# Review of the Bingham Wind Project Visual Impact Assessment

# Part 1: Adequacy

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## Table of Contents

# 1. Introduction

On May 10, 2013, Maine's Department of Environmental Protection (DEP) accepted as complete Blue Sky West LLC and Blue Sky West II LLC's permit application for the Bingham Wind Project. This project has a nameplate capacity of 191 megawatts (MW) generated by 62 Vestas V112-3.0 (or the slightly smaller Siemens SWT-3.0-113) wind turbines. The turbines are located in Bingham, Bingham Plantation, Kingsbury Plantation, and Mayfield Township, in Somerset and Piscataquis Counties, Maine and are within the area designated for expedited grid-scale wind development. The visual impact assessment (VIA) was prepared by LandWorks (2013a).

The current document reviews the adequacy of this VIA and presents an independent analysis of the potential scenic impacts that may be caused by the Bingham Wind Project. The analysis may not be as thorough or as a complete as the VIA, due to time and budgetary constraints. Its primary purpose is to assure that the approach used by the VIA responds to the Maine Wind Energy Act's (WEA) Evaluation Criteria in a valid and reliable way, and to demonstrate that such an approach is possible. By valid I mean that the evaluation directly addresses what the WEA criteria require; by reliability I mean that another knowledgeable qualified professional would obtain similar results.

### 1.1 Project Description

The Bingham Wind Project turbines are located on ridges and hills in the vicinity of Route 16, including Johnson Mountain and unnamed hills north and northeast of Johnson Mountain, and an unnamed ridge north of Route 16 in Somerset and Piscataquis Counties, Maine. The project is within the area designated for expedited grid-scale wind development. The generation facilities include:

- **Turbines**. The project includes 62 3.0 MW turbines produce a nameplate capacity of 191 megawatts (MW), though the project application identifies 63 potential turbine sites for approval. For the purposes of analysis, it is assumed that Vestas V112-3.0 wind turbines will be used, though a slightly smaller turbine is also being considered. The height to the hub center is 94 meters (approximately 308 feet), plus 56 meters (approximately 184 feet) for the rotor blades, resulting in a total height of 156 meters (492 feet) to the tip of an upright blade. The turbines will be painted white.
- **Warning lights**. Red warning lights will be installed according to Federal Aviation Administration (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. As well as on meteorological towers. Blue Sky West LLC and Blue Sky West II LLC indicate that they will install radar-assisted warning lights when they are approved for use by FAA. However, FAA has not yet approved such guidelines, and it is not certain that FAA will approve radar-assisted lighting for the Bingham Wind Project.
- **Collector line.** A 34.5 kV collector line will run between turbines. A substantial portion will be buried along project roads. However, approximately 9.75 miles will be above ground, and 3.7 miles of this will run parallel to Route 16. The

Associated facilities include:

- **Roads**. The primary access to the project is from Route 16. One new and four existing roads will be upgraded and widened to 24 feet, with portions widened to 38 feet to accommodate the crane during construction. An additional 17 miles of crane path will be built between turbines. Following construction, approximately a third of the crane path width will be allowed to revegetate naturally.
- **Turbine pads**. It appears that 3.5 acres typically will be 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 just south of Route 16 in Mayfield Township. A buffer of trees will screen views of the building from the road. It will be 5,880 square feet (70-by-84 feet) and painted a neutral color and have a dark roof to minimize color contrast.
- **Meteorological towers**. There will be five permanent 105-meter (344-foot) guyed 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 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 temporary meteorological towers, up to 105 meters (344-foot) in height. These towers will be located on turbine pads and will be removed before the turbines are assembled.
- **Generator lead line and substations**. The project collector lines will terminate at a substation that is located close to project turbines. A 17-mile 115 kV generator lead line connects this substation to an existing Central Maine Power Company substation in Parkman, Maine, near the village of Guilford. The generator lead line extends beyond the normal area of potential effects—8 miles from the generating facilities.

### 1.2 Area of Potential Effects

The WEA requires that "an applicant for an expedited wind energy development shall provide the primary siting authority with a visual impact assessment" (VIA)[1] Impacts are limited to scenic resources of state or national significance (SRSNS).[2] In practice, every VIA has evaluated the potential scenic impacts of "those portions of the development's generating facilities that are located" within 8 miles, measured horizontally from a SRSNS.[3] 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, for every VIA conducted under the WEA the study area boundary or area of potential effects (APE) has been set to 8 miles from the generating facilities.

However, there are important subtleties to the WEA's establishment of the 8-mile limit to potentially significant scenic effects. First, only generating facilities within 8 miles of a viewer can be considered and toward the edge of the APE boundary it is possible that some project

[1] 35-A MRSA, § 3452, §§ 4
[2] 35-A MRSA, § 3451, §§ 9
[3] 35-A MRSA, § 3452, §§ 4
[4] 35-A MRSA, § 3452, §§ 3

turbines are potentially visible but beyond the 8 mile threshold. Second, the APE is based on the distance from generating facilities; it makes no mention of associated facilities. It is assumed that associated facilities within the 8-mile APE are evaluated using the WEA criteria. When associated facilities fall beyond the 8-mile APE it may be appropriate for the primary siting authority to require that they be evaluated using the traditional Site Law and NRPA procedures.[5]

## 2. Adequacy of the Report

There is a standard process that is followed by all VIAs, which includes: (1) project description, (2) landscape character, (3) visibility analysis, (4) significant scenic resources, (5) public use and expectations, and (6) evaluation of potential impacts. This section reviews what the *Visual Impact Assessment for the Proposed Bingham Wind Project* by LandWorks (2013a) reported for each portion of the standard VIA process. This will include the survey of recreation users on Wyman Lake and Bald Mountain Pond that was conducted on six days between September 1st and 25th, 2012 (Kleinschmidt 2013a). In addition, the geographic information system (GIS) data used for the VIA were reviewed and additional analysis conducted. In particular, a standard visibility analysis was performed using ArcMap software, and the visual simulations were compared to a three-dimensional ArcScene model to determine representational accuracy.

### 2.1 Project Description

The basic visual characteristics of the project's elements and their locations are described (LandWorks 2013a, pages 12-14). Data locating these elements were provided upon request, including the extent of clearing and location of the generator lead line utility poles. Perhaps the most important shortcoming is the lack of an explicit description of the extent of clearing and earth grading required, and whether any new slopes will be visible from SRSNS or other areas beyond the project site. It appears that all disturbed areas will be allowed to naturally revegetate, but there is no assessment about how rapidly an area loses its high contrast appearance.

### 2.2 Landscape Character

The VIA names the towns within 8 miles of the turbines, provides their population density, identifies the three state highways, and recognizes the area as part of the Central Mountains biophysical region (LandWorks 2013a, pages 14-18). A number of minor conservation areas are identified within 8 miles of the project turbines. The area is characterized as "privately owned and has been heavily harvested" (LandWorks 2013a, p. 15). The recreation activities on the Kennebec River and its impounded portion, Wyman Lake, are described. The area is identified as "well known for its all-terrain vehicle and snowmobile trails" (LandWorks 2013a, p. 16). The Appalachian National Scenic Trail is identified as an "amenity for hikers" (LandWorks 2013a, p. 17). A diagram shows snowmobile and ATV trails superimposed over a shaded relief map, and an aerial photo shows that the area is indeed an active working forest. The VIA also describes

[5] 35-A MRSA, § 3452, §§ 2 states: "The primary siting authority shall evaluate the effect of associated facilities of a wind energy development in terms of potential effects on scenic character and existing uses related to scenic character in accordance with Title 12, section 685-B, subsection 4, paragraph C or Title 38, section 484, subsection 3, in the manner provided for development other than wind energy development, if the primary siting authority determines that application of the standard in subsection 1 to the development may result in unreasonable adverse effects due to the scope, scale, location or other characteristics of the associated facilities."

each of the SRSNS (p. 21-40), however these descriptions are also less about visual character and more about their factual record.

Landscape character is central to understanding the positive attributes that create an area's sense of place and contribute to its scenic quality. LandWorks references scenery management concepts such as scenic integrity (p. 85) and visual absorption capability (p. 91) that are based on a thorough documentation of landscape character. In both cases, LandWorks cites *Landscape Aesthetics: A Handbook for Scenery Management* as the authoritative reference. This is what *Landscape Aesthetics* has to say about describing a landscape character (USFS 1995, p. 1.3):

> A description of landscape character normally will include:
> - How the landscape has developed over time using information from archeologists, historians, ecologists, and others familiar with the landscape being studied.
> - Potential landscape character ... i.e. information from potential vegetation inventories.
> - The existing landscape attributes such as landform, vegetative pattern, water characteristics, and cultural features.
> - Existing landscape attributes which affect the senses of the aesthetic experience other than sight i.e.: sound, smell, taste, touch include:
> - Habitat of native wildlife that has particularly colorful sounds
> - Native vegetation that has a uniquely fragrant spring flower
> - Mix of vegetative species that have both course and fine textures adding a tactile dimension
> - Vegetative species that add both sound and sight (i.e., quaking aspens)
>
> The purposes of existing landscape character descriptions are:
> - to establish the current overall visual impression of a landscape, the physical appearance of the landscape that contributes to an identity and a "sense of place."
> - to provide a reference from which to compare existing landscape character to desired landscape character.
> - to provide a reference for changes in landscape character as the landscape progressed toward the character goal.
> - to establish a baseline from which to measure scenic integrity.

The VIA fails to discuss landscape character in a manner and depth that makes it useful when conducting a VIA. Without this foundation it is not possible to provide an analysis of potential scenic impacts. In fairness to LandWorks, the description of landscape character has been weak in all of the wind energy VIAs. However LandWorks' insistence on the importance of qualitative data and analysis necessitates the type of thorough descriptive documentation described in *Landscape Aesthetics*. Without this foundation, the qualitative analysis becomes unsupported opinion.

**2.3 Significant Scenic Resources**

The VIA identifies all of the scenic resources of state or national significance (SRSNS) within 8 miles of the proposed wind turbines (LandWorks 2013a, p. 21-40). The SRSNS include four sites on the National Register of Historic Places (NRHP), three great ponds with outstanding scenic quality, scenic segments of two rivers, a scenic turnout on a scenic highway, and a

designated scenic trail that is also a Unit of the National Park Service. These SRSNS identified by LandWorks are listed in Table 1, along with the distance to the nearest visible turbine and the number of turbines visible within 8 miles. This determination was based on visibility analysis of the turbine hub over terrain and a 40-foot forest canopy and agrees with the same analysis conducted for this review.

The WEA requires that a SRSNS be owned by the public, or be a place "to which the public has a legal right of access."[6] Of the 14 SRSNS identified by LandWorks within 8 miles of the generating facilities, Concord Haven appears to be the only private property without some sort of right public of access and would not qualify as a SRSNS.

The Arnold Trail to Quebec presents a further difficulty. The National Register of Historic Places nomination form identifies the location of the Arnold Trail with a large four-sided polygon without locating the route or other boundaries. Within the 8-mile APE, the Arnold Trail followed the Kennebec River (including part of what is now Wyman Lake), to which the public has access. The party made camp near the river on sites that may not provide public access. In addition, it appears that a small portion of the river lies to the east of this quadrilateral. Since the NRHP nomination form also makes clear that one present use is as a "combined historic trail and public highway scenic turnouts and interpretive sites along the road" (Holmstrom 1969), it is clear that the nomination anticipated designation of an area larger than the narrow path followed by Arnold's party, and included some other publicly accessible areas. For technical reasons that are unclear to me, it appears that the boundaries of sites placed on the NRHP in its early years are not easily adjusted. In response to this problem, the Maine Historic Preservation Commission prepared an American Battlefield Protection Program (ABPP), Associated Historic Property Form (Cranmer and Spiess 2001). The attached continuation sheets provide a clear description of the existing physical and cultural landscape, known and potential historic resources, the overall condition of the resource setting, threats to the site's historic integrity, and a rationale for a property boundary. However, the ABPP form is not recognized by the WEA as designating or describing a SRSNS.

**Table 1. Summary of Scenic Resources of State and National Significance within 8 Miles of the Generating Facilities as Identified by LandWorks†**

| Scenic Resources of State or National Significance in the Surrounding Area | Nearest Visible Turbine (miles)[1] | Number of Turbines Visible w/in 8 miles[1] |
|---|---|---|
| **Historic Sites** | | |
| Arnold Trail to Quebec | 3.9 | 10 |
| Bingham Free Meetinghouse | N/A | 0 |
| Caratunk Falls Archaeological District | N/A | 0 |
| Concord Haven | N/A | 0 |
| **National or State Park** | | |
| Appalachian National Scenic Trail | N/A | 0 |
| **Great Ponds** | | |
| Bald Mountain Pond | 6.8 | 3 |
| Jackson Pond | N/A | 0 |
| Punchbowl Pond | 4.2 | 8 |

[6] 35-A MRSA, § 3451, §§ 9

| Scenic Resources of State or National Significance in the Surrounding Area | Nearest Visible Turbine (miles)[1] | Number of Turbines Visible w/in 8 miles[1] |
|---|---|---|
| **Segment of a Scenic River** | | |
| Kennebec River -Augusta to the Forks (downstream of Wyman Dam) | 3.9 | 10 |
| Kennebec River - Augusta to the Forks (Wyman Lake) | 5.6 | 12 |
| Piscataquis River – Howland to West Branch | N/A | 0 |
| East Branch Piscataquis River | N/A | 0 |
| West Branch Piscataquis River | N/A | 0 |
| **Public Reserved Lands or Pedestrian Trail** | | |
| Appalachian National Scenic Trail | N/A | 0 |
| **Scenic Turnout on a Scenic Highway** | | |
| Old Canada Road Scenic Byway (Route 201) Turnout | N/A | 0 |

† Source: LandWorks (2013a, p. 20-21)
[1] "Based on visibility within 8-miles from the hub and accounting for topography and 40-foot vegetation. Data for Punchbowl Pond is from a modified viewshed, which accounts for shoreline vegetation." (LandWorks 2013a, p. 21).

The VIA states that "none of the [associated] facilities are located within 3-miles of…scenic resources of state or national significance" (LandWorks 2013a, p. 105). Strictly speaking, this may be true. The generator lead line extends approximately 3.75 miles beyond the 8-mile APE for the generating facilities. The WEA specifies that scenic impacts only be evaluated for SRSNS within 8 miles of the generating facilities. It therefore would seem that scenic impacts of this stretch of generator lead line will not be evaluated, even though within 3 miles of the line there is a designated scenic river segment, a scenic lake, and five historic sites on the National Register of Historic Places.

- Picataquis River—Howland to West Branch
- Sebac Lake
- H. Hudson Law Office
- Straw House
- Guilford Memorial Library
- Robert Carleton House
- Sangerville Town Hall

The historic sites are also not considered in the archeological and historic section of the application because the closest one is just beyond the half-mile threshold. It would seem reasonable that in the future DEP should invoke the "exception for certain associated facilities"[7] so that potential scenic impacts of associated facilities outside the 8-mile APE will be evaluated.

### 2.4 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

[7] 35-A MRSA, § 3452, §§ 2

blade tips and turbine hubs (LandWorks 2013a, Exhibits 1 through 4). On these maps, the number of visible turbines is shown in eight groups of eight turbines (i.e., 1-8, 9-16, 17-24, 25-32, 33-40, 41-48, 49-56, and 57-63 visible turbines). The VIA also includes a maps of potential visibility over forest cover for the generator lead and electric collector lines, the substations, the O&M building, the permanent meteorological towers, the FAA aviation warning lights (LandWorks 2013a, Exhibits 7 through 4).

These analyses were conducted using ArcMap GIS software and elevation data from the National Elevation Dataset (NED) at a 1/3 arc-second resolution (approximately 10 meters)[8] (LandWorks 2013a, p. 6).

The visibility maps that take into account the screening effect of forest trees used Maine Land Cover Data (MELCD) (LandWorks 2013a, p. 7). In this case, 40 feet are added to the following land cover classes: (9) deciduous forest, (10) evergreen forest, (11) mixed forest. These cover types are dominated by trees that are at least 5 meters (16 feet) high. Assigning a height of 40 feet to the forest canopy in all likelihood will overestimate visibility, since fieldwork for nearby wind development found that tree-tops around the SRSNS often measured 65 feet high.[9] This conservative approach has become accepted practice because it is less likely to indicate that there will be no visibility, but when a project is built it is discovered visibility exists.

LandWorks' "viewshed maps also include visibility of any turbine, including those located greater than eight miles, as a conservative measure and to ensure that readers are not mislead. Although the presence of turbines located more than eight miles is deemed insignificant under Maine law, this approach is consistent with more typical viewshed analyses, which identify the visibility of all turbines from within an 8-mile radius, or area of potential effect, regardless of individual distance. Consistent with the comments by the Department's outside visual reviewer, the resource specific discussions provide the viewshed analysis based on visibility only of those turbines located within eight miles" (LandWorks 2013a, p. 8). DEP is prohibited by the WEA from considering the effect of turbines greater than 8 miles from the observer. By conducting an analysis and presenting the resultant maps using one set of parameters (i.e., visibility of nay turbine), but discussing the results of a different analysis using a different set of parameters (i.e., turbines within 8 miles of the observer), LandWorks makes it awkward for DEP and others to critically consider their presentation. The WEA is clear and there is no excuse for refusing to conduct and present the analysis it requires.

A second subtlety of LandWorks' discussion is that "the numbers of turbines visible and percent of visibility represented in this analysis are taken from viewsheds generated from the hub" (LandWorks 2013a, p. 8). I concur with LandWorks' (2013a, p. 7) observation that "view of a hub and rotor has a greater impact than turbine blades." However, that does not seem to be to be sufficient reason in and of itself to exclude any discussion of blade tip visibility. If it is as LandWorks states, that "the difference in overall percent of visibility between hub and tip of the blade is usually insignificant," then why not just report the full potential visibility represented by blade tips (LandWorks 2013a, p. 7)?

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[8] http://nationalmap.gov/elevation.html#data

[9] Punchbowl Pond visibility is based on a modified viewshed, which accounts for shoreline vegetation (LandWorks 2013a, p. 2 and 7).

The visibility maps prepared for this review and those prepared by LandWorks appear to have used the same elevation and land cover data. However, there are likely slight difference in how the data were handled and the analysis conducted. As mentioned, the most important difference is that LandWorks' visibility analysis includes turbines that are further than 8 miles from the observer—the threshold for potentially significant impacts established by the WEA.

For an unexplained reason, the viewshed results provided for this review were converted from the native raster format to a polygon. In order to compare the two viewshed analyses, it was necessary to reverse this conversion. Once the analyses are in the same format, LandWorks' result was subtracted from the visibility maps portrayed in Appendix A of this review. The results are shown in Table 2.

The correspondence between the maps portraying the visibility of blade tips over bare terrain is rather poor, being in agreement only 34 percent of the time. The visibility over forest cover is identical for 78 percent of the blade tip and 83 percent of the turbine hub visibility maps. For all three analyses, the primary source of agreement is for those areas with no visibility. By including turbines that are further than 8 miles from the observer, LandWorks estimates that more turbines will be visible, though the area of visibility is very similar.

**Table 2. Comparison of the Visibility Maps by LandWorks and Scenic Quality Consultants.**

| | Percent | | |
|---|---|---|---|
| **Difference in visibility** | **Tip over Terrain** | **Tip over Forest** | **Hub over Forest** |
| 10-63 more turbines visible in LW | 27.8 | 6.6 | 5.4 |
| 7-9 | 4.7 | 1.5 | 1.4 |
| 4-6 | 6.0 | 2.2 | 2.3 |
| 1-3 | 9.7 | 4.7 | 5.8 |
| LW & SCQ have the same result | 34.4 | 78.4 | 83.3 |
| 1-3 | 15.3 | 6.0 | 1.3 |
| 4-6 | 1.0 | 0.4 | 0.2 |
| 7-9 | 0.5 | 0.2 | 0.1 |
| 10-63 more turbines visible in SQC | 0.6 | 0.2 | 0.1 |

## 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.[10] The eye chart is composed of letters that subtend 5-minutes of arc in overall size, with

[10] 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

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 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 1 illustrates the importance of pixel resolution in representing visual information.

**Figure 1. The effect of higher pixel density for capturing image detail.**

**2.5.2 Bingham Wind Project simulations.** Visual simulations were prepared for scenic resources that appeared to have potential visibility. During its fieldwork, LandWorks took photographs from a number of viewpoints at each SRSNS where they anticipate visibility based on the visibility maps and local field conditions, evidence of public use and accessibility. I did not see a clear explanation of how the viewpoints used for the visual simulations were select, but there seems to be an effort to balance the number of potentially visible turbines with the number of potential viewers (LandWorks 2013a, p. 10).

Visual simulations are a primary tool to investigate the impact to significant scenic resources. LandWorks prepared four photosimulations as part of their VIA. Two different cameras were used, a Canon 350D (Digital Rebel XT) capable of capturing an image that is 3,456-by-2,304 pixels (8.3 million effective pixels), and a Canon 500D (Digital Rebel T1i) capable of capturing 4,752-by-3,168 pixels (15.1 million effective pixels). A 35 mm prime lens with a 35.2° horizontal angle of view[11] was used with the Rebel XT, while a zoom lens was used with the Rebel T1i. The focal lengths used are close to the convention for a "normal" lens. Basic

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Baskahegan Lake boat launch under good viewing condition, which suggests that it may be appropriate to have even higher resolution than discussed here.

[11] Calculated using the lens angle calculator at: http://www.isotton.com/misc/lens-angle-calculator/.

information about the photographs used for the simulations and their appropriate viewing distance is presented in Table 3. Two of the images have 2.1 pixels per minute, which is adequate, and two have 1.6 pixels per minute, which may be marginally adequate.

**Table 3. Apparent Resolution of Original Simulation Imagery**

| Simulation | Camera | Focal Length | Lens Equivalent | Horizontal Angle | Horizontal Pixels | Pixels per Minute |
|---|---|---|---|---|---|---|
| 1. Bald Mountain Pond | Canon 500D | 33 mm | 54.5 mm | 37.2° | 4752 | 2.1 |
| 2. Wyman Lake | Canon 500D | 34 mm | 55.1 mm | 36.2° | 4752 | 2.1 |
| 3. Kennebec River | Canon 350D | 35 mm | 56.8 mm | 35.2° | 3456 | 1.6 |
| 4. Punchbowl Pond † | Canon 350D | | | | | |

† The Punchbowl photos were not provided with the review data, so these values could not be verified.

The simulations are not composed of a single frame, but are somehow stitched together to form a composite image that is cropped at the top and bottom. The width of the simulation can be directly measured, and by carefully comparing the simulation image to the original photographs it is possible to estimate the simulation's horizontal angle of view. This information can be used to calculate the simulation's available dots-per-inch (dpi) when it is printed at its intended width of 15.75 inches, as described in Table 3. Similarly, the number of pixels per minute can also be calculated. The results are summarized in Table 4.

**Table 4. Apparent Resolution of the Finished Simulation**

| Simulation | Width (inches) | Width (pixels) | Available dpi | Est. Horiz-onta Angle | Pixels per Minute |
|---|---|---|---|---|---|
| 1. Bald Mountain Pond | 15.75 | 4,327 | 274.7 | 46.3° | 1.6 |
| 2. Wyman Lake | 15.75 | 4,325 | 274.6 | 44.7° | 1.6 |
| 3. Kennebec River | 15.75 | 4,734 | 300.6 | 45.0° | 1.8 |
| 4. Punchbowl Pond † | 15.75 | 4,734 | | | |

† The Punchbowl photos were not provided with the review data, so these values could not be verified.

The Canon 500D (Digital Rebel T1i) paired with a 35mm lens provides adequate resolution, while the Canon 350D (Digital Rebel XT) paired with a similar lens provides marginal resolution for the visual simulations. However, the visual editing that accompanied the creation of the simulation images resulted in lower resolution for the two images taken with the Canon 500D. In contrast, the images taken with the Canon 350D were resampled to have more pixels per minute than the original photography provides. This is a slight of hand, since one cannot add additional resolution when it is not present in the original photograph.

The simulations have a horizontal angle near 45-degrees, which is close to the "normal" horizontal angle of 40-degrees and certainly is not "panoramic," as suggested by the VIA (LandWorks 2013a, p. 9). The simulation images have been cropped at the top and bottom, which has the effect of giving the image an aspect ratio that one might expect from a panoramic

photograph, but they are not.[12] It seems to me that this sort of digital reformatting is not providing useful information, and may confuse viewers by giving them a mistaken impression.

When the simulations are printed on 11-by-17 inch paper, they are 15.75 inches wide. At this width, there are either 275 or 300 pixels per inch. If the color printer properties are set to at least 600 dpi, then all of the information in the simulations should be adequately represented.

**2.5.3 Representativeness of the photographs**. The photographs LandWorks uses for the visual simulations do not represent the "worst case" viewing conditions. The Bald Mountain Pond and Wyman Lake photos are generally hazy and the visual contrast of the turbines appears to have been reduced to imitate this condition. The photograph from Punchbowl Pond was taken into the sun and it's western half is over exposed; this photograph should have been taken in the morning or at mid-day. However, the turbines do not appear to be visible from this location so it more a problem of acceptable practice. The Kennebec River photograph is clearer and was taken at a time when the turbines are front lit to contrast with the blue sky. LandWorks acknowledges that: "The weather and atmospheric conditions presented in the visual simulations depict a range of conditions experienced during our site visits. Due to the highly variable and changing weather of the northeast, not all photos depict sunny, blue-sky conditions. However, the visual simulations depict a range of weather and light conditions that are typical of the area" (LandWorks 2013a, p. 10-11).

This raises the question of representativeness of the photographs used for the visual simulations. If only a single simulation is used to represent a SRSNS, should it represent very good viewing conditions, or is it adequate to use a hazy or poorly exposed photograph and justify it as representing the "range of weather and light conditions that are typical of the area." This reviewer believes that every SRSNS with potential views of generating or associated facilities must be represented with a photosimulation representing the "worst case" conditions, not typical conditions or some lesser standard. If the "worst case" condition is not described in the analysis and portrayed by a photosimulations, then how will the primary siting authority be able to determine "whether the development significantly compromises views from a scenic resource of state or national significance such that the development has an unreasonable adverse effect on the scenic character or existing uses related to scenic character of the scenic resource of state or national significance."[13] The applicant may present evidence that the "worst case" condition is not typical and present photosimulations of other visual conditions, but the "worst case" simulation always must be presented—to do less than this is to withhold information from the permitting agency about possibly unreasonably adverse scenic impacts.

The "worst case" is when the visual condition are very high quality and the turbines will present a high visual contrast. These are what might be referred to as "picture perfect" conditions when the experience of scenery is most memorable. Normally this would be when humidity (i.e., haze) is low, and there is front light on the turbines with a bright blue sky background, or back lit

[12] A "normal" photograph has an aspect ratio of approximately 1:1.5. The Wikipedia entry on panoramic photography indicates that panoramas typically have aspect rations of between 2:1 and 4:1 (http://en.wikipedia.org/wiki/Panoramic_photography); the Bingham simulations have an aspect ratio of approximately 2.3:1.

[13] 35-A MRSA, § 3452, §§ 1

turbines (i.e., dark) with a bright white cloud background. If the photograph must be taken into the sun, then it is advisable to move to a shaded viewpoint or use a polarizing filter. I accept that the realities of fieldwork may make this difficult, so it may be necessary to digitally adjust the photograph to enhance the contrast. These adjustments must be explained and documented. If this is unacceptable to the applicant, then they need to wait until they can photograph high quality viewing conditions.

**2.5.4 Photosimulation Verification**. The VIA presents simulations that appears to cover a horizontal viewing angle of approximately 45-degrees (LandWorks 2013a, Exhibits 12 and 19). ArcScene software is used to create visualizations to independently validate the relative accuracy of the VIA photosimulations (Appendix 2 of this review).

These visualizations use the viewpoint location and eye-level elevation listed on the photosimulations. The horizontal angle of view is set to 45-degrees. Deciduous, evergreen and mixed forest cover is represented by two canopy layers, one represented by opaque darker greens set at 12 meters (40 feet), and another by translucent lighter greens set at 18 meters (60 feet). Light partial cuts and forested wetlands are represented in purple. A red dot is placed above the nacelle of those turbines that have been identified as having FAA aviation warning lighting. All turbines that are visible are displayed, even if they are beyond 8 miles from the observer.

**Bald Mountain Pond**. The photosimulation shows blades above the hub will be visible for three turbines at a distance greater than 7 miles. The turbine on the left is marked for a FAA warning light.[14]

The visualization verifies this accuracy of the photosimulation—the blades above the hub for two turbines are clearly visible, and the tips of one to four turbines may also be visible. The three partially visible blade tips on the left in the visualization are screened by shoreline vegetation in the photosimulation. This screening by shoreline vegetation appears to be accurate.

**Wyman Lake**. The photosimulation shows visible hubs and blades for eight turbines at a distance greater than 6.5 miles. Counting from the left, the photosimulation indicates that the first, second, sixth and seventh turbines will have FAA warning lights.

The visualization verifies the accuracy of the photosimulation—the same eight turbines are visible from their hubs and above. The three turbines on the right side of the visualization will be screened by foreground vegetation that is apparent in the photosimulation and represented by a translucent green scalloped polygon in the visualization. The turbines identified as having FAA lights are different—left to right they are the first, third, fifth and seventh turbines.

**Kennebec River**. The photosimulation shows several visible turbines visible from a distance greater than 6 miles—two include the full sweep of the blades, two from the hub and above, and blade tips for six more. From the right, the first and fourth turbine will be lit with FAA lights.

[14] The VIA states that "turbines 1, 4, 6, 7alt, 9, 11, 12, 15, 16, 18, 20, 21, 24, 25, 27, 29, 32, 35, 38, 41, 42, 44, 45, 47, 49, 51, 53, 55, 58, 73, 75, and 77 will have red aviation warning lights that will be lit at night" (LandWorks 2013a, p. 13).

The sixth turbine is also indicated as having FAA lighting, but it may be screened by trees at the horizon.

The visualization shows the same turbines with the same amount of exposure. The FAA warning lights have the same exposure as shown in the photosimulation. The photosimulation is verified as accurate.

**Punchbowl Pond**. The photosimulation shows only the tips of four turbine blades being visible between the tops of shoreline trees at distances greater than 4.25 miles. The blade tips do not rise above the tops of the tallest shoreline trees. While two turbines will have FAA warning lights, they will be screened by the trees.

LandWorks notes that the land cover along the far shore of Punchbowl Pond is classified as a (24) Light Partial Cut, which was conducted after 1995. A light partial cut retains at least a 50 percent canopy coverage. In addition, Maine forestry regulations require a forest buffer along the shore. LandWorks (2013a, p. 7) measured the heights of shoreline trees to be approximately 65 feet and has taken this into account in their analysis.

The visualization suggests that the blade tips of three turbines may be visible over the tops of the shoreline vegetation. The viewpoint is on land under an evergreen canopy—the green areas at the top of the visualization represent this canopy at a height of 40 and 60 feet. The Light Partial Cut areas are shown in purple with a nominal canopy of 65 feet (higher than in the other visualizations, but approximating what LandWorks observed in the field). Even so the visualization shows that blade tips should be visible above the tops of 65-foot trees on the opposite shore.

The difference between photosimulation and visualization is subtle and turns on the height of the solid canopy and tree tops of the shoreline vegetation. The visualizations are less accurate where foreground vegetation is the determining factor. It may be that the photosimulation shows slightly less visibility than will occur, but it is also possible that the visualization is overstating the amount of visibility. In either case, turbine visibility will be limited.

**Conclusion**. The approach used to validate the photosimulations is particularly effective for evaluating the proper location of the turbines (and possibly other elements), as well as their relative scope and scale in the landscape. Overall, the photosimulations appear to be accurate representations of the future visual condition if the Bingham Wind Project is constructed.

**2.5.5 Viewing Distance**. Simulations are intended to be viewed at a specific distance to place the image in proper perspective so that the image accurately represents the visual magnitude of the wind turbines. A procedure to calculate viewing distance is described by Sheppard (1989, page 185) based on the horizontal angle imaged by the digital camera's lens and sensor and the width of the printed simulation. The Bingham simulations all state that the proper viewing distance is 19 inches.

Calculating viewing distance is not a straightforward exercise for these simulations, since they are composed of multiple photographs that have been stitched together, cropped and resized (see

section 2.5.2 Bingham Wind Project simulations). Therefore, it was necessary to estimate the width of a single frame within the photosimulation. A single photograph can be located in the Wyman Lake and Kennebec River photosimulations. However, none of the Bald Mountain Pond photographs lie totally within the simulation, so the width of a single frame had to be estimated. The Punchbowl Pond photographs were not included with the review data, so its photosimulation could not be verified. Viewing distance was calculated for these simulations, as shown in Table 3, and the results verify that the proper viewing distance is approximately 19 inches.

**Table 5. Establishing Viewing Distance for the VIA Photosimulations Simulation**

| Simulation | Horizontal Angle | Printed Width* | Viewing Distance§ |
|---|---|---|---|
| 1. Bald Mountain Pond | 37.2° | 13.125 | 19.5 |
| 2. Wyman Lake | 36.2° | 12.375 | 18.9 |
| 3. Kennebec River | 35.2° | 11.75 | 18.5 |
| 4. Punchbowl Pond † | 35.2° | 11.75 | 18.5 |

* Simulation is a multi-frame panorama, the viewing distance is based on the estimated single frame portion (LandWorks 2013a).
§ Viewing distance is calculated using the method described by Sheppard (1989, page 185).
† The Punchbowl photos were not provided with the review data, so these values could not be verified.

## 2.6 Evaluating Scenic Impact for SRSNS with Potential Visibility

**Evaluation approach**. As LandWorks and others involved in evaluating scenic impacts as specified by the WEA recognize, "the criteria listed in the Act are very broad and do not clearly dictate how they should be interpreted, nor does the Act specify how they should be presented or the specific tools or definitions that must be used to understand the evaluation criteria" (LandWorks 2013a, p. 40). In an effort to begin to rectify this problem, the review of the Bower Wind Project VIA introduced an "approach to evaluating scenic impacts based on applying indicators and thresholds appropriate to each of the Evaluation Criteria" (Palmer 2013, p. 11). As described in that review:

> The use of indicators is becoming common for all types of assessment, from learning outcomes and public health, to investment portfolios and environmental impacts. This approach can also be applied to landscape character and scenic impact assessment (Tveit et al. 2006; Ode et al. 2008). If one were to adopt their Framework, the Concept being evaluated is Scenic Impact, and the Dimensions are analogous to the Evaluation Criteria. Attributes and Indicators appropriate to the WEA Evaluation Criteria need to be identified (Tveit et al. 2006, p. 233). Finally, to be relevant to the WEA, Indicator Thresholds need to be identified that help determine when scenic impacts are Not Adverse, Adverse or Unreasonably Adverse.[15] The objective is to identify Indicators and Thresholds that are directly relevant to the statutory Evaluation Criteria and that can be applied reliably (independent objective measurement by competent experts produce similar results). This is a major shift from reliance on professional judgment, where the developer's expert supports a project and the opponent's expert condemns the project (Palmer 2013, p. 11).

[15] 35-A MRSA, § 3452, sub-§1

In response to this, "LandWorks has therefore outlined the methods and indicators that were used in this analysis to evaluate the criteria's effect on scenic impact. This approach reflects an evolving methodology and effort to develop objective standards and metrics. The indicators, taken collectively, help determine each criterion's contribution to or potential effect on scenic impact" (LandWorks 2013a, p. 40-41). LandWorks seems to accept the desirability of indicators to be based on "reliable, quantitative data" (LandWorks 2013a, p. 59). However quantitative data are not always available, therefore qualitative data or professional judgment must be used (LandWorks 2013a, p. 53, 59, 60, 66 and 77).

The following review will consider each of the Indicators proposed by LandWorks and comment on their apparent validity (i.e., relevance to the criterion) and reliability (i.e., given the same conditions and assessment procedures, different trained professionals would arrive at the same result).

**Intercept survey.** It has become accepted practice for wind energy developers to conduct an intercept survey in support of the VIA. An intercept survey is particularly relevant to evaluating Criterion C: Typical Viewer Expectations, Criterion E.1: Extent, Nature and Duration of the Public Use, and Criterion E.2: Effect on Continued Use and Enjoyment. In the field of recreation research, using best professional practices for conducting intercept surveys has been found to provide generally reliable results.

An intercept survey was conducted by Kleinschmidt (2013) to investigate the potential effect of the Bingham Wind Project on SRSNS users. The survey was conducted at two SRSNS, Bald Mountain Pond and Wyman Lake. In both cases the survey location was a boat launch that served as a primary access point to the water for boaters and others. At Wyman Lake the boat launch was also near the photosimulation viewpoint. Based on the information provided, it appears that commonly accepted professional practices were followed in conducting the interviews.

The survey was conducted for half a day at each site on September 1, 2, 8, 15, 21 and 25, 2012, which included the Labor Day Weekend. One adult from each group of individuals was randomly identified to be interviewed. In all, 76 people were observed. Of these 27 were approached and 23 were interviewed, 7 at Bald Mountain Pond and 16 at Wyman Lake, for a response rate of 88 percent of possible respondents. However, it is recognized that this is too few responses to calculate statistics with any reasonable level of confidence (LandWorks 2013a, p. 71).

Kleinschmidt (2013, p. 8) reference a study conducted for FPL Energy, the owner and operator of the Wyman Hydroelectric Project, that estimated "recreation use for 2008 … to be approximately 77,000 recreation days, and nighttime use was estimated to be 4,300 recreation days." Table 6 summarizes the estimated use of Wyman Lake in 2008. One could reasonably expect hundreds of users each day, and over 500 on the Labor Day weekend, yet Kleinschmidt (2013, p. 14) observed a high of 13 people at Wyman Lake on Saturday. I do not have an answer to why so few people were encountered during the survey, but there should be no problem obtaining responses from 50 or more people given the apparent level of use.

**Table 6. Estimated 2008 Recreation Use for Wyman Lake by Season**

| Season † | Percent Total Use | Number User Days | Users per Day |
|---|---|---|---|
| Summer (July—September) | 62 | 47,740 | 525 |
| Fall (October—December) | 13 | 10,010 | 110 |
| Winter (January—March) | 6 | 4,620 | 51 |
| Spring (April—June) | 19 | 14,630 | 161 |

† Months in each season as defined by the Wyman monitoring report (TRC Engineering, 2009).

Another possible short coming of the intercept survey is that it was conducted only in September. Therefore, it may or may not provide information that describes users and their experiences throughout the year.

### 2.6.1 Criterion A: Significance of the SRSNS

LandWorks does not provide an explanation of what they believe Criterion A: Significance of the SRSNS means or how it applies to conducting a VIA. The inclusion of the levels of significance used by the WEA to identify STSNS seems obvious, but what purpose do other indicators serve?

LandWorks proposes three indicators for this criterion: (1) Documentation used to designate the SRSNS, (2) Reason for visit, and (3) Uniqueness (LandWorks 2013a, p. 41-47).

**Documentation**. The WEA identifies the documentation for identifying SRSNS. It seems inappropriate to refer to other sources that do not directly contribute to the designation. For instance, LURC's Comprehensive Land Use Plan is not used by WEA to identify scenic lakes; it is not relevant to this indicator. On the other hand, it seems appropriate to reference the *Scenic Lakes Character Evaluation in Maine's Unorganized Towns* (Jones 1986) because it is the basis for the scenic ratings in the *Maine Wildlands Lake Assessment* (Giffen et al. 1987).

The ponds in the study area, Bald Mountain Pond and Punchbowl Pond are among the highest rated ponds in the state. This supports LandWorks' rating of High for Documentation.

The final lists of A, B, C and D rivers in the *Maine Rivers Study* is also irrelevant. These lists are based on all of a river's resource qualities, not just scenic. The WEA is clear that the designation comes from Appendix G of the *Maine Rivers Study* (Maine DOC 1982), not the river ranking lists. This information is also shown in the "Scenic" column of the river ranking lists. Similar to the *Wildlands Lakes Assessment*, two evaluation levels are used–Unique and Significant. Only the Kennebec River, Machias River, West Branch of the Penobscot River, West Branch of the Pleasant River, and Sheepscot River are identified as having "Unique" scenic value, which is the highest level of significance. The section of the Kennebec River, including Wyman Lake are part of 5 rivers identified as having "Unique" scenic value out of 102 rivers that were evaluated. This would seem to recommend both the Kennebec River and Wyman Lake has having a High rating for Documentation.

The difficulty with all the sites listed in the National Register of Historic Places (NRHP) is that they are based on historical significance, which often has little to do with landscape scenic value. The relevant documentation for Arnold Trail to Quebec is the NRHP nomination form, which certifies it as having State-level significance. This suggests a Medium rating for Documentation.

To rate importance of scenic value to a historic site's significance, one must read the nomination form for indications of the importance of how the landscape appears. Portions of the text that describe the visual character of the resource include:

> Much of the countryside through which the army passed looks much as it looked in the fall of 1775. … Above Binghamton the agricultural section ends, the land gets more hilly and rocky, and the forest closes in. Virtually no virgin timber remains along the trail from Bingham to the Canadian border, but the entire region does give the appearance of a vast, hostile wilderness, as it did in 1775.
>
> The rivers have been altered more than anything since 1775. …above Augusta, the Kennebec has an entirely different aspect than it did in 1775. Dams have been constructed at 10-15 mile intervals up the river, giving the stream a rather placid appearance, far different from the quick flowing shallow and treacherous Kennebec that the bateaux men knew (Holmstrom 1969).

This description from the official document that led to the designation of this SRSNS indicates that the surrounding landscape was judged to have retained a sufficiently similar visual character that one could still imagine "the appearance of a vast, hostile wilderness." However, it also acknowledges that the visible character of the river has changed.

However, I do appreciate that the Maine Historic Preservation Commission would like to revise the NRHP designation, but has been unable to for technical reasons. Instead they addressed this problem through the American Battlefield Protection Program (ABPP), which is separate from the NRHP designation recognized by the WEA. In this situation, it may be appropriate to consider the ABPP nomination form.

It may be that an indicator that considers other evaluation studies, guide books, or postings on the internet could provide information relevant to determining Significance of the SRSNS. However, it seems inappropriate to mix these sources of various unknown quality and applicability with the sources specified by the WEA.

**Reason for visit**. LandWorks (2013a, p. 44) proposes that "this indicator considers whether the resource is being visited for its scenic qualities. Typically, a resource that experiences high use due primarily to its exceptional or one-of-a kind scenic feature(s) indicates a higher value or contribution to scenic significance." I believe that this indicator is more appropriately placed with Criterion E.1: Extent, Nature and Duration of Use; no support is given why the reason for a visit is an indicator of Criterion A: Significance of the Resource.

LandWorks does not suggest a procedure to measure this indicator. The obvious way is to ask people the reason for their visit as part of the intercept survey, but no use is made of this resource. For instance the intercept survey reports that enjoying the scenery was the primary recreation activity for 19% of those interviewed at Wyman Lake (Kleinschmidt 2013a, p. 16) and that "recreation use for 2008 was reported to be approximately 77,000 recreation days," up from 69,000 in 2002 (Kleinschmidt 2013a, p. 8). This suggests that as many as 14,630 people use Wyman Lake primarily to view scenery. Since no thresholds are given, it is not known whether this indicates that Wyman Lake a highly significant SRSNS or not.

**Uniqueness**. LandWorks (2013a, p. 45) proposes as an indicator that "the unique, distinctive or exceptional character of the scenic resource as it exists today – is the resource typical of the region, or does it have special, memorable qualities unlike any other in the area? This indicator considers the physical character of the resource (i.e. landform, vegetation, shoreline configuration, and other special features)." From this description one gathers that uniqueness is an attribute of physical character. The *Maine Wildlands Lake Assessment* (Giffen et al. 1987) and *Maine Rivers Study* (MDOC 1982) are examples where physical character indicators were measured and thresholds applied to determine levels of significance. While LandWorks describes three levels of Uniqueness, it does not present a procedure to measure this indicator.

Since the "physical character of the resource (i.e. landform, vegetation, shoreline configuration, and other special features)" is precisely what was considered in determining the significance of lakes and rivers, this indicator seems redundant with the first indicator, which was based on documentation such as the *Maine Wildlands Lake Assessment* (Giffen et al. 1987) and *Maine Rivers Study* (MDOC 1982).

**Summary**. The documentation appears to support assigning Bald Mountain Pond, Punchbowl Pond, the Kennebec River, and Wyman Lake ratings of High for Documentation; the Arnold Trail would be rated as Medium. LandWorks seems to ignore what is actually listed in the documentation that the WEA requires be the basis for identifying SRSNS, and proposes that the ratings be substantially lower.

No systematic procedure is presented for determining Reason for Visit and Uniqueness, allowing LandWorks simply present unsupported assertions in place of analysis. Even though the intercept survey does provide some data concerning Reason for Visit, it is not used. It is also unclear why Uniqueness needs to be considered here, since one could argue that it is already covered by any scenic analysis in documentation.

### 2.6.2 Criterion B: Existing Character of the Surrounding Area.

LandWorks does not provide an explanation of what they believe Criterion B: Existing Character of the Surrounding Area means or how it applies to conducting a VIA.

LandWorks proposes two indicators for this criterion: (1) Intactness and (2) Remoteness.

**Intactness**. LandWorks (2013a, p. 50) proposes that "The extent to which the existing landscape is free from non-typical visual intrusions. The more man-made elements and by-products of human culture that are present in the landscape, the lower the scenic quality and the lower the sensitivity to change." While LandWorks describes three levels of Intactness, it does not present a procedure to measure this indicator; nor does it cite sources that describe such a procedure. When queried whether they conducted an analysis to determine Intactness, LandWorks (2013b) replied that "We based our assessment of scenic integrity or intactness on visual observations of the landscape, not on a data or map based form of analysis."

It is difficult to know how to apply this indicator to SRSNS. It appears that "man-made elements and by-products of human culture" lower Intactness; yet some SRSNS are so designated because

they are important cultural element (e.g., Bingham Free Meeting House). In addition, the existing character of this area is, and has been for a long time, a working landscape. Its visual character is predicated upon the presence of human activities, such as forest and water management, which result in a natural-appearing but productive landscape. It is disingenuous to imply that the baseline landscape character for this area should be "pristine," otherwise it is not intact (LandWorks 2013a, p. 3, 50).

The US Forest Service incorporates intactness and scenic integrity into the scenery management of all National Forest lands (USDA Forest Service 1994, p. 2.6). The White Mountain National Forest is the only National Forest in Maine. The first scenery management guideline in the Forest Plan reads:

> In evaluating cumulative effects for viewed landscapes from established concern level 1,[16] open, higher elevation viewpoints affording expansive or large scale views, no more than 9 percent of the acreage within the view should be treated with regeneration vegetation management activities within a 30 year period. Total area affected during any one entry period with new regeneration treatment should not exceed 4 percent of the acreage. Assessment may need to be made from multiple viewpoints (that view a common land base). The assessment will apply to each view separately (USDA Forest Service 2005).

So even in national forests, there is the expectation that some harvesting activity may be visible from even the most important viewpoints, such as from the Appalachian Trail. It is recognized and accepted that some level of appropriately implemented harvesting activity is compatible with a natural-appearing landscape. LandWorks does not seem to recognize this.

LandWorks appears to interpret Criterion B: Existing Character of the Surrounding Area to require ratings of the specific SRSNS. If this is so, based on how the US Forest Service appears to implement the concepts of scenic integrity and intactness, I believe that LandWorks inappropriately rated all of the SRSNS.

Wyman Lake is describes as "not an intact landscape given that it is a man-made lake." The presence (not the visibility) of the dam, residences along the shore, and the highway are indications that "the natural landscape of the area around the lake has been noticeably altered. Therefore, the rating for this resource is Low" (LandWorks 0213, p. 50). However, it has been shown that in the US Forest Service procedure, scenic integrity and intactness are based on the qualities of the view, not the presence of human structures. Wyman Lake may be experienced as a natural-appearing lake, even though it is man-made. While there may be residences along the lake, Maine's shoreline vegetation standards may provide an adequate screen so that they are not apparent to users of the SRSNS. Similarly, people may find that the road is simply passing through this natural-appearing landscape, and not a disruptive part of it. When asked to rate a photograph of the existing conditions seen from the boat launch, 27 percent of the respondents to the intercept survey gave it the highest scenic rating, and another 47 percent rated it as more than typically scenic (Kleinschmidt 2013a, p. 20). This seems quite high if intactness is Low as

[16] "Concern levels are a measure of the degree of public importance placed on landscapes viewed from travelways and use areas" (USDA Forest Service 1994, p. 4.8). The most important is concern level 1, which includes the Appalachian Trail through the White Mountains National Forest (USDA Forest Service 2005, p. 3.52).

asserted by LandWorks. If the focus is whether views from Wyman Lake generally represent an intact natural-appearing landscape to users of the SRSNS, I would expect them to indicate that might be rated Moderate or even Moderate-High.

"The Kennebec River in the Project area is not at all intact" because of the "two hydropower complexes, transmission and road corridors… and it is far removed from being in an unaltered, natural state. Therefore, the rating for this resource is Low" (LandWorks 2013, p. 50). There is no question that the dam and associated power generating facilities are visible from a portion of the Kennebec River and that this warrants assigning a Low rating for the area from which the dam is visible. However, the dam is not visible from most of the river. LandWorks describes the Kennebec River this way:

> The stretch of river that meanders southerly downstream of the dam is generally wooded with a gently to steeply sloping shoreline. The river is bordered by both Route 201 to the east and Route 16 to the west, and stretches of the road can be seen and heard at times. Development is denser and readily apparent near Wyman Dam and south until about a mile downstream of the bridge located near the downtown of Bingham, where development becomes spotty or not noticeable (LandWorks 2013a, p. 30).

This description indicates that the river is not dominated by the dam, roads or development; rather it is "generally wooded with a gently to steeply sloping shoreline." So again, LandWorks seems to be selectively emphasizing human presence to assign a Low rating for Intactness, but their description of the SRSNS does not support this decision. Perhaps the Intactness ratings should be Medium.

Bald Mountain Pond is described as having "little in the way of physical intrusions or disturbances, which are limited to the boat launch, and the natural appearance of the landscape remains dominant. However, given the visible evidence of logging activity on nearby hillsides, the resource cannot be considered an untouched, unaltered environment. Therefore, the rating for this resource is Medium" (LandWorks 2013, p. 50). The White Mountain National Forest guideline described above make it clear that the US Forest Service accepts a certain amount of harvesting activity being visible from areas of the highest visual concern in a working forest, and that this is not sufficient reason to lower the view's scenic integrity. There is no suggestion that the harvested areas are so extensive that they occupy greater than 9 percent of the view—the White Mountain National Forest threshold. Field observation indicates that all of the harvested areas were in the middle distance and had green regeneration; they were natural-appearing. Based on the description provided, one would conclude that an Intactness rating of High would be appropriate.

Punchbowl Pond is described as having:

> the appearance of an intact landscape once at the shoreline or on the pond itself. As with many of the lakes and ponds throughout Maine's forested regions this is a deceiving appearance - only a thin strip of intact landscape buffer is in place around the pond (50 feet from on-site observations) and on the approach to the pond there is extensive evidence of logging activity that yields the impression of a landscape that is altered from what it might look like naturally. Thus, the analysis must determine

> whether intactness is a totally visual concept and to the extent that the intactness of the landscape must include the environs - not just the pond itself" (LandWorks 2013a, p. 51).

Once again, if the intent is to evaluate the Intactness of views from the SRSNS, then LandWorks' description of the views from Punchbowl Pond have a High Intactness.

LandWorks states that "the area through which the Arnold Trail is located has not retained the original intactness of the wilderness character it may have had in the 18th century" (LandWorks 2013a, p. 51). This may be true, but the landscape character in the 18th century is not the standard—Criterion B concerns existing character. In addition, the NRHP nomination form states that "above Binghamton the agricultural section ends, the land gets more hilly and rocky, and the forest closes in. Virtually no virgin timber remains along the trail from Bingham to the Canadian border, but the entire region does give the appearance of a vast, hostile wilderness, as it did in 1775" (Holmstrom 1969). Except for relatively circumscribed locations (e.g., the Kennebec River just below Wyman Dam), this description is generally supported by LandWorks' characterization of the Kennebec River and Wyman Lake quoted above (LandWorks 2013a, p. 30). Most of the Arnold Trail through the study area would be experienced as natural-appearing, and the Intactness rating may be Medium or Medium-High.

**Remoteness**. LandWorks (2013a, p. 51) apparently accepts the reasoning and "methodology detailed by Palmer in his Bowers report (pg. 22) as a basis" for using Remoteness as an indicator of Criterion B: Existing Character. However, LandWorks does not define Remoteness except as a footnote to Exhibit 13: Predicted Remoteness where they use the distance criteria shown in Table 7. [17] While LandWorks is using the terminology of the Recreation Opportunity Spectrum (ROS) as the basis for determining Remoteness, there is no reference to the ROS literature (e.g., More et al. 2003) and it is unclear whether they have gone beyond reading Palmer's (2013b) review.

The Bowers Wind review only discussed the surrounding area's remoteness and did not propose evaluation thresholds for individual SRSNS (Palmer 2013b). However, the Hancock Wind review does suggest remoteness thresholds for Criterion B (Palmer 2013c, p. 46). These are compared in Table 7 with those proposed by LandWorks (2013a, p. 51-52). The difference is whether a SRSNS within half a mile of a road maintained to be accessible to two-wheeled vehicles but not within a developed area has Medium or Low Remoteness; LandWorks decided that Semi-Natural Developed areas have Medium Remoteness. While this may seem a minor concern, these are the types of details that need to be worked out if the system of Criteria-Indicators-Thresholds is to be reliable.

**Table 7. Comparison of Remoteness Rating by LandWorks and Scenic Quality Consultants.**

[17] LandWorks' (2013, Exhibit 13: Predicted Remoteness): "DATA SOURCES: Two different road shapefiles have been combined for this analysis: e911Rds.shp from the Maine Office of GIS and trans.shp, an older database of roads. Data is only as accurate as the original source and is not guaranteed by LandWorks. REMOTENESS DETERMINATION: 'Semi-Developed Natural' indicates areas within 0.5 miles of a maintained public road (classes 1-3 in trans.shp). 'Semi-Primitive Motorized' indicates areas within 0.5 miles of any road, including unimproved roads (classes1-6 in trans.shp and all roads in e911Rds.shp). 'Semi-Private Non-Motorized' indicates areas between 0.5 and 2 miles from any road."

| ROS Class | Distance from Road | LandWorks Rating | SQC Rating |
|---|---|---|---|
| Primitive (P) | > 2.0 (E911RDS) | High | High |
| Semi-Primitive Non-Motorized (SPNM) | >.5, < 2.0 (E911RDS) | Medium | Medium |
| Semi-Primitive Motorized (SPM) | < 0.5 (E911RDS) | Medium | Medium |
| Semi-Developed Natural (SDN) | < 0.5 (MEDODPUBRDS) | Medium | Low |
| Developed Natural (DN) | < 0.5 (MEDODPUBRDS) | Low | Low |

When discussing the Remoteness of each SRSNS, LandWorks ignores their analysis (LandWorks 2013, Exhibit 13: Predicted Remoteness) and brings in other attributes. In particular there is little reference to Exhibit 13. For instance, it does not identify any Developed Natural (aka Rural Developed) areas, yet the Arnold Trail, Kennebec River and Wyman Lake are identified as Developed Natural areas (i.e., Low Remoteness) rather than Semi-Developed Natural areas (i.e., Medium Remoteness). One cannot distinguish between Semi- Developed Natural and Developed Natural from the perspective of Remoteness, the difference lies in other aspects of the setting and user experience (More et al. 2003). While there may be small discrete areas on these three SRSNS that have a sufficiently density of structures or people to be considered Developed Natural, they are predominately Semi- Developed Natural areas.

Wyman Lake is identified as having Low Remoteness because of "the human influences which created the lake and which are readily visible or audible when on the lake, and, more specifically the proximity to public roads and a major north-south U.S. Highway route, this resource is not at all remote. It also has several maintained boat launches, parking lots, and picnic areas, and interaction between users is relatively high" (LandWorks 2013a). Rather than refer to their analysis (i.e., Exhibit 13: Predicted Remoteness), LandWorks lapses into non-analytic reasoning to make their determination—"this resource is not at all remote." "Designed roads and/or highways are present" in both Semi- Developed Natural and Developed Natural areas (More et al. 2013, p. 21). A primary distinction between these two classes is the number of interactions (not just sightings) among users. LandWorks claims that "interaction between users is relatively high," yet the intercept survey observed only 20 groups at Wyman Lake over 6 days (Kleinschmidt 2013a, p. 14), which cannot support the assertion of high interaction. The description of Remoteness for the other SRSNS is similarly non-analytic. Using LandWorks' standards, it appears to me that the Remoteness rating for all of the SRSNS should be Medium.

LandWorks did not provide the road data they used in their analysis, as requested (Palmer 2013d). However, the footnote to Exhibit 13: Predicted Remoteness indicates that they used the e911Rds.shp file from the Maine Office of GIS and the file named trans.shp that is not publicly available. When asked about the trans.shp data, the Maine Office of GIS replied that "this data is well outdated, and if you still have a copy, we would not recommend its use. The most current road data is found in the e911rds, which contains both public and private roads, and the Medotpubrds layer" (Bistrais 2013). In comparison to DeLorme's *Maine Atlas and Gazetteer*, it appears that the e911.shp data lacks many unimproved roads, such as logging roads, though how passable these roads are is unknown. It would be desirable for there to be a standard database and procedure for evaluating Remoteness if it is decided to be an important indicator for Criterion B.

**Summary**. This review of Criterion B: Character of the Surrounding Area attempts to use the procedure apparently being referenced by LandWorks to introduce the definition and systematic

analysis that they fail to provide. The results shown in Table 8 indicate that the Existing Character is higher than asserted by LandWorks. This difference illustrates why it is important to provide a clearly described and then implement a procedure to measure Indicators and Thresholds.

**Table 8. Revised Ratings for Criterion B: Existing Character of the Surrounding Area**

| Resource | Intactness | Remoteness | Overall Rating |
|---|---|---|---|
| Arnold Trail | Medium | Medium | Medium |
| Bald Mountain Pond | High | Medium | Medium-High |
| Wyman Lake | Medium | Medium | Medium |
| Kennebec River | Medium | Medium | Medium |
| Punchbowl Pond | High | Medium-High | High |

### 2.6.3 Criterion C: Typical Viewer Expectations

LandWorks does not provide an explanation of what they believe Criterion C: Typical Viewer Expectations means or how it applies to conducting a VIA.

Kleinschmidt (2013, p. 1) states that one of the "three primary areas of investigation" for the intercept survey includes "user expectations and the impact to enjoyment." However, LandWorks notes that "the User Survey Report prepared by Kleinschmidt did not ask this question ["what are your expectations"] so this information is not available at this time" (LandWorks 2013a, p. 53). Clearly this was a missed opportunity, since Wyman Lake may be the SRSNS with the highest opportunity for potential visibility.

LandWorks proposed three other indicators for this criterion: (1) Activity, (2) Landscape Character, and (3) Support for wind power.

**Activity**. LandWorks is relying on the Kleinschmidt (2013) survey to identify the activities on Wyman Lake and Bald Mountain Pond. However, LandWork's asserts "for the Bingham Project area, the primary activities have been identified… based on comprehensive research as well as user surveys" (LandWorks 2013a, p. 54). While they do not state it here, this "comprehensive research" appears to be "a comprehensive review of websites, guidebooks, and brochures obtained from local retailers"—in other words, advertisements (LandWorks 2013a, p. 62). LandWorks also used personal observation of these sites, and I would venture common sense, to identify probably activities. This type of information is more apropos for Criterion E.1: Extent, Nature and Duration of Use. What is not known is what people were looking forward to as they were planning and traveling to the SRSNS they were using.

Other intercept surveys for wind energy projects have asked about expectations:

Saddleback Ridge Wind

1. What brought you to Mt. Blue today? PROBE: Any other reasons?

Spruce Mountain Wind and Bull Hill wind

1. What brought you to Bald Mountain today? PROBE Any other reasons?
2. And which of those reasons would you say is your primary reason?

Hancock Wind

1. What prompted you to come out to Tunk Mountain today? (Prompt: How did you find out about Tunk Mountain, have you seen or heard anything recently about Tunk Mountain?)
2. What motivated you to hike Tunk Mountain today? (Prompt: What were the reasons for your hike today?)

BowersWind

1. On a scale of 1 to 7, where a 1 is very low quality, a 7 is very high quality, and a 4 is is neither high nor low quality, what was the overall quality of experience you expected on your visit to ____Lake today?

Oakfield Wind and Passadumkeag Wind

1. In general, what are your expectations for your recreational experience during your visit to Pleasant Lake?

I would like you to think about two specific aspects of your expectations.

2. First please think about your expectations for the number of people that may also be using the lake. Please rate this on a scale from 1 to 7 where one means you expect it to be un-crowded with few or no other people and 7 means you expect it to be crowded with a large number of people. You may also use any number in between.
3. Next think about your expectations for level of development that you will see along the lake. Please rate on a scale from 1 to 7 where one means you expect the lake to be largely UN-developed and 7 means you expect it to largely or mostly developed. You may also use any number in between.

One interesting finding has been that when given the opportunity to answer an open ended question about their expectations, people often do not list one of the common recreation activities. A preliminary reading of these open ended responses suggested to me that people's expectation are less about specific recreation activities and more about the following:

1. Challenge—to bag a new peak, to catch a big fish, to run the rapids
2. Companionship—camaraderie, being with my friends
3. Get outdoors—fresh air
4. Novelty—trying something different
5. Rejuvenation—relief from the tensions of modern civilization
6. Scenery—enjoying the beautiful surroundings

This list was originally prepared in preparation for a content analysis that was not completed and is not presented as a final product. The important lesson is that traditional recreation activities may not be the best way to characterize people's expectations.

Perhaps more important is LandWorks failure to even attempt to document a connection between expectations and common activities at SRSNS. Nor do they attempt to document how they set their rating thresholds.

**Landscape character**. LandWorks asserts without supporting evidence or citations that "a viewer's expectation to change in the landscape may be tempered or influenced by the level of alteration already present within and surrounding the resource. The more alterations present in the landscape, the lower the scenic quality and the lower the viewer expectations" (LandWorks 2013a, p. 55). Three thresholds are suggested, but no process to measure or otherwise determine

these thresholds is described. Viewer Expectation is asserted to be Low if "the resource is altered…development is easily noticed," it is Medium if "the resource has minor alterations…development is present but is not always noticeable," and High if "the resource is unspoiled…the landscape is pristine" (LandWorks 2013a, p. 55). As with Intactness, is unreasonable to assume High Viewer Expectations are only associated with a "pristine" landscape. For instance, it seems reasonable that there might be High Viewer Expectations when planning a trip to bicycle on Acadia National Park's carriage roads or for someone visiting Maine for the first time to shop at L.L. Bean (or a child anticipating a first visit to Disney World, if I can use examples outside of Maine)—these are not unaltered, pristine landscape. LandWorks has taken the mistaken position that only pristine environments can support High quality scenic experiences. However the discussion of Intactness under Criterion B: Existing Character gives documentation that this is not how the White Mountain National Forest interprets the thresholds for its highest Scenic Integrity Objectives. Overall, Landscape Character, as presented by LandWorks, seems to be very similar to the Intactness indicator for Criterion B: Existing Character, and to have similar flaws.

**Support for wind power**. It is unclear how support for wind power by Maine residents at large is applicable to expectations of users of the SRSNS within 8 miles of the Bingham wind turbines. I can document that supporters of wind power are more likely to rate images of wind turbines as more scenic than opponents of wind power. However, that is not to say that supporters of wind power who responded to an intercept survey did not believe that the apparent scenic impact of the proposed turbines was seriously negative. This is often dismissed as NIMBY-ism, but researching this phenomenon find this a simplistic and erroneous understanding of why public opinion may support the abstract idea of wind power, but there may not be social acceptance for specific projects, as explained in this selection from Wolsink (2012).

> Kaldellis and Zafirakis (2011, p.1898–9) provide a short paragraph on the acceptance of wind power in society:
>
> > ''…environmental performance of wind energy perceived by the majority of people (over70%infavor) and transformed into widespread social support (only solar energy seems to be more socially accepted) further boosts wind energy developments''.
>
> This is illustrated with figures taken from the Eurobarometer (2007) survey regarding the popularity of energy generating techniques. Implicitly, this paragraph suggests that public popularity reflects social acceptance. Perhaps such figures maybe remotely considered indicators of the general acceptability of the techniques among individual citizens, but presenting public opinion about an abstract idea ('windpower') as a proxy for a very complex phenomenon (such as decisions about actual application and implementation, taken by many different types of actors in a wide variety of conditions) is a fundamental misconception. Social acceptance concerns complex decisions taken by many social actors (Wüstenhagen et al., 2007).

LandWorks has made this error by including Support for Wind Power as an indicator of Criterion C: Typical Viewer Expectations. The WEA makes it clear that the VIA needs to consider actual users of SRSNS within 8 miles of a proposed wind energy project, not the preference for an abstract idea among the population of Maine, other states or even other nations. This Indicator has little relevance to the problem at hand.

**Summary**. No relevant data or analyses for Criterion C are presented. It is particularly disappointing that the intercept survey did not ask about expectations.. The actual activities of users at SRSNS is likely not the same as their expectations, and there is no research or other evidence cited that links the two. Landscape Character has already been considered under Criterion B: Existing Character of the Surrounding Area. LandWorks makes the demonstrably false assumption that High expectations are only associated with pristine landscapes. LandWorks fails to present any evidence that Support for Wind Power in indicator of the Expectations of the Typical Viewer. In proposing this indicator, LandWorks confuses public opinion about an abstract idea with societal acceptance of actual wind projects.

**2.6.4 Criterion D: Purpose and Context of the Proposed Activity**.
LandWorks does not provide an explanation of what they believe Criterion D: Purpose and Context of the Proposed Activity means or how it applies to conducting a VIA.

LandWorks proposes three indicators for this criterion: (1) State Policy, (2) Significance of the Site, and (3) Limiting New Infrastructure.

**State Policy**. LandWorks states that "This indicator is not site specific, but is a more general requirement that the agency consider state policy to encourage the siting of wind energy projects within the expedited permitting area when determining the reasonableness of the visual impacts. 35-A M.R.S.A. §3402(2). The rating for this indicator is therefore Low because the Project fulfills the goals and policies of the state" (LandWorks 2013a, p. 58).

It seems appropriate for an Indicator to address the extent to which a project contributes to the State wind energy goals. However, LandWorks does not propose a way to measure this Indicator so that it can make a contribution to evaluating Criterion D. From their description all proposals would be rated the same. It would seem desirable to somehow measure the contribution that a project makes to the state goal; perhaps this could be standardized as nominal megawatts per area with potential visibility within the 8-mile APE.

**Significance of the Site**. This Indicator asks: "Does the site hold local or state significance or value other than wind generation? Is the site a prominent feature in the landscape?" (LandWorks 2013a, p. 58). LandWorks asserts without discussion that "the Project hills are not prominent and are not cherished features in the landscape, so the rating for this indicator is Low." At a minimum there should be reference to section 3.7 Project Area (pages 14-18). The ridge line upon which the project is sited is a significant topographic element. If the site is not a prominent or cherished feature in the area, what is? What is the basis of this assertion?

The implicit standard proposed by LandWorks is that a site must be at least "prominent" and a "cherished feature" in the landscape to obtain a Medium rating (since hot being these thing, the site is rated Low). However, LandWorks does not clearly present the Thresholds that they use to evaluate this Indicator.

**Limiting New Infrastructure**. This Indicator asks: "Does the siting of the project make use of available infrastructure, such as transmission lines, and cluster turbines near other projects so as

to minimize the overall impact to the state?" (LandWorks 2013a, p. 58). This description suggests that when evaluating the indicator, LandWorks would list the infrastructure elements that already exist, will be upgraded, and still must be built. LandWorks does not present a rational for Thresholds to justify their rating so that we can understand the basis of their decision that "the rating for this indicator is Medium."

**Summary**. LandWorks does not present a procedure to measure these Indicators, or establish Thresholds to use for rating them.

**2.6.5 Criterion E.1: Extent, Nature and Duration of the Public Use**.
LandWorks notes "that this criterion does not assess impact to scenic quality, but simply what is the use and how frequently is it used and by whom. This criterion then provides the information necessary to assess viewer expectations and effect on continued use and enjoyment of the resource" (LandWorks 2013a, p. 59). It may be parsing words, but this criterion does provide very important information for understanding the overall scenic impact. LandWorks does not provide any citations or data that link Extent, Nature and Duration to Expectations, Effect on Continued Use, or Enjoyment.

It is a common assumption that the overall scenic impact is greater if more people (Extent) are potentially exposed for longer periods (Duration) to views of the project. In addition, it is commonly assumed that some types of SRSNS use (Nature) are more sensitive to scenic impacts than others. For instance, The USDI Bureau of Land Management's (1986) *Visual Resource Inventory* manual states:

> Sensitivity levels are a measure of public concern for scenic quality. Public lands are assigned high, medium, or low sensitivity levels by analyzing the various indicators of public concern.
>
> A. Factors to Consider.
>
> 1. Type of Users. Visual sensitivity will vary with the type of users. Recreational sightseers may be highly sensitive to any changes in visual quality, whereas workers who pass through the area on a regular basis may not be as sensitive to change.
>
> 2. Amount of Use. Areas seen and used by large numbers of people are potentially more sensitive. Protection of visual values usually becomes more important as the number of viewers increase.

The US Forest Service (1994, p. 4.8) conducts a comparable analysis to determine Concern Levels:

> Concern levels are a measure of the degree of public importance placed on landscapes viewed from travelways and use areas. Divide concern levels into three categories: levels 1, 2, and 3. At the inventory stage, the type of area and its level of use is an adequate indicator of the level of interest that people are likely to have in the surrounding landscape.

At the inventory stage, the "type of area" is used as a surrogate to characterize the Extent, Nature and Duration of visitors. However, for an environmental assessment or impact statement, it

would be expected that actual data would be collected, as appropriate. The US Forest Service (1994, p. 3.1-3.18) handbook, *Landscape Aesthetics*, has a whole chapter on obtaining and using Constituent Information.

LandWorks needs to describe a procedure to measure Nature, Extent and Duration, and justify a procedure to analyze these Indicator data so they may be interpreted (i.e., establish reasonable Thresholds).

LandWorks proposes three indicators for this criterion: (1) Extent, (2) Nature, and (3) Duration.

**Extent**. LandWorks states that "this indicator measures the amount of use of the resource. This can be determined quantitatively by user surveys. However, when this information is not available, or not statistically reliable, other measures must be used to ascertain extent of use" (LandWorks 2013a, p. 59). The only attempt to collect data about the extent of use occurred over 6 days half-day periods at Wyman Lake and Bald Mountain Pond during September 2012, including part of the Labor Day weekend. The observation at Wyman Lake is instructive. The intercept survey indicated there were 8 users per day, yet a use survey conducted in 2008 reported an average of 211 users per day (77,000 per year ÷ 364 days) (LandWorks 2013, p. 60). No threshold is given for what level of use 8 or 211 users qualifies a SRSNS. For other sites, LandWorks indicates that ease of access and availability of facilities will be used as a surrogate for determining Extent.

It should be possible to obtain data about the Extent of use of a SRSNS. For instance, it may be possible to pay a nominal fee to a resident living on or adjacent to a SRSNS to systematically monitor use. Alternately, an automated traffic monitoring system (e.g., TRAFx[18]), or an infrared monitor that triggers a camera (e.g., TrailMaster[19]) could be rotated among the SRSNS. However, it is recognized that these method do encumber an expense, so it may be that they are only used at SRSNS where there is a prominent view of wind turbines.

**Nature**. LandWorks states that "this indicator considers how the resource is being used and what are the primary activities" (LandWorks 2013, p. 61). The intercept survey provides data about the Nature of use at Wyman Lake and Bald Mountain Pond, though the sample size is small. LandWorks conducted an extensive review of advertising media (i.e., web sites, brochures, and guidebooks) to identify the "types of activities available in the region." Viewing scenery was not one of the activities that LandWorks identified. Another source that they could tap for this purpose would be the 2012 Kennebec and Moose River Valleys Regional Report from the Maine Office of Tourism.[20] While the Wyman Survey found that viewing scenery was the primary activity for 19 percent of respondents and the Maine Office of Tourism survey found that 12 to 15 percent of local day users and 23 to 37 percent of overnight visitors to the region state that "enjoying the mountain views" is a top priority.

[18] http://www.trafx.net/
[19] http://www.trailmaster.com/tm1550.php
[20] http://www.visitmaine.com/resource/visitmaine/vault/application/2012-kennebec-moose-river-valley-regional-report.pdf

However, LandWorks does not have a procedure to determine what activities are happening where. In particular, there is no procedure or cited research to determine when scenery is important to a particular activity. LandWorks simply asserts that some activates should be rated Low, some Medium and others High.

**Duration**. LandWorks states that "This indicator considers the length of time a user is engaged in an activity at the resource, or how long they are visiting the resource. Typically, the longer a user spends recreating or visiting a scenic resource, the higher the potential for impact" (LandWorks 2013a, p. 64-65). The intercept survey provided Duration values for Wyman Lake and Bald Mountain Pond, though they are based on a small sample size. LandWorks does not explain how they determine the Duration spent at the other SRSNS. Nor is there an explanation of the Thresholds used to assign the Low, Medium or High rating.

**Summary**. Extent, Nature and Duration are all clearly measurable attributes. However, an intercept survey was conducted for a very limited time at only two SRSNS, and the small number of respondents was less than satisfactory. It is a concern that the intercept survey suggests there is an average of only 8 users of Wyman Lake per day, while a 2008 study found an average of over 200 users per day.

LandWorks makes no attempt to link these three Indicators to levels of sensitivity or concern, as does the BLM and the USFS. No citations or reasoning is given to substantiate the rating Thresholds, nor is the procedure clear for determining what rating should be assigned to a SRSNS.

### 2.6.6 Criterion E.2: Effect on Continued Use and Enjoyment.

LandWorks states that "in effect, this is the key issue in terms of impact to users of the resource – does the project adversely impact their use so much so that they will not come back?" (LandWorks 2013a, p. 66). The procedures for determining how users of SRSNS believe the visual change will affect their enjoyment and continued use are reasonably well established using methods that have been found reliable and valid in other contexts. Rather than adequately implement these methods, LandWorks choses to place a greater emphasis on "other available data (background polling, studies, guide books, publications, online media, anecdotal and interview sources, as well as general field observations and professional expertise)" (LandWorks 2013a, p. 66).

LandWorks proposes four indicators for this criterion: (1) Scenic Change (2) Effect on Enjoyment, (3) Effect on Continued Use, and (4) Other Survey Information.

**Scenic Change**. LandWorks describes "This indicator considers how users' opinions about scenic quality change when a wind power project is within view" (LandWorks 2013a, p. 66). LandWorks reports intercept survey data where they are available, so apparently they recognize that it is the preferred procedure for determining Scenic Change. However, they do not present a procedure or thresholds for determining the Indicator ratings. For instance, LandWorks finds that "the effect on scenic value is Low for Wyman Lake" (LandWorks 2013a, p. 66). However, 74 percent of users found the existing condition to have high scenic vale, and none though it had low scenic value. In contrast, the proportion thinking the view with the turbines retains high

scenic vale drops to 57 percent, and 21 percent think that it now has low scenic value. By what procedure did LandWorks determine that this shift is a Low effect? In this particular case, it is also a problem that there are relatively few respondents, which reduces the reliability of the results.

The results for Bald Mountain Pond are similar, though with only 7 responses there can be no pretense that it would be responsible to use the results to influence a decision as important as permitting a 191 MW wind energy project. Nonetheless, LandWorks assigns a rating of Low for user perceptions of Scenic Change.

LandWorks presents a rhetorical apologia in an effort to deflect the credibility of these results, asserting that the respondents may be employing "what is known as hyperdefensiveness strategy" or "a precautionary strategy, which results in people erring on the side of being conservative when asked about the impact of a project that they are not actually observing" (LandWorks 2013a, p. 67). This may or may not be true, and the way to determine if it is a problem is to conduct a well-designed post-construction intercept surveys at the same sites where pre-construction surveys have been conducted.

Other SRSNS are assigned ratings based on their similarity to the two surveyed SRSNS—one an ostensibly a very accessible and high use location and the other low use location with poorer accessibility. There is no evidence of using data other than the intercept survey, which highlights its importance for this indicator" (LandWorks 2013a, p. 69).

**Effect on Enjoyment**. LandWorks states that "This indicator considers how a wind power project in view would effect their enjoyment" (LandWorks 2013a, p. 68). The intercept survey gathered responses from 15 users of Wyman Lake and 7 users of Bald Mountain Pond.[21] LandWorks reports that 73 percent of the Wyman Lake respondents and 57 percent of the Bald Mountain Pond respondent judged the presence of the wind turbines would have a positive or no effect on their enjoyment (p. 68). Said another way, 27 percent of the users at Wyman Lake and 43 percent at Bald Mountain Pond though that the presence of the wind turbines would have a negative effect on their enjoyment. LandWorks does not address how these values relate to the Low-Medium rating for Wyman Lake and the Low rating for Bald Mountain Pond.

LandWorks then proposes that "the type of activity must also be considered when evaluating effect on enjoyment" (p. 68). However, it is reasonable to assume that this has already been taken into account by the respondents, who understand their individual mix of activities and the role that scenery plays in enjoyment of those activities. It is only important to consider type of activity because data about effect on enjoyment were not collected at all the SRSNS. LandWorks proposed three Threshold levels based on assumptions about the importance of scenery to people engaged in different recreation activities. No data or research citations are offered to support these Thresholds.

LandWorks also introduces Indicators from other Criteria into their description of the Effect on Enjoyment Thresholds. For instance, "impact may also be low due to limited use of the resource" (p. 68), which is clearly a reference to Extent, a Criterion E.1 indicator (p. 59). The Medium

[21] LandWorks (p. 71) recognizes that the results from so few responses are "not necessarily statistically significant."

rating considers, in part "access to 360° views" (p. 68), which seems related to Criterion F's Angle of View indicator (p. 86), and the High rating references Duration, another Criterion E.1 indicator (p. 64). Effect on Enjoyment is a perception, for which there are established measurement procedures; there should be no need to draw on other Criteria to explain this Indicator.

**Effect on Continued Use**. LandWorks states that "this indicator is in effect the most critical as it considers if users will return and continue to use the resource" (LandWorks 2013a, p. 69). The intercept survey gathered responses from 15 users of Wyman Lake and 5 users of Bald Mountain Pond. LandWorks reports that 13 percent of the Wyman Lake respondents and none of the Bald Mountain Pond respondent indicated that they were unlikely to return if the project were built. LandWorks does not attempt to establish Thresholds that could be used to evaluate these values.

**Other Survey Information**. LandWorks summarizes the response to questions about effect on enjoyment and continued use asked as part of intercept surveys conducted for Maine wind projects. "Only about 33% of all respondents to surveys conducted for proposed wind projects in Maine (Table X) were negatively impacted, and roughly 20% of all respondents were unlikely to return" (LandWorks 2013a, p. 77). However there is no attempt to suggest thresholds based on the results—is negatively effecting the enjoyment of 33 percent of respondents Reasonably Adverse or Unreasonably Adverse? Why and what standard is used to make this decision?

LandWorks also discusses a number of other studies investigating perceptions of wind projects, many of them from other countries. These studies are selected to support a conclusion that people mostly support wind energy, that fears of very negative scenic impacts are greatly reduced once projects are in operation, and that tourism is not diminished by the presence of wind projects. There is no indication that a comprehensive review is attempted, and no analysis is presented.

**Summary**. Effect on Enjoyment and Continued Use are recognized as central to the determination of whether the scenic impact from a wind project is Reasonably or Unreasonably Adverse. Methods are available to measure Criterion E.2 Indicators that are generally recognized to be reliable and valid when appropriately implemented. Intercept surveys were conducted at two SRSNS, but they were not during the primary season of use and number of responses may be too few to provide confident results. Nonetheless, no attempt is made to establish Thresholds that directly apply the intercept survey results to evaluate Criterion E.2.

### 2.6.7 Criterion F: Scope and Scale of the Potential Effect of Views of the Generating Facilities.

LandWorks states that "The assessment of this criterion is based primarily on desktop analysis of project visibility using a variety of tools (e.g. viewshed analysis, visual simulations, spatial analysis), in concert with field observations and professional expertise" (LandWorks 2013a, p. 77). They fail to mention that the WEA specifically directs consideration of "the number and extent of turbines visible"[22] from the SRSNS.

[22] 35-A MRSA, § 3452, sub-§3(F)

LandWorks proposes six indicators for this criterion: (1) Number of Visible Turbines, (2) Percent of SRSNS with Visibility of Turbines, (3) Proximity or Distance of Turbines, (4) Angle of View, (5) Visual Dominance, and (6) Visual Clutter/Landscape Coherence.

**Number of Visible Turbines**. The WEA specifically directs that the number of visible turbines be considered. LandWorks has determined that this Indicator is best measured as the maximum number of turbine hubs visible from any point within a SRSNS. The result is based on a visibility analysis that accounts for the screening effect of terrain and a 40-foot forest canopy. LandWorks (2013a, p. 78) uses the following Thresholds for this indicator:

Low = 1 to 15 turbine hubs

Medium = 16 to 30 turbine hubs

High = 31 or more turbine hubs

Land Works thought that the visibility analysis for Punchbowl Pond was providing inaccurate results, so they made field measurements of the intervening shoreline trees, which turned out to be 65 rather than 40 feet high. They only did this for the Punchbowl Pond analysis. It seems like a reasonable correction. If data accuracy is a concern, then more accurate ground and canopy elevation data are available commercially, for instance from Intermap.[23]

Detailed visibility maps are provided for each of the SRSNS. I find that using an aerial photo as the map's background makes it difficult to read the relevant information. I would also suggest not using a scale that grades from red to green, since it is not easily interpreted by color-blind readers. However, it is clear that no SRSNS will have visibility of as many as 15 turbine hubs over a forest canopy, so the rating is Low for each of them.

This Indicator is derived from the Bowers Wind VIA review (Palmer 2013b). While the thresholds are accepted without comment, LandWorks argues that the maximum number of turbines visible is a better procedure than using the $10^{th}$-percentile. This is a detail that can be discussed, just as whether we should consider visibility of blade tips, and where to set the Threshold break-points. The important point is that the Indicator is one required by the WEA, and that it should be possible to agree on a clear procedure to measure it reliably.

**Percent of SRSNS with Visibility of Turbines**. The basis of this Indicator is the visibility of turbine hubs over terrain and a 40-foot forest canopy. The measurement is the percent of a SRSNS that has potential visibility of a turbine hub. This Indicator was also used in the Bowers Wind VIA review (Palmer 2013b). The thresholds are as follows:

Low = 1% to 33%

Medium = 34% to 66%

High = 67% to 100%

LandWorks discusses some of the problems with using the 2008 Maine Land Cover Data to estimate the height of vegetation screening. The issue is that the only cover types with a

[23] http://www.intermap.com/en-us/databases/nextmap.aspx

definition that provides essentially a solid screen are the three forest types. Forty feet is used to describe the height where there is a solid canopy; there may be individual tree-tops that are emerge above this height. One cannot be confident that other vegetated types will provide a solid screen extending to 4- feet, since they can have a much lower or much thinner canopy. Rather than assume heights for a vegetation screen that may not exist, the appropriate solution is to field-check specific locations, such as LandWorks did for Punchbowl Pond, or purchase commercially available surface data, such as that available from Intermap. [24]

LandWorks observes that "for some of the resources, the areas with potential visibility do not represent areas that would get much use" (p. 84). There is some discussion of where users are most likely to be present, for instance on Bald Mountain Pond. Rather than speculate, it would be appropriate to ask people to indicate on a map where they had been and where they intend yet to go within the SRSNS. This type of data were gathered as part of the Bower Wind intercept survey, but they were not analyzed (Kleinschmidt 2013b).

While LandWorks accepted the Threshold break-points, they may still be a point for further discussion and research. For instance, it may be that if 10 meters of a blade is visible within 3 miles it is counted; between 3 and 8 miles only visible turbine hubs are counted. The reason being that moving blade tips are much more likely to be noticed at a distance less than 3 miles.

**Proximity or Distance of Turbines**. LandWorks asserts that "aesthetic experts agree that the visual impact of wind turbines diminishes over distance" (p. 84) and the US Forest Service's *Forest Aesthetics* handbook is mentioned as an authoritative source (USFS 1994, p. 4.8-4.13). In the past, LandWorks has adjusted the thresholds for these distance zone to reflect ranges that they believe are more appropriate for wind turbines (LandWorks 2013c). It is these distance zones that have been proposed as Thresholds for this Indicator:

Low = 6 to 8 miles

Medium = 2 to 6 miles

High = 0 to 2 miles

I think this is a misapplication of the USFS distance zones. The definition of distance zones concerns the mode of perception at various distances: foreground is surface textures, middle ground is individual objects, and background is large generalized patterns (USFS 1994, p. 4.10-4.11). There is no discussion of impact.

It seems more appropriate to use the Thresholds identified in the WEA: High if the closest turbine is within 3 miles and Medium if it is between 3 and 8 miles. It has been demonstrated that wind turbines are clearly visible beyond 8 miles (Kleinschmidt 2012) and the WEA establishes that beyond 8 miles the impact of wind turbines is "insignificant,"[25] therefore the rating for areas beyond 8 miles is Low.

[24] http://www.intermap.com/en-us/databases/nextmap.aspx
[25] 35-A MRSA, § 3452, sub-§3

While knowing the closest distance may be useful, it might be more helpful to know the distribution of the closest visible turbine throughout the SRSNS.

Again, the important point is that there is agreement on using Proximity as an Indicator; there can be further discussion on establishing the procedures of measurement and rating Thresholds.

**Angle of View**. LandWorks states that "a turbine array that occupies a narrow angle of view typically has less visual impact than one that occupies a wide angle of view" (LandWorks 2013a, p. 86). They note that the central field of vision is 40° to 60°, while stereoscopic vision extends out to 120°, and peripheral vision extends to 180° and beyond. No authoritative references are given, and there is no attempt to describe the relation between the mechanics of vision and how we might perceive things. LandWorks proposes a metric where "based on the angle of view encompassing visible turbine hubs divided by the total possible view angle from a given resource (e.g. for a lake 360 degree views would be possible, while a scenic pull-off with a fixed view would potentially have a total possible view of 180 degrees or less, depending on site conditions)" (LandWorks 2013a, p. 87). These Thresholds are shown in Table 9, along with the implied Angle of View for views from a lake and a scenic pull-off.

**Table 9. Angle of View Thresholds Proposed by LandWorks**

| Rating | Percentage of View | Lake | Scenic Pull-off |
|---|---|---|---|
| High | Greater than 21% | Greater than 76° | Greater than 38° |
| Medium | 7% to 21% | 25° to 76° | 13° to 38° |
| Low | Under 7% | Under 25° | Under 13° |

However this proposal makes no reference to how people look at the landscape. Generally speaking we "look" at things using foveal vision; peripheral vision is used to detect objects and direct foveal vision (Yamamoto & Philbeck 2012). As long as turbine hubs and moving blades are within the peripheral vision, there is an attraction to investigate the source of the movement. As a result, either on a lake or at a scenic pull-off, if there is a line-of-sight to a turbine hub and moving blades, a viewer will direct her foveal vision to investigate.

The fovea occupies the central 2° of the visual field and provides the sharpest visual acuity. The macula surrounds the fovea and has a sufficiently high density of photoreceptor cells to provide clear vision for the central 13° of the visual field. In addition, we unconsciously use a series of fixation and saccades movements that effectively increases the effective area of foveal vision to ±10° (Fulton 2009). We must consciously shift our gaze in order to obtain information outside this area.

I suspect that whether an observer has a potential field of view that is 360° or 180° is irrelevant, as long as the observer is free to investigate her full field of view. If there is some evidence to support this distinction, LandWorks should provide the citations. I might speculatively suggest that the Thresholds for Angle of View be:

> Low: 10° or less, which is the area covered by unconscious fovea fixation-saccade movements.

> Medium: 10° to 25°, which approximately corresponds to the area covered by the macula during the fixation-saccade movements.
>
> High: 25° or greater, which corresponds to the area where we must consciously move our head to obtain a clear view of a whole wind energy project.

These thresholds are reasonably close to those suggested for the scenic pull-off, but much less than suggested for views from a lake.

A significant limitation with this proposed Indicator is its dependence on only a single simulation viewpoint. It is unknown whether this viewpoint has the highest angle of view of the project, or represents a typical angle of view. It would seem more desirable to understand the distribution of the project's angle of view throughout the area of the SRSNS.

**Visual Dominance**. LandWorks states that "this indicator considers the scale of the project in relation to the vantage point and the project surroundings. Do the turbines command the attention of the viewer away from all other aspects of the landscape?... Are the turbines in the center of an important view, and/or in close visual association with an important natural or cultural focal point?... the height of the turbines in relation to the height and mass of the landforms below them affects visual dominance" (LandWorks 2013a, p. 91). Visual dominance is an attribute of the view, but there is no description how it is measured or where the rating Thresholds are located. One might argue that previous four Indicators are all ways to measure Visual Dominance: (1) Number of Visible Turbines, (2) Percent of SRSNS with Visibility of Turbines, (3) Proximity or Distance of Turbines, and (4) Angle of View.

LandWorks states that "The potential for this effect is related to the landscape's visual absorption capability (VAC), which is another factor we consider when determining a project's potential for visual dominance." (LandWorks 2013a, 91). The US Forest Service handbook, *Landscape Aesthetics* states that "Visual absorption capability relates to physical characteristics of the landscape that are often inherent and often quite static in the long term" (Forest Service 1994, p. C.1). In contrast, "landscape visibility [is] a 'perceptual factor' [that is] dynamic" (p. C.1).While a detailed procedure for analysis is not provided, several variables for analyzing VAC are discussed (p. C.4-C.5), and it is clearly expected that the results of the analysis would be mapped (p. C.5). However, there are examples of how to conduct VAC analyses in the literature (e.g., Anderson et al. 1979; Yeomans 1979). There is an expectation that "Forest Service Manual Supplements should be prepared by each region to establish visual absorption capability factors and ranking values, preferably for each landscape province" (p. C.7). I have been unable to locate these Forest Service Manual Supplements.

When queried whether they conducted an analysis to determine VAC, LandWorks (2013b) replied that "As part of our assessment of visual dominance, LandWorks utilized principles applied to the analysis of visual absorption capability (VAC) as a means of informing our professional opinion. We did not conduct an analysis based on data and results in a map, rather we based our assessment mainly on visual observations of the landscape's qualities and their relationship to turbine visibility as indicated in the visual simulations."

However, even at the conceptual level it does not make sense that one would characterize ridgelines (i.e., high points) with a 65-foot forest cover as having the capability to visually

absorb wind turbines that are greater than 300 feet to the turbine hub and almost 500 feet to an upright blade tip. It is reasonable to assume that this is the reason that "the [Maine] Legislature recognizes that wind turbines are potentially a highly visible feature of the landscape"[26] and that "a finding by the primary siting authority that the development's generating facilities are a highly visible feature in the landscape is not a solely sufficient basis for determination that an expedited wind energy project has an unreasonable adverse effect on the scenic character." [27] While the US Forest Service references to VAC concern visual impacts that are below the forest canopy (e.g., harvest openings), the mapped example that they provide shows that high-points have Low VAC while valleys have High VAC, as shown in Figure 2.

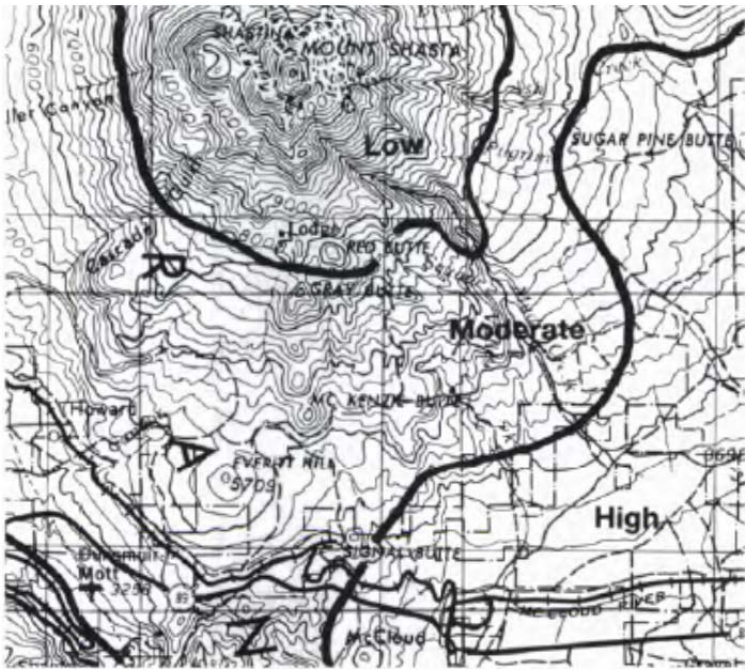


**Figure 2.** Visual Absorption Capability as illustrated in the US Forest Service's Landscape Aesthetics (p. C-7).

LandWorks fully understands this situation and has properly applied it for other clients. In preparing visual management guidelines for Lake George, LandWorks proposed:

> Standard 11.3 Rooflines and other appurtenant structures shall be at a minimum 40 feet below the ground level of any background ridgeline or hilltop elevation when viewed from public vantage points. Under no circumstances shall there be backgrounding or skylining of any structures.
>
> Standard 11.5 Utility towers and transmission and generation facilities shall not be visible from the public vantage points of Lake George and its environs. (LandWorks 2006, p. 6.7).

LandWorks illustrated the problem of how houses on ridgelines can present highly visible unnatural forms that break the skyline, as shown in Figure 3. If ridgelines in cannot visual

[26] 35-A MRSA, § 3402, sub-§2(C)
[27] 35-A MRSA, § 3452, sub-§3

absorb a 50-foot residential structure that uses local materials and architectural styles, how can they visually absorb a 492-foot white wind turbine that has 184-foot blades moving around a point 308 feet in the air?

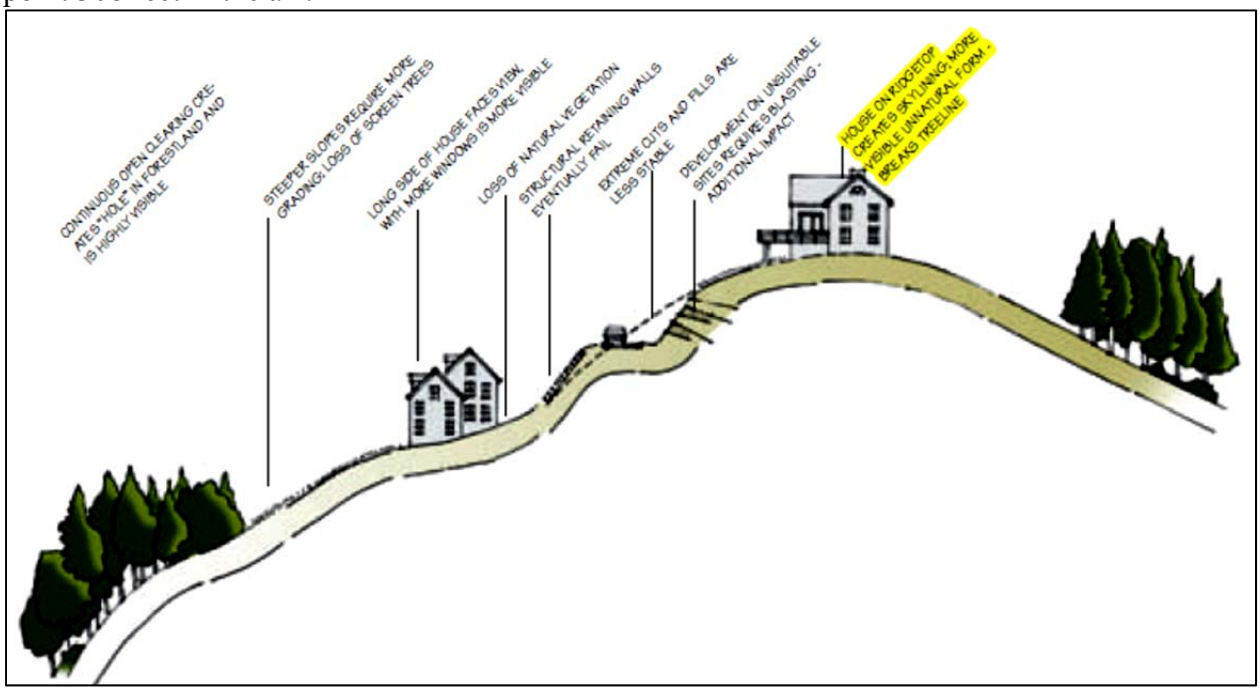


**Figure 3**. This illustration, LandWorks states that a "house on a ridgetop creates skylining, more visible unnatural form breaks treeline" (LandWorks 2006, p. 3.10)

**Visual Clutter/Landscape Coherence**. LandWorks states that "turbines spaced in a linear fashion at fairly regular intervals can be more aesthetically pleasing than turbines that overlap each other and appear jumbled. An example of a project/view that would receive a High rating would be one in which turbines are located on several ridges at varying distances to the viewer, viewed at an angle that results in a high degree of visual chaos due to their overlapping, jumbled appearance" (LandWorks 2013a, p. 94). LandWorks does not present a procedure to measure Visual Clutter/Landscape Coherence. Nor is any literature cited that supports the assertion that in a predominately natural environment, regularly spaced turbines are preferable to a slightly irregular spacing. For instance, is the spacing of the Rollins turbines shown in Exhibit 5 aesthetically more pleasing than the turbines in the Bingham Wind simulation for the Kennebec River in Exhibit 16? It is not at all obvious to me that regular spacing is superior.

LandWorks also states that "Clusters of turbines or structures of different designs can create a potentially discordant appearance and reduce the coherence of the landscape" (LandWorks 2013a, p. 94). This may be true if the turbines are quite different, but it is irrelevant to this project since only one model of turbine will be visible from the SRSNS.

**Summary**. There are six Indicators proposed for Criterion F: Scope and Scale of the Potential Effect of Views of the Generating Facilities. The first four are (1) Number of Visible Turbines, (2) Percent of SRSNS with Visibility of Turbines, (3) Proximity or Distance of Turbines, and (4) Angle of View. While detail procedures are not given, it should be possible to measure each of

these Indicators reliably. There are questions about what is the best approach to measuring each one, for instance should angle of View be based only on a simulation photo or should it be calculated for multiple areas within an SRSNS? There is no attempt to link the Thresholds for evaluating these Indicators to the literature on VIA or landscape perception. This clearly needs to be improved.

No clear procedure is described for measuring two of the Indicators: (5) Visual Dominance, and (6) Visual Clutter/Landscape Coherence. Visual Dominance relies in part on Visual Absorption Capability (VAC). LandWorks reported that they did not conduct a VAC analysis. Examples are provided that indicate ridgelines have very Low VAC, including work by LandWorks for another client. This contradiction and the failure to describe the analysis procedure undermine the credibility of Visual Dominance as an Indicator.

In the case of Landscape Coherence, it is asserted that turbines regularly spaced along a ridgeline are more aesthetic than irregularly spaced turbines. No evidence or literature is cited that would support this assertion; no way measure and evaluate Landscape Coherence is given. The Bingham VIA does contain several photographs of the Rollins Wind project (LandWorks 2013a, Exhibit 5), where the turbines are regularly spaces. When compared to the irregularly spaced turbines as seen in the Kennebec River simulation (LandWorks 2013a,Exhibit 16), it is not immediately clear that the regular spacing has less scenic impact.

**2.6.8 Summary Matrix of the Scenic Analysis.** LandWorks (2013a, p. 97) presents the evaluation for each Criterion in the form of a summary matrix. No procedure is described for how the Overall Scenic Impact for a SRSNS is obtained, though there is a footnote that suggests they are averaged (LandWorks 2013a, p. 98). Nor is there a procedure for determining how the Overall Scenic Impact across all SRSNS is obtained.

**2.7 Associated Facilities**

LandWorks proposes to use the same methods to evaluate associated facilities that were used for evaluating the generating facilities. They employed an 8-mile viewshed from each of the associated facilities, though they note that the 3-mile viewshed is generally more appropriate. I concur that visibility of the associated facilities is relatively minor, and that they will not be visible from any of the SRSNS within 8 miles of the generating facilities.

However, LandWorks does not identify all of the SRSNS within 8 miles of the generator lead line. Sebac Lake and the Piscataquis River are identified, but there are several historic properties on the National Register of Historic places that are not:

- Eva and Walter Burgess Farm, Dover-Foxcroft
- James Sullivan Wiley House, Dover-Foxcroft
- Robert Carleton House, Sangerville. 12/6/1975
- Sangerville Town Hall, Sangerville
- H. Hudson Law Office, Guilford
- Guilford Memorial Library, Gilford

- Straw House, Guilford

There is no visibility from any of these additional potential SRSNS to the associated facilities.

## 3. Summary and Conclusions

This review has evaluated the adequacy of the *Visual Impact Assessment for the Proposed Bingham Wind Project* (LandWorks 2013a). The review simultaneously considers two questions:

1. Is there sufficient evidence presented to support LandWorks' conclusion that "the proposed Project conforms with the provisions of the Act, is well sited and designed and would not have an unreasonable adverse effect on the scenic character or existing uses related to the scenic character of any scenic resource of state or national significance" (p. 2)?
2. Are the procedures and evaluation thresholds used clearly described so that they may be reliably applied, and us their validity supported by evidence or cited literature?

### 3.1 Determination of No Unreasonable Adverse Effect

In reviewing the Bingham Wind Project, it has become clear that LandWorks is correct in stating that this project "is well sited." There are a dozen SRSNS and none is within 3 miles of any turbine. Sixty-three potential turbine locations were evaluated, and only four SRSNS has any visibility with the greatest visibility being 12 turbine hubs and at most a couple more blade tips from a small area of Wyman Lake. The area of visibility from SRSNS is a relatively small proportion of their total area, and the most sensitive SRSNS—the Appalachian National Scenic Trail—will have no visibility. It is this lack of proximity and visibility that make this such a suitable location for a wind project, since according to the WEA there can be no unreasonably adverse scenic impact if the development does not "significantly compromise views from a SRSNS."[28]

### 3.2 Procedures and Evaluation Thresholds

LandWorks has made good use of the primary tools for conducting a standard VIA. They appear to have accurately located and described all the project elements (e.g., the turbines, roads, generator lead line, etc.). They have identified all of the SRSNS within 8 miles of the generating facilities (though they missed some beyond this range that were within 8 miles of the generator lead line). They have created visibility maps that appear to be accurate, though they include the visibility of generating facilities that are further than 8 miles from the observer and are therefore "insignificant" by the WEA's standards. They appear to have conducted adequate fieldwork to acquaint themselves with the project area's landscape character and visual quality. They have prepared photosimulations that appear to be quite accurate, though they use photographs with lighting or atmospheric conditions that do not represent common high contrast viewing conditions. In other words, the basic working tools needed to conduct a VIA analysis have been created and are of a quality commonly found in professionally prepared VIAs. However, LandWorks' analysis of the information they have gathered is poorly described, and frequently amounts to professional opinion without any supporting evidence.

LandWorks (2013a, p. 40-41) seems to agree that objective Indicators need to be identified that are valid measures of the WEA Criteria. Clear procedures need to be described for each

[28] 35-A MRSA, § 3402, sub-§3(C)

Indicator, so that the measurement can be performed reliably. LandWorks (2013a, p. 59) acknowledges that "reliable, quantitative data" are preferred, but when not available it may be necessary to use qualitative data or professional judgment. The evaluation of the Indicator measurements requires the identification of Thresholds to interpret the severity of the potential impact. When possible these Thresholds need to be grounded in evidence or cited literature that provides them with a rational basis. When this is not possible, professional judgment must be used to establish Thresholds and some explanation given to justify where the Thresholds are set.

It is acknowledged that the transition from conducting VIAs based primarily on professional opinion to implementing a VIA procedure based on the WEA Criteria, valid Indicators, and reliably measured Thresholds is not a simple task, and that it is evolving. In conducting this review, there are many comments asking for (1) some evidence or cited research literature that shows the Indicator is a valid for the specified Criterion, (2) a clearly described procedure for reliably measuring the Indicator, and (3) some evidence or cited research literature to support the validity of the Thresholds. These are questions are not easily answered, but they are similar to what is expected of the other environmental factors evaluated under the Site Law or NRPA.

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# Appendix 1

# Review Maps

Map 1: Terrain Viewshed for Blade Tips

Map 2: Terrain Viewshed for Turbine Hubs

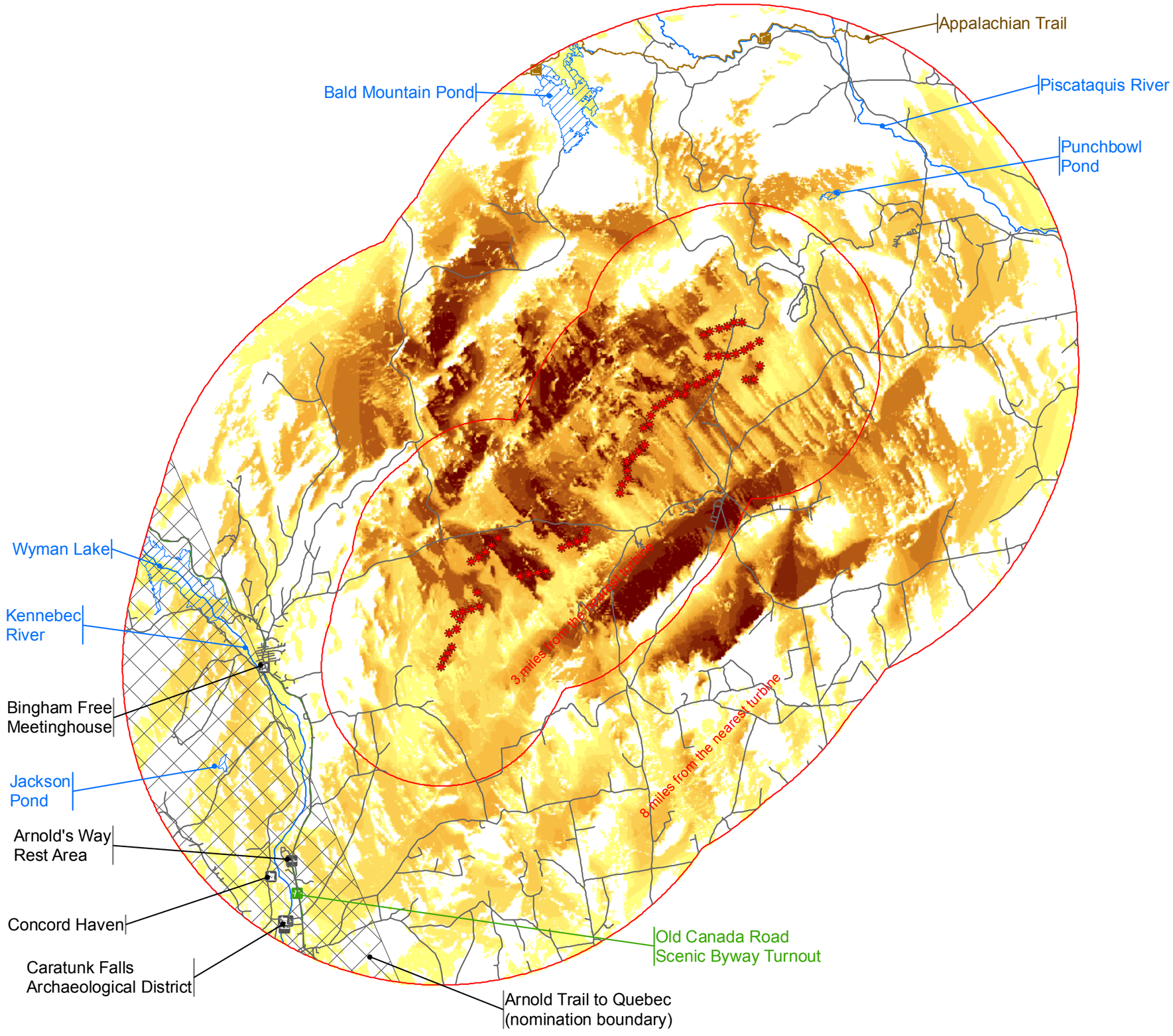
Map 3: Forested Viewshed for Blade Tips

Map 4: Forested Viewshed for Turbine Hubs

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 Bingham 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
# Terrain Viewshed for Blade Tips
# Bingham Wind Project

GIS viewshed mapping is a preliminary means of visual analysis. While beneficial for preliminary orientation and investigation, because of data assumptions and omissions, viewshed maps are not a definitive indication of visibility. Potential visibility needs to be confirmed through field investigation and other visualization techniques.




## Legend

### Turbines

| 1 - 5 | 6 - 10 | 11 - 15 | 16 - 20 | 21 - 25 | 26 - 30 | 31 - 35 | 36 - 40 | 41 - 45 | 46 - 50 | 51 - 55 | 56 - 63 |
|---|---|---|---|---|---|---|---|---|---|---|---|

### Scenic Resources of State or National Significance

- Lakaes and Rivers
- National Register of Historic Places
- National Park Units
- Scenic Road Turnout

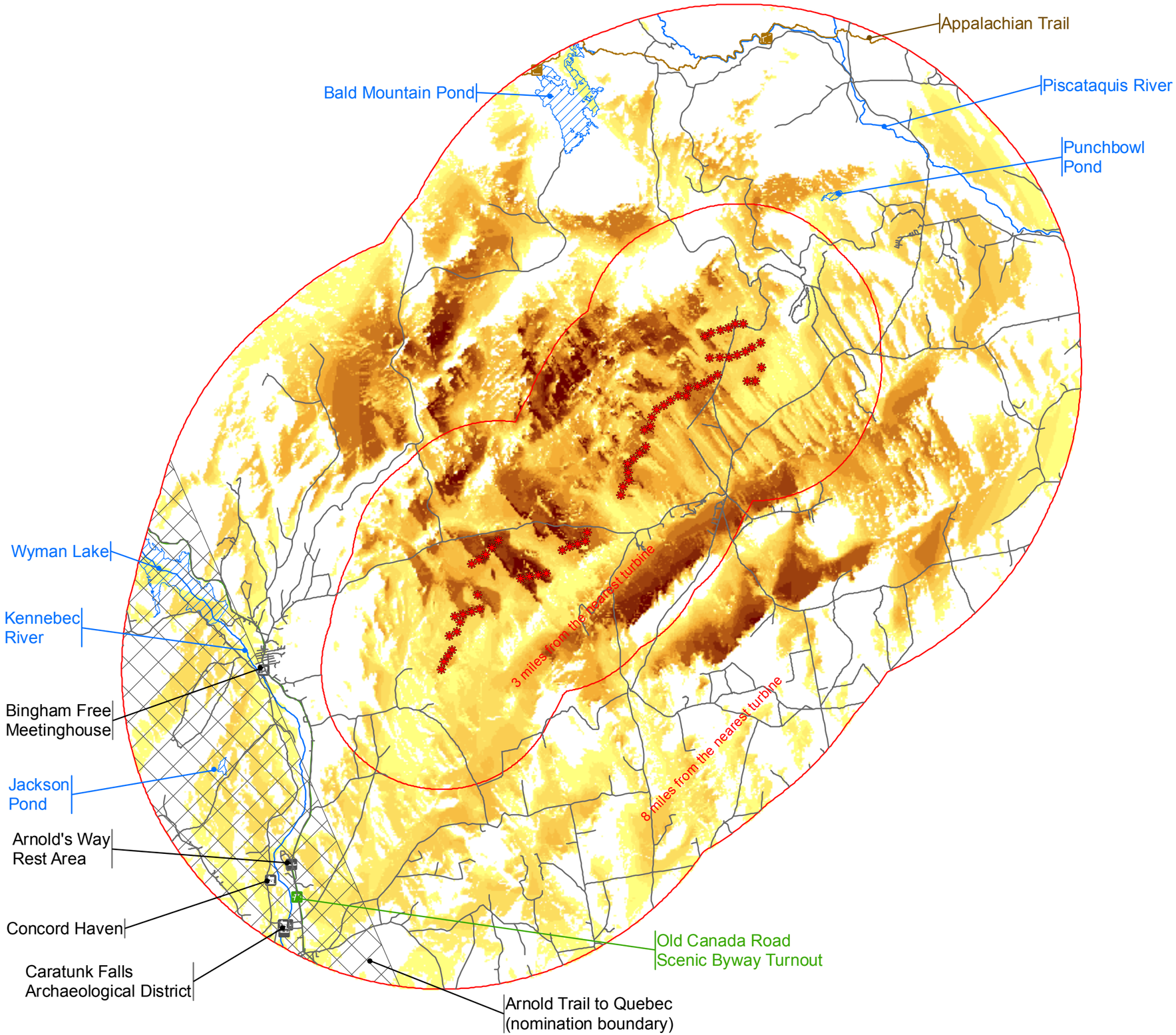
N

0 1 2 4 6 8

Miles

# Map 2
# Terrain Viewshed for Turbine Hubs
# Bingham Wind Project

GIS viewshed mapping is a preliminary means of visual analysis. While beneficial for preliminary orientation and investigation, because of data assumptions and omissions, viewshed maps are not a definitive indication of visibility. Potential visibility needs to be confirmed through field investigation and other visualization techniques.




## Legend

### Turbines

1 - 5
6 - 10
11 - 15
16 - 20
21 - 25
26 - 30
31 - 35
36 - 40
41 - 45
46 - 50
51 - 55
56 - 63

### Scenic Resources of State or National Significance

- Lakaes and Rivers
- National Register of Historic Places
- National Park Units
- Scenic Road Turnout

N

0 1 2 4 6 8

Miles

# Map 3
# Forested Viewshed for Blade Tips
# Bingham Wind Project

GIS viewshed mapping is a preliminary means of visual analysis. While beneficial for preliminary orientation and investigation, because of data assumptions and omissions, viewshed maps are not a definitive indication of visibility. Potential visibility needs to be confirmed through field investigation and other visualization techniques.

## Legend

### Turbines

1 - 5
6 - 10
11 - 15
16 - 20
21 - 25
26 - 30
31 - 35
36 - 40
41 - 45
46 - 50
51 - 55
56 - 63

### Scenic Resources of State or National Significance

- Lakaes and Rivers
- National Register of Historic Places
- National Park Units
- Scenic Road Turnout

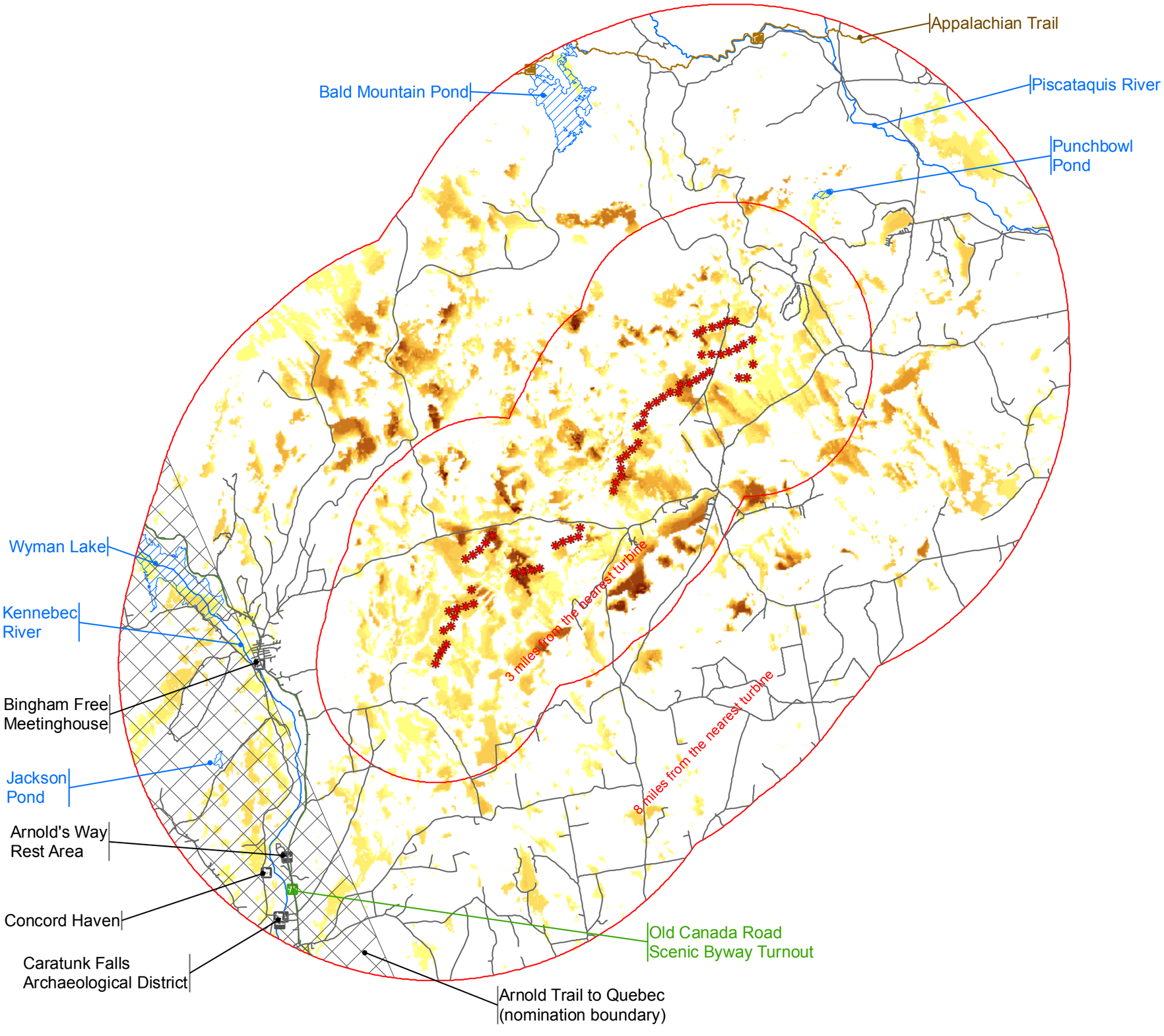
N

0 1 2 4 6 8
Miles

Appalachian Trail
Bald Mountain Pond
Piscataquis River
Punchbowl Pond
Wyman Lake
Kennebec River
Bingham Free Meetinghouse
Jackson Pond
Arnold's Way Rest Area
Concord Haven
Caratunk Falls Archaeological District
Old Canada Road Scenic Byway Turnout
Arnold Trail to Quebec (nomination boundary)
3 miles from the nearest turbine
8 miles from the nearest turbine

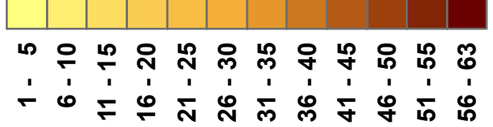
# Map 4
# Forested Viewshed for Turbine Hubs
# Bingham Wind Project

GIS viewshed mapping is a preliminary means of visual analysis. While beneficial for preliminary orientation and investigation, because of data assumptions and omissions, viewshed maps are not a definitive indication of visibility. Potential visibility needs to be confirmed through field investigation and other visualization techniques.




## Legend

### Turbines




### Scenic Resources of State or National Significance

- Lakaes and Rivers
- National Register of Historic Places
- National Park Units
- Scenic Road Turnout

N

0 1 2 4 6 8

Miles

# Appendix 2

# ArcScene Visualizations

Visualization 1: Bald Mountain Pond

Visualization 2: Wyman Lake

Visualization 3: Kennebec River

Visualization 4: Punchbowl Pond

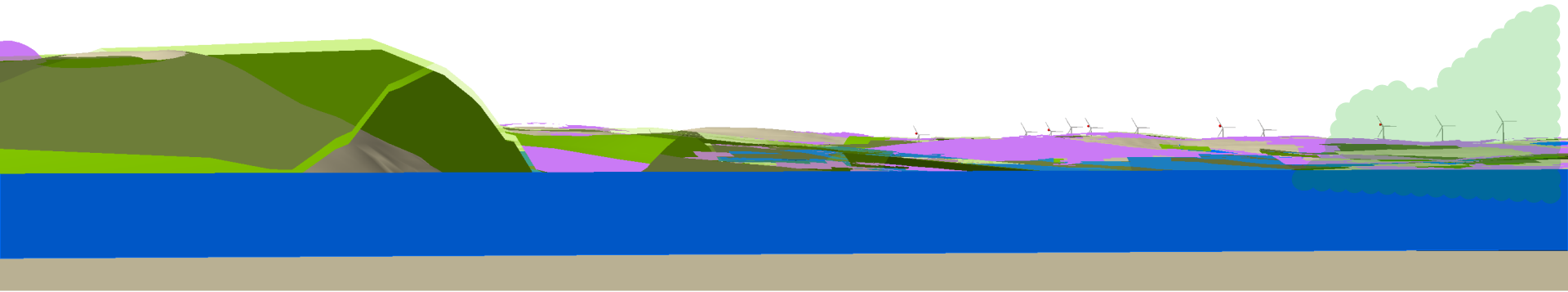
The purpose of these visualizations is to validate the relative accuracy of the *Visual Impact Assessment for the Proposed Bingham Wind Project* photographic simulations (LandWorks 2013a, Exhibits 15 and 16). They are created using the location and camera information from the photograph metadata and GIS database that were used to prepare the Bingham Wind Project 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 Punchbowl Pond visualization, there is a second canopy in lighter translucent greens at 18 meters (60 feet). The representation of foreground vegetation may not be accurate. A red dot is placed above the nacelle of those turbines that have been identified as having FAA aviation warning lighting. The horizontal angle of view is 45 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.

**ArcScene Visualization 1: Bald Mountain Pond**

The purpose of this visualization is to validate the relative accuracy of Visual Simulation from Bald Mountain Pond (LandWorks 2013a, Exhibits 12 and 19). 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 for the Proposed Bingham Wind Project.* Two forest canopy layers are shown in green, a darker opaque one at 40 feet and a lighter semi-transparent one at 60 feet high. Areas of light partial cutting since 1995 or forested wet lands are shown at 40 feet in purple. The representation of foreground vegetation may not be accurate. The turbines are 150 meters to the upraised blade tip. The FAA aviation warning lighting is represented as a red dot above the nacelle. The horizontal angle of view is 45 degrees, and the visualization will be in proper perspective when viewed from a distance 1.2 time its width.

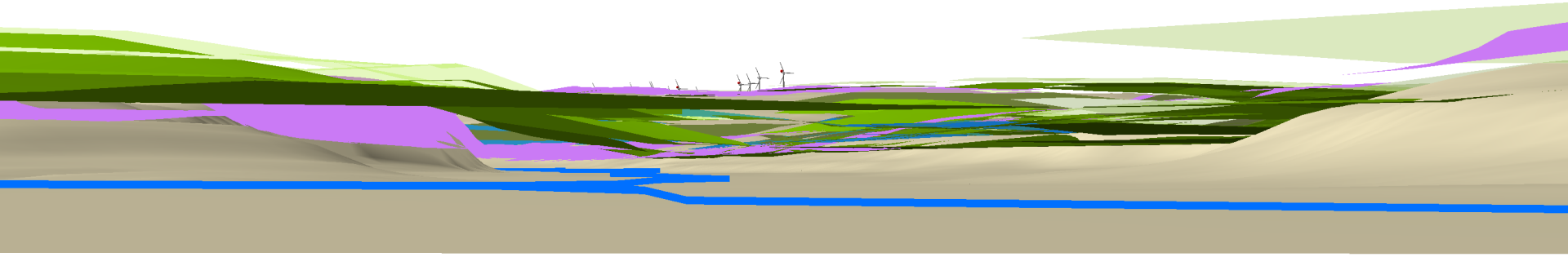
**ArcScene Visualization 2: Wyman Lake**

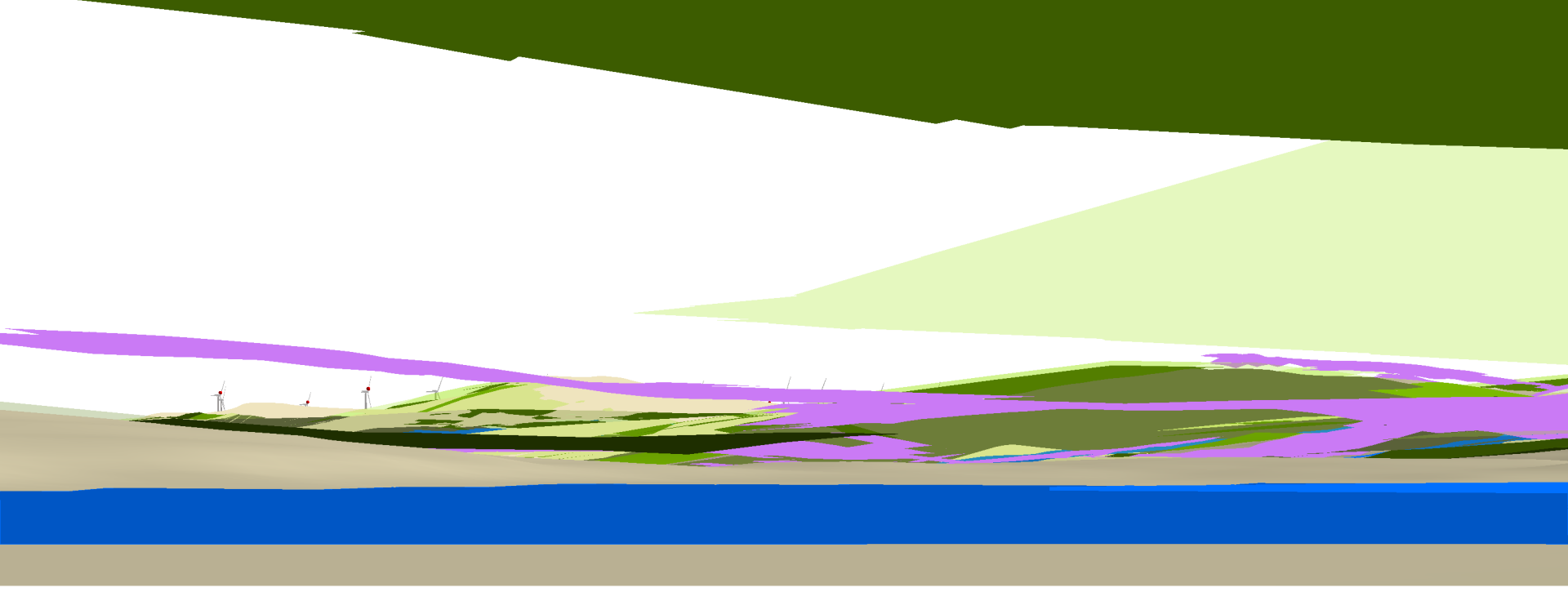
The purpose of this visualization is to validate the relative accuracy of Visual Simulation from Wyman Lake (LandWorks 2013a, Exhibits 12 and 19). It is created using the location and camera information from the photograph metadata and GIS database that were used to prepare the *Visual Impact Assessment for the Proposed Bingham Wind Project.* Two forest canopy layers are shown in green, a darker opaque one at 40 feet and a lighter semi-transparent one at 60 feet high. Areas of light partial cutting since 1995 or forested wet lands are shown at 40 feet in purple. The translucent green polygon screening the three turbines on the right represents foreground vegetation visible in the original photograph. The turbines are 150 meters to the upraised blade tip. The FAA aviation warning lighting is represented as a red dot above the nacelle. The horizontal angle of view is 45 degrees, and the visualization will be in proper perspective when viewed from a distance 1.2 time its width.



**ArcScene Visualization 3: Kennebec River**

The purpose of this visualization is to validate the relative accuracy of Visual Simulation from Kennebec River (LandWorks 2013a, Exhibits 12 and 19). 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 for the Proposed Bingham Wind Project.* Two forest canopy layers are shown in green, a darker opaque one at 40 feet and a lighter semi-transparent one at 60 feet high. Areas of light partial cutting since 1995 or forested wet lands are shown at 40 feet in purple. The representation of foreground vegetation may not be accurate. The turbines are 150 meters to the upraised blade tip. The FAA aviation warning lighting is represented as a red dot above the nacelle. The horizontal angle of view is 45 degrees, and the visualization will be in proper perspective when viewed from a distance 1.2 time its width.





**ArcScene Visualization 4: Punchbowl Pond**

The purpose of this visualization is to validate the relative accuracy of Visual Simulation from Punchbowl Pond (LandWorks 2013a, Exhibits 12 and 19). 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 for the Proposed Bingham Wind Project.* Two forest canopy layers are shown in green, a darker opaque one at 40 feet and a lighter semi-transparent one at 60 feet high. Areas of light partial cutting since 1995, including the shoreline trees on the opposite shore are shown at 65 feet in purple. The representation of foreground vegetation may not be accurate. The turbines are 150 meters to the upraised blade tip. The FAA aviation warning lighting is represented as a red dot above the nacelle. The horizontal angle of view is 45 degrees, and the visualization will be in proper perspective when viewed from a distance 1.2 time its width.