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Admitted in NH and MA

March 30, 2015

Site Evaluation Committee
N.H. Department of Environmental Services
29 Hazen Drive
Concord, NH 03302-0095

**Re: Docket No. 2014-05: Antrim Wind Energy, LLC Petition for Jurisdiction
Over a Renewable Energy Facility**

Dear Sir or Madam:

In connection with the above-referenced docket I enclose an original and eighteen (18) copies of the pre-filed testimonies of Jack Kenworthy and David Raphael in the above-referenced matter.

If you have any questions regarding these materials, please do not hesitate to contact me.

Sincerely,

A handwritten signature in blue ink, appearing to be "P. H. Taylor", written in a cursive style.

Patrick H. Taylor

Enclosures

STATE OF NEW HAMPSHIRE
BEFORE THE SITE EVALUATION COMMITTEE
Docket No. SEC 2014 - 05

PETITION FOR JURISDICTION OVER A RENEWABLE FACILITY
BY ANTRIM WIND ENERGY, LLC

PREFILED DIRECT TESTIMONY OF DAVID RAPHAEL
ON BEHALF OF ANTRIM WIND ENERGY, LLC

MARCH 30, 2015

1 **Q. Please state your name, title and business address.**

2 A: My name is David Raphael, and I am a Professional Landscape Architect and
3 Planner as well as Lecturer in the School of Natural Resources at the University of Vermont. I
4 am the Principal and owner of LandWorks, a multi-disciplinary planning, design, and
5 communications firm based in Middlebury, Vermont. My business address is 228 Maple Street,
6 Suite 32, Middlebury, Vermont 05753.

7 **Q. Briefly summarize your educational background and work experience.**

8 A: I began my career as landscape architect and planner working for the State of
9 Massachusetts Department of Environmental Management. I have been associated with
10 LandWorks since its inception in 1986. LandWorks serves both public and private sector clients
11 in Vermont and the Northeast. Our areas of expertise include visual, aesthetic and environmental
12 assessment, site and master planning, graphic communications and GIS mapping, permit
13 planning, participatory and community planning, downtown revitalization, open space and
14 conservation planning, zoning ordinance and design review development, landscape architecture
15 and environmental design. At LandWorks we have worked as advocates for communities,
16 appellants, the State of Vermont and private corporations. I personally have testified before most
17 of the District Commissions in Vermont and the former Environmental Board, as well as the
18 Public Service Board. Additional detail regarding my education, background and experience is
19 contained in my curriculum vitae, which is attached hereto as Attachment DR-1.

20 LandWorks has extensive experience with regard to visual assessment and environmental
21 impact, as well as the design and installation of utility facilities and structures. We have been a
22 consultant in this capacity for the Vermont Department of Public Service as well as the Maine
23 Department of Environmental Protection. We have evaluated the aesthetic and environmental

1 impact of transmission lines and corridors; transmission structures; telecommunication facilities;
2 solar farms; biomass facilities; hydropower; and, wind energy development (several in Vermont
3 and Maine). We have prepared feasibility studies for wind energy facility siting for the Lamoille
4 County Development Commission. LandWorks has provided visual assessments for a number of
5 utility scale wind power projects now in operation in Vermont and Maine.

6 **Q. Have you ever testified before the New Hampshire Site Evaluation**
7 **Committee (“SEC”)?**

8 **A.** No, although I have testified many times in other state forums regarding visual
9 impact assessments.

10 **Q. What is your role in relation to the Antrim Wind Project and AWE’s**
11 **application for a certificate of site and facility (the “Application”)?**

12 **A.** AWE retained LandWorks to conduct a visual assessment of the Antrim Wind
13 Project (the “Project”) and evaluate its potential effect upon aesthetics.

14 **Q. What is the purpose of your testimony?**

15 **A.** The purpose of my testimony is to explain the differences in visual impacts
16 between the prior Antrim Wind Project proposal and the current proposal.

17 **Q. What is the basis for your testimony?**

18 **A.** LandWorks conducted a Visual Assessment (VA) of the proposed Antrim Wind
19 Project in connection with AWE’s anticipated Application for a Certificate of Site and Facility.
20 In the process of conducting the VA, LandWorks reviewed the Project as it was proposed in the
21 prior Docket, including the previously submitted visual assessment.

1 **Q. How does the LandWorks approach to preparing the VA differ from the**
2 **approach utilized in preparing the VA submitted by Antrim Wind Energy in Docket 2012-**
3 **01?**

4 **A.** Our approach in developing the Visual Assessment for the proposed Antrim Wind
5 Project is more extensive, detailed, and precise compared to the visual assessments offered in the
6 previous Docket. The LandWorks approach includes specific definitions and clear thresholds
7 (i.e. for low, moderate, high), which reduce subjective conclusions. The methodology includes a
8 well-defined list of the types of scenic resources to be reviewed, and each identified scenic
9 resource was analyzed through a step-by-step screening process to determine the resource's
10 sensitivity to change based on its level of scenic quality and cultural designation. The visual
11 change to each resource identified as sensitive was then fully examined based on six specific
12 categories with well-defined thresholds for low, moderate, and high. These criteria include
13 measurable, consistent, and established techniques for determining if a project will be highly
14 visible or dominant. The LandWorks methodology also includes a detailed assessment for
15 determining what the project's effect will be to the reasonable person from a sensitive scenic
16 resource with higher visual effect. The four criteria used in this process are well documented
17 and well established in both the BLM VRM and the USFS SMS, as well as the USFS Recreation
18 Opportunity Spectrum (ROS), and include specific definitions for low, moderate, and high.

19 **Q. Do the physical attributes of the newly proposed Antrim Wind Project differ**
20 **from those of the Project proposed in Docket 2012-01?**

21 **A.** Yes. Those differences are detailed in the testimony of Jack Kenworthy, but I am
22 familiar with the proposed Project and the various ways in which it differs from the previously
23 proposed Project.

1 **Q. Do these changes have an effect upon the aesthetic impacts of the Project to**
2 **the surrounding area?**

3 **A.** Yes, they have a substantial effect. The area with potential visibility of the project
4 within the 10-mile radius has been reduced by 12%. The change in context and nature of view is
5 more dramatic, particularly in sensitive areas such as Willard Pond. As outlined in the previous
6 filing, turbine 10 and turbine 9 appear to be the most dominant structures when viewed from
7 most locations at Willard Pond or the DePierrefeu Wildlife Sanctuary. Turbine 10, the closest
8 (1.33 miles away) and most dominant due to its location directly atop Willard Mountain at an
9 elevation of 1897 feet, has been removed. Turbine 9's height has been reduced so much so that
10 the hub now sits below the treeline, virtually eliminating its visual presence at these locations. I
11 have attached visual simulations to illustrate this point. See Attachments DR-2 – DR-4. The
12 simulations show existing conditions, the previously proposed ten-turbine project and the newly
13 proposed project. Furthermore, no turbine sits at an elevation higher than 1750 feet, which is
14 about 150 feet below turbine 10 and the summit of Willard Mountain.

15 This change in effect can also be measured in part by angle of view, which, from several
16 key locations, has been dramatically reduced. An angle of view of less than 7% is typically
17 considered low, and the removal of turbine 10 and reduction of turbine 9 downgrade the effect
18 on many resources to the low range. From the southeast corner of Willard Pond, overall field of
19 view has been cut nearly in half from 7.9% to 4.5%; from the northeast portion of Willard Pond,
20 where visibility of the most turbines is more likely, overall field of view has been reduced
21 significantly from 10.7% to 6.4%. Furthermore, the 5 turbines that are visible from this location
22 are at distances of 1.62 miles or greater (3/10 of a mile further than the 10 turbine layout).

1 The field of view from the vantage point on Bald Mountain Trail has also been
2 diminished greatly from 12.31% to 5.92%, and the closest turbine visible has also moved 3/10 of
3 a mile further away. From the waters of Gregg Lake at a point of highest potential visibility, the
4 field of view will be reduced from 17.28% down to 16.14%. There will also no longer be
5 visibility from Center Pond in Stoddard, Spoonwood Pond in Nelson, or Nubanusit Lake in
6 Hancock with the removal of turbine 10 and the reduction in height of turbine 9. In fact,
7 visibility in the lower west quadrant of the 10-mile radius has been essentially eliminated with
8 these changes in layout. This means locations of higher scenic significance that are found here,
9 such as Dublin Lake or Beech Hill, will have no visibility of the project.

10 Another significant change is the overall reduction, or shift, in area where total number of
11 turbines would be visible. For example on Willard Pond, there will be a significant area of the
12 lake that used to have 8 and 9 turbines potentially visible, that will now have 6 or 7 turbines
13 potentially visible. This is similar at Gregg Lake, where a great portion of the lake had 9
14 turbines potentially visible, that will be reduced to 6 and 7 turbines potentially visible. Again,
15 given other factors such as angle of view, proximity, or dominance, the reduction of 1 or 2
16 turbines can have a dramatic effect on the change of context and nature of view, downgrading an
17 impact from moderate or high, to low or moderate.

18 **Q. Does this conclude your pre-filed testimony?**

19 **A. Yes.**

CURRICULUM VITAE

David Raphael, B.A., M.L.A. :: Principal/Landscape Architect & Planner

EDUCATION

M.L.A., Harvard University Graduate School of Design, 1977 Cambridge, Massachusetts

B.A. in English, Tufts University, Cum Laude, Minor in Ecology, 1972 Medford, Massachusetts

School of the Museum of Fine Arts, 1971, Boston, Massachusetts

Diploma, Dartmouth College Outward Bound Program, 1970, Hanover, New Hampshire

EMPLOYMENT HISTORY, PROFESSIONAL SKILLS, & DUTIES

1986-present: LandWorks, Middlebury, Vermont

Founder and Principal Landscape Architect, Planner, & Graphic Designer

1984 - 1985: Alexander, Truex, deGroot, Architects, Burlington, Vermont

Consultant and staff, Landscape Architect/Planner

1980 - 1982: Kiley-Walker, Charlotte, Vermont

Associate Landscape Architect

1976 - 1979: Massachusetts Department of Environmental Management

Planner/Landscape Architect

TEACHING/ACADEMIC APPOINTMENTS

2013-2014: University Fellow in Sustainability, Rubenstein School of Environmental & Natural Resources, University of Vermont, Burlington, VT

2010-2011: University Fellow in Service Learning, Rubenstein School of Environmental & Natural Resources, University of Vermont, Burlington, VT

1982-present: Lecturer, Rubenstein School of Environment & Natural Resources, University of Vermont

1992-1994: Visiting Instructor, Middlebury College, Middlebury, VT

1991-1993: Adjunct Faculty Member, Vermont Technical College

1988-1989: Director, "Design Vermont" project of the Vermont Council on the Arts and the Governor's Institute on the Arts, funded by the National Endowment of the Arts & held at Castleton State College, July 1989

1983: Visiting Assistant Professor, School of Architecture, University of Arkansas

1982-1984: Adjunct Associate Professor, Graduate Program in Urban and Environmental Policy, Tufts University

PROFESSIONAL REGISTRATIONS

- Registered/Licensed Landscape Architect - State of Rhode Island, Vermont
- Passed Uniform National Examination: eligible for registration in other states
- Certified with the Professional Ski Instructors of America

MEMBERSHIPS/COMMUNITY SERVICE

- Chair, Vermont Urban and Community Forestry Council (VTUCFC)
- Member, American Society of Landscape Architects (ASLA)
- Member, American Planning Association (APA)
- Member, Society of Environmental Graphic Designers (SEGD)



CURRICULUM VITAE

David Raphael, page 2

- Member, Board of Trustees, Lake Champlain Land Trust
- Fellow in Sustainability, University of Vermont
- Former Member, Board of Directors, Vermont State Craft Center at Frog Hollow
- Chairman, Town of Panton Planning Commission and Development Review Board 1985 - present
- Delegate, Addison County Regional Planning Commission (ACRPC)
- Member, Agency of Natural Resources, Design Issues Study Committee
- Former Member, Town of Middlebury, Design Advisory Committee

PARTIAL LISTING OF RESEARCH AND PUBLICATIONS

"Wayfinding Principles & Practice, 2nd Edition", Landscape Architecture Technical Information Series (LATIS). American Society of Landscape Architects. 2013

"I Believe: Green is the Infrastructure of the 21st Century, Let's Begin the Blueprint" Burlington Free Press, Dec. 6, 2009

"Land-Working: David Raphael", SEGD Magazine on Sustainability in *Moses Brown School Cupola*. Spring 2008

"Wayfinding Principles & Practice", Landscape Architecture Technical Information Series (LATIS) Number 2. American Society of Landscape Architects. 2006

"BGOC (Big Graphics on Campus) Signs and Environmental Graphics that Impact Collegiate Environments" Signs of the Times, Oct. 2003

"A New Vision for Vermont," Landscape Architecture Magazine, December 1999

Special Correspondent, Burlington Free Press, Burlington, Vermont, 1994 to 1998

"Brave New Vermont," Vermont Magazine, June 1995, Contributor.

Sign Management: Aesthetics, Economics, Environment - The Vermont Experience, 1992 ("Best of the Conference" award at national conference on sign management, 1992)

"Prospect," Landscape Architecture Magazine, September/October 1985.

"Grounds for Playful Renaissance," Landscape Architecture Magazine, July 1975.

Richard P. White Award, Horticultural Research Institute, Washington, D.C., 1983-1984 Windbreaks and Shelterbelts for the Northeast

Rivers Downtown: Riverfront Revitalization in Vermont, for the Winooski Valley Park District, October 1981; funded with a Housing and Urban Development and Research Grant

"Evolutionary Trends and Essential Themes of Wilderness Preservation" in Public Space, Peter Trowbridge, Ed. and with an Introduction by J.B. Jackson; Harvard University, Cambridge 1975.

INTERESTS

Research and Writing, Mountaineering, Natural History, Landscaping, Carpentry, Kayaking, Soccer (Official Referee VSSA, USSF), Skiing (Professional Instructor, PSIA).

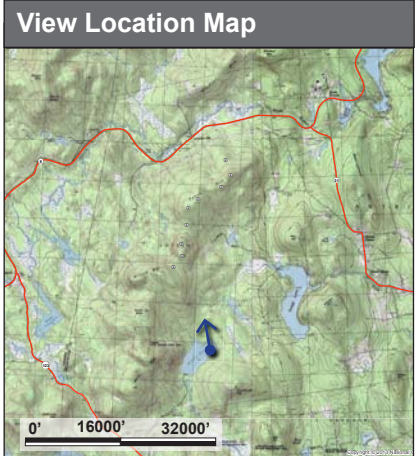
EXHIBIT 18: EXISTING CONDITIONS FROM WILLARD POND, ANTRIM (SHEET 1 OF 3)



View Location Map

Simulation Information		
Turbine Information	Model: N/A	
	Hub height: N/A	
	Rotor diameter: N/A	
	Overall turbine height: N/A	
Photograph Information	Date and time: 7/1/14, 2:14pm	
	Weather conditions: Partly sunny	
	Location: Northeast corner of Willard Pond, facing North/Northwest at 43.023107, -72.011880	
	Camera elevation above sea level: 1,159' (353.26m)	
	Simulation viewing distance: 19" (48.26 cm)	Focal length (35mm equivalent): 56mm
Technical Information	Distance to nearest visible turbine: N/A	
	Software: N/A	
	Digital elevation data source: N/A	

EXHIBIT 18: VISUAL SIMULATION OF PROPOSED CONDITIONS FROM WILLARD POND, ANTRIM - 10 TURBINE LAYOUT (SHEET 2 OF 3)



Simulation Information		
Turbine Information	Model: ACCIONA AW3000/116	
	Hub height: 302' (92.05 m)	
	Rotor diameter: 380' (113 m)	
	Overall turbine height: 492' (150 m)	
Photograph Information	Date and time: 7/1/14, 2:14pm	Weather conditions: Partly sunny
	Location: Northeast corner of Willard Pond, facing North/Northwest at 43.023107, -72.011880	
	Camera elevation above sea level: 1,159' (353.26m)	
	Simulation viewing distance: 19" (48.26 cm)	Focal length (35mm equivalent): 56mm
	Distance to nearest visible turbine: 1.33 miles (2.14 km) Furthest visible turbine: 3.05 miles (4.90 km)	
Technical Information	Software: ArcGIS ArcMap 10; Nemetschek VectorWorks 2015; SketchUp Pro 8; Adobe Photoshop CS5	
	Digital elevation data source: USGS National Elevation Dataset (NED) 1/3 arc-second	

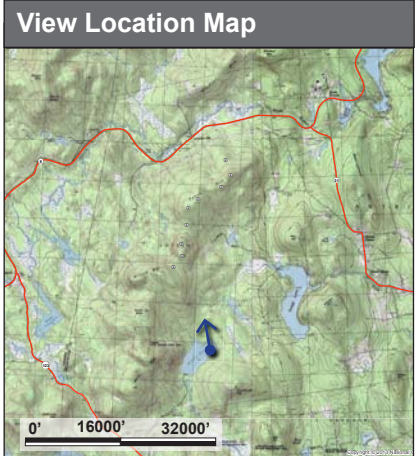
NOTES:

1. This visual simulation is based on GIS data available at the time from USGS National Elevation Data Set and Antrim Wind Renewable Energy. Data is only as accurate as the original source and is not guaranteed by LandWorks.

2. This simulation depicts turbines, as well as visibility of access roads, collector lines, and associated clearing.

Prepared by LandWorks,
Middlebury, VT
Prepared for Antrim Wind
Renewable Energy, LLC,
Portsmouth, NH

EXHIBIT 18: VISUAL SIMULATION OF PROPOSED CONDITIONS FROM WILLARD POND, ANTRIM - 9 TURBINE LAYOUT (SHEET 3 OF 3)



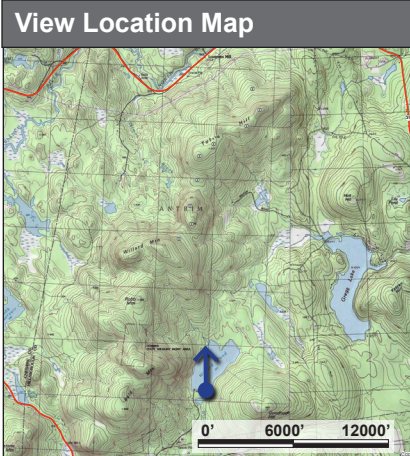
Simulation Information		
Turbine Information	Model: Siemens SWT 3.2 / 113	
	Hub height: T1 - T8 303'-6" (92.5 m) T9 260'-10" (79.5')	
	Rotor diameter: 370'-8" (113 m)	
	Overall turbine height: T1 - T8 488'-10" (149.01 m) T9 445'-2" (135.67 m)	
Photograph Information	Date and time: 7/1/14, 2:14pm	Weather conditions: Partly sunny
	Location: Northeast corner of Willard Pond, facing North/Northwest at 43.023107, -72.011880	
	Camera elevation above sea level: 1,159' (353.26m)	
	Simulation viewing distance: 19" (48.26 cm)	Focal length (35mm equivalent): 56mm
	Distance to nearest visible turbine: 1.62 miles (2.60 km) Furthest visible turbine: 3.05 miles (4.90 km)	
Technical Information	Software: ArcGIS ArcMap 10; Nemetschek VectorWorks 2015; SketchUp Pro 8; Adobe Photoshop CS5	
	Digital elevation data source: USGS National Elevation Dataset (NED) 1/3 arc-second	

NOTES:

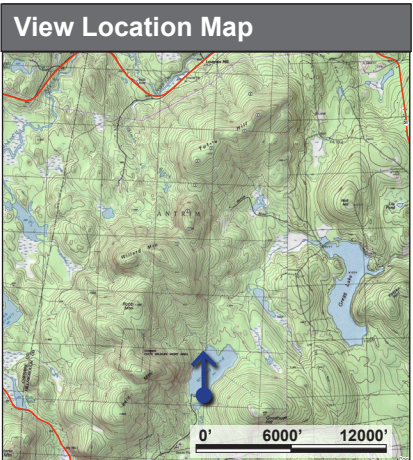
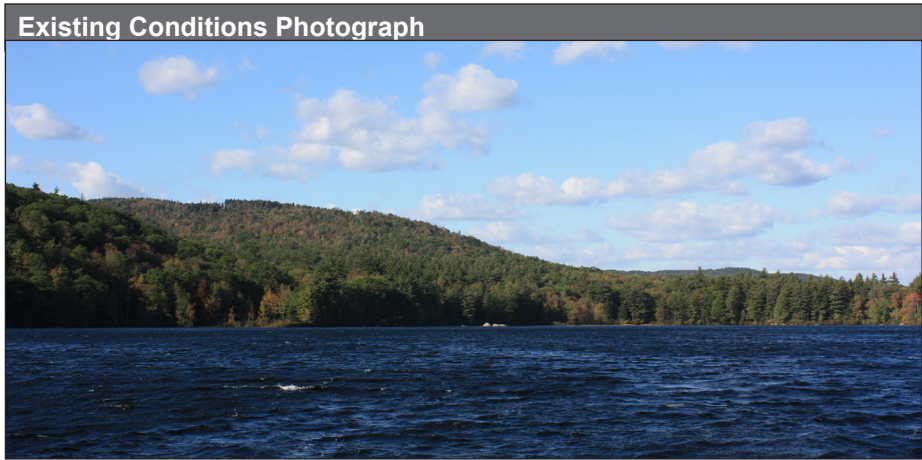
1. This visual simulation is based on GIS data available at the time from USGS National Elevation Data Set and Antrim Wind Renewable Energy. Data is only as accurate as the original source and is not guaranteed by LandWorks.

2. This simulation depicts turbines, as well as visibility of access roads, collector lines, and associated clearing.

Prepared by LandWorks,
Middlebury, VT
Prepared for Antrim Wind
Renewable Energy, LLC,
Portsmouth, NH



Simulation Information		
Turbine Information	Model: N/A	
	Hub height: N/A	
	Rotor diameter: N/A	
	Overall turbine height: N/A	
Photograph Information	Date and time: Unavailable	
	Weather conditions: Partly sunny	
	Location: Southeast Shore Willard Pond, Antrim NH; 43.018411° N, -72.01759° W	
	Camera elevation above sea level: 1167' (355.70 m)	
	Simulation viewing distance: N/A	Focal length (35mm equivalent): N/A
Technical Information	Distance to nearest visible turbine: N/A	
	Software: N/A	
	Digital elevation data source: N/A	



Simulation Information		
Turbine Information	Model: Siemens SWT 3.2 / 113	
	Hub height: T1 - T8 303'-6" (92.5 m) T9 260'-10" (79.5')	
	Rotor diameter: 370'-8" (113 m)	
	Overall turbine height: T1 - T8 488'-10" (149.01 m) T9 445'-2" (135.67 m)	
Photograph Information	Date and time: Unavailable	Weather conditions: Partly sunny
	Location: South Shore Willard Pond, Antrim NH; 43.018411° N, -72.01759° W	
	Camera elevation above sea level: 1167' (355.70 m)	
	Simulation viewing distance: N/A	Focal length (35mm equivalent): N/A
	Distance to nearest visible turbine: 1.74 miles (2.80 km) Furthest visible turbine: 3.21 miles (5.17 km)	
Technical Information	Software: ArcGIS ArcMap 10; Nemetschek VectorWorks 2015; SketchUp Pro 8; Adobe Photoshop CS5	
	Digital elevation data source: USGS National Elevation Dataset (NED) 1/3 arc-second	

NOTES:

1. This visual simulation is based on GIS data available at the time from USGS National Elevation Data Set and Antrim Wind Renewable Energy. Data is only as accurate as the original source and is not guaranteed by LandWorks.

2. This simulation depicts turbines, as well as visibility of access roads, collector lines, and associated clearing.

Prepared by LandWorks,
Middlebury, VT
Prepared for Antrim Wind
Renewable Energy, LLC,
Portsmouth, NH



Proposed Condition

**FIGURE A8-B**

Photo Simulation

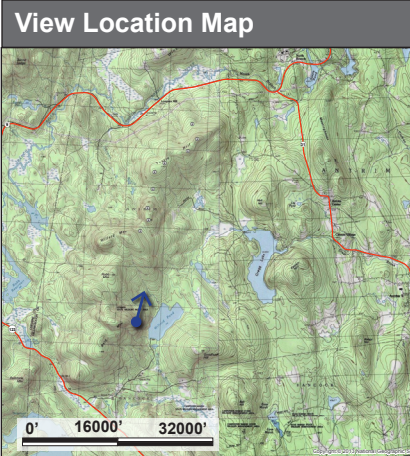
VP# 44 - dePierrefeu-Willard Pond Wildlife Sanctuary

Town of Antrim

EXHIBIT 6: EXISTING CONDITIONS FROM BALD MOUNTAIN, ANTRIM (SHEET 1 OF 2)

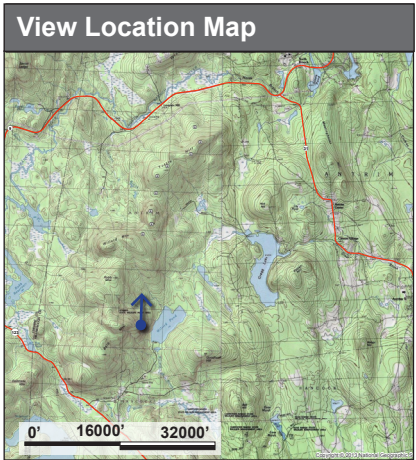
ANTRIM WIND VISUAL ASSESSMENT

March 2015



Simulation Information			
Turbine Information	Model: N/A		
	Hub height: N/A		
	Rotor diameter: N/A		
	Overall turbine height: N/A		
Photograph Information	Date and time: 7/1/14, 1:17 pm		Weather conditions: Partly sunny
	Location: Summit of Bald Mountain, facing North/Northeast at 43.0220,-72.02450		
	Camera elevation above sea level: 1,695' (516.8m)		
	Simulation viewing distance: 19" (48.26 cm)		Focal length (35mm equivalent): 56mm
	Distance to nearest visible turbine: N/A		
Technical Information	Software: N/A		
	Digital elevation data source: N/A		

EXHIBIT 6: EXISTING CONDITIONS FROM BALD MOUNTAIN, ANTRIM (SHEET 2 OF 2)



Simulation Information		
Turbine Information	Model: Siemens SWT 3.2 / 113	
	Hub height: T1 - T8 303'-6" (92.5 m) T9 260'-10" (79.5')	
	Rotor diameter: 370'-8" (113 m)	
	Overall turbine height: T1 - T8 488'-10" (149.01 m) T9 445'-2" (135.67 m)	
Photograph Information	Date and time: 7/1/14, 1:17pm	Weather conditions: Partly sunny
	Location: Summit of Bald Mountain, facing North/Northeast at 43.0220,-72.02450	
	Camera elevation above sea level: 1,695' (516.8m)	
	Simulation viewing distance: 19" (48.26 cm)	Focal length (35mm equivalent): 56mm
	Distance to nearest visible turbine: 1.62 miles (2.60 km) Furthest visible turbine: 3.05 miles (4.90 km)	
Technical Information	Software: ArcGIS ArcMap 10; Nemetschek VectorWorks 2015; SketchUp Pro 8; Adobe Photoshop CS5	
	Digital elevation data source: USGS National Elevation Dataset (NED) 1/3 arc-second	

NOTES:

1. This visual simulation is based on GIS data available at the time from USGS National Elevation Data Set and Antrim Wind Renewable Energy. Data is only as accurate as the original source and is not guaranteed by LandWorks.

2. This simulation depicts turbines, as well as visibility of access roads, collector lines, and associated clearing.

Prepared by LandWorks,
Middlebury, VT
Prepared for Antrim Wind
Renewable Energy, LLC,
Portsmouth, NH



Proposed Condition

**FIGURE A7-B**Photo Simulation
VP#43 - Summit of Bald Mountain
Town of Antrim