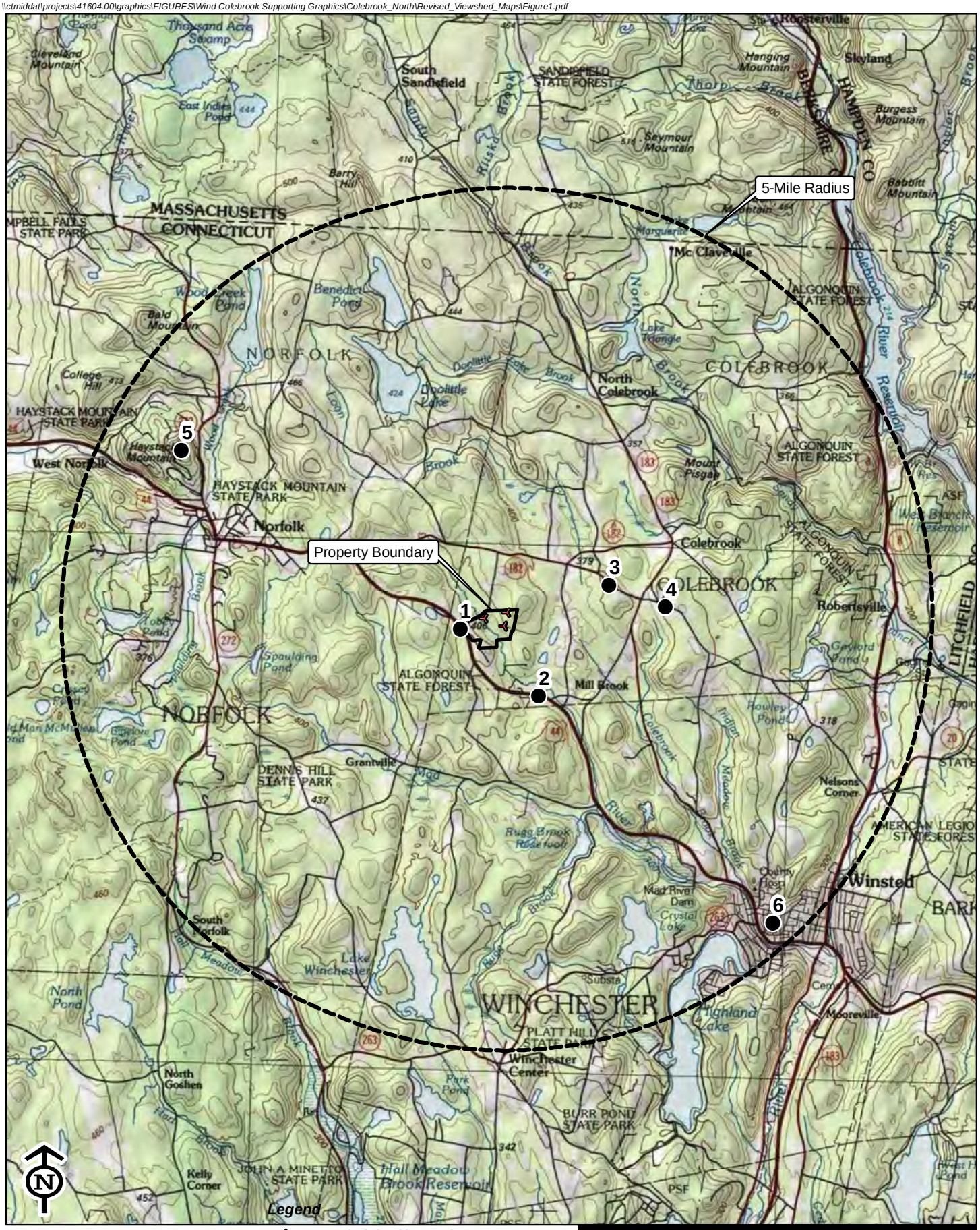
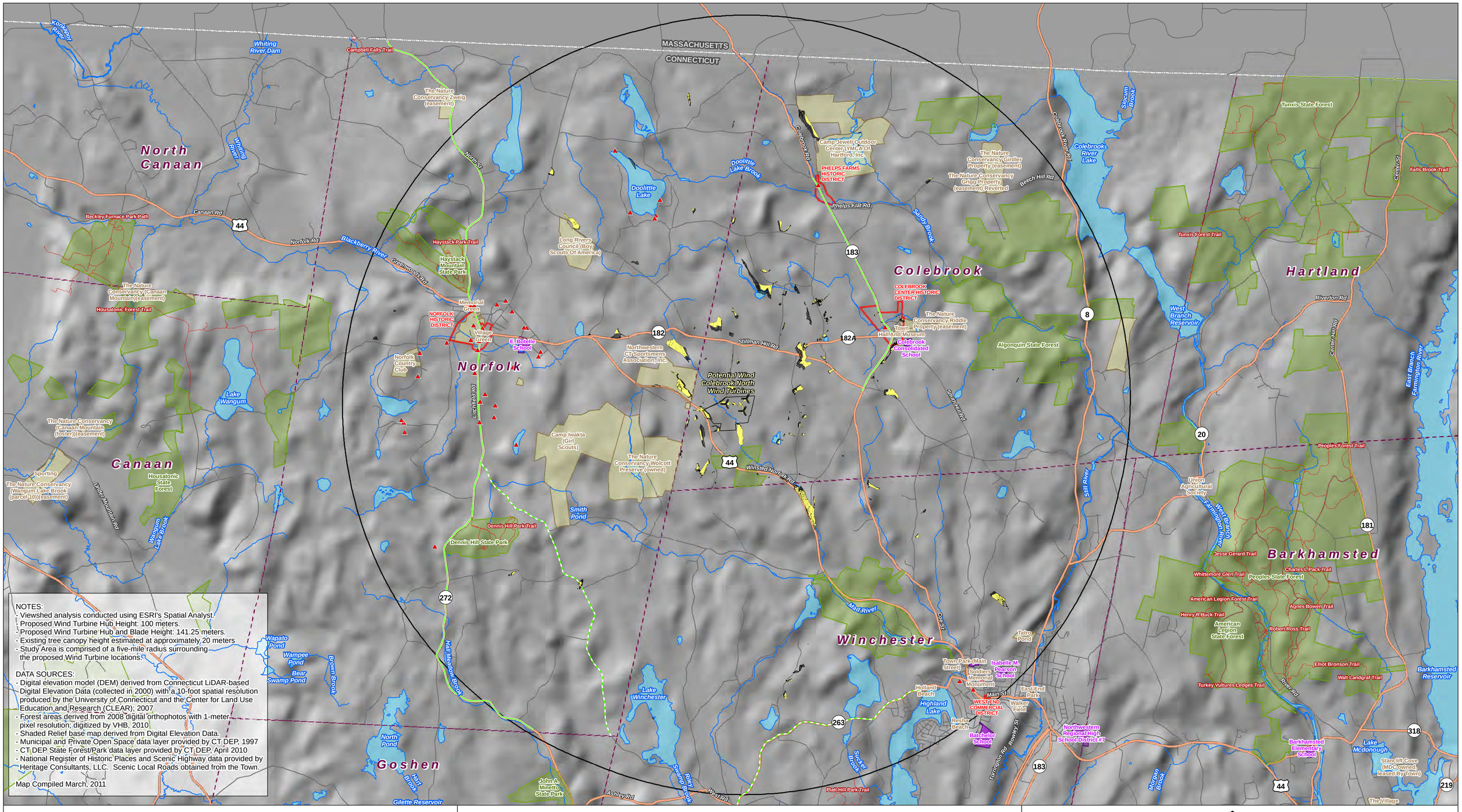


Vanasse Hangen Brustlin, Inc.

Figure 1 Property Location Map
Wind Colebrook North
BNE Energy, Inc.
Winsted-Norfolk Road
Colebrook, Connecticut

BNE Energy Inc.
Producer of green clean energy



NOTES:
- Viewshed analysis conducted using ESRI's Spatial Analyst.
- Proposed Wind Turbine Hub Height: 100 meters.
- Proposed Wind Turbine Hub and Blade Height: 141.25 meters.
- Existing tree canopy height estimated at approximately 20 meters
- Study Area is comprised of a five-mile radius surrounding the proposed Wind Turbine locations.

DATA SOURCES:
- Digital elevation model (DEM) derived from Connecticut LiDAR-based Digital Elevation Data (collected in 2000) with a 10-foot spatial resolution produced by the University of Connecticut and the Center for Land Use Education and Research (CLEAR); 2007
- Forest areas derived from 2008 digital orthophotos with 1-meter pixel resolution, digitized by VHB, 2010
- Shaded Relief base map derived from Digital Elevation Data.
- Municipal and Private Open Space data layer provided by CT DEP, 1997
- CT DEP State Forest/Park data layer provided by CT DEP, April 2010
- National Register of Historic Places and Scenic Highway data provided by Heritage Consultants, LLC. Scenic Local Roads obtained from the Town.

Map Compiled March, 2011

Legend

- Proposed Wind Turbine Location
- 5-Mile Study Area
- Property Boundary
- National Register Listed Historic Site
- National Register Listed Historic District
- Scenic Highway
- Scenic Local Road
- Trails
- Wind Turbine 100 Meter Hub Height Year-Round Visibility (+/- 159 acres)
- Wind Turbine 141.25 Meter Hub and Blade Height Year-Round Visibility (+/- 292 acres)
- Municipal & Private Open Space
- School
- State Forest/Park
- Open Water
- Town Line

Figure 2 - Year-Round Visibility
Wind Colebrook North Viewshed Analysis

BNE Energy, Inc.
Winsted-Norfolk Road
Colebrook, Connecticut

N

2 1 0 2 Miles

BNE Energy Inc.
Producer of green clean energy

VHB Vanasse Hangen Brustlin, Inc.

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- Forest areas derived from 2008 digital orthophotos with 1-meter pixel resolution; digitized by VHB, 2010
- National Geographic Topographic base map provided by ESRI's online mapping resources.
- National Register of Historic Places and Scenic Highway data provided by Heritage Consultants, LLC. Scenic Local Roads obtained from the Town.

Map Compiled March, 2011

Legend

- Proposed Wind Turbine Location
- Photo Locations
- 5-Mile Study Area
- Property Boundary
- National Register Listed Historic Site
- National Register Listed Historic District
- Town Line
- Wind Turbine 100 Meter Hub Height Year-Round Visibility (+/- 159 acres)
- Wind Turbine 100 Meter Hub Height Seasonal Visibility (+/- 1,365 acres)
- Scenic Highway
- Scenic Local Road
- Trails

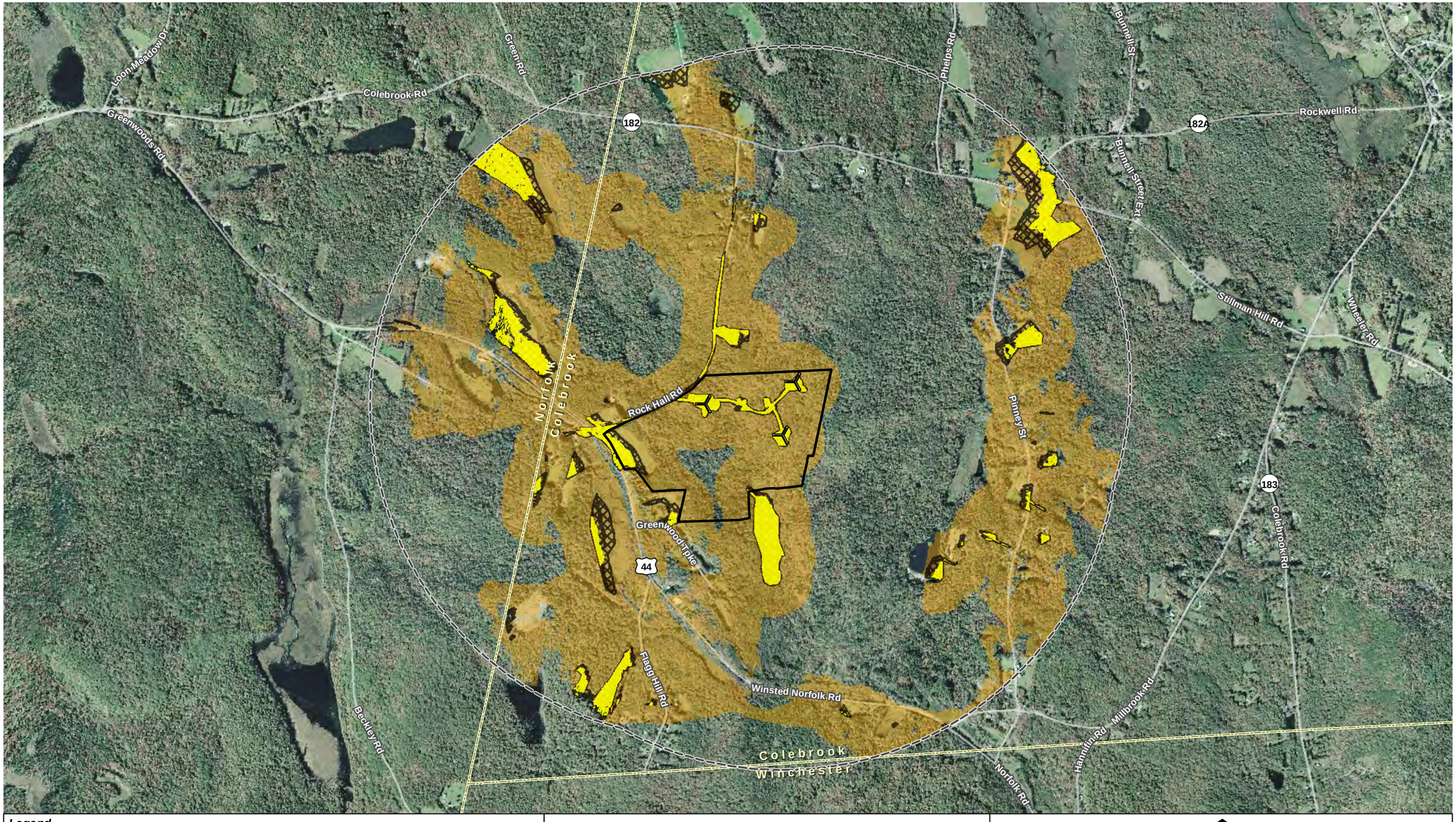
Figure 3 - Hub Height Visibility
Wind Colebrook North Viewshed Analysis

BNE Energy, Inc.
Winsted-Norfolk Road
Colebrook, Connecticut

2 1 0 2 *Miles*

BNE Energy Inc.
Producer of green clean energy

VHB Vanasse Hangen Brustlin, Inc.



Legend

- Proposed Wind Turbine Location
- 1-Mile Radius from Wind Turbines
- Property Boundary
- Town Boundary
- Wind Turbine 100 Meter Hub Height Year-Round Visibility (+/- 70 acres)
- Wind Turbine 141.25 Meter Hub and Blade Height Year-Round Visibility (+/-115 acres)
- Wind Turbine 100 Meter Hub Height Seasonal Visibility (+/- 1,176 acres)

Figure 4 - Visibility Within One Mile
Wind Colebrook North Viewshed Analysis

BNE Energy, Inc.
Winsted-Norfolk Road
Colebrook, Connecticut

N

0.5 0.25 0 0.5 Miles

BNE Energy Inc.
Producer of green clean energy

VHB Vanasse Hangen Brustlin, Inc.

VIEW	DESCRIPTION	CITY/TOWN	ORIENTATION	DISTANCE TO SITE AREA
1	U.S. ROUTE 44 ADJACENT TO PROPOSED PROJECT AREA (24mm focal length)	COLEBROOK	NORTHEAST	0.18 MILE +/-

Seasonal Visibility: Green outlines represent approximate location of the turbines and interveining topography that would break the viewer's line of sight

VIEW	DESCRIPTION	CITY/TOWN	ORIENTATION	DISTANCE TO SITE AREA
2	U.S. ROUTE 44 (50mm focal length)	COLEBROOK	NORTHWEST	1.47 MILES +/-

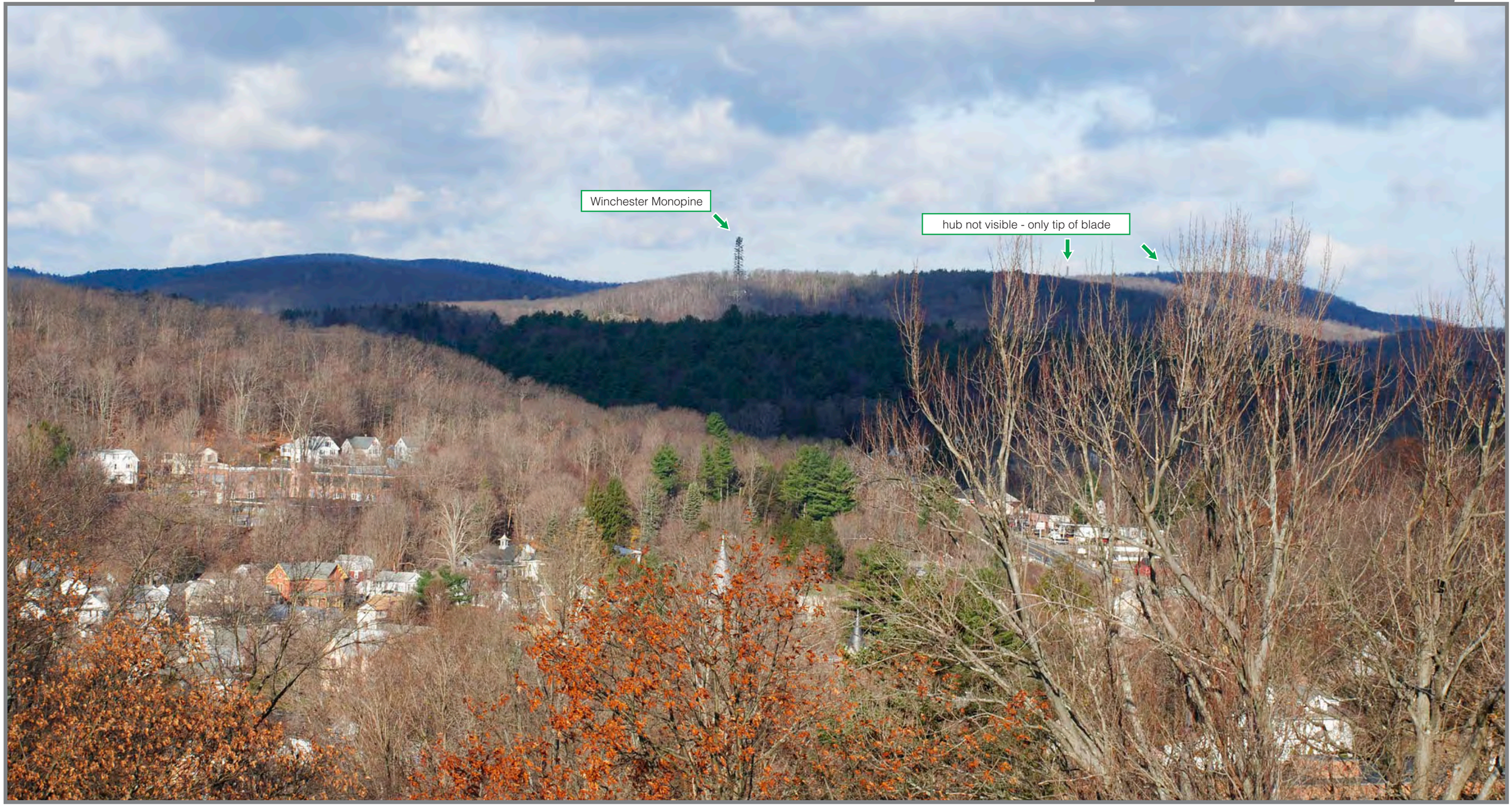
Seasonal Visibility

VIEW	DESCRIPTION	CITY/TOWN	ORIENTATION	DISTANCE TO SITE AREA
3	ADJACENT TO #42 STILLMAN HILL ROAD (24mm focal length)	COLEBROOK	SOUTHWEST	1.40 MILES +/-

Seasonal Visibility: Green outlines represent approximate location of the turbines and interveining topography that would break the viewer's line of sight

VIEW	DESCRIPTION	CITY/TOWN	ORIENTATION	DISTANCE TO SITE AREA
4	OLD COLEBROOK ROAD (50mm focal length)	COLEBROOK	SOUTHWEST	2.05 MILES +/-

VIEW	DESCRIPTION	CITY/TOWN	ORIENTATION	DISTANCE TO SITE AREA
5	LOOKOUT TOWER AT HAYSTACK MOUNTAIN (24mm focal length)	NORFOLK	SOUTHEAST	4.17 MILES +/-



VIEW	DESCRIPTION	CITY/TOWN	ORIENTATION	DISTANCE TO SITE AREA
6	LOOKOUT TOWER AT SOLDIERS' MEMORIAL PARK (50mm focal length)	WINSTED	NORTHWEST	4.81 MILES +/-