

Adequacy Review of the Number Nine Wind Project Visual Impact Assessment

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1. Introduction

On September 3, 2015, Maine’s Department of Environmental Protection (DEP) accepted as complete Number Nine Wind Farm, LLC’s permit application for the Number Nine Wind Farm (the “Project”). This project has a nameplate capacity of 250 megawatts (MW) generated by 17 Gamesa G114-2.0 and 102 Gamesa G114-2.1 wind turbines. The application identifies 129 potential turbine locations, of which only 119 will be used; the analysis will include all 129 locations. The turbines are located in T10 R3 WELS, E Township, T9 R3 WELS, TD R2 WELS, T8 R3 WELS and Saint Croix Township, Aroostook County, Maine and are within the area designated for expedited grid-scale wind development. In addition to the generating facilities, the Project includes associated facilities, such as access roads, and a 51.6 mile 345 kV generator lead line.¹ DEP has determined “that the potential effects of the generator lead transmission line on the scenic character and existing uses will be reviewed under 38 M.R.S.A. § 484(3) of the Site Law and 38 M.R.S.A. §480-D(1) of the Natural Resources Protection Act” (NRPA)²

Terrence J. DeWan and Associates (TJD&A) prepared the visual impact assessment (VIA) for both the generating and associated facilities (TJD&A 2015a). This document reviews the adequacy of the VIA prepared by TJD&A. It is logically divided into two main sections, one for those portions of the Project being evaluated according to the standards and criteria of the so called Wind Energy Act (WEA), and the second for the associated facilities evaluated according to the standards and criteria of the Site Law and NRPA.

¹ I am not aware of DEP having clarified the difference between “generating facilities” and “associated facilities.” However, LURC made such a clarification in the Second Procedural Order In the Matter of Development Permit DP 4889 Champlain Wind, LLC Bowers Wind Project, dated April 21, 2011.

As a preliminary matter, to determine which scenic standard applies to the associated facilities in this project, the definition of associated facilities, as compared to generating facilities, must be clear. In accordance with 35-A M.R.S. §3451(1) and (5):

Generating facilities means wind turbines, including their blades, towers, and concrete foundations, and transmission lines (except the generator lead line) immediately associated with the wind turbines.

Associated facilities means all other facilities that are not generating facilities, and that includes the turbine pads, which are the cleared, leveled areas around each turbine, all roads used to access the turbines, the generator lead line, the meteorological towers, as well as the operations and maintenance building and the substation.

The transmission lines in this project require clarification with respect to whether certain lines are generating facilities or associated facilities. In this project, there are transmission lines that run between the turbines, collecting the power. Those transmission lines are immediately associated with the wind turbines and are generating facilities. In this project there is also, however, a so-called express collector line that runs for 5.2 miles from the summit of the project to the substation. The express collector line is not immediately associated with the wind turbines, is more like a generator lead line, and therefore is an associated facility.

² Letter from Jessica M. Damon, Project Manager, Bureau of Land Resources, DEP to Joy Prescott, Stantec Consulting Services, dated October 1, 2015, RE: Number Nine Wind Farm, LLC – Associated Facilities.

2. Reviewed under the Wind Energy Act Standards and Criteria

2.1 Project Description

The Project is within the area designated for expedited grid-scale wind development. The turbines are located on ridges and hills around Number Nine Mountain (496 m) between 8 and 18 miles to the west of the Canadian border, in the vicinity south of Presque Isle and north of Houlton. These include East Branch Pinnacles (316 m), Burnt Land Ridge, Nineteen Mountain (363 m), Collins Ridge, Hedgehog Mountain, Spruce Top, Maple Mountain (411 m), Hovey Mountain (416 m), Meduxnoageag Mountain (431 m), and various unnamed hills and ridges.³

The generation facilities include:

- **Turbines.** The project includes 17 Gamesa G114-2.0 MW turbines and 102 Gamesa G114-2.1 MW turbines that will produce a nameplate capacity of 250 megawatts (MW), though the project application identifies 129 potential turbine sites for approval. For the purposes of analysis, it is assumed that all 129 potential wind turbine sites will be used. The height to the hub center is 93 meters (approximately 305 feet), plus 57 meters (approximately 187 feet) for the rotor blades, resulting in a total height of 150 meters (492 feet) to the tip of an upright blade. The turbines will be painted white, per Federal Aviation Administration (FAA) regulations.
- **Warning lights.** Red warning lights will be installed according to FAA guidelines to warn pilots of the location of project elements higher than 200-feet. Typically lights are placed on the ends of a turbine string, and on alternating turbines between them. The lights are red, and set to flash synchronously. Number Nine Wind has not indicated that they will install radar-assisted warning lights when they are approved for use by FAA.
- **Collector line.** The 34.5 kV collector line that runs between turbines will be buried; they will be collected between clusters of turbines with overhead lines running along the access roads.

Associated facilities evaluated under the standards and criteria of the WEA include:

- **Roads.** The VIA indicates that 74 miles for existing road will be for construction and maintenance without widening; an additional 15 miles of existing road will require widening. Additionally, there are an additional 50 miles of new permanent access roads and 8.5 miles of new roads that will be temporary.
- **Turbine pads.** It appears that 2.75 acres are typically cleared around each turbine to facilitate construction. Following construction, the area will be allowed to revegetate naturally.
- **Building.** A single-story Operations and Maintenance building will be constructed on Hovey Mountain Road in T9 R3. The cleared site is approximately 5.4 acres.
- **Meteorological towers.** There will be four permanent 93-meter (305-foot) guyed or free-standing lattice meteorological (met) towers. Met towers will require FAA safety lighting and will be painted a distinctive color pattern (i.e., broad white and orange stripes). It is

³ These place names and elevations come from the Esri topographic base map.

anticipated that the permanent met towers will become part of the system of radar-activated warning lights, when approved by FAA.

There will be up to five 93-meter (305-foot) temporary meteorological towers. These towers will be located on turbine pads and will be removed before the turbines are assembled.

2.2 Study Area

The VIA identifies the towns and how many turbines are to be installed in each. The VIA evaluated 129 potential turbine sites, though the intention is to use only 119 of them. The turbines are located on hills and ridges that range in height between 400 and 600 feet above the surrounding terrain.

The WEA directs that “the primary siting authority shall consider insignificant the effects of portions of the development's generating facilities located more than 8 miles, measured horizontally, from a SRSNS.”⁴ As a result, the study area boundary for the Number Nine Wind Farm and for every VIA conducted under the WEA has been set to 8 miles from the generating facilities.

2.3 Scenic Resources of State or National Significance

The WEA specifies that potential impacts from generation facilities are limited to scenic resources of state or national significance (SRSNS).⁵ Table 1 lists the SRSNS within 8 of a generating facility identified by the VIA.

Table 1. Summary of Scenic Resources of State and National Significance within 8 Miles of the Generating Facilities as Identified by TJD&A (2015a)

Scenic Resources of State or National Significance in the Surrounding Area	Nearest Turbine (miles) ¹	Number of Turbines Visible w/in 8 miles ¹
Historic Sites		
Bridgewater Town Hall and Jail	6.2	0
National or State Park		
Aroostook State Park	(5.6)	0

As part of this review, a search was made for additional scenic resources and none were found. In particular, the WEA has defined the first type of SRSNS as:

A national natural landmark, federally designated wilderness area or other comparable outstanding natural and cultural feature, such as the Orono Bog or Meddybemps Heath.⁶

A search was made for scenic resources within 8 miles of Number Nine generation facilities that might qualify as a “comparable outstanding natural and cultural feature,” and none were found.

⁴ 35-A MRSA, § 3452, §§ 3

⁵ 35-A MRSA, § 3451, §§ 9

⁶ 35-A MRSA, § 3451, §§ 9(A)

2.4 Visibility Analysis

2.4.1 VIA visibility analysis. An analysis of the visibility of both blade tips and turbine hubs over bare terrain was conducted. In addition, an analysis that included the screening effect of forest cover was conducted for both blade tips and turbine hubs (TJD&A 2015a, Maps 3 through 6). On these maps, the number of visible turbines is shown in eight groups of ten turbines (i.e., 1-10, 11-20 and so on through 91-100, concluding with 101-129 visible turbines).

TJD&A conducted these analyses using WindPRO software. The VIA states that the terrain elevation data were obtained from the GIS Data Depot. The visibility analysis over bare terrain is shown in Map 3.

It is useful, and more realistic, to prepare a visibility analysis that considers the potential screening of land cover. MELCD 2004 land cover data are used to estimate the screening effect of forest land cover. The metadata description for MELCD 2004 is:

MELCD is a land cover map for Maine primarily derived from Landsat Thematic Mapper 5 and 7 imagery, from the years 1999-2001. This imagery constitutes the basis for the National Land Cover Dataset (NLCD 2001) and the NOAA Coastal Change Analysis Program (C-CAP). This land cover map was refined to the State of Maine requirements using SPOT 5 panchromatic imagery from 2004. The Landsat imagery used was for three seasons: early spring (leaf-off), summer, and early fall (senescence) and was collected with a spatial resolution of 30 m. The SPOT 5 panchromatic imagery was collected at a spatial resolution of 5 m during the spring and summer months of 2004. The map was developed in two distinct stages, the first stage was the development of a state wide land cover data set consistent with the NOAA-CAP land cover map. The second stage was: a) the update to 2004 conditions, b) a refinement of the classification system to Maine specific classes and, c) a refinement of the spatial boundaries to create a polygon map based on 5 m imagery.

It has become common practice to assign a fixed height of 40 feet to the three forest land cover types (i.e., deciduous, evergreen and mixed forest). It is recognized that often trees are taller than 40 feet, particularly in conservation buffers around water features. However, trees are often shorter than 40 feet also and 40 feet has been generally accepted as the height suitable for visibility analysis in northern New England. Other land cover types are not assigned a screening height because they are too variable. In particular, most have large areas both above eye-level and at ground level, so assigning any height would be very misleading. VIA Maps 4 through 6 are based on these assumptions.

The VIA indicates that Aroostook State Park had some potential visibility when only bare terrain was considered, but no potential visibility when the screening effect of the forest was included. This result was supported by the conditions observed during the field visit, though there may be some elevated location that is not readily accessible with a view of the project.

The visibility analyses indicate that there is the potential for visibility from the Bridgewater Town Hall and Jail. This SRSNS is located in an area classified by the MELCD 2004 as low

intensity development. As such, no screening potential is assigned to this area. However, the field visit determined that existing vegetation would screen views of toward the Project.

2.4.2 Verifying the visibility analysis.

A new visibility analysis was conducted to verify the results of the analysis in the VIA, and the results are presented in Appendix 1. The analyses used ArcMap GIS software. Terrain elevation data are from the National Elevation Dataset (NED) at a 1/3 arc-second resolution (approximately 10 meters).⁷ The NED raster was resampled to match the finer resolution of the MELCD 2004 data.

Land cover data came from the MELCD 2004, which has a 5 meter resolution. The areas of forest cover were extracted, and the areas that would be cleared for turbine pads, staging areas, roads and other associated facilities were removed from this area of forest cover. The remaining forested area was assigned a height of 40 feet (12 meters) which was added to the NED data (i.e., this has the effect of adding a forest screen to the terrain elevation).

The viewshed was calculated to 8 miles from each of the 129 potential turbine locations for the upright blade tips (150 meters or 492 feet) and the turbine hubs (93 meters or 305 feet). This raw viewshed indicates visibility from forested areas, as if the observer had climbed to the top of the trees (i.e., these are the areas where a 12 meters was added to the NED to account for the screening effect of forest cover). However, if one is in the forest they will not have a view because it will be blocked by the trees, so visibility from forested areas is removed. The resulting map shows visibility of the Project from non-forested areas over the screening effect of a 40-foot forest canopy.

A potential source of inaccuracy in a visibility analysis concerns the accuracy of the land cover data. The MELCD 2004 data are based primarily on satellite imagery from 1999 to 2001. Then 2004 SPOT 5 panchromatic imagery was used to identify land cover classes unique to the MELCD, such as forested areas harvested after 1995, which would otherwise be classified as “Shrub/Scrub.” However, the new National Land Cover Data 2011 (NLCD 2011) is based on more current 2011 data. Areas with 20 years of growth may have reached a height of 5 meters (16 feet), which is the minimum height to be classified as forest cover. This more recent data could also classify recently harvested areas as shrub/scrub, which by definition is less than 5 meters tall. The NLCD 2011 data were resampled to match the resolution of the MELCD 2004 data. The same procedures were used to create visibility analysis using these more recent data.

The resulting viewshed maps are included in Appendix 1. They are in general agreement with the visibility analysis of the VIA.

2.4.3 Field visit verification. On November 20, 2014, James Palmer (Scenic Quality Consultants), Jessica Damon and Jim Beyer (DEP), and Kate Chapman and Kellen Ingalls (edpr) conducted a field visit of the visual effects of the Number Nine Wind Project. It was anticipated that the Project permit application would be submitted to DEP within a couple of months. There was snow on the ground and access conditions were not ideal. However, it was thought

⁷ <http://nationalmap.gov/elevation.html#data>

expedient to conduct the field visit while there was still possible access to viewpoints in Aroostook State Park, which there might not be a week or two latter.

Aroostook State Park is anywhere from 5.5 to 7.3 miles to the closest wind turbine. A ridge runs from the northwest to the southeast through the park, screening the eastern half of the park from any possible views. The park is largely forested, and views from nearly all areas are screened by forest cover—the forested viewsheds do not indicate any possible visibility. However, the Park recently constructed a tent or viewing platform on the west side of South Peak, which affords the best opportunity identified to view the project. Figure 1 shows the panoramic nature of the view from this platform; Figure 2 shows the extreme southern end of this view. It is likely that four or more turbines will be visible, but they will be greater than 8 miles distant from the viewer and therefore their effect is “insignificant.”⁸

The view from the Bridgewater Town Hall and Jail is shown in Figure 3. The field visit verifies that vegetation will screen visibility of the Project.

⁸ 35-A MRSA, § 3452, §§ 3



Figure 1. Panoramic image of the view from the platform constructed on the west side of South Peak, Aroostook State Park.



Figure 2. The extreme southern end of the view from the platform—it is likely that four or more turbines will be visible, but they are all further than 8 miles distant.



Figure 3. The view of the Number Nine Wind Project from Bridgewater Town Hall and Jail is screened by vegetation.

2.5 Visual Simulations

2.5.1 Image resolution. Wind projects can extend across a large part of a view; however they are always composed of individual turbines. Visual simulations must have sufficient resolution and clarity to represent the detail of turbines (e.g., the blades) that viewers can see under good viewing conditions. One approach would be to establish the minimum resolution of a visual simulation based on the standard of “normal vision.”

“Normal vision” is based on recognition acuity, which is measured by the familiar Snelling eye chart.⁹ The eye chart is composed of letters that subtend 5-minutes of arc in overall size, with lines and gaps that subtend a 1-minute arc. Though the human eye is capable of detecting smaller elements under very good viewing conditions, “normal vision” seems like an appropriate standard to specify a photograph’s resolution if it is going to adequately represent visual conditions. Relating this to the dimensions of a wind turbine, the widest part of a blade or the

⁹ It is recognized that the limits of recognition acuity are frequently set at 30 seconds or half a minute (Schiffman 2000). The turning blade tips of the Stetson Wind turbines are clearly visible at will over 9 miles from the Baskahegan Lake boat launch under good viewing condition, which suggests that it may be appropriate to have even higher resolution than discussed here.

width of a nacelle (both approximately 4 meters) will occlude just over 1 minute of arc at approximately 8 miles.

Conceptually, a digital photograph must have one pixel for each minute of arc (or whatever unit we decide represent the minimum resolution that must be visible). However, the camera sensor's pixels will not always lineup with the actual elements in the landscape (e.g., a blade tip), so the widely used rule of thumb is that the image needs twice the resolution of the target to adequately capture the desired information. This means that there needs to be two pixels for every minute of arc in the lens' view. Figure 4 illustrates the importance of pixel resolution in representing visual information.



Figure 4. The effect of higher pixel density for capturing image detail.

2.5.2 Number Nine Wind Project simulations. Visual simulations were prepared for the two scenic resources from locations that appeared to have the greatest potential for visibility of the generating facilities. The photographs were taken with a Nikon D300 DX-format digital camera with a 35 mm prime lens. The Nikon D300 is capable of capturing images with a resolution of 4,288-by-2,848, which results in 1.9 pixels per minute or very close to the desired resolution.

However, the photographs used for the simulations were taken at a lower resolution, as shown in Table 2. The resolution for the Aroostook State Park: South Peak is marginal, but the resolution for the other two simulations are clearly not adequate.

Table 2. Apparent Resolution of Original Simulation Imagery

Simulation	Horizontal Angle	Horizontal Pixels	Pixels per Minute
1. Aroostook State Park: South Peak	37.8°	3,216	1.4
2. Bridgewater Town Hall and Jail	37.8°	2,144	0.9
3. Interstate 95	37.8°	2,144	0.9

It is unclear why the full resolution of the camera was not used. However, it appears that there is no visibility of turbines within 8 miles of the generating facilities from either Aroostook State Park or Bridgewater Town Hall and Jail (the Interstate 95 simulation is of the generator lead line, which is discussed in the next chapter).

2.5.4 Photosimulation Verification. The VIA presents exceptional information to understand the visual conditions at the simulation viewpoints. There is a study area map locating the SRSNS in relation to the generating facilities, an annotated aerial photograph describing the viewpoint and its relation to elements of the SRSNS, particularly as one looks toward the generating facilities. In addition, annotated eye-level photographs describe the landscape visible from the viewpoint. The existing conditions photograph used for the simulation is presented as well as the simulated view of the proposed Project. Wire-frame representations of the turbines are shown to explain where turbines will be visually obstructed by vegetation or where turbines greater than 8 miles from the viewpoint may be visible. All this information is presented on 11-by-17 inch paper.

The review includes inspection of the simulation photographs and draft images. All of these elements appear in order (except that the image resolution is lower than desired). The accuracy of the simulations is also checked using ArcScene software visualizations, which are included in Appendix 2. These visualizations use the GIS database to construct a perspective visualization that is directly comparable to the simulation. The limits of the ArcScene visualization are the resolution of the data and the generalization of land cover. In particular, they may not represent the foreground accurately.

Aroostook State Park: South Peak. Aroostook State Park is almost entirely forested, and as a result distant views are very restricted. The simulation viewpoint was chosen because it is one of the few locations where there are distant panoramic views toward the south. However, the local vegetation along this ridge will block views of Number Nine turbines within 8 miles of the viewpoint. There appear to be seven turbines 8.7 to 10.4 miles distant that will be visible. The documentation provided in the VIA clearly explains this, and Visualization 1 in Appendix 2 supports this documentation. The field visit also confirms that no turbines within 8 miles of this viewpoint will be visible. While unlikely, it may be possible to bushwhack to a point along this high ridge to find a view of turbines within 8 miles of the viewer, but it would not be a normally visited location. The field visit was conducted in winter conditions which precluded extensive investigation beyond normally accessed sites.

Bridgewater Town Hall and Jail. The Bridgewater Town Hall and Jail is located on US Route 1. The viewpoint is in front of the Town Hall looking across the street at the post office and a wooded area. The VIA documents the local land cover and shows that the trees and building across the street will obscure any potential view of the Project turbines. This is confirmed by Visualization 2 in Appendix 2 and by the field visit.

2.5.5 Conclusion. There are only two SRSNS within 8 miles of the Number Nine Wind Farm. The VIA documents that no turbines within 8 miles of these SRSNS will be visible. This conclusion is supported by the field visit and visualizations prepared for this review.

2.6 Evaluating Scenic Impact

The VIA discusses the evaluation criteria specified by the WEA. However, since there is no visibility from either of the SRSNS there can be no visual impact. As a result the evaluation is brief.

The VIA considers the possibility of cumulative impacts from the Mars Hill and Oakfield wind projects. Since there are no visible turbines within 8 miles of the SRSNS, the Number Nine Wind Farm cannot contribute to cumulative impacts.

2.7 Adequacy of the VIA under the WEA

The VIA appears to have identified all of the SRSNS within 8 miles of the proposed generating facilities. The potential for visibility from these SRSNS has been appropriately evaluated and visual simulation have been prepared using best professional practices. No adverse visual impacts are identified. This review supports that conclusion.

3. Reviewed under the Site Law and NRPA Standards and Criteria

DEP has determined “that the potential effects of the generator lead transmission line on the scenic character and existing uses will be reviewed under 38 M.R.S.A § 484(3) of the Site Law and 38 M.R.S.A. §480-D(1) of the Natural Resources Protection Act” (NRPA)¹⁰

As a reviewer of wind energy projects for DEP, I have had relatively little experience with reviewing visual impacts using the Site Law and NRPA regulations. My review of the relevant regulations is offered below.

3.1 Review of the Site Law and NRPA

3.1.1 Site Law. The Site Law states:

The developer has made adequate provision for fitting the development harmoniously into the existing natural environment and that the development will not adversely affect existing uses, scenic character, air quality, water quality or other natural resources in the municipality or in neighboring municipalities.¹¹

Chapter 373, Section 14 *No Unreasonable Effect on Scenic Character* describes the rules to implement this standard from the Site Law.

- A. Preamble.** The Board considers scenic character to be one of Maine's most important assets. The Board also feels that visual surroundings strongly influence people's behavior.
- B. Scope of Review.** In determining whether the proposed development will have an unreasonable adverse effect on the scenic character of the surrounding area, the Board shall consider all relevant evidence to that effect, such as evidence that:
 - (1) The design of the proposed development takes into account the scenic character of the surrounding area.
 - (2) A development which is not in keeping with the surrounding scenic character will be located, designed and landscaped to minimize its visual impact to the fullest extent possible.
 - (3) Structures will be designed and landscaped to minimize their visual impact on the surrounding area.

The guidelines and other information that follows this description concerns development such as parking lots and site development. They do not appear to envision a project of the scope and scale of a 52-mile 345 kV transmission line.

3.1.2 NRPA. The NRPA states that “The activity will not unreasonably interfere with existing scenic, aesthetic, recreational or navigational uses.”¹²

¹⁰ Letter from Jessica M. Damon, Project Manager, Bureau of Land Resources, DEP to Joy Prescott, Stantec Consulting Services, dated October 1, 2015, RE: Number Nine Wind Farm, LLC – Associated Facilities.

¹¹ 38 M.R.S.A § 484(3)

¹² 38 M.R.S.A. §480-D(1)

Chapter 315 *Assessing and Mitigating Impacts to Existing Scenic and Aesthetic Uses* “describes the process for evaluating impacts to existing scenic and aesthetic uses resulting from activities in, on, over, or adjacent to protected natural resources subject to NRPA.” Chapter 315 “applies to the alteration of a coastal wetland, great pond, freshwater wetland, fragile mountain area, river, stream, or brook, as defined in” the NRPA. As a naive reviewer using this regulation, it is noted that Chapter 315, Section 10 describes many scenic resources that are not related to water resources or fragile mountain areas.

Chapter 315 defines the tasks and components of a VIA, approaches to reasonable mitigation, criteria for determining whether an adverse visual impact is unreasonable, and what constitutes a scenic resource. These requirements are outlined below, in the order Chapter 315 presents them:

7. Visual impact assessment.
 - A. Visualize the proposed activity and evaluate potential adverse impacts
 - B. Determine effective mitigation strategies
 - C. Must be prepared by a design professional trained in visual assessment procedures
 - D. Scenic resources within the viewshed of the proposed activity must be identified
 - E. The existing surrounding landscape must be described
 - F. Follow standard professional practices to illustrate the proposed change to the visual environment
 - G. The impact area to be analyzed must be based on the relative size and scope of the proposed activity
 - H. Areas of the scenic resource from which the activity will be visible, including representative and worst-case viewpoints, must be identified
 - I. Line-of-sight profiles constitute the simplest acceptable method of illustrating the potential visual impact of the proposed activity from viewpoints within the context of its viewshed
 - J. Photosimulations and computer-generated graphics may be required for activities with more sensitive conditions
 - K. Narratives to describe the significance of any potential impacts
 - L. Level of use and viewer expectations
 - M. Measures taken to avoid and minimize visual impacts
 - N. Design actions taken to mitigate potential adverse visual impacts to scenic resources

8. Mitigation.
 - A. Planning and siting
 - B. Design
 - C. Offsets

9. Determination
 - A. Landscape compatibility
 - B. Scale contrast
 - C. Spatial dominance
 - D. Consider the type, area, and intransience of an activity related to a scenic resource
 - E. Significance of the scenic resource (i.e., national, state, local, or not used)

- F. The degree to which the use or viewer expectations of a scenic resource will be altered, including alteration beyond the physical boundaries of the activity

10. Scenic resources.

- A. National Natural Landmarks and other outstanding natural and cultural features
- B. State or National Wildlife Refuges, Sanctuaries, or Preserves and State Game Refuges
- C. State or federally designated trail
- D. Property on or eligible for inclusion in the National Register of Historic Places
- E. National or State Parks
- F. Public natural resources or public lands visited by the general public, in part for the use, observation, enjoyment and appreciation of natural or cultural visual qualities

The DEM has prepared the *Visual Evaluation Field Survey Checklist* to assist in the evaluation of visual impacts under the NRPA. However, the *Checklist* focuses mainly on the identification of scenic resources and their distance from the project.

3.2 Project Description

The associated facilities evaluated under the Site Law and NRPA include:

- **Collector-Substation.** The system of collector lines terminate at a new substation in T9 R3. The collector substation appears to be located on 4.3 acres in what was an area harvested sometime between 1995 and 2004.
- **North Generator Lead Line.** The North Line is an approximately 26.2 mile long proposed 345 kV generator lead line sited in a 170 foot wide corridor; the cleared width of the corridor will be up to 150 feet. The North Line begins at the turbine area collector substation in T9 R3 and runs south through T8 R3 WELS, TC R2 WELS, Hammond, Littleton, and Houlton, and ends north of Ludlow Road in Houlton. Most of the 219 H-frame structures will be similar to those shown in Figure 5.
- **Bridal Path Generator Lead Line.** The Bridal Path Line is an approximately 25.4 mile long proposed 345 kV generator lead line sited within an existing 225 foot wide transmission line easement; the cleared width of the corridor will be up to 150 feet. The Bridal Path Line runs south from Ludlow Road in Houlton through Hodgdon, Linneus, TA R2 WELS, Forkstown Township, and Haynesville and ends at an Interconnection Switchyard north of Route 2/Military Road in Haynesville. Most of the 205 H-frame structures will be similar to those shown in Figure 5.
- **Haynesville Interconnection Switchyard.** The Interconnection Switchyard is located north of Route 2/Military Road in Haynesville. The collector substation appears to be located on 4.3 acres in what was classified as evergreen forest in 2004. The existing 345 kV line is shown in Figure 5, the Bridal Path Line and new Interconnect Switchyard will be located to the right.



Figure 5. A view from Route 2 of the existing 345 kV transmission line—the proposed Haynesville Interconnection Switchyard would be to the right.

3.3 Study Area

The VIA identified the study area as being within 4 miles of the Number Nine Wind Farm generator lead line, but also indicates that significant visual impacts are unlikely beyond a mile from the Project.

The defined study area is more than adequate for a transmission line, which normally would not have significant visual impacts to views more than one or one and a half miles distant, unless the ROW is viewed from a very elevated position, or the ROW is routed directly up a slope following a viewer's line-of-sight.

3.4 Significant Scenic Resources

The Maine DEP has prepared a *Visual Evaluation Field Survey Checklist* to assist in the evaluation of visual impacts under the NRPA. The Checklist walks the applicant through an inventory of potential scenic resources, and the proximity of the proposed project to them, but not all of the other tasks identified above. The VIA includes a completed *Checklist* and identified the following scenic resources.

- A. National Natural Landmark or other outstanding natural feature.
 - a. There are none.

- B. State or National Wildlife Refuge, Sanctuary, or Preserve or a State Game Refuge.
 - a. **Gordon Manual Wildlife Management Area** (WMA) in Hodgdon is more than one mile from the Project; there will be no visibility.
- C. State or Federal trail
 - a. **Interconnected Trail System** (ITS) 86 in forestland in TC R2 WELS crosses the project.
 - b. **ITS 83** in agricultural fields in Houlton, New Limerick and Linneus crosses the project.
 - c. **International Appalachian Trail** (IAT) on Ludlow Road in front of the Mullen substation.
- D. Public site or structure listed on the National Register of Historic Places
 - a. **Putnam Blackhawk Tavern** is the closest listed historic site at more than 1 mile away; there is no visibility.
- E. National or State Park
 - a. **Nickerson Lake State Park** in Linneus within a quarter mile of the Project; there does not appear to be any visibility.
 - b. **Crescent Park** in New Limerick within a half mile of the Project; there does not appear to be any visibility.
 - c. **DEC boat launch on Nickerson Lake** in Linneus is .4 miles from the Project; there does not appear to be any visibility.
- F.1 Municipal park or public open space
 - a. **Linneus Community Ballfields** on Bangor Road (Route 2A) in Linneus is 0.4 miles from the Project; there does not appear to be any visibility.
 - b. **Riverfront Park** and associated trails in Houlton is a mile from the Project; there does not appear to be any visibility.
 - c. **Nickerson Lake Wilderness Preservation, Inc.** makes 187 acres of land on Nickerson Lake available to the public. It is over 2.0 miles from the Project; there may be view of the Project.
- F.2 Publicly owned land visited, in part, for the use, observation, enjoyment and appreciation of natural or man-made visual qualities
 - a. There are none.
- F.3 Public resource, such as the Atlantic Ocean, a great pond or a navigable river
 - a. **Meduxnekeag River** from Houlton to Maduxnekeag Lake is used for paddling; it is crossed by the Project and there will be views. The Maine Rivers Study ranked it as a C river. It is identified as significant for critical ecological, anadromous fishery, and recreational fishery resource.
 - b. **West Branch of the Maduxnekeag River** from Haynesville to its headwaters is used for paddling; it is crossed by the Project and there will be views. The Maine Rivers Study ranked it as a B river. It is identified as significant for its critical ecological, undeveloped, anadromous fishery, recreational fishery and whitewater resources.
 - c. **East Branch of the Maduxnekeag River** from Haynesville to its headwaters is less used for paddling; it is crossed by the Project and there will be views. The Maine Rivers Study ranked it as a B river. It is identified as significant for its undeveloped, anadromous fishery, recreational fishery and whitewater resources.

- d. **Nickerson Lake** is located as close as 0.2 miles; there will be views of the Project. The Maine Lakes Study identified it as significant for its physical and outstanding for its recreational fishery resources.
- e. **Beaver Brook Lake** is located in Linneus is not rated for scenic qualities in the Maine Lakes Study; there is not visibility of the Project.
- f. Local streams (**B Stream** in Houlton, **Bither Brook** in Linneus, and **Yellow Brook** and **Tenmile Brook** in TA R2 WELS) intersect the Project corridor; there will be visibility.

Chapter 315 requires that “In all visual impact assessments, scenic resources within the viewshed of the proposed activity must be identified.” Additional potential scenic resources that are within the 4 mile study area that are not identified by the VIA *Checklist* include:

A. State or Federal trail

- a. **Houlton to Presque Isle Rail Trail**. The Maine BPL apparently holds title to this multi-use trail. It may be that the International Appalachian Trail follows this same alignment within the study area, however the Rail Trail is a state property and the VIA describes the IAT is a “private enterprise.” At one point it comes within 125 meters of the Project; the visibility analysis suggest there will visibility.

F.2 Publicly owned land visited, in part, for the use, observation, enjoyment and appreciation of natural or man-made visual qualities

- a. **Hammond Lot Public Reserved Land** covers 960 acres. It appears that a corner of the property is crossed by the Project, so there will be some visibility. The Aroostook Hills Region Management Plan indicates that it is managed for timber and wildlife (MDOC BPL 2009).
- b. There are a number of **publicly owned roads** crossed by the Project. The recreation survey conducted in support of the 2015 Maine SCORP found that Driving for Pleasure is the most popular recreational activity for Maine’s general population, with an 86% participation level (Scaccia et al. 2015). While not identified as a scenic resource in the VIA *Checklist*, the only simulation of visual impacts from the generator lead line is from Interstate 95. Other public roads that are crossed by the Project and will therefore **have visibility** include:

- c.
 - i. **Harvey Siding** in T8 R3 WELS
 - ii. **Bubar Road, Burnt Brow Road, B Shore, and Yellow Brick Road** in Hammond
 - iii. **Black Ridge Road, and Front Ridge Road** in Littleton
 - iv. **Gogan Drive, London Lane, B Lane, Ludlow Road, Interstate 95, Smyrna Street, Porter Settlement Road, and Drews Lake Road** in Houlton
 - v. **Burton Road, Linneus Horseback Road, Ruth Road, Mill Road, and Oakfield Road**, in Linneus
 - vi. **Unnamed 3 Road** in TA R2 WELS

- vii. **Unnamed 4 Road, Unnamed 11 Road, Unnamed 8 Road, and Bell Field River Road** in Forkstown Twp
- viii. **Bell Field River Road, Sweden Road, and Babcock Road** in Haynesville

- F.3 Public resource, such as the Atlantic Ocean, a great pond or a navigable river.
- a. **Presque Isle Stream** (grindstone to headwaters) has two branches within 4 miles of the Project; it is unlikely to have visibility of the project. The Maine River Study ranks it as a D river. It identified as having a highly significant recreational fisheries; is also significant for its hydrologic and undeveloped character. It may have visibility.
 - b. **Number Nine Lake** is just beyond 1 mile from the project; it may have views from the northern side. The Maine Wildlands Lake Assessment identified it as significant for recreational fishery resources. It may have visibility.
 - c. **West Lake** is 3.2 to 3.5 miles from the Project and is unlikely to have views. The Maine Wildlands Lake Assessment identified it as significant for recreational fishery resource. It may have visibility.
 - d. **Scott Pond** is 1.6 miles from the Project and may have some visibility. The Maine Wildlands Lake Assessment identified it as significant for wildlife resource. It may have visibility.
 - e. **Long Lake** (west) is 2.5 miles from the Project and is unlikely to have visibility. The Maine Lake Assessment identified it as significant for its physical resource. It may have visibility.
 - f. **Carry Lake** is 1.3 miles from the Project and is unlikely to have visibility. The Maine Lake Assessment identified it as significant for its physical resource. It may have visibility.
 - g. **Deep Lake** (west) is 2.5 miles from the Project and is unlikely to have visibility. The Maine Lake Assessment identified it as significant for its physical resource. It may have visibility.
 - h. **Monson Lake** (west) is 0.3 miles from the Project and is likely to have visibility. The Maine Lake Assessment identified it as significant for its physical resource. It may have visibility.
 - i. **Logan Lake** (west) is 0.5 miles from the Project and is unlikely to have visibility. The Maine Lake Assessment identified it as significant for its recreational fishery resource. It may have visibility.
 - j. **Green Pond** is 1.8 miles from the Project and is unlikely to have visibility. The Maine Lake Assessment identified it as significant for its recreational fishery and wildlife resources. It may have visibility.
 - k. **Glancy Lake** (west) is 3.3 miles from the Project and is unlikely to have visibility. The Maine Lake Assessment identified it as significant for its recreational fishery resource. It may have visibility.
 - l. **Medeuxnekeag Lake** is as close as 3.8 miles from the project, and is unlikely to have visibility of the Project from within the study area. The Maine Lake Assessment identified it as significant for its physical, and outstanding for its fishery and wildlife resources. It may have visibility.
 - m. **Mud Pond** is as close as 1.4 miles from the project, and is unlikely to have visibility of the Project from within the study area. The Maine Lake Assessment

identified it as significant for its recreational fishery, and outstanding for its wildlife resources. It may have visibility.

- n. **Hunter Pond** is 3.1 miles from the Project and is unlikely to have visibility. The Maine Lake Assessment identified it as significant for its recreational fishery and wildlife resources. It may have visibility.
- o. **B Lake, Cameron Bog, Carlisle Pond, Mud Lake, North Pond, Presque Isle Lake, Scitacook Lake, Smith Brook Pond and Tenmile Lake** are all unlikely to have visibility. Neither the Maine Wildlands Lake Assessment nor Maine Lake Assessment found any of their resources significant.

No attempt was made as part of this review to identify additional local scenic resources.

3.5 Visibility Analysis

A visibility analysis of generator lead line structures was not presented as part of the VIA. As commonly calculated, visibility analysis depends on land cover data to approximate the heights for the visual screen (which is a rough approximation at best) and the structures are often close to the height of the surrounding forest or urban land cover. In addition, the standard approach only considers forest screening and not screening from structures or other vegetation. In this situation, the tentative nature of visibility analysis can become a greater problem.

The obvious solution is to use remotely sensed data for the surface elevation of the tree canopy, buildings and other landscape elements. Surface elevation is provided by the first reflective measurement of LiDAR or similar remote sensors. Unfortunately, it does not appear that LiDAR data are available for this area of Maine. However, Intermap Technologies sells NEXTMap, a 5-meter resolution digital terrain model (DTM) and digital surface model (DSM) for Aroostook County. As part of the environmental review of the Northern Pass Transmission Line in New Hampshire, NEXTMap data were used for a visibility analysis of the 184-mile 345 kV transmission line (T. J. Boyle Associates 2015, TJD&A 2015b).

Even if viewshed maps are not created, it is clear that Chapter 315 requires a documented analysis of visibility:

Areas of the scenic resource from which the activity will be visible, including representative and worst-case viewpoints, must be identified. Line-of-sight profiles constitute the simplest acceptable method of illustrating the potential visual impact of the proposed activity from viewpoints within the context of its viewshed.

There are a number of scenic resources identified above. The analysis of the Project's potential visibility from them needs to be documented and clearly presented.

Maps 7 and 8 in Appendix 1 of this review are forested viewshed maps prepared using 2004 Maine Land Cover Data, and 2011 National Land Cover Data. See section 2.4.2 for a discussion of these two datasets. These maps show the number of transmission structures that would be visible over a 40-foot forest cover screen. The maps show the lakes and rivers identified in the State inventories as having some significance, all public roads, and State lands that are within 4 miles of the generator lead line. Any of these landscape features might be considered a scenic

resource by NRPA standards. The scale of visibility is mapped on top of these resources. As is always the case, visibility mapping is primarily important to indicate areas for further investigation. These two viewshed maps do suggest that the structures may be visible from many locations that might be considered scenic resources. This that further investigation and systematic documentation is warranted.

3.6 Visual Simulations

The VIA identifies a number of scenic sites, but did not present a visual simulation from any of them. Instead it presented a simulation of the Project crossing the north bound land of Interstate 95. As noted above, the NRPA definitions for a scenic resource might qualify I-95 as a scenic resource, and it certainly has high public exposure, so in that sense it is a good choice for a simulation. However, there are a number of rivers, roads and lakes that are crossed by the Project and would benefit from a similar analysis. It may be that not every potential view of the generator lead line requires a simulation. However, at a minimum, there should be a table that lists the potentially effected NRPA scenic resources, a key to locate a photograph of a “worst case” view toward the generator lead line in Appendix B, and a description of the surrounding context and potential impact.

The general practice when preparing a VIA for a project of the scope and scale of the Number Nine Wind Farm generator lead line is to identify key observation points (KOPs), typically from sensitive viewpoints, and conduct a detailed analysis of those viewpoints. This would include some sort of visibility analysis, either viewshed maps or a line-of-sight cross-sections to understand potential visibility and screening of the project. It would also include visual simulations for at least representative KOPs, and a discussion of the visual change to each KOP and how it may change experience of the view. This approach was used effectively for the Northern Pass Transmission Project’s Federal environmental impact assessment (T. J. Boyle Associates 2015) and the New Hampshire site development permit (TJD&A 2015b). The Northern Pass is a 184-mile long 345 kV transmission line. These VIAs provide examples of best professional practices for a 345 kV transmission project VIA.

One photosimulation is presented to illustrate the visual change from the Project; a view approaching the Project crossing of Interstate 95 as one drives north. The documentation for this simulation is quite good. It includes a Project study area map, an aerial photograph of the viewpoint and some of the potentially visible structures, a panoramic view of the existing conditions with and without the project, and a “normal” photosimulation of the project. The only potential fault I have is that the Project may have greater visual exposure 400 or 500 feet further north. The VIA indicates that exposure for those driving at the legal speed limit will be “about 24 seconds.” Also, “transmission lines are evident from many other locations along I-95.” Both of these statements seem reasonable.

What is needed is the evaluation of other KOPs. The Northern Pass DEIS VIA included simulations from 67 viewpoints (TJBA 2015), and the application to the NH Siting Board appears to included simulations from 73 viewpoints (TJD&A 2015b). This equates to at least one KOP viewpoint and simulation for every 3 miles. If this standard were applied to the Number Nine generator lead line, at least 17 KOPs would be analyzed. While this number many be higher

than necessary for this Project, it is reasonable to expect more than one simulation from a viewpoint that is not even identified as a scenic resource (though perhaps it should have been).

3.7 Evaluating Scenic Impact

Number Nine's generator lead line is a 52-mile long 345 kV transmission project. By any criteria, this is a big project in the context of northern New England. As such it warrants a through consideration of the potential impact to each of the NRPA scenic resources. Many, but not all of these resources are identified by the *MDEP Visual Evaluation Field Survey Checklist*. In each case a brief description of the resource and the potential for the visual change to impact the experience of users is presented. In no case are photographs, viewsheds or line-of-sight cross sections, or simulations referenced. Perhaps the *MDEP Visual Evaluation Field Survey Checklist* is not the best format to consider the visual impacts of a project with the scope of a 52-mile 345 kV transmission line.

The summary evaluation in the VIA may be overly brief. On page 37, it states:

River Crossings. The line will cross B Stream and the Meduxnekeag River in Houlton and the East and West Branches of the Mattawamkeag River near Haynesville. Project visibility will be limited due to the meandering nature of rivers and streams and the riparian vegetation.

Yet the descriptions of river crossings in the text indicate there will be visual impacts. For instance, on page 29 the crossing of the Meduxnekeag River is described in the *MDEP Visual Evaluation Field Survey Checklist* as: "the corridor will have a moderate to strong visual impact on the 70-foot wide river crossing, but the overall the impact to the river experience will be low to moderate."

On page 30 the description for the West Branch of the Mattawamkeag River states that "the corridor will have a moderate to strong visual impact on the 200-foot wide river crossing, but the overall the impact to the river experience will be low." And for the East Branch of the Mattawamkeag River "the corridor will have a moderate to strong visual impact on the river crossing within this discrete limited area, but overall the impact to the river experience will be low."

On page 31 the crossing of several streams (i.e., B Stream, Bither Brook, Yellow Brook and Tenmile Brook) is characterized as: "There will be a moderate to strong visual impact on the small streams that intersect the corridor...due to the presence of the transmission structures and the cleared transmission corridor."

This summary characterizes these four stream or river crossing as having limited visibility, yet the more detailed descriptions from the *MDEP Visual Evaluation Field Survey Checklist* all characterize the visual impact of the river crossings as moderate to strong. I am not seeing an analysis process that brings us to this conclusion. In particular, I understand the NRPA to require a discussion of mitigation treatments that might help in this regard.

3.8 Adequacy of the VIA under the Site Law and NRPA

The WEA clearly defines the parameters of the VIA for a wind project—a study area of up to 8 miles, SRSNS drawn from designation lists, and a series of relatively well specified evaluation criteria. The Site Law provides little useful guidance for evaluating a project of the scope and scale of a 52-mile 345 kV transmission line structure. The NRPA is substantially better, but with a greater focus on tasks rather than evaluation criteria. Nonetheless, one way to review the adequacy of a VIA prepared for the NRPA is to review the requirements identified in Chapter 315. These requirements were summarized in the introduction to this chapter, and are reorganized for presentation below:

3.8.1 Purpose

- A. Must be prepared by a design professional trained in visual assessment procedures**
- B. Follow standard professional practices to illustrate the proposed change to the visual environment**
- C. Visualize the proposed activity and evaluate potential adverse impacts**

The VIA is prepared by T. J. DeWan and Associates, a landscape architecture office that is well known for the quality of their VIAs. They have helped set the standard for professional work of this type. The essential purpose of a VIA is to (1) visualize the proposed changes and (2) evaluate the potential adverse effects. As described below, a project of the scope and scale of a 52-mile 345 kV transmission line probably warrants both more visualization and more evaluation than is presented here.

3.8.2 Study Area

- D. The impact area to be analyzed must be based on the relative size and scope of the proposed activity**
- E. The existing surrounding landscape must be described**

The VIA “identified all scenic resources within 4 miles of the” Project. The VIA seems to indicate that unreasonably adverse impacts are more likely where the Project is “highly visible from the scenic resources within 1 mile” (page 2). Both of these distances are reasonable in most situations for a 345 kV transmission line using wooden H-frame structures.

3.8.3 Scenic Resources

- F. Scenic resources within the viewshed of the proposed activity must be identified**
 - a. National Natural Landmarks and other outstanding natural and cultural features**
 - b. State or National Wildlife Refuges, Sanctuaries, or Preserves and State Game Refuges**
 - c. State or federally designated trail**
 - d. Property on or eligible for inclusion in the National Register of Historic Places**
 - e. National or State Parks**
 - f. Public natural resources or public lands visited by the general public, in part for the use, observation, enjoyment and appreciation of natural or cultural visual qualities**

G. Level of use and viewer expectations

The WEA refers to specific inventories to identify scenic resources. Chapter 315 has a more open definition. Category “a” includes any “outstanding natural or cultural feature;” “d” includes property eligible (e.g., older than 50 years) for inclusion in the National Register of Historic Places, which could be a large number of places; and “f” includes any public natural resource or land visited “in part for the use, observation, enjoyment and appreciation of natural or cultural visual qualities.” This is a much more expansive definition than the WEA. It includes local and regional resources, as well as the state and national resources to which the WEA is limited. It includes historic resources yet to be evaluated for inclusion on the National Register of Historic Places, as well as those that are on the Register. And it includes public lands visited in part to observe or enjoy natural or cultural visual qualities. This is general enough to include a pickup basketball game in a town park, or wildlife observation at the town dump—both are activities focused on the observation of natural or cultural visual qualities. It would appear that it is primarily engagement in a use that involves “observing natural or cultural visual qualities” that determines a scenic resource, not an independent assessment of scenic quality *per se*.

This review identified a number of NRPA scenic resources that were not identified or considered in the VIA.

A 4-page discussion of the affected populations is presented on pages 31 through 34. This discussion is primarily about viewer expectations and exposure; there is little presented about levels of use.

3.8.4 Visibility

H. Line-of-sight profiles constitute the simplest acceptable method of illustrating the potential visual impact of the proposed activity from viewpoints within the context of its viewshed

There is no visibility analysis presented. Chapter 315 requires at least a line-of-site analysis from areas of potential visibility within each scenic resource. A visibility map can also be presented, such as is included in Appendix 1 of this review, and in the Northern Pass VIAs (TJBA 2015, TJD&A 2015b).

3.8.5 Key Observation Points and Simulation

- I. Areas of the scenic resource from which the activity will be visible, including representative and worst-case viewpoints, must be identified**
- J. Photosimulations and computer-generated graphics may be required for activities with more sensitive conditions**

A potential KOP should be identified for each scenic resource with potential visibility. Simulations should be prepared to represent the range of conditions that different types of users will experience. The I-95 simulation is a small beginning; a project of this scope and scale should have several more KOPs with simulations.

3.8.6 Impact Analysis

- K. Narratives to describe the significance of any potential impacts. This Determination is to include an analysis of:**
 - a. Landscape compatibility**
 - b. Scale contrast**
 - c. Spatial dominance**
- L. Consider the type, area, and intransience of an activity related to a scenic resource**
- M. Significance of the scenic resource (i.e., national, state, local, or not used)**
- N. The degree to which the use or viewer expectations of a scenic resource will be altered, including alteration beyond the physical boundaries of the activity**

Chapter 315 indicates that DEP is to consider these factors in determining the degree of impact. It is reasonable to expect that they would also be considered in the VIA, in order to better inform DEP.

While the VIA presents and follows a procedure of analysis for the Number Nine generating facilities, there is no similar process for the generator lead line. The Project is of sufficient scope and scale that a clear process of analysis should be presented and followed. Again, the Northern Pass VIAs might provide useful models (TJBA 2015, TJD&A 2015b).

3.8.7 Mitigation

- O. Measures taken to avoid and minimize visual impacts**
- P. Design actions taken to mitigate potential adverse visual impacts to scenic resources**
- Q. Determine effective mitigation strategies as part of:**
 - a. Planning and siting**
 - b. Design**
 - c. Offsets**

There is no apparent discussion of mitigation. This is particularly appropriate for a project of this scope and scale, since it is unlikely that all high impact viewpoints can be avoided. Where they exist, such as where the corridor crosses a scenic resource, whatever the significance, some sort of appropriate onsite mitigation treatment should be considered.

3.8.8 Conclusion

The VIA for the Number Nine Wind Farm's generator lead line does not seem to be adequate for a project of the scope and scale of a 52-mile 345 kV transmission line. It appears that there were NRPA scenic resources that were not considered, including scenic resources that were crossed by the Project corridor. A visibility analysis is not presented. KOPs are not identified and documented; additional simulations seem warranted. An analysis procedure is not described and implemented. Mitigation of impacts to scenic resources are not discussed.

4. Summary and Conclusions

This review has evaluated the adequacy of the *Visual Impact Assessment: Number Nine Wind Farm* (TJD&A 2015a). The review simultaneously considers whether there is sufficient evidence presented to support VIA's conclusion that:

- A) The generating facilities and the associated facilities in the turbine area...will not significantly compromise views from any scenic resources of state or national significance or existing users related to scenic character or any scenic resource of state or national significance.
- B) The generator lead line will not have an unreasonable adverse effect on the scenic character or the existing uses related to the scenic character of the scenic resources within the study area (page 38).

The review of the generating and associated facilities under the WEA must be considered separately from the review of the generator lead line under the NRPA and Site Law.

4.1 Adequacy of the VIA under the WEA

The VIA appears to have identified all of the SRSNS within 8 miles of the proposed generating facilities. The potential for visibility from these SRSNS has been appropriately evaluated and visual simulations have been prepared using best professional practices. No adverse visual impacts are identified. This review supports that conclusion.

While it does not affect the conclusions of this review, it is noted that the resolution of the original photography was lower than necessary to full capture the visible detail of a wind project. The camera was capable of taking higher resolution photographs, and the higher resolution setting should have been used.

4.2 Adequacy of the VIA under the Site Law and NRPA

The VIA for the Number Nine Wind Farm's generator lead line does not seem to be adequate for a project of the scope and scale of a 52-mile 345 kV transmission line. It appears that there were NRPA scenic resources that were not considered, including scenic resources that were crossed by the Project corridor. A visibility analysis is not presented. KOPs are not identified and documented; additional simulations seem warranted. An analysis procedure is not described and implemented. Mitigation of impacts to scenic resources are not discussed.

I have little professional experience with the standard for implementing the VIA procedures associated with the Site Law and the NRPA. I have therefore accepted what I have read at face value, and interpreted it as I thought appropriate for a project of the scope and scale of a 52-mile 345 kV transmission line project.

The VIA does not appear to have addressed the VIA requirements identified in Chapter 315. As a result, it appears there is insufficient information to determine whether the impact of the generator lead line is unreasonably adverse or not.

5. References

Expedited Permitting of Grid-Scale Wind Energy Development. MRSA Title 35-A, Chapter 34-A. <http://www.mainelegislature.org/legis/statutes/35-A/title35-Ach34-A.pdf> (accessed February 23, 2010).

Maine Department of Conservation, Bureau of Parks and Lands. 2009. *Aroostook Hills Region Management Plan*.

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CB0QFjAAahUKEwi1pOLktJ3JAhUKox4KHaD9BrE&url=http%3A%2F%2Fwww.maine.gov%2Fdacf%2Fparks%2Fget_involved%2Fplanning_and_acquisition%2Fmanagement_plans%2Fdocs%2FAroostookHillsFinalPlan.pdf&usg=AFQjCNGaxgPFudOXbvDPo71eKpO66bOqcw&sig2=ihqc4huxGCTla9kjjxWDpw

Scaccia, Matt D., Sandra De Urioste-Stone, John Daigle. 2015. *How Well Are We Serving Maine's Outdoor Recreation Public? A Report to the Maine Department of Agriculture, Conservation, and Forestry in Support of the 2015-2020 Maine State Comprehensive Outdoor Recreation Plan (SCORP)*. Orono, ME: University of Maine.

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CBwQFjAAahUKEwj8qOn2tJ3JAhWCIR4KHW_EDNg&url=http%3A%2F%2Fwww.maine.gov%2Fdacf%2Fparks%2Fpublications_maps%2Fdocs%2FFinal%2520Report-%2520How%2520Well%2520are%2520We%2520Serving%2520Maine%27s%2520Outdoor%2520Recreation%2520Public-%2520Scaccia%2C%2520De%2520Urioste-Stone%2C%2520Daigle-%25202015.pdf&usg=AFQjCNHwu4_swUE4r7-yysiZsfWvVhyl8Q&sig2=V9xox9saAo4LRgc7CdA6MQ&bvm=bv.107763241,d.dmo

Terrence J. DeWan and Associates. 2015a. *Visual Impact Assessment: Number Nine Wind Farm, Aroostook County, Maine*. Yarmouth, ME: Terrence J. DeWan and Associates. 120 p.

Terrence J. DeWan and Associates. 2015b. *Northern Pass Transmission LLC Public Service of New Hampshire NH SEC Application for a Certificate for Site and Facility. Volume XV, Appendix 17: Northern Pass Transmission Line Visual Impact Assessment*. Yarmouth, ME: Terrence J. DeWan and Associates.

<http://www.northernpass.us/assets/filings/Volume%20XV/Appendix%2017%20Visual%20Impact%20Assessment.pdf> .

T. J. Boyle Associates. 2015. *Visual Impact Assessment: A Technical Report for the Northern Pass Transmission Line Project Draft Environmental Impact Statement*. Burlington, VT: T. J. Boyle Associates.

<http://www.northernpasseis.us/library/draft-eis/technical-reports#accordioncontent1> .

Appendix 1

Review Maps

Map 1: Terrain Viewshed for Blade Tips

Map 2: Terrain Viewshed for Turbine Hubs

Map 3: Forested (2004) Viewshed for Blade Tips

Map 4: Forested (2004) Viewshed for Turbine Hubs

Map 5: Forested (2011) Viewshed for Blade Tips

Map 6: Forested (2011) Viewshed for Turbine Hubs

Map 7: Forested (2004) Viewshed for Generator Lead Line Structures

Map 8: Forested (2011) Viewshed for Generator Lead Line Structures

Visibility analysis determines whether a line-of-sight exists between two specified points. A geographic information system (GIS) is used to map the viewsheds from which the Number Nine Wind Project's turbines are potentially visible. In principle this is an objective exercise in geometry highly suited to a computer application. In practice however, since the data are only approximations of the actual condition and may include errors and assumptions, the resulting viewshed maps are best considered a preliminary analysis of potential visibility under specified conditions. The maps are useful for providing a preliminary investigation of the overall potential visual impact. If potential visual impacts appear to exist for significant scenic resources, they need to be confirmed through field investigation and other visualization techniques.

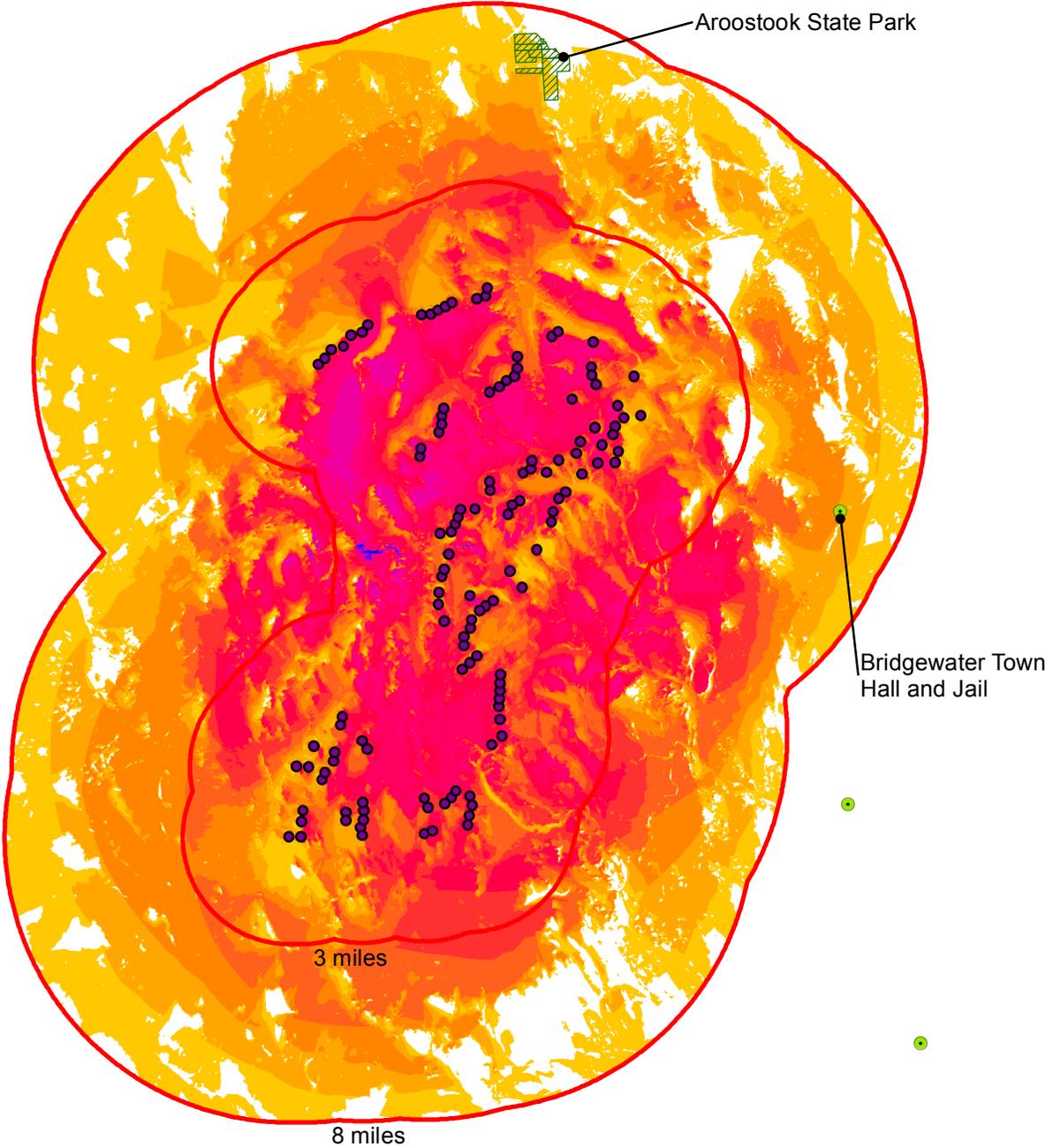
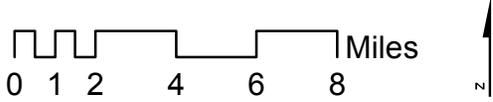
Map 1: Number Nine Wind Terrain Visibility of Blade Tips

Legend

-  State Park
-  Historic Places

Turbines

-  1 - 10
-  11 - 20
-  21 - 30
-  31 - 40
-  41 - 50
-  51 - 60
-  61 - 70
-  71 - 80
-  81 - 90
-  91 - 100
-  101 - 110
-  111 - 120



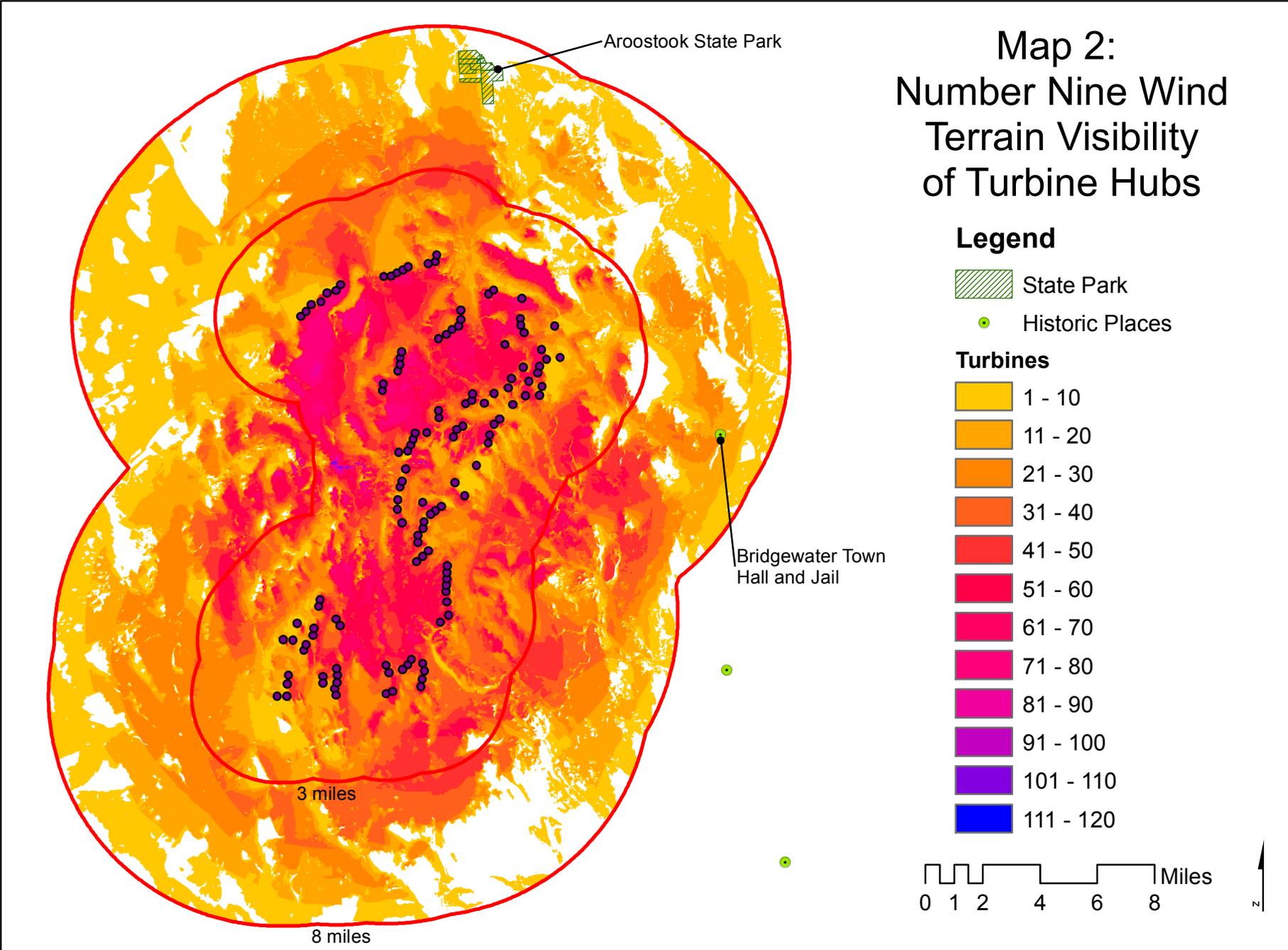
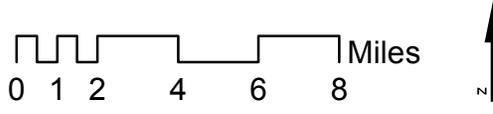
Map 2: Number Nine Wind Terrain Visibility of Turbine Hubs

Legend

-  State Park
-  Historic Places

Turbines

-  1 - 10
-  11 - 20
-  21 - 30
-  31 - 40
-  41 - 50
-  51 - 60
-  61 - 70
-  71 - 80
-  81 - 90
-  91 - 100
-  101 - 110
-  111 - 120



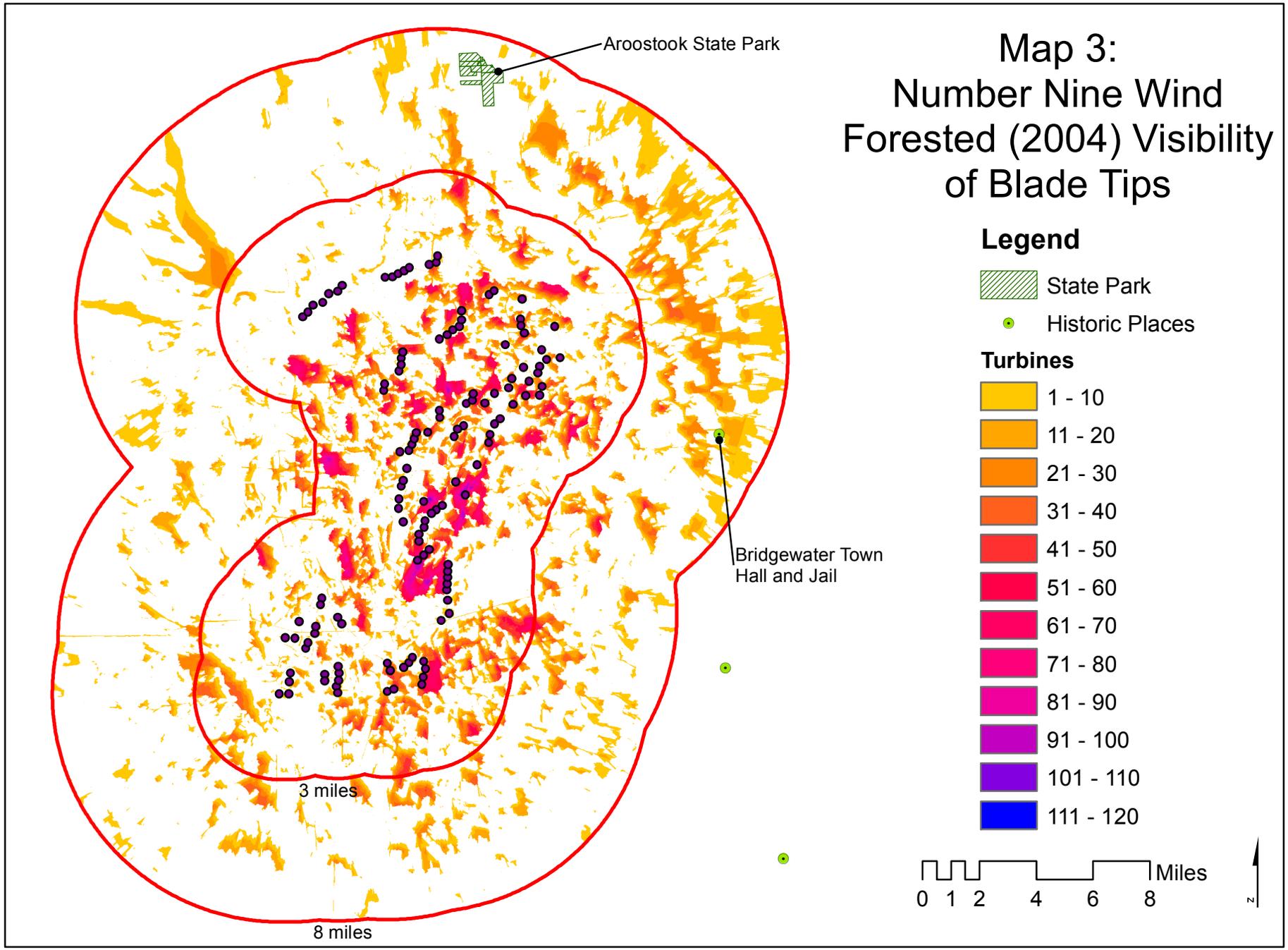
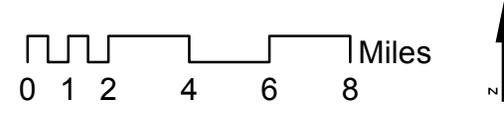
Map 3: Number Nine Wind Forested (2004) Visibility of Blade Tips

Legend

-  State Park
-  Historic Places

Turbines

-  1 - 10
-  11 - 20
-  21 - 30
-  31 - 40
-  41 - 50
-  51 - 60
-  61 - 70
-  71 - 80
-  81 - 90
-  91 - 100
-  101 - 110
-  111 - 120



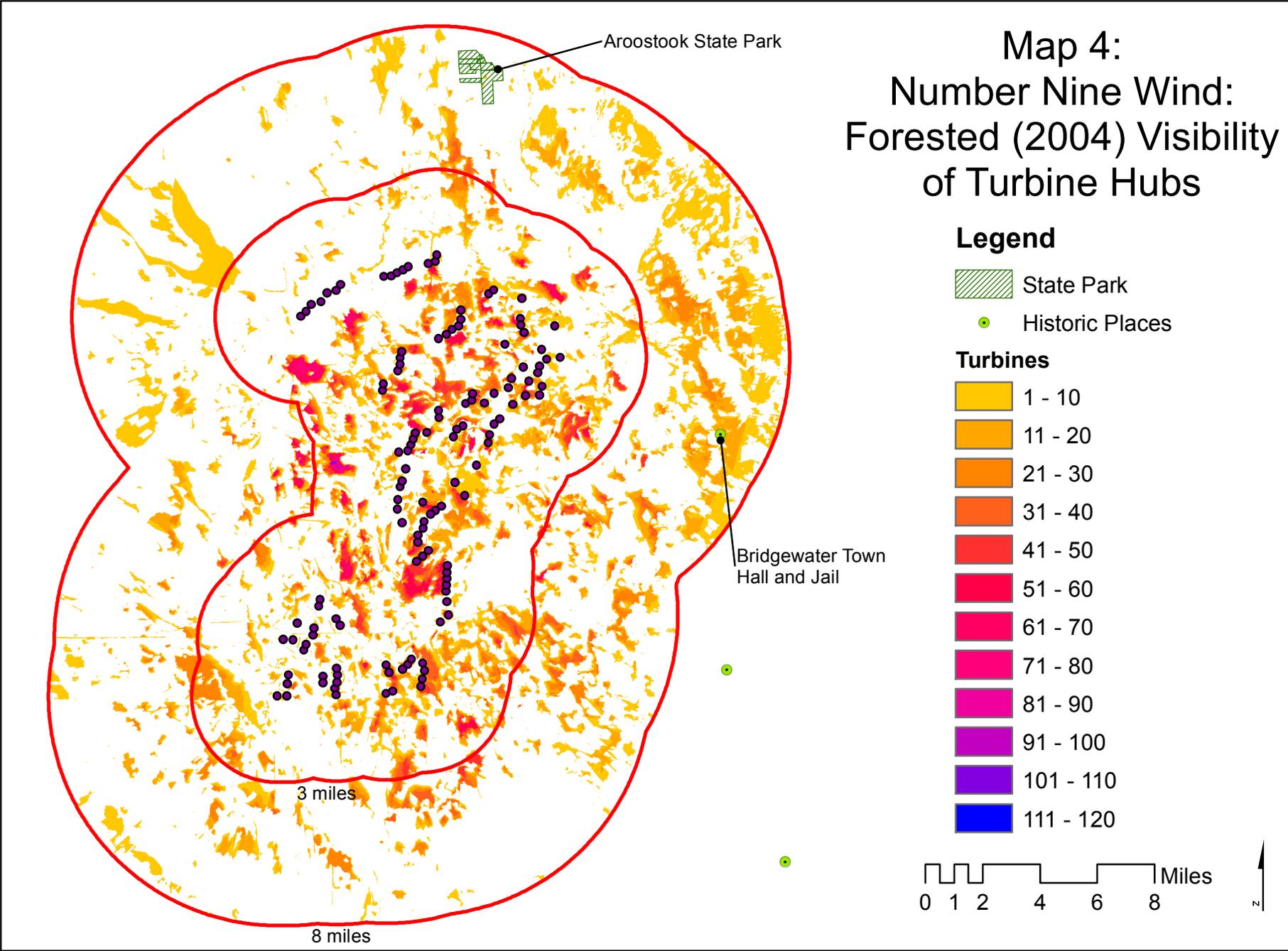
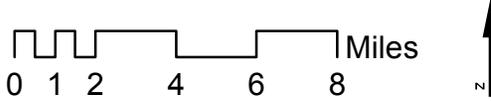
Map 4: Number Nine Wind: Forested (2004) Visibility of Turbine Hubs

Legend

-  State Park
-  Historic Places

Turbines

-  1 - 10
-  11 - 20
-  21 - 30
-  31 - 40
-  41 - 50
-  51 - 60
-  61 - 70
-  71 - 80
-  81 - 90
-  91 - 100
-  101 - 110
-  111 - 120



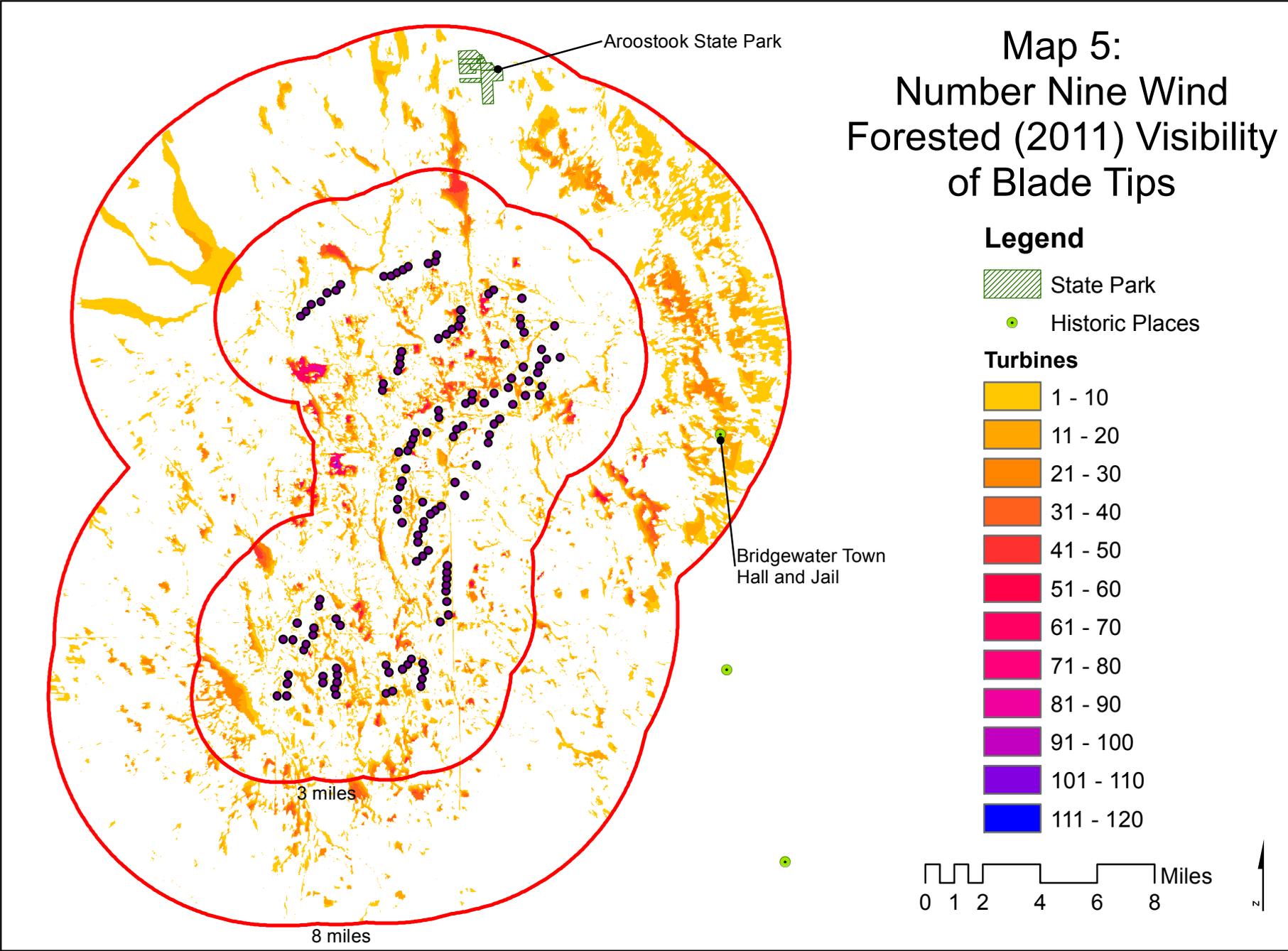
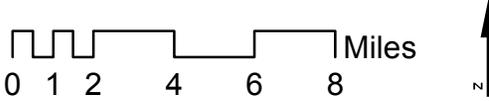
Map 5: Number Nine Wind Forested (2011) Visibility of Blade Tips

Legend

-  State Park
-  Historic Places

Turbines

-  1 - 10
-  11 - 20
-  21 - 30
-  31 - 40
-  41 - 50
-  51 - 60
-  61 - 70
-  71 - 80
-  81 - 90
-  91 - 100
-  101 - 110
-  111 - 120



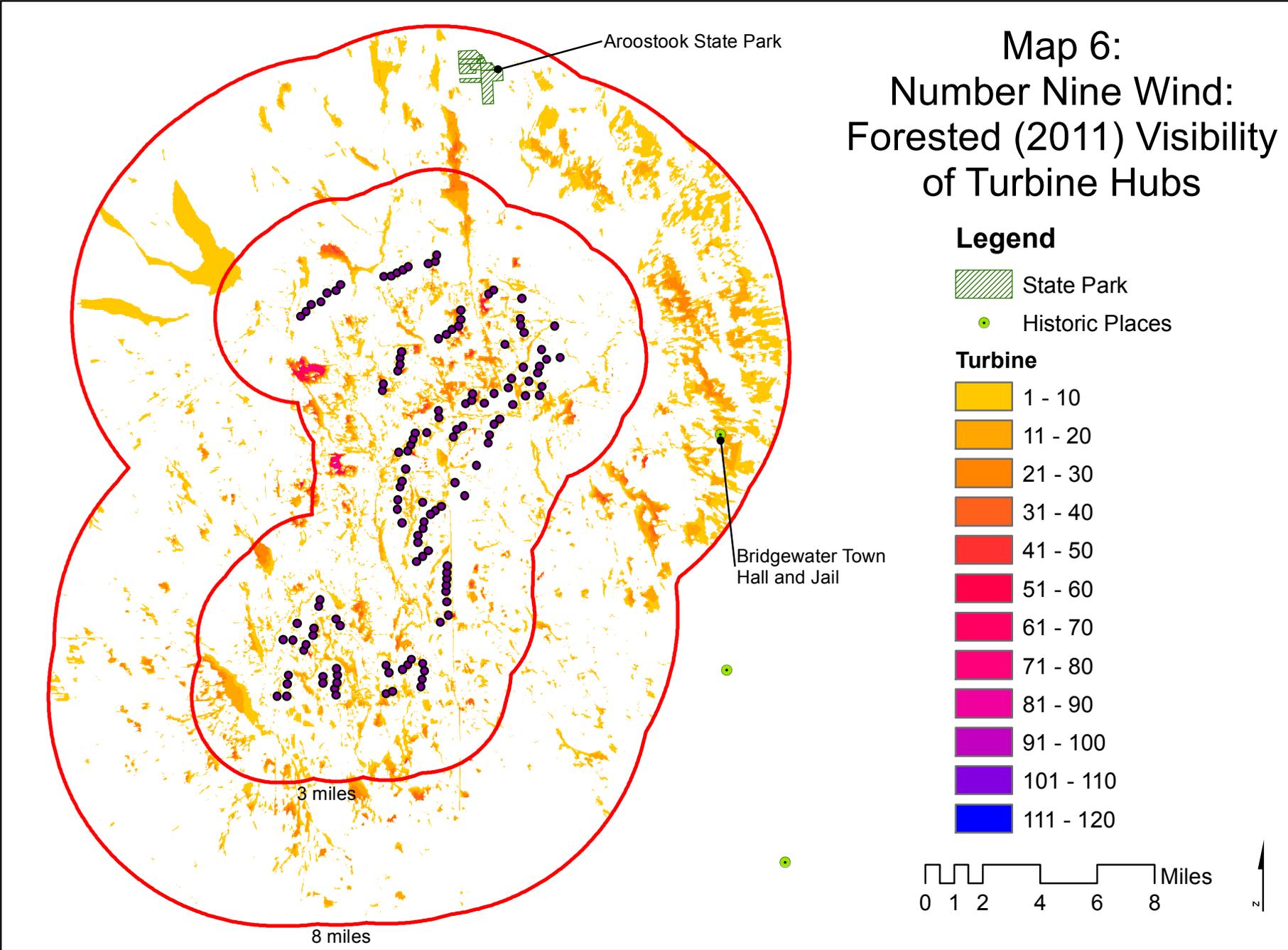
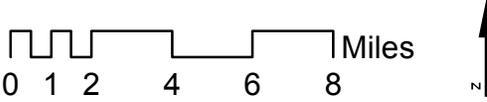
Map 6: Number Nine Wind: Forested (2011) Visibility of Turbine Hubs

Legend

-  State Park
-  Historic Places

Turbine

-  1 - 10
-  11 - 20
-  21 - 30
-  31 - 40
-  41 - 50
-  51 - 60
-  61 - 70
-  71 - 80
-  81 - 90
-  91 - 100
-  101 - 110
-  111 - 120



Map 7: Generator Lead Line: Forested (2004) Visibility of Structures

Legend

— Rivers and Lakes

— Roads

■ State Lands

Structures

■ 1 - 10

■ 11 - 20

■ 21 - 30

■ 31 - 40

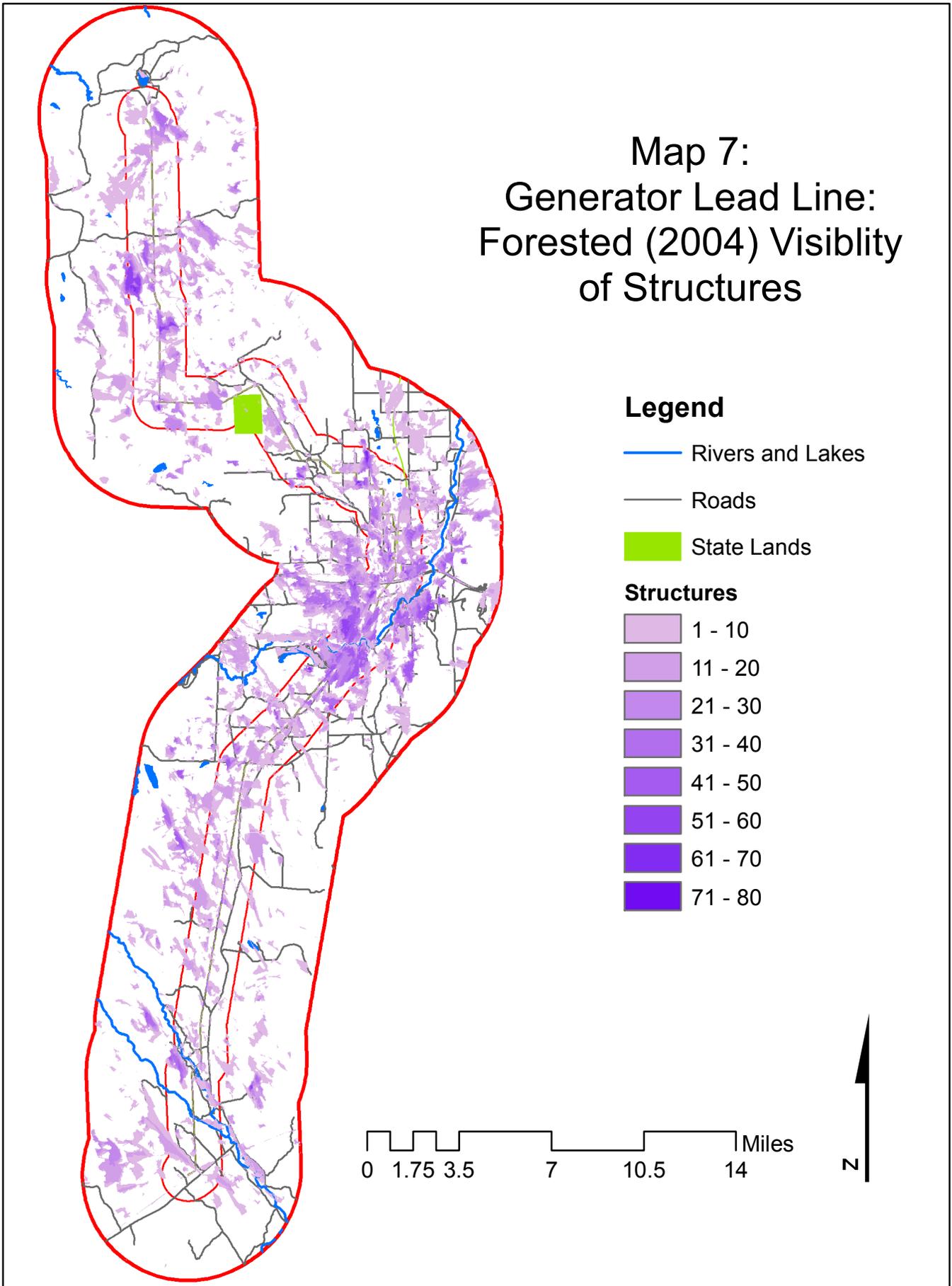
■ 41 - 50

■ 51 - 60

■ 61 - 70

■ 71 - 80

0 1.75 3.5 7 10.5 14 Miles



Map 8: Generator Lead Line: Forested (2011) Visibility of Structures

Legend

— Rivers and Lakes

— Roads

■ State Lands

Structures

■ 1 - 10

■ 11 - 20

■ 21 - 30

■ 31 - 40

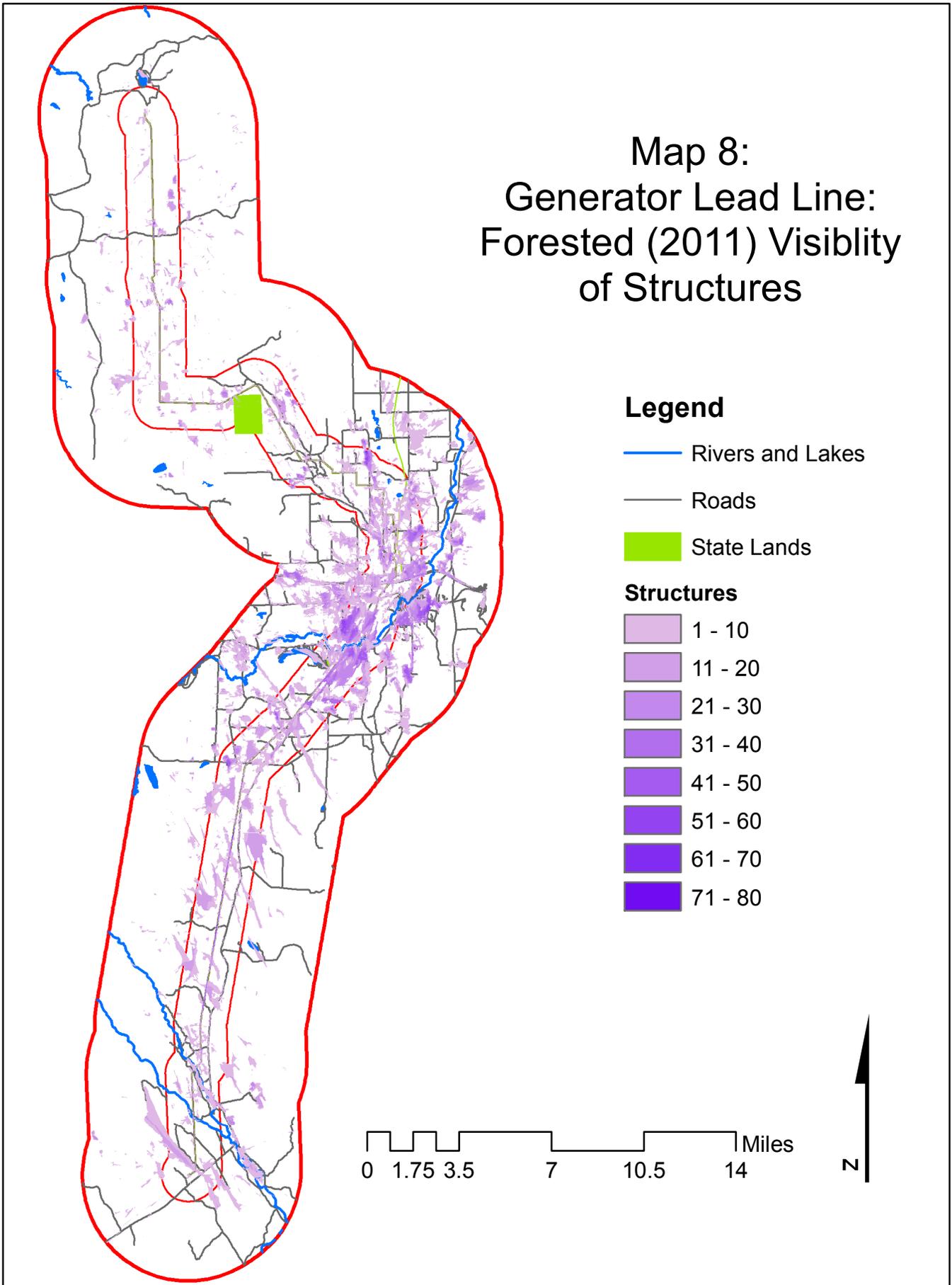
■ 41 - 50

■ 51 - 60

■ 61 - 70

■ 71 - 80

0 1.75 3.5 7 10.5 14 Miles



Appendix 2

ArcScene Visualizations

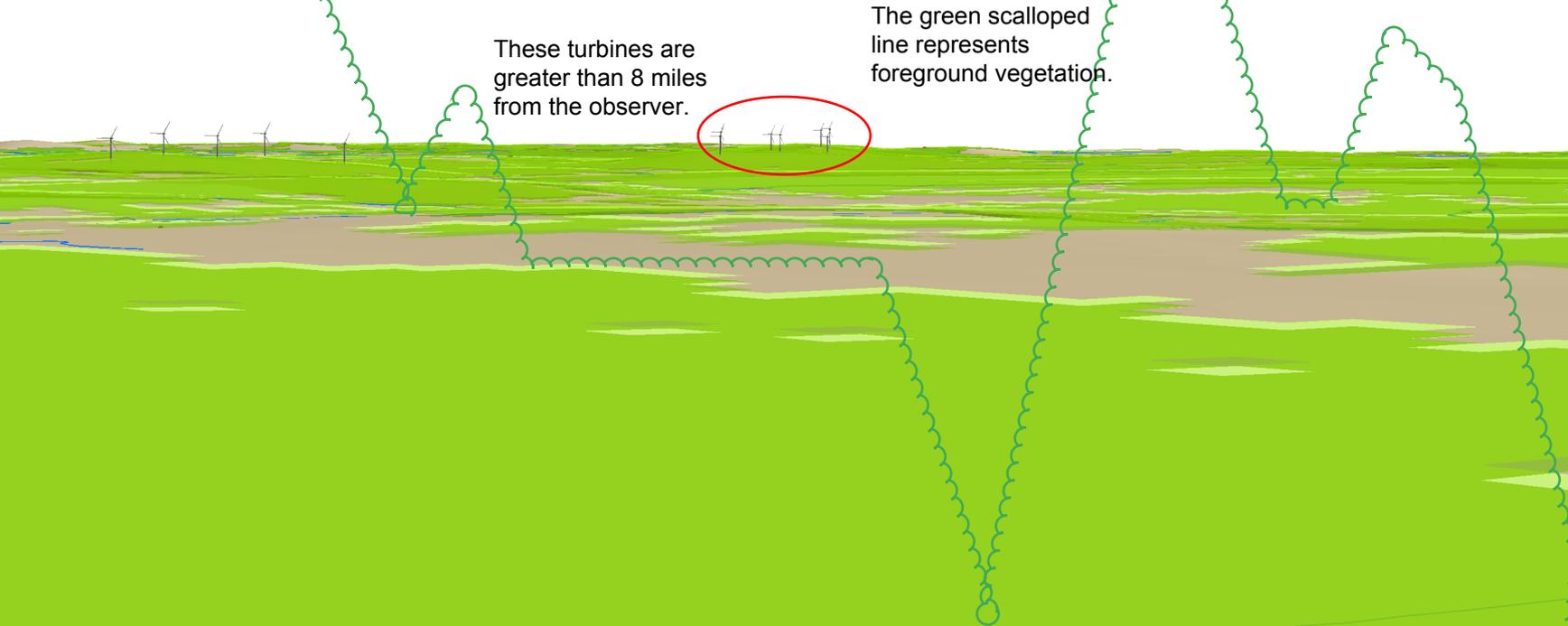
Visualization 1: Aroostook State Park--South Peak

Visualization 2: Bridgewater Town Hall

The purpose of these visualizations is to validate the relative accuracy of the *Visual Impact Assessment: Number Nine Wind Farm* photographic simulations (TJD&A 2015). They are created using the location and camera information from the photograph metadata and GIS database that were used to prepare the Number Nine Wind Farm VIA. Forest cover does not include forested wetlands or areas harvested since 1995. A 12-meter (40-foot) forest canopy is represented in opaque greens. For the Aroostook State Park visualization, there is a second canopy in lighter translucent greens at 18 meters (60 feet). The representation of foreground vegetation may not be accurate. The horizontal angle of view is 40 degrees, which is similar to the VIA photosimulations, and the visualization will be in proper perspective when viewed from a distance approximately 1.2 times its width.

Visualization 1: Aroostook State Park--South Peak

The purpose of this visualization is to validate the relative accuracy of the photosimulation Proposed Conditions A: South Peak (TJD&A 2015). It is created using the location and camera information from the photograph metadata and GIS database that were used to prepare the *Visual Impact Assessment, Number Nine Wind Farm*. Forest cover is set to 60 feet, and does not include forested wet lands or areas harvested since 1995. The representation of foreground vegetation may not be accurate. The horizontal angle of view is 40 degrees, and the visualization will be in proper perspective when viewed from a distance slightly greater than its width.



Visualization 2: Bridgewater Town Hall

The purpose of this visualization is to validate the relative accuracy of the photosimulation Computer Model Overlay: Bridgewater Town Hall (TJD&A 2015). It is created using the location and camera information from the photograph metadata and GIS database that were used to prepare the *Visual Impact Assessment, Number Nine Wind Farm*. Forest cover is set to 40 feet, and does not include forested wet lands or areas harvested since 1995. The vegetation across the street will clearly block any view of the Project turbines. The horizontal angle of view is 40 degrees, and the visualization will be in proper perspective when viewed from a distance slightly greater than its width.

